DIFFERENTIAL INTERFEROMETRY SYNTHETIC APARTURE RADAR (DINSAR) METHOD FOR ANALYSIS GROUND DEFORMATION IN EARTHQUAKE AREA (Case Study: Mentawai Archipelago, West Sumatran)

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Abstract

Technological development have led a variety of ways for monitoring and mapping of earth movement activities. Movement of earth activity is closely related to the deformation phenomena. One of the technologies developed for deformation monitoring technology is using Synthetic Aperture Radar Interferometry (InSAR). InSAR is a powerful tool for measuring deformation on the surface of the ground with sub-centimeter accuracy. InSAR combines the two images to produce a SAR interferogram image. Interferogram images are used to monitor the movement. Mentawai is one area in Indonesia, located in the ring of fire. Based on the tectonic structure, Mentawai earthquake that occurred on October 25, 2010 was a result of the Indo-Australian plate moving toward the north-northeast to the Sunda plate at a speed of 57-69 mm/year.

Detection ground deformation in Earthquake area uses two ALOS PALSAR pairs from September 29th 2010 and November 14th 2010. As an external elevation model is used 90 m DEM SRTM3. Method that is used process is two-pass differential interferometry synthetic aperture radar (DInSAR).
DInSAR value perform the displacement between -20 cm until 20 cm. Based on results of SAR processing to know accuracy of ground deformation is validated with Sumatran GPS Array (SuGAr) Network data. SuGAr Network is GPS stations along the Sumatran plate boundary. Sugar Network that is used for the validation of SAR data is MKMK, BSAT, PRKB and BSAT station. Displacement in each GPS station towards Sumatra trench subduction zone, with displacement values 7,268 cm, 4,352 cm and 5,576 cm at GPS stations BSAT, PRKB and SLBU. Resulting DInSAR method and GPS data have an average residual 0,947 cm. Based on the GPS data processing and DInSAR value, can be concluded that there are subsidence in each GPS station with the direction of movement to the southwest.

Keywords: DInSAR, Earthquake Area, Ground Deformation, SuGAr Network