Supporting Information for

The Sea Spray Chemistry and Particle Evolution Study (SeaSCAPE): Overview and Experimental Methods

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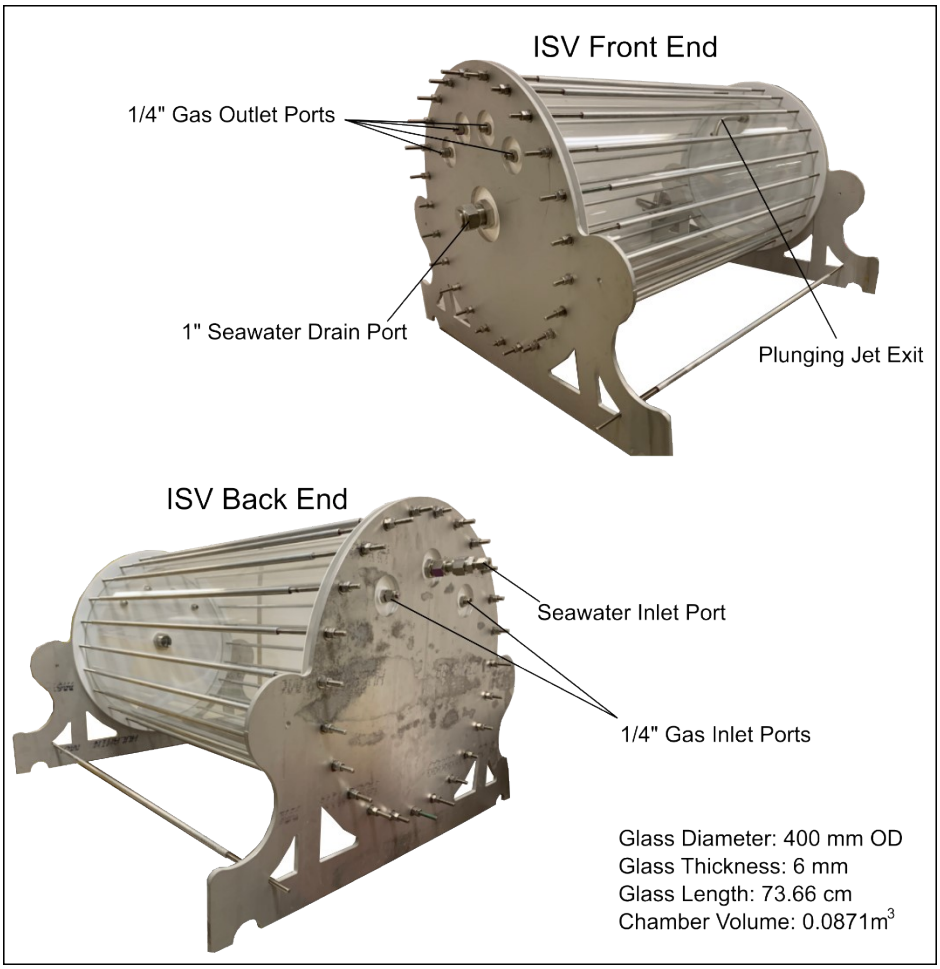

Figure S1. Photographs showing the design and dimensions of the isolate sampling vessel (ISV) used for gas-phase and OFR experiments during SeaSCAPE

