EGU24-11883, updated on 08 Dec 2024
https://doi.org/10.5194/egusphere-egu24-11883
EGU General Assembly 2024

Change in eruption location in Kerguelen hotspot and Kinematic Reconstruction of Rajmahal Trap: Implications for Cretaceous to present day Geodynamics of Indian plate

Simran Guleriya[1], Anouk Beniest[2], and Sudheer Kumar Tiwari[1]
[1]Department of Earth Sciences, Indian Institute of Technology Roorkee, Uttarakhand 247667, India
(simranguleriya@gmail.com, simran_g@es.iitr.ac.in)
[2]Department of Earth Sciences, Vrije Universiteit Amsterdam, De Boelelaan 1085, 1081 HV, Amsterdam, the Netherlands

The Rajmahal Traps is one of the two major Large Igneous Provinces (LIPs) that erupted in the Indian subcontinent in the Mesozoic. The trap was the product of activity at the Kerguelen hotspot, located in the Indian Ocean, that initiated around 117 Ma. Earlier studies on the eruption location of the Rajmahal trap show that its location does not coincide with the present-day location of the Kerguelen Hotspot. This difference in the paleo-locations could be the result of mantle dynamics beneath the Indian Ocean during the Cretaceous and has been explained with concepts such as the multiple diapir-single plume model, the migration pathway of the hotspot beneath the mantle, and the complex plume-ridge interaction.

In this study, we use paleogeographic reconstruction software GPlates to reconstruct the paleogeography of the Rajmahal Traps on the Indian subcontinent plate in an Antarctica fixed reference frame since 117 Ma to pin-point the paleo-location of the Kerguelen hotspot and eruption location of the Rajmahal trap along with the tectonic changes that the Indian Ocean was encountering. The mantle structure below the Indian Ocean was further studied using publicly available P-wave tomography data. The paleogeographic reconstruction linked to the mantle structure hints towards the presence of a tree-like hotspot-plume structure beneath the Kerguelen hotspot where a deep-seated single plume feeds into various fissures at the surface which are active at different points in time.

Our kinematic analysis for the Indian Plate reveals significant changes in the velocity of the plate since the Cretaceous at specific points in time in response to tectonic activities initiated by the plumes present in the Indian Ocean. These activities that link to changes in the velocity include interactions with the Morondova plume (velocity increase at 90 Ma) and Reunion hotspot (velocity increase between 78 – 62 Ma), and other processes like continental collision (velocity decrease at 56 Ma and between 50-43 Ma) and slab pull (velocity increase at 56 Ma). Using this new velocity profile, we have developed a revised velocity model for the drift of the Indian subcontinent since the Cretaceous.