Below we have provided our responses **(in red text)** point-by-point to each comment from the reviewers **(in black text)**. ***Italic texts*** are used to highlight specific changes in the updated manuscript.

Response to Reviewer 1

General comments:

I appreciate that the authors made a big revision to the manuscript and gave their kindly responses to my comments. The paper is much improved, although some of the limitations and concerns raised in the reviews remain. Below, I have listed a few minor points that could still be addressed but I believe that the paper is now basically suitable for publication.

We sincerely thank Reviewer 1 for the comments and suggestion in our revised manuscript. We have addressed nearly all the concerns raised by Reviewer 1 and made necessary changes in the revised manuscript. We would like to invite to the revised sections of the manuscript.

Minor comments:

Line 20: How do you get that cloud cover also restricts the turbulent heat fluxes by around 50% in this work? I do not find such data (50%) in the main text. The author could add some sentences to explain why cloud cover restricts the turbulent heat fluxes.

This has been discussed in Sect. 4.4. In the previous manuscript, we didn't mention this in terms of '%' reduction. In the revised manuscript we have added a few lines mentioning turbulent heat flux reduction in '%' and a brief explanation for that. Revised and new sentences are shown below:

Line No. 377-387 (in the revised manuscript; track-changed version)

'Turbulent heat fluxes were generally higher in clear-sky conditions due to higher instability of the surface boundary layer (Fig. 9). In clear-sky, the mean daytime H was -66 W m^{-2} which is three times more negative compared to overcast conditions (-21 W m^{-2}), corresponding to 68% reduction of H in overcast conditions than in clear-sky. Similarly, the mean daytime LE was also higher in clear-sky, with -136 W m^{-2} compared to -47 W m^{-2} in overcast conditions (65% reduction). The reduced magnitude of turbulent heat fluxes in overcast/cloudy conditions was due to the neutral stability of the surface boundary layer (Fig. 9B; $R_{ib} \approx 0$). In neutral stability conditions, cold temperature ($T_{air} - T_s$ close to 0) restricts the magnitude of H and LE (Fig. 9). In clear-sky conditions, more negative LE was due to the surface's intense heating (T_{air} - T_s < 0°C), which creates a stronger vertical moisture gradient (q - q_s) than overcast conditions. $F_{surface}$ showed a slight daytime variation during clear-sky, but no significant variation in overcast conditions.'

Line 22-24: Please add the interpretation that why a strong control of cloud cover in shaping favorable conditions for turbulent latent heat flux.

The interpretation is presented in detail in Sect 5.1. The texts are shown below:

Line No. 508-512

'For example, cloud cover shapes the prevailing weather conditions at the study site by influencing the stability of the surface boundary layer (Fig. 9). In a stable stratification (T_{air} - T_s > 0°C), the snow surface remains cooler than the air, which attributes to a gentle near-surface moisture gradient and a lower LE, whereas in an unstable stratification (T_{air} - T_s < 0°C), steep near-surface moisture gradient results in a high negative LE.'

Also, to mention this in the abstract briefly, we revised the respective sentence (in the abstract) as:

Line No. 22-23

'Sublimation rates were three times higher in clear-sky conditions than overcast, indicating a strong role of cloud cover in shaping favourable conditions for turbulent latent heat flux by modulating the near-surface boundary layer conditions.'

Line 44-46: Li et al. (2019) have modeled the glacier mass balance and energy balance in the western Kunlun Mountains (not in the Pamir). And the similar questions in some other sites also need to check.

Thanks for pointing this out. We have revised the sentence and shown below:

Line No. 43-46

'Glaciers in the Pamir and Kunlun Mountains are extreme continental type, with cold temperature and low annual precipitation (Zhu et al., 2020; Li et al., 2019), thus their SEB characteristics are expected to behave differently than majority of HK glaciers which are alpine type, with relatively higher precipitation and temperature.'

