1 EDITORIAL

To mark his recent appointment as Chairman of the EARSeL Bureau, Prof. Dr. Eberhard Parlow of the University of Basel has kindly agreed to write the Editorial for this issue of the Newsletter.

Dear EARSeL Members,

Those of you who participated in the EARSeL Symposium in Marne-la-Vallée will know that this year we have had changes in the EARSeL Bureau. EARSeL's regulations say that after a period of four years, the positions in the Bureau must be changed. Therefore, an important issue at the June Council Meeting and General Assembly was the election of a new Bureau. Three members quit their functions, and our Honorary Chairman, Preben Gudmandsen, undertook to talk to many people and to propose a new Bureau. I wish to thank Preben for his successful work, and for many fruitful discussions on the list of candidates. It is never easy to find interested and experienced people who are willing to invest their time and work to navigate the ship EARSeL.

After many years engaged in various positions, Robin Vaughan left the Bureau, having been our Chairman for the last four years. It was very stimulating to work with Robin, and I wish to express my thanks for the last years of excellent co-operation. The second Bureau member who left was Lucien Wald, our former Secretary General. He started working on the Bureau four years ago, and I would have very much appreciated if he had accepted to contribute to the Association in another position. However his work at Ecole des Mines did not allow him to stay on board. Thanks to Lucien for the last four years of friendship, inspiring ideas, and very professional work. He will remain in close contact with EARSeL as Chairman of our very active SIG (Special Interest Group) on Data Fusion. The last person to leave was Peter Winkler, who was our Treasurer for the last four years, before that being responsible for East-West relations. Peter did a fantastic job, and successfully ensured our secure financial situation. I must thank Peter very much for his effort.

The EARSeL Council approved Preben Gudmandsen's proposal for a new Bureau at the recent meeting in Marne-la-Vallée. I am acting as the new Chairman, after four years as Vice-Chairman. I have been Professor for Meteorology at the University of Basel in Switzerland since 1989. My research interests focus especially on boundary layer meteorology in complex terrain, and urban climatology. Our research projects are based on field measurements of radiation and heat fluxes, in combination with remotely sensed data. Our new Vice-Chairman is Paul Mather, who has been Professor of Geographical Information Science at The University of Nottingham, England, since 1988. His research interests include methods of digital image processing and pattern recognition based on multispectral and hyperspectral images. He has been secretary and chairman of the Remote Sensing Society, of which he is currently Honorary Vice-President. Our Secretary General is Rudi Goossens, who is Professor of Geography at the Faculty of Agriculture and Applied Biological Sciences, of the University of Gent, Belgium. His research areas cover vegetation studies, forest management, hydrology and water management, based on remote sensing and GIS. He leads the EARSeL SIG on Remote Sensing for Developing Countries. Our new Treasurer is Rainer Reuter, who is Academic Director at the Physics Department and at the Institute for Chemistry and Biology of the Marine Environment, University of Oldenburg, Germany. His research interests include optical remote sensing of the ocean, including the use of lasers, and the application of these data for ecological studies, monitoring and pollution survey. He is chairperson of the EARSeL SIG on Laser Remote Sensing of Land and Sea. Tomas Benes from Prague is responsible for East-West relations, and also held this position in the former Bureau. Tomas works in the field of forest management, and is organising our next annual Symposium in Prague in 2002.

Nevertheless, the most important person within the Association is Madeleine Gode-

froy. She keeps the system running – she is the heart of EARSeL. It is very important for me to thank Madeleine for her work in recent years, and it is a pleasure to know that she will be active in the years to come.

The new Bureau had its first meeting in Paris at ESA Headquarters, and we discussed a long list of items concerning our future work. In recent years we recognised a slight decline in member laboratories. We must take note of this, and try to improve the situation in the future. Other tasks are to improve further the quality of our Symposia, and to make them even more attractive to the remote sensing community. EARSeL must become more visible, and must sharpen its profile within the European research field. One item which also was heavily discussed is electronic publishing. There are many pros and cons: downloading the proceeding of our Symposia and Workshops, as well as the Newsletter, is a very convenient technique. On the other hand we must consider that our member laboratories must get something in return for the membership fees. Free access to our proceedings and newsletters using the internet will automatically result in a sharp reduction of member laboratories. We need a certain financial income to keep EARSeL alive as a pan-European and trans-disciplinary association. The former Bureau developed some first actions plans towards this direction, and we are intending to follow the same path.

Last but not least, I wish to express my personal thanks to Gérard Bégni, who took over the burden to organise our recent Symposium in Marne-la-Vallée. I think it was a well organised meeting with many interesting papers, and I hope that all those who participated will not forget these days.

Eberhard Parlow, EARSeL Chairman

2 NEWS FROM THE ASSOCIATION AND ITS MEMBERS

2.1 Closing Session of 21st EARSeL Symposium

Report on the closing session of the 21st EARSeL Symposium, in Marne-laVallée, France, on 16 May 2001

Rudi Goossens, University Gent, Belgium

At the closing session of the 21st EARSeL Symposium, after the final scientific presentations of the Symposium, the Conference Chairman, Prof. Dr. Robin Vaughan, summed up the proceedings and commended the organisers for an interesting and smoothly run meeting, with many excellent papers. Regarding EARSeL in general, he commented that, on stepping down from the EARSeL Bureau, he was leaving the association in good shape: the financial situation is stable, many SIGs are very active, and EARSeL has a full scientific programme over the coming years. He made a final plea to ask members to encourage other laboratories to join EARSeL.

This year, for the first time, EARSeL instituted a prize for best poster presented at the Symposium. A selection committee had scrutinised all posters during the preceding three days. The committee nominated two outstanding poster presentations: (a) "Seismotectonic Activity in the Dinaric Alps based on Satellite Data and Geophysical Survey", by M. Oluic, D. Cvijanovic and S. Romandic, GEOSAT, Zagreb, Croatia; (b) "Evaluation of Linear Mixture Modelling of Urban Areas in Landsat TM imagery, by A. Hofmann, Institute of Photogrammetry and Remote Sensing, University of Dresden, Germany. After much deliberation, the jury awarded the prize for best poster presentation to Alexandra Hofmann from the Dresden University, who was presented with a certificate and a cash prize by the Founder and first Chairman of EARSeL, Prof. Preben Gudmandsen.

After this small ceremony, Robin Vaughan handed over responsibilities to Prof. Dr. Eberhard Parlow, the newly elected Chairman of EARSeL. In his conclusion, Eberhard Parlow thanked the former EARSeL Bureau for all the work and effort they had contributed over the last four years. Dr. Gerard Begni was thanked for hosting the

Best poster competition at the EARSeL Symposium, 2001: the winner (Ms. Alexandra Hoffman) and runner-up (Prof. Dr. Marinko Oluic)

21st EARSeL symposium in Paris (Marne-la-Vallée), which was especially difficult since he had to co-ordinate the work from Toulouse. Special thanks were accorded to Madeleine Godefroy, the EARSeL secretary and Isabelle Grujard of the SFPT, for all their work in organising the Symposium.

The 22nd EARSeL Symposium and General Assembly will be held in Prague, Czech Republic, on 4-6 June 2002. The First Announcement – Call for Papers has been distributed, and is on EARSeL's web-site (www.earsel.org). The Symposium will be followed on 7 June by a specialist Workshop, Remote Sensing for Environmental Modelling, organised by Dr. Jan Kolar (kolar@fsv.cvut.cz).

2.2 News from the Special Interest Groups

2.2.1 DLR's Imaging Spectrometers: DAIS, ROSIS

The following is an activity report of SIG Imaging Spectroscopy. It describes the imaging spectrometers DAIS (Digital Airborne Imaging Spectrometer) 7915 and ROSIS (Reflective Optics System Imaging Spectrometer) of DLR.

The 2001 DAIS / ROSIS Imaging Spectrometer Campaign: a Successful Joint European Research Project to Collect Airborne Hyperspectral Imagery for Environmental Applications

Andreas Mueller, DLR, Wessling, Germany

Airborne imaging spectroscopy has undergone rapid development over the last decade. The number of research groups making use of this technology has increased by an order of magnitude. Starting from the late 1980s at the DLR research centre at Oberpfaffenhofen, spectroscopic Earth Observation has been further developed in order to provide reliable imaging spectrometer data to the scientific community. Currently, the integrated hyperspectral facilities at the DLR Cluster for Applied Remote Sensing, consists of the two imaging spectrometers (DAIS 7915 and ROSIS), a laboratory calibration facility, and the respective processing and archiving facilities. As an additional important factor in airborne remote sensing, access is granted to a DLR-owned fleet of research aircraft (Dornier Do228, Cessna 208B Grand-Caravan, FALCON 20 E5 Jet).

Numerous imaging spectrometer campaigns have been carried out during the last years, with flight activities all over Europe. Currently, the DAIS 7915 and ROSIS airborne imaging sensors are identified by the European Commission as a major research infrastructure and supported by a three-year project (see below: Call for Proposals on HySens). In the frame of this project, hyperspectral data sets are acquired over different test areas proposed by international research teams. From May to July 2001, an airborne campaign has been carried out combining DLR's two imaging spectrometers in one aircraft. The main system specifications of DAIS 7915 (four spectrometers) and ROSIS (imaging and spectral modes) are given in below.

Due to their different system configurations, both instruments are used for different applications. DAIS, with its broad spectral coverage is dedicated for land applications (geology, soil sciences, vegetation studies). ROSIS was designed as a water

Instrument	Bands	Range (µm)	Width (µm)	FOV(deg)	IFOV(mrad)
DAIS (1)	32	0.50 - 1.05	0.015 -0.030	±26	3.30
DAIS (2)	8	1.50 – 1.80	0.045	±26	3.30
DAIS (2)	32	1.90 – 2.50	0.035	±26	3.30
DAIS (3)	1	3.00 – 5.00	2.000	±26	3.30
DAIS (4)	6	8.70 - 12.50	0.900	±28	3.30
ROSIS (im)	32	0.43 - 0.86	*	±8	0.56
ROSIS (sp)	84	0.43 - 0.86	*	±8	0.56

* Spectral half-width: minimum 7.6 nm (depends on spectral binning)

DAIS 7915, ROSIS – system specifications

sensor, with some specific further application possibilities such as fluorescence analyses in vegetation. This wide range of applications is also reflected in the requests DLR has received for imaging spectrometer flights in 2001. Information on the different user groups involved in the 2001 campaign, including the research topic and contacts of the principle investigators, is on the website www.op.dlr.de/dais/hysens/hysens_users2001.htm.

In preparation for the flight campaign, a workshop was held at DLR, Oberpfaffenhofen, to co-ordinate the thematic needs of the research teams, the necessary ground activities, and the technical requirements of both the airborne sensors and the aircraft. The geographic distribution of the test areas can be seen in Figure 1. Despite the difficult weather situation in some of the test areas during this year's summer, all planned data acquisitions were carried out mostly under good to perfect atmospheric conditions. This success could only be achieved thanks to the flexibility and fighting spirit of all participating researchers, in the field or at the coordinating points, as well as the air crew (Figure 2), who showed outstanding motivation to be always over the desired spot on time.

Because of this, we expect the highest level of scientific evaluation based on the recorded data, and many contributions to the next International Workshop on Imaging Spectroscopy, in Spring 2002. Further information can be found at the web-site www.op.dlr.de/dais/, or by contacting Andreas Mueller, DLR (German Aerospace Centre), German Remote Sensing Data Centre, D-82234 Wessling, Germany (e-mail: Andreas.Mueller@dlr.de).

The European test areas for the 2001 DAIS / ROSIS campaign

The aircraft crew preparing for the DAIS / ROSIS data acquisitions in Northern France

2.2.2 Imaging Spectrometry Opportunity: HySens/DLR

Dear Colleagues,

DLR's imaging spectrometers DAIS 7915 and ROSIS, and their hyperspectral processing facilities, have been selected by the European Community to be supported in the period 2000-2002, within the framework of the "Access to Research Infrastructures" action of the EC Programme "Improving Human Potential and the Socio-Economic Knowledge-Base" (contract no. HPRI-CT-1999-00075).

Access to the two airborne imaging spectrometers of DLR (i.e. DAIS 7915 and ROSIS), operated on board DLR's Do228 research aircraft, will be offered to the European remote sensing community free of charge. Imaging spectrometer data sets acquired over test areas proposed by the individual user groups, will be system corrected and calibrated to at-sensor radiance. For radiometric and spectral calibration of the instruments, a Laboratory Calibration Facility is available. It is intended to operate the sensors over five target areas in Europe, during each year of the project.

Upon request, part of the data may also be geo-coded and atmospherically corrected using DLR's hyperspectral processing facil-

ity. Training and access will be provided to researchers by means of workshops and individual training courses.

An information package including a detailed description of the facility, and a guide for the preparation of proposals, is available for download at the HySens website (www.op.dlr.de/dais/hysens.htm), or may be requested from: Andrea Hausold, DLR, German Remote Sensing Data Centre, D-82234 Wessling, Germany (fax +49-8153-28-1458; e-mail: Andrea.Hausold@dlr.de). Deadline for the Call for Proposals for flight activities in 2002: 15 November 2001. The proposals received will be evaluated by an independent User Selection Panel. The outcome of this evaluation will be communicated to the proposers by the end of February 2002.

The following general eligibility criteria are given by the Commission of the European Communities regulating the Access to Research Infrastructures. Only research teams (User Groups) conducting their research in the Member States of the Community and Associated States are eligible to access the research infrastructure. The researchers must be entitled to publish the results of their work at the Facility in the open literature. Proprietary research shall not be supported. Priority should always be given to users that have not already benefited under the "Access to Research Infrastructures" Programme, and those coming from countries where similar facilities do not exist. Individual researchers within the selected User Groups are eligible to receive reimbursement of travel and subsistence expenses. User groups from Germany may not benefit from HySens funding. If you require additional information, please do not hesitate to contact the HySens team at DLR.

With the best regards, Andreas Mueller (HySens Project Manager)

2.2.3 Report on EARSeL Forest Fires Workshop

Third International Workshop "Remote Sensing and GIS Applications to Forest Fire Management: New Methods and Sensors", in Paris, France, on 17-18 May, 2001

Report by Emilio Chuvieco (University of Alcalá, Spain), with inputs from José Miguel Pereira (University of Lisbon, Portugal); Chris Justice (University of Maryland, USA); Pietro Ceccato (Natural Resources Institute, University of Greenwich, UK).

The EARSeL (European Association of Remote Sensing Laboratories) Special Interest Group on Forest Fires, held a recent workshop on "Remote Sensing and GIS Applications to Forest Fire Management: New Methods and Sensors". The meeting followed the 21st EARSeL Symposium, and was hosted by the Ecole Nationale des Sciences Géographiques, outside Paris. The workshop was attended by seventy researchers from fifteen countries (Spain, Portugal, Greece, Italy, France, Germany, Finland, Canada, USA, Senegal, United Kingdom, Russia, Ukraine, Switzerland, Czech Republic). Contributions were made on three topics: Fire Prevention (ten papers); Fire Detection (nine papers); Burned Land Mapping (eleven papers). All papers were presented in three one-hour poster sessions, followed by a one-hour general discussion. A round-table session on challenges in applying remote sensing to operational forest fire management was also held.

