



Detailed ice studies under atmospheric conditions – potential and inherent limitations of the molecular beam method

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Molecular beam techniques are traditionally applied under high vacuum to obtain detailed information about gas-surface interactions and to probe surface properties. We here evaluate the potential and limitations for molecular beam studies of ice surfaces at elevated pressures using direct simulation Monte Carlo (DSMC) calculations. Simplified experimental setups are treated and the results demonstrate that well-defined experiments are feasible at pressures up to 10⁻² mbar. This will allow for molecular level studies of water ice surfaces at temperatures up to 230 K, which corresponds to an altitude of about 8 km in the atmosphere. The method may provide detailed information about the reaction dynamics of gas-surface interactions at the level of single collisions, and it may thus significantly improve our fundamental understanding of aerosol and cloud processes in the upper troposphere.