

1 EDITORIAL

As our regular readers will know, this, the first EARSeL Newsletter of the year always contains a selection of reports from EARSeL Member Laboratories, describing the main developments in remote sensing (RS) in their countries during the past year. This is just one of the ways in which EARSeL enables its members to inform about and learn from RS activities throughout Europe.

One of the most significant developments in the history of RS in Europe – the recent launch of ESA's "Envisat" environmental monitoring satellite – is reported in this issue of the Newsletter. There are also reports on, for example, the recent successful upgrading of the ESA / NASA Hubble space telescope, and on two major current European RS-related initiatives – i.e. the European Research Area (ERA) and the Infrastructure for Spatial Information in Europe (INSPIRE).

The last year was also an extremely active period for Europe's planned GMES (Global Monitoring for Environment and Security) initiative. As reported in previous issues of this Newsletter, GMES aims at establishing, by 2008, a European capacity for the provision and use of operational information for monitoring and management of the environment, and for civil security. Given the rapid pace of events recently, it is worth recapping on some notable GMES milestones of 2001.

Early in 2001, two meetings which provided impetus for subsequent developments on GMES, were held: 21-22 March – GMES User Workshop in Stockholm, Sweden (under the Swedish EU Presidency); 2-3 May – GMES Consultation Meeting in Baveno, Italy. Following these and other consultations, on 19th June 2001 the European Commission (EC) issued a Joint EC / ESA document ("A European Approach to GMES: Towards Meeting Users' Needs") to be presented to the EC and ESA Councils. This document described GMES and its implementation strategy, and identified nine "priority themes" for the initial set-up peri-

od of 2001-2003: (1) Land cover change in Europe (EU and Accession Countries); (2) Environmental stress in Europe; (3) Global vegetation monitoring; (4) Global ocean monitoring; (5) Global atmosphere monitoring; (6) Support to regional development aid; (7) Systems for risk management; (8) System for crisis management and humanitarian aid; (9) Support for development of European Spatial Data Infrastructure (now called INSPIRE – see Section 3.2.2 of this Newsletter). Later, on 27th July 2001, a document describing the key elements of the EC's draft Action Plan for GMES, covering the initial period, and complementary to ESA's GMES implementation proposal, was published.

Two further high-level meetings, directly related to GMES, took place in 2001. On 15th October, top officials from ESA, the EU and other governmental organisations attended a GMES Conference in Brussels (under the Belgian EU Presidency). Then, on 15th November, ESA's Ministerial Council (i.e. the ministers responsible for space affairs in the fifteen ESA countries), meeting in Edinburgh (Scotland), endorsed proposals for the next stages of a series of on-going space science and technology programmes, including GMES.

Finally, and most "concretely", on 20th December 2001, a dedicated Call for Proposals to support the GMES Action Plan (initial period 2001-2003), and covering the first five priority themes identified in the Joint Working Document (see above), was issued under the EESD (Energy, Environment and Sustainable Development) programme of the EU's Fifth RTD Framework Programme (1998-2002).

In view of these and other GMES-related events during the past year or so, and especially given the reportedly huge response to the GMES Call for Proposals, it can be stated that the process towards establishing GMES, with all its implications for RS in Europe, is well and truly underway!

The Editor

2 NEWS FROM THE ASSOCIATION AND ITS MEMBERS

2.1 22nd EARSeL Symposium and General Assembly

Preparations are forging ahead for our annual meeting, which this year will take place in Prague, Czech Republic, on 4-6 June 2002. With more than 130 abstracts received and several invited papers, we have a full and exciting programme. The Preliminary Programme will appear very shortly on the EARSeL web-site (www.earsel.org), which links to that of our hosts and local organiser, the UHUL Forest Management Institute (www.uhul.cz), where details concerning the organisation, social events, etc. can be found.

Please note that we had planned for the Symposium to be followed, on Friday 7th June, by a specialist workshop entitled "Remote Sensing for Environmental Modelling", but this has had to be cancelled. Friday is therefore now free to take advantage of the social events that our hosts have organised. We look forward to a most enjoyable week in Prague!

2.2 EARSeL Bureau and Council meetings

The EARSeL Bureau and Council held their regular January meetings on 17-18 January, at the European Space Agency (ESA) in Paris. Countries represented included Austria, Belgium, Czech Republic, Denmark, France, Germany, Hungary, Switzerland and the United Kingdom. The Joint Research Centre was represented by our Newsletter editor, Mr. Niall McCormick. Mr. Øysten Andersen, President of the OEEPE (European Organisation for Experimental Photogrammetric Research) and Mr. Claude Luzet, Secretary General of EuroGeographics, were our guests, and each made a presentation of the current work of their organisations (The presentation by EuroGeographics is reported in Section 3.3 of this Newsletter). Mr. Robert Missotten, who is Head of the Earth Sciences Division at UNESCO and our contact there, also gave a presentation of the ongoing activities and co-operations within that organisation. We

shall reproduce his report in the next issue. As our regular readers will know, it is the custom at our January meetings for Council Members to report on RS activities during the past year in their countries. These reports are reproduced in Section 2.4 below, while the news from the Special Interest Groups is presented in Section 2.3.

It was noted that the workshop planned for Abisko, Sweden on "Remote Sensing in High Mountain Areas", has been postponed until 2003 or 2004, in view of the fact that an important conference, "Enviromount" (web-site: www.enviromount.uj.edu.pl), which EARSeL is supporting, is planned for the same period (19-23 September 2002), in Zakopane, Poland.

It was also noted that in several countries, there are now less pupils who undertake scientific studies at university level, and so less are studying remote sensing (RS). It was thought desirable that EARSeL should put together a basic course in RS that might be aimed at not only geography teachers, but also teachers of physics, biology and other natural sciences for inclusion in their curricula, with the aim of encouraging students to study RS at university level. It was agreed that Dr. Rainer Reuter, EARSeL Treasurer, would draw up a list of existing basic courses and educational internet web-sites, together with the possibilities for accessing data free of charge. Council members will be asked to supply information about what exists in their countries, and of course all EARSeL members are welcome to contribute. A basic course suitable for High Schools will then be drawn up and made available to High School teachers.

Concerning the EARSeL Annual Symposium to be held in Ghent, Belgium, in June 2003, it was agreed to implement a "convener system", whereby persons are appointed to chair sessions on specific topics, and are responsible for ensuring a good scientific level of invited and contributed papers. Topics chosen for the Ghent meeting include: Envisat; ice and snow; imaging spectroscopy; RS for High School education/exploiting image databases; vegeta-

tion and biomass; hazards and risks; ground penetrating radar; high-resolution data applications; RS from small satellites; data analysis techniques; ocean and atmospheric studies; data calibration. The Call for Papers will be distributed at the Prague symposium, at the latest.

The proceedings of the 2001 EARSel Symposium in Paris, which had just been printed and were available for inspection, have been distributed to participants and to all paid-up member laboratories. Any readers wishing to obtain these Proceedings should contact the Secretariat. The reports from the EARSel Special Interest Groups (SIGs) and from the National Representatives are presented in Sections 2.3 and 2.4 below. Finally, the EARSel accounts for 2001 and the provisional budget for 2002 were approved.

2.3 News from the Special Interest Groups

SIG Coastal Zones: It was agreed to merge the SIGs "Lidar RS of Land and Sea" and "Coastal Zones and Water Applications". The new SIG, entitled "Coastal Zones" and led by Dr. Rainer Reuter, will hold a specialist workshop following the Annual Symposium and General Assembly in Ghent, in June 2003.

SIG Developing Countries: Prof. Rudi Goossens reported that abstracts are coming in for the workshop to be held in Bonn in September 2002. A formal agreement has been reached to hold a workshop (including a field trip) in Cairo in 2004.

SIG Forest Fires: This group plans another workshop, after the 2003 Symposium in Ghent.

SIG Forestry and Land Use: Dr. Benes proposed that this group should organise a workshop in Seč (ca. 100 km from Prague), Czech Republic, on 10-11 March 2003, together with the annual meeting on "Information Systems for Agriculture and Forestry". Transport from Prague would be arranged and the overall cost for participants would be modest.

SIG Geological Applications: This group plans a joint session during the Prague Symposium in co-operation with the Geological RS Group in the UK. It is possible that the ERIM Geological RS Conference

may be in London in 2002/2003. Sponsorship is being sought.

SIG Land Ice and Snow: The Proceedings of the workshop in Berne, Switzerland, on 11-13 March 2002, will be produced on CD-ROM in the EARSel eProceedings series.

New SIG Multilateral Environmental Agreements (MEA): The Council had previously endorsed the creation of this new SIG, and had asked Dr. Gérard Begni to work on a detailed proposal, for official launch at the Prague General Assembly. Co-operation with ISPRS on this topic was welcomed. Any scientist willing to be involved in SIG-MEA is kindly invited to contact Gérard Begni (begni@medias.cnes.fr). For information on the Terms of Reference of SIG MEA, please contact Dr. Begni or the EARSel Secretariat.

Former SIG Sea Ice: It had been suggested to revive this SIG, but Prof. Gudmandsen pointed out that with four conferences having been held recently on this topic, he felt that there was too much going on in this field to merit the creation of yet another group.

2.4 Reports from National Representatives

2.4.1 RS activities in 2001: Austria

Dr. Erwin Mondre, Austrian Space Agency (ASA), Vienna

Earth Observation (EO) is still one of the major activities in the participation of Austria in optional programmes of ESA. Therefore Austria has agreed at the ESA Council at Ministerial Level to participate in the second period of the EO Envelope Programme with 22.5 M€, corresponding to 2.43% of the approved financial envelope, and to participate in the GMES element of the Earth Watch Programme with 1%. Participation in the InfoTerra/TerraSAR element of the Earth Watch Programme is presently still under discussion. Austria has so far joined all ESA programmes related to EO (e.g. ERS-1/2, Envisat, MSG, METOP, EOPE, EOEP, Earth Watch), and is also a member of EUMETSAT.

At a national level, ASA has signed six research contracts for the evaluation and interpretation of Envisat data, covering: snow

cover and snow melting processes in Alpine regions; atmospheric change analysis derived from GOMOS, MIPAS and GPS limb sensors; environmental monitoring in the Eastern Alps using ASAR and MERIS; geo-scientific application (agriculture, forestry, hydrology) of Envisat data; ice/climate interaction in Antarctica; soil moisture retrieval over Mali from ASAR data. These were postponed due to the launch delay of Envisat caused by the failure of the Ariane-5 launcher in summer 2001.

Austrian scientists have prepared detailed proposals for future Earth Explorer Opportunity Missions to be selected by ESA in the first half of 2002. One concerns a mission for improved representation of snow- and ice-related processes in hydrology and climate models using a high-frequency (17 GHz) SAR sensor. A further proposal aims at accurate observations of humidity and temperature in the troposphere and stratosphere for climate variation monitoring, using a small constellation of microsatellites together with GPS satellites. In preparation for the EU's GMES initiative, the Ministry for Traffic, Innovation and Technology has initiated nationally funded studies, on EO for land use planning and GIS application, and the development of methods for monitoring hazards on Alpine traffic routes. A national information day took place on May 9, 2001 in Vienna, to present ongoing EC-, ESA-, and nationally funded projects, and to provide information on current and future ESA programmes. The papers and poster presentation have been published in a special issue of VGI (*Österreichische Zeitschrift für Vermessung und Geoinformation*). Based on an ESA study contract on the application of RS data for Mega-Cities, Geospace has published a book with colour satellite images and air photos of large cities in all five continents, which is available in German and English (ISBN-3-85313-061-5, 264pp).

2.4.2 RS activities in 2001: Czech Republic

Dr. Tomas Benes, UHUL Forest Management Institute, Brandys-nad-Labem

Two international projects on the use of RS were carried out. The Morocco Project orig-

inally aimed at the protection of wild animals, but then became a thematic GIS for the whole territory. The project was carried out by the Forest Management Institute in co-operation with FAO (Rome). The final report was submitted in 2001 and the results were considered by the Moroccan authorities and by FAO to have been very successful. The Wireless Info Project is also considered by our EU colleagues to be very successful, and will be completed in 2003. This project was initiated in the IST Programme, coordinated by JRC, Ispra. Czech forestry GIS technology is also being applied in Morocco for environmental monitoring. This project will be finished by the end of 2001 and, based on final results and consultation with colleagues from Morocco we can say that this has been very successful. The latest news is that it is recommended to continue the project for the next few years. The Forest Management Institute submitted a further five project proposals to the EU, to be carried out within the next three years. These concern mostly the use of RS/GIS, for nature protection in particular. Finally, the Forest Management Institute and Austrian colleagues have begun preparations for co-operation under the international project INTERREG II.

Within the Czech Republic, three main projects have been implemented. The first, on new methods in forestry management and regional plans for forest development, aims at a new type of thematic map (i.e. typological, ecological, protection, etc.), and will enable the improved sustainable development of Czech forests. The project's main new element regarding forest mapping, is that it concerns natural regions, not just administrative districts. The second domestic project, which is in the initiation phase, concerns forest inventory. This very large project, planned to last until 2006, aims to create a basic database for Czech forests (i.e. general inventory and summary of all forests) at a mapping scale of 1:10,000. This is headed by the Forest Management Institute according to a governmental decision. The main identification of forests will be from colour air photos. The third domestic project, which in the preparation phase, is called "National Geo-Information Infrastructure". One part concerns the updating of the national geographic in-

formation system database ("Zabaged"), planned for the whole territory of the Czech Republic every two years. Thus, half of our territory will be photographed by colour air photos (23x23 cm) per year. The project is in the final negotiating stage with our government. Apart from these new projects, the relatively old project – i.e. forest disease monitoring based on a two-year period of full classification of Landsat TM data by our special technology – will continue. This year preparatory work for synchronous ground measurements, and selection of testing areas, were carried out.

As was reported in our last Annual Report, most potential applications of RS data are tied in with GIS applications. In this context, a very important event took place: the establishing of the Special Experts Forum (Nemoforum), whose members are all experts in GIS technology applications in our country. It is run jointly by the State Office for Geoinformation and the Czech Association for Geoinformation. Several new activities were undertaken by new members of our long-standing Czech Society for Photogrammetry and Remote Sensing. Most of the time, however, the work was ineffective, but after the big change in our common life, the author of this report hopes that a "new time" has begun.

Three major events are held in our country annually, as well as one every 2-3 years. The first, normally organised with EARSeL sponsorship, is the international conference "Information Systems for Agriculture and Forestry", usually held in February at Seč (ca. 100 km from Prague). The second event, GIS Ostrava, is held each January, and is oriented towards GIS applications incorporating RS. Thirdly, and most important from my point of view (it can be recommended to any country in the transition stage), is "GIS in State Administration", traditionally organised each June at Seč. It has a very positive influence on Ministries, state offices and officials, especially for its information about GIS potential and utilisation.

The most important event held in our country every 2-3 years, is "GIS Brno". It is organised by the Laboratory for Geoinformatics, Masaryk University, and has the highest international reputation among

events in our country on this topic. A relatively new, but most popular special conference, authorised by our government, concerns Web Communications, Applications, and Utilisation in general. The venue for this conference is the regional centre in eastern Bohemia (Hradec Králové). It is currently very popular (about 500 delegates per year), and as part of this event a special award – i.e. Geo-Application of the Year Competition – has been created.

Apart from these mostly annual events, a very important forthcoming meeting – the EARSeL Symposium and General Assembly – will be held in Prague in June 2002, under authority of EARSeL and our Ministry of Agriculture. Then, in September, the NATO General Assembly will meet in Prague, under the authority of President Havel and the Ministry of Defence.

2.4.3 RS activities in 2001: Finland

Prof. Martti Hallikainen, Helsinki University of Technology

Public funding for RS activities in Finland comes mostly from the National Technology Agency (Tekes), Academy of Finland, and EU- and ESA-funded projects. The average annual level of Finnish contribution to ESA's RS programmes is 5 M€. The aims of the Tekes five-year RS technology programme, GLOBE 2000, were: (a) development of operational RS methods with commercial potential or beneficial socio-economic effects; (b) development of sustainable RS industry; (c) research in areas having high national importance (environment, forests, water, snow, ice). The total value was ca. 9 M€ in 1995-2000. The evaluation report, by two international experts, was published in November 2001 (website: www.tekes.fi/eng).

