



## Externally mixed aerosol : simulation of ice nucleation in a parcel model

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The effect of different aerosol (mineral dust, bacteria and soot) acting as immersion ice nuclei is investigated using ACPIM (AerosolCloud Precipitation Interaction Model) [1]. ACPIM is a powerful tool which can be used in two different ways. This box model can be, either, driven by experimental data (experiments carried out at the AIDA cloud chamber facility) or used as an air parcel in order to examine different ice nucleation parameterizations under specific conditions. This adiabatic air parcel model was employed for the simulation of a convective cloud. The study consists here in the investigation of how two externally mixed aerosols interact with one another. The initial study concentrates on mineral dust aerosol and biological aerosol without any background in order to fully understand the interaction between the different types of aerosol. Immersion freezing is described for the mineral dust aerosol by Niemand *et al.*'s parameterization [2], which was derived from laboratory studies in AIDA and is an extension of surface site density approach suggested by Connolly *et al.* [1]. Regarding bioaerosol, we introduce Hummel *et al.*'s parameterization [3] :

$$f_{(in)} = f_{(max)} (1 - \exp(-Ap * n_{(s)}(T)))$$

With an empirically fitted ice nucleation active site density  $n_s$  based on AIDA measurements of *Pseudomonas syringae* bacteria [4]. This initial study is conducted for different proportion of each aerosol (the total number of aerosol being constant throughout all the simulation runs) at different vertical velocities. We then extended this study with different backgrounds (urban, marine, rural) in order to get a full picture. We found that there is not only a CCN competition but an IN competition as well.

References :

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- [3] Hummel, M. et al., In preparation, (2014).
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