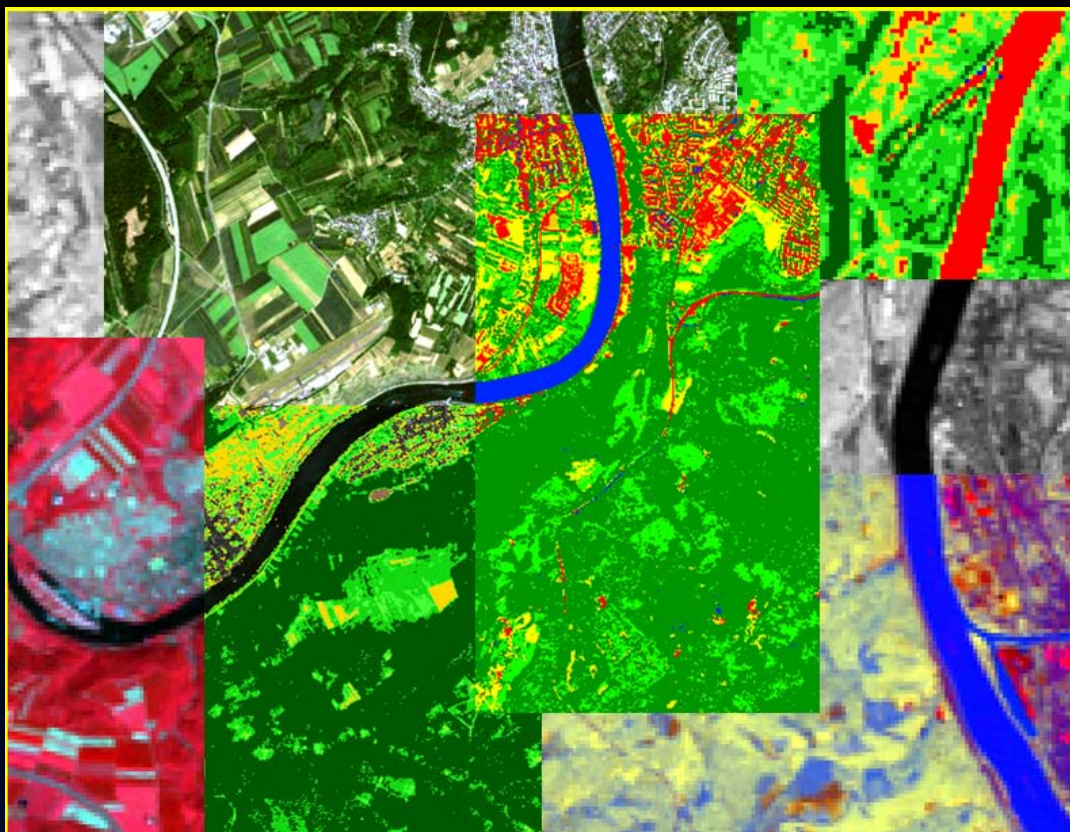# EARSeL

September 2014

No. 99

NEWSLETTER

EARSeL

European Association of Remote Sensing Laboratories

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

Konstantinos Perakis

Athanasios Moysiadis

Department of Planning and Regional Development,
University of Thessaly, Greece

perakis@uth.gr
moysiadis@uth.gr
Phone: +30 24210 74465
Fax: +30 24210 74371

Anna Jarocińska

Department of Geoinformatics and Remote Sensing
(WURSEL),
University of Warsaw, Poland

ajarocinska@uw.edu.pl

Editorial Assistance

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Contents

EARSeL Bureau

Chairman: Dr. Lena Halounova

Department of Mapping and Cartography
Czech Technical University in Prague
166 29 Prague 6, Czech Republic

Phone: +420 22435 4952
lena.halounova@earsel.org

Vice-Chairman: Dr. Klaus-Ulrich Komp

EFTAS Fernerkundung Technologietransfer
GmbH, Oststrasse 2 – 18, 48 145
Mónster, Germany

Phone: +49 2 51 1 33 07 0
klaus.komp@eftas.com

Secretary General: Jean-Christophe SCHYNS

Belgian Science Policy Office (BELSPO),
Avenue Louise, 231, Louizalaan, 1050,
Brussels, Belgium

Phone: +32 2 23 83 591
schy@belspo.be

Treasurer: Dr. Bogdan Zagajewski

Remote Sensing of Environment Laboratory
Faculty of Geography and Regional Studies,
University of Warsaw
Krakowskie Przedmiescie, 30, 00-927
Warsaw, Poland

Phone: +48 22 826 83 58
bogdan@uw.edu.pl

International Relations: Dr. Mario Hernandez

UNESCO
1 Rue Miollis
75732 Paris cedex 15, France

Phone: +33 1 45 68 4052
Email: m.hernandez@unesco.org

Honorary Bureau Members

Prof. Preben Gudmandsen

Danish National Space Center
Technical University of Denmark
2800 Lyngby, Denmark

Phone: +45 45 25 37 88
prebeng@space.dtu.dk

Prof. Gottfried Konecny

Institut für Photogrammetrie und
Geoinformation
Leibniz Universität Hannover
30167 Hannover, Germany

Phone: +49 511 7622487
konecny@ipi.uni-hannover.de

EARSeL Newsletter Editors

Prof. Konstantinos Perakis

Mr. Athanasios Moysiadis, MSc.

Department of Planning and Regional
Development, University of Thessaly,
38334, Volos, Greece

Phone: +30 24210 74465
perakis@uth.gr
moysiadis@uth.gr

Dr. Anna Jarocińska

Department of Geoinformatics and Remote
Sensing (WURSEL), University of Warsaw,
00-927 Warsaw, Poland

ajarocinska@uw.edu.pl

Newsletter Proofreading

Dr. Samantha Lavender

slavender@pixalytics.com

Springer Series on Remote Sensing and Digital Image Processing Editor

Dr. André Marçal

Faculdade de Ciencias, Universidade do Porto
D.M.A., Rua do Campo Alegre, 687
4169-007 Porto, Portugal

Phone: +351 220 100 873
andre.marcal@earsel.org

EARSeL eProceedings Editor

Dr. Rainer Reuter

Institute of Physics
University of Oldenburg
26111 Oldenburg, Germany

Phone: +49 441 798 3522
rainer.reuter@earsel.org

EARSeL Secretariat

Mrs Heide Bierbrauer
Wasserweg 147
48149 Münster (Westf.), Germany

Fax: +49 251 13307 33
secretariat@earsel.org

Editorial

Dear members,

The September Issue of the EARSeL Newsletter starts with a welcoming message of our newly elected chairperson Dr Halounova after the elections that took place during the 34th EARSeL Symposium in Warsaw, including three brand new Bureau members. A feedback of the 2nd International Workshop of the Forestry EARSeL SIG and the 5th international Workshop of the Geological Applications EARSeL SIG is provided by two reports in this issue. It is always with great pleasure to welcome new members at EARSeL.

A report on the "Global Space Applications/GLAC-2014" Conference that took place in Paris last June is provided by Dr Mario Hernandez whereas Wim Baker reports, as in the previous issues, on recent developments in Earth-observation satellites and sensors.

