European Partnership in Polar Climate Science
PolarCLIMATE

PolarCLIMATE Project: Progress Report

Submission deadline: 3 May 2013

Important :

- The document is to be filled in by the project coordinator and should be returned to ESF as a Word (.doc) document.
- Please note that this document should be considered as **Final Report** in case your project is completed, or as **Progress Report** should it still be continuing.

1. Overview of the PolarCLIMATE project

Title and Acronym: Sensitivity of Svalbard glaciers to climate change (SvalGlac)

Project Coordinator: Jacek A. Jania, University of Silesia, Poland
Francisco Navarro, Technical University of Madrid, Spain

Principal Investigators: Friedrich Obleitner (UI), Austria
Rein Vaikmäe (IG TUT), Estonia
John Moore (AC), Finland
Dieter Scherer (TU), Germany
Daniela Mansutti (IAC), Italy
Jacek A. Jania (US), Poland
Francisco Navarro (UPM), Spain
Veijo Pohjola (UU), Sweden

Associated Partners: Jon Ove Hagen (UiO), Norway; Carleen Tijm-Reijmer (IMAU), the Netherlands; Andrey Glazovskiy (IGRAS), Russia; Xiao Cheng (BNU), China; Regine Hock (UAF), USA

Project start and end dates: 1.03.2010 – 31.12.2013

Project website: http://svalglac.eu

Scientific & technical personnel involved in the Project

Personnel directly funded under the PolarCLIMATE budget
(Name, position, contract start/end dates; estimated percentage of work time dedicated to the programme)

Austria
Florian Karner, PhD, 01.01.2012 – 31.12.2012, 100%
Gerhard Fiegl, field assistant, 01.05.2012 – 31.05.2012, 0.01%

Estonia
Hannes Martma, technical support, 1.01.2012 – 31.12.2012, 80%
Tõnu Martma, Senior Researcher, 1. 01.2012 – 31.12.2012, 10%

Finland
Rupert Gladstone, PostDoc, May 2012 – Dec 2012, percentage 100%
Tiimo Riikilä, part of his PhD, 01 – 06/2012, percentage 100%

Germany
Roman Finkelnburg, PhD Student, year round, 100%
Marco Möller, PostDoc, year round, 90%

Italy
Dr. Ing. Edoardo BUCCHIGNANI, permanently employed at Centro Italiano Ricerche Aerospaziali, enrolled within the project for writing and testing the computational code; contract start: October 16, 2012 – contract end: April 16, 2013; work-time reserved: 50%

Poland
Dr. Joanna Szafraniec, PostDoc, 28.05.2012 – 10.12.2012, 38% of work time in 2012
Tomasz Budzik, technician, 3.07.2012 – 29.11.2012, 29% of work time in 2012
Lidia Falkowska-Winder, support, 17.07.2012 – 29.11.2012, 10% of work time in 2012

Spain
None

Sweden
None

Personnel funded through sources other than the PolarCLIMATE budget
(Name, position, nature of involvement)

Austria
Prof. Dr. Friedrich Obleitner, Professor

Estonia
Prof. Dr. Rein Vaikmäe, Full Professor, 1.01.2012 – 31.12.2012, 100%
Dr. Tõnu Martma, Senior researcher, 1.01.2012 – 31.12.2012, 90%
Hannes Martma, technical support, 1.01.2012 – 31.12.2012, 20%

Finland
Prof. Dr. John Moore
Martina Schäfer, PostDoc, whole year 2012, ice dynamical modelling of Vestfonna ice-cap/Nordaustlandet

Germany
Prof. Dr. Dieter Scherer, Full Professor, whole year (coordination of climatological research including field work)
Prof. Dr. Christoph Schneider, Full Professor, whole year (coordination of glaciological research including field work)

Italy
Dr. Daniela Mansutti
Dr. Edoardo Bucchignani
Rossella Cossu
Andrea Di Mascio
Dr. Alessandro Forieri
Dr. Giuseppe Pontrelli

