

# EARSel



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# NEWSLETTER



European Association of Remote Sensing Laboratories

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**Front Cover** – Celebrating the 100th issue of the EARSeL Newsletter with a mosaic of previous covers.

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## EARSeL Newsletter

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## Editorial

Dear members,

We are very proud to present you an anniversary publication of EARSeL. This is the 100th issue of the EARSeL Newsletter. It has always been the aim of this EARSeL publication series to present the latest news, publications, advances and research activities from both the EARSeL and other organisations related to Remote Sensing and Earth Observation. This issue starts with an interesting report by the EARSeL Chairperson and ISPRS Congress Director Dr Lena Halounová, regarding the collaboration between EARSeL and ISPRS. Moreover, in this issue Martti Hallikainen presents the “Remote Sensing Activities” in Finland for the past year 2014. We also want to welcome as a member of the editorial team of the EARSeL Newsletter Ms Karolina Orłowska.

The preparations for the 35th EARSeL Symposium 2015 in Stockholm, Sweden accompanied by the Second International Workshop on “Temporal Analysis of Satellite Images” and the 7th EARSeL Workshop on “Remote Sensing of the Coastal Zone” are underway. You are more than welcome to contribute by submitting research papers to the respective events. Last but not least, it is always with great pleasure to welcome new laboratory members at EARSeL.

Next May 20-22nd in Thessaloniki, Greece, the SPLIT Remote Sensing Summer School 2015 will be held, organised by G-ECO Research Inc. under the technical and organising assistance of the Laboratory of Forest Management and Remote Sensing of the Department of Forestry and Natural Environment of the Aristotle University of Thessaloniki.

Wim Baker contributes once more with a report on recent developments in Earth-observation satellites and sensors. EARSeL eProceedings feature with new remote sensing research publications along with a special issue of selected papers from the 34th EARSeL Symposium edited by Dr. Rainer Reuter and Dr. Bogdan Zagajewski.

The 9th SIG Imaging Spectroscopy Workshop will take place in Luxembourg during April 2015 and the Annual 35th EARSeL Symposium and the Second International Workshop on “Temporal Analysis of Satellite Images” and the 7th EARSeL Workshop on “Remote Sensing of the Coastal Zone”, in Stockholm, Sweden, during June 2015.

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

As always, you can contribute to the EARSeL Newsletter via a science article or report for the forthcoming issues. We are very much looking forward to your feedback on the EARSeL Newsletter.

The current editorial team wants to thank all the past editorial teams, past and current EARSeL Bureaus and Councils as well as all individuals who have contributed to the EARSeL Newsletter. We will keep on making each and every effort for a high quality and respective EARSeL Newsletter.

Enjoy reading the 100th issue!

The Editors

## News from EARSeL

### International Society for Photogrammetry and Remote Sensing & EARSeL



EARSeL and ISPRS (International Society for Photogrammetry and Remote Sensing) signed a Memorandum of Understanding about future cooperation in 2010. ISPRS has a two level hierarchy of groups of scientists. ISPRS scientific activities are led by eight Technical Commissions. Each Technical Commission manages a lower level of the hierarchy – working groups. The scientific activities are managed by working groups in a form of workshops. Each Technical Commission organises midterm symposium (two years after a previous ISPRS Congress). 2014 was a year of eight Symposia of all Technical Commissions. Proceedings of the Symposia are on the web pages of <http://www.isprs.org/publications/archives.aspx> and <http://www.isprs.org/publications/annals.aspx>.

Proceedings called Archives are proceedings with reviewed abstracts. They have already been awarded the CPCI (Thomas & Reuter index for proceedings) and are included in SCOPUS. The second proceedings are Annals with a double blind review of Full Papers. Submission of registration to the Thomson & Reuter has been sent for Annals as well.

Cooperation between EARSeL and ISPRS occurred in 2014 in terms of co-organising the Young Scientists Days within the 34th EARSeL symposium in Warsaw (<http://www.earsel.org/symposia/2014-symposium-Warsaw/YoungScientistDays.php>).

Four participants of the Young Scientist Days received air tickets thanks to the sponsorship from ISPRS, which was financed by UN OOSA.



Photo of receivers of the sponsored air tickets.

I would like to draw your attention to the most important event of ISPRS in 2015. It is the ISPRS Geospatial Week 2015 (<http://www.isprs-geospatialweek2015.org>), which takes place in Europe, France, La Grande Motte. The main goal of the event is to propose a rich scientific program concerning geoinformation (from data collection and information extraction, to data quality control and dissemination through services) with a mix of methodology-oriented and thematic-oriented events during a full working week.

The most important events of ISPRS are Congresses. They are organised in various places of the world once every four years. The next one will be held in Prague on 12 – 19 July 2016.

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EARSeL Chairperson, ISPRS Congress Director



## National Reports

### Remote Sensing Activities in Finland, 2014

#### Aalto University, Department of Radio Science and Engineering (RAD)

The Aalto University Space Technology and Remote Sensing Group develops future microwave remote sensing concepts and airborne and space-borne Earth Observation instrumentation, and has recently extended its field of interest to satellite platforms.

During year 2014 a remote sensing Cubesat satellite, called Aalto-1, started engineering model level and environmental tests. Behind the Aalto-1 satellite is a wide Finnish consortium and Aalto University students. The main payload of the satellite is a miniature visible light spectral imager AaSI, developed by VTT Research Centre of Finland. The spectrometer will be able to adjust the placement of spectral channels with 10 nm accuracy and will deliver images with a ground resolution around 70 m. The satellite should be ready and tested by spring 2015; the launch is scheduled for late 2015.

RAD continues its work on solutions for lean space platforms. The Aalto-2 atmospheric research Cubesat satellite for the EU-sponsored QB50 satellite constellation is under development and should be ready by the end of 2015. The launch is scheduled for 2016.

RAD also continues its Skyvan research aircraft operations and replenishes its remote sensing instrumentation selection onboard the airborne platform. During autumn 2014, a series of test flights were conducted with a new X-band SAR instrument, which was entirely developed in-house. The instrument is dedicated for use in the arctic environment and it is a first step towards new generation instrumentation for small space-borne platforms. The test flights were successful and delivered the first SAR images for further analysis.

