Data User Guide

Advanced Scatterometer (ASCAT) CPEX

Introduction
The Advanced Scatterometer (ASCAT) CPEX dataset consists of ice probability, wind speed, and wind direction estimates collected by the ASCAT. The ASCAT is onboard the MetOp-A and MetOp-B satellites and uses radar to measure the electromagnetic backscatter from the wind-roughened ocean surface, from which data on wind speed and direction can be derived. These data were gathered during the Convective Processes Experiment (CPEX) field campaign. CPEX collected data to help answer questions about 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 files are available from May 24, 2017 through July 16, 2017 in netCDF-3 format.

Citation
Turk, Joe. 2022. Advanced Scatterometer (ASCAT) 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/MODEL/DATA101

Keywords:
NASA, GHRC, CPEX, Virgin Islands, ASCAT, ice age, ice probability, wind speed, wind direction

Project
The NASA Convective Processes Experiment (CPEX) field campaign took place in the North Atlantic-Gulf of Mexico-Caribbean Oceanic region during the early summer of 2017. This campaign collected data to help answer questions about convective storm initiation, organization, growth, and dissipation (CPEX 2017 | Home). The CPEX science goals include:
- Improve understanding of convective processes including cloud dynamics, downdrafts, cold pools, and thermodynamics during initiation, growth, and

dissipation. Determine what combinations of environmental structure, including moist entropy budgets, and convective properties such as vertical velocity and reflectivity profiles, result in rapid upscale growth of a convective system into a large organized mesoscale convective system (MCS), or alternatively, result in failure to grow or rapid decay.

● Obtain a comprehensive set of simultaneous wind, temperature, and moisture profiles, using wind lidar, microwave radiometer and sounder, and GPS dropsondes, to conduct a quantitative evaluation of those profiles in the vicinity of scattered and organized deep convection, especially in the lowest 4 km, in all phases of the convective life cycle.

● Improve model representation of convective and boundary layer processes over the tropical oceans using a cloud-resolving, fully coupled atmosphere-ocean model. Assimilate the wind, temperature, and humidity profiles from the wind lidar and dropsondes into the model, and quantify the impact of these detailed lidar wind profiles on the ability of the model to simulate the life cycle of convective systems over tropical oceans.

More information about the CPEX field campaign can be found at CPEX 2017: A Field Experiment to study Convective Processes in the Tropics.

Figure 1: CPEX field campaign logo
(Image source: CPEX 2017 | Home)

Instrument Description

The Advanced Scatterometer (ASCAT) is carried on the MetOp-A and MetOp-B satellites and uses radar to measure the electromagnetic backscatter from the wind-roughened ocean surface, from which data on wind speed and direction can be derived. The measuring principle relies on the fact that winds over the sea cause small-scale disturbances of the sea surface, which modify its radar backscattering characteristics in a particular way. These backscattering properties are well known and are dependent on both the wind speed over the sea and the direction of the wind with respect to the point from which the sea surface is

observed. More information about ASCAT can be found at [ESA - About ASCAT](#), [Figa-Saldana, et al., 2014](#), and [ASCAT Home Page](#).
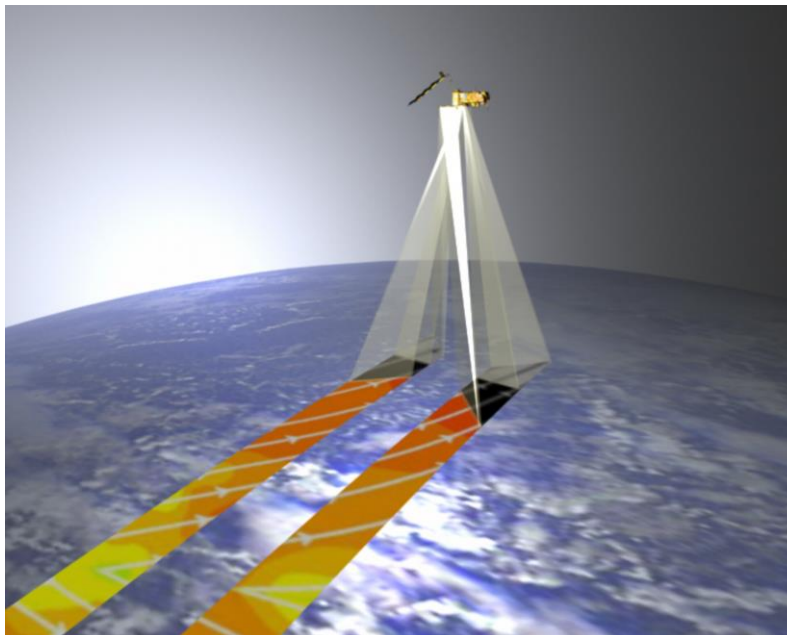

