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Supplement of

Carbon dioxide retrieval from OCO-2 satellite observations using the RemoTeC algorithm and validation with TCCON measurements

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1 Overview

5 Here, we provide additional information about: Fig.S1: Error on XCO₂ retrievals as a function of six parameters: air mass, water column, blended albedo, mean signal in O₂ A-band, aerosol ratio and aerosol size parameter (reff); Fig.S2: same as Fig. S1 but after bias correction; Fig.S3: Validation of individual XCO₂ retrieved from OCO-2 measurements after bias correction; Fig.S4-Fig.S6: Validation of overpass averaged retrievals with TCCON before bias correction for target, land and ocean soundings, respectively; Fig.S7-Fig.S9: The dependence of the bias on latitude before bias correction for target, land
10 and ocean soundings, respectively.

2 Content of this file

- (1). Figures S1 to S9.
- (2). Table S1

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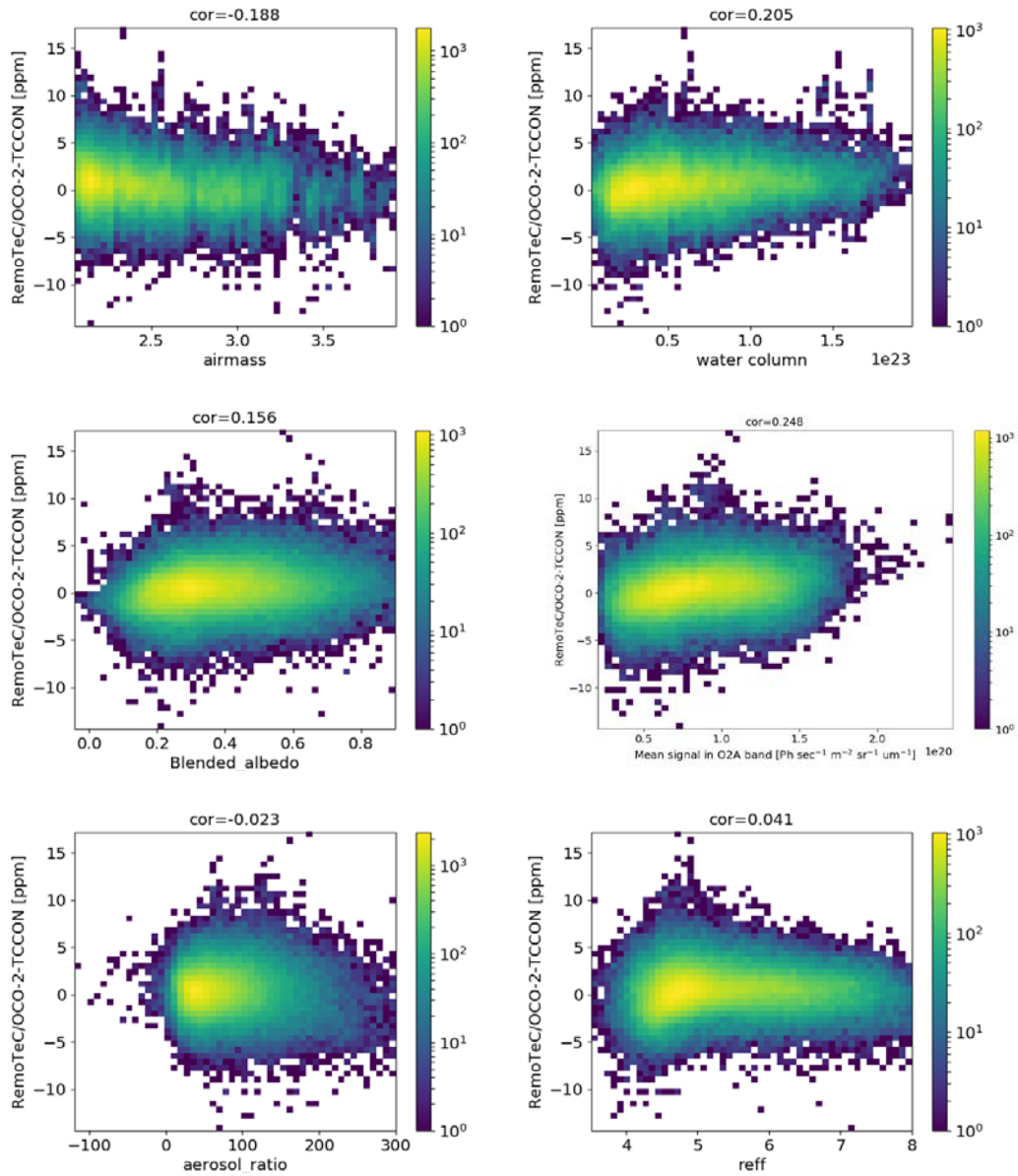
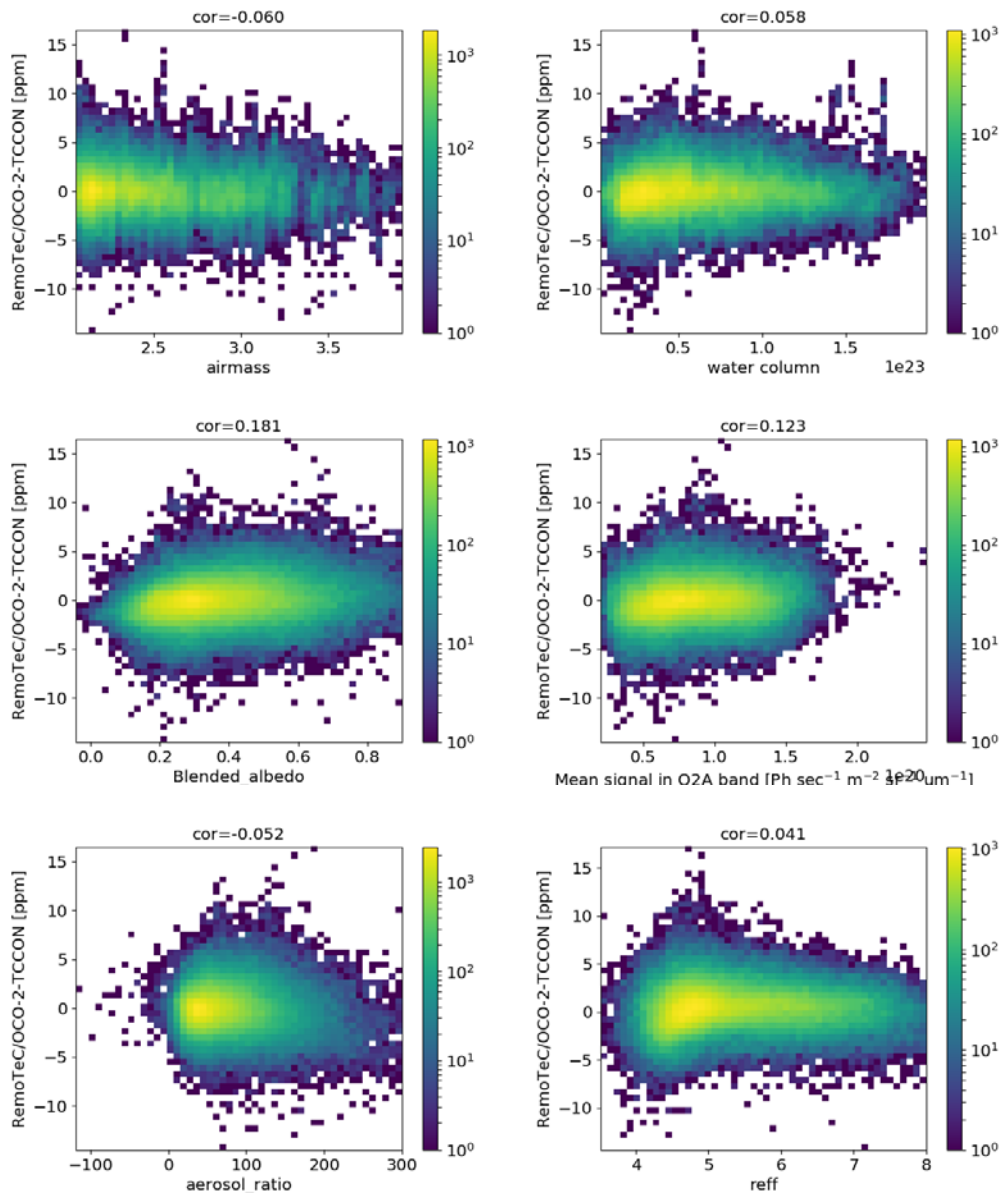


