

MEMBER COUNTRY: Finland

National Report to SCAR for year: 2011

Activity	Contact Name	Address	Telephone	Fax	Email	web site
<b>National SCAR Committee</b>						
<b>SCAR Delegates</b>						
1) Delegate	Prof. Markku Poutanen	Finnish Geodetic Institute, Geodeetinrinne 2, FIN-02430 Masala, FINLAND	+358-9-29555216		Markku.Poutanen@fgi.fi	<a href="http://www.fgi.fi">http://www.fgi.fi</a>
2) Alternate Delegate	Prof. Kari Strand	University of Oulu, PO Box 7300, FI-90014 Oulu	+358 8 5533556	+358 8 5533564	<a href="mailto:kari.strand@oulu.fi">kari.strand@oulu.fi</a>	<a href="http://thule.oulu.fi/englanti/index.html">http://thule.oulu.fi/englanti/index.html</a>
<b>Standing Scientific Groups</b>						
<b>Life Sciences</b>						
1)	Dr Harri Kuosa	University of Helsinki, Tvärminne Zc	+358 (0)19 280176		harri.kuosa@helsinki.fi	<a href="http://luoto.tvärminne.helsinki.fi/">http://luoto.tvärminne.helsinki.fi/</a>
2)	Prof Jorma Kuparinen	Department of Biological and Envirc	Tel: +358-9-191 57820		jorma.kuparinen@helsinki.fi	<a href="http://luoto.tvärminne.helsinki.fi/">http://luoto.tvärminne.helsinki.fi/</a>
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2)	Dr Jaakko Mäkinen	Finnish Geodetic Institute, Geodeeti	-29554968	-29554862	jaakko.makinen@fgi.fi	<a href="http://www.fgi.fi">www.fgi.fi</a>
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<b>Physical Sciences</b>						
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3)						
4)						

Activity		Contact Name	Address	Telephone	Fax	Email	web site
<b>Scientific Research Program</b>							
1) 2) 3) 4)	<b>ACE</b>	Prof. Kari Strand	University of Oulu, PO Box 7300, FI-90014 Oulu	+358 8 5533556	+358 8 5533564	<a href="mailto:kari.strand@oulu.fi">kari.strand@oulu.fi</a>	<a href="http://thule.oulu.fi/englanti/index.html">http://thule.oulu.fi/englanti/index.html</a>
1) 2) 3) 4)	<b>AGCS</b>						
1) 2) 3) 4)	<b>EBA</b>						
1) 2) 3) 4)							
1) 2) 3) 4)	<b>SALE</b>						
1) 2) 3) 4)	<b>AAA (2010-)</b>						

Activity	Contact Name	Address	Telephone	Fax	Email	web site
<b>ACTION GROUPS</b>						
1) 2) 3) 4) insert others as needed						
<b>EXPERT GROUPS</b>						
1) Geodetic Infrastructure of Antarctica 2) ICESTAR 3) 4) insert others as needed	Prof. Markku Poutanen Dr. Kirsti Kauristie	Finnish Geodetic Institute, Geodeetinrinne 2, FIN-02430 Masala, FINLAND Finnish Meteorological Institute, PO	+358-9-29555216 +358 9 1929 4637		<a href="mailto:Markku.Poutanen@fgi.fi">Markku.Poutanen@fgi.fi</a> <a href="mailto:kirsti.Kauristie@fmi.fi">kirsti.Kauristie@fmi.fi</a>	<a href="http://www.fgi.fi/">http://www.fgi.fi/</a> - GIANT: <a href="http://www.scar.org/researchgroups/geoscience/giant/">http://www.scar.org/researchgroups/geoscience/giant/</a> <a href="http://www.fmi.fi">www.fmi.fi</a>
<b>SCADM</b>						
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<b>SCAGI</b>						
1) 2)	Dr Jaakko Mäkinen	Finnish Geodetic Institute, Geodeeti	-29554968	-29554862	<a href="mailto:jaakko.makinen@fgi.fi">jaakko.makinen@fgi.fi</a>	<a href="http://www.fgi.fi">www.fgi.fi</a>
<b>NATIONAL ANTARCTIC DATA CENTRE</b>						
In Finland there is no central national data centre for Antarctic data. The data is safeguarded at the research institutes and universities which are doing research, like Finnish Meteorological Institute and Geological Survey.						
<b>SCAR DATABASE</b>						
insert name of database for which your country has responsibility						

## A BRIEF SUMMARY OF SCIENTIFIC HIGHLIGHTS\*:

### FINNARP 2010 expedition, December 2010 - January 2011

Carried out at Aboa-station and surrounding areas in Dronning Maud Land in addition to the scientific programs mentioned above also the maintenance and data collection for the AWS and a seismometer which are measuring continuously at Aboa, and the AWS 5, a Dutch weather station about 10 km from Aboa.

#### Researcher Onni Järvinen and Professor Matti Leppäranta, University of Helsinki

During the 2010-2011 season Researcher Onni Järvinen and Professor Matti Leppäranta took part into the FINNARP 2010 expedition.

