LARGE-SCALE HOLOCENE TRANSLOCATION OF TERRESTRIAL ORGANIC CARBON FROM THE GODAVARI RIVER

M.O. Usman[1], C. Ponton[2], F. Kirkels[3], H. Zwart[3], S. Basu[4], F. Peterse[3], M. Lupker[1], L Giosan[2], T. Eglinton[1, 2]

[1] *ETH Zurich, Zurich, Switzerland*
[2] *Woods Hole Oceanographic Institution, Woods Hole, USA*
[3] *Utrecht University, Utrecht, The Netherlands*
[4] *Indian Institute of Science Education and Research Kolkata, Kolkata, India*

The Godavari River - the largest non-Himalayan river in India - traverses various geological formations, climate gradients and vegetation types. It is characterized by strong seasonal variability, with high precipitation and sediment discharge during the monsoon while low sediment transport typifies the dry season. In this study, we examine the interplay between the Indian monsoon, human activities and terrestrial carbon cycling both within the modern river basin and over the Holocene. Geochemical and sedimentological measurements on river basin samples are combined with those on a sediment core collected adjacent to the Godavari river mouth in the Bay of Bengal. Gradients in bulk and molecular-level (plant wax) stable carbon isotopic composition reflect the modern-day distribution of C_4 and C_3 vegetation within the river basin, while hydrogen isotopes and radiocarbon compositions yield insights into the hydrological conditions and dynamics of carbon turnover and mobilization within the basin. The results show strong spatial variability in terrestrial OM composition, sources, and storage/transport time in response to climatic gradients and/or anthropogenic activity.

Corresponding measurements on the Bay of Bengal core reveal a marked transition during the Holocene in which organic matter signatures indicate a shift towards greater C_4 plant contributions. This transition is accompanied by increased sediment and organic carbon fluxes, as well as an increase in the age of exported OM. Taken together, these observations suggest that the river basin was subject to increasing aridification in the late Holocene, with increased fluxes of aged organic carbon consistent with destabilization and translocation of soil organic matter from the drainage basin to the adjacent margin. We attribute these large-scale changes within the basin to a combination of climate and anthropogenic influences on carbon cycle processes.