



Relevance of methodological choices for accounting of land use change carbon fluxes

Julia Pongratz (1), Eberhard Hansis (1), and Steven Davis (2)

(1) Max Planck Institute for Meteorology, Hamburg, Germany (julia.pongratz@mpimet.mpg.de), (2) Department of Earth System Science, University of California, Irvine, USA

To understand and potentially steer how humans shape land-climate interactions it is important to accurately attribute greenhouse gas fluxes from land use and land cover change (LULCC) in space and time. However, such accounting of carbon fluxes from LULCC generally requires choosing from multiple options of how to attribute the fluxes to regions and to LULCC activities. Applying a newly-developed and spatially-explicit bookkeeping model, BLUE (“bookkeeping of land use emissions”), we quantify LULCC carbon fluxes and attribute them to land-use activities and countries by a range of different accounting methods. We present results with respect to a Kyoto Protocol-like “commitment” accounting period, using land use emissions of 2008-12 as example scenario. We assess the effect of accounting methods that vary (1) the temporal evolution of carbon stocks, (2) the state of the carbon stocks at the beginning of the period, (3) the temporal attribution of carbon fluxes during the period, and (4) treatment of LULCC fluxes that occurred prior to the beginning of the period. We show that the methodological choices result in grossly different estimates of carbon fluxes for the different attribution definitions. The global net flux in the accounting period varies between 4.3 Pg(C) uptake and 15.2 Pg(C) emissions, depending on the accounting method. Regional results show different modes of variation. This finding has implications for both political and scientific considerations: Not all methodological choices are currently specified under the UNFCCC treaties on land use, land-use change and forestry. Yet, a consistent accounting scheme is crucial to assure comparability of individual LULCC activities, quantify their relevance for the global annual carbon budget, and assess the effects of LULCC policies.