Session 1: Fire Prevention

The Fire Prevention session was introduced by two short lectures, by Bryan Lee from the Canadian Forest Service, and Pietro Ceccato from the Natural Resources Institute, UK. The expected speaker, J.D.Carlson (Oklahoma State University), could not travel to Paris due to last-minute family problems. Bryan Lee presented an overview of the methods used for Fire Danger Rating in Canada. Bryan illustrated the combined use of GIS and remote sensing for forest fire monitoring, mapping and modelling in Canada. He also emphasised the challenge for the remote sensing community to provide products that are useful and robust in terms of validation and accuracy. In addition, Bryan suggested clarifying definitions regarding fire risk, fire danger, and fire hazard, to have consensus on terminology. Pietro Ceccato, in his presentation on the use of remote sensing for fire danger, pointed out that most remote sensing methods currently focus on fuel status and fuel type estimation for provid-

ing information in assessing fire danger. He indicated that these methods could also be used to assess burning efficiency, an important factor that can provide information to estimate type of combustion, and quantity and type of gases emitted into the atmosphere. Pietro then focussed on the potential of different sensors for estimating vegetation moisture content.

The posters presented in the Fire Prevention session focussed on the use of remotely sensed data either to monitor vegetation status (fuel moisture content), or to map vegetation type. Each method showed strengths and weaknesses with potential for improvement and better integration with other information sources to assess fire risk. It was recognised that remote sensing cannot provide all solutions to assess fire risk. Instead, remote sensing could provide complementary information (spatial and temporal) to the "traditional-equivalent" methods to estimate vegetation status or vegetation type. It could also provide a replacement to traditional methods if the information provided is better, cheaper and faster. It was recognised that much research, development and validation is needed to show that remote sensing is better than "traditional-equivalent" methods. In some regions validation can also be quite difficult. These actions require funding that the user community is not always ready to provide. In addition, comments on user requirements were made, emphasising the fact that users were often multiple and each might require a different product. It was noted that users do not always know what they want in terms of information products.

Session 2: Fire Detection

The second session, on Fire Detection, was opened by a presentation from Olivier Arino of ESA, describing an impressive list of current and planned programmes and projects related to forest fires. The ATSR World Fire Atlas has provided the first multi-year, global active fire data set, and the Italscar and Globscar Projects are providing important steps towards developing burn scar products.

Posters presented at this session represent the major research areas currently being undertaken on this topic. Kuhrt et al. presented a tower-based CCD camera system for early warning of forest fires. This practical, low-cost solution offers a means for fire detection at the local scale. Algorithm refinement was presented by Lasaponara et al. who developed a self-adapting approach for fire detection, using pixel information from before the fire to set thresholds for fire detection. Research leading to new products on fire emissions was presented by Sini et al. using ATSR and GOME data on the ERS-2 satellite, combining active fire and NO2 measurements. Los et al. examined fires in the Chernobyl exclusion zone, and modelled the associated nuclide dispersion. Integration of data from multiple satellites was presented by Kelha and Rauste, combining AVHRR and ATSR data for operational fire detection in the boreal zone. Integration of remote sensing, satellite telemetry, and GIS was presented by Ambrosia et al., describing a real-time data system using a UAV (Unmanned Aerial Vehicle) for fire management. A comparison of AVHRR active-fire algorithm performance for Canada, was presented by Ichoku et al. Mbow presented the implications of satellite-based research on the timing of fires for improved range management in Kobe National Park in Senegal. Barducci et al. presented analysis of fire monitoring using the MIVIS spectrometer.

The open discussion of the poster session followed some of the common themes from the meeting. The use of satellites for fire monitoring lies largely in the research domain, and there is a need to transfer the tested techniques to operational applications. A close partnership between fire managers and remote sensing researchers will be needed to ensure a smooth transfer. This partnership would involve operational research and development – i.e. taking research methods and adapting them for operational use. It was recognised that there is a considerable body of experience in remote sensing technology transfer and that this should be applied when transitioning fire-monitoring techniques. In this context, it will be important to provide users with a good understanding of the accuracy of the various fire products for different applications in different environ-

ments. The emergence of product validation as a new and important aspect of remote sensing research and the support that is currently being given by the space agencies to this topic, gives an indication of the importance of this aspect of the work. For operational monitoring, continuity of data provision is essential and in this respect it is important to ensure that the high quality instruments and data products that are starting to be used operationally are transferred to the operational satellites. To secure data continuity there is the need for strong advocacy and support from the operational user community. This will require a significant increase in the operational use of fire data. One way to help this process would be to disseminate examples of where and how satellite data are currently being used cost effectively for fire monitoring and management. One further approach to strengthen the advocacy and commitment is to form partnerships between university researchers, private industry and government laboratories. It was recognised that community efforts are needed to develop and test new regional and global fire products and to address the complex interdisciplinary research questions associated with fire and global change research. The existing networks of scientists such as the Special Interest Group on Fire will be important mechanisms for developing these community efforts. The discussion session ended with a presentation by Chris Justice from the University of Maryland on the Fire Component of the Global Observation of Forest Cover Project.

Session 3: Burned Land Mapping

The third session, on Burned Land Mapping, was introduced by a lecture by Yoram Kaufman, of the Laboratory for the Atmospheres, NASA Goddard Space Flight Center. His talk emphasised the capabilities of the MODIS instrument to detect fires and smoke and to quantify geophysical parameters related to fire activity. He explained the advantages of MODIS thermal channels, designed to detect fires, compared with those of its precursors, emphasising the reduced sensitivity to water vapour and solar reflection, and the higher saturation temperature. The latter also allows MODIS to discriminate between smouldering and flaming combustion. Dr. Kaufman presented the algorithms for active fire and smoke analysis developed by the MODIS Fire Science Team. The solar reflective channels of MODIS were designed to permit characterisation of smoke aerosols over land and ocean. Smoke quantification products have been validated with various campaigns, namely SCAR-C (California), SCAR-B (Brazil), and currently under SAFARI 2000 (southern Africa) and LBA (Amazon basin), with support from the AERONET ground-based sun photometers. Validation of active fire algorithms is also in progress, but early results show that the rate of thermal energy emission by the fire correlates well with smoke production, rate of fire scar expansion, and with qualitative, ground-based estimates of fire severity. Finally Dr. Kaufman alluded to the direct broadcasting capability of MODIS, and the opportunities it affords for operational use of fire products in almost real-time.

The poster session displayed a variety of topics and revealed progress in the objectives, data, and methods used by Europe's research community involved in burned area mapping with remotely sensed data. Progress in the objectives was primarily illustrated by the studies of Retzlaff et al. and Diaz-Delgado et al., who addressed the issue of characterising fire severity with remotely sensed data. The posters by Vafeidis et al. and Sá et al. also expanded the traditional approach of burned area, by attempting to estimate sub-pixel burned area fraction. Another indication of a maturing field was given by studies that focused on the incorporation of remotely sensed burned area data in GIS meant for operational use. These were presented by Lee et al., with the Canadian Fire M3 system, and for the forthcoming FUEGO constellation of fire monitoring satellites, by Palacios-Orueta and Carmona-Moreno. The spatial scale of the work presented in this session ranged from the single fire event (Retzlaff et al., Diaz-Delgado et al.) to the sub-continental scale of the study by Fraser et al., who mapped burned areas in Canada's boreal forest. The types of data used also reflect the increasing diversity of Earth Observation instruments currently available, which are beginning to be used by the fire remote sensing community. Fraser et al. employed SPOT-VEGETATION data in their work, while Sá et al.

used MODIS imagery. Both studies relied on higher spatial resolution Landsat data to calibrate the areal estimates of fire scars obtained from the coarser resolution sensors. Dwyer et al. worked with spaceborne SAR data to map burns in the boreal forest of Canada, thus expanding the use of radar data for fire mapping.

Innovative or seldom used methodologies were also presented. Benvenuti et al. are developing a methodology to map burned areas with Landsat TM, that integrates spectral change detection with seeded region-growing, to map fire scars in Italy. Koutsias et al. proposed an approach based on a forward / inverse principal components transformation to improve the detectability of fire scars in Landsat TM images. Retzlaff et al. used the recently developed technique of foreground / background spectral mixture analysis in the fire severity mapping study. Sá et al. used committees of classification trees ("bagging") and a regression tree to map burns in northern Mozambique.

Discussion of the posters presented in the Fire Mapping session focused on three main, closely related topics: accuracy assessment of remotely sensed products; development of robust algorithms for burned area mapping; operational use of remote sensing in fire management. Accuracy assessment was discussed first. The need to develop standards, guidelines, and protocols was stressed, especially for burned area maps. Accuracy assessment of active fire products is considered problematic, due to the transient nature of the signal. The development of a global network of sites for long-term research on remote sensing of fires, capable of supporting coordinated validation activities, is considered a high priority of the international research community. It is also critical to identify clearly the uses for specific remotely sensed products, since accuracy assessment standards are purpose-specific, and vary according to legislative context, geographical scope, organisational mandate, etc. Attention was called to the fact that areas burned often represent a small fraction of the total region of interest. This creates particularly stringent accuracy requirements for burned area mapping, since a small classification error may completely obliterate the class of interest. More dialogue between fire managers and remote sensing researchers is also needed, to clarify terminology and to adjust expectations to the current potential of remote sensing technology. Overselling remote sensing has in the past created credibility problems, and thorough accuracy assessment of products is a fundamental step to restore credibility with user communities.

Robustness of satellite image analysis algorithms, essential to promote the operational use of remotely sensed data, was discussed next. Difficulties in the development of robust algorithms arise from biome-specific responses, such as differential persistence of the burn-scar signal in tropical savannas versus boreal forests, or phenological status of the vegetation immediately prior to burning. Variable atmospheric conditions and surface illumination / observation geometrical effects also affect algorithm robustness. Distinct burned area spatial fragmentation patterns in different regions affect the accuracy of areal estimates. Cases of coarse-resolution (AVHRR-based) overestimation (in Brazil) and underestimation (in Canada) of burned area were mentioned.

Transition to an operational application phase of remotely sensed data was considered urgent, since the technology has been available for over thirty years, and only the meteorological community employs it in a fully operational mode. Funding may start to become scarcer in the near future if actual operational use of data and products does not become more widespread. The technology is mature for operational application, but there has been a lack of funding for the development of operational production systems. The scientific community needs to alert funding agencies, potential operational users, and commercial software suppliers of the need to develop such systems. Significant legal and institutional obstacles will have to be removed, on the way to establishing widespread operational use of remote sensing for fire management support.

Session 4: Round-Table Discussion

The final session of the Workshop focused on analysing several aspects that may pre-

vent the operational use of remote sensing methods in operational fire management. The session was chaired by Bryan Lee, of the Canadian Forest Service, who promoted a lively discussion among attendants by raising hot issues in the current dialogue between remote sensing experts and fire managers. The need for a common terminology, adopting concepts that are well accepted in the fire community, was raised again. The correct definition of end-user was also critically reviewed, and the importance of accomplishing operational requirements. Current deficiencies of remote sensing methods originate from the lack of proper spatial, temporal or spectral resolution of sensors, most often designed as general-purpose systems, which cannot fulfil the needs of specific user communities.

The final session was dedicated to review past and future activities of the SIG on Forest Fires. The interest of maintaining a link among European researchers in the field was stressed. Among potential future activities, the following were emphasised: (1) Support of the web-page of the group, increasing the links between different projects active in this field; (2) Co-ordination of a special issue of the International Journal of Remote Sensing, dedicated to the most innovative papers presented in the workshop; (3) Preparation of a book on remote sensing and forest fires for the World Scientific Publishers; (4) Organisation of a network of study cases, which could be shared by the members of the group to validate new algorithms; (5) Proposal of the next workshop; Dr. Beata M. Vliegher, from the University of Gent, offered their installations to host the fourth workshop in 2003, which would follow the 23rd EARSeL symposium.

Any active researcher in this field is welcome to collaborate with any of these activities, and to join the SIG, by writing to the Group Chairman (emilio.chuvieco @uah.es), or visiting the web-page: www.geogra.alcala.es/EARSeL/SIG_group.htm.

Proceedings of the EARSeL Forest Fires Workshop

The Proceedings of the EARSeL Forest Fires Workshop in Paris are now available in the form of an attractive brochure, giving the full text of the three keynote lectures, plus the extended abstracts of the other papers presented. A selection of these papers will be published in a future issue of the International Journal of Remote Sensing. Orders for this brochure and a copy of the discussions should be sent to Madeleine Godefroy, EARSeL Secretariat, 2 avenue Rapp, 75340 Paris Cedex 07, France (phone +33-1-45567360; fax +33-1-45567361; e-mail earsel@meteo.fr). The price is 170 French Francs including postage and packing.

Forest fires – a perennial problem

2.2.4 Call for Papers: RS of Land Ice and Snow

The First Announcement and Call for Papers for the 3rd EARSeL Workshop on Remote Sensing of Land Ice and Snow, to be held in Bern, Switzerland on 11-13 March 2002, is included with this Newsletter. The theme will be: "Observing our Cryosphere from Space: Techniques and Methods for Monitoring Snow and Ice with Regard to Climate Change". The 1st Workshop was held in Frieburg, Germany, in 1997. The 2nd Workshop was held following the 20th EARSeL Symposium, in Dresden in 2000. The Proceedings of the 1st Workshop are available as a printed volume. Those of the 2nd workshop are published on a CD-ROM, together with the Proceedings of the Workshop on Lidar Remote Sensing of Land and Sea. Both are available from the EARSeL Secretariat.

This 3rd Workshop will again be organised by Dr. Stefan Wunderle of the University of Bern, assisted by Dr. Thomas Nagler of the

University of Innsbruck. Presentations are encouraged on all fields of environmental research and applications concerning snow and land ice, on sensors and on sensor properties, systems calibration, atmospheric and topographic corrections, modelling and data assimilation, correlation with in situ observations, etc. The workshop offers the possibility for sessions covering preparations of and results from field campaigns in Antarctica, mountains of the world and the Northern Polar region. Deadline for abstracts: 1 November 2001. For more information contact Dr. Stefan Wunderle (e-mail swun@giub.unibe.ch).

2.2.5 Call for Papers: RS for Developing Countries

The Call for Papers for the 2nd EARSeL Workshop on Remote Sensing for Developing Countries has been distributed. The full text and details are on the SIG web-site: www.rsrg.uni-bonn.de/earsel_2002/index.htm. Send abstracts to Dr. H. P. Thamm (e-mail thamm@rsg.uni-bonn.de). Deadline for abstracts: 31 January 2002. For more information contact Prof. Dr. G. Menz (e-mail menz@rsg.uni-bonn.de).

2.3 New EARSeL Member in Portugal

We are pleased to introduce a new Portuguese member: Centro de Investigação em Ciências Geo-Espaciais (CICGE). This research centre is affiliated to the Faculdade de Ciências, University of Porto, Portugal. Its headquarters are at the University Astronomical Observatory in Vila Nova de Gaia. The main activities of the centre are research, education and promotion of the Earth and Space Sciences. Members of the CICGE actively participate in the MSc in Remote Sensing of the Faculdade de Ciências, University of Porto, both as lecturers and in demonstration sessions. This course started in October 2000 and is the first MSc in Remote Sensing in Portugal.

The CICGE research activities are in the areas of Geodesy, Satellite Navigation, Remote Sensing, Geographic Information Systems and Astronomy. The total number of staff involved in Remote Sensing research is at present seven. The main Remote Sensing interests of the CICGE staff are satellite altimetry, image processing, geo-coding and various applications of remote sensing data. There are currently two research projects financed by the Portuguese Ministry of Science and Technology: SADAMOS (a study of the potential use of medium-resolution SAtellite data for the Detection And Monitoring of Oil Spill events at sea), and SATFISH (Remote sensing applied to fisheries monitoring in the Cape Verde region). The EARSeL representative at CICGE is Dr. André Marçal (e-mail amarcal@oa.fc.up.pt).