Investigation of microwave radiometry of snow on lake ice was continued with airborne measurements in winter 2014. These data help improve the accuracy of snow water equivalent retrieval from space-borne radiometer data in boreal lake-rich regions. Data are collected using the HUTRAD 6.9 to 36.5 GHz radiometer and the HUT-2D interferometric 1.4 GHz radiometer; both instruments are accommodated onboard the Skyvan research aircraft.

Airborne experiments with HUT-2D radiometer were also continued to investigate soil humus and understory caused effects in SMOS soil moisture retrieval in Boreal forest.

RAD has also supported several other institutes and projects with airborne platform operations in various scientific projects.

Martti Hallikainen, the long-time leader of Aalto University Space Technology and Remote Sensing Group, resettled in 2014 to an active emeritus professor position at Aalto. The work in the group continues under the leadership of young tenure track professor, Jaan Praks.

#### VTT Technical Research Centre of Finland

VTT's remote sensing research is focused towards data fusion, intelligent algorithms, increased automation and modeling in 2014. The rationale behind the emphasis of the research agenda comes from the rapidly increasing volume of data and diversification of data sources. Conventional methods cannot fully utilize the emerging data.

In a FP7 project North State, intelligent algorithms are developed to estimate parameters of carbon and water cycle models. Such parameters include fraction of absorbed photosynthetically active radiation, leaf area index, tree species and biomass, for instance. Very high and high resolution optical data from satellites and unmanned aircraft and several radar data sources were used. The remote sensing partners of the research consortium provide predictions of the model parameters to

the carbon modeling partners that apply them in dynamic vegetation and process models to compute carbon balance. The project, coordinated by VTT, is aiming to provide methods that can significantly reduce the present uncertainties in carbon models [www.northstatefp7.eu](http://www.northstatefp7.eu).

Novel concepts were developed for forest growing stock volume and biomass estimation with very high resolution data. Individual trees were located and their species identified. Other variables were predicted by applying object based methods to satellite data and finally tree species information was combined with these predictions. The root mean square error of the growing stock volume and a level of single stands was 29 % of the mean (of 170 m<sup>3</sup>/ha).

A completely automatic method for land cover class estimation was developed with radar data. An initial automatic classification was further iterated by utilizing statistical information on the areas of the target classes. This project, Electric Brain, will extend to more complex data sources and combination of predicted variables in 2015.

An important topic in radar data analysis was new developments for the prediction of forest degradation in the tropical regions. Methods using multitemporal L-band and C-band SAR data were developed and successfully tested in a project for the European Space Agency. In a recent study with C-band SAR, test results with independent data indicated significant omission error but negligible commission error in the detection of selective thinning cuttings. It could be concluded that C-band SAR data can be used to locate areas of selective cuttings.

An integrated pilot system for ice information was further developed in FP7 project Polar Ice. Remote sensing products from different data providers are automatically collected, processed and delivered from specified areas according to user specifications.

Commercialization of VTT's method continued in a specific project. The methods to be commercialized include VTT's Probability image analysis chain and data collection with crowd sourcing techniques using cellular phones. In a project for the European Space Agency, forest observation techniques with Relasphone (see Google Play Store) were extended to Mexico.

### **Finnish Geodetic Institute**

The department of Remote Sensing and Photogrammetry (RSP) of the Finnish Geodetic Institute continued its strong focus on international activities in 2014. The personnel of 35 researchers, out of which 15 have a PhD degree, produced 35 peer-reviewed international journal articles. The research activities of the Centre of Excellence in Laser Scanning Research (CoE-LaSR) of the Academy of Finland, led by Prof. Juha Hyyppä/FGI, are described on the CoE-LaSR [www](http://www.fgi.fi/coelasr) page (<http://www.fgi.fi/coelasr>). For example, CoE-LaSR was presented in the Intergeo 2014 meeting in Berlin, which is the largest event in the Geospatial business in Europe. The article "An International Comparison of Individual Tree Detection and Extraction Using Airborne Laser Scanning" by the researchers of the CoE-LaSR was the most cited article in Remote Sensing Journal in 2012-2014. The CoE-LaSR signed a memorandum of understanding (MoU) with Professor Masato Katoh from Shinshu University, with the Shanghai Jiaotong University, and the Shangdong University of Science and Technology. The CoE-LaSR established joint labs with the following Chinese partners: 1) "Electro-Optical Payload Information Acquisition and Quality Control" joint lab with the Academy of Optoelectronics, Chinese Academy of Science, and 2) "Sensing and Navigation" joint lab with Shanghai Jiaotong University, which is listed as a top 3 university for the Engineering field in China. Regarding the European Union funded research, the first year of the EU/FP7 project, Advanced\_SAR, was reviewed in Brussels in November 2014. More information and details of the project are available on the [www](http://www.fgi.fi/advancedsar) page of the project (<http://www.fgi.fi/advancedsar>). Regarding European Space Agency projects, in 2014, the FGI team demonstrated the use of satellite data in monitoring rice fields in the Mekong Delta area, Vietnam, for the United Nation International Fund for Agricultural Development (IFAD), see <http://esamultimedia.esa.int/multimedia/publications/IFAD>.



The FGI also participated in the ESA IAP project with the aim to develop remote sensing systems for high-voltage power line monitoring (<http://artes-apps.esa.int/projects/sharpersat>). The FGI has also worked in the Dragon3 programme of the ESA and the Ministry of Science and Technology of China, and participated in the Dragon3 mid-term review symposium in Chengdu, China, May 2014.

The FGI also participates in the European Metrology Research Program (EMRP) project European Metrology for Earth Observation and Climate (MetEOC) which aims to develop the calibration and validation methods of the remote sensing measurements for the purposes of climate change monitoring. FGI has a joint research project with the University Estadual Paulista, Presidente Prudente, SP, Brazil, Department of Cartography (UNESP) funded by the Joint project call in Biodiversity research of Academy of Finland and Brazilian FAPESP.

### **Geological Survey of Finland**

At the Geological Survey of Finland (GTK) a doctoral thesis on geoenvironmental applications related to forest regeneration, peatland site type recognition, and prediction of water and chemical element concentration glacial till soils from airborne and close-range hyperspectral spectroscopic datasets was published and defended in the year 2014 ([http://tupa.gtk.fi/julkaisu/erikoisjulkaisu/ej\\_088.pdf](http://tupa.gtk.fi/julkaisu/erikoisjulkaisu/ej_088.pdf)). In the recent years GTK has focused on developing interpretation of airborne LiDAR derived digital elevation models for geomorphological features. Specifically, neotectonic faults and sediment deposits related to them have been recognized from the high resolution digital elevation models, as well as surveying of peat resources, structural mapping of ground water resources and sediment mapping for civil engineering and land use. In addition, mineralogical interpretation of close-range hyperspectral imaging has been developed in order to aid interpretation of bedrock core logs.

