EARSeL Newsletter

ISSN 0257-0521

Bulletin of the
European Association of Remote Sensing Laboratories
Http://www.earsel.org
September 2005 - Number 63

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Published by:	EARSeL Secretariat
Desk Top Publishing by:	GITC bv, Lemmer, The Netherlands
Printing by:	Giethoorn Ten Brink, Meppel, The Netherlands

Subscription rates 2005

Members receive the Newsletter as part of the annual membership fee. For non-members, the annual rates (4 issues) are as follows:

Within Europe	80€
Outside Europe	88€
Personal subscription from members	30€

EARSeL membership fees 2005

Individual observer	330€
Laboratory/company with fewer than 10 researchers	330€
Laboratory/company with 10 or more researchers	500€

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1 EDITORIAL

This is the first issue of the EARSeL Newsletter for which I am the Editor, taking over from Niall McCormick, who has been the editor for the last five years. I would like to take this opportunity to compliment Niall on the quality of the Newsletter during his stewardship. I hope that I can maintain such a standard, but it will take some effort to do so. Niall also acknowledged the work done by Madeleine Godefroy as the Secretary of EARSeL. I would like to echo his sentiments. I first met Madeleine when I attended my first EARSeL Symposium, in Paris (2001). Even though Madeleine did not know me from a bar of soap, she made me feel very welcome in the EARSeL family. I have always greatly appreciated her warmth, energy, humour and overriding interest in EARSeL. I wish her the very best for her retirement and I hope that she enjoys her summer house on the Channel Islands for a long time to come. I also hope that she maintains her interest in this baby of hers, and that she keeps feeding me with information and the occasional bit of advice, as they are both greatly appreciated.

As is the nature of things, you will see changes in the format and structure of the Newsletter. What I would like to underline is that this is your newsletter, it is for you, to provide you with a forum to discuss issues that you consider are important, and to promote this discipline to the broader community in a way that is to the benefit of the discipline and thus to the members of EARSeL. Towards this end, it is important that the newsletter be as good as possible in addressing its goals as part of the EARSeL suite of methods of communicating both with its membership, and with the broader community. I welcome your contributions to the newsletter, in whatever form you would wish to send them to me, as information, comments, criticisms, articles and so forth. I hope that you see some of the changes as being designed to encourage comment and discussion.

Obviously a major goal of a newsletter is to inform members about developments in their discipline. Some of these developments are political, and some are technical, where I am using the terms political and technical in very simple ways. By politics I mean the way people operate, individually or in groups, so as to achieve certain goals, and technical involves the science and the various aspects of its implementation.

The scientific parts of the technology evolve in the scientific literature, to which EARSeL has built a contribution through the Symposiums and the eJournal, which I hope all of you access on a regular basis. The applied technological parts get promoted through the various news media and web pages of the active participants in this implementation. Thus the majority of the news articles in this newsletter are not original but come from various sources, including ESA, NASA and so forth. My responsibility in this has been to sort out from all of the available material what may be of most interest to you. But it may be just as useful for you if I simply listed the headlines and the source. There are technical issues that I consider have not adequately been dealt with through those sources, and of course when this occurs, then I have a responsibility to bring these issues to your attention. In this issue those issues include the material on GMES, INSPIRE, the FAO Africover program and the Joint German – French Image Analysis Centre.

However, when it comes to politics, then the interests of EARSeL and its members are quite different to those of the vested technical interests in Remote Sensing, each of whom have, of course, their own political interests. So, this aspect of discussion tends to be under-represented in the media, and certainly many aspects that are of interest to us do not get into the media at all. So, this dimension of Remote Sensing needs to be aired in some way, and I consider that the newsletter is an appropriate medium to do that. You will thus see that I will be encouraging more articles on the political dimensions of Remote Sensing, including those of direct interest to us, but also those of interest to other players, because it helps us understand why they act in the way that they do. You will see that I have started this off with four articles in this Newsletter. I hope that this development meets with your approval.

Keith McCloy

2 NEWS FROM THE ASSOCIATION AND ITS MEMBERS

2.1 New Members

Five new members were welcomed to EARSeL at the Porto Conference:

- Centre for Cartography and GIS
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2.2 The department of physical geography, Utrecht University (www.geo.uu.nl)

The Faculty of Geosciences of Utrecht University is one of the largest Geo-Institutes in the world (staff of 425 and 1800 students), including the Departments of Physical Geography, Human Geography, Cartography, Environmental Sciences, Geology and Geochemistry. DPG with a staff of 30 has a long-term research record on modern methods and techniques in Geography comprising spatial-dynamic modelling, Geographical Information Systems and geostatistics. Examples of our products are the 'PCRaster Environmental Modelling Language' (**pcraster.geog.uu.nl**), the 'Multivariable Geostatistical Modelling Package: GSTAT' (**www.gstat.org**) and the physically-based runoff and soil erosion model LISEM (**www.geog.uu.nl/lisem**).

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

Current PhD studies include 'Modelling Mediterranean Ecological Processes using High Resolution Hyperspectral Remote Sensing Images' by Raymond Sluiter. The focus of his research is the effect of agricultural land abandonment and the re-establishment of the natural vegetation. Emphasis is put on the Peyne experimental area in southern France. Aerial photos dating back to 1943, Landsat TM, ASTER airborne hyperspectral images are used to quantitatively map vegetation dynamics. A second example is the PhD work of Hans van der Kwast 'Integrated Modelling of Top Soil Moisture using Earth Observation'. In this study the spatial and temporal distribution of top soil moisture in the semi-arid region of Al Sehoul in Marocco is quantitatively modelled using the Surface Energy Balance Simulation model SEBS and optical and thermal ASTER images. In either study the field component of collecting data for model input and for model calibration and validation is important.

More information about our Physical Geography group is available at: **www.geo.uu.nl**
Steven M. de Jong Utrecht

2.3 Department of geography, Aachen University

Remote sensing activities at the Department of Geography, RWTH Aachen University, cover three main areas of interest:

Land use and land cover change are assessed using different remote sensing methodologies in conjunction with GIS and 3-d modelling. These studies serve for environmental planning and research within the Euregio Maas-Rhine including parts of Germany, the Netherlands and Belgium around the cities of Aachen, Maastricht and Liège.

Glacial inventory and glacier change of the Gran Campo Nevado, Peninsula Muñoz Gamero, located in the southernmost Andes of Chile just north of the Strait of Magallan is studied in the framework of the worldwide Global Land Ice Measurement from Space (GLIMS) project. Multitemporal and multisenor analysis of remote sensing data allows for the estimation of ice area and ice volume change during recent decades.

Geomorphological mapping based on Landsat TM imagery in central East Asia is part of on-going research activities on Holocene landscape evolution in Sibiria, Mongolia and Tibet. In especially, Late Glacial Maximum ice extent within different mountain systems is detected based on the analysis of digital terrain data and remote sensing data.

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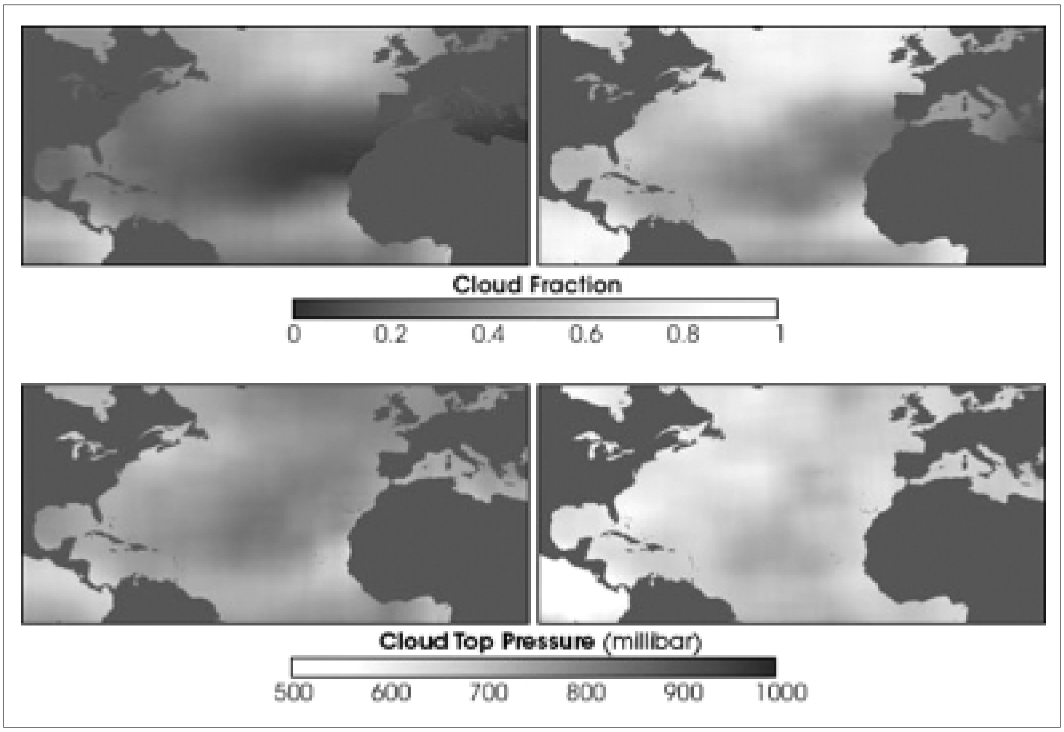
3 NEWS ITEMS

3.1 Aerosols play dirty pool

Of all the things that influence Earth's climate, the tiny particles called aerosols may win scientists' award for "least predictable." Not only do aerosols scatter, absorb, and reflect energy that enters and exits Earth's atmosphere, but they also tinker with the size, shape, and location of clouds and how much rain they produce. New research based on cloud and aerosol observations from the Moderate Resolution Imaging Spectroradiometer on NASA's Terra satellite demonstrates that when



The top pair of images shows the fraction of sky that was filled with convective clouds on low-haze days (left) versus hazy days (right) from June-August 2002. Deepest grey indicates cloud-free skies, while white indicates completely cloudy skies. On hazy days, cloud fraction increased dramatically across broad areas such as the northern Atlantic Ocean between North America (left) and Europe (right), and in smaller, more localized regions off the west coast of Africa (lower right).

aerosols were present in the air over the Atlantic Ocean, convective clouds (the tall puffy clouds that produce thunderstorms) covered a larger area and grew taller than they did on low-haze days.