Tekes is preparing a new programme, AVALI, for the development of space business in the following areas: satellite instrumentation; telecommunications and navigation; RS; satellite services. The goal is to create business outside ESA and EU markets. Consequently, companies are expected to play a major role, with research institutes and universities transferring their

know-how to companies. The programme will run from spring 2002 to 2005, with a total volume of 15 M. In addition, Tekes provides funding to eighteen research units and twelve companies, with an annual amount of 3 M. In 2001 the Academy of Finland and Tekes started a joint four-year space technology programme, Antares. Its focus is on space science and environmental RS, and the essential technological areas are development of instruments and observational and analytical methods. An international evaluation board selected a total of eight projects that receive funding since spring 2001. The total funding is 4.5 M (Tekes) and 4 M (Academy of Finland). Several Finnish research institutes and universities participate in EU- and ESA-funded projects. Numerous nationally funded Envisat AO (Announcement of Opportunity) projects are ready to use Envisat data, when these are available. For more information, please contact Prof. Martti Hallikainen, Helsinki University of Technology (e-mail: Martti.Hallikainen@hut.fi).

2.4.4 RS activities in 2001: France

Dr. Gérard Begni, SFPT President/ISPRS 2nd Vice-President/MEDIAS-France Deputy Manager/START-MEDCOM Secretary

French activities in Earth study and observation are mainly characterised by a huge scientific, industrial and financial effort for the conception, implementation and exploitation of systems where the space component plays a major part.

Contribution to ESA Programmes:

In 2001, France actively prepared the ESA Edinburgh Ministerial Council (November 14-15, 2001) and was particularly involved in the main programmes of ESA, including the programmes implemented together with EUMETSAT.

From the beginning, France strongly supported the EOEP component of the ESA "Living Planet" programme. EOEP phase 2 cost is estimated at 1699 Meuros, 915 of which are now subscribed, 215 of which from France. It is worth noting that two "framework" missions, GOCE and EOLUS,

have been already planned. A third should be chosen among three selected during the "Granada" Conference: EarthCare (Earth radiation mission); WALES (lidar measuring water vapour concentration); SPECTRA (measurement of directional and spectral properties of Earth radiation). Two parallel Phase A studies will be undertaken, and two Phase A "opportunity missions", CRYOSAT (with DORIS) and SMOS, have been led. The decision to start the SMOS phase B is on the PB / EO agenda in January 2002.

In the framework of the EarthWatch programme, some components have also been actively elaborated. ESA will contribute to the European GMES initiative up to 83 Meuros, 18 of which will be supplied by France, a strong GMES supporter from its beginning in 1998. Among other events, the Lille symposium (October 16-17, 2000), organised under the French EU Presidency, followed by similar symposia in Stockholm and Brussels in 2001, gave a strong impetus to that initiative. The L-band TERRASAR and the FuegoSAT projects will be consolidated (respectively 25 Meuros of a targeted contribution of 30 Meuros, and 9 of 10 have been subscribed). An EarthWatch contribution to RADARSAT and Cosmo-Skymed is also planned. The present subscription levels of these two projects are low.

The French scientific community is also actively mobilised in the exploitation of Envisat, to be launched in early 2002, and which constitutes one of the major events in European space history. It is worth mentioning as well that a consortium for the distribution of its products has been formed around SPOT-Image.

SPOT and VEGETATION Programmes:

In the field of high resolution, the three current SPOT satellites (1, 2, 4) enable observation of the Earth's surface in panchromatic and multispectral modes, at 10m and 20m resolutions, respectively, including the "short wave infrared" wavelength (1.58-1.75 μm) for SPOT-4. SPOT-4 carries the VEGETATION-1 instrument. This system is exploited by a distributed ground segment, providing high accuracy elaborated products, whose production unit is operated by VITO in Mol, Belgium. It enables observa-

tions of medium resolution (1.1 km), wide-field (2,200 km) and typically daily revisits. The aims of VEGETATION-1 are both operational and scientific. The EC/JRC is a major user of the system. The follow-on SPOT-5 satellite is scheduled for launch in the first half of 2002. The two high resolution instruments will include significant innovations (production of panchromatic data with 2.5m ground sampling distance, multispectral mode at 10m). Moreover, SPOT-5 will carry VEGETATION-2, which will ensure a long-term continuity of observations over ten years, essential for many long-term analyses. SPOT-5 will also carry the HRS instrument, dedicated to the operational collection of along-track stereoscopic couples (5x10m resolution).

CNES is studying a new multi-sensor programme based on small satellites, Pléiades, which should include optical satellites and radar satellites with 1m resolution, based on innovative technologies. An agreement was signed with Italy in January 2001 to coordinate the Pléiades and Cosmo-Skymed projects. Pléiades should succeed SPOT and be operational in 2005. France and Italy should respectively focus on optical and SAR components. The joint Pléiades/Cosmo-Skymed programme could in particular be a major contribution to GMES.

Solid Earth, Ocean, Atmosphere and Coupled Systems:

Some systems intended for a more general use provide much information in the field of inner geophysics, such as DORIS (providing a location precision of 1cm) and SAR interferometry. The French scientific community plays a leading part in both fields.

The Franco-American TOPEX-POSEIDON system, launched in 1992, has enabled to determine ocean level with a precision of 1cm, and to study its dynamics. This field of research is very active in France. The successful launch of the JASON-1 mini-satellite on December 7th, 2001, the successor to TOPEX-POSEIDON, ensures the essential long term continuity of these data. It also shows that satellite costs can be dramatically reduced, opening the way to their gradual funding by end users. The follow-on OSTM (Ocean Surface Topography Mission) system is planned as a joint project

with NASA, NOAA, and EUMETSAT. From the applications side, France has developed the MERCATOR project for operational oceanography (real time assimilation of global data in complex high resolution models). The first bulletins were issued in January 2001. CNES ensures with OOPC the co-ordination of its international counterpart, the GODAE project.

Following a previous co-operation agreement, in 2001 CNES and the Indian Space Agency (ISRO) signed a Phase B Memorandum of Understanding to lead together the MEGHA TROPQUES project, to be initiated in 2006. This mini-satellite is for the observation of seasonal variations in the water cycle and energy exchanges within the atmosphere-ocean-earth system in tropical areas.

NASA and CNES also agreed to develop together the CALIPSO project (formerly known as PICASSO-CENA). The aim of this mini-satellite, to be launched in 2004, is to study the radiative forcing due to clouds and aerosols by coupling lidar backscattering measurements with passive radiometry measurements (visible and infrared imaging and spectrometry in the near infrared). France will supply an infrared imaging radiometer with micro-bolometers, as well as the PROTEUS platform and the satellite control centre.

The POLDER instrument, a wide-field imaging optical radiometer launched by the Japanese ADEOS-1 satellite (1996-1997), enables to obtain multispectral, multi-angular and multi-polarisation observations. The follow-on POLDER-2 instrument will be launched by the Japanese ADEOS-II satellite in February 2002. POLDER also is planned to be carried by PARASOL, a mini-satellite intended for a joint mission with CALIPSO and CLOUDSAT.

The thematic ground segments programme:

The thematic ground segments programme is a major initiative aiming to provide scientists with relevant products and information, saving them as much time as possible in data handling and pre-processing out of their scope of research. These programmes are led in close co-ordination between

CNES and the scientific users (and others if any), who are in the driving seat, providing the system with advanced retrieval algorithms, validating its outputs and improving these. Of specific interest here is the so-called POSTEL (Pôle d'Observation des Surfaces Terrestres aux Echelles Grandes) project. The objective of POSTEL, which is in its definition phase (to be co-ordinated by MEDIAS-France in 2002), is to derive several biophysical parameters related to terrestrial surfaces from wide-field satellites. Using several space systems enables the reasonable eradication of instrumental biases linked to specific viewing modes, by taking advantage of the wide spectrum of observations now available. The ambition of POSTEL is to provide both the scientific and industrial community with products duly labelled in terms of description and accuracy. Links to existing structures (such as land SAF) are taken into due consideration. POSTEL is nominally envisioned as a component of GMES. Several research laboratories and service providing companies are ready to co-operate. VITO, the present operator of the VEGETATION pre-processing ground segment could play a major role, such as turning POSTEL into a joint GMES initiative led mainly by Belgium and France. EC / JRC could be involved as well.

The PNTS Programme:

PNTS (French National Programme for Space Remote Sensing) has an important role, with operations lasting several years. It aims at developing methodologies to prepare the use of space data by the scientific community, promoting the implementation of operational methods, and assessing and assimilating space data into complex models. PNTS, which includes many themes, has backed the following existing space programmes: POLDER; SeaWiFS; SPOT; VEGETATION; ERS; TOPEX/Poseidon; JASON; ENVISAT. It has also supported new gravity missions (e.g. CHAMP, GOCE), and others (e.g. IASI, Lidar WIND, MSG, CALIPSO, SMOS). PNTS has also supported research on radar image processing (GDR / ISIS) and SAR interferometry (GDR/InSAR, GDR/Strain-SAR), as well as instrument development (e.g. RAMSES). PNTS aims to continue supporting future missions (ESA Earth Ex-

plorer programme, EUMETSAT Second Generation METEOSAT/MSG), by undertaking studies on new concepts (e.g. the P-band with the RAMSES radar, fluorescence in Fraunhofer lines, polarimetry of Envisat or RADARSAT-2 SAR, bi-static or radar interferometry/"ALOS wheel", hyperspectral data/CHRIS, directionality in the thermal field).

2.4.5 RS activities in 2001: Germany

Gottfried Konecny, em. Prof. University of Hanover

This report has been compiled from reports submitted directly by Member Laboratories or from other web-sites, when representatives were unavailable or did not respond.

The most significant RS activities are carried out by the DLR (German Aerospace Research Establishment) in Oberpfaffenhofen and in Berlin-Adlershof. Concerning the ground segment in Oberpfaffenhofen (Prof. Dr. M. Schröder), the German RS Data Centre (DFD) has now processed ten years of ERS-1/2 data. The receiving station also processes Landsat-7 and MODIS data and is ready for ENVISAT with the DFD Robot Archive. Mission proposals include several Earth Explorer missions, VOICE (volumetric interferometry cartwheel), SAND (dryland degradation spectral analysis), SWIMSAT (surface waves), BIOGEOSAT (ocean colour multi resolution), TROC (Tropical chemistry), GeoTROPE (geostationary tropospheric pollution explorer) and FEMAS (Fire Assessment system). On-going projects include the SRTM with the first data releases to the Principal Investigators, the GOME service, Kiruna, dealing with NO₂ enhancement and SO₂ monitoring), MERIS processors for water and aerosols, and aid for Afghanistan. New projects include: SIBERIA II (EU), CORINE 2000 for Germany, ChiCo (coal fires in China), SPIN (nature conservation in Europe), BIOTA-East (GIS for biodiversity in Kenya), 60,000 km² DEMs from MOMS data, pipeline RS, InfoMining processor development, Heliosat 3 (energy weather prediction), GOME expansion (O₃, Br O, NO₂). At present the DLR DFD is being evaluated as a

world data centre for atmospheric RS by ICSU. DLR Adlershof is working on the BIRD mission with particular reference to the Sydney wildfires of January 2002, using WAOSS-B (VIS, NIR) and HSRS (hotspot recognition by MIR, TIR sensors).

The Institute for Remote Sensing and GIS of the University of Freiburg (Prof. Dr. B. Koch) is working on quantitative methods for the ecological diversity of forests, on biodiversity in Europe in co-operation with many other European institutes, on monitoring forest stands in Thüringen by high-resolution satellite data and laser-scanning, monitoring trees outside of forests in tropical regions (Honduras, Costa Rica), vegetation in Jalisco (Mexico), tropical rain forest inventory in Kalimantan (Indonesia), damages after storms in Baden Wurthenburg, and damages of the Atlantic rain forest in Brazil.

The BKG (Federal Office for Cartography & Geodesy – Prof. Dr. Schulz) produces digital orthophotos for the verification of Atkis data via knowledge-based methods, in co-operation with the University of Hanover. The RS Research Group in Bonn works mainly in developing countries. Currently they are working on Land Use / Cover in Ghana (Glowa Volta Project), which is concerned with the sustainable use of water taking into account changing land use, rainfall and water demands conditions. They also work on modelling vegetation dynamics and biomass in semi-arid ecosystems in East Africa and global change (IMPETUS) concerned particularly with the management of scarce water resources in West Africa, Benin and Morocco. A Centre for RS for Land Applications (ZFL) has recently been founded. This group in Bonn is organising the 2nd EARSel Workshop on "RS for Developing Countries" to be held 18-20 September 2002.

The Geographical Institute of the Humboldt University in Berlin (Prof. Endlicher, N. Zahnen) is working on climatological parameters and mass balance of the Devon Island Ice Cap, as well as on urban ecology. The Meteorological Institute of the Technical University of Berlin is working on environmental applications. They undertake the operational recording of NOAA-14/16

AVHRR and TOVS data, NOAA-15 AMSU, and METEOSAT. They have produced a normalised database of NDVI 1 km data for 1989-2002, energy balance at ground level, cloud cover over Central Europe, cloud climatology, and the ice-covered area between Greenland and Novaja Semlaya

The Institute of Cartography, University of Dresden (Prof. Manfred Buchroithner) has produced 3D visuals of the Dachstein south wall and Eiger north wall, a multi-lingual map of Mars (the first in a new series of planetary maps). It has also worked on a GIS for the Katun National Park, Altai-Siberia and on tourist maps of "Saxonian Switzerland". The Institute of Geography, GIS and RS of the University of Göttingen (Prof. Dr. Martin Kappas) is working on climate monitoring, forest inventory and precipitations in the Dominican Republic, on land use / cover changes in the Sahel, desertification indices in Ouagadougou, Burkina Faso. There are plans to study precision farming in S. Lower Saxony.

The Marine Physics Section of the University of Oldenburg started a new research project within the interdisciplinary programme "BioGeoChemistry of the Wadden Sea", (www.icbm.de/watt/eng_index.html). The investigations aim at a fundamental understanding of important processes in a tidal flat system. Considering the hydrodynamic conditions, the influence of the different processes on the material budgets will be determined. Experimental data are gathered in ship-borne experiments, but also with a new time-series station near Spiekeroog Island. This station will be equipped with physical, biological and chemical instruments for measuring water column parameters. Measured on a long-term basis, these data will also be of value as ground truth for satellite RS in coastal regions where satellite data are often difficult to interpret. Within the JGOFS Indian Ocean Project, a bio-geochemical model of the Arabian Sea has been developed. In addition to parameters such as phytoplankton biomass and productivity, it focuses on chromophoric dissolved organic matter (CDOM, gelbstoff) which is also relevant for ocean RS. It could be shown that the influence of CDOM on water leaving radiance can exceed phytoplankton pigments,

which points out its relevance in ocean colour data analysis. The results (in German) can be downloaded at docserv.uni-oldenburg.de/publikationen/dissertation/2002/brebio01/brebio01.html.

GAF, Munich (Dr. Rupert Haydyn) is developing a multi-sensor high-resolution system for the EC. It is very active in overseas projects. In Bolivia it is developing a decision support system for transport planning, as well as regional transport planning in Chile and Peru. Together with fifteen partners it is developing a World Fire Web for mapping fires. The company is also developing an information system for inventory and agricultural monitoring in Kazakstan, Mongolia and Uzbekistan. In Tanzania there are projects for resource protection in seven areas concerned with land use, erosion and soil monitoring. Other systems under development include a Flood Risk Emergency Information System, and the surveillance of mining operations, in co-operation with Danish, German and Spanish partners. The company operates the Neustrelitz receiving station for IRS distribution in Europe. It has produced "Alpenflug" CDs with fly-throughs based on satellite imagery and DEMs.

