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EARSeL Newsletter

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The Newsletter is a forum for an exchange of news and views among the members of the Association. The opinions expressed in the Newsletter do not necessarily reflect the views of the editor, the EARSeL Bureau or the other members of the Association.

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1 EDITORIAL

It is with great pleasure that I can inform you that the executive of EARSeL has approved changes to the Newsletter that I think will make it a better product for us. At this stage it has been decided to maintain the hardcopy version of the Newsletter, and to supplement this with an electronic version.

The hardcopy version has been maintained because it has the capacity to be used to promote EARSeL in ways that are not available to the electronic version. For example, display of the Newsletters within university libraries promotes EARSeL and its activities to prospective graduates working in or with remote sensing. However, to make it more attractive, it has been decided to change the cover of the newsletter so as to incorporate images on the front and back covers. It will not have colour within the body of the Newsletter. At this stage, the same images will be maintained for the four issues in the one-year. I expect that this change will take place from the June issue of the Newsletter, subject to acceptance of a suitable design.

The electronic version will be placed on the EARSeL website. It will, of course, be able to include colour images within the body of the Newsletter. The members of EARSeL will be notified of the issue of a new edition of the newsletter, and they will be able to arrange for other members of staff covered by their EARSeL membership to also be informed. It has been decided to initiate an electronic version because this version can be distributed in ways that are not convenient or more expensive for a hardcopy version, and because it can include coloured image material. At this stage the design process for the electronic version is also taking place.

This issue of your newsletter is dominated by the national reports of most of the member countries represented in EARSeL. It is essential that EARSeL have at its disposal up to date information on the status of remote sensing in Europe and the status of its member laboratories. Such information is important for at least two reasons; other members of EARSeL have access to information on complimentary groups in other parts of Europe that they may need to find partners in proposed applications or contracts, and EARSeL itself needs to be able to identify issues as they arise that may require some form of reaction from EARSeL itself on behalf of its members.

Most of us are aware of what is happening within our own countries, simply because of the existence of a dense network of communications of various forms, where most of these networks are not set up for remote sensing at all. However, few of us are aware of what is happening within the broader European area, simply because few such networks exist at this level. Yet we are likely to need to interface more and more across the whole of the European arena as the concept of the European Union becomes more integrated into daily life. Certainly the European Commission wants this to occur as can be seen from the conditions that must be met to receive research funding from the EU. Such a trend is likely to be accompanied by increasing specialisation as in fact is happening in the USA where different laboratories tend to specialise in different aspects of remote sensing and its application.

Such information does not change at an annual pace, and so it does not need to be included in each annual report. It is in recognition of the need for this type of information that I initiated "The Country Report" in the newsletter. However, it may be more valid to in fact have such information incorporated within our webpage in some way.

The second has to do with evolving issues that are relevant to EARSeL and its member institutions. Frequently such needs will not be appreciated until the information from the different countries is pooled, so as to identify trends and tendencies that are not obvious at the national level. It is for this reason that we do need an annual report. For example, it may become obvious that trends in research funding policy across Europe are detrimental to the development of applications in remote sensing, or that the need for particular types of skills that may be thought of as being a local problem are in fact a problem across most of Europe. It is to help us identify such trends that we need an

annual report from the member countries of EARSeL.

If the annual report is to provide a consistent picture of the status of Remote Sensing in Europe, then the national reports need to also be consistent in their content and depth. We started moving towards this goal at our last meeting in Frascati. I hope that we will continue to move in this direction, so as to provide guidance to our national representatives on the contents of the national reports, and so that we can then distil more useful information out of these reports.

Keith McCloy, Editor.

2 NATIONAL REPORTS

2.1 AUSTRIA

The continuation of the national programme for space research and development (ASAP - Austrian Space Application Programme), which is approved and financed by the Ministry for Transport, Innovation and Technology and coordinated and monitored by FFG is supporting several remote sensing projects for different applications. In reply to the call in 2005 for new proposals 45 projects were received including nine related to remote sensing and the use of satellite data. The international peer group evaluated all proposals and recommended seven remote sensing projects for implementation. Contract negotiations are in progress.

Several ENVISAT projects were financed in the time period 2002-2005 with an overall financial support of 1 M . In Austria as in some other countries no special budget line is available for remote sensing projects. Scientists have at national level to apply to ASAP, which is providing support for all space related research. During the first period of ASAP from 2002 – 2006 some 2,8 M were awarded to remote sensing activities. In addition financing can be requested and has been achieved from ESA programmes (EOEP and GMES Service Element) and the framework programme of the EC.

Projects from the first ASAP phase have been completed and final reports are available. One of these projects (NEOS-QUICK, Novel Earth Observation Systems) with the aim to develop and prove a concept for the verification of parameters as required by the Kyoto-Protocol is carried out by a value adding company (GeoVille) in cooperation with research and university institutes. At four different test sites the implementation has been verified with the involvement of the users responsible at national and regional level for reporting the actual situation as defined in the Kyoto-Protocol.

A project sponsored by the Ministry for Transport, Innovation and Technology to support the GMES initiative of the EC and ESA, deals with the application of satellite remote sensing data from different sensors, combined with GIS information, to monitor and improve the security on Alpine transport routes (highways and railroad lines). This project was carried out by the value adding companies Geospace and ENVEO in cooperation with the scientific institute Joanneum Research. The results have been presented at the EURISY Conference on "High Mountain Security", Geneva, 08/09. September 2005.

In 2005 ESA issued a call for ideas for the next Earth Explorer Core missions in the framework of the Earth Observation Envelope Programme (EOEP). Some 25 proposals have been received and are under evaluation. Two of these proposals tabled by international science groups are under the leadership of Austrian scientists as principal investigators. One project is based on high frequency SAR sensors (Ku- and X- bands) for improved snow and ice monitoring applications in hydrology, water management and climate research. The other project is using the occultation methods to achieve improved atmospheric data (temperature, pressure, humidity) on

a global and continuous basis for meteorology application and climate monitoring.

Several international events related to remote sensing from space were hosted and supported by Austrian and through the active involvement of Austrian scientists in 2005:

The EURISY/ESA/Austria/Switzerland Conference on High Mountain Security was held in Geneva, 8 – 9th September 2005.

United Nations/Austria/European Space Agency Symposium on space applications to support the plan of implementation of the World Summit on Sustainable Development dealing with "Space Systems – Protecting and Restoring Water Resources", from 13-16 September 2005 in Graz.

In 2006 the EARSeL Special Interest Group on Forestry is organising a workshop on 3D Remote Sensing in Forestry at the University of Natural Resources and Applied Life Sciences in Vienna from 14-15 February.

Austria has the Presidency of the European Union in the first half of 2006. Within this framework the Ministry for Transport, Innovation and Technology has decided to organise a conference on the GMES initiative of the EC and ESA. From 19-20 April 2006 this event will take place in Graz as "A Market for GMES in Europe and its Regions – the Graz Dialogue". The European Space Policy Institute (ESPI) in Vienna will coordinate the programme. Key speakers representing all major stakeholders, users and service providers will be invited. The audience will comprise selected representatives of public entities at national, regional and local levels from all member states, present and potential end users of Earth observation applications and relevant industrial representatives.

The Aeronautics and Space Agency of FFG is continuing the long tradition of the yearly summer schools in Alpbach/Tyrol, which since 1975 was carried out by ASA to educate the young generation on space related topics. This year the selected topic is "Monitoring of Natural Hazards from Space". The event will take place from 25 July to 3 August. The summer school is supported by space agencies of all the ESA member states. Additional details can by found on: -

http://www.ffg.at.

Dr. Erwin Mondre, Aeronautics and Space Agency of FFG, Vienna

2.2 BELGIUM

The VEGETATION (VGT) programme ended in December 2005, while the STEREO I programme lasts until December 2006. The total budget dedicated to research on EO has been 14 M€ over a six years period, and in total 45 projects have been financed. 65 % of the budget of our programmes has been used to build and consolidate the scientific expertise, 28 % to the technological transfer and the development of products and operational services to the benefit of the public and private sectors, 6 % to support the development of new hyperspectral activities, and 1 % to shared-cost actions.

The programmes focused mainly on following five thematic priorities: Vegetation at global scale, vegetation at local scale and agriculture, cartography and land planning, coastal zones and innovation. More details about the projects (promoters, objectives, results, etc.) are available on our website: -

http://telsat.belspo.be/projects/project.asp.

We invite you to perform the search by "Research programme", choosing STEREO or VGT.

Two conferences were organized in 2005 to officially close several projects dealing with agriculture and vegetation at local scale (**http://telsat.belspo.be/documents/habay2005.html**), and on spatial information mining for local and regional authorities on the basis of VHR images (**http://telsat.belspo.be/documents/spider2005.html**).

Market development.
In 2005, we started a new project to develop an information service from hyperspectral techniques to assess the environmental impact of mining and industrial activities (MINPACT, 24 months: - **http://telsat.belspo.beprojects/projectresult. asp?var=267**).

Hyperspectral Remote Sensing.
Within the framework of the commitments to the development of the ESA imaging spectrometer APEX (Airborne Prism EXperiment), our programmes support hyperspectral activities in order to familiarize the scientists with this new type of data. Following the earlier hyperspectral flight campaigns of 2004, the Belgian Science Policy invited the Belgian and international teams involved to present the results in a workshop in Bruges (7 October 2005). The presentations are available on the web page: -

http://telsat.belspo.be/documents/bruhyp2005.html.

In 2005, a fourth hyperspectral flight campaign with an AHS 160 sensor was organized in collaboration with Vlaamse Instelling Voor Technologisch Onderzoek (VITO, Belgium) and INTA (Spain). The call for proposals was opened to international teams. They were not financed, but they received the datacubes. Six projects were selected. Twelve test sites were surveyed in June and July 2005 over Belgium, Luxembourg, the Netherlands and Spain. A fourth workshop will be held on 10 October 2006.

The hyperspectral data from previous campaigns are available for a minimal fee (250 €) for scientific usage only one year after acquisition: -

http://campaigns.vgt.vito.be.

The 1st HyperTeach training course (**http://hyperteach.vgt.vito.be**), funded by the Belgian Science Policy Office was held in the premises of VITO, K.U.Leuven and the Royal Museum for Central Africa, in collaboration with Management Unit of the North Sea Mathematical Models. This course was intended to theoretically and practically introduce early-stage researchers and decision-makers to hyperspectral remote sensing. Three parallel sessions of hands-on exercises addressed water, geology and biodiversity specific applications. The course was a great success with 35 participants, 15 of whom came from foreign countries.

On 1 September 2005 airborne hyperspectral CASI images were acquired over the coral reefs surrounding the islands Pulau Fordata and Pulau Nukaha in the South-East Moluccas in Eastern Indonesia. The aim of the KABAR project of VITO, University of Ghent and BPPT (Indonesia) which was funded by the Belgian Science Policy Office is to map the reef ecosystem (i.e. species distribution and health status) and the geomorphology using bathymetry and to integrate airborne and spaceborne remote sensing data with in-situ measurements.

In the frame of the STEREO I project HYPERKART (led by VITO), a semi-automatic method to map dune vegetation along the entire Belgian coast was developed and validated.

From February 2006, VITO will lead for 2 years the FP6-SSA HYRESSA project (10 partners) to improve the coordination of flight campaigns and to increase the use of hyperspectral images in Europe.

EODESK educational projects.
In 2005, a complete coverage of Belgium with Landsat 7 images was made available on the website: - (**http://telsat.belspo.be/beo/mapviewer/viewer.aspx**).

Teachers and the public at large are able to download Landsat 7 ETM+ images of 500 by 500 pixels (7,5 km by 7,5 km on the ground), and this for any part of Belgium. The four bands (blue, green, red and infrared) of the images, as well as true and false color composites, are available.

RELATED EO ACTIVITIES IN BELGIUM

Geomatics Engineering group (KULeuven). The Geomatics Engineering group at the Biosystems Department of the KULeuven, under supervision of Prof. Pol Coppin, is involved in the process of integration of data from hyperspectral sensors and digital terrestrial instruments for enabling the evaluation of vitality or to predict stress, quality and harvest in vegetative systems such as fruit orchards and forests. Moreover, they use time series analysis to study

generally large-scale process dynamics. Current studies with study sites in South-Africa include the monitoring of vegetative regrowth after natural disasters such as fire, and evaluation of vegetative fire sensitivity through water and environmental indicators, together with the development of fire risk indicators. Parallel quantitative ground measurements are also essential to identify the causal agents responsible for changes. They focus on quantities like leaf area, vitality, and structural forest indicators. They also develop a complex virtual 3D-forest model, in order to simulate the 3D reflection of a forest canopy. They are creating a fully automated ground-based LIDAR measurement system that will facilitate data acquisition for 3D-models and allow the direct derivation of forest structural variables in order to develop a standardized structural descriptor that will be exclusive, as well as repeatable. For additional information, visit them at: -

http://www.biw.kuleuven.be/lbh/lbnl/sites/Engels/geomatics.htm.

VITO's UAV.
Since 2005, the Pegasus High Altitude Long Endurance Unmanned Aerial Vehicle (HALE UAV) team of VITO has been preparing test flights with a scale model scheduled in Spring 2006 and acceptance flights with the Mercator High Altitude Long Endurance UAV scheduled in Summer 2006: - (**http://www.pegasus4europe.com/pegasus/index.htm**).

Belgian participation in ORFEO.
Belgium committed 28.2 M€ (2004-2009) to support the French Earth Observation programme "Pléiades" and the accompanying French-Italian preparatory programme ORFEO (Optical and Radar Federated Earth Observation). The Belgian scientific EO community has been actively involved in 5 thematic working groups (Agriculture, Cartography, Civil security, Coastal zones, Forest). In June 2005, a call for proposals (1.1 M€) was launched to grant methodological research (PhD and post-doctorates) using simulated Pléiades and Cosmo-Skymed data. A panel of international experts selected six proposals to be financed. Belgian researchers involved in both thematic and methodological projects will participate in the common workshop organized by CNES in Paris on March 23-24, 2006.

Belgian collaboration with UNESCO.
Belgian Science Policy supports two scientific projects in collaboration with the programme "Earth Observation from Space" of UNESCO to edit a new map of Democratic Republic of Congo (SYGIAP project), and to develop an operational chain to monitor the coral reefs in Indonesia (KABAR project, see **Hyperspectral Remote Sensing**). The new map of Democratic Republic of Congo (1:2,000,000) is achieved and will be edited in March 2006.

News from Belgian participation in DUE.
VITO will coordinate the SEVESEO ESA-DUE project. The kick-off meeting was held in January 2006. The SEVESEO project will develop geo-spatial techniques for the management of industrial risks and technological accidents by mapping risks for SEVESO II industrial sites integrating environmental parameters derived from satellite images. The SEVESEO information systems will be demonstrated on SEVESO II test sites located in five countries (Belgium, Luxembourg, France, Germany and the Netherlands).

Belgian participation in GMES.
Several Belgian remote sensing laboratories and private companies are involved in both ESA and FP6-EC projects: GUS, GSE Forest Monitoring, SAGE, Risk-EOS, TerraFirma, GMFS, CoastWatch, ROSES, Icemon, Northern View, Respond, Promote, GMES Maritime Security, GSE Land, geoland, GMOSS, Hawkeye, VGT4Africa. Additional information is available on the GMES website: - (**http://www.gmes.info**).

ESA station in Redu.
The ESA ground-station of Redu (in the Belgian Ardennes) has recently contributed to the success of two major "firsts" for Europe in space. First, on 9 December 2005, a bi-directional laser link was achieved between European ARTEMIS at some 35,800 km altitude and Japanese Kirari/OICETS in 600-km orbit. Second, on 12 January 2006, the first Galileo navigation signals were received from GIOVE-A satellite. This achievement is described as a crucial one to

register the L-band frequencies for the Galileo system. Moreover, the station of Redu is the control centre for the first Belgian sun-synchronous satellite PROBA-1: - (**http://www.esa.int/SPECIALS/Proba_web_site/index.html**).

Events organized in Belgium.

- The IAMG'2006 annual conference on "Quantitative Geology from Multiple Sources" (**http://www.geomac.ulg.ac.be/iamg06/**) is organized by the Department of Georesources, Geotechnologies and Building materials (**http://www.geomac.ulg.ac.be/**) of University of Liège and will be held in Liège on September 3-8, 2006.
- VITO co-organises with the ISPRS Inter Commission Working Group I/V the second International Workshop "The future of Remote Sensing" which will be held in Antwerp (Belgium), on 17 and 18 October, 2006 (**http://www.pegasus4europe.com/pegasus/workshop/home.htm**). The first results from the UAV flights will be presented there.

PREPARING THE FUTURE

Towards STEREO II.

Year 2005 was mainly a transition period devoted to the preparation of the second programme STEREO II (Support to the Exploitation and Research in Earth Observation). The programme STEREO II (2006-2013, 25.85 M€) was approved by the Council of Ministers on 3 February, 2006. STEREO II will focus on four main thematic priorities: (I) Global monitoring of vegetation and large terrestrial ecosystems; (II) Environmental management; (III) Health and humanitarian aid; (IV) Security and risk management. The first call will be launched before summer 2006.

Opening of STEREO II to international teams. Call for proposals of STEREO II will be opened to international scientific partners to encourage them to go into partnership with Belgian teams. Their participation could reach maximum 20 % of the total budget of the proposal, half of which will be funded by STEREO II.

For additional information, please contact the programme managers (**carine.petit@belspo.be** or **joost.vandenabeele@belspo.be**).

Towards a VEGETATION follow-on.

Within the framework of bilateral agreements with France, the Space department of the Belgian Science Policy supported the development and launch of the VEGETATION-1 and VEGETATION-2 on board the SPOT-4 and SPOT-5 platforms, as well as the distribution of their images to the scientific community (**http://www.vgt.vito.be/**). It is expected that VEGETATION-2 will be operational until 2009-2010. Aware of the needs and requirements of European end users in a daily global monitoring of terrestrial ecosystems, Belgium wishes to launch a VEGETATION follow-on to ensure the data continuity.

Carine Petit
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2.3 CANADA

During the past year, Canada has been very active in Remote Sensing in all sectors of the Earth Observation community, including government, private industry, education, research and associations. This report gives the highlights of major EO programmes in Canada.

The RADARSAT programme.

RADARSAT-1 has celebrated in 2005 its 10th year in orbit and is still working well. Initially planned for a 5-year lifetime, RADARSAT-1 is working beyond expectations and continues providing data to the user community. Over 200 000 requests for data have been processed by the order desk. The Canadian Space Agency (CSA) operates the satellite, MDA Geospatial Services (formerly RADARSAT International) markets and distributes RADARSAT-1 data. MDA also manages the Canadian Data Processing Facility in Gatineau, Quebec, in cooperation with the Canada Centre for Remote Sensing (CCRS).

Scheduled for launch in late 2006,

RADARSAT-2 will be the most advanced commercial Synthetic Aperture Radar (SAR) satellite in the world. The satellite will carry a C-band remote sensing radar with a ground resolution ranging from 3 to 100 metres. Swath widths may be selected in a range from 20 to 500 kilometres. RADARSAT-1 compatible beam modes are also available ensuring data continuity for existing users. Other key features of RADARSAT-2 include the ability to select all beam modes in both left and right looking modes, high downlink power, secure data and telemetry, solid-state recorders, on-board GPS receiver and the use of a high-precision attitude control system. The will continue to operate some of the data acquisition systems

CSA and CCRS activities.

The Canadian Space Agency and the Canada Centre for Remote Sensing are actively involved in the development of Earth Observation activities in Canada. CCRS has recently opened an EO applications division located in the CSA offices in St-Hubert. Besides the developments made in-house, two programs support the development of remote sensing activities: the EOADP (Earth Observation Applications Development Programme) targeted at the value added industry, and the GRIP (Government Related Initiatives Programme) targeted at government departments, mostly at the federal level.

These programmes have brought a strong impulse to the development of innovative applications of remote sensing in a wide range of environments, ranging from sea ice to tropical forests and from the Canadian national territory to international cooperation. CSA is a member of ESA, and as such, it has a strong motivation to participate in European space activities, either directly or through contractual support. In 2004, Canada and France have been celebrating 25 years of cooperation in the Space sector, with an official ceremony in Paris, which did also coincide with the UN joining the International Charter on Space and Major Disasters. CSA is also participating, together with several other federal departments, to the GEO/GEOSS initiative, where Canada is chairing or co-chairing several committees.

The EOADP mechanism has been used in 2004-2005 to support the Canadian contribution to the ESA TIGER initiative for Africa. Seven contracts have been awarded after a call for proposals issued in 2004 and they all support the concept of Integrated Water Resources Mananagement (IWRM), with a strong involvement of African end users. The projects are:

- **Vexcel Canada**: Aquifer and River Basin Resource Evaluation (ARBRE) in Burkina Faso.
- **Golder Associates**: Satellite Hydrogeology for Water Resource Management – Northern Ghana
- **Hatfield Consultants Ltd.**: Nile River Awareness Kit (several countries).
- **Info-Electronics Systems Inc.**: Development of an Integrated Decision Aid System for water resources management based on satellites data for the Souss-Massa basin in Morocco.
- **IUCN Canada**: Remote Sensing and GIS Application in Integrated River Basin Management Vulnerability: Assessment and Formulation of Adaptation Strategies in the Zambezi Delta and Medium Limpopo Basin.
- **Noetix Research Inc**.: Development and Demonstration of EO Technology for Identifying Natural Mosquito Habitats and Predicting Malaria Risk in Africa.
- **Viasat Geo-Technologies**: An operational solution using satellite stereoscopy to provide assistance for sustainable water management in the Volta River Basin.