Not only did aerosols change the area covered by convective clouds, they also changed how tall the clouds became. The bottom pair shows a comparison of cloud top pressure on low-haze days (left) versus hazy days (right). Generally, air pressure decreases as altitude increases, so the lower the pressure at the top of the cloud, the higher that cloud is in the atmosphere. When haze was present, cloud top pressures dropped, a sign that clouds were climbing higher into the atmosphere than they did on days with low amounts of aerosols.

Although some of the relationship between changes in convective clouds and the presence of aerosol may be due to meteorological conditions that bring both aerosols and clouds to the area, the scientists conducted additional tests on the observations to verify that the aerosols themselves, and not just the weather conditions, caused the changes MODIS observed.

These large-scale changes were accompanied by micro-scale changes in the clouds. Individual cloud droplets were smaller and more numerous when aerosols were present because each aerosol particle attracts water vapour and serves as a seed for cloud droplets. How could smaller droplets lead to taller clouds? Mainly, scientists think, it’s because water vapour gets spread out among all the aerosols in a cloud, which slows or prevents the formation of big droplets—rain. Falling raindrops create downdrafts that counter the upward rush of air that produces tall, towering clouds. Without these competing downdrafts, rising air carries the small droplets higher and higher into the atmosphere.

Scientists have known for many years that aerosols can modify cloud droplets, but this study offers a rare big-picture view of the changes they can make to cloud structure over a large area of the planet. That aerosols can modify the clouds over much of the Atlantic Ocean strongly suggests that human-produced and naturally occurring aerosols influence Earth's water cycle and energy balance. By changing the properties of clouds—which themselves are the biggest controller of how much energy enters and exits the atmosphere and therefore the climate system—aerosols add another layer of complexity to their ability to influence climate.

References

Koren, I., Kaufman, Y. J., Rosenfeld, D., Remer, L.A., and Rudich, Y. (2005). Aerosol invigoration and restructuring of Atlantic convective clouds. *Geophysical Research Letters*. 32, LI4828, doi: 10.1029/2005GL023187

Part of the flooding of the Nen River Valley as recorded by the ASAR radar sensor.

3.2 Envisat monitors flooding in China

China's rainy season has led to serious flooding in the north-east and south of the country. A joint Chinese-European team is gathering Envisat radar imagery of the developing situation to give the authorities a way to swiftly assess affected areas and plan their responses.

Summer flooding is nothing new in these regions of the People's Republic of China (PRC), though this year it is proving particularly severe, with more than 800 casualties countrywide and 2.45 million people forced to evacuate their homes. However this season's flooding is being monitored in near real-time by ESA's Envisat Advanced Synthetic Aperture Radar (ASAR) sensor, which can acquire imagery during both day and night and in all weathers.

This activity is taking place as part of ESA's Dragon Programme of cooperation with the National Remote Sensing Centre of China (NRSCC) within the Ministry of Science and Technology of the PRC. These Envisat images are a means for the authorities to identify floodwater extent and coordinate mitigation efforts, and should be a foretaste of things to come – next season the aim is that a full near real-time monitoring service should be operational.

The Strasbourg-based company SERTIT, specialising in rapid satellite mapping, has been cooperating with a team of Chinese researchers led by Professor Li Jiren of the China Institute of Water Resources and Hydropower Research (IWHR) of the Ministry of Water Resources in Beijing.

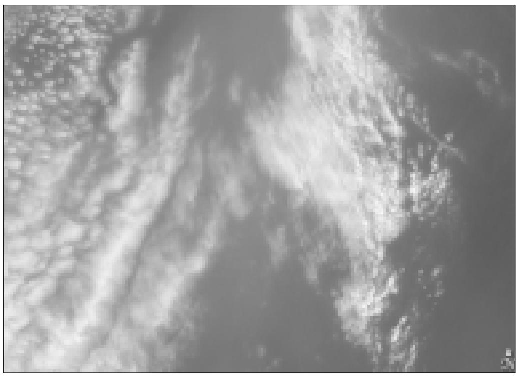
Flood monitoring is only one of numerous Dragon Programme research themes, which range from agriculture and forests to seismic activity and landslide monitoring, assessing drought, air quality, oceanography and climate. Dragon formally began in April 2004. Since then more than 2500 radar images from Envisat and ESA's ERS missions have been delivered to the Dragon teams.

Reference

http://www.esa.int/esaEO/SEM8MD808BE_index_0.html

3.3 African dustbowl comes to the USA

A huge dust cloud blown westward from the Algerian desert wafted over the south-eastern United States during the final week of July 2005. The cloud, about the width of the United States, was expected to produce dramatic sunsets and possibly leave a light coating of red-brown dust on vehicles from Florida to Texas. The Jet Propulsion Laboratory's Multi-angle Imaging Spectro-Radiometer (MISR) aboard the Terra satellite captured the image shown below on July 20, 2005. It provides a detailed view of the yellow dust over a band of clouds just off the west coast of Africa near Mauritania and Senegal. The image covers about 1,800 Km north-south, and 400 Km east-west.



African dust storm and cloud over the Atlantic Ocean.

MISR, which views Earth at nine different angles in four wavelengths, can derive the amount, size and shape of airborne particles. This means it can distinguish desert dust, by far the most common non-spherical atmospheric aerosol, from pollution and forest fire particles, which are typically spherical. This image was taken by MISR's 26-degree forward-viewing camera.

Reference

http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=16987

3.4 Envisat used to survey the aftermath of Spanish forest fires

A 24 July MERIS Full Resolution mode image with a spatial resolution of 300 metres was processed to reveal burned areas by a team led by Dr. Federico González-Alonso, head of the Madrid-based Laboratorio de Teledetección (Remote-sensing Laboratory) of the Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (National Institute for Agriculture, Food Research and Technology or INIA).

The results of our completed study will be sent to the Spanish Ministry of Environment for economic, social and ecological damage assessment," González-Alonso stated. "Our team has been studying the use of MERIS data for fire-damage assessment - obtaining these images from ESA in near-real time via the internet is an essential component in this kind of application."

"The results achieved so far show that estimates can be extremely useful not only in establishing the scale of the damage but also for the subsequent forest renewal projects and for subsidy management."

The four-day blaze began on 16 July, when a barbecue in pine woodland went out of control, spread by strong winds across a very dry landscape. Eleven volunteer fire-fighters died tackling the blaze, which at its height threatened to engulf the nearby villages of Selas and Ablanque. Fire-fighters succeeded in creating a fire-break to stop its spread, backed up by water-bombing aircraft.

The Spanish authorities continue to assess the fire's aftermath, aided by a rapid damage estimate derived from the analysis of data acquired using Envisat's Medium Resolution Imaging Spectrometer (MERIS) instrument.

A follow-on to MERIS is planned as payload for the GMES-1 spacecraft, intended to support operational GMES services into the next decade.

References

http://www.esa.int/esaCP/SEM25M808BE_Protecting_0.htm

3.5 Establishment of a joint image analysis centre

The French Space Agency (CNES) and the German Aerospace Centre (DLR) have agreed to create a joint Earth Observation Research Centre to support processing and analysis of data from their future satellites constellations. A new network will be created in partnership with the French national school of telecommunications (ENST), which includes a department specialized in image processing. ENST would chair the new network whilst CNES and DLR facilities in Toulouse and Oberpfaffenhofen respectively will provide the necessary R&D support. The network is intended to improve the ability of ground facilities to handle the overwhelming amount of high-resolution satellite imagery and to automatically extract information with upgraded algorithms. Among the systems to benefit from the new network is the German TerraSAR radar observation satellite, to be launched next year, as well as the French dual-use high-resolution optical Pleiades constellation.

3.6 Don Quixote's home shows way to future earth observation missions

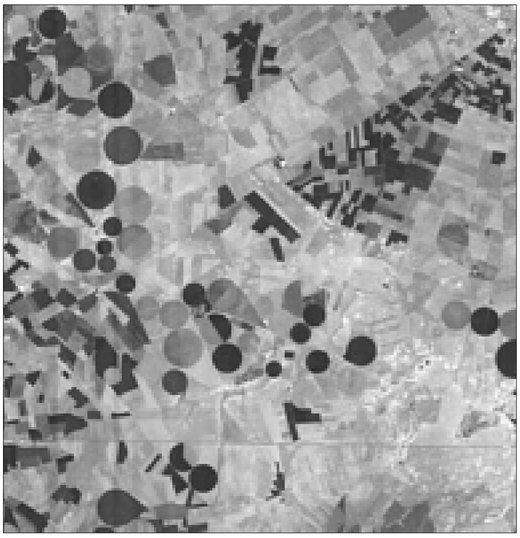
A team of 60 scientists from ten countries have returned to Spain to complete testing a new type of sensor intended to yield new insights into global vegetation growth, as well as gather data for the design of a next-generation ESA Earth Observation mission and support efforts to use satellite data for irrigation management.