### **University of Turku, Laboratory of Computer Cartography**

University of Turku, Laboratory of Computer Cartography (UTU-LCC, <http://www.utu.fi/en/units/sci/units/geo/Pages/home.aspx>) has been developing new laser scanning (MLS and TLS) based approaches in fluvial morphology and change detection methodology for riverine environment including UAV-photogrammetry and back-pack MLS.

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Aalto University

## 35th EARSeL Symposium 2015

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**

Due date for abstract submission

**27th February 2015**

Notification of authors

**15th March 2015**

Due date for the Symposium fee payment of authors\*

**15th April 2015**

Submission due date for full papers (Symposium and Workshops)

**15th June 2015**

For more information please refer to the Symposium website at:

<http://www.earsel.org/symposia/2015-symposium-Stockholm/index.php>

**Second International Workshop on “Temporal Analysis of Satellite Images”**

Organised by KTH Royal Institute of Technology

17 – 19 June 2015, Stockholm, Sweden

[More info](#)



This workshop intends to be a forum for discussion of research issues related to temporal analysis of remotely sensed data. Since the launch of Landsat-1 in 1972, a large number of earth observation satellites have been launched. The wealth of multitemporal data provides excellent opportunities to study environmental changes at local, regional and global scale. The workshop includes a wide array of topics.

**Topics**

- Multitemporal image calibration and correction
- Landsat, NOAA AVHRR, MODIS, MERIS, SPOT VGT Data Archive
- Multitemporal SAR and InSAR data analysis

- Cross-sensor satellite data - data fusion
- Methodology for analysis of temporal data
- Change detection methods
- Landuse and land cover dynamics
- Vegetation dynamics, ecological processes and environmental impact
- Applications of multitemporal data

### Important dates

Submission of Abstract	<b>February 27, 2015</b>
Notification of Acceptance	<b>March 15, 2015</b>
Payment of workshop fees	<b>April 15, 2015</b>
Manuscripts Due Date	<b>June 17, 2015</b>

For more information please refer to the Workshop website at:  
<http://www.earsel.org/SIG/timeseries/stockholm.php>

## 7th EARSeL Workshop on Remote Sensing of the Coastal Zone

Organised by KTH Royal Institute of Technology  
 17 – 19 June 2015, Stockholm, Sweden

[More info](#)





The 7th EARSeL Workshop on Remote Sensing of the Coastal Zone will take place at the Royal Institute of Technology Stockholm, Sweden from 17th to 19th June 2015.

The Workshop will provide an interdisciplinary forum for presentations and discussions of our current state of knowledge on remote sensing of the coastal zone environment in terms of algorithms' accuracy, time series analysis of environmental indices based on remote sensing data, and new technologies. These topics will emphasize the impact of the climate variability on the European Seas with particular emphasis on coastal zones and inland waters highlighting the importance of measuring essential climate variables which can exhaustively describe the status of the coastal environment.

## Topics

The 7th workshop will focus on the contribution of the remote sensing to the monitoring of the terrestrial and marine ecosystem status and its variability in the coastal zone of the European Seas. As suggested by the strategic plan for Coastal GOOS (Global Ocean Observing System) and the Panel for Integrated Coastal Ocean Observations (PICO) the priority indicators of the ecosystem state (health) are:

- Surface phytoplankton biomass and subsurface oxygen fields
- Distribution and abundance of waterborne pathogens and toxic phytoplankton
- Spatial extent of living benthic habitats (coral reefs, seagrass beds, mangrove forests and tidal marshes) and ecological buffers to coastal flooding
- Distribution and condition of calcareous organisms (cold and warm water corals, coccolithophores and pteropods)
- Distribution and abundance of exploitable fish stocks

These indicators can be evaluated on the basis of some “essential variable”. The list includes both ecosystem state variables such as temperature, salinity or phytoplankton biomass and external pressures such as winds, solar radiation or precipitations as listed in the PICO report: Remote sensing methodologies represent a real opportunity for estimating at least some of these essential variables with increasing precision, starting from basic measured variables such as remote sensing reflectance, emitted radiation, or radar backscattering. Considering this general framework and future challenges for the coastal zone remote sensing community, the 7th Workshop represents an ideal opportunity for discussing these themes and trace the route for forthcoming projects and collaborations. Themes proposed for discussions are:

- changing terrestrial run-off into coastal waters
- escalation of extreme coastal events: floods, storms, high tides
- hydrology and water budget evolution of rivers and lakes
- increasing temperatures in inland and coastal waters
- impact of varying physical forcing on morphodynamics and ecosystems
- new developments of habitats, biodiversity and alien invaders
- fluxes and fate of seawater constituents, including pollutants
- role of Coastal Zone Management in adapting to climate change

and their investigation with Remote Sensing:

- active and passive methods in all spectral ranges, sensor combinations

- satellite, airborne and ground-based methods including ground truth
- modelling of radiative transfer, image processing and related aspects
- interaction of physical, biological and chemical conditions and processes
- Ocean Colour Remote Sensing for Coastal and Inland Waters

### Important dates

Due date for submission of abstracts

**27nd February 2015**

Notification of Authors

**15th March 2015**

Due date for the Symposium fee payment of authors

**15th April 2015**

Submission due date for full papers

**25th May 2015**

For more information please refer to the Workshop website at:

<http://www.earsel.org/SIG/CZ/7th-workshop/index.php>

### New EARSeL Members

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



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## News from Other Organisations

### SPLIT Remote Sensing Summer School 2015

Thessaloniki, Greece, 20-22 May 2015



**SplitRS 2015 is taking us to Thessaloniki.**

#### Venue

Laboratory of Forest Management and Remote Sensing, Department of Forestry and Natural Environment of the Aristotle University of Thessaloniki

Environmental Security: Remote Sensing of Natural Resources" (*SplitRS 2015*) is an interactive event between universities, research institutions and private firms. It considers the state-of-the-art remote sensing technology, sophisticated and comprehensive modelling approaches, data analysis, sophisticated software capabilities - all of which is incorporated in the framework of building the well-designed strategy to protect natural resources and public well-being. The proposed topics include the environmental security issues related to:

- Food security and sustainable agriculture
- Energy resources
- Climate changes
- Water quantity and water quality
- Environmental hazards

#### The objective of SplitRS 2015 is to:

- promote the state-of-the-art Remote Sensing Technology among young professionals
- strengthen young people's professional networking.

