

## Project information

### Project title

Arctic Winter Processes and Global Change Impacts

### Year

2011/2012

### Project leader

Jarle W. Bjerke, NINA

### Participants

Scientists receiving the incentive funding:

- Jarle W. Bjerke, Senior Researcher, Dr.; NINA (project leader)
- Eirik Malnes, Senior Researcher, Dr.; Norut
- Hans Tømmervik, Senior Researcher, Dr.; NINA
- Jan Åge Riseth, Senior Researcher, Dr.; Norut

Partners:

- Dr. Gareth K. Phoenix, University of Sheffield, UK
- Prof. Terry V. Callaghan, Royal Swedish Academy of Sciences, Sweden and University of Sheffield, UK; Honorary Prof. at Lund University, Sweden
- Dr. Stef Bokhorst, Researcher, Swedish University of Agricultural Sciences, Sweden
- Dr. Cecilia Johansson, Uppsala University, Sweden
- Dr. Susanne Ingvander, Stockholm University, Sweden
- Prof. Mathew Williams, University of Edinburgh, UK
- Prof. Torben R. Christensen, Lund University, Sweden
- Prof. Roland Psenner, University of Innsbruck, Austria
- Prof. J. Hans C. Cornelissen, Vrije Universiteit Amsterdam, The Netherlands
- Chris Routh, ECUS Ltd., UK
- Dr. Hans Winsa, Sveaskog Förvaltnings AB, Sweden
- Dr. Jørgen Mølmann, Dr. Marit Jørgensen and Dr. Matthias Zielke, Bioforsk
- Prof. Serge Bahuchet, National Museum of Natural History, France
- Prof. Martin Grube, University of Graz, Austria
- Dr. Robert Baxter, University of Durham, UK
- Prof. Torbjørn Eltoft and Prof. Arve Elvebakk, UiT
- Dr. Simon James, Royal Haskoning, UK
- Dr Mark Diamond, Environment Agency, UK
- Dr. Dagrun Vikhamar-Shuler and Dr. Jan Erik Haugen, Met.no

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### Flagship

Terrestrial, Theme: Ecosystem effects of extreme climate events and season

### Funding Source

Fram Centre

### Summary of Results

The sum was granted as incentive funding so the Snow&Ice personnel could take part in

the international interdisciplinary MULTIPLI consortium, which consists of scientists and advisors from seven level-1-partners (University of Sheffield, University of Edinburgh, NORUT, NINA, Lund University, University of Innsbruck and Vrije Universiteit Amsterdam) and ten level-2-partners (ECUS Ltd, Sveaskog Förvaltnings AB, Norwegian Institute for Agriculture & Environment, National Museum of Natural History Paris, University of Graz, University of Durham, University of Tromsø, Royal Haskoning, Royal Swedish Academy of Sciences, and UK Environment Agency). Jack Kohler at the Norwegian Polar Institute is also in the Snow&Ice initiative, but he is not involved in this particular project to which the incentive funding was granted.

As said in our flagship proposal from December 2010, the MULTIPLI consortium was planning a proposal, which was submitted to the Marie Curie Initial Training Networks Programme of EU's FP7. Regrettably, the proposal was rejected, but the overall score was quite good, so we are putting together an improved proposal, which will be submitted in early 2012, probably with additional level-1 and level-2 partners than those mentioned above.

In our proposal we also stated that we would aim for additional national grants. In accordance with this, a proposal was submitted to the Research Council of Norway programme NORKLIMA in August, and we are awaiting the decision. The title of this proposal is "Extreme winter warming in the High North and its biological effects in the past, present and future" (EWWA – PI: Jarle W. Bjerke). Some of the partners mentioned above are only participating on this proposal, and not on MULTIPLI, while some partners are involved on both MULTIPLI and EWWA.

Jan Åge Riseth was PI on a proposal that was submitted to Nord-Norges Forskningsfond. The title was "Climate Change, Sámi Reindeer Herders' Adaptability & Technological Assistance" (Clim Adapt). This proposal was rejected.

As stated above, the Snow&Ice initiative also has had other activities in 2011, but the primary use of the incentive funding was to develop the above-mentioned proposals. Nevertheless, we include here a few highlights of other activities.

- Field campaign in Jarin, northern Sweden, mid-March 2011: Measurements of snow depth and snow density using newly developed conductance technology, snow hardness, characterization of snow crystals using new imaging methodology, and measurements of snow layering. Recording of Sami terms for characterization of snow and grazing conditions.
- Abisko, northern Sweden, June-Aug 2011: Monitoring of recovery in experimental vegetation plots which were subjected to experimental winter warming during 2007-2009.
- Malnes: Updated snow climatology 2010/2011, reprocessing of results. Reported to ISIS2.
- Malnes: Contribution to "User requirement document" and "Product specification document", FP7 CryoLand deliverables.
- Malnes: Contribution to chapter in Report for Assessment for CoReH2O, ESA report Dec., 2011.
- Negotiations with ESA for participation in GlobSnow- Snow cover and Snow water equivalent – as climate variables. Processing system.

