



International Association of Cryospheric Sciences

<http://www.cryosphericciences.org>

IACS is a constituent Association of the International Union of Geodesy and Geophysics IUGG and aims at promoting the study of the cryosphere in all of its aspects

Quadrennial Report 2011-2014

Introduction

The International Association of Cryospheric Sciences (IACS) is the eighth and youngest Association of the International Union of Geodesy and Geophysics (IUGG). IACS is concerned with snow and ice science and provides expert advice on cryospheric issues to governmental and non-governmental organisations. Most snow and ice research within IUGG was previously covered within the International Commission on Snow and Ice (ICSI), a commission of the International Association of Hydrological Sciences (IAHS). The IUGG Council voted to establish IACS at the IUGG General Assembly in Perugia, Italy in 2007. This is hence the second Quadrennial report of IACS as an independent Association, the first having covered the period from 2007-2011.

The objectives of IACS are to:

- promote studies of cryospheric subsystems of the Earth solar systems,
- encourage research in the above subjects by members of the cryospheric community, national and international institutions and programmes, and individual countries through collaboration and international co-ordination,
- provide an opportunity on an international basis for discussion and publication of the results of the above research,
- promote education and public awareness on the cryosphere, and
- facilitate the standardisation of measurement or collection of data on cryospheric systems and of the analysis, archiving and publication of such data.

Administration

The business of IACS is managed by a Bureau of elected officers. Members of the present Bureau were elected at the Plenary Administrative Session in Melbourne in 2011 and membership has remained stable during this second quadrennium. They have been President (Ian Allison, Australia – until July 2013 whence he became immediate Past-President), President-Elect (Charles Fierz – until July 2013 whence he became President), Secretary General (Andrew Mackintosh, New Zealand), three Vice-Presidents (Andres Rivera, Chile; Olga Solomina, Russia; Xiao, Cunde, China) and the heads of five disciplinary Divisions (Glaciers and Ice Sheets, Cecilie Rolstad-Denby, Norway; Snow and Avalanches, Ethan Greene, USA; Marine and Freshwater Ice, Hirouyuki Enomoto, Japan; Planetary and Other Ices of the Solar System, Ralf Greve, Japan; and Cryosphere, Atmosphere and Climate, Valérie Masson-Delmotte, France). The President, President Elect/Immediate Past President, and Secretary General make up the IACS Executive (EC). Most internal business of the Association and interaction with other scientific agencies is conducted by email. In addition, the EC conducts monthly teleconferences, which bureau members are invited to join. The Bureau meets in person once per year. Bureau meetings (BM) during this quadrennium were held in Melbourne, Australia (BM07), Sanya, China (BM08), Davos, Switzerland (BM09) and Tokyo Japan (BM10). Minutes of these meetings are available on the IACS website, www.cryosphericciences.org. Plenary



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meetings with the IACS stakeholders, the cryospheric science community, were held in Melbourne, Australia in 2011 and Davos, Switzerland, in 2013.

The President and the Secretary General of IACS participated actively in the IUGG Executive Committee meetings in Melbourne, Australia in 2011, and in Prague, Czech Republic in 2013.

The current four-year term of most Bureau members finishes in July 2015, and a “nominating panel” of members independent of the Bureau (Kumiko Goto-Azuma, Japan; Martin Sharp, Canada; Danny Marks, USA) was established in October 2014 to identify suitable candidates for election to the Bureau. The nominating panel’s role is to ensure that candidates for the IACS Bureau provide a good coverage of world regions and cryospheric disciplines. The new slate of candidates will be circulated to National Committees at least three months prior to its Plenary Administrative Session, to be held in Prague on Friday 26th June, 2015.

IACS facilitates the transfer of research methods and explores new avenues in cryospheric science through Standing Groups and Working Groups devoted to a theme or subject and composed of experts in the particular field of study. IACS Standing Groups include

IACS partnerships and collaborations

The IACS Bureau is proactive in keeping our partnerships alive, by keeping in regular email contact via specific liaisons, and by attending meetings and visiting the offices of our partners. There is not space to detail all of these activities, but below we list the partners that we have been active with during the last quadrennium;

- World Climate Research Programme Climate and Cryosphere Project (CliC; www.climate-cryosphere.org/).
- Association of Polar and Early Career Scientists (APECS; www.apecs.is/)
- International Permafrost Association (IPA; ipa.arcticportal.org/).
- Scientific Committee on Antarctic Research (SCAR; www.scar.org/).
- International Arctic Science Committee (IASC; www.iasc.info/).
- World Meteorological Organisation Global Cryosphere Watch (globalcryospherewatch.org/)
- International Glaciological Society (IGS; www.igsoc.org/)

Activities - Standing Groups

GAPHAZ, the Standing Group on Glacier And Permafrost HAZard in mountains organized a one-day “retreat” Workshop 14 September 2014 in Torino, Italy. GAPHAZ also launched a new website (<http://www.gaphaz.org>).

