ABSTRACT:

This study is dedicated to the study of nucleation of sulphuric acid and water, which presents the key process associated with secondary aerosol formation via gas to particle conversion. We investigated the nucleation rates, new aerosol particles formation and growth dynamics of newly nucleated particles. These processes were explored in both laboratory and field experiments.

In the laboratory measurements, we explored the H_2SO_4 – H_2O nucleation rates and growth rates of newly formed particles under well-defined conditions and we also investigated the effect of experimental conditions on particle growth dynamics. Furthermore, we proposed a model, which predicts the particle growth and accounts for condensation of H_2SO_4, H_2O and NH_3. The comparison of experimental growth rates with atmospheric ones was made and resulting implications of the chemical nature of compounds involved in the early growth of nucleated particles is also presented.

To investigate the atmospheric H_2SO_4 – H_2O nucleation and new particle formation, we analysed a two-year long dataset of particle number size distributions, obtained from a urban background station in Prague Suchdol. A special attention was given to a recently reported special feature of particle growth dynamics - a particle shrinkage following previous new particle formation. We determined the basic characteristics of observed new particle formation and particle shrinkage events and their seasonal variability was investigated as well. We also focused on the analysis of the meteorological and atmospheric conditions favouring the particle shrinkage.