FLUIDIZED EJECTA BLANKETS ON MARS: MEASUREMENTS OF CRATER GEOMETRY FOR FORMATION HYPOTHESIS TESTING. S. T. Stewart and G. J. Valiant. Harvard University (Department of Earth and Planetary Sciences, 20 Oxford St., Cambridge, MA 02138, sstewart@eps.harvard.edu, valiant@fas.harvard.edu).

Introduction. All fresh [1] and many older [2-5] Martian craters larger than a few km are surrounded by ejecta blankets which appear fluidized, with morphologies believed to form by entrainment of liquid water [2, 4, 6, 7]. The liquid-water formation hypothesis may be tested by detailed comparison between impact cratering simulations and measurements of crater forms using the Mars Orbiter Laser Altimeter (MOLA) topography data set. In particular, the mass distribution between distinct inner and outer ejecta blanket regions and the height of rim uplift may be related to the composition of the surface and the excavation process [8, 9].

Crater Measurements. We have developed a toolkit for measurements of crater forms using the MOLA data set. The features of the toolkit include:

- Generating digital elevation maps (DEMs) from the MOLA data tracks to obtain the maximum spatial resolution and user-specified map projections for the region of interest. The data are gridded using the TRIGRID function in the Interactive Data Language (IDL);
- Refining the user-estimated crater center by convolving a ring with the gradient of the topography;
- Calculating the crater radius and rim uplift by fitting the rim in the MOLA tracks that pass near the crater center;
- Defining a background surface layer using user-specified tie points;
- Fitting of the background surface uplift;
- Calculating crater and ejecta blanket volumes;
- Restricting calculations to a pie-shaped wedge to avoid gaps in the data set and background topographic features (e.g., ridges, nearby craters, etc.);
- Generating shaded relief DEMs and 3-D shaded surfaces of the original topography, background surface layer, and ejecta blanket volumes;
- Viewing along-track profiles or arbitrary profiles through the DEM;
- Comparing the DEM to the MOLA DEMs distributed through the Planetary Data System; and
- Viewing the Viking Orbiter Digital Image Maps for the region of interest.

Discussion. The primary goal is to obtain as precise volume measurements as possible of the ejecta blanket. We find that the definition of the background surface is the largest source of variation (and error) in the ejecta volume measurements. We are currently testing different surface definition methods and surface fit reproducibility using artificial DEMs to search for systematic errors in the volume measurements. Because the variation in the background surface is often comparable to the height of the distal rampart and thickness of the outer ejecta layer, these features will also be measured using individual MOLA tracks. Measurements of crater features may be made in both semi-automated and interactive mode to generate a crater geometry database.

Future Work. These measurements of crater forms will be compared to other crater geometry studies [e.g., 1, 5, 10] to assess the robustness of crater measurements using the MOLA data set. The proposed liquid water entrainment mechanism for formation of rampart ejecta forms will be tested by comparing the candidate crater measurements with a database of crater shape and ejecta blanket geometrical properties generated from impact cratering simulations.

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