EARSeL eProceedings feature with new research publications of remote sensing along with a special issue of selected papers from the 34th EARSeL Symposium edited by Dr. Rainer Reuter and Dr. Bogdan Zagajewski.

Call for abstracts for the forthcoming EARSeL events is out, the 9th SIG Imaging Spectroscopy Workshop in April 2015 and the Annual 35th EARSeL Symposium, organised by KTH Royal Institute of Technology, in Stockholm, Sweden in June 2015.

A list of conferences, training courses and summer schools to attend in the near future appear at the last part of the Newsletter.

We are very much looking forward to your feedback on the EARSeL Newsletter, helping us to improve our work with more attractive issues in the future.

As always, you can contribute at the EARSeL Newsletter via a science article or report for the forthcoming issues.

Enjoy reading the September issue!

The Editors

News from EARSeL

Message from the New EARSeL Chairperson

Dear colleagues and friends,

I am very honoured that I was elected the new Chairperson along together with other new Bureau members. Unlike previous years, there are three brand new Bureau members. It enables us to invite many new and fresh ideas of people who are not influenced by the previous "routine". We would like to continue in the effort of higher visibility of EARSeL publications. Therefore a new proposal concerning eProceedings to become a journal with an impact factor will be submitted after the reviewing process from the Warsaw Symposium papers has been finished and a new eProceedings has been issued.

Organisers of scientific meetings (workshops and symposia) are no longer obliged to use the CMS (Conference Management System) for registration and reviewing process. It was decided to choose ConfTool software as a verified useful tool for both processes.

I would like to encourage individual members of EARSeL laboratories to share news from their research, education experiences and projects with our members and address editors of EARSeL Newsletter to publicize such reports and make its colleagues aware what is going on in our Association would be a benefit for all.

I would like to close my first Editorial with a big thanks to the organisers of the Warsaw Symposia. The Symposium together with EARSeL & ISPRS Young Scientist Days was a very successful meeting giving the floor to the young generation to take part in keynote speeches, lectures and courses, and present their achievements. The programme and organizers allowed them also to enjoy the social programme of the Symposium. ISPRS supported four young scientists from developing countries using the financial grant of UN OOSA for the payment of their air tickets.

Let all future EARSeL meetings be as successful as the 2014 Symposium.

Lena Halounová

lena.halounova@fsv.cvut.cz

New EARSeL Bureau

In June 2014, as part of the 34th EARSeL Symposium that took place in Warsaw, the EARSeL Council elected the new EARSeL Bureau for the forthcoming two years. Dr. Bogdan Zagajewski is the new Treasurer and Jean-Christophe SCHYNS, the National Representative of Belgium, is elected to the position of the Secretary General. Dr. Klaus-Ulrich Komp, National Representative of Germany, is elected Vice-Chairman and Dr. Lena Halounová, former Vice-Chairman and the National Representative of Czech Republic is the newly elected Chairman of EARSeL.

From left to right (Bogdan Zagajewski, Jean-Christophe SCHYNS, Klaus-Ulrich Komp and Lena Halounová)

Report on the 2nd International Workshop of the Forestry EARSeL SIG

17 – 18 June 2014, Warsaw, Poland

During the 34th EARSeL Symposium in Warsaw we held a two-day 2nd Workshop of the Special Interest Group on Forestry. The title of the Workshop "Remote sensing for forestry applications - the new challenges, approaches and achievements" covered the usage of the state-of-the-art GeoTechnologies in forestry science. The thematic sessions and practical exercises (LasTools, FUSION and eCognition) were open also for the other participants of the conference and Young Scientist as well.

Forestry SIG 2nd Workshop sessions consisted of total 27 presentations and 4 posters. Additionally our Workshop began with the presentation of invited speaker (Frank Martin Seifert) from the ESA concerning the future plans in terms of monitoring vegetation including forests in the next decade.

The first session was dedicated to the *ALS technology* (6 presentations), i.e. their practical use in forest inventory (from single tree is a stands based), determining the health condition of the forest stands, the ecosystem services and land cover change detection as well. Some research on the interpretation of full waveform recording and its utility as well as studies on the determination of the biomass of forests was presented. Also the open source software for ALS data processing was discussed.

Session *Hyperspectral Remote Sensing and Vegetation indices* (6 presentations) is largely focused on applications of hyperspectral imaging to determine the health condition of forests, tree species composition, biomass of forest stands and individual spectral characteristics of the vegetation and single selected trees.

A separate session was a *GEOBIA* which presents two papers on process automation classification of satellite images in mapping of forests and forest cover change in boreal forest based on LANDSAT series imageries.

The next session under the name *3D Photogrammetry, TLS and Radar application* included eight presentations from the above range. They focused on the use of UAVs (drones) to acquire 3D spatial information about forests, the use of methods based on stereo-matching (SGM approach) to generate a point cloud from aerial photographs and stereo satellite images. Also the TLS tree detection approach on tree plantations was presented. Many presentations related to the use of 3D information in determining the biomass of forests especially active remote sensing systems using radar (SAR, InSAR).

Session Forest monitoring and GIS analyses related to the presentation of research on the use of LANDSAT and SPOT imagery supported by GIS analyses of multi-temporal dynamics of changes of forest cover.

In conclusion, a noticeable trend in the study relies on multi-source, multi-temporal and multi-(hyper) spectral data integration was observed. Especially the use of information on the 3D structure stands in monitoring changes in forest stands and their biomass was one of the most common goals of the studies. A clear trend of ongoing research concerns the 3D technology, both active remote sensing systems (like Airborne Laser Scanning and Radar) and passive stereo-matching from aerial photographs can be observed.

<div align="right">

Piotr Wężyk

rlwezyk@cyf-kr.edu.pl

Chairman of SIG Forestry

University of Agriculture, Faculty of Forestry

</div>

Report on the 5th international Workshop of the Geological Applications EARSeL SIG

19 – 20 June 2014, Warsaw, Poland

The 5th international Workshop of the EARSeL SIG Geological Applications titled *Remote Sensing and Geology* "Surveying the GEOsphere" took place in Warsaw in June 19th and 20th in conjunction with the 34th EARSeL conference.

Scientists from many countries have presented twenty two papers. Fifteen oral presentations and seven poster presentations divided in 7 different topics were carried out. The topics covered were: GEOHAZARDS, GEOLOGY, GEOMORPHOLOGY, HYPERSPECTRAL, GEOARCHAELOGY and MINE MONITORING.

The first day was dedicated to the oral and poster presentations, while during the second day a tutorial titled "3D Geological Mapping using ERGAS IMAGINE" took place.

The chairman of the SIG would like to express his sincere thanks:

> to the participants whose presence and the high quality of their work helps to establish the workshop among the international conferences,

> to the organising committee for the support to the preparation of the workshop,

> to the scientific committee for helping in the paper evaluation and

> to Geosystems Hellas SA and Intergraph for providing the evaluation License of ERDAS IMAGINE 2014 that was necessary in order to perform the tutorial.

Finally we would like to congratulate Prof Bogdan Zagajewski and the EARSeL Bureau for the excellent organization of the symposium.

<div align="right">

Dr. Konstantinos Nikolakopoulos
Assistant Professor
knikolakop@upatras.gr

</div>

New EARSeL Members

We extend a warm welcome to the new member registered with EARSeL. We are looking forward to its active participation and contribution to EARSeL, and in collaboration with other members, in this long-established network of scientific research laboratories.

