

The ability of GeoCarb to constrain the interannual variability of carbon gases over the Amazon

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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).

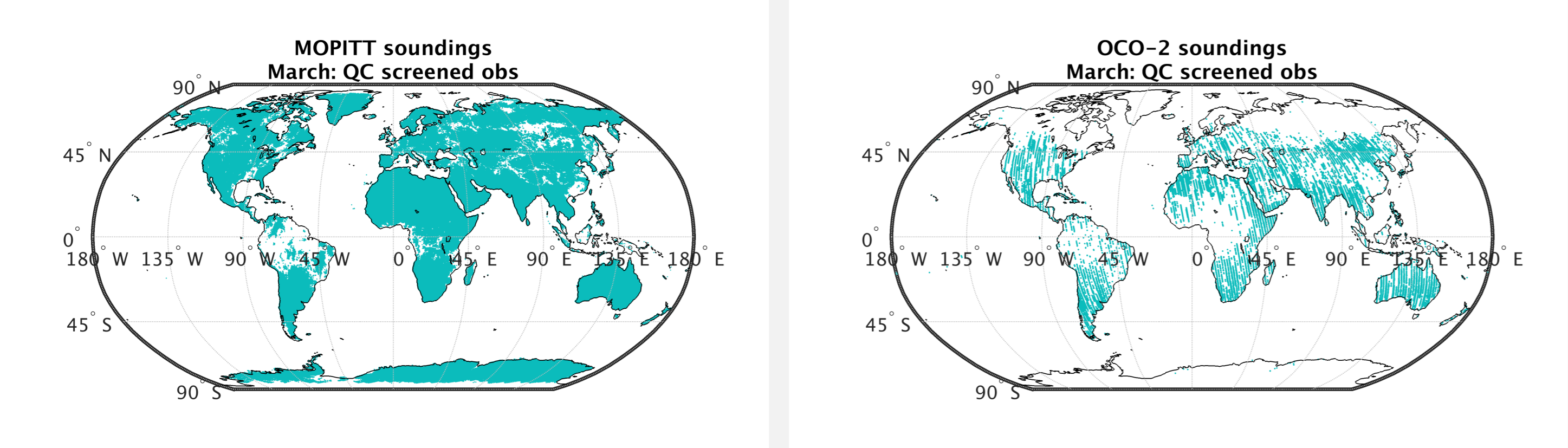


Fig 1. Quality control flag good soundings over a single March from (left) MOPITT and (right) OCO-2. The two instruments have significantly different swath widths: MOPITT has a 29 footprints per swath, each roughly 22km x 22km, while OCO-2 has 8 footprints, each roughly 1.3km x 2.3km at nadir.

