Geophysical Research Abstracts
Vol. 14, EGU2012-170, 2012
EGU General Assembly 2012

Amazon tree stems respiration: Is the O_2 influx a better measure?

A. Angert (1), J. Muhr (2), R. Negron Juarez (3), W. Alegria Muñoz (4), J.Q. Chambers (5), and S.E. Trumbore (2)

(1) Institute of Earth Sciences, Hebrew University of Jerusalem, Jerusalem, Israel (angert@huji.ac.il), (2) Department of Biogeochemical Processes, Max-Planck Institute for Biogeochemistry, Jena, Germany (trumbore@bgc-jena.mpg.de), (3) Ecology and Evolutionary Biology, Tulane University, New Orleans, USA (rjuarez@tulane.edu), (4) Facultad de Ciencias Forestales, Universidad Nacional de la Amazonía Peruana, Iquitos, Peru (walmu@hotmail.com), (5) Climate Sciences Department, Lawrence Berkeley National Laboratory, Berkeley, USA (jchambers@lbl.gov)

Respiration in tree stems strongly controls the tree carbon use efficiency. The rate of CO_2 efflux from the stem has often been assumed to be a measure of stem respiration. However, recent work has demonstrated that stem CO_2 efflux can either overestimate or underestimate respiration rate, because of emission or removal of CO_2 by transport in xylem water. Here, we have used high precision measurements of O_2 to estimate the ratio between local stem respiration and local CO_2 efflux, in tropical forest trees. This approach is based on the much lower solubility of O_2 in water relatively to CO_2. The measured ratios between the stems CO_2 efflux and O_2 influx indicated that a large portion of the respired CO_2 ($\sim$35% on average) is not emitted locally, and is probably transported upward in the stem. Our results indicate the existence of a considerable internal flux of CO_2 in the stem. If the transported CO_2 is used in the canopy as a substrate for photosynthesis, it could account for several percent of the carbon fixed by the tree, and perhaps serve as a mechanism that buffers the response of the tree to changing CO_2 levels or to drought stress. We have also demonstrated that measurements of O_2 uptake, while are more difficult to make, can be a more appropriate method to estimate stem respiration rates.