



IVAD – Enhancing Marine Climate Data Records

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<http://icoads.noaa.gov/ivad/>



Abstract

A new initiative began in 2011 to embed observational bias adjustments, improved uncertainty estimations, and advanced quality control (QC) into the International Comprehensive Ocean-Atmosphere Data Set (ICOADS). ICOADS, the most complete and extensive archive available of historical in situ marine meteorological observations, is used by the research community to develop long-term assessments of climate over the world's oceans. However, the range of expert-derived data corrections, adjustments, and QC created for these and other applications are not readily available to other users. Developing the ICOADS value-added database (IVAD) will establish the infrastructure to capture adjustments and will provide the research community with easy access to observations and recommended adjustments. IVAD will (a) establish a database management system to support the development of value-added records and an access service for users; and (b) implement modifications to an internationally recognized data archive format to expand the capabilities for record tracking, data provenance, and inclusion of new parameter adjustments and essential metadata. In time, IVAD will support development of new marine climate data records and summary products.

ICOADS Overview

- Internationally recognized as the most extensive and complete surface atmosphere and ocean in situ data collection
- Release 2.5 (Fig. 1) completed in 2009 (Woodruff et al. 2011)
 - Major delayed-mode (DM) update: 1662-2007
 - "Preliminary" near-real-time (NRT) updates added monthly from Global Telecommunication System data (2008 – Jan 2012 at present)
- Data, metadata, and product access
 - NCAR, NCDC, and ESRL all provide complementary capabilities serving a diverse range of customers.
 - ~400 unique users per year just from NCAR
 - Project web portal: <http://icoads.noaa.gov/>

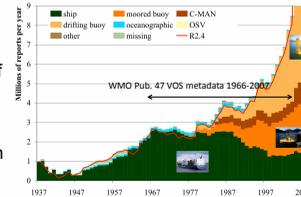


Fig. 1: Number of reports per year broken down by platform types in Release 2.5 (R2.5). Red line shows total reports in Release 2.4. Extensive Voluntary Observing Ship (VOS) metadata has also been added for 1966-2007 in R2.5 products.

What Is IVAD?

- A database and archive solution to link individual marine reports from ICOADS with state-of-the-art adjustments, bias corrections, and/or additional information (e.g., advanced quality control) to support future marine climate research
- Adjustments based on documented research and recommendations of experts in the marine climate community

Why Develop IVAD?

- The marine community has expended time and resources to develop and publish climate quality analyses that account for observing system inaccuracies.
- Ensure these efforts are preserved with the observations
- Ease application of adjustments by future users
- IVAD will support development of marine climate data records, atmospheric and oceanic reanalyses, and satellite products.

IVAD Structure

The IVAD project design has six components. Development of the central data management structure was started in 2011 under NOAA Climate Program Office (CPO) funding.

- Adjustment definitions:** International expert teams working with ICOADS will create and recommend adjustments to various parameters (SST, AT, waves, clouds, etc.).
- Steering panel:** Marine data experts will approve adjustment factors, corrections, and new critical metadata to be added to IVAD.
- Central data management:** Technical experts will define data formats, manage databases, integrate adjustment factors, and distribute and archive IVAD.
- Platform and instrumental metadata augmentation:** Accurate and complete metadata is critical to the development of adjustments and corrections to ICOADS.

Quality control: Developing and implementing new methods (e.g., track checking, multivariate checks) will improve ICOADS quality.

Product development: Research and operational groups will develop climate data records, data analyses, models, and indices for the community from IVAD.

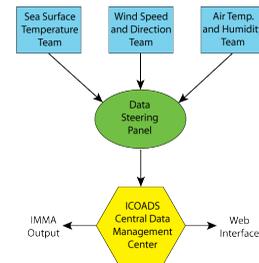


Fig. 2: Data flow schematic for community-developed adjustments into IVAD. The expert teams and steering panel will be activated after a prototype database and archive file format are created and tested.

