



IACS

International Association  
of Cryospheric Sciences

<http://www.cryosphericciences.org>

## Quadrennial Report 2019-2022

### Introduction

The International Association of Cryospheric Sciences (IACS) is the youngest Association of the International Union of Geodesy and Geophysics (IUGG), established by a vote of the IUGG Council at the 2007 IUGG General Assembly in Perugia, Italy (snow and ice research within IUGG had previously been covered by the International Commission on Snow and Ice of the International Association of Hydrological Sciences). IACS is concerned with snow and ice science and provides expert advice on cryospheric issues to governmental and non-governmental organisations. The objectives of IACS are to:

- promote studies of cryospheric subsystems of the Earth and solar system;
- 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 coordination;
- 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;
- promote and support diversity, inclusion and equality within the field of cryospheric science, including but not limited to career stage, gender, racial and ethnic identities, and geographic origin.

### Administration

The business of IACS is managed by a Bureau of elected officers. Bureau members serve for four-year terms, with the exception of the President, who serves for two years as President-Elect, four years as President, and two years as Immediate Past President. The members of the present Bureau, elected at the 2019 Plenary Administrative Session in Montreal, are:

President (2021-25)

Liss M. Andreassen, Norway

Immediate Past President (2021-23)

Regine Hock, Norway/USA

Secretary General

Richard Essery, UK

Vice-Presidents:

Minghu Ding, China

Stanislav Kutuzov, Russia

Andrew Mackintosh, Australia

Heads of Divisions:

Snow and Avalanches

Charles Fierz, Switzerland

Glaciers

Gwenn Flowers, Canada

Ice Sheets

Sophie Nowicki, USA

Sea Ice, Lake and River Ice  
Cryosphere, Atmosphere and Climate  
Planetary and other Ices of the Solar System

Takenobu Toyota, Japan  
Anaïs Orsi, France  
Christine Schøtt Hvidberg, Denmark

The IACS by-laws have a provision that the Bureau may appoint deputy heads for divisions on request from the Division Head. The Division Head can temporarily delegate the right to vote on Bureau matters to the Deputy, but no Division can have more than one vote. Three Deputy Division Head were appointed in 2020 and 2021: Marie Dumont (Snow and Avalanches), Lauren Vargo (Glaciers), Alex Fraser (Sea Ice).

Most of the internal business of IACS and interactions with other organizations are conducted by email. To run the day-to-day business of IACS, an Executive Committee consisting of the President, Secretary General and President-Elect or Immediate Past-President holds regular teleconferences, in which all Bureau members are welcome to join. The full Bureau meets annually and there is a Plenary Administrative Session at least once during each General Assembly. There have been no opportunities to meet in person since the Bureau and Plenary meetings in Montreal in 2019, so all of these meetings have been held online this quadrennium.

An independent nomination panel (Jon Ove Hagen, chair, Norway; Mary Albert, USA; Ian Allison, Australia) was established in September 2022 to identify suitable candidates for election to the IACS Bureau for 2023-2027. The nominating panel's role is to ensure that candidates for the Bureau provide a good coverage of world regions and cryospheric disciplines. The slate of candidates will be circulated to National Committees at least three months prior to the IACS Plenary Administrative Session in Berlin on Saturday 15 July 2023.

## Activities

### Membership

IACS established free individual membership in 2017, and membership reached 1000 in August 2022. Individual membership is intended to create a strong community around IACS, promoting its activities and its relationship with IUGG and the other seven constituent Associations. Specifically, IACS members receive regular information about IACS activities and opportunities, and are eligible to engage in IACS activities and bodies. This includes the possibility of receiving IACS sponsorship and financial support for workshops, training schools and other IACS-sponsored activities, as well as eligibility for IACS early-career scientist prizes. Everybody is welcome to join, including members of other IUGG associations; see <https://cryosphericosciences.org/members/membership/>.

