PyCAMA report generated by tropl2-proc

tropl2-proc

2025-06-04 (03:40)

1 Short Introduction

1.1 The list of parameters

You may want to keep the list given in table 1 at hand when viewing the results.

2 Definitions

The averages shown here are *unweighed* averages:

$$\overline{x} = \frac{1}{N}\sum_{i=1}^{N} x_i \tag{1}$$

with N the number of observations in the dataset.

The spread of the measurements is indicated with the variance $V(x)$, or rather the standard deviation $\sigma(x) = \sqrt{V(x)}$.

$$V(x) = \frac{1}{N-1}\sum_{i=1}^{N}(x_i - \overline{x})^2 \tag{2}$$

We also report the more robust statistics median, minimum, maximum, various percentiles and inter quartile range.

The median m is the value of parameter x for which half of the observations of x is smaller than m:

$$P(x \leq m) = P(x \geq m) = \int_{-\infty}^{m} f(x)\,\mathrm{d}x = \frac{1}{2} \tag{3}$$

with $f(x)$ the probability density function.

The median is a special case of a percentile. Instead of ½ in equation 3, other threshold values can be used. We report results for 1 %, 5 %, 10 %, 15.9 %, 25 %, 75 %, 84.1 %, 90 %, 95 % and 99 %. The inter quartile range is the difference between the 75 % and 25 % percentiles. Similarly the minimum and maximum values correspond to the 0 % and 100 % percentiles respectively.

For normally distributed parameters the mean and median are the same, while the $\mu \pm \sigma$ values and the 15.9 % and 84.1 % percentiles coincide.

To get a measure for the relation of one variable $x_{(k)}$ with another $x_{(l)}$, we calculate the covariance matrix C_{kl}.

$$C_{kl} = C(x_{(k)}, x_{(l)}) = \frac{1}{N-1}\sum_{i=1}^{N}(x_{(k),i} - \overline{x_{(k)}})(x_{(l),i} - \overline{x_{(l)}}) \tag{4}$$

Rather than a dimensionally dependent covariance, it is often easier to interpret a correlation matrix R_{kl}, a matrix of Pearson's r coefficients:

$$R_{kl} = R(x_{(k)}, x_{(l)}) = \frac{C_{kl}}{\sqrt{C_{kk}C_{ll}}} = \frac{C_{kl}}{\sqrt{V(x_k)V(x_l)}} \tag{5}$$

The diagonal elements of the covariance matrix are the variances of the elements, $V(x_{(k)}) = C_{kk}$ and obviously $R_{kk} = 1$.

Table 1: Parameterlist and basic statistics for the analysis

Variable	mean $\pm\sigma$	Count	Mode	IQR	Median	Minimum	Maximum
qa value [1]	0.633 ± 0.408	17393702	0.995	0.790	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.007 \pm 106.183) \times 10^{-2}$	17393702	0.263	0.438	1.035×10^{-2}	-93.1	919
sulfurdioxide total vertical column precision [DU]	0.490 ± 0.652	17393702	0.222	0.315	0.318	3.693×10^{-2}	639
sulfurdioxide slant column density corrected [DU]	$(2.099 \pm 49.762) \times 10^{-2}$	17393702	0.242	0.373	9.597×10^{-3}	-42.4	699
sulfurdioxide slant column density cobra [DU]	$(2.035 \pm 38.917) \times 10^{-2}$	17393702	0.242	0.373	9.597×10^{-3}	-42.4	66.0
sulfurdioxide slant column density cobra precision [DU]	0.297 ± 0.130	17393702	0.213	0.127	0.258	7.639×10^{-2}	28.9
sulfurdioxide slant column density window1 [DU]	0.112 ± 0.699	17393702	0.125	0.748	0.112	-80.9	122
sulfurdioxide slant column density window1 precision [DU]	0.297 ± 0.130	17393702	0.213	0.127	0.258	7.639×10^{-2}	28.9
sulfurdioxide slant column density corrected win1 [DU]	$(3.352 \pm 68.910) \times 10^{-2}$	17393702	-2.500×10^{-2}	0.732	1.375×10^{-2}	-80.9	121
background so2 slant column offset window1 [DU]	$(-7.820 \pm 13.006) \times 10^{-2}$	17393702	-0.180	0.162	-0.106	-0.720	1.84
sulfurdioxide slant column density window2 [DU]	0.928 ± 8.922	17393702	0.750	11.2	0.854	-1.129×10^{3}	863
sulfurdioxide slant column density window2 precision [DU]	8.10 ± 2.39	17393702	7.43	2.69	7.74	2.16	831
sulfurdioxide slant column density corrected win2 [DU]	-0.614 ± 8.830	17393702	-0.750	11.0	-0.626	-1.130×10^{3}	862
background so2 slant column offset window2 [DU]	-1.54 ± 1.96	17393702	0.250	2.76	-1.25	-10.8	12.6
sulfurdioxide slant column density window3 [DU]	-6.08 ± 23.62	17393702	-7.28	29.0	-6.16	-757	396
sulfurdioxide slant column density window3 precision [DU]	28.0 ± 13.4	17393702	21.5	10.4	24.4	9.33	270
sulfurdioxide slant column density corrected win3 [DU]	3.14 ± 23.31	17393702	2.80	28.6	3.33	-743	411
background so2 slant column offset window3 [DU]	9.22 ± 5.00	17393702	14.0	8.19	9.41	-13.1	26.8
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17393702	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.216 \pm 6.984) \times 10^{-2}$	17393702	1.217×10^{-2}	2.411×10^{-2}	1.484×10^{-2}	2.234×10^{-4}	2.46
fitted radiance shift [nm]	$(-2.030 \pm 25.519) \times 10^{-4}$	17393702	1.000×10^{-4}	1.691×10^{-3}	-1.992×10^{-4}	-0.104	4.132×10^{-2}
fitted radiance squeeze [1]	$(-3.939 \pm 18.691) \times 10^{-5}$	17393702	-3.000×10^{-5}	2.159×10^{-4}	-3.462×10^{-5}	-1.466×10^{-2}	3.884×10^{-2}
fitted root mean square [1]	$(1.291 \pm 0.522) \times 10^{-3}$	17393702	1.025×10^{-3}	5.184×10^{-4}	1.145×10^{-3}	3.261×10^{-4}	7.245×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.935 ± 0.517	17393702	0.620	0.629	0.826	5.000×10^{-2}	2.76
sulfurdioxide total air mass factor polluted precision [1]	0.119 ± 0.125	17393702	3.500×10^{-2}	0.117	7.597×10^{-2}	3.095×10^{-3}	1.89
sulfurdioxide clear air mass factor polluted [1]	0.782 ± 0.382	17393702	0.620	0.416	0.704	6.810×10^{-2}	2.71
number of spectral points in retrieval [1]	73.4 ± 0.5	17393702	73.0	1.000	73.0	52.0	155

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	3.000×10^{-2}	9.000×10^{-2}	0.210	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.16	−0.828	−0.512	−0.347	−0.205	0.233	0.386	0.570	0.930	2.47
sulfurdioxide total vertical column precision [DU]	9.376×10^{-2}	0.124	0.150	0.177	0.214	0.529	0.706	0.916	1.35	3.16
sulfurdioxide slant column density corrected [DU]	−0.855	−0.496	−0.361	−0.271	−0.175	0.198	0.299	0.399	0.556	1.04
sulfurdioxide slant column density cobra [DU]	−0.855	−0.496	−0.361	−0.271	−0.175	0.198	0.299	0.399	0.556	1.04
sulfurdioxide slant column density cobra precision [DU]	0.142	0.173	0.188	0.200	0.215	0.342	0.397	0.449	0.540	0.771
sulfurdioxide slant column density window1 [DU]	−1.67	−0.940	−0.655	−0.465	−0.265	0.483	0.680	0.867	1.15	1.94
sulfurdioxide slant column density window1 precision [DU]	0.142	0.173	0.188	0.200	0.215	0.342	0.397	0.449	0.540	0.771
sulfurdioxide slant column density corrected win1 [DU]	−1.63	−0.964	−0.707	−0.532	−0.347	0.386	0.588	0.784	1.09	1.94
background so2 slant column offset window1 [DU]	−0.310	−0.236	−0.209	−0.192	−0.171	-8.708×10^{-3}	4.868×10^{-2}	9.963×10^{-2}	0.168	0.320
sulfurdioxide slant column density window2 [DU]	−20.3	−13.3	−9.97	−7.49	−4.72	6.47	9.30	11.9	15.4	23.1
sulfurdioxide slant column density window2 precision [DU]	4.23	5.06	5.59	6.02	6.55	9.24	10.2	11.1	12.3	15.0
sulfurdioxide slant column density corrected win2 [DU]	−21.9	−14.8	−11.4	−8.91	−6.14	4.87	7.64	10.1	13.6	21.1
background so2 slant column offset window2 [DU]	−6.15	−4.97	−4.24	−3.59	−2.83	-7.728×10^{-2}	0.207	0.430	0.734	1.99
sulfurdioxide slant column density window3 [DU]	−65.9	−44.6	−34.8	−27.9	−20.5	8.46	16.1	23.1	32.8	52.3
sulfurdioxide slant column density window3 precision [DU]	13.2	15.4	17.4	18.9	20.6	31.0	35.4	40.9	52.6	85.2
sulfurdioxide slant column density corrected win3 [DU]	−56.4	−35.3	−25.5	−18.5	−11.0	17.6	24.9	31.7	40.9	60.2
background so2 slant column offset window3 [DU]	−1.24	1.45	2.77	3.82	5.21	13.4	14.5	15.4	16.6	19.0
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	4.807×10^{-4}	8.042×10^{-4}	1.254×10^{-3}	2.249×10^{-3}	5.993×10^{-3}	3.010×10^{-2}	4.835×10^{-2}	7.099×10^{-2}	0.114	0.315
fitted radiance shift [nm]	-8.036×10^{-3}	-3.930×10^{-3}	-2.511×10^{-3}	-1.719×10^{-3}	-1.068×10^{-3}	6.228×10^{-4}	1.269×10^{-3}	2.097×10^{-3}	3.583×10^{-3}	7.836×10^{-3}
fitted radiance squeeze [1]	-5.350×10^{-4}	-3.412×10^{-4}	-2.599×10^{-4}	-2.041×10^{-4}	-1.450×10^{-4}	7.084×10^{-5}	1.245×10^{-4}	1.744×10^{-4}	2.464×10^{-4}	4.204×10^{-4}
fitted root mean square [1]	5.914×10^{-4}	7.388×10^{-4}	8.253×10^{-4}	8.885×10^{-4}	9.615×10^{-4}	1.480×10^{-3}	1.725×10^{-3}	1.956×10^{-3}	2.285×10^{-3}	3.167×10^{-3}
sulfurdioxide total air mass factor polluted [1]	8.331×10^{-2}	0.263	0.369	0.460	0.569	1.20	1.48	1.73	2.01	2.33
sulfurdioxide total air mass factor polluted precision [1]	1.059×10^{-2}	1.921×10^{-2}	2.578×10^{-2}	3.089×10^{-2}	3.889×10^{-2}	0.156	0.204	0.258	0.355	0.612
sulfurdioxide clear air mass factor polluted [1]	0.238	0.327	0.387	0.444	0.522	0.938	1.07	1.25	1.60	2.10
number of spectral points in retrieval [1]	73.0	73.0	73.0	73.0	73.0	74.0	74.0	74.0	74.0	74.0

Table 3: Parameterlist and basic statistics for the analysis for observations in the northern hemisphere

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.574 ± 0.418	12096007	0.860	0.490	0.0	1.000	0.140	1.000
sulfurdioxide total vertical column [DU]	$(2.372 \pm 105.578) \times 10^{-2}$	12096007	0.400	8.562×10^{-3}	-93.1	611	-0.189	0.212
sulfurdioxide total vertical column precision [DU]	0.463 ± 0.646	12096007	0.286	0.289	3.693×10^{-2}	37.3	0.195	0.481
sulfurdioxide slant column density corrected [DU]	$(1.846 \pm 44.879) \times 10^{-2}$	12096007	0.352	8.173×10^{-3}	-7.22	354	-0.166	0.186
sulfurdioxide slant column density cobra [DU]	$(1.786 \pm 36.723) \times 10^{-2}$	12096007	0.352	8.173×10^{-3}	-7.22	54.1	-0.166	0.186
sulfurdioxide slant column density cobra precision [DU]	0.278 ± 0.117	12096007	0.105	0.243	7.639×10^{-2}	10.5	0.206	0.312
sulfurdioxide slant column density window1 [DU]	$(9.838 \pm 66.166) \times 10^{-2}$	12096007	0.713	0.103	-25.1	56.4	-0.257	0.455
sulfurdioxide slant column density window1 precision [DU]	0.278 ± 0.117	12096007	0.105	0.243	7.639×10^{-2}	10.5	0.206	0.312
sulfurdioxide slant column density corrected win1 [DU]	$(2.587 \pm 64.779) \times 10^{-2}$	12096007	0.693	8.765×10^{-3}	-25.1	56.2	-0.333	0.360
background so2 slant column offset window1 [DU]	$(-7.251 \pm 14.072) \times 10^{-2}$	12096007	0.194	-0.104	-0.720	1.84	-0.179	1.528×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.848 ± 8.244	12096007	10.6	0.827	-463	355	-4.45	6.12
sulfurdioxide slant column density window2 precision [DU]	7.58 ± 2.06	12096007	2.30	7.29	2.16	392	6.23	8.53
sulfurdioxide slant column density corrected win2 [DU]	-0.718 ± 8.141	12096007	10.4	-0.704	-463	354	-5.90	4.46
background so2 slant column offset window2 [DU]	-1.57 ± 2.00	12096007	2.98	-1.37	-9.32	12.6	-2.96	2.194×10^{-2}
sulfurdioxide slant column density window3 [DU]	-6.10 ± 21.79	12096007	26.9	-6.37	-303	396	-19.7	7.25
sulfurdioxide slant column density window3 precision [DU]	26.2 ± 13.2	12096007	8.05	22.7	9.33	270	19.5	27.6
sulfurdioxide slant column density corrected win3 [DU]	3.31 ± 21.42	12096007	26.5	3.45	-302	411	-9.84	16.7
background so2 slant column offset window3 [DU]	9.41 ± 5.21	12096007	8.97	10.6	-13.1	23.5	4.75	13.7
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.17	12096007	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.338 \pm 7.643) \times 10^{-2}$	12096007	2.959×10^{-2}	1.241×10^{-2}	2.234×10^{-4}	2.46	2.676×10^{-3}	3.226×10^{-2}
fitted radiance shift [nm]	$(-6.526 \pm 255.850) \times 10^{-5}$	12096007	1.580×10^{-3}	-8.264×10^{-5}	-4.268×10^{-2}	4.132×10^{-2}	-8.686×10^{-4}	7.112×10^{-4}
fitted radiance squeeze [1]	$(-6.620 \pm 17.503) \times 10^{-5}$	12096007	2.083×10^{-4}	-5.435×10^{-5}	-2.281×10^{-3}	1.006×10^{-2}	-1.636×10^{-4}	4.466×10^{-5}
fitted root mean square [1]	$(1.221 \pm 0.489) \times 10^{-3}$	12096007	4.399×10^{-4}	1.088×10^{-3}	3.261×10^{-4}	2.796×10^{-2}	9.253×10^{-4}	1.365×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.982 ± 0.568	12096007	0.771	0.853	5.000×10^{-2}	2.76	0.561	1.33
sulfurdioxide total air mass factor polluted precision [1]	0.132 ± 0.138	12096007	0.133	8.796×10^{-2}	3.095×10^{-3}	1.89	4.116×10^{-2}	0.174
sulfurdioxide clear air mass factor polluted [1]	0.809 ± 0.430	12096007	0.484	0.709	6.810×10^{-2}	2.71	0.501	0.985
number of spectral points in retrieval [1]	73.5 ± 0.5	12096007	1.000	73.0	52.0	155	73.0	74.0

Table 4: Parameterlist and basic statistics for the analysis for observations in the southern hemisphere

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.766 ± 0.349	5297695	0.560	1.000	0.0	1.000	0.440	1.000
sulfurdioxide total vertical column [DU]	$(4.455 \pm 107.537) \times 10^{-2}$	5297695	0.537	1.594×10^{-2}	-80.0	919	-0.248	0.289
sulfurdioxide total vertical column precision [DU]	0.554 ± 0.660	5297695	0.354	0.387	4.264×10^{-2}	639	0.268	0.622
sulfurdioxide slant column density corrected [DU]	$(2.676 \pm 59.421) \times 10^{-2}$	5297695	0.428	1.361×10^{-2}	-42.4	699	-0.198	0.230
sulfurdioxide slant column density cobra [DU]	$(2.606 \pm 43.507) \times 10^{-2}$	5297695	0.428	1.361×10^{-2}	-42.4	66.0	-0.198	0.230
sulfurdioxide slant column density cobra precision [DU]	0.339 ± 0.146	5297695	0.154	0.304	9.420×10^{-2}	28.9	0.243	0.397
sulfurdioxide slant column density window1 [DU]	0.142 ± 0.775	5297695	0.840	0.135	-80.9	122	-0.284	0.556
sulfurdioxide slant column density window1 precision [DU]	0.339 ± 0.146	5297695	0.154	0.304	9.420×10^{-2}	28.9	0.243	0.397
sulfurdioxide slant column density corrected win1 [DU]	$(5.099 \pm 77.493) \times 10^{-2}$	5297695	0.836	2.736×10^{-2}	-80.9	121	-0.384	0.453
background so2 slant column offset window1 [DU]	$(-9.120 \pm 10.041) \times 10^{-2}$	5297695	9.875×10^{-2}	-0.109	-0.485	1.47	-0.148	-4.927×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.11 ± 10.30	5297695	12.8	0.928	-1.129×10^{3}	863	-5.41	7.42
sulfurdioxide slant column density window2 precision [DU]	9.27 ± 2.66	5297695	2.90	8.94	2.50	831	7.65	10.6
sulfurdioxide slant column density corrected win2 [DU]	-0.376 ± 10.228	5297695	12.7	-0.408	-1.130×10^{3}	862	-6.77	5.95
background so2 slant column offset window2 [DU]	-1.49 ± 1.86	5297695	2.25	-1.07	-10.8	12.2	-2.52	-0.270
sulfurdioxide slant column density window3 [DU]	-6.01 ± 27.35	5297695	34.7	-5.56	-757	310	-23.1	11.6
sulfurdioxide slant column density window3 precision [DU]	32.1 ± 12.9	5297695	10.4	29.1	9.90	237	24.8	35.2
sulfurdioxide slant column density corrected win3 [DU]	2.77 ± 27.14	5297695	34.5	2.98	-743	325	-14.3	20.2
background so2 slant column offset window3 [DU]	8.79 ± 4.44	5297695	5.87	8.02	-10.6	26.8	5.83	11.7
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.28	5297695	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.939 \pm 5.162) \times 10^{-2}$	5297695	1.618×10^{-2}	1.786×10^{-2}	1.175×10^{-3}	1.53	1.212×10^{-2}	2.830×10^{-2}
fitted radiance shift [nm]	$(-5.177 \pm 25.085) \times 10^{-4}$	5297695	1.833×10^{-3}	-5.127×10^{-4}	-0.104	3.891×10^{-2}	-1.472×10^{-3}	3.611×10^{-4}
fitted radiance squeeze [1]	$(2.181 \pm 19.841) \times 10^{-5}$	5297695	2.295×10^{-4}	1.575×10^{-5}	-1.466×10^{-2}	3.884×10^{-2}	-9.668×10^{-5}	1.328×10^{-4}
fitted root mean square [1]	$(1.450 \pm 0.557) \times 10^{-3}$	5297695	6.297×10^{-4}	1.303×10^{-3}	3.622×10^{-4}	7.245×10^{-2}	1.075×10^{-3}	1.705×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.828 ± 0.357	5297695	0.442	0.783	5.000×10^{-2}	2.57	0.583	1.02
sulfurdioxide total air mass factor polluted precision [1]	$(8.867 \pm 8.026) \times 10^{-2}$	5297695	8.280×10^{-2}	5.673×10^{-2}	3.653×10^{-3}	1.58	3.584×10^{-2}	0.119
sulfurdioxide clear air mass factor polluted [1]	0.718 ± 0.226	5297695	0.302	0.699	8.857×10^{-2}	1.84	0.562	0.863
number of spectral points in retrieval [1]	73.4 ± 0.5	5297695	1.000	73.0	52.0	155	73.0	74.0

Table 5: Parameterlist and basic statistics for the analysis for observations over water

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.661 ± 0.391	11262043	0.740	1.000	0.0	1.000	0.260	1.000
sulfurdioxide total vertical column [DU]	$(2.427 \pm 84.152) \times 10^{-2}$	11262043	0.437	9.810×10^{-3}	-80.0	510	-0.206	0.231
sulfurdioxide total vertical column precision [DU]	0.469 ± 0.544	11262043	0.303	0.311	3.876×10^{-2}	54.6	0.217	0.520
sulfurdioxide slant column density corrected [DU]	$(1.647 \pm 45.613) \times 10^{-2}$	11262043	0.376	9.005×10^{-3}	-42.4	699	-0.177	0.199
sulfurdioxide slant column density cobra [DU]	$(1.620 \pm 36.373) \times 10^{-2}$	11262043	0.376	9.005×10^{-3}	-42.4	66.0	-0.177	0.199
sulfurdioxide slant column density cobra precision [DU]	0.301 ± 0.131	11262043	0.142	0.262	8.526×10^{-2}	28.9	0.214	0.356
sulfurdioxide slant column density window1 [DU]	0.105 ± 0.689	11262043	0.760	0.113	-80.9	54.2	-0.271	0.488
sulfurdioxide slant column density window1 precision [DU]	0.301 ± 0.131	11262043	0.142	0.262	8.526×10^{-2}	28.9	0.214	0.356
sulfurdioxide slant column density corrected win1 [DU]	$(3.073 \pm 67.786) \times 10^{-2}$	11262043	0.744	1.519×10^{-2}	-80.9	54.5	-0.351	0.392
background so2 slant column offset window1 [DU]	$(-7.443 \pm 13.753) \times 10^{-2}$	11262043	0.169	-0.109	-0.720	1.84	-0.171	-1.636×10^{-3}
sulfurdioxide slant column density window2 [DU]	0.951 ± 8.943	11262043	11.3	0.831	-511	810	-4.76	6.51
sulfurdioxide slant column density window2 precision [DU]	8.11 ± 2.27	11262043	2.65	7.76	2.17	831	6.60	9.25
sulfurdioxide slant column density corrected win2 [DU]	-0.594 ± 8.838	11262043	11.1	-0.609	-512	808	-6.16	4.94
background so2 slant column offset window2 [DU]	-1.54 ± 2.03	11262043	2.92	-1.11	-10.8	12.6	-2.95	-3.050×10^{-2}
sulfurdioxide slant column density window3 [DU]	-3.62 ± 23.71	11262043	29.4	-3.90	-757	238	-18.3	11.1
sulfurdioxide slant column density window3 precision [DU]	27.1 ± 11.4	11262043	9.49	24.2	9.33	270	20.7	30.2
sulfurdioxide slant column density corrected win3 [DU]	5.32 ± 23.16	11262043	28.8	5.22	-743	253	-9.03	19.7
background so2 slant column offset window3 [DU]	8.94 ± 5.01	11262043	8.17	8.68	-13.1	26.8	5.00	13.2
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	11262043	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.215 \pm 4.347) \times 10^{-2}$	11262043	1.677×10^{-2}	1.394×10^{-2}	2.463×10^{-4}	2.41	7.319×10^{-3}	2.409×10^{-2}
fitted radiance shift [nm]	$(-2.283 \pm 22.113) \times 10^{-4}$	11262043	1.628×10^{-3}	-2.080×10^{-4}	-0.104	3.917×10^{-2}	-1.059×10^{-3}	5.690×10^{-4}
fitted radiance squeeze [1]	$(-3.170 \pm 18.940) \times 10^{-5}$	11262043	2.176×10^{-4}	-2.607×10^{-5}	-1.359×10^{-2}	1.488×10^{-2}	-1.379×10^{-4}	7.972×10^{-5}
fitted root mean square [1]	$(1.314 \pm 0.532) \times 10^{-3}$	11262043	5.864×10^{-4}	1.161×10^{-3}	3.261×10^{-4}	5.217×10^{-2}	9.611×10^{-4}	1.548×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.930 ± 0.477	11262043	0.574	0.848	5.000×10^{-2}	2.64	0.596	1.17
sulfurdioxide total air mass factor polluted precision [1]	0.108 ± 0.114	11262043	9.359×10^{-2}	6.927×10^{-2}	4.495×10^{-3}	1.89	4.076×10^{-2}	0.134
sulfurdioxide clear air mass factor polluted [1]	0.810 ± 0.387	11262043	0.408	0.738	9.038×10^{-2}	2.60	0.550	0.958
number of spectral points in retrieval [1]	73.4 ± 0.5	11262043	1.000	73.0	52.0	74.0	73.0	74.0

Table 6: Parameterlist and basic statistics for the analysis for observations over land

Variable	mean $\pm\sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.632 ± 0.426	4245035	0.840	1.000	0.0	1.000	0.160	1.000
sulfurdioxide total vertical column [DU]	$(3.812 \pm 132.987) \times 10^{-2}$	4245035	0.440	1.045×10^{-2}	-93.1	919	-0.204	0.236
sulfurdioxide total vertical column precision [DU]	0.510 ± 0.758	4245035	0.321	0.334	3.693×10^{-2}	639	0.211	0.532
sulfurdioxide slant column density corrected [DU]	$(2.751 \pm 57.269) \times 10^{-2}$	4245035	0.359	9.665×10^{-3}	-26.4	279	-0.167	0.192
sulfurdioxide slant column density cobra [DU]	$(2.616 \pm 43.027) \times 10^{-2}$	4245035	0.359	9.665×10^{-3}	-26.4	59.2	-0.167	0.192
sulfurdioxide slant column density cobra precision [DU]	0.283 ± 0.125	4245035	9.566×10^{-2}	0.247	7.639×10^{-2}	23.0	0.213	0.308
sulfurdioxide slant column density window1 [DU]	0.146 ± 0.705	4245035	0.715	0.132	-69.9	122	-0.224	0.491
sulfurdioxide slant column density window1 precision [DU]	0.283 ± 0.125	4245035	9.566×10^{-2}	0.247	7.639×10^{-2}	23.0	0.213	0.308
sulfurdioxide slant column density corrected win1 [DU]	$(4.290 \pm 69.846) \times 10^{-2}$	4245035	0.701	1.763×10^{-2}	-69.9	121	-0.326	0.375
background so2 slant column offset window1 [DU]	-0.103 ± 0.110	4245035	0.135	-0.122	-0.550	0.770	-0.181	-4.586×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.652 ± 9.031	4245035	11.2	0.646	-1.129×10^{3}	863	-4.94	6.22
sulfurdioxide slant column density window2 precision [DU]	8.20 ± 2.68	4245035	2.77	7.82	2.16	454	6.57	9.34
sulfurdioxide slant column density corrected win2 [DU]	-0.599 ± 8.961	4245035	11.0	-0.614	-1.130×10^{3}	862	-6.11	4.87
background so2 slant column offset window2 [DU]	-1.25 ± 1.77	4245035	2.29	-0.978	-10.1	12.6	-2.31	-2.097×10^{-2}
sulfurdioxide slant column density window3 [DU]	-10.9 ± 23.4	4245035	28.5	-10.3	-433	396	-24.8	3.70
sulfurdioxide slant column density window3 precision [DU]	30.3 ± 16.8	4245035	12.5	25.7	9.39	255	21.0	33.5
sulfurdioxide slant column density corrected win3 [DU]	-1.93 ± 23.67	4245035	29.0	-1.11	-418	411	-16.1	13.0
background so2 slant column offset window3 [DU]	8.92 ± 4.96	4245035	8.18	9.07	-13.1	26.8	4.95	13.1
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.14	4245035	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.530 \pm 10.126) \times 10^{-2}$	4245035	5.865×10^{-2}	2.178×10^{-2}	2.270×10^{-4}	2.36	6.386×10^{-3}	6.504×10^{-2}
fitted radiance shift [nm]	$(-1.687 \pm 31.792) \times 10^{-4}$	4245035	1.764×10^{-3}	-2.028×10^{-4}	-6.924×10^{-2}	4.132×10^{-2}	-1.075×10^{-3}	6.880×10^{-4}
fitted radiance squeeze [1]	$(-3.876 \pm 17.846) \times 10^{-5}$	4245035	2.062×10^{-4}	-3.650×10^{-5}	-1.289×10^{-2}	3.884×10^{-2}	-1.406×10^{-4}	6.563×10^{-5}
fitted root mean square [1]	$(1.226 \pm 0.478) \times 10^{-3}$	4245035	3.961×10^{-4}	1.110×10^{-3}	3.403×10^{-4}	7.245×10^{-2}	9.532×10^{-4}	1.349×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.921 ± 0.569	4245035	0.665	0.755	5.000×10^{-2}	2.76	0.526	1.19
sulfurdioxide total air mass factor polluted precision [1]	0.132 ± 0.140	4245035	0.154	8.640×10^{-2}	3.187×10^{-3}	1.65	3.282×10^{-2}	0.186
sulfurdioxide clear air mass factor polluted [1]	0.729 ± 0.364	4245035	0.358	0.646	7.957×10^{-2}	2.71	0.496	0.854
number of spectral points in retrieval [1]	73.4 ± 0.5	4245035	1.000	73.0	52.0	155	73.0	74.0

3 Granule outlines

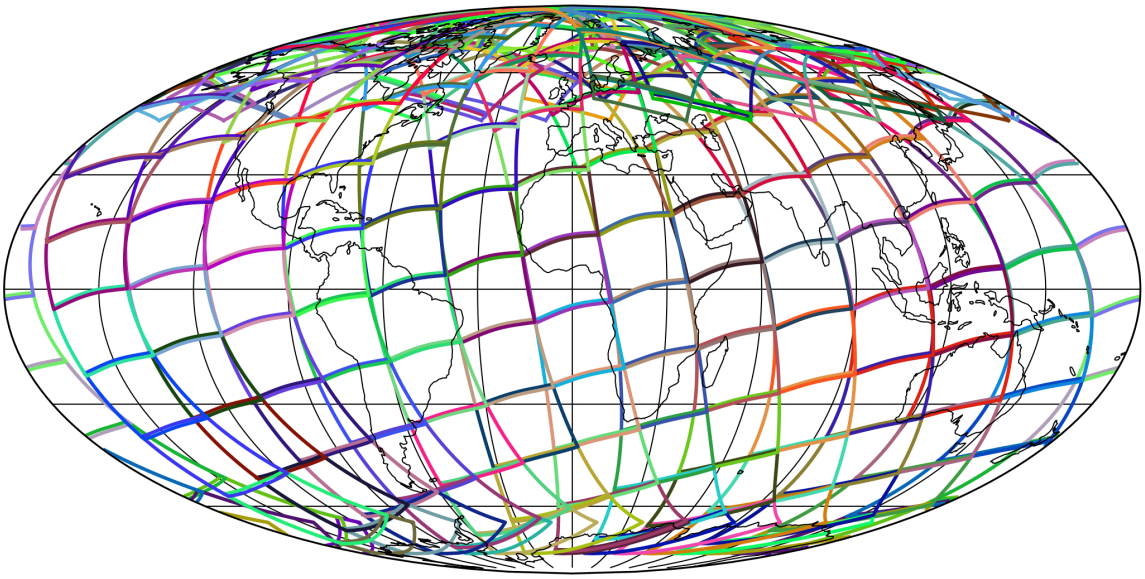

Figure 1: Outline of the granules.

