

Improving Mobile Platform Gaussian-Derived Emission Estimates Using Hierarchical Sampling and Large Eddy Simulation

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Supplemental

Table S1. Summary of LES site conditions and parameters.

Characteristic	Site 1	Site 2	Site 3	Site 4	Site 5*
Sample Date	7/15/2015	7/21/2015	6/21/2016	6/23/2016	8/5/2016
Time (EDT)	18:15-20:15	7:00-9:15	9:45-10:30	20:00-20:30	16:15-20:00
Wind Speed (m s^{-1})	1.30 ± 0.64	1.30 ± 0.70	1.9 ± 2.2	0.62 ± 0.27	1.70 ± 0.89
Wind Direction	325 ± 101	252 ± 40	276 ± 50	40 ± 47	218 ± 28
Friction Velocity (m s^{-1})	0.26	0.29	0.48	0.18	0.10-0.21
Distance from Source (m)	176	154	29	49	110
Elevation gain (m)	3.5	1.5	2	2	2
Simulation Time (min)	59.2	33.33	33.33	33.33	30
Simulation Warm-up Time (min)	10	5	5	5	5
Simulation x-dimension (m) (x resolution)	288 (2)	256 (1)	256 (1)	256 (1)	256 (1)
Simulation y-dimension (m) (y resolution)	256 (2)	256 (1)	256 (1)	256 (1)	256 (1)
Simulation z-dimension (m) (z resolution)	100 (1)	100 (1)	100 (1)	100 (1)	33.33 (0.2222)

* Controlled release site.

