

# When to Watch for Martian Dust Devils

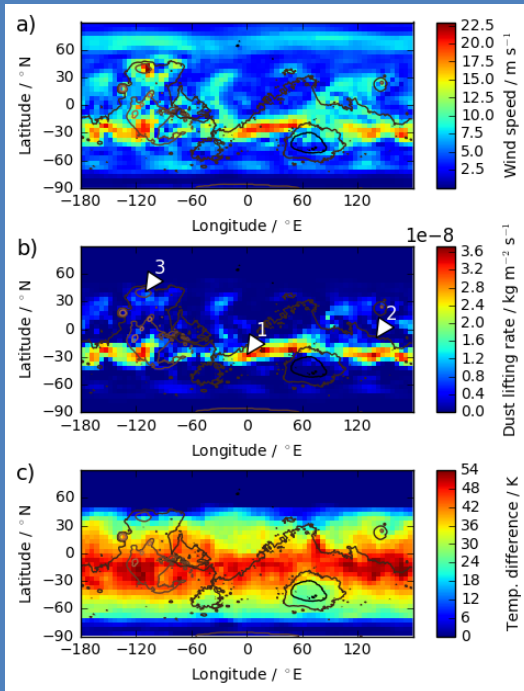


Figure 1: Global map of **a)** near-surface wind speeds, **b)** dust devil lifting and **c)** surface-to-atmosphere temperature difference. Data is displayed at local time 1300, averaged over  $L_S = 240-270^\circ$ . Dust devil lifting occurs across 'permitted' envelope represented by *temperature difference*  $> 0$ , but at locations governed by wind speeds [compare lifting at locations in panel **b)**]. See paper for full details.

- Dust devils are near-surface atmospheric vortices made visible by the particles they lift from the ground and entrain in a vertical, upwardly-spiraling column of air.
- Martian dust devils are expected to be most active in the afternoon, based upon the maximum thermal contrast at the planet's surface and on observations of terrestrial dust devils.
- We tested the diurnal variability of Martian dust devils using a Mars Global Circulation Model (MGCM). The dust devil subroutine in our model is common across many MGCMs.
- Our model produces an unanticipated level of dust devil activity during *morning hours*, with many locations experiencing a peak in dust devil activity before mid-sol.
- We show that the diurnal *variability* of modelled dust devil activity is governed by local wind speeds, rather than solely by the surface-to-atmosphere thermal contrast. Higher wind speeds result in higher levels of dust devil activity (Figure 1).
- We propose that the description of dust devil behaviour on Mars is incomplete, and that theories of dust devil formation may need to be tailored for the Martian environment.