PyCAMA report generated by tropl2-proc

tropl2-proc

2025-02-25 (04:01)

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]	0.652 ± 0.406	18548765	0.995	0.780	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(6.033 \pm 177.167) \times 10^{-2}$	18548765	0.249	0.451	1.053×10^{-2}	-145	561
sulfurdioxide total vertical column precision [DU]	0.666 ± 1.278	18548765	0.222	0.370	0.315	3.777×10^{-2}	48.3
sulfurdioxide slant column density corrected [DU]	$(1.966 \pm 37.639) \times 10^{-2}$	18548765	0.242	0.355	9.087×10^{-3}	-16.1	73.7
sulfurdioxide slant column density cobra [DU]	$(1.951 \pm 36.824) \times 10^{-2}$	18548765	0.242	0.355	9.087×10^{-3}	-16.1	33.8
sulfurdioxide slant column density cobra precision [DU]	0.293 ± 0.146	18548765	0.188	0.152	0.243	7.621×10^{-2}	24.1
sulfurdioxide slant column density window1 [DU]	0.182 ± 0.701	18548765	0.225	0.734	0.195	-80.6	133
sulfurdioxide slant column density window1 precision [DU]	0.293 ± 0.146	18548765	0.188	0.152	0.243	7.621×10^{-2}	24.1
sulfurdioxide slant column density corrected win1 [DU]	$(2.181 \pm 68.819) \times 10^{-2}$	18548765	-2.500×10^{-2}	0.710	2.766×10^{-4}	-80.6	133
background so2 slant column offset window1 [DU]	-0.160 ± 0.190	18548765	-0.300	0.219	-0.200	-1.44	5.05
sulfurdioxide slant column density window2 [DU]	1.11 ± 9.05	18548765	0.250	11.4	0.848	-2.612×10^{3}	1.217×10^{3}
sulfurdioxide slant column density window2 precision [DU]	8.07 ± 2.24	18548765	7.43	2.60	7.71	2.00	625
sulfurdioxide slant column density corrected win2 [DU]	-0.646 ± 8.661	18548765	-0.750	10.9	-0.629	-2.611×10^{3}	1.207×10^{3}
background so2 slant column offset window2 [DU]	-1.76 ± 2.77	18548765	0.250	3.25	-0.742	-16.7	4.60
sulfurdioxide slant column density window3 [DU]	-3.14 ± 24.23	18548765	-2.80	30.6	-3.20	-1.271×10^{3}	1.476×10^{3}
sulfurdioxide slant column density window3 precision [DU]	28.4 ± 13.2	18548765	22.5	9.81	24.8	10.0	602
sulfurdioxide slant column density corrected win3 [DU]	6.37 ± 23.22	18548765	6.16	29.3	6.35	-1.270×10^{3}	1.482×10^{3}
background so2 slant column offset window3 [DU]	9.51 ± 7.37	18548765	3.92	11.6	8.90	-29.5	56.9
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.22	18548765	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.509 \pm 8.669) \times 10^{-2}$	18548765	1.423×10^{-2}	1.961×10^{-2}	1.783×10^{-2}	5.569×10^{-4}	3.13
fitted radiance shift [nm]	$(-2.779 \pm 26.028) \times 10^{-4}$	18548765	1.000×10^{-4}	1.881×10^{-3}	-2.649×10^{-4}	-4.934×10^{-2}	6.178×10^{-2}
fitted radiance squeeze [1]	$(-3.355 \pm 18.415) \times 10^{-5}$	18548765	-1.000×10^{-5}	2.046×10^{-4}	-2.356×10^{-5}	-1.928×10^{-2}	1.562×10^{-2}
fitted root mean square [1]	$(1.281 \pm 0.595) \times 10^{-3}$	18548765	9.250×10^{-4}	5.975×10^{-4}	1.093×10^{-3}	3.293×10^{-4}	6.897×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.835 ± 0.461	18548765	0.700	0.539	0.775	5.000×10^{-2}	2.92
sulfurdioxide total air mass factor polluted precision [1]	0.122 ± 0.138	18548765	3.500×10^{-2}	0.126	6.939×10^{-2}	2.500×10^{-3}	2.10
sulfurdioxide clear air mass factor polluted [1]	0.727 ± 0.388	18548765	0.660	0.391	0.680	1.969×10^{-2}	2.96
number of spectral points in retrieval [1]	73.4 ± 0.5	18548765	73.0	1.000	73.0	52.0	74.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	5.000×10^{-2}	0.110	0.220	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−3.62	−1.03	−0.565	−0.365	−0.211	0.240	0.410	0.639	1.20	4.55
sulfurdioxide total vertical column precision [DU]	9.208×10^{-2}	0.127	0.154	0.179	0.210	0.580	0.872	1.31	2.25	6.45
sulfurdioxide slant column density corrected [DU]	−0.884	−0.493	−0.351	−0.260	−0.166	0.188	0.288	0.389	0.553	1.08
sulfurdioxide slant column density cobra [DU]	−0.884	−0.493	−0.351	−0.260	−0.166	0.188	0.288	0.389	0.553	1.08
sulfurdioxide slant column density cobra precision [DU]	0.131	0.158	0.172	0.183	0.197	0.349	0.408	0.468	0.566	0.839
sulfurdioxide slant column density window1 [DU]	−1.77	−0.902	−0.586	−0.384	−0.179	0.556	0.746	0.931	1.22	2.04
sulfurdioxide slant column density window1 precision [DU]	0.131	0.158	0.172	0.183	0.197	0.349	0.408	0.468	0.566	0.839
sulfurdioxide slant column density corrected win1 [DU]	−1.72	−0.973	−0.707	−0.531	−0.349	0.361	0.562	0.764	1.09	2.04
background so2 slant column offset window1 [DU]	−0.470	−0.362	−0.336	−0.316	−0.291	-7.180×10^{-2}	9.009×10^{-3}	8.975×10^{-2}	0.187	0.432
sulfurdioxide slant column density window2 [DU]	−19.7	−13.1	−9.86	−7.45	−4.73	6.66	9.67	12.4	16.2	24.3
sulfurdioxide slant column density window2 precision [DU]	4.26	5.15	5.68	6.09	6.58	9.19	10.1	10.9	12.1	14.7
sulfurdioxide slant column density corrected win2 [DU]	−21.7	−14.7	−11.3	−8.86	−6.11	4.84	7.57	10.0	13.3	20.3
background so2 slant column offset window2 [DU]	−9.72	−7.78	−6.23	−4.70	−3.05	0.205	0.477	0.702	1.03	2.22
sulfurdioxide slant column density window3 [DU]	−63.2	−42.8	−33.1	−26.1	−18.4	12.2	20.1	27.2	36.7	55.4
sulfurdioxide slant column density window3 precision [DU]	14.5	16.8	18.4	19.6	21.1	30.9	35.5	41.5	53.4	85.1
sulfurdioxide slant column density corrected win3 [DU]	−51.6	−31.7	−22.3	−15.5	−8.19	21.1	28.6	35.3	44.3	62.5
background so2 slant column offset window3 [DU]	−4.76	−1.24	0.436	1.87	3.73	15.4	17.8	19.6	21.7	24.5
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]	1.655×10^{-3}	3.810×10^{-3}	6.120×10^{-3}	8.136×10^{-3}	1.067×10^{-2}	3.028×10^{-2}	4.075×10^{-2}	5.860×10^{-2}	0.111	0.335
fitted radiance shift [nm]	-8.046×10^{-3}	-4.158×10^{-3}	-2.778×10^{-3}	-1.974×10^{-3}	-1.264×10^{-3}	6.164×10^{-4}	1.331×10^{-3}	2.220×10^{-3}	3.740×10^{-3}	7.868×10^{-3}
fitted radiance squeeze [1]	-5.673×10^{-4}	-3.373×10^{-4}	-2.476×10^{-4}	-1.891×10^{-4}	-1.297×10^{-4}	7.483×10^{-5}	1.242×10^{-4}	1.698×10^{-4}	2.356×10^{-4}	4.011×10^{-4}
fitted root mean square [1]	5.724×10^{-4}	7.028×10^{-4}	7.774×10^{-4}	8.335×10^{-4}	9.017×10^{-4}	1.499×10^{-3}	1.753×10^{-3}	2.006×10^{-3}	2.428×10^{-3}	3.471×10^{-3}
sulfurdioxide total air mass factor polluted [1]	6.650×10^{-2}	0.188	0.292	0.397	0.521	1.06	1.25	1.45	1.73	2.29
sulfurdioxide total air mass factor polluted precision [1]	6.610×10^{-3}	1.478×10^{-2}	2.219×10^{-2}	2.876×10^{-2}	3.663×10^{-2}	0.162	0.219	0.278	0.380	0.644
sulfurdioxide clear air mass factor polluted [1]	0.120	0.234	0.328	0.407	0.496	0.887	0.978	1.06	1.27	2.48
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]	0.676 ± 0.402	8295112	0.760	1.000	0.0	1.000	0.240	1.000
sulfurdioxide total vertical column [DU]	0.115 ± 2.547	8295112	0.599	1.586×10^{-2}	-145	561	-0.273	0.326
sulfurdioxide total vertical column precision [DU]	1.01 ± 1.78	8295112	0.737	0.426	4.220×10^{-2}	44.3	0.247	0.983
sulfurdioxide slant column density corrected [DU]	$(2.977 \pm 45.064) \times 10^{-2}$	8295112	0.396	1.216×10^{-2}	-13.1	45.3	-0.183	0.214
sulfurdioxide slant column density cobra [DU]	$(2.948 \pm 43.863) \times 10^{-2}$	8295112	0.396	1.216×10^{-2}	-13.1	24.6	-0.183	0.214
sulfurdioxide slant column density cobra precision [DU]	0.334 ± 0.177	8295112	0.204	0.280	7.745×10^{-2}	8.73	0.209	0.413
sulfurdioxide slant column density window1 [DU]	0.216 ± 0.809	8295112	0.807	0.231	-20.8	20.4	-0.177	0.630
sulfurdioxide slant column density window1 precision [DU]	0.334 ± 0.177	8295112	0.204	0.280	7.745×10^{-2}	8.73	0.209	0.413
sulfurdioxide slant column density corrected win1 [DU]	$(5.071 \pm 80.414) \times 10^{-2}$	8295112	0.792	1.704×10^{-2}	-20.8	20.6	-0.368	0.425
background so2 slant column offset window1 [DU]	-0.166 ± 0.208	8295112	0.219	-0.209	-1.44	5.05	-0.302	-8.321×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.02 ± 9.63	8295112	12.3	1.62	-539	1.217×10^{3}	-4.32	7.95
sulfurdioxide slant column density window2 precision [DU]	8.46 ± 2.30	8295112	2.84	8.10	2.00	625	6.87	9.71
sulfurdioxide slant column density corrected win2 [DU]	-0.715 ± 9.041	8295112	11.5	-0.697	-548	1.207×10^{3}	-6.45	5.04
background so2 slant column offset window2 [DU]	-2.74 ± 3.41	8295112	5.72	-1.39	-16.7	4.43	-5.64	8.637×10^{-2}
sulfurdioxide slant column density window3 [DU]	-5.74 ± 24.71	8295112	31.4	-5.49	-300	172	-21.3	10.1
sulfurdioxide slant column density window3 precision [DU]	29.2 ± 13.2	8295112	9.89	25.7	10.4	238	22.0	31.9
sulfurdioxide slant column density corrected win3 [DU]	6.44 ± 23.83	8295112	30.2	6.56	-282	190	-8.53	21.6
background so2 slant column offset window3 [DU]	12.2 ± 6.9	8295112	11.6	12.0	-27.2	56.9	6.33	18.0
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	8295112	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.329 \pm 12.422) \times 10^{-2}$	8295112	3.255×10^{-2}	2.067×10^{-2}	5.569×10^{-4}	3.13	1.237×10^{-2}	4.492×10^{-2}
fitted radiance shift [nm]	$(-1.403 \pm 25.552) \times 10^{-4}$	8295112	1.745×10^{-3}	-1.188×10^{-4}	-3.956×10^{-2}	3.488×10^{-2}	-1.036×10^{-3}	7.091×10^{-4}
fitted radiance squeeze [1]	$(-2.508 \pm 20.754) \times 10^{-5}$	8295112	2.195×10^{-4}	-1.251×10^{-5}	-7.210×10^{-3}	3.381×10^{-3}	-1.263×10^{-4}	9.318×10^{-5}
fitted root mean square [1]	$(1.442 \pm 0.722) \times 10^{-3}$	8295112	8.025×10^{-4}	1.201×10^{-3}	3.293×10^{-4}	2.410×10^{-2}	9.481×10^{-4}	1.751×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.703 ± 0.415	8295112	0.541	0.662	5.000×10^{-2}	2.88	0.391	0.932
sulfurdioxide total air mass factor polluted precision [1]	0.104 ± 0.153	8295112	9.056×10^{-2}	5.091×10^{-2}	2.500×10^{-3}	2.10	2.814×10^{-2}	0.119
sulfurdioxide clear air mass factor polluted [1]	0.602 ± 0.295	8295112	0.451	0.588	1.969×10^{-2}	2.22	0.366	0.818
number of spectral points in retrieval [1]	73.5 ± 0.5	8295112	1.000	73.0	52.0	74.0	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]	0.633 ± 0.408	10253653	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(1.610 \pm 65.148) \times 10^{-2}$	10253653	0.373	7.544×10^{-3}	-56.7	82.6	-0.178	0.195
sulfurdioxide total vertical column precision [DU]	0.387 ± 0.460	10253653	0.233	0.270	3.777×10^{-2}	48.3	0.190	0.424
sulfurdioxide slant column density corrected [DU]	$(1.149 \pm 30.306) \times 10^{-2}$	10253653	0.327	7.018×10^{-3}	-16.1	73.7	-0.155	0.171
sulfurdioxide slant column density cobra [DU]	$(1.145 \pm 29.917) \times 10^{-2}$	10253653	0.327	7.018×10^{-3}	-16.1	33.8	-0.155	0.171
sulfurdioxide slant column density cobra precision [DU]	0.259 ± 0.104	10253653	0.113	0.227	7.621×10^{-2}	24.1	0.191	0.304
sulfurdioxide slant column density window1 [DU]	0.153 ± 0.597	10253653	0.683	0.170	-80.6	133	-0.180	0.503
sulfurdioxide slant column density window1 precision [DU]	0.259 ± 0.104	10253653	0.113	0.227	7.621×10^{-2}	24.1	0.191	0.304
sulfurdioxide slant column density corrected win1 [DU]	$(-1.578 \pm 576.536) \times 10^{-3}$	10253653	0.654	-1.122×10^{-2}	-80.6	133	-0.336	0.318
background so2 slant column offset window1 [DU]	-0.155 ± 0.174	10253653	0.221	-0.192	-1.35	2.58	-0.283	-6.215×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.378 ± 8.483	10253653	10.7	0.297	-2.612×10^{3}	809	-5.03	5.70
sulfurdioxide slant column density window2 precision [DU]	7.75 ± 2.14	10253653	2.35	7.44	2.24	465	6.40	8.74
sulfurdioxide slant column density corrected win2 [DU]	-0.590 ± 8.340	10253653	10.5	-0.578	-2.611×10^{3}	809	-5.85	4.69
background so2 slant column offset window2 [DU]	-0.968 ± 1.758	10253653	2.20	-0.476	-10.5	4.60	-1.93	0.271
sulfurdioxide slant column density window3 [DU]	-1.03 ± 23.63	10253653	29.9	-1.44	-1.271×10^{3}	1.476×10^{3}	-16.1	13.8
sulfurdioxide slant column density window3 precision [DU]	27.8 ± 13.2	10253653	9.46	24.1	10.0	602	20.5	30.0
sulfurdioxide slant column density corrected win3 [DU]	6.32 ± 22.71	10253653	28.6	6.19	-1.270×10^{3}	1.482×10^{3}	-7.94	20.7
background so2 slant column offset window3 [DU]	7.35 ± 7.00	10253653	11.3	6.24	-29.5	28.6	1.77	13.1
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	10253653	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.037 \pm 2.502) \times 10^{-2}$	10253653	1.595×10^{-2}	1.585×10^{-2}	6.513×10^{-4}	2.42	9.683×10^{-3}	2.563×10^{-2}
fitted radiance shift [nm]	$(-3.892 \pm 26.353) \times 10^{-4}$	10253653	1.950×10^{-3}	-3.965×10^{-4}	-4.934×10^{-2}	6.178×10^{-2}	-1.426×10^{-3}	5.244×10^{-4}
fitted radiance squeeze [1]	$(-4.040 \pm 16.247) \times 10^{-5}$	10253653	1.932×10^{-4}	-3.151×10^{-5}	-1.928×10^{-2}	1.562×10^{-2}	-1.320×10^{-4}	6.113×10^{-5}
fitted root mean square [1]	$(1.151 \pm 0.427) \times 10^{-3}$	10253653	4.578×10^{-4}	1.035×10^{-3}	3.344×10^{-4}	6.897×10^{-2}	8.739×10^{-4}	1.332×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.942 ± 0.469	10253653	0.548	0.864	5.000×10^{-2}	2.92	0.621	1.17
sulfurdioxide total air mass factor polluted precision [1]	0.136 ± 0.123	10253653	0.147	9.613×10^{-2}	3.933×10^{-3}	1.43	4.442×10^{-2}	0.192
sulfurdioxide clear air mass factor polluted [1]	0.828 ± 0.423	10253653	0.355	0.732	0.109	2.96	0.580	0.935
number of spectral points in retrieval [1]	73.4 ± 0.5	10253653	1.000	73.0	52.0	74.0	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]	0.687 ± 0.396	13751621	0.730	1.000	0.0	1.000	0.270	1.000
sulfurdioxide total vertical column [DU]	$(3.437 \pm 118.919) \times 10^{-2}$	13751621	0.422	9.114×10^{-3}	-125	164	-0.200	0.222
sulfurdioxide total vertical column precision [DU]	0.525 ± 0.891	13751621	0.295	0.295	4.260×10^{-2}	48.3	0.208	0.503
sulfurdioxide slant column density corrected [DU]	$(1.548 \pm 34.703) \times 10^{-2}$	13751621	0.340	7.857×10^{-3}	-13.1	45.3	-0.161	0.179
sulfurdioxide slant column density cobra [DU]	$(1.538 \pm 34.189) \times 10^{-2}$	13751621	0.340	7.857×10^{-3}	-13.1	21.3	-0.161	0.179
sulfurdioxide slant column density cobra precision [DU]	0.279 ± 0.139	13751621	0.132	0.232	7.745×10^{-2}	24.1	0.193	0.326
sulfurdioxide slant column density window1 [DU]	0.175 ± 0.657	13751621	0.704	0.189	-30.5	133	-0.169	0.535
sulfurdioxide slant column density window1 precision [DU]	0.279 ± 0.139	13751621	0.132	0.232	7.745×10^{-2}	24.1	0.193	0.326
sulfurdioxide slant column density corrected win1 [DU]	$(4.439 \pm 642.090) \times 10^{-3}$	13751621	0.681	-9.382×10^{-3}	-30.5	133	-0.346	0.335
background so2 slant column offset window1 [DU]	-0.171 ± 0.173	13751621	0.206	-0.204	-1.44	5.05	-0.292	-8.569×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.673 ± 8.734	13751621	11.0	0.462	-698	1.217×10^{3}	-4.97	6.06
sulfurdioxide slant column density window2 precision [DU]	7.92 ± 2.14	13751621	2.50	7.57	2.00	625	6.49	8.99
sulfurdioxide slant column density corrected win2 [DU]	-0.692 ± 8.469	13751621	10.8	-0.671	-698	1.207×10^{3}	-6.07	4.70
background so2 slant column offset window2 [DU]	-1.36 ± 2.41	13751621	2.55	-0.585	-16.7	4.60	-2.30	0.250
sulfurdioxide slant column density window3 [DU]	-0.553 ± 23.979	13751621	30.4	-0.735	-1.271×10^{3}	836	-15.7	14.7
sulfurdioxide slant column density window3 precision [DU]	28.0 ± 12.8	13751621	9.58	24.4	10.0	433	20.9	30.4
sulfurdioxide slant column density corrected win3 [DU]	8.17 ± 22.79	13751621	29.1	7.90	-1.270×10^{3}	838	-6.40	22.7
background so2 slant column offset window3 [DU]	8.72 ± 6.97	13751621	10.6	8.08	-29.5	56.9	3.44	14.1
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.18	13751621	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.476 \pm 4.175) \times 10^{-2}$	13751621	1.620×10^{-2}	1.709×10^{-2}	5.569×10^{-4}	3.13	1.094×10^{-2}	2.714×10^{-2}
fitted radiance shift [nm]	$(-2.487 \pm 25.107) \times 10^{-4}$	13751621	1.871×10^{-3}	-2.149×10^{-4}	-4.277×10^{-2}	3.642×10^{-2}	-1.220×10^{-3}	6.506×10^{-4}
fitted radiance squeeze [1]	$(-3.551 \pm 17.594) \times 10^{-5}$	13751621	1.969×10^{-4}	-2.465×10^{-5}	-1.394×10^{-2}	1.473×10^{-2}	-1.270×10^{-4}	6.990×10^{-5}
fitted root mean square [1]	$(1.221 \pm 0.552) \times 10^{-3}$	13751621	5.097×10^{-4}	1.049×10^{-3}	3.293×10^{-4}	6.676×10^{-2}	8.836×10^{-4}	1.393×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.841 ± 0.391	13751621	0.479	0.807	5.000×10^{-2}	2.71	0.573	1.05
sulfurdioxide total air mass factor polluted precision [1]	0.116 ± 0.113	13751621	0.117	7.178×10^{-2}	2.500×10^{-3}	1.50	4.064×10^{-2}	0.157
sulfurdioxide clear air mass factor polluted [1]	0.725 ± 0.275	13751621	0.350	0.701	4.260×10^{-2}	2.66	0.541	0.891
number of spectral points in retrieval [1]	73.5 ± 0.5	13751621	1.000	73.0	70.0	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]	0.581 ± 0.419	3820249	0.860	0.490	0.0	1.000	0.140	1.000
sulfurdioxide total vertical column [DU]	0.107 ± 2.482	3820249	0.525	1.295×10^{-2}	-145	351	-0.240	0.285
sulfurdioxide total vertical column precision [DU]	0.947 ± 1.747	3820249	0.674	0.375	3.777×10^{-2}	44.3	0.213	0.887
sulfurdioxide slant column density corrected [DU]	$(2.749 \pm 42.847) \times 10^{-2}$	3820249	0.392	1.168×10^{-2}	-7.87	73.7	-0.182	0.211
sulfurdioxide slant column density cobra [DU]	$(2.721 \pm 41.307) \times 10^{-2}$	3820249	0.392	1.168×10^{-2}	-7.87	33.8	-0.182	0.211
sulfurdioxide slant column density cobra precision [DU]	0.320 ± 0.151	3820249	0.176	0.285	8.252×10^{-2}	18.3	0.213	0.389
sulfurdioxide slant column density window1 [DU]	0.198 ± 0.786	3820249	0.816	0.213	-80.6	43.8	-0.204	0.611
sulfurdioxide slant column density window1 precision [DU]	0.320 ± 0.151	3820249	0.176	0.285	8.252×10^{-2}	18.3	0.213	0.389
sulfurdioxide slant column density corrected win1 [DU]	$(6.346 \pm 77.415) \times 10^{-2}$	3820249	0.785	2.810×10^{-2}	-80.6	43.5	-0.353	0.432
background so2 slant column offset window1 [DU]	-0.135 ± 0.225	3820249	0.254	-0.194	-1.35	2.13	-0.292	-3.800×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.06 ± 9.72	3820249	12.3	1.81	-2.612×10^{3}	585	-4.19	8.07
sulfurdioxide slant column density window2 precision [DU]	8.45 ± 2.46	3820249	2.73	8.09	2.32	465	6.90	9.63
sulfurdioxide slant column density corrected win2 [DU]	-0.466 ± 9.168	3820249	11.4	-0.458	-2.611×10^{3}	584	-6.17	5.26
background so2 slant column offset window2 [DU]	-2.53 ± 3.16	3820249	5.10	-1.32	-16.1	4.34	-5.00	9.580×10^{-2}
sulfurdioxide slant column density window3 [DU]	-10.6 ± 23.5	3820249	29.4	-10.1	-884	1.476×10^{3}	-25.1	4.33
sulfurdioxide slant column density window3 precision [DU]	29.8 ± 14.5	3820249	10.2	26.0	10.7	602	21.9	32.0
sulfurdioxide slant column density corrected win3 [DU]	0.633 ± 23.740	3820249	29.6	1.30	-885	1.482×10^{3}	-13.8	15.8
background so2 slant column offset window3 [DU]	11.2 ± 7.9	3820249	13.6	11.6	-25.3	35.0	4.43	18.1
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.27	3820249	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.029 \pm 13.900) \times 10^{-2}$	3820249	4.274×10^{-2}	2.114×10^{-2}	6.144×10^{-4}	2.91	9.029×10^{-3}	5.176×10^{-2}
fitted radiance shift [nm]	$(-3.870 \pm 28.788) \times 10^{-4}$	3820249	1.806×10^{-3}	-4.436×10^{-4}	-4.934×10^{-2}	6.178×10^{-2}	-1.372×10^{-3}	4.345×10^{-4}
fitted radiance squeeze [1]	$(-3.218 \pm 19.911) \times 10^{-5}$	3820249	2.249×10^{-4}	-2.334×10^{-5}	-1.928×10^{-2}	1.562×10^{-2}	-1.402×10^{-4}	8.473×10^{-5}
fitted root mean square [1]	$(1.412 \pm 0.644) \times 10^{-3}$	3820249	6.901×10^{-4}	1.250×10^{-3}	3.473×10^{-4}	6.897×10^{-2}	9.777×10^{-4}	1.668×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.862 ± 0.642	3820249	0.784	0.679	5.000×10^{-2}	2.92	0.383	1.17
sulfurdioxide total air mass factor polluted precision [1]	0.139 ± 0.191	3820249	0.155	5.938×10^{-2}	2.500×10^{-3}	2.10	2.593×10^{-2}	0.180
sulfurdioxide clear air mass factor polluted [1]	0.782 ± 0.642	3820249	0.524	0.606	1.984×10^{-2}	2.96	0.367	0.890
number of spectral points in retrieval [1]	73.4 ± 0.5	3820249	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

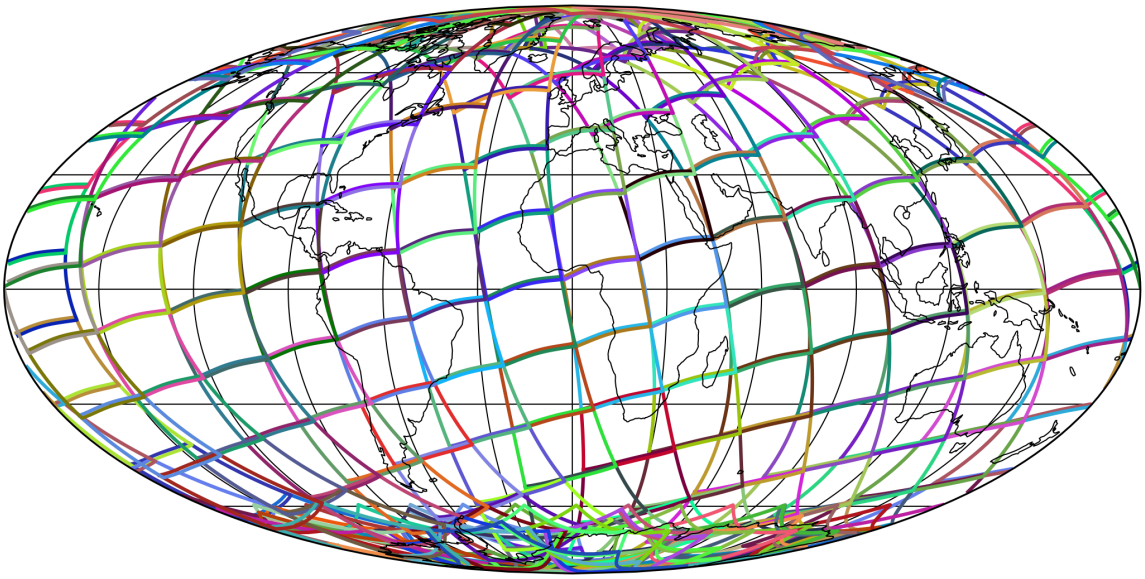

Figure 1: Outline of the granules.