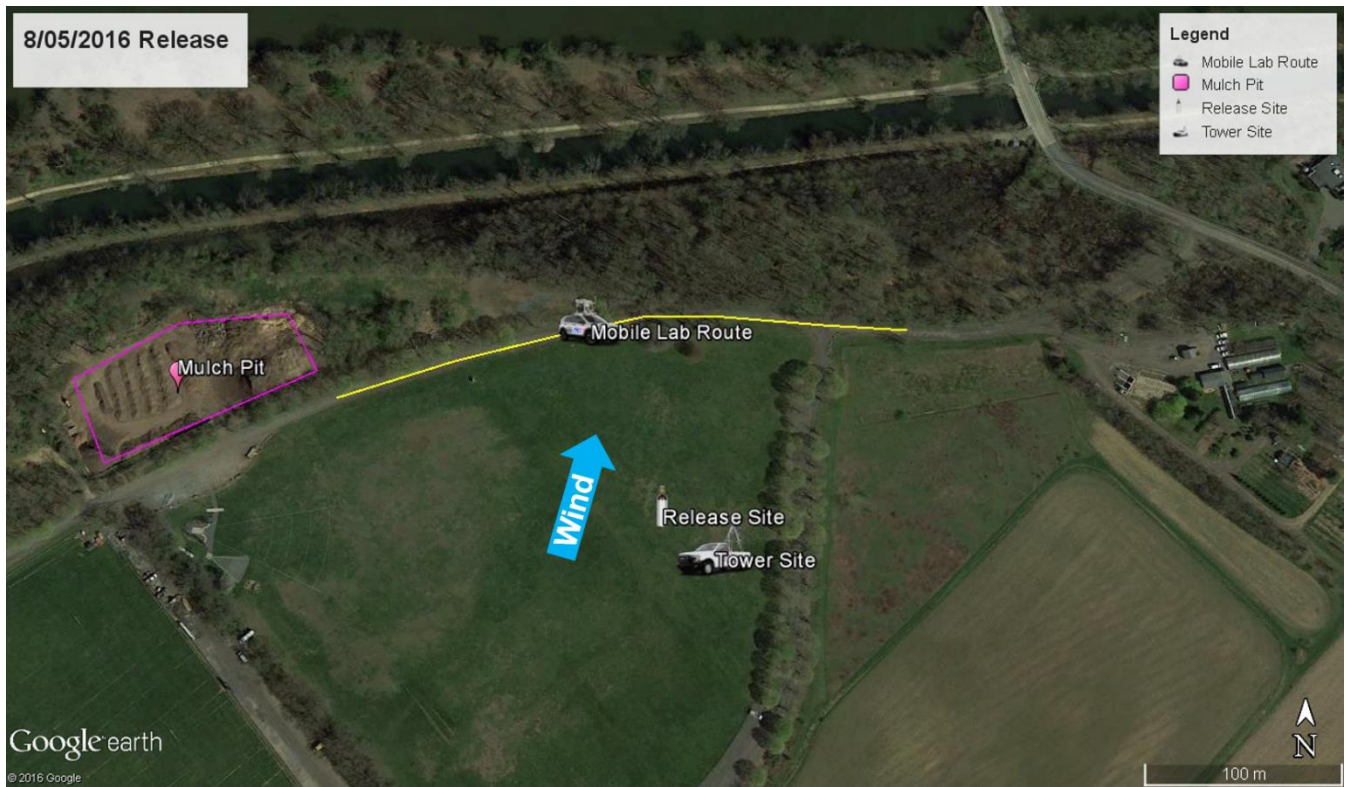


Figure S1. Controlled release site schematic.

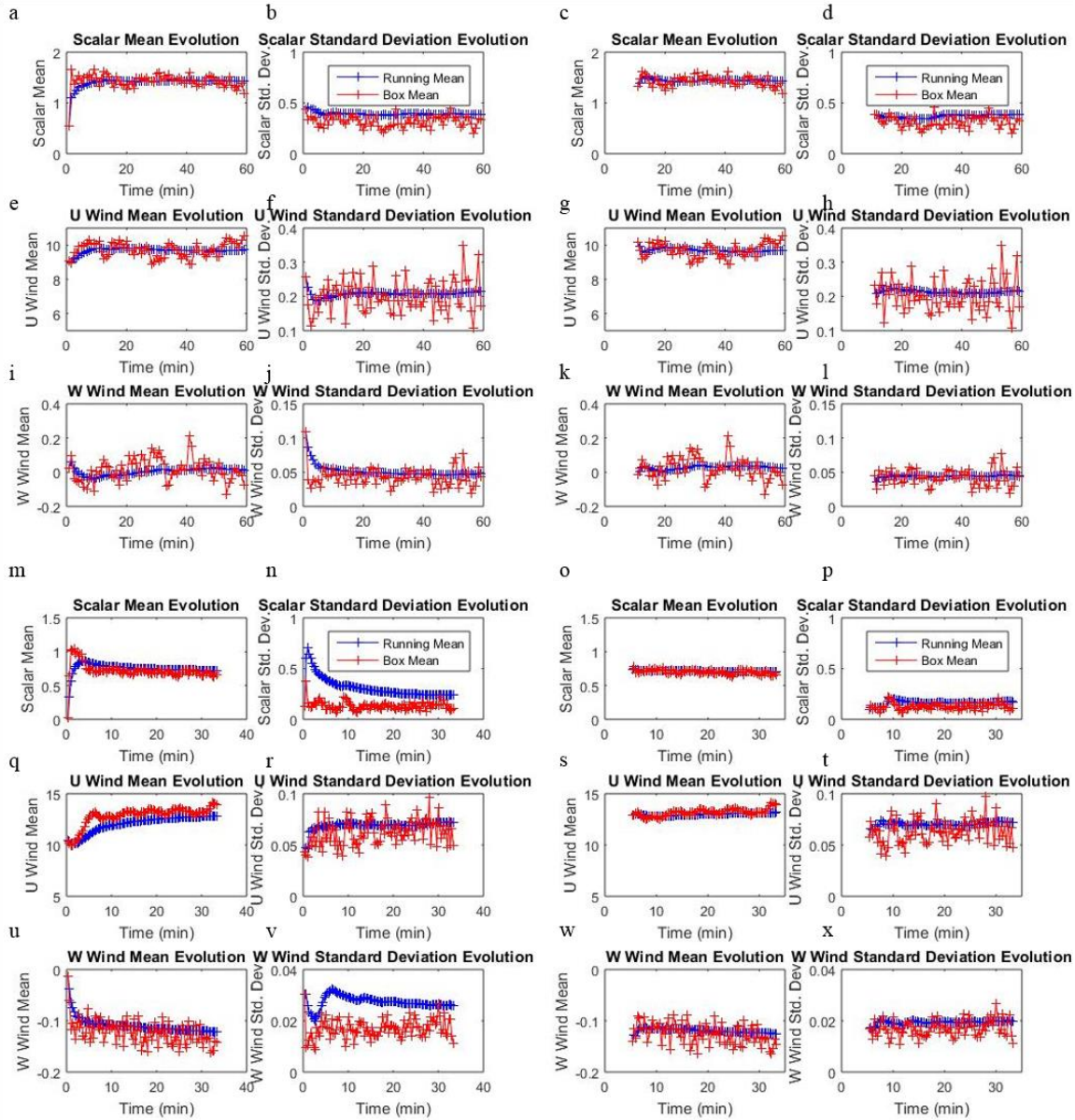


Figure S2. Comparison of box-means or standard deviations (red) and running means or standard deviations (blue) for (a-l) Site 1 and (m-x) Site 2. Left-hand panels show both sites from start-up and right-hand panels are screened to show results after a steady-state has been achieved. The running mean in the screened results starts at the determined onset of steady state.

