Geophysical Research Abstracts
Vol. 21, EGU2019-18169, 2019
EGU General Assembly 2019

Water erosion modelling for mitigation planning in Denmark

Goswin Heckrath (1), Nils Onnen (1), Antoine Stevens (2), Preben Olsen (1), Johannes W.M. Pullens (1), Brian Kronvang (3), and Kristof Van Oost (2)

(1) Aarhus University, Department of Agroecology, Tjele, Denmark (goswin.heckrath@agro.au.dk), (2) Earth & Life Institute, TECLIM, UCL, Louvain-la-Neuve, Belgium, (3) Department of Bioscience, Aarhus University, Silkeborg, Denmark

Water erosion on agricultural land affects soil productivity and surface water quality. Despite being a country with relatively low relief and low rainfall erosivity, field observations and coarse-scale modelling exercises rank Denmark as vulnerable to water erosion. However, in the farming sector and among authorities perception of the problem has been low. Climate change and different societal drivers, amongst others EU legislation, now require Denmark to take action for protecting soil and water resources. This necessitates stakeholders – authorities as well as farmers – to address the extent and impact of water erosion on agricultural land on an informed basis. As erosion processes are spatially and temporarily very variable, reliable modelling tools play an increasing role in targeted and effective mitigation planning. The erstwhile demand of indiscriminate establishment of buffer zones along most water bodies had been highly controversial in Denmark. Therefore, our erosion modelling work has been coordinated with agro-environmental authorities and farmers' organizations in an attempt to increase transparency and acceptance among stakeholders.
Here we present the results of a national modelling study that estimated long-term average sediment redistribution and delivery to surface water in landscapes at fine spatial resolution and assessed the effect of buffer zone placement in Denmark. We adapted the WaTEM tool, which combines a spatially distributed sediment transport model with the Revised Universal Soil Loss Equation. All input data are available in public databases at 10-m grid resolution. We calibrated and validated the model with sediment yield data from 31 catchments and with data from a comprehensive, long-term rill erosion survey. To demonstrate mitigation planning options, we simulated multiple riparian buffer zone scenarios for assessing their effectiveness in reducing sediment input into surface waters. In Denmark, 6% of the agricultural land is estimated to have erosion rates of >2.5 t ha-1 year-1, often considered unsustainable. Sediment delivery from agricultural land to surface water is predicted at 86,000 t year-1. This confirms the need to intensify mitigation actions.