Interaction of the Indian craton with the Reunion plume

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One of the fundamental characteristics of cratons is the presence of thick lithosphere of more than 200 km, whereas any standard non-cratonic lithosphere thickness is about 100 km thick. The thickness of Indian craton has remained quite controversial. Under the Indian plate, most seismic studies fail to recognise a thick lithosphere; however, a few studies using other geophysical methods (e.g., magnetotellurics) argue for a thick Indian craton. In the last 30 years, more than ten research articles estimated the thickness of the Indian craton that varied from less than 100 km to 260 km. Such controversy arose primarily because of the Reunion plume and Indian craton interaction at ~65 Ma. Some studies suggested that due to the Reunion plume’s eruption underneath the Indian craton, the thick lithosphere of the Indian craton was thinned down. This thin lithosphere is attributed as one of the primary reasons for the acceleration of the Indian plate since 65 Ma. On the other hand, several studies advocated that the Reunion plume did not affect the thickness of the Indian craton. Still now, no study has actually investigated the nature of plume-craton interaction under the Indian plate and how the craton was deformed in the presence of a plume. In this study, we develop time-dependent global mantle convection models using CitcomS to understand the evolution of Indian craton for the last 100 Ma. The models are initiated at 100 Ma and are driven forward up to the present day using reconstructed plate velocities at every 1 Myr interval. Our results show that it is possible to thin down the thicker cratonic lithosphere due to the eruption of the Reunion plume. We also observe that the plume could get bifurcated due to the craton, and eruptions could occur on both the eastern and western parts of the Indian continental lithosphere.