

Interactive comment on “Conditioning Ensemble Streamflow Prediction with the North Atlantic Oscillation improves skill at longer lead times” by Seán Donegan et al.

Anonymous Referee #1

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The authors apply the ensemble streamflow prediction (ESP) and conditioned ESP to quantify the predictability across time scales over different catchments in Ireland by hydrological model. In this work, they find that the prediction based on memory of initial hydrological condition is skillful up to several months, especially in summer. In addition, the skillful prediction of North Atlantic Oscillation (NAO) is benefit to the hydrological prediction in winter. Overall, this manuscript is well prepared and organized. I only have the following minor suggestions.

1. Besides the CRPSS, NSE and ROC, the correlation coefficient (CC) is an important index. Therefore, I think you should also provide the CC in your analysis, such as the

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relationship between observation and simulation.

2. Why do you divide the 46 catchments into 8 regions? The Figure 5 also can be plotted as the Figure 10, or the Figure 10 can be arranged as the Figure 5?

3. You should explain the conditioned ESP in more details to ensure reproducibility. For example, you didn't explain that what the '17' is in the Line 193. In your work, the conditioned ESP is able to improve the skill significantly over many catchments in Ireland. In addition to conditioned ESP, the post-ESP is another prediction method, which involves the information from initial hydrological condition and internal climate variability as well (Yuan & Zhu, 2018). You can compare the impacts of these two methods on the improving of prediction skill.

4. Your work represents the skill of conditioned ESP performs better than the ESP over many catchments. However, the information of NAO reduces the skill in a few regions where the ESP is skillful, especially at 3-month lead, such as the three catchments in East region. This is an interesting phenomenon, you should discuss it.

5. Many previous works show that the memory of initial hydrological condition in winter is more important because the snow cover plays a key role in seasonal streamflow forecast. However, you get a different conclusion in the work. You should discuss the difference.

6. Each panels in your figures should be labeled.

Yuan, X., & Zhu, E. (2018). A first look at decadal hydrological predictability by land surface ensemble simulations. *Geophysical Research Letters*, 45(5), 2362–2369. <https://doi.org/10.1002/2018GL077211>

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