Are magmatic processes at volcanoes from motionless plates analogues to those of the giant shield volcanoes on Mars?

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The near "one-plate" planet evolution of Mars has led to the edification of long-lasting giant shied volcanoes. Unlike the Earth, Mars would have been a transient convecting planet, where plate tectonic would have possibly acted only during the first hundreds of million years of its history. On Earth, where plate tectonic is active, most plates are regenerated and recycled through convection. However, the Nubian and Antarctic plates could be considered as poorly mobile surfaces of various thicknesses that are acting as conductive lids on top of Earth's deeper convective system. In these environments, volcanoes do not show any linear age progression at least for the last 30 Ma, but constitute the sites of persistent, spatially focused long-lived magmatic activity. Here, the near stationary absolute plate motion probably exerts a primary control on volcanic processes, and more specifically, on the melting ones. Depleted mantle residues left behind by the melting processes are difficultly dragged away from the melting locus. The thickening of the near-stationary depleted layer progressively forces the termination of melting to higher depths, reducing melt production rate, extraction and increasing mantle lithospheric-melt interactions. With time, it might cause long-term fluctuations of the volcanic activity, in generating long periods of quiescence. The pronounced topographic swells/bulges observed in these environments are thus probably both supported by large scale mantle upwelling and residual mantle roots. Most of these processes are likely similar to those observed on Martian giant shield volcanoes. The goal of this presentation will be to describe the essential characteristics of intra-oceanic magmatic processes on slow moving plates on Earth and to point out their similarities with those of the large shield volcanoes from the Tharsis region (Meyzen et al., 2015).

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