

EGU21-6414

<https://doi.org/10.5194/egusphere-egu21-6414>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



## Effect of early Oligocene cooling on the deep-sea benthic foraminifera at IODP hole 1138A, Kerguelen Plateau (Southern Ocean)

**Rakesh Kumar**, Abhayanand Singh Maurya, and Dharmendra Pratap Singh

Indian Institute of Technology Roorkee, Earth Sciences, Roorkee, India (rakeshgeobhu@gmail.com)

Benthic foraminifera are typical unicellular marine fauna forming calcareous tests that are commonly used as a proxy to infer the past climatic variabilities. To study the benthic foraminiferal response, we collected 146 samples from IODP hole 1138A, the Southern Ocean (Indian Sector, water depth of 1140 m). We computed various diversity parameters of benthic foraminifera, i.e., Shannon-weaver index ( $H(S)$ ), Equitability ( $E'$ ), Hurlbert's diversity index ( $S_m$ ), Fisher's alpha index ( $\alpha$ ), and Species richness ( $S$ ). The calculated diversity indices with the abundance of dominant early Oligocene (33.5 to 31.2 million years ago) benthic foraminifera taxa reveal significant palaeoceanographic changes viz. cooling and warming events in the Southern Ocean. The early Oligocene interval exhibits an unusual condition at hole 1138A dominated by high oxygen species, intermediate food supply, well-ventilated, cold, and corrosive bottom water condition. The calculated values of all diversity parameters increase from 33.7 Ma to 32.8 Ma while attaining the maximum from 32.8 Ma to 32.2 Ma, followed by a decreasing trend. The highest value of diversity parameters coincides with the Oi-1 events. The relative increase in the species diversity between Oi-1 (33.5 Ma) and Oi-1b (31.7 Ma) events correspond to the brief interruption of Warm Saline Deep Water (WSDW). The enhanced values of low species diversity by high seasonality and relatively cold, strong bottom-water currents after Eocene-Oligocene Transition (EOT; 33.9 Ma) and after Oi-1b (31.7 Ma) event relates to the intensification of Antarctic Circumpolar Current (ACC) and Antarctic Bottom Water (AABW) along with the substantial buildup of the southern hemisphere glaciation. The abrupt decrease of abundance of species such as *Nuttallides umbonifera*, *Astrononion echolsi*, and *Uvigerina peregerina* at the end of the studied interval (31.3 Ma) further corroborates the major southern hemisphere glaciation. The present study of the benthic foraminiferal abundance and diversity indices therefore reveals the cooling of the Southern Ocean at early and late stages of the studied interval interrupted by a short-lived warming event. The study further enhances the understanding of paleo-marine ecology by evaluating the response of deep-sea benthic foraminifera to global climate change.

**Keywords:** Kerguelen Plateau, Benthic Foraminifera, Southern Ocean, early Oligocene