

Reviewer 1

Reviewer report, egusphere-2026-1481 Ojha, Kjellsson, Martin, Chafik, Maisonnave & Park, “Meridional heat transport in the North Atlantic: Effects of ocean and atmosphere grid resolutions in FOCI-OpenIFS-AGRIF 3.0”, submitted to Geoscientific Model Development. Line numbers refer to the PDF margin numbering.

Recommendation: publication after moderate revisions.

This is a useful model-description-and-application paper within the scope of GMD. The direct nest-to-atmosphere coupling is a genuine technical contribution, the three member design (LL, LH, HH) isolates the ocean- and atmosphere-resolution effects cleanly, and the central result, that increasing ocean resolution alone shifts meridional heat transport from the atmosphere to the ocean while a matching atmospheric resolution is needed for a realistic subpolar balance, is novel and well motivated. The science is not in question; the required work is in the figures, a number of citation attributions, and the language. On the citations specifically, several cited claims are only partially supported by the work they cite and two are miscited; these are listed under Citation fixes.

The authors sincerely thank the reviewer for the positive and encouraging evaluation of our work. We appreciate the acknowledgment of the novelty and significance of our study. Point-by-point responses are given below.

Major points

M1. Figure 5 must be regenerated: the Mediterranean is absent from the 800 m maps and sub-seafloor points appear plotted at about -2 degC, and the caption mislabels the cross-sections “(d-h)” where it should read “(e-h)”.

Ans: Thank you for your comments.

Figure 5 has been regenerated and replaced in the revised manuscript. The caption has also been corrected.

M2. Replot Figure 8 on latitude and longitude instead of model grid indices, so the Gulf Stream separation latitude and NAC path it is meant to demonstrate can actually be located.

Ans: Thank you for your comment.

Figure 8 has been modified as suggested and been replaced in the revised manuscript.

M3. Figure 4 has four panels but shows only two differences, LH-LL in (a) and (c) and HH-LH in (b) and (d), with no HH-LL panel; yet the caption lists “LL, LH, and HH respectively” and the text at L226-L227 compares “HH-LL” against LH-LL, which is not plotted. Fix it either by (i) adding the HH-LL panels, or (ii) rewording the text to compare HH-LH with LH-LL and renaming the caption “(a, c) LH-LL and (b, d) HH-LH”.

Ans: Thank you for pointing this out.

Figure 4 caption has been corrected and the text has been modified accordingly.

M4. State clearly that the constant-1950 runs cannot exhibit a forced trend; relabel the Figure 6d axis as model years rather than 1950-2040, and present the lower-climate-sensitivity inference (L491-L495) as an untested hypothesis.

Ans: Thank you for the comment.

The Figure 6d axis label has been replaced with model years in the revised manuscript. The

text has been modified as:

"Hence, the weaker response in the LH and HH configurations could be indicative of a lower climate sensitivity associated with AGRIF. However, as the simulations presented here are conducted under constant 1950 forcing conditions, this hypothesis cannot be tested directly, and we are therefore unable to assess changes in climate sensitivity associated with increasing horizontal resolution."

M5. Two citations are simply wrong, the “eddy killing” effect (L108) and the SST/heat-flux result (L463-L465); see Citation fixes for the correct references.

Ans: Thank you for pointing this out.

The citations are fixed.

M6. Three further attributions are over-broad and should be softened or re-cited (Sidorenko 2015, Gent and McWilliams 1990, Meccia 2023); the reasons are under Citation fixes.

Ans: Thank you for pointing this out.

The text has been revised accordingly.

M7. Add the missing companion and recent references listed below.

Ans: Thank you for the comment.

The citations has been fixed and related texts has been revised.

M8. The headline result, that higher resolution shifts heat transport from the atmosphere to the ocean, is a Bjerknes-compensation statement: rising ocean heat transport (OHT) is offset by falling atmospheric transport (AHT), leaving the total nearly unchanged. The paper argues this only qualitatively from the hard-to-read Figure 11 sketch. Quantify it with a compensation rate $C = -dAHT/dOHT$ for each configuration pair and latitude band (C near 1 is near-complete compensation); this would back the claim that compensation is stronger at mid-latitudes than toward the Arctic. Also expand the Figure 11 caption (arrows, TOA/surface levels, sign convention, integration regions).

Ans: Thanks a lot for the suggestion.

Following the reviewer’s suggestion, we quantified the atmosphere-ocean compensation using the compensation ratio $C = -dAHT/dOHT$, computed from atmospheric and oceanic meridional heat transport anomalies (see Table below). We have also calculated the time mean compensation rate (CR) as a function of latitude for each of the three model configurations. The CR was computed using the definition of van der Swaluw et al. (2007), in which it is expressed as a percentage of the maximum local heat transport:

$$R_C = (1 - V) \times 100\% \quad (1)$$

with

$$V = \frac{|dH_A + dH_O|}{\max(|dH_A|, |dH_O|)}. \quad (2)$$

where dH denotes the anomaly of the respective heat transport compared to the time mean for each latitude.

