FINAL REPORT on the Ny-Ålesund GLAcier Mass Balance workshop (NÅGLAMB)

A Svalbard Science Forum Workshop proposal

PRINCIPAL INVESTIGATORS

PI: Jack Kohler (Norwegian Polar Institute)

Co-PIs: Jon Ove Hagen (Oslo University), Songtao Ai (Wuhan University), Florian Tolle (Université de Franche-Comté), Parmanand Sharma (National Centre for Antarctic and Ocean Research), Irek Sobota (Nicolaus Copernicus University), Carleen Tijm-Reimer (Utrecht University). Complete list of participants below.

OBJECTIVES OF THE WORKSHOP

The primary aim of this workshop was to bring together researchers from the five international groups studying glacier mass balance in the Ny-Ålesund area. The secondary aims were to promote better collaboration and cooperation between these groups, and to integrate the field studies with modelling efforts, through inclusion of selected members of the Svalbard modelling community. The workshop addresses the four SSF strategic objectives by 1) increased cooperation within Svalbard research groups, 2) increasing coordination of their activities, 3) promoting data sharing, and through better dialogue and coordination between groups 4) potentially helping to reduced environmental impact.

WORKSHOP PARTICIPANTS

Jack Kohler, Norwegian Polar Institute, Tromsø, Norway
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Carleen Tijm-Reimer, University of Utrecht, Utrecht, Holland
Ward Van Pelt, Uppsala University, Uppsala, Sweden
Carina Leander, Forskningsrådet

WORKSHOP PROGRAM

Tuesday, November 01, 2016

Start	End	Talk title	
9:00	12:00	*Arrival, checkin*	
12:00	13:00	Lunch	
13:00	13:30	Jack Kohler	Introduction
13:30	14:00	Jack Kohler	Norwegian MB program
14:00	14:30	Irek Sobota	Polish MB program
14:30	15:00	Coffee	
15:00	15:30	Songtao Ai	Chinese MB program
15:30	16:00	Florian Tolle	French MB program
16:00	16:30	Ankit Pramanik	Indian MB program
16:30	17:00	AL. Ramanathan	Indian MB program
17:00	17:30	Ward Van Pelt	MB modelling
17:30	18:00	*Break*	
18:00	20:00	Dinner	

Wednesday, November 02, 2016

Start	End	Talk title	
7:30	8:30	Breakfast	
8:30	9:00	Carleen Tijm-Reijmer	RCM modelling
9:00	9:30	Chris Nuth	Remote sensing, photogrammetry
9:30	10:00	Group	Identify data gaps and challenges
10:00	10:30	Coffee	
10:30	12:00	Group	Data intercomparison and harmonization
12:00	13:00	Lunch	
13:00	13:30	Thomas Schuler	Precipitation modelling
13:30	15:00	Group	Summarize modelling techniques and data needs
15:00	15:30	Coffee	
15:30	16:30	Group	Evaluate data errors
16:30	17:00	Group	Develop strategy for future funding of collaborative research
17:00	18:00	*Break*	
18:00	20:00	Dinner	

Thursday, November 03, 2016

Start	End	Talk title	
7:30	8:30	Breakfast	
8:30	10:00	Group	Discuss SSF strategic objectives
10:00	10:30	Coffee	
10:30	12:00	Group	Develop common paper
12:00	13:00	Lunch	
13:00	14:30	Group	Conclusions
14:30	15:30	*Checkout*	

SUMMARY

Measuring glacier mass balance in the field is expensive, and therefore spatially limited. In Svalbard, glaciers with mass balance observations are mostly located along the western coast. However, field-based mass balance programs do not exist solely to provide data for one particular glacier. These data are instead crucial for gaining a better understanding of the regional situation, either through aggregation with other similar measurements, or by combining direct observations, satellite data, and surface mass balance models.

Surface mass balance models, forced either by meteorological observations or output from regional climate models, evaluate the surface energy balance to determine surface temperature and melt production. The most complete models couple the surface module to subsurface routines to account for the impact of water storage and refreezing on the mass and energy budgets.

A key need then for the modelling community is in situ measurements of winter accumulation, summer ablation, and net annual change at specific locations.

Mass balance data

The most significant direct output from the NÅGLAMB workshop meeting was that we assembled a first version of a common mass balance database, based on at-stake measurements, for the period 2000-2015. Our ongoing goal is to generate a paper summarizing and integrating these measurements made over the common period. A further goal of the group will be to develop a comparable database of density data, and possibly of general snow depth data, where applicable.

Snow and firn

More snow depth data are needed, in general, but especially around the archipelago, for use in model validation, possibly on an organized campaign basis. SIOS may be helpful in this context. Firn temperature profiles are very useful to constrain mass balance models. An action point is to encourage all field parties to collect such data.

At Austre Lovénbreen there are two field groups working on mass balance: this provides an opportunity to evaluate mass balance error. There may well be Chinese funds to promote analysis of data, something that Songtao Ai and Florian Tolle are looking into.

Errors in mass balance estimates

Internal accumulation (IA) still represents a significant part of the mass budget for the large glaciers and ice fields in the study area. One solution for estimating IA is through modelling, and this probably represents the best option. IA can be detected in the field using thermistor strings, but this is a major additional cost. Gravimetry was also mentioned as a possible tool, but again, this is relatively esoteric for the sorts of campaigns we are able to conduct.

The second element of the mass budget that is not consistenly addressed is superimposed ice (SI); currently SI is not measured at Austre Lovénbreen, Vestre Brøggerbreen, Feiringbreen, Kaffiøyra glaciers. Jack Kohler showed slides of how he detects winter SI in the field, using a Kovacs corer.

There is also the question of the contribution of summer rain to the small glaciers. Estimating this requires the deployment of precipitation gauges. These either need to be ither manually emptied or automatic.

On the small study glaciers, the contribution of snow from valley sides is likely significant, yet measurements of the snow amount have only been conducted on Austre Lovénbreen, using LIDAR. A solution would be to conduct field campaigns with the LIDAR when it is in Ny-Ålesund, although at this stage only UNIS has such a device, and it is in heavy demand. The second more realistic short-term option is to use results from the limited LIDAR campaigns at Austre Lovénbreen to estimate the contributions from the valley sides.

Other

For logistical and financial reasons, there are not always winter measurements on the Kaffiøyra glaciers. We agreed to improve coordination between Nicolaus Copernicus University and NPI biologists, who also seek to come to Kaffiøyra in spring to monitor Svalbard reindeer population there.

There are no ice thickness measurements for any of the Kaffiøyra glaciers. There is a further need for improvements at Austre Brøggerbreen, Vestre Brøggerbreen, Feiringbreen, Holtedahlfonna. Strictly speaking, this lack is not an impediment to mass balance estimates, but ice bed maps represent fundamental information underpinning glaciological investigations.

Future

Finally, we discussed the Liestøl Symposium to be held in 2017. The primary aim of this symposium will be to bring together researchers from the international groups studying Svalbard-wide glacier mass balance, with a focus similar to NAGLAMB on better integrating of field data into regional climate modelling efforts, and improving communication between the Svalbard field, remote sensing, and modeling communities.