Assessment and Exploitation of the existing Arctic observing systems under the INTAROS project

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Abstract

The identification of "The Business Case for a pan-Arctic Observing System", main goal of the Arctic Observing Summit 2018, requires a thorough evaluation of the present observing system. In the framework of the H2020 project Integrated Arctic Observation System (INTAROS), the existing Arctic observing systems and selected in situ and satellite data products are assessed, exploited, and standardized to enable their delivery to a multidisciplinary, integrated Arctic Observing System (iAOS) through established databases. This assessment and exploitation is carried out in the INTAROS Working Package 2 (WP2) and it addressed observations of the ocean, atmosphere, cryosphere and land including physical, chemical, and biological parameters.

Strengths, weaknesses, gaps in spatial/temporal coverage, missing monitoring parameters, sustainability, and data management of the existing in situ observation networks are analyzed. Moreover, coverage, resolution, timeliness, uncertainty, format, and metadata of selected in situ and satellite data collections are assessed with respect to the requirements needed for applications within weather prediction and sea ice services, hazard risk assessment and prevention, climate, environmental protection. The quality and the processing of selected datasets are improved to meet the highest standards set by the European and international organizations. New products resulting from the exploitation of available data are provided, and sparse data are made accessible through the existing repositories.

The main result is the enhanced quality, quantity, accessibility and documentation of existing Arctic observations, which are then ready to be ingested into the iAOS. The assessment will provide a reasoned basis for future observational funding calls, investment planning, and improvements of the observing system.

1. Method applied to perform the assessment

The assessment and gap analysis of the present Arctic observing system are performed through 4 steps: 1) a survey on the characteristics of the existing and recently exploited (via INTAROS) in-situ and satellite-based observations of the ocean, atmosphere, terrestrial sphere and cryosphere, 2) an evaluation of the requirements of the addressed data for various applications, 3) a gap analysis of various aspects of the data, obtained through the comparison between the surveyed data characteristics and the identified requirements and through Observing System Simulation Experiments (OSSE), and 4) an assessment of the system maturity.

1. The web-based survey was undertaken via three questionnaires (Fig 1), and built upon similar efforts to assess climate data record maturity (EUMETSAT, 2014), measurement series maturity (Thorne et al. 2015; 2017), data management maturity of the Polar observing systems (EU-PolarNet, 2016), and polar satellite

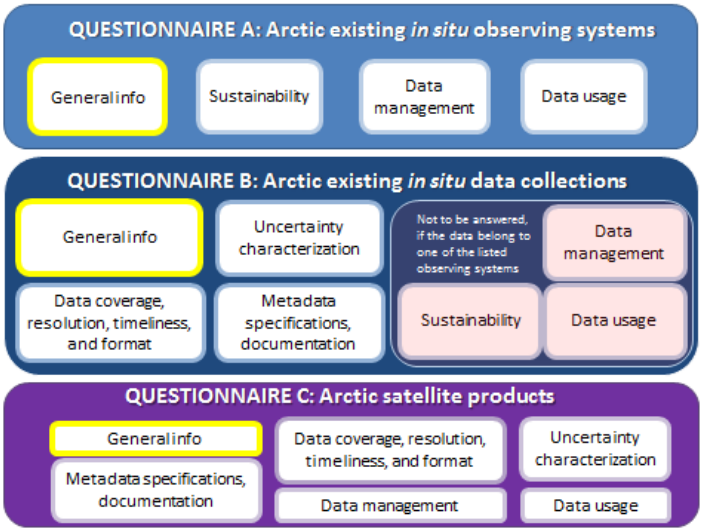

Figure 1. *Schematic illustration of the topics addressed in the three questionnaires*

products (Polar View, 2016). The survey was designed to collect homogeneous and consistent information about in-situ and satellite observations across the bio, geo, and chemical spheres.

2. The requirements are defined with respect to data applications: climate, operational services, environmental protection, geo-hazard forecast, research development. When applicable, the requirements listed in the WMO OSCAR database (https://www.wmo-sat.info/oscar/requirements) for the in-situ and satellite-based data collections were used. When the OSCAR requirements were inapplicable, other requirements were described, following the general indications provided by the INTAROS Initial Requirement Report.

3. The gaps of the existing Arctic observing system were identified on the basis of the comparison between the data characteristics obtained through the survey and the identified requirements. Moreover, OSSE experiments performed using ocean, land and atmospheric models will reveal observational gaps from the perspective of operational and climate monitoring applications.

4. A synthesis and assessment of the observing system maturity across the Arctic and across domains will be performed on the basis of the information collected through the survey, following the methodology developed in previous EU projects (EUMETSAT, 2014; Thorne et al. 2015; 2017) and discussions with GCOS and WMO.

2. Next step and applications

Only INTAROS partners contributed to the fist assessment and gap analysis and to the maturity assessment report. However, an updated assessment will include also the information on the existing observing systems provided by collaborators outside the INTAROS project through the Questionnaire A, which is openly accessible from the INTAROS web page (www.intaros.eu). The described assessment and exploitation effort carried out in the INTAROS WP2 well integrates into the framework of the International Arctic Observations Assessment developed by the IDA Science and Technology Policy Institute (STPI) and the Sustaining Arctic Observing Networks (SAON) (IDA STPI and SAON, 2017). The aim of the framework is to assess the societal benefits derived from Arctic Observations. The INTAROS work is an essential contribution of the Phase 1 of the framework, which aim to the identification of the observational inputs that are or can be used to develop key products and services for the society. As such, *the INTAROS work will provide a reasoned basis for future observational funding calls, investment planning, and improvements of the observing system.*

3. References

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