

# ***Interactive comment on “Exploring the role of hydrological pathways in modulating North Atlantic Oscillation (NAO) teleconnection periodicities from UK rainfall to streamflow” by William Rust et al.***

## **Anonymous Referee #1**

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In this paper the authors draw upon an extensive UK hydro-climatological data-set, comprising >700 gaged records of streamflow and estimated precipitation to examine 7-year periodicities related to the NAO. The range in catchment responses (and potential additional cycles at 2 and 5 years) are interesting and I think the paper is appropriate for this journal (with suggested revisions noted below), although I'm not personally convinced that this paper provides 'critical process understanding' as suggested in the abstract, and its not clear how this work can translate to improvement of the practice and policy of water resources management (as suggested in the abstract).

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For a non-UK reader it would be useful to provide more context in introducing the work and commenting on confounding influences (e.g. there is no mention / discussion of abstraction, nor the potential for anthropogenic water use / return flows, to influence streamflow). Moreover, the authors only mention one aquifer (the Chalk) and it is difficult to interrogate the results to consider the potential for varying periodicities on other geologies (and catchments with differing land use), given the scale of figures such as Fig. 5. At this scale of analysis, I would also question whether the authors are able to infer hydrological pathways with confidence (although the Groundwater Response Time concept appears very interesting).

In addition to these thoughts, the authors may wish to consider the following points when revising the paper:

- \* There are multiple (>10) references missing in the ref. list including: Bloomfield & Marchant, 2013; Dixon et al. 2013; Forootan et al. 2018; Haarsma et al. 2015; Tanguy et al. 2016.
- \* It would be useful to include more specific details in the abstract.
- \* A stronger argument to demonstrate the effectiveness of the BFI in relating 'physical catchment processes to streamflow' would be helpful (e.g. as I understand the Bloomfield et al 2009 study, cited in support, focused on the Thames catchment).
- \* Lines 179-183 should be reworked (e.g. GRT is lowest in southern and eastern England, but highest in south-east England?).
- \* Figures 2 & 5: are rather small, and it would be useful to reproduce these at a larger scale.
- \* Is it possible to combine Figures 3 & 4 so the plots can be compared more easily?
- \* The Discussion is rather long and would benefit from a more selective review of the results, with more attention to suggestions for future research.

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