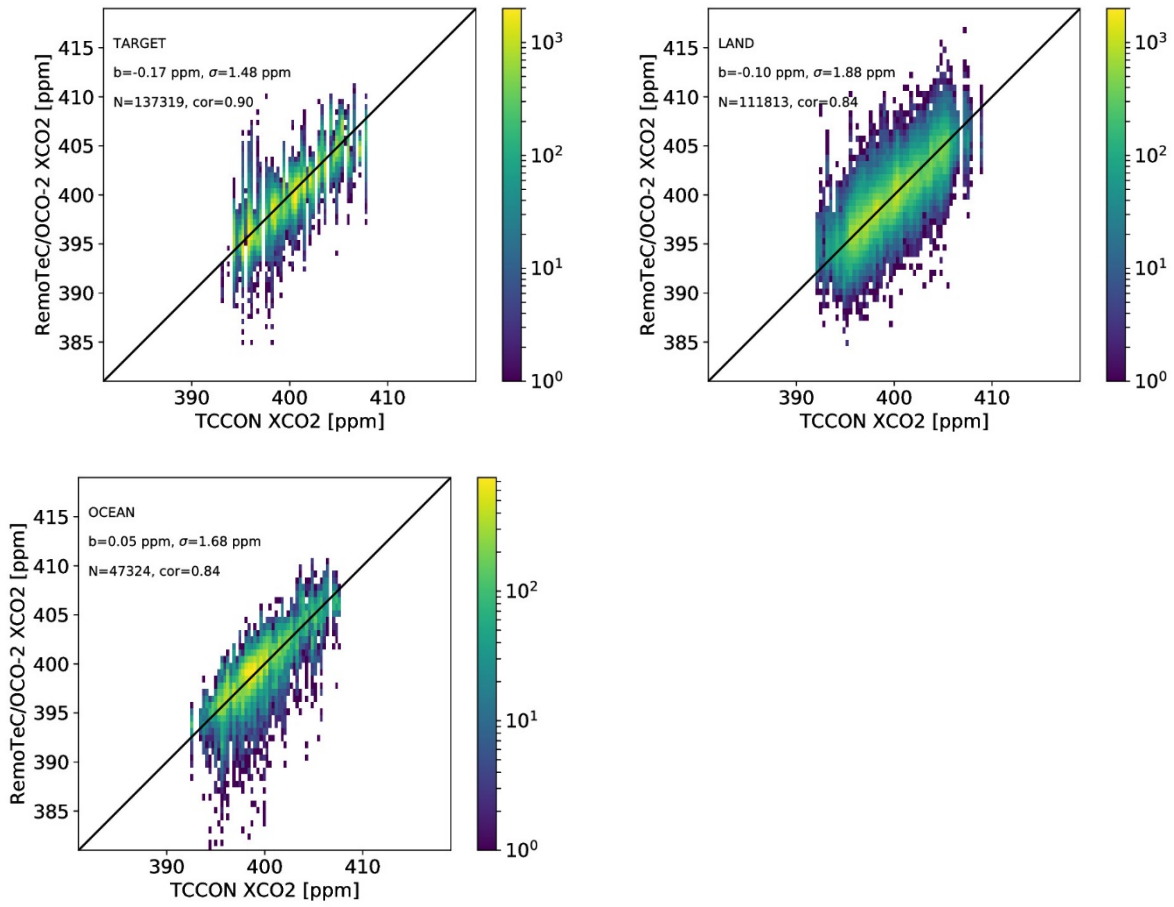
Figure S1. Error on XCO₂ retrievals as a function of six parameters: air mass, water column, blended albedo, mean signal in O₂ A-band, aerosol ratio and aerosol size parameter (reff). Different colors represent the frequency of point occurrence.



