Global XCO$_2$ retrievals from TanSat: A detailed intercomparison between UoL-FP and IAPCAS
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Global XCO$_2$ products have now been generated for UoL-FP, allowing us to compare to the global products from IAPCAS.

Why compare retrievals from two algorithms and the filters used?
• Provides a means of benchmarking XCO$_2$ retrievals
• Algorithm performance check
• Sensitivity of retrieved quantities to input physics

In this poster, we will provide an overview of comparisons between TanSat retrievals as processed by UoL-FP/IAPCAS.
The TanSat observatory and data products

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<th>TanSat Product Specification</th>
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<td>Launch date</td>
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- UoL-FP algorithm is used to process the entire TanSat dataset spanning 1<sup>st</sup> Mar 2017 – 25<sup>th</sup> May 2018 (land only).
- The data products have been produced as part of the ESA CCI+ project.
- L2 data products for colocated observations over TCCON sites, and global data for Jun/Aug 2017 available at [https://climate.esa.int/en/projects/ghgs/Data/](https://climate.esa.int/en/projects/ghgs/Data/)
UoL-FP Retrieval Algorithm

• Algorithm originally developed for processing OCO retrievals using the optimal estimation method, and radiative transfer scheme LIDORT, with aerosol information taken from CAMS.
• Adapted to process TanSat retrievals, UoL-FP uses O$_2$A and weak CO$_2$ bands only as there are calibration issues with the strong CO$_2$ band.
• Algorithm performs radiometric corrections using 8th-order Fourier series to improve calibration of operational data*.

*See Yang et al. (2020),
TCCON validation and bias correction

Colocation Criterion:
- ±3° of TCCON site
- ±1h of observation time
- \( N_{\text{TCCON}} > 20, N_{\text{TanSat}} > 50 \)

Red – TanSat/IAPCAS
Blue – TanSat/UoL-FP
Grey – TCCON data
Green – CAMS data
Seasonal plots

- The UoL-FP and IAPCAS products use different quality filters when selecting XCO\textsubscript{2} values to include.
- This results in the UoL-FP data having ~factor 2 more data points per day than the corresponding IAPCAS dataset.
- Therefore, for this seasonal comparison we match up common soundings in the UoL-FP/IAPCAS datasets.
Conclusions

- Generally good agreement between retrieved UoL-FP/IAPCAS XCO₂ values.
- Largest differences seen in the tropics where there are no TCCON validation stations.

To-do next:

- Investigation of other bias-correction methods using different truth proxies such as the Small Area Approximation, and model median.
- Reassessment of the UoL-FP quality filters in light of the global data.