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Committed climate change due to historical land use and management: the concept

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A significant fraction of the European land surface has changed its land use over the last 50 years. Management practices have changed in the same period in most land use systems. These changes have affected the carbon and greenhouse gas (GHG) balance of the European land surface. Land use intensity, defined here loosely as the degree to which humans interfere with the land, strongly affects GHG emissions. Land use and land management changes suggest that the variability of the carbon balance and of GHG emissions of cultivated land areas in Europe is much more driven by land use history and management than driven by climate. Importantly changes in land use and its management have implications for future GHG emissions, and therefore present a committed climate change, defined as inevitable future additional climate change induced by past human activity.
It is one of the key goals of the large-scale integrating research project "GHG-Europe - Greenhouse gas management in European land use systems" to quantify the committed climate change due to legacy effects by land use and management. The project is funded by the European Commission in the 7th framework programme (Grant agreement no.: 244122).
This poster will present the conceptual approach taken to reach this goal.
(1) First of all we need to proof that at site, or regional level the management effects are larger than climate effects on carbon balance and GHG emissions. Observations from managed sites and regions will serve as empirical basis. Attribution experiments with models based on process understanding are run on managed sites and regions will serve to demonstrate that the observed patterns of the carbon balance and GHG emissions can only be reproduced when land use and management are included as drivers.
(2) The legacy of land use changes will be quantified by combining spatially explicit time series of land use changes with response functions of carbon pools. This will allow to separate short-term and long-term effects of land-use changes, to quantify how much current changes in biomass and soil carbon are driven by past land use change and how much future changes in biomass and soil carbon have already been committed by past and present land use changes.
(3) The legacy of land management changes will be quantified by combining spatially explicit time series of land management activities with response functions and relatively simple models of carbon pools and greenhouse gases. This will allow to detect major trends and spatial patterns in carbon and GHG fluxes driven by intensification or extensification over the last decades.
The poster will concentrate on background, concept of the legacy analysis, data sources and the scientific strategy for deriving the climate change committed by past and present land use and management in Europe.