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Figure S2. Same as Figure S1 after bias correction.

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5 Figure S3. Validation of individual XCO₂ retrieved from OCO-2 measurements with collocated TCCON data after bias correction.

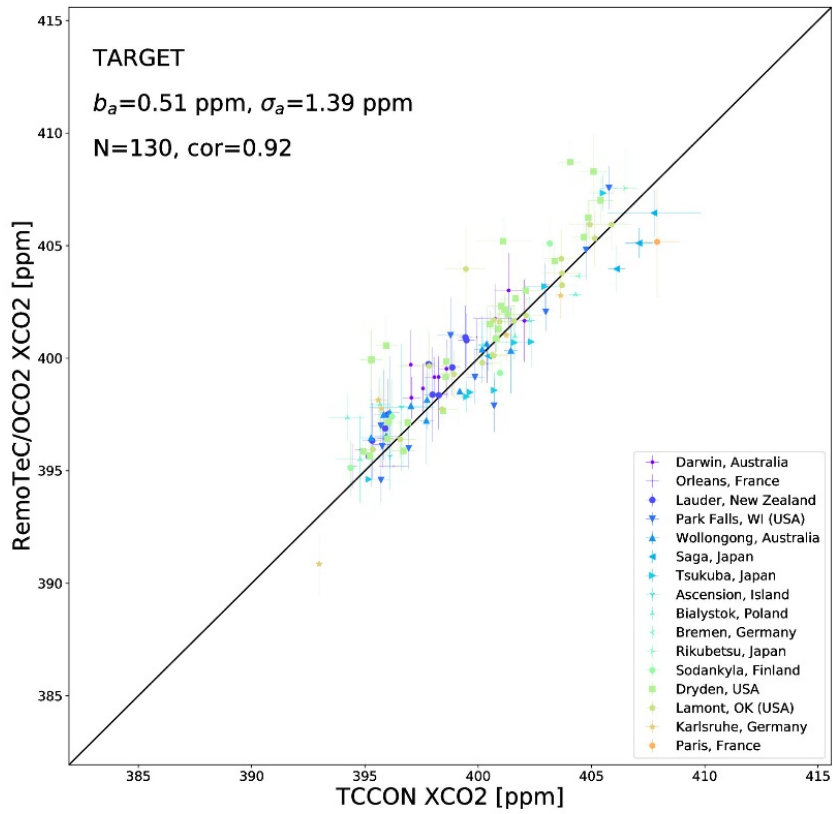


Figure S4. Validation of averaged XCO₂ retrieved from OCO-2 target measurements with collocated TCCON data before bias correction. The standard deviation of individual TCCON data and that of RemoTeC/OCO-2 retrievals are presented with error bars. The bias (b_a), standard deviation (σ_a), number of points (N), the Pearson correlation coefficient (cor) and one-to-one line are included.

