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Source process for the 2013 Santa Cruz Islands earthquake

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Many places in the world have experienced damage from tsunami. Most tsunamis are induced by large earthquakes that occur under the sea along the trench. Therefore understanding the characteristics of large earthquakes is important to evaluate tsunami hazard as well as earthquake damage. In order to understand the characteristics of large tsunamigenic earthquakes, in this study we analyzed the source process of the 2013 Santa Cruz earthquake (M8.0) on Feb. 6, 2013.
According to the U.S. Geological Survey (USGS), 56 earthquakes with magnitudes greater than 5.5 occurred in Jan. 27 - March 8, 2013. Among them, eleven events happened for a week before the mainshock and the maximum magnitude was 6.4. A large aftershock with magnitude of 7.1 occurred immediately after the mainshock, about 10 minutes later. Including this event, the 2013 Santa Cruz event seems to be followed by two large aftershocks of M$\sim$7. The length of spatial distribution of aftershocks in 30 days was about 200 km. And this value of the length was used for rough estimation of the fault length during the waveform inversion process.
We carried out teleseismic body-wave inversion to obtain the slip distribution of the 2013 earthquake. Teleseismic P waveform data from 19 stations in the epicentral distance between 30° and 90° were used and band-pass filter at 0.005 - 1.0 Hz was applied. And focal depth was assumed to be 28.7 km, according the USGS catalog. And the initial value of source time window was assumed as 120 seconds by the duration of high-frequency energy radiation.
According to our inversion results, the fault plane seems the northwesterly striking (strike = 291) and shallowly dipping (dip = 24) fault plane. Large slip area was seen near the hypocenter. Rupture velocity was obtained to be 2.0 km/s. And moment magnitude of 7.9 and maximum dislocation of 1.4 m had the smallest variance between the observed and synthetic waveforms. These values were smaller than the result of previous study.
To verify our slip distribution and inversion results, we carried out tsunami simulation using the slip distribution, and then compared the simulated tsunami with observed data. We will discuss on the best solution of slip distribution that explain tsunami data.