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Soil erosion modelling: from European to Global scale

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Nowadays, soil erosion is known as one of the most critical forms of soil degradation and a major threat to agricultural soil productivity and this may create societal problems in many regions of the world. More than 99% of the world\'s food supply comes ultimately from land-based production depending on soils and this should be considered carefully taking into account the population increase to 9 billion by 2050. Given the expected increase of extreme storm events and the agriculture intensification to face the population grow, soil erosion is expected to increase in the next 30 years. In the European Union, the Soil Thematic Strategy (COM(2012) 46) and the Common Agricultural Policy (CAP) promoted management practices to better manage our soils, decrease soil erosion and increase soil organic carbon in agricultural soils. At global scale the Land Degradation Neutrality, the Sustainable Development Goals (SDG 15) and the 4 per mille initiative are the main policy drivers for promoting best management practices against soil erosion and soil organic carbon accumulation.
The JRC in collaboration with University of Basel and Centre for Ecology and Hydrology (NERC) have proposed a new global soil erosion map which can be a starting point for policy support at global scale. This recently published assessment of global soil erosion (Borrelli et al., 2017) is coupled with advanced geo-statistical modelling and measured data on rainfall erosivity. A second advancement is the incorporation of land use changes, cropping management systems and spatial distribution of global croplands. The global study investigates global soil erosion dynamics by means of high-resolution spatially distributed modelling (250?×?250?m cell size). The modelled area is ca. 85% of earth surface (125 * 10^6 Km^2) covering 202 countries. The new global erosion assessment was necessary to cover a knowledge gap, as reliable global soil erosion estimates were missing and the most well know and cited ones, dated in late 1980s and early 1990s, were based on expert knowledge. Compared to those estimates, the current publication estimates a considerably lower amount of soil loss by water erosion (35.9 Pg yr^{-1}). However, there is an increasing trend of around 2.5% between 2000 and 2012 mainly due to decrease of forestlands. The highest erosion rates and the most accelerated erosion increase is noticed in Africa and South America. Moreover, the study estimates that conservation practices, if applied correctly, could save over a billion tonnes of soil per year. Conservation agriculture currently covers about 15.3% of the observed cropland globally, reducing soil erosion by an estimated 7%.
This new study addresses also interesting aspects such as the linkage between soil erosion and national wealth, land use dynamics and carbon fluxes. Finally, new modelling framework can

further be developed to include soil erosion changes into other important ecosystem processes such as carbon dynamics in Earth System Models.

References

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