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Supplement of

Partitioning of ionic surfactants in aerosol droplets containing glutaric acid, sodium chloride, or sea salts

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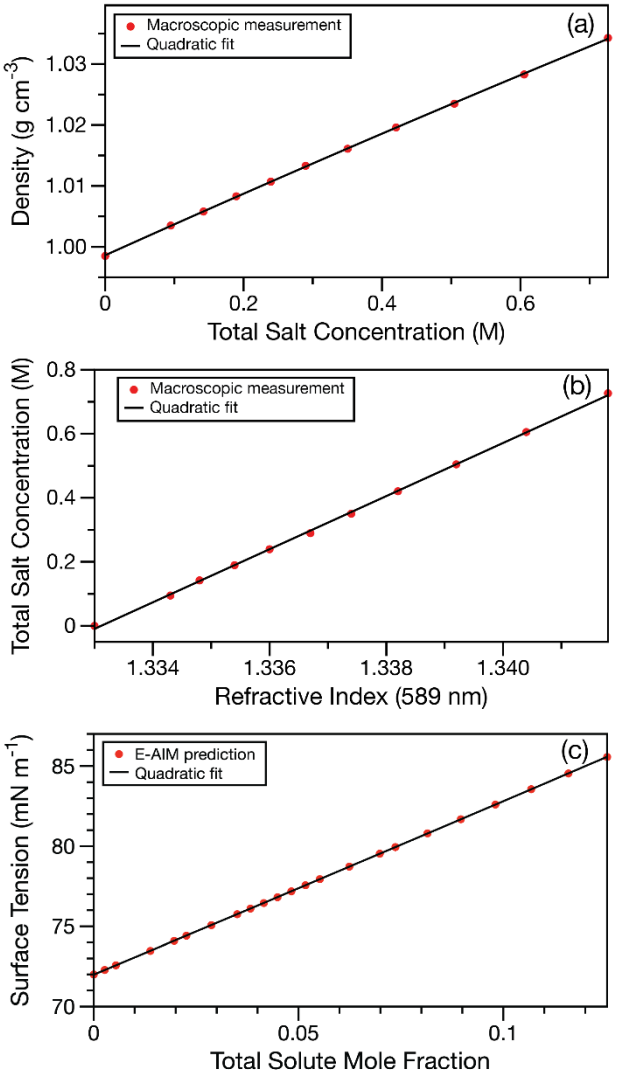

Figure S1: Physical properties of sea spray mimic solutions. (a) Measured density of aqueous sea spray solutions. Total salt concentration on the x-axis is the total moles of salt in sea spray per litre of solution. (b) Measured refractive index at 589 nm of aqueous sea spray solutions. (c) E-AIM prediction (Dutcher et al., 2010; E-AIM online model) for surface tension of aqueous sea spray solutions. Fit parameters are in Table S1. Total salt concentration on the x-axis of panel (a) and y-axis of panel (b) is the total moles of salt in sea spray per litre of solution.

