The study uses the VIKING20X-JRA-short ocean hindcast simulation to explore mechanisms explaining the anomalously fresh and cold conditions in the subpolar North Atlantic during 2012-2016. Utilizing Lagrangian tracking, the authors show that the freshening/cooling seen at OSNAP-East to a large extent is caused by a higher fraction of Labrador Sea source water due to increased recirculation in the subpolar gyre. The study addresses a timely question, and makes for an interesting contribution in the debate regarding subpolar variability. That being said, I have several questions and comments related to the mechanism proposed and how it relates to previous studies. Moreover, the manuscript is quite dense with results, and being precise with definitions and language will be crucial for getting the main messages across to a reader.

Mechanisms and relationship to related work

1) The introduction highlights particularly the 'warming hole'. However, as the warming hole is a multi-decadal signal thought to be caused by effects that are not the main focus here (Keli et al. 2020; cloud feedback, low-latitude AMOC), the introduction reads a little misleading. I recommend restructuring so that the 2012-2016 freshening and cooling is the focus, as well as previously proposed mechanisms for interannual to decadal variability (i.e. expand on mechanisms mentioned in l.34-42 and in Section 5).

2) Throughout, it's unclear to me exactly how the proposed mechanism agree/disagree/link to previous proposed mechanisms in literature. Formulations such as l.575 'we find neither of these to be fully convincing' make it sound like you discard all previous work, but surely your mechanism is not entirely independent of what's been proposed earlier?

3) l.314-316, l.322-324 and Fig. 8: You do see signs of an eastward shifted subpolar front, but you seem quite dismissive of horizontal redistribution in the conclusion (l.600-601). In addition to Holliday et al. 2020 and Desbruyères et al. 2021, Kenigson et al. 2020 and Asbjørnsen et al. 2021 are relevant for such horizontal shifts. Asbjørnsen et al. 2021 is also quite similar in terms of the particle tracking approach.

4) Are you seeing the subpolar trend reversal in VIKING20X as documented in Desbruyères et al. 2021?

5) Fig. 8a-b: Eastern and western parts look quite different. Interesting that OSNAP-E-37W-500m total (Fig. 5a) is dominated by what's happening at 37W-21W. A point that should be noted? The fractional evolution seen for the eastern part is more consistent with what is seen for the Nordic Seas inflow in Asbjørnsen et al. 2021.

6) l.358-360 and onwards: In any sort of AMOC change discussion, it needs to be clear that there is no consensus on whether the AMOC actually has systematically weakened over the 20th century until today (e.g., debate summarized in Jackson et al. 2022, Latif et al. 2022).

7) l.445-446: Labrador Coastal Current and 'the other' – are both these branches what's typically called the Labrador Current? I also don't get the LC-Arctic and LC-Atlantic distinction (l.411-412).

8) You make a convincing case for the freshening/cooling seen at OSNAP-E is due to a higher fraction of Lab. Sea water (Fig. 5, Fig. 7, Table 1) related to longer residence times in the SPG (Fig. 10a). I don't fully get why more SPG recirculation necessarily must be due to reduced heat loss and deepening isopycnals (l.435-441). Do you reference studies showing this mechanism for the SPG anywhere? Perhaps this point needs to be repeated in the conclusions.

Lagrangian analysis:

1) Are particles released over the full OSNAP-East line as said in l.75-76 or only over the part of OSNAP-East shown in Figure 3? Are you analysing releases over the upper 1000m as said in l. 76 or the upper 500m as stated in l.111. I think the information in l.111-116 needs to come earlier to avoid conflicting messages.

2) l.84-86: A bit unclear. How about explaining it as: 'Each particle represents a volume transport of 0.001797 Sv. The number of particles released along the 2-dimensional OSNAP-E section is scaled with the model velocity normal to the section at the release time.'

3) l.87-89: What is the reasoning for choosing Parcels and not a tool like Ariane where streamlines are computed analytically?

4) l.89-95: I don't quite get the type of errors discussed here (Errors induced by temporal resolution? Errors related to lacking diffusion? Errors related to particle release number? Errors related to assumption of stationarity?). What are the 32 subsets?

5) Gulf Stream and Lab. Sea are defined as the two 'upstream origins' for OSNAP-E water (l.96). Then you subdivide Lab. Sea 'origin' by 'upstream origin' again (l.102): Hudson Bay, Davis Strait. Greenland Sea, Denmark Strait, SPG. Later in the manuscript the word 'source' is frequently used. I would be very clear with the definitions and use them consistently throughout. Perhaps Lab. Sea and Gulf Stream is your 'upstream sources' while the Labrador source region is subdivided by four 'origin regions'?

6) Figure 3: I'm confused by the lines on the map. Lines over land should be gone? Are particles crossing the orange line cutting across the Lab. Sea defined as having Lab. Sea origin? Is the north-south orange line the Loop path/Slope Sea pathway definition? I get the east-west green line is the Gulf Stream definition, but what about the north-south thin green line? What about showing definitions for Davis, Hudson, Greenland Sea origins in panels f-h, respectively?

7) l.209-212: Such fractions will depend on the depths evaluated over and the source definition used. In Koul et al. 2020, particles are initialised in the upper 100m only. In Asbjørnsen et al. 2021, 26% of the Iceland-Scotland Ridge inflow (upper 1000m or so) has a subpolar or Arctic origin (Davis, Hudson, Denmark straits, or circulation in the SPG), with 42% of the surface inflow being water from Davis Strait and Hudson Bay.

Minor comments / technical corrections:

1) l. 80: reference in parenthesis or write 'shown in Biastoch et al. 2021'.

2) Fig. 1 and Fig. 2 is not referenced in the text until page 9. Either reference earlier or rethink figure-order.

3) l.107-110: Would shorten this point. Doesn't need to be its own paragraph.

4) Section 2.4: Unless you want to expand on OSNAP measurements and how the EN4 product is produced, I would delete this section and move the sentence somewhere suitable.

5) Section 2.5: Not really necessary information – I recommend deleting the section and put the information about code availability in the data statement at the end.

6) l.216-217: Stated already in section 2.2, not necessary to repeat.

7) Starting sentences with 'So' or 'But' (sometimes) making them not 'full sentences' with a subject, verb, and an object: e.g., l.220, l.247, l.255, l.269, l.427, l.465, l.519, l.546.

8) l.220-223: No need to repeat the details here.

9) l.294-305: I would cut this section and save such summarizing statements for the conclusion. If you are worried some of the interesting results might be 'lost' because the manuscript is quite dense, you could even do a bullet point list summarizing the main results in the conclusion.

10) l.337-340: check punctuation and parentheses.

11) l.341-344, l.411:413: check parentheses.

12) Section 5.3 title: title sounds like you again will discuss what was addressed in 5.1. I would find an alternative pointing to the Labrador Sea focus.

13) l.414-416: ref. Fig. 10?

14) Fig. 10 and l.414-419: What depth is the ‘light upper layers’ - are you still looking at 0-500m?

15) l.528-532: Too long sentence – difficult to decipher.

16) Legends Fig. 7, Fig. 8, Fig. 10 looks quite messy. I would display text as a structured column. Fig. 8 could have one common legend on the side.

Mentioned literature:

Kenigson et al. 2020 – 10.1175/JPO-D-20-0071.1
Asbjørnsen et al. 2021 – 10.1175/JCLI-D-20-0917.1
Desbruyères et al. 2021 - 10.1038/s43247-021-00120-y
Jackson et al. 2022 - 10.1038/s43017-022-00263-2
Latif et al. 2022 - 10.1038/s41558-022-01342-4