4 Input data monitoring

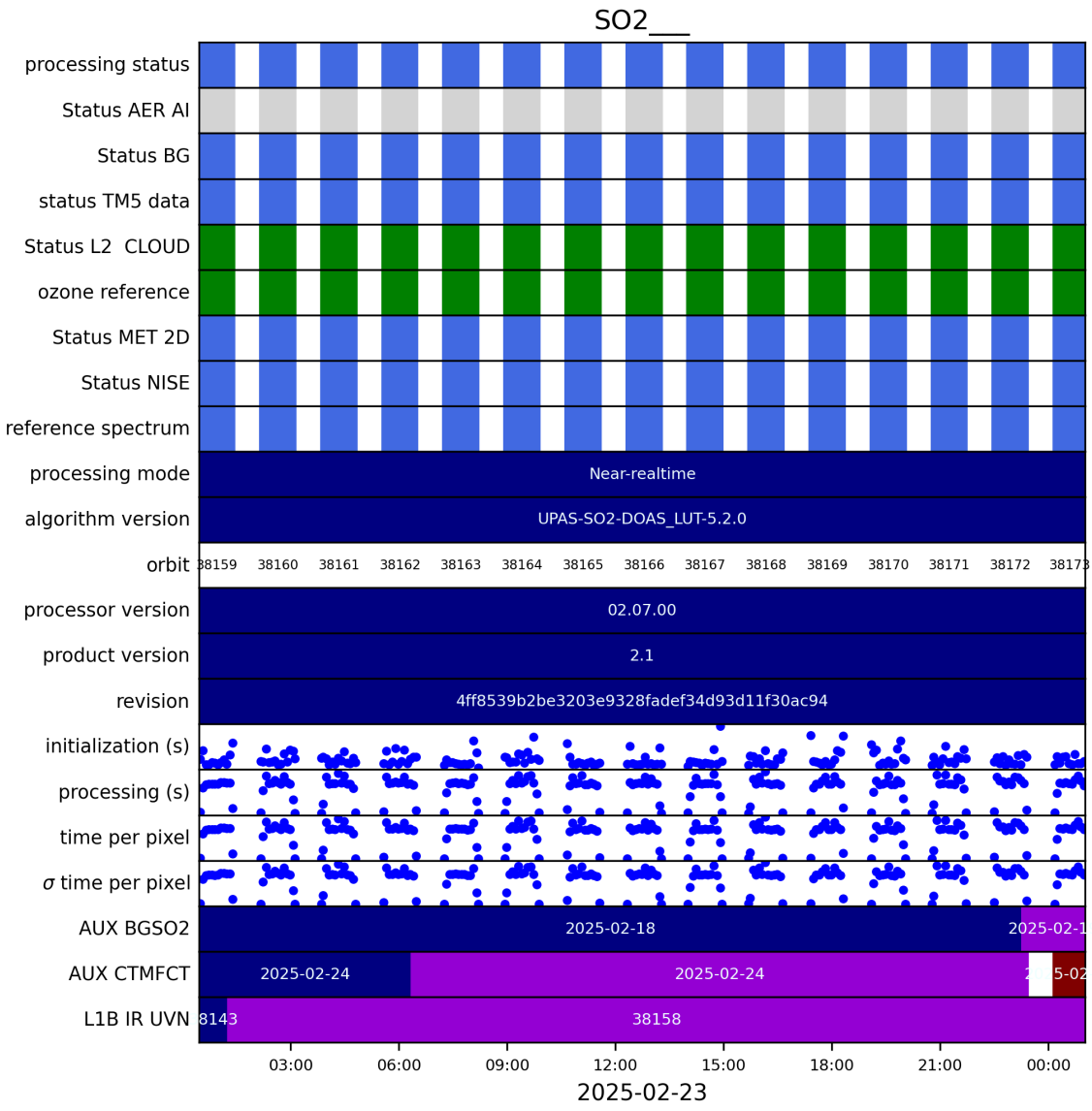

Figure 2: Input data per granule

5 Warnings and errors

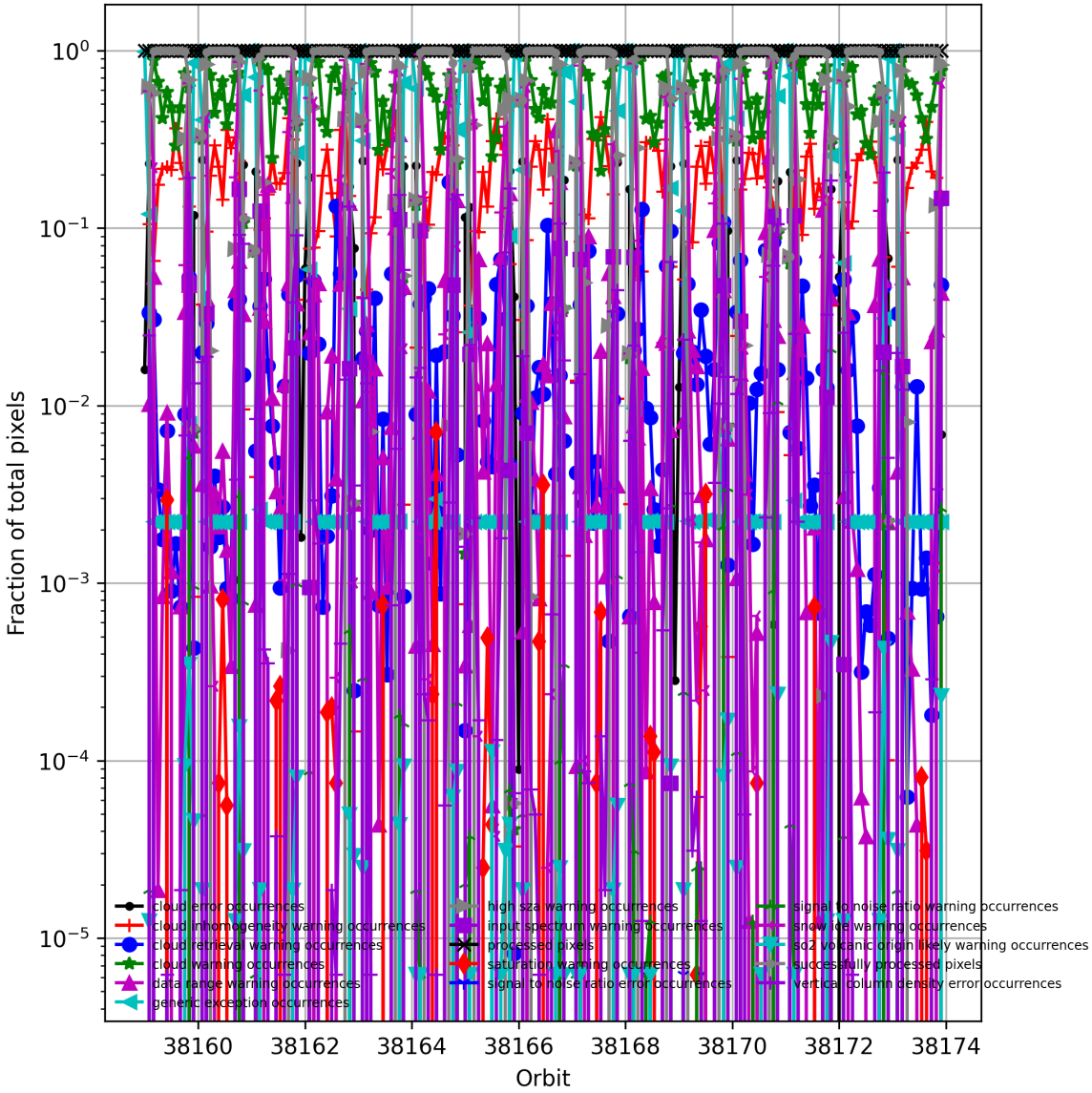

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

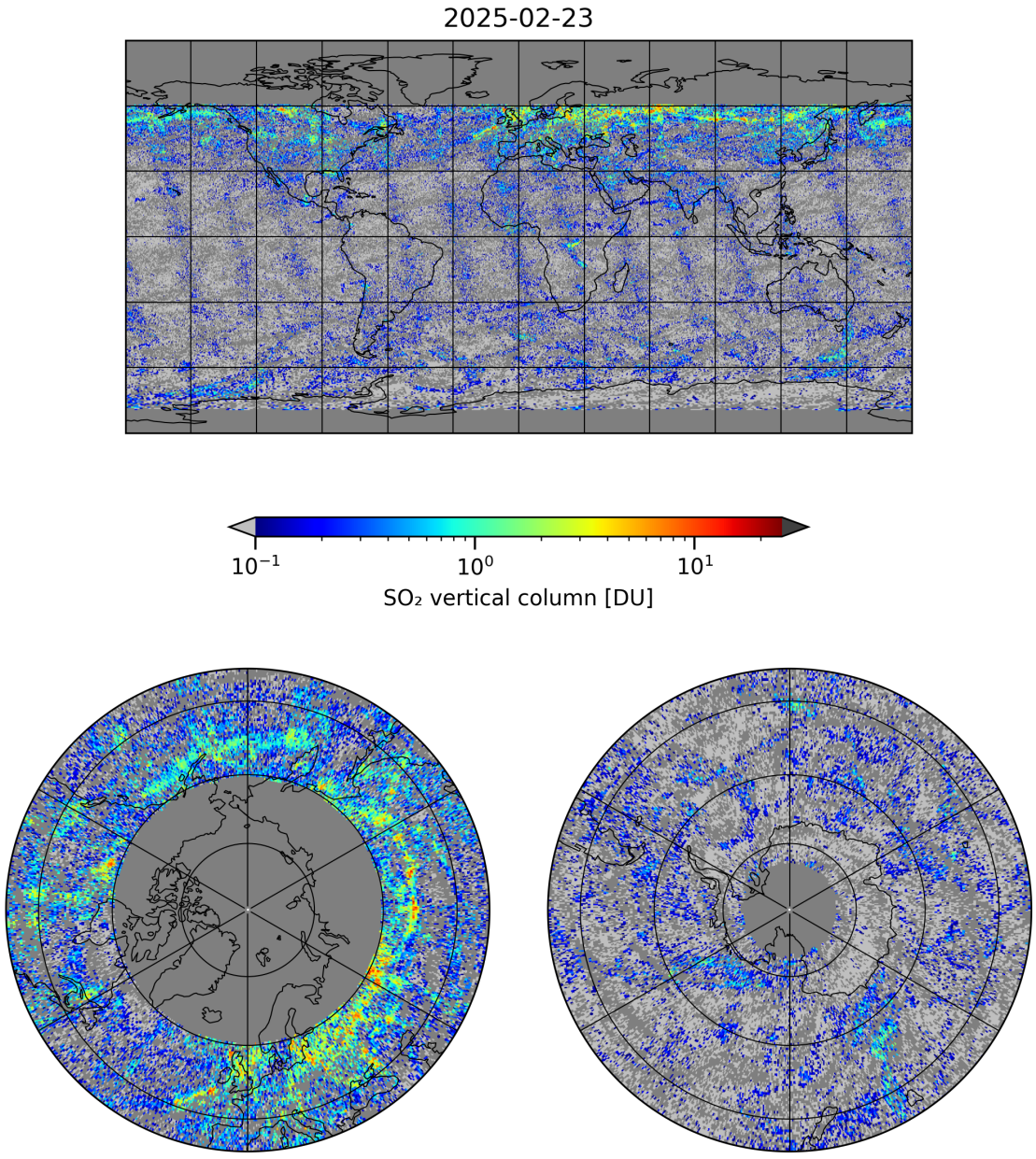

Figure 4: Map of "SO_2 vertical column" for 2025-02-23 to 2025-02-24

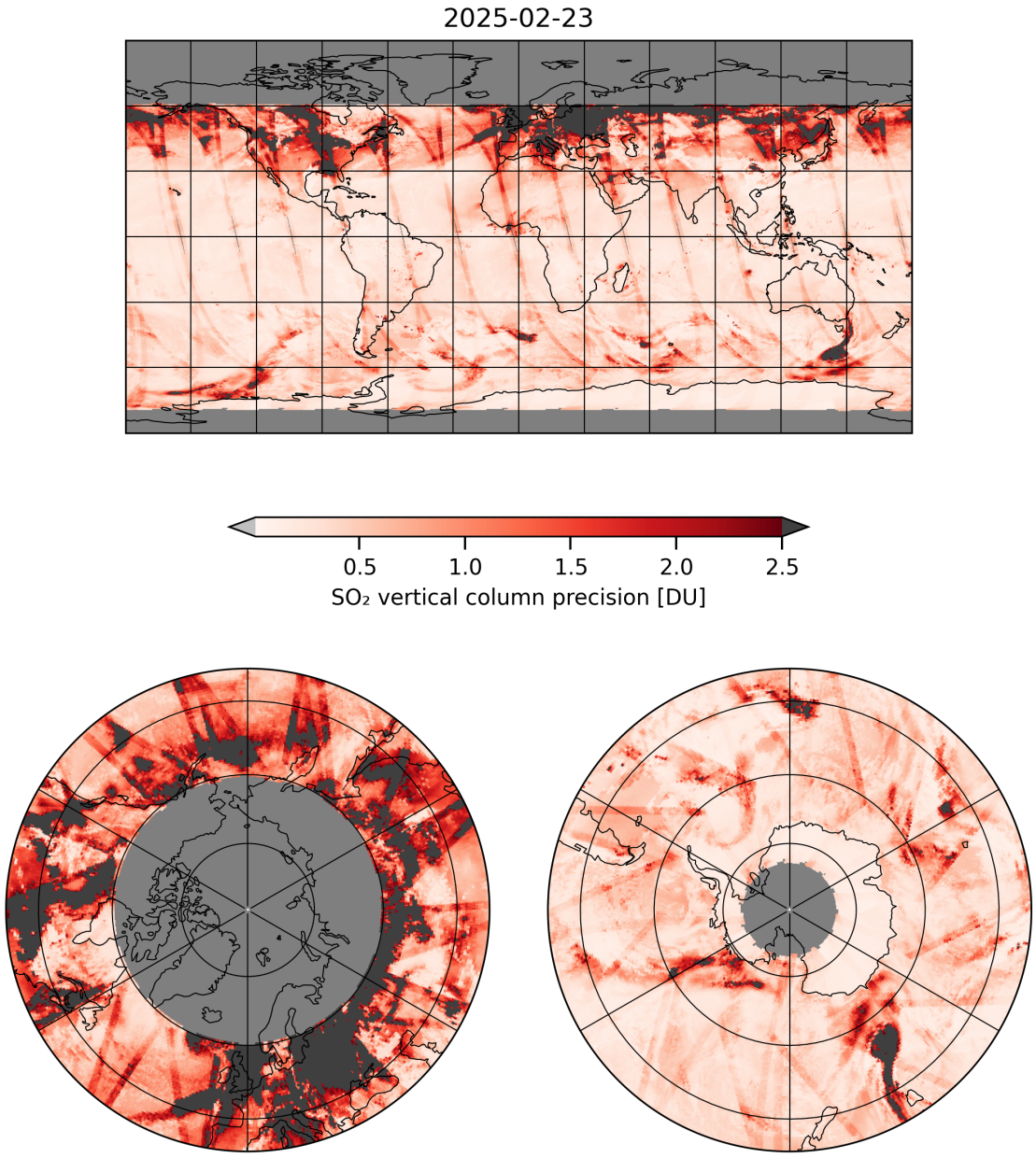

Figure 5: Map of "SO_2 vertical column precision" for 2025-02-23 to 2025-02-24

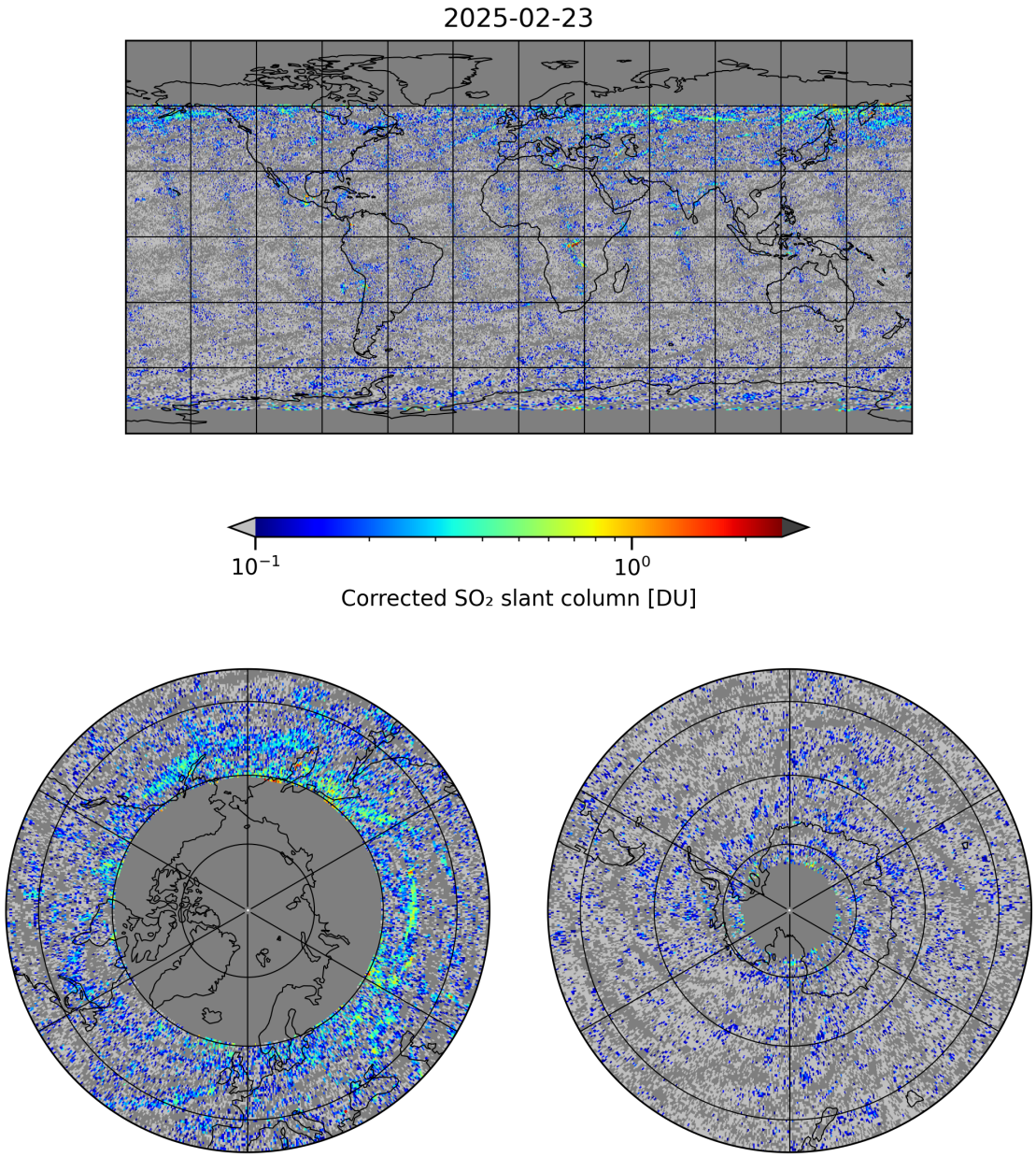

Figure 6: Map of "Corrected SO_2 slant column" for 2025-02-23 to 2025-02-24

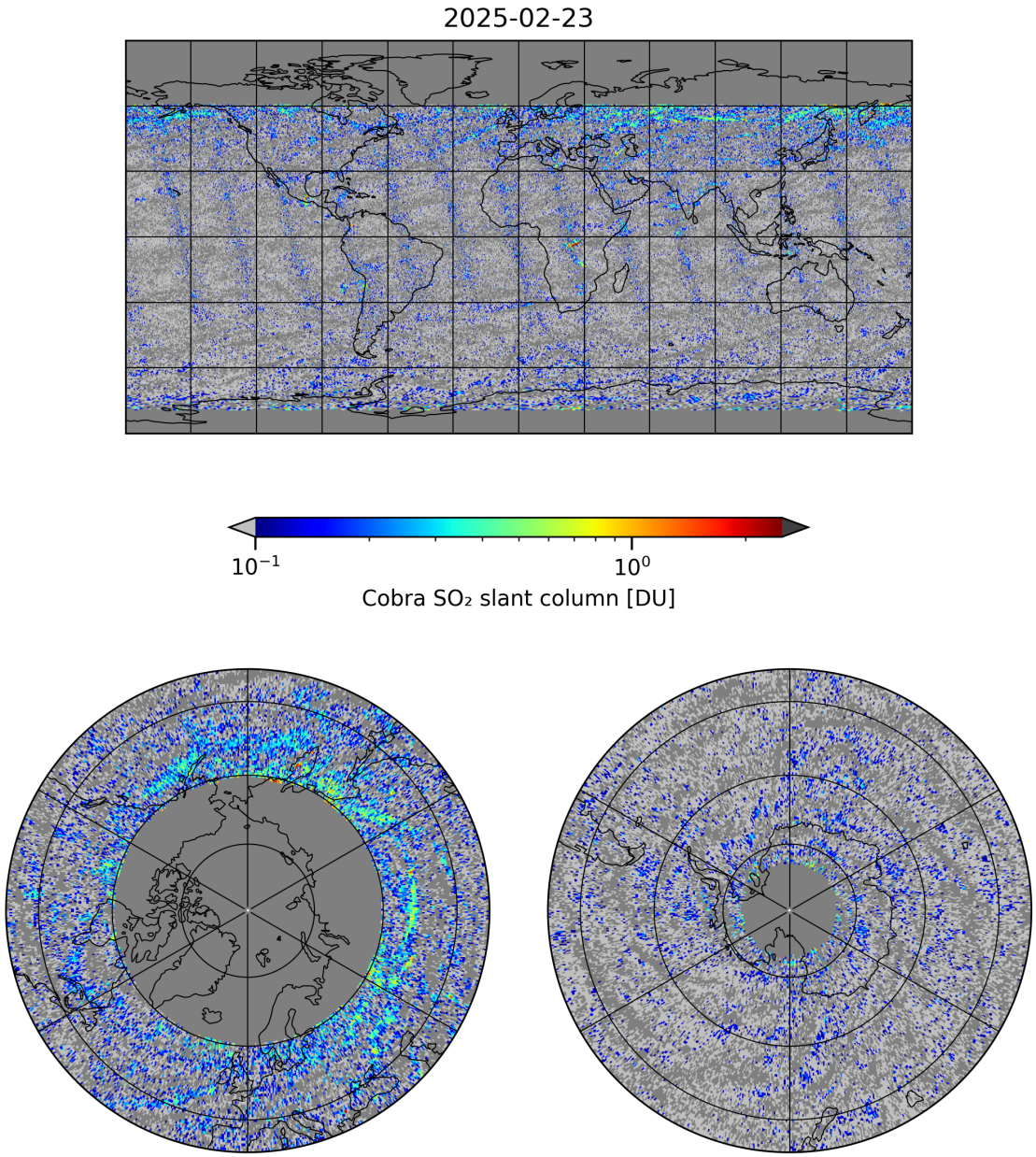

Figure 7: Map of "Cobra SO_2 slant column" for 2025-02-23 to 2025-02-24

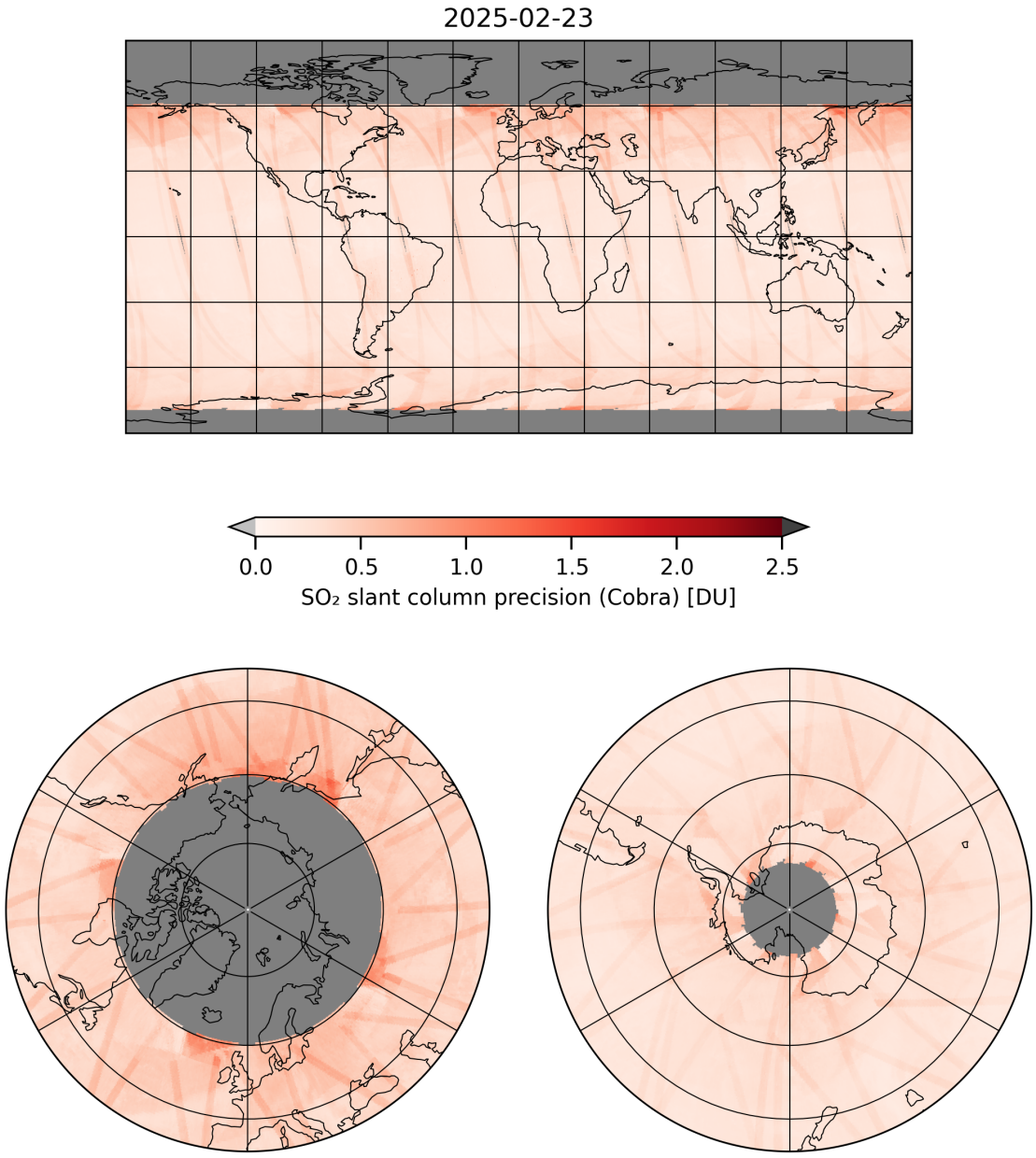

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-02-23 to 2025-02-24

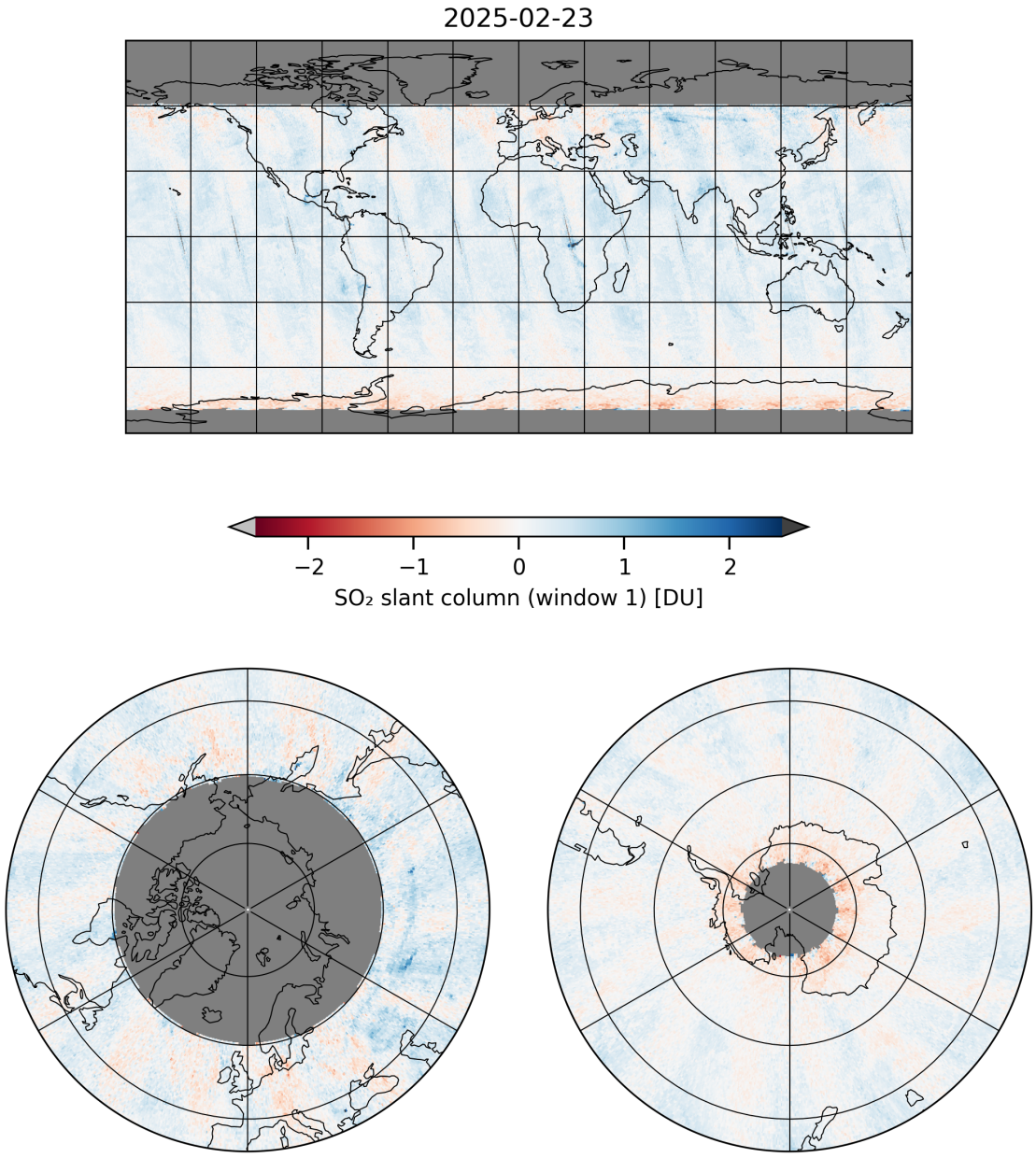

Figure 9: Map of "SO_2 slant column (window 1)" for 2025-02-23 to 2025-02-24

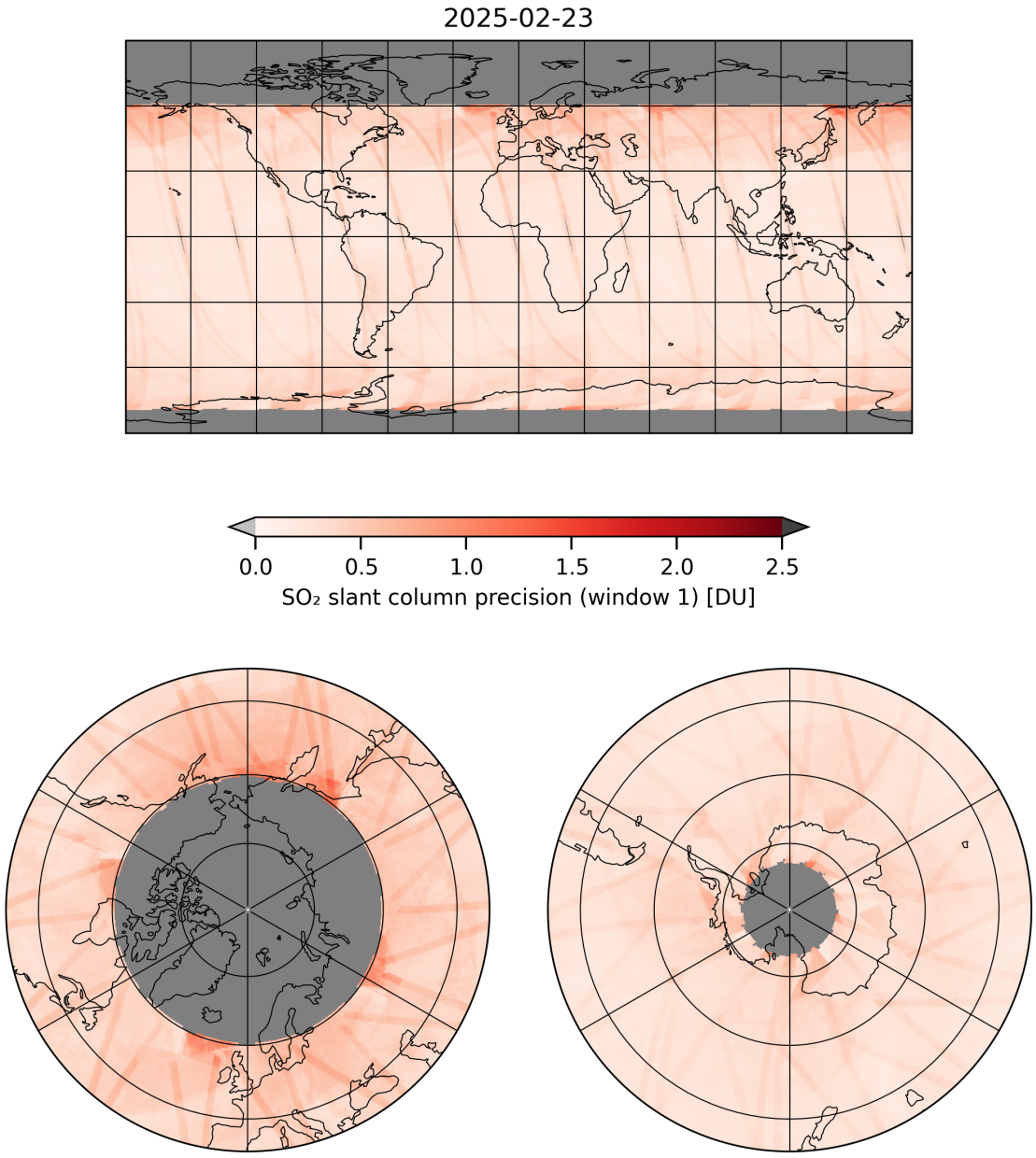

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-02-23 to 2025-02-24

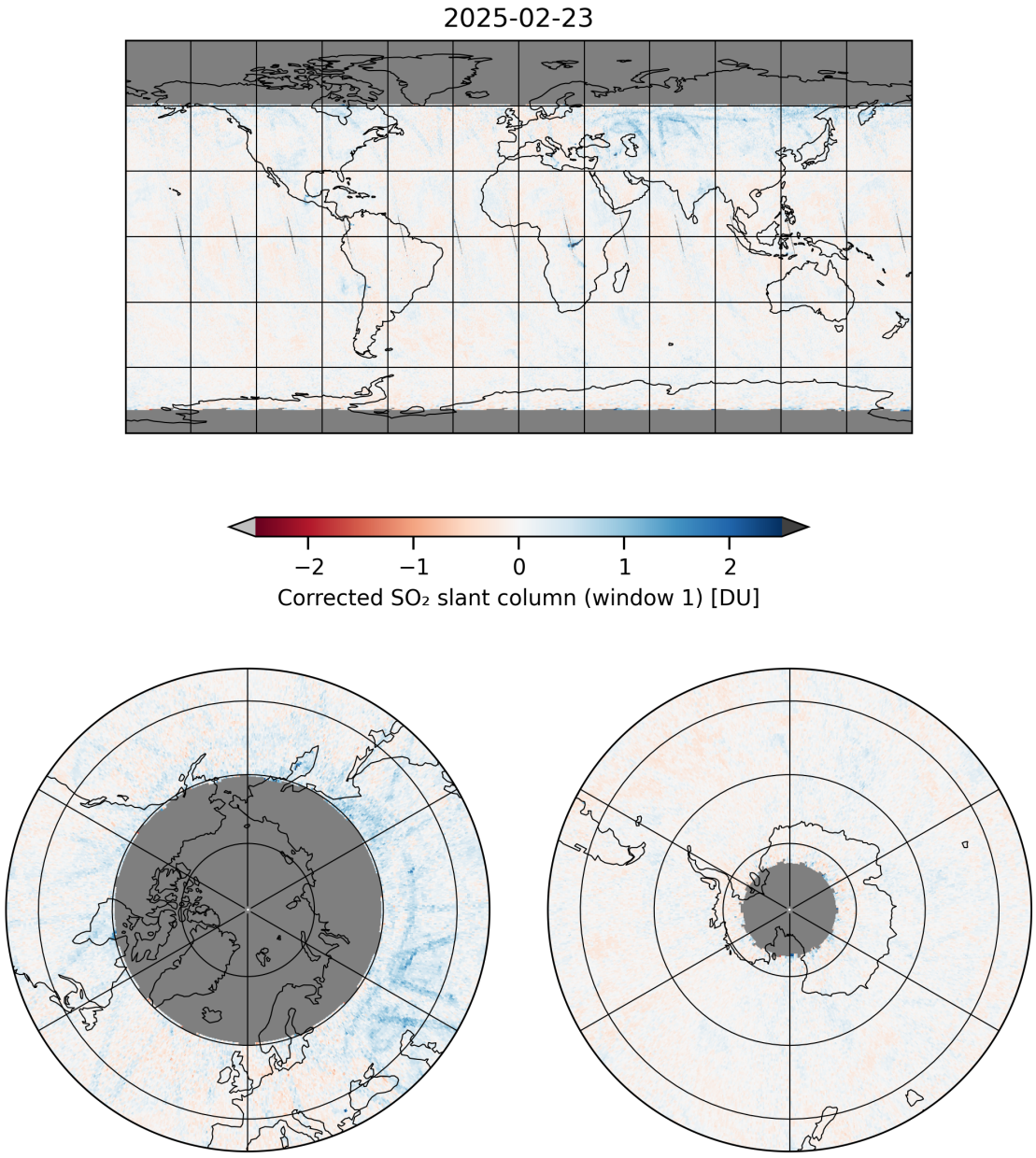

Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-02-23 to 2025-02-24

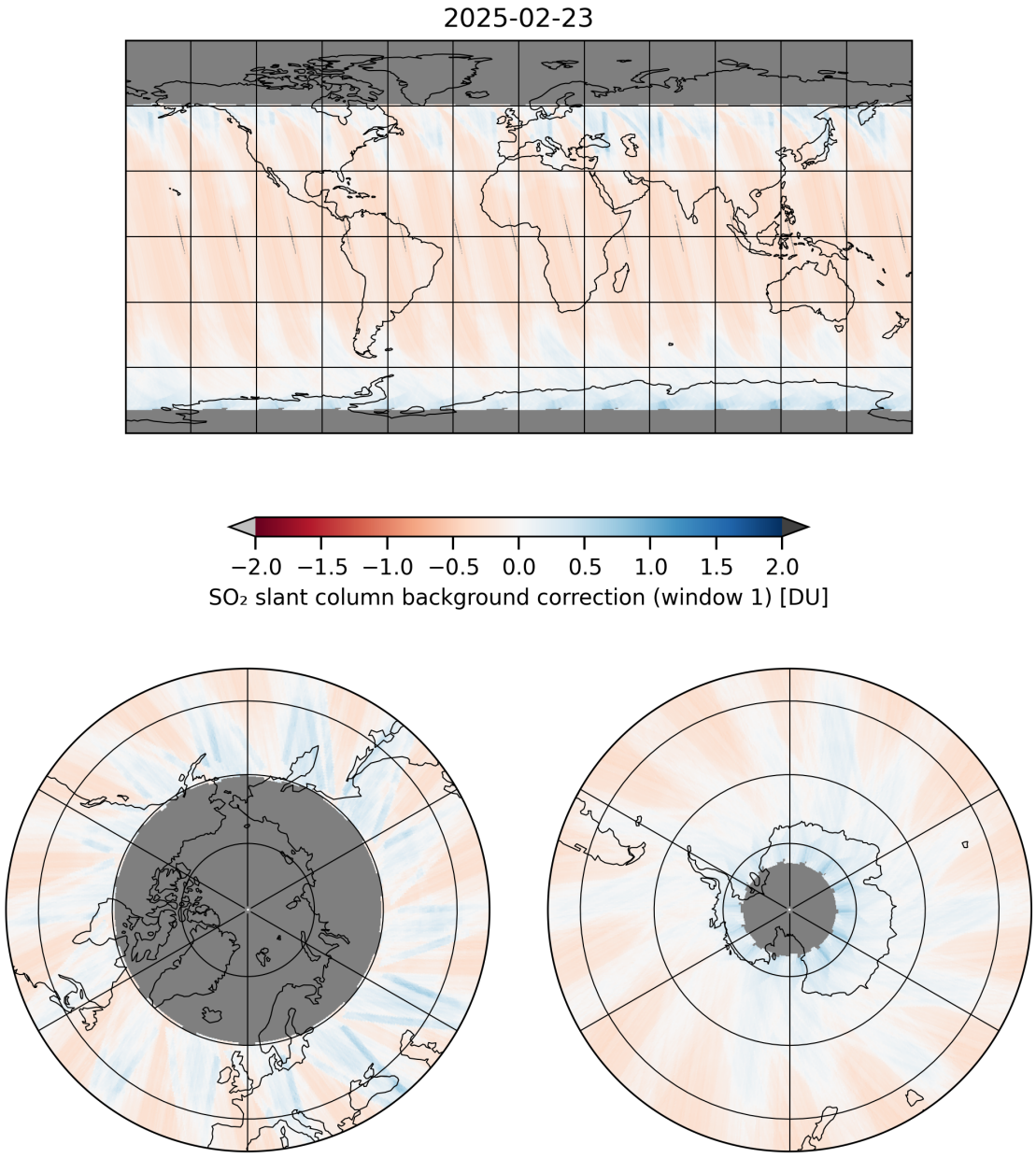

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-02-23 to 2025-02-24

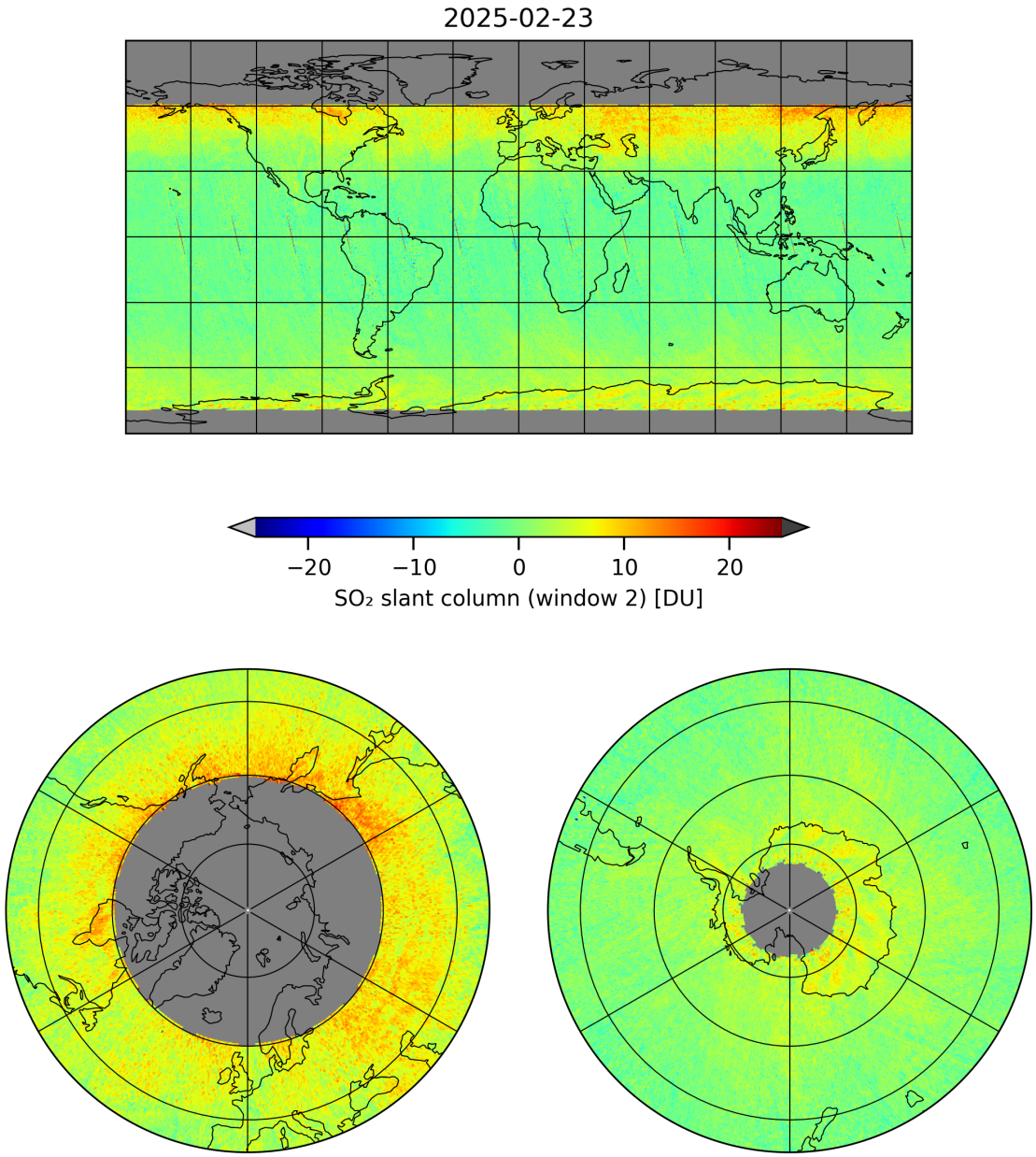

Figure 13: Map of "SO_2 slant column (window 2)" for 2025-02-23 to 2025-02-24

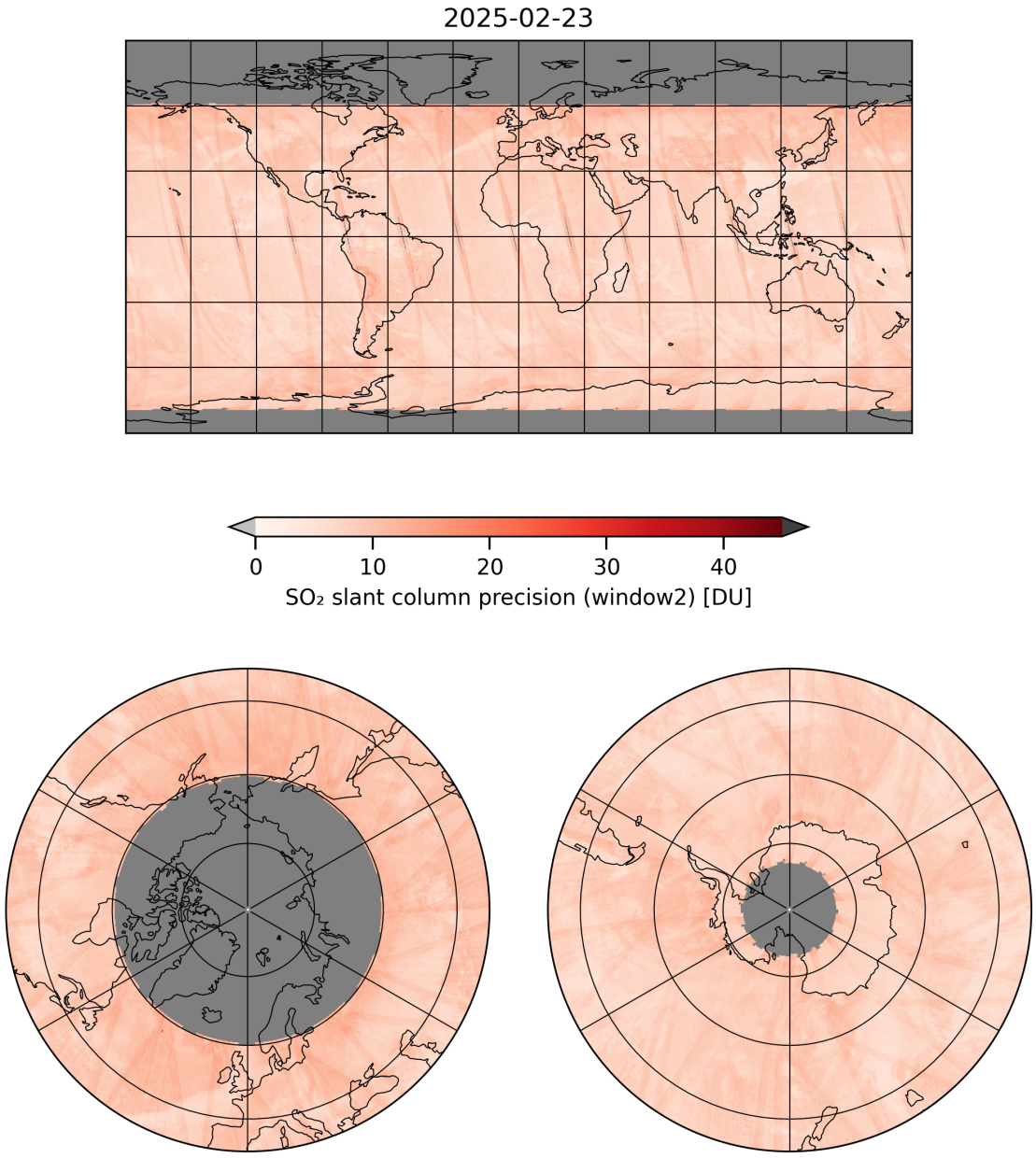

Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-02-23 to 2025-02-24

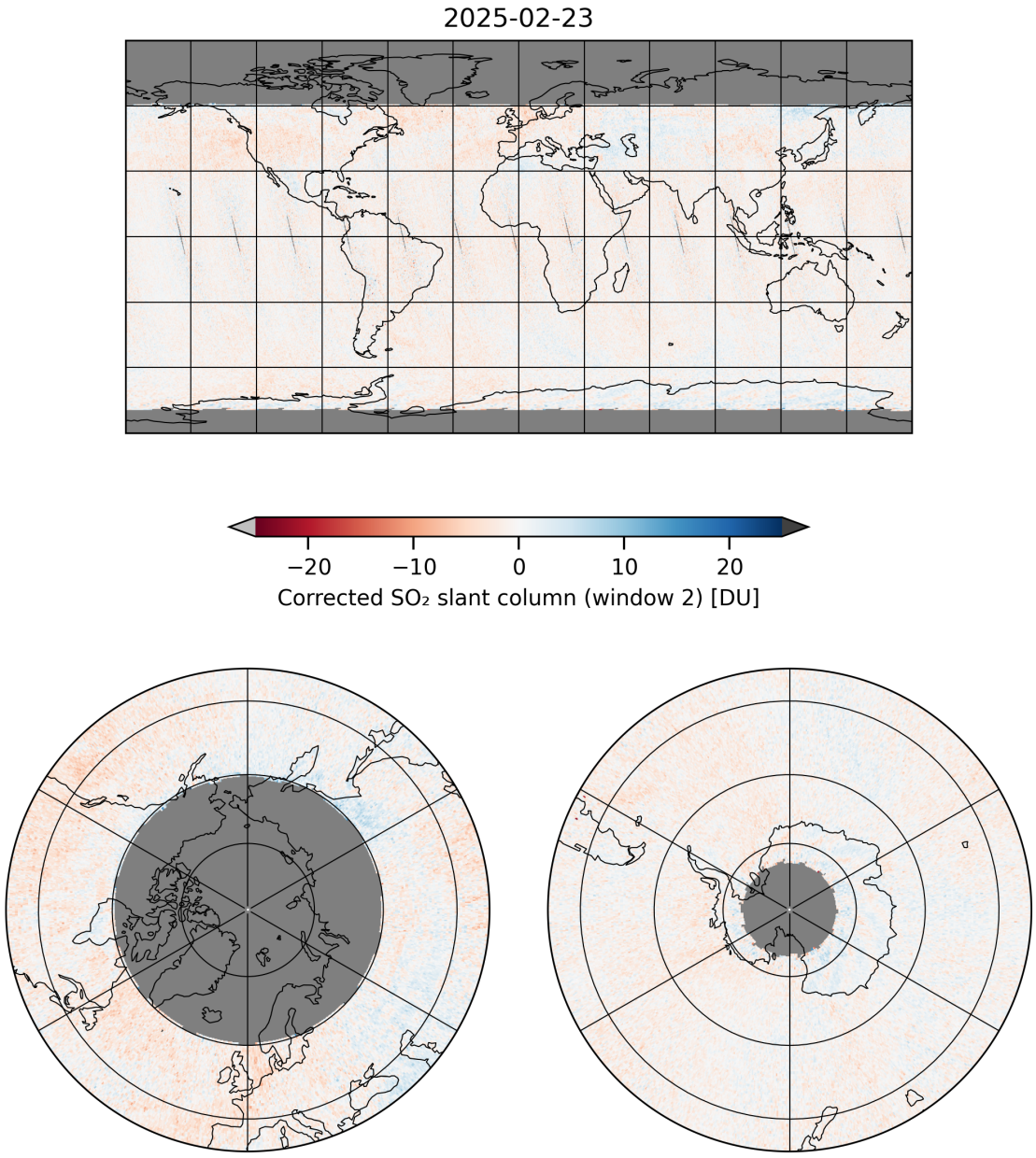

Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2025-02-23 to 2025-02-24

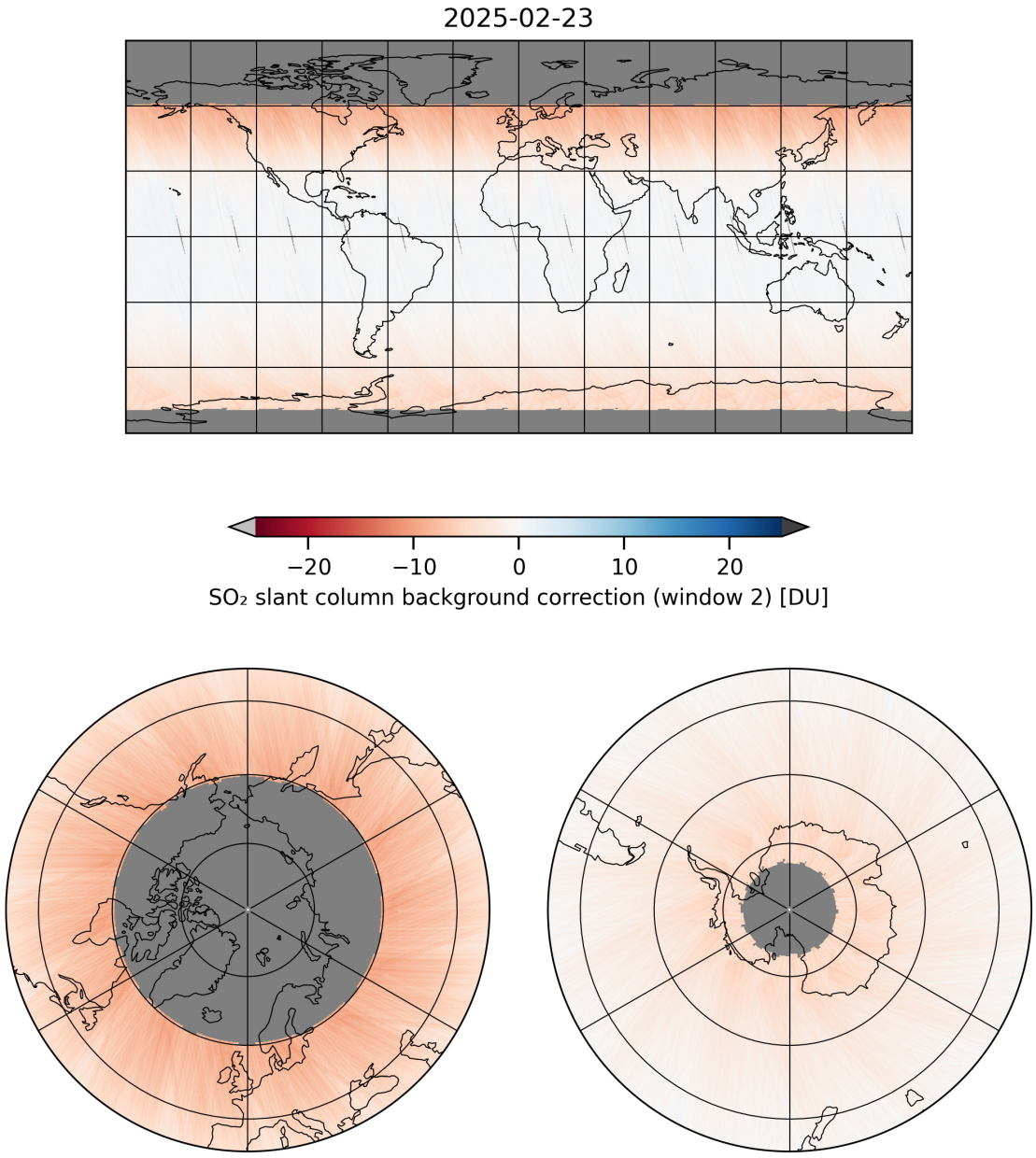

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-02-23 to 2025-02-24

