Geophysical Research Abstracts
Vol. 19, EGU2017-8367, 2017
EGU General Assembly 2017

Aged organic carbon exported from the eastern margin of Tibetan Plateau

Jin Wang (1), Robert Hilton (1), Zhangdong Jin (2), Fei Zhang (2), Alexander Densmore (1), Darren Gröcke (3), Xiaomei Xu (4), and Xiaojuan Feng (5)

(1) Department of Geography, Durham University, Durham, United Kingdom, (2) Institute of Earth Environment, Chinese Academy of Sciences, Xi'an, China, (3) Department of Earth Sciences, Durham University, Durham, United Kingdom, (4) Department of Earth System Science, University of California, Irvine, Irvine, USA, (5) Institute of Botany, Chinese Academy of Sciences, Beijing, China

Erosion of particulate organic carbon from the terrestrial biosphere ($POC_{biosphere}$) and sedimentary rocks (POC_{petro}) plays an important role in the global carbon cycle across a range of timescales. Knowledge of the age of $POC_{biosphere}$ is of first order importance. Discharge of young $POC_{biosphere}$ (i.e. decades old) by rivers is an export of recent productivity which is not well captured in ecosystem carbon budgets. Older $POC_{biosphere}$ (centuries to millennia in age) can be eroded from deeper soils. If this aged $POC_{biosphere}$ is oxidised during river transport, it represents a source of CO_2 to the modern atmosphere. Previous work on the major Himalayan rivers has identified old $POC_{biosphere}$ sourced from high elevations in the Tibetan Plateau, yet its regional significance remains unclear. Here we attempt to quantify the source of POC and age of $POC_{biosphere}$ carried by rivers draining the eastern margin of Tibet. Using suspended sediment samples from 6 river gauging stations in the Min Jiang from 2005 to 2012, we measured the elemental composition (%OC and %N) and carbon isotopes (^{12}C, ^{13}C, ^{14}C). In contrast to many other rivers, we find that the POC_{petro} is characterized by a large range of stable carbon isotope ratios, ranging from -26.2‰ to -13.2‰This mixes with $POC_{biosphere}$ and sets the bulk isotopic and elemental geochemistry. Using the radiocarbon content and an end member mixing model, we estimate that the age of $POC_{biosphere}$ranged from modern to over 3000 ^{14}C years. Data from the high elevation tributaries of the Min Jiang support the notion that aged $POC_{biosphere}$ is supplied into rivers draining the Tibetan Plateau. The annual $POC_{biosphere}$ yields are significant (from 0.2 to 3.1 tC km^{-2} yr^{-1}) and are set by the frequency of intense runoff events. Overall, our study highlights the need to better quantify the age of $POC_{biosphere}$ in rivers and its fate in the river system.