

Interactive comment on “Technical note: Towards a continuous classification of climate using bivariate colour mapping” by A. J. Teuling

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General comments

First, I would like to thank the three anonymous referees for their generally positive and constructive comments on my paper. Since the first two referees were very positive about the manuscript and had only very few comments, I will mainly focus on the issues raised by Referee 3.

The main concern raised by Referee 3, and shared by Referee 2, is the lack of a quantitative comparison between the maps in Figure 2A and 2B. Although such comparison

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is difficult for reasons already outlined in the paper, I decided to follow the suggestion made by Referee 2 as to include a table which lists the number of cells of each Köppen climate-class that fall within the climate zones defined in Figure 2B. This table is available as supplement to this response, and also contains the total number of cells in each Köppen and bivariate climate class.

Both Referee 2 and Referee 3 make remarks about the CRU gridded observational dataset. Indeed, this data is described only in little detail since these datasets are widely used. Some confusion seems to come from the resolution: whereas Referee 3 seems to interpret the 10 minute resolution as being temporal, it refers in fact to the spatial resolution of the dataset. To be more specific about the dataset, I changed the sentence “For my analysis I use gridded observations (10 min spatial resolution) for the period 1961–1990 compiled by the Climate Research Unit” into “For my analysis, I use a gridded dataset compiled by the Climate Research Unit. In this dataset, monthly climatologies of temperature and relative humidity derived from observations made at meteorological station have been interpolated onto a high-resolution global grid (10 min spatial resolution).”

The illustration of the use of daily data from De Bilt and Madrid in Figure 3 is commented upon by Referee 3. First, it is noted that it is not explained why these examples were chosen. Second, it is claimed that winter conditions do differ between De Bilt and Madrid. The stations were chosen, in fact, because of their different climate conditions, but also simply because of the data availability. The argument of data being available for these stations at the required (daily) timescale will be added to the paper. The reviewer is correct in his statement that winters differ between De Bilt and Madrid, however the winters are much more similar to each other than the summer conditions. In fact, the modes of the T,RH distribution are almost identical. In spite of this similarity, winters in De Bilt are characterized by more days with low temperatures, which are absent in Madrid. This will be described more precisely in a possible revision.

Referee 1 also comments about the role of advection versus locale processes on ex-

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tremes. In the paper, I provide the false impression that local processes are less important than advection during hot and cold extremes. Indeed, local processes can leave an important signature on temperatures, as was for instance shown to be the case by Fischer et al. (2007) for European heat waves. Therefore I added the following sentence (and reference): "It should be noted that local processes can also have an important impact on temperature extremes in Europe, as was shown by Fischer et al. (2007) for heatwaves."

Specific comments

Referee 3 requests the quality of the CRU data to be discussed. The CRU product I used is based on monthly climatologies of station data only, and no satellite data is used. This will be clarified (see above).

Relative humidity was chosen alongside temperature for climate classification for reasons outlined in the paper, namely it being continuous, defined at all scales, and it reflecting the amount of water in the environment better than precipitation, which can fall in few events with long dry periods in between, and can runoff rather than remain in the environment to influence climate.

Referee 3 notes that a definition of climate, other than being the "weather you expect", is lacking. I will define climate more precisely in the Introduction as: "Climate is thus defined as the weather averaged over a long period of time, usually 30 years."

Referee 3 notes corrected that no reference is given to the original work by Köppen. I added two references to acknowledge his early work (Köppen, 1884, 1918). The Thornthwaite classification is mentioned in addition to the Köppen one.

Both Referee 1 and 3 comment on the size of Figure 2. Indeed, it appeared small in the Discussion paper. This figure will appear in the maximum possible size in case of

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possible publication in HESS.

References

- Fischer, E. M., S. I. Seneviratne, D. Lüthi, and C. Schär, 2007: Contribution of land-atmosphere coupling to recent European summer heat waves. *Geophys. Res. Lett.*, 34, L06707, doi:10.1029/2006GL029068.
- Köppen, W., 1884: Die Wärmezonen der Erde, nach der Dauer der heissen, gemässigten und kalten Zeit und nach der Wirkung der Wärme auf die organische Welt betrachtet (The thermal zones of the earth according to the duration of hot, moderate and cold periods and to the impact of heat on the organic world). – *Meteorol. Z.* 1, 215–226. (translated and edited by Volken E. and S. Brönnimann. – *Meteorol. Z.* 20 (2011), 351–360).
- Köppen, W., 1918: Klassifikation der Klimate nach Temperatur, Niederschlag und Jahresablauf (Classification of climates according to temperature, precipitation and seasonal cycle). *Petermanns Geogr. Mitt.* 64, 193–203, 243–248.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/8/C3745/2011/hessd-8-C3745-2011-supplement.pdf>

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 5733, 2011.

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