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Charged and total particle formation and growth rates during EUCAARI 2007 campaign in Hyytiälä

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Abstract. Despite the fact that frequent aerosol formation has been observed in various locations in the atmosphere, the overall magnitude of the new particle formation as a particle source is still unclear. In order to understand the particle formation and growth processes, we investigate the magnitudes of the particle formation and growth rates at the size where the real atmospheric nucleation and activation occurs. The relative contribution of neutral and charged particles to the new particle formation rate is also studied. The data include particle and ion number size distributions and total particle concentration measurements at a boreal forest site in Hyytiälä, Finland, during the spring 2007 EUCAARI field campaign. The total and charged particle formation rates differed from each other by approximately an order of magnitude. The median formation rates of 2 nm total and charged particles were $0.65 \text{ cm}^{-3} \text{ s}^{-1}$ and $0.03 \text{ cm}^{-3} \text{ s}^{-1}$, respectively. The median growth rates of particles in size classes 1.3–3, 3–7 and 7–20 nm were 1.9, 3.6 and 4.2 nm h^{-1} , respectively. The calculated ion-ion recombination rates were about the same order of magnitude as the ion-induced formation rates. The results indicate that the ion-induced nucleation involving the ion-ion recombination products, i.e. ion mediated nucleation, contributes approximately 10% to the boreal forest new particle formation events.

[Final Revised Paper](#) (PDF, 821 KB) [Discussion Paper](#) (ACPD)

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