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Predicting secondary organic aerosol phase state and viscosity and its effect on multiphase chemistry in a regional-scale air quality model

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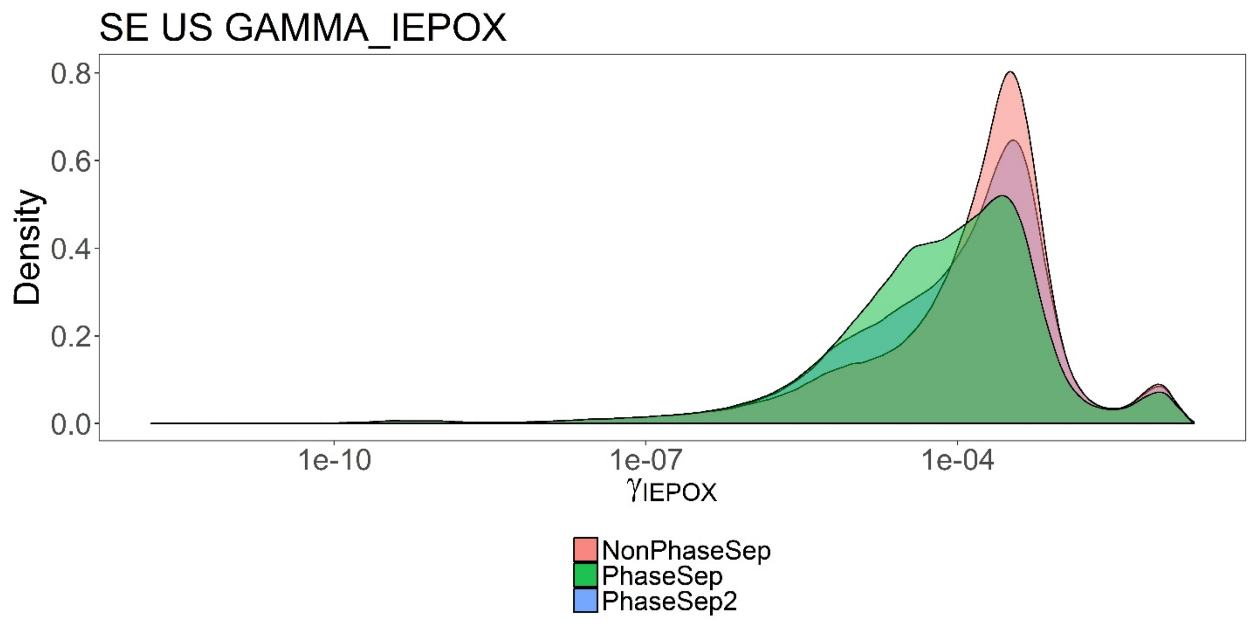

Figure S1 – For Southeastern United States, Probability distribution of γ_{IEPOX} at the surface level for the *NonPhaseSep* (red), *PhaseSep* (green) and *PhaseSep2* (blue) for SOAS 2013 simulation period.