Table 1: Compensation diagnostics for atmospheric and oceanic meridional heat transport anomalies. The compensation ratio is defined as $C = -dAHT/dOHT$, where values approaching 1 indicate stronger atmosphere–ocean compensation.

Configuration	Latitude band	Compensation ratio (C)	Compensation frequency (%)
LL	20–40°N	0.08	56.8
LL	40–65°N	−0.24	45.5
LH	20–40°N	−0.09	40.9
LH	40–65°N	−0.27	31.8
HH	20–40°N	0.24	74.4
HH	40–65°N	0.75	86.0

The results indicate that the compensation strength depends on both latitude and model configuration. In particular, the HH configuration exhibits substantially stronger compensation than the LL and LH configurations, especially over the 40–65°N band. We have incorporated this quantitative analysis into the revised manuscript and revised the corresponding discussion to reflect the latitude- and configuration-dependent nature of the compensation.

M9. Show that the model drift over years 51–100 is comparable across LL, LH and HH, to justify interpreting the inter-configuration differences as resolution effects rather than differential drift.

Ans: Thank you for raising this important point.

To address this concern, we have examined the time series of the top-of-atmosphere (TOA) radiation budget together with several key model diagnostics for all three simulations. These analyses indicate that the long-term model drift is comparable among the three configurations over years 51–100.

The HH configuration exhibits a sudden change in the TOA radiation budget. This discontinuity resulted from a technical issue encountered during the simulation. To evaluate its potential impact on our results, we repeated the key analyses after excluding the final 22 years of the HH simulation. The results remain qualitatively and quantitatively very similar to those obtained using the full 50-year analysis period.

Furthermore, we find that this discontinuity does not affect the evolution of the atmospheric and ocean temperatures, sea-ice distribution, and the Atlantic Meridional Overturning Circulation (AMOC) which evolve smoothly across the period of the TOA radiation change, with no discernible shift associated with the technical issue.

Taken together, these sensitivity analyses demonstrate that our main conclusions are robust and are not affected by the technical discontinuity. We are therefore confident that using the complete 50-year analysis period for the intercomparison is justified. To support this conclusion, we have included the relevant figures in the response.

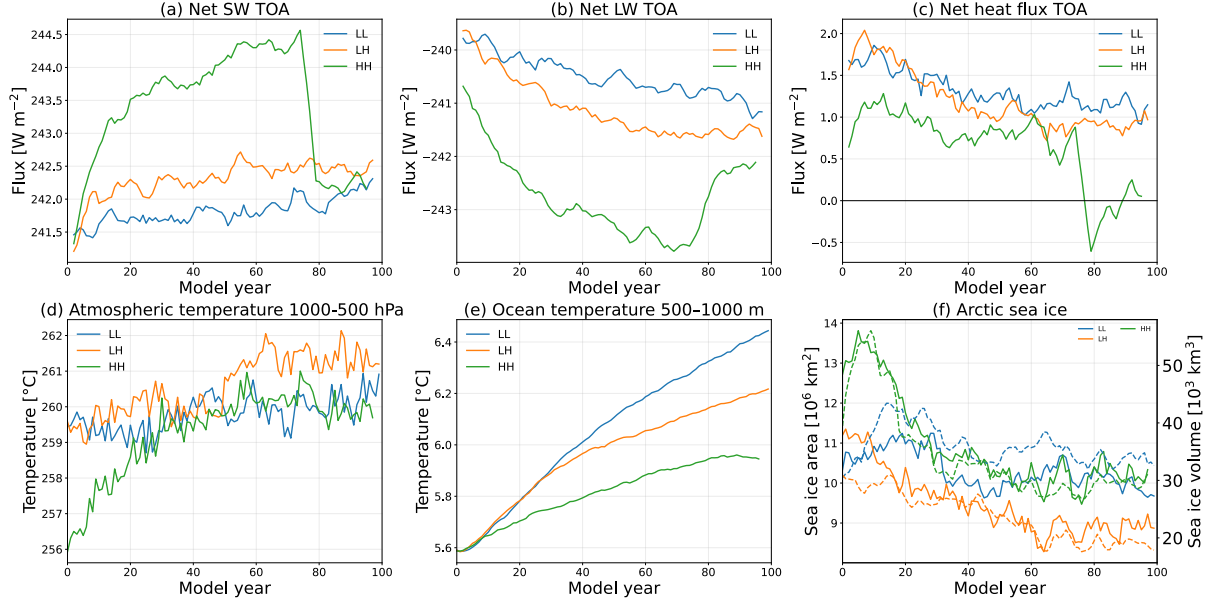


Figure 1: Time series of globally averaged (a) Top-of-atmosphere shortwave radiation (W/m^2), (b) Top-of-atmosphere longwave radiation (W/m^2), (c) Top-of-atmosphere net heat flux (W/m^2), (d) mean atmospheric temperature between 500 and 1000 hPa north of 60°N , (e) mean ocean temperature between 500 and 1000 m south of 40°N , (f) Arctic sea ice area (10^6 km^2) (solid lines) and sea ice volumes (10^3 km^3) (dashed line).

