

Greeley et al. (2006) revisited: the size distribution and frequency of dust devils at the Gale crater

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Many dust devils have been observed by the Pathfinder, the Spirit rover, and the Phoenix lander. The most useful statistical summary of dust devils is found in the two papers by R. Greeley and co-authors (Greeley et al., 2006; 2010). They detected visually dust devils, counted the number of the dust devils, and measured their size, lifetime, and speed. The distributions of the diameter, speed and local time, and the seasonal variation of the dust devil frequency they reported are quality statistical information describing properties of Martian dust devils near the Spirit site because of the large number of dust devils visually detected. They showed that dust devils tended to occur in the early afternoon in the southern summer season and peaked the frequency around the southern summer solstice. This can be explained by the diurnal and seasonal variations in the thickness of the boundary layer (Rennó et al., 1998)

On the other hand, there may be atmospheric phenomena that change the thickness of the boundary layer and the stability. Stationary and traveling waves in low latitudes may modify the atmospheric conditions regarding dust devil occurrences although amplitudes of the diurnal and seasonal variations are larger than those of such waves. If the atmospheric waves can modify the conditions of dust devil occurrences significantly, we can find the correlation between the phase of the waves around the Spirit rover and dust devils frequency observed by the Spirit/Navcam. However, Greeley et al. (2006; 2010) neither reported the number of dust devils observed on each sol nor listed time stamps of each observed dust devil. The correlation between the atmospheric waves and dust devil frequency cannot be investigated only based on information they showed in their paper. Therefore, we again detect dust devils from images the Spirit took, estimate the diameter of the dust devils and record the time of the occurrences.

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