CRP - Gabriel Lippmann
Département Environnement et Agro-biotechnologies
EARSeL Representative: Dr. Lucien Hoffmann, Scientific Director
Email: hoffmann@lippmann.lu
41, rue du Brill
L-4422 BELVAUX
Grand Duchy of Luxembourg

News from Other Organisations

Report on the "Global Space Applications/GLAC-2014" Conference

Paris, 2-4 June 2014

A Global Space Applications Conference, known as GLAC-2014, organized by the International Astronautical Federation, and hosted by the United Nations Educational Scientific and Cultural Organization (UNESCO), was convened in Paris from June 2nd to June 4th 2014.

http://www.iafastro.org/events/global-series-conferences/glac-2014

GLAC brought together the global satellite-based services community, including senior representatives of the major space agencies, industry, academia and NGOs. These leaders in their respective fields converged in Paris to present results, exchange ideas, debate roadmaps, and discuss the future opportunities provided by satellite-based applications. A comprehensive programme included high-level round tables and 15 technical sessions that addressed the most recent achievements in satellite-based applications and explored how industry, politics, and law will help shape the future environment for the space applications domain.

There were interesting Discussion Panels, as for example the one of the *"Heads of Space Agencies"*, or the one on "Solutions for barriers to access to application services, requirements for capacity building and knowledge *management*".

The EARSeL Chairperson, Lena Halounová, presented the International Society for Photogrammetry and Remote sensing (ISPRS) making an overall invitation to all GLAC participants to attend ISPRS-Prague in 2016.

What comes out of the GLAC-2014 Conference is that in general space applications are becoming mature, a series of associated services are being provided by large and middle range enterprises. However, a main problem still to be resolved is that space applications, mainly Earth Observation, are not yet at the table of decision makers. An important aspect discussed was also that sometimes the end-user does not even know that she/he can be an end-user of space technologies. There is therefore the need to have meetings with potential end-users, explain to them the benefits that certain space technologies can provide and let them then conclude by understanding on which areas of their work space technologies can be of assistance.

Space has significantly contributed to the development of Meteorological applications. In the area of meteorology, space has produced such simple applications that, for example people watching the 'TV Weather Chanel' are not aware of the fact that a tremendous amount of space technology is behind what is shown in the 'Weather Chanel'. In this sense, I would say that space meteorological applications are able to produce today information that can be immediately used by a large inter-disciplinary community.

A similar situation occurs with space based GPS applications. Here again the general public think that the GPS device installed in their car, autonomously computes the position of the car. It is difficult for them to conceive that a large amount of space technology is behind such a simple GPS application. Once again Digital Earth can make use of these GPS applications to immediately use such information as additional layers to be combined with Digital Earth layers.

The situation is completely different in the area of Earth Observation (also known as Remote Sensing). In this area the current status is that the data is being managed and analyzed by high-level experts and the out coming results remain still extremely useful for such experts, but far from the understanding by decision makers and the general public. There is the need to further work Remote Sensing results in order to enrich such results and to convert such data into information for decision makers and the general public. There is a need to undertake some research to assess how to add

value to remote sensing results making such results easier to understand and easy accessible to decision makers and the general public. Maybe if we undertake such a complex task, one day we will be able to have a 'TV Deforestation Chanel' or a 'TV Climate Change Chanel' where all the information is so nicely presented and clearly understandable by everyone, so that the end-users will not notice that, behind these sources of information, hundreds of remote sensing satellites are continuously providing data and hundreds of computers are processing such data.

Is this an eventual topic for an EARSeL Special Interest Group?

Dr Mario Hernandez

m.hernandez@unesco.org

Science Article

Satellites & Sensors

This article reports on recent developments in Earth-observation satellites and sensors.

ALOS-2

Japan launched the Advanced Land Observing Satellite 2, nicknamed Daichi-2, on 24 May. The satellite carries the PALSAR-2 radar imager. It is the successor of the ALOS-1 which was launched in 2006 and operated until May 2011 when it lost power. The new SAR has an improved resolution of 3 meter, compared to the 10-meter resolution of the old system.

Deimos-2, KazEOSat-2

On 19 June, the launch of a Dnepr rocket from the Yasniy missile base put a record 38 payloads in sun-synchronous orbits ranging from 550 to 610 km at perigee and 620 to 715 km at apogee. The largest payload, Deimos-2, is a 300 kg Earth imaging satellite with 0.75-meter resolution from Elecnor Deimos, Spain.

KazEOSat-2 is an enhanced Surrey Satellite SSTL-150 Earth imaging satellite with a medium resolution of 6.5 meter built for Kazakhstan.

SPOT-7

India's PSLV rocket successfully lifted the French SPOT-7 imaging satellite on 30 June. SPOT-7 is identical to SPOT-6 which was launched earlier in September 2012. The architecture is similar to that of the Pleiades 1A and 1B satellites, which are designed as a dual civil and military system. Resolution of SPOT-7 will be 1.5 meter panchromatic and 6 meter multispectral (4 bands). Already three days after the launch, SPOT-7 delivered its first images.

Meteor-M2, SkySat-2, UKube-1

On 8 July, the Meteor-M2 satellite was launched along with a number of companions, including Scotland's first satellite, the UKube-1. The Meteor-M2 is a meteorological satellite with a heritage that goes back to the 1960s. Its 3 KMSS cameras have a resolution of 50 and 100 meter in 6 visible bands.

SkySat-2 is the second satellite developed by the American company Skybox, which intends to use the satellites for commercial Earth imagery. Eventually, the company aims to fly a constellation of 24 spacecraft. The 100-kilogram cubesats can deliver images with a 1-meter resolution. SkySat-1 was launched earlier in November 2013. SkySat-3 will be launched in early 2015. In the meantime, Skybox has been acquired by Google for a mere 500 million dollars. Once the whole constellation of SkySat satellites are in place, this could have a dramatic impact on the amount and quality of information the search giant is able to accumulate and offer to its users.

UKube-1 carries a camera that will take images of the Earth at 25-meter resolution and test the effect of radiation on space hardware using a new generation of imaging sensors.

OCO-2

On 2 July, the OCO-2 satellite was launched. The satellite is now in the same orbit as a constellation of five other international Earth-observing satellites, the so-called the A-train. The objective of the OCO-2 mission is to give a detailed global picture of the sources and sinks of the greenhouse gas carbon dioxide, and how these change over time. The first OCO spacecraft was lost in a launch failure in February 2009.

Gaofen-2

Gaofen-2 was launched on 19 August. The Gaofen satellites are a series of high-resolution optical Earth observation satellites of China. Resolution of its camera is 0.8 meter panchromatic and 3.2 meter multispectral.

WorldView-3

WorldView-3 was launched on 13 August. WorldView-3 provides 31 cm panchromatic resolution, 1.24 meter multispectral resolution, 3.7 meter short wave infrared resolution and a 30-meter resolution CAVIS (for clouds, aerosol, water vapor, ice, and snow atmospheric correction). WorldView-3 is an improved version of WorldView-2, which was launched earlier in October 2009. The high-resolution of WorldView-3 is the direct result of the US government's relaxation of satellite resolution restrictions. Especially the 8-band, 1.24 meter resolution multispectral images may be interesting for many applications.

