The Polar CLIMATE **SvalGlac** Project
Sensitivity of Svalbard Glaciers to Climate Change
Scientific Steering Committee Meeting
University Center Obergurgl, Austria
26 February 2013

Minutes

1. Welcome

The SC Meeting was chaired by **Jacek Jania (PI), Poland** – Coordinator and **Francisco Navarro, Spain** – Co-Coordinator, who welcomed everyone to the meeting:

Joanna Szafraniec – Coordination Office Scientific Secretary, Mariusz Grabiec, Piotr Głowacki – Project Researchers, **Poland**;

Alba Martin, **Spain** – Project Researcher;

Marco Möller, **Germany** (representant of PI) – Project Researcher;

Friedrich Obleitner, **Austria** (PI);

Martina Schäfer – Project Researcher, **Finland**;

Daniela Mansutti **Italy** (PI);

Jon Ove Hagen, **Norway** – Associated Partner;

Carleen Tijm-Reijmer, **the Netherlands** – Associated Partner;

Regine Hock, **the United States** – Associated Partner.

2. Adoption of the agenda

Proposed agenda and the aim of the meeting were presented and accepted by Members of the Steering Committee.

3. Plans of common publications and final report

Jacek Jania: presentation of the formal state of the Project – Requests of project extension made by partners to national funding agencies approved in all cases except Germany (though they got the official approval soon after the meeting, by mid-March).

Francisco Navarro: proposal of the preparation of the Project progress report (Barcelona) – based on the national reports provided to the Project Secretariat.

JJ: the final report will be based on publications in scientific journals, with particular emphasis on joint papers. The report will also include results from the PhD thesis of Alba Martin (Spain).

List of SvalGlac Project publications – an updated version of the table presented in Uppsala in October 2012:

OBJECTIVES OF THE PROJECT	PAPERS / CONFERENCE ABSTRACTS
1. OBTAIN A RELIABLE ESTIMATE OF THE TOTAL ICE VOLUME STORED IN SVALBARD Martín-Español A., F.J. Navarro, J. Otero, J.J. Lapazaran and M. Błaszczyk: Volume-area(-length?) relationships for Svalbard glaciers and estimate of the total ice volume stored in Svalbard glaciers. To be submitted to *The Cryosphere/J. Glaciol.*; STATUS: Planned June 2013; RELATED TASKS: Task 1, in general, with emphasis on 1c and 1d	
1a. Make an updated catalogue of the radio-echo sounded glaciers and ice caps of Svalbard and define a new set of glaciers to be echo-sounded using the available platforms for logistic support	See 1b
1b. Undertake the planned echo-sounding campaigns and produce the corresponding ice thickness maps and ice volume estimates	E.V. Vasilenko, F. Machío, J.J. Lapazaran, F.J. Navarro and K. Frolovskiy, 2011: A compact lightweight multipurpose ground-penetrating radar for glaciological applications. J. Glaciol., 57 (206), 1113–1118; STATUS: Published A. Martín-Español, 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 to Ann. Glaciol.; STATUS: Submitted (31-07-2012). Under review. and 1a F.J. Navarro, A. Martín-Español, J.J. Lapazaran, M. Grabiec, J. Otero, E.V. Vasilenko and D. Puczko (in preparation): Radio-echo sounding and ice volume estimates of Wedel Jarlberg Land glaciers, Svalbard. To be submitted to Arct. Antarct. Alp. Res.?; STATUS: Planned March 2013. and 1a Pettersson R., P. Christoffersen, J.A. Dowdeswell, V.A. Pohjola, A. Hubbard and T. Strozzi, 2011: A new subglacial bed topography dataset for Vestfonna ice cap, Svalbard, including constraints on thermal regime and basal conditions. Geogr. Ann., 93(A), 311–322, DOI: 10.1111/j.1468-0459.2011.00438.x. Van Pelt W.J.J., J. Oerlemans, C.H. Reijmer, V.A. Pohjola, R. Pettersson and J.H. van Angelen, 2012: Simulating melt, runoff and refreezing on Nordenskiöldbreen, Svalbard, using a coupled snow and energy balance model**.** The Cryosphere, 6(3), 641–659, doi:10.5194/tc-6-641-2012 See 1c Lapazaran J., Petlicki M., Navarro F., Machío F., Puczko D., Glowacki P, Nawrot A.: Radio-echo sounding and ice volume changes 1936–1990–2007 of Ariebreen, Hornsund, Spitsbergen. Accepted (8-2-2013) for publication in Polar Research

