

Fault plane Determination for the Niigataken Chuetsu-oki Earthquake in 2007 Using Tsunami Simulations

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On July 16th 2007, the Niigataken chuetsu-oki earthquake in 2007 occurred along the Japan Sea coast of central Japan. This strike of the fault was estimated to be approximately northeast-southwest but from the preliminary aftershock distribution and crustal deformations, it was difficult to determine if the fault dipped toward the west or toward the east. A tsunami occurred due to the sea bottom deformation caused by this earthquake. This tsunami was not so large, so it did not cause significant damage along the Japan Sea coast. However, it was clearly recorded by a number of tide-gauge stations along the Japan Sea coast.

In this study, we use various models for the slip on the fault plane, as estimated by teleseismic body-wave inversions and local GPS data. We calculated the sea floor deformation from these models and then calculated the resultant tsunami waveforms for tide-gauge stations that clearly recorded the tsunami. We pay particular attention to stations east and west of the fault at Kashiwazaki and Sado Island, respectively.

Using comparisons of the model and observed tsunami waveforms, we try to estimate whether the major part of the slip was on a westward or eastward dipping fault plane. In general, it is difficult to distinguish between the two fault planes, because both give similar patterns of sea floor deformations. There are some differences due to the shallow slip on the fault that cause different timing of the waves to the east and west.