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40Ar/39Ar dating of the Malwa Plateau subprovince, Deccan Traps, India

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Our systematic study of the spatial-temporal evolution of magmatism in the Deccan Traps Large Igneous Province provides new data from the Malwa Plateau(MP) subprovince, which lies north of the comparatively well-studied Western Ghats. 40Ar/39Ar analysis was performed by incremental laser heating of multigrained plagioclase aliquots, in multiple (typically 4) experiments per sample. Achievable precision is strongly anticorrelated with Ca/K of the plagioclase, reaching ~0.1% (pooled plateau ages, 1 s.d. intralaboratory precision) for some samples with Ca/K< 80. Results have been obtained from samples between ~100-800 m elevation, spanning virtually the entire exposed stratigraphy of the MP. Most of the MP overlaps in age with the older Kalsubai and Lonavala subgroups (~66.3 to 66.0 Ma) of the Western Ghats(WG), but MP basalts do not align with traditional WG chemical stratigraphy suggesting multiple contemporaneous eruptive centers and magma systems. The lowest (134 masl) lava dated is 66.8 ±0.07 Ma, significantly older than anything yet dated in the WG but identical to the result of Schöbel et al. (2014) for a stratigraphically low lava elsewhere in the MP. This is consistent with the consensus that the inception of volcanism progressed generally from North to South. Collectively, our data indicate a much slower mean lava accumulation rate for the basal MP, increasing sharply from 66.4 to 66.2 Ma and slowing by the Cretaceous-Paleogene boundary (KPB). MP lava accumulation rates decrease around the time of the KPB coincident with when eruption rates are inferred to increase in the WG. At similar elevations, our results overlap with the age model presented by Eddy et al. (2020) based on U/Pb dating of zircons from presumed silicic ashes preserved in red boles between lava flows, however our data span about twice their elevation range encompassing the lower portions of the section where we obtained the oldest ages. Our results indicate that the peak lava extrusion in the MP coincided closely with the Late Maastrichtian Warming Event (Barnet et al., 2017).