

Joint inversion using ABIC evaluation of prior constraints for the 2009 Papua, Indonesia earthquakes

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Two large earthquakes occurred in the Papua, Irian Jaya region of Indonesia on January 3, 2009. The first earthquake with Mw 7.6 occurred at 19:40 (UTC) and about 3 hours later, at 22:33 (UTC), a Mw 7.3 earthquake occurred about 70 km northeast of the first earthquake. These events occurred closely together as a doublet.

There are several micro plates and the geometry in this region is complex, however the Pacific plate is being subducted southward under New Guinea which is on the Australian plate. These events appear to be on this subduction interface.

The aims of this study are to estimate the slip distribution and understand the relationships for the two Papua, Indonesia earthquakes using teleseismic data and inSAR modelling.

For the joint inversion, we used the P waveform modelling of teleseismic data and inSAR data collected from July 14, 2008 to January 14, 2009. We calculated the slip distribution for the Mw7.6 earthquake as model parameters with least square inversion. Using both the waveform and geodetic data for the inversion helps constrain the source parameters. The addition of the inSAR data helps fix the exact location of the fault and also is useful for determining which of the nodal planes is the fault plane.

We calculate the weighting factor of the data using ABIC (Akaike's Bayesian Information Criterion). ABIC is useful for determining the parameters and using prior constraints on the model parameters. Also the weighting of the prior constraints are calculate with ABIC.

The results of the inversion using ABIC for the Mw 7.6 earthquake show that maximum slip of about 2.5 m to 3.0 m occurred around the hypocenter and the seismic moment is about 2.44×10^{20} Nm (Mw 7.5). The fit between data and model for the inSAR displacement has RMS = 0.033 (m).

Keywords: Joint Inversion, slip distribution