In Cervantes' comic tale the central Spanish region of La Mancha was where Don Quixote undertook a series of knightly quests. Exactly four hundred years later researchers have been participating in a different type of quest: the direct in-situ detection of photosynthesis, the process by which plants convert sunlight into energy.

When the chlorophyll in plants absorbs energy then some is re-emitted at longer wavelengths as fluorescence. This fluorescence is routinely measured in laboratories to study photosynthetic activity but the signal is very weak compared to direct sunlight. This campaign is the first time that large-scale outdoor measurements have been successfully carried out.

Vegetation fluorescence represents a direct measurement of vegetation's ability to absorb atmospheric carbon dioxide that – mapping it on a global scale by a space-based sensor would transform our understanding of the carbon cycle and climate change.

Researchers also gathered a host of multispectral data on the local vegetation from a pair of airborne sensors plus satellite acquisitions by Landsat, MODIS and ASTER as well as Envisat's Medium Resolution Imaging Spectrometer (MERIS) and Advanced Along Track Scanning Radiometer (AATSR) sensors. The Compact High Resolution Imaging Spectrometer (CHRIS) aboard ESA's microsatellite Proba made several acquisitions, and complete field measurements were also made in-situ. This data has being gathered to help identify requirements for ESA's planned Sentinel-2 mission that will carry a multispectral imager, capable of monitoring plant pigments and so derive photochemical indicators of vegetation status.



The study area in Spain.

Sentinel-2 is one of a series of operational Earth Observation satellites planned as the space segment of the Global Monitoring for Environment and Security (GMES) joint initiative between ESA and the European Commission.

Reference
http://www.esa.int/esaLP/SEMF34808BE_LPgmes_0.html

3.7 GMES

The 'Global Monitoring for Environment and Security' (GMES) initiative represents in simple terms a concerted effort to bring data and information providers together with users, so they can better understand each other and agree on how to make environmental and security-related information available to the people who need it.

A challenge for GMES is to gather relevant data and provide innovative, cost-effective, sustainable and user-friendly services, which will enable decision-makers to better anticipate or integrate crisis situations issues relating to the management of the environment and security.

Why GMES ?
Making Europe a better place for its citizens requires the collection and exchange of accurate information on the world around us. Up-to-date weather and pollution reports are just one example in which high-quality and timely information can be of interest to the man or woman in the street.

But there are many other types of information that can be of use in a wide variety of fields.

Unfortunately, organisations that promote public welfare are often forced to rely on

N°	Immediate management actions in 2004	Actors	Instrument
1	Establish the management structures: -a) Programme Office and Advisory Council. b) an organizational framework for dialogue and partnership.	a) EC and ESA, Member States. b) in close consultation with broader range of partners.	a) EC/ESA Framework Agreement b) Memorandum of Understanding.
2	a) Establish a policy for GMES international Partnerships. b) Coordinate the European position within GEO. c) Coordinate actions regarding developing countries in the context of the GEO and emerging GMES services	EC, with Member States and European organisations (e.g. ESA, EUMETSAT)	a) Memorandum of Understanding b) GEO co-chairmanship. c) GEO co-chairmanship

Summary of Main GMES Actions in the Implementation Phase, 2004 – 2008.

fragmented and poorly presented information. Users of Earth Observation (EO) data, including scientists, policy-makers and industry, are confronted with volumes of data so immense and varied that it becomes impossible to extract the information relevant to their specific needs. The work of data and information providers is not sufficiently coordinated; the data is often incomplete, not comparable or difficult to access.

The two stages of GMES
Development of a GMES capacity is defined as a two stages process; the Initial period (2002-2003) and the Implementation Period (2004-2008). For each of them the aim and methodology were clearly stated in an Action Plan.

The Initial Period ended with the publication of the GMES Initial Period final report. The Implementation Period started with the EC's publication of a communication to the Parliament and the Council outlining the Action Plan 2004-2008.

Where is GMES up to today?
According to Mr Marco Malacarne, Responsible for GMES within the European Commission, GMES is "going operational" on three pilot services, which it is planning to activate by 2008. They are: information for crisis management, land monitoring and marine services. Watch these pages as we report on the status of these three applications as they develop.

Contact sites
http://www.gmes.info/
http://europa.eu.int/comm/space/gmes/index_en.htm
http://www.gmes.it/
http://www.esa.int/esaLP/LPgmes.html

3.8 INSPIRE

The purpose of the INfrastructure for SPatial InfoRmation in Europe (INSPIRE) initiative is to trigger the creation of a European spatial information infrastructure that delivers to the users integrated spatial information services. These services should allow the users to identify and access spatial or geographical information from a wide range of sources, from the local level to the global level, in an interoperable way for a variety of uses.

INSPIRE Principles
- Data should be collected once and maintained at the level where this can be done most effectively
- It should be possible to combine seamlessly spatial data from different sources

N°	Implementation actions	Actors (coordinated by GMES Program Office	Implementing instrument	Timing
3	Prepare the in-situ component: a) implementation plan b) investigating feasibility of novel technologies c) upgrade in-situ component	EC, EEA, Member States	a) 6th FP b) 6th FP c) stakeholder programs	a) 2004 b) 2005 -2006 c) 2005-2008
4	Establish an action plan to meet the users' needs for security and explore dual use	EC and Council, ESA, Member States	Advisory Council and Space Policy Working Group	2004-mid-2005
5	Establish a data policy Framework.	EC, ESA, EEA, Member States through Advisory Council	INSPIRE Memorandum of Understanding	2004-mid-2005
6	Define the follow-up management structure (e.g. Joint Undertaking)	EC	EC Treaty, Art. 171	2004 -2005
7	Preparation for the provision of regular and reliable services	EC, ESA	ESA Services element	2004-2008
8	Improve data integration and information management and validate with stakeholders	EC, ESA, EEA, Member States and service providers (e.g. EUMETSAT).	- 6th FP, 7th FP - INSPIRE - Stakeholder programs	2004-2008
9	Develop the space component	ESA in consultation with EUMETSAT and national space agencies	- ESA Agenda 2007 EUMETSAT and national programmes	2004 -2008
10	Ensure sustainability of GMES services through appropriate funding mechanisms	EC, ESA, Member States, private sector	EU Financial Perspectives and national budgets	2004–2006 – 2007 onwards

and share it between many users and applications
- Spatial data should be collected at one level of government and shared between all levels
- Spatial data needed for good governance should be available on conditions that are not restricting its extensive use
- It should be easy to discover which spatial data is available, to evaluate its fitness for purpose and to know which conditions apply for its use.

The target users of INSPIRE include policy-makers, planners and managers at European, national and local level and the citizens and their organizations. Possible services are the visualization of information layers, overlay of information from different sources, spatial and temporal analysis, etc.

References

[1] http://www.ec-gis.org/inspire/home.html

3.9 FAO's Africover goes international

The Food and Agriculture Organization (FAO) have now completed the 1:200,000 land cover mapping of 10 countries in East Africa, specifically Burundi, Congo, Egypt, Eritrea, Kenya, Rwanda, Somalia, Sudan, Tanzania and Uganda. These maps are available as part of the FAO Multipurpose Africover Databases on Environmental resources (MADE) initiative that includes the land cover and navigational data in a GIS format.

FAO, with UNEP have recently launched the Global Land cover Network (GLCN), designed to provide the basis for standardized land cover maps of the globe and using the Africover products as a standard. The Africover maps are typically produced by the analysis of TM images with field data.

Reference
http://www.africover.org/index.htm

3.10 Mumbai is drenched

India's financial capital, Mumbai (formerly Bombay), received a record-breaking 942 mm of rain in a twenty-four hour period on Tuesday, July 26, 2005. India's previous all-time single-day record of 838 mm was set in 1912. The heavy monsoon rain triggered deadly floods, which have claimed more than 500 lives in the country's western Maharashtra state, with 273 fatalities in Mumbai alone, as of July 28. Monsoon-related flooding is not unusual in the summer when the heating landmass generates winds that pull warm, moisture-laden air over the Indian subcontinent, but Tuesday's rains were unusual even for the summer monsoon.

The Tropical Rainfall Measuring Mission (TRMM) satellite captured images of the rain over Mumbai at 3:39 p.m., local time, on July 26, 2005. These images showed that the rainfall intensity over Mumbai, was as high as 50 mm per hour immediately around the city.

The TRMM satellite has been collecting rainfall data since its launch in 1997. It does this using the TRMM Precipitation Radar (PR), the only radar capable of measuring precipitation from space.

Reference
http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=16985

3.11 Luxemborg joins ESA

Following its ratification of the ESA Convention, Luxembourg has become ESA's 17th Member State with effect from 30 June 2005.

The agreement between ESA and Luxembourg concerning the accession of the Grand Duchy to the ESA Convention was signed by Erna Hennicot-Schoepges, Minister for Culture, Higher Education and Research, on behalf of the Luxembourg government, and Jean-Jacques Dordain, Director General, on ESA's behalf, on 6 May 2004. The latter agreement made possible the application of transitional measures to deal with the practicalities of Luxembourg's accession to the ESA Convention, such as the participation of observers at the meetings of Council and other delegate bodies and increased coordination on industrial policy matters.

3.12 Two glaciers in Greenland are moving at a not so glacial pace

Two University of Maine scientists studying the effects of climate change in the Arctic have discovered that two glaciers in Greenland are moving at a not-so-glacial pace. The scientists returned last week from a five-week expedition to the east coast of Greenland, where they studied the movement of five glaciers. They found that two of the glaciers are moving at a far faster rate than just a few years ago, raising questions about the effects of regional warming. To take measurements, the scientists drilled holes in the ice and placed GPS devices in them to precisely measure the forward motion of the glaciers by satellite.