Potential Adjustments

- Ship heating (Fig. 3, Berry et al. 2004)
- Beaufort winds (Lindau 1995)
- Instrument height (Thomas et al. 2008)
- Variations in instrumentation (e.g., bucket vs. intake SST; Kent and Taylor 2006)
- Differing platform types (Kent and Taylor 2006)
- Enhanced metadata (Kent et al. 2007)
- Improved QA/QC procedures (Smith and Reynolds 2003)
 - spurious rejection of extreme climate events = "trimming" problem
 - incorrect platform ID vs. type

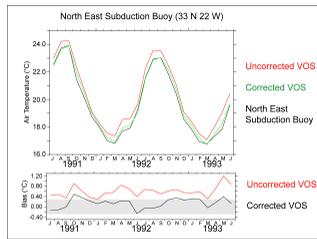


Fig. 3: Example of ship heating bias correction from Berry et al. (2004). Uncorrected air temperatures are biased high because of solar heating of instruments and instrument environment. Applying the bias adjustment brings data into much better agreement with moored buoy air temperatures. Mean bias is +0.6 C before and +0.1 C after adjustment.

IVAD Progress

- Two key changes to ICOADS are necessary to moving IVAD forward.
- Addition of unique identifiers (UID) to every marine report
- Modification of the International Maritime Meteorological Archive (IMMA, see below) format to include
 - the UIDs
 - an IVAD attachment (see Fig. 4)
- In addition to modifications to IMMA and the development of the IVAD database, the National Oceanography Centre Southampton and FSU will test the proposed IMMA IVAD attachment.
- An IVAD website is under development at <http://icoads.noaa.gov/ivad/>.

IMMA: A Robust and Extensible Observational Data Format

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- IMMA is an ASCII format (<http://icoads.noaa.gov/e-doc/imma/R2.5-imma.pdf>).
- IMMA includes a common Core + optional attachments.
- IMMA will form the archive foundation for IVAD.
- A new attachment has been designed (Fig. 4) to store IVAD values and associated metadata.

Key requirement: Attach original data forms. Experience demonstrates format translations frequently contain errors or omissions.

Advantage: An exact copy of original data permits re-translation and cross-checks at any time.

Uncertain Future

- IVAD is recognized as an important modernization of ICOADS by the marine climate community (Smith 2011).
- Severe NOAA funding cuts in FY12 have suspended ICOADS and IVAD development (Fig. 5).
- Emergency planning has outlined a way to maintain the NRT ICOADS extension at NCAR and NCDC.
- Development that leads to new ICOADS Releases and key changes for IVAD can not occur at present.
- For the longer term future, augmented partnership and resourcing possibilities are under discussion, but meanwhile the future of ICOADS and IVAD is uncertain.**

Public Notice: Termination of ICADS Development Due to NOAA Budget Cuts

ICADS has operated for decades in the US as a partnership between NOAA—its Earth System Research Laboratory (ESRL) and the National Climatic Data Center (NCDC)—and the National Center for Atmospheric Research (NCAR), together with growing international participation.

For budgetary reasons, stemming from mandated large cuts at the NOAA Climate Program Office (CPO), ESRL Directors have determined that it is no longer feasible for its Physical Science Division (PSD) to continue supporting any further ICADS work—effective immediately.

This immediate cessation of support by ESRL means the future of ICADS is unclear. The project is working to transition some operations to NCDC, but for the foreseeable future, the operational maintenance, development, releases, and quality control services of the existing Release 2.5 (R2.5-2007) will continue through NCAR and NCDC, provided it is supported there.

All data archives there are plans for any new major ICADS delayed-mode updates or releases.

"Preliminary" near-real-time updates of the observations and base gridded monthly summary products will continue to be produced and served at NCAR for as long as current data flows remain unchanged.

The ICADS website (<http://icoads.noaa.gov/>), the project central information source, as hosted at FSU cannot be updated further. A private home for the extensive existing content of ICADS web pages and metadata is under discussion.

The database remains in related website currently hosted under the leadership of NOAA, including the international marine meteorological website, <http://meteo.noaa.gov/>, and the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) website. The IVAD project is being held in development at ESRL, as it is likely this will be terminated.

Regularly however, there will be no staffing support for routine work or consultation from ESRL.

This situation suddenly became known to the project membership in December 2011, and we are very sorry about this development and for each short notice. We know it will have significant impacts on the quality of a wide range of scientific research. Please address any further questions or concerns to ESRL, NCDC, and/or higher-level NOAA management.

Fig. 5: Public notice of termination of ICOADS development.

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