2.4 Δ = 9 Years: Two EARSeL Symposia Compared

Preben Gudmandsen, Technical University of Denmark, Lyngby, Denmark

Professor Manfred Buchroithner convened two EARSeL Symposia at a nine-year interval (1991-2000). This gave somebody the idea that it could be an interesting exercise to compare them. It was also suggested that an EARSeL old-timer should attempt to do this – such as the present author.

The first Symposium took place in 1991 in Graz, Austria, where Manfred was teaching at the time. The other took place last year (2000) in Dresden, Germany, where he is now a professor. The reader may understand the plot. What are the similarities and what are the differences between the two programmes organised by the same person?

Before we look into this question it is perhaps worth reviewing the different situations in the two cases. Clearly there are differences in the ambience, but what I still recall is that during several of the meetings in Graz we had a background noise of cannons reaching us from Slovenia. It was a weak noise that did not disturb the presentations, but certainly many of us felt very unhappy. In Dresden there were no disturbances – although a great deal of the town has been rebuilt since the tragic bombardment of the town at the very end of the last war. Wandering in the town could still give

a feeling of the incredible disaster at that time.

It will be recalled that the first Symposium was held just two weeks before ERS-1 was launched, whereas the other one demonstrated nine years of experience with data from SAR (Synthetic Aperture Radar). This is reflected by the fact that the first Symposium had a full session under the heading of SAR, whereas this was not the case with the second. Of the nine papers on SAR during the first Symposium, only one dealt with actual SAR (i.e. NASA Airsar) data – including a tutorial section on radar polarimetric signatures – where the other papers described preparatory work and applications using simulated signals. In contrast, the Dresden Symposium had a great number of papers on various environmental issues that exploited SAR data. SAR had come to work. In several cases presentations described multisensor work, with SAR data combined with other remote sensing data – and naturally with ground information.

Another observation is related to the subject of forest fires. Whereas the first Symposium had only two papers on that subject, one of which was concerned with detecting the smoke from fires, the second Symposium had a number of presentations describing the use of different types of remote sensing data at various sites, some dealing with the problem of estimating risk. This is in line with the present world-wide interest in risk management that resulted in the creation in 1995 of an efficient EARSeL Special Interest Group (SIG) on Forest Fires. On reading these papers, there seems to be a case for a thorough comparison of the various methods applied, in order to find the optimum one – a process which apparently was approached at the recent SIG Workshop following the 2001 Symposium in Marne-la-Vallée. (See report in this issue). The second Symposium also reflects the increased interest in monitoring forests and measuring various forestry parameters.

Being remote sensing meetings, it is natural that each Symposium should contain a relatively large session dealing with methods and algorithms for processing data and for environmental analyses. Both Symposia lived up to this. A comparison of the two sessions at a nine-year interval shows clearly that the work carried out had taken advantage of progress in techniques and analysis methods, that have taken place in the course of time. Thus, the later Symposium included analyses that exploit fractals and neural networks, for instance. This is also valid for new airborne and satellite sensors, such as lidar, for instance.

It has been a feature for EARSeL Symposia that they to some extent constitute a forum for young scientists. This was also the case with these two Symposia. Often the work presented constitutes a version of a PhD thesis. This is not surprising when it is recalled that EARSeL is an organisation of laboratories of which the majority are university bodies. Nevertheless, a review shows that, over the years, there are (older) scientists that present their latest work at meeting after meeting, as was done at these two Symposia. Not to forget the people having special feelings towards EARSeL, such as the present author, and who turn up almost every time…

In both cases, the Symposia had an audience coming from many countries in east and west, and from northern and southern Europe. The first one really deserved its title: "Europe: From Sea-Level to Alpine Peaks, from Iceland and the Urals", since it had participants from Iceland (which is exceptional) and Russia – but also from North Africa and the Middle-East. The Graz meeting was the first that attracted a number of scientists from central and eastern Europe, which contributed to the decision to hold the 1992 meeting in the town of Eger in Hungary. The second Symposium did not attract many people from northern Europe, unfortunately.

In one way the two Symposia are similar and different at the same time, and that is reflected in the Proceedings. They both carry an aerial photo of the town of the meeting on the cover: Graz and Dresden, respectively. In another important way they were similar, namely by the good arrangements made by the convener and his staff, being Austrian or German. That ensured also that the social events were most enjoyable, so that many good contacts were made - which is just as important as all the rest.

3 NEWS FROM ESA, THE EC AND INTERNATIONAL ORGANISATIONS

3.1 News from ESA

3.1.1 Artemis Satellite Successfully Positioned

Ground control in Fucino, Italy – the operations team and system engineers of the Altel (Alenia Spazio-Telespazio) consortium, supported by ESA specialists – reported that, since the night of Tuesday 24 July 2001, ESA's Artemis (Advanced Relay and Technology Mission Satellite) satellite has been successfully positioned in its circular parking orbit at about 31,000 km.

The satellite, launched from Kourou by an Ariane 5 on Thursday 12 July, had been put into the wrong orbit due to a malfunction on the launcher's upper stage. The injection orbit had a perigee of 590 km, an apogee of 17,487 km and an inclination of 2.94°, compared to expected values of 858 km, 35,853 km and 2° respectively. Since injection into orbit, the spacecraft's behaviour has been nominal, allowing ESA rapidly to adopt a recovery strategy that aims to take the satellite to a nominal geostationary position of approximately 36,000 km, maximising the lifetime of the spacecraft, originally planned to last ten years.

The recovery strategy consists of four steps, the first two of which have been successfully completed. At the time of writing, the satellite is operating in quasi-nominal mode, fully under the control of the ESA / Alenia Spazio-Telespazio team, pointing at the Earth and with the solar panels tracking the Sun, while not yet in geo-stationary orbit. Under the current step 3, with the satellite in parking orbit, new, unforeseen but now required control modes for orbit-raising using ion engine propulsion will have to be patched (by software uploads) and commissioned. The ion engines themselves will then be initialised and checked out.

Under step 4 (expected to start in late September and to last several months), the satellite will be "spiralled" from parking to nominal geo-stationary orbit, using its novel electrical ion-propulsion system. Spacecraft commissioning (activation and checking that all items are operating correctly) will proceed subsequently. These operations, which are common to all satellites at the beginning of their lifetime, will last a further couple of months. The recovery operation involves a certain number of unusual activities which could not all be planned for in advance. In particular, the ion propulsion system – originally to be used only for controlling the inclination of the spacecraft throughout its lifetime – will be operated in a new mode. The next progress update on the recovery operation will be at the start of step 4 operations, presently scheduled for late September.

During a planned lifetime of ten years, Artemis will test and develop operations in new areas of telecommunication and navigation, and also initiate a European data-relay system – a means of satellite to satellite communication. In particular, Artemis will explore advanced technology to transmit data directly from one satellite to another, both conventionally (using radio links) and in a revolutionary new way using laser beams. At present, Earth Observation satellites in low orbit like ERS-1 must use on-board recording and global networks of ground stations to provide high-rate data links. But, as information requirements and the number of missions grow, this approach is becoming expensive, and in some situations technically unfeasible. For further information, please contact: ESA Media Relations, Franco Bonacina (phone +33-(0)1-53697713), or visit the ESA web-site (www.esa.int).

3.1.2 SPECTRA Workshop at ESA-ESTEC

Eberhard Parlow, University of Basel, Switzerland

A Workshop on SPECTRA (Surface Processes and Ecosystems Changes through Response Analysis) was organised at ESA-ESTEC in Nordwijk, The Netherlands, on 12-13 June, 2001. SPECTRA is one of the five candidate Earth Explorer Core Mis-

sions, which will be presented for selection at the Third ESA Workshop in Granada, Spain, during the week of 29 October 2001. Fifty participants joined in this very specialised and well organised Workshop on the development and scientific benefits of a space-borne hyperspectral system.

SPECTRA is a space-borne spectrometer addressing a variety of terrestrial vegetation issues which are – amongst others - important variables for a proper carbon cycle analysis and modelling. The sensor is designed to cover the solar spectrum of 400-2500 nanometres continuously, in more than two hundred spectral bands with ten nanometres bandwidth. The spatial resolution will be fifty metres, and the agile platform allows multi-directional viewing of the same site, to enable BRDF correction along the satellite track. Field experiments at the Barrax test site in Spain with various airborne multispectral and hyperspectral systems showed that BRDF has a great influence on a proper retrieval of geophysical variables from satellite data.

Hyperspectral satellite data will play an important role in improving satellite data input for numerical models such as GCMs (Global Climate / General Circulation Models) and global carbon models, and enable direct satellite-derivation of geo- / bio-physical variables (plant water content, LAI, chlorophyll content, etc.) with very high accuracy. In many presentations at the Workshop the usefulness of hyperspectral data was demonstrated. It is a challenge for Europe's remote sensing community to continue this line of technological development, and to keep its nose in front.

One of the responsibilities of EARSeL is to keep its members informed about recent developments in remote sensing and Earth Observation. Therefore, a tutorial on hyperspectral imagery was organised during our recent EARSeL Symposium in Marne-la-Vallée which was joined by most of the participants. Dr. Michael Schaepman from the Remote Sensing Laboratory of the University of Zurich, introduced this very challenging and promising field of remote sensing. In our 2002 Symposium in Prague, a special session on hyperspectral data will be organised.

3.2 News from the EC

3.2.1 SAI Merged with Two New JRC Institutes

Niall McCormick, DG-JRC, Space Applications Institute, SSSA Unit, Ispra, Italy

In a year that has marked something of a sea change for the European Commission's Joint Research Centre (JRC), it has been decided that, from 1 September 2001, the Space Applications Institute (SAI) will cease to exist as a formal JRC institute, and its activities will be immediately incorporated into two new (or rather, existing but re-focused) JRC institutes, that directly address EU policy objectives. Thus, SAI's activities on environmental mapping, GIS, urban monitoring, atmospheric pollution and radiation, global vegetation monitoring, and marine environment will be transferred to the Institute for Environment and Sustainability / IES (formerly the Environment Institute), while SAI's activities on agricultural monitoring (including the MARS project), and on crisis preparedness and humanitarian aid, will be transferred to the Institute for the Protection and Security of the Citizen / IPSC (formerly the Institute for Systems, Informatics and Safety).

The formal mission statements of the JRC's new IES and IPSC institutes are as follows:

- The mission of the Institute for Environment and Sustainability is to provide scientific and technical support to EU policies for the protection of the environment, and to contribute to the EU strategy on sustainable development.
- The mission of the Institute for the Protection and Security of the Citizen is to provide research-based, systems-oriented support to EU policies so as to protect the citizen. The main application areas are cyber-security and the fight against fraud; technological and economic risks; humanitarian security; non-proliferation and nuclear safeguards. The institute will continue to maintain and develop its expertise in information, communication, space and engineering technologies, in support of its mission.

The merging of SAI with IES and IPSC takes place within the context of the ongo-

ing re-focusing of the JRC, as outlined in the Commission's communication, in April 2001, entitled "Fulfilling the JRC's Mission in the European Research Area" (COM (2001) 215 final). In this communication the Commission states that the JRC will concentrate its activities around three main competence pillars: food, chemical products and health; environment and sustainability; nuclear safety and security.

The briefing note on the re-organisation of the JRC Ispra institutes is available on the JRC's web-site, at www.jrc.cec.eu.int/download/ispra_institutes_reorganisation.pdf. As is confirmed in this note, as a result of its re-organisation "the JRC's expertise in space technologies will not be compromised, and the JRC will continue to use space technologies, integrated with other technologies, to support EU policies – especially the Global Monitoring for Environment and Security (GMES) initiative".

3.2.2 EC's Web-Based RS and Mapping Activities

A Report on the European Commission's Increasing Use of Open Source Web-Servers for Distributed Remote Sensing and Mapping Applications

Guido Lemoine, DG-JRC, Space Applications Institute, ARIS Unit, Ispra, Italy

With the ever increasing availability of diverse remote sensing imagery and digital geographical feature databases, the development of "downstream" distribution becomes a crucial part of any sustainable, operational use of such data. In particular, in the case of remote sensing imagery, most current distribution schemes (frame-based, projection, price) are not well adapted to mass use. On the other hand, recent developments with LANDSAT 7 pricing and new access services, for example (see www.eurimage.com), point in the right direction.

The need for intelligent distribution of remote sensing data and associated digital feature information is particularly evident in the MARS "Control with Remote Sensing" project. This project has an inherently distributed nature, which involves data suppliers, value-adding data service providers, national administrations, and the European Commission (DG AGRI, DG JRC). Sensor data are usually supplied by the image providers (at Level 1) to a contractor who, amongst others, processes it into ortho-rectified image products. The contractor uses the data with other co-registered image data (digital orthophotos, optical and SAR data, etc.) and digital map data to check the vector data outlining farmers' declarations that are supplied by the administration. The results from these checks are forwarded, through the administration, to inspection teams that verify anomalies in the field. The feedback from these field visits returns to the administration (and sometimes, the contractor) and is integrated into the reporting to the Commission.

Currently, many of the data processing steps are done "on paper". For instance, farmers outline their parcels on large scale maps (usually at scale 1:10,000). For the control, field boundaries need to be digitised first. Results from the remote sensing checks are then usually sent to field inspectors as high quality printouts, showing the field boundaries against the image background accompanied by tabular data. Field inspectors use their own formats to report on the inspection cases.

Note that apart from the cumbersomeness of handling thousands of paper-based declarations (there are nine million declarations made in the EU every year...) the various data input and exchange steps are prone to a number of errors. At the field boundary digitising stage, for instance, things may go wrong if a reference number is not properly typed in, an edge is not properly digitised, or simply the map reference was not sufficiently up to date to locate exactly a field. Besides, in this process, there is considerable scope for savings, both in cost and time. For instance, the field inspection could be streamlined by supplying the latest image interpretation results on-line, together with image and map outlines, and with the possibility to feed the inspection results "live" back into the control system. Various contractors in the programme have already been experimenting

with different forms of electronic supply, and it is envisioned that this functionality will become increasingly important in the programme.

The last two years have seen a rush of web-server development for image and geographical feature supply (e.g. map and image servers), and a big push by the major GIS vendors to expand their traditional desktop functionality onto the Web. At the same time, however, developments in Open Source applications (Linux, Apache, MySQL), client / server programming (Java) and internet standards (XML) have become mature enough to "roll your own" web-server, with the full functionality required, and nicely tailored to the application. Major advantages of using an "open" solution are low cost and independence from any particular vendor and their proprietary formats. When standards are followed (e.g. those of the OpenGIS Consortium), exchange with other services that follow such a standard is greatly simplified. Still, some effort is needed to understand and implement the software modules, although this part is benefiting from ever increasing functionality. For instance, the upcoming Java release JDK 1.4, has integrated image I/O functions, which, together with the already existing Java2D API make up a very mature (and fast!) graphical toolkit.

Within the MARS project, we maintain a small R&D activity on web-server development. While most of the existing web-servers are concerned with "on-request" serving of image and map features, we concentrate more on capturing user information (e.g. crop type, crop parameters, field observations) on the basis of served features. In the end, we believe that most of the added value of (especially) remote sensing data, is in the collection of information, at least in an agronomic context. The most obvious functionality is that related to the control programme (see mars.aris.sai.jrc.it/nsam/ii/etmserver.html) but we have recently started a small research project in which the collection of crop-state parameters for disease forecasting is the main application. In the latter, all components are 100% Open Source (Linux, MySQL back-end data base, Apache Tomcat server) with a Java servlet and JSP server-side and a JavaScript client. The use of JavaScript on the client facilitates the use of the service by a wide range of end-users, as there is no requirement for extensive downloads. Farmers make up a large part of the test group.

