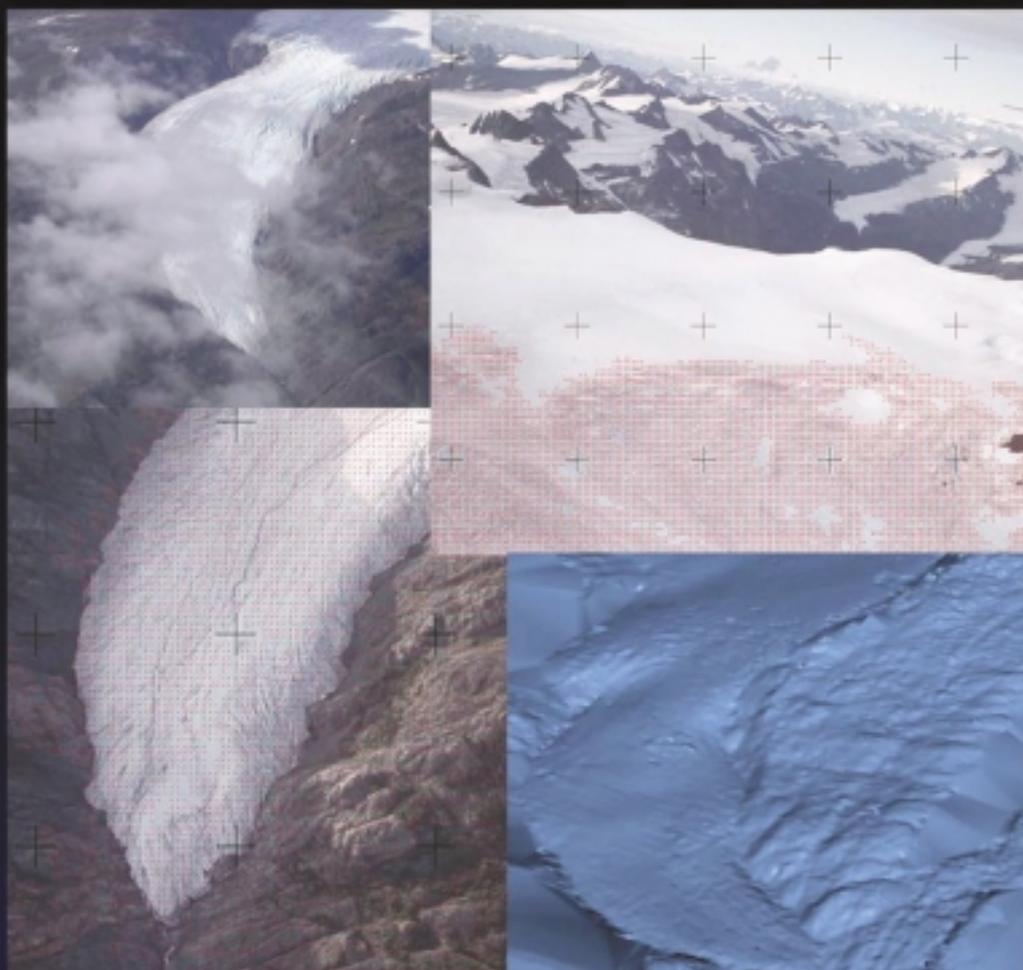


# EARSel



## NEWSLETTER

JUNE 2006 No 66



# EARSel Newsletter

Bulletin of the European Association of Remote Sensing  
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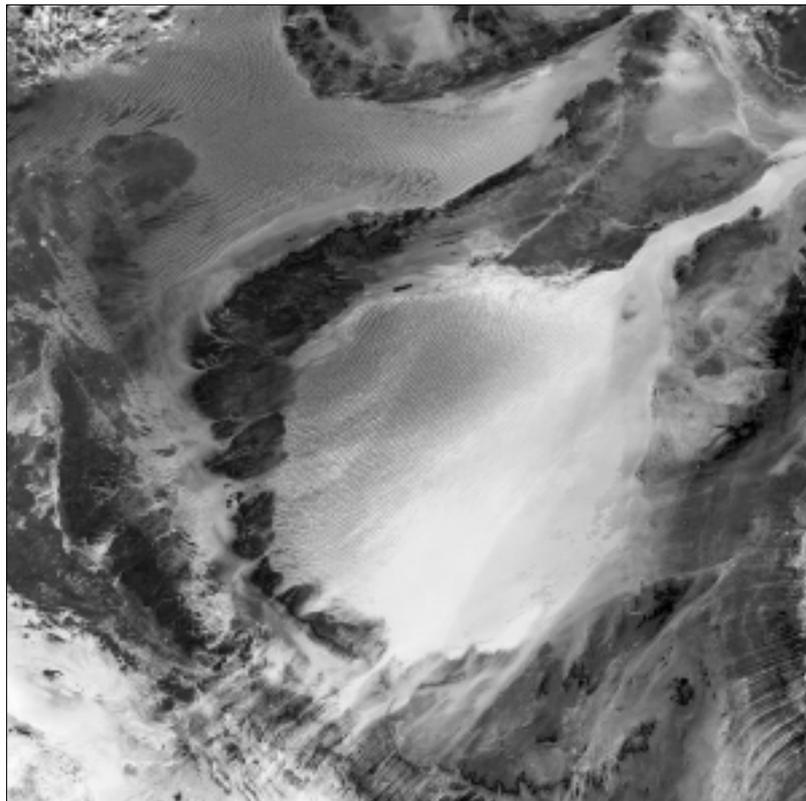
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# 1 EDITORIAL

The world is too much with us; late and soon,  
Getting and spending, we lay waste our powers;  
Little we see in Nature that is ours;  
We have given our hearts away, a sordid boon!  
This Sea that bares her bosom to the moon,  
The winds that will be howling at all hours,  
And are up-gathered now like sleeping flowers,  
For this, for everything, we are out of tune;  
It moves us not.--Great God! I'd rather be  
A Pagan suckled in a creed outworn  
So might I, standing on this pleasant lea  
Have glimpses that would make me less forlorn;  
Have sight of Proteus rising from the sea;  
Or hear old Triton blow his wreathed horn.      William Wordsworth



**The Libyan Uban and Murzuq Sand Seas as seen by ESA MERIS on 24 November 2004.** To see the true beauty of this image, in all its colour, the reader is referred to the electronic version of the Newsletter, available from the EARSel Website at [www.earsel.org/welcome.html](http://www.earsel.org/welcome.html). The image has been accessed from the ESA web page, [www.esa.int/esaEO/index.html](http://www.esa.int/esaEO/index.html). Further comments on the significance of the colours in this image would be appreciated.

## 2 NEWS FROM MEMBERS AND SPECIAL INTEREST GROUPS

### 2.1 Remote Sensing activities in Croatia in 2005

Remote sensing and GIS activities in Croatia in 2005 were concentrated on the active participation of Croatian experts in domestic and international conferences, and on project-related work.

These activities were mainly conducted within the Scientific Council for Remote Sensing and Photo Interpretation of the Croatian Academy of Sciences and Arts. The most important activities were as follows:

In September 2005, Croatia hosted and organised the EUMETSAT Annual Conference. The Conference was held in Dubrovnik, gathering together approximately 200 experts dealing with satellite meteorology and satellite technology. The Croatian experts (DHMZ) presented a paper on the use of the new Meteosat 8 satellite images in creating short-term weather forecasts. The Prize of the European Geophysical Association for young scientists was awarded this year at the EUMETSAT Annual Conference to Ms T. Trošić from the Ruđer Bošković Institute, Zagreb.

Croatian experts also took an active part in the 25th EARSel Symposium, held in 2005 in Porto, Portugal.

In 2005 a number of Croatian experts were also actively involved in the design and development of a number of remote sensing and GIS projects.

The cyclic acquisition of aerial photography for Photogrammetric mapping of South Dalmatia was continued; as was the scanning of analog maps and land-registry plans in accordance with the prearranged plan. *Geophoto* acquired a digital air-camera, which will make possible the commencement of the acquisition of digital aerial photography for Photogrammetric and ortho-photo purposes.

*INA Naftaplin* successfully used satellite

images in its oil- and gas-related work both at home and abroad (in Syria).

Satellite images were furthermore successfully used in the Zagreb – *Dubrovnik motorway* project-related work, as well as in other projects.

In the field of oceanography, a pilot programme was launched, designed to create a highly automatic monitoring network for the Eastern Adriatic coast. Optical sea characteristics were measured, and the results were compared to the satellite data. Final results were used for the standardisation of sea areas according to the optical characteristics of the sea-water. In addition to this, research was done in relation to determining the sea-surface temperature with the help of the satellite data.

Within the scope of forestry research, in assessing the forest stand volume (fir-forest degeneration); infrared coloured aerial photographs were acquired and used for Photogrammetric mensuration purposes. In analysing the level of damage suffered by trees, the key to photo interpretation in assessing the level of damage suffered by individual trees was defined. In analysing the chosen forest complexes, a high-resolution digital camera (MS-3100) was used.

Croatian-forest-ecosystem-related work is underway. In this framework, LANDSAT ETM images are used, as well as the data measured in situ. The final result of this study will be the development of a 1:500000 scale ecological mapping system.

In the field of hydrometeorology, the ten-year-lasting SATMANU project was brought to its end. In this project, experts from Austria, Finland and the Netherlands were involved. Its final aim was creating the Synoptic Satellite Meteorology Manual. The Manual is now available on the Internet at [www.zamg.ac.at/docu/Manual/](http://www.zamg.ac.at/docu/Manual/), in electronic format. It comprises the descriptions of approximately 50 structures stored in satellite images as well as the physical background of their formation. It furthermore includes numerous descriptions and

analyses of interesting meteorological situations and natural disasters.

Work related to the international EUME-Train project on the topic of *Creating computer-teaching material based on the interpretation of satellite images achieved via meteorological satellites* is underway. Apart from Croatian experts, involved in the project are experts from Austria, Germany, Finland, the Netherlands and the United Kingdom.

Marinko Olui\_ (geo-sat@zg.htnet.hr)

## 2.2 New member of EARSel - Institute for geoinformatics and remote sensing, university of Osnabrück.

The **Institute for Geoinformatics and Remote Sensing** (German acronym: IGF) was officially founded in December 2005 at the University of Osnabrück, Germany. Its immediate predecessor was the 'Research Center for Geoinformatics and Remote Sensing' which has conducted research projects in Geoinformatics (GI) and RS for the last five years and was a part of the Environmental Sciences program of the University of Vechta. The transfer of the research group around Prof. Dr. Manfred Ehlers into a more technical environment created the opportunity to start an interdisciplinary research and teaching program in Geoinformatics and Remote Sensing in the School of Mathematics and Computer Science of the University of Osnabrück. The director of the Institute is Prof. Manfred Ehlers.

