Geophysical Research Abstracts
Vol. 16, EGU2014-9303, 2014
EGU General Assembly 2014

Spatial scaling of CO_2 efflux in a temperate grazed grassland

Nicole Archer (1), Barry Rawlins (2), and Benjamin Marchand (2)

(1) British Geological Survey, Murchison House, West Mains Rd, Edinburgh, EH9 3LA, United Kingdom (nicarc@bgs.ac.uk), (2) British Geological Survey, Nicker Hill, Keyworth , Nottingham, NG12 5GG, United Kingdom

Understanding CO_2 efflux from soil at different scales is important when up-scaling CO_2 measurements from plot to larger scales, but there have been few studies investigating spatial CO_2 efflux in temperate environments.
We conducted a nested analysis of variation to explore how the CO_2 efflux variation occurs between different spatial scales. Ninety-six manual dynamic chamber flux measurements of CO_2 were undertaken during three, four hour surveys within seven grouped sites, each containing an optimised nested design with lag distances of 0.3m, 1m, 3m and 9m across six hectares of grazed hillslope grassland. This design also included continuous logging soil moisture sensors (plus conductivity and temperature) at 10cm soil depth.
A previous study showed at this site that the variation of soil moisture is divided relatively equally between the four spatial scales <0.3m, 0.3-3m, 3-9m and >9m. The proportion of large-scale (>9m) variation increased after rainfall. In contrast in the three surveys analysed to date, the vast majority of the variation in CO_2 flux occurred over the two smallest scales. No significant correlation between CO_2 and soil moisture was observed over any of the spatial scales. All of these three surveys were conducted on relatively dry soils.
We also investigated whether there were significant temporal variations in CO_2 efflux over a period of three weeks using an automated soil flux system. These data showed there was no significant temporal variability between 10:00 to 16:00 hrs during late summer.
There has recently been substantial rainfall at the field site and we are now conducting additional surveys to examine how the total CO_2 fluxes and their spatial variation is effected by these wetter conditions.