A roundtable of all projects has been held in Montreal in October 2005 and the next one will probably be held together with the ESA supported projects in the Fall of 2006 in Africa. More information can be found on **http://www.space.gc.ca**.

Canadian Remote Sensing Society (CRSS). The Canadian Remote Sensing Society, a member society of the Canadian Aeronautics and Space Institute, has held its annual Canadian Symposium on Remote Sensing in Wolfville, Nova Scotia, from June 14-16 2005. It was a pleasant symposium, hosted in a seaside resort, where several papers were dealing with the new developments of Lidar technologies. More than 100 participants from all over

Canada were present. CRSS also publishes the Canadian Journal of Remote Sensing, a high quality, peer reviewed journal, which is gaining an increased readership nationally and internationally. It has been recently awarded ISI status. More information on CRSS can be found on **http://www.casi.ca**.

L'Association québécoise de télédétection (L'AQT).

L'AQT has been celebrating its 30th anniversary in 2005. Since 1975, the association has been active in organising symposia, workshops and short courses on remote sensing and applications. In May 2005, it organised its 12th congress in Chicoutimi which was attended by approximately 200 people, several of them coming from overseas. The latest short course, organised in September 2005 in Quebec City, in cooperation with CSA, was on polarimetry, in order to prepare the users to the extended capabilities of RADARSAT-2. More information on L'AQT can be found on **http://www.laqt.org**.

News from EARSeL members in Canada.

There are three EARSeL member laboratories in Canada, according to the EARSeL directory. Two of them are in universities, and one is an industry.

Department of Geomatics Engineering, University of Calgary.

The department is well known internationally for its pioneering work on the development of high precision GPS systems. In the area of Earth observation, Dr. Couloigner and her research team have been developing new algorithms using Radon transform, texture analysis or fuzzy logic classification to detect automatically urban road network and changes in buildings from very high spatial resolution imagery in the aim of updating GIS, to more accurately map wetlands from Landsat imagery, and has been assessing the quality of Ikonos and Quickbird fused images by different data fusion in the case of urban mapping. Dr. Valeo and her research team have been developing a variety of new algorithms to exploit new sensor technology for determining environmental parameters. One study examined ways to improve remotely sensed estimates of Leaf Area Index in Montane and Boreal Forests. Dr. Habib and his research team have been developing new methodologies to semi automatically register multi-source satellite imagery with varying geometric resolutions, integrate photogrammetric and LIDAR data, and generate true orthophoto, and they has been looking at the stability analysis and geometric calibration of Off-the-Shelf digital camera. His team also deals with biomedical imagery applications of photogrammetry. List of publications can be found in the personal webpage of the researchers at: **http://www.geomatics.ucalgary.ca/people/faculty/index.html** .

Centre d'applications et de recherches en télétetection (CARTEL), Université de Sherbrooke.

CARTEL is the largest university based Earth observation research centre in Canada, with 12 research professors, 28 associated researchers, 70 graduate students and 10 postdocs and research professionals. The present director of the centre is Dr Alain Royer. CARTEL celebrated its 20th anniversary in 2005, in a meeting gathering over 100 people in Mount Orford National Park outside Sherbrooke, Québec. One of the highlights of this year's activity has been the International Summer School: *Recent Advances in Quantitative Remote Sensing of the Environment (QUARS 2005)*, held for 10 days in June 2005. It gave the students an opportunity to listen to world-class researchers and to do their field work in the new SIRENE station (Site Interdisciplinaire de Recherche en ENvironnement Extérieur), a unique remote sensing ground truth facility established by the Canada Research Chair in Earth Observation of Dr Ferdinand Bonn, with a support from the Canadian Foundation for Innovation (CFI). Figures 1 and 2 below give an idea of this station where sensors can be "flown" 4 m above the soil surface where all kinds of experiments are conducted (soil moisture, roughness, residue cover, etc). CARTEL is also working presently on the improvement of the CCRS truck based C, L and Ku band scatterometer to prepare future SAR missions, especially RADARSAT-2, and has its own imaging Lidar camera. It operates and coordinates the Canadian network of sun photometers for aerosols measurements at the continental scale (AERO-

Figure 2: CARTEL's SIRENE agricultural plot with hyperspectral sensor above.

CAN), which is part of the NASA managed AERONET network. The centre is also very active internationally, by working on Earth Observation capacity building in Vietnam, Cambodia, Morocco, Madagascar and Burkina Faso. More information on CARTEL can be found on **http://www.usherbrooke.ca/cartel**.

Océ Display Graphics Systems, Inc. (formerly Cymbolic Sciences Inc)
The Océ LightJet 430RS is still the most-accurate, highest-quality photographic imaging system available for Remote Sensing applications. Period. We effectively have no competition in this unique market, where absolute geometric accuracy is critical, and consistency print-to-print is expected. The company anticipates several new installations of the Océ LightJet 430RS in the coming year.The one piece of corporate news that may be of some interest is that Océ Display Graphics Systems has elected to relocate the headquarters of the division from the offices of the former Raster Graphics in San Jose, CA, USA to the offices of the former Cymbolic Sciences in Richmond, B.C., Canada. The management team is once again housed in the same facility where the LightJet is designed and manufactured. Contact: Jeff Edwards, International Product Marketing Manager, Océ Display Graphics Systems, Inc. 13231 Delf Place, Suite 501 | Richmond, B.C. Canada V6V 2C3.
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2.4 CZECH REPUBLIC

Prof. Gottfried Konecny summerized the optimal conditions for remote sensing by following conditions; the country; governmental support; scientific research lead by universities or scientific institutes; and private companies for practical applications during the EARSeL Bureau meeting in Frascati on January 12, 2006. The Czech Republic has a very weak governmental support oriented mainly to the hydrometeorological sphere. The Czech Grant Agency finances only three or four remote sensing projects or projects using remote sensing data per year – each of them is planned for a 3 years period. Ministry of Environment is another sponsor for these activities whose number is usually lower than that for the Czech Grant Agency. The situation is improved by small scale projects processed by remote sensing laboratories of universities and financed by institutional financial sources of universities on one side and by data providers on the other side offering data for reduced prices or free of charge.

The activities of private companies are always a result of combined services comprising remote sensing, photogrammetry and GIS. Most of their projects are processed for foreign clients – private or state. We can find cadastral mapping performed by GEODIS Brno for Ireland and a state in the Near East, and geological mapping of Nicaragua done by the Czech Geological Institute.

Private companies focus on land cover of the Czech Republic prepared from satellite data and from aerial photographs. The main company in this sphere offers updated version of color orthophoto of the whole country each year (Geodis Brno). The data collection and processing in Geodis is done by using Terra Share as a robust technology for control of all image processing and storing. Color orthophotos create one layer. Infrared photographs newly create an additional information layer.

There are four EARSeL members in the Czech Republic – three of them are at universities – of natural sciences, of forestry and agriculture and at the technical one.

Therefore their activities are still focused on education in masters and doctoral programs, the Department of Mapping and Cartography at the Czech Technical University (CTU) opens a new study program - geoinformatics. The first year of the program will be in the 2006/2007 university year. The Remote Sensing Laboratory of the Department is responsible for 6 subjects from the whole study program. The geoinformatics study program at the Faculty of Natural Sciences is less technically presented, the students have more applicable version geoinformatics. Deeper theoretical education is either at CTU or at the West Bohemia University; both universities have close relations to geodesy or cadastre.

The research in geoinformatics includes data collection focused on radar data, laser data, image processing comprising multisensor data processing, VHR data processing hyperspectral data, and data orthorectification and DTM modeling. GIS tasks cover spatial databases, languages for spatial data management in databases, metadata and standardization of spatial data and metadata. The last sphere of research analyzes theoretical questions of mathematical cartography, visualization and symbology of spatial data. Interferometric and image classification research are being performed at the Faculty of Civil Engineering of CTU Prague.

The Institute of geodesy and photogrammetry at Mendel´s University in Brno as a member of UniGIS international network has been offering IDRISI distance learning in GIS at many important European universities (Clark University in Massachusettes is its central university). The goal of the program is to support and distribute GIS technology. The research projects are focused on forestry, image processing, photogrammetry and GIS.

The most important national conference in remote sensing and GIS spheres was usually held in Sec in June but was transfered to Brno due to a sad personal reason. The International symposium organized by the Technical University in Ostrava, by the Faculty of Mining was for many years an important conference for GIS and remote sensing in the Czech world. The 12th international GIS Ostrava conference/symposium has a different program content (if compared to previous years) related more to informatics´ items than to general GIS and remote sensing items. The Department of Mapping and Cartography (EARSeL member) of the Faculty of Civil Engineering of the Czech Technical University together with the Czech Society of ISPRS organized the 5th conference of Topical Problems of Photogrammetry and Remote Sensing on December 15, 2005 in Prague at the Faculty of Civil Engineering. This conference is organized mainly for students´ activity presentations even though it is open to all who are interested in remote sensing, photogrammetry and GIS.

The last EARSeL member – the Forestry Institute in Brandys nad Labem has completed a very large and detailed database with the whole country forestry and non-forestry data. The main interest in the remote sensing sphere is to get important forestry data by automatic processing of aerial color orthophotos necessary for forest inventory – in the form of a pilot project at first. The Institute co-operates with specialists from the Agricultural University in Prague.

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2.5 FINLAND

The main goals of the national space strategy for 2005-2007 are increasing utilisation of satellite technology, positioning and remote sensing in commercial activities. Participation in major European space programmes and strong research groups are considered vital to achieve these goals. Annual public funding of space activities is presently approximately 48 M€. Tekes, Finnish Funding Agency for Technology and Innovation (supporting R&D for commercial and operational activities), and the Academy of Finland (supporting basic research) are the main public funding sources for remote sensing research along with the European Space Agency and European Union. Currently the Finnish con-

tribution to ESA's remote sensing programmes is 5 M€ and that to Eumetsat is 3.7 M€. Tekes and the Canadian Space Agency (CSA) provide in 2005-2007 funding to joint Finnish-Canadian remote sensing projects, based on the co-operation agreement between the two agencies. The Avali programme (Business Opportunities from Space Technology, 2002-2005) was funded by Tekes in order to create new and viable business with the aid of space technology and its applications. The total volume was 22.3 M€ with 11.4 M€ provided by Tekes. The programme's main technical areas were satellite instruments/software and space-based applications. The national Remote Sensing Symposium in 2005 had 110 attendees.

Helsinki University of Technology, Laboratory of Space Technology (TKK/LST; http://www.space.tkk.fi).
TKK/LST participates in Phase C/D of the ESA SMOS Programme, working on the L-band synthetic aperture radiometer. The calibration network subsystem task includes, in addition to actual testing of the calibration system, development of various system-specific testing methods to verify that the system meets the strict environmental and performance requirements posed by the mission. In the reference radiometer task a new method for calibration of polarimetric radiometers using digital correlation has been developed and demonstrated. An airborne two-dimensional interferometric L-band radiometer, HUT-2D, is under construction and will be accommodated onboard TKK/LST's Skyvan research aircraft. The first test flights will be made in 2006. Progress in the development of maritime wind vector retrieval using airborne polarimetric radiometer measurements was achieved with a study concerning the effect of incidence angle. The development of techniques to assess surface water quality and snow cover characteristics using spaceborne remote sensing data was investigated in the Finnish-Canadian Wrdp project. The main results include the development of methodology and a software implementation for mapping fractional snow-covered area using Radarsat ScanSAR images. The developed system is implemented for the operative use at the Finnish Environment Institute. In the Finnish-Canadian project Pol-Ice the development of SAR-based classification algorithms for sea ice has continued. In the EU/FloodMan project a SAR-based method has been developed and tested for flood inundation monitoring.

Helsinki University of Technology, Institute of Photogrammetry and Remote Sensing (TKK/IPARS; http://www.foto.hut.fi).
Present research projects include SAR interferometry (coherent target monitoring and forest biomass estimation), laser scanning (quality of laser scanning data, single-tree forest inventory, development of interpretation methods for forest and urban areas, forest change detection, fusion of laser points and remote sensing images), spherical imaging (create methods to generate spherical images and to develop advanced semiautomatic and automatic algorithms to measure 3-D objects from them), 3D/4D modelling and virtual reality (archaeological documentation (Finnish Jabal Haroun project), road and environmental 3D/4D-models), and hyperspectral remote sensing (classification and interpretation of object properties, methods for collection of ground truth data).

VTT Technical Research Centre of Finland (http://www.vtt.fi).
The environmental monitoring system Envimon was further developed. It comprises six application areas including forestry, traffic monitoring, nuclear repository monitoring, season monitoring for tourism, natural disaster mitigation, and ship navigation in ice-covered seas. New algorithms were generated for the separation of pine and spruce and for the segmentation of super high resolution satellite images. The applications utilize a common software framework called EOFrame. The common software takes particular care of data pre-processing and tailored information delivery to fixed and mobile platforms. It also includes actual image analysis. In the Tesi project for ESA a chain that utilizes L-band SAR data together with optical Landsat type data was generated and demonstrated to forest industry. The models using L-band SAR data to predict growing stock volume of boreal forest

were very similar during the summer months, suggesting that an existing model can be applied to new summer time images without a need to collect new ground reference data.

Finnish Geodetic Institute (http://www.fgi.fi).
The department of photogrammetry and remote sensing has coordinated three international projects on laser scanning in 2004-2005: quality of laser scanning (Eureka), EuroSdr Building extraction comparison and EuroSdr/Isprs Tree extraction comparison. In the latter two projects, the reconstruction and accuracy of individual houses and trees were analysed in a global network. The Sjökulla photogrammetric test field was used to analyse the quality of four aerial digital cameras. The national specification for orthophoto production and first recommendations for laser scanning usage were published.

Geological Survey of Finland (GTK) (http://www.gtk.fi).
The Remote Sensing group at GTK has investigated satellite image data for studying the environmental impacts of mining and carried out detailed reflectance studies for mineral exploration, mining activities and peat exploitation. Remote sensing monitoring using Landsat, Aster and Hyperion satellite data has resulted in the detection of environmental stress due to acid mine drainage, smelter impact, dust, contaminated surface waters and spreading of tailings in Finland and in South Africa. Follow-up studies of airborne HyMap imaging spectrometry data resulted in mire site type mapping of Boreal peatlands in Northern Finland. The spectral library of GTK was expanded: a total of 998 VSWIR (Visible to Short Wave Infrared) reflectance measurements on drill-core, mineral ore and enriched material, tailing sands and peat samples were carried out.

University of Joensuu, Faculty of Forestry (http://www.forest.joensuu.fi).
Remote sensing research concentrates on the combined use of airborne laser scanning and digital aerial photographs in various forestry applications. These include, e.g. small scale forest inventory, monitoring of natural and restored forests of conservational areas and estimation of stand characteristics of marked stands.

University of Turku, Laboratory of Computer Cartography (UTU/LCC; http://utu-lcc.utu.fi).
The Amazon Research Team has concluded estimation of the species distribution and analyses of biogeographical regions based on the river network characteristics. Furthermore, the members have studied anisotropic reflectance characteristics of the rain forest surface using Landsat TM scenes. The Extreflood project develops GIS and RS techniques for flood inundation mapping to re-determine the risks and minimise the damages involved in extreme flood events. A national wide flood mapping procedure has been developed. The Landis project aims at designing new RS, GIS and hydraulic modeling methods and techniques for addressing and understanding desertification and spatial entities of flooding in Iceland. The research methods include satellite remote sensing (IfSAR-DEM, Landsat TM), GIS analyses and hydraulic modelling in combination with in situ process monitoring in the field. Results of reconstruction of the European largest glacial outburst flood in Holocene have been published. The Zanzibar project is utilizing multiple spatial data sources (e.g. aerial photographs, maps) to study the interaction between landscape pattern, changes and nature-human processes. The project aims to model sustainability of natural resources for land use, conservation and management purposes and involves the local stakeholders.

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2.6 FRANCE

Author: Gérard BEGNI[1] - Director of MEDIAS-France – START/MEDCOM Secretary – Associated member of the Siberian Branch of the Russian Academy of Sci-

[1] *Acknowledgements: Delphine FONTANNAZ, Catherine TINE and Marc LEROY (MEDIAS-France) for their kind collaboration.*

ences, IGBP Committee - Member of the French Scientific Committee on Desertification and of the EARSeL and SFPT Councils.

French activities are characterised by huge scientific, industrial and financial investments for the design, implementation and operation of systems in which the space component plays a major part. In 2005, the French Space Agency (CNES), granted 22% of its budget to sustainable development programmes and to the science sector (which are directly relevant to remote sensing and Earth Observation), i.e. respectively 117.8 million euros and 117.9 million euros.

These efforts aim at meeting global needs for research and to develop applications of earth observation in the various socio-economic sectors likely to benefit from them. French activities are led within the scope of an international cooperation inspired by CEOS[2]/IGOS-P[3] initiatives. Collaboration within the framework of the European Space Agency Convention is a priority for France, as underlined at the ESA Council meeting of December 2005[4]. France has reaffirmed its proactive policy and intention to sustain its pivotal role in European space, materialised by an annual contribution of 685 million euros to ESA programmes until 2010.

Regarding more specifically the French Society for Photogrammetry and Remote Sensing (SFPT), let us mention that, after being for a long time quite absent from the ISPRS governing bodies, France accepted responsibility for the Second Vice-Presidency of the Council from 2000 to 2004 and has been entrusted with the Presidency of Commission I from 2004 to 2008. France will host the next Commission I Symposium entitled "From sensors to imagery", due to take place in Paris-Marne la Vallée from 3 to 6 July 2006.

SPOT and its follow-on Programmes

The high resolution optical sector corresponds to major investments in France. It includes both the civilian SPOT and military HELIOS systems.

It is vital for the French defence, security and independence to own relevant information sources about on-going conflicts or possible threats. Other European countries share this opinion, that may be considered as a contribution to the CSFP[5] under way. DGA[6] has therefore developed the HELIOS programme with CNES as its technological partner, in order to provide France and its European associates (Belgium, Spain) with a high resolution system for military space observation.

The **HELIOS-2A**[7] satellite has been operational since April 2005, after its successful launch in December 2004. It enables to consolidate the HELIOS system whose first satellite, HELIOS-1A, has been operating for ten years. HELIOS-2A, whose development and launch are wholly European, meets the growing needs of its various partners. A substantial synergy with the SPOT-5 programme reduced its implementation costs (total funding: 95% France, 2.5% Belgium and 2.5% Spain). It features sharper imagery, improved field of view and access time to information, as well as an infrared capability for night imaging. Its ground segment has been enhanced as well. HELIOS-2A allows targeting, guidance, mission planning and war damage assessment. In parallel, France has signed agreements with Italy and Germany regarding access right exchange between HELIOS-2, Pléiades (see below), Cosmo-Skymed, and SAR Lupe, so these three countries will obtain an all-weather space-based observing capacity. Greece is expected to join the programme and to have a small stake in the future HELIOS-2B satellite to be launched in 2008.

Developed in cooperation with Sweden and Belgium, the **SPOT**[8] constellation currently includes three satellites (2, 4, 5). The two HRV (High Resolution Visible) instruments on SPOT-2 and -4 provide 10-m resolution in panchromatic mode and a 20-m resolution in multispectral mode, including

[2] ***C**ommittee on **E**arth **O**bservation **S**atellites.*
[3] ***I**ntegrated **G**lobal **O**bserving **S**trategy **P**artnership.*
[4] *In which all participants agreed to give special priority to the GMES programme space segment (see further).*
[5] ***C**ommon **F**oreign and **S**ecurity **P**olicy, including the European Security and Defence Policy.*
[6] *French Armament Procurement Agency.*
[7] *HELIOS, sun-synchronous satellites, are named after the Sun God in Greek mythology, supposed to see everything.*
[8] ***S**atellite **P**our l'**O**bservation de la **T**erre.*

the "short wave infrared" (SWIR) wavelength for SPOT-4.

Since its launch in May 2002, SPOT-5 has significantly improved the system performance with two new high spatial resolution and high accuracy positioning products. The two HRG (High Resolution Geometric) instruments enable a 5-m resolution panchromatic mode and a 10-m resolution multispectral mode. SPOT-5 also offers a 2.5-m panchromatic mode by reconstruction at ground of two 5-m images. Imaging swath remains 60x60 km, with a positioning accuracy ranging from less than 50 m to 70 m at the maximum, without ground control points. In addition, a HRS (High Resolution Stereoscopic) instrument onboard allows the simultaneous collection of along-track stereopairs (in panchromatic mode) with a 10-m resolution (re-sampling at 5 m along track) in order to develop high precision Digital Terrain Models (DTMs). In that case, the viewing field is 600x120 km, with a positioning accuracy of less than 15 m.

SPOT-5 innovative technical features have opened new perspectives in the sphere of high resolution spatial imagery and stereoscopy. The considerable collection capacity of the HRS instrument (more than 125,000 km^2 daily on an average) provides the capacity to establish a worldwide DTM database.

Figure 1 - Spot-5 image of the wooded area around Fréjus in south-east France, showing fire damage in July 2005.