Poland
Prof. Dr. Jacek Jania, Full Professor (Project Coordinator, field work coordination and studies of glacier dynamics and calving intensity, data analysis and interpretation)
Prof. Dr. Piotr Głowacki, Associate Professor (field work coordination, mass balance of S Spitsbergen glaciers, data analysis and interpretation)
Dr. Małgorzata Błaszczyk, Eng., PostDoc (inventory of glaciers, remote sensing studies on fluctuation of tidewater glaciers and geometry changes, data analysis and interpretation)
Dr. Mariusz Grabiec, PostDoc (field work, studies on snow accumulation, modelling, GPR sounding, internal structure and drainage of glaciers, data analysis and interpretation)
Dr. Joanna Szafraniec, PostDoc, (fractal analysis of shapes of glaciers, data interpretation, grains size analysis within outwash fans, coordination secretary, webmaster and editor of the project web site)
Dr. Leszek Kolondra, Eng., Senior Research Scientists (mapping of fluctuation of tidewater glaciers, survey data analysis on glacier dynamics)
Dr. Dariusz Puczko, Research Assistant (glacial flow modelling, data analysis and interpretation, mass balance calculations)
Dr. Bartłomiej Luks, technician (snow cover modelling, data analysis and interpretation, mass balance calculations)
Tomasz Budzik, technician (maintaining the AWSs, climate data collecting, analysis and modelling, field assistant)
Michał Laska, PhD Student (snow data collecting and analysis, maintaining the field equipment, field assistant)
Jarosław Hałat, MSc Student (data analysis – master thesis)
Grzegorz Żołna, MSc Student (data analysis – master thesis)

Spain
Prof. Dr. Francisco Navarro, Co-coordinator
Dr. Javier Lapazaran, Interim Associate Professor
Dr. Jaime Otero, Assistant Professor
Dr. Francisco Machío, Assistant Professor
Dr. Maria Luisa Cuadrado, Associate Professor
Dr. Maria Isabel Corcuera, Associate Professor
Alba Martín, PhD Student, funded by Ministry of Science and Innovation, 50% time devoted to SvalGlac project (preparation of catalogue of radio-echo sounded glaciers on Svalbard and corresponding ice volume estimates)

Sweden
Veijo Pohjola, Professor, Associate partner
Rickard Pettersson, Associate Professor
Björn Claremar Carlsson, PostDoc
Sergey Marchenko, PhD Student

The Netherlands
Prof. Dr. Carleen Reijmer, Assistent Professor, Associate partner
Ward van Pelt, PhD Student
Wim Boot, technical support

Russia
Dr. Andrey Glazovskiy, Associate partner, Research Scientist (work coordination, data analysis and interpretation)
Dr. Ivan Lavrentiev, Research Scientist (RES field studies, data analysis and interpretation)
Dr. Yuri Macheret, Research Scientist (data analysis and interpretation)

Progress report and scientific highlights (please describe the progress made and the scientific highlights since the beginning of the project)

Coordination activity
The SvalGlac Coordination Secretariat has been involved in communication between Partners and coordination of common field work by groups of partners. Preparation of the previous year comprehensive report to the ESF has been done. The project web site http://svalglac.eu has been maintained (with significant contribution of Technical University of Madrid, Spain and input from other PIs). Link to the TU Berlin Knowledge Base portal http://www.klima.tu-berlin.de/KB/SvalGlac/ is kept. The project's Steering Committee Meeting was prepared and held in Uppsala, Sweden on 27th October 2012 (hosted by the Uppsala University). Besides brief reporting of progress in activity of working groups and national teams, state-of-the-art and plans of publications has been presented and discussed (http://svalglac.eu/reports.htm). Next SSC Meeting in Obergurgl (Austria) in February 2013 has been prepared.

Preparation and development of data bases
The catalogue of radio-echo sounded Svalbard glaciers available from previous years' work was extended as new echo-soundings were performed by SvalGlac partners and also new GPR data was obtained from researchers external to the SvalGlac project. The newly available GPR data was used to continue expanding the pool of computed glacier ice volumes (with corresponding error estimates).
Update of the Hornsund meteorological and glaciological database http://www.glacio-topoclim.org/
Glaciological and meteorological data gathered in past years went through processing procedures and were used in two PhD dissertations (Poland):

- "Spatial and temporal dynamics of tidewater glacier flow – Hansbreen case study" by Dariusz Puczko – worked on ice flow velocities. He calculated and compared surface, deformation and basal ice flow of Hansbreen and gave insight into in-glacial hydraulics and seasonal flow speed-ups;
- "Snow cover dynamics in SW Spitsbergen" by Bartłomiej Luks – how different types of snow cover models perform in glacial environment.