Järvinen studied the accumulation and ablation of snow as well as the metamorphosis of snow and light penetration into it. Data was collected from the two automatic snow station that were installed during the earlier season.

Leppäranta studied the physics and ecology of supraglacial lakes and nunatak bonds in Basen, Plogen and Fossilrygg. Samples were also taken for soil ecology studies.

#### Geodetic research (coordinator Dr. Jaakko Mäkinen, Finnish Geodetic Institute)

1) Fieldwork:

(i) The GPS station at Aboa is collecting continuous data. It is serviced annually by FINNARP expeditions.

(ii) The time series on the snow stake line for monitoring the close-range snow and ice mass at Aboa has been maintained through the kind support of FINNARP staff.

2) Research:

(iii) The GPS time series at Aboa was in cooperation with the University of Newcastle incorporated in a large-scale recomputation of Antarctic crustal motion, to better correct GRACE estimates of current ice mass balance for postglacial rebound.

(iv) The absolute-gravity time series in the Antarctic by FGI and others were analyzed together with observations of vertical motion, to assess the uncertainty in the z-direction (direction of rotation axis) of the global reference frames. In a bipolar approach, the results were then combined with similar data from Fennoscandia.

#### The changing atmosphere at the Antarctica (Coordinator Prof. Esko Kyrö)

The main objective of the project is to improve the understanding of the impact of climate change in the polar regions and its effect on the recovery of the ozone layer. The project continues the long-term Antarctic ozone soundings and UV data series conducted as Finnish-Spanish-Argentine collaboration. These activities resulted in a PhD-thesis which was accepted in the University of Helsinki at the end of 2010. During 2010-2011 first results were published concerning modeling work on Antarctic ozone hole evolution and the impact of longitudinal variations in the hole appearance.

#### Interhemispheric ionosphere-magnetosphere studies (Coordinator Doc. Ari Viljanen)

Like the name tells, this project studies the interhemispheric relationships in solar-terrestrial physics. The topology of the magnetospheric magnetic field is a critical factor controlling the interhemispheric relationships. The project evaluates the performance of some widely used magnetospheric models in describing the interhemispheric symmetries of auroral phenomena. During 2010 a statistical study of the inter-hemispheric relationships in different geomagnetic conditions (magnetic storm-time activations, sawtooth oscillations and steady magnetospheric convection events) were conducted and the main results were presented in the Oslo IPY 2010 meeting. The work for improved tools for the magnetic mapping between the two hemispheres was started in the change of 2010-2011.

#### Antarctic Meteorology and its Interaction with the Cryosphere and Ocean (AMICO)

Timo Vihma, Finnish Meteorological Institute

Hannu Savijärvi, University of Helsinki

##### Field work

February – March 2010: Participation in a meteorological measurement campaign using research aircraft, based in Rothera, in collaboration with BAS and AWI.

December 2010 – January 2011: Field expedition in Queen Maud Land (Aboa station). Measurements on dynamics and thermodynamics of the atmospheric boundary layer, surface energy balance, albedo, as well as properties and thermodynamics of the upper snow pack. Devices used: unmanned aircraft, tethered sonde, sodar, weather masts, sonic anemometers, radiation sensors.

##### Recent publications:

Vihma, T., M. M. Johansson, and J. Launiainen (2009). Radiative and turbulent surface heat fluxes over sea ice in the western Weddell Sea in early summer. *J. Geophys. Res.*, 114, C04019, doi:10.1029/2008JC004995.

Vihma, T., J. Launiainen, and R. Pirazzini (2009). 20-years of Finnish research on boundary-layer meteorology and air-ice-sea interaction in the Antarctic, *Geophysica*, 45(1-2), 7-26.

Savijärvi, H. (2009). Stable boundary layer: Parametrizations for local and larger scales. *Quarterly Journal of the Royal Meteorological Society*. 135, p. 914-921. 8 p.

Valkonen, T., T. Vihma, S. Kirkwood, and M. M. Johansson (2010). Fine-scale model simulation of gravity waves generated by Basen nunatak in Antarctica. *Tellus*, 62A, 319–332.

Tastula, E.-M., and T. Vihma (2011). WRF model experiments on the Antarctic atmosphere in winter. *Mon. Wea. Rev.*, 139, 1279-1291, doi:10.1175/2010MWR3478.1

Uotila, P., T. Vihma, A. B. Pezza, I. Simmonds, K. Keay, and A. H. Lynch (2011). Relationships between Antarctic cyclones and surface conditions as derived from high-resolution numerical weather prediction data. *J. Geophys. Res.*, 116, D07109, doi:10.1029/2010JD015358.

Vihma, T., O.-P. Mattila, R. Pirazzini, and M. M. Johansson. (2011). Spatial and temporal variability in summer snow pack in Dronning Maud Land, Antarctica. *The Cryosphere*, 5, 187–201, doi:10.5194/tc-5-187-2011.

Vihma, T. (2011). Atmosphere-snow/ice interactions. In: V.P. Singh, P. Singh, U.K. Haritashya (Eds.) Encyclopedia of snow, ice and glaciers. Springer, in press.

