Topography-dependent relation between offshore wind field and swell-dominant surface waves observed inside bays on the Sanriku ria coast of Japan

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Real-time monitoring of wind and surface waves in Otsuchi Bay, a ria in the Pacific coast of Sanriku, the northeastern portion of Japan, has been continued since October 2012, using a mooring buoy with an ultrasonic anemometer and a single-mode GPS wave sensor. We analyzed two-dimensional energy spectra of surface waves and wind data monitored hourly over four years in order to assess the variability and occurrence of wind and waves and to elucidate the main reasons for wave variation in Otsuchi Bay. The monitoring data revealed in all seasons that surface waves in the bay were predominantly affected by swells propagated from the northeastern offshore region and that the wave height was significantly correlated with the component of wind velocity toward the bay in the northeastern offshore region that faces the bay mouth. The offshore wind field was expected to provide information useful for predicting coastal waves in rias bays in Sanriku such as Otsuchi Bay. More interestingly, comparison of the horizontal distribution of strong correlation between the offshore wind field and the significant wave height in rias bays, Miyako and Kamaishi Bays close to Otsuchi Bay clarified that the offshore wind field which affects predominantly surface waves in rias bays depends heavily on the topographic shape of the bay.

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