**G-ECO Research** welcomes participants of all racial and cultural backgrounds and encourages women to apply.

This intensive and advanced, 3-day learning event, presents best insights into most recent techniques learned from top international professors and researchers through lectures and hands-on sessions. Participants will learn about different remote sensing applications using hyperspectral, SAR, LiDAR,

and UAS technologies. Learning about information extraction techniques will be an integral part of the school program in 2015.

### Registration

Registration to the **SplitRS 2015** will be available from Feb 01 – May 01 2015.

For more information please refer to the Summer School website at:

<http://splitremotesensing2015.com>

## GEO Business 2015

**27 - 28th May 2015, Business Design Centre, London, UK**

**The geospatial event for everyone involved in the gathering, storing, processing and delivering of geospatial information.** Incorporating an **international trade exhibition**, a **cutting edge conference** and a **programme of live commercial workshops sessions**, featuring the technology and services used by those working with spatial data.

Organised in collaboration with the Royal Institution of Chartered Surveyors (RICS), the Chartered Institution of Civil Engineering Surveyors (ICES), The Survey Association (TSA), the Association for Geographic Information (AGI) and the Institution of Civil Engineers (ICE).

### Registration

GEO Business 2015 exhibition and workshops are FREE to attend. There is a fee to attend the conference.

Visitors are encouraged to register in advance at [www.GeoBusinessShow.com/registration](http://www.GeoBusinessShow.com/registration) to avoid the queues onsite.

For further information, please visit [www.GeoBusinessShow.com](http://www.GeoBusinessShow.com), follow us on twitter @geobusinessshow #geobiz or join our LinkedIn group GEO Business.

Contact us at [info@GeoBusinessShow.com](mailto:info@GeoBusinessShow.com) or call +44(0)1453 836363.

## Science Article

### Satellites & Sensors

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

#### ISS/RapidScat

SpaceX CRS-4 was launched on 21 September 2014. SpX-4 is a cargo resupply mission to the International Space Station. Its cargo included the ISS-RapidScat instrument, which is a replacement for NASA's QuikScat earth observing satellite for monitoring ocean winds.

QuikScat's measurements were so valuable that when the satellite stopped operating in late 2009, NASA was challenged to quickly come up with a replacement. NASA's Jet Propulsion Laboratory and the ISS program came up with a solution that reuses hardware originally built to test parts of QuikScat, and created an instrument for a fraction of the cost and time it would take to build and launch a new satellite. The ISS RapidScat instrument is attached on the outside at the end of the station's Columbus laboratory and consists of a dual-beam scatterometer with a single rotating antenna.

#### Rosetta/Philae

ESA have been cleverly playing with social media for its space probe Rosetta. First spacecraft to orbit a comet, first landing on a comet, etc. So, what more can we tell about Rosetta? The short version goes like this. Rosetta was launched on 2 March 2004, and after 10 years of cosmic billiard, bouncing around the solar system using gravity assist manoeuvres, it reached the comet 67P/Churyumov-Gerasimenko in August 2014. On 12 November it launched its lander Philae, which, after a couple of bounces on the surface due to the failure of its anchoring harpoons, finally came to rest on the surface of the comet. Unfortunately, the final landing of Philae left it in a dark spot where its solar cells only had an hour of sunshine for recharging its batteries. After the bumpy ride, Philae's batteries eventually went dead, but not before the lander managed to upload valuable science data.

At the time of the landing, ESA had a live streaming of the event. However, this must have been the most boring footage of a spacecraft landing in the history of space flight as the lander approached 67P at a relative speed of about 1 m/s and only first touched down after 7 hours of free fall. No wonder the press jumped on the inappropriate shirt worn by one of the scientists. But I do hope that Rosetta and Philae will be remembered for the science and not for the shirt of a poor absentminded scientist.

We'll be hearing more from Rosetta as 67P approaches the Sun and bursts into life spewing more gas and dust. And even Philae may spring to life again due to the increasing amount of sunshine.

#### The Nimbus Data Rescue Project

Fifty years ago NASA launched the first of the Nimbus weather satellites. The Nimbus satellites were a series of seven earth-observing satellites launched over a 14-year time period from 1964 to 1978. The satellites provided observations for 30 years and together carried a total of 33 instruments, including ozone mappers, the Coastal Zone Color Scanner instrument and microwave and infrared radiometers.

Back in the 1960s the data was recorded on film. Advancements in technology now allows for the processing of film into a digital format and storing of it in online archives. The Nimbus Data Rescue Project set out on an archaeological mission to convert data and images from the Nimbus satellites.

Using the data from the Nimbus Data Rescue Project, NSIDC scientists have estimated the location of the North and South Pole sea ice edges at various times during the late 60s and early 70s. The researchers used the recovered images to delineate the North and South Pole sea ice extent of that time.

The Nimbus Data Rescue Project can be found here: <http://nsidc.org/data/nimbus>

### Himawari-8

A Mitsubishi Heavy Industries H-IIA rocket placed Japan's Himawari-8 next-generation weather satellite in geostationary transfer orbit on 7 Oct 2014. As planned, the satellite entered geostationary orbit on 16 October. After completion of in-orbit testing and overall system checking the satellite is expected to start operations somewhere mid-2015. Himawari-8 has 16 bands with a best resolution of half a kilometer. In addition to improved spatial and spectral resolution, also the temporal resolution has improved with regular full-disk observations every 10 minutes and a rapid scan mode of every 2.5 minutes around Japan.

### Asnaro-1, Hodoyoshi-1, ChubuSat-1, QSAT-EOS and Tsubame

Asnaro-1, the first of "Advanced Satellite with New system Architecture Observation" series, is an earth-observing satellite with a resolution better than 0.5 meter panchromatic and 2 meter multispectral. The satellite was launched on 6 November 2014. In addition to the Asnaro-1, four smaller satellites were launched on the same Dnepr rocket.

Developed by the University of Tokyo, the Hodoyoshi-1 satellite will collect medium-resolution imagery of Earth. The Hodoyoshi-1 spacecraft features a 4-band pushbroom optical camera (red, green, blue, and near-infrared) for images with a resolution of 6.7 m.

