General Assessment

This is a well-executed and ambitious study. The methodology is robust and clearly presented, and the figures—both in terms of quality and content—are excellent. However, the manuscript's organization and presentation could be improved. Given the amount of data and analysis presented, these adjustments are non-trivial but will significantly enhance readability. That said, some of these suggestions are inherently subjective.

Title. Recommendation: The current title focuses narrowly on Atlantic Waters, but the manuscript covers a broader range of water masses. Consider adjusting the title to reflect this broader scope, even in the abstract, where Atlantic water is only discussed in the final paragraph. Options might include:

Section 3.

Terminology: Use terms consistently—e.g., choose either potential temperature or temperature, and salinity or practical salinity throughout.

Quantification: Reduce the use of vague comparative language such as "around," "slightly more," or "much higher." Instead, refer directly to measured values, as these are available in the figures.

Narrative Style: The figures are beautiful and highly informative—consider letting them speak more for themselves. The current text is thorough, but some passages feel overly explanatory, which detracts from readability.

Section 3.3–3.6: These could potentially be moved to the Discussion, as they begin to interpret rather than purely describe.

Idea: It would be helpful to define Sections 1 and 2 by station numbers and geographic location early in the manuscript. This would eliminate the need to repeatedly remind the reader later. Maybe abbreviate to S1 and S2..

Section 4.

Some subsections (4.1, 4.5, 4.6) feel underdeveloped. Suggest adding a short note on uncertainty due to data resolution.

Consider explicitly addressing the uncertainty introduced by the spatial and temporal resolution of the datasets. This would strengthen the interpretations, particularly those related to circulation patterns.

Recommendation: Recommended for publication.

Specific Suggestions and Comments

Lines 1–20: The abstract would benefit from streamlining and reorganization. Consider introducing both new and historical datasets earlier, as both are essential for analyzing temporal changes — and should only be introduced once. For example, move the sentence starting with "Temporal changes in the circulation [...] between 2011 and 2021" (line 15) closer to the beginning to clarify the study's focus.

Line 5: Remove "mainly" — both datasets are necessary to characterize Atlantic Water (AW) changes.

Line 28: Add original citations for the stated information.

Line 32: Replace "driven" with "linked to" or "associated with" — warming is likely the true driver.

Line 41: Replace "was" with "is," or clarify the time frame. Consider citing Smith et al. (2021) here, as it discusses AO-related boundary current changes.

Line 47: Use "the two *primary* large-scale circulation patterns."

Line 49: Add original references.

Lines 70–73: Remove "extensive." Add original sources: e.g., Polyakov et al. (2005) use T anomaly propagation, Dmitrenko et al. (2008), Woodgate et al. (2001), Li et al. (2021). For tracers, include Frank et al. (1998); Broecker & Peng (1982) may not be the best reference for CFCs/SF_6.

Figure 1: Consider color-coding historical data by cruise or sampling year for clarity.

Line 89: Also cite Smith et al. (2011).

Line 95: Add a supporting citation.

Line 98: Add a reference for the statement about timescales "on the order of decades or below."

Line 103: Cite a source for the convergence of waters before exiting via Nares or Fram Strait.

Line 107: Replace "Arctic system" with a more specific term (e.g., Arctic Ocean circulation or stratification).

Line 139: "Data from *six* expeditions."

Lines 142–145: Use original references.

Lines 158–159: Remove the phrase referencing Raimondi et al. (2024) and Payne et al. (2024).

Line 180: Rephrase to "This model calculates mixing lines..." for clarity.

Line 195: Clarify whether "mid-depth" here matches the typical depth range used for AW elsewhere in the manuscript.

Lines 245–249: Consider revising to: "Station 5 shows a sharp decrease between 700 and 1000 m."

Line 280: "Color-coded" may be redundant — consider removing.

Line 306: "Close to the temperature maximum" — is this referring to the AW core? Clarify.

Line 319: Sentence beginning with "The compilation of available 129I data..." may not be necessary — consider cutting.

Line 330: Rephrase: "To account for differences in sampling depths and water mass composition..."

Line 333: "Very low" may be unnecessary — consider deleting.

Lines 343–345: Replace "shallow" with "surface waters" for consistency.

Line 365: [Appears incomplete — please confirm if something's missing.]

Line 411: Clarify which layer is being referred to — "surface" vs. AW could be confusing. Add original Rudels reference.

Line 431: Rephrase and support with citations: e.g., "Because 129I is introduced via Atlantic waters and diluted by Pacific inflow, its distribution across the SAS2021 section reflects the Atlantic–Pacific water mass composition in PSW."

Line 531: Sentence on TTD-derived mode ages not needed in the Discussion — already addressed in Results.

Lines 564–571: Quantify terms like "slowdown" and "increasing ages" for accessibility to broader readership.

Lines 598–600: Consider omitting this restatement if already covered earlier.

Line 615: This is the first 129I and 236U dataset north of Greenland — highlight this earlier, perhaps in the abstract.

Line 651: Add a sentence defining equation terms: e.g., "...where fA, fPac, fSIM, and fMet represent the fractions of Atlantic Water, Pacific Water, sea-ice melt, and meteoric water, respectively."