Biomarker radiocarbon evidence of terrestrial organic carbon aging during transport within in Pearl River estuary

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Large river estuaries are highly dynamic, with sediment transport and depositional processes occurring over a broad range of spatial and temporal scales. Understanding the fate of terrestrial organic carbon (OC_{terr}) in large river estuaries is important for evaluating carbon cycle processes in these dynamic land-ocean environments. In this study, we employed compound-specific radiocarbon analysis on both suspended particulate matter (SPM) samples and surface sediments from the upper and the lower Pearl River estuary to examine the spatiotemporal variation of OC_{terr}. Our results revealed ^{14}C aging of long-chain fatty acids (LCFAs, C_{24}-C_{32}) along the 60 km dispersal pathways of fluvially derived materials. The ^{14}C ages of LCFAs for SPM samples increased by about 540-1650 yr, while the ^{14}C ages of LCFAs for surface sediments increased by about 2160-4220 yr. LCFA ages in sediments were always older than those in the corresponding SPM at the same sites. In addition, the discrepancy of LCFAs age between SPM and corresponding sediment increased along the salinity gradient. This transport-related aging of OC_{terr} in the Pearl River estuary is likely because of 1) selective degradation of more labile OC by the cyclic deposition-resuspension processes; 2) protracted lateral transport time caused by daily tidal activities.