

Compositional variation of mare on the lunar farside and its implication for the impact tectonics of the South Pole-Aitken basin

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Most of volcanic activities have taken place in impact basins on the moon. The structure of impact basin is a key to the development of the magma chamber in the lunar mantle and the extrusion of the magma to the lunar surface. On the farside of the moon, mare ponds are well discrete and easy to locate their eruptive sites within the areas of mare deposits. Moreover, the South Pole-Aitken (SPA) impact basin exists on the lunar farside. In order to examine the correlation of the impact structure of the SPA basin and the locations and compositions of mare deposits on the farside, Clementine UV/VIS data are analyzed.

The distribution of mare deposits in the SPA indicates the correlation of mare emplacements with the structure of the impact basin. Inside the inner ring, crater floor is relatively filled with mare deposits, whereas, in the regions of just inside the middle and outer rings, some mare extrusions were emplaced.

Compositional analysis of Clementine UV/VIS images shows that mare deposits in the SPA arise from Low-Ti basaltic magma sources. The increase of FeO and TiO₂ contents along the radial distance from the SPA center to the location of the mare pond is recognized. Moreover, only Low-Ti basaltic volcanism took place in the SPA basin.

It may represent the excavation or heavily brecciation of the layer of the High-Ti basaltic magma source, due to the SPA impact cratering, and resulting the lack of the layer in the center of the SPA. On the contrary, in the outer region of the SPA, upper mantle layers of both High- and Low-Ti basaltic magma sources can be preserved, and only dikes reaching the surface triggered by another large impact could induce the mare volcanism.