The Institute reflects the origins of the emergent science of Geoinformatics. Its scientists come from various disciplines such as Geography, Computer Science, Mathematics, Surveying, Biology and Environmental Sciences. The IGF consists of 4 professors and about 14 scientific staff members, most of them working in funded research projects. It is organized in 4 working groups reflecting its primary research fields:

- Geographic Information Systems (GIS)
- Remote Sensing and Image Processing
- Spatial Databases
- E-Learning and Distant Learning

Research projects receive funding from various institutions ranging from the German

Research Foundation (DFG) to the Ministry of Science of Lower Saxony and to the GI industry. In GIS and spatial databases, emphasis is placed on 3D/4D developments, enabling geotechnologies, location based services (mobile GIS) and the development of spatial data infrastructures. In Remote Sensing, research projects focus on automated analysis techniques for ultra high resolution and hyperspectral sensors as well as data fusion techniques and environmental monitoring concepts. E-Learning projects address the internet as learning platform (UNIGIS express) for unemployed academics and the development of specialized Geoinformatics and Remote Sensing modules for academic teaching (FerGI). Another ongoing field of research is the integration of different spatial technologies, i.e. GPS (and in the future Galileo), GIS, remote sensing, image analysis, and LIDAR technologies.

The IGF has also started a comprehensive teaching program offering Bachelor of Science (BSc) and Master of Science (MSc) degrees in Geoinformatics. The program starts in October 2006. It is also possible to obtain a Ph.D. in Geoinformatics. The IGF is the lead institute for the Association for the Advancement of Geoinformatics in Northern Germany (GiN) which is comprised of universities, companies involved in spatial information processing, and public institutions. Information about the IGF can be obtained from the web site [www.igf.uni-osnabrueck.de](http://www.igf.uni-osnabrueck.de).

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## 2.3 Special interest group on the time series analysis of image data

As the convenor of the SIG TAID I have

been invited to give a one-hour tutorial on the analysis of time series data at the Warsaw Symposium at the end of May. The tutorial will cover the classical approaches to time series analysis, where they can be used with image data and when they are not suitable for such analysis as well as some results from the use of such techniques in the analysis of image data. The tutorial will then mention the comparison of two time series, where one may come from the output of a model and the other may be based on image data, or both can come from different models, or indeed from different sets of image data. The tutorial will then move on to consider major issues in the analysis of time series of image data.

Keith McCloy,  
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#### **2.4 Workshop - 3D remote sensing in forestry, Vienna, 14-15 february 2006.**

The workshop "3D Remote Sensing in Forestry" was held in Vienna, Austria, on 14-15 February 2006. It was initiated by the EARSel Special Interest Group "Forestry" and co-sponsored by ISPRS WG VIII/11. The workshop theme was also co-ordinated with the EARSel Special Interest Group "3D Remote Sensing". The event aimed at dealing with all aspects of remote sensing in forestry where the 3-dimensional structure of forests is the object of study or is of major importance in the course of the analysis. The topics covered at the workshop thus included

- geometric forest canopy modelling
- single tree detection from high spatial resolution reflectance data
- airborne and terrestrial laser scanning for forest information retrieval
- interferometric SAR for forest information retrieval
- multidirectional and hyperspectral remote sensing for forest information retrieval
- radiation transfer modelling in forests
- application-oriented remote sensing of 3D forest parameters.

The interest in this workshop exceeded all expectations. Seventy-seven papers were submitted. Forty-four were accepted for

oral presentations and 27 for poster presentations. The number of participants had to be limited to 150 for organisational reasons.

The programme was organised in 12 oral sessions and a poster session. Invited speakers gave reviews of the topics of the workshop: Barbara Koch discussed "3D data for forest- and environmental planning", Juha Hyypä summarised "Methods of airborne laser scanning for forest information retrieval", Andres Kuusk gave an overview of "Radiative transfer in a forest", and Benoît St-Onge reviewed "High spatial resolution imagery for forest mapping, accomplishments and challenges". The distribution of the contributed papers over the various topics showed a focus on laser scanning. A big interest in full waveform laser scanning was noted. The other topics were rather evenly represented, with the exception of applications, which were discussed in only a few contributions. It became obvious that there are many overlaps between the different aspects of 3D remote sensing in forestry, indicating a high potential of synergetic effects.

In addition to the scientific sessions, five companies presented their products and services (laser scanning and digital aerial photography) in an exhibition.

The contributions to the workshop are published on the web-site [www.rali.boku.ac.at/3drsforestry.html](http://www.rali.boku.ac.at/3drsforestry.html). Both full papers and slide presentations are available for most contributions. The selection of outstanding papers to be published in reviewed journals is still under way.

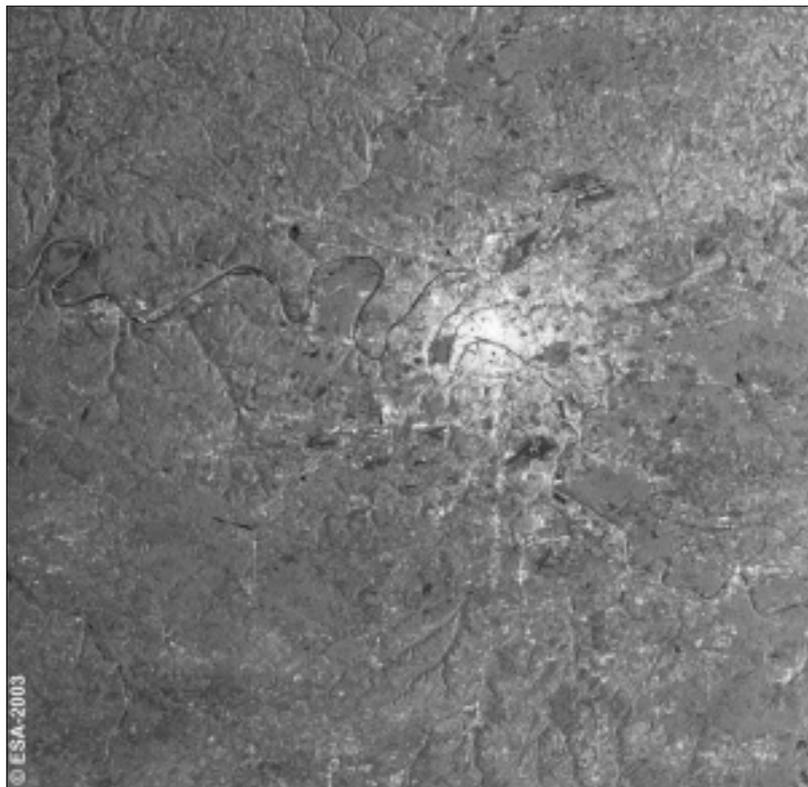
#### **Other events organised by EARSel SIG Forestry**

A more general workshop called ForestSat 2005 was held in Borås, Sweden, May 31 - June 3, 2005. The ForestSat meeting covered all aspects of remote sensing of forests, but had an emphasis on large area operational applications, including methods where National Forest Inventory sample plots were used in combination with satellite remote sensing data. More than 100 persons from 22 countries attended the four day ForestSat 2005 meeting. The meet-

ing was jointly organised by the Swedish University of Agricultural Sciences and the Swedish Forest Agency. The proceedings from the two first days with scientific presentations are available at the web site of the Swedish Forest Agency [www.svo.se/forlag/rapport.asp?boktyp=rappporter](http://www.svo.se/forlag/rapport.asp?boktyp=rappporter). A special issue of Remote Sensing of Environment is also under preparation. The last two days of the meeting were devoted to talks and field excursions related to practical applications of remote sensing of forests. ForestSat 2005 marked the end of the EU-Life program ForestSafe which had

started with the first ForestSat in Edinburgh, 2002. The ForestSat series of meetings is however continuing as a joint activity between EARSeL SIG Forestry and ISPRS WG VIII/11. The next meeting is planned to be hosted by CEMAGREF and will be held in Montpellier, France during 2007.

Prof. Werner Schneider, University of Natural Resources and Applied Life Sciences (BOKU), Vienna, Austria.  
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*Paris, as viewed by the Envisat ASAR on 5 July 2003. Clearly obvious is the Seine, the ring road around the centre of Paris, the high radar returns from the city itself, the forest cover of the Bois De Boulogne to the west south west of the city ring route and the Bois De Vincennes to the east of the city ring route, as well as the Charles De Gaulle, Le Bourget and Orly airports. To see the true beauty of this image, in all its colour, the reader is referred to the electronic version of the Newsletter, available from the EARSeL Website at [www.earse.l.org/welcome.html](http://www.earse.l.org/welcome.html). The image has been accessed from the ESA web page, [www.esa.int/esaEO/index.html](http://www.esa.int/esaEO/index.html). Further comments on the significance of the colours in this image would be appreciated.*

## 3 NEWS ITEMS

### 3.1 Report on the ESA living planet programme strategy workshop

This report has been edited by Preben Gudmandsen, with sections written by those authors as listed with their sections. Contact details are at the end of the article.

#### EO strategy

#### 180 European scientists joined a two-day workshop in Frascati to define the scientific strategy for future satellite missions.

The meeting on 15 and 16 February was called by the European Space Agency to define 'what are the issues to be emphasized and addressed in the next phases' of the Earth Observation Envelope Programme (EOEP) that was endorsed by the December 2005 ESA Ministerial Council meeting.

#### Introduction

The meeting was welcomed by Dr. Volker Liebig, Director of Earth Observation, by stressing the importance he places on the communication with the science committee that this meeting demonstrates. In reviewing present and past ESA activities in Earth observation and EOEP in particular he mentioned that these activities recently were subject to a very positive scientific evaluation demonstrating a high international standing. In this context he commented upon the relationship between the smaller missions that are undertaken versus the long-term observations that are necessary in climate change studies. Among the former he felt convinced that Programme Board would approve a replacement of Cryosat that unfortunately failed in launch in October last year. This was in fact done at the Board meeting on 22 and 23 February. In that case it will eventually be launched in 2009. Although the Earth Observation budget for the next five years is 1.9 B€ a final statement by the director was that the programme nevertheless will have financial boundaries that have to be taken into account. The aim of the meeting shall be to reflect on a new satellite mission for the period after SPOT and Envisat. Future smaller missions with

a launch frequency of about one per year are planned, such as SMOS in 2006, ADEOS in 2008, SWAM and the new CryoSat mission in 2009 and others, with a total of 18 missions being prepared until year 2013.

