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Impact of anticyclonic eddies on the spatial distribution and emission of non-methane hydrocarbons in the northern South China Sea

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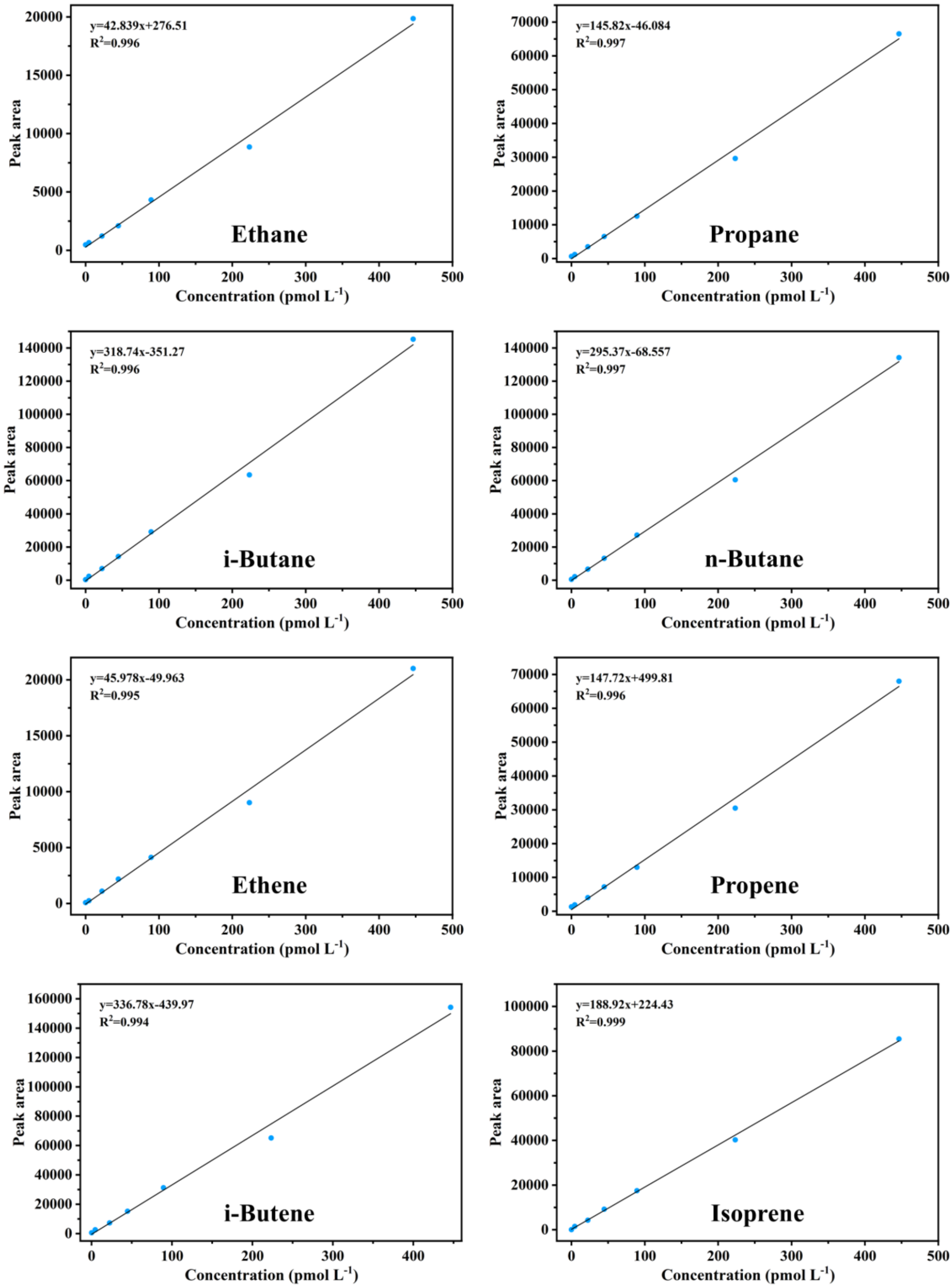

Figure S1. Calibration curves for the eight target NMHCs.

