Titel ideas:

* Agricultural soil have lost 13 GtC topsoil carbon
* Historical soil organic carbon budget
* Linking agricultural management data to soil modeleling – a global approach

0. Abstract

SOC one of larges c sinks on earth (3 times larger biospehre pool). Agricultural management leads to a depletion of soil organic crabon. However this depletion of soil organic carbon (SOC) pools are so far not well represented in global assessments of historic carbon emissions. While SOC models often represent well the biochemical processes that lead to the accumulation and decay of SOC, the management decisions driving these biophysical processes are still little investigated.

Here we create a spatial explicit data set for crop residue and manure management on cropland based on global historic production (FAOSTAT) and land-use (LUH2) data and combine it with the IPCC Tier 2 approach to create a half-degree resolution soil organic carbon budget on mineral soils.

We estimate that due to arable farming soils have lost over (?) GtOC of which (??) GtOC have been released within the period 1990-2010.

Tier 2 IPCC methodolgy estimates higher soil organic carbon losses than Tier 1 methods, which may origin from … . We also find that SOC is very sensity to management decision such as residue recycling indicating the nessessity to incorporated better management data in soil models.

1. Intro (500)

Soils are biggestes terrestical pool causing high emission by landuse activities.

Learning from history for future

Referring to important soil C activities.

2. Method (50)

Soil carbon dynamics are modeled using a yearly based SOC model and carbon input and management data.

2.1 Agricultural management (50)

We combine data sets to estimate agricultural flows and management decisions on cropland.

2.1.1 Landuse and Landuse Change (150)

We use LUH2v2 data for major Landuse types and their transition and fit cropspecific areas to country scale FAO data.

2.1.2 Crop Production and Residues (300)

FAO Production values are combined with Feed estimations from [Isabelles Paper] and rule based demand shares. LPJmL yield and LUH landuse patterns are used to scale down to half-degree.

2.1.3 Livestock Distribution and Manure Excretion (300)

Based on [Gridded Livestock of the world] we use rule based asumption to estimate livestock and manure distribution on the globe. Animal waste system shares are used as is [Bodirsky].

2.1.4 Irrigation (100)

Simple growing period calculations together with irrigation shares of LUH2v2 are use to estimate water effects on decay rates.

(Maybe ) 2.1.5 Tillage (100)

Tillage data sets of [Vera, others] together with rules are used to drive tillage effect on decay rates.

2.2 Carbon Budget (50)

Connecting carbon inputs with soil carbon dynamics will create a budget of in- and outflows.

2.2.1 Tier 2 (300)

Yearly turnover between three different SOC pools for the topsoil is model using global parameters.

2.2.2 For validation: Tier 1 (150)

Stock changes are calculated using simple change factors on the SOC pools for the topsoil.

3. Results (200)

3.1 Carbon Loss (500)

Carbon losses since for the whole historic period are about 30 (?) GtC due to anthropogenic land use. Global cropland have lost (?)% of topsoil carbon compared to natural vegetation.

3.2 SOC flows (200)

Carbon flows in the agricultural system as shown in figure 2.

3.3 Stock Change Factors (300)

Tier 2 compared to Tier 1 method for calculating stock change factors draw a closer connection to real agricultural flows, but maybe point to gaps in stock taking of carbon inflows from additional sources such as cover crops or weeds.

4. Discussion (500)

Agricultural management data plays a major role for identifing global status of soil organic carbon.

5. Conclusion/Outlooks (250)

Aligning agricultural management with soil carbon management is critical to reduce emissions in the land use sector or even create additional sinks.

Total words: 4000