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

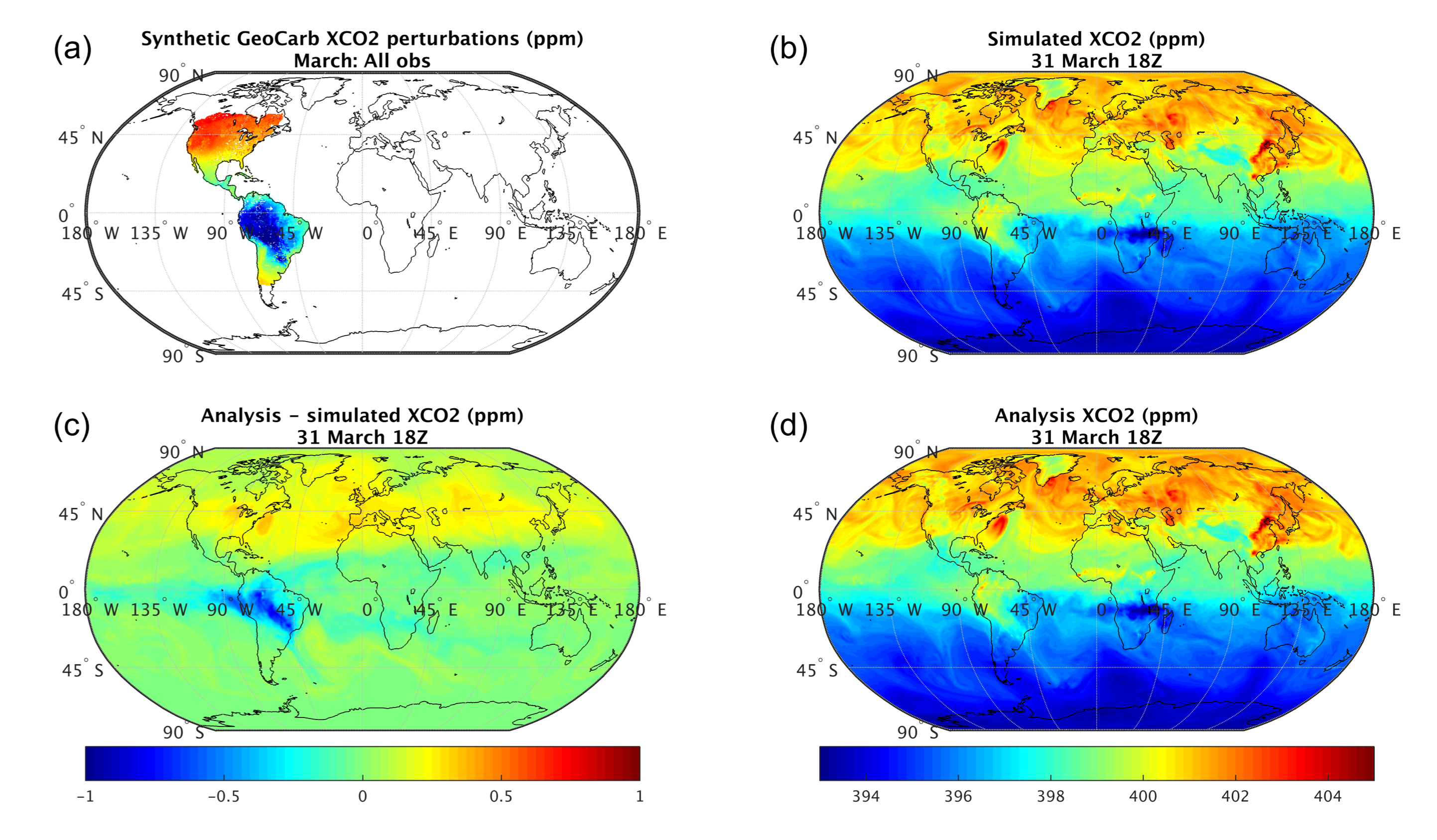


Fig 2. Synthetic data and assimilation results *without* applying the QC mask. Clockwise from top left: a) all synthetic GeoCarb samples for March, b) the GEOS simulated (no assimilation) XCO₂ field at the end of the month, c) the difference between the analysis and XCO₂ fields, d) the GEOS assimilated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

4 Assimilation with QC mask

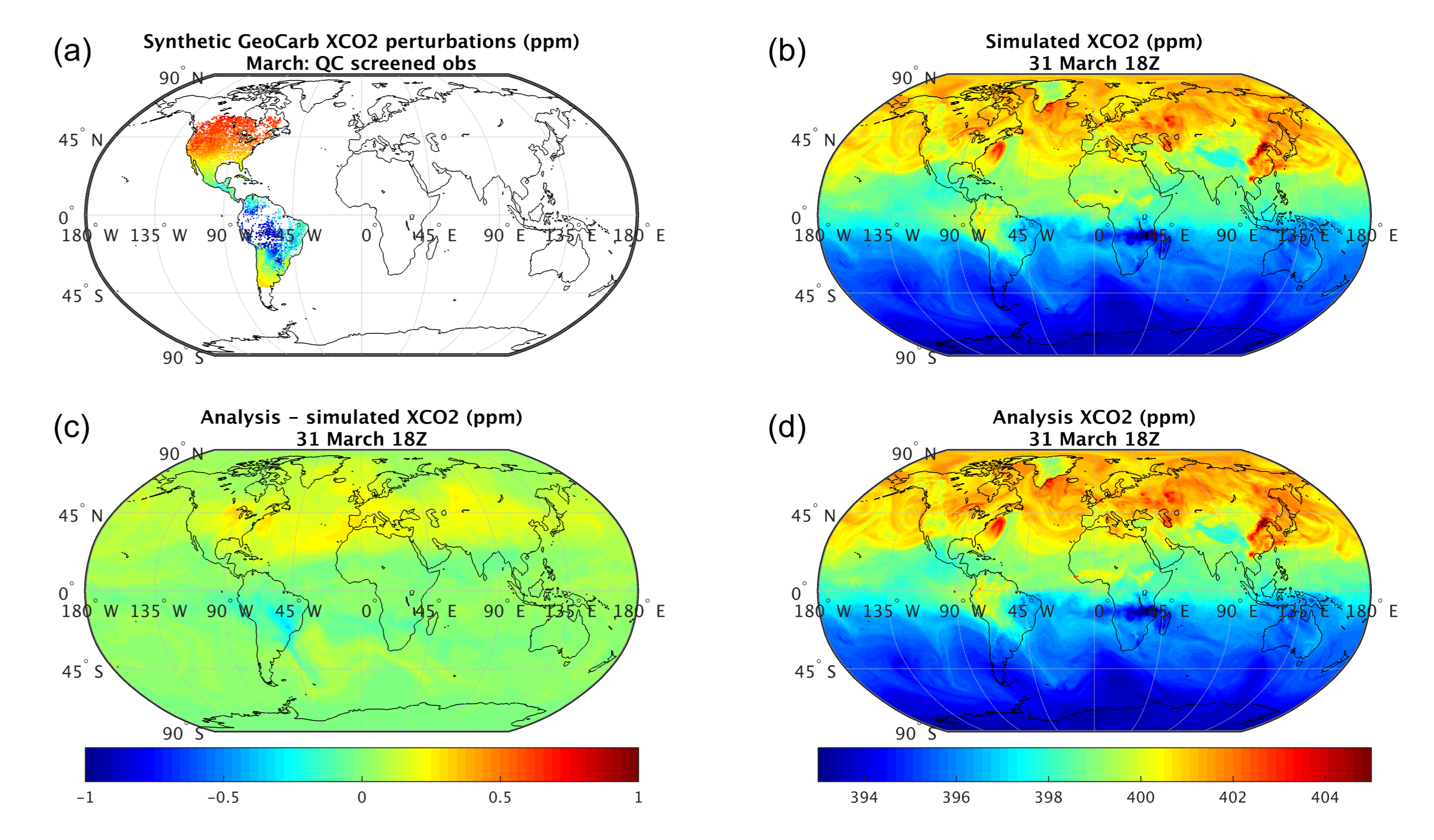


Fig 3. Same as Fig 2, but *with* applying the QC mask.

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