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Atmos. Chem. Phys., 3, 347-359, 2003
www.atmos-chem-phys.net/3/347/2003/
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Particle formation at a continental background site: comparison of model results with observations

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Abstract. At Hohenpeissenberg (47° 48' N, 11° 07' E, 988 m asl), a rural site 200--300-m higher than the surrounding terrain, sulphuric acid concentrations, particle size distributions, and other trace gas concentrations were measured over a two and a half year period.

Measured particle number concentrations and inferred particle surface area concentrations were compared with box-model simulations for 12 carefully selected data sets collected during the HAFEX experiment (Birmili et al., 2003). The 12 cases were selected after meteorological and aerosol dynamical criteria in order to justify the use of a box-model. The aerosol model included a binary sulphuric acid water nucleation scheme. Calculated nucleation rates were corrected with a factor to match measured and calculated particle number concentrations. For the investigated 12 data sets, the correction factors were smallest for measurements made under stable thermal stratification and low wind conditions, i.e. conditions that are frequently encountered during winter. Correction factors were largest for measurements made under strong convective conditions.

Our comparison of measured and simulated particle size distributions suggests that the particle formation process maybe strongly influenced by mixing processes driven by thermal convection and/or wind shear.

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Citation: Uhrner, U., Birmili, W., Stratmann, F., Wilck, M., Ackermann, I. J., and Berresheim, H.: Particle formation at a continental background site: comparison of model results with observations, Atmos. Chem. Phys., 3, 347-359, 2003. [Bibtex](#) [EndNote](#) [Reference Manager](#)

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