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## The contribution of sulphuric acid to atmospheric particle formation and growth: a comparison between boundary layers in Northern and Central Europe

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**Abstract.** Atmospheric gaseous sulphuric acid was measured and its influence on particle formation and growth was investigated building on aerosol data. The measurements were part of the EU-project QUEST and took place at two different measurement sites in Northern and Central Europe (Hyytiälä, Finland, March-April 2003 and Heidelberg, Germany, March-April 2004). From a comprehensive data set including sulphuric acid, particle number size distributions and meteorological data, particle growth rates, particle formation rates and source rates of condensable vapors were inferred. Growth rates were determined in two different ways, from particle size distributions as well as from a so-called timeshift analysis. Moreover, correlations between sulphuric acid and particle number concentration between 3 and 6 nm were examined and the influence of air masses of different origin was investigated. Measured maximum concentrations of sulphuric acid were in the range from  $1 \times 10^6$  to  $16 \times 10^6 \text{ cm}^{-3}$ . The gaseous sulphuric acid lifetime with respect to condensation on aerosol particles ranged from 2 to 33 min in Hyytiälä and from 0.5 to 8 min in Heidelberg. Most calculated values (growth rates, formation rates, vapor source rates) were considerably higher in Central Europe (Heidelberg), due to the more polluted air and higher preexistent aerosol concentrations. Close correlations between  $\text{H}_2\text{SO}_4$  and nucleation mode particles (size range: 3-6 nm) were found on most days at both sites. The percentage contribution of sulphuric acid to particle growth was below 10% at both places and to initial growth below 20%. An air mass analysis indicated that at Heidelberg new particles were formed predominantly in air advected from southwesterly directions.

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