

WC-130J Flight-level data

Point of Contact

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1.0 DATA

These datasets contain the flight-level data for WC-130 flights during the ITOP field program between 15 August - 20 October 2010. Original data files were unpacked from an internal binary format using software provided by the 53rd Weather Reconnaissance Squadron. The file names were created to define the mission time, aircraft, mission number, mission type, and data type. Examples of the file-name convention are provided below.

Other than checks for gross errors that typically result from incorrect data entry or transmission problems during the flight operations no other quality-control procedures were conducted. No future quality-control procedures are planned.

In realtime, HDOB files are transmitted in 10-minute segments. For each flight, the 10-minute segment files have been concatenated to create one file that spans the entire flight period.

For the ITOP period, a total of 28 WC-130 flights were conducted (Table 1)

Table 1. Details associated with all WC-130J missions during ITOP.

Start Date/Time	Aircraft	Mission number	Mission Type	Mission Description
1800 UTC 25 AUG	307	0107	Surveillance	Survey of ITOP07 (pre-formation)
1800 UTC 28 AUG	304	0110	Surveillance	Survey of ITOP10 (pre-formation)
1800 UTC 31 AUG	304	0114	Surveillance	Survey of ITOP14 (pre-formation)
1800 UTC 1 SEP	304	0214	Reconnaissance	Reconnaissance of ITOP14 as a tropical cyclone

1800 UTC 8 SEP	304	WXWX	Internal Tide	Mission to sample internal tides west of Guam
1800 UTC 12 SEP	304	0120	Surveillance	Survey of ITOP20 (pre-Fanapi)
1800 UTC 13 SEP	304	0220	Surveillance	Survey of ITOP20 (pre-Fanapi)
1700 UTC 14 SEP	304	0320	Surveillance	Survey of ITOP20 (pre-Fanapi)
1700 UTC 15 SEP	304	0420	Reconnaissance	RECCO of TY Fanapi
1800 UTC 16 SEP	307	0520	Reconnaissance and buoy drop	Deploy buoys ahead of TY Fanapi, then perform reconnaissance
1800 UTC 17 SEP	307	0620	Reconnaissance	Reconnaissance into TY Fanapi at time the storm passes over buoy array
1800 UTC 18 SEP	307	0720	Fanapi wake	Fanapi wake flight
1800 UTC 19 SEP	307	0820	Fanapi wake	Fanapi wake flight
1800 UTC 21 SEP	307	0920	Fanapi wake to Malakas Reconnaissance	Began as wake flight into FAABAI then changed to reconnaissance formation of Malakas (11)
1800 UTC 22 SEP	304	0222	Malakas Reconnaissance	Reconnaissance into TY Malakas
1100 UTC 23 SEP	307	0322	Malakas Reconnaissance	Reconnaissance into TY Malakas
1100 UTC 24 SEP	307	0422	Malakas Reconnaissance	Reconnaissance into TY Malakas
1200 UTC 28 SEP	307	0522	Wake flight I	Purpose to obtain measurements over the wake of TY Malakas
1200 UTC 29 SEP	307	0622	Wake flight II	Second flight over the wake of TY Malakas
2100 UTC 6 OCT	307	WXWX	Calibration	Calibration flight with the R/V Reville
1700 UTC 12 OCT	307	0130	Surveillance	Survey of pre-formation of pre-Megi
1800 UTC 13 OCT	304	0230	Surveillance and Abort	Survey and subsequent abort of surveillance
2300 UTC 13 OCT	307	0330	Survey	Surveillance of pre-Megi
1700 UTC 14 OCT	304	0430	Reconnaissance	RECCO mission into pre-Megi
1900 UTC 15 OCT	304	0530	Reconnaissance	Reconnaissance missing into TY Megi
1700 UTC 16 OCT	307	00630	Reconnaissance	Reconnaissance into STY Megi

0600 UTC 17 OCT	304	0830	Reconnaissance	Reconnaissance into TY Megi
0000 UTC 18 OCT	304	0930	Wake flight	Flight over Megi

The file names are constructed from the start time of the flight, aircraft tail number, the mission number, the storm name, the mission type, and the data type. The data types are defined in Table 2.

Table 2. Data types for WC-130J flight-level data

File label	Description
01SEC.txt	Flight-level parameters at 1-second intervals
10SEC.txt	Flight-level parameters at 10-second intervals
30SEC.txt	Flight-level parameters at 30-second intervals
60SEC.txt	Flight-level parameters at 60-second intervals
ADJ.txt	Height adjustments
CAL.txt	Calibration values
HDB.txt	High Density Observations (HDOBS)
REC.txt	RECCO Messages
VOR.txt	Vortex Messages

For example, the eighth reconnaissance mission into TY Megi that began at 0600 UTC 17 October and was flown by aircraft 304, the 10-second flight-level data file is named 2010101706_304_0830W_MEGI_RECCO.10SEC.txt. In the sequence of Megi flights, note that there is no flight labeled 0730. This number was assigned to the DOTSTAR flight that was conducted into Megi. The flight-level data from the DOTSTAR flight are contained in the DOTSTAR section of the data catalog.

