

Interactive comment on “The 2018 northern European hydrological drought and its drivers in a historical perspective” by Sigrid J. Bakke et al.

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Thank you so much for the helpful feedback on our paper “The 2018 northern European hydrological drought and its drivers in a historical perspective”. Hereby, we would like to respond to your comments (comments marked by ‘AR#2’ and response paragraphs marked by ‘Authors’):

AR#2: P4L24: Do the temperature data here refer to 2 m temperature?

Authors: The E-OBS temperature data is interpolated station data of air temperature, which to our knowledge are measurements at 2 m (currently getting this confirmed).

AR#2: P4L31-32: I am wondering why do the authors use 2 different spatial scales for analyses in section 3.1 and 3.2 (0.25), and 3.3 (0.1)? Why do not simply use a spatial

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resolution of 0.1?

Authors: We agree that this is confusing, and will change to use the resolution of 0.1 for all analysis using the E-OBS datasets. The figures will be remade using the resolution of 0.1 degrees.

AR#2: P8L15: The authors may write: three-month.

Authors: We will do so in the revised version.

AR#2: P8L27-29: Here, I am also wondering why do the authors use SPI-3 (SPEI-3) distributions derived from the data year 1971 to 2000 to calculate SPI-3 (SPEI-3) in the year 2018? Why do not use the distribution derived from 1971 to present data? By only using data from 1971 to 2000 (20 years ago), the drought 2018 might be too extreme because the authors excluded extreme drought years e.g. 2003, 2006-2008, and 2015. This has implications in the distributions that the authors used. Moreover, the average temperature >20 years ago was lower than the average temperature in the past 20 years (2000-2020). In Europe, we also use drought years 1976 and 2003 as a benchmark for extreme drought years. 2018 was comparable to those years in terms of drought severity. This question applies to other reference data (e.g. section 3.1, from 1981 to 2000).

Authors: We agree that the extremeness of the anomaly plots as well as SPI3 and SPEI3 are sensitive to the choice of reference period. The reason we use a 30-year period of reference and not the period 1971 to 2018 is to allow for easier comparison with other studies (e.g. Ionita et al., 2017; doi:10.5194/hess-21-1397-2017). Even though the 30-year period of reference might be subject to choice, they are more consistent than using a longer period up to the year of interest. However, we used the ranking maps to be able to investigate the historical extremeness compared to other extreme years during the whole 60-year period. The main purpose of including the SPI and SPEI figures is to map the dynamic (in space and time) of the meteorological drought. Following the reviewer’s remark, we calculated the SPI and SPEI using

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the whole period (1959-2018) as reference, and found similar spatial patterns in the drought evolution throughout 2018 (ref. monthly plots). See attached figures at the end of the document. Accordingly, we prefer to keep the 30-year period of reference (i.e. 1971-2000).

AR#2: P9L4-6: I am wondering why do the authors use absolute values to determine the SPI classes? Figure 6 also shows the SPI/SPEI index values from -3 to +3.

Authors: If we understand your comment correctly, the confusion may arise from displaying absolute values rather than the wet and dry ranges. We separate between negative and positive values in the study, and suggest instead to write e.g. “defining SPI values in the range $[-1.5, 1.5]$ (9.2 % probability) as moderate drought/moderately wet”.

AR#2: P10L3: The authors may write as Figure 3a-d. P10L11: The authors may write as Figure 3e-h. P12L30: Please write the Figure number after the sentence thus the reader can follow the description easily. Here is Figure 9a. P12L33: The authors may write Figure 9b after the sentence. P13L2: The authors may write Figure 9c after the sentence.

Authors: We agree on the above five comments about figure number inclusions, and will do so in our revised version.

AR#2: P14L20: Typo “than 3 std, respectively 2 std” Authors: We are not sure what typo you refer to. It might be the use of commas. We will check this phrase with a native speaker.

AR#2: P24: Table 1: The author may write last accessed before the date. E.g. (last accessed 24.03.20).

Authors: “URL (last access)” is written in the column heading to indicate that the date in parenthesis is the last access date.

AR#2: P25: Back to my question about the reference data, here in Table 2, the authors

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indicate that they have temperature, precipitation, Geopotential height at 500MB data up to the year 2018.

Authors: Yes, Table 2 shows the data used for the different indices. If we are to change the reference period of parts of the analysis, we will also update the Table accordingly.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2020-239>, 2020.

