



11TH EARSEL SIG IMAGING SPECTROSCOPY WORKSHOP

6-8 February 2019, Brno, Czech Republic

Programme Book



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Tutorials and Excursions CzechGlobe, Bělidla 986/4a	page 5
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Welcome to EARSeL Imaging Spectroscopy Workshop, Brno 2019

CzechGlobe and the Workshop organizing committee warmly welcome you to 11th EARSeL SIG Imaging Spectroscopy Workshop in Brno. The Workshop of the EARSeL Special Interest Group on Imaging Spectroscopy aims to continue the long-term international discussion among researchers and specialists working with innovative imaging spectroscopy Earth Observation technologies. As imaging spectroscopy increasingly expands from traditional airborne platforms towards new ground-based, unmanned airborne and satellite systems, it is finding its way to interdisciplinary research addressing today's key environmental and societal challenges. At the same time, novel prospective spectral signals, as for instance chlorophyll fluorescence or thermal emissions, are being intensively explored.

The 11th EARSeL SIG Imaging Spectroscopy Workshop in Brno brings together students and professionals from universities, research organizations and private companies to present, exchange and discuss their basic and applied research achievements, as well as newly developing concepts related to all aspects of imaging spectroscopy.

We hope that you will enjoy scientific presentations, posters, exhibition booths, complementary excursions and tutorials, followed by attractive social programme including tasting of good Czech beer.

We thank to the Workshop sponsors, members of the scientific and organizing committees, colleagues from the remote sensing team of CzechGlobe and student volunteers for all their efforts to make this Workshop a successful event.

Lucie Homolová and the local organizing team

Scientific Committee

Eyal Ben-Dor (Tel Aviv University, Israel) Jocelyn Chanussot (Grenoble INP, France) Jean-Baptiste Feret (Irstea, France) Claudia Giardino (IREA CNR, Italy) Luis Guanter (GFZ Potsdam, Germany) Robert O. Green (NASA JPL, USA) Lammert Kooistra (Wageningen University, The Netherlands) Sebastian van der Linden (Humboldt University, Germany) Zbyněk Malenovský (University of Tasmania, Australia) Jóse Moreno (University of Valencia, Spain) Michael Rast (ESA ESRIN, Italy) Miina Rautiainen (Aalto University, Finland) Michael E. Schaepman (University of Zürich, Switzerland) Martin Schlerf (LIST, Luxembourgh) Christiaan van der Tol (University of Twente - ITC, The Netherlands) Jochem Verrelst (University of Valencia, Spain)

Organizing Committee

Lucie Homolová (CzechGlobe, Czech Republic) Jan Hanuš (CzechGlobe, Czech Republic) Olga Brovkina (CzechGlobe, Czech Republic) Petr Lukeš (CzechGlobe, Czech Republic) František Zemek (CzechGlobe, Czech Republic) Růžena Janoutová (CzechGlobe, Czech Republic) Heide Bierbrauer (EARSeL Secretariat, Germany) Lena Halounová (EARSeL Vice-Chair, Czech Technical University in Prague, Czech Republic) Mathias Kneubühler (SIG IS Chairman, University of Zürich, Switzerland) Andreas Müller (SIG IS Chairman, German Aerospace Centre DLR, Germany)

Workshop Venue



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The Workshop is organized at the Masaryk University Campus, Kamenice 5, Brno.

Plenary sessions take place in the aula (A116).

Parallel sessions take place in the lecture rooms 205, 206 and 234.

1

The small lecture room 211 is available at your disposal to host small meetings, discussions during



Practical Information

Posters

Please put up your posters on Wednesday morning on a panel with your poster ID (for poster IDs see pages 13 and 14). Posters will remain on the panels for the entire Workshop. We have two dedicated poster sessions:

- Poster session 1 Wednesday 6 February 2019, 16.20 17.20, see page 13
- Poster session 2 Thursday 7 February 2019, 12.40 13.40, see page 14

Oral Presentations

Oral presentations will be maximum 20 minutes long, including 3–4 minutes for discussion and changeover to the next speaker (your presentation should not be longer than 17 minutes). Keynote presentations will be maximum 35 minutes long, including 5 minutes for discussion.

Please upload your presentation to the computer in the respective lecture room before the start of your session. Personal laptops cannot be used.

Internet Access

Free WiFi access is available using login details given to each Workshop participant at the registration. Besides, eduroam is also available on the university campus.

Best contribution awards

EARSeL will award three best student presentations and posters at the end of the Workshop.

The Workshop scientific committee and the audience will vote and select the most outstanding research contributions that will be awarded with 33% discount on article processing charges in the special issue in Remote Sensing.



Scan to vote



Tutorials and Excursions



The pre-workshop tutorials and excursions are organized on 5 February 2019 at CzechGlobe premises (Bělidla 986/4a, Brno).

One excursion to Flying Laboratory of Imaging System is also offered after the Workshop ends on 8 February 2019 at 15.00 (meeting point at the reception desk, Masaryk University Campus).

Building A

Tutorials and registration (room A120, ground floor)

Building C

Spectro lab (basement) and the meeting point for excursions (foyer)

5 Feb 2019 9.00-12.30	 Tutorial on ARTMO – a toolbox for optimizing and automating mapping of vegetation properties CzechGlobe – Lecture room A120
	 Tutorial on laboratory spectroscopic measurements of leaf and soil optical properties CzechGlobe – Spectro lab
5 Feb 2019 13.30–17.00	 Tutorial on machine learning based unmixing using the EnMAP-Box CzechGlobe – Lecture room A120
	 Excursion to Flying Laboratory of Imaging Systems at CzechGlobe Meeting point at CzechGlobe, building C foyer
	 Excursion to Plant phenotyping facility at PSI Meeting point at CzechGlobe, building C foyer
8 Feb 2019 15.00–17.30	 Excursion to Flying Laboratory of Imaging Systems at CzechGlobe Meeting point at the reception desk, Masaryk University Campus

Ice Breaker



Ice Breaker will take place at **Brno Observatory and Planetarium** (Kraví hora 522/2, Brno).



