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Interactive comment on "Detection and attribution of global change effects on river nutrient dynamics in a large Mediterranean basin" *by* R. Aguilera et al.

Anonymous Referee #2

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This manuscript deals with river nutrient dynamics in the Ebro basin, and attempts to link nutrient variations in the river and its tributaries to a number of environmental and anthropogenic factors. For this study, the authors use data from public databases, from which they extracted nitrate and phosphate concentrations, and are using the data from 50 sampling locations where they were able to construct a 31-year time series. They are also using water discharge time series for 37 of these 50 sampling locations. They are using a number of statistical tools, in conjunction, to highlight trends and patterns, in order to identify interannual or seasonal cycles, and to associate them with the external factors considered.

I appreciated the fact that the authors do point out that public databases and time series

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often are poorly maintained and lack data.

Overall, the manuscript is well written, the description of the tools used, and why, is helpful and clear. The topic is within the Biogeosciences scope. I would only suggest minor revisions, mostly clarifications on some points I will go over below.

The main issue for me here is the use of the term "global change". We are all aware that global change does not exclusively mean climate change, and I understand that the external factors taken into account in this study can fall within the "global change" category. However, I would like to see a short paragraph defining what exactly the authors mean by global change in this instance, and why these particular factors were chosen and relate to that definition. The reason why I mention this is that the notion of global change appears early in the manuscript, and then in the conclusions, but we lack insight so as to what it really means here. "Global change effects" or "global change impacts" is an extremely broad notion.

The spatial component of the variability studied also could benefit from extra space in the manuscript. In section 3.7 it is said that for each sampling point, mean values and percent areas were calculated considering 2 regions: is this for all potential explanatory variable listed above between lines 17 and 25, or only some of them? Were you able to get complete time series for ALL these variables? And what of their location (reservoirs, WWTPs. . .), this could be useful to know. If I understand correctly, the spatial distribution of patterns/explanatory variables is computed from the patterns themselves found though DFA? I had a hard time picturing spatial distribution from the manuscript alone, even though the figures are good. Figure 5 is a good attempt at putting together explanatory variable and affected clusters, but if the colored circles refer to clusters in Fig. 3 and Fig 4., how can we know if red circles are Cluster 1 from fig. 3 or Cluster 1 from fig. 4. Same thing with blue circles (Cluster 4 from fig. 3 or cluster 2 from fig. 4?). The clustering and conclusions drawn from explanatory variables identified should be discussed more in depth in section 5. All in all the "spatial" talk is very technical, and adding a paragraph in the discussion regarding this would make it easier to

understand.

Section 4.1: Are the 3 extracted patterns common to all 50 times series?

Section 3.1: - "collected from public databases": did you use multiple different databases to construct the time series? If so, were the measurements made the same way at each sampling site, maybe they were automated? Were they all comparable? - "some unreasonable values were manually removed": did you try to link these values with land use data? How unreasonable? Were they measurement errors?

Streamflow time series: I was a bit confused with the streamflow time series. Were you able to get complete streamflow time series for 37 sampling sites? Why reconstruct it? Maybe a sentence could be added in section 3.3 explaining this further?

References: In the manuscript you cite (Caille, 2009) but in the reference list we find Caille et al., 2012. Please correct. P 5274, line 2: Gonzalez et al., 2012 does not appear in the reference list

p. 5275, section 5.1, lines 1-13: ENSO discussion/oscillation pattern: Is there also a similar pattern affecting precipitation? Or air temperatures? Could this further link your findings with ENSO? On the same page, line 15, I zould replace "in our view", maybe with "in our opinion"?

Typos: P 5272, line 18 "showed the largest relevance of pattern 1": please replace "of" with "for"

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