1.1 Data Limitations

Due to satellite communication problems or other types of communication problems, gaps exist in some flight-level data files. These are listed below for the three time-resolution file types:

Table 3. Flight-level data with extended missing periods

Flight Label	File Type
2010090118_304_0214W_ITOP14_RECCO	10-second data
2010091318_304_0220W_FANAPI_SURVEILLANCE	10-second data
2010091417_304_0320W_FANAPI_SURVEILLANCE	10-second data
2010092812_307_0522W_MALAKAS_WAKE_I	10-second data
2010101417_304_0430W_MEGI_RECCO	10-second data
010090818_304_WXWXW_INTERNAL_TIDE	30-second data
2010101417_304_0430W_MEGI_RECCO	30-second data
2010082818_304_0110W_ITOP10_SURVEILLANCE	60-second data
2010090818_304_WXWXW_INTERNAL_TIDE	60-second data
2010091517_304_0420W_FANAPI_RECCO	60-second data

2010092411_307_0422W_MALAKAS_RECCO	60-second data
2010092812_307_0522W_MALAKAS_WAKE_I	60-second data
2010101706_304_0830W_MEGI_RECCO	60-second data

2.0 DATA FORMATS

The specific formats for the primary data types are defined in the National Hurricane Operations Plan (FCM-12-2010), which is available at <http://ww.ofcm.gov/nhob/10/nhop10.htm>. All data files are provided in ASCII format.

For completeness, formats of some of the primary data types contained in the ITOP WC-130J flight-level data files are provided below.

2.1 HDOBS

The HDOB data are defined by the aircraft system software. Each data line defines environmental parameters at the midpoint of a 30-second averaging interval. For definition of the peak flight-level and SFMR-based surface winds, the time interval begins 15 seconds after the nominal time of the previous line and ends 15 seconds after the nominal time of the current line.

The specific data format is defined as:

```

0           1           2           3           4           5           6           7
01234567890123456789012345678901234567890123456789012345678901234567890
-----
hhmmss LLLLH NNNNNW PPPP GGGGG XXXX sTTT sddd wwwSSS MMM KKK ppp FF
142230 2612N 08752W 7010 03057 9282 +102 +102 141153 166 148 999 00

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hhmmss:

Observation time, in hours, minutes and seconds (UTC). The observation time is the midpoint of the 30-s averaging interval used for the record's meteorological data.

LLLLH:

The latitude of the aircraft at the observation time in degrees (LL) and minutes (LL). The hemisphere (H) is given as either N or S.

NNNNH:

The longitude of the aircraft at the observation time, in degrees (NNN) and minutes (NN). The hemisphere (H) is given as either E or W.

PPPP:

Aircraft static air pressure, in tenths of mb with decimal omitted, at the observation time. If pressure is equal to or greater than 1000 mb the leading 1 is dropped.

GGGGG:

Aircraft geopotential height, in meters, at the observation time.

XXXX:

Extrapolated surface pressure or D-value (30-s average). Encoded as extrapolated surface pressure if aircraft static pressure is 550.0 mb or greater (i.e., flight altitudes at or below 550 mb). Format for extrapolated surface pressure is the same as for static pressure. For flight altitudes higher than 550 mb, XXXX is encoded as the D-value, in meters. Negative D-values are encoded by adding 5000 to the D-value.

±:

Sign of the temperature or dew point (+ or -).

sTTT:

The air temperature in degrees and tenths Celsius, decimal omitted (30-s average).

sddd:

The dew point temperature, in degrees and tenths Celsius, decimal omitted (30-s average).

www:

Wind direction in degrees (30-s average). North winds are coded as 000. 999 indicates missing value.

SSS:

Wind speed, in kt (30-s average). 999 indicates missing value.

MMM:

Maximum 10-second average wind speed occurring within the encoding interval, in kt. 999 indicates missing value.

KKK:

Maximum 10-second average surface wind speed occurring within the encoding interval from the Stepped Frequency Microwave Radiometer (SFMR), in kt. 999 indicates missing value.

ppp:

SFMR-derived rain rate, in mm hr-1, evaluated over the 10-s interval chosen for KKK. 999 indicates missing value.

FF:

Quality control flags.

First column indicates status of positional variables as follows:

- 0 All parameters of nominal accuracy
- 1 Lat/lon questionable
- 2 Geopotential altitude or static pressure questionable

3 Both lat/lon and GA/PS questionable

Second column indicates status of meteorological variables as follows:

- 0 All parameters of nominal accuracy
- 1 T or TD questionable
- 2 Flight-level winds questionable
- 3 SFMR parameter(s) questionable
- 4 T/TD and FL winds questionable
- 5 T/TD and SFMR questionable
- 6 FL winds and SFMR questionable
- 9 T/TD, FL winds, and SFMR questionable

2.3 RECCO Observations

Coded reconnaissance observations are defined using the World Meteorological Organization (WMO) data format for aircraft reconnaissance data. The format contains one mandatory section and two additional sections. The specific format definition is defined in detail in Appendix G of the NHOP document referenced above.

2.4 VORTEX Messages

Vortex messages are provided for reconnaissance flights. The messages define the location and physical characteristics of the vortex center region. The specific format of the vortex message is defined in Chapter 5 of the NHOP document referenced above.

2.5 ADJ File

The adjustment file defines the height adjustments for each mandatory level and each channel as defined by the ARWO for each flight. These files are provided for completeness.

2.6 CAL File

The calibration file is defined by the Air Weather Reconnaissance Officer (ARWO) and lists values for various in flight parameters.

2.7 Flight-level data

The detailed flight-level data are provided at intervals of 1, 10, 30, and 60 seconds. The files contain a header section that defines the flight number, aircraft tail number and flight start time. Each column of data is labeled appropriately. The primary data define the time, location, environmental parameters, and SFMR values.