



**Centrum  
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Subject Short Term Scientific Mission

Reference COST Action ES1404

Host institution: Arctic Research Centre of Finnish Meteorological Institute

Period: 12/02/2017 to 18/02/2017

Reference code: COST-STSM-ECOST-STSM-ES1404-120217-081911

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**Sosnowiec, 15.03.2017**

**3<sup>rd</sup> European Snow Science Winter School, 12-18 February 2017, Sodankylä, Finland**

### Report of participation

In February 2017 two major snow research institutions: Finnish Meteorological Institute (FMI)- Finland and Institute for Snow and Avalanche Research (SLF) - Switzerland have organized a one-week long specialist course concerning study of snow.

Snow school was addressed to graduate students and post-docs working on snow related research. Participants referred to fields covering glaciology, hydrology, oceanography, geography, biology, chemistry as well as engineering and materials sciences. From many countries applications, around 24 were chosen. From Poland has come Aleksander Uszczyk – all supported by Centre for Polar Studies KNOW (Leading National Research Centre). Participants were accommodated in campus of the Arctic Research Center at Finnish Meteorological Institute FMI in Sodankylä – located in boreal, sub-Arctic zone of northern Finland.

Main goal of the workshop was to learn both modern and classical snow measurement techniques and instruments.

All participants had chance to learn and use following techniques:

- standardized snow pit stratigraphy analysis;
- measurements of snow water equivalent (SWE);
- measurements of snow layers hardness by SnowMicroPen (SMP);



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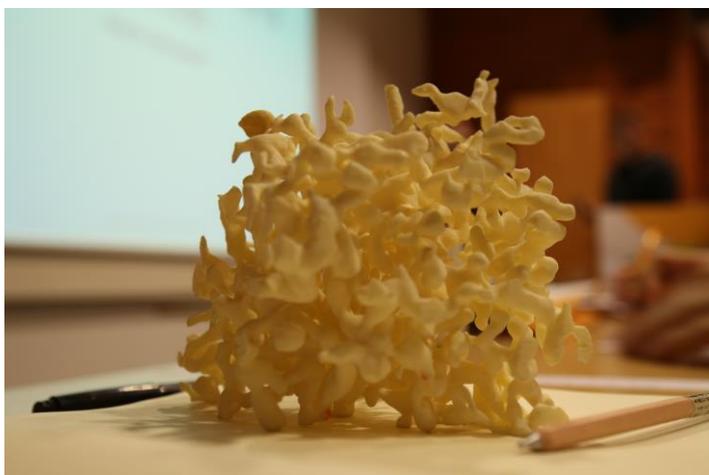


- measurements of density with variety of density cutters;
- measurements of Specific Surface Area (SSA) of snow crystals with IceCube and shortwave InfraRed Integrating Sphere system (IRIS);
- MagnaProbe;
- Near Infra-Red photography (NIR);

Daily schedule was divided into morning classroom presentations (9.00-12.00 am), field measurements (1.00 – 5.00 pm) and evening lecture or wrap-up sessions (7.00-9.00 pm). Major stress lied on fieldwork, prepared in small, 3-4 person groups. Such solution allowed better recognition of each technique.

On Monday we had an first practice of measurement equipment and short site tour around FMI-ARC. It was an occasion to get to know one of the biggest and oldest snow research observatories in Finland. In this day we also participated in 3 lectures:

- “Quantifying snow: traditional and emerging methods” leading by Martin Schneebeli (Fig.1);
- “Physical snow models” (Marie Dumont);
- “Snow interactions with sea and lake ice” (Matti Leppäranta).



*Fig.2. Model of snow structure in snow cover.*



From Tuesday to Wednesday we learned about diversity in physical features of snowpack at different sites (forested area and opened bog) where we could use and compare methods applied in snow study (Fig. 2.). Additionally we had a few hours of lectures:

- “Microstructural controls on snow physical properties” (Henning Löwe)
- “Passive microwave remote sensing of snow” (Juha Lemmetyinen)
- “Active microwave remote sensing of snow” (Silvan Leins)
- “Why current snow physics models cannot simulate Arctic snowpack? Consequences” (Florent Domine)
- “Optical remote sensing of snow”, field work considerations (Roberta Pirazzini)
- “Optical remote sensing of snow”, satellite applications (Marie Dumont)



*Fig.2. Analysis of snow properties in snowpits during field work (Tuesday).*

Thursday was our last day in Sodankylä, because in the evening we moved another 100 km north to Saariselkä, for last fieldwork. During this day we had the last interactive lecture “Setup of simulations (MemIs, Tartes) from collected field data” and independent planning of research next day.



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Friday was a day of a big field campaign. For many also, a first day on cross-country skis – our mean of transport to the test site. Each group was responsible for a part of research programme discussed day before, which concerned spatial variability of snow cover deposition and its internal diversity on mountain tundra region (Fig.3).



*Fig. 3. Participants of 3<sup>rd</sup> Science Snow School. The science expedition in Saariselkä (last day of school).*

In addition to getting new skills and learning about state-of-the-art measuring techniques we had also chance to meet many people whose are focusing on snow study and hence it was big opportunities to exchange our experience. Besides, this acquaintanceship is very helpful in our future cooperations with science project.



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### Lecturers

- Florent Domine, Takuvik Joint International Laboratory, Université Laval (Canada);
- Marie Dumont, Centre d'Etudes de la Neige, Météo France;
- Anna Kontu, Finnish Meteorological Institute FMI, Finland;
- Silvan Leinss, ETH Zurich;
- Juha Lemmetyinen, Finnish Meteorological Institute FMI, Finland;
- Henning Löwe, WSL Institute for Snow and Avalanche Research SLF;
- Roberta Pirazzini, Finnish Meteorological Institute FMI, Helsinki;
- Martin Schneebeli, WSL Institute for Snow and Avalanche Research SLF;
- Matti Leppäranta, Department of Physics, University of Helsinki, Finland.

Aleksander Uszczyk