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The Mt. Gamalama Instability in Generating Landslides in Ternate Island, Indonesia

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Mt. Gamalama has a history of volcanic tsunamis that have occurred in 1608 and 1840. Regarding its geomorphology, Mt. Gamalama has very steep flanks, and landslides entering the sea could be the potential mechanism of tsunami generation which could threaten the coastal population and submarine infrastructure in the vicinity of Mt. Gamalama.

The potential volumes and types of landslides are estimated by a study of the Mt. Gamalama instabilities using the Generalized Hoek-Brown failure criterion which is applied in *Slide2D* (Rocscience), a 2D slope stability program using limit equilibrium methods. This procedure will result in a so-called *Factor of Safety* or FoS which represents a value of the Mt. Gamalama slope stability level.

The critical FoS values ranging from 1.945 to 3.361 have been obtained for four sections i.e., north, south, west and east side of the Mt. Gamalama edifice and are considered in relatively stable condition. These values hold for a static condition only under the force of gravity and in the absence of any volcanic activities. The application of seismic coefficients of 0.103 and 0.658, magma pressure of 2-17 MPa, and various angles of a dyke intrusion decreases the Mt. Gamalama stability and might cause landslides. Based on posture parameter analysis of modeled landslides, the landslide volumes could reach 10^6 - 10^9 m³. Furthermore, regarding the morphometric characteristic parameter analysis, the landslide mobility could enter the Molucca sea and generate tsunamis.

Keywords: Gamalama, volcanic instability, volcanic landslides, volcanic tsunamis