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Atmos. Chem. Phys., 4, 1933-1943, 2004

www.atmos-chem-phys.net/4/1933/2004/

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Ion production rate in a boreal forest based on ion, particle and radiation measurements

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Abstract. In this study the ion production rates in a boreal forest were studied based on two different methods: 1) cluster ion and particle concentration measurements, 2) external radiation and radon concentration measurements. Both methods produced reasonable estimates for ion production rates. The average ion production rate calculated from aerosol particle size distribution and air ion mobility distribution measurements was 2.6 ion pairs $\text{cm}^{-3}\text{s}^{-1}$, and based on external radiation and radon measurements, 4.5 ion pairs $\text{cm}^{-3}\text{s}^{-1}$. The first method based on ion and particle measurements gave lower values for the ion production rates especially during the day. A possible reason for this is that particle measurements started only from 3nm, so the sink of small ions during the nucleation events was underestimated. It may also be possible that the hygroscopic growth factors of aerosol particles were underestimated. Another reason for the discrepancy is the nucleation mechanism itself. If the ions are somehow present in the nucleation process, there could have been an additional ion sink during the nucleation days.

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Citation: Laakso, L., Petäjä, T., Lehtinen, K. E. J., Kulmala, M., Paatero, J., Hörrak, U., Tammet, H., and Joutsensaari, J.: Ion production rate in a boreal forest based on ion, particle and radiation measurements, Atmos. Chem. Phys., 4, 1933-1943, 2004. [Bibtex](#) [EndNote](#) [Reference Manager](#)

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