

Precise monitoring of the sea surface height by GNSS Reflectometry on D/V Chikyu

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The sea surface height (SSH) is an important variable in the physical oceanography, which can provide various information such as tides, tsunami, surface geostrophic currents and the heat content of sea surface water. Satellite altimeters have been widely used to measure SSH, but their observations are spatially limited only to the satellite tracks and temporally intermittent. In this study, we have deployed a real-time kinematic (RTK) Global Navigation Satellite System (GNSS) system to D/V Chikyu in order to examine an alternative method to obtain SSH. As far as the vessel stays within about 100km from lands, the RTK GNSS would provide the height of the antenna in a geodetic coordinate, so that SSH in the given coordinate can be obtained if the vertical distance of the antenna from the sea surface are known. The antenna was originally deployed about 36m above the sea surface, but its height would change due to the draft of the vessel. In this study, this height is determined using GNSS reflectometry (GNSS-R). Since the intensity of the received signal is subject to the interferometric intensity variations between the direct and reflected signals, the time scale of the intensity variations of the received signal provides the change rate of the path length of the reflected signal during a GNSS satellite movement. The antenna height can be determined using this change rate and a simple geometry.

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