Replies to the reviewer RC1

Thank you for taking the time to review the paper. Your comments are very appreciated and will add values to the paper.

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.
Including blowing snow particles into the microphysics scheme to better capture its influence on cloud processes is indeed part of our future work, as we mentioned in the conclusion.

For both topics to be analyzed in detail, ICNC and clouds microphysics, we think that two papers are necessary. Therefore we restructured the current paper and focused it on ICNC, considering your comments that helped to strengthen this part.
In the future, we will continue working on a new CRYOWRF version that includes blowing snow in the microphysics, also using your suggestions.

Summary

To clarify the two comments in the Summary:

- “ When blowing snow particles…” This sentence was meant to compare MOR_BS with ISH_BS. Both take into account the blowing snow particles but ISH_BS does not include the SIP collision breakup that are implemented in MOR_BS. In the new Fig.5, both results are shown for a more direct comparison. What we intend to show is that they have a similar trend, despite the fact that ISH_BS does not include the collision breakup mechanism. We included that in L198-200.We then point out in L351-353 that including it in ISH_BS could improve the ICNC estimation in the regions where this mechanism is effective (see CTRL vs MOR_noBS in Fig.6).
- The importance of adding secondary ice production is explained in the updated section 3.3.

Main comments

- Adding blowing snow particles in the cloud microphysics is our next step in the development of CRYOWRF. The current paper is now renamed, and the parts on erosion/deposition and precipitation are removed.
- As stated in the paper in L236, MOR_BS is the same simulation as MOR_noBS and only the postprocessing changes to add blowing snow particles to the former. This is why the plots in the original version of Fig.7 were similar. However, the increase at the start of simulation in ICNC due to blowing snow is visible in MOR_BS in the bottom left of the figure. To explain this better we added Fig.8 that shows how blowing snow particles rapidly decrease away from the surface with respect to the sum of the other three terms in ICNC. In addition, we now removed the plot of MOR_noBS in the new Fig.7 that was causing confusion, and added a plot showing the blowing snow particles only. Fig.7 (c) now includes temperature profiles that clarify the regions where the collision breakup mechanism is more effective.

- During times where blowing snow is active, relative humidity is above 90%, and at the start of simulations, where blowing snow is the most present, is above 95%. This can be seen comparing Fig.5 and Fig.6 with Fig.4. We also added a statement on L247. We added shaded areas in Fig.6 to show the mass flux of blowing snow. The small values found at the end of the simulation could be associated with advected blowing snow particles.
- The influence of SIP does contribute to the ICNC up to at least an order of magnitude in some parts of the plot (e.g. January 26 at 00:00 and January 27 at 00:00). We do agree that this is not consistent throughout the simulation and we modify the related sentences accordingly. In addition the temperature profile in Fig.6 help to identify periods where the collision breakup is more active.
- To better understand this we added in Fig.6 shaded areas that correspond to blowing snow mass flux in regions of active blowing snow events (u*>u*threshold). These are also associated with higher wind speeds. In particular, in the first 12 h, wind speed reaches its highest values, leading to the most influence on blowing snow. Also added is Appendix A which shows the threshold friction velocity used in the model.

Minor comments

- We included letters to identify figures in all plots.
- They are not the same. MOR_noBS is run with the blowing snow equations turned on but without adding blowing snow particles in the count of ICNC. MOR_noBSeq is a run turning off the blowing snow equations. Note that the latter is not included in the new version of the paper.