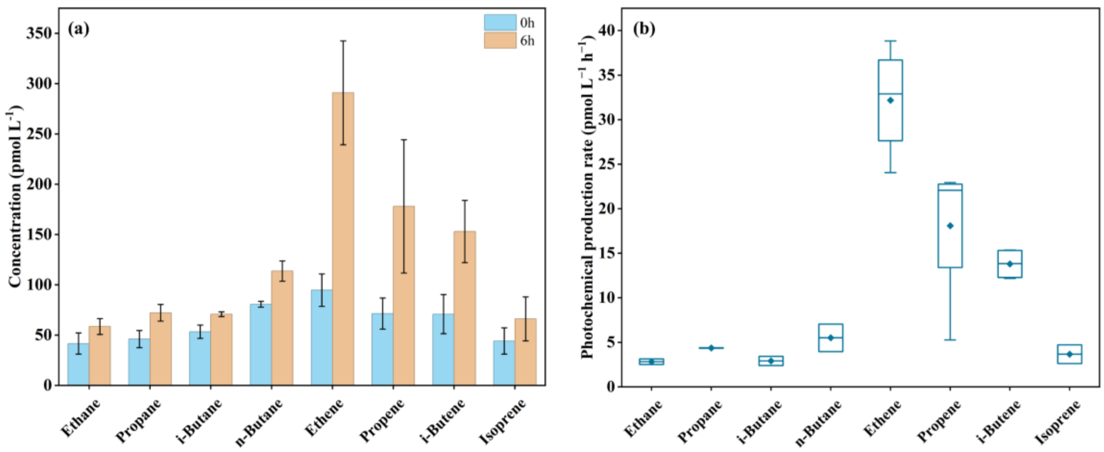

Figure S2. (a) Temporal variations in NMHC concentrations with light exposure (error bars represent one standard deviation calculated from triplicate incubations) and (b) photochemical production rate of each species. The lines in the boxes represent the 25th (bottom), 50th (middle), and 75th (top) percentiles, respectively; solid diamonds represent the mean values.

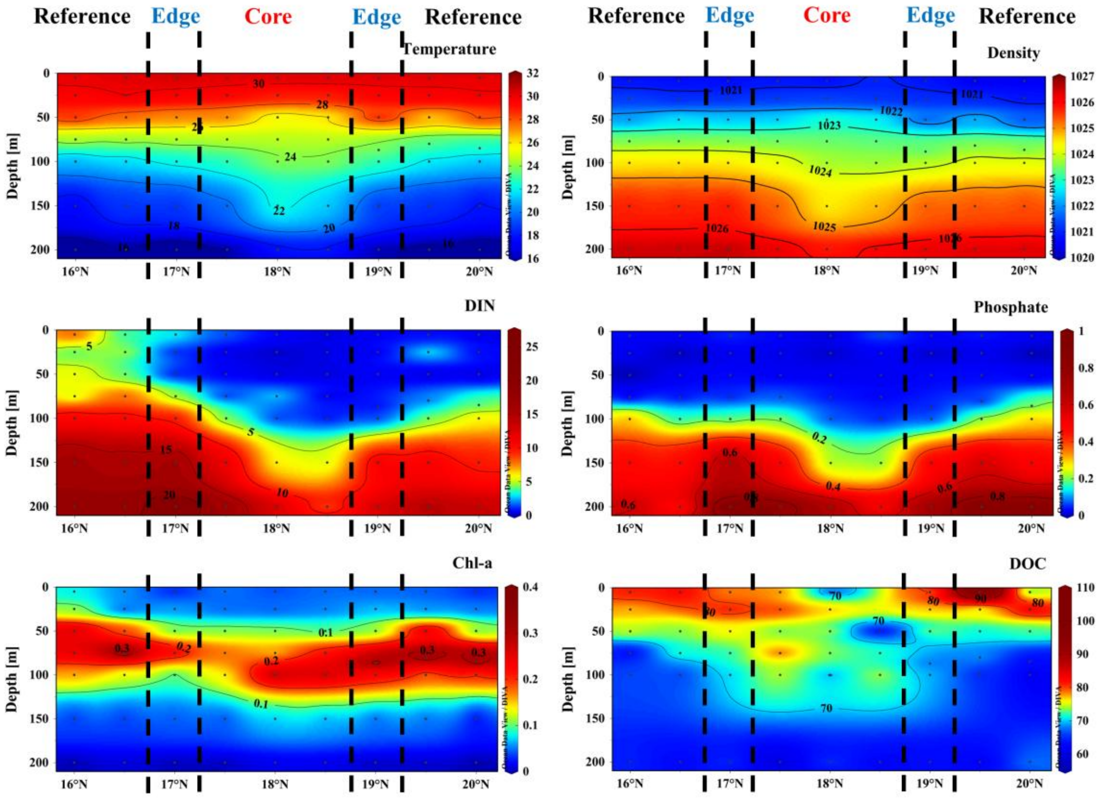

Figure S3. Sectional distributions of environmental parameters including temperature (°C), density (kg m^{-3}), dissolved inorganic nitrogen (DIN, μmol L^{-1}), phosphate (μmol L^{-1}), Chl-*a* (μg L^{-1}), and dissolved organic carbon (DOC, μmol L^{-1}) along transect C. Figure credits: Schlitzer, Reiner, Ocean Data View, https://odv.awi.de/, 2026 (last access: 19 May 2026).

