An itemized response (blue words) to reviewer's comments and suggestions

We sincerely thank the reviewer for valuable comments on our manuscript entitled "Impact of anticyclonic eddies on the spatial distribution and emission of non-methane hydrocarbons in the northern South China Sea" [Paper # egusphere-2026-1212]. In the revised manuscript, we have clarified and supplemented critical methodological, datasets, and statistical details to enhance the transparency and reproducibility of our study. Overly assertive or imprecise statements have been revised to improve the scientific rigor and accuracy of the manuscript. We refined the figures to make them clearer and polished the manuscript throughout to improve its readability and consistency. All modifications are highlighted in blue, and our specific responses to the reviewer's comments are presented as follows.

General comments: This study was designed to investigate the impact of anticyclonic eddy systems on the distribution and oceanic efflux of an array of non-methane hydrocarbon compounds (NMHCs) and the projected atmospheric impact in the South China Sea. The measurements in this manuscript show that 1) the concentrations and oceanic emissions of NMHCs were significantly lower in eddy-influenced stations compared to the reference stations; 2) the photoproduction of NMHCs was slower in eddy-influenced waters compared to the reference waters. This work is of significance because the biogeochemical cycling of NMHCs and other volatile organic compounds (VOCs) has not been thoroughly studied in mesoscale eddies. However, the most critical issue with this work, in my opinion, is the lack of clarification on the method of statistical analysis on multiple occasions that has compromised the quality of this manuscript in telling a compelling story. That's being said, statistical analyses must be performed throughout the manuscript to truly tell if these differences are significant, particularly when error propagation is involved in this work. Please see the texts below for the major and minor issues that I believe need to be addressed for the manuscript to be of a better quality. Overall, I think this work is well designed and carries significant scientific merits by providing new knowledge to the study of oceanic NMHCs in the system of mesoscale eddies. Thereby I believe it's suited for publication in *Biogeosciences* after revision.

Reply:

We sincerely thank the reviewer for the positive assessment of our work. We have revised and improved the entire manuscript. Specifically, we have added a dedicated Statistical Analysis section (Section 2.7) describing the statistical methods used in this study. For all comparative statements, we now clearly indicate which statistical test was performed, the test statistic, and the p-value. Uncertainty reporting has been improved throughout, with all mean values now accompanied by standard deviations (SD) derived from either triplicate incubations or between-station variability.

Major issues and recommendation: 1) This study relies on the comparison made for the measurements between eddy-impacted water and reference waters. However, the uncertainty associated with these measurements and the method of statistical analysis are missing on many occasions in the manuscript. For instance, in the Abstract (Lines 16-19), the authors claimed that the difference between the two means of NMHC concentrations was significant. What statistical analysis was performed that led to this conclusion? What is the sample number? Can authors clarify if the data are normally distributed? This is just an example. Authors should check through manuscripts and ensure proper statistical analyses are coupled with comparisons of means.

Reply:

We thank the reviewer for raising this critical issue regarding statistical analysis and uncertainty reporting. For the comparison of NMHC concentrations between the eddy-controlled region ($n = 8$) and reference sites ($n = 17$), we first assessed data normality using the Shapiro-Wilk test and homogeneity of variances using Levene's test. Both assumptions were satisfied, and therefore a parametric independent-samples t-test was employed to compare the two means. The result showed a statistically significant difference between the two groups ($t = 5.645$, $p < 0.05$). In the revised Abstract, we have now included the t-value to provide greater transparency. Additionally, we have also reviewed the entire manuscript to ensure that all statistical comparisons are accompanied by appropriate information regarding specific statistical tests used. A detailed description of our statistical approach has been added to the Materials and methods section (Section 2.7 Statistical analysis).

Line 17-19:

"Significantly lower NMHC concentrations were observed in surface seawater within the eddy-controlled region (201 ± 101 pmol L^{-1}) relative to the reference sites (433 ± 62.5 pmol L^{-1}) (t-test: $t = 5.645$, $p < 0.001$)."

Line 217-226:

2.7 Statistical analysis

Normality of the data was assessed using the Shapiro-Wilk test, and homogeneity of variances was evaluated using Levene's test. For comparisons between two groups, parametric t-tests were applied when both normality and homoscedasticity assumptions were satisfied; otherwise, non-parametric Mann-Whitney U-tests were used. For comparisons involving more than two groups, one-way ANOVA was used when assumptions were met, followed by Tukey's post-hoc test for multiple comparisons; otherwise, the Kruskal-Wallis test was employed. For comparisons where sample sizes were too small for meaningful statistical significance testing, Cohen's d was calculated as a measure of effect size to quantify the magnitude of observed differences. A significance threshold of $p < 0.05$ was used in all analyses. Statistical analyses were performed via SPSS 25.

