

Table S1. Altitude drift of UAV-GPS compared to RTK-GPS

Fl. Code	Drift [cm s ⁻¹]	Release Rate	RTK-Estimate [g s ⁻¹]	UAV-Estimate [g s ⁻¹]
309_02	0.01 ± 0.54	0.29 ± 0.03	0.39 ± 0.28	0.38 ± 0.22
312_01	0.21 ± 0.67	0.31 ± 0.03	0.32 ± 0.34	0.31 ± 0.24
312_03	0.02 ± 0.82	0.39 ± 0.03	0.32 ± 0.53	0.29 ± 0.38
313_01	0.12 ± 0.72	0.28 ± 0.02	0.15 ± 0.20	0.15 ± 0.17
313_02	0.17 ± 0.67	0.41 ± 0.04	0.82 ± 0.77	0.82 ± 0.66
313_03	0.04 ± 0.81	0.47 ± 0.04	0.08 ± 0.16	0.08 ± 0.18
313_04	0.05 ± 0.80	0.48 ± 0.04	0.13 ± 0.12	0.15 ± 0.13
313_05	0.17 ± 0.75	0.52 ± 0.05	0.24 ± 0.34	0.28 ± 0.29
314_01	0.13 ± 0.56	0.26 ± 0.03	0.09 ± 0.08	0.09 ± 0.07
314_02	0.21 ± 0.46	0.45 ± 0.05	0.02 ± 0.03	0.02 ± 0.03
314_03	0.10 ± 0.44	0.68 ± 0.03	0.40 ± 0.43	0.42 ± 0.45

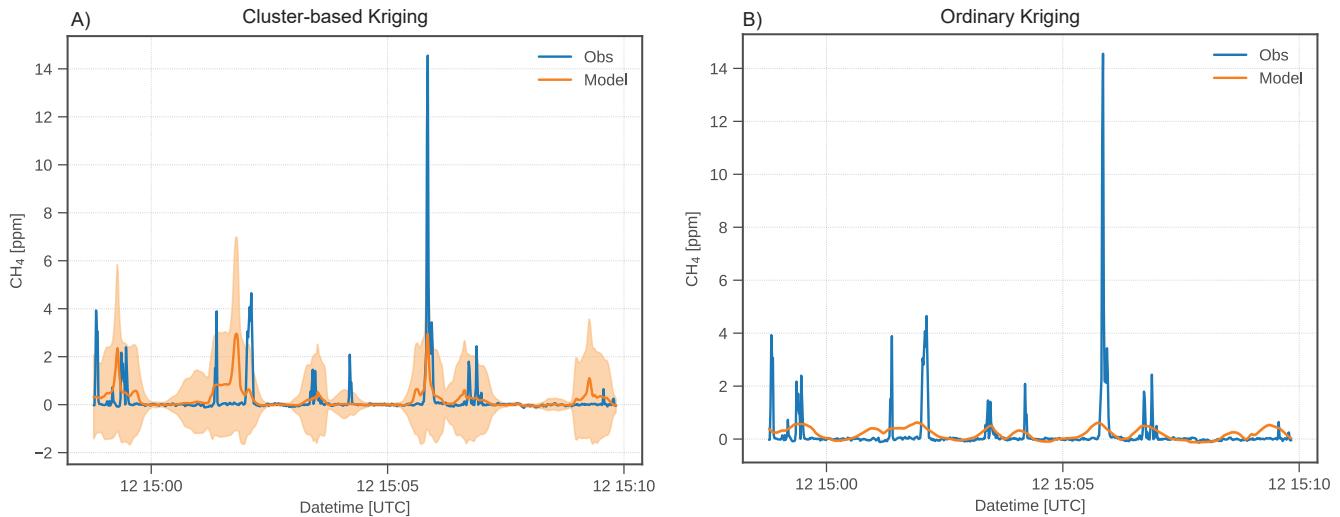


Figure S1. Reconstructed timeseries of flight 312_03 extracted from the produced A) cluster-based kriging field compared and B) ordinary kriging field to the original timeseries of methane measurements. Orange band refers to the uncertainty produced by kriging.