4 Input data monitoring

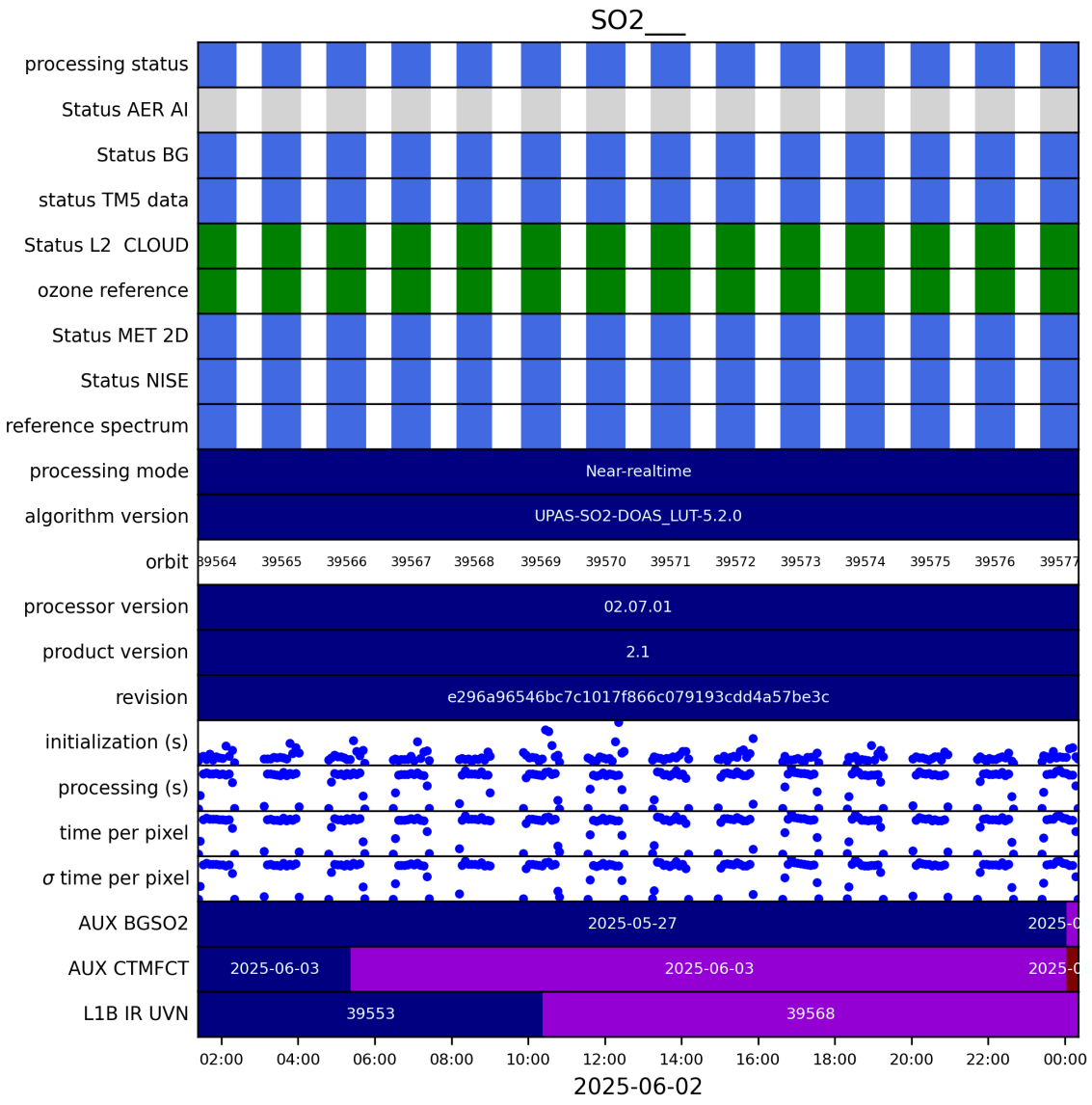

Figure 2: Input data per granule

5 Warnings and errors

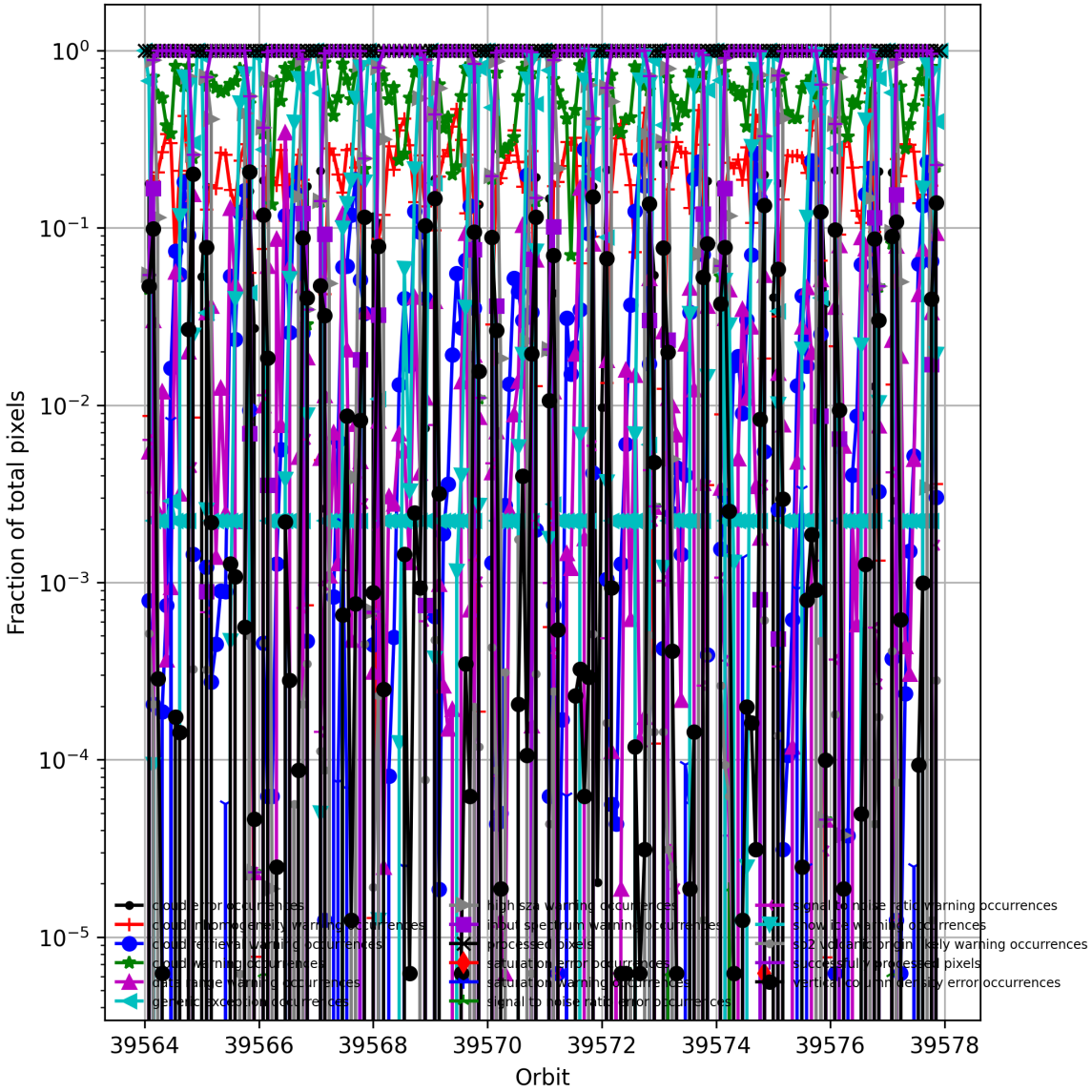

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

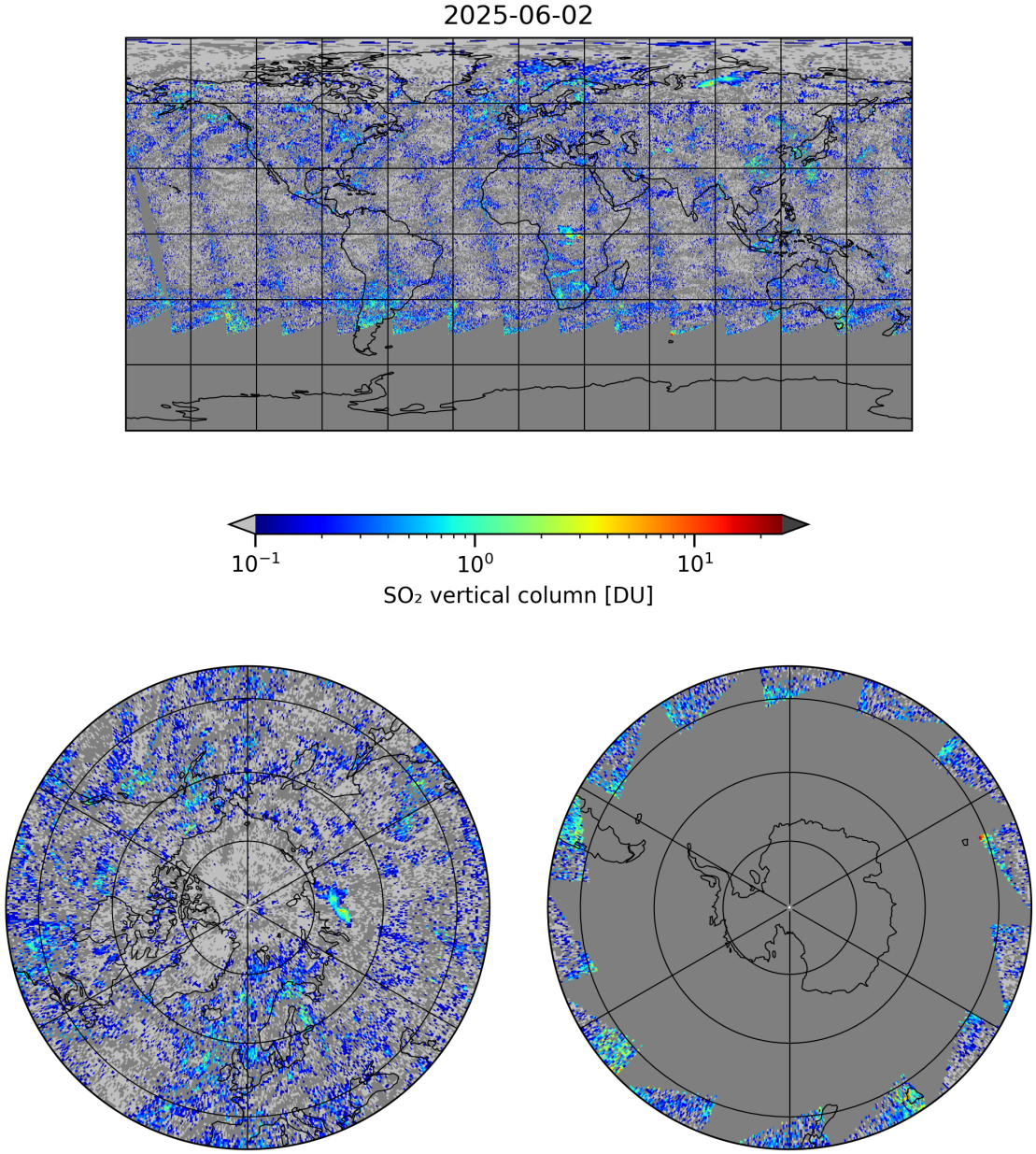

Figure 4: Map of "SO_2 vertical column" for 2025-06-02 to 2025-06-03

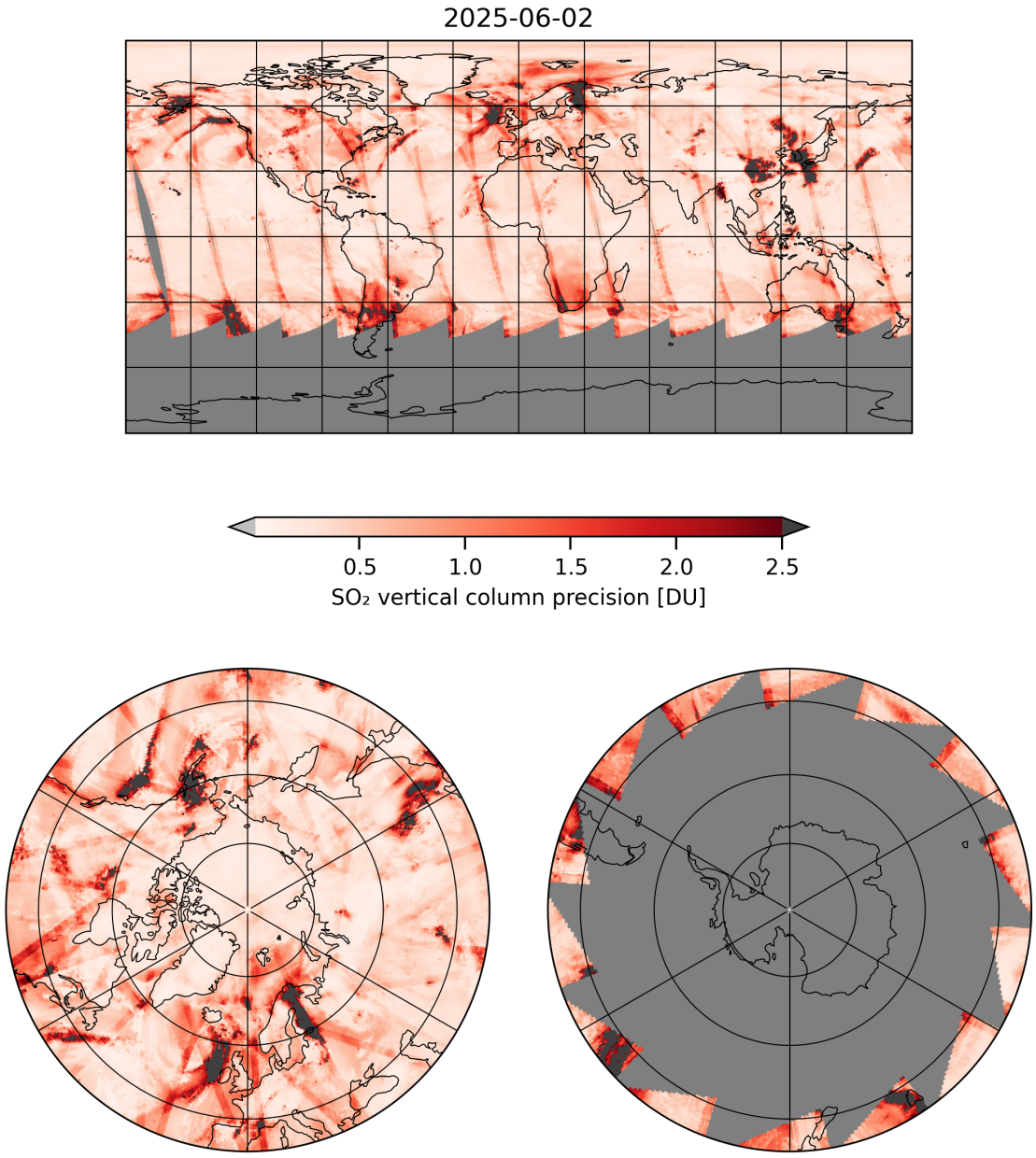

Figure 5: Map of "SO_2 vertical column precision" for 2025-06-02 to 2025-06-03

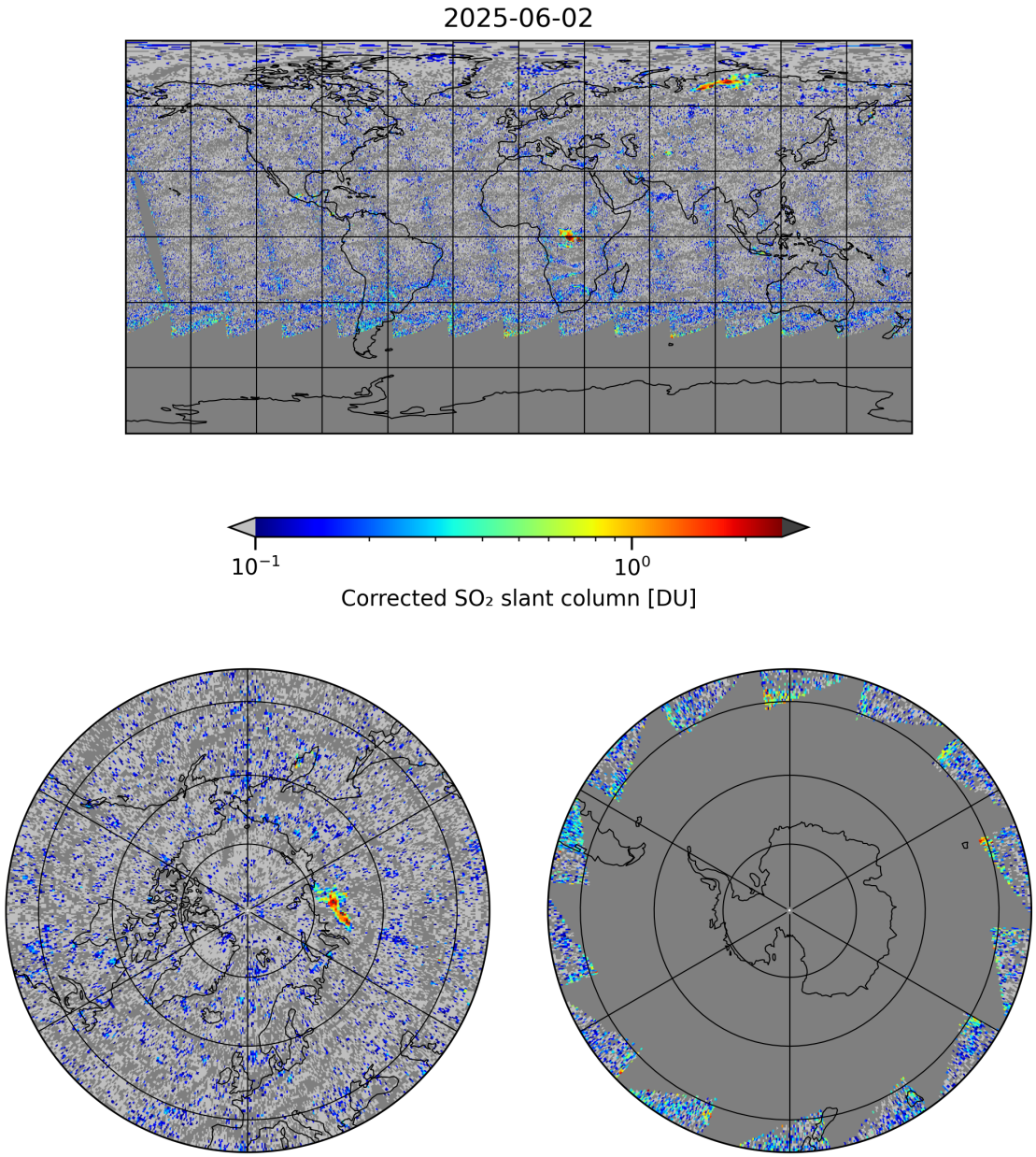

Figure 6: Map of “Corrected SO_2 slant column” for 2025-06-02 to 2025-06-03

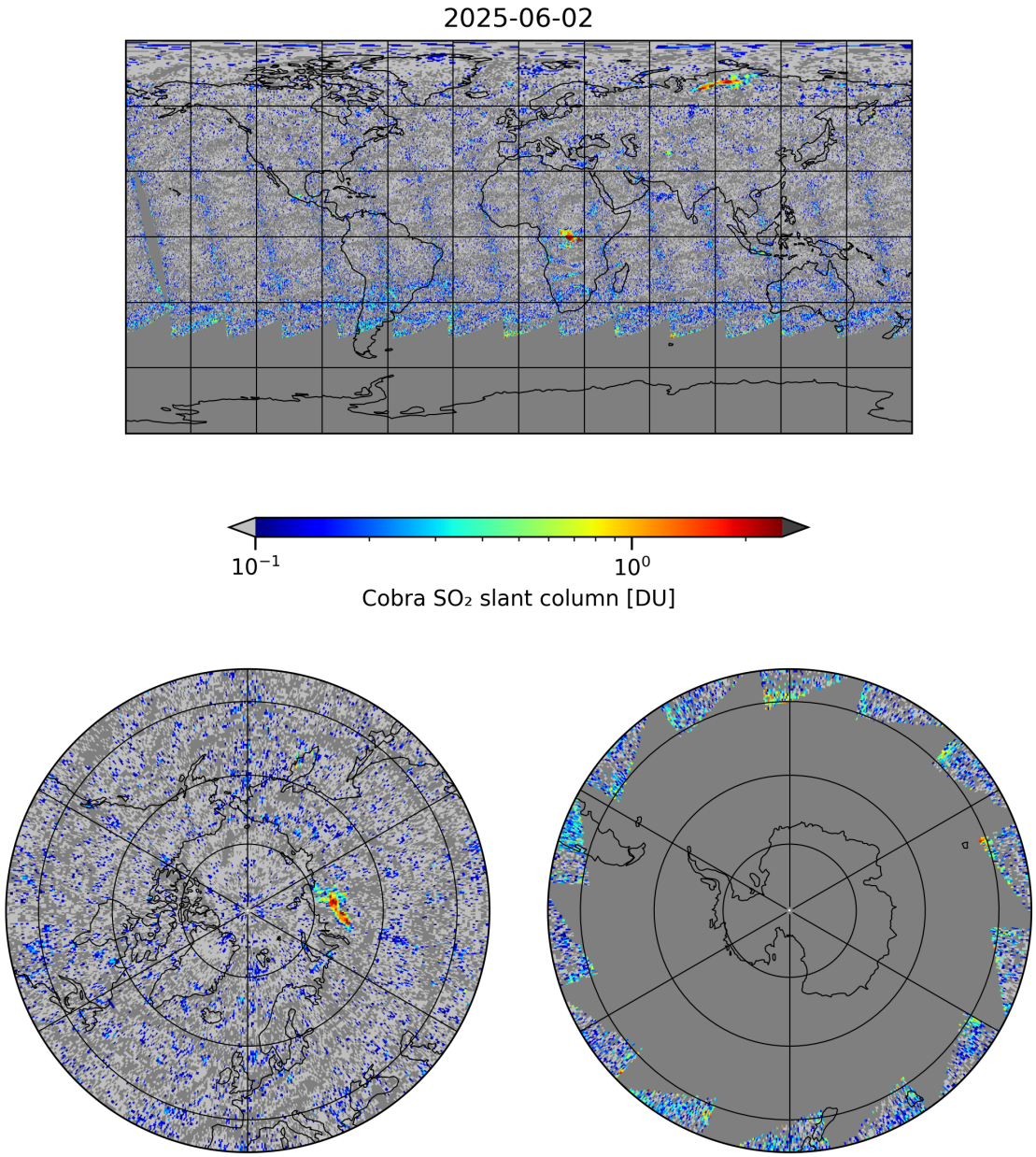

Figure 7: Map of "Cobra SO_2 slant column" for 2025-06-02 to 2025-06-03

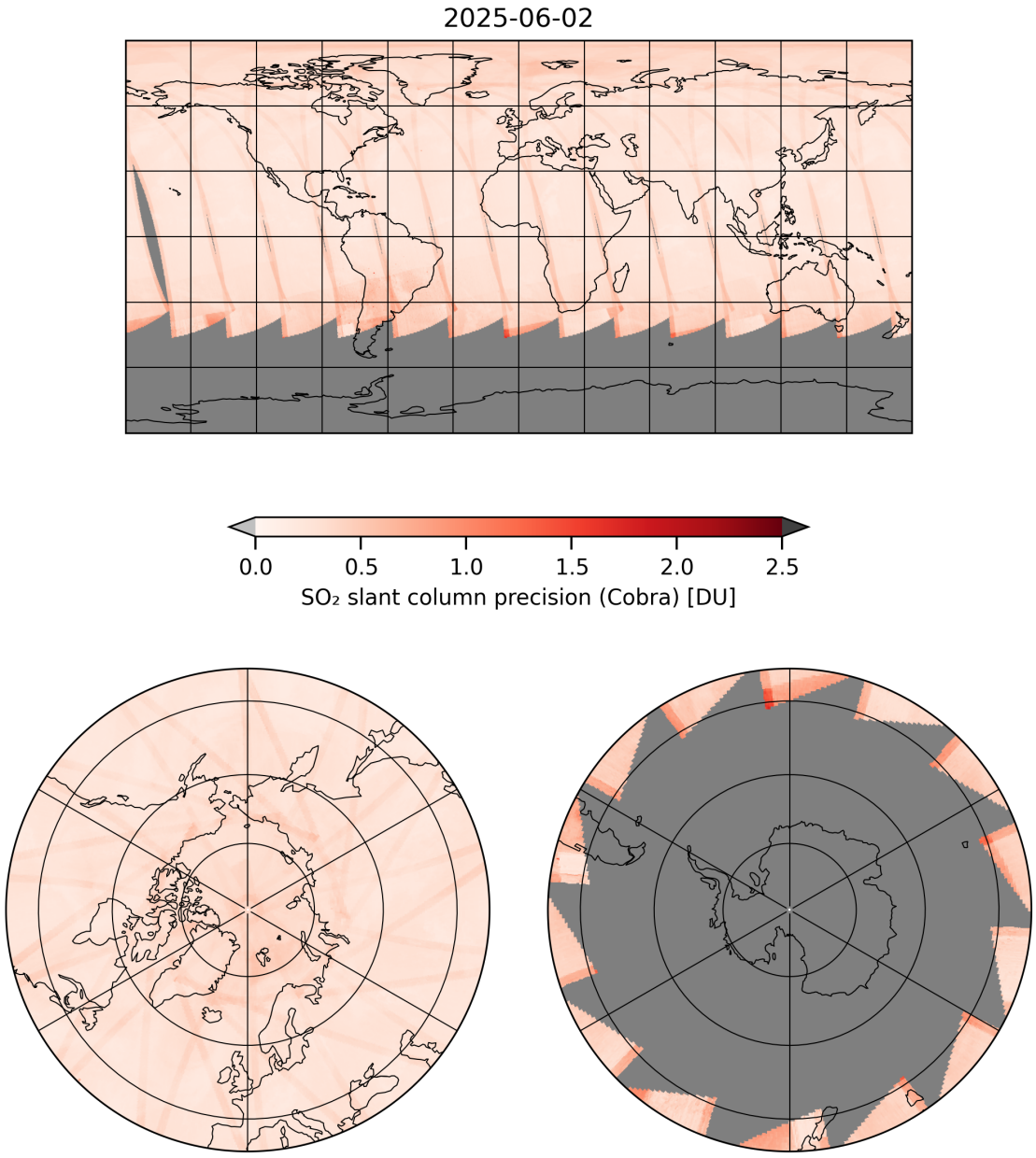

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-06-02 to 2025-06-03

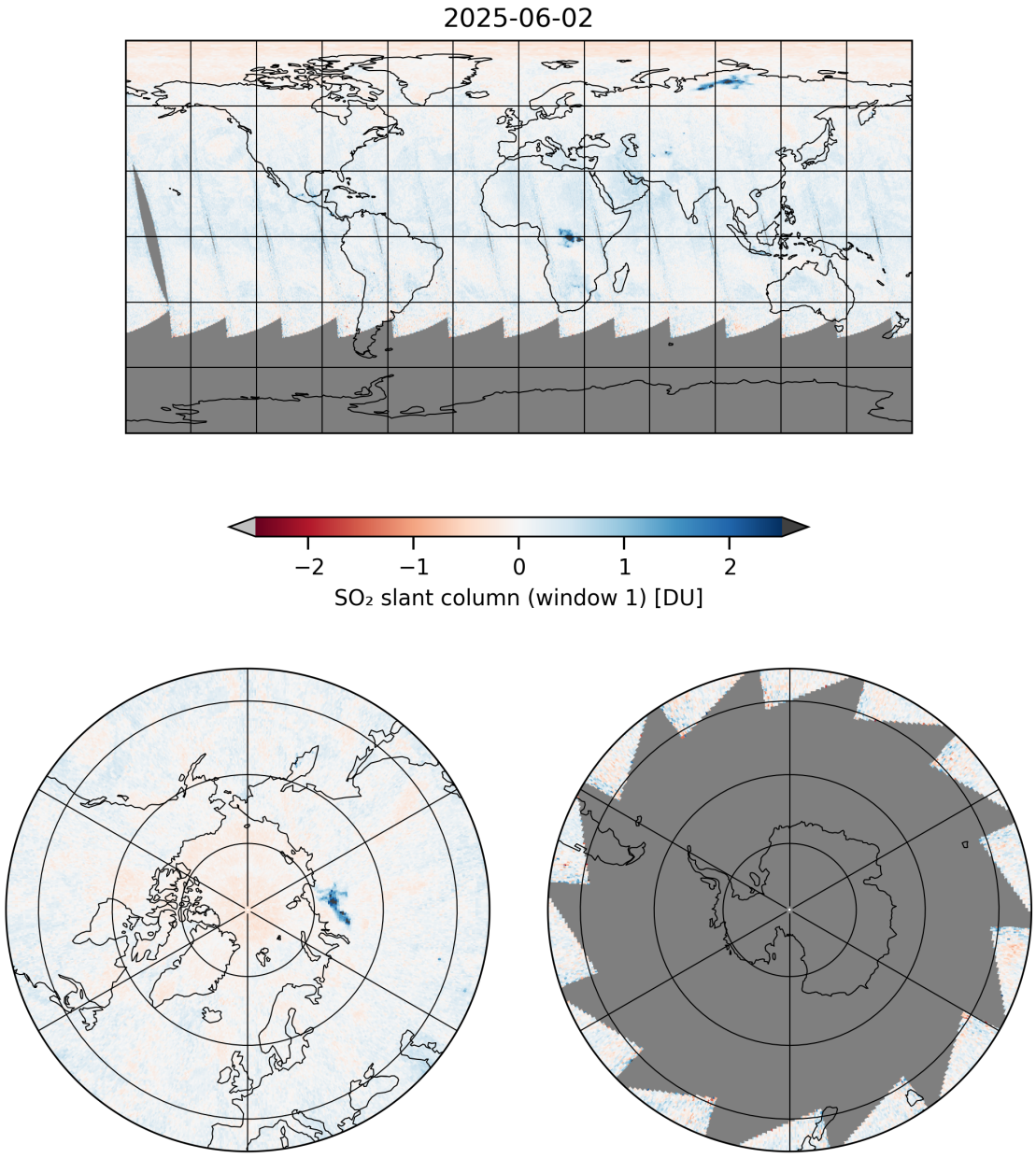

Figure 9: Map of "SO_2 slant column (window 1)" for 2025-06-02 to 2025-06-03

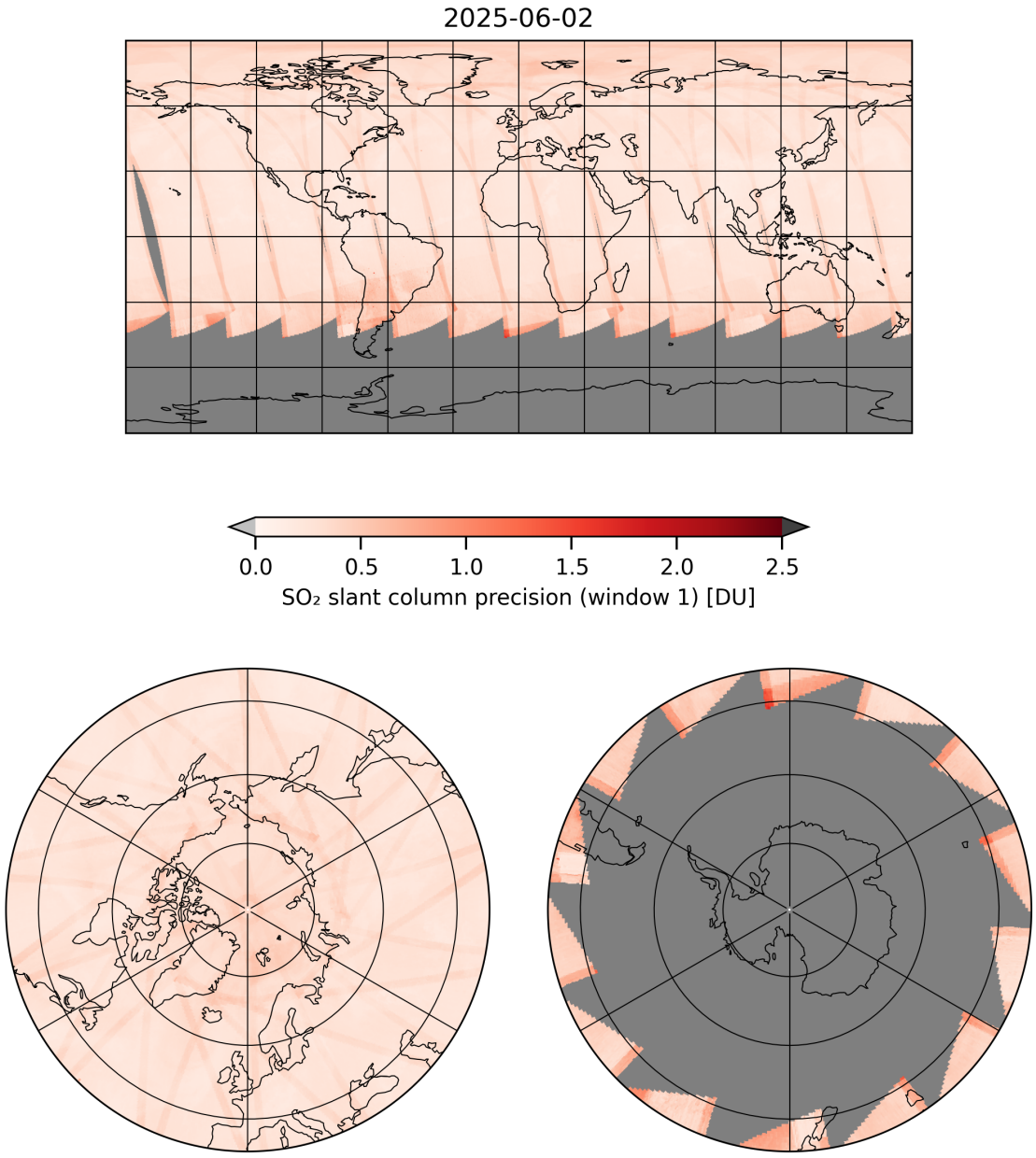

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-06-02 to 2025-06-03

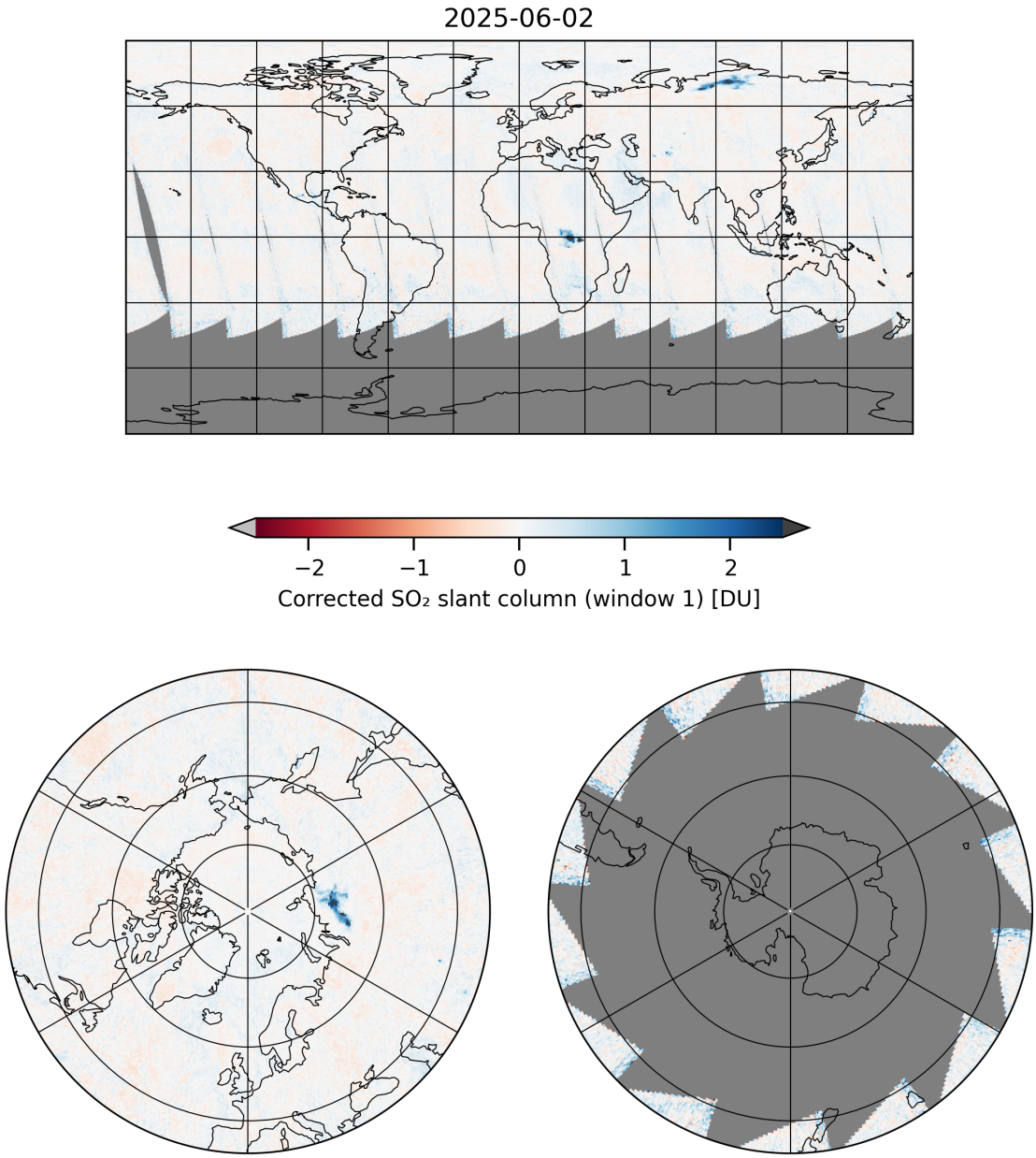

Figure 11: Map of "Corrected SO_2 slant column (window 1)" for 2025-06-02 to 2025-06-03