One of the glaciers, called Kangerdlugssuaq, was moving at the rate of

ABOUT 14 Km a year, making it one of the world's fastest-moving glaciers, the researchers said. In the late 1990s, it was moving at about 5,5 Km a year. The glaciers' accelerated speeds in Greenland suggest that the climate is warming up, at least in that region reported the scientists. Recently the scientists have been studying Greenland's glaciers at the Climate Change Institute using satellite imagery.

The scientists took readings over the course of several days, calculated the speeds of the glaciers and extrapolated the data into annual measurements. The three northern glaciers that the scientists visited were moving at about 4 Km a year, the same rate they've been moving at since scientists first started measuring them in 1968. But that wasn't the case with the two southernmost glaciers, Kangerdlugssuaq and Helheim. Kangerdlugssuaq was moving at a rate of 14,1 Km a year - nearly half a football field a day - up from 5,5 Km a year in the 1990s. Helheim was moving at about 11,5 Km a year, up from 8 Km a year only four years ago.

Reference

http://www.seacoastonline.com

4 THE COUNTRY SURVEY: DENMARK

The concept of conducting Country Surveys arose from the idea that it is much more difficult to know what is happening in other countries in Europe than it is to know what is happening at home. Yet few, if any, countries in Europe cover the full range of theories and applications as are relevant to remote sensing, so there is considerable scope to collaborate to mutual interest, if one is aware of the other groups who have complimentary interests to your own. I decided to try this exercise in my country, since I know most of the players and I can talk directly to them if necessary. However, it has taken a lot of work; I will now wait and see what reaction I get to this idea before deciding whether to continue with it.

Denmark is a small country, with a population of about 5.2 million. The workforce is highly educated, and a major focus in Denmark is the skills in the workforce, so that education is seen as a major priority in Denmark. It has a number of businesses that are involved in the space sector and Denmark has launched one satellite.

Danish research is distributed between the Universities, Sectoral Research Institutes and industry. The universities tend to focus more on fundamental research, driven by the interests of the individual researcher; the institutes focus on applied research, driven by societal needs and industry conduct research to their benefit.

Recently Denmark established a Space Consortium, designed to bring together all of those interested in the space sector, including remote sensing. This consortium now provides advice to government on issues related to space.

At present three universities and three research institutes are active in remote sensing research and education in Denmark. All of these institutions are represented in this survey. In addition the firm of GRAS A/S has recently started commercial operations in Denmark, and is also represented in this survey.

The Danish Institute of Agricultural Sciences (DIAS) (Keith McCloy)

The Danish Institute for Agricultural Sciences is a sectoral research institute, responsible for the conduct of applied and basic research directed at improving agricultural use of the land, productivity and quality. It is funded by the state (about 65%) and by grants (about 35%). It has about 1600 employees in four research centres and five research stations, of which about 600 are scientists or senior scientists.

Within the institute four scientists and about two technicians are involved in the conduct of basic and applied research into improving our understand of vegetation dynamics and how they are recorded in image data, as well as into the development of tools and techniques to improve the management of agricultural resources. In addition to the conduct of research, two members of the professional staff and two technical staff are involved in the operational application of remote sensing, for land use mapping as part of the EU agricultural subsidy program and in the conduct of various PHARE-Twinning projects in Eastern Europe.

The two engineers (Birger Pedersen and Rene Larsen) involved in the operational projects manage the Control of Area Based Subsidy (CABS) project and conduct various PHARE-Twinning projects. One scientist (Anton Thomsen) is involved in the construction and use of field based remote sensors, to be used in various field level applications including scientific research and precision agriculture. One Senior Scientist (Niels Broge) uses these facilities extensively in the development of various applications of field based remote sensing. The remaining scientist (Peder Bøcher) is focussing on the extraction of information from spatial indices derived from image data. He has mainly worked with the Average Local Variance Function algorithm and he has shown that this algorithm provides an estimate of the separation between objects rather than the size of the objects per se. He is using this tool in the estimation of the density of forest cover in Denmark. The last Senior Scientist (Keith McCloy) is mainly focussing on the development of improved classification algorithms and the development of methods to analyse time series of image data to better understand the relationship between vegetative growth, as recorded in the data, and the drivers for that growth. The current focus is the investigation of the accuracy with which the Nitrogen levels in crops can be estimated from the growth rates in the crop during the growing season.

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Remote sensing activities at the Danish Meteorological Institute (DMI) (Peter Viskum Jørgensen)

The main focus of the DMI remote sensing activities has been sea-ice monitoring for many years. This has changed in the last 5 years, due to increasing interest in new applications and new staff. The other applications in question are ocean colour, cloud and sea surface temperature applications.

Peter Viskum Jørgensen focuses on Ocean Colour. Has worked with this topic for 10 years. Involved previously (1997-2001) in large Danish research project, DECO, on Coastal Marine Monitoring. Has since then worked within two large EU int. project (SISCAL 2000-2004 & REVAMP 2001-2005) and taken part in ESA's MAVT work (MERIS & ATSR validation Team); more specifically studying ocean color sensing algorithms, inversion models, bio-optical parameters, automating processing-steps and user requirements with specific focus on Case 2 waters in Northern Europe (The North Sea and the Baltic Sea). Current status is that chlorophyll concentration- and suspended matter map products can be delivered operationally now from DMI using MERIS or MODIS data.

In addition, a cooperation with AGHRYMET in Niger has recently been established in order to help the Sahel region countries to improved rainfall estimates, seasonal forecasts and crop modelling using operational MSG data.

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Earth observation activities at the Ørsted-DTU Department, Technical University of Denmark (Associate Professor Henning Skriver)

Space technology is a large research area at the Ørsted-DTU Department at the Technical University of Denmark. It includes instrumentation and systems, e.g. magnetometers, microwave radiometers, radar systems, star trackers, communication antennas, and autonomous control systems; airborne campaigns; antenna measurements; and data processing methods for radar and radiometer data. This report describes the activities within the last subject, i.e. development of advanced methods for processing and interpretation of microwave Earth Observation data.

The microwave Earth Observation activities at the Ørsted-DTU department started in the 1970's, where the thickness of the Greenland ice sheet was the measured by an airborne radar developed at the institute. These activities were the origin of the two main areas within microwave Earth Observation, i.e. microwave instrument development and development of methods for data processing and interpretation. The activities in the latter area have focused on applications such as sea ice monitoring, ice sheet-monitoring, glacier monitoring, monitoring of crops and vegetation, and general topographic mapping. The focus has been to develop advanced methods for processing of data from airborne and spaceborne microwave sensors, and their application in extraction of geophysical parameters. This has very often taken place in collaboration with national and international partners.

The activities for sea ice monitoring cover from detailed studies of sea ice using polarimetric synthetic aperture radar (SAR) data to development of websystems and methods to utilise many different satellite data and other types of data for operational sea ice monitoring and climate monitoring. Results produced by Ørsted-DTU on mapping of glacier dynamics using interferometric SAR data have been published in Nature. Data from ESA's ERS-1 and -2 missions have been used, and methods are developed under ESA contracts for data processing of data from these and future missions. The research is carried out in close collaboration with geophysical experts. A special problem exists for mapping of ice sheets and glaciers with radar, and this is the penetration of the radar signal into the ice. This problem is addressed in studies carried out under ESA contract in collaboration with the German DLR, where Ørsted-DTU participates in the developments of a new radar observation technique, where two well known techniques, SAR interferometry and SAR polarimetry, are combined into polarimetric SAR interferometry. Ørsted-DTU is also involved in development of advanced methods for processing and interpretation of polarimetric SAR data for mapping of crops and vegetation. These methods will be used for future missions, such as the Japanese ALOS-mission, the Canadian Radarsat-2 mission, and the German TerraSAR-X mission.

The above-mentioned developments are to a large degree based on data from the advanced airborne polarimetric and interferometric SAR, EMISAR, developed at Ørsted-DTU. The EMISAR sensor produce e.g. polarimetric SAR data at both C- and L-band simultaneously, single-pass interferometric data at C-band or repeat-pass interferometric SAR data. The EMISAR system has acquired a large amount of data for national scientific campaigns and ESA-sponsored campaigns.

GRAS A/S (Geographic Resource Analysis & Science) (Michael Schultz Rasmussen)

GRAS is a company specialized in remote sensing and GIS. GRAS was created as a joint collaboration between The Institute of Geography, University of Copenhagen and DHI – Water & Environment in October 2000 and has since been involved in a number of different types of remote sensing projects. The two single most important areas of expertise are the use of very high resolution (VHR) data such as QuickBird, Ikonos and SPOT 5 for mapping and other services and using ocean colour remotely sensed data to derive information about the marine environment. At the present we are working closely with DHI on assimilation of remote sensing data into hydrological models. An operational model for the North Sea, the inner Danish seas and the Baltic Sea is currently run by DHI and processing chains and methods for assimilation has been developed. We have operational automatic processing chains for Meris, Modis, SeaWiFS and AVHRR data. Mapping projects are carried out all over the world and GRAS is an authorized reseller of QuickBird, Ikonos and SPOT data. At the present we are working on a project mapping changes in the rain forest in Peru and mapping roads in southern Africa. In Uganda we are studying changes around the Kyoga Lake. GRAS is a non profit organisation and all profit goes back to research and development.

