



CYGNSS LEVEL-1 AND LEVEL-2 NetCDF MATCH-UP DATASET

DESCRIPTION

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This document provides a short description of the collocated dataset, generated at NOAA, with the CYGNSS Level-1 and -2 data. A large set of active and passive microwave sensor data, as well as data from numerical weather prediction models (NWP) are collocated in space and time with each specular point found in the CYGNSS level-1 NetCDF files, and each retrieved wind speed found in the CYGNSS level-2 NetCDF files. Tables 1 and 2 provide the list of NWP and sensor data variables, respectively, collocated with CYGNSS data. Below is additional key information regarding the collocated dataset.

1. Match-up criteria:
 - for NWP data: bilinear interpolation in space and linear interpolation in time
 - for all sensor data: a +/- 90mn time window and a 25km distance threshold are used
2. Additional information regarding each collocated data point
 - each collocated sensor data point has its longitude and latitude saved
 - each collocated sensor timestamp is also saved following the same convention found in the CYGNSS Level -1 and -2 NetCDF files (i.e. the time is reported in seconds referenced to the global attribute 'time_coverage_start' found in the NetCDF files)
 - since NWP data is linearly interpolated in time to the specular point time (or retrieved wind speed sample time), the NWP data do not carry a timestamp variable
 - if no collocated sensor or model data is found for a given specular point or retrieved wind speed sample, a value of -9999 is assigned to the sensor or model data
 - information about each sensor variable unit and flag value are provided as variable string attributes in the NetCDF files
3. File information
 - the complete collocated data set is appended to the existing CYGNSS Level-1 and -2 NetCDF files
 - files will be made available at the following SFTP server cygnss-sftp-2.engin.umich.edu
 - actual file location on that server is TBD
4. Miscellaneous information
 - the ISRO ScatSAT data is still unavailable at the time of writing. Although the corresponding variables currently exist in the NetCDF files, a value of -9999 are currently assigned to these
 - the AMSR-2, GMI, and Windsat instruments may provide more than one collocated 10-m wind speed variable for each specular point or retrieved wind speed; the reason being that these are retrieved from different frequency channels (for additional information, see the variable description in the NetCDF files)

Table I: Summary of Numerical Weather Prediction data collocated with Level -1 and -2 CYGNSS data

	GDAS	ECMWF	WAVEWATCH 3 (source: IFREMER) Input wind forcing: ECMWF	MFWAM (source: Météo-France) Input wind forcing: ECMWF
10-m wind speed	X	X		
10-m wind direction	X	X		
Sea surface temperature	X	X		
Depth			X	
Significant wave height (Hs) for combined wind waves-swell			X	X
Hs for wind sea			X	
Hs for the first swell			X	
Hs for the second swell			X	
Hs for the third swell			X	
Mean period of wind waves			X	
Peak period for wind sea			X	
Peak period for the first swell			X	
Peak period for the second swell			X	
Peak period for the third swell			X	
Mean direction (full spectrum)			X	
Mean direction for wind sea			X	
Mean direction for first swell			X	
Mean direction for second swell			X	
Mean direction for third swell			X	
Whitecap coverage			X	
Mean square slopes			X	X
Product resolution	1 deg	0.25 deg	0.5 deg	0.5 deg

Table II: Summary of active and passive sensors collocated with Level -1 and -2 CYGNSS data

	Scatterometers		Radiometers (source: Remote Sensing Systems)						Altimeters (source: NOAA)				
	NOAA ASCAT-A/B	ISRO ScatSAT	AMSR-2	GMI	SSMI F16	SSMI F17	WINDSAT	SMAP	Cryosat-2	Jason-2	Jason-3	Altika	Sentinel-3A
10-m wind speed	X	X	X	X	X	X	X	X	X	X	X	X	X
10-m wind direction	X	X					X						
Sea surface temperature			X	X			X						
Columnar atmospheric water vapor			X	X	X	X	X						
Columnar cloud liquid water			X	X	X	X	X						
Rain rate			X	X	X	X	X						
Significant wave height									X	X	X	X	X
Product resolution	25 km		0.25 deg						~6 km				