

Title: University of Louisiana Monroe (ULM) Radiosonde Data for Meso18-19

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1.0 Dataset Overview

This data set contains the thermodynamic and kinematic information from the InterMet (iMet) radiosonde systems operated by ULM during the Meso18-19 intensive observation periods (IOPs). ULM released radiosondes from Monroe, LA and Breaux Bridge, LA for all IOPs during the campaign from 1 November 2018 – 30 April 2019. This includes one training/shakedown IOP (IOP0) and nine full IOPs (IOP1-9) as detailed in the Meso18-19 EOL field catalog.

2.0 Instrument Description

ULM utilized iMet-4 403 MHZ radiosondes with pressure sensor and GPS wind finding during Meso18-19. In some cases, iMet-4C sondes were used in close proximity to electrically charged clouds, as these provided additional electromagnetic protection by the manufacturer. In Monroe, data were received by the iMet 3050A ground station and in Breaux Bridge, the iMet 3150 ground station was used. Balloons were inflated with helium to attain a target vertical ascent rate of 4-5 m s⁻¹. Manufacturer-stated calibration, accuracy, and resolution of the iMet-4 measured variables is provided in Table 1.

Table 1: Manufacturer-stated accuracy and resolution for each of the variables sampled by the iMet-4 radiosondes (available from http://www.intermetsystems.com/ee/pdf/202084-10_iMet-4_Technical_Data_Sheet.pdf).

MEASUREMENTS		GEOPOTENTIAL HEIGHT		Pressure derived
Measurement cycle	1 Hz	Measurement range	SFC to 40 km	
Resolution		Resolution	0.1 m	
TEMPERATURE SENSORS	Glass Bead	Combined Uncertainty/Reproducibility ¹		
Manufacturer	Shibaura	1080 - 400 hPa	15 m / 10 m	
Measurement range	+60°C to -90°C	400 - 10 hPa	200 m / 150 m	
Resolution	0.01°C			
Response time: still air/ 5 ms ⁻¹ (1000 hPa)	2 / < 1 sec			
Repeatability in Calibration	0.2 C	GEOPOTENTIAL HEIGHT	GPS derived	
Combined Uncertainty/Reproducibility ¹		Measurement range	SFC to 40 km	
> 100 hPa	0.5 C / 0.3 C	Resolution	0.1 m	
< 100 hPa	1.0 C / 0.75 C	Combined Uncertainty/Reproducibility ¹		
Night flight	0.3 C / 0.3 C	1080 - 400 hPa	30 m / 15 m	
Solar correction	≤ 1.2 C	400 - 3 hPa	60 m / 20 m	
HUMIDITY SENSOR	Capacitive Polymer	WIND SPEED AND DIRECTION		
Manufacturer	IST	Resolution	0.1 m/s / 1 degree	
Measurement range	0-100 % RH	Speed		
Resolution	0.1%	Combined Uncertainty/Reproducibility ¹	0.5 / 0.25 m/s	
Response time	0.6 seconds	Direction		
@ 25C	5.2 seconds	Combined Uncertainty/Reproducibility ¹	1 degree	
@ 5C	11 seconds			
@ -10C	61 seconds			
@ -40C	5 %			
Repeatability in Calibration		TELEMETRY		
Uncertainty/Reproducibility ¹		Transmission type	Synthesized	
> 0 C	5% / 3%	Maximum Range	> 250 km	
-40 to 0 C	5% / 5%	Frequency stability	± 2 kHz	
PRESSURE ²	Sensor	Deviation, peak to peak	6 kHz	
Manufacturer	Measurement Specialties	Output Power	30 - 500 mW	
Measurement range	1200 hPa - 10 hPa	Modulation	GFSK	
Resolution	0.01 hPa	Data Rate	1200 Baud	
Response time	0.5 milliseconds	Standard Frequencies	402, 402.5, 403, 403.5	
Uncertainty/Reproducibility ¹		404, 404.5, 405		
Whole range	2.0 / 1.5 hPa	Custom Frequencies	Available	
1200 - 400 hPa	1.0 / 0.75 hPa			
400 hPa - 10 hPa	2.0 / 1.5 hPa			
PRESSURE	GPS derived	GPS RECEIVER		
Measurement range	SFC to 3 hPa	Manufacturer / Type		
Resolution	0.1 hPa	Cold Start Time	U-Blox CAM-M8	
Uncertainty/Reproducibility ¹			< 60 seconds (typical)	
1080 - 400 hPa	2.0 / 1.5 hPa			
400 hPa - 3 hPa	0.5 / 0.25 hPa			
OPERATIONAL DATA				
Battery		Lithium		
Operating time		> 135 minutes		
Weight		120 grams		
Dimensions		Body (LWH): 139x67x31		
Calibration Stability		With boom (LWH): 235x67x31		
		2 years		

* Subject to ground station, balloon size and atmospheric conditions

¹All uncertainties expressed at a 95% confidence level

²Primary atmospheric pressure derived by GPS altitude

³ GECOS Reference Upper-Air Network

Specifications subject to change without notice, Rev 10 171208

3.0 Data Collection and Processing

Data collection occurred in Monroe, LA (-92.074, 32.528) on ULM's campus and in Breaux Bridge, LA (-91.921, 30.301) for all IOPs. Sondes were generally launched every six hours during IOPs valid at 00, 06, 12, and 18 UTC in coordinated with the other Meso18-19 radiosonde sites. In some cases, special soundings were launched outside of the coordinated launches; these data are also provided. Sondes were typically released 45-60 minutes prior to their "valid" time. Independent surface observations were collected at launch time and compared with the radiosonde measurements. If measurements agreed, then the radiosonde-measured values were used as the surface observation. Data were collected and initially processed using the iMetOS-II software. Additional post-processing were performed to remove obvious spurious data.

4.0 Data Format

The ULM post-processed data are given as CSV text files at 5-s temporal resolution in the SPC/SHARPpy format. The data are stored as individual files for each radiosonde launch.

The file naming convention for sondes launched in Monroe, LA is:

upperair.ULM_sonde.YYYYMMDDHHmm.Monroe_LA_SHARPpy.txt where YYYY is the year, MM is the month, DD is the day, and HHmm are the UTC hour and minute.

And similarly, for sondes launched in Breaux Bridge, LA:

upperair.ULM_sonde.YYYYMMDDHHmm.Breaux_Bridge_LA_SHARPPY.txt.

The SPC/SHARPpy format contains the following header and footer information:

```
%TITLE%
Site-ID YYMMDD/HHmm
LEVEL HGHT TEMP DWPT WDIR WSPD
-----
%RAW%
%END%
```

Sounding data are then arranged in six-column CSV format with each row marking a new data point. Variables reported are: pressure (hPa), height above MSL (m), temperature (°C), dewpoint temperature (°C), wind direction (deg), and wind speed (kts).

%END%

5.0 Data Remarks

Soundings were generally terminated upon reaching the tropopause, though some were terminated early due to signal loss, balloon burst, or lightning contamination.

Soundings are not available from Breaux Bridge, LA during IOP0 and IOP8.

ULM maintains a local archive of the raw data files for each launch. These can be provided upon request (please contact T. Murphy).