

[Home](#)[Online Library ACP](#)[Recent Final Revised Papers](#)[Volumes and Issues](#)[Special Issues](#)[Library Search](#)[Title and Author Search](#)[Online Library ACPD](#)[Alerts & RSS Feeds](#)[General Information](#)[Submission](#)[Review](#)[Production](#)[Subscription](#)[Comment on a Paper](#)

Impact  
Factor  
4.865

ISI  
indexed

[Volumes and Issues](#) [Contents of Issue 6](#)

Atmos. Chem. Phys., 9, 2089-2095, 2009

[www.atmos-chem-phys.net/9/2089/2009/](http://www.atmos-chem-phys.net/9/2089/2009/)

© Author(s) 2009. This work is distributed under the Creative Commons Attribution 3.0 License.

## Vertical advection and nocturnal deposition of ozone over a boreal pine forest

Ü. Rannik<sup>1</sup>, I. Mammarella<sup>1</sup>, P. Keronen<sup>1</sup>, and T. Vesala<sup>1,2</sup><sup>1</sup>Department of Physical Sciences, P.O. Box 64, 00014 University of Helsinki, Helsinki, Finland<sup>2</sup>Department of Forest Ecology, P.O. Box 27, 00014 University of Helsinki, Helsinki, Finland

**Abstract.** Night-time ozone deposition for a Scots pine forest in Southern Finland was studied at the SMEAR II measurement station by evaluating the turbulent eddy covariance (EC), storage change and vertical advection fluxes. Similarly to night-time carbon dioxide flux, the eddy-covariance flux of ozone was decreasing with turbulence intensity (friction velocity), and storage change of the compound did not compensate the reduction (well-known night-time measurement problem). Accounting for vertical advection resulted in invariance of ozone deposition rate on turbulence intensity. This was also demonstrated for carbon dioxide, verified by independent measurements of NEE by chamber systems. The result highlights the importance of advection when considering the exchange measurements of any scalar. Analysis of aerodynamic and laminar boundary layer resistances by the model approach indicated that the surface resistance and/or chemical sink strength was limiting ozone deposition. The possible aerial ozone sink by known fast chemical reactions with sesquiterpenes and NO explain only a minor fraction of ozone sink. Thus the deposition is controlled either by stomatal uptake or surface reactions or both of them, the mechanisms not affected by turbulence intensity. Therefore invariance of deposition flux on turbulence intensity is expected also from resistance and chemical sink analysis.

[Final Revised Paper](#) (PDF, 474 KB) [Discussion Paper](#) (ACPD)

Citation: Rannik, Ü., Mammarella, I., Keronen, P., and Vesala, T.: Vertical advection and nocturnal deposition of ozone over a boreal pine forest, Atmos. Chem. Phys., 9, 2089-2095, 2009. [Bibtex](#) [EndNote](#) [Reference Manager](#)

[Search ACP](#)

Library Search

Author Search

[News](#)

- [Sister Journals AMT & GMD](#)
- [Financial Support for Authors](#)
- [Journal Impact Factor](#)
- [Public Relations & Background Information](#)

[Recent Papers](#)

01 | ACPD, 31 Mar 2009:  
One year of CNR-IMAA multi-wavelength Raman lidar measurements in correspondence of CALIPSO overpass: Level 1 products comparison

02 | ACPD, 31 Mar 2009:  
The impact of resolution on ship plume simulations with NO<sub>x</sub> chemistry

03 | ACPD, 31 Mar 2009:  
Ozone in the Boundary Layer air over the Arctic Ocean – measurements during the TARA expedition