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Bottom up natural fluxes of CH4 for Europe

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We estimated daily **natural peatland** and **mineral soil methane fluxes** in Europe from 2005 to 2017 with JSBACH-HIMMELI coupled model framework (see poster by Raivonen et. al.). In the first set-up we used a spatial resolution of 0.5° (Fig 1) and recently a 0.1° (Fig 2) spatial resolution.

- vegetation cover from European **CORINE landcover 2012** (CLC12) data
- CLC12 inland wetland vegetation types – Bogs and Fens – were attributed to peatland category in both run set-ups
- In the low resolution set-up a fraction of other vegetation types – Moors and Heathlands - characterized by peat soils was attributed to peatlands
- Salt marshes and other wetland habitats in the vicinity of salty water bodies were not included in the peatland class as salt effectively inhibits methane production
- Wetland hydrology model (Topmodel) boundary data was based on a high-resolution topographic index dataset (Marthews et al. 2015)

Fig. 1

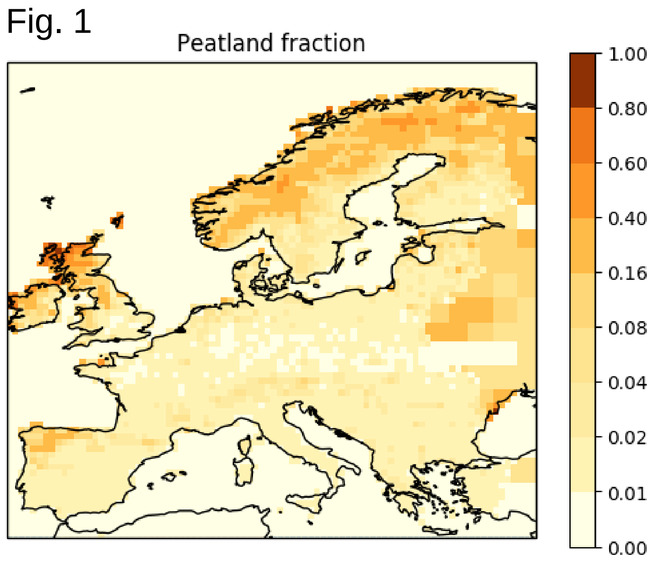
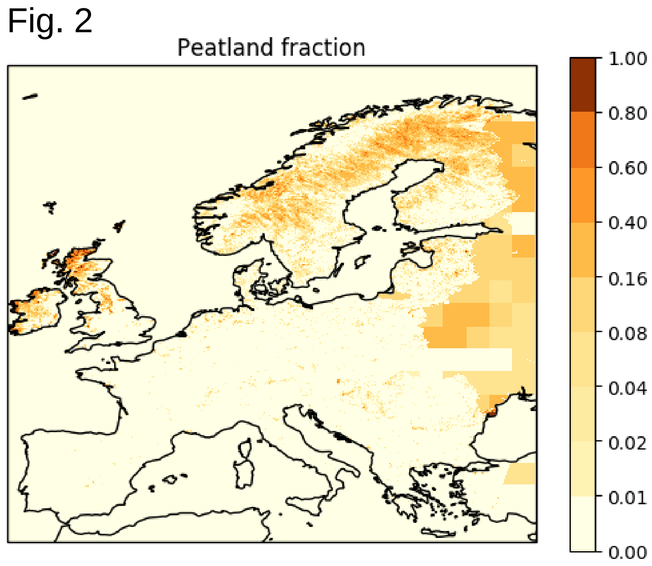


Fig. 2



Climatic forcing data was adopted from CRUJRA dataset (used in Global Carbon Project) in 0.5 degree spatial resolution and daily time resolution.

-**tmin, tmax, precipitation, wind speed, specific humidity, down-welling short wave radiation** and **long wave radiation**

Running sequence:

-*Initial run:* with **80's CO2** concentration of 340ppm through **climate of 1984-2010**.
-*Soil carbon and peat spin-up:* soil carbon storages (from soil carbon model Yasso as modified by Thomas Kleinen, MPI-MET, Hamburg) were accumulated with drivers (e.g. NPP, LAI, Tair) from of the initial run **cycled for 3500 years**.
-*Production run*: **a run through 1981-2017** with the system state adopted from the end of the initial run and carbon pools generated in the carbon spin-up.
-Yearly **observed global CO2** concentration was used in the production run
-Soil moisture from JSBACH soil hydrology scheme (Hagemann and Stacke 2014) was used to calculate **mineral soil methane emissions** and **uptake** as a postprocessing step using method similar to Spahni et al. (2011).
-All regional methane fluxes from JSBACH-YASSO-HIMMELI framework were corrected for the deviation between inland water body distributions from CLC and Regnier lake product for VERIFY

Results:

We obtained average peatland CH4 emissions (Fig. 3), mineral soil emissions (Fig. 4) and mineral soil uptake (Fig. 5) for 2005-2017 over Europe.
Month to month evolution of European natural CH4 surface fluxes is shown in Fig. 6.