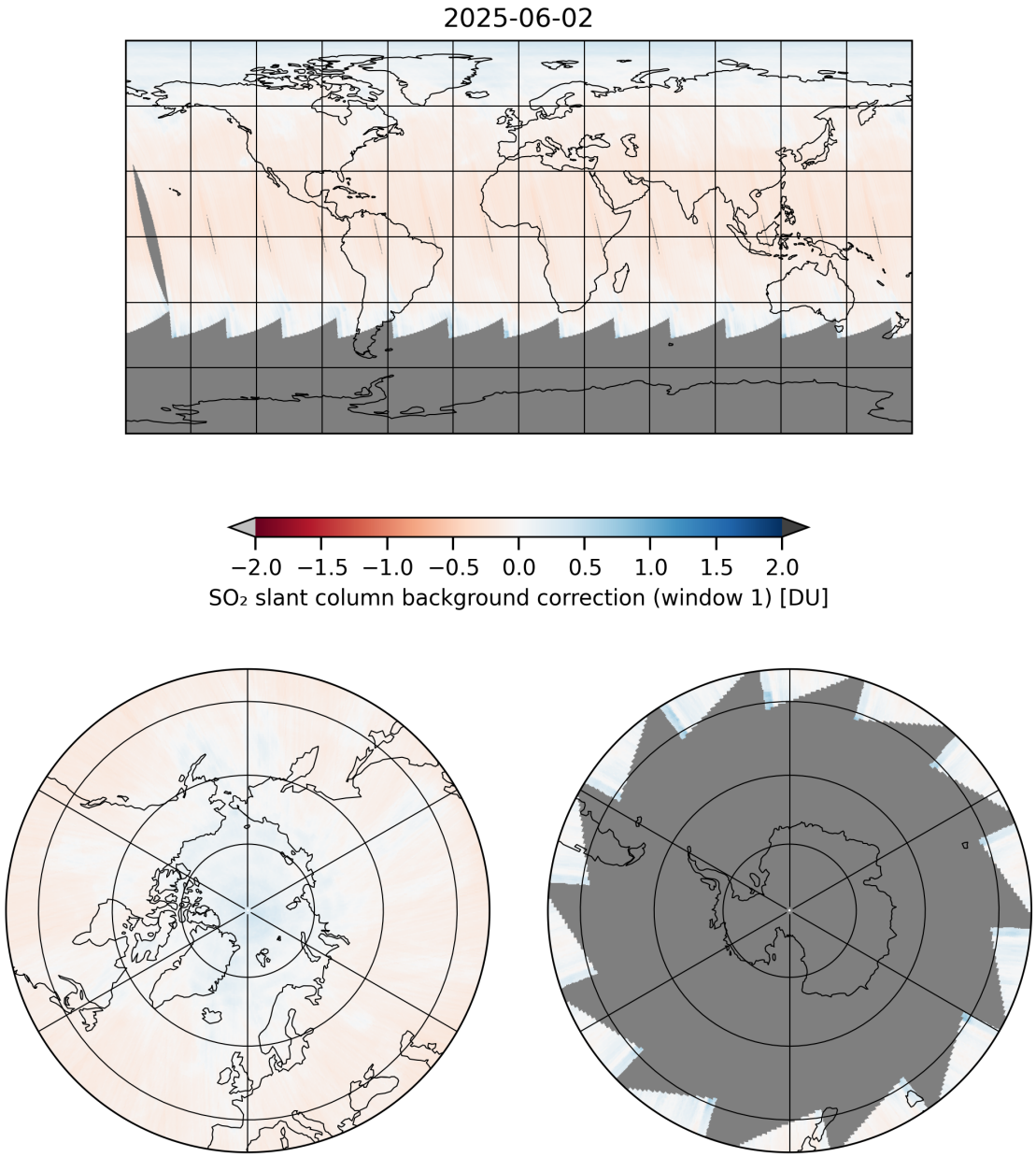

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-06-02 to 2025-06-03

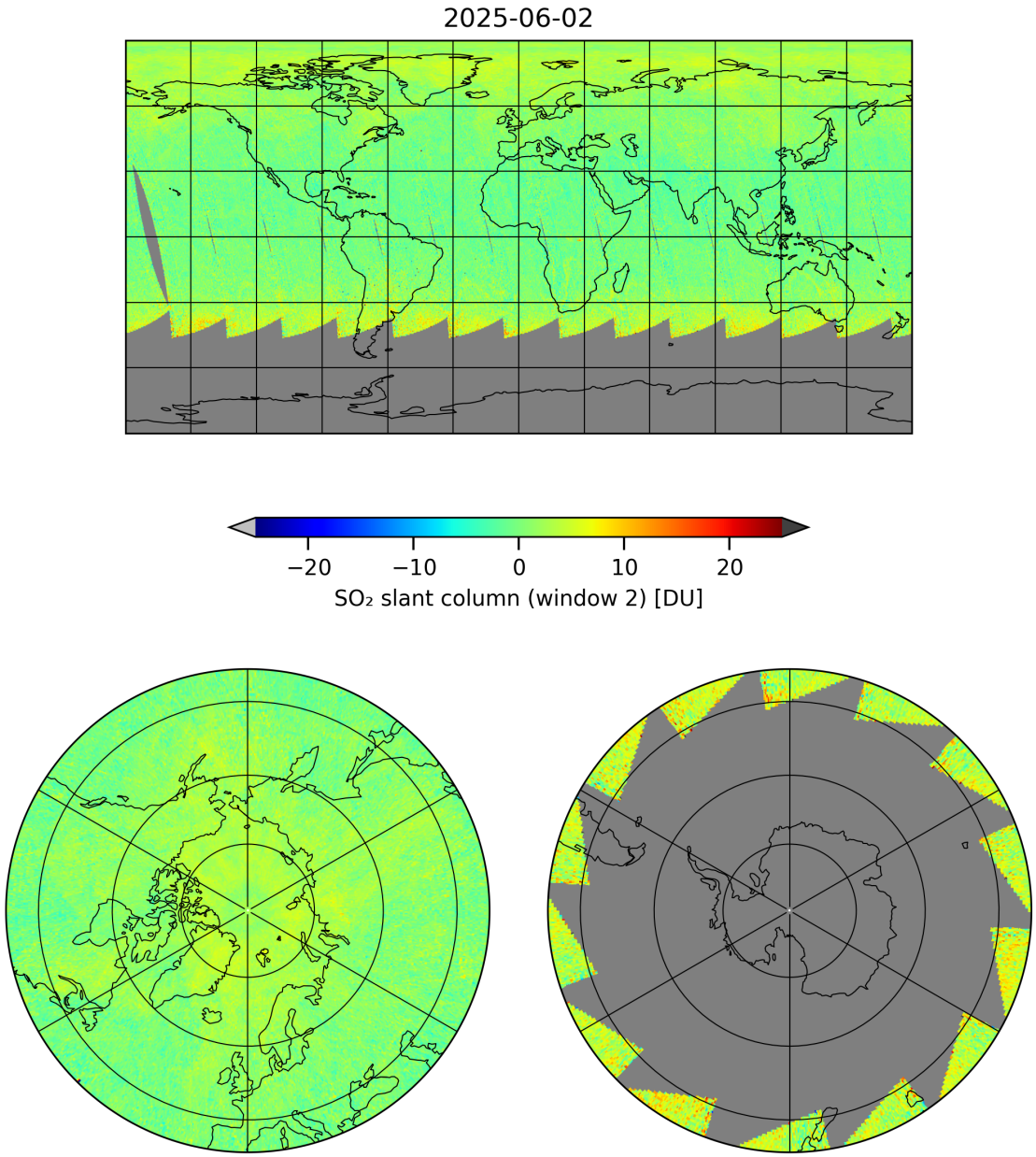

Figure 13: Map of "SO_2 slant column (window 2)" for 2025-06-02 to 2025-06-03

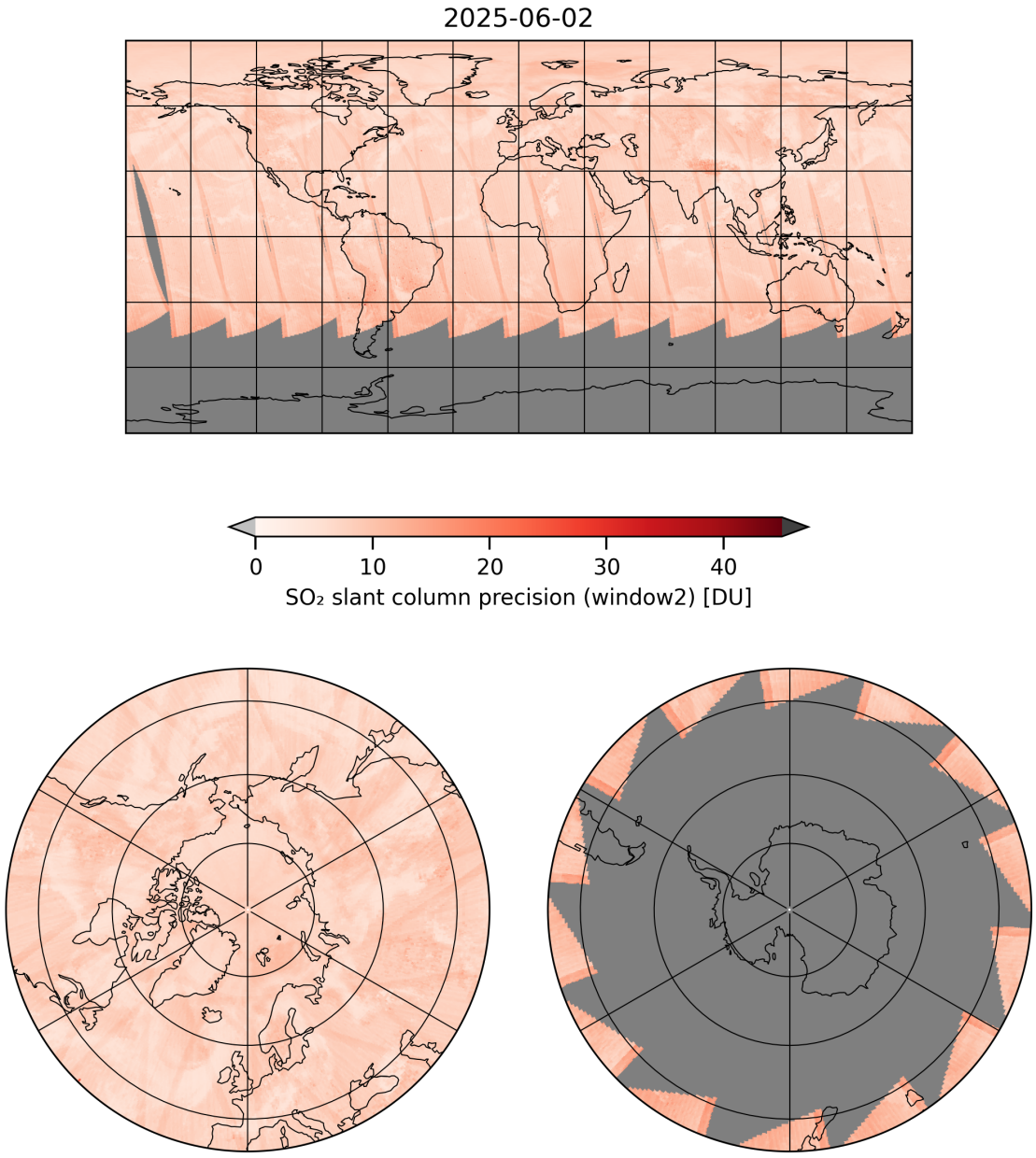

Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-06-02 to 2025-06-03

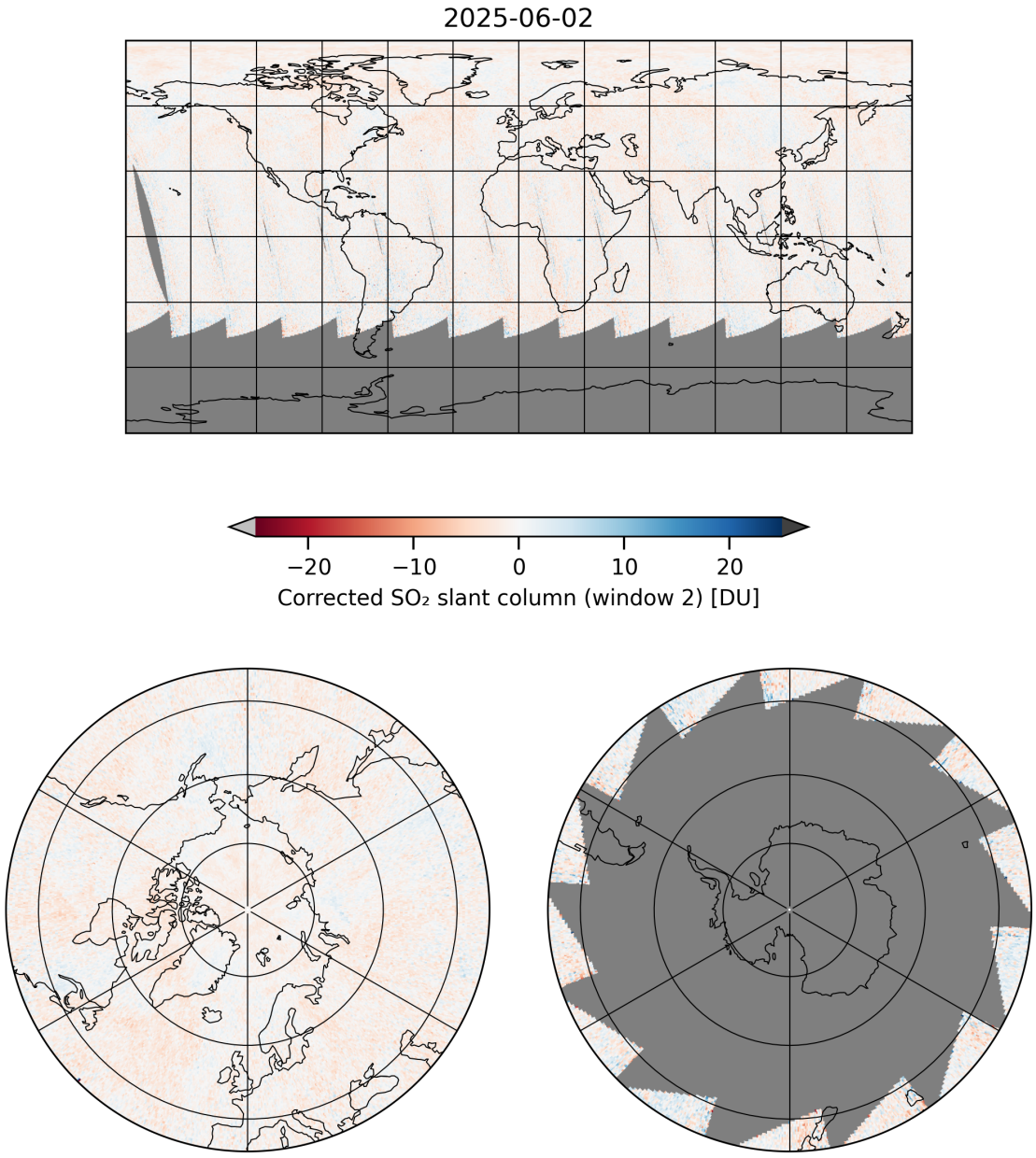

Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2025-06-02 to 2025-06-03

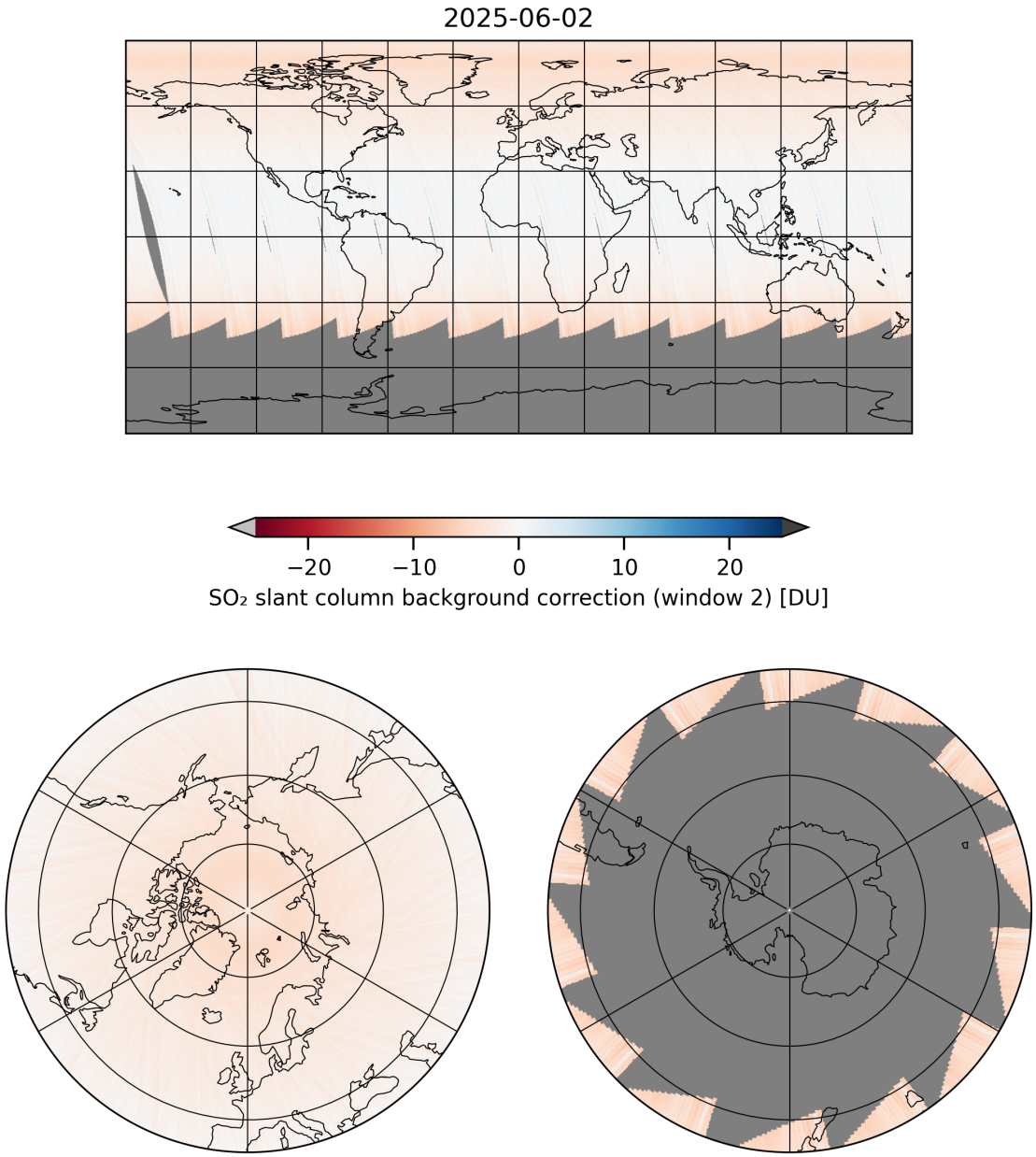

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-06-02 to 2025-06-03

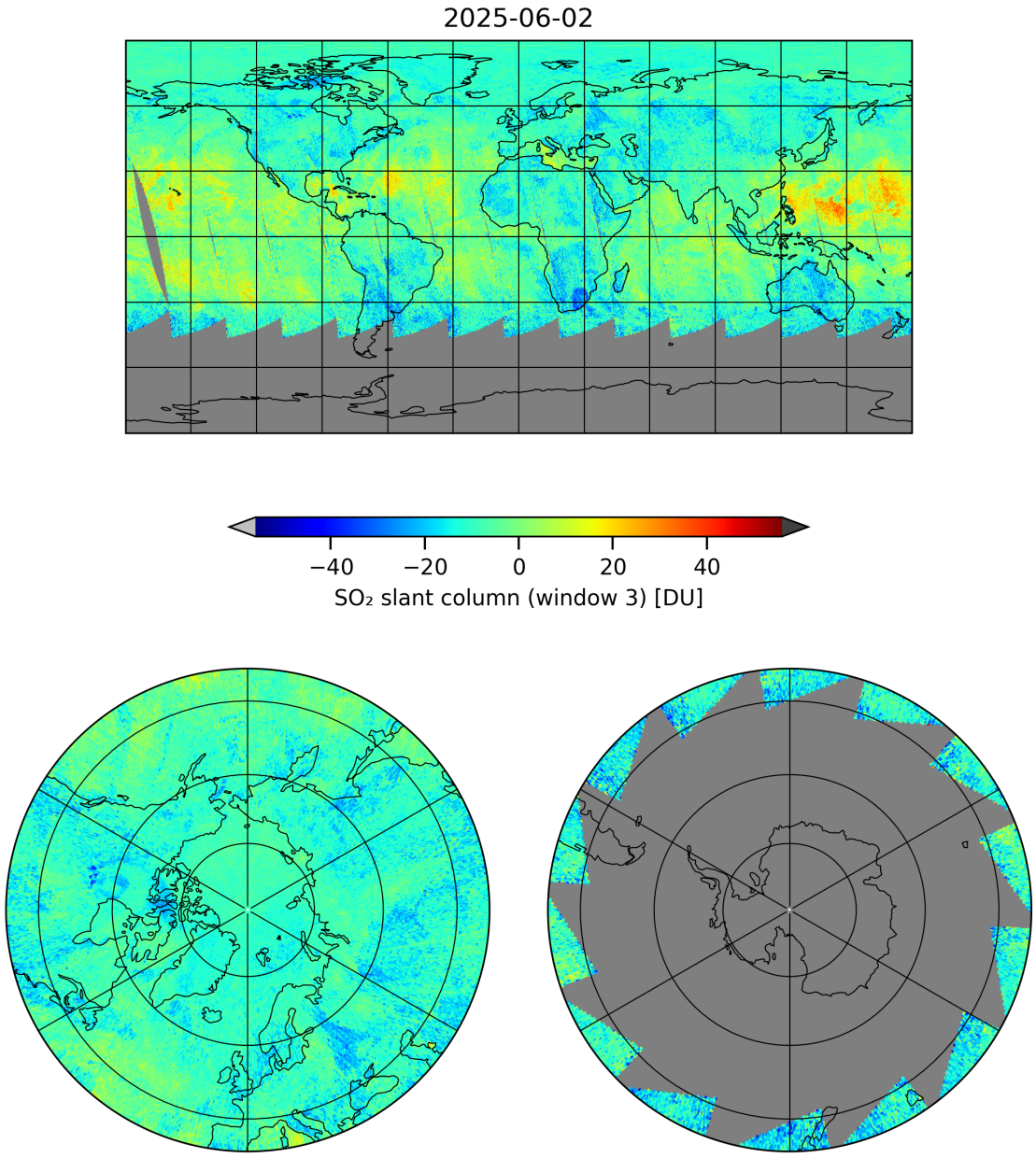

Figure 17: Map of "SO_2 slant column (window 3)" for 2025-06-02 to 2025-06-03

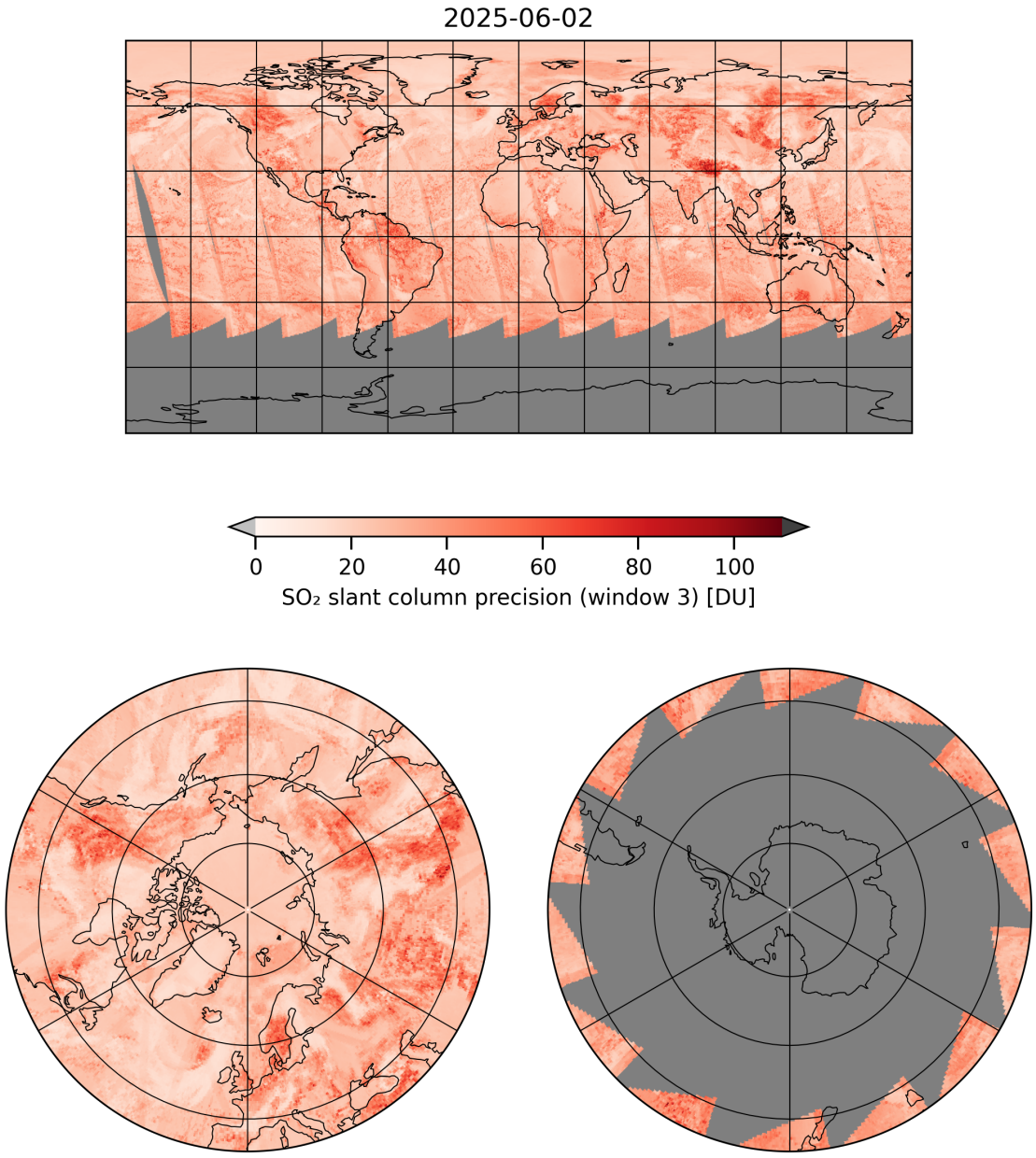

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-06-02 to 2025-06-03

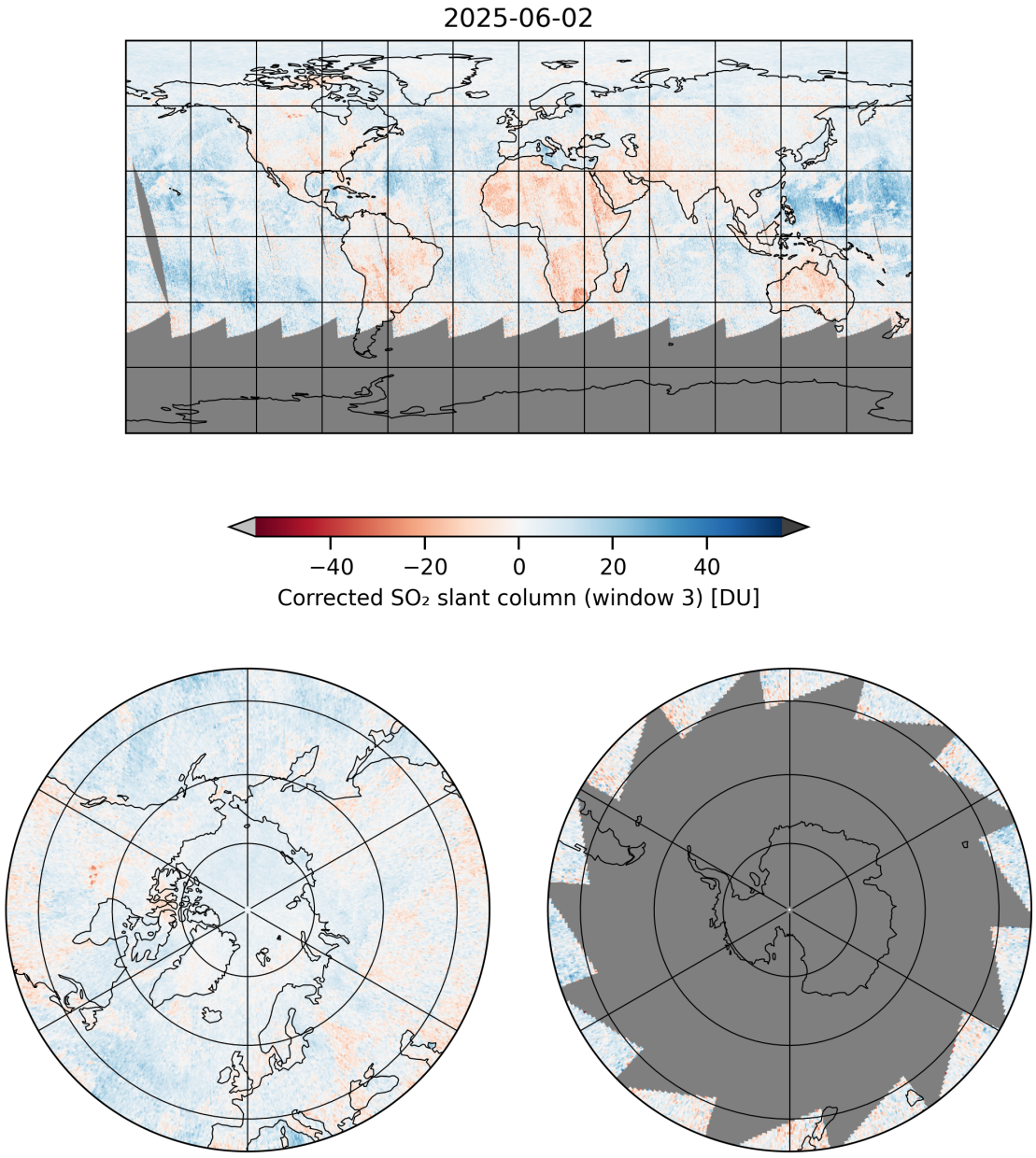

Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-06-02 to 2025-06-03

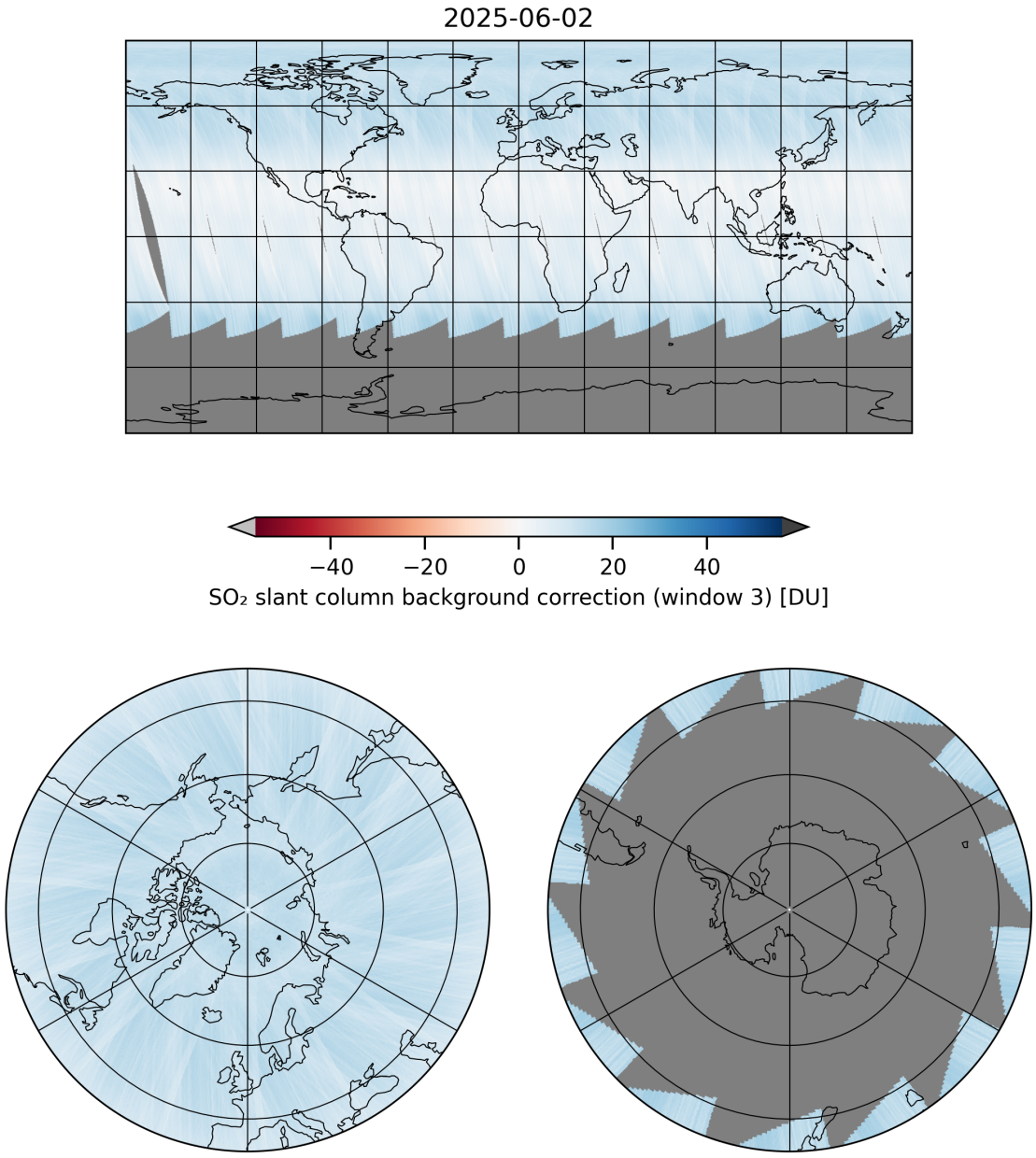

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-06-02 to 2025-06-03

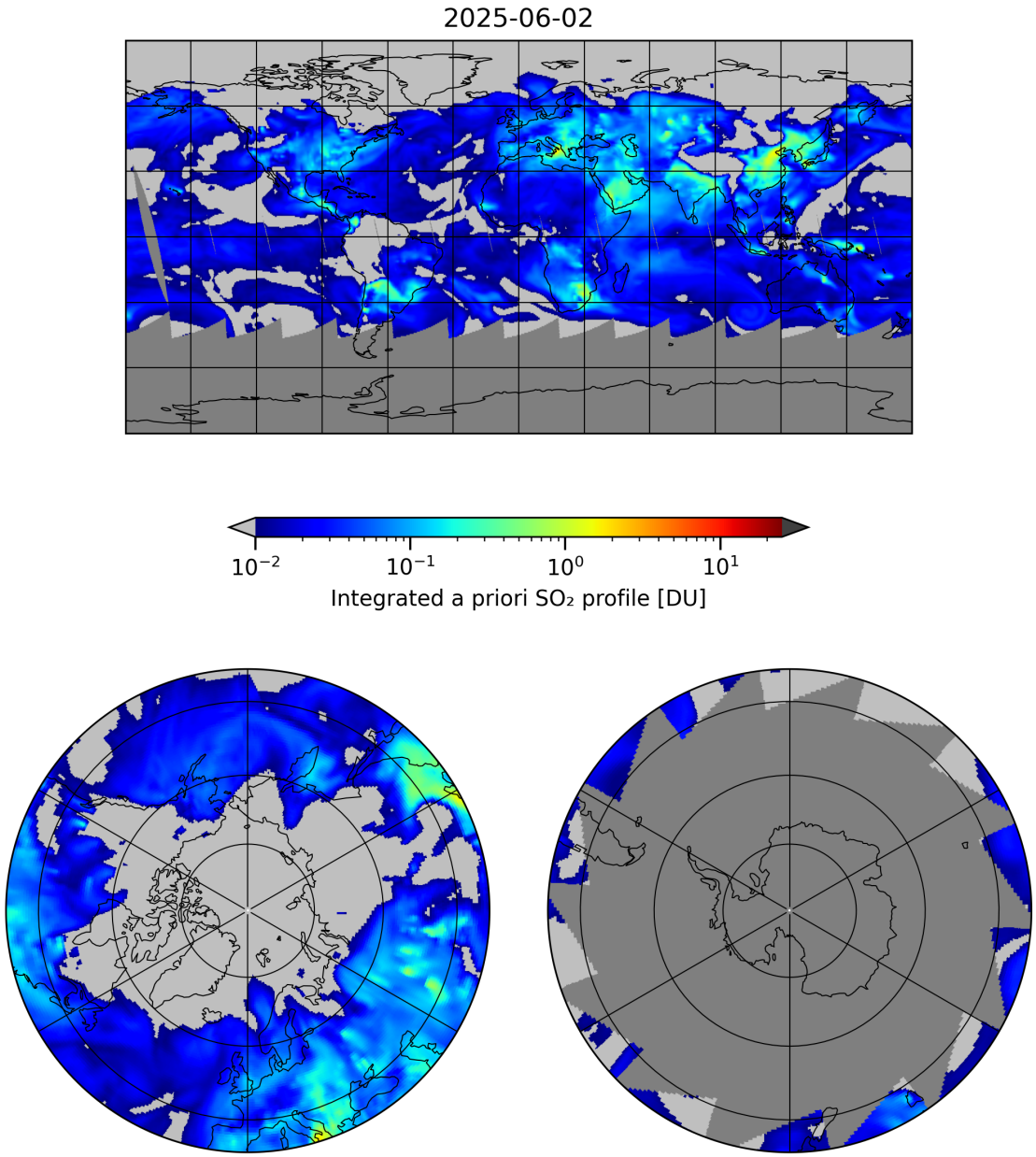

Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-06-02 to 2025-06-03

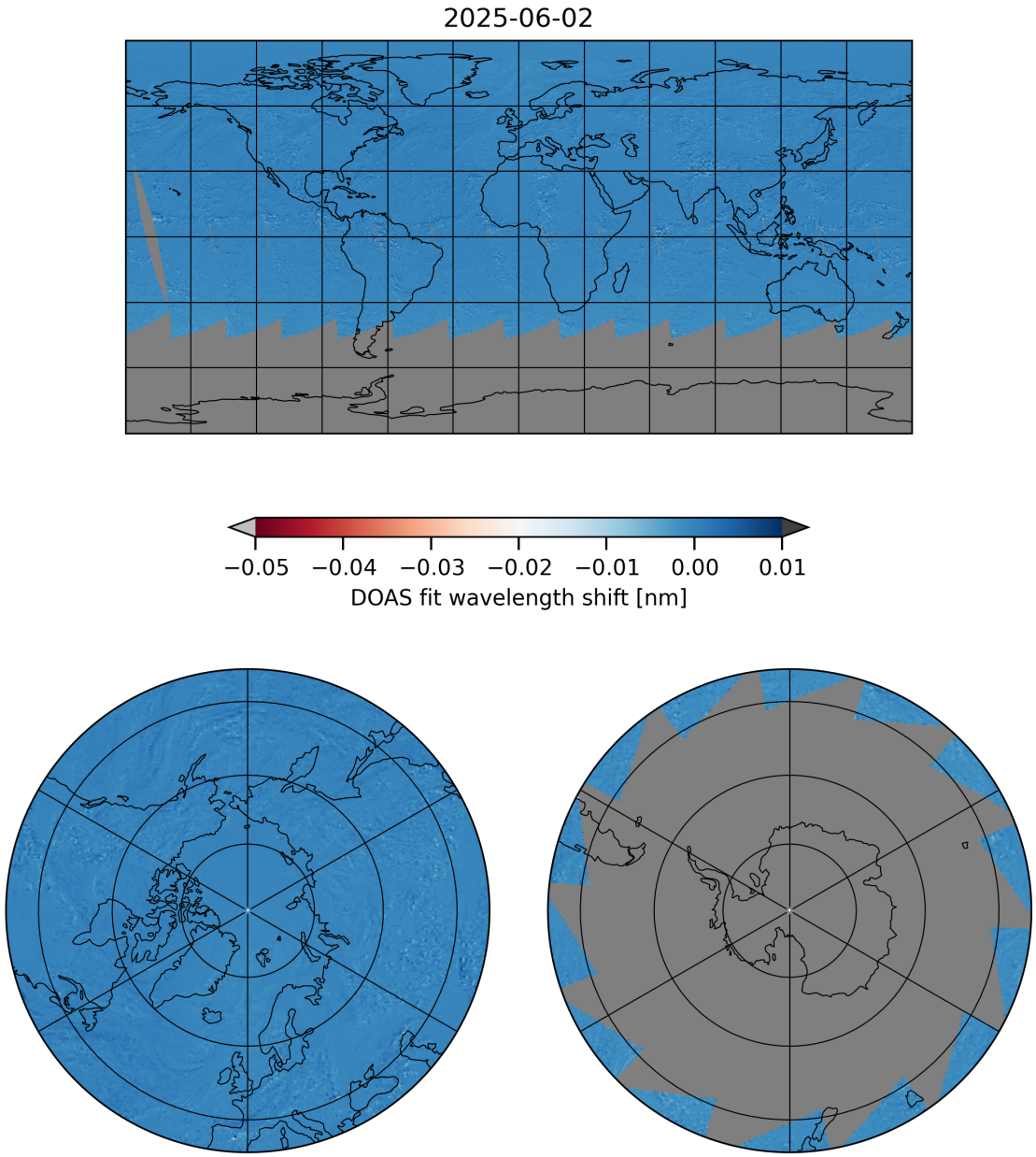

Figure 22: Map of “DOAS fit wavelength shift” for 2025-06-02 to 2025-06-03

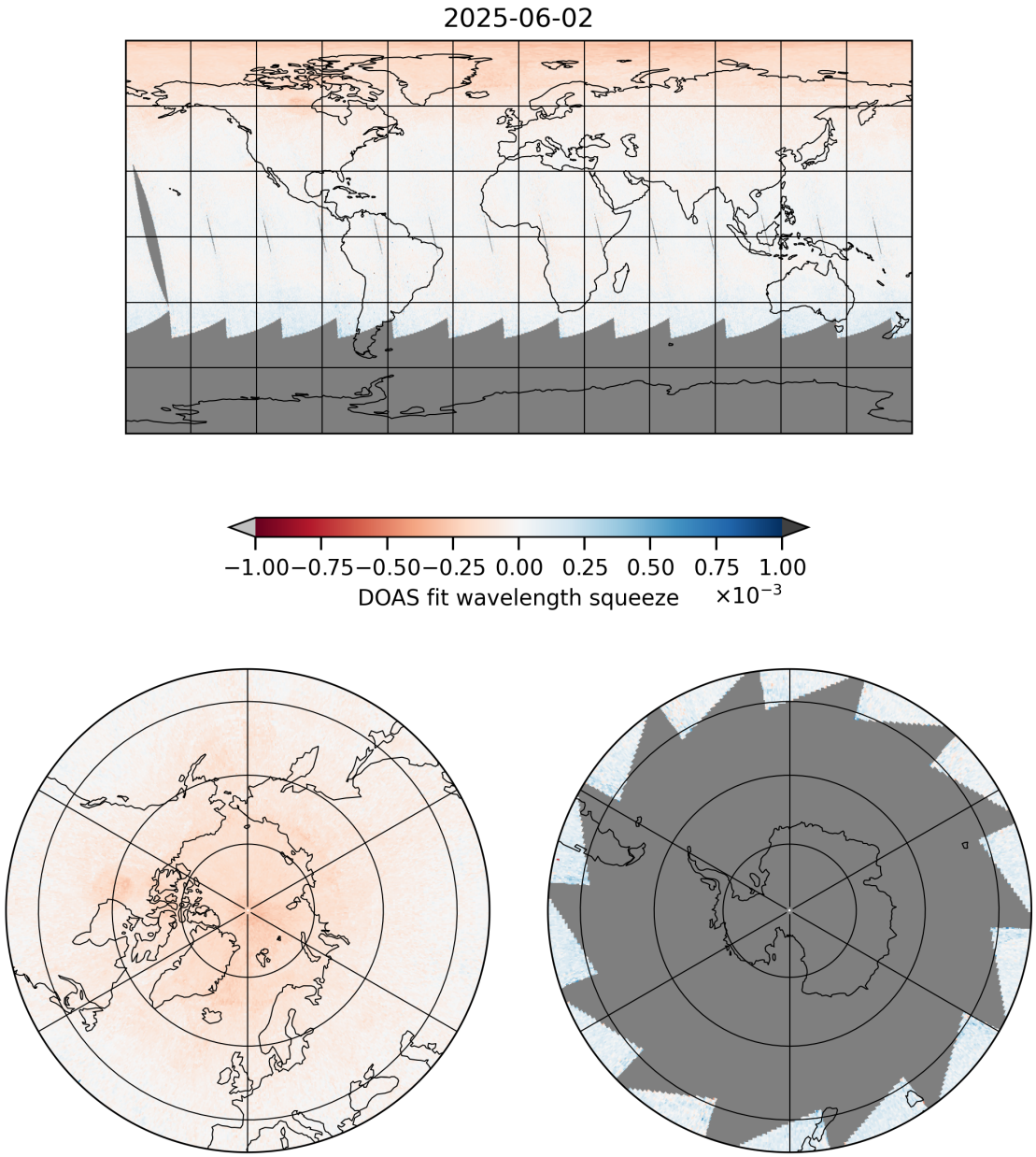

Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-06-02 to 2025-06-03

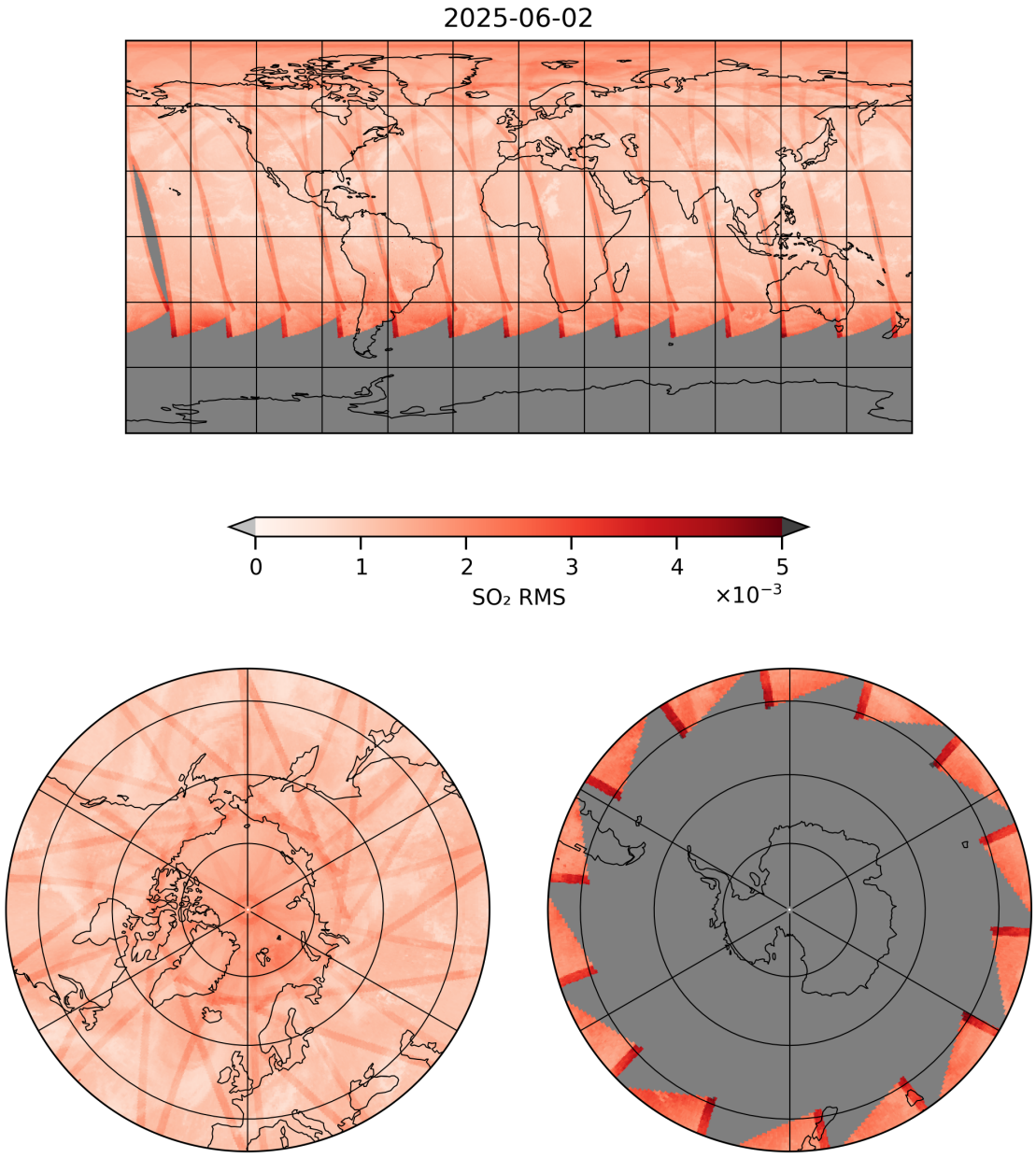

Figure 24: Map of "SO_2 RMS" for 2025-06-02 to 2025-06-03

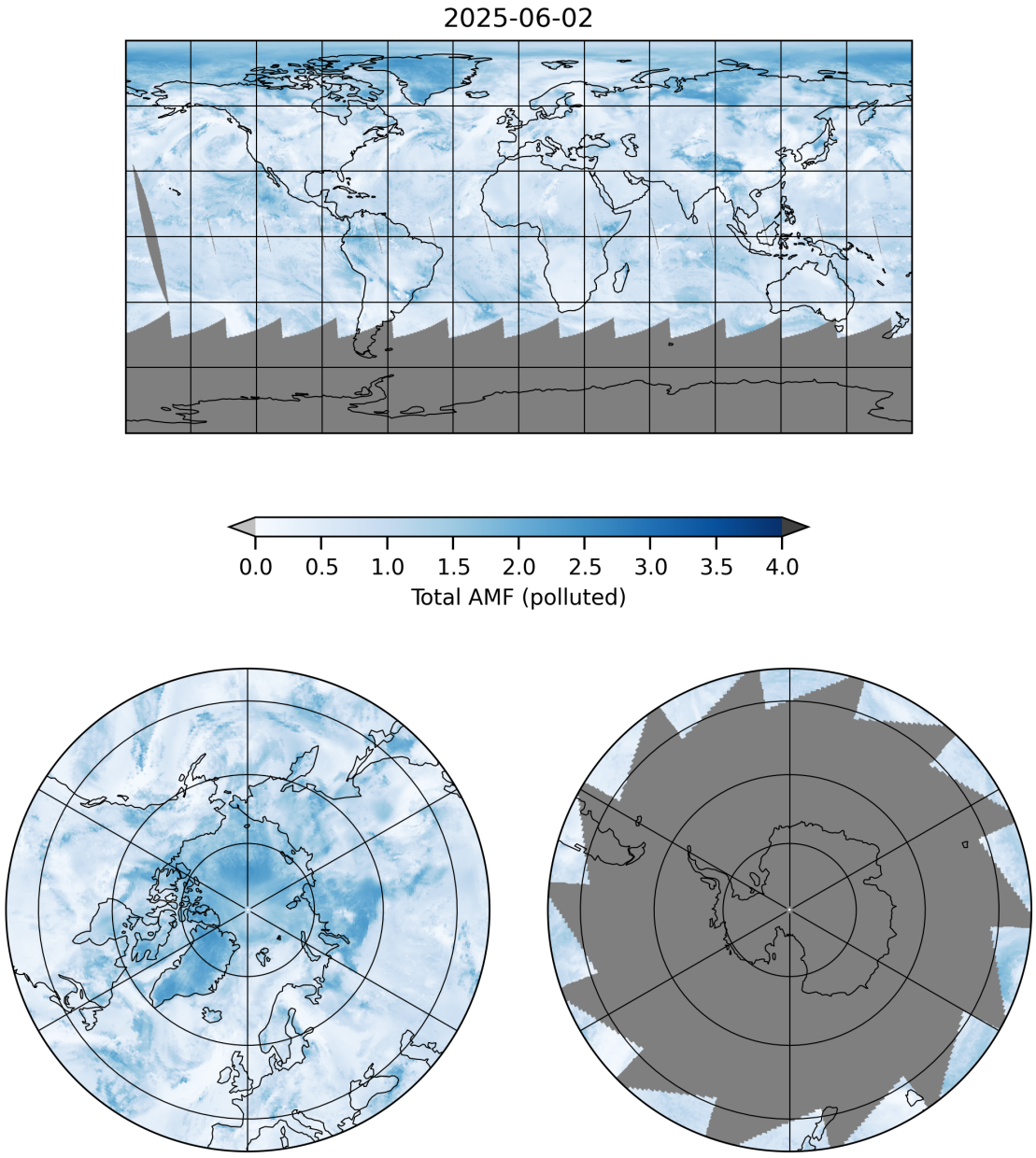

Figure 25: Map of “Total AMF (polluted)” for 2025-06-02 to 2025-06-03

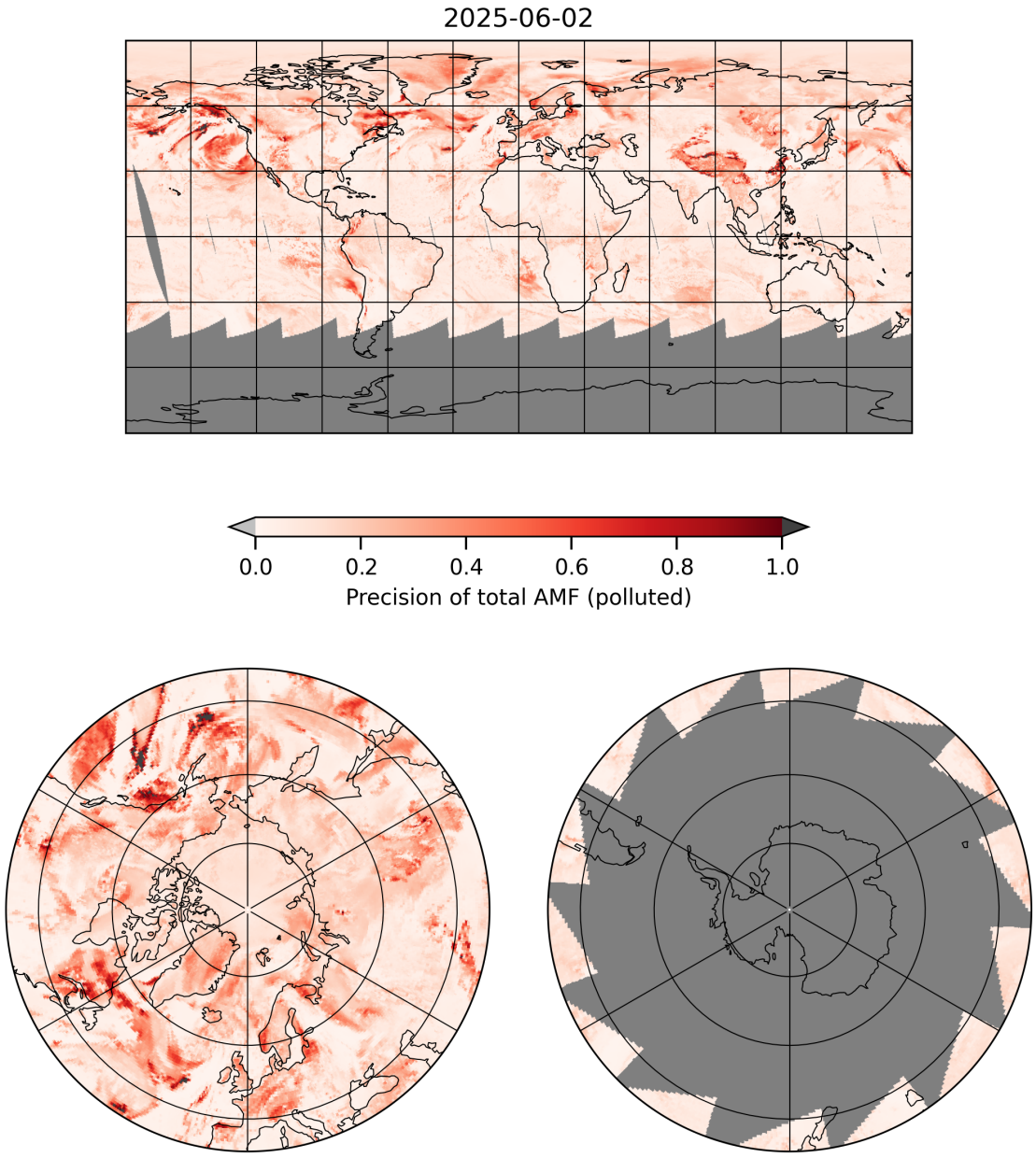

Figure 26: Map of “Precision of total AMF (polluted)” for 2025-06-02 to 2025-06-03

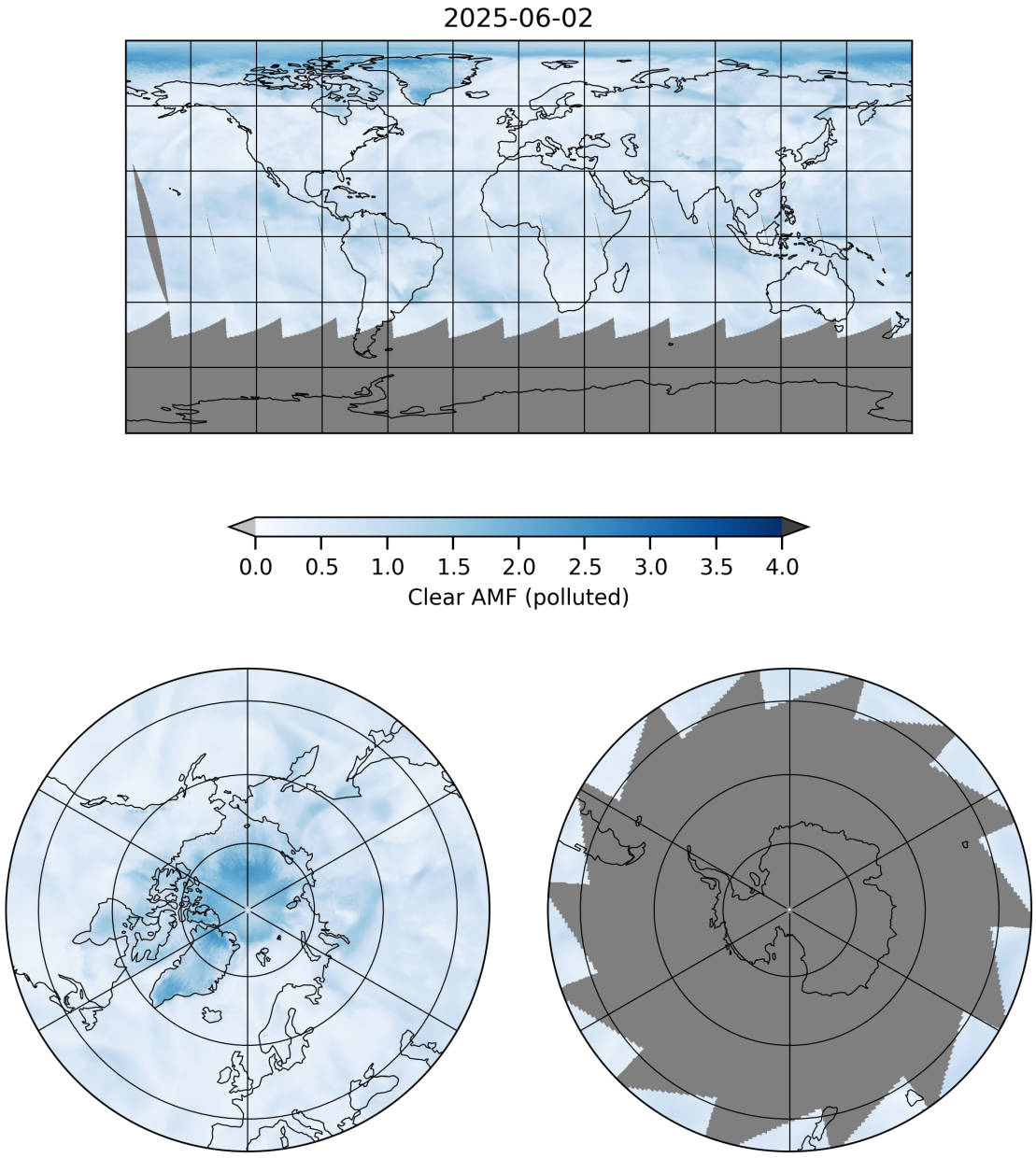

Figure 27: Map of “Clear AMF (polluted)” for 2025-06-02 to 2025-06-03

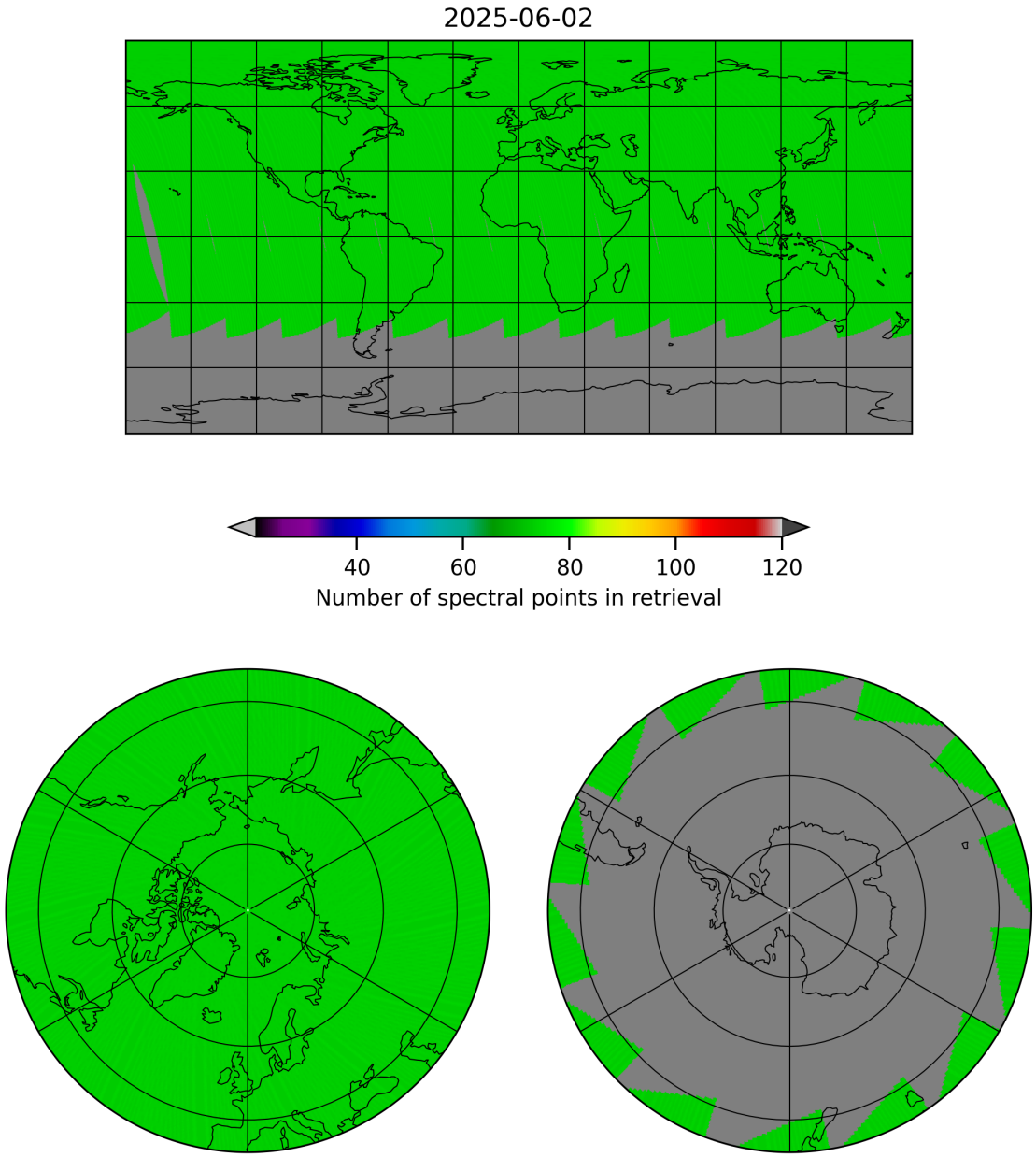

Figure 28: Map of “Number of spectral points in retrieval” for 2025-06-02 to 2025-06-03

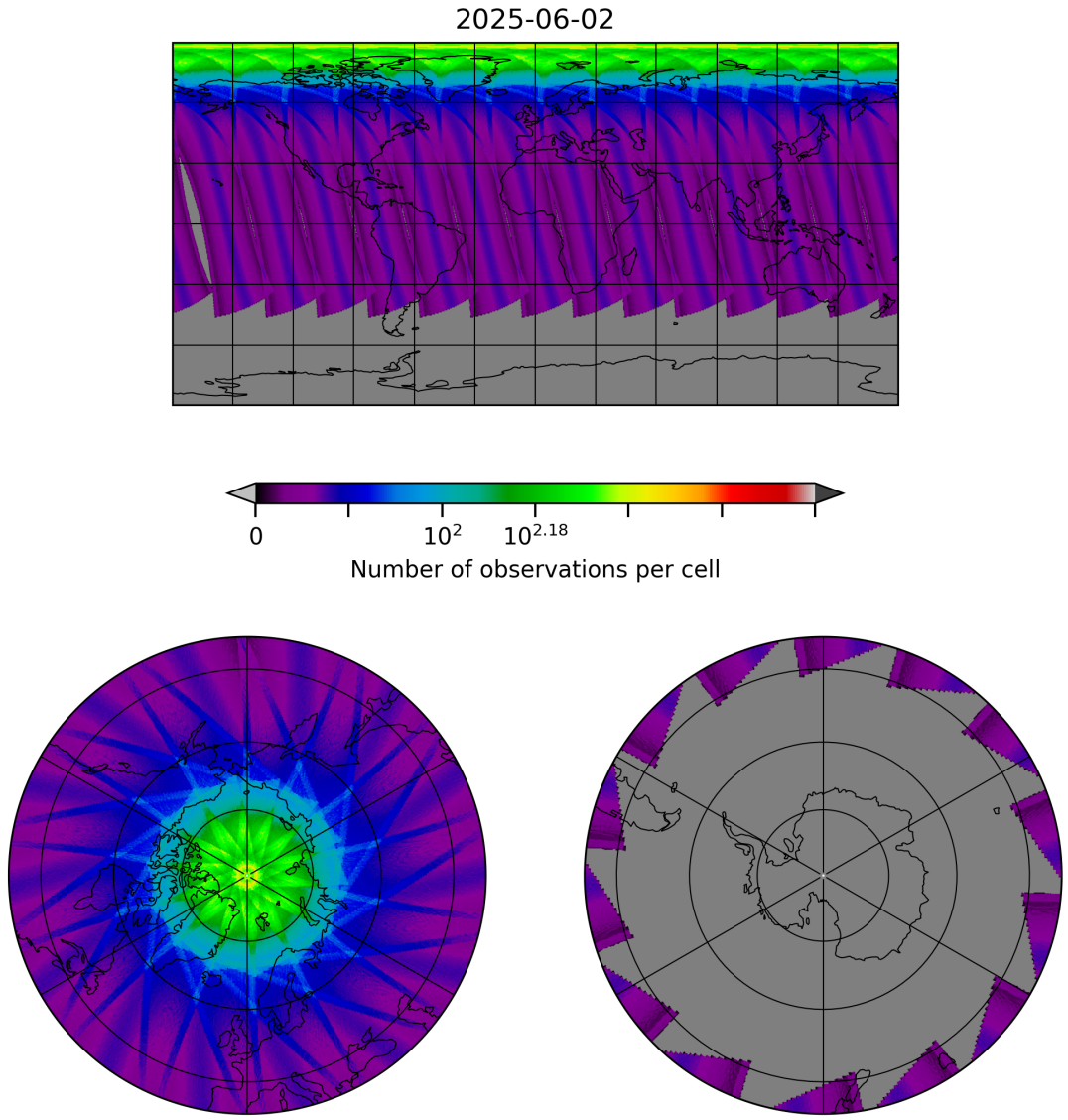

Figure 29: Map of the number of observations for 2025-06-02 to 2025-06-03

7 Zonal average

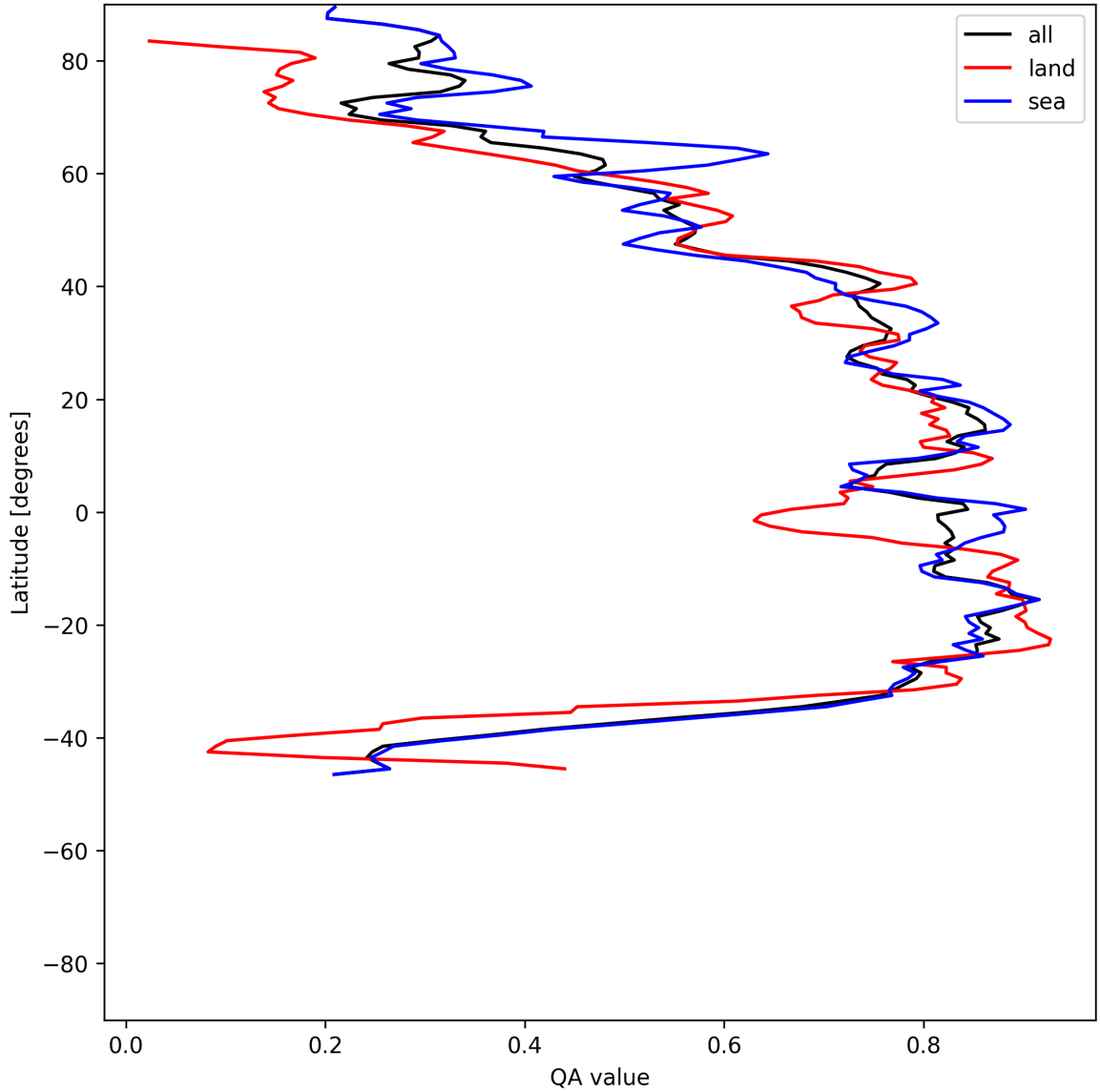

Figure 30: Zonal average of “QA value” for 2025-06-02 to 2025-06-03.

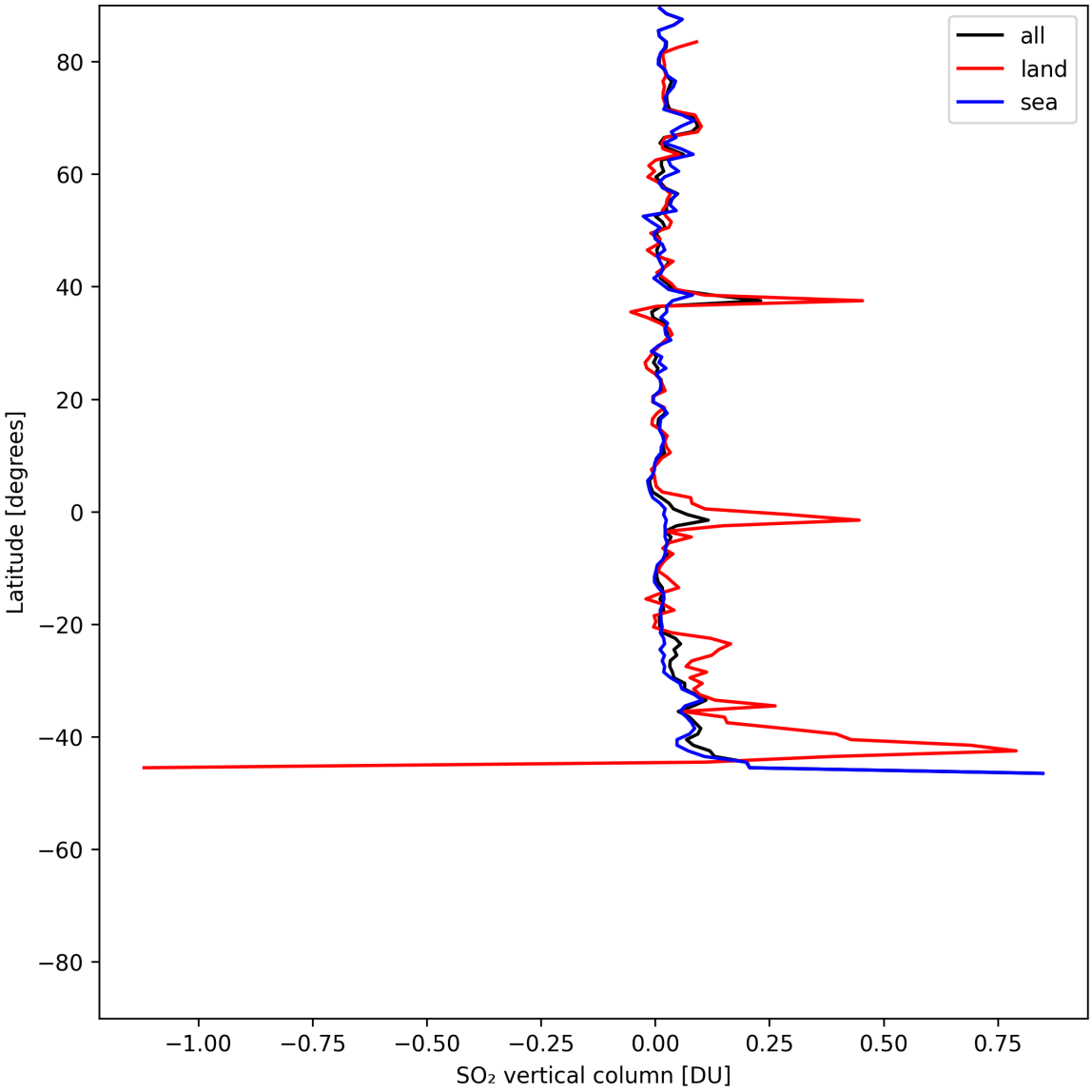

Figure 31: Zonal average of "SO_2 vertical column" for 2025-06-02 to 2025-06-03.

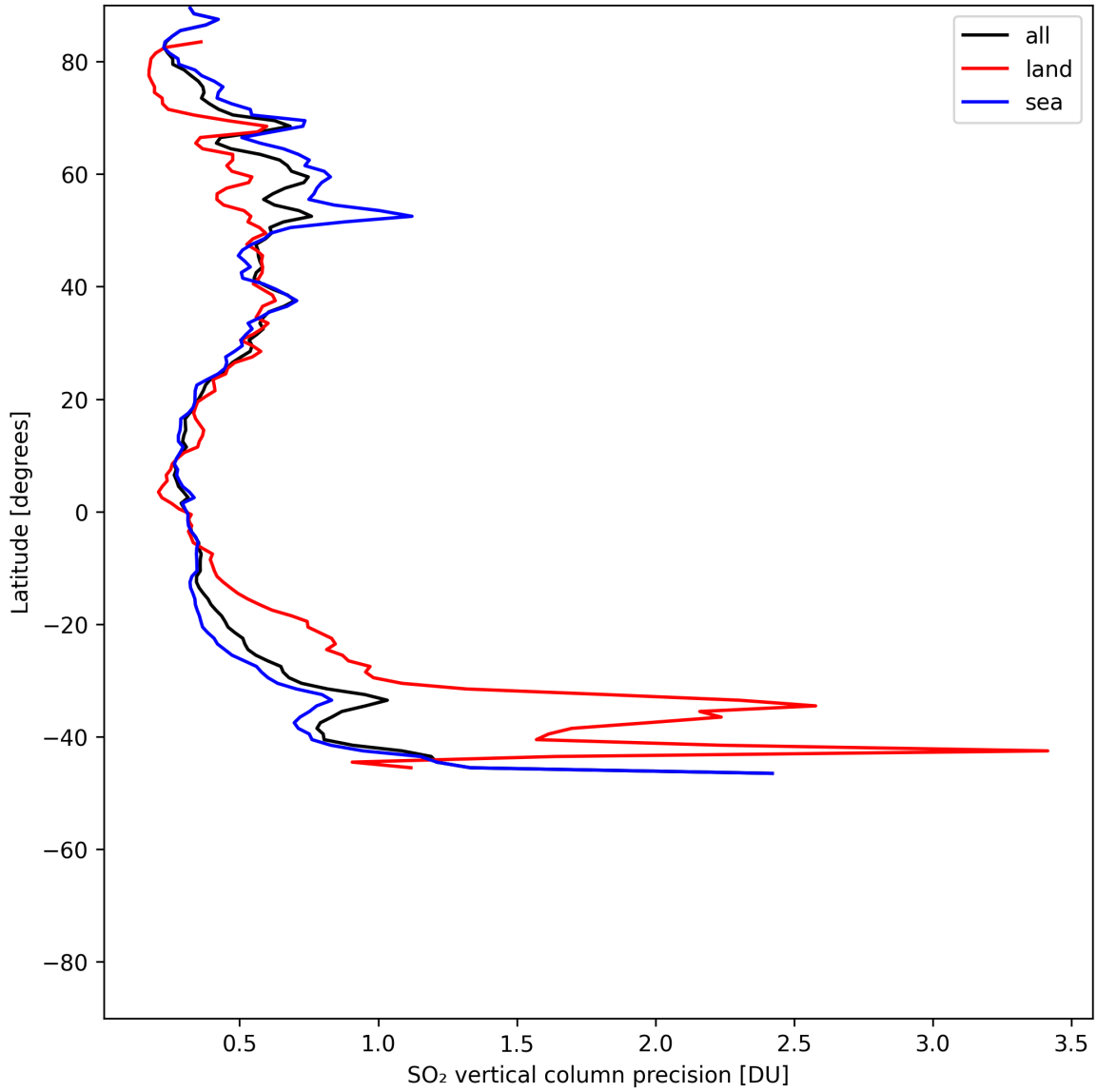

Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-06-02 to 2025-06-03.

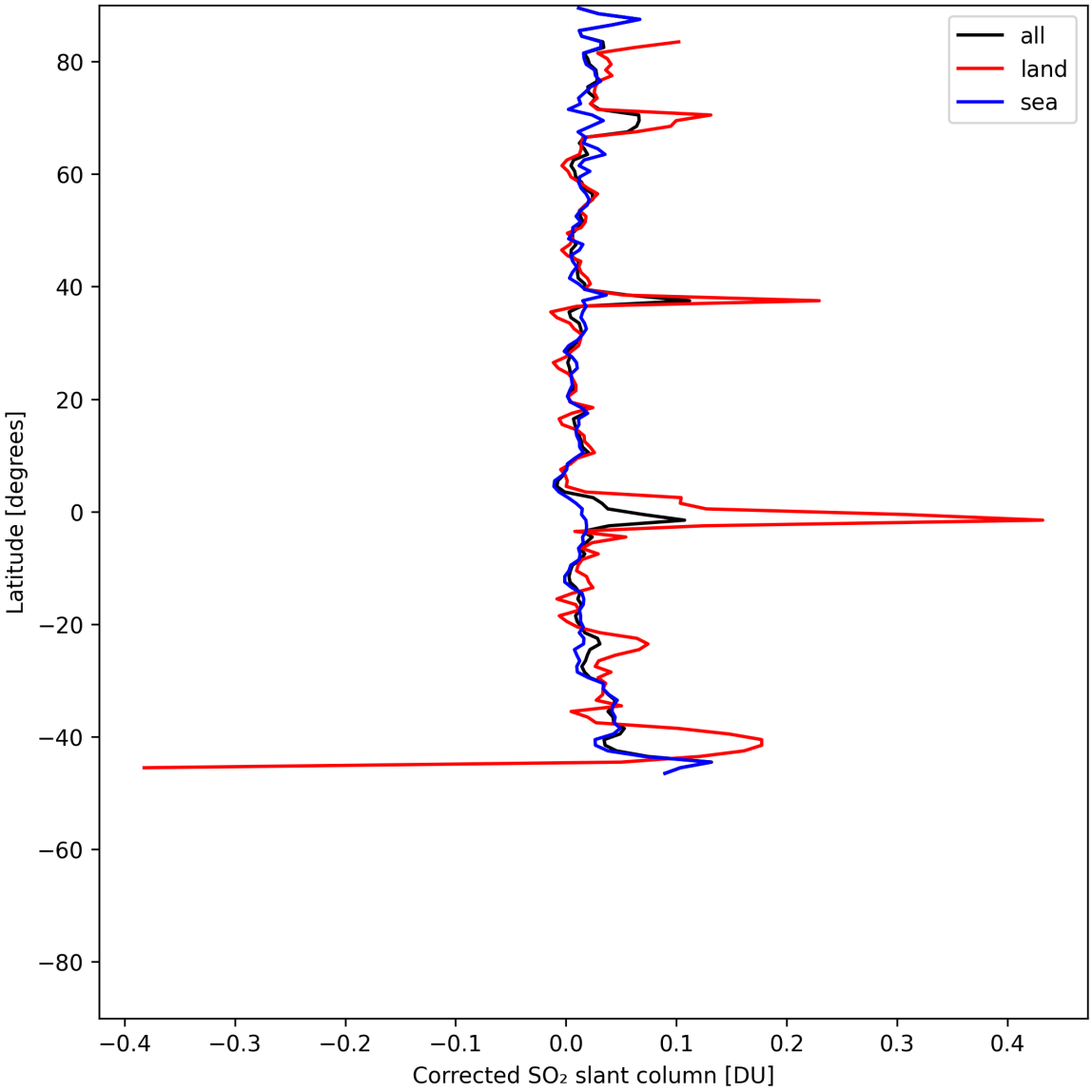

Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-06-02 to 2025-06-03.

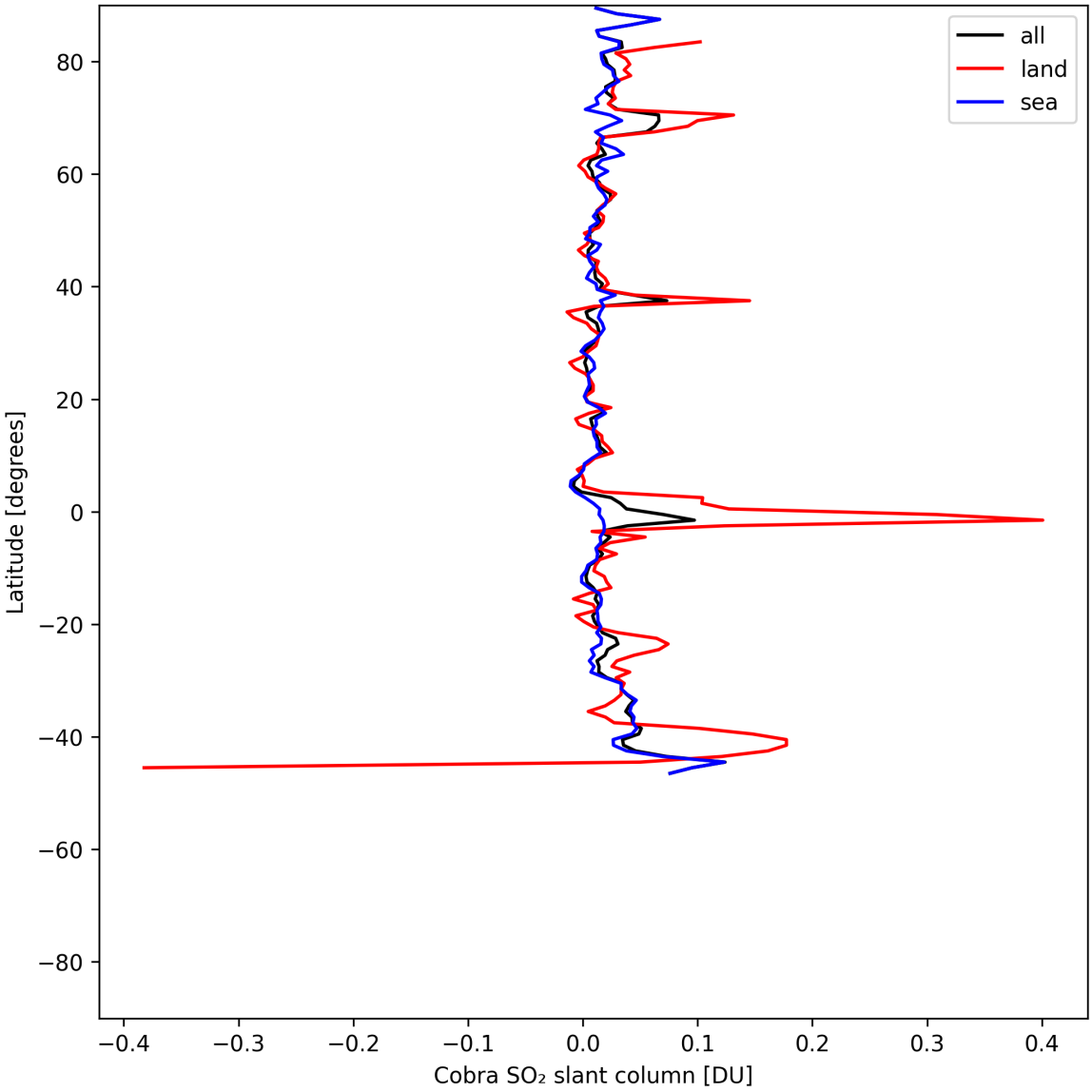

Figure 34: Zonal average of “Cobra SO_2 slant column” for 2025-06-02 to 2025-06-03.

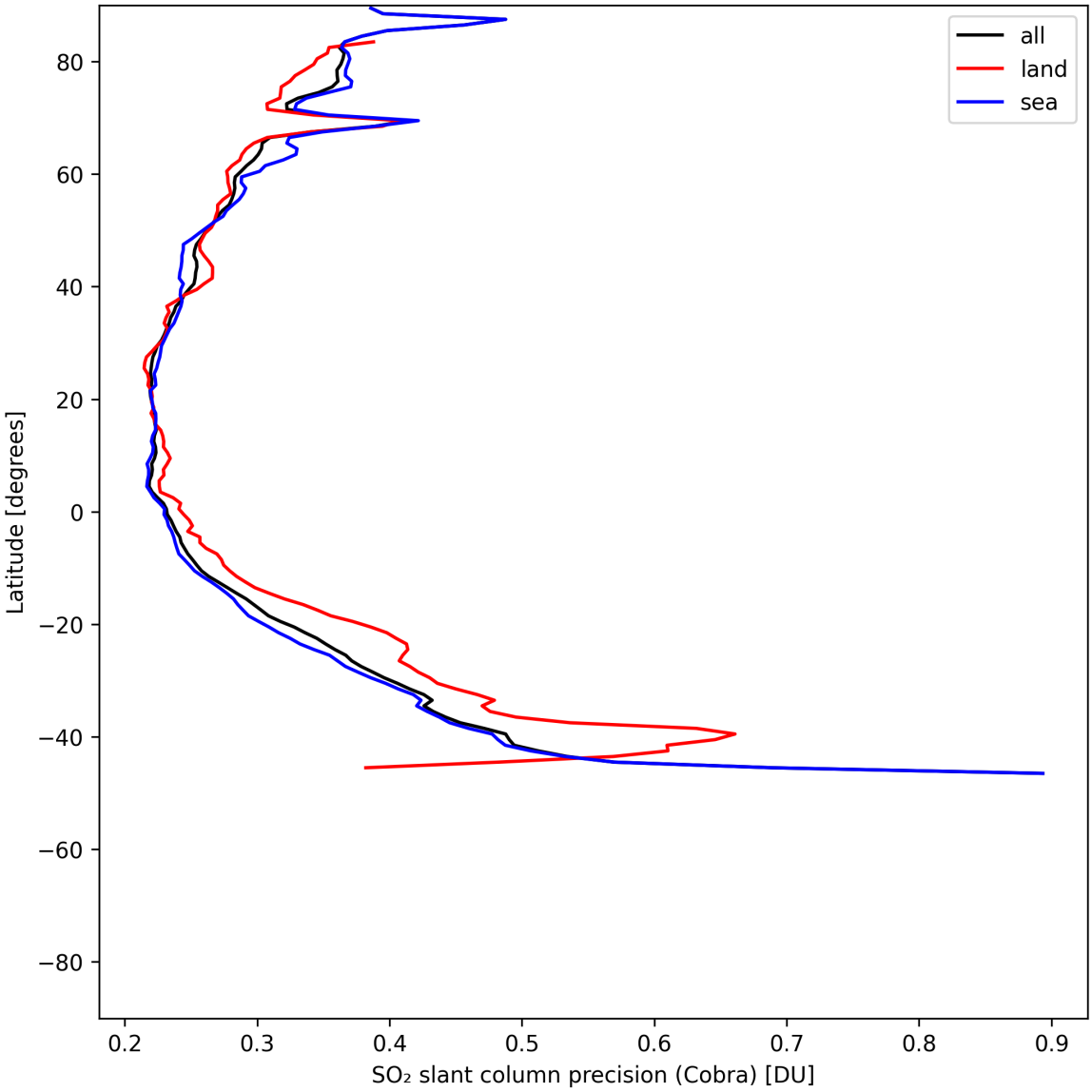

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-06-02 to 2025-06-03.

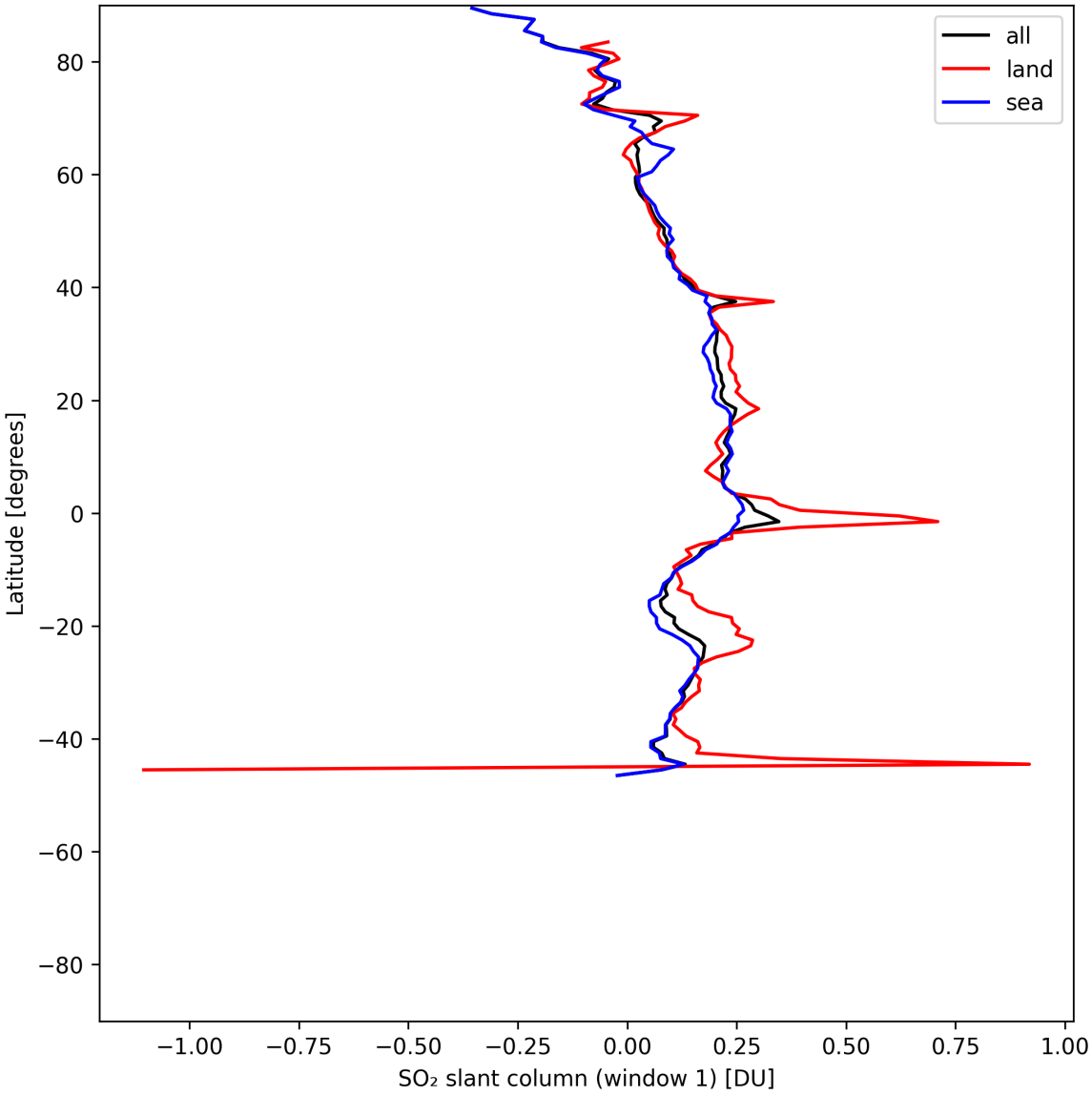

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-06-02 to 2025-06-03.