An instance of the efficiency of the SPOT system was the coverage of the tsunami that ravaged south-east Asia in December 2004. In the wake of this catastrophe, the three SPOT satellites were tasked to acquire imagery of all the countries affected, just hours after the Charter on Space and Major Disasters[9] was activated. Thanks to receiving stations in Singapore and Malaysia, the first images were received the day after the tidal wave. In total, SPOT-2, -4 and -5 supplied some 8,000 views of the disaster area in the two weeks following the tsunami. The global SPOT archive of more than 10 million images was a rich source of pre-disaster imagery, allowing multidate comparisons to assist damage assessment.

The **VEGETATION** system, developed in cooperation with the European Commission, France, Belgium, Sweden and Italy, is still operational and has been enhanced in 2004 with a new database. Two VEGETATION instruments are currently flying onboard SPOT-4 and -5. They offer long-term (beyond 10 years), medium resolution (1.1 km) and wide field (2,200 km) observations, with a typical daily revisit period. VEGETATION is designed for both operational and scientific aims; it is much used within the scope of the Millennium Ecosystem Assessment.
Faced with a growing international competition, and in order to meet at best the ever-increasing demand from users, CNES has associated with Italy to implement the **ORFEO**[10] programme that eventually will consist of several small compact satellites. This dual-use (military and civilian) programme includes two main components: a high-resolution optical instrument developed by France (Pléiades-HR), and an X-band radar element (3-12 cm wavelength) developed by Italy (Cosmo-Skymed, 1 to 100-m resolution depending on the mode). The first Cosmo-Skymed[11] satellite is scheduled for launch in mid-2006; the first Pléiades-HR satellite should follow it in 2008. Pléiades will ensure the continuity of wide field observations after SPOT-5, in panchromatic and multispectral bands. The ORFEO programme will bring a major contribution to the European GMES programme, in particular in the sphere of security.

[9] *The French Space Agency is a founder member of this international Charter.*
[10] *Optical and Radar Federated Earth Observation.*
[11] *4 radar satellites scheduled, to be launched in 2006, 2007, 2008 and 2009.*

Pléiades is a two-satellite system, the first to be launched in 2008 and the second in 2010. It will be used mainly for defence and civil security applications, and its great agility will enable:
- a daily access all over the world,
- a 20-km viewing field,
- better scales (0.7-m resolution in panchromatic mode, 2.8-m in multispectral mode with four spectral bands[12]) than those accessible by SPOT,
- a stereoscopic (or even triplet) acquisition capacity,
- a very accurate positioning (<1 m with ground control points).

Each satellite will be able to provide up to 500 images per day.

In addition, ORFEO benefits from an ambitious accompanying programme launched in 2003, to prepare and promote the use of derived data, including a methodological and thematic part. The seven thematic groups (Sea and coastlines, Risks and humanitarian aid, Cartography and town and country planning, Geology and geophysics, Hydrology, Forestry, Agriculture) correspond to its key civilian applications. The interest of such data is obvious within the scope of IGBP[13] and IHDP[14] programmes. A first meeting between the thematic and methodological groups should take place in 2006.

Figure 2 - Simulation of a view of the Pont des Demoiselles, Toulouse, France, at the space resolution and panchromatic mode of Pléiades-HR.

After completion of ORFEO's definition phase in 2004, several contractors have been selected in 2005 (e.g. ground segment parts, encrypting server…).

The **ISIS**[15] programme (CNES) that grants the European scientific community an easier access to SPOT space imagery through preferential rates (over 2,700 images including 532 SPOT-5 scenes) is now reserved for French users only. Since 1 February 2005, and upon CNES' initiative, European researchers can access the new **OASIS**[16] programme, wholly funded by the European Commission[17]. OASIS aims at widening and consolidating ISIS at a larger European scale in order to cover the needs for research of EU member states and associated countries[18]. It thus allows the scientific community of 32 countries to use SPOT products for free. (Please see the separate article on OASIS)

France and Israel are cooperating in their first joint space programme, which is dedicated to Earth Observation (especially vegetation and sustainable development applications). The Venμs[19] research mission, defined in 2003, has now entered its development stage, and is scheduled to be operational in 2008. The Venμs micro-satellite will cover every other day 50 representative sites of the main terrestrial and coastal ecosystems in 12 spectral bands, in the visible and near infra-red regions. Its main characteristics are the use of a super-spectral camera and low thrust (electric propulsion) for orbit change. France will be responsible for the sci-

[12] *Blue: 0.43-0.55 μm; Green: 0.49-0.61 μm; Red: 0.6-0.72 μm; SWIR: 0.75-0.95 μm.*
[13] *International Geosphere-Biosphere Programme.*
[14] *International Human Dimensions Programme.*
[15] *Incitation à l'utilisation Scientifique des Images Spot.*
[16] *Optimising Access to SPOT Infrastructure for Science.*
[17] *The OASIS proposal was submitted to FP6/Research Infrastructures as Trans-national Access and was approved in July 2003.*
[18] *24 European Union countries (excluding France), plus Bulgaria, Denmark, Iceland, Israel, Liechtenstein, Romania, Turkey and Switzerland.*
[19] *Vegetation and Environment Monitoring New Micro-Satellite.*

ence mission, scientific data processing, programming and payload. This mission will serve as a demonstration for the European GMES programme (see below).

Solid Earth, Ocean, Biosphere, Atmosphere, Coupled Systems

DORIS[20] instruments are currently flying onboard SPOT-2, -4 and -5 remote sensing satellites, as well as JASON-1 and ENVISAT altimetric satellites. In its latest configuration, DORIS provides a 1-cm positional accuracy and an annual oscillation of a few mm for the motion of its 55 ground stations over a period of one year. This high standard of performance makes DORIS a major system in the field of geodesy and Earth reference frame definition, and enhanced DORIS instruments are planned to be used in future missions such as Pléiades, Jason-2 and Altika. The DORIS tracking network is being modernised using third-generation antennas and improved beacon monumentation. The International Association of Geodesy officially created the DORIS International Service, in which CNES has a leading role, in July 2003.

Regarding spatial measurements of the Earth magnetic field, France has been cooperating with Denmark by providing the **OVH**[21] scalar magnetometer for the **OERSTED**[22] mission. The OERSTED satellite, launched in February 1999, is still operating and expected to live one or two more years in order to collect data through the entire span of solar activity, i.e. from solar maximum (2000) to solar minimum (2006/2007). Then, the three satellites of the ESA **SWARM** mission, scheduled for launch in 2009, should continue the geomagnetic mission for four years. France will also provide the magnetometers that will equip such satellites. The French instruments will experiment a new concept designed to acquire absolute and vectorial field measurements with the same instrument. This technological innovation in space magnetometry could be used in future observation missions. The French scientific community will exploit derived data (modelling of magnetic field, analysis of geophysical data).

France also collaborates with the three main dedicated gravity missions of the decade, i.e.:

- with Germany by supplying magnetometers and the STAR micro-accelerometer for **CHAMP**[23]. This mission initiated in July 2000 was scheduled to last five years, but should be extended till the end of 2008;
- with the US **GRACE**[24] mission, launched in 2002, by supplying an enhanced version of the STAR micro-accelerometer, called the Super-STAR;
- with ESA's **GOCE**[25] mission, scheduled for launch in 2006. French organisations are involved in the European GOCE Gravity Consortium for data processing from level 1a/1b to 2 in order to produce gravity and geoid models, and for the development of the Electrostatic Gravity Gradiometer instrument.

As mentioned in our 2004 report, the **CRYOSAT** mini-satellite assigned to the study of the cryosphere and developed within the framework of the ESA Earth Explorer programme was expected to be launched in 2005. Unfortunately, it crashed into the Arctic Ocean after the failure of its vehicle. At its Council of December 2005, the European Space Agency decided to rebuild CryoSat, in which France is involved (supply of the DORIS instrument, processing of the data provided by the SIRAL radar, and long-term archiving of the mission).

DEMETER[26], the first micro-satellite of the MYRIADE series developed by CNES, was successfully launched in June 2004. This micro-satellite is equipped with autonomous orbit control, a new process designed by CNES, which will be experimented throughout this mission dedicated to the study of electromagnetic and ionospheric disturbances and to their relation with earthquakes, volcanic eruptions, tsunamis and human activities. The first scientific results have been acquired in 2005 and confirm the relevance of the high quality data obtained.

[20] *DOppler and Radio Positioning Integration by Satellite.*
[21] *OVerHauser magnetometer.*
[22] *Named after the Danish physicist.*
[23] *CHAllenging Mini-satellite Payload for Geophysical Research and Application.*
[24] *Gravity Recovery And Climate Experiment.*
[25] *Gravity Field and Steady-State Ocean Circulation Explorer.*
[26] *Detection of Electro-Magnetic Emission Transmitted from Earthquake Regions.*

ESA's **SMOS**[27] mission has been designed to observe soil moisture over the Earth's landmasses and salinity over the oceans. Soil moisture data are urgently required for hydrological studies and data on ocean salinity are vital for improving our understanding of ocean circulation patterns. SMOS is scheduled for launch in February 2007, and the mission is being prepared actively. For instance, the SMOS Validation and Retrieval Team met for the first time in December 2005. This mission is led by ESA within its Earth Observation Envelope Programme, in collaboration with France[28] and Spain (CDTI). SMOS will carry the first-ever, polar-orbiting, space-borne, 2-D interferometric radiometer (the MIRAS[29] instrument) that will be integrated onto an Alcatel PROTEUS bus, which was developed by the French Space Agency and Alcatel Space Industries. The Spacecraft Operations Control Centre will be located in Toulouse, France.

The still operating Franco-American TOPEX-POSEIDON system, launched in 1992, and its successor, the JASON-1 mini-satellite launched at the end of 2001, enabled study of ocean dynamics and determination of sea level with 1-cm accuracy. The need to keep on getting accurate altimetric data from non-sun-synchronous orbits has been clearly expressed by ocean data users, especially the Global Ocean Data Assimilation Experiment (GODAE), the Integrated Global Observing Strategy Partnership (IGOS-P) and the European Global Ocean Observing System (EuroGOOS). Consequently, CNES (France), NASA and NOAA (USA), and EUMETSAT (Europe) have agreed to jointly implement the JASON-2 satellite meant to take over. JASON-2 is scheduled for launch in 2008, with a nominal five-year lifetime. Its first aim is to ensure that the global user community continues to receive non-stop accurate altimetry data on an operational basis. Together with complementary data delivered by ERS and ENVISAT, it will be a key component of the Ocean Surface Topography Mission (OSTM), EUMETSAT's first optional programme. The space segment/JASON-2 satellite is provided by CNES, with spacecraft and instrument components provided by both NASA and CNES (Poseidon-3 radar altimeter and DORIS instrument). The OSTM ground segment comprises the integrated ground segment capabilities of NOAA, NASA, CNES and EUMETSAT. The JASON-2 Ocean Altimetry Programme moved ahead in November 2005 with the implementation of the first antenna and radome of the ground system in Germany.

Regarding oceanography, a new ocean observation programme has been approved by CNES. The operational ocean altimetry **ALTIKA**[30] mission will be carried out in cooperation with ISRO (Indian Space Research Organisation). France will provide a Ka-band radar altimeter for India's Oceansat-3 Earth Observation satellite. This instrument will offer among others enhanced observation of ocean surface levels, currents, wave height and wind speed at sea surface. As it will operate in near-polar low orbit, it will allow to complement the data from the JASON-2 satellite, with which it will work in unison (both launches are scheduled in 2008).

In the same domain, France celebrated this year the 10th anniversary of its national **MERCATOR** project for operational oceanography (real-time assimilation of global data in complex high resolution models). The Mercator-Ocean Public Interest Group was founded in April 2002 by six French organisations to set up an operational system for describing the state of the ocean, at any given time and at any place on Earth. The latest Mercator prototype was issued in October 2005; it was the first 1/4° global ocean forecasting bulletin. The Arctic, Antarctic, Indian, Atlantic and Pacific oceans are now depicted every week with two weeks forecast, from surface to bottom.

MERCATOR is part of the French involvement in the **MERSEA**[31] Integrated Project of the European Community (a core component of GMES), launched in April 2004.

[27] *Soil Moisture and Ocean Salinity.*
[28] *This mission had been proposed by French scientists (CESBIO – Y. Kerr) in line with the recommendations of the national seminar on future scientific prospects held in 1998.*
[29] *Microwave Imaging Radiometer with Aperture Synthesis.*
[30] *Altimetry in Ka-band.*
[31] *Marine EnviRonment and Security for the European Area.*

This project consists in developing a European system for ocean operational monitoring and forecasting. It is coordinated by IFREMER, the French Research Institute for Exploitation of the Sea, and includes seven French contractors out of 38. MERSEA in turn contributes to the **GODAE**[32] global experiment, aimed at promoting a permanent global ocean observing, modelling, assimilation and forecasting system, which is completing its demonstration phase.

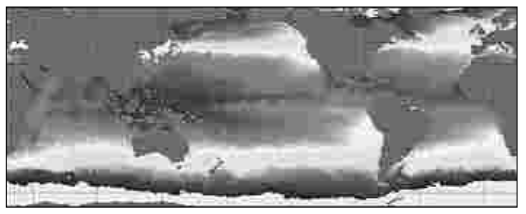

Figure 3 - Sea surface temperature - Forecast for the 25/10/2005 made on 12/10/2005. Credit: Marie Drévillon.

In the sphere of meteorology, a major event of 2005 was the successful launch of the EUMETSAT **MSG-2**[33] satellite developed under the leadership of the French industry (Alcatel Space Industries). The launch took place in Kourou, French Guiana, on 21 December 2005. MSG-2 has 12 spectral channels and will provide an image every 15 minutes in the visible, infrared and water vapour bands. MSG-2 (to be renamed Meteosat-9 when operational) will ensure that European forecasters and researchers continue to benefit from the advanced data and images provided by the current operational satellite, Meteosat-8.

The experimental **PUMA**[34] exploitation programme, aimed at fostering the use of MSG data for non-meteorological applications, ended in September 2005. This programme successfully met its objectives; i.e. in total, 53 African countries have been equipped with EUMETCast receiving stations, 350 persons have been trained and 6 pilot projects have been implemented (agriculture, food security, water resources). The project was funded by the European Commission and the European Development Fund and involved EUMETSAT and WMO.

A follow-on to this programme, **AMESD**[35], has been prepared since 2002. This programme, funded by the European Union and considered as a GMES component for Africa, is to help African countries to manage better their natural resources by providing them with relevant environmental information, in particular with remotely sensed data. The feasibility study was completed in June 2005, and the final project proposal should be ready at the end of this year. The actual in situ implementation should be led during the second half of 2006.

In the same sector, France takes an important part in the development of the **METOP**[36] programme, which is the space segment of the EUMETSAT Polar System (EPS)[37]. The METOP programme consists of three polar orbiting satellites to be launched at five-year intervals; it is managed by ASTRIUM and jointly developed by ESA and EUMETSAT. The first METOP satellite is scheduled for launch in 2006; it will be Europe's first polar-orbiting satellite dedicated to operational meteorology. The main objectives of the METOP series are to ensure continuity and availability of meteorological and climate observations from the "morning" orbit (thus complementing the NOAA POES "afternoon" orbit), and to provide enhanced capabilities (complementary to ENVISAT) to study the Earth climate system as requested by major cooperative programmes such as GCOS[38], IGBP[39] and WCRP[40].

METOP will embark eight different instruments, among which **IASI**[41] will be the core payload. This new-generation interferometer developed by CNES will provide atmospheric infrared emission spectra of unprecedented accuracy. It will supply temperature and humidity profiles accurate to 1°C and 10% respectively, with a vertical resolution of 1 kilometre. The French Space Agency will provide as well part of the Search and Rescue auxiliary payload, and the Argos System for environmental data

[32] *Global Ocean Data Assimilation Experiment.*
[33] *Meteosat Second Generation.*
[34] *Preparation to the Use of MSG in Africa.*
[35] *African Monitoring of the Environment for Sustainable Development.*
[36] *METeorological OPerational Satellite.*
[37] *The EUMETSAT Polar System consists of the METOP spacecrafts and associated ground segment.*
[38] *Global Climate Observing System.*
[39] *International Geosphere-Biosphere Programme.*
[40] *World Climate Research Programme.*
[41] *Infrared Atmospheric Sounding Interferometer.*

collection. METOP will embark the first Argos-3 instrument, an enhanced version with downlink from satellite to beacons, so that users will be able to communicate with them.

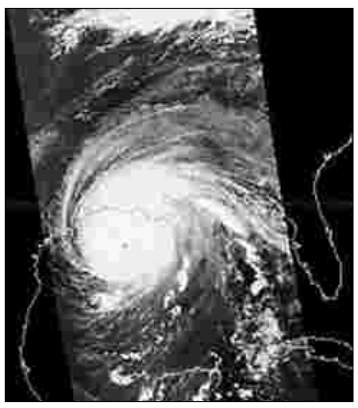

Figure 4 - RITA cyclone seen by PARASOL Orbit n°019070, 23 September 2005.

PARASOL[42] is the second micro-satellite of the MYRIADE series developed by CNES. It carries a **POLDER**[43]-like wide-field radiometer, also designed under French leadership. The scientific mission of PARASOL concerns aerosols, clouds and the Earth radiative budget. It measures the directional characteristics and polarisation of light reflected by the Earth and atmosphere to further our understanding of the radiative and microphysical properties of clouds and aerosols. PARASOL, launched in December 2004, contributes to the so-called "A-train" formation in relation to the TERRA, AQUA and AURA satellites, already orbiting, and to the future CALIPSO, CLOUDSAT and OCO satellites (the first two ones scheduled for launch in 2006, the latter in 2008). After a successful in-orbit commissioning, the products derived from the PARASOL mission have been made available to users since April 2005. They are distributed by CNES and by the ICARE French centre (see "thematic units" below).

The Indian Space Research Organisation (ISRO) and CNES are developing together the **MEGHA-TROPIQUES**[44] satellite for atmospheric and climate research. At first planned to be launched in 2005, its flight has been postponed to 2008-2009, due to modifications in the original programme. According to a Memorandum of Understanding signed in November 2004, both Space Agencies will proceed with the development and implementation of their joint mission. Megha-Tropiques will not be integrated onto an Alcatel PROTEUS bus as initially planned, but onto an Indian platform. It will embark a multi-frequency microwave scanning radiometer (**MADRAS**[45], jointly developed by CNES and ISRO), a high-resolution multi-channel microwave humidity profiler (**SAPHIR**[46], developed by CNES) and **ScaRaB**[47], a multi-channel instrument (already flown by CNES on Russian missions). MADRAS will provide information on rain above the ocean, integrated water vapour content in the atmosphere, liquid water in clouds, and convective rain over land and sea. SAPHIR will supply data on vertical humidity profiles in the atmosphere, while ScaRaB will transmit information on the Earth radiative environment. The satellite will be placed in a 867-km high orbit at an inclination of 20 degrees with respect to the equatorial plane. Megha-Tropiques, with its unique combination of scientific payloads and its special orbit, is expected to provide valuable data for climate research. It should be instrumental in improving the reliability of weather forecasts, since the influence of energy exchanges in the ITCZ[48] is not fully analysed as yet.

Managed by NASA in cooperation with France, the **CALIPSO**[49] mission was planned for launch this year, together with the CloudSat satellite, on a single Boeing rocket. However, due to current Boeing labour problems and to the closing of the Vandenberg Air Force Base for maintenance, both satellites (that belong to the A-train) will have to wait until after the VAF

[42] *Polarisation and Anisotropy of Reflectances for Atmospheric Sciences coupled with Observations from a Lidar.*
[43] *POLarisation and Directionality of the Earth's Reflectances. POLDER instruments flew onboard ADEOS-I and -II Japanese satellites and provided innovative data on aerosols and clouds (aerosol characterisation, clouds/aerosols interactions, radiative forcing), land surfaces (vegetation, carbon cycle) and ocean colour (primary production, carbon cycle).*
[44] *"Megha" means cloud in Sanskrit and "Tropiques" means tropics in French.*
[45] *Microwave Analysis & Detection of Rain & Atmospheric Structures.*
[46] *Sondeur Atmosphérique du Profil d'Humidité Intertropicale par Radiométrie.*
[47] *SCAnner for RAdiation Budget.*
[48] *Inter-Tropical Convergence Zone.*
[49] *Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations.*

base reopening in February 2006. CALIPSO will enable scientists to address important questions about the effects of clouds and aerosols (airborne particles) on the Earth climate change. The satellite will contain a scientific payload of three instruments (CALIOP, IIR, WFC) integrated onto an Alcatel PROTEUS bus. French contributions to CALIPSO are the PROTEUS spacecraft, the IIR[50] instrument, payload-to-spacecraft integration and spacecraft mission operations. The IIR contributed by CNES is a nadir-viewing (64x64 km swath, 1-km pixel size) imager that offers three-channel measurements (8.7 µm, 10.5 µm and 12.0 µm). It will optimise joint CALIOP/IIR retrievals of cirrus cloud emissivity and particle size.

Programme of Thematic Competence Networks

The programme of thematic competence networks ("thematic units") is a major initiative meant to provide scientists with relevant products and information, while saving as much time and manpower as possible regarding data handling and preprocessing irrelevant to their scope of research. Each initiative is led by a cluster of several public entities, some of which are in charge of scientific matters. CNES has been entrusted with space data issues, and is accordingly developing advanced retrieval algorithms, validating outputs and improving the system.