Fig. 3

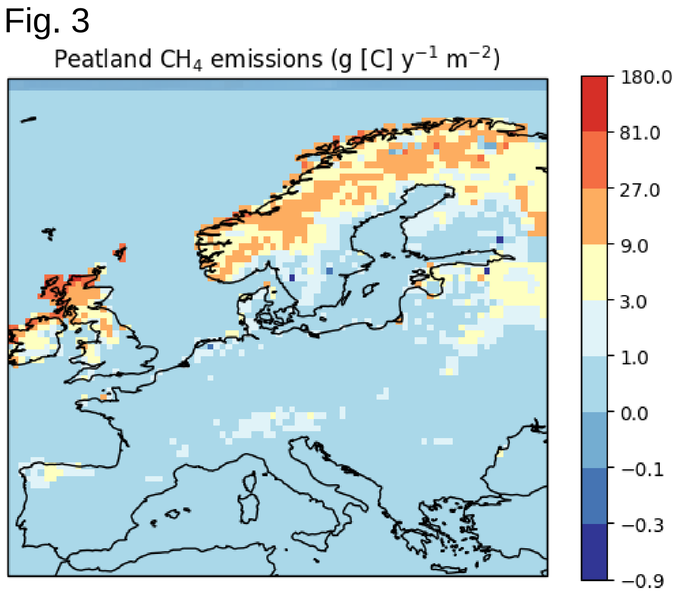


Fig. 4

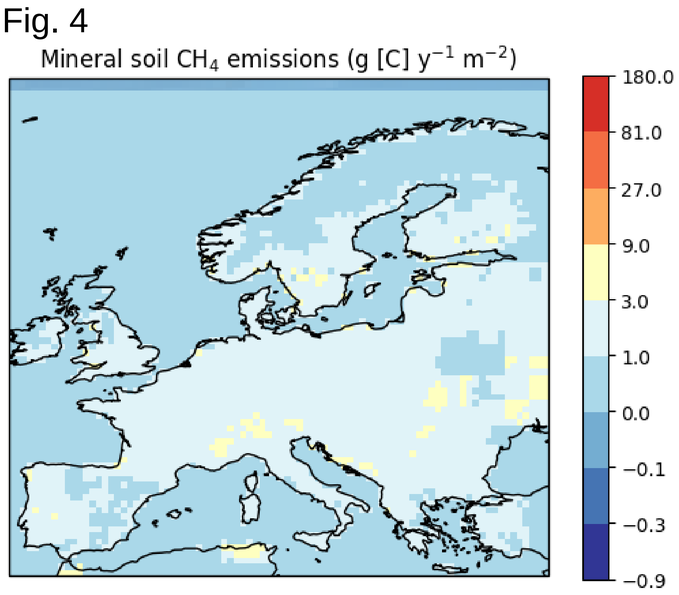


Fig. 5

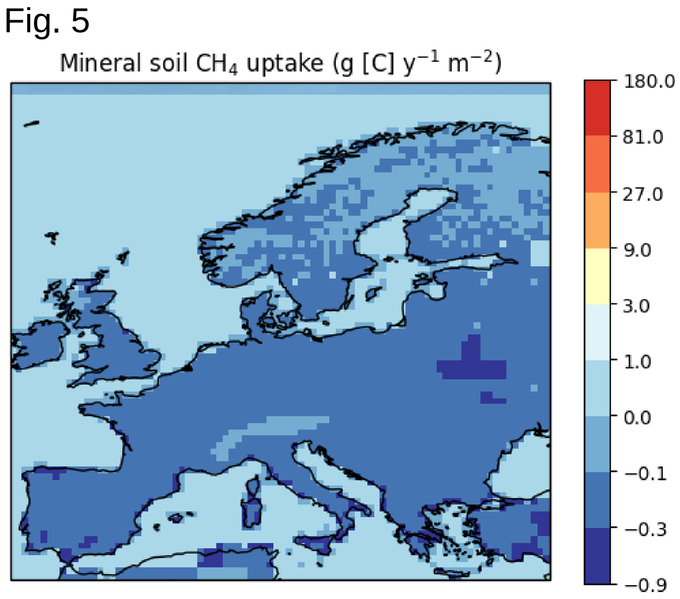
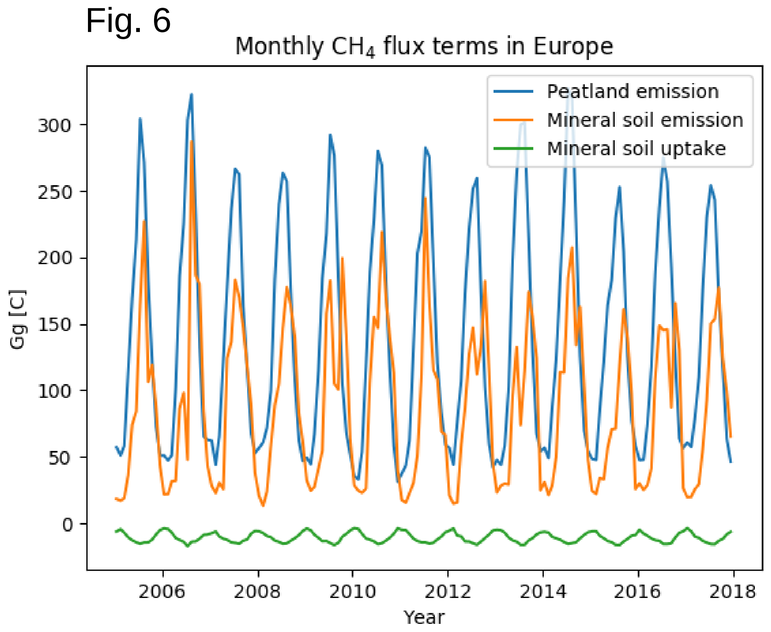


Fig. 6



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