

INTISARI

Gunung Merapi terletak di perbatasan Jawa Tengah dan Daerah Istimewa Yogyakarta. Gunung Merapi merupakan salah satu gunung berapi paling aktif di Indonesia yang ditandai dengan pertumbuhan dan pengurangan kubah lava secara berulang. Perubahan morfologi pada kubah lava, terutama kubah tengah dan kubah barat daya, memiliki peran penting terhadap munculnya awan panas guguran yang dapat mengancam permukiman di sekitarnya. Oleh karena itu, diperlukan pemantauan pada kubah lava untuk mengetahui perubahan bentuk, volume, dan laju ekstrusi kubah lava. Proyek akhir ini bertujuan untuk memetakan perubahan morfologi kubah lava Gunung Merapi dalam bentuk 2D dan 3D, menghitung perubahan volume, serta menganalisis laju ekstrusi pada periode Maret 2024 hingga April 2025.

Metode yang digunakan adalah pengolahan data foto udara hasil akuisisi UAV oleh Balai Penyelidikan dan Pengembangan Teknologi Kebencanaan Geologi. Foto udara diolah menggunakan perangkat lunak *Agisoft Metashape* untuk menghasilkan ortofoto, DEM, dan *tiled model*. Hitung ketelitian geometri dilakukan untuk mengetahui ketelitian horizontal dan vertikal peta berdasarkan Peraturan Kepala Badan Informasi Geospasial Nomor 18 Tahun 2021. Perubahan volume dihitung dengan metode *cut and fill*, sedangkan nilai laju ekstrusi diperoleh dari selisih volume antara periode waktu. Hasil pengolahan *tiled model* selanjutnya divisualisasikan dalam bentuk peta 3D berbasis *web scene* menggunakan *ArcGIS Online* sehingga dapat diakses secara *online*.

Hasil proyek akhir menunjukkan kubah tengah mengalami perubahan yang tidak stabil, dengan pengurangan sekitar 62.027 m³ pada 30 Maret 2024 – 11 Juli 2024, pengurangan besar sekitar 83.235 m³ pada 11 Juli 2024 – 23 Juli 2024, dan kembali bertumbuh sekitar 80.426 m³ pada 23 Juli 2024 – 26 April 2025. Sementara itu, kubah barat daya mengalami dinamika yang lebih signifikan, dengan pengurangan sekitar 86.853 m³ pada 30 Maret 2024 – 11 Juli 2024 dan 58.364,09 m³ pada 11 Juli 2024 – 23 Juli 2024, serta bertambah secara pesat 558.163,23 m³ pada 23 Juli 2024 – 26 April 2025. Laju ekstrusi kubah tengah 290 m³/hari, sedangkan kubah barat daya mencapai lebih dari 2.015 m³/hari pada periode pertumbuhan kubah lava. Visualisasi peta 3D membantu memperlihatkan perubahan morfologi secara lebih jelas, serta hasil menunjukkan bahwa kubah barat daya lebih aktif dalam dinamika morfologi Gunung Merapi.

Kata Kunci: Gunung Merapi, Kubah Lava, Morfologi, Perubahan Volume, Laju Ekstrusi

ABSTRACT

Mount Merapi is located on the border between Central Java and the Special Region of Yogyakarta. Mount Merapi is one of the most active volcanoes in Indonesia, characterized by repeated growth and reduction of lava domes. Changes in the morphology of lava domes, especially the central and southwest domes, play an important role in the emergence of hot clouds that can threaten surrounding settlements. Therefore, monitoring of the lava dome is necessary to determine changes in its shape, volume, and extrusion rate. This final project aims to map the morphological changes of Mount Merapi's lava dome in 2D and 3D, calculate volume changes, and analyze the extrusion rate during the period from March 2024 to April 2025.

The method used was the processing of aerial photo data acquired by UAV conducted by the Center for Geological Disaster Technology Research and Development. Aerial photos were processed using Agisoft Metashape software to produce orthophotos, DEM, and tiled models. Geometric accuracy calculations were performed to determine the horizontal and vertical accuracy of the map based on Regulation of the Head of the Geospatial Information Agency Number 18 of 2021. Volume changes were calculated using the cut and fill method, while the extrusion rate was obtained from the difference in volume between time periods. The results of the tiled model processing were then visualized in the form of a web scene-based 3D map using ArcGIS Online so that it could be accessed online.

The results of the final project showed that the central dome experienced unstable changes, with a reduction of approximately 62,027 m³ from March 30, 2024, to July 11, 2024, a large reduction of approximately 83,235 m³ from July 11, 2024, to July 23, 2024, and a subsequent growth of approximately 80,426 m³ between July 23, 2024, and April 26, 2025. Meanwhile, the southwest dome experienced more significant dynamics, with a reduction of approximately 86,853 m³ from March 30, 2024 to July 11, 2024 and 58,364.09 m³ from July 11, 2024 to July 23, 2024, rapidly increasing by 558,163.23 m³ from July 23, 2024, to April 26, 2025. The extrusion rate of the central dome was 290 m³/day, while the southwest dome reached more than 2,015 m³/day during the lava dome growth period. The 3D map visualization helped to present the morphological changes more clearly, and the results indicated that the southwest dome was more active in the morphological dynamics of Mount Merapi.

Keywords: *Mount Merapi, Lava Dome, Morphology, Volume Change, Extrusion Rate*