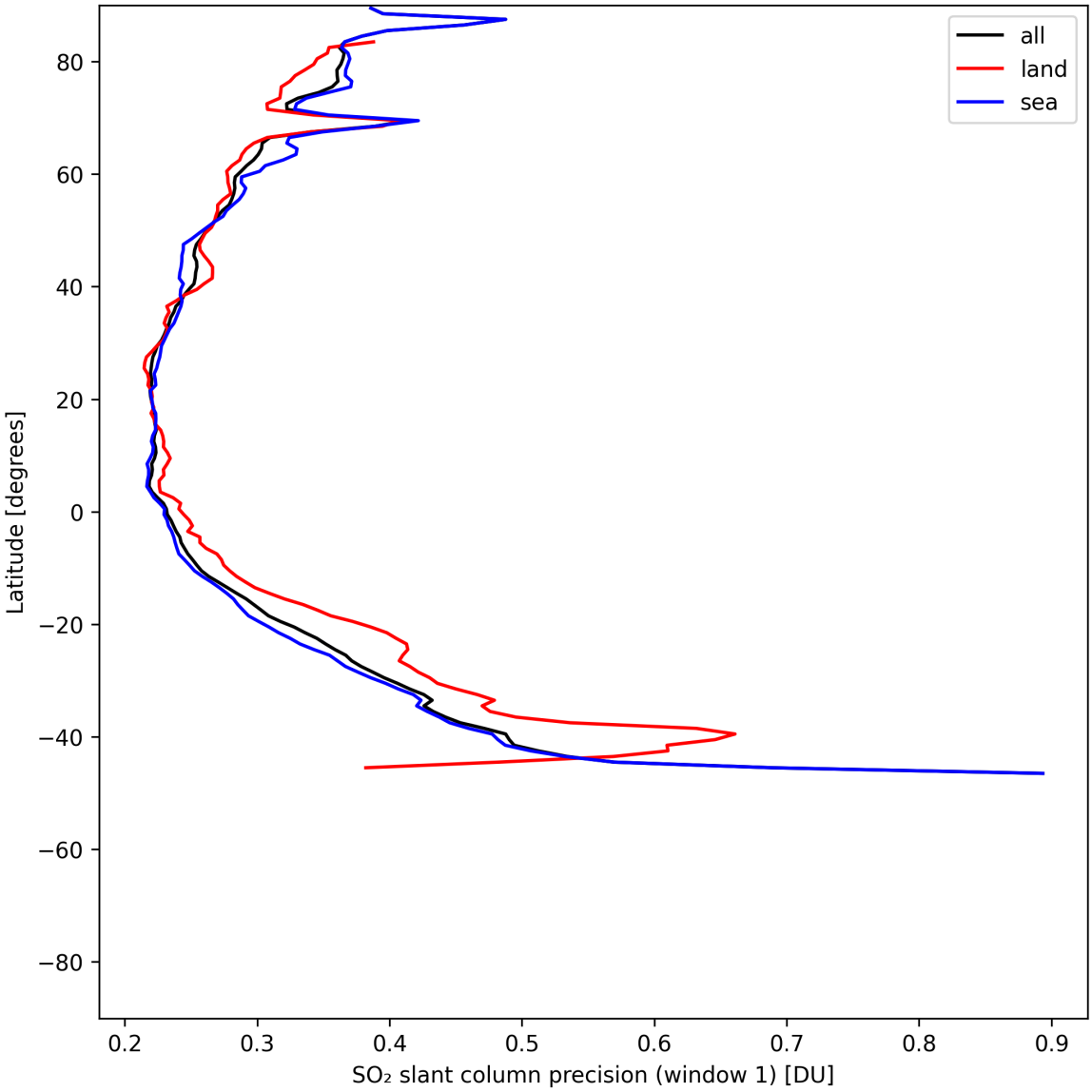

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-06-02 to 2025-06-03.

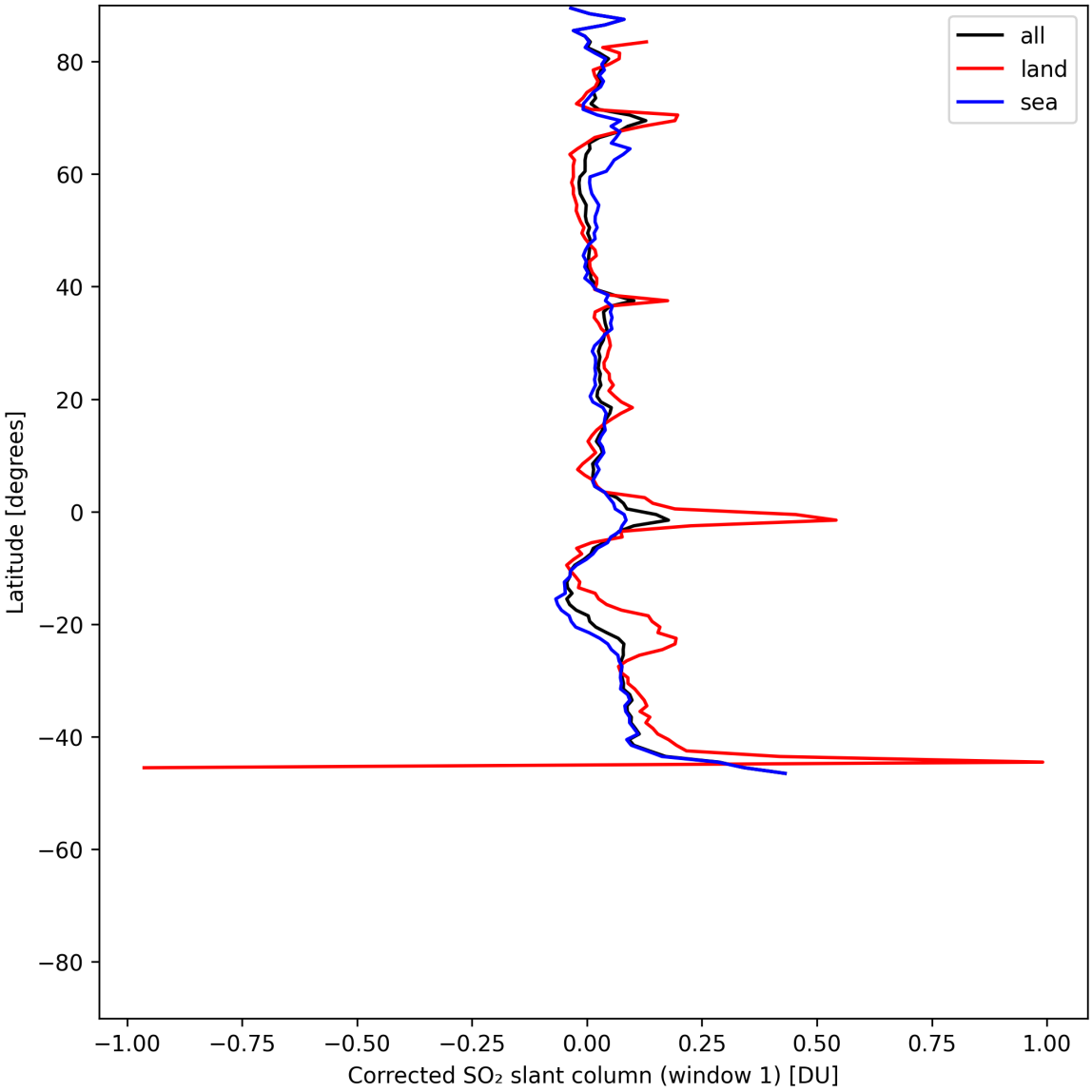

Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-06-02 to 2025-06-03.

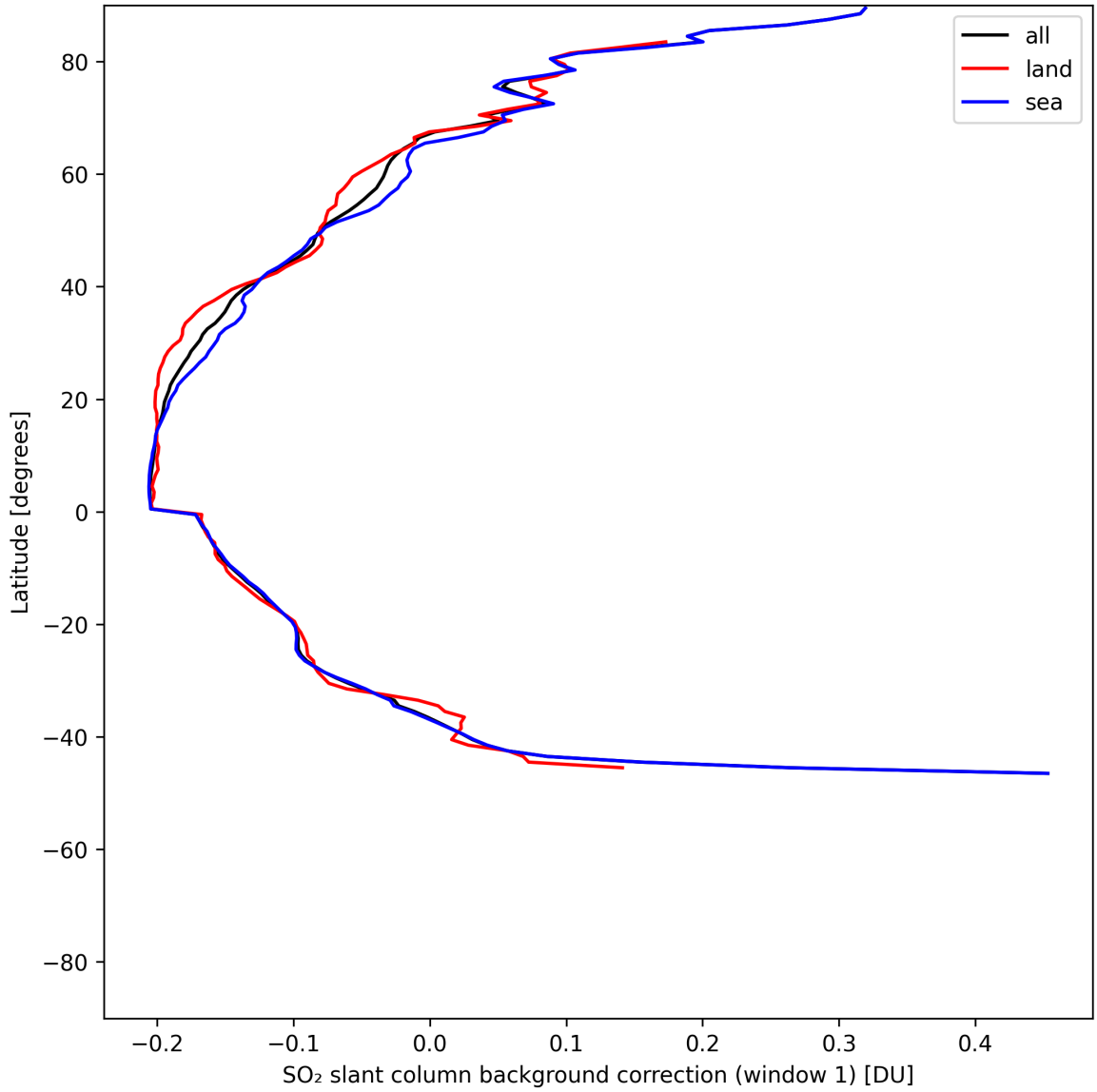

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-06-02 to 2025-06-03.

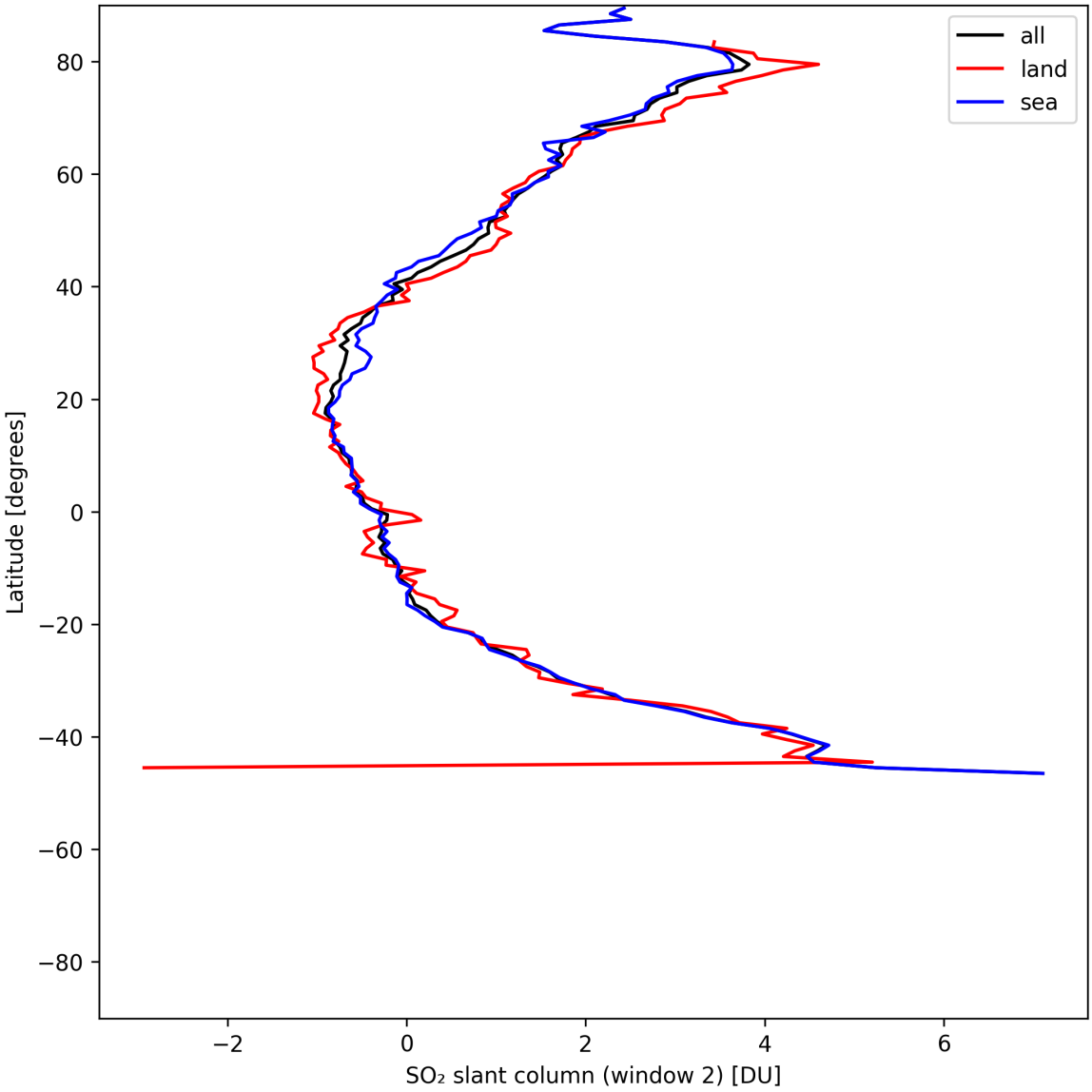

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-06-02 to 2025-06-03.

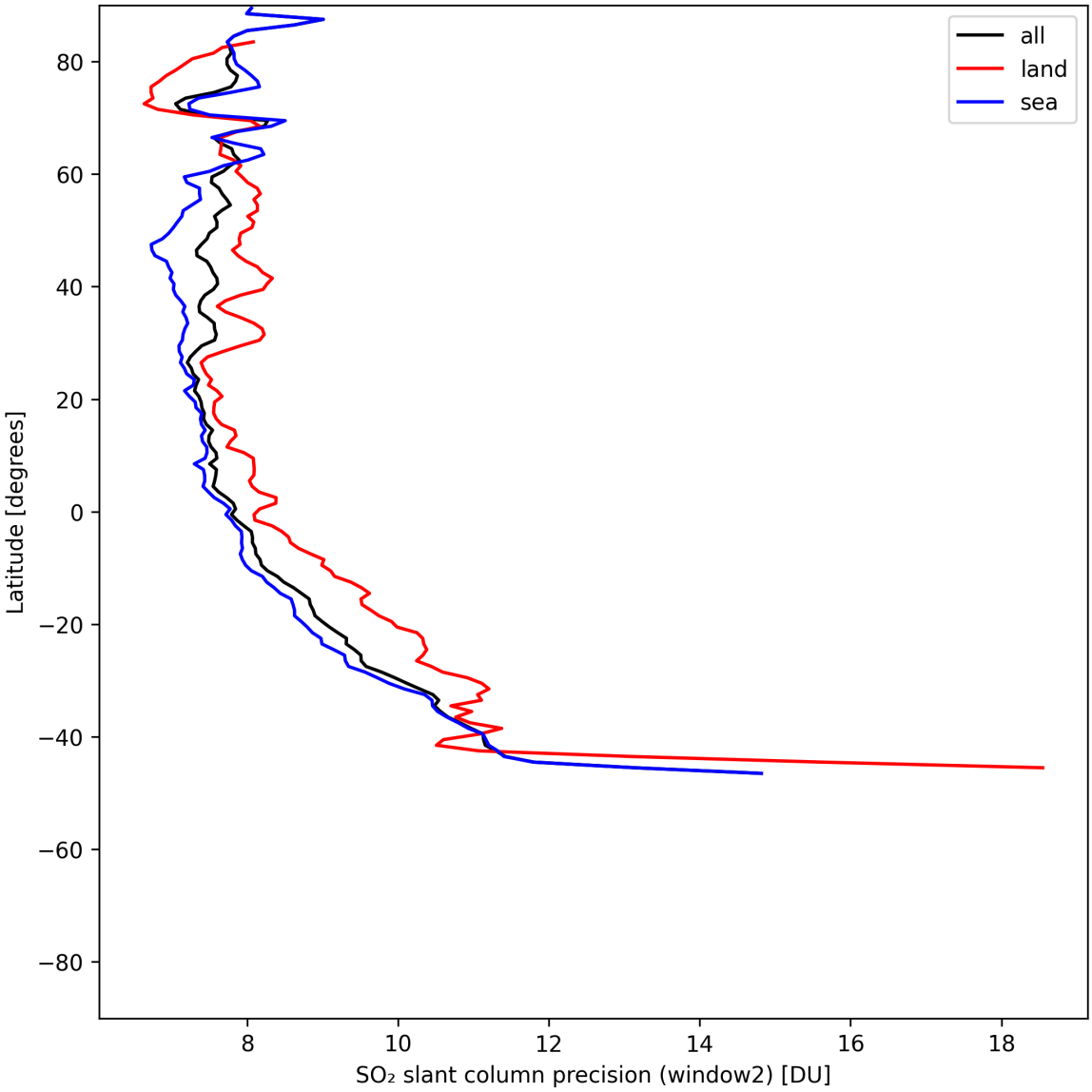

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-06-02 to 2025-06-03.

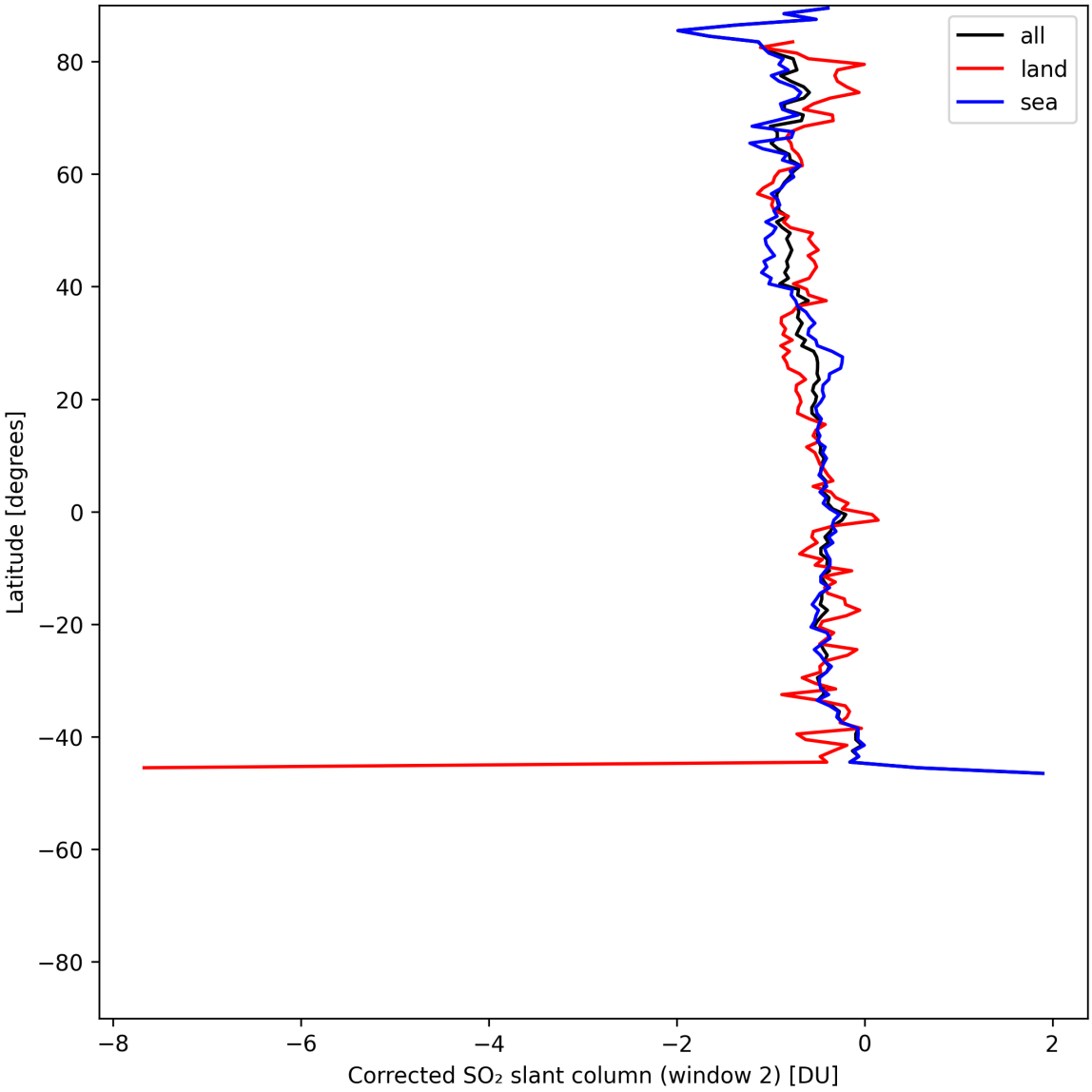

Figure 42: Zonal average of “Corrected SO_2 slant column (window 2)” for 2025-06-02 to 2025-06-03.

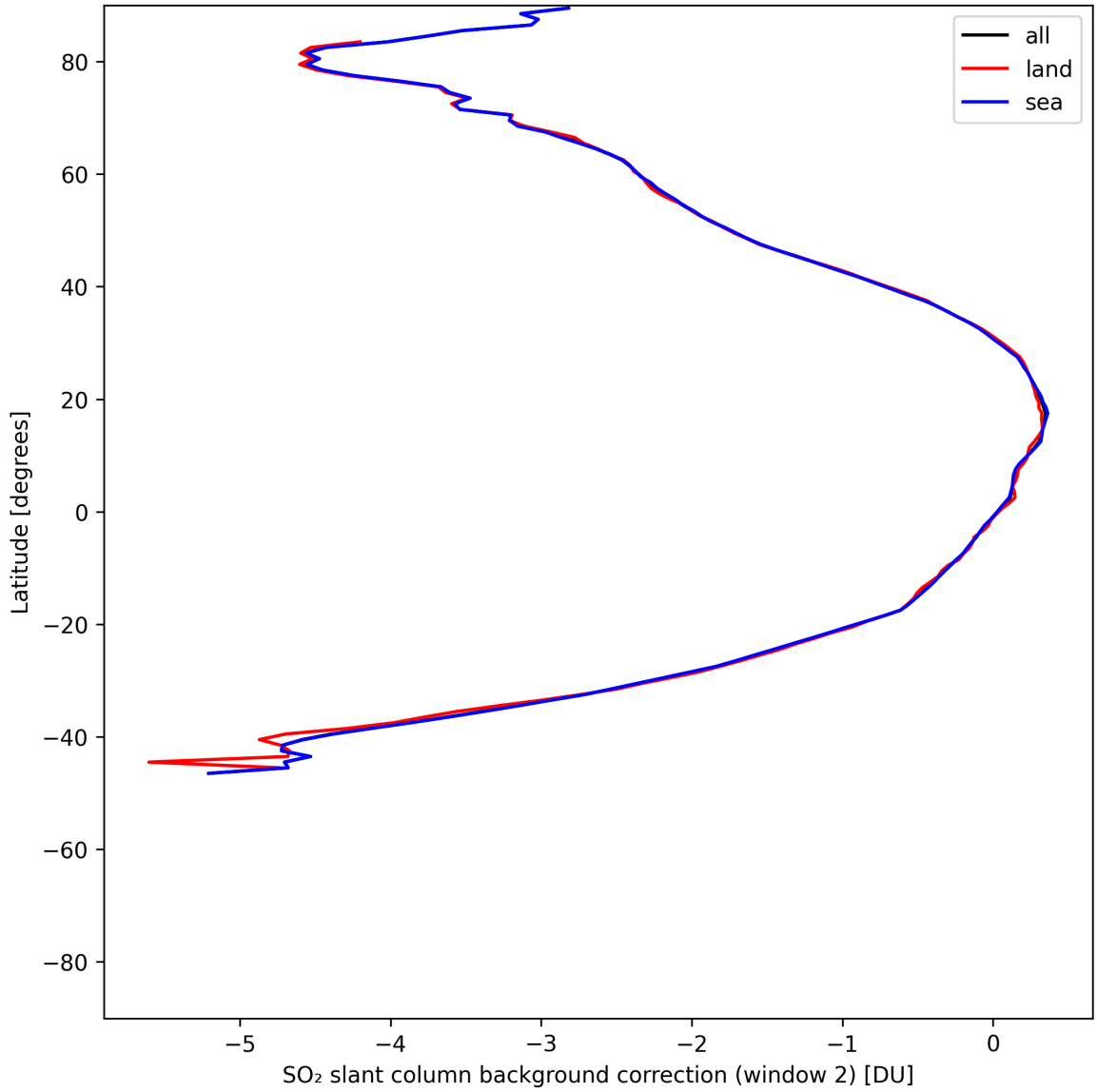

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-06-02 to 2025-06-03.

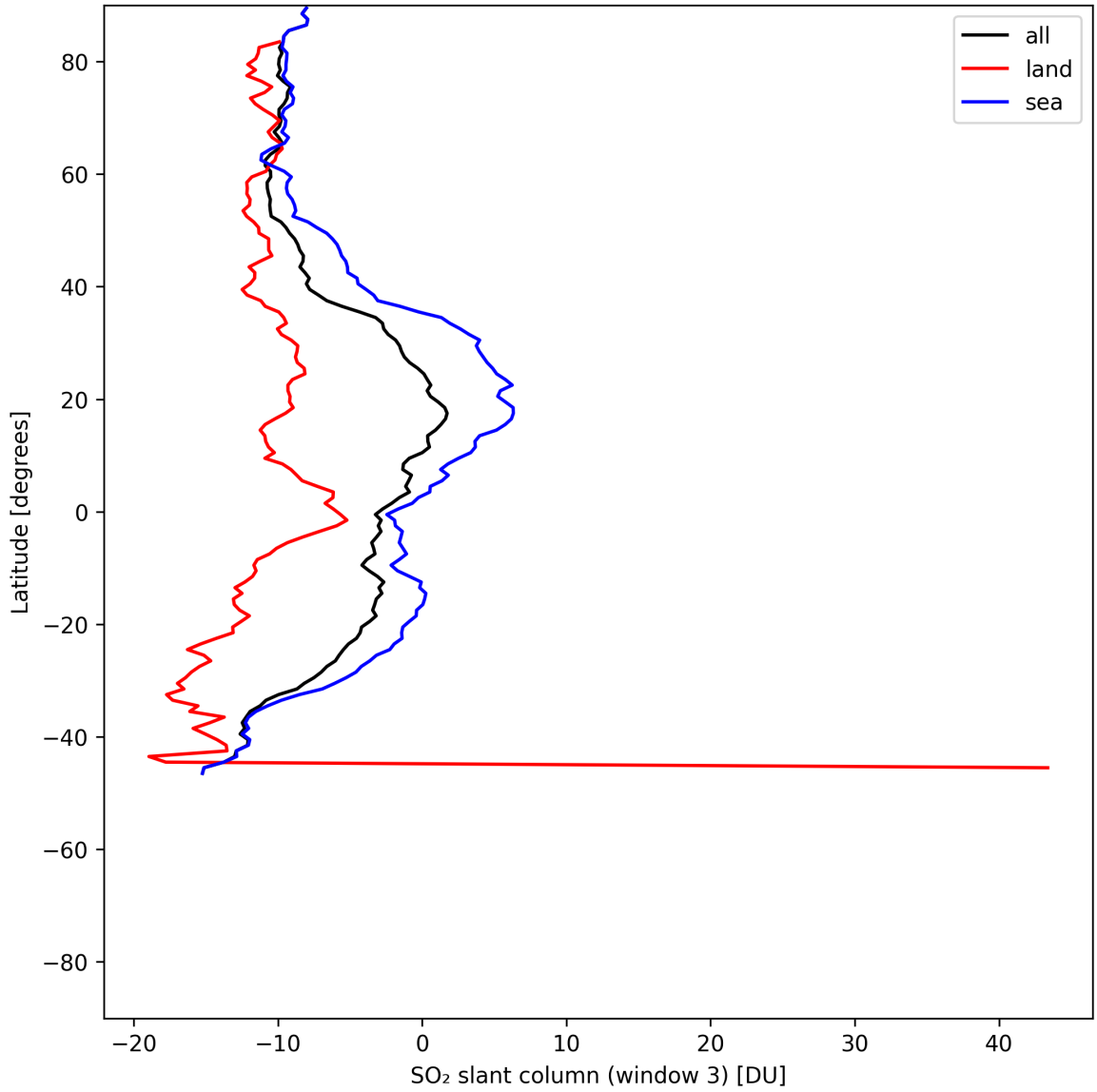

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-06-02 to 2025-06-03.

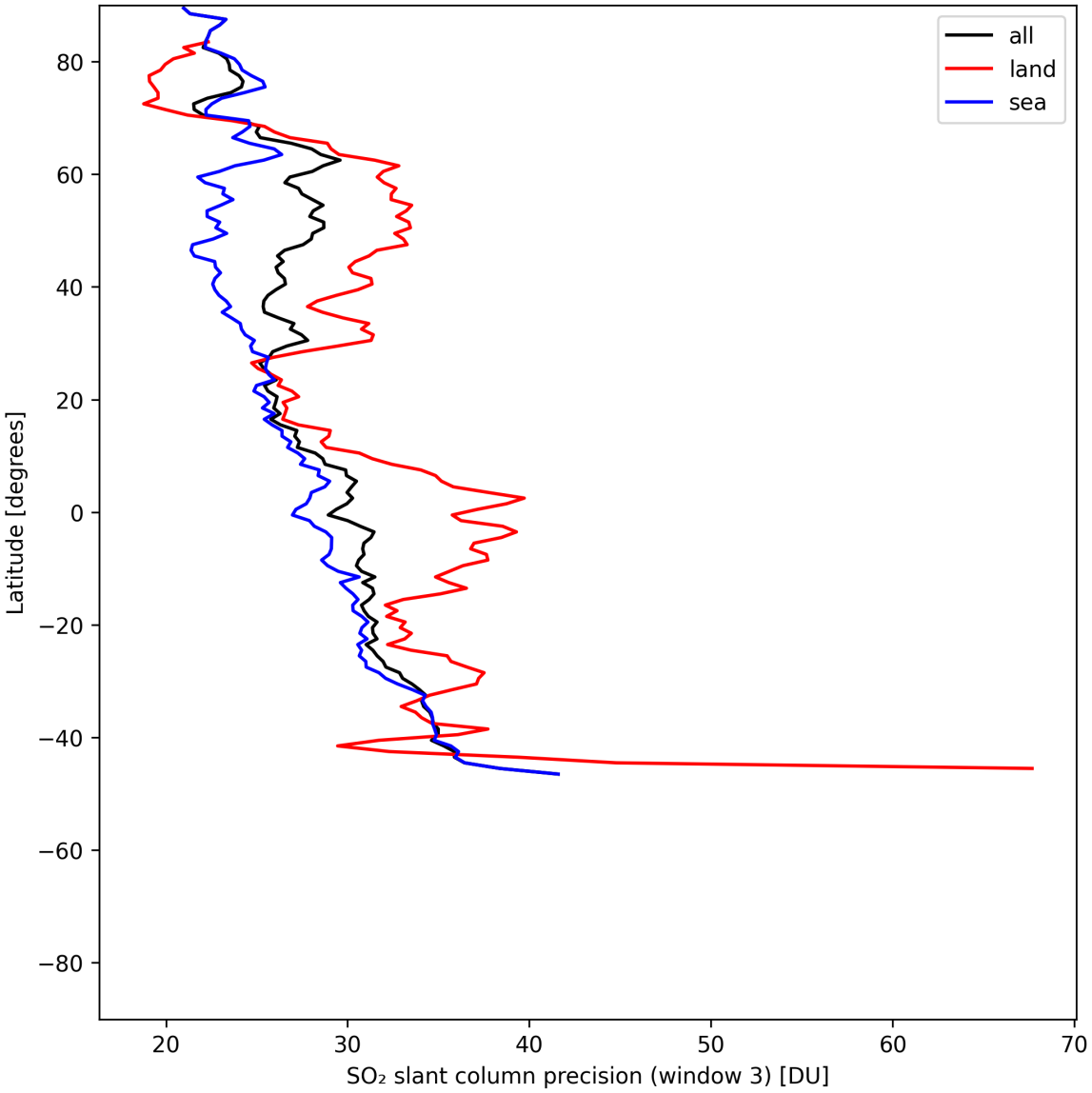

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-06-02 to 2025-06-03.

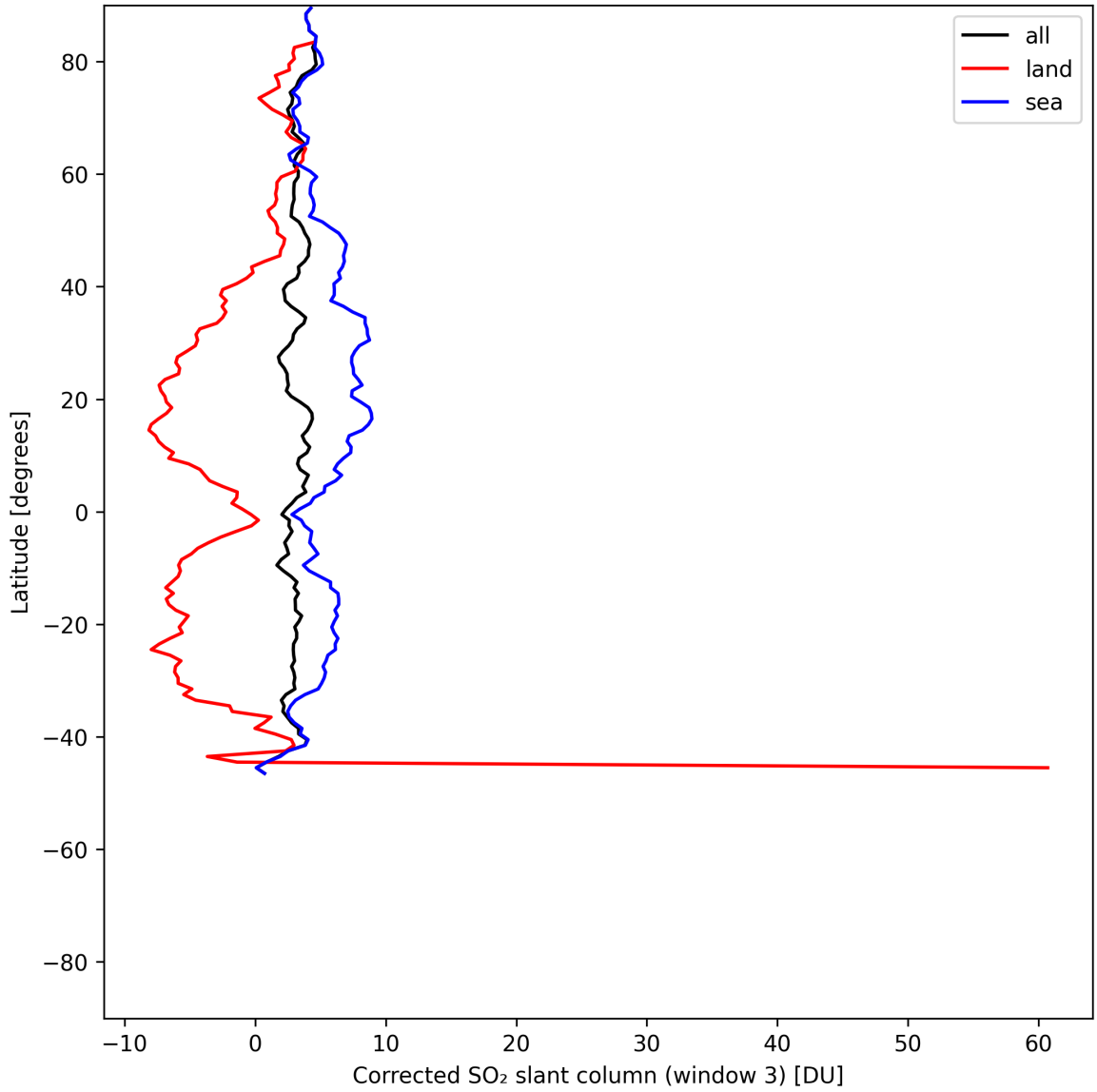

Figure 46: Zonal average of “Corrected SO_2 slant column (window 3)” for 2025-06-02 to 2025-06-03.

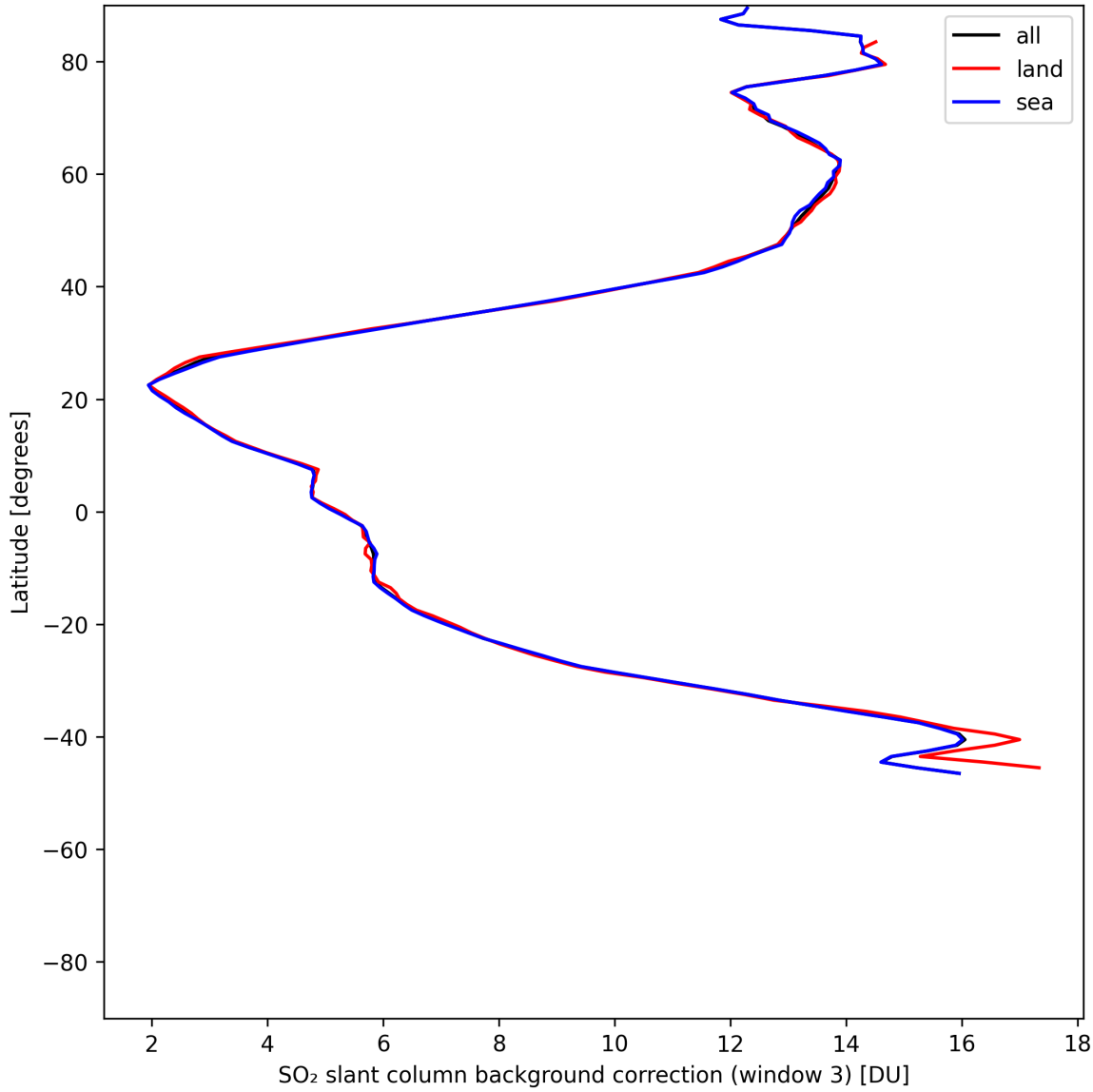

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-06-02 to 2025-06-03.

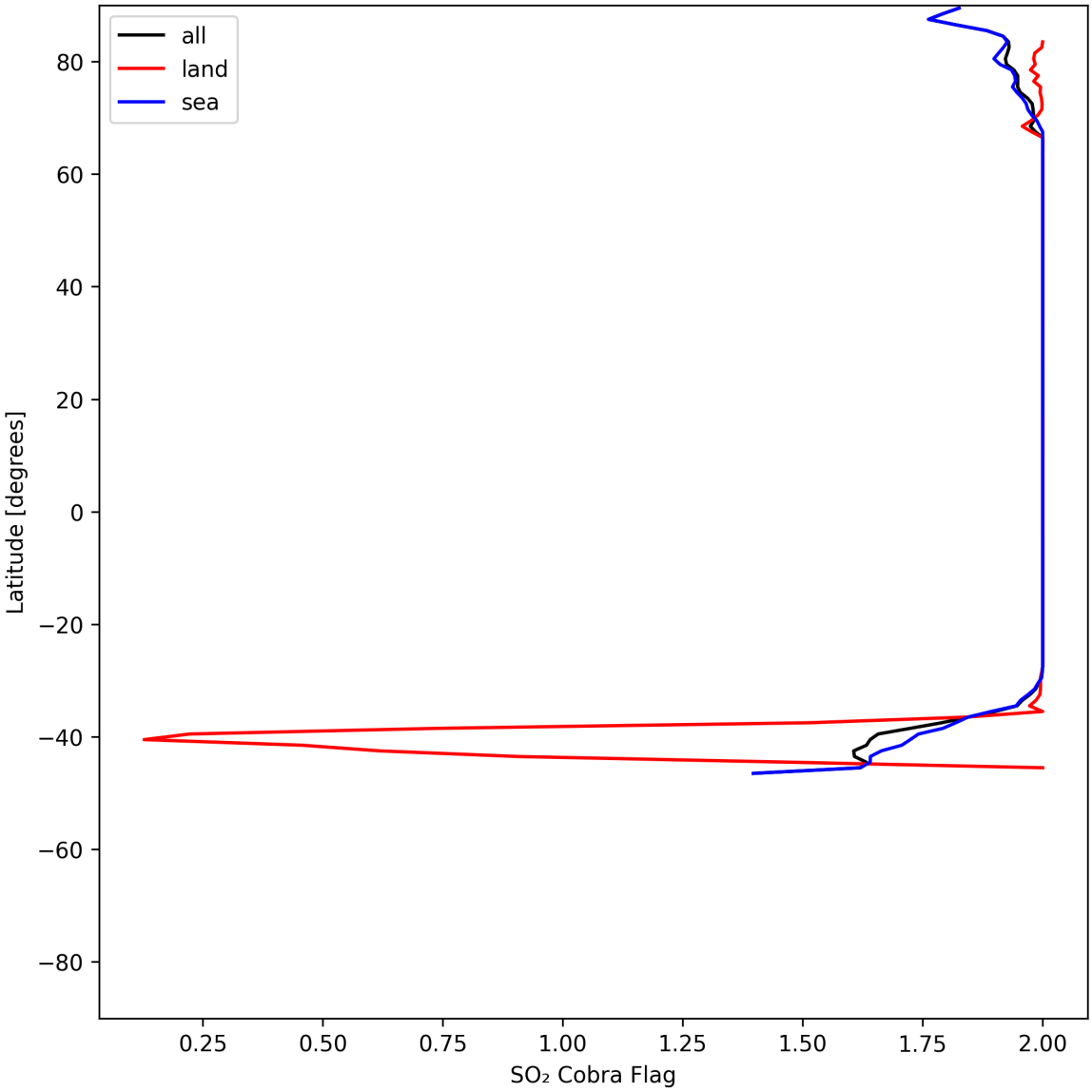

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-06-02 to 2025-06-03.

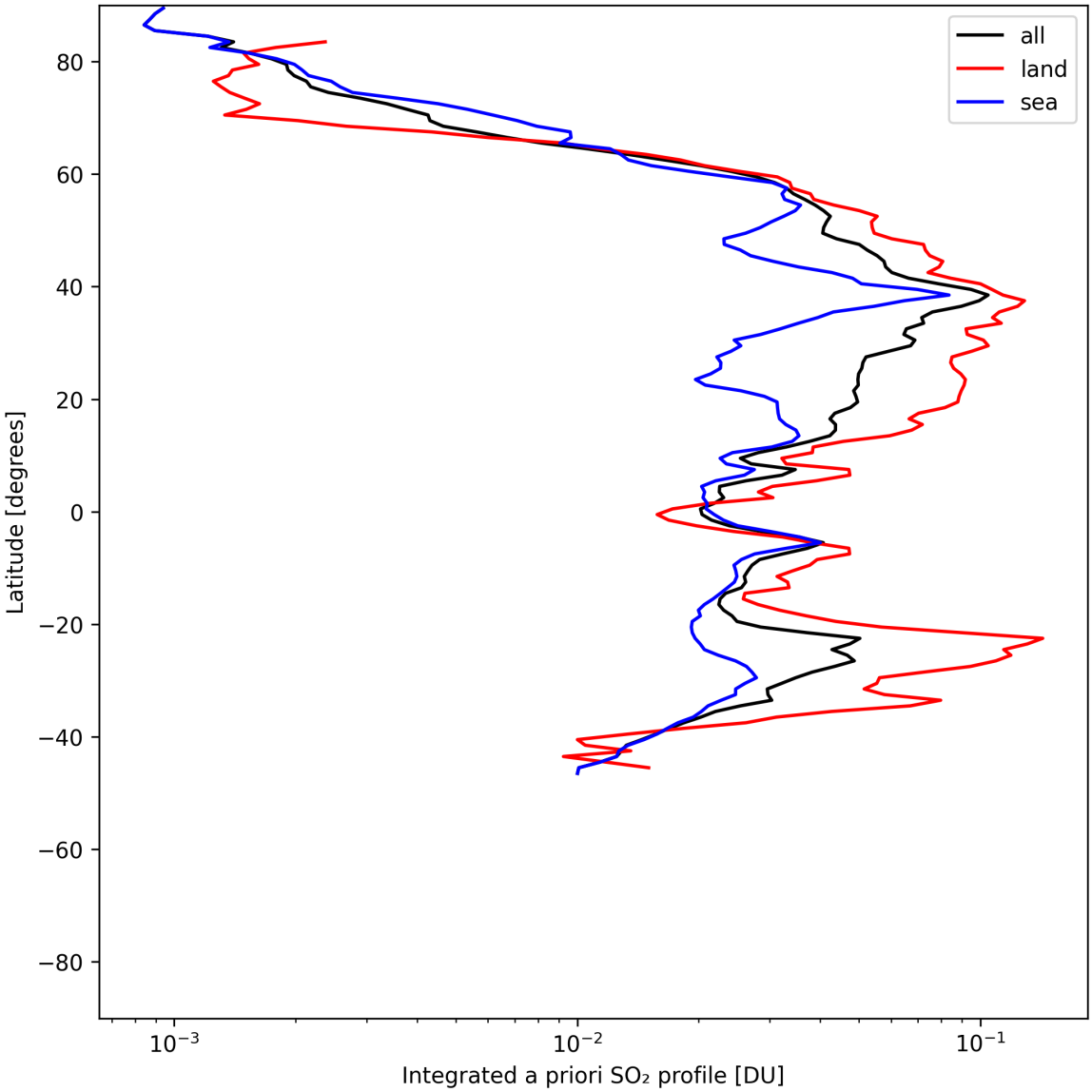

Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-06-02 to 2025-06-03.

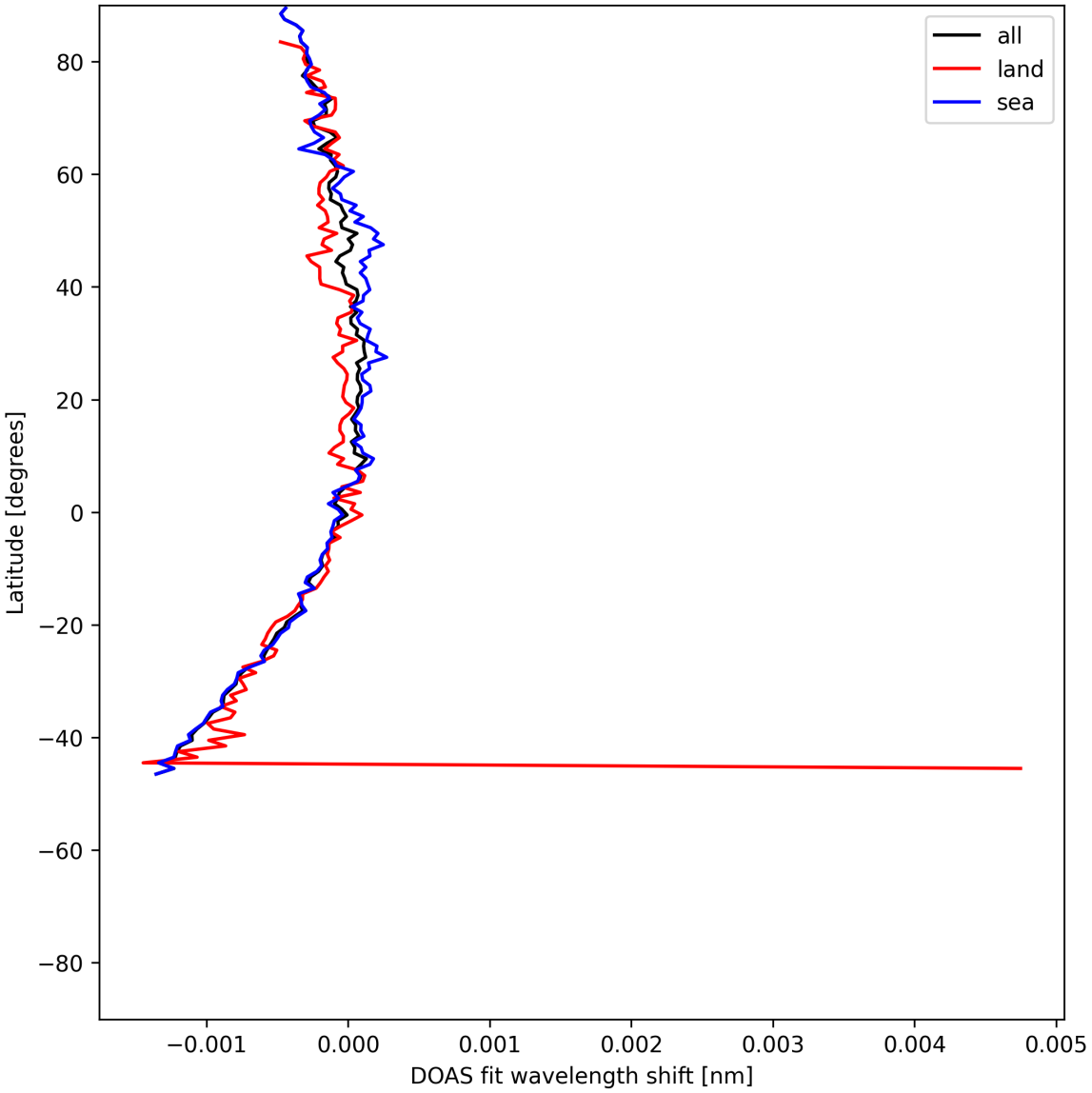

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-06-02 to 2025-06-03.

