Geophysical Research Abstracts
Vol. 21, EGU2019-14590, 2019
EGU General Assembly 2019

Pinning down uncertainties in global CO_2 emissions from land use change

Julia Pongratz (1,2), Ana Bastos (2), and Julia Nabel (1)

(1) Max Planck Institute for Meteorology, Land in the Earth System, Hamburg, Germany (julia.pongratz@mpimet.mpg.de),
(2) Ludwig-Maximilians-Universität, Department of Geography, Munich, Germany
(julia.pongratz@geographie.uni-muenchen.de)

Land use change and land management are considered a key driver of past and future global climate change – for contributing about a third of anthropogenic CO_2 emissions until today, and for playing a key role in achieving net negative emissions under strong mitigation scenarios. Yet estimates of CO_2 fluxes associated with land use change and land management even in recent years have an uncertainty of typically +/- 50%. This hampers trust in our understanding of the carbon cycle and of estimates of future sink potentials by land use activities. Understanding why land use change fluxes are so uncertain is therefore an imminent research gap.

Here we review the state of knowledge of differences in land use change fluxes, the relevance of land management in carbon emissions, and the terminological differences of fundamentally different approaches of quantifying these fluxes. We then use BLUE ("bookkeeping of land use emissions"), one of the two bookkeeping models providing the net land use change flux for the annual carbon budget estimates, to investigate in detail the land use dynamics and flux dynamics of time periods and regions that diverge from other estimates. This is particularly relevant as BLUE provides a link between other bookkeeping estimates and process-based land surface model intercomparisons because it shares the same land use reconstruction (the land use harmonization) with the latter. In our analysis we for example show that a substantial part of global emissions in particular in the first part of the 20th century is an overlay of temporarily high emissions from temporary land use activities in individual, often pristine, regions, which permanently degrades the land carbon stocks in the bookkeeping models.