Data User Guide

Atmospheric Infrared Sounder (AIRS) CPEX

Introduction

The Atmospheric Infrared Sounder (AIRS) CPEX dataset contains products obtained from the Atmospheric Infrared Sounder (AIRS) onboard the NASA Aqua satellite. These data were collected in support of the NASA Convective Processes Experiment (CPEX) field campaign. The CPEX field campaign took place in the North Atlantic-Gulf of Mexico-Caribbean Sea region and conducted a total of sixteen DC-8 missions from May through June 2017. The CPEX campaign collected data to help explain convective storm initiation, organization, growth, and dissipation in the North Atlantic-Gulf of Mexico-Caribbean Oceanic region during the early summer of 2017. These data are available from May 11, 2017 through July 16, 2017 and are available in HDF-4 format.

Citation

Li, Peggy and Brian Knosp. 2023. AIRS CPEX [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/CPEX/AIRS/DATA101.

Keywords:

AIRS, CPEX, NASA, infrared sounder, temperature

Campaign

The NASA Convective Processes Experiment (CPEX) aircraft field campaign took place in the North Atlantic-Gulf of Mexico-Caribbean Sea region and conducted a total of sixteen DC-8 missions from May through June 2017. The 16 missions covered a wide range of weather conditions from clear and calm wind, isolated convective cloud systems, to Tropical Storm Cindy (2017). It is the first field campaign that collected airborne observations continually from pre-tropical disturbance in the Caribbean Sea, to tropical depression, and formation of Tropical Storm Cindy in the Gulf of Mexico prior to landfall. The three main science objectives of CPEX were: 1) Improve understanding of convective processes including

cloud dynamics, downdrafts, cold pools and thermodynamics during initiation, growth, and dissipation. 2) Obtain a comprehensive set of simultaneous wind, temperature, and moisture profiles, using Doppler wind lidar (DAWN), microwave radiometer and sounder (HAMSR/MASC), and GPS dropsondes, conduct a quantitative evaluation of those profiles in the vicinity of scattered and organized deep convection measured by airborne precipitation radar (APR2), in all phases of convective life cycle. 3) Improve model representation of convective and boundary layer processes over the tropical oceans using a cloud-resolving, fully coupled atmosphere-ocean model, and assimilate the wind, temperature and humidity profiles into the model. More information is available from NASA's Jet Propulsion Laboratory's CPEX field campaign webpage.

Figure 1: CPEX field campaign logo
(Image source: CPEX)

Instrument Description

The Atmospheric Infrared Sounder (AIRS) on NASA's Aqua satellite, gathers infrared energy emitted from Earth's surface and atmosphere globally, every day. Its data provides 3D measurements of temperature and water vapor through the atmospheric column along with a host of trace gases, surface and cloud properties. AIRS data are used by weather prediction centers around the world to improve their forecasts. They are also used to assess the skill of climate models and in applications ranging from volcanic plume detection to drought forecasting.

Aqua was launched on May 4, 2002, and has six Earth-observing instruments on board, collecting a variety of global data sets. Aqua was originally developed for a six-year design life but has now far exceeded that original goal. It continues transmitting high-quality data from four of its six instruments, Atmospheric Infrared Sounder (AIRS), Advanced Microwave Sounding Unit (AMSU), Clouds and the Earth's Radiant Energy System (CERES), and Moderate Resolution Imaging Spectroradiometer (MODIS). A fifth instrument, Advanced Microwave Scanning Radiometer for EOS (AMSR-E), suffered a major anomaly in

October 2011 and ceased its high-quality data transmission at that time. Later the instrument was turned back on, and it transmitted reduced quality data important for intercalibration purposes before being powered off in March 2016.

Figure 2: AIRS onboard the NASA Aqua satellite
(Image source: AIRS)

Investigators

Peggy Li
Jet Propulsion Laboratory
Pasadena, CA

Brian Knosp
Jet Propulsion Laboratory
Pasadena, CA

Data Characteristics

The AIRS CPEX dataset consists of files in HDF-4 format at Level 2 processing level. The AIRS CPEX datafiles are available for all dates between May 11, 2017 to July 16, 2017. Table 1 lists the characteristics of this dataset.

Table 1: Data Characteristics

Characteristic	Description
Platform	NASA Aqua satellite
Instrument	Atmospheric Infrared Sounder (AIRS)
Spatial Coverage	N: 64.114, S: -18.251, E: -14.600, W: -130.881 (North Atlantic, Gulf of Mexico, Caribbean)
Spatial Resolution	1 km
Temporal Coverage	May 11, 2017 - July 16, 2017

Temporal Resolution	Hourly -> Daily
Parameter	Cloud properties, pressure levels, temperature, water vapor, surface and atmospheric conditions
Version	1
Processing Level	2

File Naming Convention

The AIRS CPEX dataset files are named using the following convention:.

Data files:
CPEX_AIRS_YYYY_MM_DD_<min>_L2_RetStd_IR_v6_0_31_0_R<YYMMDDhhmmss>.hdf

Table 2: File naming convention variables

Variable	Description
YYYY	Four-digit year of aquisition
MM	Two-digit month of aquisition
DD	Two-digit day of aquisition
<min>	Three-digit minute of aquisition
<YYMMDDhhmmss>	Date and time of production (YY=two-digit year, MM=two-digit month, DD=two-digit day, hh=two-digit hour, mm=two-digit minute, ss=two-digit second)
hdf	HDF-4 format

Data Format and Parameters

The AIRS CPEX data are available in HDF-4 format. The dataset files are separated by date and time, and contain surface and atmospheric conditions at a specific latitude and longitude. Please refer to Table 3 for additional data field information.

Table 3: Data Fields

Variable	Description	Unit
Latitude	Latitude	deg N
Longitude	Longitude	deg E
Time	Time	s
AIRSTrack	Along-track subspot	-
AIRSXTrack	Across-track subspot	-
Cloud	Cloud layers in order of increasing pressure	-
coremetadata	Core metadata	-
coremetadata.1	Core metadata 1	-
coremetadata.2	Core metadata 2	-
GeoTrack	Along-track	-
GeoXTrack	Across-track	-

H2OPressureLay	Mid-layer pressure	hPa
H2OPressureLev	Pressure	hPa
HingeSurf	Frequency	cm^-1
MWHingeSurf	Frequency	GHz
StdPressureLay	Mid-layer pressure	hPa
StdPressureLev	Pressure	hPa
StructMetadata.0	Struct metadata	-

Software

This dataset is in HDF-4 format and does not require any specific software to read. However, the data are easily readable and viewed in Panoply.

Known Issues or Missing Data

There are no known issues with these data or any known gaps in the dataset.

References

NASA JPL - Atmospheric Infrared Sounder (AIRS)
https://airs.jpl.nasa.gov/

NASA Aqua
https://aqua.nasa.gov/

Related Data

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

Contact Information

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

NASA Global Hydrometeorology Resource Center DAAC
User Services
320 Sparkman Drive
Huntsville, AL 35805
Phone: 256-961-7932
E-mail: support-ghrc@earthdata.nasa.gov
Web: https://ghrc.nsstc.nasa.gov/

Created: May 19, 2023