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Relation of volcanic activity of Talang volcano with tectonic earthquakes

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Talang volcano is located in Solok district, West Sumatera, Indonesia. It consists of North and South craters and rises to 2597 m above sea level. Eruptions in 19th century were characterized by magmatic eruptions after the first historic record in 1833 with black ash plume and glowing lava emerging near Jantan peak. Magmatic eruptions repeated in 1843, 1845, and 1883. After dormant period in 20th century, eruption style of the volcano has changed to phreatic eruption in 21th century. The eruption occurred at Gabuo atas crater and formed hot spring pond. Phreatic eruption then repeated in 2003, 2005, and 2007. Relation of eruption of the volcano with large tectonic earthquakes was firstly recognized by a phreatic eruption on April 12, 2005 at the volcano. The eruption occurred 2 days after Mentawai earthquake (Mw 6.7) with epicenter distance about 147 km from the volcano. Increase in volcanic activity repeated after occurrence of large tectonic earthquakes in surrounding area of Talang Volcano, such as Padang earthquake (Mw 7.6) on September 30, 2009. Deep volcanic earthquake increased up to 79 events and shallow one increased up to 40 events. Interaction of large tectonic earthquake with volcanic activity at Talang volcano was shown by increasing seismicity or eruption. The hypocenters of the tectonic earthquakes were located near West Sumatera subduction zone or Great Sumatera fault. The increase in volcanic activity was triggered by tectonic earthquake with intensity more than III on MMI scale at the Talang volcano. Intensity of Talan's ground motion by Mentawai earthquake (Mw 6.7) 2 days prior to phreatic eruption on April 12, 2005 was V on MMI scale. Intensity of ground motion of Padang earthquake (Mw 7.6) on September 30, 2009 was VI on MMI scale at the volcano. In contrast, Talang volcano showed no increases in seismicity and eruptivity after the Mentawai Earthquake (Mw7.7) on October 25, 2010. The MMI scale at the volcano was only III. It was suggested that volcanic activity of Talang volcano was affected by large tectonic earthquake with intensity more than III on MMI scale.

Similarly to Talang volcano, Guntur volcano is located near active faults (Cimandiri, Lembang, and Baribis faults) and subduction zone. Subduction zone at southern part of Guntur volcano was a source of destructive earthquakes. On July 17 2006, Pangandaran earthquake (Mw 7.7) occurred and was felt at Guntur volcano with intensity III on MMI scale, however it was followed by increase in neither seismicity nor eruptivity. Similarly there was no change of seismicity when Tasikmalaya earthquake (Mw 7.0) struck south region of West Java with MMI III on September 2, 2009.

Talang volcano is more susceptible triggered by tectonic earthquakes than Guntur volcano. Active geothermal systems beneath the volcanoes become important factor for triggering phreatic eruption. However, magmatic systems of the volcanoes may still in normal stage. Intensity of the ground motion caused by the large tectonic earthquakes and previous condition of the volcanoes take important role in triggering increase in seismicity or eruption of volcano.

Keywords: Talang volcano, volcanic activity, tectonic earthquake, MMI