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Estimation of emission from organic soils

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Dynamic modeling of the processes of transformation of soil organic matter is part of a more complex problem - modeling the processes of soil formation and functioning of soils, and the development of the entire soil system. It is important tool for studying the functioning and predicting changes in the soil system, quantifying the role of the soil cover in the balance of greenhouse gases in the atmosphere and in the processes of climate change

The PEAT-GHG-Model (furthermore – PEAT-GHG-MODEL), based on further development of ROTHC-model (Coleman, Jenkinson, 2008) for mineral soil and ECOSSE model (Smith, Gottschalk et al., 2010) for organic soils.

The PEAT-GHG-MODEL evaluates of CO_2, CH_4, N_2O fluxes values at organic soils and soil carbon deposition for non-forest types of land cover. The model utilize data from existing weather stations, published soil data, and data generated by remote sensing of land cover. The model evaluates of CO_2, CH_4, N_2O fluxes values at organic soils and soil carbon deposition, including at peatlands, retrospectively for targeted period or back in time with available space images library. The model can evaluates of CO_2, CH_4, N_2O fluxes values at organic soils and soil carbon deposition for future period based on meteorological input data generated by climate change scenarios and land cover data generated by relevant habitats (land cover) change scenarios. The PEAT-GHG-MODEL estimates of CO_2, CH_4, N_2O fluxes from organic soils and soil carbon deposition for non-forest types of land cover. The model input data generates by existing weather stations, remote sensing of land cover and published soils data. The model estimates of GHG emissions from organic soils, including peatlands, retrospectively for targeted period or back in time with available space images library. The model can simulates of GHG emissions for future period based on meteorological input data generated by climate change scenarios and land cover data generated by relevant habitats change scenarios. The model generates georeferenced data. Minimum land surface area, which can be evaluates by model, equal of size of one pixel of land cover images, used for remote sensing of land cover, it can be 1 m^2 or less. Due to high resolution, the model estimates highly variable in space CO_2, CH_4, N_2O fluxes with high accuracy. Maximum land surface area is not limited. The model generates data on decade and/or annual bases. Article presents the model' verification results. The model verified in 2017 by independent, from the model authors, verification team in frame of "CLIMA EAST: conservation and sustainable use of peatlands" project (UNDP-Ukraine). Direct field measurement data for two peatlands used for model verification, including one site drained, and another one is under natural hydrological conditions. The

cumulative annual of CH_4 and CO_2 emission presented in Table.

The model calculations were compared with the experimental data obtained for peat soils in the western Polesie of Belarus. The cumulative annual of CH_4 and CO_2 emission presented in Table.

Table. Cumulative annual of CH_4 and CO_2 emissions according to field measurements and assessment of PEAT-GHG-MODEL

Sedge fen site						
years	CO_2 ($g(CO_2-eq)/m^2$)			CH_4 ($t(CO_2-eq)/ha$)		
	measured	calculated	difference	measured	calculated	Difference
2010 (6 months)	278,70	294,18	-15,48	6,65	4,64	2,01
2011	83,92	50,17	33,75	16,28	15,36	0,92
2012	207,13	254,96	-47,83	2,38	1,37	1,01
2013	331,70	382,02	-50,32	4,34	5,14	-0,8
2014 (3 months)	52,53	38,70	13,83	0,16	0,04	0,12
Agricultural drained fen site						
2010 (6 months)	843,83	755,09	88,74	-	-	-
2011	452,95	511,60	-58,65	-	-	-
2012 (8 months)	114,75	157,57	-42,82	-	-	-