1c. Derive from all available ice volume estimates new volume/area relationship appropriate for Svalbard glaciers of different typology	J.J. Lapazaran, A. Martín-Español, J. Otero and F.J. Navarro (in preparation): On the errors involved in the estimate of glacier ice volume from ice thickness data. To be submitted to J. Glaciol.; STATUS: Planned May 2013 and 1b See 1 (general) Grabiec M., Jania J., Puczko D., Kolondra L., Budzik T., 2012: Morfologia powierzchni i podłoża Lodowca Hansa (Spitsbergen) – in Polish (Morphology of the surface and bedrock of the Hans Glacier, Spitsbergen). The XXXIV Polar Symposium, 14–16 June 2012 – oral presentation
1d. Use such relationships, together with updated remote sensing images or maps, to produce an updated estimate of the ice volume and mass stored in Svalbard glaciers and its total potential contribution to sea-level rise	See 1 (general) Pettersson R., P. Christoffersen, J.A. Dowdeswell, V.A. Pohjola, A. Hubbard and T. Strozzi, 2011: A new subglacial bed topography dataset for Vestfonna ice cap, Svalbard, including constraints on thermal regime and basal conditions. Geogr. Ann., 93(A), 311–322, DOI: 10.1111/j.1468-0459.2011.00438.x. Braun M., V.A. Pohjola, R. Pettersson, M. Möller, R. Finkelnburg, U. Falk, D. Scherer, C. Schneider, 2011: Changes of glacial front positions of Vestfonna (Nordaustlandet, Svalbard). 2011. Geogr. Ann., 93(A), 301–310, DOI: 10.1111/j.1468-0459.2011.00437.x Martin A., Navarro F., Błaszczyk M., Lapazaran J., Grabiec M., 2012: Progress in the development of techniques of estimation of the ice volume of Svalbard Glaciers from GPR data. Workshop on the Dynamics and Mass Budget of Arctic Glaciers & the IASC Network on Arctic Glaciology Annual Meeting, Zieleniec, Poland, 10 – 13 January 2012 – oral presentation
2. ESTIMATE THE RECENT PAST CLIMATE CHANGES AND MASS BALANCE RATES OF SVALBARD	
2a. Make a catalogue of available estimates from shallow ice cores or locations where repeated measurements have been done for a sufficiently long period, and define locations, within the radar profiles in the glaciers selected in 1a, where further shallow ice cores should be drilled	Beaudon E., Arppe L., Jonsell U., Martma T., Möller M., Moore J.C., Pohjola V., 2011: Spatial and temporal variability of precipitation volume from shallow cores from Vestfonna ice cap. Geografiska Annaler: Series A, Physical Geography, 93(4); STATUS: Published. See 2b, 3d Divine D., Sjolte J., Isaksson E., Meijer H., van de Wal R., Martma T., Pohjala V., 2011: Modeling the regional climate and isotopic composition of Svalbard precipitation using REMOiso model: a comparison with available GNIP and ice core data. Hydrological Processes. 25,3748-3759; STATUS: Published. and 3d 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: STATUS: Published. and 3c R. Vaikmäe, T. Martma, E. Isaksson, D. Divine, V. Pohjola,