In his remarks, Professor Hartmut Grassl, chairman of ESA's Earth Science Advisory Committee (ESAC), stressed the need for long-term space observations and for preparing time series of homogenous data, which is a challenge that needs to be met to obtain trends in various Earth parameters. As an example he referred to the Meteosat series of satellites that constitute a source of data that are useful to scientists also in climate research programmes. Sea surface temperature data is another example of available data – albeit a somewhat shorter time series but with small error bars. How this will be secured in the future is presently not clear but the new GMES programme (Global Monitoring of the Environment and Security) might serve that purpose. He referred to the fact that the ESA component to the programme was over subscribed when presented to the December Ministerial meeting, which indicates a great interest in the ESA Member States – and is a strong memento to the EU Commission who will be the other – and larger - contributor to the joint programme. A number of small satellites might also secure long time series of data. The subdivision of remote sensing into ocean, land and atmosphere-related applications would appear old-fashioned, and interactions between these 'disciplines' need more consideration.

#### Overviews

Einar-Arne Herland of ESTEC gave an overview of the activities of the two previous EOEP-1 and 2 with its three main lines of Earth Explorer (EE) missions, Earth Watch Missions and a Technology and Exploitation programme. The Meteosat and GMES programmes may be considered examples of the Earth Watch activity. EE missions include studies of the Earth interior, the physical climate, the geosphere/biosphere and the atmosphere and marine environment. They comprise so-called Core

Missions at a 'price level' of less than 400 M€ and Explorer Missions at less than 110 M€. The initial step is submission of call for ideas that are evaluated on the basis of selection criteria outlined followed by mission and Phase-A studies where the ideas are studied in greater detail as a basis for a final selection by ESAC. A recent call for ideas for Core Missions resulted in 24 proposals that are being evaluated for a decision by June 2005.

Mark Doherty of ESRIN described the exploitation of data and reported on the increasing number of science users that are classified as Category 1 Users or Announcement of Opportunity members. In this context he mentioned the great number of scientific publications that have resulted from studies based on EI data from ESA. He also described the many outreach activities of ESA by way of websites and an education programme aimed at school children, the latter operated with a number of schoolteachers. Consideration is also being given to embark on a series of summer schools and possibly some scheme of support of research students that might benefit from closer cooperation with ESA/ESRIN.

#### Procedures

ESAC had prepared a framework for the discussions in the form of power point presentations on the five topics of Solid Earth, Land, Ocean, Cryosphere and Atmosphere to be verified and amended by the participants in five splinter groups. However, when commenting on this subdivision of the meeting Professor Grassl stressed the need for interactions between the five research areas as many have observed and urged that this be taken into account in the elaborations of the groups. As an example he mentioned that phenomena observed in the coastal zone often were related to events on the adjacent land areas. On similar grounds, he suggested that the two splinter groups on ocean and cryosphere should merge due to the strong interrelationship between these two disciplines.

ESA meetings are always well prepared and in this case a number of drafting teams had prepared power point presentations divided into chapters such as Introduction, State of the Art, Challenges, Observations and System Approach. The number of

slides was limited to about 2 per chapter, and in each chapter a number of bullets proposed ideas that would be relevant in the research area in question. They were available on the web well before the workshop so that participants could be prepared for the discussions in the splinter groups, and it proved to be a very efficient way of arriving at statements and ideas.

Already the day after the workshop a writing team would meet to draft the first version of a document on the basis of the amended power point presentations. The document may be seen as an up-dated version of the one that formed the basis for the present programme and available at ([www.esa.int/esaLP/ASERBVNW9SC\\_index\\_0.html](http://www.esa.int/esaLP/ASERBVNW9SC_index_0.html))

#### Cryosphere

Prepared by Preben Gudmandsen, Technical University of Denmark

Participants followed the suggestion to merge the two splinter groups on ocean and cryosphere. However, in the first meeting it was found that this was unmanageable even though the one person, who had attended both groups, had prepared the power point slides. A main reason was that participants had prepared themselves based on the power point versions and that a new version for a joint action was not prepared.

'The cryosphere (ice, snow and permafrost) exerts feedbacks on the climate system through a number of complex and intertwined processes involving high-latitude land, ocean and atmospheric environment'. This was the opening sentence by the splinter group that also stressed that although 25 years of satellite data are available we still have a poor understanding of the many processes involved.

One issue considered a challenge is the spatial distribution of sea ice and sea-ice thickness and type first-year and multiyear ice) and their variation with time. Another is the mass balance of glaciers and the large ice caps (Greenland and Antarctica), in principle the rate of change of thickness and in the satellite context measurements of snow accumulation and melt. Still an-

other is the qualification of solid precipitation (snow) over land but also on sea ice where snow is a disturbing factor when measuring the thickness (by way of free-board) from aircraft and satellite. A final challenge is the study of permafrost, its seasonal and perennial extent and depth. A number of observations were listed stressing the importance of sustained monitoring at large. One reason for the lack of understanding of many processes stem from the fact that many missions were of short duration and that repetition rate is too small so that important observations are missed. A daring example is the monitoring of tides that influence near-coastal processes that cannot be solved by satellite considering the orbit design.

The group agrees that we need a better integration of the cryosphere in coupled ice-ocean-atmosphere models and pointed out the impact on surface exchange processes, radiation, energy and water balance). It influences biological activities both on high-latitude land areas and in sea-ice frequented waters. The fresh water release from glaciers and ice caps has a consequence for sea level rise and the ocean circulation.

### **Atmosphere**

Prepared by Yasmine Calisesi, University of Berne

The atmosphere splinter group was probably the best attended of the five splinter sessions. About 50 to 60 scientists participated in these discussions, led by the members of the Writing Team Bruno Carli, Tony Hollingsworth, Hennie Kelder, and Paul Simon.

The discussion opened with the recognition of the dramatic evolution observed in recent decades as to the importance of space based observations in atmospheric sciences. While 25 years ago only very few global datasets were available, space-based observations have now become central to our understanding of the Earth system, to our ability to monitor its present state, and to model and forecast its evolution. Progress continues to be made in the scientific understanding and modelling of atmospheric composition and thermo-

dynamics, with primary benefits in the fields of meteorology (short- and seasonal-term weather predictions) and climatology.

Today, changes in atmospheric composition are of political and scientific major concern. Satellites have acquired the ability to monitor air quality and pollution from space, while ground-based networks provide global surface observations. However, knowledge gaps still exist as to the processes determining the composition of the Earth atmosphere, and the sensitivity of the climate system to long-term natural and anthropogenic changes. Special focus was set by the splinter group participants at the lowermost troposphere and its air quality, with, for instance, recognition of the future challenge represented by the need of accurate space-based measurements of water vapour in the lowest 5 km of the atmosphere, or of a better characterisation of the global distribution and radiative properties of aerosols of both natural and anthropogenic origin. The upper troposphere – lower stratosphere (UTLS) region constituted a second point of focus, with identification of the need for a better understanding of the chemical and thermodynamical processes taking place in this highly relevant region of the atmosphere. Finally, the sensitivity of the climate system shall be investigated more particularly with regard to changes in greenhouse gases concentrations, clouds, water vapour, and circulation.

In addition to the definition of the above priorities, the group emphasized the present necessity for a global, interdisciplinary approach to the Earth system. A system approach is required in order to understand and reproduce the complexity of the involved mechanisms, with biological, physical, and chemical exchanges between the oceans, the continents, the biosphere, and the atmosphere. Synergies between different communities and instruments shall be developed and exploited, with the ultimate goal of providing increasingly realistic models of the Earth system as a whole. In an end-to-end vision, recommendation was put forward that the system shall support all aspects of mission-related science from the mission design to its data analysis, including the crucial steps of instruments cal-

ibration and data validation, not neglecting in-situ observations, and reaching as far as the development of fully coupled models and data assimilation systems.

### **Solid Earth**

Prepared by Prof. Christian Tscherning, Copenhagen University

The Solid Earth changes due to processes both at the surface and inside the Earth. They are due to both physical and anthropogenic processes.

Several "challenges" were identified:

- (a) understand and qualitatively estimate mass-transport inside the Earth
- (b) obtain a better knowledge of geodynamic processes (earthquakes, volcanoes, land slides)
- (c) and to develop the basis for a predictive capability of these processes.

An observational strategy was outlined including both mapping of the changing "geometry" and of the associated gravity and magnetic potential fields. It was stressed that long time series were needed. The panel advocated a system approach, having in mind the relationship with other earth-observation areas; a good example here being tsunami warning.

### **Oceans**

Prepared by Rainer Reuter, University of Oldenburg

As pointed out in the plenum session, the missing link to the land and in particular the atmosphere session was regretted. This was emphasised by a number of phenomena e.g. the input of desert dust into the oceans which adds nutrients to the upper water layers and hence enhances biological productivity, and also the exchange of carbon dioxide between atmosphere and oceans, relevant for climate studies, all of them requiring input from the atmosphere community.

It was emphasised in the discussion that remote sensing data are strongly needed for assimilation into models, where the physical models of e.g. ocean currents were considered more developed than the ecological models because of their much higher complexity. The discussion was focussing on the "scientific" aspects of ocean observation

as it is in the foreground of the Living Planet Programme and its Earth Explorer missions. Topics like environmental hazards and pollution aspects were not further considered, since these are part of the Earth-watch Programme. It was clear however that data derived e.g. in GMES and similar operational programmes can be of high value for oceanographic research and should be exploited as well.

The group considered that the open ocean and the coastal zone need to be considered in quite different ways. This concerns a number of instrumental aspects such as geometric versus spectral resolution of ocean colour sensors: a 1-km geometric resolution is appropriate over the large ocean basins, but 50 m would be needed in many coastal areas to observe small-scale features such as turbulent mixing processes and phytoplankton patchiness. Studies of heat exchange between atmosphere and ocean require data of the surface roughness in the range from about 5 cm to metres, and hence a combination of C-band and P-band SAR. The need for new methods and their application with novel instruments was mentioned, but higher priority was given to the continuation of existing data types for achieving longer time-series, and to future studies of the interaction between Earth system components such as the oceans and land surfaces in coastal zones which have not yet been well addressed.

### **Land**

Prepared by Michael Rast, ESTEC, Noordwijk

The Land Splinter Session identified what it considered to be the main challenges for the future. One issue is to understand the structure and dynamics of terrestrial ecosystems by focusing on biological diversity and key ecosystem characteristics and processes, such as productivity, structure, nutrient cycling and system vulnerability.

Further, the dynamics of the redistribution of water within terrestrial ecosystems and the dynamics of the terrestrial component of the carbon cycle should be understood much better.