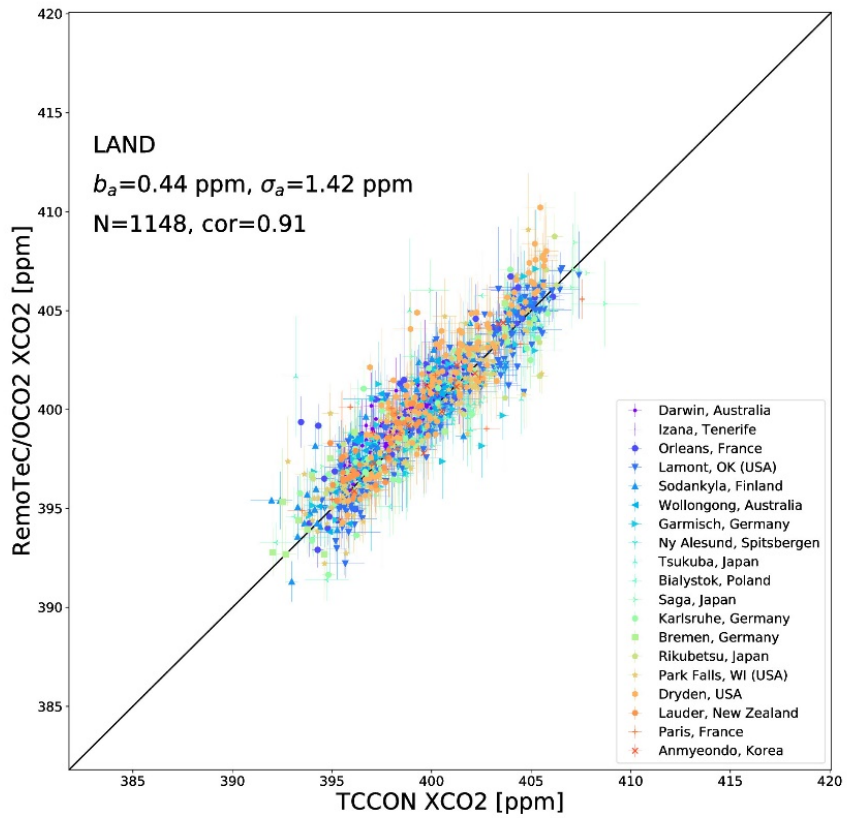


Figure S5. Same as Fig. S4, but for OCO-2 land type measurements obtained under nadir and glint modes.

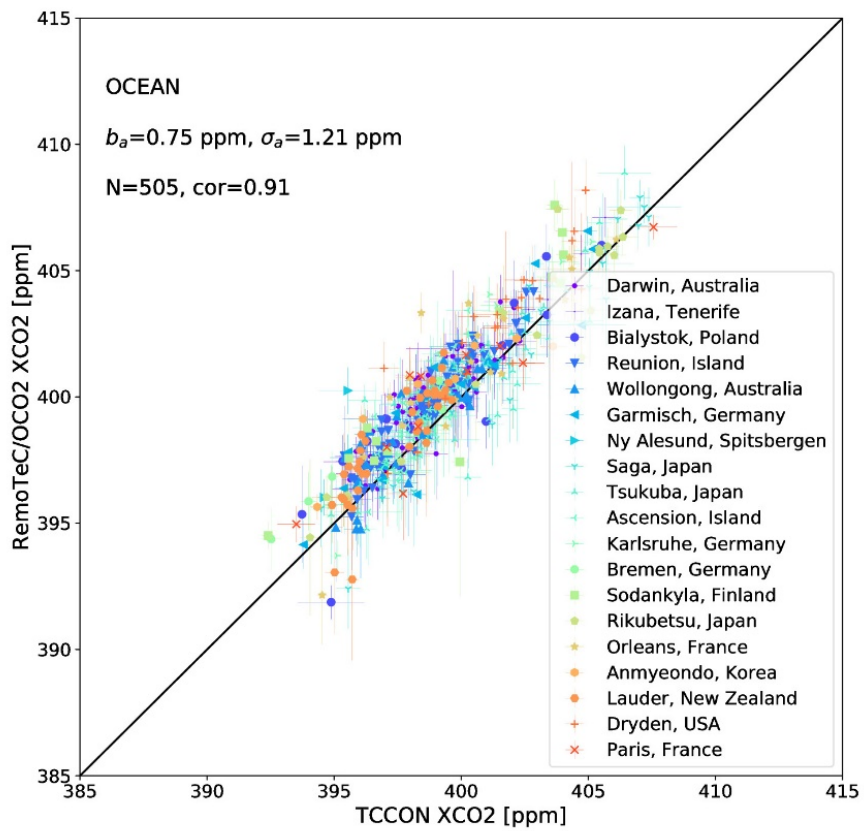


Figure S6. Same as Fig. S4, but for OCO-2 ocean type measurements obtained under glint mode.

