Geophysical Research Abstracts
Vol. 16, EGU2014-11037-1, 2014
EGU General Assembly 2014

Field measurements of del13C in ecosystem respiration

Hella van Asperen (1), Simone Sabbatini (2), Giacomo Nicolini (2), Thorsten Warneke (1), Dario Papale (2), and Justus Notholt (1)

(1) University of Bremen, Institute of Environmental Physics, Remote Sensing, Bremen, Germany (v_asperen@iup.physik.uni-bremen.de), (2) Department for Innovation in Biological, Agro-food and Forest systems, University of Tuscia, Viterbo, Italy

Stable carbon isotope del13C-measurements are extensively used to study ecological and biogeochemical processes in ecosystems. Above terrestrial ecosystems, atmospheric del13C can vary largely due to photosynthetic fractionation. Photosynthetic processes prefer the uptake of the lighter isotope 12C (in CO_2), thereby enriching the atmosphere in 13C and depleting the ecosystem carbon. At night, when ecosystem respiratory fluxes are dominant, 13C-depleted CO_2 is respired and thereby depletes the atmospheric del13C-content. Different ecosystems and different parts of one ecosystem (type of plant, leaves, and roots) fractionate and respire with a different del13C-ratio signature. By determining the del13C-signature of ecosystem respiration in temporal and spatial scale, an analysis can be made of the composition of respiratory sources of the ecosystem.

A field study at a dry cropland after harvest (province of Viterbo, Lazio, Italy) was performed in the summer of 2013. A FTIR (Fourier Transform Infrared Spectrometer) was set up to continuously measure CO_2-, CH4-, N2O-, CO- and del13C-concentrations. The FTIR was connected to 2 different flux measurements systems: a Flux Gradient system (sampling every half hour at 1.3m and 4.2m) and 2 flux chambers (measured every hour), providing a continuous data set of the biosphere-atmosphere gas fluxes and of the gas concentrations at different heights.

Keeling plot intercept values of respiratory CO_2, measured by the Flux Gradient system at night, were determined to be between -25‰ and -20‰Ќeeling plot intercept values of respiratory CO_2, measured by the flux chamber system, varied between -24‰ and -29‰ and showed a clear diurnal pattern, suggesting different (dominant) respiratory processes between day and night.