Site 1

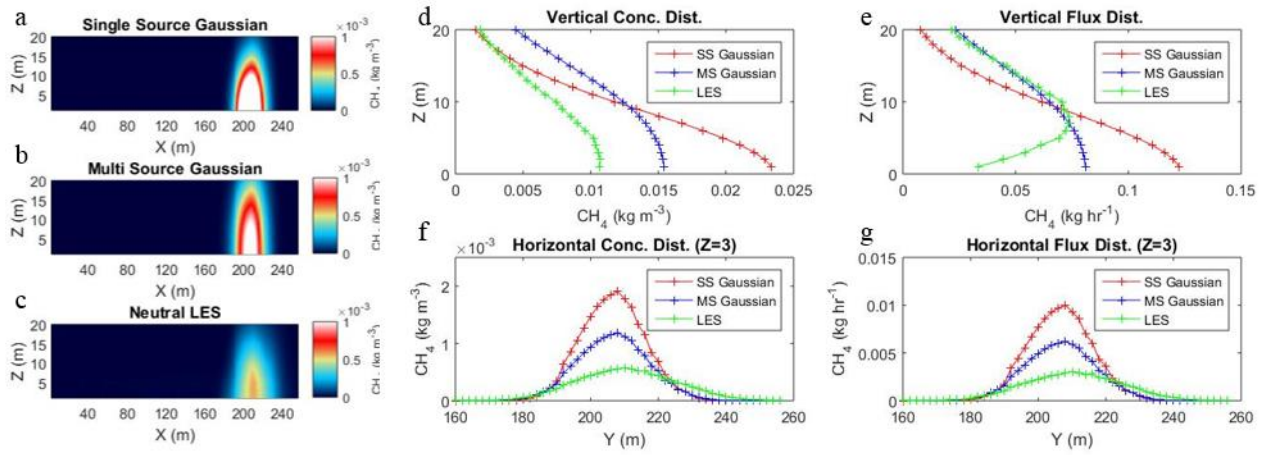


Figure S3. Comparison of three scenarios for Site 1 showing images of (a) single Gaussian, (b) multi-source Gaussian and (c) averaged LES. The comparison of vertical distributions (d) concentrations and (e) fluxes, and horizontal distributions of (f) concentrations and (g) fluxes are also shown.