Of specific interest here is the **POSTEL**[51] "Continental Surfaces" thematic unit, that meets GMES priorities and key scientific objectives. POSTEL is a network that associates laboratories in charge of designing products (research function) and MEDIAS-France that is the service provider. Its goal is to produce and make available various biogeophysical parameters related to surface lands derived from Earth Observation satellites. (Please see the separate article on POSTEL).

POSTEL thus supplies scientific and operational communities with products duly referenced in terms of description and accuracy. Links between existing structures (such as EUMETSAT Land-SAF, VITO in Belgium, ECMWF in the United Kingdom, the EC/JRC) and forthcoming GSE elements are taken into due consideration. Decided upon in 2002, POSTEL is in its early phase. Nevertheless, it already involves several national and international projects approved and funded by now: FP6/CYCLOPES (implementation of an operational processing chain), FP6/GEOLAND (see below), FPS/AMMA (data circulation), POLDER/PARASOL (production and circulation of "land surface" parameters), FP6/VGT4Africa[52] (distribution of SPOT VEGETATION data through EUMETSAT's EUMETCast telecommunication network), and ESA/GLOBCOVER (a 300-m resolution land use global map). The most outstanding enterprise is the GEOLAND integrated project of the EC 6th Framework Programme. Jointly led by INFOTERRA GmbH, Germany, and MEDIAS-France, GEOLAND basically consists of two parts: regional scales and global scales, the latter being coordinated by the POSTEL project team (CSP, Core Service biogeophysical Parameters). A project of Memorandum of Understanding is under way between the Meteorological Institute of Portugal, VITO (Belgium) and MEDIAS-France/POSTEL in order to coordinate the supply of biogeophysical products within the scope of the future "Global Land Monitoring" GMES Service. POSTEL will also take part in the processing of level-2 and-3 products of the Venµs mission (see above).

The French **ETHER** Thematic Expertise Network manages and calibrates data related to atmospheric chemistry, with the aim to make them available to the world scientific community. It includes a Product and Service Centre as well as fifteen French Expertise Centres working on instruments, models, scientific algorithms and data related to atmospheric chemistry. Since its creation at the end of 2000, it has been recognised by a broad community of users. It is expected to become a GMES service centre.

The **ICARE**[53] competence unit is a French partnership dedicated to aerosols, clouds, radiation and the water cycle. This research

[50] Imaging Infrared Radiometer.
[51] Pôle d'Observation des Surfaces Terrestres aux Echelles Larges.
[52] Project complementing the ASMED programme.
[53] Interactions Clouds Aerosols Radiations Etc.

structure was set up in 2003 by French institutions, in order to meet two main objectives, i.e. to pool data and provide shared services enabling the scientific community to exploit the huge volumes of data relevant to this topic, in particular those derived from the A-train. Its Data Management and Processing Centre has become operational in 2005. This Centre develops, processes and distributes standard, synthesis and multisource products derived not only from A-train data, but also from previous and current missions including ScaRaB, POLDER and MSG (see above). These data products are then distributed to Scientific Expertise Centres that design and validate products and contribute to define new missions in this field. Like POSTEL and ETHER, ICARE should become a reference centre in Europe regarding its own thematic, within the scope of the GMES initiative.

Fostering Aplications; The GMES and PNTS Programmes

From the very beginning (Baveno manifesto, 1998), France has strongly supported the **GMES**[54] initiative, aimed at designing and establishing by 2008 a European capacity to provide and use operational services for Global Monitoring of Environment and Security. France also actively contributed to define this programme, which is now in its implementation stage. ESA is involved in GMES through the **GSE**[55] scheme, that is a suite of Earth Observation-based precursor services. Out of the 12 initial GSE projects[56], France is engaged in 11 and leading 3 of them.

The GMES Space Component programme is built around five space missions called "Sentinels", namely: Sentinel-1, a C-band SAR[57] mission; Sentinel-2, a multispectral optical imaging mission; Sentinel-3 devoted to operational oceanographic services (altimeter and wide-swath low/medium resolution optical and infrared radiometers); Sentinel-4 on geostationary orbit and Sentinel-5 on low Earth orbit being both dedicated to atmospheric chemistry monitoring. France is involved in the preliminary definition of these missions, and should contribute to their actual provision. The first satellite of these clusters is expected to be launched in 2008-2009.

At the national level, the French Programme for Remote Sensing (**PNTS**[58]) associates an important part of the community in operations lasting several years. It aims at developing methodologies designed to prepare the use of satellite data by scientists, promoting the implementation of operational methods, and assessing and assimilating space data in complex models. It has for instance backed the following existing space programmes: POLDER, SeaWIFS, SPOT, VEGETATION, MERIS/ENVISAT regarding studies in the solar field, and ERS (altimeter, windscatterometer, SAR), ENVISAT, TOPEX/Poseidon and JASON in the microwave sphere. It also helped exploit new missions on gravity such as CHAMP or GRACE, and will be involved in the future GOCE project. It promoted missions now scheduled such as IASI, Lidar WIND, MSG, CALIPSO and SMOS and supported projects involving the P-band (RAMSES[59] radar) or hyperspectral data (CHRIS[60]).

The PNTS also plays an important part in structuring communities on specific themes by organising workshops. Some devoted to higher spatial resolution or LUCC[61]-related issues already took place.

In April 2005, the PNTS held a workshop on future prospects. It was an occasion to take stock of the period 2002-2005 in all the PNTS themes, i.e.: Biosphere and continental surfaces, Solid Earth, Ocean, Atmosphere, Societies and environments; as well as regarding all the sensors and methodologies to which the programme contributed, i.e.: active sensors, very high resolution imagery, radiometric passive sensors, GPS, gravimetry, data fusion and assimilation.
Future prospects highlighted the GMES programme, and the PNTS plans to sup-

[54] *Global Monitoring for Environment and Security.*
[55] *GMES Service Elements.*
[56] *These 12 projects cover the following areas: ground motion hazards, operational ice monitoring, polar monitoring, crop monitoring, urban mapping services, forest monitoring, water management, forest fire and flood management risk information, coastal zone management, ocean surveillance, atmospheric composition, humanitarian aid.*
[57] *Synthetic Aperture Radar.*
[58] *Programme National pour la Télédétection Spatiale.*
[59] *Radar Aéroporté Multi-Spectral d'Etude des* Signatures.
[60] *Compact High Resolution Imaging Spectrometer.*
[61] *Land Use and Cover Changes.*

port the methodological development of future missions and to undertake studies applying new concepts such as higher spatial resolution (namely ORFEO, Pléiades-HR and Cosmo-SkyMed). The PNTS is also maturing methods that use new measurement techniques: RADARSAT-2 SARs, ALOS[62] cartwheel (both satellites to be hopefully launched in 2006).

2.7 ITALY

The conflict between reduction of national costs and the need for a more competitive and active research and development program are in strong contrast in Italy. This situation has forced the selection of specific strategic activities; one consequence of this has been a reduction in the allocation of resources to Remote Sensing research. This situation is not enabling Italy to build a stronger R&D base, which may have some future implications for space related activities in Italy. Nevertheless, the productivity of the Italian scientific community is still very high and incredibly active.

The definition of the budget allocated to the Earth Observation research and application is rather difficult. The National Space Plane (PSN) in the three-annual program 2003-2005 has in particular allocated resources for the development of radar technology and payloads with reduced resources to other forms of RS research and application. The remote sensing activities are often encrypted in inter-disciplinary projects and initiatives or left at the participation in European and International programs (6th Framework Program and bilateral international collaboration).

ASI - Italian Space Agency
The most relevant effort among the ASI Earth Observation activities is the COSMO-SkyMed national Programme, in terms of resources allocated and national strategy. COSMO-SkyMed is an end-to-end Earth observation system that foresees the lunch of four satellites equipped with a SAR X-band payload. The system, that should be usable as well by civilian and military users, is carried out in tightened contact with CNES that is developing an observation system in the optical band, named ORFEO-Pleiades. The lunch of the first COSMO-SkyMed satellites is foreseen for 2006.

Besides the CNES, ASI has strongly collaborated with the CONAE (Argentina Space Agency) that is studying the design of two satellites with onboard and L-band SAR payload (SAOCOM). ASI and CONAE have considered together both the potential integrated use of the two systems (COSMO-SkyMEd and SAOCOM) both the combined use of X-band and L-band SAR data for the developing of earth observation applications. This project is named SIASGE.

All the activities previously mentioned are carried out taking into consideration the Italian participation to the ESA earth observation ongoing and future programme like ENVISAT, the Living Planet Programme and the GMES services under the frame of the activities of the new world-wide program GEO.

The Italian Space Agency is also involved in the definition of the scientific and operational requisites of an hyperspectral satellite mission in cooperation with the Canadian Space Agency. To this purpose several meetings were organised along with the italian scientific community in order to define the major applications and as a function of these the technical characteristics of the mission.
web: **www.asi.it**

ASSOCIATIONS

The Federation of the Scientific Societies for the Geographic and Environmental Information (ASITA)
The ASITA federation is based, since 1997, on the collaboration of four Scientific Associations concerning with different aspects of Geomatics:
SIFET - Società Italiana di Topografia e Fotogrammetria, representing Italy in ISPRS (International Society for Photogrammetry and Remote Sensing)
AIC - Associazione Italiana di Cartografia representing Italy in ICA (International Cartography Association)

[62] *Advanced Land Observing Satellite.*

AIT - Italian Remote Sensing Association, since1996 Associate Member of ISPRS,
AM/FM/GIS Italia - Automated Mapping/Facilities Management/ Geographic Information System/Italia, representing Italy in (European Umbrella for Geographical Information).

The 9th National Conference was held in Catania, 15-18 November 2005. About 1.000 registered at the Conference, 370 papers were published in the Proceedings, distributed at the Conference, in paper and electronic format, and more than 60 exhibitors presented their technical solutions in the field of the Geo-spatial Information.
The list of the several activities promoted by ASITA are reported in the Web site: www.asita.it

The Italian Remote Sensing Association (AIT)
The Association, Member of ASITA, EARSeL and ISPRS, has about 450 Members. AIT proposed, and EARSeL Council accepted, the candidature of Italy for the 27th EARSeL Symposium and Workshops to be hold in Bolzen, 4-7 June 2007. The only other EARSeL Symposium held in Italy was in capri in 1988.

Remote sensing, in fact, involves several public and private Institutions in Italy and has been recognised as an important tool to manage different environmental issues. The increased diffusion of this discipline is mainly due to the work carried out by the scientific community that took advantages of the opportunities offered by the Earth Observation projects supported by the European Space Agency and European Community (GMES and INSPIRE activities), and also by the availability of satellite images at very high spatial resolution. This, in particular, caused the public administration to recognise Remote Sensing as a reliable tool to produce cartographic and thematic data for environmental monitoring.
This new scenario determined a new commercial perspective to Remote Sensing in Italy that resulted in a growing cooperation between scientific community and public administrations and also to an increased request of qualified education in the field of Geomatics.
In Italy, in particular, there are many scientific and operational issues that involve the use of Remote Sensing techniques. Among the most relevant projects is the COSMO-SkyMed mission (Italian Space Agency) that, starting in 2006, will launch a constellation of satellites equipped with SAR sensors, designed to provide data in the fields of risk management, geology, agriculture and forest systems, land management and ecology, monitoring of coastal zones and law enforcement. Also several projects are supported by regional administration to produce thematic maps and to update base cartography, and involve the scientific community about the use of radar, hyperspectral and very high resolution sensors, as well as laser scanning techniques.
About the new infrastructures available in Italy it is worth mentioning the antenna installed at the University of Cagliari to receive MODIS images.
Web site: **www.asita.it/ait**

Mario A. Gomarasca, Italian Remote Sensing Association, **www.asita.it/ait**

2.8 POLAND

Activities of the **Institute of Geodesy and Cartography, Departments of Remote Sensing and GIS** were concentrated on land applications of satellite data. In particular, special emphasis was placed on further improvement and operational application of remote sensing based system for crop condition assessment and yield forecasting. Extensive studies on using multisensor data for analysis of soil moisture/vegetation conditions, crop recognition, land use mapping and urban studies were also conducted. The major works carried out in 2005 are listed below: -

Integrated Project within 6th Framework Programme - Geoland
GMES products and services integrating EO monitoring capacities to support the implementation of European directives and policies related to land cover and vegetationInstitute of Geodesy and Cartography participated in two Geoland sub-projects: -

- Observatory food security and crop monitoring.
- Core service generic land cover

The sub-project "Observatory Food Security and Crop Monitoring" in the first phase, carried out in 2004-2005 was aimed at evaluation of the methodologies of crop yield assessment developed by observatory partners,, which were applied for 3 pilot areas in Europe (Poland, Belgium, Spain). over the period 1990 – 2002. Validation of the results for each methodology was done by aggregation of the yield indicator to administrative units and comparing the time series of yield indicators with the observed crop yields. Different methods were compared with regard to accuracy, timeliness and cost-effectiveness.
Institute of Geodesy and Cartography prepared the assessment of crop yields for three mentioned above countries using its own approach, based on vegetations indices derived from NOAA AVHRR and SPOT VEGETATION data. The results of the work were submitted to the Joint Research Centre, where intercomparison of different methods and evaluation of their efficiency was done.

The sub-project "Core Service Generic Land Cover" was aimed at preparation of remote sensing technology for European-wide land cover / land use mapping. It was based on assessment of user needs in various European countries, presentation of concept of land cover map, its discussion with end-users, preparation of prototype maps for 5 pilot areas and evaluation of the produced maps by user community in order to refine the applied approach.

Institute of Geodesy and Cartography participated in the first stages of the project. In the first stage nationwide action was undertaken to collect information concerning needs of Polish users of land cover maps. The collected materials in the form of questionnaires were passed to the main coordinator of the project to make further analyses.

As a result of analysis of these needs expressed by users of land cover maps in various European countries preliminary technical specification was prepared, which determines basic elements of technology of land cover mapping at a scale of 1:100 000. This specification comprises map legend, consisting of 15 land cover classes, corresponding to the legend applied in CORINE Land Cover Programme. Evaluation of technology was done at the Institute of Geodesy and Cartography and sent to the main coordinator of the project.

The latest stage of the project, conducted in 2005, was concentrated on preparation of land cover maps for 5 selected test areas according the accepted preliminary specification. Such maps have been produced and evaluated by end users to create final version of technical specification for land cover mapping at European level.

Assessment of crop recognition efficiency using microwave ASAR images acquired from ENVISAT-1
The work using ENVISAT data delivered by ESA within Category-1 Project was aimed at preparation of the method of crop recognition based on classification of microwave ASAR images. Investigations aimed on finding the best set of ASAR images ensuring a required crop classification accuracy have been conducted since the growing season of 2003 through 2005. Relevant in-situ observations were made in Wielkopolska test site in western Poland, collecting information from over 700 plots covered by homogeneous crops. The ongoing work is focused on the derivation of relevant parameters from ASTER and IKONOS images and the investigation of SAR image sensitivity to these parameters. Beside soil moisture maps are also produced from ASAR images. These maps will be used as a reference during the validation of low resolution soil moisture products from SMOS satellite. This work will constitute our contribution to the Spanish project, MIDAS-4: SMOS mission's MIRAS radiometer measurements: calibration and generation of ocean salinity and soil moisture maps.

Preparation of the method for classification of urban areas using high-resolution satellite images
The work was concentrated on examining different classification methods to find optimum approach for making land cover

maps for urban areas. Various approaches were studied in the course of the work, like spectral mixture analysis, object-oriented classification, neural network analysis. High-resolution QuickBird images were applied as a primary source of analysis; ASTER and Landsat ETM images were also included.. The ongoing work is concentrated on intercomparison of different methods in order to select the best one suitable for classification of urban environment.

Moreover, object-oriented classification was thoroughly studied within a separate project to evaluate its usefulness for detailed land cover mapping. Fused panchromatic and multispectral Landsat ETM data were used for this purpose. The approach included application of specific rules of segmentation and utilization of non-spectral information for achieving high accuracy of classification.

Development of Crop Condition Assessment System for drought monitoring and yield forecast. About 200 daily NOAA/AVHRR satellite data of Poland were acquired for the whole year 2005. NOAA/AVHRR archival database, covering period 1992 – 2005, was created for the whole Poland.. Information packages on crop condition assessment, containing maps and images derived from comparative analysis of NOAA/AVHRR data, were operationally delivered to the Central Statistical Office throughout the whole vegetation period (April – September). INFOSAT database, containing vegetation and temperature indices derived from NOAA AVHRR data, was also updated.

Development of methods for soil moisture assessment and classification of wetland areas on the basis of synergic use of optical and microwave satellite data
Within this project the method of soil moisture assessment for wetlands, with the use of information derived from microwave satellite data ERS SAR; ENVISAT ASAR, was created. In parallel, methodology of studying ecological changes within wetlands through application multisource optical/microwave satellite data, was prepared. The combined approach was aimed at analysis of vegetation parameters and water balance with the use of microwave ERS SAR, ENVISAT ASAR, MERIS and NOAA/AVHRR data.

Dasymetric mapping statistical population data using GIS and remote sensing data
The research work demonstrates use of satellite derived ancillary land cover data to map population densities using dasymetric mapping. Three dasymetric methods (binary method, areal weighting aggregation, areal weighting correlation) were prepared and presented in the form of thematic maps. They revealed the interregional variations in population density more realistically, in particular between urban and rural areas. The methods were tested for Mazovia region located in central Poland.

Activities of the **Remote Sensing and GIS Laboratory, Faculty of Geodesy and Cartography, Warsaw University of Technology** were concentrated on three research areas:

Methodology of use of experimental satellite CHRIS/PROBA data for lake water quality analysis related to land use/ land cover structure of lakes basin.

CHRIS/PROBA images collected in characteristic limnological moments were used for water quality monitoring in Masurian Lake District. Simultaneously, in-situ measurements of several water quality parameters were made (temperature, Secchi depth, chlorophyll concentration, suspended particular material, turbidity, phosphorous, etc.). the results obtained with the use of different methods of image processing were compared with in-situ reference measurements. CHRIS data gave very good correlation with lake trophy and with in-situ parameters as: Secchi disk depth, concentration of chlorophyll-a, total suspended solids, total phosphorous and total nitrogen. The detailed interpretation of the spatial diversification of different lake water quality parameters brought good results.

In the frame of the project some analyses of the influence of land use of the lakes basin on water quality were made. Results of the studies gave the answer what kind of factors have essential impact on lake water quality.

Creation of methodology for the purposes of vector elements extraction for database of topographic data and discrete multispectral analysis of areal changes based on very high resolution satellite images. The following main research goals are considered as the most important for the Project:
- the evaluation of usability of different VHR satellite images (Ikonos, Eros, QuickBird) for the creation of topographic database,
- the usefulness of VHR images Ikonos and QuickBird for crop identification in IACS control methodology (testing and evaluation of data fusion algorithms for visual interpretation purpose, digital classification of pansharpened images, etc).

With regard to the subject and planned to be achieved results, the project is carrying on with the cooperation with the Agency of Restructuring and Modernisation of Agriculture (ARMA) to which the final results will be also transferred.

Vertical accuracy assessment of SRTM C-band DEM data for different terrain characteristics.
The results of the tests carried out in Warsaw University of Technology had the goal of determining the quality and potential suitability of the Shuttle Radar Topographic Mission product (version II). Three test areas (approx 10,000km^2 each) were chosen over Poland, one in the north of Poland, second in the centre and third in the south. Test sites represent different terrain and landscape characteristic, moreover representation of various classes gave a good overview of the vertical accuracy of the radar data. A large number of independent and accurate control points were used for vertical accuracy determination. The additional set of accuracy tests using national data elevation model (25 m grid size) was done as well.

The results show that the SRTM version II data for the tiles tested performed better than its standard specification, and can be suitable for wide use in many applications without further processing (improvement), apart from projection and datum transformations.

Activities of **Remote Sensing of Environment Laboratory (WURSEL), Faculty of Geography and Regional Studies, University of Warsaw** were concentrated on developing applications of data collected within HySens 2002 international project, which was aimed at the development and evaluation of hyperspectral data and techniques in mapping and monitoring of high mountain vegetation. Other research projects: land use mapping and land cover changes analyses of Bystrzanka catchment (Low Beskid); Artificial Neural Networks in land cover classifications; Socio-economics changes in Polish Carpathian Mountains (since 19th century).

In April 2005 the Remote Sensing of Environment Laboratory (WURSEL) organized in cooperation with European Association of Remote Sensing Laboratories (EARSeL) the 4th Workshop on Imaging Spectroscopy. During the event, which was attended by almost 160 participants, almost 90 oral presentations and 40 poster presentations were presented.

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2.9 PORTUGAL

There are currently 4 active members of EARSeL: Laboratório Nacional de Engenharia Civil (LNEC), University of Porto (CICGE/FCUP), Portuguese Geographic Institute (IGP) and Instituto de Meteorologia (IM). The individual reports of Remote Sensing activities in 2005 are listed below.

LNEC – Laboratório Nacional de Engenharia Civil
LNEC has a Programmed Research Plan (PIP 2005-2008) entitled "Remote Sensing and Digital Image Processing Applied to Civil Engineering", with the objective of operational use of very high resolution satellite imagery for the production of photo-maps for local authorities. A number of publications and presentations were made within this project.