The Global Terrestrial Network of Glaciers (GTN-G) Standing Group and its daughter organisation the World Glacier Monitoring Service organised a number of glacier monitoring sessions at major





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conferences including the European Geosciences Union (EGU) in 2013 and 2014, and the American Geophysical Union (AGU) in 2014. WGMS has now also organised two summer schools (see below).

In June 2014, an advisory board consisting of C.R. Denby, L.M. Andreassen, A. Arendt, J.G. Cogley, A. Gardner and V. Ryabinin formally evaluated GTN-G. This included a site visit to the National Snow and Ice Data Center (NSIDC) in Boulder, USA. The report was very supportive of GTN-G activities but also made useful recommendations.

The IAVCEI/IACS Joint Commission on Volcano-Ice Interactions organised the Third International Conference on Volcano-Ice Interactions on Earth and Other Planets', held at the U.S. Geological Survey office in Anchorage, Alaska, USA between 18-22 June 2012. In addition, this joint commission organised a large number of individual sessions at major conferences. Please see their website for more information (http://volcanoes.dickinson.edu/iavcei_iacs_viic/events2012.html).

Activities - Working Groups

IACS working groups active in this quadrennium include;

- 'Mass balance terminology and methods' (2008-2012). This working group ended its successful term with publication of the '*Glossary of Glacier and Mass Balance Terms* (edited by Graham Cogley and WG members) published by IHP/UNESCO as IACS Contribution No. 2.
- 'Flow law for polycrystalline ice' (2010-2014). This WG ended its term in 2014, but its leaders are currently working on a paper to be submitted to an international peer reviewed journal in 2015.
- 'MICROSNOW; From quantitative stratigraphy to microstructure-based modelling of snow' (2012–2016). This WG has organised a number of workshops (see below), and is currently very active.
- 'Randolph Glacier Inventory and infrastructure for glacier monitoring' (2014-2018) and 'Glacier thickness estimation' (2014-2018). These two new working groups now have a presence on the IACS website (<http://www.cryosphericciences.org/workingGroups.html>) and will host their first symposia at IUGG Prague (Sessions C01 and C02; <http://www.iugg2015prague.com/iacs-symposia.htm>).

Conferences and Symposia

DACA-13, the Davos Atmosphere and Cryosphere Assembly 2013, "Air, Ice & Process Interactions"
IACS and IAMAS held their joint scientific assembly DACA-13 on 8-12 July 2013 in Davos, Switzerland. More than 950 participants from 52 countries and five continents were welcomed by Charles Fierz and Andrew Mackintosh (IACS President Elect and Sec.-Gen.), Athena Coustenis and Hans Volkert (IAMAS President and Sec.-Gen.), and Alik Ismail-Zadeh (IUGG Sec.-Gen.). Scientifically, the assembly covered numerous fields of atmospheric and cryospheric sciences, enriched by snow hydrology, oceanography, natural hazards, economy and risks, and the history of science. These made up an attractive programme consisting of 21 mostly joint Symposia featuring several sessions each. More



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than 350 posters were on display for the whole week while dedicated poster sessions facilitated deeper discussions with the presenters in attendance. Four distinguished scientists delivered well-attended end-of-day keynote lectures, also open to the Davos public: Thomas Stocker started with the topic “Climate change: Making the best use of scientific information”, Valérie Masson-Delmotte introduced us to “Water stable isotopes and climate in Greenland, from present-day atmospheric monitoring to glacial-interglacial ice core records”, Ronald B. Smith presented “Global aspects of orographic precipitation”, and Georg Kaser closed the scientific part of the assembly talking about “The cryosphere after AR5: more knowledge but also more uncertainty”.

The assembly was highly rated by the attendees. The quality of both talks and posters was generally regarded as excellent and the environment of Davos and its Congress Centre allowed for easy exchanges between colleagues. Indeed, many sessions brought together scientists that would not have otherwise met, and the question “When will the next DACA conference be held?” was often heard. It was a great pleasure to see many early career scientists (ECS) attending the conference. In addition, the Association of Polar Early Career Scientists (APECS) organized a successful workshop that for the first time considered the needs of early career cryospheric scientists in the Alpine area. Further social events included the Festa Cryospherica at the famous *Schatzalp Hotel*, and the Conference Dinner with over 500 diners in the plenary hall, entertained by a group of traditional musicians. During the latter Joyce Penner (IAMAS Vice President) and Andrew Mackintosh read out together a resolution of thanks to the hosts that had been passed by both associations. All guests warmly applauded the joint organizing team and the considerable group of student helpers.

