

10th EARSeL Workshop on Land Ice and Snow

06 - 08 February 2023, Bern, Switzerland

Remote Sensing of the Cryosphere: methods and applications from regional to global scale

WORKSHOP PROGRAMME



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UNIVERSITÄT
BERN

OESCHGER CENTRE
CLIMATE CHANGE RESEARCH

Monday, 6th February

Welcome and opening

08:00 – 09:30 *Registration and coffee / tea*

09:30 – 09:45 **Jean-Christophe Schyns** (EARSeL President)
Welcome

09:45 – 10:00 **Stefan Wunderle** (Chair EARSeL SIG Remote Sensing of Land Ice and Snow)
Welcome and Workshop Overview

Cryosphere in polar regions

Chair: Stefan Wunderle

10:00 – 10:20 **Rodica Nitu (keynote)**
Global Cryosphere Watch - WMO, Switzerland
Global Cryosphere Watch – Status and Future Plans WMO - GCOS

10:20 – 10:40 **Laura Aguilar**, Jan-Peter Muller, Michel Tsamados, Thomas Johnson, Said Kharbouche
Dept. of Geography, University College London, United Kingdom
MISR Arctic and Antarctic Sea Ice Albedo 2000-2022 Product Creation and Trend Analysis

10:40 – 11:00 **Horst Machguth**, Andrew Tedstone
University of Fribourg, Switzerland
Greenland Surface Runoff Extent, Mapped From Daily MODIS Imagery 2000 To 2021

11:00 – 11:20 **Andrew Tedstone**, Horst Machguth, Julien Ducrey, Nicole Clerx, Nicolas Jullien, Paolo Colosio, Stef Lhermitte, Marco Tedesco, Dirk van As
University of Fribourg, Switzerland
Meltwater Retention Around the Greenland Ice Sheet Runoff Limit

11:20 – 11:40 **Angelika Humbert**, Markus Appel, Matthias Bohnen, Rene Griesbach, Veit Helm, Ingmar Nitzsche, Ralf Müller
Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Germany
Benchmarking Ice Mechanical Simulations at Supraglacial Lakes with Satellite and Airborne Remote Sensing

11:40 – 13:00 *Lunch break*

Snow cover (basics and operational applications)

Chair: Kathrin Nägeli

13:00 – 13:20 **Bojan Bojkov**
EUMETSAT, Germany
EUMETSAT's Interest in Snow Detection from Space

13:20 – 13:40 **Jeff Dozier**
University of California, United States of America
Retrieval of Subpixel Snow Albedo and Temperature from Visible through Thermal Infrared Sensing

13:40 – 14:00 **Zuhal Akyurek**, Cagri Karaman, Semih Kuter, Berkay Akpinar, Ali Arda Sorman
Middle East Technical University, Turkey
Investigating the Snow Dynamics over Mountainous Terrains from EUMETSAT HSAF Snow Cover Product-H10

14:00 – 14:20 **Kerttu Kouki**, Kari Luojus, Aku Riihelä
Finnish Meteorological Institute, Finland
Evaluation of Snow Cover Properties in ERA5 with Several Satellite-based Datasets in Northern Hemisphere in Spring 1982-2018

14:20 – 14:50 Short poster presentations (2min/poster)

Kenta Ochi, Patricia de Rosnay, David Fairbairn
ECMWF, United Kingdom

Impact of Assimilating ESA CCI Snow Cover on ECMWF Land Reanalysis

Christoph Herbert, Patricia de Rosnay, David Fairbairn, Kenta Ochi, Peter Weston
ECMWF, United Kingdom

Towards a Consistent and Unified Land Data Assimilation Scheme by Analysing Multi-Layer Snow and Soil Temperature in the Operational Forecast System

Adrián Melón-Nava, Javier Santos-González, Amelia Gómez-Villar, Andrés Merino
Department of Geography and Geology. Universidad de León, Spain

