We thank you once again for your reviews and responses to our revised version of the manuscript.

We respond to your comments below:

Reviewer 1

The manuscript has clearly improved from the previous version. Effects of inversion on differences between 2m-temperature between observations and reanalyses has briefly been discussed but it is still unclear how large part of differences between observation and ERA5 or BCR reanalysis is associated with real biases in reanalysis and how large part of biases is associated with effects local conditions (subgrid scale variation of temperature) which cannot be captured by reanalyses.

On one hand, the temperatures in reanalyses represent the mean temperature in grid box but there could be a large variation in 2m-temperature inside each grid box which cannot be captured by reanalyses, and location of observation stations are probably not always representative for the whole grid cell. On the other hand, the correlograms in the supplement and the sentence in lines 78 – 80 " Nevertheless, our results do suggest that the ERA5 dataset has predominantly neutral to warm biases in the valleys, despite elevations, and neutral to cold biases in the mountain ranges " suggest that ERA5 probably have on average too weak inversion in winter which may explain the differences between observation and ERA5 reanalysis and cause real bias in 2m-temperatures in ERA5. The complex topography and inversion amplify local variations in near surface temperature. Therefore I think, It would be clarifying to see the mean seasonal difference between analysis and over all observation stations. Even though a single station is not representative for average condition of the grid box, a relatively large sample of stations in this relatively small area could probably well present the mean conditions in the area. Therefore, I think that a figure which shows the seasonal cycle of mean difference between all stations and reanalyses would useful to understand biases in the reanalyses.

Overall, I could recommend publishing the manuscript after minor revision.

Thank you for the thoughtful suggestion. Indeed, including the figure showing the mean difference between all stations and the ERA5 and BCR reanalyses gives a different perspective to understand the biases. We addressed this by stacking the interpolated time series of all stations and all the grid cells within a box in the Dry Valleys (now shown in Figure 1). We are also adding a figure to the supplement to show the individual stacks, which are generally coherent.

Interestingly, this new analysis shows that the BCR version has a small warm bias and the ERA5 reanalysis has a strong cold bias when considering all the region. Even though this new piece of analysis does not elucidate the reasons behind the biases, it does add to the scope of our manuscript, which is to simply report the existence of these biases in the McMurdo Dry Valleys at different scales so that other researchers can consider them in the future. Certainly, future research, hopefully with the help of an increasing number of AWS, might help determine the exact causes of these biases at different locations.

Reviewer 2

The revised version of the manuscript is better but still includes some issues that should be clarified. On lines 49-51 it is stated that BCR is obtained applying the WATCH forcing data methodology to the ERA5 dataset, which includes an elevation correction. However, it remains unclear if this elevation correction differs from the dry-adiabatic one applied to ERA5 in this study. To interpret the reasons for the differences between the AWS data set and the BCR and ERA5 products, and the possible dependence of the differences on elevation, it is really important to clarify if the elevations corrections applied are similar or different. The Discussion section has to be extended accordingly.

Thank you for pointing this out. We have clarified that the elevation correction applied to the bias-corrected reanalysis is done based on the difference between the grid used by the Climate Research Unit (CRU) and the ERA5 grid. We also added two citations for referencing the CRU grid and further details on the corrections applied to the bias-corrected version of the ERA5 reanalysis can be found in Cucchi et al., 2022.

Cucchi M., Weedon G. P., Amici A., Bellouin N., Lange S., Müller Schmied H., Hersbach H., Cagnazzo, C. and Buontempo C.: Near surface meteorological variables from 1979 to 2019 derived from bias-corrected reanalysis, version 2.1, Copernicus Climate Change Service (C3S) Climate Data Store (CDS), 10.24381/cds.20d54e34, 2022.

New, M., Hulme, M., and Jones, P.: Representing Twentieth-Century Space–Time Climate Variability. Part I: Development of a 1961–90 Mean Monthly Terrestrial Climatology, Journal of Climate, 12, 829–856, https://doi.org/10.1175/15200442(1999)012<0829:RTCSTC>2.0.CO;2, 1999.

New, M., Hulme, M., and Jones, P.: Representing Twentieth-Century Space–Time Climate Variability. Part II: Development of 1901–96 Monthly Grids of Terrestrial Surface Climate, Journal of Climate, 13, 22172238, https://doi.org/10.1175/15200442(2000)013<2217:RTCSTC>2.0.CO;2, 2000.