X-RAY FLUORESCENCE DATA FOR MARALDI AND ITS ENVIRONS. P.L. Strain, Ann W. Gifford, and Farouk El-Baz, National Air and Space Museum, Smithsonian Institution, Washington, D.C. 20560.

The use of X-ray fluorescence data to distinguish chemical differences over relatively small areas has been well-documented (1,2,3). The area chosen for this study was the embayment of mare material to the north of Tranquillitatis known as Sinus Amoris (Fig. 1). The rugged highlands which surround this bay are characterized by numerous highly degraded mare- and plains-filled craters. Three mare units have been mapped in the region (4). These are two similar Imbrian age units and an Eratosthenian unit of relatively low albedo. Interest centered on this darkest unit which occurs in several patches in and around Maraldi D and Maraldi E, and covers the floor of Maraldi itself. Previous photogeologic investigators, as well as Apollo 17 command module pilot R.E. Evans (5,6),noticed the similarity in appearance between this unit and the dark mantle in eastern Serenitatis at the Taurus-Littrow landing site.

Figure 2 is a geologic sketch map of the Maraldi region showing Al/Si intensity ratios for parts of orbital revolutions 27,30, and 36 that cross the dark unit. Correlation is good between the lowest intensity values in each revolution and the dark mare. Highland boundaries are also evident, as well as a small dome east of Maraldi D.

An attempt was made to determine an average intensity for the low albedo unit relative to other geologic units in the region. 16 second Al/Si data (derived from a sliding average of 8 second data points) was used. Each data point represents the center of the total field of view seen by the X-ray fluorescence spectrometer. The field of view for a 16 second point combines two 8 second fields of view. The X-ray signal is strongest from the units closest to the center point while the contribution from the outer edges of the field of view is much smaller. 75% of the signal comes from an area less than half the size of the total field of view (Bielefeld, personal communication). Therefore, we approximated the field of view by an oval 70km long that represents the area from which 75% of the signal is derived (2). The area of the field of view occupied by each geologic unit was measured to determine the relation between the amounts of individual units present and the total intensity (7). No consistent relation was found. This is most likely due to: (1)inter-revolution and intra-revolution variations caused by changes in the solar spectrum (Ref. 8); (2) effect of decreasing signal strength with distance from the center of the 75% field of view; (3) inclusion in the field of view of unmapped minor components such as rays and small primary and secondary crater ejecta deposits.

In order to document the observed similarity between this unit and the Maraldi floor fill, X-ray data in the region of the Serenitatis dark mantle were examined. Data from four Apollo 15 revolutions (25,27,30, 31) in the Serenitatis region show a noticeable decrease in intensity as the amount of dark mantle in the field of view increases. This drop in intensity is mirrored in the Maraldi area on Apollo 15 revolutions 27,29,30, and 31. The average decrease in intensity for the same increase in area of dark unit

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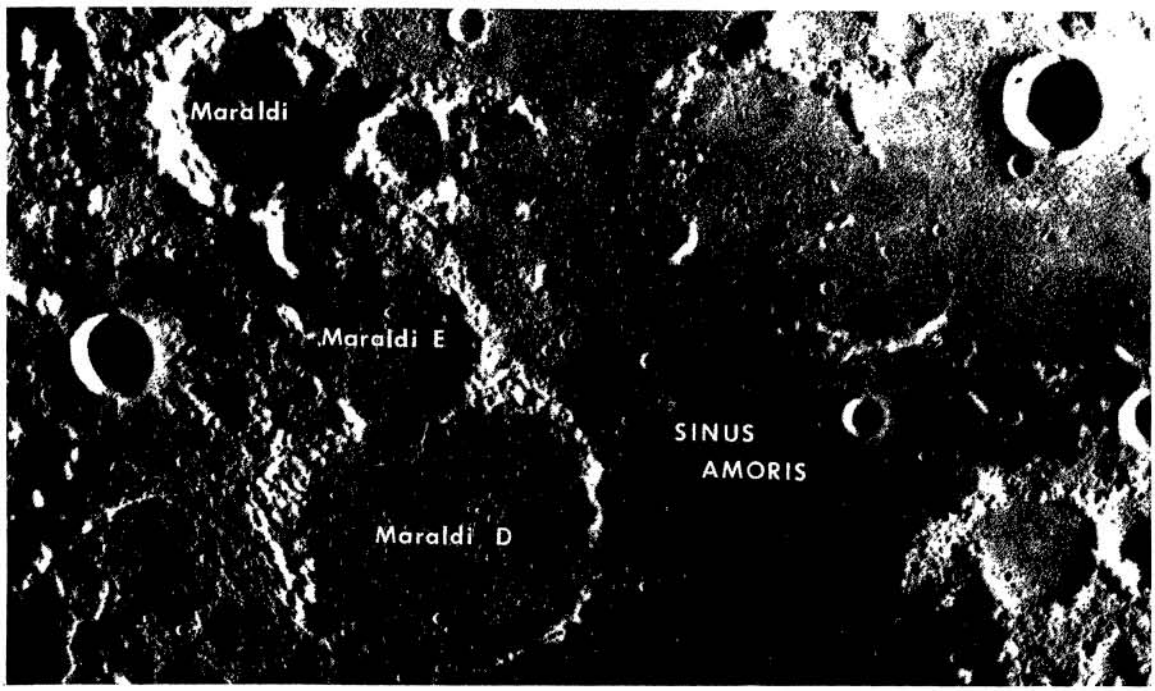

Fig. 1. Sinus Amoris (AS17-M-302, courtesy of NSSDC).

