

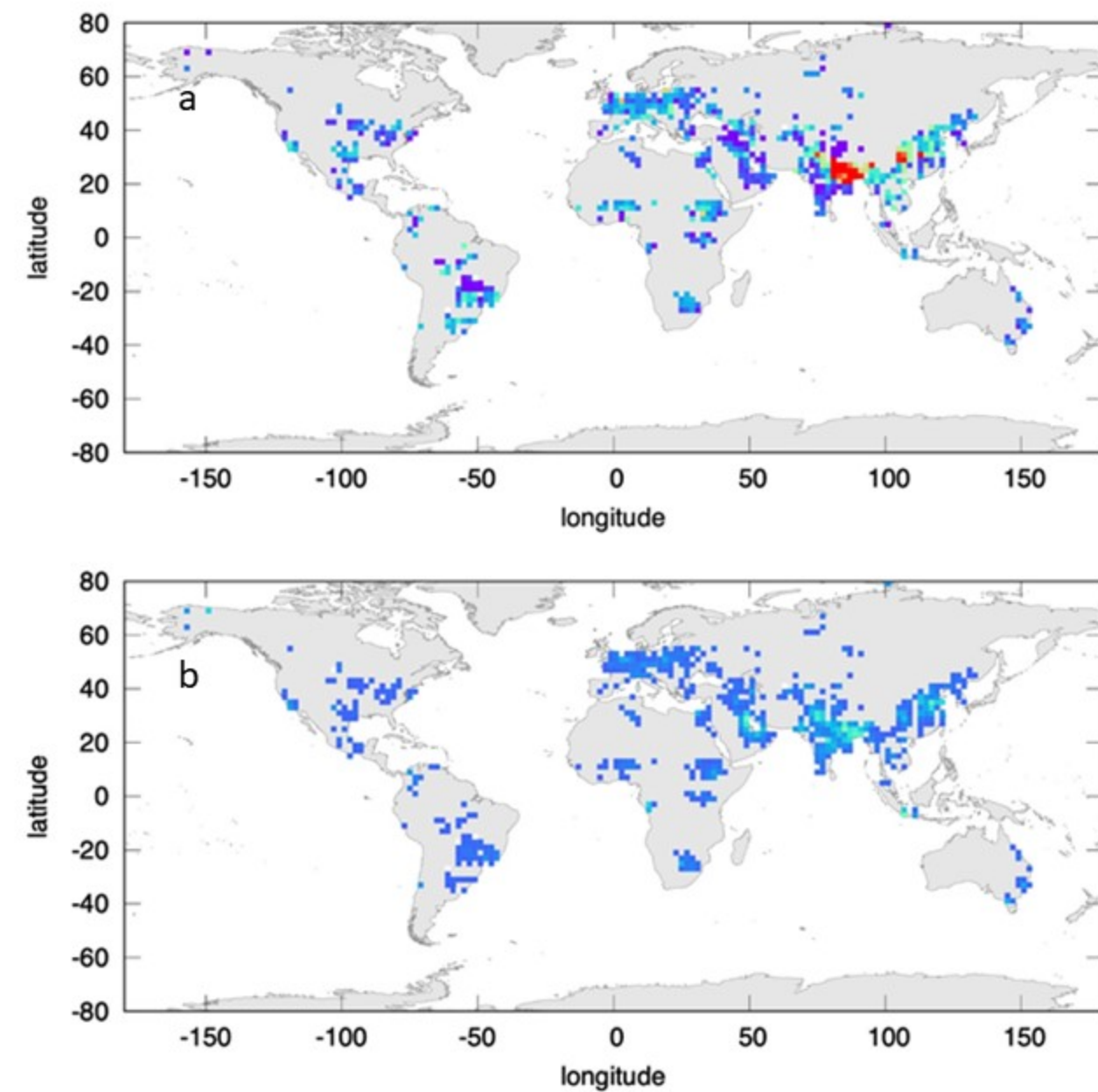
Observations of atmospheric CH₄ enhancements due to anthropogenic emissions by GOSAT/GOSAT-2 satellites.