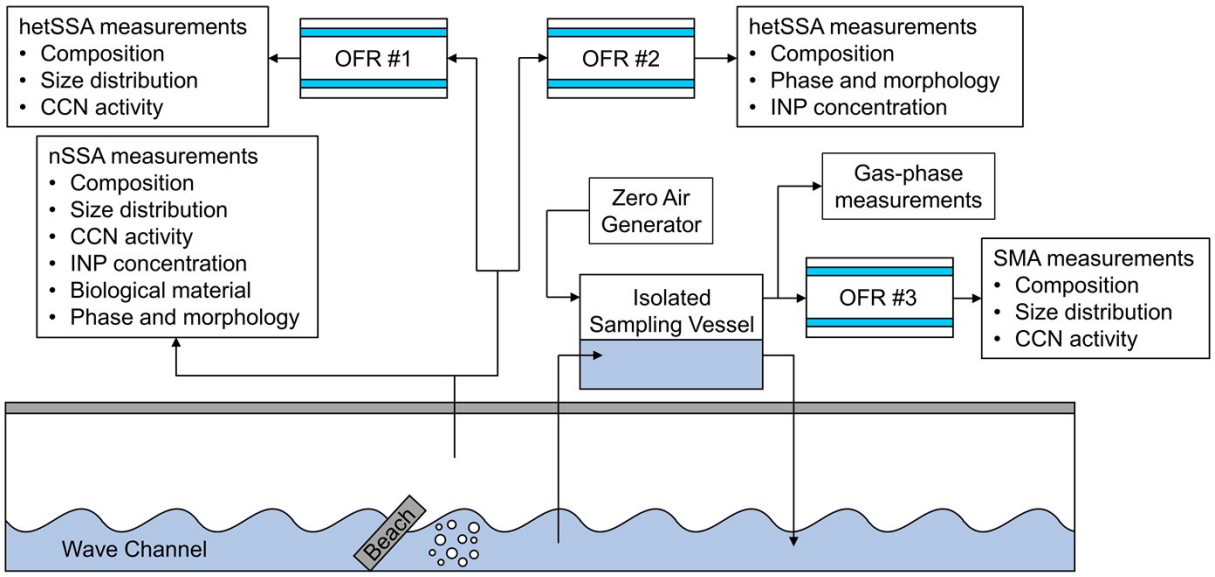

Figure S2. Schematic of the sampling lines used during SeaSCAPE, with selected measurements highlighted. A full inventory of measurements conducted during the campaign can be found in the main text (Tables 2-5). The heterogeneous SSA (hetSSA) measurements were conducted using OFR1 and OFR2. Secondary marine aerosol (SMA) measurements were conducted using headspace air from the isolated sampling vessel (ISV) and OFR3. Nascent SSA (nSSA) was measured directly from the wave channel headspace.

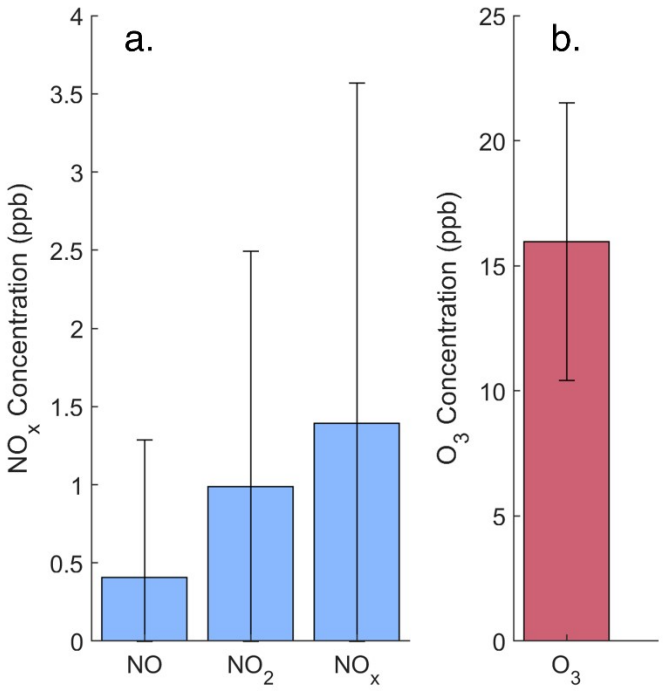

Figure S3. Average headspace concentrations of a) NO, NO_2, NO_x and b) O_3, measured from the upstream sampling port on the wave channel throughout the duration of the SeaSCAPE campaign. Error bars represent ± σ.

