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Supplement of

Effect of wind speed on the size distribution of gel particles in the sea surface microlayer: insights from a wind–wave channel experiment

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1 **Supplementary Material**

2 **Manipulations during the experiment:**

3 During the experiment, a series of manipulations was conducted. To stimulate phytoplankton
4 growth, artificial illuminators were switched on from day 9 to day 16 and from day 20 to day
5 26, with a 12 Light: 12 Dark regime. On 14 November (day 12), nutrients were added to the
6 concentrations of $14.7 \mu\text{mol L}^{-1}$ for nitrate (NO_3), of $9.5 \mu\text{mol L}^{-1}$ for silicate (SiO_4) and of
7 $0.48 \mu\text{mol L}^{-1}$ for phosphate (PO_4). In order to induce phytoplankton growth and exudation,
8 ~1L of a culture of coccolithophore algae (*Emiliana huxleyi*, $4.6 \times 10^5 \text{ cells ml}^{-1}$) was added
9 to the tank on day 20. In addition, 6L of water enriched with organic matter, sampled from
10 surface microlayer during previous phytoplankton mesocosm experiment, was added to the
11 tank on day 21, and had been stored frozen at -20° for about 6 months until the addition.

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13 **TEP and CSP developments in bulk and microlayer surface**

14 For SML samples, figure 2 corresponded to the average gels concentration of all wind speeds
15 conditions on each one experiment day. Sampling of SML was done at the end of each one
16 wind speed condition. Bulk water was also sampled at the end of each one wind speed
17 condition excepted for day 2 and day 4. On day 2 and day 4, bulk samples were collected at
18 the first wind speed condition (morning) and the end wind speed condition (evening).
19 Compared to the significant changes of gel concentration in SML with wind speed, the gel
20 concentration changes with wind speed in bulk water were smaller (data not shown). Therefore,
21 the average of gel concentration in bulk was less sensitive to wind speed changes.

22 The developments of TEP and CSP abundance in the bulk water and SML are shown in
23 Figure S1. Abundance and total area of TEP_{SML} declined until the addition of the *E. huxleyi*

1 seed culture and of pre-collected biogenic SML on day 20. The bulk water had lower TEP
2 abundance and total area. Abundance of TEP_{Bulk} increased from the initial $79.3 \pm 0.9 \times 10^6 L^{-1}$
3 on day 2 until the peak on day 22 (Fig. S1 A). Total area of TEP_{Bulk} was $3.8 \pm 0.1 \times 10^2 mm^2 L^{-1}$
4 initially and increased to the maximum value of $14.2 \pm 1.0 \times 10^2 mm^2 L^{-1}$ on day 15 (Fig S1 B).
5 Similar to TEP_{SML} , CSP_{SML} abundance and total area showed two peaks at start and end of
6 Aeolotron experiment (Fig.2 C, D). The lowest CSP_{SML} abundance was observed on day 9.
7 Total area of CSP_{SML} dropped from an initial $20.5 \pm 2.7 \times 10^2 mm^2 L^{-1}$ to $6.39 \pm 0.4 \times$
8 $10^2 mm^2 L^{-1}$ on day 15 (Fig.S1 D). CSP_{Bulk} concentration started with $12.9 \pm 10.7 \times 10^6 L^{-1}$ in
9 abundance and $0.5 \pm 0.04 \times 10^2 mm^2 L^{-1}$ in total area on day 2, respectively, increased to the
10 first peak on day 9 for abundance, and then declined (Fig.S1 C, D). Although the
11 concentrations of CSP_{Bulk} were lower than in the SML, the peaks of CSP abundance and total
12 area in both SML and bulk water occurred on day 24 corresponding to increasing *Chla*
13 concentration in the bulk water. Generally, abundance and total area in the bulk and SML
14 were less for CSP than for TEP.