Update of the Kongsvegen and Vestfonna mass balance meta data base http://imgi.uibk.ac.at/node/617
Update of the Kongsvegen and Vestfonna automatic weather station data base
http://imgi.uibk.ac.at/node/618
Update of SSF data base
http://zope.data.npolar.no/svalbard/search/select_index_html7_script?project_id=4660

Field work
Termination of field studies on Vestfonna ice cap by German team: field campaign in May 2012 (3 weeks, 4 persons), data download at two AWS (Vestfonna and De Geerfonna), measuring stake networks on Vestfonna and De Geerfonna, snow pits at AWS on Vestfonna and De Geerfonna, removal of all AWS and stakes.
The Russian-Spanish team performed radio-echo sounding (RES) fieldwork in western Nordensiöld Land

glaciers during 12 – 28 April 2012, with logistic support from the Russian Academy of Sciences Research Station in Barentsburg. This work was aimed to determine the glacier ice thickness (and associated volume) and hydrothermal state. The total length of RES profiles was 237 km, including 180 km on Fridtjofbreen, 31 km on Erdmanbreen and 18 km on Dahlfonna.
The Netherlands & Sweden – in spring 2012 regular maintenance work of the equipment installed on Nordenskiöldbreen (Lomonosovfonna), Duvebreen and Basin no3 (Austfonna) and Kronebreen, was carried together with colleges from Uppsala University, University of Oslo and Norwegian Polar Institute. This monitoring program is an extension of the IPY-GLACIODYN and IPY-KINNVIKA projects.
The maintenance work consisted of visiting and replacing GPS stations on all glaciers, and servicing the automatic weather station on Nordenskiöldbreen. On Nordenskiöldbreen we further sampled a number of snow pits, drilled a shallow ice core and retrieved snow radar profiles. The observational records are now 4 to 6 years long and results are currently being published.
Austria (09 April 2012 until 23 April 2012): maintenance of Kongsvegen automatic weather stations (AWS), reduce Kongsvegen AWS network leaving 2 stations, set up AWS at Kronebreen, Midre Lovenbreen and Austre Broggerbreen for investigation of regional characteristics of katabatic winds, clean up abandoned measurement sites to comply with Svalbard Science Forum regulations and return of equipment not used any more, assist Kongsvegen routine snow and mass balance work performed by NP, Tromsoe.
Polish field campaigns:

- spring 2012: very limited in time and field work due to very difficult weather and sea ice conditions – maintaining the field equipment on Hansbreen, Werenskioldbreen and at the forefield of this glaciers;
- summer 2012: maintenance of AWSs on Hansbreen, mass balance and snow studies, measurements of short wave radiation, albedo and properties of snow surface (physic-chemical properties and densities), time lapse terrestrial scanning of ice cliff, series of Hansbreen front position with use of laser scanning (cooperation with the Centro de Estudios en Zonas Aridas Avanzados in Chile), record of mini-tsunami by sea level divers, time lapse cameras maintenance, precise measurements of stakes location on the glacier front for cameras calibration purposes, tests of photopoints on glaciers for the automatic cameras calibration;
- meteorological data collection, accumulation and ablation measurements on ablation stakes in altitudinal profile on the Hans Glacier; maintenance of the equipment round year – the Polish Polar Station team.

