ON THE NATURE AND DISTRIBUTION OF FERROMAGNETIC PHASES IN THE TAURUS-LITTROW VALLEY: COMPARISON WITH OTHER REGIONS OF THE MOON, D. L. Griscom, Solid State Division, Naval Research Laboratory, Washington, D. C. 20375.

Specific ferromagnetic resonance (FMR) intensities [1, 2] have been measured for an Apollo-17 dark mantle soil (75081) and for skim (78481) and trench-bottom (78421) soils from the Sculptured Hills-valley floor contact. The results tabulated in Table I suggest that the distribution of ferromagnetic phases in the Taurus-Littrow Valley is remarkably uniform over lateral distances ~ 3 km and to depths ~ 25 cm. It is also seen that the total concentration of ferromagnetic constituents and the partitioning [2] of single domain (SD) + superparamagnetic (SPM) versus multidomain (MD) + acicular components is remarkably similar to previous determinations [1] for other mature lunar soils.

Previous evidence has indicated that the total concentration of ferromagnetic constituents may be correlated with soil maturity [1] and more specifically with the concentration of glass-welded aggregates [3]. However, the skim and trench-bottom soils from Sta. 8 display nearly identical FMR intensities in contrast to a report [4] that the trench sample contains twice the amount of agglutinates. While this discrepancy may be due to sampling error in the FMR experiment, previous data (Table I, for instance) indicate that such random variations are generally less than ±25%. It is thus possible that a significant fraction of the ferromagnetic phases in the lunar soils is associated with comminuted rocks, in spite of the fact that magnetic separation experiments tend to concentrate the glasses [3].

About 14% of the total FMR intensity of 75081 appears [2, 5] to be due to magnetite-like phases. While ~ 0.17 wt % magnetite has been found in the orange soil 74220 [6] and orange glasses are present in nearly all dark mantle soils (average 10%) [4], this orange glass component can account for only a tenth of the estimated [2] "magnetite" content of 75081. It has been demonstrated [5, 7] that such "magnetite-like" constituents could have resulted from the interaction of finely divided lunar material with water vapor at temperatures $\sim 750^{\circ}$C. Carter and McKay [8] have suggested that reduction of iron bearing silicates by hydrogen could be a source of water in impact-generated base surge deposits, and Schmitt [9] has cited several pieces of evidence for fluidized mass transport at the Taurus-Littrow site. The uniformity of the measured FMR intensities (Table I) and the estimated magnetite contents [2] of lunar soils support the suggestion [9] that fluidized flows may have been a continuing factor in the depositional history of the Taurus-Littrow Valley and many other regions of the Moon.

DISTRIBUTION OF FERROMAGNETIC PHASES

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Table I. Specific ferromagnetic resonance intensities of some Apollo 17 soils, with comparison to typical values for other lunar units and to the orange and green glasses.

Sample	Description of sample and environment	Specific FMR Intensity[a]		
		Total	SD+SPM	MD+Acicular
15021, Luna 16, 10084, 12001 [b]	Average of four mare soils collected from mature inter-crater surfaces.	390^{+100}_{-65}	300^{+90}_{-65}	100^{+50}_{-20}
75081, 70	Dark mantle, upper 5 cm	368	219	149
78481, 25	Sculptured Hills skim soil	351	238	113
78421, 27	Sculptured Hills, bottom 10 cm of 25 cm trench	375	251	124
69961, 69941 [b]	Average of two mature Cayley Plains Soils	320	190^{+18}_{-18}	130^{+17}_{-17}
63501, 63341, 63321, 67601 [b]	Average of 4 immature soils (10. sub samples) from North Ray ejecta blanket	102^{+22}_{-23}	65^{+18}_{-24}	36^{+14}_{-22}
74220 [c]	Orange soil, unseparated	~18	~5[d]	~13
15426, 78 [b]	Green glass separate	~2	2[d]	~0

[a] All data analyzed by a method described by Griscom et al [1, 2]. Values are convertible to wt % metallic iron by division by 500 or to wt % magnetite by division by 227.

[b] Results taken from Griscom et al [1].

[c] Experimental spectra courtesey of R. A. Weeks. Normalization of intensity data to rest of Table is approximate (estimated error limits: ±50%).

[d] These intensities have been ascribed entirely to "magnetite". (See Ref. [1] and future publications by Weeks, et al and Griscom et al).

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