Rosetta

After 10 years of cosmic billiard, using gravity assist maneuvers through the inner solar system, the Rosetta space probe has finally arrived at the comet 67P/Churyumov–Gerasimenko. After further orbit corrections it will become the first spacecraft to orbit a comet. By 10 September, its orbit will take it as close as 30 kilometer to the surface of the comet. Eventually Rosetta will release its robotic lander called Philae. By 25 August 2014, five potential landing sites were selected for Philae. For more than a year, Rosetta will escort the comet around the Sun, while observing the comet with a plethora of instruments.

Chasqui-1

On 18 August, during a 5-hour spacewalk, flight engineer Oleg Artemyev manually deployed Chasqui-1 from the International Space Station (ISS). Chasqui-1 is a Peruvian nanosatellite designed to capture images of the Earth. The project is an effort by the National University of Engineering in Peru to gain familiarity in satellite technology and emerging information and communication technologies.

Upcoming Launches

Satellite	Launch date
Asnaro-1	8 Oct
Himawari-8	7 Oct
KOMPSAT-3A	Q4 2014
SMAP	November
Amazônia-1	December
CBERS-4	December

Wim Bakker
University of Twente / ITC
The Netherlands
w.h.bakker@utwente.nl

EARSeL eProceedings

New Publications in Vol. 13(1), 2014

A review of INTA AHS PAF

Eduardo de Miguel, Alix Fernández-Renau, Elena Prado, Marcos Jiménez, Óscar Gutiérez de la Cámara, Clara Linés, José Antonio Gómez, Ana I. Martín, and Félix Muñoz

Abstract   Read full paper online: http://www.eproceedings.org

The INTA AHS system has been operational since 2004, having performed over 60 flight campaigns throughout Europe up to the present time. The system is formed by an airborne scanner (AHS), a navigation system, calibration equipment, and a specific processing chain that have been implemented within the INTA airborne data Processing and Archiving Facility (PAF). In this chain, raw data (level 0 product) is transformed to at-sensor radiance (level 1b) and later to georeferenced at-sensor radiance (level 1c). Other processing levels, as atmospherically corrected reflectance, temperature or emissivity (L2b / L2c), can also be produced. The resulting image products are delivered together with radiometric statistics, metadata and quality descriptors according to EUFAR HyQuaPro recommendations. In this paper, details about this processing chain are given. The paper also describes the procedure for in-flight geometric calibration (internal orientation calibration and boresight estimation). Finally, an evaluation of the product accuracy (radiometric, spectral and geometric) is presented, using imagery from different AHS campaigns.

The processing of CASI-1500i data at INTA PAF

Eduardo de Miguel, Alix Fernández-Renau, Elena Prado, Marcos Jiménez, Óscar Gutiérez de la Cámara, Clara Linés, José Antonio Gómez, Ana I. Martín, and Félix Muñoz

Abstract   Read full paper online: http://www.eproceedings.org

The Remote Sensing Laboratory at INTA has been operating a CASI-1500 instrument since 2009. A specific processing chain has been implemented within the INTA airborne data Processing and Archiving Facility. In this chain, raw data (level 0 product) are transformed to at-sensor radiance (level 1b) and later to geolocated at-sensor radiance (level 1c). Other processing levels, as atmospherically corrected reflectance (L2b / L2c), can also be produced. The resulting image products are delivered together with radiometric statistics, metadata and quality descriptors, the latter according to EUFAR HyQuaPro recommendations. In this paper, details about this processing chain are given, including some points related to in-flight spectral calibration and noise and SNR estimation in operational images. The paper also describes the procedure for in-flight geometric calibration (internal orientation calibration and boresight estimation). Finally, an evaluation of the product accuracy (radiometric, spectral and geometric) is presented, using imagery from CASI campaigns performed by INTA.

Special Issue 1 - Vol. 13, 2014: 34th EARSeL Symposium

A new method for artefact-free estimation of surface slope from bathymetric Lidar data

Teemu Kumpumäki, and Tarmo Lipping

Abstract   Read full paper online: http://www.eproceedings.org

When estimating the slope and aspect of a natural surface obtained by bathymetric Lidar scanning, discrepancies in the elevation data from neighbouring strips often cause artefacts. In this paper, a novel algorithm for slope estimation avoiding this kind of artefacts is presented. The algorithm is based on filtering the point data in the region of overlap using a set of scan angle based thresholds. Each threshold yields a data set with different selection of points from the neighbouring strips. Gradient estimates based on these data sets are then combined by either averaging or applying a trimmed mean type operation to obtain the artefact-free slope estimate. The algorithm is developed using bathymetric Lidar data and the obtained slope estimate of the seabed is used for the correction of the Lidar waveform data. The developed method is applicable in a wide range of situations where overlapping data from different sources need to be combined.

Quantitative modelling of urban changes using multi-temporal Digital Elevation Models

Cornelis Stal, Alain De Wulf, Philippe De Maeyer, Rudi Goossens, Timothy Nuttens, Frederik Tack, and Marijn Hendrickx

Abstract   Read full paper online: http://www.eproceedings.org

The construction of multi-temporal data sets for the modelling and documentation of urban environments has gained a large interest in the last few years. The growing availability of remote sensing data and sophisticated software tools has enabled the construction of Digital Elevation Models (DEMs) with various spatial and temporal resolutions. For this research, multiple scanned airborne images of the inner city of Ghent (Belgium) were processed for the calculation of DEMs using a conventional digital photogrammetric workflow. The aerial images were acquired during four campaigns: 1965, 1977, 1987 and 1990. All resulting image-based DEMs were compared with a DEM acquired with Airborne Laser Scanning (ALS) from 2009. This comparison allowed a model adjustment by minimizing the systematic shift between the data sets. In order to distinct built-up, destroyed or unchanged buildings over time, a threshold of 2.5 m was applied on the resulting vertically shifted points. Finally, a connected component analysis allowed the removal of outliers in the data. The resulting points were evaluated against a 2D digital cadastre map, which enabled a quantitative determination of difference in urban topography. The procedure to detect these changes, as well as the potentials and challenges of this technique, are discussed in this contribution.

Data processing of Russian forest fire remote monitoring systems

Vitold Komorovski

Abstract   Read full paper online: http://www.eproceedings.org

Sustainable forestry and forest fire management are not possible in Russia without using remote monitoring data, because the territory under forest fire risk is huge. There are three main remote monitoring systems in Russia. The aim of the study is to consider data of two systems and to suggest some methods for comparison. Different SQL and geospatial queries were used for the systems to be compared. The results obtained demonstrate that there are some considerable contradictions

between these systems. To overcome these problems advanced processing remote monitoring datasets were used and some kinds of advanced processing methods are suggested. A fuzzy logic was applied to match the fires reported by different systems. The fuzzy logic model is considered in detail in this paper. The result of this data processing can be the basis to develop future fire forecasting systems and decision support systems. The proposed methods of comparative analysis and additional processing of the data provided by the monitoring systems meant to improve input data quality in various modelling and forecasting applications.

