

Evidence for deliquescence and liquid water on Mars

Nilton O. Renno and Manish Mehta

Department of Atmospheric, Oceanic and Space Sciences, University of Michigan, Ann Arbor, MI, USA

contact e-mail: nrenno@umich.edu

The water vapor pressure at the triple point of water is below the atmospheric pressure on the lowest regions of Mars, but the low surface temperature and dry atmosphere inhibits the presence of pure liquid water on them. However, liquid water can exist as brines because salts can lower the freezing temperature to Mars like temperatures. The lowest temperature at which brines freeze, known as their eutectic temperature, can be lower than 200 K for single salts found on Mars, and mixtures of different salts can have even lower eutectic temperatures. In addition, salts absorb water from the air and melt into a liquid solution (deliquesce) when the relative humidity over them is above threshold values that can be lower than a tenth of the saturation value over pure water. Here we show physical, thermodynamical, photometric and spectral evidence that liquid saline water or brines exists on Mars. This has important implications for the search for extraterrestrial life because a diverse array of terrestrial microorganisms thrives in brines.