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Can tropical shallow marine carbonate record the true carbon isotope excursion associated with the Late Paleocene-Early Eocene warming event?

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The Paleocene-Eocene Thermal Maximum (PETM) is an abrupt and transient global warming event across the Paleocene-Eocene boundary ($\sim$ 55.9 Ma). Massive addition of ^{13}C depleted CO_2 to the exogenic carbon reservoir, recorded as negative carbon isotope excursion (CIE) in various proxies, caused this global warming event. The magnitude of the CIE, i.e., the difference between the pre PETM and peak PETM $\delta^{13}C$ values, is pivotal to estimate the mass and source of the added carbon. However, different proxy records report different magnitudes of the CIE. While massive dissolution of the deep sea carbonates underestimates the actual magnitude of the CIE in the marine records, the enhanced hydrological cycle along with plant community change overestimate the actual magnitude of the CIE in the continental records. Since shelf sediments lie well above the carbonate compensation depth (CCD) and is least affected by the carbonate dissolution at the onset of the PETM, special attention is given to the shallow marine carbonate records to estimate the actual magnitude of the PETM CIE. However, most of the studies on the PETM shallow marine sections have been conducted in the tropical western Tethyan shelves. Only limited studies are reported from the tropical eastern Tethyan shelves. The present study attempts to do a high resolution carbon isotope analysis of the Early Paleogene shallow marine carbonate sequence of the Sylhet Limestone Group located in Jaintia Hills, NE India. The $\delta^{13}C$ profile exhibits a PETM CIE magnitude of $\sim$ 3.6 ‰ which probably underestimates the actual magnitude of the PETM CIE ($>$ 4 ‰). Here, it suggests that tropical PETM carbonate records may potentially underestimate the actual CIE magnitude because of the (1) productivity change and (2) latitudinal position related temperature-dependent carbon isotope fractionation (-0.1 ‰°C) during the air-sea CO_2 exchange. If true, then the long standing discrepancy between the deep and shallow marine CIE magnitude records could be solved by implementing a productivity proxy and a simple temperature correction.