

A Possible Slope Failure monitored by GPS Ranging in Tamagusuku Village, Southern Region of Okinawa Island

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According to the GEONET GPS baseline ranging operated by Geographical Survey Institute (GSI), the station in Tamagusuku Village, southern region of Okinawa Island, at which the operation was stopped in March 2012, was showing different movement from that at most of the other stations in Okinawa Island. The baseline between the Tamagusuku station and other stations in the central and northern areas on the island decreases gradually since around 2000. And then, according the GPS-based horizontal deformation record, the Tamagusuku GPS Station shifted NE relative to other stations in Okinawa Island. The ratio of NE-ward shift is not uniform and fluctuates from 2001. The fluctuation has good correlation with the amount of rainfall at the nearest AMeDAS (Automated Meteorological Data Acquisition System) Itokazu Station by Japan Meteorological Agency. The Tamagusuku station was located on the southward dipping slope surrounded by hills. A lot of cracks on the roads and walls on the buildings nearby are observed on these neighbouring hills. Since the basement rock in Tamagusuku Village is mudstone (Shimajiri Formation, 1.5-3Ma.), a slope failure may occur easily. Therefore, a possible reason of the shift and fluctuation of the GPS-based ranging record may be weakening of the mudstone basement (Shimajiri formation) at the Tamagusuku Station due to absorption of water after the heavy rainfalls. The GPS antenna of the Tamagusuku Station tends to lean towards northeast as the result of a possible slump. The geographical condition around the Station suggests a downslope focusing of soil, especially after a heavy rainfall. The large-scale slump which occurred in Shuri and in Nakagusuku in 2006 was the result at the final stage of the collapse due to the accumulation of weakening of the ground. On the other hand, the deformation observed around the Tamagusuku Station is regarded as the early stage of the slump. Considering that the amount of deformation is growing year by year, a sudden large-scale slump may take place at any time in Tamagusuku Village.