Nocturnal Carbon Efflux:
Can we take advection terms into account without measuring them?

Measurements from an intensive measurement campaign at Tumbarumba flux site indicate that there is a time delay between radiative cooling, the onset of gravity currents and the development of horizontal carbon concentration gradients. This leads to a time window in the early evening where respiration measurements are unaffected by advection terms. Selection of these early evening maxima (*Rmax*) in the sum of eddy flux and rate of change of storage of carbon to derive a temperature response function lead to more realistic respiration rates than applying e.g. filtering criteria based on turbulence properties measured well above the forest (van Gorsel et al. 2007).

Indication of advection is given by the time series of CO_2 concentrations. Given a continuous input of carbon (soil-, wood- and leaf respiration) into a control volume (CV) we expect concentrations to rise continuously if we do not observe a flux through the top lid and assume that no advection occurs. We usually observe a strong increase in carbon concentration once the atmosphere is stably stratified. But later on in the evening concentrations increase far more slowly or even remain relatively constant. As this is not associated with fluxes through the top of the CV we can assume that advection is draining CO_2 out of the CV.

Decreasing rates of change of storage of CO2 have been observed on many sites (e.g. Aubinet, 2005) and we assume that our approach of indirectly taking advection into account by using early evening *Rmax* only, to determine the temperature response function may be applicable to other sites as well. It can however be anticipated that there are limitations to the applicability, as the time delay between radiative cooling and onset of advection is quite certainly site dependent and will be shorter for sites situated closer to a ridge.

We intend to investigate the limits of our approach by applying it to suitable datasets and relating results to topographic characteristics of the sites.

Aubinet, M. et al., 2005. Comparing CO2 storage and advection conditions at night at different carboeuroflux sites. Boundary-Layer Meteorology, 116(1): 63-94.
van Gorsel E., Leuning R. , Cleugh H.A., Keith, H. and Suni T.: Nocturnal Carbon Efflux: Reconciliation of Eddy Covariance and Chamber Measurements using an alternative to the u*-threshold Filtering Technique. Tellus B (OnlineEarly Articles). doi:10.1111/j.1600-0889.2007.00252.x

initial coordinators and proposing group

Eva van Gorsel and Ray Leuning
CSIRO Marine and Atmospheric Research, P.O. Box 1666, Canberra, ACT 2601, Australia
The group is still evolving (see below)

sites that initially would be involved

We have sent out a call for interest in this project via the fluxnet email list. Many groups who do fulfill the specific requirements for this analysis have sent their agreement to share their data. So while in this context it is not our primary aim to gain access to the data sets (which are provided directly by those groups) we would be happy to contribute to synergies between the project groups.

rules applied for co-authorship

Every group who contributes with data is included in the co-authorship with one co-author. Scientist contributing with additional scientific input will not be listed in alphabetical order but according to the significance of their contribution.