Nagoya University's ChubuSat-1 spacecraft carries optical and infrared cameras to observe the Earth and space debris. Its visible and near-infrared bands (0.5 and 0.85 micron) have a resolution of around 10 meter, while its thermal band (7.5 to 13.5 micron) has a spatial resolution of 130 meter.

The Tsubame (swallow) mission, led by the Tokyo Institute of Technology, will test gyroscopes for pointing control, conduct X-ray astronomy observations, and demonstrate a compact camera for earth-observation. Its camera has a resolution of 14 meter. The microprocessor of the camera system is based on an FPGA (Field Programmable Grid Array) implementation. This concept provides flexibility to adapt easily to different types of satellite bus systems. Linux was adopted as the operating system of the camera.

The QSAT-EOS satellite was specifically designed for monitoring disasters and vegetation. It was developed by a consortium of institutions led by Kyushu University. The satellite is a 50-centimeter cubesat with a mass of 50 kilograms. Its 400 mm camera has two spectral bands (0.55 and 0.75 micron) with a spatial resolution of 5 meter at nadir.

### Upcoming Launches

Satellite	Launch
KOMPSAT-3A	December 2014
CBERS-4	January 2015
SMAP	29 Jan 2015
Sentinel-2A	Spring 2015
Sentinel-3A	mid-2015
Jason-3	2015

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## EARSeL eProceedings

### New Publications in Vol. 13(1), 2014



#### Satellite remote sensing applied to off-shore wind energy

Sara Venafra, Marco Morelli, and Andrea Masini

##### Abstract

Read full paper online: <http://www.eproceedings.org>

Wind as an energy resource has been increasingly in the focus of attention over the past decades, starting with the global oil crisis in the 1970s. The possibility of expanding wind power production to off-shore locations is attractive, especially in sites where wind levels tend to be higher and more constant.

Wind turbine energy production is usually evaluated by means of a wind turbine power curve, which is provided by the manufacturer and it is an important parameter to estimate wind plant performances. In this study we present a methodology aimed to support both planning of offshore wind farms using historical series of satellite data in order to detect the sites which could provide more wind energy production than others, and near real-time monitoring of offshore wind energy performances by means of SAR data. SAR wind data are retrieved from measured radar backscatter using empirical geophysical model functions, achieving good accuracy, global coverage and greater spatial resolution with respect to other wind measurement methods.

Moreover, we are able to calculate the AC power yield expected behaviour, using detailed models of each part of the wind plants.

In brief, we use SAR data from Cosmo-SkyMed in X-Band and from ERS and ENVISAT in C-Band to generate instant wind speeds and a composite product from NCDC NOAA to investigate wind climatology.

Such methodologies are currently being developed within the scope of SATENERG, a research project funded by ASI (Italian Space Agency). These methods have been applied in several test cases, and successful results in comparison with standard methodologies were obtained

#### An application of the Perpendicular Moisture Index for the prediction of fire hazard

Carmine Maffei, and Massimo Menenti

##### Abstract

Read full paper online: <http://www.eproceedings.org>

Various factors contribute to forest fire hazard, and among them vegetation moisture is the one that dictates susceptibility to fire ignition and propagation. The scientific community has developed a number of spectral indices based on remote sensing measurements in the optical domain for the assessment of vegetation equivalent water thickness (EWT), which is defined as the mass of liquid water per unit of leaf surface. However, fire models rely on the live fuel moisture content (LFMC) as a measure of vegetation moisture. LFMC is defined as the ratio of the mass of the liquid water in a fresh leaf over the mass of oven dry leaf, and spectral indices proposed so far fail in capturing LFMC variability. Recently, the perpendicular moisture index (PMI), based on MODIS, was proposed to overcome this limitation and provide a direct measure of LFMC. The aim of this research was to



understand the potential and limitations of the PMI in predicting fire hazard, towards its application in a practical context.

To this purpose, a data set of more than 7,700 fires recorded in Campania (13,595 km<sup>2</sup>), Italy, between 2000 and 2008 was compared with PMI derived from MODIS images. Results show that there is no relationship between PMI and fire size, whereas a linear correlation was found between the spectral index and fire rate of spread.

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

### **Urban growth patterns for Bucharest, Romania: Analysis of Landsat imagery**

Mihaela Aldea, and Florian Petrescu

#### **Abstract**

Read full paper online: <http://www.eproceedings.org>

Is there any spatial pattern for Bucharest urban growth that occurred during the last 25 years, after the end of Cold War? This question is answered by the results obtained through the Landsat data analysis performed in order to detect the changes produced in land use in the last 25 years for the city of Bucharest and its surroundings. The analysis is based on the four major land use classes that are generated by means of a processing methodology proposed in this paper.

### **Temporal changes in Norway spruce physiological status using hyperspectral data: A case study of mountainous forests affected by long-term acidic depositions**

Lucie Cervená, Zuzana Lhotáková, Veronika Kopacková, Lucie Kupková, Jan Mišurec, Markéta Potucková, Pavel Cudlín, Petya Entcheva-Campbell, and Jana Albrechtová

#### **Abstract**

Read full paper online: <http://www.eproceedings.org>

A decline in the Norway spruce forests of the Krušné Hory Mts., Czech Republic, has been reported since the early 1950's. It was attributed to the combination of severe atmospheric pollution and climatic conditions. The physiological status of the Norway spruce forests has been assessed using ground-truth data (biochemical and spectroscopic data) as well as two hyperspectral data sets acquired in 1998 (ASAS sensor, NASA Goddard Space Flight Center) and in 2013 (APEX sensor, developed by a Swiss-Belgian consortium on behalf of ESA, currently operated by VITO). The very first results coming from the analysis of the foliar chemistry indicate that the stands exhibit different physiological statuses corresponding to the pollution gradients in 1998 and 2013. Slight improvement of the Norway spruce physiological status was recorded in the eastern part of the mountains (e.g., total carotenoids to chlorophyll ratio), while the status of the western-located stands slightly worsened. These findings may correspond to a tremendous decrease in the atmospheric pollution which was most severe in the east. However, remains of the pollution can be still seen in the adverse soils conditions. Further linkages among foliar chemistry and reflectance and soil chemistry are currently under investigation.

