Geophysical Research Abstracts
Vol. 16, EGU2014-280, 2014
EGU General Assembly 2014

Significance of erosion-induced carbon fluxes in the carbon balance of a Mediterranean catchment

Elisabet Nadeu (1,2), Joris de Vente (1), and Carolina Boix-Fayos (1)

(1) Soil and Water Conservation Department, CEBAS-CSIC, Murcia, Spain, (2) Earth and Life Institute - TECLIM, Université catholique de Louvain, Louvain-la-Neuve, Belgium

Large uncertainties surround our knowledge of the processes through which carbon (C) sequestration takes place in terrestrial ecosystems. Nevertheless, terrestrial ecosystems could be capturing up to one fourth of the CO_2 that is emitted annually to the atmosphere from the burning of fossil fuels and land use changes. Soils are the third largest C reservoir in the C cycle, storing around 1500 Gt of C. Over the last decades, geomorphologists and soil scientists have claimed the role of soil erosion within the C cycle and its potential contribution to the terrestrial C sink. In order to assess the impact of soil erosion on the C cycle, however, an understanding and quantification of the impact of soil erosion on soil C stocks is needed. This implies quantifying lateral and vertical C fluxes associated to detachment, transport and deposition of soil and sediment at different spatial scales. As an example, we present a C budget for a mountainous catchment in south-eastern Spain for a 28 year study period during which the catchment underwent significant land use changes and hydrological correction works (i.e. check-dam construction and reforestations). We quantified lateral C fluxes induced by soil erosion processes and closed a soil/sediment C budget by combining field measurements and numerical modeling. In addition, correlation analysis was conducted between catchment properties (topographic, land use, lithology) and measured C deposition rates to understand the controlling factors on C yield (export) and C concentration in sediments. The results showed that the highest C yields (associated to high sediment yields) were found in subcatchments dominated by soft lithologies and high drainage densities. On the other hand, C concentration in deposited sediments was higher in areas dominated by forest cover, and presented high variability in those parts of the catchment with smoother slopes. Overall, we estimated that around 4000 Mg of C were mobilized from the catchment's slopes during the study period, 80% of which remained within the catchment's boundaries (10.5% in stream beds, 42% behind check-dams and 26% on the slopes) while the rest was exported out of the catchment or was assumed to be mineralized. We did not account for C replacement at eroding sites, which could potentially balance C exports. Yet, the presented situation could significantly change in the long term. The fact that the redistributed C remains mainly stored in the depositional sites created by the network of check-dams indicates that the stability of these structures and the effectiveness of C burial at these depositional sites will be crucial for the significance and temporal evolution of the C balance at the catchment.