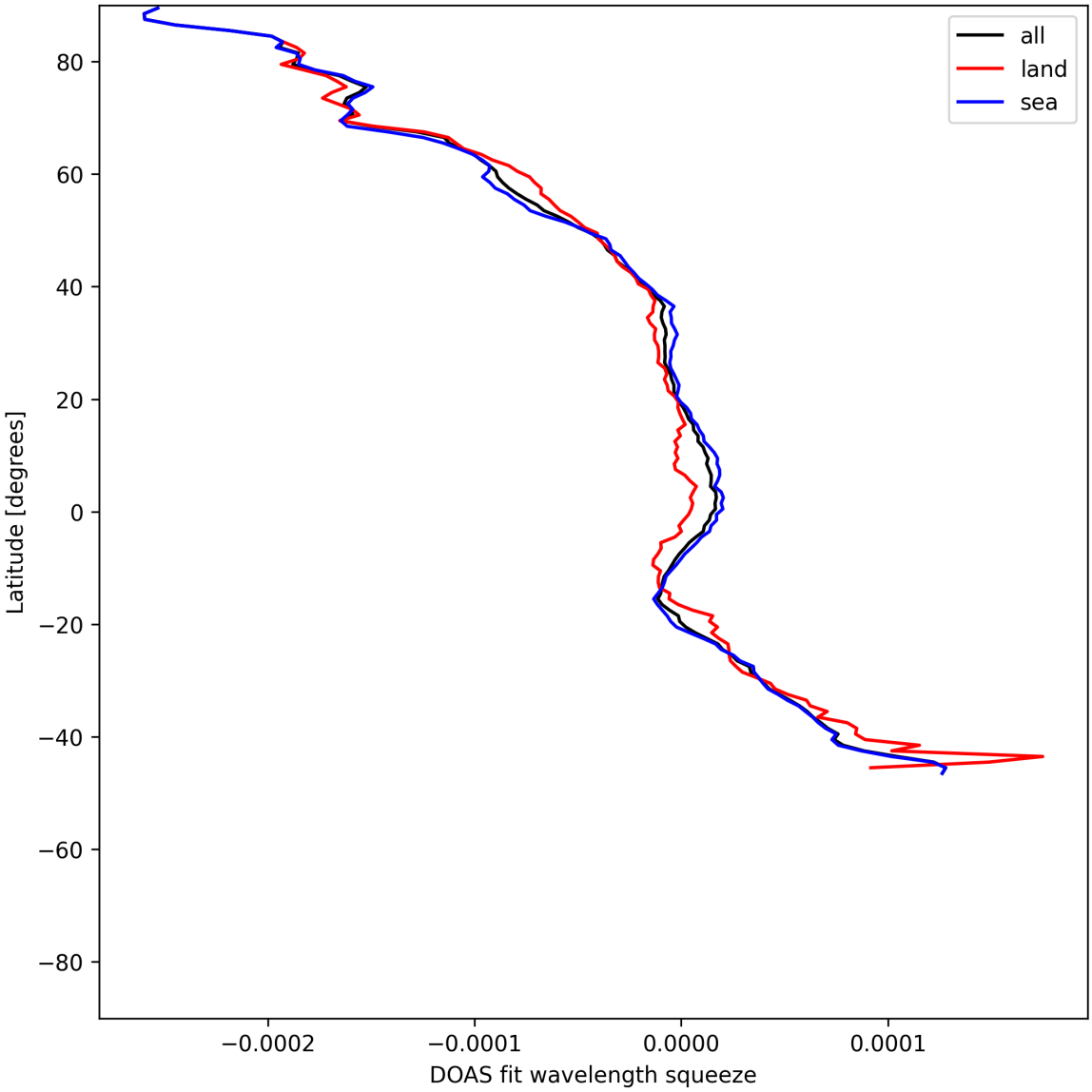

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-06-02 to 2025-06-03.

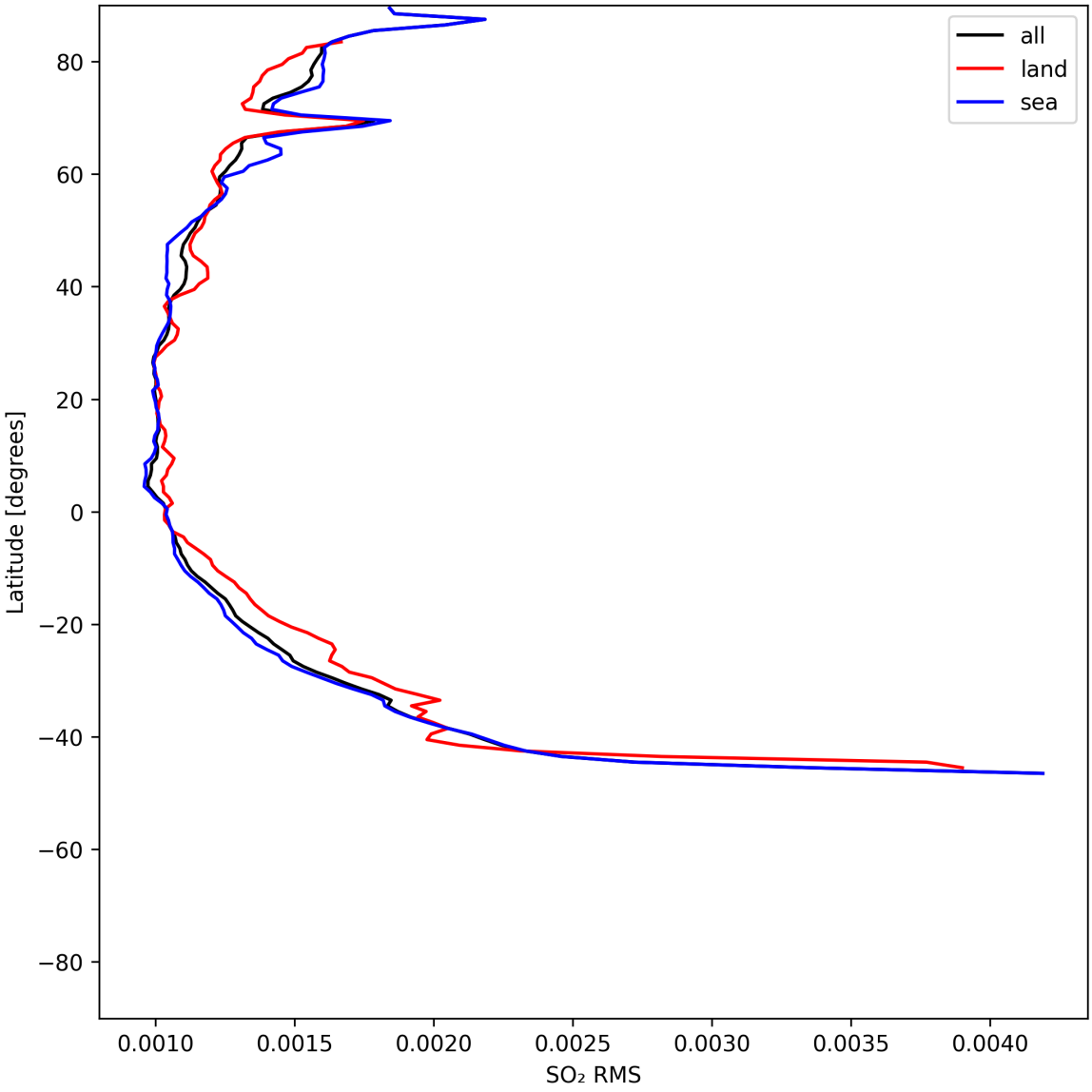

Figure 52: Zonal average of "SO_2 RMS" for 2025-06-02 to 2025-06-03.

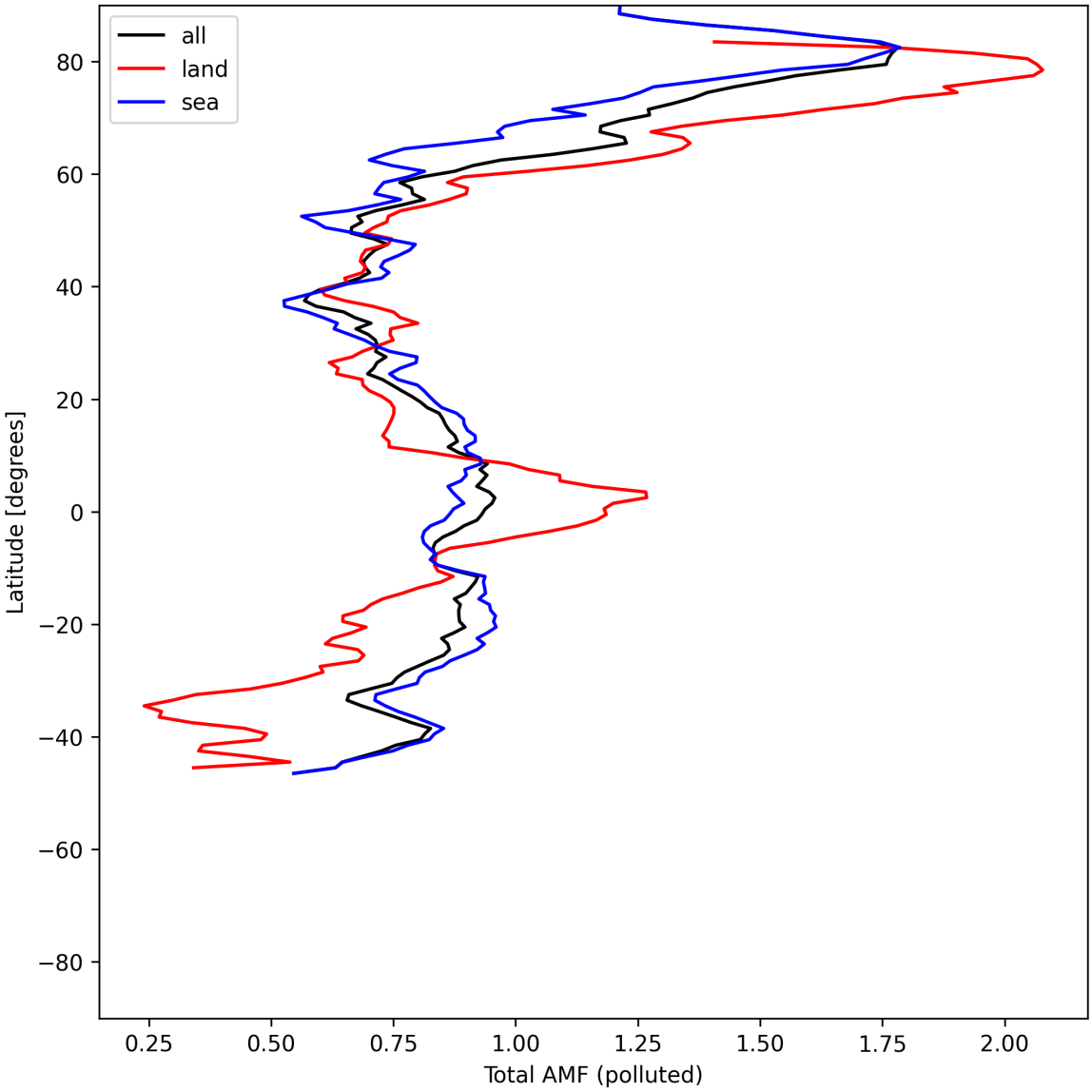

Figure 53: Zonal average of “Total AMF (polluted)” for 2025-06-02 to 2025-06-03.

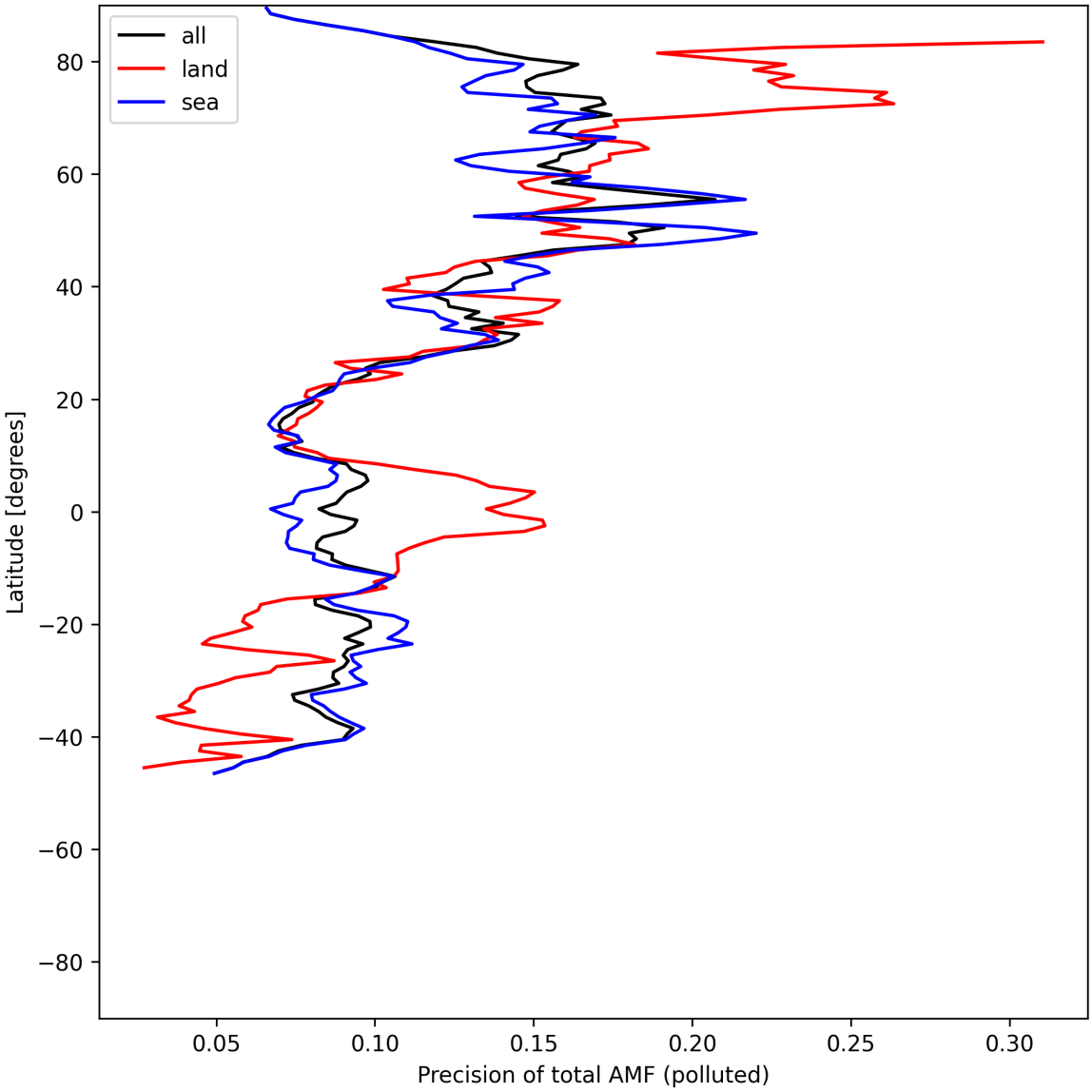

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-06-02 to 2025-06-03.

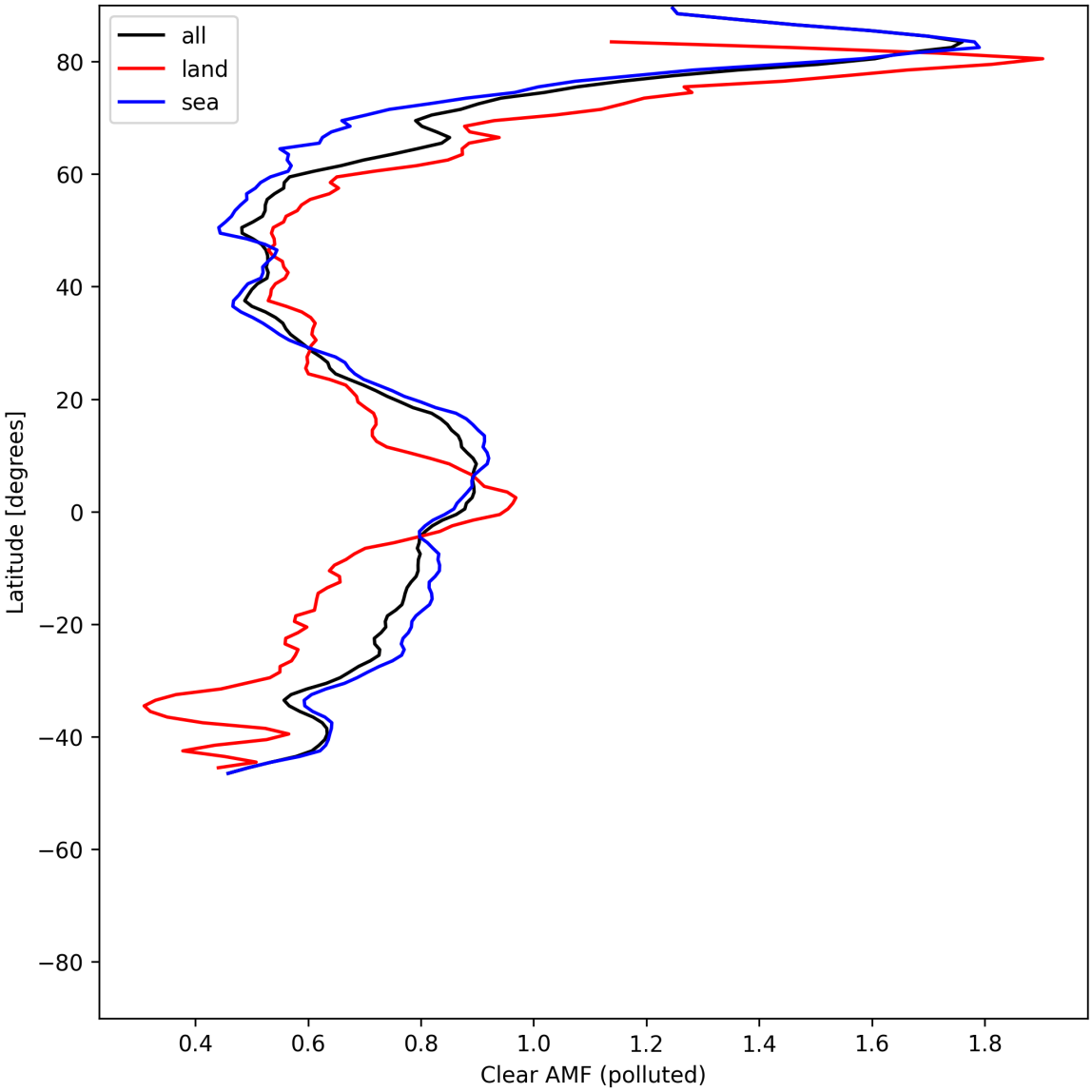

Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-06-02 to 2025-06-03.

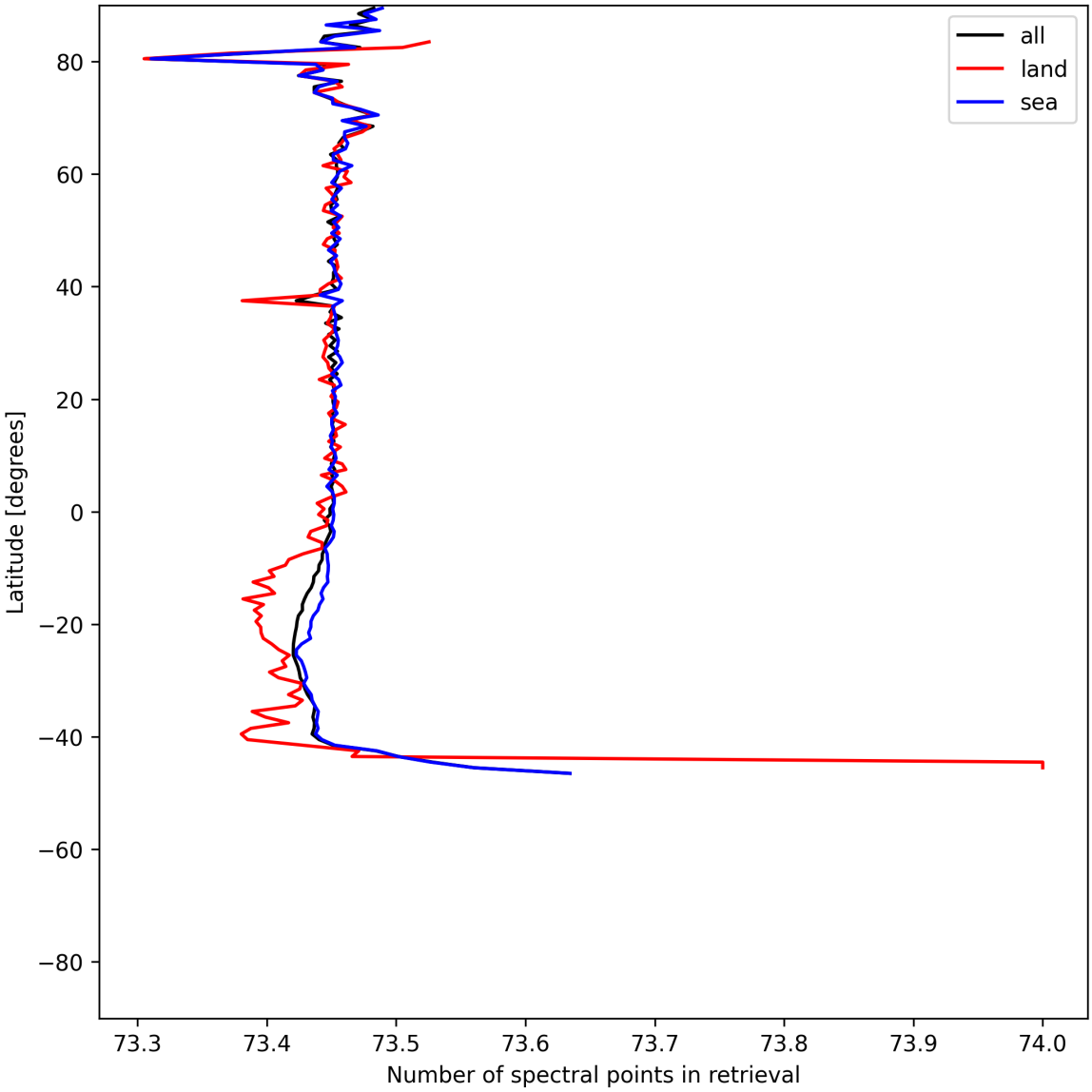

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-06-02 to 2025-06-03.

8 Histograms

The definitions of the parameters given in this section can be found in section 2.

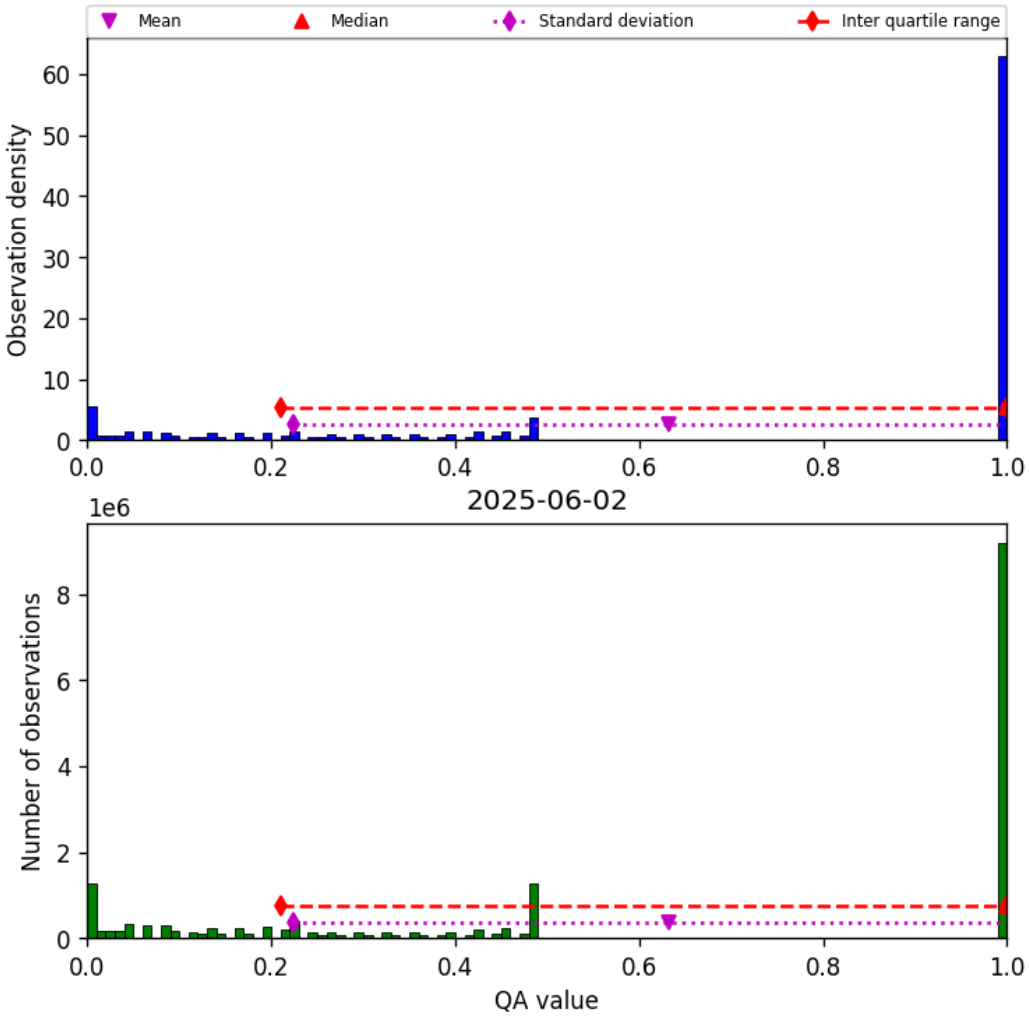

Figure 57: Histogram of “QA value” for 2025-06-02 to 2025-06-03

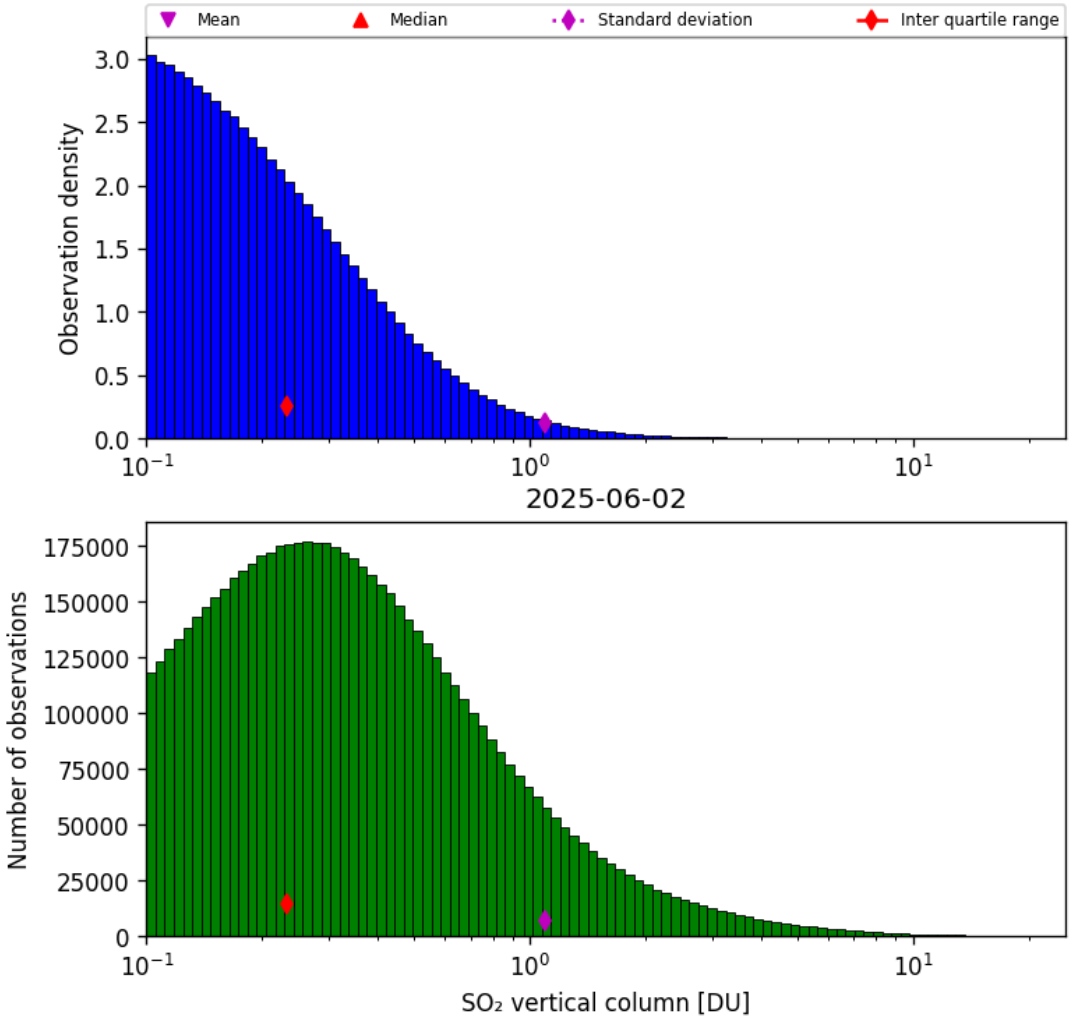

Figure 58: Histogram of "SO_2 vertical column" for 2025-06-02 to 2025-06-03

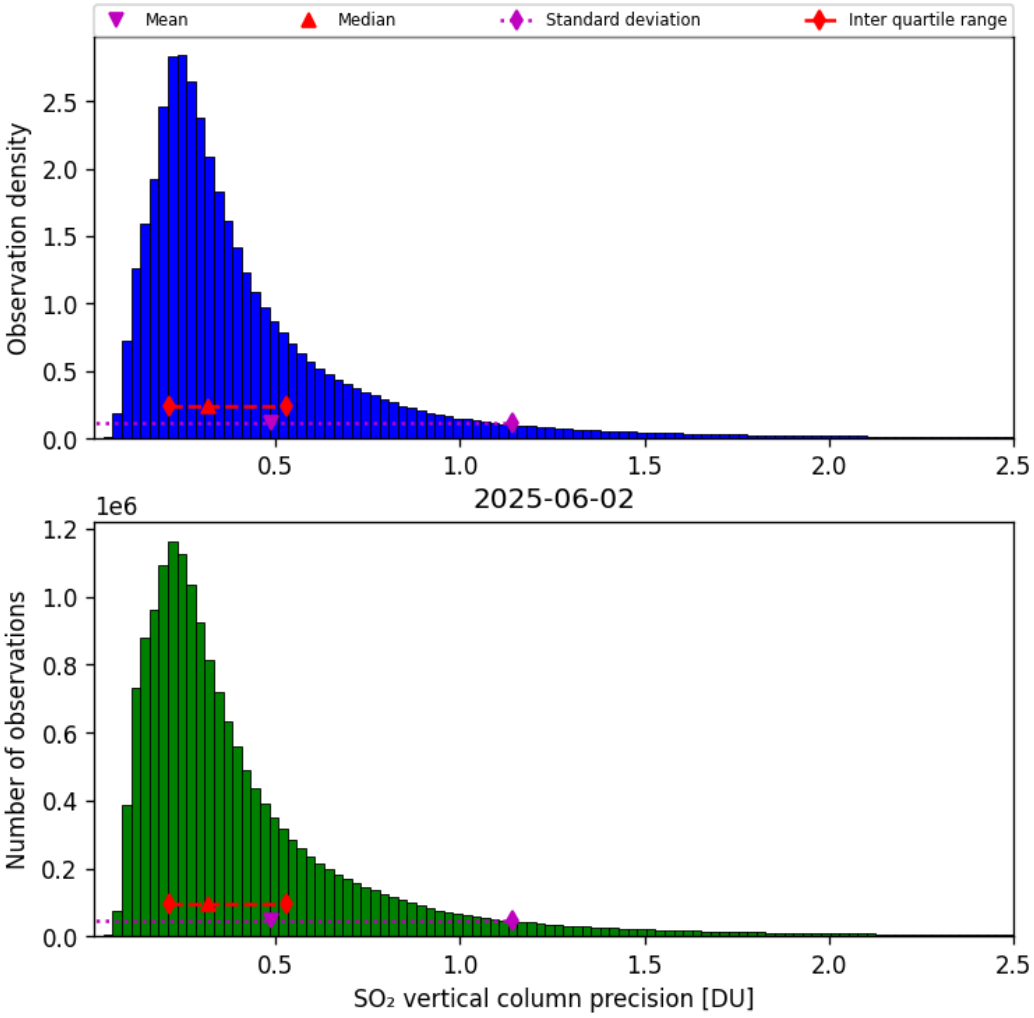

Figure 59: Histogram of "SO_2 vertical column precision" for 2025-06-02 to 2025-06-03

