European Partnership in Polar Climate Science
PolarCLIMATE

PolarCLIMATE Project: One Year Report

Submission deadline: 15 March 2010

Important:

- The document is to be filled in by the project coordinator and should be returned to ESF as a Word (.doc) document.

1. Overview of the PolarCLIMATE project

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

Project Coordinators: 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 Reijmer (IMAU), The Netherlands; Andrey Glazovskiy (IGRAS), Russia; Xiao Cheng (BNU)), China; Regine Hock (UAF), USA

Project start and end dates: 1.03.2010-28.02.2013

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
Mag. Karner Florian, 01.04.2010 - 31.12.2010, 64% (of potential i.e. 100% of working hours during year 2010)
Bilgeri Florian, field assistant, 01.04.2010 - 31.07.2010, 01.20.2010 - 31.10.2010, 0.03%
Krismer Thomas, research assistant, 01.03.2010 - 31.03.2010, 0.01%
Estonia
Dr. Tõnu Martma, senior scientist, founded by Estonian Science Foundation for Polar CLIMATE research - 25%;
Hannes Martma, laboratory technician; 01.01.2010 - 30.06.2011, 80%
Finland
Torsetn Malm, MSc Student, wind field modelling, 1.06.2010-31.12.2010 - 100%
Germany
Roman Finkelnburg, PhD-Student, since April 2010, 30%;
Marco Möller, PhD-Student, since April 2010, 30%
Italy
Dr. Edoardo Bucchignani, Eng., 2.05.2010 – 1.03.2011, 50%
Poland
Dr. Joanna Szafraniec, Post Doc, 10.11.2010-10.12.2010, 50%;
Dr. Leszek Kolondra, Eng., senior scientist, 10.11.2010-10.12.2010, 75%;
Dr. Malgorzata Blaszczyk, Eng., Post Doc, 10.11.2010-10.12.2010, 50%;
Mr Mateusz Baran, Eng. MSc, technician, 1.09.2010-30.09.2010, 100%;
Mr Dariusz Puczko, MSc, scientist, 1.12.2010-31.12.2010, 10%;
Mr Bartłomiej Luks, MSc, technician, 1.12.2010-31.12.2010, 17%
Spain
None
Sweden
None
Institutions of Associated Partners: None

Personnel funded through sources other than the PolarCLIMATE budget
(Name, position, nature of involvement)
Austria:
None
Estonia:
Dr. Tõnu Martma, senior scientist, Partly founded by the Estonian Ministry of Education targeted research project for Polar climate research
Prof. Rein Vaikmäe, Head of Department, PI, Partly founded by the Estonian Ministry of Education targeted research project for Polar climate research
Finland:
Martina Schaefer, Post Doc, University of Lapland, Finland, - ice flow modeller
Germany:
Roman Finkelnburg, PhD-Student, since April 2010, 50% from DFG funding (directly related to SvalGlac)
Marco Möller, PhD-Student, since April 2010, 50% from DFG funding (directly related to SvalGlac)
Italy:
None
Poland:
None
Spain:
Mrs. 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:
Prof. Veijo Pohjola, partly funded by the Swedish Research Council for PolarCLIMATE research
Dr. Rickard Pettersson, senior scientist partly funded by the Swedish Research Council for PolarCLIMATE research
Dr. Jim Hedfors, scientist, partly funded by the Swedish Research Council for PolarCLIMATE research

Netherlands:
Dr. Carleen Reijmer, Assistent Prof., Associate partner.
Ms Marianne den Ouden, PhD-Student.
Norway:
As associated partner in SvalGlac, University of Oslo, Norway, has no direct funding support from PolarCLIMATE, but through other projects we still contribute to the overall aims in SvalGlac and cooperate with the SvalGlac partners. Personnel involved in 2010 and their main task:
Prof. Jon Ove Hagen, Professor, Austfonna mass balance;
Dr. Thomas V. Schuler, Assistent Prof. AWS-data, modelling;
Thorben Dunse, PhD-student, dynamics, radar;
Chris Nuth, PhD-student, glacier geometry changes;
Geir Moholdt, PhD-student, satellite data, glacier geometry changes
Russia:
None