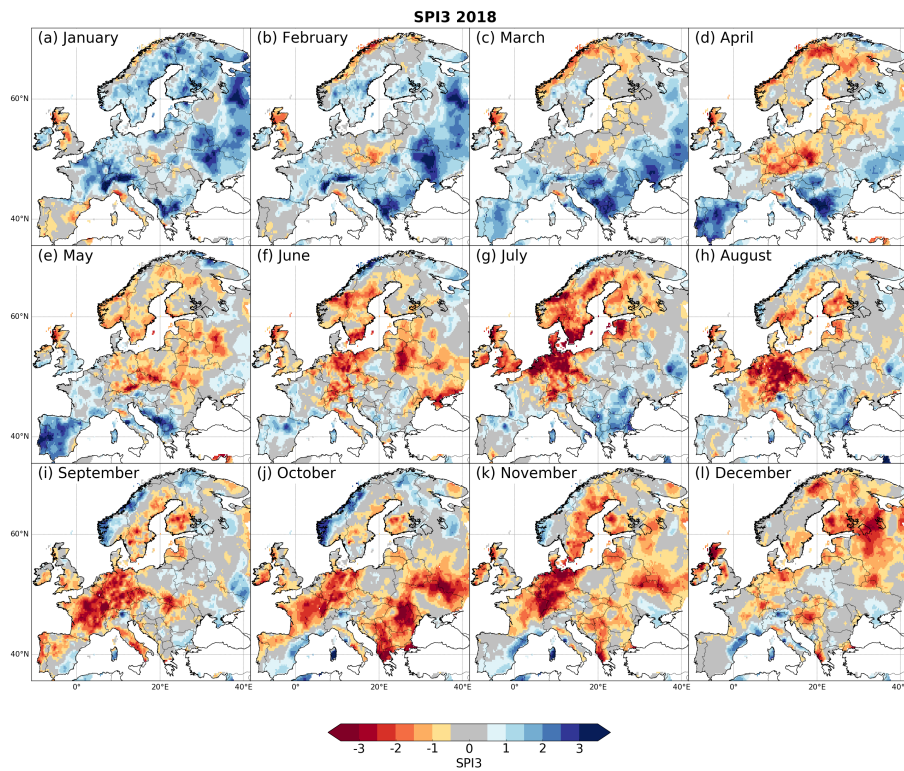


Fig. 1. Same as Figure A6 in the paper; Monthly meteorological drought indexed by SPI3 throughout 2018 relative to the reference period 1971–2000.

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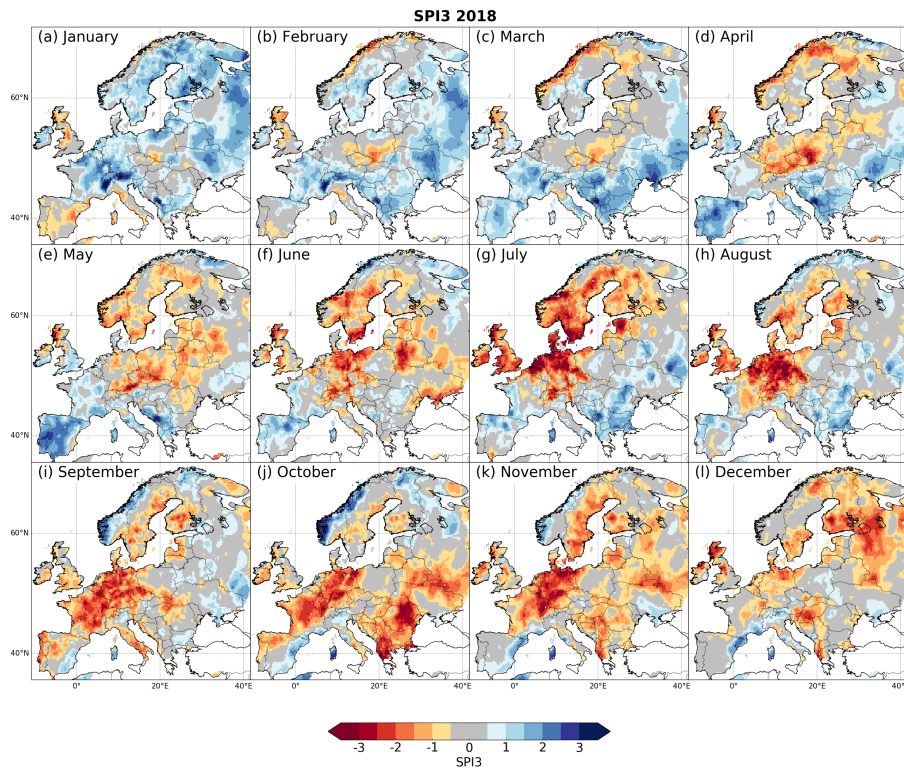


Fig. 2. Monthly meteorological drought indexed by SPI3 throughout 2018 relative to the reference period 1959–2018.