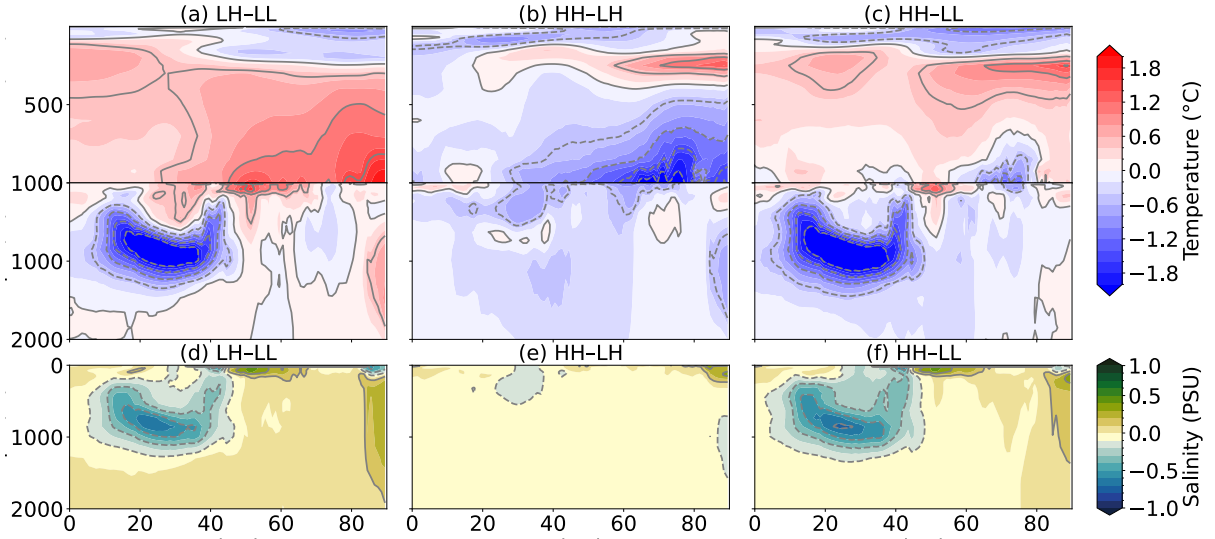


Figure 2: Annual-mean differences in North Atlantic region zonal mean (a–c) air temperature ($^{\circ}\text{C}$) as well as ocean potential temperature and (d–f) salinity (PSU) between the three model configurations. In the atmosphere the region is limited to 60°W – 0° . The differences are computed over simulations years 47–76.

