

ESA LAND TRAINING COURSE, SZIU GODOLLO, HUNGARY

Daily Programme with summary of contents

ESA	MISSIONS AND TOOLS	PHYSICAL PRINCIPLES (THEORY)	APPLICATIONS (THEORY)	PRACTICAL	FIELD TRIP
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SUNDAY 3 September 2017

18:00–19:00: Registration in the student hostel lobby.

MONDAY 4 September 2017

	Technical Museum of the Faculty of Mechanical Engineering, Hall TK9:
08:00–09:00	Registration (outside of Hall TK9)
09:00–09:10	Welcome speeches János Tózsér (Rector of SZIU), Erika Michéli (Head of the Institute of Environmental Sciences, SZIU)
09:10–09:20	Course Introduction & Overview Zoltan Bartalis (ESA-ESRIN)
09:20–09:40	Space-Related Activities in Hungary Zoltán Zboray, Hungarian Space Office
09:40–10:15	Land Remote Sensing in Hungary Dániel Kristóf, Government Office of the Capital City Budapest
	Group Photo (outside steps of the museum)
	Coffee Break (registration area of museum)
10:45–11:00	ESA Science for Society Programme Zoltan Bartalis (ESA-ESRIN, Italy)
11:00–11:30	Sentinels for Science and Applications Zoltan Bartalis (ESA-ESRIN, Italy) • Sentinels 1, 2 & 3 missions for land applications • Instruments and geo-physical parameters retrieval • Science and applications
11:30–12:10	Earth Explorers for Science and Applications (CryoSat-2, SMOS, FLEX, Biomass) Zoltan Bartalis (ESA-ESRIN, Italy), José Moreno (Univ. Of Valencia, Spain) • Current and future ESA Earth Explorers missions for land applications • Instruments and geo-physical parameters retrieval • Science and applications
12:10–12:30	Third-Party Missions Data Andy Zmuda (Serco S.p.A. c/o ESA ESRIN, Italy) • Overview of ESA TPM missions' & data, data access
	Lunch
14:00–14:45	Sentinel Data Access and Processing Tools Michael Fournelis (BRGM, France) • How to access, visualise and process Sentinels' data

MONDAY 4 September 2017 (continued)

14:45–15:45	D1T1 Introduction to Optical Remote Sensing and Atmospheric Correction José Moreno (<i>Univ. Of Valencia, Spain</i>) • Optical systems • Optical properties and retrievable information • Corrections & modelling of Surface reflectance • Land applications from Sentinels data
Coffee Break (registration area of museum)	
Computer Room 114 (10 mins walk):	
16:15–17:45	D1P1 ESA SNAP Sensinel-2 Tools Fabrizio Ramoino (<i>Serco S.p.A. c/o ESA ESRIN, Italy</i>) • Introduction and background to SNAP & S2 data • Processing, corrections and bio-physical products • Hand on ingestion, display, corrections and processing of S2 imagery using SNAP
18:00–20:00	Rector's Hall: Ice-breaker

TUESDAY 5 September 2017

Rector's Hall:	
08:00–09:00	D2T1 Introduction to SAR and InSAR Kostas Papathanassiou (<i>DLR, Germany</i>) • Motivation for SAR remote sensing • SAR Imaging • Principle of SAR Interferometry; • Principle of Differential SAR Interferometry; • Examples of SAR, DEM and D-InSAR Applications
Short break	
09:15–10:15	D2T2 SAR Polarimetry Eric Pottier (<i>Univ. Rennes 1, France</i>) • Intro.to radar polarimetry & land applications • Review of space borne POLSAR sensors • Principles, scattering and target behaviours • Processing, speckling and target decompositions
Coffee break outside of the Rector's Hall	
Computer Room 114:	
10:45–12:15	D2P1 ESA SNAP Sensinel-1 Tools Michael Foumelis (<i>BRGM, France</i>) • Intro. to open source ESA SNAP Toolbox & Sentinel-1 SAR products • Training on calculation and analysis of backscatter coefficient from Sentinel-1 detected products • Inspection of manual as well as batch processing options of ESA SNAP Toolbox • End-to-end showcase over the broader area of Bucharest (Hungary)
Lunch break	
13:30–15:00	D2P2 Introduction to PolSARpro Toolbox Eric Pottier, Laurent Ferro-Famil (<i>Univ. of Rennes 1, France</i>) • Visualisation, handling and processing of polarimetric and polarmetric interferometric SAR data using POLSARPRO v5.1
Short break	

TUESDAY 5 September 2017 (continued)

