The 2004 Sumatra Earthquake and Indian Ocean Tsunami

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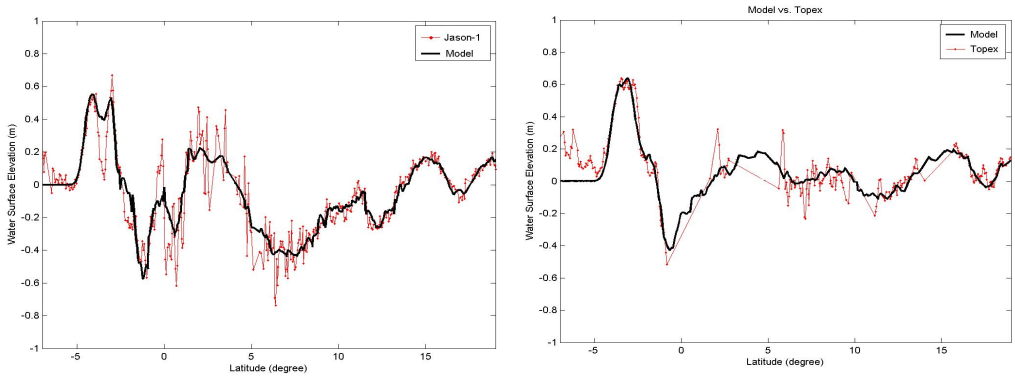
Abstract

The 2004 Sumatra earthquake and the Indian Ocean tsunami is one of the most devastating natural disasters in the past 100 hundred years. More than 280,000 people were killed, 14,100 are still listed as missing, and 1,126,900 were displaced in 10 countries around the rim of the Indian Ocean. Serious damages and death were even reported along the east coast of Africa, as far as 8,000km away from the epicenter. To understand the earthquake and the tsunamis several fault plane models have been presented in the literature. These models represent different fault plane rupture mechanisms. In this paper, a series of numerical simulations is carried out to calculate the tsunami generation and propagation based on different fault plane models. The simulated results are compared with the measurements taken by two altimetry satellites. The comparisons suggest that the entire rupture zone of the seafloor is indeed very long; about 1,300 km. The transient rupture motion may be only important for first several hundred kilometers north of the epicenter. To fine tune that fault plane mechanism, an inversion method was introduced to optimize the fault plane model based on the measurements of satellite Jason-1. The optimized fault plane model gave a very good match the measurements of the second satellite TOPEX/Poseidon and available tidal gage data.



Comparison between optimized fault model results and Jason-1 measurements (left)/TOPEX measurements (right)