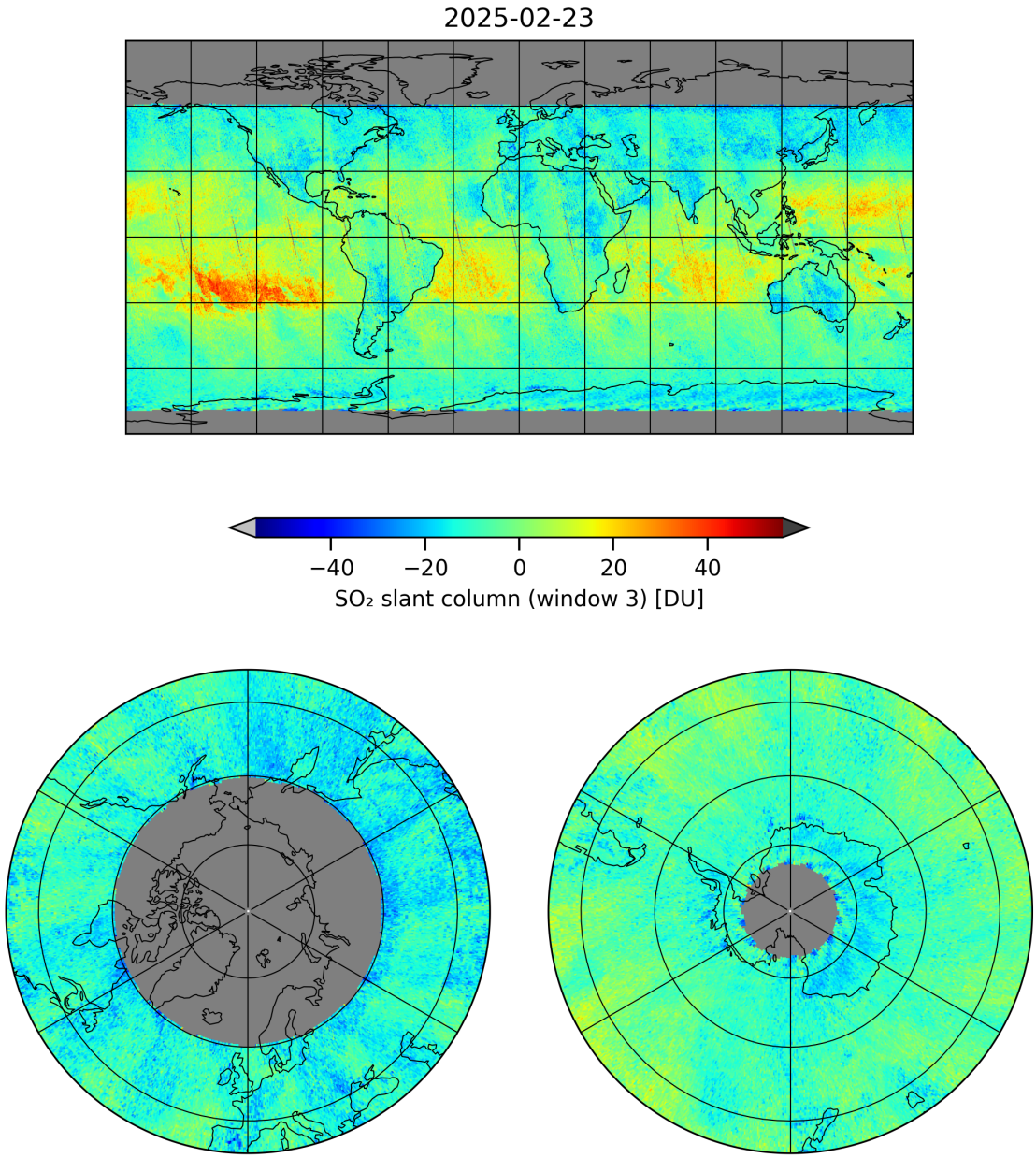

Figure 17: Map of "SO_2 slant column (window 3)" for 2025-02-23 to 2025-02-24

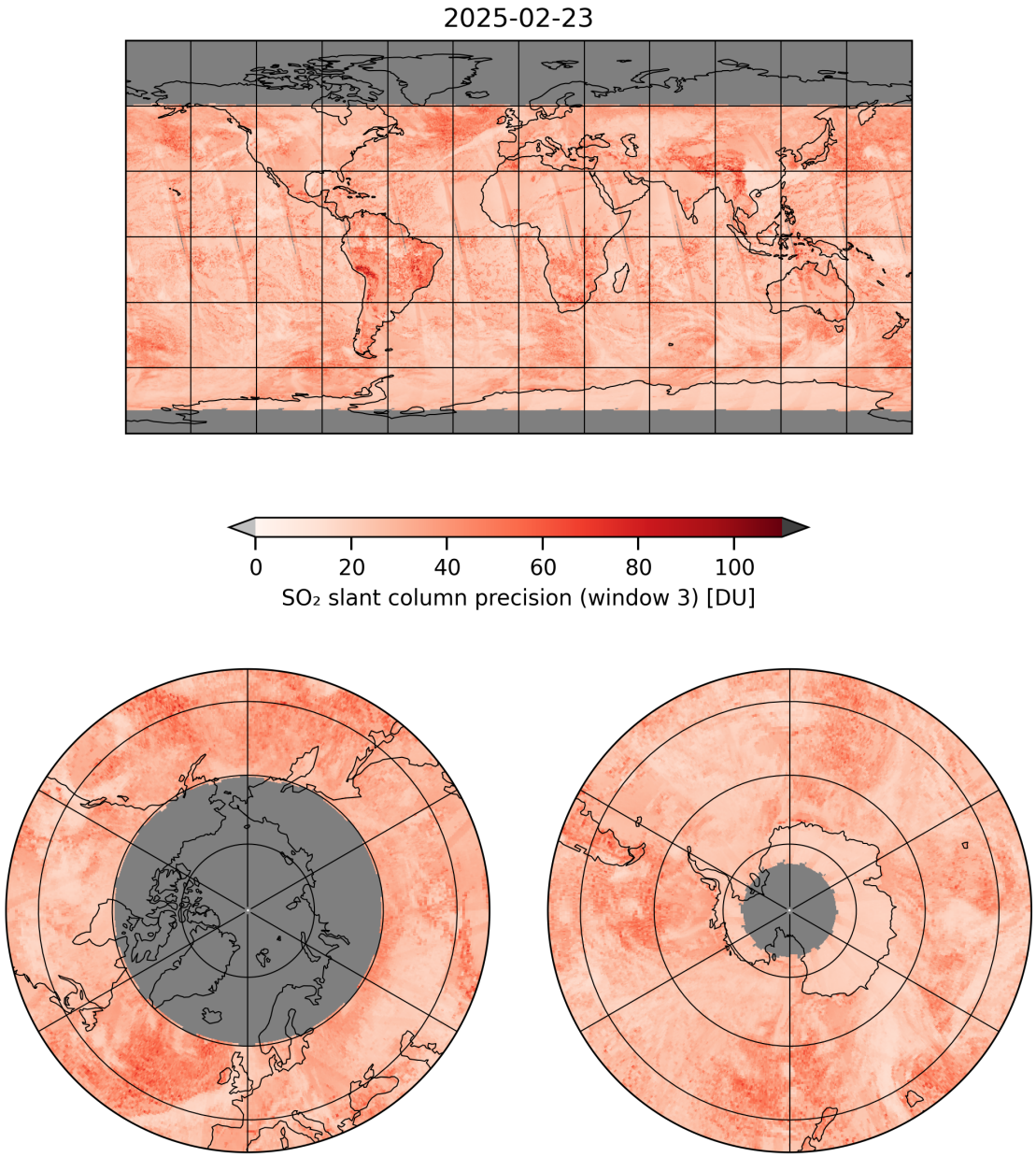

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-02-23 to 2025-02-24

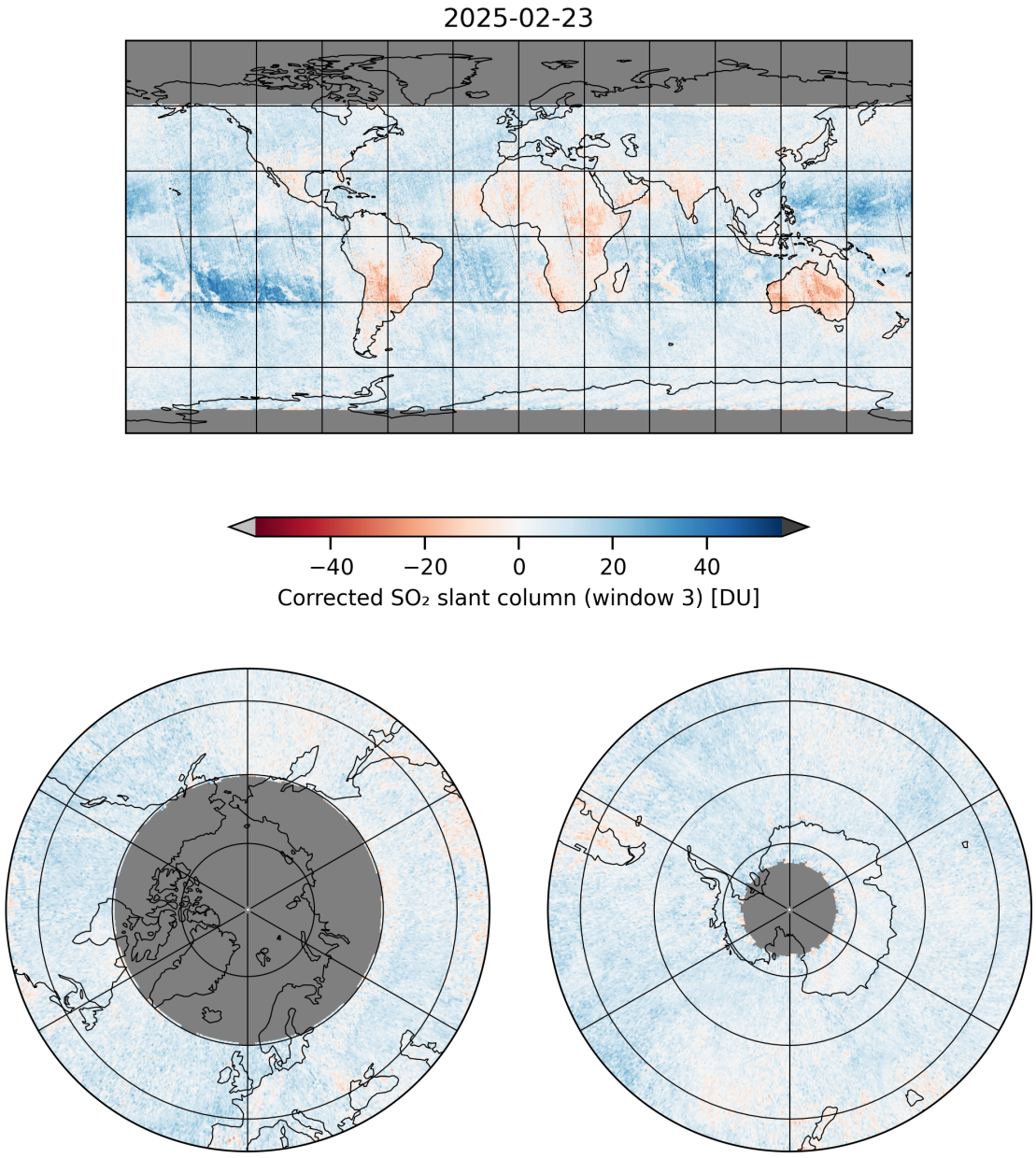

Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-02-23 to 2025-02-24

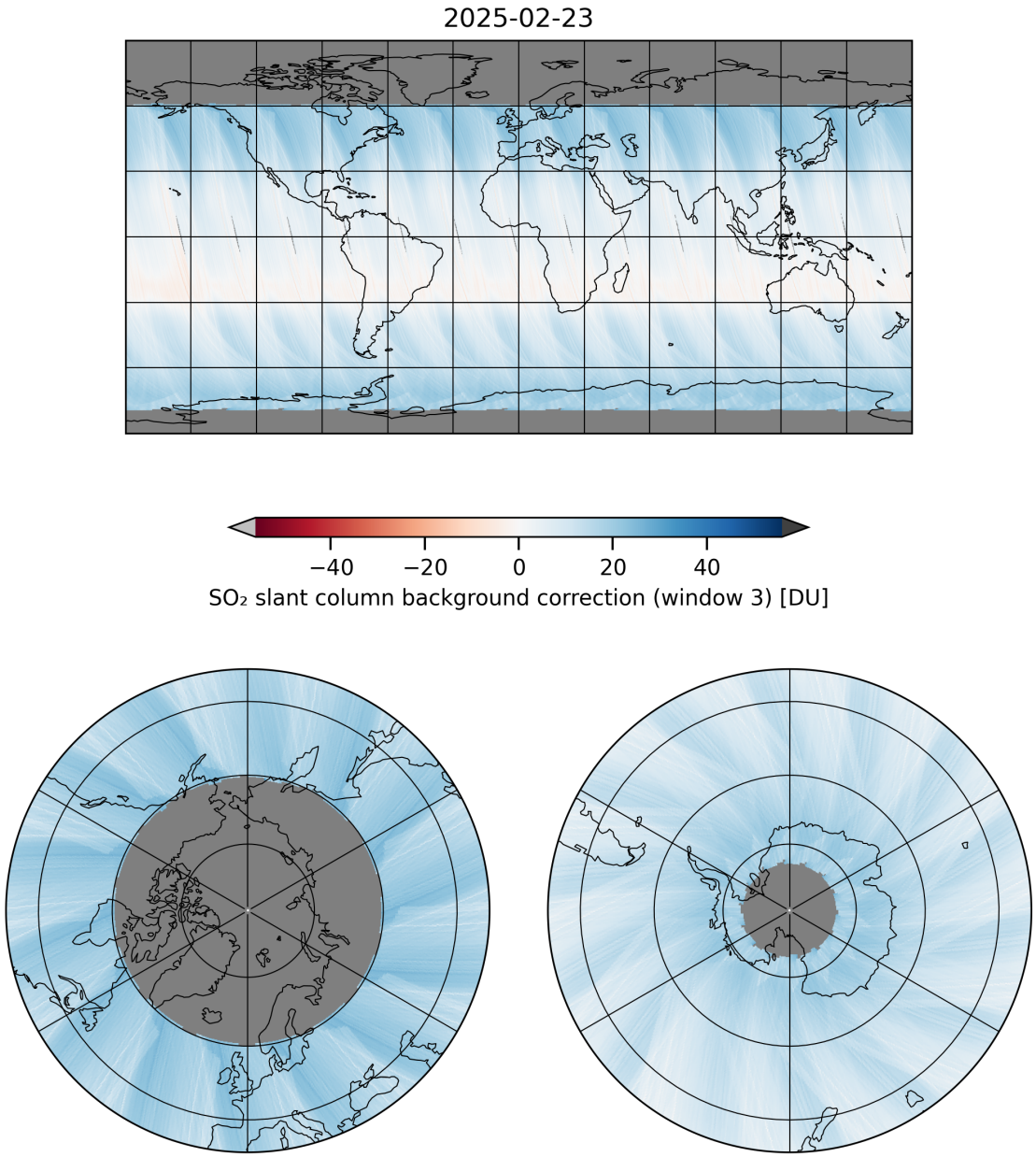

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-02-23 to 2025-02-24

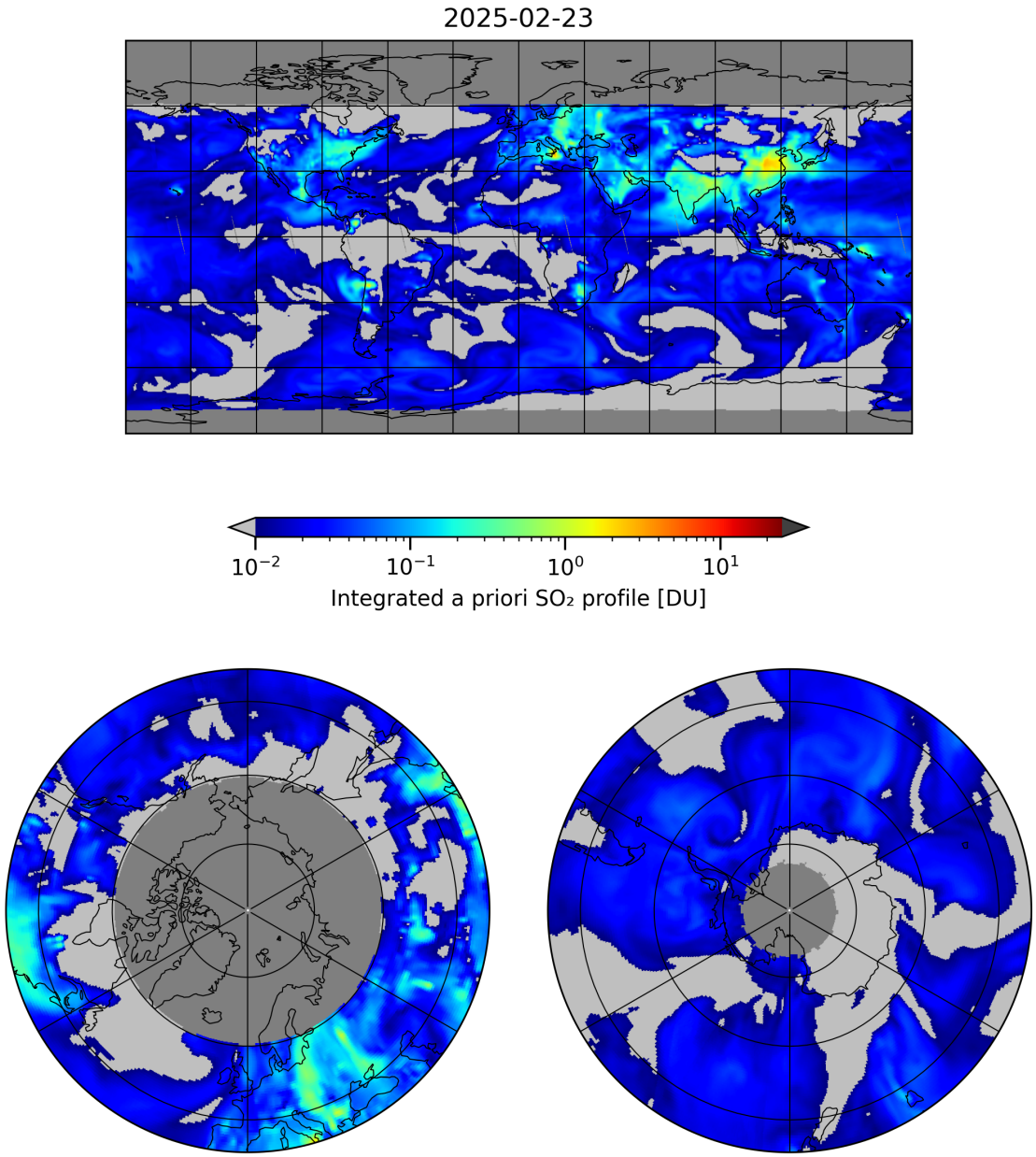

Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-02-23 to 2025-02-24

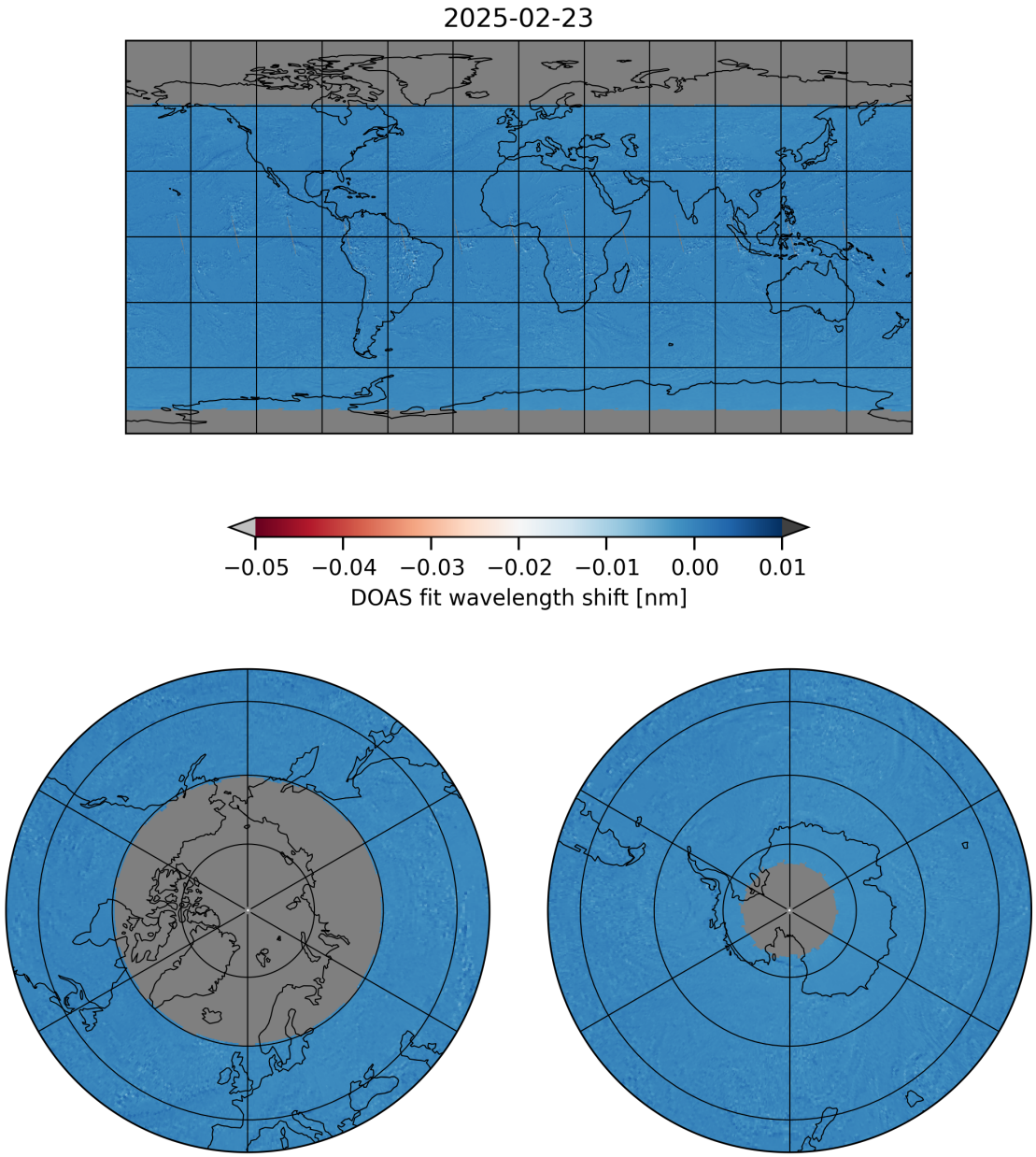

Figure 22: Map of “DOAS fit wavelength shift” for 2025-02-23 to 2025-02-24

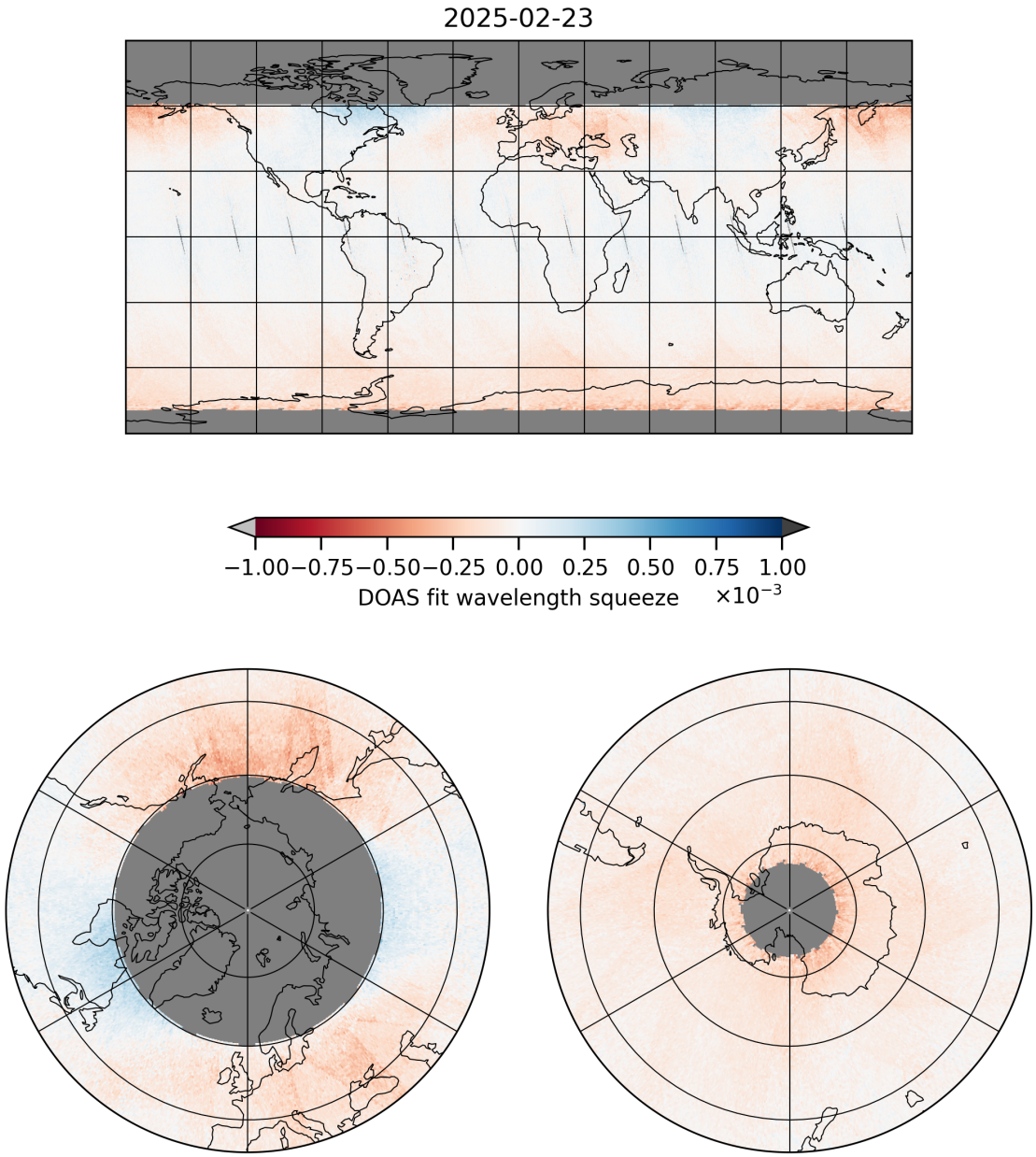

Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-02-23 to 2025-02-24

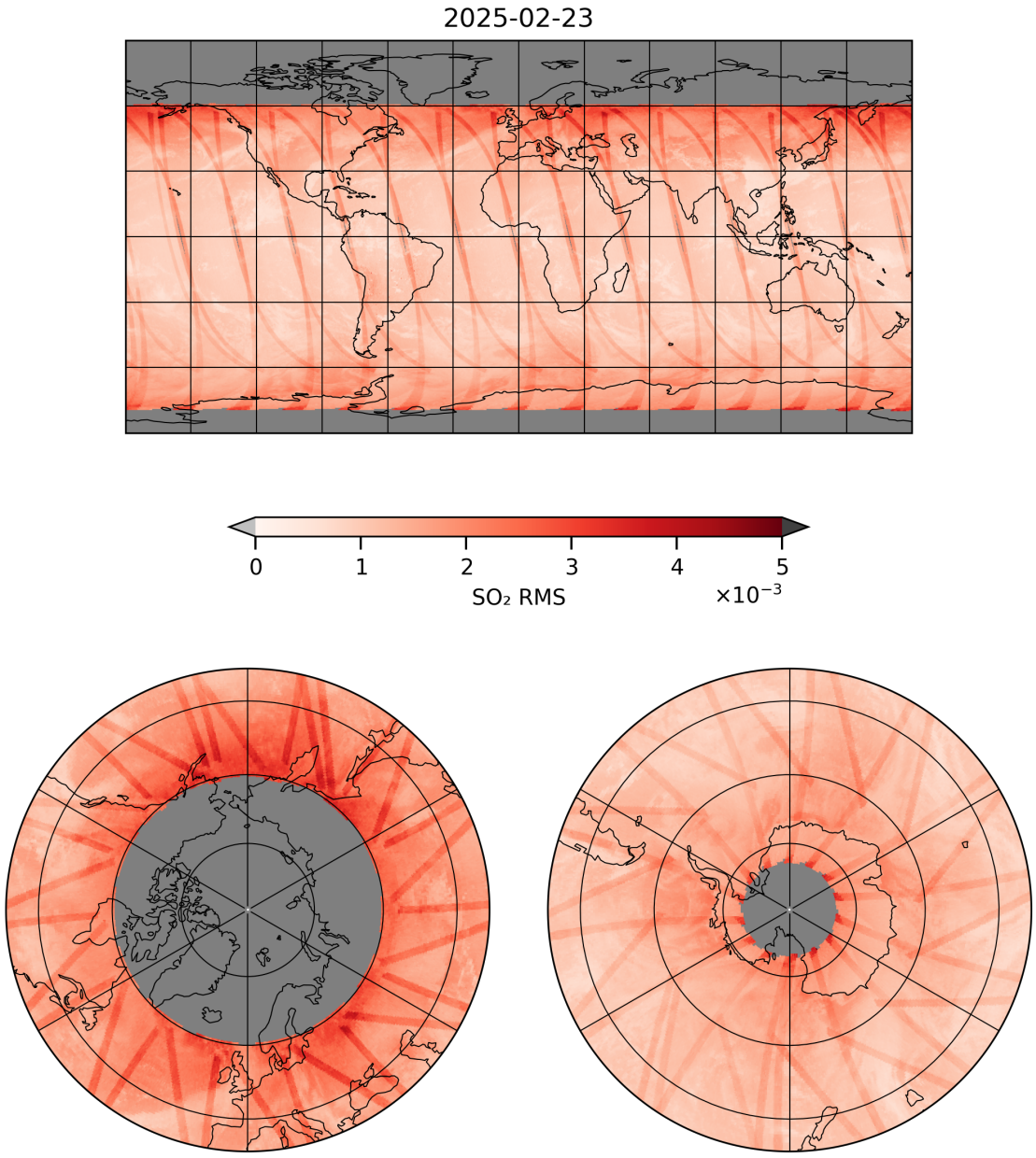

Figure 24: Map of "SO_2 RMS" for 2025-02-23 to 2025-02-24

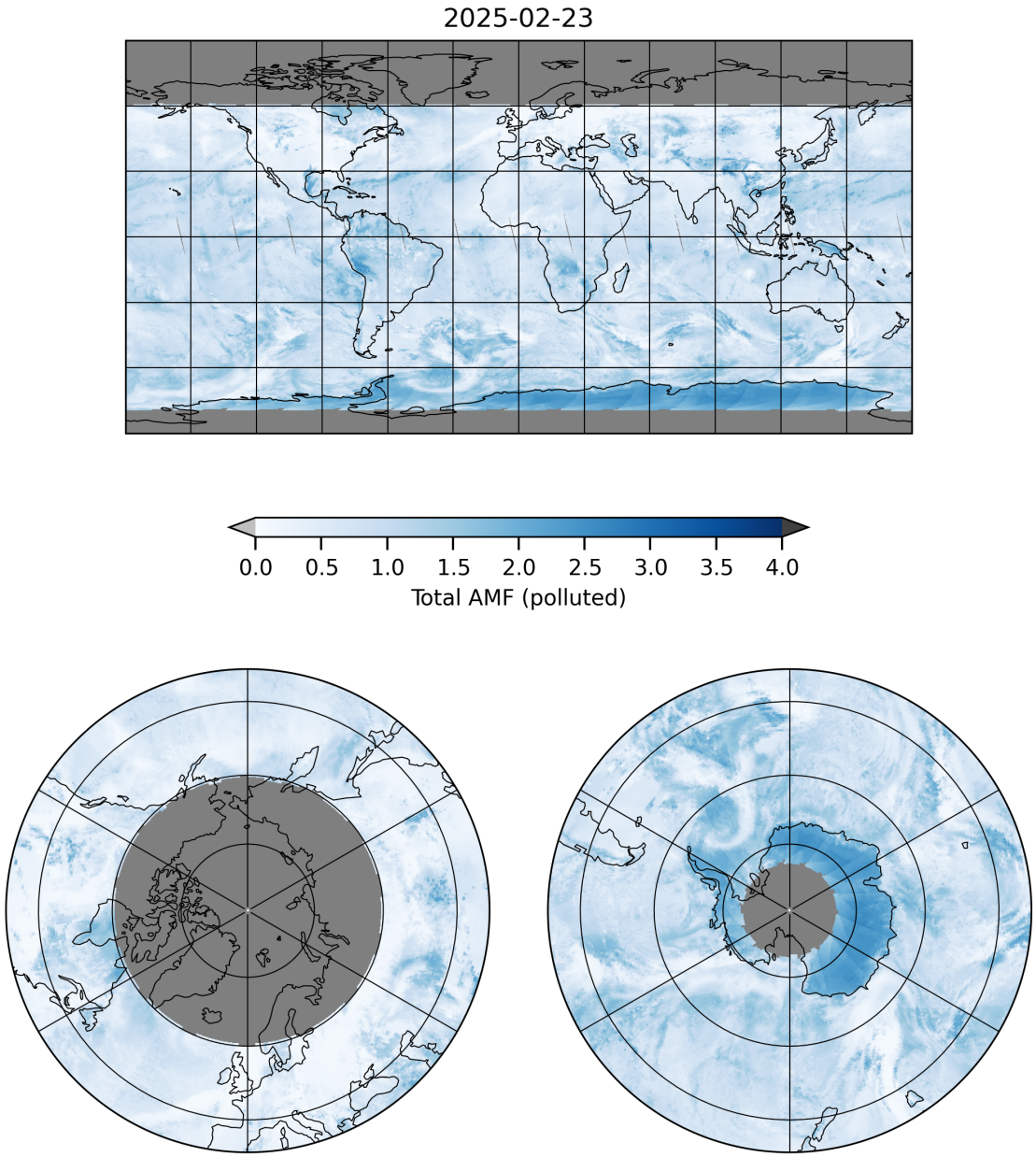

Figure 25: Map of “Total AMF (polluted)” for 2025-02-23 to 2025-02-24

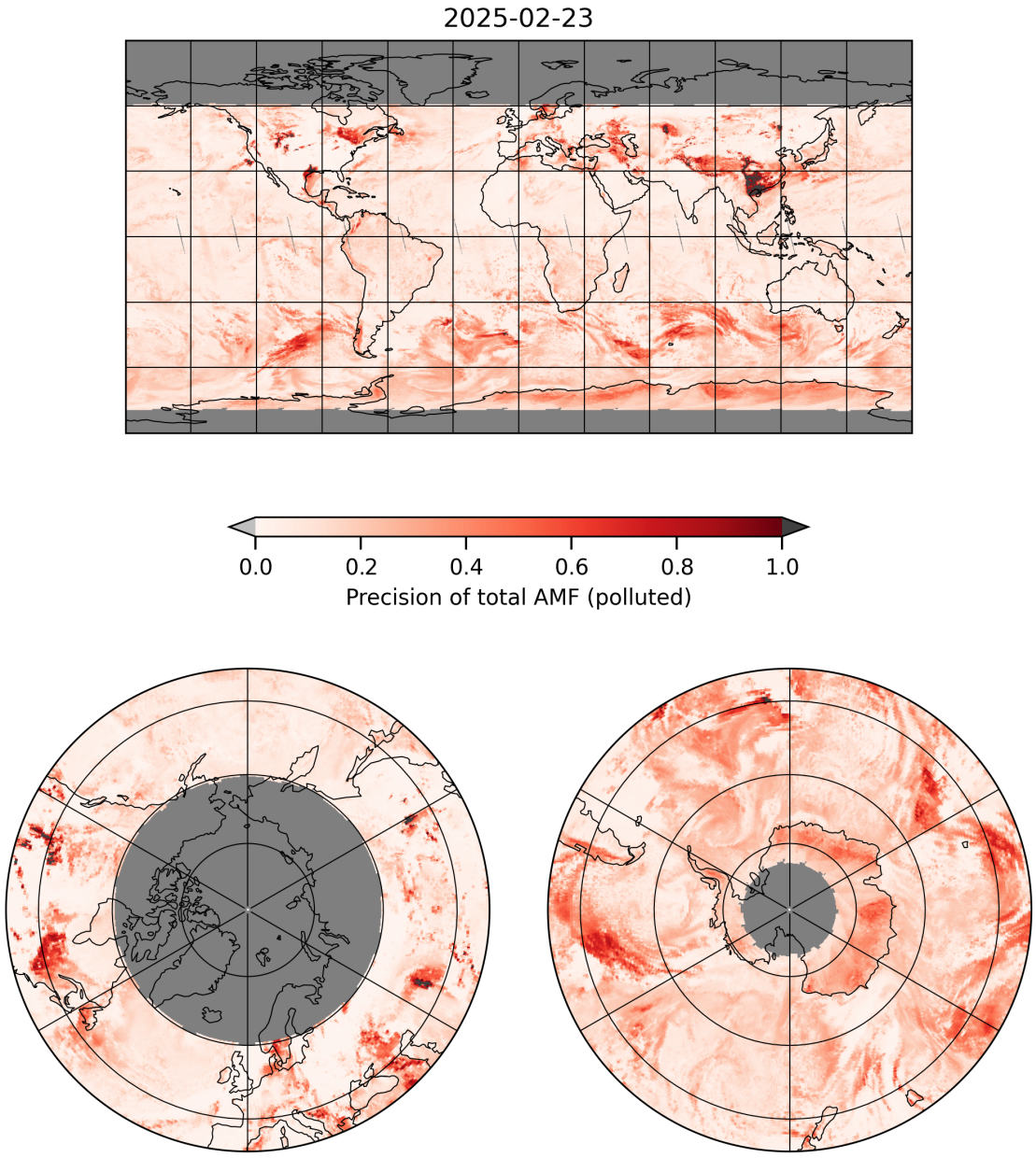

Figure 26: Map of “Precision of total AMF (polluted)” for 2025-02-23 to 2025-02-24

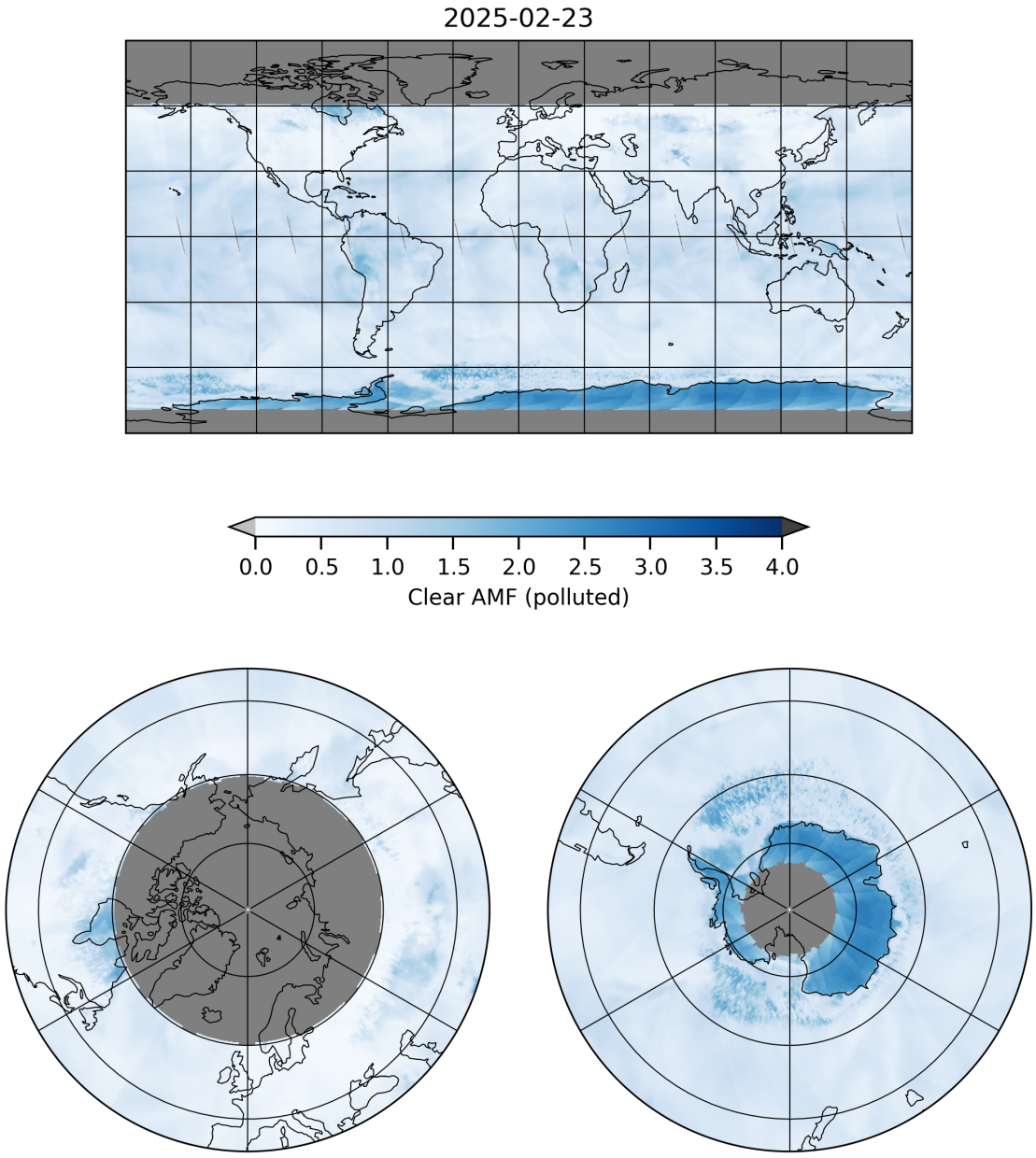

Figure 27: Map of “Clear AMF (polluted)” for 2025-02-23 to 2025-02-24

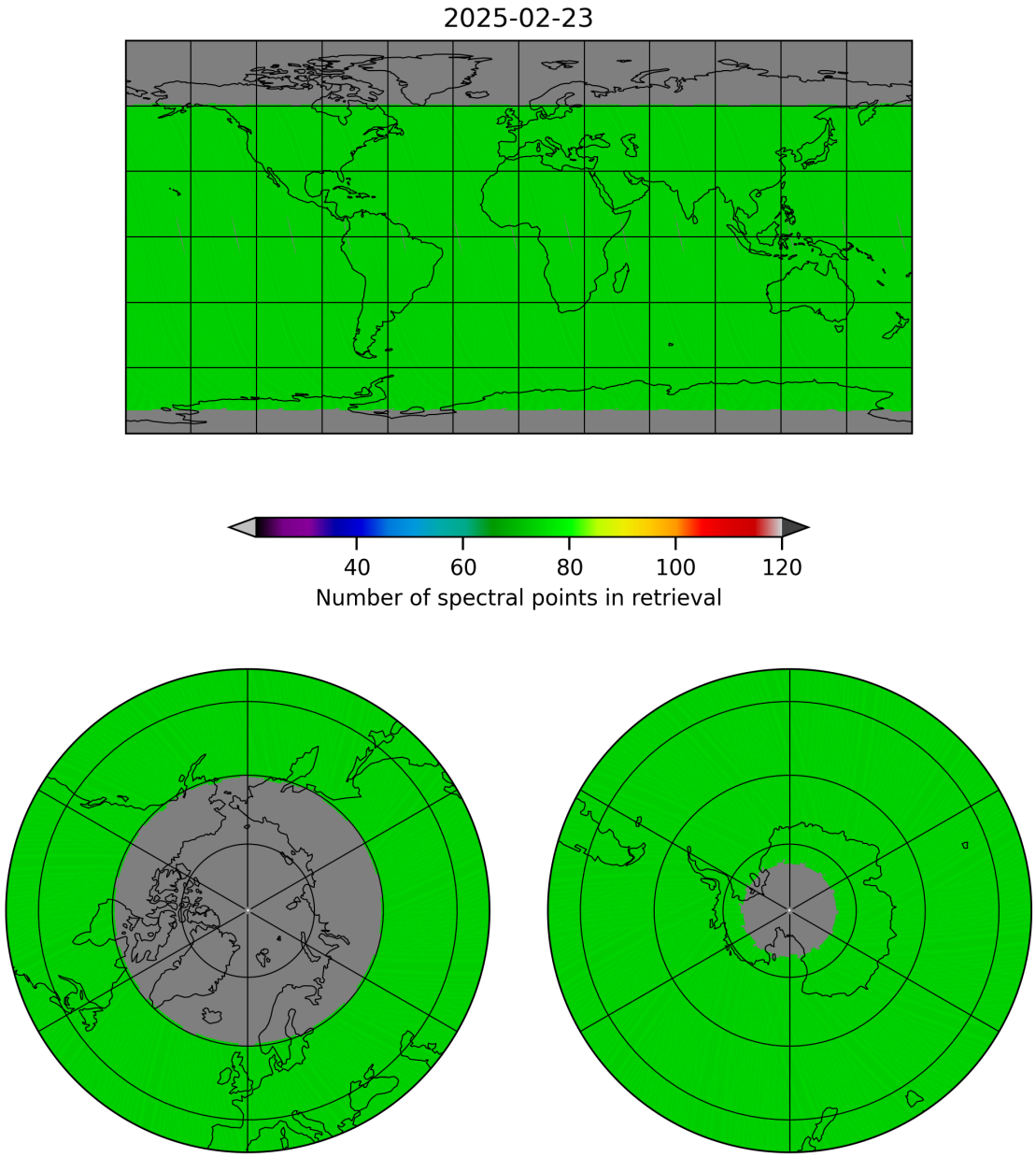

Figure 28: Map of “Number of spectral points in retrieval” for 2025-02-23 to 2025-02-24

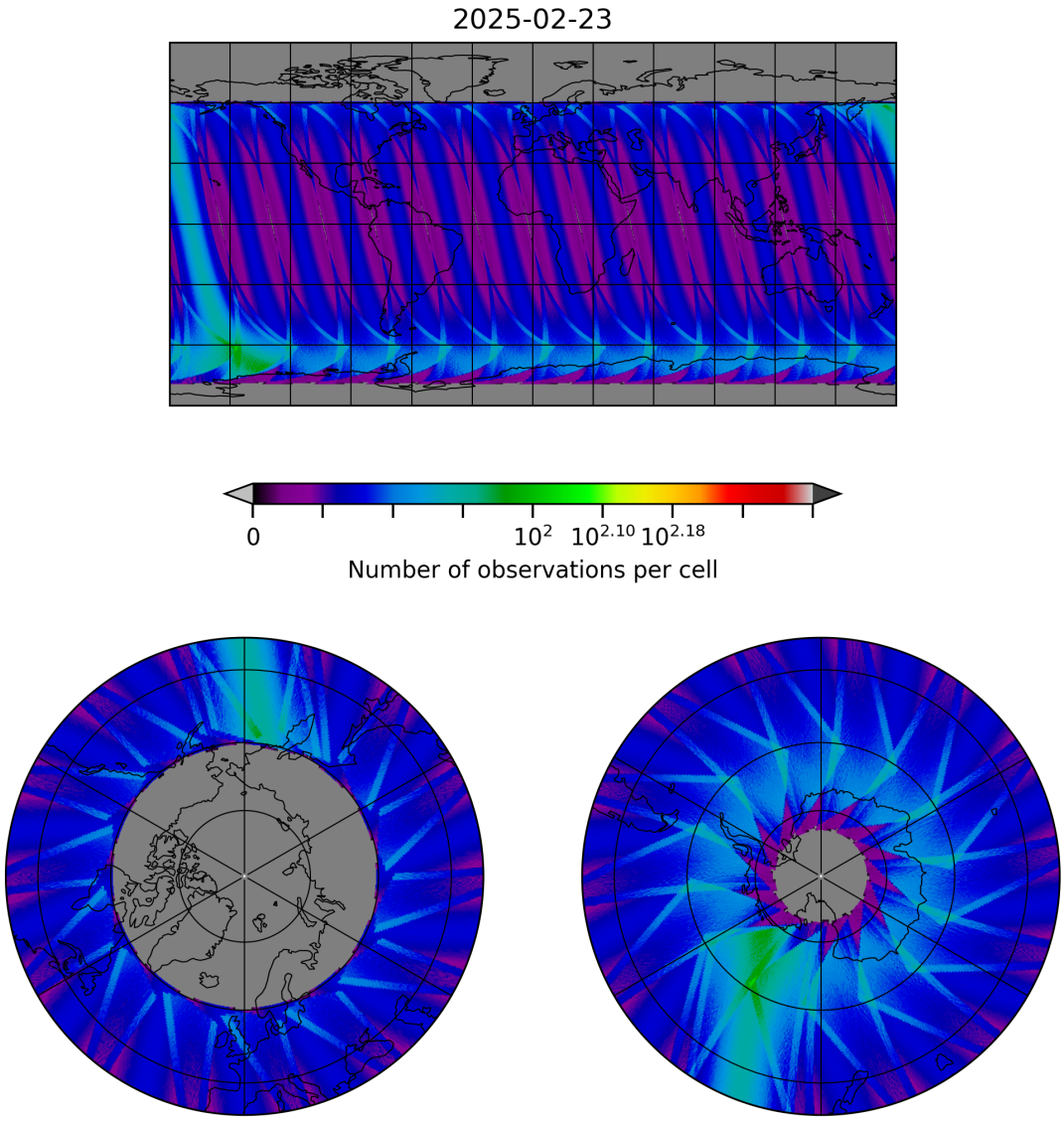

Figure 29: Map of the number of observations for 2025-02-23 to 2025-02-24

7 Zonal average

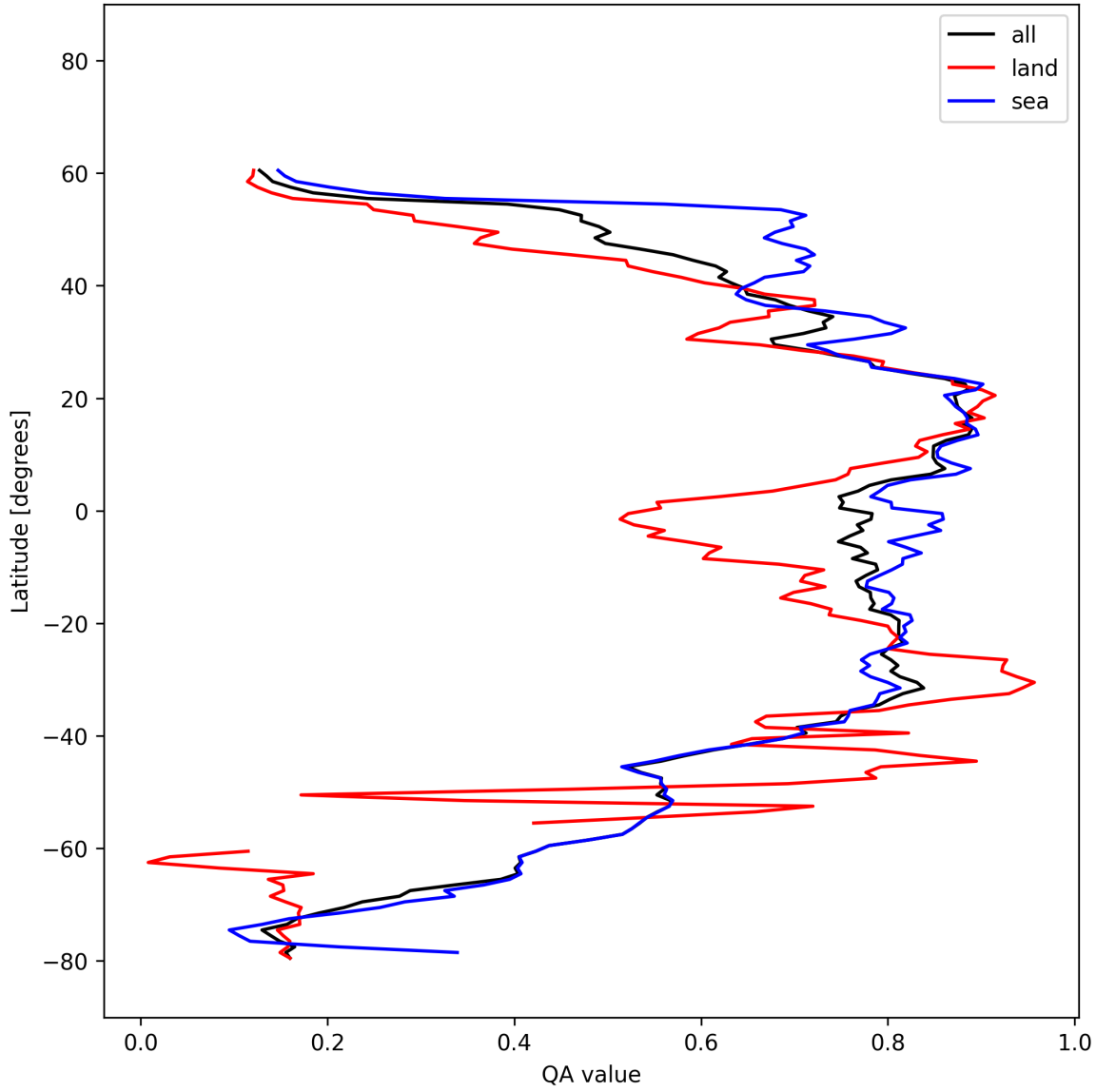

Figure 30: Zonal average of “QA value” for 2025-02-23 to 2025-02-24.

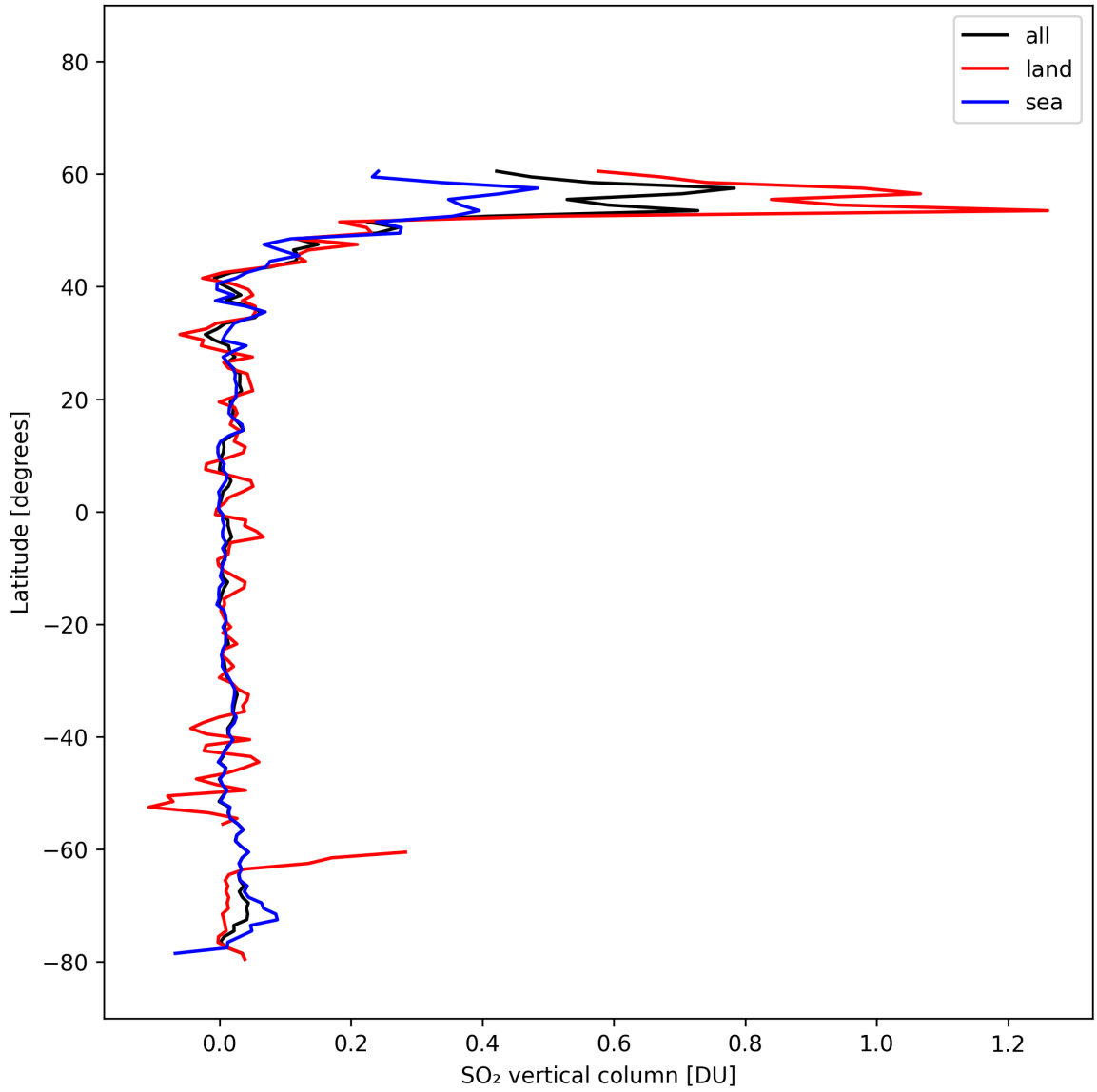

Figure 31: Zonal average of "SO_2 vertical column" for 2025-02-23 to 2025-02-24.

