Supplement of Atmos. Chem. Phys., 26, 1931–1946, 2026
https://doi.org/10.5194/acp-26-1931-2026-supplement
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Atmospheric Chemistry and Physics
Open Access
EGU

Supplement of

How can we trust TROPOMI based methane emissions estimation: calculating emissions over unidentified source regions

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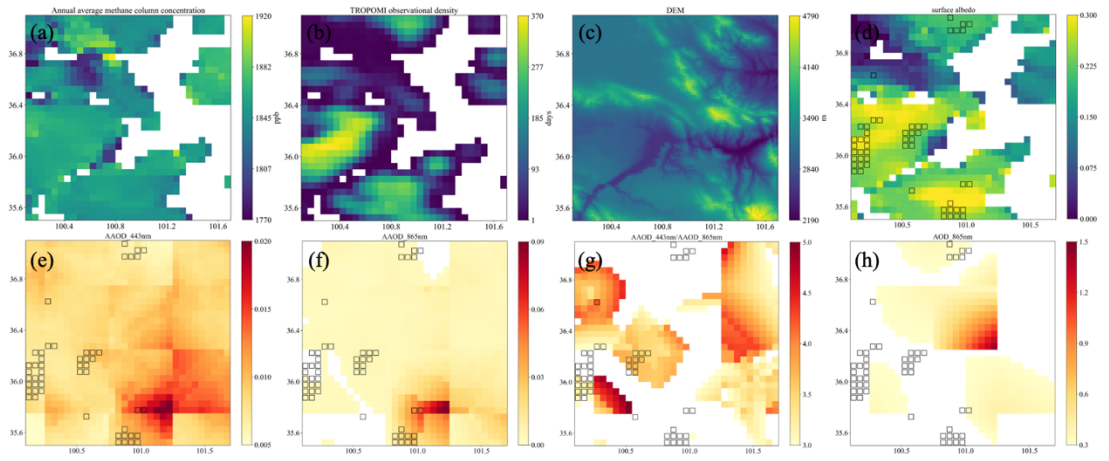

Figure S1: (a) Annual average methane column concentration of Waliguan region; (b)TROPOMI XCH4 observational density in Waliguan region; (c) Surface pressure in the Waliguan region; (d) The average surface albedo of Waliguan region; (e) The average AAOD_443nm of Waliguan region; (f) The average AAOD_865nm of Waliguan region; (g) The ratio of AAOD_443nm to AAOD_865nm; (h) The average AOD_865nm of Waliguan region. The black box represents the grid where our retained valid emissions are located

