



Secondary Aerosol Formation in the planetary boundary layer observed by aerosol mass spectrometry on a Zeppelin NT

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The airship Zeppelin NT is an airborne platform capable of flying at low speed throughout the entire planetary boundary layer (PBL). In combination with the high scientific payload of more than 1 ton, the Zeppelin is an ideal platform to study regional processes in the lowest layers of the atmosphere with high spatial resolution.

Atmospheric aerosol as a medium long lived tracer substance is of particular interest due to its influence on the global radiation budget. Due its lifetime of up to several days secondary aerosol at a certain location can result from local production or from transport processes.

For aerosol measurements on a Zeppelin, a High-Resolution Time-of-Flight Aerosol Mass spectrometer (DeCarlo et al, 2006) was adapted to the requirements posed by an airborne platform. A weight reduction of over 20 % compared to the commercial instrument was achieved, while space occupation and footprint were each reduced by over 25 %. Within the PEGASOS project, the instrument was part of 10 measurement flight days over the course of seven weeks. Three flights were starting from Rotterdam, NL, seven flights were starting from Ozzano in the Po Valley, IT.

Flight patterns included vertical profiles to study the dynamics of the PBL and cross sections through regions of interest to shed light on local production and transport processes. Analysis of data from transects between the Apennin and San Pietro Capofiume in terms of “residence time of air masses in the Po valley” indicates that aerosol nitrate has only local sources while aerosol sulfate is dominated by transport. The organic aerosol component has significant contributions of both processes. The local production yields are commensurable with inultaneously observed precursor concentrations and oxidant levels.

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DeCarlo, P.F. et al (2006), *Anal. Chem.*, 78, 8281-8289.