Since 2009, the Swiss National Organizing Committee (SNOC) chaired by Heini Wernli had meticulously planned this event, strongly supported by the two local Davos institutes, the Physikalisch-Meteorologisches Observatorium Davos / World Radiation Center (PMOD/WRC with Local Organizing Committee chair Werner Schmutz) and the WSL Institute for Snow and Avalanche Research (SLF with Scientific Programme Committee chair Michael Lehning). Several generous sponsors helped in staging this event: the Swiss Academy of Sciences, MeteoSwiss, the Federal Office for the Environment, the Canton of Grisons as well as WMO (WCRP, WWRP) and IUGG by awarding travel grants in addition to those provided by IAMAS and IACS.

IACS also supported the following workshops, symposia and summer schools between 2011-2015:

IACS Working Group workshops:

- First International Snow Grain Size Workshop; Measurement and Applications was held in Grenoble, France from 2-5 April, 2013.
- Intercomparison of Snow Grain Size Measurements Workshop, 9-14 March 2014 in Davos, Switzerland.
- Microstructure in Snow Microwave Radiative Transfer (MICROSNOW), 6-8 August 2014, University of Reading, UK.



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Conferences supported by IACS:

- International Partnerships in Ice Core Sciences (IPICS), held in Giens, France, from 1-5 October 2012.
- Third International Conference on Volcano-Ice Interactions on Earth and Other Planets', held at the U.S. Geological Survey office in Anchorage, Alaska, USA between 18-22 June 2012
- International Conference on Cryosphere: Changes, Impacts and Adaptation held between 10-12 November 2012 in Sanya, China.
- IAG/IACS symposium on "Reconciling observations and models of elastic and viscoelastic deformation due to ice mass change" that took place in Ilulissat, Greenland, 30 May-2 June 2013 (www.dtu.dk/subsites/iag.aspx).
- Symposium on "Physics, chemistry and mechanics of snow", in Yuzhno-Sakhalinsk, Russia, 23-28 September 2013
- International Symposium on Sea Ice in a Changing Environment, Hobart, Tasmania, Australia, 10- 14 March 2014 (seoice.acecrc.org.au/igs2014/).
- Model-data workshop for the Late Pleistocene evolution of the Greenland and Antarctic ice sheets, 22-24 May 2014, Grenoble, France (<http://www.physics.mun.ca/MOCA/IceSheetModelandData2014.html>).
- International Workshop on Calving, 1-2 June 2014, Grenoble, France (<http://www-igge.obs.ujf-grenoble.fr/calving2014/theme.html>).
- *Special Session on Cryosphere Science*, XIX Geological Congress of Argentina, 2-6 June 2014, Cordoba, Argentina.

Summer schools supported by IACS

- World Glacier Monitoring Service (WGMS) on 'measurement and uncertainty assessment of glacier mass balance' in Tarfala, Sweden from 9-11 July 2012.
- WGMS summer school on 'Mass Balance Measurements and Analysis' in Zermatt, Switzerland, 2-7 September 2013.
- Second International Summer School in Glaciology University of Alaska, Fairbanks Glaciology Summer School, McCarthy, Alaska, USA from 10-20 June 2012.
- Third International Summer School in Glaciology University of Alaska, Fairbanks Glaciology Summer School, McCarthy, Alaska, USA, 6-16 August 2014.

Future Activities

IACS is looking ahead to the 26th IUGG General Assembly in Prague. IACS will lead Union Symposium U10 (Ian Allison, lead convener) at IUGG Prague. IACS is involved in a number of other union and joint symposia, as well as 17 IACS symposia. In addition to the scientific activities, the following important bureau activities will be carried out in Prague:

- IACS will hold its Plenary Administrative Session on Friday 26th June (6-8 pm), where the new Bureau will be confirmed. The current four-year term of most Bureau members finishes



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in July 2015

- We have established an IACS Early Career Scientist Prize, for the best cryospheric publication by an early career scientist in the calendar year (first year will be 2014). The Selection Committee will announce the winner late-March 2015 and the 2015 Prize will be formally presented during the IACS Plenary Administrative Session.
- The IACS dinner known as *Festa Cryospherica* will be held at Bastion Restaurant in Prague, immediately following the Plenary Administrative Session.
- IACS will hold its open Bureau meeting on Wednesday 24th June in the evening (6-8 pm).
- IACS will hold its annual Bureau meetings in Prague. The closed bureau meetings will be held on Monday 22nd June and Monday 29th June.
- IACS will hold its open Bureau meeting on Wednesday 24th June in the evening (6-8 pm).
- IACS are co-sponsoring an event by the Association of Polar Early Career Scientists (APECS) in the evening of Saturday 27th June.

Planning has commenced for a Joint IACS/International Glaciological Society (IGS)/World Climate Research Programme Climate and Cryosphere (CliC) Assembly in Wellington, New Zealand, February 2017.