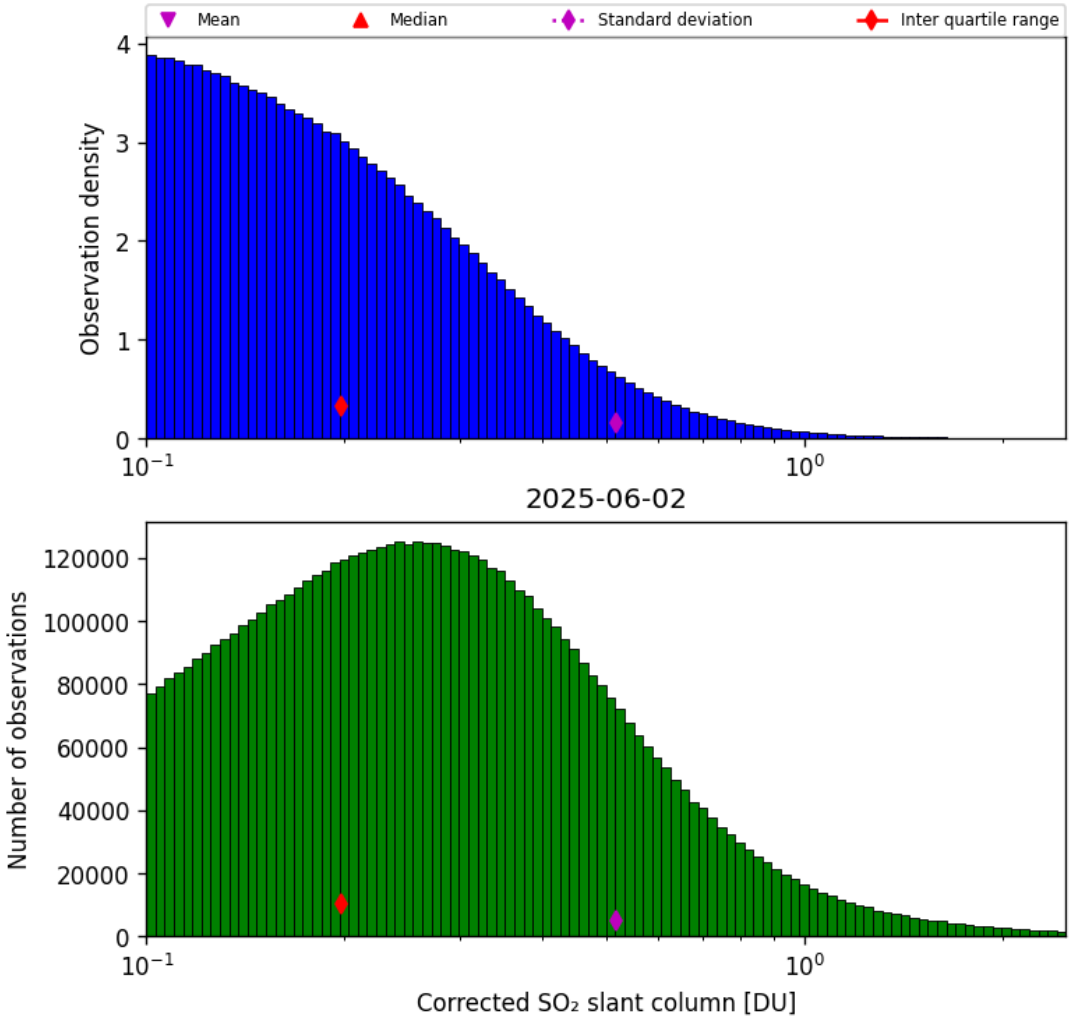

Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-06-02 to 2025-06-03

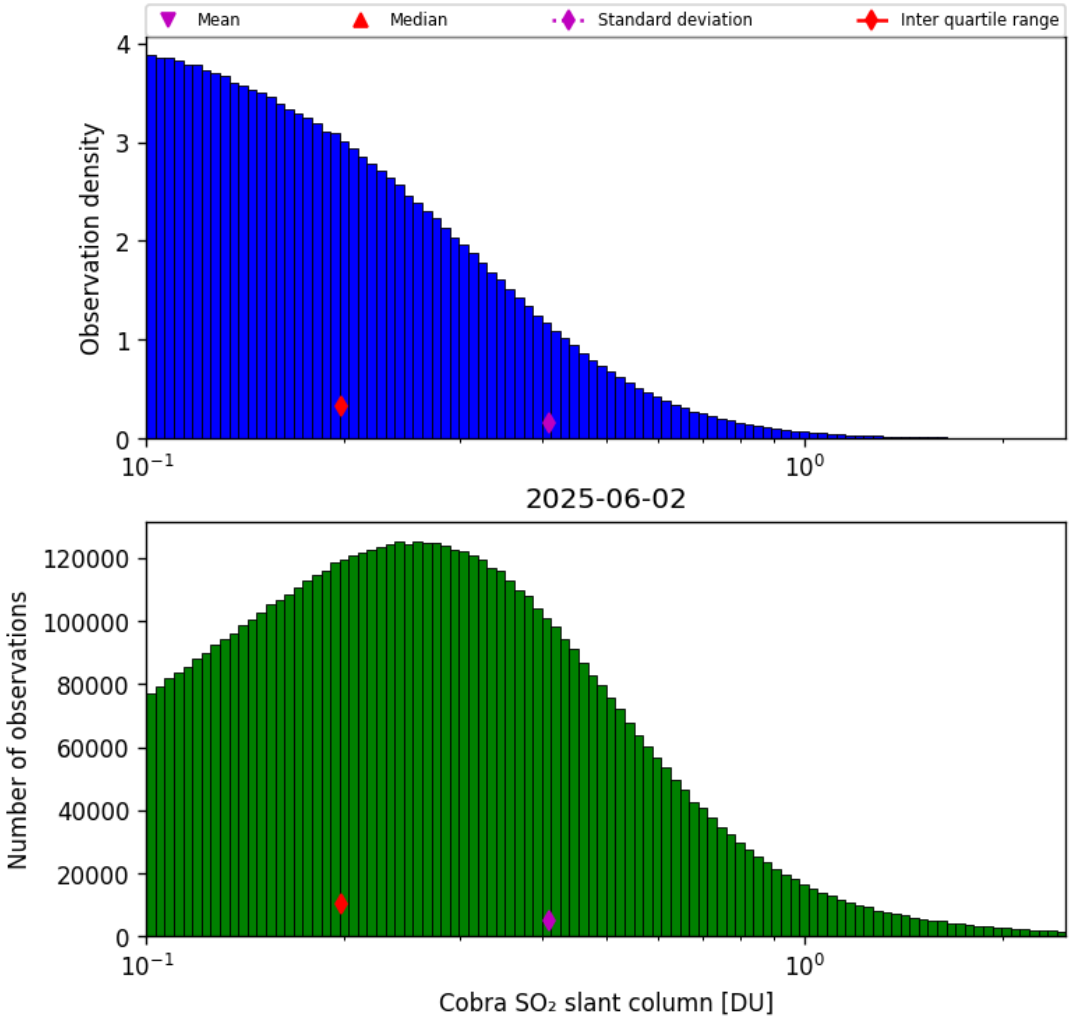

Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-06-02 to 2025-06-03

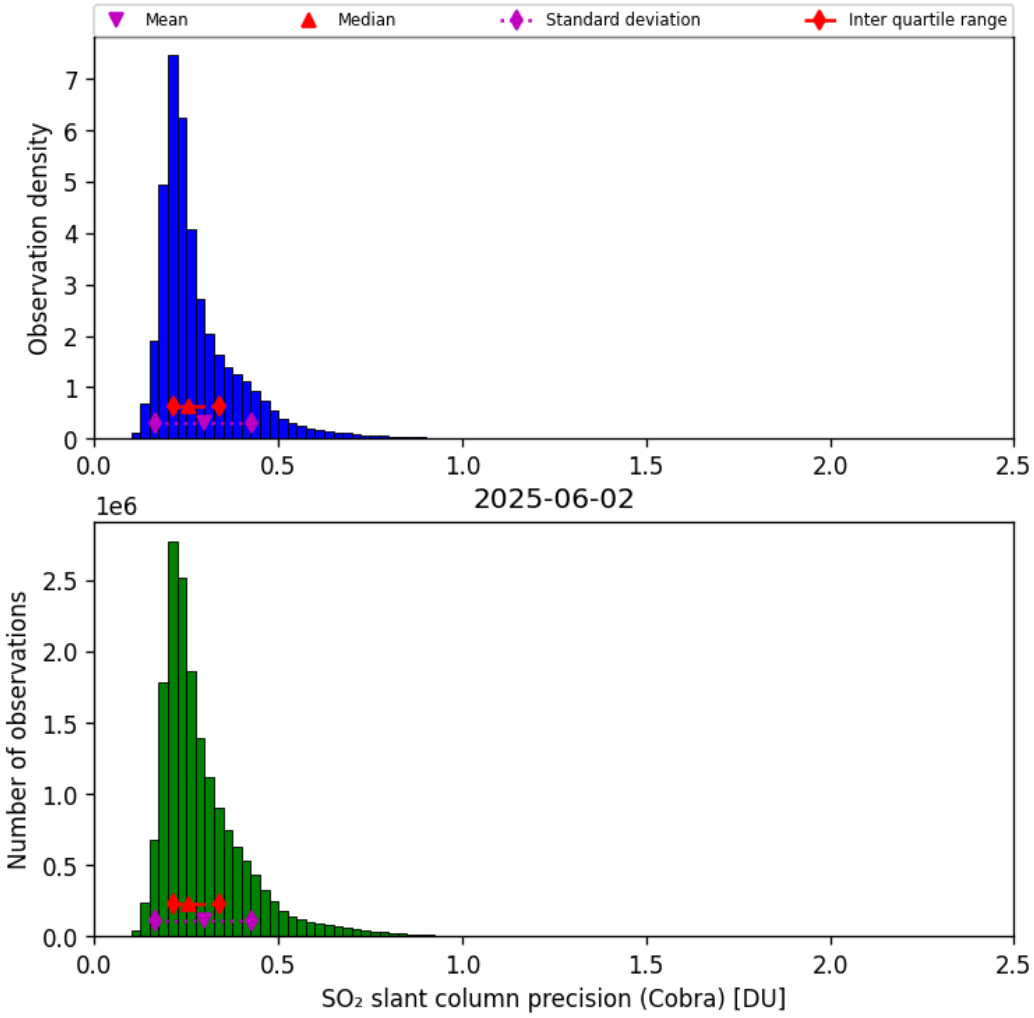

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-06-02 to 2025-06-03

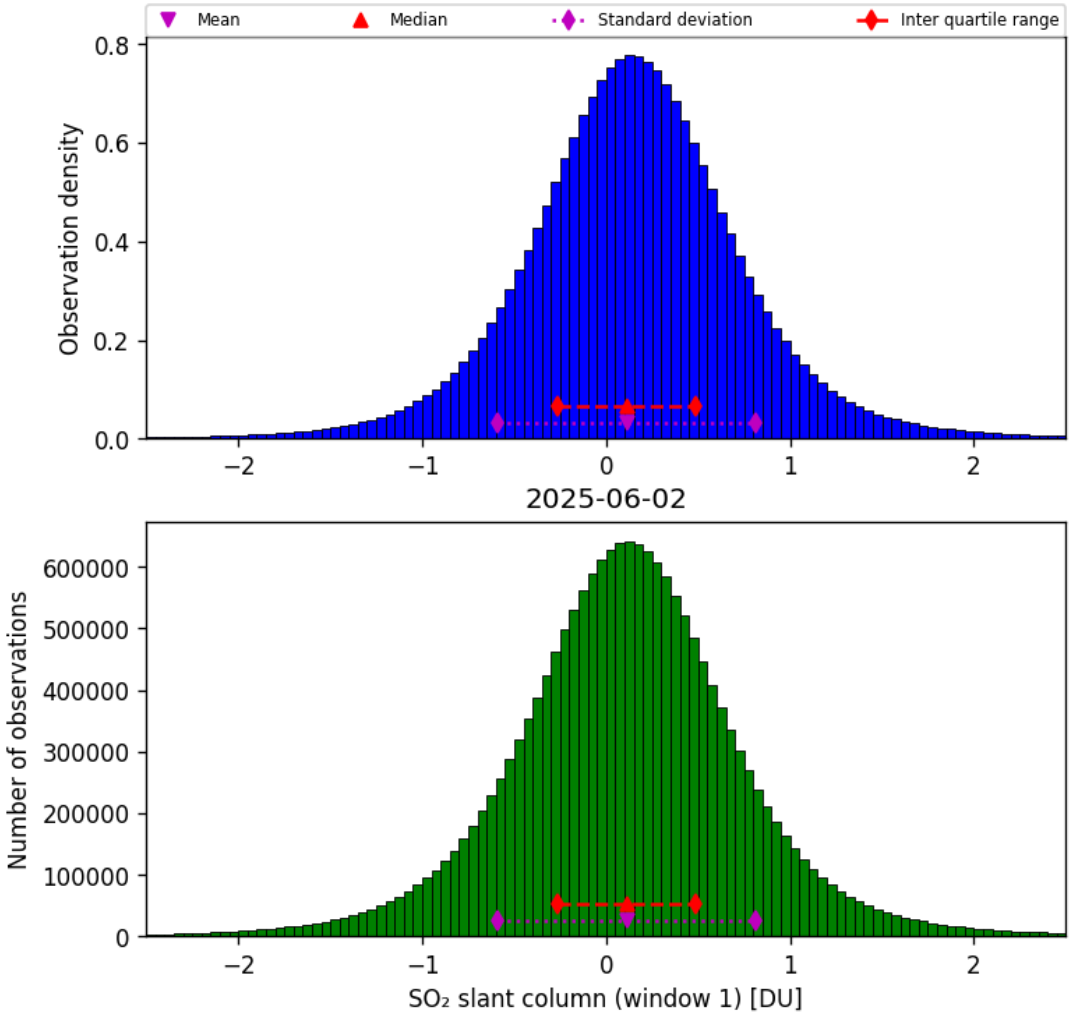

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-06-02 to 2025-06-03

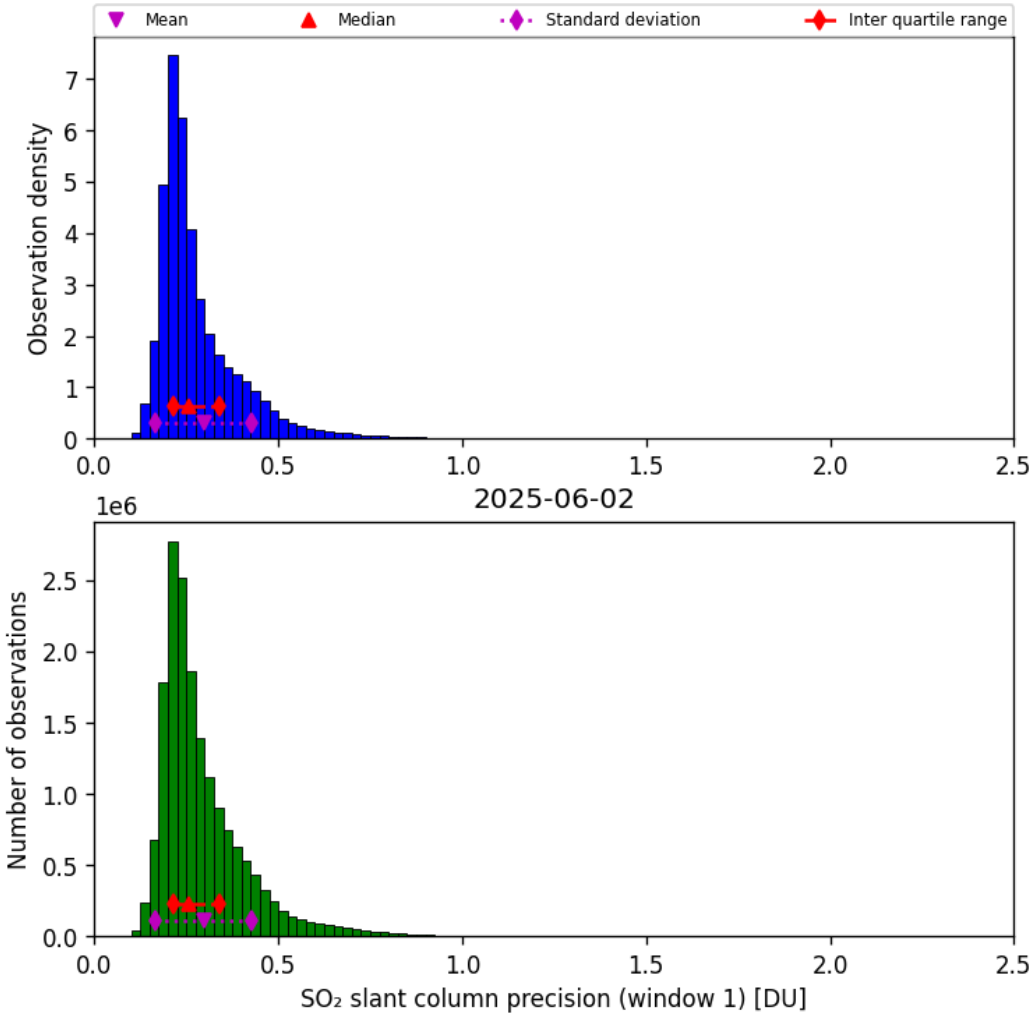

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-06-02 to 2025-06-03

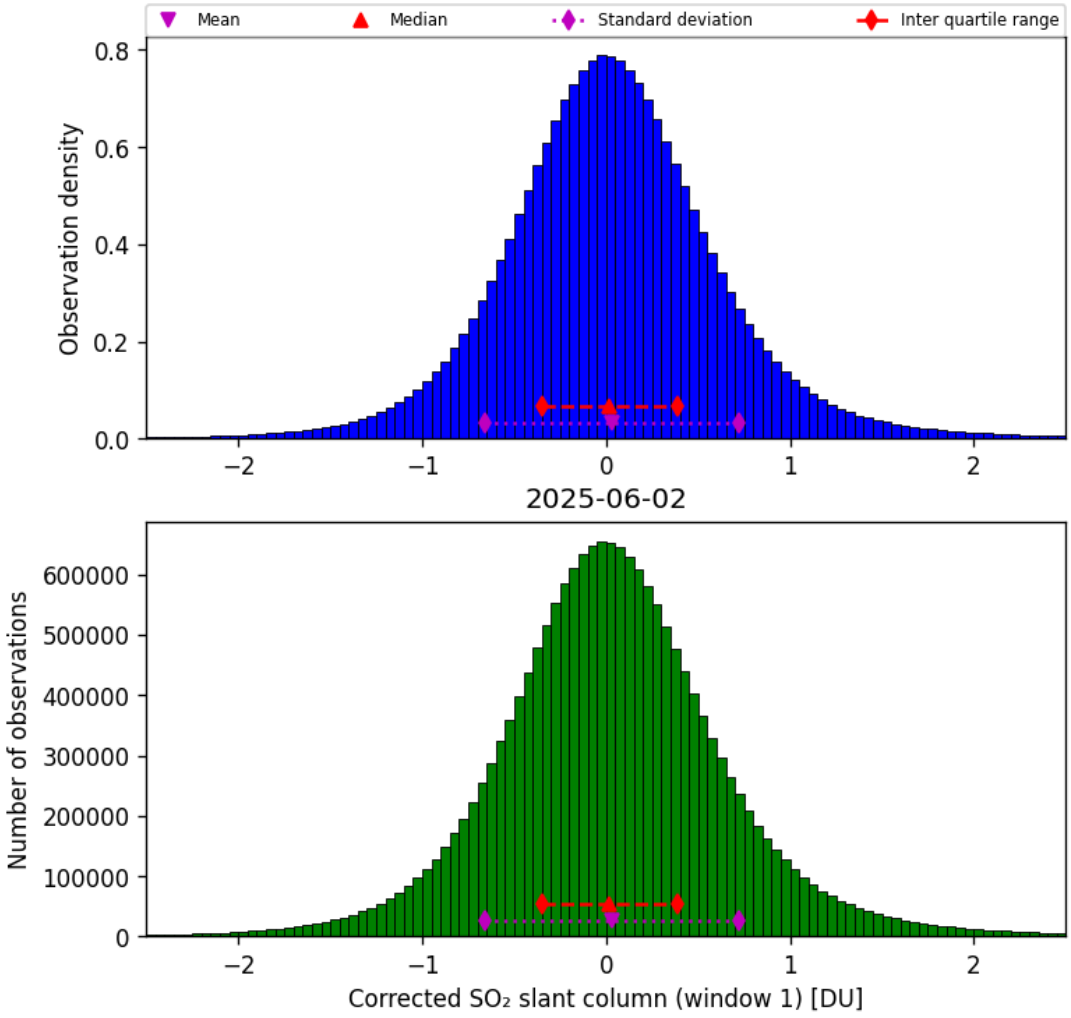

Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-06-02 to 2025-06-03

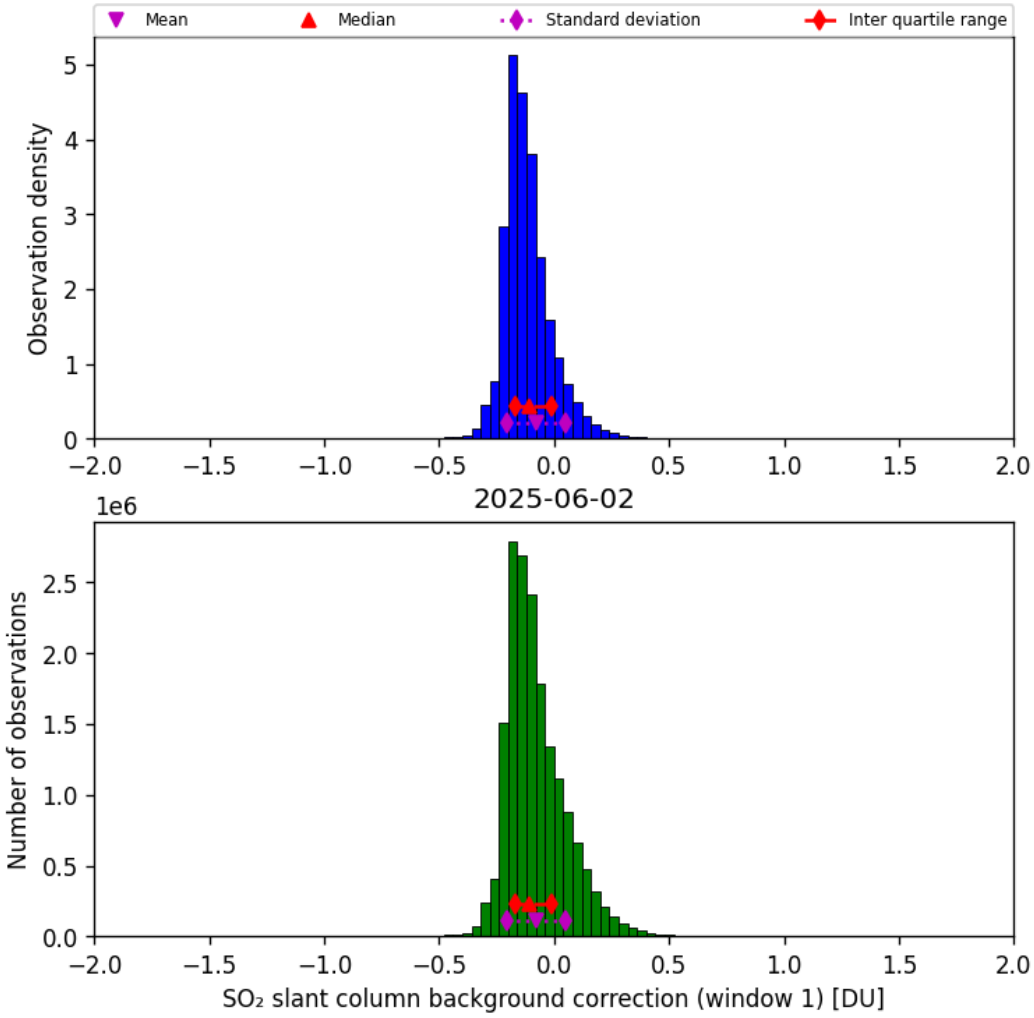

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-06-02 to 2025-06-03

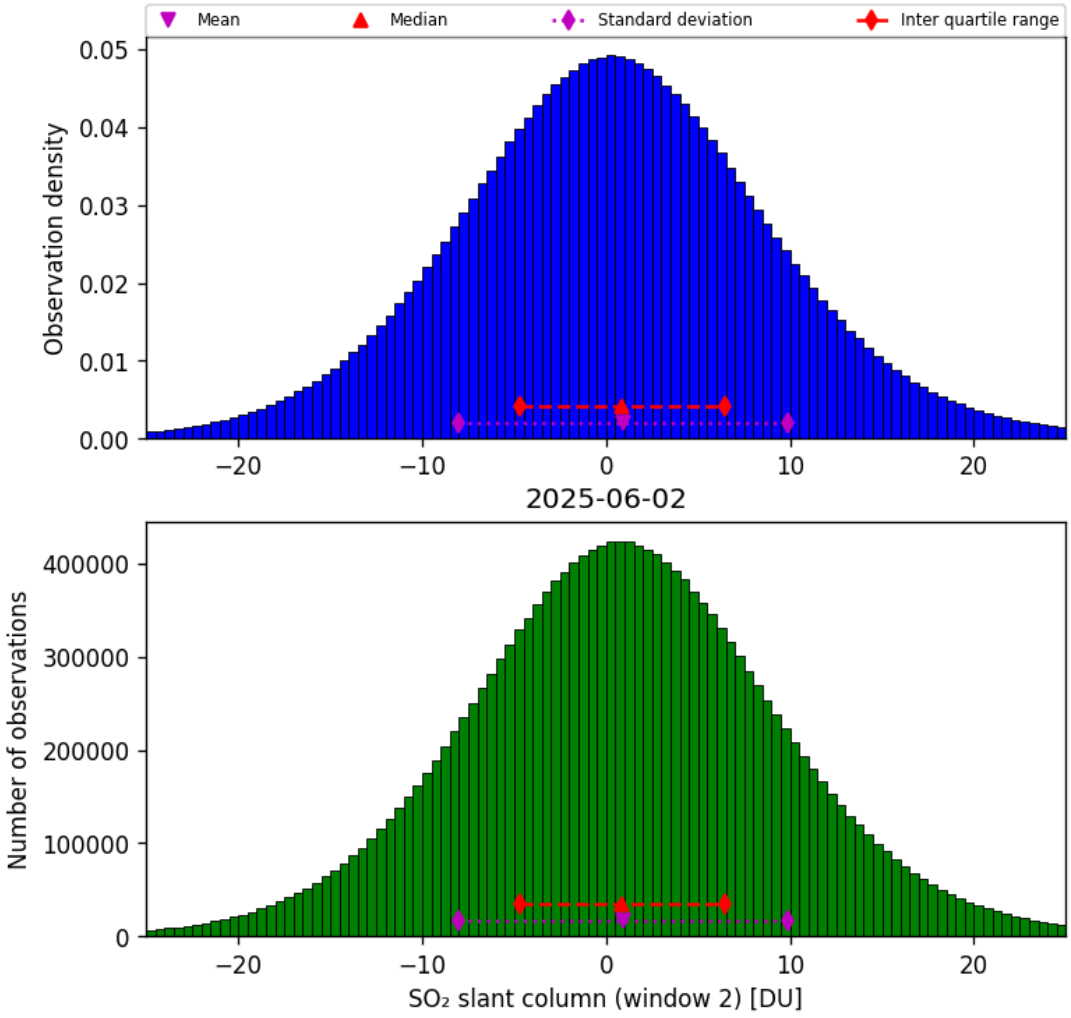

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-06-02 to 2025-06-03

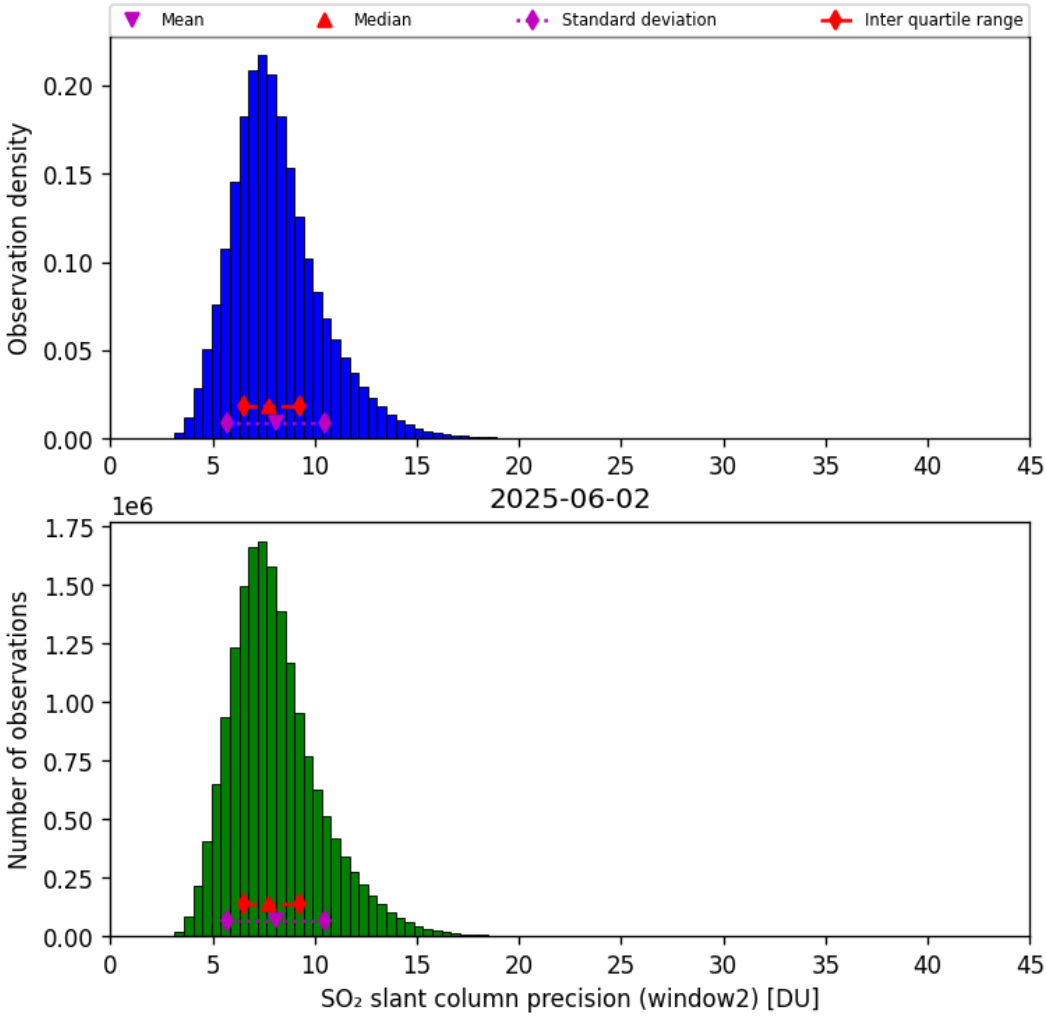

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-06-02 to 2025-06-03

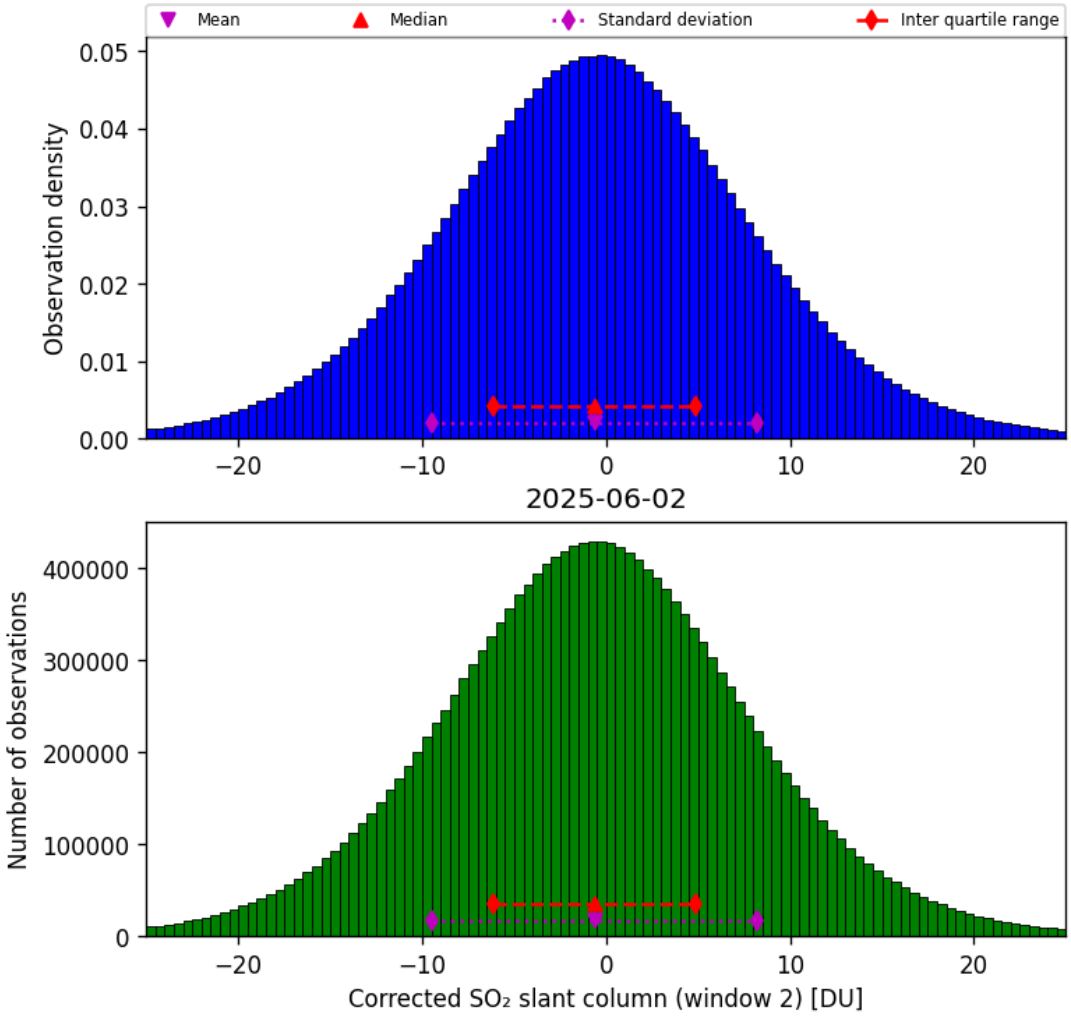

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-06-02 to 2025-06-03

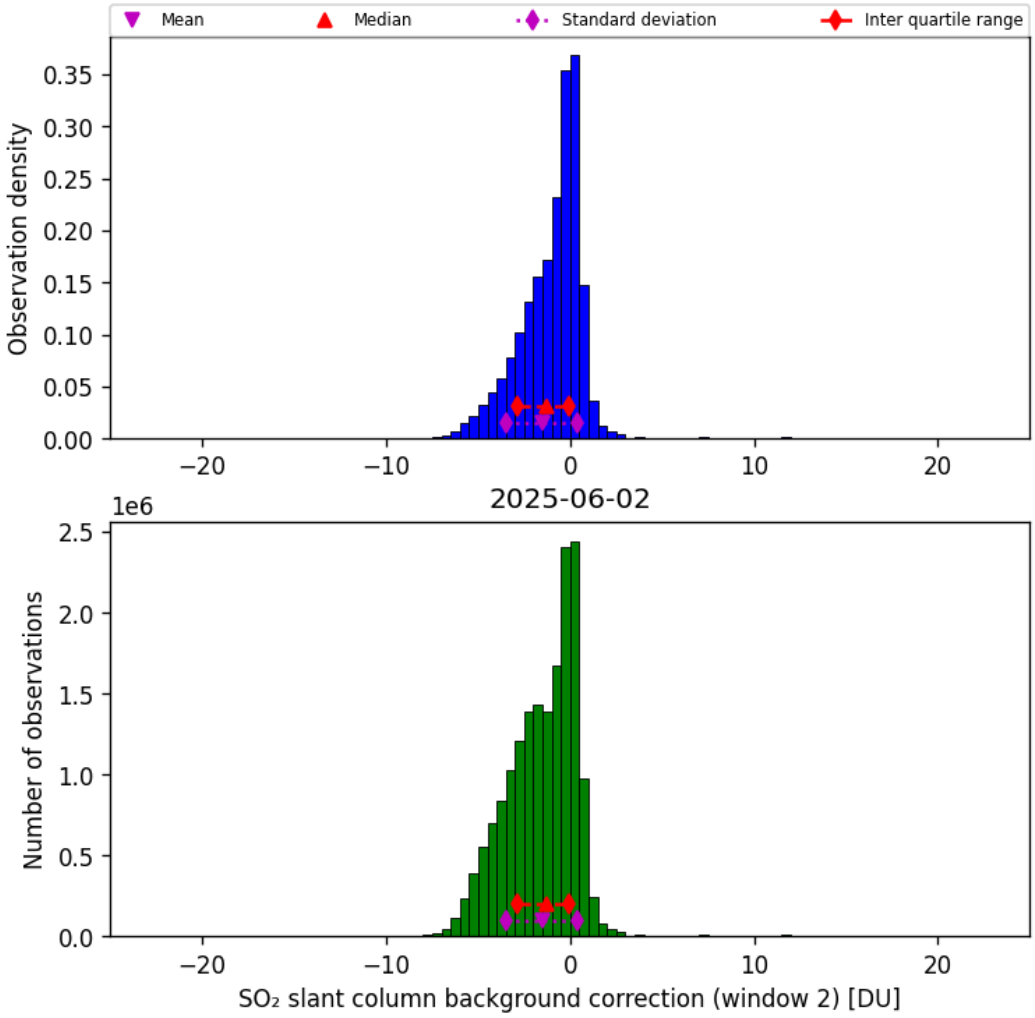

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-06-02 to 2025-06-03

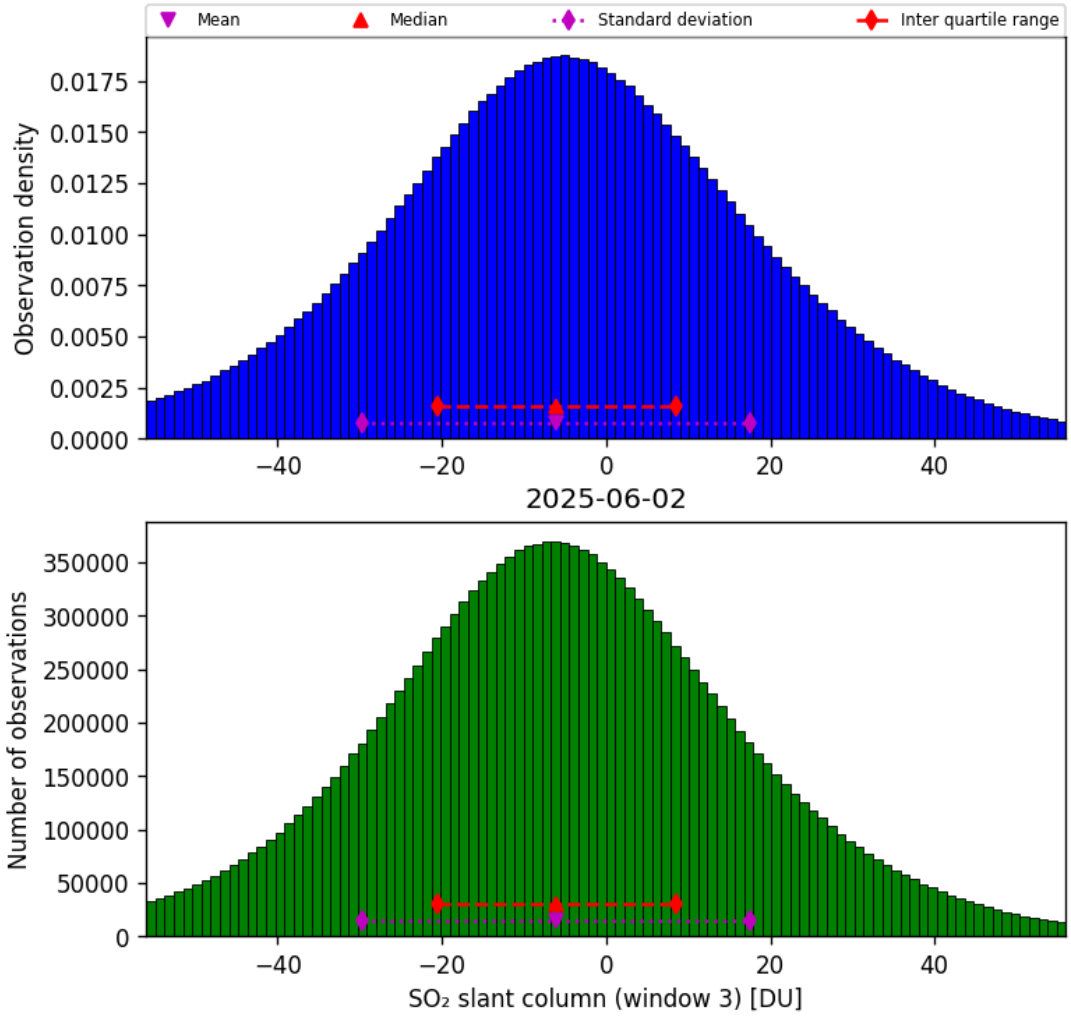

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-06-02 to 2025-06-03

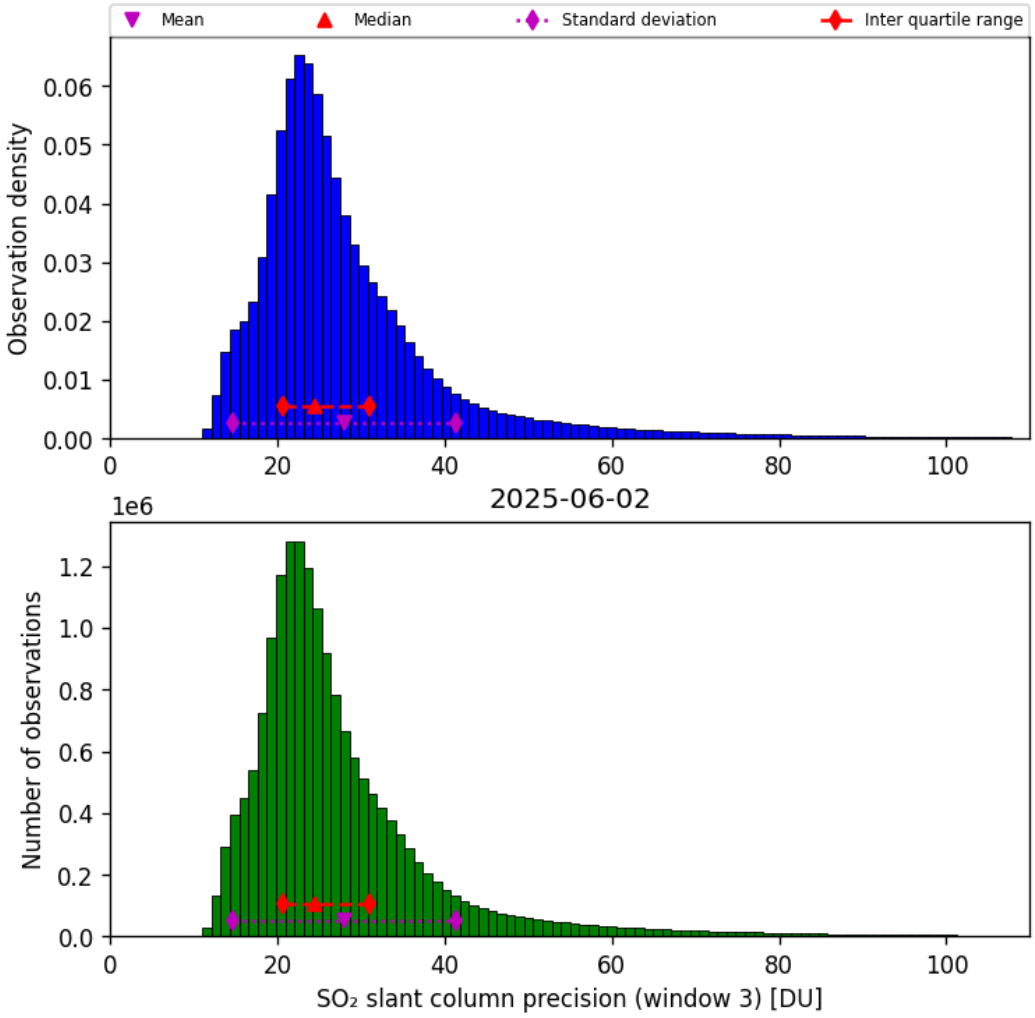

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-06-02 to 2025-06-03

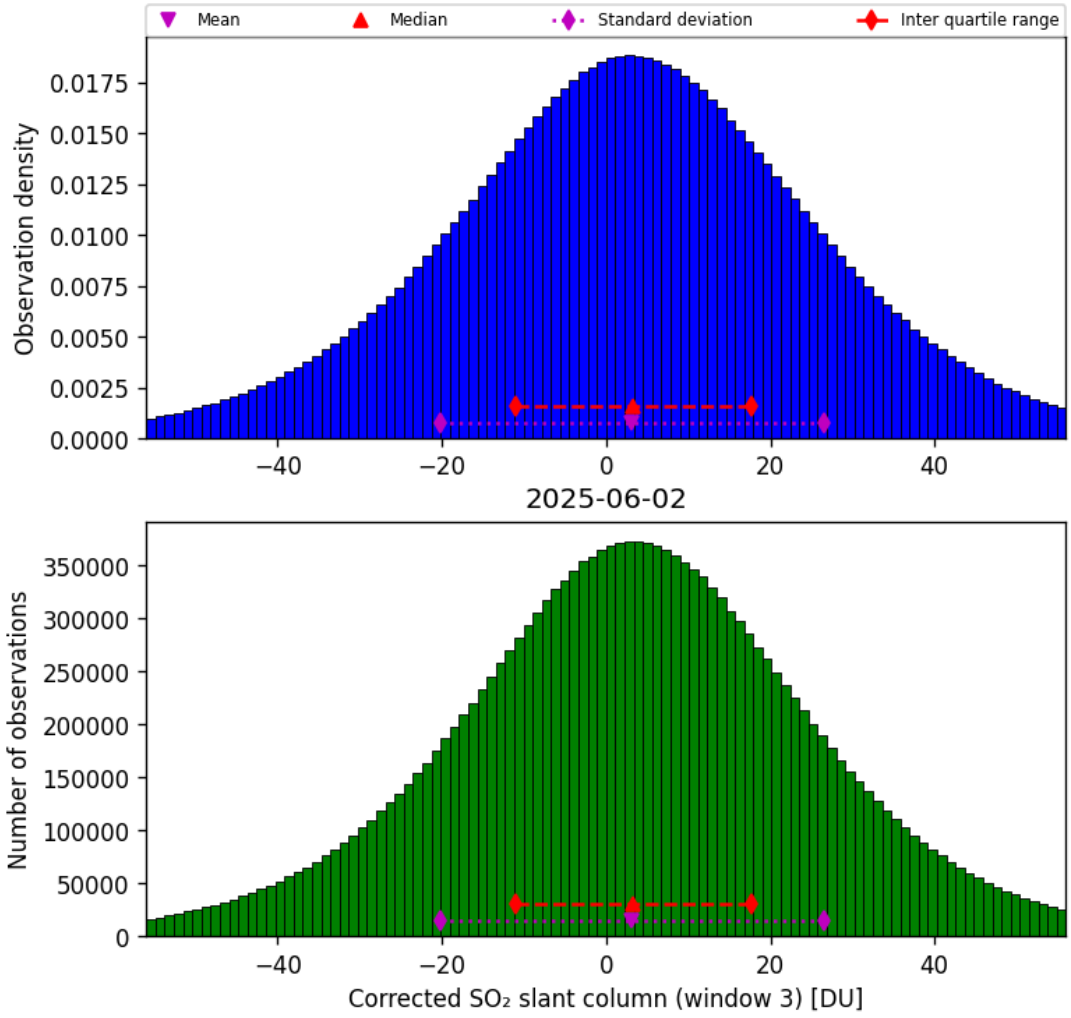

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-06-02 to 2025-06-03

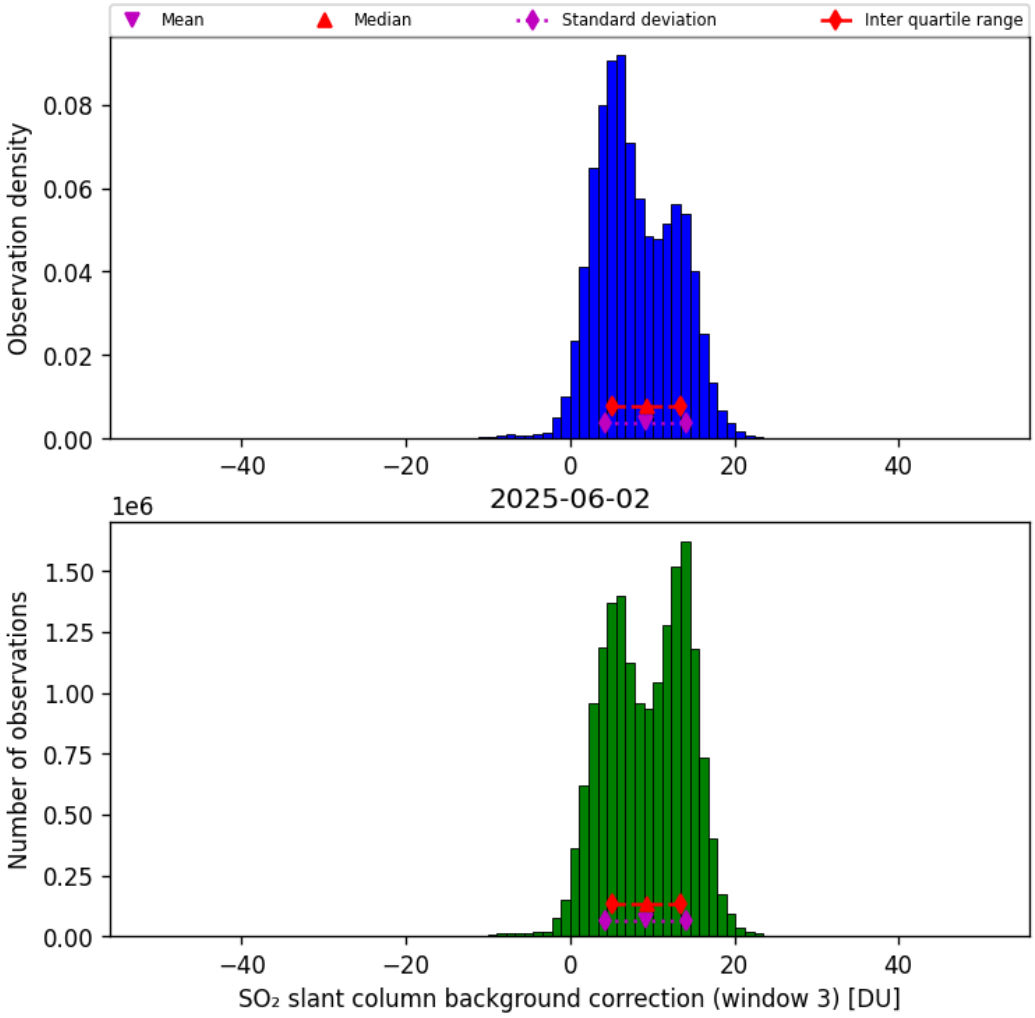

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-06-02 to 2025-06-03

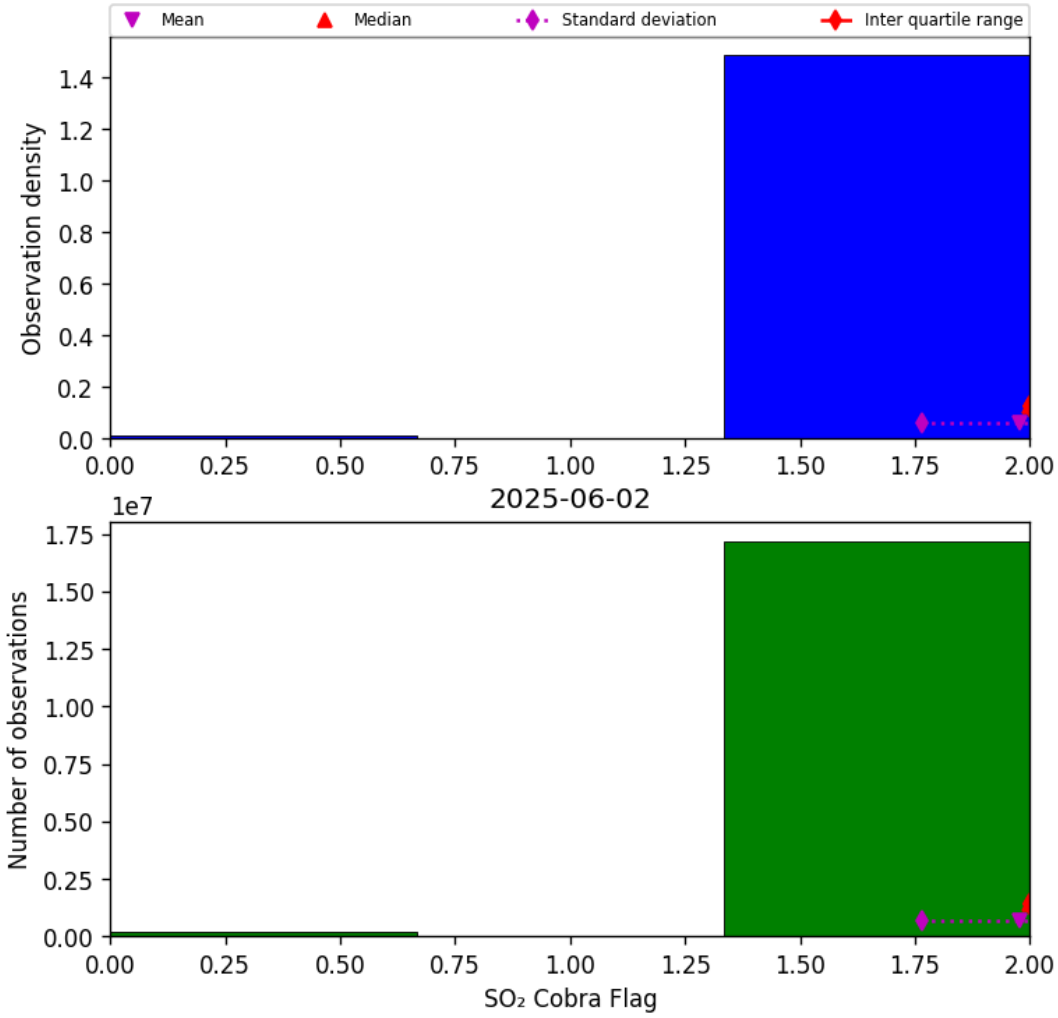

Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-06-02 to 2025-06-03

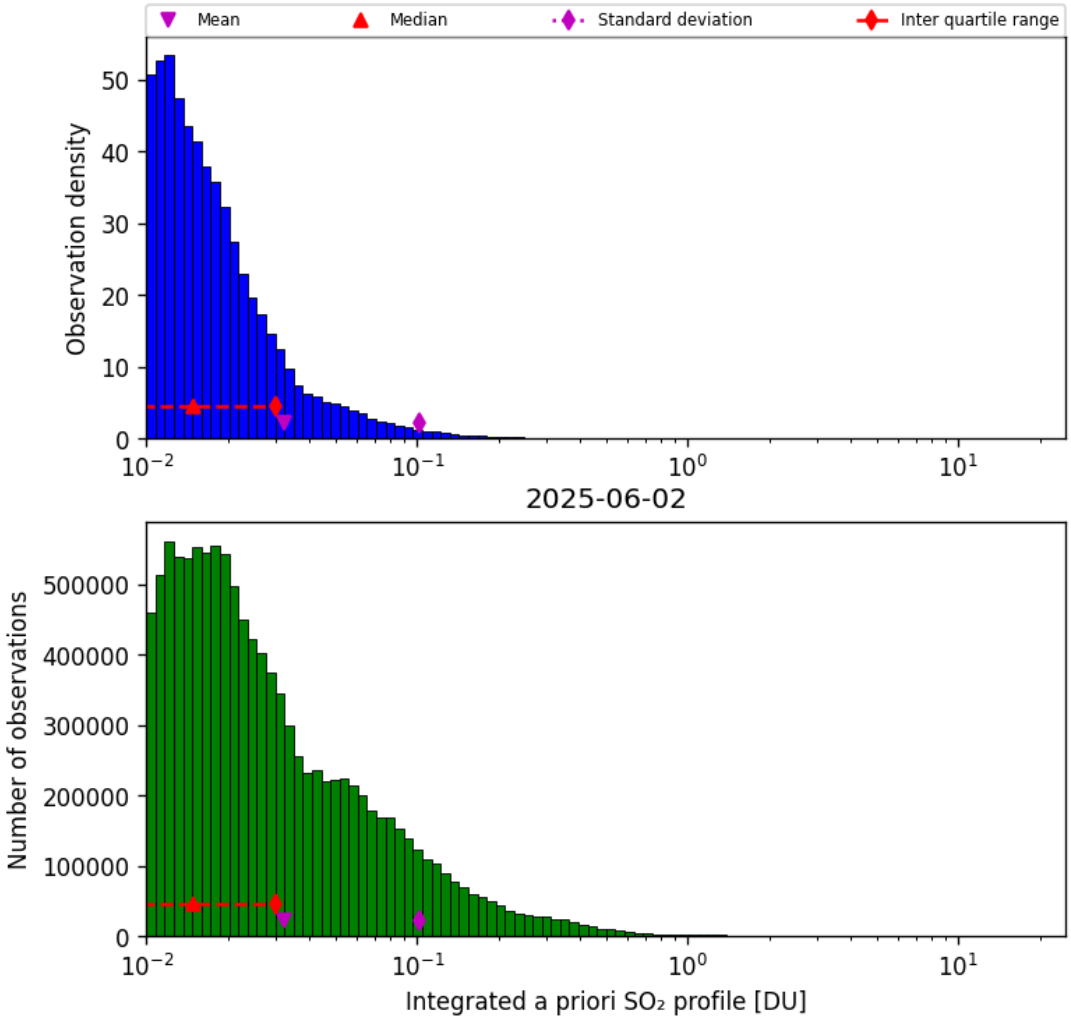

Figure 76: Histogram of "Integrated a priori SO_2 profile" for 2025-06-02 to 2025-06-03

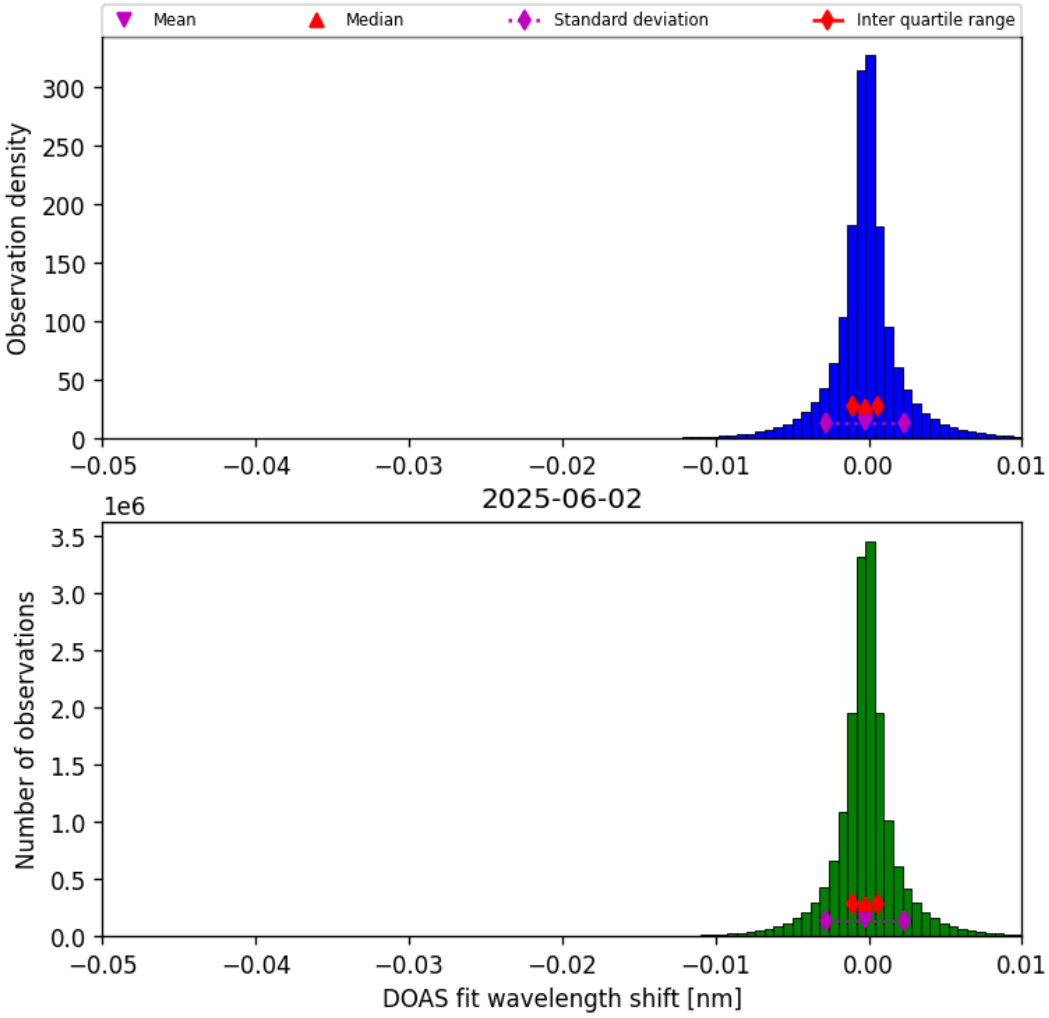

Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-06-02 to 2025-06-03

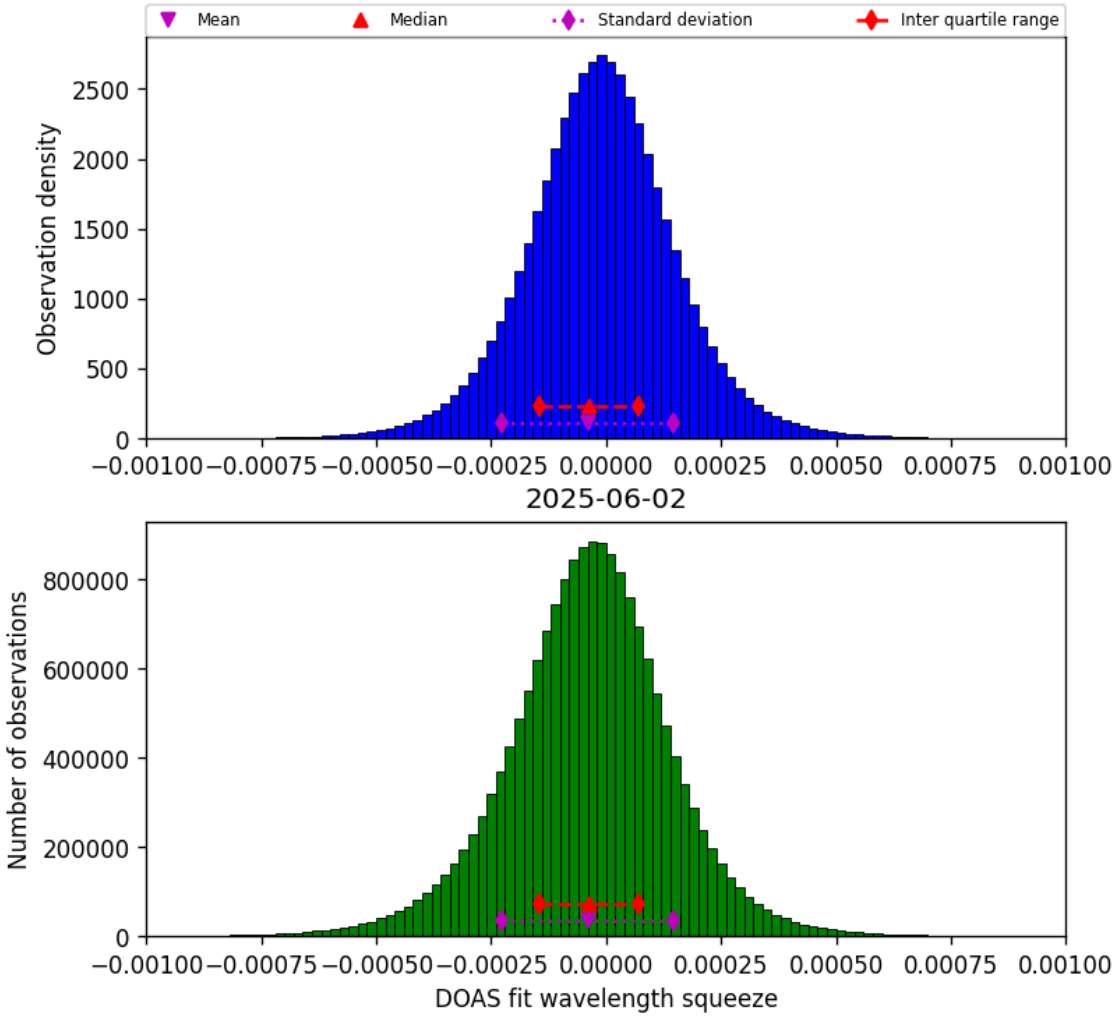

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-06-02 to 2025-06-03

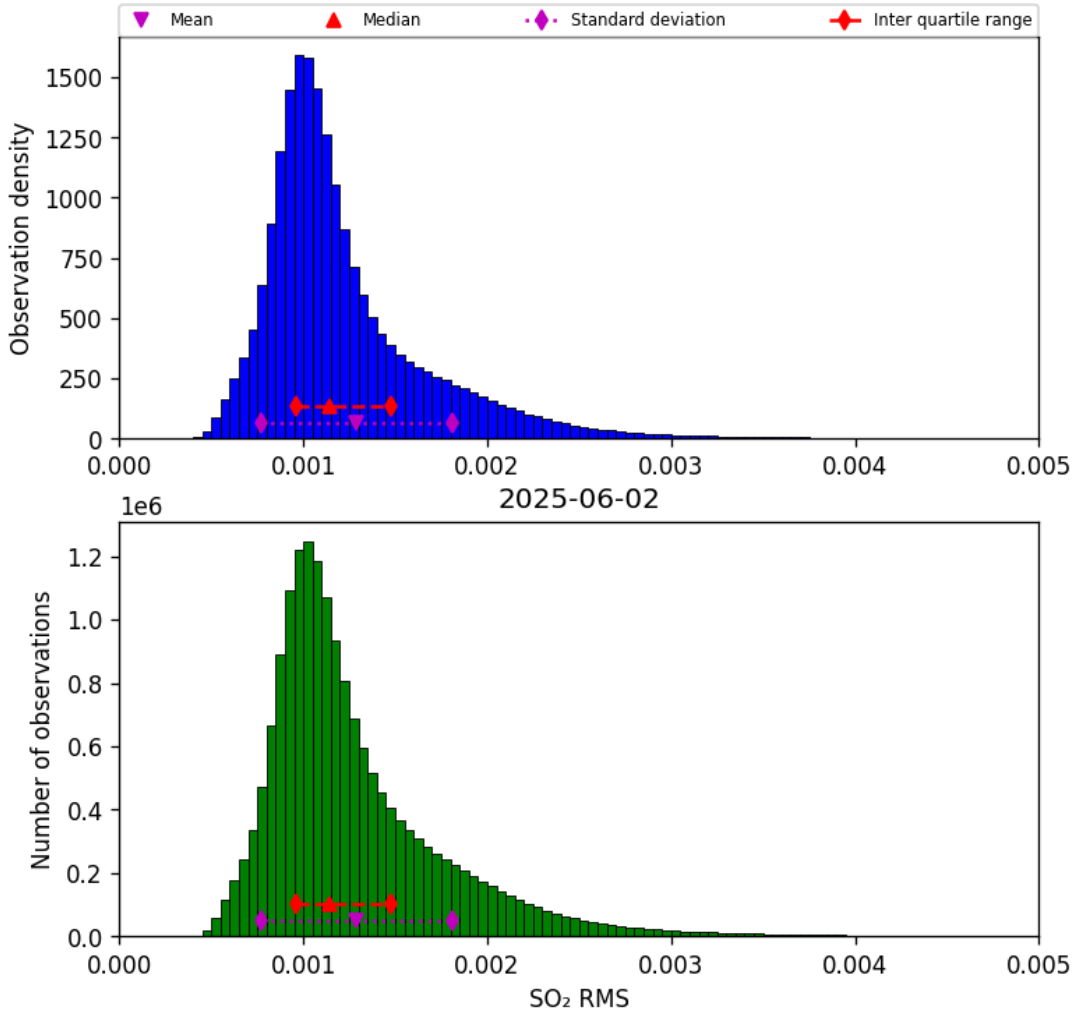

Figure 79: Histogram of "SO_2 RMS" for 2025-06-02 to 2025-06-03

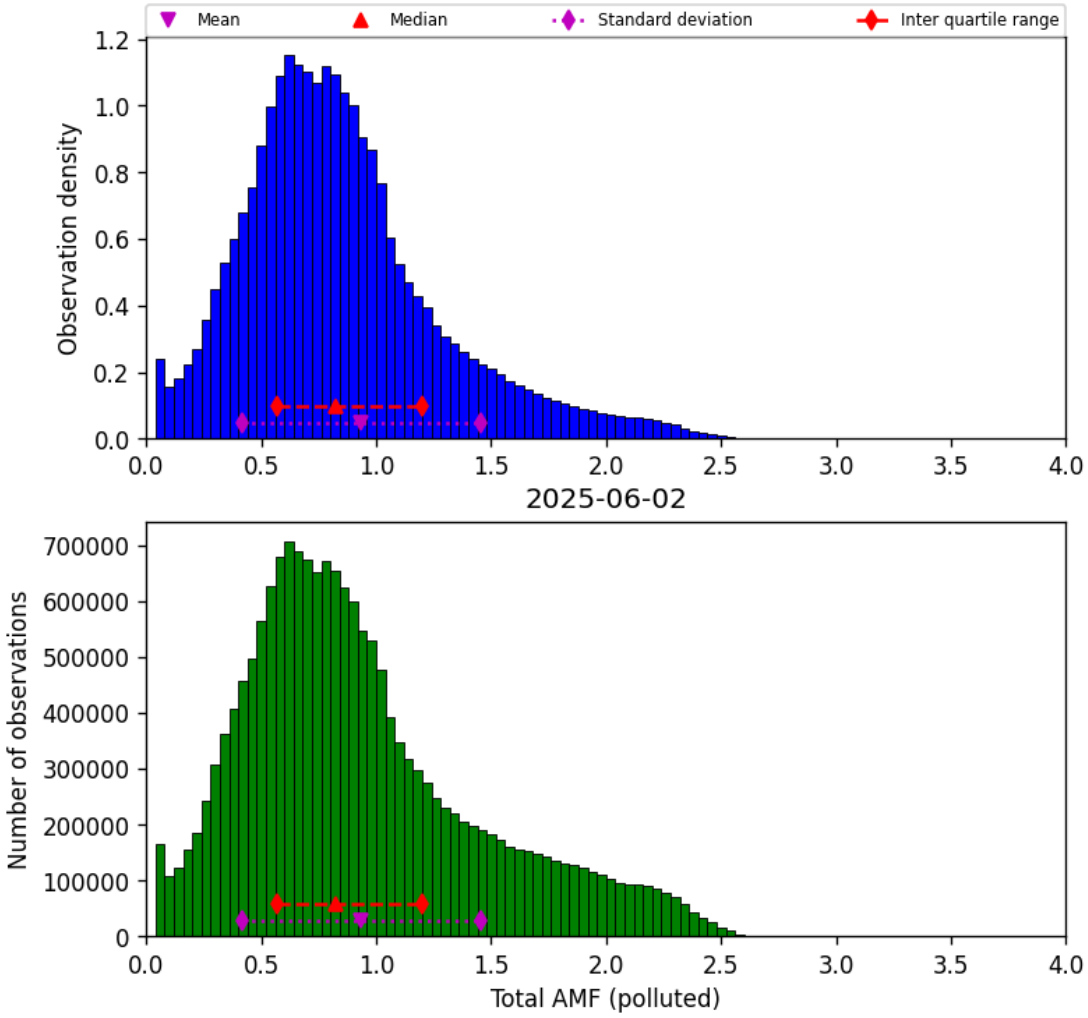

Figure 80: Histogram of “Total AMF (polluted)” for 2025-06-02 to 2025-06-03

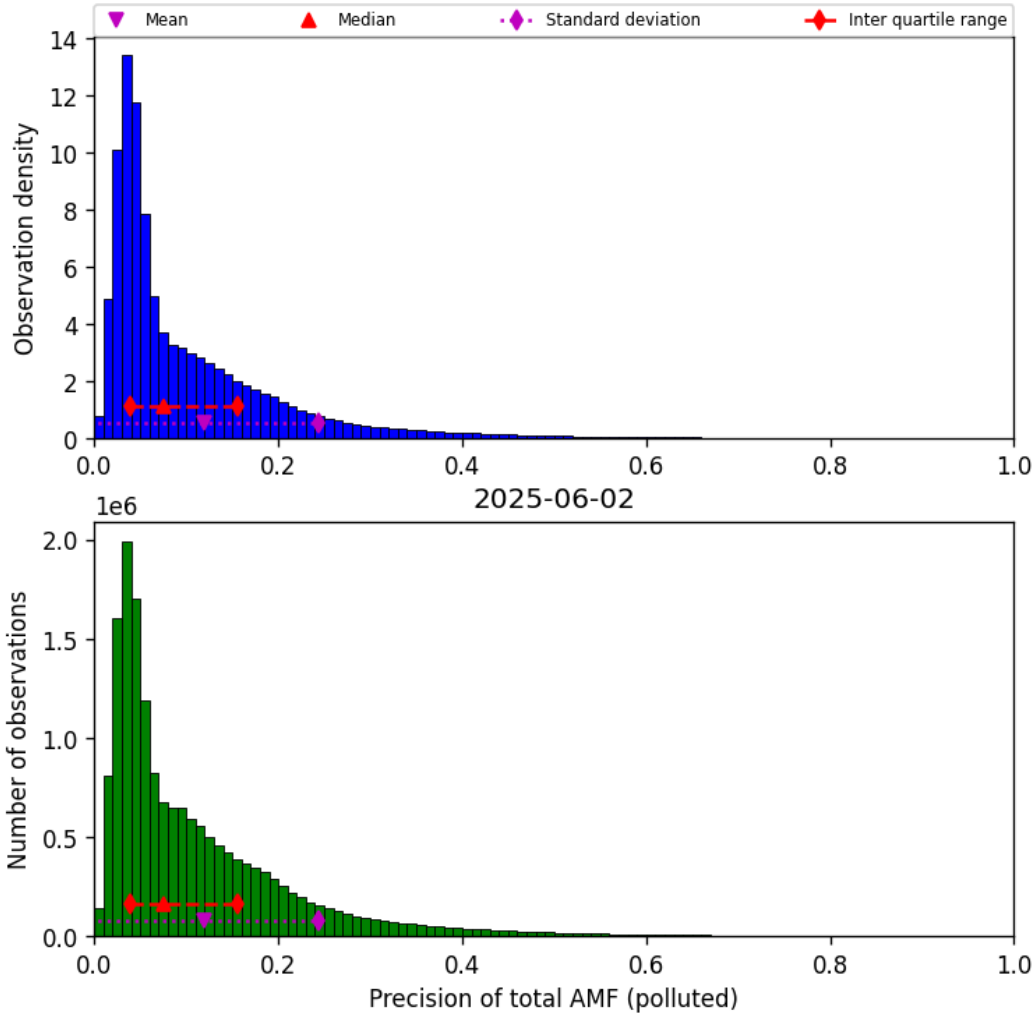

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-06-02 to 2025-06-03

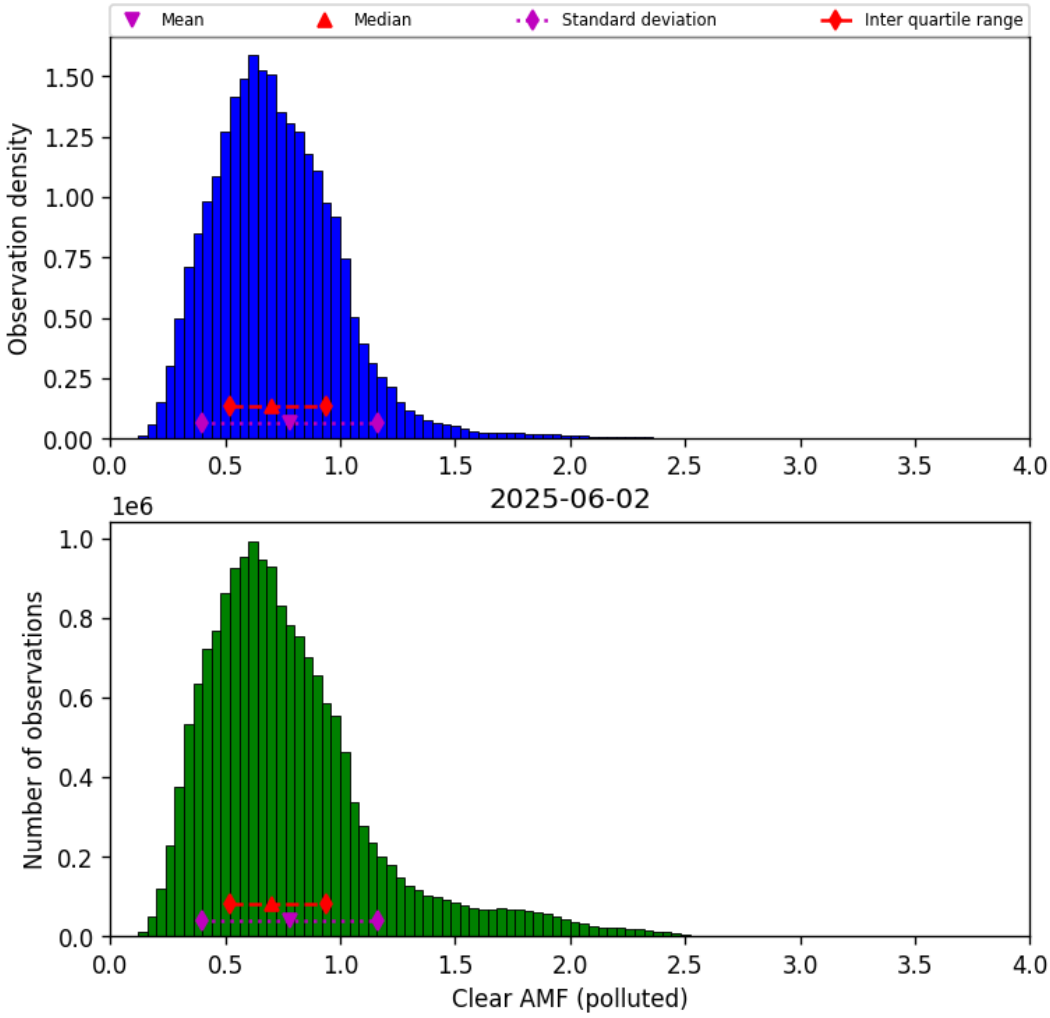

Figure 82: Histogram of “Clear AMF (polluted)” for 2025-06-02 to 2025-06-03

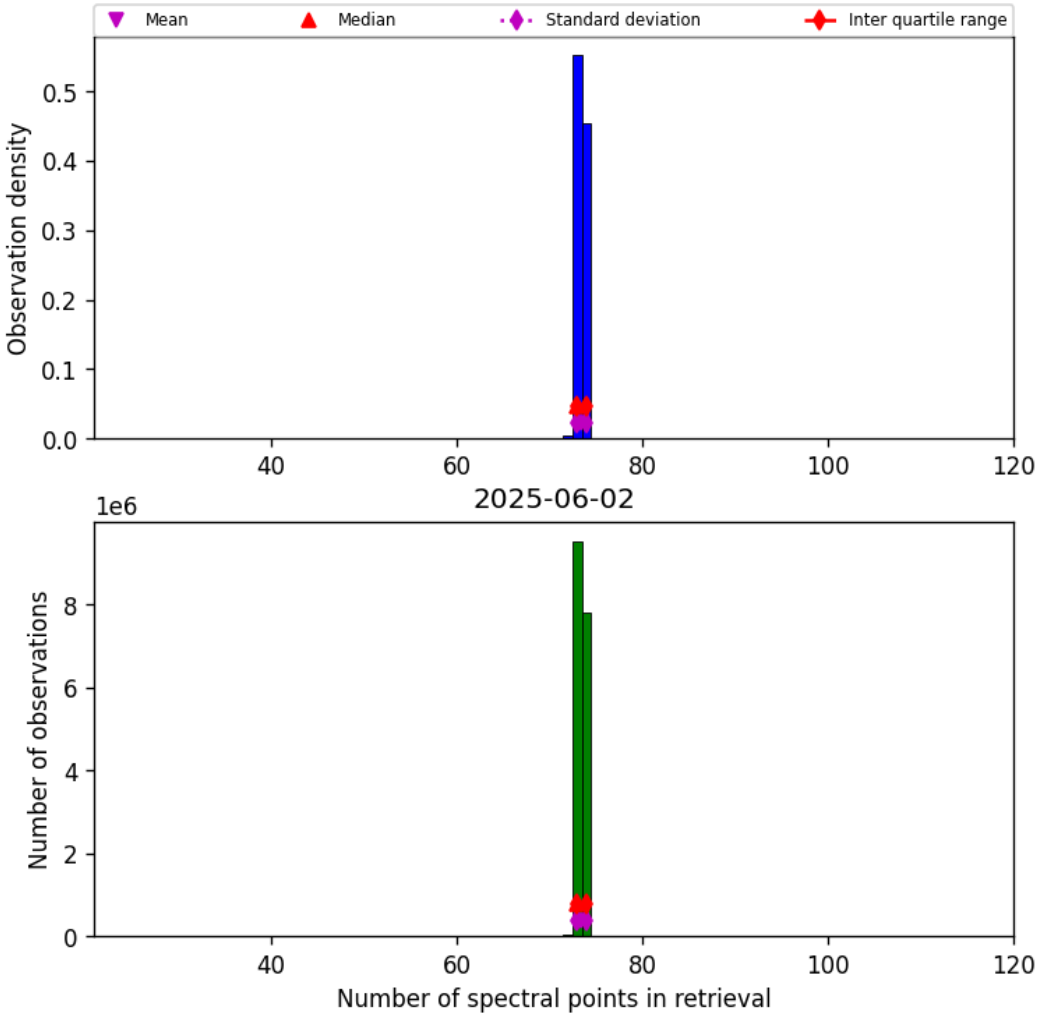

Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-06-02 to 2025-06-03

9 Along track statistics

The TROPOMI instrument uses different binned detector rows for different viewing directions. In this section statistics are presented for each of the binned rows in the instrument.

