

Tsunami Simulation of the 2007 Solomon Islands Tsunami Recorded in Northeastern Australia

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A great earthquake occurred on 1 April, 2007 at the southern New Britain-San Cristobal Trench off the Solomon Islands (the 2007 Solomon Islands earthquake). Because it was a large submarine earthquake, it generated a large tsunami which left 52 people dead and more than 7,000 people homeless in the Solomon Islands. The tsunami also propagated into the Coral Sea and reached the Australian coast over the Great Barrier Reef (GBR), the world's largest coral reef system. In this paper, we investigate whether the Great Barrier Reef offshore Queensland, Australia, may have weakened the tsunami impact from the 2007 Solomon Islands earthquake. The fault slip distribution of the 2007 Solomon Islands earthquake was firstly obtained by teleseismic inversion. The tsunami was then propagated to shallow water just offshore the coast by solving the linear shallow water equations using a staggered grid finite difference method. We used a relatively high resolution (approximately 250m) bathymetric grid for the region just off the coast containing the reef. The tsunami waveforms recorded at tide gauge stations along the Australian coast were then compared to the results from the tsunami simulation when using both the realistic 250m resolution bathymetry and with two grids with an imaginary bathymetry. One of the grids with an imaginary bathymetry removes the coral reef and interpolates an artificial bathymetry across it. The other imaginary grid replaces the reef with a flat plane at a depth equal to the mean water depth of the Great Barrier Reef. From the comparison between the synthetic waveforms both with and without the Great Barrier Reef, we found that the Great Barrier Reef significantly weakened the tsunami impact. According to our model, the coral reefs delayed the tsunami arrival time by 5-10 minutes, decreased the amplitude of the first tsunami pulse to half or less, and made the period of the tsunami longer.