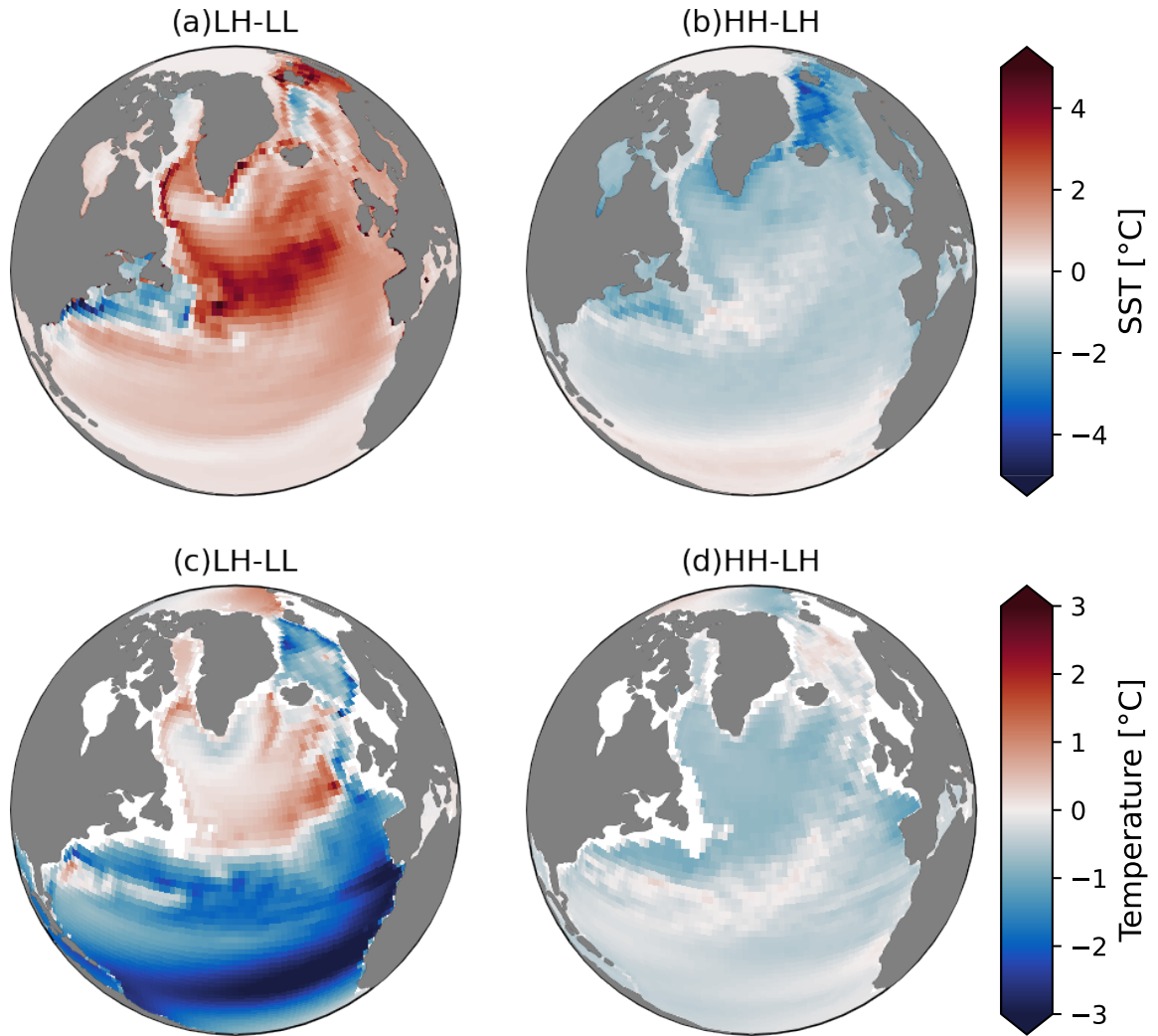


Figure 3: Annual mean differences in (a-b) SST ($^{\circ}\text{C}$), and (c-d) 500–1000 m mean potential temperatures ($^{\circ}\text{C}$) between the model configurations, (a, c) LH-LL and (b, d) HH-LH. The differences are computed over simulations years 47–76.

