Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09275, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09275
EGU General Assembly 2008

The role of Photosynthetic activity on short-term temporal variation of soil CO_2 efflux: A synthesis study

Curiel Yuste J., Janssens I., Bahn M., Longdoz B., Davidson EA, Kutsch W., Reichstein M., Luyssaert S., Acosta M., Arriga N., Aubinet JM, Carrara A., Gimeno C., Gruenwald T., Inglima I., Ma S., Misson L., Montagnani L., Moyano F., Pavelka M., Pumpanen J., Richardson, Rurh N., A., Suleau M., Tang JW., Wohlfahrt G.

Jorge Curiel Yuste <j.curiel@creaf.uab.es>

Michael Bahn <michael.bahn@uibk.ac.at>

Fernando Moyano <fmoyano@bgc-jena.mpg.de>

Manuel Acosta <manuel@brno.cas.cz>

Ivan Janssens <ivan.janssens@ua.ac.be>

Thomas Grunwald <gruenwald@forst.tu-dresden.de>

Nadine K Ruhr <nadine.ruehr@ipw.agrl.ethz.ch>

Jana Kurajdov <kurajdova@slunovrat.info>

Bernhard Longdoz <longdoz@nancy.inra.fr>

Jianwu Tang <jtang@umn.edu>

Cristina Gimeno <cristina@ceam.es>

Jukka Pumpanen <jukka.pumpanen@helsinki.fi>

Marian Pavelka <marian@brno.cas.cz>

Laurent Misson <lmisson@nature.berkeley.edu>

Markus Reichstein <markus.reichstein@bgc-jena.mpg.de>

Ilaria Inglima <ilaria.inglima@unina2.it>

Werner L. Kutsch <wkutsch@bgc-jena.mpg.de>

Suleau Marie <suleau.m@fsagx.ac.be>

JM Aubinet <aubinet.m@fsagx.ac.be>

Inputs of recent photosynthates to belowground parts of the vegetation affect substantially soil respiration. Plants allocate part of their sugar production to belowground plant functioning, which not only involves root respiration, but also sugar allocation to mycorrhiza and production of easily decomposable sugars (exudates, mucilage) that stimulates mineralization in the vicinity of the root system (rhizosphere). These patterns of C allocation might be reflected into diurnal fluctuations in soil respiration, as it has already being shown in some study cases. Understanding possible short-term influence of photosynthetic activity on the variability of soil respiration has important implications on ecosystems C modeling: current predictions and gap-filling strategies relying only in temperature and soil moisture may include important errors. Using data from multiple ecosystems covering a broad range of climates and biomes, the objective of the study was to find causal correlations between variations in plant photosynthetic activity and soil respiration. Both signals (C assimilation and soil CO_2 efflux) have been continuously and independently monitored, which allowed a finer study of short-term correlations between the two main C fluxes on terrestrial ecosystems. Net Ecosystem Exchange (NEE), obtained from eddy covariance towers, was the independent variable chosen as proxy for plant activity. In those ecosystems, soil respiration was simultaneously monitored, either by autochambers or open path soil probes. Soil temperature tended to explain most of the variation in soil respiration, but the correlation between temperature-independent soil CO_2 effluxes and NEE increased during periods of high photosynthetic activity. While the intensity and nature (lags) of this temperature-independent signal varied strongly among ecosystem type, the inclusion of plant photosynthetic activity to a temperature/moisture model improved significantly the predictions of soil CO_2.