For more information:
GRAS: www.gras.ku.dk
Institute of Geography, University of Copenhagen: www.geogr.ku.dk
DHI – Water & Environment: www.dhi.dk

Remote sensing at the Institute of Geography, University of Copenhagen (Inge Sandholt)

For more than 20 years, Earth Observation (EO) has been an area of research and higher education at the Institute of Geography, the University of Copenhagen (IGUC). Activities related to Remote Sensing play today a pivotal role in the research- and teaching activities at the IGUC. The research is organized in the research platform for geoinformatics, dealing with and combining Earth Observation and Geographic Information Systems (GIS), spatial statistics and dynamic process modelling. Currently the platform comprises eight permanent faculty members, two post docs, and six PhD students. The department is equipped with three computer labs, with state of the art image processing software, including the locally developed WinChips, ENVI, IDL and various ESRI products. Since 1990, the department has had its own NOAA-AVHRR receiving station, and since January 2005, a local Meteosat Second Generation receiving station has been operational for the reception of real time data from the SEVIRI sensor. A processing chain and dedicated software has been developed for NOAA-AVHRR as well as SEVIRI data, for calibration and atmospheric correction of the data. Since the late 80's the department has been involved in several capacity building projects with EO as the main issue, particularly in African counties. The department is involved in adapting remote sensing techniques to use in high school teaching, training of high school teachers and presenting remote sensing research to high school students.

Researchers at IGUC have long time experience with development and application of Remote Sensing techniques within optical, infrared and SAR data covering a range of different topics and geographic locations. The Remote Sensing research has its regional focus on Denmark, Africa, Greenland and Asia, with thematic focus on:

- the application of remote sensing in dynamic simulation models, in particular of hydrology and vegetation from local to regional scales
- validation of new satellite data and algorithms using on in situ measurements
- development of advanced statistical classification algorithms based on spectral and spatial information
- up and down-scaling of surface processes and data
- land use/land cover changes and long term trends in vegetation productivity.

Recent and current work is, among other things, dealing with iterative methods for deriving surface fluxes of carbon dioxide and water vapour fluxes from NOAA AVHRR and MODIS data; cloud field tracking for all sky applicability of the models; assessment of water stress using short wave infrared data and using thermal infrared data, in particular from MODIS and MSG-SEVIRI sensors; modelling Net Primary Productivity based on satellite data; time series analysis of satellite datasets (Pathfinder, GIMMS) for assessing long term trends in vegetation productivity; subpixel classification algorithms for improved forest and land cover classification of tropical forest; contextual and texture based classification algorithms for urban areas; the application of geostatistical scaling lows for the downscaling of low resolution satellite data; in situ measurements for validation of satellite data and intercomparison of sensors; the application of satellite data in large and regional scale hydrological models; mapping snow and vegetation in arctic regions.

The department takes part in several national and larger international research projects and experiments with major EO components, for instance the EO-flux, the international AMMA project focusing on West Africa, and a nationally funded project on upscaling of fluxes and surface properties, and the INTEO project with focus on remote sensing and hydrological modelling in West Africa. Researchers at IGUC have obtained PI-status on several of ESA's satellite missions, including ERS1/2, ENVISAT and MSG. More information can be found on http://www.geogr.ku.dk/platforms/geoinf

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Remote sensing activities at Roskilde University (RUC) (Eva Bøgh)

At Roskilde University (RUC, www.ruc.dk), Institute of Geography and International Development Studies, earth observations play an important role in both education and research. In education, it has its most important value as a spatial environmental information source which is integrated with other spatial data in Geographical Information Systems (GIS) and applied for spatial data analysis, environmental modelling and/or planning purposes. Research activities focus on the development and testing of methodologies for extracting land surface information from satellite data and to use such information to model the atmospheric exchanges of heat, water vapour and CO2 and their interaction with sub-surface hydrology. In cooperation with other partners (see below), methodologies for assimilation of satellite products in GIS based agro/eco-hydrological modelling and new model algorithms are being developed, tested and implemented in model tools.

Remote sensing and GIS education at RUC

In the first years of study, an extensive 72 hours course in integrated GIS and remote sensing is offered to provide students with the basic technical skills that allow them to understand and work independently with both remote sensing and GIS spatial analysis and modelling tools. The teaching language is English to comply with the growing number of international students at RUC. Because RUC is a cross-disciplinary and project-oriented campus university, the course enrols students who combine geography with many other disciplines. Most students combine with topics in environmental biology or computer science. 50% of the education activities at RUC are project-oriented so that students possess great flexibility to apply their remote sensing and GIS skills in subsequent cross-disciplinary and problem-oriented project studies.

At higher education levels, a problem-oriented course in "Environmental remote sensing" is available. Furthermore, preprocessed remote sensing based products constitute important data sources in courses such as "Drainage basins: processes, modelling and management" and "Urban Ecology". In the Drainage basin course, satellite based vegetation cover maps are assimilated in an agro-hydrological GIS model, and in the Urban Ecology course, infrared surface temperature maps and vegetation maps are used to calculate biodiversity indices.

From autumn 2005, two new international master educations are launched at RUC in respectively "Landscape Ecology for Planning" and "Geoinformatics" where remote sensing and GIS are important components. A new introductory "Landscape ecology" course is being prepared where fieldwork and remote sensing/GIS analysis play equally important parts. From autumn 2006, all courses and master educations at RUC will be announced and conducted in English.

Remote sensing research at RUC

Remote sensing research activities at RUC focus on the use of remote sensing data and their assimilation in agro/ecohydrological models to achieve improved understanding and prediction of landscape vegetation productivity and its interaction with the climates and soils in which it is found. This involves not only consideration of the basic physics as confined by the energy- and water balance settings but includes the role of bio-physiological control resistance and nutrient dynamics. A close cooperation exists with the Danish Institute of Agricultural Sciences who have great facilities for field based remote sensing. In collaboration with the Agricultural University, DHI-Water & Environment and Copenhagen University, methodologies to assimilate remote sensing based estimates of vegetation dynamics in agro/ecohydrological GIS model tools are being developed and the impact on atmospheric as well as hydrological phenomena investigated. Current research interests are expressed by a number of major research projects, as given below.

Remote sensing of leaf nutrition and its incorporation for biochemical and environmental modeling of crop photosynthesis and evapotranspiration.
Financed by the National Agricultural Research Council, 2005-2008. Partners: Institute of Geography and International Development Studies/ Roskilde University (coordinator), Danish Institute of Agricultural Sciences, the Agricultural University, and Institute of Geography/University of Copenhagen.

The main objective of the research project is to exploit the feasibilities of new measurement techniques and new Earth observation data to measure and quantify the impact of temporal and spatial variations in leaf area index and leaf nitrogen nutrition levels on photosynthesis and evapotranspiration and its association to the surface energy- and water balance. A new nitrogen-photosynthesis module is being developed and implemented in a GIS model and applied to evaluate the impact of climate, land use and nutrient dynamics on landscape surface energy balance and water resources.

Estimation of water vapour- and carbon dioxide exchange over a heterogeneous Danish landscape. Financed by the National Scientific Research Council, 2005-2008. Partners: Institute of Geography/

Figure 1: Nysted offshore wind farm, Denmark, seen from satellite SAR.

University of Copenhagen (coordinator), Risø National Laboratory, Institute of Geography and International Development Studies/Roskilde University.

The main objectives of the research project are to 1) develop and test methods for deriving water vapour and carbon dioxide fluxes on landscape scale with the island of Zealand (7000 km^2) as main study object, 2) elaborate satellite based methods that can be operated under both sunny and cloudy sky, 3) evaluate the accuracy of landscape fluxes by comparing direct measurements and earth observations against an integrated soil-vegetation-atmosphere transfer model and 4) elaborate a GIS scheme for upscaling fluxes from stand to landscape.

The nitrogen cycle and its influence on the European greenhouse gas balance.
Financed by EU-FP6, 2005-2010. Partners: Natural Environmental Research Council, UK (coordinator) + 62 partners.

The major question of this project is: What is the effect of reactive nitrogen supply on the direction and magnitude of net greenhouse gas budgets for Europe. RUC contributes with remote sensing analysis to the landscape component of the project where a key question is: Can we simulate the effects of land management, land use and climate change on nitrogen greenhouse gas exchange at plot, landscape, regional and European scales? Remote sensing based maps of leaf area index and leaf nutrition and GIS based agro/ecohydrological models will be used for landscape modeling.

Other remote sensing activities at RUC
RUC is represented in the Steering Committee of the Danish Space Consortium.

RUC is contributing to the realization of a Danish innovation-accelerating research platform related to water resources and information technology (ie. remote sensing and GIS).