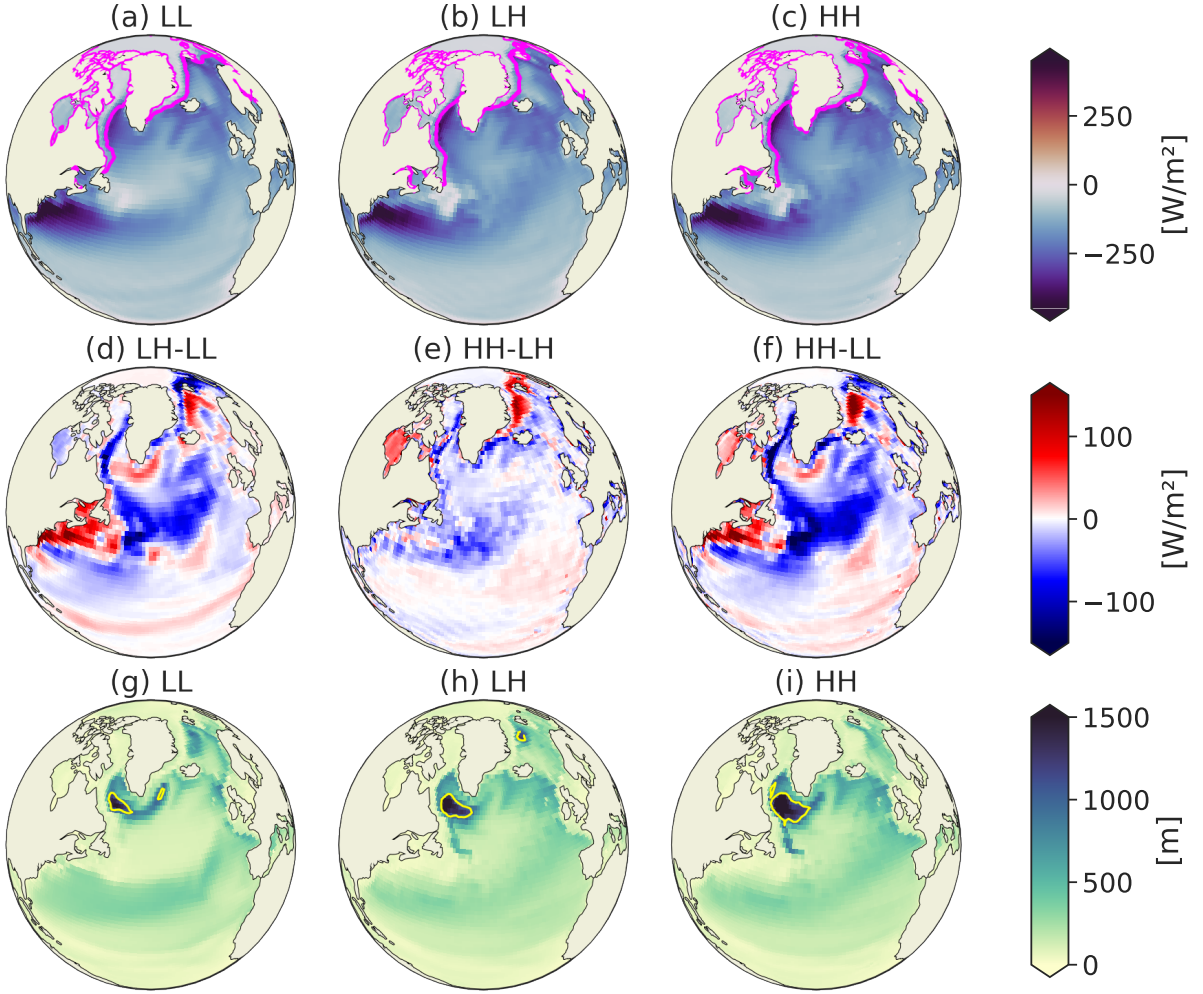


Figure 4: (a–c) DJF mean turbulent heat flux (W/m^2) (negative is ocean heat loss), (d–f) difference in DJF turbulent heat flux (W/m^2), (g–i) March mean MLD (m). The magenta contours show the 15% sea-ice concentration and yellow line shows the center of deep convection where mean MLD exceed 1000 m. The DJF means are computed over simulations years 47–76.

Citation fixes

- L108 (miscited). The “eddy killing” wind-stress feedback is attributed to Zhai et al. (2010), which is about eddy-energy dissipation at western boundaries; the correct reference is Renault et al. (2016, doi:10.1175/JPO-D-16-0115.1).

Ans: Thank you for pointing this out.

The citation is corrected.

- L463-L465 (miscited). The SST/latent-heat-flux result is attributed to Roberts et al. (2017), an ocean-heat-content budget study; the intended reference is Roberts et al. (2016, doi:10.1002/2016GL070559).

Ans: Thank you for pointing this out.

The citation is corrected.

- L68-L71 (overstated). Sidorenko et al. (2015) state that AWI-CM performs “at least as well as” leading CMIP5 models, not that it beats their average.

Ans: Thank you for pointing this out.

The text has been revised as:

"For example, the Alfred Wegener Institute Climate Model (AWI-CM) with a sea ice-ocean component based on an unstructured mesh demonstrates skill in reproducing the observed mean climate that is comparable to that of some of the most realistic Coupled Model Intercomparison Project Phase 5"

- L38-L40 (overstated). That Gent-McWilliams “does not include the kinetic energy transfer accurately” is the authors’ framing, not a finding of Gent and McWilliams (1990).

Ans: Thank you for pointing this out.

The text has been revised as suggested as:

"Non-eddy ocean models often use an eddy-parameterisation scheme such as the Gent–McWilliams method to account for unresolved eddy processes"

- L50-L52 (mis-grouped). Meccia et al. (2023) concerns internal multi-centennial AMOC variability, not the resolution dependence for which it is cited.

Ans: Thank you for your comment.

The citation has been fixed.

- L19-L21 (partially supported). The “1.2 PW, 60%” value at 26.5N sits at the upper end of Trenberth and Fasullo (2017), who give about 1.0 PW there; check the value or the latitude.

Ans: Thank you for pointing this out.

The text has been revised as: "The AMOC carries almost 1.0 PW of heat northward at 26.5°N which is 60% of the net poleward heat flux carried by the global oceans"

- L430-L432 (loose fit). Roberts et al. (2018) is a model-configuration description and is a weak citation for enhanced poleward heat transport; the other three references in that sentence do support the claim.

Ans: Thank you for pointing this out.

The citation has been fixed.

References to add (verified DOIs)

- VIKING20X, the lineage of the eddy-rich nest: Biastoch et al. (2021), doi:10.5194/os-17-1177-2021.

Ans: Thanks for the suggestion.

