

Geochemical clues on the origins of Rajahmundry Trap basalts, India

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⁴⁰Ar/³⁹Ar ages for plagioclase separates from Rajahmundry Trap basalts of eastern India reveal a mean age of 64.7 Ma (Knight *et al.*, submitted), placing the eruption of the Rajahmundry Traps coincident with late stage Deccan Trap flood basalts, often associated with K-T boundary events and lying over 400 km to the west. Here, we further examine the plausibility of a petrogenetic relationship between the two provinces (e.g. Baksi *et al.*, 1994). A recent set of published papers detailing the geochemistry of the north-eastern margins of the Deccan Traps (Mahoney *et al.*, 2000; Peng *et al.*, 1998) and a preliminary study of the preserved margins of eastern Deccan Trap volcanism (Bilgrami, 1999) provide the best-to-date basis for geochemical comparison. In light of these newly available data we use trace element data on 6 samples and isotopic data on 11 samples from the Rajahmundry Traps to better constrain the nature of a possible petrogenetic connection between the Rajahmundry and Deccan Traps. Rare earth element data for all samples normalised to chondritic abundances show slight enrichment in the light rare earth elements (La/Sm ~1.4) and no notable Eu anomaly. Pb isotope data show three statistically distinct groups, with ²⁰⁶Pb/²⁰⁴Pb of 17.42 - 18.60. The Rajahmundry Traps reflect REE and isotopic ratios of north-eastern Deccan Trap flows pointing towards similar magmatic sources and placing constraints on the origins and amount of crustal contamination present in the Rajahmundry Traps. Establishing the nature of a petrogenetic relationship between these two provinces also addresses melt transport mechanisms within flood basalt provinces and the original extent of the Deccan Traps.

References

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Diversity of microorganisms mediating anaerobic oxidation of methane

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Methane is present in huge amounts in marine sediments. Little of the methane reaches the oxic water column because it is oxidized with sulfate to CO₂ by microorganisms in the anoxic sediments. Recent studies demonstrated that the anaerobic oxidation of methane (AOM) is mediated by a structured consortium of sulfate-reducing bacteria belonging to the *Desulfosarcina* group and archaea belonging to the ANME-2 group, which is phylogenetically affiliated with the order Methanosarcinales.

The microbial diversity of AOM-communities was investigated by 16S rDNA clone library analysis of samples from different methane-rich submarine environments (Hydrate Ridge, Haakon Mosby Mud Volcano, Black Sea). The bacterial diversity was always high, and comparable with that of coastal sediments. The most abundant 16S rDNA sequences were derived from δ -proteobacterial sulfate-reducing bacteria (SRB), γ -proteobacteria and members of the *Cytophaga/Flavobacterium* cluster. In sediments from HMMV, however, the abundance and diversity of SRB was very low. Here, sequences related to methylotrophic bacteria (*Methylomonas* spp., *Methylophaga* spp.) dominated. The archaeal diversity was low in all habitats. Most sequences belong to recently described groups of uncultivated methanogenic archaea, ANME-1 and ANME-2.

Aggregated archaea and sulfate-reducing bacteria were present in all sediments investigated. In addition to structured consortia, consisting of an inner core of archaea partially or fully surrounded by SRB (Hydrate Ridge, Eel River Basin), we also found unstructured consortia (HMMV, Guaymas Basin, Gulf of Mexico) as well as consortia consisting of just two archaeal cells and a single SRB cell (Congo Basin). During submersible dives to methane seeps in the permanently anoxic Black Sea giant microbial structures were discovered, composed of massive microbial mats of centimeter to decimeter thickness, and producing large carbonate columns and platforms. Microbial 16S rDNA and FISH analysis of mat sections revealed that the massive mat is composed to 70% of archaea (ANME-1 cluster) which occur densely aggregated with SRB (*Desulfosarcina* group).

This presentation will give an overview on the different types of AOM consortia in methane seep environments