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Supplement of

Consistent satellite XCO₂ retrievals from SCIAMACHY and GOSAT using the BESD algorithm

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Table S1. Comparison of the validation results against TCCON using three different collocation criteria, the $10^\circ \times 10^\circ$ box around a TCCON site, a 5° radius and a 350 km radius. Shown are the statistical summary values: (i) the mean of the mean differences to TCCON (offset, $\bar{\Delta}$), (ii) the standard deviation of the mean differences (estimated station-to-station bias, SD Δ), (iii) the mean of the standard deviation of the difference (estimated single measurement precision, $\bar{\sigma}$), (iv) the mean correlation coefficient (\bar{r}) and (v) the number of stations with a sufficient amount of collocations ($n > 30$).

Collocation method	GOSAT BESD – Full Dataset					SCIAMACHY BESD – Full Dataset				
	$\bar{\Delta}$ [ppm]	SD Δ [ppm]	$\bar{\sigma}$ [ppm]	\bar{r} [-]	n [-]	$\bar{\Delta}$ [ppm]	SD Δ [ppm]	$\bar{\sigma}$ [ppm]	\bar{r} [-]	n [-]
$10^\circ \times 10^\circ$	-0.30	0.43	2.09	0.79	11	-0.05	0.89	2.20	0.78	11
5° radius	-0.27	0.39	2.08	0.79	11	-0.05	0.90	2.20	0.77	11
350 km radius	-0.22	0.41	1.99	0.80	9	-0.10	0.85	2.26	0.74	9
Collocation method	GOSAT BESD – 2010–2011					SCIAMACHY BESD – 2010–2011				
	$\bar{\Delta}$ [ppm]	SD Δ [ppm]	$\bar{\sigma}$ [ppm]	\bar{r} [-]	n [-]	$\bar{\Delta}$ [ppm]	SD Δ [ppm]	$\bar{\sigma}$ [ppm]	\bar{r} [-]	n [-]
$10^\circ \times 10^\circ$	-0.42	0.48	2.04	0.71	11	-0.08	0.88	2.12	0.63	11
5° radius	-0.38	0.44	2.05	0.71	11	-0.09	0.86	2.12	0.62	11
350 km radius	-0.39	0.40	1.93	0.72	9	-0.20	0.75	2.25	0.54	9

Table S2. Same as Tab. S1 but for daily means. The statistical summary values are computed using only stations with more than 10 days of data.

Collocation method	GOSAT – TCCON					SCIAMACHY – TCCON					GOSAT – SCIAMACHY				
	$\bar{\Delta}$ [ppm]	SD Δ [ppm]	$\bar{\sigma}$ [ppm]	\bar{r} [-]	n [-]	$\bar{\Delta}$ [ppm]	SD Δ [ppm]	$\bar{\sigma}$ [ppm]	\bar{r} [-]	n [-]	$\bar{\Delta}$ [ppm]	SD Δ [ppm]	$\bar{\sigma}$ [ppm]	\bar{r} [-]	n [-]
$10^\circ \times 10^\circ$	-0.17	0.54	1.28	0.85	9	-0.05	0.85	1.60	0.73	9	-0.77	0.59	1.51	0.80	9
5° radius	-0.24	0.46	1.39	0.85	5	-0.17	0.74	1.68	0.66	5	-0.38	0.40	1.60	0.77	5
350 km radius	-0.34	0.11	0.96	0.88	2	0.07	0.71	1.51	0.69	2	-0.23	0.58	1.48	0.72	2

