Geochemical relationship of the Moon and Earth

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Giant impact theory for the origin of the Moon gives several constraints on the geochemical relationship of the Moon and Earth. For example, it is simple prediction that the Mg# [molar Mg/ (Mg+Fe) x 100] of the Moon should be similar to that of the Earth because Mg is neither volatile or siderophile element and will not deplete during moon forming event or swept by the terrestrial core. The Mg# of the Earth is considered to be well known as 89 (e.g. O' Neil and Palme, 1998), on the other hand, the Mg# of the Moon is considered to be much lower than that of the Earth but its real value still have ambiguity. From several resent studies of the lunar magnesian granulitic breccias (Korotev and Jolliff, 2001) and lunar meteorites (Takeda et al., 2002) it is suggested that there can be still unknown Mg reservoirs in the Moon which contain sufficient Mg to change previous estimation of Mg#. Other than the possible unknown Mg reservoirs mentioned above, Nyquist et al., 2002 shows negative epsilon Nd values in anorthositic clasts in two lunar meteorites and suggest that positive epsilon Nd value which previously considered to be constraints of the generation mechanisms of the ferroan anorthosite suite (FAN) was not a universal feature of the early lunar crust and it is possible that there are different mechanism of crust formation in the farside compare to the nearside.

To explore such unknown Mg reservoirs and to investigate diversity of crust formation mechanism remote-sensing global data of the Moon is a powerful tool when it is combined to the information derived from the lunar samples and lunar meteorites. Prettyman et al., 2003 shows high-Mg# region using gamma-ray data of the Lunar Prospecta. In this study such regions were investigated to find the candidate of unknown Mg reservoirs by combining data from Clementine and Lunar Prospecta with resent results of previous studies done by numerous researchers from studies of lunar samples and lunar meteorites. And the results were evaluated the effect on the geochemical relationship of the Moon and Earth.

Using similar method, geochemical relationship of the Moon and Earth including Mg and other elements is re-visited in this study and checked if there can be possible new constraints. Regions analyzed in this study can be good candidates of study area of Multiband Imager (MI) in the future SELENE mission.

References:

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