

Atmos. Chem. Phys. Discuss., author comment AC1
<https://doi.org/10.5194/acp-2021-478-AC1>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Reply on RC1

Anna A. Shestakova et al.

Author comment on "The foehn effect during easterly flow over Svalbard" by Anna A. Shestakova et al., Atmos. Chem. Phys. Discuss.,
<https://doi.org/10.5194/acp-2021-478-AC1>, 2021

We thank the reviewer for his comments that helped to improve the manuscript and the presentation. We tried to take into account all of the reviewer's suggestions, as explained in detail below.

«Figure 1 - Are all the place names used in this figure?»

Some of the AWS names are not used, but observations from all of these stations are used (for example, in Fig.5).

«Figure 4 – I wasn't sure this figure was necessary for the paper. The Polarstern is moving a lot during this period and a shorter time series is given in Fig 5. The winds at Ny Alesund show the foehn period, but also show elevated wind speeds on 29 May, which aren't really discussed. Not sure this is needed.»

Figure 4 was removed.

«Figure 6 – there is a bit of a mismatch between the names on lines 190-191 and the names in Figure 6. "Verkegenhuken" is not shown on Fig 6. You could consider showing the upstream temperature from Kvitøya on Figure 6, and changing upstream to be blue, downstream to be red. Maybe rephrase caption, "temperature change from 'initial' time at each individual AWS station, where the initial time is 00 UTC 30 May".»

Fixed. The text describing the figure was slightly rewritten (lines 181-188).

«Figure 7 – I'm not sure what wind speed is plotted here? Is it a 'maximum' (better than 'maximal') wind speed?»

"Maximal" was replaced by "maximum".

«Figure 9 – I think this could be more clearly presented. Add a location map as another panel. Maybe choose colours so 'cold' colour is upstream and 3 'warm' colours are the 3 downstream locations.»

Fixed.

«Figure 10 – The layout here is a little confusing. a) and b) compare two soundings in

approximately the same location. But c) compares two soundings in different locations and one of them is the same sounding as panel b). I'd be tempted to merge (b) and (c) – but make it clear in the caption that the first sounding is in a different location. I'd also redo this figure with a different colour scheme, so first profile blue, then foehn and after-foehn profiles as red and magenta (as 'warm' colours). Rephrase caption to be clear.»

Fixed.

«Figure 11 – I'd recommend adding sea-ice concentration to 11b.»

Fixed.

«Figure 13 – I'd recommend adding a zero line to the bottom panels. Caption should mention these are net SW and net LW. I'd move 'albedo' to end of the sentence about top panels, as it is the right hand axis.»

Fixed.

«Figure A1 – The caption needs improving. Make it clear that observations are solid line and WRF simulations are dotted lines and squares for WD? You comment on fact that WRF underestimates the air temperature. But it is also poor for wind speed at Ny Alesund for some of this period. You maybe want to comment on that? I guess it is an area of complex orography so 10-m wind speed is challenging.»

Fixed. A sentence about the poor wind in the model was added (lines 507-509).

Minor Suggestions

«Line 1 – I'd suggest adding a "The foehn effect.." to the title.»

Added.

«L17 – "downwind of Svalbard"»

Fixed.

«L19 - "A positive... budget at the surface..."»

Fixed.

«L30 – "Altogether, this results in the highest...Europe being observed in ..."»

This sentence was removed.

«L40 – delete "the"»

Fixed.

«L53 – could also cite Elvidge et al. (2020) here, this is a relatively new paper which focuses on surface energy budget over the Antarctic Peninsula; and also Turton et al. (2018) which used AWS observations to investigate foehn winds in this area.»

These references were added.

«L69 - I'd rephrase as southern Greenland tip jets (plural) because there are both westerly jets (Doyle and Shapiro 1999) and easterly tip jets (e.g. Renfrew et al. 2009; Outten et al. 2009).»

Fixed.

«L76 – it may be pertinent to cite a more general paper, such as a review paper, when discussing hydraulic jumps, e.g. Durran (1990); Smith (1989).»

Fixed.

«L77 – the horizontal pressure gradient is down the slope. not along it.»

This sentence was removed.

«L103 – delete "used" and, edit to be "section 2.1 and the setup... "The synoptic background..." Then each sentence is about each section.»

Fixed.

«L117 "Information about the observations..."»

Fixed.

«L121 "a series of ..."»

Fixed.

«L166 "reached a maximum"»

Fixed.

«L199 – I'd rephrase "Obviously" as we are still at the beginning of the paper and you haven't presented evidence that it is obvious to the reader yet.»

Fixed.

«L217 – "over southern Svalbard"»

Fixed.

«L232 – start a new paragraph here, with "The vertical..."»

Fixed.

«L261 – you cite "profile 1 in Fig 9" here, but that is the upwind profile, did you mean to cite another (downwind) profile? Incidentally, I don't think you really need Figure 2 – it is not that useful. Instead I'd consider just plotting the domains 2 and 3, as a second panel for Fig 9, so that it is easier to see where these profiles are located when looking at Fig 9.»

No, we referenced exactly the incoming flow (upwind profile). Figure 2 was remade and placed as a second panel in Fig.9 (now Fig.7)

«L294 – "the North"»

Fixed.

«L295 – I would rephrase, the diagram doesn't "clearly show the downward propagation" because it is a snapshot in time.»

Fixed.

«L298 – you note the sea-ice here – I think it would be helpful to mark sea-ice concentration on Fig 11b.»

Sea-ice concentration was added.

«L301 – "downwind of the mountains"»

Fixed.

«L303 – rather than "advective origin" perhaps you mean "large-scale flow" or something?»

Rephrased.

«L306 – I'd rephrase as "increase of the BL height to the North" – so it is not ambiguous»

Rephrased.

«L319 – delete "a"»

Fixed.

«L286 – I'd be clear that you are plotting net SW radiation»

Fixed.

«Figure 13 – I'd mark the zero line on the bottom panels, it would enable easy comparison of T_{surface} against 0.»

Added.

«L422 – "was large"»

Fixed.

«L443 – "conclude" is the wrong word here, because there is an element of hypothesis here, so I would say "we surmise"»

Fixed.

«L458 – "cloud"»

Fixed.