An example client application that can select arbitrary parts of an orthoimage coverage, combine these with digital vectors, and allow the editing of individual vector geometry and attributes. Changed vectors can be saved on the server. All components are built in Java, and use Open Source modules at the server side. Vector information is drawn from a data base. The example illustrates the possible use in a distributed project environment, typical for the MARS "Control with Remote Sensing" programme

Apart from enabling the development of nifty client / server applications, open web-servers have considerable potential for the research community. It is relatively simple to set up a network of servers connected to a "brokerage" on which available image and map layers are published (think of Napster). Thus, a treasure of historical and recent geographical information could be available to other researchers, for instance, involving swapping against other resources. It would also enable "remote" surveys (e.g. ask a local team to perform a field survey, possibly in exchange for image data…), true data fusion projects, and a number of other initiatives yet unimagined. For more information contact Guido Lemoine, JRC-SAI-ARIS, I-21020 Ispra, Italy (e-mail guido.lemoine@jrc.it).

3.3 Spot Image Achieves ISO 9001 Certification

The AFAQ Group, the French quality assurance association, has awarded Spot Image certification to the ISO 9001:2000 standard, making it the first European satellite data supplier to achieve this milestone. The company received certification for production and sale of geographic information products and services derived from SPOT satellite imagery.

Spot Image initiated the move towards ISO 9001 certification in 1999 to support changes required to adapt to the fast-growing geographic information market and to guarantee customers optimum quality of service. At the same time, the company has used its certification project as an opportunity to streamline its organisation, improve quality and boost efficiency. In seeking certification to the new ISO 9001:2000 standard, Spot Image has thus chosen to sharpen its customer focus.

The scope of certification covered seven key processes within Spot Image's business and supporting functions: image acquisition (programming and reception); design and development of products and services; product sales; project sales; telemetry sales; human resources management; hardware resources management. The organisational changes and technical developments made to prepare for the entry into service of SPOT 5, to be launched in the first half of 2002, have taken ISO 9001 fully into account. Certification to ISO 9001 is just a first step in a continuous improvement process based on the EFQM reference model. The ISO 9001:2000 award applies to Spot Image HQ in Toulouse, France. The US subsidiary Spot Image Corporation was certified in 1995. The group's other subsidiaries will now initiate their own projects aimed at achieving certification in 2002.

Spot Image is the world's leading provider of satellite-based geographic information, with a market share close to fifty per cent. Today, the company has a worldwide commercial network of four subsidiaries (in the US, Australia, Singapore and China), an office in Germany, and over eighty distributors and twenty-three receiving stations. To complement its portfolio of SPOT products and services, the company also distributes products derived from the ESA's ERS and Envisat radar satellites, Radarsat, the VEGETATION instrument on SPOT 4, and OrbView one-metre-resolution satellites, the first of which is set for launch in August 2001. For further information, contact Spot Image – Corporate Communications (phone +33-(0)5-6219 4040; e-mail Sandrine.Franck-May@spotimage.fr).

3.4 Meeting on IGOS Geohazard Theme in Paris

Meeting of IGOS (Integrated Global Observing Strategy) – Geohazard Theme, at UNESCO Headquarters in Paris, on 2-3 May 2001

Summary by Madeleine Godefroy (EARSeL), based on Minutes of the Meeting Prepared by Vern Singhroy (Canada Centre for Remote Sensing)

On 2-3 May 2001, a meeting was hosted by UNESCO (United Nations Educational, Scientific and Cultural Organisation) in Paris, convened under the auspices of ICSU (International Council of Scientific Unions), UNESCO, and the CEOS-DMSG (Committee of Earth Observation Satellites – Disaster Management Support Group). It was attended by representatives of the leading space agencies (ASI, BNSC, CNES,

CSA, ESA, NASDA) and other international agencies and societies. EARSeL was represented by Prof. Dr. Manfred Buchroithner of the University of Dresden.

The objective of the meeting was to explore interest in a Geohazard Theme (defined as Earthquake, Landslides, Volcanoes), for establishing an IGOS Partnership using integrated techniques – i.e. Earth Observation (EO) and in-situ (field) – to characterise (map), monitor, predict and assess damage in areas prone to geological hazards. Currently, a patchwork approach exists. A more comprehensive and integrated approach is needed, to build on CEOS disaster management (DM) activities, to include EO, in-situ measurements networks, models and geoinformation systems.

Representatives of the main space agencies summarised their activities, and presented the possibilities of their sensors currently in operation from the standpoint of applying their image data to hazard mitigation. Other agencies, such as ITC (The Netherlands) outlined how EO systems and GIS are being used for education, research and advisory services applied to natural hazards in developing countries, especially earthquakes, landslides, floods, volcanoes and coastal hazards.

One issue discussed was the definition of integration. This includes EO and in-situ data, GPS in support of InSAR / deformation studies, optical-SAR-DEM, image risk maps, and user focus and technology transfer (e.g. the UNESCO-IUGS GARS / Geological Applications of Remote Sensing programme). Another issue was why to have a strict definition of geohazards (earthquakes, landslides, volcanoes). Geohazards share common techniques – e.g. InSAR and high resolution (1-3 metres) stereo-optical and SAR. All needs should be considered, but regional-scale inventories and risk-hazard maps are needed. This fits well with GARS. It must be clear why other geohazards (e.g. land degradation, coastal processes) are excluded. Political viability is essential: there is a need for base data, including EO, to assess risk. The theme should establish research and operational standards (e.g. inventory; risk maps; RS techniques; inter-calibration issues).

The tasks of the IGOS Geohazard team were drawn up. These include preparing a Technical Document (Research and Operational vis-a-vis EO and in-situ measurements). Ocean and Carbon themes could be used as examples, and theme proposal must include: background; objectives; linkages; agreement by partners; definition of space-based and in-situ observing systems. A clear statement justifying the theme is required, explaining why a focused approach is needed. Milestones should be identified, with concrete dates and what is expected. The resources, institutional framework, and Working Team should be determined. How user agencies can work with the data should be established. An ad hoc Working Group, consisting of representatives of the main agencies involved, was nominated to develop the proposed IGOS Geohazards Theme.For more information see the IGOS web-site (ioc.unesco.org/igospartners/ igoshome.htm).

3.5 RIMS (Risk Management Services) Project

Paper by Mr. Claude Meyer (Bull S.A., France; Chief Co-ordinator of the RIMS Project), presented at the 21st EARSeL Symposium in Paris on 14-16 May 2001

Introduction

RIMS (Risk Management Services) is a project funded by the European Commission under the TEN-Telecom (Trans-European Networks for Telecommunications) programme. RIMS complies with the second of TEN-Telecom's four phases – i.e. it is a Feasibility Study, followed by a Market Analysis and Business Plan. RIMS started in January 2000, and will end in October 2001.

The RIMS project does not stand alone. It is a conjunction between NTICs (New Technologies of Information and Communication) and the wishes and needs of governments to use these new technologies to help in disaster management. The RIMS project is the first visible sign of the EDRIM (Electronic Discussion in Risk Management) programme, that was launched by the Open Partial Agreement called "EUR-

OPA Major Hazards Agreement", adopted by the Committee of Ministers of the Council of Ministers in March 1987.

The reasons behind RIMS are clear from the impact of recent major hazards on national economies: El Nino, Pacific Rim, 1997-1998 (losses in Ecuador of US$ 2 billion / 12% GNP); earthquake in Izmit, Turkey, 17 August 1999 (losses of US$ 13 billion). Nearly all European countries have been hit by a natural disaster of some importance in 1999-2001. In order to make this even clearer, there were sixteen great natural disasters in 1960-1969, with economic losses reaching US$ 52.5 billion. In 1990-1999 there were fifty-three disasters, with losses of US$ 479.3 billion.

RIMS for whom?

RIMS as a project aims to help the various actors in the field of Risk Management. This means of course to help not only all Civil Protection authorities but also the other ministries or governmental bodies and private industries being affected (Environment, Health, Transport, Utilities Industries, Insurance Companie, etc.). RIMS and EUR-OPA seek to involve all partners that can help. The agreement not only includes Member States, but also international organisations such as the European Commission, UNESCO, WHO, OCHA. We can also count on help from different European bodies like EARSeL (for Remote Sensing), the EU's Joint Research Centre, and ESA.

RIMS to do what?

RIMS deals with the five phases of Risk Management: prevention / knowledge; alert; crisis management; damage assessment; rehabilitation. For all five phases the RIMS services will be the same. These services, which use international standards, are based on video-conferencing, shared work, groupware capabilities, and teletraining. RIMS is a tool for contributing to decision-making in Risk Management, for the five phases. These services will use stepwise-defined information coming from various specialised databases, risk maps, mathematical models, and simulations. Most of the time (for the moment), telecommunications will be based on a hybrid system: in order to send information from any particular place, we will use terrestrial lines (ISDN or fibre), then a client station will send this information flow to a satellite using an up-link (two Mbps), which will broadcast to any place on the network. In order to be usable, the equipment must be completely transparent to the end-user, and the hardware tools must be user-friendly.

The objectives in the field are to help in the distributed monitoring of risks at European level, and in co-operation and collaboration between the European Civil Protection authorities, and experts or scientific information providers. All of this serves to save lives and to make economic savings, by using efficient and quick decision-making tools. Quick, as it is well known that the efficiency curve in Risk Management depends strongly on the time-lapse between occurrence and intervention. Specialists think that after two days, the chances of finding people alive under their houses after an earthquake, are small. In the case of catastrophic fires, when people have to be moved away from the danger area, it must be known where the fire will be in half an hour, one hour, and so on. A big challenge is to supply as early as possible the most adequate and precise information. This information is not always present in the country where the catastrophe occurs.

At present, the RIMS Consortium comprises public and private partners in France, Greece, Spain and Portugal. International organisations include: Council of Europe; EU's Joint Research Centre; European Space Agency; Centre Européen de Prévention des Risques; Institut Royal pour la Gestion Durable des Ressources Naturelles et la Promotion des Technologies Propres (Belgium). For more information on the RIMS Project, contact Mr. Claude Meyer (e-mail C.Meyer@frlv.bull.fr), or see the TEN-Telecom web-site (www.ten-telecom.org/en/projects.html).

3.6 Satellite-Based Prediction of Earthquakes

The following paper was submitted to the EARSeL Newletter by Dr. Qiang Zuji of the Institute of Geology, China Seismological Bureau, in Beijing, China.

Use of the Satellite Thermal-Infrared Brightness Temperature Anomaly for Short-Term and Impending Earthquake Prediction

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Background and rationale:

It is still difficult to make predictions of impending earthquake around the world. Since 1960, observations on earthquake precursors, based on geophysics, geochemistry, crust deformation, and astronomical factors, have been made in Japan, Russia, USA, and China. To some extent, successful predictions (including time, place, and magnitude) have been made based on those observations. However, the fact that there are far more earthquakes which are missed or falsely predicted – such as those in Tangshan, China (28 July 1976, mag. 7.8), Kobe, Japan (17 January 1995, mag. 7.2), and Northridge, Los Angeles, USA (17 January 1994, mag. 6.7) – perplexes seismologists.

Many seismologists are studying the questions of how many earthquake precursors will occur repeatedly, and how many factors can stand scientific scrutiny from a practical and scientific perspective. In March 1997 American seismologists R. J. Geller, D. D. Jackson, and others, wrote an essay entitled "Earthquakes Cannot Be Predicted", in Science Magazine. However, they overlook the fact that different scientific areas are correlated with and supplement each other, and only comment on a single technique and a single subject, while ignoring comprehensive analysis. In fact, successful predictions have been made using a method based on satellite remote sensing in the infrared spectrum, to observe the increase in near-surface atmospheric temperature. Examples are the earthquakes in Changshu, Jiangsu Province (10 February 1990, mag. 5.1), Tainan, Taiwan Island (12 March 1991, mag. 6.0), Hualian, Taiwan Island (20 April 1992, mag. 6.8), and the great earthquake in Taiwan Island (21 September 1999, mag. 7.6).

How is it possible to predict earthquakes, volcanoes, and forest fires? In the past, people regarded the Earth as a solid sphere. NASA has a research and development department specialising in this field. In fact, the Earth is not only a solid sphere, but also a liquid globe. When the crust of the Earth is under pressure, the crust deforms and ruptures, in the process releasing gases (CH_4, CO, H_2O, etc.) from below the crust. Coupled with sunlight radiation, the surging of the electric particles and the transient electric field eventually lead to a temperature increase – the so-called satellite thermal infrared temperature increase anomaly.

Mechanism research:

Using the correct theory or hypothesis is the key to earthquake prediction. Observation data for open areas provide the foundation for the correct theory or hypothesis. For years we have been observing the pre-earthquake brightness temperature and temperature-increasing anomaly, from satellite thermo-infrared cloud-image. From 1991 we began to observe the ratio of CH_4, CH_4 isotope, and CO_2 in the near-surface atmosphere, and found that the CH_4 level is 1-5 times higher than on a normal day, in an area of 400 km around Beijing. We also collected the data of CH_4 and CO_2 content in the atmosphere near the epicentre, pre- and post-earthquake, in the former USSR. In the 1970 mag. 6.6 earthquake in the Dakistan oil basin (north of Kavkas Mountain, southern USSR), workers found a 1-3 increase of CH_4 and CO_2 content in the atmosphere. In another mag. 4 earthquake, H_2 increased 4-5 times in the preceding two months. According to reports from Golubif, former USSR, during the mag. 4.2 earthquake in 1981 in Boernomi, Grujia, the gas-detecting instrument in Bakuliani showed a 1.9-2.8 increase in CH_4 in the air during the two days before the earthquake, relative to a normal day. The epicentre is 10 km from the measurement site. Thus, CH_4 content in the air changes significantly before a medium and small earthquake.

