Abstract

Intergovernmental Panel on Climate Change report indicates substantial increase in the global atmospheric temperature during the last few decades due to fossil-fuel burning affecting the global climate. The Early Cenozoic greenhouse warming events, considered as past analogue for future greenhouse globe, are excellent cases to test the causes and consequences of global warming and were studied extensively during the last two decades. These studies, however, were mostly concentrated on high/mid-latitude regions. Studies from the equatorial region, especially from terrestrial domains are indeed rare hindering a comprehensive understanding of the climate response on a global scale during this time. Such Early Paleogene rocks, deposited in a shallow coastal lagoon (paleolatitude ~ 5 °S), exist in the Cambay Basin, western India and have been investigated in the present study. Calcareous nannofossils, palynology, carbonate $^{87}Sr/^{86}Sr$ ratio, and ^{40}Ar-^{39}Ar dating of glauconite suggest that the sequence developed between ~56 and 52 Ma. $\delta^{13}C$ stratigraphy shows complete preservation of all the Early Eocene Carbon Isotopic excursions (CIE) and hyperthermal events (PETM, H1/ETM2/ELMO, H2, I1, and I2), hitherto unknown from tropical near-terrestrial records. Estimated surface temperature from $\delta^{18}O$ and δD compositions of authigenic kaolinite clays suggests that in tropics the peak warming preceded the CIE of the PETM (~43 ºC) and ETM2 (38 ºC). Temperatures during all the hyperthermal events (~20-34 ºC) were, however, similar to the present day. Calculated $\delta^{18}O$ values of meteoric water during the PETM and other hyperthermals (excepting the ETM2) show depletion by ~0.5-1 ‰ and is explained by higher precipitations. Precipitation at the ETM2 was relatively lower. The findings suggest temporally non-uniform response of the hydrological cycle during these warming events. Plant diversity pattern (family) deduced from pollen assemblage also show proliferation of tropical rain forest elements during all the hyperthermals, except the ETM2 when dry loving taxa flourished. Sequence stratigraphic analysis reveals preservation of only one highstand (maximum flooding surface) coinciding with the thickest coal seam at the ETM2 against three globally recognized high sea stands during this interval. It suggests that climate, rather than tectonics, probably acted as a main driver of sequence development in this Paleogene rift basin.