Two Black Carbon Pools Transported by the Yangtze and Yellow Rivers in China

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Recent studies have suggested that world's rivers play an important role in transporting black carbon (BC) from land to the ocean (Dittmar et al., 2012; Jaffé et al., 2012). It is estimated that 26.5 ±1.8 x 10^6 tons of BC is transported in dissolved phase by the rivers each year, which accounts for ~ 10% of the global flux of dissolved organic carbon (DOC) (Jaffé et al., 2013). The sources of this large amount of riverine dissolved black carbon (DBC), whether is from recent biomass burning or from ancient fossil fuel combustion, however, is not clear. Here, we present results from radiocarbon measurements of BC in both dissolved and particulate phases transported by the Yangtze and Yellow Rivers, the largest two rivers in China. Our results show that two distinct BC pools (young *vs*. old) were carried by the rivers. The ^{14}C ages of DBC (475-1,510 years BP) were much younger than the ages of the particulate BC (PBC, 2,675-12,600 years BP) in the two rivers. Isotopic mass balance calculation indicates that the DBC contained a large fraction BC derived from biomass burning while the PBC comprised mainly fossil fuel combusted BC. The great age differences of the two BC pools suggest that BC derived from biomass burning and fossil fuel combustion have different chemical structure and mobilized in different phases and time scales in the rivers.

Reference

Dittmar, T., de Rezende, C. E., Manecki, M. et al., 2012. Continuous flux of dissolved black carbon from a vanished tropical forest biome. Nature Geoscience 5, 618-622.

Jaffé, R., Ding, Y, Niggemann, J. et al., 2013. Global charcoal mobilization from soil via dissolution and riverine transport to the oceans. Science 340, 345-347.