Site 2

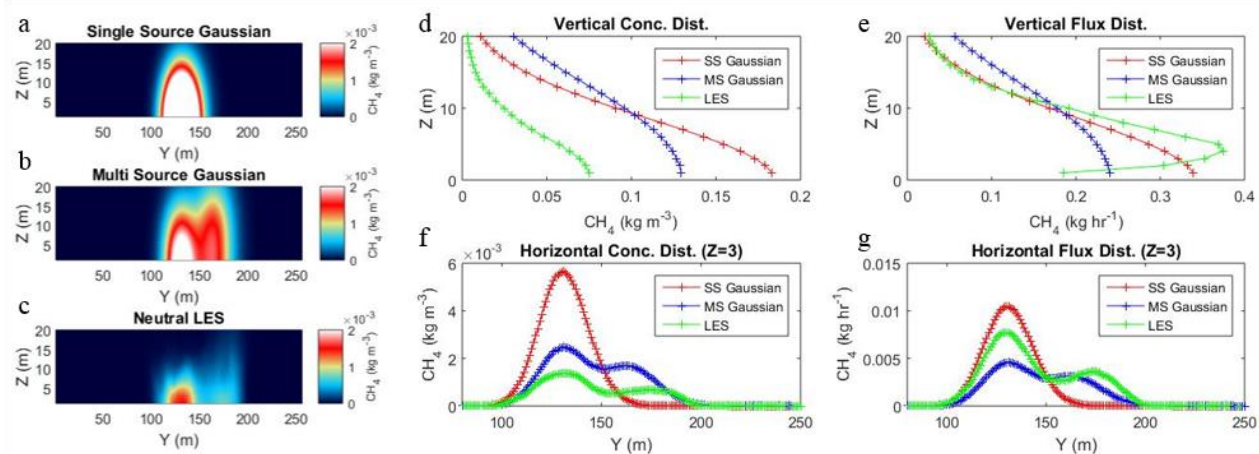


Figure S4. Comparison of three scenarios for Site 2 showing images of (a) single Gaussian, (b) multi-source Gaussian and (c) averaged LES. The comparison of vertical distributions of (d) concentrations and (e) fluxes, and horizontal distributions of (f) concentrations and (g) fluxes are also shown.

Site 4

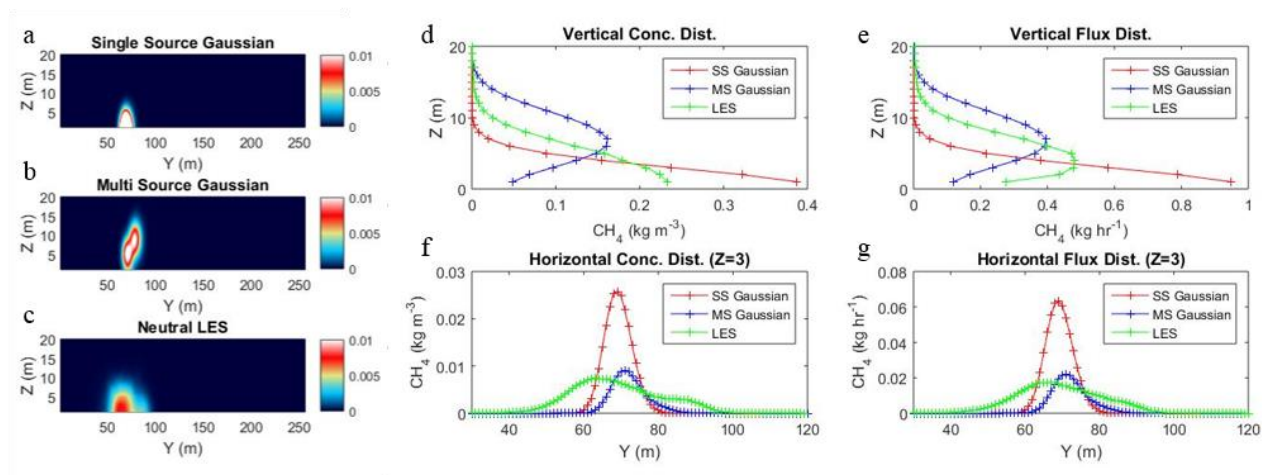


Figure S5. Comparison of three scenarios for Site 4 showing images of (a) single Gaussian, (b) multi-source Gaussian and (c) averaged LES. The comparison of vertical distributions of (d) concentrations and (e) fluxes, and horizontal distributions of (f) concentrations and (g) fluxes are also shown.

Site 1

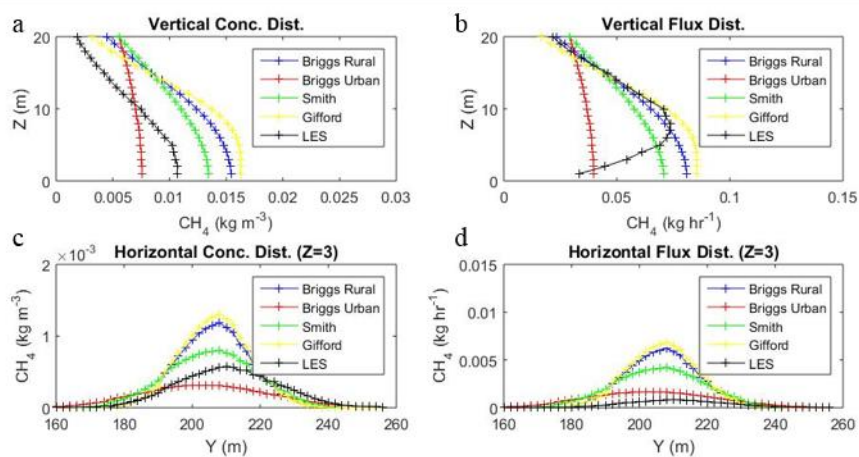


Figure S6. Comparison of scenarios using different diffusion models for Site 1 showing images of the comparison of vertical distributions of (a) concentration, (b) flux and of the horizontal distributions of (c) concentration and (d) flux.