The citation has been included.

- Companion FOCI-OpenIFS resolution study, to be updated from “in press”: Sieker et al. (2026), doi:10.1007/s00382-026-08110-6.

Ans: Thank you for pointing this out.

The citation has been fixed.

- OpenIFS-FESOM2 unstructured-mesh alternative AWI-CM3: Streffing et al. (2022), doi:10.5194/gmd-15-6399-2022.

Ans: Thank you for the suggestion.

The citation has been included.

- Mesoscale review for the methodological premise (L35-L41): Hewitt et al. (2020), doi:10.1007/s40641-020-00164-w.

Ans: Thank you for pointing this out.

The citation has been fixed.

- AMOC framing in the introduction (L17-L19): Buckley and Marshall (2016), doi:10.1002/2015RG000493.

Ans: Thank you for the suggestion.

The citation has been included.

- Mesoscale control of subpolar MHT (L32-L34): Zhao et al. (2018), doi:10.1038/s41467-018-03134-x.

Ans: Thank you for the suggestion.

The citation has been included.

- Scalability of OpenIFS over ECHAM6 (L85-L86): Kjellsson et al. (2020), doi:10.21957/469hc10jk5 (already in the list; cite it at this sentence).

Ans: Thank you for the suggestion.

The citation has been included.

Figures and tables

Table 1. Columns are ordered HH/LH/LL while the text uses LL/LH/HH; reorder for consistency, and state the global lateral-viscosity scheme and value.

Ans: Thank you for pointing this out. Table 1 has been updated and both the Table caption and main text clearly state that we use harmonic iso-neutral tracer diffusion and bi-harmonic horizontal viscosity.

- Figure 4. See M3 (four panels, two differences, no HH-LL panel).

Ans: Thank you for the suggestion.

The figure and caption has been modified in the revised manuscript.

- Figure 6. See M4 (calendar-labelled axis on constant-1950 runs).

Ans: Thank you for pointing this out.

The figure axis has been modified accordingly.

- Figure 10. The caption omits “(c)” before turbulent heat flux and the SST units in (a); state the heat-flux sign convention.

Ans: Thank you for pointing this out.

The caption has been modified and the sign convention has been added.

- Figure 11. See M8 (caption needs defining; printed numbers hard to read).

Ans: Thank you for the comment.

The figure caption has been modified in the revised manuscript.

- Figure A1. The panels are labelled February but the caption says March, and the caption calls them “annual mean” while showing monthly means.

Ans: Thank you for pointing this out.

This has been revised.

- Figure A2. The caption repeats “(d-f)”, and panel (b) appears labelled “LM” rather than “LH”; please verify.

Ans: Thanks for the comment.

The caption and label has been corrected.

- Figures 1, 2, 3, 7 and 9 are clear and need no changes beyond the points above.

Ans: Thank you for the comment.

Grammar, wording and typography

77 line-level items (none affect the science).

Grammar, wording and typography

[L1] “a new coupled climate model configurations named” -> a new coupled climate model configuration named

Ans: Thank you for the comment.

The text has been revised as suggested.

[L21] “is an crucial contribution” -> is a crucial contribution

Ans: Thank you for pointing this out.

The text has been revised as suggested.

[L27] “as the the residual” -> as the residual

Ans: Thank you for pointing this out.

The text has been revised as suggested.

[L32] “However in situ measurements” -> However, in situ measurements

Ans: Thank you for the correction.

The text has been revised as suggested.

[L33] “as it can not capture the mesoscale activities realistically” -> as it cannot capture the

mesoscale activity realistically

Ans: Thank you for pointing this out.

The text has been revised as suggested.

[L38] “Non-eddyding ocean models, often use” -> Non-eddyding ocean models often use

Ans: Thank you for the correction.

The text has been revised as suggested.

[L44] “A realisitc representation” -> A realistic representation

Ans: Thank you for pointing this out.

The text has been revised as suggested.

[L51 “which further enhance the poleward heat transport” - which further enhances the poleward heat transport

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L60] “nested models still enable far-field feedbacks” - nested models still capture far-field feedbacks

Ans: Thank you for the suggestion.

The text has been revised accordingly.

[L87] “as it it largely the same” - as it is largely the same

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L90] “the reader is referred to (Matthes et al., 2020)” -> the reader is referred to Matthes et al. (2020)

Ans: Thanks a lot for the correction.

The text has been corrected as suggested.

[L99] “as function of grid resolution” -> as a function of grid resolution

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L108] “a drag coefficient which in dependent on atmospheric stability” -> a drag coefficient which is dependent on atmospheric stability

Ans: Thanks a lot for the correction.

The text has been corrected as suggested.

