



## Metastable Phases in Ice Clouds

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Polar Stratospheric Clouds and Cirrus Clouds contain both, pure water ice and phases of nitric acid hydrates. Preferentially for the latter, the thermodynamically stable phases have intensively been investigated in the past (e.g. nitric acid trihydrate, beta-NAT). As shown by Peter et al. [1] the water activity inside clouds is higher than expected, which might be explained by the presence of metastable stable phases (e.g. cubic ice). However, also metastable nitric acid hydrates might be important due to the inherent non-equilibrium freezing conditions in the upper atmosphere. The delta ice theory of Gao et al. [2] presents a model approach to solve this problem by involving both metastable ice and NAT as well. So it is of high interest to investigate the metastable phase of NAT (i.e. alpha-NAT), the structure of which was unknown up to the present.

In our laboratory a production procedure for metastable alpha-NAT has been developed, which gives access to neutron diffraction and X-ray diffraction measurements, where sample quantities of several Gramm are required. The diffraction techniques were used to solve the unknown crystalline structure of metastable alpha-NAT, which in turn allows the calculation of the vibrational spectra, which have also been recorded by us in the past.

### References

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