	Rector's Hall:
15:15–16:15	D2T3 Advanced Optical and Thermal Applications Costas Cartalis (<i>Uni of Athens, Greece</i>) - Thermal remote sensing and laws governing thermal dynamics - Kinetic vs radiant temperature - Emissivity and role in thermal remote sensing - Link between LST & thermal properties of materials - How to estimate LST and interpret thermal images - LST applications
Coffee break outside of the Rector's Hall	
	Computer Room 114:
16:45–18:15	D2P3 ESA SNAP Sentinel-3 Tools, OLCI and SLSTR data Anna Ruescas (<i>Brockmann Consult GmbH, Germany</i>) - Synergistic use of S3 OLCI/SLSTR instruments to retrieve LST products - Visualisation and processing using the Sentinel-3 SNAP Tools - Optical and thermal image processing over land: vegetation indices, emissivity, land surface temperature. - Validation activities and batch processing included

WEDNESDAY 6 September 2017

	Rector's Hall:	
08:30–09:30	D3T1a Multitemporal Analysis Lorenzo Bruzzone (<i>Univ. Of Trento, Italy</i>) - Current trends and background on multitemporal images - Change detection in multispectral and SAR images - Change detection in VHR multispectral images - Change detection in VHR SAR images - Change detection in hyperspectral images - Change detection in multisensor/multisource images	
	Computer Room 111:	Computer Room 114:
09:30–10:15	D3P1a Multitemporal Analysis using ILU Products Michael Foumelis (<i>BRGM, France</i>) - Familiarize with open source ESA SNAP Toolbox - Familiarize with Copernicus Sentinel-1 SAR products. - Training on the generation of Coherence-Intensity False Colour Composites. - Provide instruction on step-by-step processing for land cover mapping - End-to-end showcase over the broader area of Bucharest (Hungary).	D3T1b Cloud Computing and the ESA Exploitation Platforms Alessandro Marin (<i>Solenix co ESA</i>) Show case of 3 TEPs: - Execution of interactive applications on a platform: Case studies Forestry & Coastal TEP - Integration of user applications on a platform for hosted processing: Case Studies Forestry & Coastal TEP - Visualization and analysis of land-cover products generated by the TEPs: Case Studies Urban TEP
Coffee break (outside of Rector's Hall)		
10:45–12:30	D3P1a (continued)	D3P1b (continued)
Lunch		

WEDNESDAY 6 September 2017 (continued)

14:00–15:00	D3T2a Forest Retrievals using SAR Kostas Papathanassiou (<i>DLR, Germany</i>) - Interferometric Imaging of Forests - Tomographic Imaging of Forests - The effect of frequency and polarization in forest monitoring 3D Forest Structure from SAR Data - Applications and Examples	D3T2b Urban Mapping & Change Detection Sebastian van der Linden (<i>Humboldt-Universität zu Berlin, Germany</i>) - Motivation for urban remote sensing - Challenges and characteristics of urban land cover - Contribution of different sensor types for urban mapping, - The influence of scale - Examples of mapping growth and composition - Quantitative mapping of land cover fractions in urban areas
15:00–15:45	D3P2a Forest Retrievals using SAR Polarimetry Laurent Ferro-Famil, Eric Pottier (<i>Univ. Rennes 1, France</i>) Fully polarimetric and interferometric SAR simulation of forest using POLSARPRO-SIM	D3P2b Urban Mapping & Change Detection Sebastian van der Linden (<i>Humboldt-Universität zu Berlin, Germany</i>) Case study Berlin: - Create quantitative maps on impervious/vegetation cover using Sentinel-2 data and regression modelling - Sentinel-2 feature space in urban areas - Empirical modelling with support vector regression, - Parameterisation of support vector regression, training data generation - Quantitative accuracy assessment
<i>Coffee break (outside of Rector's Hall)</i>		
16:15–18:00	D3P2a (continued)	D3P2b (continued)
18:00–19:30	Corridor next to Rector's Hall: Poster session & refreshments	

THURSDAY 7 September 2017

	Computer Room 111:	Computer Room 114:
08:30–09:30	D4T1a Terrain Motion using InSAR and PSInSAR Andy Hooper (<i>Univ. of Leeds, UK</i>) - Comparison and processing algorithms - PS techniques - Estimation with time - Comparing reflectors with levelling - Case studies	D4T1b Urban Heat Islands Costas Cartalis (<i>Univ. of Athens, Greece</i>) - Urban thermal climatology and temporal trends 3D structure & urban climate - Weather effects on urban thermal environment - Urban heat islands and influence of environmental and human factors - The physics of the thermal environment (including UHI)
09:30–10:15	D4P1a Terrain Motion using PSInSAR – case study using SNAP and STAMPS Andy Hooper (<i>Univ. of Leeds, UK</i>) - Data selection and pre-processing - PS selection & corrections - Phase unwrapping - Velocity estimation - Error analysis due to atmospheric artifacts	D4P1b Urban Heat Islands Costas Cartalis (<i>Univ. of Athens, Greece</i>) - To estimate and map LST, NDVI and land surface emissivity - To define areas with increased LST and to assess the link between land use/land cover and LST - To assess the existence of an UHI as well as to define its intensity.
<i>Coffee break and briefing on field trip logistics</i>		
10:45–12:30	D4P1a (continued)	D4P1b (continued)

