HIRISE OBSERVATIONS OF NEW MARTIAN SLOPE STREAKS. C. M. Dundas[1], [1]Astrogeology Science Center, U.S. Geological Survey, 2255 N. Gemini Dr., Flagstaff, AZ 86001, USA (cdundas@usgs.gov).

Introduction: Dark slope streaks [1-3] are distinctive Martian slope features that have been studied for several decades. These elongated features are generally darker than their surroundings and typically begin at point sources. Relatively-bright slope streaks likely result from modification of originally dark features [4]. The leading hypotheses for their origin are dust avalanches [3,5] or various aqueous models [2,6-7]. New slope streaks were observed by the Mars Orbiter Camera (MOC) [3] and have subsequently been studied in more detail [4, 8-10]. As a prominent example of Martian slope activity, slope streaks are important to understand both for their own role in shaping the current surface and as a comparison for other slope processes. This project examines HiRISE before-and-after images to reveal details of the changes at high resolution.

Observations: *Growth timescales:* To date, all observations are consistent with rapid formation of dark slope streaks rather than incremental growth over an extended period. This includes examples in which the formation time is constrained to within weeks, and no subsequent extension occurred over a period of years. However, over-printing of older streaks by newer does occur (Fig. 1), so it is not necessary to reset the surface entirely in order to permit streak propagation. In one case a streak straddles the scarp left by a previous avalanche of slope material, with no apparent difference on either side (Fig. 2). As the topographic effects of this streak appear minimal (no relief is visible along the margin), this indicates that removal of the entire avalanche-prone layer is not necessary to produce a dark streak.

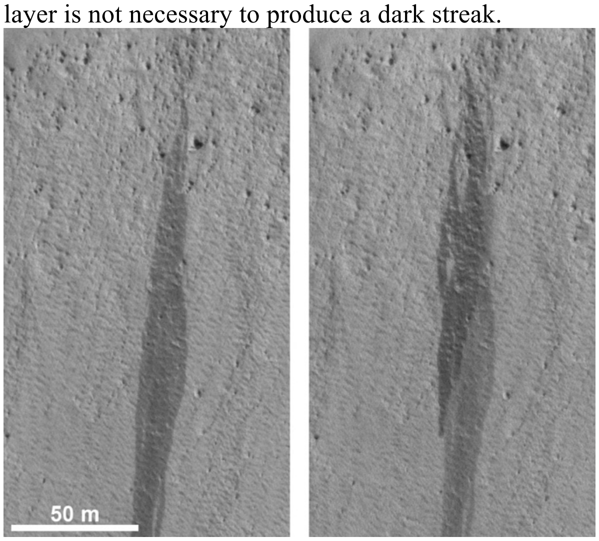

Figure 1: Overprinting of older slope streak by younger (HiRISE images PSP_003595_2115 and ESP_029888_2115). The brightness of the new streak is similar in the area within and outside the older streak.