Also, characterizing the anthropogenic dynamics and the resulting pressures on land surfaces with a focus on land-use and land-cover change would be an important priority. The interconnections between land, atmosphere, oceans and solid earth is important and should take account of biochemical, water, carbon and energy fluxes. This could be achieved by focusing primarily on surface characteristics including bio-geophysical characteristics, biodiversity of ecosystems and natural resources, as well as surface processes such as energy, water, biochemical cycles and biological dynamics. The state of the human population and its interactions with nature is important in this context.

Amongst other priorities the need for long-time series of data was discussed. Combination of observations at multiple spatial and temporal scales was found mandatory. This issue could benefit from synergies among different observation techniques and/or platforms.

### Conclusions

It was the aim of the meeting to outline what are the main lines of future research whilst the likely methods of tackling them were not dealt with in depth i.e. what could be the possible satellite missions to serve this research were only addressed in few cases. Likewise, mission characteristics such as orbit configuration were not dealt with. The importance of long-time period missions were stressed by several groups. All participants considered that the meeting was very successful, with good discussions in all splinter groups that led to useful statements, proposals and ideas. The 'ESA Executive' appeared satisfied but pointed out that the final version of the document might get a somewhat different format than the previous one in view of the many interactions between disciplines that were stated by all splinter groups. The document may be available in June 2006.

In an after-thought it is interesting to note that 180 scientists would take time to join a meeting as this one – and to spend their travel funds on the purpose. Well, one ensures that ones research interests are safeguarded and one meets with old friends and new colleagues. But, still! For ESA it is a

manifestation of the interest in the Earth Observation programme and a good way of getting input to the document envisioned. And a cheap way considering that the salaries of the many participants are for free.

The suggestion to merge two splinter groups leads to the question as to how we may organise future similar meetings. How can we get 'atmospheric scientists' interested in participating in a group of 'cryology scientists', for instance – is the science issues of the polar atmosphere sufficiently interesting for them to join? Or vice versa? Another example is that referred to by Professor Grassl on the relationship between land/river observations and coastal water phenomena? These questions and many more have also a bearing on EARSel activities in the Special Interest Groups (SIG) that are directed towards disciplines. The other problem raised by Professor Grassl of creating time series of existing and future data in a harmonised format and with error bars is another interesting and important issue that could be dealt with in our SIG's. ESA representatives pointed out that presently the agency has no mandate to undertake this type of work.

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### 3.2 School for land administration established

On 23 March 2006 the International Institute for Geo-Information Science and Earth Observation (ITC) and the Netherlands Cadastre, Land Registry and Mapping Agency ('Kadaster') signed an agreement to cooperate in the establishment of a School for Land Administration Studies at ITC.



The issue of land and land administration is increasingly claiming the attention of the international community. In a recent interview in ITC News magazine Professor Hans van Ginkel, rector of the United Nations University of which ITC is an Associated Institution, said: "We have to start work and find solutions that are fair and humane to all parties involved. Zimbabwe has attracted the attention of the international media, but in many countries there is a problem as to who owns the land and how it is registered. Redistribution is a touchy subject. It is in the collective interest to reassign functions to land in both urban and rural areas but with adequate government compensation. And this is a major issue in Europe too. For example: once land is known to be eligible for urban expansion, the price rises. It should be possible to set a price on such plots early on and so reduce the element of speculation. This is a problem shared by developed and developing countries."

The School will deliver land administration education and research within ITC, and will manage and execute a joint land administration programme with the United Nations University. This programme consists of a series of seminars, short courses, and networking. ITC's rector, Prof.dr.ir. Martien Molenaar, said: "ITC is very much dedicated to good governance issues of which administration of land is an important part. As ITC students are mid-career professionals, ITC is fully aware that they are not only interested in academic knowledge, but also in organisational and institutional issues." Therefore he welcomed the cooperation with the Dutch Kadaster, as a prerequisite for good education and research in land administration.

Mr. Godfried Barnasconi, member of the Executive Board represented the Kadaster in the signing ceremony. Mr. Barnasconi said: "the Dutch Kadaster's organisational strategy is to enhance its performance by use of modern management approaches and by the application of advanced information technology. The organisation is aware that in order to eradicate poverty and sustainable development- knowledge and expertise of how to create a good working land registry and cadastre is nec-

essary and the organisation is prepared to share its knowledge with other countries." Mr. Barnasconi is convinced that the School is a very appropriate channel to the developing world.

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### **3.3 27th EARSeL symposium - Geo-information in Europe, Bolzano, Italy, 2007.**

It is with great pleasure that Italy welcomes the return of the EARSeL Symposium after an absence of 18 years. The 8th EARSeL Symposium 17 – 20 May 1988, was the first to be held in Italy, in Capri. The beautiful beaches and coastal environment of Capri stand in contrast to the stark beauty of the Alpine mountains of the Bolzano area where we are hosting the 27th Symposium next year.

In 1988, Sergio Vetrilla, now the President of the Italian Space Agency, was the EARSeL Chairman. The 8th Symposium, using the theme "Alpine and Mediterranean Areas: a Challenge for Remote Sensing" was a great success. It was instrumental in promoting the science and application of remote sensing in Italy and the Mediterranean area in general. Since Capri, EARSeL and Remote Sensing have grown and have witnessed diffusion beyond the borders of the research into the application of remote sensing, usually through integration with complimentary tools and techniques as well as the development of new instruments and the development of new fields of application.

Integration of remote sensing with other disciplines, consolidation of existing techniques and the development of new sources and types of data as well as new analysis techniques provide a rich source of motivation for the future development of remote sensing research and application. The title of the 27th EARSeL Symposium, **GeoInformation in Europe** reflects the broadening scope and deeper integration of diverse technologies towards the better

management of European resources and a recognition of the need to develop ways to foster and strengthen these developments through various European initiatives including GeoInformation, INSPIRE, Galileo, GMES, GEOSS, etc.

The 7th European Framework Programme (2007-2013) will be a fundamental instrument for funding scientific research and technological development in the European Community and specifically in EARSel activities. At present nine sub-programmes have been defined within the 7th Framework Programme. Each of them will be operationally autonomous as far as possible while at the same time demonstrating coherence and consistency and allowing for joint, cross-thematic approaches to research subjects of common interest. Three of them will be of high interest for the Remote Sensing community:

- Information and Communication Technologies (primarily concerning risk management);
- Environment (including Climate Change);
- Security and Space.

We are excited at the range of workshops that are proposed in conjunction with the Symposium, where these include:

**GMES and Risk Management** is a theme that was initiated with a meeting in Italy and taken up by both ESA and the EU as the way to promote the application of remote sensing and the associated spatial technologies. Since then GMES has been developed in the 6th FP of the EU as well as by ESA, and it is emerging as a major EU initiative in the use of space data in support of environmental monitoring strategies. Several EARSel Special Interest Groups (SIG) can find benefit from participation in this theme. An example is the Geologic Hazards in Mountainous Areas (SIG) that has been combined in this Workshop. As proposed by the Chairman of this SIG, the last day of the Workshop will be dedicated at an excursion in the Dolomites with presentation by experts of the area and discussion on Geological Hazards.

The GMES Service Elements should begin to be operational from 2008. This development in the application of remote sensing

should be kept in mind as a guide to how environmentally and risk management oriented applications of remote sensing are likely to evolve in the immediate future, as well as recognising the importance of the various key players in these activities, including ESA and EC-JRC.

The **Remote Sensing of the Coastal Zone, from Inland to Marine Waters**, workshop is one of the most relevant SIG in EARSel that attracts a large number of papers and participants.

The Workshop **Tools and Techniques for the Analysis of Time series Image Data** will focus on the emerging area of analysis in remote sensing to do with changes over time and what sort of information can we get on the land covers and their dynamics from time series image data. The use of time series image data offers real challenges to the researcher as to how to use the data to better understand the problems being investigated and then to subsequently development and test hypotheses concerned with the dynamic processes being studied. There are thus real challenges in the development of tools and techniques as well as in the calibration of the data so as to provide consistent datasets.

The Workshop **Geologic Hazards in Mountainous Areas** focuses on highland hazards including landslides, earthquakes etc and is a joint activity of the EARSel special interest group geological applications and the Geological Remote Sensing Group of the RSPSOC and the IGOS working group on geohazards. A fundamental theme of the workshop is the Risk Management in which several EARSel Special Interest Groups (SIG) can find interoperable interest benefit from participation. The proposed workshop concerns with the Geologic Hazards in Mountainous Areas. The last day of the Workshop will be dedicated at an excursion in the Dolomites with presentation by experts of the area and discussion on Geological Hazards. The Workshop proposed is a follow up from the Warsaw workshop in 2006 which focused on low land hazards.

The Symposium also includes a collaboration with **ISPRS Commission VIII**, Re-

mote Sensing Applications and Polices, the Working Group 2: 'Natural Hazards and Human Health'.

Integrate remotely sensed observation and communication strategies studying vulnerability and hazard for different type of disasters such as forest fire, cyclone, floods, drought, volcanoes, earthquake, land slides etc.

The Symposium and Workshops events have been proposed by the Institute of Electromagnetic Sensing of the Environment of the National Research Council of Italy (CNR-IREA) EARSel Member since its foundation, with the collaboration of the Italian Remote Sensing Association (AIT).

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**3.4 When statistics talk about us .....**

In 2004, the EARSel website ([www.earsel.org](http://www.earsel.org)) was moved from the Center for Energy and Processes in Sophia Antipolis (Ecole des Mines de Paris, France) to a server of Unit for Environmetry and Geomatics in Louvain-La-Neuve (Catholic University of Louvain, Belgium).

Since then, the EARSel website has been regularly updated and fed with as relevant as possible information for EARSel's members, as well as for the international Earth Observation community at large. This website is an efficient way for EARSel's members to collect and disseminate information. It is also a way for the Association itself to make it more dynamic, more visible and widely known.

The main concern of any Webmaster (especially one working on a voluntary basis) is to assess the impact and the utility of the website that he/she maintains. How attractive is it? How relevant is it? Who does visit it? How frequently? What factors can influence the traffic on the website?, and so forth. Replying to these questions can be partly done by tracking the visits of the website and by analyzing them and their trends with specialized software. For this study, elementary statistics were performed with Wusage 8.0 ([www.boutell.com](http://www.boutell.com)) from mid September 2005 until mid April 2006,

and already some trends and lessons have emerged from the analysis conducted on them to date.