Snow Cover Monitoring in the Cantabrian Mountains (NW Spain) from Webcam Images Network, Satellite Products and WRF Modelling

Sebastian Rößler, **Andreas Dietz**, Jonas Köhler, Celia Baumhoer
German Remote Sensing Data Center (DFD), Germany

New Development Of DLR's Global SnowPack - Integration Of New Sensors And Potential Applications Of The Near Real-Time Product

Sanghee Jun, Kyung-Hee Seol, In-Hyuk Kwon, Myung-Seo Koo
Korea Institute of Atmospheric Prediction Systems, South Korea

Improvement of Snow Data Assimilation for KIM

Marco Mazzolini, Désirée Treichler, Kristoffer Aalstad, Esteban Alonso-González
Department of Geosciences, University of Oslo, Norway

Satellite Altimetry as a New Data Source for Snow Depth Data Assimilation

Mariel Dirscherl, Andreas Dietz, Celia Baumhoer, Sebastian Roessler, Claudia Kuenzer
German Aerospace Center (DLR), Germany

Artificial Intelligence for the Monitoring of Seasonal Supraglacial Lake Dynamics in Multi-Sensor Remote Sensing Data

Celia Amélie Baumhoer, Mariel Dirscherl, Konrad Heidler, Erik Loebel, Ingmar Nitze, Saurabh Kaushik, Andreas Dietz
German Aerospace Center (DLR), Germany

The Potential of Artificial Intelligence and Remote Sensing for Cryospheric Research

Anders U. Waldeland, Arnt B. Salberg, David Gustavsson, Jarle H. Reksten, Øivind D. Trier, **Rune Solberg**

Norwegian Computing Center, Norway

Fractional Snow Cover Retrieval from Sentinel-3 Data Using Deep Convolutional Neural Networks

Céline Portenier, Martina Hasler, Stefan Wunderle

Institute of Geography and Oeschger Center for Climate Change Research, University of Bern, Switzerland

Public Webcams and its Potential for Complementing Satellite-Derived Snow Cover Information

Kathrin Naegeli, Dominik Amschwand, Martin Hoelzle

Remote Sensing Laboratories, Department of Geography, University of Zurich, Switzerland

Thermal Infrared Remote Sensing Across Scales to Monitor Surface Energy Fluxes over Rockglacier Murtèl, Switzerland

14:50 – 15:40 Poster session with coffee break

Snow Hydrology – Snow Water Equivalent

Chair: Zuhal Akyurek

15:40 – 16:00 **Kari Luojus**, Jouni Pulliainen, Matias Takala, Pinja Venäläinen, Mikko Moisander, Lina Zschenderlein, Chris Derksen, Colleen Mortimer, Lawrence Mudryk, Thomas Nagler, Gabriele Schwaizer, Anna-Maria Trofaier
Finnish Meteorological Institute, Finland
Efforts to Improve the Northern Hemisphere Snow Water Equivalent Retrievals in the ESA CCI+ Snow Project

16:00 – 16:20 **Colleen Mortimer**, Haorui Sun, Yiwen Fang, Steve Margulis, Lawrence Mudryk, Chris Derksen
Environment and Climate Change Canada, Canada
Integrating Snow Mass Estimates for Mountain Areas in the Snow CCI+ SWE Product

16:20 – 16:40 **Valentina Premier**, Carlo Marin, Giacomo Bertoldi, Riccardo Barella, Claudia Notarnicola
Institute for Earth Observation, Eurac Research, Italy
On the Use of High-Resolution Remote Sensing Product to Generate SWE Maps

16:40 – 17:00 **Kristina Belinska**, Georg Fischer, Julia Boike, Irena Hajsek
German Aerospace Center (DLR), Germany
Assessing the Potential Interferometric and Polarimetric SAR Data for the Retrieval of Snow Water Equivalent