	H.A.J. Meijer, 2011: The ice-core stable isotope records from small Arctic ice caps as proxis of climatic and environmental changes. Geophysical Research Abstracts 13, EGU2011-8934-1. Poster: STATUS: Published. See 1 (general)
2b. Undertake the planned shallow ice coring	See 2a G. Jacopo, A. Spolaor, T. Martma, J. Kohler, M. Björkman, E. Isaksson, P. Vallelonga, C. Barbante, 2012: Sensitivity of trace and rare earth elements as dust source proxies in Svalbard and Greenland glaciers. IPICS (International Partnerships in Ice Core Sciences) OSC, 1–5 October 2012, Presqu'île de Giens, France. Poster: STATUS: Published. and 3d Beaudon, E., L. Arppe, U. Jonsell, T. Martma, M. Möller, V.A. Pohjola, D. Scherer, J.C. Moore, 2011: Spatial and temporal variability of net accumulation from shallow cores from Vestfonna ice cap (Nordaustlandet, Svalbard). Geogr. Ann., 93(A), 287–299, doi: 10.1111/j.1468-0459.2011.00439.x Błaszczyk M., Jania J.A., Kolondra L. Seasonal and multi-year fluctuations of tidewater glaciers cliffs on Southern Spitsbergen. Workshop on the Dynamics and Mass Budget of Arctic Glaciers & the IASC Network on Arctic Glaciology Annual Meeting. 10 – 13 January 2012, Zieleniec, Poland. Poster Błaszczyk M., Jania J.A., Kolondra L., (in preparation): Fluctuations of tidewater glaciers in Hornsund Fiord (Southern Svalbard) since the beginning of the 20th century. To be submitted to Polish Polar Research. STATUS: Planned March 2013
2c. Analyse the ice cores for layer dating purposes (e.g. Tchernobyl layer) and estimate the mean mass balance for the period	Divine D., Isaksson E., Martma T., Meijer H.A.J., Moore J., Pohjola V., van de Wal R.S.W., Godtliebsen F., 2011: Thousand years of winter surface air temperature variations in Svalbard and northern Norway reconstructed from ice core data. Polar Research, 30 (7379), 1–12 Van der Wel L.G., Streurman H. J., Isaksson E., Helsen M.M., Van de Wal R.S.W., Martma T., Pohjola V.A., Moore J.C., Meijer H.A.J., 2011: Using high resolution tritium profiles to quantify the effects of melt on two Spitsbergen ice cores. International Glaciological Society. Journal of Glaciology, 57 (206), 1087–1097. and 3c Divine D., J. Sjolte, H.A.J. Meijer, R.S.W. van de Wal, T. Martma, V. Pohjola and F. Godtliebsen, 2011: Modeling the regional climate and isotopic composition of Svalbard precipitation using REMOiso model: a comparison with available GNIP and ice core data. Hydrological Processes, 25(24), 3748–3759, DOI: 10.1002/hyp.8100 Samyn D., Vega C., H. Motoyama, V.A. Pohjola, 2012: Nitrate and Sulfate Anthropogenic Trends in the 20th Century from Five Svalbard Ice Cores. Arc. Alp. Ant. Res., 44(4), 490–499
2d. Drill one deep ice core on the summit of Austfonna and/or Vestfonna to extend the present and recent past climate history further back	Wendl I., Eichler A., Tobler L., Eikenberg J., Martma T., Isaksson I., Vogel E., Schwikowski M., 2012: First dating attempt for the 2009 ice core from Lomonosovfonna, Svalbard. Annual Report 2011. Eds: A. Türler, M. Schwikowski, A. Blattmann. Paul Scherrer Institut, Bern, 41; STATUS:

