Interpretation of the Lunar Surface Evolution Combining Space Weathering and Impact Gardening

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On the lunar surface, space weathering is primarily caused by solar wind particles and micrometeorites, whereas impact gardening arises from meteoroids that are incident to the surface. Lunar regolith undergoes maturation through space weathering and refreshment through impact gardening simultaneously. In this study, we measured the latitudinal and longitudinal trends of the flux variation with wall quadrants of approximately 30,000 lunar craters, and obtained two findings—longitudinal offset and hemispheric asymmetry—using the flux differences between the opposite walls. We interpret these findings as the effects of refreshment by impact gardening, and suggest that the observations can be understood with a simple model integrated with space weathering by solar wind particles and impact gardening by sporadic meteoroids and meteor showers.