Supplement of

Atmospheric Organosulfate Formation Regulated by Continental Outflows and Marine Emissions over East Asian Marginal Seas

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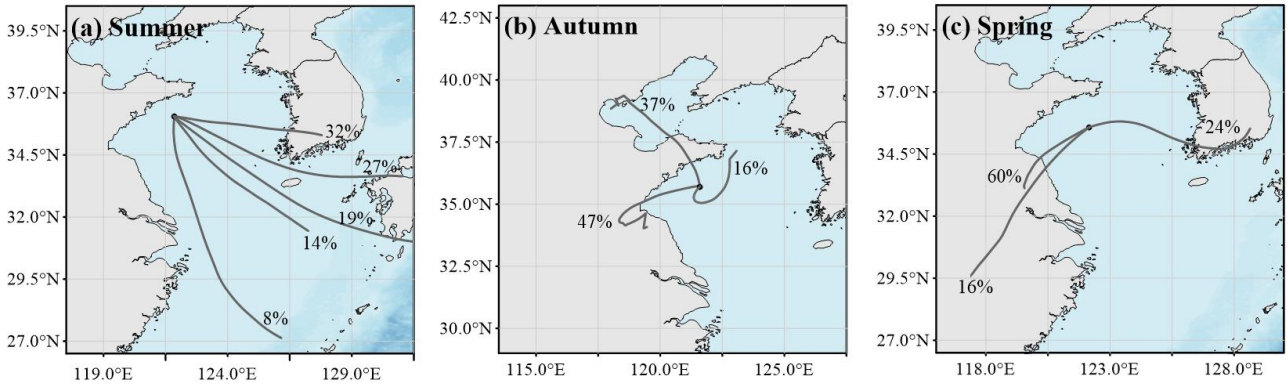

Figure S1 The 72h back trajectories of air masses over the YBS during the observation in (a) summer (15 July–26 July), (b) autumn (21 Oct.–2 Nov.), and (c) spring (14 April–25 April). Trajectories at the center site of the observation region were calculated during each cruise: 36.1°N, 122. 0°E for the summer 2021 and spring 2022 cruises, and 35.7°N, 121.7°E for the autumn 2021 cruise.

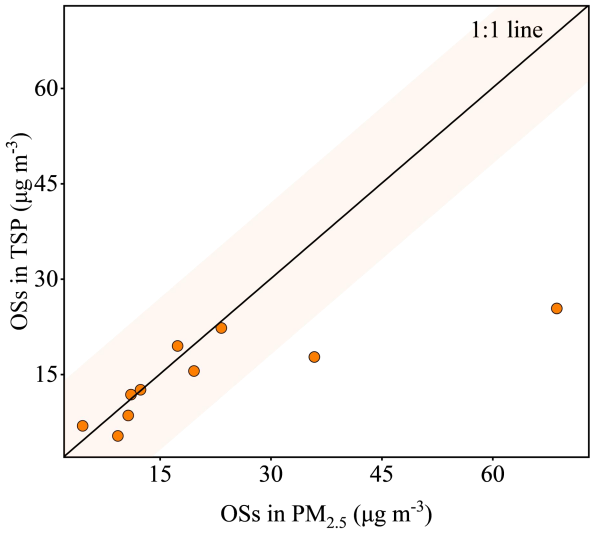

Figure S2 Comparison of OSs mass concentrations in the $PM_{2.5}$ and the TSP samples during the autumn cruise over YBS.