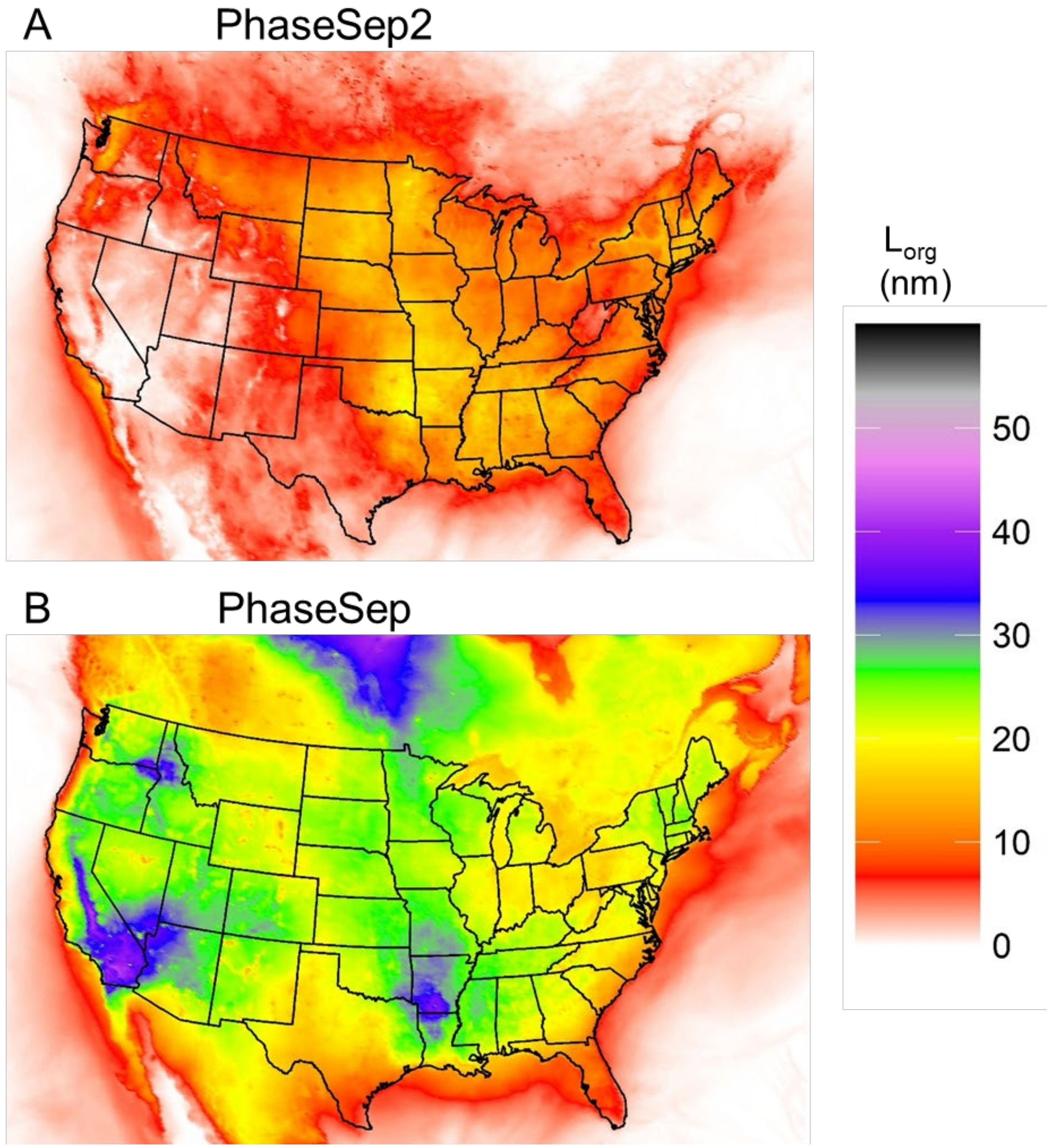

Figure S2 – Average organic coating thickness (l_{org} in nm) at the surface level for **(A)** *PhaseSep2* and **(B)** *PhaseSep* cases for SOAS 2013 simulation period.

