

# Coastal Sea Level and the Large-Scale Climate State: A Downscaling Exercise for the Japanese Islands

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## Abstract

A major problem which is envisaged in the course of man-made climate change is sea-level rise. The global aspect of the thermal expansion of the sea water likely is reasonably well simulated by present day climate models; the variation of sea level, due to variations of the regional atmospheric forcing and of the large-scale oceanic circulation, is not adequately simulated by a global climate model because of insufficient spatial resolution. A method to infer the coastal aspects of sea level change is to use a statistical "downscaling" strategy: a linear statistical model is built upon a multi-year data set of local sea level data and of large-scale oceanic and/or atmospheric data such as sea-surface temperature or sea-level air-pressure.

We apply this idea to sea level along the Japanese coast. The sea level is related to regional and North Pacific sea-surface temperature and sea-level air pressure. Two relevant processes are identified. One process is the local wind set-up of water due to regional low-frequency wind anomalies; the other is a planetary scale atmosphere-ocean interaction which takes place in the eastern North Pacific.