

# Latitudinal and Longitudinal Asymmetries of the Lunar Surface Evolution on Lunar Crater Walls

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Lunar regolith undergoes maturation through space weathering and refreshment through impact gardening simultaneously. Space weathering on the Moon is primarily caused by solar wind particles and micrometeorites, while impact gardening arises from meteoroids and interplanetary dust particles incident to the surface. In the present work, we measured the latitudinal and longitudinal trends of flux variation with wall quadrants of ~27,000 lunar craters, distributed across latitudes within  $\pm 50^\circ$ . Through detailed analysis using a large number of craters, we discovered a latitudinal asymmetry and a distinct longitudinal offset between the northern and southern hemispheres. These results trace evidence of impact gardening caused by meteoroids. We suggest that the observations can be understood with a simple model integrated with space weathering by solar wind particles and impact gardening by meteoroids.