2) The authors should acknowledge that only four photochemical experiments were done in the field that a robust assessment cannot be made here in any capacity for the photoproduction rates of NMHCs between eddy-influenced and reference stations. I understand that field work is labor intense and it's of great value to collect preliminary results. For future, 1) more photochemical experiments should be carried out; 2) I recommend authors think about what the rationales are that a difference is expected for their photoproduction in eddy vs reference stations; 3) Authors should also measure the CDOM absorbance in these waters to see if there is a difference in absorbance; 4) The most effective approach to study spectral dependence of a photochemical process is to determine wavelength-dependent apparent quantum yields. The crude spectral study, using optical treatments, is less valuable as it's well known that marine photochemistry is a UV-controlled process particularly during field work at sea. I'd rather invest the valuable sea time in performing more photochemical experiments that would afford one a larger dataset.

Reply:

We thank the reviewer for these thoughtful and constructive comments. In the revised manuscript, we have added a paragraph in Section 4.2 to acknowledge the study limitations and address the reviewer's suggestions for future research. Specifically, we acknowledge that the observed spectral response patterns and comparisons of photoproduction rates should be considered preliminary, and we state that future investigations with a larger number of incubation experiments are needed to validate these findings. Regarding the rationales for expecting differences in photoproduction between eddy and reference stations, we think that anticyclonic eddies can alter the concentration and composition of chromophoric dissolved organic matter (CDOM) through physical processes such as horizontal advection and vertical mixing, and that eddy-induced variations in CDOM concentrations are expected to influence NMHC photoproduction rates. Therefore, we agree that future studies should measure CDOM concentrations to better understand the optical properties of eddy-influenced waters. Finally, we acknowledge that the most effective approach to studying spectral dependence is to determine wavelength-dependent apparent quantum yields, and we state that future research should employ monochromatic irradiation systems to allow a more rigorous assessment of spectral dependencies.

Line 359-371:

"We acknowledge that only four photochemical incubation experiments were conducted in this study, which limits robust assessment of in NMHC photoproduction rates between eddy-controlled region and reference stations. Consequently, the observed spectral response patterns and comparisons of photoproduction rates should be considered preliminary. Future investigations with a larger number of incubation experiments are needed to validate these findings. Furthermore, mesoscale eddies can alter the concentration and composition of chromophoric dissolved organic matter (CDOM) through physical processes such as horizontal advection and vertical mixing (Zarokanellos and Jones, 2021; García et al., 2026). Since CDOM is a key substrate for photochemical reactions, eddy-induced variations in CDOM concentrations are expected to influence NMHC photoproduction rates. Therefore, future studies should measure CDOM concentrations to better understand the optical properties of water masses influenced by eddies. Moreover, future research should employ monochromatic irradiation systems to determine wavelength-dependent apparent quantum yields, allowing a more rigorous assessment of spectral dependencies."

References:

García, J. L., Arístegui, J., Pazó, M. J., Vieitez dos Santos, V., Hernández-Hernández, N., Nieto-Cid, M., Gelado-Caballero, M. D., Martínez-Marrero, A., and Álvarez-Salgado, X. A.: Mesoscale and submesoscale variability of organic matter in island-induced eddies across their life cycle: implications for the biological carbon pump, Front. Mar. Sci., 13, 1711689, https://doi.org/10.3389/fmars.2026.1711689, 2026.

Zarokanellos, N. D. and Jones, B. H.: Influences of physical and biogeochemical variability of the central Red Sea during winter, J. Geophys. Res. Oceans, 126(3), e2020JC016714, https://doi.org/10.1029/2020JC016714, 2021.

Minor issues: The writing of this manuscript in English language could benefit from further polishing for a more concise and accurate communication of your research.

Reply:

Thank you for this helpful suggestion. We have carefully re-read the entire manuscript and made revisions to enhance the language quality. Specifically, we have removed vague or redundant expressions, simplified overly complex sentences, and improved the text logic.

Specific comments:

Line 16: Get rid of "particular"

Reply:

We thank the reviewer for the suggestion. We have deleted the word "particular" as suggested.

Line 15-17:

"Herein, we characterized the distributions and emissions of eight C_2–C_5 NMHCs in the South China Sea, with emphasis on the impacts of an anticyclonic eddy."

