

# Scatterometer biographies

## ASCAT



ASCAT Credit: ESA

The first Advanced Scatterometer (ASCAT) was launched on the EUMETSAT MetOp-A satellite in October 2006. It became fully operational in May 2007 and continues to operate today. Another ASCAT instrument became operational on MetOp-B when launched in September 2012. And MetOp-C satellite was launched in June 2018 with another ASCAT. The main objective of ASCAT is the measurement of wind speed and direction over the oceans, though ASCAT is also used for studying polar ice, soil moisture and vegetation.

ASCAT is a C-band scatterometer with 3 vertically polarized antennas transmitting pulses at 5.255 GHz. The fan-beam antennae are oriented at 45, 90, and 135 degrees with respect to the satellite track. The antennae extend on either side of the instrument, resulting in a double swath of observations, each about 500 km wide separated by a gap of about 360 km. Each satellite row can be divided into 42 or 21 wind vector units with a corresponding resolution of 12.5km or 25km. The wind speed measurement range of ASCAT is 0-50 m/s. When the wind speed range is 0-25 m/s, the wind speed

accuracy is less than 2 m/s. The measurement range of the wind direction is 0° to 360°, and the accuracy of the wind direction is less than 20°. When the wind speed is 25-50m/s, the measurement accuracy are under development.

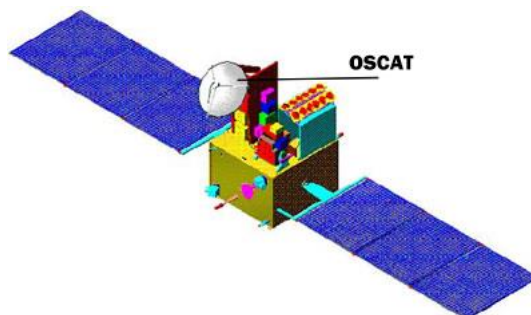
Two types of products are available: 1 swath product which contains the data in one swath per file organized by swath rows perpendicular to the satellite path or 2) gridded binary data files similar in many ways to those provided for RSS radiometer data. OSI SAF provides ASCAT L2 data at resolutions.

**Data access:** [Wind products | OSI SAF \(eumetsat.int\)](#)

### Instrument details:

Acronym	ASCAT				
Full name	Advanced Scatterometer				
Purpose	Sea surface wind vector. Also large-scale soil moisture				
Short description	C-band (5.255 GHz), 1 MHz bandwidth, side looking both left and right. 3 antennas on each side.				
Background	Evolution of the AMI-SCAT flown on ERS-1 and ERS-2				
Scanning Technique	Two 550-km swaths separated by a 700-km gap along-track. 3 looks each pixel (45, 90 and 135° azimuth)				
Resolution	Best quality: 50 km – standard quality: 25 km – basic sampling: 12.5 km				
Coverage/Cycle	Global coverage in 1.5 days				
Mass	260 kg	Power	215 W	Data Rate	42 kbps
Providing Agency	ESA				
Instrument Maturity	Flown on operational programme				
Utilization Period	2007-01-15 to 2021-11-15				
Last update	2022-08-30				

## OSCAT



### SCATSAT-1 Credit: ISRO

The OSCAT is a Ku-band conically scanning scatterometer system designed and built by the India Space Research Organization (ISRO)/Space Applications Center (SAC). OSCAT was launched aboard the Oceansat-2 satellite on September 23, 2009. The objective is to monitor ocean surface wind speed and directions. The instrument is a pencil beam wind scatterometer operating at Ku-band of 13.515 GHz. OSCAT has a 1-meter parabolic antenna and a doubly-fed component to generate two beams. OSCAT was scanned at a speed of 20.5rad/min to cover the entire area. The incident Angle of the inner beam on the ground is  $48.9^\circ$ , and the incident Angle of the outer beam is  $57.6^\circ$ . The inner and outer beams cover continuous bands of 1400km and 1840km, respectively. In addition to wind speed, OSCAT collects wind direction information and covers about 90% of the global ocean in a single day, with a repetition of its ascent and descent paths for two days. Wind products are 25km and 50km.

