AN ANALOGY STUDY OF BASALTIC DUNE SANDS ON MARS AND HAWAII

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Dark aeolian deposits on Mars are thought to consist of volcanic materials due to their mineral assemblages, which are common to basalts. However, the sediment source is still debated. Basaltic dunes on Earth are promising analogues for providing further insights into the assumed basaltic sand dunes on Mars. The basaltic dunes in Hawaii are especially interesting for addressing the source of Martian dunes because of the co-occurrence of active volcanic processes and dune development. This rare geologic setting allows the study of the entire process of dune formation from the emplacement of probable source materials to the resulting aeolian bedforms. Our study is intended to (i) characterize the basaltic sands petrologically, (ii) to determine if the dune sands originate from the stripping of Keanakako'i tephra or from local reworked tephra emplaced by larger phreatomagmatic eruptions, (iii) to determine the material's transport mechanisms (i.e., fluvial and/or aeolian), and (iv) to assess the implications for the potential sediment sources of Martian basaltic dunes. In our study we characterize basaltic dunes collected in the Ka'u Desert in Hawaii using optical microscopes, electron microprobe, and spectral analyses. We compare the spectra of terrestrial and Martian dune sands to determine possible origins of the Martian dark sediments. Spectral analyses reveal an initial hydration and/or dissolved water in the terrestrial samples and a mineralogical correlation between the terrestrial and Martian aeolian sands pointing to an origin consistent with volcanic ash and lava.