Validation of the greenhouse gases observing satellite GOSAT using an ensemble of COCCON spectrometers

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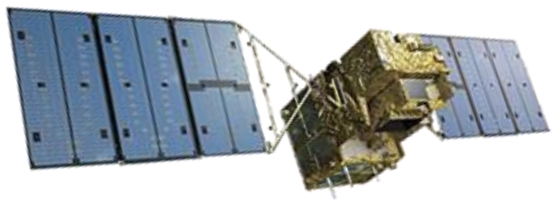
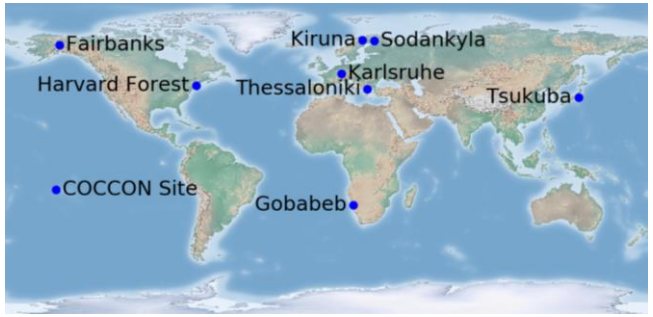


GOSAT

- Launched 2009
- First satellite for dedicated XCO_2 & XCH_4 measurements

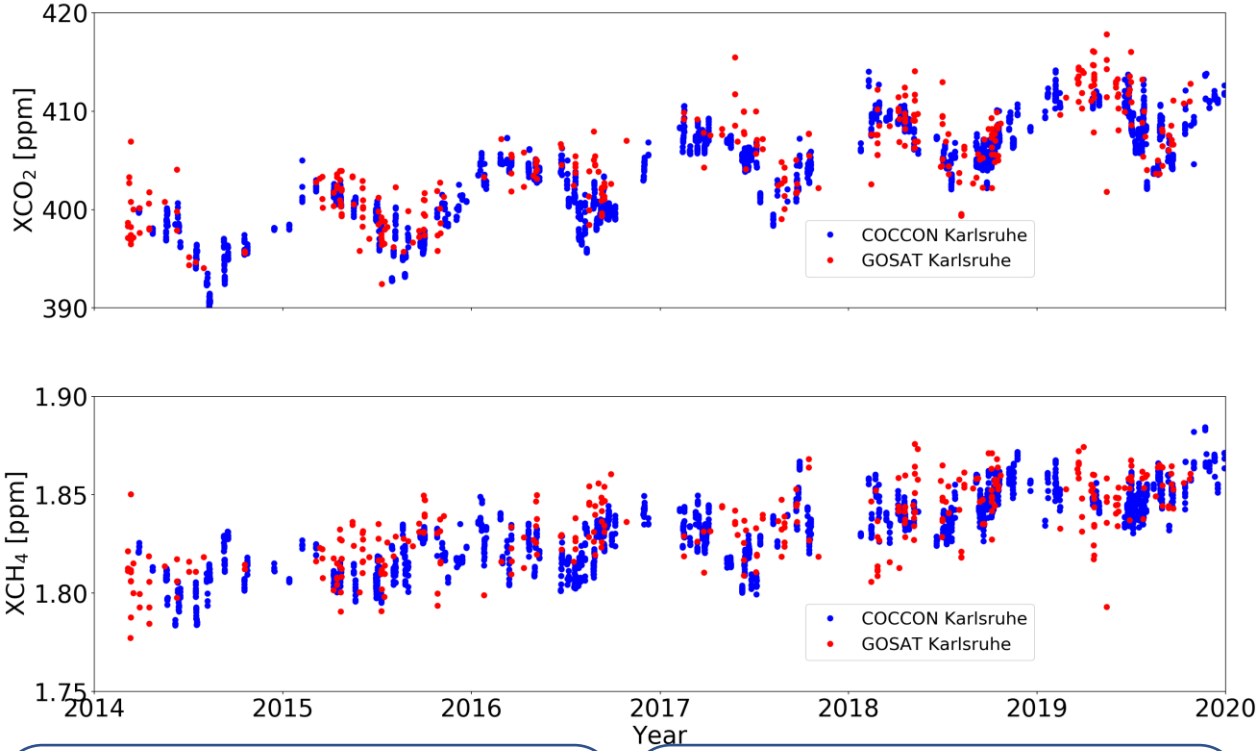
COCCON

- Established 2019
- Measures XCO_2, XCH_4 & XCO in remote regions



Validation

- 8 sites
- GOSAT: NIES V02.90
- COCCON: PROFFAST
- Coincidence criteria: +/- 2° of COCCON site, +/- 30 min of GOSAT overpass



Karlsruhe: GOSAT - COCCON

- ΔXCO_2: 1.3 +/- 2.0 ppm
- ΔXCH_4: 8.1 +/- 11.3 ppb

All sites

- ΔXCO_2: 0.9 +/- 1.6 ppm
- ΔXCH_4: 5.8 +/- 12.7 ppb

COCCON network

