# The contribution of global ocean observation of continuity of HY-2 satellite

HY-2 satellite, an ocean dynamic environment observation satellite, mainly objective is monitoring and detecting the parameters of ocean dynamic environment. These parameters include sea surface wind fields, sea surface height, wave height, gravity field, ocean circulation and sea surface temperature etc.

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## 1. Introduction

HY-2 satellite scatterometer provides sea surface wind fields, which can offset the observation gap of the plan of global scatterometer. At the same time, HY-2 satellite altimeter provides sea surface height, significant wave height, sea surface wind speed and polar ice sheet elevation, which can offset the observation gap of the plan of global altimeter around 2012, and can offset the observation gap of JASON-1&2 at polar area. More details as follows.

#### 2. Observation of sea surface wind fields

The analysis accuracy of wind field for ocean-atmosphere can improve 10-20% by using the satellite scatterometer data, by which can improve greatly the quality of initial wind field of numerical atmospheric forecast model in coastal ocean. Satellite scatterometer data has play important role on study of large-scale ocean phenomenon, such as sea-air interactions, ocean circulation, EI Nino etc.

The figure 1 shows that QuikSCAT scatterometer has operational application in 1999, but it has not the following plan. ERS-2 scatterometer mission has transferred to METOP ASCAT in 2006. GCOM-B1 will launch in 2008, one of its payloads is an ocean vector wind measurement (OVWM) instruments, and it also called AlphaScat. This is SeaWinds follow-on. HY-2 satellite scatterometer will launch in 2010, it can fill up the gap of scatterometer observation after 2012.At the same time, HY-2 scatterometer is Ku band, therefore it can measure wind field higher sensitivity and signal-noise- ratio than ASCAT. So, HY-2 satellite scatterometer will become a good supplement to global wind field monitoring and can keep the continuity of global scatterometer observation plan.



Figure 1. The vector wind retrieval instruments and satellites for 1999-2019. The horizontal arrows show the mission duration. A dashed outline, that the mission is under consideration. The short arrow with diagonal hatching represents the SeaWinds sensor on ADEOS-2.

### 3. The compatibility of HY-2 scatterometer data

The table 1 shows that the technical data are in basic agreement between HY-2 scatterometer and other same kind of scatterometers. HY-2 scatterometer can run by self, it also can applicants by using data merging with other scatterometers.

	ERS1/2 (AMI)	SeaWinds	ASCAT	HY-2/SCAT
Swath	500km	1800km	600×2km	H polarization: 1350km V polarization: 1700km
Frequency	5.255 GHz	13.4 GHz	5.255 GHz	13.256GHz
Wind speed	2m/s or 10%	2m/s or 10%	2m/s or 10%	2m/s or 10%
Wind direction	20°	20°	20°	20°
resolution	50km	12.5/25km	25km	50km

Table1. The technical data of HY-2 scatterometer and other scatterometers

#### 4. Observation of sea surface height

HY-2 satellite altimeter can measure the global sea surface height, sea surface wind speed and significant wave height. These measurement data have extensive requirements on some field of study, such as oceanography, geodesy, climatology, hydrography and biology etc.

The table 2 shows that JASON-2 has launched on June 20, 2008. It and JASON-1 will service continuously for forecast system. ENVISAT RA-2 will be end-of-life around 2010; Sentinel 3 is its follow-on, which will launch in 2014. Therefore it will be the measurement gap from 2011 to 2013. Fortunately, HY-2 altimeter can fill up the gap. At the same time, HY-2 also can measure polar area and glacier area; therefore it can offset the measurements of JASON-1&2. In 2010, there will be HY-2 and JASON-2 on the on-orbit, As far as ocean measurement concerned, the not less than two satellite altimeter is necessary. So, HY-2 altimeter and JASON-2 can keep the continuity of global altimeter observation plan.

In addition, the geoid and ocean gravity anomalies of high space resolution need massive altimeter data to determine. Geosat, ERS-1/2, TOPEX, JASON-1 and ENVISA RA-2 data have merged to determine high space resolution geoid and ocean gravity anomalies in the current study. HY-2 satellite altimeter will provide an important data source for determining geoid and ocean gravity anomalies.

Satellite	Inclination	Sensor	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Envisat	98.5	RA-2															
Jason-1	66°	Poseidon2															

 Table 2. Timeline for altimetry missions

Jason-2	66°	Poseidon3								
HY-2	99°	RA-1								
Sentinel 3	98.5	Altimeter								

The table 1 shows that the technical data are in basic agreement with HY-2 satellite altimeter and other same kind of altimeters. So, HY-2 satellite altimeter measures the sea surface height, sea surface wind speed and significant wave height can meet the requirements of application.

Tables the technical data of 111-2 altimeter and other altimeters										
Satellite	GFO-1	JASON-1	ENVISAT	JASON-2	HY-2					
Orbit (km)	880	1336	800	1336	963&965					
Frequency (GHz)	13.5	13.6&5.3	13.575&3.2	13.6&5.3	13.58&5.25					
Inclination (°)	108	66	98.5	66	99.34015°					
Exact repeat cycle (days)	17	10	35	10	14&168					
Life	1998~	2001~	2002~	2008~	2010~					
Sea surface height (cm)	1.8	3.3	<4.5	3.3	<5					
Wave height (cm)	50	25	25	25	50					
Wind speed (m/s)	2	1.5	2	1.5	2					

Table3 the technical data of HY-2 altimeter and other altimeters