Outgassing of CO_2 /H_20-ice mixtures through dust layers - an experimental approach

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To model the activity of comets, it is important to understand the gas transport mechanisms and the evolution of the subsurface ices. In the scope of the Rosetta mission, the ices of volatiles and super-volatiles, like H_2O, CO_2, CO, were identified as the main drivers of activity, whereas the dust consist of several organic components and minerals. However, details of how the sublimation process of the ices leads to dust ejection are still poorly understood.

While numerical simulations provide a tool to study the mechanisms capable of explaining cometary activity, their outcome is subject to assumptions of the gas transport processes and of the distribution of the volatile ices in the sub-surface layers. With this work, we intend to confine the multiplicity of gas transport mechanisms used in numerical simulations, by quantifying the gas flux and gas production of granular CO_2 and H_2O ice-dust samples for different temperatures and mixing ratios.

The experimental setup comprises a nitrogen-cooled and temperature-regulated cylindrical sample holder of 2 cm diameter. Above the sample surface, a a mass spectrometer allows us to identify the outgassing rate of the investigated samples and the simultaneous detection of different gas species. By testing several model approaches for their temperature dependency of the outgassing rate, we investigated the gas transport mechanism in dust-ice mixtures. In the presentation, we will provide a comprehensive collection of volatile and material dependent formalisms relevant for cometary outgassing simulations.