Figure 2: ASCAT on MetOP satellite (Image source: [ESA - About ASCAT](#))

Investigators

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Data Characteristics

The ASCAT CPEX dataset consists of ice probability, wind speed, and wind direction estimates stored in netCDF-3 files. 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 characteristics of this dataset are listed in Table 2 below.

Table 2: Data Characteristics

Characteristic	Description
Platform	MetOp-A, MetOp-B
Instrument	ASCAT
Spatial Coverage	N: 42.518, S: 3.906, E: -25.096, W: 160.241 (Tropics)
Temporal Coverage	May 24, 2017 - July 16, 2017
Temporal Resolution	Hourly -< Daily
Sampling Frequency	~2 seconds
Parameter	ice probability, wind speed, and wind direction estimates
Version	1

Processing Level	2

File Naming Convention

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

Data files:
CPEX_ascat_YYYYMMDD_hhmmss_[metopa|metopb]_xxxxx_eps_o_coa_2401_ovw_l2.nc

Table 3: 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
[metopa|metopb]	metopa: METOP A satellite metopb: METOP B satellite
xxxxx	Orbit number
.nc	netCDF-3 data file

Data Format and Parameters

The ASCAT CPEX dataset is stored in netCDF-3 files. The ASCAT data field descriptions are listed in Table 4 below.

Table 4: ASCAT NetCDF-4 Data Fields

Field Name	Description	Unit
bs_distance	Backscatter distance to model function	-
ice_age	Ice age (a-parameter)	dB
ice_prob	Ice probability	-
lat	latitude	Degrees North
lon	longitude	Degrees East
model_dir	Model wind direction at 10 m from ECMWF (operational model)	degrees
model_speed	Model wind speed at 10 m from ECMWF (operational model)	m/s
time	Time. seconds since 1990-01-01 00:00:00	s
wind_dir	Wind direction at 10 m	degrees
wind_speed	Wind speed at 10 m	m/s
wvc_index	Cross track wind vector cell number	-

	Wind vector cell quality Flag meanings: - Distance to GMF too large - Data are redundant - No meteorological background used - Rain detected - Rain flag not usable - Small wind less than or equal to 3 m/s - Large wind greater than 30 m/s	
wvc_quality_flag	- Wind inversion not successful - Some portion of WVC is over ice - Some portion of WVC is over land - Variational quality control fails - KNMI quality control fails - Product monitoring event flag - Product monitoring not used - Any beam noise content above threshold - Poor azimuth diversity - Not enough good sigma0 for wind retrieval	degrees

Algorithm

ASCAT uses radar to measure the electromagnetic backscatter from the wind-roughened ocean surface, from which data on wind speed and direction can be derived. More information about how the wind speed and wind direction are derived can be found at ESA - About ASCAT and ASCAT Home Page.

Quality Assessment

There is a wind vector cell quality flag within the data (see Table 4). More information can be found in ESA - About ASCAT and ASCAT Home Page.

Software

No software is required to view these HDF-5 data; however, Panoply can be used to easily view the data.

Known Issues or Missing Data

There are no known issues or missing data.

References

Figa-Saldana, J., J J,W, Wilson, E. Attema, R. Gelsthorpe, M. R. Drinkwater, and A. Stoffelen, 2014, The advanced scatterometer (ASCAT) on the meteorological operational (MetOp)

platform: A follow on for European wind scatterometers, Canadian Journal of Remote Sensing, 28:2002. doi: https://doi.org/10.5589/m02-035

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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