MATURITY OF THE CRATER RIM WALLS AS A FUNCTION OF THE CRATER SIZE. Chae Kyung Sim, Sungsoo S. Kim, and Minsup Jeong, Dept. of Astronomy & Space Science, Kyung Hee University, Yongin, Gyeonggi 17104, Korea, cksim@khu.ac.kr.

Introduction: Space weathering agents such as micrometeoroids and solar wind particles continuously age the uppermost regolith of the lunar surface by comminuting as well as darkening and reddening the grins. Among several maturity indices, optical maturity (OMAT) and the median grain size \(<d>\) suggested by [1] and [2-3], respectively, have been widely used. \(<d>\) quantifies the external modification and its estimation comes from the relationship between the maximum degree of linear polarization and albedo in visible wavelength range [2-3]. OMAT illustrates spectral alteration and darkening and is deduced from the near-infrared ratio-reflectance plot [1].

The vertical and horizontal regolith-mixing processes such as excavation and ejecta blanket formation by impact cratering and mass-movement by seismic and thermal activities stop and (re)start the maturation clock of each regolith grain that ticks only when exposed to the space. Studying maturity indices of impact crater features that show a diversity of maturation rate as functions of its size and/or formation age gives us a hint to understand the maturation and mixing process of the covering regolith.

Methods: We investigate median grain size \(<d>\) and optical maturity (OMAT) of the regolith covering ~140 near-side craters. The crater diameter ranges from 2.5 km to 110 km and their formation periods from Copernican to pre-Nectarian. Here we focus on the crater rim walls where the vertical mixing process by mass-movement can enhance the gardening of regolith and the supply of immature materials in the deeper layer to the surface.

We obtained \(<d>\) values from our multi-band polarimetric observations of the Moon using a 15-cm reflecting telescope [4]. We obtained OMAT values from the Clementine data using the formula suggested by [1]. We subtract the median value of the “outside” (background) of the crater from that of the interior rim wall. For both \(<d>\) and OMAT, the larger the value, the less mature the regolith.

Analyses: Both \(<d>\) and OMAT values of the interior rim wall initially increase as the crater size increases until \(~10-20\) km, then decrease. This transition crater size happens to correspond to the transition diameter from simple to complex craters.

For larger craters, i.e., complex craters, it is clear that the interior rim wall of the craters formed in recent eras tend to remain fresh and become mature along with time. For the simple crater case, smaller craters are more mature, which is opposite to the case of complex craters. This is thought to be because smaller craters become flattened more quickly [5], thus have smaller vertical mixing in the regolith due to mass movement.

We will also discuss on the maturity indices of the crater rim walls at high latitudes as a function of the position angle to see the latitude dependence of the space weathering process [6].