A NEW LOOK AT MAGNESIUM VARIATIONS ON THE MOON, P.E. Clark, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, 91109.

INTRODUCTION. The orbital geochemistry data from the Moon are important keys to the understanding of the development of major lunar rock types (1-6). Petrological investigation of samples has determined the nature of major rock types on the Moon. Remote sensing data, particularly orbital geochemistry data, can be used to map the extent of these rock types—their degree of influence in forming the regolith in a given area. Of particular significance in the mapping of highland or maria rock types are the X-ray fluorescence Mg/Si intensity ratios, which can be used in conjunction with other data to determine the contribution of Fra Mauro basalts to highland soils, and the type of maria basalt (1-6).

DATA TREATMENT. Recently, new Mg/Si data have become available. The method developed to treat these data, which has been described extensively elsewhere (1,7,8,9) has eliminated spurious inter-orbit variation to a greater extent than any previous method. Variations in the solar flux, which are the primary source of lunar fluorescent X-rays, are the principal causes of these spurious inter-orbit variations (1,5,6). The correction of Mg/Si ratios for such variations is based on the relationship between emission measure ratios, which are parameters derived from solar flux, and normalized XRF silicon intensities. (Most of the variation in silicon intensities is caused not by changes in Si concentrations which are relatively constant, but by variations in solar flux (1,7,8,9)). Data from small portions of two orbits, which remained high (>2σ from averages of surrounding data points) even after correction, were eliminated.

GEOCHEMICALLY DEFINED UNITS. Global unit maps (3) for magnesium data illustrate the basic dichotomy between maria and highland regions. Distinctively mafic deposits are located by high Mg/Si units within the maria. There is great variation in Mg/Si ratios in areas geologically defined as highland. High magnesium areas are often correlated with specific craters such as the Condorlet series or known pyroclastic deposits. Areas which are particularly low in magnesium are the Hadley Apennine region and some areas east of Smythii. Unit maps have also been created for smaller regions, namely the Hadley Apennine (1) and Undarum/Spumans regions (2) and the far Eastern highland region east of Smythii (4). Color scales on these maps were created to show the maximum variation for the range of Mg/Si ratios occurring in these regions. These maps allow better estimation of major rock types from which soil has formed. Pyroclastics-rich areas such as Sulpicius Gallus show magnesium highs and mare areas are high to moderate in magnesium. In both cases, mare basalts are indicated as major contributors to the soil. Plains units are often low to moderate in magnesium, and in plains areas it is not unusual for aluminum values to be correlated to magnesium values. A good example of the latter phenomenon is the Apennine Front, where KREEP is a major soil-forming rock. In other plains units such areas north of Balmer, Fra Mauro basalts or buried basalts, may be present. Other low to moderate magnesium areas, where aluminum concentrations are high to moderate, probably contain anorthositic gabbro, gabbroic anorthosite, and other ANT-suite materials.

The research described here was partially supported under NASA contract

© Lunar and Planetary Institute • Provided by the NASA Astrophysics Data System
MAGNESIUM VARIATIONS ON THE MOON

P.E. Clark

NAS7-100 at the Jet Propulsion Laboratory, and was performed both at the Jet Propulsion Laboratory and the University of Hawaii.

REFERENCES