Data analysis from field work, laboratory and remote sensing
Estonia: Lomonosovfonna 2009 ice core δD and $\delta^{18}O$ analysis were continued, cooperation with Paul Scherrer Institut (Switzerland), NPI (Norway) and Uppsala University (Sweden). A 149 m long ice core was drilled at Lomonosovfonna in spring 2009 and transported to Bern and sampled by now: 4000 samples for isotopes, chemistry and black carbon. Isotope measurements was finished in January 2013 (half in Bern and half in Tallinn).
Holtedahlfonna 2012 shallow core δD and $\delta^{18}O$ measurements were completed (cooperation with NPI and Institute for the Dynamics of Environmental Science, Venice, Italy). First results were presented at IPICS, (Gabrieli et al, 2012).
Lomonosovfonna and Austfonna shallow core $\delta^{18}O$ measurements (cooperation with Uppsala University). Results of $\delta^{18}O$ measurement will be used for dating and interpreting the paleoclimatolocical conditions.
Jan Mayen shallow core δD and $\delta^{18}O$ measurements (cooperation with Arctic Center) (in progress).
Sea ice studies in Svalbard area (cooperation with NPI). The spring sea ice evolution in Rijpfjorden was studied. A paper (Wang et al), accepted Annals of Glaciology, 54 (62).
Austria:

- complete analyses of decadal meteorological and mass balance data; see Karner F., F. Obleitner, Th. Krismer, J. Kohler, W. Greuell, 2012),
- evaluate 2010 – 2012 energy balance and mass balance at a key site on Kongsvegen glacier (see Karner F., F. Obleitner, F. Bilgeri, J. Kohler, G. Jocher, J. Reurder, 2012),
- develop Kongsvegen meteorological data sets for RCM validation studies (cooperation with University Uppsala; see Claremar B., F. Obleitner, C. Reijmer, et al., 2012),
- develop long-term data sets for validation of a new surface mass balance model using gridded climate

data (cooperation with IMAU, Utrecht; see Giesen R. H. and Oerlemans, J., 2012),
- process turbulence data measured at Kongsvegen glacier in spring 2011 (cooperation with AWI, Bremerhaven; see Jocher G., F. Karner, Ch. Ritter, F. Obleitner et al., 2012, Jocher G., F. Karner, F. Obleitner, J. Reuder, Ch. Ritter, R. Neuber, K. Dethloff, and Th. Foken, 2012),
- analyze snow microstructure data measured at Kongsvegen glacier (see Bilgeri F., F. Karner, W. Steinkogler, R. Fromm, F. Obleitner, and J. Kohler, 2012),
- analyse data for SLF, Davos (Switzerland) and LGGE (Grenoble) to initiate common investigation of snow characteristics.

Poland: The geometry of both the surface and the bed of the Hans Glacier obtained from GPR and GPS measurements in the years 2005 to 2011 was analyzed. It was pointed out that the main morphological characteristics of the bed and slopes (direction of the glacial valleys, the occurrence of trims, asymmetry of slopes and others) refer to the course of tectonic lines (faults and overthrust). The topography of the surface reflects (more or less) the morphology of the glacier bed. Depressions in the bed, separated by distinct thresholds significantly influence on sub- and inglacial drainage conditions and consequently the glacier movement by sliding. The volume of the glacier was estimated at 9.6 km^3.
Discharge of meltwater directly from the outflows of the Werenskiold Glacier was calculated on the basis of field data measured in 2011 in two sessions: on 27 and 29 July 2011 – 8.26 and 9.18 m^3/s respectively. In the same time discharges in a profile closing the Werenskiold Glacier catchment were calculated at 6.71 and 7.03 m^3/s respectively. This indicates big retention capacity of the inner part of the glacier marginal zone in this period (master thesis of J. Hałat). Results are important for verification the subglacial drainage system modelling.
The work on the multi-year fluctuations of tidewater glaciers since the beginning of the twentieth century in Hornsund at Spitsbergen was finished – on the basis of four-year series of 38 satellite radar images (ERS SAR and Envisat ASAR). Radar images were obtained free of charge from the ESA, the project C1P.9630 - Seasonal and multi-year tidewater glaciers fluctuations of cliffs, Southern Spitsbergen, Svalbard (for SvalGlac purposes).