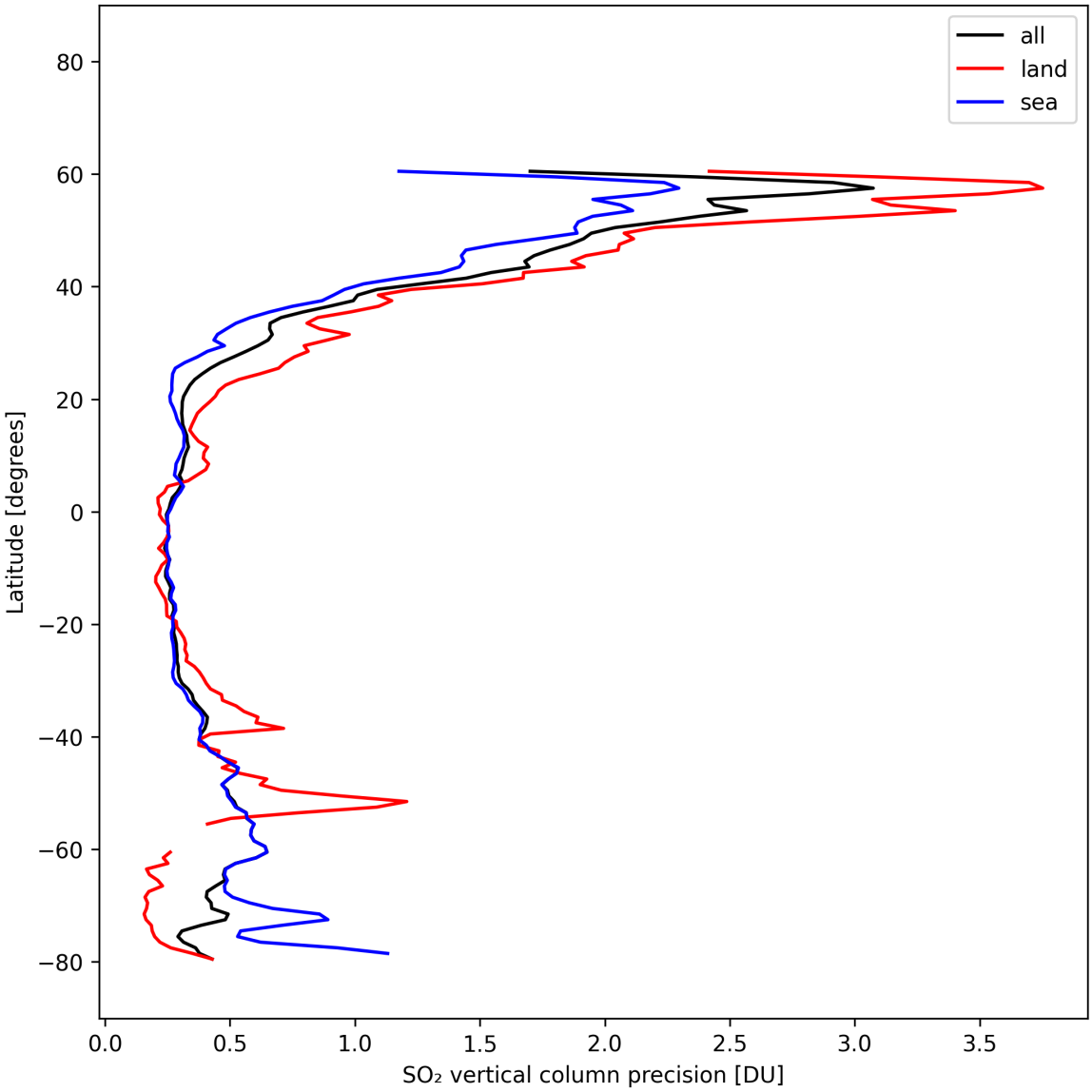

Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-02-23 to 2025-02-24.

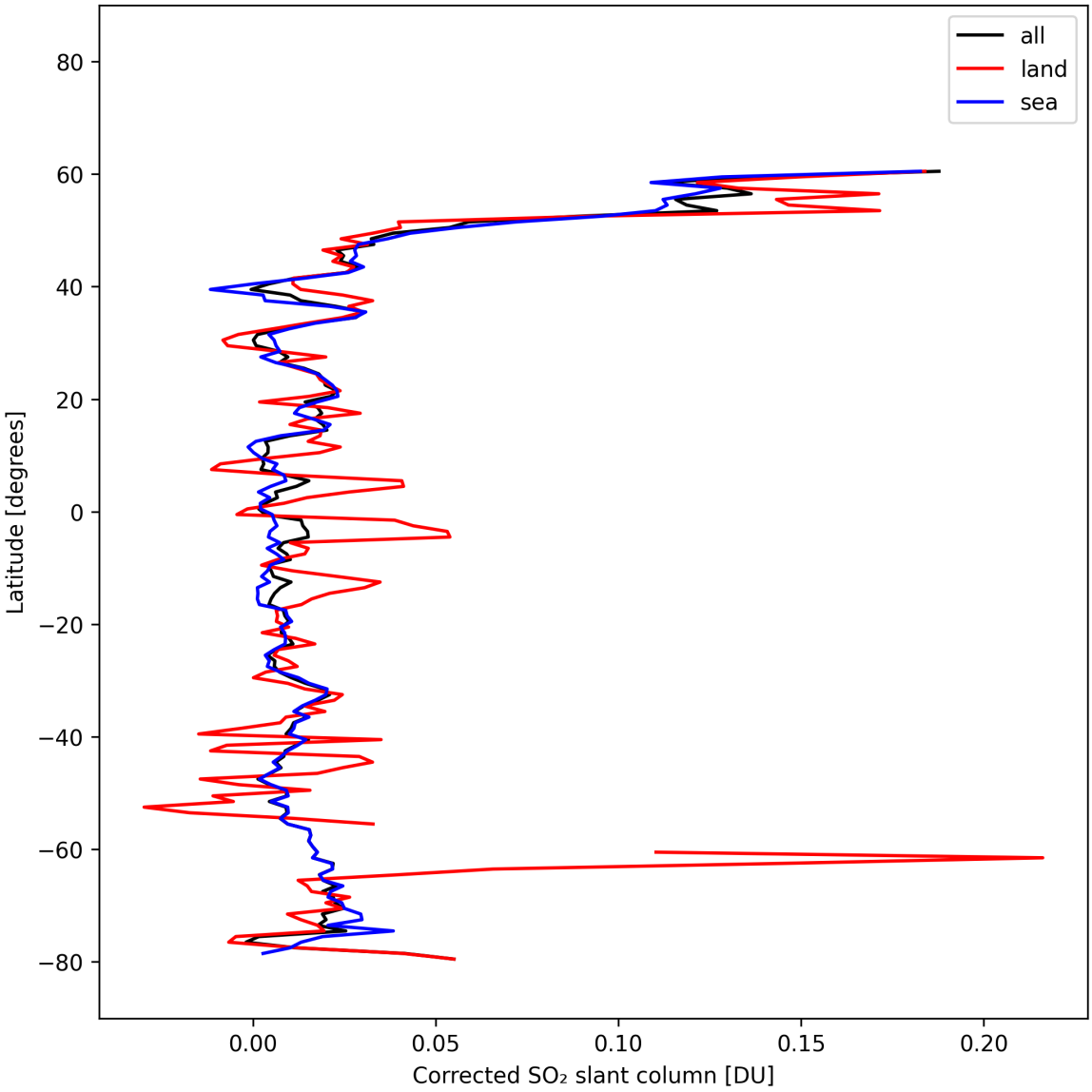

Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-02-23 to 2025-02-24.

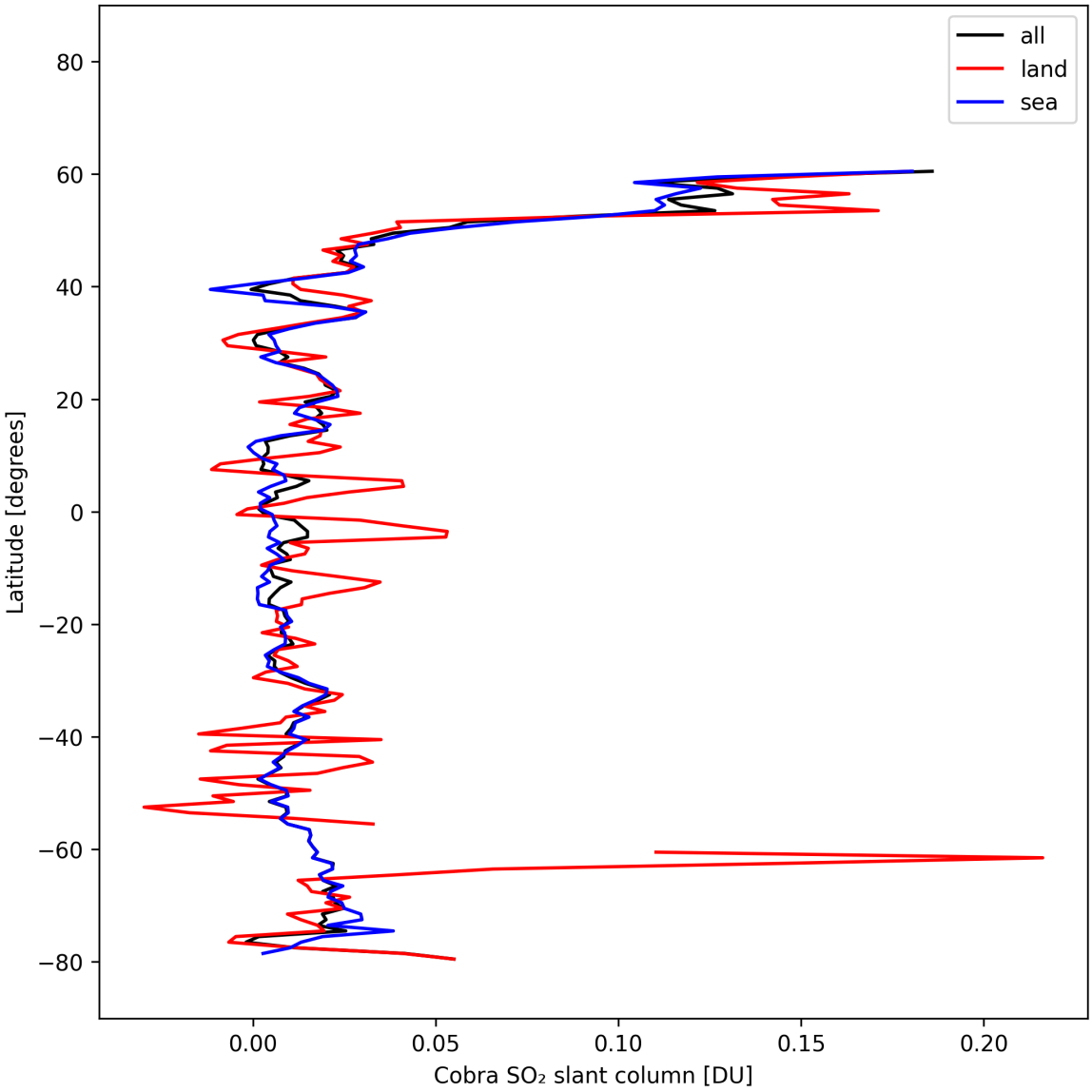

Figure 34: Zonal average of "Cobra SO_2 slant column" for 2025-02-23 to 2025-02-24.

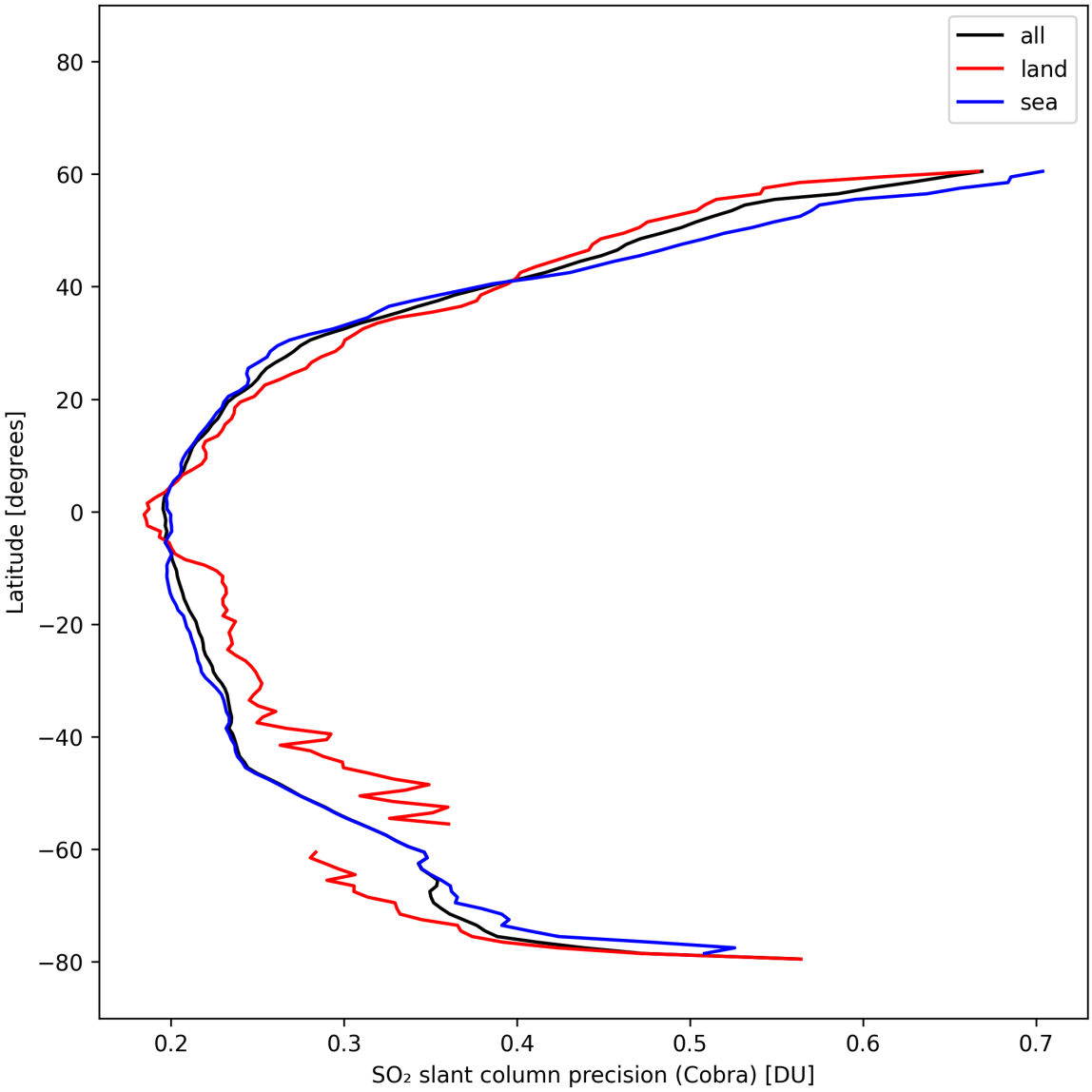

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-02-23 to 2025-02-24.

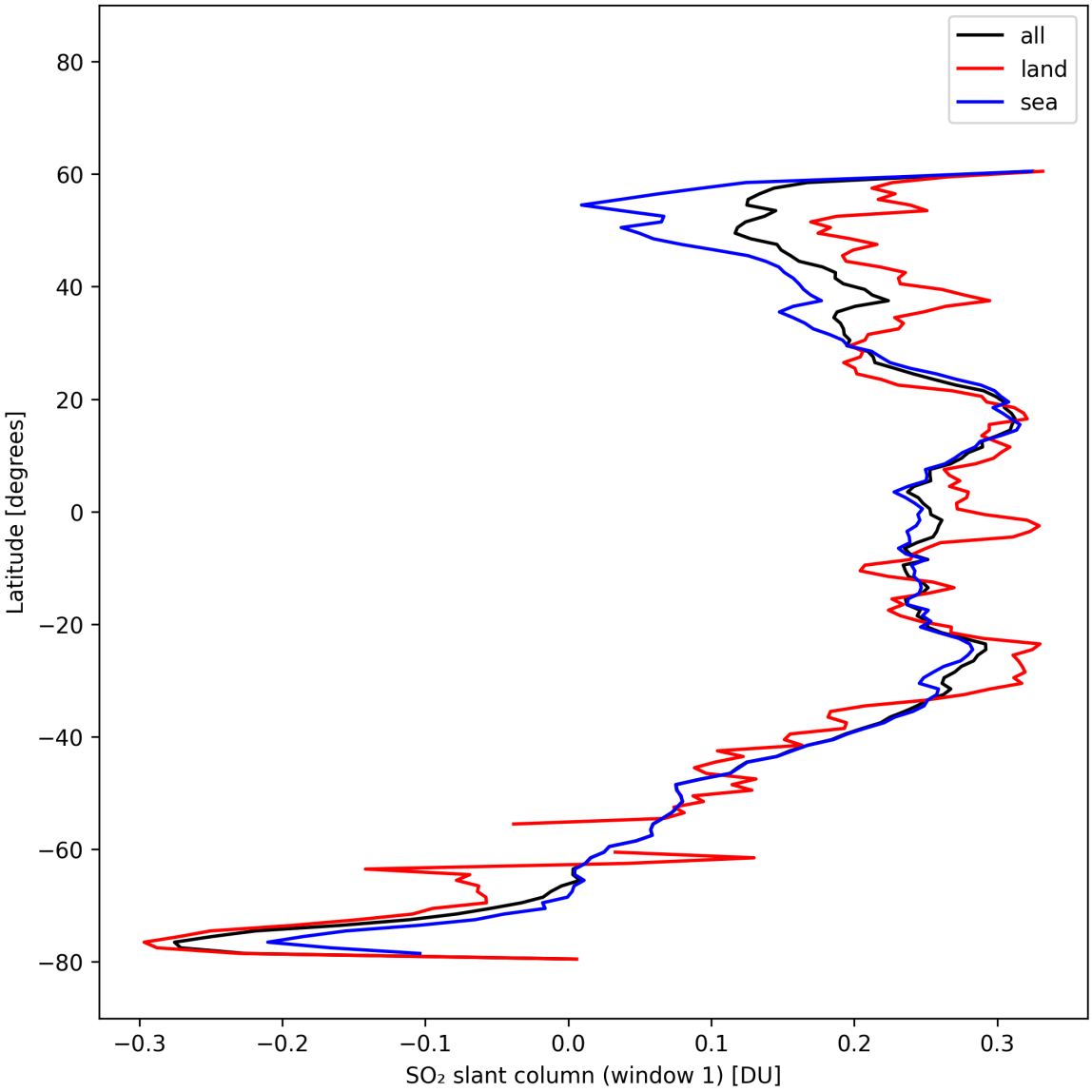

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-02-23 to 2025-02-24.

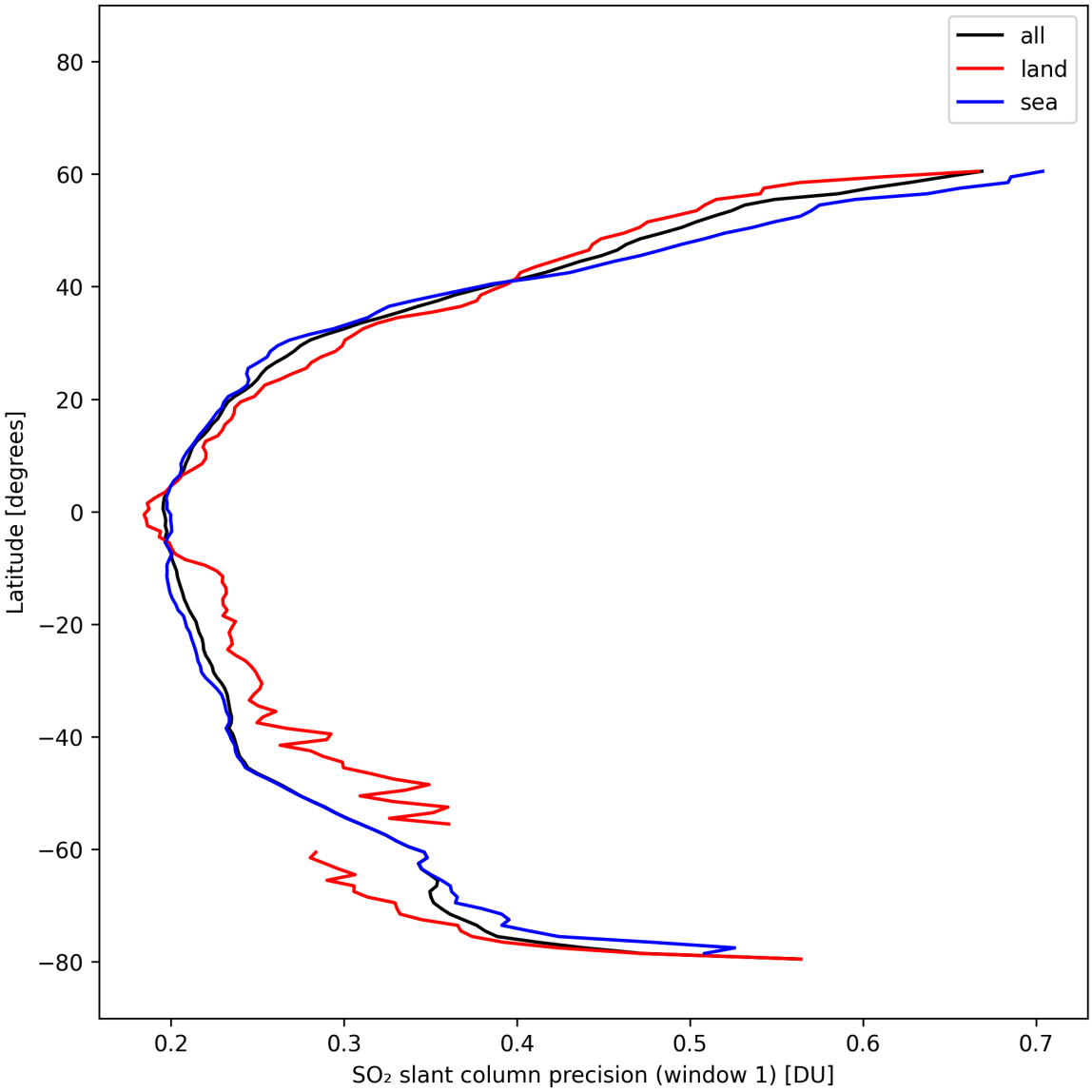

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-02-23 to 2025-02-24.

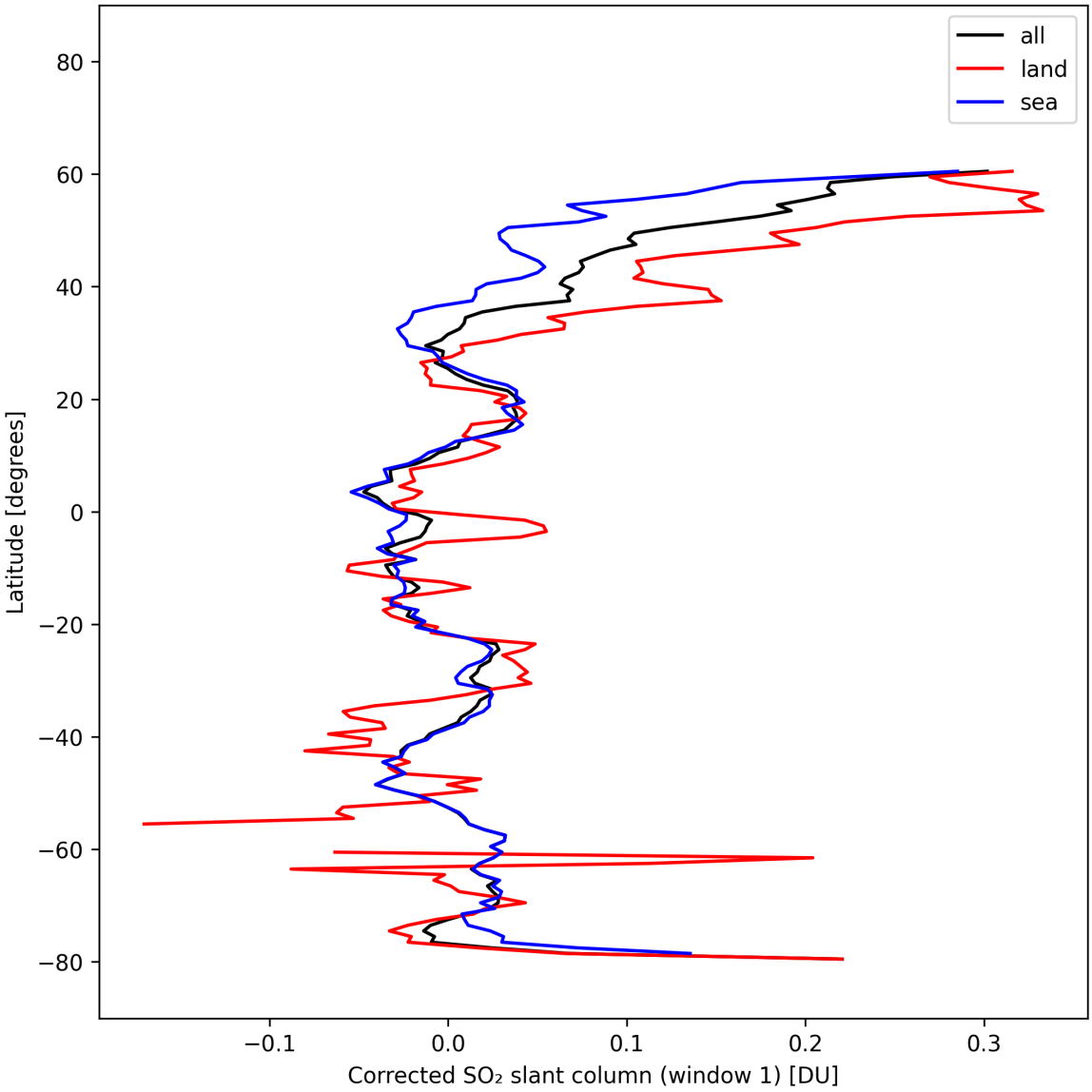

Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-02-23 to 2025-02-24.

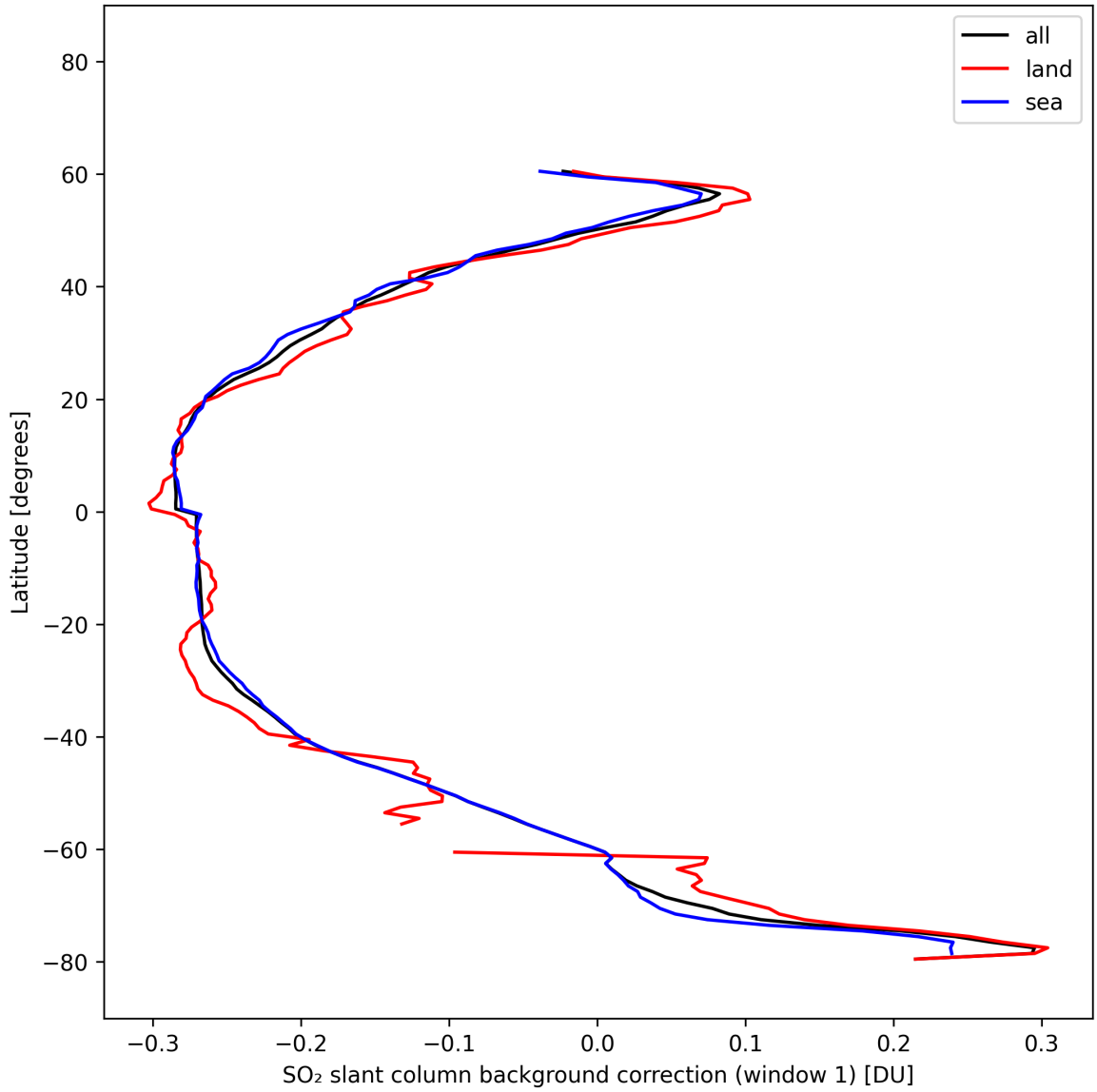

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-02-23 to 2025-02-24.

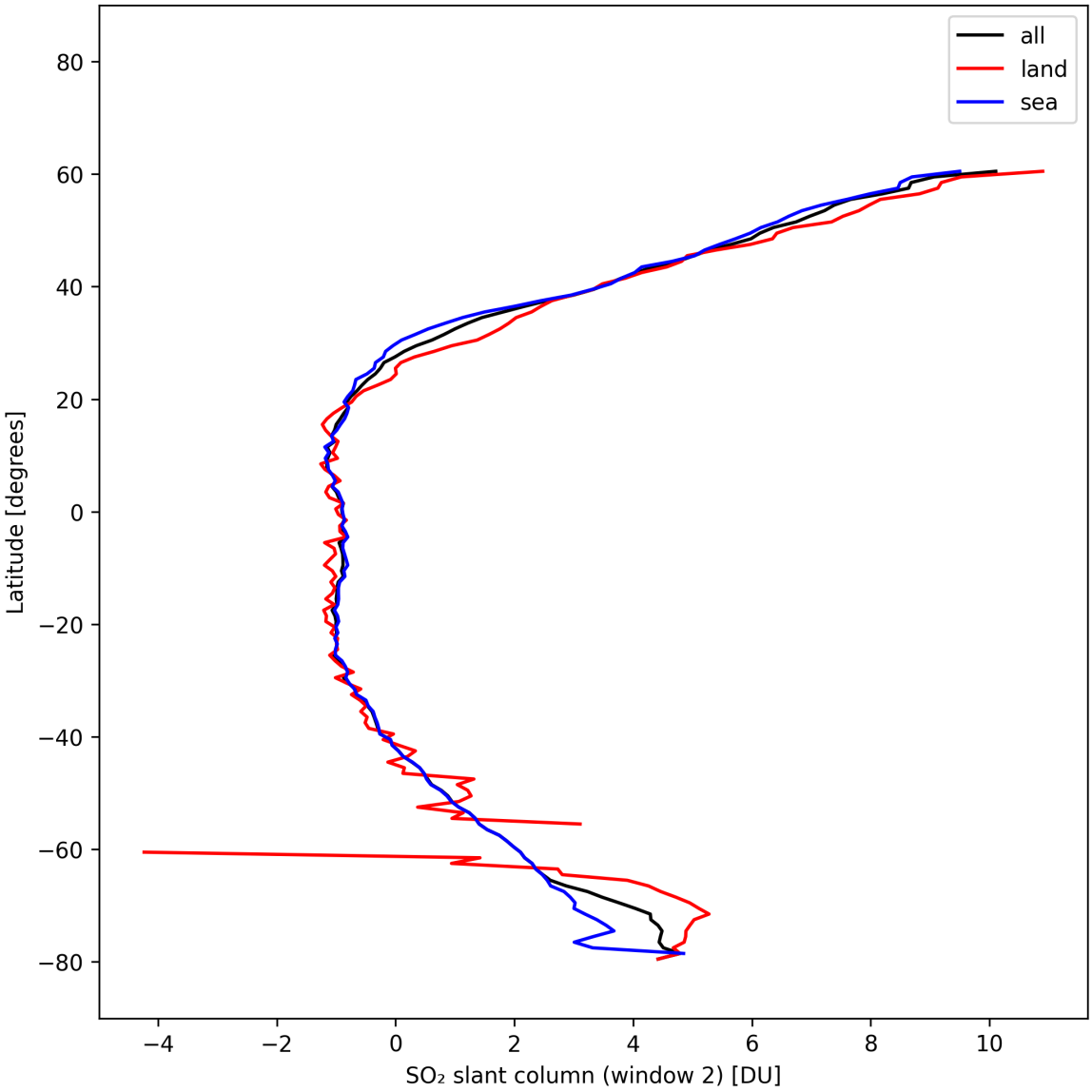

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-02-23 to 2025-02-24.

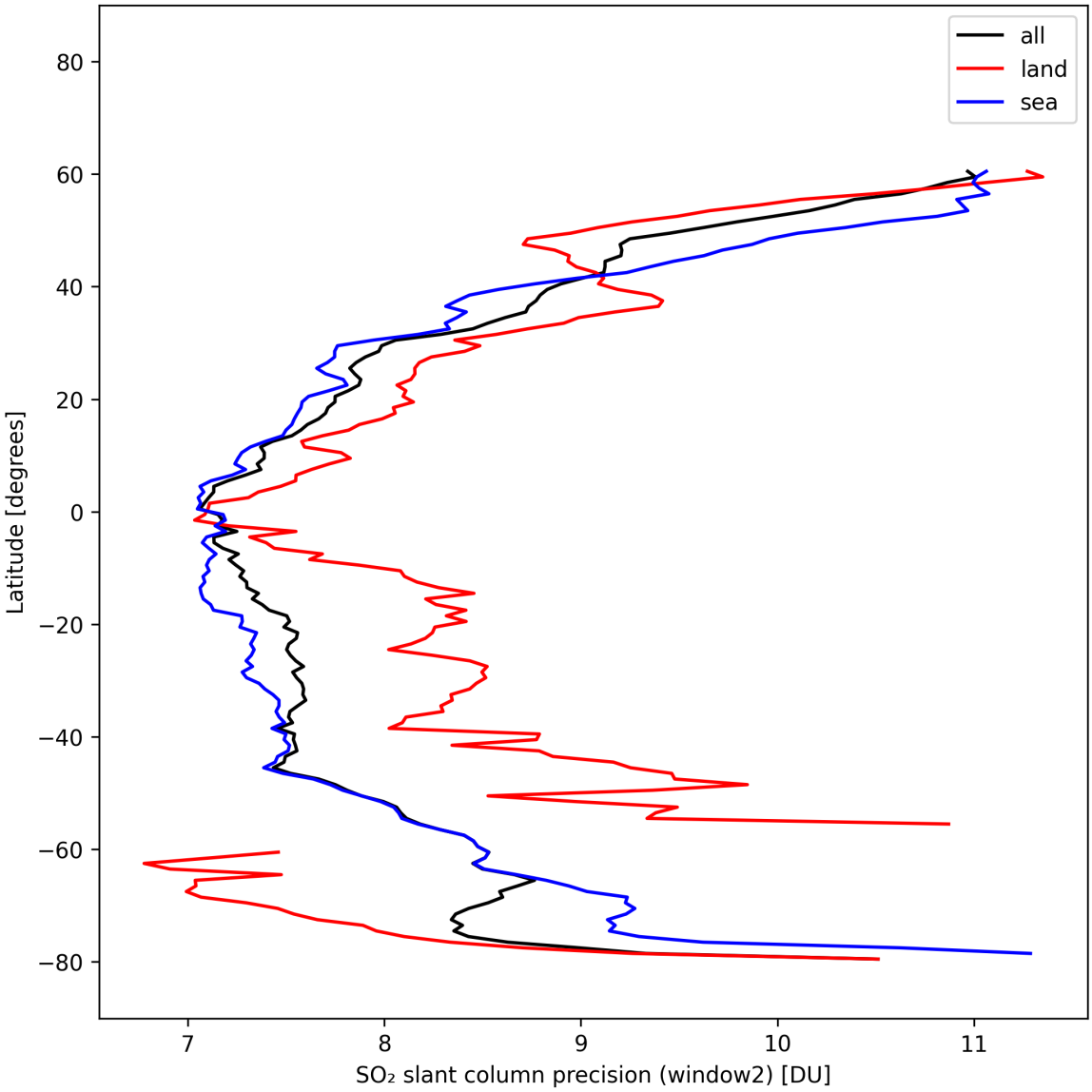

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-02-23 to 2025-02-24.

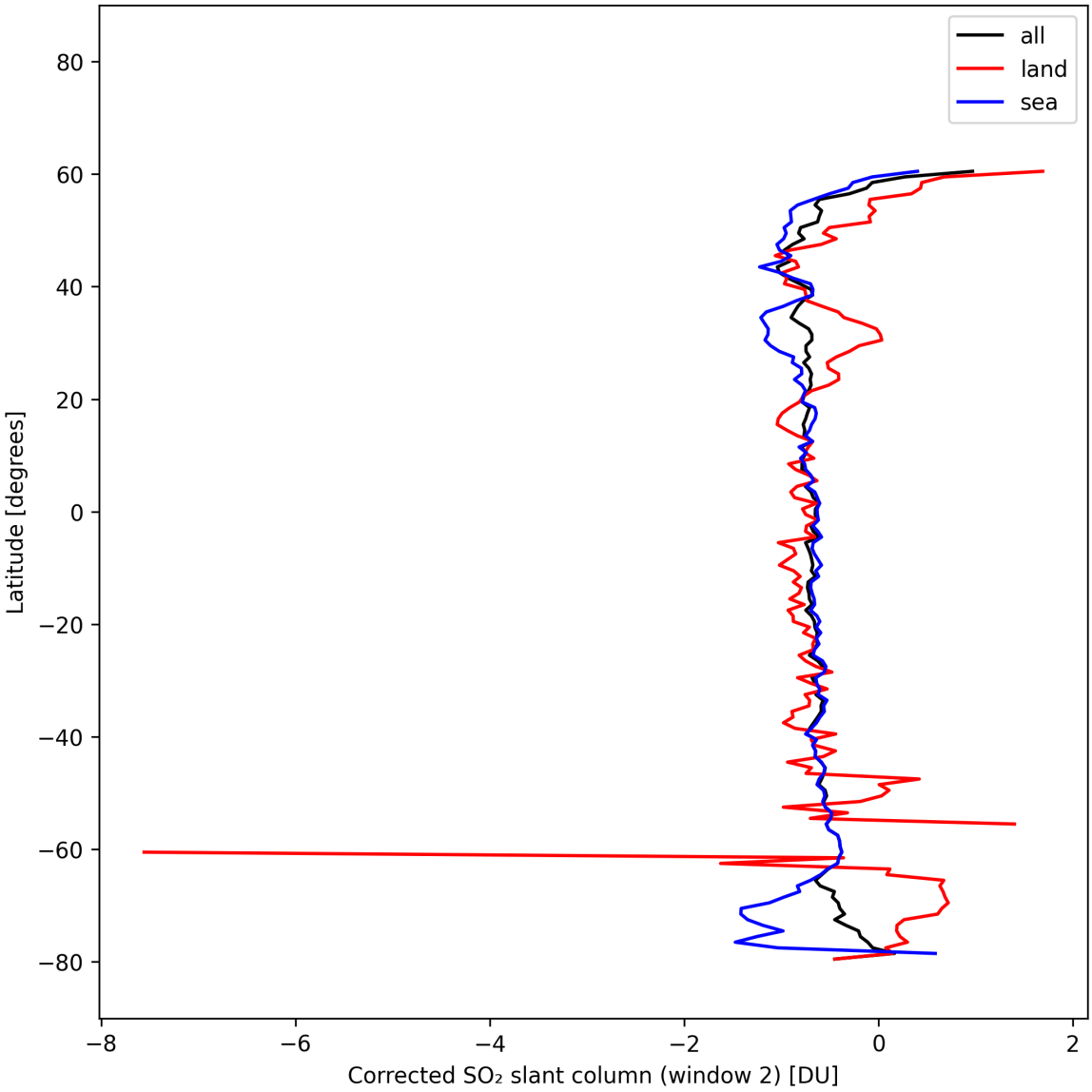

Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-02-23 to 2025-02-24.

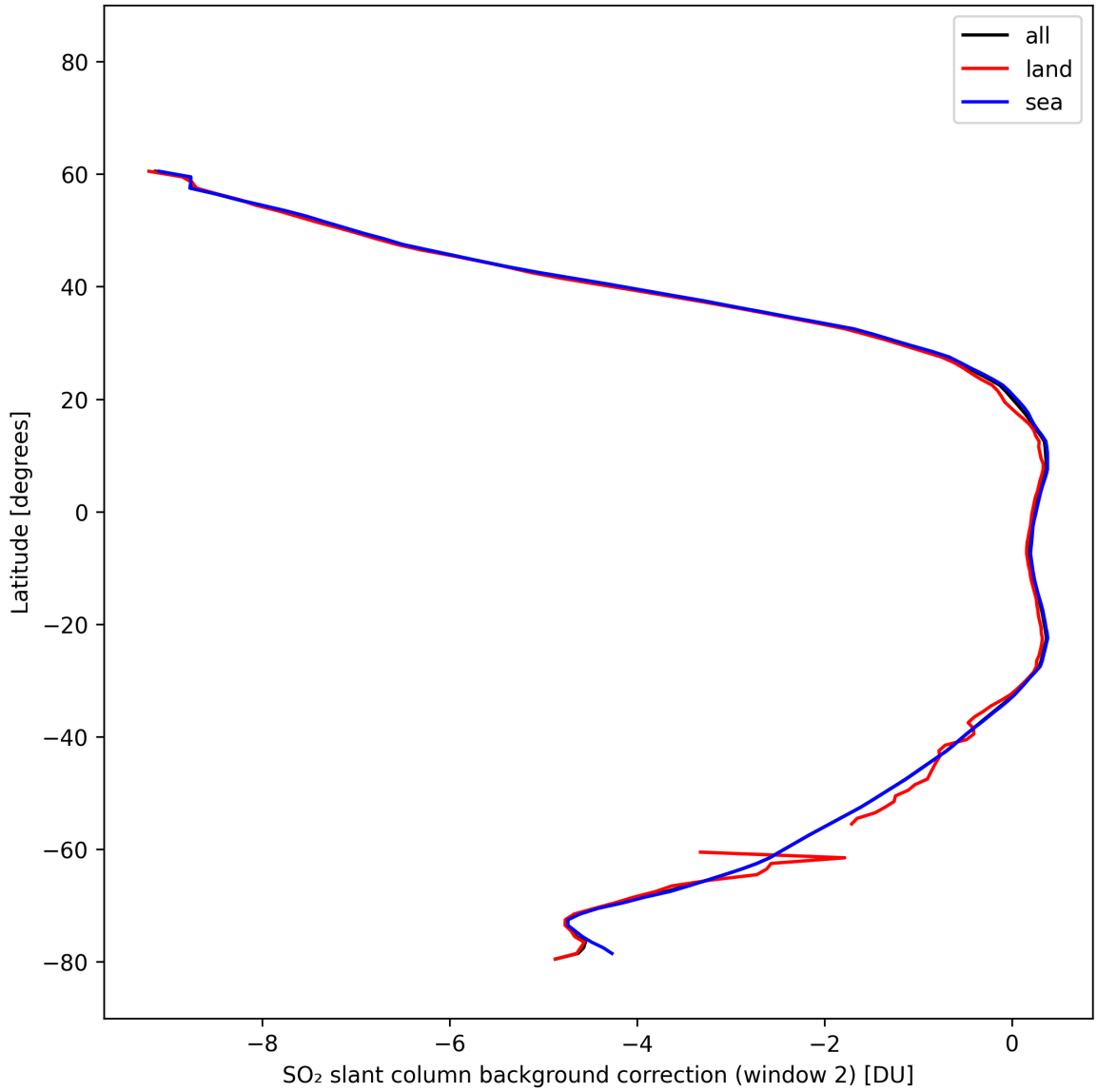

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-02-23 to 2025-02-24.

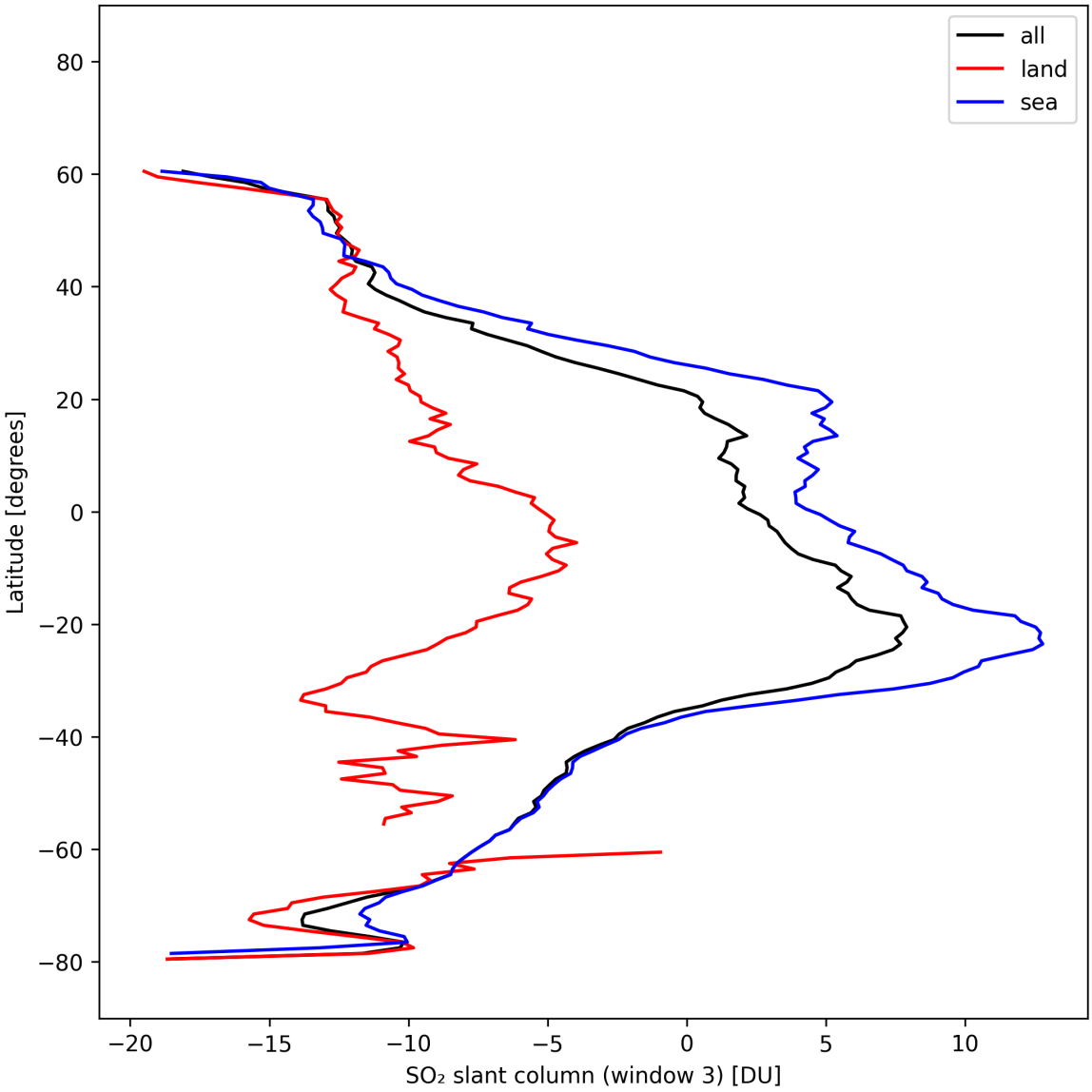

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-02-23 to 2025-02-24.

