Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2018-289-RC1, 2018

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "High-spatial resolution probability maps of drought duration and magnitude across Spain" *by* Fernando Domínguez-Castro et al.

Anonymous Referee #1

Received and published: 30 December 2018

The topic of this paper is very actual and important taking into account recent extreme climate events and what we will face in near future. The authors have presented probabilities of extreme drought events in terms of drought duration and magnitude. They compared two the most used drought indices (SPI and SPEI) at 4 time scales and high spatial resolution by applying extreme value theory. In order to increase readability and relevance of the paper some points need to be addressed.

Some parts of the text are hard to understand so I would recommend English check before final publication. Please use term "percentile" instead of "centile". Overuse of the adverb "Nevertheless".

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Discussion paper

The Abstract should be rewritten as well as the Section “Data and methods” since it is not clear in every step what is done on what data and it would not be understandable to wider audience.

Through the selection of the appropriate threshold you observed percentiles from 0th to 95th. Why haven’t you take values greater than e.g. 40th or 50th percentile since you are studying extremes? Then you would have less figures and they would be more visible. Figures are hardly visible (Supplement ones even less), especially if they are printed in black and white. Lines and dots should be thicker.

Page 1

L10 – “-for the first time-” should be removed. Make unique terminology – drought severity > drought magnitude. It is not the same. L14 “. . .implying that drought event is attained only when the index values are lower than zero.”It is not “implied”. It is according to index definition. Or I didn’t understand the sentence well. L15 “drought severity and magnitude series” > “drought duration and magnitude series” L16 “evaluating different three-parametric distributions” – in the text you are mentioning only one distribution, have you tested some more? L29 What are the “large legislation practices”?

Page 2

L10-L14 If the stated studies “developed drought-related probability maps for Spain” how they “did not account for the different drought hazard probability”? I understand the point you want to make, but the text should be reformulated. L20 What do you mean by “normalizing data of climatic variables for common periods”? > Suggestion “climate data standardization over standard climatological periods” L23 There are various drought indices including ones that do not account for the climatology of the location that is observed, as you explained in part L14-20. You should specify the group of drought indices you are talking about. L25-26 Sentence “Taken together. . .” should be reformulated.

Page 3

L6 “Unfortunately, this aspect has receives less attention in the literature.” Is this your opinion? Can you somehow confirm this statement? If not, it should be omitted. L19 Datasets cover the whole Spain. How many points are in the grid you considered? L19-20What is the source of the meteorological parameters? L21 Have you calculated the indices or are the datasets for the indices downloaded from the website you provided? L23 What is “normalization of the climatic balance”? L24 Which method have you used for PET calculation? L28 Chosen timescales include agricultural drought as well, and agriculture is very important sector. It should be included.

It should be stated here that the indices include wet conditions as well, and the indices values below 0 signify drought condition. You mentioned it in the Abstract but not in the text. For which time period have you calculated distribution parameters for indices calculation?

Page 4

L1-10 I think this part is unnecessary and brings a bit of confusion in the paper. According to the indices definition, drought event is when the indices values are below 0. For each drought event you calculated its magnitude and duration and then extracted extreme ones using POT. There was no need to introduce run theory. L13 I am curious how you did the integration. I don’t have access to Dracup paper, so if you could be more specific on this. L15 “drought duration was calculated for the consecutive weeks. . .” > “drought duration was calculated as number of consecutive weeks. . .” L19 Stationarity is referred to series of drought magnitude and duration, right? L26-30 In the abstract you are mentioning “evaluating different three-parametric distributions”. Have you tested some other distributions beside GP? On the Figure 1 are presented L moment diagrams for different distributions, but in the text there are no explanations regarding them.

Page 5

L3-4 Repetition of the Page 4 L26-30 L6-L13 This part should be rewritten and be one paragraph. The first sentence “Hosking (1990). . .” Is hanging and it is connected to the sentence in L2 of the previous paragraph but I cannot see its point in the whole text? Sentences from L8 till L12 refer to the same thing: you plotted L-moment diagrams and applied Anderson-Darling test to obtain and test POT series, fitting to GP distribution, for different x0 thresholds; am I right? L17 “t years” or “T years”? L19 What is “original sample” in this case? L14-L21 There should be one paragraph referring to maximum duration and magnitude.