Line 17: Were these concentrations determined in water samples from the near-surface?

Reply:

Thank you for highlighting this ambiguity. The concentrations of NMHCs were determined in surface seawater samples at a depth of 5 m. We have revised the manuscript to specify the sampling layer.

Line 17-19:

"Significantly lower NMHC concentrations were observed in surface seawater within the eddy-controlled region (201 ± 101 pmol L^{-1}) relative to the reference sites (433 ± 62.5 pmol L^{-1}) (t-test: $t = 5.645$, $p < 0.001$)."

Lines 21-22: It's not that the flux dropped by 56% in the eddies. I believe you meant that the flux in the eddies is 56% lower than reference sites. Please have this sentence rewritten if that's true.

Reply:

Thanks for this comment. We have rewritten the sentence as follows:

Line 22-24:

"The sea-to-air fluxes of NMHCs within the eddy were 56% lower than reference sites, which reduce their potential contributions to ozone and secondary organic aerosol by 59% and 60%, respectively."

Line 29: Add a dot (•) to the side of OH to make a radical.

Reply:

Thank you for this careful correction. We have added a dot (•) to the side of OH to make a radical.

Line 30-31:

"Atmospheric NMHCs can participate in reactions with hydroxyl radicals (•OH) and significantly contribute to tropospheric ozone (O_3) production (Atkinson, 2000; Tran et al., 2013)."

Line 74: Get rid of "systematically", and I'd avoid this type of "empty" words in scientific writing.

Reply:

Thanks for this suggestion. We have deleted the word "systematically".

Line 85-86:

"Here, we investigated NMHC spatial distributions and emissions in northeastern SCS, specifically focused on their response to an anticyclonic eddy."

Line 76: Get rid of "formation".

Reply:

We thank the reviewer for the suggestion. We have deleted the word "formation".

Line 86-88:

"By further assessing the contribution of NMHCs to O_3 and SOA production, we evaluate the potential climate effects induced by mesoscale eddies through their modulation of oceanic NMHC fluxes."

Line 95: Add "photochemical" before incubation experiments.

Reply:

Thank you for this suggestion. We have added the word "photochemical" before "incubation experiments" in the caption of Figure 1.

Line 109-114:

"Figure 1. (a) Geographic location of the study area. (b) Locations of sampling stations during the cruise. Yellow squares indicate the stations for photochemical incubation experiments. The background color and vector arrows represent sea level anomaly (SLA, m) and the derived surface geostrophic currents (m s^{-1}) on 21 August 2021, respectively. Transect C that cutting through the core of anticyclonic eddy (AE) was chosen to analyze the sectional distributions of NMHCs. The data for SLA and surface geostrophic current were obtained from Copernicus Marine Service (https://marine.copernicus.eu)."

Line 93: Can you clarify what that 0.5 m/s on the figure to the right shows?

Reply:

Thank you for this suggestion. The arrow labeled “0.5 m/s” in the right panel of Figure 1 reflects flow rates of surface geostrophic currents. We have revised the figure caption to clarify this information.