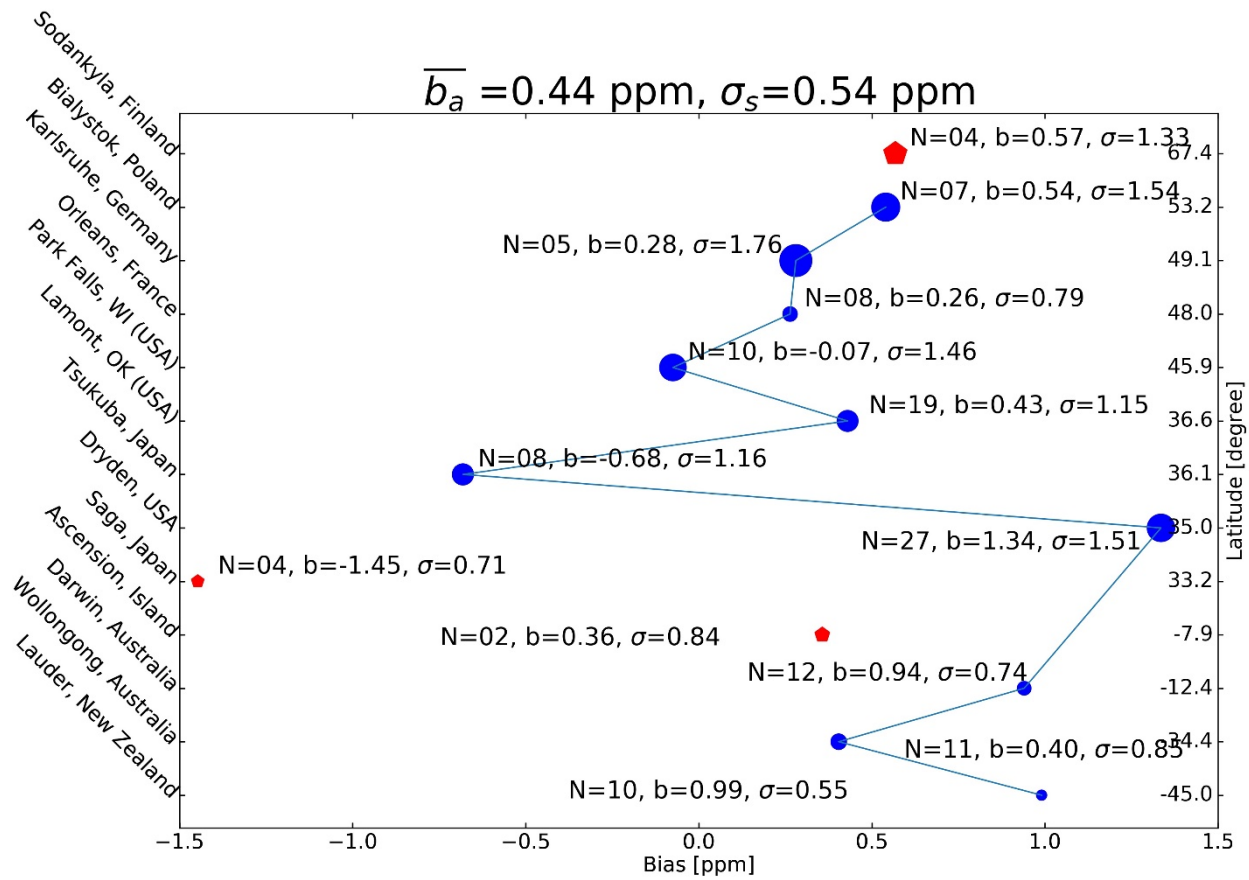


Figure S7. The dependence of the bias between RemoTeC/OCO-2 target XCO₂ retrievals coincident with TCCON data on the latitude of each station. Shown are the averaged results before bias correction. Stations with less than 5 collocation points (marked with red pentagon) should be interpreted with care and are therefore excluded from the calculation of the derived parameters including mean bias (b_a) and the station-to-station variability (σ_s). The size of each dot represents the standard deviation of the difference at each station.

