



EUCAARI ion spectrometer measurements at 12 European sites – analysis of new particle formation events

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We present comprehensive results on continuous atmospheric cluster and particle measurements in the size range ~1–42 nm within the European Integrated project on Aerosol Cloud Climate and Air Quality interactions (EUCAARI) project. We focused on characterizing the spatial and temporal variation of new particle formation events and relevant particle formation parameters across Europe. Different types of air ion and cluster mobility spectrometers were deployed at 12 field sites across Europe from March 2008 to May 2009. The measurements were conducted in a wide variety of environments, including coastal and continental locations as well as sites at different altitudes (both in the boundary layer and the free troposphere). New particle formation events were detected at all of the 12 field sites during the year-long measurement period. From the data, nucleation and growth rates of newly formed particles were determined for each environment. In a case of parallel ion and neutral cluster measurements, we could also estimate the relative contribution of ion-induced and neutral nucleation to the total particle formation. The formation rates of charged particles at 2 nm accounted for 1–30% of the corresponding total particle formation rates. As a significant new result, we found out that the total particle formation rate varied much more between the different sites than the formation rate of charged particles. This work presents, so far, the most comprehensive effort to experimentally characterize nucleation and growth of atmospheric molecular clusters and nanoparticles at ground-based observation sites on a continental scale.

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