



Construction of an Eruption Record for the Elysium Volcanic Centre, Mars: Preliminary Results

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In our ongoing study to quantify volatile escape during volcanic eruptions on Mars we first focussed on the Elysium Volcanic Region. The total minimum volume of erupted material at the Elysium Volcanic Region has already been estimated [1], however, to evaluate the volatile release in time, we also need to identify the main periods of volcanic activity and associated volumes of erupted material.

The Elysium Volcanic Centre consists of three edifices: Elysium Mons, Hecates Tholus, and Albor Tholus. Elysium Mons is the largest volcano and is located on a c.1000 km × 1500 km rise. The summit of Elysium Mons rises c.17,700 m above the surrounding plain to the west. Hecates Tholus and Albor Tholus are located to the NNE and SSE, respectively, of Elysium Mons at the periphery of the Elysium rise. Volcanic material erupted from Late Hesperian to Early Amazonian from the Elysium Volcanic Centre was mapped as unit AHEe [2,3]. It spreads over 110° E-W (>3600 km) and 35° N-S (>1600 km) and covers an area of approx. 3.37×10^6 km². We estimated the total volume of volcanic material produced by the Elysium Volcanic Centre at c. 3.5×10^6 km³ [1]. The young lava plains of Elysium Planitia are not considered in this study.

Although attempts were made to estimate the age of Elysium Mons and some individual lava flows at its flanks, few efforts were made to determine the eruption record of a suite of lava flows. Here, we present first results of crater modelling ages of the first 102 mapped lava flows located at proximal, medial, and distal reaches of the Elysium Volcanic Region. Determined lava flow ages range from 0.2 Ga to 3.8 Ga. A cumulative probability density plot of all modelled ages was prepared showing five rather prominent peaks which may correspond to five main periods of activity. The first two peaks of volcanic activity is observed at 3.8 Ga and 3.4 Ga which are followed by a broad peak centred at about 1.9 Ga. The most prominent peak occurs at 1 Ga after which the curve drastically drops. Late-stage volcanic activity appears to have occurred at around 0.25 Ga.

References: [1] Platz et al. 2010, LPS XLI. [2] Tanaka, K. L. et al. (2003) J. Geophys. Res., 108, E4, 8043. [3] Tanaka, K. L. et al. (2005) U.S. Geol. Surv. Sci. Inv., Map SIM-2888.