

# Aerosol Process Modelling at the AIDA Chamber

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This contribution presents status and perspective of the process models MAID/NACHE and COSIMA for AIDA ice nucleation and SOA chemistry experiments as well as first steps to simulate AIDA thermodynamic conditions and the flow field using fluid dynamics (CFD).

The modelling activities with MAID/NACHE at IMK aim at testing and improving available parameterizations for homogeneous and heterogeneous ice nucleation. Ice nucleation parameterizations can be evaluated by comparing process model output and experimental findings from AIDA chamber ice nucleation experiments. For this purpose a large data set of ice nucleation experiments with different kind of aerosol covering a broad temperature range is available. The model MAID includes a full description of size-bin resolved aerosol physics, gas-particle interactions, and thermodynamics of cloud expansion experiments. Available formulations of CCN and IN activation are included. The model was adapted (version NACHE) to investigate, on the basis of field observations, the impact of ice nucleation processes on the dynamic water partitioning and supersaturation in cirrus cloud life cycles.

First steps to simulate the thermodynamic conditions and the flow field in the aerosol and cloud chamber AIDA by a commercial fluid dynamics code (CFD) have been done. The flow field is driven by natural convection and mixing by a fan which is located in the lower part of the chamber. Strongly correlated with this flow field is the mass transport of water vapour from the ice covered chamber wall. It is planned to check whether the fluid dynamics code is suitable to simulate the flow field inside the chamber during AIDA expansion experiments with suitable measurements. Based on the results of these studies it will be considered to couple the aerosol model MAID/NACHE to the CFD model.

The aerosol behaviour code COSIMA, originally developed to simulate the time evolution of structure, dynamics, optics and heterogeneous chemistry of fractal like agglomerate particles has been supplemented by a module treating the formation and dynamics of secondary organic aerosol. While pure SOA particles are believed to be compact spheres, the fractal approach is required to account for the restructuring of agglomerates induced by coating with low volatile organic material. The extended COSIMA code enabled us to perform a detailed analysis and comprehensive interpretation of the experimental results obtained during three extensive SOA campaigns conducted at the AIDA facility in 2003, 2005, and 2006 in collaboration with several external partners. Currently it is further developed to account for the effects of OH induced ageing of SOA as studied in the MUCHACHAS campaigns conducted at AIDA, PSI, and soon at SAPHIR.

We present and discuss selected model – experiment comparisons.