

Source, transport and fluxes of particulate organic carbon in the Yellow River, China

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The Yellow River, one of the largest river system in China, has long been recognized as the main contributor of suspended particulate matter (SPM) to the Ocean with a total SPM export flux of about 1,100 Mt/yr [1]. As a consequence, the Yellow River carries a significant amount of terrestrial particulate organic carbon (POC) that can be eventually buried in ocean sediments, sequestering atmospheric CO₂. However, the Yellow River has become a highly managed river system over the last few decades, impacting SPM and carbon exports. To determine the source and the transport mode of POC in this river, SPM was collected along water depth profiles and also on a monthly basis over one year at 300 km upstream of the river mouth. Riverine SPM samples were analyzed for grain size and major/trace element contents as well as for POC concentration and isotopic composition (¹³C and ¹⁴C). A general pattern shows that POC content decreases with decreasing Al/Si ratio (a proxy for grain size), as the grain size becomes coarser along the depth profile. The one-year record shows that the Yellow River underwent massive sediment transfer during a 2-month period that accounted for about 77% of the annual sediment export. The SPM transported during this period was much coarser than during the rest of the year. Based on information on sediment load at several hydrological station along the main channel and our geochemical and grain size data, it can be evidenced that the erosion of resuspended bedload contributes to the SPM transfer which can be linked to hydrodynamics. Seasonal variations in POC content, source (POC_{bio} vs. POC_{petro}) and flux will be discussed in terms of transport mode and river management, highlighting the importance of flood events. This study could better constrain the mechanisms of fluvial transfer of riverine POC and its role in the global carbon cycle.

[1] Milliman and Farnsworth, (2011) River Discharge to the Coastal Ocean. Cambridge University Press, 143-144.