

Answer to editor's comments for "15 Years of Satellite, In Situ and Reanalyzed Salinity Data: Insights into Sea Surface Salinity Trends, Variability, and Water Cycle Links"

By authors Ana Claudia Parracho, Patricia Zunino, Michela Sammartino, Jacqueline Boutin, Eric Greiner, Bruno Buongiorno Nardelli, Nicolas Kolodziejczyk

Dear authors,

I have noted a few following minor revisions to be made in addition to those suggested by the reviewers. Please take these into account in your revised manuscript.

We thank the editor for their careful reading and detailed comments. We have carefully considered these comments and made the changes to the manuscript requested, in addition to the changes already made in response to the reviewers' comments. We provide a point-by-point response below.

L.49 : wordy sentence; needs rephrasing : Terray et al. (2012) also found that the trends in the Pacific and the increase in the interbasin contrast were different from those expected due only to internal variability

We shortened the sentence to "Terray et al. (2012) also showed that these Pacific trends and the increasing interbasin contrast cannot be explained by internal variability alone, indicating an emerging anthropogenic signal."

L. 51: wordy sentence; needs rephrasing :Cheng et al. (2020) looked at the period between 1960 and 2017 using a new salinity dataset, for both the sea surface and averaged over the top 2000 m of the water column.

We shortened the sentence to: "Cheng et al. (2020) analyzed salinity changes from 1960 to 2017 using a new dataset, at both the surface and over the upper 2000 m."

L. 54 this amplification signal is separated from natural variability

We rephrased this sentence to make it clearer: "They also highlighted that, because subsurface salinity is less affected by interannual variability and sampling error, this amplification signal is probably of anthropogenic origin, rather than due to natural variability."

L. 60: rewording: – also analyzed in the following, to be replaced by 'discussed further here'

Done.

L. 63: What does 'least-damped non-oscillating mode' mean ?

In empirical principal oscillation patterns analysis, the mode can either be oscillating, damped or damped and oscillating. For the attribution of the forcing to the least-damped non-oscillating mode, readers can refer to Frankignoul et al. (2017). We have now cited this paper at L63 and added it to the references.

C. Frankignoul, G. Gastineau, Y.-O. Kwon, Estimation of the SST response to anthropogenic and external forcing and its impact on the atlantic multidecadal oscillation and the pacific decadal oscillation. J. Climate 30, 9871–9895 (2017).

L. 92 : wordy sentence; needs rephrasing: Therefore, there is still the question, on the one hand, if satellite data can produce similar SSS trends to the in-situ data, and on the other hand, what novelties the satellite data can bring in the study of trends.

We rephrased the sentence: “This raises two questions: whether satellite data can reproduce SSS trends seen in in situ data, and what new insights they provide.”

L. 104 unclear sentence; needs rephrasing: The number of SSS products is increasing thanks to the advances in SSS from satellite observations.

We rephrased it to “The number of SSS products is increasing thanks to the advances in satellite remote sensing of SSS.”

L. 121: wordy sentence; needs rephrasing: According to this test, a significant trend is a trend that is significantly different from 0 with 95% confidence.

The phrase was rephrased to: “A significant trend is one that differs from zero at 95% confidence.”

L. 156: grey instead of white in the figure 2a).

Done.

L. 192: Regarding the noise in the time series noted by Reviewer 1 in GLORYS and SMOS L3G. In GLORYS, the SSS is averaged over a 1 m layer depth but remains effectively a surface quantity, as in L3G. It should also be noted that the 1/12° eddy-resolving resolution used in GLORYS at intertropical latitudes may increase even low-frequency variability compared to products with lower resolution or those that filter out high frequencies.

Thank you for this information, which was included in this paragraph:

“Increased variability in these datasets is also found in stratified regions such as the South Pacific near the South Pacific Convergence Zone (SPCZ), likely reflecting differences in SSS representation. Whereas SMOS samples only the upper centimeter of the ocean and GLORYS represents an average over the top meter (effectively a surface measure), the other datasets are more strongly influenced by deeper in situ observations. In addition, the 1/12° eddy-resolving resolution of GLORYS in the tropics may amplify variability, even at low frequencies, compared to lower-resolution or more strongly filtered products.”

L. 198: ... is more important than the interannual?

The phrase was rewritten and completed: “Nevertheless, the statistically significant trends in these regions indicate a robust long-term change despite interannual variability.”

L. 207: wordy sentence: suggestion? : However, a generally good compatibility between all products is found, even between independent products such as SMOS L3G and Glorys.

After revision, this sentence is no longer present in the revised version of the paper. We replaced it by (lines 140-141): “The agreement between the trends obtained with various products is particularly remarkable for datasets that are independent, such as SMOS (product 1) and GLORYS (product 3).”

L. 209: Like reviewer 1 to strengthen the results analysis; here, we’d like to know more, provide even brief explanations, why these regions in particular? it would be interesting to explore this further.

