

Merged Observatory Data Files (MODFs) from an Arctic Atmospheric Observing Network: Developed to support the Year of Polar Prediction (YOPP)

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The International Arctic Systems for Observing the Atmosphere (Uttal et al., 2016, Vihma, et al., 2016, and www.IASOA.org) is a consortium of scientists that work with the measurements made at observatories that encircle the Arctic Ocean. Arguably, IASOA can be considered the most substantive, already existent component of a pan-Arctic Observing system for atmospheric and related surface and snow-ice observations for Arctic terrestrial regions. The consortium has a long history of partnership initiated during the International Polar Year (IPY) and over the last decade, the focus has been on developing cross-network inventories, filling observing gaps, providing data access, developing standardized observing practices, compiling climatologies of individual components of the Arctic system, and supporting science working groups with research outcomes. As IASOA enters its second decade, the challenge is to not only maintain and expand high-quality, long-term, observing programs and science, but also to develop products and protocols that will allow full usage of the observational datasets.

Data discovery and access has been a topic since the inception of IASOA and data stewardship efforts have included promoting submission of data to global archives and developing the framework for an IASOA data portal (<https://www.esrl.noaa.gov/psd/iasoa/dataataglance>). The limitation of the first approach is that individual global network archives such as BSRN (<http://bsrn.awi.de/>) or ebas (<http://ebas.nilu.no/>) are developed for a narrow range of instrument specific variables; the limitation of the second approach is that the portal is dependent on target repositories voluntarily complying with metadata standards that allow data harvesting.

IASOA is currently taking a new approach to data usability by developing standardized Merged Observatory Data Files (MODFs) to support the verification and modeling plans of the Year of Polar Prediction (YOPP, Jung et al., 2016). This short statement is submitted to the AOS Operating Systems and Networks Subtheme and describes “Use of data and information derived from observing systems”. The MODFs which are being developed in collaboration with the YOPP modeling and verification teams will have the following properties:

- There will be one MODF per observatory per defined period (not a continuous product).
- The MODFs will not be real-time
- MODFs will be consistent with YOPP model output files and will internally match time and interval conventions, levels and units and externally match output formats (TBD)
- Surface meteorological variables will be acquired consistently for all stations from NOAA/NCEI
- Each variable will be processed consistently for all observatory, typically with a single individual/team responsible for processing assigned variables for all observatory MODFs rather than establishing processing format/procedure/requirement protocols and relying on processed contributions from individual researchers
- IASOA working group specialists will determine most usable and representative MODF values for the many variables (e.g. turbulent fluxes) that have multiple measurement and derivation techniques

- The YOPP atmosphere-surface variable inventory will be expanded to include greenhouse gases and atmospheric constituents
- Missing data flagging protocols will be developed to accommodate the fact different observatories have different permutations of instruments and measurement capabilities, data may be embargoed, data exists but has failed QC, resources may not be available for processing etc.
- Uncertainty estimates will be included with units information
- The initial MODFs will be for the YOPP 2018 special observing periods (Feb-Mar and June-July-Aug).
- Each observatory and SOP specific MODF will have an individual doi.
- Each MODF will internally and externally attribute all contributing parties
- The MODFs generated specifically for YOPP will be hosted by ACTRIS (<https://www.actris.eu/>) as well as by IASOA (www.iasoa.org)
- Policies will be developed to accommodate and document the situation when individual MODF variables constitute either duplicate or alternative products that are generated from the same original raw data but served through other archives

This short statement is submitted to the AOS Operating Systems and Networks Subtheme and contributes to the discussion on “Use of data and information derived from observing systems”. These unique dataset multi-variate observatory measurements will not only enable detailed process-based analysis investigations for YOPP when paired with the high frequency, site specific model outputs, but it will also produce prototype canonical data files that will substantially increase the usability and accessibility of information across the IASOA network for other research objectives as well as public and commercial applications. The MODF product described thus furthers a business case for an integrated Arctic Observing system.

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