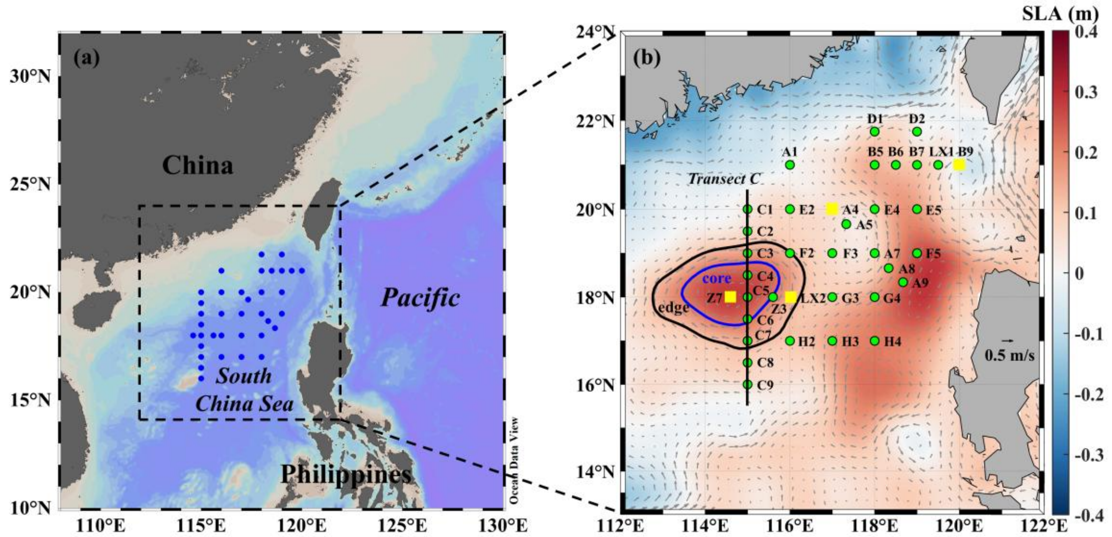

Figure 1. (a) Geographic location of the study area. (b) Locations of sampling stations during the cruise. Yellow squares indicate the stations for photochemical incubation experiments. The background color and vector arrows represent sea level anomaly (SLA, m) and the derived surface geostrophic currents (m s^{-1}) on 21 August 2021, respectively. Transect C that cutting through the core of anticyclonic eddy (AE) was chosen to analyze the sectional distributions of NMHCs. The data for SLA and surface geostrophic current were obtained from Copernicus Marine Service (https://marine.copernicus.eu).

Line 100: Just simply say “samples were collected in duplicate at 4 stations”.

Reply:

We thank the reviewer for the suggestion. We have revised the sentence as recommended.

Line 116-117:

“To assess analytical variability, samples were collected in duplicate at 4 stations.”

Line 144: Change “light” to optical.

Reply:

We thank the reviewer for the suggestion. We have changed “light” to “optical”.

Line 160-161:

“These quartz tubes were subjected to four distinct optical treatments:”

Line 145: To my knowledge, the term "visible light" rather than PAR is used more often in photochemical studies.

Reply:

Thank you for this precise terminological suggestion. We have replaced "photosynthetically active radiation (PAR)" with "visible light".

Line 163-164:

"(ii) wrapped with Mylar-D film to transmit radiation in the visible light (400–700 nm) and ultraviolet A (UVA, 320–400 nm) spectral bands."

Lines 159-160: Are there any studies supporting this statement about photolysis of NMHCs in seawater? If so, provide the references. If not, get rid of this statement since it's meaningless. I highly doubt any of these NMHCs photolyze in ambient seawater. What would be the photolysis mechanism(s)?

Reply:

We thank the reviewer for this comment. There are no relevant literatures reported photolysis of NMHCs in seawater. Thus, we have removed the statement about "photodegradation of NMHCs may have occurred".

Line 211: Authors should take time to verify the scales on the y-axes of these plots. As an example, the scale for the DOC plot seems to be too broad if you look at the color scheme in the plot. There is no dark red in the plot.

Reply:

Thank you for this comment. We have adjusted the color scale for the DOC plot to better match the data range. We have also verified the y-axis scales for all other plots in other figures to ensure that each scale appropriately reflects the range of the data.

