Geophysical Research Abstracts
Vol. 14, EGU2012-11991, 2012
EGU General Assembly 2012

Using radiocarbon as a high-frequency tracer of forest CO_2 emissions sources: preliminary results from a Northern Wisconsin case study

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Radiocarbon represents a potentially sensitive natural tracer for detecting contributions of soil carbon to whole forest CO_2 emissions. We are monitoring the ^{14}C abundance in soil and whole ecosystem CO_2 emissions from a Northern Wisconsin deciduous hardwood forest, to 1) examine how the age of soil carbon emissions varies at high frequencies (weekly to seasonal timescales), and 2) ascertain whether soil carbon dynamics can be detected in the ^{14}C abundance of CO_2 at higher atmospheric levels (30 m and 450 m). Preliminary results suggest ^{14}C abundance in CO_2 above the forest canopy does vary substantially, and is consistent with changing contributions from forest respiration as well as fossil fuel emissions. Measurements and modeling suggest the age of soil CO_2 emissions likely varies in response to abiotic drivers (moisture, temperature) as well as biotic drivers (plant activity).