HIGH RESOLOUTION DIGITAL ELEVATION MODELS OF PRISTINE EXPLOSION CRATERS.

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In order to effectively capture a realistic terrain applicable to studies of cratering processes and landing hazards on Mars, we have obtained high resolution digital elevation models of several pristine explosion craters at the Nevada Test Site. We used the Airborne Terrain Mapper (ATM), operated by NASA's Wallops Flight Facility [1] to obtain DEMs with 1 m spacing and 10 cm vertical errors of 4 main craters and many other craters and collapse pits. The main craters that were mapped are Sedan, Scooter, Schooner, and Danny Boy [2].

The 370 m diameter Sedan crater, located on Yucca Flat, is the largest and freshest explosion crater on Earth that was formed under conditions similar to hypervelocity impact cratering. As such, it is effectively pristine, having been formed in 1962 as a result of a controlled detonation of a 100 kiloton thermonuclear device, buried at the appropriate equivalent depth of burst required to make a "simple" crater [2]. Sedan was formed in alluvium of mixed lithology [3] and subsequently studied using a variety of field-based methods. Nearby secondary craters were also formed at the time and were also mapped by ATM. Adjacent to Sedan and also in alluvium is Scooter, about 90 m in diameter and formed by a high-explosive event. Schooner (240 m) and Danny Boy (80 m) craters were also important targets for ATM as they were excavated in hard basalt [3] and therefore have much rougher ejecta. This will allow study of ejecta patterns in hard rock as well as engineering tests of crater and rock avoidance and rover trafficability.

In addition to the high resolution DEMs, crater geometric characteristics, RMS roughness maps, and other higher-order derived data products will be generated using these data. These will provide constraints for models of landing hazards on Mars [4, 5] and for rover trafficability [6]. Other planned studies will include ejecta size-frequency distribution at the resolution of the DEM and at finer resolution through air photography and field measurements, correlation of ejecta size and composition with radar and visible-thermal IR remote sensing signatures, and comparison of these results with similar measurements of Mars.

The final DEMs, ancillary data sets, and derived data products will be made available to the community.

References:[1] http://aol.wff.nasa.gov/aoltm.html [2] DOE (2000) DOE/NV-209-Rev 15. [3] Slate, JL et al. (1999) USGS OFR 99-554-A. [4] Bernard, D.E., M.P. Golombek (2001) Proc. AIAA Space 2001 Conf. , Albuquerque, NM. [5] Golombek, MP and D. Rapp (1997) *J. Geophys. Res.*, v. 102, p. 4117-4129. [6] Golombek, MP et al. (2003) *J. Geophys. Res.*, v. 108, doi: 10.1029/2002JE002035.

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