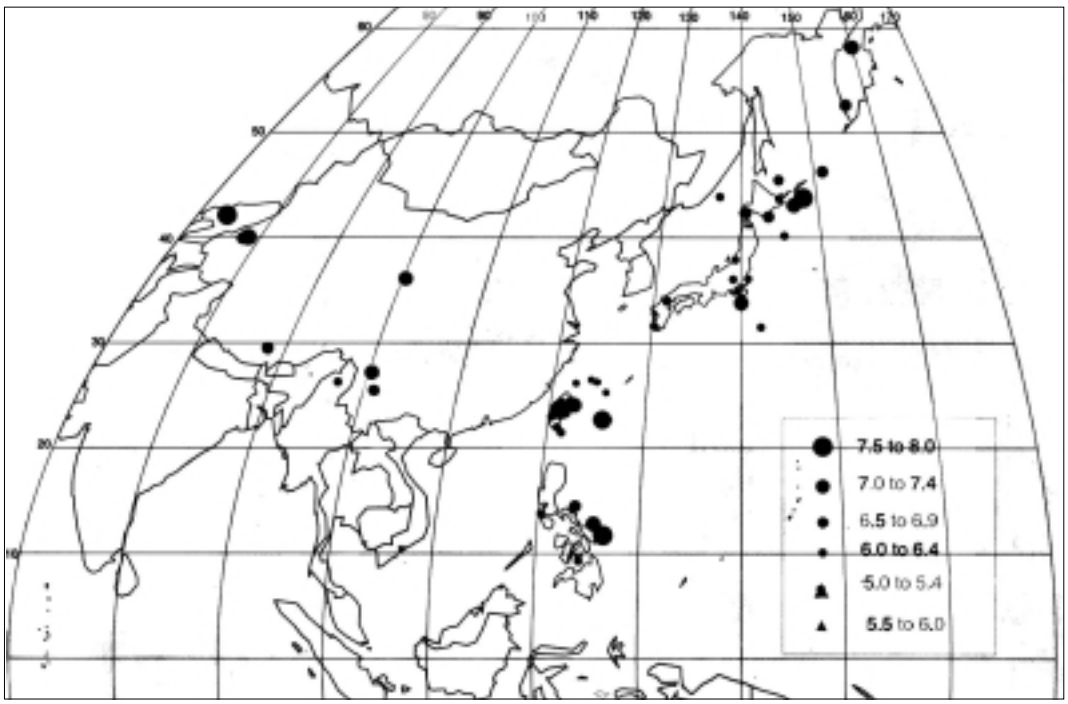
In the past, the researchers Brady, Rowell, and Martell, experimented with light radiation, and found that when the crust breaks, gas is emitted, and when the gas is bombarded by particles and ions, it can give out light. One defect of this experiment is that it neglects the existence of underground water. When the crust is broken, it is deep down in the ground. The question of how

the phenomena transmit to the surface is still unresolved. Current scientific developments make it practical to carry out simulation experiments on the characteristics of increasing temperature. In the laboratory, certain amounts of CH_4, CO_2, and mixtures of CO_2 and CH_4 in different ratios, are mixed and put in a sealed container. The internal temperature increases by 2.6-6.0 degrees Celsius, under the action of a transient electric field. The increase is 2-3 degrees with solar radiation. When normal air is put inside, under the action of transient electric field which is fifteen times weaker then that mentioned above, a temperature increase of 0.2 degrees is observed, together with pulse radiation of thermal photons (detected using a photomultiplier).

To summarise, anomalous temperature increases in the low-altitude atmosphere prior to an earthquake are not caused by heat from underground, because the heat conductivity of the crust (or sea-water) does not allow underground heat to transmit above the ground profusely. However, the source that causes the temperature increasing anomaly is from underground: it is the result of the accumulation of stress that transmits energy through another medium. The crust disrupts in the stress-field and pre-earthquake region (Red Swelling Theory), and the existing gases in the crust such as CH_4 are emitted above the ground- or water-surface. Meanwhile, due to the abrupt movement of underground water, electric particles transmit to the surface, resulting in the mutation of the transient electric field. Gases such as N_2 and CO_2 obtain energy from the electric field, change energy level, and release heat, thus creating impending earthquake precursors. The above study on the temperature increasing mechanism is the so-called Gas-Thermal Theory.

Experiments:

Experiments provides the only means of verification. We have been making earthquake predictions using satellite thermo-infrared imagery since 1989. Altogether we have made 149 experimental short-term and impending earthquake predictions, in mainland and sea areas. Some successful predictions of earthquakes have been made, reports on which have been submitted to the Bureau of Seismology. Of the 149 predictions, one hundred were correct. Of these, sixty-five were highly accurate, including ten of mag. 7, nineteen of mag. 6, and thirty-six of mag. 5. Twenty-five predictions were of medium accuracy, including four mag. 7 earthquakes. The



Epicentre distribution of the forty-six earthquakes and two volcanic eruptions predicted from January 1990 to September 2000

remaining ten predictions were of low accuracy (according to the three-factor rating standard stipulated by the UN's Global Planning Projects Co-ordination Office). There were forty-six events of mag. ≥ 0 earthquakes, and two events of volcanic eruptions. Owing to cloud interference, forty-nine earthquakes were neglected and twenty wrong predictions were made. From the above, it is concluded that the satellite thermo-infrared technique for short-term and impending earthquake predictions, is a good example of putting high technology to practical use, and the technique has brilliant prospects.

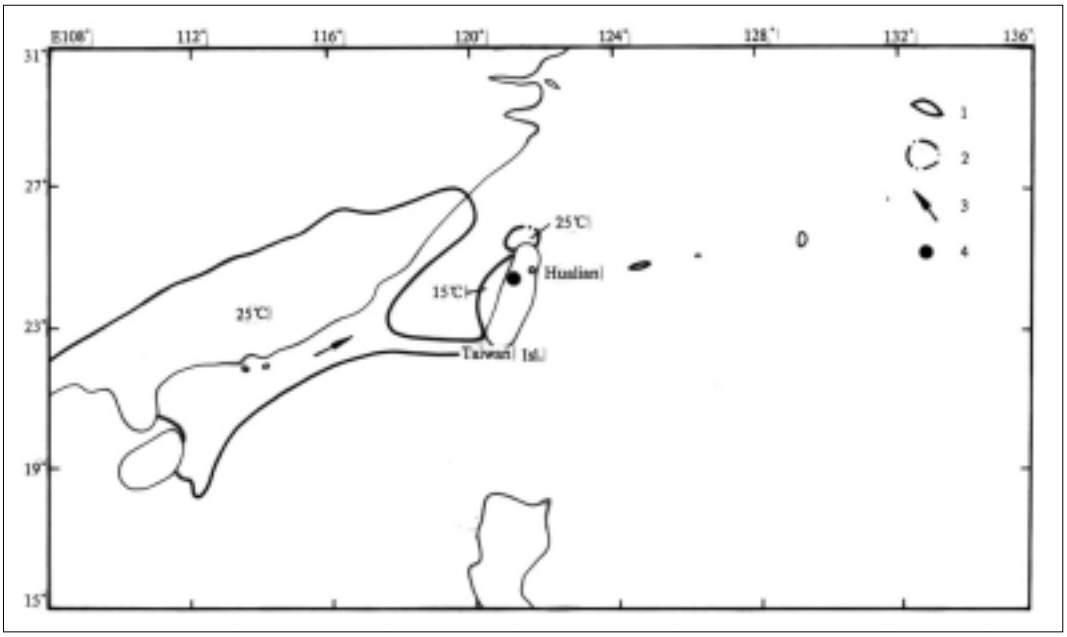
The rating standards for short-term and impending earthquake predictions are not yet mature, and new techniques and methods are being developed. Considering that time (T), space (R – i.e. radius of the predicted area), and magnitude (M) have different degrees of difficulty, the rating standards take the medium value of each factor. Each item is rated based on 30-100 points, with five-point intervals. Earthquakes are categorised according to magnitude into three groups: 5.0-5.9; 6.0-6.9; 7.0-8.0. For each group, the difference between "prediction realisation" and the medium value of the prediction range is computed. ΔT is counted in days for impending earthquake prediction, and ΔR is counted in kilometres. Due to different degrees of difficulty, the final prediction result is rated according to the sum. Furthermore, a difficulty factor (A) is used in the final sum: A = 0.20 for M; A = 0.35 for T; A = 0.45 for R. The prediction rating formula is: P = AmPm + AtPt + ArPr.

Image characteristics of precursors of Great Taiwan Earthquake:

Since 1990 we have studied earthquake precursors of Taiwan earthquakes, using satellite thermal-infrared scanners. Leaving aside cloud interference, almost eighty per cent of earthquakes (mag. >= 5.0) have earthquake precursors. Over this ten-year period we have made seventeen earthquake predictions (not including the earthquake on 21 September 1999). The most famous earthquakes in Taiwan include that on 21 September 1999 (mag. 7.6), and those in southern Beigang (6 November 1904, mag. 6.5), near Zhuolan (11 April 1935, mag. 7.1), Jiayizhongfu (17 December 1941, mag. 7.1) and Tainan Nanxi (18 January 1964, mag. 6.5).

On 19 August 1999, at 05:55 (UT) – thirty-four days before the great earthquake – there appeared an intensive temperature-increasing phenomenon in the southern part of the mainland and south coast, South China Sea, Taiwan Strait and the eastern sea of China. On the same day, at 15:55 (UT), in the water of North Taiwan Island there also appeared small individual temperature increase patches. The temperature increase anomaly moved from Pearl River to Taiwan Island. Its diameter was 120 km, and water temperature was 25 degrees, combined with isolated temperature increase points (25-28 degrees), on August 22 at 05:55 (UT), of diameter of 50 km.

The prediction of a strong earthquake was made by us on 12 September 1999. In September the temperature increase reached a peak. At this time, tropical hurricanes from the South China Sea and western Pacific coast severely interfered with the observation on the temperature increase area. Nevertheless we submitted the earthquake prediction on September 12. Before long, a mag. 7.6 earthquake occurred south-west of Hualian, which had not happened for one hundred years. Within four hours another mag. 7.0 earthquake took place. Many houses crumbled, and the total death roll exceeded 2,000, with 20,000 casualties. Within three days (i.e. on September 23), we submitted a new prediction based on the evolution of the satellite thermal-infrared image. We believed that 50 km south of the original epicentre, there was a possibility of a mag. 7.0 earthquake. On September 26, a mag. 7.1 earthquake took place. Taiwan's great earthquakes are characterised by "swarms". Therefore, there is a long delay in the sequence of these earthquakes. For every strong earthquake, the predictions are corrected based on the satellite infrared data. In fact, several predicted great earthquakes did occur near Nan-tou town: 20 September 1999 (mag. 7.6); 20 September 1999 (mag. 7.0); 25 September 1999 (mag. 7.1); 22 October 1999 (mag. 6.4); 22 October 1999 (mag. 6.1); 1 November 1999 (mag. 6.6); 17 May 2000 (mag. 6.1); 10 June 2000 (mag. 6.8).



The satellite thermal-infrared temperature-increasing map: (1) Boundary thermal anomaly on 19 August 1999 at 05:55 (UT); (2) Boundary thermal anomaly on 19 August 1999 at 15:55 (UT); (3) Direction of satellite thermal infrared temperature increasing movement; (4) Epicentre (21 September 1999, N23.7° / E120.9°, mag. 7.6)

Conclusions:

Conclusions are drawn on the connection between satellite brightness temperature, temperature increasing anomaly, and the three factors (time, space, magnitude) of an earthquake.

- Using satellite infrared spectrometer (bands 10.5-12.5 μm.) to explore the Earth's surface (both water and land), it is observed that there appears a huge isolated temperature-increasing area far from the epicentre, before the earthquake. The temperature is 2-6 degrees celsius higher than that in the peripheries.
- Magnitude is determined by the anomalous area. The bigger the magnitude, the larger the brightness temperature and temperature-increasing area. Usually, when the brightness temperature and temperature-increasing area is equal to or greater than 700,000 km^2, it means a magnitude of ≥ 7. Similarly, a temperature-increasing area ≥ 400,000-700,000 km^2 forecasts an earthquake of mag. ≥ 6; a temperature-increasing area ≥ 100,000-300,000 km^2 means an earthquake of mag. ≥ 5.
- The processing characteristics of the temperature-increasing anomaly are used in detecting the future earthquake epicentre. The epicentre is usually at the place where the fringe of the temperature-increasing anomaly area intersects with the earthquake belt, or in the hollow place of an isolated anomalous temperature-increasing area, or the movement structure or intersection where two stress hot lines cross.
- The time of the earthquake is when the brightness temperature anomaly reaches its peak, usually from several to sixty days.

Acknowledgements:

This paper has been translated by Ms. Jia Yanchun. The authors sincerely thank her.

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3.7 ISPRS: Data Generalisation and Data Mining

Dear Colleagues,

We would like to bring your attention to the web-site of a recently established Working Group of Commission IV of ISPRS (International Society for Photogrammetry and Remote Sensing): www.commission4.isprs.org/wg3. ISPRS Commission IV deals with "Spatial Information Systems and Digital Mapping", while Working Group IV/3 focuses on issues related to "Data Generalisation and Data Mining". The aim of this Working Group is to bring together researchers from different fields, who are dealing with various aspects of this topic. The Working Group intends to address issues related both to raster and vector data generalisation, as well as the integration of methods developed for both data types. Through workshops, our web-site, and special meetings, we hope to facilitate scientific exchange and disseminate information in this challenging area of research. With this message we would like to invite you to participate actively in our activities. This can be achieved by participating in upcoming workshops or conferences, sharing your research experience or expertise, or making data sets available as test-beds for the larger user community.

Forthcoming events: Workshop – "Challenges in Geospatial Analysis, Integration and Visualisation", Athens, Georgia, USA, 29-31 October 2001 (www.crms.uga.edu/wg_iv6/joint_workshop.htm); OEEPE Workshop – "From 2D to 3D: Establishment and Maintenance of National Core Geospatial Databases", Hanover, Germany, 8-10 October 2001 (www.ipi.uni-hannover.de/isprs-wg2-4/oeepe-isprs-2001.html); Joint Symposium of ISPRS Commission IV – Spatial Data Handling, and the Canadian Institute for Geomatics, Ottawa, Canada, 9-12 July 2002 (www.geomatics2002.org).

For more information, contact Monika Sester or Dianne Richardson, Institut für Kartographie und Geoinformatik (IKG), Universität Hannover, Appelstrasse 9a, 30167 Hanover, Germany (phone +49-511-7623588 / 3589; fax +49-511-7622780; e-mail monika.sester@ikg.uni-hannover.de).

4 RS DATA, PRODUCTS AND PROJECTS

4.1 Observations

Wim Bakker, ITC, The Netherlands

Artemis

Arianespace's Ariane 510 vehicle failed to reach its correct orbit on 12 July 2001. The last stage of the Ariane rocket did fire to increase velocity, but not enough. Instead of reaching an 858x35,853 km orbit, only a 592x17528 km orbit was reached.

The two satellites on the Ariane were the Artemis and BSAT-2b communications satellites. The 3,105 kg Artemis carries a liquid apogee engine with 1,538 kg of propellant as well as a set of attitude control thrusters, and also carries four ion

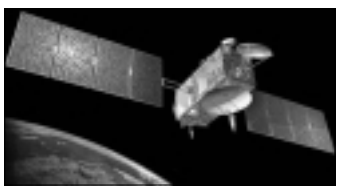
thrusters with 40 kg of xenon. The much simpler BSAT-2b satellite, with a launch mass of 1,298 kg, carries a solid apogee motor and a set of station-keeping thrusters with perhaps about 200 kg of fuel, which gives it much less flexibility than Artemis in recovering its intended orbit.

Artemis is an ESA satellite for testing new communications technologies. It carries the Silex laser communications experiment, an S-band inter-orbit link, a Ka-band data relay package, a large L-band antenna for mobile services, and an L-band navigation package. Silex is the interesting part for Earth Observation, as it will enable high-volume image data down-link for remote sensing satellites. SPOT-4 carries Pastel, which is the SPOT laser communications payload, a component of ESA's Silex experiment. BSAT-2b is a television broadcast satellite for the Japanese B-SAT company.

Ground controllers are evaluating possibilities to recover the mission of the Artemis satellite. The satellite is fully under control, and can remain in this safe condition for as long as it is needed to allow ground controllers to evaluate the best way to rescue the mission. Thanks to the availability of the ion propulsion system for position-keeping manoeuvres, most of the ordinary chemical fuel on board the satellite can be used to raise its orbit to the right altitude.

Jason-1

The French-American ocean observation satellite Jason-1 is scheduled for launch in September 2001. Jason-1 will measure the topography of the oceans surface just as accurately (3-4 cm height accuracy) as its predecessor, Topex / Poseidon. Jason-1, however, weighs only 500 kg, five times lighter than Topex. Topex was launched in 1992 and cost three times more than its successor. The development of Jason's project amounted to one billion French Francs, which was payed equally by France and USA. Data collected by Topex / Poseidon proved invaluable for the understanding of El Niño, and enabled improvement of global climate models, and especially the understanding of ocean-atmosphere coupling. The successor of Jason-1, Jason-2, is scheduled for 2004.



