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

Ü. Rannik et al.

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The vertical integrated mass balance equation is most frequently presented in literature for scalar densities (e.g. Stebler and Fitzjarrald, 2004, Agric. Forest Meteorol., 122, 139-156; Finnigan et al., 2003, Boundary-Layer Meteorol., 107, 1-48). Also the storage and vertical advection terms presented in our manuscript are for scalar density c (the mass per unit volume or number of moles per unit volume). The units of concentration c are unfortunately not specified for equations (1) and (2) in our manuscript.

The evaluation of vertical advection and storage terms is based on the measurements of ozone concentration profile. The O3 profile analyser used in study outputs the molar mixing ratio. Dilution by water molecules is not directly taken into account by the analyser - thus for clarity the analyser actually measures the mixing ratio with respect to moist air. However, we have used the simultaneous water vapour measurements

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to correct the ozone mixing ratios and obtained the mixing ratio values with respect to dry air. The mixing ratios were then converted to concentration densities by taking into account the air temperature and pressure. The air temperature was measured at the same heights as the ozone mixing ratios. The air pressure was assumed to be constant within the height interval of interest and obtained from the measurements at 2 m level.

Dilution with water vapour is not taken into account also in the mixing ratio values given by the fast-response O3 analyser used for the eddy covariance flux calculations - this is mentioned in Keronen et al. (2003) referred by authors for more details on measurements. Therefore for turbulent ozone flux calculation the Webb correction was applied by using the simultaneously measured water vapour flux (Eq. 3 in Keronen et al., 2003).

The authors agree that the physical quantity actually meant by concentration should always be explained when it has importance in context. In our understanding use of concentration is justified in general expressions (such as ozone concentration profile) when the units have no importance.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 18437, 2008.