- COCCON: **Co**llaborative **C**arbon **C**olumn **O**bserving **N**etwork
- Framework for EM27/SUN spectrometer operation
- Check of new instruments at KIT
  - Solar measurements side-by-side with reference EM27/SUN and co-located TCCON instrument
  - Alignment check and ILS measurements
  - ILS ensemble mean: 0.985 $\pm$ 0.008
  - XCO_2, XCH_4, XH_2O, XCO calibration factors
- Loan of instruments possible for campaigns
- Open-source processing codes available
  - PREPROCESS + PROFFAST
  - Calibration tied to TCCON (and thereby WMO scale) using long term TCCON/COCCON comparisons in Karlsruhe and Sodankyla
- Offers centralized processing facility

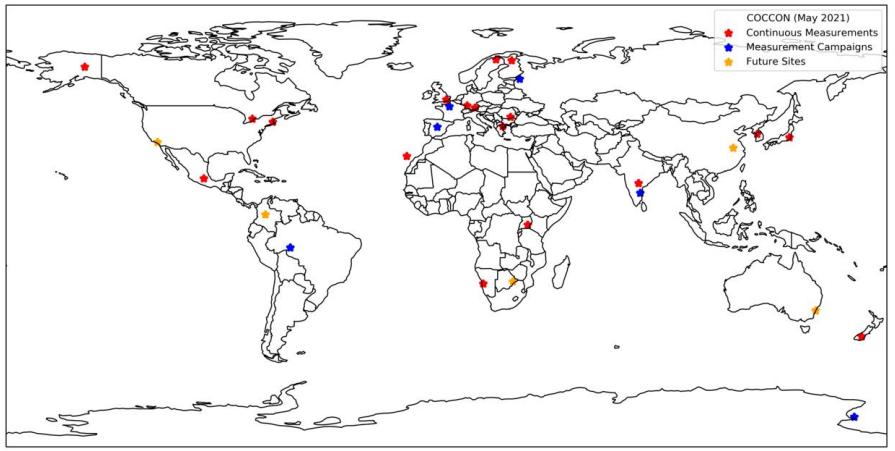
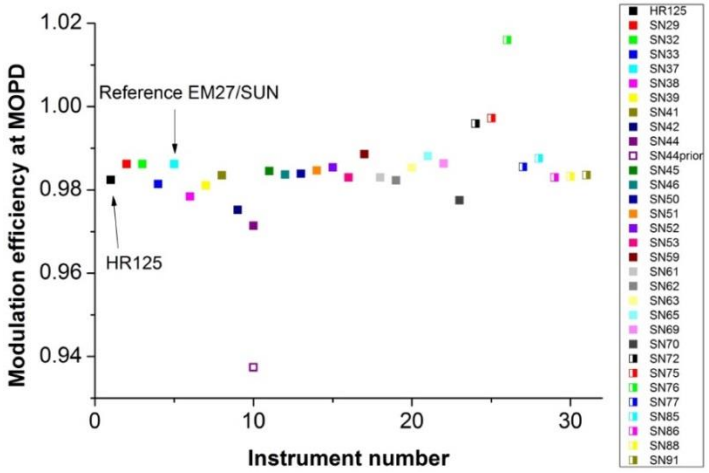