In September 2016 ISRO launched the ScatSAT-1 as a follow-up mission to the OceansAT-2 scatterometer, which also carrying OSCAT. The data of OSCAT include L1B(Geophysical Data containing Radiance Data for all 8 Bands of OCM-2),L2B(Chlorophyll, Aerosol Depth, Different Attenuation, Total Suspended Sediments),L2C(Chlorophyll, Aerosol Depth, Different Attenuation, Total Suspended Sediments).

**Data access:** [Vector Winds OSCAT-2 SCATSAT-1 | NOAA CoastWatch & OceanWatch](#)

**Instrument details:**

Acronym	OSCAT				
Full name	OceanSat Scatterometer				
Purpose	Sea surface wind vector				
Short description	Ku-band (13.515 GHz)				
Background	New development				
Scanning Technique	Conical scanning, two beams, to provide four views of each spot from different angles; incidence angles: 48.9° and 57.6°; scan rate: 20.5 rpm; swath 1440 km				
Resolution	25 km, or 50 km (for best quality data)				
Coverage/Cycle	Global coverage every day				
Mass	108 kg	Power		Data Rate	
Providing Agency	ISRO				
Instrument Maturity	Flown on operational programme				
Utilization Period	2010 to 2014-02-20				
Last update	2021-06-15				

## HY-2



HY-2 Credit NSOAS)

HY-2B satellite is China's second Marine dynamic environment series satellite successfully launched in Taiyuan at 6:57 on October 25, 2018. The

microwave scatterometer on board measures the backscattering coefficient of the sea surface by pen-shaped conical scanning from the satellite platform. Single working frequency, double feed, double beam, double polarization working mode, support internal calibration correction Drift of the instrument. The microwave scatterometer covers at least 90% of the global sea area in one to two days. The satellite adopts an orbit with a regression period of 14 days in the early stage, and changes its orbit to an orbit with a regression period of 168 days in the late stage. L2A and L2B Data can be obtained from China Ocean Satellite Data Service Center.

The precision index of HY-2B observation parameter is shown in the following table:

Parameter	Accuracy	Effective Range
Wind Speed	2m/s or 10% whichever is the greater	2-24 m/s
Wind Direction	20°	0°-360°
Sea Surface Height	~5 m	
Significant Wave height	0.5m or 10% whichever is the greater	0.5-20 m
Sea Surface Temperature	±1.0°C	-2~35°C
Moisture Content	±3.5 kg/m <sup>2</sup>	0~80 kg/m <sup>2</sup>
Cloud Liquid Water	±0.05kg/m <sup>2</sup>	0~1.0 kg/m <sup>2</sup>

**Data access:** [中国海洋卫星数据服务系统 \(nsoas.org.cn\)](http://nsoas.org.cn)

**Instrument details:**

Acronym	SCAT (sso)			
Full name	Scatterometer			
Purpose	Sea surface wind vector			
Short description	Ku-band (13.515 GHz)			
Background	New development			
Scanning Technique	Conical scanning, two beams, to provide four views of each spot from different angles; swath 1300 km			
Resolution	Best quality: 50 km; standard quality: 25 km			
Coverage/Cycle	Near-global every day			
Mass		Power		Data Rate
Providing Agency	NSOAS			
Instrument Maturity	Backed by strong heritage			
Utilization Period	2011-11-15 to 2020-11-01			
Last update	2021-10-31			

## CFOSAT



**CFOSAT (Credit NSOAS)**

The CFOSAT is a joint oceanographic satellite developed by China and France, which was launched on October 29, 2018, carrying a microwave scatterometer developed by China and an oceanographic spectrometer developed by France. CFOSAT microwave scatterometer is the first fan-beam scanning microwave scatterometer for sea surface wind field

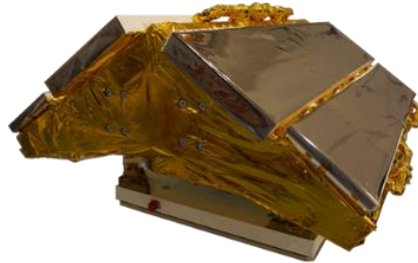
measurement in the world. The CFOSAT microwave scatterometer works 24 hours a day in an orbit 520km above the ground, realizing high-precision observation of the global sea surface wind field. It has the highest spatial resolution (12.5km commercial wind field product) and the most observation Angle coverage (bearing: 0-360°, pitch:26-46°) and the spaceborne microwave scatterometer with the highest wind field measurement accuracy (wind speed better than 1.5m/s, wind direction better than 15°). L2A and L2B Data can be obtained from China Ocean Satellite Data Service Center.