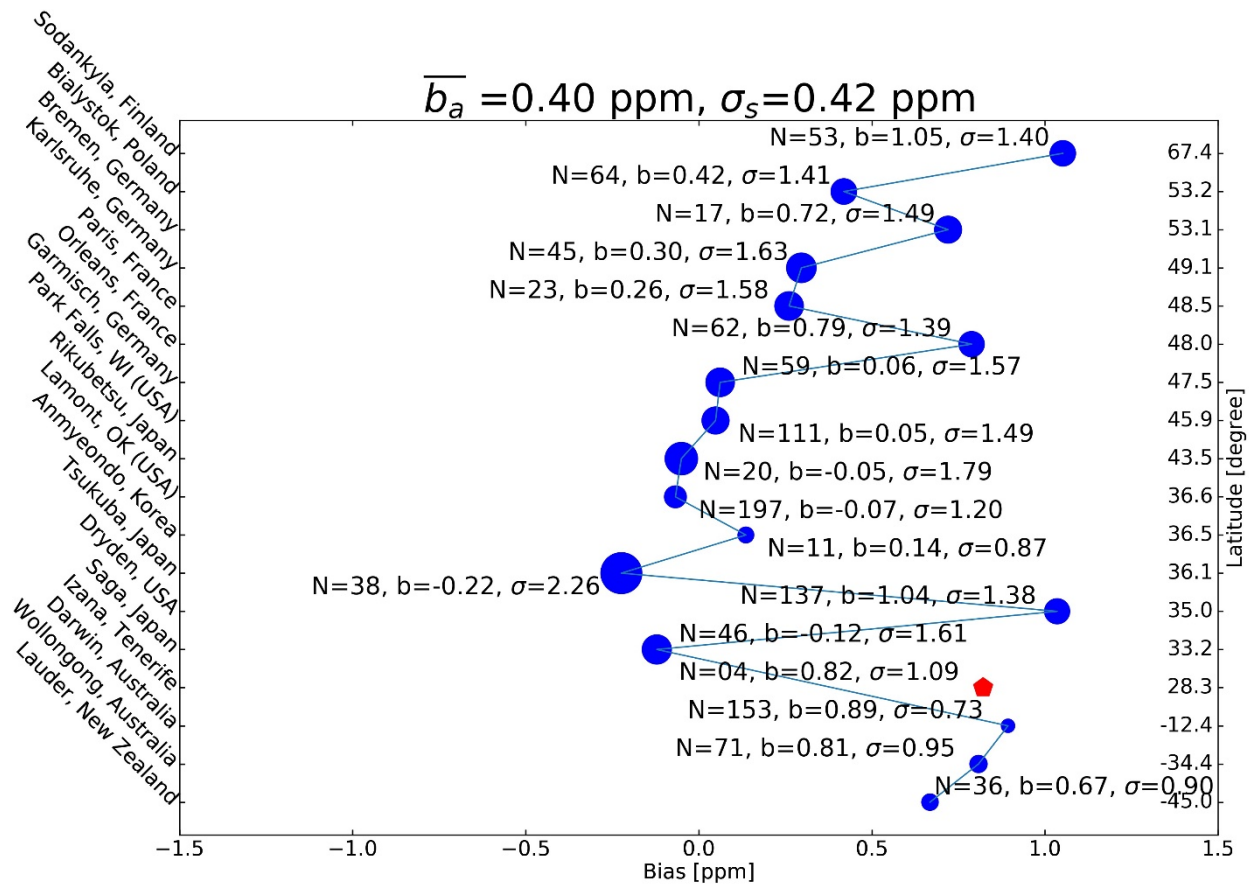


Figure S8. Same as Fig. S7, but for OCO-2 land type measurements obtained under nadir and glint modes.