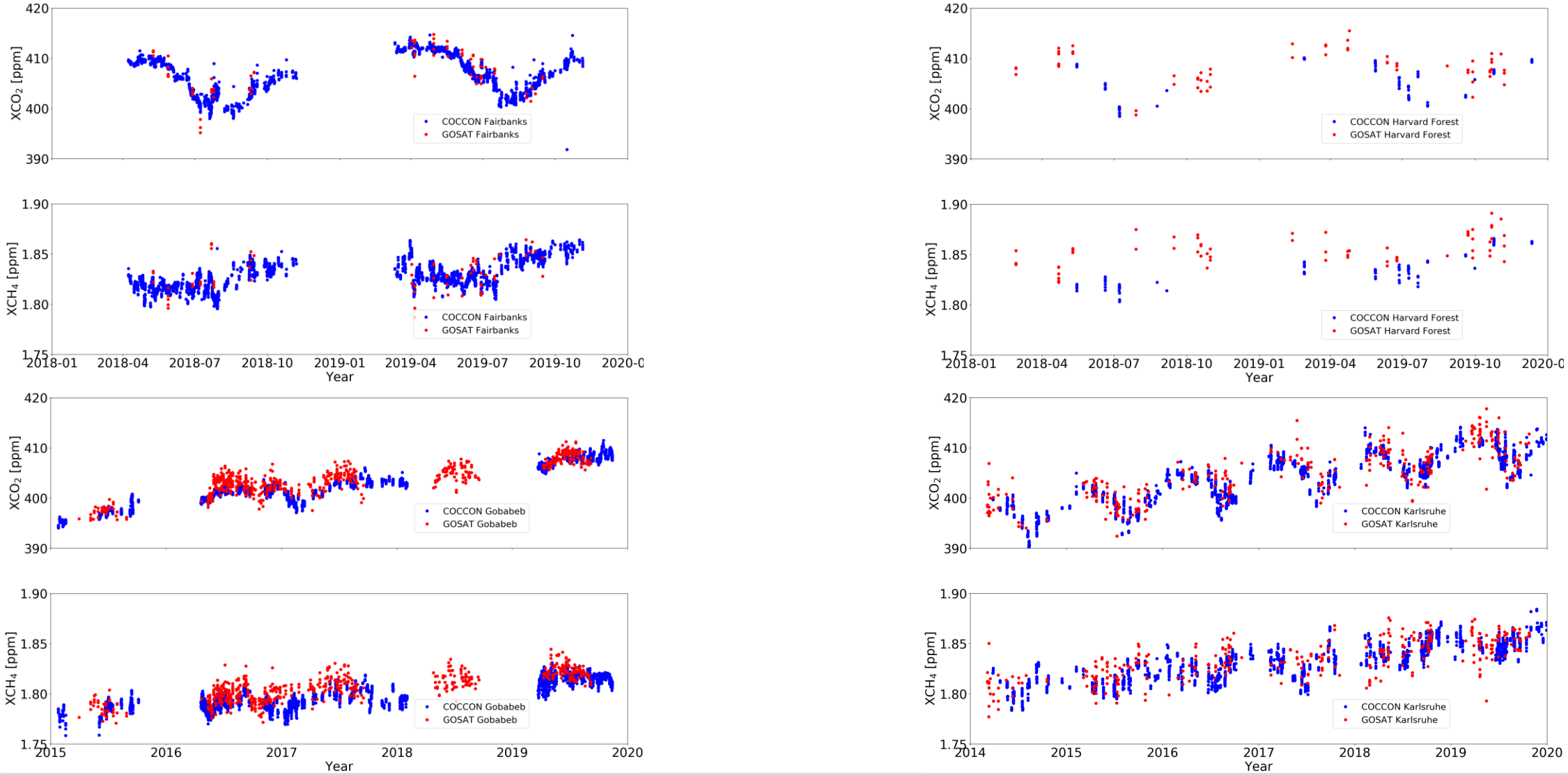
Fig. Source: https://www.imk-asf.kit.edu/english/3884.php