We provide explanations to the best extent of our knowledge:

“On the other hand, some of the datasets separate from the others at certain periods of time. For instance, the CNR time series separates from the others in the Solomon Islands in 2011. ARMOR3D, which assimilates the CNR data, also follows this discrepancy (probably related to the number and treatment of in situ observations, and handling of background in the processing chains). In the East of Australia in the 2022-2023 period, the higher weight given to in situ observations in the CNR processing algorithm may enhance the representation of certain regional processes that are less evident in the other datasets. In this context, the stronger negative SSS anomalies observed in CNR SSS in 2022–2023 may be associated with precipitation variability affecting the western New Caledonia region and consequently the East of Australia area in that period (Blunden et al. 2023). ARMOR3D separates from the other time series in February 2023 in the Solomon Islands, the South Atlantic, the North Atlantic, and the Eastern Indian Ocean. This is because of anomalous data assimilated in the ARMOR3D near real time (NRT) data, which was used to complete the reprocessed time series, for the last two years of the period at study. In the Eastern Indian Ocean, there is no SMOS or SMOS/SMAP OI data from December 2023, due to RFI contamination in the satellite data in the region. Finally, SMOS separates from the rest of the time series in the South Atlantic after 2024 for an unclear reason.”

Answer to Review #1 for “15 Years of Satellite, In Situ and Reanalyzed Salinity Data: Insights into Sea Surface Salinity Trends, Variability, and Water Cycle Links”

By authors Ana Claudia Parracho, Patricia Zunino, Michela Sammartino, Jacqueline Boutin, Eric Greiner, Bruno Buongiorno Nardelli, Nicolas Kolodziejczyk

We thank the reviewer for their careful reading, detailed comments, and constructive suggestions. We have carefully considered these comments and provide below a point-by-point response addressing the main issues raised.

This study analyzes 15 years of satellite, in-situ, and reanalysis sea surface salinity (SSS) data to reassess global salinity trends and their links to the intensification of the global water cycle. By comparing six independent SSS products, the authors identify consistent regional patterns of salinification and freshening, revealing both long-term signals and shorter-term variability influenced by ENSO. The work highlights the “salty gets saltier and fresh gets fresher” paradigm, while also pinpointing regions departing from classical patterns. By contrasting satellite-era trends with longer records, the study supports disambiguating anthropogenic signals from natural variability.

The introduction is clear and well structured, providing a solid and up-to-date overview of long-term surface salinity studies. It also provides an informative summary of the different types of salinity measurements available to the scientific community.

We recognize the authors’ effort in the *Data* section to provide a summary table describing the products used in this study, including data access and associated documentation. However, it remains difficult for the reader to follow which products are being referenced throughout the text. For example, Table 1 introduces product reference numbers that are not used consistently in the manuscript, while the authors rely on acronyms in the text that do not appear in the table. Product #1 is referred to in several different ways: ‘SMOS SSS (L3G product)’ (line 107), ‘SMOS L3G’ (line 131), ‘L3G’ (Figures 1 and 2) and ‘SMOS-only’ in other sections. We recommend replacing product reference numbers with clear acronyms and using them consistently throughout the manuscript (text body, tables and captions).

We acknowledge the reviewer for this meaningful remark. When making the table, we were following strict guidelines from the OSR coordination team, so the organization of the table and the columns used were not up to our choice. However, as suggested by the reviewer, we replaced “Product ref. no.” with “Product ref. no. and abbreviation” and we used this same abbreviation throughout the text, figures and tables, avoiding the inconsistencies pointed out.

Product ref. no. and abbreviation	Product ID and type	Data access	Documentation
1 - SMOS	CATDS-PDC L3OS 3G, satellite SSS observations only	SEXTANT, https://doi.org/10.12770/9c97fb5c-d7d5-4bc2-a5c7-57944026cd60	Boutin et al. (2018)

			Vergely et al. (2022)
2 - ISAS	ISAS17, in situ data	SEANOE, https://doi.org/10.17882/52367	Gaillard et al. (2016) Kolodziejczyk et al. (2023)
3 - GLORYS	GLOBAL_MULTIYEAR_PHY_001_030, in situ data and numerical models	EU Copernicus Marine Service Product (2023b)	QUID: Dréville et al. (2023) PUM: Dréville et al. (2024)
4 – SMOS/SMAP/OI	MULTIOBS_GLO_PHY_SSS_L4_MY_015_015, in situ and satellite observations	EU Copernicus Marine Service Product (2024b)	QUID: Kolodziejczyk (2024) PUM: Tarot (2024)
5 - CNR	MULTIOBS_GLO_PHY_S_SURFACE_MYNRT_015_013, in situ and satellite observations, includes SST	EU Copernicus Marine Service Product (2024c)	QUID: Buongiorno Nardelli et al. (2024) PUM : Buongiorno Nardelli et al. (2023)
6 – ARMO R3D	MULTIOBS_GLO_PHY_TSUV_3D_MYNRT_015_012, in situ and satellite observations	EU Copernicus Marine Service Product (2023a)	QUID: Greiner et al. (2023) PUM: Verbruggen (2023)
7 - IAP	IAPs-v2, bias-corrected in situ observations	Ocean and Climate – Chinese Academy of Sciences http://www.ocean.iap.ac.cn/pages/dataService/dataService.html	Cheng et al. (2020) Cheng and Zhu (2016)

