Integrated Global Radiosonde Archive (IGRA) Version 2 Readme File

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I. OVERVIEW

This file provides guidance for how to navigate the FTP directory for Integrated Global Radiosonde Archive (IGRA). It provides a brief overview of what is new in IGRA 2, step-by-step instructions for downloading desired data and metadata, and an explanation of the contents of the directory and all of its subdirectories.
The formats of the various types of files available are described in separate documents.

IGRA 2 replaces IGRA 1 as NCDC's baseline upper-air dataset.
IGRA 1 continues to be available in a subdirectory v1 of this FTP directory, but is no longer updated.

Send any feedback to the IGRA Team at ncei.igra@noaa.gov.

II. WHAT'S NEW IN IGRA 2

Following is a summary of what is new and different in IGRA 2 compared to IGRA 1.

- More Data: IGRA 2 contains nearly twice as many stations and 30% more soundings than IGRA 1.

- Longer Records: The earliest year with data in IGRA 2 is 1905, and there are several hundred stations with data before 1946. In IGRA 1, only one station's record extends back to before 1946, and its record begins in 1938.

- Ships and Ice Islands: IGRA now contains data from 112 floating stations, including 17 fixed weather ships and buoys, 72 mobile ships, and 23 Russian ice islands.

- Additional Variables:
  1. Reported relative humidity and time elapsed since launch are now

provided in the sounding data files whenever they are available. This allows for the inclusion of humidity observations prior to 1969, the first year with dewpoint depression in IGRA 1.

2. The derived-parameter files now include both reported and calculated relative humidity. In soundings in which humidity is reported only as relative humidity, all moisture-related derived parameters are based on the reported relative humidity. In all other soundings, they are based on dewpoint depression/calculated relative humidity.
3. In addition to monthly means of geopotential height, temperature, an wind, monthly means of vapor pressure are now also available.

For details on these variables and associated changes in data format, see the respective format descriptions.

- Additional Data Sources:
1. IGRA 2 is constructed from a total of 33 data sources, including 10 of the 11 data sources used in IGRA 1.
2. To improve spatial coverage, data received via the Global Telecommunications System (GTS) by the U.S. Air Force 14th Weather Squadron replace the less complete NCDC/NCEP-based 1973-1999 GTS data which was the largest contributor of data to IGRA 1. This change particularly improves the spatial coverage over China in the 1970s and 1980s.
3. Daily updates now come not only from the GTS, but, for U.S. stations, also directly from the U.S. National Weather Service (NWS), resulting in higher-precision, higher-vertical resolution data for U.S. stations in near real-time.
4. Global coverage prior to the 1970s was enhanced primarily by the "C-Cards" and "MIT" datasets from the National Centers for Atmospheric Research as well as Version 1.01 of the Comprehensive Historical Upper Air Network from the Institute for Atmospheric and Climate Science at ETH Zurich in Switzerland.
5. Additional data sources include pilot balloon observations for the United States that were digitized under the Climate Data Modernization Program (CDMP), radiosonde and pilot balloon observations for several countries in Africa from CDMP and Meteo-France, ship and ice island observations from NCDC's archive, Antarctic radiosonde observations provided by the British Antarctic Survey, the Historical Arctic Radiosonde Archive from the National Geophysical Data Center, and 1990s Indonesian radiosonde data provided by the Japan Agency for Marine-Earth Science and Technology.

- Eleven-character Station IDs: To accommodate stations other than those with world Meteorological Organization (WMO) station numbers, IGRA now uses 11-character station identifiers that consist of a two-character country code, a one-character station network code, and an eight-character station identifier.

The station IDs for WMO stations, which account for approximately 80% of the IGRA 2 stations, contain a network code of "M" followed by "000" followed by the five-digit WMO identification number. For example, the IGRA 2 station identifier for Key West (WMO# 72201) is USM00072201.

The remaining stations are identified by ship call signs (network code "V"), Weather Bureau, Army, Navy (WBAN) numbers ("W"),

International Civil Aviation Organization call signs ("I"), and
specially constructed identifiers ("X").
For more details, see the format description of the station list.

- Changed station list format: The order of fields in the station list has been changed for consistency with some of NCDC's other datasets. In addition, the identification of stations as GCOS Upper Air Network (GUAN) and Lanzante/Klein/Seidel (LKS) stations has been removed. Relevant LKS stations are captured within the RATPAC product, and the latest list of GUAN stations is best obtained directly from the WMO.

- Additional Information in Sounding Headers:
  1. Header records in sounding data files now include two data source codes, one for pressure levels and one for non-pressure levels.
  2. In order to be able to indicate the position of mobile stations at each observation time, fields for the latitude and longitude have been added to the sounding headers in data files. For fixed stations, including moored ships, the coordinates entered into these fields are always the same as those shown in the IGRA station list since the actual position is generally not known on a sounding-by-sounding basis at those stations. Coordinates are not included in the sounding headers of the derived-parameter files since sounding-derived parameters are provided only for fixed stations.

  For more details, see the format description of the data files.

- Soundings Without Observation Hour: Unlike IGRA 1, IGRA 2 contains soundings from some data sources in which the time of day at which an observation was made is indicated only by the release time, i.e., the time at which the balloon was launched, and the nominal/observation hour is missing (= 99). Since conventions for determining the observation hour from the release time vary over time and among agencies, no attempt has been made to infer the observation hour from the release time in IGRA 2.