Wednesday, 6 February 2019, 18.30–21.00

Bus transportation from the Workshop venue will be **arranged**, departure at 17.30.

If you wish to arrive at the Observatory and Planetarium individually, please,



note that there is a traffic diversion, therefore you shall take bus X4 either at bus/tram stop Komenského náměstí (opposite the "red church") or tram/trolley stop Údolní/Úvoz (trolley 25, 26). **No transportation** will be provided on the way **back**, you can take bus X4 from "Náměstí míru" stop back to the city centre.



Workshop Dinner

- The Workshop Dinner will take place at Starobrno Brewery (Mendlovo náměstí 158/20, Brno).
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Thursday, 7 February 2019, 19.00–23.30

Please, **arrive** to the restaurant at the Mendel square **individually**. Mendel square is one of the main public transport hubs, well connected by trolleys 25 and 26, trams 1, 5 and 6.





Programme – Wednesday 6 February 2019

8.30 8.45	Workshop Registration & Office Location: WS. Registration & Office – A22 Foyer		
8.45 9.20	Opening session Location: A22 – Aula 116 Chair: Lucie Homolová Dr. Klaus Ulrich Komp (EARSEL Chair), Dr. Mathias Kneubühler (SIG Imaging Spectroscopy Chair), Prof. Michal V. Marek (CzechClobe), Prof. Michael Rast (ESA)		
9.20 10.30	KN-1: Keynote 1 Location: A22 – Aula 116 Chair: Zbyněk Malenovský Update on Recent Developments in Imaging Spectroscopy from Space by LUIS GUANTER		
	Low-altitude UAV Remote Sensing Approaches	for Vegetation Monitoring by HELGE AASEN	
10.30 11.00	o Coffee Break o Location: Corridor		
11.00 12.45	SPACE-1: Spaceborne Imaging Spectroscopy Location: A11 – Lecture room 205 Chair, Uta Haidan, Luis Cuantar	UAS-1: Imaging spectroscopy from UAS Location: A11 – Lecture room 206 Chair: Helre Ascen, Juliane Viktoria Bendir	EUFAR: Special session on EUFAR Location: A11 – Lecture room 234 Chair: Jan Hanui, Stefanie Holzwarth
	Commissioning Phase of the Satellite Mission DESIS by Rupert Mueller, Kevin Alonso, MARTIN BACHMANN, Emiliano Carmona, Daniele Cerra, Daniele Ditrich, Birgit Gerasch, Uta Heiden, Harald Krawczyk, Raquel de los Reyes, Valentin Ziel, Ilse Sebastian, Burghardt Günther, Ingo Walter, Thomas Säuberlich EMIT: A New Space Imaging Spectrometer Mission to Advance Modeling of the Earth System by ROBERT O. GREEN The Photosynthetic fAPARchl Canopy Fraction Among Six Sites Derived with EO-1 Hyperion Time-Serie by ELIZABETH M. MIDDLETON, Qingyuan Zhang, Petya K. Campbell, David R. Landis, Karl F. Huemmrich 2017 Decadal Survey: Surface Biology and Geology Science and Application with Global Imaging Spectroscopy Observables by ROBERT O. GREEN, David S. Schimel	Best Spatial Scale For Crop Classification Using Uncalibrated UAV Data by JONAS E. BÖHLER, Michael E. Schaepman, Mathias Kneubühler Low-Altitude Multispectral Remote Sensing Disease Recognition in Maize by QUIRINA NOËMI MERZ, Ulrich Buchmann, Katrin Rehak, Simon Strahm, Jürg Hilbrunner, Frank Liebisch, Achim Walter, Helge Aasen Using High Spatial Resolution Hyperspectral Imagery to Investigate Grassland Optical Diversity by HARIZ ALI IMRAN, Loris Vescovo, Damiano Gianelle, Duccio Rocchini Modelling The Seasonal Traits Of Production Grasslands From UAV-Based Imaging Spectroscopy by LAMMERT KOOISTRA, Lotte ten Harmsen van der Beek, Marston Franceschin, Harm Bartholomeus, Custavo Togeiro De Alckmin, Clara Berendonk	o Years of Airborne Imaging Spectroscopy within EUFAR, the European Facility for Airborne Research by STEFANIE HOLZWARTH, Jan Hanus, IIs Reusen, Elisabeth Cerard, Phil Brown Airborne Remote Sensing For Monitoring Essential Biodiversity Variables In Forest Ecosystems (RS4forestEBV): A EUFAR Summer School by ROSHANAK DARVISHZADEH, Andrew Skidmore, Stefanie Holzwarth, Marco Heurich, IIs Reusen Use of Bi-Temporal Hyperspectral Imagery to Determine the Influence of Soil Degradation on Rainfed Crop Yield by ROBERT MILEWSKI, Sabine Chabrillat, Thomas Schmid, Paula Escribano, Monica Carcia, Eyal Ben Dor, Stéphane Cullaso, Marta Pelayo, Marcos Jiménez Michavila
	EnMAP Ground Segment: Design and Status of the Integration and Technical Verification and Validation Phase by MARTIN HABERMEYER, Emiliano Carmona, Sabine Engelbrecht, Uta Heiden, Klaus-Dieter Missling, Helmut Mühle, Andreas Ohndorf, Gintautas Palubinskas, Tobias Storch, Steffen Zimmermann	Predicting Canopy Traits In Tree Diversity Experiments Using Drone-Based Hyperspectral Imagery by KYLE RYAN KOVACH, Charles Andrew Nock	by JAN HANUŠ, Jan Novotný
12.45	Lunch break (extended by instrument demo session)		
13.30	DEMO-1- Instrument demonstration		

14.15 UAV demo flight (HySpex)

14.15SPACE-2: Spaceborne Imaging Spectroscopy16.00Location: A11 – Lecture room 205

Chair: Uta Heiden, Sebastian van der Linden

Radiometric Characterization, Calibration, and Correction for the Imaging Spectroscopy Mission EnMAP by TOBIAS STORCH, Hans-Peter Honold, Harald Krawczyk, Kevin Alonso Gonzales, Miguel Pato, Martin Bachmann, Richard Wachter, Martin Muecke, Sebastian Fischer

