



Raman tomography of natural air hydrates

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Ice cores are the only climate archives incorporating paleo-atmosphere as individual gas inclusions, enabling the extraction and analysis of the contained gasses. A firm understanding of the processes involved is mandatory for a reliable interpretation of the gas records. One prominent process is the transition from air bubbles to crystalline air hydrates, which is known to influence, at least temporarily, the gas mixing ratios by diffusion and fractionation. This transition is still not understood completely and the existing theories do not explain the large diversity of observed hydrate morphologies.

Raman tomographic measurements using the AWI cryo-Raman system provide 3D reconstructions of air hydrate morphologies. The results show complex growth structures that emphasize the importance of crystallography, microstructure and ice rheology for the hydrate formation process. Accurate hydrate volumes can be calculated from the 3D objects, improving the estimates of total gas contents.