A BAD DAY AT MAJURO CRATER: EXTENSIVE MODIFICATION BY NEARBY IMPACT. A. D. Howard[1], A. M. Morgan[2], S. A. Wilson[2], J. M. Moore[3] and O. L. White[3,4], [1]Planetary Science Institute, 1700 E. Fort Lowell, Suite 106, Tucson, AZ 85719 (ahoward@psi.edu), [2]Center for Earth and Planetary Studies, Smithsonian Institution, Washington, D.C., [3]NASA Ames Research Center, Moffet Field, CA, [4]SETI Institute, Mountain View, CA.

Introduction: The 44-km diameter Majuro crater is located on the northeastern interior rim of the Hellas basin. Eastern Hellas basin has been extensively modified by volcanic, fluvial, and glacial processes [*1-9*]. The interior and rim of Majuro crater likewise contains imprints of fluvial erosion, alluvial fan deposition, possible paleolakes, light-toned deposits, and glacial modification [*3-6*]. A 24 km diameter unnamed crater ("U" in Fig. 1a) is centered 68 km west of the center of Majuro crater. Fluidized ejecta from this crater has significantly modified Majuro crater, providing a strong constraint on the timing of the major fluvial activity in Majuro.

Morphology of crater "U": The interior rim of crater "U" is moderately dissected by fluvial incision and the interior is ringed by alluvial fans. Fluidized ejecta from this crater can be traced up to 58 km to the west of its rim.

Modification of Majuro Crater: Effects of ejecta from crater "U" extend across the entire extent of Majuro crater and reach as far as 15 km beyond its eastern rim. We trace those effects on Majuro eastward as illustrated in the five regions (1 to 5) in Fig. 1.

Region 1: reverse-flow ejecta. The western rim of Majuro crater rises about 1 km above terrain to the west. Region 1 features distinct flow-patterned terrain with textures similar to those found on young rampart craters (the red arrow in Fig. 1b points to the terminal end of a flow). The westward direction indicated by flows in Region 1 might be interpreted as modification by Majuro crater's ejecta. However, the rim of Majuro crater is rounded indicating appreciable post-impact degradation, and the contact between the flow textures and the Majuro crater rim is sharp. The flow features are thus better interpreted as ejecta from crater "U" that flowed backwards after impinging on the western rim of Majuro crater.

Region 2: ponded ejecta. The western floor of Majuro crater features a hummocky deposit with flow-like patterns and dessication/sublimation cracks. This deposit superimposes the extensive alluvial fan deposits in northern Majuro (the red line in Fig. 1c delineates the contact). We interpret this deposit to be ejecta from crater "U" that overtopped the rim of Majuro crater and cascaded 2.2 km downward onto its floor.

Region 3: Blast-induced erosion. The southeastern floor of Majuro crater features exposures of light-toned deposits [*6*] eroded into scarps (white arrows in Fig. 1d) above the lowest portion of the crater floor. Erosional linear ridges and troughs (parallel to the red lines in Fig. 1d) are superimposed on the floor, scarp edges, and inner crater rim. These ridges are aligned along the direction from Majuro to crater "U". We interpret their origin to blast erosion from the air displaced by impact of the ponded ejecta of Region 2.

Region 4: Deflation depressions in alluvial fan deposits. Two shallow relative depressions about 2-3 km across and 60-110 m deep occur at the boundary between the alluvial fan deposits and the eastern interior rim of Majuro. These exhibit no post-depression fluvial activity. Depressions of this size and depth are unlikely on active alluvial fans, so we likewise interpret the depressions to have been scoured by blast resulting from Region 2 deposition.

Region 5: distal effects. East of Majuro crater aligned depressions incise a post-Majuro branch of the Navua Valles (red arrow in Fig. 1e). These are aligned along the direction to crater "U". We interpret these to be distal effects of the crater "U" impact. The irregularity of the depressions makes it uncertain whether these are secondary craters or blast scour.

Implications: The modifications of Majuro crater due to the impact of crater "U" occurred near the end of alluvial fan deposition in Majuro crater and after eolian erosion forming the scarps in light-toned deposits within Majuro. This constrains the majority of post-impact degradation of Majuro crater to have occurred between its ~3.5 Ga age [*5, 6*] and the ~2.6 Ga age of crater "U" [*5*]. Some fluvial activity occurred after 2.6 Ga as indicated by fans within crater "U" and small channels excavated into its ejecta. The southwestern edge of Region 2 deposits within Majuro are also overlain by small alluvial fans. Inactive glaciers on the eastern and northern interior rim of Majuro postdate crater "U".

