

ESurf-2022-64: Morphologic and Morphometric Differences between Gullies Formed in Different Substrates on Mars: New Insights into the Gully Formation Processes

Technical/typographical corrections from Frances Butcher, Associate Editor:

L14: either 'consisting of ice' or 'comprising ice'

L17: alcove and fan > the alcoves and fans

L20: that mean gradient > that the mean gradient

L33: incised into the > incised into:

L34-35: The citations currently used are for one specific type of glacial deposit (GLFs), which don't seem to be the focus of this manuscript. More appropriate would be references to LDAs. But more specifically papers which show the glacier-gully interactions. For example Conway et al. 2018, de Haas et al. 2017 etc.

L47: (VFF) > (VFFs)

L48: extent of latitudes > latitude ranges (It would be good to state the latitude range here.)

L49: This is the first in-text use of lobate debris apron, so define LDA acronym here.

L49: fill > fills

L51: Conway et al. 2018 citation is not a suitable reference for this statement. You could refer to SHARAD papers, which infer high purity ice and thin debris cover. E.g.:

Holt et al. 2008 <https://doi.org/10.1126/science.1164246>; Plaut et al 2009 <https://doi.org/10.1029/2008GL036379>; Petersen et al. 2018 <https://doi.org/10.1029/2018GL079759>

L70 & 81: morphology and morphometry > morphologies and morphometries

L75: Gullies by studying long profiles of gullies > gullies by studying their long profiles

L81: southern hemisphere > southern hemisphere of Mars

L83: digital terrain model (DTM) > digital terrain models (DTMs)

L88: DTMs are produced > we produced DTMs with

Table 1, row 'Artik': See L49 comment about defining LDA earlier, and remove LDA definition from here.

L107-114: There are currently no in-text references to Fig 2b-d, please add

L107: 'alcoves on the walls': would it be better to say 'topographic depressions'? Alcoves is confusing if you don't necessarily mean gully alcoves.

L109-111: see above comments - you could just change alcoves to 'topographic depressions' to avoid this confusion?

L114: Could do with an extra phrase here - that they are also inferred to incise LDM? Your explanation in the response to reviewers was helpful in this regard, and this explanation would benefit from that addition in the manuscript itself.

L115: Add reference to Fig 2d

L115: listed in LDM/glacial deposits > listed in criterion 1 (LDM/glacial deposits)

L122: delete the in 'the Terra Sirenum'

L122: delete 'evidence of'. The polygons are visible and are themselves evidence of LDM.

L133: 'dimensionless variables' – give a couple of examples here?

Table 2 (and Figs 5, 6 & Table 3): Perimeter > Alcove Perimeter

L155: HiRISE DTM that was used > HiRISE DTMs used for

L157&158: source area is > source areas are

L167: Conway et al. 2015 isn't a seminal reference for CDA – provide one for CDA and/or make clear that this citation refers specifically to gullies.

L174:

- (a) LDM and VFFs > LDM and/or VFFs (you go on to say some aren't affected by both)
- (b) Consider whether 'glacial deposits' would be better than VFFs. Are there locations where there are arcuate ridges and no accompanying VFFs? If so, 'glacial deposits' would be more appropriate as it covers both arcuate ridges and VFFs.

L177: 4 craters out of 24 craters > 4 craters out of 24 craters influenced by LDM and/or VFFs (see also comment 174b above)

L233-234: Please fully describe the boxplot elements. e.g. Box shows interquartile range, central horizontal bar shows median, and whiskers show range.

L242: Define threshold for 'very strong positive correlation'

L245: What correlation coefficient is this? Pearsons?

L246: Values approaching -1 are also strong, so reword this. e.g. 'Values approaching either 1 or -1 have stronger correlations. Zero indicates no correlation.'

L255: Is this an explanation of the 'weight'? If so, explain this after the first mention of weights (i.e. line 253). e.g. on line 253, you could say weight values indicate the discriminator power in separating between....' Then here, '...relief ratio (fan) have nearly 1/5 or greater (but less than 1/3) of the weight of alcove perimeter...'

L261: Discussions > Discussion

L270: alcoves > gully alcoves

L272: Care needed with these citations: most early papers didn't infer high ice purity (instead preferring a rock glacier model). High confidence of ice content only came later, particularly with the radar studies.

L273: interpreted to be comprised of > interpreted to comprise

L285: are having an elongated, V-shaped cross-section in their mid-section > do have elongated, V-shaped cross-sections in their mid-sections

L287: perimeters and reliefs Please check pluralisation throughout

L288: citations for 'previous studies'?

L370: latitudes > latitudes on Mars

L394: ESurfD > ESurf