in time	Published. and 2c 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: STATUS: Published. and 2a This was not done due to the lack of funding for Norway and Netherlands in SvalGlac. One 150 m deep ice core drilled on Lomonosovfonna 2009, not yet published.
2e. Combine the above information with the layering from the high frequency radar data in order to estimate the spatial variability of average past mass balance	Work in progress
2f. Estimate long term geodetic mass balance changes during the recent past from comparison of maps/air photos and recent remote sensing images or topographic measurements (airborne laser and ground-based GPS)	Pohjola V.A., P. Christoffersen, L. Kolondra, J.C. Moore, R. Pettersson, M. Schäfer, T. Strozzi and C.H. Reijmer, 2011: Spatial distribution and change in the surface ice-velocity field of Vestfonna ice cap, Nordaustlandet, Svalbard, 1995–2010 using geodetic and satellite interferometry data. Geogr. Ann., 93(A), 323–335, doi: 10.1111/j.1468-0459.2011.00441.x
3. IMPROVE THE PROCESS UNDERSTANDING	
3a. Study the surface energy balance (by AWS) as a prerequisite for 3b and 3c	F. Karner, F. Obleitner, Th. Krismer, J. Kohler, W. Greuell, 2012: A decade of energy and mass balance investigations on the glacier Kongsvegen, Svalbard, JGR-Atmospheres. In press. And 3c, 4d, 5a, 5b, 5c, 5d G. Jocher, F. Karner, Ch. Ritter, F. Obleitner et al., "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 and 3c, 4d, 5a, 5c, 5d http://www.isrn.com/journals/meteorology/2012/357925/ Möller M., R. Finkelnburg, M. Braun, R. Hock, U. Jonsell V.A. Pohjola, D. Scherer, C. Schneider, 2011: Climatic mass balance of the ice cap Vestfonna, Svalbard – a spatially distributed assessment using ERA-Interim and MODIS data. J. Geogr. Res., 116(F03009), doi:10.1029/2010JF001905, 14pp. R. Finkelnburg, 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, Oslo; STATUS: Published

	C. Schneider, D. Scherer, M. Braun, M. Möller, O. Käsmacher, 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; STATUS: Published. and 3c R. Finkelnburg, 2011: Weather and Climate observations on Nordauslandet, Svalbard. TiP Young Scientists Workshop: "Atmo-Cryo-Hydro: spheres and interactions", Berlin. and 3c
3b. Study the coupling between surface melt water, subglacial water flow, melting at the glacier bed and sliding	See 3a, 5e IASC 2013: Modeling Nordaustlandet's ice-caps, M. Schäfer, R. Gladstone, T. Zwinger, V. Pohjola, R. Pettersson, T. Dunse, M. Möller, J. Moore EGU 2013: Importance of basal processes in simulations of a surging Svalbard outlet glacier, R. Gladstone, M. Schäfer, T. Zwinger, T. Strozzi, Y. Gong, J. Moore, T. Dunse Bucchignani E., Mansutti D., Navarro J.F., Otero J., Glowacki P., 2012: Numerical modelling of Amundsenisen Icefield for compatibility check of a subglacial lake. Preliminary tests, Geophysical Research Abstracts Vol. 14, EGU2012-8148, 2012 (poster) and 5e Bucchignani E., Mansutti D., Navarro J.F., Otero J., Glowacki P., 2012: Arguments from modelling about the existence of a subglacial lake at Amundsenisen Icefield (Svalbard), IGS Nordic Branch Meeting, Stockholm, 25–27 October 2012 (abstract and poster) and 5e Bucchignani E., Mansutti D., Navarro F.J., Otero J., Glowacki P., 2013: Plausibility of a subglacial lake under Amundsenisen Icefield (Svalbard): spatially variable water content and sensitivity to thermal effect of snow and firn layers. Geophysical Research Abstracts, Vol. 15, EGU2013-9289, 2013 (EGU General Assembly 2013) and 5e Bucchignani E., Mansutti D., Navarro J.F., Otero J., Glowacki P., Arguments from modelling about the existence of a subglacial lake at Amundsenisen Icefield (Svalbard): effect of variable water content; STATUS: Planned June 2013, to be submitted to glaciology specialistic journal and 5e Bucchignani E., Mansutti D., Navarro J.F., Otero J., Glowacki P., Arguments from modelling about the existence of a subglacial lake at Amundsenisen Icefield (Svalbard): effect of climate change; STATUS: Planned December 2013, to be submitted to glaciology specialistic journal; and 5e Schaefer M., T. Zwinger, P. Christoffersen, F. Gillet-Chaulet, K. Laakso, R. Pettersson, V.A. Pohjola, T. Strozzi, J.C. Moore, 2012: Sensitivity of basal conditions in an inverse model: Vestfonna Ice-Cap, Nordaustlandet, Svalbard, The Cryosphere