17:00 – 17:20 **Nora Krebs**, Paul Schattan, Sascha Oswald, Martin Schrön, Martin Rutzinger, Johann Stötter
University of Innsbruck, Austria
Snow from space: combined analysis of Snow Water Equivalent from Cosmic Ray Neutron Sensors and Fractional Snow Cover products from Sentinel and MODIS

17:20 – 17:40 **Lina Zschenderlein**, Kari Luojus, Matias Takala, Pinja Venäläinen, Jouni Pulliainen
Finnish Meteorological Institute, Finland
Comparison of Passive Microwave Dry Snow Detection Algorithms and Application to SWE Retrieval

18:30 **Ice Breaker Reception**

Dampfzentrale, Marzilistrasse 47, 3005 Bern

Tuesday, 7th February¹

Microwave technologies to observe the Cryosphere

Chair: Stefan Wunderle

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| 08:20 – 08:40 | Charles Werner , Andreas Wiesmann, Rafael, Othmar Frey, Urs Wegmüller, Mike Schwank, Christian Mätzler, Martin Suess
<i>Gamma Remote Sensing AG, Switzerland</i>
Measuring Coherent Polarimetric Backscatter Time-Series Covering 1-40 GHz with the ESA WBSCAT Scatterometer |
| 08:40 – 09:00 | Marcel Stefko , Silvan Leinss, Othmar Frey, Irena Hajnsek
<i>ETH Zurich, Switzerland</i>
Radar Observations of Coherent Backscatter Enhancement for Snow Parameter Estimation |
| 09:00 – 09:20 | Othmar Frey , Andreas Wiesmann, Charles Werner, Rafael Caduff, Henning Löwe, Matthias Jaggi
<i>Gamma Remote Sensing / ETH Zurich, Switzerland</i>
Time Series Of Vertical Snow Profiles Measured By SAR Tomographic Profiling - A Comparison With Reference Snow Characterizations |
| 09:20 – 09:40 | Richard Kelly , Aaron Thompson, Peter Toose, Chris Derksen, Alex Langlois, Alex Roy, Laura Brown, Aaron Berg, Jim Hodgson, Adriano Meta
<i>University of Waterloo, Canada</i>
The Airborne Cryosphere-Observing SAR System (CryoSAR): Season-long Airborne and Ground-based Observations of Terrestrial Snow and Lake Ice During Fall 2022 and Winter 2023 |
| 09:40 – 10:00 | Thomas Nagler , Helmut Rott, Stefan Scheiblauer, Nico Mölg, Lars Keuris, Ralf Horn, Jens Fischer, Alberto Moreira, Julia Kubanek
<i>ENVEO IT GmbH, Austria</i>
A Field Campaign on InSAR Retrieval of Snow Mass in Alpine Terrain |

10:00 – 10:30 *Coffee break*

Intertwined Essential Climate Variables: Permafrost and Snow

Chair: Gabriele Schwaizer

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| 10:30 – 10:50 | Julia Boike (keynote) , Inge Grünberg, Brian Groenke, Julia Martin, Moritz Langer
<i>Alfred Wegener Institute, Germany</i>
Arctic Permafrost: The Importance of Snow |
| 10:50 – 11:10 | Roberto Salzano , Giulio Esposito, Rosamaria Salvatori
<i>National Research Council of Italy, Italy</i>
The Integrated Description of the Snow Cover in Polar Areas: a Multi-scale and Multi-platform Solution |
| 11:10 – 11:30 | Sonam Wangchuk , Kevin Schaefer, Jorien Vonk, Sander Veraverbeke
<i>Vrije Universiteit Amsterdam, Faculty of Science, Netherlands</i>
Unraveling Fire Permafrost Interactions in Northeastern Siberian Tundra Using InSAR and Machine Learning |
| 11:30 – 11:50 | Arnab Singh , Darwin Rana, Sangya Mishra, Dibas Shrestha
<i>Central Department of Hydrology and Meteorology, Tribhuvan University, Nepal</i>
Modeling Permafrost Distribution Using Machine Learning Models In Khumbu Region, Nepal |