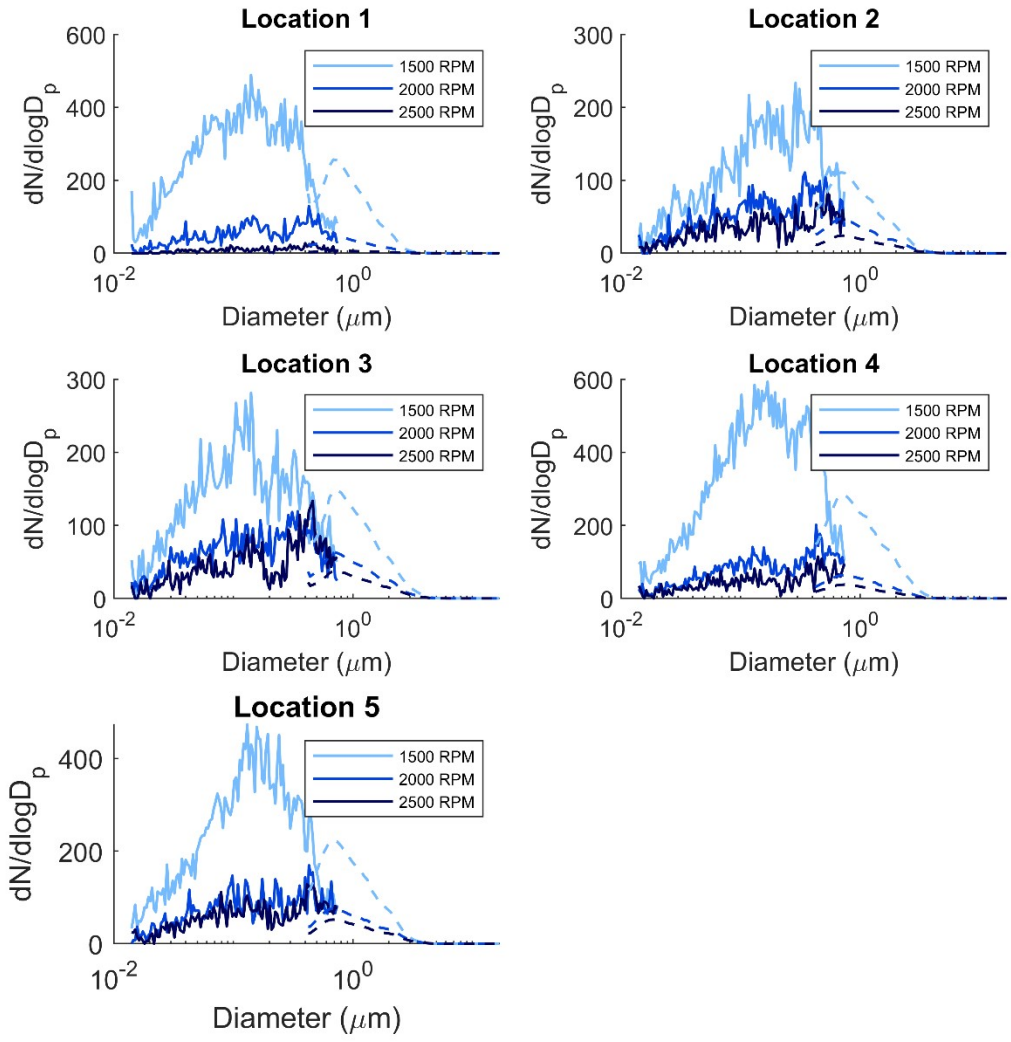

Figure S4. SSA size distributions from the different sampling port locations at different air handling fan speeds. SMPS data is represented by solid lines, whereas APS data is represented by dashed lines. The aerodynamic diameter measured by the APS is converted to physical diameter using an assumed particle density of 1.8 g·cm^{-3} and a shape factor of 1. The SMPS mobility diameter is assumed to be the same as the physical diameter. The port depth is fixed at 5 cm. The sampling port locations correspond to 0 cm, 60 cm, 120 cm, 180 cm, and 240 cm from the downstream end of the beach, respectively.