Table S1. Detection limit and precision of the analytical method for NMHCs in seawater.

Species	Detection limit (pmol L^{-1})	Precision (%)
Ethane	1.0	6%
Propane	0.7	4%
i-Butane	0.5	3%
n-Butane	0.5	3%
Ethene	0.7	4%
Propene	0.5	3%
i-Butene	1.0	6%
Isoprene	0.5	3%

Table S2. SLA and the results from K-means cluster analysis for stations.

Station	SLA (cm)	K-means Cluster
A1	12.15	reference site
A4	17.84	reference site
A5	15.08	reference site
A7	16.90	reference site
A8	27.85	eddy edge
A9	35.05	eddy core
B5	25.10	eddy edge
B6	24.16	eddy edge
B7	22.03	eddy edge
B9	10.75	reference site
C1	14.40	reference site
C2	18.79	reference site
C3	28.06	eddy edge
C4	36.71	eddy core
C5	38.08	eddy core
C6	31.89	eddy core
C7	24.33	eddy edge
C8	19.64	reference site
C9	15.75	reference site
D1	16.37	reference site
D2	14.95	reference site
E2	17.06	reference site
E4	18.44	reference site
E5	27.70	eddy edge
F2	22.28	eddy edge
F3	17.46	reference site
F5	37.37	eddy core
G3	20.22	reference site
G4	27.34	eddy edge
H2	19.53	reference site
H3	24.86	eddy edge
H4	32.03	eddy core
LX1	18.21	reference site
LX2	25.27	eddy edge
Z3	30.16	eddy edge
Z7	40.40	eddy core

Table S3. The average values of temperature (°C), salinity, concentrations of DOC (μmol L^{-1}), nutrients (μmol L^{-1}), Chl-*a* (μg L^{-1}), and NMHCs (pmol L^{-1}) in the surface seawater at different regions.

Parameters	AE	Reference Sites
Temperature	30.54 ± 0.12	30.14 ± 0.27
Salinity	33.95 ± 0.06	33.80 ± 0.12
Chl-*a*	0.04 ± 0.01	0.07 ± 0.02
DOC	77.3 ± 8.0	80.5 ± 8.9
DIN	0.26 ± 0.09	0.25 ± 0.20
Phosphate	0.03 ± 0.02	0.03 ± 0.01
Ethane	10.0 ± 10.6	30.1 ± 8.2
Propane	10.9 ± 5.6	29.5 ± 12.9
i-Butane	7.5 ± 5.4	20.5 ± 11.3
n-Butane	13.6 ± 7.9	41.3 ± 19.0
Ethene	95.3 ± 66.2	146 ± 40.6
Propene	39.5 ± 23.5	51.1 ± 16.3
i-Butene	51.4 ± 18.2	78.8 ± 32.5
Isoprene	19.8 ± 8.2	35.9 ± 12.7

Table S4. Sea-to-air fluxes of NMHCs (nmol m^{-2} d^{-1}) in different studies.

Region	Ethane	Propane	i-Butane	n-Butane	Ethene	Propene	Isoprene	Reference
South China Sea	29.0 ± 29.9	26.4 ± 33.0	18.2 ± 23.0	35.0 ± 44.0	145 ± 136	48.4 ± 45.0	27.9 ± 24.1	This study
Yellow Sea and East China Sea	44.6 ± 35.0	41.5 ± 39.9	31.7 ± 38.2	10.9 ± 25.4	321 ± 294	56.1 ± 55.2	112 ± 134	Wang et al., 2024
Yellow Sea and East China Sea	31.7 ± 27.8	29.7 ± 25.1	18.5 ± 16.4	15.9 ± 19.1	240 ± 258	67.9 ± 74.5	52.4 ± 82.3	Wu et al., 2021
East China Sea (spring)	132 ± 126	123 ± 128	–	–	658 ± 591	93.4 ± 89.0	120 ± 98.6	Qiao et al., 2023
East China Sea (autumn)	31.1 ± 25.9	36.5 ± 40.5	–	–	352 ± 212	71.2 ± 43.9	78.6 ± 64.8	Qiao et al., 2023
Marginal seas of China	–	–	–	–	529	383	111	Li et al., 2021
Western Pacific Ocean	6.6	12.4	–	–	74.7	24.1	43.4	Li et al., 2019
Northwest Pacific Ocean	–	–	–	–	–	–	38.9 ± 13.9	Wang et al., 2023
Northwest Pacific Ocean	28.0 ± 38.9	21.0 ± 26.7	12.7 ± 15.9	14.2 ± 16.8	65.2 ± 73.3	48.7 ± 62.6	41.7 ± 80.4	Wu et al., 2023

"–" indicates no data.