Modelling

The work of the German team included:

- Surface-albedo model for Vestfonna: development of a minimal, statistical model for calculations of monthly surface-albedo fields of the ice cap on the basis of air temperature and precipitation data only; implementation of the albedo model as a sub-module into a climatic mass balance model of the ice cap;
- Reconstruction of climatic mass balance of Vestfonna: development of a reconstruction model for the climatic mass balance of the ice cap; modelling of the climatic mass balance of the ice cap on a daily resolution for the mass-balance years 1979/1980 to 2010/2011 on the basis of statistically downscaled ERA-Interim data;
- WRF modelling: The period of the regional reanalysis by the Polar Weather Forecast and Research model (PWRF) was extended to the period September 2000 to August 2011. The data set is now available for all 30, 10 and 2 km domains. Easy-to-use netCDF products have been processed for simplification of analyses and data exchange. Results from the regional reanalysis have been compared and analysed with AWS data in the region of Vestfonna and synoptic observations in Hopen, Hornsund, Longyearbyen and Ny-Ålesund have been conducted (cooperation with the Netherlands, Sweden, Austria, Poland);
- Snowdrift model for Vestfonna: development of a physically-based, high-resolution (250 m) snowdrift model driven by WRF output; successful application of the model for the southwestern part of the ice cap and the adjacent fjell areas;
- Air temperature gradients on Vestfonna: measured and reconstructed air temperature gradients using a statistical reconstruction methods and dynamical downscaling from the reanalysis have been analysed.

The work of the Spanish team included:

- Co-operative work with the Italian team on the thermo-mechanical modelling of the Amundsenisen icefield, aimed to determine the feasibility of subglacial lake conditions;
- Improvements to the 2D full-Stokes (Elmer) modelling of the transient dynamics of Hansbreen,

including a Benn-type calving low. These included improved basal boundary conditions (introducing an initialization scheme according to Arthern & Gudmundsson, 2010) and improved treatment of lateral drag (in cooperation with other teams).

The work of the Finnish team included:

- VSF/ASF modeling: inverse model for basal drag, study of role of heat sources: highlights included the observation of speed up of Fanklinbreen in Vestfonna and Basin 3 in Austfonna;
- Calving: development of af discrete particle model with novel simulations of calving on glaciers.

The work of the Italian team included:

- development of the numerical simulation of the Amundsenisen icefield/subglacial lake with uniform water content of (temperate) ice;
- inconsistencies are observed in a) icefield velocity and b) lake thermal field. Causes are identified: a) the formula, introduced into the mathematical model and numerical code, for the flow rate function (Glen's law), adopted from The Physics of Glaciers, W.S.B. Paterson, 3rd ed. (reprinted with corrections, 2002) in the case of temperate ice, *due to a misleading use of the notation in the text*, was affected by an error; b) from heat balance theoretical analysis – the firn layer and the snow layer must be included in the model and the depth of the conjectured subglacial lake must be higher than a threshold value in order to allow the heating of the subglacial water to overcome the metastable state and be in liquid phase;
- after implementation of changes from a) and b) – the development of final numerical simulations of the Amundsenisen icefield/subglacial lake:
  i) temperate icefield with constant water content (Duval, 1977) – corrected-;
  ii) temperate icefield with water content depending on depth and flow rate function depending on water content and temperature (Vallon et al. 1976);
  iii) comparison of the numerical results obtained with all-temperate icefield (both ice types, i) and ii)) vs. temperate icefield covered by firn layer vs. temperate icefield covered by snow and firn layers;
  iv) comparison of systems with different lake depth.
  Results from iii) and iv) confirm that inconsistencies have been understood and overcome.
- a paper is being completed on the mathematical and numerical model of the Amundsenisen icefield/subglacial lake system and the above simulation tests (to be submitted to Intl. J. Sci. Comp. or Meccanica).

Austria:

- complete the long-term (decadal) simulations of the mass an energy balance at about the ELA of Kongsvegen glacier ; see Karner F., F. Obleitner, Th. Krismer, J. Kohler, W. Greuell, 2012),
- start development of a model chain for Monte-Carlo type simulations of the long-term mass and energy balance at a key site on Kongsvegen glacier addressing better quantification of the inherent uncertainties (to be presented at the SSC Meeting in Obergurgl, Austria in February 2013),
- perform initial simulations of the seasonal evolution snow micro-structure observed at several sites on Kongsvegen glacier during 2010 – 2012 (presented at EGU 2012 and at the forthcoming Davos Atmosphere and Cryosphere Assembly DACA-13),
- Contribute to validation of a regional climate model (WRF) aiming at quantification of the skill of the model to simulate the atmospheric conditions over different glaciers on Svalbard in order to apply the model output for investigation of their mass and energy balance in a climate perspective (cooperation with University Uppsala; see Claremar B., F. Obleitner, C. Reijmer, et al., 2012),
- contribute to validation of a new surface mass balance model using gridded climate data developed by IMAU, Utrecht (see Giesen R. H. and Oerlemans, J., 2012),
- Contribute to development of a paper on the meso-scale atmospheric processes in the Kongsvegen environment (see Esau I. and I. Repina, 2012).