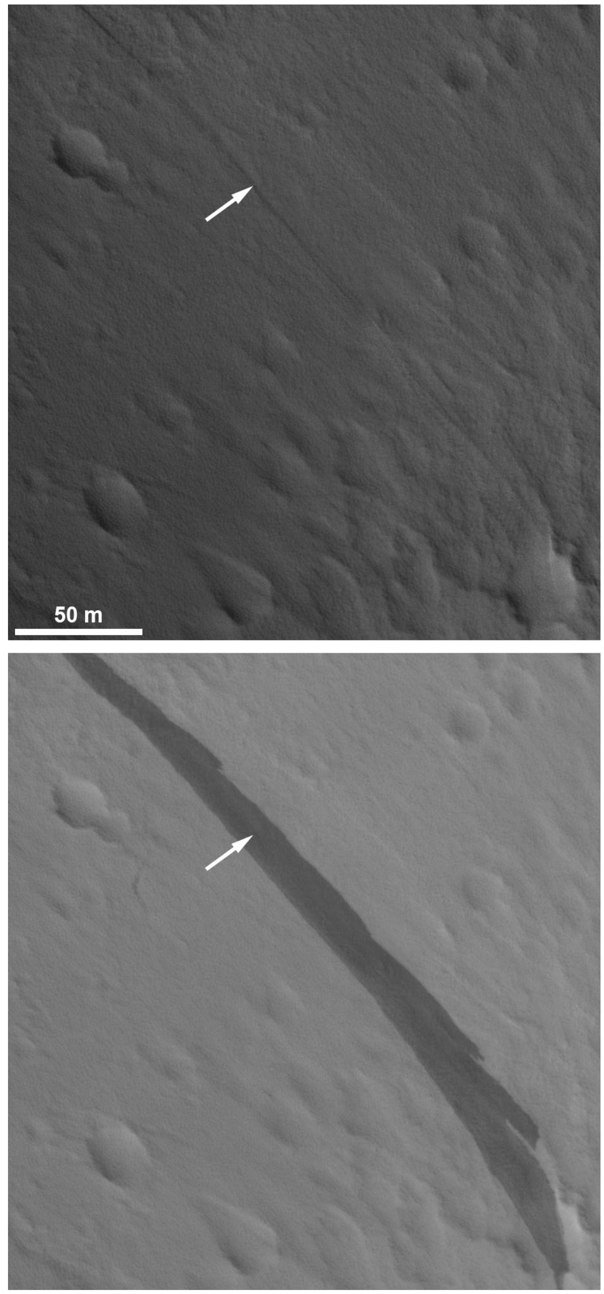

Figure 2: Slope streak straddling an avalanche-margin scarp (HiRISE images PSP_003595_2115 and ESP_032301_2115). Arrow indicates the scarp and is at the same location in both images.

Topographic interactions: Fig. 3 shows an example of a dark slope streak mostly blocked by a ridge of dust. The streak overtopped the ridge at several locations. There is no evidence for percolation through the ridge, as would be expected for seeping water; instead, the flow appears to have overtopped the ridge at locations favorable for a flow over the surface.

Topographic effects: In many cases subtle topographic features are preserved within slope streaks, even in some km-scale examples. However, topographic changes also occur in some cases. Fig. 4 shows a slope streak with a multi-lobed distal reach. The lobes are separated by subtle ridges that extend up-slope within the streak, suggesting clumps of moving material at the time of formation. Nevertheless, even in this case minor topography is preserved between the ridges in some parts of the streak. Ridges appear to cross-cut each other at one location, suggesting that the features are erosional in origin.

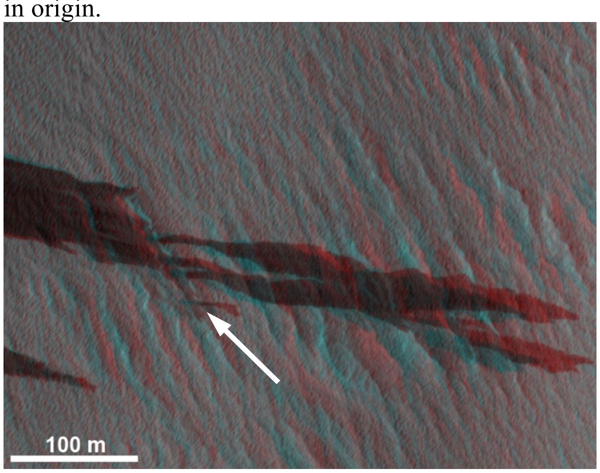

Figure 3: Anaglyph of HiRISE images ESP_041968_2075 and ESP_042614_275.

Clustered formation: Although slope streak formation can occur at any time of year and is often sporadic [9], we have observed evidence for annual variability and clustered formation in some cases. Some locations have experienced high rates of streak formation in particular years. This can occur in conjunction with impacts [11] but in some cases no trigger is apparent.