The OPTIMARE company in Wilhelmshaven (Dr. Theo Hengstermann) specialises in RS for oceanographic studies, air monitoring and polar research. The Institute of Navigation – University of Stuttgart (Prof. Dr. Ing. Alfred Kleusberg), studies satellite navigation, ionosphere modelling, radar interferometry (SRTM), radar RS and airborne laser scanners. The Institute for Physical Geography of the University of Freiburg (Prof. Dr. H. Gossmann) is involved in glacier monitoring in the Antarctic and a GIS of King George Island. The Institute of Photogrammetry and Geoinformation, University of Hannover (Prof. Dr. C. Heipke) has developed DEMs from ERS-1/2, SRTM and from laser-scanners over a test area in Lower Saxony. It also has a wide range of other areas of RS research.

2.4.6 RS activities in 2001: Hungary

Dr. Peter Winkler, FÖMI Remote Sensing Centre, Budapest

Operational National Crop Monitoring and Production Forecast (NCMPF):

As part of the Hungarian Agricultural Remote Sensing Programme (HARSP) supported by the National Committee for Technological Development (NCTD) and Ministry of Agriculture and Regional Development (MARD), three hundred man-years of R&D were invested by FÖMI Remote Sensing Centre (FÖMI RSC). The original objective was to introduce RS to the operational agro-information system in Hungary. The R&D phase (1980-1996) of HARSP was fundamental to the operational NCMPF (from 1997 to date). After the successful implementation of the NCMPF in Hungary in 1997, the programme gradually extended covering a characteristic sub-sample (nine) of all counties (nineteen) in 1998-2001. In the NCMPF programme that was operational for the fifth year in 2001, FÖMI RSC provided county and country level crop production forecasts based on RS, measuring the areas and expected yields of the eight main crops. Beyond the crop-area assessment and yield prediction for the counties, these data were expanded to the entire area of Hungary. The eight main crops monitored together represent the 78-82% of the entire Hungarian crop-land. The area and forecasted yield data were reported by a strict calendar to MARD across the season in harmony with the existing traditional production forecast system of MARD.

The crop area assessment in NCMPF is based on the quantitative analysis of multi-temporal high-resolution images (Landsat TM and IRS-1C/1D LISS-III) providing precise crop area estimation at different levels: locally, in the counties (nine) and for the entire country through extrapolation. More factors of the 1999-2001 vegetation seasons (spring and summer waterlog / flood – 1999; drought - 2000; flood – 2001) made the 2000 and 2001 crop monitoring and production forecast very difficult. Three counties beyond the directly surveyed nine counties had to be involved in crop area assessment to maintain the reliability of the national level data in the extrapolation procedure. The actual standard crop maps were also provided to MARD. The crop yield forecast is accomplished by the application of a FÖMI-developed

model which combines high-resolution satellite data (Landsat TM and IRS-1C/1D LISS-III or SPOT) and NOAA AVHRR time series. An HRPT receiving station had been installed and operated in FÖMI since May 1998 to provide secure and real-time NOAA AVHRR data access for the models. FÖMI provided yield estimates for the counties and expanded them to Hungary using a regional-historical correlation scheme. Because of the method applied, yield spatial distribution maps could also be reported for the major crops.

The correlation of county area and yield measurements of FÖMI and Central Statistical Office is very good (more than 50-50 county-year data) in a long interval (1991-2000) comprising nine counties, and almost the entire range in weather from severe drought to good year. A merely AVHRR-based robust crop yield prediction model also worked very well for all counties, and also for Hungary regarding four major crops. This method is validated by more than 160 measurements from 1991-2000, including all nineteen counties in Hungary. Beyond accuracy, objectiveness and high benefit / cost ratio, timeliness is an important feature of the RS-based information systems. This forecast is certainly ahead of the end of the harvest (and final data) by 6 (-15) weeks. Being the fifth operational year of NCMPF, gradual extension of the directly observed counties is under way. At the same time, the operational NCMPF makes implementation of other programmes possible and very cost effective on the same data, infrastructure and know-how basis. This leads to a number of additional applications.

Area-Based Subsidy Control by RS:

The NCMPF basis can be used not only for information extraction at county and regional level, but also to extract information at field level. The principal national crop area-based subsidy programme has been operative in Hungary for many years now. Both the crop subsidy and the ad-hoc partial loss compensation programmes, which are responses to extreme natural disasters (e.g. waterlog / flood damages) work in a sound legal framework. In 1997 FÖMI proposed to MARD the introduction of RS into the control of the subsidy and partial compensation programmes. The subsidy controls were

performed on the NCMPF basis. Using FÖMI's operational RS-based technology, a three-counties sample was controlled in a pilot project in 1999. The target area for RS-based subsidy control in year 2000 was extended to the same areas of NCMPF: nine intensive agri-counties that comprised a 7% sample of all the dossiers. In 2001 a similar project was carried out, furnished with several components towards the implementation of the 1593/2000 Council Regulation.

Additional RS applications and projects implemented on the NCMPF basis:

A water-log and impact-monitoring programme was launched for MARD. It covered the most affected four (1998) and eight (1999) counties of about four million hectares. Reliable waterlog maps and areal measures were derived. Beyond the static status assessment and delineation of the areas under water or having saturated soil, impact analysis on the crops and the dynamism of changes could also be monitored quantitatively. This assessment made use of high- and medium-resolution optical data (i.e. Landsat TM, IRS-1C/1D LISS-III, WiFS). The resulting GIS database and printed maps were intensively used by MARD, and provide fast, operational information for decision-makers. Moreover, RS can successfully be used within the parcel-specific disaster compensation programme for the control of claims.

Regarding the serious flood situation along the upper part of Tisza River, FÖMI RSC could also mobilise its operational capabilities in spring 2001. For the first time in fifty-three years, the dike along Tisza River was breached by the water. The water flooded the neighbouring areas through a 120 metre-wide gap threatening tens of villages and thousands of people. The extent of flooded areas was evaluated both on the Ukrainian and the Hungarian side, and high-, low- and medium-resolution flood maps were electronically forwarded to the central and local management authorities.

The aim of the Prodex-Envisat project is to develop the application of ESA's Envisat data for regional RS-based flood/waterlog and drought/crop monitoring (2000-2002). Further extension of the existing NCMPF methodologies with Envisat data was pro-

posed for rapid, regional monitoring of the spatial extent and temporal changes of flood-, waterlog- and drought-affected areas. Envisat's new generation sensors increase the security of satellite data availability and effectiveness of RS-based rapid, large area flood/waterlog and drought/crop monitoring. In the implementation of the first and second stage of the project, the processing and comparative analysis of currently available, operational satellite data (NOAA AVHRR, SPOT VEGETATION, IRS-1C/1D WiFS and Landsat) were done so far on a regional (2-3 counties) test area to accomplish the model setting, extension, testing (1998-2000 data) and semi-operational (2001 data) monitoring phases of the project. The category system of the WiFS-based regional waterlog map could be further refined, since the degrees of wet soils and wet vegetation could be identified and differentiated more effectively using the lower spatial but higher spectral resolution SPOT 4 VEGETATION images. These data also were successfully tested for regional drought and flood monitoring (2000).

FÖMI RSC is developing methods for satellite-based monitoring of the real area of production vineyards in Hungary. In December 2000, according to the EU regulations, the Hungarian Government ordered the Central Statistical Office to conduct a census in 2001. The objective of the census was to have up-to-date information about the vineyard and orchard areas in Hungary. As an initial map and database for the census FÖMI RSC carried out the preliminary

assessment of the vineyard and orchard areas covering the whole country (19 counties). High resolution satellite data were applied in a very short, two months surveying period in 2001. This high-tech RS-GIS technology gave a really good basis for the census.

CLC50 Project – CORINE Land Cover Database at Scale 1:50,000:

As part of fulfilling the Government resolution on the "Development of Environmental Information Systems", the implementation of the CORINE Land Cover database at scale 1:50,000 is taking place. The database supports Hungary's accession to the EU in various programmes, such as the planning of sustainable agriculture, rural development, agri-environment and nature protection. The CLC50 Project has direct links to the standard European CORINE Land Cover Project. However, most elements of the methodology were upgraded according to the present level of technology in geo-data processing (see Table **below**). The CLC50 nomenclature has been developed from the standard (i.e. Level 3) nomenclature, and includes nearly eighty Levels 4 and 5 classes, which have been adapted for Hungarian conditions. Ortho-rectified SPOT-4 satellite images taken in 1998-1999, and computer-assisted photo-interpretation, allow for high positional accuracy of delineation. The minimum mapping unit of 0.04 km² (0.01 km² for lakes) provides enhanced geometric detail. A rigorous internal supervision and an external quality control provided by state services (i.e. National Park Directorates,

Parameter	CLC100	CLC50
Nomenclature	standard EU level-3	extended level-4/5
Methodology	hardcopy photointerpretation	softcopy photointerpretation
Min. mapping unit	0.25 km ² for all categories	0.04 km ² (0.01 km ² for lakes)
Spatial resolution	100x100 m	50x50 m
Number of classes	27 (out of 44)	~ 80
Number of polygons	24,000	> 150,000 (estimated)
Positional accuracy	< 100 m (RMS)	< 20 m (RMS)
Thematic reliability	> 80%	> 90%
Supervision	Undocumented: direct corrections on plastic overlays	Documented: remarks on polygons (correction instructions)
External quality control	No	Yes
Final product	Topologically structured database	Topologically structured database

Table: Technical comparison of CLC50 and CLC100 in Hungary

Agro-Environmental Services) are the other key elements to producing a high quality database. By the end of 2001, two thirds of the country has been completed, supported by the Ministry of Environment and MARD.

2.4.7 RS activities in 2001: Italy

Mario A. Gomasca, Italian Remote Sensing Association (www.asita.it/ait)

RS activities in 2001 in Italy were extremely active, but the strong reduction of the research budget, approved by the Parliament in the Financial Law for 2002, will be very negative for the Italian RS community. Several but not all of the RS activities are reported below.

Besides ESA programmes, ASI (Italian Space Agency/www.asi.it) promotes and funds several Earth Science R&D/operational national programmes: (a) COSMO - SkyMed: This is an end-to-end EO System dedicated to Earth RS and data exploitation for both military and civil applications. The aim is to establish a global provision of services and products suited to market demand and final user requirements, by a constellation of various satellites, including advanced high resolution SAR/X-band, panchromatic, multispectral, hyperspectral, and thermal infrared (optical bands from the Pleiades System of CNES). The first launch is scheduled for end of 2003. (b) HypSEO (HyperSpectral Earth Observer): This is a low-cost demo mission in the framework of COSMO - SkyMed (spectral range: 0.4-2.5 μm ; spatial resolution: 20x20m; spectral resolution: 10 nm; 220 contiguous bands). The aim is to validate the Hyperspectral Sensor and to test its data capabilities for various applications. The B Phase of the programme started in December 2000. Launch is planned before the end of 2003. (c) Lagrange RO: This is a GPS and Glonass receiver for Radio Occultation, which will enable profiling of pressure, temperature and humidity in the atmosphere up to less than 1km. The main applications are meteorology, climatology, and space weather. It will be carried on the ASI mission DAVID, scheduled for the end of 2004. (d) Small Mission for Earth Sci-

ence: In 2000 ASI announced a Small Mission Opportunity for Earth Science. Six missions were selected to the ASI-funded study phase: BISSAT/ Bistatic SAR for EO; ESPERIA/Earthquake Investigations by Satellite and Physics of the Environment Related to the Ionosphere and Atmosphere; FOURIER/Small Satellite Mission to Detect Global Warming; IGPM/Italian Participation in Global Precipitation Mission; REFIR/Radiation Explorer in the Far Infrared for Atmospheric Studies; VISIR/Visible Infrared Camera for ocean colour. Selection will finish at the end of January 2002, with only one mission continuing to phase B. (e) Matera: This is an important station for acquiring, archiving and processing EO data.

Sergio Vetrella, for several years EARSeL Chairman, is the new President of ASI. Thanks to his wide experience and expertise, ASI and the Italian scientific community can expect to grow in quality and competitiveness.

ASITA (Federation of the Scientific Societies for Geographic and Environmental Information / www.asita.it) is made up of four scientific geomatics associations: SIFET (Società Italiana di Topografia e Fotogrammetria); AIC (Associazione Italiana di Cartografia); AIT (Italian Remote Sensing Association); AM/FM /GIS Italia (Automated Mapping/Facilities Management /GIS). The 5th National Conference was held in Rimini on 6-9 October 2001. About 1,000 people registered at the Conference, ca. 300 papers were presented, and over fifty exhibitors presented their technical GI solutions. Other events were: AIC - Cartography for Excursions and Tourism (16-17 March 2001, Vicenza); Workshop "Towards the European Market for Geographic Information: comparison of Italian and French solutions" (19 June 2001, Imperia); "SIFET - 1951-2001: for Fifty Years the Reference Point for Photogrammetrists and Surveyors" (20-22 June 2001, Rome).

AIT (Italian Remote Sensing Association/www.asita.it/ait) increased its membership in 2001 to 450. It actively collaborates in the enlargement of ASITA, and publishes three issues per year of the Italian Remote Sensing Journal (Rivista Italiana di Telerileva-

mento). AIT coordinates a research team of Italian Laboratories for the definition of quality in RS products. In 2001 AIT was involved in organising the following International Conferences/Workshops in Italy: (a) "La biosfera osservata dallo spazio: temi di ricerca e tecniche di osservazione, Accademia dei Georgofili" (23-24 April 2001, Florence); (b) 2nd International Conference on Archaeology, Volcanism and RS (20-22 June 2001, Sorrento); (c) International Workshop "Geo-Spatial Knowledge Processing for Natural Resource Management" (28-29 June 2001, Stresa); (d) 1st International Workshop "Analysis of Multitemporal RS Images"/www.aris.sai.jrc.it/multitemp2001 (13-14 September 2001, Trento); (e) Joint Workshop "RS and Data Fusion over Urban Areas"/tlc.unipv.it/urban_2001 (8-9 November 2001, Rome); (f) "Collecting and Analysing Information for Sustainable Forest Management and Biodiversity Monitoring, with Special Reference to Mediterranean Ecosystem" –www.geolab.unifi.it/iufro_conference (4-6 December 2001, Palermo).

The Working Group on Earth Observation (OT / www.iroe.fi.cnr.it/ot) was formed in March 2000, by several Institutes of the National Research Council of Italy concerned with EO. The main aim is to promote relationships among entities interested in EO data in Italy.

The Dipartimento di Elettronica e Telecomunicazioni – Laboratorio Comunicazioni ed Immagini, Florence (www.det.unifi.it) carries out research mainly along two lines: (a) Image processing for RS data fusion: This work concerns a general and formal solution to the problem of fusion of multi-spectral data with high-resolution panchromatic images. (b) Protection and authentication of RS images distributed through computer networks: With increased commercial interest in the global sale of satellite images, demand for secure protection mechanisms enabling enforcement of copyright laws has also grown.

During 2001, the research activities carried out at IATA (Istituto per l'Agrometeorologia e l'Analisi Ambientale Applicata all'Agricoltura)/CNR and LaMMA (Laboratorio per la Meteorologia e la Modellistica Ambi-

entale)/FMA (Fondazione per la Meteorologia Applicata) in Florence, focussed on continuing vegetation investigations at different spatial and temporal scales. In particular, studies were conducted to: extract vegetation parameters (type, conditions, leaf area index, etc.) from existing satellite sensor imagery (Landsat-TM, NOAA-AVHRR, MODIS, Spot-HRV, IKONOS); simulate the performance of near-future satellite sensors (MSG, ENVISAT-MERIS, Cosmo – Skymed, etc.) for the evaluation of these parameters; assimilate the extracted parameters into ecosystem simulation models (FOREST-BGC, BIOME-BGC) for the estimation of the main bio-geo-chemical processes (water and carbon fluxes, productivity, etc.) of terrestrial environments.