RUC supports with research interest descriptions the preparation of micro- and GMES satellite missions at CNES, France.
RUC is presently involved in the preparation of a proposal for an European research training network in precision agriculture

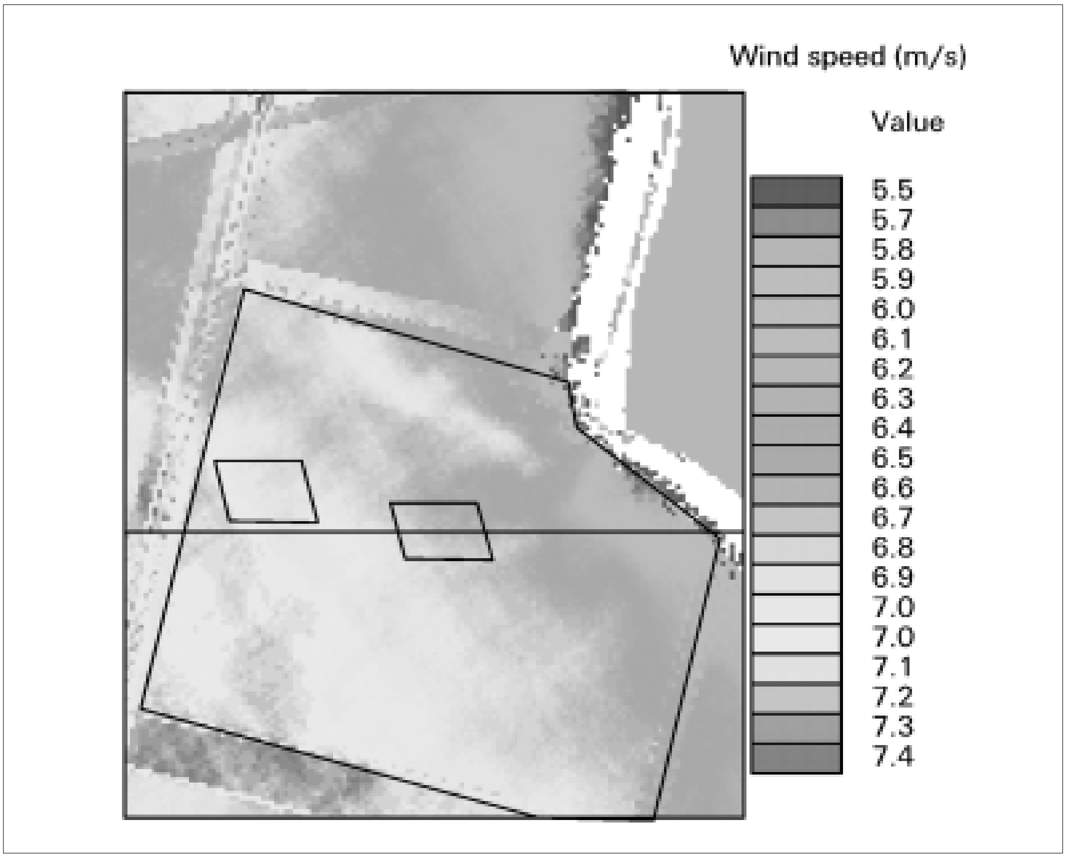

Figure 2: Offshore mean wind speed at 10 m from 30 ERS-2 SAR images. The Horns Rev wind farm with 80 2 MW wind turbines is located in the eastern trapezoid, the prospected wind farm in the western trapezoid. Each trapezoid is 5 km by 4 km.

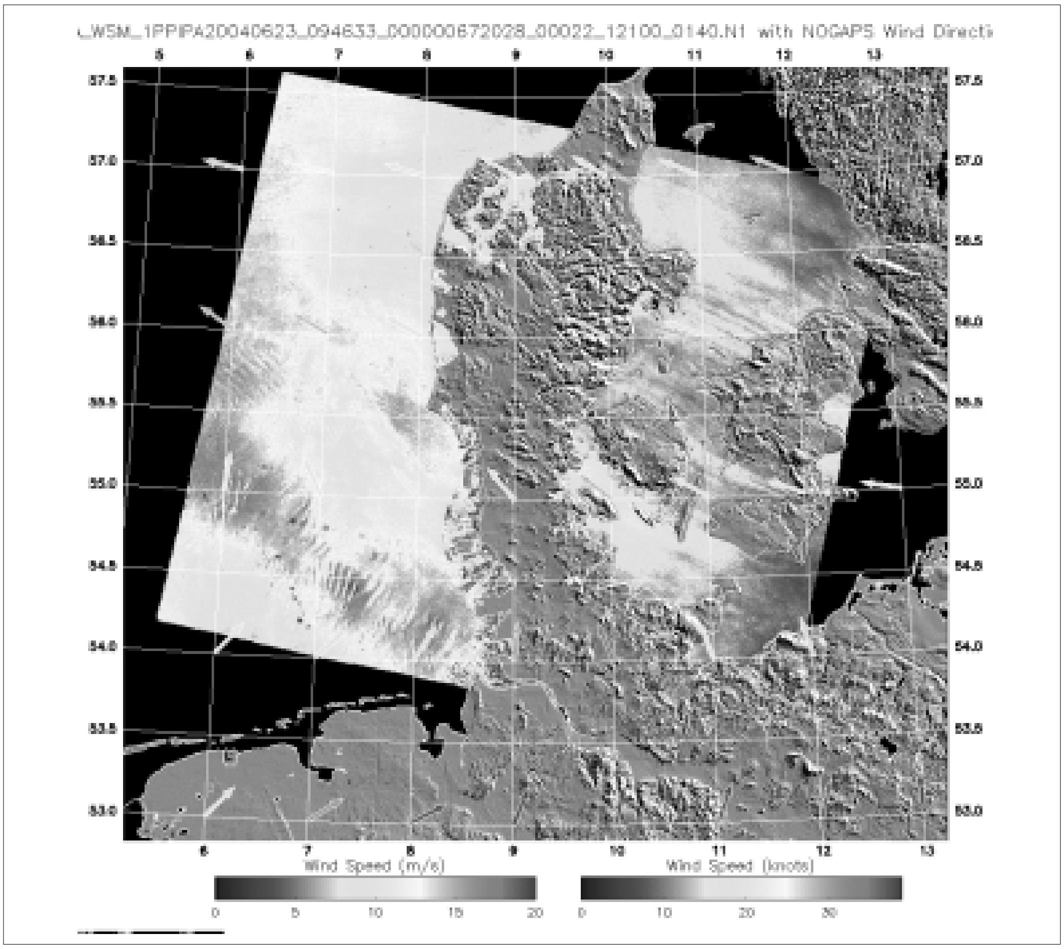

Figure 3: Offshore wind speed map on 23 June 2004 measured by Envisat ASAR Wide Swath Mode. Courtesy: F. Monaldo and D. Thompson, Johns Hopkins University, USA.

(coordinated by Universitá degli Studi della Tuscia, Italy).

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Remote sensing at Risø National Laboratory (Charlotte Hasager)

Wind energy benefits from Earth Observation images

Wind energy offshore is in rapid development. In Denmark 400 MW is installed. The wind turbines are mainly arranged in large arrays, e.g. at Nysted with 72 2.3 MW turbines shown in Figure 1. Each turbine extracts energy and wake loss is found downstream. The total offshore wake loss has been quantified from satellite and airborne SAR images in the Wind Energy Department at Risoe National Laboratory. Information on wake loss is important for siting of new wind farm arrays in the vicinity of existing wind farms. Such planning occurs at Nysted in the Baltic Sea as well as Horns Rev in the North Sea, Denmark.

For Horns Rev, satellite SAR images are also used to estimate wind resources near the present and prospected wind farms. Figure 2 shows mean wind speed based on 30 ERS-2 SAR images. The mean wind speed at 10 m above sea level is around 5% higher in the centre of the prospected area than that of the present wind farm. Wind resource estimation at national scale using Envisat ASAR Wide Swath Mode wind maps is in progress. A wind map for Denmark is shown in Figure 3. Satellite SAR observations are calculated into wind speed maps using the CMOD algorithms developed for scatterometers.

The work is supported by Danish Research Council and European Space Agency, Earth Observation Market Development.

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5 ARTICLES AND COMMENT

5.1 Focus on scientific strategy

As EARSeL heads into its forth decade it useful to consider: where is EARSeL today, what are its plans for the future? EARSeL is a European community that advances our understanding of Earth system science by using mostly the space-based measurements. With the next phase of EARSeL there is a need to update the position statement concerning the strategy. I would like to make a few personal comments.

Although EARSeL Symposia attempt to deal with the environmental issues on the global scale the papers tend to be dominated by research on a sub-regional level. To overcome this current bias EARSeL needs to become more inclusive and more global, in the sense of using large spatio-temporal remote sensing data sets. The trouble is that often the rhetoric is not being translated into action. There is a need to reconsider our priorities and develop a scientific strategy organized around programs that focus on the key aspects of the changing environment. We must keep in mind that this topic is very broad and very multi-disciplinary.

EARSeL has to be involved not as observer but as a expert organization dealing with the remote sensing component of programs designed to address the problems that have been identified or that are anticipated in these key aspects of the changing environment. Its role must be regarded as indispensable. We really need to inject new dynamism into EARSeL strategy. Maybe this is a way to get ESA backing for implementation of the scientific strategy. I am trying to understand why ESA is losing interest in the EARSeL activity. The question is how to find out a solution to this problem. In particular it might be useful to know whether EARSeL Proceedings are recognized as being of high quality and how wide the readership is. Information on these issues may help us clarify our scientific strategy.

Multi-temporal remote sensing provides the worldwide scientific community with unprecedented opportunities to assess the potential disturbances in the future functioning of the Earth system. The development of new methodologies and their implementation in international research efforts will be a major challenge in addressing this problem. There is a need for a hierarchy of models, ranging from simple conceptual models for exploring ideas to highly detailed models to check process simulations against remote sensing observation data. To cite Richard Feynman: "The rate of the development of science is not the rate at which you make observation alone but, much more important, the rate at which you create new things to test." Such new things emerge only as research progresses; they are not known in advance. At each milestone, the scientist must study all possible directions. This is due in part to the enormous amount of remote sensing data.

Disturbances that occur at discrete points in time and space – abrupt, locally catastrophic events – are especially interesting. These impacts are highly non-linear and not easily approximated by low-order power series. The notion of disturbance as a discrete event is of course inherently scale-dependent. This includes multi-resolution representations, in which the scale of observations controls the level of detail. The non-linear interactions within the Earth System are on a variety of time and space scales. On all time scales, the drivers may not be linearly proportional to the responses that can give rise to non-linear interactions. The so-called "hot spots" of Earth System vulnerability need to be identified and monitored so that their non-linear interactions can be understood. It is necessary to focus EARSeL activity on this interdisciplinary non-linear Earth System science so as to focus on and encourage the conduct of appropriate investigations on the key issues facing the globe. By promoting research devoted to the international projects/programs EARSeL at the same time will maintain its participation and hence role in a wide spectrum of approaches and studies. The updated strategy has to be developed to facilitate the research objectives focusing on new problems posed by Earth System science in the 21st century. So environmental dynamics provide interesting physics in different ways, illustrating and exercising principles we know but also demonstrating how far we have to go to understand some of the complex phenomena that are involved. Implementation of remote sensing techniques in large-scale projects and fostering quality in the remote sensing research are the highest priority in the EARSeL position. Members are encouraged to help inform the remote sensing community with thoughtful presentations of scientific viewpoints about our ability to understand natural hazards, map changes in Earth's surface, forecast space weather and understand Earth – Sun connections.

