Review of manuscript:

"11-year record of wintertime snow surface energy balance and sublimation at 4863 m a.s.l. on Chhota Shigri Glacier moraine (western Himalaya, India)" by Arindan Mandal and co-authers

Submitted to The Cryosphere

General comments:

This paper analyzes the winter meteorological data and surface energy balance (SEB) on a lateral moraine of the Chhota Shigri Glacier in the western Himalaya during 2009-2019, and then explored the effects of cloud cover on winter energy balance and sublimation on that site. In addition, this paper presents long-term glacio-meteorological data in the western Himalayas, which is very important for studying the glacier mass balance changes on the Tibetan Plateau and the surrounding areas. This is an interesting paper, but needs major revisions before can be accepted for publications in TC. I have several comments that the authors should address.

Main comments:

1. Introduction: There are some studies discussing the energy balance and mass balance around HK regions and other regions on the Tibetan Plateau in recent years, such as Pamir and Tibet. Although the authors reviewed some studies, it is relatively simple. The authors should review more recent studies about energy balance and mass balance around the Tibetan Plateau, and pointed out the limitations of these studies.
2. I do not find how authors calibrate or evaluate their modeled results in this work. The parameters in the energy balance always need to be calibrated by some measured values. For example, the selected surface roughness lengths for momentum, temperature, and humidity, and the different formula of turbulent heat will impact the modeled H and LE. If the modeled results are calibrated, the data will be more credible. Why the author does not select surface temperature to

calibrate their model using the iteration method. In this work, the author can deduce that there is no snow cover at the AWS-M site when albedo is smaller than 0.4. This data can also be used to calibrate their modelled values. In addition, it seems that there are few studies about the glacier energy balance which delete G in their model. The AWS-M site remains snow-covered during winter and bare sand/sediment exposed during summer. Whether bare sand below the snow can provide more energy to heat the snow when compared to glacier ice below the snow? Or the author just focuses on the energy feature.

3. There are so many results in section 4. The author could shorten this section, because some studies have introduced the meteorological data at AWS-M in that glacier (Azam et al., 2016). Are there any special features from your data? Those special features are important. In addition, I hope that the author can discern the timescales for their results, such as diurnal cycle, seasonal cycle, and interannual timescales.
4. Line 23-25: The author does not discuss the influence of mid-latitude western disturbances on sublimation in the main text. The author can use the Reanalysis data (such as geopotential height and wind fields at 500 hPa or other heights from ERA5 or JRA55) to obtain the direct knowledge of circulation which can impact the sublimation and energy balance.
5. The author examines the role of cloud cover on SEB and turbulent heat fluxes based on clear-sky conditions and overcast conditions. However, this can be finished by using just two years of data. The relationship between CF and sublimation is small (Table 4). Thus, CF (or Sin) is not the main factor causing the interannual changes in sublimation in winter during 2009-2020. I strongly recommend that authors analyze the factors which control the interannual changes in sublimation in winter during 2009-2020 through correlation analysis. The author can explain interannual changes in sublimation from the view of energy balance. And the author should analyze the relationships between RH and sublimation, between albedo and sublimation, between Sin and sublimation, between Sout and sublimation, between Lin and sublimation, Lout and sublimation between D and Tair, between D and Ts,

and between D and RH. I guess that albedo is an important factor that contributes to the interannual changes in sublimation by changing Ts. The concrete results are depending on your further analysis.

6. Discussion: I sometimes feel confused about the sentences in the discussion. Take section 5.3 for example. The author said that sublimation during the summer-monsoon season was lower, which could be due to the ISM-driven warm and moist atmosphere in the southern slope of the HK region. However, sublimation is higher at very high altitudes despite high summer-monsoon humidity, e.g., East Rongbuk Glacier site (6523 m a.sl.). What is the main point of the author? When author compared their study with other studies, the author should note the spatial and temporal scales. Some studies used the glacier-wide values, while others used point values. Some studies used the low-altitude values, while others used the high-altitude values. Some studies used the annual values, while others used winter values. These data with different scales are incomparable. The author should select these data carefully.

Minor comments:

Line 32: wind-driven transport can cause accumulation in some sites.

Line 121-123: How do you get albedo in the night? Thus, what is your surface albedo threshold value in the night which is used to discern snow or bare-ground?

Line 153: Please explain the physical significance of Fsurface. If Fsurface is larger than 0, does melt occur at that time?

Line 209-210: Can you analyze the difference between infrared measured Ts and Ts derived from Lout? Please list the figure. Is the emissivity of bared-ground similar to that of snow cover? This is important for the author to calculate Ts from Lout.

Line 312-313: Which components in Rnet are more important in playing an essential role in governing the turbulent fluxes? And the author should indicate the timescale.

Line 313-314: I can not understand this sentence.

Line 325: What do you mean about the different colors of lines in Figure 6?

Line 359. Please add the “in the daytime” in the title of section 4.5.

Line 363-364 Why precipitation is higher in February and March than in January and April? High precipitation always means high cloud cover. This is different from your results of CF.

Line 376: 3 times lower?

Line 423: 145 ± 25 mm w.e. a-1?

Section 4.7: There is no section 4.7.2 in this part. The author can merge section 4.7 and section 4.7.1 as one part.

Line 451-452: I can not agree with the author, because we can not find that low Tair (-5°C and -10°C) corresponds to high Ts (0°C and -10°C) for the same time. From figure 14b, we can only find that sublimation was the larger when Tair ranged between -5°C and -10°C (compared to Tair in other values). This is similar to the Ts. Thus, the content in Line 451-452 is not correct.

Line 480-481: What is your timescale?

Line 544: Do you want to say that sublimation during the summer-monsoon season was lower than that during winter?

Line 545-547: The studies of Mölg et al. (2012) and Li et al. (2018) are in the south and central Tibet, respectively. They do not study the glaciers in the northern slope of the HK region.

Line 547-548: Can you explain the phenomenon that you found in these sentences?

Line 548-549: I do not find that the moisture content is relatively higher during post- and pre-monsoon on the Mera Glacier than that in winter in Table 5. And the altitudes are significantly different between the post- and pre-monsoon periods.

Line 550-551: What is the cause for the differences that the authors found in this sentence?

Line 553-555: I cannot understand what you want to say.

Line 560-564: These sentences have no relationship with the title ‘Sublimation fraction to winter snowfall and its importance’.

Line 569: Why sublimate is higher in the northwestern part of the HK than that in the other parts of the HK region?

Line 579-580: Such a higher sublimation fraction? You mean that the sublimation

fraction is higher on Qiangtang No 1 Glacier than other glaciers on the TP. Have you compared the meteorological data at the Qiangtang No. 1 Glacier to that on other glaciers?

Line 610-611: This result disagreed with your description in section 5.4. Sublimation fraction to winter snowfall is higher on Qiangtang No 1 Glacier than that on Chhota Shigri Glacier.

Line 620: There are more than 10 published works about Chhota Shigri Glacier. However, the meteorological data for that glacier is still not open to scientists in the world.