## **Forest damage assessment using SAR and optical data: Evaluating the potential for rapid mapping in mountains**

Ruben Remelgado, Claudia Notarnicola, and Ruth Sonnenschein

### **Abstract**

Read full paper online: <http://www.eproceedings.org>

In mountain ecosystems, forest damages are of high importance and a challenge for forest management and conservation. However, a quick assessment of these changes is difficult in complex terrain. In response to this constraint, rapid mapping using earth observation data has become an attractive solution. In particular, Synthetic Aperture Radar (SAR) offers a unique opportunity for forest management applications due to its independence of weather conditions. In this study, the potential of X-band COSMO-SkyMed Stripmap SAR images for forest change detection in mountainous environments is evaluated. A forested area in the Southern Alps (South Tyrol) is chosen which was affected by a storm event in June 2011. We mapped the forest changes using a statistical approach (Principal Component Analysis (PCA)). To evaluate the potential of radar relatively to optical data, two RapidEye images were obtained and forest changes by thresholding image differences between both years were mapped. The results show that optical data showed higher forest change accuracies than the SAR images. Using RapidEye imagery we accurately captured changes with a minimum area of 0.1 ha while the minimum detectable area was 0.5 ha with COSMO-SkyMed. The difference in results is explained by the high level of speckle noise introduced by the SAR resolution and by the high Local Incidence Angles (LIAs) within the study area (55° to 95°). The combination of these two effects introduced an increase in false alarm changes. The advantage of using SAR data is the capability of a quick assessment of changes especially in difficult weather conditions. However, the use of radar for rapid mapping of forest damages in mountains can be limited depending on the acquisition geometry. Thus, the acquisition geometry should be carefully chosen with respect to the topography to reduce layover and shadowing effects.

## **Monitoring forest cover change in boreal forests: A methodological approach**

Ouns Kissiyar, Svyatoslav S. Bartalev, and Frédéric Achard

### **Abstract**

Read full paper online: <http://www.eproceedings.org>

The purpose of this study is to develop a monitoring tool for boreal forest cover change on continental level at high resolution. The system is based on Landsat satellite imagery and has been implemented for the period 1990-2000-2010. For the identification and classification of the forest cover within a large amount of satellite imagery, a robust methodological approach combining multi-date image segmentation and cluster based supervised automated classification was chosen. Thus, an object based, automatic classification method with a regional expert validation are combined to produce regional scale land cover statistics over Russia and Mongolia. High resolution satellite imagery is used to accurately estimate land cover and land cover change for the epochs 1990-2000-2010. The overall method consists of four distinct steps: (i) automatic image preprocessing and pre-interpretation, (ii) validation by regional expert, (iii) statistic computation and (iv) accuracy assessment. The automated procedures have as main objective to unequivocally identify the objects so as to maximally reduce the post-classification interventions of manual procedures and of visual interpretation. A total of 14 different land cover classes are defined in the legend. Given the focus on forests, special attention was devoted to the differentiation of eight different forest cover types, going up to species level.

**Semi-automatic open source geoprocessing for change-detection in federal geodata**

Andreas Wicht, and Ansgar Greiwe

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

This project addresses the vast complexity of keeping federal geodata up to date according to the official regulations. Cooperating with the Hessian state agency for land management and geoinformation (Hessisches Landesamt für Bodenmanagement und Geoinformation - HLBG) concepts and solutions have been developed in a two-year project. It is supposed to enhance the efficiency of the geodata update processes within state agencies.

With the help of the concept of change detection datasets are supposed to be updated. The aim of the project is to provide a thematic layer of change indicators for the staff dealing with updating datasets. To assess the feasibility of this approach in a federal agency surrounding two exemplary datasets were defined. The long-term goal is to use semi-automatic change detection processes for increasing numbers of datasets within the agency.

Lake boundaries as well as relevant (meaning: above a  $\Delta z$ -threshold defined by the agency) elevation changes were processed. Light detection and ranging DEM (Lidar) is supposed to be kept up to date without subsequent flights. This paper describes the process of updating the lake boundaries.

According to the needs of the state agency processing rule sets (e.g. accuracy tolerances or minimum area size) were developed. The rule sets were then implemented using the Python programming language to create geoprocessing scripts as post-processing algorithms for raster database queries, which can tackle the data amount for Hesse with its  $\sim 21,000 \text{ km}^2$ .

This paper presents the methods which are being used to detect objects and derive features to be used in the process of change detection. Due to the high topicality of the oriented aerial images their derivatives (photogrammetric point clouds, orthophotos) serve as the core element for the detection of change features in the more recent epoch.

**Mineral mapping based on automatic detection of multiple absorption features**

Veronika Kopčková, and Lucie Koucká

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

In comparison with multispectral image data, hyperspectral (HS) imagery with higher spectral resolution provides sufficient spectral resolution to describe diagnostic absorption signatures. Specific chemical bonds in materials, whether solid, liquid or gas, determine the surface reflectance and emittance, as variations in material composition often cause shifts in the position and shape of absorption bands in the spectrum. In addition, detecting the exact absorption wavelength position is a key factor not only for mineral identification but also for tracking diverse environmental processes and pathways. A couple of techniques to identify absorption parameters have been suggested, however, they are capable of a quantitative characterization of just one major absorption feature and, due to the techniques they use, limited to the SWIR region.

In this paper, new tools are presented allowing automatic detection of multiple absorption feature parameters (absorption maximum wavelengths and depths). The tools employ methods based on a trend analysis of the spectra, while bad bands (e. g., noise, error bands) are detected at first and

excluded from further analysis. The tools – e.g. called QUANTools – have been created using IDL programming language and can be used under ENVI/IDL (version 5.0 and higher). As multiple absorption features are detected within the VNIR/SWIR/TIR regions and their wavelength positions, respectively, the newly suggested method has a potential to become a new mapping technique suitable for environments with high heterogeneity and dynamics.

### **Using thermal IR imaging for identification of cold air influxes and topoclimatological investigations - a case study from Roztocze National Park**

Grzegorz Siwek, Andrzej Gluza, Mirosław Krukowski, and Krzysztof Siwek

#### **Abstract**

Read full paper online: <http://www.eproceedings.org>

Meteorological research has been carried out in Roztocze Region for many years by numerous scientists. Nevertheless, information about its climate is limited to general climatic classifications of Poland. Knowledge about local climates of this specific area is rather limited. In this case study, the authors combined traditional methods of investigating this topic with ground-based thermal IR imaging not used in small-scale climatology so far.

