

Review of „Long vs. Short: Understanding the dynamics of persistent summer hot spells in Europe“ by Pappert et al. submitted to Weather and Climate Dynamics

Summary and general assessment

Pappert et al. analyse the dynamics of long-lasting (> 12 days) and short-lived (4-5 days) summer hot spells in southwestern and western Europe. While hot spells are extensively studied in the existing literature, the authors focus here on the spatio-temporal characteristics of an ensemble of various dynamical processes in different European regions, with a special focus on the difference between short and long lasting hot spells. These processes include, amongst others, atmospheric blocks, recurrent Rossby wave packets (RRWP) and cut-offs. In addition to the dynamical, more short lived processes, they also incorporate the analysis of the longer-lasting climate variable soil moisture prior to the hot spells. The main results of the study are, amongst others, a stronger link between antecedent soil moisture and long-lasting hot spells in southwestern Europe compared to western Europe. In the latter region, long-lasting hot spells are associated with a more stationary upper-level flow, together with a high blocking frequency and high amount of RRWPs. Short hot spells in western Europe feature a higher than average upstream cyclone frequency, which underlines the important role of cyclones for terminating heat waves in this area.

Overall, the study is very well-written, very nicely analysed and figures are of high quality. I have only a few minor comments which should be addressed prior to publication.

Suggestion: Accept with (very) minor revision

Minor comments:

1. L121: is there a reason for a 3-week, non-overlapping period? How does this influence your results, in particular the short heat waves?
2. L146: how do you define a heat wave day? Is there a minimum spatial threshold or is one grid point sufficient?
3. L161: for long-lasting heat spells: do you use the same 4-5 day period for all meteorological fields?
4. Figure 1: there appears to be a typo in the box next to I. (l_4^* and l_3^* must be switched)
5. L210: the reader may be interested in the other regions too (maybe add some results to the supplementary material if it adds an added value to the study)
6. L259: parenthesis missing in the quotation
7. L286: remove point before Rossby wave
8. L331: cutoffs > cutoff
9. L361: insert blank space before Wehrli et al.
10. Figure 9c/10c: ≥ 2 instead of $2 \geq$
11. Figure 9/10: the size of the squares ... \longrightarrow does it mean that e.g. in 66% of the heat wave it is dominated by a feature (e.g. a block)
12. L393: remove typo before Rossby waves (WN)