Section 3.2: How do you discern snow or bare-ground in the night? This is related to calculating turbulent heat fluxes at the night.

We simply assumed snow-cover at night if the snow-cover existed during the daytime considering no S_{in} in the night and significantly cooler temperature. To properly handle this, we discarded data from the entire day when a single half-hourly albedo value was lower than the snow-cover albedo threshold (0.4).

Moreover, the night-time turbulent heat fluxes were significantly lower (below ± 20 W m^{-2}; Fig. 6 in the revised manuscript) compared to daytime values (close to 100 W m^{-2}). Considering the low/negligible values of turbulent heat fluxes at night and possible uncertainty in night-time albedo, we restricted our analysis to the daytime hours only (09:00-16:00 Indian Standard Time).

The snow-cover filtration method based on albedo threshold is discussed in Sect. 3.1. Below we copied a few lines from the respective section:

Line No. 133-136

'We filtered the snow-covered period for SEB based on the daytime surface albedo threshold value above 0.4 at the AWS-M (the mean bare-ground/snow-free surface albedo was lesser than 0.25 for July-August; 2009-2020). Additionally, we discarded the data of 74 days (2975 data points) out of a total of 1664 days (76248 data points; DJFMA 2009-2020) when albedo was below 0.4 (refer to Table S2 for snow-free dates).'

Section 4.5: The title of this section needs to be modified because this section explains the relationship between climate and turbulent heat fluxes and cloud cover is not the key factor impacting the changes in LE.

We modified the title of the respective section (Sect. 4.5) to **"Relationship of turbulent heat fluxes and meteorological variables under different cloud conditions"**.

We kept 'under different cloud conditions' considering that the section discusses the relationship of turbulent fluxes for both clear-sky and overcast conditions.

The manuscript is not concise and too wordy. There are some similar contents in Section 4.5, 4.6 and 5.1.

We removed some of the similar explanations/sentences from the respective sections. We invite Reviewer 1 to go through the revised sections.

Line 456-457: Do you mean overcast conditions cause the neutral stability of the surface boundary layer? Please explain it.

Yes. In overcast conditions, due to significantly lower S_{in}, temperature (both T_{air} and T_s) remains lower, with stronger wind (Fig. 9B). Due to cold temperature, vertical temperature difference ($T_{air} - T_s$) remains lower close to zero which results in $R_{ib} \approx 0$ (near-neutral stability; Fig. 9B). This phenomenon is also visible in Fig. 11A and 11D, where in overcast conditions (blue dots), $T_{air} - T_s$ values lie close to zero corresponding to a reduced magnitude of turbulent heat fluxes. To clearly show this phenomenon we have added T_s in Fig. 9 (revised plot shown below).

Considering your 1st comment and this one, we have revised the respective Sect. 4.4 and added a few lines explaining how overcast conditions cause the neutral stability and impacts turbulent heat fluxes. Kindly refer to the 1st comment above. Below we have showed the revised and newly added lines:

Line No. 371-372

'Due to comparatively lower temperature (both T_{air} and T_s) and higher u in overcast conditions, the surface boundary layer remains near-neutral (R_{ib} close to 0 due to low vertical temperature difference; T_{air} - T_s).'

Line No. 380-385

'The reduced magnitude of turbulent heat fluxes in overcast/cloudy conditions was due to the neutral stability of the surface boundary layer (Fig. 9B; R_{ib} values close to 0). In neutral stability conditions, cold temperature (T_{air} – T_s close to 0) restricts the magnitude of H and LE (Fig. 9).'

