An Important Dust Storm Track in the Southern Hemisphere of Mars

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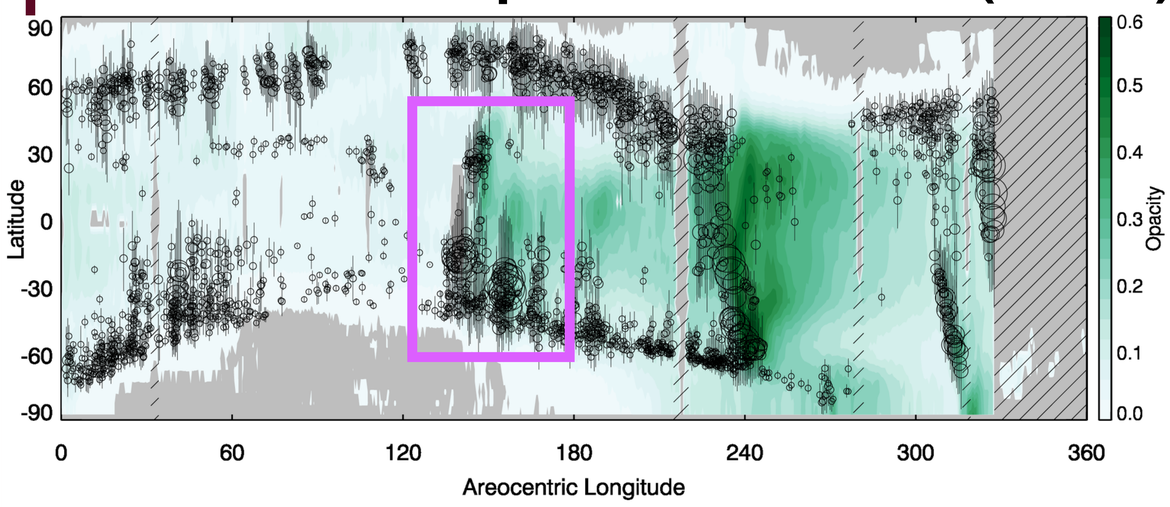
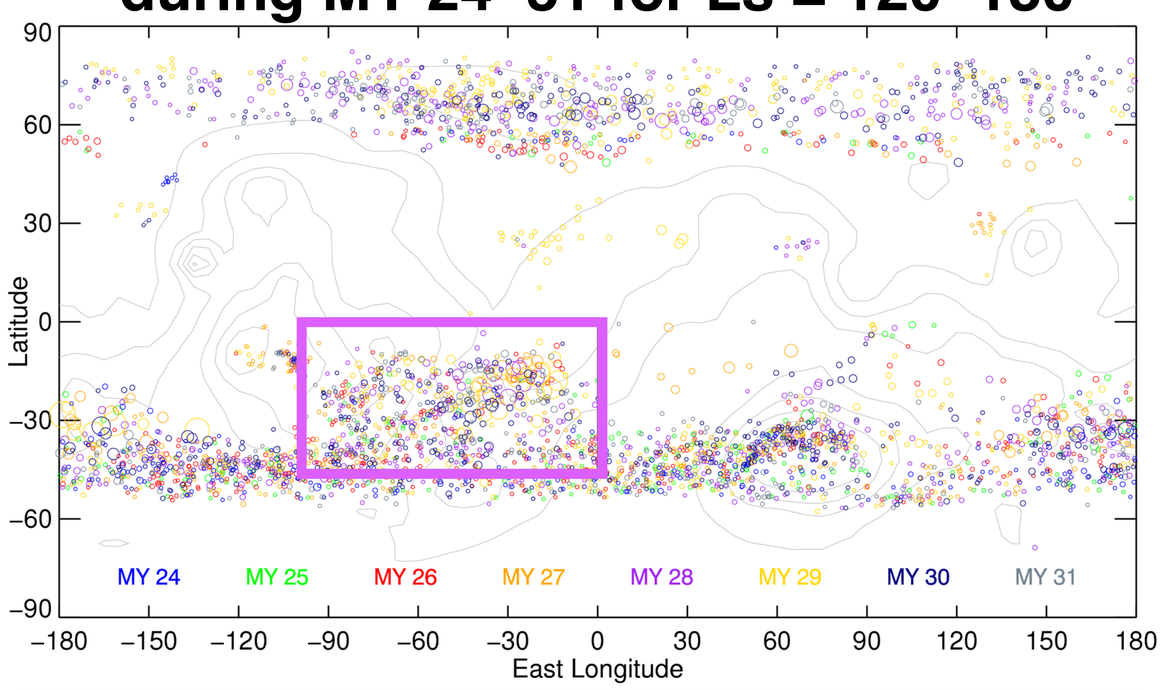
1 Dust Storm Temporal Distribution (MY 29)