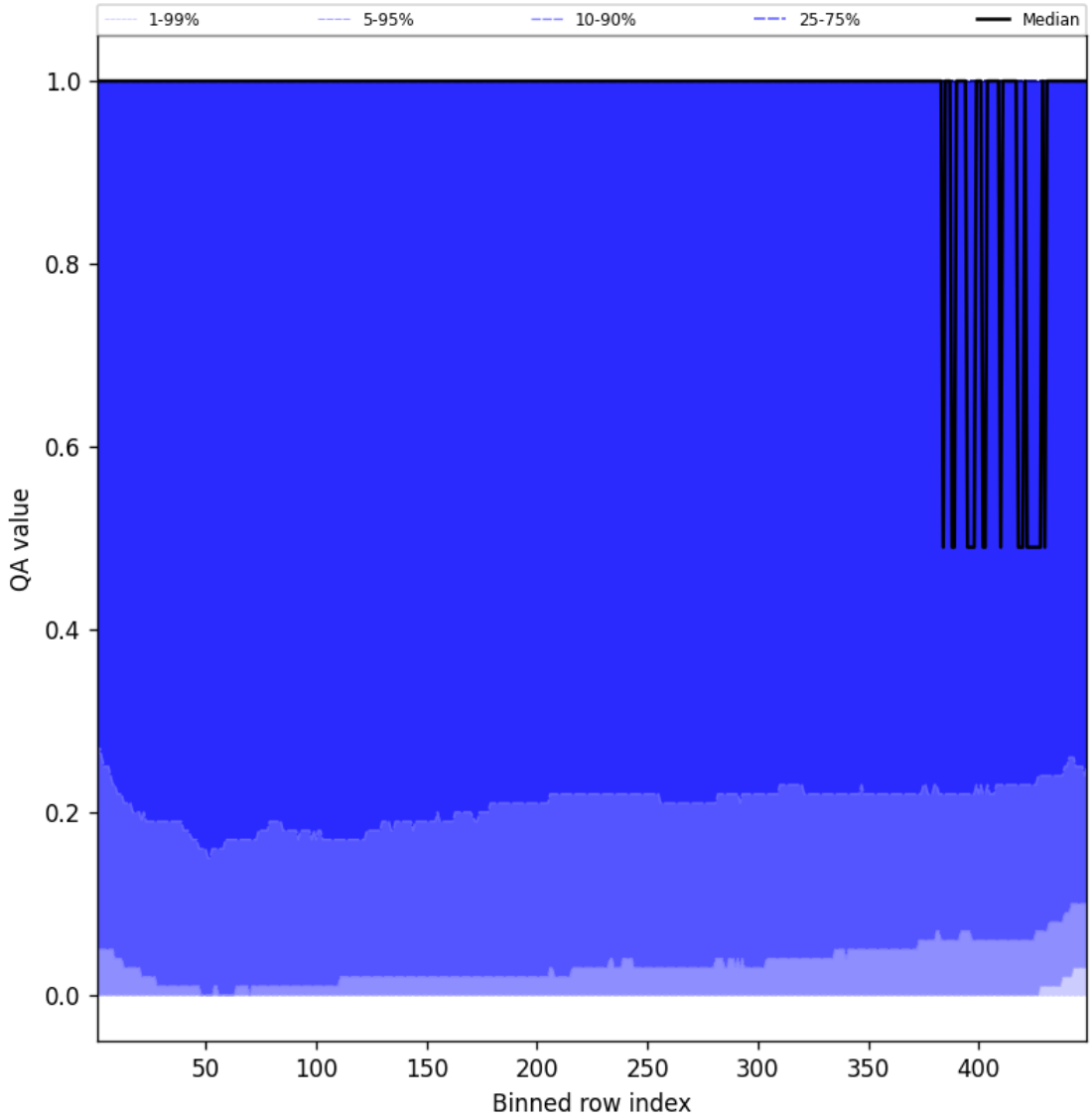

Figure 84: Along track statistics of “QA value” for 2025-06-02 to 2025-06-03

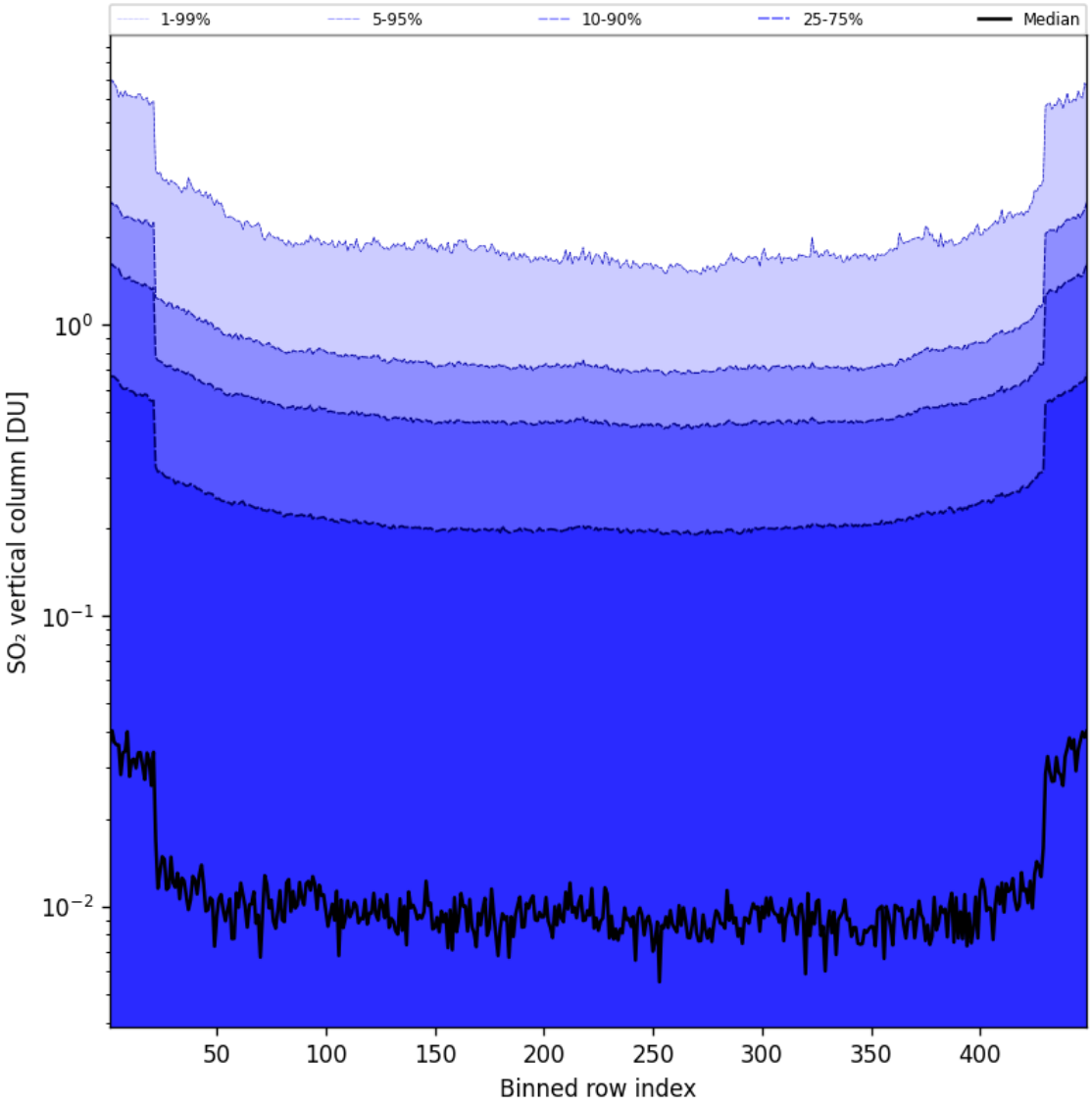

Figure 85: Along track statistics of "SO_2 vertical column" for 2025-06-02 to 2025-06-03

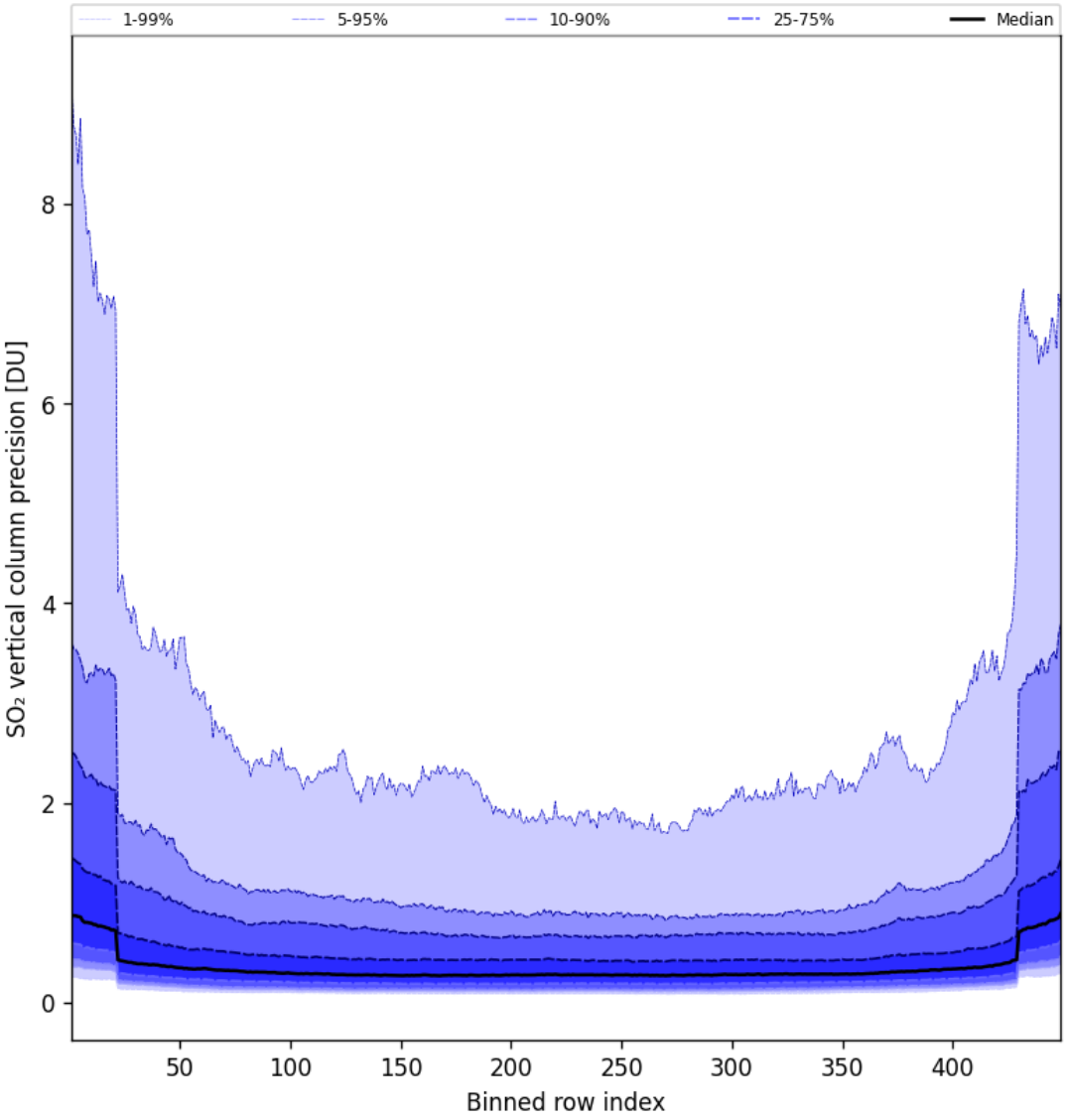

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-06-02 to 2025-06-03

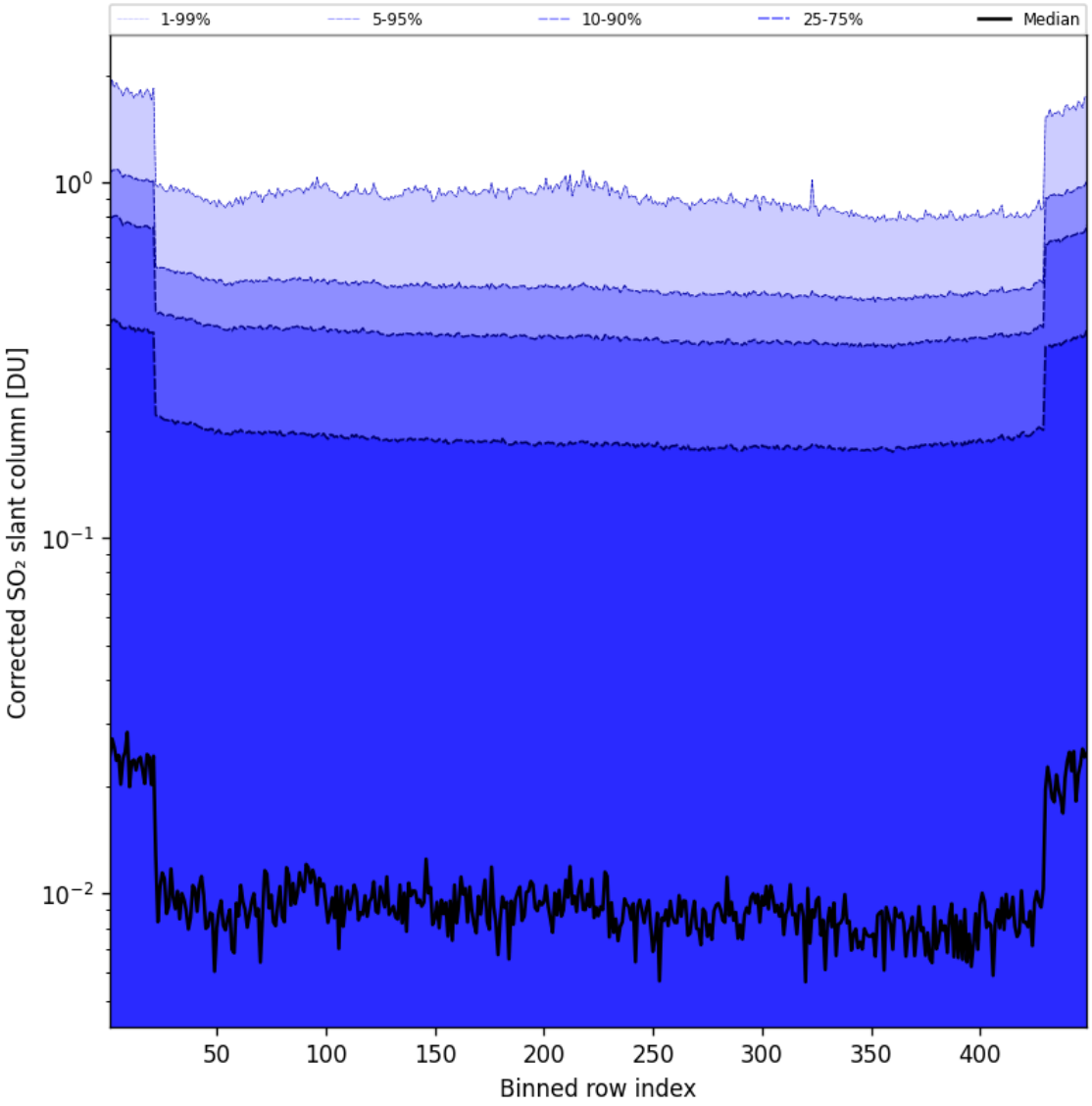

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-06-02 to 2025-06-03

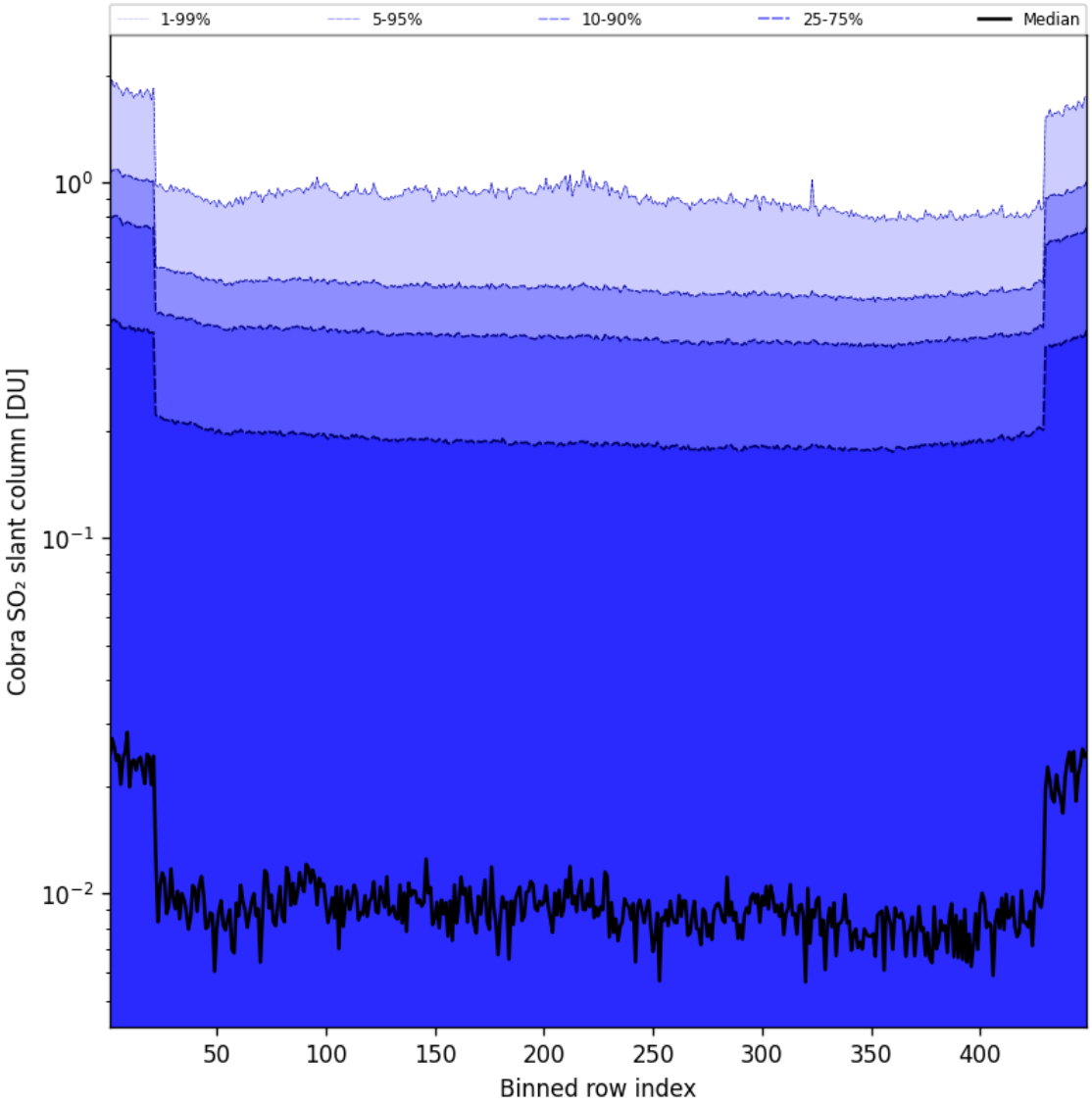

Figure 88: Along track statistics of "Cobra SO_2 slant column" for 2025-06-02 to 2025-06-03

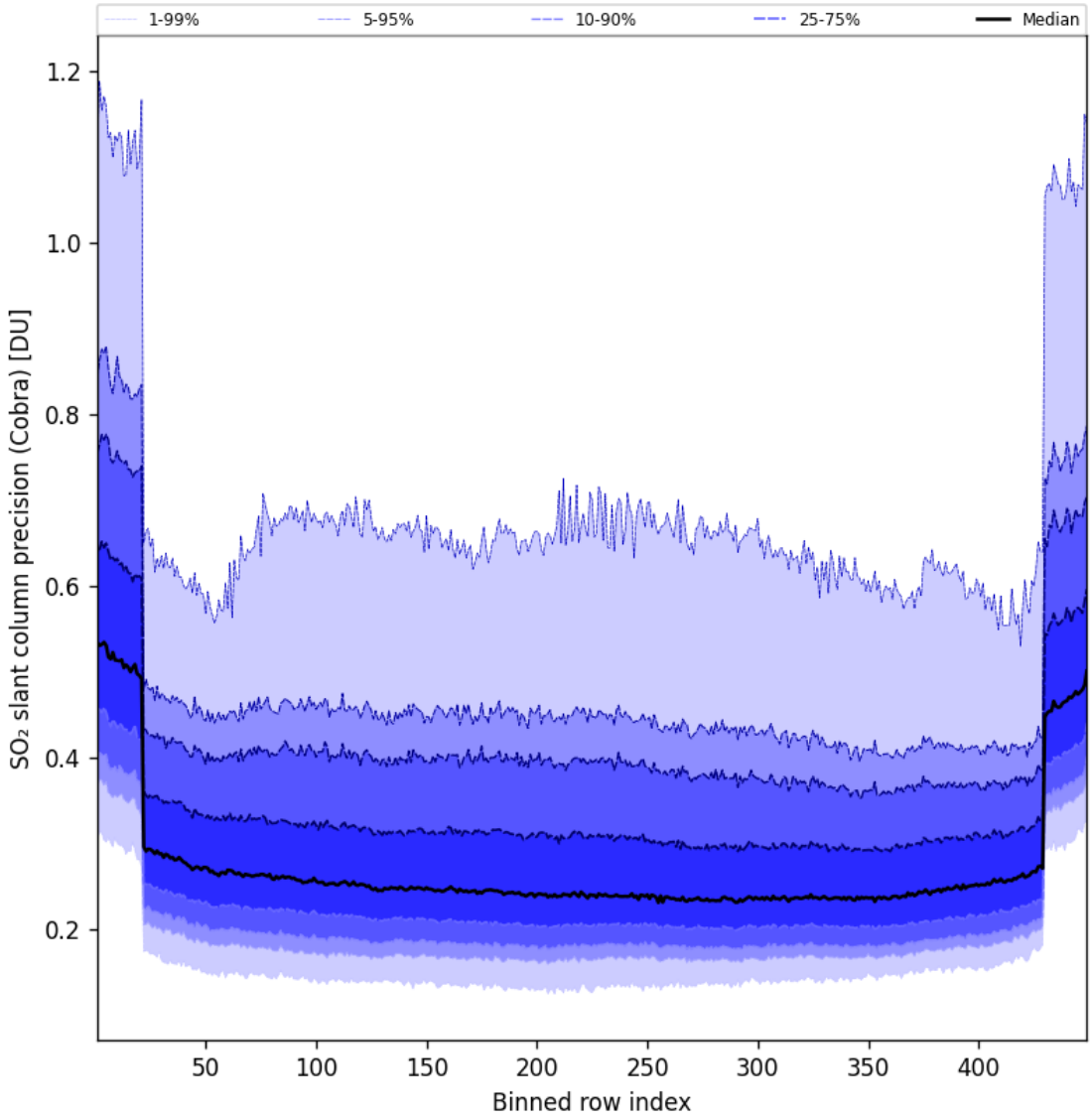

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-06-02 to 2025-06-03

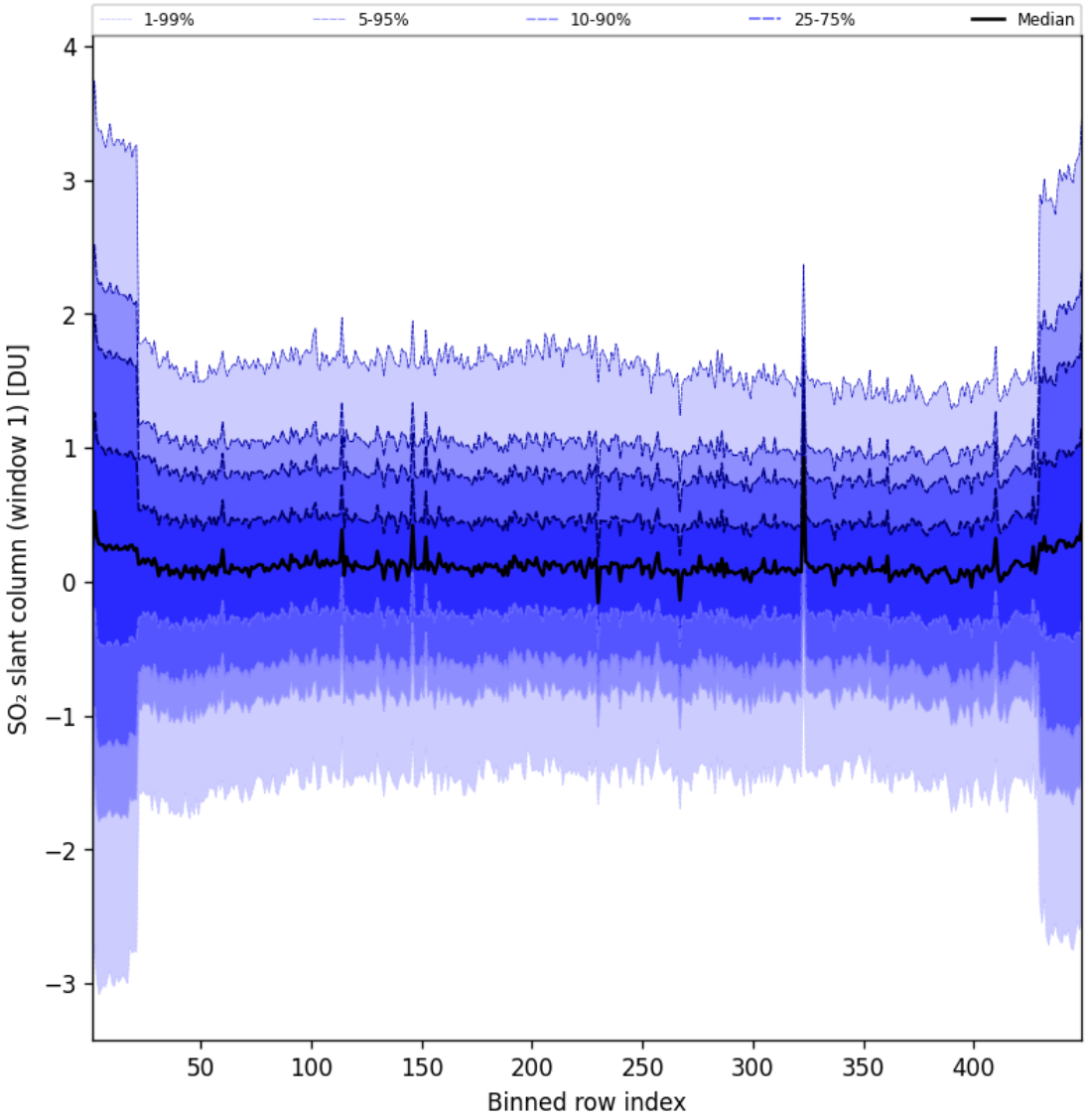

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-06-02 to 2025-06-03

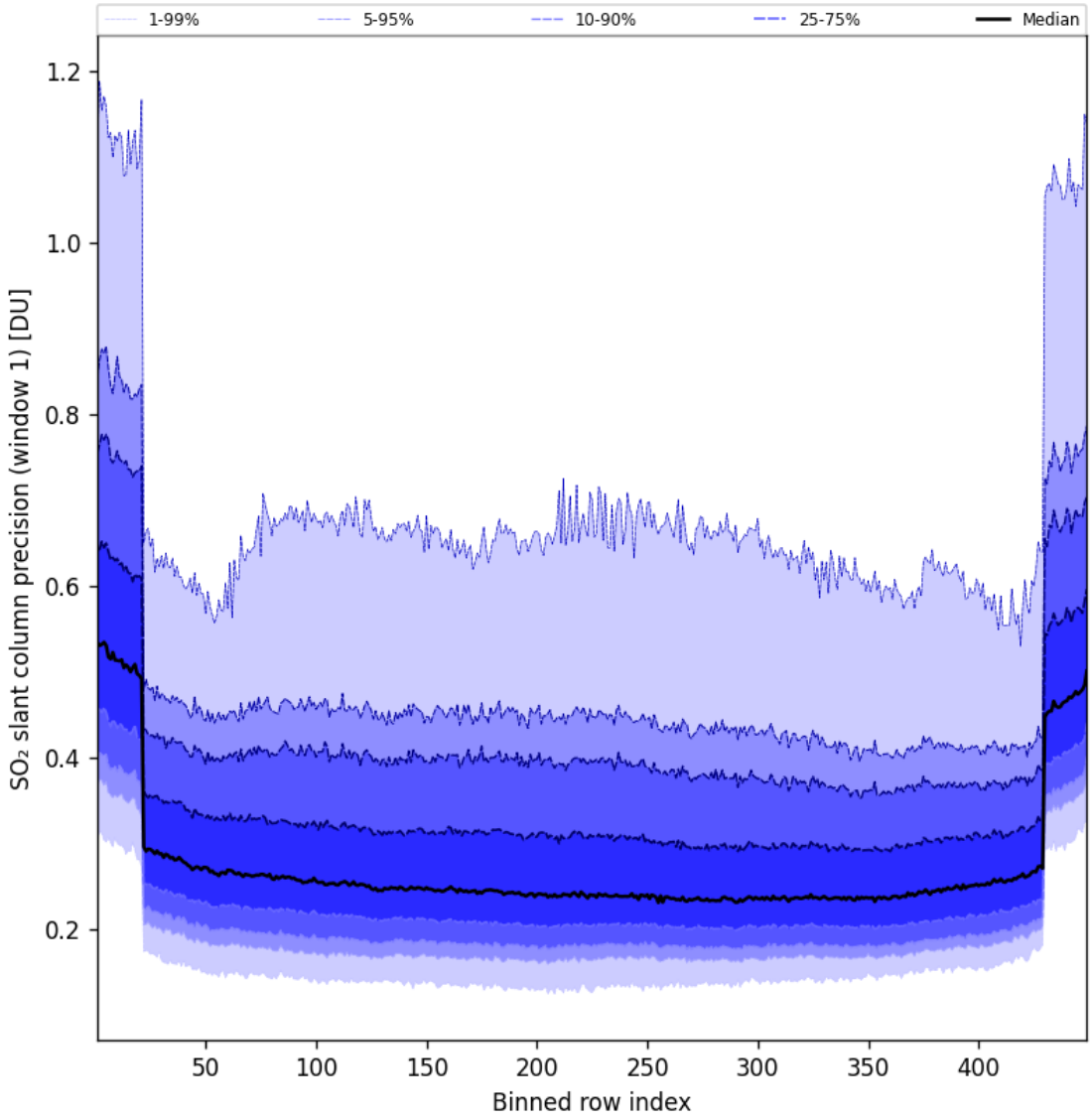

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-06-02 to 2025-06-03

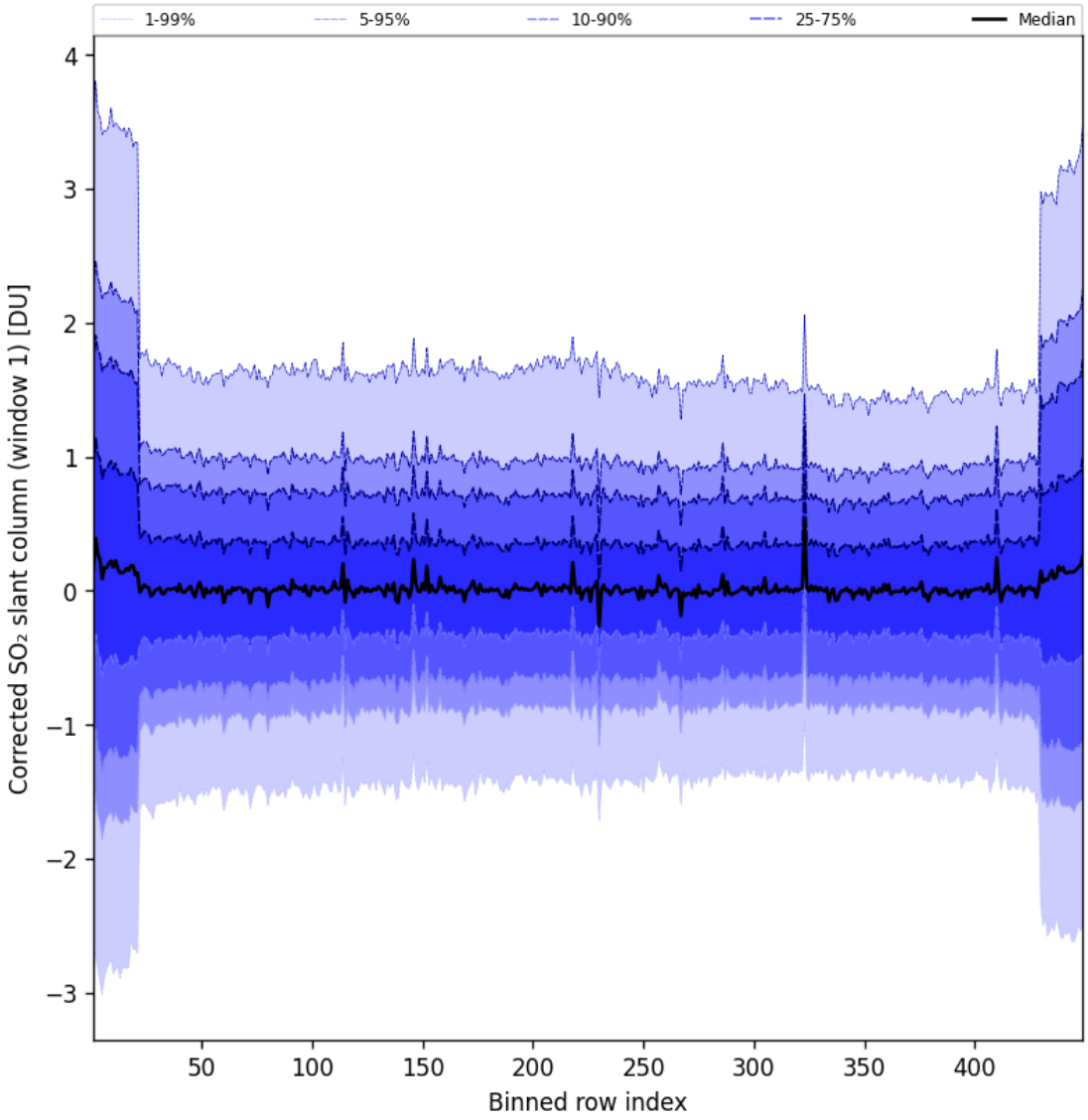

Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-06-02 to 2025-06-03

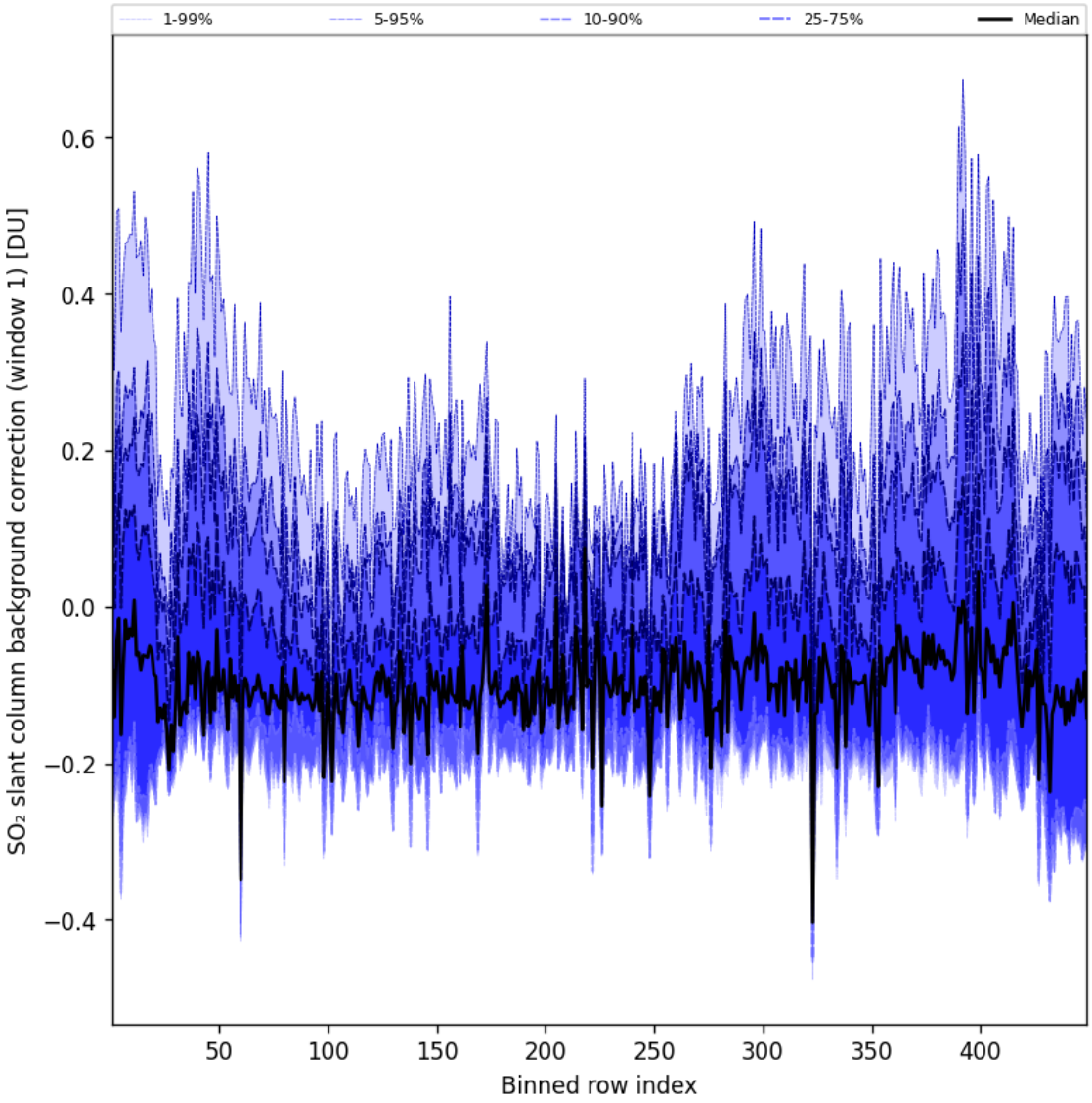

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-06-02 to 2025-06-03

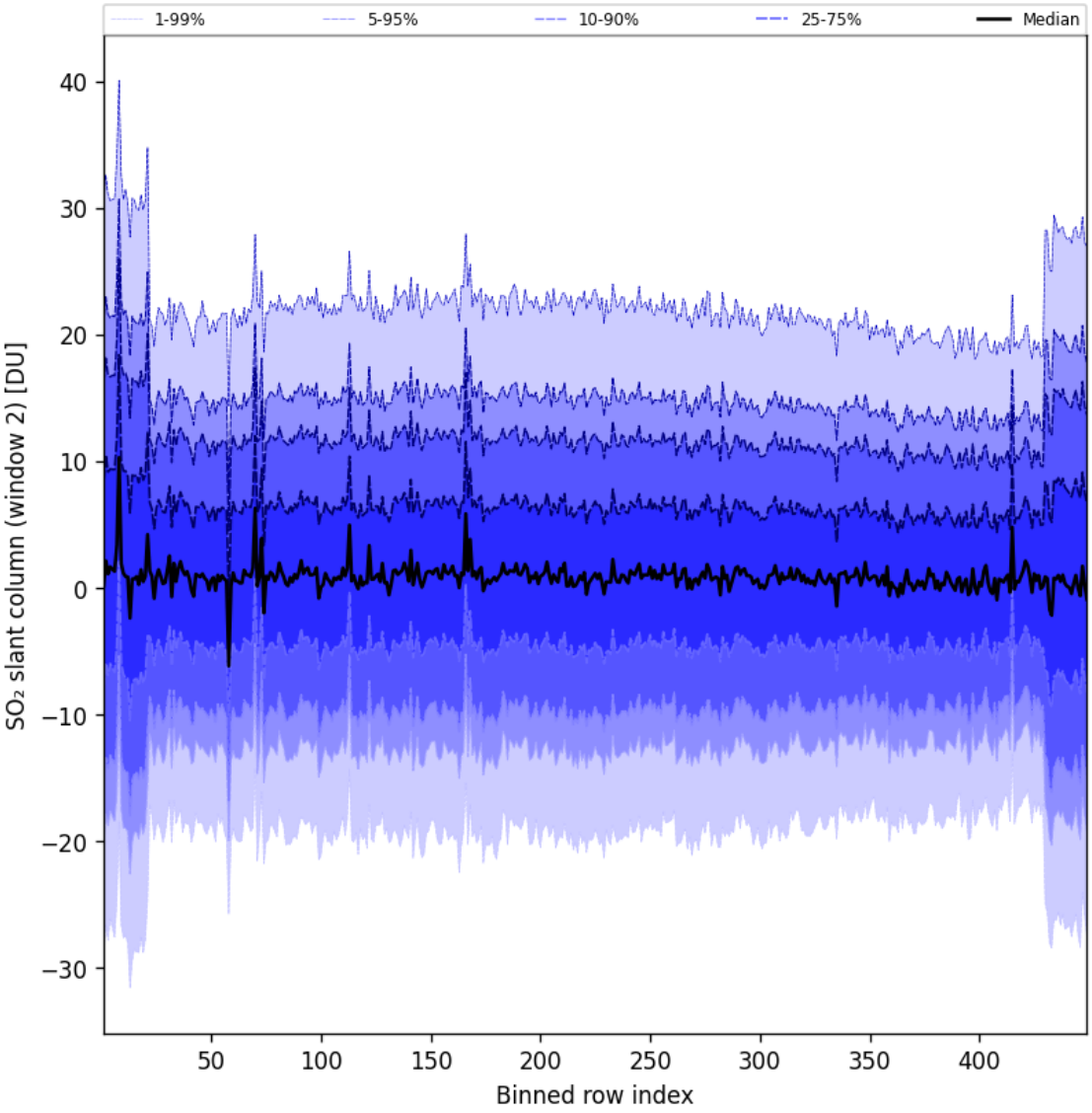

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-06-02 to 2025-06-03

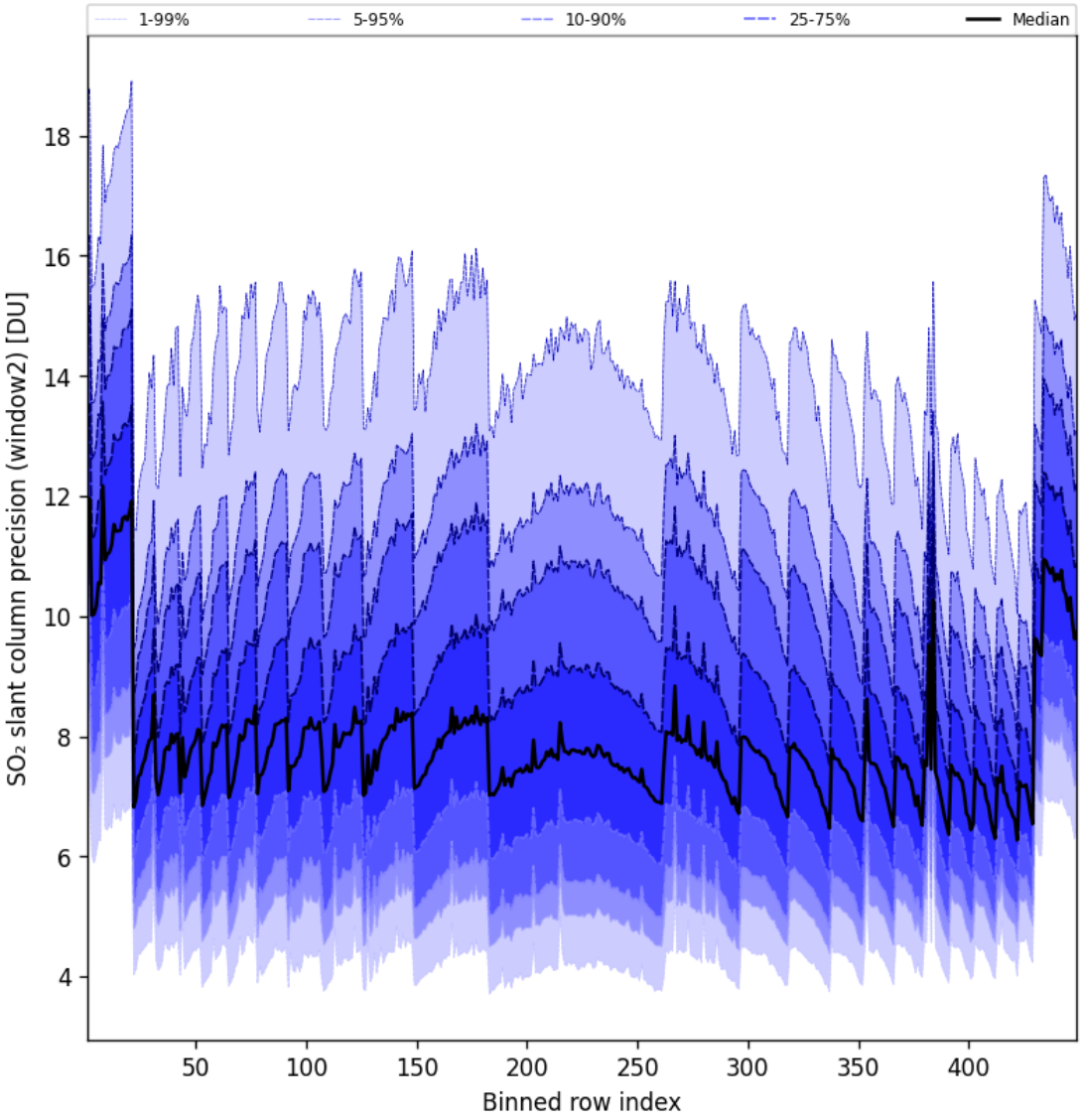

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-06-02 to 2025-06-03

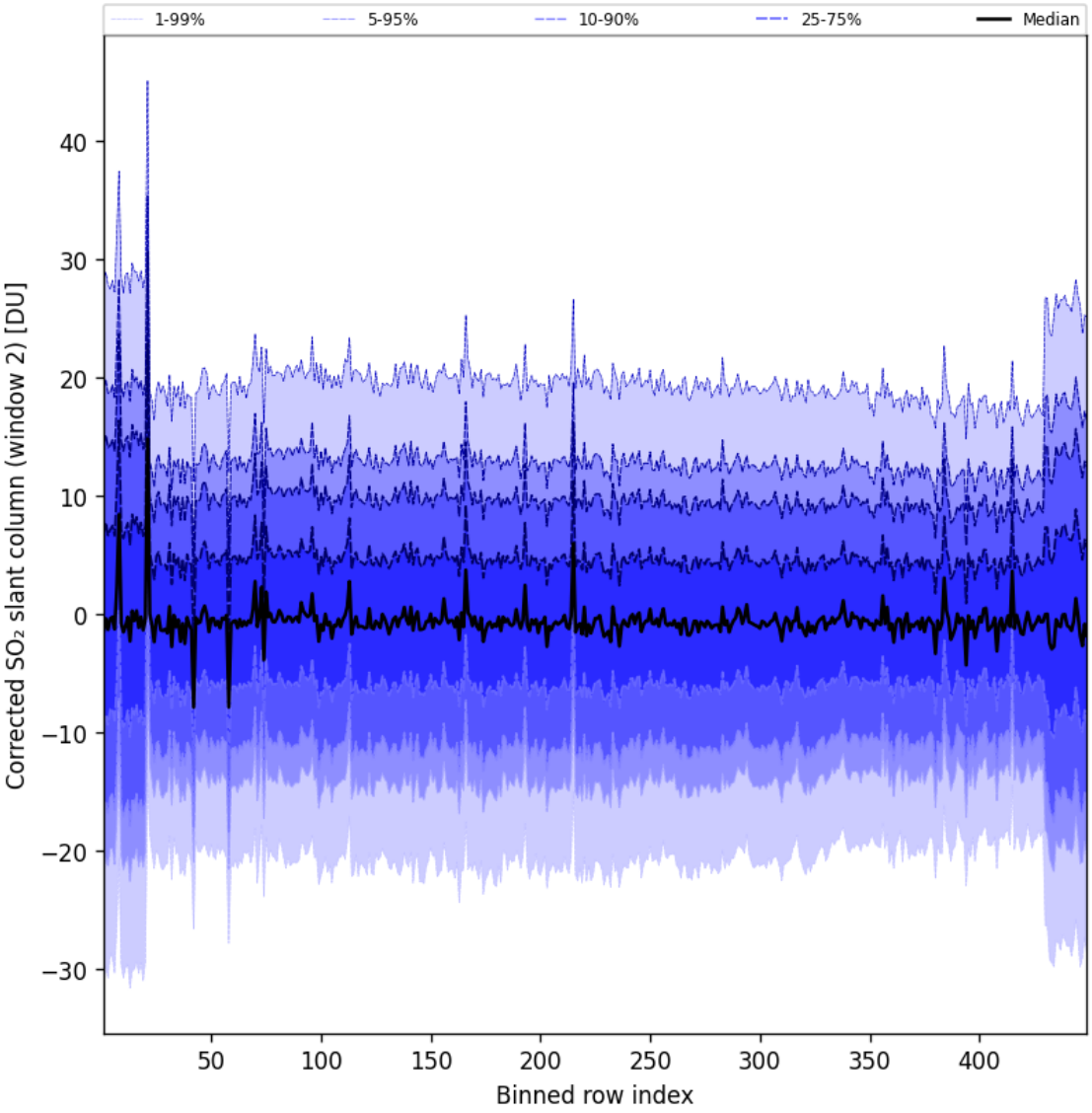

Figure 96: Along track statistics of "Corrected SO_2 slant column (window 2)" for 2025-06-02 to 2025-06-03

