



Cryobrines on Mars: latitudinal distribution and enhancement through premelting

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Using results from numerical models for the variation of atmospheric parameters on Mars we determine the geographic location of stable liquid brines throughout the seasonal and diurnal cycles. Several salts that are expected to be present on Mars are shown to exhibit deliquescence on the Martian surface at certain times of day in certain seasons. The most favorable conditions for liquefaction occur at high latitudes in the spring time with a preference for morning and evening hours. The latter is a consequence of competing conditions that promote deliquescence: high humidity (occurring during nighttime) and high temperatures (occurring during daytime). We discuss how premelting phenomena could significantly extend the range of stability of liquid brines resulting from salts that are located not on the surface but in the upper subsurface of Mars. Premelting occurs at interfaces between soil particles and interstitial ice where forces that depend on material properties and on surface charge can impose a disjoining pressure. The result is a local freezing point reduction leading to a liquid film at temperatures well below the bulk freezing point. Premelting induced enhancement of liquid brines in the upper subsurface is of particular interest for the question of habitability as it adds to other factors like shielding from radiation and extreme temperature variations which make the Martian regolith less hostile to life than the immediate surface.

References: D. T. F. Möhlmann, *Icarus* **214**, 236 (2011); H. Hansen-Goos and J. S. Wettlaufer, *Phys. Rev. E* **81**, 031604 (2010).