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# Reconstructing Holocene hematite and goethite variations in the Indus Canyon to trace changes in the Asian monsoon system

Cornelia Koehler (1), Peter Clift (1), Nicola Pressling (2), David Limmer (1), Liviu Giosan (3), and Ali Tabrez (4)

(1) School of Geosciences, University of Aberdeen, King's College, Meston Walk, Aberdeen, AB3 24UE, UK, (ckoehler@abdn.ac.uk), (2) School of Ocean and Earth Science, National Oceanography Centre, University of Southampton, Waterfront Campus, European Way, Southampton SO14 3ZH, UK, (3) Woods Hole Oceanographic Institution, Clark 257, MS#22, Woods Hole, Ma. 02543, USA, (4) National Institute for Oceanography, ST-47-Block 1, Clifton, Karachi 75600, Pakistan

In order to study Holocene Asian monsoon variations, we reconstructed changes in chemical weathering by examining sediments from the Indus Canyon. During the late Holocene, the Asian monsoon system had periods of high and low intensities that influenced the civilisations living in its realm. For example, the demise of the Harappan civilisation has been linked to a weakened monsoon system around 4 ka. The sediments in the Indus Canyon, which originate from the River Indus and its Himalayan tributaries, provide an ideal, natural environmental archive of the South Asian monsoon system. In order to investigate the alternation between arid and humid monsoonal climatic conditions, variations are traced using the magnetic minerals hematite and goethite, which form under distinct environmental conditions: goethite is stable under humid conditions, whereas hematite forms from the dehydration of goethite under arid conditions. The two minerals are characterised and quantified using environmental magnetic measurements, as well as diffuse reflectance spectrometry. Combining both approaches will enable us to reconstruct variations in chemical weathering over time. Furthermore, because this is governed by temperature and the availability of moisture, our weathering record will allow us to understand monsoon variability during the Holocene and test whether summer rain intensity has been decreasing in SW Asia since 8 ka. In addition, the multi-component analysis of colour reflectance spectra identifies different mineral components including hematite/goethite, clay mineral mixtures, calcite and organics. We will present our results from the multi-sensor core logger equipped with a Minolta spectrometer, measuring both magnetic susceptibility and the optical properties of the split sediment cores. Initial results indicate the presence of hematite and goethite in the sediment. There is an increasing hematite content up the cores, indicating an aridification trend during the Holocene. The sediments are further analysed using the environmental magnetic proxies NRM, ARM and IRM to fully understand the mineral magnetic variations and to quantify hematite and goethite contributions. This work plays an integral part of a larger scale palaeoenvironmental project on Indus Canyon sediments.