Calibration work continued by Carlos Alberti

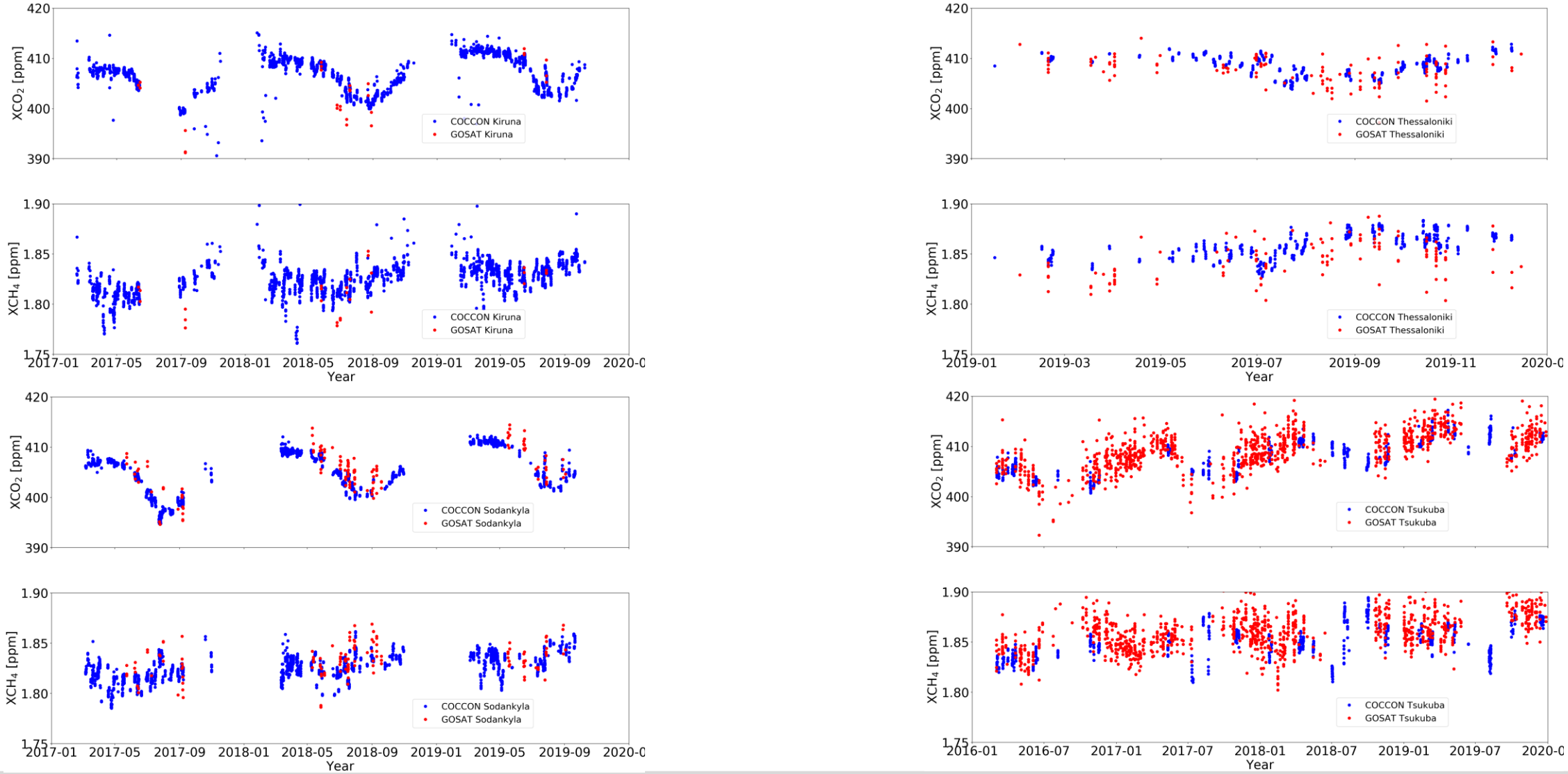


[Frey et al., AMT, 2019]