THURSDAY 7 September 2017 (continued)

<i>Pick-up of Brown Bag Lunch sandwiches in front of the Rector's Hall</i>	
	Rector's Hall (Brown Bag Lunch):
12:45–13:15	D4T2 Water Ponding in Hungary – case study Zoltán Vekerdy (SZIU, Hungary), János Tamás (Univ. Debrecen)
13:15–18:00	FIELD TRIP Water Ponding in Hungary: Collection of Ground and Drone Data Zoltán Vekerdy (SZIU, Hungary), János Tamás (Univ. Debrecen)
19:00–22:00	Lázár Lovaspark (Bus transport provided): Social Dinner (Hosted)

FRIDAY 8 September 2017

	Computer Room 111:	Computer Room 114:
08:30–09:30	D5T1a SAR Tomography Laurent Ferro-Famil (Univ. Rennes 1, France) - SAR tomography basics - Application of PolTomoSAR - Towards spaceborne SAR tomographic missions	D5T1b Surface Energy Balance and Evapotranspiration Bob Su (Univ. of Twente, Netherlands) - Principles of advanced thermal remote sensing - Critical processes in surface energy balance (SEBs) - Using SEBS for deriving different flux terms and evapotranspiration - Developing applications of SEBS
09:30–10:15	D5P1a SAR Tomography using PolSARpro Toolbox Laurent Ferro-Famil, Eric Pottier (Univ. Rennes 1, France) SAR tomography forest retrievals using P and L band airborne SAR data	D5P1b Surface Energy Balance and Evapotranspiration Bob Su (Univ. of Twente, Netherlands) - EO data in SEBs and estimating surface fluxes and moisture content - Processing in ILWIS and SNAP
<i>Coffee break</i>		
10:45–12:30	D5P1a (continued)	D5T2 River Discharge and Lake Volume using Radar Altimetry and Imaging Sensors Angelica Tarpanelli (CNR, Italy) <u>Radar altimetry</u> - Principles and definitions - Missions & Technologies - Data access - Toolboxes (BRAT, GUT, SARvatore) - Applications (sea, ice rivers hydrology) <u>Optical and multispectral sensors</u> - Principles and classifications - Missions (MODIS and MERIS) - Technologies for detecting water signal from NIR sensors - Data access <u>Case Studies</u> - Dunube, Po and Niger Rivers
<i>Lunch</i>		

FRIDAY 8 September 2017 (continued)

14:00–15:00	D5T3a Monitoring Vegetation in a Changing Climate Grégory Duveiller (JRC, Italy) - Measuring vegetation productivity from space - measuring biophysical properties of vegetation - links between remote sensing and climate modelling - biophysical versus biochemical effects of vegetation change - inter comparison of data streams	D5T3b Observing the Hydrological Cycle over Land using SMOS Ahmad Albitar (CESBIO, France) - Background to SMOS and SM applications - Processing levels and products - Data access - Tool boxes for visualisation and further processing - Comparison with other EO sensors
15:00–15:45	D5P3a Monitoring Vegetation in a Changing Climate Grégory Duveiller (JRC, Italy) - Using R for climate data analysis, - Data visualization with ggplot, - Data wrangling with dplyr, - Manipulating netcdf files, - Comparing datasets in climate space	D5P3b Observing the Hydrological Cycle over Land using SMOS Ahmad Albitar (CESBIO, France) - SMOS tools in SNAP - Hungarian Case Study – Regionals drought index using root zone soil moisture
<i>Coffee break</i>		
16:15–17:15	D5P3a (continued)	D5T4 Long-Term Hydrological Land Monitoring with Active and Passive Microwave Missions Wouter Dorigo (Vienna Univ. of Technology, Austria) Multi-mission potential and characteristics of the long-term satellite data records of soil moisture
17:15–18:00		D5P4 Long-Term Hydrological Land Monitoring with Active and Passive Microwave Missions Wouter Dorigo (Vienna Univ. of Technology, Austria) On-line tools for display and analysis of long term multi-mission soil moisture for climate change studies

SATURDAY 9 September 2017

	Computer Rooms 111 & 114:	
08:30–10:15	D6P1 Water Ponding in Hungary: Analysis of Ground and Drone Data, Sentinel-1/2 Data, Digital Elevation Models and the SNAP Toolbox Zoltan Vekerdy (SZIU, Hungary) Exercices with EO and ground data collected during Thursday's field trip	
<i>Coffee break</i>		
	Rector's Hall:	
10:45–11:15	D6T1 Summary and Conclusions	
11:15–12:00	Closing Ceremony, Awarding of Diplomas	

List of Lecturers

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