Earth System
Dynamics
Discussions

Open Access

EGU

Interactive comment on "The extremely warm summer 2018 in Sweden – set in a historical context" *by* Renate A. I. Wilcke et al.

Anonymous Referee #2

Received and published: 16 July 2020

This study provides a statistical analysis of summer temperature-based heat wave metrics in several different types of observations and several different ensembles of climate models (both multi-model and initial condition ensembles) in order to contextualize the 2018 heat event in Sweden. I commend the authors for their thorough characterization of the event; many aspects are evaluated including conditions in northern vs. southern Sweden, daily average temperature, monthly and seasonally aggregated temperature, warm day indices, a heatwave magnitude index, and a heatwave duration index. Authors find that the 2018 heat event was noteworthy within the historical station record due to the number of above-climatological-average days in the May-August season, rather than the magnitude of the temperature anomalies on those above-average days. However, the station data used has a summer correction applied to it before conclu-

sions are made, and it is not clear how this methodological choice influences results.

Additionally, the large number of model simulations used in the second part of the study are not described in sufficient detail. For instance, which models make up the CMIP5 ensemble used in this study? What component versions are used in the CMIP5 vs. CMIP6 versions of EC-Earth? Certain models may have systematic biases that influence to what extent the 2018 Swedish summer is considered exceptional; biases that would be useful to consider and discuss. Because of methodological choices (different spatial resolutions and land masks, corrections to observational datasets, assorted radiative forcing pathways), it is somewhat challenging to interpret the comparisons between models and observations. I believe addressing methodological inconsistencies and evaluating sensitivities to other methodological choices (i.e., base period) would strengthen this paper considerably.

General thoughts:

Clarity is also undermined by numerous inconsistencies in capitalization, spelling, tense, and sentence structure. I have indicated several common issues below, but significant language editing should be carried out before resubmission.

Persistent blocking conditions are identified throughout the study as the driver of the 2018 Swedish heatwave but are not systematically evaluated. Assessing whether the models you evaluate are able to simulate these synoptic conditions would strengthen the study by ensuring that the longer duration, higher intensity events seen in the models originate from similar-to-observed weather patterns. This would begin to address the question of whether global climate models are able to realistically simulate Swedish heat events.

Specific comments:

L10 and throughout: There are several inconsistencies with the presence and absence of hyphens (i.e., long-lasting vs. long lasting, MPI-GE vs. MPIGE).

L11: A comma is missing in the list.

L13: the whole of Sweden?

L15: What heatwave indicators are used?

L22 and throughout: Sentences of this structure (dependent clause before independent clause) need a comma separating the two clauses.

L23: Identifying the models by '1861-90' and '1951-80' time ranges is unclear at this point. Are 1861 and 1951 start years of different models? What are the ranges indicating in this case?

L40: and rather than ;

L47: References to support this statement would be useful.

L51-52: Variability on what time scales? What is the time scale of a warm period?

L59: Large year-to-year variability of what?

L66: 'Leach et al.' is missing the year.

L75-76: What does "to what extent ... may have changed" refer to? Duration? Intensity? Frequency?

L98: What does "used to complement of correct" mean?

L110: Wouldn't these adjustments affect your analysis in fundamental ways?

L126: from 2006 onward,

L131: Can you comment on differences between the RCP and SSP forcing scenarios used? As I understand it, RCP8.5 and SSP585 are similar but not interchangeable.

L140: Does "pooled" mean seasonally averaged?

L142: "were" is inconsistent with the "is" in the prior paragraph. Either present or past

tense should be used consistently throughout the methods section.

L154: Is this threshold the threshold stated above?

L182: How is the diurnal mean temperature computed?

L188 and throughout: You switch between northern and Northern, southern and Southern, etc. I think the lower case monikers (as you have used here) are correct. For cardinal direction, capitals should be used.

L192-193: Are results sensitive to your choice of the climatological period?

L198-199, 201: Because the figures you are mentioning here are not a part of this paper, it is confusing to list them as Fig. 5 and 10 etc.

L201: What does a heatwave intensity of 65 K mean?

L206: The two opening clauses are repetitive.

L288-289: The legend of Figure 3B seems to cover some of the data.

L391: Can these 1 in 20 and 1 in 100 statistics also be discussed in the results section?

L400: To occur in models?

Figure S1: Models and observations appear to have different spatial coverage; are results affected by this? It tends to be standard in model intercomparisons to re-grid models to a common grid.

Figure 2: The color differences corresponding to percentiles in the bars above the panels are difficult to see. Can you describe the kernel density fit used in more detail as well?