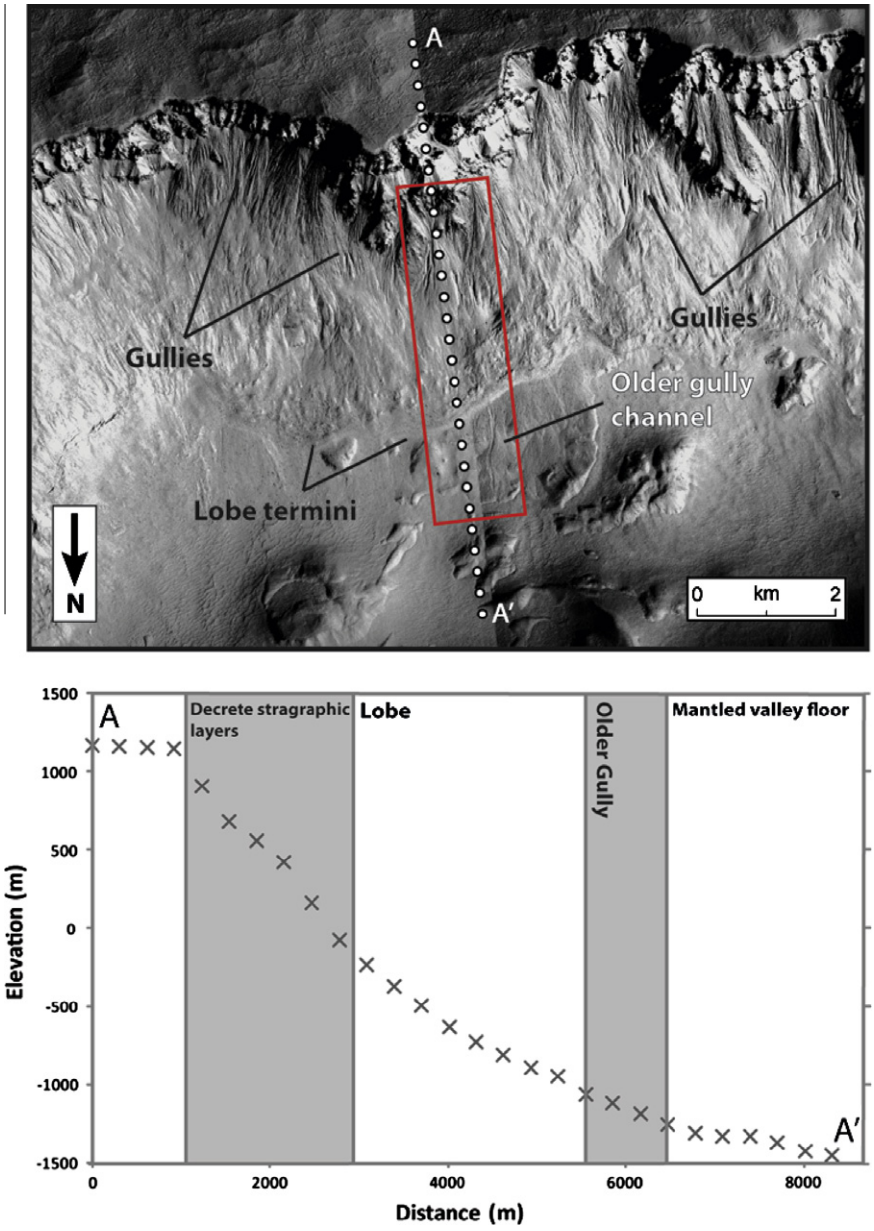

Fig. 17. Image and accompanying MOLA profile of a portion of the southern wall of the southern valley that shows a degraded LDT superimposed on a relict gully channel. Gullies are also superposed on the surface of the LDT, opening the possibility that the formation of the LDT postdated a previous period of gully formation or occurred during an extended gully formation period. Composite of CTX images. The box represents the location of the image in Fig. 18.

of thick ice deposits at the mid-latitudes (Head et al., 2006a,b; Madeleine et al., 2007). This is relevant to the LDT providing Mars experienced similarly high obliquity values during their formation >8 Ma. If this was the case the direct deposition of this ice onto the walls of the valleys or the calving of ice from deposits above the cliff at the summit of the slopes may have enabled the formation of small glaciers in the valleys. Debris supplied to the surface of the lobes from mass wasting along the cliffs above could have buried ice-rich material and protected it from sublimation in a manor similar to that described for the preservation of the Olympus Mons debris-covered glaciers (Head et al., 2005). The subsequent downslope movement of this material could have resulted in the LDT preserved today.

The occurrence of a similar texture and features interpreted to be related to the occurrence of near-surface ice (e.g. boulders with moats and elongated depressions, see Fig. 16) along the floor of valleys <5 km wide to those present on the surface of the LDT suggests that ice-rich deposits may also be preserved within these valleys. Such deposits could have been formed the same way as the LDT, except that the lack of a steep topographic gradient prevented the formation of obvious flow features (e.g. compressional ridges). The absence of these features within the wider valleys (such as the southern valley) is logical as the floors of narrower valleys would be more sheltered from insolation and would receive higher amounts of debris due to the closer proximity of the valley walls, and therefore would provide a higher preservation potential for buried ice. The preservation of ice within the narrower valleys may in part explain their shallower cross sectional profiles relative to the southern valley (Fig. 4).

Once the source of ice was cut off to the valley slopes, the LDT would be dominated by sublimation, which, in turn is dictated by the thickness and porosity of the debris layer above the ice (Kowalewski et al., 2006). We attribute the loss of ice from the LDT as the reason for the downturn of small craters in the crater size–frequency