Page 6

L1 Formula is not explained, i.e. elements of formula are not defined. L9 “Nevertheless... 1-month timescale can be different considering other drought timescales.” It can be, but is it in your study? L4-11 Is there any specific reason why you have chosen to present SPEI1 for duration and SPEI12 for magnitude? L13 There are too many supplementary figures regarding this part. Can they be reduced and just described in the text. There are no significant differences between them (I think, the dots on the Figures are barely visible on some panels. . .is there any for 95th percentile?). L15 Have you done Anderson-Darling statistic for other distributions? What are the other distributions that you have tested? L20-21 “Notably. . .” This sentence refers to 1-month scale or general? L26 Could you please say something more on Fig 3? Does Fig 3 unify duration and magnitude? Scales on panels are different (even for the same percentile) so they are hardly comparable. L28 What did you do in the cases when you could not calculate distribution parameters? Is this 99% referring to percent of series for both indices, magnitude and duration, all time scales and all grid points? L29 “A comparison of the observations and estimations. . .” where we can see this?

Page 7

L4 “Similar results . . .” Does it mean that previous sentences are related to other two metrics? L6 “Again . . . at the pixel scale. . .” - what else was compared on pixel scale?

As I understood, previous paragraph was on maximum duration/magnitude over the whole grid. L7 Have you plotted cdfs for every grid point and then chosen the representative example? Why this grid point? Could you put some mark on this point on Fig 6. Do you have any idea why there is smaller correlation in some locations, are there any specific geographical characteristics that influence the results (e.g. in NW for SPI3 duration, Fig.6)? L18-L21 What the differences mean? In general, what these figures are showing, what you can conclude from them? It is notable that κ changes the sign between 3 and 6 month timescale for all cases (SPI/SPEI and duration/magnitude), do you have idea why? L22 "We mapped drought probability.... using the parameter maps and Eq.3" – How did you do this, using some GIS software? L31 "southeast" or "southwest"?

Page 8

Supplementary Fig 17, 18 - What are "SPI/SPEI units"? L31 You mention "climatic balance" again. Climate balance is based on the balance between various components of climate system. I doubt you are referring to them all, so this terminology is not correct.

Page 9

L6 "This difficulty is also enhanced by our findings on the spatial differences in the drought probability in response to the selected drought index." But in Page 7/8 you say "Drought probability maps using the SPI show spatial patterns similar to those observed by means of the SPEI". So, are there significant spatial differences in the drought probability comparing two indices? L21 "As such, the degree of vulnerability can vary according to drought timescale" – I would add "drought timescale and region."

Technical corrections

Please make unique way of representation in tables and figures: order of SPI and SPEI as well as "duration" and "magnitude".

Page 1

L26 Add “e.g.” in the brackets since you stated only two articles published in 2018. L30 “practices to drought events” – should it be “practices during drought events”?

Page 2

L10 “several works” > “several studies” L17-18 “wet conditions” > “moisture conditions” “km2” > “km2”

Page 4

L3 “varying” > “various” L11 “. . .drought event as that event with a period. . .” > “. . . drought event as period. . .”

Page 5

L2 “(Hosking, 1990)” > “Hosking (1990)” L4 “world regions” > “regions of the world”

Page 7

L9 “low agreement” > “lower agreement” (because in preceding sentence you said “very good agreement” for all; not to be contradicted) L23 “predicted” > “estimated” L28 “12-month” > “12-months” L31 “>180 months” > “>180 weeks”

Page 8

L10 “Standardized precipitation Index” > “Standardized Precipitation Index” L19 “was made to make balance” > “was to make balance”

Page 12

L3 & L7 Check the references (names of the authors)

In Table 1, “SPEI”, the “I” went to the second row. Figure 3 Both lower and upper panels have the same name “SPEI” Figure 6 There is number “40” on panels SPI 1, 3, 6 for duration. Figure 11 Axis labels “duracion” > “duration” Supplementary Fig 19 - Figure

caption is for duration.

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