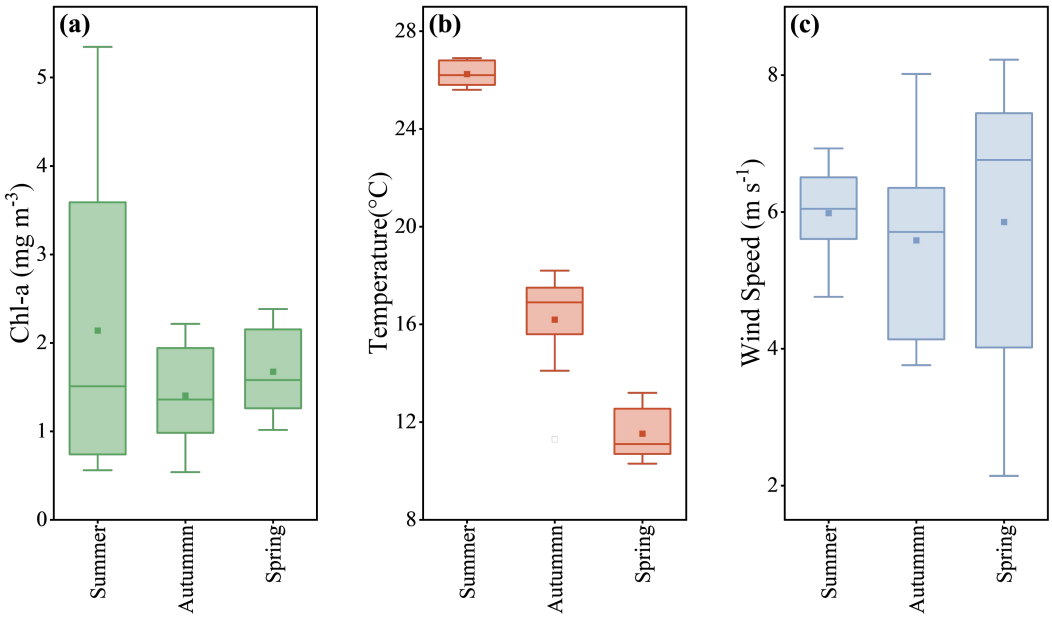

Figure S3 Seasonal variations of (a) *Chl-a*, (b) temperature, and (c) wind speed during the observations. The markers represent the mean values and the boxes represent the ranges of 25th−50th−75th percentiles.

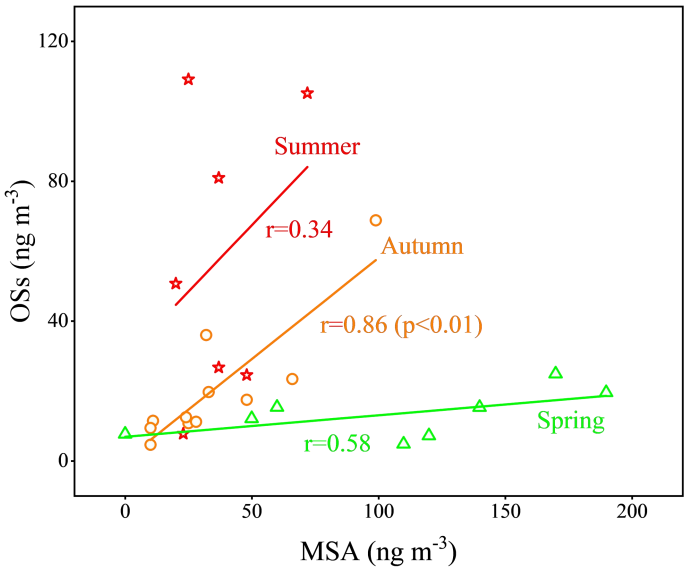

Figure S4 Correlations of OSs and MSA in marine aerosols in summer (red), autumn (yellow), and spring (green).

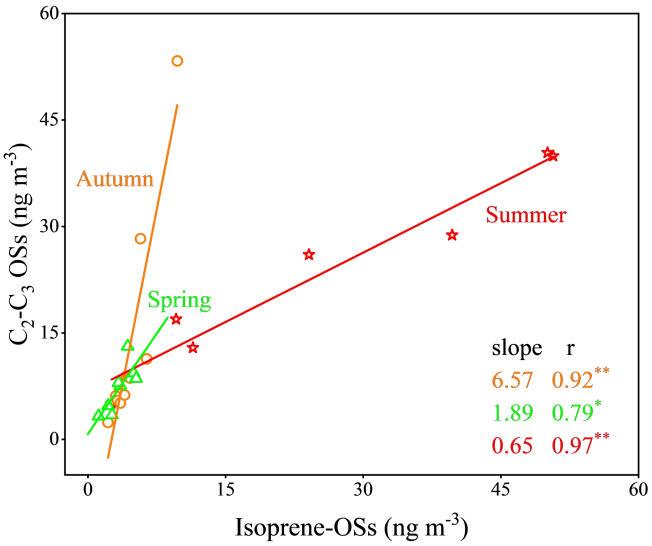

Figure S5 Correlations of C_2–C_3 OSs and isoprene-OSs in marine aerosols over the YBS during summer (red), autumn (yellow), and spring (green). The values listed in the panel are the curve slopes (mass ratios) of C_2–C_3 OSs versus isoprene-OSs and their correlation coefficients (* p<=0.05, ** p<=0.01).