In May 2005 LNEC organised a short course, together with FUNDEC, entitled "Very high resolution satellite imagery ex-

ploration". For more information please contact the LNEC representative at EARSeL, Eng. Ana Fonseca **(anafonseca@lnec.pt).**

FCUP (CICGE / University of Porto)
Centro de Investigação em Ciências Geo-Espaciais (CICGE) is a research Centre of the Faculty of Sciences, University of Porto (FCUP). The main Earth Observation activities of CICGE / FCUP are research and teaching, both undergraduate and post-graduate courses, in Remote Sensing, Photogrammetry, Image Processing, GIS, GPS, Geodesy and other topics in the fields of geomatics. It is worth pointing out that FCUP is responsible for the first MSc course in Remote Sensing in Portugal, a 2-year course that started in 2000 and that is now on its 3rd edition. FCUP has currently 10 PhD students in the field of Remote Sensing or related Geomatics areas.

In 2005 CICGE/FCUP was involved in several research projects, both individually and through partnerships with other national and international organisations. The most significant are listed below.

MOCTIM. The main objective of this project is to integrate LIDAR and stereo IKONOS data to develop 3D city models.

POCUS – Study of the Portuguese Oceanic Coastal Zone using Remote Sensing Data. The objectives of this project are twofold: to study the oceanic processes governing the Portuguese coastal zone using Remote Sensing Data and to exploit the synergetic use of ENVISAT data, with particular emphasis to satellite altimetry, for coastal studies.

In 2005 FCUP organised the EARSeL annual Symposium, with the general theme "Global Developments in Environmental Earth Observation from Space". The Symposium was followed by two Workshops, organised by the EARSeL Special Interest Groups (SIGs) – the 2nd Workshop on Remote Sensing of the Coastal Zones and the 1st Workshop on 3D Remote Sensing. The three events together took place from 6 to 11 June 2005 and attracted over 230 participants from 35 different countries. This was the first time an EARSeL conference was held in Portugal, and there was a very significant national participation, including over 20 MSc and graduate students from the University of Porto. For more information about the CICGE/FCUP activities in Earth Observation please contact the EARSeL representative, Dr. André Marçal **(andre.marcal@fc.up.pt)**

Portuguese Geographic Institute (IGP – Instituto Geográfico Português)
The Remote Sensing activities at IGP are carried out by the Remote Sensing Unit (RSU), a research & development department that develops its activity in the framework of the mission and functions of the Institute. Since its creation RSU has built up a strong experience of working with moderate spatial resolution satellite imagery (e.g. Landsat TM). In response to recent developments in Remote Sensing technologies, the Unit's activities are expanding towards both very high (e.g. IKONOS) and low (e.g. MODIS) spatial resolution satellite data. From another perspective, the major part of the Unit's activity is focused on digital image processing methods for thematic information extraction from satellite data, mostly applied in view of land cover and land use characterisation.

In 2005 RSU has been involved in several projects, both individually and through partnerships with other national and international organisations, briefly summarised below.

CORINE Land Cover 2000 (CLC2000) Portugal.
The CLC2000 Portugal was developed in the framework of the initiative IMAGE and CORINE Land Cover 2000 (I&CLC2000) of the European Commission, which has, as main goal, the production of land cover and land use cartography for Europe's territory, for the year 2000. The production of such cartography for Portugal occurred from October 2002 and February 2005 and was financed by the Institute for the Environment (Portugal) and the European Commission. It was co-ordinated by the Institute for Statistics and Information Management (New University of Lisbon), in co-operation with the Portuguese Geographic Institute.
LANDEO. The main objectives of this project are: to develop integrated methodolo-

gies to explore new ENVISAT optical and radar sensors for land cover characterisation at different scales; to illustrate through demonstration case studies the usefulness of earth observation data as a source of environmental monitoring products.

AGRO130.
The project AGRO130 has the following main goals: to demonstrate the use of satellite images for automatic mapping of clear cuts and new forest plantations at local and regional scales; to demonstrate the usefulness of monitoring clear cuts and new plantations on information gathering (e.g. forest inventory, map updating) and decision making (e.g. planning and controlling environmental legislation compliance); to use Internet as an interactive tool between information producers and users.

CARFOR. This project started in October 2004 and will be concluded in middle 2006. It concerns the study of the potential of IKONOS images for forest mapping at large-scale, using information extraction automated methods. This project is being executed in the framework of a protocol among the Portuguese Geographic Institute (IGP), the Association of Paper Industries (CELPA) and the company MECI, SA.

Currently, the Remote Sensing Unit, together with the Institute for Statistics and Information Management (New University of Lisbon), is also organising an international conference entitled Accuracy 2006 (http://2006.spatial-accuracy.org/). This conference is the 7th meeting in a series of biannual symposia organised by the Spatial Accuracy Research Group. It aims at bringing together experts coming from the environmental and natural resources fields, spatial statistics and geographic information science, in view of contributing to the development of the theoretical and practical knowledge about spatial uncertainty in environmental sciences. For more information about the IGP activities in Earth Observation please contact the EARSeL representative, Dr. Mário Caetano **(mario.caetano@igeo.pt).**

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2.10 SPAIN

Many of the 2005 Spanish remote sensing activities have been dealing with sea and continental waters. The key role of the Spanish scientific and technologic community to the development of the SMOS (Soil Moisture and Ocean Salinity) mission of the European Space Agency has continued during 2005. Spain has been involved from 1998 in this Earth Observation mission that aims at providing global measurements of surface ocean salinity and soil moisture after 2007. The main activities have been: campaigns to improve the models of the emissivity of land surfaces, development of algorithms for the processing of level 1 and 2 data, preparation of validation plans, and development of a high level processing centre. Also, several Spanish marine research institutes and universities have been participating in the ESEOO project (Establishment of a Spanish Operational Oceanography System) that includes the preparation of remote sensing tools and services to be used in emergencies in open ocean and coastal areas.

The Physical Oceanography Group from the Dept. of Marine Geology and Physical Oceanography at the Institut de Ciencies del Mar, CMIMA – CSIC, in Barcelona, leaded by Dr Jordi Font **(http://www.icm.csic.es)** participates in the European MERSEA project (Marine Environment and Security for the European Area) by developing a technique to extract the surface velocity field from individual remote sensing images. A publication on this technique was highlighted in the cover of the September 5th issue of Physical Review Letters.

They are requesting now a two year research project that is a follow-on of previous activities generically named MIDAS (Microwave Measurements and Algorithms Development for the SMOS mission) to perform theoretical and experimental work to improve the retrieval algorithms of both geophysical variables from satellite observations, to validate SMOS products after the satellite launch (February 2007), and also to continue the development of the payload data processing centre (PDPC and CP34) in the Villafranca del Castillo ground station,

according to the general mission funding scheme agreed with ESA. Finally, several Spanish Marine research groups have established a scientific network to facilitate the cooperation and dissemination of techniques between them and optimise the use of their facilities.

Three main projects in the field of Ecology of Continental Aquatic Systems have been conducted in 2005 by the Applied Remote Sensing Group at the Centre for Hydrographical Studies from CEDEX, Ministries of Fomento (Public Works) and Environment lead by Dr. Ramón Peña, who is also the PI of all of them:

1.- Ecological Quality Assessment in several Reservoir integrated in the GIG-Lakes-Mediterranean during 2005,

Highlights: EU Water Framework Directive, Ecological quality, Intercalibration, Satellite imagery.

Funding: For 1 year. The project is ending, with funds from M. of Environment.

Relevant research policy issues: Support to IC process helping to complete data. Spain is the Leader of the GIG-LM. This propject is related with ESA Cat-1 Projects: AO-3123 Chris and AOE-594 Meris.

2.- Development of an operational system to direct mapping of photosynthetic pigments using ENVISAT-1 MERIS sensor. Application to Spanish reservoirs.

Highlights: Ecological quality, Water optics, Satellite imagery.

Funding: For 4 years. The project is ending, with funds from M. of Environment.

Relevant research policy issues: Development of models and algorithms to map pigment concentration in inland water bodies. This project is related with ESA Cat-1 Project: AOE-594 Meris.

3.- Research and Development of a system to periodic thematic mapping of reservoirs using satellite Remote Sensing.

Highlights: EU Water Framework Directive, Ecological quality, Satellite imagery.

Funding: For 4 years. The project is starting, with funds from M. of Environment.

Relevant research policy issues: Supporting to Ministry of Environment helping to complete and public visual information of water quality data trough the official web page. This project is related with ESA Cat-1 Project: AOE-594 Meris.

A very active research in the field of the Spanish inner water using Hymap, Hyperion, ASTER and Hyperspectral DAIS images has been carried out by the remote Sensing Group from the National Geological and Mining Institute, lead by Dr Asunción Riaza. Some of the obtained results could be seen in "Mineral climate indicators on paleoflooded and emerged areas around lake marshes (Tablas de Daimiel, Spain) using Hyperspectral DAIS 7915 Spectrometer data, International Journal of Remote Sensing, vol.26, nº 20, 2005, 4565-4582.

The Remote Sensing Laboratory of the University of Valladolid, LATUV, is one of the 77 laboratories including in Direct Broadcasting Group from MODIS, and during year 2005 has gathered daily images MODIS AQUA and TERRA of Spain, Portugal, Morocco, the south of France and Italy. These images have been used for the operational application of agrarian insurances, the pursuit of fishing banks, the location and monitoring of forest fires and others, along with images NOAA and Feng Yun that also are received in the LATUV. In the case of forest fires it is to emphasize an operative procedure for the detection of forest fires by means of MSG images that immediately are transmitted in real time to the end users, within a project financed by ESA.

In the educational field, the Polytechnical University of Madrid, UPM, made up of Drs Agueda Arquero, Consolation Gonzalo and Estibaliz Martinez, have used the Internet for the diffusion of two courses. First, opened to all the students of the University "Analysis and processing of remote sensing digital images", **http://neptuno.gate.upm.es/campus/FRV/busqueda.php,**

supported in the AGWS (Agora Groupware Web server): - **https://agws.dit.upm.es/projects/cyberaula.** The second is a course of continuous formation online "Remote sensing for natural resources management"
http://neptuno.gate.upm.es/campus/FCV/busqueda.php.
Its activity is covering Ibero-America too, where Prof. Consolation Gonzalo has distributed other two post-degree courses in Chile: "Artificial Neuronal Networks: application to the processing, analysis and interpretation of satellite images" at the Faculty of Agricultural Engineering of the University of Conception, and" Introduction to Remote Sensing" distributed by the Department of Sciences of the Faculty of Engineering, Sciences and Administration of the University of the Border, Temuco, within the framework of a Complementary Action subsidized by the Spanish Agency of Cooperation with Ibero-America.

The Institute of Geomatics, a public consortium between the Polytechnic University of Catalonia and the Regional Government, is developing an "International Master in Airborne Photogrammetry and Remote Sensing". This Master is composed by different modules and many conferences and other activities. The next courses could be highlighted, due to its close proximity to remote sensing:

"Digital Photogrammetric Systems" (40 hours) By: Prof. Dr. Ing. Christian Heipke, University of Hannover, from Monday, 30th of May to Friday 3rd of June 2005. Sponsored by: Intergraph, Z/I Imaging
"Sensor Orientation (2): Precise trajectory and attitude determination with INS" (40 hours) By: Prof. Dr. Ismael Colomina, Institute of Geomatics, from Monday, 13th of June to Friday 17th of June 2005. Sponsored by: IGI and Applanix
"Laser Ranging-LIDAR" (40 hours) by Peter Friess, Joachim Lindenberger, Grady Tuell, from 24-28/Oct/2005
"Interferometric SAR. Airborne SAR" (40 hours) by Riccardo Lanari, Joao Moreira, from 07-11/Nov/2005.

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2.11 SWEDEN

Hurricane Gudrun On January 8th, 2005, southern Sweden was hit by hurricane force winds, felling an estimated 250 million trees over a 300 * 300 km area. This catastrophe triggered many remote sensing activities. The International Charter for Space and Major Disasters was activated. As a result, many C-band radar images from ENVISAT, ERS-2 and RADARSAT were quickly obtained. These images were analysed by the Radar Remote Sensing Group at Chalmers University of Technology in co-operation with the Swedish University of Agricultural Sciences (SLU) in Umeå (two EARSeL member labs). Although images were available from just before and after the storm, and different polarisations were tested, it was almost impossible to detect storm damaged forest areas with C-band SAR. The Charter also provided access to a few SPOT winter images which were analysed by Metria, a branch of the National Land Survey. In spite of the low sun angle and partial snow cover, change detection using the post-hurricane winter images paired with images from the previous summer provided useful results. However, during the emergency phase after the hurricane, visual estimates from aircrafts and systematic coverage with digital air photos provided the most useful information. Later, during the summer of 2005, a change detection of fellings between the years 2004 and 2005 for the whole catastrophe area was made by the Swedish Forest Agency. This time, high quality SPOT images from the summer after the hurricane were used. The result was very satisfying for mapping of areas where all trees had been felled. However, because of the risk for increased population of parasites (such as the spruce bark beetle) it was also of interest to obtain an overview of scattered felled trees within remaining standing forest. The CARABAS VHF SAR system, developed by the Swedish defence research agency (FOI) operates with a 3m – 15 m wavelength and penetrates through the canopy. CARABAS was successfully tested for this purpose. The analysis was carried out jointly by FOI, Chalmers University of Technology, SLU and the company Dianthus. As a result of these tests, a 125 * 125 km area are being

operationally mapped in January 2006 using CARABAS and analysed for remaining wind-felled trees.
Among the lessons learned are that the availability of reference data from before the catastrophe event is essential. Furthermore, the relevant authorities must be aware of the Disaster Charter and how to activate it. Once the Charter is activated (or if remote sensing data is obtained in other ways), there must be remote sensing professionals ready to order, receive and analyse the image data. The delivery of data from the Charter was very quick and efficient. The limitations at this occasion was the limited amount of SPOT data available, and that the C-band was the wrong wavelength for forest issues. However, taken altogether, the Disaster Charter is perceived as an important instrument that is improving and evolving, e.g. with the access to L-band radar from ALOS.

The research funding situation
The Swedish National Space Board (SNSB) has two remote sensing programs open for yearly applications. One program is for academic remote sensing research and fund studies with 1 – 3 years length. The other program is for remote sensing application development. It is open for authorities, companies and other organisations that are developing operational applications. Priority is put to realistic applications where co-funding is available. The funding available from SNSB is in the order of 1 million Euro yearly per program. Both these programs focus on space based remote sensing, which thereby is sufficiently funded in Sweden. There is no dedicated program for airborne remote sensing and such research has been difficult to fund.

The Swedish National Land Survey
The Swedish National Land Survey has adopted a new plan for aerial photography. From 2006 and onwards, air photos will be acquired for an area corresponding to one-third of Sweden. A digital mapping camera was acquired in 2004, and by 2007 all images will be registered with digital technology. During 2005 the Land Survey also finalized a pilot project about techniques for using laser scanning towards creation of a new national elevation model. The results are very promising.

In Sweden, most satellite data are distributed and geo-corrected by Metria, the commercial branch of the Swedish National Land Survey. Metria Miljöanalys is a section of Metria which creates value added remote sensing products. Metria is carrying out a large number of projects related to environmental protection, forestry and security applications. On the European level, Metria is, for example, partners in the GMES Service Element Stage 2 projects Forest Monitoring, Land and Risk-EOS, and in the FP6 projects Geoland and Preview.

Activities in EARSeL member labs
The Geoinformatics section at the Department of Urban Planning and Environment at the Royal Institute of Technology in Stockholm is presently focusing its research on fusion of multi-sensor remote sensing data for landuse/land-cover classification and change detection, and assessing the impact of these changes on the environment. The multi-sensor data investigated include SAR data such as RADARSAT-1 SAR, ENVISAT ASAR data and optical data such as QuickBird, SPOT and ENVISAT MERIS data.

The Department of Physical Geography and Quaternary Geology, University of Stockholm is carrying out several different types of remote sensing projects such as mapping of changes in sea grass meadows around Zanzibar; monitoring of glaciers using EO data; and optical modeling in the Baltic Sea for validation of MERIS data.

The Radar Remote Sensing Group at Chalmers University of Technology in Gothenburg is working with radar remote sensing of forests. Much activity has focused on evaluation of forest mapping from the Swedish airborne VHF SAR system CARABAS. During 2006 ALOS PALSAR L-band data will also be investigated in co-operation with SLU. The group has also re-started the work with studying sea ice using Radar data.

The Remote Sensing Laboratory at the Swedish University of Agricultural Sciences (SLU) in Umeå is working with remote sensing of forests and mountain vegetation. All relevant sensors, ranging from MERIS to small digital cameras onboard UAVs are used,

with an emphasis on the use of SPOT HRG, the Z/I DMC camera, and laser scanner data. During 2005, the group worked together with the Swedish Forest Agency to arrange the EARSeL sponsored ForestSat 2005 workshop. The automated production of a new national remote sensing based forest data base, using the kNN algorithm with approximately 200 SPOT scenes from the year 2005 and about 30,000 National Forest Inventory plots has also started.

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2.12 THE NETHERLANDS

The Netherlands role in earth observation has been carved out by over the last 15 years of support and guidance by the Netherlands Remote Sensing Board (BCRS) through its User Support programme. BCRS no longer exists, but through the National Science Foundation (delegated to the SRON bureau external research) support for earth observation research as well as operational services is given. The priority areas for this instrument are:

- Support of the use of European and non-European earth observation satellite datasets to support scientific research and applied research as well as commercial use
- Strengthening the Netherlands position of value adding industry on the international EO market
- Support the development of a national infrastructure for EO data to support the Netherlands user community.
- To provide information on the application of earth observation data and research for a broad national audience.

Research themes addressed focus on areas in which the Netherlands has gained a strong initernational position:

- Atmospheric chemistry, radiation budgets, atmosphere dynamics
- Physical oceanography, coastal and inland waters and cryosphere research
- Land processes including energy balances
- Solid earth research and space geodesy

Main areas of application include:

- Operational meterology and oceanography
- Water and coastal management
- Land use and agriculture
- Climate and environmental monitotoring
- Security and disaster management

For the period 2002-2005 a budget of 12,48 M€ is available for support of EO projects besides contributions to ESA and other strategic funds. The proposed projects are linked to EU and worldwide initiatives such as GMES (Global Monitoring for Environment and Security and GEOSS), the Integrated Global Observing Strategy (IGOS) and the research programmes International Geosphere Biosphere Programme (IGBP), the World Climate Research Programme (WCRP) and ESA Data User Programme (DUP) and sixth and seventh framework programmes of the EU. The research funding for earth observation is organised through a GO ('gebruikersondersteuning'=user support) programme that has a scientific stream organised by SRON (see also below in the institues) and a application-oriented stream organised by NIVR (the Netherlands Agency for Aerospace Programmes). In 2004 a total of 27 proposals were submitted and 9 were funded and started in 2005. The last call for the GO programme is now open. A total of 38 proposals were submitted, decision on funding is taken in March 2006. Finally, it is now clear that the scientific part of GO (through SRON) will continue after 2006 (for another 5 years).

The professional society for the earth observation branch in the Netherlands has for long been the Netherlands Society for earth observation and geoinformation (NSEOG). The NSEOG had 700 members and three sections namely remote sensing, GIS and photogrammetry. The mission of the NSEOG was dissemination of information in these fields through the organization of regular meetings on specific topics. This culminated in the organization of the 2000 general meeting of ISPRS in Amsterdam.

On 23 October 2003 the NSEOG together with several other professional organizations in the field of geoinformation science formed a new society named 'Geoinformation Netherlands – GIN'. GIN has some

3500 members and covers a wide range of professional fields in the arena of geoinformation science at academic but also at a polytechnic and practitioners level. Of the six sections, two deal with remote sensing aspects namely the section on earth observation chaired by Prof. Vosselman of ITC.

During 2005 the following one-day workshops/symposia were organized by the section earth observation:

- Land applications of ENVISAT on 25 May 2005 at Wageningen University
- Modern Methods in Hyperspectral Remote Sensing and Advances in Image Processing, 22 April 2005 at Utrecht University

In addition, GIN organizes each year a one day GIN symposium and a three day GIN conference and exhibition (former Geodesia congres). GIN also has a email newsletter and a bulletin (Geo-Info) and (of course) a website: **www.geo-info.nl**).

It is worth noting that The Netherlands (formally GIN section earth observation) has been awarded the ISPRS technical commission VII on thematic processing, modeling and analysis of remote sensed data. As President for the commission, Professor John van Genderen of ITC will serve.

Terms of reference for the commission cover:

a) Relationship between spectral, radiometric and temporal properties of objects and surfaces, their physical and chemical properties and their variations;
b) Image classification and analysis methodologies;
c) Analysis of characteristics of multispectral, hyperspectral, multi-sensor, microwave and multi-temporal image data for extraction of attribute information;
d) Methodologies of computer-assisted interpretation and analysis of remotely sensed data;
e) Validation of data and information using laboratory and in-situ methodologies
f) Improving atmospheric modeling for radiometric correction;
g) Multi-source data fusion and integration techniques;
h) Modeling of satellite data derived parameters;
i) Global databases and determination of indicators of change for global modeling, monitoring and sustainable development;
j) Integration of remote sensing and GIS techniques;
k) Aerosol and particulate detection and identification.