In addition, there is also confusion regarding the IAP product: it is introduced in the manuscript and later used for long-term comparisons, yet it does not appear in the Data section or Table 1. Including it alongside the other datasets, with a brief description, would greatly improve consistency.

Thank you for noting this. In the revised version of the manuscript, the IAP product has been added to the Data section and to Table 1. We remove the description of IAP product in the Results section.

Adding a column to Table 1 indicating the period of availability for each product would also help readers understand the specificity of this dataset. To further support readers, we recommend adding a column to Table 1 indicating each product's dependence on ancillary data (e.g., other SSS sources, in situ measurements, SST, SLA). This would clarify which datasets are truly independent and which share common inputs. The authors suggest that independence is determined primarily by the absence of shared SSS inputs; however, it would be helpful to briefly justify why this criterion does not extend to other variables. For example, why are two products that assimilate the same SST field still considered independent? Providing a short explanation would prevent confusion and enhance the transparency of the dataset intercomparison.

Due to the OSR guidelines we are not able to add columns to Table 1, but following the reviewer's suggestion we have added an additional table with the information on each product's resolution, available time period, and auxiliary data.

Product ref. no. and abbreviation	Input data	Resolution	Temporal coverage
1 - SMOS	SMOS SSS (CATDS L2Q Copernicus Marine Service datasets, Parracho et al. 2024)	1/4°	2010-present
2 - ISAS	In situ salinity profiles from Argo and Deep Argo floats and other in situ measurements, particularly where Argo sampling is sparse	1/2°	2002-present
3 - GLORYS	In situ salinity profiles (from EN4)	1/12°	1993-present
4 – SMOS/SMAP OI	Optimal interpolation of in situ observations (ISAS) and satellite (SMOS and SMAP) observation	1/4°	2010-present
5 - CNR	Multivariate optimal interpolation combining satellite salinity observations from SMOS and SMAP with in situ salinity measurements	1/8°	1993-present

	(Cora/Easycora Copernicus Marine Service datasets) and satellite SST information		
6 – ARMOR3D	In situ observations (Argo profiling floats, XBT, CTD1 and moorings measurements) and satellite observations (the CNR product)	1/4°	1993-present
7 - IAP	Bias-corrected in situ observations of CTD, Argo, Bottle, Glider, mooring etc. from the World Ocean Database, plus data owned by the research group	1°	1940-present

More broadly, improving the Data Section by organizing and adding relevant information, harmonizing acronyms and product names between the table and the text would significantly enhance clarity and traceability.

We thank the reviewer for this suggestion. This has been taken into account in the revision.

At present, the Results section is difficult to read not only because of the numerous non-standard acronyms, but also because it is highly descriptive and progresses in a strictly linear manner without a clear narrative thread. As a result, readers may struggle to discern the main scientific messages from secondary details. Reorganizing the section around a clearer storyline—highlighting the key results first and then supporting them with detailed descriptions—would greatly improve accessibility and impact.

Thank you for pointing this out. We have revised the text, trying to make it clearer. We now start each section with the more general results and leave the specific results and/ or exceptions to the end of the section. We also tried to reduce the descriptiveness and repetitiveness of some of the results that didn't add to the discussion.

It is also important to enhance the readability of the Results section so that readers do not need to continually refer back to maps and tables to follow the text. We recommend avoiding acronyms that are not widely used in the scientific community (e.g., SASG, WAUS) and instead using explicit region names such as “South Atlantic” or “Southeast Indian Ocean.” To further support clarity and reproducibility, the authors should add a table listing the exact coordinates of the boxes shown in Figure 3a.

We have changed the names of the boxes to reflect this and added a table with the coordinates of each box. The order of the boxes was chosen by the order in Figure 4, where the regions are ordered according to their mean SSS in the regions. This way, the order of the boxes can stay consistent throughout all the Figures and Tables.

