

Report of the ISMASS Workshop, University of Sheffield, UK, 7 October 2013

Present: Dan Dixon, Xavier Fettweis, David Holland, Catherine Ritz, Andrew Shepherd, Pippa Whitehouse, Francisco Navarro (representing IASC), Frank Pattyn (representing SCAR), Edward Hanna (representing WCRP CliC)

Chaired by: Edward Hanna

A steering committee meeting of ISMASS was held at the University of Sheffield on 7 October 2013. The main purpose of the meeting was to reorganize the ISMASS Steering Committee (according to the recommendations made at the ISMASS Workshop held in Portland, USA in July 2012) and to redefine the terms of reference.

1. ISMASS Steering Committee composition & Chairperson

It was decided to retain the present committee of 9, including the SCAR, IASC and CliC representatives. The latter were seen as crucial to the smooth running of ISMASS. It was agreed that an unspecified number of (but probably several) invited subject experts could occasionally be invited to attend future ISMASS SC meetings, funds permitting, as the current committee is not a large one so we can get a better community view that way. It was agreed that an APECS member should also be enrolled on the committee. Normal maximum length of committee service would be 5 years, and it would therefore be necessary to co-opt two new members per year onto ISMASS. During the meeting Catherine Ritz volunteered to assume the position of ISMASS Chairperson, which she would assume with effect from after the meeting.

2. ISMASS Terms of Reference (update)

The ISMASS ToR were updated and are attached here (Appendix I).

3. ISMASS strategy

Several ongoing and near-future initiatives were discussed:

- (i) IMBIE follow-up and the forthcoming AGU Chapman Conference in September 2014 arranged by Andy Shepherd. This presented an opportunity to establish a NASA-/ESA-funded diagnosis of the sea-level budget more frequently than is currently done by the IPCC, and perhaps provide an annual survey of ice-sheet mass balance.
- (ii) Improving ice-sheet models and model assessment, especially concerning grounding-line migration and model uncertainty. Improved consideration of consensus datasets (including data uncertainties).
- (iii) Coupled ice-ocean and marine ice sheet model intercomparisons.
- (iv) Stimulation of the ice-sheet community to improve methods and agree on common framework when producing ice-sheet mass balance model projections for the next 100 years.

- (v) More informed use of meteorological reanalysis datasets by the ice-sheet community through a comprehensive validation exercise against (improved) in situ data and systematic control of biases thus detected.
- (vi) Improved development of glacial isostatic adjustment (GIA) models and the incorporation of GIA processes into ice-sheet models.

It was also deemed necessary to ensure that future key satellite missions such as IceSat2, Cryosat and GRACE2 actually happen.

*4. ISMASS **plan of action** including visibility and revitalisation aspects. ISMASS-sponsored publication activities and science meetings. Consideration of ISMASS sub-groups.*

It was decided that Catherine Ritz (assisted by other SC members) would compile and submit a 1000-word EOS position piece, detailing how ISMASS can most effectively facilitate progressing ice-sheet mass-balance science. This would set up a common framework for modelling activities, link with ongoing activities, and help raise the profile of ISMASS in the wider ice-sheet mass-balance community. An ISMASS advertisement will be posted on Cryolist when the EOS article is published.

It was decided not to form ISMASS sub-groups, as these were not felt to be the most efficient way of proceeding. Several workshops were instead proposed, including:

- (i) a West Antarctic ice-ocean workshop in Spring 2014;
- (ii) an AGU Chapman Conference in September 2014 - details as above;
- (iii) a workshop on constraining uncertainty in SMB model output and in situ validation, to be held in autumn 2014 or spring 2015;
- (iv) a workshop on future projections to be linked with the SCAR New Zealand Meeting and Open Science Conference in August 2014;
- (v) a future of ice-sheet model inter-comparison splinter group meeting to be held at EGU in Spring 2014.

5. Links with other international bodies and meetings

Delegates would promote the revitalised ISMASS to interested organisations such as FRIS and WAIS at the earliest opportunity.

6. ISMASS sponsors and funding

Extra money may need to be requested from the co-sponsoring organisations for workshops. It was hoped that CliC would sponsor the proposed APECS representative on ISMASS.

7. Hosting of ISMASS website

Following discussion, it was decided that this should be provided by CliC.

Appendix I: Terms of Reference for ISMASS (updated 7 October 2013)

Background: In 1993 the Global Change in Antarctica (GLOCHANT) Group of Specialists (GoS), a SCAR initiative, established a task group on the "Antarctic ice sheet mass balance and sea-level" contributions (ISMASS) to address the requirements for a coordinated international approach to resolving the role of the Antarctic ice sheet in sea-level change. The group was established under the chairmanship of Professor Charles Bentley and ISMASS held their first meeting at Cambridge in conjunction with the Fifth International Symposium on Antarctic Glaciology (VISAG), in 1993. With the re-organisation of SCAR and the dissolution of GLOCHANT, ISMASS became an Expert Group of the SCAR Physical Sciences Standing Scientific Group (SSG).