Urban Gradients – Surface material composition from 30 m hyperspectral remote sensing data by Marianne Jilge, HANNES FEILHAUER, Carsten Neumann, Ji Chaonan, Uta Heiden

Monitoring Of Crop Nitrogen Status Using A Hybrid Inversion Scheme In The Context Of The Future Hyperspectral EnMAP Mission by KATJA BERGER, Martin Danner, Matthias Wocher, Zhihui Wang, Wolfram Mauser, Tobias Hank

Quantitative Vegetation Mapping of California Ecosystems Using Simulated EnMAP Data by SAM COOPER, Akpona Okujeni, Clemens Jänicke, Sebastian van der Linden, Patrick Hostert

The Hyperspectral Sensors DESIS and EnMAP for Aquatic Ecosystems Monitoring – a Sensitivity Study by NICOLE PINNEL, Peter Gege, Anna Göritz

16.00 Coffee Break

UAS-2: Imaging spectroscopy from UAS Location: A11– Lecture room 206 Chair: Helge Aasen, Eija Honkavaara

Drone-based Forest Inventory In Different Seasons Using High Resolution RGB Cameras And Hyperspectral Imaging by OLLI NEVALAINEN, Eija Honkavaara, Niko Viljanen, Raquel Alves de Oliveira, Roope Näsi, Teemu Hakala

Multi Modal Sensing Fosters Drone Application In Breeding: An Example On Sugar Beet Tolerance to Beet Cyst Nematode by FRANK LIEBISCH, Samuel Joalland, Claudio Screpanti, Achim Walter

Introduction Of Variable Relations For Improved Retrieval Of LAI Through the Soil-Leaf-Canopy Model Inversion by ASMAA MAHMOUD ABDELBAKI, Martin Schlerf, Thomas Udelhoven

Assessment Of Downey Mildew Infection on Grapevine Using Hyperspectral In Situ and UAV Data by MIRIAM MACHWITZ, Kritiya Pimkotr, Rebecca Retzlaff, Daniel Molitor, Gilles Rock, Mareike Schultz, Franz Ronellenfitsch, Christian Bossung, Marco Beyer, William Metz, Martin Schlerf

Hyperspectral Ortho-Mosaic From UAV-Borne Hyperspectral Imagery For Discriminating Different Grassland Management Regimes by JAYAN WIJESINGHA, Thomas Moeckel, Frank Hensgen, Michael Wachendorf

VEG-1: Spectroscopy of vegetation Location: A11 – Lecture room 234 Chair: Petr Lukeš, Miina Rautiainen

A Novel Dataset For Testing Physical Reflectance Models Of Trees by AARNE HOVI, Petri Forsström, Giulia Ghielmetti, Daniel Kükenbrink, Felix Morsdorf, Michael Schaepman, Miina Rautiainen

Vegetation Functional Photoprotection Dynamics Seen From Leaf Absorbance Features by SHARI VAN WITTENBERGHE, Luis Alonso, Zbynek Malenovsky, Jose Moreno

After this Talk You will always map Leaf Pigment Content and not Concentration by TEJA KATTENBORN, Felix Schiefer, Pablo Zarco-Tejada, Sebastian Schmidtlein

Seasonal Course of Leaf Optical Properties and Traits – Linking Structure with Leaf Dorsiventral Reflectance by PETR LUKEŠ, Eva Neuwirthová, Růžena Janoutová, Zuzana Lhotáková, Jana Albrechtová

Understanding Dynamics of Leaf Spectral Properties Under Bark Beetle (Ips typographus, L.) Infestation by HAIDI JAMAL ABDULLAH, Andrew K Skidmore, Roshanak Darvishzadeh, Marco Heurich

16.20	Location: Corridor	
16.20 17.20	POSTER-1: Poster session 1 Location: Corridor	e 13
18.30 21.00	Ice Breaker Location: Planetarium Brno Observatory and Planetarium – Transportation from the Workshop venue will be arranged.	ge 6

