DISTRIBUTION OF INTRACRATER ALLUVIAL FANS AND DELTAIC DEPOSITS IN THE SOUTHERN HIGHLANDS OF MARS. S. A. Wilson [1, 2], J. A. Grant[1] and A. D. Howard[2], [1]Center for Earth and Planetary Studies, National Air and Space Museum, Smithsonian Institution, 6th at Independence SW, Washington, DC, 20560 (purdys@si.edu, grantj@si.edu), [2]Department of Environmental Sciences, University of Virginia, Charlottesville, VA 22904-4123 (ah6p@virginia.edu).

Introduction: Alluvial fans and deltaic deposits are accumulations of loose, fluvially-transported material deposited where high-relief drainage emerges into a low-relief, sometimes water-filled, basin. The resulting fan-shaped landforms evolve as successive lobes of material are deposited during ephemeral, high-magnitude flood events [e.g., 1]. Alluvial fans in craters on Mars typically originate in alcoves near a crater rim and are deposited on the interior crater walls and floors [e.g., 1-4], whereas deltaic deposits are generally deposited on a crater floor below the mouth of a valley that has breached the crater rim [e.g., 5-7]. Alluvial deposits on Mars were first identified in Viking data [8], but detailed studies of fans [e.g., 1-4] and deltas [5-14] were not possible before high resolution image and topographic data from the Mars Global Surveyor (MOC, MOLA), Mars Odyssey (THEMIS), and Mars Reconnaissance Orbiter (CTX and HiRISE) missions. This preliminary study uses images from the Context Camera (CTX, 6 m/pixel-scale) to expand on the previously mapped distribution of alluvial deposits in craters across the southern highlands of Mars.

Inventory of Alluvial Deposits in Southern Highland Craters: Using ~100 m/pixel daytime thermal infrared (IR) Thermal Emission Imaging System (THEMIS) data, [1] and [2] located 21 craters with large alluvial fans in the southern highlands of Mars between 0-40°S, clustered into three geographic regions: southern Margaritifer Terra, southwestern Terra Sabaea, and southwestern Tyrrhena Terra [1] (**Fig. 1**). In the same latitude band, 16 craters hosting deltaic deposits have been previously identified and (or) studied [5-14], as summarized in [7] and [13] (**Fig 1**).

Nearly complete coverage of CTX image data between 0-40°S enabled the identification of 78 additional alluvial deposits within craters (73 craters with alluvial fans and 5 craters with deltas) (**Fig. 1**). This distribution of intracrater alluvial fans and deltas broadens the geographic regions identified by [1], and there is an apparent paucity of craters containing such deposits in regions underlain by Hesperian and Amazonian volcanic plains. It remains uncertain, however, whether this distribution reflects the timing of fan versus plains emplacement, elevation, or properties of the volcanic plains that may have inhibited their formation. Further work will examine potential correlations between crater diameter, relief and elevation as well as age and morphology of the alluvial versus bounding deposits.

Implications for Climate and Source of Water: The distribution of alluvial deposits on Mars records evidence for the nature and origin of past fluvial activity [1-14] that likely occurred during a period(s) of enhanced precipitation (snow) and runoff [e.g. 1, 4]. Although many alluvial deposits were thought to be late Noachian to Hesperian in age, these estimates were often based on the age of their host craters [e.g., 5-6] or crater statistics compiled using moderate resolution image data [1, 3]. A recent study of alluvial deposits in large craters in southern Margaritifer Terra, however, indicates that deposition of exposed surfaces occurred in the late Hesperian or early Amazonian [4], thereby implying a late period of widespread fluvial activity [e.g., 4, 15]. Although the newly identified alluvial deposits represent a range in morphology, preservation and likely age, many of the deposits appear morphologically similar to the fans in Margaritifer Terra [1, 4]. Hence, additional constraints on their relative ages coupled with their widespread distribution may distinguish between synoptic rather than local (e.g., impact-related) sources of water [e.g., 16].

