The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC3
https://doi.org/10.5194/tc-2022-64-RC3, 2022


# Comment on tc-2022-64

Rijan Kayastha (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-RC3, 2022

This paper tries to do something new on the positive degree-day factor by analyzing different previous research which is very good. It is good that the authors still agree that the conventional degree-day approach is still good to use where data are insufficient. I have found the paper deals with the shortwave radiation calculation in detail which is very good for data insufficient regions. But the others such as the need of using different degree-day factor for space and time has already been applied in many previous researches and need to mention in this study. I also like to comment on the symbol used for a degree-day factor; in the past papers degree-day factor is denoted by the letter "k or K" but nowadays DDF is being used. The authors should also think about this issue. About the use of the degree-day factor in a climate change study, if we consider all parameters which affect the degree-day factor and assign the degree-day factor accordingly, it will still give a good result. Authors should also think about it.

A few other line-wise comments are as follows:

Line 118: Need to mention the name of the country (Germany) after Ammergauer Alps.

Line 260: It should be "The net longwave radiation flux …….

Line 161: Equation (20) should be at line 164 instead of line 161 at present. The sentence does not look good at present.

Line 233: Need to use a different letter for a coefficient other than *k*. Because *k* is used as Von Karmann constant on line 310.

Line 404: should be degree-day models instead of "degree-day factor models."

Line 461-463: The result stated in those lines "All of these models show the same tendency of linear increase by altitude, with the altitude factor being comparatively smaller under clear sky compared to overcast conditions" is to some extent is different from the results which we have received on a Glacier AX010 in Nepal (Kayastha et al., 2000). Figure 10 shows that the degree-day factor at higher altitudes is higher in a comparative clear sky (in June) compared to July and August (peak monsoon season with a highly overcast period in Nepal). We assumed that due to the overcast situation, air temp. does not change much and hence degree-day factors too do not change much. Why in the present study is the altitude factor comparatively smaller under the clear sky?

Line 639 -640: This statement "Under overcast conditions, however, the DDF is virtually stable ranging from 4.4 to 4.5 mm °C-1 d-1 in the same period" is in agreement with what was shown in Figure 10 in Kayastha et al. (2000).

Line 760-761: The message of this statement "Therefore, and as pointed out by many researchers, the DDF cannot be considered a constant model parameter. Rather, its spatial and temporal variability must be taken into account …." Has already been implemented in Kayastha et al. (2020; Table 3) in which we have used two sets of degree-day factors; lower degree-day factor at lower attitudes (lower than 5000 m) and higher degree-day factor for higher altitudes (above 5000 m). Also, monthly degree-day factors are used to incorporate the seasonality of degree-day factors.

References:

Kayastha, R. B., Ageta, Y. & Nakawo, M. (2000). Positive degree-day factors for ablation on glaciers in the Nepalese Himalayas: case study on Glacier AX010 in Shorong Himal, Nepal. *Bulletin of Glaciological Research*, 17, 1-10.

Kayastha, R. B. & Kayastha, R. (2020). Glacio-Hydrological Degree-Day Model (GDM) Useful for the Himalayan River Basins. In: Dimri A., Bookhagen B., Stoffel M., Yasunari T. (eds) Himalayan Weather and Climate and their Impact on the Environment. *Springer, Cham,* Doi: 10.1007/978-3-030-29684-1_19.