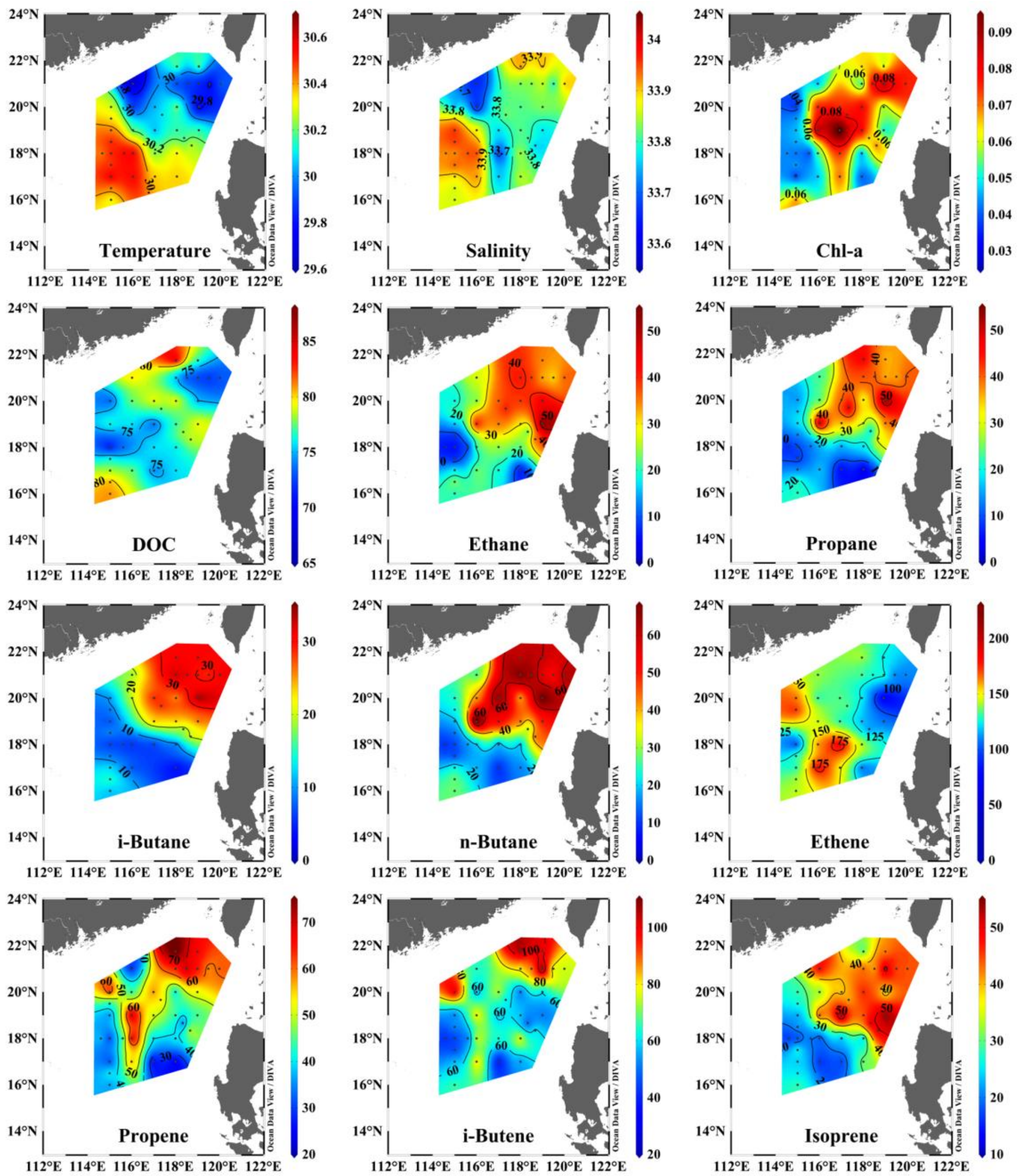

Figure 2. Horizontal distributions of temperature (°C), salinity, Chl-*a* (μg L^{-1}), DOC (μmol L^{-1}), and NMHCs (pmol L^{-1}) in surface seawater of the northern SCS.

