

ASTROPHYSICS SEMINAR SERIES



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Was ancient Mars warm and wet or cold and icy? Mineral signatures of climate in rover, orbiter, and terrestrial analog studies

Abundant valley networks and thick sequences of lake deposits dating from billions of years ago on Mars are clear evidence that liquid water was once abundant on the surface, but whether the climate was warm and wet or cold and icy is poorly understood. This problem has major implications for the types of environments that may have hosted life on ancient Mars. Here we take a new approach to this problem, by using the mineralogical record of ancient Mars to constrain the climate. Chemical reactions to form minerals are sensitive to temperature and rates of weathering, both of which are strongly influenced by climate. Using samples from terrestrial analog sites, we have shown that cold climates produce distinctly different mineral assemblages than warm climates. The mineral record of ancient Mars includes a wide array of minerals, but cannot be explained without one or more long term warm climatic optimums. The Mars 2020 rover will investigate lake deposits dating from one of these climatic optimums, and search for signs of ancient microbial life.



PHYSICS