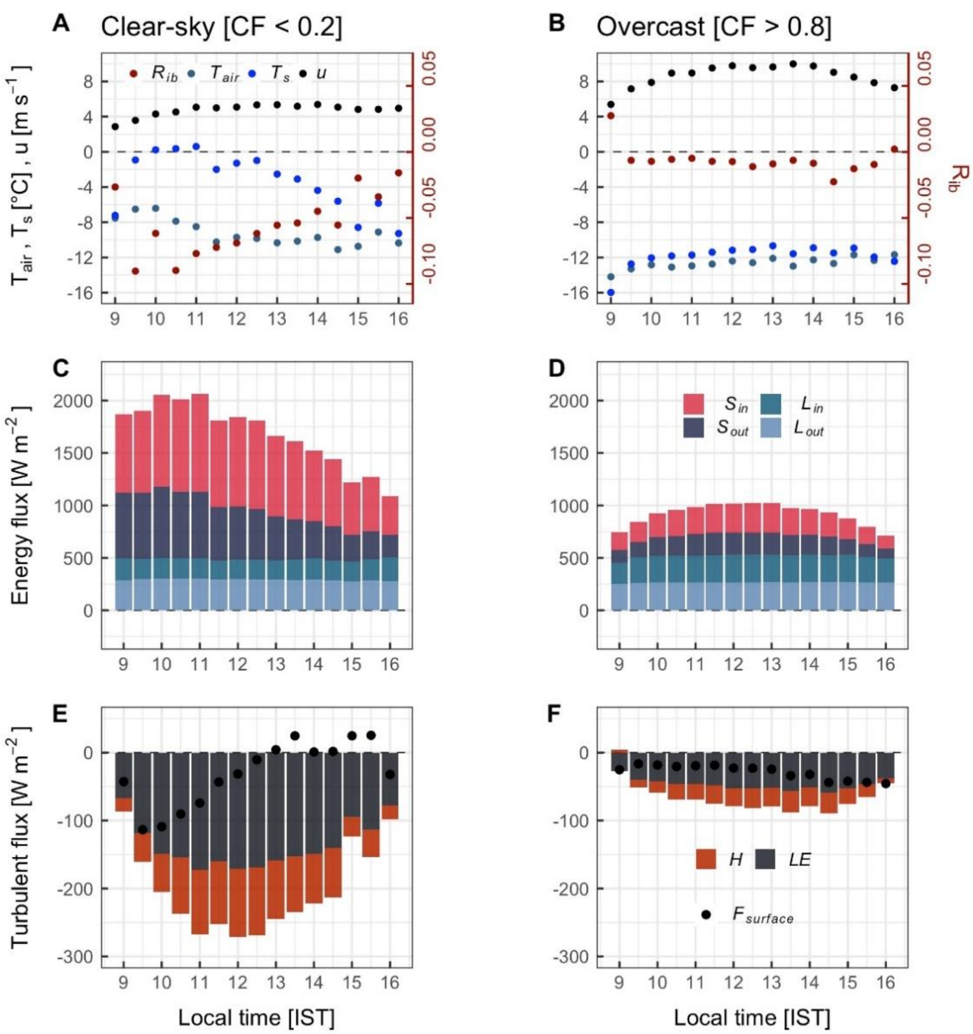


Fig. 9 (Revised): Daytime (09:00-16:00 IST) diurnal cycle of T_{air}, T_s, u, R_{ib} and SEB components under the clear-sky ($CF \leq 0.2$) and overcast ($CF \geq 0.8$) conditions.

Similar phenomena occurred in sections 4.4, 4.5, 4.7, and 5.1. The author could explain how cloud cover impacts climate conditions in the main text.

Kindly refer to the previous comment and the 1st comment where we have explained this aspect and mentioned the necessary changes we have made in the revised manuscript.

Line 474-475: Please explain this sentence.

We have revised the sentence for a clearer explanation.

Line No. 397-400

'Similarly, LE was strongly correlated with T_{air} - T_s in clear-sky ($r = 0.84$; $p < 0.001$) but moderately correlated in overcast conditions ($r = 0.50$; $p < 0.001$), which suggests that the vertical temperature difference significantly controls the near-surface vertical moisture gradient (one of the primary drivers of LE). This attributes to a significantly higher negative LE in clear-sky than in overcast conditions (Fig. 11).'

