



Local Sources for the Dark Intra-Crater Dune Material on Mars

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The conventional assumption about the relationship between the dark mafic material and depressions is that the material is blown into as well as out of the craters. Depressions may act as sediment traps into which the aeolian material is blown to accumulate on the depression floor. Once the material is deposited on a crater floor, it may also act as a source, meaning that material is blown out or deflated, frequently in the form of wind streaks. In view of the aeolian character of transport and the huge number of traps, it might appear logical at first sight that the trapping function of craters should be the main mechanism that governs the accumulation of dark material. However, HRSC images show that the material is only blown out in most cases indicating that there might be an intra-crater source. We present morphological indications and mineralogical evidence for dark layers acting as local sources for the dark dune material on Mars. In many regions, the material solely appears inside and downwind of impact craters, forming visible dark dunes and wind streaks. The material seems to originate from a sediment source just beneath the crater floor, which was cut by the smaller craters. Other craters exhibit dark layers exposed on the crater walls. High-resolution HiRISE images disclose dark gully-like streaks extending down-wall, indicating erosion of these dark layers and a transport of dark material into the crater's interior. CRISM spectral analyses of the dark layers exposed in crater walls confirm the suggestion that the dark wall material and the dune material are of similar mafic composition. Previous analysis on the mineralogical composition of dark deposits in Martian craters by using OMEGA data revealed a similar mafic composition. The dark layers acting as local sources for the dark intra-crater material on Mars appear in two different morphological crater-layer-relationships. The layer is either exposed on the crater wall or is located just beneath the floor of a larger impact crater, which does not reach the depth of the layer. Subsequently smaller impacts on the larger crater floor cut the dark layer and result in the exposure and mobilization of the material, which is then blown out of the craters.