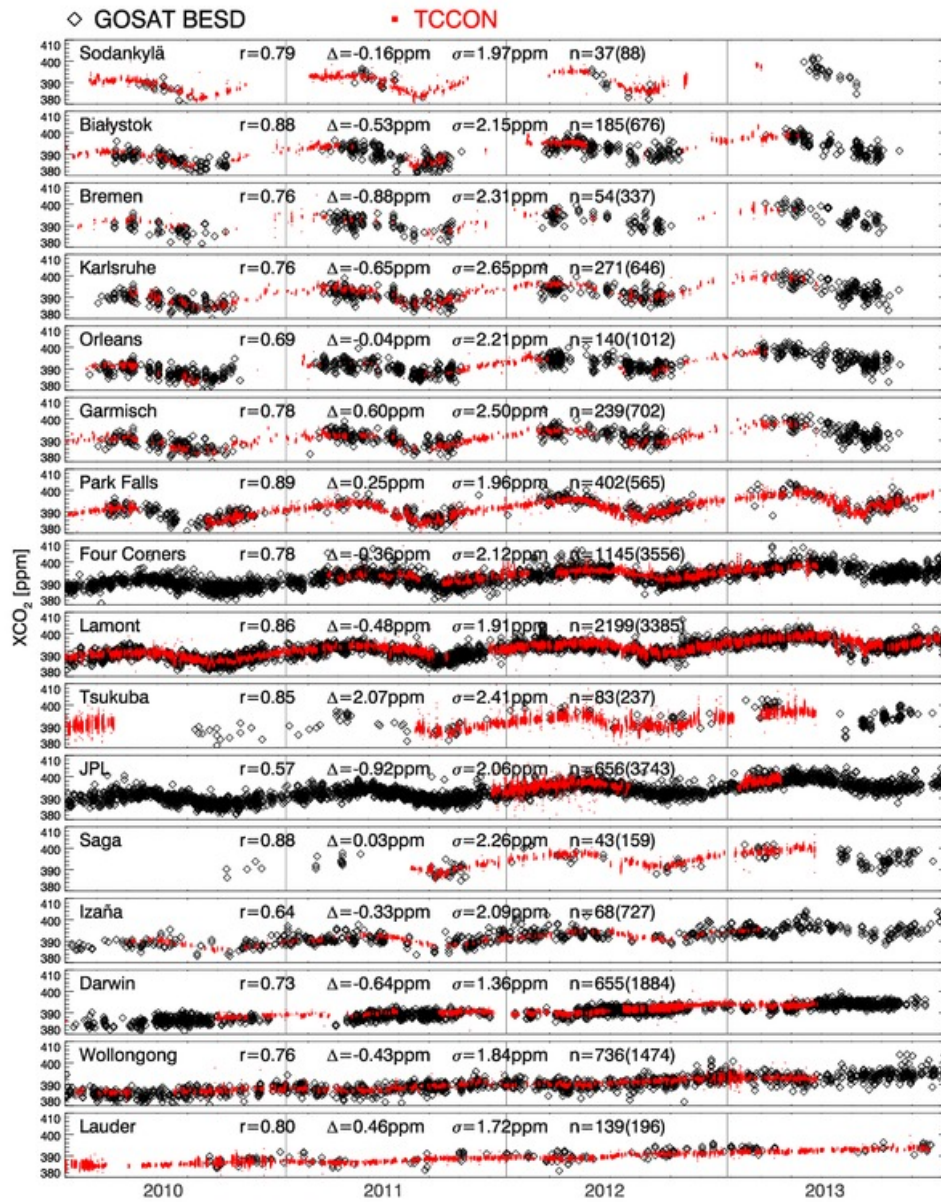


Figure S1. GOSAT BESD XCO₂ and TCCON XCO₂ at the chosen TCCON sites. “ r ” is the correlation coefficient, “ Δ ” is the mean of the difference GOSAT minus TCCON, “ σ ” is the standard deviation of the difference and “ n ” the number of collocations (± 2 h, $10^\circ \times 10^\circ$, in brackets: number of GOSAT measurements with “good” quality). A summary of all values is given in Table 5.