- Modified Level Type Indicators: The meaning of the first digit of the level type indicator in sounding records has changed as follows:

  Blank is no longer used.
  1 continues to indicate a standard pressure level.
  2 indicates a non-standard pressure level regardless of whether it contains thermodynamic data or only wind data.
  3 indicates a non-pressure level, which always only contains wind observations in IGRA 2.

- Non-Pressure Surface Levels: Unlike in IGRA 1, IGRA 2 contains surface levels that do not contain a pressure value. Such levels only appear in soundings that consist entirely of data levels whose vertical coordinate is identified only by height.

- Methodological Changes:
  1. The process of choosing which data sources contribute to each station record as well as the process of merging multiple data sources into

one station record were redesigned to increase automation, accommodate
a greater variety of data sources and station identifiers, and preserve
a larger number of pilot balloon observations.

2. In addition, some minor improvements were made to the quality assurance
procedures, including, most notably, the addition of basic checks on
elapsed time and relative humidity as well as improved selection of
a single surface level within soundings in which multiple levels are
identified as surface.

3. The compositing procedure was redesigned. Stations are now composited
when they are within 5 km of each other and their records do not contain
soundings at concurrent observation times.

All of these modifications will be described in greater detail in a
future article.

- Additional Station History Information:

1. The IGRA metadata file, which contains documented information about
the instrumentation and observing practices at many stations, has been
augmented with additional records extracted from the Gaffen (1996)
collection that formed the basis for the original IGRA metadata.
The additional records are for nearly 700 IGRA 2 stations for
which no data was available in IGRA 1.

2. To provide information on instrumentation used in recent years for which
documented station history information is not available in the IGRA
IGRA metadata file, the WMO radiosonde/sounding system and measuring
equipment codes contained in Global Telecommunications System messages
are also supplied in separate files for the years 2000-2013. Note that
these codes have not been checked for accuracy and are provided
as received.

III. DOWNLOAD QUICK START

Start by downloading "igra2-station-list.txt", which has metadata for all stations
in the dataset. You can find this file in the same location where this README
file resides, i.e., by going to directory pub/data/igra/
at ftp.ncdc.noaa.gov or pointing your browser to
http://www1.ncdc.noaa.gov/pub/data/igra/ .

Then, to find and download the data for a specific station, proceed
as follows:

- Find the station's name in "igra2-station-list.txt" and note its station
identification code (e.g., Key West is "USM00072201").

- Decide which of the following types of data you desire, navigate
to the appropriate subdirectory, and download the desired
ZIP-compressed data file(s) and associated format documentation.

For individual soundings for the full period of record, go to
subdirectory data/data-por and download the file containing the desired

station ID in its filename (e.g., USM00072201-data.txt).
For individual soundings from this year only, go to data/data-y2d and download the file containing the desired station ID in its filename.
For period-of-record sounding-derived moisture, stability, and other parameters, go to derived/derived-por and download the file whose name contains the desired station ID (e.g., USM00072201-drvd.txt).
For monthly means for the full period of record, go to monthly/monthly-por download the file(s) for the desired variable and nominal hour (e.g., temp_00z-mly.txt.zip for 0000 UTC temperature).
For monthly means for only the last calendar month, go to monthly/monthly-upd and download the file(s) for the desired variable and nominal hour.

- Uncompress the downloaded file using an uncompressing software (e.g., 7-Zip or winzip under Windows or the "gunzip" command under Linux).

IV. CONTENTS OF FTP DIRECTORY(ftp.ncdc.noaa.gov/pub/data/igra/)

Main level (pub/data/igra/):
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data/	contains IGRA 2 sounding data files.
derived/	contains IGRA 2 derived sounding parameters.
history/	contains IGRA 2 station history information.
monthly/	contains IGRA 2 monthly means
v1/	contains IGRA 1 files (see v1/readme.txt)
igra2-country-list.txt	is a list of country codes used in IGRA 2 station identifiers.
igra2-list-Format.txt	is the description of the format of the IGRA 2 station list.
igra2-station-lsit.txt	is the list of all IGRA 2 stations and their name, location, period Of record, and number of soundings.
igra2-readme.txt	is this file.
igra2-us-states.txt	is a list of all two-letter state codes shown in the IGRA 2 station list.
status.txt	notes on the current status of IGRA's online files

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Subdirectory data/ (pub/data/igra/data/):
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data-por/	contains sounding data for the full period of record.
data-y2d/	contains sounding data since January 1 of the current or previous year.
igra2-data-format.txt	is the description of the format of the

sounding data files.

Subdirectory derived/ (pub/data/igra/derived/):
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derived-por/ contains sounding-derived parameters for the full period of record.
igra2-derived-format.txt is the description of the format of the sounding-derived parameter files.

Subdirectory history/ (pub/data/igra/history/):
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igra2-metadata.txt is documented station history information for IGRA 2 stations.
igra2-metadata-readme.txt is a description of the format and origin of the documented station history information.
wmo-history.txt is a description of the format of the WMO instrument code history files.
wmo-sonde-history.txt is a list of the radiosonde codes extracted from GTS messages received at NCDC.
wmo-wndeq-history.txt is a list of the measurement equipment codes extracted from GTS messages received at NCDC.

Subdirectory monthly/ (pub/data/igra/monthly/):
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monthly-por/ contains monthly means for the full period of record.
monthly-upd/ contains monthly means for the last available month.
igra2-monthly-format.txt is the description of the format of the monthly-mean files.