PROSAIL model for reflectance simulations of mountainous non-forest communities

Anna Jarocińska, Bogdan Zagajewski, Adrian Ochtyra, Adriana Marcinkowska, and Lucie Kupkova

Abstract   Read full paper online: http://www.eproceedings.org

Monitoring vegetation cover, especially in mountain and protected areas is an important issue. The analyses were conducted in Krkonoše Mountains in the Krkonoše National Park, Czech Republic. Heterogeneous non-forest mountain communities were analysed. The aim of the study was to check the possibility of using the Radiative Transfer Model to simulate the reflectance of very diverse mountain non-forest communities. In field measurements, biophysical parameters were collected and calculated to input parameters to the PROSAIL model. At the same time a reference spectrum was acquired. Then, the PROSAIL model was used to simulate the spectrum for each polygon. The accuracy was tested using Root Mean Square Error (RMSE) and normalised Root Mean Square Error (nRMSE) values for comparison with the reference spectrum. The average RMSE value for the whole analysed range was equal 0.129. The biggest errors were noticed in the near infrared (0.242) and the smallest in the 400-600 nm range (0.017). Generally, all noticed RMSE and nRMSE values are very diverse and quite big. The acquired results show that PROSAIL can be used to simulate the reflectance, but the model has to be adjusted, especially in the near infrared range.

Use of a Lidar high resolution Digital Elevation Model for risk stability analysis

Nathalie Stephenne, Christophe Frippiat, Mathieu Veschkens, Marc Salmon, and Daniel Pacyna

Abstract   Read full paper online: http://www.eproceedings.org

Remote sensing data offer an accurate source of information to the administration. Walloon administration develops its capacities in using Earth Observation data to respond to the EU request of characterizing the risks related to closed and/or abandoned mining sites. This paper compares two Digital Elevation Models (DEM) derived either from aerial photos or from a LiDAR (Light Detection And Ranging) scanner in their capabilities of characterizing unstable land cover and risks of landslides for Walloon coal waste heaps.

A first inventory of Walloon facilities at risk provided to EU authorities identified geotechnical failure as being one of the major risks linked to coal mine waste heaps. The risk of geotechnical failure was quantified using a geotechnical factor of safety computed on a pixel basis using the topography of the facility. The topography was extracted from a regional-scale DEM with a spatial resolution of 10 m (ERRUISSOL model, information on http://geoportail.wallonie.be). Since the first inventory, a new DEM dataset using LiDAR scanner has been acquired by the Walloon Region. This paper compares both datasets in their ability to quantify the risk of slope instability on five specific heaps.

The DEM from LiDAR data offers a resolution of 1 m. It leads to significant differences in the spatial and statistical distributions of slopes, as compared to the regional 10 m-resolution DEM. To test this spatial effect, the resolution of the LiDAR DEM has been averaged by pixel aggregation to 2/4/8 and 10 m - resolution for direct comparison with the ERRUISSOL DEM. In all cases, the application of the geotechnical factor of safety criterion based on the high-resolution LiDAR DEM leads to larger

portions of heap surfaces at risk of geotechnical failure. In the next months, this method will be proposed to the Walloon administration for application to all facilities considered at risk by the first inventory to improve the characterization of the risk of geotechnical failure, and confirm or not the risk.

Wetland Leaf Area Index modelling with field and satellite hyperspectral data

Tomasz Berezowski, and Jaroslaw Chormański

Abstract   Read full paper online: http://www.eproceedings.org

Leaf Area Index (LAI) is an important variable in environmental processes modelling. Already several approaches were proposed to model wetlands LAI with remote sensing data. However, none of these methods was based on upscaling the field spectral reflectance measurements, which is a matter of this paper. In this study, we used combined measurements of spectral reflectance (350-2500 nm) and LAI to establish a regression model of LAI. The spectral reflectance was resampled to the spectral resolution of a satellite hyperspectral sensor (CHRIS-PROBA) beforehand and then used to calculate NDVI-based spectral indices. From the set of spectral indices the one with the strongest correlation with LAI was chosen for the regression. Finally, the regression was applied to the CHRIS satellite images and the results were analysed within the scope of different wetland communities of the study area. The results show that the optimal regression model gives statistically different LAI values for the majority of different ground truth plant communities, rivers and urban areas.

A tool for predicting diurnal soil albedo variation in Poland and Israel

Jerzy Cierniewski, Arnon Karnieli, Cezary Kaźmierowski, and Jakub Ceglarek

Abstract   Read full paper online: http://www.eproceedings.org

Results of studies on the effects of soil surface roughness on the diurnal broadband blue-sky albedo variation of cultivated and uncultivated soils conducted so far in Poland and Israel indicated that the spectral reflectance behaviour of so genetically different soils such as those developed in these countries is similar enough to use the same procedure to predict the albedo variation for all the soils together. This paper discusses this variation using data generated by equations describing the overall albedo level of these soils taking into account only the organic carbon and carbonates content and the slope of their diurnal albedo increase in the function of the solar zenith angle, disregarding other properties of the soils.

Applying spectral unmixing to determine surface water parameters in mining environment

Veronika Kopačková, and Lenka Hladíková

Abstract   Read full paper online: http://www.eproceedings.org

Water has been traditionally monitored by in situ measurements taking point samples at regular intervals. From an optical perspective, in addition to pure water itself, the optical properties of surface waters are mainly influenced by three constituents: phytoplankton, suspended sediment, and coloured dissolved organic matter (CDOM). Although imaging spectroscopy can serve as a modern method to monitor polluted surface waters, only a limited number of studies have been published on this topic. In our study, we tested the feasibility of mapping the properties of surface waters affected by long-term mining activities using airborne multi-flight-line HyMap hyperspectral

(HS) datasets. An approach using fundamental water image end-members to map relative abundances of selected parameters of surface waters (dissolved Fe, dissolved organic carbon DOC, non-dissolved particles) was tested and ground truth (eight monitored ponds) was then used to validate the results of spectral mapping. Although the detected end-members did not implicitly have to be absolutely pure, they represented the most extreme water types within the studied area. Correlations between the studied water parameters and three fractional images were detected (dissolved Fe: $R^2=0.74$, undissolved particles: $R^2=0.57$, DOC: $R^2=0.42$); these images were further used to create semi-automatic maps.

