

WHAT LURKS IN THE MARTIAN ROCKS AND SOIL? INVESTIGATIONS OF SULFATES, PHOSPHATES, AND PERCHLORATES
Sulfate-bearing deposits at Dalangtan Playa and their implication for the formation and preservation of martian salts†

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ABSTRACT

The sulfate-bearing strata on Mars must have recorded rich information of its aqueous history. However, the hydrated sulfates observed in the surface thin layer by remote sensing, especially widespread kieserite, are likely weathering products rather than pristine deposits. Here we report the results from mineralogical investigations and environmental monitoring on the sulfate-bearing Dalangtan Playa (an analog site with Mars-like environmental conditions in northern Tibetan Plateau) to examine the depositional and secondary processes of hydrated sulfates. The regional deposition characters of DLT Playa were described based on our mineralogical results. Widespread kieserite was identified in situ by portable laser Raman spectrometer on the weathered surface of the Mg-sulfates-rich section, which formed from the hexahydrite dehydration after exposed to the ambient conditions in six months covering the summer, and survived in the winter. During summer days, wind and sunlight may have facilitated the dehydration process, leading the formation of kieserite from dehydration. On the basis of the observed kieserite formation, the recorded local environment conditions, as well as previously reported phase diagrams for Mg-sulfates, we suggest that the current diurnal relative humidity-temperature circles at low latitudes of Mars favor the formation of kieserite through secondary processes.

Keywords: Mars analogs, Tibetan Plateau, DLT Playa, sulfates deposits, martian kieserite