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Interpretation of MSL REMS data using 1D coupled heat and water vapor transport model of Mars subsurface

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MSL Rover Environmental Monitoring Station (REMS) performed high-resolution measurements of temperature and relative humidity during more than one Martian year. In this work, a 1D subsurface model is used to study water vapor exchange between the atmosphere and the subsurface at Gale crater using REMS data.
The thermal model used includes several layers of varying thickness with depth and properties that can be changed to correspond to those of Martian rocks at locations studied. It also includes the transport of water vapor through porous Martian regolith and the different phases considered are vapor, ice and adsorbed H_2O. The total mass flux is given by the sum of diffusive and advective transport. The role of an adsorbing regolith on water transfer as well as the range of parameters with significant effect on water transport in Martian conditions are investigated. In addition, kinetics of the adsorption process is considered to examine its influence on the water vapor exchange between the subsurface and the atmosphere.