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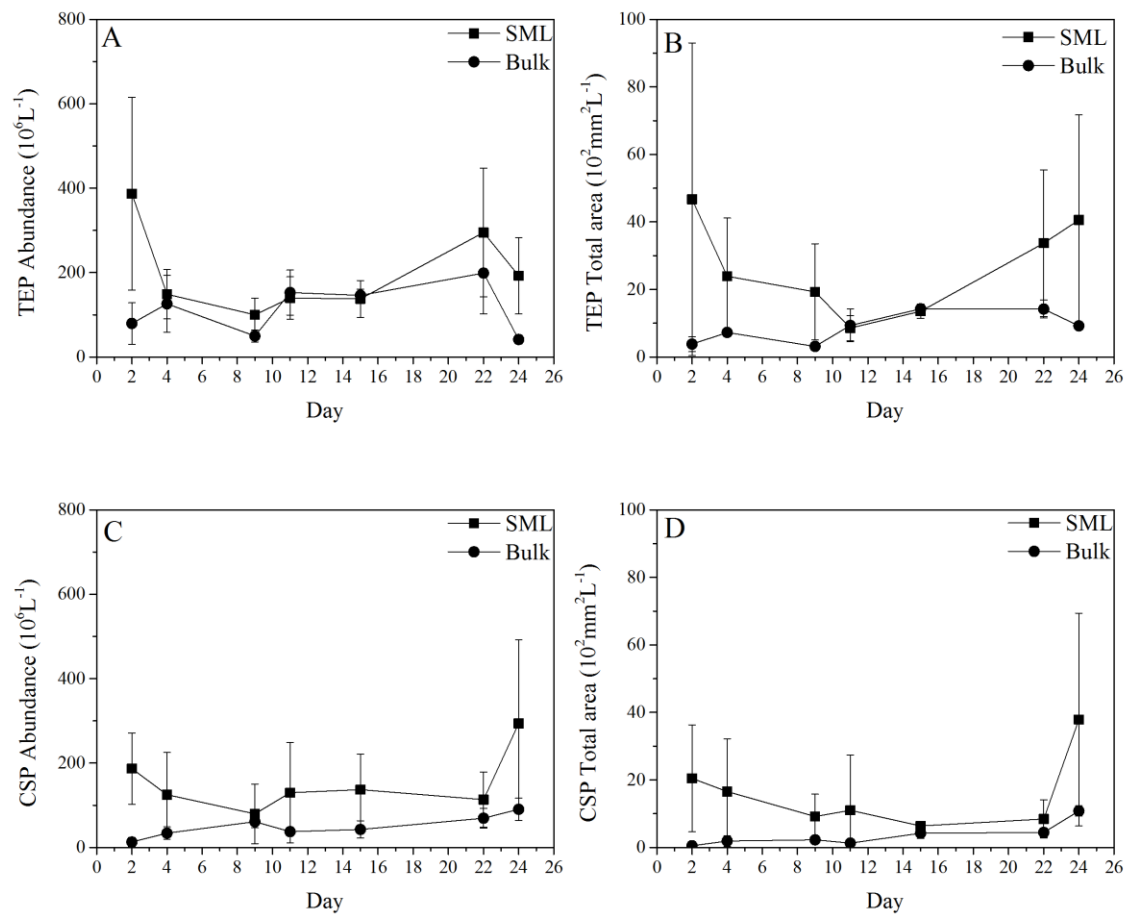
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Table S1: The size of distribution of gel particles (2-16 μ m) in the SML.