[L117] “Sea-ice dynamics and physics is done” -> Sea-ice dynamics and physics are done

Ans: Thanks a lot for the correction.

The text has been corrected as suggested.

[L133] “We applied and AGRIF refinement factor of” -> We applied an AGRIF refinement factor of

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L145] “In FOCI verison 1.0” -> In FOCI version 1.0

Ans: Thanks a lot for the correction.

The text has been corrected as suggested.

[L157] “rather via file I/O alleviates” -> rather than via file I/O alleviates

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L167] “as well as ship-borne instruments” -> (no change needed; flagged for hyphenation consistency with shipborne)

Ans: Thank you very much for the comment.

[L190] “A technical comparison can be found in (Kjellsson et al., 2020)” -> A technical comparison can be found in Kjellsson et al. (2020)

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L192] “listed in Table (1)” -> listed in Table 1

Ans: Thank you very much for the comment.

The line has changed in the revised manuscript.

[L198] “All the experiments have carried out for 100 years” -> All the experiments were carried out for 100 years

Ans: Thank you very much for the comment.

The line has been modified in the revised manuscript.

[L205] “is discussed in details in the next sections” -> is discussed in detail in the next sections

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L206] “the higher resolution in both atmosphere and ocean have improved” -> the higher resolution in both atmosphere and ocean has improved

Ans: Thanks a lot for the correction.

The text has been corrected as suggested.

[L218] “the ocean at mid-depth and 10–45°N cools” -> the ocean at mid-depth and 10–45°N cools

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L239] “900 s compared to 18000 s in LL” -> 900 s compared to 1800 s in LL

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L240] “In consequence, sea ice is thicker” -> Use “As a consequence,” or “Consequently,”

Ans: Thanks a lot for the suggestion.

The text has been revised as suggested.

[L246] “resulting in significant warmer SST” -> resulting in significantly warmer SST

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L249] “This ocean dynamics–driven temperature change” -> “ocean-dynamics-driven” or “ocean-circulation-driven” (hyphenation/awkward)

Ans: Thanks a lot for the suggestion.

The text has been revised as suggested.

[L254] “to explain the cold and fresh difference at mid-depth” -> “the cold and fresh anomaly” or “cold, fresh difference”

Ans: Thanks a lot for the suggestion.

The text has been revised as suggested.

[L259] “We found no conclusive evidence for this in our simulations however.” -> Move/offset “however”: “We found no conclusive evidence for this in our simulations, however.”

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L261] “a prominent warm and saline intermediate-depth water mass of heat and salinity” -> Redundant; delete “of heat and salinity”

Ans: Thanks a lot for the suggestion.

The sentence has been removed in the revised manuscript.

[L267] “allows for an unrealistically large outflow” -> Acceptable; consider “allows an unrealistically large outflow”

Ans: Thanks a lot for the suggestion.

The sentence has been removed in the revised manuscript.

[L278] “the maximum of the overturning streamfuction” -> the maximum of the overturning streamfunction

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L284] “This stronger AMOC result from explicitly resolving” -> This stronger AMOC results from explicitly resolving

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L288] “an observational mean meridional heat transport estimate . . . are shown as dashed black line” -> “is shown as a dashed black line” (singular estimate)

Ans: Thanks a lot for pointing this out.

The caption has been corrected accordingly.

[L289] “A stronger AMOC is an enhanced northward volume transport” -> A stronger AMOC implies an enhanced northward volume transport

Ans: Thanks a lot for the suggestion.

The text has been revised accordingly.

[L289] “meridional heat ransport estimate from the RAPID and OSNAP arrays” -> “heat transport estimate” (Fig. 7 caption)

Ans: Thanks a lot for pointing this out.

The caption has been corrected accordingly.

[L291] “into the the subpolar North Atlantic” -> into the subpolar North Atlantic

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L292] “into the the subpolar North Atlantic” -> Delete duplicate “the”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L295] “but HH simulating the overall largest transport” -> “with HH simulating” or “but HH simulates”

Ans: Thanks a lot for the suggestion.

The text has been revised accordingly.

[L296] “at 63°N the volume transport of LH and HH is the same” -> “are the same” or “is identical” (two configs)

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L299] “As the changes in ocean circulation primarily results from” -> “primarily result from” (plural subject “changes”)

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L300] “From drifter observation, Li et al. (2022) showed” -> “From drifter observations,”

Ans: Thanks a lot for the suggestion.

The text has been revised accordingly.

[L305] “the reduction of the North Atlantic cold bias in LL” -> “in LH” (the bias is in LL; reduction occurs in LH), check intended config

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L305] “arrows of standard length indicates current direction” -> “arrows of standard length indicate”

Ans: Thanks a lot for pointing this out.

The caption has been corrected accordingly.