Discussion: These observations are largely consistent with the dust-avalanche model for dark slope streaks. However, it is possible to produce a prominent streak by removing only a small amount of dust. The near-uniform internal tone within most streaks, despite variable topographic effects, suggests darkening by a photometric effect rather than exposure of a darker substrate. These and additional observations of new slope streaks will be discussed at the meeting.

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References: [1] Morris E. C. (1982) *J. Geophys. Res.*, 87, 1164-1178. [2] Ferguson H. M. and Lucchitta B. K. (1984) *NASA Tech. Memo.* 86246, 188-190. [3] Sullivan R. et al. (2001) *J. Geophys. Res.*, 106, 23607-23633. [4] Schorghofer N. et al. (2007) *Icarus*, 191, 132-140. [5] Baratoux D. et al. (2006) *Icarus*, 183, 30-45. [6] Ferris J. C. et al. (2002) *Geophys. Res. Lett.*, 29, doi:10.1029/2002GL014936. [7] Kreslavsky M. A. and Head. J. W. (2009) *Icarus*, 201, 517-527. [8] Aharonson O. et al. (2003) *J. Geophys. Res.*, 108. [9] Schorghofer N. and King C. M. (2011) *Icarus*, 216, 159-168. [10] Bergonio J. R. et al. (2013) *Icarus*, 225, 194-199. [11] Burleigh K. J. et al. (2012) *Icarus*, 217, 194-201.

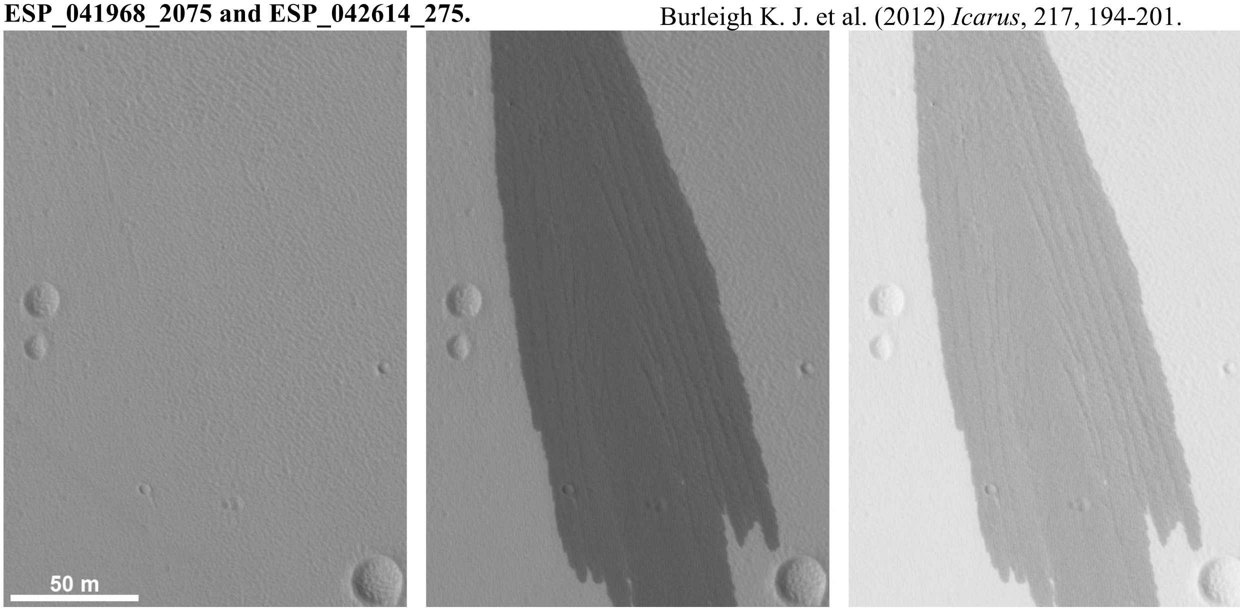

Figure 4: Formation of ridges within a new slope streak. Left: HiRISE image PSP_003694_1800. Center and right: ESP_029420_1800 with two different stretches.