PLANETARY ANALOG STUDY AT THE DANAKIL DEPRESSION, ETHIOPIA, TO TEST THE VISUALIZATION SOFTWARE PRO3D FOR MASTCAM-Z INSTRUMENT ON MARS-2020. Christian Koeberl[1], Gerhard Paar[2], Robert Barnes[3], Sanjeev Gupta[3], Christoph Traxler[4], Thomas Ortner[4] [1]Natural History Museum, Vienna, Austria, and Department of Lithospheric Research, University of Vienna, Austria (christian.koeberl@univie.ac.at), [2]Joanneum Research, Graz, Austria; [3]Imperial College London, United Kingdom; [4]VRVis Zentrum für Virtual Reality und Visualisierung Forschungs-GmbH, Vienna, Austria;

Introduction & Rationale: The NASA mission to Mars scheduled for 2020 is due to land at Jezero crater in Spring 2021. Planetary rover missions use panoramic stereo camera systems to image rock outcrops along rover traverses. The Mars 2020 rover will also carry a Panoramic Camera System (Mastcam-Z 0) to obtain multi-spectral stereoscopic panoramic images.

This instrument will provide 3D vision capabilities from which the stratigraphy, sedimentary architecture, impact cratering history, and paleoenvironmental information can be reconstructed from Digital Outcrop Models (DOMs). The 3-D visualization software for the camera is being jointly developed by Austrian-based Joanneum Research and VRVis through local & ESA funding. An area of crucial interest to our team is the study of planetary impacts, including the detection and understanding of impact breccias, shatter cones, and other materials of impact origin. The rapid collection of these data greatly facilitates the full scientific exploitation of image data collected by Martian rovers, providing vital context for planning of rover science operations, as well as for analysis of scientific results.

This report is an update of visualization tests at a terrestrial planetary analog site in northern Ethiopia during field work in January 2019.

Danakil Depression: The Danakil Depression is in north-eastern Ethiopia, near the border with Eritrea. It sits around 125m below sea level and is at the junction of three of the Earth's lithospheric plates (Arabian, Nubian, and Somalian). These plates are regions of Earth's crust and upper mantle about 100 km thick that move across the fluid mantle of molten rock underneath. The plates are moving apart and have created a triangular feature, called the Afar Depression, of which the Danakil Depression is the northern tip and one of the deepest features. Average temperatures are thought to be 34.4 degrees Celsius and can reach more than 48 degrees Celsius, making it a candidate for the hottest place on Earth.

Field Tests and Visualization: The interactive 3D viewing tool ***PRo3D*** 0 allows virtual exploration of reconstructed Martian terrain and geologic analysis of 3D datasets. It provides a variety of measurement and annotation tools (e.g., Fig.1).

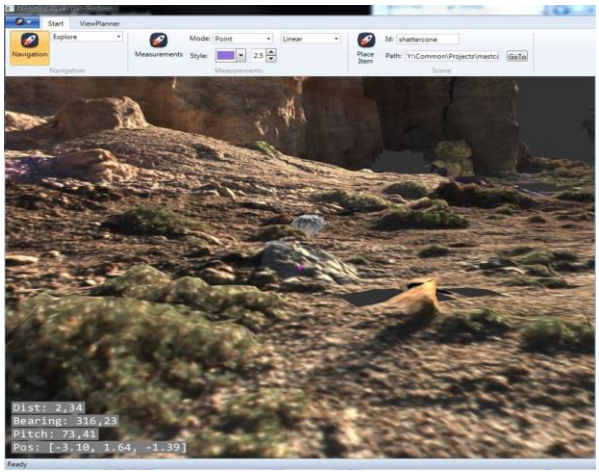

Figure 1: Partial screenshot of shatter cones placed in Mars-like environment (middle of the image) in the PRo3D software suite. Field tests should help to provide more realistic simulation conditions and validate the simulation method.

Shatter Cone Test: As Jezero is an impact crater, it can be expected that impact lithologies are encountered, such as shatter cones. The Mastcam-Z instrument data and PRo3D possibly allow the identification and study of impact breccias and their clast population, as well as the possible detection (for the first time) of shatter cones, with implications for shock metamorphic studies on Mars. The field work at Danakil, Ethiopia, serves for validation studies, using shatter cones from known impact structures, to test the software capabilities and pave the way for future automatic recognition of such structures.

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