Changes in the work plan or in the Consortium composition (please add new cooperation with researchers from other research institutes)

Estonia: Planned fieldwork in Amundsenisen in spring 2012 was canceled because of unfavourable ice conditions in Svalbard fiords. It was impossible to transport people and equipment to Hornsund station. Picarro laser instrument (Picarro L2120-i) is working after repair in early spring in USA and is now our main instrument for δD and $\delta^{18}O$ analysis of ice core samples.

Germany: A Project is officially extended till 31 December 2013.

Italy: We have a delay in the development of the final results motivated by a mistake introduced in our mathematical model and numerical code (see Third year activity, second step above). In consequence of this we had to re-develop the whole numerical simulations. Anyways we plan to reach the goals of our IP by the end of 2013, according to the extended end date of the project.

Poland: The spring 2012 expedition was failed due to the lack of sea ice on Svalbard fjords and consequently logistics problem to get to the Polish Polar Station in Hornsund. Planned drilling of shallow ice cores on Amundsenisen glacier plateau and other field work failed. Part of tasks of planned field work (maintenance of AWSes and time lapse cameras) was kindly fulfilled by the permanent crew of the Polish Polar Station. Shallow ice coring combined with high frequency radar profiling was shifted to the 2013 spring field campaign planned in cooperation with Estonian colleagues.

Spain: The fieldwork planned for spring 2012 in Hornsund area (with logistic support from Hornsund Polish Polar Station) could not be done due to the inaccessibility of the station because of lack of sea ice on Van Mijenfjorden. This fieldwork was replaced by fieldwork in western Nordeskiöld Land, with logistic support from the Russian Academy of Sciences Research Station in Barentsburg. The fieldwork originally planned for Hornsund area was postponed to Spring 2013, which fits within the approved extended period for SvalGlac project (ending 31 Dec 2013).

Austria:
A proposal for a cost neutral extension of the project duration until December 2014 has been submitted to the national funding agency (FWF) due to various reasons. These include some delay in data evaluation and related modelling due to more extensive field work than originally planned (snow measurements in particular) and discontinuation of the project related PhD work by the end of 2012. Perspectives for proper achievement of the proposed work are developed. However, there will be some inevitable delay until the Postdoc will be effectively in work.

Budgetary issues (please indicate here deviation from the planned expenses of the project, investments outside the project or money for additional research support, etc...)

Estonia: For last 2 years Estonian team did not participate in fieldwork on Svalbard, rather were working with earlier drilled ice cores in the cold laboratory of the Norwegian Polar Institute, collecting samples and transporting to Tallinn. As the finances, planned for fieldwork were not used as planned at the beginning of project, the Estonian Research Council suggested to prolong the usage of SvalGlac budget up to the end of 2013!

Italy: No deviation from planned income/outcome.

Poland: Task No. 2 “Field work” was finished in November 2012 but some funds have not be used (1/10 of task costs) due to failure of the spring 2012 expedition to Hornsund. This funds will be transferred on other tasks. We received permission from the National Centre of Research and Development to extend the project to the end of 2013.

Spain: The cancellation of the Hornsund spring 2012 campaign and its substitution by the Barentsburg campaign implied some savings. This will allow to partly fund (ca. 6000 €) the spring 2013 fieldwork planned within the extended period (ending 31 Dec 2013) of the SvalGlac project. The rest of funding needed for the campaign will come from a Polar Research Project funded by the Spanish Ministry of Economy and Competitiveness.

Austria:
Due to several saving measures (collaborative field work, partly financed by specifically developed side projects), the Austrian national project secures money to employ a 14 month Postdoc. This allows for continuation of project work based on the discontinued PhD work and to accomplish proposed project work within the extended project duration. There will be no more project specific field work and all effort will go towards enhanced data evaluation and modelling as proposed.
Some field equipment sent back to Austria in May 2012 got lost for still unknown reasons. Clarification by the involved transport companies is still pending.

