Source Characterization of the 15 November 1994, Mw 7.1 Mindoro, Philippines Earthquake

Janette Manahan[1]; Keiko Kuge[1]

[1] Dept. of Geophysics, Kyoto Univ.

On 15 November 1994, at 3:15 PST (1915 GMT) a Mw 7.1 earthquake occurred in the northern part of Mindoro Island. The epicenter was located at 13.525 N lat, 121.067 E lon, south of Verde Island. It was a major event identified to be associated to the movement of local fault in the area known as the Aglubang River Fault. The earthquake was particularly devastating which generated tsunami that was accounted to the most number of casualties. The source of the tsunami has remained an enigma to date in the scientific community. We examined a large amount of waveform data of this event in order to characterize its tectonic origin. The P polarity data were utilized for the estimation of the gross fault plane solution using the program FOCMEC (Snoke, 1997). We have also performed the point source inversion as well as the finite fault inversion to retrieve the rupture history of this event using the numerical method developed by Kikuchi and Kanamori (1991). The results from the analysis of polarity data and body waveform inversion show a general consensus to the Harvard CMT solution. The fault mechanism depicts a NNW-SSE trending nodal plane which was consistent with the mapped ground rupture. The event was a dominantly right lateral strike-slip faulting with the shallow focal depth and a rupture that propagates to the south of Mindoro island. We also performed a careful inspection of the body waveforms for multiple event analysis in search for its spatio-temporal distribution using the method of Oike (1969). Our result suggests that the 1994 Mindoro earthquake consisted of two sub-events and that these events are separated by 9 seconds and are located about 30 km apart from each other. The P arrival of the 1994 Mindoro earthquake was followed by a noticeable downward pulse in many waveform data. Our inspection shows that the downward pulse is observed at a nearly constant time delay after the P arrival from the second sub event, so the pulse could be related to some structure effect around the source region and/or depth phase of the second sub event rather than complexity of the source. Similar waveform characteristic was also observed in records of a small event (03 Sept 2002, Mw 5.7) that occurred almost on the same location as of the 15 November 1994 event. The theoretical radiation pattern was computed using the result of our finite inversion which generally matched the surface observed data. The observed radiation pattern of long-period surface waves can be explained by a dominant strike-slip faulting. From all the analysis we have made in this study, we found no evidence that some waveform complexity including the downward pulse after the observed P-waves is related to the generated tsunami in this event.