Artist's impression of Jason-1 in orbit (JPL)

OrbView-4

Orbital Sciences has announced that two of its satellites, OrbView-4 and QuikTOMS, were shipped to the mission launch site in California. Both satellites will be launched aboard a Taurus rocket of Orbital, which is currently planned for launch 12 August. The OrbView-4 satellite is a high-resolution satellite. It carries sensors for one-metre panchromatic and four-metre multispectral imagery. In addition, OrbView-4 will be the world's first commercial satellite to collect hyperspectral imagery. QuikTOMS carries a Total Ozone Monitoring System (TOMS) sensor for NASA. The last TOMS sensor, launched aboard a NASA Earth Probe satellite in 1996, is still operating flawlessly, providing not only the most widely used ozone data, but also information on aerosol particles from desert dust storms, forest fires and biomass burning, as well as UV-B radiation (a potential cause of skin cancer), and Earth surface and cloud reflectance.

Landsat 4 and 5

The US Geological Survey (USGS) has begun decommissioning Landsat 4 and 5. (See Section 4.3 – Editor). Although communication hardware for sending images to the ground failed on Landsat 4 several years ago, the satellite continued to be operated as a test-bed for software modifications intended for Landsat 5. Engineers recently began the process of retiring Landsat 4. Landsat 5, using its several backup sub-systems, can still provide high-quality image data. However, the costs of operating the aging satellite now exceed available resources. USGS is still struggling to find sufficient funding to keep it operational after September 2001. An estimated three million dollars would be needed to keep it in orbit for another year.

Meanwhile, Landsat 7 is still going strong. At the direction of the US Congress, Landsat 7, built by NASA and launched in 1999, is operated by the USGS under an ongoing Landsat Programme partnership with NASA. The Landsat user community has responded strongly to Landsat 7's non-commercial pricing and open-ended data policy. Also, several indicators point to an emerging market being developed by commercial value-added resellers of Landsat 7 data.

Life, the Universe and Everything

Douglas Adams
Like a coincidence culled from one of his novels, on the day writer Douglas Adams died the Minor Planet Centre announced the naming of asteroid "Arthurdent," after a character created by the late British author. Science fiction buffs around the world were saddened to learn of Adams' sudden death of an apparent heart attack, on 11 May 2001. Adams was 49. In 1978 Adams created The Hitchhiker's Guide to the Galaxy series of books, radio programmes and television shows. A common theme was the strange space travels of a mild-mannered Earthling called Arthur Dent, who was rescued by Ford Prefect from Earth just before it was destroyed to make way for a hyperspace bypass. Arthur Dent is confronted with the adversities of life, the universe and everything, in a highly amusing and entertaining way in Douglas Adams' famous five-volume trilogy, The Hitchhiker's Guide to the Galaxy. You'll never read funnier science fiction. Adams was a master of intelligent satire, barbed wit, and comic dialogue.

GRBs linked to Black Holes
For the first time a reasonable theory has been brought forward explaining the elusive gamma-ray bursts (GRBs). Researchers say GRBs may be the by-product of black hole formation. As a giant star collapses into a black hole, the idea goes, an extremely strong electric field can form. This energy would then be converted into matter and anti-matter electrons in a tiny fraction of a second. The opposing electrons would then collide, generating an enormous pulse of energy that races outward at nearly the speed of light. This expanding field of energy then runs into stuff left over when the original star collapsed, and it heats this material to billions of degrees. This heated material, in turn, expands at the speed of light and produces the burst of gamma rays.

Gamma-ray bursts are cosmic explosions that are observed to produce tremendous amounts of X-rays and gamma rays in a relatively short period of time. The flashes are known to be more energetic than anything else in the universe. All of those observed have come from the far reaches of the cosmos. Would such a GRB occur in out own galactic neighbourhood, the night would turn into day. GRBs also are thought to have the potential to wipe out all life forms within entire galaxies, setting back evolution of Intelligent Life hundreds of millions of years.

Atomic Clock
Researchers of the US National Institute of Standards and Technology (NIST) have demonstrated a new kind of atomic clock that has the potential to be up to 1,000 times more accurate than today's best clock. The new clock is based on an energy transition in a single trapped mercury ion. Building a clock based on such a high-frequency transition (1.064 petahertz!) was previously impractical as it requires both "capturing" the ion and holding it very still to get accurate readings, and having a mechanism that can "count" the ticks accurately at such a high frequency.

Today the best clocks are based on a natural atomic resonance of the cesium atom - the atomic equivalent of a pendulum. For example, NIST-F1, one of the world's most accurate time standards, neither gains nor loses a second in 20 million years. Better clocks help astronomers and deep-space satellite operators in locating objects. It will also help building satellite navigation systems with a higher accuracy; and, finally, it takes away your last excuse to be late! Sorry, got to run!

4.2 Satellites Capture Eruption of Mount Etna

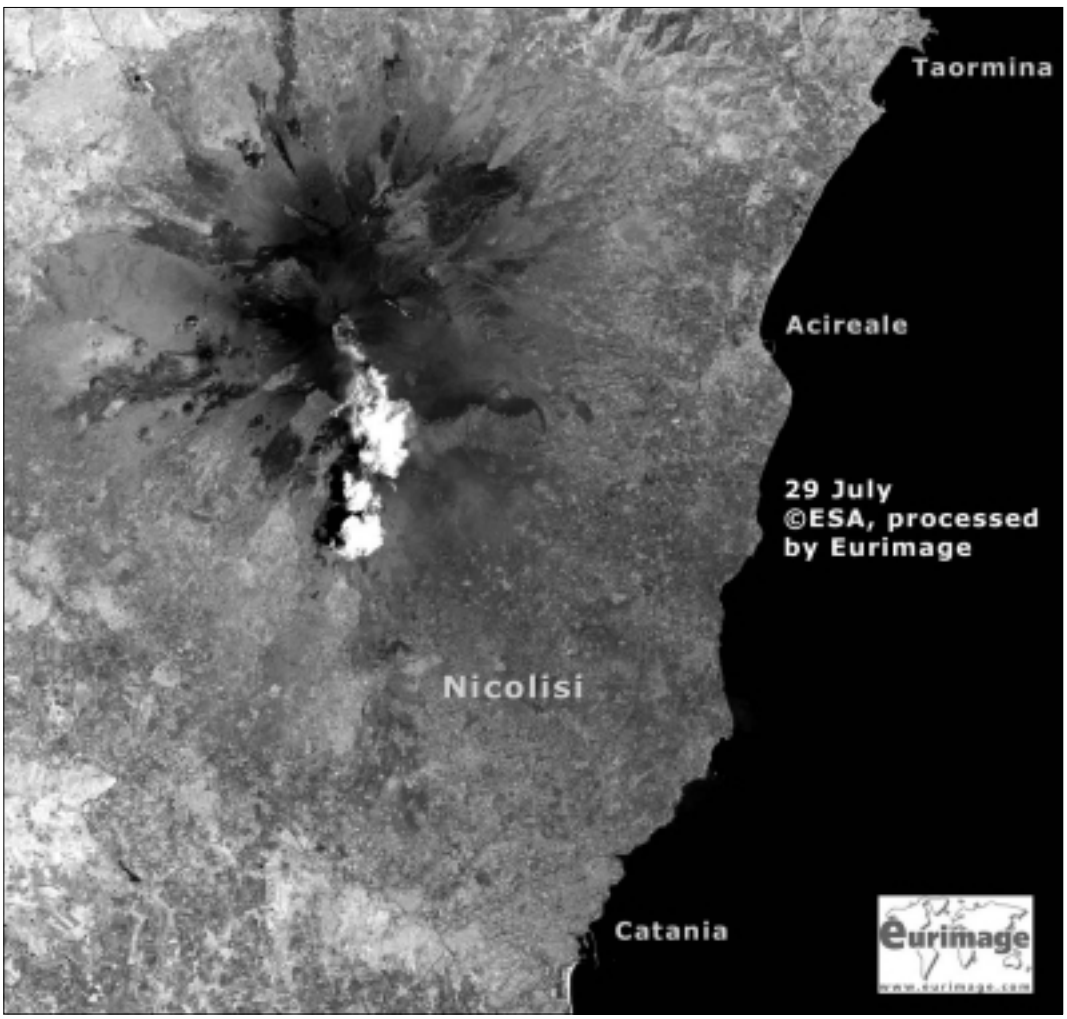
Niall McCormick, DG-JRC, Space Applications Institute, SSSA Unit, Ispra, Italy

The latest eruption of Europe’s most active volcano, Mount Etna, in Siciliy, Italy, is being closely monitored by a whole battery of Earth Observation (EO) satellites. Mount Etna began its current eruption on 17 July 2001. Since then, the lava flows and ash plumes of the 3,350 metres high volcano have been imaged and tracked, at different spatial resolutions and spectral wavelengths, by a wide variety of EO devices, including ESA’s GOME (Global Ozone

Monitoring Experiment), ATSR (Along Track Scanning Radiometer), and SAR (Synthetic Aperture Radar) sensors, NASA's MISR (Multi-Angle Imaging Spectro-Radiometer) instrument, the NOAA AVHRR (Advanced Very High Resolution Radiometer) scanner, as well as the Landsat and SPOT satellites. During Mount Etna's present eruption, a company in the UK – the Remote Sensing Data Analysis Service (RSDAS) at the Plymouth Marine Laboratory – has been providing the Italian authorities with a near real-time monitoring service, using specially processed NOAA AVHRR imagery. Based on this information the ground crews in Sicily can quickly identify the location of new lava flows. More information on the work of RSDAS on the Mount Etna eruption is on the website www.npm.ac.uk/rsdas/projects/etna. Spectacular images of the recent volcanic activity in Sicily are available, for example, on the Eurimage web-site (www.eurimage.com/etna/etna.shtml).

4.3 Landsat 5 to Continue Operating

On 6 July 2001 the USGS (United States Geological Survey) announced that Landsat 5, an important but ageing satellite that had been scheduled for decommissioning on 30 June 2001, will continue collecting Earth science information, for at least several more months. Landsat 5 (launched in 1984) and Landsat 7 (launched in 1999) cover the entire Earth's surface in alternating cycles, every eight days. Users of USGS Earth satellite images were concerned over the loss of that once-every-eight-days cycle,



Landsat 7 satellite image of Mount Etna eruption, on 29 July 2001. RGB: TM7, TM5, TM2. Pixel size: 30 metres. The near-infrared channels (TM7 and TM5) show the hot lava flows as glowing red and yellow. (Image from the Eurimage web-site: www.eurimage.com)

and the end of Landsat 5 as a backup for the technologically advanced Landsat 7. "Users like the eight-day cycle from two satellites because it gives them greater opportunities to obtain critical, cloud-free images of forest clear-cutting, forest and wild-land fires, agricultural crops, floods, tornado damage swaths, urban change, coastal erosion and a host of other landscape changes," said USGS Landsat Programme manager, R. J. Thompson. Several large orders for Landsat 5 data from the US Department of Agriculture, NASA, other federal agencies, universities and private users, were sufficient to enable the satellite to continue collecting images for several more months. Because commercial marketing rights to current and historical Landsat data expired on 1 July 2001, Landsat 5 data-users will no longer have restrictions on the use or re-distribution of Landsat 5 products. Landsat 5 has performed far beyond its two-year design lifetime, sending hundreds of thousands of 100x100 mile land surface images to US and international ground receiving stations. Landsat 5, using its several back-up subsystems, still provides high-quality image data to ground antennas. More information on Landsat 5, and ordering satellite data from USGS, can be found at the web-site earthexplorer.usgs.gov. Landsat 5 complements Landsat 7's Earth Science Research. More information is on the USGS web-site (www.usgs.gov).

4.4 Landsat 7 Web-Sales Now Operational

Eurimage reports that, after an intensive period of testing in demonstration mode, the Eurimage tool for buying Landsat imagery on the Web is now fully operational (www.eurimage.com). For technical users, "Landsat 7 on the Web" offers a complete frame-based coverage of Germany, to be followed soon by France and Italy. Users can choose the area they want through a simple map interface, order multi-spectral and panchromatic products, pay (from just 0.05 Euro / km^2) using a credit card and download the imagery via the Web. Imagery and products for the consumer market are also available. A continuous mosaic of Landsat images of all of Italy (France, Germany and other countries to follow) allows customers to buy exactly the area they want, again with credit card (from 0.03 Euro per km^2) and internet delivery of the real-colour product (Bands 3, 2, 1).

4.5 ORBIMAGE Wins NASA Hyperspectral Contract

On 23 July 2001, ORBIMAGE announced a multi-year agreement with the NASA Stennis Space Centre to supply up to $6 million in imagery from the 200-band hyperspectral camera to be carried on its OrbView-4 satellite. As the world's first commercial hyperspectral imagery from space, NASA will use the OrbView-4 hyperspectral data to develop environmental monitoring applications for managing the Earth's water and land resources. "We view NASA as a leader in Earth imaging research," said Mr. Gilbert D. Rye, ORBIMAGE President and CEO. "Through this agreement, we have more than another customer for our hyperspectral imagery – we have a development partner who will expand the uses of this leading edge technology".

All natural and man-made materials on the Earth's surface have a unique signature of reflected light from the sun. This signature is more detailed than can be captured with either a conventional camera or the human eye. However, the OrbView-4 hyperspectral camera will be able to measure this signature and actually identify materials from space that include plant species, mineral types, and inland and coastal water features. ORBIMAGE will distribute OrbView-4 hyperspectral imagery for applications including mineral, oil and gas exploration, national security activities, forestry, farming and environmental monitoring applications.

Under this new agreement with ORBIMAGE, NASA will use the OrbView-4 hyperspectral imagery to develop environmental monitoring applications as part of its Earth Observations Commercial Applications Program (EOCAP). Environmental monitoring applications for hyperspectral data focus on the ability to efficiently measure, map and monitor natural resources on a global basis. A few examples of current environmental uses for hyperspectral im-

agery include: identifying sources of heavy metal contamination from abandoned mines; monitoring the health of desert vegetation, performing climate change studies; monitoring grizzly bear habitats and monitoring the health of coral reef eco-systems.

ORBIMAGE's OrbView-4 imaging satellite is planned for launch in mid-August on board an Orbital Sciences Taurus rocket. In addition to the eight-metre spatial resolution hyperspectral camera, the satellite will have a one-metre resolution black-and-white and a four-metre resolution multispectral camera, that will provide imagery to customers worldwide. In terms of hyperspectral imagery, the new OrbView-4 imagery will complement both the current aerial sources of these data, (e.g. NASA's AVIRIS instrument) as well as the only other space-based hyperspectral camera, (NASA's Hyperion instrument).

ORBIMAGE is a leading global provider of Earth imagery products and services, with a planned constellation of five digital remote sensing satellites. The company currently operates the OrbView-1 atmospheric imaging satellite (launched in 1995), the OrbView-2 ocean and land multispectral imaging satellite (launched in 1997), and a worldwide integrated image receiving, processing and distribution network. Currently under development, ORBIMAGE's OrbView-3 satellite will offer one-metre panchromatic and four-metre multispectral digital imagery, and is planned for launch in 2002. ORBIMAGE is also the US distributor of imagery from the Canadian RADARSAT-2 satellite. ORBIMAGE currently offers one-metre high-resolution panchromatic imagery of major US and international urban areas through its OrbView Cities catalogue (www.orbimage.com). In addition, ORBIMAGE distributes imagery from SPOT Image, Canada's RADARSAT-1 satellite and Russia's SPIN-2 satellite. ORBIMAGE also offers the SeaStar Pro Fisheries Information Service, which provides fish finding maps derived from OrbView-2 satellite imagery of the world's oceans to fishing customers worldwide. For more information, contact Barron Beneski (phone +1-703-4065528; e-mail beneski.barron@orbital.com), or see the web-site www.orbimage.com.

