Earth Syst. Dynam. Discuss.,
https://doi.org/10.5194/esd-2019-91-RC2, 2020

Earth System Dynamics
Discussions

Interactive comment on "Storylines of the 2018 Northern Hemisphere heat wave at pre-industrial and higher global warming levels" *by* Kathrin Wehrli et al.

Geert Jan van Oldenborgh (Referee)

oldenborgh@knmi.nl

Received and published: 10 June 2020

Review of 'Storylines of the 2018 Northern Hemisphere heat wave at pre-industrial and higher global warming levels' by Kathrin Wehrli, Mathias Hauser, and Sonia I. Seneviratne.

This paper analyses what the heat waves of the NH summer of 2018 would look like in pre-industrial, current, 1.5 °C, 2 °C, 3 °C and 4 °C climates with the same circulation prescribed. This prescription makes it impossible to estimate probabilities, but the dependence of local heat wave temperatures and other properties such as drought and solar radiation can be shown, and a scaling with the global mean temperature

Printer-friendly version

Discussion paper

established. The results look solid and are certainly interesting, giving the important message that local temperature effects may be much stronger than the global mean temperature rise. It does not address the possible interconnectedness of the heat waves around the globe in that summer beyond citing Kornhuber (2019b).

There is only one major comment I have on the analysis, namely that it is only analyses climate model data and does not make any connection to observations beyond showing the patterns agree. Trends in heat waves are notoriously badly simulated by climate models and some comparisons of the modelled trends to the observed trends would make the paper and a discussion on possible discrepancies and how these would affect future trends much more useful for readers who want to apply the results to the real world rather than the model world.

As an example, I computed the observed trends corresponding to Fig.7 from CRU TS 4.04. The observed scaling factors are very different from the modelled ones, lower in North America and higher in Europe:

WNA: 0.9±0.2 K/K, CNA: 0.2±0.3 K/K (see eg https://doi.org/10.1038/s41467-020-16676-w), ENA: 0.6±0.2 K/K.

NEU: 1.2±0.3 K/K, CEU: 1.5±0.3 K/K, MED: 1.8±0.2 K/K.

With the addition of observed trends and a discussion on the differences with climate models (and the minor comments belo) the paper would be a useful contribution to the literature.

Minor comments

l.16 The Koreas were also very badly affected.

l.78 How does the end date of July 27 affect the results? Although this captures the largest area with heat, individual regions had heat waves after this date: North Korea experienced its worst heat the first days of August. The Benelux had a second heat wave in early August and the heat on the North American west coast was most severe

during the second week of August.

l.162 I would propose "almost simultaneous", there were weeks differences between these heat waves. Please also mention that there were severe heat waves after the cut-off date.

l.174 My Newfie friends prefer "Newfoundland".

l.201 Please mention that in contrast to the CMIP5 model simulations, observed precipitation has increased in CNA over the last century.

l.221 Why do you switch from a two-week period to a monthly period? The properties of short-duration heat waves are different from monthly anomalies. Please justify this choice.

Interactive comment on Earth Syst. Dynam. Discuss., https://doi.org/10.5194/esd-2019-91, 2020.

Printer-friendly version

Discussion paper