Geophysical Research Abstracts
Vol. 18, EGU2016-8338, 2016
EGU General Assembly 2016

RUSLE2015, GIS-RWEQ and CENTURY: new modelling integration for soil loss and carbon fluxes at European scale

Panos Panagos, Pasquale Borrelli, and Emanuele Lugato
European Commission, Joint Research Centre, Ispra (VA), Italy (panos.panagos@jrc.ec.europa.eu)

Land degradation through erosion has been identified as major threat to European soils and agriculture. During the last years, the Directorates General for Agriculture and for Environment (plus EUROSTAT) require formal assessments and indicators on the state of soil erosion for the European Union. Moreover, the European Soil Data Centre (ESDAC) is the main data repository for soil threats at European scale. To meet these needs we have worked with recognized research institutes and scientists to develop a series of pan-EU modelling tools that estimate soil erosion by water and wind.

Over the past three years, the European Commission Joint Research Centre has worked to develop a modified RUSLE modelling approach, named RUSLE2015 and the necessary input factors. These have all been peer reviewed and published as individual papers in different refereed journals. The published soil erodibility map for Europe has been modelled with the latest state of the art soil data (LUCAS) and a robust geo-statistical model (*Science of Total Environment*, **479–480**: 189–200). Rainfall erosivity has been modelled after an extensive data collection of high temporal resolution rainfall data and the compilation of Rainfall Erosivity Database at European Scale (REDES) (*Science of Total Environment*, **511**: 801-814). Cover-Management factor has been modelled taking into account crop composition, management practices (reduced tillage, plant residues, cover crops) and remote sensing data on vegetation density (*Land Use policy,* **48C**: 38-50). Topography has been modelled with the recently published Digital Elevation Model at 25m resolution (*Geosciences*, **5**: 117-126). Conservation and support practices have included the Good Agricultural Environmental Condition (GAEC database) and the 270,000 earth observations of LUCAS survey (En*vironmental Science & Policy* **51**: 23-34). The new assessment of soil erosion by water in Europe has been recently published (*Environmental Science & Policy*. **54**: 438-447) and subsequently the core message focusing on soil erosion in agricultural lands was published in a recent correspondence in Nature (*Nature,* **526**, 195). Additionally, the soil erosion potential for the European Union's forests was modelled using the high-resolution Global Forest Cover Loss map (2000–2012) and taking into consideration the lodging, forest cuts and forest fires (*Ecological Indicators*, **60**:1208-1220).

The first qualitative assessment of wind erosion at European scale has been done using the Index of Land Susceptibility to Wind Erosion (ILSWE) (*Sustainability, 7(7)***:** 8823-8836). The wind-erodible fraction of soil (EF) is one of the key parameters for estimating the susceptibility of soil to wind erosion (*Geoderma*, **232-234**: 471-478). ILSWE was created by combining spatiotemporal variations of the most influential wind erosion factors such as climatic erosivity, soil erodibility, vegetation cover and landscape roughness) (*Land Degradation & Development*, 10.1002/ldr.2318). The quantitative assessment of wind erosion has been concluded recently using Revised Wind Erosion Equation (GIS-RWEQ).

Modelling the lateral carbon fluxes due to soil erosion both at national scale (*Land Use Policy*, **50**: 408-421) and at European scale (*Global Change Biology*, 10.1111/gcb.13198) is an important milestone in climate change perspective. We coupled soil erosion into a biogeochemistry model, running at 1 km^2 resolution across the agricultural soils of the European Union (EU). In the future, the soil erosion (by water and wind) modelling activities will incorporate temporal variability, sediment transport and economic assessments of land degradation.