DISTRIBUTION OF GULLIES IN UTOPIA PLANITIA, MARS. R. D. Capitan[1], G. R. Osinski[1,2], M. J. Van De Wiel[3], M. Kerrigan[3], N. Barry[2], S. Blain[2] , [1]Centre for Planetary Science and Exploration University of Western Ontario, London, ON, Canada N6A 5B7 (rcapita@uwo.ca), [2] Dept. of Earth Sciences/Physics and Astronomy, University of Western Ontario, London, ON, Canada N6A 5B7, [3]Dept. of Geography, University of Western Ontario, London, ON, Canada N6A 5C2.

Introduction: Gullies are thought to be one of the youngest landforms on Mars [1]. In Utopia Planitia they are found predominantly within impact craters, where they develop on crater walls as typical gullies on shallower slopes and debris flows on the steeper ones [2]. We have identified four types of processes that are associated with channeling on the crater walls: gullying, debris-flows, head-cut channeling and dry flows [2]. High-resolution satellite imagery, including Mars Orbiter Camera (MOC), Mars Reconnaissance Orbiter Context Camera (CTX), and High Resolution Imaging Science Experiment (HiRISE) data provides an opportunity to locate "gullies" and study their distribution [2]. We present here ongoing work into the distribution of gullies in Utopia Planitia. We show that there are distinct trends with respect to the different geological units present in Utopia Planitia, a trend that has not previously been noted.

Observations: In the effort to map distinct morphologic units of Utopia basin [3], we have also mapped the diverse surface processes that acted throughout the entire region. The initial assumption is that craters evolved differently in different morphologic areas. We chose several craters of the same diameters and crater ejecta characteristics within four different units (Figure 2) to show that within a restricted longitudinal and latitudinal bands craters that have almost the same ejecta characteristics are affected by different processes.

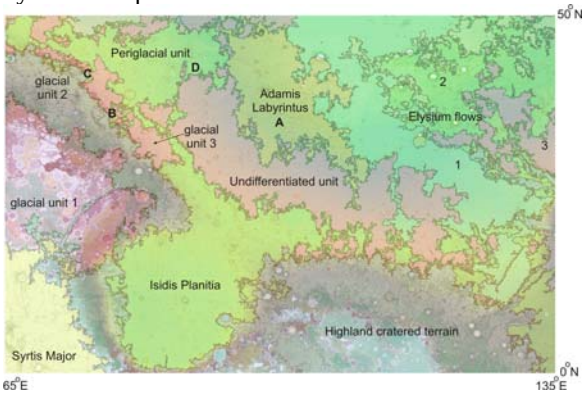

Fig. 1 Regional scale morphometric and geomorphologic mapping of Utopia basin and its surroundings. Polygon boundaries define regions which local relief differs due to erosional/depositional differences. A to D represent the location of craters in Figure 2.

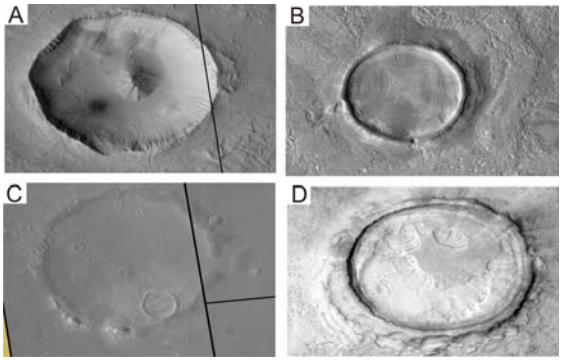

Fig 2. Different types of crater modifications seen in CTX imagery: A. impact crater modified by guliies and debris flows; B. concentric crater fill produced by glacial processes; C. impact crater erosion and burial by glacial and aeolian sediments; D. impact crater modified by periglacial processes. Crater locations are shown in Figure 1. Craters diameters is ~10 km.

We then mapped the distribution of major processes that act within the perimeter where we focused the analysis (Figure 3).

