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## Kinetic nucleation and ions in boreal forest particle formation events

L. Laakso<sup>1</sup>, T. Anttila<sup>1,3</sup>, K. E. J. Lehtinen<sup>1</sup>, P. P. Aalto<sup>1</sup>, M. Kulmala<sup>1</sup>, U. Hörrak<sup>2</sup>, J. Paatero<sup>3</sup>, M. Hanke<sup>4</sup>, and F. Arnold<sup>4</sup>

<sup>1</sup>Department of Physical Sciences, P.O. Box 64, FIN-00014 University of Helsinki, Finland

<sup>2</sup>Institute of Environmental Physics, University of Tartu, 18 Ülikooli Street, Tartu, 50090, Estonia

<sup>3</sup>Finnish Meteorological Institute, Air Quality Research, Sahaajankatu 20E, FIN-00880 Helsinki, Finland

<sup>4</sup>Max-Planck-Institute für Kernphysik (MPI-K), D-6900 Heidelberg, P.O. Box 103980, Germany

**Abstract.** In order to gain a more comprehensive picture on different mechanisms behind atmospheric particle formation, measurement results from QUEST 2-campaign are analyzed with an aid of an aerosol dynamic model. A special emphasis is laid on air ion and charged aerosol dynamics. Model simulations indicate that kinetic nucleation of ammonia and sulphuric acid together with condensation of sulphuric acid and low-volatile organic vapours onto clusters and particles explain basic features of particle formation events as well as ion characteristics. However, an observed excess of negative ions in the diameter range 1.5-3nm and overcharge of 3-5nm particles demonstrate that ions are also involved in particle formation. These observations can be explained by preferential condensation of sulphuric acid onto negatively charged clusters and particles and/or contribution of ion-induced nucleation on particle formation. According to model simulations, which assume that the nucleation rate is equal to the sulfuric acid collision rate, the relative contribution of ion-based particle formation seems to be smaller than kinetic nucleation of neutral clusters. Conducted model simulations also corroborate the recently-presented hypothesis according to which a large number of so-called thermodynamically stable clusters (TSCs) having a diameter between 1-3nm exist in the atmosphere. TSCs were found to grow to observable sizes only under favorable conditions, e.g. when the pre-existing particle concentration was low.

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