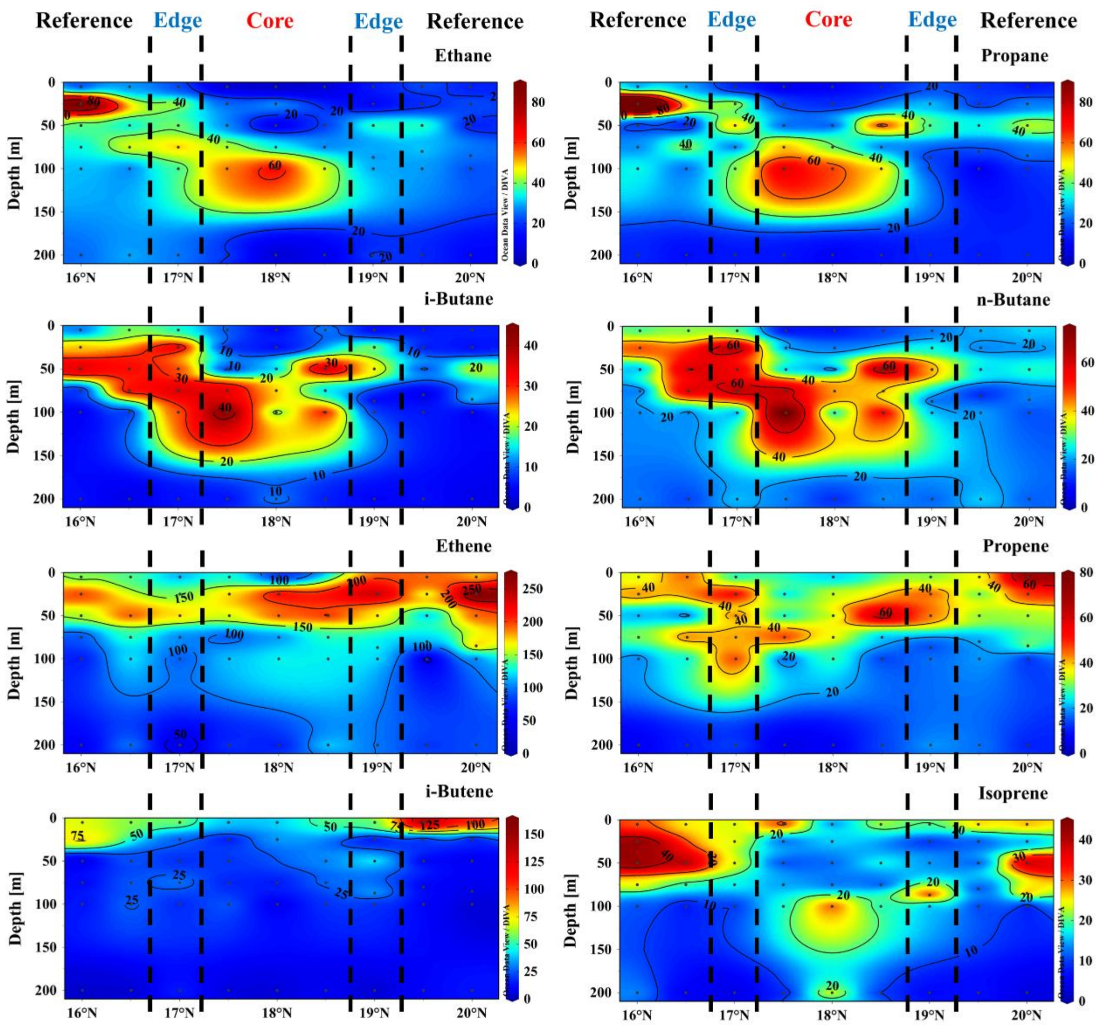

Figure 3. Vertical profiles of NMHCs (pmol L^{-1}) along transect C in the northern SCS.

Lines 218-219: please provide statistics for the DOC comparison like you did for Chl a. Are these two means truly statistically different?

Reply:

Thanks for the valuable comment. The DOC data in AE core include only two samples, which is insufficient for *t*-test. Therefore, we used Cohen's d to test the significance. The calculated Cohen's d was 0.92 (large effect size), which suggests a substantial difference in DOC concentrations between the eddy core and the reference sites. This has been revised in the manuscript.

Line 244-246:

"Similarly, the distribution of DOC was also influenced by the AE, with lower values in the core of AE (72.2 ± 9.6 μmol L^{-1}) and higher concentrations at the reference sites (80.5 ± 8.9 μmol L^{-1}) (Cohen's d = 0.92, large effect size)."

Line 22, section 3.2: As a general comment, the concentration or standing stock of an NMHC species measured is always a net result of its production and removal. Are there any previous studies that investigated the impact of eddies on bacterial activity or more specifically on the consumption rates of NMHCs or any other biogenic products?

Reply:

We thank the reviewer for the insightful comment. We have added a discussion in the revised manuscript addressing the impact of eddies on bacterial activity and its potential effects on NMHC consumption rates. Specifically, previous studies demonstrated that mesoscale eddies can significantly alter bacterial community structure and activity (Sun et al., 2022; Villegas-Mendoza et al., 2022). More directly, studies from the South China Sea demonstrating that anticyclonic eddies significantly influence microbial consumption rates of biogenic sulfides and methane (Li et al., 2025; Wu et al., 2025). Therefore, the eddy-driven variations in bacterial community structure and activity may potentially impact the microbial consumption of NMHCs.

Line 328-334:

"It should be noted that the NMHC concentrations represent net values resulting from the balance between biological production and microbial consumption. Previous studies have shown that mesoscale eddies can significantly alter bacterial community structure and activity (Sun et al., 2022; Villegas-Mendoza et al., 2022), thereby influencing the microbial consumption rates of marine reactive gases such as dimethylsulfide and methane (Li et al., 2025; Wu et al., 2025). Therefore, the eddy-driven variations in bacterial community structure and activity may potentially impact the microbial consumption of NMHCs, and also contribute to the observed spatial patterns of NMHCs."

Reference:

Li, X. J., Li, S., Gao, X. X., Li, J. L., Xu, F., Zhou, C., Zhang, H. H., and Zhuang, G. C.: Regulation of mesoscale eddies on oceanic methane production, oxidation, and emissions, Glob. Biogeochem. Cycles, 39(10), e2025GB008500, https://doi.org/10.1029/2025GB008500, 2025.

Sun, F., Xia, X., Simon, M., Wang, Y., Zhao, H., Sun, C., Cheng, H., Wang, Y., Hu, S., Fei, J., and Wu, M.: Anticyclonic eddy driving significant changes in prokaryotic and eukaryotic communities in the South China Sea, Front. Mar. Sci., 9, 773548, https://doi.org/10.3389/fmars.2022.773548, 2022.