	, 6, 771–783 and 5e Schäfer M. and others (to be defined – probably R. Gladstone, T. Zwinger, F. Gillet-Chaulet, T. Strozzi, V. Pohjola, R. Pettersson, J. Moore), Relative influence of heat production sources on the dynamics of VSF, to be submitted in 2013 and 5e Gladstone R. and others (to be defined – probably M. Schäfer, T. Zwinger, F. Gillet-Chaulet, T. Strozzi, T. Dunse, J. Moore), Importance of basal processes in simulations of a surging Svalbard outlet glacier, to be submitted by August 2013 and 5e NIGS 2010: Basal drag pattern inferred from surface velocities for Vestfonna ice-cap (Svalbard) with a Full-Stokes model, M. Schäfer, T. Zwinger, K. Laakso, V. Pohjola, R. Pettersson, F. Gillet-Chaulet, P. Christoffersen, J. Moore and 5e NIGS 2011: Basal drag pattern inferred from surface velocities for Vestfonna ice-cap (Svalbard) with a Full-Stokes model in 1995 and 2008, M. Schäfer, T. Zwinger, V. Pohjola, R. Pettersson, F. Gillet-Chaulet, T. Strozzi, M. Möller, J. Moore, and 5e IASC 2012: Basal drag pattern inferred from surface velocities for Vestfonna ice-cap (Svalbard) with a Full-Stokes model in 1995 and 2008, M. Schäfer, T. Zwinger, V. Pohjola, R. Pettersson, F. Gillet-Chaulet, T. Strozzi, M. Möller, J. Moore and 5e Tidewaterglacier workshop Svalbard 2012, Remote sensing data used on Svalbard glaciers to infer basal drag pattern from surface velocities with a Full-Stokes ice-sheet model (Vestfonna ice-cap 1995, 2008 and 2011), M. Schäfer, T. Zwinger, V. Pohjola, R. Pettersson, F. Gillet-Chaulet, T. Strozzi, M. Möller, J. Moore and 5e NIGS 2012: Towards simulating Nordaustlandet surging glaciers: Inverse modelling through stages of surge events (part 1), The temperature distribution in the ice and its interaction with basal sliding (part 2), M. Schäfer, R. Gladstone, T. Dunse, F. Gillet-Chaulet, J. Moore, R. Petterson, V. Pohjola, T. Strozzi and 5e Dobiński W., Grabiec M., Gądek B., 2011: Spatial relationship in interaction between glacier and permafrost in different mountainous environments of high and mid latitudes, based on GPR research. Geological Quaterly 55(4): 15–27 Szafraniec J., 2013: Paleoflood marks in sandur morphometry as the result of the glacier surge (NW Poland). Hydrology Research, 44.2: 264–280 (paper is also based on terrain observations in SW Spitsbergen and satellite scenes analysis of the Spitsbergen glaciers)
3c. Study the surface melt-water production and the coupling to internal refreezing and superimposed ice formation	Van Pelt W.J.J., J. Oerlemans, C.H. Reijmer, V.A. Pohjola, R. Pettersson, J.H. van Angelen, 2012: Simulating melt, runoff and refreezing on Nordenskiöldbreen, Svalbard, using a coupled snow and energy balance model. The Cryosphere, 6(3), 641–659, doi:10.5194/tc-6-641-2012

