The authors use statistical analysis of observations and reanalysis data to examine a potential link between freshwater anomalies in the North Atlantic subpolar gyre region and summer weather in Europe in the following year. They propose that stronger freshwater anomalies are associated with a stronger meridional SST gradient between the subpolar and subtropical gyre and consequently increased baroclinic instability in the atmosphere above. The resulting changes in the large-scale circulation lead to significant anomalies in near-surface temperature and precipitation in different parts of Europe. The foundation of the analysis are freshwater indices derived from a mass balance equation that are used to identify freshwater anomalies in relation to simultaneous sea surface temperature (SST) anomalies linked to the North Atlantic Oscillation (NAO).

The current manuscript is another substantial improvement to previous versions and I appreciate the added detail in the derivation of the mass balance and estimation of the freshwater indices, and the more precise description of the results. As outlined in my comments below, there is some remaining uncertainty regarding the construction of the freshwater indices. Additionally, the presentation and description of the central results, i.e., the link between the freshwater anomalies and European summer weather, requires – in my opinion – some larger context and relation to known atmospheric circulation and weather patterns that are described in the literature. Overall, I recommend a series of minor revisions that may appear major due to their extent.

I. Main Comments:

1. Section 3.2:
    1. I now understand why this part has been – and, in part, still is – confusing to me: the threshold of $NAO_S < -0.05$ is based on the non-linear relationship shown in Figure 1d. The y-axis of that figure is ΔSST which "corresponds to the SST difference between the red, subtropical and blue, subpolar 95% confidence regions in panels e (red years) and f (blue years) respectively, relative to the respective means". However, these confidence regions are not known a priori, so I am trying to wrap my head around the specific steps to get from the time series of NAO_S (Figure 1c) and winter SST at each grid point, via the scatter plot in panel d, to the maps in panels a and b. Strictly speaking, you cannot determine the value of ΔSST for Figure 1d, and therefore the threshold of -0.5, until you have the two maps (panels e and f) after the subsampling. The subsampling itself, however, depends on the relationship in Figure 1d, so there must have been some iteration or trial-and-error. Please add more details in the text (before l. 202) to lay out you analysis steps.
    2. Please define ΔSST in the text. Is this the difference between the regressed SST or the actual SST values in these regions? Is it relative to the respective spatial or temporal mean (over which period)?
    3. Caption of Figure 1: $-NAO_S/+NAO_S$ is confusing – this could be interpreted as positive and negative phase of the NAO. Maybe " $-1 \times NAO_S$" is more obvious.
    4. l. 235: Have you looked at the differences of regressions/composites between the included an rejected years? This could potentially help identify or constrain a physical mechanism at play for years with a strong relationship.

2. Section 4.4: Given the title of the manuscript, this section describes the central result of the study: the statistical link between summer weather and freshwater anomalies in the subpolar gyre in previous years. However, the presentation of the results leaves me as the reader unsatisfied. While I appreciate the added details compared to the previous version, some some of the conclusions remain slightly hand-wavy and are missing some larger context:
    1. Based on the regressed meridional wind anomalies at 700 hPa, you describe a "northward deflection of the jet stream" following both FE and FW freshwater anomalies that differ in there location between years and subsets. Given that the jet stream occurs at higher altitude, you are rather describing circulation anomalies in the lower troposphere. Regardless of this semantic distinction, I am missing a discussion of the southward anomalies in the 700 hPa winds in Figures 5c and 6b as they can help put these anomalies in the context of known large-scale circulation patterns (e.g., Cassou, 2008; Grams et al., 2017) and their related expressions in surface temperature and precipitation anomalies. Relating your result to previous studies may also help identify physical processes that lead to the anomalies that you describe – is it advection of warmer/dryer air masses or changes in radiation/heat fluxes that can be linked to the large-scale circulation? For example, the anticyclonic circulation anomaly over the North Sea in Figure 6b might be suggestive of a blocking event (reduced winds, increased radiation, less precipitation...) – interestingly, the dry anomalies in Figure 6d are roughly co-located.
    2. Figure 5: In order to make it easier for the reader to interpret the regressed anomalies, it might be worthwhile adding another column of maps showing the mean conditions.
    3. I do not understand the justification for excluding the 2016 anomalies (caption of Figure 5).