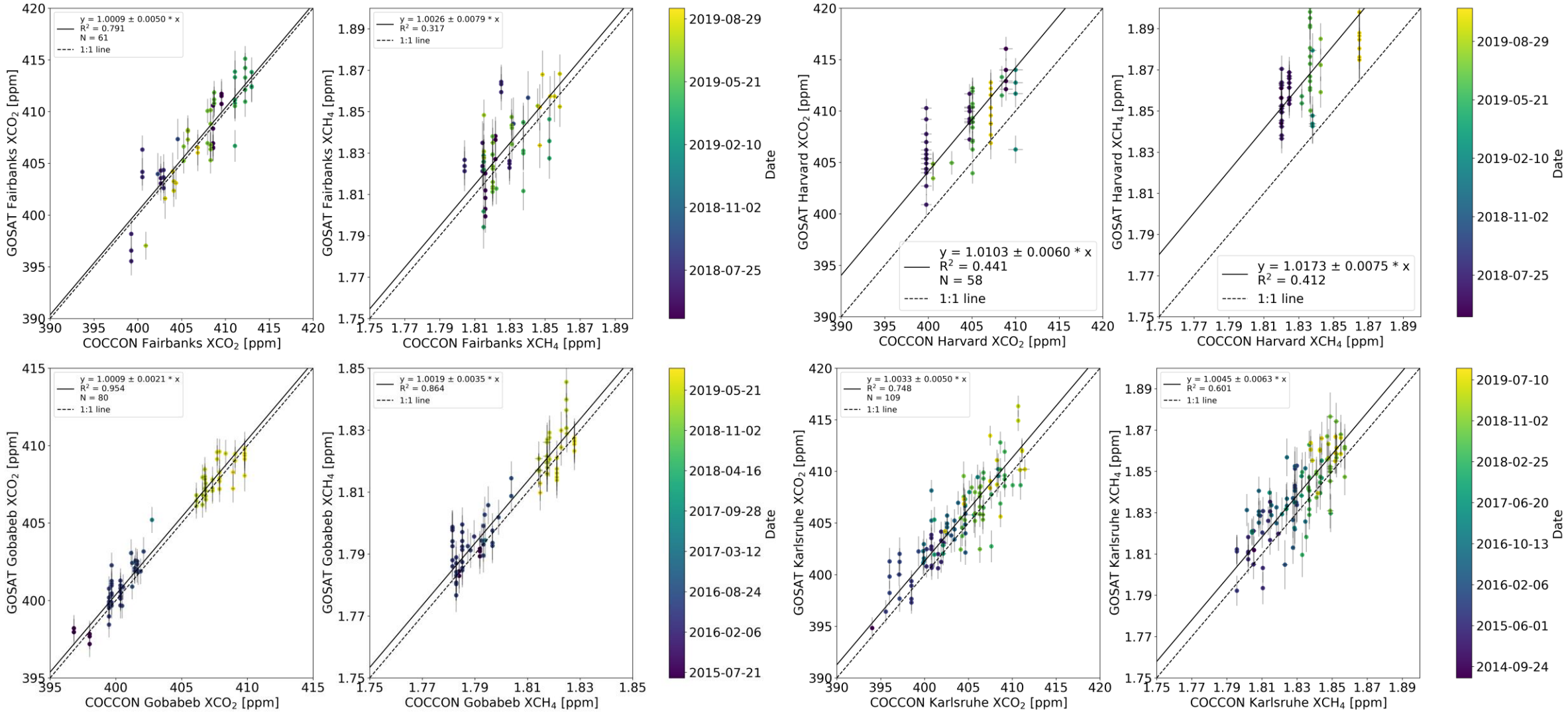
COCCON GOSAT timeseries comparison



COCCON GOSAT timeseries comparison



Correlation analysis



Correlation analysis