Weather Clim. Dynam. Discuss., referee comment RC2
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Comment on wcd-2022-43

Anonymous Referee #2

Referee comment on "The role of Rossby waves in polar weather and climate" by Tim Woollings et al., Weather Clim. Dynam. Discuss., https://doi.org/10.5194/wcd-2022-43-RC2, 2022

The authors discuss theoretical insights into the creation and propagation of Rossby waves at high latitudes. The paper provides a much needed foundation for an active area of research, is well written and a substantial contribution. I recommend the manuscript for publication with only a few minor comments:

- L 26/27 The authors later refer to recent research discussing to what extent 'annular mode' variability is caused by a physically symmetric phenomenon or emerges from EOF analysis despite the actual variability being more regional. It would be good to present this consistently throughout the paper.
- L 53/54 Having read the paper, my impression now is that Rossby waves do play a role in the Arctic, but might be a little less important at polar latitudes then suggested in some of the above-cited literature. With this in mind, the sentence might be read as a subtle criticism suggesting precisely this. If this is intended, the criticism might be a bit too subtle at first reading. Otherwise, the authors might want to elaborate in the discussion section (or explicitly open the question) to what extent the suggested mechanisms for Rossby waves to play a (key) role in Arctic climate in the literature appear plausible in the light of their analysis.

Section 6: In addition to the heat low mechanism, it would be interesting to refer to the formation of cold-core anticyclones through radiative cooling (Curry 1987)

Curry, J. (1987). The contribution of radiative cooling to the formation of cold-core anticyclones. *Journal of the atmospheric sciences*, *44*(18), 2575-2592.