CNR-IREA (Istituto per il Rilevamento Elettromagnetico dell'Ambiente/www.irea.cnr.it) in Milan was established in 2001 by merging CNR-IRRS, Remote Sensing Unit (Milan) and CNR-IRECE (Naples). The aim is to develop studies in the optical and radar spectral ranges with environmental applications. The Institute aims to cover in a coherent and integrated way the fundamental aspects of RS and electromagnetic diagnostics, regarding the development and consolidation of methodology and techniques for data acquisition, elaboration, fusion and interpretation, as well as biological and dosimetric aspects of the electromagnetic risk control.

Under DLR's (Germany) EU-funded HySens Project, IREA-CNR has proposed the DARFEM (DAIS and ROSIS for Forest Ecosystem Monitoring) experiment. The study's main goal is the better understanding of the capability of hyperspectral and directional data for the retrieval of physiologically relevant parameters at the canopy scale. Current activity is focused on the analysis of collected data-set using semi-empirical models and the inversion of leaf and canopy reflectance models, with higher predictive capability than empirical approaches correlating ground measurements with derived spectral indices.

During 2001 the research activity of Microwave RS Group, Politecnico di Milano (www.elet.polimi.it) has been mainly devoted to two topics of microwave RS: (a)

Improvement and new applications of the "Permanent Scatterers" technique in order to measure ground deformation with millimetric accuracy, involving identification and measurement of landslide motion in Italy and the seasonal ground motion in the Santa Clara Valley, USA, due to periodic water level variation, affecting an area limited by two known seismic faults; (b) Construction of a second generation prototype of passive SAR that uses the digital television signal from satellite as a ground illuminator (with field use foreseen by mid 2002). See also the web-site: www.elet.polimi.it/people/prati.

The ISPRS (Image Processing and Pattern Recognition for RS/spt.dibe.unige.it/IPRS) Laboratory, Genoa, is involved in the development of image analysis and pattern recognition methodologies for several applications related to EO. In recent years, IPRS has contributed to several projects for the Italian Space Agency and the Italian Ministry of University and Scientific Research. The activity of this year deals mainly with: multi-temporal contextual classification using spectral/contextual fusion; multi-sensor fusion; feature selection on hyperspectral data; water quality analysis; change detection; SAR polarimetry; SAR interferometry; coastal monitoring.

RSL (Remote Sensing Laboratory / ict.unitn.it/Research/SPT.htm) of the Department of Information and Communication Technologies – SPT (Signal Processing and Telecommunications) Group at the University of Trento, addresses several research studies dealing with pattern recognition and image processing applied to RS data. In 2001 RSL organised a successful International Conference "Analysis of Multi-temporal RS Images" (MultiTemp 2001), supported by AIT, ASITA, JRC, IEEE and ITC-IRST (Istituto Trentino di Cultura – Centro per la Ricerca Scientifica e Tecnologica), and attended by more than 100 international scientists (www.multitemp.org). In 2001, research at RSL focussed on: feature selection for classification; multi-sensor and multi-temporal image classification; change detection in multi-temporal images; risk assessment; biophysical parameters estimation.

In 2001, CNR-IIA (Consiglio Nazionale delle Ricerche – Istituto sull'Inquinamento Atmosferico/www.iaa.mlib.cnr.it/Iia/IHome.htm), Rome, carried out several initiatives on the use of the hyperspectral airborne MIVIS (Multispectral Infrared/Visible Imaging Spectrometer) in Italy, in co-operation with CGR (Compagnia Generale Ripresearee, Parma), published the results as part of several projects on MIVIS data processing and interpretation. MIVIS performances were checked and a substantial improvement was achieved by setting up a procedure to calibrate radiometrically the instrument, by comparing spectral responses of a portable reference panel measured by a portable field spectro-radiometer and the MIVIS detectors. Relevant environmental issues were studied using MIVIS. In particular, in several Italian regions surveys were made to collect information on vegetated areas, and in urban areas to detect asbestos and to monitor impact of waste disposal. MIVIS data were also acquired during the Etna eruption in July / August 2001, and provided valuable data for volcanological research, and to support ASTER (Advanced Space-Borne Thermal Emission and Reflection Radiometer) data validation. The papers presented at the MIVIS workshop in Colorno (Parma), Italy in June 2000, were included in a special issue of the Italian Remote Sensing Journal at the end of 2001. There are seventeen papers spanning a wide range of applications of MIVIS data. Many of the papers discussed the study of active volcanic areas of southern Italy, and the atmospheric correction and calibration of the MIVIS sensor. A relevant feature, common to all the papers, was the contribution of field spectral signatures in the 350-2500 nm range to support MIVIS data calibration and validation.

In 2001 CO.RI.S.T.A. (Consorzio di Ricerca su Sistemi di Telesensori Avanzati/www.corista.unina.it), Naples, carried out several programmes for the design and development of electro-optical sensors and radars for RS systems. CO.RI.S.T.A. has completed the last part of ARCHEO research activities and the related validation tests. ARCHEO project has run for three years, and has been funded by the Italian Ministry of Scientific and Technological Research. The

aim is to create an integrated system for recognition and conservation of buried archaeological sites using RS techniques. CO.R.I.S.T.A. is developing also two new research projects: (a) LAPMI (Atmospheric Pollutant Concentration Monitoring by Lidar); (b) Three-Dimensional Observation Systems in any Weather Conditions for Natural Disasters Management and Territory Protection. In July 2001 the MITAR project was approved by ASI. The aim is to create an innovative miniaturised electro-optical sensor for micro-satellites, suitable for space, to be installed on small space platforms, for RS missions. In addition to these projects CO.R.I.S.T.A. is carrying out another programme, INPUT, whose primary goal is to provide public bodies with space technology and thus to give a positive kick-off to technology transfer in city-planning. This project, which started in September 2000, will run for two years, and aims to create the first pilot projects of space technologies transfer, and to start a permanent network for technologies transfer. In September 2001 CO.R.I.S.T.A. organised, together with EARSel, an international workshop "Remote Sensing by Low-Frequency Radars". It aroused great interest in the scientific community in the characteristics of this type of sensor, and a great number of participants came from the major universities and research centres. The workshop objective was to discuss the latest technological developments and innovations in this field, thus opening the way to future deadline conferences on this subject. The Proceedings of the workshop, published on CD-ROM, are available from the EARSel Secretariat.

The IAO (Istituto Agronomico per l'Oltremare/www.iao.florence.it), Florence, provides support and consultancy to the Ministry of Foreign Affairs in agriculture, and works in the field of the Development Co-operation in Africa, Latin America and Asia. Its activities include: bilateral development co-operation projects; training project on Natural Resources Management and Food Security in the Sahel (in collaboration with the Agrhymet Regional Centre); support to the Centre de Suivi Ecologique (CSE) in Senegal for the production and management of information on natural and environmental resources;

development of a GIS to support the management of agricultural research on durum wheat in Algeria. IAO's contracts with international agencies include: FAO/Africa-cover project – finalisation of the land cover database for Eritrea (1:100,000) and first phase of building the database for the Democratic Republic of Congo (1:200,000); IGAD Secretariat (Djibouti, Eritrea, Ethiopia, Kenya, Somalia, Sudan and Uganda); collaboration for the first phase of RIIS (Regional Integrated Information System), and formulation of a project proposal for phase II; JRC, Ispra – contract for "Consistency Assessment of the TREES-II High Resolution Exercise". IAO's training activities include a professional Master's Course on "Geomatics and Natural Resources Evaluation". The 21st edition was completed in 2001, with field work carried out in Morocco, and the 22nd edition started with participants from several Mediterranean countries.

2.4.8 RS activities in 2001: Poland

Dr. Z. Bochenek, IGIK Remote Sensing Centre, Warsaw

Operational system for capturing NOAA satellite data for crop growth monitoring:

About 200 NOAA / AVHRR satellite images were collected during the vegetation period 2001 by the receiving station at IGIK (Institute of Geodesy and Cartography). The raw images were geometrically and radiometrically corrected to produce NDVI images, as a base for monitoring crop development in Poland with the use of RS data. A set of comparative images was delivered every ten days to the Central Statistical Office for further analysis.

Development of crop condition assessment system based on multi-source data for monitoring drought in Poland and yield forecasting:

INFOSAT, system of crop condition assessment based on NOAA visible, near-infrared and thermal infrared images, incorporating agro-meteorological data, was established at the Remote Sensing Centre, IGIK. Different vegetation indices were created within the system (NDVI, VCI, TCI), and compared with meteorological data collected for veg-

etation period 1992, characterised by drought conditions in Poland. Detailed comparative analysis of multi-source data proved that the monitoring of a drought situation in Poland with the use of NOAA-derived vegetation indices is feasible. The first studies on inferring yield of cereals from satellite-derived information revealed the usefulness of some vegetation indices for assessing yields of crops on a regional scale.

Hybrid method for characterising pine stands using classified satellite images:

The classification of satellite images for deriving information on forest stands was developed at IGIK. The approach is based on a hybrid method: supervised digital classification of Landsat TM images supported by visual analysis of satellite colour composites. This hybrid method enables to distinguish different forest sites and tree species, as well as to monitor changes related to forest decline, deforestation, and regeneration.

Method for rainfall detection and assessment using NOAA and METEOSAT data: The analysis of microwave data collected by the Advanced Microwave Sounding Unit (AMSU) on the NOAA KLM satellites was developed at the Department of Satellite Studies, Institute of Meteorology and Water Management, Cracow. The method enables to determine water vapour content, air humidity profile, identify snow- and ice-covered areas, and assess rainfall resources. Used with METEOSAT, it can support hydrological and climatological services.

Method of using cloud information for assessing UV radiation at Earth's surface:

The method developed by the Institute of Meteorology and Water Management uses optical depth of clouds determined using NOAA / AVHRR and METEOSAT data for creating global maps of UV radiation distribution. The work was conducted within the Ozone SAF international collaboration, sponsored by the EUMETSAT Visiting Scientist programme.

International collaboration:

- Collaboration with EUMETSAT in developing meteorological services and organising courses for meteorologists from East-Central Europe

- Participation in R&D COST programmes "Meteorological Applications for Agriculture" and "Use of GIS in Meteorology and Climatology", sponsored by the EU
- Participation in the research programme "Assessment of Synergy of ATSR, MERIS and AATSR Data for Monitoring and Management of Temperate European Sensitive Ecosystems: Case Study of Grasslands in Biebrza, Poland and Wetlands of Alsacian Floodplain, France", as part of ESA ENVISAT Nr AO-ID122 programme (1999–2003) by IGIK in collaboration with SERTIT (Service Regional de Traitement d'Image et de Teledetection), Strasbourg, France
- "Application of Microwave and Optical Data in Land Use Classification", by IGIK and the Chinese Academy of Surveying and Mapping (CASM)
- "Satellite Data Applications for Monitoring of Cultivated Land", by IGIK with the National Institute of Agro-Environmental Sciences, Japan.
- "Application of Multi-Source Satellite Data (NOAA/AVHRR, MODIS, Landsat TM, ERS, ENVISAT) for vegetation monitoring", by IGIK and Agricultural Research Council, Institute for Soil, Climate, Water, Pretoria, Republic of South Africa.

2.4.9 RS activities in 2001-2002: Spain

During 2002 the Spanish Association of Remote Sensing (AET) will continue with the twice yearly (June, December) publication of the Remote Sensing Magazine, which accepts works from all countries. Although it is mainly in Spanish, it also accepts works in English. There are also plans for a seminar in July 2001 called "Legal Relevance of RS", which aims to instruct judges and prosecutors in the characteristics of RS, and help them in the increasingly frequent trials in which spatial observation-related proofs are presented. AET will also distribute the third edition of the directory "Who's Who in Remote Sensing?" which is about to be printed and where the activities and addresses of nearly 400 Spanish-speaking RS users are collected. Copies of this directory can be requested from: aet@latuv.uva.es.

Forest fires are a serious problem in Spain

and many groups will continue their activities in this field. The Remote Sensing Laboratory of the University of Valladolid (LATUV) will continue its operational campaign of Forest Fire Risk Index dissemination throughout Spain, via both Internet and the Teletext of TVE. The team from the Geography Department, University of Alcalá de Henares, headed by Prof. Emilio Chuvieco (also responsible for the SIG on Forest Fires), will continue developing several projects. The projects SPREAD (EC-funded), FIRE RISK (funded by the Spanish Government), and others related to fire effects, are among the most noteworthy. The group from CREAM (Centre for Ecological Research and Forestry Applications of Cataluña) have also been analysing fire incidence and effects in this region for many years. Under the direction of Dr. Xavier Pons, this group will continue their long time-series analysis using medium-resolution sensors. Other studies on the regeneration of different vegetation species affected by fires will be completed by the Geo-Ecological Unit of Doñana National Park, in Cadiz, directed by Dr. Patricia Siljeström.

From the University of Valencia, Dr. Vicente (current President of AET) and his team will continue with their works on the development of algorithms for the calculation of both emissivity and ground temperature, directed towards the estimation of evapo-transpiration on a regional scale. Another team from the Polytechnic University of Cataluña, directed by Dr. Joan Jorge, is also working in this field, focussed on obtaining surface parameters such as albedo, emissivity, thermal inertia and vegetation cover.

The Institute of Marine Sciences (ICM-CMIMA, Spanish Council for Scientific Research) in Barcelona participates in the Envisat Radar Altimeter range calibration. From February 2002, they will carry out sea-level and atmospheric measurements on an oil platform located very close to a satellite track off the NW Mediterranean coast. ICM, together with IEEC (Institute of Spatial Studies of Catalonia) will deploy light GPS buoys during Envisat's overpass, along several tracks during the six-month calibration phase.

ICM also plays an important role in scientific studies for the preparation of the ESA Soil Moisture and Ocean Salinity (SMOS) Earth Explorer Opportunity Mission, to be launched in 2006. Dr. Jordy Font is Co-Lead Investigator for Ocean Salinity, and ICM is participating, with the Polytechnic University of Catalonia and the University of Valencia, in the Wind and Salinity Experiment (WISE). They measure the effects of wind on sea-surface emissivity at L-band, to improve sea surface salinity retrieval algorithms from SMOS measurements.

Under the direction of Dr. Asunción Rianza (Geological and Mining Institute of Spain) and together with the University of Castilla-La Mancha and the University of Salamanca, the results obtained during the Hysens Campaign operated by the German Space Agency will be analysed. Hyperspectral images of different lithologies will be used for the analysis of geological events and for the evolution of the Earth's surface caused by erosion and destructive processes through wind, rainfall, run-off, land slides, etc. Recent tectonic movements define directions of weakness and preferred degradation lines of the landscape. Climate-dependent saline soils and carbonate and iron oxide crusts, affecting water infiltration and run-off, are developing under unknown parameters. Such processes are active and influence all human activities. All this work is done within the project "Evaluation of degradation processes and induced changes on wetlands using DAIS 7915 and ROSIS airborne hyperspectral imagery" funded under the Fifth Framework Programme's "Improvement of Human Potential, Access to Research Infrastructures".

A team from the University of Almeria, directed by Prof. Manuel Cantón, is currently working on the study and applications of Artificial Intelligence methods, such as neural nets, expert systems and others, for the automatic interpretation of satellite data, mainly satellite images. Their final goal is to achieve the automatic interpretation of the RS products.

The Spanish Administration also makes extensive use of RS through contracts with companies. It also has several Departments working directly in RS. SITGA, from the

General Department of Regional Planning and Development of the Local Government of Galicia, is carrying out several projects on the assessment of burnt surfaces, generation of ortho-images, land uses, and agrarian statistics. The Agri-Research Service of the Government of Aragon makes extensive use of images for the management of crops, estimation, forecasting and mapping of water volume for irrigation, control of lake beaches and the monitoring of humid areas with an environmental interest. These are the normal tasks of these Departments.