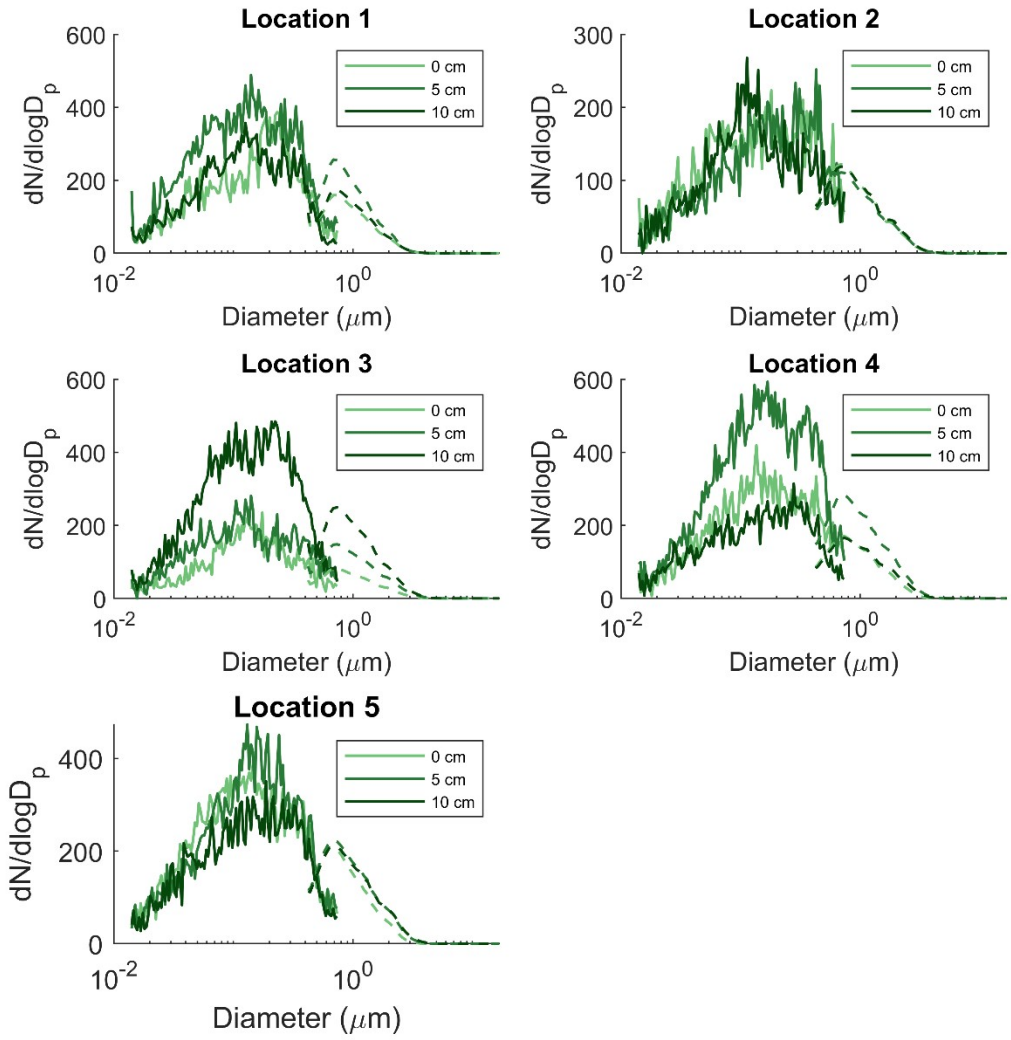

Figure S5. SSA size distributions from the different sampling port locations with different port depths. The fan speed is fixed at 1500 RPM. SMPS data is represented by solid lines, whereas APS data is represented by dashed lines. The aerodynamic diameter measured by the APS is converted to physical diameter using an assumed particle density of 1.8 g·cm^{-3} and a shape factor of 1. The SMPS mobility diameter is assumed to be the same as the physical diameter. The sampling port locations correspond to 0 cm, 60 cm, 120 cm, 180 cm, and 240 cm from the downstream end of the beach, respectively.

