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THE MINERALOGICAL COMPOSITION OF DARK DUNES IN MARTIAN CRATERS AND UPDATED RESULTS OF THE GRAIN SIZE ANALYSIS

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We study the Martian fine-grained dark material by focussing on a global selection of impact craters. These craters are interesting because the material frequently accumulates on their floors into huge dune fields such as barchan or transverse dunes.

We extended our crater database up to 67 craters and updated the TES thermal inertia analysis. The thermal inertia is a measure of a material's thermal response to the diurnal heating cycle and thus expresses the resistance of a material to temperature change. This measure is closely related to properties such as particle size, degree of induration, abundance of rocks and exposure of bedrocks . Thus, we were able to reveal the grain size of dark material dunes, also for those dune fields of our database for that no convincing results could be obtained so far. The dunes showing higher thermal inertia values, which correspond to resistant outcrops, are supposed to be consolidated [3]. The global consideration of unconsolidated and consolidated dunes still shows a slightly correlation between consolidated dunes and lower elevations (northern lowlands) and between unconsolidated dunes and higher elevations (southern highlands).

Analysis of near infrared spectra from the OMEGA spectrometer [4] on MarsExpress yields a higher content of mafic unoxidized minerals such as high and low Ca-pyroxenes and olivine. Most of the crater deposits show strong pyroxene absorptions. The minor part has olivine absorptions, whereas forsterite occurs in most cases. Until this point, no mineralogical difference between unconsolidated and consolidated dunes could be identified. There is also no correlation between the mineralogical composition and the geographical location recognisable. Pyroxene and olivine are unweathered mafic silicates, which have never experienced a chemical weathering. This indicates that this unoxidized material has never had a contact to liquid water or water vapour. Thus, mechanical weathering could be the only process that caused the comminution of the material [5].

In some places, a portion of a few dunes show absorption bands of hydrated minerals indicating that the material has underlain a alteration process. The hydration might have been caused by the supply of water [6], e.g. by melting H_2O-frost layers.

There is no obvious correlation between hydrated minerals and consolidated dune surfaces. The global mineralogical distribution of the dark dunes is shown in figure 1.

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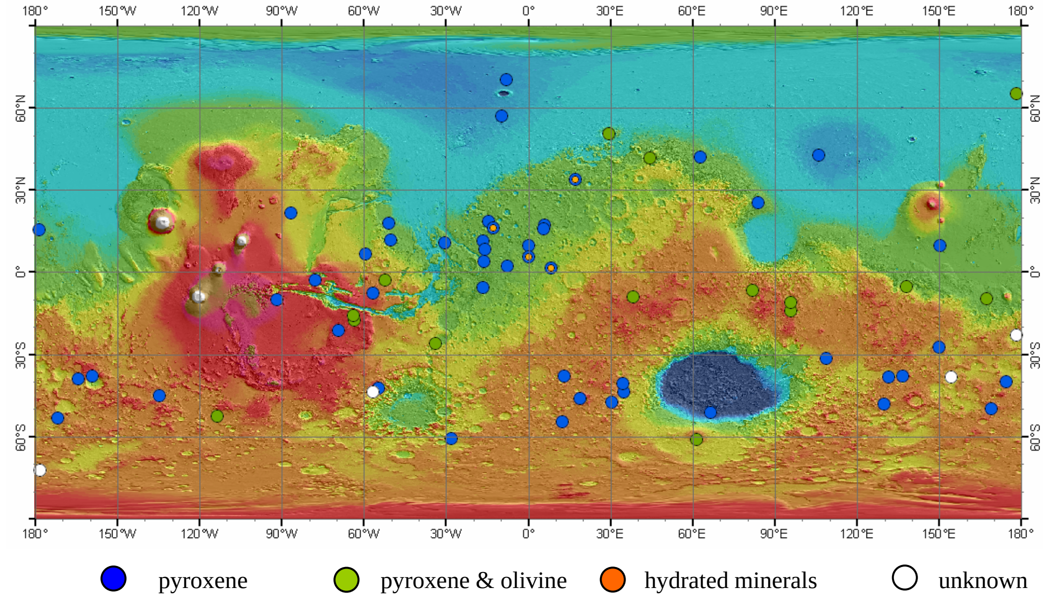

Figure 1. Global distribution of olivine and/or pyroxene-composed dark dunes