Site 2

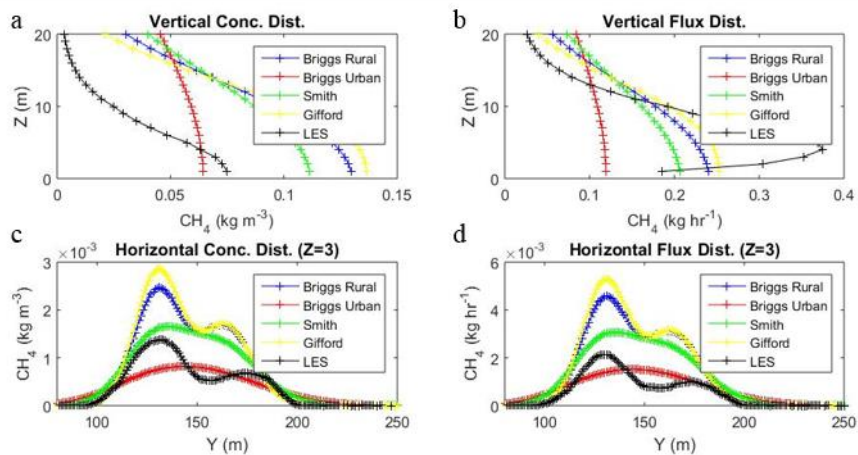
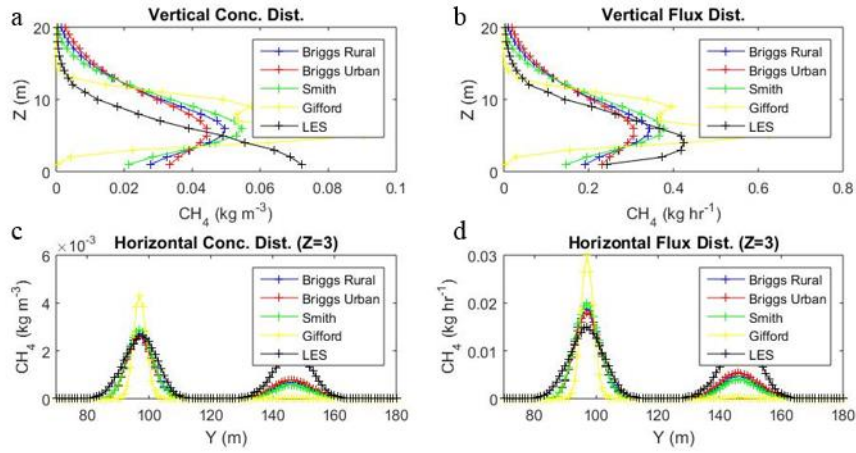


Figure S7. Comparison of scenarios using different diffusion models for Site 2 showing images of the comparison of vertical distributions of (a) concentration, (b) flux and of the horizontal distributions of (c) concentration and (d) flux.

Site 3



5 **Figure S8. Comparison of scenarios using different diffusion models for Site 3 showing images of the comparison of vertical distributions of (a) concentration, (b) flux and of the horizontal distributions of (c) concentration and (d) flux.**

Site 4

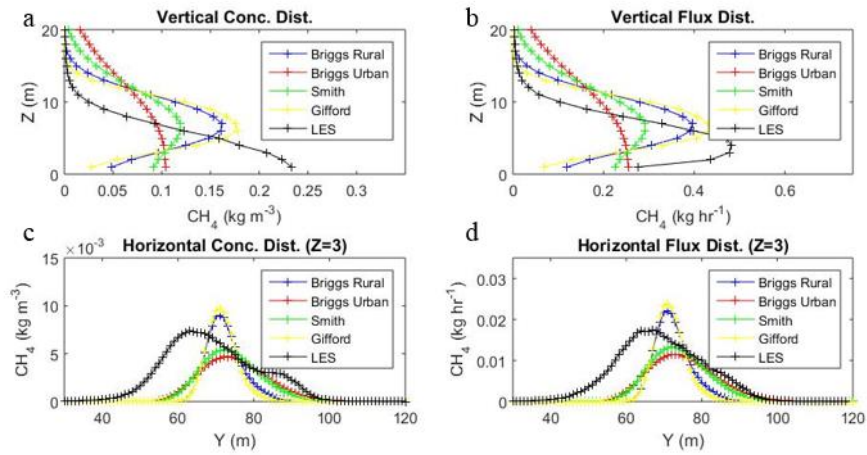


Figure S9. Comparison of scenarios using different diffusion models for Site 4 showing images of the comparison of vertical distributions of (a) concentration, (b) flux and of the horizontal distributions of (c) concentration and (d) flux.