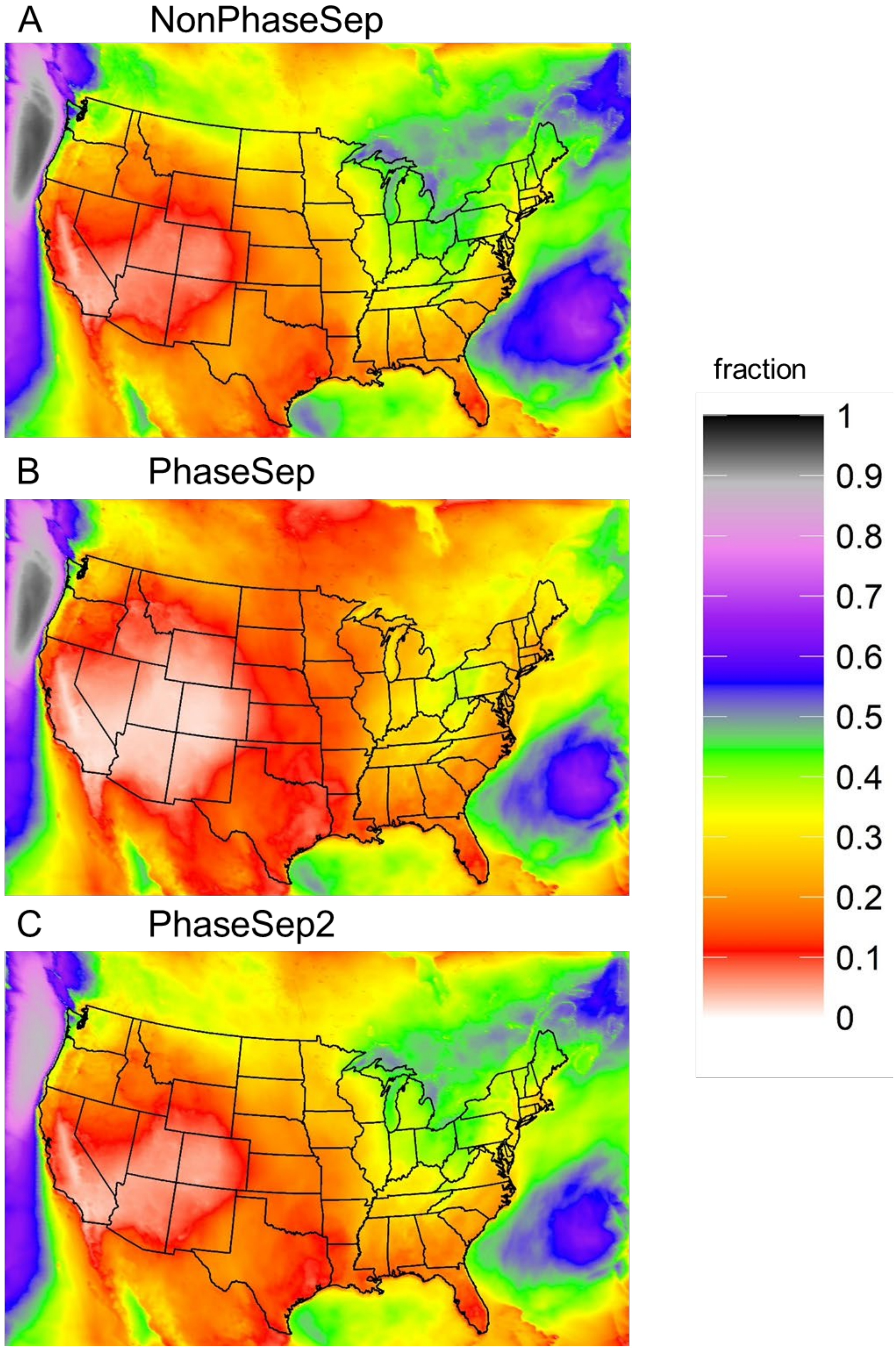
A
NonPhaseSep
B
PhaseSep
C
PhaseSep2
fraction
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

Figure S3 – Average fraction of IEPOX-derived SOA in biogenic SOA mass at the surface level for: **(A)** *NonPhaseSep*, **(B)** *PhaseSep* and **(C)** *PhaseSep2* case for SOAS 2013 simulation period.