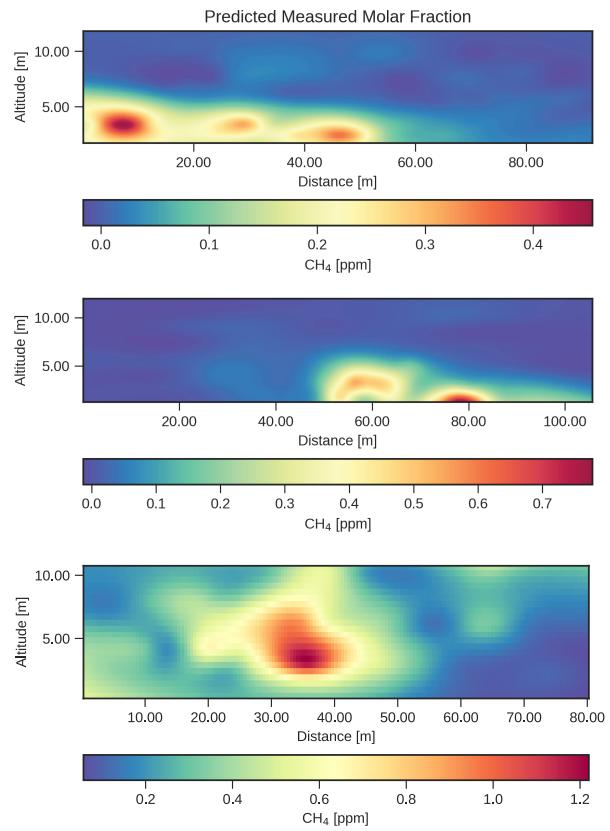
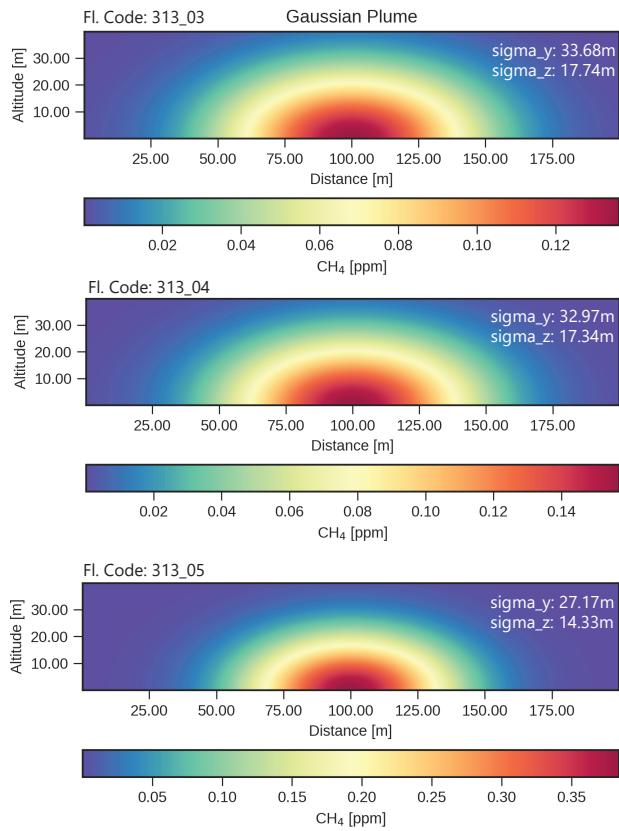


Figure S2. Vertical cross-section from downwind distance of more than 100m of methane molar fractions using a theoretical Gaussian dispersion model and cluster-kriging estimated prediction