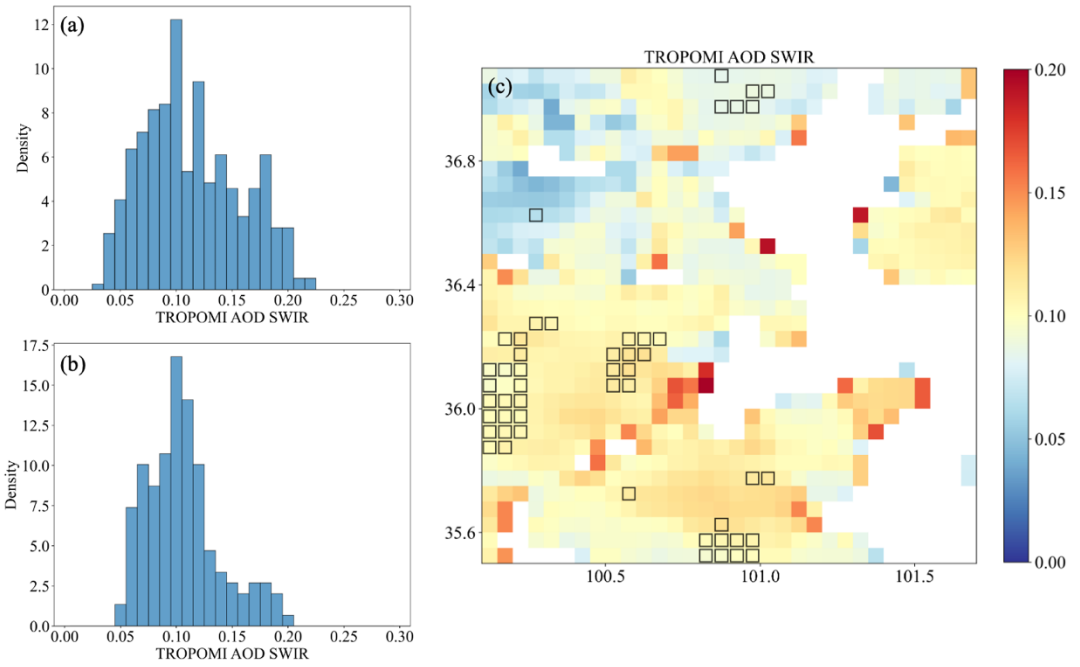

Figure S2: (a), (b), are the PDFs of the TROPOMI AOD_SWIR corresponding to the points of the invalid emission and valid emissions, respectively; (c) The average TROPOMI AOD_SWIR of Waliguan region. The black box represents the grid where our filtered emissions are located.

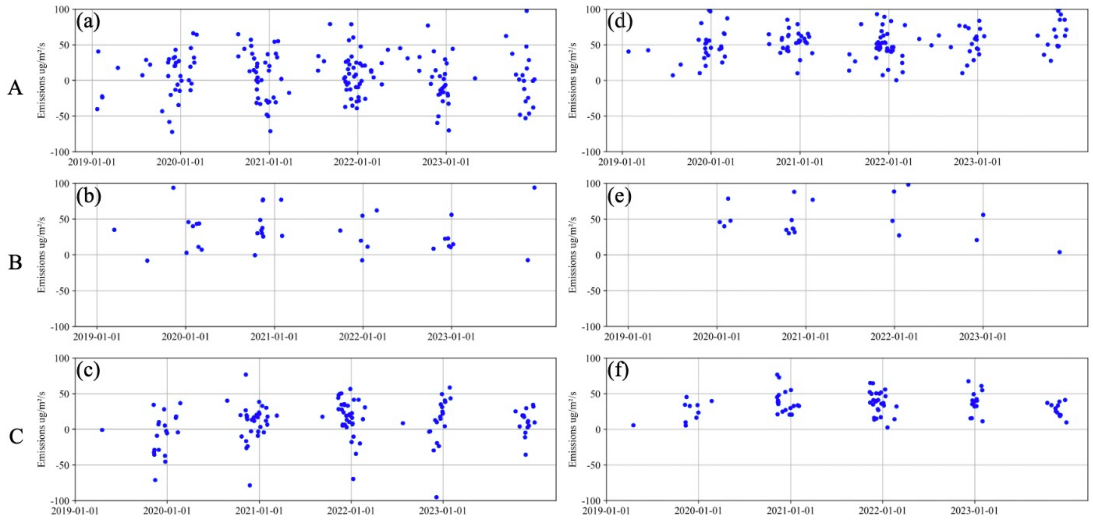

Figure S3: (a), (b) and (c) are the time series of regions A, B and C in Figure 4a, and (d), (e) and (f) are the time series of the retained emissions of A, B and C.

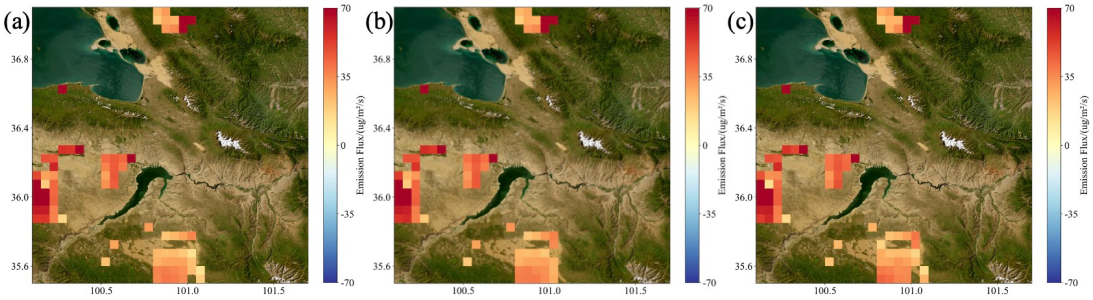

Figure S4: (a), (b) and (c) correspond to the emission distribution of Figures 4 (a), (b) and (c) after filtering using the 50th percentile (12.4ug/m^2/s) of the emission results as the threshold (background portion of image is from Esri World Imagery| Powered by Esri).

