

Line numbers refer to the version with tracked changes.

- 1) Lines 81 & 82. Sentence should be rephrased: “it potentially affects” is not clearly related to the preceding part of the sentence (where the subject is plural, namely “LTNE effects”).
- 2) Lines 88 & 89. Sentence “Following studies varying meteorological and thermo-hydraulic parameters further reveal conditions promoting LTNE effects and address the uncertainty in model parameterization” should be rephrased.
- 3) Line 95. I prefer “matric potential” to “pressure head”.
- 4) Line 98. It would be useful to recall the measurement units for  $\alpha$ , i.e., [ $m^{-1}$ ].
- 5) Equation (3). I am afraid that this equation is incorrect. If I am not missing something, it does not correspond to equation (23) of van Genuchten (1980). Basically,  $(\epsilon_{l,sat} - \epsilon_{l,ref})^{1-m}$  should be substituted with  $(\epsilon_{l,sat} - \epsilon_{l,ref}) \times (1 - m)^{-1}$ . Am I wrong?
- 6) Lines 103, 104, 107, 108, 259. A space is missing in “van Genuchten”.
- 7) Line 108. A space should be added after “season”.
- 8) Line 111. Word “been” is missing in “have also successfully used”.
- 9) Equation (4). It is necessary to recall the measurement units for  $\alpha$ . In particular the equation could be rewritten as  $\alpha = 7.3 m^{-1} \times mm^{-1} \times d + 1.9 m^{-1}$ .
- 10) Equation (5). Analogously to (4), a preferred format for this equation is  $n = -3.3 mm \times d + 14.4$ .
- 11) Line 127. I think that “From rocks” should be substituted, possibly with “For saturated porous media”.
- 12) Equation (7). The definition of phi and phi0 is missing.
- 13) Line 142. Sentence “Throughout... respectively” should appear much early, when the indices for the three phases are used for the first time.
- 14) Lines 149, 169. “K” (kelvin) should be preferred to “°C”.
- 15) Line 156. “Dispersivity” could be substituted with “Dispersion coefficient”, as the term dispersivity is often used for the “dispersive length”. The same term appears elsewhere, so if it is changed, it is necessary to check it throughout the whole manuscript. Notice that alpha appears earlier as one of the van Genuchten parameters: different symbols should be selected for these two quantities.
- 16) Line 170. I prefer the use of braces “{ }” to denote a set of variables, instead of square brackets.
- 17) Line 171. May be an adjective different from “complex” could be better, because, at a first reading I interpreted this as a complex number.
- 18) Line 175. Expression “besides better knowledge but due to the lack of any robust data” should be rephrased.
- 19) Line 185. Erase “,” after “shown”.
- 20) Line 194. I would use an adjective different from “classical”, may be “standard” or “common”.
- 21) Line 217. “Per unit time” should be added after “melted”, shouldn’t it?
- 22) Line 223. “Note, that” can be erased.
- 23) Line 238. “Per unit time” should be added after “freeze”, shouldn’t it?
- 24) Line 253. Expression “of 13 - 90%” should be substituted with “between 13 % and 90 %”.
- 25) Line 254. Expression “within the affects” should be corrected.
- 26) Line 268. IS “donating” the right word? May be, “denoting”?

- 27) Line 289. "A porous media" should be corrected: either singular (a porous medium) or plural (porous media).
- 28) Table 1, last line. It is not clear that "e" is used to denote scientific notation:  $1.7 \times 10^{-3}$  and  $1.7 \times 10^{-5}$  should be preferred. The same applies to lines from 480 to 482, 494 & 495, 497, 530 to 532, and to the K values in Table 2.
- 29) Line 314. "10 hours" could be substituted with "10-hour-long".
- 30) Lines 319 & 320. Expression "of 0.1–0.5mm" should be substituted with "between 0.1 mm and 0.5 mm".
- 31) Line 324. Word "observerations" should be corrected.
- 32) Lines 325 & 327. The same format should be used for "first" and "second". May be "shallowest" and "deeper" or similar could be used.
- 33) Line 344. "Quantitative" or "qualitative"?
- 34) Line 381 & 382. Sentence "the effect... meteorological quantities" should be corrected.
- 35) Line 400. Expression "coincides similar" should be corrected.
- 36) Figure 4. "(c)" is missing in the figure caption. Expression "describe to the scenario" should be corrected.
- 37) Line 420. "between 20 to 70%" should be rephrased either as "between 20 % and 70 %" or "from 20 % to 70 %". Analogous corrections should be introduced in the following lines.
- 38) Table 2. The measurement units of h should be written more precisely as "W/(m<sup>2</sup> K)".
- 39) Line 580. I would use "down to a depth of 30 cm" instead of "up to 30cm".
- 40) Throughout the whole paper, the space between values and measurement units is often missing.
- 41) The vertical axis of all the figures should be changed. At line 95, it is stated that the z-axis is assumed positive downwards. Therefore, it would be better to use positive numbers increasing downwards for the vertical axes of the figures. Moreover, the axis title is "depth of the snow column" and this is 0 at the top of the glacier or snowfield and increases downwards, so that it should be positive.