

Weather Clim. Dynam. Discuss., referee comment RC1  
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## Comment on wcd-2021-56

Anonymous Referee #1

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Referee comment on "Atmospheric blocking and weather extremes over the Euro-Atlantic sector – a review" by Lisa-Ann Kautz et al., Weather Clim. Dynam. Discuss.,  
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Review of "Atmospheric Blocking and Weather Extremes over the Euro-Atlantic Sector - A Review" by Lisa-Ann Kautz et al.

The manuscript by Lisa-Ann Kautz and co-authors presents an extensive review of the state of research on atmospheric blocking with a strong focus on their impacts. It starts with an overview of blocking types including the most important mechanisms during a blocking live-cycle. Then the impacts of blocking on several types of extreme events are addressed: temperature, hydrological, wind, and compound. For each extreme an overview is given, the involved dynamics are explored and some case studies are given. In the final part of the manuscript the predictability of blocking induced extremes events as well as their relationship in a changing climate is investigated. The manuscript ends with a summary of the most important open research questions in relation with blocking.

This review manuscript presents a timely and extensive overview of the manifold blocking impacts, that can sometimes seem contradictory at first glance (hot/cold and wet/dry extremes can both be caused by blocking). The topic it addresses is well motivated, it is well-written and -structured. Mostly, the authors manage to generalize and combine results from different studies to clear top-level messages (one exception is mentioned in my comments below). My only real point of critique are the first two figures: they are never mentioned in the text and the information I could extract from them was limited. I think both of them aim to address important topics (blocking locations and their naming as well as impacts depending on their relative position to the block) but fail to fully do so.

Apart from that I only have a few minor comments outlined below. Given that the authors address them my evaluation is that this manuscript should be published in Weather and Climate Dynamics.

Minor Comments

Figure 1: I personally find this figure to be too schematic. What is the authors aim with it? If it is only in the paper to indicate the names of the different areas in use it should be stated so. Otherwise, it might be better to use some figure which gives more realistic representation of blocking regions, potentially also distinguishing between winter and summer (such as figure 1a/e in Davini et al. 2020) In any case, if the authors show the figure is should be discussed and referenced in the text.

Figure 2: Basically the same comment as for figure 1: It is not discussed at all and I am unsure what to take away from it. What are the different impact areas based on? Does a single block have all these effects or are these merely all the potential effects that have been observed/reported at some point? Are they only valid for an omega block in the exact region as indicated or is this to be understood more generally? Some of the shaded areas are quite small (e.g., high IVT and heavy precip to the north), how can they be interpreted? Are there physical mechanisms that can lead to heavy precip only in that area or is it rather that it has just been reported in this area for a specific case? I think it could even be helpful to have several figures with blocks at different locations and their impacts in a more general sense. These could then be referenced in the relevant sections in the text.

section 2.3: Could the authors try to better distinguish the different datasets used to investigate blocking here and in section 2 in general? (or explicitly state whenever statements are valid for simulating blocking in general) E.g., it is mentioned that blocking representation is a concern in numerical models (line 147) is this referring to global climate models (as discussed in the rest of the paragraph) or also to NWP models? It is further stated that blocking is underestimated but relative to what? Conversely, are the considerations discussed from line 154 for weather forecast systems also valid for climate models?

216 "separately form each"

Figure 3: Please make clear that temperature is indicated as shading and gp as lines. Please make clear that dots refer to significance of the temperature anomalies (as I assume).

323: Not sure if the \* should be removed from Kautz\*?

421: "surface negative temperature anomalies" should be "negative surface temperature anomalies"?

435: I acknowledge that the dynamics of precipitation are more complex but I find this paragraph a bit convoluted (in particular compared to, e.g., the one about temperature extremes). Could the authors try to extract clearer high-level impacts here? E.g., it seems a bit strange to me to separately explain the effect of blocking between 0-40E and 0-30E or to switch between clearly defined areas (0-40E) to more general geographical terms ('Central Europe', 'several regions in Europe')

508: "We next move to blocking related flood cases in Europe" This first example was also about flood in Europe?

525: "In October 2000 a feedback between heavy precipitation events could be identified." between heavy precip and blocking?

Figure 4a: The last category is a precipitation anomaly exceeding -100% of the climatology and it seems to exist on the map. This should not be possible, right?

572: "low wind conditions" weak wind? or low wind speed conditions?

702 "changes blocking occurrence"