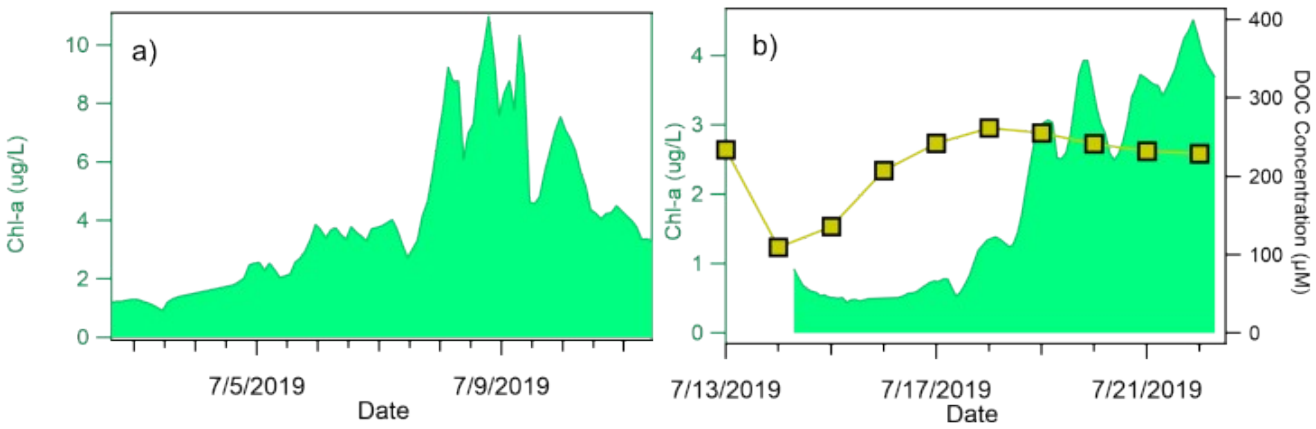

Figure S6. Time series of chl-a and DOC concentrations for a) Bloom 1 and b) Bloom 2.