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

Initial and preparatory work
Development of conditions for office work and field and laboratory research. Personnel completion and planning of field work (all Partners).
Coordination activity
Establishing of the SvalGlac Coordination Secretariat at the Faculty of Earth Sciences, University of Silesia, Poland. Preparation and launching of the project web site http://svalglac.eu (University of Silesia, Poland and Technical University of Madrid, Spain with contribution of Technical University in Berlin - link to the TU Knowledge Base platform and impute from other PIs). Maintenance of the web site. Preparation and held of two meetings of the SvalGlac Steering Committee: Kick-off Meeting in Obergurgl, Austria on 7th and 9th March 2010 (hosted by University of Innsbruck) and Steering Committee Meeting combined with scientific workshop in Gdynia, Poland on 10th October 2010 (hosted by Institute of Geophysics PAS and Maritime University in Gdynia). Establishing of thematic working groups on: Modeling of Glacier Dynamics , Radio Echo Soundings (GPR), Ice Coring, Mass Balance & Automatic Weather Stations, Atmospheric Modeling and Remote Sensing Studies. Atcitity of working groups is in progress (e.g. preparation of catalogue of available GPR instruments by UPM Spain and US Poland; initiative of inter-comparison and unification of used Automatic Weather Stations (AWSes) and snow distribution modeling seminar by German Partners, UI Austria, UU Sweden and US Poland).

Preparation of data bases

- Meteorological – compilation of meta-data chart on available data from classic meteo-stations and AWSes from the key areas of Svalbard: S Spitsbergen, NW and Central Spitsbergen and Nordaustlandet (Polish Partners; UI Austria; UU Sweden; IMAU Netherlands; German Partners; Norwegian Associated Partners).
- Glaciological – Reanalyse existing data at the Kongsvegen glacier (UI Austria in cooperation with UIO and NPI, Norway). Completion of comprehensive archive and recent glaciological data on Hansbreen: i.e. front position and elevation changes, velocity measurements, mass balance components(US and IGF Poland). Developing of tidewater glacier inventory of Svalbard by data from recent years and preparation of new complete inventory of glaciers in Southern Spitsbergen (South of Van Keulen Fiord) based upon ASTER satellite images (US Poland). Start of compilation of data bas on all available RES data on glacier thickness (UPM Spain and US Poland with contribution of IGRAS Russia). Compilation of all snow pit data and ablation stake data over recent years provided important insights on the spatial pattern of accumulation and ablation on Vestfonna. These findings were submitted for publication to Geografiska Annaler in January 2011 (German Partners).
- remote sensing and cartographic – inventory of high resolution satellite images, detailed archive maps and aerial photos available for particular glaciers; archive cloud free satellite images acquired in different years were selected and brought to fill gaps in coverage (Polish Partners).

Field work

Spring 2010 field work at Kongsvegen glacier was prepared and performed: set up a network of automatic weather stations for meteorological parameters including energy balance, mass balance studies of the glacier together with snow investigations i.e. snow pits and surface observations (UI Austria in cooperation with NPI Norway).

Continuation of monitoring program on Lomonosovfonna/Nordenskiöldbreen as a SvalGlac activity (extension of the IPY GLACIODYN activity). The network of 11 GPS stations, and the automatic weather station was maintained, a number of snow pits were sampled and made a bedrock mapping using radio - echo sounding (UU Sweden; IMAU Netherlands; IG TUT Estonia; cooperation with NPI Norway). Samples on oxygen and hydrogen isotope analysis from 4 snow pits Lomonosovfonna were taken - 150 ones (IG TUT Estonia).

Important progress was achieved through reconfiguring the measurement units on Vestfonna Ice Cap during field campaigns in May and August 2010. In particular, data from two automatic weather stations were retrieved, snow pits and ablation stakes both on Vestfonna and De Geerfonna were done and analysed.

