Soil surface characterization. The texture of the near surface martian soil was sensed remotely by the combination of three optical parameters: - the thermal inertia I which is essentially a measurement on the soil compaction or an effective particle size in the soil texture through the first few decimeters below the exposed surface (1),(2). - The optical linear polarization parameter b, which characterizes grain sizes at the exposed surface on top of the layer sensed by thermal inertia (3) - The albedo A, which refers to the composition of the top surface sensed by polarimetry.

Inertia measurements were derived from instrument IRTM on board Viking spacecraft (4) and polarization data from instrument VPM on board soviet spacecraft Mars-5 (5),(6),(7). The dark hued area Mare Erythraeum and the adjacent bright hued region Thaumasia were analysed with a resolution of a few tens of kilometers. The three parameters were combined to produce grain size vertical distribution models through the first few decimeters of the top martian surface (8),(9).

Soil texture: dark hued region. The large dark region Mare Erythraeum is characterized everywhere by a uniform polarization response despite the large geomorphological diversity of its surface. Parameter b and A require a ubiquitous presence of small dark grains, 10 to 20μm in size, with 12% in albedo. Thermal inertia I indicates a subsurface dislocated in pieces around 300 to 600μm in size. A simple model is schematized in the Figure 1 and applies almost everywhere all over the highly diversified surface relief features. The small dark grains may be tightly attached or could be integral parts of the large blocks.

Light hued region. Conversely, the bright terrain Thaumasia discloses a large variety of soil textures. The top surface appears covered with bright orange grains of average albedo 16%, probably very dispersed in size, the largest having several tens of μm, overlying and probably mixed with a sub-surface dislocated into pieces 180 to 300μm or smaller if there is some cementation. Figure 2 is an example although large variations do occur from place to place in this case.

Soil composition. Although the sensing parameters used are not directly related to composition, terrestrial analogs of the martian soil (10) enable

![Figure 1](image1)

![Figure 2](image2)
us to surmise that the near surface soil on the dark areas could be tachylite sand-size grains, surficially coated by cohesive black particles of titanomagnetite. The bright orange grains in Thaumasia-like terrains could be weathered (palagonitized) brown volcanic basalt glass particles of sideromelane (11) found to simulate the spectral and magnetic properties of the martian soil at both landing sites.

Surface-Wind interaction. The albedo feature variegations and variations at the surface of Mars were interpreted to result from transportation of dust particles by wind effects (12),(13). The soil textures for the dark areas and for the bright regions schematized by Figs. 1 and 2 support this interpretation.

- Thaumasia is known, and was observed during the period of our measurements, to be an area in which dust is easily raised up in the atmosphere. It is a classical precursor area for large dust storm events (14). To lift-up grains by wind effect requires a saltation process in which large grains are bouncing at the surface and serves to kick upward the smallest grains. The bimodal texture of Figure 2 is relevant for the generation of such a process.
- The dark hued markings at the surface of Mars are known to be long term permanent features, with some transient variations, despite the process of albedo uniformity due to the deposition of bright dust particles at the surface after global dust storms. The large grains, in the Figure 1 model, have relevant sizes to produce a saltation mechanism able to lift-up the allent non-cohesive dust storm particles added, but the small dark indigenous grains could remain stuck at their surfaces.
- The permanent bright regions Arabia or Amazonis, with low thermal inertia, were not sensed in our measurements, but are apparently areas of accumulation for small dust grains, with a lack of the large grains needed to produce saltation and removal of the small grains (4).
- All these mechanisms imply that only the bright orange material is able to be comminuted in non-cohesive minute grains, small enough to be lifted and transported by wind. They have to be made of a material more friable than the dark material.

REFERENCES
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