- 1- Eastern Indian Ocean (previously EIND)
- 2- North Pacific (previously NPAC)
- 3- West of Australia (previously WAUS)
- 4- Solomon Islands (previously SALOMON)
- 5- South Pacific (previously SPCZ)
- 6- East of Australia (previously EAUS)
- 7- South Atlantic (previously SASG)
- 8- North Atlantic (previously SPURS)

The new table with the coordinates of each region is:

	Minimum Latitude (°N)	Maximum Latitude (°N)	Minimum Longitude (°E)	Maximum Longitude (°E)
Eastern Indian Ocean	0	20	80	95
North Pacific	15	25	-180	-140
West of Australia	-30	-20	90	110
Solomon Islands	-15	-10	-180	-150
South Pacific	-30	-20	-180	-150
East of Australia	-30	-20	150	170
South Atlantic	-40	-30	-45	-10
North Atlantic	20	30	-60	-40

The table reporting the trends of each region is now organized with the right order of products and regions:

	SMOS	ISAS	GLORYS	SMOS/SMAP OI	CNR	ARMOR3D
Eastern Indian Ocean	-0.142	-0.110	-0.262	-0.197	-0.187	-0.127
North Pacific	-0.137	-0.167	-0.164	-0.156	-0.150	-0.155
West of Australia	0.170	0.173	0.168	0.173	0.150	0.161
Solomon Islands	0.233	0.316	0.276	0.258	0.297	0.265
South Pacific	-0.137	-0.106	-0.172	-0.119	-0.087	-0.078
East of Australia	-0.110	<u>-0.043</u>	-0.086	-0.051	<u>-0.028</u>	<u>-0.02</u>
South Atlantic	0.114	0.099	0.150	0.101	0.156	0.124
North Atlantic	0.183	0.136	0.174	0.129	0.156	0.156

We would expect the authors to take the analysis one step further. For example, they describe the L3G and Glorys datasets as “noisier” (line 192) but do not explain the origin of this noise—whether it is related to instrument resolution, sensitivity to sea-state, data processing differences, or other error sources.

When we described SMOS and GLORYS as “noisier” in the text we were not precise enough, so we rephrased to “The time-series of the SSS anomalies of the 6 datasets in each of the 8 regions show a general good agreement among them, with different products superposing well (Figure 3b). In spite of the general good agreement between SSS products, some differences are observed between the time series from the various products (Figure 3b). On the one hand, some datasets show slightly more variability in certain regions. For example, SMOS and GLORYS show higher variability in the eastern Indian Ocean, where sparse in situ coverage coincides with strong coastal signals linked to river discharge and surface currents that are well captured by SMOS (Akhil et al., 2020). Increased variability in these datasets is also found in stratified regions such as the South Pacific near the South Pacific Convergence Zone (SPCZ), likely reflecting differences in SSS representation. Whereas SMOS samples only the upper centimeter of the ocean and GLORYS represents an average over the top meter (effectively a surface measure), the other datasets are more strongly influenced by deeper in situ observations. In addition, the $1/12^\circ$ eddy-resolving resolution of GLORYS in the tropics may amplify variability, even at low frequencies, compared to lower-resolution or more strongly filtered products. Conversely, in the Solomon Islands region, the higher SMOS variability may also be related to RFI contamination (Bonjean et al., 2024).”

Similarly, the manuscript notes inconsistencies in 2024, 2023, and 2011 (lines 192–195) without offering hypotheses that might account for these deviations. Presenting such observations without attempting to interpret or contextualize them limits the readers’ ability to understand the differences between products. Providing even brief explanations or possible causes would significantly strengthen the results analysis and improve the interpretability of the comparisons.

Thank you for pointing this out. We have tried to explain, to the extent of our knowledge and without being too speculative, some of the main inconsistencies found. Namely:

- In East of Australia, over the 2022–2023 period, the CNR time series exhibits a temporal evolution consistent with that of other datasets (e.g., GLORYS and SMOS), although with differences in magnitude. Differences among datasets may be related to the specific approach adopted in the CNR product, where satellite and in situ data are combined through optimal interpolation, as well as to differences in spatial resolution or interpolation methods. In particular, the stronger influence of in situ observations in the CNR dataset may enhance the representation of certain regional processes that are less evident elsewhere. In this context, the negative SSS anomalies observed in 2022–2023 may be associated with precipitation variability affecting the western New Caledonia region and consequently the EAUS area.
- The discrepancy of ARMOR3D at the end of 2023 in Salomon and South Atlantic (and North Atlantic and Eastern Indian Ocean) is due to the fact that for the years 2023 and 2024 we had to use the near real time (NRT) ARMOR3D product (instead of the reprocessed product, as for the rest of the period), as this was the only one available at the time the paper was submitted. In February 2023 there was some

spurious data assimilated in ARMOR3D that would have been flagged after in careful delayed mode processing. However, this anomalous month, even if visible in the time series should not impact the trends, as the method used should be robust to singular outliers, such as this one, and the trends obtained for this product are consistent with all the other products.