Results: The main focus of the mapping was to differentiate the morphogenetic units that comprise Utopia basin. There is a clear segregation of the three processes that define surface modifications; gullies and debris flows are located towards Elysium volcanic flows while the periglacial mantle and glacial processes are located in centre and western Utopia basin and at the contact with high elevated terrain (Figure 3).

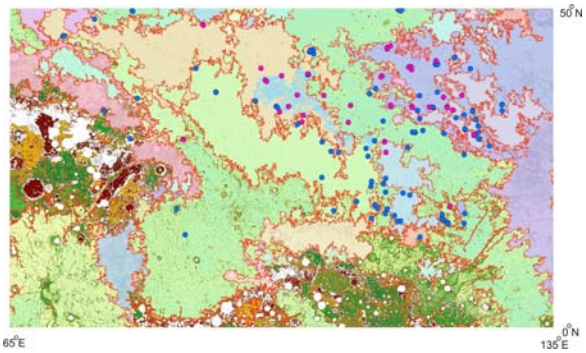

Fig. 3 Location of gullies (blue dots) and debris flows (purple dots) identified on CTX imagery superposed on morphometric mapping of surface in Utopia Planitia region (units named in Fig. 1).

An important outcome is the description of the relative timing of fluvial processes relative to the main modifications that affected the craters [4]. In most cases where concentric crater fill occured, gullying is postdated by the glacial mantling (arrow, Figure 4a). Where the gullying process is most abundent, on the craters developed within Elysium lava flows, fluvial erosion occured during or immediately after tan episode of mantling (arrow, Figure 4b). In some cases the fluvial processes developed either before (black arrow), or after (white arrow) mantling processes (Figure 4c). Our preliminary work suggests that they are multiple episodes of gully formation in Utopia Planitia region, which can either preceed or postdate glacial and periglacial processes in this area.

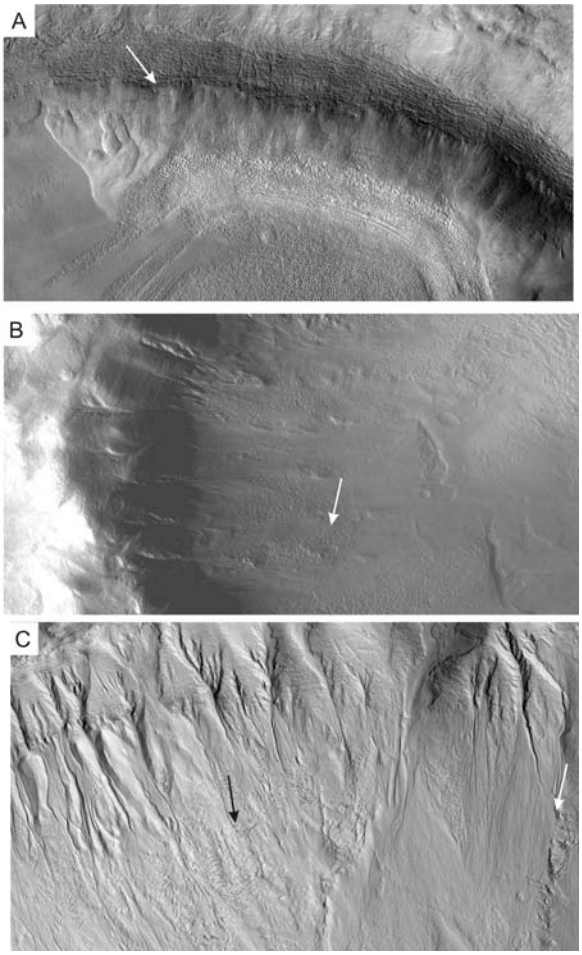

Fig. 4 Types of fluvial erosion with respect to glacial, periglacial mantling and mass movements. HiRISE imagery: ESP 015994_2205 (A), P03_002266_2188 (B), PSP 007845_2190 (C), credit images MRO mission.

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