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Extracts from the "Dust in the Atmosphere of Mars" workshop related to weather forecasting

The Dust in the Atmosphere of Mars and Its Impact on the Human Exploration of Mars: A NESC Workshop

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Findings

F-5. Landing and crewed surface exploration and operations on Mars require improved and more accurate forecasting of Mars dust storms, a capability that needs to be developed. *(Panel 1; Panel 3)*

Observations

O-5. There is insufficient knowledge of the causes and modes of formation, propagation, integration, and duration of dust events to forecast their occurrence effectively. Dust storm forecasting on seasonal time scales seems to work fairly well, at least on global or synoptic scales. However, the capability for shorter-term forecasting on local scales in the lower atmosphere appears to be non-existent. Dust storm forecasting capabilities need to be improved to allow for advance notice on the order of days to weeks, depending on the application (e.g., for Entry, Descent, and Landing or Mars ascent it would be necessary to have at least short-term forecasting, longer-term forecasting would be needed for planning EVAs, especially if the rover were solar powered). Having advance warning of dust events may be critical to safeguarding systems, supplies, and resources at the habitation complex. *(F-5)*

NESC recommendations

R-7. **(priority: HIGH)** A high-quality meteorological station on the surface is recommended, potentially at the actual human landing site. This should be in place >5 years before the human landing to allow for data collection and analysis. The lander should monitor the dust conditions near the surface, and be instrumented to make mineralogical and chemical measurements, including spectroscopic analysis, of atmospheric dust grains on the surface. An areostationary satellite for atmospheric monitoring would also be desirable for local weather prediction at the human landing site. *(F-5, F-6; O-5, O-6)*