

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2022-64

Lander Van Tricht (Referee)

Referee comment on "Estimating degree-day factors of snow based on energy flux components" by Muhammad Fraz Ismail et al., The Cryosphere Discuss.,
<https://doi.org/10.5194/tc-2022-64-RC2>, 2022

Review "Estimating degree-day factors based on energy flux components"

The manuscript describes the possibility to estimate degree-day factors based on energy flux components. It studies in detail the contribution of each component as well as the variation (spatial, temporal, climate change). Consequently, the study is a valuable contribution in the context of calibrating DDF in temperature-index models to better represent melting. This is relevant given the importance of correctly calibrated models to assess (future) snowmelt.

The paper is well written, and the methods/formulations are clearly described. Further, the main ideas are very well presented in the introduction which ensures that the reader is immediately introduced in the topic and knows what the study focuses on. The study also contains an enormous number of references and (explanations of) parametrisations that sometimes make it read like a literature review, especially in the method section. The study is not particularly "innovative", but it does contribute to a better understanding of DDF and the implementation/calibration of these factors in models that can be used to determine snowmelt.

In conclusion, I think the study is worth publishing with some smaller (technical) revisions. Further, the authors may consider making the structure/division of method - results - discussion a bit clearer. Now it is not entirely clear what certain datasets are used for in this study (Brunnenkopfhuette, Upper Indus Basin, etc.). Furthermore, it could be an option to do an analysis with the hourly temperature data instead of just looking at the average, as this data is available from the meteorological station.

Specific comments

- Line 23: yields <-> yielded
- Line 24: mm w.e.? If water equivalent is used, use this abbreviation
- Line 24: What is BIAS? RSM is clear for most readers. Use the full notation, especially the first time.
- Line 45: Odd use of however in this sentence
- Line 61-66: Some repetition with previous paragraphs. Consider integrating this a little more in other paragraphs. That way, the text can also become a bit shorter.
- Line 88: Why does albedo decrease with increasing altitude?
- Line 96: .. and topographic settings?
- Line 117: a part of "the" Isar River system "lying" in the ...
- Line 122: made up sounds a bit strange. Is mainly composed/characterised?
- Line 123: A reference here is not essential.
- Line 128: Have <-> has
- Line 130: Sometimes British – American English is used (parametrise – parametrize etc.)
- Line 130: Summarizes
- Table 1: Some variables need explanation. What is K_t ? SR_{in} ?
- Figure 1: Snow station or meteorological station?
- Line 151: Units are in water equivalent?
- Line 155: What is the difference between part 1 and part 2 of this sentence? "T is set to 0°C" vs "The freezing point is chosen."
- Line 193-194: Which value is used in this study?
- Line 252: Odd use of however. Use a different word or rephrase the (part of the) sentence
- Line 294: Parametrise vs parametrize
- Line 304: Parametrise vs parametrize
- Line 324: It would be interesting to also mention a typical value for these conditions ($W m^{-2}$)
- Line 391: Analysed vs analyzed
- Line 419-420: This is based on data of the Hutt? How is the mean calculated?
- Line 470: I think it is clearer o put the panel letter before the sentence.
- Line 474: Snow station or meteorological station?
- Line 488-489: An average temperature of 20°C, it is not very common in early spring, wright?
- Line 492 and Figure 5: for selected cloudiness and average air temperatures?
- Line 510-512: Would it be an option to derive an average using the average hourly windspeeds?
- Line 539: In prefer "refreezes" <-> is refrozen
- Line 554: meteorological station <-> snow station
- Line 563: What is BIAS? Use full notation the first time
- Line 563-565: The snowmelt periods which are neglected, are these particular days? Or 10-day periods?
- Line 582: "is" or "to be"
- Line 704-706: Where does this data come from? The area of Indus Basin is not elsewhere introduced or mentioned.)
- Line 734: Parametrizes <-> parametrises (probably I have missed other ones)