HIGH-RESOLUTION X-RAY DATA FROM THE LUNAR NEARSIDE/FARSIDE CHEMICAL TRANSITION ZONE. Constance G. Andre and Isidore Adler, University of Maryland, College Park, MD 20742.

Orbital X-ray measurements made during close approaches to the lunar surface early in the Apollo 16 mission indicate pronounced regional and local chemical variations in the terra crust. An understanding of the local rock types comprising the nearside and farside terra is fundamental to the study of early crustal formation. Terra sites from which samples were collected are limited to two nearside locations, Luna 20 and Apollo 16. Thus, the distribution of terra rock types from orbital X-ray data (1, 2, 3) is of special interest. Secondary X-rays are characteristic of surface soils exclusively. However, the data are a lucrative source of geochemical information about the crust because extensive transport of soils is not an efficient process (4, 5). With few exceptions, the chemistry of the soils reflects the composition, distribution and abundance of the local rock types.

The Mg/Al ratio is a sensitive indicator for distinguishing the lithologic members of the anorthosite-norite-troctolite suite. The consistent inverse variation of magnesium and aluminum in the anorthositic series results in an increased dynamic range of the Mg/Al ratio compared to that of the Al/Si or Mg/Si ratios. The Mg/Al ratio can discriminate between the following rock types (in order of increasing Mg/Al concentration): (1) anorthosites, (2) gabbroic anorthosites, (3) anorthositic gabbros and (4) norites and troctolites.

DATA DESCRIPTION

Data from the low-altitude eliptical orbits of Apollo 16 have the advantage of the most extensive coverage of the eastern farside and significantly improved spatial resolution compared to later orbits. For example, the diameter of the instantaneous field of view (projected onto the lunar surface) is reduced by a factor of 2 to 9, depending upon the spacecraft altitude (See FOV symbol in Fig. 1.).

Figure 1 is a graph of Mg/Al variations for geographic locations along the orbit path A A' on the map. None of the early orbit paths deviate far from this line. Thus, it is possible to improve statistical reliability by combining co-located points from several orbits to produce those points in the profile shown. Standard deviations are indicated by representative error bars.

The upper reference line of the graph represents the most common mare value within the X-ray coverage and the lower reference line represents the most common value for highland areas, a value roughly equivalent to anorthositic gabbro.

DISCUSSION

The general west to east trend of Mg/Al values in terra areas steadily decreases from the nearside to the farside. This decrease represents a transition from anorthositic gabbro to gabbroic anorthosite. However,

superposed on this distinct regional trend are local variations which coincide with topographic features. For example:

(1) Low Mg/Al material exposed on the floor of the Langrenus Crater contrasts sharply with the terra beyond the eastern rim of the crater.

(2) The material on the floor of the Smythii Basin has high Mg/Al ratios relative to those for the terra to the east and to the west.

(3) The extremely old, degraded Al-Kwarizmi Basin (6) appears to have some chemical expression that has persisted through a long history of meteorite bombardment.

(4) The most anorthositic material within the areas covered by either the Apollo 15 or Apollo 16 X-ray experiments is centered inside the Mendeleev Basin between 135 E and 145 E.

ACKNOWLEDGEMENTS

This work was supported by NASA contract NSG 7046 Sup 4.

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NEARSIDE/FARSIDE TRANSITION

Andre C. G. and Adler I.

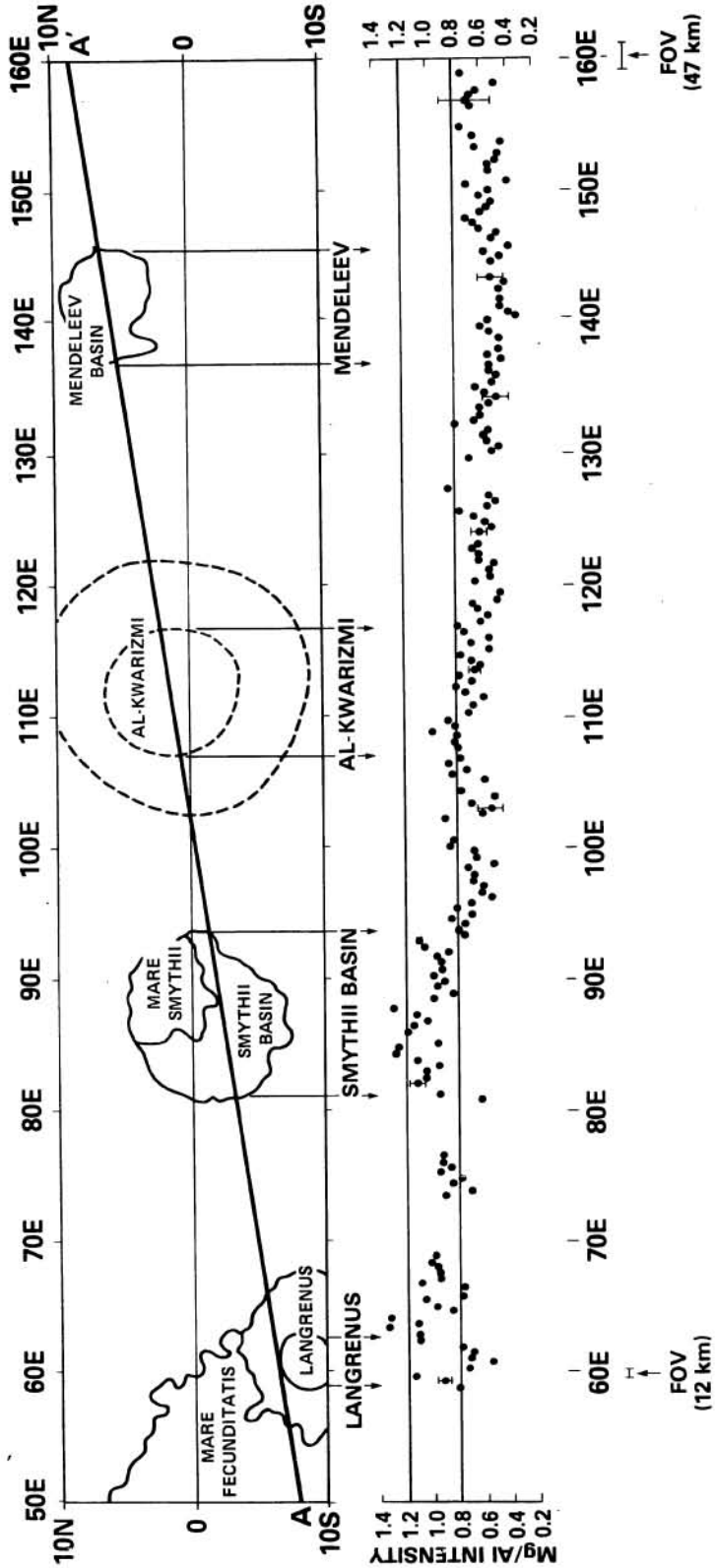

FIGURE 1