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Laboratory experiments on pine pollen and their abilities to nucleate ice

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Only recently Pratt et al. (2009) have revealed by field measurements with an aerosol mass spectrometer that an amount of 33% of the matter in upper tropospheric aerosols consists of biological materials. In contrast to inorganic compounds the properties of the biological materials have not yet been investigated to the same extent.
As commonly known, aerosols act as cloud nuclei and so affect the climate indirectly. The IPCC report 2007 presented the impact of the aerosol and cloud interaction as the largest uncertainty in Earth's radiation balance. Therefore, the necessity to investigate biologic material comes into play to improve the knowledge of all influencing factors.
Pine pollen has been used in this investigation because of various advantages: On one hand, the pine tree is one of the most common species in northern hemisphere and therefore its pollen should be available in a sufficient amount in the troposphere. On the other hand, pollen has a diverse surface structure that might act as good ice nuclei.
The interaction with oxidizing trace gases in the troposphere might lead to a different surface chemistry and thus to better nucleation properties. Nitric oxides are among the most reactive species in the atmosphere. Hence, in our laboratory experiments some pollen samples were treated with NO_2. Finally, those two kinds of pine pollen were investigated by spectroscopic methods and changes in morphology were observed by SEM. The used spectroscopic methods were FTIR (ATR and DRIFTS mode) and Raman Spectroscopy.