Programme – Thursday 7 February 2019

8.15 Workshop Registration & Office 8.45 Location: WS. Registration & Office – A22 Foyer			
 8.45 KN-2: Keynote 2 10.00 Location: A22 – Aula 116 Chair: Lucie Homolová The FLEX Satellite Mission – Update on the Mission Status and our Und UWE RASCHER Modelling And Scaling Imaging Spectroscopy Signatures Of Terrestria Erthegeney, Tiangang Vin, Nuria Duran, Nicolas Lauret, Eric Chavanon, Id 	erstanding of solar-induced Fluorescence measured on different Scales by I Photosynthesis by ZBYNĚK MALENOVSKÝ, Jean-Philippe Gastellu- vrdan Guilleux, Jianho Di Douglas Morton, Bruce Cook		
10.00 Coffee Break 10.30 Location: Corridor	Confee Break O Confee Streak O Confee Streak O Confee Streak		
 10.30 FLUO-1: Terrestrial Chlorophyll Fluorescence 12.10 Location: Ant – Lecture room 205 Chair: Uwe Rascher, Zbyněk Malenovský Systematic Assessment Of Airborne Sun-Induced-Fluorescence Maps By The Application Of Quality Criteria by VERA KRIECER, Maria Matveeva, Patrick Rademske, Sergio Cogliati, Alexander Damm, Uwe Rascher FLUOSPECCHIO: A Spectral Data Base System in Support of a Validation Network for the Upcoming Fluorescence Explorer (FLEX) Mission by ALEXANDER DAMM, Andreas Burkart, Marco Celesti, Sergio Cogliati, Andreas Hueni, Tommaso Julitta, Franco Miglietta, Dirk Schuettemeyer, Simon Trim, Roberto Colombo Measuring Temporal Patterns of Crop Sun-induced Chlorophyll Fluorescence at Canopy and Plot Scale by NA WANG, Harm Bartholomeus, Lammert Kooistra, Juha Suomalainen, Benjamin Brede, Marcello Novani, Dainius Masiliunas, Jan Clevers Combining Vegetation Traits with Multi/hyperspectral, Thermal and Fluorescence at Canop and Plot Scale by NA WANG, Harm Bartholomeus, Lammert Kooistra, Juha Suomalainen, Benjamin Brede, Marcello Novani, Dainius Masiliunas, Jan Clevers Combining Vegetation Traits with Multi/hyperspectral, Thermal and Fluorescence Measurements across different Scales and Plattforms – First Results from 2018 ESA FLEXSense Campaign by BASTIAN SIECMANN, Maria Matveeva, Patrick Rademske, Onno Muller, Dzhaner Emin, Norman Wilke, Sascha Heinemann, Lars Grünhagen, Ines Munoz Fernandez, Christoph Jedmowski, Paul Nätthe, Juliane Bendig, Zbyněk Malenovský, Mareike Burba, Andreas Burkart, Tommaso Julitta, Kai Wittneben, Franco Miglietta, Roberto Colombo, Alexander Damm, Mirco Migliavaca, Ilja Reiter, Jan Hanus, John Gamon, Dirk Schüttemeyer, Matthias Drusch, Uwe Rascher Investigating Impacts of Avocado Canopy Structures on Simultaneous Solar and Actively Induced Chlorophyll Fluorescence Measurements by Rhys Wyber, JULIANE BENDIC, Deepak Gautam, Arko	 TOOL-1: Data analyzing software, toolboxes Location: Att – Lecture room 206 Chair: Jochem Verrelst, Akpona Okujeni EnMAP-Box 3 Free And Open-Source Imaging Spectroscopy Data Processing in QCIS by ANDREAS RABE, Benjamin Jakimow, Akpona Okujeni, Sam Cooper, Fabian Thiel, Patrick Hostert, Sebastian van der Linden A Flexible Imaging Spectroscopy Processing Software Suite for Vegetation Studies by PHILIP TOWNSEND, Adam Chlus, Zhiwei Ye, John Chapman, Ting Zheng, Aditya Singh, Fabian Schneider, Natalie Queally, David Thompson, Ryan Pavlick, David Schimel TOC2TOA: An ARTMO Toolbox to Simulate Top-Of-Atmosphere Radiance Data for Imaging Spectroscopy Applications by JOCHEM VERRELST, Juan Pablo Rivera-Caicedo, Jorge Vicent, Pablo Morcillo, Jose Moreno FRANCA – A Fully Automated Hyperspectral Processing Chain For FRActional Cover Analysis by Valentin Ziel, MARTIN BACHMANN, Stefanie Holzwarth, Uta Heiden "Get a Look at Image Processing for Students" (CLIMPS) – an Educational Imaging Spectroscopy Tool by DANIEL SCHLÄPFER 		
12.40 Location: Corridor			
12.40 POSTER-2: Poster session 2 13.40 Location: Corridor	page 14		

13.40 VEG-2: Spectroscopy of vegetation

15.20 Location: A11 – Lecture room 205 Chair: Alexander Damm, Philip Townsend

> LAI And Cab Retrieval From The Synergetic Use Of OLCI And FLORIS Reflectances by CHARLOTTE DE GRAVE, Jochem Verrelst, Pablo Morcillo Pallarés, Juan Pablo Rivera-Caicedo, Jóse Moreno

> Intra-Annual Multi-Temporal Hyperspectral Data for Tree Species Classification of an Extensive Forest Area by ANETA MODZELEWSKA, Krzysztof Stereńczak, Fabian Fassnacht, Rafał Sadkowski

Spectral Invariants in Remote Sensing of Vegetation by MATTI MÕTTUS

LiDAR Data Improves Predictions Of Canopy N And P Concentrations From Imaging Spectroscopy by Michael Ewald, Raf Arts, Jonathan Lenoir, FABIAN EWALD FASSNACHT, Manuel Nicolas, Sandra Skowronek, Jérôme Piat, Olivier Honnay, Carol Ximena Garzón-López, Hannes Feilhauer, Ruben Van De Kerchove, Ben Somers, Tarek Hattab, Duccio Rocchini, Sebastian Schmidtlein

NEON Imaging Spectroscopy: Characterizing Fine-Scale Vegetation Function at the Continental Scale by PHILIP TOWNSEND, Zhihui Wang, Eric Kruger

15.20 Coffee Break

15.40 Location: Corridor

15.40 VEG-3: Spectroscopy of vegetation

17.00 Location: A11 – Lecture room 205 Chair: Jan Clevers, Roshanak Darvishzadeh

> The Optical Profile Of Herbaceous Plant Functional Types by ELISA VAN CLEEMPUT, Kenny Helsen, Hannes Feilhauer, Olivier Honnay, Ben Somers

Correction of Spatial Autocorrelation for Comparison of Regional Statistics: a Case Study on Alluvial Vegetation by GILLIAN MILANI, Michael Schaepman, Mathias Kneubühler

Comparison Of Object-based And Pixel-based Random Forest Algorithm For Tree Species Classification Using Airborne APEX Hyperspectral Imagery by ZAHRA DABIRI, Stefan Lang

Integrated Hyperspectral and Multispectral Approach for Mapping Invasive Plant Species Based on Phenological Characteristics by TARIN PAZ-KAGAN, Natalya Panov, Micha Silver, Arnon Kamieli

SOIL-1: Spectroscopy of soils and geology applicaitons

Location: A11 – Lecture room 206 Chair: Veronique Carrere, Veronika Kopackova

Cloud Computing of Remote Sensing Products for Soil Properties Mapping by JOSÉ LUCAS SAFANELLI, José Alexandre Melo Dematté, Sabine Chabrillat, Eyal Ben-Dor, André Carnieletto Dotto, Wanderson de Souza Mendes, Nelida Quiñonez, Benito Roberto Bonfatti, Raul Poppiel, Rodnei Rizzo, Arnaldo Souza Barros, Caio Troula Fongaro

Using Complex And Multi-mineral Natural Systems As Analogues For Modelling Diverse Geochemical Processes On Mars by VERONIKA KOPACKOVA, Lucie Koucká, Jan Jelenek

