RESPONSE TO THE SECOND ROUND OF REVIEW

REVIEW OF DAVRINCHE ET AL., 2023 – UNDERSTANDING THE DRIVERS OF NEAR-SURFACE WINDS IN ADÉLIE LAND, EAST ANTARCTICA

Once again, we thank the reviewers for their valuable and helpful comments on the manuscript. We propose to implement the following changes in the final version.

Black = reviewer comment / Blue = author's response / *Italic* = revised text.

1. Reviewer #1

Line 15: "northward" should surely be "southward"? This has been replaced: *They transport cold surface air northward, which causes warmer subpolar air masses to rise and travel southward to replenish the cold air removed .*

Advection is computed as the scalar product of wind speed and horizontal wind speed divergence." I assume that you are trying to write out the advective tendency term, (u.grad)u, in plain language? However, the words chosen don't make sense. Wind speed is a scalar, so you can't compute its divergence or form a scalar product with it. This was indeed a mistake, this has been corrected: *Advection is computed as the scalar product of the wind vector and its horizontal gradient.*

2. Reviewer #1

The authors' response to my suggestion regarding the vector directions on Figure 7 is still of concern to me. While I disagree with it I am willing to accept the authors' preference to show equivalent geostrophic wind direction for each force in Figure 7. But, I found the revised text that states that the katabatibc acceleration increases the wind speed in the cross-slope direction to be confusing. I agree that the katabatibc acceleration, which points in the downslope direction, will result in a geostrophic flow oriented in the cross-slope direction but the reality is that within the boundary layer an increase in the katabatibc acceleration results in increased downslope flow due to the three-way balance between the katabatibc, Coriolis and frictional acceleration. The text here needs to be revised to more clearly explain how the actual near surface flow arises from the balance of the various forces shown in Figure 7 since the equivalent geostrophic direction of each force is not what is seen in the actual winds. We thank the reviewer for the insightful comment. We have added a few sentences to explain better the rotation of the vectors: *As we are in the quasi-geostrophic stationary conditions detailed in Section 4.1, we can neglect the first temporal derivative of wind speed. Consequently, the resulting wind speed is the sum of all the equivalent geostrophic wind speeds associated to the 5 accelerations detailed in Fig.7(a-e). Therefore,* *we show here on Fig.7 the direction of the equivalent geostrophic winds (which are rotated by 90° to the left with respect to the acceleration vectors). The same maps with the direction of the acceleration vectors are presented in Fig. S8 of the supplement.*

Wind vectors associated with the katabatic acceleration are therefore always directed in the cross-slope direction. However, note that an increase of the katabatic acceleration does not increase the wind speed purely in the cross-slope direction because of the action of the turbulent acceleration.

Personally, I think this is most easily done by showing the force vectors in the direction that they actually act rather than as equivalent geostrophic vectors. Since the authors' preference is to show the forces as equivalent geostrophic vectors I kindly ask that a supplemental figure be added that shows the results in Figure 7 with the vectors oriented in the direction the forces act so that readers that prefer this perspective can easily see this.

A supplemental figure (S8) has been added that shows the vectors oriented in the direction of the force.