Finally, in March 2002, LATUV will inaugurate a spin-off firm with a technological base exclusively dedicated to RS. Called COTESA (Spatial Remote-sensing and Observation Centre), its headquarters will be in the Technological Park of Boecillo. This company has a MODIS antenna and will join other Spanish companies, such as AU-RENSA or Ortega García Consultants, which focus on the use of images for all types of cartography, land uses, agriculture projects and impact assessment or geology.

2.4.10 RS activities in 2001: United Kingdom

Mr. Ian Downey, BNSC / Chairman of the Remote Sensing and Photogrammetry Society

RSPSoc:

The Remote Sensing Society and the Photogrammetry Society are now officially merged as the Remote Sensing and Photogrammetry Society (RSPSoc). RSPSoc has almost completed one full year in its new form and has ~1250 members, of which about 5% are corporate members and 30% are members outside the UK. The respective journals of the two former societies will continue to be published and distributed: the RSPSoc Newsletter four times a year, the Photogrammetric Record twice a year (though it is planned to increase this), and the International Journal of Remote Sensing which publishes twenty-four issues a year. Members enjoy preferential subscription rates to these journals. (A separate arrangement enables members to subscribe to Remote Sensing of Environment at reduced rates).

RSPSoc has elected a new Council and will conduct a strategic review of objectives in spring 2001. This is an important phase as RSPSoc adjusts to its new constituency. RSPSoc intends to maintain its core objectives of widely promoting RS and photogrammetry, and to provide a focus for researchers, practitioners, individuals and companies and the public regarding the subject. It seeks to encourage links between academia and industry, and is strengthening international contacts, especially with ISPRS, whose Secretary General is Ian Dowman. RSPSoc intends to increase use of the Web to provide information, links and services offering more support to members. Special Interest Groups and technical meetings provide opportunities for members and non-members to meet and exchange ideas and information. The Thompson Symposium, a biennial meeting of the Society, will be the major event of the 2002 technical programme, at Loughborough University (Leicestershire) on 5-7 April 2002.

Supported by the British National Space Centre (BNSC), several promotional CDs have been produced and widely distributed via the UK national press: Window on the World, Window on the UK and Window on the Universe. Another edition – Window on Europe – may be in the pipeline. The CDs can be obtained from BNSC. RSPSoc also participates in educational conferences to promote (via the CDs) knowledge of RSPSoc and RS more widely.

BNSC:

The British National Space Centre (BNSC) is Britain's space agency. BNSC (web-site: www.bnsc.gov.uk) advises and acts on behalf of Government and the Research Councils, to provide a focus for UK civil space policies, and help win the best possible scientific, economic and social benefits from putting space to work. BNSC is a partnership of different government and industry-relayed organisations. Together their expenditure on civil space amounts to around £180 million (ca. €300 M) per year. Approximately two thirds of UK civil space expenditure is channelled through the European Space Agency (ESA).

BNSC's Earth Observation National Pro-

programme was approved by the Science Minister on 27th March 2000. The DTI-funded programme aims to help meet diverse customer needs for information services by the cost-effective exploitation of Earth Observation (EO) scientific and operational opportunities. The Programme addresses the specific EO-related objectives in the UK Space Strategy. Running from April 2000 to March 2003, with a total budget of £12.6 million and additional private venture contributions of ca. £9M, it is split into four headings: user liaison; exploitation (in response to needs); technology; mission preparation.

BNSC's policy and aims are set out in detail in the document "Space Strategy 1999-2002: New Frontiers", available in English on their web-site. A new national programme will be drafted for 2003 and the outcome of the November Ministerial meeting will be relevant.

BNSC issued an Announcement of Opportunity (AO) in September 2001 for a new EO programme on Service Mission Support (SMS). The aim of the programme is to develop further the UK's industrial expertise in all aspects of service/operational EO missions. This will ensure that the UK is well placed to propose and lead future operational EO programmes in ESA's Earth Watch framework, and other national and international opportunities.

BNSC has announced their support for proposals from UK industry for the first phase of the DTI New Technology for Observational Needs (NEWTON) programme. This programme addresses the technology needs of the science community for new environmental science. NEWTON is designed to improve UK industrial capability and economic benefits from the development of EO technology. The principal exploitation route for this technology is through international environmental science mission opportunities. Attention is largely focussed on ESA Earth Explorer. It is intended that DTI NEWTON will run parallel with the NERC New Observing Techniques (NERC NOT) programme, initiated in 1999. NERC NOT, which is open only to academic institutions, aims to identify scientific needs for EO instrumentation

and reduce scientific uncertainties associated with new instrumentation and techniques.

Several Market Sector Studies were completed in 2001. BNSC aims to address industry sectors or definable user groups that hold potential for substantial new use of EO-derived information products. The work is very much a top-level exercise and will not address the development of specific applications. In other words, it is a "far from market" activity to determine whether such sectors could make a significant impact on demand for use of EO data, and thereby increase market growth.

GIFTSS is a BNSC-funded initiative to help UK government departments and agencies implement satellite-derived information. Its objectives are: increased routine uptake of appropriate space information into routine operational processes; more effective users where this can be enabled by using appropriate information derived from appropriate space assets; increased involvement of other appropriate areas of support from academia, institutes and industry, increasing the "critical mass of innovation" in UK industry in these areas

BNSC has issued an AO for a new EO Programme, the Market Entry Programme (MEP). This aims to develop links in the market chain that will bring the benefits of EO data to much wider markets, through mechanisms already proven by the information service sector.

Other RS activities:

Several companies provide air photo-based services covering the UK, giving a competitive market for users. A millennium map of the UK, from air photos, is nearly ready. England is completed, and Wales and Scotland are in the process of completion. The Ordnance Survey has announced that it will include an imagery layer within the new National Digital Framework (NDF). Similar initiatives include the release of the UK Land Cover Map 2000 and LANDMAP – an ortho-rectified archive of SAR, TM and SPOT image data of the UK.

The fourth Oxford / RAL Spring School in Quantitative Earth Observation, sponsored

by the UK Natural Environment Research Council (www.nerc.ac.uk), British Atmospheric Data Centre (www.badc.rl.ac.uk), NERC Environmental Systems Science Centre (www.nerc-essc.ac.uk), and Research Systems International (www.rsinc.com), will be held in Oxford on 18-22 March 2002. The focus will be the use of EO to study earth radiation and climate.

The UK's first government-backed Information Centre on Near Earth Objects (NEOs), is to be sited at the National Space Science Centre in Leicester. The facility will also analyse the potential threat of NEOs hitting the earth, and provide an extensive range of information about asteroids and comets. The new centre will be operational by Easter 2002

The first images from a new low-cost UK instrument, CHRIS (Compact High Resolution Imaging Spectrometer), have been received. CHRIS was successfully launched into orbit in late 2001 on the ESA technical demonstrator satellite PROBA-1. This new space-borne instrument technology will observe the Earth from 800 km giving UK and European scientists access to new measurements of the atmosphere, vegetation and minerals. CHRIS is a hyperspectral instrument with a spatial resolution ~20 metres. CHRIS is flown as the main payload on an ESA-managed European satellite, built by Verhaert (Belgium) with the contribution of European and Canadian industry, as part of the ESA Programme for On-Board Autonomy (PROBA). This programme sets out to demonstrate new on-board technologies in the design of a small, flexible and versatile satellite missions.

TOPSAT is a Qinetiq-led mission to provide relatively high-resolution imagery directly to local users from a low-cost small satellite. The mission comprises an advanced optical camera able to form images of Earth at 2.5 m resolution, integrated with a micro-satellite that can deliver this imagery directly to a mobile ground station. The mission is possible through the collaborative efforts of Qinetiq, SSTL, RAL and InfoTerra (ex-NRSC), and makes good use of the UK's world-class capability in small satellites and high performance space missions. The programme is funded by the UK

Ministry of Defence (MoD) and BNSC "Mosaic" small satellite initiative, and includes provision for spacecraft, ground segment, commercial launch and one year of planned demonstration. Launch is planned for November 2003.

Surrey Satellite Technology Limited (SSTL) is a prime contractor for the advanced RAPID-EYE EO satellite constellation. The spacecraft will provide global daily revisit in six bands, primarily for agriculture and cartographic use. The constellation consists of four satellites phased around a single orbit, each supporting two cameras to provide Earth images of up to 150 km by 1500 km at 6.5 m GSD (ground sampling distance) in six bands. The launch is planned for Spring 2003.

SSTL are developing a Disaster Monitoring Constellation (DMC). Each year natural and man-made disasters cause world-wide devastation, by loss of life, widespread human suffering and huge economic losses. Current EO satellites offer infrequent images, and delivery of critical images often takes months due to periodic cloud-cover and tasking conflict. They are also very expensive and designed as general-purpose instruments for many wide-ranging user requirements, with spectral characteristics not ideal for disaster monitoring functions. SSTL and its partners propose a network of affordable micro-satellites providing daily imaging as an affordable solution to the problem of disaster assessment and monitoring from space.

2.5 New EARSeL member in Finland

We are pleased to welcome among our members the Laboratory for Computer Cartography of the University of Turku (UTU-LCC), in Finland. The laboratory is located within the Department of Geography at the University of Turku.

UTU-LCC is an inter-disciplinary research unit which aims to develop new ways of processing spatial data for the benefit of research in different fields of natural and human environment. The activities are in the areas of RS, GIS and computer cartogra-

phy. The main applications are landscape ecology and RS of waters, land cover, forests and glaciers. Although the laboratory is located within the premises of the Department of Geography, it is used also by biologists and geologists. Besides research, the activities include under- and post-graduate courses at the University of Turku. There is currently a total of ten staff involved in RS research. The laboratory is well equipped with sufficient hardware and several types of image processing and GIS software. UTU-LCC is also a founding member of AGILE (Association of Geographic Information Laboratories for Europe).

The RS activities of UTU-LUCC range from data acquisition and data calibration, to image processing, analysis and outputs in forms of cartographic products. In research, Iceland is the focus of many process-oriented geo-morphological studies. Glacier monitoring has been carried out in the USA, Norway and Austria. Bio-geographical projects applying RS data and methods have been carried out in the Amazonian lowland

in Peru, boreal forests of Canada and North European Taiga. In addition to study areas abroad, the land cover of Finland and the waters of the Baltic Sea are studied.

The three main on-going projects at UTU-LUCC are: (a) origins and maintenance of biodiversity in the Western Amazonia – a multi-disciplinary approach; (b) environmental history of the severely eroded north-eastern Icelandic semi-desert – a multi-disciplinary approach using RS data combined with detailed investigations on palaeoecological, sedimentological and cultural aspects (LANDIS); (c) development of an operational monitoring system of European glacial areas – a synthesis of EO data from the present, past and future (OMEGA). The current projects are financed by the European Commission, the Academy of Finland, CIMO, and private scientific foundations. More information is available at www.utu.fi/ml/kartografia/compcart. The EARSel representative at UTU-LCC is Docent Petri Pellikka (petri.pellikka@utu.fi).

3 NEWS FROM ESA, THE EC AND INTERNATIONAL ORGANISATIONS

3.1 News from ESA

3.1.1 Envisat gets off to a perfect start!

On 1st March 2002 the eagerly awaited launch of ESA's Envisat environmental monitoring satellite took place in Kourou, French Guiana, at 02:07:59 hours CET. Envisat's spectacular night-time launch also marked the return to business for Europe's Ariane 5 launcher. Lift-off was witnessed by dozens of cheering engineers, scientists and project members at the launch site and at ESA centres across Europe. Rising into a clear sky, the Ariane 5 propelled the Envisat towards a lofty vantage point some 800 kilometres above the Earth's surface.

Envisat – the most ambitious Earth observation (EO) satellite – follows in the footsteps of ESA's successful ERS-1 and ERS-2 missions launched in the 1990s. It will boost Europe's capacity to take part in the

study of the Earth and its environment by supporting critical research programmes on global warming and climate change issues, as well as performing crucial tasks such as pollution and disaster monitoring. After a flawless lift-off, the Ariane 5 placed Envisat into sun-synchronous orbit, allowing ESA ground controllers at the space operations centre in Darmstadt, Germany, to take full control for the first time of the most complex satellite ever built in Europe.

"This has been a particularly exciting day for ESA and the European space community as a whole", said José Achache, ESA's Director of EO. "Europe is taking an important lead in global observations for worldwide environmental needs and Envisat is going to make a significant impact on the future of remote sensing of the Earth. The ten instruments on board Envisat, more than on any other satellite, cover a wide spectrum of phenomena, delivering evidence of the in-

teractions between the atmosphere, the ocean, the polar ice caps, the vegetation as well as human activity at the surface of the Earth. We will be able to trace the smallest changes to the Earth's surface anywhere on the globe. The importance of this mission has triggered great interest in the Earth-science community, both at a European level and worldwide".

Given its sheer size, Envisat has involved almost all of Europe's space industries in the development of numerous advanced technologies, particularly for the payload. Envisat is expected to be operational after a few weeks, once its payload has been checked and the various data-recovery links set up. Then the satellite's six-month long commissioning phase will begin, ensuring that the ten instruments are operating as specified and that we can start delivering validated products. "Now Envisat is in orbit, the culmination of many years' work really begins and we are looking forward to the environmental benefits the satellite is going to bring to Europe", added Mr Achache.

The successful launch of Envisat also marked a return to service for the Ariane 5 launcher. Its upper stage has undergone over 300 tests since last summer, following the failure of flight Ariane 510 to insert two satellites, including ESA's Artemis, in the correct orbits. However, thanks to ion propulsion, the Artemis mission is turning into a success story, as the satellite is making its way to geostationary orbit, and nominal operations could start this summer.

Built by a consortium of fifty companies led by Astrium, Envisat is the successor to ESA's ERS satellites. For further information, please contact: ESA Media Relations (telephone: +33-1-53697155, fax: +33-1-53697690).

Report from ESA web-site (www.esa.int) on 1st March 2002.

3.1.2 Update on the INFEO information system

Report by Ivan Petiteville, European Space Agency

INFEO (Information on Earth Observation) is a World-Wide-Web information system for providing a single access whereby a potential user can explore in an efficient way all providers' services registered within the system. INFEO was developed by an industrial consortium under the direction of the former Centre for Earth Observation (CEO) programme of the European Commission's Joint Research Centre (JRC).

SEMA (France) operated INFEO on behalf of JRC until the end of 2000. Following a request by the JRC, ESA took over the operations at the beginning of 2001 and initiated significant upgrades of INFEO (e.g. the WWW User Interface) to attract more users and data providers. INFEO had been operating at ESA since January 2001. However the service was suspended in mid-November 2001, as ESA had to return temporarily the computers (still the property of JRC) for administrative reasons (i.e. customs clearance). This has now been resolved, and happily the machines are on their way back to ESA, so INFEO (www.infeo.org) should be up and running again very soon.

When taking over INFEO, ESA's short-term objective was the enhancement of INFEO for the benefits of both users and data providers (space and non-space). The most urgent tasks identified are both the upgrade of the Use Interface and the improvement of the performances. A running mockup of the future Web interface was developed in spring 2001, by C. Reck, DLR, under an ESA contract. The finalising of this interface as well as the improvement of performance are activities being addressed within an on-going contract called GA-IANET (5th Framework Programme / IST).

Since the start of 2001, ESA has also invested a lot of resources to enlarge the INFEO community, as well as to connect INFEO to other major data providers (IMS-NASA and GEO World). A second INFEO retrieval manager has been installed at the UK RAL in 2001. Today some collections from the UK BADC (British Atmospheric Data Centre) are visible from INFEO. The installation of a third INFEO node is on-going at NASA. In addition, we have organised several meetings with non-space data providers (oceanographic and geographic

communities) to prepare an extension of INFEO to non-space data providers. Long-term activities in order to align INFEO with international standards or specifications are also foreseen.

ESA's ongoing INFEO-related activities represent a significant amount of effort. The satisfaction of both users and data providers is our main goal. For further details, contact Ivan Petiteville (Ivan.Petiteville@esa.int) or Jolyon Martin (Jolyon.Martin@esa.int).

