Geophysical Research Abstracts
Vol. 12, EGU2010-8584-1, 2010
EGU General Assembly 2010

A missing link in the carbon-erosion budget: floodplain carbon dynamics.

Timothy Quine, Andrew Nicholas, and Liz Boddy
University of Exeter, School of Geography, Exeter, United Kingdom (t.a.quine@exeter.ac.uk, +44 (0)1392 263342)

The perturbation of the global carbon cycle by soil erosion and sediment deposition is propagated through processes that promote carbon sequestration and processes that promote carbon release to the atmosphere. Sequestration is associated with accelerated soil organic carbon storage in 'young' eroded soils and burial of soil organic carbon below the depths at which microbial activity is highest. Atmospheric release is promoted by soil aggregate breakdown and increased exposure of soil organic carbon to microbial respiration during and following transport. Significant progress has been made in understanding the balance of these process groups on hillslopes, however, the fate of soil associated carbon further down the sediment cascade is far less clear.

Floodplain sediments represent significant medium-term stores of clastic sediment eroded from basins and, therefore, quantifying the fate of soil organic carbon deposited on floodplains represents an important step in deriving a closed carbon budget. Several studies have demonstrated that floodplains are significant stores of carbon, however, much of this carbon has been generated elsewhere in the river basins and it is not axiomatic that stores are net sinks of atmospheric carbon. Here we explore the quantification of this element of the carbon budget, for a study site in SW England, by using fallout radionuclides, mineralisation experiments and a coupled geomorphological-biogeochemical model. Fallout radionuclides are used to reconstruct sediment and carbon deposition for a series of coring sites; predicted and measured carbon depth profiles are compared to estimate local net exchanges of carbon between floodplain and atmosphere. Laboratory mineralisation experiments are used to explore down-core variation in susceptibility of soil organic carbon to microbial consumption. Both of these groups of empirical data are used to inform a coupled carbon dynamics-floodplain evolution model. The model is used to explore potential scenarios for net carbon exchange with the atmosphere during floodplain evolution.