Villegas-Mendoza, J., Gómez-Ocampo, E., Velásquez-Aristizábal, J., and Rodríguez-Escobar, D.: Microbial metabolic activity in two basins of the Gulf of Mexico influenced by mesoscale structures, J. Mar. Syst., 234, 103781, https://doi.org/10.1016/j.jmarsys.2022.103781, 2022.

Wu, J. W., Xu, F., Yan, S. B., Xu, G. B., Jiang, Y. C., Li, X. R., Zhai, X., Zhou, L. M., Zhang, H. H., and Chen, Z. H.: Effect of anticyclonic eddies on the production and emission of marine dimethylsulfide in the northern South China Sea, Glob. Planet. Change, 252, 104883, https://doi.org/10.1016/j.gloplacha.2025.104883, 2025.

Lines 247-248: Make your writing concise by simply saying “In 0.2μm-filtered seawater”. In the method, you already clarified about the purpose of filtration.

Reply:

We thank the reviewer for this helpful suggestion to improve conciseness. We have revised the sentence as follows:

Line 274-275:

“In 0.2 μm-filtered seawater, the concentrations of NMHCs increased after 6 hours of solar irradiation (Fig. S2).”

Lines 252-254: what is the sample number n?

Reply:

Thank you for pointing out this missing information. The photochemical production rates were determined from incubation experiments conducted at four stations. We have revised the sentence to include the sample size as follows:

Line 277-281:

“The photochemical production rates of ethane, propane, i-butane, n-butane, ethene, propene, i-butene, and isoprene ranged from 2.5–3.1, 4.3–4.4, 2.4–3.4, 4.0–7.0, 24.1–38.8, 5.3–22.9, 12.2–15.3 and 2.6–4.7 pmol L^{-1} h^{-1}, with mean values of 2.8 ± 0.4, 4.4 ± 0.1, 2.9 ± 0.7, 5.5 ± 2.2, 32.2 ± 6.2, 18.1 ± 8.6, 13.8 ± 1.7, and 3.7 ± 1.5 pmol L^{-1} h^{-1}, respectively (n = 4).”

Lines 257-260: what is the sample number for eddy, eddy edge, and refence stations? Very important to show these information.

Reply:

Thank you for this important comment. The incubation experiments were conducted at four stations, comprising one eddy-core station, one eddy-edge station, and two reference stations. We have clarified this information in the text.

Line 284-289:

“The rates of ethene, propene, and i-butene in the eddy core (24.1 ± 2.6, 5.3 ± 0.6, and 12.2 ± 1.2 pmol L^{-1} h^{-1}, respectively; from one station with triplicate incubations) were lower than those at the eddy edge (ethene: 34.6 ± 2.2 pmol L^{-1} h^{-1}; propene: 21.5 ± 1.3 pmol L^{-1} h^{-1}; i-butene: 15.3 ± 0.7 pmol L^{-1} h^{-1}; from one station with triplicate incubations) and at the reference sites (ethene: 35.0 ± 5.4 pmol L^{-1} h^{-1}; propene: 22.8 ± 0.2 pmol L^{-1} h^{-1}; i-butene: 13.9 ± 2.1 pmol L^{-1} h^{-1}; mean ± SD from two stations) (Table 1).”

Line 266, Table 1: Change “natural light” to Full spectrum because that’s the comparison you are showing Full spectrum vs Specific spectral bands (e.g. UVB). Please clarify why there are these blank spaces. Experiments were not performed at these stations or data were problematic? Also, please provide the concentrations in your dark controls as it’s so important to know the level of [ ]s in the dark. You said that triplicate quartz tubes were irradiated. Can you provide the uncertainty associated with these measurements? Can you actually say with confidence that the production in PAR is significant since the production is so low?

Reply:

We thank the reviewer for these constructive comments on Table 1. We have changed “natural light” to “Full spectrum”. The blank spaces indicate that the photochemical incubation experiments with distinct spectral band treatments (visible light, UVA, UVB) were not performed at these stations. In the revised manuscript, we have replaced the blank spaces with “-” and added a footnote below Table 1. We have provided the concentrations in the dark controls and irradiated groups after 6 hours of incubation in the revised Table 1, and provided the uncertainty associated with triplicate measurements. Given the small sample size, we calculated Cohen’s d as a measure of effect size to quantify the magnitude of the difference between visible light treatment and dark controls. The Cohen's d values ranged from 2.10 to 8.43 (large effect size) across different NMHC compounds, indicating substantial differences between the two treatments. Therefore, the observed production under visible light was significantly higher than that in the dark control.