Impact Of The Spatial Resolution For Mineralogical Mapping From Hyperspectral Sensors HySpex, HYPXIM And EnMAP: Application To The Almeria Sedimentary Basin, Spain by KARINE ADELINE, Véronique Miegebielle, Marine Larrey

Using Imaging Spectroscopy For Detecting And Mapping Of Land-Use Effects On Soil Quality In Dryland by NATHAN LEVI, Arnon Karnieli, Tarin Paz-Kagan

UAV Hyperspectral-3D Fusion for Peatland Biogeochemistry by MARCARET KALACSKA, Juan Pablo Arroyo-Mora, Deep Inamdar, Oliver Lucanus

SOIL-2: Spectroscopy of soils and geology applicaitons

Location: A11 – Lecture room 206 Chair: Eyal Ben Dor, Frantisek Zemek

A Novel Approach for Detecting Petroleum Hydrocarbons Contamination in a Real Manmade Disaster Zone Using Airborne Imaging Spectroscopy by RAN PELTA, Eyal Ben-Dor

Evaluating The Capability Of The Sentinel a Data For Soil Organic Carbon Prediction In Croplands by FABIO CASTALDI, Andreas Hueni, Chabrillat Sabine, Ward Kathrin, Buttafuoco Cabriele, Bomans Bart, Vreys Kristin, Brell Maximilian, Van Wesemael Bas

Quantitative Mapping of Ultramafic Rocks in Presence of Abundant Lichens Using Airborne Imaging Spectroscopy and Spaceborne Sentinel-2 And Landsat-8 OLI Data in The Arctic by SARA SALEHI, Christian Mielke

PARACUDA-II Engine as Compared to other Data-Mining Algorithms for the Prediction of Soil Carbon Using Diffuse Reflectance Spectra by ASA GHOLIZADEH, Mohammadmehdi Saberioon, Nimrod Carmon, Lubos Boruvka, Eyal Ben-Dor DEMO-2: Demonstration of data processing Location: A11 – Lecture room 211 Chair: Jan Hanuš

13.40-14.20

Data Processing Chain Of Hyperspectral Imaging From UAV Platform by TROND LØKE

14.20-14.50

Integration of LiDAR for Use with Headwall Photonics Hyperspectral Imaging UAVs by FRANCESCO BECCARI

14.50-15.20

Online Classification of Spectral Data Using EZ-ID Software by EDWARD SAENZ, Hans-Joerg Fischer

SENS-1: New airborne and UAV systems, spectroradiometers Location: A11 – Lecture room 234 Chair: Robert O. Green. Lammert Kooistra

WaterSat Imaging Spectrometer Experiment (WISE) for Canadian Microsatellite Missions by STEPHEN ACHAL, Shen-En Qian, Martin Bergeron

Simulation and Improvements of the Hyperspectral Images of the SIELETERS Airborne System by OLIVIER GAZZANO, Yann Ferrec, Alain Kattnig, Christophe Coudrain, Laurent Rousset-Rouviere

Analysis Of High Frequency Hyperspectral Remote Sensing Reflectances From Autonomous In Situ Sensors Deployed In Lakes by MARIANO BRESCIANI, Claudia Giardino, Annelies Hommersom, Dario Manca, Tommaso Julita, Cesana Ilaria, Valentina Della Bella, Rosalba Padula

Implementation Of A UAV – Hyperspectral Line Imager For Ecological Applications by JUAN PABLO ARROYO-MORA, Margaret Kalacska, Deep Inamdar, Raymond Soffer, Oliver Lucanus, Janine Coldman, Tomas Naprstek, Gabriela Ifimov, Erica Skye Schaaf, Kathryn Elmer