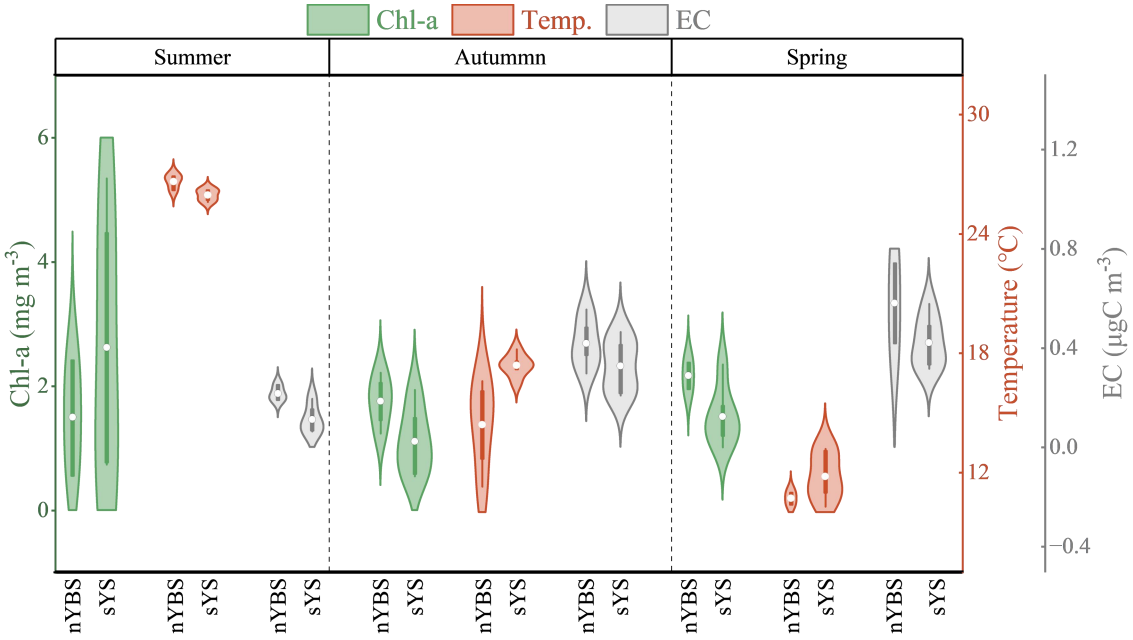

Figure S6 Comparison of chlorophyll-a (*Chl-a*) in surface seawater, air temperature, and particulate EC concentrations over the nYBS and sYS during the summer, autumn, and spring cruises.

Table S1 Atmospheric OSs and NOSs quantified in this study and their concentrations during each cruise over the YBS.

Common name	Formula	$[M-H]^-$	Standard	Concentrations (ng/m³)		
				Summer (n=7)	Autumn (n=11)	Spring (n=8)
Hydroxyacetone sulfate (HAS)	$C_3H_5O_5S^-$	152.99	HAS	2.13±1.25	1.28±0.39	0.98±0.28
Glycolic acid sulfate (GAS)	$C_2H_3O_6S^-$	154.97	GAS	20.69±10.41	10.01±13.43	5.05±2.72
Lactic acid sulfate (LAS)	$C_3H_5O_6S^-$	168.98	LAS	1.40±0.83	1.54±0.77	1.12±0.38
ΣC_2-C_3 OSs				24.22±12.44	12.84±14.38	7.15±3.13
Methacrylic acid epoxide (MAE)-OS	$C_4H_7O_7S^-$	198.99	LAS	2.33±1.66	1.06±0.42	0.46±0.24
Isoprene-OS (m/z 211)	$C_5H_7O_7S^-$	210.99	LAS	11.15±7.44	2.71±1.35	2.19±0.92
Isoprene epoxydiol (IEPOX)-OS	$C_5H_{11}O_7S^-$	215.02	LAS	10.64±7.63	0.49±0.19	0.52±0.17
Isoprene NOSs	$C_5H_{10}NO_9S^-$	260.01	LAS	2.82±2.09	0.31±0.16	0.29±0.16
ΣIsoprene OSs/NOSs				26.94±2.09	4.57±2.01	3.46±1.31
Monoterpene OSs	$C_{10}H_{17}O_5S^-$	249.08	α-Pinene OS β-Pinene OS limonene OS	0.02±0.02	0.03±0.01	0.02±0.01
	$C_9H_{15}O_6S^-$	251.06	limonaketone OS	0.96±0.99	0.49±0.35	0.26±0.12
Monoterpene NOSs	$C_{10}H_{16}NO_7S^-$	294.06	α-Pinene NOS limonene NOS	5.45±6.39	2.24±2.48	2.18±3.18
	$C_9H_{14}NO_8S^-$	296.04	limonaketone NOS	0.20±0.21	0.22±0.19	0.19±0.16
ΣMonoterpene OSs/NOSs				6.63±7.60	2.98±2.74	2.65±3.39
Total quantified OSs/NOSs				57.79±38.93	20.39±19.73	13.25±8.34

Table S2 Principal Component Analysis of the measured compounds in marine aerosols over the YBS.

Compounds	PC1 (52%)	PC2 (21%)	PC3 (10%)
HAS	0.93	0.13	0.07
GAS	0.81	0.48	0.15
LAS	0.59	0.70	0.21
MAE-OS	0.96	0.10	-0.15
$C_5H_7O_7S^-$	0.97	-0.07	0.02
IEPOX-OS	0.96	-0.22	-0.02
Isoprene-NOS	0.96	-0.17	0.07
$C_{10}H_{17}O_5S^-$	0.42	0.38	-0.06
Limonaketone-OS	0.86	0.23	-0.03
$C_{10}H_{16}NO_7S^-$	0.69	-0.04	0.18
$C_9H_{14}NO_8S^-$	0.32	0.19	0.12
MSA	-0.11	0.08	**0.83**
EC	**-0.38**	**0.39**	**0.51**
nss-K^+	**-0.13**	**0.95**	0.01
NO_3^-	-0.06	**0.95**	0.15
nss-SO_4^{2-}	**0.95**	0.05	-0.11
Cl^-	**0.53**	0.45	**0.64**
Na^+	0.07	0.01	**0.87**