In conclusion, this manuscript addresses an important topic and offers valuable insights into recent SSS trends by leveraging multiple datasets across the satellite era. The study is scientifically sound and has strong potential, but significant improvements in clarity, structure, and dataset documentation are needed to strengthen its readability and impact. More importantly, providing additional interpretation of dataset discrepancies and results would greatly enhance the manuscript. With these revisions, the work would offer a clearer and more compelling contribution to understanding global salinity changes and their drivers from satellite observations.

Thank you for your valuable feedback, which will help make the paper better.

Answer to Review #2 for “15 Years of Satellite, In Situ and Reanalyzed Salinity Data: Insights into Sea Surface Salinity Trends, Variability, and Water Cycle Links”

By authors Ana Claudia Parracho, Patricia Zunino, Michela Sammartino, Jacqueline Boutin, Eric Greiner, Bruno Buongiorno Nardelli, Nicolas Kolodziejczyk

We thank the reviewer for their careful reading, detailed suggestions, and positive feedback. We have carefully considered these comments and provide below a point-by-point response to the issues raised.

General comments

This paper investigates SSS trends in different kinds of up-to-date products based on either in situ data, satellite data, or both, combined with a model or not. While not groundbreaking as it builds on other studies of SSS trends and do not deeply investigate processes at work, it provides a very interesting comparison of short-term trends for which satellite data allow unprecedented monitoring, and long-term SSS trends that only historical in situ observations can capture. Moreover, it gives a good overview of the different kind of products available through Copernicus, and therefore fits perfectly within the State of the Planet report.

