

EGU2020-399

<https://doi.org/10.5194/egusphere-egu2020-399>

EGU General Assembly 2020

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Reconstructing Past Indian Summer Monsoon Productivity and Stratification During the Late Pliocene and Early Pleistocene

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The South Asian or Indian Summer Monsoon (ISM) brings seasonal winds and rains to the Indian subcontinent and affects billions of people. It is likely that the global monsoon will strengthen in a 1.5 °C warming scenario (IPCC special report (2018)), however our ability to predict ISM behaviour in the future is restricted due to lack of understanding of its behaviour under varying climatic conditions before instrumental records began. Thus, reconstructing the palaeo-monsoon using proxies gives insight into past and potentially future controls on the ISM. We present new data covering the interval ~5 to ~2 million years ago (Ma), during the Pliocene and early Pleistocene when the long-term Cenozoic cooling trend culminated in intense northern hemisphere glaciations from 2.7 Ma. At this time, global temperatures are suggested to have been 2-3 °C warmer than today and atmospheric CO₂ was over 400 ppm (similar to today).

This study focuses on sediments from Site U1443 (5°N, 90°E), drilled during International Ocean Discovery Program (IODP) Expedition 353 in the Bay of Bengal (BoB) for the Pliocene – early Pleistocene. We present X-ray fluorescence (XRF)-derived bulk sediment geochemical data and suggest that erosional flux (terrigenous elements/total counts) as well as productivity (Br/Cl) varied in response to runoff strength, precipitation, and wind stress at the study site to reconstruct ISM variability. Additionally, new nannofossil assemblage and morphometric data, collected using the automated system SYRACO, are used to reconstruct BoB stratification and productivity and thereby assess ISM dynamics. A new benthic oxygen isotope-based age model will allow us to place the Site U1443 records into the context of existing climate and monsoon records and evaluate ISM response due to external and internal climate forcing factors.