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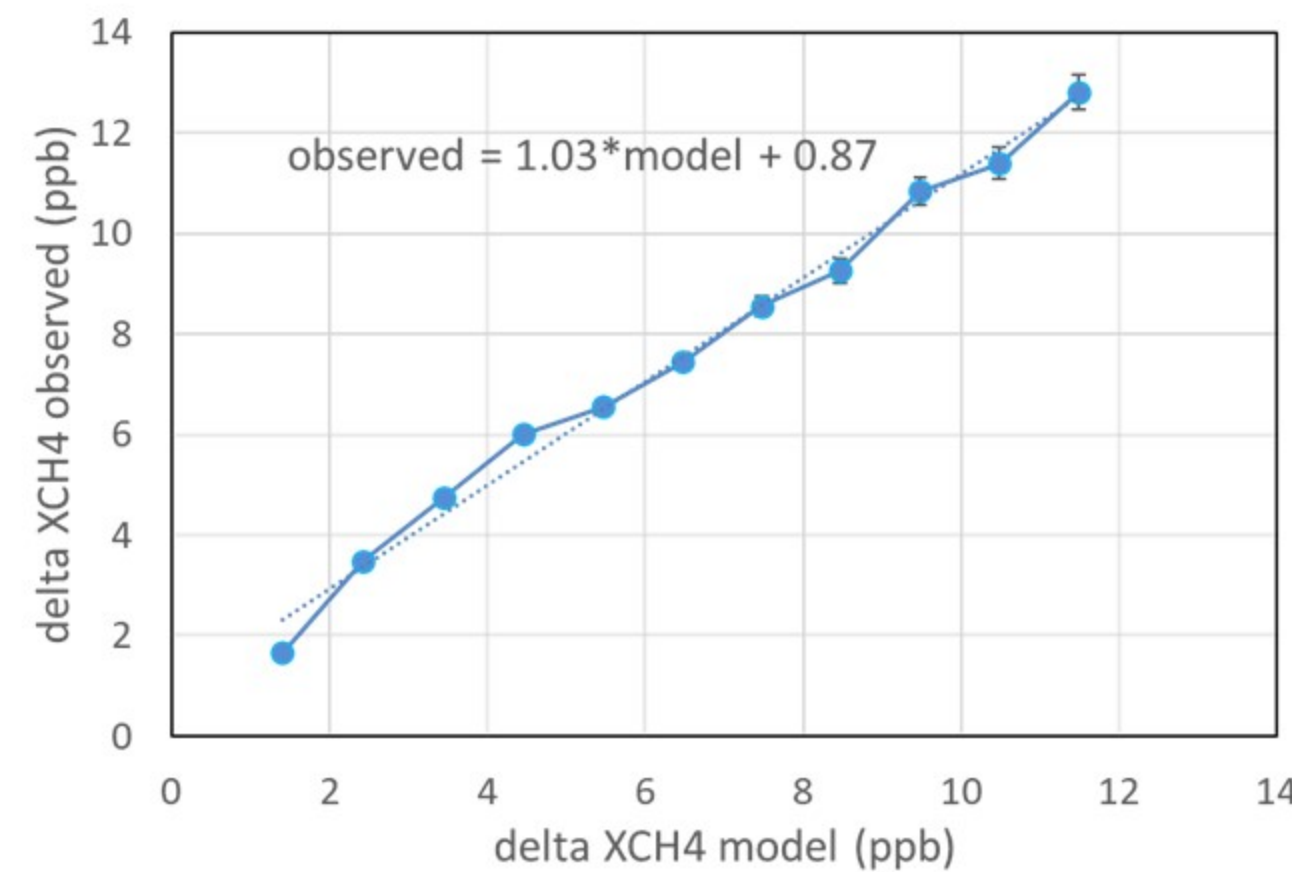
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Method

