

PYRY-SEMINAR 1.11.2017 POSTER AND ORAL PRESENTATIONS, AND ABSTRACTS (version 31.10.2017)

POSTER PRESENTATIONS

Annakaisa von Lerber, Finnish Meteorological Institute, Finland, Investigating Dependences of Ze-S relation on Microphysical Properties of Snow

Jaakko Mäkinen, Finnish Geospatial Research Institute, FGI, Finland, Experience with the Campbell CS725 Snow Water Equivalent sensor at the Metsähovi Geodetic Research Station, Kirkkonummi, Finland

Juha A. Karhu, Finnish Meteorological Institute, Finland, Effect of snow on solar panel output

Kati Anttila, Terhikki Manninen, Emmihenna Jääskeläinen, Finnish Meteorological Institute, Finland, Darkening of winter time surface albedo in Finland using CLARA-A2 SAL

Kirsti Jylhä, Finnish Meteorological Institute, FMI, Finland, Severe sea-effect snowfall on the Finnish coast

Marke Hongisto, Finnish Meteorological Institute, FMI, Snow in the Finnish golden age painters works

Outi Meinander et al., Finnish Meteorological Institute, FMI, Finland, High latitude dust and elemental and organic carbon aerosols: what processes make them important to Arctic snow and ice?

Piia Post, University of Tartu, Estonia, Observing Large-scale Atmospheric Moisture Transport from Multiple Sources to Analyse Severe Snow Storm in the Baltic Sea Region (invited)

Xiao Deng, Tainyuan University of Technology, China, Multi-sensors monitoring method on snow and ice parameters in the Heilongjiang, the northernmost river of China

ORAL PRESENTATIONS (invited)

Welcome and opening: Director General Dr. Juhani Damski, Finnish Meteorological Institute (FMI)

Johanna Ekman, FMI: A short comment on Finland's chairmanship of the Arctic Council 2017-2019

KEYNOTE SPEAK Docent Esko Kuusisto, Finnish Environment Center: "One hundred years of snow research in Finland"

Ali Nadir Arslan (FMI): Introduction to COST Action ES1404

Roberta Pirazzini (FMI Helsinki): Overview of the in situ snow albedo measurements

Leena Leppänen (FMI Sodankylä): Results of questionnaires on snow measurement practices and data assimilation in Europe

Nacho López-Moreno (Spanish National Research Council): Highlights from the field campaigns

KEYNOTE SPEAK Professor Jouni Pulliainen, FMI: "Satellite based research, services and products for high latitude terrestrial areas"

Terhikki Manninen, FMI: "The effect of snow on boreal forest albedo"

Elena Saltikoff, FMI: "Snow forecasts for airports"

Vesa Raulos, Esri Finland: "Esri and GIS in snow management"

Lasse Makkonen, Technical Research Centre of Finland: "Wet snow"

Arttu Jutila, University of Helsinki, Geophysics: "Spatially distributed high-resolution snow evolution modeling"

Teemu Lemmettylä, Finnish Ski Association, "Skiers on Snow"

Paola Livorsi, Sibelius Academy, Helsinki, Finland: "Water, snow, air, fire, earth"

EU Life+ MONIMET-project team, FMI: "Animation of seasonal changes in Finland using MONIMET camera network"

KEYNOTE SPEAK Professor Timo Vesala, University of Helsinki: "From Vertigo to Blue velvet - Connotations between movies and climate change"

PYRY-SEMINAR 1.11.2017 ABSTRACTS (version 31.10.2017)

Wet snow

Lasse Makkonen, VTT Technical Research Centre of Finland

Abstract

Within a limited range of atmospheric conditions, wet snowflakes stick due to capillary forces. Then, if the accumulation rate is faster than the melting rate, wet snow accumulates on an object. On inclined surfaces, the accumulation rate may be much higher than on horizontal surfaces because the speed of wind, at which the snowflakes move, is often an order of magnitude higher than their fall velocity. On the other hand, wet snow readily slides off from inclined surfaces. Therefore, no large wet snow accumulations form on fixed structural components, such as light poles, chimneys and antennas.

However, an overhead electric power-line cable rotates around its axis already under a small non-eccentric snow weight. This makes it possible for a continuous snow sleeve to grow around a cable. Due to the high tensional strength of wet snow, such a circular sleeve does not shed off easily and may thus grow big. Consequently, catastrophic power line failures, with severe indirect losses due to cut-off of electricity, occasionally occur in many countries.