4.6 NASA Launches GOES-M Weather Satellite

On 23 July 2001, an advanced environmental satellite, equipped with instruments to monitor Earth's weather and with a telescope that will be used to detect solar storms, was launched from Cape Canaveral Air Force Station, Florida, USA. The Geostationary Operational Environmental Satellite (GOES-M) will monitor hurricanes, severe thunderstorms, flash floods and other severe weather. It is the first of the GOES satellites equipped with a Solar X-ray Imager, which will be used to forecast earth space weather due to solar activity. The GOES-M spacecraft was carried into space aboard a Lockheed Martin Atlas IIA rocket. "We're off to a great start," said Martin Davis, GOES Project Manager at NASA's Goddard Space Flight Centre, Greenbelt, Maryland. "The spacecraft is now in transfer orbit and all data indicates we have a healthy spacecraft".

The spacecraft is a three-axis internally stabilised weather spacecraft that has the dual capability of providing pictures while performing atmospheric sounding at the same time. Once in geo-stationary orbit, the spacecraft is to be designated GOES-12 Throughout the first seventeen days, NASA and the National Oceanic and Atmospheric Administration (NOAA) controllers were scheduled to perform several apogee motor firings and adjust manoeuvres, culminating with the spacecraft arriving in a geosynchronous orbit 22,240 miles (35,790 kilometres) above the Earth's equator at 90 degrees West Longitude. Controllers will operate the spacecraft from the NOAA's Satellite Operations Control Centre in Suitland, Maryland.

The primary objective of the GOES-M launch is to provide a fully capable spacecraft in on-orbit storage, which can be activated on short notice to assure continuity of services from a two-spacecraft constellation. GOES-M was built and launched for the National Oceanic and Atmospheric Administration (NOAA), under technical guidance and project management by the NASA Goddard Space Flight Centre. GOES information and imagery are available on the web, at www.goes.noaa.gov and goes2.gsfc.nasa.gov.

4.7 New NASA Airborne Radar Mapping Technology

NASA has licensed a new airborne radar mapping system that can produce high-resolution, three-dimensional maps of the Earth, by seeing beneath foliage and vegetation. The Geographic Synthetic Aperture Radar (GeoSAR) is the first system that can map above, through and below the planet's vegetation cover. EarthData International of Fresno, California, a mapping and remote sensing company, has been licensed by NASA's Jet Propulsion Laboratory (JPL) to use the technology in a year-long test on board the company's Gulfstream II aircraft. Data will be collected over sites in California, Pacific North-West, Alaska, Eastern United States, and South America. The National Imagery and Mapping Agency (NIMA), which manages GeoSAR in conjunction with JPL, expects the system to become commercially operational by late 2002. The airborne radar system will generate high-resolution, three-dimensional maps using a dual-frequency radar system that will be able to collect 249 km2 of data per minute. Since GeoSAR uses radar, the system will be able to operate both day and night, under almost any weather condition. The GeoSAR radar system is a dual frequency design using both P- and X-band wavelengths. The longer P-band will penetrate deeper into the canopy and, coupled with computer modelling, map beneath the vegetation canopy. When combined with other remote sensing data, such as Landsat multispectral information, it will be possible not only to determine land cover type such as tree species, but also tree height and perhaps even width, and crown diameter. For more information on GeoSAR, see the Department of Conservation web-site (www.consrv.ca.gov/radar/geosar/).

4.8 RSI Contracts: Infoterra (UK), NRSA (India)

Infoterra Uses RADARSAT Data for Oil Seeps:

On 24 July 2001 it was announced that RADARSAT International (RSI) of Richmond, British Columbia, Canada, and Infoterra Ltd of Leicestershire, UK, have signed a purchase agreement for the supply of up to three thousand RADARSAT-1 images by RSI to Infoterra over the next two years. The images form an integral component of Infoterra's Global Seeps programme, which provides oil seep information for offshore oil and gas basins worldwide. Infoterra's Global Seeps programme combines Earth Observation data, such as RADARSAT-l, with other geological and geophysical data, to produce a range of consistent information products. Exploration companies are provided with high quality seepage information at global, regional, and country scales, which helps them to identify new exploration opportunities. "The flexibility of acquisitions offered by the RADARSAT-1 satellite, combined with its consistent data quality, make it an ideal platform to supply data for use in this global programme", said Adrian Huntley, Infoterra Ltd's Global Seeps Sales Manager. "We are very pleased to be providing offshore RADARSAT-1 data for Infoterra's Global Seeps programme. This is part of our ongoing objective to be the image provider of choice for all offshore oil seepage and spillage detection", said Adrian Bohane, RSI's Director of Worldwide Sales. Oil seeps are detected on RADARSAT-1 images as dark regions against the grey background colour of the ocean. Optimal wind conditions exist where this detection is possible (as ocean wave height affects the visibility of the oil on the ocean). To ensure that only images acquired during this optimal "sea-state" are processed for Infoterra, RSI uses a meteo-programming service whereby Infoterra verifies the "sea-state" for each acquired image before asking RSI to process the data. For more information, contact Cory Rossignol or Kate Stephens, Communications Department, RSI (phone +1-604-2315000; e-mail crossignol@rsi.ca or kstephens@rsi.ca).

India's Use of RADARSAT Data to Continue:

RADARSAT International (RSI) and the National Remote Sensing Agency (NRSA), Department of Space, Government of India, have signed a monitoring contract whereby NRSA will buy a minimum of three hundred RADARSAT-1 scenes in the next two years. This follows on from a previous two-year commitment by NRSA.

RADARSAT-1 data and services have been used extensively in India for flood and agricultural (particularly rice crop) monitoring. Time-sensitive services, such as near-real time data processing and electronic delivery, enable scientists in India to receive data within hours of RADARSAT-1 data reception, to be used as a key information source in reacting to a flood disaster. India has among the world's most advanced radar experts, particularly in the development of agricultural applications. Extensive rice monitoring programmes are in effect, that use RADARSAT-1 and IRS data to classify the amount of land under rice cultivation, and to monitor anomalies in crop growth and locate regions adversely affected by extended periods of flooding or inundation. "Our use of RADARSAT-1 data jointly with IRS data over the past two years has met with high success for flooding and agriculture applications in India. We look forward to continued success", said Dr. R. R. Navalgund, Director of NRSA. The chief activities of NRSA include satellite and aerial data reception, processing, dissemination and value-added services and training. Operational uses of remote sensing include applications such as hydrology, agriculture, soil and land degradation, mineral exploration, mapping, coastal and ocean monitoring and urban studies. For more information, contact Cory Rossignol or Kate Stephens, Communications Department, RSI (phone +1-604-2315000; e-mail crossignol@rsi.ca or kstephens@rsi.ca).

4.9 ILWIS 3.0 Released by PCI Geomatics for ITC

PCI Geomatics, the world distributor of the ILWIS Remote Sensing and GIS software products for the International Institute for Aerospace Survey and Earth Sciences (ITC), The Netherlands, announced the release of ILWIS Version 3.0, on 4 July 2001. The ILWIS (Integrated Land and Water Information System) software integrates image, vector, and thematic data in one unique and powerful package on the desktop, delivering a wide range of features including import / export, digitising, editing, analysis and display of data as well as production of quality maps. ILWIS 3.0 has a completely modernised user-interface to take advantage of memory management improvements that are most notable when working with multiple file projects. There has also been a series of new additions and improvements, including a rejuvenated online help. Despite the many developments in ILWIS 3.0, it retains its unrivalled user-friendliness. Currently, over five thousand ILWIS systems are in use in more than one hundred countries.

ITC (the makers of ILWIS) and PCI Geomatics collaborate on the development and commercial distribution of the ILWIS software. Within this agreement, ITC pursues academic aims in correspondence with its mission, including the distribution of the academic version of ILWIS, while PCI Geomatics is responsible for sales in the commercial sector. All orders (other than from alumni and staff) can be placed with PCI Geomatics (www.pcigeomatics.com). ILWIS 3.0 upgrades are now available for purchase online (www.pcigeomatics.com / e-commerce / ilwis_index.html). PCI Geomatics also arranges shipment of the academic version of the software.

4.10 EarthWatch Links with ERDAS, PCI Geomatics

EarthWatch Inc. has announced the execution of strategic software partnerships with both ERDAS Inc. and PCI Geomatics, which supports the new "Open Systems" approach within the satellite imagery industry. The new partnerships will license the QuickBird sensor model to ERDAS and PCI Geomatics, for incorporation into their geographic imaging software packages. The partnership will allow both existing and new users of both companies' software to fully leverage the highest resolution commercially available satellite imagery, as soon as it is available early next year. EarthWatch recently confirmed its plan to launch the QuickBird 2 satellite in October 2001. QuickBird 2 will offer 61 cm panchromatic and 2.5 metre multispectral imagery.

EarthWatch is an imagery and information company located in Longmont, Colorado, USA, that is establishing a market leadership position by providing the highest res-

olution satellite imagery product, the greatest collection capacity, and the largest image size commercially available. The company offers geographic information products through its digitalglobe.com online imagery store, an Internet-based global archive of geographic information available to commercial businesses and governments worldwide. For more information, contact Earthwatch Inc., 1900 Pike Road, Longmont, Colorado, USA 80501-6700 (phone +1-303-6823800; fax +1-303-6823848; web-site: www.digitalglobe.com).

4.11 ERDAS IMAGINE® 8.5 Now Shipping

ERDAS Inc. is pleased to announce that ERDAS IMAGINE Version 8.5 – packed with powerful feature enhancements including upgrades to the mosaicking tool, advanced 3D visualisation and scene-creation capabilities, and MrSID's (Lizardtech, Inc.) space-saving compressor – is now available to customers. "ERDAS is happy to offer ERDAS IMAGINE 8.5, the newest version of our industry-leading, easy-to-use imaging and raster-based software, to customers who expect and demand more from their geographic imaging software, and want it to remain affordable," said ERDAS President Lawrie E. Jordan, III.

ERDAS IMAGINE has long provided tools for merging multiple images into a single, mosaicked image. And now, with an even easier-to-use mosaicking tool in ERDAS IMAGINE 8.5, users can create seamless output images with the use of specialised colour-balancing procedures that remove "hot spots" from aerial photography and other off-nadir imagery. Additional highlights of the expanded mosaicking tool include: a preview feature that allows the customer to see the mosaicked image and make changes prior to finalising the product; a cropping feature that removes the "rough" edges from the image; support for off-line imagery.

Other new features in ERDAS IMAGINE 8.5 include the addition of license administration flexibility, more import and export utilities, greater mobility for fieldwork, the ability to preserve pixel location and boundaries, an enhanced ability to create and edit ESRI Shapefiles, military grid reference system (MGRS) support, extensions to the IMAGINE Developers' Toolkit, and numerous enhancements previously released to ERDAS' Software Subscription Service (SSS) members via the ERDAS web-site. In addition to the many upgrades available with the release of ERDAS IMAGINE 8.5, ERDAS is pleased to add support for a new suite of spectral analysis tools, stereo collection and editing tools, and upgrades to our photogrammetry suite. These add-on modules, which will inter-operate with ERDAS IMAGINE 8.5 and will be available in 2001, include: a new suite of Spectral Analysis tools, aimed at extracting information from hyperspectral imagery; updated versions of ATCOR which support atmospheric correction of hyperspectral imagery, and correction of atmospheric anomalies using a DEM in mountainous regions; Stereo Analyst Version 1.2, with added sensor support for SPOT and IRS-1C stereo imagery; IMAGINE OrthoBASE Pro (an upgrade of IMAGINE OrthoBASE) for automatically extracting DEMs from imagery.

Sensor model support for IKONOS stereo imagery will soon be available. IMAGINE Advantage will support the orthorectification of IKONOS imagery; IMAGINE OrthoBASE will support the simultaneous adjustment and orthorectification of multiple IKONOS stereo images; IMAGINE OrthoBASE Pro will support the automated extraction of DEMs from IKONOS stereo imagery; and Stereo Analyst will allow for the high-accuracy collection, interpretation and visualisation of 3D geographic information from IKONOS stereo imagery. For more information, see the ERDAS web-site (www.erdas.com).

4.12 PCI Geomatics' IKONOS Orthorectifying Tool

On 23 July 2001, PCI Geomatics announced that it had begun shipping its Geomatica OrthoEngine software, which incorporates the ability to orthorectify Geo OrthoKit IKONOS satellite imagery. Space Imaging recently announced the first major photogrammetric software companies that will

incorporate the ability to orthorectify its new Geo OrthoKit IKONOS satellite imagery into their software suites. In providing this capability immediately, PCI Geomatics is the first company able to offer customers the immediate ability to orthorectify IKONOS satellite imagery with Space Imaging's newest product, the Geo Ortho Kit.

Geo Ortho Kit consists of a high-resolution Geo image derived from the IKONOS satellite and an Image Geometry Model (IGM) digital file. The IGM is a mathematical way of expressing the complex sensor geometry of the IKONOS camera, which is necessary to correct the imagery for terrain distortions. By incorporating the IGM and a Geo image into the leading commercial imagery software suites, users will now be able to create an accurate ortho-image using their own DEMs and ground control points (GCPs). Since IGM provides the complete and accurate sensor geometry, the metric accuracy of the final orthorectified image is limited only by the accuracy of the DEM and GCPs. The product is available as a part of the Geo product suite, in one-metre black-and-white, one-metre colour, or four-metre multispectral.

Dr. Robert Moses, President and CEO of PCI Geomatics, is always interested in bringing greater value to customers, and supports this liberating step by Space Imaging. "As a leading developer of affordable geospatial software solutions, PCI Geomatics seeks to answer customer needs with the affordable tools they want. Our two organisations have enjoyed a long and productive relationship over the years, and we are proud to include this leading-edge technology in our newest Geomatica OrthoEngine solution". For more information, contact PCI Geomatics, Corporate Communications (phone +1-905-7640614; fax +1-905-7649604; e-mail info@pcigeomatics.com; web-site www.pcigeomatics.com).

Space Imaging, the world's leader in providing Earth imagery and related services to commercial and government markets, launched the world's first and only one-metre resolution, commercial Earth imaging satellite, IKONOS, on 24 September 1999. Other products are produced from the Indian Remote Sensing (IRS) satellites, Canada's RADARSAT and ESA's ERS satellites. Space Imaging also delivers aerial-derived imagery products collected by its own Digital Airborne Imaging System (DAIS-1). For more information on Space Imaging, see its web-site (www.spaceimaging.com).

4.13 ER Mapper Releases New Image Web Server

ER Mapper's new Image Web Server Version 1.6 is breakthrough technology for full integration of truly interactive imagery with web-based GIS data. It features fast and seamless integration of city, state and country-wide imagery with GIS map servers and database information. This powerful combination makes possible industrial strength web solutions to meet any organisations needs. Based on the two-way streaming protocol of the patented ECW compressed wavelet imagery format, Image Web Server 1.6 provides true real-time panning and zooming over terabytes of imagery – now with full GIS vector layers draped over imagery. Query, layer control and other GIS functions are fully supported. Numerous integration features have been included in response to user interest and input: tight integration with ESRI's ArcIMS and MapObjects IMS, Autodesk's MapGuide, MapInfo's MapXtreme, Intergraph's GeoMedia WebMap, UMN's MapServer, Vicinity's MapBlast; real-time roaming and zooming of imagery and GIS layers in resizable map view windows; ability to integrate, query and blend GIS map layers with imagery; reduced GIS map server loads; seamless integration which can be accomplished in a matter of minutes, from scratch or within existing web-sites. For more information, see the Image Web Server 1.6 White Paper (www.ermapper.com/products/iws/release16_wp.pdf).