We welcome as members, affiliates and partners all who share our interest in understanding the environment by using remote sensing and those who seek to apply this knowledge to the solution of problems that face society. I believe it is achievable and necessary.

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5.2 What is the role of remote sensing in resource management?

I have been involved with remote sensing since 1973. At that stage I was a young academic, in a university School of Surveying in Australia, primarily teaching Photogrammetry, and looking for a suitable PhD topic. A Government agency in Adelaide had accepted the US invitation to investigate the use of what was then called ERTS. All of a sudden they received some of these images, each stored on four large computer magnetic tapes and with advice on their responsibilities in terms of publication of their findings. But they had no one to allocate to this task, certainly no one with the time or the interest, so their need and my interest were brought together in my PhD project.

Early in my remote sensing career, I thought, well, I will be 20 years in research into this technology, then I will move into the commercial side of the technology. Well, I am still in research, even though I have dabbled with the commercial side of remote sensing on a number of occasions.

So, what has happened, or maybe more to the point, what has not happened? Firstly, this is not a unique story; there are many of our members who thought that this technology would provide a good opportunity as it became operational and in the process, commercially exploited. And this technology has provided good opportunities for some individuals, and indeed for most of us who continue to work within remote sensing. But it has not been exploited operationally anywhere near as much as many people had expected when they started their career in remote sensing, and as a consequence, there are many people who saw a career in remote sensing, took up the discipline and then moved out of it, simply because of a lack of career opportunities in remote sensing and finding better job opportunities in other disciplines. So, is remote sensing just a rather delightful optical illusion?

Well, no it is not, at least it is not in some areas. One of the earliest uses of remote sensing was for the operational topographic mapping of large parts of the earth's land surface, even if that was called Photogrammetry. Another operational application is in the weather prediction industry, and of course we have seen the use of imagery to map things like the ozone hole and other environmental phenomena. So, what are the criteria that characterise these operational applications? I suggest that a major criterion is that the information required changes significantly over the area or the period of interest. In this context, the word "significantly" has a number of meanings. One meaning is that the changes are of a large magnitude relative to the unit of measurement, but each element of change may have only a small spatial or temporal extent relative to the total spatial or temporal extent that is of interest. Thus the capacity to map these changes is crucial, and this means that the level of detail that needs to be mapped is small relative to the total extent of the mapping. The second meaning of the word "significantly" is that the changes are important to those who will use the information. With topographic mapping, the changes in elevation can be significant over a matter of tens of metres, which means that there are very many changes to be recorded over the area being mapped, and topographic mapping is of little use unless these changes are mapped. With the weather, the spatial changes are important, but so too are the temporal changes. In both cases the complexity of the technology was high, but the benefits justified the use of this complex technology. It should also be noted that if we are going to use this technology in a routine way, as is the case for the weather and topographic mapping, then the technology has to be made useable by appropriately trained technical people.

With topography, the shape of the land surface is primarily driven by the underlying geologic processes as moulded by the climatic history of the area, modified by the land cover. With only three drivers, one would be excused from expecting that topographic shape and hence the topography itself would be quite predictable, once these drivers are known. But just ask Gottfried or any other Photogrammetrist if you can extend their mapping using numerical modelling techniques and without actual topographic data, and you will receive a look of incredulity. Topography is highly unpredictable, which leads me to suggest that the second major criterion is that the changes are unpredictable, indeed the less predictable the changes, the more important is remote sensing.

We have seen the US, Australia and various other countries attempt to commercialise remote sensing, without success. Now we are seeing the EU and ESA attempting to do this through the GMES initiative. Will this attempt be more successful than these other attempts? A large part of the focus of GMES is on the regional use of remotely sensed data. This is not how remote sensing has been successfully used in a routine operational way up until now, so will it be successful this time?

In considering this question, I cannot help thinking about how a doctor deals with the health of a patient. If a doctor wishes to rapidly and cheaply determine if the patient is in reasonable health, they check their blood pressure and pulse, they do not send them out for costly body scans of one type or another. Using this analogy, maybe the cheapest way for us to monitor the health of the environment is by the use of appropriate indicators. If the indicators show that there is a problem, then maybe these sophisticated imaging techniques are required. Now if we are going to use these technologies in this way, then instead of them being used on a routine basis for a specific role, they are going to be used for quite different purposes and possibly in quite sophisticated ways. So, the groups using them are not going to use them in the same way all of the time, but in quite different ways at different times and for different purposes. If this is the case, then I suggest that the training required, and maybe the type of person involved, needs to be quite different to the case where the technology is to be used for the same general purpose all of the time. So, will remote sensing take on a role in regional resource management, and if so, will it be used routinely for a number of specific tasks, or will it be used, just for emergencies?

Many of us considered that remote sensing would become used in a routine way in the management of regional resources, as part of a new resource management paradigm. This new resource management paradigm is embedded in the assumptions of much of the technical and political discussions that take place in remote sensing. For example it is embedded in many of the comments made at the first Earth Observation Summit, as reported in this newsletter. It happens to also be embedded in the construction of my textbook, the second edition of which will be published in January 2006. This paradigm assumes that imagery and models will be integrated together to provide decision support tools that include predictive and "What If" capacities for resource managers.

For myself, I saw the EC as being a natural place to look to as being a leader in the implementation of such a new paradigm, simply because the EC cannot establish their our bureaucracy within the different countries of the Union, yet they need advice on conditions within the different countries that is independent of individual national biases. So, I saw the EC as a natural user of remotely sensed data. Indeed the Agricultural Directorate is a large user of remotely sensed data, but in terms of GMES, the Agricultural Directorate have chosen not to be part of this push for operational implementation. If we consider another European Institution, the European Environmental Agency (EEA) see indicators as their main weapon in dealing with environmental conditions in Europe. In fact, the EC commissions are, in broad terms denying their interest in being large users of remotely sensed data; at least they were within the GMES forums during the Initial GMES Phase (2002 – 2003). I know because I asked this question. I believe that this reaction by the EC is in part due to their role in the management of resources, and in part due to their reaction to the costs of the data and its analysis. The EC see themselves as being part of the policy-making strata of resource management, and regional management as being the implementation part. Certainly policy formulation is usually done on the basis of statistically collected data, and this is the direction being taken by the EEA.

Is this vision of a new paradigm realistic, given that there are quite fundamental reasons why many environmental processes cannot be modelled with a high degree of accuracy. We have seen that the weather prediction service has managed to extend their prediction from 1 – 2 days in the pre-satellite era to five days now, by the use of an extensive suite of image data, extensive field data and powerful computer systems. And they manage to do this by maintaining a level of generality in their predictions. So, they cannot tell you when it will rain during the day or by how much, if you gave them the coordinates of your location. So, if the weather prediction service is an indicator of the future, then we are going to need a range of sophisticated image data, with extensive field data and models to achieve this goal of providing generalised information in a decision support environment, to strengthen the decisions being made by resource managers. The natural question that arises is when would such a system be justified.

I think that the fires in the Iberian Peninsular this summer have indicated one line of potential use, since fires are very dangerous, very expensive in their control and in their effects and very unpredictable. A second potential application could be flooding. Yet is it most rational to build expensive systems based on emergency needs? I suggest that maybe these emergency needs may drive implementation, but the need to have such systems used on a routine basis will then drive their implementation in more routine tasks.

An important aspect of such a scenario has to do with the capacity of regional management to actually implement such a paradigm. Regional management is notoriously cash strapped in most countries. We have had regional management for a long time, but historically it has had a homo-centric view of its responsibilities; garbage collection, local transportation, pre and primary schooling, health services and so forth. The push within the EC to make implementation of their environmental policies a responsibility of regional government is quite new. Of course, at some point, the pressure created by the dissatisfaction of the EC at the rate and /or level of implementation and the inability of regional management to adequately respond, will create conflict between the various levels of government and this will create opportunities to implement the new paradigm. Only Australia has attempted to implement this new paradigm, "on the cheap", but they soon found that it did not work unless there was adequate funding allocated to that task.

So, I have now come full circle back to the original question. I think, to answer this question, we need to have a better idea about the criteria that govern the routine use of remotely sensed data for resource management, such as in the weather industry, so as to better judge whether operational implementation may be successful. I think that we also need to determine whether this paradigm shift in resource management is a realistic goal, and if so, how is it best to implement such a shift.

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5.3 Is the future digital, hard copy, or both?

There is some debate within the EARSeL Bureau as to whether the newsletter should be digital, hard copy or both. The matter will be considered at the next meeting of the Bureau on 16th September 2005.

A paper version of the newsletter has the advantage that it can be placed in locations where others may read it, who would otherwise not look for it, often simply because they are not aware of its existence, such as students in universities, guests to your office and so forth. It has the disadvantage that the costs will go up if we include images on the cover, sourced either from the articles or from papers in our eJournal, as I would like to do.

An electronic form has the advantage that we can include colour images with the articles at no extra cost, the electronic links to the source material can be maintained and the overall costs of the newsletter will go down. Its disadvantage is that it does not have the same promotional capacity to those not looking for this topic on the web.