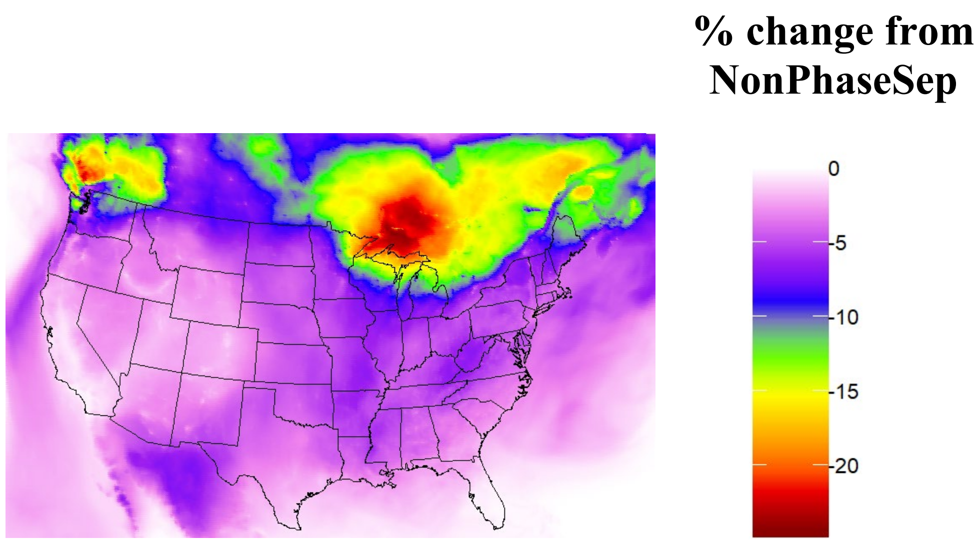

Figure S4 – Spatial map of the mean percent relative change of surface $PM_{2.5}$ organic carbon (OC) mass in *PhaseSep* case relative to the *NonPhaseSep* Simulation.

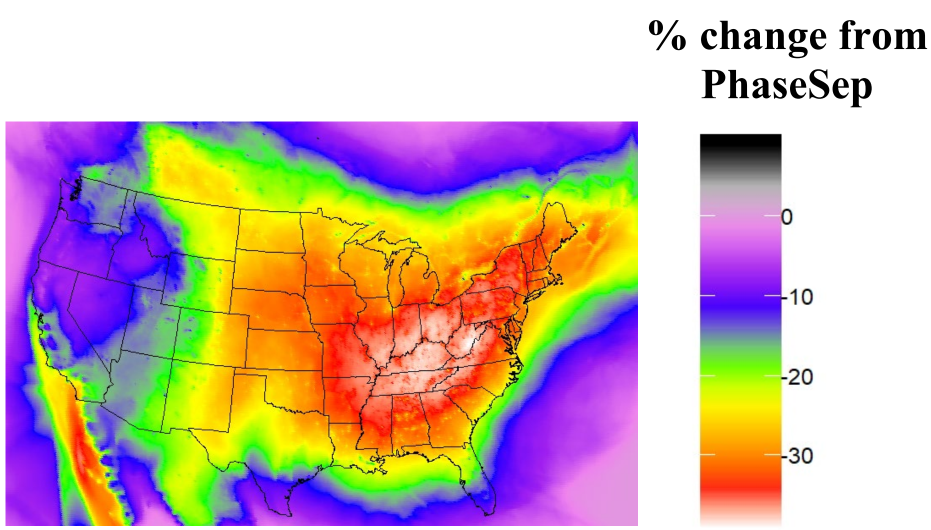

Figure S5 – Spatial map of the mean percent relative change of $PM_{2.5}$ sulfate mass at surface in *Emission Reduction* sensitivity case relative to the *PhaseSep* Simulation.

Table S1 – Comparison of different simulations on phase separation frequencies (for Continental US) and model performance in isoprene-abundant southeastern United States (rural Centreville, AL and urban Atlanta sites).

Parameter (units)		*PhaseSep*	*PhaseSep2*	*Emissions Reductions*	*HighHorg*
For Continental US	**LLPS Frequency** (%)	13.7	13.7	13.5	12.5
	SSPS Frequency (%)	54.8	29	57	55.8
NMB (%, compared to SEARCH $PM_{2.5}$ OC)	**Rural Centreville, AL forest site**	-36	-33	-44	-32
	Urban Jefferson Street, Atlanta site	-21	-18	-29	-18