Day	Wind speed	TEP			CSP		
		$k(L^{-1})$	δ	R^2	$k(L^{-1})$	δ	R^2
2	3.98	1.02E+09	-2.93	0.999	6.14E+08	-2.77	0.997
	5.38	1.31E+09	-2.69	0.984	3.87E+08	-2.80	0.983
	11.1	2.72E+09	-4.05	0.999	2.26E+08	-3.07	0.993
	17.9	2.18E+09	-3.86	0.998	9.78E+08	-3.35	0.995
4	2.09	2.95E+08	-2.31	0.999	2.42E+08	-2.63	0.965
	3.44	1.98E+08	-2.20	0.999	9.38E+08	-2.95	0.942
	4.31	1.51E+08	-2.17	0.999	4.15E+08	-2.75	0.991
	8.31	1.81E+09	-3.69	0.988	1.86E+08	-3.06	0.882
	14.2	6.64E+08	-3.47	0.995	3.44E+08	-3.35	0.946
9	1.54	1.93E+08	-2.03	0.994	2.92E+08	-2.59	0.999
	2.40	2.34E+08	-2.33	0.999	7.17E+07	-2.41	0.993
	4.07	1.14E+08	-2.12	0.998	8.41E+07	-2.45	0.995
	5.29	8.36E+07	-1.99	0.997	1.03E+08	-2.57	0.989
	11.1	2.66E+08	-3.11	0.999	1.19E+08	-3.46	0.998
11	3.93	4.74E+08	-3.88	0.994	5.58E+08	-2.63	0.994
	8.03	3.70E+08	-3.65	0.811	1.34E+09	-3.78	0.941
	14.0	2.64E+08	-3.41	0.820	2.59E+08	-3.06	0.962
	18.2	2.32E+08	-3.01	0.957	1.24E+08	-3.13	0.992
15	2.58	3.01E+08	-2.37	0.998	5.20E+08	-3.07	0.861
	4.99	1.82E+08	-2.18	0.996	1.30E+08	-2.63	0.971
	6.42	1.04E+08	-2.06	0.992	2.93E+08	-2.96	0.953
	11.1	2.49E+08	-2.20	0.994	4.32E+08	-3.09	0.980
	18.1	3.85E+08	-2.52	0.997	5.97E+08	-3.09	0.984
22	1.37	1.09E+08	-1.32	0.829	1.68E+08	-2.17	0.972
	4.53	3.17E+08	-1.74	0.965	3.07E+08	-2.17	0.971
	6.10	4.67E+08	-2.15	0.996	1.73E+08	-2.24	0.990
	11.3	3.38E+08	-2.41	0.997	8.95E+07	-2.36	0.994
	18.7	1.78E+08	-2.39	0.996	1.26E+08	-2.50	0.995
24	1.44	2.28E+08	-1.92	0.998	6.14E+08	-2.31	0.968
	2.65	4.43E+08	-2.11	0.940	1.83E+09	-2.58	0.994
	4.27	4.43E+08	-2.26	0.953	1.39E+09	-2.50	0.972
	5.38	3.89E+08	-2.33	0.924	1.29E+09	-2.60	0.985
	11.4	1.16E+08	-2.48	0.998	1.77E+08	-2.32	0.955
	18.1	1.56E+08	-2.68	0.999	2.04E+08	-2.35	0.932

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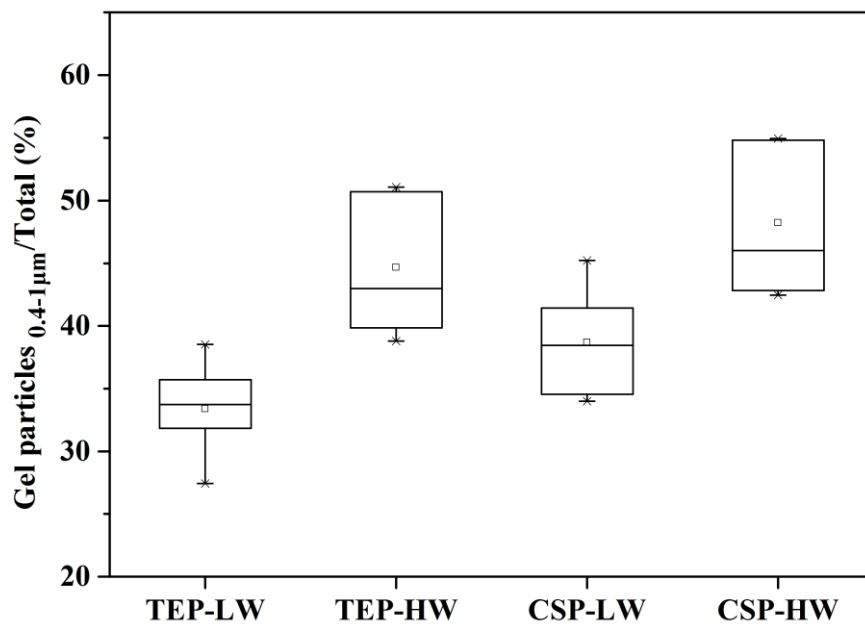
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3 Figure S1 A-D: Developments of TEP and CSP in the SML and the bulk water in the course
4 of the Aeolotron study; A) TEP abundance; B) TEP total area; C) CSP abundance; D) CSP

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total area, the error bars indicate ± 1 SD.

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2 Fig. S2: The abundance fractions of submicron particles (0.4-1μm) in the SML at low wind

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(LW, $<6\text{ms}^{-1}$) and high wind (HW, $>6\text{ms}^{-1}$).

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