If you wish to express your opinion on this matter, then you can do so to your national contact point, directly to a member of the Bureau as listed at the front of this newsletter, or to myself.

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5.4 The earth observation summits

The first Earth Observation Summit was held in Washington DC on 31 July 2003. Representatives of 34 nations and several non-governmental organizations attended the summit. The intention was to pull together disparate systems of sensors - from 'floats' gathering data deep below the sea surface to satellites in Earth orbit. The idea is to create a more tightly linked set of tools for tracking and forecasting environmental changes that can affect fisheries, agriculture, water resources, and climate.
If successful, the effort would be historic. Not since scientists around the world marshaled their efforts for a coordinated study of the planet during the International Geophysical Year, which began in July 1957 and involved 67 countries, has the global community put such a plan on the table.

The statement issued from this summit reads as follows:
We, the participants in the Earth Observation Summit held in Washington, DC, on July 31, 2003:
Recalling the World Summit on Sustainable Development held in Johannesburg that called for strengthened cooperation and coordination among global observing systems and research programs for integrated global observations;
Recalling also the outcome of the G-8 Summit held in Evian that called for strengthened international cooperation on global observation of the environment; Noting the vital importance of the mission of organizations engaged in Earth observation activities and their contribution to national, regional and global needs; Affirm the need for timely, quality, long-term, global information as a basis for sound decision making. In order to monitor continuously the state of the Earth, to increase understanding of dynamic Earth processes, to enhance prediction of the Earth system, and to further implement our environmental treaty obligations, we recognize the need to support:

(1) Improved coordination of strategies and systems for observations of the Earth and identification of measures to minimize data gaps, with a view to moving toward a comprehensive, coordinated, and sustained Earth observation system or systems;
(2) A coordinated effort to involve and assist developing countries in improving and sustaining their contributions to observing systems, as well as their access to and effective utilization of observations, data and products, and the related technologies by addressing capacity-building needs related to Earth observations;
(3) The exchange of observations recorded from in situ, aircraft, and satellite networks, dedicated to the purposes of this Declaration, in a full and open manner with minimum time delay and minimum cost, recognizing relevant international instruments and national policies and legislation; and
(4) Preparation of a 10-year Implementation Plan, building on existing systems and initiatives, with the Framework being available by the Tokyo ministerial conference on

Earth observations to be held during the second quarter of 2004, and the Plan being available by the ministerial conference to be hosted by the European Union during the fourth quarter of 2004.
To effect these objectives, we establish an ad hoc Group on Earth Observations (GEO) and commission the group to proceed, taking into account the existing activities aimed at developing a global observing strategy in addressing the above. We invite other governments to join us in this initiative. We also invite the government bodies of international and regional organizations sponsoring existing Earth observing systems to endorse and support our action, and to facilitate participation of their experts in implementing this Declaration.

If the Earth Observation Summit is a success, what can we expect in the future? Proponents say it could lay the groundwork for a new suite of tools to forecast a range of environmental conditions whose changes can have a major effect on economic development. It could provide scientists building those forecasting tools with the kind of consistent, long-term, high- quality data that gives them greater confidence in the trends and fresh discoveries the data yield. Those in turn get fed back into forecast models to improve their accuracy. In short, the network would become the most powerful tool yet for understanding and managing humanity's pervasive influence on Earth and its ecosystems. Conrad Lautenbacher Jr. (ret.), who heads the US National Oceanic and Atmospheric Administration and who was the lead US representative at the first summit, said that any network that evolves out of the summit must be able to support efforts to provide useful forecasts - from the effects of solar storms on communications and climate to the emergence of harmful algae blooms along coasts to crucial shifts in the salinity of water in seaports, which effects the buoyancy of cargo ships.
The summit came a week after the Bush administration unveiled its blueprint for reorganizing and setting priorities for federal climate-change research. It listed efforts to establish an international Earth-observation network as one of those initiatives. Yet Admiral Lautenbacher points out that the concept of a global environmental observation network has a long pedigree, and it covers far more than elevation alone.

For the past 20 to 30 years, he says, various scientific organizations have been interested in establishing what he terms "a Hubble Space Telescope for the Earth." Meanwhile, population growth, economic development, and the degradation they can bring to ecosystems have prompted increased interest in using an Earth-observation system to help manage the planet's resources. Finally, watershed events like last year's summit on sustainable development in Johannesburg and the growing recognition that environmental problems are no respecters of international boundaries have helped pave the way politically. "The confluence of these things makes this an interesting period, and a time when we're ready" for a truly international environmental monitoring effort, Lautenbacher says.

The Second summit was held in Japan on 25th April 2004 and the third summit was held in Belgium, 16th February 2005. Both of these summits essentially endorsed the 10-Year Implementation Plan being implemented by the *ad hoc* Group on Earth Observations (GEO as the basis for its further development and for establishing a Global Earth Observation System of Systems (GEOSS) to fulfill user requirements among various socio-economic benefit areas. The participants at the third summit affirmed their intention of providing the support necessary to execute the GEOSS 10-Year Implementation Plan as well as resolving to meet before the end of 2007, to take stock of progress and provide further guidance towards the successful implementation of GEOSS.

The 10 year Implementation Plan that was adopted at the Third Summit is given in reference [4] below. The main points about the Implementation Plan are:

1 To establish over the next ten years a Global Earth Observation System of Systems (GEOSS).
2 The vision for GEOSS is to realize a future wherein decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and

sustained Earth observations and information.

3 The purpose of GEOSS is to achieve comprehensive, coordinated and sustained observations of the Earth system, in order to improve monitoring of the state of the Earth, increase understanding of Earth processes, and enhance prediction of the behavior of the Earth system.

4 GEOSS will provide the overall conceptual and organizational framework to build towards integrated global Earth observations to meet user needs. GEOSS will capture the success of Earth observation research programs, and facilitate their transition to sustained operational use.

5 The EC sees GMES and INSPIRE as major components of the EU contribution towards GEOSS.

References

[1] www.earthobservationsummit.gov/
[2] www.mext.go.jp/english/kaihatu/earth/
[3] http://earthobservations.org/docs/EOS%20III/GEO%20RESOLUTION.doc
[4] http://earthobservations.org/docs/10-Year%20Implementation%20Plan.pdf
[5] http://europa.eu.int/comm/research/environment/geo/article_2450_en.htm

6 FORTHCOMING EVENTS

6.1 INTERGEO 2005

INTEGEO 2005 "Crossing Borders" will be held October 4 through 6 at the Düsseldorf Trade Fair Centre. This will be the first time that the congress will convene for three entire days. The trade fair will be open daily Tuesday through Thursday from 9 AM to 6 PM. Visit www.intergeo.de for additional information.

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6.2 Workshop on the analysis of time series of image data

The EARSeL Special Interest Group on the Time Series Analysis of Image Data has organized its first workshop for 20-21st January 2006 in Copenhagen. The purposes of the workshop are to:

- Consider the issue of the adequate pre-processing of image data so as to provide a consistent data set for temporal analysis.
- Learn about some of the datasets being constructed for temporal analysis purposes.
- Learn about the classical methods of time series analysis and consider how it may be adapted to the analysis of image data.
- Hear about current work being done in the temporal analysis of image data.

For a brochure on the workshop please contact the undersigned.

Dr Keith McCloy,
Keith.mccloy@agrsic.dk

6.3 Workshop on 3-D remote sensing in forestry

A joint EARSeL, ISPRS workshop on this topic will be held in Vienna, Austria, 14th – 15th February 2006. Further information is available at the website: -

http://ivfl.boku.ac.at/3DRSForestry

For more details please contact:

Werner Schneider: werner.schneider@boku.ac.at

6.4 Workshop on urban remote sensing

The EARSeL Special Interest Group "Urban Remote Sensing" has organised its first Workshop, to be held on the 2nd-3rd March 2006 in Berlin, Germany. For a brochure on the workshop please contact the undersigned.

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6.5 UDMS 2006, 25th urban data management symposium

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

First announcement & Call for Papers
UDMS, the Urban Data Management Society, has organised international symposia at various locations in Europe in order to promote the development of information systems in local government since 1971.

An important aim of UDMS has been to provide a forum for people to discuss new approaches, to consider new technologies and to share practical experiences in the field of urban data management.

The focus has been on urban applications but regional and rural issues have always been well represented and have grown recently in importance.

6.6 GOOGLE SEARCH SERVICE

Google offer a number of advanced search facilities that can be useful, including:

Scholarship - http://scholar.google.com/

6.7 26th EARSeL Symposium, Warsaw

The 26th EARSeL Symposium, "New Developments and Chalenges in Remote Sensing", will be held in Warsaw, 29th May to 1st June 2006.

For more details please contact Gesine Boettcher at the EARSeL Secretariat, at boettcher@ipi.uni-hannover.de

6.8 Workshop on geohazards; with emphasis on Lowland hazards

The EARSeL Special Interest Group on Geologic Applications has announced this workshop, to be held in Warsaw, 2nd June 2006. For more details please visit the EARSeL Website or contact Prof. Freek van der Meer at vdMeer@itc.nl

6.9 COASTGIS 2006

There is now a call for abstracts for CoastGIS 2006 which is being held in Wollongong, Sydney, from Thursday 13th - Monday 17th July 2006.

For a brochure please contact rfurness@ozemail.com.au

6.10 STM05

The International Symposium on Spatial-temporal Modeling, Spatial Reasoning, Analysis, Data Mining and Data Fusion (STM'05) will be held from 27 to 29 of August this year in Peking University of China. The link to the conference:
http://isstm2005.casm.ac.cn/
The brochure:
http://isstm2005.casm.ac.cn/STM05%20First%20Announcement(Enlish).pdf