CRYOSPHERE 2020

International Symposium on Ice, Snow and Water in a Warming World

Harpa Conference Centre
Reykjavík, Iceland
21–24 September 2020

Organization: Icelandic Meteorological Office (IMO), World Meteorological Organization (WMO), International Association of Cryospheric Sciences (IACS), International Association of Hydrological Sciences (IAHS), International Glaciological Society (IGS)

Co-sponsors: International Hydrological Programme, University of Iceland, Danish Meteorological Institute, WSL–Institute for Snow and Avalanche Research, Melnikov Permafrost Institute, University of Wisconsin, University of Alaska Fairbanks, University of Ottawa, UNESCO-IOC, TU Vienna, Alfred Wegener Institute, International Arctic Science Committee, National Snow and Ice Data Center, St Petersburg State University, Scientific Committee for Antarctic Research, Agrocampus OUEST, Arctic Monitoring and Assessment Programme, NOAA.

The Icelandic Meteorological Office, the WMO Global Cryosphere Watch (GCW), the International Association of Cryospheric Sciences, the International Association of Hydrological Sciences and the International Glaciological Society will jointly host an international symposium on the Earth´s Cryosphere in Reykjavík, Iceland, 21–24 September 2020. The occasion is the 100th anniversary of the Icelandic Meteorological Office and the transformation of GCW into operational stage.
Left: Morsárjökull outlet glacier from the Vatnajökull ice cap (7700 km$^2$, see inset), SE-Iceland. The glacier is fed by an icefall from the main ice cap. The stippled line indicates the extent of the glacier at the end of the Little Ice Age (~1890 AD). A lagoon is forming at the retreating front. A recent rock avalanche onto the glacier from the slopes on the right may have been partly due to the thinning of the glacier. Vatnajökull receives ~20 km$^3$ of snow each year but the annual mass balance has been negative by 0.6 m w.e. a$^{-1}$ since 1995, causing the ice cap to lose 4% of its volume.

Photo: Snævarr Guðmundsson, 13.9.2014

THEME

As a result of global atmospheric warming, all components of Earth’s cryosphere are now changing at a dramatic pace. More than a quarter of the planet’s land surface receives snow precipitation each year and declining snow cover in many parts of the world is causing concern for the future of wintertime recreation activities. Water stored as snow and ice makes a critical contribution to the world’s available freshwater supply and is essential to the sustenance of natural ecosystems, agriculture and human societies. Mass loss continues from glaciers and ice fields in all mountainous regions of the world and from Arctic and sub-Arctic ice caps. The two large ice sheets in Greenland and Antarctica are major contributors to rising sea-level and are now beginning to show signs of irreversible mass loss. The areal extent and thickness of Arctic sea ice cover continues to decline and the resulting albedo changes are now believed to affect winter weather patterns in North America and Eurasia. Increasing attention is being given to hazards due to thinning of lake and river ice cover and permafrost degradation, including slope failure, which calls for increased in situ monitoring and the development of new remote sensing techniques.

This symposium will bring together scientists, stakeholders and policy makers for a discussion on the latest results from studies of the entire cryosphere, which plays an important role in the hydrological cycle and the Earth System and is one of the most useful indicators of climate change. The symposium will allow ample time for panel discussions on scientific results, new technologies, research gaps and future perspectives in the light of the Paris Agreement, which calls for limiting global warming to 1.5−2°C.