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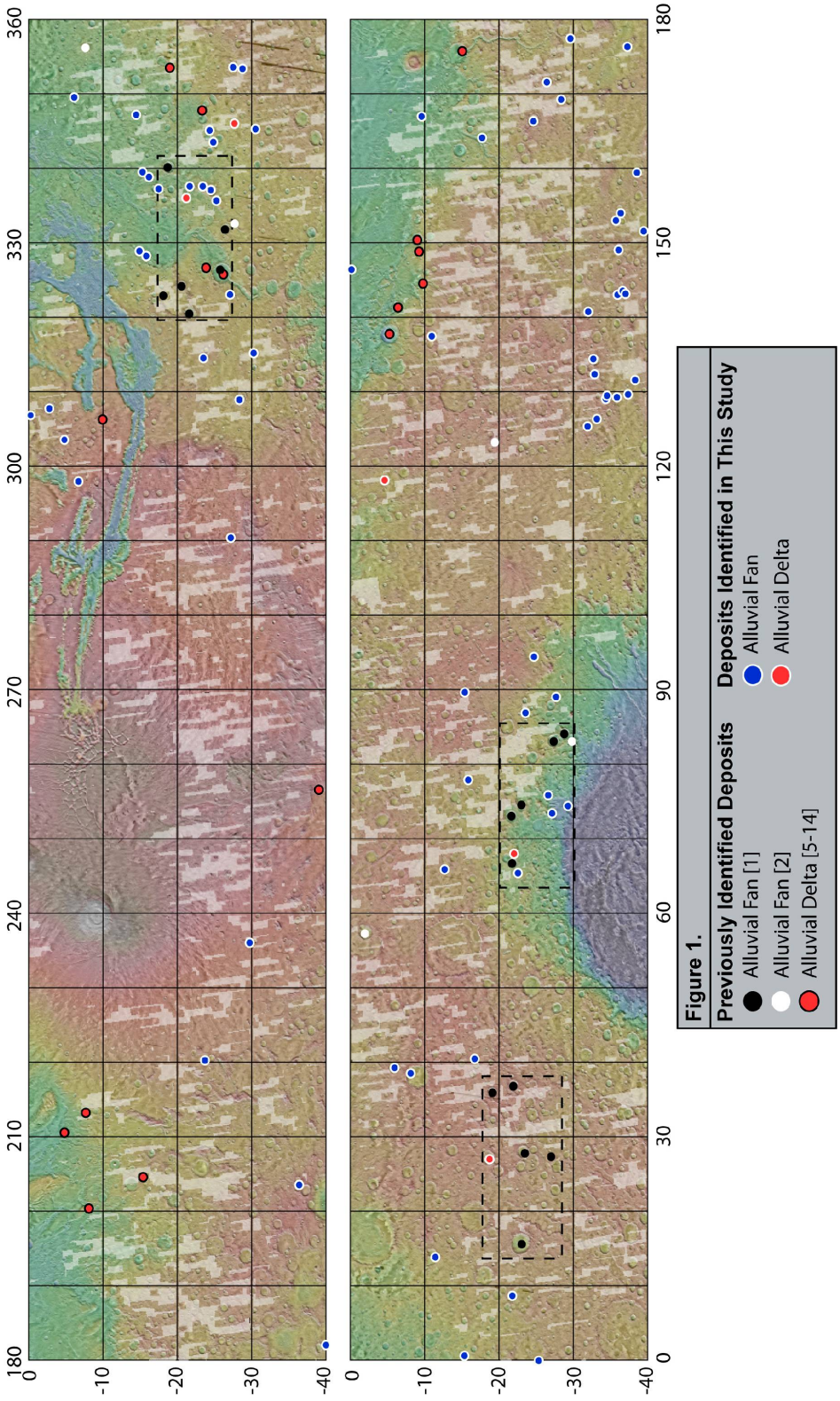

Figure 1. Distribution of previously and newly identified intracrater alluvial fan and deltaic deposits from 0° to 360°E between 0° and 40°S. Black dashed boxes show regional clusters described in [1]. MOLA over THEMIS day IR; white shaded areas indicate gaps in CTX coverage.