



Supplement of

Diel variability affects the inorganic carbon system in the sea-surface microlayer and influences air-sea CO₂ flux estimates

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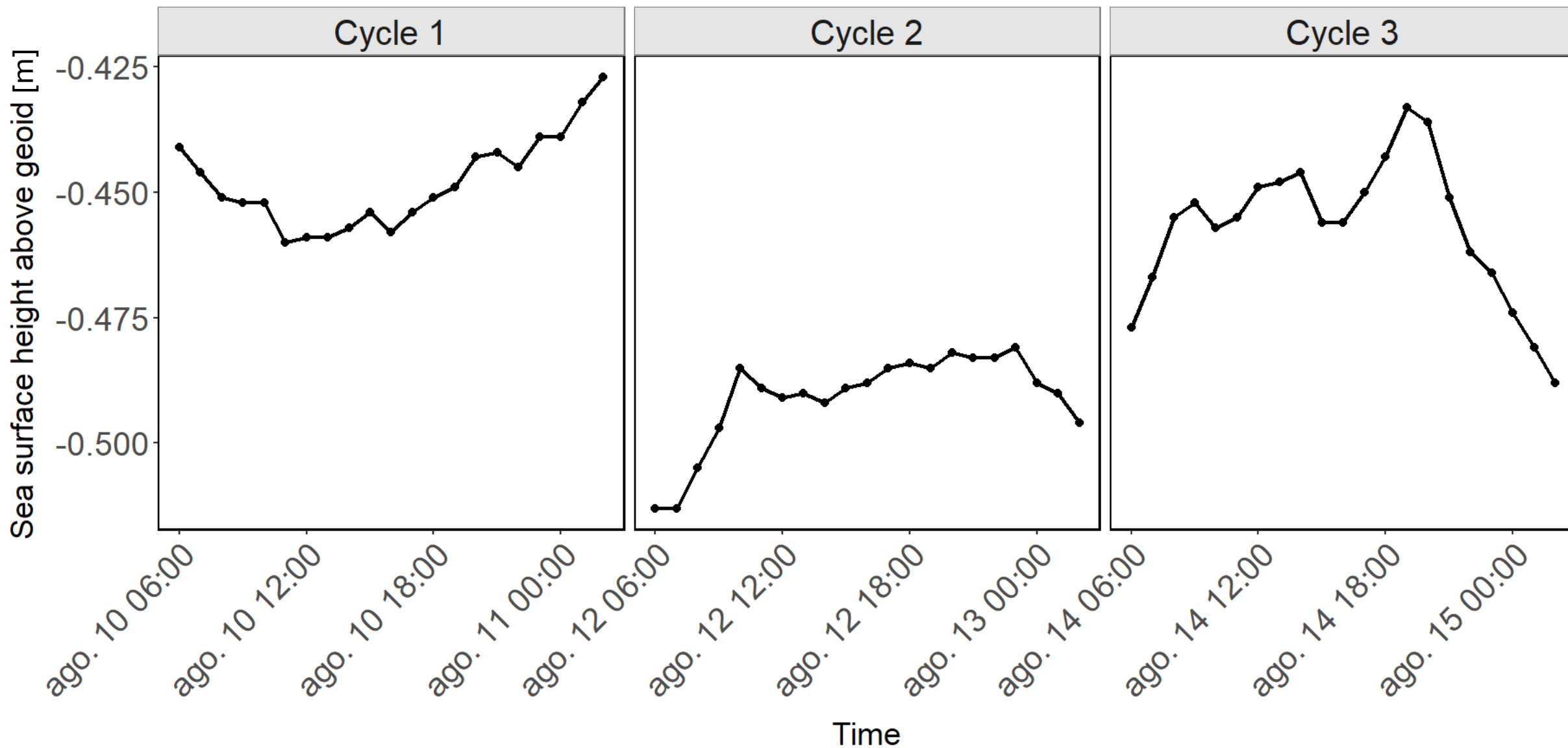
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Table S 1. Summary of the Kruskal–Wallis test statistics comparing temperature, salinity, and pH between SML and ULW. (n = sample size; χ^2 = chi-square statistic (df = 1)).