TOPICS

We seek papers and presentations on timely topics related to all components of the cryosphere and its changes due to global warming. Contributions related to adaptation and mitigation strategies in view of the UN’s 2030 sustainable development goals and on the coordination of studies of snow and ice and associated hydrological changes on Earth through the Global Cryosphere Watch or other bodies are also welcome. Key focus areas will include (but are not limited to):

1. **The state of the planet and its cryosphere**: Introductory overviews and statements by representatives of scientific societies and policy makers; presentations on past
changes in climate and Earth’s snow and ice cover and the associated impact on the hydrological cycle

2. Earth’s snow cover: Satellite monitoring of snow cover; avalanche hazard mitigation; importance for tourism; runoff changes due to atmospheric warming; importance of snow-melt as a water resource for mountain region populations and for hydropower utilization

3. Glacier changes: Historical changes in glacier area and mass-balance all over the world; access to data on glacier changes; new developments in remote sensing of glaciers; mass-balance modelling, melt processes and glaciohydrology in warmer climates; risks due to outburst floods (jökulhlaups) from glaciers; glaciers in high-mountain areas and impacts of their melting on populations; future perspectives on glacial rivers as water resources

4. The Greenland Ice Sheet: History; internal structure; recent changes; likely response to near-future warming; varying contribution of Greenland mass loss to sea level in different parts of the world’s oceans; research on surface melt lakes and runoff; ice velocity studies

5. The Antarctic Ice Sheet: History; internal structure; key data from ice cores on past atmospheric composition; vulnerability of the West Antarctic Ice Sheet to rising sea level; research on subglacial water systems; Antarctica in the climate system

6. Sea ice on Earth: Nature and distribution; changes in area, thickness and volume; past variations; likely changes during the 21st century; importance of sea ice in Earth’s climate system; ongoing developments in the Arctic (shipping, settlements, research coverage)

7. Permafrost/frozen ground: Nature and distribution; ongoing changes; monitoring challenges; increased risks of landslides due to permafrost thawing, impacts on the hydrological cycle

8. Lake and river ice: Nature and distribution; ongoing changes; monitoring methods; hazard mitigation

9. Climate variations, climate and Earth systems modelling: Representation of the cryosphere in climate models and Earth systems models; modelling of cryospheric variations and resulting hydrological changes on all time scales, from ice ages through Holocene climate variations to centennial, decadal and annual variations; importance of the cryosphere as a trigger of rapid climate change

10. The cryosphere in high mountain areas: Monitoring and forecasting the retreat of glaciers in the world’s high mountain regions; changes in seasonal runoff; increased risks of flash floods; impact on water resources

11. Research gaps and new technologies: Emerging methods and technologies in surface-based, airborne and spaceborne studies of snow, ice masses, lake and river ice conditions and permafrost, with special emphasis on the development of derived products for cryospheric and polar scientific research and applications

12. Opportunities, adaptation and mitigation: Importance of understanding and taking current and future cryospheric variations into account for the design and operation of societal infrastructure, such as coastal and hydrological infrastructure and hydropower systems

13. The Global Cryosphere Watch: A special session will outline the major aims of GCW, its station network, the data portal and its role in research on the past, present and future of the cryosphere.

Proposals for topics that are not listed above can be considered prior to the call for abstracts. Contact: Thorsteinn Thorsteinsson (thor@vedur.is)
PROGRAM
The symposium will include oral and poster sessions. The organizers will facilitate interaction between representatives of different research fields, and stimulate discussions on one of the most pressing issues facing humanity. Additional activities will include an opening Icebreaker reception, a banquet dinner and an optional full-day excursion after the symposium.

ABSTRACT SUBMISSION AND PAPER PUBLICATION
Participants who wish to present a paper (oral or poster) at the Symposium will be required to submit an abstract. The Council of the International Glaciological Society will publish a thematic issue of the *Annals of Glaciology* on topics consistent with the Symposium themes. Participants are encouraged to submit manuscripts for this *Annals* volume. A call for abstracts will be issued in the Second Circular.

VENUE AND AUDIENCE
The symposium will be held in the Harpa Conference Centre, in downtown Reykjavík, the capital of Iceland. We will aim to run the entire conference in a single session, but meeting rooms will be made available for working groups. Poster sessions will also be organized. We seek participation from the scientific community and from various sectors of society affected by snow and ice, whether through utilization, hazard prevention or in other ways. Public lectures and exhibitions will be held on the symposium topics, as part of activities commemorating the 100th anniversary of the Icelandic Meteorological Office in 2020.

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