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Meteorology and ultrafine aerosols, an airborne study

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The horizontal and vertical distribution of aerosols in the lower troposphere and planetary boundary layer is affected by efficient transport and mixing processes. For example aerosol transport can be followed over several hundred km with small airborne platforms in case of well defined aerosol sources which increase the particle number concentrations significantly above typical background values. Such 'plume' studies also allow compare with and to investigate the spatial and temporal patterns of particle number and size distributions as observed from ground based field studies.
Airborne measurements using ultralight aircraft were performed all over Germany covering in situ fine and ultrafine particle size distributions and (micro)meteorological data. Based on in situ data and additional HYSPLIT backtrajectories major individual particle sources were identified and quantified and their impact on rural and urban environments on a regional scale downwind studied. The results are well in agreement with recent observations of aerosol spatial, temporal and size distributions in the ultrafine size spectrum and confirm the dominant role of meteorological processes on aerosols not only in the lower troposphere but also for ground level investigations.