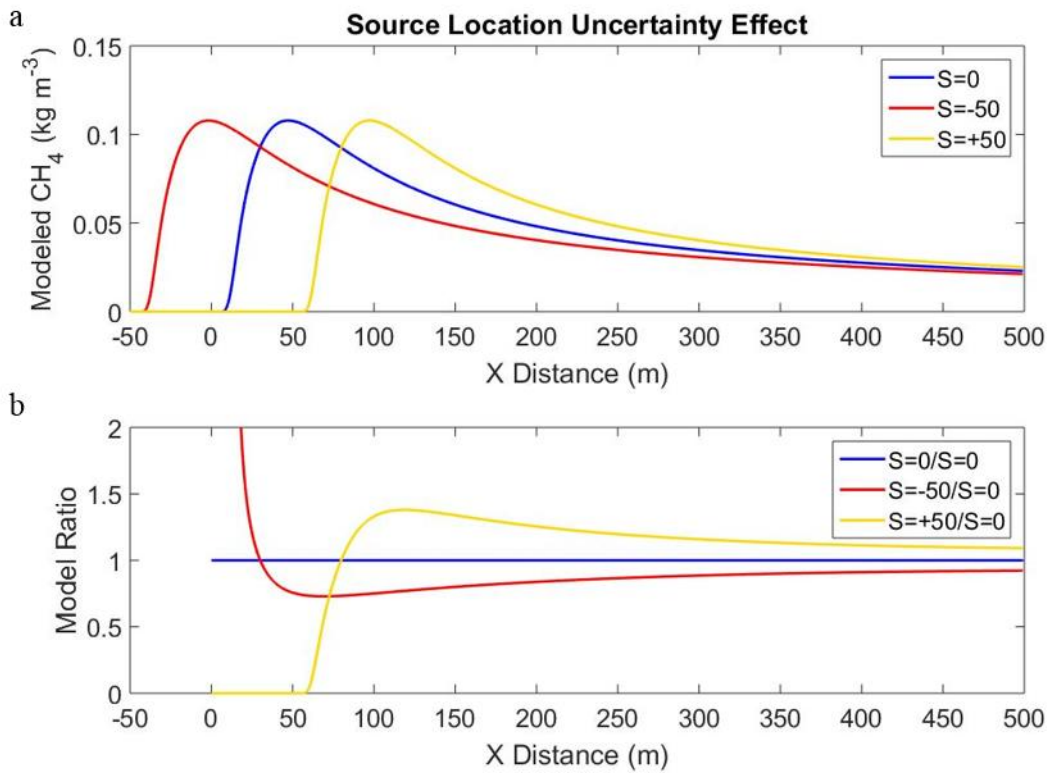


Figure S10. (a) Modeled CH₄ at three source locations at different x positions assuming 3 m receptor height, 1 m source height, neutral stability and 1.5 m s⁻¹ wind speed. (b) Ratio between the sum in y and distance x of the scenarios and base scenario (S=0).