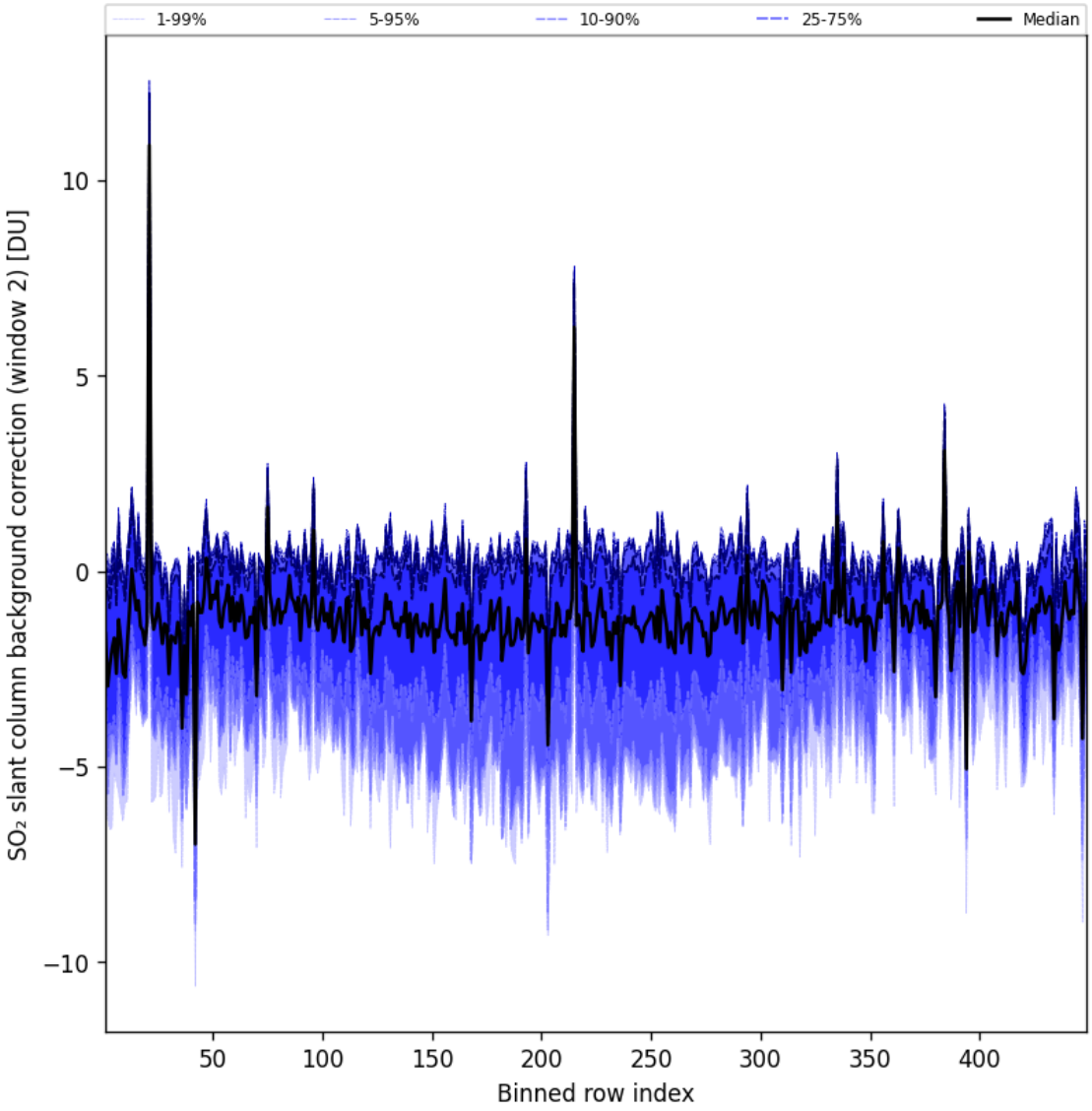

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-06-02 to 2025-06-03

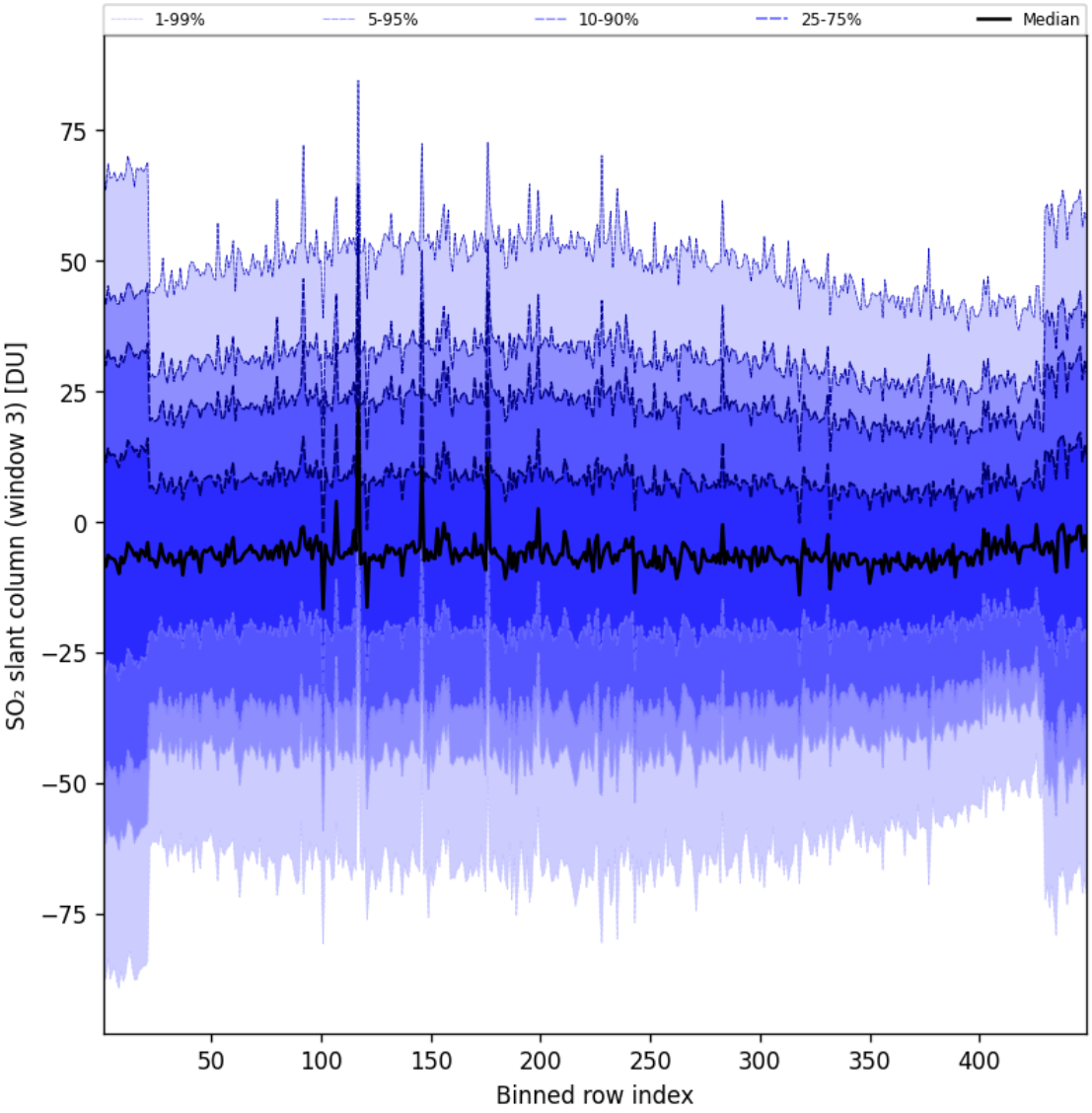

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-06-02 to 2025-06-03

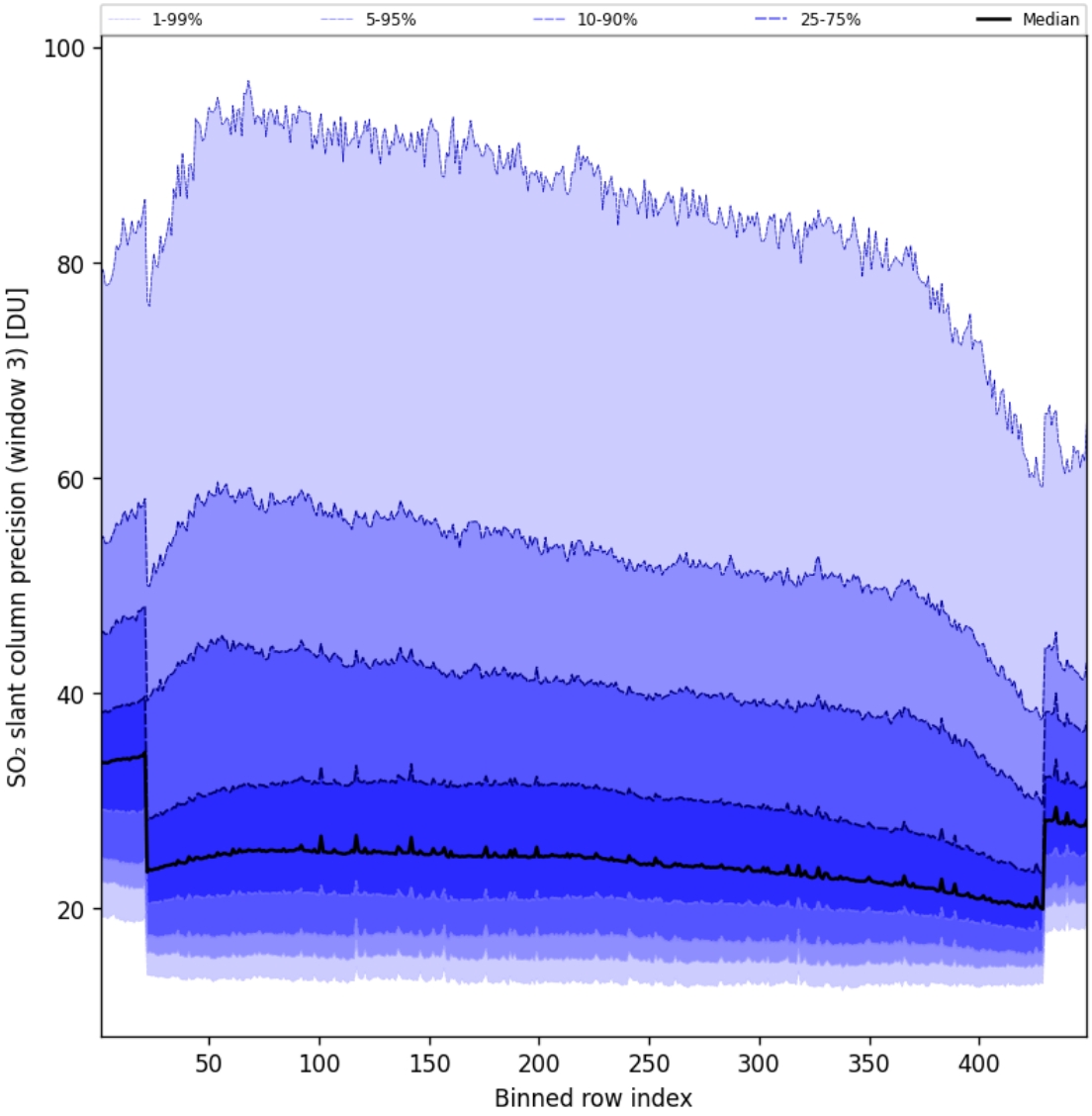

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-06-02 to 2025-06-03

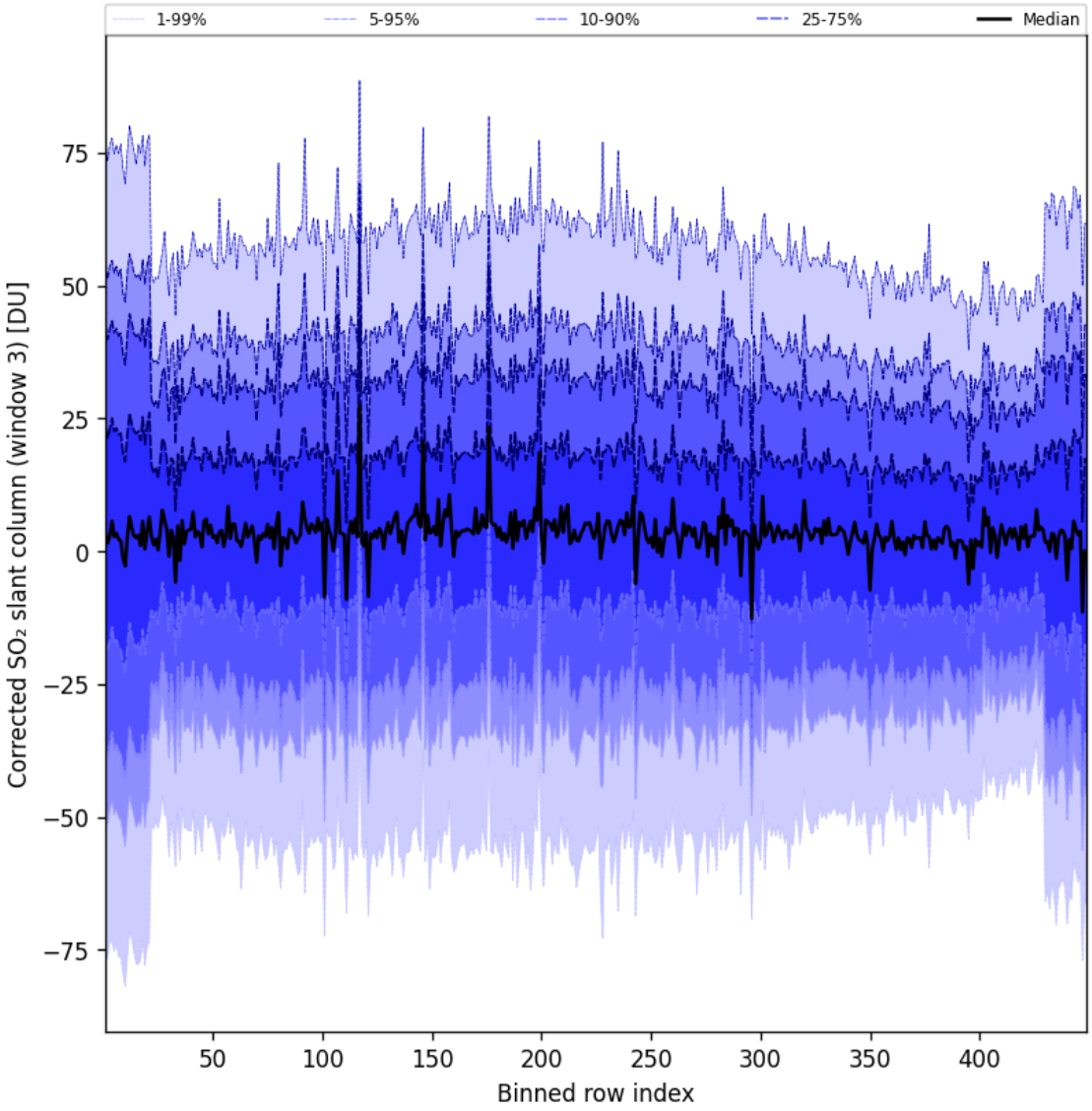

Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-06-02 to 2025-06-03

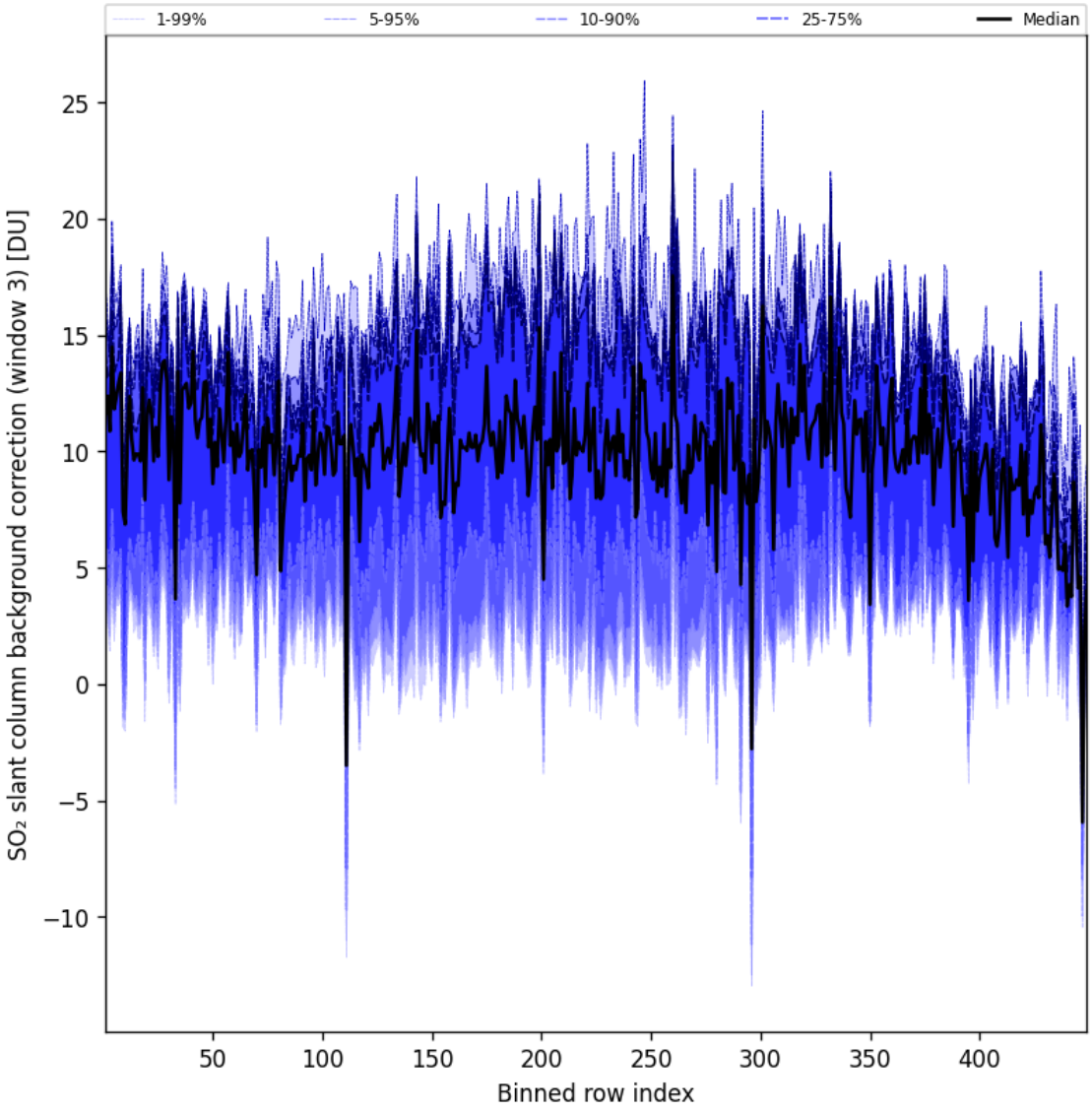

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-06-02 to 2025-06-03

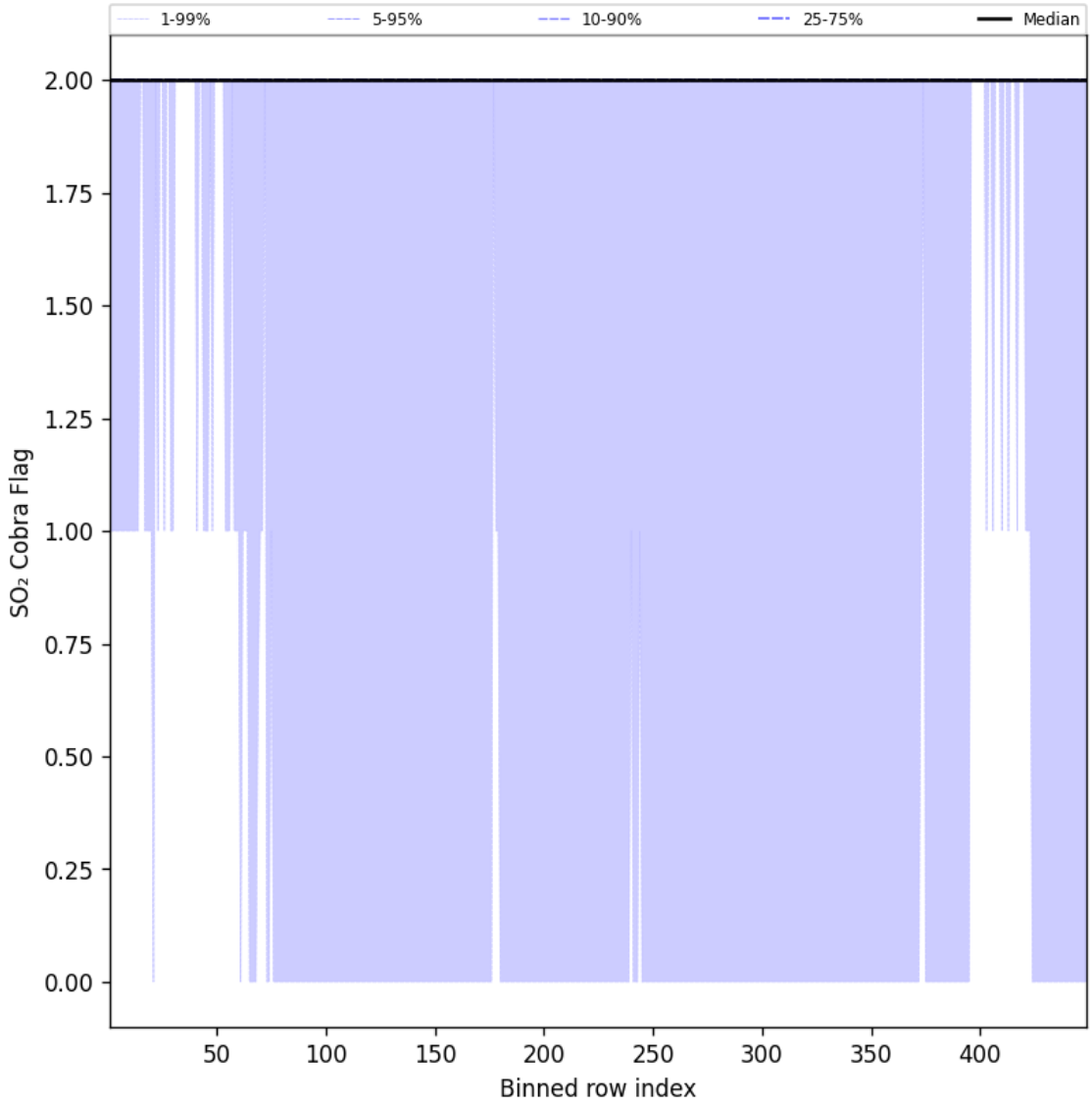

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-06-02 to 2025-06-03

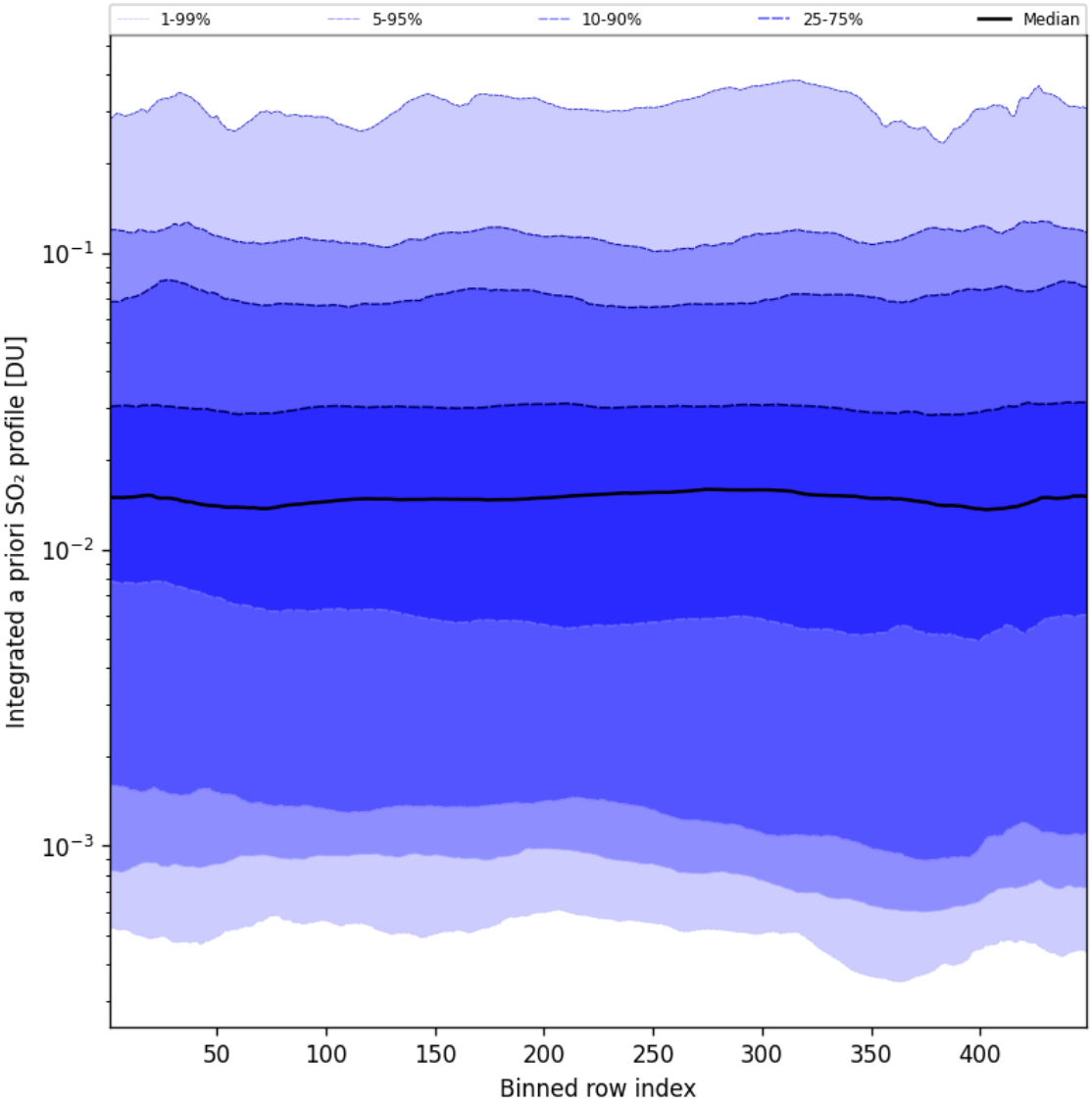

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-06-02 to 2025-06-03

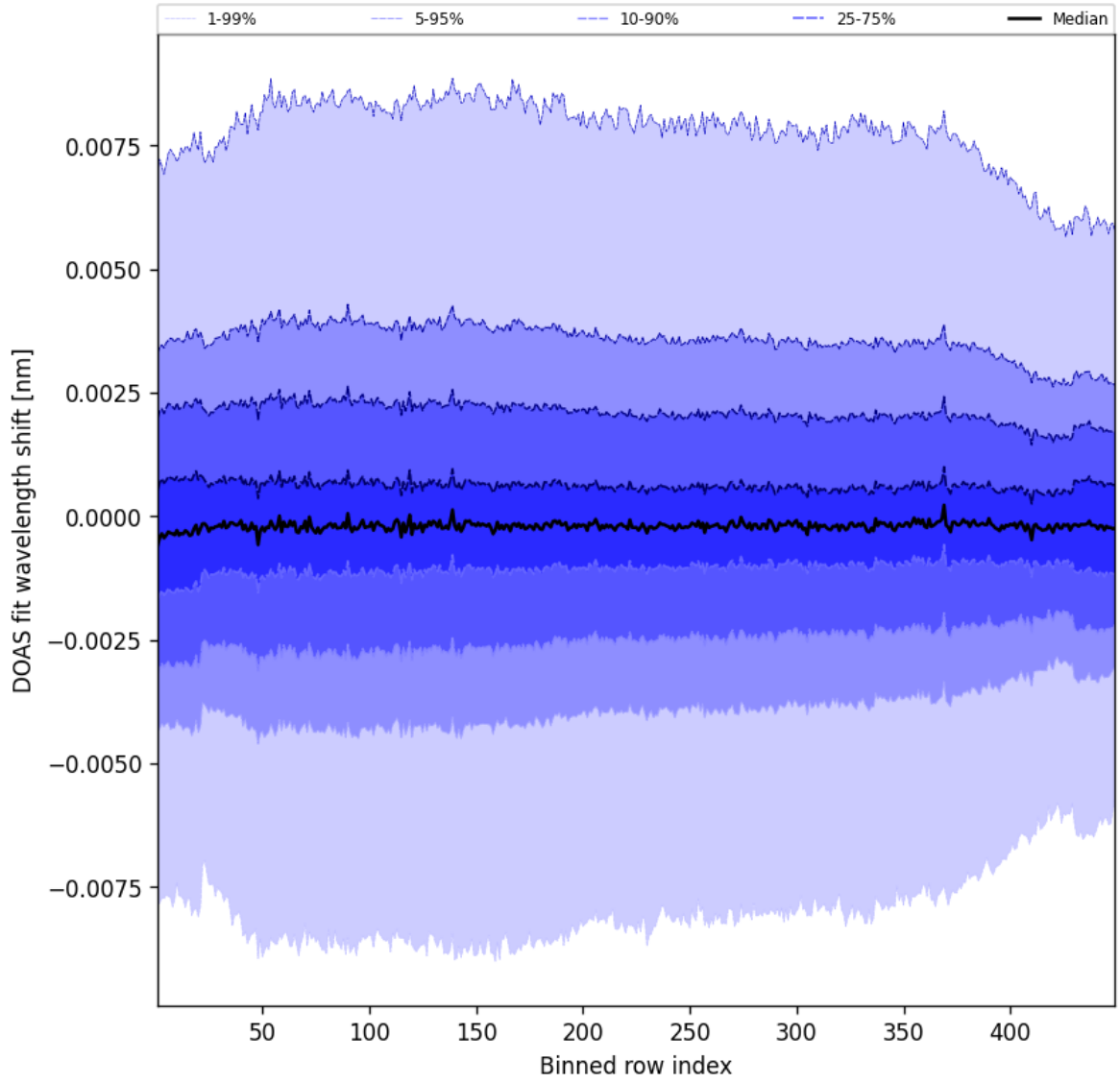

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-06-02 to 2025-06-03

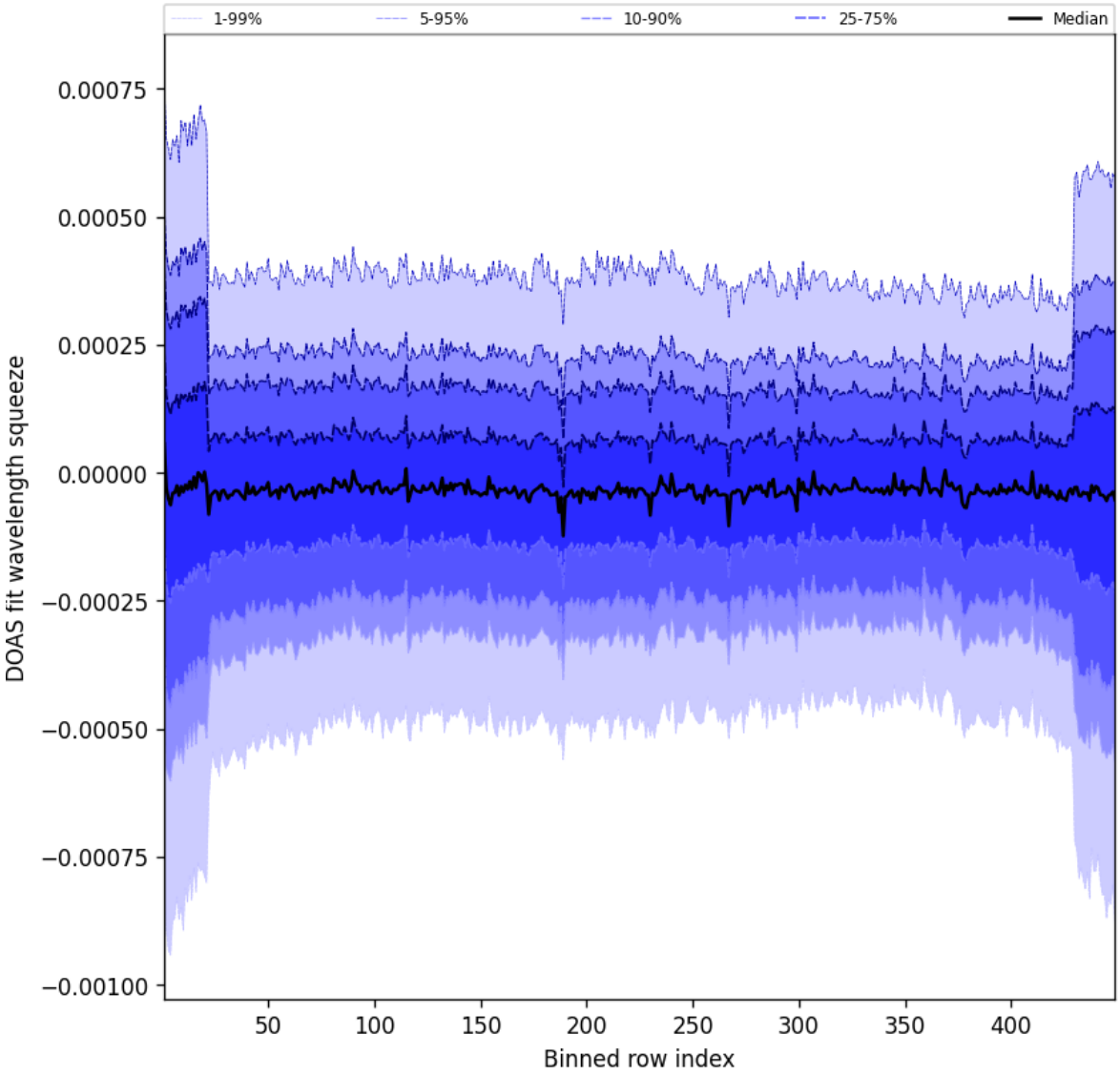

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-06-02 to 2025-06-03

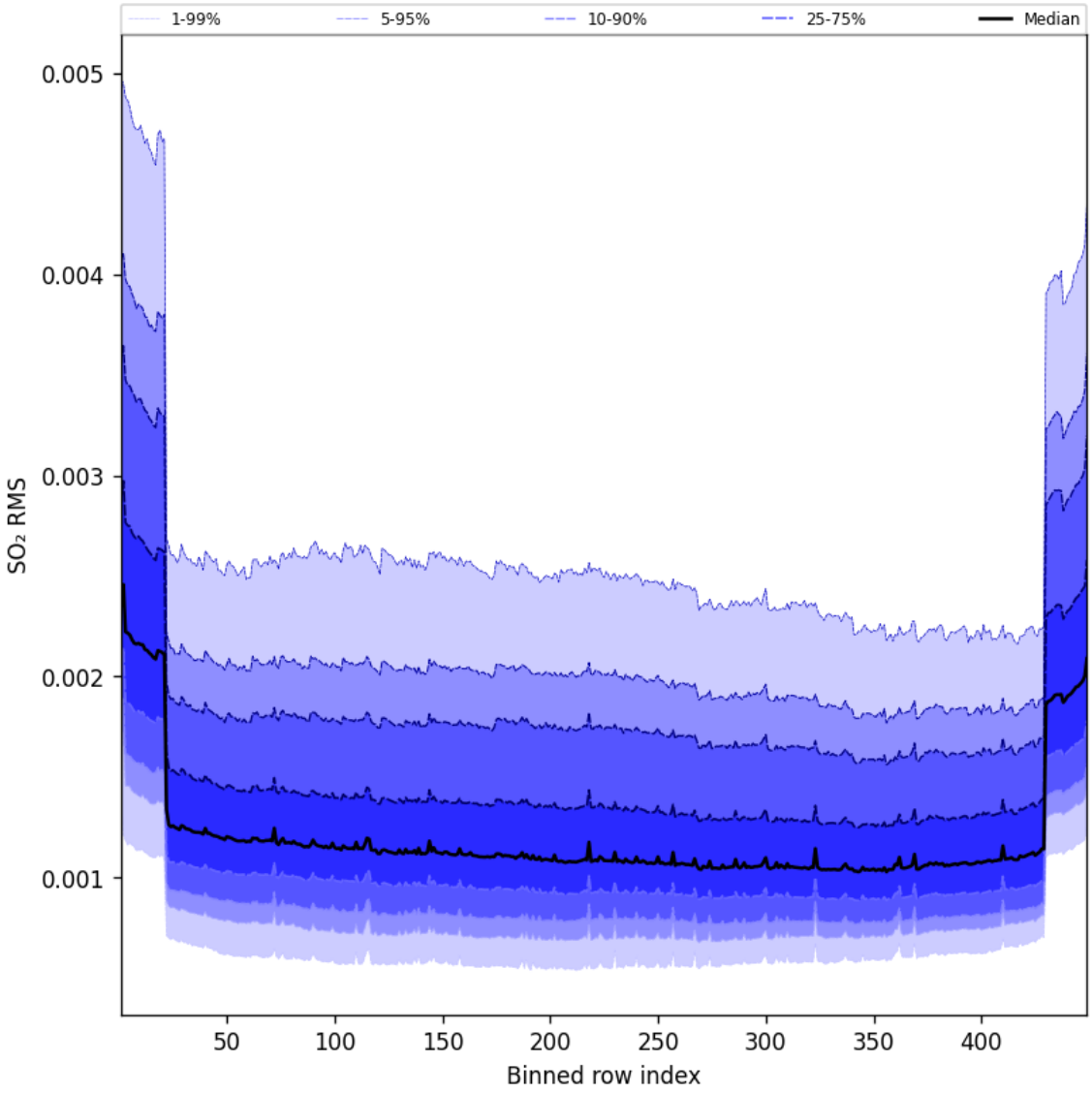

Figure 106: Along track statistics of "SO_2 RMS" for 2025-06-02 to 2025-06-03

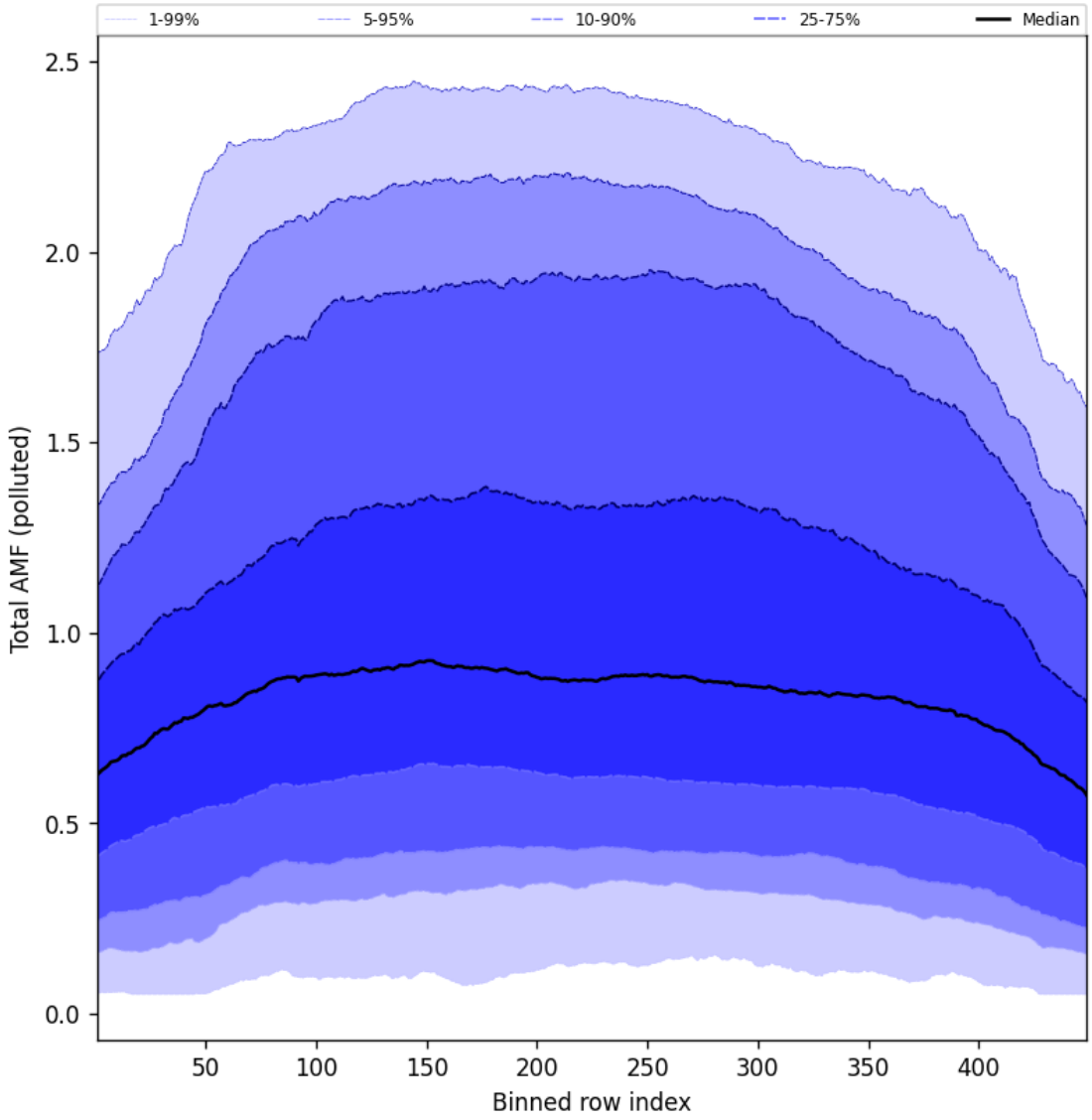

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-06-02 to 2025-06-03

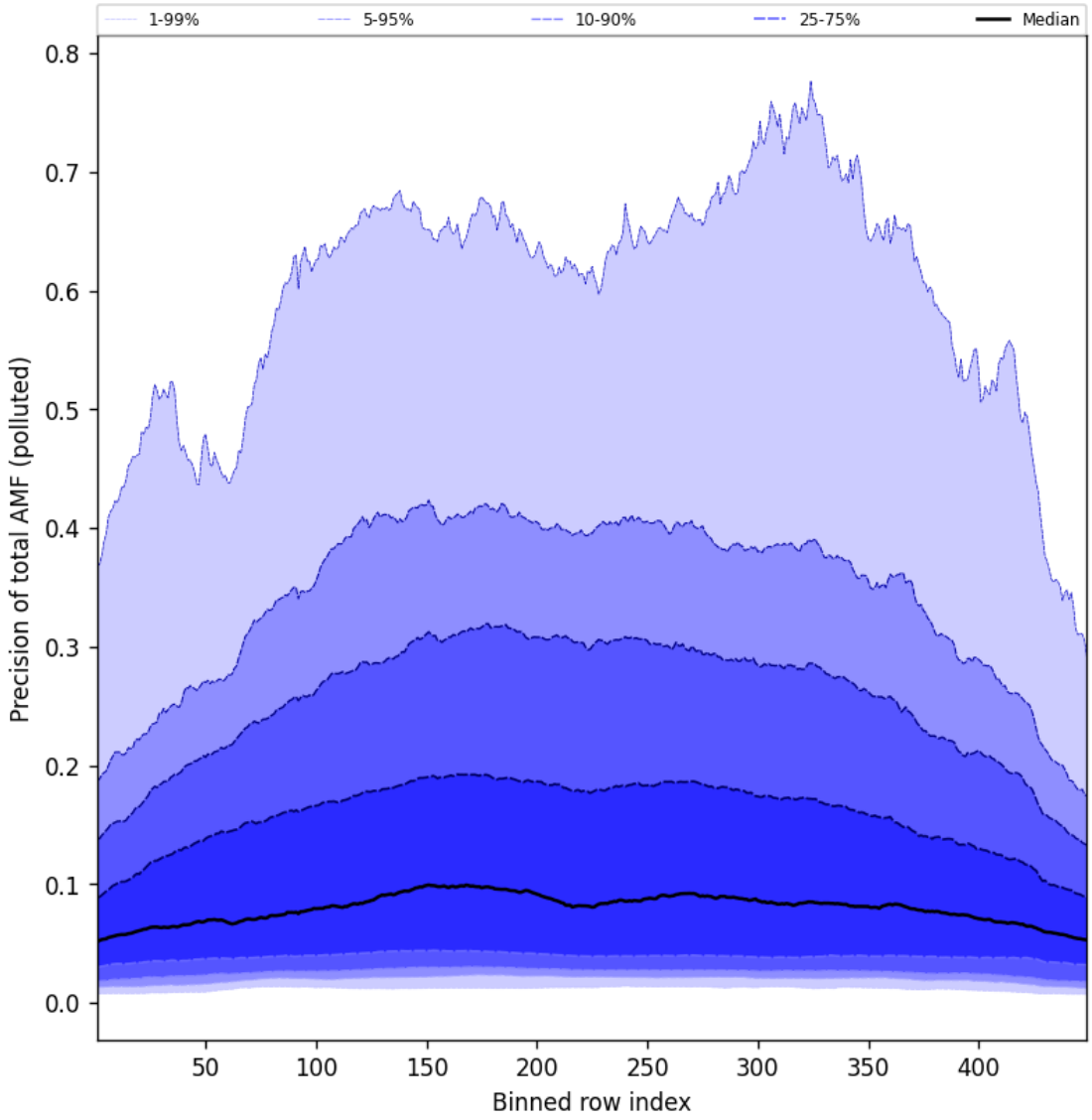

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-06-02 to 2025-06-03

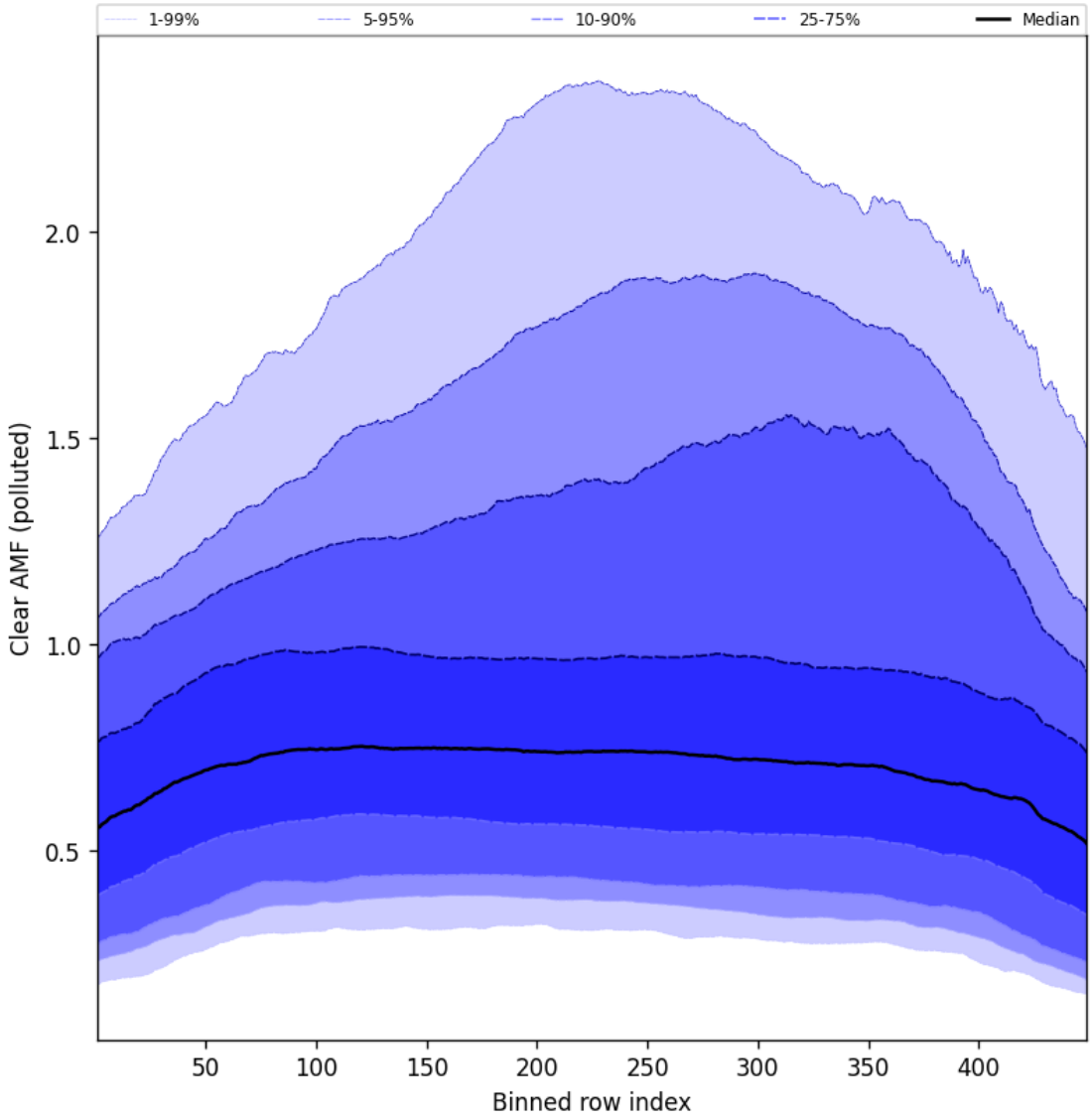

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-06-02 to 2025-06-03

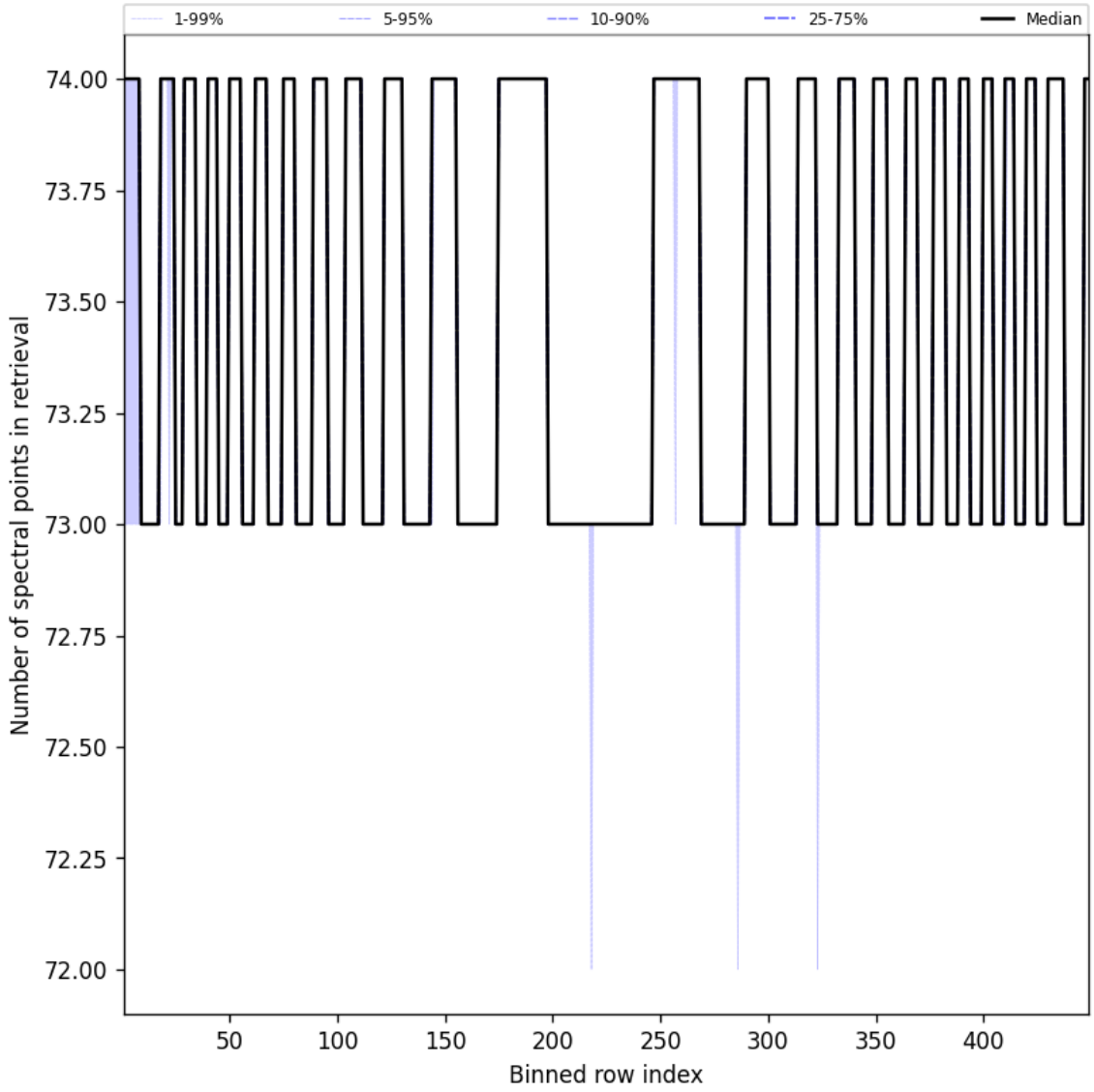

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-06-02 to 2025-06-03

10 Coincidence density

To investigate the relation between parameters scatter density plots are produced. These include some 'hidden' parameters, latitude and the solar- and viewing geometries, in addition to all configured parameters. All combinations of pairs of parameters are included *once*, in one direction alone.

Contents

List of Figures

List of Tables

11 Copyright information of 'PyCAMA'

Copyright © 2005 – 2023, Maarten Sneep (KNMI).

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

3. Neither the name of the copyright holder nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

This software is provided by the copyright holders and contributors "as is" and any express or implied warranties, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose are disclaimed. In no event shall the copyright holder or contributors be liable for any direct, indirect, incidental, special, exemplary, or consequential damages (including, but not limited to, procurement of substitute goods or services; loss of use, data, or profits; or business interruption) however caused and on any theory of liability, whether in contract, strict liability, or tort (including negligence or otherwise) arising in any way out of the use of this software, even if advised of the possibility of such damage.

Maarten Sneep (maarten.sneep@knmi.nl).