Effects of the Kuroshio on coastal sea level south of Japan by using altimetry data

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Effects of the Kuroshio on coastal sea level variations south of Japan have been studied by mainly using tide gauge records in the past. Since in situ data were too little to describe offshore fluctuations in wider regions for longer periods, only remarkable changes of the Kuroshio path, such as large meander or non-large meander, have been discussed. In recent years, however, it became possible to quantitatively evaluate the effects of the Kuroshio on coastal sea level variations with the development of satellite altimetry observation. In this study, the correlation between the Kuroshio and coastal sea level south of Japan has been examined using the altimetry and tide gauge data during the period from October 1992 to September 2000, which is a non-large meander period. The correlation between coastal and offshore sea level variations indicates that the sea level varies uniformly in a region bounded by the coast and the mean Kuroshio axis, which stretches for several hundred kilometers along the coast. Furthermore, the correlation between coastal sea level variations and the geostrophic velocity anomalies indicates that above variations are related with the Kuroshio velocity, as coastal sea level decreases (or increases) when the Kuroshio is faster (or slower). In addition, to the east side of the Cape Shiono-misaki, where sea level variations are different from these to the west side, movement of the Kuroshio axis additionally affects coastal sea variations. In other words, coastal sea level increases when the Kuroshio meanders southward on the east of the Cape Shiono-misaki. However, this response is restricted to variations whose period is longer than one year.