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The Cryosphere Discussions

Interactive comment on "Synoptic conditions and atmospheric moisture pathways associated to virga and precipitation over coastal Adélie Land in Antarctica" *by* Nicolas Jullien et al.

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General Comments This manuscript investigates, using ground-based measurements (MRR) and reanalysis simulations (back-trajectories and diagnostic tools), the synoptic conditions that produce precipitation, both virga and surface snowfall, over Durmont d'Urville station. The authors found that precipitation and virga (pre- and post- precipitation) are associated to different phases of crossing warm fronts. In the study, they identify the synoptic mechanisms that produce such precipitation, showing the importance of large-scale lifting into the warm conveyor belt. Although some sublimation produced by katabatic winds is almost always present in the three phases, what dis-

tinguishes surface precipitation from virga is an enhanced lifting near the station that releases moisture picked up nearby.

Since first MRRs (in Dumont D'Urville and Princess Elisabeth) were recently installed in Antarctica, several advances in the field of Antarctic precipitation have been produced. Now, precipitation and sublimation is been better quantified, and we know better the ability of the reanalyzes to reproduce it. This is another piece of work that improves our knowledge about how moisture is released as precipitation over the Eastern Antarctic coast. In this case, the investigation focuses on the conditions that produces such precipitation. Although most of the results are not unexpected (for example that precipitation is associated with a cyclone west to DDU), they are quantified. In my opinion, the most important finding is showing that the areas where moisture is picked up, is in the Southern Ocean near to the station that may have implications for ice core analysis.

Piecemeal:

The title is clear and clearly define the object of this study. Introduction is well written, and the unifying thread is appropriate. Relevant literature about previous studies about East Antarctic precipitation are cited. The objectives are clear and concise. The several data sources and methods of this paper are clear and correctly described. Results are organized and very well exposed. I like that authors have shown a study case to exemplify the statistical analysis. I think that it enriches the investigation.

Conclusions

I think that the subject of this paper fits the target of The Cryosphere journal. It is furthermore very well written and structured. I think this interesting research should be published in The Cryosphere. I only have very few minor reviews.

Specific Comments

P14 L1 Please, specify in which height start back-trajectories. The statistics is for the lowest back-trajectories or for all the starting heights from 1000 to 300 hPa? If the later,

it would be interesting showing the differences between low-level trajectories, medium-level trajectories and high-level trajectories (maybe in another Appendix), since their pathways may be very different.

Fig 7 Showing Equivalent Potential Temperature at 700 hPa is a good choice to show here because it is high enough to penetrate into the continent but low enough to show the low-level front. However, using the 700 hPa field over the plateau has no much sense since it intercept the terrain showing extrapolated values. The authors should shade (in black for example) the area over 2500 or 3000 m to avoid to distract the reader with the values under the terrain. Figure 7d is a good way to visualize the differences between pre-precipitation virga and precipitation stages, since at first glance, maps look similar despite the differences. I suggest also to show the difference between c-b.

Technical corrections

P10 L3-9 The paragraph "Given the almost. . ." have only one sentence. Usually paragraph have several sentences and describe one idea. So, I suggest including this paragraph and the following together with the previous one (that starts in the previous page) since the authors are arguing about the same idea.

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