Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2018-362-RC2, 2019

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Precipitation extremes in a EURO-CORDEX 0.11° ensemble at hourly resolution" *by* Peter Berg et al.

Anonymous Referee #2

Received and published: 4 January 2019

General comments:

The representation of sub-daily precipitation extremes and their future changes are investigated using a subset of EURO-CORDEX 0.11° climate models. The article gathers an impressive number of datasets and hourly-output from models to assess the limits to the use of convection-parameterised models at sub-daily time-scales in summer, which had never been done before. The authors first provide an evaluation of depth-duration-frequency curves (return-levels) against pre-calculated country-wide DDF curves. They conclude that convection-parameterised models at 0.11° are not able to represent hourly intense rainfall events: they mostly underestimate 10-year return level precipitation. Their ability is mostly RCM dependent. However, the models show skills in representing 12-hourly return values. The authors show that the 12h

return value is increasing with temperature in future climate scenarios, but that the slope depends both on the RCM and the GCM. Although not reliable, hourly intensities increase generally at a larger rate than 12-hourly intensities. This study introduces an interesting methodology and comparison with observations which could be further used in the assessment of future convection-permitting ensembles of models.

I find the article scientifically robust, written in a clear manner and worth of publication in NHESS. I mainly have minor comments, which I believe could improve the manuscript.

Specific comments:

1) P6L19-21: Is the 3h separation for values below 3h enough to assume "iid"? You write that this is higher than many studies, but it is lower than Ban et al (2018) (2days) or Chan et al. 2014 (1day). Does using 1 day for all durations significantly impact the results? L21-22 is not comprehensible. Please clarify.

2) P4 L17: "The analysis is restricted to summer-half years (April–September) to focus on the main convective season in Europe (Berg et al., 2009)." Note that you are missing most of the season of deep convective events in the Mediterranean (Sept.-Dec.): it may be worth producing the French map or Europe-wide map for this season, or extending the season to October. e.g.: Enno, Sugier and Alber (2018) Lightning flash density in Europe on the basis of 10 years of ATDnet data; 25th international lightning detection conference & 7th international lightning meteorological conference You could also note that seasonality changes, such as reported by Marelle et al. (2018) are not taken into account in your study.

3) This is a semantic question, but I find the term "cloud burst" in the introduction rather ill-defined, it seems to be defined by its impacts, and to correspond to convective rainfall above 100mm/h? 50mm/h? 12h duration rainfall is probably more like frontal rainfall in most european regions, is this a "cloud burst"? I would use the term "heavy precipitation event" or extreme precipitation event, which is probably less dependent on the type of precipitation event/the impacts it has.

4) P2L34-35: Ban et al. (2018) do not find a stronger scaling for intense events in convection-permitting models compared to convection-parameterised models, to the contrary it is weaker in summer, which is your season of interest.

5) Figures 2-7 and S1-4: you show continuous fields with a diverging colorbar, this can me a bit misleading, please use a sequential (multi-hue) colorscale. https://journals.ametsoc.org/doi/pdf/10.1175/BAMS-D-13-00155.1 You could start the colorscale above 0 to use all the colour intervals in the figure.

6) It'd be interesting to see the spatial variability of the precipitation enhancement thanks to the additon of a map of future changes (e.g. 10-year return value of 12h-duration) for RCP8.5. In Fig. 8, you are pooling the results in a single figure, on which it is difficult to see individual regions (you could reduce the y limits to 60% (or 90Âă% if you want to keep consistency between hourly and 12-hourly graphs).

7) P2L20-21: you could add that convection-permitting models better represent Mediterranean heavy precipitation events (which stand out in your Fig. 4-5) and in some regions still overestimate moderate to intense hourly precipitation (Berthou et al. 2018).

Technical corrections:

P2L16: add "in Sweden". P8L9: parameters fits -> parameter fits P10L15: intra-RCM spread -> inter-RCM spread P12L9: the core of the events -> the peak of the events P6L24: de Haans -> de Haan P6L24: Picklands (1975) not referenced

Berthou, S., Kendon, E. J., Chan, S. C., Ban, N., Leutwyler, D., Schär, C., & Fosser, G. (2018). Pan-European climate at convection-permitting scale: a model intercomparison study. Clim. Dyn. http://doi.org/10.1007/s00382-018-4114-6

Chan, S. C., Kendon, E. J., Fowler, H. J., Blenkinsop, S., & Roberts, N. M. (2014). Projected increases in summer and winter UK sub-daily precipitation extremes from high-resolution regional climate models. Environmental Research Letters, 9(8), 84019.

Marelle, L., Myhre, G., Hodnebrog, Ø., Sillmann, J., & Samset Bjørn, H. (n.d.). The changing seasonality of extreme daily precipitation. Geophysical Research Letters, 0(ja). http://doi.org/10.1029/2018GL079567

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2018-362, 2018.