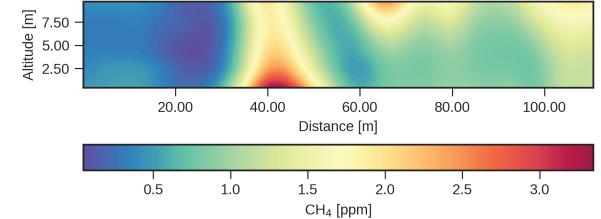
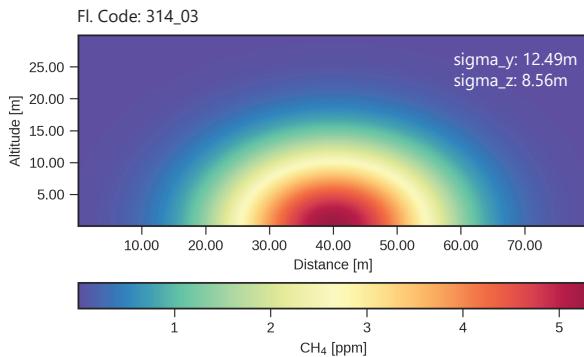
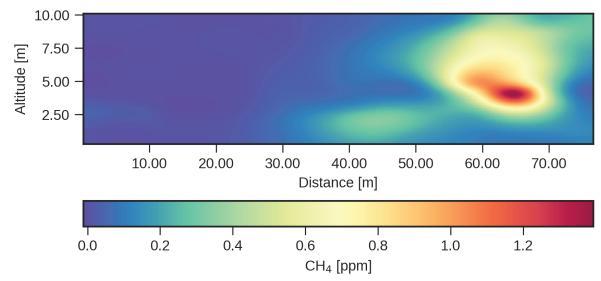
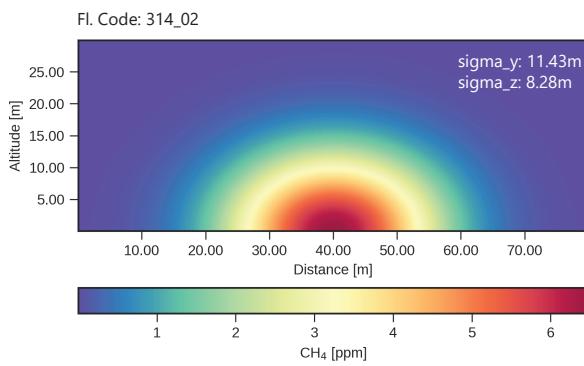
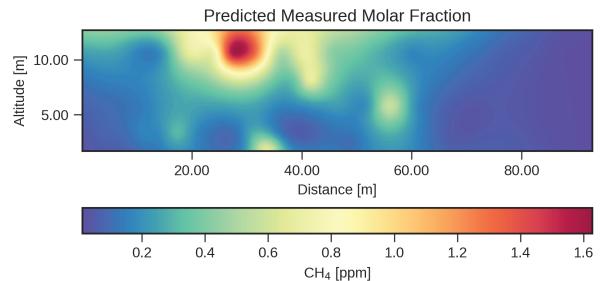
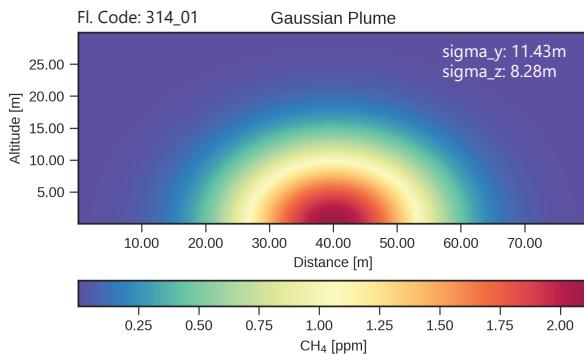


Figure S3. Vertical cross-section methane molar fractions generated using a theoretical Gaussian dispersion model and cluster-kriging estimated prediction at low wind speeds (< 1 ms)