Field investigations on the Austfonna Ice Cap were conducted with support from the Norwegian Research Council to the IPY GLACIODYN project and the EU-project Ice2Sea. Network of mass balance stakes over the ice cap have been maintained and three AWSes as well. Measurements of elevation profiles across the ice cap by the precise GPS and measurements of the snow distribution was done. Record of ten continuous GPS stations along the flow line of two fast-flowing outlets from the ice cap have been maintained (UIO Norway).

In April 2010 a joint Spanish-Russian fieldwork was performed on Western Spitsbergen, in Grojfjørden area, with the logistic support of the Polar Station of the Russian Academy of Sciences in Barentsburg. Radio-echo sounding (RES) of several glaciers in this area was done (on Tavlebreen, Austre/Vestre Grojfjørdenbreen and Aldegondabreen). The total length of RES profiles done on these glaciers was ca. 196 km by use of the VIRL-20 MHz and Ramac 100/200 MHz instruments (UPM Spain and IGRAS Russia).

Maintenance of classic WMO meteorological station and AWS station on the northern shore of Hornsund Fiord were continued. Preparations for new set of glaciers to be echo-sounded in April 2011 Paierlbreen, Recherchebreen and parts of Amundsenisen) was done (cooperation of UPM Spain, Polish Partners and AC Finland). The IPY-GLACIODYN monitoring program on Hansbreen was extended in April and May 2010 and supplemented later by equipment and instruments funded from the SvalGlac project in August and September 2010 (both Polish Partners). Maintenance of monitoring system for Hansbreen front dynamics has been done by Polish Partners (i.e. surface mass balance measurements, AWSes, time lapse cameras, precise GPS station for velocity record, laser and horizontal radar distance meters for record of front position changes).

Data analysis from field work, laboratory and remote sensing

Meteorological and glaciological data collected from all studied glaciers in the reference areas were verified, analysed and prepared for modeling (all Partners and Associated Partners involved in field work).

Oxygen isotopes analysis of about 300 samples from Vestfonna Ahlmann Summit from the 2009 shallow core of 15.4 m (79°58'53" 20°06'51") were performed. Oxygen and hydrogen isotope analysis of 150 samples from 4 Lomonosovfonna 2010 pits (150 samples) and 400 oxygen isotope analysis from upper part of the Lomonosovfonna 2009 deep drill core were completed (IG TUT Estonia).

A compilation of all snow pit data and ablation stake data over recent years provided important insights on the spatial pattern of accumulation and ablation on Vestfonna. These findings were submitted for publication to Geografiska Annaler in January 2011 (German Parners).

Mass balance calculation, including calving flux component for Hansbreen was done, based upon glacier velocity measurements and geometry of the glacier terminus changes (Polish Partners).

Data from RES measurements performed on Aldegondabreen and Austre Gronfjordbreen (20 MHz), on Tavlebreen (20, 100 and 200 MHz), an Vestre Gronfjordbreen (20 and 100 MHz) were analysed. At Aldegondabreen, Vestre Gronfjordbreen and Austre Gronfjordbreen, besides reflections from bedrock, the reflections from internal reflecting horizon (IRH) were recorded as characteristic indicator of polythermal (two-layered) glacier structure that confirm the ice temperature measurements in bore holes at several glaciers. At Tavlebreen these reflections were not obtained at frequencies of 20, 100 and 200 MHz, but were observed in 2007 at higher frequency of 850 MHz. They also were not indicated at Austre Gronfjordbreen in 1974-1984 at frequencies of 440, 620 and 60 MHz. Therefore, this glacier was considered earlier as cold one. Comparison with airborne and ground-based RES data, collected in 1974 and 1999 at frequencies of 440 and 20 MHz, was shown, that Aldegondabreen maintained its polythermal structure during last 20-35 years. At Austre Gronfjordbreen the polythermal evidences were not observed in 1974-1984 at frequencies of 440, 620 and 60 MHz, but were

