Geophysical Research Abstracts
Vol. 20, EGU2018-2035, 2018
EGU General Assembly 2018

The impact of water erosion on global crop yields under different tillage scenarios

Tony Carr (1), Juraj Balkovic (2), Christian Folberth (2), and Rastislav Skalsky (2)

(1) University College London, Institute for Sustainable Resources, United Kingdom (tony.carr.16@ucl.ac.uk), (2) International Institute for Applied Systems Analysis, Ecosystem Services and Management Program, Laxenburg, Austria

Land degradation from unsustainable agricultural management is thought to have already reduced food production in many areas of the world, and crop damage from climate change is now on the horizon. Though difficult to predict, interactions between climate change and land degradation will likely intensify pressure on food security. Global crop models are used to assess future pathways for global food production under climate scenarios, but the impact of land degradation processes on crop yields have been neglected so far due to their complexity. This study will provide new insights into the impacts of climate change and land degradation on global crop cultivation under different scenarios for agricultural management. The main tool for this study is a global gridded version of the Environmental Policy Integrated Climate (EPIC) model, which is used to simulate the growth and development of major crops using soil, weather and field management data at more than 100 000 locations worldwide. The model has been coupled with outputs from climate models to simulate future yields of staple crops under three different agricultural management scenarios including no tillage, reduced tillage and conventional tillage. The simulations include processes limiting the growth and development of crops by estimating the loss of soil and its fertility due to water erosion, which is one of the most severe land degradation processes. The most appropriate equations for representing this degradation process have been analysed and simulated water erosion values were evaluated with field measurements. The simulated impact of water erosion on crop yields decreases with decreasing soil disturbance through reduced or no tillage. This study demonstrates that the proper representation of agricultural management in global crop yield projections would improve projections about the impacts of climate change and land degradation on global crop yields.