

## Sedimentary structures as indicators of flowing wind and water in Gale crater, Mars

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### Abstract

Gale crater was selected as the Mars Science Laboratory landing site largely because remote images suggested the crater contains a 5 km (or thicker) sequence of sedimentary rocks. The rover, *Curiosity*, has identified deposits of aeolian, fluvial, and lacustrine environments. We review these deposits and the flows that produced them.

## 1. Discussion

### 1.1 Aeolian deposits

Aeolian deposits examined by *Curiosity* include both unconsolidated sediment and lithified rocks. Unconsolidated aeolian sands (Figure 1) were examined in a sand shadow at Rocknest [1] and the Dingo Gap dune. The field of dunes between the rover and Mt. Sharp also provides information about winds in the crater.

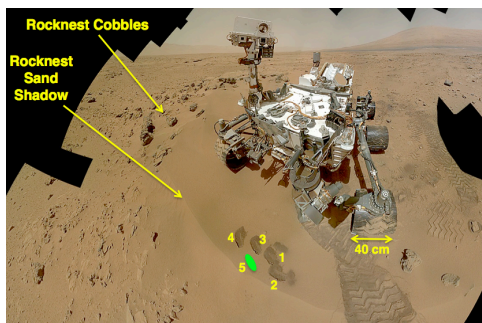


Figure 1: Rocknest sand shadow (sand deposited in the weaker winds behind rock obstacles).

Lithified aeolian deposits include sandstones with pinstripe laminae deposited by migrating wind ripples. On its route to Mt. Sharp, it is likely that the rover will pass near “washboard” deposits that have previously been interpreted as lithified eolian dunes.

### 1.2 Fluvial deposits

Fluvial deposits examined by *Curiosity* include both conglomerates and sandstones. The conglomerates have textures of fluvial conglomerates and contain rounded pebbles indicating substantial abrasion [2]. The fluvial sandstones are cross-bedded (Fig. 2) — including compound cross-bedding— with dip directions indicating transport generally toward the southeast (toward Mt. Sharp). Fractures interpreted to be desiccation cracks and interbedded eolian (pinstriped) sandstones suggest that fluvial activity alternated with dry, windy, periods.



Figure 2: Cross-stratified sandstone and conglomerate observed by *Curiosity* at Shaler outcrop (sol 319). Cross-beds dip toward the south and east, with subsets of cross-beds deposited by smaller superimposed bedforms migrating to a wider range of directions.

### **1.3 Lacustrine deposits**

*Curiosity* also examined deposits interpreted as distal fluvial or lacustrine mudstones, with chemistry suitable for a habitable environment [3].

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### **References**

- [1] Blake, D., and others: Curiosity at Gale crater, Mars: characterization and analysis of the Rocknest sand shadow, *Science*, v. 341, DOI: 10.1126/science.1239505, 2013.
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- [3] Grotzinger, J., and others: A habitable fluvial-lacustrine environment at Yellowknife Bay, Gale crater, Mars, *Science*, 24 January 2014: 343 (6169), 1242777.