

Interactive comment on “An investigation of processes controlling the evolution of the boundary layer aerosol size distribution properties at the Swedish background station Aspövreten” by P. Tunved et al.

P. Tunved et al.

Received and published: 7 December 2004

Response to comments by Referee Markku Kulmala:

The referee acknowledges the usefulness of the paper and also concludes that the scientific ideas behind it are sound. However, an improvement of the English language is called for. The referee raises three questions besides the use of proper English. The replies to these are outlined below.

Comment #1: Pg 4510. On page 4510 it is stated that coagulation is important for

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particles smaller than 10 nm. The referee suggests that the greatest importance is for particles smaller than 3 nm. We agree on that and rewrite the sentence as below:

“For small particles at high number concentrations, especially below three nm, coagulation is a very fast process and as a consequence the time these small particles remain as individual particles in this size range is short. Nucleation events over the boreal forest are a transient phenomenon due to the short lifetime of the freshly formed particles.”

Following line,

“Condensation further grows these small particles into larger sizes.”
was omitted.

Comment #2: Pg 4524. The role of entrainment should be better explained:

Corresponding line was slightly rewritten as:

“It is however not possible to rule out the role of entrainment of air from the free troposphere, contributing to mixing situations concerning humidity and temperature favouring nucleation rate and extent (e.g. Nilsson et al., 2001a; Capaldo et al., 1999). Entrainment of air with low concentration from the free troposphere could also reduce the pre-existing aerosol surface in the boundary layer leading to conditions favouring nucleation.”

Comment #3: Pg 4526. How often is nearly always low surface concentration?

The use of word nearly always is not very scientific. In the revised copy line

“Evidence of recent nucleation is nearly always associated with a low-mass aerosol and corresponding low surface area”

was replaced by: “Size distribution clusters with indications of recent particle formation were associated with a low mass and surface concentration.”

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In the revised copy of the manuscript an additional change was implemented for sake of clarity: Pg 4522 l. 28: “Through continuous growth by condensation and coagulation, but more importantly through in-cloud process the distribution evolves to become cluster type F. If the cloud precipitates then to become a size distribution as defined by H.”

Was replaced by:

“Through continuous growth by condensation and coagulation into a size distribution represented by cluster F or by processing by clouds and wet deposition into a size distribution represented by H.”

In addition to these changes figure 10 was slightly modified to agree with the text.

In addressing the improvement of the English language many changes was included, mainly following the suggestions by Referee #2. These changes do not alter the content of the publication and are not outlined in detail. It is our wish that the manuscript at this revised stage uses proper English.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 4507, 2004.

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