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Insights into modelling of soil organic carbon from Irish grassland sites using ECOSSE model

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Abstract

Grassland represents the dominant land use in Ireland, and the estimation of soil organic carbon (SOC) stocks and changes for Irish grasslands requires further improvements. This study uses the ECOSSE 6.2b process-based model in site-specific mode (Smith et al., 2010) to predict SOC stocks and changes associated with different grassland management practices. The work presented here aims to provide preliminary insights into SOC modelling procedures. Five Irish sites under different grassland management were selected from the 2009 LUCAS SOC database (JRC, 2018). Due to the lack of repeated SOC measurements over time, the initial SOC input values (required for the simulation initialisation) were assigned from the Irish NSDB database (EPA, 2007). This was done based on the site-specific information from both databases such as distance and matching land-use. The initial SOC values from the NSDB were assigned to 2002 (i.e. the start of simulation). Information on management was obtained from the Irish Integrated Administration and Control System database,LPIS (Zimmermann et al., 2016b), climate data were obtained from MÉRA (Met Éireann, 2018) and atmospheric N deposition from http://www.emep.int (Premrov et al. 2019). Fertilisation inputs were adapted from the literature and categorised based on stocking rates derived from Green et al. (2016). The 2009 yearly averaged SOC predicted values were compared to LUCAS measured SOC across five sites (r^2 = 0.06), showing over- and under-estimation of simulated SOC, which could be due to potential poor matching NSDB and LUCAS data. This result indicates that the repeated SOC field-measurements over the time are needed for proper model-parameterisation. This was further supported by the observed strong relationship between initial SOC inputs and ECOSSE predicted SOC (r^2 = 0.85) indicating the high sensitivity of model SOC predictions to the initial SOC inputs.

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Literature

EPA, 2007. National Soils Database (NSDB). Environmental Protection Agency (EPA), Ireland.

Green, S., et.al., 2016. Cattle stocking rates estimated in temperate intensive grasslands with a spring growth model derived from MODIS NDVI time-series. Int. J. Appl. Earth Obs. & Geoinfo. 52, 166-174.

JRC, 2018. LUCAS 2009 TOPSOIL data, European Soil data Centre. Joint Research Centre. European Commission.

Met Éireann, 2018. MÉRA: Met Éireann Re-Analysis – Climate Re-analysis.

Premrov, A., et al., 2019. Biogeochemical modelling of soil organic carbon-insights into the processing procedures of selected atmospheric input data: Part II. IGRM2019.UCD. Dublin.

Smith, J., et al., 2010. ECOSSE. User Manual.

Zimmermann, J., et al., 2016. The Irish Land-Parcels Identification System (LPIS). Experiences in ongoing and recent environmental research and land cover mapping. Biol. & Environm. Proceedings RIA 116B, 53-62.