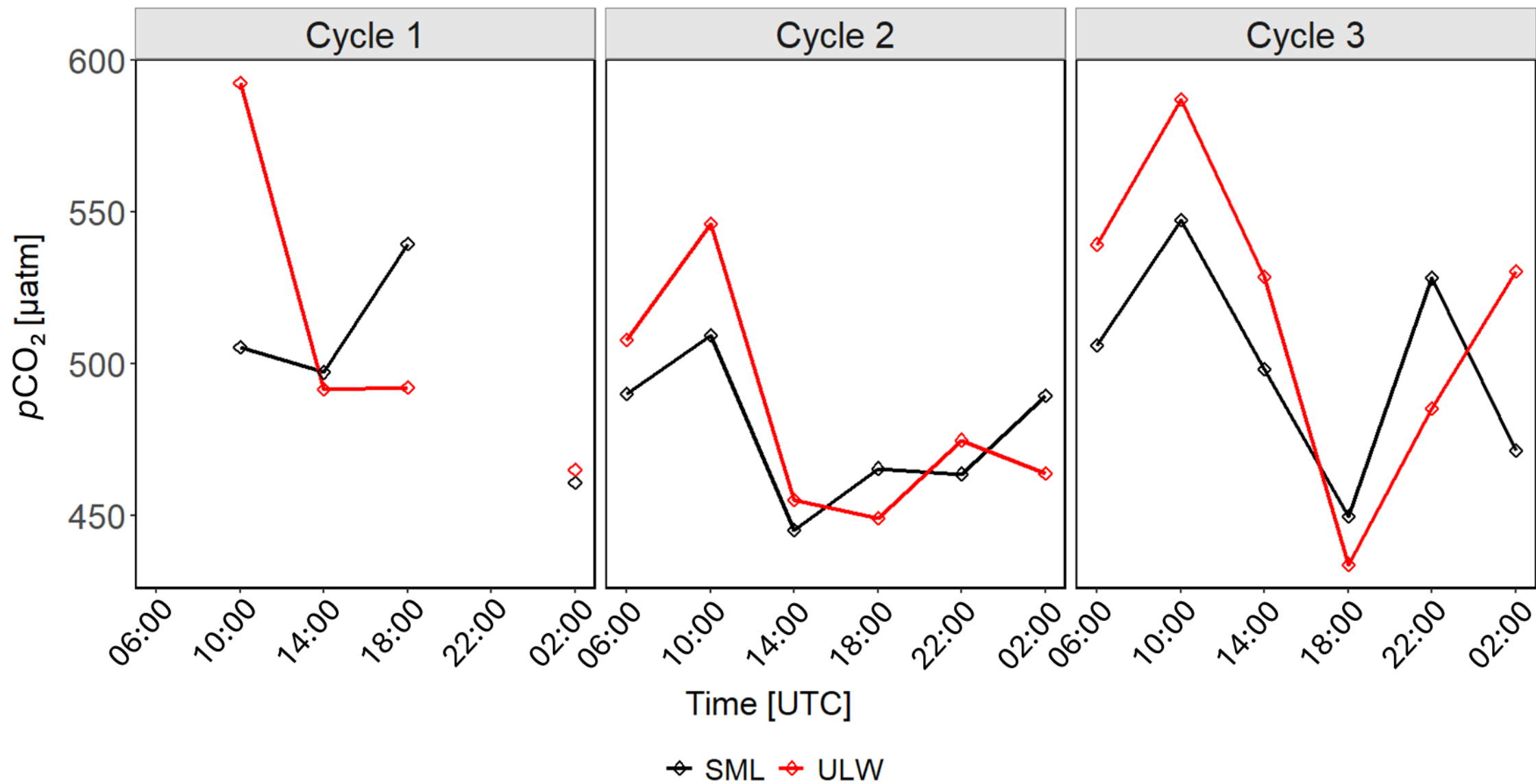
	Cycle	n	χ^2	p-value
Temperature	Cycle 1	638	1.3	0.25
	Cycle 2	978	2.8	0.10
	Cycle 3	978	16.1	$2.12 \cdot 10^{-10}$
Salinity	Cycle 1	645	105.4	$<2.20 \cdot 10^{-16}$
	Cycle 2	996	109.5	$<2.20 \cdot 10^{-16}$
	Cycle 3	-	-	-
pH _{T25}	Cycle 1	630	28.9	$7.47 \cdot 10^{-8}$
	Cycle 2	977	36.6	$1.42 \cdot 10^{-9}$
	Cycle 3	326	2.9	0.08

