Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09084, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09084
EGU General Assembly 2008

Preliminary observations of temperature effects on carbon loss through BVOC emissions in *Fagus sylvatica* L.

Šimpraga M. (1), Steppe K. (1), Demarcke M. (2), Amelynck C. (2), Schoon N. (2), Joó E. (3), Dewulf J. (3), Vanlangenhove H. (3), Samson R. (4), Müller J.-F. (2), Lemeur R. (1)

(1) Laboratory of Plant Ecology, Faculty of Bioscience engineering, Ghent University, Ghent, Belgium, (2) Belgian Institute for Space Aeronomy, Brussels, Belgium, (3) Research Group Environmental Organic Chemistry and Technology, Faculty of Bioscience Engineering, Ghent University, Ghent, Belgium, (4) Department of Bioscience Engineering, Faculty of Science, University of Antwerp, Antwerp, Belgium (maja.simpraga@ugent.be/ Fax: +32 9 224 44 10 / +32 9 264 61 13)

Plants emit an essential fraction of their carbon fixed by photosynthesis into the atmosphere as biogenic volatile organic compounds (BVOCs). These BVOCs are diverse, including isoprene, monoterpenes and sesquiterpenes among others, and they can be synthesized directly from photosynthetic carbon in the chloroplasts (Lichtenthaler 1999, Loreto *et al*. 2001). When released into the atmosphere via stomata (Rennenberg *et al.* 2002, Tani *et al.* 2007), they represent a large carbon loss, which can be up to ∼10% of that fixed by photosynthesis (Sharkey *et al*. 1995; Peňuelas *et al.* 2003; Firn *et al.* 2006). It is expected that this species-specific carbon loss through BVOC emission, and thus the plant's C-budget, might change with global warming and rising temperatures.

The effect of temperature on carbon loss through BVOC emissions at constant daily PAR was therefore studied in a 3-year-old potted beech tree (*Fagus sylvatica* L.) in a walk-in growth room. BVOC emissions and simultaneous net photosynthesis rates were monitored on-line using enclosed branch measurements. Two branch cuvettes equipped with a sensor for PAR, relative humidity, air temperature and leaf temper-

ature were used. An infrared gas analyzer (IRGA BINOS 100-4P, Walz, Germany) was used to measure net photosynthesis rates, while a proton transfer reaction mass spectrometer (PTR-MS, Ionicon, Austria) was used to monitor BVOC emissions. Air temperature in the growth room was constant during the day, but varied from 17 to 25 ˚C between days. Pronounced dynamics, following the imposed temperature regimes, were observed in the continuous measurements of photosynthesis and monoterpenes. These dynamics show the interdependence between monoterpene emissions and the plant's metabolic processes. The results also revealed that the potted beech tree under well-watered conditions re-emitted a rather low fraction of the assimilated carbon back into the atmosphere as monoterpenes. This fraction increased from 0.01 to 0.04 % with a temperature rise from 17 ˚C to 25 ˚C in growth room conditions.

We would like to express our acknowledgements to BELSPO (Belgian Science Policy) for funding the IMPECVOC research project and Philip Deman, technician of the Plant Ecology Laboratory, for technical support.

Firn *et al.* 2006: Trends in Plant Science, Vol.11, No.3.

Lichtenthaler 1999: Ann. Review of Plant Physiology Plant Molecular Biology, 50, 47-65.

Loreto *et al.* 2001: Global Change Biology, 7, 709-717.

Peňuelas *et al.* 2003: Trends in Plant Science, Vol.3, No.3.

Rennenberg *et al.* 2002: New Phytologist, 155, 197-203.

Sharkey *et al.* 1995: Nature, 374, 769.

Tani *et al.* 2007: Atmospheric Environment, 41, 1736-1746.