Several related working group are installed and chaired by Dutch delegates including:

- WG VII/1: Fundamental physics and Modeling, chair Prof. M. Schaepman, Wageningen University
- WG VII/3: Information Extraction from Hyperspectral Data, chair Prof. F. van der Meer, ITC
- WG VII/5: Processing of Multi temporal data and change detection,
- Co chair Dr. B. Gorte, TUD
- WG VII/7: Innovative problem solving methodologies for Less Developed Countries, Co chair Dr. N. Kerle, ITC

The ISPRS Mid-term Symposium for commission VII will be hosted by ITC in Enschede from 8-11 May 2006. Theme of the conference will be "Remote Sensing: From Pixels to Processes". More details are found at:

http://www.itc.nl/isprsc7/symposium 2006/organization.aspx

Earth observation in the Netherlands; EARSeL member reports

The Netherlands has 18 members of EARSeL namely:

1 Adviesdienst v. Geo-Informatie en ICT (AGI), RWS
2 Synoptics, Integrated Remote Sensing and GIS Applications
3 Netherlands Institute for Sea Research
4 Environmental Analysis and Remote Sensing (EARS)
5 Royal Netherlands Meteorological Institute (KNMI)
6 ALTERRA
7 National Aerospace Laboratory NLR
8 TNO-Physics & Electronics Laboratory
9 Institute for Environmental Studies (IVM)
10 Laboratory of Geo-Information Science and Remote Sensing

11 International Institute for Aerospace Survey and Earth Sciences (ITC)
12 Department of Physical Geography
13 ARGOSS
14 P. Geerders Consultancy
15 TerraImaging B.V.
16 Institute for Coastal and Marine Management (RIKZ)
17 Landscape and Environmental Research Group
18 Coastal Zone Management Centre/ Rikz

The Netherlands delegate has approached all of the members and asked them for a status report on activities in their organization on remote sensing relevant to the EARSeL community. The replies received are listed in this section and have been inserted as provided by the contact person of the institute involved.

The International Institute for Geoinformation Science and Earth Observation – ITC (F. van der Meer)

ITC was established in 1950 with the primary aim to build capacity in earth observation and geoinformation science for various land applications (natural resources mapping, watershed management, disaster management, land administration) for the purpose of economic development of the then still referred to as "developing world". The main instruments have been educational programmes at professional master, Master of Science, and PhD level that addresses the capacity requirements in technical and conceptual skills and land-related applications. In addition, short and tailor-made courses have been offered both in our headquarters in Enschede, Netherlands, as well as on-site. Traditionally this training was directed to mid-career professionals. To date, over 16,000 mid-career professionals from over 160 countries have graduated from ITC. ITC has six scientific departments

- The Department of Earth Observation Systems;
- The Department of Geo-information Processing;
- The Department of Urban and Regional Planning and Geo-information management;
- The Department of Natural resources;
- The Department of Water Resources;
- The Department of Earth Systems Analysis.

and educational programmes at post graduate, master and master of science level (supported by a research programme including a PhD programme) run in Enschede.

Geoinformatics - Master and Master of Science (MSc) degree courses
Specialisation options:
- Digital Photogrammetry
- Remote Sensing
- Spatial Data Infrastructures
- Geographical Information Systems
- Spatial Databases
- Cartography and Geo-visualisation

Geoinformatics - Diploma course
Specialisation options:
- Digital Photogrammetry and Remote Sensing
- GIS Operation
- Cartography and Geo-visualisation

Geo-information Management - Master and Master of Science (MSc) degree courses
Specialisation options:
- Cadastre
- Land Administration
- National Mapping Agencies
- Spatial Data Infrastructure (SDI)
- Earth Sciences Organisations
- Rural and Natural Resources
- Planning and Management
- Urban Planning and Management
- Hydrological Organisations
- Earth Science Data Provision (in collaboration with the AES programme)

Urban Management - Postgraduate diploma (PGD) and Master of Science (MSc) degree courses
Specialisation options:
- Urban Planning
- Urban Land Administration
- Urban Infrastructure Management

Natural Resources Management - Master and Master of Science (MSc) degree courses
- Specialisation options:
- Planning and Coordination in Natural Resources Management
- Sustainable Agriculture
- Geo-information for Biodiversity Conservation

	PURPOSE	FOCUS
CAPACITY BUILDING FOR GEOINFORMATICS	Human resources development	Supply of technical and professional personnel
	Organisational strengthening	Strengthen the management capacity of organisations; institutionalise geo-ICT solutions (systems and processes) as well as strategic management principles
	Institutional strengthening	Strengthen the capacity of organisations to develop & negotiate appropriate mandates and modus operandi as well as appropriate (new) legal and regulatory frameworks

- Forestry for Sustainable Development
- Soil Information Systems for Sustainable Land Management
- Environmental System Analysis and Management

Water Resources and Environmental Management - Postgraduate diploma (PGD) and Master of Science (MSc) degree course
Specialisation options:
- Groundwater Assessment and Modelling
- Integrated Watershed Modelling and Management
- Water Resources Studies and Food Production (MSc course only)

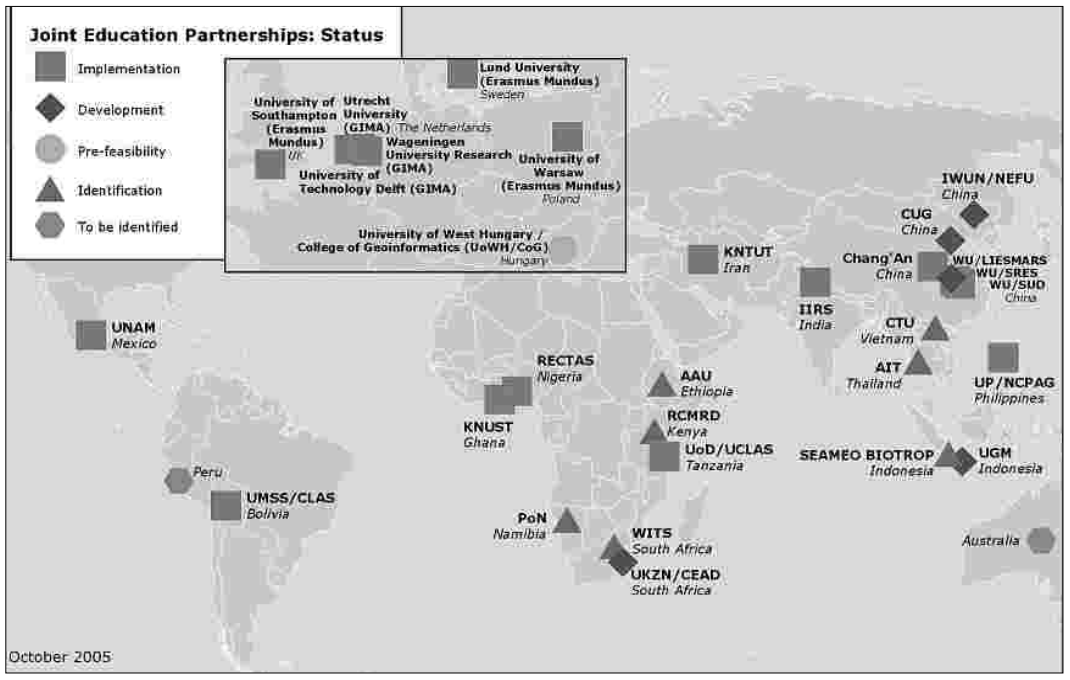
Applied Earth Sciences - Postgraduate diploma (PGD) and Master of Science (MSc) degree course (formerly EREG course)
Specialisation options:
- Geo-hazards
- Geo-engineering
- Earth Resource Exploration
- Earth Science Data Provision

(in collaboration with the GIM programme)

In recent years ITC's efforts shifted from training of individual candidates to addressing the manpower requirements of entire professional organisations. It became rapidly clear, however, that the demand in terms of capacity requirements would never be met by limiting capacity building efforts to the Netherlands. Strengthening that capacity building capability in the recipient countries themselves then became a major focus of ITC's activities. Where a proper organisational and institutional environment is lacking, as is the case in many developing and emerging economies organisational and institutional strengthening form the two major other components of capacity building.

Components of the chain of capacity building addressed by ITC.
During the last five years ITC has concentrated on setting up joint education educational programmes at technician, PM and MSc level in partnership with local universities and institutes in various regions in the world. These are instruments to contribute to building organisational capacity in less developed countries focusing on issues of relevance (droughts in Sub Saharan Africa, tsunamis in SE Asia, floods in China etc.) to the region and embedded in local infrastructures.

Status (October 2005) of ITC joint educational partnerships.
The joint education partnerships are no isolated bilateral agreements between ITC and one partner, but they are part of a larger network in which ITC participates: the GI-Net. GI-Net stands for Geo-Information Network for Education and Training". The main aim of the network is to promote the use of spatial information and earth observation through capacity building and institutional development. The network is active in research and development, as well as in education, training and advisory services. In order to further develop the network, a number of working groups have been established that will each deal with certain aspects of the network (i.e. the set-up and functioning of the network itself, but also issues such as capacity building, education, accreditation, research and consulting). More details can be found at **http://www.gi-net.org/.**



SRON National Institute for Space Research (Rolf de Groot)
SRON is active in the following remote sensing areas:

- Atmosphere chemistry (SCIAMACHY, TELIS, TRAQ)
- Earth gravity missions (GOCE, LDIM, LISA PF)
- Future planetary missions (ExoMars)

SCIAMACHY (instrument on ENVISAT). Main activities were calibration of SCIAMACHY, validation of CO measurements and the assessment of the effect of aerosol on CO measurements. The TELIS SIR (super conductive integrated receiver) was assembled and tested. TELIS will be launched on a balloon in August 2006 and will measure atmospheric trace gasses. GOCE. SRON has the co-PI status for the High-level processing facility (10 European institutes) of GOCE. SRON also contributes to the quality control and external calibration assessment. GOCE will be launched in early 2007. SRON's participation in LISA PF, being the inertial sensor test module, is mainly focused on a future similar contribution to the next generation of Earth Gravity missions, LDIM). SRON is planning to contribute to future planetary missions (e.g. ExoMars) with miniaturized front-end electronics (mixed signal ASIC). This will be applied in the GEP (Geophysical Environmental Package) on ExoMars.

P. Geerders Consultancy (Ir. Paul Geerders)
Paul Geerders operates as consultant in several countries in South America and the Caribbean, mainly related to applications of Remote Sensing and GIS in the field of marine and coastal science and management. Besides, he has carried out projects in Turkey related to the same applications.

Although there is an increasing awareness in developing countries on the potential of Remote Sensing and GIS, still there are many scientific demonstrations while only few of them develop into real operational applications. There is ample room for the transfer of knowledge and technology, and for the creation of independent capacity in these countries. Especially, there are many opportunities for local value-adding industries. Also there is a trend towards the use of data from cheaper and locally accessible platforms for remote sensing surveys (small planes, RC models, balloons) instead of the (comparatively expensive and not always available) data from (high resolution) satellites. In several countries, highly advanced, airborne, UAV-like remote sensing platforms for civil applications have been developed or are under development.

EARSeL and other European space-related organisations could play a valuable role to

assist the development and implementation of operational remote sensing applications in developing countries. This could include: the development and distribution of dedicated promotional and educational material, mutual expert and trainee visits, and active participation in remote sensing related events in the regions (congresses, symposia). Joint projects between EARSeL members and counterparts in the developing world could lead to the development of new, dedicated applications, and could include an element of technology transfer. The major objective of these projects should be to create and strengthen independent capacity on Remote Sensing in the developing countries, with an ultimate goal to provide updated, complete and reliable information for environmental science and resource management.

More details on P. Geerders consultancy at **www.pgcons.nl.**

TNO Defence, Security and Safety (TNO-DSS) (Peter Hoogeboom)

In 2005 TNO has been reorganised and the Remote Sensing activities now fall under TNO Defence, Security and Safety in The Hague. Formerly the TNO laboratory in The Hague was known as TNO Physics and Electronics Laboratory.

In the field of Remote Sensing various activities took place at TNO in The Hague and in the university chair for Radar Earth Observation at TU Delft, which is sponsored by TNO. TNO focused in 2005 on the following activities:

1. The realization of a miniature Synthetic Aperture Radar for unmanned and small aircraft, called miniSAR, has started. This radar will be developed for both military and civil applications. It will combine low costs with high resolution.
2. At TU-Delft two SAR projects are ongoing, one for an extremely small FM-CW SAR and another project for the realization of a small P-band SAR for forest monitoring. This latter project is carried out in cooperation with Wageningen University (Dirk Hoekman).
3. The SHIRA oil spill and wave monitoring radar system is now being offered on commercial basis through the company called Seadarq.
4. The development of algorithms for shipdetection and monitoring as part of a 6th framework EU project (Declims). The final goal is to achieve a coastal monitoring system that integrates information from satellite SAR, shore radars and AIS (Automatic Information System; a shipbased transponder system).
5. In cooperation with the GBP (Geomatics Business Park) in Marknesse, The Netherlands services for the reception, processing, information extraction and dissemination are being developed. These activities are organized through several projects, among them the North Sea monitoring project, which is linked to the previous topic.
6. Development of methods for the detection and monitoring of coastlines, based on SAR imagery.
7. A feasibility study on the detection of landmines in cooperation with ARL (Army Research Lab in the USA) has been completed.
8. An EU project called Presens on the detection of gas and oil pipelines has been completed (see **www.presense.net**).
9. TNO participates with 25 other European research institutes in the GMOSS European network of Excellence on global monitoring for security and stability. The goal of the network is to achieve a better integration of safety research results. The application of EO satellites plays a prominent role. See also **http://gmoss.jrc.it/**.
10. In a national project new change detection software is developed. The development aims at the extraction of infrastructural changes from satellite SAR data (Envisat, Radarsat) and from airborne systems.
11. Participation in various atmospheric and aerosol studies through GMES, other international programs and national projects.
12. TNO participates in several military (NATO and national) initiatives that will lead to advanced radar sensors for SAR and MTI (Moving Target Indication). These developments may have spin-off to civil Security, traffic monitoring and border protection.

AGI (Geo-Information Advisory Service), Rijkswaterstaat (Ministry of Transport

and Water). (Stephen Dury).
AGI is tasked to prepare the implementation of remote sensing based services within Rijkswaterstaat. Its responsibilities include sub-contracting, quality control, and product development. In 2005, AGI was active in developing and implementing a water quality mapping service using remote sensing. There is a close cooperation with 'end-users' of the information within Rijkswaterstaat - including RIKZ, RIZA, North Sea Directorate and Directorate Ijsselmeer Region - as well as commercial service providers and the research community. To further these aims AGI has participated in a number of national and international initiatives, including:

- European GMES (GSE) projects 1) COASTWATCH, and its successor 2) MarCoast, funded by European Space Agency. These initiatives are aimed at establishing a set of operational information services, derived (in part) from EO data. AGI is a key member of the Validation Bureau, ensuring rigorous quality control of the products delivered to end-users, including RIKZ and North Sea Directorate.

In addition a number of complimentary projects were part-funded by the Netherlands Agency for Aerospace Programmes (NIVR):

- Towards Remote Sensing Supported Monitoring of the North Sea (TORSMoN) where the objective is to provide recommendations for a cost-effective monitoring strategy for water quality in the North Sea, using a combination of remote sensing and in situ measurements. Collaboration with National Institute for Coastal and Marine Management (RIKZ); Royal Netherlands Institute for Sea Research (NIOZ); Institute for Environmental Studies (IVM); Advisory and Research group on Geo- Observation Systems and Services (ARGOSS)
- Spatial mapping of the Algal Concentrations in Lake Ijssel, using SeaWiFS satellite data. Results compiled in an atlas. Collaboration with Institute for Environmental Studies (IVM); Rijkswaterstaat - Directorate IJsselmeer Region (RDIJ); Delft Hydraulics.
- Towards an Operational Geo-spatial Infrastructure for satellite enabled Marine Services - collaboration with ARGOSS
- Processing of MODIS data for water quality monitoring in the North Sea - collaboration with ARGOSS, RIKZ, BOSKALIS

In the past two decades, AGI has also been involved in the development of the Bathymetry Assessment System (BAS). This software, owned by ARGOSS, constructs sea depth maps from radar images and a limited number of echo soundings, thus allowing more efficient bathymetric monitoring. In December 2005, an external audit concluded that the BAS service is operational, reproduceable, verifiable and reliable and can be offered to Rijkswaterstaat as operational.
During 2005 AGI also participated in a consortium using remote sensing within the 'Monitoring and Evaluation Programme; Effects of the land reclamation and nature compensation, Rotterdam Mainport Development Project. Initially this comprised of a Baseline Study, since there is a possibility of significant effects on the ecological values of the dune areas.

Remote sensing group, Institute for Environmental studies IVM, Free university Amsterdam (Marieke Eleveld)
The Institute for Environmental Studies (IVM) is the oldest environmental research institute in the Netherlands. Since its creation in 1971, IVM has built up considerable experience in dealing with the complexities of environmental problems. Its purpose is to contribute to sustainable development and the rehabilitation and preservation of the environment through academic research and training.

Recently, several research projects of the remote sensing group of IVM enabled the construction of excellent algorithms and (near-real time) processing lines for water quality products. Important results were achieved within the REVAMP, AAN, ISCHA, SPAC & WATeRS projects. More information on these projects is available from http://www.ivm.falw.vu.nl/ > Research Projects > Climate, water and spatial analysis > Remote Sensing Projects. Here we would like to highlight, that a remote sensing image can now be converted to a chlorophyll map and be made available on

Internet that within 12 hours. Have a look at the CHL standard MODIS products from WATeRS on the Reaserch Projects site that features a movie showing best data (least clouds) for 2005, and at **http://ivm10.ivm.vu.nl/mapserver/waters** for web-mapping (shows only last 5 images; all data covering the North Sea are collected, also when only partly covered, or cloudy).
WATeRS has been a stable CHL service since 1 Jan 2005. Some of the web-mapping tools are still in development, but we're approaching the testing and validation stage now.
Building on similar developments IVM has become a member of the GMES MARCOAST GSE project.

Progress with the algorithms and automated processing also allows an additional focus on the relevant application of such products. Scientific applications in limnology and oceanography and towards climate research are mainly embedded through current PhD research projects. Additional interdisciplinary cooperation occurs in the EU ELME project, and possibilities for cooperation with biochemists is encouraged through the CRESCIO cluster.

IVM is chairing Light and Water, a platform and discussion forum on hydro-optics in the Netherlands. IVM's commercial counterpart is a spin-off company Water Insight.

University Utrecht, Department of Physical Geography (DPG) (Steven de Jong)
One of the new members of EARSeL is the Department of Physical Geography (DPG), Faculty of Geosciences of Utrecht University in The Netherlands. This faculty is one of the largest Geo-Institutes in the world (staff of 425 and 1800 students) because the Departments of Physical Geography, Human Geography, Cartography, Environmental Sciences, Geology and Geo-chemistry reside together here. DPG with a staff of 30 has a longterm research record on modern methods and techniques in Geography comprising spatial-dynamic modeling, Geographical Information Systems and geostatistics. Examples of products are the 'PCRaster Environmental Modelling Language' **(pcraster.geog.uu.nl)**, the 'Multivariable Geostatistical Modelling Package: GSTAT' **(www.gstat.org)** and the physically-based runoff and soil erosion model LISEM **(www.geog.uu.nl/lisem)**.

The Remote Sensing group of the faculty is part of DPG and is headed by Steven M. de Jong. The group offers courses in basic remote sensing and hyperspectral remote sensing at the BSc and MSc level with a focus on geographical applications. Furthermore, we have a 4 year PhD programme of Remote Sensing and Geocomputation in Geography. Research activities of the remote sensing group focus on applications of hyperspectral remote sensing, image analysis algorithms including the spatial domain and on object-based image analysis. Over the years DPG was involved in a wide range of European experiments with hyperspectral instruments. It started in 1989 with the EISAC'89, the European Imaging Spectrometry Airborne Campaign (MACEurope) in 1991 followed by the airborne experiments with DAIS7915, ROSIS and HyMAP between 1997 and now. DPG contributed to these experiments by collecting field data, analysing the imagery and assessing the suitability of these new instruments for quantitative mapping of soil and vegetation variables. The object-based image analysis aims at improving the quantitative survey of vegetation variables by using image objects and image segments in stead of using per-pixel spectral image analysis methods. The object-based studies are managed and supervised by Elisabeth Addink.

Two examples of current PhD studies are given below. The first is 'Modelling Mediterranean Ecological Processes using High Resolution Hyperspectral Remote Sensing Images' by Raymond Sluiter. He recently finished his research on the effect of agricultural land abandonment and the re-establishment of the natural vegetation. Emphasis is put on the Peyne experimental area in southern France. Aerial photos dating back to 1943, Landsat TM, ASTER airborne hyperspectral images are used to quantitatively map vegetation dynamics (see for more information: **http://www.sluitertijd.org**). A second example is the

PhD work of Hans van der Kwast 'Integrated Modelling of Top Soil Moisture using Earth Observation'. In this study the spatial and temporal distribution of top soil moisture in the semi-arid region of Al Sehoul in Marocco is quantitatively modelled using the Surface Energy Balance Simulation model SEBS and optical and thermal ASTER images. In either study the field component of collecting data for model input and for model calibration and validation is important.