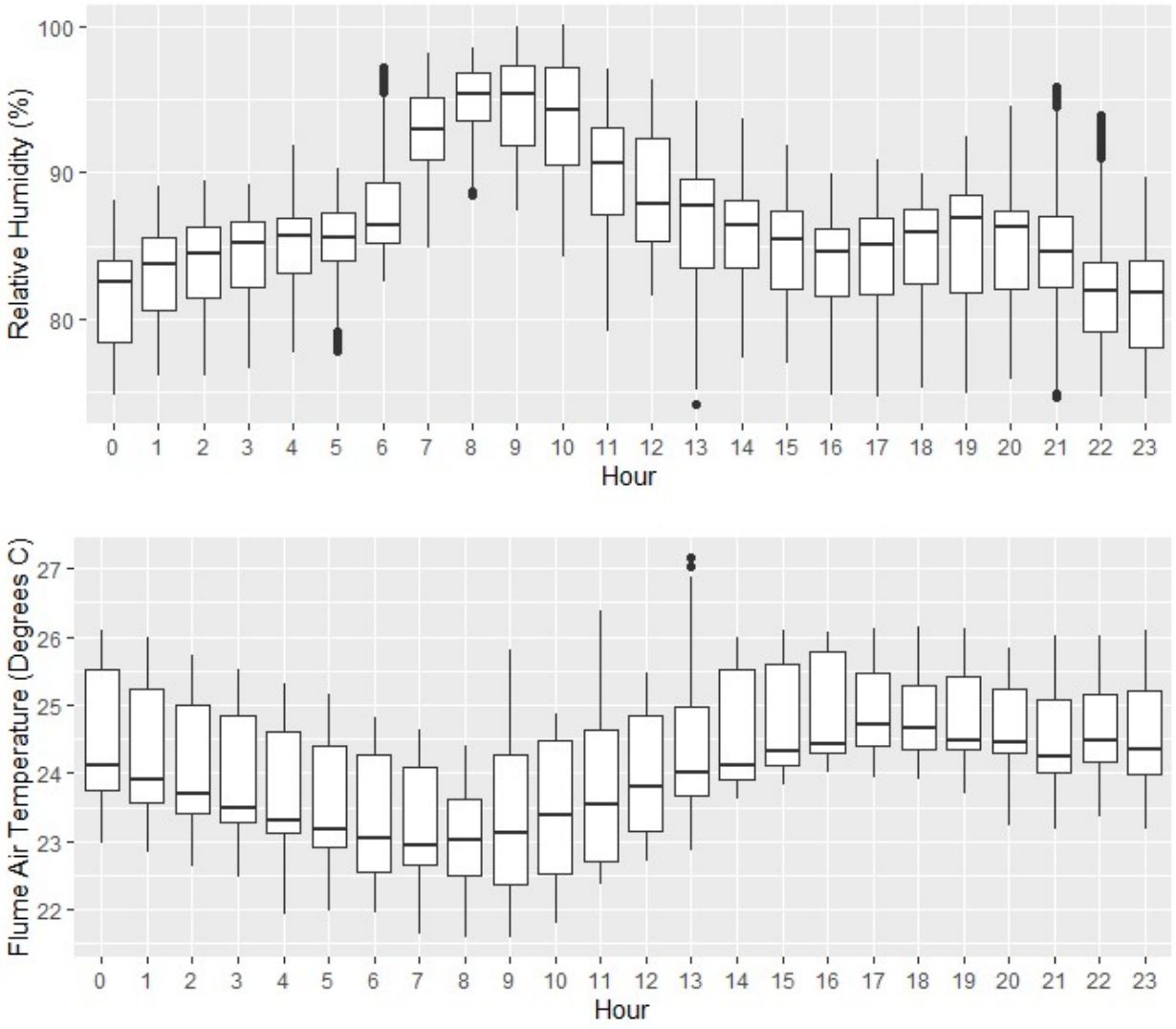

Figure S7. Diurnal variability of the a) relative humidity and b) air temperature in the waveflume headspace over time during Bloom 3 of SeaSCAPE.

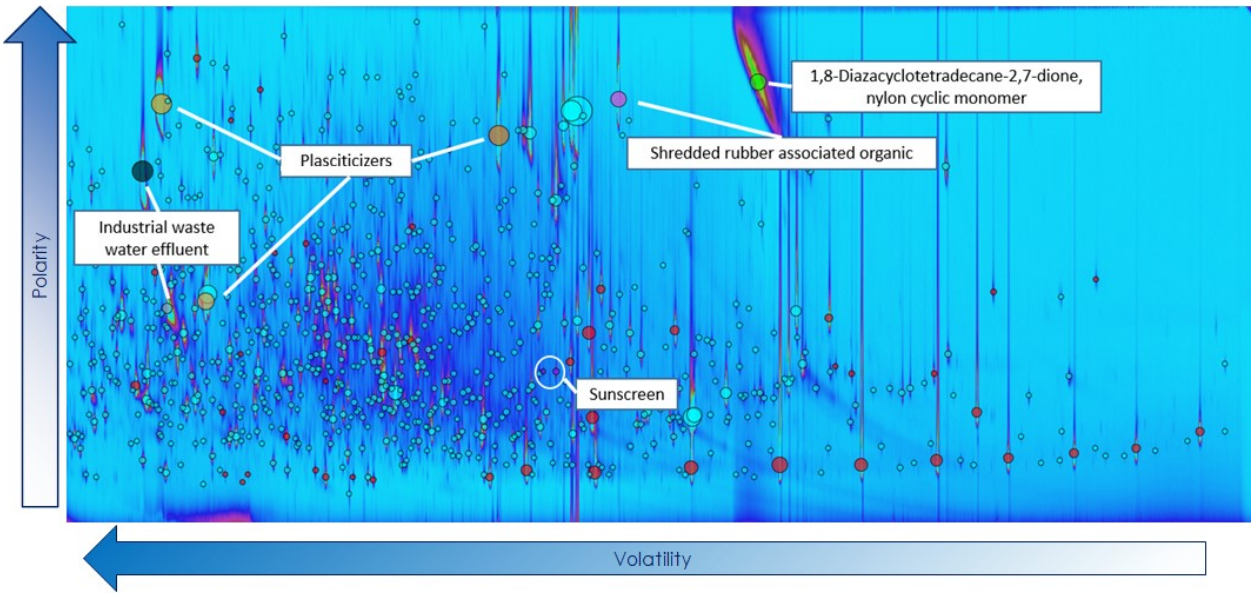

Figure S8. GCxGC spectrum of Scripps Pier mDOM prior to transport. Significant contributions of anthropogenic plasticizers, wastewater effluent products, and personal care products (identified by confident mass spectral match to NIST library complemented by literature review) highlighted.