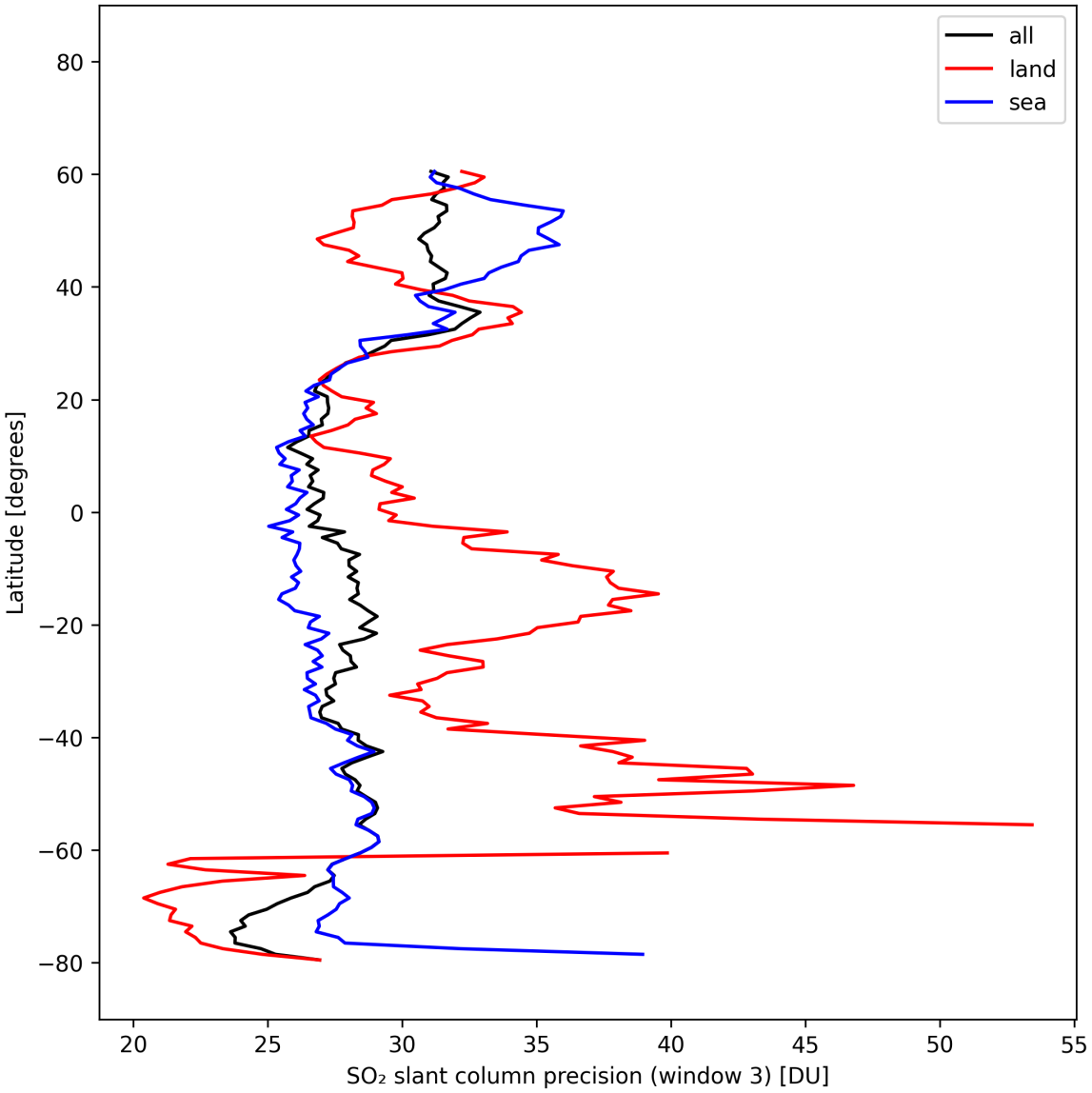

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-02-23 to 2025-02-24.

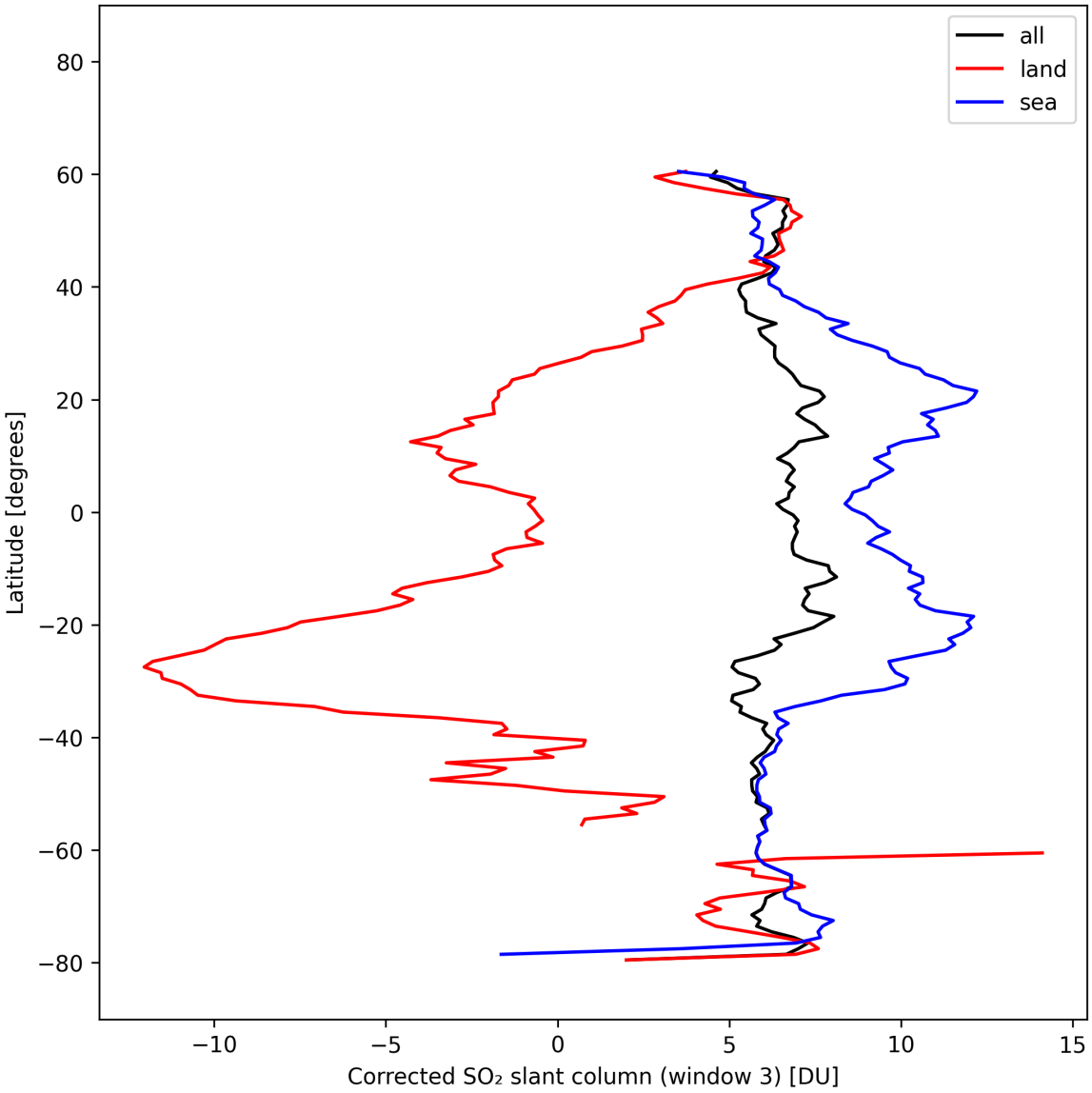

Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-02-23 to 2025-02-24.

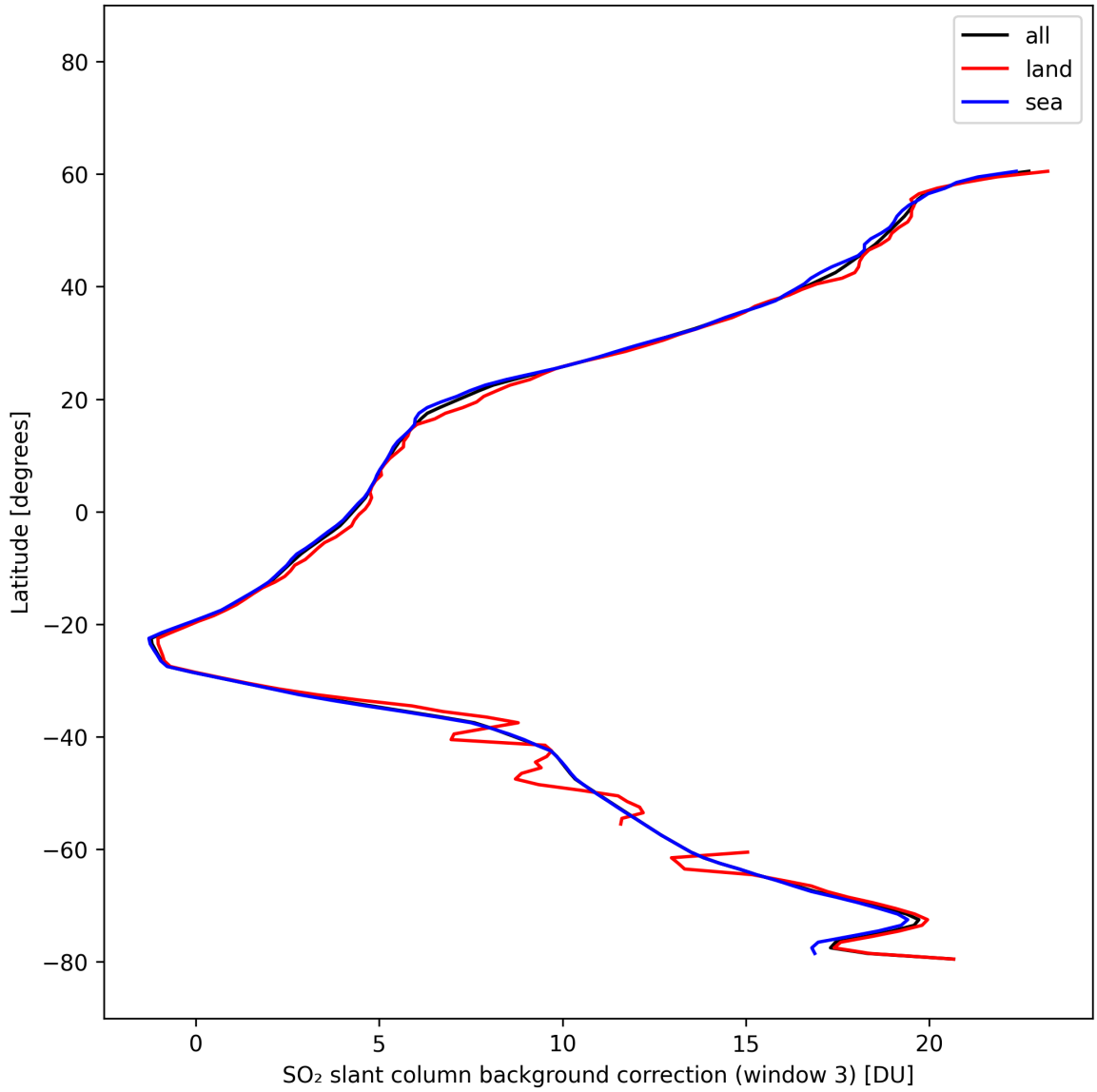

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-02-23 to 2025-02-24.

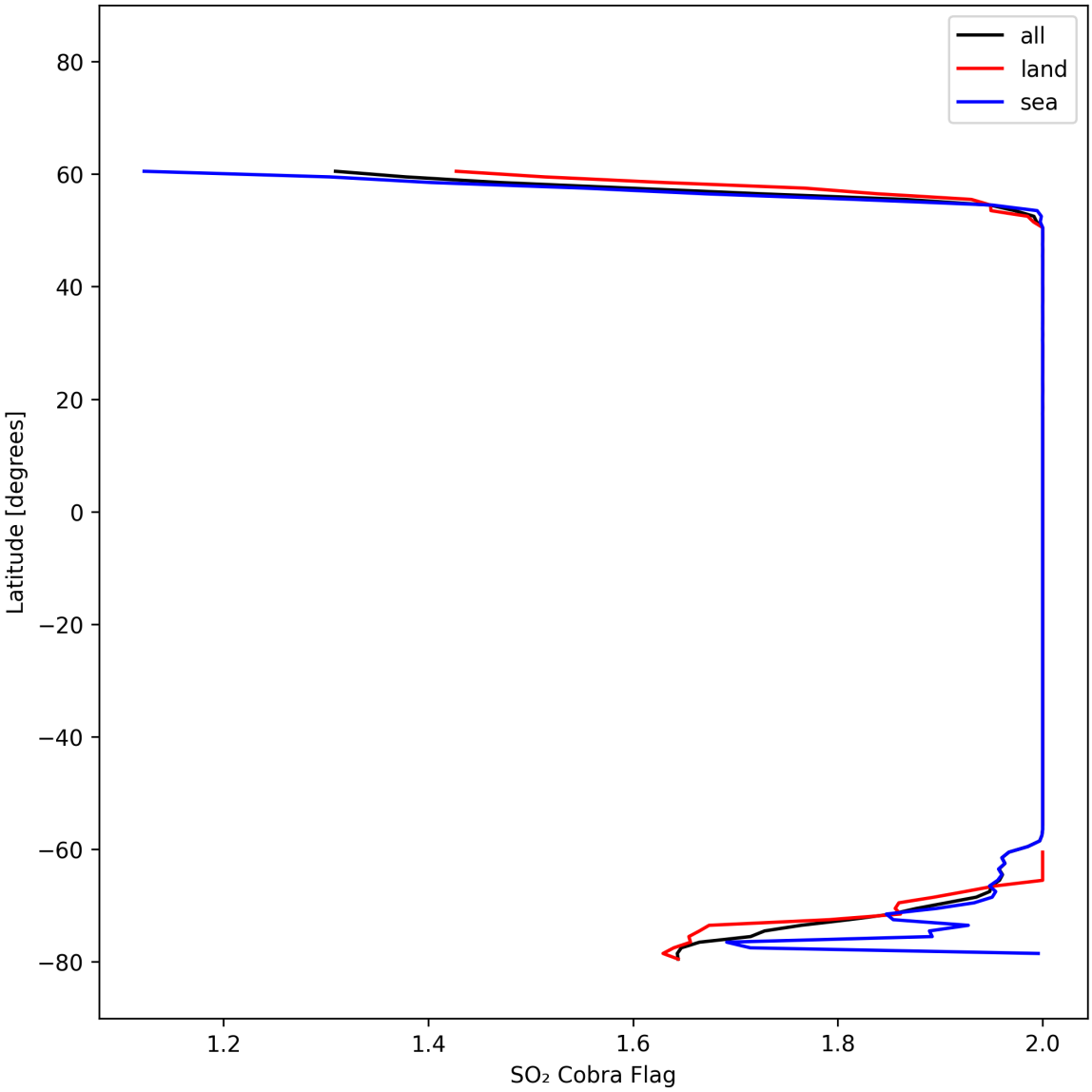

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-02-23 to 2025-02-24.

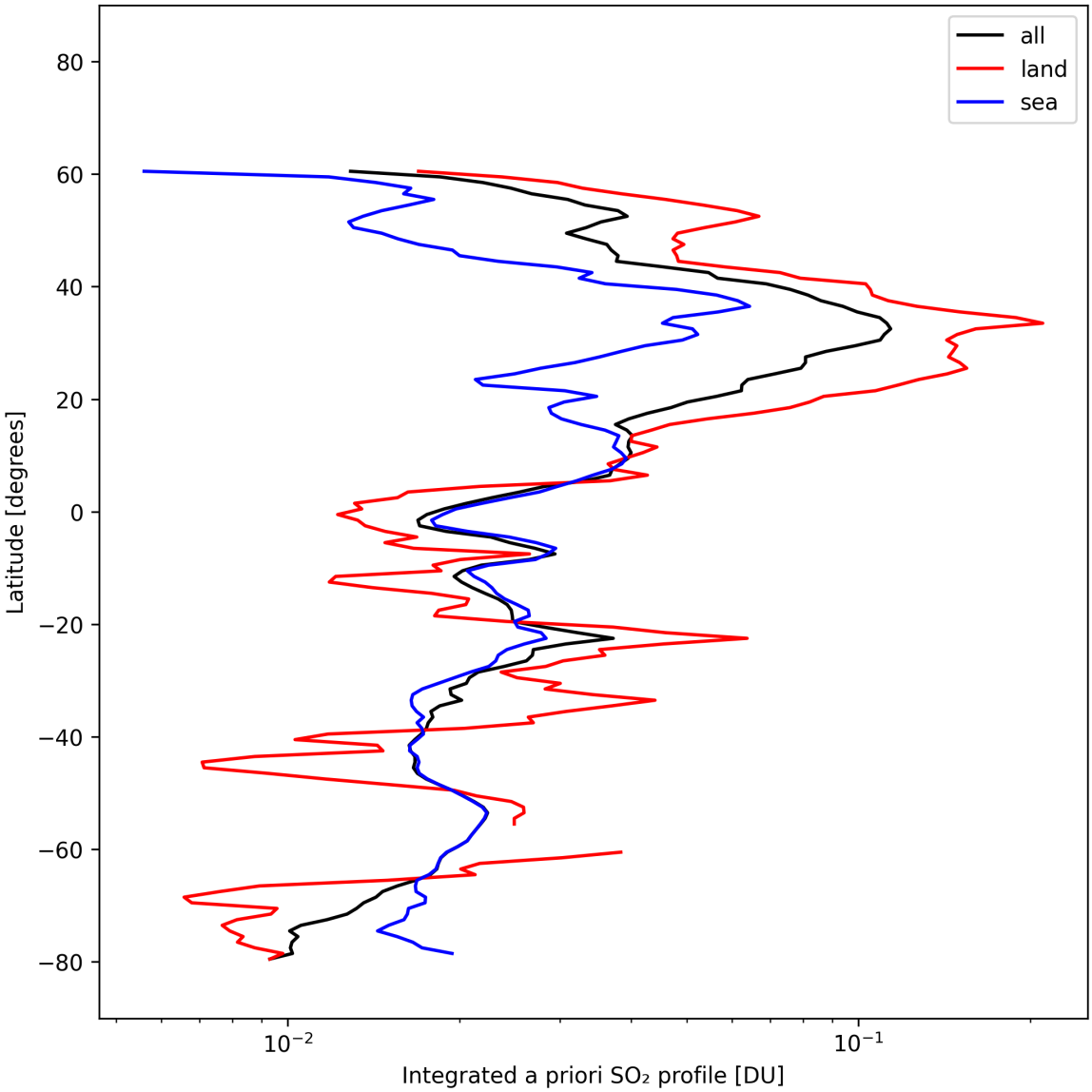

Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-02-23 to 2025-02-24.

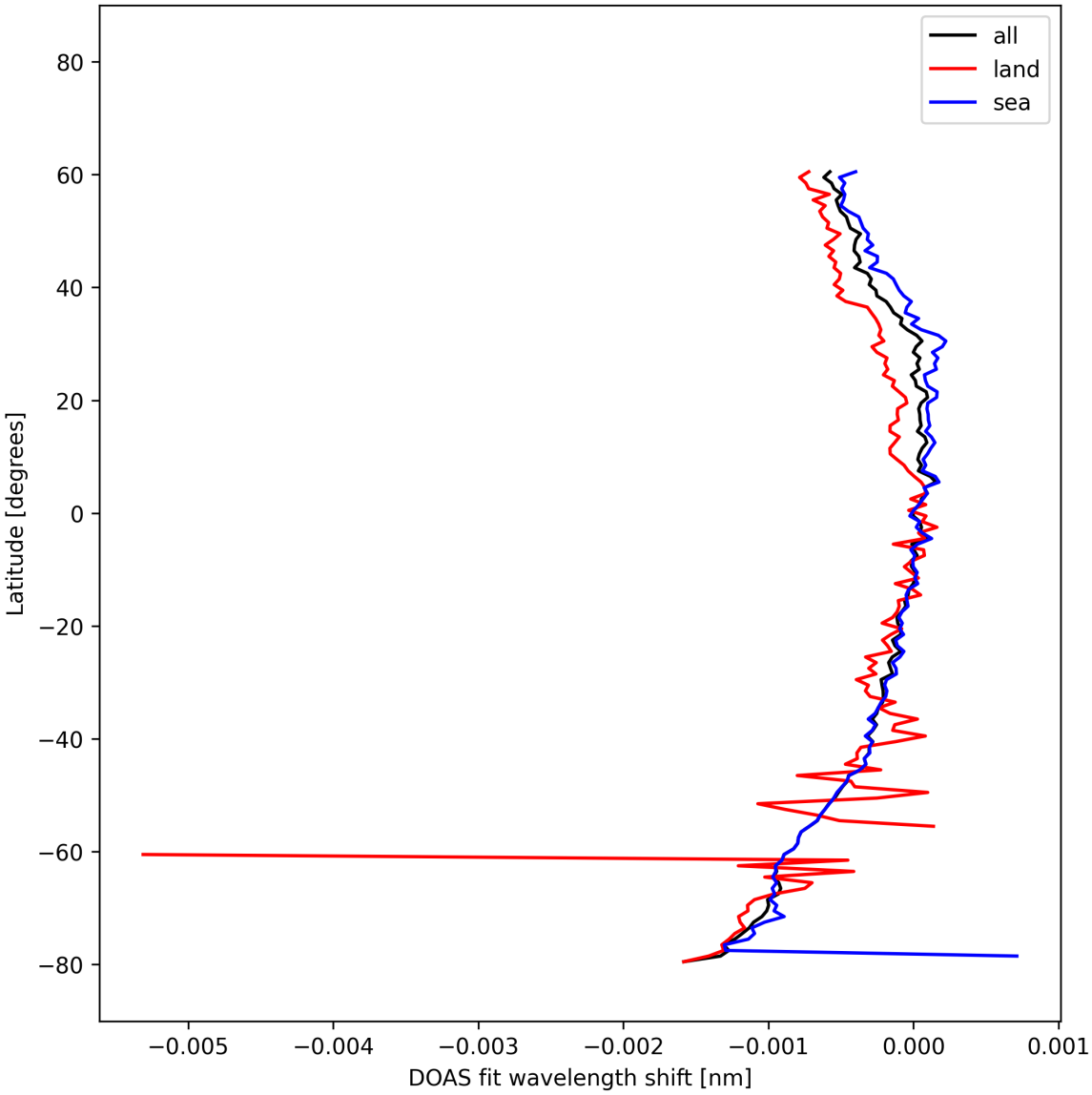

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-02-23 to 2025-02-24.

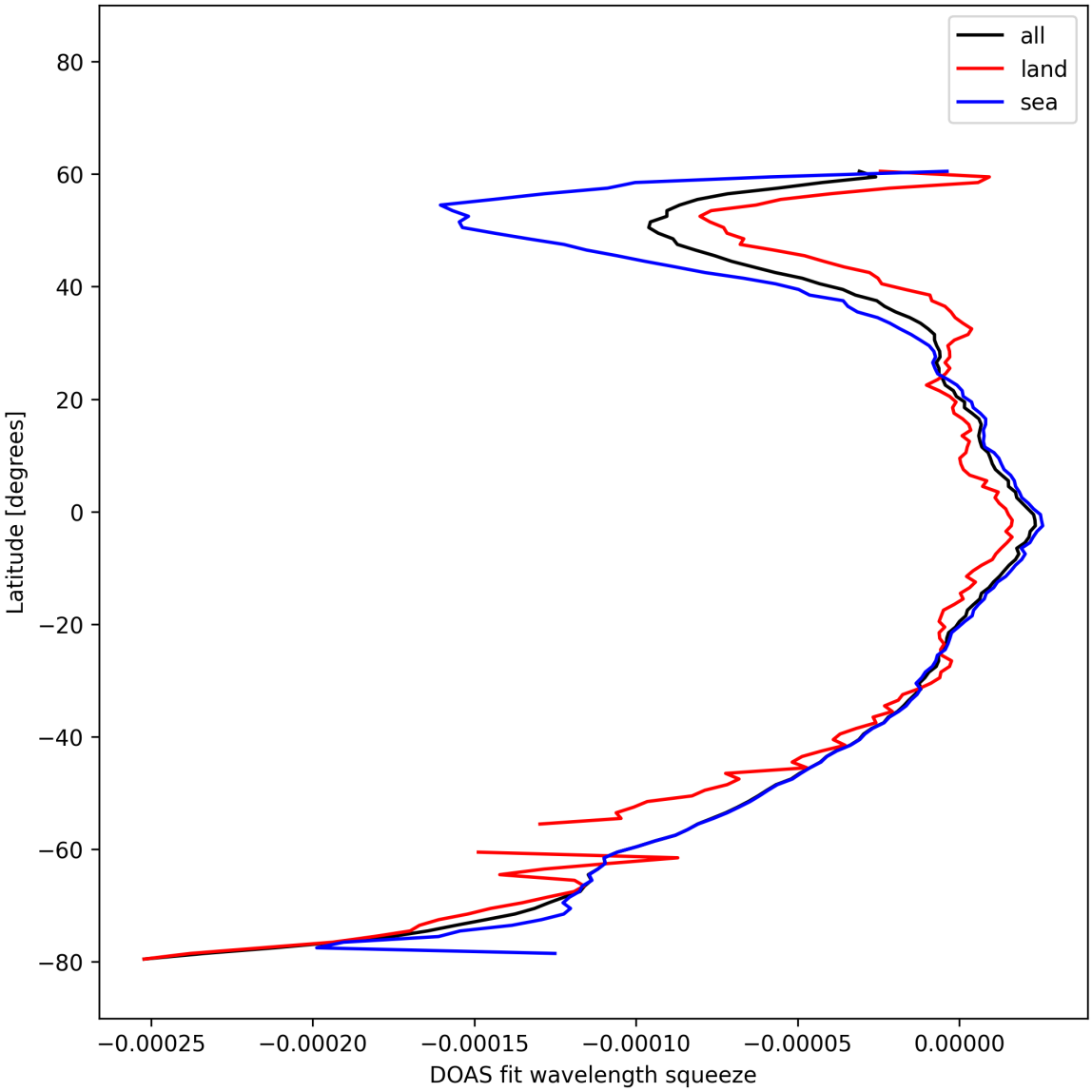

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-02-23 to 2025-02-24.

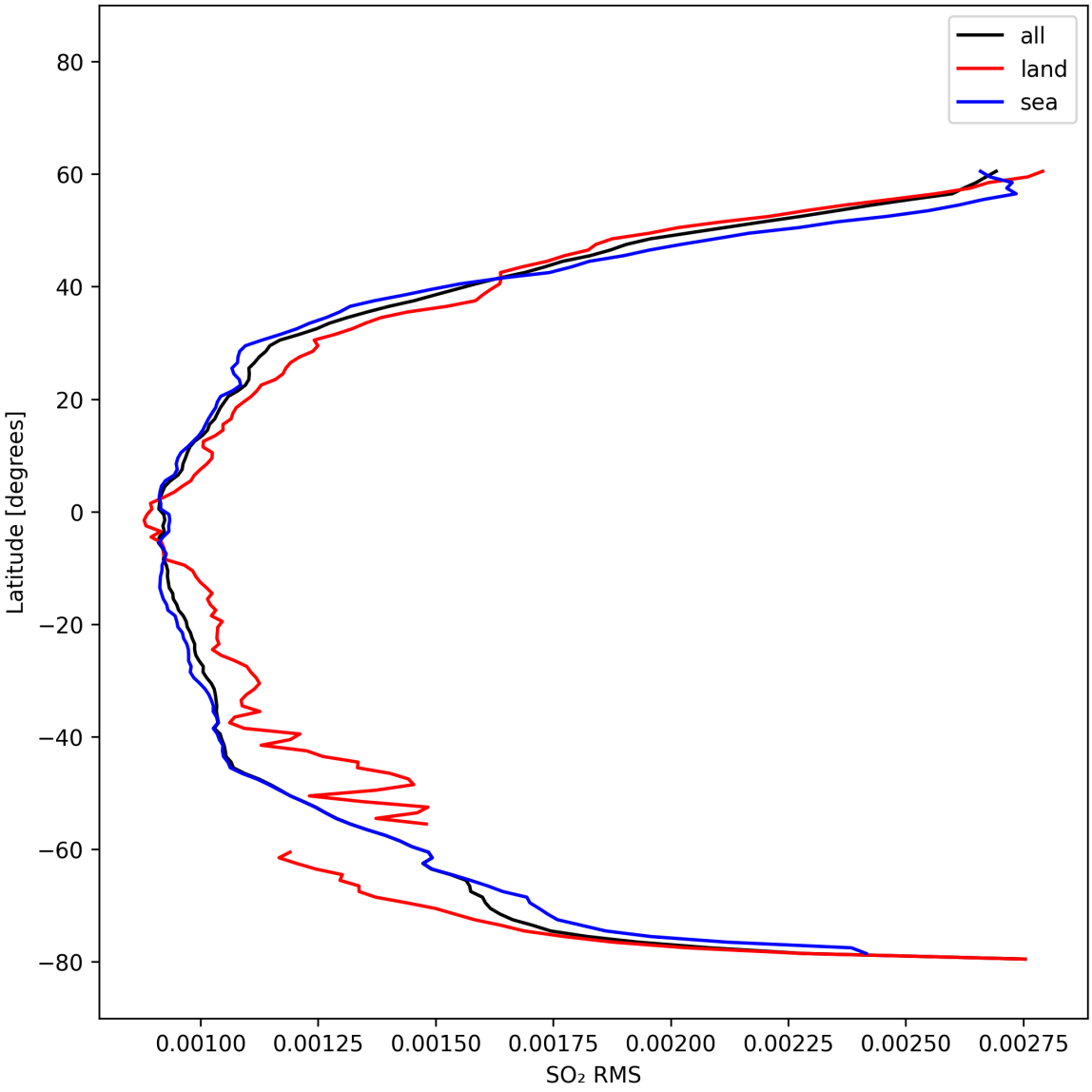

Figure 52: Zonal average of "SO_2 RMS" for 2025-02-23 to 2025-02-24.

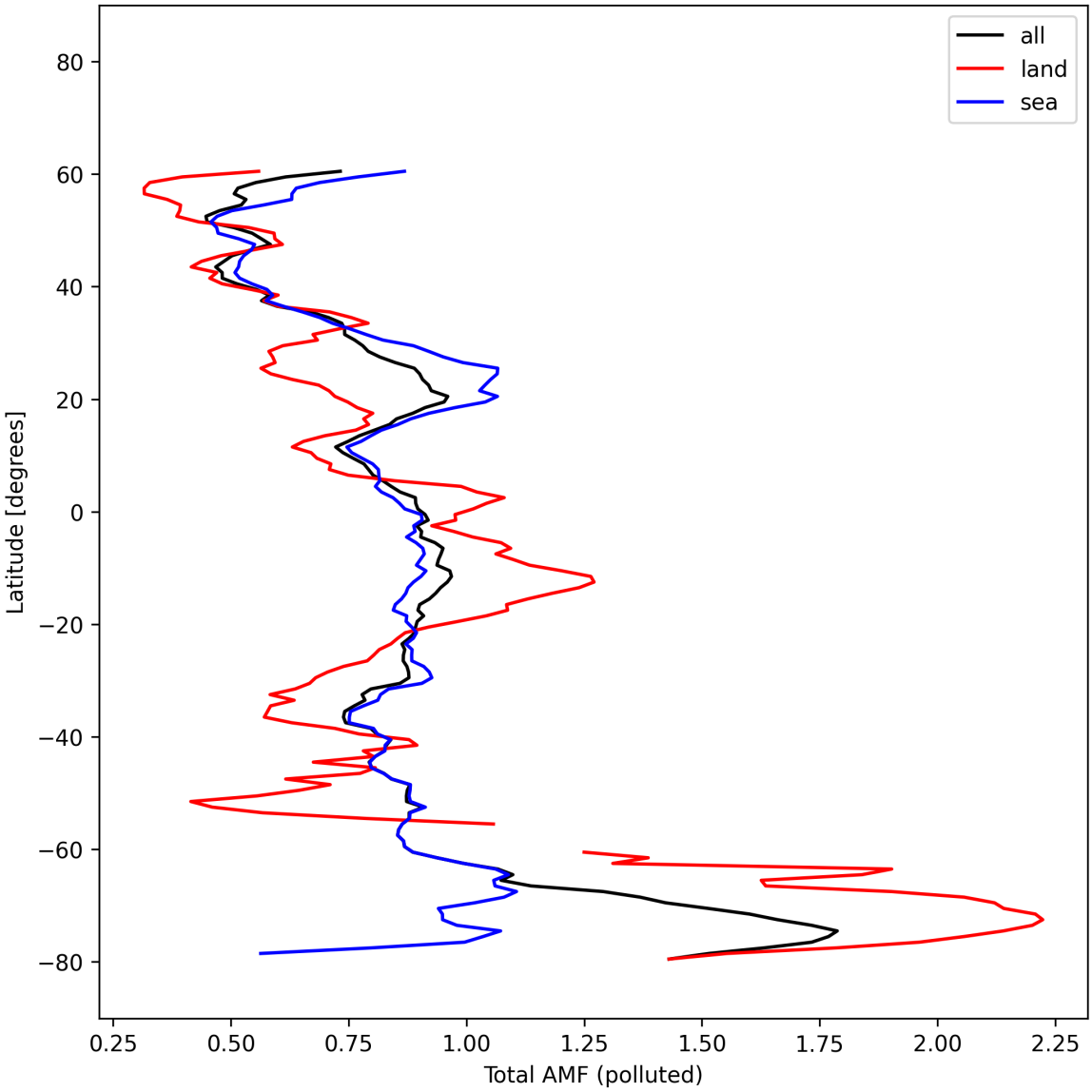

Figure 53: Zonal average of “Total AMF (polluted)” for 2025-02-23 to 2025-02-24.

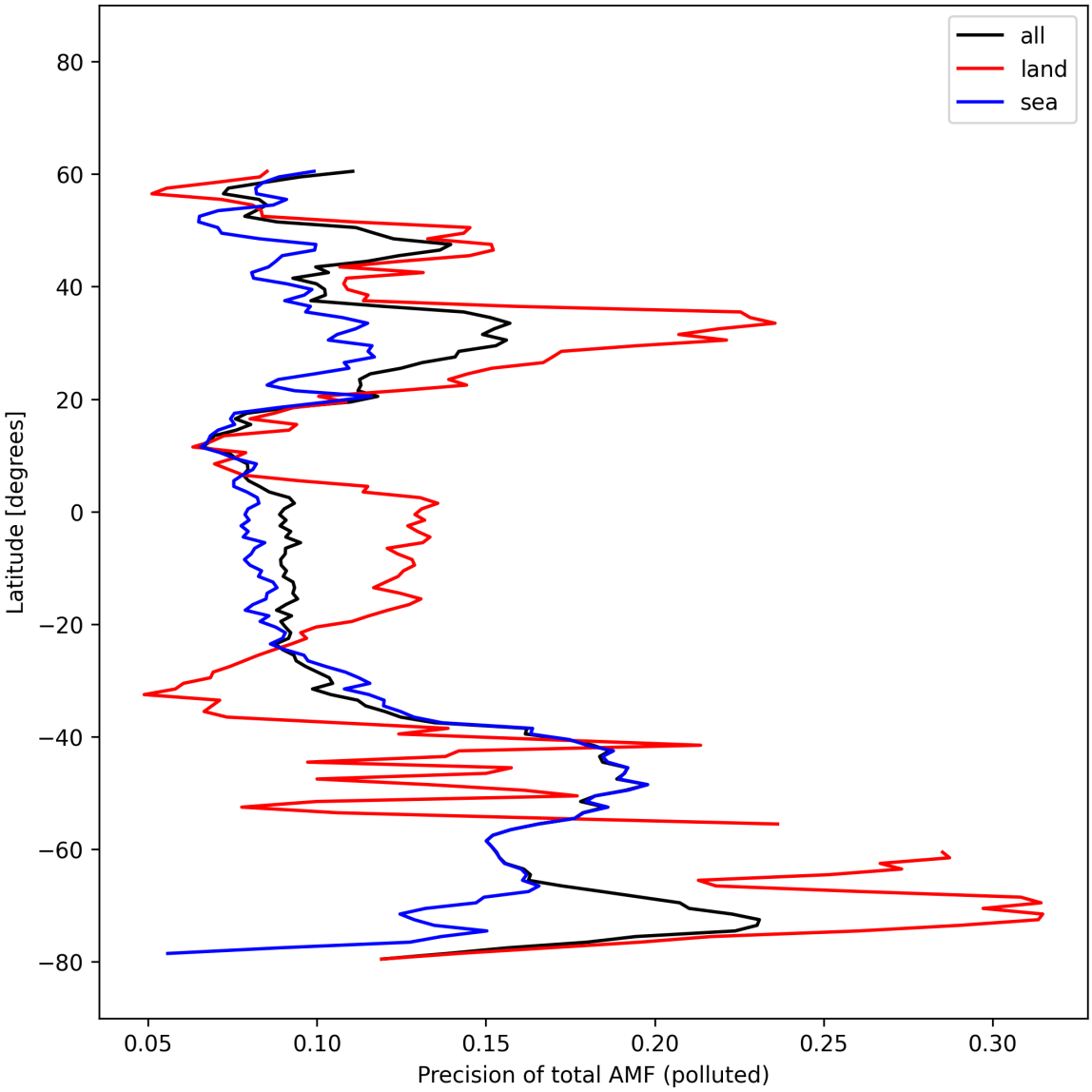

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-02-23 to 2025-02-24.

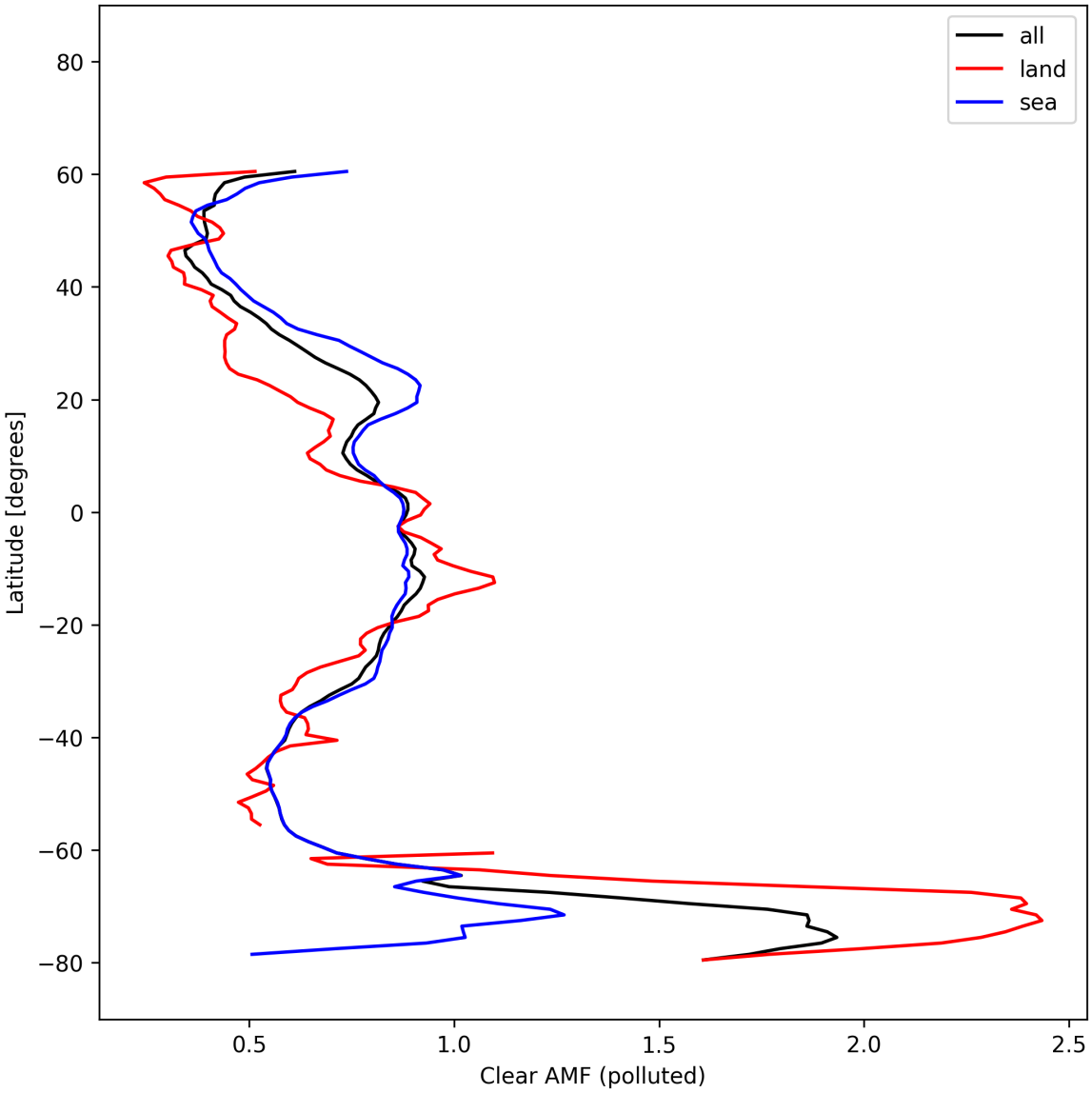

Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-02-23 to 2025-02-24.

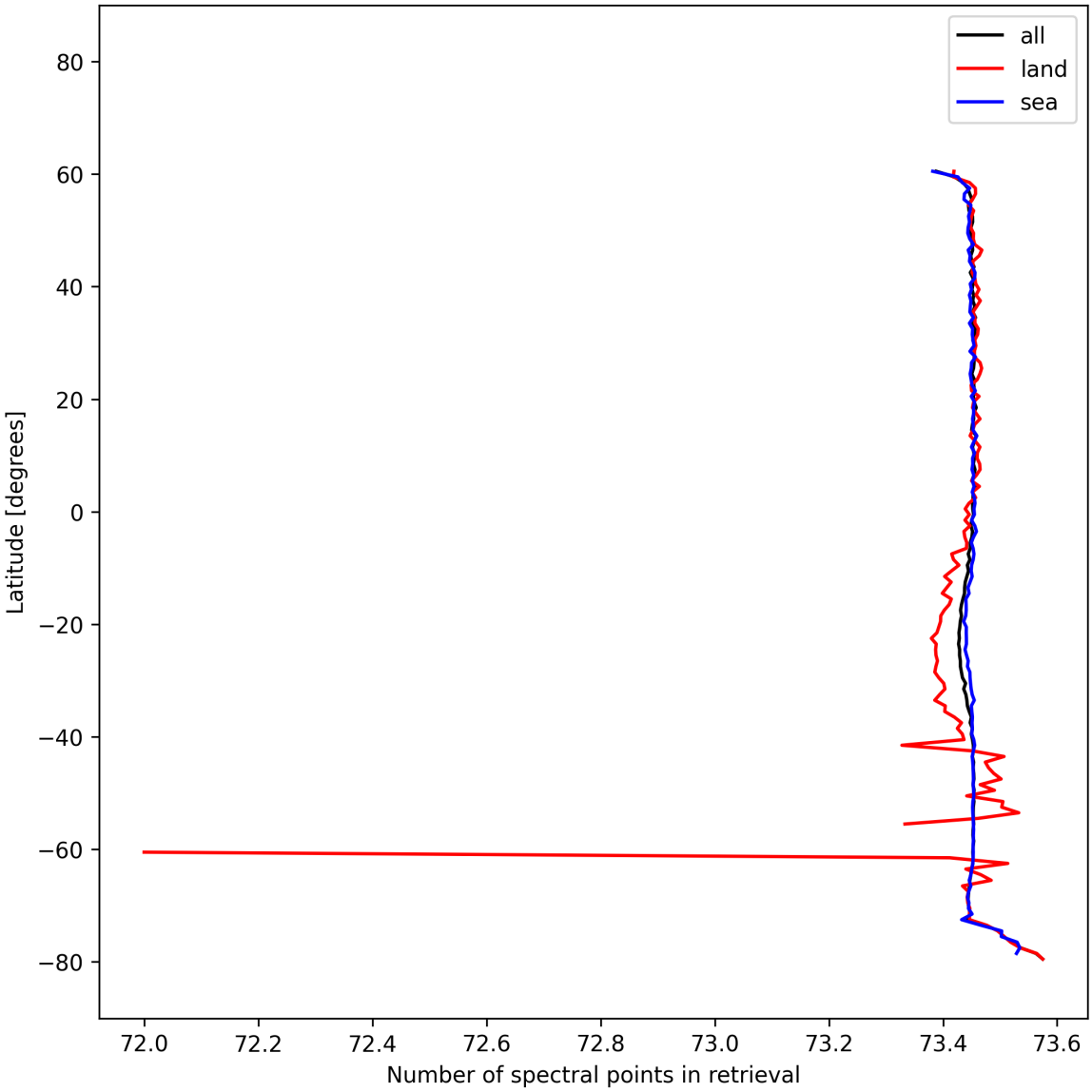

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-02-23 to 2025-02-24.