[L307] “such as the western boundary currents and NAC” -> “and the NAC”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L318] “All configurations simulate weaker heat transport” -> “All configurations simulate a weaker heat transport” or “simulate weaker heat transports”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L320] “surface heat fluxe (d-f)” -> “surface heat flux” (caption Fig. 9)

Ans: Thanks a lot for pointing this out.

The respective caption has been changes in the revised manuscript.

[L321] “shows the the center of deep convection” -> Delete duplicate “the”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L326] “increase in volume transport occurs between the LH and HH configurations,(Fig. 7d)” -> Add space before parenthesis; remove stray comma

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L338] “relatively low numbers (<100 w/m2)” -> “W/m2” (capital W); inconsistent with W/m2 elsewhere

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L344] “yields not only higher SST but also a wider distribution” -> Parallelism: “not only a higher SST but also a wider distribution” or “not only higher SST but also wider distribution”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L347] “sufficient to produce larger and thus a wider range of surface heat fluxes” -> “larger and thus a wider range” is garbled; e.g. “larger and thus a wider range of surface heat fluxes” -> “larger surface heat fluxes and thus a wider range”

Ans: Thanks a lot for the suggestion.

The text has been revised accordingly.

[L362] “keeps the atmosphere cold in HH - LH” - Clarify difference notation; “in HH relative to LH (HH - LH)”

Ans: Thanks a lot for the suggestion.

The text has been revised accordingly.

[L383] “both surface conditions, e.g. SST and THF” -> “e.g.,” with comma; consider “such as SST and THF”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L388] “The three model configuration with varying” -> “The three model configurations”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L392] “the mean state of North Atlantic Ocean” -> “the North Atlantic Ocean”

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L404] “colder and fresher water masses at mid-depths (approx 500 - 1500 m) from 0–50°N in LH and HH is observed” -> “are observed” (plural “water masses”)

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L407] “a more realistic overflow of dense water similarly to the high-latitude overflows” -> “similar to the high-latitude overflows”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L408] “in Colombo et al. (2020)” -> “as in Colombo et al. (2020)” or “reported by Colombo et al. (2020)”

Ans: Thanks a lot for the suggestion.

The text has been revised accordingly.

[L418] “(Grist et al., 2018; Roberts et al., 2020, 2019; Hirschi et al., 2020), not found but disagrees” -> Stray “not found” appears erroneous; delete

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L420] “The stronger AMOC in the LH and HH configuration” -> “configurations”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L437] “The intense warm boundary currents (Fig. 8) leads to higher SST” -> “currents ... lead to” (plural subject)

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L445] “our study specifically highlight the differences” -> “our study specifically highlights”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L447] “the differences in oceanic meridional heat transport between the simulations is also reflected” -> “differences ... are also reflected”

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L448] “leads to increase in mid-high-latitude SST” -> “leads to an increase”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L449] “in the LH and HH configuration” -> “configurations”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L453] “The nested ocean model in LH and HH, simulates a deeper mixed layer” -> Remove comma before “simulates”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L455] “A multi-model intercomparison by (Koenigk et al., 2021) reported” -> “by Koenigk et al. (2021)” (citation form)

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L462] “The warmer SPNA in the LH and HH configurations than in the LL configuration lead to stronger heat loss and increases deep convection” -> “leads to stronger heat loss and increases” (singular subject SPNA) or make both consistent

Ans: Thank you very much for the correction.

The text has been corrected as suggested.

[L478] “consistent with findings by (Outten et al., 2018)” -> “by Outten et al. (2018)” (citation form)

Ans: Thank you very much for the correction.

The citation has been corrected as suggested.

[L483] “heat transport to the Nordic Seas decreases with increase in atmospheric model resolution” -> “with an increase in atmospheric model resolution”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L488] “could potentially feedback the strength of the AMOC” -> “feed back on the strength” (verb form /preposition)

Ans: Thanks a lot for the suggestion.

The text has been revised accordingly.

[L489] “particularly deep convection and the overflow transports will enhance” -> Comma before “will”: “...and the overflow transports, will enhance”

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L492] “which implies, the mean AMOC state plays” -> “which implies that the mean AMOC state plays” (remove comma, add “that”)

Ans: Thanks a lot for pointing this out.

The text has been revised as suggested.

[L504] “OpenIFS’s licence is easily given free of charge” -> “is provided free of charge” (“easily given” awkward)

Ans: Thanks a lot for pointing this out.

The respective section has been modified in the revised manuscript.

[L511] “(Valcke et al., 2021).The observation” -> Missing space after period: “2021). The

observation”

[L504] “OpenIFS’s licence is easily given free of charge” -> “is provided free of charge” (“easily given” awkward)

Ans: Thanks a lot for pointing this out.

The respective section has been modified in the revised manuscript.