Scientific publication and outreach (please mention published papers related to the project or outreach and education activities (e.g. conference attendance etc...)

Scientific papers:

- Aström J.A., T.I. Riikilä, T. Tallinen, T. Zwinger, D. Benn, J.C. Moore, J. Timonen, 2013: A particle based simulation model for glacier dynamics. The Cryosphere Discuss., 7, 921 – 941, doi:10.5194/tcd-7-921-2013
- Beaudon E., Moore J.C., Martma T., Pohjola V.A., van de Wal R.S.W., Kohler J., Isaksson E. A 300 years environmental and climate archive for western Spitsbergen from Holtedahlfonna ice core. Submitted Journal of Glaciology.
- Błaszczyk M., 2012: Capability of glacier zone detection using radar images - ERS SAR and ALOS PALSAR (in Polish, abstract in English). Archiwum Fotogrametrii, Kartografii i Teledetekcji, 24, 21 – 30.
- Claremar B., F. Obleitner, C. Reijmer, et al., 2012: Applying a Mesoscale Atmospheric Model to Svalbard Glaciers, Advances in Meteorology, vol. 2012, Article ID 321649, 22 pages, 2012. doi:10.1155/2012/321649, http://www.hindawi.com/journals/amet/2012/321649/.
- Dunse T., T.V. Schuler, J.O. Hagen, and C.H. Reijmer, 2012: Seasonal speed-up of two outlet glaciers of Austfonna, Svalbard, inferred from continuous GPS measurements. The Cryosphere, 6, 453 – 466, doi:10.5194/tc-6-453-2012.
- Grabiec M., Budzik T., Głowacki P., 2012: Modelling and Hindcasting of the Mass Balance of Werenskioldbreen (Southern Svalbard). Arctic, Antarctic and Alpine Research, 44(2), 164 – 179.
- Grabiec M., Jania J.A., Puczko D., Kolondra L., Budzik T., 2012 : Surface and bed morphology of Hansbreen, a tidewater glacier in Spitsbergen. Polish Polar Research, 33(2), 111 – 138.
- Gulley J.D., Grabiec M., Martin J.B., Jania J., Catania G., Głowacki P., 2012: The effect of discrete recharge by moulins and heterogeneity in flow-path efficiency at glacial beds on subglacial hydrology. Journal of Glaciology, 58(211), 926 – 940.
- Jocher G., F. Karner, Ch. Ritter, F. Obleitner et al., 2012: The Near-Surface Small-Scale Spatial and Temporal Variability of Sensible and Latent Heat Exchange in the Svalbard Region: A Case Study, ISRN Meteorology, vol. 2012, Article ID 357925, 14 pages, 2012. doi:10.5402/2012/357925, http://www.isrn.com/journals/meteorology/2012/357925/.
- Karner F., F. Obleitner, Th. Krismer, J. Kohler, W. Greuell, 2012: A decade of energy and mass balance investigations on the glacier Kongsvegen, Svalbard, in press at JGR-Atmospheres, http://www.agu.org/pubs/crossref/pip/2012JD018342.shtml.
- Martín-Español A., E.V. Vasilenko, F.J. Navarro, J. Otero, J.J. Lapazaran, I. Lavrentiev, Y.Y. Macheret and F. Machío, *submitted*: Radio-echo sounding and ice volume estimates of western Nordenskiöld Land glaciers, Svalbard. Submitted (31-07-2012) to Annals of Glaciology.
- Möller M., 2012: A minimal statistical model for the surface albedo of Vestfonna ice cap, Svalbard.

The Cryosphere, 6(5), 1049 – 1061.