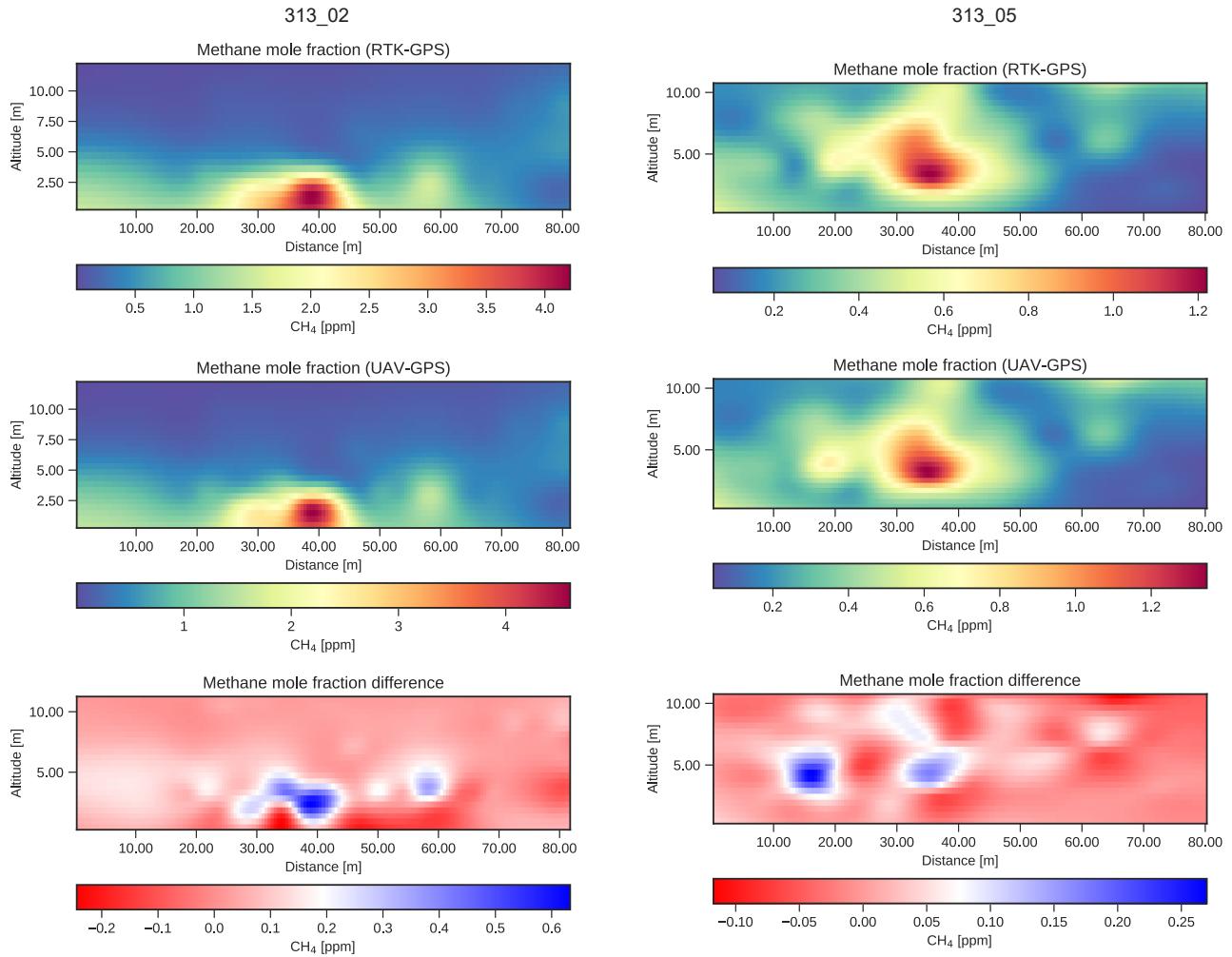


Figure S4. Mapped methane plume for flights 313_02 and 313_05 using RTK-GPS and UAV-GPS. The difference between the methane mole fraction field is also shown.

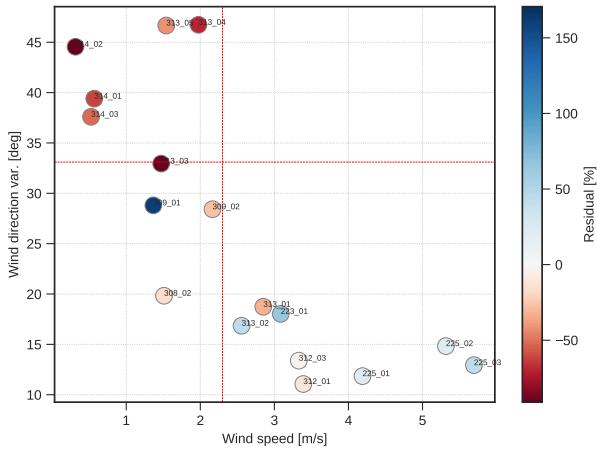


Figure S5. Residual plot between true and estimated release with respect to mean wind speed and directional variability. The circles in the lower right corner correspond to the eight out of 18 flights that meet the prescribed threshold. Residual errors characterized by light red and blue colors are generally lower for these flights.

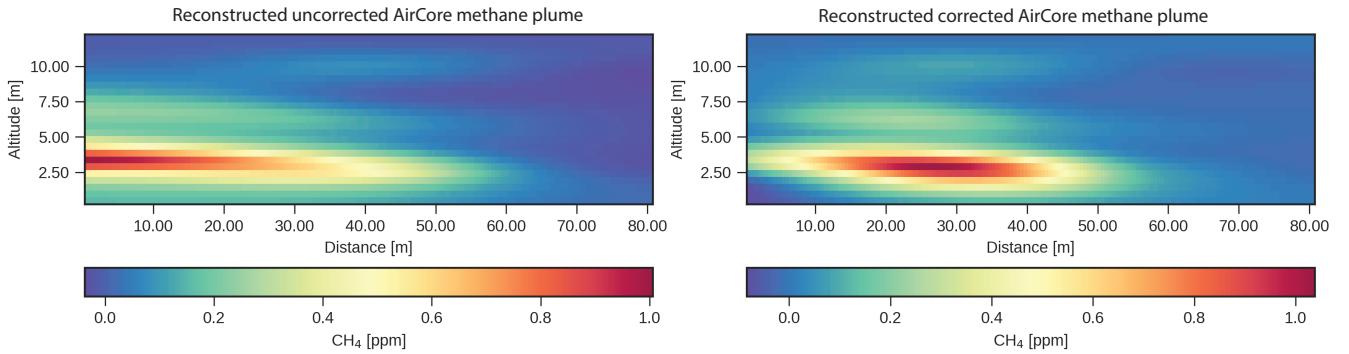


Figure S6. Reconstructed methane plume for flight 312_03. The figure on the left shows a reconstructed plume without applying a proper time correction for AirCore measurements whereas the figure on the right is a reconstructed plume obtained after applying the proper time correction. After applying the proper correction, the methane plume moved spatially to the right placing it towards the center of the mapping plane. This resulted to a 23% increase in emission estimate—closer to the true release.

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