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Liquid-like water in the upper surface of Mars – presence and properties

D. Möhlmann

DLR Institut für Planetenforschung, Rutherfordstr. 2, D-12489 Berlin, Germany
(dirk.moehlmann@dlr.de)

Liquid layers of water can via adsorption develop on grain and mineral surfaces at and in the surface of Mars. The upper parts of these layers will freeze at temperatures clearly below the freezing point of bulk water (freezing point depression). This will be modeled in terms of a sandwich structure with layers of ice (top), liquid water (in between) and mineral surface (bottom) can evolve. Thickness (or number of mono-layers) of the liquid water layer and the related content of liquid-like water in dependence on the diurnal temperature variations, the freezing point depression temperatures of the unfrozen water, and the related equilibrium content of liquid water in surface soil are derived on the basis of this “sandwich model” with van der Waals interactions between the mineral-substrate and the ice layer. These results are discussed with respect to the mid- and low-latitudinal surface and shallow subsurface of Mars.