

## ***Interactive comment on “The response of Iberian rivers to the North Atlantic Oscillation” by J. Lorenzo-Lacruz et al.***

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The authors want to express our gratitude for the interesting comments and observations received from the reviewer, all of them aimed to improve substantially the quality of our work and the clarity of the presented results. Following we include a detailed letter where we respond to every suggestion and concern of the reviewer, explaining all changes introduced in the revised version of the manuscript.

-In section 3.2, they applied the Wilcoxon-Mann Whitney test to the two NAO extreme cases. Prior to application of this test there are some assumptions to be checked, such as all the observations from both groups are independent of each other. There is no explanation in the text for this-

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The authors agree with the concern arisen by the reviewer. In fact we are sure about the independence of the two samples tested, since they correspond to anomalies from different years, mostly not correlative, thus free of autocorrelation. To make it explicit we have added the next paragraph in the revised manuscript:

"The Wilcoxon Mann-Whitney test is based on ranks that do not require normally distributed samples. Before the use of this test, the assumption of the independence of the observations from both groups is required. In this case, the samples tested are independent since the streamflow anomalies correspond to different and non-correlative years that only coincide in having a extreme NAO winter value."

-In section 5.2, I found their explanations for spatial and temporal variability in IP very logical, but once they mentioned reservoir impacts, I wonder if they observed homogeneity conditions in the selected rivers.-

We think that the reviewer refers to the impact of reservoirs in the persistence of the winter NAO influence during the rest of the year. We observed a great homogeneity in the behavior of such rivers with a high degree of impoundment related to this persistence: gauging stations with a retention capacity exceeding the mean annual discharge (impoundment ratio  $> 1$ ) present a sustained response to winter NAO conditions during the rest of the year, especially those in the south, with the exception of the Segura basin which is highly altered by the Tajo-Segura water transfer. We have completed the next paragraph:

"The water management strategy relies on a large number of dams impounding the majority of basins in the IP, which explains the multi-temporal lagged relationships between NAO, precipitation and stream flows. Water is stored in reservoirs during the rainy period (winter and spring) to meet the water demand during summer, which reduces streamflows downstream of the reservoirs during winter and spring. This explains the close relationship of summer and autumn streamflow to the previous winter NAO, especially in the southern basins with larger impoundment capacities (Tagus,

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11,012 hm<sup>3</sup>; Guadiana, 8635 hm<sup>3</sup>; and Guadalquivir, 8280 hm<sup>3</sup>): the majority of those rivers with retention capacity upstream exceeding the mean annual discharge showed a sustained response to the winter NAO during the rest of the year."

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