obtained in 2010 at frequency of 20 MHz. It suggests temporal evolution of englacial drainage system accompanying by changes in sizes and concentration of water inclusions in temperate ice (IGRAS Russia and UPM Spain).
Ice thickness maps for Hansbreen and Werenskioldbreen based upon GPR profiles from previous years were elaborated (Polish Partners).
Novel remote sensing procedure of use daily MODIS satellite products in order to account for cloud coverage over Vestfonna and surface albedo values was developed (German Partners).
Digital photogrammetric processing aerial photographs of 1960 (archive photos from Norwegian Polar Institute) for obtaining data on geometry of selected glaciers was done (front position, longitudinal elevation profile and DTM for areas with good quality of images). Satellite orthophoto maps of Southern Spitsbergen based upon Terra/ASTER images acquired in 2005 were elaborated in scales of 1:100 000 and 1:50 000 (front positions changes of tidewater glaciers extracted from historical maps, aerial photos and other geodetic and remote sensing sources were marked). Retreat rate of tidewater glaciers and their dynamics (by feature tracking method) for more precise than before estimation of calving flux from South Spitsbergen and the entire Svalbard Archipelago using subsequent remote sensing data have been done (US Poland). Progress in implementation of SAR images for studies of glacier dynamics was noted (Polish Partners in cooperation with IAC Italy).
Recognition pattern examples of geomorphic forms of glacier marginal zones have been distinguished for more precise delineation of land based glacier boundaries and distinction of outwash plain areas as meltwater outflow routes (preliminary studies for automatic recognition and classification) - based upon digital analysis of aerial photos of 1960 and 1990 and ASTER satellite images acquired in 2005, 2006 and 2009 (US Poland).

Modelling:

The main reason for modelling studies is to improve the understanding of the mass balance, and hence fresh-water flux from the ice caps on Svalbard.
Meteorological data for regional atmospheric model have been prepared (UI Austria, German Partners, Polish Partners, UU Sweden & IMAU Netherlands, Polish Partners).
Data collected in 2010 complement a time series now covering three ablation seasons allowing for detailed modelling of surface processes on Vestfonna over almost half a decade.
A surface model was set up that calculates the surface mass balance based on a temperature-radiation-index model. It includes procedure of use of daily MODIS satellite products for extraction of cloud coverage and surface albedo. Modelling results are very promising and match observations. A manuscript documenting these efforts and achievements is currently under review at the Journal of Geophysical Research (German Partners).
An objective weather type classification scheme using self-organising-maps and a subsequent clustering algorithm making use of reanalysis numerical weather forecast data from NCEP/NCAR was developed for and applied to the Svalbard region. The classification results in nine classes that separate pressure patterns by season and distinct situation characterised by different dominant air masses. Each class shows distinct mean values for air temperature and precipitable water compared to the overall means. A paper on these results has been submitted to Geografiska Annaler early in January 2011. The results from the efforts in weather pattern classification will enable us to extend our studies on mass balance variations over several decades in the future based on changing frequency of the occurrence of the dominant weather types (German Partners).
A finite element full Stokes ice flow model for Vestfonna ice cap, which is one of the most advanced models presently existing world-wide has been developed. The model successfully resolves the rapid outlet glaciers, and produces realistic ice velocities (AC Finland). To advance the model further and make use of field data collected on the meteorological conditions, a local wind field finite element model was created (AC Finland). This is important since wind plays a dominant role in the distribution of snow and hence mass balance over much of the polar regions, and yet has been largely neglected to date in mass balance and ice flow studies. A transient simulation with the newly developed VMS method has been used to model the turbulent flow, and thus the model run until a nice state is achieved, however a steady state will never be achieved because of the chaotic nature of turbulence. Developing process models has been begin over blue ice areas (BIAs, namely Scharffenbergbotnen - SBB, Antarctica) since this is a simpler environment than the Svalbard archipelago. Qualitative research is done using a LSCFD code (ELMER) for a finite element model to resolve the local wind fields in the SBB area, and thus making it possible to investigate the snow redistribution patterns (AC Finland).
Glacier dynamics numerical modelling work focused on the preparation of a 3-D full-Stokes model of the dynamics of the Amundsenisen Icefield in Southern Spitsbergen. Stochastic Transfer Function and Dynamic Harmonic Regression methods for analysis of relations between glacier flow speed, meteorological inputs and tides; model of snow cover structure and distribution over selected glaciers in Svalbard; a concept of evolution of

