



## **Stability of clathrate hydrates and gas transport in the Martian subsurface**

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Current conditions in the Martian crust are favourable to the presence of clathrate hydrates, crystalline compounds constituted by cages formed by hydrogen-bonded water molecules inside of which guest gas molecules are trapped. In this study, we focused on the stability of methane and carbon dioxide clathrates in the Martian subsurface. We coupled the stability conditions of clathrates with a 1D thermal model in order to obtain the variations of the hydrate stability zone within the Martian crust as a function of time. Our 1D thermal model includes the diffusion of water vapor through porous regolith. The mass conservation equation takes into account the different phases of water: vapor, ice or adsorbed H<sub>2</sub>O. The flow is calculated by combining the advective flow, due to pressure gradients and given by Darcy's law, and the Fickian diffusion due to density gradients of water vapor. Finally, we considered the diffusion of methane through the crust from the place where clathrates are dissociated into the atmosphere.