

Volcanic sulfur dioxide index and volcanic explosivity index inferred from eruptive volume of volcanoes in Jeju Island, Korea: application to volcanic hazard mitigation

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Jeju Island located in the southwestern part of Korea Peninsula is a volcanic island composed of lavaflows, pyroclasts, and around 450 monogenetic volcanoes. The volcanic activity of the island commenced with phreatomagmatic eruptions under subaqueous condition ca. 1.8–2.0 Ma and lasted until ca. 1,000 year BP. For evaluating volcanic activity of the most recently erupted volcanoes with reported age, volcanic explosivity index (VEI) and volcanic sulfur dioxide index (VSI) of three volcanoes (Ilchulbong tuff cone, Songaksan tuff ring, and Biyangdo scoria cone) are inferred from their eruptive volumes. The quantity of eruptive materials such as tuff, lavaflow, scoria, and so on, is calculated using a model developed in Auckland Volcanic Field which has similar volcanic setting to the island. The eruptive volumes of them are 11,911,534 m³, 24,987,557 m³, and 9,652,025 m³, which correspond to VEI of 3, 3, and 2, respectively. According to the correlation between VEI and VSI, the average quantity of SO₂ emission during an eruption with VEI of 3 is $2\text{--}8 \times 10^3$ kiloton considering that the island was formed under intraplate tectonic setting. Jeju Island was regarded as an extinct volcano, however, several studies have recently reported some volcanic eruption ages within 10,000 year BP owing to the development in age dating technique. Thus, the island is a dormant volcano potentially implying high probability to erupt again in the future. The volcanoes might have explosive eruptions (vulcanian to plinian) with the possibility that SO₂ emitted by the eruption reaches stratosphere causing climate change due to backscattering incoming solar radiation, increase in cloud reflectivity, etc. Consequently, recommencement of volcanic eruption in the island is able to result in serious volcanic hazard and this study provides fundamental and important data for volcanic hazard mitigation of East Asia as well as the island.

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