

## INTISARI

Kepulauan Sangihe merupakan salah satu kabupaten kepulauan di Provinsi Sulawesi Utara. Kepulauan Sangihe terletak di lempeng Sangihe yang merupakan salah satu lempeng tektonik mikro dari lempeng Eurasia. Berdasarkan studi geodinamika oleh Macperson, dkk (2003) lempeng Sangihe berada pada zona subduksi Laut Maluku yang telah menenggelamkan cekungan samudra lempeng Laut Maluku karena adanya subduksi dua arah oleh lempeng Sangihe dan Lempeng Halmahera. Geodinamika ini menyebabkan wilayah Kepulauan Sangihe sangat rawan akan bencana gempa bumi, sehingga diperlukan upaya mitigasi untuk meminimalisir korban jiwa maupun kerugian dalam bentuk materi lainnya. Salah satu upaya tersebut adalah Pemetaan Potensi Gempa Bumi melalui studi Geodinamika yang direpresentasikan pada titik kontrol deformasi.

Studi geodinamika pada penelitian ini menggunakan empat *epoch* data pengukuran GNSS, yaitu *epoch* 2014, 2015, 2016, dan 2017 dimana data pengukuran *epoch* 2014, 2015, dan 2016 adalah data sekunder, sedangkan data pengukuran *epoch* 2017 adalah data primer. Data pengamatan diolah dengan menggunakan perangkat lunak GAMIT/GLOBK yang diikatkan terhadap ITRF 2014 sehingga menghasilkan koordinat beserta ketelitiannya. Berdasarkan koordinat dan ketelitian setiap kala, maka dilakukan analisis deformasi untuk mengetahui besar pergeseran, arah pergeseran dan perubahan volume dari lempeng tektonik beserta uji statistik. Besar pergeseran, arah pergerakan, dan perubahan volume lempeng diketahui berdasarkan perbedaan posisi dalam interval waktu tertentu dari titik kontrol deformasi SGH1, SGH3, dan SGH4.

Hasil dari penelitian ini adalah koordinat dan ketelitian titik pada *epoch* 2017. Titik SGH1  $N = 415703,29711 \text{ m} \pm 0,00148 \text{ m}$ ,  $E = 13934663,16222 \text{ m} \pm 0,00213 \text{ m}$ , dan  $U = 93,23951 \text{ m} \pm 0,00720 \text{ m}$ . Titik SGH3  $N = 371708,33339 \text{ m} \pm 0,00080 \text{ m}$ ,  $E = 13954900,17086 \text{ m} \pm 0,00098 \text{ m}$ , dan  $U = 146,92242 \text{ m} \pm 0,00293$ . Titik SGH4  $N = 403326,19403 \text{ m} \pm 0,00098 \text{ m}$ ,  $E = 13936373,02272 \text{ m} \pm 0,00122 \text{ m}$ , dan  $U = 89,45712 \pm 0,00434$ . Hasil tersebut apabila dibandingkan dengan data pengukuran *epoch* 2014, 2015, dan 2016, titik SGH1 mengalami deformasi horizontal sebesar 10,93 mm/tahun ke arah tenggara dan deformasi vertikal naik sebesar 12,41 mm/tahun. Titik SGH3 mengalami deformasi horizontal sebesar 15,94 mm/tahun ke arah tenggara dan deformasi vertikal turun sebesar 21,82 mm/tahun. Titik SGH4 mengalami deformasi horizontal sebesar 16,21 mm/tahun ke arah tenggara dan deformasi vertical naik sebesar 44,97 mm/tahun. Penelitian ini juga membuktikan hipotesis adanya perubahan volume lempeng tektonik Kepulauan Sangihe berdasarkan nilai parameter regangan normal dan regangan geser yang berada pada fraksi  $10^{-7}$  s.d.  $10^{-4}$  strain.

**Kata kunci:** Kepulauan Sangihe, geodinamika, deformasi, kecepatan, regangan

## ABSTRACT

Sangihe Islands is one of the islands districts in North Sulawesi Province. Sangihe Islands are located on Sangihe plate which is one of the micro tectonic plates of Eurasian plate. Based on geodynamic study by Macperson, et al. (2003), Sangihe plate is in the subduction zone of Maluku Sea that has drowned the ocean basin of Moluccan Sea plate due to the two-way subduction by Sangihe plate and Halmahera Plate. This geodynamics causes the area of Sangihe Islands is very vulnerable to earthquake disaster, so it takes mitigation efforts to minimize casualties and losses in other material forms. One such effort is Earthquake Potential Mapping through a Geodynamic study that is represented at the point of deformation control.

The geodynamic study in this research used four *epoch* data of GNSS measurement, that was *epoch* of 2014, 2015, 2016, and 2017 where *epoch* measurement data of 2014, 2015, and 2016 as secondary data, and *epoch* measurement data of 2017 as primary data. Observation data were processed using GAMIT / GLOBK software tied to ITRF 2014 to produce coordinates and accuracy. Based on the coordinates and accuracy of each *epoch*, deformation analysis can be perform to knowed the movement values, the direction of movement and changes in tectonic plate volumes and statistical tests. The movement values, the direction of movement and changes in tectonic plate volumes are known based on the position difference within a certain time interval from deformation control points.

The result of this research is coordinates and accuracys at *epoch* 2017. SGH1 points are N = 415703,29711 m  $\pm$  0,00148 m, E = 13934663,16222 m  $\pm$  0,00213 m, and U = 93,23951 m  $\pm$  0,00720 m. SGH3 points are N = 371708,33339 m  $\pm$  0,00080 m, E = 13954900,17086 m  $\pm$  0.00098 m, and U = 146,92242 m  $\pm$  0.00293. SGH4 points are N = 403326,19403 m  $\pm$  0,00098 m, E = 13936373,02272 m  $\pm$  0.00122 m, and U = 89.45712  $\pm$  0.00434. These results when compared to *epoch* measurement data 2014, 2015, and 2016, SGH1 point undergoes horizontal deformation of 10.93 mm/year to the southeast and the vertical deformation rises by 12.41 mm/year. SGH3 points has a horizontal deformation of 15.94 mm/year to the southeast and a vertical deformation down by 21.82 mm/year. SGH4 point undergoes a horizontal deformation of 16.21 mm/year to the southeast and the vertical deformation rises by 44.97 mm/year. This study also proves the hypothesis of changes in tectonic plate volumes of Sangihe Islands based on the value of normal strain parameters and shear strain located at fraction  $10^{-7}$  s.d.  $10^{-4}$  strain.

Keywords: Sangihe Islands, geodynamics, deformation, speed, strain