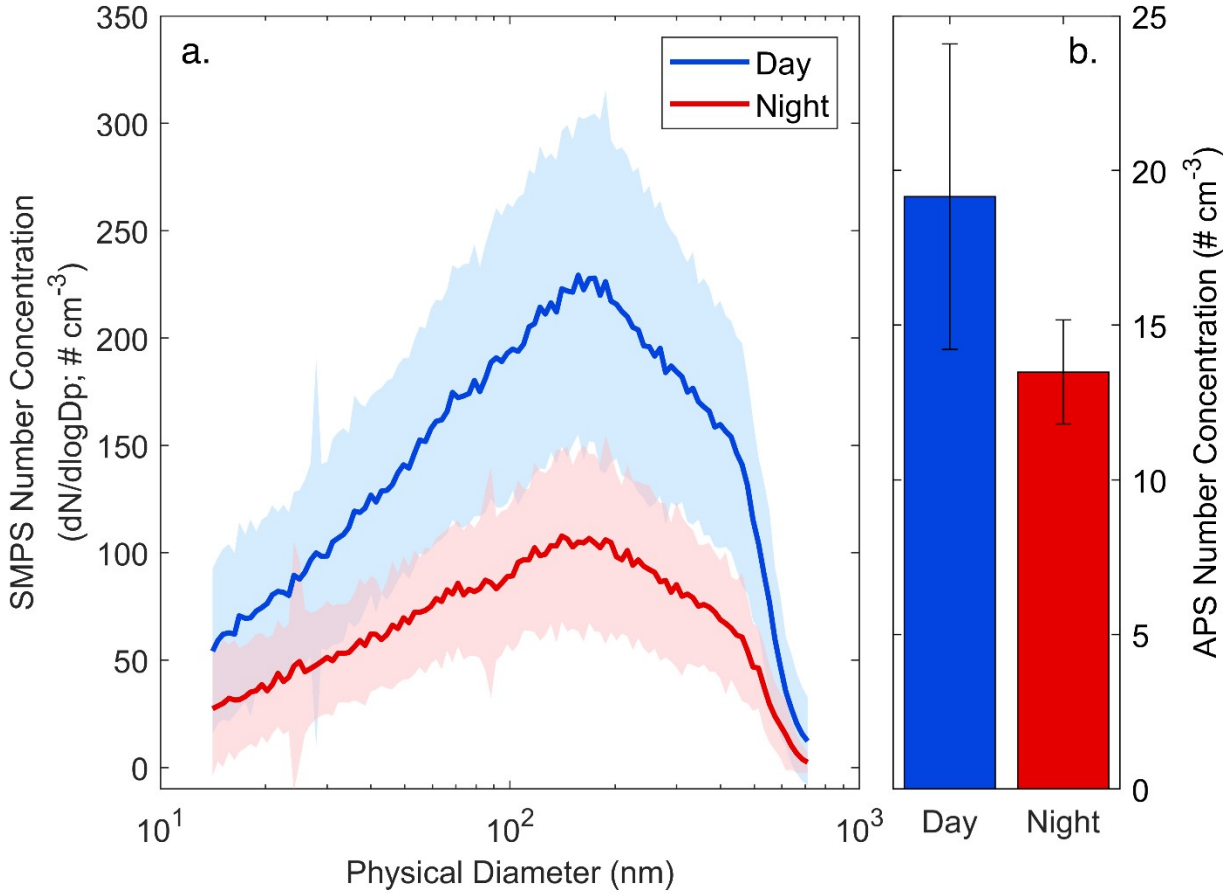

Figure S9. A) SMPS size distributions and B) APS total number concentrations (D_p = 0.6 – 10 μm) of nascent SSA from the day and night of a representative sampling period during Bloom 3 (8/7/2019). Shaded regions and error bars represent ± 1 σ. Day is defined as local time 07:00-21:59 PST and night is defined as 22:00-06:59 PST. While the number concentrations of SSA exhibit a strong diurnal change, the shape of the size distribution is relatively stable.

Trace Gas	Mean	Standard Deviation	Median
NO	0.41	0.88	0.25
NO_2	0.99	1.51	0.58
NO_x	1.39	2.18	0.88
O_3	15.97	5.55	15.56

Table S1. Mean, median, and standard deviations of trace gases monitored in the wave channel headspace. All values are in ppb.

	Temperature (ºC)	Relative Humidity (%)
Minimum	21.58	74.15
1st Quartile	23.41	82.77
Median	24.15	86.04
Mean	24.12	86.19
3rd Quartile	24.84	88.89
Maximum	27.18	100
Standard Deviation	1.03	5.22

Table S2. Statistics describing the distribution of air temperature and relative humidity in the waveflume headspace during the SeaSCAPE campaign.