Hydrology and Earth System Sciences Discussions

Interactive comment on "Are droughts occurrence and severity aggravating? A study on SPI drought class transitions using loglinear models and ANOVA-like inference" *by* E. E. Moreira et al.

Anonymous Referee #2

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General comments

The manuscript addresses the question whether there have been changes to meteorological drought characteristics in Portugal. The topic is timely and touches on important aspects of trends and cyclic behaviour of environmental variables. It is potentially in the scope of HESS, but may be similarly suitable to a climatology journal as it only looks at precipitation (SPI), specifically at transition frequencies between SPI classes. These are compared between subperiods.

My main criticism about the overall study is that it lacks a clear hypothesis or model

of how differences in the transition between SPI classes will relate to the searched-for 'aggravation of drought'. The authors claim as their objective (also in the title and abstract) to analyse a potential "aggravation of occurrence and severity". Hence they must have an expectation or hypothesis of how such an aggravation will appear in the trends or changes in the transition matrices. Also the role of the search for or assumption of a cyclic behaviour or non-linear trend is not clearly embedded into the methodology. The lack of introduction of this clear model of the link between SPI class transitions and meanig for drought aggravation makes the results of the analysis difficult to appreciate and its contribution unclear.

While the topic and the analysis is certainly interesting and has potential, the presentation of the study, specifically the results, has significant deficiencies with respect to clarity, structure and presentation (see specific comments). Therefore I cannot recommend publication of the manuscript, but certainly encourage the authors to improve and resubmit it either here or elsewhere.

Specific comments

The second page of the introduction reviews what appears to be a random selection of literature. Review sections need to have a specific focus related to specifc aspects of this study. These are unclear. If the aspect of cyclic behaviour is as important as the authors claim, they need to substantiate this with references. "Cohn and Lins: Nature's style naturally trendy" may provide a starting point for further references and citations. A number of SPI based studies, e.g. out of Spain and the UK, that link drought to (cyclic?) atmosphere-ocean oscillations is also ignored.

The methods section spends a lot of time on the previously published part as I understand. The final paragraph on the ANOVA-like analysis that is new here is very short. Given the knowledge about AO modes such as NAOI etc. influencing drought behaviour, I would assume that the sub-period data are not independent. Does this matter? I also agree with referee 1 that the sensitivity of the analysis to selection of

subperiods is unclear. I suggest a randomization approach for more objectivity. The same applies to the SPI classses. Some sensitivity analysis assessing how these subjective decisions influence the results are needed to make the analysis robust and credible.

I found the results section difficult to read and relate to the quantitative results. Could the results be presented in another way than these long tables? I don't think anyone will ever look at them. They do not present what is important and may be best in an Annex.

This also relates to my main comment of a lack of clear model or hypothesis of what to look for. I acknowledge there is a bit of this in the beginning of the results section and in Table 9 with the 'typical cyclic pattern', but it doesn't go far enough to create a usable framework for presentation and discussion of the results and it should have been presented in the method section as a reference of what is looked for and introduced in the introduction generically. Considerable structural work on such a framework is needed to successfully communicate the results and relate them to the processes responsible.

I found some contraditions in results and conclusions, possibly because of different periods meant. The north vs south differences need to be discussed with respect to other studies findings on trends and changes in climate and hydrology. Likewise potential drivers that other studies found to influence the behaviour found need to be releated to these results to form a picture of cause effect and nature of variability in droughts in Portugal.

The language needs considerable improvement.

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