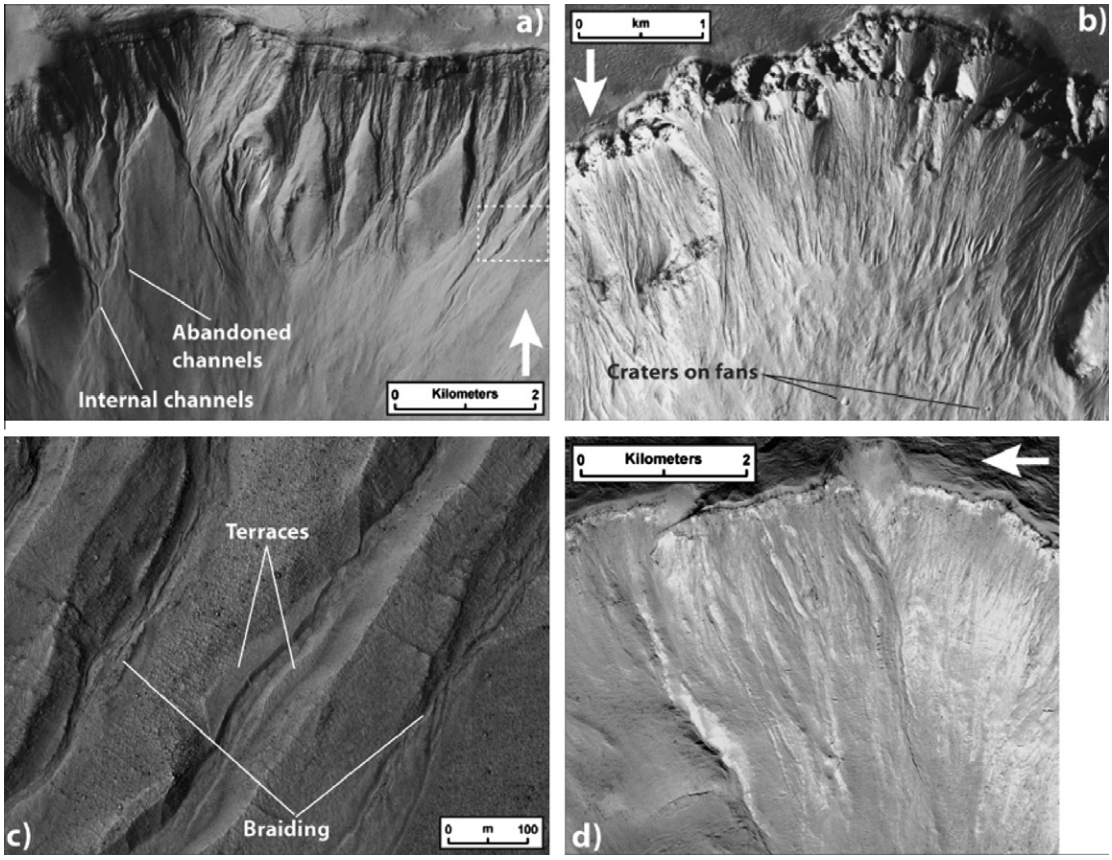

Fig. 9. Aspect dependence of the morphology of gullies within Asimov Crater. (a) Gullies on pole-facing slopes are highly incised and display dendritic tributaries that merge into single ~100 m wide channels. (b) Gullies on equator-facing slopes originate from cuspate, ~500 m wide alcoves cut into the upper portion of the slopes. Multiple, relatively straight, 50 m wide channels emerge from the apex of the alcoves. (c) High-resolution image of pole-facing gully channels that display fluvial features, including small ~5 m-wide channels that are present within the larger channel systems (see box in (a) for location). (d) Gullies on west-facing slopes are also well incised, but are not as densely eroded into the slopes as the pole facing gullies are and do not display tributaries. (a) and (b) CTX: P07_003880_1327. (c) and (d) HiRISE image: PSP_004091_1325.

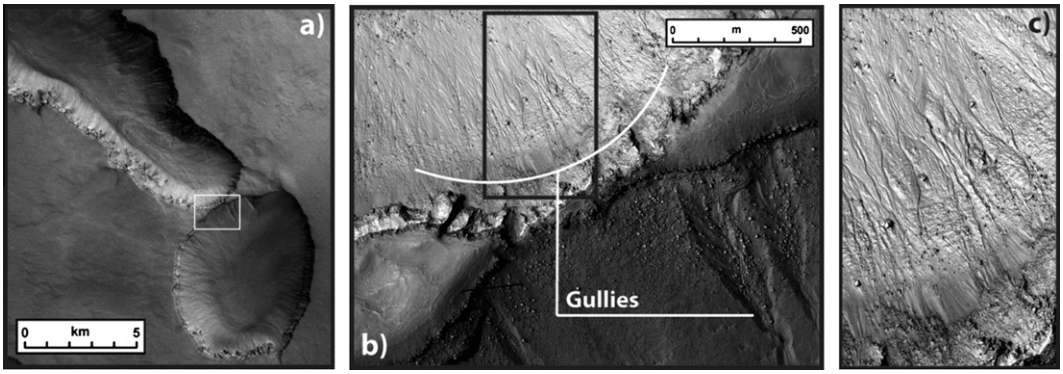

Fig. 10. Isolated ridge gullies. (a) Gullies eroded into slopes on either side of an isolated ridge along the southern end of the northeastern valley; boxes represent the location of the adjacent images. (b) The occurrence of gullies on an isolated slope here and elsewhere within the study area, argues against a groundwater source for the water that carved the gullies. (c) Enlarged view of gullies in (b), demonstrating that gullies are located along the narrowest portions of the ridge, arguing against their formation via a confined aquifer. Morgan et al. (2010) suggested that the gullies were formed by the melting of snow deposits. The image in (b) also shows the aspect dependence of gully morphology present throughout the valley systems. (a) HRSC: h1932_0000, (b) HiRISE: PSP_003880_1325.

disconnected valleys (Fig. 10), argues against the occurrence of perched aquifers providing the gully water source. Morgan et al. (2010) underlined this observation as an argument in support of an external source of water, and suggested that the melt of atmospherically deposited snow was the most likely candidate for the formation of these gullies.

Smaller gully forms that are only resolvable at HiRISE resolutions are also present along slopes within the lower portions of the valleys. There are two distinct morphological types. The first type is located along the side of boulder-covered mounds on valley floors (Fig. 11). These exhibit the three morphological components (alcove, channel and depositional fan) used to define gullies on Mars by Malin and Edgett (2000a), although they are much smaller than the main gullies within the crater (channel lengths are ~200 m, Fig. 11). The alcoves are 20 m wide and are positioned adjacent to each other in single rows cut into the flanks of the mounds. Narrow <1 m wide channels emerge from the alcoves and maintain straight courses except for gentle meanders around