Line 531-532: Cloud cover, on the other hand, has a significant impact on the primary meteorological variables, particularly Sin, Ts and qs. Several sentences can be added to simply explain the cause for this point.

Thank you for the suggestion. Here, we refer the readers to the section (Fig. 9; Sect 4.4) where we explicitly discussed the impact of cloud cover in primary meteorological variables and SEB components. We could have added a few sentences here, however, such explanation has already been discussed in Sect. 4.4, with sole focus on cloud cover impact on daytime meteorology and SEB components. Therefore, considering the potential repetition/similar texts, we avoided to add new sentences here. The revised sentence shown below:

Line No. 449-451

'Cloud cover, on the other hand, has a significant impact on the primary meteorological variables, particularly S_{in}, T_s and q_s (Fig. 9; Sect. 4.4).'

Line 691: Muztag Ata No.1 is changed as Muztag Ata No.15.

Corrected. Thanks.

Line 705-706: Sublimation rate during the June-September, in general, was lower than that of October-May. This also occurs in the westerlies region (such as Muztag Ata No.15 Glacier) and the area of transition between the westerlies- and monsoon-dominated climate regimes (such as Xiao Anglong Glacier). However, the ratio of June-September sublimation to October-May sublimation is larger in the monsoon region than that in the westerlies and the transition area (Zhu et al. 2020).

Thanks for the point. We have included the suggested text almost as it is in the discussion.

Line No. 604-607

'This also occurs in the westerlies dominated region such as Muztag Ata No. 15 Glacier in Pamir (Zhu et al., 2018) and the area of transition between the westerlies- and monsoon-dominated climate regimes such as Xiao Anglong Glacier in Upper Shiquanhe region (Zhu et al., 2021b).'

Line No. 611-613

'The ratio of summer (June-September) sublimation to winter (October-May) is larger in the monsoon-dominated region such as Parlung No. 4 and Zhadang glaciers than that in the westerlies and the transition area, e.g., Xiao Anglong Glacier (Zhu et al. 2020).'

Response to Reviewer 2 (Jakob Steiner)

The authors have done an excellent job in addressing the concerns raised by reviewers. I have a few minor issues to be addressed below before publication.

We would like to thank Jakob Steiner for his comments and suggestion in our revised manuscript. We have addressed all the concerns pointed by him and made necessary changes in the revised manuscript.

L52: '…applications of SEB remain rare to date in the …'

Revised as suggested.

L63: maybe write 'fluxes' instead of 'flux'

Done.

L68: '…observed to be up to 66% …'

Revised as suggested.

L93: 'Special attention is given to …'

Revised as suggested.

L98: Like with Glacier/Basin etc 'Valley' should also be capitalized if referring to a specific one.

Thanks, Done.

L111: Why was 'were' replaced by 'was'? Data is always plural! Same elsewhere (e.g. l166).

We have corrected it everywhere in the manuscript.

L138: 'less than'

Revised as suggested.

L181: '(positive)' but actually I think you can leave the whole bracket away

Thanks. Removed the text within brackets.

L318: 'are shown' – maybe give a good read through once on where you should have plural and were singular, this occurs quite often.

Thanks for catching this. We have corrected it across the manuscript.

L550: Remove ‘whereas’ – better not to start sentences with it.

We revised it as suggested. Now the sentence reads as:

‘Sublimation was considerably lower when moisture availability was higher, T_s was significantly lower, with very strong u (Fig. 12; Fig. 13).’

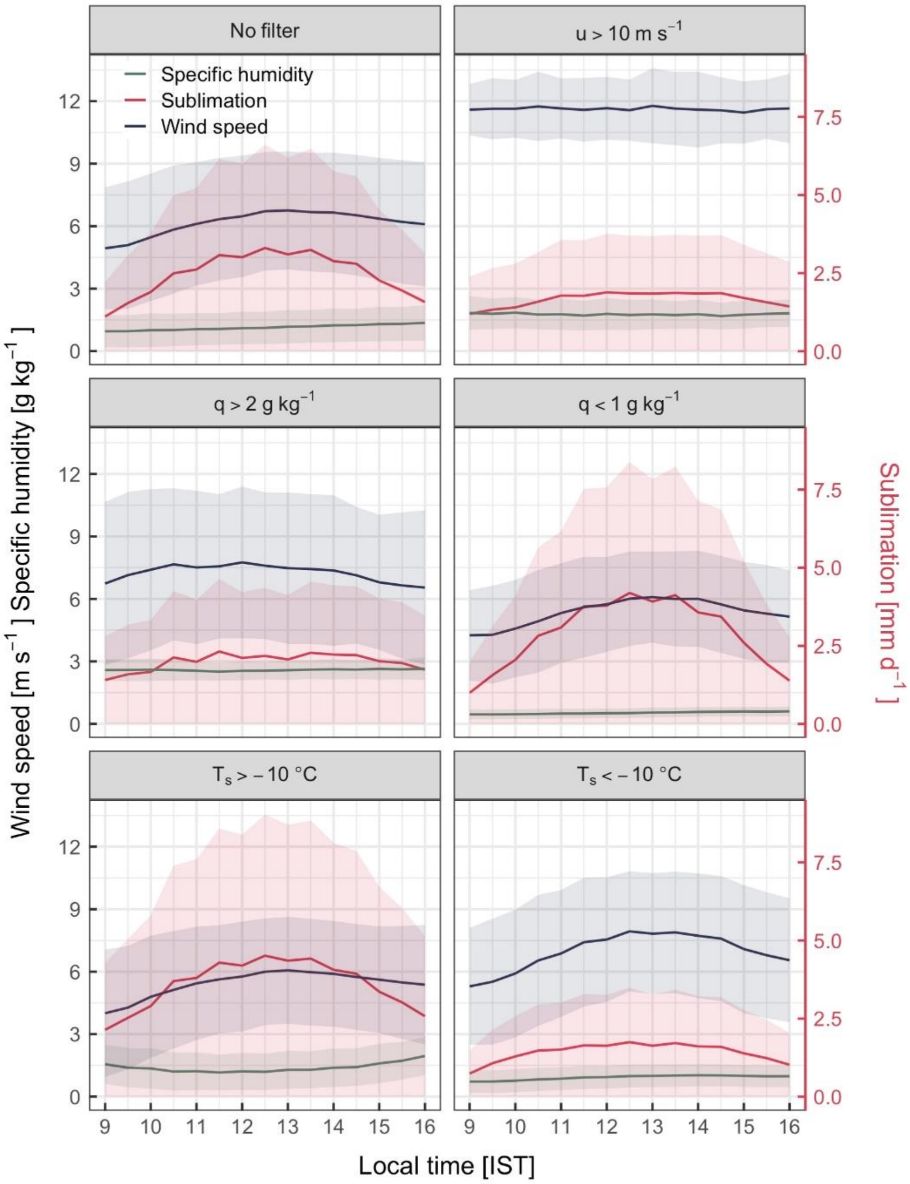
L667: ‘This could …’ I do not quite understand what you want to say here? ‘This could possibly lead to a lower energy sink through the LE flux, which will …’?

Thanks. We have revised the sentence as suggested:

‘This could possibly lead to a lower energy sink through the LE flux, which will boost the efficiency of S_{in}/R_{net} resulting in more surface melt.’

Figure 12: I know this is always a bit challenging, but it would be good if the legend does not overlay any data visualization in the top left panel.

Thanks. We have revised the figure as suggested and shown below:



L705: ‘rates’

Done.

L732: ‘This is a big issue …’ Again I don’t get what that sentence is supposed to say. What is the ‘issue’ here? Honestly I think that sentence is not required.

We removed the sentence as suggested.

L809: ‘schemes’

Done.