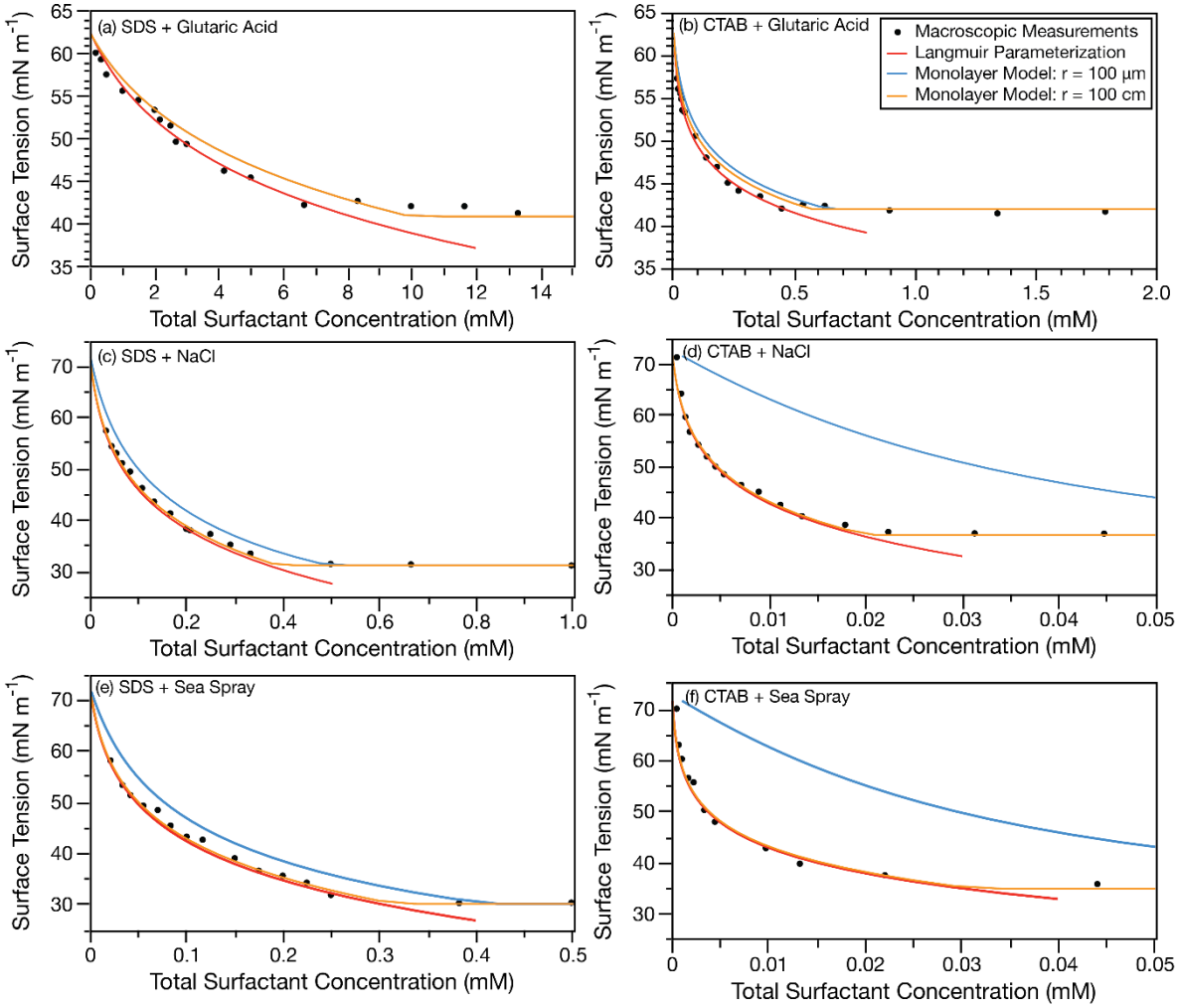

Figure S2: Macroscopic surface tension data (black points) for SDS and CTAB surfactants with glutaric acid, NaCl, and sea spray cosolutes with parameterizations using Table 1 parameters (red lines) and Monolayer Model predictions for 100 μm (blue lines) and 100 cm (orange lines) radius droplets. In panel (a), for SDS + GA, the 100 μm and 100 cm predictions are identical. In panels (d) and (f), strong bulk depletion is predicted by the Monolayer Model for droplet radii of 100 μm, but as the droplet radius is further increased to 100 cm, bulk depletion becomes minimal and the Monolayer Model predictions agree well with the macroscopic data and the Langmuir parameterization. Note the different x- and y-axis ranges are selected to best show the experimental data and difference in model lines for each system, which have CMCs spanning nearly two orders of magnitude and cover different ranges in surface tension depending on the cosolute.