**Data success:** [中国海洋卫星数据服务系统 \(nsoas.org.cn\)](http://nsoas.org.cn)

### Instrument details:

Acronym	SCAT (CFOSAT)				
Full name	Scatterometer				
Purpose	Sea surface wind vector				
Short description	Rotating Fan-beam Scatterometer (RFSCAT). Ku-band (13.256 GHz), dual polarisation (HH and VV).				
Background	New development				
Scanning Technique	Combining the fan-pencil concept (such as, e.g., ASCAT) and the rotating concept (such as, e.g., WindSat). Rotating speed: 5.7 rpm; swath 1000 km. Duty cycle 15-35 %.				
Resolution	High quality data: 50 km. Basic sampling: 10 km.				
Coverage/Cycle	Global in one week.				
Mass		Power		Data Rate	220 kbps
Providing Agency	CNSA				
Instrument Maturity					
Utilization Period	2019 to $\geq$ 2022				
Last update	2021-06-15				

## WindRAD



WindRAD (Credit CMA

WindRAD was launched aboard the FY-3E satellite on July 05, 2021. It is a dual-frequency, dual-polarization radar operating in both C (5.4Ghz) and KU (13.256Ghz) bands, each band consists of two polarization measurements, horizontal and vertical. The two polarization measurements in the same band are made at different time intervals, and the measurements in different bands are independent of each other.

The radar adopts sector beam cone scanning system, and the detection head of the antenna rotates 360 ° without interruption. The incident angle of the antenna is greater than 30 °. The width of observation is more than 1200 km, the spatial resolution of C-band is  $25 \times 0.5$  km (azimuth  $\times$  distance), and Ku-band is  $10 \times 0.5$  km (azimuth  $\times$  distance). The minimum detectable wind speed is better than 3M/s.

The main purpose of the WindRAD is to measure the global ocean surface wind field vector (including wind speed and wind direction) in all weather, at any time, with high accuracy and high resolution. WindRAD accomplished the measurement of ocean surface wind indirectly through measuring the backscattering coefficient of sea surface. It provides important data for assimilation application search and weather forecast. In addition, WindRAD also can measure the characteristics of ground features such as sea ice.



FY-3E/WindRAD data can be applied to assimilation of numerical forecast data, global sea surface wind field inversion, the product development of ocean ice, freeze - thaw the ice cover, snow density, soil moisture etc. The data after 2022.01 can be provided for trial and will be adjudged later.

A single file of windRAD L1 product is halftrack data, and 28 files are generated every day. WindRAD L1 products are stored in HDF5 file format. The L1 product file mainly contains time code, geographic positioning results (longitude and latitude, satellite zenith angle, satellite azimuth, etc.), radiation calibration data (backscatter coefficient), quality identification and other information. L1 data provides 10km and 20km grid resolutions, which can be selected as required. C and Ku band data is stored separately, and each piece of data contains backscatter coefficient data and positioning data of HH and VV dual polarization.

**Data success:** [风云卫星遥感数据服务网 \(nsmc.org.cn\)](http://nsmc.org.cn)

**Instrument details:**

Acronym	WindRAD			
Full name	Wind Radar			
Purpose	Sea surface wind, surface soil moisture			
Short description	Two frequencies, C-band (5.4GHz) and Ku-band (13.256 GHz). Four antennas with HH and VV for both frequencies. Each pixel illuminated under several viewing angles. Minimum detectable windspeed 3 m/s.			
Background	New development			
Scanning Technique	Conical scanning with incidence angles 36-45° (C-band) and 37-43° (Ku-band). Swath > 1200 km.			
Resolution	C-band: 25 km, Ku-band: 10 km			
Coverage / Cycle	Near-global coverage each day.			
Mass		Power	265 W	Data Rate
<b>Providing Agency</b>	CMA			
<b>Instrument Maturity</b>	Flown on operational programme			
<b>Utilization Period:</b>	2021 to ≥2027			
<b>Last update:</b>	2022-05-16			