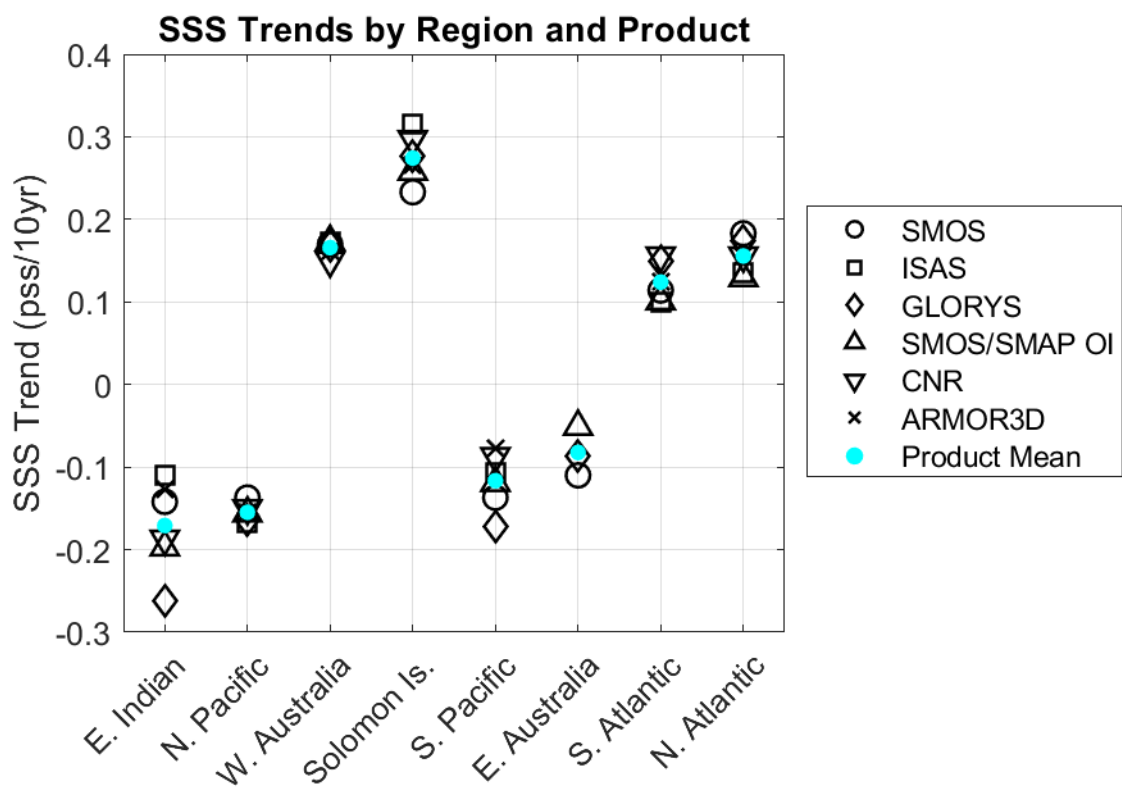
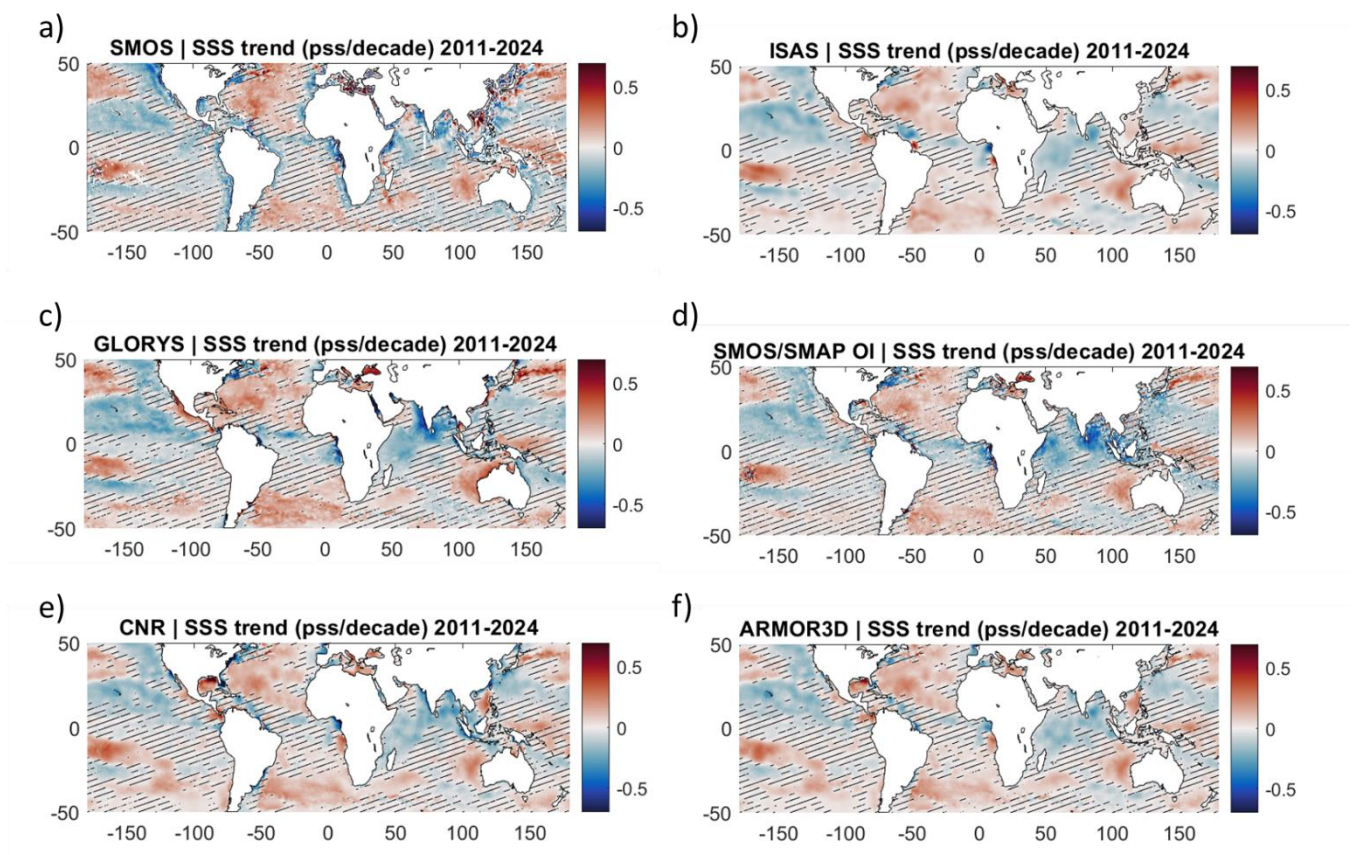
The multi-product analysis is done rigorously, the writing and figures are of very good quality. My main recommendations are to always present the different products in the same order in the figures and tables throughout the paper to improve the reading flow, and to check that all references are in the end list as I found that some of them missing.

In the revised version, the products have been presented in the same order in the figures and papers. The missing references have been added.

We now follow the following order for the products and the following abbreviations used throughout the paper:

1. SMOS
2. ISAS
3. GLORYS
4. SMOS/SMAP OI
5. CNR
6. ARMOR3D

This order and names have been used in the Tables, the Figures and the Legends of some of the figures. For example:



I recommend to accept the paper, while I provide below a number of minor comments (mostly typos, rephrasing) that should help to polish it before publication.

Minor comments

L39 by saltier regions getting saltier L54 is probably of anthropogenic origin rather than due to natural variability

Done.

L63 least-damped

Done.

L76 there is now at any time around 4000 Argo floats in the global ocean, so the cumulative number of floats deployed since the early 2000s is certainly higher. Please rephrase

Thank you for catching this. We have corrected it to “Since the early 2000s, there has been a large increase in near-surface and subsurface salinity data sampling at a global scale, with the deployment of around 20 000 Argo floats in the global ocean. Over 4000 Argo floats are currently in operation, each providing at least one salinity cast every 10 days in a three-degree cell in the top 2 km of the water column (Thierry et al., 2025).”