II. Additional Comments and Suggestions:

1. l. 36: This wording suggests that it is certain that freshwater initiates the causal chain, but only the physical mechanism is unclear.
2. l. 77-79: You mention that you use monthly – presumably mean – ERA5 output in the analysis. Please clarify: did you estimate the maximum Eady growth rate of the monthly mean circulation or did you compute it from higher-frequency, e.g., daily mean, output that you then averaged over a month? Given the nonlinearities in the equation these two estimates could be quite different, however, I do not expect them to change your results.
3. l. 195, 197, 246: I am still stumbling over the phrase "lower/higher NAO phase". I am not familiar with the detail of the previous studies that you refer to in the first two instances, but I would assume the most of them contrasted the two states of the NAO and therefore, I suggest to use "negative/positive NAO phase". The last instance can be changed to "associated with $NAO_S < -0.5$".
4. l. 323-325: Please clarify: the runoff-NAO_S relationship is calculated over all years, yet you use it as a potential explanation for F_E freshwater anomalies, i.e., only a very specific subset of years. In Figure 3a, this relationship is not that clear if you only consider $NAO_S < -0.5$. If anything, there seems to be a clearer relationship and less spread around the regression line for the F_W years.
5. l. 376-377: Please clarify: do you show that "after strong F_E anomalies, the NAO anomaly switches sign from being strongly negative in summer to being strongly positive in winter" or do you infer

that from Figure 4b? Out of curiosity, what is the correlation between summer NAO and winter NAO with and without conditioning on F_E years?

6. l. 457-459: This sentence is unclear.
7. l. 471: It is easy to get lost here: I think what you are doing is regressing the winter SST on NAO_S for all years, but calculate ΔSST bases on the regions shown in Figure 1e with the resulting time series shown in Figure 7a. Please add more detail to clarify your analysis steps here.
8. l. 484: Notably, the T2m anomalies are offset to the east of the V700 anomaly. Similar to my comments on Section 4.4 above, please discuss this in the context of the existing literature and speculate about the physical mechanism.
9. Figure 7a: What did you normalize the SST difference by? Please add more details in the text.
10. l. 525-526: Please clarify: your predictors are F_E and F_W (i.e., NAO_S) and ΔSST, so the common denominator is the atmospheric circulation associated with the summer NAO. How does sea surface salinity constrain weather predictions?
11. l. 535. Please add more details in the discussion of your results with respect to the large-scale circulation (see comments on Section 4.4 above).
12. Please add more details: how exactly do you "trace the cold SST anomaly back to a freshwater anomaly in the preceding winter".
13. l. 557-558: The northward deflection of the jet stream is a bit too hand-wavy for me. Please discuss this in the context of large-scale atmospheric circulation in summer and associated weather patterns.
14. l. 563: Please discuss: the freshwater anomalies themselves are part of the chain reaction that are ultimately linked to the summer NAO. Provocatively asked: if you wanted to create a statistical model to predict summer weather with one or two year lead time, what information is added by knowing the freshwater anomalies? While I do understand the role of the freshwater anomalies as part of the chain that eventually leads to changes in European weather, I am missing a discussion how knowledge of sea surface salinity can constrain the predictions (see also comment II.10).
15. l. 610: What salinity did you use in the evaluation of the buoyancy flux?
16. l. 664: Regarding the "northward deflection of the jet stream", please see my comments above.

III. Typos/Wording:

I suggest the following changes:

l. 39: "requiring a fine grid spacing" to "requiring *ocean models* with fine grid spacing"
Caption of Figure 1 d: "SST" to "ΔSST"
l. 227: "0.5" to "-0.5" (minus sign missing)
l. 368: "pariticularly" to "particularly"
l. 371: "circulation" to "atmospheric circulation"
Figure 7: The title fo panel e should be T_{+1}
l. 657: "ΔSSS" to "ΔSST"

References:

Cassou, C., 2008. Intraseasonal interaction between the Madden-Julian Oscillation and the North Atlantic Oscillation. Nature 455, 523–527. https://doi.org/10.1038/nature07286

Grams, C.M., Beerli, R., Pfenninger, S., Staffell, I., Wernli, H., 2017. Balancing Europe’s wind-power output through spatial deployment informed by weather regimes. Nature Clim Change 7, 557–562. https://doi.org/10.1038/nclimate3338