Thermal IR images of places where cold air influxes are expected were taken as a first step of fieldworks. Then, measurements of temperature and relative humidity spatial differentiation were conducted at chosen sites. Simultaneously, continuous meteorological measurements were performed in different local ecosystems with the aim of, e.g., verifying hypotheses about differences of thermal conditions at those sites. The results of fieldwork were processed and analysed using GIS and then related to local topographical conditions assumed from satellite imaging land cover.

As a conclusion of the investigation, it can be stated that the influence of forest on grassland phytoclimate during advection of cold air can be observed only in a limited range of distances. This interaction changes according to the type of weather, relief of the land and type of vegetation. It is also worth emphasizing that using a handheld thermal IR camera, GIS analysis and satellite imaging can be considerably helpful in research on local climate and extreme thermal phenomena.

### **Determining Frankfurt's suitability potential for the OnTop concept**

Marzena Markiewicz

#### **Abstract**

Read full paper online: <http://www.eproceedings.org>

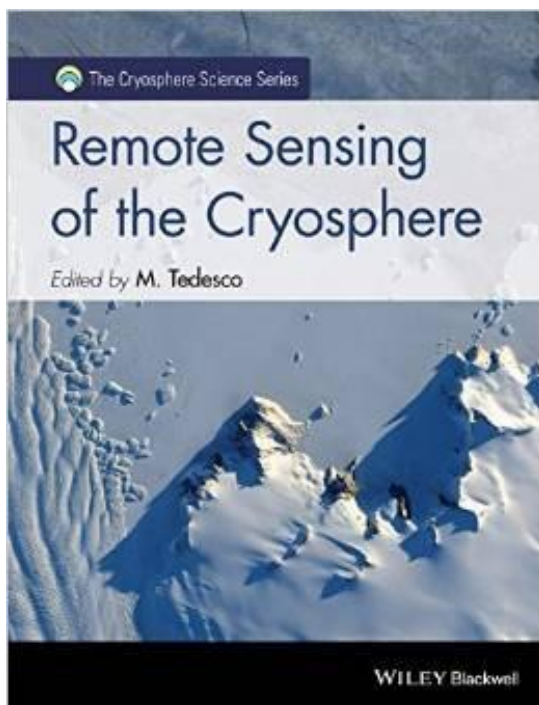
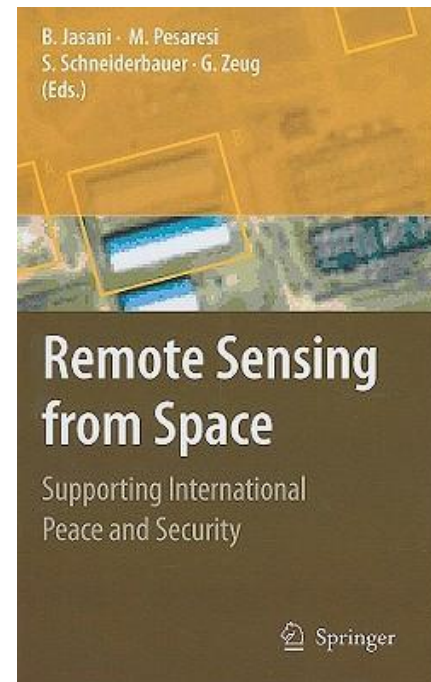
The OnTop Project performed at Frankfurt University of Applied Sciences, competing in Solar Decathlon Europe 2014, aims to demonstrate an approach to the rising challenge of urban densification by the help of an extra construction on top of an already existing building. While architects work on the most profitable structure of the building, it is equally important to detect which buildings are actually suitable for this purpose. Through the spatial data (3D city model, solar-roof and buildings cadastre, orthophotos, thermal images and LiDAR data) an analysis was conducted, deriving acceptable buildings within Frankfurt meeting the appointed criteria. Unfortunately, data protection issues and the aim of making the entire analysis automatic left only few criteria usable. Some of them proved to be crucial: height, function and roof surface, while others were used to weigh the results and appoint each building to a suitability class. For instance, the concept assumed that re-modelling roofs is acceptable. It was stressed that no resettlement should occur. Therefore, one of the most essential criteria was to assess from the available data, whether a building's attic is

inhabited. This question was mainly assessed by the derived average roof angle per building, small angles indicating less likely habitation. One of the biggest challenges of the project was to manage the huge amount of data, their accuracy and inadequacy as well as their different origins. The analysis yielded estimations, overlaid on building polygons, which may be used for this concept and further evaluation resulted in a possible number of built OnTop structures.

## Book Releases

**Remote Sensing from Space** edited by Bhupendra Jasani, Martino Pesaresi, Stefan Schneiderbauer, Gunter Zeug was published by Springer.

This volume provides the reader with an overview of the state-of-the-art Earth Observation (EO) related research that deals with national and international security. The book comprises management aspects (issues and priorities of security research, crisis response), applied methodologies and process chains (treaty monitoring, estimation of population densities and characteristics, border permeability models, damage assessment) and the latest developments in generic tools (feature recognition, change detection and visualization). Moreover, issues of data sharing and standards, as well as new approaches to training security relevant techniques, are addressed. The contributing authors are leading researchers and experts from private companies, national research institutions and international organizations, all of whom were brought together under the aegis of the European research project GMOSS (Global Monitoring for Security and Stability).



**Remote Sensing of the Cryosphere** edited by Marco Tedesco was published by Wiley Blackwell.

The cryosphere, that region of the world where water is temporarily or permanently frozen, plays a crucial role on our planet. Recent developments in remote sensing techniques, and the acquisition of new data sets, have resulted in significant advances in our understanding of all components of the cryosphere and its processes. This book, based on contributions from 40 leading experts, offers a comprehensive and authoritative overview of the methods, techniques and recent advances in applications of remote sensing of the cryosphere. Examples of the topics covered include: snow extent, depth, grain-size and impurities, surface and subsurface melting, glaciers, accumulation over the Greenland and Antarctica ice sheets, ice thickness and velocities and many others.

All figures are in color and provide an excellent visual accompaniment to the technical and scientific aspect of the book.

Remote Sensing of the Cryosphere is the significant first volume in the new Cryosphere Science Series. This new series comprises volumes that are at the cutting edge of new research, or provide focussed interdisciplinary reviews of key aspects of the science.