Over these 7 months, 8,863 unique visitors, identified on basis of unique IP addresses, visited the site. In total, the web site received 16,428 visits. Figure 1 shows clearly the increasing number of unique visitors from September until now. The website was less visited during December because of the Christmas time. So, the best periods to announce something via the website are October-November, January to March, and probably April to June (to be confirmed later).

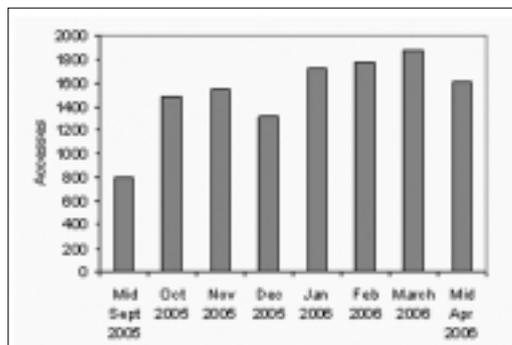


Figure 1. Unique visitor accesses per month from mid September 2005 to mid April 2006.

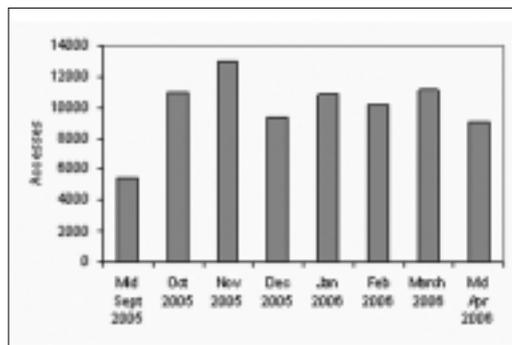


Figure 2. Page views accesses per month from mid September 2005 to mid April 2006.

The web server delivered 669 unique documents one or more times each. These documents are mainly pdf and doc files. A typical visitor examined 3 distinct files before leaving the site. The behavior of the visitors evolved a little bit over this period since, from November 2005 the number of page views decreased (Figure 2) while the number of unique visitors went up (Figure 1). This probably indicates that a greater

number of visitors access directly their pages of interest and no longer surf in an aimless manner.

In September 2005, the website received on average per week 300-400 visits and 2000-2500 accesses. In October and November 2005, these figures increased to 400-500 visits and 2500-3500 accesses per week. In February and March 2006, the number of visits continued to get higher with 600-700 visits per week, but the number of accesses went down to 2500-3000 per week.

Concerning the traffic by day, table 1 confirms increasing number of visits per day from September 2005 to mid April 2006. It shows that the maximum of visits is also continuously increasing over the period. On average, the number of visits per day is highly correlated to the number of mails the members receive from EARSeL's secretariat. Over each period, maximum traffic by day was always observed during the week after an email from the EARSeL secretariat.

After having examined the traffic by hour, one can say that the typical EARSeL visitor visits the site between 9:00 and 17:00, preferably between 10:00 and 12:00 or between 13:00 and 15:00, preferably drinking a cup of tea or coffee!

Figure 3 presents the 9 most frequent entry pages. 44% of the visits start from the Welcome page. Two facts are new from a previous analysis made in December 2005: (i) the page of the Special Interest Groups appears in 4th position of entry pages, being in 5th position before; (ii) the Other Events page, absent from the results of the previous analysis, is now in 5th position of the top 9. This means that visitors are interested in being informed about other events and that the page is regularly visited. A typical visit lasts for 3 minutes.

The typical visit for 18,5% of the visitors starts probably at the Welcome page and ends at the About Us page, while 15,2% of the visitors leave the site at the Welcome page (Figure 4). A part of these visitors enter the website, visit it and then come back to the Welcome or About Us pages before leaving it.

Figure 4 also shows that all the services offered by the website are visited. In future, we should try to make them more dynamic and attractive, and to regularly invite people to use them.

Origin of the visitor	Visits	%
Unknown	12443,00	75,74
Europe	2279,00	13,87
com	879,00	5,35
net	353,00	2,15
gbl	204,00	1,24
Asia	82,00	0,50
edu	64,00	0,39
Australia	33,00	0,20
Canada	33,00	0,20
Africa	18,00	0,11
South America	14,00	0,09
mil	8,00	0,05
North America	8,00	0,05
int	7,00	0,04
gov	3,00	0,02

Table 2. Origin of the visitors.

Only a part of IP addresses can be resolved into DNS addresses providing the origin of the visitor (Table 2). It was not possible to identify 75% of the visitors, which is acceptable. Visitors from all continents visit the EARSeL website. In future, a more detailed analysis on Europe should be performed.

From	To	Days	Period	Average	Max	Min	Mails
14/09/2005	15/10/2005	32	Start of acad.year	69	100	17	0
16/10/2005	12/12/2005	58	Normal period	89	131	42	1
13/12/2005	1/01/2006	22	Christmas time	68	91	0	0
2/01/2006	31/03/2006	88	Normal period	120	168	55	5
1/04/2006	17/04/2006	20	Start of Easter time	105	211	35	3

Table 1. Average, maximum, and minimum of visits per days over 5 periods in relation to mails from EARSeL secretariat to members.

Thanks to our Vice Chairman Rainer Reuter, a new service is coming soon: the Conference Management System (CMS), is under preparation and will be accessible from mid June 2006 from the EARSel website ([www.earsel.org/?target=cms](http://www.earsel.org/?target=cms)). This service will allow the organizers of EARSel events to easily prepare the sessions and the programme (communications, posters, book of abstracts) of their event, and will allow the participants to directly submit their abstracts and to follow their status.

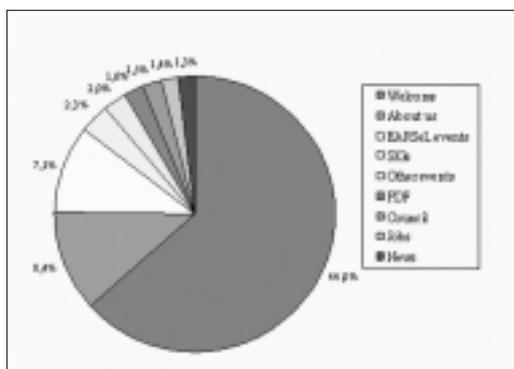


Figure 3. Top 9 of 180 entry pages from mid September 2005 to mid April 2006 in percentage.

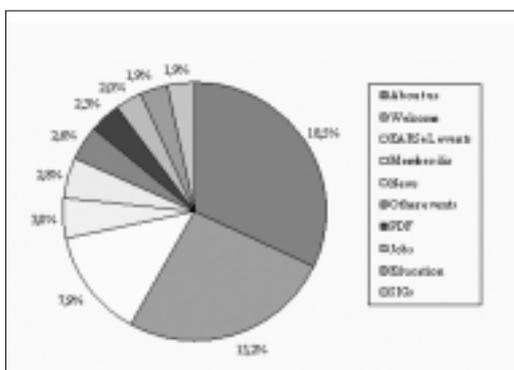


Figure 4. Top 10 of 193 exit pages from mid September 2005 to mid April 2006 in percentage.

Last but not least, our website was recently selected by Thomson Scientific for inclusion in Current Web Contents™ (<http://scientific.thomson.com/products/cwc/faq/>), a selection of scholarly web sites complementing the journal coverage in Current Contents Connect®, the Web of Science®, and other ISI Web of KnowledgeSM applications. Thomson Scientific developed high selection standards (<http://scientific.thomson.com/free/essays/selectionofmateri->

[al/cwc-criteria/](#)). This is a very encouraging situation.

From these preliminary results, several conclusions can be drawn and several actions can be proposed to maintain the website and improve it continuously, and to increase the visibility of EARSel in general:

- planning your announcements for the best periods of website visits;
- providing us regularly with relevant information for the EARSel members or the Earth Observation community ([secretariat@earsel.org](mailto:secretariat@earsel.org), [carine.petit@belspo.be](mailto:carine.petit@belspo.be));
- inviting members by emails to use the services (news, events, jobs, SIGs, eProceedings, education);
- mailing 3 or 4 times per year to a larger database than the EARSel members only.

Open to your suggestions and waiting for your input and collaboration, it is my pleasure to continue to offer this service to EARSel. So, do not hesitate to contact me by email, the success of our association is relying on all of us!

Carine PETIT  
EARSel webmaster, [Carine.petit@belspo.be](mailto:Carine.petit@belspo.be)

### 3.5 Derivation of chlorophyll - a concentrations and bottom properties of lake Garda from remote sensing

This short letter summarises part of research activities carried out by the "water lab." of CNR-IREA within National/International projects on water quality and Remote Sensing. The potentials of MIVIS (airborne hyperspectral instrument) data have been evaluated for mapping chlorophyll-a concentrations and bottom properties in the shallowest water of the Garda Lake. Multi-temporal MERIS data have been instead used to map chlorophyll-a concentrations in the whole lake, in four dates in summer 2003.

#### Rationale

Lake water is an essential renewable resource for mankind and the environment and it is important for civil, industrial and recreational purposes. Sustainable use of

water resources requires the coupling of surface waters assessment monitoring programs and decision-making and management tools. In Europe, the Water Framework Directive (WFD) is the major reference to guide efforts for attaining a sustainable aquatic environment in the years to come. The WFD includes guidelines which define the categories of quality and the required components and parameters. As some of these parameters can be determined by Remote Sensing (RS) with a reasonable accuracy, RS-related technologies may be integrated in the monitoring programs defined by the WFD.

**Study area**

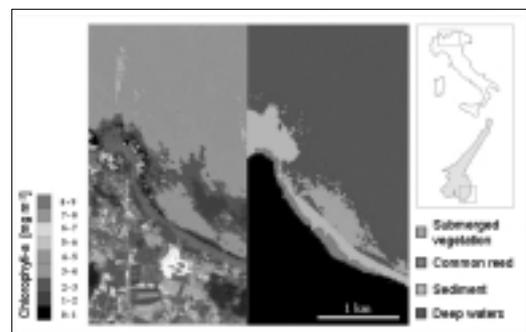
Approximately 500,000 lakes with over 1 hectare in surface area exist in Europe. Most of the largest European lakes are located in the Nordic countries and in the Alpine regions. The most important Italian lake district is located in the northern part of Italy and represents more than 80% of the total Italian lacustrine volume. Lake Garda, located 65m a.s.l. at the eastern border of the subalpine lake district, is the largest Italian lake. It has a surface area of 368 km<sup>2</sup>, a volume of 49 million m<sup>3</sup> and a maximum and a mean depth of 350 m and 133m, respectively. According to the OECD, Lake Garda can be classified as an oligo-mesotrophic basin even if values recorded in the last years appear to suggest change towards more mesotrophic conditions as also indicated by the recent Cyanobacteria blooms (e.g. *Anabaena lemmermannii*). The shallowest waters of the Lake Garda are characterised by the presence of several species of aquatic macrophytes, which conclude their vegetative cycle either standing below the air/water interface (e.g. *Potamogeton natans*, *Vallisneria spiralis*, *Chara*), or emerging from the water (e.g. *Phragmites australis*).