Laboratory of Geo-Information Science and Remote Sensing, Wageningen University and Research Center (Jan Clevers)
The laboratory of Geo-Information Science and Remote Sensing forms together with the department of Geo-Information of Alterra the Centre for Geo-Information (www.geo-informatie.nl). The Centre for Geo-Information comprices two chairs: Geo-Information Science with special emphasis on GIS (Prof. dr. ir. A.K. (Arnold) Bregt) and Geo-Information Science with special emphasis on Remote Sensing (Prof. dr. M.E. (Michael) Schaepman), as part of the Department of Environmental Sciences of Wageningen University. The Centre focusses on education and fundamental and applied research within the domain of Geo-Information.
The fundamental education and research of the centre is subdivided in four themes: 'Geo-Information Infrastructure', Quality of Geo-Information', 'Remote Sensing' and 'Visualization and Communication'. Likewise the applied subjects are subdivided in four themes: 'Ecosystems and Landscape', Soil and Landcover', Spatial Planning' and Water and Climate'.
Concerning education the centre is in particular focused on the Master programme Geo-Information Science. PhD research is mainly coordinated within the C.T. de Wit Graduate School of Production Ecology & Resource Concervation (PE&RC).
One of the specialist themes concerns Remote Sensing (RS) or Earth Observation (EO). This theme deals with the acquisition and analysis of spatial data through geo-information and RS techniques. The theme deals with image processing techniques (e.g., classification, segmentation, aggregation, change detection, data fusion, data mining, neural networks, wavelets), physical parameter estimations (atmospheric correction, BRDF, estimating vegetation parameters such as LAI, fAPAR, coverage, albedo, emissivity, plant and soil temperatures, soil moisture, and the synergy VIS/SWIR-TIR-MW) and data assimilation (coupled numerical modelling of complex water-soil-vegetation-atmosphere systems by assimilation of satellite observations).
Besides education and research tasks, the centre's Geodesk provides support regarding collection, distribution and maintaining Geo-Information within the Wageningen University and Research Centre.
During the last ISPRS conference (July 2004) in Istanbul, Turkey, Prof. Dr. Michael Schaepman (Wageningen University - CGI) has been appointed the new chairman of the working group VII/1 on fundamental physics and modelling in remote sensing. Under the lead of the president of the ISPRS Commission VII, Prof. Dr. John van Genderen from ITC in the Netherlands, Michael Schaepman will jointly with his co-chair Prof. Dr. Shunlin Liang (Univ. of Maryland, USA) and secretary Dr. Mathias Kneubuehler (Univ. of Zurich, Switzerland) strengthen the importance of quantitative remote sensing using physical based approaches in the user community. During 2005 the 9th International Symposium on Physical Measurements and Signatures in Remote Sensing (ISPMSRS) was organized in Beijing, China. Also a successful workshop on Imaging Spectroscopy was organized in Warsaw, Poland, together with the EARSeL Special Interest Group on Imaging Spectroscopy.

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2.13 UNITED KINGDOM

International initiatives

During 2005 there was a coincidence with the U.K. chairing the G8, the Presidency of the E.C. and several international Earth observation initiatives. The British National Space Centre (BNSC) was chair of CEOS and co-chair of IGOS; the U.K. also hosted the November CEOS Plenary in London. The U.K. IGOS Geohazards Theme co-chaired by the British Geological Survey, BRGM and ESA was proposed as a GEO Community of Practice. The U.K has a strong involvement in the GEO process through several government departments and the BNSC. Coordination of GEO inputs began, chaired by the Met Office, and involved NERC, DEFRA, BGS, amongst other organisations. Individuals from this community were nominated for the GEO Committees on Science & Technology, for example. BNSC coordinated U.K. inputs to GMES and led on the Terrafirma, RESPOND and other FP6 projects.

U.K. Initiatives

The Natural Environmental Research Council (NERC) maintains a vigorous and effective Earth Observation programme as part of its science strategy 'Science for a Sustainable Future'. Research using Earth observation data is embedded in the Standard Grant schemes as well as special initiatives such as the Earth Observation Centres of Excellence Programme, the New Observing Techniques Programme, the NERC Earth Observation Data Centre and the planned new Centre for Earth Observation Instrumentation. During 2005 NERC appointed Dr Arwyn Davies as new Director of Earth Observation who will oversee a major review of the NERC EO Programme, including the EO Centres of Excellence and U.K. funding for ESA. The review will report in 2006.

The British National Space Centre (BNSC) coordinates civil space policy across U.K. Government. A voluntary partnership of 11 Government departments and research councils, BNSC represents the U.K. at the European Space Agency. Lord Sainsbury, Minister for Science and Innovation, recently announced the appointment of Dr David Williams as the next Director General of the British National Space Centre (BNSC) from April 2006. Dr Williams has been Head of Strategy and International Relations with EUMETSAT since 1996 and he succeeds Dr Colin Hicks who retires in March 2006. The current U.K. Space strategy (2002-2006) is available from the BNSC web site. **http://www.bnsc.gov.uk/**

Highlights

- the loss of Cryosat was a disappointment for the U.K. PI, but it is hoped that a replacement will be funded soon
- the NERC airborne remote sensing facility recently procured an airborne hyperspectral scanner which is available for transnational access through EUFAR.
- NERC led successful Mediterranean airborne remote sensing campaigns during 2004 and 2005
- U.K. scientists participated in the Belgian airborne hyperspectral campaign in 2004
- Industry remains concerned over the strength of U.K. Government support for initiatives like GMES
- in academia we saw new EO Centres such as the Edinburgh Earth Observatory established by Universities
- there remains ongoing concern over the RAE and its effects on long term development of research excellence
- emerging consensus formed that the geoinformation profession is suffering because of low visibility in schools

The Remote Sensing and Photogrammetry Society (RSPSoc)

The U.K. based society maintains an active technical meetings programme throughout the year including an annual Conference and General Meeting in September. RSPSoc membership is stable at around 1000. The society regularly hosts meetings in collaboration with ISPRS, EARSeL, NERC and other organisations; a strong emphasis is placed on external partnership in the areas of GI and surveying, through the newly established UK Geo Forum.

Continued collaboration is warmly welcomed with EARSeL. RSPSoc Council would like to record their thanks to Madeleine Godefroy for past collaboration and we wish her all the best for the future.

- RSPSoc Chairman is Dr Stuart Marsh who succeeded Ian Downey in 2004. Recently there have been major changes in Council membership its officers with John Finch and Tony Smart completing their terms; there is a strong interest within the membership in standing for election to Council.
- The Annual Conference has continued to develop with increased collaboration with NERC, ISPRS, and other learned societies boosting delegate numbers and international attendances
- RSPSoc has launched new Special Interest Groups in LiDAR, Vegetation, possibly UAVs
- A major project to redevelop the website has commenced and is due to deliver the new website by September 2006
- the UKGeoForum, bringing together 12 "geoinformation" related societies inc. RSPSoc, continued to develop, as well as cross-promotion and general coordination of exhibits, etc., it launched an annual lecture and award scheme.

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3 GENERAL ITEMS

3.1 REMOTE SENSING – A SUCCESS OR A DISAPPOINTING FAILURE?

This article is based on the keynote talk I gave in Aberdeen in September 2004 during the Annual Conference of the UK Remote Sensing Society, the text of which was not published in the proceedings. It was recently published in the RSPSoc Newsletter and elicited quite a bit of interest. I admit that I was at the time about to retire and hence a bit free with my words, but I did NOT say, as some people seem to remember, "Remote Sensing is pure rubbish". What I did say was that I had been tempted to sub-title the talk "Remote Sensing is Rubbish", but this was merely for alliteration and to grab the attention of the audience (after all it was quite early in the morning).

The gist of the talk was that, as I see it, remote sensing has been rather oversold over the years. There are certainly many exciting things that can be done, in principle, but in many cases these have proved difficult or impossible to achieve in practice, due mainly to the lack of suitable data. Admittedly, there are many examples of useful work that have been carried out, especially for scientific studies, and some examples of where successful monitoring has been done (eg in agriculture). But this latter has been due to the fortuitous availability of Landsat and SPOT data over a number of years. The continuation of the Landsat series has been the subject of much discussion over the past few years, as well as the subject of many heated arguments by eminent scientists and the lobbying of the US Congress. With the notable exception of the success of the highly organised meteorology community, there are no really operational satellites available for medium to small scale remote sensing. By operational, I mean guaranteed continuity of compatible data over many years, such as AVHRR. I don't mean that examples cannot be found that are useful application, but they are not operational in the normally accepted sense of the word (ie available when needed). But of course, others may define it in other ways to suite their own ends.

Let us look first at the perceptions. In the 1970s and 1980s, remote sensing was an exciting new technique. Many enthusiasts were busy developing applications and algorithms, funding was fairly readily available and the prospects of, for example, ERS1 and Space Station Freedom, were being flogged by ESA and NASA respectively. I remember attending an EARSeL Annual Symposium on Capri in 1988 at which a representative from ESA was urging us to go out and sell the idea of the future ERS in South America and Africa etc. This was supposed to be some sort of panacea for the ills of the world. In prac-

tice, the expensive infrastructure invested in many of these countries became white elephants as the experts walked away and left the local operators to fend for themselves. OK, ERS has provided a great deal of useful data, but most of it has been analysed by first world organisations. In the 1990s, realism set in. It slowly dawned that there were practical limitations as to how the data could be exploited and to the available techniques. Data were beginning to be priced out of the market for many scientists (vide the disastrous commercialisation of Landsat). There was loss of political interest, as other priorities sidelined the development of new systems, and the commercial sector started seeing this as a milch cow.

During this time also, other changes were taking place. There was a change in philosophy. Remote sensing was changing from being a science to a tool. Although there was still much development of applications and analytical techniques going on, particularly in the universities, there was more and more emphasis on the integration of remote sensing with other techniques and on the commercial and environmental justification for any development. Funding was changing from local/international projects to huge international, ones. Projects were no longer themed (eg for EU) but integrated into multidisciplinary programmes with vague titles such as "sustainability" or "the information society".

Other changes were taking place on the technological front too. There was the shift from analogue to digital. Computer speeds and capacity were rising dramatically and costs were plummeting. Electronic communications not only made personal interactions quicker, but also revolutionised the transmission and distribution of data. Images could, in principle, now be examined and acquired almost instantaneously. Falling travel costs to meetings and workshops opened up new dimensions in cooperative projects. Data costs were then, as now, a limiting factor. Should providers charge consumers full costs or only marginal costs? The answer, of course, depends on where you are standing. Consumers, especially those in academia, resisted the commercialisation of data acquisition, eg Landsat, IKONOS, Quickbird etc, as well as the charging for Meteosat and other low-resolution data. Some concessions were forced for educational purposes and for older archived data, but you needed to be part of a fairly large project in order to be able to do much more than just look at an occasional image.

The drivers to these changes were many and complex. The political climate had changed. Gone were the cold war and the space race, and consequentially the huge military investments on whose back much of the early development had taken place. Technological developments in electronics, in materials as well as in computing gave unprecedented impetus to the changes. Competing demands on national and international budgets and changes in national economies greatly affected the pace of development. The blinkered policies of the Space Station, space exploration and manned missions by the United States drained much needed resources from the Earth observation programmes.

Changes in philosophy were also apparent. The initial impetus to the development of satellites was to examine and explore space, but the potentials of Earth observation were soon realised. During the 1990s, space again became the obsession, and the desire to return to the Moon and to send someone to Mars is again in the ascendancy. The first lunar landing took place in 1969, and the last in 1972. So what? There have been over a hundred Space Shuttle flights, which have accomplished nothing of consequence. The Space Station is rapidly becoming a white elephant and may soon have to be abandoned. Apart from a few trivial experiments, mainly on zero gravity effects (which could equally well be carried out either on Earth or in a vastly less expensive unmanned environment), what has it all achieved, apart from the consumption of huge quantities of money?

Let us look at some figures relating to manned space flights. Firstly there is the financial cost - $400 million for a Shuttle launch, Space Station estimated at more that $100 billion and a manned mission to Mars more than $500 billion. Next are the human costs. There have been 14 deaths in

the Columbia/ Challenger accidents as well as an unknown number of cosmonauts and technicians in the old USSR, if rumours are to be believed. There are also the scientific costs, alluded to earlier. For the cost of one shuttle launch, one could finance one Mars rover, one Mercury probe or 5 Earth Explorer missions. The cost of the Space Station is equal to 50 trips to Saturn, 40 Envisats or 5000 Opportunity missions! Has the world gone mad?

But to get back to remote sensing. There have been many changes and developments over the past few years. There is a move away from large, multipurpose platforms (eg Envisat) to dedicated smallsats. These tend to be one-off, experimental, have 3 – 5 years lifetime and usually no follow-on is planned. They may be commercial (eg IKONOS, Quickbird) or not (eg ESA Opportunity missions). Hitherto unimaginably high spectral and spatial resolutions are being achieved, and integrated space techniques (RS/GIS/GPS) are now fairly commonplace.

But a severe shortcoming of even these new generations of satellites is the problem of being in the right place at the right time. Sixteen, 28 or even 35 day repeats may be sufficient for many applications, and a lot of useful developmental work and observation of unusual/important events have been carried out using opportunistic images. But there are many occasions when much more frequent observations are required. For the problem of natural hazards, some progress has taken place with the cooperative projects between SPOT and Landsat, in GMES and with the UK-led DMC programme for the management of disasters. But that still does not solve the problem of having continual, or even timely, monitoring of areas of high risk. For example, it has been shown that slight bulges on the side of volcanoes can indicate an imminent eruption and these can be observed from INSAR images. But that presupposes that there is a satellite there when needed. Envisat has a 35-day repeat, if it happens to be switched on! This is an example of something that can be done in principle, but is virtually valueless in practice.

A few years ago, I was involved in a project to demonstrate that ships could not only be detected in SAR images, but that you could estimate their size, speed, direction and even type. The coastguards were very interested till told that they could get one image every month – if they were lucky. Forget it, they said; we'll stick to using boats. Another project involved monitoring chlorophyll and sediment round North Sea coasts. Even though data were available from AVHRR, SeaWiFS, MODIS and MERIS several times a day, albeit at about 1km resolution, there was a great problem of intercalibration, and, when we did a long-term analysis of the data, we found that daily coverage was limited by cloud cover to only a handful of images a month over much of the year. I am sure most readers can provide their own examples.

So what is required? We must remember that the end user requires INFORMATION (remember that remote sensing instruments only provide data). We must ask the questions: Is it in a form they can understand/use? Is it relevant/useful? And, most important, is it the information they want? What are the operational requirements? A really operational system must provide adequate temporal resolution, adequate spatial resolution, adequate spectral resolution, guarantee the provision of data and give real-time access to data. How many current systems measure up to this?

Can we turn promises into realities? There are a number of questions we need to address. Can we provide **suitable** data (spectral/spatial/temporal)? Can we guarantee **continuity** of data? Much has been achieved using Landsat and NOAA data over 23 years and SPOT over 19 years, but the provision of long-term datasets must be a political problem and the intercalibration a scientific one. Can we provide **affordable** data? Are the data **accessible**? Can we deliver **information** to the end user at an adequate level of accuracy, resolution, and can we provide **guarantees**? Until we can answer yes to all these, we cannot really say that remote sensing has lived up to its potential.

But let us be positive. There is no doubt that mankind has benefited greatly from remote sensing. It has helped us think glob-

ally. It has helped us understand our changing environment. It still has an essential role to play. BUT we need operational systems – and the real question is WHO PAYS?

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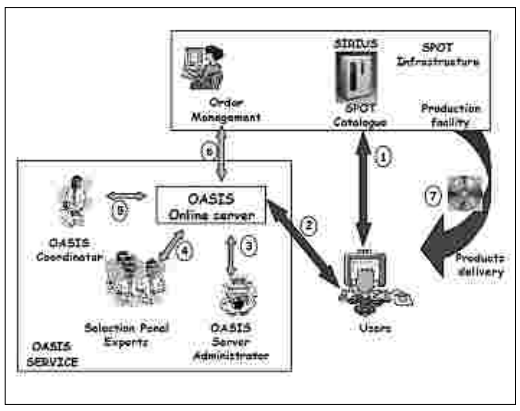
3.2 THE OASIS PROGRAMME

Optimising Access to SPOT Infrastructure for Science

Authors[63]: Delphine FONTANNAZ (Médias-France), Hervé JEANJEAN (CNES).



With the enlargement of the European Union, the remote sensing sector faces a new dimension in terms of research needs: access to space and ground segments; access to data, products and services; integration of research capabilities from Associate States into EU networks; extension of GMES[64] services to these new EU countries.

Aimed at facilitating the access to SPOT products and services for the French scientific community, the **ISIS**[65] programme supported by the French Space Agency (CNES) has been implemented more than ten years ago. This programme gained considerable notoriety throughout the research community, particularly with the opening of ISIS to EU Member States in 2001. The **OASIS** programme, set up in March 2004 by CNES for a 4-year period (2004-2007), is aimed at enlarging the scope and activities of ISIS to a wider European dimension. OASIS is entirely devoted to European countries, with emphasis to new users from several Associate States, whereas ISIS is from now on restricted to French national users. 33 countries are thus eligible to OASIS: 24 European countries plus Bulgaria, Croatia, Romania, Turkey, Iceland, Israel, Liechtenstein, Norway and Switzerland.

OASIS is wholly funded by the European Commission and covers access costs to SPOT services, **thus allowing the scientific community of 33 countries to use SPOT products for free**. This programme is led by a Steering Committee composed of the SPOT programme partners, i.e. CNES (France, OASIS Co-ordinator), SSTC (Belgium) and SNSB (Sweden), plus the German Space Agency (DLR). Requests are assessed by a Scientific Committee of European experts.

Applicants to the OASIS programme should belong to a research laboratory, or to an institution that carries out scientific activities. Their project must be dedicated to research or to GMES-related demonstration activities. Projects for educational purposes (graduate and post-graduate

Spot-5, 2.5 m – Athens, Greece © CNES 2003 - Spot Image distribution

[63] *Acknowledgements: Catherine Tiné (Médias-France).*
[64] *Global Monitoring for Environment and Security.*
[65] *Incentive for the Scientific use of Images from the Spot system.*

programmes, Masters and Doctorates) qualify as well.

Applicants are invited to fill in a request form on the OASIS online server **(http://medias.obs-mip.fr/oasis/)**. To be eligible, potential users must satisfy specific conditions **(http://medias.obs-mip.fr/oasis/StaticConditions.do)**. The OASIS submission form includes: applicant's identification and experience, project outline (partners or other users, duration, themes, areas of interest), project description (title, objectives, methodology, expected results and publications, implementation plan) and the requested SPOT products. Requests are reviewed within two months, for project analysis.

Accepted requests allow applicants to:
- access the full Digital Archive of raw images (over 10 million images, acquired through the SPOT network of receiving stations) which is used to generate products required by users. The Spot Image catalogue is accessible through the SIRIUS browsing facility **(http://sirius.spotimage.fr/anglais/welcome.htm)**;
- access the programming capability of SPOT satellites for the acquisition of new images at predefined location and date.

If you have any question before submitting an OASIS request, please contact: **oasis@cnes.fr**

3.3 MADELEINE HONOURED

In September 2005, the UK RSPSoc honoured Madeleine Godefroy with their Founder's Award. This is an award linked to the names of departed Founders for those who have made significant, original and personal contributions to the Society. It is awarded only occasionally by resolution of Council, and consists of a Silver Medal and a cheque for £250. It has only been awarded once before.

As many members know, there has been, for many years, a close link between RSPSoc and Earsel. This began in 1988, when

Madeleine receiving the UK RSPSoC's Founder's Award from Robin Vaughan.

Madeleine helped out in the organisation and registration of the IGARRS meeting held in Edinburgh, which was a joint venture with the Remote Sensing Society, as it then was (see the upcoming "History of EARSeL" for more information). Since that time, her cheery presence has been appreciated at nearly all RSPSoc Annual Conferences. In return, Karen Laughton, her RSPSoc counterpart, has helped out at a number of EARSeL's Annual Symposia. This has led to great cooperation and the promotion of the exchange of information between the two associations in a number of ways. The Citation reads – "For Services to the Remote Sensing and Photogrammetry Society"

"Madeleine Godefroy is the outgoing secretary of EARSeL - the European Association of Remote Sensing Laboratories. She has provided continuous and long standing, committed support to the members and to Council and Bureau of EARSeL since 1981 when she was appointed as the first full time secretary. In parallel to over 25 years of dedicated support to EARSeL, Madeleine has been a staunch supporter of both RSS and now of RSPSoc, ensuring that technical meetings and Society business are reported swiftly and accurately to EARSeL and that the Society is kept aware of European developments. Madeleine has even gone so far as to travel from France to attend and help assist coordination at almost every Society Annual Conference since the mid 1980s. This has been of immense practical and moral support to Karen Laughton and all the Society office staff over a considerable period, and delegates always appreciated her cheerful and efficient

presence on the registration desk. Consequently, the Society has enjoyed excellent support, and wonderful friendship, which the Society seeks to reciprocate in full whenever possible. It is with great pleasure that the Society thanks Madeleine for everything she has given to the remote sensing community over the years, especially to the Society, and wishes her well in her retirement.

Unfortunately, Madeleine was unable to attend the presentation in Portsmouth in September, so the medal was later presented to her in Paris by sometime Chairman Robin Vaughan.

