EVIDENCE FOR REGIONAL OCCURRENCE OF ORANGE GLASS AND RELATED SOILS: Carle Pieters and Thomas B. McCord, P.A.L., Dept. of Earth and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, Mass. John B. Adams, West Indies Laboratory, Fairleigh Dickinson Univ., St. Croix, U. S. V. I.

Pre-mission photogeology of the Taurus-Littrow region[1] called attention to a very dark material that appears to blanket portions of the mare plains, including many craters. This material was thought to extend into the Apollo 17 landing site, and, in fact, samples returned from the dark valley floor are referred to as "dark mantle"[2]. Inspection of the typical Apollo 17 mare soils, however, shows a mature, agglutinate-rich regolith.

Spectral reflectance measurements were made using a telescope for a 10 km area (Littrow DMM) of well developed dark mantle 50 km northwest of the Apollo 17 site. Comparison of the telescopic spectral reflectance curve with laboratory curves of typical Apollo 17 mare soils reveals that the two units are not the same (Fig. 1a). The Apollo 17 soil (for example 75081) is instead very similar to the Apollo 11 soil (Fig. 1b).

The orange soil (74220) and the related black-sphere soil (74001) are minor but conspicuously unusual components of the mare regolith at Apollo 17. Reflectance measurements show that while the orange glass has no recorded telescopic equivalent, the spectrum for the black-sphere soil contains the principal elements of the telescopic curve for the dark mantle deposits. The spectral features of sample 74001, however, are approximately 10 times exaggerated over the telescopic curve (Fig. 1b). This suggests that 74001 is an essentially pure sample of dark mantle material, and that the surface deposits of dark mantle observed telescopically are mixed with agglutinate-rich regolith. This interpretation is supported by laboratory spectra of other samples of Apollo 17 soil (e.g. 79221) that contain up to 18% of dark glass spheres[3] and whose spectral character approaches that of the telescopic dark mantle material (Fig. 1b).

It is concluded that the photo-geologically defined dark mantle outside the Apollo 17 site contains dark-sphere soil (like 74001) as a major component, and that this material is only a minor constituent of the soil (2-18%[3]) within the Apollo 17 site. We suggest that the term "dark mantle" not be used for the dark agglutinate-rich regolith. Only the dark-sphere component of the Apollo 17 soils could be termed a dark mantle deposit.

Heiken et al.[3] have presented evidence that the dark spheres are the devitrified equivalents of the orange glass spheres and that these are of pyroclastic origin. If this is true, the extensive areas of dark mantle appear to be pyroclastic deposits

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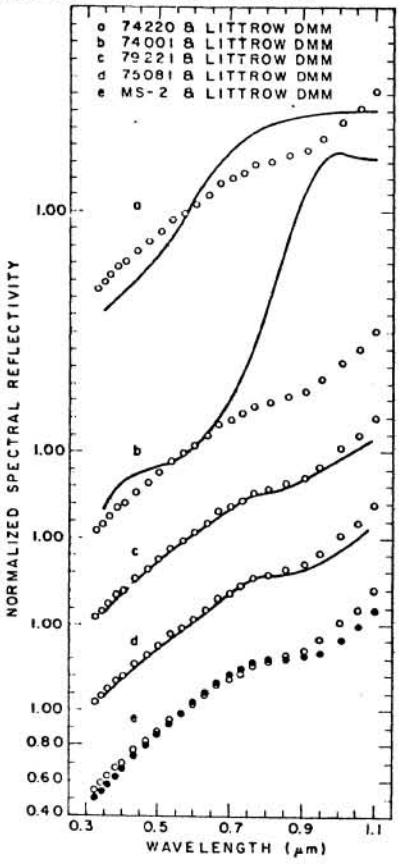
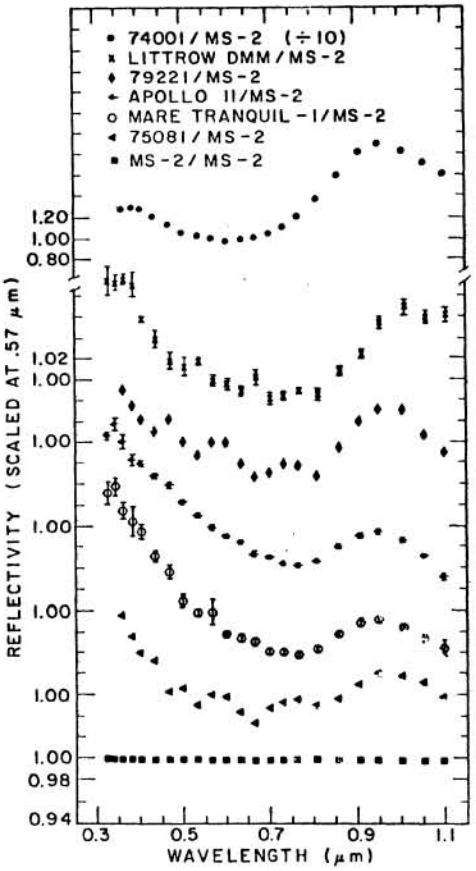
as was suggested by McGetchin and Head. We have mapped these deposits on the basis of their spectral reflectance properties using a vidicon imaging device.[5] Figure 2a is an image of the Apollo 17 region taken through a filter centered at λ = .56μm. Figure 2b shows a greatly enhanced ratio image (.95μm/.56μm) of the same region. The dark mantle unit is bright at .95μm relative to other lunar areas (Fig. 1b) and stands out as the bright area in the center of the figure.