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#### Published Results/Planned Publications

The incentive funding has not directly lead to any publications (as stated above, proposal submissions were the primary objective and the reason why we got the funding). However, we have recently published relevant results, based on other types of funding. So, just for the record, we include them here:

- Rott H., D.Cline, C.Duguay, R. Essery, P. Etchevers, I. Hajnsek, F. Hélière, M.Kern, G. Macelloni, E. Malnes, A. Lecuyot, J.Pulliainen and S.Yueh, "CoReH2O, a dual frequency radar satellite for cold regions", IGARSS-2011, Vancouver, Canada, 24–29 July. 2011.
- Triebnig G., A. Diamandi, R. Hall, E. Malnes, L.Marklund, S.Metsämäki, T. Nagler, J. Pulliainen, H.Rott, C.Schiller, R.Solberg, A. Wiesmann, "CryoLand – GMES Service Snow and Land Ice – Interoperability, Service Integration and User Access", Proceedings to ISESS, the International Symposium on Environmental Software Systems, Brno, Czech Republic, June 27– 29, 2011.
- Bokhorst S., Phoenix G.K., Bjerke J.W., Callaghan T.V., Huyver-Brugman F. & Berg M.: Extreme winter warming events more negatively impact small rather than large soil fauna: shift in community composition explained by traits not taxa. *Global Change Biology*
- Dana, Leo Paul & Jan Åge Riseth (2011). Reindeer Herders in Finland: Pulled to Community-based Entrepreneurship & Pushed to Individualistic Firms. *The Polar Journal*, <http://dx.doi.org/10.1080/2154896X.2011.568795>.
- Tømmervik H., Bjerke J.W., Gaare E., Johansen B., Thannheiser D.: Rapid recovery of recently overexploited winter grazing pastures for reindeer in northern Norway. *Fungal Ecology*
- Bjerke J.W., Bokhorst S., Zielke M., Callaghan T.V., Phoenix G.K. 2011: Contrasting sensitivity to extreme winter warming events of dominant sub-Arctic heathland bryophyte and lichen species. *Journal of Ecology* **99** (6): 1481–1488.
- Bokhorst S., Bjerke J.W., Street L.E., Callaghan T.V., Phoenix G.K. 2011: Impacts of multiple extreme winter warming events on sub-Arctic heathland: phenology, reproduction, growth, and CO2 flux responses. *Global Change Biology* **17** (9): 2817–2830.
- Bjerke J.W. 2011: Winter climate change: Ice encapsulation at mild subfreezing temperatures kills freeze-tolerant lichens. *Environmental and Experimental Botany* **72** (3): 404–408.
- Riseth, J. Å., Tømmervik, H., Helander-Renvall, E., Labba, N., Johanson, C., Malnes, E., Bjerke, J.W., Jonasson, C., Pohjola, V., Sarri, L.E., Schanche, A. & Callaghan, T.V. 2011. Sámi TEK as a guide to science: Snow, ice and reindeer pasture facing climate change. *Polar Record*.
- Ween, Gro B. & Jan Åge Riseth (Accepted). Doing is learning: Analysis of an unsuccessful attempt to adapt IK methodology to Norwegian Sámi circumstances. *Acta Borealia*.

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#### Communicated Results

The incentive funding has not directly lead to any communications (as stated above, proposal submissions were the primary objective and the reason why we got the funding). However, we have recently communicated some relevant results, based on other types of funding. So, just for the record, we include them here:

- Malnes E., J.Å.Riseth, C. Johansson and H. Tømmervik, "Satellite monitoring of Snow on reindeer pastures in Northern parts of Sweden and Norway", Oral presentation in Proceedings to EARSeL LIS workshop, Bern, February 7-9, 2011.  
<http://www.earsel.org/SIG/Snow-Ice/workshops.php>
- Malnes E., Solberg R. and R. Hall, "The Scandinavian snow service within Polarview" ", Poster presentation in Proceedings to EARSeL LIS workshop, Bern, February 7-9, 2011.  
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- Malnes E., H. Rott, D.Cline, P. Etchevers, I. Hajsek, M.Kern, G. Macelloni, „T. Nagler, J. Pulliainen, S.Yueh, "CoReH2O, a future satellite mission for exploration of the cryosphere", Nordic remote sensing days, Tromsø, Norway, August 30-31, 2011.  
<http://www.nordicrsdays2011.no/>
- Participation at Conference: Nordic Remote Sensing days, 30-31 August 2011, Tromsø. Poster Session: Poster 11. Tømmervik, H., Bokhorst, S.F, Bjerke, J.W, Callaghan, T.V. and Phoenix, G.K. Winter warming damage to sub-Arctic vegetation detected and monitored from space.
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- Invited participation at International workshop, CNRS, Paris, 14-17 June 2011. Talk. Riseth, J.Å. Challenges of Integrating Local/Indigenous Knowledge into a Scientific Framework.

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#### Interdisciplinary Cooperation

The above mentioned proposals are all highly multidisciplinary in their approach, involving scientists and environment advisors/consultants from a range of disciplines, i.e. ecology, meteorology, climatology, sociology, economy, remote sensing, physics, nature-based industries, atmospheric chemistry, ecophysiology, etc.

As these proposals yet not have resulted in any initiated projects, we cannot use them as fundament for evaluating positives and negatives. From previous interdisciplinary projects, we have strongly positive experiences with such collaborations.

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#### Budget in accordance to results

The funding from Fram Centre has been crucial for bringing forward new and innovative research ideas. The ideas have materialized as proposals for national and international funding, as stated above.

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Could results from the project be subject for any commercial utilization

No

If Yes

Not directly related to the incentive funding, but strongly linked: Results from satellite-based snow mapping service can potentially be commercialized. Ongoing processes with KSAT (under ESA Polarview and EU CryoLand) could result in operational and sustainable services for the government and the hydropower market (Malnes).

#### Conclusions

Incentive funding: No results yet to report.