**MIVIS Data**

On 13th July 2000, the Multispectral Infrared and Visible Imaging Spectrometer (MIVIS) surveyed the southern portion of Lake Garda, providing image data of about 9m x 9m pixel size, used to derive the following products.

The applicability of semi-empirical algorithms to assess chlorophyll-a concentra-

tion using atmospherically corrected MIVIS data was investigated by the calculation of channel ratios. The ratio of each of the VIS and NIR MIVIS derived reflectance against each other was calculated. These ratios were linearly correlated with calibrated continuous track fluorometer data measured in situ in coincidence to the overflight. This allowed the identification of any channel ratios which showed a high correlation with chlorophyll-a concentrations. The highest value of the Pearson correlation coefficient (r=0.92) was provided by the 560nm/760nm ratio. The regression equation related to this band ratio was finally used to produce the map on the left of those shown below.



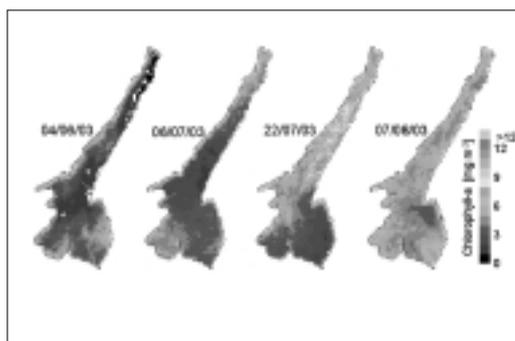
*LakeGarda\_MIVIS: Exploitation of MIVIS (Multispectral Infrared and Visible Imaging Spectrometer) data acquired over the southern portion of Lake Garda (Italy) on 13th July 2000. On the left: spatial variation of chlorophyll-a concentrations obtained from the sensor radiances and in situ chlorophyll-a data. On the right: classified MIVIS data to bottom cover classes of sediment (cyan) and submerged vegetation (green), together with optically deep waters (blue) and common reed, *Phragmites australis*, (red) classes.*

A standard clustering procedure on RS data consists in the determination of a suitable mixture of radiance distributions, based on training samples only, followed by a classification, pixel by pixel, performed by maximizing the likelihood ratio. In this way all the information on clustering contained in the unsupervised samples is lost. To fully exploit the whole data set, a suitable bayesian method, called Data Augmentation Algorithm, has been implemented. Here it was applied to the aerial MIVIS hyperspectral data, whose purposes

include also the detection of submerged macrophyte growing in the lake. Results relative to 4 cover classes are shown on the right of the map shown above.

**MERIS data**

Level-1P (L1P) Full resolution (FR) MERIS data acquired close to *in situ* measurements of chlorophyll-a concentration in Lake Garda were analysed. The top of atmosphere radiances of L1P were converted to RS-reflectances with an algorithm based on the 6S radiative transfer model. To estimate concentrations of chlorophyll-a from RS-reflectance values a bio-optical model, parameterised with the specific inherent optical properties of the lake, was inverted using fast inversion procedures, such as band-ratios or optimisation techniques. The image products were then compared to *in situ* data measured close to the image acquisitions.



*LakeGarda\_MERIS: Chlorophyll-a concentrations maps obtained from full resolution MERIS data acquired over Lake Garda (Italy) in summer 2003. These maps have been derived using a bio-optical model parameterised with the inherent optical properties of Lake Garda waters and optimisation techniques*

The optimisation technique (from bands 5 to 9) and the band ratio (b5/b7) applied to the 6S-corrected L1P data provided values in agreement with *in situ* observations (RMSE=0.87 mgm<sup>-3</sup> for optimisation, RMSE=1.20 mgm<sup>-3</sup> for band-ratio). Results obtained from the optimisation technique are shown in the figure above.

**Outlook**

This work is part of ongoing research efforts aimed at developing RS strategies to-

wards the implementation of a procedure, ensuring systematic monitoring of water quality in lacustrine waters. The study site is Lake Garda where different activities in the past years have been converged. Lake Garda is also the largest lake of Italy and also offers the most suitable features to meet geometric resolutions of operational-oriented sensors, such as MERIS. Research efforts are now required to improve the parameterisation of the bio-optical model and to extend the procedure to the other basins of the Subalpine lake district.

**Acknowledgements**

MIVIS data were acquired by CGR-Parma (Italy), MERIS data were provided by the AO553 Project supported by ESA. The Italian Space Agency - NINFA Project and the CNR/CSIRO Agreement (2004-06) have been the main sources of funding of our research activities.

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**3.6 EOVOX finds that the eo value added industry is inadequately represented in the development of GMES type activities**

The EO VOX contract was let by ESA to, "Liaise with and collect information from industry members, organizations and associations concerning the issues that a representation body should be addressing; consolidate input from the Survey of the EO service industry concerning industry representation. Propose definitions of the possible Beneficiaries bases (i.e. Value Added Companies potential beneficiaries of a representation body, taking into account the:

- EO services sector with its diverse constitutive elements
- Positioning of EO within the aerospace sector and, in particular, the space applications sector (EO, Navigation, Telecom)
- Positioning of EO within the geo-information (GI) sector.

Refine the existing characterisation of the

EO services sector and propose possible Beneficiaries bases to be considered for the analysis of industry representation. Perform the analysis of the interests, issues and needs for each category of player for each Beneficiaries base. Identify major common issues concerning the development of the market for EO based services. Identify key topics which are relevant to the EO sector and which represent important prospects for federating industry around common issues. For these key topics identify and characterise common issues that can contribute to uniting the EO services sector for common strategic actions that industry representation can support.

Output a report that at least includes:

- Categorization and characterisation of Beneficiaries bases
- Analysis of issues for each segment of the Beneficiaries base and of commonalities within issues
- Identification of key topics of EO applications and characterisation of common issues.

The report has now been tendered back to ESA. The key findings of that report are:

#### *The case for improved representation*

The majority of the Value Added Companies (VAC's) feel that the current representations for the EO downstream service sector are too weak and that their views and influence is out of balance with that of the larger space companies.

A stronger lobbying position to influence future programmes, public development funding and to address some of the real obstacles for market development such as lack of operational data supply constitute the strongest (upstream) drivers for industry representation.

A stronger industry representation is likewise believed to be of benefit in addressing future market opportunities by establishing links to players outside the traditional EO industry (downstream).

#### *Drivers that affect supply and demand in the EO Service Sector*

Over 60% of respondents regarded GMES to be an important driver for future market development.

Many respondents believed GMES commercial spin-offs to be an important driver but just as many predicted a negative effect on existing commercial relationships and based on past experience, doubted possibilities for entering GMES "end-to-end" service chains created by players already active in GMES.

About half of all respondents regarded the development of innovative EO based services such as Location Based Services (LBS) and Geo-marketing as important drivers stressing the importance of applications taking advantages of synergy between different technologies.

#### *Market Obstacles*

Some companies report that there is a risk associated with operational access to data from EO missions relevant to VACs. However some do report the opposite, e.g. some EO services using ENVISAT ASAR with data access success rate close to 99%.

Many companies report that there is a risk if data continuity is not ensured for EO missions relevant to services that industry is offering today and in the future.

Industry needs adequate public support to develop their businesses and this requires adequate levels and types of support, at the right time that matches the overall industry agenda.

This need must be properly communicated and explained to supporting institutions (e.g. the EC and ESA).

#### *Industry Evolution*

There are a number of recent disruptive developments concerning evolution of the industry that many VACs have not yet assimilated into their strategies, these include the impact of GoogleEarth, geo-spatial technology convergence and ubiquity, in-sourcing, off-shoring and new European policies impacting technical standards, high value jobs and corporate sustainability.

The keyword best summarising the future structure foreseen for the EO Industry is consolidation. Around 75% of respondents believed in industry consolidation where the value chain will be fused and, at the same time, some VACs are forming and will form closer collaboration in order to become stronger and remain competitive in the future.

It is believed that the overall market will grow and the interview responses confirm the growth trend estimated in the "The State and Health of the European EO Service Industry" report by the VEGA Group, Booz Allen Hamilton.

It is expected that the larger companies will grow bigger through absorption and expansion. Their prevailing strategy will be to provide end-to-end systems and to deliver standardized GIS ready products directly to the end-user.

It is believed that some small VACs will be absorbed or bought up either by the big EO players or by complementary players or end user organisations (in-sourcing). Others will disappear, grow bigger by networking or sustain as niche players. At the same time new players will keep emerging due to low entrance barriers into the industry. VACs do not however necessarily see these changes as a threat or as a negative thing. Rather as a natural consequence of industry growth, this might also open up new opportunities.

#### *Common Industry Issues*

Answering questions on common industry issues, almost 80% of respondents believed that VACs could work together on the development of new products and services. More than 60% of respondents thought that new types of markets could also be better accessed through collaboration between VACs.

#### *Expectations for a Trade Association*

Three main roles of an EO Trade Association have been identified, these are to act as a common voice for the industry, to establish synergies by facilitating collaboration with non-EO players to optimise the development of applications from synergistic technologies (e.g. satellite navigation/communication, mobile technologies etc) and to promote the combined capabilities of the EO Service Sector.

A "wish list" of the main activities of an EO Trade Association, as compiled from the survey included:

- professional lobbying to influence future EO programmes;
- network facilitation
- market intelligence gathering

- export facilitation/support
- communication on what is going on.

Feedback concerning development financing to support VACs:

- Respondents were very positive about ESA EO application development projects since they were seen as being uniquely tailored to small and medium sized VACs.
- Geo-return (ESA) was seen as an issue creating an imbalanced tendering process and given the capabilities of Europe and Canada, did not result in the optimal solutions, which normally arise from free competition.
- Recommendations for further funding included testing new ideas, user demonstration, commercial market development and export oriented initiatives.
- Recommendations for improvement included less prescriptive SOW and more freedom and flexibility in proposal/project implementation to maximise on innovativeness and an introduction of a pre-screening service to minimise efforts lost due to the high level of competition.
- In some countries, e.g. UK, Portugal, Finland national funding for the development of EO applications is scarce.
- The EC funding programmes instruments, e.g. the large FP6 Integrated Projects were not regarded as a very efficient way of conducting applications development.

