Replies to the reviewer RC2

Thank you for taking the time to review the paper. We particularly appreciated the depth of detailed comments and suggestions provided to improve this research.

General comments

1. What prompted this paper was to demonstrate the effect of blowing snow on ICNC using our new version of CRYOWRF, following the work of Georgakaki, P et.al. 2022. In their work, which focuses on SIP processes, they include blowing snow by adding a constant source in the first grid level. With our work, we wanted to expand the blowing snow part by using a model that resolves snow conditions at the surface and includes prognostic blowing snow equations. We agree that we deviated from this by introducing topics on erosion/deposition and precipitation sections, and that the title of the paper was misleading.
For both topics to be analyzed in detail, i.e. ICNC and clouds microphysics, we think that two papers are necessary. Therefore we plan to restructure the current paper and focus it on ICNC.
Your general first comments will be certainly valuable in our next paper where we plan to treat microphysics and blowing snow more in detail. However, we did add Figure 10 to show blowing snow sublimation with respect to relative humidity near the surface.
Moreover, we explained more in detail the part related to surface hoar. As mentioned in the new version of the paper, even though SNOWPACK can predict surface hoar, meteorological conditions from the paper are not suited for surface hoar formation and we plan to investigate this in the near future. Appendix A was added to also explain what are the conditions that are associated with the presence of surface hoar as blowing snow particles.

2. Modifications:
- The introduction has been modified and restructured with a more general paragraph and additional references.
- We added a paragraph describing the three comments requested in L66-78.
- Appendix B was added to describe the SIP introduced in CRYOWRF

3. A dedicated paragraph in the new Discussion section, L321-349, was introduced to talk about the differences in the two schemes. In addition, we clarified the previous statement that was confusing in L375-377. We indeed believe that collision breakup is important to add in cloud microphysics scheme.

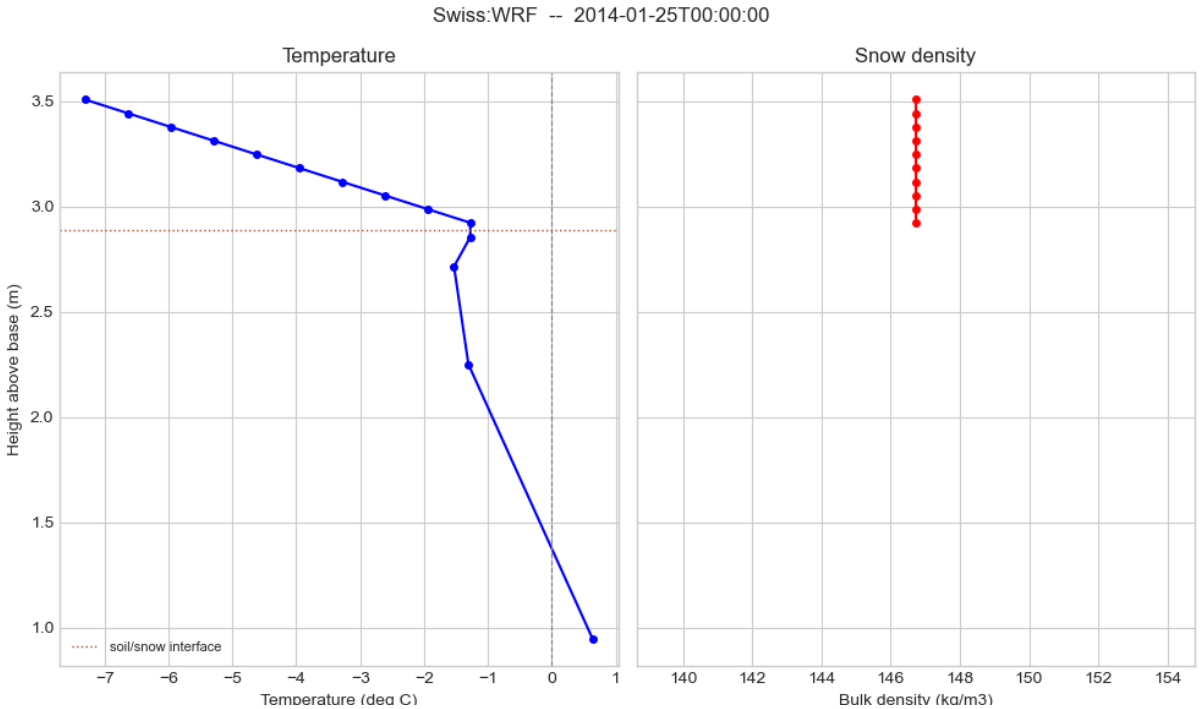
4. We agree that given the focus of the paper this section is not relevant, and we removed it in the new version of the paper.

5. We added both tables suggested for a better comparison of the models, Table 2 and Table 3.

6. We agree with the reviewer that the initial snowpack may influence the blowing snow and that it should be explicitly stated in the manuscript, now in L160-163. As information for the reviewer, the snowpack is initialized using a self made program make_sno.py, that can be found in the EnviDat link provided. The program basically uses the WRF initialization files and creates 10 layers of snowpack with:

- Temperature linearly varying between the skin temperature for the surface layer and the soil temperature in the base layer.
- Constant density determined by the division between SWE and snow height
- Snow properties are:
    - Grain radius = 0.4 mm
    - Bond radius = 0.1 mm
    - Dendricity = 0 (old snow)
    - Sphericity = 1 (rounded grains)
    - Surface hoar = 0 kg m^{-2}

For illustration, Figure 1 shows the snow initialization profile at JFJ.
In practice, this setup is very conservative. Real snowpack contains lower density on the top and higher density in the bottom. By maintaining the density constant, we provide to CRYOWRF a denser surface layer which cause less blowing snow. We believe that studying the variability of blowing snow with respect the initial conditions is, together with the surface hoar, a full topic to explore in a separate study. Therefore, it is not in the scope of this paper, but we are working to address it in future research.



Specific comments

L15: Explanation added in the introduction, L36-38.

L30: We added this detail, L21.

L45-46: We clarify this citation in L86-87.

L80: Details of the mesh are added, L137-141.

L84-85: References added. L146-147

L86: Reference and details added, L148.

L137-154: We moved this part to Appendix C

L 156-165: The paragraph is now at the end of section 2.3, L167-173.

L 159: we added an explanation in section 3.1, L189-190.

L 180-182: relative references to HICAR are now moved in the Discussion sections, L346-348.

L 186: We added this in section 3.2, L204-205.

L193-194: In the new version this sentence was removed and replaced with a better description of the results.

Figure 5: We clarified this in the new version of the paper, L178.

L 207: the observed temperature profiles is now added to the Fig.6.

L 216: Based on this suggestion we added a contour showing the mass flux of blowing snow which is related to the u* threshold condition, in both Fig.5 and Fig.6.

L225: We added an explanation of the threshold u* associated with surface hoar in Appendix A.

L232-237: We modified the sentence based on the data from the new tables that were suggested. See L242-243, L256-257.

L 275-277: We added only the reference to HICAR associated to the comparison between microphysical processes in the Discussion section. L346-348.

Technical comments

L1: References to “numerical models” have been changed to “atmospheric models” through the paper.

L4: we modified this line, L4.

L24: acronym defined, L35.

L170: we removed the definition of WS10m in the new version of the paper as considered standard practice.

L 259: we changed it to “orographic waves”, L294.