UNIVERSITI TEKNOLOGI MARA

Monitoring Motion of Mount Kinabalu and Its Surrounding Using High Precision GNSS

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Abstract

Sabah is situated on the Sunda Plate in a tectonically active region of Borneo, bordered by active Eurasian, India-Australian, and Philippine-Pacific plates, making it vulnerable to seismic activity. In Sabah also has the highest mountain which is Mount Kinabalu, with a summit height of 4095 meters. Sabah, which is located in the semi-stable South China Sea Basin, is influenced by active mobile belts in Sulawesi and the Philippines. Because earthquakes happen every so often, it's crucial to look at the ground surface motion and the station's displacement as a result of the shaking. Therefore, the goal of this study is to investigate motion that occurs in Mount Kinabalu and surrounding Mount Kinabalu using High Precision GNSS. The MyRTKnet station was used in this study to measure ground deformation movements in horizontal and vertical components. MyRTKnet stations have been processed using GIPSY software using data from 2011-2020 to find out the time series and strain rate of each station in Sabah. However, from the analysis obtained from strain rate, Sabah has moved towards the southeast of Sabah with a velocity of 22.9-31.7 mm/year. Therefore, the strain map will make it possible to classify seismic zones, which is helpful for managing geohazards.

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CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Crustal deformation is a term used to describe changes in the earth's surface caused by tectonic forces that accumulate in the crust and produce earthquakes. These processes include earthquakes, landslides, volcanic eruptions, ice sheet melting, etc., which may cause significant damages to society. In recent years, ground movements such as subsidence caused by a several of factors have received more attention. The earth crust is a solid bedrock that exists beneath the ground and above the Moho surface (Guo et al., 2019) and is made up of volcanic rocks, sedimentary rocks, metamorphic rocks, and other rocks. To establish the rate and extent of subsidence, domestic scientists used geodetic, geological, and hydrological data to investigate and assess the trend of regional vertical motions.

Global Navigation Satellite System (GNSS) has been proven to be an effective and excellent tool to study natural hazards such as earthquakes by extracting the dynamic parameters accompanied by the earthquake, analysing the seismic wave, and detecting the displacements of points on the ground surface as a result of earthquake shaking (Abd et al. 2020). With the growing number of Continuously Operational Reference Stations (CORS) and their application for land deformation monitoring, GNSS is becoming an essential research instrument for quantifying vertical movements (Qu et al., 2018). The Global Location System (GPS) was designed by the United States Department of Defense (DOD) for military and civilian navigation and positioning. It has been utilised as a geodetic tool of choice for investigating a wide range of geophysical phenomena. Currently, in Malaysia, the only active CORS is the Malaysian Real Time Kinematics GNSS Network (MyRTKnet) which consists of 97 stations, of which peninsular Malaysia has 66 stations Sabah and Sarawak each has 15 stations (by Jabatan Ukur Pemetaan Malaysia, 2021).

CORS is a facility that automatically collects and records GPS/GNSS data at a given location 24 hours a day. Each CORS has been erected at a fairly stable landmark with power and internet access, as well as a GPS/GNSS receiver and antenna. All data is transmitted in real-time through the internet to a control centre before being distributed to users. The data is also retained locally at the station before being transferred to a control centre for archiving and post-processing in hourly and daily data sequences. The deformation of the earth's crust in Sabah that impacts from the earthquake can be studied. Because earthquakes happen every so