- Möller M., R. Finkelnburg, M. Braun, D. Scherer & C. Schneider, 2013: Variability of the climatic mass balance of Vestfonna ice cap (northeastern Svalbard), 1979 – 2011. Annals of Glaciology, 54(63), in press.
- Østby T.I., T.V. Schuler, J.O. Hagen, C.H. Reijmer and R. Hock, 2013. Parameter uncertainty, refreezing and surface energy balance modelling at Austfonna ice cap, Svalbard, over 2004 – 2008. Ann. Glaciol., 54(63A), in print.
- Schaefer M., T. Zwinger, P. Christoffersen, F. Gillet-Chaulet, K. Laakso, R. Pettersson, V.A. Pohjola, T. Strozzi, and J.C. Moore, 2012: Sensitivity of basal conditions in an inverse model: Vestfonna Ice-Cap, Nordaustlandet, Svalbard, The Cryosphere, 6, 771 – 783.
- Sikora S., Migała K., Budzik T., Głowacki P., Puczko D., Ignatiuk D., Jania J., 2012: System gromadzenia danych meteorologicznych i glacjologicznych w obszarach polarnych - infrastruktura pomiarowa Polskiej Stacji Polarnej im. Stanisława Siedleckiego (SW Spitsbergen). Przegląd Geofizyczny, 1, 35 – 47 (in Polish).
- Van Pelt W.J.J., J. Oerlemans, C.H. Reijmer, V.A. Pohjola, R. Petterson, J.H. van Angelen, 2012: Simulating melt, runoff and refreezing on Nordenskiöldbreen, Svalbard, using a coupled snow and energy balance model. The Cryosphere, 6, 641 – 659.
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Outreach:

- Overview of SvalGlac was presented on the joint Estonian-Norwegian seminar on cooperation in Arctic, organized by the Estonian Foreign Ministry and the Norwegian Embassy in Tallinn (30.10.2012) and on the Polar Seminar of the Estonian Geographical Society (15.12.2012).

PhD thesis:

- Puczko D., 2012: Spatial and temporal dynamics of tidewater glacier flow – Hansbreen case study (in Polish). Institute of Geophysics, Polish Academy of Sciences, Warsaw (research partly supported from the SvalGlac project)
- Luks B., 2012: Snow cover dynamics in SW Spitsbergen (in Polish). Institute of Geophysics, Polish Academy of Sciences, Warsaw (research partly supported from the SvalGlac project)
- Pętlicki M., 2012: Modelling of mass and energy balance of the Arie Glacier in Spitsbergen (in Polish). Institute of Geophysics, Polish Academy of Sciences, Warsaw (research partly supported from the SvalGlac project)
- Ignatiuk D., 2012: The energy balance of the glacier surface and the water supply to the glacier drainage system of Werenskioldbreen (in Polish). Faculty of Earth Sciences, University of Silesia (research partly supported from the SvalGlac project)

Master thesis:

- Żołna G., 2012: The use of remote sensing and GIS methods to examine some characteristics of the

Spitsbergen glaciers (in Polish). Faculty of Earth Sciences, University of Silesia, Sosnowiec.

- Hałat J., 2012: Changeability of rivers discharges draining the Werenskiold Glacier (in Polish). Faculty of Earth Sciences, University of Silesia (in advanced stage of final preparation).

Comments on the interaction with funding agencies, challenges or any problems encountered during the project.

Austria: Major deviations are that PhD work is discontinued due to leave of F. Karner. To ensure proper progress and final developments the duration of the national project is now extended until Dec 2014 and at neutral costs.

Estonia: The Estonian Science Foundation (from 01.03.2012 – the Estonian Research Council) suggested to prolong the usage of SvalGlac budget up to the end of 2013.

Finland: The date of the final report (but not any change of funding) was agreed to be delayed until end of 2013 in line with other partners in the project.

Poland: Longer lasting procedure within the founding agency the National Centre of Research and Development has been finished by extension of the project to the end of 2013.

Spain: Because of
1) the cancellation of the fieldwork planned for spring 2012 in Hornsund area due to the inaccessibility of the area because of lack of sea ice on Van Mijenfjorden, and
2) not finding a suitable candidate for the postdoc position announced in late 2011 (the candidate selected in early 2012 finally resigned, because he took another position),
on 15 Oct 2012 (upon completion of a new selection process for the postdoc position, re-announced on June 2012) it was requested to the Spanish Funding Agency (currently, the Ministry of Economy and Competitiveness) the extension of the SvalGlac expenditure project till 31 Dec 2013. This request was formally was approved by the funding Agency on 20 Dec 2012.