Geophysical Research Abstracts
Vol. 18, EGU2016-17762, 2016
EGU General Assembly 2016

Erosion factor in the Carbon Cycle; assessing POC losses at a European scale

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Soil erosion transports fine particle soil material from the hillslopes down to low-lying land areas, which leads to an established carbon loss from the topsoil layer. Sediments mobilized by erosion are often highly enriched in particulate organic carbon (POC) during the transport downslope towards the stream. Although exhaustive studies of the principals ruling carbon erosion can be found in the literature, the exact mechanism of the POC transport and fluxes is still not soundly understood. As a consequence, small or regional scale erosion models do not provide a proper spatial representation of organic carbon erosion and deposition.

Within the Marie Skłodowska-Curie ITN network and as part of a PhD research under the EU Horizon 2020 project C-CASCADES we have developed a large scale erosion model as a transport agent for POC to simulate the hillslope carbon losses and carbon loading in the river network. We are aiming to better understand the role of lateral soil and sediment movement on a continent scale level as an important component of the global carbon cycle across the Land-Ocean Aquatic Continuum (LOAC) within the Anthropocene, and a regulator of Earth's climate in respect to GHG emissions. Our study is based on the RMMF model, where sediment transport is driven by sediment mobilisation processes in relation to calculated transport capacity. The model uses validated soil class maps, as well as crop cover and slope estimates from EDIT geoplatform and HydroSHEDS & GMTED2010, respectively. The Hydrology was derived using the E-HYPE model dataset (SMHI, 2008). Spatially variable topsoil carbon content grids were used to derive the carbon yields, which will be further fine-tuned by usage of the Deltares processes library within the D-WAQ software. Here we present preliminary results of sediment and related POC budgets for the larger European river catchments.