

INTISARI

Busur vulkanik Pulau Sumatra terbentuk akibat subduksi *oblique* antara Lempeng Indo-Australia dan Lempeng Eurasia ditandai dengan jajaran gunung api di sepanjang Bukit Barisan. Aktivitas magmatik yang terjadi membentuk gunung api di sepanjang Pulau Sumatra termasuk di Provinsi Aceh. Proses subduksi ini dicirikan oleh keberadaan Sesar Sumatra sebagai struktur utama. Penelitian ini bertujuan untuk mengidentifikasi karakteristik morfologi gunung api dan tektonik serta menganalisis pengaruh kontrol tektonik terhadap perkembangan morfologi gunung api di daerah penelitian. Analisis morfologi gunung api menggunakan parameter morfometri seperti tinggi gunung api dan kawah, luas basal dan kawah, indeks eliptisitas basal dan kawah, *cone elongation*, *crater elongation*, dan orientasi bukaan kawah. Data morfometri kemudian dikorelasikan dengan parameter tektonik tidak langsung seperti geometri lempeng subduksi/*slab* yaitu *slab depth*, *slab dip*, serta faktor tektonik langsung seperti sesar regional maupun lokal. Metode yang dilakukan berbasis data DEM menunjukkan delineasi pusat erupsi dan data morfometri gunung api serta sesar pada daerah penelitian. Hasil penelitian diperoleh 54 pusat erupsi gunung api diantaranya terdapat 36 pusat erupsi bertipe monogenetik, 16 pusat erupsi bertipe *stratovolcano*, dan 2 pusat erupsi bertipe kaldera. Tipe morfologi gunung api di daerah penelitian menunjukkan adanya variasi nilai morfometri yang dipengaruhi oleh kombinasi faktor geometri *slab* serta struktur regional maupun lokal. Variasi *slab depth* dan *slab dip* memengaruhi posisi gunung api dan kerapatannya. Sementara itu, orientasi bukaan kawah, *cone elongation*, *crater elongation*, indeks eliptisitas basal, dan bentuk area basal banyak dipengaruhi Sesar Sumatra maupun sesar lokal yang ditunjukkan oleh keselarasan orientasi NW–SE. Secara keseluruhan, integrasi antara kontrol tektonik tidak langsung seperti geometri *slab* serta kontrol tektonik langsung seperti Sesar Sumatra dan sesar lokal membentuk morfologi gunung api yang bervariasi, sehingga interaksi tektonik berperan penting dalam mengontrol morfologi gunung api di daerah penelitian.

Kata kunci: morfometri gunung api, sesar regional dan sesar lokal, *slab depth*, *slab dip*, Provinsi Aceh

ABSTRACT

The volcanic arc of Sumatra Island was formed as a result of oblique subduction between the Indo-Australian Plate and the Eurasian Plate, marked by a chain of volcanoes along the Bukit Barisan range. Magmatic activity associated with this subduction process has generated volcanoes distributed along Sumatra Island, including those in Aceh Province. This subduction system is characterized by the presence of the Sumatra Fault System as the major tectonic structure. This study aims to identify the morphological and tectonic characteristics of volcanoes and to analyze the influence of tectonic controls on the development of volcanic morphology in the study area. Volcanic morphology was analyzed using morphometric parameters, including volcanic and crater height, basal and crater area, basal and crater ellipticity indices, cone elongation, crater elongation, and crater opening orientation. The morphometric data were subsequently correlated with indirect tectonic parameters, represented by subduction slab geometry (slab depth and slab dip), as well as direct tectonic factors such as regional and local faults. The methodology is based on DEM-derived data, enabling the delineation of eruption centers, volcanic morphometric parameters, and fault structures within the study area. The results identify 54 volcanic eruption centers, consisting of 36 monogenetic centers, 16 stratovolcano centers, and 2 caldera centers. The volcanic morphologies in the study area exhibit a wide range of morphometric values influenced by the combined effects of slab geometry and regional to local tectonic structures. Variations in slab depth and slab dip influence the spatial distribution and density of volcanoes. Meanwhile, crater opening orientation, cone elongation, crater elongation, basal ellipticity index, and basal area geometry are strongly controlled by the Sumatra Fault System and local faults, as indicated by a dominant NW–SE structural alignment. Overall, the integration of indirect tectonic controls, such as subduction slab geometry, and direct tectonic controls, including the Sumatra Fault System and local faults, produces diverse volcanic morphologies. This indicates that tectonic interactions play a significant role in controlling volcanic morphology in the study area.

Keywords: *volcanic morphometry, regional and local fault, slab depth, slab dip, Aceh Province*