FURTHER DEVELOPMENT OF MONTE CARLO MODELING OF LUNAR MEGAREGOLITH THICKNESS; Jac Cashore, Dept. of Geosciences, Univ. of Houston, U.P., Houston, TX 77004 (current address: Dept. of Geological Sciences, Univ. of Tennessee, Knoxville, TN 37996-1410)

Improvement and addition of new features to the earlier Monte Carlo model (1) have led to an improved understanding of highland and maria megaregolith thickness. These refinements include allowing ejecta blankets to extend 3 crater radii beyond the impact crater, corrected final depth-to-diameter crater morphologies from Pike (2), further attenuation of "edge effects" by adjusting the area each crater "sees" for each individual crater, examination of thickness of megaregolith versus final elevation, and determining the amount of material brecciated, transported, and slumped around the craters during cratering. Correction and improvement of the aforementioned model parameters has led to an overall increase in highlands megaregolith thickness for a small fraction of the modeled area, but most of the modeled area has a decreased thickness over the previous model (1). There is also a corresponding decrease in the area actually cratered and in the number of impacts cratered areas actually experienced, again, however, small fractions of the modeled area were impacted more times than in the previous model (1). These factors have lead to 29.7% of the surface being cratered to 1 km or greater for the observed highlands crater density; for 2 times the observed highlands crater density 50% is cratered to 2 km or greater and 20% is cratered to 16 km or more; for 5 times the observed highlands crater density 50% is cratered to 7 km or greater and 20% is cratered to 37 km or more. Similar, but much smaller, changes have been noted in preliminary maria studies. The small mass balance problem reported in the earlier model (1) has also been markedly reduced by extending the ejecta blankets outward. The remaining small mass balance problem is apparently related to bulking of ejected material allowed for in the cratering equations (1). The relationship of megaregolith thickness to the final elevation indicates that the megaregolith thickness is lowest when the final elevation approaches zero. In both the deepest, negative, and highest final elevation areas the thickness is the greatest. The thickness decreases steadily toward a zero final elevation. However, in the 5 and 10 times observed highlands crater density runs the results show thickness decreasing in the area of 1 to 2 km (positive) in elevation. In these latter runs, within which most of the modeled surface has been deeply cratered, the thicknesses become much larger over the entire range of final elevations. Otherwise, the decreasing thicknesses near a zero elevation, found in the lesser cratered runs, appears to be due to not cratered or very shallowly cratered areas with small megaregolith thicknesses due to later deposited ejecta. This pattern of thickness variation remains the same in both highlands and maria calculations. When the material, transported, brecciated, and slumped into the crater bowl, is averaged across the modeled surface area some differences in thickness are noted from the previous method of determining megaregolith thickness, (1) and above. For example, the observed highlands density yields a 4.42 km average thickness; for 2 times the observed highlands density a thickness of 11.89 km is obtained; and for 5 times the observed highlands density a thickness of 37.91 km. Again the higher cratering rates show an opposing pattern from that of the lower cratering rates, the average thickness in the more cratered terrains being dominated by a relatively small percentage of very large craters. The averaged maria thicknesses show a much more correlated relationship with the previous maria thicknesses, probably due to the very small thicknesses that are generated, making obvious differences less apparent. The differences found in the less cratered runs are probably due to the way in which the results are gathered and presented. If the results of the previous model are skewed towards the thicker or thinner megaregolith extremes, i.e. large thicknesses due to craters
affecting only small portions of the gridded areas, then the results only show a small percent of the area as having been affected. The averaged results are different because they consider all of the megaregolith formed and then simply spread it out across an even surface. While the previous method results in a realistic final topography in which megaregolith thickness may be related to the final elevation; the latter results are important in recognizing the actual amount of megaregolith being dealt with.

REFERENCES: