EGUsphere, referee comment RC2
https://doi.org/10.5194/egusphere-2022-334-RC2, 2022

Comment on egusphere-2022-334

Anonymous Referee #2

Referee comment on "Effects of topographic and meteorological parameters on the surface area loss of ice aprons in the Mont Blanc massif (European Alps)" by Suvrat Kaushik et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-334-RC2, 2022

Review of the manuscript Egusphere-2022-334 "Effects of topographic and meteorological parameters on the surface area loss of ice aprons in the Mont Blanc massif (European Alps)" by Kaushik et al.

General comments

The paper is presenting the results of a study dealing with 70 years of evolution of ice aprons (IAs), namely cold ice fields located in very steep slopes (>40°), in the Mont-Blanc massive. 200 IAs have been investigated. As a main highlight, the paper evidences the dramatic and ongoing decrease in area of most IAs mainly in response to rising air temperature, with however an impact which is reduced and even not perceptible at the highest elevations.

The novelty of the paper is high as there has been almost no publication dedicated to IAs so far.

The paper is well structured and refers adequately to existing literature. Data, method and results are almost clearly presented. I would however suggest to separate the discussion aspects in a distinct section. The figures are mostly adequate, need however some improvement (see specific and technical comments). The conclusions are well concise and supported by the results of the study.

Beside an additional slight reorganization of the Results section (see Specfic comments), my main concern is about the evolution of the accumulation proxy as precipitation-temperature dependent factor and its impact on the IAs area changes. The proxy – which I fully agree with – is presented in the methodological section, but not further in the

results (sub-section 5.5).

I would consider the paper very worth of being published, after minor improvements having been undertaken.

Specific comments

As ice aprons are almost unknown in the literature and to facilitate the understanding, I would strongly suggest to insert an initial figure (picture) illustrating what is talking about. For sure, many very illustrative pictures should exist. The orthoimages presented in Fig. 5 are not sufficient for that purpose.

There is only one year used for the longer-term analysis, namely 1952. The conditions during that year could be worth of being described. According to the GSB data, there was a severe heat wave of a few weeks in late June – early July. 1952 was also finishing a period of about 10 warmer years with some "hot" summers as 1947. A significant reduction of IAs took place during those years, before that the conditions became again more favorable for the next about three decades. This is attested for some alpine IAs outside of the MBM area (e.g. Mont-Blanc de Cheilon in the Valais Alps).

(L. 425) I agree with the way of doing for estimating the accumulation on ice aprons being limited to precipitation by air temperature ranging between -5 and 0°C. It would be nice to provide an example for an annual period, at different elevation. It will show that such conditions are only (mostly) prevailing during the summer half-year and the winter precipitation are almost not entering into consideration (what is maybe however not the case on south slopes). Later in the result section, similarly to figure 11, it would be important to illustrate its evolution since 1952.

A description of the spread of IAs over e.g. elevation and aspect is missing. There is the figure 1, but it does not help.

In the result section, beside a sub-section 5.3 is missing, I would suggest to invert the order of sub-sections 5.5 (Influence of changing climate…) and 5.4 (Influence of local topography…), as 5.5 appears to be more closely the follow-up of sub-section 5.2 (Total loss area… over seven decades).

Minor/technical comments

L.83 – Maybe replace “most” by “many” or “frequent”, or does it apply to the MBM area only ?

L.227 – What is the source of the GSB data ? Is the homogenized time series used ? Because there is quite a significant difference from the non-homogenized data.

L.243 – Using the GSB data for precipitation as a proxy for the MBM area is a bit tricky, as the GSB pass is located in the “shadow” of the MBM massive by “westerlies” and is largely influenced by precipitation coming from the south. But I know, this is difficult to do better.

L.330 – Figure 3 is not depicting precipitation

L.510 – There is some issue with the values of area loss and their correspondence to figure 8 :

The area reduction is 2001 compared to 1952 is 25.4 % and must be rounded to -25%

31% is the relative area loss in 2019 compared to the 2001 area (this must be specified) or recalculated to the 1952 area. In addition, this value is wrong as it is obviously the addition of the area reduction in 2012 to 2001 and in 2019 to 2012. The area reduction in 2019 compared to 2001 is 28.8%

The “alarming rate” is not provided but left to the calculation by the reader. The values must be presented, for instance as an average annual rate compared to 1952, which appears to be 0.5%/year from 1952 to 2001, 1.1%/year from 2001 to 2012 and 1.2%/year from 2012 to 2019.

L.617-618 - The evolution of the accumulation rate must be provided as well

L.636 – 4 IAs are increasing is size. Is this significant for all ? Where are these 4 IAs located ? Maybe worth of providing a picture of each ?

L.678 – The comment on L. 510 must be considered and the sentence adapted in accordance

L.680 – The “climate forcing parameters” must be specified

L.683 – 685 – This bullet can be omitted at it would not say anything else than the next one, but keeping vague (“some topographic factors… , while other factors…”)

Figures

As a general comment for the figures : the layout must be improved for many of them. The legibility must be checked, the character size must be homogenized and made large enough, the use of caption and brackets in the axis legends must be homogenized, all unnecessary surrounding boxes (e.g. fig. 9 – 10) should be removed.

Figure 3 – The figure is not legible. If it is meant to show an annual cycle at different elevations, it must provide just one year (which could be the mean 1952-2019). If it is meant to show the overall trend, only a running annual (or multiannual) mean should be represented.

Why 8/1/1952 in the time axis ?

What does the box “Interpolated data from GSB temperature” mean ? Better to insert an arrow to the 1952-1958 box.

There are two issues with the blue (2400 m) curve. First, it is mostly shifted in comparison to the other (e.g. for the last years, the peak temperature is appearing in winter). Second, there is a peak temperature apparently in 1985, which has never occurred. There is a mistake somewhere. July 1983 was extremely hot, but nothing occurred in 1985.

Figure 4 – Again, there is an outlier at about +14°C (in SAFRAN), which is doubtful. This is probably the 1985 peak mentioned above… but why not at the same temperature (+15°C in Fig. 3) ?

Figure 5 - Yellow on white is not adequate. Maybe orange ?

Figure 10 – The layout (legend, axis label, dot size, etc) must be homogenized and made legible on all figures.

Figure 11 – What are the represented values ? What is for instance a PDD ranging from +14 to +30°C at 2400 m ? I don’t understand.

Figure 12 – Legend … “The colour and size of the ticks represent the mean elevation of the IA”. I guess the colour one is representing the elevation, the dot size being representative of the IA size (in this case, the legend must be provided)