

Integrated Global Radiosonde Archive (IGRA) ARC Proposal

The Integrated Global Radiosonde Archive (IGRA) consists of radiosonde and pilot balloon observations at 1536 globally distributed stations with varying periods of record during 1938-present. Observations include pressure, temperature, geopotential height, dewpoint depression, wind direction, and wind speed at standard, surface, tropopause, and significant levels. Radiosonde observations are critical to the verification of satellite measurements and satellite-derived products. Furthermore, they constitute the only source of upper-air observations prior to the 1970s and frequently provide the highest vertical resolution available in critical layers of the atmosphere such as the planetary boundary layer. In recognition of these facts, NOAA has provided funding for the construction of a dataset of in situ upper-air observations for the past decade. Thanks to this support, IGRA now is the largest and most comprehensive dataset of quality-assured radiosonde observations freely available. Its temporal and spatial coverage is most complete over the United States, western Europe, Russia, and Australia. IGRA data are updated in near-real-time (daily) and thereby directly support NOAA's mission to monitor the climate not only at the surface, but also in the free atmosphere.

1. Basic Description of Data Set

A) Variables: Pressure, geopotential height, temperature, dewpoint depression, wind speed, and wind direction.

B) Type of observations: Radiosonde and pibal observations.

C) Geographic coverage: Global land areas, surface to middle stratosphere.

D) Resolution: Highly variable; nominal twice-daily temporal resolution; up to 16 mandatory levels and a varying number of significant levels.

E) Duration: 1938 to present, but the period of record varies from station to station.

F) Update interval: Daily via reports transmitted over the GTS; occasional integration of new data sets from individual sources (e.g., countries).

G) Access mechanisms: ftp; WWW access under development.

H) Operational applications: RATPAC, 2004 State of the Climate report in BAMS, Health of the Network monitoring of GUAN.

2. Scientific Stewardship Activities

A) Quality control: The IGRA quality assurance procedures can be grouped into six general categories: basic plausibility checks, internal consistency checks, checks for the repetition of values, climatologically-based checks, checks on the vertical and temporal consistency of temperature, and data completeness checks. Various format checks are also performed to ensure that the structure of the data files as well as any codes employed are consistent across all files and adhere to the standards set forth in the documentation. No changes to the system are planned for this fiscal year. However, messages from the daily update system continued to be monitored and refined, so that they may alert to any need for such changes. The next revision to the QA system is anticipated to be undertaken in 2006.

B) Bias identification: Currently, no bias adjustments are applied to the individual soundings. However, adjusted global and hemispheric time series of temperature will become available through the RATPAC project during this fiscal year.

C) Reprocessing work: The GUAN station Marte, which started to report in early 2004, will be added to IGRA. Furthermore, the RATPAC algorithms will be integrated into the IGRA update system such that global and hemispheric monthly mean temperatures will be available for climate monitoring by the eighth day of the subsequent month.

D) Utilization activities: Since IGRA has only been completed for a few months, projects utilizing IGRA data at NCDC are in their initial stages. RATPAC time series will be used in monthly and annual State of the Climate reports as well as in international assessments (e.g., CCSP). IGRA data are also being used to monitor the completeness and quality of the GCOS upper-air network as part of the health of the network project. In addition to these operational applications, various measures of inversion characteristics and atmospheric water vapor content derived from IGRA will be required for the C2D2-funded project, "Investigating Climate Change Using Hourly Observations." Furthermore, an investigation of the

climatology and variability of the tropospheric lapse rate and location of the tropopause has been initiated in collaboration with John M. Wallace at the University of Washington. IGRA will also be incorporated into the NOAA Operational Model Archive and Distribution System (i.e., NOMADS) for use in comparing *in situ* and GCM temperature fields.

E) Dataset Champion: Imke Durre (NCDC)

3. Funding Request

A) Personnel: Durre (1 month), Vose (1 month), and a physical scientist (1 month); \$40K per year.

B) Other resources: Travel and page charges; \$5K per year.

C) Funding history: The NOAA Climate and Global Change Program has supported the development of a global dataset of upper-air observations since the mid-1990s. IGRA in particular, with Imke Durre as the PI, has received two grants totaling \$70K.

4. Transition of Project to Operational Center

_____Not applicable (project already resides at NCDC, although the transition from development mode into the official archive and operational processing is still under way.)