5 REVIEWS, PUBLICATIONS AND REPORTS

5.1 Urban RS Symposium in Regensburg, Germany

Dr. Carsten Jürgens, Dept. of Geography, University of Regensburg, Germany

The Second International Symposium "Remote Sensing of Urban Areas" was held in the city of Regensburg, Germany, on 22-23 June 2001. More than one hundred and thirty participants came from over twenty countries, to listen to forty oral presentations and enjoy about fifteen posters. According to the thematic focus and to new technological developments, the Symposium consisted of the following session-topics: Monitoring Urban Growth; Thermal Data Analysis; Towards a Global Urban Monitoring Facility; Road Extraction Techniques; IKONOS-Applications; Special Applications; Monitoring Urban Land Cover Dynamics; Extraction of Height and Density; HRSC-A (High Resolution Stereo Camera – Airborne) Applications; RADAR Applications; Monitoring of Informal Settlements; Ecological Aspects of Urban Landscapes.

Symposium Director Dr. Carsten Jürgens (foreground), of the University of Regensburg, during a presentation (by the EARSeL Editor) at the 2nd International Symposium on Remote Sensing of Urban Areas, in Regensburg (Germany) on 22-23 June 2001

That the participants came from so many different countries underlines the global importance of the remote sensing of urban areas. On the one hand, there is an increasing migration to urban centres, and consequently the need for timely data. On the other hand, new sensors help to acquire more detailed data that can be exploited by application of sophisticated data analysis techniques to extract the necessary spatial information, to answer specific questions.

The Proceedings of the Symposium consist of two parts. The printed part contains the abstracts of all oral presentations. The annexed CD-ROM contains the full papers (approximately 350 pages) together with coloured illustrations that can be viewed on a computer. It is believed that this combination of printed and digital information serves most needs. The Proceedings (including CD-ROM) are available at a price of DM 30 from Dr. Jürgens (details below). The booklet contains all abstracts to help find the full papers on the CD-ROM. The full papers contain all colour figures, full text, and all references of the authors. In total, the Proceedings contain forty papers, consisting of approximately 350 pages on the CD-ROM.

The full reference details for the Proceedings are as follows:

- Jürgens, C. (Ed.). 2001. Remote Sensing of Urban Areas / Fernerkundung in urbanen Räumen. Abstracts and Full Papers

(on Supplementary CD-ROM) of the Second International Symposium held in Regensburg, Germany, 22-23 June 2001. Regensburger Geographische Schriften Heft 35. ISBN 3-88246-222-1. DM 30.

If you are interested in purchasing your personal copy, for DM 30 (plus shipment), please send me your order by fax or e-mail. It is possible to pay by credit card (Eurocard, Master Card, or Visa). The credit card payment is required for foreign orders. Please give your credit card details by fax or email to Prof. Dr. Carsten Jürgens, Dept. of Geography, University of Regensburg, D-93040 Regensburg, Germany (phone +49-941-9433630; fax +49-941-9434933; e-mail carsten.juergens@geographie.uni-regensburg.de).

5.2 CoastGIS 2001 in Halifax, Canada

Report on CoastGIS 2001 – Fourth International Symposium on Computer Mapping and GIS for Coastal Zone Management, in Halifax, Nova Scotia, Canada, on 18-20 June 2001

Jacques Populus, IFREMER, Brest, France

This Symposium, the fourth in a series under this title, was organised by Andy Sherin of the Geological Survey of Canada (GSC) in Halifax. It brought together approximately one hundred and fifty delegates, roughly the same number as in Brest in 1999. It opened up the community towards the American Continent (with just under ten participants from South America), and confirmed the renown of the CoastGIS meetings among certain experts, whom we hope will continue to support these meetings. The only other such specific meeting on this continent is Coastal Geotools, organised every two years by the NOAA Coastal Resources Centre in Charleston, which is rather more technical and draws practically exclusively a North American audience.

At this meeting the Canadians were of course well represented, especially from the maritime regions. Their preoccupations are close to ours, and their level in geomatics is very advanced. Europe was represented by our delegation (seven French participants presenting five papers and two posters, one of which won Second Prize), but especially by the British delegation, who always come in numbers and whose level is excellent, as well as some participants from other countries, such as Ireland, Denmark, Italy, Germany and Belgium.

Darius Bartlett, of University College Cork, Ireland, is preparing a summary of the Final Discussion, which will be available in a few weeks. At the request of the organising committee, I participated in the final round-table panel, where I made the following remarks: (a) there is a lack of communication on the aquatic element (i.e. models, networks, and links with GIS); (b) as a consequence, there was a lack of papers on "object" databases (raster in general); (c) it is necessary in our projects to be closer to the end-users (stakeholders), which, although obvious, needs to be constantly kept in mind at each stage of a project. At a time when Europe is launching "Water Guidelines", including coastal waters, we heard little reaction from the audience on the first point.

The idea of "CoastGIS" is becoming more formal, at a time when the "family circle" is growing, and North American supporters are being recruited. The decision of the central committee (consisting of the organisers of the first four conferences) is to remain rather informal. The composition of the scientific committee therefore is not fixed, and is adapted according to the wishes of each new organiser. A CoastGIS web-site has been set up (www.coastgis.org). It will give a short report of past conferences and will also provide the publications on-line (PDF format). For the time being it is hosted by the Geological Survey of Canada. It will be transferred when appropriate to the site of the new organiser, in this case the University of Genoa (for CoastGIS 2003). Concerning publications, taking into account the new technologies, a specific strategy for CoastGIS is currently under consideration. The principle of holding meetings alternately in Europe and North America, every two years as until now, was put forward and accepted.

5.3 New Book on Practical IDL Programming

Gumley, Liam E. 2001. Practical IDL Programming: Creating Effective Data Analysis and Visualisation Applications. Published by Morgan Kaufmann. 508 pages, paperback. ISBN 1-55860-700-5. $49.95.

Announcement by the author:

IDL is a particularly important tool for working with data in Hierarchical Data Format (HDF), such as the large volumes of data now available from the EOS Terra spacecraft. For more information about the book, including an extended table of contents, links to my favourite IDL resources on the Web, a list of other recommended books, and a growing collection of IDL software, please visit the accompanying web-site: www.gumley.com.

My philosophy in writing the book was to start with the fundamentals of procedural programming in IDL (syntax, program construction, I/O including HDF, direct graphics), followed by application of the fundamentals to real-world problems (plotting, imaging, creating graphical output, graphical user interfaces). At every stage in the book, I have augmented the text with figures, command-line examples, non-trivial sample programs, and tables that list the most useful information about a particular topic (e.g., commonly used keywords). I have also highlighted "Notes" that deserve extra consideration, and "Tips" that are only discovered after many years of IDL programming. The book has been in development for almost three years, and has benefited greatly from external reviews by experts in the field. The reviewers and the editorial staff of the High Performance Computing division at Morgan Kaufmann Publishers have made the book a much stronger and better organised reference on IDL. I am confident that programmers at all levels will find the book informative and useful. Please let me know if you have any questions or comments about the book.

For more information, contact Liam E. Gumley, Space Science and Engineering Center, University of Wisconsin-Madison. 1225 W. Dayton St., Madison WI 53706, USA (phone +1-608-2655358; fax +1-608-2625974; web-site: www.gumley.com).

5.4 New Web-Site for Sea Ice Data

The National Snow and Ice Data Centre (NSIDC), of the University of Colorado, USA, has released a new web-site (nsidc.org/seaice) that summarises the characteristics of over two dozen sea ice data sets. The site offers a complete summary and inter-comparison of sea ice data derived from passive microwave sensors and other sources, including ice charts, surface observations, and drifting buoys. Where possible, the site includes links to browse images, and tools to assist users in understanding and working with NSIDC's diverse sea ice data holdings, and in finding the data set that best fits their application. Links to various other external sea ice data sources are also provided.

6 FORTHCOMING MEETINGS AND COURSES

6.1 3rd Urban RS Symposium in Istanbul, Turkey

Dear Colleagues,

The Organising Committee of the Third International Symposium on "Remote Sensing of Urban Areas", which will be held in _stanbul, Turkey on 11-13 June 2002, kindly invites you to participate in this Symposium, and to share this information with other interested scientists around the world. Please mark your calendar and plan to attend this meeting, which will demonstrate the value of geo-information systems for urban areas. Deadline for abstracts: 15 December 2001.

The first Symposium on "Remote Sensing of

Urban Areas" was held in Regensburg, Germany, in 1997. This topic was addressed during the autumn meeting of the DGPF (Deutsche Gesellschaft für Photogrammetrie und Fernerkundung E.V.) working group on "Interpretation of Remote Sensing Data", led by Prof. Dr. C. Gläßer. Due to the success of this Workshop, and due to the availability of new data sources and emerging image processing techniques, a follow-up Symposium on remote sensing of urban areas was organised in 2001, again in Regensburg, to continue scientific discussions on the topic. This initiative was supported by ISPRS activities – e.g. the new working group VII-4 "Human Settlements and Impact Analysis" that was created during the ISPRS Congress in Amsterdam 2000. Due to the great interest of scientists from different countries in both Symposia, and continuous developments in space technologies for urban monitoring, the Third International Symposium is supported by several institutions at national and international level.

For more information, contact: Prof. Dr. Derya Maktav (Symposium Chair), Istanbul Technical University, Remote Sensing Department, 80626 Maslak, Istanbul, Turkey (phone +90-0212-2853808; fax +90-0212-5737027; e-mail dmaktav@ins.itu.edu.tr; web-site www.ins.itu.edu.tr/derya maktav). You can also look at our website: www.ins.itu.edu.tr/rsurban3.

With best regards,

Assoc. Prof. Filiz Sunar Erbek (Organising Committee), Istanbul Technical University, Turkey

6.2 Conference on Urban Green Spaces in Ukraine

The Organising Committee of the International Conference "Urban Green Spaces: Past, Present And Future" invite you to take part in the Conference, which will be held on 3-5 October 2001, at the Ukrainian State University of Forestry and Wood Technology, Lviv, Ukraine. The Conference will include two plenary sessions (opening and closing) and several work sessions. The Conference will address the following topics: the role of Botanical Gardens in ornamental plants introduction; ancient gardens and parks: problems of restoration, conservation and reconstruction; actual problems in greening a new residential region; transformation of city forests into urban forests; park phyto-coenology and biodiversity; specialists training for lay-out of gardens and parks.
For more information contact the Organising Committee, at: Ukrainian State University of Forestry and Wood Technology, Department of Ecology and Landscape Architecture, Kobylyanska str. 1, 79005 Lviv, Ukraine (phone +380-322-725792 / +380-322-720092; fax +380-322-352269 / 380-322-971765; e-mail dendro@is.lviv.ua or park@forest.lviv.ua).

6.3 Calendar of Remote Sensing Meetings

NEW
6-8 September 2001 Sopron, Hungary
ISPRS Commission V11 / WG IV (Human Settlement and Impact Analysis): Workshop on Global Monitoring for World Heritage Sites
Contact: Ms. Eszter Boda, University of West Hungary. E-mail: be@cslm.hu Web: geoinfo.cslm.hu/

17-21 September 2001 Toulouse, France
8th SPIE International Symposium on Remote Sensing
Contact: SPIE. Web: www.spie.org/info/rs/

20-21 September 2001 Naples, Italy
EARSeL / CORISTA Workshop on Remote Sensing by Low-Frequency Radar
Contact: Anna Maria Esposito, CO.RI.S.T.A., Naples, Italy. E-mail: corista@unina.it Final programme: www.corista.unina.it/docs/programme.pdf

NEW
2-4 October 2001 Sofia, Bulgaria
3rd Balkan Scientific Conference on Study, Conservation, and Utilisation of Forest Resources
Fax: 359-2-622965 E-mail: forestin@bulnet.bg Web: www.bulnet.com/forestin

NEW
3-5 October 2001 Lviv, Ukraine
International Scientific Conference on Urban Green Spaces – Past, Present, and Future
Contact: Ukrainian State University of Forestry and Wood Technology, Lviv, Ukraine. Phone / fax: +380-322-352269. E-mail: dendro@is.lviv.ua, park@forest.lviv.ua

NEW
7-10 Oct. 2001 Thessaloniki, Greece
ICIP 2001 – International Conference on Image Processing
Contact: IEEE Signal Processing Society. E-mail: icip2001@zeus.csd.auth.gr Web: icip01.ics.forth.gr/

8-9 November 2001 Rome, Italy
IEEE / ISPRS Joint Workshop on Remote Sensing and Data Fusion over Urban Areas
Accepted papers: tlc.unipv.it/urban_2001/submission.htm

23-25 January 2002 Sophia Antipolis, France
EARSeL SIG Workshop: Fusion Of Earth Data – Fourth International Conference
Web: www-datafusion.cma.fr/conf E-mail: fusion@cenerg.cma.fr

NEW
11-13 March 2002 Bern, Switzerland
3rd EARSeL Workshop on Observing our Cryosphere from Space: Techniques and Methods for Monitoring Snow and Ice with Regard to Climate Change
Contact: Dr. Stefan Wunderle, University of Bern, Switzerland. E-mail: swun@giub.unibe.ch Web: saturn.unibe.ch/rsbern

4-6 June 2002 Prague, Czech Republic
22nd EARSeL Symposium and General Assembly :
Geoinformation for European-Wide Integration
Contact: Dr. Tomas Benes, UHUL Forest Management Institute, Czech Republic. Phone: +420202800121. Fax: +420202803371. E-mail: benes@uhul.cz Web: www.uhul.cz (Followed on 7 June by Workshop on Remote Sensing for Environmental Modelling, organised by Dr. Jan Kolar).

NEW
11-13 June 2002 Istanbul, Turkey
3rd International Symposium on Remote Sensing of Urban Areas
Contact: Assist. Prof. Filiz Sunar Erbek, Istanbul Technical University, Turkey. Phone: +90-0212-2853801. Fax: +90-0212-5737027. E-mail: fsunar@ins.itu.edu.tr Web: www.ins.itu.edu.tr/rsurban3

24-28 June 2002 Toronto, Canada
IGARSS 2002 / 24th Canadian Symposium on Remote Sensing
Contact: Tammy Stein, IEEE Geoscience and Remote Sensing Society. Phone: +1-281-2516067. Fax: +1-281-2516068. E-mail: tstein@phoenix.net Web: www.igarss02.ca

NEW
18-20 September 2002. Bonn, Germany
2nd EARSeL Workshop on Remote Sensing for Developing Countries
Contact: Prof. Dr. G. Menz, University of Bonn, Germany. E-mail: menz@rsrg.uni-bonn.de Web: surya.rsrg.uni-bonn.de/earsel_2002/index.htm

NEW
19-23 September 2002. Zakopane, Poland
Conference on GIS and RS in Mountain Environment Research
Contact: Jagiellonian University, Krakow and IUFRO Phone: +48-12-4230354. Fax: +48-12-4225578. E-mail: confe2002@enviromount.uj.edu.pl Web: www.enviromount.uj.edu.pl

NEW
3-6 June 2003 Gent, Belgium
23rd EARSeL Symposium
Contact: Prof. Dr. Rudi Goossens, University of Gent, Belgium. E-mail: rudi.goossens@rug.ac.be or earsel@meteo.fr