11:50 – 13:30 *Lunch break*

¹ Fun Run 7:00 – 7:45 along river Aare for interested participants; slow pace 7:00min/km; contact: stefan.wunderle@giub.unibe.ch

- 13:30 – 13:50 **Gabriele Schwaizer**, Thomas Nagler, Nico Mölg, Lars Keuris, Sari Metsämäki, Carlo Marin, Richard Essery, Anna Maria Trofaier
ENVEO IT GmbH, Austria
Recent Developments Towards The Upcoming Snow Cover Fraction Climate Research Data Package V3.0 From Terra MODIS And Sentinel-3 SLSTR Data Within ESA CCI+ Snow
- 13:50 – 14:10 **Xiongxin Xiao**, Andreas Wiesmann, Kathrin Naegeli, Valentina Premier, Stefan Wunderle
Institute of Geography and Oeschger Center for Climate Change Research, University of Bern, Switzerland
40 Years Times Series of Global Snow Cover Fraction Based on AVHRR Data - First Analysis and Results within ESA CCI+ Snow Project
- 14:10 – 14:30 **Rune Solberg**, Øystein Rudjord, Arnt-Børre Salberg, Mari Anne Killie, Steinar Eastwood, Atle Sørensen, Carlo Marin, Valentina Premier
Norwegian Computing Center, Norway
New 38-Year Time Series of Daily, Global Fractional Snow Cover Maps
- 14:30 – 14:50 **Sari Johanna Metsämäki**, Sakari Väkevä, Gabriele Schwaizer, Lars Keuris, Mikko Moisander, Pinja Venäläinen, Kari Luojus, Colleen Mortimer, Thomas Nagler
Finnish Environment Institute, Finland
Evaluation of Snow Cover Extent Products Against In-situ Snow Depth Measurements Within ESA SnowPEX+

Poster Session II

Chair: Helga Weber

- 14:50 – 15:15 Short poster presentations (2min/poster)
- Thomas Nagler**, Lucia Felbauer, Nico Mölg, Gabriele Schwaizer, Stefan Scheiblauer, Sari Metsämäki, Lars Keuris, Helmut Rott, Igor Appel, Edward Bair, Che Tao, Walter Clark, Christopher Crawford, Jeff Dozier, Cho Eunsang, Dorothy Hall, Masahiro Hori¹, George Riggs¹, Karl Rittger, David Robinson, Peter Romanov, Timbo Stillinger, Matias Takala, Elzbieta Wisniewski, Michael Kern, Anna Maria Trofaier, Philippe Goryl
ENVEO IT GmbH, Austria
SnowPEX+: Results of the Intercomparison and Validation of Northern Hemispheric Snow Extent Products 2015-2020
- Sonia Dupuis**, Frank Göttsche, Sebastian Westermann, Stefan Wunderle
Institute of Geography and Oeschger Center for Climate Change Research, University of Bern, Switzerland
Towards a Northern Hemisphere Land Surface Temperature Time Series to Support Permafrost Modelling
- Sara Arioli**, Ghislain Picard, Simon Gascoin, Laurent Arnaud, Esteban Alonso-Gonzalez
Université Grenoble Alpes, Institut des Géosciences de l'Environnement, France
Ground-based Observations of the Surface Temperature of Snow over Complex Topography for the Assessment of Future Thermal Infrared Earth Observation Missions
- Kirsikka Heinilä**, Sari Metsämäki, Sakari Väkevä, Kari Luojus, Gabriele Schwaizer
Finnish Environment Institute (SYKE), Finland
The Lake Ice Extent Information On Hemispherical Scale
- Steven Margulis, Simon Yueh, Elias Deeb, **Jeff Dozier**, Kelly Elder, Dara Entekhabi, Manuela Giroto, Ethan Gutmann, Adrian Harpold, Mimi Hughes, Dennis Lettenmaier, Dongyue Li, Glen Liston, Jessica Lundquist, Keith Musselman, McKenzie Skiles
University of California, United States of America
A Spaceborne Snow Mission Concept Using P-band Signals of Opportunity

