

# Response to Jatin Katla for GMD-2022-255

Philip G. Sansom and Jennifer L. Catto

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In reviewing the manuscript, I found a result which is very intriguing. The authors have acknowledge this result, but not really explained or carried out further analysis, that i think is warranted. I refer to this result:

“Somewhat surprisingly, cold fronts are slightly more common though less widely distributed in the Southern Hemisphere during southern summer (DJF, Figure 7(a)) than in southern winter (JJA, Figure 7(c)).”

This is indeed very surprising, and runs counter-intuitive. When I focus on the region of southwest Western Australia (where I live and regularly check MSLP charts), the analysis shows a higher frequency of cold fronts in DJF as compared to JJA. I find this very odd, and would like the authors to dig a little further.

Regions with Mediterranean climates, such as southwest WA, get most rainfall in Winter (JJA), and the heaviest rain events, are most commonly associated with cold fronts. Yet, Figure 7 suggests there are more cold fronts in Summer than Winter, which is very counter-intuitive. It is generally accepted that cold-fronts bring rain, and it would not be un-reasonable to assume, at least based on first principle, that where you have more frequent cold fronts, one might expect more rainfall. Your results suggests the opposite.

*There are indeed more cold fronts apparent over south-western Western Australia (WA) itself in southern Summer (DJF). A similar phenomenon is visible in the original climatologies of Berry et al. [2011b] and Berry et al. [2011a]*

who noted that these are non-precipitating fronts associated with strong moisture gradients between the ocean and adjacent hot dry areas a short distance inland. There are also many cases of non-precipitating fronts that contribute to severe fire weather (e.g., <https://www.nature.com/articles/s41612-023-00425-z>). The revised colour scheme in Figure 7 shows that over the frequency of cold fronts over the ocean to the west of south-western Western Australia in south Winter (JJA) does increase as expected, with a coherent area of heightened cold front frequency (compared to the surrounding area) extending over the Mediterranean portion of south-western Western Australia.

## References

- Gareth Berry, Christian Jakob, and Michael Reeder. Recent global trends in atmospheric fronts. *Geophysical Research Letters*, 38(21):1–6, 2011a. ISSN 00948276. doi: 10.1029/2011GL049481.
- Gareth Berry, Michael J. Reeder, and Christian Jakob. A global climatology of atmospheric fronts. *Geophysical Research Letters*, 38(4):1–5, 2011b. doi: 10.1029/2010GL046451.