Table 1. Concentrations of C_2–C_4 alkenes in 0.2 μm-filtered seawater from the northern SCS under dark control and irradiated conditions after 6 hours of solar exposure, and the calculated photochemical production rates (mean ± SD, n = 3).

Category	Station	Species	Concentration (pmol L^{-1})				Photochemical production rate (pmol L^{-1} h^{-1})			
			Dark	Full spectrum	Visible light + UVA	Visible light	Full spectrum	UVB	UVA	Visible light
Eddy core	Z7	Ethene	80.3 ± 1.9	225 ± 14.2	122 ± 8.5	85.1 ± 1.7	24.1 ± 2.6	17.1 ± 1.3	6.1 ± 1.7	0.8 ± 0.2
		Propene	47.9 ± 2.8	79.5 ± 6.5	64.4 ± 3.3	53.2 ± 2.2	5.3 ± 0.6	2.5 ± 0.9	1.9 ± 0.8	0.9 ± 0.4
		i-Butene	37.9 ± 1.4	111 ± 7.9	64.7 ± 4.0	46.9 ± 0.8	12.2 ± 1.2	7.7 ± 0.7	3.0 ± 0.8	1.5 ± 0.3
Eddy edge	LX2	Ethene	108 ± 3.6	315 ± 10.0	163 ± 7.9	120 ± 4.0	34.6 ± 2.2	25.4 ± 2.6	7.1 ± 1.5	2.1 ± 0.6
		Propene	69.0 ± 1.2	198 ± 8.9	120 ± 9.8	82.4 ± 1.9	21.5 ± 1.3	13.0 ± 1.5	6.3 ± 2.0	2.2 ± 0.4
		i-Butene	93.6 ± 4.4	185 ± 7.6	146 ± 8.7	108 ± 4.5	15.3 ± 0.7	6.5 ± 1.4	6.3 ± 0.7	2.5 ± 0.9
Reference site	A4	Ethene	111 ± 4.2	344 ± 14.3	–	–	38.8 ± 3.0	–	–	–
		Propene	83.8 ± 2.3	219 ± 7.5	–	–	22.6 ± 1.5	–	–	–
		i-Butene	80.3 ± 3.6	155 ± 17.9	–	–	12.4 ± 3.0	–	–	–
Reference site	B9	Ethene	91.9 ± 3.5	279 ± 13.0	–	–	31.2 ± 2.6	–	–	–
		Propene	77.0 ± 6.7	215 ± 9.3	–	–	22.9 ± 2.1	–	–	–
		i-Butene	68.8 ± 4.8	161 ± 15.0	–	–	15.3 ± 2.7	–	–	–

"–" indicates that the corresponding experiments were not conducted.

Line 281: these differences in Chl a are statistically different? They are definitely not substantially different.

Reply:

We thank the reviewer for this important statistical comment. We have calculated Cohen's d to quantify the magnitude of the observed differences in Chl-*a* concentrations. The results showed a Cohen's d of 1.08 between the eddy core and reference sites (large effect), and a Cohen's d of 0.55 between the eddy core and eddy edge (medium to large effect). These effect sizes indicate that the observed differences are indeed substantial. In the revised manuscript, we have reported the effect sizes.

Line 310-313:

"Moreover, Chl-*a* concentrations within the DCM layer of the eddy core (0.25 ± 0.11 μg L^{-1}) were substantially lower than those at the eddy edge (0.31 ± 0.09 μg L^{-1}) (Cohen's d = 0.55, medium effect size) and reference sites (0.34 ± 0.06 μg L^{-1}) (Cohen's d = 1.08, large effect size)."

Line 298: It's not entirely accurate to say "wavelength dependence" because the way you did in this work can only give you an idea of the crude spectral dependence. The best way to do it is using a monochromatic system or even a polychromatic system with narrower spectral range.

Reply:

We thank the reviewer for this methodological critique. We have revised the section title accordingly to better reflect what was actually done in this study. Additionally, we also acknowledge that a more precise determination of wavelength dependence would require monochromatic or polychromatic systems with narrower spectral ranges. In the future photochemical experiments, we will incorporate such improvements to resolve the wavelength-dependent production rates of C_2-C_4 alkenes more accurately.

Line 335:

4.2 Eddy-driven changes in alkene photochemical production and their spectral dependence