

Geologic History of Water On Mars

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New data from spacecraft currently operating both on the surface and in orbit are revealing a very rich and complex history of water on Mars. Morphologic and remote sensing evidence from these missions indicates that volcanic, fluvial, lacustrine, glacial and aeolian processes have operated throughout Martian geologic time. However, the intensity of these processes appears to have decreased with time. Nevertheless, the most recent lava flows, channels and gullies are dated, by crater size-frequency relationships, to be between 1-20 million years old. From orbit numerous deltas and alluvial fan complexes have been located at the mouths of channels. Evidence of persistent flow, multiple flow events, and long term paleoenvironmental change are found in the observations of terraces, meanders, braided channels, degree of highlands dissection, and inverted channels.

The Mars Exploration Rover Missions (Spirit and Opportunity) have been analyzing Gusev crater and Meridiani Planum since January 2004. The discovery and analysis of bedrock outcrops by the Opportunity Rover in Meridiani Planum has revealed that liquid water played a major role in the formation and alteration of this sedimentary rock unit. This sulphate rich rock is composed of numerous thinly laminated layers (several mm thick) with small hematitic spherules (up to 6 mm diameter) randomly scattered throughout the rock. Numerous sedimentary bedforms and structures also reveal that water played a major role in its deposition. To date no conclusive evidence has been found regarding a past lacustrine history of Gusev crater. To date groundwater appears to have been the dominant type of aqueous activity in Gusev crater.

Current results from the Mars Exploration Rovers, Mars Global Surveyor, and Mars Odyssey missions will be reported on in this presentation.