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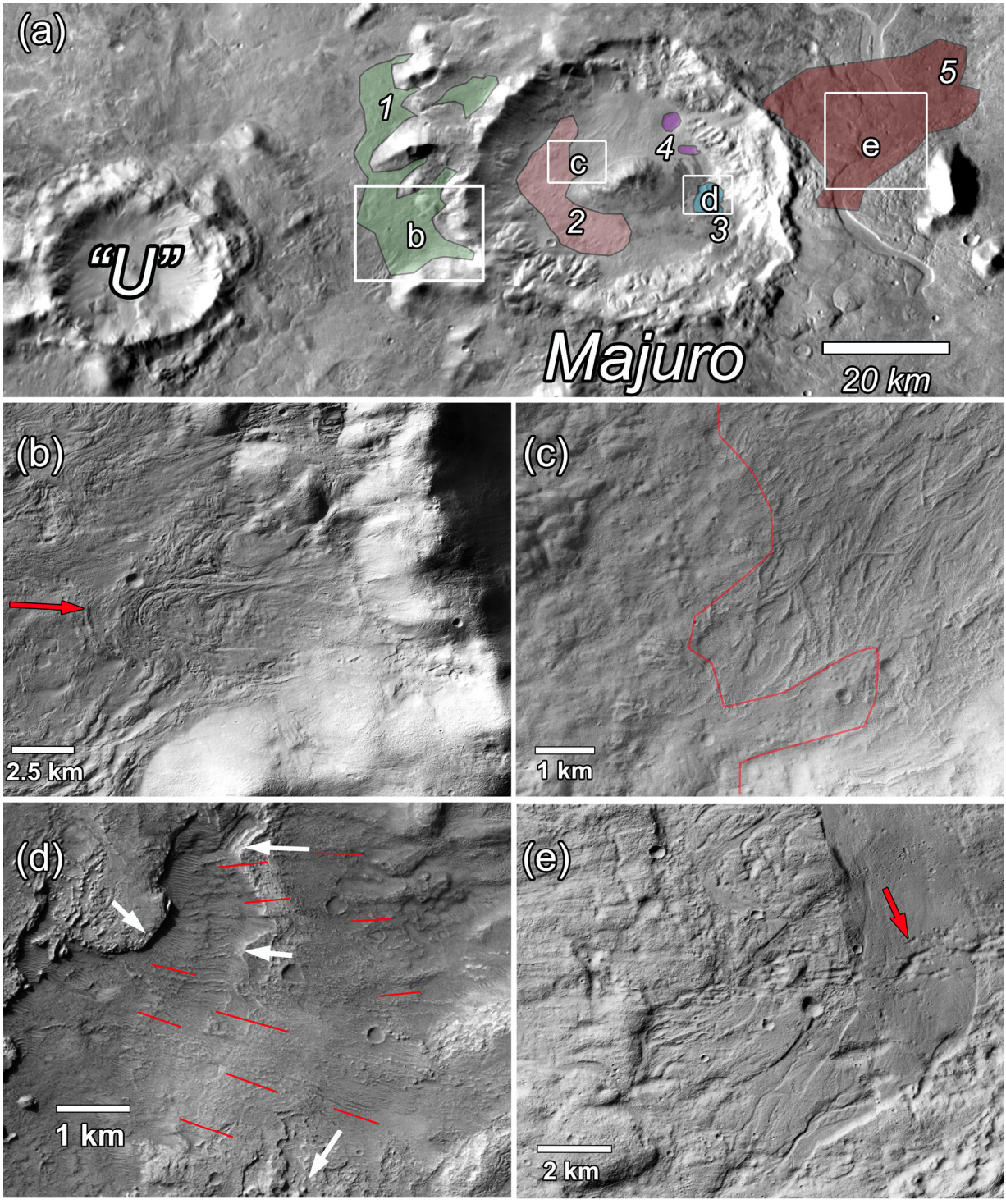

Fig. 1. Modification of Majuro crater (88.3°E, 33.2°S) by ejecta from crater "U". Boxes in (a) show locations of (b) through (e). See text for discussion of regions labeled 1 through 5.