	See 3a, 4d, 5a
3d. Evaluate the relationships between the resulting climate proxy records and the relevant climate and climate forcing variables	See 2a C. Wang, L. Shi, S. Gerland, M.A. Granskog, A.H.H. Renner, Z. Li, E. Hansen, T. Martma: Spring sea ice evolution in Rijpfjorden (80°N), Svalbard, from in-situ measurements and Ice Mass Balance Buoy (IMB) data;STATUS : Accepted Annals of Glaciology 54(62) 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; STATUS: Published see 1 (general) M. Möller, 2012: A minimal, statistical model for the surface albedo of Vestfonna ice cap, Svalbard. Cryosphere, 6(5), 1049–1061; STATUS: Published C. Schneider, R. Finkelnburg, M. Möller, M. Braun, T. Sauter, O. Käsmacher, F. Meier and D. Scherer, 2010: Climate forcing of glacier mass balance at Vestfonna, Nordaustlandet, Svalbard. IPY Oslo Science Conference, Oslo; STATUS: Published
3e. Study the processes responsible for calving intensity	See 5e J.A. Aström, T. Riikilä, T. Tallinen, T. Zwinger, D. Benn, J. Moore, J. Timonen, A particle based simulation model for glacier dynamics. The Cryosphere Discussion (in press) Nordig IGS meeting 2012: Discrete element model for modeling viscoelastic materials like ice, T. Riikilä, J. Åström, T. Tallinen, T. Zwinger
4. OBTAIN AN UPDATED ESTIMATE OF THE PRESENT MASS BALANCE OF SVALBARD GLACIERS	
4a. Make a catalogue of glaciers for which estimates of present mass balance are available	http://imgi.uibk.ac.at/node/617 (to be updated upon input from partners) M. Braun, V.A. Pohjola, R. Pettersson, M. Möller, R. Finkelnburg, U. Falk, D. Scherer, C. Schneider, 2011: Changes of glacier frontal positions of Vestfonna (Nordaustlandet, Svalbard). Geogr. Ann. A, Physical Geography, doi:10.1111/j.1468-0459.2011.00437.x; STATUS: Published
4b. Define areas of interest where new mass balance in situ measurement programs could be started, at low logistic cost, using the available platforms	
4c. Continue already running programs of in situ mass balance measurements,	See 4d Błaszczyk M., Jania J.A., 2012: Estimation of calving from

including calving flux as an important factor of mass loss on selected tidewater glaciers	Svalbard tidewater glaciers based upon satellite remote sensing. Tidewater Glaciers Workshop 2012, High Arctic Issues – 26–31 August Svalbard, Norway. Extended Abstract
4d. Combine all of the above information to get an improved estimate of the present mass balance of Svalbard and its current contribution to sea-level rise	See 3a M. Möller, R. Finkelnburg, M. Braun, D. Scherer, C. Schneider (in press): Variability of the climatic mass balance of Vestfonna ice cap (northeastern Svalbard) in the period 1979–2011. Ann. Glaciol.; STATUS: in press. and 3c M. Möller, R. Finkelnburg, M. Braun, R. Hock, U. Jonsell, V.A. Pohjola, D. Scherer, C. Schneider, 2011: Climatic mass balance of the ice cap Vestfonna – a spatially distributed assessment using ERA-Interim and MODIS data. J. Geophys. Res., 116, F03009, doi:10.1029/2010JF001905; STATUS: Published. and 3c, 4c M. Möller, R. Möller, E. Beaudon, O.-P. Mattila, R. Finkelnburg, M. Braun, M. Grabiec, U. Jonsell, B. Luks, D. Puczko, D. Scherer, C. Schneider, 2011: Snowpack characteristics of Vestfonna and DeGeerfonna (Nordaustlandet, Svalbard) – a spatiotemporal analysis based on multiyear snow-pit data. Geogr. Ann. A, 93(4), 273–285; STATUS: Published. and 3d, 4d Jania J.A., Grabiec M., Błaszczyk M., 2011: Odpowiedź lodowców polarnych na współczesne zmiany klimatu – in Polish (An answer of the polar glaciers to the contemporary climate change). Współczesne zmiany środowiska abiotycznego I biotycznego obszarów polarnych, Warszawa, 6 June 2011 – oral presentation
5. MODEL THE EXPECTED RESPONSE IN SURFACE MASS BALANCE AND CALVING FLUX RATE UNDER DIFFERENT SCENARIOS OF CLIMATE CHANGE	
5a. Compile all available information from AWS and ice velocity as well as surface parameters from remote sensing data for model validation	See 3a For AWSs: http://imgi.uibk.ac.at/node/618 (to be updated upon input from partners) Möller M., R. Finkelnburg, M. Braun, R. Hock, U. Jonsell, V.A. Pohjola, D. Scherer, C. Schneider, 2011: Climatic mass balance of the ice cap Vestfonna, Svalbard – a spatially distributed assessment using ERA-Interim and MODIS data. J. Geogr. Res., 116(F03009), doi:10.1029/2010JF001905, 14pp. Claremar B., F. Obleitner, C. Reijmer, V. Pohjola, A. Waxegård, F. Karner, A. Rutgersson, 2012: Applying a meso-scale atmospheric model to Svalbard glaciers. Advances in Meteorology, vol. 2012, Article ID 321649, 22 pages, 2012. doi:10.1155/2012/321649 and 3a, 3c, 4d, 5b, 5c R. Finkelnburg, D. Scherer, M. Möller, R. Hock, U. Jonsell, M. Braun, C. Schneider, On elevational gradients of air temperature on Vestfonna, Svalbard. to be submitted in April 2013
5b. Develop a Regional Climate Model including a sub-surface snow model tuned	See 3a, 5a http://www.hindawi.com/journals/amet/2012/321649/

