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Pervasive aeolian activity along rover Curiosity's traverse in Gale Crater, Mars

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Abstract

The NASA Mars Science Laboratory (MSL) rover, Curiosity, has safely landed near a 35-km-long dark dune field in Gale Crater on Mars. This dune field crosses the landing site from the northeast to the southwest and lies along Curiosity's traverse to Aeolis Mons. Here we present the first evidence of recent aeolian activity in the form of ripple and dune migration, and further estimate wind directions within the dune field through analysis of ripple and dune morphologies and the Mars Regional Atmospheric Modeling System (MRAMS). We measured a minimum ripple migration rate of 0.66 m per Earth year, and dune migration rate of 0.4 m per Earth year, in the southwest portion of the field. A strongly bidirectional ripple crestline orientation, nearly orthogonal dune slipfaces, and linear seif or oblique dunes indicate a bidirectional wind regime with winds mainly coming from the ENE and from the northwest; however, MRAMS results indicate primary winds from the ENE. Our constraints on the wind regime provide the unique opportunity to use ground measurements from MSL to test the accuracy of winds predicted from orbital data.

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