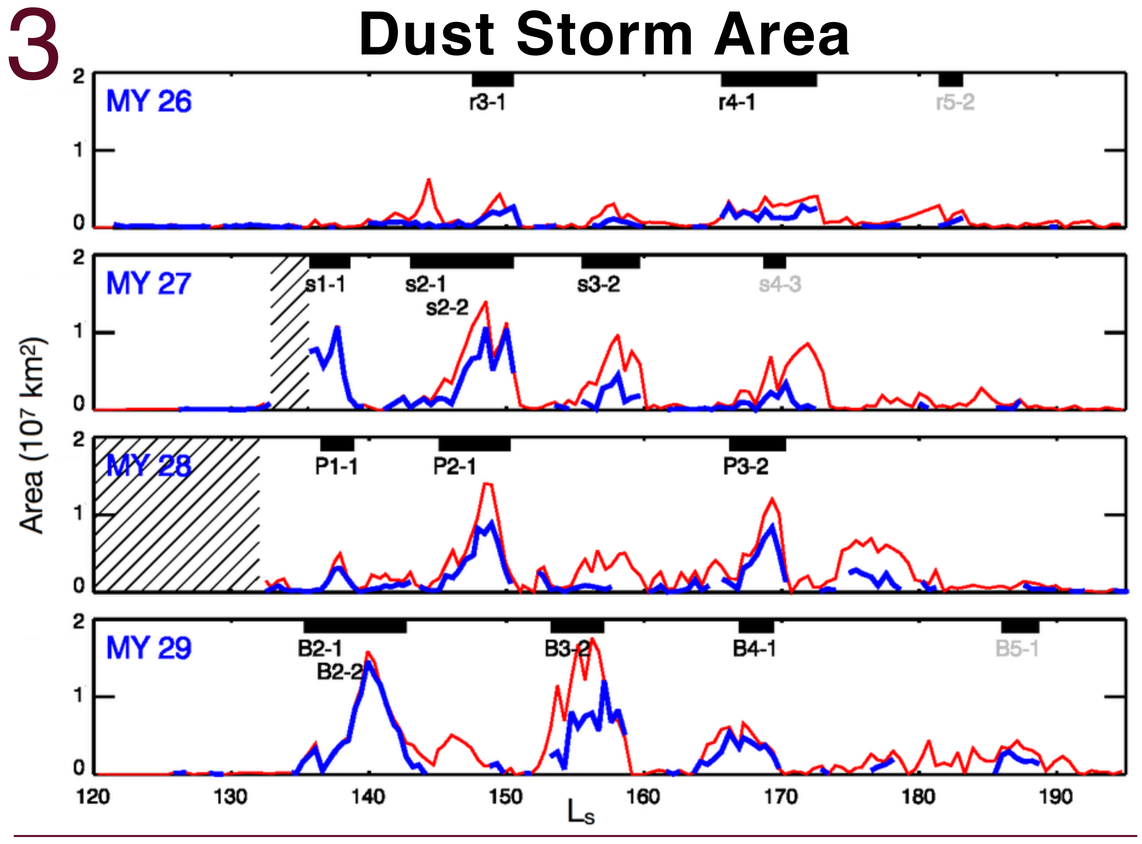
Most SH dust storms follow the cap edge, but some flush equatorward during Ls=0–180°. The most active portion is during Ls=120–180° (purple box). Each circle is the centroid of a dust storm, scaled by storm size with a vertical line indicating latitudinal extent. Shading denotes zonal-mean dust opacity [1].

