INVESTIGATING VOLCANISM WITHIN IMBRIUM AND SERENITATIS BASINS: A SYSTEMATIC STUDY OF BASALTIC REGOLITH FRAGMENTS.

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Introduction: From remote sensing data obtained by different lunar orbiters, there is a clear dichotomy between a KREEP-enriched terrain (containing heat-producing elements and covering most of the nearside of the Moon) and a KREEP-depleted terrain (the remainder of the Moon). Most lunar volcanism ocurred within the KREEP-rich terrain where the lunar crust is also thinner. Imbrium Basin is located within the KREEP-enriched terrain, whereas most of Serenitatis Basin is outside of it. Visible and spectral images of the interior of the Imbrium and Serenitatis Basins reaveal 30 and 29 spectrally different lava flows, respectively. Considering the continuous "gardening" of the lunar surface resulting from the continued cratering, it is conceivable that ejecta material formed by small craters on different lava flows travelled to where the Apollo 15 and 17 landing sites are located, enabling access to "rocks" (2-4 mm, ~50 mg, basaltic fragments) that formed 100-1000 kms from the landing site. Small craters in the vicinity of the landing sites excavated both the local stratigraphy and potentially also exposed some of this distant material.
Samples and Methods: In this presentation will be reported results from the systematic study of Apollo 15 and Apollo 17 basaltic regolith fragments (2-4 mm Ø) collected along the ejecta of small craters. Each fragment was characterized petrographically (SEM), geochemically (EMPA), chronologically ($^{40}Ar/^{39}Ar$ step-heating & in-situ U-Pb), and for its trace-element composition (LA-ICP-MS). Figure 1A shows phase identification and vol% determination used for estimation of bulk composition; Figure 1B shows a 30 heating steps $^{40}Ar/^{39}Ar$ age spectrum corresponding to an age of 3659±35 Ma.

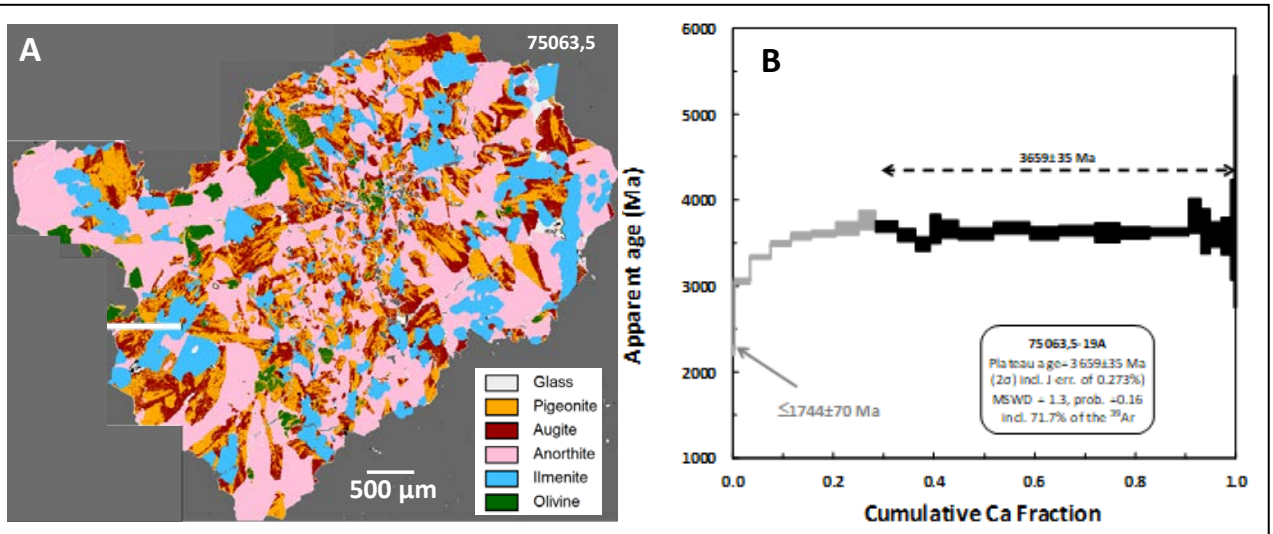

Figure 1: Data acquired for Apollo 17 basaltic regolith fragment 75063,5: **A)** Mineral volume percent using spectral imaging obtained using elemental mapping. These values were multipli. **B)** $^{40}Ar/^{39}Ar$ release spectrum showing an age of 3659±35 Ma.

Results: Data show that the regolith basalts comprise an array of compositions, the age of Apollo 17 fragments ranges between 3.66 Ga and 4.01 Ga extending the known range towards older ages, whereas Apollo 15 fragments range between 3.16 and 3.90 Ga. Mineral trace-element data suggest compositions outside the known range.

Preliminary findings: Using thermobarometry, estimated pressure (depth) and temperature of basaltic magma generation were similar to those calculated when using Apollo 15 and 17 bulk compositions reported in the literature. This suggests that it is possible to have lithic-representability out of 2-4 mm Ø regolith basaltic fragments.

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