Supporting Information for

Opinion: Influence of mean free path of air on atmospheric particle growth

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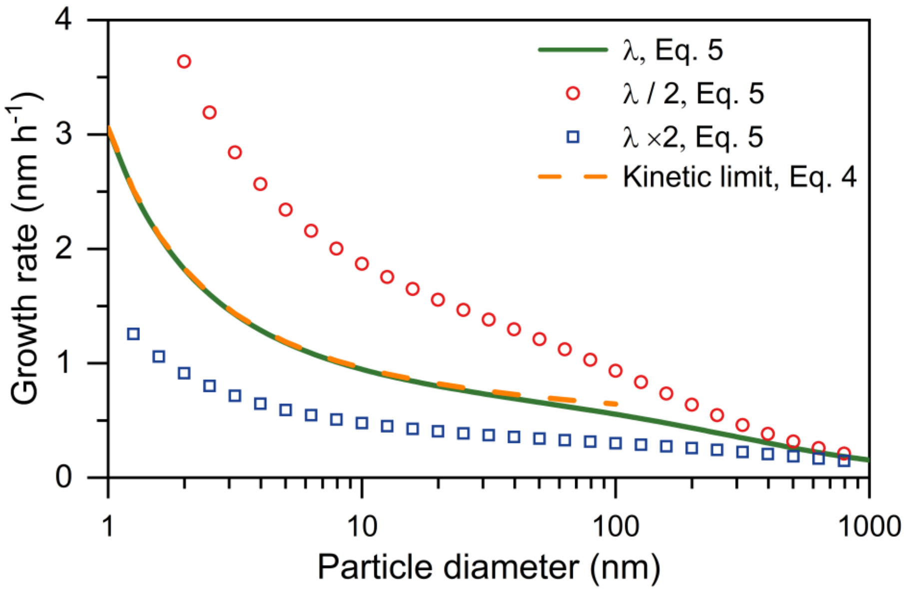

Figure S1: Theoretical influence of the effective mean free path on particle growth rate. The growth rate is calculated for the condensation of non-volatile sulfuric acid with a concentration of 10^7 cm^{-3}. The solid line indicates the growth rate corresponding to the effective mean free path (λ) for vapor and particle collision in Eq. 2. Open markers indicate the growth rates with λ values hypothetically multiplied and divided by a factor of 2. The dashed line indicates the growth rate calculated using Eq. 4 for collisions at the kinetic limit ($Kn \rightarrow \infty$).

Here we explore the sensitivity of particle growth rate to the value of λ, though we do not think updating the value of λ_{air} as discussed in the main text affects the value of λ. Taking the results for $\lambda/2$ as an example, a smaller λ corresponds to a smaller Kn (Eq. 3) and hence a larger β_m (Eq. 6). This increases the value of K calculated using Eq. 5 for collisions in the transition regime ($0.1 < Kn < 10$) and the kinetic regime ($Kn \geq 10$). However, this also leads to an inconsistency that Eq. 5 with halved (or doubled) λ does not converge to Eq. 4 at the kinetic limit. Similar to the discussion on the value of Cs in Eq. 10, this is because the parameters for β_m calculation is fitted with a predetermined λ, which is an effective value determined by the diffusion coefficients and thermal velocities of vapor and particle, whereas here we simply assume the fitted parameters and the properties of vapor and particle do not change as the value of λ changes.