Data User Guide

SBU Mobile Sounding IMPACTS

Introduction

The SBU Mobile Sounding IMPACTS dataset consists of mobile sounding profiles collected during the Investigation of Microphysics and Precipitation for Atlantic Coast-Threatening Snowstorms (IMPACTS) campaign. Funded by NASA's Earth Venture program, IMPACTS is the first comprehensive study of East Coast snowstorms in 30 years. Mobile-sounding profiles were obtained about every three hours during snow events by Stony Brook University (SBU). The sounding measures temperature, humidity, height, and horizontal wind direction and speed in the atmosphere. Atmospheric pressure is calculated from GPS height. Data files are available from January 18, 2020, through February 28, 2023 in netCDF-3 format.

Citation

Kollias, Pavlos, Brian Colle, and Mariko Oue. 2020. SBU Mobile Sounding IMPACTS [indicate subset used]. Dataset available online from the NASA Global Hydrometeorology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/IMPACTS/SOUNDING/DATA301

Keywords:

NASA, GHRC, IMPACTS, SBU, mobile sounding, snowstorm, atmospheric pressure, atmospheric temperature, humidity, wind speed, wind direction

Campaign

The Investigation of Microphysics and Precipitation for Atlantic Coast-Threatening Snowstorms (IMPACTS), funded by NASA's Earth Venture program, is the first comprehensive study of East Coast snowstorms in 30 years. IMPACTS will fly a complementary suite of remote sensing and in-situ instruments for three 6-week deployments (2020-2023) on NASA's ER-2 high-altitude aircraft and P-3 cloud-sampling aircraft. The first deployment began on January 17, 2020, and ended on March 1, 2020.

IMPACTS samples U.S. East Coast winter storms using advanced radar, LiDAR, and microwave radiometer remote sensing instruments on the ER-2 and state-of-the-art microphysics probes and dropsonde capabilities on the P-3, augmented by ground-based radar and rawinsonde data, multiple NASA and NOAA satellites (including GPM, GOES-16, and other polar-orbiting satellite systems), and computer simulations. IMPACTS addressed three specific objectives: (1) Provide observations critical to understanding the mechanisms of snowband formation, organization, and evolution; (2) Examine how the microphysical characteristics and likely growth mechanisms of snow particles vary across snowbands; and (3) Improve snowfall remote sensing interpretation and modeling to significantly advance prediction capabilities. More information is available from NASA's Earth Science Project Office's IMPACTS field campaign webpage.

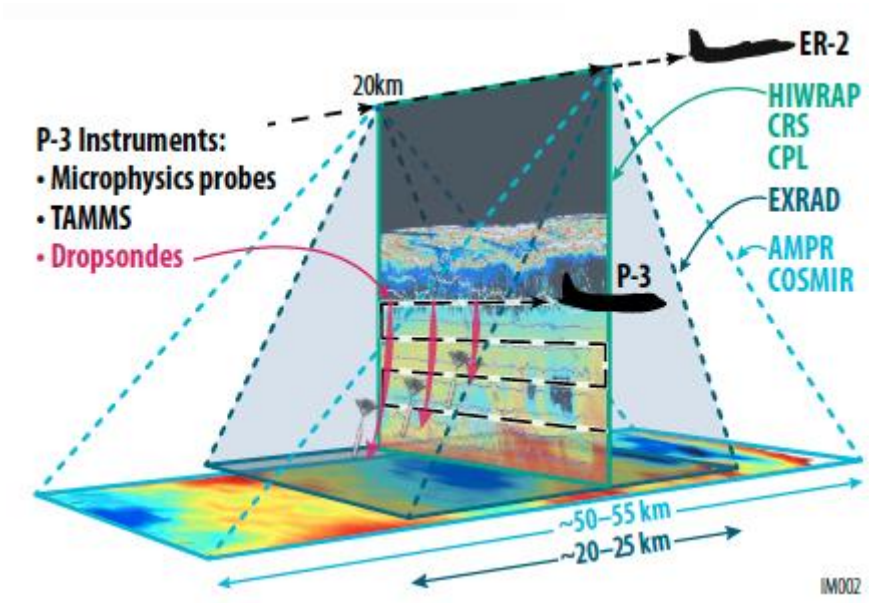

Figure 1: IMPACTS airborne instrument suite
(Image source: NASA IMPACTS ESPO)

