Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union

Atmos. Chem. Phys., 7, 5147-5158, 2007
www.atmos-chem-phys.net/7/5147/2007/

Behaviour of tracer diffusion in simple atmospheric boundary layer models

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Abstract. 1-D profiles and time series from an idealised atmospheric boundary layer model are presented, which show agreement with boundary layer measurements of polar NO_x. Diffusion models are increasingly being used as the framework for studying tropospheric air chemistry dynamics. Models based on standard boundary layer diffusivity profiles have an intrinsic behaviour that is not necessarily intuitive, due to the variation of turbulent diffusivity with height. The simple model presented captures the essence of the evolution of a trace gas released at the surface, and thereby provides both a programming and a conceptual tool in the analysis of observed trace gas evolution. A time scale inherent in the model can be tuned by fitting model time series to observations. This scale is then applicable to the more physically simple but chemically complex zeroth order or box models of chemical interactions.

Final Revised Paper (PDF, 706 KB) Discussion Paper (ACPD)

Citation: Anderson, P. S. and Bauguitte, S. J.-B.: Behaviour of tracer diffusion in simple atmospheric boundary layer models, Atmos. Chem. Phys., 7, 5147-5158, 2007. Bibtex EndNote Reference Manager