2 Dust Storm Spatial Distribution during MY 24–31 for Ls = 120–180°



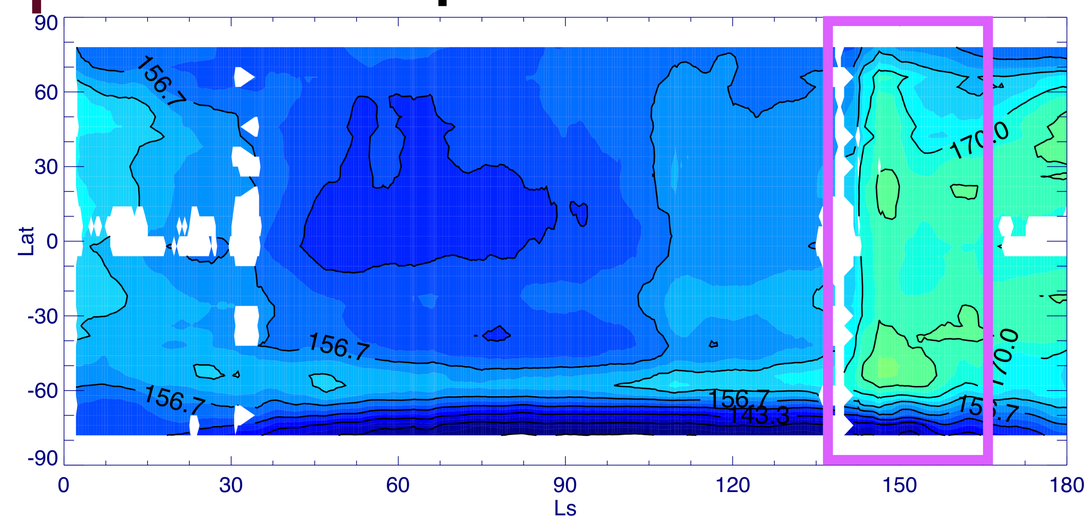
The Aonia-Solis-Valles Marineris (ASV) storm track (purple box) [0–115° W, 0–46° S] contains most of the equator-bound SH dust storms. Each circle is a dust storm centroid, scaled by size. Colors denote Mars years.

3 Dust Storm Area



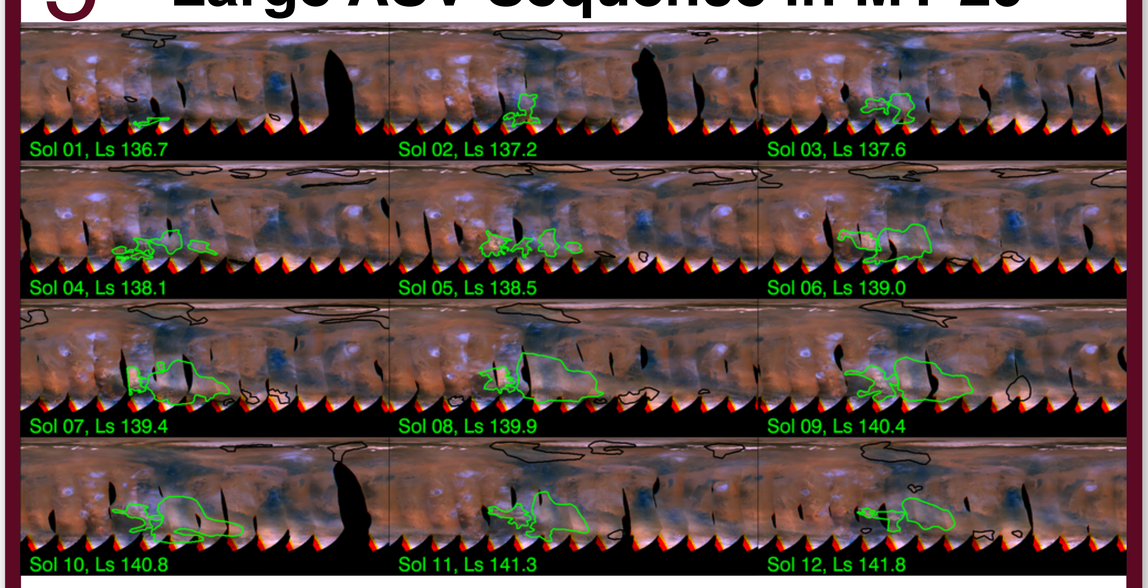
Dust storms in ASV organize into sequences that represent the bulk of SH dust activity. They exhibit a quasi-periodicity of ~25 sols. The blue line is the dust area for ASV storms. The red line is the dust area for the whole SH. Individual sequences are labeled with a thick line at the top of each panel. Hatching indicates missing MDGMs.