using the mass balance data and forced with ERA-40 reanalysis data	R. Finkelnburg, F. Maussion, M. Möller, M. Braun, D. Scherer, C. Schneider, 2010: A regional atmospheric reanalysis approach for Nordaustlandet (Svalbard). SvalGlac SC Meeting, Gdynia, Poland; STATUS: Published Sauter T., Möller M., Finkelnburg R., Grabiec M., Scherer D., Schneider C., 2013: Snowdrift modeling for Vestfonna ice cap, north-eastern Svalbard. The Cryosphere Discuss, 7: 709–741, doi:10.5194/tcd-7-709-2013, 2013
5c. Develop mass balance models tuned using the mass balance data, AWS data, data available from manned stations, from ERA-40 reanalysis and from the Regional Climate Model described in 5b, as well as changes in geometry derived from dynamic models	F. Karner, 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. And 3a, 5d
5d. Run these models for different scenarios of climate, in order to estimate the expected changes in surface mass balance	See 3a, 5c R. Finkelnburg, F. Maussion, D. Scherer, 2011: Eine regionale Reanalyse der atmosphärischen Bedingungen in der europäischen Arktis (Svalbard) der Dekade 2001–2010. 30. Annual Meeting of the German Working Group on Climate (AK Klima), Graz, Austria D. Scherer, R. Finkelnburg, F. Maussion, 2011: A regional atmospheric reanalysis for studying weather and climate in Svalbard. 11th Annual Meeting of the European Meteorological Society (EMS) / 10th European Conference on Applications of Meteorology (ECAM), Berlin, Germany; STATUS: Published M. Möller, R. Finkelnburg, M. Braun, D. Scherer, C. Schneider, 2011: Climate sensitivity of the surface mass balance of Vestfonna, northern Svalbard. EGU General Assembly 2011, Vienna, Austria; STATUS: Published M. Möller, R. Finkelnburg, M. Braun, D. Scherer, C. Schneider (in preparation): A 21st-century projection of the climatic mass balance of Vestfonna ice cap (Svalbard) from multi-model CMIP5 scenarios. To be submitted to Clim. Dyn.?; STATUS: Planned in 2013. See 5f
5e. Develop ice dynamics models for the main glaciers and basins, with a focus on calving ones	See 3b J. Otero, F.J. Navarro, J.J. Lapazaran, M. Grabiec, D. Puczko, C. Molina and A. Vieli (in preparation): Modelling the variations of the calving front position of Hansbreen, Svalbard. To be submitted to J. Glaciol.; STATUS: Planned March 2013 and 3b, 3e E. Bucchignani, D. Mansutti, F.J. Navarro, J. Otero, P. Glowacki (in preparation): Thermo-mechanical finite volume description of an icefield with firn cover and subglacial lake. An Arctic test case. To be submitted to Int. Sci. Comp. J.; STATUS: Planned March 2013 and 3b Schäfer M., T. Zwinger, P. Christoffersen, F. Gillet-Chaulet, K.