## 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/EARSeL-IS-2015.pdf](http://www.earsel2015.com/fileadmin/user_upload/EARSeL-IS-2015.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 Invited Sessions:** 31 October 2014

**Deadline for submission of abstracts:** 14 December 2014

**Notification of acceptance:** 31 January 2015

**Early-bird registration ends:** 28 February 2015

**Deadline for registration:** 31 March 2015

**Deadline for submission of papers:** (to be determined)

**Abstracts must be submitted to the Conference Administration Tool ConfTool.**

<https://www.conftool.net/earsel2015/>

## **35th EARSeL Symposium 2015**

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.

Further information of the Symposium can be found at the “News from EARSeL” section in this Newsletter or to the Symposium website at:

<http://www.earsel.org/symposia/2015-symposium-Stockholm/index.php>

## **Second International Workshop on “Temporal Analysis of Satellite Images”**

Organised by KTH Royal Institute of Technology

17 – 19 June 2015, Stockholm, Sweden

[More info](#)

This workshop intends to be a forum for discussion of research issues related to temporal analysis of remotely sensed data. Since the launch of Landsat-1 in 1972, a large number of earth observation satellites have been launched. The wealth of multitemporal data provides excellent opportunities to study environmental changes at local, regional and global scale. The workshop includes a wide array of topics.

Further information of the Workshop can be found at the “News from EARSel” section in this Newsletter or to the Workshop website at: <http://www.earsel.org/SIG/timeseries/stockholm.php>

## 7th EARSel Workshop on Remote Sensing of the Coastal Zone

Organised by KTH Royal Institute of Technology

17 – 19 June 2015, Stockholm, Sweden

[More info](#)



The 7th EARSel Workshop on Remote Sensing of the Coastal Zone will take place at the Royal Institute of Technology Stockholm, Sweden from 17th to 19th June 2015.

The Workshop will provide an interdisciplinary forum for presentations and discussions of our current state of knowledge on remote sensing of the coastal zone environment in terms of algorithms' accuracy, time series analysis of environmental indices based on remote sensing data, and new technologies. These topics will emphasize the impact of the climate variability on the European Seas with particular emphasis on coastal zones and inland waters highlighting the importance of measuring essential climate variables which can exhaustively describe the status of the coastal environment.

Further information of the Workshop can be found at the “News from EARSel” section in this Newsletter or to the Workshop website at: <http://www.earsel.org/SIG/CZ/7th-workshop/index.php>

## Other Conferences



19-21 January, 2015: [Defence Geospatial Intelligence Conference](#)  
London, United Kingdom.



20-21 January, 2015: [International Workshop on Spatial Data and Map Quality](#)  
Valletta, Malta.



26-28 January, 2015: [GIS Ostrava 2015](#).  
Ostrava, Czech Republic.



27-28 January, 2015: [Esri Asia Pacific User Conference](#)  
Hong Kong.



26-30 January, 2015: [POLinSAR 2015 and 1st BIOMASS Science workshop](#).  
Frascati, Italy.



10-12 February, 2015: [India Geospatial Forum](#)  
Hyderabad, India.



22-27 February, 2015: [7th International Conference on Advanced Geographic Information Systems, Applications, and Services \(GEOProcessing 2015\)](#)  
Lisbon, Portugal.



03 March, 2015: [Geospatial Advancement Canada 2015](#)  
Ottawa, Canada.



03 March, 2015: [Workshop on Data Management for Life Sciences](#)  
Hamburg, Germany.



05-07 March, 2015: [International Conference on Location-based Social Media](#)  
Athens, United States.



11-12 March, 2015: [ICRS 2015: XIII International Conference on Remote Sensing](#)  
Dubai, United Arab Emirates.



16 March, 2015: [ISPRS WG VII/5 and VII/3 and Workshop on Laser Scanning Applications](#)  
Cologne, Germany.



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.
- 

9-10 April, 2015: [2015 International Conference on Remote Sensing and Applications \(ICRSA2015\)](#)  
Los Angeles, United States.
- 

12-17 April, 2015: [European Geosciences Union General Assembly 2015](#)  
Vienna, Austria.
- 

13-16 April, 2015: [SPIE Optics + Optoelectronics 2015](#).  
Prague, Czech Republic.
- 

20-22 April, 2015: [Interexpo GEO-Siberia 2015](#)  
Novosibirsk, Russia.
- 

20-25 April, 2015: [SPIE DSS 2015](#)  
Baltimore, United States.
- 

22-24 April, 2015: [UDMS 2015 - 30th Urban Data Management Symposium](#)  
Ghent, Belgium.
- 

24 April, 2015: [SkyTech 2015 UAV - Conference & Exhibition](#)  
London, United Kingdom.
- 

11-15 May, 2015: [36th International Symposium on Remote Sensing of Environment](#).  
Berlin, Germany.
- 

14-16 May, 2015: [GISCA 2015 - the Annual Central Asia GIS Conference Geospatial Management of Land, Water and Resources](#)  
Tashkent, Uzbekistan.
- 

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



21-22 May, 2015: [ISPRS WG IV/7 and WG V/4 - Joint Workshop - Indoor-Outdoor Seamless Modelling, Mapping and Navigation](#)  
Tokyo, Japan.



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



27-28 May, 2015: [GEO Business 2015](#)  
London, United Kingdom.

## Summer Schools and Advanced Courses



[2nd SMOS Training Course](#)  
18-22 May 2015, CESBIO, ESA-ESAC (near Madrid), Spain  
Registration deadline: **23 January 2015**.



[SPLIT Remote Sensing Summer School 2015 \(SPLITRS 2015\)](#)  
20-22 May 2015, Aristotle University of Thessaloniki, Thessaloniki, Greece  
Registration deadline: **01 May 2015**.



[GIS Institute Summer 2015](#)  
02-12 June 2015, Center for Geographic Analysis, Harvard University, Cambridge, United States  
Registration deadline: **20 March 2015**.



[Innsbruck Summer School of Alpine Research 2015](#)  
5-11 July 2015, Obergurgl University Center, Obergurgl, Austria  
Registration closed.



[Hands-on GIS for Earth Scientists](#)  
06-17 July 2015, Utrecht University, Faculty of Geosciences, Utrecht, The Netherlands  
Registration deadline: **01 June 2015**



[6th ESA Advanced Training Course on Land Remote Sensing](#)  
14-18 September, University of Agronomic Science and Veterinary Medicine, Bucharest, Romania  
Registration deadline will be announced.



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