Geophysical Research Abstracts
Vol. 18, EGU2016-13205-1, 2016
EGU General Assembly 2016

Coupled carbon-nitrogen land surface modelling for UK agricultural landscapes using JULES and JULES-ECOSSE-FUN (JEF)

Edward Comyn-Platt, Douglas Clark, and Eleanor Blyth
Centre of Ecology and Hydrology, Wallingford, United Kingdom (edwcom@ceh.ac.uk)

The UK is required to provide accurate estimates of the UK greenhouse gas (GHG; CO_2, CH4 and N2O) emissions for the UNFCCC (United Nations Framework Convention on Climate Change). Process based land surface models (LSMs), such as the Joint UK Land Environment Simulator (JULES), attempt to provide such estimates based on environmental (e.g. land use and soil type) and meteorological conditions. The standard release of JULES focusses on the water and carbon cycles, however, it has long been suggested that a coupled carbon-nitrogen scheme could enhance simulations. This is of particular importance when estimating agricultural emission inventories where the carbon cycle is effectively managed via the human application of nitrogen based fertilizers. JULES-ECOSSE-FUN (JEF) links JULES with the Estimation of Carbon in Organic Soils – Sequestration and Emission (ECOSSE) model and the Fixation and Uptake of Nitrogen (FUN) model as a means of simulating C:N coupling.

This work presents simulations from the standard release of JULES and the most recent incarnation of the JEF coupled system at the point and field scale. Various configurations of JULES and JEF were calibrated and fine-tuned based on comparisons with observations from three UK field campaigns (Crichton, Harwood Forest and Brattleby) specifically chosen to represent the managed vegetation types that cover the UK. The campaigns included flux tower and chamber measurements of CO_2, CH4 and N2O amongst other meteorological parameters and records of land management such as application of fertilizer and harvest date at the agricultural sites. Based on the results of these comparisons, JULES and/or JEF will be used to provide simulations on the regional and national scales in order to provide improved estimates of the total UK emission inventory.