Moderate Resolution Imaging Spectroradiometer (MODIS) CPEX

Introduction

The Moderate Resolution Imaging Spectroradiometer (MODIS) CPEX dataset includes measurements gathered by MODIS during the 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. 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. Data are available from May 9, 2017 through July 16, 2017 in netCDF-3 format.

Citation

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Keywords:

NASA, GHRC, CPEX, MODIS, atmospheric precipitation, cloud thickness, cloud height, cloud temperature

Campaign

The NASA Convective Processes Experiment (CPEX) aircraft field campaign took place in the North Atlantic-Gulf of Mexico-Caribbean Sea region from 25 May-25 June 2017. CPEX conducted a total of sixteen DC-8 missions from 27 May-24 June. 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

MODIS (or Moderate Resolution Imaging Spectroradiometer) is a key instrument aboard the Terra (originally known as EOS AM-1) and Aqua (originally known as EOS PM-1) satellites. Terra's orbit around the Earth is timed so that it passes from north to south across the equator in the morning, while Aqua passes south to north over the equator in the afternoon. Terra MODIS and Aqua MODIS are viewing the entire Earth's surface every 1 to 2 days, acquiring data in 36 spectral bands, or groups of wavelengths. These data will improve our understanding of global dynamics and processes occurring on the land, in the oceans, and in the lower atmosphere. MODIS is playing a vital role in the development of

validated, global, interactive Earth system models able to predict global change accurately enough to assist policy makers in making sound decisions concerning the protection of our environment. More information about MODIS can be found at modis.
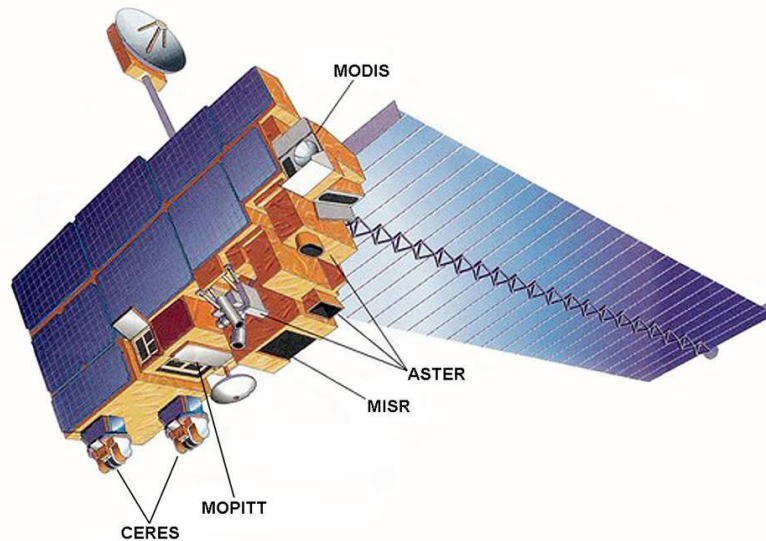

Figure 2: Instruments onboard Terra
(Image source: NASA Terra)

Investigators

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Data Characteristics

The MODIS CPEX dataset consists of files in netCDF-3 format at Level 2 processing level. These data are available at a Level 2 processing level. More information about the NASA data processing levels is available on the EOSDIS Data Processing Levels webpage. The MODIS datafiles are available for all dates between May 9, 2017 to July 16, 2017.

Table 1: Data Characteristics

Characteristic	Description
Platform	NASA Terra Spacecraft
Instrument	Moderate Resolution Imaging Spectroradiometer (MODIS)
Spatial Coverage	N: 62.054, S: -15.769, E: -7.965, W: -133.329 (North Atlantic, Gulf of Mexico, Caribbean)
Spatial Resolution	1 km
Temporal Coverage	May 9, 2017 - July 16, 2017
Temporal Resolution	Hourly -> Daily
Parameter	Cloud thickness, cloud height, cloud pressure, cloud temperature
Version	1
Processing Level	2

File Naming Convention

The MODIS CPEX data are within netCDF-3 files and are named using the following convention:

Data files: CPEX_MYD06_L2_A[YYYYDDD]_[HHMM]_006_[YYYYDDDHHMMSS].nc

Table 2: File naming convention variables

Variable	Description
A[YYYYDDD]	Julian Date of Acquisition (YYYY = four-digit year, DDD = Julian day of year)
[HHMM]	Hours and minutes of acquisition (HH = two-digit hour, MM = two-digit minute)
[YYYYDDDHHMMSS]	Julian Date of Productuon (YYYY = four-digit year, DDD = Julian day of year, HH = two-digit hour, MM = two-digit minute, SS = two-digit second)
.nc	netCDF-3 format

Data Format and Parameters

The MODIS CPEX data are available in netCDF-3 format. The dataset files are separated by date and time, and contain cloud properties at a specific latitude and longitude. Please refer to Table 3 for additional data field information.

Table 3: Data Fields

Variable	Description	Unit
cloud_optical_thickness	Cloud optical thickness two-channel retrieval using band 7 (2.1um) and either band 1 (0.65um), 2 (0.86um), or 5 (1.2um)	-
cloud_top_height_1km	Cloud top height at 1km resolution from LECAT	m

cloud_top_pressure_1km	Cloud top pressure at 1km resolution from LEOCAT	hPa
cloud_top_temperature_1km	Cloud top temperature at 1km resolution from LEOCAT	K
Latitude	Geodetic Latitude	Degrees North
Longitude	Geodetic Longitude	Degrees East

Algorithm

Algorithm Theoretical Basis Documents (ATBD's) were developed for every EOS (Earth Observing System) instrument product including MODIS. In ATBD's, both physical theory and the mathematical procedures and possible assumptions have been applied for the calculations that have to be made to convert the radiances received by the instruments to geophysical quantities. As such the ATBD's serve as useful background for understanding the development of the MODIS products and their application in the study of land, ocean, atmosphere and Level 1 characteristics of the Earth-atmosphere systems. Some of the ATBD's are the original documents for a MODIS product while others have been updated or supplemented by other approaches that help the user community to effectively use the MODIS products.

Software

This dataset is in netCDF-3 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 Moderate Resolution Imaging Spectroradiometer (MODIS)
https://modis.gsfc.nasa.gov/

NASA Terra Spacecraft
https://www.nasa.gov/mission_pages/terra/spacecraft/index.html

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:

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