Thus, from the spectral reflectance evidence the Apollo 17 dark-sphere soil (and the orange glass equivalent) are samples of an important unit of regional extent, not only in the Taurus Littrow area, but possibly including the "black spots"[6] elsewhere on the moon.



1a: Spectral reflectance of Apollo 17 samples (solid line) and telescopic areas (circles).



1b: Relative reflectance: To bring out small spectral differences both the Apollo sample and the telescopic spectra have been divided by the spectra of a standard area in Mare Serenitatis, (MS-2).

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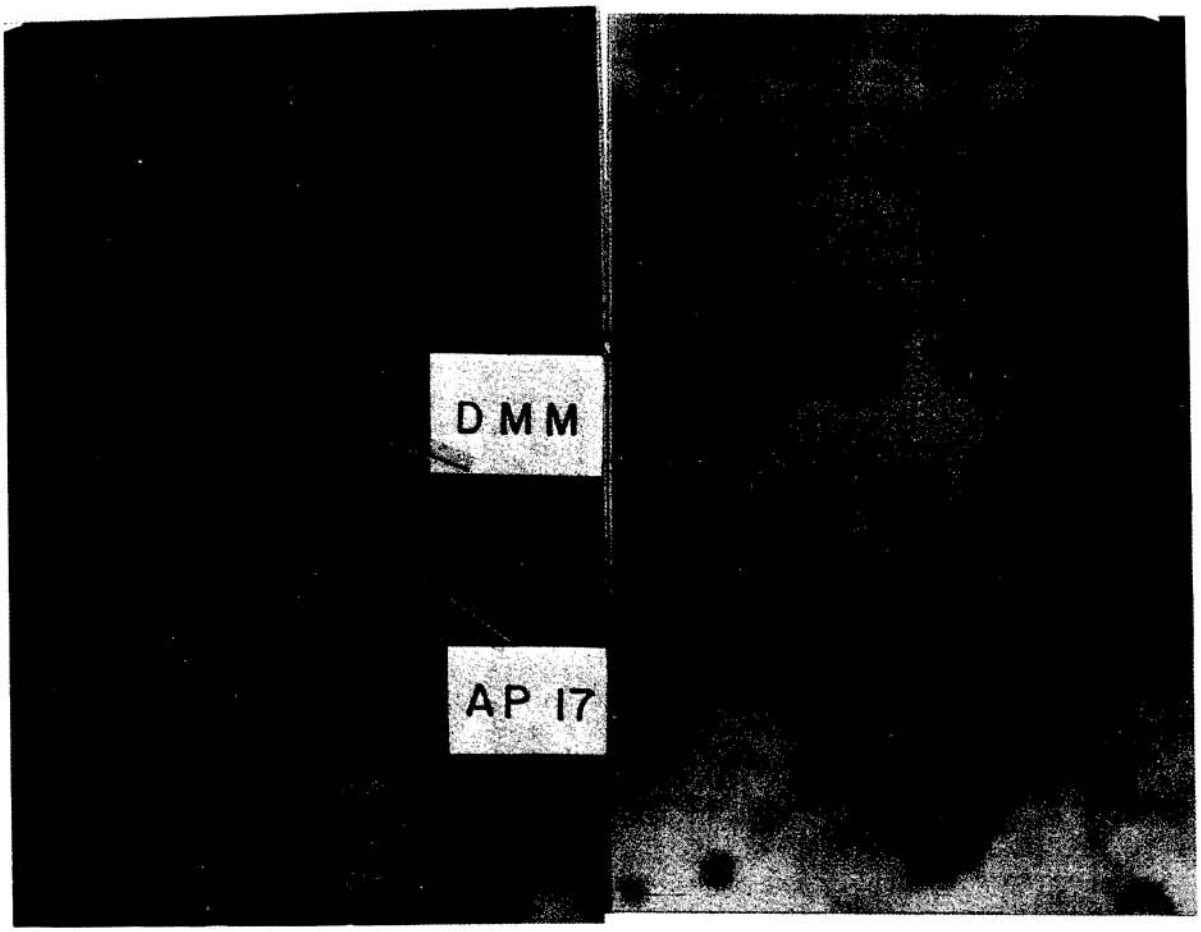

2a: Vidicon Image, λ=.56μm 2b: Ratio Image, .95μm/.56μm

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