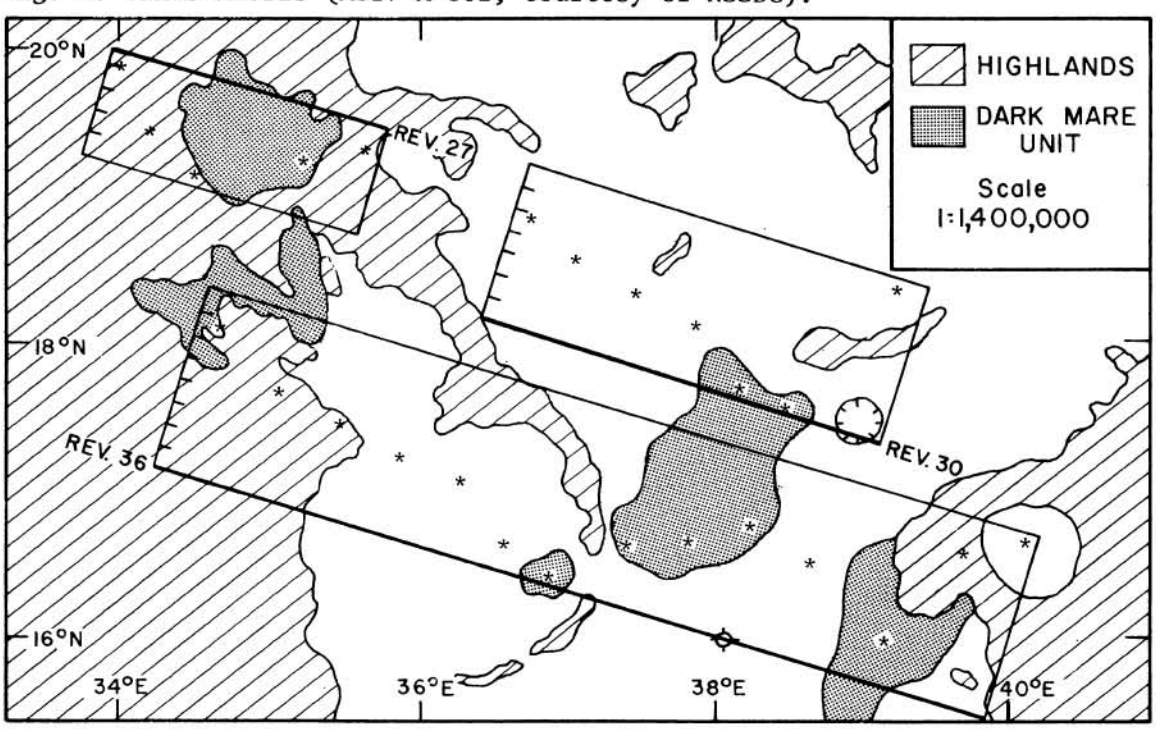

Fig. 2. Correlation of data with dark unit. Vertical axis is relative intensity, increasing from bottom of rectangle to top.

is within 20% in both areas. This discrepancy may be due to the scatter in the data.

To further examine the similarity between these dark mare units, we measured the film density of the two areas on an IR-UV color difference photograph from E. A. Whitaker using a densitometer. There was only a 1% difference in the two units, which supports the observation that they may be chemically similar.

It is concluded that the X-ray fluorescence data can be used to distinguish chemical variations within small areas, provided that repetitive observations are made at the proper solar conditions. It is further concluded that the floor fill of the crater Maraldi is chemically similar to the dark mantle unit of southeastern Serenitatis. A possible implication of this is that the volcanic materials of the Apollo 17 type are not limited to large basins such as Serenitatis, but also may be confined to craters as small as 30 km in diameter such as Maraldi.

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REFERENCES

1. Andre, C. G. et al(1975) Lunar Science VI, pp. 15-17.
2. Andre, C. G. et al(1976) Proc. Lunar Sci. Conf. 7th, pp.2649-2660.
3. Maxwell,T. A. et al(1977) Lunar Science VIII, pp.634-636.
4. Scott, D. H. and Pohn, H. A.(1972) USGS Map I-799.
5. Wilhelms, D. E. and McCauley, J. F.(1971) USGS Map I-703.
6. Evans, R. E. and El-Baz, F.(1973) Apollo 17 Prelim. Sci. Rept., pp.28-1 to 28-32.
7. Maxwell, T. A. et al(1977) Proc. Lunar Sci. Conf. 8th, PP.933-944.
8. Adler, I. and Trombka, J. I.(1977) Phys. Chem. Earth, v. X,pp.17-43.