Svalbard glaciers in response to climate changes as result of remote sensing and GPR studies together with profound interpretation of field data from the IPY Glaciodyn project (UPM Spain).
Italian modelling work begins by collection all available observational data and set of the existing mathematical models for ice dynamics in the cases of temperate, cold and polythermal ice with focus on the temperate case; identification of the most appropriate model for the pre-fixed study site of Amundsenisen. Modelling procedures of accumulation/ablation at the air/ice interface (dependence of parameters from climate/other local factors) and modelling the sliding phenomenon at the ice/bedrock interface and on the interaction ice/subglacial water have been in foci. Report on the mathematical model adopted has been prepared (in progress). An up-grading sequence of numerical simulation steps converging to the complete model and finite volume numerical solution procedure together wit the numerical code: logical (nested) block structure have been constructed (IAC Italy).
Debugging and validation upon prototype geometry and physical set-up (in progress). This work is currently underway (IAC Italy in cooperation with UPM Spain).

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

Italy:
The only change from our original plan of work of the first year of activity has been established in agreement with the Spanish PI, Prof. F. Navarro, and is about the time of release of data on spatial domain, initial and boundary values, duty of the Spanish group. This has been scheduled March 2011 and comes along with debugging and validation of our code, so, in any case, perfectly on time with the progress of our work.
Poland:
Changes in the work plan. Originally planned shallow ice coring and radio echo sounding of selected glaciers on Southern Spitsbergen in April 2010 has been postponed to the next end-of-winter/spring field activity due to delay in beginning of financing of the project by the Polish funding agency (financing has started in beginning of July 2010)

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

No deviations or problems other than presented in the section 'Comments on the interaction with funding agencies, challenges or any problems encountered during the first reporting period'.
Moreover, it is worth to note synergy in preparation and running of different projects in the same / similar area using common platform of the Polish Polar Station and share logistic costs between project to reduce expenses.

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

Papers:

Beaudon, E., Arppe, L., Jonsell, U., Martma, T., Möller, M., Moore, J.C., Pohjola, V.: Spatial and temporal variability of precipitation volume from shallow cores from Vestfonna ice cap. Submitted to Geografiska Annaler: Series A, Physical Geography (Submitted).

Den Ouden, M.A.G., C.H.Reijmer, V.Pohjola, R.S.W. van de Wal, J.Oerlemans and W.Boot., 2010: Stand-alone single-frequency GPS ice velocity observations on Nordenskiöldbreen, Svalbard. The Cryosphere, 4, 593-604.

Divine, D., Sjolte. J., Isaksson, E., Meijer, H., van de Wal, R., Martma, T., Pohjala, V.: Modeling the regional climate and isotopic composition of Svalbard precipitation using REMOiso model: a comparison with available GNIP and ice core data." (Hydrological Processes - accepted for publication).

Mansutti, D. and E. Bucchignani, 2011a: Diagnostic simulation of a subglacial lake at Amundsenisen (South-Spitzbergen). Part 1: a mathematical model. IAC Reports n. 191 (2/2011).

Mansutti D. and E. Bucchignani, 2011b: Diagnostic simulation of a subglacial lake at Amundsenisen (South-Spitzbergen). Part 2: a finite volume solution procedure. IAC Reports n. 192 (2/2011).

Moholdt, G., Hagen J.O., Eiken, T., and Schuler, T.V., 2010: Geometric changes and mass balance of the Austfonna ice cap, Svalbard, The Cryosphere, 4, 21-34, doi:10.5194/tc-4-21-2010.

Moholdt, G., Nuth, C., Hagen, J. O. and Kohler J., 2010: Recent elevation changes of Svalbard glaciers derived from ICESat laser altimetry. *Remote Sensing of Environment*, 114, 2756-2767, doi:10.1016/j.rse.2010.06.008.

Navarro, F.J. & Eisen, O., 2010: Ground Pentrating Radar. In P.Pellikka & W.G. Rees (eds.): *Remote sensing of glaciers – techniques for topographic, spatial and thematic mapping*, pp. 195-229. CRC Press, Leiden.