8 Histograms

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

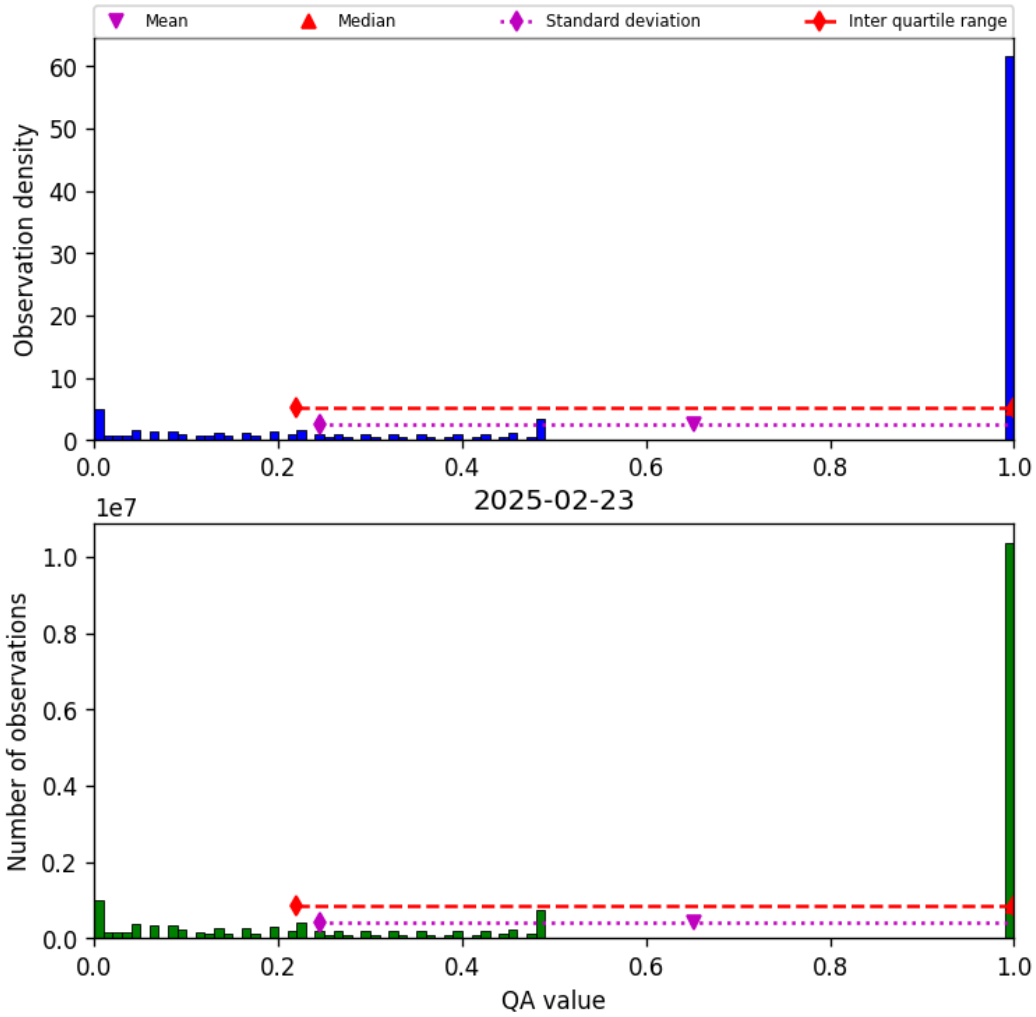

Figure 57: Histogram of “QA value” for 2025-02-23 to 2025-02-24

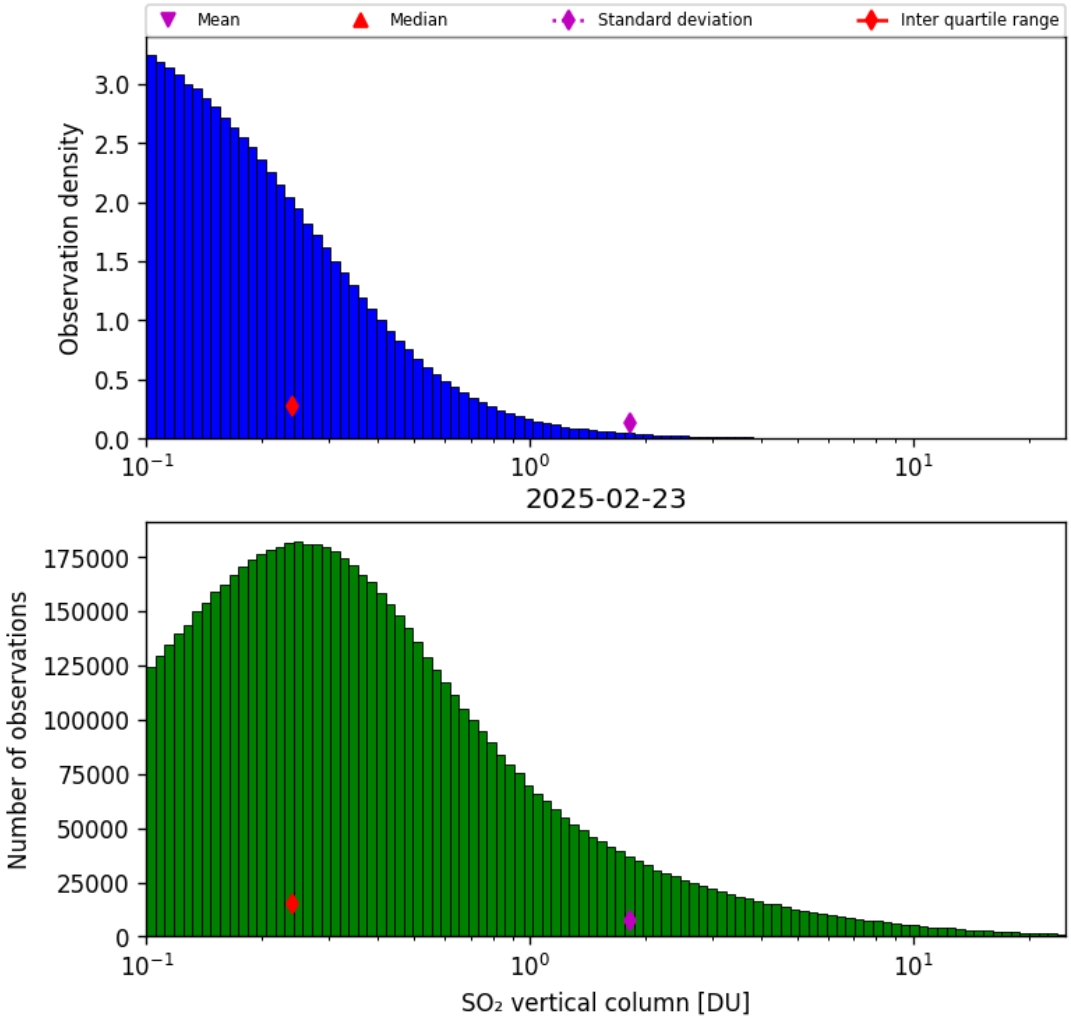

Figure 58: Histogram of "SO_2 vertical column" for 2025-02-23 to 2025-02-24

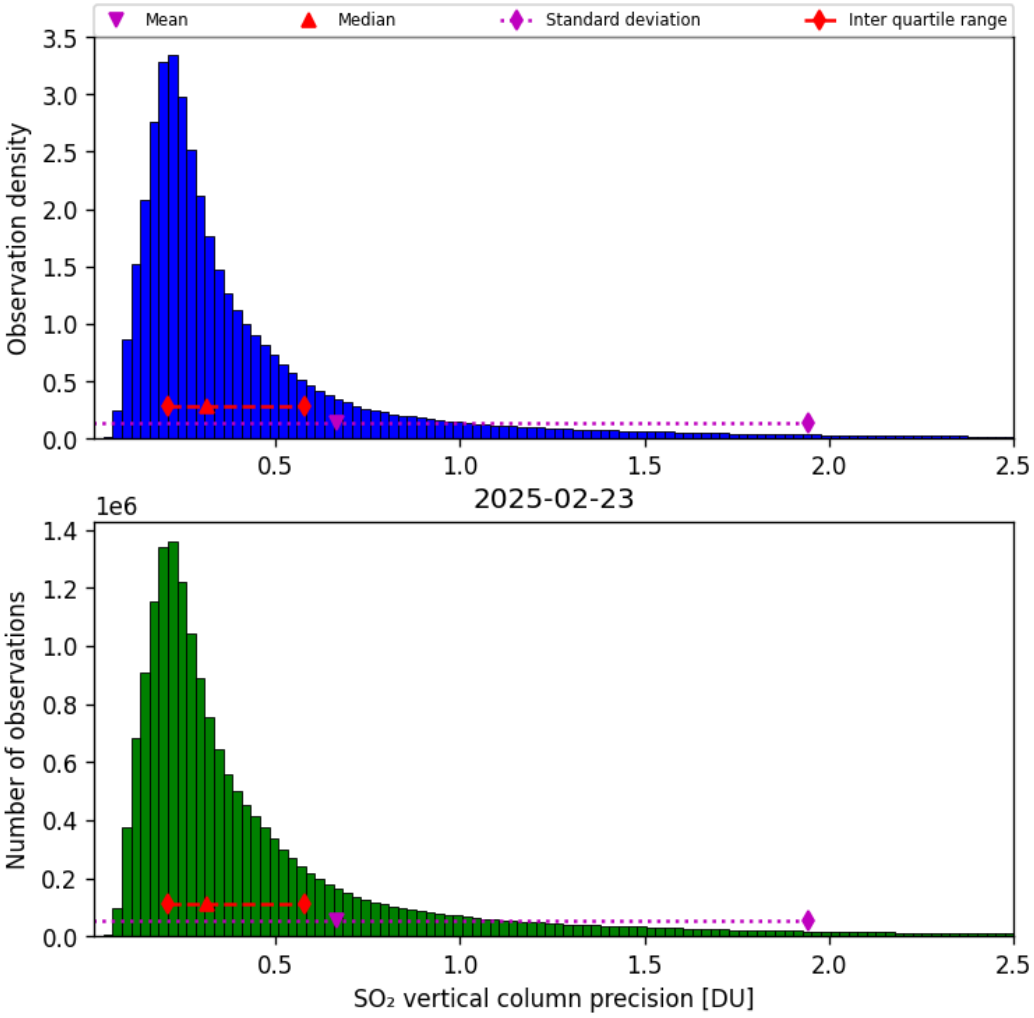

Figure 59: Histogram of "SO_2 vertical column precision" for 2025-02-23 to 2025-02-24