3.1.3 Astrium to build ESA's new "ice satellite"

On 8th February the ESA Director of Earth Observation (EO), José Achache, signed the contract confirming that Astrium will build the new European environmental and climate satellite CryoSat. The satellite is planned for an April 2004 launch into a polar orbit, and will measure changes in the thickness of ice sheets and polar ocean sea-ice cover with unprecedented accuracy for at least three years. The satellite will provide climate researchers with data previously not available from these uninhabited regions. The industrial contract, worth ca. 70 million euros, involves a number of European partners, in particular Alcatel Space Industries, responsible for the SIRAL instrument.

The evidence of climate warming can no longer be ignored. As the Intergovernmental Panel on Climate Change confirmed in its most recent (2001) report: the average global surface temperature rose by 0.6 degrees in the 20th century; the year 1998 was the warmest since 1861, when instrumental recording started. Climate data estimate that the 20th century was the warmest in the last thousand years. At the same time, the concentrations of greenhouse gases in the atmosphere, such as CO₂ and methane have grown by 30% and 150% respectively as a result of human activities.

A large part of the uncertainties in today's climate models is due to the lack of precise measurements of polar ice and its development. It is conjectured that sea ice has receded by 10-15% since 1950. The thickness of the Arctic ice is reported to have reduced

by 40% in the past few decades. These statements, however, are extremely uncertain, due to the lack of widespread information on sea-ice thickness.

CryoSat should fill in this gap in climate research. The satellite will start as the first Earth Explorer mission of ESA's Living Planet Programme, created in 1998. This science-driven programme, whose target is to provide critical observations to address pressing scientific questions, involves Core Missions, which comprise relatively complex and innovative EO satellites (costing ca. 350 million euros), and Opportunity Missions, which will use more mature technology currently available in industry, thus allowing speedier implementation.

CryoSat will circle the Earth in a polar orbit 720 kilometres high. Its radar will measure the thickness and circumference of the polar ice sheets and sea-ice cover. Radar satellites to date, such as the European ERS 1 and 2, have been equipped with only one antenna, delivering information about uniform ice surfaces over a large area. CryoSat, on the other hand, will have two antennae. Similar to the way in which humans, with two eyes, can see spatially, CryoSat's double radar will be able to scan the upper surface very precisely. This is known as radar interferometry. With this system, an average accuracy of 1-3 centimetres can be achieved. Thus it can also collect data on inhomogeneous ice structures in the polar seas and glaciers or ice sheets with very steep walls.

In order for this extreme precision of measurement to be attained, the orbiting altitude of the satellite must be constantly known. To determine this to within a few centimetres, CryoSat will use the DORIS system developed by CNES, the French space agency. In this system, ground stations emit signals which are received and processed by an instrument on board the satellite. The information on satellite altitude so calculated is then transmitted back to the ground station.

CryoSat's outer side also sports a laser retro-reflector. Similar to "cats' eyes" on roads, it reflects a ray of light. When a ground station sends a laser beam to CryoSat and receives the reflected signal from the satellite, it will

be possible to determine the altitude of the satellite from the transit time. CryoSat's radar altimeter will function regardless of daylight, also penetrating clouds. Therefore, it is particularly suited to research on large polar ice sheets, which rise up to 4000 metres above sea level and are often covered by cloud. The data from the CryoSat mission should deliver information about the rate of change in these ice sheets.

Based on report from SpaceDaily web-site (www.spacedaily.com) on 10th February 2002.

3.1.4 Hubble's 4th Service Mission goes smoothly

On 9th March 2002, astronauts on board the space shuttle Columbia released the repaired ESA / NASA Hubble Space Telescope (HST) back into orbit after a record-breaking five days of spacewalks. The purpose of this, Hubble's fourth Service Mission, was to upgrade Hubble's systems and install newer and more powerful instruments that will astoundingly increase Hubble's discovery capabilities and extend the longevity of the observatory.

As a unique collaboration between ESA and NASA, Hubble has had a phenomenal scientific impact, since its launch nearly twelve years. The unsurpassed sharp images from this space observatory have penetrated into the hidden depths of space and revealed breathtaking phenomena. But Hubble's important contributions to science have only been possible through a carefully planned strategy to service and upgrade Hubble every two or three years. ESA played a particular role in this Servicing Mission. One of the most exciting events came when the ESA-built solar panels were replaced by newer and more powerful ones. The new panels, developed in the US, are equipped with ESA-developed drive mechanisms and were tested at the facilities at ESA's European Space Research and Technology Centre (ESTEC) in the Netherlands. This facility is the only place in the world where such tests can be performed.

In addition to the new solar panels, Hubble's new digital camera (ACS / Advanced

Camera for Surveys) can take images of twice the area of the sky and with five times the sensitivity of Hubble's previous instruments, therefore increasing by ten times Hubble's discovery capability. ACS replaces the ESA-built FOC (Faint Object Camera). The FOC, which has functioned perfectly since the beginning, has been a key instrument to get the best out of the unprecedented imaging capability of Hubble. The FOC was a state-of-the art instrument in the 1980s, but the field of digital imaging has progressed so much in the past twenty years that, having fulfilled its scientific goals, this ESA flagship on Hubble is chivalrously giving way to newer technology. However, the story of FOC is not over yet: experts will still learn from it, as it will be brought back to Earth and inspected, to study the effects on the hardware of long-duration exposure in space.

Hubble is expected to continue to explore the sky during the next decade, after which its work will be taken over by its successor, the powerful ESA / NASA / CSA (Canadian Space Agency) Next Generation Space Telescope (NGST), whose main focus will be observations of the faint infrared light from the first stars and galaxies in the Universe. For more information contact: ESA Communication Department Media Relations Office, Paris, France (telephone: +33-1-53697155, fax: +33-1-53697690), or visit the ESA web-site (www.esa.int).

3.2 News from the EC

3.2.1 The European Research Area and the JRC

Peter Churchill, Neil Hubbard, and Francesco Pignatelli, European Commission, DG Joint Research Centre, Ispra

European research and more specifically the creation of a European Research Area (ERA) are now high on the policy agenda in Europe. What are the roots of this debate?

Conducting European research policies and implementing European research programmes are, in the first instance, a legal and political obligation resulting from the Amsterdam Treaty. The Treaty does in fact

include a whole chapter on research and technological development (RTD), to underline that RTD is an essential element in the functioning of industrialised countries, such as EU Member States. The competitiveness of companies and the employment they can provide depend on RTD to a great extent. RTD is also essential for the support of other policies such as consumer protection or the protection of the environment. In short, the individual and collective well-being of citizens depends on the quality and relevance of RTD.

But Europe must also play an active role in RTD because of a number of developments inherent in the RTD sector itself: high-level research is increasingly complex and interdisciplinary; high-level research is increasingly costly; high-level research requests a constantly increasing "critical mass". Hardly any research team, research laboratory, or company can reasonably claim to be able to respond to these challenges. Even entire Member States find it increasingly difficult to be active and play a leading role in the many important areas of scientific and technological advance.

Organising co-operation at different levels, co-ordinating national or European policies, networking teams and increasing the mobility of individuals and ideas are therefore requirements resulting from the development of modern research in a global environment. Without determined actions at European level the present fragmentation of Europe's efforts cannot be overcome. Taking up this challenge the European Commission, Member States and the European Parliament, the scientific community, and industry are now committed to work jointly towards the creation of a European Research Area (ERA).

A series of initiatives aimed at making the ERA become a reality has already been launched –including the proposal for a new framework programme for Research and Technological Development 2002-2006, which the European Commission has tabled in February 2001. The new framework programme will be an important tool in support of the ERA, alongside national efforts and other European co-operative research activities. The framework pro-

gramme will support co-operative research, promote mobility and co-ordination, and invest into mobilising research in support of other EU policies.

Within the ERA, the EC's Directorate General Joint Research Centre (JRC) will play an important role. As the scientific and technical arm of the Commission, the JRC will contribute to the ERA in line with its overall mission. This will involve support to the policy-making process by providing a broad range of scientific and technical services, as well as contributing to the development and operation of EU systems of scientific reference for policy decision. Five areas of participation have been defined for the JRC in the ERA:

1. Aid wider participation in the ERA:

The JRC is expected to have a multifaceted role in the European research scene over the next decade and, in particular, in forging the operational links between science and governance in a rapidly changing Europe. As such, the JRC will act as a catalyst for efficient scientific networking, especially in areas where integrated action at the European level is needed. Its major assets in this endeavour comprise an extensive networking culture and hands-on scientific expertise. The objectives of the JRC in this context will include: catalysing the construction of the ERA by providing a technical platform for efficient scientific networking and collaboration; extracting real EU added value from scientific networks in the context of the ERA; strengthening the EU position in international RTD

2. Establishment of a European Scientific Reference System:

Citizens' trust in the answers scientists give to their most critical concerns is required, if these answers are used for policy-making. The JRC will aim to act as a key pivot of a European science and technology reference system. Specific JRC activities in this field include: development of certified reference materials, common databases, and harmonised information exchange systems (e.g. molecular register / incident reporting system, etc.); harmonisation and validation of advanced methods in areas of key Community poli-

cy interest, such as environmental protection and integration, food safety and GMOs; reference measurements and testing, based on unique or more accurate facilities existing at the JRC; provision of neutral, factual knowledge, judgment and reference intelligence

3. Access to European infrastructure:

The JRC will set as its key objective in FP6 the significant increase of the rate at which its European infrastructure gets used by European scientists and industry. Special focus will be given to inviting industry to get access and use the JRC infrastructure more extensively aiming at catalysing the innovation cycle. This will be an organisation-wide initiative involving all the JRC sites across Europe.

4. Mobility and training:

Currently the JRC provides interdisciplinary research training possibilities in all its sites. Its multi-national research facilities are amongst the very few in Europe capable of providing this kind of research setting to young scientists. This is of importance particularly in areas of Europe characterised by poor inward mobility. The JRC will strive to improve scientific human resources development and mobility in the ERA by ensuring that for each scientific and technical reference system the training of young scientists and the exchange of scientists with national institutes and other research centres in Member States and applicant countries is assured. In order to achieve this, full use of the ERA instrument in promoting human resources and mobility will be made. A policy targeted specifically to address the issue of gender balance in science will be applied, aiming at contributing at gender balance in the overall EU research mobility schemes.

5. Specific enlargement activities:

In addition to the actions envisaged above specific instruments will be used to support the mobility of researchers from candidate countries. This is expected to enhance information and knowledge exchange for mutual benefit and generation of added value. The JRC will focus on the provision of training concerning the use of science for better governance. This entails training in advanced scientific methods, in the legislative

basis of the JRC's work, as well as in the Community legislation to which the JRC provides scientific and technical support. This programme will be established in close collaboration with policy DGs in order to facilitate scientists and administrators from candidate countries to implement and defend the *acquis communautaire* in the fields of competence of the JRC.

For further information on the ERA, visit the Europa web-site (europa.eu.int).

3.2.2 INSPIRE initiative on spatial information

Since January 2002, the new name for the European Commission's twin initiatives on a European Spatial Data Infrastructure (ESDI) and Environmental ESDI (E-ESDI), is INSPIRE (Infrastructure for Spatial Information in Europe).

The INSPIRE initiative aims to make available relevant, harmonised and quality geographic information for the purpose of formulation, implementation, monitoring and evaluation of Community policy-making. Almost all themes of the environmental policy (water, forestry, climate, soil, biodiversity etc.) have a spatial dimension. This common spatial dimension is very important for environmental and other sector policies.

Interactions between the living environment of citizens and the effects of environmental policies are spatial in nature. These interactions are not sufficiently understood and taken into account in current policies. For example, the relationship between environment and health would be better understood if timely and accurate information on where people live, their health, and the pollution of their living environment could be combined. For this to happen, we need to increase the knowledge on the spatial dimension of the environment.

Geographic information systems allow the exploitation of spatial data for policy definition, implementation, monitoring and evaluation. This is recognised in the Sixth Environment Action Programme of the European Community (2001-2010), and in

Community environmental policies that increasingly request geographic information from the Member States. There are however important obstacles to the use of such systems, all linked to problems with the availability and usability of geographic information. The proposed initiative on INSPIRE aims to overcome gradually these obstacles.

The INSPIRE initiative comprises the following components: (a) advisory groups (INSPIRE expert group, COGI/Interservice Committee for Geographical Information within the Commission, and GMES / Global Monitoring for Environment and Security structures); (b) horizontal working groups which contribute to the formulation of legal requirements (INSPIRE framework legislation and daughter legislation); (c) thematic working groups (e.g. on water, forestry etc.); (d) co-ordination groups (i.e. thematic, technical and cross-sectoral) and analysis and support groups (impact analysis and funding). Technical co-ordination of INSPIRE is carried out by the Institute for Environment and Sustainability of the European Commission's Joint Research Centre (JRC).

For more information on INSPIRE, contact Mr. Alessandro Annoni (telephone: +39-0332-786166; e-mail: alessandro.annoni@jrc.it) or Ms. Karen Fullerton (telephone: +39-0332-789101; e-mail: karen.fullerton@jrc.it), Institute for Environment and Sustainability, JRC, Ispra, Italy, or visit the INSPIRE web-site: www.ec-gis.org/inspire/. See also Sections 3.3 and 6.1 of this Newsletter.

3.3 EuroGeographics: description and activities

Mr. Claude Luzet (e-mail: claude.luzet@eurogeographics.org), EuroGeographics, Marne-la-Vallée, France

EuroGeographics (web-site: www.eurogeographics.org) is the association of the European National Mapping Agencies (NMAs) working together for the development of the European Geographic Information Infrastructure. This article provides some background about the history of EuroGeographics and its current direction and activities.

The foundation – CERCO, 1980:

Our founding legend says that our history started in 1979, with the then Director General of Institut Géographique National of France (IGN-France), Mr. Mayer, reasoning as follows: "All my best staff are attending world-wide symposia, conferences, workshops, etc. They meet with their foreign colleagues, exchange ideas and create common new concepts, while I, sitting at the top of the pyramid, do not even know who my immediate neighbours are". Sharing these thoughts with some of his neighbours resulted in the creation, in 1980, of CERCO (Comité Européen de la Cartographie Officielle), a small club of five members, whose main goal was defined as being: "Mutual information, consultation and co-operation in the field of cartography". The "club" developed steadily to reach, in 2000, a membership covering some forty European countries. To achieve its objectives, CERCO set up a number of Working Groups (WGs), some of them being still active within EuroGeographics.

The daughter – MEGRIN, 1993:

With the advent of "digital mapping" (Geographic Information was not yet a popular term), the harmonisation of data for cross-border or pan-European applications became a practical issue of increasing importance. It was soon recognised that addressing this required a more commercial approach than the legal status of CERCO allowed. Thus the decision to create MEGRIN (Multi-Purpose European Ground-Related Information Network) was made. MEGRIN got quickly to work, following the business plan that justified its creation. Its two main achievements – i.e. a metadata service called GDDD / Geographical Data Description Directory (www.megrin.org/gddd/gddd.html), describing the products and services available from the European National Mapping Agencies, and a product named SABE / Seamless Administrative Boundaries of Europe (www.megrin.org/sabe/sabe.html) – were considered as pioneering successes, and are still relevant today.

The merger – EuroGeographics, 2001:

For different reasons, mostly legal, not all CERCO members could join MEGRIN, a commercially oriented organisation. Dur-

ing the years 1999-2000 the achievements and objectives of the two organisations were reviewed, to improve efficiency and coherence. The Joint Management Board – bringing together the Management Board members of CERCO and MEGRIN – decided that the best option was to disband the two existing organisations, and to create a new one (EuroGeographics). The proposal was endorsed at the last CERCO-MEGRIN General Assembly, at Malmö, in September 2000. Thus EuroGeographics was formally born on 1 January 2001. This was a smooth transition, with all CERCO and MEGRIN activities continuing, but with a new focus on improved efficiency and adjustment of the strategy to the 21st century context. It was decided also that EuroGeographics would initially continue with the existing CERCO and MEGRIN WGs and project structure.

