Geophysical Research Abstracts
Vol. 13, EGU2011-5784, 2011
EGU General Assembly 2011

The origin and evolution of organic matter signatures carried by rivers to the oceans

Timothy Eglinton (1,2), Valier Galy (2), Bernhard Peucker-Ehrenbrink (2), Nicholas Drenzek (2,3), Angela Dickens (2,4), Xiaojuan Feng (1,2), Enno Schefuss (2,5), Britta Voss (2), Daniel Montlucon (1,2), Ying Wu (2,6)

(1) Geological Institute, ETH Zurich, Switzerland (timothy.eglinton@erdw.ethz.ch), (2) Marine Chemistry & Geochemistry Department, Woods Hole Oceanographic Institution, Woods Hole, USA, (3) Schlumberger-Doll Research, Cambridge, USA, (4) Mt. Holyoke College, South Hadley, USA, (5) MARUM, University of Bremen, Germany, (6) East China Normal University, Shanghai, China

Recent studies have greatly advanced our understanding of the flux and composition of particulate organic matter that is exported by different river systems to the oceans and becomes sequestered in marine sediments. However, several key aspects of the transfer of carbon from biological source to geological sink remain much more poorly constrained. Fundamental questions that remain unresolved include: (i) From where within the drainage basin does the organic matter that is ultimately discharged originate (i.e. what is its provenance)? (ii) How and where does organic matter become associated with mineral phases, and how does the "partnership" between organic matter and the mineral load evolve during transit through the drainage basin? (iii) What are the timescales involved in the transfer of carbon from the terrestrial biosphere to the marine environment (i.e. what is the "residence time" of biospheric carbon on the continents)? Answers to these questions of organic matter provenance and dynamics are crucial not only for examining the role of fluvial systems in the global carbon cycle and the sensitivity of these systems to climate and anthropogenic perturbation, but also for interpretation of sedimentary records of past terrestrial vegetation change through studies of organic signatures preserved within the marine sedimentary record.

In an effort to bridge this information gap, we are exploring the variability in the composition and radiocarbon age of terrestrial organic matter – both at the bulk and molecular level - in a wide range of river drainage basins. A primary goal of this work is to build a global perspective on the controls on terrestrial biospheric carbon residence times through radiocarbon measurements on molecular markers specific to vascular land plants isolate from sediments collected close to the terminus of the river systems that differ markedly in terms of factors such as drainage basin size, relief, latitude, and material fluxes. Preliminary observations suggest that the latitude of the drainage basin exerts a first-order control on terrestrial biospheric carbon residence times but other factors also play a role. We will discuss the potential mechanisms influencing the residence time of vascular plant-derived carbon. We will also examine the characteristics of terrestrial carbon export dynamics in the context of organic matter cycling on regional and global scales, and explore potential implications for assessment of the legacy of terrestrial productivity preserved in the marine sedimentary record.