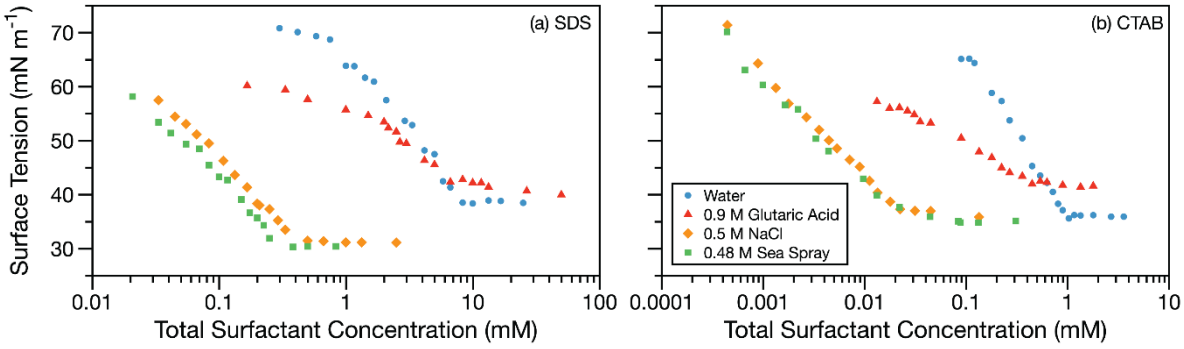

Figure S3: Macroscopic surface tension data for (a) SDS and (b) CTAB in binary aqueous solution (blue circles) and in complex mixtures with glutaric acid (red triangles), NaCl (orange diamonds), and sea spray mimic (green squares).

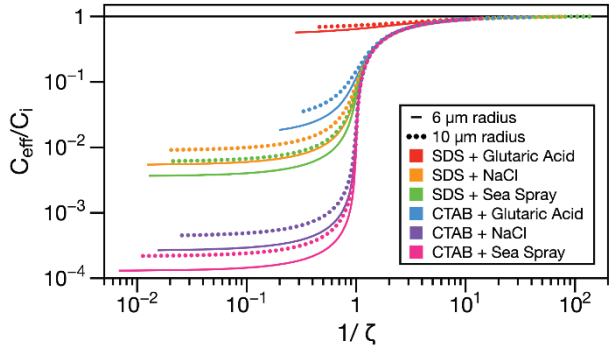

Figure S4: Normalized surfactant effective bulk concentration as a function of the total possible mass lost to the interface for ionic surfactant-cosolute systems for experimentally-measured radii and total surfactant concentrations. The black horizonal line indicates the effective bulk concentration is equal to the bulk concentration (i.e. no bulk depletion is predicted by the Simple Kinetic Model).

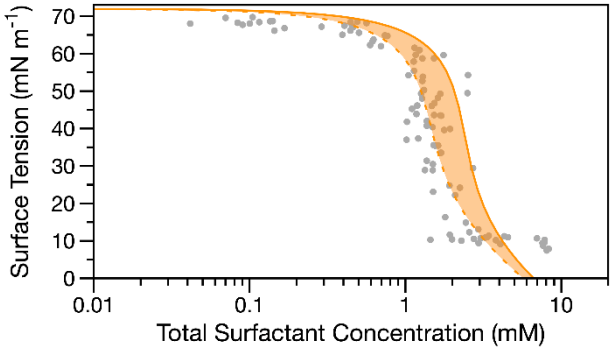

Figure S5: SDS and sea spray experimental data (grey points) and Simple Kinetic Model Predictions for 6 µm (solid line) and 10 µm (dashed line) radius droplet. The model output has not been constrained by the minimum surface tension determined from macroscopic measurements.

Table S1: Parameterizations for aqueous sea spray.

	Parameterizations for sea spray cosolute	R^2
Total salt concentration (M) (RI = refractive index at 589 nm)	$82.92\text{RI} - 110.54$	0.9995
Density (g cm^{-3}) (x = total salt concentration, M)	$0.0031x^2 + 0.0511x + 0.9986$	0.9999
Surface tension (mN m^{-1}) (x_{salt} = total salt mole fraction)	$9.56x_{salt}^2 + 107.24x_{salt} + 71.99$	1.0000

Table S2: Physical parameters for solutes and surfactants used in this study.

	Density (g cm^{-3})	Surface tension (mN m^{-1})			Molecular mass (g mol^{-1})
		Glutaric acid	NaCl	Sea spray	
NaCl[a]	1.9772		169.45		58.4428
Glutaric acid[b]	1.4149	37.26			132.115
Sea spray[c]	1.2116		188.79		69.66
Water	0.9983[d]		72.0		18.0153
SDS	0.9985[e]	41.1[f]	31.3[f]	30.4[f]	288.372
CTAB	0.9996[e]	41.9[f]	36.8[f]	35.2[f]	364.45

[a] Janz (1980)

[b] Gaman et al. (2004)

[c] Dutcher et al. (2010) & E-AIM online model

[d] Wolk and Strey (2001)

[e] measured for a binary aqueous surfactant solution with surfactant concentration greater than the critical micelle concentration.

[f] determined from the surface tension plateau in macroscopic surface tension measurements.

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