Use of Unmanned Aircraft Systems (UAS) in a multi-scale vegetation index study of Arctic plant communities in Adventdalen on Svalbard

Hans Tømmervik, Stein-Rune Karlsen, Lennart Nilsen, Bernt Johansen, Rune Storvold, Anna Zmarz, Pieter S. Beck, Kjell-Sture Johansen, Kjell-Arild Høgda, Scott Goetz, Taejin Park, Bogdan Zagajewski, Ranga B. Myneni, and Jarle W. Bjerk

Abstract   Read full paper online: http://www.eproceedings.org

Use of Unmanned Aircraft Systems (UAS) gives the opportunity to carry out research with a reduced environmental footprint. Unmanned aircraft, including both fixed wing and multi rotor types (helicopters) allow us to collect very high resolution image data for vegetation mapping without the need for any personnel walking into the site and thereby potentially disturbing the sensitive Arctic ecosystems. The main aim of this project was to explore the feasibility of UAS-based vegetation mapping and extraction of vegetation indices (NDVI) for a range of different Arctic plant communities including dense marshes, moss tundra communities and different tundra heaths. The study area of Adventdalen valley on Svalbard, Arctic Norway, is located at 71.2°N 16°E and experiences a dry Arctic climate with a mean July temperature of about 6°C. The UAS was a fixed wing aircraft instrumented with a Red, Green, Blue (RGB) compact camera and a Normalized Difference Vegetation Index (NDVI) camera taking pictures from 100 metres altitude with highest ground resolution of 2.5 cm capable of mapping 2-3 km2 per flight. The study area's two main plant communities; the Arctic bell heath and a graminoid rich Polar Willow heath were easily detected both in the NDVI and RGB images. In addition, wet moss tundra and mires were separated from the heath communities. In the NDVI image the moss-dominated mires were difficult to separate from the graminoid dominated mires in most cases, but they were well separable in RGB colour space. Also in situ NDVI measurements by a handheld passive proximal sensor were simultaneously done during the flight campaign. These measurements were analysed in order to correlate the species level NDVI and community level NDVI measurements with the NDVI images acquired at a variety of spatial resolutions by the UAS. The analysis shows that NDVIs of four main plant species at in situ leaf and community levels were significantly correlated (R2 = 0.60, p<0.01). The correlation between the surface (in situ) NDVI community level and the UAS NDVI community level acquired from 100 metres above the surface of four main plant communities was R2 = 0.75 (p<0.01), and these two scales are considered to be best for extraction of NDVI observations in Arctic areas like Svalbard.

RGBI images with UAV and off-the-shelf compact cameras: an investigation of linear sensor characteristics

Ralf Gehrke, and Ansgar Greiwe

Abstract   Read full paper online: http://www.eproceedings.org

UAVs are able to close the gap between ground-based (total station, Global Navigation Satellite System - GNSS) and airborne data acquisition. Usually, cameras in the visible range of light are used

for this purpose. Until now, only a few sensors have been commercially available for the capturing of non-visible wavelengths, e.g., of the near infrared for vegetation analysis. Almost all common camera sensors can be used and be modified through small interventions for the near infrared to make a RGBI (red, green, blue, near infrared) sensor head. Vegetation parameters like NDVI can be calculated from this data.

At the Frankfurt University of Applied Sciences, a sensor head has been developed to collect RGBI data. The sensor head consists of two Sigma DP2 FOVEON-sensor cameras. One of them is modified for the near infrared. This sensor head is mounted to an octocopter UAV with a maximum take-off weight of 3.5 kg. The cameras are triggered simultaneously. In the post-processing, the image channels are registered to each other by a self-developed software script and a radiometric adjustment based on reference targets in the field is carried out. The resulting multispectral images are processed to multispectral orthophoto mosaics in standard photogrammetric software. A spectrometer and various test panels are available for the investigation of linear characteristics of the cameras.

This paper briefly presents the construction of the sensor head. In particular, the radiometric characteristics of the sensor should be considered. The Sigma cameras have a poor colour separation due to the installed FOVEON sensors. This is balanced by the algorithms implemented in the raw data software Sigma PhotoPro, offered by the manufacturer. However, the linear sensor characteristic is destroyed by gamma correction and white balance. Freely available raw data converters can process the Sigma data without these photographic corrections and preserve the linear characteristic, but the image quality suffers from the poor spectral separation.

Extraction of urban building heights from LiDAR data: an integrated remote sensing and GIS approach

Muhammad Tauhidur Rahman

Abstract   Read full paper online: http://www.eproceedings.org

Although passive remote sensing technology allows us to detect and map urban buildings and infrastructures, they have several limitations when it comes to extracting their heights. However, by using a combination of data from passive and active sensors, it is possible to overcome some of those limitations and produce highly accurate 3-D height maps of urban areas. In this paper, a combination of IKONOS and LiDAR data is used and processed through integrated remote sensing-GIS based method to extract individual building heights in the urban central part of Norman, Oklahoma. Results show that while the method extracts the location of buildings with moderately high (75%) degree of completeness, the accuracy level in estimating the area and height was lower and depends mostly on the presence of trees surrounding the buildings. Future research should focus on using the method on IKONOS and LiDAR data collected during winter seasons when the leaves of trees are not present.

Book Releases

Global Land Ice Measurements from Space edited by Jeffrey S. Kargel, Gregory J. Leonard, Michael P. Bishop, Andreas Kääb and Bruce H. Raup was published by Springer Praxis Books and Geophysical Sciences.

An international team of over 150 experts provide up-to-date satellite imaging and quantitative analysis of the state and dynamics of the glaciers around the world, and they provide an in-depth review of analysis methodologies. The book is the leading state-of-the-art technical and interpretive presentation of satellite image data and analysis of the changing state of the world's glaciers. The book is the product of a global glacier remote sensing consortium, Global Land Ice Measurements from Space. With 33 chapters and a companion e-supplement, the world's foremost experts in satellite image analysis of glaciers review the current state and recent and possible future changes of glaciers across the globe and interpret these findings for policy planners. Starting with a Foreword, Preface, and Introduction, the book gives the rationale for and history of glacier monitoring and satellite data analysis. It includes a comprehensive set of six "how-to" methodology chapters, twenty-five chapters detailing regional glacier state and dynamical changes, and an in-depth summary and interpretation chapter placing the observed glacier changes into a global context of the coupled atmosphere-land-ocean system.
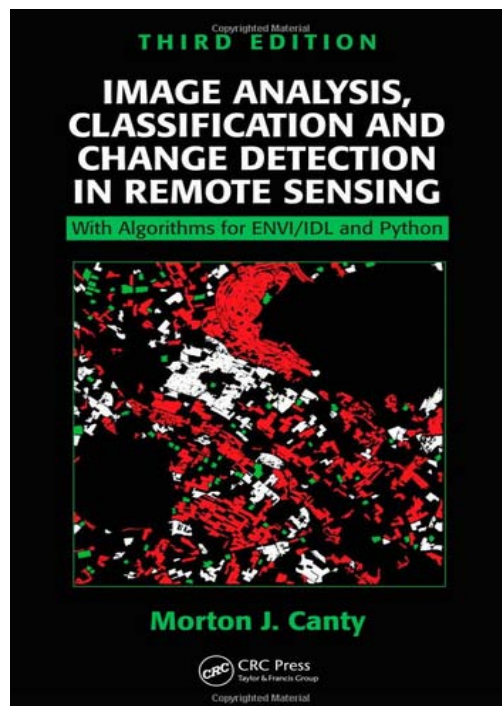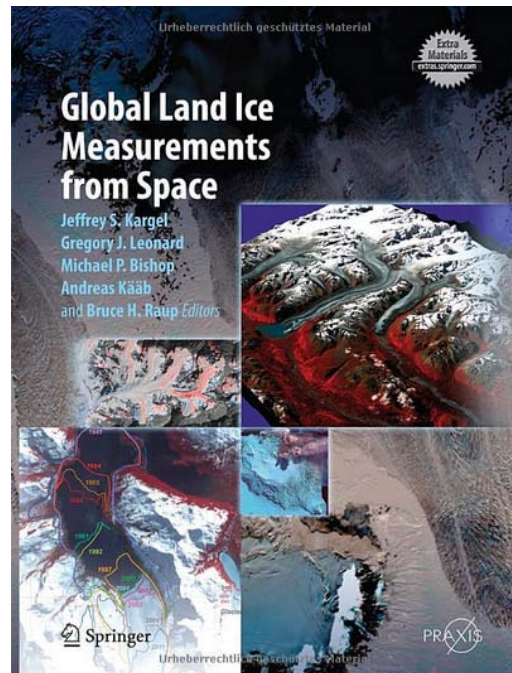
The third edition of **Image Analysis, Classification and Change Detection in Remote Sensing: With Algorithms for ENVI/IDL and Python** written by Morton J. Canty was published by CRC Press.

