

Study on Source Model of the December 26, 2004 Sumatra Earthquake Using GPS Data

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This study tried to obtain source model of the December 26, 2004 Sumatra earthquake using GPS data and to analyze static strain changes by numerical computation. We used fault parameter such as strike, dip, depth, reference points coordinate, fault dimension (length, width) and slip calculated based on slip rate motion (Nuvel1) and adjusted several times to get appropriate values compared with GPS data. 180 years slip accumulation was obtained from the model. Estimated displacement has been calculated using the Elastic Half Space Theory. The maximum surface displacement was obtained 4.65 meters, located at the north and south of Andaman islands in the middle and northern of rupture area. The minimum surface displacement was obtained 2.32 meters, (about 50 km north of epicenter). The result of dilatation calculation showed that rebounding (springing back) occurred in the southwest of rupture area just after the earthquake, while relaxation occurred on two segments that coincide with aftershocks region. We tried to model the tsunami propagation using estimated fault model and obtained the maximum tsunami height was found along the west coast of northern Sumatra. Computation waveform shows similarity with tsunami waveforms at two observation stations (Sibolga and belawan). Study results showed that GPS data can be used for earthquake source model, even for an event which has very long duration that is difficult to be determined by other data such as by seismic waveform.

Keywords: 26 December 2004 Earthquake, GPS, Static Strain, Tsunami