Eduard Khachatryan, Wolfgang Dierking, Saloua Chlaily, Torbjørn Eltoft, Frode Dinessen, Nick Hughes, Andrea Marinoni
The Arctic University of Norway, Norway
 SAR and Passive Microwave Fusion Scheme: a Test Case for Sea Ice Classification

Ian A. Brown, Mikael Hovemyr
Department of Physical Geography, Stockholm University, Sweden
 Framework For Snow Cover Monitoring Using A Coherence-Based Approach

Riccardo Barella, **Carlo Marin**, Francesca Carletti, Loic Brouet, Mathias Bavay, Claudia Notarnicola
EURAC Research, Institute for Earth Observation, Italy
 A Fast and Low-Cost Instrument for Snow Roughness Measurements in the Field

Pinja Venäläinen, Kari Luojus, Juha Lemmetyinen, Jouni Pulliainen, Mikko Moisander, Matias Takala, Colleen Mortimer
Finnish Meteorological Institute
 Improving GlobSnow Snow Water Equivalent Retrieval with Spatially and Temporally Varying Snow Densities

15:15 – 16:00 *Poster session with coffee break*

Mountain snow

Chair: Helga Weber

16:00 – 16:20 **Carolina Adler (keynote)**
Mountain Research Initiative, University of Bern, Switzerland
 The Mountain Cryosphere in a Changing Climate: a View from Within Science-Policy Processes

16:20 – 16:40 **Sangya Mishra**, Darwin Rana, Arnab Singh, Dibas Shrestha
Tribhuvan University, Nepal
 Snow Cover Dynamics In The Hindu-Kush Himalayas Using Improved Modis Snow Products

16:40 – 17:00 **Hendrik Wulf**, Bernhard Sassik, Gillian Milani, Reik Leiterer
ExoLabs GmbH, Switzerland
 Next-Generation Snow Products For Entire Mountain Ranges

17:00 – 17:20 **Semih Kuter**, Cansu Aksu, Zuhail Akyurek
Çankırı Karatekin University, Faculty of Forestry, Department of Forest Engineering, Turkey
 Snow Cover Classification over Mountainous Terrains at Optical Wavelengths by Machine Learning: Existing Challenges and New Opportunities

17:20 – 17:40 **Lars Keuris**, Markus Hetzenecker, Gabriele Schwaizer, Thomas Nagler, Nico Mölg
ENVEO IT GmbH, Austria
 Near-Real-Time Snow Cover Fraction Estimation using Linear Spectral Unmixing of Sentinel-2 MSI Top-of-Atmosphere Reflectance Data

17:40 – 18:00 **Shiyi Li**, Lanqing Huang, Philipp Bernhard, Irena Hajnsek
ETH Zurich, Switzerland
 High-resolution Wet Snow Mapping in the Karakoram: A Probabilistic Method Based on SAR Imagery and Topography Data

