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Interactive comment on "Vertical advection and nocturnal deposition of ozone over a boreal pine forest" *by* Ü. Rannik et al.

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The equations put forth in this manuscript to define the fluxes of interest violate a fundamental principle of physics, namely that of dimensional consistency.

The authors rely on the paper by Keronen et al. (2003) to define the "concentrations" measured by the chemiluminescence gas analyzer, and these are specified in relative, dimensionless units of ppb (referenced to dry air). Given such a definition, dimensional analyses reveal that equations (1) and (2) define storage and advection "fluxes" with units representing a velocity scale (distance per unit of time). Similarly, the eddy covariance and all of the "fluxes" defined in equation (4) appear to represent velocities. By contrast, the fluxes presented in all of the figures (using the same symbols as in the equations) have units of nmol m-2 s-1.

I have little doubt that the authors calculated these fluxes correctly (by multiplying the velocities expressed in the equations by the number of moles of dry air per cubic meter of volume), but this must be accurately expressed in the equations. The simplest correction is for such a scaling operation to be included in equations (1) and (2).

An additional comment that is intimately related to the above has to do with the description of equation (2) as a "mass balance expression", which it manifestly is not. Rather, equation (2) is an expression of conservation for the relative concentration defined as the number of moles of ozone normalized by the number of moles of dry air (equivalent to the mixing ratio, but scaled according to molecular masses). Such a dry molar fraction is perfectly conserved through numerous boundary-layer processes including expansion, compression, and humidification - any process not specifically representing an ozone source or sink.

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