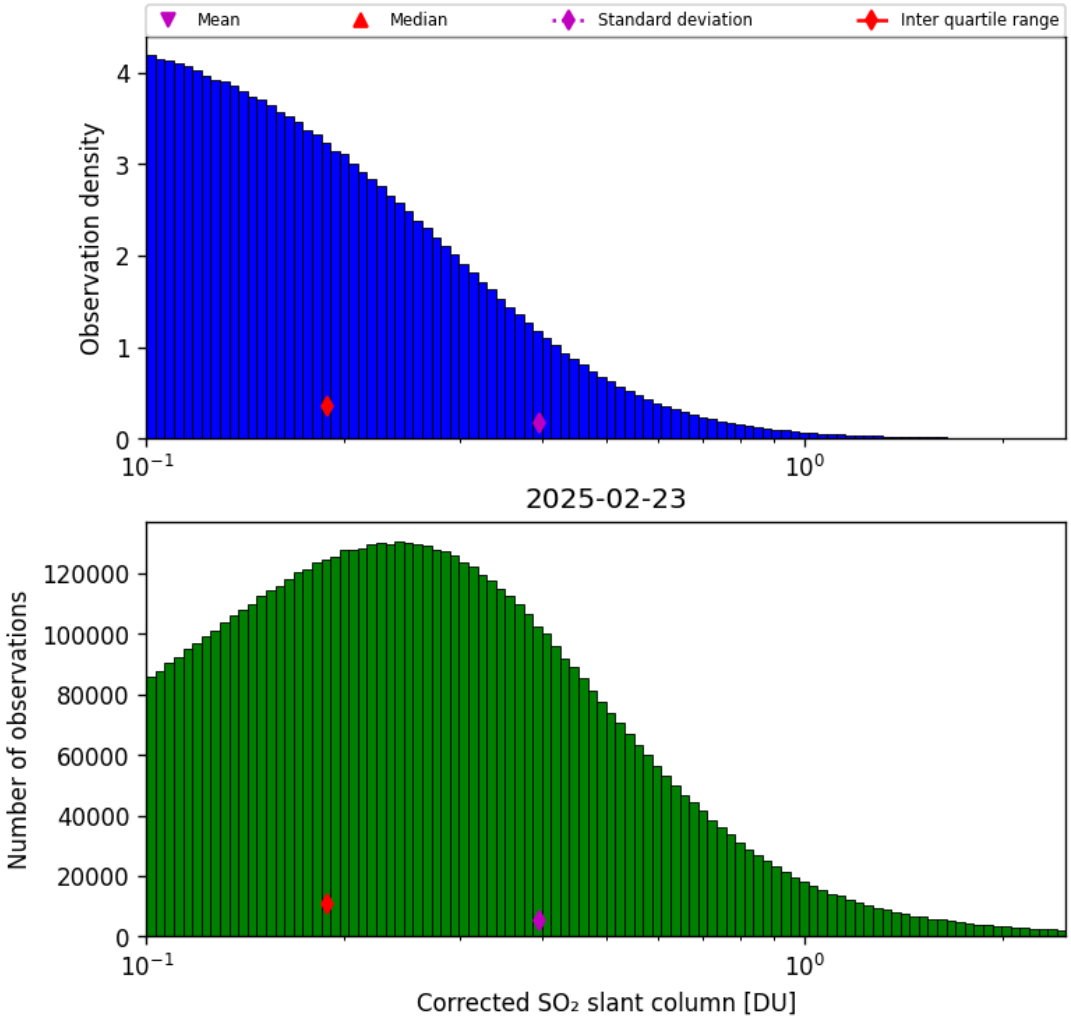

Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-02-23 to 2025-02-24

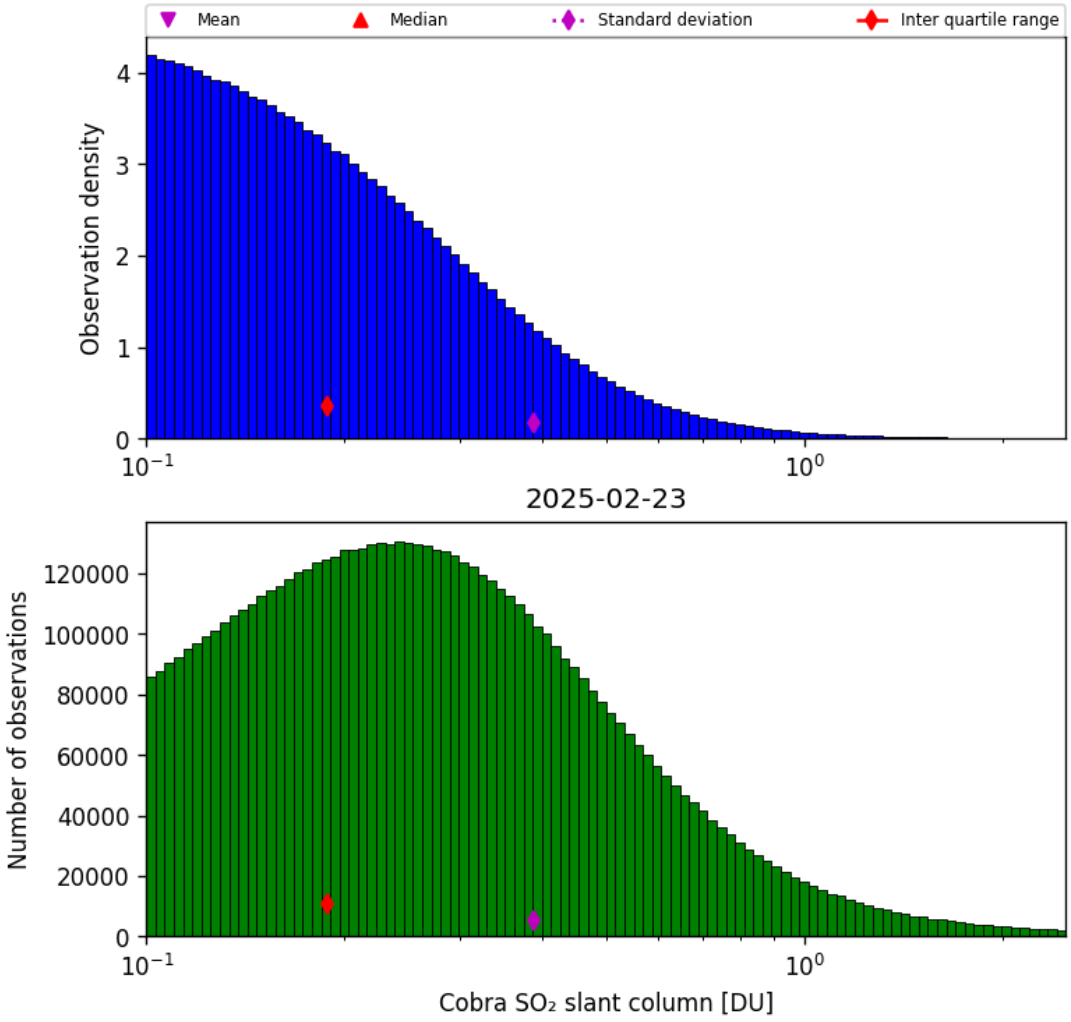

Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-02-23 to 2025-02-24

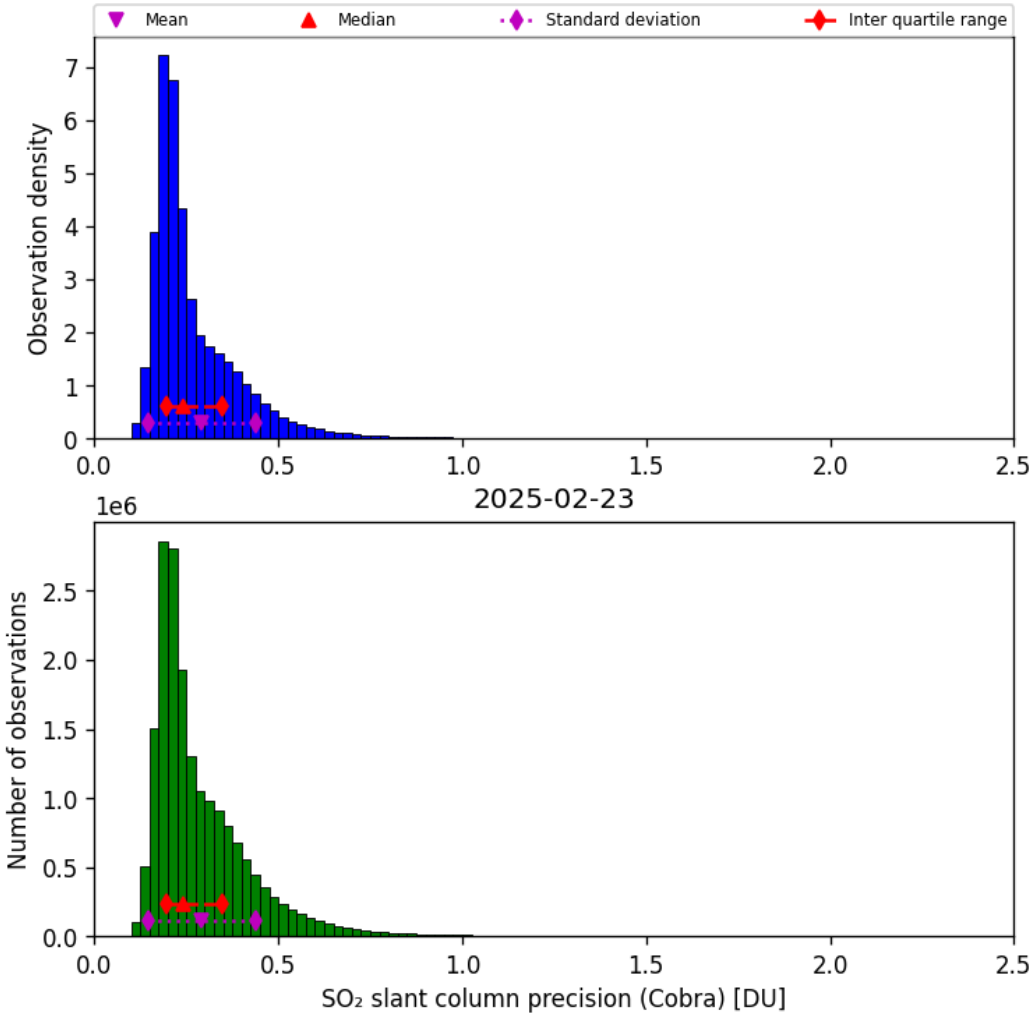

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-02-23 to 2025-02-24

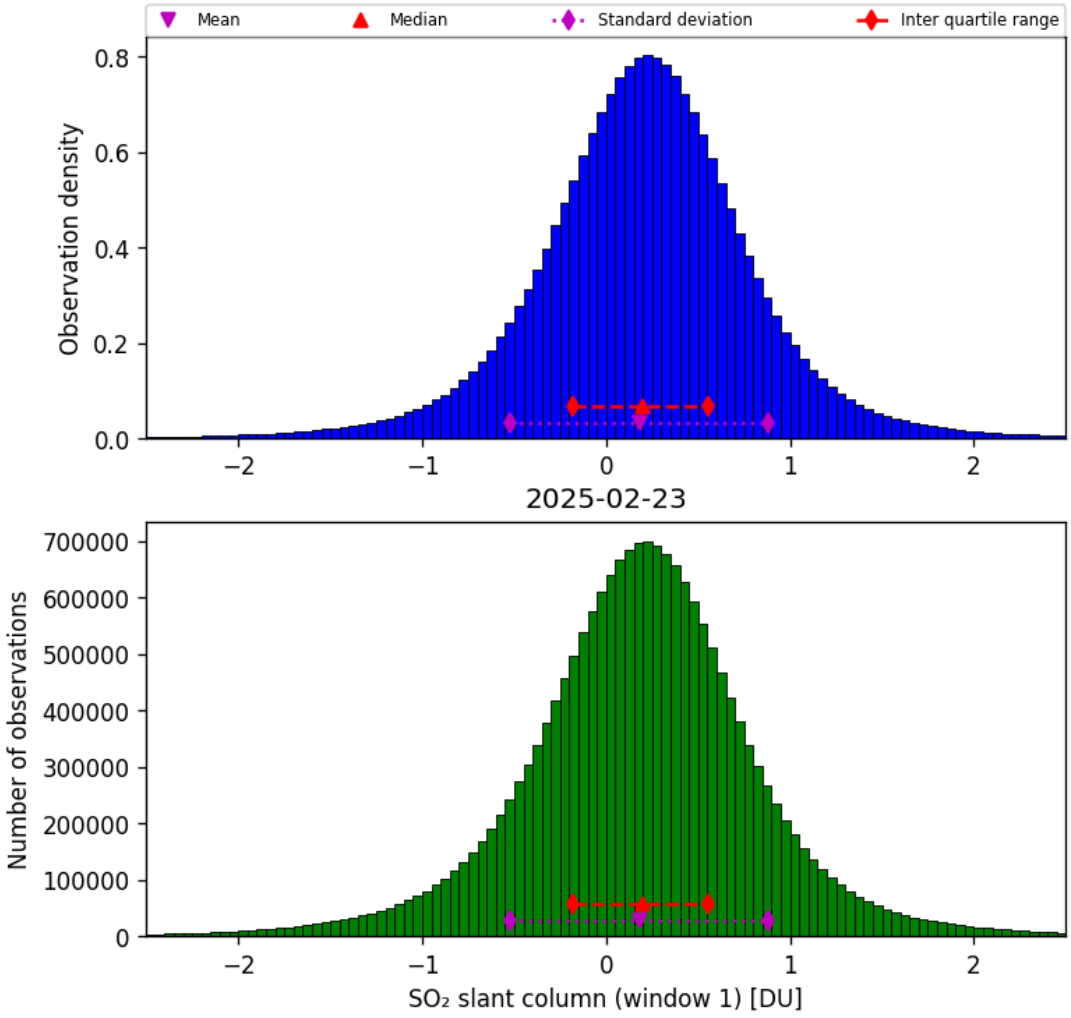

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-02-23 to 2025-02-24

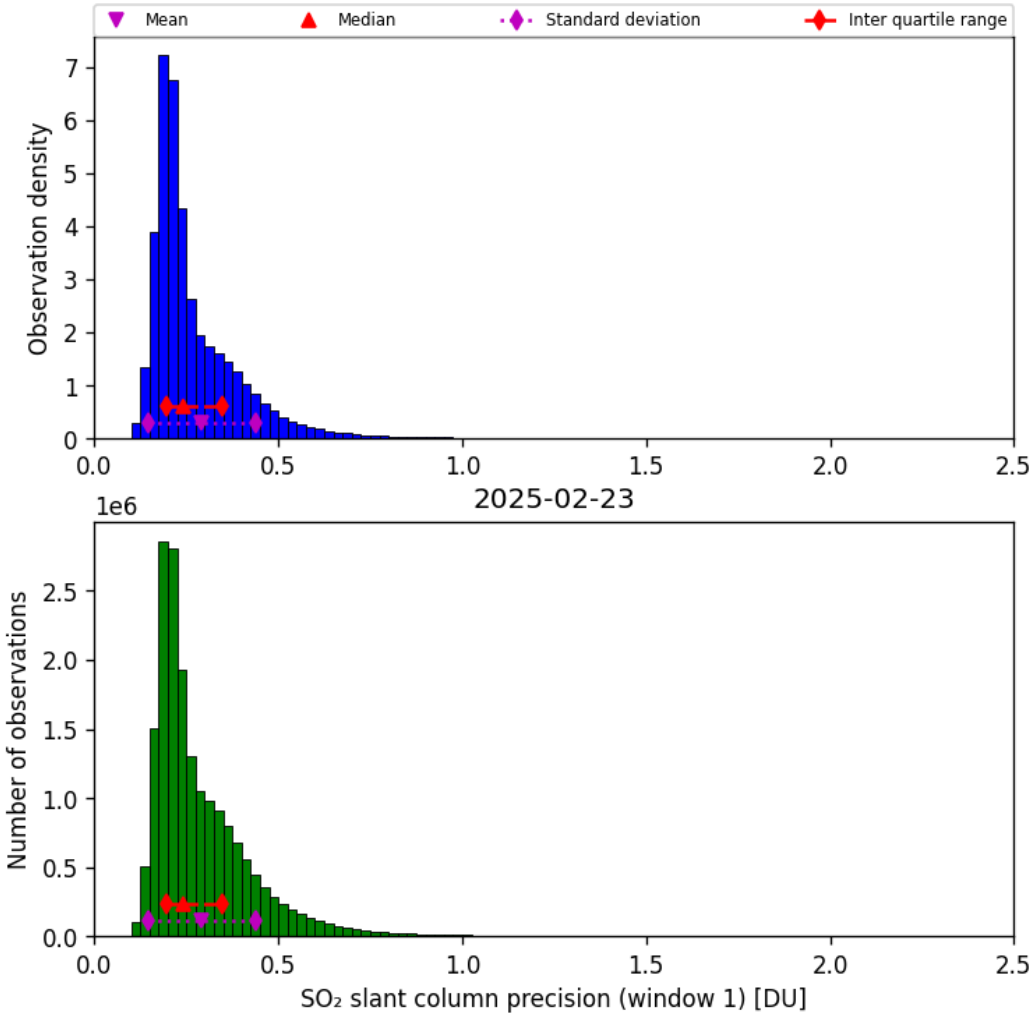

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-02-23 to 2025-02-24

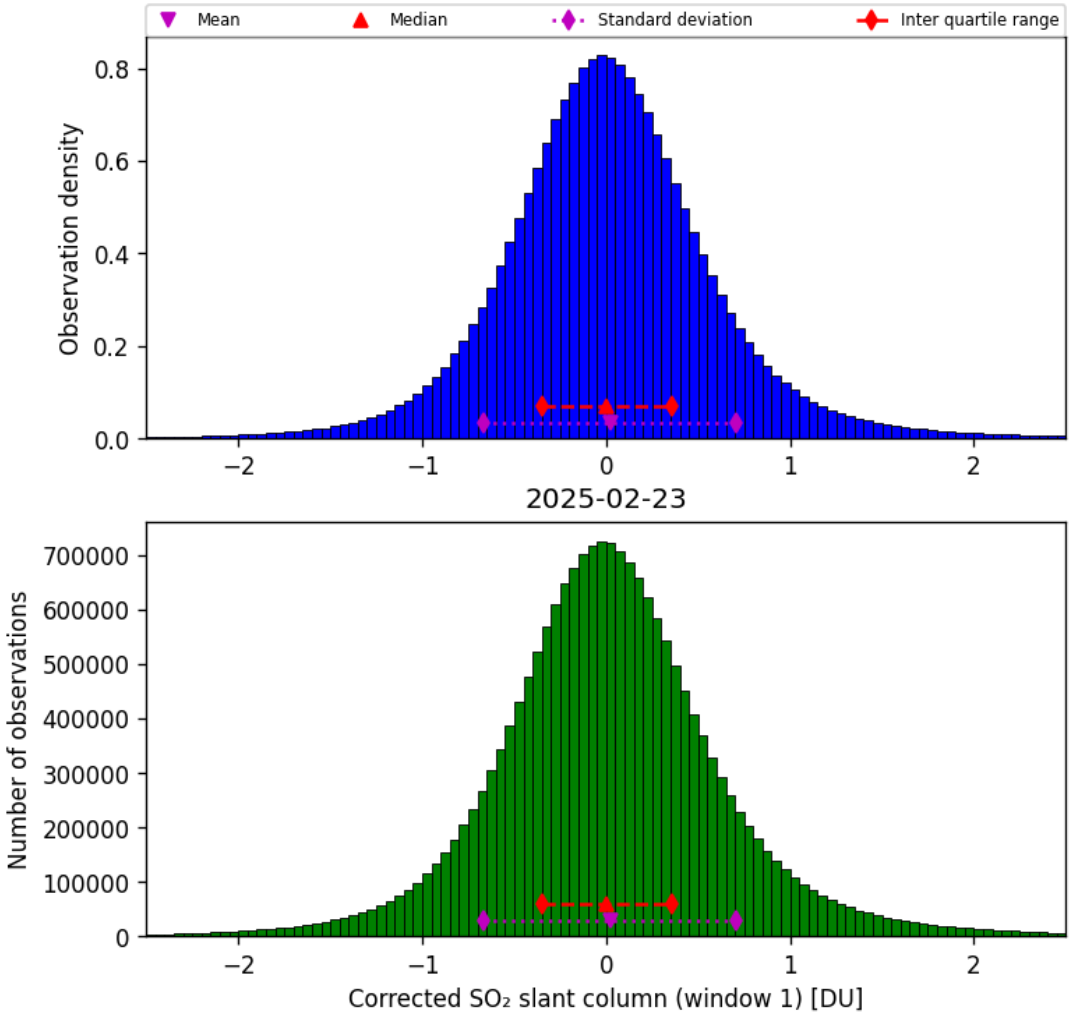

Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-02-23 to 2025-02-24

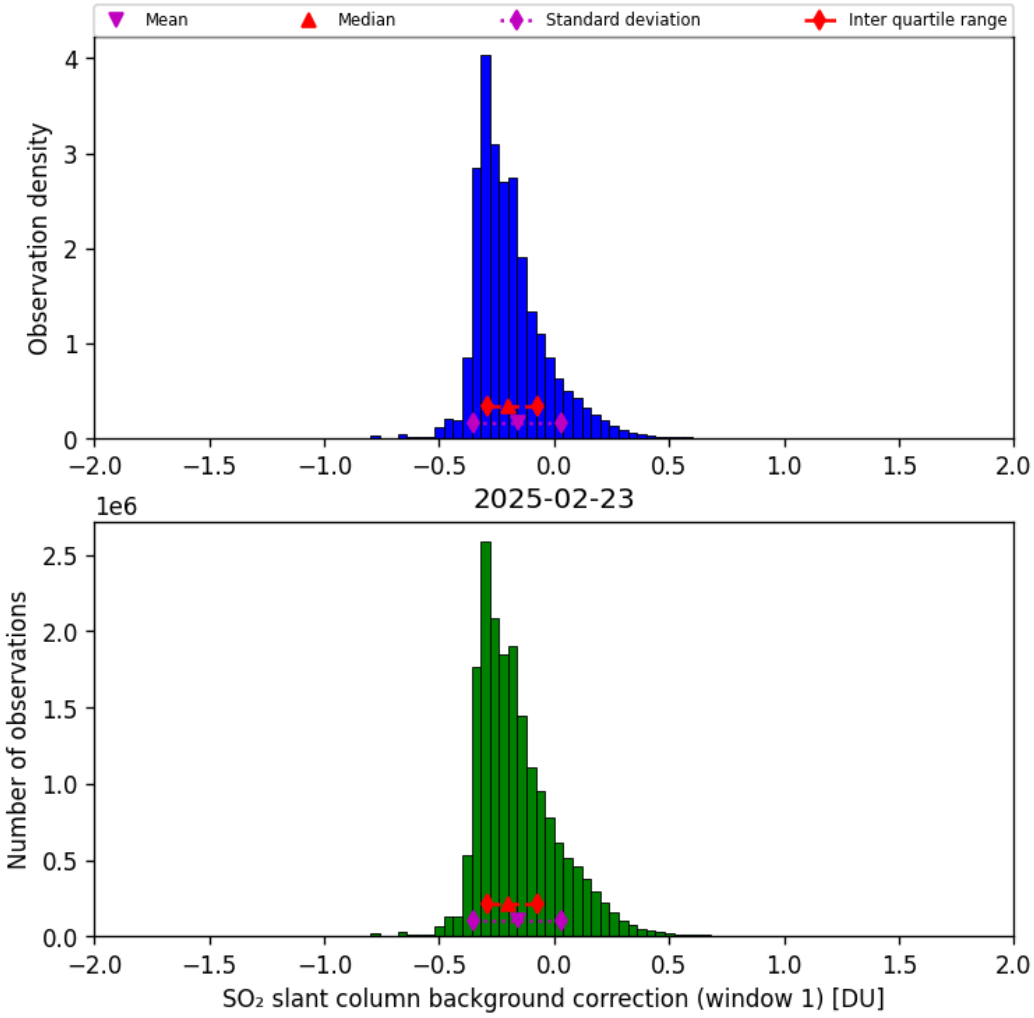

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-02-23 to 2025-02-24

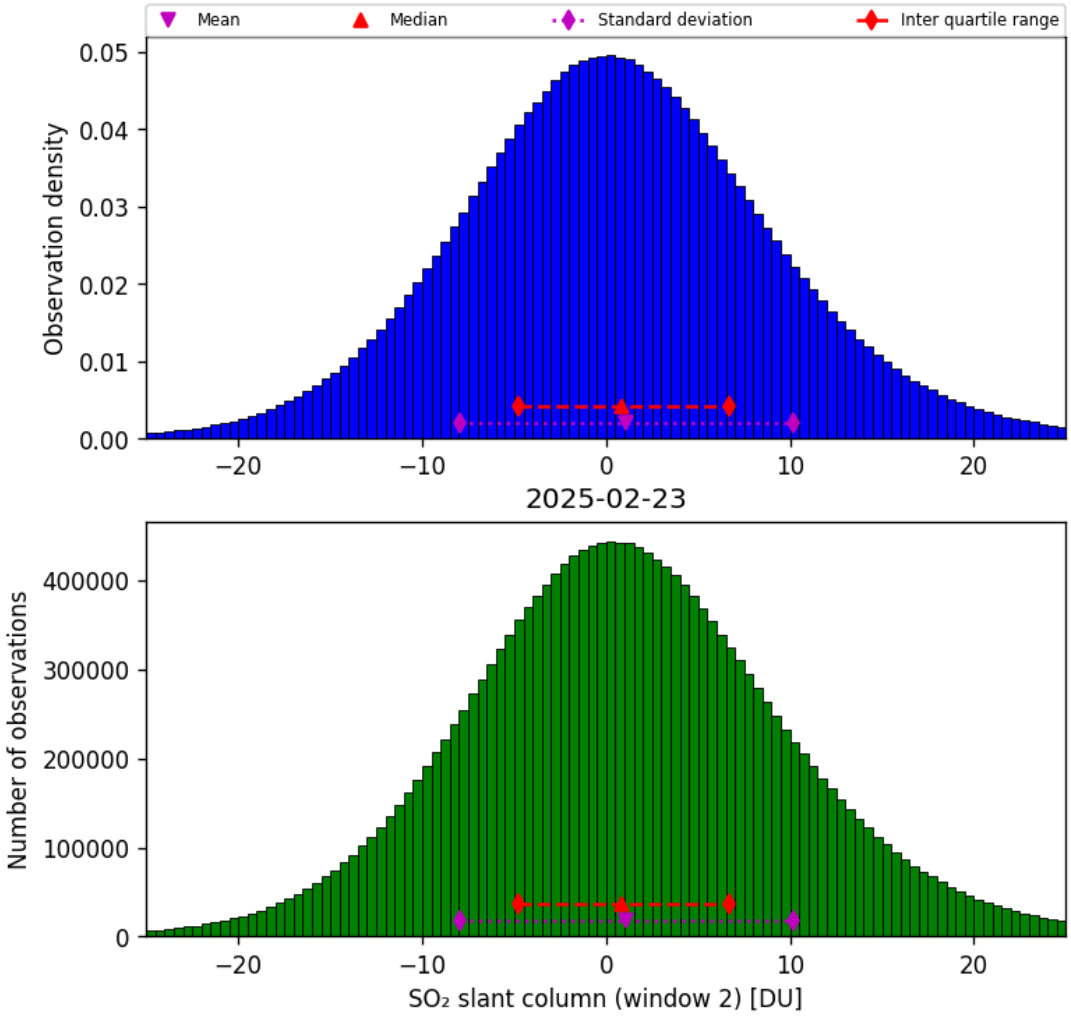

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-02-23 to 2025-02-24

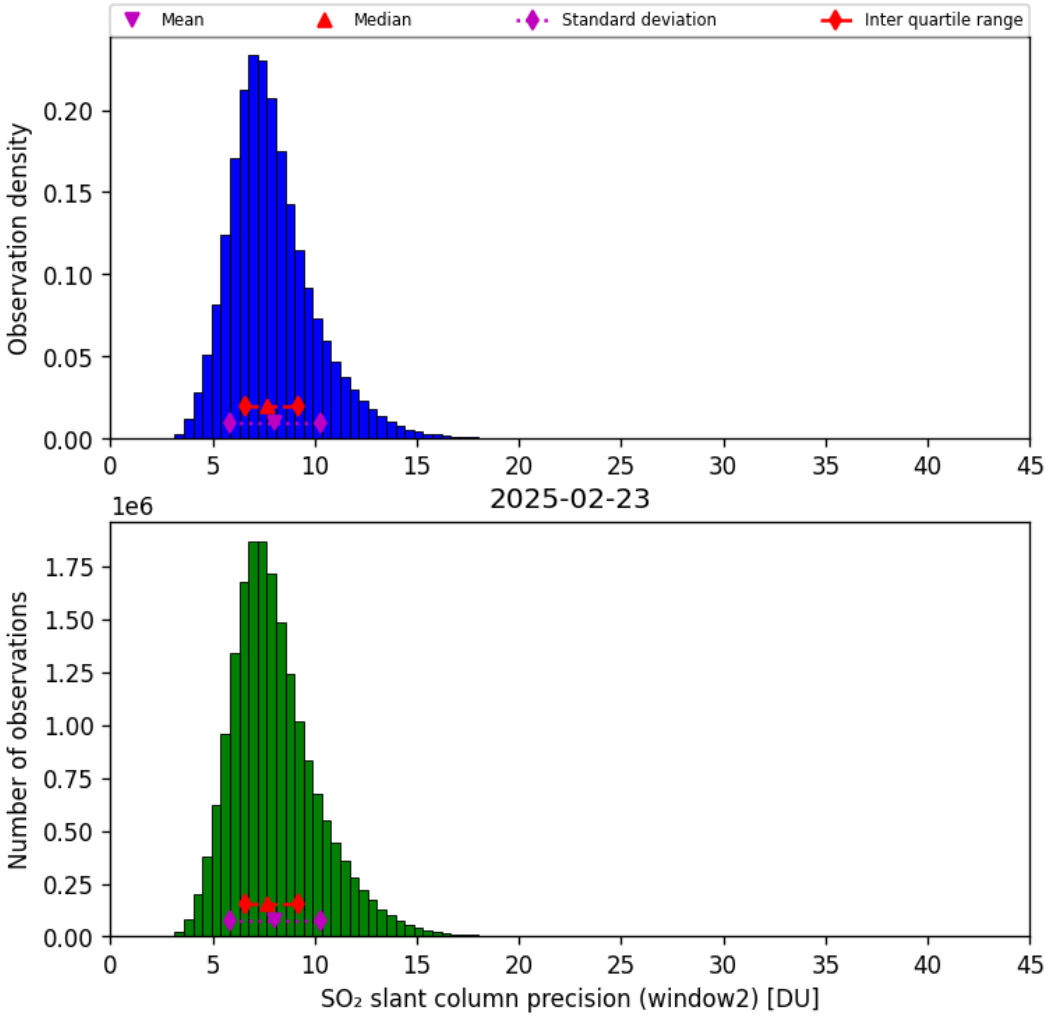

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-02-23 to 2025-02-24

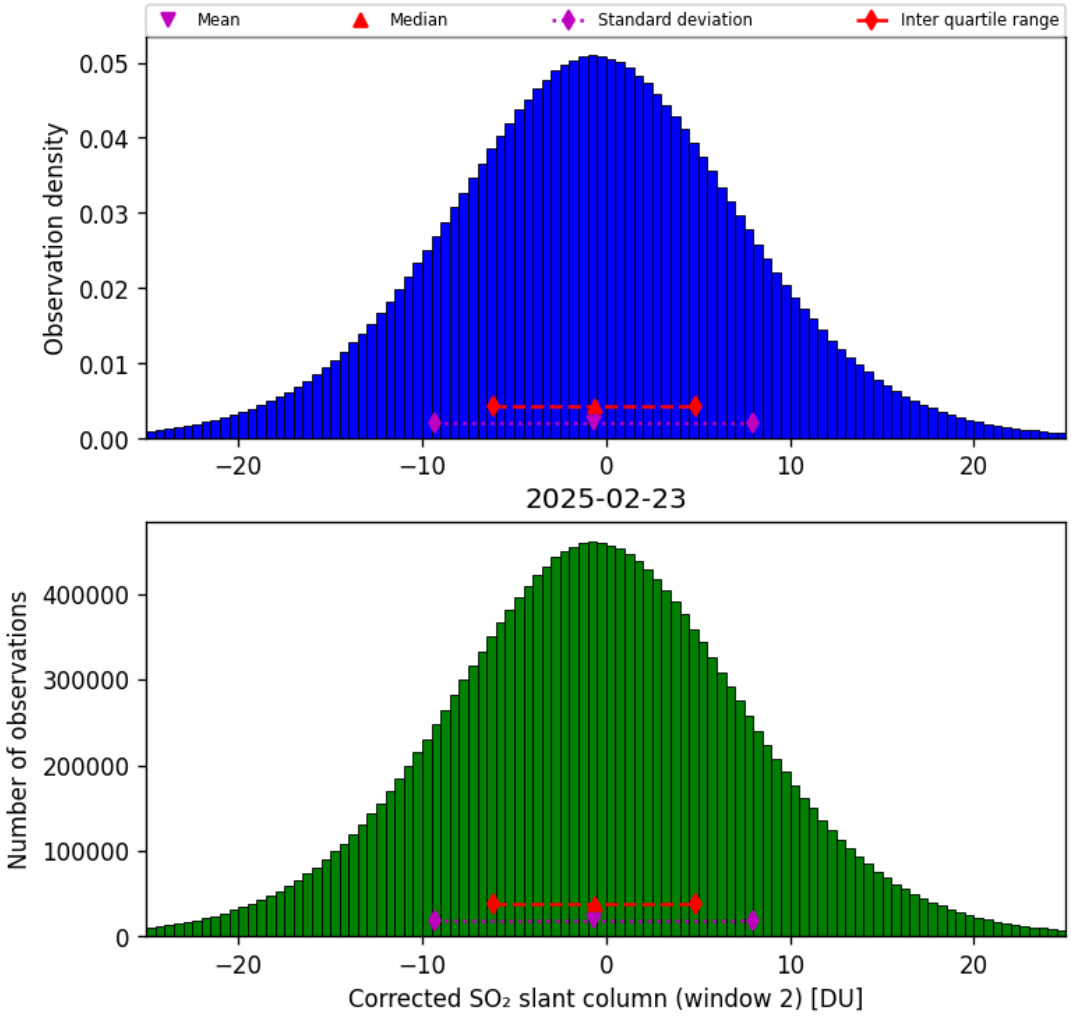

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-02-23 to 2025-02-24

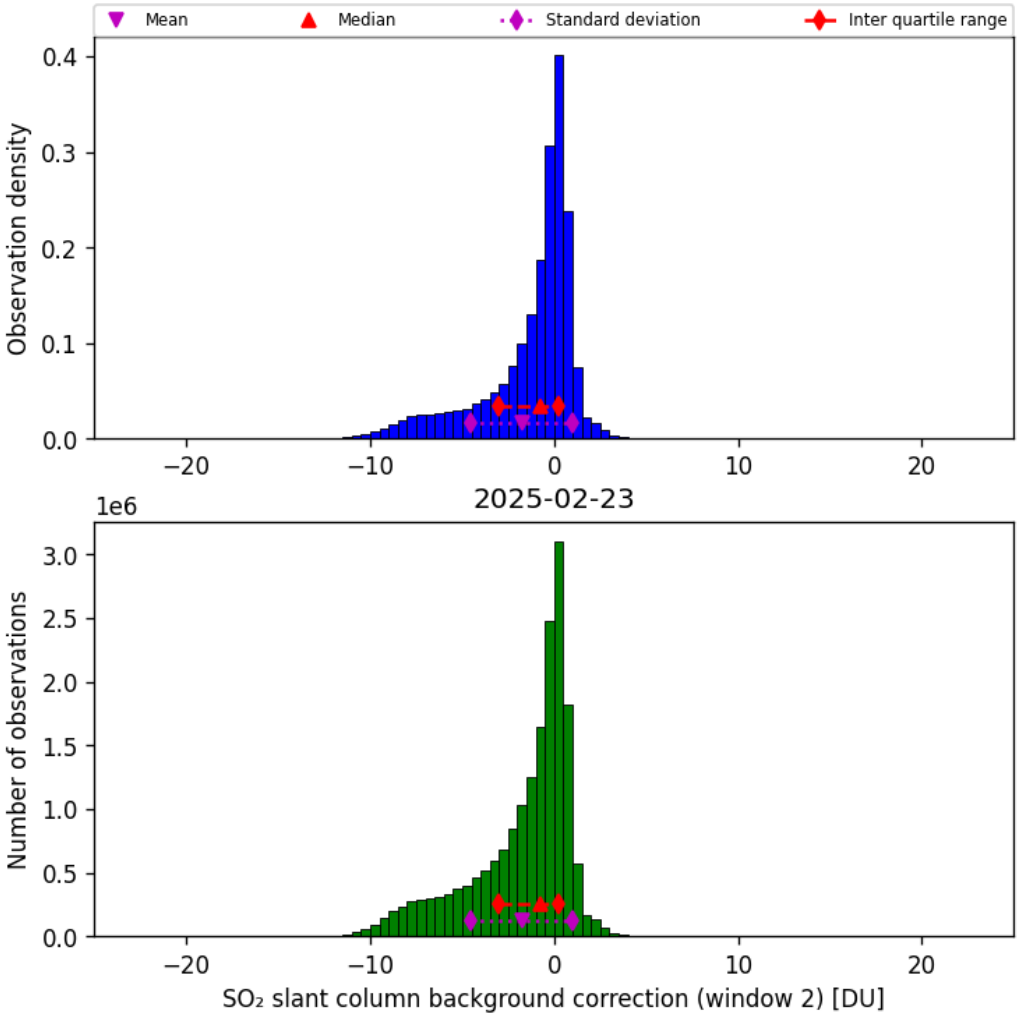

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-02-23 to 2025-02-24

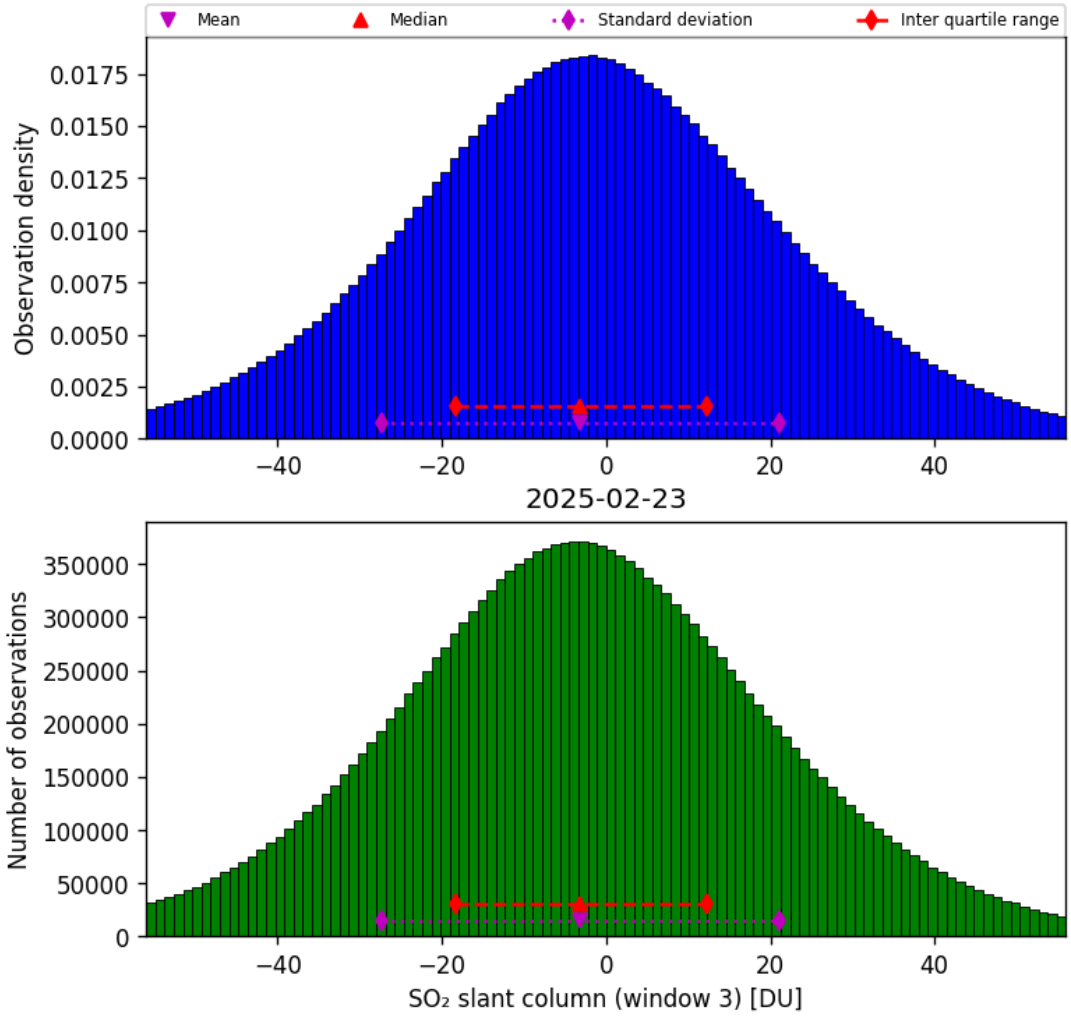

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-02-23 to 2025-02-24

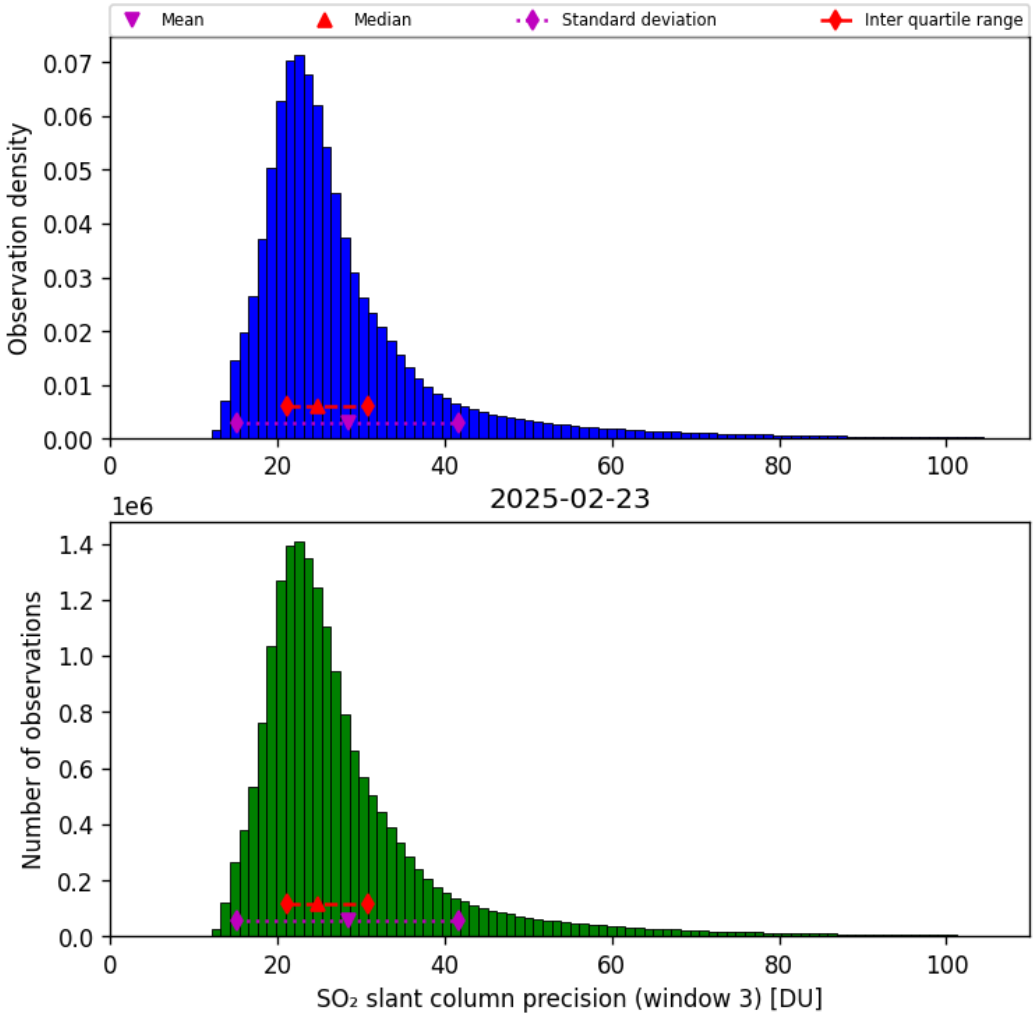

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-02-23 to 2025-02-24

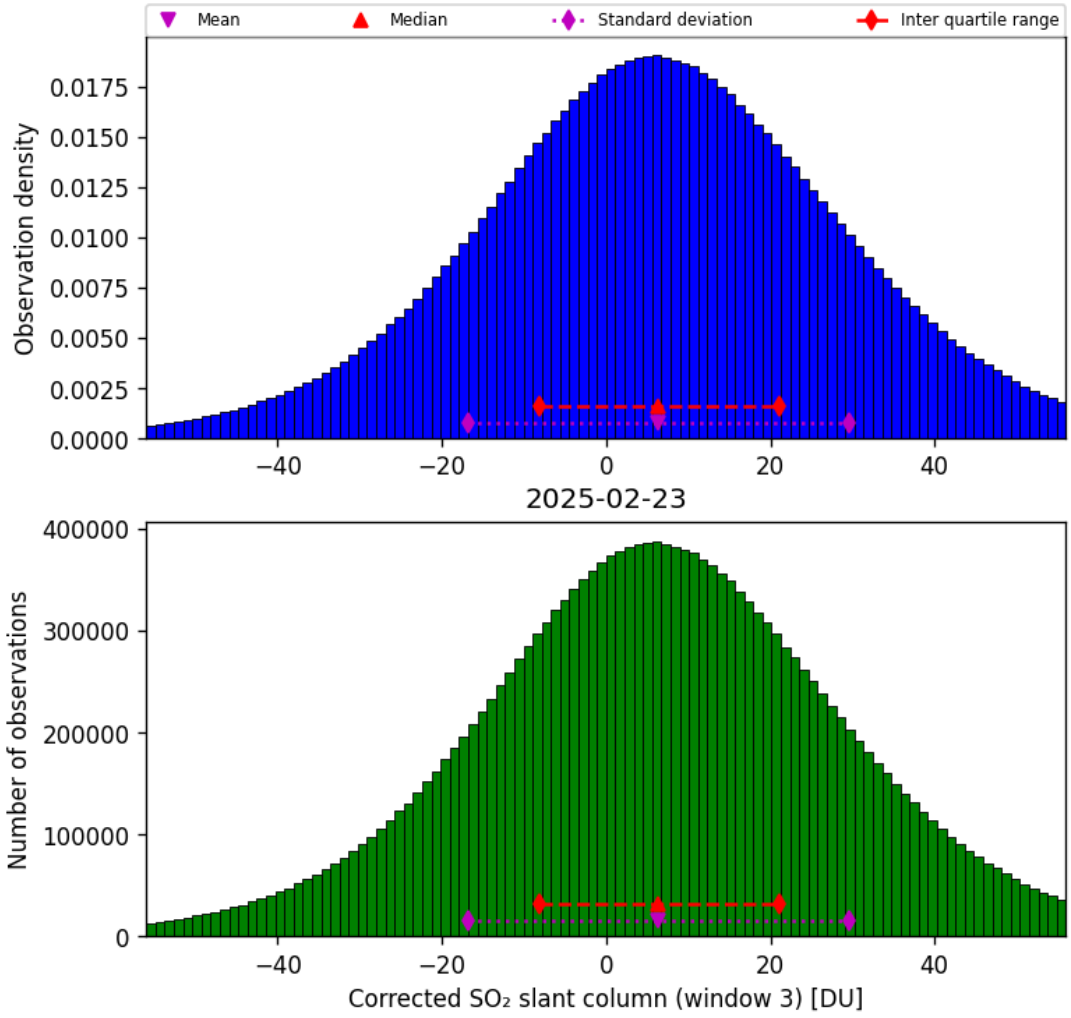

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-02-23 to 2025-02-24

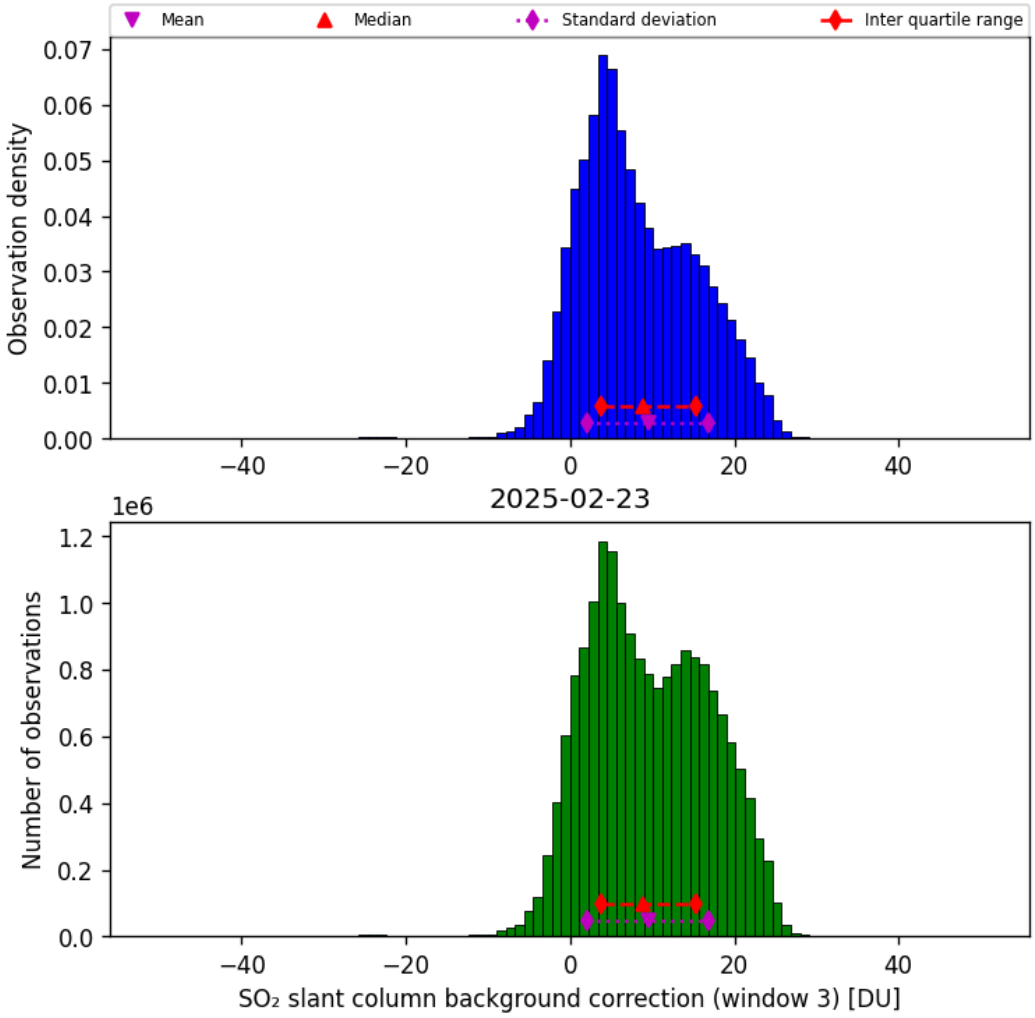

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-02-23 to 2025-02-24

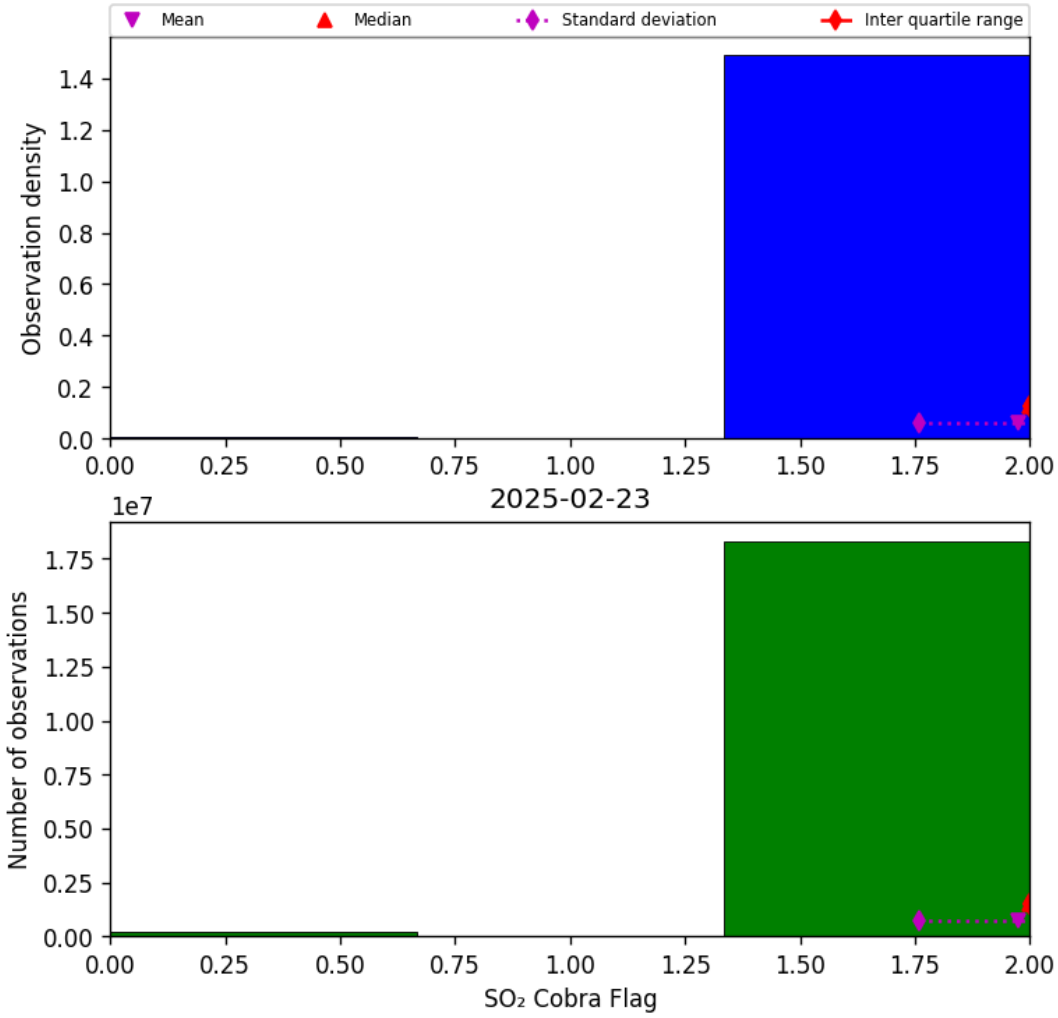

Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-02-23 to 2025-02-24

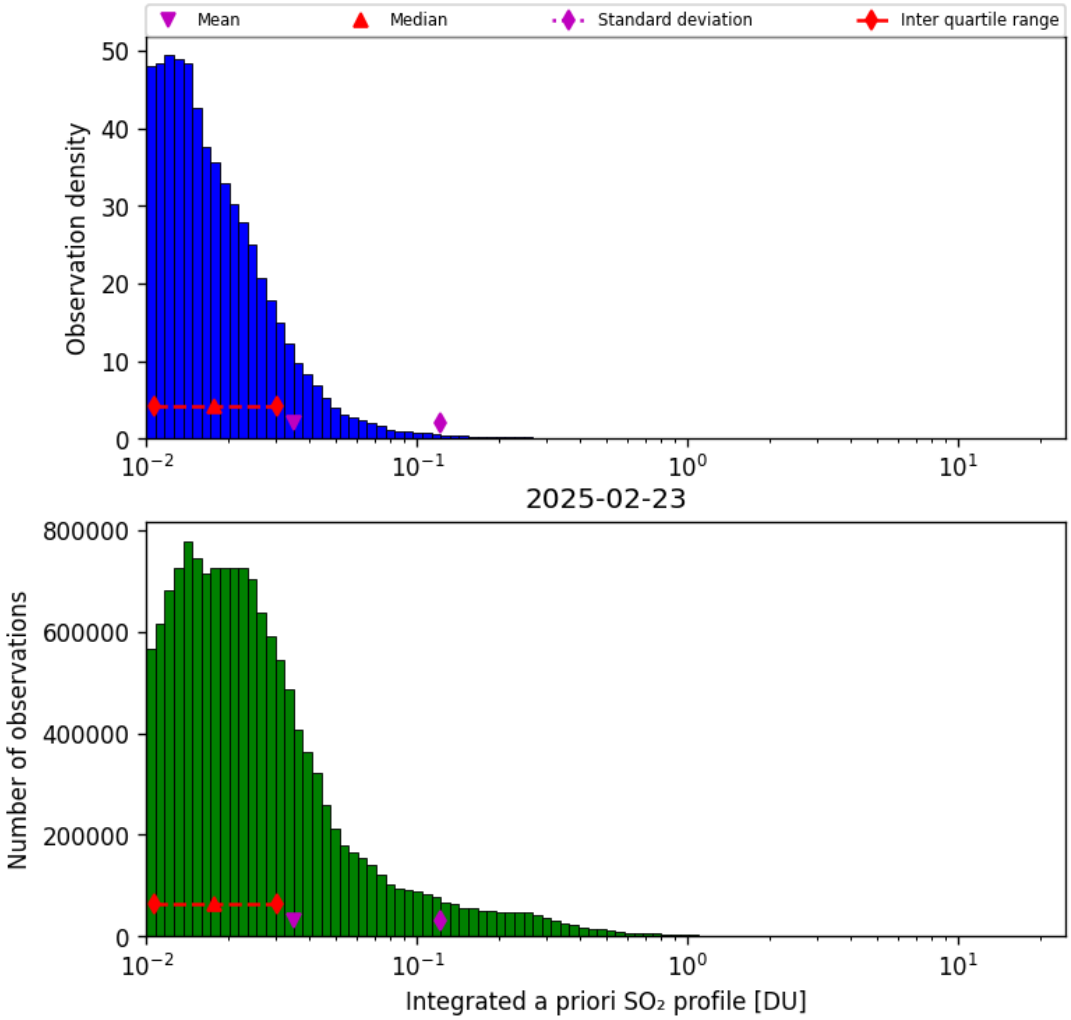

Figure 76: Histogram of "Integrated a priori SO_2 profile" for 2025-02-23 to 2025-02-24

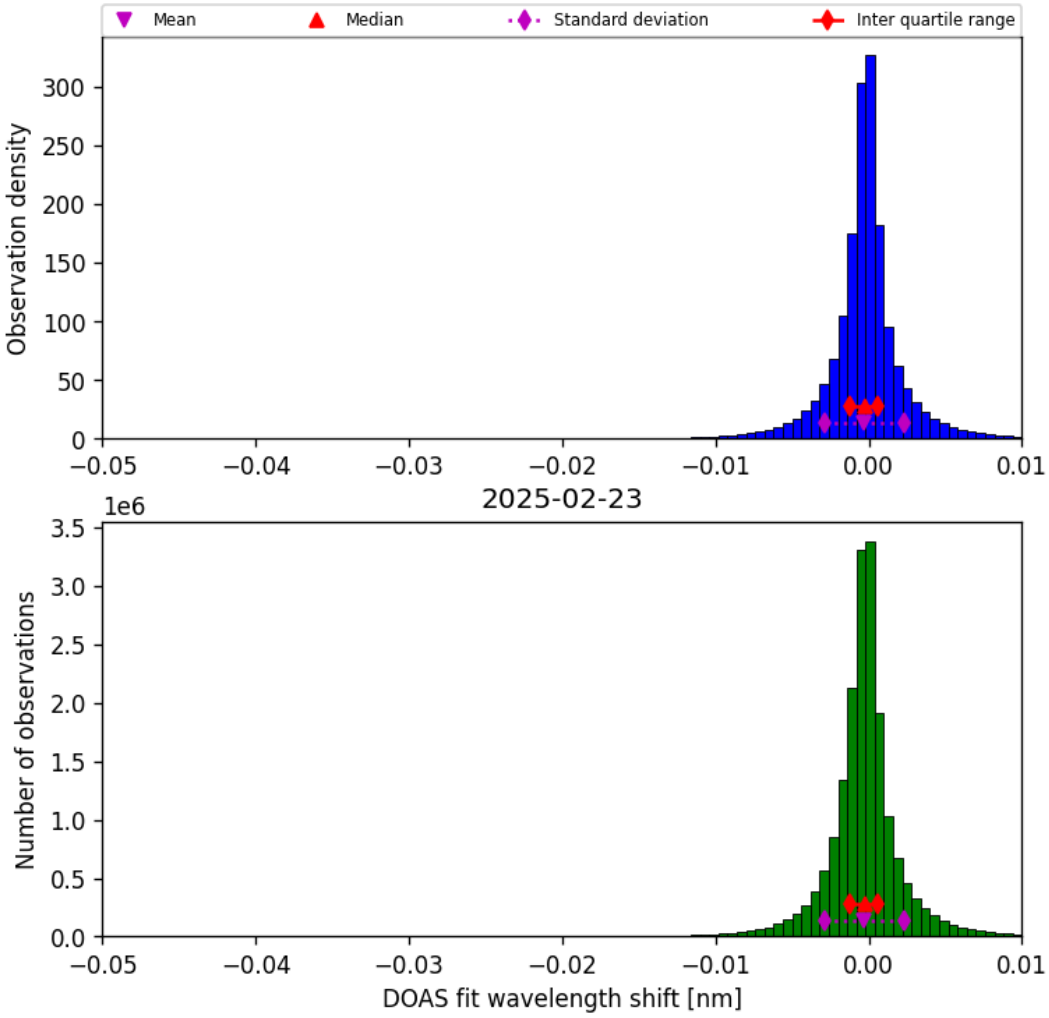

Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-02-23 to 2025-02-24

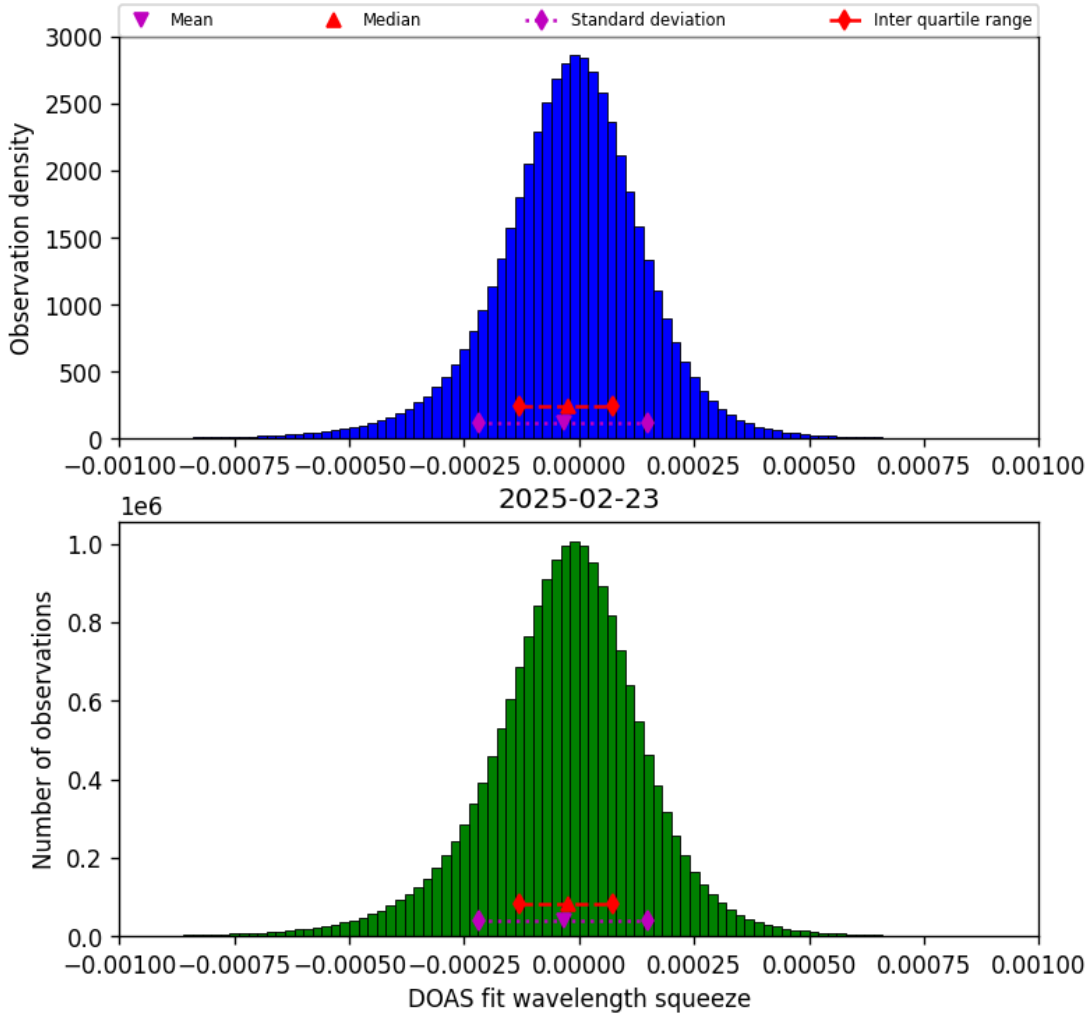

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-02-23 to 2025-02-24

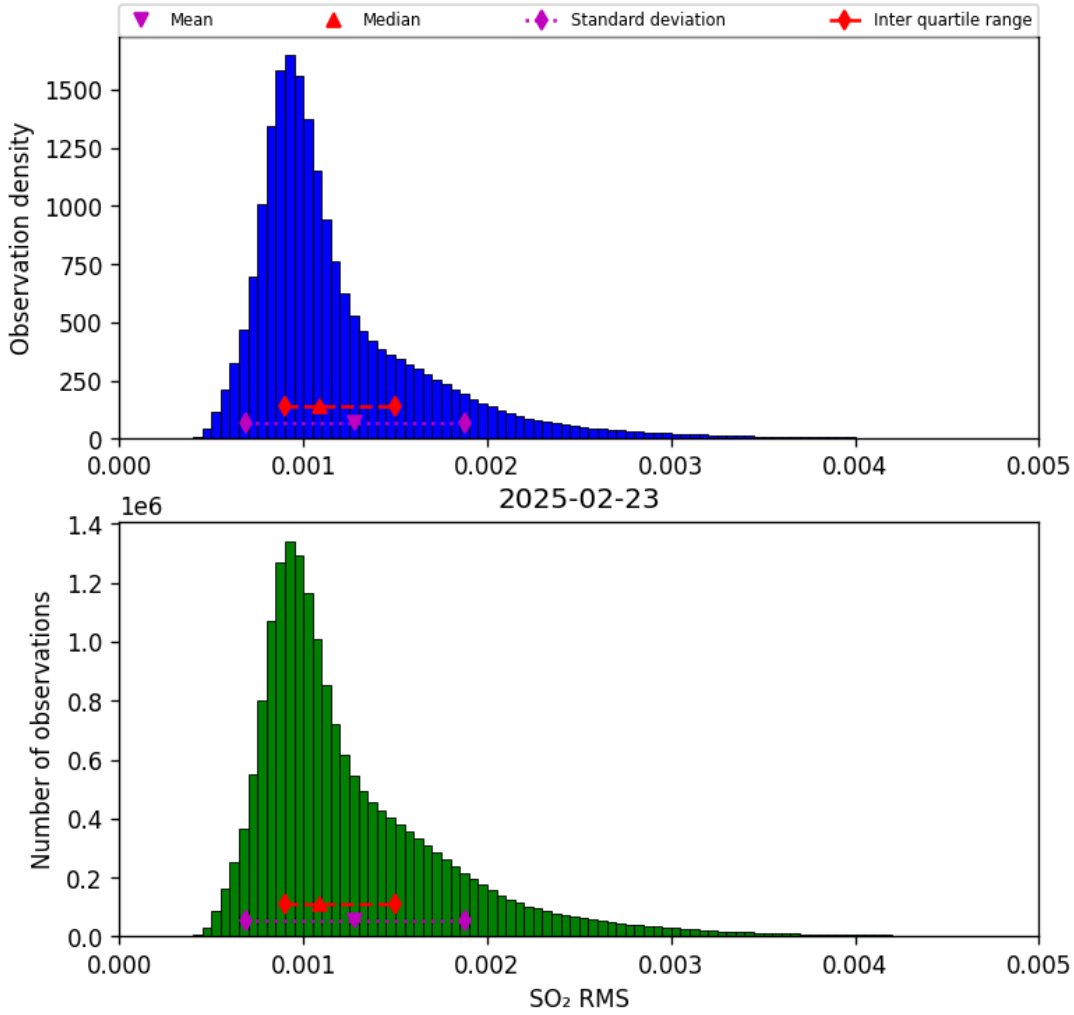

Figure 79: Histogram of "SO_2 RMS" for 2025-02-23 to 2025-02-24

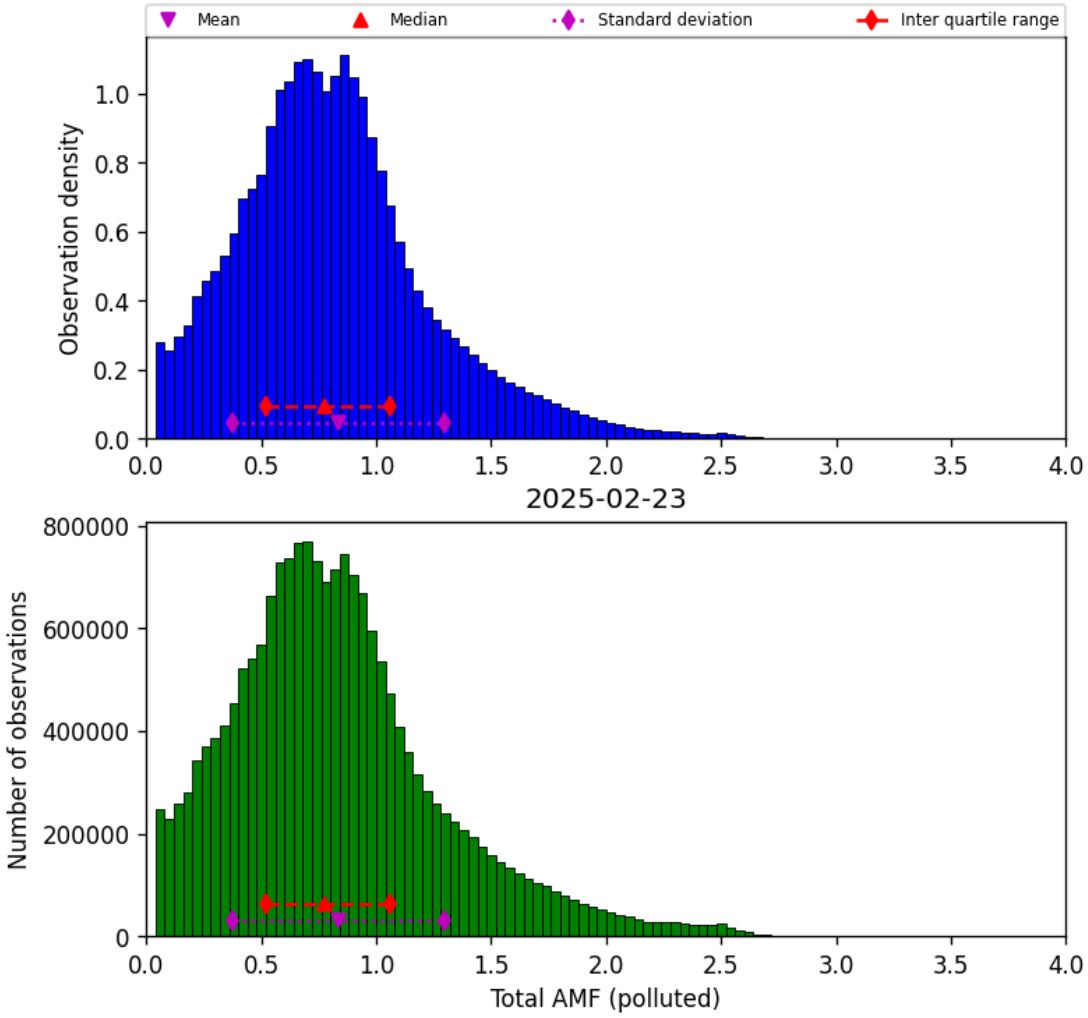

Figure 80: Histogram of “Total AMF (polluted)” for 2025-02-23 to 2025-02-24

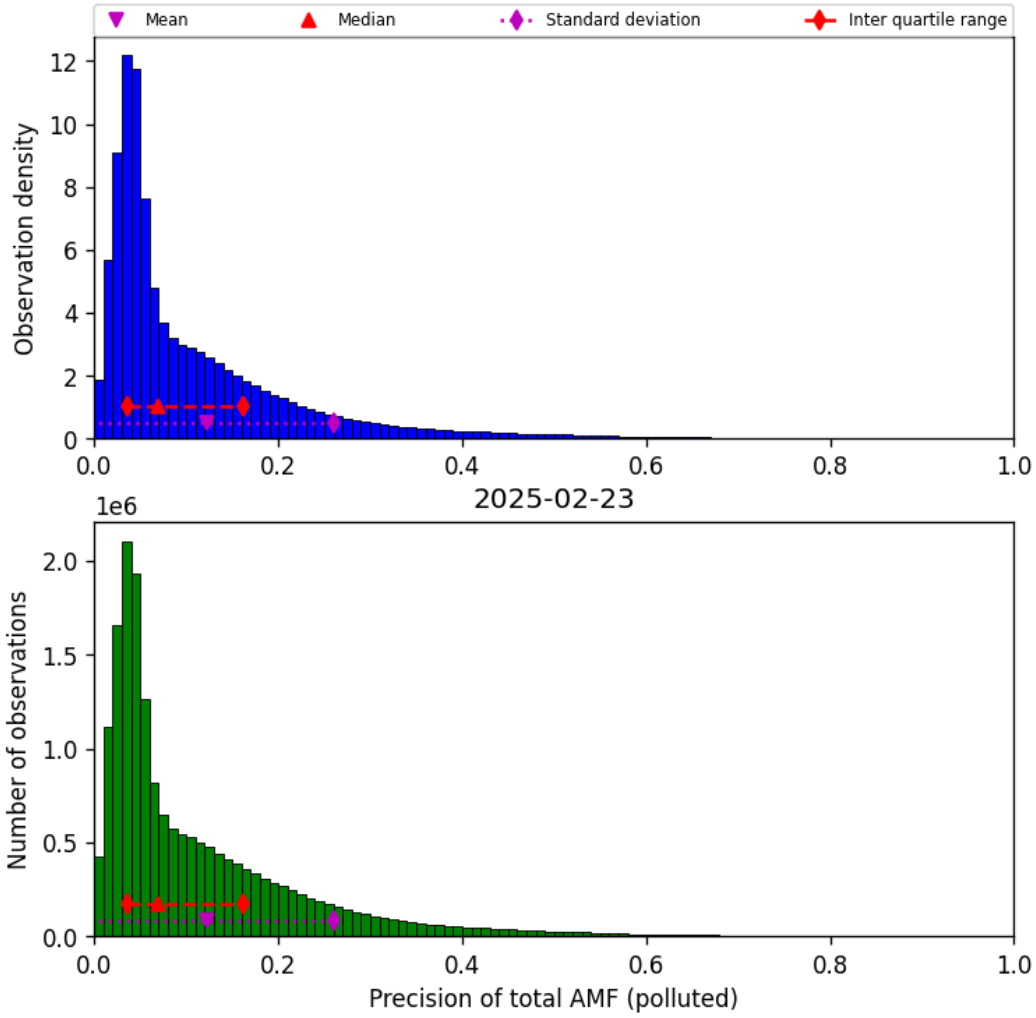

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-02-23 to 2025-02-24

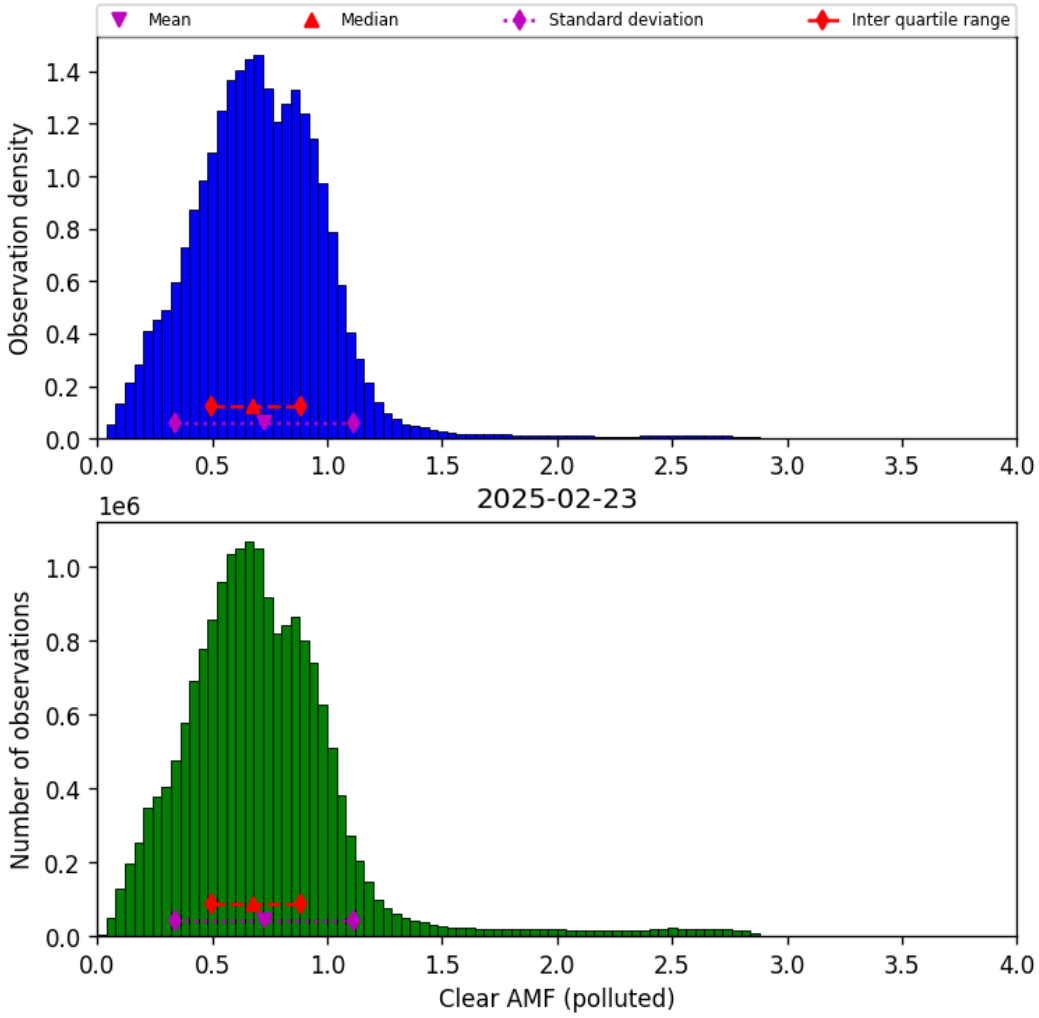

Figure 82: Histogram of “Clear AMF (polluted)” for 2025-02-23 to 2025-02-24

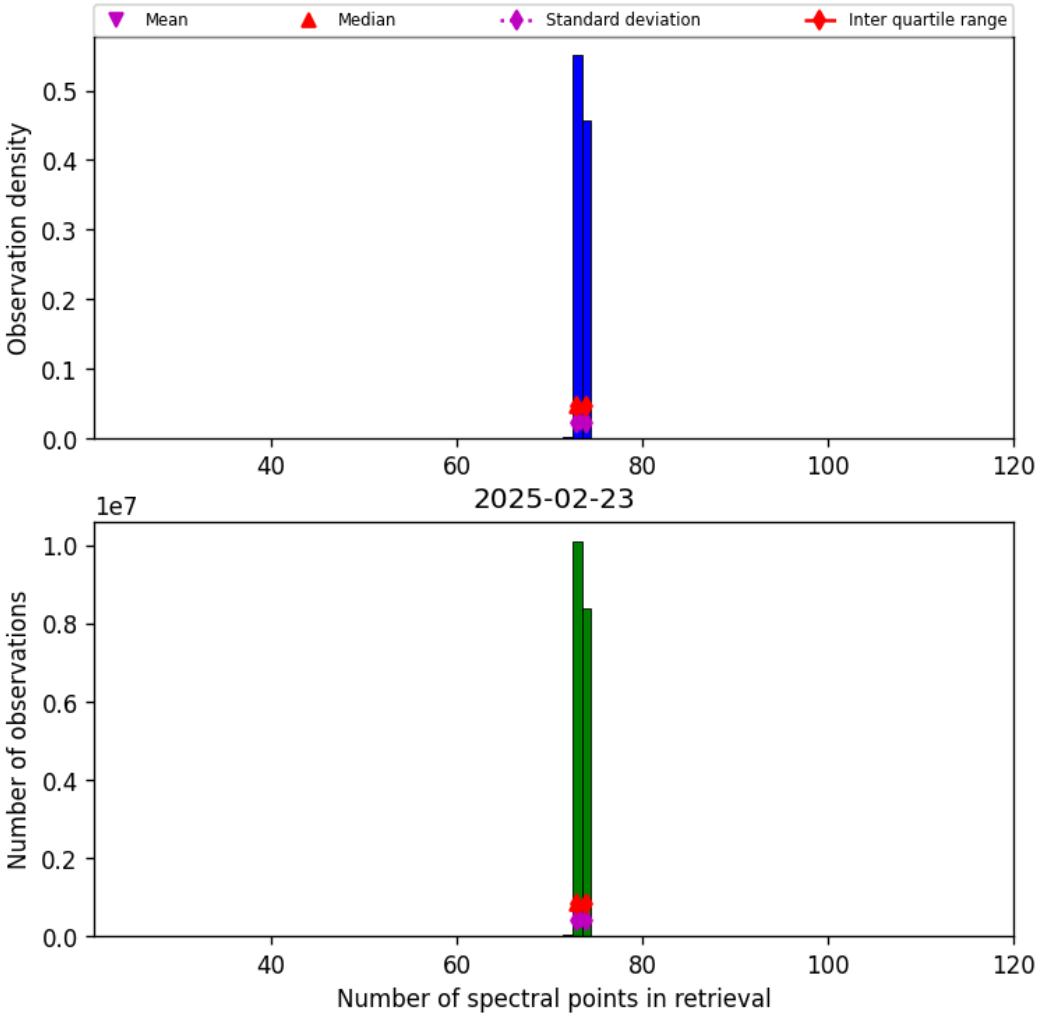

Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-02-23 to 2025-02-24

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.