Nuth, C., G. Moholdt, J. Kohler, J. O. Hagen, and A. Kääb, 2010: Svalbard glacier elevation changes and contribution to sea level rise, J. Geophys. Res., 115, F01008, doi:10.1029/2008JF001223.

Schneider, C., D. Scherer, M. Braun, M. Möller, O. Käsmacher and R. Finkelnburg, 2010: Climate Variability and Glacier Response at Vestfonna - A Case Study of Arctic Climate and Glacier Dynamics at Nordaustlandet (Svalbard) in Recent Years. -- Nova Acta Leopoldina 112 (384), 145-151.

Conferences:

Co-organized by the SvalGlac coordination team with scientific reporting components:
1) Kick-off Meeting of the SvalGlac Project
as a side meeting of the IASC-NAG workshop (Obergurgl, March 7-10, 2010)
2) Kinnvika and SvalGlac Workshop, Gdynia, October 8-10, 2011.

Conference contributions:

Beaudon, E., L. Arppe, T. Martma & M. Möller (2010): Spatial and temporal variability of precipitation volume and snow chemistry on Vestfonna ice cap (Svalbard, Nordaustlandet). -- IGS Nordic Branch Meeting 2010, Copenhagen (poster).

Blaszczyk, M., J. Jania, M. Moskalik, W.T. Pfeffer and G. Zołna, (2011): New estimation of calving flux from Southern Spitsbergen tidewater glaciers, Winter Park, Colorado, 2-4 February 2011.

Divine, D., Isaksson, E., Martma, T., Pohjola, V., Meijer, H., van de Wal, R. S.W., Moore, J., Godtliebsen, F. (2010): Reconstructing the past climate variability in Svalbard from the Lomonosovfonna and Holtedahlfonna $\delta^{18}O$ ice core records . Geophysical Research Abstracts, EGU General Assembly 2010, Vienna, Austria, 02-07 May 2010. 12, EGU2010-2624-1. poster

Divine, D., Isaksson, E. D., Martma, T., Pohjola, V. A., Meijer, H. A., Van de Wal, R., Moore, J. C., Godtliebsen, F. (2010): Thousand years of winter surface air temperature variations in Longyerbyen, Svalbard Arhcipelago and Vardo, northern Norway, reconstructed from Svalbard ice core oxygen isotope data. 2010 AGU Fall Meeting, 13–17 December 2010, San Francisco, California, USA. AGU. Abstract C13B-0549. , Poster

Divine, D., Isaksson, E., Martma, T., Pohjola, V., Meijer, H., van de Wal, R. S.W., Moore, J., Godtliebsen, F. (2010): Reconstructing the past climate variability in Svalbard from the Lomonosovfonna and Holtedahlfonna δ18O ice core records . Geophysical Research Abstracts, EGU General Assembly 2010, Vienna, Austria, 02-07 May 2010. **12**, EGU2010-2624-1.

Divine, D., Isaksson, E., Martma, T., Pohjola, V. A., Meijer, H., van de Wal, R., Moore, J. Godtliebsen, F. (2010): Thousand year long reconstruction of winter air temperature variations in Longyerbyen, Svalbard Arhcipelago and Vardo, northern Norway, based on Svalbard ice core oxygen isotope data. Nordic Glaciology, Abstract from Glaciological Society Nordic Branch Meeting, 28-30 October 2010. GEUS, Copenhagen. *Danmarks og Gronlands Geologiske Undersogelse Rapport 2010* 94, 31-32.

Dunse, T., R. Greve, T.V. Schuler, J.O. Hagen, F. Navarro, E. Vasilenko, C.H Reijmer., (2010): Insights into the dynamic regime of the Austfonna ice cap, Svalbard, from numerical modelling and observation. IASC GLACIODYN (IPY) workshop, 7 – 10 March 2010, Obergurgl, Austria.

