

1 The GeoCarb mission

GeoCarb is a geostationary satellite mission launching in 2021 that will observe column CO₂, CO, and CH₄ at least twice per day over the Americas.

Retrievals from current missions (e.g. MOPITT and OCO-2) are sparse over the Amazon due to persistent cloud cover and low surface reflectivity. Reproducing realistic cloud coverage in simulation experiments has yet to prove successful.

2 Quality control (QC) masks

MOPITT and OCO-2 retrievals reflect when and where successful GeoCarb retrievals are likely because they observe in similar bands at different times of day (10:30AM and 1:30PM).

Here, we train a QC mask to MOPITT and OCO-2 coverage (Fig 1) and apply it to synthetic GeoCarb data. To demonstrate the impact of reduced coverage, we assimilate the synthetic data with (Fig 2) and without (Fig 3) the QC mask into GEOS (cf. Poster #5 sidebar).

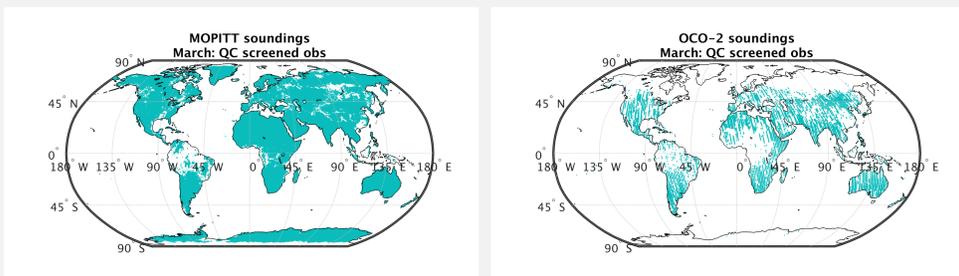


Fig 1. Quality control flag good soundings over a single March from (left) MOPITT and (right) OCO-2. The two instruments have significantly different swath widths: MOPITT has a 29 footprints per swath, each roughly 22km x 22km, while OCO-2 has 8 footprints, each roughly 1.3km x 2.3km at nadir.

5 Summary

- MOPITT and OCO-2 coverage over Amazon remarkably similar
- Even without QC screening, analysis vs. simulated differences are small compared to global variability
- QC screening has considerable impact on analysis
- Analysis impact can be reduced with further tuning of covariances
- Highlights importance of realistic synthetic data for pre-launch tuning

3 Assimilation without QC mask

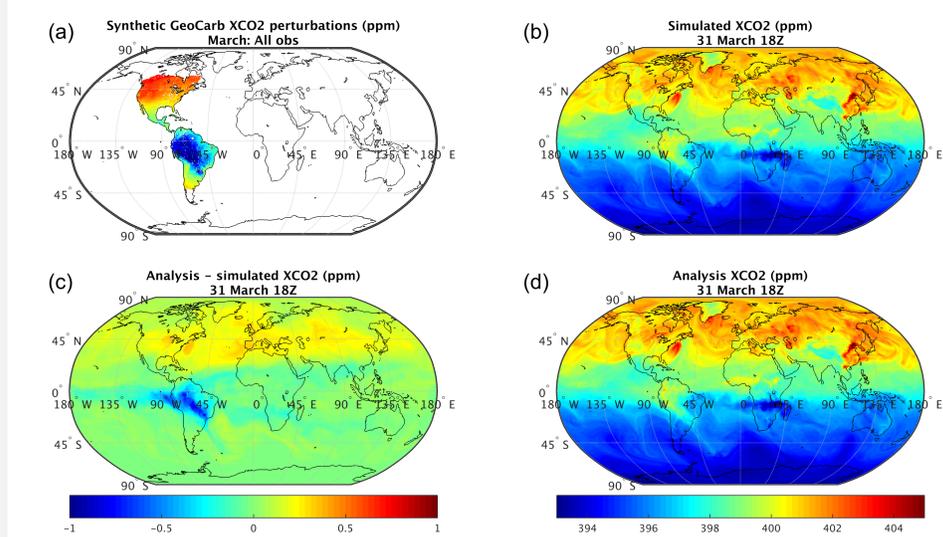


Fig 2. Synthetic data and assimilation results *without* applying the QC mask. Clockwise from top left: a) all synthetic GeoCarb samples for March, b) the GEOS simulated (no assimilation) XCO₂ field at the end of the month, c) the difference between the analysis and XCO₂ fields, d) the GEOS assimilated XCO₂ field.

4 Assimilation with QC mask

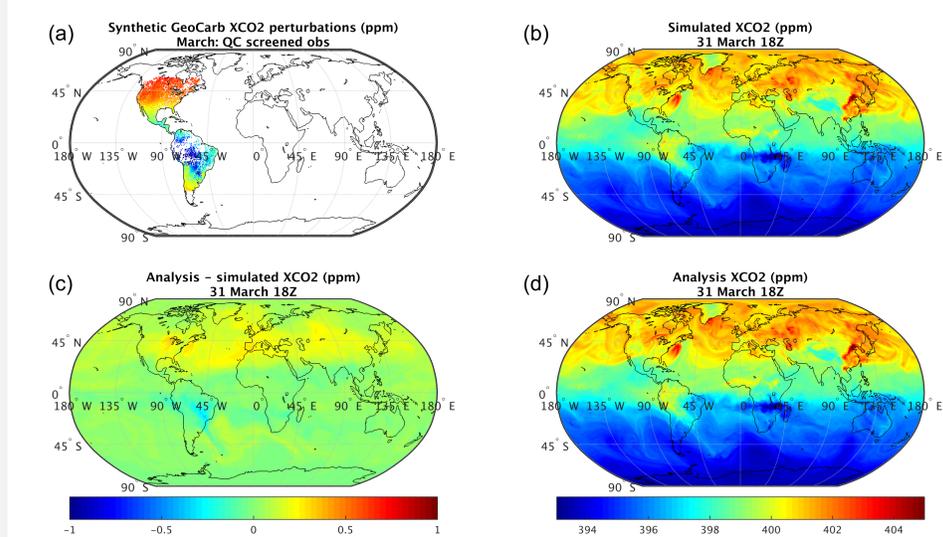


Fig 3. Same as Fig 2, but *with* applying the QC mask.

Acknowledgements: NASA CMS & OCO-2 projects

