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MICROGRAVITY EXPERIMENTS ON THERMAL CREEP IN MARTIAN SOIL

Abstract

At the low ambient pressure at the Martian surface, thermal gradients drive sub-soil gas flows. This thermal creep can generate overpressure supporting dust lifting or provide directed gas transport from and to the atmosphere. As the Martian soil is complex, the resulting gas flow might depend on a number of details with respect to pore space, gas-species, ambient pressure and temperature distribution.

In a number of parabolic flights, drop tower experiments and in laboratory work we studied thermal creep for different settings including variations of gas, grain size and pressure. We developed an analytical model for the granular bed which describes the gas flow very well. Including CO_2 this model allows quantitative calculations of the gas flow within the Martian soil in the future by applying a network of Knudsen pumps.