Data harmonisation – SABE:

The Seamless Administrative Boundaries of Europe (SABE) has been the priority of MEGRIN for several years. This product, defined together with EUROSTAT (the EU statistical agency) is the prototype of a pan-European dataset produced by the joint efforts of the source data owners. Following the 1991, 1995 and 1997 versions, the 2001 update is in preparation, for release in late 2002. SABE now covers thirty countries, and extension to new countries is foreseen for the 2001 version. SABE exists in two geometric resolutions, at scales 1:1 million and 1:100,000, and provides snapshots of the administrative boundaries of Europe, to the level of the "commune", "ward", or "gemeinde". It is fully harmonised and edge-matched, in a unique coordinate system (ETRS89) and semantic model. But more than the technical aspects, the main challenge in harmonisation was dealing with licencing. SABE, wholly or in part, is now available for commercial use from EuroGeographics, the NMAs or private sector value-added resellers under the terms of a common licence agreement and pricing strategy. This achievement can be well measured by all who know the extent of the differences between the data policies throughout Europe.

Decentralised Project Management:

In its early phases, the SABE project was

managed directly by the Head Office, the central managing and co-ordinating unit of the EuroGeographics network, the right arm of its Management Board. But following the multiplication of the projects and tasks, MEGRIN, and then EuroGeographics needed to rely more on the resources of its member NMAs. While the Head Office does still have the role of a "super" project manager, overseeing and co-ordinating all EuroGeographics projects, the actual project management is generally delegated to one NMA. The SABE project management has thus been naturally delegated to Bundesamt für Kartographie und Geodäsie (BKG), Frankfurt, the federal German NMA, that had provided the main task force during the definition phase of the project.

More pan-European data:

Work is now under way to develop pan-European topographic data that will complement the administrative data available through SABE, and thus provide a more comprehensive "reference" base. Two projects have been initiated: EuroGlobalMap (EGM) and EuroRegionalMap (ERM):

- EGM has been stimulated by the Global Mapping project – a truly global map covering the whole of the Earth – which is advertised by its promoters and managers (GSI of Japan) as a contribution to the Agenda 21 of the Rio conference. EGM will be a harmonised and edge-matched vector topographic map, covering about forty countries of the European part of Global Map. It will be suitable for applications at scales 1:500,000 to 1:1000,000, and should be released by end 2003.
- ERM is more ambitious and more significant commercially. Its objective is the creation of a harmonised European GI dataset for applications at scales 1:100,000-1:250,000. Due to the high level of resources required, the initial phase of the project only covers six countries, though it is expected that more will join before the first ERM release planned for end 2003.

National Land Survey of Finland is leading the EGM project and Institut Géographique National of Belgium has taken leadership of the ERM project. A new project on harmonisation of large-scale road data is currently being formulated, and is led by the National Land Survey of Sweden.

Other activities:

Beyond these "big" projects, EuroGeographics facilitates, within its Working Groups discussions, sharing of information, studies and surveys on topics of common interest to Member NMAs. Currently active working groups include the following: legal and commercial issues, chaired by Norway; geodesy, in conjunction with

Spatial Information in Europe) is the latest name of the E-ESDI initiative (Environmental European Spatial Data Infrastructure (www.ec-gis.org/e-esdi), the first practical implementation in building the EGII (European Geographic Information Infrastructure) mentioned in the EuroGeographics mission statement. (Editor's note: see also Section 3.2.2 in this Newsletter). This is much more than assembling pan-European datasets, more than data harmonisation. Such an infrastructure is "achieved through the co-ordinated actions of nations and organisations that promote awareness and implementation of complimentary policies, common standards and effective mechanisms for the development and availability of interoperable digital geographic data and technologies to support decision making at all scales for multiple purposes" (GSDI definition).



The first EuroGeographics Management Board (from left to right): Nick Land (Great Britain), current Director; Dietmar Gruenreich (Germany); Joakim Ollen (Sweden), Vice-President; Dick Kirwan (Ireland), President; Jean Poulit (France), Vice-President; John Badekas (Greece); Imrich Hornansky (Slovakia), Treasurer

EUREF, chaired by Switzerland; quality, chaired by Finland. To these we can add a long history of work on metadata, starting with the GDDD, followed by the ESMI and LaClef projects. Today only the GDDD can exhibit concrete operational results, as this pioneering metadata on-line service is still valid and appreciated on the Internet as a precious source of information. Meanwhile EuroGeographics is exploring ways for further developing this service.

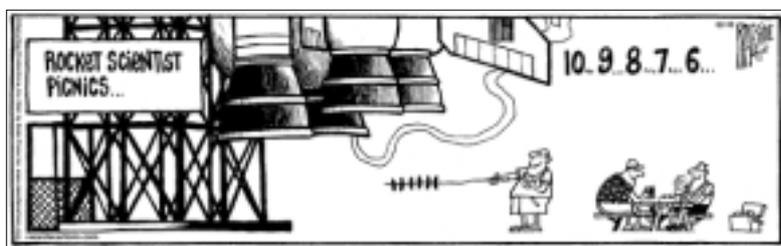
New Inspiration?

What's next? INSPIRE (Infrastructure for

This is the new direction that EuroGeographics is taking. Beyond CERCO's focus on "mutual interest" and MEGRIN's focus on "commercial joint-ventures", EuroGeographics is becoming a cornerstone in building the European SDI, aiming at making the data existing nationally (or locally) more accessible and easily usable, for better governance, for the citizen and for use by the "value-adding" private sector. All actors in GI have a role to play in this new and inspiring venture. Synergies and collaborations must be developed, and in particular more dialogue between the main pan-European GI-related organisations would contribute to a faster success of INSPIRE. For more information, contact: EuroGeographics, 6-8, Avenue Blaise Pascal, Cité Descartes, Champs-sur-Marne, F-77455 Marne-la-Vallée Cedex 2, France (telephone: +33-1-64153240; fax: +33-1-64153219; e-mail: contact@eurogeographics.org), or visit the EuroGeographics web-site: www.eurogeographics.org.

4 RS DATA, PRODUCTS AND PROJECTS

Editor's note: Most of you will be disappointed to see that Wim Bakker's Observations column is missing from this issue of the Newsletter. In fact, due to changes in his work, Wim can no longer provide us with his informative insights into the latest remote sensing satellites. Happily, one of Wim's colleagues at ITC has offered to contribute a regular section on satellite "current affairs", starting from the next (June) Newsletter. In the meantime, on behalf of EARSel, I wish to thank Wim for his service, and to wish him well in his new GIS endeavours. I'm sure that Wim will somehow keep in touch with the world of satellites and remote sensing, even if he has to do this in his spare time (see accompanying figure)...



4.1 MITCH Project on natural hazards

MITCH (Mitigation of Climate-Induced Natural Hazards) is an EC-funded Concerted Action in the Fifth Framework Programme, with thirteen European partners. The project plans to bring together research institutions and end-users with a leading involvement in the mitigation of natural hazards with a meteorological cause. The aim will be to assist planning and management by: evaluating the state of research; encouraging greater uptake of existing research knowledge (both EC and nationally funded); trying to better match users' perceptions and needs with what the research community can provide. MITCH is being conducted through a series of three workshops and an active website for the exchange of views and evaluation of best practice. This first workshop – on floods, droughts and landslides – was held in Delft, Netherlands, on 12-13 December, 2001, sponsored by WL Delft Hydraulics and the UK Environment Agency. Details on this and the next workshops can be

found at www.mitch-ec.net, or by e-mailing the MITCH co-ordinator, Bridget Woods Ballard (baw@hrwallingford.co.uk).

4.2 SPOT Image offers free Vegetation imagery

On 5 December 2001 SPOT Image announced a major evolution in its Vegetation data distribution policy. The aim is to encourage new applications to be developed as a result of an increase in users, particularly among the scientific community. The new policy decided by the Vegetation programme partners (EU, Belgium, France, Italy and Sweden) marks their interest for global environmental studies, and comes in support of the EU's GMES (Global Monitoring for Environment and Security) initiative. As of December 2001, the archive of ten-day syntheses over three months old is freely accessible to the entire user community via the distribution server (free.vgt.vito.be) hosted by Vito, the Belgian data production entity. This free access is an invitation to scientists and industry to develop new applications and new tools. For more information, see www.spotimage.fr/home/news/press/.

4.3 New atmospheric correction programmes

ATCOR3 is the unique complete atmospheric and topographic correction programme for satellite imagery, created by Rolf Richter from DLR Munich, and available through ReSe Applications. More details are at www.rese.ch/atcor3/index.html. The latest version of ATCOR3 includes two major new features: (a) For sensors with bands in the 1.6 or 2.2 μm region (e.g. Landsat TM, Landsat ETM, SPOT, IRS-1C/1D LISS-3), the areas with dark vegetation pixels are determined automatically. Previously, interactive thresholds had to be defined by the user. (b) Water vapour maps over land can be generated for sensors with bands in the 870, 940, 1010 nm region. An APDA algorithm is being employed to calculate the spatial distribu-

tion of the atmospheric water vapour column. Currently, the MOS-B sensor is supported covering the wavelength region 400-1010 nm with 13 bands.

ATCOR4 is the only commercial software product available to offer simultaneous atmospheric and topographic correction for wide FOV airborne optical scanner and imaging spectrometry data. More details are at www.rese.ch/atcor4/index.htm. The new version, ATCOR4 v2.1, includes the following improvements: (a) For thermal band sensors the calculation of a surface emissivity file was included. It can be computed with the assumption of a user-specified constant scene emissivity in one channel (reference channel method) or using a cover-dependent emissivity obtained with a classification of the reflective channels. (b) An empirical method for compensating brightness gradients in scan direction was

included as a simple BRDF elimination. The algorithm calculates column means with an angular resolution (1° or 3°) and normalises the reflectance image (after atmospheric correction) to a nadir image. The method can be applied with the global column means, i.e. surface cover independent, or with four surface cover classes.

Version 2.4.4 of MODO (the IDL Modtran Interface) has become available now. Thanks to a contribution of Vittorio Brando from CSIRO, this version includes support for the direct link to MODTRAN on the Windows OS. Further improvements include some better plotting capabilities and a few bug fixes. The software is compatible to IDL version 5.4 and 5.5 and can be obtained from www.rese.ch/modo/index.html. For further information contact Dr. Daniel Schlaepfer, ReSe Applications (info@rese.ch / www.rese.ch).

5 REVIEWS, PUBLICATIONS AND REPORTS

5.1 RS symposium in Marrakech, Morocco

Gérard Begni and Richard Escafa del, Toulouse, France

A Symposium on "Arid Regions Monitored by Satellites: from Observing to Modelling for Sustainable Management", took place in the Semlalia Faculty of Sciences of Marrakech, Morocco, on 12-15 November 2001. The symposium was jointly organised by the Semlalia Faculty of Sciences, University Cadi Ayyad, Marrakech and Institut de Recherche pour le Développement (IRD, France), supported by IUSS WG-RS (International Union of Soil Sciences, Working Group for Remote Sensing) and other sponsors and contributors (JRC, CESBIO, CNES, Conseil Régional Midi-Pyrénées, MEDIAS-France). Initially the symposium was just the regular final workshop of the CAMELEO project. But several actors of that project considered it worthwhile to show its links with other initiatives. The workshop was thus enlarged to an international symposium addressing major issues

for Southern Europe and many developing countries, for which major scientific developments were achieved these last few years.

The objective of CAMELEO was to develop a comprehensive method for monitoring desertification in the south of the Mediterranean basin, providing relevant information for the operational management of arid lands. CAMELEO planned to involve all the affected countries. The main purpose was to discriminate, at the local scale, (and after seasonal adjustments), areas where soil and vegetation face degradation, where they are in a stable state, and where they are recovering (e.g. after restoration actions). Understanding the relationships between those changes and land use was a major objective. In particular, describing the associated spectral signatures paved the way to setting up scientifically assessed links between RS observations and these processes.

The symposium had two introductory sessions. Then the main CAMELEO results were presented. Thematic sessions on desertification, land cover and erosion, water

and climate, and methodology issues followed. The importance and quality of the many posters presented in parallel with oral sessions has to be highlighted. In a lively final forum, the importance of several issues was highlighted, such as: bridging ecological and RS disciplines; bridging new technologies and local knowledge; defining proper in situ sampling methodologies; improving some issues in water resources management (evapo-transpiration, illegal irrigation); better addressing forest and aerosols issues. The importance of new projects such as SUDMED starting this year (partnership of CESBIO and Univ. of Marrakesh) was emphasised.

About eighty specialists from various disciplines attended the symposium, which was unanimously considered as very successful. The complete proceedings are being edited with the support of IRD and MEDIAS-France. Showing how RS technology based upon sound scientific basis can help decision-makers to address some major socio-economic concerns, highlighting success, limits, and advances still to be made, is a task that scientific organisations and associations have the moral and professional duty to develop. For more information, please contact: Richard.Escadafal@cesbio.cnes.fr.

5.2 Meeting on Risk Management, Paris, France

Prof. (em.) Preben Gudmandsen, Lyngby, Denmark

The annual meeting of the Directors of Euro-Mediterranean specialised centres of the EUR-OPA Major Hazards Agreement was held in Paris on 30 January - 2 February 2001, in the framework of the Open Partial Agreement on the Prevention of, Protection Against and Organisation of Relief in Major Natural and Technological Disasters. EARSel was invited to this meeting as a member of the European Federation of Scientific Networks (FER).

The aim of the meeting was to review initiatives undertaken with the support of DG Research/International Co-operation of the EC, on "Mobilisation of the scientific community for the improvement of risk man-

agement", and to examine the implementation of the proposals made following the Montpellier meeting on 12-14 December 2001. This was the culmination of a number of specialised meetings held in 2001. Mr. Massué, Executive Secretary of the EUR-OPA Agreement, proposed to encourage co-operation between the specialised Centres and the members of the FER (Federation of European Scientific networks). Opportunities were examined for participating in the various current or forthcoming ITTs from EC or ESA, which deal with risk management, in the framework of GMES or similar projects.

The activities under this Agreement involve more than twenty centres dealing mainly with disasters such as earthquakes, tsunamis, volcanic eruptions and floods, covering a wide field of work (e.g. prevention and forecasting, emergency medicine, techniques of informing the public, training of authorities, education of school children). It includes a Centre for Cultural Heritage. It is interesting that centres are established in almost all countries in southern Europe and North Africa from Portugal and Morocco to Cyprus, Georgia, Azerbaijan, Russia and Bulgaria. (EARSel Secretariat holds a list of all centres with addresses and names of responsible persons, etc.). Of special interest to RS people was a presentation by Professor Jean Bonnin from the European Centre for Seismic and Geomorphological Hazards in Strasbourg, France, entitled "About aid to decision-making in the field of earthquake risk".

Earthquake management comprises three steps: localisation of the epicentre and focal depth; estimation of the potential damage that has occurred and dissemination of the information to authorities; firmer estimation of the damages that actually incurred. It is in the latter step that RS comes into action. Professor Bonnet mentioned the techniques for estimating the extent of the damage zone by detection of night-time illumination compared to the usual light detected by NOAA satellites, the six-hour repeat cycle being an advantage, though observations need to be made on two consecutive cloud-free nights. He referred to other satellites in orbit but concluded that although useful from an observation point of view (spatial resolution,

weather independence etc.) their repeat cycles make them less useful. Also, satellite observations require the acquisition, processing and dissemination to be carried out at very short delay, i.e. less than six hours after acquisition. (Bonnet did not refer to the International Charter on Space and Major Disasters established by ESA, CNES and CSA on 1 November 2000. One may get an impression of this activity by addressing www.earth.esa.int/applications/dm, which shows recent examples of ERS SAR acquisitions of areas where a natural disaster has occurred. This scheme operates presently with a 12-hour delay.