L100 remain

The subject “15 years” is treated as singular when referring to a single period of time, so it should be “remains”. But to avoid confusion, we replaced it with “is”.

L104 in remote sensing of SSS

Done, but added “satellite” before “remote sensing”.

Table 1 Information on the spatial resolution of these products is lacking, is it similar from one product to the other and have they been interpolated on a similar grid ? Also it would be good to give the available period for these products, even if only the period common to all is later used in the analysis. I suggest to give the short name of each product in a separate column for more visibility, and used « SMOS L3G » rather than « L3G » (both are used, depending on the figures, better to be consistent). Also it seems some QUID and PUM references are missing in the reference list (e.g. Tarot, 2024 ; Verbrugge, 2023), please verify and complete.

When making the table, we were following strict guidelines from the OSR team, so the organization of the table and the columns used were not up to our choice. However, as suggested by the reviewer, we have replaced “Product ref. no.” with “Product ref. no. and abbreviation” and we use this same abbreviation throughout the text, figures and tables, avoiding the inconsistencies pointed out. In addition, following your suggestion we have added an additional table with the information on each product’s resolution, available time period, and auxiliary data. The datasets were not interpolated to the same grid, they were computed at the grid of the resolution indicated in Table 2.

The references have been added.

Table 1, Product 2 : Kolodziejczyk

Done.

L115 Theil, 1950; Sen, 1968 : missing in the references list

These references have been added.

L131 « SMOS L3G (product 1) and Glorys (product 5) » It would be more intuitive to present the maps in Figure 1 in the same order as the products are presented in Table 1. Also I suggest to present in that order : in situ-only product, satellite-only product, hybrid products.

For the revision, the product order has been made consistent throughout. We have ordered the products starting from satellite-only, in-situ only on top (SMOS and ISAS respectively) and then mix of in-situ and satellite. We decided to order satellite-only first, because the satellite data is the one with the shortest available period, and hence is driving the main period chosen for this study. It was also one of the goals of the paper to show that satellite products are able to capture SSS trends, so the satellite-only product, SMOS, was the one used in a lot of the comparisons (for instance, in the bottom panel in Figure 2 and in Figure 3a). This order also allows for an easier comparison between independent datasets: SMOS, ISAS and GLORYS, as well as between dependent datasets, like ISAS and SMOS/SMAP OI, and CNR and ARMOR3D at the bottom. The organization will now look like this and we hope the reviewer find it suitable:

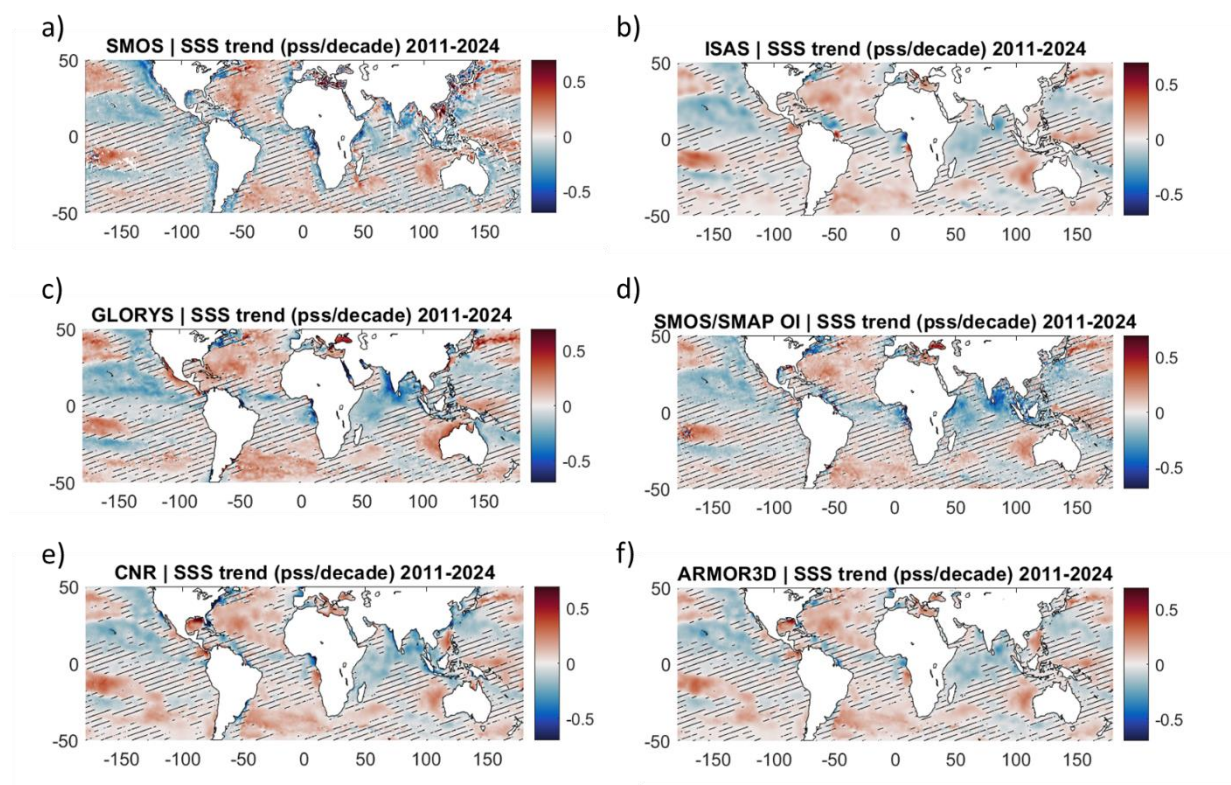
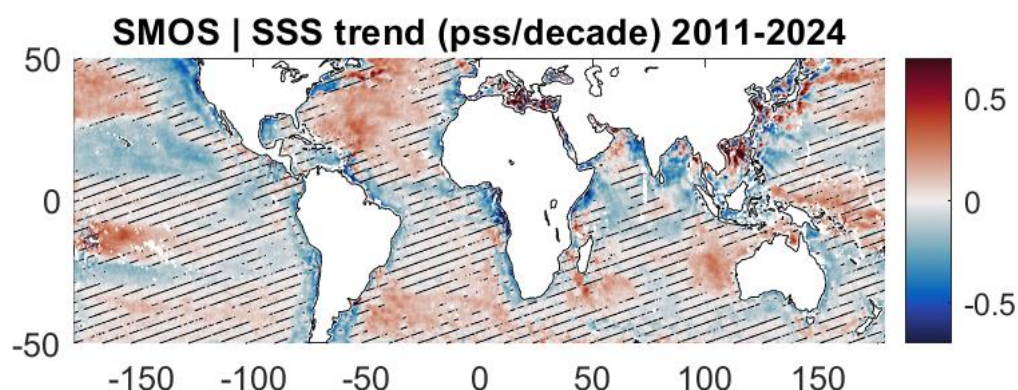