4 MY 29 Temperatures at z~45 km



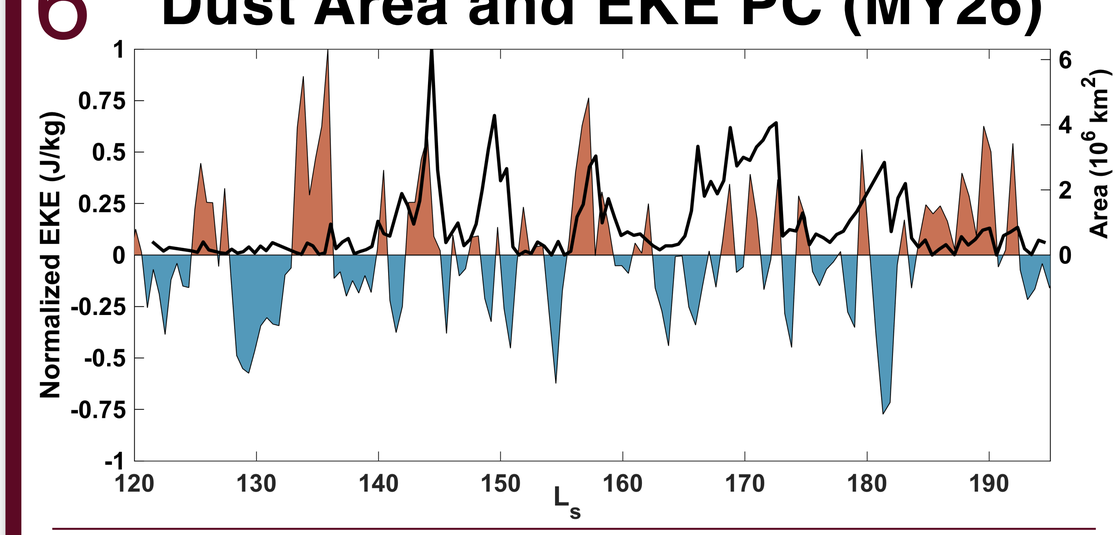
Large ASV sequences can influence the large-scale thermal structure. They represent the most significant dust activity during northern spring and summer. Shown is the 15-sol zonal mean MCS temperatures at z~45 km [2]. Widespread warming (highlighted in the purple box) follows Sequence B2-2 (Fig. 3).

5 Large ASV Sequence in MY 29



The ASV sequence B2-2 that corresponds to Fig. 4. Each panel is a Mars Daily Global Map [3]. The storms outlined in green are members of sequence B2-2. Storms outlined in black are other storms. The ASV track is influenced by a combination of strong synoptic, tidal, and zonal-mean winds (not shown).

6 Dust Area and EKE PC (MY26)



The quasi-periodicity of ASV storms matches the first principal component (PC) of the zonal-mean eddy kinetic energy (EKE) derived from MACDA. Its positive phase is correlated with times of large ASV dust storm area (black line). In the terrestrial atmosphere, the PC corresponds to the BAROCLINIC ANNULAR MODE [4].

A paper that fully describes our results has been submitted to Icarus: **"The Aonia-Solis-Valles dust storm track in the southern hemisphere of Mars."**

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[1] Montabone, Luca, *et al.*: Icarus 251, (2015): 65–95.
[2] MCS Temperature data are available at PDS.
[3] Mars Daily Global Maps are available at the Harvard Dataverse and USGS Astropedia
[4] Thompson D. W. and J. E. Barnes.: Science 343, (2014): 641–645.