Earthquakes and volcanoes affecting the bottom of the ocean can generate a sea wave that propagates over long distances and eventually hits a shoreline causing some damage. Such tsunamis occur in the Atlantic and Pacific Oceans and even in the Mediterranean. (A well-known tsunami is the one that destroyed the greater part of Lisbon in 1755 and it is therefore understandable that this is of particular interest to the European Centre for Urban Risks in that very town). Given the wave nature of this phenomenon, observation requirements are very much more stringent as to the process, observation, and dissemination of data.

In a chapter on "Monitoring zones where an earthquake could happen in the 'near' future" the Professor refers to detection of deformation of the ground in areas where they are likely to occur, and refers specifically to differential radar interferometry or its refinements with corner reflectors or 'permanent scatterers'. This also applies to volcanologic activity. However, such activity requires co-operation between organisations with different expertise as in many other cases of risk management, which is in fact the goal of the EUR-OPA activity. (A written version of the presentation is available from the EARSel Secretariat.).

5.3 EARSel special offer from John Wiley & Sons

We are pleased to inform our members and readers of the EARSel Newsletter that John Wiley and Sons have extended their special offer of a 15% discount on all books fea-

tured in the GIS and RS Brochure, to March 31, 2002. Just quote reference number "Z038E" when ordering. There is also a new web-site (www.wiley-europe.com) with a complete catalogue of new, recent, and established GIS and RS titles, offering up-to-date search functionality as well as secure on-line ordering. One can sign up for regular e-mail updates on new and forthcoming products in a specific area of interest. Subscribe at www.wiley-europe.com/email

5.4 New Croatian textbook on earth imaging

Earth Imaging and Exploration from Space: Satellites, Sensors, Applications/ SNI-MANJE I ISTRA_IVANJE ZEMLJE IZ SVEMIRA. Edited by Marinko Olui_. Published by the Croatian Academy of Sciences and Arts and GEOSAT Corporation, Zagreb. 516 pages, many colour illustrations and tables. Zagreb 2001. Price: 150 DM.

In his undertaking to make a comprehensive and concise textbook on space-borne RS the author, Prof. Dr. Marinko Olui_, has been very successful. He has published a glossy full-colour monograph which has only one big disadvantage: its Croatian language limits the use of this excellent volume outside of Croatia.

As is appropriate for a book of this type, it begins with the definition, history and physical principles of RS. With 60 pages this is a comprehensive chapter. The whole sequence of civilian platforms and their sensors, from Landsat to MAKS, are described. A chapter of 35 pages about visual scene analysis and digital image analysis leads to the big 300-page section dealing with various applications: geology incl. mineral exploration (75), forestry (30), agriculture (35), cartography (12), meteorology (20), regional and urban planning (20), ecology (40) and military applications incl. landmine detection (20). A 20-page chapter on RS and GIS which also briefly refers to the use of GPS, concludes the application part.

A full-text list of acronyms and a glossary of technical terms will certainly prove most useful. It is, however, a pity that the book lacks an index that would be most helpful

to fully exploit the tremendous treasure of information provided in it. Unfortunately, the sequence of the described platforms and sensors is not always logical and the image examples of the satellite imagery are in some cases not well selected. Due to a somewhat blurred reproduction, the unique brilliance of the IKONOS images is not adequately represented. In general,

however, the quality of the glossy printing is very high, as is the average quality of the photography. All figures are in colour, even most simple diagrams and graphs. Despite the above-mentioned language draw-back the book can be strongly recommended to any student of RS as a most comprehensive source of information: one of the best recent textbooks on this subject.

6 FORTHCOMING MEETINGS AND COURSES

6.1 8th EC-GI&GIS Workshop in Dublin, Ireland

The Joint Research Centre (JRC) of the European Commission and the GINIE (Geographic Information Network in Europe) Project, are pleased to announce that the 8th European Commission GI & GIS Workshop, "ESDI - a Work in Progress", will take place in Dublin, Ireland, on 3-5 July 2002. The topics covered in the workshop, which are in line with the main objective of E-ESDI (now called INSPIRE - see Section 3.2.2 of this Newsletter), are as follows:

- Spatial data infrastructure (SDI) initiatives (SDI development; from local to global SDI; coordination bodies)
- INSPIRE development (data policy and legal aspects; common reference data; architecture and standards; impact analyses; implementation structures and funding)
- e-Europe (eGovernment; public sector information; spatial aspects of EU policies; public access to environmental information)
- From FP4 to FP6 (lessons from EC-funded projects / initiatives; research needs; education; awareness-raising)

For more information see www.ec-gis.org/Workshops/8ec-gis, or contact Ms. Karen Fullerton (telephone: +39-0332-789101; e-mail: karen.fullerton@jrc.it), Institute for Environment and Sustainability, JRC, Ispra, Italy.

6.2 ForestSAT 2002 in Edinburgh, Scotland

An International Symposium entitled "ForestSAT: Operational Tools in Forestry

using Remote Sensing Techniques", will take place on 5-9 August 2002, in Edinburgh, Scotland. This symposium, which is being organised by the British Forestry Commission, is partly funded by the EU LIFE Environment project ForestSAFE. The purpose of the symposium is to show forestry managers, forest practitioners, policy makers, planners and scientists, examples of operational tools developed from remote sensing (RS) techniques. The organisers would like to bring together developers and users of these technologies into a common forum where both can be informed about the development and application of those tools regarded as operational. The forum would also give an opportunity for users to provide feedback about their requirements in future development of tools. The event programme aims to address all the RS techniques such as aerial photography, radar, lidar, optical systems and thermography.

The symposium topics are: (1) forest inventory; (2) forest health and nutrition; (3) forest sustainability; (4) forest Ecology; (5) forest growth. Full details, including programme and abstracts are on the ForestSAT 2002 web-site: www.forestry.gov.uk/forestSAT. The Symposium Convenor may be contacted by e-mail at ForestSAT@forestry.gsi.gov.uk. For further information, please contact the symposium organiser: Juan C. Sua rez, ForestSAT Symposium, Forest Research, Northern Research Station, Roslin, Midlothian, EH25 9SY, UK. Telephone: +44-131-4452176. Fax: +44-131-4455124. E-mail: juan.suarez@forestry.gsi.gov.uk.

6.3 Joint MSc: KU Leuven and Purdue University

A joint Master of Science programme has been initiated between the Katholieke Universiteit Leuven, Belgium, and Purdue University, U.S.A. The programme focuses on Earth Observation (EO) technology (i.e. RS, GIS and decision support systems, GPS, etc.) and its applications in terrestrial systems modelling (i.e. vegetation studies, land use assessment and planning, coastal and river management, erosion and pollution monitoring, etc.). The programme is specifically geared towards the needs of the EO market place, and will be closely monitored for consistency and technological excellence by an external steering committee, composed of representatives from the different professional sectors that will employ the graduates of this programme.

The joint graduate programme consists of two consecutive study years, the first encompassing two semesters of course work, one at each university. While Purdue offers the basic geomatics courses in the first semester, KU Leuven continues in the second semester with courses centred on earth-based biophysical processes and applications. Courses taught at Purdue include RS of Land Resources, GIS Concepts and Applications, Fundamentals in Photogrammetry and Geodesy, and Spatial Data Analysis. Courses at KU Leuven are Vegetative Canopy Monitoring, Reference Data Base Establishment, Global Change Monitoring, Image Analysis and Understanding, and Land Processes Monitoring. The second year is dedicated to research at the university where the student has registered. Regardless of their home-base, all students will also participate during that second year in an Internet-driven research-based seminar course. Apart from successful course evaluations, graduation requires the submission of a thesis manuscript in the form of a peer-reviewable article. Those interested in learning more about this joint programme are invited to contact the programme administrators at the KU Leuven (greta.camps@agr.kuleuven.ac.be) or at Purdue (pgraves@purdue.edu). The website (partly under construction) can be consulted at www.lars.purdue.edu/EOProgram.

Prof. Chris Johannsen (programme co-ordinator, Purdue University, USA); Prof. Pol Coppin (programme co-ordinator, Katholieke Universiteit Leuven, Belgium).

6.4 IOCCG announces fellowships in ocean colour

Dear Colleagues,

One of the mandates of the International Ocean Colour Co-ordinating Group (IOCCG) is to facilitate the merging of data from different satellite ocean-colour missions and to encourage the development of a global, long-term data-set. The role of the IOCCG in this regard is one of co-ordination and leadership since it does not have the funds to finance the large-scale merging of data-sets. At the recent annual meeting of the IOCCG Committee (Villefranche, 10-12 January 2002) it was brought to our attention that the European Space Agency's (ESA) Postdoctoral Research Fellowships could be used to fund students to carry out research on merging data from different ocean-colour missions.

We are therefore soliciting young post-doctoral students with a strong mathematical and computer background to apply for these fellowships. The IOCCG will supplement the fellowship by reimbursing transport and other miscellaneous expenses. The recipient will carry out research at one of ESA's establishments, ESTEC, ESOC or ESRIN.

The fellowships are available for one year (possibly renewable for a second year) and are available to nationals of ESA Member States. Applications from Canada (a co-operating State) will also be considered. If you know of any post-doctoral students who would be interested in applying for an ESA fellowship to carry out research on data merging, please contact the IOCCG Secretariat (vstuart@is.dal.ca).

Best regards, Venetia Stuart

For further information, contact: Venetia Stuart, Executive Scientist, International Ocean Colour Co-ordinating Group (IOCCG), Bedford Institute of Oceanography, PO Box 1006, Dartmouth, Nova Scotia, B2Y 4A2, Canada. Telephone: +1-902-

4263817. Fax: +1-902-4269388. E-mail: vstu-
art@is.dal.ca. Web-site: www.ioccg.org.

6.5 Radar course at Georgia Tech Lorraine

Georgia Tech Lorraine, an affiliate of the Georgia Institute of Technology in Atlanta, Georgia, USA, which is located at the Technopôle Metz 2000, 2-3 rue Marconi, 57070 Metz, France, is offering the following courses on radar techniques:

- Session 1 (June 3-5, 2002): Basic Radar Concepts; 800 Euros (10% discount for 2 sessions; 15% discount for all 3);

www.conted.gatech.edu/courses/radar/
dc_RAD-112.html

- Session 2 (June 5-7, 2002): Phased Array Antennas for Radar and Communication; 800 Euros (10% discount for 2 sessions; 15% discount for all 3); www.conted.gatech.edu/courses/radar/dc_RAD-113.html
- Session 3 (June 10-14, 2002): Adaptive Array Radar Processing; 1370 Euros (10% discount for 2 sessions; 15% discount for all 3); www.conted.gatech.edu/courses/radar/dc_RAD-109.html
- Web-site listing ALL Georgia Tech radar-related short courses, and practical details: www.conted.gatech.edu/courses/radar/radar.html

6.6 Calendar of Forthcoming Meetings

NEW
15-17 April 2002
Toulouse, France

Workshop on Sea-Ice Extent and the Global Climate System

Contact: Chad Dick or Tordis Villinger, Polar Environmental Centre, NO-9296 Tromsø, Norway. E-mail: acsys@npolar.no.

NEW
22-24 May 2002
Miami, USA

5th Veridian Airborne RS Conference and Exhibition

E-mail: Nancy.wallman@veridian.com, Web: www.veridian.com/conferences

4-6 June 2002
Prague, Czech
Republic

22nd EARSel Symposium: Geo-Information for European-Wide Integration

Contact: Dr. Tomas Benes, UHUL Forest Management Institute, Czech Republic. E-mail: benes@uhul.cz, earsel@meteo.fr., Web: www.earsel.org

NEW
10-15 June 2002
Biarritz, France

Biarritz 2002 – International Oceanography Symposium and associated meetings: (a) En Route to DODAE / 13-15 June 2002; (b) Jason-1 Science Working Team / 10-12 June 2002; (c) International DORIS Service (IDS) workshop / 13 June 2002.

Web: cnes.fr/BIARRITZ2002. E-mail: biarritz2002@cta-congres.com.

11-13 June 2002
Istanbul, Turkey

3rd International Symposium on Remote Sensing of Urban Areas

Contact: Prof. Dr. Derya Maktav, Symposium Chair.

E-mail: dmaktav@ins.itu.edu.tr, Web: www.ins.itu.edu.tr/rsurban3

NEW
24-28 June 2002
Toronto, Canada

IGARSS Symposium: Remote Sensing – Integrating our View of the Planet

Contact: Joseph M. Piwowar., E-mail: piwowar@uwaterloo.ca. Web: www.igarss02.ca

NEW
3-5 July 2002
Dublin, Ireland

8th European Commission GI & GIS Workshop: ESDI – a Work in Progress

Contact: Karen Fullerton, JRC, Ispra, Italy

E-mail: karen.fullerton@jrc.it, Web-site: www.ec-gis.org/Workshops/8ec-gis

3-5 July 2002
Nice / Sophia An-
tipolis, France

TELEGEO 2002 – 3rd International Symposium

Contact: Tullio Tanzi/Robert Laurini. E-mail: Tullio.tanzi@cindy.cma.fr/laurini@lisi.insa-lyon.fr

- NEW** **7th International Symposium on High-Mountain RS Cartography** (with field trip to Tienshan until 26 July)
15-17 July 2002
Bishkek, Kyrgyz Republic
Contact: Prof. Dr. Manfred Buchroithner, E-mail: Manfred.buchroithner@mailbox.tu-dresden.de
- NEW** **International Symposium ForestSAT: Operational Tools in Forestry using Remote Sensing Techniques**
5-9 August 2002
Edinburgh, Scotland
Contact: Juan C. Suaéz
E-mail: juan.suarez@forestry.gsi.gov.uk/ForestSAT@forestry.gsi.gov.uk,
Web: www.forestry.gov.uk/forestSAT.
- NEW** **4th International Conference on Reservoir Limnology and Water Quality**
12-16 August 2002
Ceské Budejovice, Czech Republic
Contact: Jakub Borovec, Conference Secretary
Phone: +420-38-777 5877. Fax: +420-38-530 0248. E-mail: reslim@hbu.cas.cz
- NEW** **GSDI 6 Conference – From Global to Local**
16-19 September 2002
Budapest, Hungary
Contact: EUROGI
E-mail (general information): eurogi@euronet.nl, E-mail (local arrangements): gabor.remetey@fvm.hu
- NEW** **ISPRS Comm. VI Mid-Term Symposium: New Approaches for Education and Communication**
16-18 September 2002
São José dos Campos, Brazil
Contact: Dr. Tania Maria Sausen, INPE, Brazil, E-mail: tania@ltid.inpe.br
- NEW** **2nd EARSel Workshop: Remote Sensing for Developing Countries**
18-20 September 2002
Bonn, Germany
Contact: Prof. Dr. G. Menz
E-mail: menz@rsrg.uni-bonn.de, Web: www.rsg.uni-bonn.de/earsel_2002/index.htm
- NEW** **Conference on GIS and RS in Mountain Environment Research**
19-23 September 2002
Zakopane, Poland
Contact: Jagiellonian University, Krakow
Phone: +48-12-4230354. Fax +48-12-4225578.
E-mail: confe2002@enviromount.uj.edu.pl, Web: www.enviromount.uj.edu.pl
- NEW** **SPIE Conference: Remote Sensing for Environmental Monitoring, GIS Applications, and Geology II**
23-27 September 2002
Crete, Greece
Web: spie.org/conferences/calls/02/rs/confs/RS09.html
- NEW** **World Space Congress and Exhibition**
10-19 October 2002
Houston, TX, USA
E-mail: wsc2002@aiaa.org, Web: www.aiaa.org/WSC2002
- NEW** **2nd European Conference on Radar Meteorology (ERAD)**
18-22 November 2002
Web: www.copernicus.org/erad Abstracts: 14 April 2002
- NEW** **23rd EARSel Symposium**
3-6 June 2003
Gent, Belgium
Contact: Prof. Rudi Goossens, University of Gent
E-mail: Rudi.goossens@rug.ac.be / earsel@meteo.fr