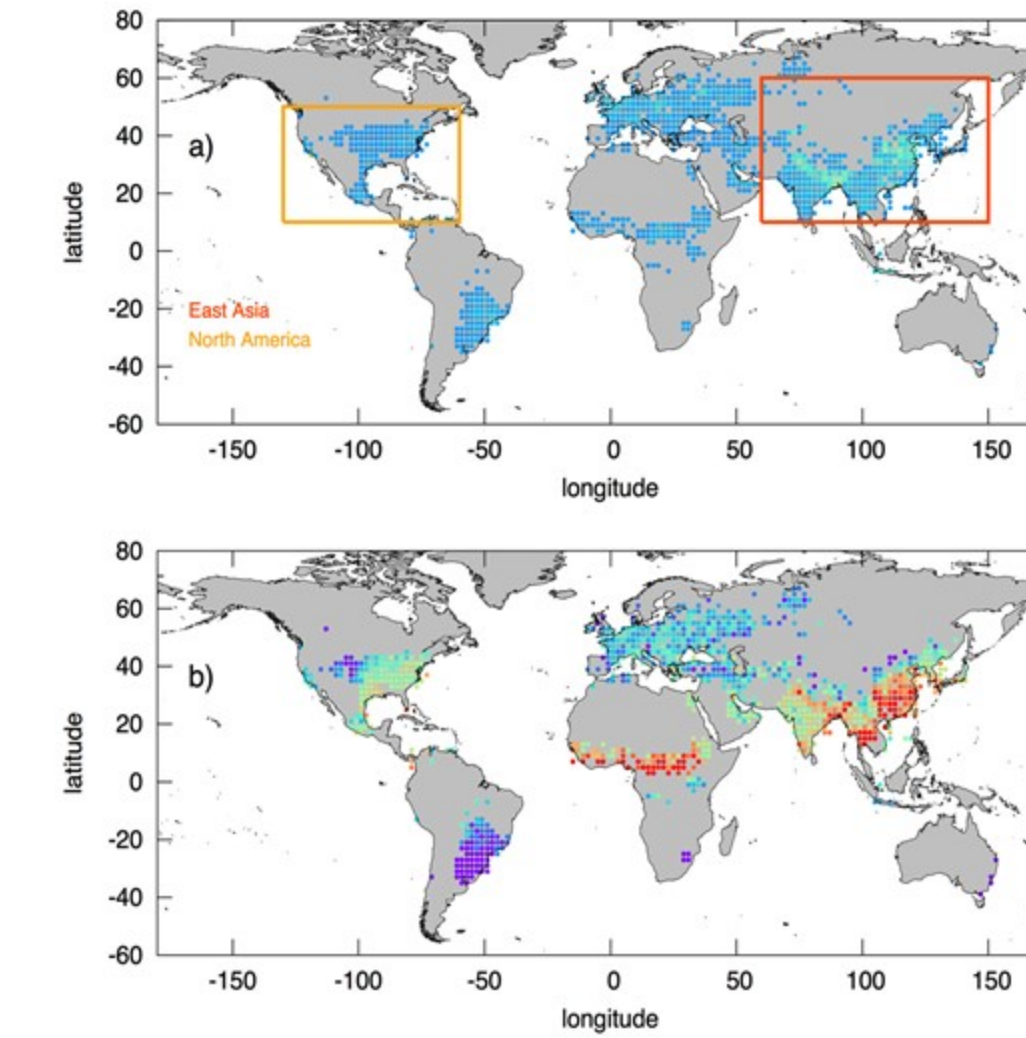
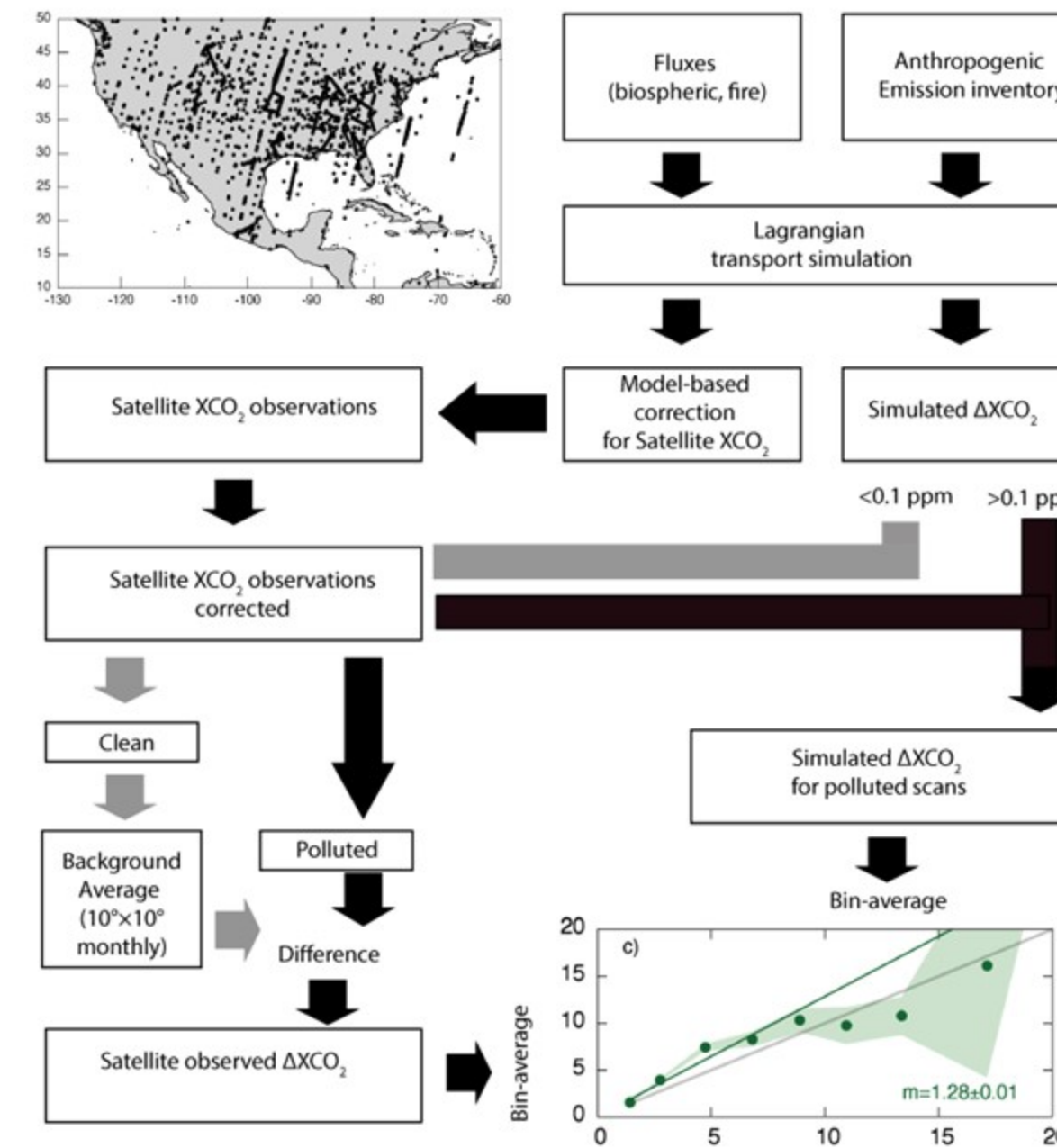
- Identify emission influenced GOSAT observations using Lagrangian simulations using anthropogenic methane (EDGAR) emissions (for simulated enhancements)
- Calculate GOSAT/GOSAT-2 observation anomalies (observed enhancements) relative to a background concentration as monthly average for 10° x 10° grid of all data with simulated (EDGAR) enhancements > 1 ppb.
- Aggregate the observed-simulated enhancements into 2 ppb simulated bins.
- Represent observed enhancements as a linear function of simulated enhancements
- Analysis over various regions or observation datasets.
- At present GOSAT-2 analysis successful for global domain.