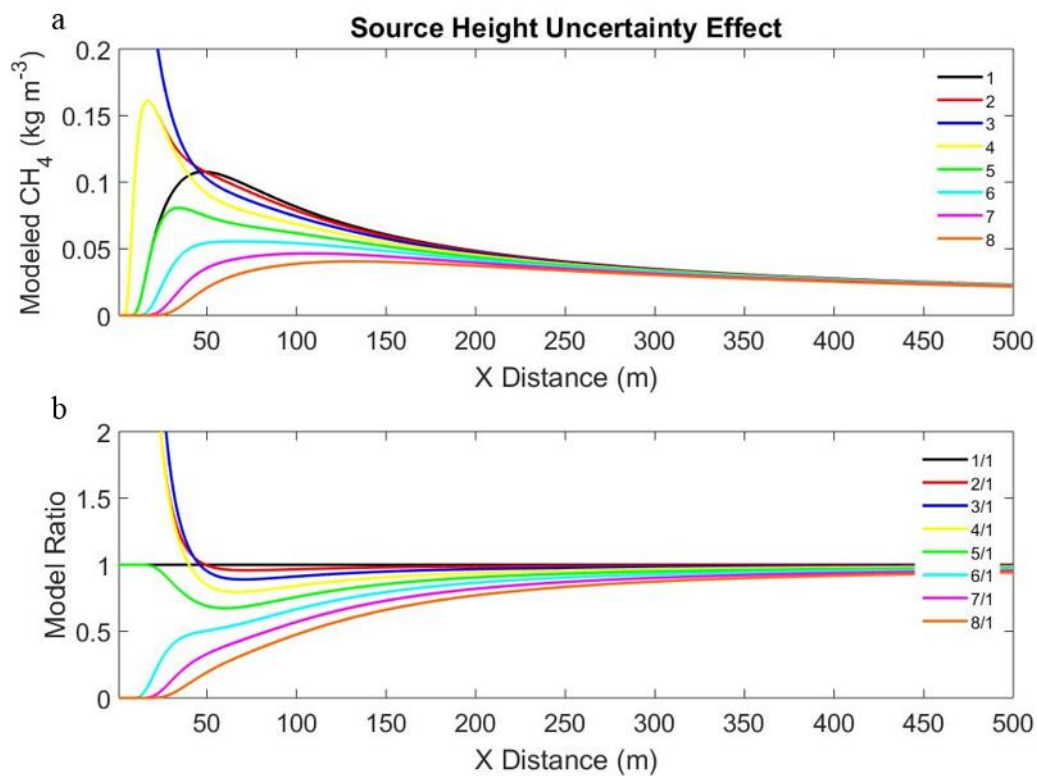


Figure S11. (a) Modeled CH₄ using 8 source heights assuming 3 m receptor height, neutral stability, and 1.5 m s⁻¹ wind speed. (b) Ratio between the sum of the scenarios and base scenario (h=1 m).

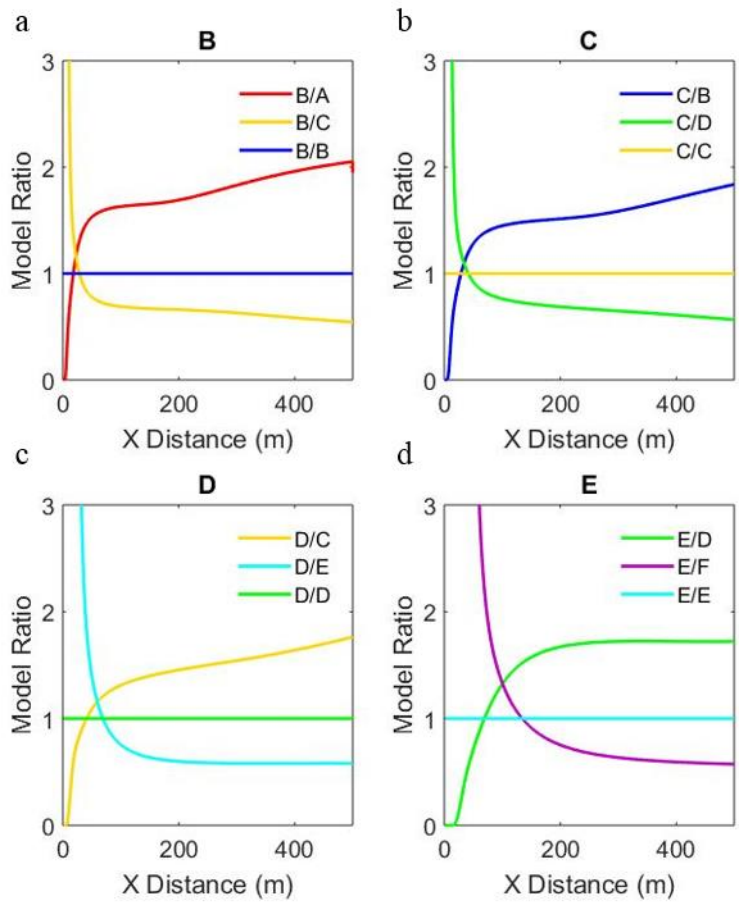


Figure S12. Comparison between Gaussian model sums and +/- one stability class for (a) Class B, (b) Class C, (c) Class D, and (d) Class E assuming 3 m receptor height, 1 m source height, and 1.5 m s^{-1} wind speed.