

Clumped isotope thermometry in Belemnite shells from the Early Cretaceous Karai Shale Formation, Trichinopoly, India

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Well-preserved Belemnites fossils are hosted in the upper Albian Karai Shale Formation, India, which represents an offshore high stand depositional environment (1,2). It has been argued that $\delta^{18}\text{O}$ variability in these Belemnites – growth bands reflect seasonal –paleo-temperature changes in the sea water (2). We investigate paleo-seawater temperatures by analyzing clumped isotopes (Δ_{47}) in 15 petrographically and chemically well-characterized unaltered samples of Belemnite guard shells. Sample powders were drilled from the exterior growth bands, avoiding the outermost portion. $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ were also determined. Our Δ_{47} measurements yield a temperature range of 20°C ($\Delta_{47} = 0.667 \pm 0.005$) to 42°C ($\Delta_{47} = 0.624 \pm 0.005$) using the Ghosh *et al.*, (2006) thermometry equation. The spread in Δ_{47} values together with $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ and inferred salinity values allowed characterization of the 15 samples into three suites with distinct temperature and salinity ranges. Considering the nektonic behaviour of Belemnites (3), we propose an alternative mechanism to explain the spread in our paleo-temperature data by invoking the role of thermohaline circulation during Early Cretaceous, similar to modern mid-latitude modern oceanic conditions.

[1] Sundaram *et al.* (2001) *Cret.Res* **22**, 743-762. [2] Zakharov *et al.* (2011) *Cret.Res* **32**, 623-645. [3] Mutterlose *et al.* (2010) *EPSL* **298**, 286-298.

Major and trace element geochemistry in groundwater of Patancheru Industrial Area, Andhra Pradesh, India

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Patancheru Industrial Development Area is located about 40 km from Hyderabad City, A.P. This is one of the contaminated areas identified by the Central Pollution Control Board (CPCB) New Delhi. More than 200 small and large-scale industries manufacture pharmaceuticals, paints, pesticides and chemicals and metallic products in this region. All effluents drain through the area to join the main Nakkavagu stream, which merges into Manjira River, and is one of the major drinking water sources to some parts of Hyderabad and adjoining areas.

During pre- and post-monsoon seasons the ground water samples were collected from open and bore wells. The samples were analysed for major, minor and trace constituents. Several heavy and toxic trace elements were estimated by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). The geochemical data obtained was utilized to assess the extent of pollution and its impact on human health. Some of the toxic and trace elements (As, Se, Pb, Cr, Cu and Mn) were found to be more than the desirable levels in drinking water (WHO guidelines). The Contour maps for these trace elements were prepared to know their spatial and temporal distribution and to identify the point source and transport of the contaminant. These studies would emphasize the need to adopt some remedial measures and combat pollution.