

Dylan Collins
GEOL 498B

Latitudinal Controls on the Martian Crater Densities

In order to gain new insight into Mars' planetary dynamics, an examination of Martian crater densities as a function of latitude was completed. There are two complete crater catalogs of the Martian surface; one manually compiled by Nadine Barlow and one compiled by crater counting software created by Tomasz Stepinski and colleagues. After loading these two data sets into ArcMap 9.2, a pole-to-pole swath centered on 0° longitude was completed. Using equal-area trapezoids, representative size-frequency distributions (SFD) were constructed for every 5° in latitude. Upon comparison, the resulting two data sets had similar crater distributions, and both revealed a broader trend of thinning crater densities towards the poles. In addition, an absence of craters greater than 1.9 km was evident at the poles. From these new observations, it is concluded that either there is a deficit in impactor flux towards the poles of the planet or that there is a currently unrecognized crater modification process taking place at the poles. It is herein suggested that the Martian polar ice caps are responsible for modifying and erasing the craters near the poles. However, it would take a long time for large crater modification by ice cap transgression and regression to take place, and would require that Mars' axial orientation has not changed for a geologically significant period of time.