In June, 2001, ISMASS held a workshop in Annapolis, MD, at which a strategy was formulated to achieve a meaningful scientific approach to understanding and predicting Antarctic ice sheet mass balance. The resulting report, "Recommendations for the collection and synthesis of Antarctic Ice Sheet mass balance data" was published in *Global and Planetary Change* (vol. 42, 1-15, 2004). ISMASS contributed (including editing of the proceedings in *Annals of Glaciology*, vol. 39) to the SCAR International Symposium on Antarctic Glaciology, Milan, Italy, August 2003, and co-organized (with the SCAR International Trans-Antarctic Scientific Expedition (ITASE) Expert Group) and contributed to a symposium (including editing of the proceedings in *Annals of Glaciology*, vol. 41) during SCAR at Bremen, Germany, July 2004.

Studies conducted over the past decade or so have focused attention on dynamic behaviour of ice streams and outlet glaciers in both Greenland and Antarctica, and on rapid changes that cannot be explained by "conventional" ice-sheet models that form the basis for sea-level projections issued by the Intergovernmental Panel on Climate Change. In its Fourth Assessment Report, the IPCC acknowledged short-comings of current models, stating that "dynamical processes not included in current models but suggested by recent observations could increase the vulnerability of the ice sheets to warming, increasing future sea level rise. Understanding of these processes is limited and there is no consensus on their likely magnitude." Recognizing the importance of ice sheets on controlling global sea level, and the inadequacies in current efforts to model the changes in ice sheets in response to a warming climate, ISMASS published "A need for more realistic ice-sheet models" (SCAR Report no 30) in November, 2007, and organized a three-day Workshop in conjunction with the SCAR/IASC Open Science Conference in St. Petersburg, Russia, July 2008. The outcome of this Workshop, "Ice Sheet Mass Balance and Sea Level" was presented at the International Symposium on "Glaciology in the International Polar Year" (Newcastle-upon-Tyne, UK, July 27-31, 2009) and published as SCAR Report no 38. A Summer School on "Ice Sheet Models for the 21st Century" was held at Portland State University, Portland, Oregon, August 3-14, 2009 (see SCAR Report no 36).

During the St. Petersburg Workshop it became evident that a bi-polar perspective is desirable for ISMASS. On-going dynamical changes in Greenland outlet glaciers, such as the speed up and rapid thinning of Jakobshavn Isbræ following weakening and disintegration of its floating terminus,

provide valuable insights into future response of Antarctic glaciers and ice streams following further warming. The Workshop Report details further the need for studying both the Antarctic and Greenland ice sheets to improve physical understanding of ice sheet processes responsible for rapid change and to incorporate improved physical understanding into numerical models.

In July 2012 ISMASS held a one-day workshop in Portland, Oregon, USA, the key outcome of which was a review paper “Ice-sheet mass balance and climate change” published in Nature in 2013. Around this time WMO CliC also joined SCAR and IASC as a formal sponsor of ISMASS.

ISMASS is presently co-sponsored by SCAR (representing the Antarctic science community), IASC (representing the Arctic science community) and WMO CliC (representing the polar climate science community), to reflect the renewed focus on both polar ice sheets as described in the following Terms of Reference.

Terms of Reference for ISMASS

ISMASS was established in 1993 as a SCAR-tasks group on Antarctic mass balance and sea-level contribution, which has since become bipolar. ISMASS is international and interdisciplinary across the spectrum of relevant ice-sheet mass balance disciplines, and is a self-governing expert group sponsored by SCAR, IASC and CliC. ISMASS aims to:

1. Assess the status of research on interactions between ice sheets and the climate and Earth systems, and identify gaps in current understanding requiring process studies, sustained and targeted campaign-based observations and model development and experiments.
2. Serve SCAR, IASC, CliC, research sponsors and other organizations as a source of knowledge on ice-sheet mass balance and propose directions for future research in this area.
3. Facilitate and serve as a forum for the evaluation and promotion of scientific understanding of ice-sheet system models for both Antarctica and Greenland, in particular with respect to their contributions to global sea-level rise, and to make such information readily available to scientists, policymakers, and the wider public.
4. Keep track of the status of ice-sheet research carried out and sponsored by scientific organizations such as WGMS, GLIMS, IACS and IGS, and liaise with them to ensure that respective activities contribute as much as possible to the objectives of SCAR, IASC and CliC.
5. Promote collaboration between all disciplines (e.g. atmospheric, oceanographic, cryospheric, biogeochemical, solid earth and palaeoclimate sciences) that have an interest in interactions between ice sheets and climate, and on rapid response to modern ocean and atmosphere forcings.
6. Work in concert with relevant SCAR, IASC and CliC panels and other groups to integrate ice-sheet observations and modelling into corresponding global and regional activities, and ensure that our collective objectives are met and resources used most efficiently.
7. Work with appropriate agencies on the distribution and archiving of ice-sheet observations and model output.
8. Attract a new generation of scientists, via interaction with groups such as APECS, into the field of ice-sheet mass balance research.

Acronyms:

APECS = Association of Polar Early Career Scientists

CliC = Climate and Cryosphere Project

FRIS = Forum for Research into Ice Shelf Processes

GLIMS = Global Land Ice Measurements from Space,

IACS = International Association of Cryospheric Sciences

IASC = International Arctic Science Committee

IGS = International Glaciological Society

IPCC = Intergovernmental Panel on Climate Change

ISMAS = SCAR/IASC/CliC Expert Group on Ice Sheet Mass Balance

SCAR = Scientific Committee on Antarctic Research

WAIS = West Antarctic Ice Sheet Initiative

WCRP = World Climate Research Programme

WGMS = World Glacier Monitoring Service

WMO = World Meteorological Organization