Instrument Description

The GRAW DFM-09 radiosonde is one of the lightest and smallest radiosondes on the market. It is designed to reliably measure the atmospheric profile of pressure, temperature, humidity, wind speed, and wind direction from the surface to an altitude of 40 km. Continuous data sets are sent to the ground station by a high-quality radio-telemetry link. The DFM-09's simple and user-friendly operation makes it one of the most popular radiosondes in the world. There is no need to prepare or calibrate the sensors. The radiosonde is delivered ready-to-fly, obtains all the necessary data from the ground station during the short initialization process, and is ready to use within just a few seconds. This makes the DFM-09 particularly suitable for mobile use, where time and flexibility are critical. More information about the DFM-09 radiosonde can be found at Upper Air Sounding Systems.

Figure 2: Radiosonde on a weather balloon
(Image Source: GRAW Radiosondes)

Investigators

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Data Characteristics

The SBU Mobile Sounding IMPACTS data are available in netCDF-3 format at a Level 1B data processing level. More information about the NASA data processing levels is available on the EOSDIS Data Processing Levels webpage.

Table 1: Data Characteristics

Characteristic	Description
Platform	Mobile stations
Instrument	Radiosondes
Spatial Coverage	N: 43.78, S: 40.484, E: -70.869, W: -76.981 (Maryland)
Spatial Resolution	point
Temporal Coverage	January 18, 2020 - February 28, 2023
Temporal Resolution	Hourly -< Daily
Sampling Frequency	1 second
Parameter	Atmospheric pressure, temperature, humidity, height, and horizontal wind direction and speed
Version	1
Processing Level	1B

File Naming Convention

The SBU Mobile Sounding IMPACTS dataset consists of data files in netCDF-3 format with the file naming conventions shown below.

Data files: IMPACTS_sounding_YYYYMMDD_hhmmss_SBU_Mobile.nc

Table 2: File naming convention variables

Variable	Description
YYYY	Four-digit year
MM	Two-digit month
DD	Two-digit day
hh	Two-digit hour in UTC
mm	Two-digit minute in UTC
ss	Two-digit second in UTC
.nc	netCDF-3 format

Data Format and Parameters

The SBU Mobile Sounding IMPACTS dataset consists of vertical profiles of temperature, humidity, height, and horizontal wind direction and speed in the atmosphere. These files are in netCDF-3 format. Table 3 describes the acronym and units for each parameter.

Table 3: Data Fields

Parameter	Unit
air_density	g/m^3
dewpoint_temperature	Degrees C
geometric_height	m
geopotential_height	m
latitude	Degrees N
longitude	Degrees E

modified_reflactive_index	-
potential_temperature	Degrees C
pressure	hPa
refractive_index	-
relative_humidity	%
specific_humidity	g/kg
speed_of_sound	m/s
temperature	Degrees C
time	Seconds since midnight
time_offset	Seconds since release time
vapor_pressure	hPa
virtual_temperature	Degrees C
wind_direction	Degrees from N
wind_speed	m/s

Algorithm and Quality Assessment

Pressure estimates were calculated from the GPS height measurements. Table 4 shows the random error and accuracy for each measurement. More information can be found at Upper Air Sounding Systems.

Table 4: Random error and accuracy of each measurement

Variable	Random Error and Accuracy
Temperature resolution	0.1 degrees C
Temperature random error	< 0.2 degrees C
Humidity resolution	1%
Humidity random error	< 4 %
Pressure accuracy	< 0.3 hPa
Geopotential height accuracy	< 10 m
Wind speed accuracy	< 0.2 m/s
Accuracy horizontal position	< 5 m

Software

No special software is needed to read these netCDF-3 data files; however, Panoply is an easy-to-use free tool for reading and visualizing the data within these netCDF-3 files.

Known Issues or Missing Data

This dataset does not have continuous data. Table 5 shows which dates have missing data.

Table 5: Dates with missing data

Missing Data Dates
1/20-24/2020
1/26/2020-2/6/2020
2/8-12/2020
2/14-23/2020
2/26/2020

References

GRAW Radiosondes. Upper Air Sounding Systems. https://www.graw.de/fileadmin/cms_upload/en/Resources/PR-GRAW_Overview_V05.00_EN.pdf

Related Data

All other datasets collected as part of the IMPACTS campaign are considered related and can be located by searching the term "IMPACTS" in the Earthdata Search.

Contact Information

To order these data or for further information, please contact:

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