Finkelnburg, R., M. Möller, E. Huintjes, T. Sauter, M. Braun, D. Scherer & C. Schneider (2010): Comparison of surface energy and mass balance of two sites (Vestfonna and De Geerfonna) at Nordaustlandet (Svalbard) during the ablation period 2009. -- IPY Oslo Science Conference (poster).

Finkelnburg, R., M. Möller, F. Maussion, M. Braun, D. Scherer & C. Schneider (2010): Ein Physical Downscaling Ansatz für Nordaustlandet (Svalbard) unter Verwendung des WRF Modells. -- 29. AK-Klima Annual Assembly, Würzburg, Germany (poster).

Glowacki, P., E.V. Vasilenko, A.F. Glazovsky, Yu.Ya. Macheret, J. Moore, F. Navarro and J.O. Hagen (2010). Subglacial Lakes in Spitsbergen. *Nature of the shelf and archipelagos of the European Arctic. Complex investigations of the Svalbard Archipelago nature*, issue 10 - Proceedings of the International Scientific Conference, Murmansk, Russia, 27-30 Oct. 2010, pp. 368-374. GEOS. [In Russian]

Grabiec, M., D. Puczko and T. Budzik (2010): Internal structure and development of snow cover on Svalbard glaciers (Hansbreen and Vestfonna) derived from high frequency GPR and classical methods. The Kinnvika and SvalGlac Projects Workshop, Gdynia, 8-10.10.2010.

Jania, J.A., (2010): Najnowsze badania cech lodowców na południowym Spitsbergenie [Recent studies of glaciers in Southern Spitsbergen – in Polish], XXXIII Sympozjum Polarne, Łódź, 18-19 June 2010 (Abstract, 1 page). Invited paper.

Jania, J.A., (2010): Zagrożenia związane z obszarami polarnymi [Threats linked to polar areas – in Polish]. Konferencja Naukowa „Zagrożenia na koniec pierwszej dekady XXI wieku", Komitet Badań nad Zagrożeniami, Warszawa, 13 October 2010. Invited paper;

Jania, J.A., M. Blaszczyk, L. Kolondra and M. Grabiec, (2010) Recent state of tidewater glaciers in Southern Spitsbergen, Meeting of IASC Network on Arctic Glaciology, Obergurgl, Austria 8-10 March 2010, Abstract Volume, p. 19

Krismer Th., Obleitner F. and Kohler J., 2010: Long-term mass- and energy balance of Kongsvegen glacier, Spitzbergen, Geophysical Research Abstracts, Vol. 12, EGU General Assembly 2010 (presentation)

Krismer Th., Obleitner F. and Kohler J., 2010: Long-term mass- and energy balance of Kongsvegen glacier, Svalbard, Meeting of IASC Network on Arctic Glaciology, Obergurgl, Austria 8-10 March 2010, Abstract Volume, p. 19 (presentation)

Stuetz E., Gohm A., Obleitner F. and Baumann R., 2010: Evaluating WRF in Svalbard on basis of a case study: First tests and preliminary results, Meeting of IASC Network on Arctic Glaciology, Obergurgl, Austria 8-10 March 2010, Abstract Volume, p. 19 (poster)

Lavrentiev, I.I, Glazovsky, A.F., Macheret, Yu.Ya., and Holmlund P. (2010): Polythermal structure of Tavlebreen in Svalbard. – Proceedings of the International Scientific Conference "Nature of the Shelf and Archipelagos of the European Arctic. Complex Investigations of Spitsbergen Nature", GEOS, 2010, pp. 417-422. (in Russian).

Lapazaran, J., M. Petlicki, F. Navarro, F. Machío, D. Puczko and P. Glowacki (2010): A study of the structure and the ice volume changes of Ariebreen, Hornsund, Svalbard, during the period 1936-2007. IPY Oslo Science Conference, 8-12 June 2010. Poster contribution.

Lavrentiev, I.I, Holmlund, P., Macheret, Yu.Ya., and Glazovsky, A.F. (2010) – Thermal structure and subglacial drainage system of Tavlebreen, Svalbard. – Oslo IPY Science Conference, 8-12 June 2010. (Abstracts).