The report has been prepared by Brigitte Holt Anderson of Controlware and reviewed by Matthew Stuttard of LogicaCMG.

### **3.7 Estimation of alpine pasture production from field and satellite remote sensing data**

**Abstract** - This short letter summarises part of research activities carried out by the "land and vegetation lab." of CNR-IREA within regional/national projects on alpine pasture production assessment by Remote Sensing.

The spectral properties of different alpine pasture species have been studied acquiring radiometric measurements for three years (2002-2003-2004) in two test sites lo-

cated in North-East of Italian Alps where contemporary green and dry biomass were measured with traditional agronomic methods. Performance of different vegetation indices in describing pasture production was evaluated by correlation analysis. Finally a pasture production/yield map was created scaling up through the use of Landsat ETM+ satellite image the best relationship defined between biomass sampling and field spectral measurements.

**Rationale**

Alpine pastures are an expression of a balanced interaction between human activity and natural environment; they represented an important economic income for the local community and guaranteed the conservation of mountain resources and natural biodiversity. Sustainable conservation and development of those areas requires a better knowledge of the available resources and ecological functionalities of alpine landscape. In this framework remote sensing and GIS techniques allow the monitoring of the grassland phenology and

productivity, over the long period and at regional scale, and the estimation of the changes in vegetation typology.

**Study area**

Two representative study sites - within the Stelvio National Park - with different vegetation characteristics and productivity were selected for experimental data acquisition: Alpe Trela (46° 31' N, 10° 14' E), covers an area of 947 ha between 2150 and 2580 m a.s.l. and Alpe Boron (46° 26' N, 10° 16' E) has an area of 112 ha between 1994 and 2117 m a.s.l.

**Material**



Figure 1 a



Figure 1 b

Figure 1- (a) Study area in relation to Italian Alpine Pastureland (b) a picture of the Malga Trela study site location

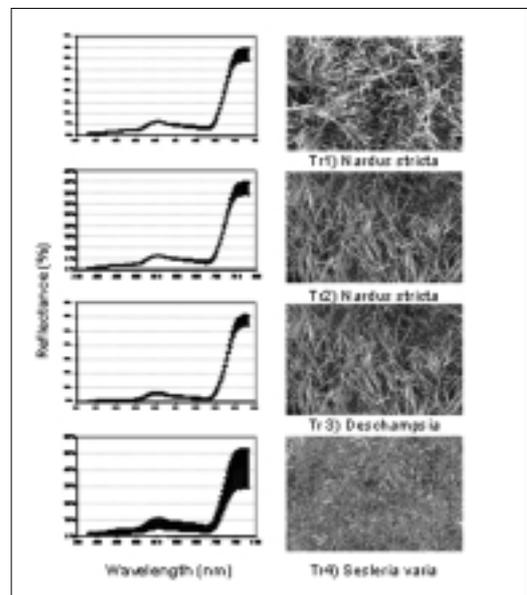


Figure 2- Mean (n=10) spectral response (350 – 900 nm) of the four different typology of alpine pasture acquired the 19th of July 2002 on Malga Trela test site. Picture of the study plot are presented. Different heterogeneities of vegetation surfaces, detected by spectroradiometer, are described by 1 standard deviation.

Test sites were selected according to a previous analysis of the available digital cartography of alpine pastures of Regione Lombardia in order to provide sampling representative of different pasture biomass production levels. For the 2002 campaign, four test sites were selected in the larger Alpe Trela and for the 2003 and 2004 campaigns, two test sites in the Alpe Boron were identified. Vegetation composition and phenological stage for each test site were assessed according to Braun-Blanquet

method over an area of 1m<sup>2</sup>. Within each test site (100 x 100m wide) six 1m<sup>2</sup> plots were selected and geo-located using a GPS system (Garmin III plus, ~ 5m accuracy). Topographic, pedological and hydrological characteristics were also recorded. Field radiometric measurements were acquired for each plot, just before clipping the grass, using using FieldSpec-FR (2151 bands, spectral range 350-2500nm). Total above ground biomass was then measured cutting the herbaceous compound along strips. Fresh biomass was weighted in the field and after drying at 70°C in the laboratory.

To study the biomass spatial distribution over an area of 50 x 50 km a Landsat-7 Enhanced Thematic Mapper Plus (ETM+) image was acquired on July 19, 2002 contemporary to the field campaign of Alpe Trela. Satellite image was pre-processed with the ortho-rectification procedure to minimize the geometric distortions and was atmospherically corrected using the 6S radiative transfer model to derive ground surface spectral reflectance.

**Methods**

Different Vegetation Indices were calculated to test the improvement of soil adjusted VIs (SAVI, MSAVI, OSAVI) with respect to commonly used NDVI and SR. Regression analysis was then conducted to study the relationship between vegetation indices and ground-collected biomass and to highlight which VI has present the best performance.

Biomass map was produced using the best derived empirical model after a scaling-up procedure that involved two steps: conversion of field spectrometer measurements into Landsat ETM+ band equivalent reflectance and calibration of the satellite derived VI data with respect to the field observed VI values.

**Results**

All the relationships resulted statistically significant (P < 0.0001) and present good correlation; soil-adjusted vegetation indices show higher coefficient of determination (SAVI R<sup>2</sup>=0.61; OSAVI R<sup>2</sup>= 0.64; MSAVI R<sup>2</sup>= 0.63) respect to the other two indices (SR R<sup>2</sup>= 0.52; NDVI R<sup>2</sup>= 0.42). Cross cali-

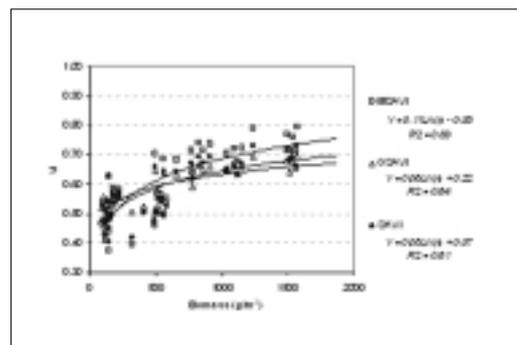


Figure 3 - Relations between measurements of the aboveground pasture biomass and spectral vegetation indices computed from field spectroradiometer data.

bration procedure highlight that MSAVI empirical model present the best performance.

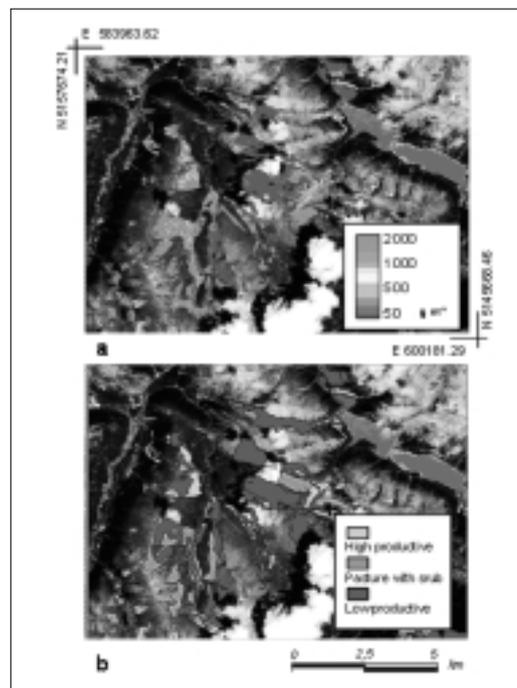


Figure 4 – Comparison between the (a) map of fresh biomass derived from satellite image (2002) and (b) alpine pasture map derived from the digital thematic cartography 1:10.000 (2000).

MSAVI model equation, after a proper scaling up procedure, was applied to the Landsat ETM+ image of 19 July 2002. Figure 2.4a shows the spatial distribution of the fresh biomass production over an area of 12 x 8 km. Estimated values of fresh biomass were generally in a reasonable range. The satellite map shows the typical trend of biomass rate in an alpine ecosystem. Be-

sides the soil typology and hydrologic characteristics of the area, pasture production strongly depends on the environmental and climate conditions such as temperature and insolation (local topographic slope and exposition).

For a visual comparison the pasture map of the study area, presently used to support rangers' activities to plan the livestock management during the season is reported in figure 4b. In this digital map pasture areas are subdivided in classes with different physiognomic characteristics that express also the expert judgement on the biomass rate and quality. A general agreement can be observed between the spatial patterns of the two products: satellite biomass map identifies areas at different biomass rate with similar shape of the class of pasture map. Additional information can be found in the satellite biomass map where certain variations within the pasture class can be observed. The spatial heterogeneity of the alpine pasture landscape, not fully captured by the pasture class polygons, is better reflected in the satellite image granularity.

#### Conclusion

Sustainable conservation and development of alpine pastureland resources require a better knowledge of their ecological functionalities. Although the spatial and spec-

tral resolution of the present operational satellite are not always the more appropriate for mountain ecosystems, remote sensing techniques can offer a great contribution to the monitoring of the alpine pasturelands at regional scale. In conclusion, aside from unavoidable variations of pasture production from year to year according to the changes in the climate conditions, the integrated use of spectroradiometer measurements and satellite observations with the proposed scaling-up approach, could in future facilitate the monitoring of alpine pasture biomass production at regional scale.

#### Acknowledgements

This work was a coordinated project with the Department of Crop Science, University of Milano, and was conducted in the framework of PAM (Multifunctional Alpine Pasture) project funded by the Regione Lombardia.

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## 4 FUTURE EVENTS

### 4.1 26th EARSel symposium, Warsaw, Poland

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

[www.earsel.org/welcome.html](http://www.earsel.org/welcome.html)

### 4.2 ISPRS commission I symposium

To be held in Paris, France, 3 – 6 July, 2006, with the theme "From sensors to imagery". Details are available from:

[www.colloquium.fr/sfpt2006](http://www.colloquium.fr/sfpt2006)

### 4.3 Seventh international symposium on spatial accuracy assessment in natural resources and environmental sciences (Accuracy 2006)

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

### 4.4 ISPRS mid-congress symposium

The ISPRS Commission VII mid-congress symposium, "Remote Sensing Applications

for a Sustainable Future", will be held between 4-7 September 2006, Haifa, Israel. Tutorials and Workshops, will be held prior to the symposium.

