



## THE DIURNAL CO<sub>2</sub> RECTIFIER EFFECT

**R. Dargaville**, L. Rivier, P. Peylin, P. Bousquet and P. Ciais

Laboratoire des Sciences du Climat et de l'Environnement, Paris France  
(dargavil@lsce.saclay.cea.fr)

The CO<sub>2</sub> seasonal rectifier (the result of the covariance between the seasonality in CO<sub>2</sub> surface fluxes and atmospheric transport) has been well studied and is recognised as a key factor in explaining the range of results produced by inversions utilising different transport models (as in the TRANSCOM experiment). However, as such little attention has been paid to the impact of the diurnal rectifier. We demonstrate that the covariance between the daily variability in atmospheric transport (deeper mixing in the afternoon) and CO<sub>2</sub> concentrations near the surface (lower CO<sub>2</sub> concentrations in the afternoon due to uptake by the terrestrial biosphere) results in horizontal and vertical gradients in atmospheric CO<sub>2</sub> of the same magnitude as the seasonal rectifier. The implications of this are significant, as including the effect in atmospheric CO<sub>2</sub> inversions (by having diurnal variability in the priors) will probably result in different distributions of calculated CO<sub>2</sub> fluxes.

We investigate the diurnal rectifier using the LMDz atmospheric transport model, together with diurnally varying CO<sub>2</sub> fluxes from the CASA, SiB and TURC terrestrial biosphere models. We present both the spatial patterns (surface distributions, zonal averages, vertical profiles) as well as the impact of the diurnal variability in the CO<sub>2</sub> concentrations at monitoring stations.