Programme – Friday 8 February 2019

8.30 8.45	Workshop Registration & Office Location: WS. Registration & Office – A22 Foyer		
8.45 10.00	KN-3: Keynote 3 Location: A22 – Aula 116 Chair: Petr Lukeš		
	Promises and Pitfalls in Geometric and Atmospheric Preprocessing of Ir	maging Spectroscopy Data by DANIEL SCHLÄPFER	
	The Advantages of Using Hyperspectral Technology in the Middle and Lo	ongwave Infrared Region for Tereestial Remote Sensing by EYAL BEN DOR	
10.00 10.30	Coffee Break Location: Corridor		
10.30 12.10	VEG-4: Spectroscopy of vegetation Location: A11 – Lecture room 205 Chair: Olga Brovkina, Zbyněk Malenovský	CORR-1: Imaging spectroscopy data corrections, calibrations, processing Location: A11 – Lecture room 206 Chair: David Ray Thompson, Daniel Schläpfer	
	Analysis of Airborne Optical and Thermal Imagery for Detection of Water Stress Symptoms by MAX GERHARDS, Martin Schlerf, Uwe Rascher, Thomas Udelhoven, Radoslaw Juszczak, Giorgio Alberti, Franco Miglietta, Yoshio Inoue	Optimal Estimation for Combined Retrievals of Surface and Atmosphere: Algorithms, Results, and Open Source Software by DAVID RAY THOMPSON, Michael Eastwood, Bo-Cai Gao, Robert O. Green, Mark Helmlinger, Vijay Natraj, Winston Olson-Duvall	
	UAV-Based High-Resolution Image Spectroscopy Towards The Assessment Of Grape Vine Health by OLAF NIEMANN, Roger Stephen, Fabio Visiintiin, Robert Skelly, Patricia Bowen, Jose Urbez-Torres, Carl Bogdanoff	NASA/JPL Airborne Imaging Spectrometer Campaigns in Support of ESA Satellite CAL/VAL and Simulation by IAN BRUCE MCCUBBIN, Andreas Hueni, Michael Schaepman, Dirk Schuettemeyer, Michael Rast, Hank Margolis, David Thompson, Robert Green, Simon Hook	
	Improving Nitrogen Status Estimation in Malting Barley Based on Hyperspectral Reflectance and Artificial Neural Networks by KAREL KLEM	In-Situ Field Spectroscopy Best Practice Guidelines for the Calibration and Validation of Airborne Hyperspectral Imagery by CABRIELA	
	Video Spectroscopy For Tilling Dust Sensing and Visualisation In Agriculture by ANDRÁS JUNG, Michael Vohland, Marianna Magyar, László Kovásc, Tímea Jung, Nóra Péterfalvi, Boglárka Keller, Fanni Sillinger, Renáta Rák, Kornél Szalay	Mitigating Sensor-Cenerated Spatial Correlations in Airborne Spectrographic Imaging Data. by DEEP INAMDAR, Margaret Kalacska, George Leblanc, Raymond Soffer, J. Pablo Arroyo-Mora	
	Fusion Of Hyperspectral Imagery With Point Cloud Information To Predict Biomass Of Agricultural Crops by THOMAS MÖCKEL, Supriya Dayananda, Jayan Wijesingha, Michael Wachendorf	Towards a Standard for Characterization Hyperspectral Imaging Devices by SIRI JODHA SINGH KHALSA, Chris Durell, David Allen, John Gilchrist, Alex Fong, Kwok Wong	
12.10 13.10	Lunch Break Location: Corridor		
13.10 14.30	VEC-5: Spectroscopy of vegetation Location: A11 – Lecture room 205 Chair: Martin Schlerf, Rahul Raj	URB-1: Spectroscopy for urban applications and societal challenges Location: A11 – Lecture room 206 Chair: Mathias Kneubühler, Frantisek Zemek	
	On The Estimation Of The Directional Area Scattering Factor From Red- Edge Bi-Directional Reflectance Spectra by RICHARD FERNANDES	Response of Leaf Chlorophyll Fluorescence to Traffic Related Air Pollution in Cities by JOLIEN VERHELST, Dimitri Dauwe, Luis Alonso, Jochem Verrelst, Shari Van Wittenberghe, Joch Margan, Pollard Vicke, Bedend Gamera	
	When The Water Is Gone – Drought Response Of Leaf Mass Per Area Of Wetland Vegetation Analyzed With Imaging Spectroscopy by HANNES FEILHAUER, Thomas Schmid, Ulrike Faude, Salvador Sánchez-Carrillo, Santos Cirujano	Real time Airborne Gas quantification using Thermal Hyperspectral Imaging : Application to methane by PIERRE-VVES FOUCHER, Jean- Philippe Gagnon, Xavier Watternez, Stéphanie Doz, Stéphane Boubanga,	
	Thermal Hyperspectral Remote Sensing-Ground-based and Airborne Examples from Vegetation Studies by MARTIN SCHLERF, Max Gerhards, Gilles Rock, Kaniska Mallick, Franz Ronellenfitsch, Thomas Udelhoven	Martin Larivière, Martin Chamberland Thermal Infrared Hyperspectral Imaging for Visualization and flow rates Quantification of Methane releases by STEPHANE ALBON	
	Autonomous Spectral Acquisitions for Vegetation Monitoring by PETYA CAMPBELL, Elizabeth Middleton, K. Fred Huemmrich, Dan Mandl, James	BOUBANGA I OMBE I, Alexandrine Huot, Frederick Marcotte, Pierre-Yves Foucher, Eric Guyot, Philippe Lagueux, Martin Chamberland	
	MacKinnon, Phill Towsend, Craig Daughtry	Exploration of Iron- and Steelworks Dump Sites – Using spectral data from the Visible Light, Near- and Shortwave Infrared (350-2500 nm) to the Mid- and Longwave Infrared (2500-15000 nm) by MICHAEL DENK, Cornelia Cläßer	
14.30 15.00	CS: Closing session Location: A22 – Aula 116 Chair: Lucie Homolová		
15.00 17.30	EXC-3: Excursion 3: Flying Laboratory of Imaging Systems at CzechGlobe Location: Airport Chair: Jan Hanuš	2	