The book introduces advanced undergraduates and graduates to techniques used in the processing of remote sensing digital imagery. It is intended for people who are working with remote sensing data in image analysis and GIS environments. The material is self-contained and illustrated with many programming examples in IDL, a computer language which supports the professional graphical user interface ENVI, one of the leading environments for remote sensing imagery analysis. The new edition includes Python-coded versions of the main image analysis algorithms discussed in the text, making it accessible to students and teachers without expensive ENVI/IDL licenses.

Forthcoming EARSeL Conferences

9th SIG Imaging Spectroscopy Workshop

European remote sensing - new opportunities for science and practice

14 - 16 April 2015, Luxembourg   **More info**

General

EARSeL's Special Interest Group on Imaging Spectroscopy aims to encourage international discussions among specialists working with innovative Earth Observation technologies.

The 9th meeting, jointly organized by Trier University and the CRP – Gabriel Lippmann, builds on the 8 previous successful workshops and will be held in Luxembourg in April 2015.

The workshop will cover all themes related to imaging spectroscopy. Hyperspectral remote sensing has started to move from a largely airborne to a fully spaceborne capability with the development of a number of satellite spectrometers, which will be launched in the next few years. Nevertheless, we find an increasing number of airborne and UAV-based systems in the research community with many new possible applications. At the same time the latest imaging spectrometers measure not just the traditional visible and near-infrared regions, but now also cover fluorescence and the thermal- and mid-infrared regions. These technical developments have fostered a number of ground breaking research fields.

For more information please refer to the Workshop flyer at:
http://www.earsel2015.com/fileadmin/user_upload/Flyer.pdf

Topics

Contributions deal in general with recent advances in and applications of the different techniques and research methods used in imaging spectroscopy and or hyperspectral remote sensing. In particular, the following topics will be covered:

Research and applications of imaging spectroscopy

➢ Agriculture, forestry, rangeland and wetland management

➢ Vegetation biophysical properties, processes and functions, as well as plant species, plant stress and disease

➢ Minerals, rocks, soils, and artificial materials

➢ Urban studies

➢ Coastal and inland waters

➢ Land use change

Advances in hyperspectral remote sensing data processing

➢ Hyperspectral data processing algorithms, data mining and data assimilation

> ➤ Sensor calibration, atmospheric correction and product validation
> ➤ Synergies of hyperspectral data with the Sentinels, i.e. with advanced multi-spectral and microwave sensors

New and innovative hyperspectral sensor systems

> ➤ Visible, near-, mid- and thermal infrared spectral and multi-angular measurements including fluorescence
> ➤ Hyperspectral images from ground, drone, airborne and satellite platforms

Important dates
Workshop dates   14 - 16 April 2015
Deadline for submission of abstracts   30 November 2015
Notification of acceptance   31 January 2015
Early-bird registration ends   28 February 2015
Deadline for registration   05 April 2015

Abstracts can be submitted online at www.earsel2015.com

35th EARSeL Symposium 2015 & Workshop on Temporal Analysis

Organised by KTH Royal Institute of Technology
15 – 19 June 2015, Stockholm, Sweden   **More info**

The 35th EARSeL Symposium is organised by KTH Royal Institute of Technology and will be in Stockholm, Sweden from 15 – 19 June 2015.

Topics

> ➤ Scientific applications of remote sensing, emerging methods and techniques
> ➤ Multitemporal analysis

- Image processing, analysis and classification
- Change detection
- 3D remote sensing
- RADAR, LiDAR, Thermal Remote Sensing
- Land use and land cover
- Land degradation and desertification
- Urban remote sensing
- Agriculture remote sensing
- Forestry and forest fires
- Natural and man-made disasters
- Activities dealing with natural and cultural heritage
- Remote sensing for archaeology
- Applications related to assist developing countries:
- Remote sensing and its associated support to the understanding of climate change
- Hydrological applications: water management, underground water sources, land ice and snow
- Oceans, coastal zones and inland waters
- New instruments and methods, incl. ground truth
- Education and training in school, university, and public life
- Capacity building at organisations and authorities involved in environmental monitoring and protection

Important dates

Abstract submission: **Feb. 27, 2015**
Notification of acceptance: Mar. 15, 2015
Early-bird registration: Apr.15, 2015

For more information please refer to the Symposium flyer at:
http://www.earsel.org/pdf/EARSeL2015_Flyer.pdf

Other Conferences

2-5 September, 2014: Remote Sensing and Photogrammetry Society Conference 2014. Aberystwyth, United Kingdom.

3-5 September, 2014: CompIMAGE'14, Computational Modeling of Objects Presented in Images: Fundamentals, Methods, and Applications. Pittsburgh, Pennsylvania, USA.

5-7 September, 2014: Photogrammetric Computer Vision - PCV 2014, ISPRS Technical Commission III Symposium. Zurich, Switzerland.

8-11 September, 2014: 1st International Geomatics Applications GEOMAPPLICA Conference. Skiathos Island, Greece.

11-12 September, 2014: Summit on Earth Observation Business. Paris, France.

13-16 September, 2014: ISCGM 2014, International Symposium on Crop Growth Monitoring. Nanjing, China.

16-17 September, 2014: Workshop on Novel Mission Concepts for Snow and Cryosphere Research. Noordwijk, The Netherlands.

17-19 September, 2014: EarthCARE Workshop 2014. Tokyo, Japan.

22-25 September, 2014: SPIE Remote Sensing 2014. Amsterdam, The Netherlands.

22-26 September, 2014: RAQRS'IV: the 4th International Symposium on Recent Advances in Quantitative Remote Sensing. Valencia, Spain.

22-26 September, 2014: EUMETSAT Meteorological Satellite Conference. Geneva, Switzerland.

23-26 September, 2014: GIScience 2014. Eighth International Conference on Geographic Information Science. Vienna, Austria.

24-25 September, 2014: International Workshop Remote Sensing and GIS for Monitoring of Habitat Quality.
Vienna, Austria.

25 September, 2014: EARSC research workshop.
Brussels, Belgium.

6-8 October, 2014: Joint International Conference on Geospatial Theory, Processing, Modelling and Applications.
Toronto, Canada.

7-11 October, 2014: GéoCongrès 2014 / GeoConference 2014.
Quebec, Canada.

13-17 October, 2014: Climate Research and Earth Observations from Space: Climate Information for Decision Making.
Darmstadt, Germany.

13-17 October, 2014: International Radar Conference 2014, Catching the invisible (RADAR 2014).
Lille, France.

