Earth **Surface**
Dynamics
Discussions

Interactive comment on **"Morphological properties of tunnel valleys of the southern sector of the Laurentide Ice Sheet and implications for their formation"** *by* **Stephen J. Livingstone et al.**

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This is an interesting paper and sound research with very useful data on tunnel valleys, an important step towards the clarification of subglacial morphogenesis. Below, please find some comments and proposed edits that may help improve the manuscript. These are mostly related to terminology and methods.

— 'Introduction' section

L80-84 (statement of objective): Consider rephrasing sentence (perhaps revise whole paragraph). Suggest to remove "To rectify this" (to correct this error), because it is about the lack of data rather than error. Scale -> geographic scale; Pattern -> spatial

arrangement; Rectify ". . .mapping of the size, shape, pattern and [spatial] distribution to better understand spatial properties. . ." L84: "constitution" -> Composition?

Reword the rationale for study area selection; e.g., that the landforms can be mapped from a DEM is unrelated to the study area.

Requires a study-area figure ahead of section 2. Ideally, it would include previously mapped tunnel valleys.

— 'Introduction'/'Limitations'

Consider a more explanatory (longer) header for this section and 'challenges' as a replacement to 'limitations'. This section does not fit the introduction. It would better come under methodology.

In what way(s) are buried tunnel valleys a limitation for the characterization of tunnel valleys? Section does not properly ponder this. What properties can be compromised?

Last sentence of paragraph L96-103: what does data from Europe show? The expectation would be for positive spatial autocorrelation – a problem for the characterization of tunnel valley spatial properties.

— 'Methods' section

Clarify that the USGS national elevation dataset (NED) is not a DEM per se. The NED includes several DEMs, not only the 3 m and 10 m DEMs.

L146-147: Which criteria were used to map each of the mentioned landforms? Define each landform; use references. "Conventional criteria" is not self-explanatory.

L148: Centrelines. Centrelines are not thalwegs. Revise manuscript accordingly. Were centrelines automatedly derived from valley side lines? Please describe methodology.

L169: Justify scale chosen for analysis of longitudinal profile.

L178-179: Clarify. Tributary tunnel valleys excluded from inventory?

L181-182: Reword. It is about describing the relationship between width and local elevation gradient; not about the influence of one on the other.

L182: Justify 1km scale. This is a particularly important issue. Why an absolute interval, if valley length varies considerably. What about the valleys under 1 km and some kms long?

L185: Reword. "Downstream distance" from what?

L191: drainage network –> tunnel valley network?

— Results section

L205: Perhaps would be more informative to the reader to name this section "results".

Suggest reviewing usage of 'network'; 'cluster' is more appropriate; most tunnel valley clusters do not seem to be networks; rephrase, e.g., sentence L211-213.

L247 vs. L399: 65 km vs. 55 km for maximum tunnel valley length. Rectify.

— 'Discussion' section

A discussion of the limitations is missing. The 'limitations' subsection under introduction is insufficient and would better be under the methodology and discussion. Include considerations on the usage of the centreline for analysing the (thalweg) longitudinal profile; and on the post-formational modification of valley bottoms, linking it to the scale chosen for longitudinal profile analysis.

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