Table S 2. Summary table with mean values, standard deviation, and n of temperature, salinity, pH_{T25}, and pCO₂ at SML and ULW for each cycle. In addition, the p-value of the statistical analysis performed when comparing day and night data at each depth is added.

		Temperature [°C]						Salinity [g kg ⁻¹]					
		SML			UWL			SML			UWL		
		Mean	n	pval	Mean	n	pval	Mean	n	pval	Mean	n	pval
Cycle 1	Day	25.66 ± 0.30	177	1.46 · 10 ⁻⁵³	25.47 ± 0.36	177	1.27 · 10 ⁻⁵³	38.73 ± 0.14	606	3.40 · 10 ⁻²⁰	38.94 ± 0.24	606	3.36 · 10 ⁻⁴⁵
	Night	24.08 ± 0.43	142		24.18 ± 0.26	142		39.12 ± 0.35	426		39.41 ± 0.21	426	
Cycle 2	Day	25.80 ± 0.48	312	5.47 · 10 ⁻⁵³	25.93 ± 0.55	310	1.36 · 10 ⁻⁶¹	39.18 ± 0.28	972	1.49 · 10 ⁻⁴	39.34 ± 0.24	972	1.52 · 10 ⁻³
	Night	24.83 ± 0.26	180		24.57 ± 0.42	176		39.26 ± 0.19	559		39.41 ± 0.37	559	
Cycle 3	Day	26.69 ± 0.82	365	5.91 · 10 ⁻³⁹	26.77 ± 0.78	349	6.93 · 10 ⁻²¹	NA	NA	NA	38.95 ± 0.29	370	0.77
	Night	24.80 ± 0.94	132		26.14 ± 0.18	132		NA	NA		38.93 ± 0.26	133	
		pH _{T25}						pCO ₂ [µatm]					
		SML			UWL			SML			UWL		
		Mean	n	pval	Mean	n	pval	Mean	n	pval	Mean	n	pval
Cycle 1	Day	8.037 ± 0.026	175	4.11 · 10 ⁻⁴	8.042 ± 0.020	189	2.69 · 10 ⁻⁴³	514 ± 18	3	0.18	525 ± 47	3	0.18
	Night	8.031 ± 0.009	140		7.993 ± 0.026	142		416	1		465	1	
Cycle 2	Day	8.025 ± 0.022	324	7.01 · 10 ⁻¹²	8.014 ± 0.030	321	0.01	478 ± 24	4	0.64	490 ± 40	4	1
	Night	8.012 ± 0.014	184		8.011 ± 0.006	180		477	2		469	2	
Cycle 3	Day	8.032 ± 0.029	141	6.87 · 10 ⁻¹⁹	8.020 ± 0.035	129	0.75	500 ± 35	4	1	522 ± 56	4	0.64
	Night	7.987 ± 0.014	53		8.013 ± 0.020	53		500	2		508	2	



Figures S1. Sea surface height above geoid (m) during the three sampling cycles, obtained from the Copernicus Marine Service reanalysis product MEDSEA_MULTIYEAR_PHY_006_004 (<https://data.marine.copernicus.eu/>, last accessed 15 November 2025).



Figures S2. Time series of $p\text{CO}_2$ in the SML and ULW across the three diel cycles.