13-17 October, 2014: SPIE Asia-Pacific Remote Sensing 2014.
Beijing, China.

14-15 October, 2014: European Space Thermal Analysis Workshop.
Noordwijk, The Netherlands.

20-23 October, 2014: 14th International Scientific and Technical Conference.
Hainan, China.

23-24 October, 2014: 8th Coastal Altimetry Workshop.
Konstanz, Germany.

27-30 October, 2014: IEEE International Conference on Image Processing.
Paris, France.

27-31 October, 2014: New frontiers of altimetry.
Lake Constance, Germany.

27-31 October, 2014: The 35th Asian Conference on Remote Sensing. Sensing for Reintegration of Societies.
Nay Pyi Taw, Myanmar.

28-31 October, 2014: Earth Observation for Ocean-Atmosphere Interactions Science.
Frascati, Italy.

3-5 November, 2014: Workshop of Photogrammetry, Remote Sensing and Laser Scanning.
Telč, Czech Republic.

3-5 November, 2014: Geomatics Atlantic 2014.
St. John's, Newfoundland, Canada.

4-7 November, 2014: ARSI and KEO 2014.
Noordwijk, The Netherlands.

5-7 November, 2014: Applied Geoinformatics for Society and Environment: Continuing Geospatial Education.
Stuttgart, Germany.

9-11 November, 2014: 5th Digital Earth Summit 2014 Earth.
Nagoya, Japan.

12-14 November, 2014: 1st Conference on Big Data from Space (BiDS'14).
Frascati, Italy.

13-14 November, 2014: SMOS Workshop, Understanding the Carbon and Water Cycles using SMOS Data and Models.
Toulouse, France.

25-27 November, 2014: Pacific Islands GIS&RS User Conference.
Suva, Fiji Islands.

25-28 November, 2014: 5th International GOCE User Workshop.
Paris, France.

26-27 November, 2014: MoLaS: Mobile Laser Scanning Technology Workshop.
Freiburg, Germany.

26-28 November, 2014: Ocean Salinity Science & Salinity Remote Sensing Workshop.
Exeter, United Kingdom.

2-3 December, 2014: LowCost3D, Sensors, Algorithms, Applications.
Berlin, Germany.

3-5 December, 2014: NAVITEC.
Noordwijk, The Netherlands.

8-10 December, 2014: SPAR Europe & European LiDAR Mapping Forum.
Amsterdam, The Netherlands.

14-17 December, 2014: Workshop on Spatial Big Data Mining and Visualization, IEEE International Conference on Data Mining.
Shenzhen, China.

26-28 January, 2015: GIS Ostrava 2015.
Ostrava, Czech Republic.

26-30 January, 2015: POLinSAR 2015 and 1st BIOMASS Science workshop.
Frascati, Italy.

23-27 March, 2015: FRINGE 2015.
Frascati, Italy.

25-27 March, 2015: High resolution imaging for geospatial information and Photogrammetric Image Analysis.
Munich, Germany.

30 March – 1 April, 2015: Joint Urban Remote Sensing Event.
Lausanne, Switzerland.

13-16 April, 2015: SPIE Optics + Optoelectronics 2015.
Prague, Czech Republic.

11-15 May, 2015: 36th International Symposium on Remote Sensing of Environment.
Berlin, Germany.

18-20 May, 2015: 7th International Workshop on Information Fusion and Geographic Information Systems.
Grenoble, France.

25-29 May, 2015: 2nd SMOS Science Conference.
Villafranca (near Madrid), Spain.

Summer Schools and Advanced Courses

2th ISPRS Student Consortium and WG VI/5 Summer School.
1-5 November 2014, University for Forestry, Yezin, Nay Pyi Taw, Myanmar
Deadline for registration: **5 September 2014**.

3rd ESA Advanced Course on Radar Polarimetry
19-23 January 2015, ESA ESRIN, Frascati (Rome), Italy
Deadline for registration: **30 September 2014**.

2nd SMOS TRAINING COURSE
18-22 May 2015, CESBIO, ESA-ESAC (near Madrid), Spain
Deadline for registration will be announced.

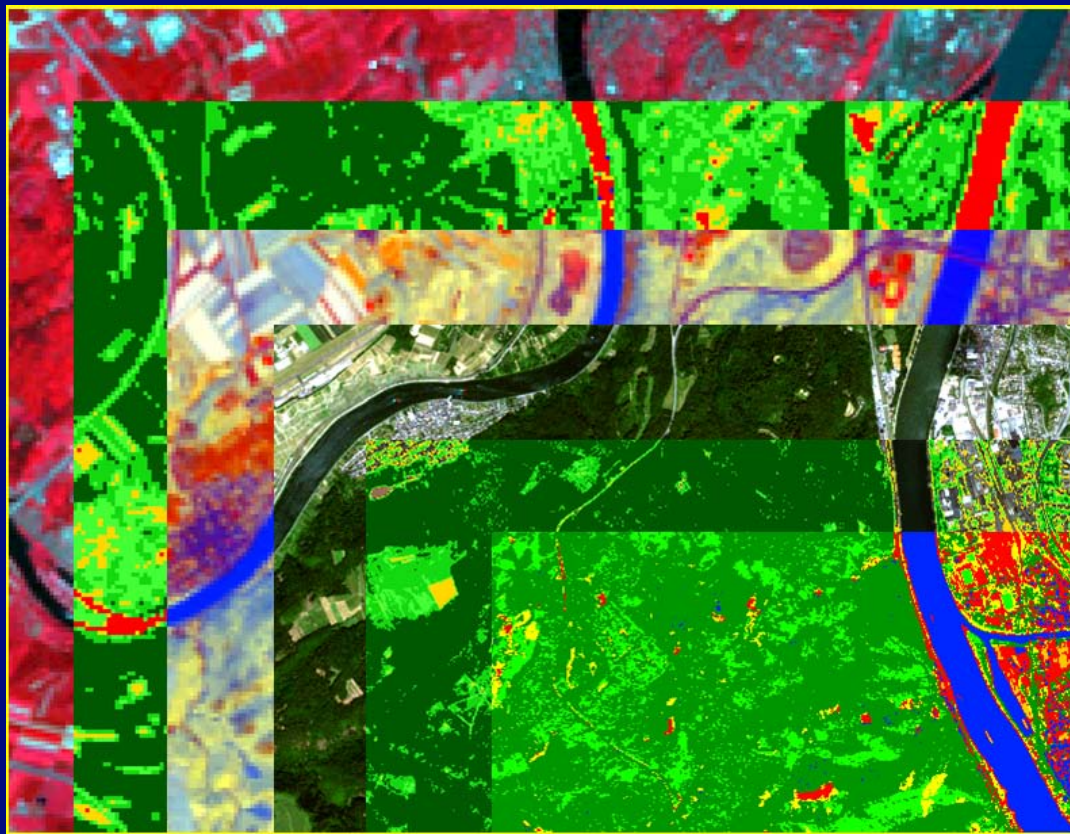Innsbruck Summer School of Alpine Research 2015
5-11 July 2015, Obergurgl University Center, Obergurgl, Austria
Deadline for registration will be announced.

Back Cover – RapidEye, Landsat 5 TM; images of Koblenz and Winningen

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