Jason-3

POSEIDON 3B ALTIMETER

Background

Poseidon-3B nadir-looking radar altimeter that maps sea surface topography used to calculate ocean surface current velocity, wave height, and wind speed.

Poseidon-3B is provided by CNES and has measurement precision identical to its predecessors Poseidon-2 and -3.

The Poseidon-3B is the primary instrument in the space-borne observation segment of the ocean surface topography mission. The objective is to map the topography of the sea surface for calculating ocean surface elevation drift, the currents velocity and to measure ocean wave height and wind speed.

Benefits

The sea surface height data is used for tides, currents (as the Gulf Stream) and eddies detection, understanding, and modeling. In addition it is of high interest for climate studies with global and regional sea surface drifts in particular.

The height of ocean wave measurement supports accurate surface wave forecasting and evaluation which are a requirement for offshore operators. Over the last decade, altimeter-derived significant wave height data have been critical for improvements in wave prediction systems. Continual, long-term, reliable data of changes in ocean surface topography will be generated and will be used by scientists and operational agencies (NOAA, European weather agencies, marine operators, etc.) for scientific research and operational oceanography for the benefit of society.

Wind speed and height of ocean waves are used in ocean models to calculate the speed and direction of ocean currents and the amount and location of heat stored in the ocean, which is used in global climate variation research. In addition to detecting climate change factors, Jason-3 will also be used in the prediction of short-term, severe weather events, such as hurricanes and tropical storms. NOAA will use the altimeter measurements to monitor ocean conditions that trigger changes in the strength of tropical cyclones as they move over the ocean towards the land. The technique involves mapping the ocean heat content—the fuel that feeds a storm's intensity—along the storm's predicted track.

Key Measurements

The Poseidon-3B emits a radar beam that is reflected back to the antenna from the Earth's surface. Poseidon-3 emits pulses at two frequencies (13.6 GHz in the K_u band and 5.3 GHz in the C band) to measure very accurately the distance from the satellite to the sea surface and then to derive the surface

POSEIDON-3B Instrument-at-a-Glance

Purpose: To map sea surface topography used to calculate ocean surface currents and waves.

Instrument Contractor:
Thales Alenia Space under CNES contract

Key specs:
- Transmission frequencies: 5.3 GHz (C-band), 13.575 GHz (Ku-band)
- Bandwidth: 320 MHz (Ku-band and C band)
- Accuracy: Typical Noise : ~1.5 cm for 1s averaging measurements.
- Long Term Stability: <1mm over 5 years mission
- Mass: 70 kg
- Average Power: 78 W
- Average Data Rate: 37 kbit/s

Website:
http://www.nesdis.noaa.gov/jason-3/spacecraft.html

altitude(within a few centimeters) using its precise location of the satellite. The two frequencies are used to determine the atmospheric electron content. Free electrons in the atmosphere can delay the signal's return, which affects the radar signal path delay and measurement accuracy. The delay is directly related to the radar frequency, so the difference between the two measurements can be used to determine atmospheric electron content. These two frequencies also serve to detect the rain events. The strength and shape of the returning signal also provides information on wind speed and the height of ocean waves.

Poseidon-3B is coupled with DORIS/DIODE to improve measurements capability over coastal areas, inland waters, and ice surfaces. Two "Diode Coupling Modes" are available. The first of these modes speeds up the acquisition of the surface. The second mode is based on an open loop tracker—the satellite to surface distance will be estimated by the altimeter using the real-time orbit position predicted by DIODE (on board navigator based on DORIS receiver) and using the elevation of the surface stored in a DEM (Digital Elevation Model) within the altimeter.

These two modes have been successfully tested on Jason-2 and the first Diode coupling mode is now the Jason-2 nominal mode. Jason-3 will have the new capability to switch automatically between these two modes to take advantages of each.