### Communications

The IACS homepage (<https://cryosphericosciences.org/>) is hosted by the World Glacier Monitoring Service in Zurich and is linked to twitter account @iacscryo (<https://twitter.com/iacscryo>). IACS newsletters feature announcements and reports of IACS activities (<https://cryosphericosciences.org/newsletter/>). Three newsletters were published in 2019, 2020 and 2021, and four in 2022.

### IACS Working and Standing Groups

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. Working Groups address scientific problems that are timely and well constrained; they are normally limited to four years in

duration, but may be renewed for up to a further four years with suitable justification. The Working Groups active during this quadrennium were:

- Randolph Glacier Inventory and its role in future glacier monitoring and GLIMS (2020-2023), which has the objective of automating the process of generating digital glacier outlines to support research in glacier mass balance and contributions to sea level rise.
- Regional Assessments of Glacier Mass Change (RAGMAC, 2019-2023), which brings together the research community that is assessing regional glacier mass changes from various observation technologies to come up with a new consensus estimate of global glacier mass changes and related uncertainties.
- Debris Covered Glaciers (2018-2022), which aims to advance our ability to map debris thickness, to identify the level of model complexity required to estimate sub-debris melt, and to coordinate knowledge exchange.

The Standing Group on Glacier and Permafrost Hazards in High Mountains (GAPHAZ) is joint with the International Permafrost Association and aims to:

- improve international scientific communication on glacier and permafrost hazards;
- compile knowledge related to glacier and permafrost hazards in high mountains;
- work towards greater transfer of information and improved communication between the scientific and governmental communities;
- signpost sources of advice to international and national agencies, responsible authorities and private companies;
- act as a focal point for information for international media during relevant crises.

IACS is part of the Global Terrestrial Network for Glaciers (GTN-G) Steering Committee. GTN-G is a framework for internationally coordinated monitoring of glaciers jointly run by the US National Snow and Ice Data Center, the Global Land Ice Measurements from Space initiative and the World Glacier Monitoring Service.

#### IACS Joint Commissions

Joint Commissions with other IUGG Associations aim to foster collaboration and coordination on topics of overlapping interests. IACS currently has three Joint Commissions, all of which were established in 2020:

- IACS-IAG Joint Commission on Cryospheric Deformation;
- IACS-IAPSO Joint Commission on Ice-Ocean Interactions;
- IACS-IAVCEI Joint Commission on Volcano-Ice Interactions, following on from the earlier Standing Group on Volcano-Ice Interactions (2010-2019).

#### Joint bodies

IACS approved the creation of a Joint Body with the Mountain Research Initiative and the WMO Global Cryosphere Watch on “the status of the mountain snow cover” in 2022. The objectives of the Joint Body are to:

- provide robust information on mountain snow cover changes at a global scale;
- better understand processes of snow accumulation and ablation based on existing modelling and observational studies;
- open access to snow data for the research community and operational capacity building for understanding mountain snow cover changes and impacts.

#### Events and activities sponsored by IACS

IACS supports events that are of interest to the cryospheric community. Contributions typically cover part of the travel costs for early career scientists and scientists from

developing countries attending cryosphere related events, or IACS awards for scientists in these categories. Proposers must be IACS members. Funding requests can be submitted for deadlines on 1 February, 1 June and 1 October and must be at least two months prior to the event that is to be supported. Proposers are informed of decisions approximately two weeks after the deadline.