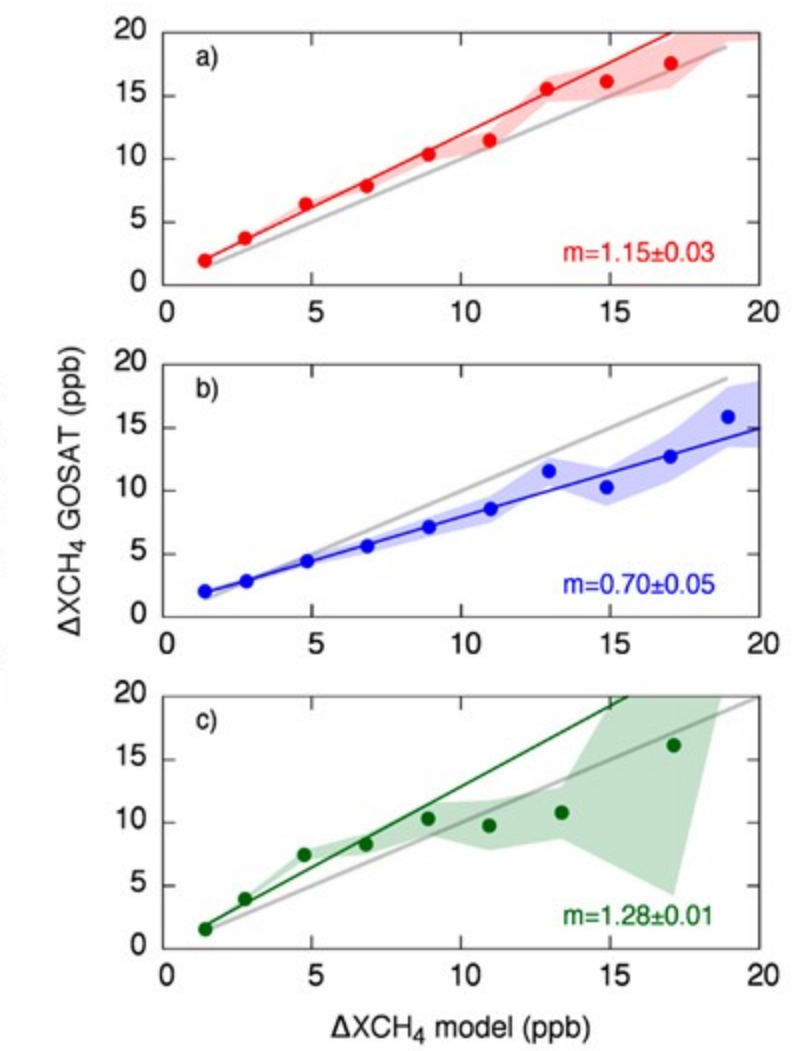
Mean XCH₄ enhancements on 2° x 2° grid from GOSAT (a) and that simulated by Lagrangian model (b) for the period 2009-2020



