

## ***Interactive comment on “Concurrent wet and dry hydrological extremes at the global scale” by Paolo De Luca et al.***

### **Anonymous Referee #2**

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In this study the authors want to identify concurrent wet and dry hydrological extremes at the global scale using PSDI indices from 1950 to 2014. In the study two new metrics are introduced to measure the relative occurrence of extreme wet or dry events and to quantify the time interval between hydrological extremes with opposite sign. The spatial patterns of wet and dry extremes are linked to climate modes, like ENSO, AMO and PDO. The idea of the analysis is interesting and the potential for the results is high, however the manuscript remains mostly descriptive. The fact that the events are concurrent is interesting, but physical explanations should be given. The idea to consider correlation with main climate modes should represent a way to identify possible physical relationship between concurrent events, at least for some regions. In my opinion some revision is needed before the work can be accepted for publication in

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the journal. Below detailed comments are listed:

1 - the main weakness of the manuscript is that at the end it results mostly descriptive, lacking some physical explanation for the concurrency of extremes events, at least for some regions; 2 - Fig 2 refers to specific cases (Dec 2010 and Jan 2003). One question is, considering for example the values or phases of PDO, AMO and ENSO, are there are years comparable to 2010? and what happen to the extremes in those years? The same question is valid for the opposite case: are there other years with values of ENSO, PDO and AMO comparable to 2003? and what happen to the extremes in those years? 3 - Fig 2: some regions, like eastern Australia, India, western Africa, Argentina, parts of western US, have opposite (at least in terms of sign) values in the two extreme cases, while others, like central Europe or eastern Canada, have similar values (at least for the sign). Do you have any comments/explanation about that? what about the possible role of large-scale climate modes, in this respect? 4 - How is ET distributed in space? Is there any relationship with the values shown in figures 2 and 3? ET is somehow related to the timescales of the climate modes considered, at least in some specific regions? 5 - Fig. 5: why extreme wet and extreme dry are considered together? Is the signal exactly symmetric in terms of the influence of the climate modes? 6 - Fig. 5: is there any relationship between the regions where the correlation (for each mode considered) is significant and specific behaviors/patterns identified in figures 2 and 3?

Other minor comments: 1 - Lines 27-31: the abstract should contains more specific details about size and shape of the influence of the climate modes considered; 2 - The introduction is apparently too detailed toward the end, but in none line before the definition of the events considered is given; 3 - does the conclusions contain answers to the questions raised from lines 4 to 8? These answers should be clearly highlighted in the Conclusions (and partially also in the Abstract) 4 - Line 14: not clear what kind of product you are using. Is it derived from reanalysis data? I would like to see more details in the description of the dataset used; 5 - Lines 21-22: reference missing or

derived from outputs not shown. Actually it would be interesting to see that; 6 - Line 24: timeserie in fig 1c is largely marked by the seasonal cycle. Visual understanding would be easier considering annual means? 7 - Lines 29-30: meaning not clear. And is this true only for neutral events? 8 - Lines 9-10: should be eastern China and south-eastern Australia instead? 9 - Fig 5: last sentence of the caption contains infos already given few lines before in the caption itself

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