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Perspective

Usage of Radar Altimetry in Sea Surface Analysis

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DESCRIPTION

Altimetry is a technique to measure the height of a ground target from the satellite. It was developed in the 1970's soon after the flight of artificial satellites became a reality. The main advantages of radar altimetry include day/night coverage in all weather conditions with no loss of data because of cloud coverage. With continuous operation across all the surfaces, the instrument behaves like a string of pseudo-gauges, measuring the elevation at a discrete interval along a narrow ground track. The satellite radar altimeter can thus observe monthly, seasonal and inter-annual variations during the lifetime of the mission. Unlike many gauge networks that operate using a local reference frame, all altimetric height measurements are given with respect to one reference datum to form a globally consistent, uniform data set.

The satellite radar altimeters were initially developed to operate over ocean surfaces and make precise measurements of the sea surface topography. They are now being operationally used for precise and repetitive global measurements of sea surface height, significant wave height and wind speed required to understand climate and for developing forecasting capabilities. With the advancement of the technology now altimetry is widely used for a number of other applications such as water level monitoring for inland water bodies.

The principle of radar altimeters is deceptively straight forward. The altimeter transmits a short pulse of electromagnetic radiation with known power towards the earth's surface. The pulse interacts with the surface and part of the incident radiation reflects back to the altimeter. This return radar power received by the altimeter is recorded through time, producing an altimetric waveform. By analyzing amplitude and shape of return waveform, various characteristics of the surface such as back scatter coefficient, surface roughness, wave height and wind speed over oceans, etc. can be retrieved. The relationship between the power of the signal transmitted by a radar altimeter and the backscattered power (received by the altimeter) is fundamentally important to altimetry. The time taken for a radar pulse to travel from the instrument to the earth's surface and back again can be used to calculate the distance between the two. Once the velocity of the propagation of the pulse and the precise arrival time is known, the altimeter range (R) can be calculated. This range information is then used for retrieving the height of the instrument above the reflecting surface.

CONCLUSION

Altimetric measurements have a wide range of applications to Oceanography, Geodesy, Geophysics, Glaciology and Continental Hydrology. For example, for oceanography people, a ship takes weeks or months to cross the ocean making measurements while the ocean is rapidly changing its circulation, temperature and salinity for different temporal and spatial scales. Therefore, it is unfeasible to make synoptic and continuous observations of the global ocean using *in-situ* measurements. The satellite altimetry has emerged as a unique tool for mapping the global ocean topography for studying the ocean circulation and its changes with time whether it long term or short term changes. In the global warming scenario, the largest contributions to sea-level rise are thermal expansion of the ocean, melting of glaciers and ice caps. Monitoring ice sheet extent and seasonal height variability are the crucial input for sea level rise/fall.

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