Martian dust devil track: the difference bright track and dark track

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The activity of the Martian dust devil (here after, DD) has been investigated by situ observation by Spirit lander [Greeley et al., 2006] and the surface trace of DD on high resolution visible images [Whelley et al., 2003; Balme et al., 2003; Cantor et al., 2006; Drake et al., 2006] which is called as dust devil track (here after, DDT). The common features of DDT are; 1) dark curvi-linear line, 2) width of about ˜100m, 3) typical length of ˜40km. The dark colored nature is interpreted that removal of the surface dust by DD vortex exposes the surface having coarse grains, which results in darker albedo along the traveling path. But in several locations bright colored DDTs have been identified. We found several such places having high concentration of the bright DDT. In this presentation, we report detailed characteristics of the bright DDT in Schiaparelli crater.

Schiaparelli crater is located at equatorial region (-2N, 17E) with a diameter of ˜460km. The surrounding ejecta and the rim exhibit typical subdued structure and the crater floor is extensively filled. The surface of crater floor is composed of two types of characteristic patterns; scratched feather patterned surface and smoothed surface. The latter is underlain by the former. The scratched feather pattern is considered to be formed by intensive action of aeolian erosion, whereas the smoothed surface is a blanket of dust and possibly ice mixture.

On the scratched feather patterned surface DDT is hardly recognized because of low contrast, whereas on the smoothed surface plenty of DDT are recognized. In this study, we construct detailed distribution map of bright and dark DDT and report their seasonal variation. The distribution map clearly shows the area of highly concentrated the bright DDT is separated from that of the dark DDT. The distribution exhibits a habitat-segregation pattern, which is confirmed by single frame of THEMIS, MOC and CTX where both regimes are displayed. This denies the possibility of apparent variation such as the phase angle dependence. Based on the unique images which shows the bright DDT transforms the dark one as DD crosses the habitat boundary, and shows the bright DDT intersects the dark one, we discuss the possible mechanism of DDT formation. The conventional view of DDT is exposure of the subsurface just below the dust cover. In this view the bright DDT can be interpreted as existence of bright material or anomalous dark dust cover, but this can not explain the transformation from bright to dark along the same track.