Geophysical Research Abstracts
Vol. 18, EGU2016-3065, 2016
EGU General Assembly 2016

Isotopic signatures of H2 and CO uptake and emissions by soil

Maria Elena Popa (1), Qianjie Chen (2), and Thomas Röckmann (1)

(1) Institute for Marine and Atmospheric research Utrecht, Utrecht University, Utrecht, the Netherlands (epopa2@yahoo.com), (2) Department of Atmospheric Sciences, University of Washington, Seattle, Washington, USA

We performed soil chamber experiments in order to determine the isotopic signatures of the exchange of H2 and CO between soil and atmosphere. The experiments took place at two sites in the Netherlands, a forest (Speuld) and a grass field (Cabauw). Flask samples were filled from the soil chamber, and then analyzed in the laboratory for δD in H2 and δ13C and δ18O in CO.

The isotope results prove that, for both species, uptake and emission occur simultaneously regardless of the direction of the net flux. We were able to determine separately the isotopic effects of the two fluxes. For both H2 and CO, soil uptake is associated with a small positive fractionation (the lighter molecule is taken up faster). The soil uptake fractionation (α = kheavy/klight) was 0.945 $\pm$ 0.004 for H2; for CO, the fractionation was 0.992 for 13C and 0.985 for 18O.

The isotopic composition of the H2 emitted from the grassland was -530 $\pm$ 40 ‰ less depleted that what is expected from the isotopic equilibrium of H2 with water. For CO, the isotopic composition of the soil emission is depleted in 13C compared to atmospheric CO, and lower than the average isotopic composition of plant or soil organic matter.