



Monitoring of Sea Level Rise around Taiwan using Satellite Altimetry and Tide Gauges

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Taiwan is an island, where most of mountains are located at the central area, so the cities where are highly developed are near to the coasts by 30-50 km. Compared with other countries, sea level rise has a relatively large impact on Taiwan, for example, erosion of beaches and increased flooding and storm surge damage. Therefore, sea level research and the impact of sea level rise is important to Taiwan. Traditionally, the instruments used to measure global and regional sea level change are coastal tide gauges and satellite altimetry. However, tide gauge records contain sea level and crustal vertical motion, and altimetry data span is too short to avoid contamination by low-frequency effect on sea level trend determination. In this study we develop a novel technique to determine accurate sea level trend around Taiwan by combining tide gauge and altimeter data. First, because there is only a few long-term gauges in Taiwan, we choose the gauges by extending the region, covering from latitude 110E to 130E and longitude 10N to 30N. Then, the records of tide gauge can be decomposed into few independent monotones cycles, which is called Intrinsic Mode Functions (IMF), by using Hilbert-Huang Transformation (HHT) method. Afterwards, residual time series computed by subtracting sea level time series reconstructed using specific IMFs, which represent low frequencies and cannot be clearly detected in altimeter data, from the corresponding altimetry data is fitted to determine the sea level trend. This method allows one also to calculate crustal vertical motions by combining tide gauge and altimeter data.