Robin Vaughan
r.a.vaughan@dundee.ac.uk

3.4 THE POSTEL THEMATIC UNIT

All over the world, scientists rely on a considerable amount of information to lead their work. They often have to **pre-process** raw **satellite data**, which, besides being time-consuming and expensive, is definitely not their job. The POSTEL[66] French thematic unit is a tentative answer to meet such needs in the domain of **biogeophysical geocoded information**. The goal of this project is to derive, from earth observing satellites, various biogeophysical parameters related to land surfaces at global and regional scales. Using several space-based systems allows to reasonably eradicate instrumental biases due to the specific viewing modes, while benefiting by the extensive range of observations currently available.
POSTEL is a network associating several national research laboratories, responsible of the conception and validation of new satellite products, and a service unit. The latter is hosted by Medias-France, and is in charge of providing the users' community with products, services and assistance. This team fulfils two functions: -

- a developing function, i.e. setting up scientific processing chains and software for the analysis of remotely sensed data, in accordance with the specifications defined and validated by relevant scientific laboratories associated to POSTEL;
- an operating function, i.e. generating, archiving and circulating products derived from space missions.

POSTEL is permanently developing; it has already mobilised considerable resources through all the projects in which it is involved. At the beginning of 2002, this thematic expertise unit gained a European dimension since it was integrated into the precursor elements of the **future European GMES**[67] **services**. A Core Service was then set up, to design and exploit advanced biogeophysical products such as Leaf Area Index, albedo, land cover, burnt areas... The Medias-France public organisation that runs this Core Service is also in charge of interfacing with the scientific and users' communities.

POSTEL is currently involved in the following programmes:
- **Research and Development projects** such as:
  - **CYCLOPES**[68] (European Commission), which aims at developing and validating long-term series of multi-sensor biophysical variables, used to detect and categorise land use changes and to assess carbon fluxes in order to better understand vegetation-atmosphere interactions;
  - A support to the international **AMMA**[69] project, devoted to the study of the African monsoon, to which POSTEL provides low-resolution biogeophysical products related to West African continental surfaces;
  - **VALERI**[70] , whose objective is to assess the accuracy and performance of biophysical variables acquired from wide-swath sensors by using in situ data;
- **Pre-operational GMES projects** of the European Commission, i.e.:

[66] ***P**ôle d'**O**bservations des **S**urfaces Continentales par **TEL**édétection*
[67] ***G**lobal **M**onitoring for **E**nvironment and **S**ecurity*
[68] ***C**arbon C**Y**cle and **C**hange in **L**and **O**bservational **P**roducts from an **E**nsemble of **S**alellites.*
[69] ***A**frican **M**onsoon **M**ultidisiplinary **A**nalyses.*
[70] ***VA**lidation of **L**and **E**uropean **R**emote Sensing **I**nstruments*

- **GEOLAND**, that is the backbone of various GMES operational services. Its many products provide information on vegetation, water bodies, temperature, moisture, etc…, and are consequently highly valuable for crop monitoring, forestry and food security among others. Medias-France is its Deputy Coordinator and is in charge of its Biogeophysical Parameter Core Service;
- **VGT4AFRICA**, which is led in cooperation by the JRC, Medias-France and VITO. It is intended to distribute in near real time data derived from VEGETATION sensors to African users, through the EUMETCAST telecommunication system of EUMETSAT;
- The **GLOBCOVER** project, which belongs to ESA's Data User Element. Its objective is to provide by 2007 a global land cover map at a fine resolution (300 m instead of 1 km for previous maps), to be mainly derived from MERIS/ENVISAT data.

- **Spatial projects:**
  - Medias-France has developed a level-3 processing chain for **POLDER**[71] that was embarked onboard ADEOS and is currently flying onboard PARASOL. This processing chain reproduces land surface characteristics based on data proceeding from POLDER sensors. The POSTEL products that are currently available mainly include albedo, vegetation cover, leaf area index, etc. that are used for instance to measure natural seasonal variations, the consequences of extreme climatic events, or man-induced damage suffered by ecosystems, etc… A specific product supplied within the scope of this project is the Bi-Directional Reflectance Distribution Function (BRDF), which is a remarkable tool to refine many environmental studies and radiative transfer models.

Website: **http://postel.mediasfrance.org**
Contact: Marc Leroy
(marc.leroy@medias.cnes.fr)

[71] ***POL**arisation and **D**irectionality of the **E**arth **R**eflectances*

3.5 GMES (Global Monitoring for Environment and Security)

This is the second time that I have written about GMES in this Newsletter, the first article being in the September 2005 issue. At that stage I simply took some easily obtained material from the web and constructed the paper that you can see in that issue. I also sent a copy to the key people in GMES that work in the EC and ESA, so that they would be aware of what I have written. Later, I received an email from one of these people, asking that I pull the article, no reason being given, either then or in response to subsequent enquiries. By the stage that I received this request, the Newsletter had in fact been printed, and so that was not an option that I could consider.

This paper is also written using material on the web, integrated with my experience in attending two of the four public forums that were held as part of the initial period of GMES (2002 – 2003) and interleaved with my 33 years experience in Remote Sensing in Australia, Asia and Europe. It is based on my strong belief in the importance of implementing operational applications of these spatial technologies, indeed that the future of remote sensing is inextricably dependent on its being of use to society sufficient to justify the costs associated with the technology, and thus its fundamental importance to EARSeL and the future of the members of EARSeL.

That a key GMES bureaucrat should feel the need to ask me to pull an article that simply uses material readily available on the web is to me indicative of the existence of some heavy politics at work. Now there is always lot of politics in the bureaucratic arena. In saying this, I am not implying that politics is negative or destructive at all, indeed most politics is designed to achieve better outcomes than those that are currently in place, at least as far as the players are concerned. But a negative characteristic of this type of politics is that it is usually conducted behind closed doors; those who are behind those doors may understand the whys and wherefores of particular decisions, but those outside the room usually do not. The system is opaque, and this can lead to confusion, frustration, alienation and sometimes, anger.

None of this may be important if all the key players that are affected by those decisions are behind those doors when the decisions are made; but it can have significant repercussions if key players who will be affected by those decisions are not in the room. An immediate question that thus arises is "Who are those who may be significantly affected by GMES and are they adequately represented in the deliberations concerning the nature and scope of GMES?"

Given this background, it would have been easiest to just ignore the issue. However, I believe that these spatial technologies are of fundamental importance if we are to manage spatially and temporally variable resources in a way that both maximises their commercial productivity and ensures the maintenance of an adequate environmental quality. That both criteria are crucial is another theme to which I will return later in this article. It is relatively easy to maximise productivity without being concerned about the environment, after all we have been chasing this goal for a considerable period of time now in relation to the use of rural resources. But overlaying the environmental criteria on top of this goal is very new. It changes the whole basis for the trading of rural resources since the basis of the valuation of the environment is fundamentally quite different to the relatively straightforward financial criteria on which production trading is based. These differences and how they get resolved is not the subject of this paper; here I am interested in the question of the role of the spatial technologies in the management of spatial resources. If the proper management of spatially and temporally extensive resources, so as to meet both production and environmental goals, requires spatial information, then one way of achieving this is by the use of remote sensing. I suggest that remote sensing, integrated with other spatial technologies into a GIS based decision support system, is an appropriate resource management system for a range of resource management purposes, but not for some other purposes. There is thus a need to show that these technologies are appropriate and to develop and implement operational applications of these technologies.

It is also clear that both the EC and ESA see the importance of operationalising these technologies. So far about 400m Euros have been spent on 98 R&D projects with a GMES component or focus, 36 within the EU Framework 5 Program, 34 in Framework 6, 15 in ESA, 8 by the Joint Research Centre in Ispra, 1 by EUMETSAT and 4 by unknown funding agencies. The EU has funded projects at a cost of at least 274m Euros out of this total. This expenditure does not include expenditures on the space component, embedded within the ESA budget, and possibly within the budgets of national space programs, nor the costs of staff, administration and so forth within the EC, ESA or at the national levels. ESA has been funded for the next phase of the space component of GMES and is optimistic that this will continue for the subsequent phase, and there is optimism that the EU Framework 7 will contain a significant level of funding for GMES oriented R&D. This support for developing further applications of these spatial technologies is thus continuing into the immediate future. We are in a window of opportunity in relation to the operational implementation of these spatial technologies.

However, the issue of **whether** to operationalise something and of **how** to do so, are two very different questions. These spatial technologies are already operational in some very important applications, in particular weather forecasting, and also the use of them within Europe for checking the farmer applications for subsidies. Both of these applications, however, are relatively easy to implement since they have a very small and clearly defined user market. There is a single weather service in each country and there is a single government responsible for the distribution of the agricultural subsidies. In both cases the spatial/temporal variability is also very obvious. Management of the land, water and air resources are much more fragmented than either of these applications, and indeed the management of the land resources are much more fragmented that the management of either the water or air resources. There are many more players involved, with overlapping and sometimes conflicting interests. The difficulty of defining and then bringing together the key players in resource management is probably one reason for the strong focus on security and crisis management in GMES.

There are, of course, industries built on the existence of catastrophes; the insurance and emergency service industries for a start, but is it rational to build an information system on the basis of crisis management?

Most current thinking seems to suggest that crisis management can be adequately supported by short, sharp and intensive campaigns conducted during and after the crisis, using prior, current to the crisis and post crisis data sets. Yet, surely the best crisis management systems will have at its disposal up to date information on conditions at the start of the crisis, and that this is then updated and/or supplemented by using appropriate data collected either during and/or post the crisis. But such a system will rarely be put in place on the basis of crisis management, simply because the costs of maintaining up to date information is too expensive relative to the risk of a crisis occurring. Such ongoing up to date information systems need to be funded for other purposes, and the obvious other purpose is the routine management of resources for other reasons. I suggest, therefore, that the successful implementation of spatially and temporally extensive information systems requires that those systems be used for the routine management of resources, and that other applications, such as crisis management, can then use these systems on an as required basis.

So, given this sort of background, where has GMES come from and where is it going to at the present point in time?

GMES itself started with an Initial period in 2001 – 2003, followed by its Implementation Phase, 2004 – 2008. The goals of the Initial Phase were to demonstrate current capabilities in selected thematic areas and to recommend how to progress through the Implementation Phase. The Initial Phase was completed with its final report that made ten recommendations: -

1 **Establish a GMES infrastructure.**
2 **Establish mechanisms for a permanent dialogue with users.**
3 **Implement priority services, using existing EU and ESA funding sources.**
4 **Develop a strategy for the data and information required by and produced from GMES products and services.**
5 **Improve the exchange and sharing of data and information.**
6 **Develop the space capability required by GMES**
7 **Review existing facilities required by GMES so as to identify weaknesses and recommend on remedies.**
8 **To fund R&D to support the ongoing development of GMES products and services.**
9 **To develop a policy on international GMES partnerships.**
10 **Ensure the sustainability of GMES through establishment of appropriate funding mechanisms.**

All of these recommendations are important for the success of GMES and some of these recommendations have now been implemented. The GMES Advisory Council (GAC) and the GMES Program Office (GPO) have now been established, funding has been allocated to the next stage of the space component and it would appear that ongoing R&D funding will come in FP7. However, what is obvious is that this is a top down method of implementation. There is but one recommendation relating to the users of GMES services, with the other nine relating to either the provision of data, the development of products or the development of data and information infrastructures. The end users of GMES have not been clearly defined; and then having identified these end users, there is a need to identify their management information needs, so as to work back and identify what information and systems need to be put in place to meet these management information needs, and then work forward again to see what changes are required to staffing, staff methods of operating, staff training and facilities by the users if they are to properly exploit the products developed by GMES. Without a clear identification of the users, development of products will be haphazard, may be developed to meet the wrong goals, and may not be prepared in a form suitable for use, in short it runs the risk of wasting critical funds, time and energy. For example, the GMES Action Plan says nothing about identifying end users; identifying their management information needs and from this identifying

what sorts of information they need and in what form they require that information.

For example, let us consider a fairly simple situation. It is easy to say that Fire Emergency services require topographic, fuel load and weather data to run their fire prediction models, so as to plan their fire control programs. But they will prefer to anticipate fires, and so they require this information in time to make control burns before the season, and they require it in a format, at a resolution and accuracy suitable for integration with the other sets of data in their fire model. If the fire authorities do get these services, then it will change the way that they manage fires, requiring changes in their management and operational structures, probably in their facilities and probably in their staff training requirements. There is a need to consider the implications of these changes and how to deal with them, as they are a significant consideration of management when considering whether or not to adapt to this new technology now or to wait. The same sorts of issues arise in relation to the regional management of water resources, concerned with implementing the Water Framework directives of the EU, and with the many other varied forms of resource management that exist. There is no initiative in place within the current structure to address these needs.

In my opinion a top down approach can carry us so far. It can also be successful when the end users can be driven in a top down manner, as can occur with some government and semi-government services. However it is likely to be less effective when the drivers for change are financial/economic or bottom up, as is much more likely to be the case with most forms of land management. I think that it is imperative if GMES is to be successful in the long run, that the GMES organisation take steps to identify their actual and potential markets, and once this has been done, to take steps to identify the management needs in these markets. Once this has been done, then within a physical area, comparison of the needs of different managers will identify overlaps in the information needs that can then lead to economies in the derivation of the management information from the data.

We can consider a second application in relation to this. Let us consider an area of increasing pig production, simply because of good financial returns. However, pigs can also seriously pollute both surface and sub-surface water resources, and so the responsible agency has set in place controls that restrict the density of pigs in an area, and also set rules on the need for buffer zones. In this application, both the entrepreneur and the environmental manager can use similar information, one to find areas of commercial opportunity, and the other to ensure that the environmental constraints are being met. Not only can they use the same information to chase their own interests, but by using a common information base, they form a better basis for reaching agreement on a solution to the issue at hand, that is how to maximise the optimum density of pigs (the production oriented goal), without seriously polluting the environment (the environmental goal).

GMES is a very important ESA/EU initiative. There is a limited window of opportunity here for the implementation of operational applications of these spatial technologies within a favourable political and funding environment. The main question is thus, "How do we achieve this goal in this time frame?"

Keith McCloy.
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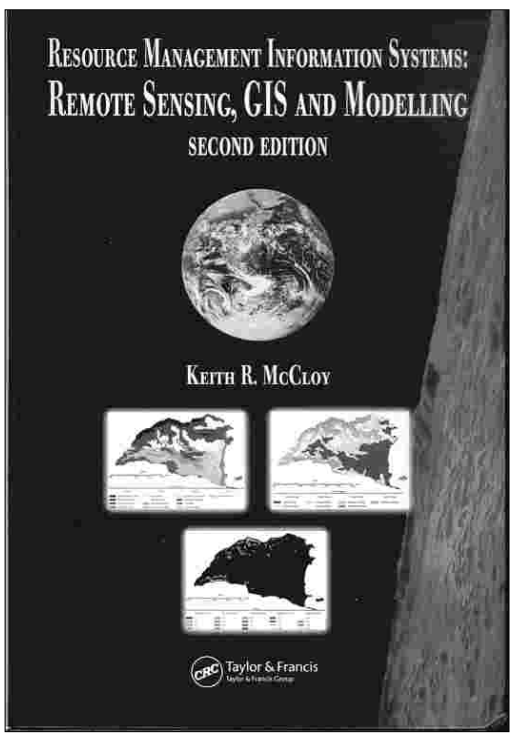
4 RESOURCE MANAGEMENT INFORMATION SYSTEMS: Remote sensing, GIS and modelling

I would like to take this opportunity to inform you that the second edition of my textbook on remote sensing, GIS and modeling and their integration into resource menagement information systems has just been published by Taylor and Francis, the publishers of various remote sensing journals and books. The title of this book was chosen to convey its dominant theme: ***to understand the role of, as well as to develop and use, spatial information systems for the proper management of physical resources.*** There are a number of critical components to such Resource Management Systems including remote sensing, Geographic Information Systems (GIS), modelling resource management and decision
support. This text covers the principles and practices associated with these components as well as their integration into a system so as to emphasise the holistic way in which the management of resources is going to evolve, if we are to achieve the twin goals of maximising productivity and maintaining the resource base.



The Chapters in the book are: -
Chapter 1
Introduction
Chapter 2
The Physical Principles of Remote Sensing
Chapter 3
Visual Interpretation and Map Reading
Chapter 4
Image Processing
Chapter 5
The Use of Field Data
Chapter 6
Geographic Information Systems
Chapter 7
The Analysis and Interpretation of Vegetation
Chapter 8
The Management of Spatial Resources and Decision Support

Details of the book: -
Author: - Keith McCloy
Publisher: - Taylor and Francis, Boca Raton, Florida.
Date of Publication – December 2005
ISBN: - 0-4152-6340-9
Price: - $99,95US

The book is designed for those who wish to use these technologies for the management of resources. It is expected that they may well wish to cover this material in the one semester course, and then apply these techniques in the areas of resource management to which they are focusing, whether it be planning, landscape ecology, geography, agriculture, engineering, forestry or environmental science.

In addition to the text, there is a CD that contains an introductory Power Point presentation, applications, data and web addresses that may be of use to the reader.
I hope that those of you out there who need a text that covers remote sensing, GIS and an introduction to modeling and decision support within a spatial environment for a one or two semester course will consider using this text, or let me know why it is not suitable to your needs.

Keith McCloy
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5 FUTURE EVENTS

5.1 NINTH INTERNATIONAL SYMPOSIUM ON HIGH MOUNTAIN REMOTE SENSING CARTOGRAPHY

The symposium will be held in Graz, Austria, from 14-22 September 2006. Call for abstracts is open until 31 January, 2006. For more details please visit **http://www.kfuni-graz.ac.at/geowww/hmrsc/hmrsc_9/**

5.2 SEVENTH INTERNATIONAL SYMPOSIUM ON SPATIAL ACCURACY ASSESSMENT IN NATURAL RESOURCES AND ENVIRONMENTAL SCIENCES (ACCURACY 2006)

This conference will take place in Lisbon, Portugal, between the 5th and the 7th July 2006. Details of the conference, including the first announcement and call for papers can be found at; **(http://2006.spatial-accuracy.org).**

5.3 26TH EARSeL SYMPOSIUM, WARSAW, POLAND

The 26th EARSeL Symposium will be held, May 29 – June 2 2006 in Warsaw, Poland. For more details please access

http://www.earsel.org/welcome.html

5.4 INTERNATIONAL SUMMER SCHOOL, "DIGITAL RECORDING AND 3D MODELLING"

This summer school will take place from 24th to 29th April, 2006 in Aghios Nikolaos, Crete, Greece. For more details please contact: - **stein@geod.baug.ethz.ch**

5.5 ISPRS MID-TERM SYMPOSIUM, "REMOTE SENSING – FROM PIXELS TO PROCESSES"

The meeting, organised by the ISPRS Technical Commission VII "Thematic Processing, Modelling and Analysis of Remotely Sensed Data", will take place at the ITC in Enschede, The Netherlands, from May 8-11, 2006.

The symposium theme focuses on the following aspects:

- Fundamental physics and modelling
- Information extraction from SAR data
- Information extraction from hyperspectral data
- Advanced classification techniques
- Processing of multi-temporal data and change detection
- Remote sensing data fusion
- Innovative problem-solving methodologies for less developed countries
- Derivation of global data, environmental change and sustainable indicators

For more information please visit, **http://www.itc.nl/isprsc7/symposium2006/.**

5.6 UDMS 2006; 25TH URBAN DATA MANAGEMENT SYMPOSIUM

May 15-17, 2006, AALBORG, DENMARK
Http://www.udms.net

FIRST ANNOUNCEMENT & CALL FOR PAPERS

UDMS, the Urban Data Management Society, has organised international symposia at various locations in Europe in order to promote the development of information systems in local government since 1971. An important aim of UDMS has been to provide a forum for people to discuss new approaches, to consider new technologies and to share practical experiences in the field of urban data management. The focus has been on urban applications but regional and rural issues have always been well represented and have grown recently in importance.

The next symposium will be held at Aalborg University, Denmark.

5.7 SECOND GOETTINGEN GIS AND REMOTE SENSING DAYS

The theme of the 2nd Göttingen GIS & Re-

mote Sensing Days is "Global Change Issues in Developing and Emerging Countries". The meeting will beheld between 4th – 6th October 2006. For more details please contact: -
GGRS@uni-goettingen.de
URL: **http://www.ggrs.uni-goettingen.de**

5.8 OSTRAVA 2006, INTERNATIONAL GIS SYMPOSIUM

This symposium will be held in January 2006 in Ostrava, Czech Republic. Information about the symposium is available at: **http://gis.vsb.cz/GISEngl/Conferences/GIS_Ova/GIS_Ova_2006/gis_ostrava_2006.htm**

5.9 ISPRS COMMISSION I SYMPOSIUM

To be held in Paris, France, 3 – 6 July, 2006, with the theme “From sensors to imagery”. Details are available from:
http://www.colloquium.fr/sfpt2006

5.10 NINTH AGILE CONFERENCE

The 9th AGILE International Conference on Geographic Information Science, "Shaping the future of Geographic Information Science in Europe" will be held between 20-22 April, 2006
In the Thermal Hotel Visegrád, Visegrad, Hungary.

Abstracts must be submitted before 15 December to: -
AGILE2006@forestry.gsi.gov.uk Submission

5.11 ISPRS MID-CONGRESS SYMPOSIUM

The ISPRS Commission VII mid-congress symposium, "Remote Sensing Applications for a Sustainable Future", will be held between 4-7 September 2006, Haifa, Israel. Tutorials and Workshops, will be held prior to the symposium.

For more details please contact: -
ISPRS8 **(isprs8@geo.haifa.ac.il)**

5.12 2ND WORKSHOP ON LANDUSE AND LANDCOVER

EARSeL Special Interest Group on LAND USE AND LAND COVER, will hold their second workshop in Bonn, from 28 – 30 September 2006.
For more details please contact: -
www.zfl.uni-bonn.de