Weather Clim. Dynam. Discuss., referee comment RC2
https://doi.org/10.5194/wcd-2022-15-RC2, 2022

Comment on wcd-2022-15

Anonymous Referee #2

Referee comment on "Large spread in the representation of compound long-duration dry and hot spells over Europe in CMIP5" by Colin Manning et al., Weather Clim. Dynam. Discuss., https://doi.org/10.5194/wcd-2022-15-RC2, 2022

This manuscript investigates the representation of compound dry and hot spells in Europe in the CMIP5 data set. The model data is compared to EOBS. The results show that CMIP5 models struggle to capture the duration and intensity of these compound events. The manuscript is well written, the figures are clear and the results are relevant. I recommend to publish the manuscript after major revisions as detailed below.

Major points:

The choice of a constant MSLP threshold needs to be further motivated and discussed. There are several issues with this choice. I) heat lows can from over the Iberian peninsula (https://rmets.onlinelibrary.wiley.com/doi/abs/10.1256/qj.01.189) during hot conditions breaking the link between MSLP and high temperatures, while the overall tropospheric circulation is still anticyclonic. Ii) in locations with high orography the correction of the surface pressure to MSLP might introduce biases. Iii) the climatologically lower pressure at higher latitudes leads to longer exceedances over the 1012hPa threshold compared to lower latitudes.

A direct comparison of absolute temperatures between EOBS and CMIP5 (Figure 5) will be strongly affected by the representation of the orography and coast lines within CMIP5. A comparison relative to a percentile might be more meaningful.

Please control for multiple testing in all analyses using the FDR (see Wilks 2916, https://journals.ametsoc.org/view/journals/bams/97/12/bams-d-15-00267.1.xml)

How relevant is the representation of summer convection in the models for the duration of the dry spells?

Minor points

Abstract: long-duration ï☐ sub-seasonal (Long duration is per se not very clear, it could also refer to spells that last for several years)

38 Zscheischler 2020/2021 is missing in the list of references

Add Ridder et al. 2022 to the list of references
https://www.nature.com/articles/s41612-021-00224-4

96 Is the mean taken across all spells? The definition is not yet fully clear.

182 IPPC ï IPCC

410ff Include the results of Zscheischler and Seneviratne (https://www.science.org/doi/full/10.1126/sciadv.17002639) in the discussion.

Figure 1a I recommend to use a colormap with only one color, two colors suggest a change in sign.

Panels c,d,e in Figure 3 do not fit the description and look the same as panels c,d,e in Figure 7, there may have been a mix-up.