Poster session 1





Date: Wednesday, 6 Feb 2019, 16.20 – 17.20 Location: Corridor

- 1 Photosynthetic Pigments Changes Related To Screening Of Photosynthesis Dynamic Of European Beech And Norway Spruce Trees Using PRI by DANIEL KOVAC
- 2 Seasonal Dynamics Of Lingonberry And Blueberry Spectra by PETRI FORSSTRÖM, Jouni Peltoniemi, Miina Rautiainen
- 3 Seasonal Modelling Of Leaf Optical Properties And Retrieval Of Leaf Chlorophyll Content Across The Canopy Using PROSPECT by Tawanda Gara, ROSHANAK DARVISHZADEH, Andrew Skidmore, Tiejun Wang
- 4 Seasonal Chlorophyll Fluorescence Changes in Citrus aurantium Exposed to Low and High Traffic Pollution. by DIMITRI DAUWE, Jolien Verhelst, Jochem Verrelst, Luis Alonso, José Moreno, Roeland Samson, Roland Valcke
- 5 Estimation Of Crop Biophysical And Productivity Properties Using Radiative Transfer And Spectral Information Analysis by JAN MIŠUREC, Jiří Tomíček, Petr Lukeš, Karel Klem
- 6 Original Method for High Spatial Resolution Classification of Tree Species Using Multi-Temporal Many and Hyperspectral Satellite Data by OLGA BROVKINA, Olga Grigorieva, Alisher Saidov
- 7 Probability Map of Invasive Tree Species Using Hyperspectral and LiDAR Dataset by ZOLTÁN KOVÁCS, Péter Burai, László Bekő, Gergely Hunyadi, Orsolya Varga
- 8 Exploring the Potential of Light Use Efficiency Derived from Eddy Covariance and Reflectance Measurements for Spatial Simulations of Gross Primary Production by RAHUL RAJ, Lucie Homolová, Petr Lukeš, Daniel Kováč
- 9 Is Retrieval of Forest Biochemical Traits Stable over Variety of Environmental Conditions? by MARIAN ŠVIK, Lucie Homolová, Růžena Janoutová, Barbora Navrátilová, Zuzana Lhotáková, Tomáš Fabiánek
- 10 Hyperspectral Analyses of Heavy Metal Contents in Floodplain Vegetation and Soils by Frank Riedel, MICHAEL DENK, Cornelia Gläßer
- 11 High Resolution UAV-based Hyperspectral Imagery For LAI And Chlorophyll Estimations For Wheat Plants With Different Nitrogen Fertilization For Grain Yield Prediction by MARTIN KANNING, Thomas Jarmer, Insa Kühling, Dieter Trautz
- 12 Determination Of Species-Related Forest Stand Characteristics With The Use Of Hyperspectral Data by MARTYNA WIETECHA, Łukasz Jełowicki, Krzysztof Mitelsztedt, Krzysztof Stereńczak, Stanisław Miścicki
- 13 Mapping of Tundra Vegetation Using Satellite Hyperspectral and Multispectral Imagery by VIKTOR MOCHALOV, Olga Grigoreva
- 14 Comparison And Validation Of In-situ Field Spectroscopy And Advanced High Pressure Liquid Chromatography To Assess Pigment Composition In Deciduous Leaves by FANNY PETIBON, Guido L.B. Wiesenberg, Giulia Ghielmetti, Michael W.I. Schmidt, Michael E. Schaepman, Mathias Kneubühler
- 15 Effect of Leaf Epidermal Structure of Arabidopsis Thaliana Mutants to Leaf Specular Reflection by EVA NEUWIRTHOVÁ, Zuzana Lhotáková, Petr Lukeš, Jana Albrechtová
- 16 Chlorophyll Content Estimations Based on CCM-300, Laboratory Measurements and Field Spectroscopy for Tundra Grass Species in The Krkonoše Mountains by LUCIE ČERVENÁ, Lucie Kupková, Markéta Potůčková, Jakub Lysák, Eva Neuwirthová, Zuzana Lhotáková, Jana Albrechtová
- 17 In-Field, UAV-Borne VIS-NIR And Thermal Spectroscopy As Tools For Distinguishing Water Stress Reaction In Common Bean. by ZUZANA LHOTÁKOVÁ, Milan Urban, Milton Valencia, Alejandro Vergara, Jaumer Ricaurte, Jana Albrechtová, Michael Selvaraj
- 18 Method For Acquiring and Comparing Spatially Explicit Measurements of Sun Induced Fluorescence on the Ground by DZHANER SAMI EMIN, Maria Matveeva, Kelvin Acebron, Benedict Vierneisel, Patrick Rademske, Andreas Burkart, Tommaso Julitta, Uwe Rascher
- 19 Prediction of Leaf Area Index using Integration of the Thermal Infrared and Optical Data over the Mixed Temperate Forest by ELNAZ NEINAVAZ, Andrew. K Skidmore, Roshanak Darvishzadeh
- 20 Predictive Performance Of PROSAIL Inversion And PLS Regression For Nitrogen Uptake Estimation Using Sentinel-2 And UAV Images by CHRISTIAN BOSSUNG, Miriam Machwitz, Adrien Petitjean, Martin Schlerf
- 21 Impact Of Environmental And Tree Structural Parameters On The Estimation Of Biochemical Properties For A Sparse Mediterranean Forest With AVIRIS Imagery by KARINE ADELINE, Thomas Miraglio, Jean-Victor Schmitt, Xavier Briottet, Jean-Philippe Gastellu-Etchegorry, Susan Ustin, Margarita Huesca, Keely Roth, Dennis Baldocchi
- 22 Variable Rate Nitrogen Application in Winter Wheat Supported by Low-Altitude Spectral Remote Sensing by FRANCESCO ARGENTO, Frank Liebisch, Helge Aasen, Achim Walter, Thomas Anken, Nadja El-Benni
- 23 Quantifying the robustness of vegetation indices through ARTMO's Global Sensitivity Analysis (CSA) toolbox by PABLO MORCILLO PALLARÉS, Juan Pablo Rivera-Caicedo, Santiago Belda, Charlotte De Grave, Helena Burriel, Jose Moreno, Jochem Verrelst
- 24 A Comparison of Tree Species Classification Acuracy Using UAV Images Acquired with a Snapshot Hyperspectral and a Multispectral Sensor by ELIAS FERNANDO BERRA, Melina Zempila, Paul Brown, Lee Butler, Michelle L. Hamilton, Rachel Gaulton
- 25 HyPlant Derived Sun-Induced Fluorescence a Way to Understand the Complex Vegetation Signals from Heterogeneous Ecosystems by Subhajit Bandopadhyay, ANSHU RASTOGI, Uwe Rascher, Patrick Rademske, Anke Schickling
- 26 Does Simple Vegetation Indices Can Predict Sun Induced Fluorescence? A Fuzzy Simulations on Airborne Imaging Spectroscopic Data by Subhajit Bandopadhyay, ANSHU RASTOGI, Sergio Cogliatti, Uwe Rasher, Maciej Gabka, Radoslaw Juszczak

Poster IDs are written in red colour.

