

Summary of EGU session GI4.5: Arctic observations: data collection, management, and user engagement

Convener: Stein Sandven, NERSC, Co-conveners: Øystein Godoy (Met.no), Torill Hamre (NERSC), William F. Manley (University of Colorado), Roberta Pirazzini (FMI)

The first section contained presentations about multidisciplinary and pan-Arctic initiatives to foster Arctic observing systems. **Peter L. Pulsifer** (Carleton University, NSIDC U Colorado) presented “Developments in Polar Data Management 2006 – 2019 and Beyond: standardization and community-building in support of enhanced interoperability”. The presentation highlighted the international, collaborative aspect of polar and Arctic data coordination under the IASC/SAON Arctic Data Committee. One key challenge will be to continue to address fundamental issues such as data documentation, quality assurance etc. while at the same time, keeping up with advancements such as AI. **Jan Rene Larsen** (SAON Secretary) presented “Roadmap for Arctic Observing and Data Systems (ROADS)”. This will be organized around Essential Arctic Variables (EAVs), which are broad observable phenomena (e.g. “sea ice”) identified for their criticality to supporting Arctic societal benefit areas. The EAVs shall be specified by their observing system and data management requirements. **Roberta Pirazzini** (FMI) presented “INTAROS synthesis of gap analysis of existing Arctic observing systems”. The analysis was based on questionnaires addressing data coverage, resolution, system sustainability, technical maturity and data handling for the entire chain from observation to users, including metadata procedures and availability of data. The synthesis provided a set of recommendations to fill the gaps and establish a sustainable observing system. **Torill Hamre** (NERSC) presented “Mapping Arctic Observing Systems and In Situ Data Collections”. This is about the ARCMAP project which aims to update and extend the INTAROS survey presented by Roberta, using a web application. Here, users can easily register new information about their observing systems and data repositories (<https://ci.nerisc.no/>). **Finn Danielsen** (NORDECO) presented “INTAROS Joint Assessment of Scientific and Community-Based Observation Programs”. The INTAROS survey was used to collect meta-data on community-based (including citizen science) and scientific observing programs. The main result was that community-based programs lack sustainable funding, which also has impact on long-term data preservation. There are ongoing efforts to disseminate original data through the portal <http://arcticcbm.org>

The next section includes presentations on multidisciplinary regional observing systems as well as thematic ocean and sea ice systems. **Øystein Godoy** (Met.no) presented the Norwegian Scientific Data Network services for providers and consumers. The Network is a distributed data management system linking together existing data centres. Integration of data centres is based on interoperability standards at both discovery and use level and technology choices are rooted in international data management frameworks. Challenges are linked to application of interoperability standards both by data centres and data providers. <https://www.nordatanet.no/>. **Dariusz Ignatiuk** (SIOS) presented “SIOS Observation Facility Catalogue”. SIOS is a regional observing system for long-term measurements in and around Svalbard addressing Earth System Science questions. SIOS integrates the existing distributed observational infrastructure and generates added value for all partners beyond what their individual capacities can provide. **Ole Jakob Hegelund** (Norwegian Ice Service) presented “Extending the Ice Watch system as a citizen science project for the collection of in situ sea ice observations”. **Hanne Sagen** (NERSC) presented “Implementation of a multipurpose Arctic Ocean Observing System”. This is a collaborative project between Norway and USA, showing how acoustic signals can be used measure the mean ocean temperature across the whole Arctic basin. The project follows up

recommendation from OceanObs19 ‘to pilot a sustained multipurpose acoustic network for positioning, tomography, passive acoustics, and communication in an integrated Arctic Observing System, with eventual transition to global coverage’. **Bin Cheng** (FMI) presented “Winter Arctic sea ice bottom evolution detected by thermistor string-based ice mass balance buoys (SIMBA)”. This is example of an automated observing system providing near realtime monitoring of snow and ice mass balance through the seasonal cycle. There is ongoing effort to improve algorithms to deliver standardized data. In situ snow and ice thickness data are required for validating satellite measurements of these parameters and as input to Copernicus ice-ocean data assimilation in forecasting models. **Trine S. Dahl-Jensen** (DTU Space) presented “Sea level in Thule measured with tide gauge, GNSS-IR and Satellite Altimetry”. The aim of the study is to test if GNSS interferometric reflectometry (GNSS-IR) can be used to measure interannual changes in sea levels using existing the GPS infrastructure in Thule, Greenland. GPS positions are used to correct GNSS-IR and tide gauge data for uplift for comparison with altimetry. Results shows good agreement between the three methods over a period of 10 years.

The last section contains presentations of atmospheric and terrestrial observations. **Alexandra Touzeau**, UIB, presented “Stable water isotope observations during INTAROS cruises North of Svalbard: links to atmospheric circulation and sea ice processes”. In the study, water samples collected from surface snow, precipitation, seawater and sea ice were analysed for $d^{18}O$, and timeseries of these measurements showed a link between air mass trajectories and isotopes. The datasets will be highly beneficial for studies using (coupled) isotope-enabled models, such as earth system models or high-latitude regional climate models, to validate their representation of the high-latitude water cycle. **Emanuele Pica** (INGV) presented “The INGV Arctic Ionospheric data management system and its synergy with the Italian NADC”. The presentation showed the IT system for the management, access and dissemination of the data collected from the Arctic GNSS receivers for ionospheric space weather monitoring. Permanent observations in the Arctic region are essential for Space Weather monitoring especially in prevision of the next solar maximum. We are trying to adopt the best practices to provide FAIR data and develop a system capable to be interoperable with data centers and catalogues (like the under-development Italian National Antarctic Data Center). In the near future we aim to start new collaborations with the Arctic data centers. **Annett Bartsch** (b.geos) gave an overview of satellite data over permafrost regions in the Arctic and around the globe to characterize changes visible at the surface and to model temperatures in the ground. Results were presented from two ESA projects: GlobPermafrost and CCI+ Permafrost. Advanced access to data is offered via the Permafrost Information System hosted by AWI. It consists of a catalogue and a WebGIS. Both are subcomponents of existing more general systems. The display provides information on how to access the data (actual data, meta data, visualization, documentation incl. validation results) and on the related projects.

(<http://www.globpermafrost.info/> and <http://cci.esa.int/Permafrost>). **Paco Navarro** (UP Madrid) gave a presentation “Integrating and assessing Arctic glacier thickness data into Glacier Thickness Database (GlaThiDa) Version 3.0”. This is an internationally collected, standardized dataset of glacier thickness from in-situ and remotely sensed observations, based on data submissions, literature review and airborne data from NASA’s Operation IceBridge. The Glacier Thickness Database (GlaThiDa) covers all glaciers over the world, though in INTAROS Work Package 2 assessment we limited to those in the Arctic. The assessment was based on GlaThiDa V2 (2018), while GlaThiDa V3 became available soon afterwards (<https://www.gtn-g.ch/glathida>).

The session had 88 registered participants.