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LETTER

Meridianiite: A new mineral species observed on Earth and predicted to exist on Mars

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ABSTRACT

Meridianiite, $MgSO_4 \cdot 11H_2O$, was recently discovered on the surface of a frozen pond in central British Columbia, Canada. Meridianiite is stable below 2 °C. Above 2 °C, it melts incongruently to a slurry of epsomite ($MgSO_4 \cdot 7H_2O$) and water. Magnesium sulfate minerals are thought to exist in the soils at Gusev crater and elsewhere on the Martian surface. These minerals can form by precipitation from a saturated solution or through evaporation of a brine solution at or below the surface. Meridianiite, instead of epsomite, is the expected magnesium sulfate phase in equilibrium with saturated brines below 2 °C on or below the Martian surface. It is expected to be the magnesium sulfate mineral in equilibrium with ice in the Martian polar ice caps. Meridianiite, if exposed to low humidity conditions in equatorial regions of Mars, would ultimately dehydrate to a fine dust of kieserite ($MgSO_4 \cdot H_2O$) that could be dispersed by wind across the Martian surface. The name, meridianiite, was chosen to reflect the locality on Mars where the MER rover Opportunity observed crystal molds in sedimentary rock that are thought to be caused by minerals that have since dehydrated or dissolved.

Keywords: Mars, epsomite, new mineral, sulfate, hydrated magnesium sulfate, meridianiite, kieserite