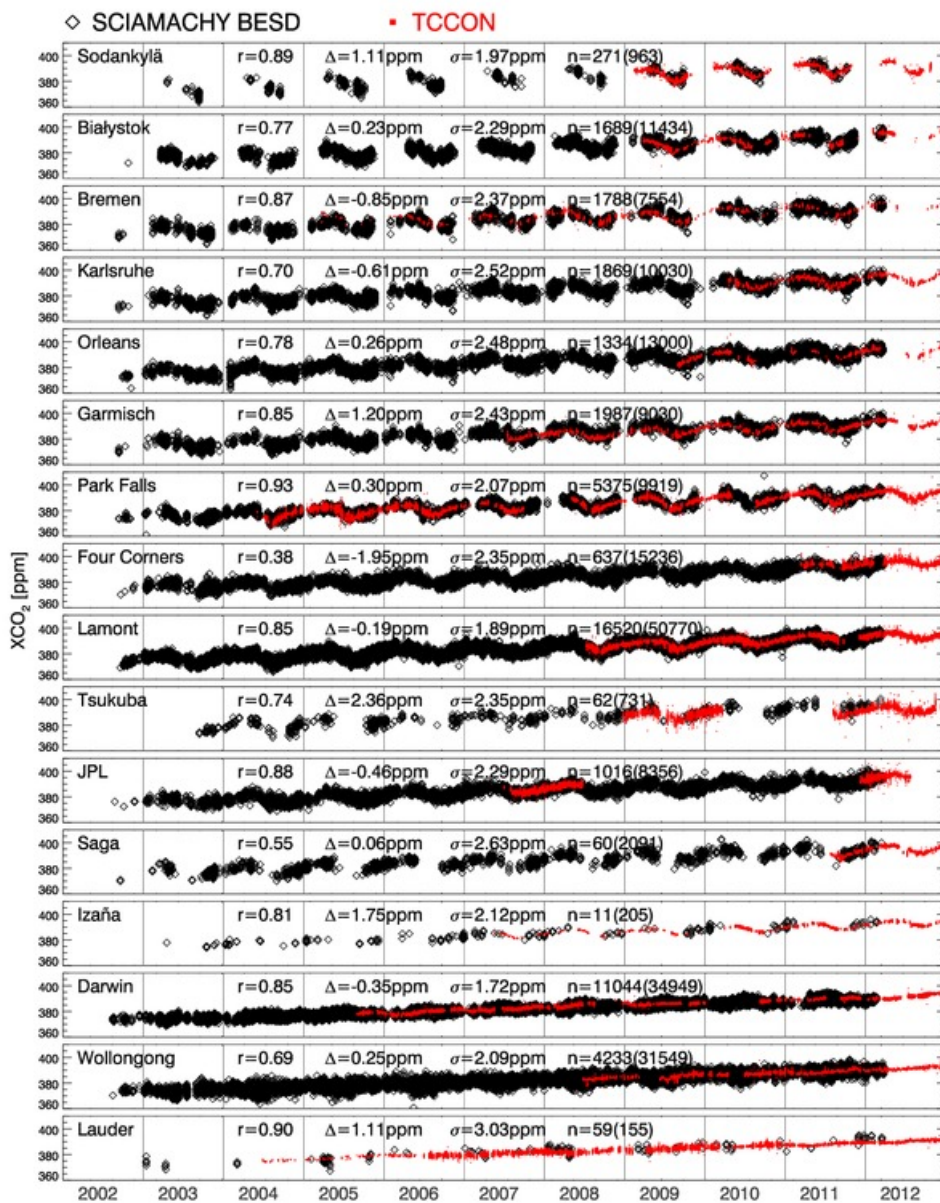


Figure S2. As Fig. S1 but for SCIAMACHY BESD XCO₂. A summary of all values is given in Table 6.

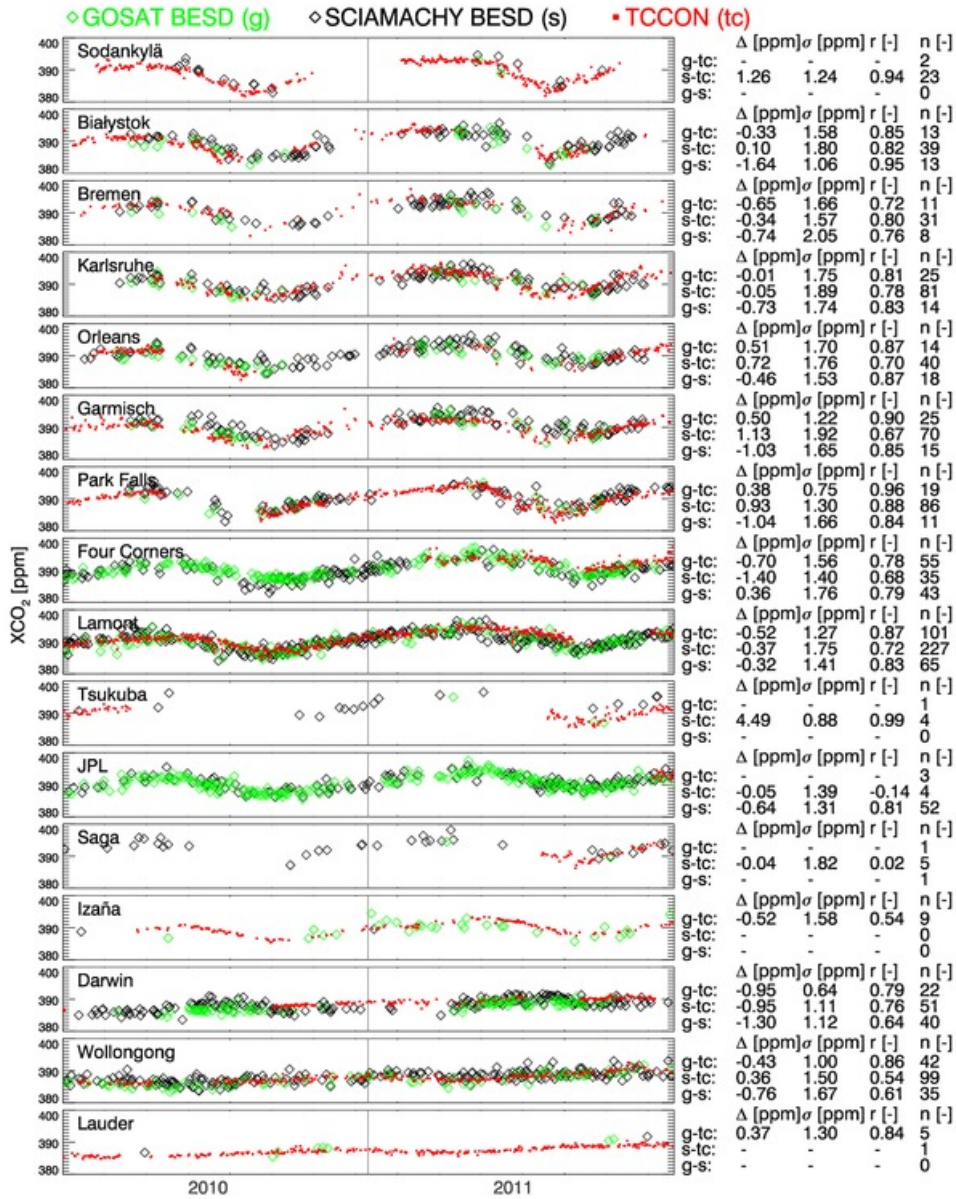


Figure S3. Daily averages of GOSAT (g), SCIAMACHY (s) and TCCON (tc) XCO₂ for 2010 and 2011. The values are computed as for Fig. S1 and are summarised in Table 7.