Figure 1 « SSS trend (pss/decade) 2011-2024 » is common in all subplot titles while the name of the product is only included as a subscript. I suggest to rather put forward the name of the products in these titles.

Thank you for this observation. The name of the products has been put forward: first in line and not in subscript. For example:



L135 Which areas of higher variability that are distinct from river plumes do you refer to ?
Red areas in Figure 2d are all associated with river plumes, it seems. Could you clarify ?

The sentence has been rephrased to: “There are also differences between the products in smaller regions, such as river plumes (e.g. of the Amazon and Congo rivers), which are areas of higher variability.”

L154 SSS trends obtained from the 6 products.

Done.

L167 When maps of the mean salinity trends estimated from the 6 products (Figure 2a) and SSS climatology (Figure 2c) are compared

Done.

L172 are found in the Indian Ocean east of India (where a fresh region shows a freshening trend)

Done.

L183 The link between the Pacific ENSO/PDO modes and the Amazon flow is not so direct, can you add a reference ? Which different periods and different techniques to estimate trends are you referring to ? Please clarify.

This refers to the paper cited earlier in the paragraph, Nardelli and Iudicone (2025). The citation was made clearer.

Figure 3b The order of products used in the legend is again different from the order in Table 1 or Figure 1. Please keep consistent.

This has been corrected so that the order of the products is the same, and also the order of the regions are consistent with the other Tables and Figures.

Table 2 I do not see the underlining of non-significant trends mentioned in L200. Again products seem to be presented in random order.

The underlines have been added.

L233 « mooring etc » : it would be worth knowing if this product includes underway SSS measurements from thermosalinographs. Also details on this product should rather be moved to the data section.

Thank you, the IAP dataset has been added to Table 1 and an additional table with the information on each product's resolution, available time period, and auxiliary data have been added to make this clearer.

L241 There is an inconsistency between the periods given in the legend and in the subplot titles, please correct.

The legend has been corrected.

L246 Figure 5d).

Done.

L253 « trends in salinity are not linear » : it is right but by definition you here discuss differences in linear trends, and it is difficult to see trends otherwise on the short period Figure 3b. Thus I would recommend to rephrase with something like « In addition, when looking at such a short period as 15 years, interannual and interdecadal variability have a strong influence on the estimation of a linear trend (as seen in time series of Figure 3b) ».

Thank you – we have replaced the sentence with your suggestion.

L256 Vinogradova and Ponte (2017) is missing in the references list

The reference has been added.

L258 compared to

Done.

L263 saltening ?

We replaced it with “increasing salinity of the”.

L270 up-to-date products derived from satellite data on one hand, and from in situ data on the other hand

Done.

L274 Glorys (a model reanalysis which assimilates only in situ salinity). L282 showed that the intensity

Done.

L283 salinity sensors

Done.