

Interactive comment on “Calculations of automatic chamber flux measurements of methane and carbon dioxide using short time series of concentrations” by N. Pirk et al.

A. Kowalski

andyk@ugr.es

Received and published: 6 November 2015

The purpose of the numerical example in my previous comment was not to use magnitudes relevant to the authors' study sites. Rather, my intent was to illustrate that the 0.9% flux underestimation that the authors allege in their initial reply (Biogeosciences Discuss., 12, C5638–C5640, 2015) has no basis in physics. To be specific, the relation put forth in the penultimate paragraph of page C5639 (relating a ratio of fluxes to a ratio of concentrations) cannot be justified. In my example, there is no true CO₂ exchange, and so the dilution error of -1.3 micromoles per square meter per second cannot be expressed as a relative error (percentage of the true flux). From this example, it is

C7411

clear to me that the calculations presented in the authors' reply to the comment of Ana López Ballesteros are not accurate. I repeat that it is the time rate of change in the water vapor concentration (proportional to the evaporation rate) that must be tracked in order to correct this error.

The assumption that "the only gas exchange is evaporation" is approximately valid for any evaporating surface. Even the modest evaporation rates admitted by the authors (50 Watts per square meter being about 1100 micromoles per square meter per second) are orders of magnitude greater than the surface exchange of dry air or any of its components such as CO₂ and CH₄. Thus, in the context of the gas law and the example that I put forth, it is reasonable to approximate total air exchange across the surface by the evaporation rate.

Regarding the spirit of the authors' reply, both the title and organization of their manuscript suggest intent to describe methods in general, and not limited in scope to the particular case of arctic wetland ecosystems with very small evaporation rates. In this context, the neglect of the "dilution correction" in their manuscript is a grave deficiency, since it can be the dominant source of error in chamber estimates of CO₂ exchanges (e.g., see Pérez-Priego et al., 2015, Plant and Soil, DOI 10.1007/s11104-015-2481-x).

Interactive comment on Biogeosciences Discuss., 12, 14593, 2015.

C7412