

Interactive comment on “On the drought in the Balearic Islands during the hydrological year 2015–2016” by Climent Ramis et al.

Anonymous Referee #1

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This paper on the extreme droughts of 2015-16, or more generally on the water resources, of the Balearic islands covers a rather important topic. These islands, like the rest of the world, faces a changing climate but they are at the same time in already quite arid conditions and furthermore they draw their resources from a very water demanding industry, namely tourism. Thus I would like to recommend NESS to consider for publication as it falls well within the scope of the journal. But in my opinion some issues need to be resolved in this manuscript before publication. I would like to encourage the authors to take advantage of this review to put their study on a stronger footage.

Major comments :

a) The entire study hinges on the meteorological stations of the airports of the three

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island. Which I guess is fine as these are high quality data sets and provide multiple meteorological variables. Still, as in the semi-arid climate rainfall is sparse (by definition !) and very variable in space, it is not obvious that a dry year at the airport is also dry on the entire island. Thus I think that the study would benefit from an analysis of the spatial representativeness of the inter-annual variability of the rainfall captured at the airports. Using all the rain gauges of the islands (or the gridded data displayed in figure 4) one could estimate the error done on the characterisation of the inter-annual variability with only the airport stations.

b) The usage of empirical formulas for estimating potential evapo-transpiration (PET) is understandable in view of the data situation. But the authors should point out that these empirical formulations have their limits, especially in a changing climate. There is wealth of literature on these aspects. Furthermore it is not very stringent to use in section 3 for the validation of the methodology the Thornthwaite formulation, and then later for the hydrological years 2015-16 Hargreaves. There should at least be some comparison of these methods and proof that the choice of empirical function does not affect the conclusion of the study.

c) The analysis of the drought in terms of a simple P-E analysis is interesting but is based on some crude assumptions. Thus it is important to bring some arguments as to why these are justified in the present case. The community has now some powerful tools to analyse and predict the continental water cycle and it is a pity that there is no attempt to show what is captured and what is lost in the proposed approach. I would recommend the authors to look at the excellent continental water balance re-analysis which has been produced by the European Earth2Observe project : <https://wci.earth2observe.eu/portal/>. As this work is performed with multiple models and at $1/4^\circ$ degree resolution, there is some interesting information to be drawn for this study of the Balearic islands. d) The hydrological year 2015-16 is characterized by very intense rainfall events in September and then a continuous deficit for the rest of the rainy period. This begs the question of the role of runoff. Especially when the

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season starts with heavy precipitation, on soil dried out by the summer, much less water will infiltrate and thus recharge soil moisture. An analysis of the Earth2Observe multi-model ensemble or river discharge data could offer some more insight into the other terms of the water balance equation. It would show how far the simple P-E balance can be trusted. Furthermore the authors use PET and E, so there is a further assumption to be tested here.

Minor Comments :

1. I guess it is OK to reference general media in a scientific publication in order to highlight the societal relevance of the topic studied. But this should not exempt the authors from putting proper references. So please cite the newspaper which served as a source of the information.
2. 3rd paragraph of Introduction : “somehow characterizes the type of natural vegetation”. This seems very vague especially when you consider that there are vegetation classification which could be used to refine such a statement.
3. Is it necessary to repeat the inter-annual analysis for the civil and hydrological years (figures 3 and 5) ? As pointed out above the spatial representativeness seems more critical to me.
4. It is unclear for which year figure 6 is ! This is neither explained in the text nor the caption of the figure.
5. Many figures do not have units on the axis or title and we have to retrieve that information from the caption. In general the figures are of poor quality.
6. Description of figure 8 in the text and its caption do not correspond. Are three stations used or only the airport data ?
7. End of conclusion : The natural vegetation in the Balearic islands is not wild I think !!

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