Geophysical Research Abstracts
Vol. 13, EGU2011-13840, 2011
EGU General Assembly 2011

A full emission balance for soil organic matter erosion

Nikolaus J. Kuhn
Evironmental Sciences, University of Basel, Basel, Switzerland, Nikolaus.Kuhn@unibas.ch

Soil erosion generates an approximate flux of C from eroding sites 0.5 Gt per year. Much of this C is assumed to be deposited in the landscape, effectively burying the organic matter from the atmosphere and taking it, at least for an unspecified time, out of the C exchange between soil and atmosphere. Such calculations raise the unfortunate notion that soil erosion generates an unintentional benefit for climate, owing to the long-term burial of soil organic carbon. But limiting the assessment of the impact of soil erosion on climate change to organic carbon burial ignores, apart from economic and social damages, the coupling between biogeochemical cycles. For example, the eroded nitrogen has to be replaced, at least in part by artificial fertilizers, to maintain soil fertility. At this point the carbon and nitrogen cycles meet, because the production of fertilizer generates greenhouse gases; the production of one ton of fertilizer in the United States generates more than 850 kg of carbon dioxide. Applying this number to the 0.5 GT C erosion estimate, the amount of nitrogen lost owing to erosion each year yields carbon dioxide emissions of 0.02–0.04 Pg per year. These emissions correspond to 15–30% of the organic carbon buried owing to soil erosion. Obviously the full complexity of biogeochemical cycling on agricultural land is not reflected by the crude calculation above. However, the example illustrates that all greenhouse gas fluxes affected by agriculture should be considered when assessing the impact of soil erosion on global biogeochemical cycles and climate.