

**Observational study to determine the causes of
the freak wave generation in the open ocean**

Takuji Waseda

(The University of Tokyo, Graduate School of Frontier Sciences, Associate Professor)

【Outline of survey】

Theoretical and experimental works suggest that the generation of freak wave is closely related to the instability of random water waves, but this has not been verified from field observation. Wave spectra in the ocean vary due to changes in the wind field and ocean current. In this study, we simultaneously measure the wind, current and wave to identify the environmental conditions that lead to the generation of the freak wave. Following hypotheses will be tested: i) dispersive energy focusing due to meteorological conditions; ii) geometrical energy focusing due to wave-current interaction; iii) generation of freak wave due to an instability of an abnormal wave spectra formed as a result of i) and ii).

We conduct the following: 1) establish a new buoy system to monitor freak waves in the deep ocean (near the Kuroshio extension); 2) analyses of the obtained time series from the moored buoy station containing freak wave; 3) comparison of the numerical simulation results and the satellite images with wave records and other measurements around the moored station from the intensive observational period.

【Expected results】

Simultaneous observation of wave, current and wind by moored and drifting buoys near a strong ocean current is rare. If a long-term monitoring is realized, the database of the wave-wind-current will be quite unique and we will likely be able to identify causes of the freak wave generation in the open ocean. We also expect to contribute to the study of the air-sea interaction (e.g. gas exchange) which is the original purpose of the moored buoy station in the Kuroshio extension.

【References by the principal investigator】

- Waseda, T., T. Kinoshita and H. Tamura, 2008: Evolution of random directional wave and extreme wave occurrence, *J. Phys. Oceanogr.* under review
- Tamura, Waseda, Miyazawa & Komatsu, 2008, Current-induced modulation of the ocean wave spectrum and the role of nonlinear energy transfer, *J. Phys. Oceanogr.*, to be published

【Term of project】 FY2008—2012

【Budget allocation】

58,900,000 yen (direct cost)

【Homepage address】

<http://waseda2.t.u-tokyo.ac.jp/~waseda>