For more details please contact:  
ISPRS8 [isprs8@geo.haifa.ac.il]

#### **4.5 Atlantic Europe conference on remote imaging and spectroscopy**

Preston, United Kingdom, 11-12 September 2006

[www.uclan.ac.uk/aecris](http://www.uclan.ac.uk/aecris)

Funded by ERDF (European Regional Development Fund), endorsed by IAPR (The International Association for Pattern Recognition), and sponsored by 8 organisations in Europe, the conference provides a venue in the Atlantic area of Europe for presenting the current development, as well as networking and sharing experiences, with academics/engineers/researchers/scientists/specialists both in the region and in the rest of the world, on all aspects of sensing technologies, processing methodologies and applications related to remote imaging and spectroscopy.

The conference programme will include presentation sessions, poster sessions, demonstration of interactive and immersive stereoscopic visualisation, and social events. There will be best paper and poster awards. The conference language is English.

Prospective authors are invited to email an abstract (less than 300 words) of the proposed paper by email before **26 April 2006** to the Technical Chair, Dr. Matuszewski B J at [bmatuszewski1@uclan.ac.uk](mailto:bmatuszewski1@uclan.ac.uk).

#### *Important Dates*

Deadline for submission of abstract:

26 April 2006

Notification of acceptance (oral or poster):

15 May 2006

Submission of full paper for publication in conference proceedings: 21 July 2006

A poster is attached to provide further information and we look forward to receiving abstract from you and your colleagues. Dr. Phil Holifield (Organising Chair)

Tel: 01772 893168

Fax: 01772 892901

Email: [pholifield@uclan.ac.uk](mailto:pholifield@uclan.ac.uk)

#### **4.6 Ninth international symposium on high mountain remote sensing cartography**

The symposium will be held in Graz, Austria, from 14-22 September 2006. Call for abstracts is open until 31 January, 2006. For more details please visit [www.kfunigraz.ac.at/geowww/hmrsc/hmrsc\\_9/](http://www.kfunigraz.ac.at/geowww/hmrsc/hmrsc_9/)

#### **4.7 Second workshop on landuse and landcover**

EARSel Special Interest Group on LAND USE AND LAND COVER, will hold their second workshop in Bonn, from 28 – 30 September 2006.

For more details please contact:

[www.zfl.uni-bonn.de](http://www.zfl.uni-bonn.de)

#### **4.8 Second Goettingen GIS and remote sensing days**

The theme of the 2nd Göttingen GIS & Remote Sensing Days is "Global Change Issues in Developing and Emerging Countries". The meeting will be held between 4th – 6th October 2006. For more details please contact:

[GGRS@uni-goettingen.de](mailto:GGRS@uni-goettingen.de)

URL: [www.ggrs.uni-goettingen.de](http://www.ggrs.uni-goettingen.de)

#### **4.9 27th EARSel symposium, Bolzano, Italy**

The 27th EARSel Symposium will be held in June 2007 in Bolzano, Italy. More details will come in the next issue of the newsletter.

## 5 WEB ADDRESSES

If you know of other good e-sites for news and information, data or advice that you wish to share with your colleagues, please let me know as I will publish those that are relevant in future editions of the newsletter.

### 5.1 Electronic news sources

#### GENACS GMES E-NEWS

This E-News is published by the GENACS Consortium – GENACS is a 6th FP Specific Support Action funded by the European Commission / Directorate General Enterprise and Industry. The views expressed in this E-News are those of the authors and do not necessarily represent those of the European Commission or of the European Space Agency.

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Contact: [info@gmes.info](mailto:info@gmes.info)

The GENACS E-NEWS covers the commonly distributed material from ESA, EU and other sources.

#### EO-PORTAL

The Earth Observation Portal provides a news service on all aspects of Earth Observation. You can register to have their e-news sent you through their web page at:

[www.eoportal.org/?=news120](http://www.eoportal.org/?=news120)

#### NASA NEWS

NASA distributes information about their activities as well as those of supporting scientists. You can have notification of the latest edition of this sent automatically to you through their web page at: -

<http://earthobservatory.nasa.gov/Study/>

#### ESA PORTAL

ESA provide news from their web site;

[www.esa.int/esaCP/index.html](http://www.esa.int/esaCP/index.html)

You can subscribe to receive your preferred

ESA news on a variety of topics by going to:

[www.esa.int/esaCP/subscribers.html](http://www.esa.int/esaCP/subscribers.html)

You can also get a lot of information on Earth Observation including copies of about 790 images of different parts of the globe at

[www.esa.int/esaEO/index.html](http://www.esa.int/esaEO/index.html)

#### ASPRS GUIDE TO LAND IMAGING SATELLITES

The latest version of the ASPRS GUIDE TO LAND IMAGING SATELLITES, is now available at

[www.asprs.org/news/satellites/](http://www.asprs.org/news/satellites/).

This version provides the most recent information on land imaging satellites. It replaces a version, which was distributed at the most recent Pecora 16 Conference in Sioux Falls. If you have questions and/or comments, please contact Bill Stoney directly at <mailto:Wstoney@mitretek.org>.

#### SARTREK

The Radarsat – 2 Newsletter carries a lot of information about preparations for Radarsat 2, as well as information about other activities related more to the analysis of radar data per se, including software, training courses, and so forth. You can register to automatically get the newsletter by contacting:

[clientservices@mdacorporation.com](mailto:clientservices@mdacorporation.com)

#### GIS DEVELOPMENT WEEKLY

This weekly electronic newsletter carries stories on Remote Sensing and Photogrammetry as well as GIS stories. You can register through:

[www.gisdevelopment.net/ezone/index.htm](http://www.gisdevelopment.net/ezone/index.htm)

#### NEWSLETTER, EUROPEAN ASSOCIATION OF REMOTE SENSING COMPANIES

Contains stories related to EARSeL and web addresses to many activities related to Remote Sensing.

[www.earsc.org/newsletter/](http://www.earsc.org/newsletter/)

## 5.2 Sources of image data

### SPOT IMAGE

This is the source for existing SPOT image data and for placing orders for new data acquisitions.

[www.spotimage.fr/html/167.php](http://www.spotimage.fr/html/167.php)

### NASA EARTH OBSERVING SYSTEM DATA GATEWAY LOCATIONS

This portal gives you access to information on most of the NASA and USGS datasets that are available. You can enter as a guest, or you can register.

<http://redhook.gsfc.nasa.gov/~imswwww/pub/imswelcome/imswwwwsites.html>

### EUROMAP

Distributes Indian IRS satellite data. They have some electronic search facilities and they will conduct searches for free.

[www.euromap.de/site/index.html](http://www.euromap.de/site/index.html)

### SATELLITE IMAGING CORPORATION

Sells Quickbird, Ikonos and SPOT-5 image data.

[www.satimagingcorp.com/](http://www.satimagingcorp.com/)

### USGS

The US Geological Survey Depository of

image and map data held by the USGS.

<http://edc.usgs.gov/>

### EURIMAGE

Sells Quickbird, Landsat, ESA, Radarsat and IRS data

[www.eurimage.com/](http://www.eurimage.com/)

## 5.3 General sources of information

### WIM BAKKER'S PAGE

Wim Bakker has gone to a considerable amount of trouble to compile a list of Web sites that may be of interest to the Remote Sensing community.

[www.itc.nl/~bakker/satellite.html](http://www.itc.nl/~bakker/satellite.html)

### THE NASA REMOTE SENSING DATA AND INFORMATION PAGE

Contains a lot of information about remote sensing, data sources within NASA and some applications.

<http://rsd.gsfc.nasa.gov/RemoteSensing.html>

### CIESIN PAGE

Summarises how CIESIN see the role of Remote Sensing in the management of the earth's resources and environment.

[www.ciesin.org/TG/RS/RS-home.html](http://www.ciesin.org/TG/RS/RS-home.html)

### Front Cover - It's all about beating the weather

*EARSeL eProceedings 05(1), 42-50, 2006: Lars Gleitsmann and Martin Kappas*  
 GLACIER MONITORING SURVEY FLIGHTS BELOW CLOUDS IN ALASKA, -OBLIQUE  
 AERIAL PHOTOGRAPHY UTILISING DIGITAL MULTIPLE-IMAGE PHOTOGRAMMETRY  
 METHODS TO COPE WITH ADVERSE WEATHER

*In a subarctic high mountain environment under oceanic climate influence, weather is of paramount concern for any optical remote sensing approach.*

*The upper right image shows the typical weather conditions with clouds over the target, the Wolverine Glacier. Of course no photogrammetry from a position above the cloud cover can work under those common circumstances. Due to this, an aerial application of close range photogrammetry was tried, where an oblique-convergent (multiple image) approach is used, orbiting the target with a low and slow flying small aircraft under the clouds. The survey camera used here, handheld - out of the open cockpit window - is the well known and tried analogue Rollei 6008metric, a good choice for both cold weather flying and yielding high resolution with 7 $\mu$ m scan. The method works for targets of limited sizes, but cannot be applied for large acreage mapping or the like.*

*The lower left image shows a small section of a measurement image with red dots from the measurements (adjusted for print/ scale & visibility). The upper right shows the typical photogrammetric problem of the featureless snow and the possible measurements on the upper glacier. The lower right image finally shows a rawish DEM product of this glacier made from the aerial oblique images.*

*The full paper can be found under the following link:  
[http://las.physik.uni-oldenburg.de/eProceedings/vol05\\_1/05\\_1\\_gleitsmann1.html](http://las.physik.uni-oldenburg.de/eProceedings/vol05_1/05_1_gleitsmann1.html)*

### Back Cover - Alaska fieldwork

*The composition of images illustrates the reality of the fieldwork of this project in south-central Alaska, in which cost-reduction is of paramount concern. Instead of the typical twin engine survey airplane the smaller single engine Cessna 185 on the upper left is used and flown by the project scientist. Also expensive helicopter charters are not used in this project, the small two-seater Piper Pa18 bush plane is being used to get a cheaper access to the study area (in this case the Knik Glacier). On the lower left, one of the many "aluminium foil -glued on a rock" ground control point markers is depicted, those are installed by the sole fieldworker after hiking from one of the thirteen natural bush plane landing sites, like gravel bars in the rivers, where the airplane could be landed. The map on the upper right shows the locations of the Wolverine Glacier (upper inset) and the Knik-Colony-and Lake George Glaciers area in the lower inset image. The main technical aspect of the study is to seek ways to survey pinpoint targets with high accuracy and less dependency on weather conditions in a cost-effective way, utilising already existing technology.*

*(all images by first author, also processing and enhancement of the used satellite images and map data, base map by DeLorme Inc.; satellite images therein by Global Land Cover Facility; GLCF)*



EARSel Sponsoring Agencies:



Council of Europe



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Information concerning EARSel activities can be obtained from the

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Mail: [secretariat@earsel.org](mailto:secretariat@earsel.org)  
Http://[www.earsel.org/](http://www.earsel.org/)