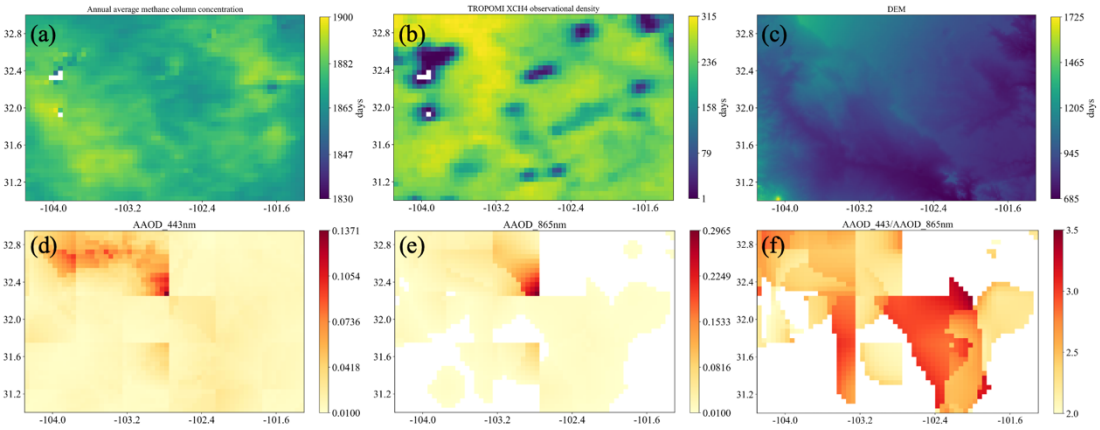

Figure S5: (a) Annual average methane column concentration of Permian basin; (b)TROPOMI XCH_4 observational density in Permian basin; (c) Surface pressure in the Waliguan region; (d) The average AAOD_443nm of Permian basin; (e) The average AAOD_865nm of Permian basin; (f) The ratio of AAOD_443nm to AAOD_865nm.

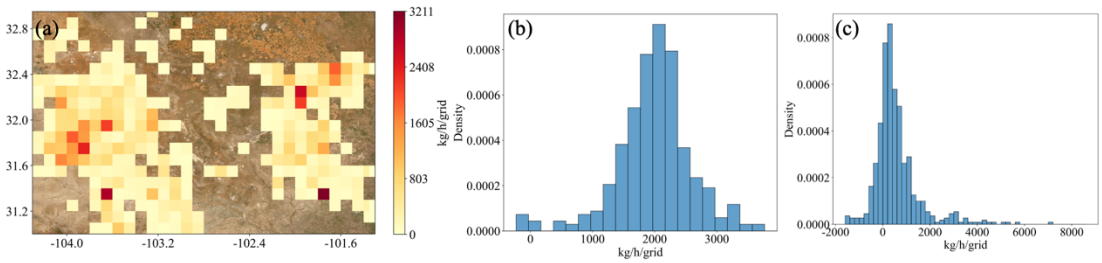

Figure S6: (a) The average annual emission flux of all sectors of EDGAR; (b) The difference between our retained valid emissions and EDGAR in 2019; (c) The difference between Cusworth et al. (2021) and EDGAR in 2019 (background portion of image is from Esri World Imagery| Powered by Esri).

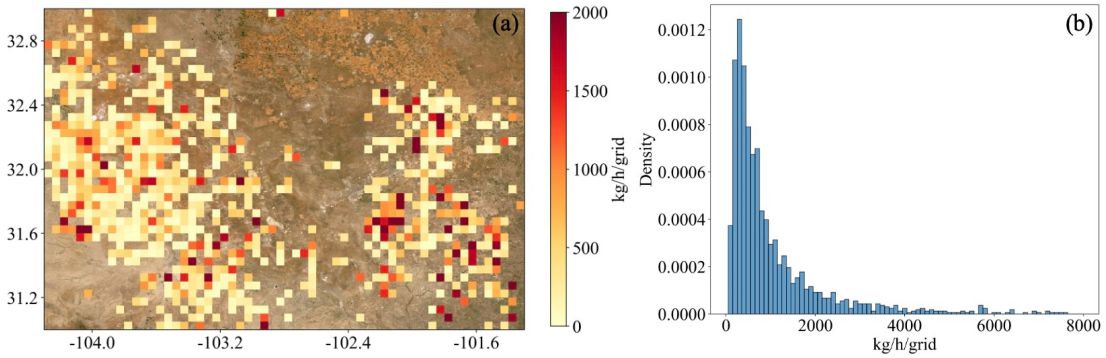

Figure S7: (a) Emissions after grid management by Cusworth et al. (2021) (background portion of image is from Esri World Imagery| Powered by Esri); (b) PDF of the grid-based emissions by Cusworth et al. (2021).