This presentation reviews the conditions of wet snow occurrence, its accumulation mechanisms, and the state-of-the-art models for estimating wet snow accretion on overhead power line cables by meteorological data. The use of WRF-models, with sophisticated cloud microphysics, in forecasting of wet snow events, and in making probabilistic snow load estimates for structural design, is outlined.

Spatially distributed high-resolution snow evolution modeling

Arttu Jutila, University of Helsinki

Abstract

The spatially distributed high-resolution snow-evolution modelling system SnowModel was used to simulate the snow conditions in the Saariselkä region in Northern Finland in winter 2015-2016. SnowModel has not been used to study a domain in Finland before, and the model gives information about variables that are hardly measured in Finland, such as snow sublimation.

The simulations were run also assimilating available snow water equivalent (SWE) observations. The simulation results show that the model needs assimilated SWE observations, preferably more frequent observations towards the spring, to produce physically sensible results. The domain averaged simulated end-of-winter maximum SWE, 220 mm, was reached on 21 April 2016. The simulated SWE patterns match with known elevation and vegetation dependencies. Timing of the first snow, the beginning of the snow season and the end-of-winter SWE are simulated well, whereas the melt and the snowfree date depend on the amount of snow. The assimilation run suggests that the needed summed precipitation is as much as 18 % larger than the observed increasing towards the northeast. Simulated summed blowing-snow and static-surface sublimations reach values up to 27 mm and 22 mm, respectively. The simulated sublimation from the canopy-intercepted snow peaks at 110 mm. Up to 16 % of the precipitation is returned to the atmosphere by sublimation.

The simulation results could be improved by utilizing more detailed data of the study domain and modifying the hard-coded variables to suit the surroundings, which could in turn decrease the need for assimilating SWE observations.

Snow forecasts for airports

Elena Saltikoff, Meteorological Research, FMI

Heikki Juntti, Rovaniemi airport, FMI

Rudolf Kaltenboeck, Austro Control, Austria

Abstract

Snowfall is a challenge for many activities at the airports, from de-icing and runway maintenance to capacity balancing in a network of airports. Weather forecasts can enable improvement efficiency and punctuality of air traffic if they are accurate, forecasting the critical parameters and understood by the end user.

In a survey executed by our project PNOWWA (Probabilistic Nowcasting of Winter Weather for Airports), the end users saw that probabilistic winter weather forecasts could help to make objective decisions.

Largest needs were for lead times 3h and 12-24h forecasts, and among the most important parameters users mentioned moderate and heavy snowfall, freezing rain and drizzle, and sleet.

In PNOWWA project we have developed and tested nowcasts based on extrapolation of movement of radar echoes at steps of 15 minutes, up to 3h. The forecasted radar reflectivity is converted to probabilities of exceeding operationally important thresholds in visibility, accumulated snow depth or other parameters as agreed with the end users. The results of the first demo were good, second demonstration will take place this winter.

Observing large-scale atmospheric moisture transport from multiple sources to analyse severe snow storm in the Baltic Sea region (Invited)

Piia Post, Tanel Voormansik, University of Tartu, Institute of Physics, Estonia; Kalev Rannat, Hannes Keernik, Tallinn University of Technology, Estonia; Rigel Kivi, Finnish Meteorological Institute, Finland;

Abstract

In January 2016 in different parts of Europe severe weather events have been enforced by remote moisture transport from the Atlantic. A detailed analysis is made to the heavy snow event on January 8, Merikarvia, at the coast of Finland. 73 cm of snow was registered in 24 hrs, what is extreme for this area.

Similar snowfalls have been detected from year to year causing serious problems in local road traffic. The mechanism of the snow-events is the same – cold air masses from the continent or ice-covered sea propagate over still open sea surface and initiate convective processes and heavy snowfalls at the coast. It can be easily proved by using moisture distribution and transport that larger scale meteorological processes have also remarkable effect on these hazardous phenomena. For example, for Merikarvia event evaporation from the sea surface only would have been insufficient for this kind of precipitation amount.

We have studied the overall meteorological situation in the North Atlantic European sector at the beginning of January 2016 by two reanalyses: ERA Interim and ERA5. A detailed analysis of atmospheric moisture fields from several sources: atmospheric soundings of GNSS IPW from Finnish and Estonian GNSS networks, as well as GNSS-IPW fields derived from EGVAP GNSS ZTDs and TPW distributions from CM-SAF is carried out. It is demonstrated that the quantities from local GNSS-networks and integration of different networks like EGVAP are a good source for evaluating satellite techniques derived water vapour fields over mid-latitudes.

A special issue of Geophysica (www.geophysica.fi) dedicated to the seminar is planned to publish papers presented either as an oral (= invited presentations) or as a poster presentation.