Method revision from Janardanan et al., 2017 (a) reference background estimated as daily mean – not monthly mean of all observations in 10° x 10° lat-lon box – using data effectively on same orbit, (b) use EDGAR 5.0 CH₄ emissions



Simulated (a) and GOSAT observed (b) XCH₄ anomaly (ppb) aggregated at 2° grid for a period 2009–2012. The grids with simulated XCH₄ abundance greater than 5 ppb in average are shown. From Janardanan et al., 2017

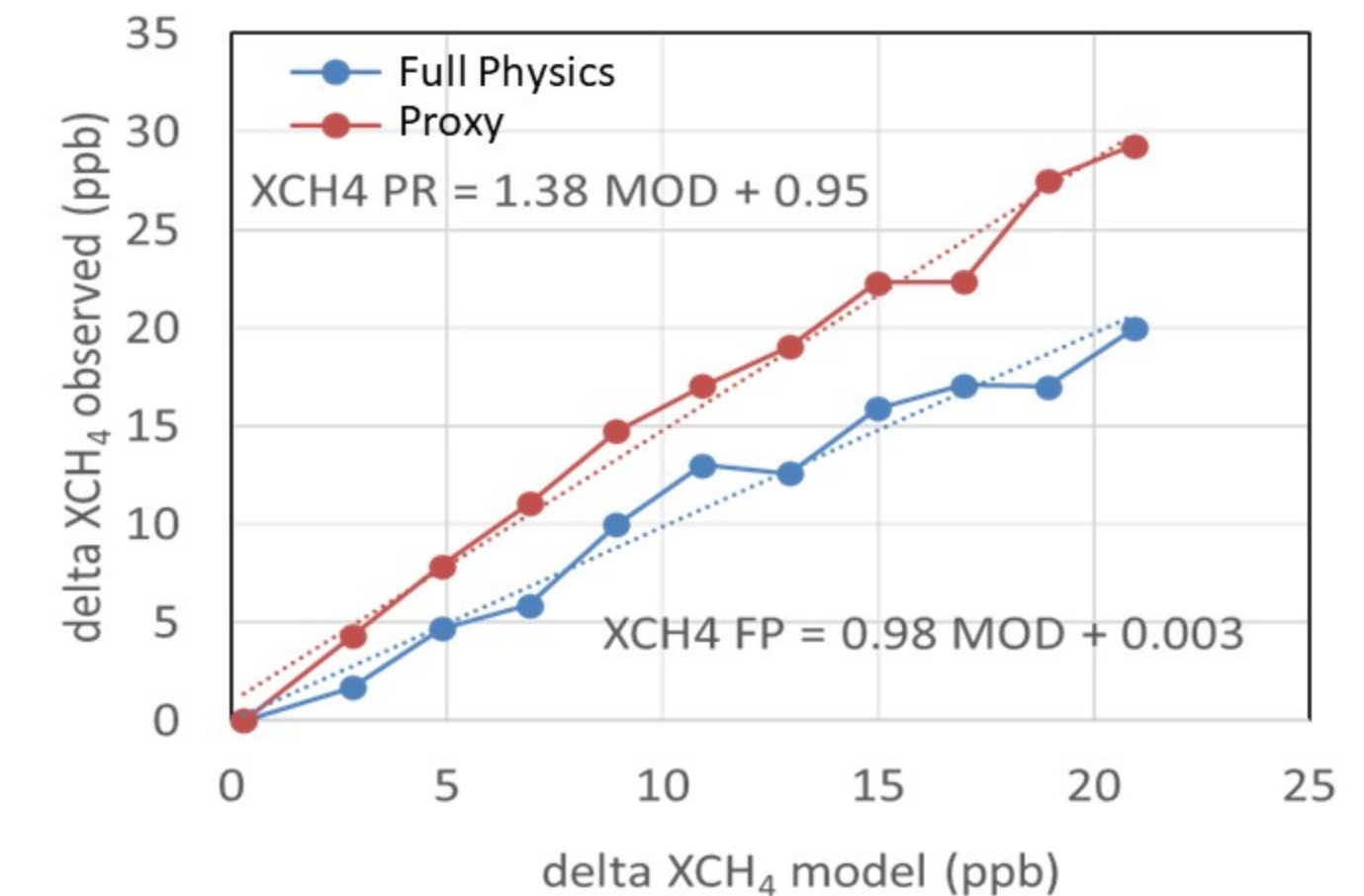


The regression between modeled (EDGAR) and observed (GOSAT) XCH₄ abundance for: (a) the Globe; (b) East Asia; and (c) North America. From Janardanan et al., 2017

- GOSAT-2 v01.03, v01.04 L2 XCH₄ data are compared to XCH₄ enhancements simulated by Lagrangian model, with EDGAR emissions as described in methods (Janardanan et al., 2017).
- Aggregated by 1 ppb bins of simulated XCH₄ enhancement due to EDGAR emissions.
- Background defined as EDGAR signal < 1 ppb
- XCH₄ full physics data are closer to model (slope near 1)

Summary

- Made preliminary analysis using GOSAT CH₄ v02.95 data with EDGAR 5.0 emissions
- The data shows good linearity and regression slope near 1 can be achieved for global domain, plan to analyze at regional scale next.
- Evaluated GOSAT-2 v 01.03, 01.04 data.
- XCH₄ Full Physics data shows good scaling (regression slope vs model near 1) but with more deviation from best fit, while proxy XCH₄ data shows less noise but slight deviation in regression slope from unity.
- Next versions of L2 products are supposed to improve this analysis.



Reference

Janardanan, R.; Maksyutov, S.; Ito, A.; Yukio, Y.; Matsunaga, T. Assessment of Anthropogenic Methane Emissions over Large Regions Based on GOSAT Observations and High Resolution Transport Modeling. *Remote Sens.* 2017, 9, 941.