19:00 **Conference Dinner**

Schwellenmätteli, Dalmaziquai 11, 3011 Bern

Wednesday, 8th February

Remotely sensed snow height		Chair: Colleen Mortimer
09:00 – 09:20	Joschka Geissler , Markus Weiler <i>Faculty of Environment and Natural Sciences, Albert-Ludwigs University Freiburg, Germany</i> Machine Learning and LiDAR Snowheight Maps from UAVs Reveal Clusters of Snow Variability in a Sub-Alpine Forest.	
09:20 – 09:40	Reuma Arav , Katharina Andres, Florian Poepl, Bernhard Hoefle, Norbert Pfeifer <i>Dept. of Geodesy and Geoinformation, TU Wien, Austria</i> Tracing Snow Cover Dynamics Using 4D Level Sets on Near-Continuous Terrestrial Laser Time Series Scans	
09:40 – 10:00	Désirée Treichler , Marco Mazzolini, Livia Piermattei, Clare Webster, Luc Girod <i>University of Oslo, Norway</i> Spaceborne Snow Depth Measurements From ICESat-2 Laser Altimetry	
10:00 – 10:40	Coffee break	
Long time series of snow cover based on AVHRR and Sentinel-3		Chair: Sari Metsämäki
10:40 – 11:00	Helga Weber , Christoph Neuhaus, Valentina Premier, Arnt-Børre Salberg, Stefan Wunderle <i>Oeschger Center for Climate Change Research and Institute of Geography, University of Bern, Switzerland</i> Less White: Decreasing Alpine Snow Cover derived from a 40-year AVHRR Snow Climatology	
11:00 – 11:20	Andreas Dietz , Sebastian Roessler, Stefanie Holzwarth <i>DFD-LAX OP - Dynamik der Landoberfläche, Germany</i> 36 Years of Daily Snow Cover Data for Europe Based on AVHRR Data: Results from the DLR TIMELINE Project	
11:20 – 11:40	Hannah Augustin , Helga Weber, Martin Sudmanns, Lucas van der Meer, Dirk Tiede, Stefan Wunderle, Christoph Neuhaus, Andrea Baraldi <i>Department of Geoinformatics - Z_GIS, University of Salzburg, Austria</i> Semantic Earth Observation Data Cube of AVHRR and Sentinel-3 SLSTR Data for Exploratory EO Analysis	
11:40 – 13:00	Lunch break	
Educational programs and activities		Chair: Kathrin Nägeli
13:00 – 13:20	Lena Hellmann, Lea Geissmann , Kathrin Naegeli, Girls on Ice Switzerland Team <i>Girls on Ice Switzerland, Switzerland</i> From Glacier to Classroom: Peer-to-Peer Communication to Foster Curiosity in Science	
13:20 – 13:40	Helga Weber , Aizirek Mederbek, Anouk Volery, Dilara Kim, Perizat Imanalieva, Martina Barandun <i>Oeschger Centre for Climate Change Research and Institute of Geography, University of Bern, Switzerland</i> Getting Inspired by the Cryosphere: A Science Program to Empower Young Women in Central Asia	
13:40 – 14:00	Dilara Kim , Helga Weber, Martina Barandun <i>Institute of Geography and Geology, University of Würzburg, Germany</i> Addressing Gender Inequality in STEM: Cryospheric Excursions in Central Asia	
14:00 – 14:20	Coffee break	

Glaciers		Chair: Stefan Wunderle
14:20 – 14:40	Gabriele Schwaizer , Johanna Nemec, Thomas Nagler, Nico Mölg, Frank Paul <i>ENVEO IT GmbH, Austria</i> Automated Classification of Glacier Facies From Sentinel-2 And Landsat Data	
14:40 – 15:00	Sahra Abdullahi , David Burgess, Birgit Wessel, Achim Roth <i>German Aerospace Center DLR, Germany</i> TanDEM-X Elevation Data For Mass Balance Estimation	
15:00 – 15:20	Tenzing Chogyal Sherpa , Sudan Bikash Maharjan <i>International Centre for Integrated Mountain Development (ICIMOD), Nepal</i> Spatial Distribution and Decadal Change of Glaciers in the Indus Basin since the 1990s	
15:20 – 15:30	Closing session (Stefan Wunderle)	
15:30 – 16:30	<i>Chill out beer and beverages offered by Remote Sensing Research Group, University of Bern, Switzerland</i>	

Further information is available at:

www.earsel.org/SIG/Snow-Ice/workshop/call.php

or from the workshop organization committee

Dr. Stefan Wunderle (stefan.wunderle@giub.unibe.ch)

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