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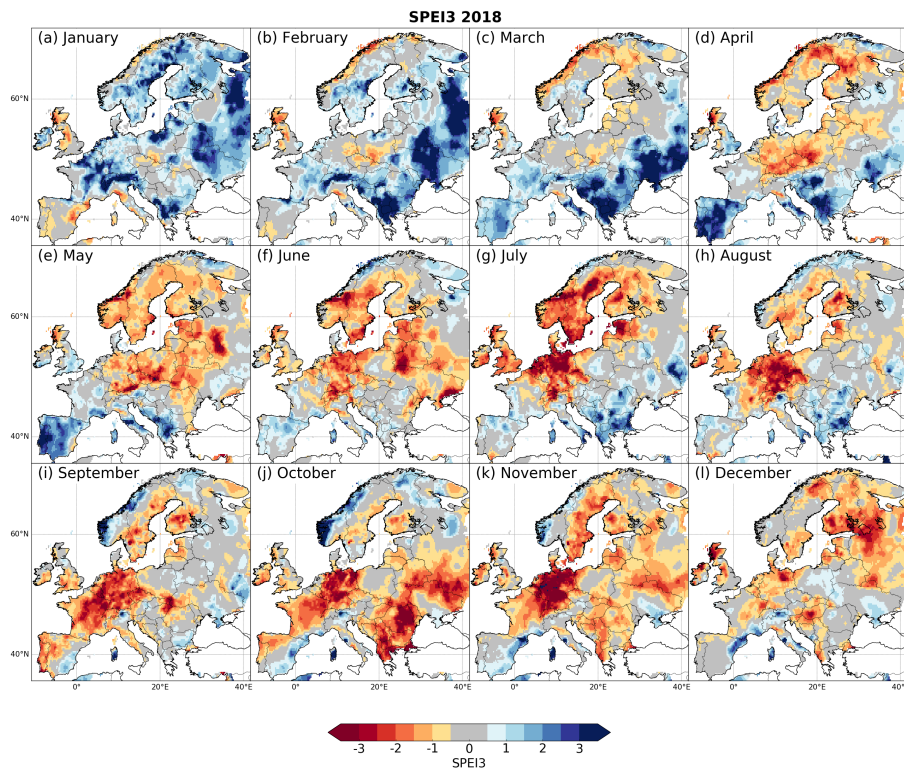


Fig. 3. Same as Figure A7 in the paper; Monthly meteorological drought indexed by SPEI3 throughout 2018 relative to the reference period 1971–2000.

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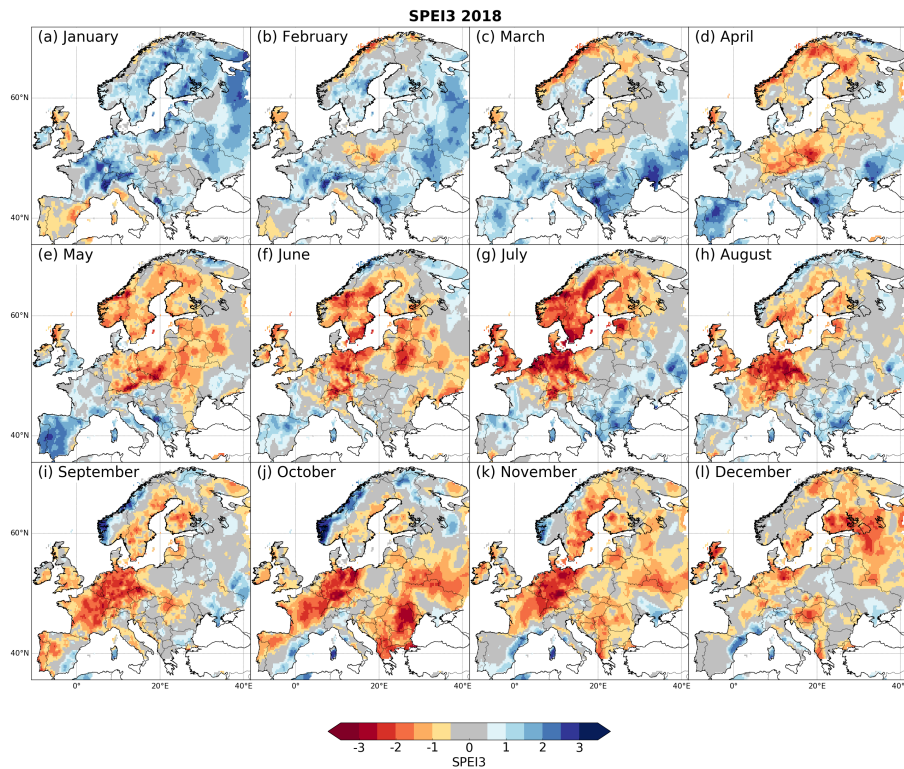


Fig. 4. Monthly meteorological drought indexed by SPEI3 throughout 2018 relative to the reference period 1959–2018.

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