Luks, B. and M. Osuch (2010): Parameter variability in transfer function modeling of snow depth, EGU 2010, Vienna, Austria;

Luks, M., Osuch, R. Romanowicz, T. Budzik, S. Sikora and D. Puczko (2010): Relations between meteorological parameters on Hans glacier and Hornsund Polish Polar Station. Meeting of IASC Network on Arctic Glaciology, Obergurgl, Austria 8-10 March 2010, Austria.

Macheret, Yu.Ya., Glazovsky, A.F., and Lavrentiev, I.I. (2010) – Water in temperate and polythermal glaciers: results of IPY studies – Oslo IPY Science Conference, 8-12 June 2010. (Abstracts).

Möller, M., R. Finkelnburg, M. Braun, U. Jonsell, D. Scherer, V. Pohjola, R. Hock & C. Schneider (2010): Surface mass balance of Vestfonna (Nordaustlandet, Svalbard) – an assessment of the current status. -- IPY Oslo Science Conference (oral presentation).

Moholdt, G., Nuth, C., Hagen J.O. and Kohler J. Recent elevation changes of Svalbard glaciers derived from repeat track ICESat altimetry, International Polar Year - Oslo Science Conference, 2010, Oslo, Norway.

Nuth, C., T. Schuler, J. Kohler, J.O. Hagen (2010). Combining mass balance measurements/modeling with geodetic elevation changes: A case study from Kongsvegen and Holtedahlfonna/Kronebreen. International Arctic Science Committee - Network on Arctic Glaciology, 2010 Annual Meeting, Obergurgl, Austria, Abstracts Volume, p. 11.

Pohjola, V., R. Pettersson, C. Reijmer, M. Den Ouden, 2010: Ice dynamical work on Lomonosovfonna and

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M. Sharp, A. Arendt, R. Hock, G. Wolken, E. Josberger, R.D. Moore, W.T. Pfeffer, J.-O. Hagen, M. Ananicheva and A. Klepikov (2010): The Current State of Mountain Glaciers and Ice Caps in the Arctic: an Update on the Arctic Council's SWIPA Project. International Arctic Science Committee - Network on Arctic Glaciology, 2010 Annual Meeting, Obergurgl, Austria, Abstracts Volume, p. 2.

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Outreach activity:

Maintenance and up dating of information on the project progress at web site of the project http://svalglac.eu/ and web sites of Partners (e.g. http://imgi.uibk.ac.at/iceclim/eb_group/proj_svalglac.htm; http://www.krios-hyperion.com/).

F. Navarro: Conference at the Campus Party Europe-Green Campus: The health state of the cryosphere. Will glaciers survive to climate change? La Caja Mágica, Madrid, 16-4-2010.

F. Navarro: Lecture within the Seminar "La Antártida: un desafío para la ciencia y la tecnología", a part of the 61ª Edition of the Summer Courses of the University of Cádiz: "Estado de salud de la criosfera". Universidad de Cádiz, 15-7-2010.

Current results of the project are included into content of series of lectures entitled *"Glaciers and contemporary climatic changes"* by J. Jania for undergraduate students of geography at the Faculty of Earth Sciences, University of Silesia.

Comments on the interaction with funding agencies, challenges or any problems encountered during the first reporting period

In generally, a proper interaction with the national founding agency is noted.
The Polish founding agency - National Centre for Research and Development (NCBiR) kindly supported additionally the SvalGlac Coordination Secretariat and coordination works including preparation and maintenance of the project web site. It caused changes in the original contract and delay of financing of the project. Such delay has affected only a segment of planned field work by shifting of shallow ice coring and further radio echo soundings of selected glaciers to the subsequent years.

In Spain the funding was not available till the end of November 2010, when all project money for the entire 3-year period (2010-2012) was transferred by the Ministry of Science and Innovation to the Technical University of Madrid. Undertaking the Svalbard Spring campaign (April 2010) was only possible by temporary use (as loan) of

external funding (from a research project from the Spanish Polar Programme, of which the Spanish SvalGlac PI was also the PI) and posterior transfer back from SvalGlac.

D.G!