

## Title: Sampling Geologic Properties of Mars' Crust with Secondary Crater Clusters

Abstract: When a meteorite impacts into a planetary surface, most of the material thrown out through the force of the impact rains back down and generates many thousands to millions of other impact craters. Those secondary craters, while an annoyance for those who count craters to determine surface ages, present an opportunity to directly measure crustal property differences of bordering geologic units. Statistics of secondary crater clusters that cross geologic units allow us to collapse crater scaling equations to depend on just the differences in crustal properties like strength and porosity. We have applied this technique to a few areas on Mars, but the sharpest contrast we measured was at the boundary between a geologically young volcanic plain and the landslide deposits of Olympus Mons. A cluster of secondaries show an average diameter difference of  $\sim 1.5:1$  with the smaller craters in the landslide deposit. This points towards comparatively higher porosity in the landslide with a minimum porosity of  $\sim 40\%$  in the upper hundred meters. Finding more locations to apply this technique could help solve the missing middle problem of Mars and other inner solar system worlds.

Bio: Jack Conrad is an NPP fellow at the Marshall Space Flight Center in Huntsville, Alabama who studies the geophysical implications of unearthy morphology. Before that he earned his PhD in Planetary Science at UC Santa Cruz, and his BS in Physics at Purdue. He is moving to the DC area this holiday season and looking for new opportunities and connections in the geophysics community.