Travel restrictions and event cancellations led to a reduction in the number of applications received in the middle of this quadrennium. Nevertheless, several events were supported:

- Glacial Isostatic Adjustment (GIA) Training School, Gävle, Sweden, 26–30 August 2019
- Workshop on computational methods for snow and avalanche release mechanics, Aussois, France, 30 September – 1 October 2019
- World Meteorological Organization High Mountain Summit, Geneva, Switzerland, 29–31 October 2019
- Development of the Cryo Connect database in 2019
- 7<sup>th</sup> International Conference on Mars Polar Science and Exploration, Ushuaia, Argentina, 13–17 January 2020
- 6<sup>th</sup> Snow Science Winter School, Col du Lautaret, France, 16–22 February 2020
- 3<sup>rd</sup> Annual Meeting of the Chilean Cryosphere Society, online, 18–19 March 2021
- Juneau Icefield Research Program, Alaska, summer 2022
- International Summer School in Glaciology, McCarthy, Alaska, 7–17 June 2022
- International Symposium on Ice, Snow and Water in a Warming World (Cryosphere 2022), Reykjavík, Iceland, 21–26 August 2022
- International Mountain Conference (IMC), Innsbruck, Austria, 11–15 September 2022

To replace the cancelled BACO-21 IACS-IAMAS-IAPSO assembly, the three Associations ran an online seminar series with invited speakers and early career award winners over the same period (19–23 July 2021). IACS organized the registration and the meeting platform. Recorded presentations can be viewed at <https://www.youtube.com/channel/UCP3bCxu-NIqIINmeoHgGxEQ/videos>. In the absence of the assembly, IACS held an online Open Plenary meeting on 17 November 2021. The meeting ran twice on the same day with repeats of the presentations to facilitate participation from different time zones.

### Awards

The IACS Early Career Scientist (ECS) Prize is a cash prize of €1000 awarded every two years to two early career scientists who have published the best scientific papers on a cryospheric subject as assessed by an independent evaluation committee. The winners in 2019 and 2021 were:

- Dr David Bigelow, Simon Fraser University, Canada
- Dr Doug Brinkerhoff, University of Montana, USA
- Dr Denis Felikson, NASA Goddard Space Center, USA
- Dr Giulia Mazzotti, WSL Institute for Snow and Avalanche Research SLF, Switzerland

The Graham Cogley award was established in memory of Graham Cogley and recognizes excellence in glaciological research by early career scientists. The award was initiated and is generously sponsored by the Cogley family for a period of 20 years, and is awarded in alternate years by IACS and the International Glaciological Society. The IACS recipients in 2019 and 2022 were

- Caroline Aubry-Wake, University of Saskatchewan, Canada
- Devon Dunmire, University of Colorado, USA

- Eric Keenan, University of Boulder, USA
- Gavin Piccione, University of California Santa Cruz, USA
- Jonathon Preece, University of Georgia, USA

IACS Immediate Past President Regine Hock received the International Glaciological Society 2021 Richardson Medal and the European Geophysical Union 2022 Julia and Johannes Weertman Medal.

## Future activities and announcements

### 28<sup>th</sup> IUGG General Assembly, Berlin

IACS has proposed 15 symposia and six joint symposia, and is contributing to nine other joint symposia at the IUGG 2023 General Assembly. Other activities during the Assembly will include:

- Announcement of IACS Early Career Scientist Prize winners
- Selection of Graham Cogley Award winners
- Union Lecture by IACS nominee Ricarda Winkelmann (Potsdam Institute for Climate Impact Research)
- IUGG Early Career Award symposium with presentations by IACS nominees Mohd Farooq Azam (Indian Institute of Technology Indore), Natalya Gomez (McGill University, Canada) and Johan Gaume (WSL Institute for Snow and Avalanche Research SLF, Switzerland)
- Presentation of the IUGG Gold Medal to IACS nominee Valerie Masson-Delmotte
- IACS Open Administration Session and “Festa Cryospherica” dinner, 15 July 2023.



The IACS Bureau, 2019–2023.

Back row, l-r: Minghu Ding, Andrew Mackintosh, Anaïs Orsi, Takenobu Toyota.

Front row, l-r: Charles Fierz, Christine Schøtt Hvidberg, Regine Hock, Gwenn Flowers (on screen), Liss Andreassen, Richard Essery.

Inset, l-r: Marie Dumont, Alex Fraser, Stanislav Kutuzov, Sophie Nowicki, Lauren Vargo.

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