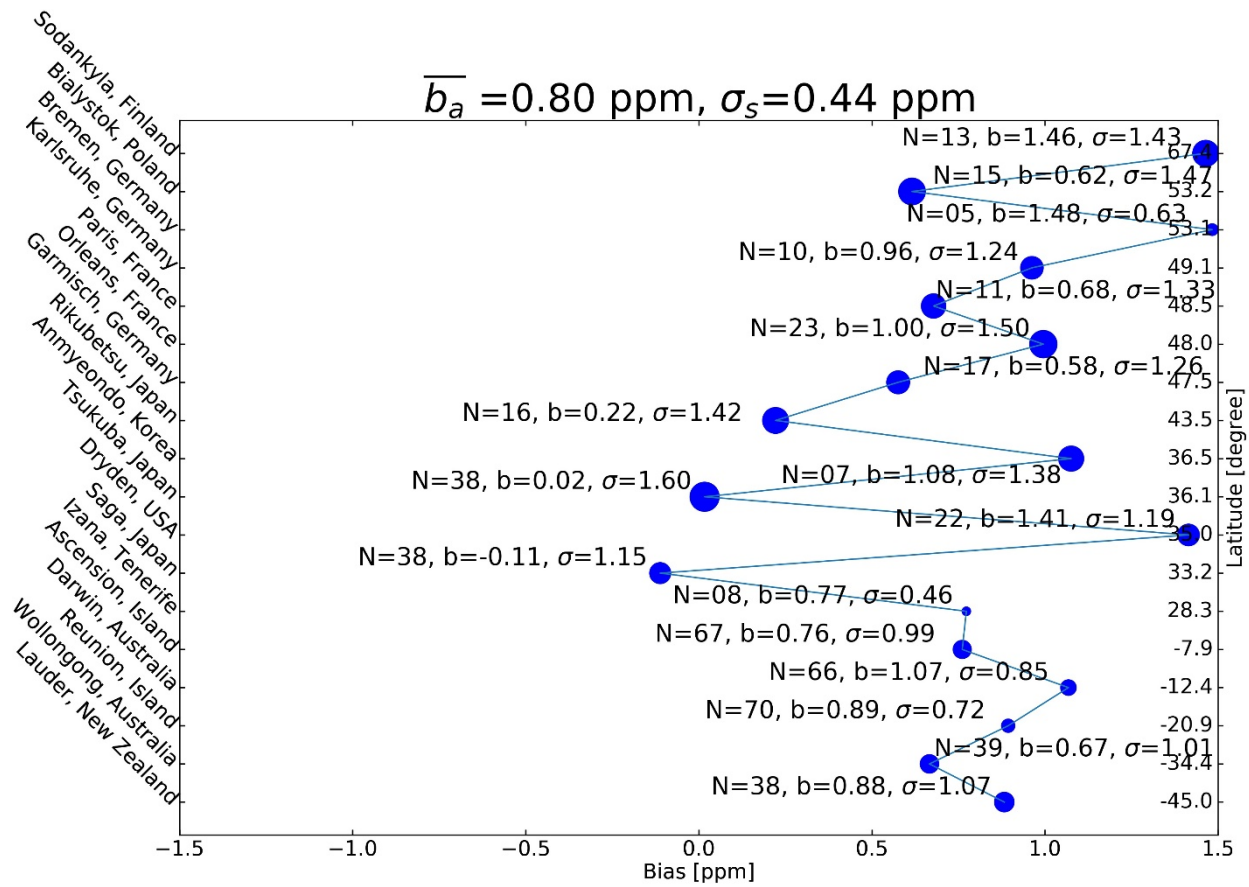


Figure S9. Same as Fig. S7, but for OCO-2 ocean type measurements obtained under glint mode.

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Table S1. Correlation coefficients between XCO₂ difference between TCCON and OCO-2 retrievals with filtering parameters listed in Table 2 in the paper.

parameters	Correlation before bias correction	Correlation after bias correction
sza	-0.19	-0.05
vza	-0.07	-0.04
χ^2	0.20	0.00
χ^2_{NIR}	0.18	0.09
χ^2_{SWIR1}	0.20	-0.04
χ^2_{SWIR2}	0.15	-0.05
Blended albedo	0.16	0.18
sev	0.07	0.10
α^s	0.04	0.01
$\tau_{0.765}$	-0.05	-0.02
Aerosol ratio parameter	-0.02	-0.05
water column	0.20	0.06
Ioff1	-0.21	-0.15
Ioff2	0.05	0.10
Ioff3	-0.11	-0.09

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