Vihma, T., E. Tuovinen, and H. Savijärvi (2011). The effect of the Antarctic katabatic winds on near-surface temperatures. Submitted to J. Geophys. Res.

Stössel, A., Z. Zhang, and T. Vihma (2011). On the Impact of an alternative wind forcing over Southern Ocean sea ice. Submitted to J. Geophys. Res.

Savijärvi, H. (2011). Antarctic local wind dynamics and polynya effects on the Adelie Land coast. Quarterly Journal of the Royal Meteorological Society. 137, 8, p. 1804-1811.

Tastula, E.-M, T. Vihma, and E. L. Andreas (2012), Modeling of the Atmospheric Boundary Layer over Antarctic Sea Ice in Autumn and Winter, Mon. Wea. Rev., 140, 3919–3935. doi: <http://dx.doi.org/10.1175/MWR-D-12-00016.1>

Kouznetsov, R., P. Tisler, T. Palo, and T. Vihma. An evidence of very shallow summertime katabatic flows in Dronning Maud Land, Antarctica. J. Appl. Meteorol. Climatol., in press.

Valkonen, T., T. Vihma, M. Johansson, and J. Launiainen (2012). Atmosphere - sea ice interaction in early summer in the Antarctic: evaluation and challenges of a regional atmospheric model. Q. J. R. Meteorol. Soc., in press.

Kilpeläinen, T., T. Valkonen, and T. Vihma. Antarctic Low-Tropospheric Humidity Inversions: 10-year Climatology, submitted to J. Climate.

## GENERAL

### **Finnish research activities in the Antarctica during 2009-2012.**

The main source of Antarctic research funding in Finland is the Ministry of Education. This funding is distributed by the Academy of Finland.

The Academy funded the following research projects for the period 2009-2012. New funding period starts 2013.

### **Aerosols and snow at the Antarctic coast and continental glacier - Aerosolit ja lumi Etelämantereen rannikolla ja mannerjäätiköllä.**

Contact: Finnish Meteorological Institute, Professor Risto Hillamo

This subproject of the consortium has activities at Dome C and Neumayer stations. The focus is in the relationship between aerosol chemical composition and optical properties.

Extended measurements have been carried out at both stations to reveal seasonal cycles.

### **Aerosols and snow at the Antarctic coast and plateau - Antartican rannikon ja ylätasangon aerosolit ja lumi.**

Contact: University of Helsinki, Professor Markku Kulmala

### **The changing atmosphere at the Antarctica - Etelämantereen muuttuva ilmakehä: Tutkimustyökaluina radioluotaukset, satelliittimittaukset ja ilmakehämallitus. Bi-polaarinen lähestymistapa.**

Contact: Finnish Meteorological Institute, Professor Esko Kyrö

### **Evolution of snow cover and dynamics of atmospheric deposits in the snow in the Antarctica**

#### **- Lumen laadun ja rakenteen evoluutio ja ilmakehän laskeuman dynamiikka Antarktisessa lumipeitteessä.**

Contact: University of Helsinki, Professor Matti Leppäranta

**FINNARP 2009 expedition**, December 2009 - January 2010 at Aboa and surrounding areas in Dronning Maud Land. Field investigations were made on the snow mass balance, snow structure and properties, and solar radiation transfer into snow pack.

### **Dynamical evolution of Scharffenbergbotnen blue ice area since the Late Glacial Maximum.**

Contact: University of Lapland/Arctic Centre, Professor John Moore

### **Stable boundary layer - Antarktisen rajakerros.**

Contact: University of Helsinki, Professor Hannu Savijärvi

### **Cenozoic East Antarctic Ice Sheet History from Wilkes Land Sediments, IODP Expedition 318 - IODP Excursion 322**

Contact: University of Oulu, Professor Kari Strand

<http://iodpfinland.oulu.fi/>

Prof. Kari Strand (Thule Institute, University of Oulu) is leading a research project related to the IODP Wilkes Land Glacial Margin Exp 318 drilled in January-March 2010.

Special interest lies in verifying the onset of Eocene-Oligocene glaciation of the East Antarctica by studying heavy minerals and quartz sand grains in sites U1356 and U1360 in collaboration with shipboard scientists Steve Bohaty, Sandra Passchier, Tina van de Flierdt, Stephen Pekar, Francisco Jimenez and Ursula Röhl.

The records from the Wilkes Land margin are complementary to same time interval obtained from the Prydz Bay during ODP Leg 188. Overall, this collaborative study is important in order to verify the history of the East Antarctic Ice Sheet and to increase our understanding of the future behavior of the Antarctic ice sheet.

2011 Wilkes Land Exp 319 science party meeting will be in Edinburgh

Funding for this research is received from the Finnish Antarctic Research Program by the Academy of Finland and it is done in collaboration of the Institute of Electron microscopy at the University of Oulu

**Antarctic Meteorology and its Interaction with the Cryosphere and Ocean (AMICO)**

Contact: Finnish Meteorological Institute, Docent Timo Vihma

**Crustal movemets in the Dronning Maud Land**

permanent GPS station and absolute gravity in base Aboa; Contact Jaakko Mäkinen, Finnish Geodetic Institute