	Laakso, R. Pettersson, V.A. Pohjola, T. Strozzi, J.C. Moore, 2012: Sensitivity of basal conditions in an inverse model: Vestfonna ice cap, Nordaustlandet/Svalbard. TC, 6(4), 771–783 E. Bucchignani, D. Mansutti, F.J. Navarro, J. Otero, P. Glowacki, 2013: Finite volume modelling of an icefield with a subglacial lake, Congress on Numerical Methods in Engineering 2013, Bilbao, 25–28 June 2013, SEMNI, Spain,2013; STATUS: Accepted for oral contribution; and 3b Poster EGU 2010: Present-day simulations of Vestfonna ice-cap (Svalbard) with Shallow-Ice and Full-Stokes models, M. Schäfer, T. Zwinger, K. Laakso, J. Moore IGS 2010 Ohio: *Present-day simulations of Vestfonna ice-cap (Svalbard) with Shallow-Ice and Full-Stokes models,* M. Schäfer, T. Zwinger, K. Laakso, J. Moore and 3b See 5f Navarro F., Otero J., Lapazaran J., Grabiec M., Puczko D., Vieli A., 2012: 2D modeling of the variations of the calving front position of Hansbreen, Svalbard. Workshop on the Dynamics and Mass Budget of Arctic Glaciers & the IASC Network on Arctic Glaciology Annual Meeting, Zieleniec, Poland, 10 – 13 January 2012 – oral presentation
5f. Run these models for different scenarios of climate, in order to estimate the expected changes in surface geometry and calving flux rate and their corresponding contribution to mass balance	IASC 2013: Modeling Nordaustlandet's ice-caps, M. Schäfer, R. Gladstone, T. Zwinger, V. Pohjola, R. Pettersson, T. Dunse, M. Möller, J. Moore Gladstone R. and others (to be defined – probably M. Schäfer, T. Zwinger, F. Gillet-Chaulet, T. Strozzi, T. Dunse, J. Moore) Century scale projections of the Austfonna icecap, to be submitted by August 2013 Martina & Marco and others, Impact of two-way coupling between mass-balance and ice-dynamics models for Vestfonna ice cap on century-scale glacier-evolution prognostics, to be submitted in 2013 and 5d, 5e
5g. Combine all of the above information in order to obtain an estimate of the expected contribution of Svalbard glaciers to sea-level rise during the 21st century	

4. State-of-the-art in the field activity preparations

Jacek Jania – Poland: Estonian partners informed us about preparations of field activity in Kongsfjorden area in cooperation with Jack Kohler, instead of Amundsenisen as originally planned. It is also planned ice core analysis in cooperation with Polish Partners who will take shallow ice cores on Amundsenisen.

Jon Ove Hagen – Norway: the Project report should stress the financial constraints or even the lack of funds (Norway and the Netherlands as examples).

JJ: plans for spring field campaigns are dependent on logistic issues. Sea ice conditions on fiords will determine the possibility of snowmobile transport from Longyearbyen to Hornsund. It it also considered to hire the ship Farm, or to use (probably for free, or at a very reduced cost) the ship Lance.

Francisco Navarro – Spain: Spanish team is planning the field campaign in the vicinity of Barentsburg with the option to extend it on the Hornsund area – depending on capabilities to get there.

Friedrich Obleitner – Austria: no plans to organize field work by the Austrian team. The AWS operation in Ny-Ålesund will be maintained by Jack Kohler's group.

Piotr Głowacki – Poland: the transport of the scientific equipment and other cargo from Longyearbyen to the mainland would be assured by the vessel "Horyzont II".

JJ: the final report preparation will start in autumn 2013.

5. Other issues

Project final meeting is regarded to be organized as a part of other conferences, e.g. the Nordic Branch Meeting in Helsinki (October 2013) as a special/additional session.