Poster session 2



Date: Thursday, 7 Feb 2019, 12.40 – 13.40 Location: Corridor

- 27 Evaluation Of A pushframe hyperspectral Camera System by STEFAN LIVENS, Klaas Pauly, Pieter-Jan Baeck, Joris Blommaert, Bavo Delauré, Dirk Nuyts, Cert Strackx
- 28 Assessment of the Estimates of Sun-induced Fluorescence in large masses of Vegetation by Fernando Rodriguez-Moreno, ZEMEK FRANTIŠEK, Miroslav Pikl
- 29 Improvements in the Processing Chain of Thermal Hyperspectral Data from TASI-600 by TOMAS PURKET, Jan Hanus, Lukas Fajmon, Tomas Fabianek
- 30 Radiometric Calibration Of Multispectral Cameras On Board Drones Using Field Spectro-radiometers And Handcrafted Low-cost Calibration Panels by M. PILAR MARTÍN, José Ramón Melendo-Vega, Javier Becerra, Javier Pacheco-Labrador, María José Checa, Adrián Navarro
- 31 The EnMAP User Interface An Overview by NICOLE PINNEL, Heiden Uta, Asamer Hubert, Dietrich Daniele, Mühle Helmut, Habermeyer Martin, Storch Tobias
- 32 Operational DataQC Within The Hyperspectral DESIS And EnMAP Missions Results Of The DESIS Commissioning Phase by MARTIN BACHMANN, Kevin Alonso, Emiliano Carmona, Daniele Cerra, Raquel de Los Reyes, Birgit Gerasch, Martin Habermeyer, Harald Krawczyk, Maximilian Langheinrich, Rupert Mueller, Cintautas Palubinskas, Miguel Pato, Mathias Schneider, Peter Schwind, Tobias Storch, Valentin Ziel
- 33 Current Status of the FLIS Infrastructure and Pre-processing chain by JAN HANUŠ, Tomáš Fabiánek, Lukáš Fajmon, Tomáš Purket
- 34 Pixelwise Classification Of Hyperspectral Images Based On Deep Convolutional Neural Networks by LUCAS WITTSTRUCK, Thomas Jarmer, Martin Kanning
- 35 Radiative Transfer Simulations of Spruce Forest Canopies Rreconstructed from Terrestrial Laser Scans by RŮŽENA JANOUTOVÁ, Lucie Homolová, Zbyněk Malenovský, Jean-Philippe Gastellu-Etchegorry, Nicolas Lauret, Jan Hanuš
- 36 In-flight Estimation and Correction of Non-Gaussian Spectral Response by DAVID RAY THOMPSON, Joseph W. Boardman, Robert O. Green, Justin M. Haag, Pantazis Mouroulis, Byron E. Van Gorp
- 37 Hyperspectral Lithium-Pegmatite Detection A Case Study for Hoydalen, Norway by FRIEDERIKE KLOS, Christian Mielke, Christian Rogass, Nicole Köllner, Friederike Körting, Agnieszka Kuras, Maria Bade
- 38 Amospheric Correction Comparison of Alsat Spectral Imagery based on model FLAASH and model 6S by MOHAMMED AMINE BOUHLALA, Farah Benharrats, Habib Mahi, Madina Asmaa Missoumi
- 39 Soil Sampling Strategy Based On Multispectral Sentinel 2 And Hyperspectral EnMAP Satellite Data by FABIO CASTALDI, Sabine Chabrillat, Bas van Wesemael
- 40 Real time Airborne gas detection using Thermal Hyperspectral Imaging. by STEPHANE ALBON BOUBANGA TOMBET, Alexandrine Huot, Frédérick Marcotte, Pierre-Yves Foucher, Eric Guyot, Philippe Lagueux, Martin Chamberland
- 41 Fast And Easy Mineral Classification Using CASI/SASI/TASI Data by LUCIE KOUCKÁ, Veronika Kopačková, Jan Jelének, Jan Hanuš
- 42 Feasibility Study for an Aquatic Ecosystem Earth Observing System by Arnold Dekker, Nicole Pinnel, CLAUDIA GIARDINO
- 43 Mineral Identification And Characterization: An Integrated Approach To Recover Mineralogical Information From Hyperspectral Images by RONAN RIALLAND, Rodolphe Marion, Véronique Carrère, Charles Soussen
- 44 Spectral characteristics of surface soils between Irbid and Al Mafraq (Jordan) by WAHIB SAHWAN, Bernhard Lucke, Rupert Bäumler
- 45 Airborne Multisensors Information for a Zonal Crop Management by FRANTIŠEK ZEMEK, Miroslav Pikl, Vojtěch Lukas, Michal Kraus, Petr Sirůček, Fernando Rodriguez-Moreno
- 46 Narrow-band Soil Spectral Indices for SOC, Clay and Calcium Carbonate Prediction: Literature Review and Performance Evaluation based on the LUCAS Soil Database by SASKIA FOERSTER, Kathrin Ward, Sabine Chabrillat
- 47 Sensor Calibration Facility for Spectral and Thermal Remote Sensing by JULIANE VIKTORIA BENDIC, Arko Lucieer, Zbyněk Malenovský, Vanessa Lucieer, Luis Gonzalez, Jonathan Roberts, Christoph Rüdiger, Sharon Robinson, Stuart Phinn, Andrew McGrath
- 48 Hyperspectral Photoluminescence Imaging as a Tool to Study Degradation of the Outdoor Silicon Solar Panels by MARIJA VUKOVIC, Vetle Odin Jonassen, Espen Olsen, Sigurd Grøver, Torbjørn Mehl, Ingunn Burud
- 49 Hyperspectral Imaging analysis of Scots Pine Wood Wffected by Decay Fungi by ARNOUD JOCHEMSEN, Gry Alfredsen, Sigrun Kolstad, Boyan Yuan, Nabil Belbachir, Ingunn Burud
- 50 Proximal Hyperspectral Outcrop Scanning-A Geological Use Case Study by FRIEDERIKE MAGDALENA KOERTING, Christian Mielke, Christian Rogass, Nicole Koellner, Friederike Klos, Uwe Alteneberger, Agnieszka Kuras
- 51 Retrieving Macrophyte Pigments From Spectral Reflectance by Paolo Villa, Monica Pinardi, Viktor Toth, Diana Vaiciute, Martynas Bucas, MARIANO BRESCIANI

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Imaging Spectroscopy Avancements in Understanding Earth Systems (scientific contributions from 11th EARSeL Imaging Spectroscopy Workshop)

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Deadline for manuscript submissions: **31 October 2019**



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Message from the Guest Editors

Dear Colleagues,

Imaging spectroscopy is a progressive optical remote sensing domain that is increasingly contributing to interdisciplinary research addressing today's key environmental and societal challenges. The imaging spectroscopy knowledge, traditionally based on airborne and limited space-borne sensors, is expanding towards new spatial and spectral perspectives with new groundbased, unmanned airborne and satellite systems. Several up-coming spaceborne imaging spectroscopy missions will in a near future open up new opportunities for hyperspectral mapping and quantitative estimations of land and water surfaces.

This Special Issue will feature the state-of-the-art imaging spectroscopy research presented and discussed in February 2019 in Brno (Czech Republic) at the **11th Workshop of Special Interest Group on Imaging Spectroscopy of the European Association of Remote Sensing Laboratories (EARSeL)**.

Dr. Zbyněk Malenovský Prof. Eyal Ben-Dor Dr. Claudia Giardino Dr. Lucie Homolová *Guest Editors*







