

D R A F T C² D² ARC (Applied Research Center) for ICOADS and Operational SST Analyses

1) Basic Description of Dataset(s)

The International Comprehensive Ocean-Atmosphere Data Set (ICOADS) offers the most complete surface marine data available over the world ocean for the past two centuries. Sea surface temperature (SST) analyses are one of the more important products derived from ICOADS and satellite data. The SST analyses using only ICOADS data will be referred to as ERSST for Extended Reconstruction SST. The SST analyses using ICOADS and satellite data will be referred to as the blended SST. The blended SST analysis is now being operationally maintained at the National Centers for Environmental Prediction (NCEP) while scientific development is being done at the NCDC. The ERSST analysis is presently maintained at NCDC with limited support. The SST funds are needed to operationally maintain these analyses and to reanalyze them for the entire period of record when scientific evaluation has defined the changes that need to be made to improve the analysis. ICOADS funding will go to CDC; SST funding to NCDC. NCAR is a key participant in ICOADS, without cost to NOAA. A-Specification of the specific variables.

I-ICOADS is a data set consisting of SST, air temperature, surface humidity, pressure, and wind measurements. In addition, other variables such as cloudiness and wave data are also included.

B- Type of observations used in the data set ICOADS uses in situ data from ships, moored and drifting buoys, plus C-MAN and some other specialized data (e.g., rigs, tuna fishing boats). The SST analyses use SST observations from ICOADS plus satellite retrievals from the AVHRR instruments when available.

C- Geographic area covered ICOADS and the SST analyses are global.

D- Temporal and spatial resolution of the data sets ICOADS consists of individual marine reports (observations) plus 2° monthly summaries back to 1800 with 1° summaries beginning in 1960. The ERSST analysis is monthly on a 2° spatial grid. The blended SST analyses are updated weekly and monthly on a 1° spatial grid.

E-Duration of the data set(s) ICOADS consists of a delayed-mode archive covering 1784-1997, extended by a less fully processed real-time (Global Telecommunication System; GTS) archive through 2002. The ERSST analyses are produced from 1854 to present. The blended SST analyses are produced from November 1981 to present.

F- Standard interval for adding new data. Delayed-mode ICOADS is updated every several years, and real-time ICOADS more frequently. The SST analyses are updated monthly or weekly in near real time as appropriate.

G- Mechanisms maintained for accessing the data A variety of mechanisms is available for ICOADS, including ASCII formats and subsetting, netCDF (usable via applications such as the Live Access Server) and a

new data base management system. The SST analyses are available in ASCII and other binary formats.

H- Current uses of data set(s) that support operational designation The ICOADS data and products are very widely used in many applications, including in national and international assessments and reanalyses. The SST analyses are also widely used for climate analysis, forecasting and prediction.

2) Scientific Stewardship Activities Required for Continued Production of the Climate-Quality Data Set

A- Quality control procedures, including ongoing improvements Continuing improvements to the basic ICOADS quality control operations will be carried out including duplicate elimination, monitoring of data receipts, and correction of known systematic data errors.

B- Bias identification and processing

None.

C- Reprocessing work underway, e.g., refresh rate (version control), production of data set(s) at finer resolution, employment of new processing algorithms, gridding, etc.

Implementation of accurate conversions from original data formats, and from earlier ICOADS formats, into the new ASCII ICOADS archival observational format (IMMA).

Examination of SST analysis errors has shown that the use of new satellite SST data sets can significantly improve the analysis. The addition of these new data sets to the SST analysis will be included in the work planned here.

D-Basic “hands-on” utilization activities

None.

E-Identification of data set “point man” or “champion”

Richard W. Reynolds.

3) Funding Request

A- Personnel/organization involved in each element above & cost

Budget (NCDC) FY 2004

Salaries (including benefits)

Chunying Liu (10 months) *

TOTAL NCDC *

Budget (CDC) FY 2004

Salaries (including benefits) Sandy Lubker (8 months) *

TOTAL CDC *

PROPOSAL TOTAL 190

B- Other resources (computational, travel, etc) required
None

C- Funding history of project ICOADS has been supported for a number of years with funding both from ESDIM and from NOAA's Office of Global Programs (OGP) Climate and Global Change Program. ESDIM provided \$85K to NCDC and \$85K to CDC in FY 2004; \$85K for each organization is anticipated in FY 2005. OGP C²D² provided \$100K to NCDC and \$100K to CDC for COADS for FY 2000 through FY 2003, and the C²D² ARC provided \$95K to CDC for ICOADS in FY 2004. Development of the ERSST analysis has been supported by OGP C²D² in FY 2000, FY 2001, and FY 20002 at 100K, 120K and 120K, respectively. Development of improvements in the blended SST analysis and the determination of importance of buoy SST data have been funded by OGP Office of Climate Observation since FY 2002 at \$100K per year. The C²D² ARC provided \$95K to NCDC for operational SST development in FY 2004.

4) Transition of ARC Project to Operational Center Outline pathway for eventual transition of your operational process to an established NOAA operational Center using the four steps outlined below. Steps.

- 1 operational processing and data archive at PI's institution only.
- 2 data being archived at NOAA Center, but all processing at PI's institution.
- 3 process being run in parallel at PI's institution and NOAA Center.
- 4 processing and archive only at NOAA Center, PI performing Scientific Data Stewardship oversight as needed.

For ICOADS: a) Current operational status: The delayed-mode observational archive has been archived at NCDC. In addition, NCDC receives contemporary marine data from GTS and other sources. Some of these are being translated by NCDC to IMMA format, and provided monthly to NCAR for archival and future delayed-mode updates. These translations have not yet achieved a level of quality and completeness satisfactory for ICOADS. However, the original data strings are attached, making parallel re-translations possible. Porting GTS (and possibly in the future other) translation software to NCDC from CDC is also planned. b) Future transition prospects: Given adequate resources (item c) it should be possible to transition more of the real-time ICOADS processing to NCDC over a multi-year period. However, the delayed-mode ICOADS processing is inherently a research activity; each iteration involves extensive new software development and tuning, as well as the in-depth involvement of NCAR plus international partners. c) Ramifications of reduced funding at CDC: The loss of ESDIM resources in FY 2006 means CDC's marine programmer may have to be partly redeployed to non-ICOADS tasks. This will slow the pace both of the transition to operations of

ICOADS real-time processing, and future delayed-mode updates, unless other funding can be found to cover the shortfall (~40% of one FTE).

For operational SST: As mentioned above the ERSST is already being run operationally at NCDC while the blended SST is being run at NCEP. During this fiscal year the ERSST analysis will be automated so that the runs occur automatically. However, monthly maps will still be examined to ensure that the ERSST ran correctly and that all incoming datasets were accurate. The ERSST analysis will also be available in netCDF as well as ASCII. The blended SST will be set up to run at NCDC in parallel to the NCEP version. This fiscal year, the input SST and sea-ice data sets have been made available operationally at NCDC in the correct format for the analysis. During this fiscal year, the complete analysis will be run operationally and compared with NCEP. Once this is complete, improved versions of the analysis will be made available. These versions will include the addition of microwave SST data from TMI and AMSR-E as well as improved bias correction procedures. New error covariance scales have been developed which will allow the data to play a more important role. One of the new versions will use these new scales. After careful testing, the new codes will be made available to NCEP. In addition, procedures will be developed to ensure that the code runs accurately at both centers and to ensure that the analyses and any supporting information are available on the web. The SST analysis will include more accurate error estimates and will be available in ASCII and netCDF.