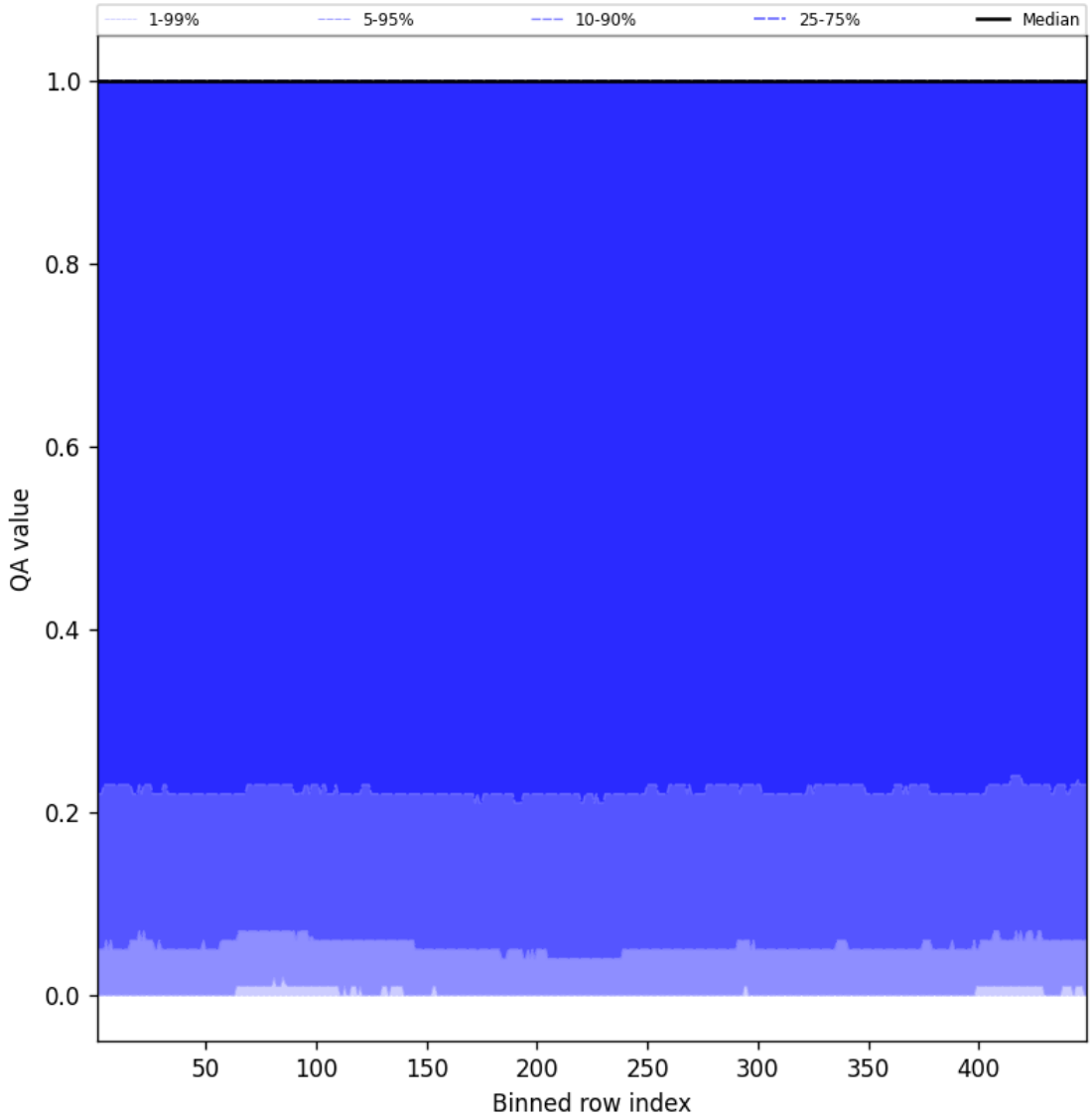

Figure 84: Along track statistics of “QA value” for 2025-02-23 to 2025-02-24

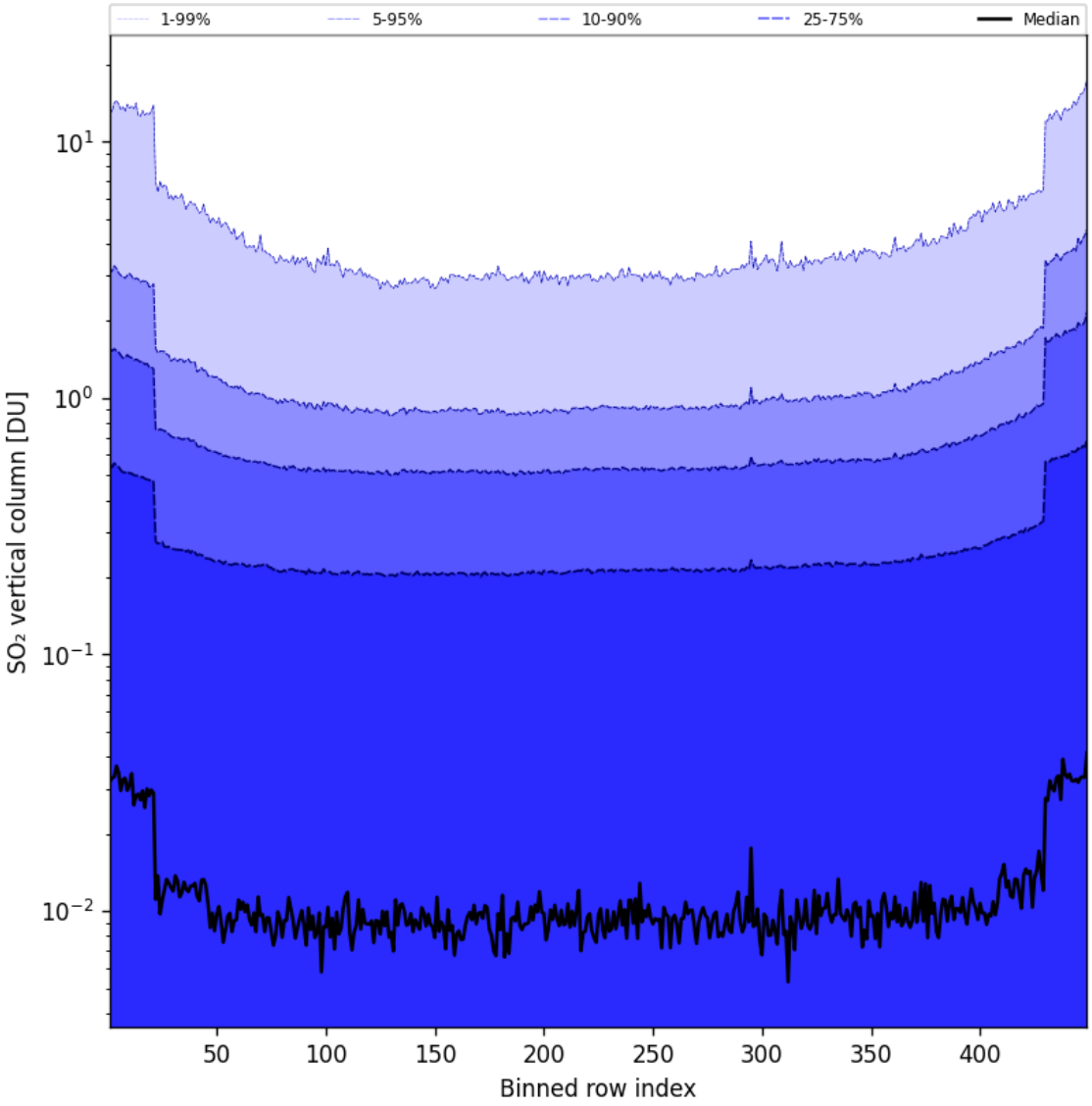

Figure 85: Along track statistics of "SO_2 vertical column" for 2025-02-23 to 2025-02-24

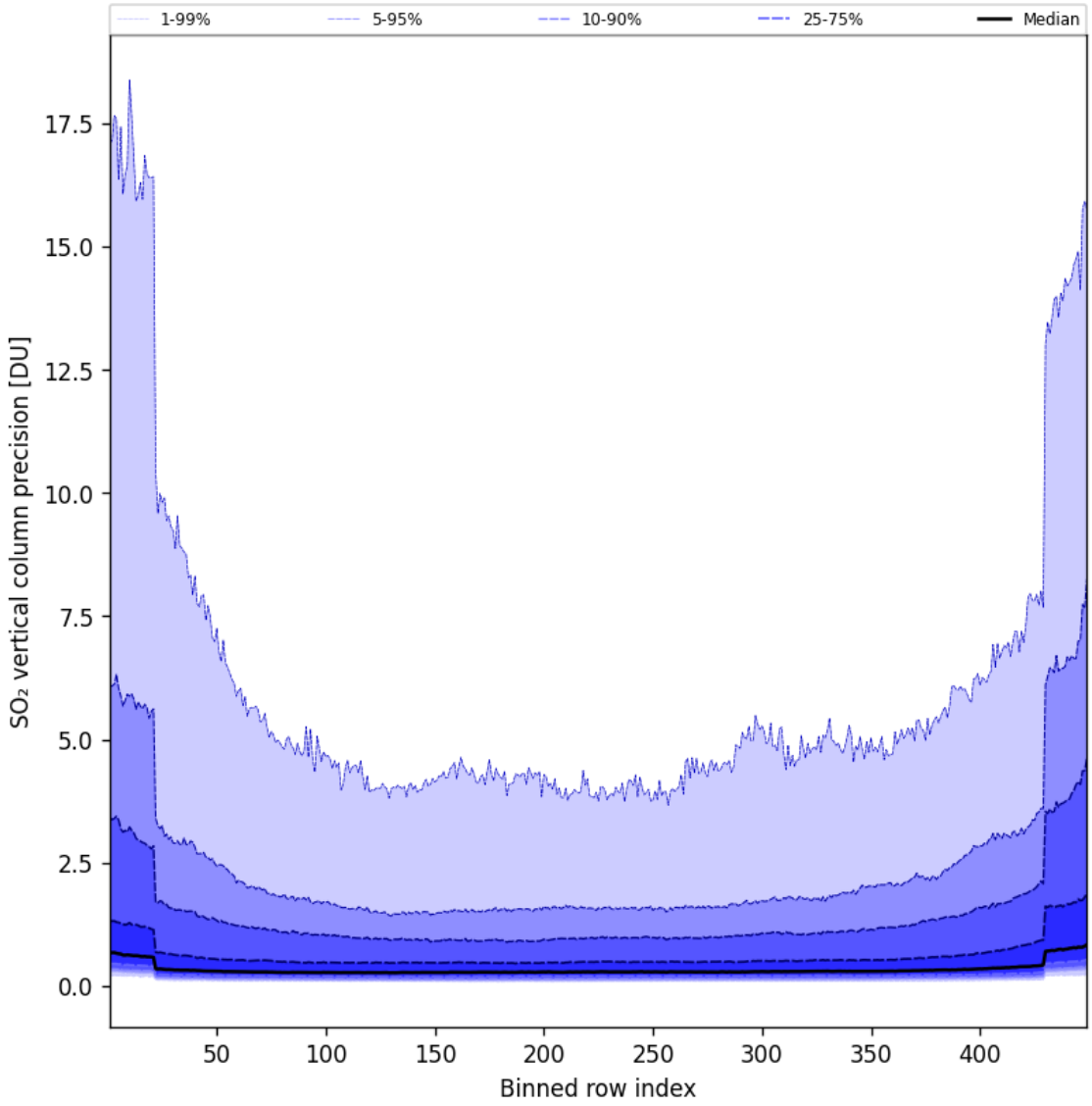

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-02-23 to 2025-02-24

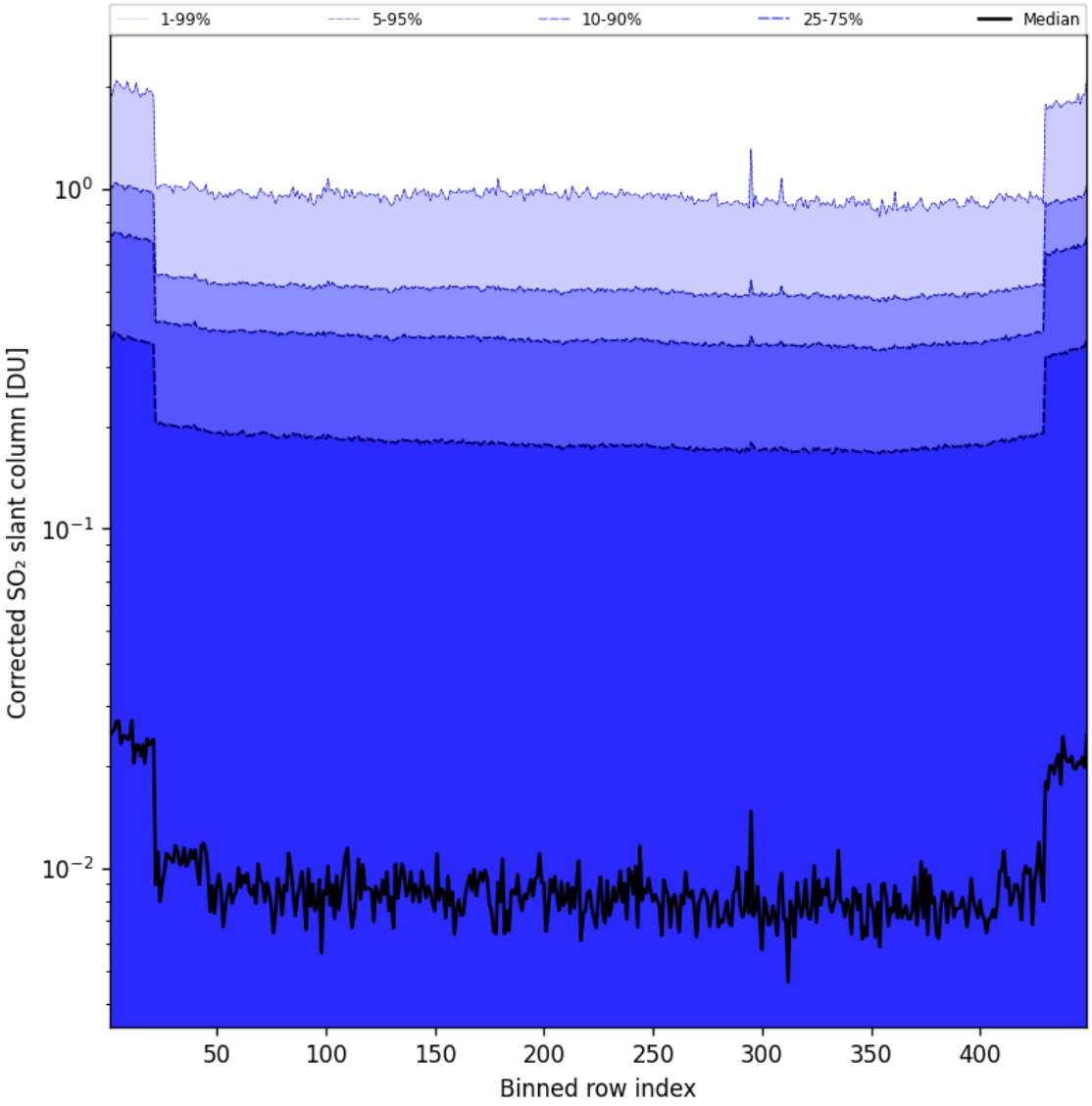

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-02-23 to 2025-02-24

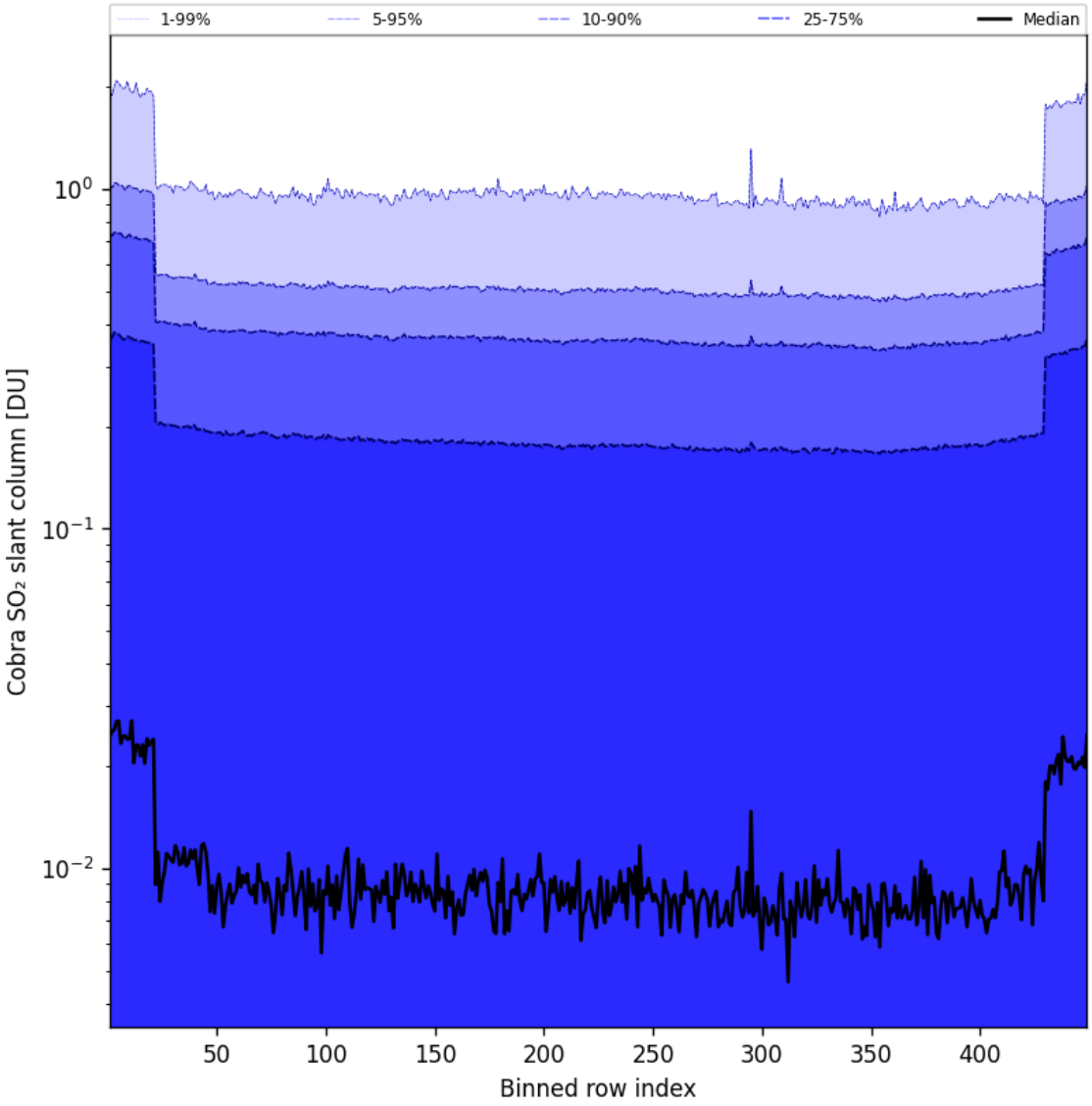

Figure 88: Along track statistics of "Cobra SO_2 slant column" for 2025-02-23 to 2025-02-24

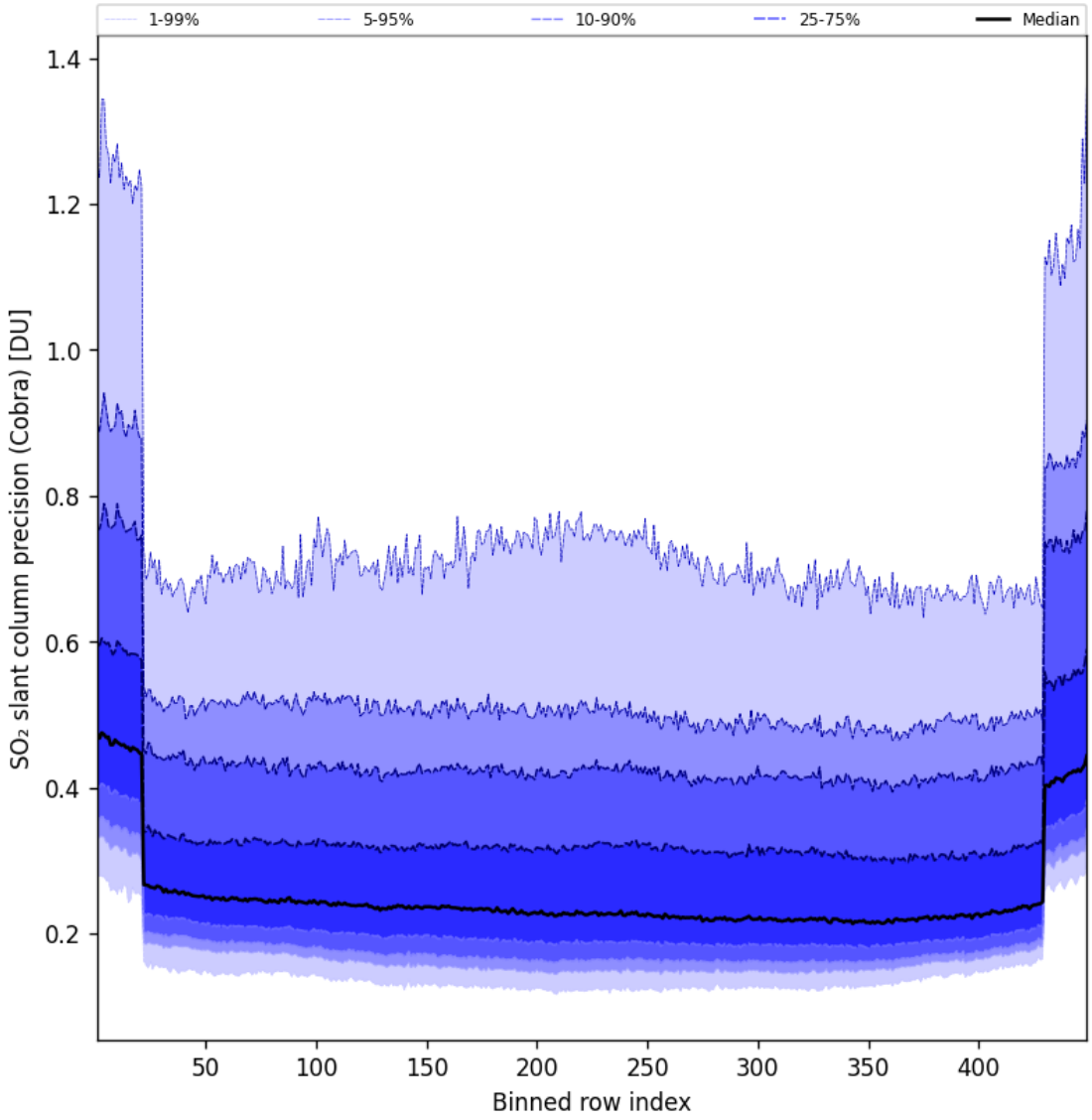

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-02-23 to 2025-02-24

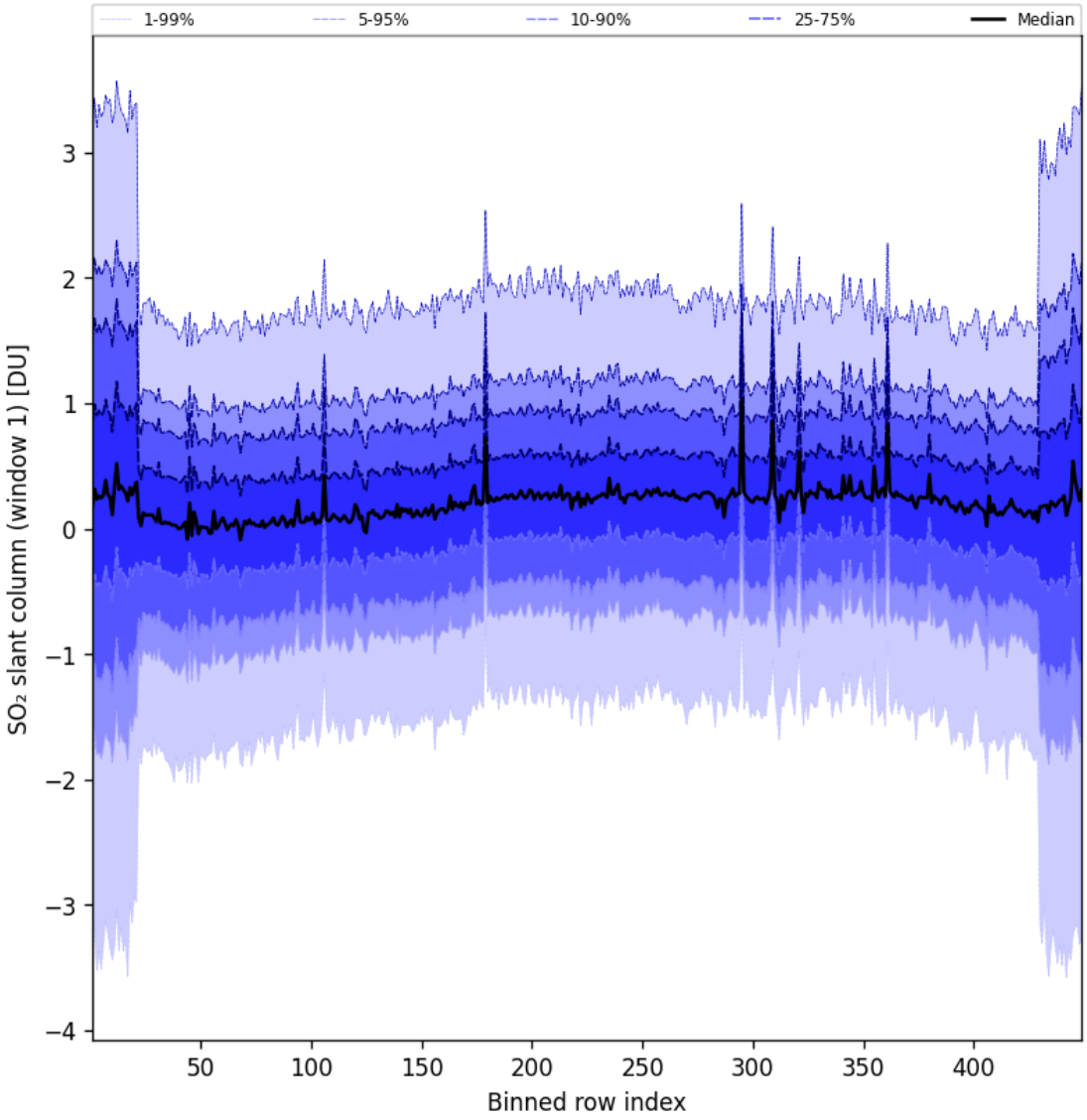

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-02-23 to 2025-02-24

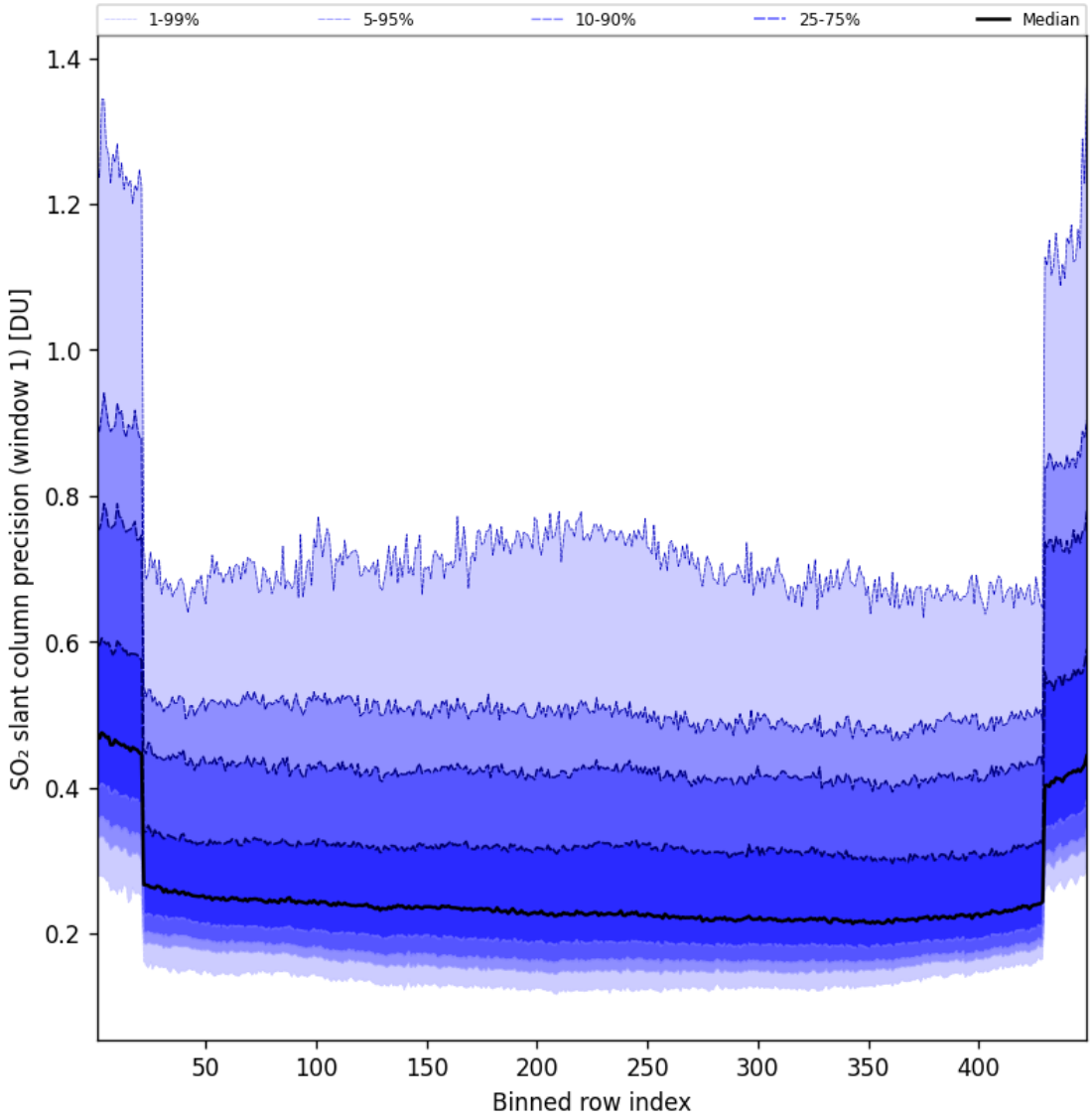

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-02-23 to 2025-02-24

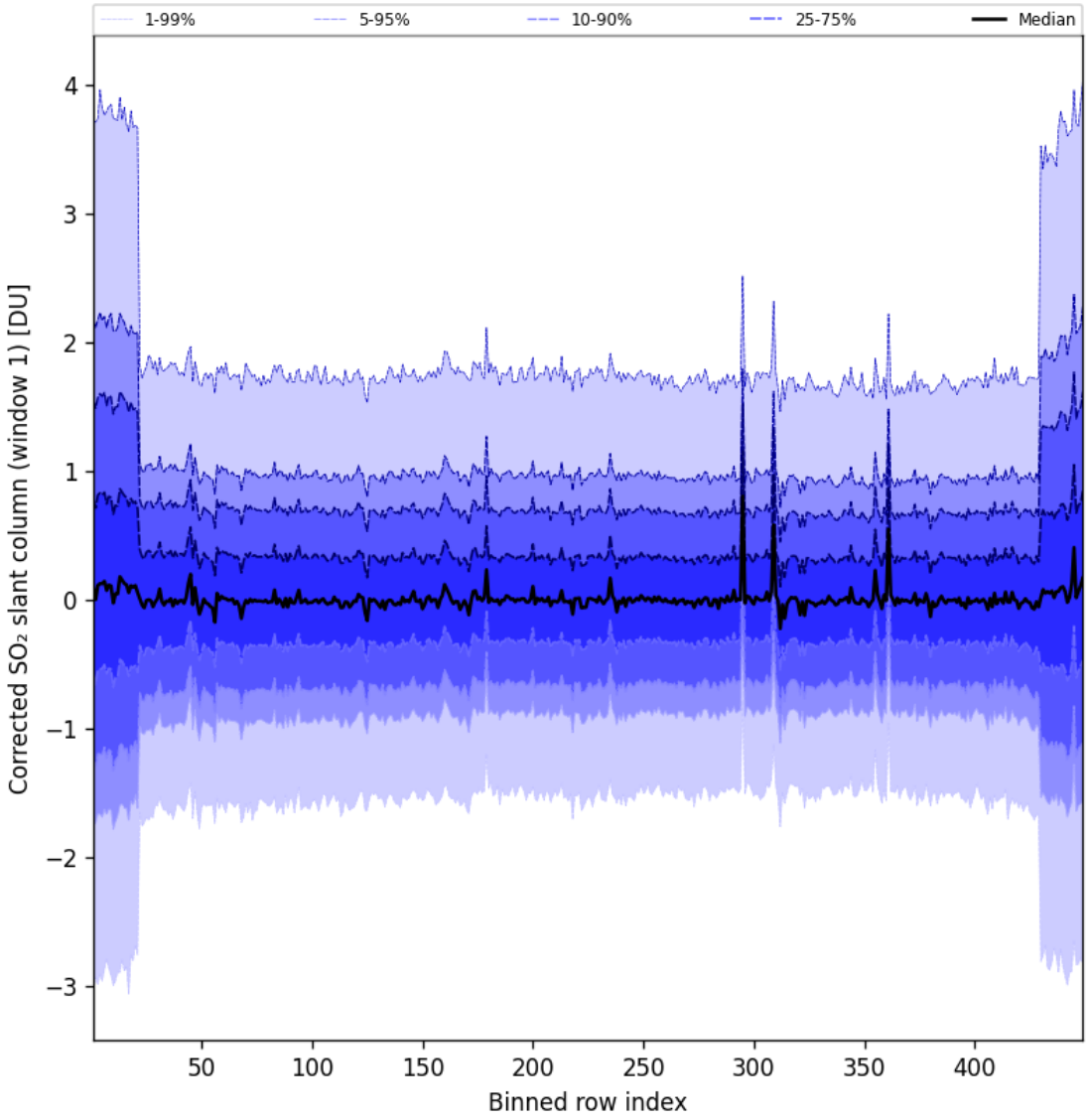

Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-02-23 to 2025-02-24

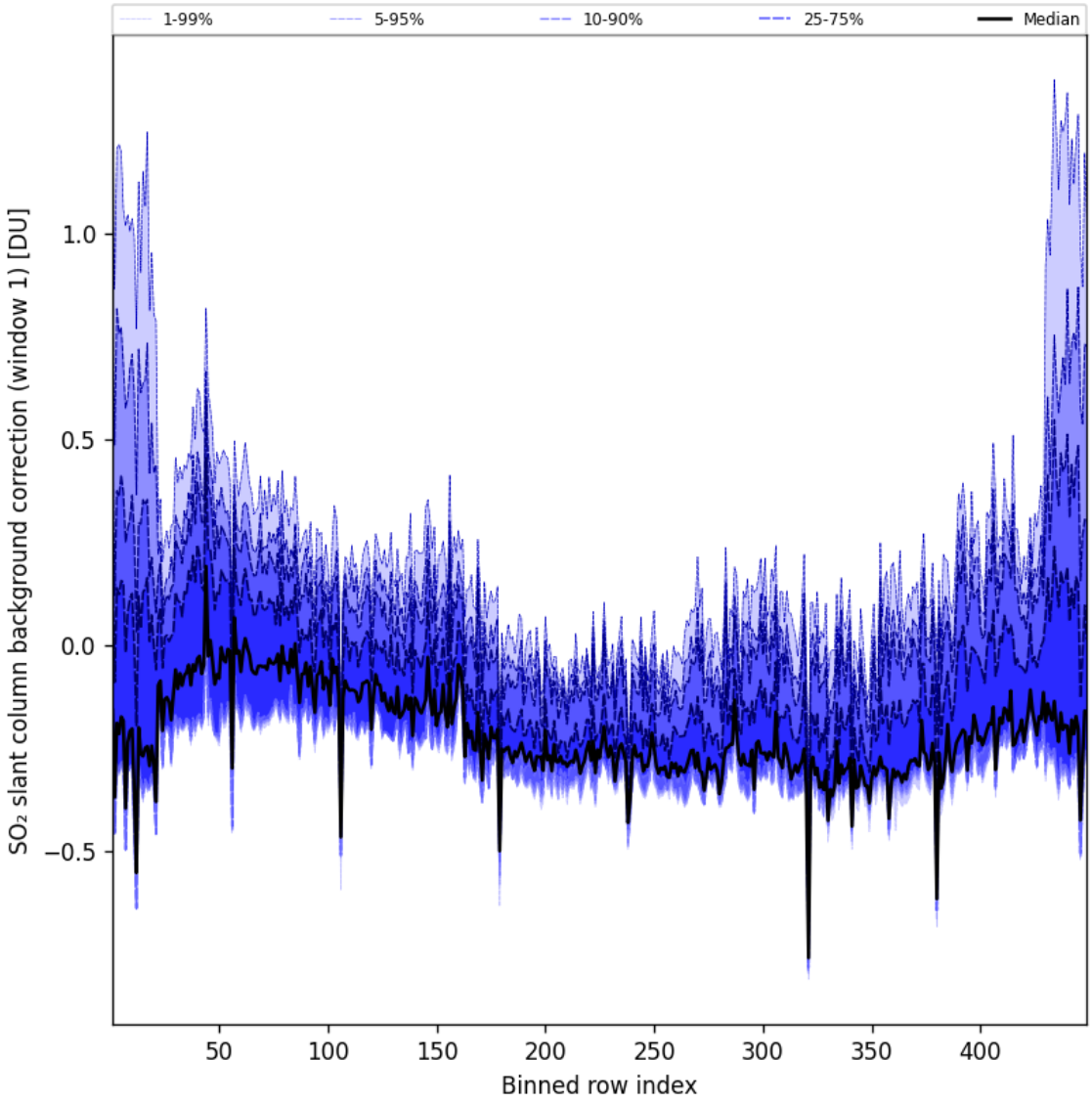

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-02-23 to 2025-02-24

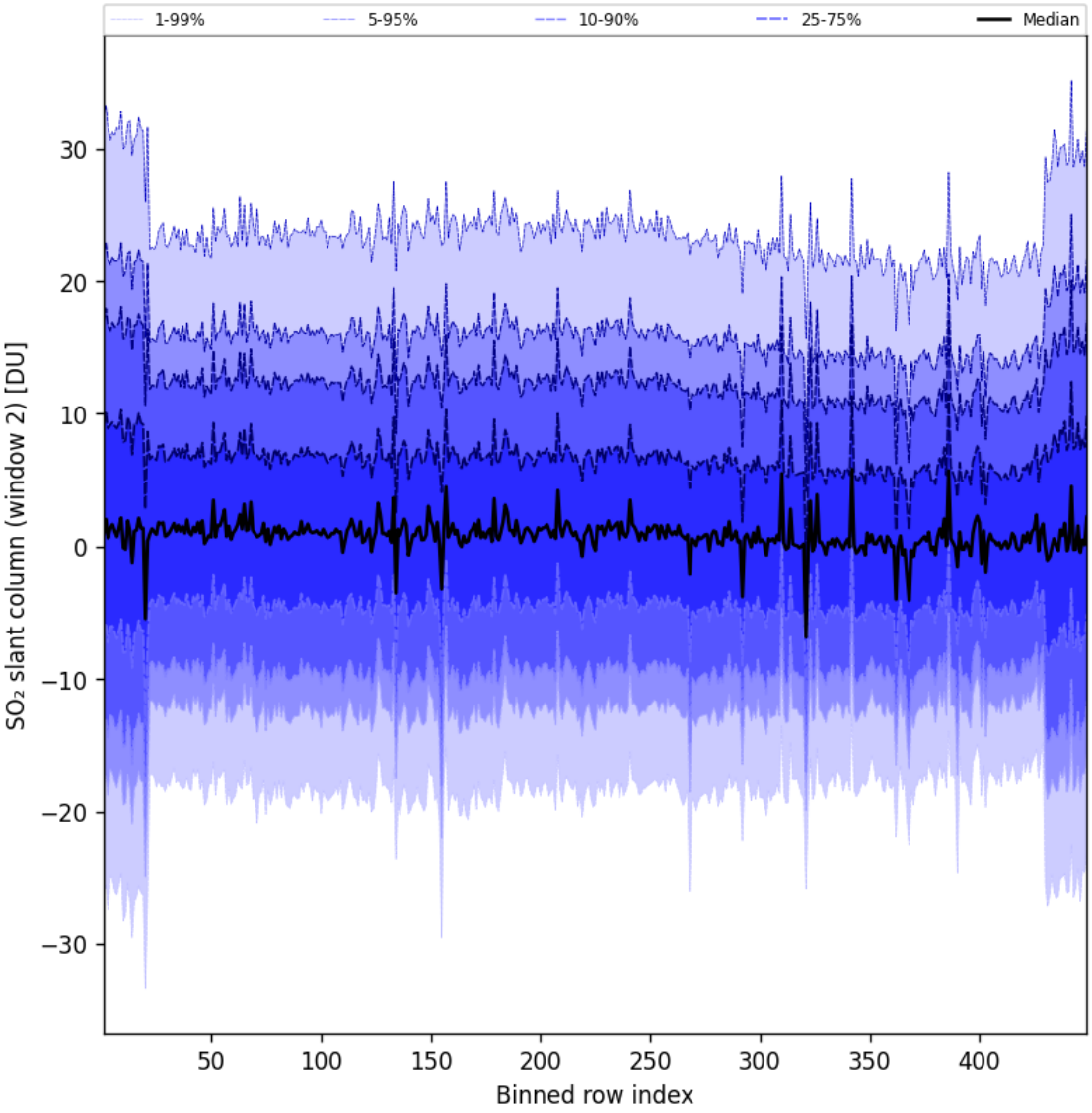

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-02-23 to 2025-02-24

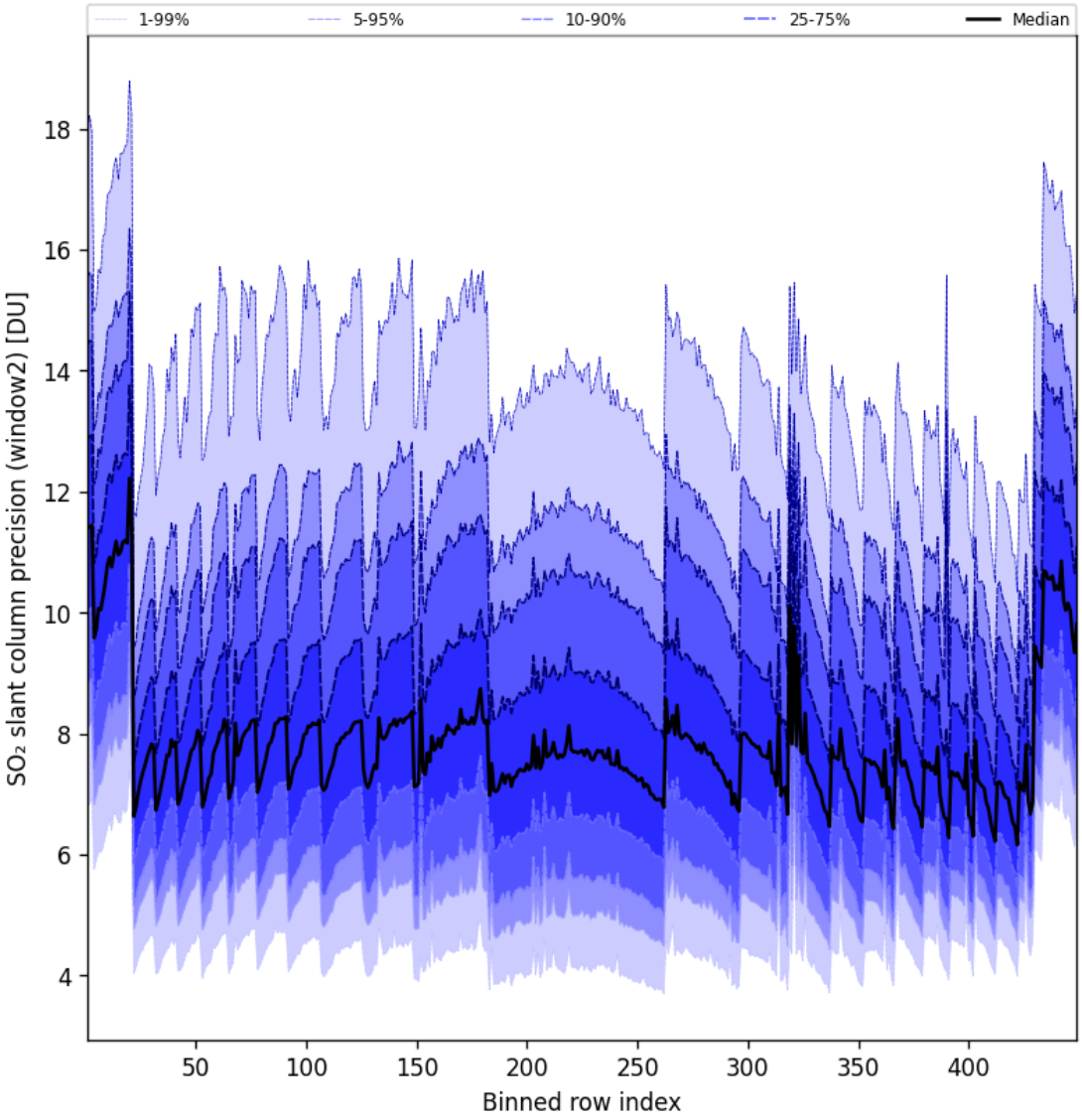

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-02-23 to 2025-02-24

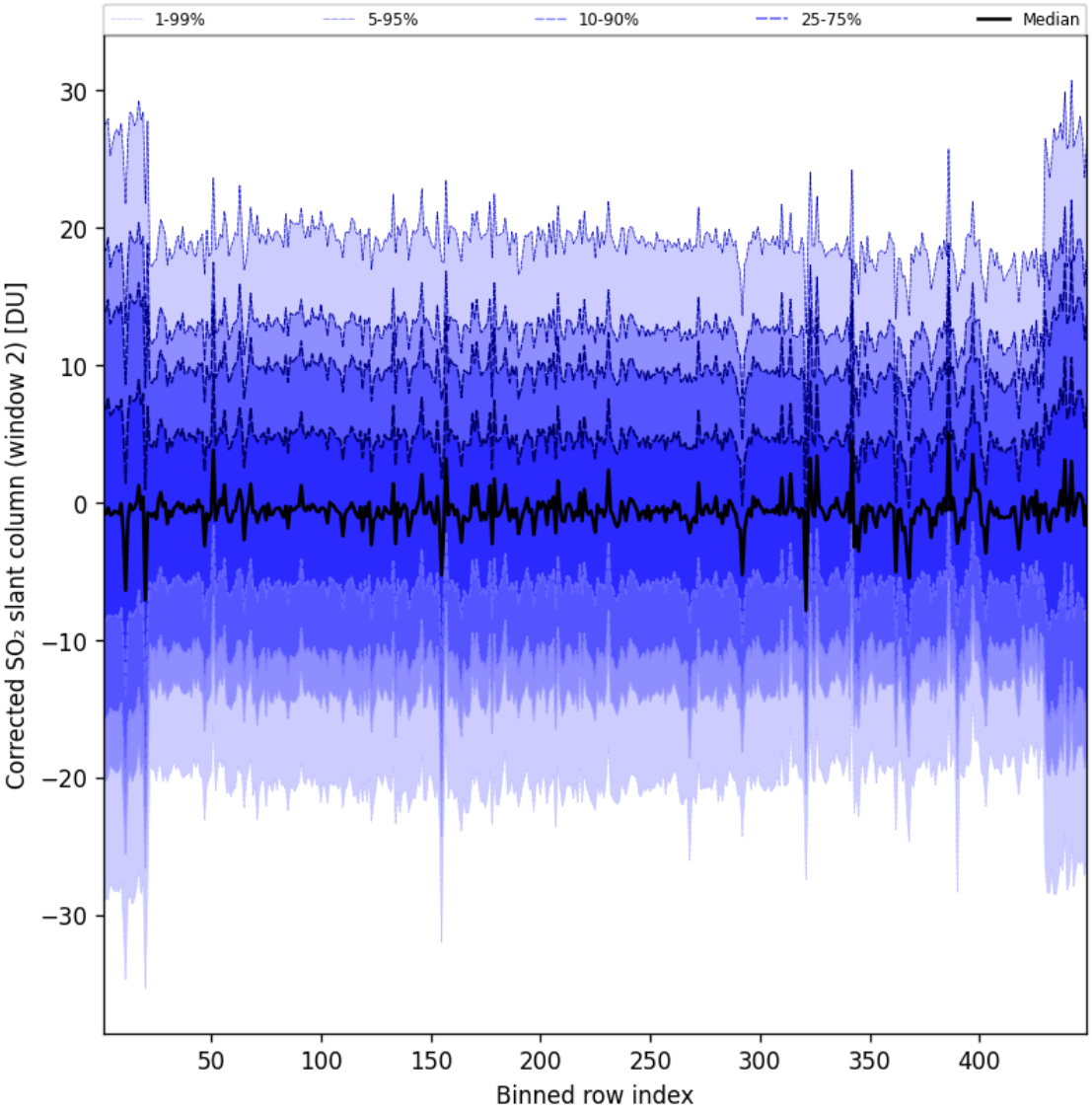

Figure 96: Along track statistics of "Corrected SO_2 slant column (window 2)" for 2025-02-23 to 2025-02-24

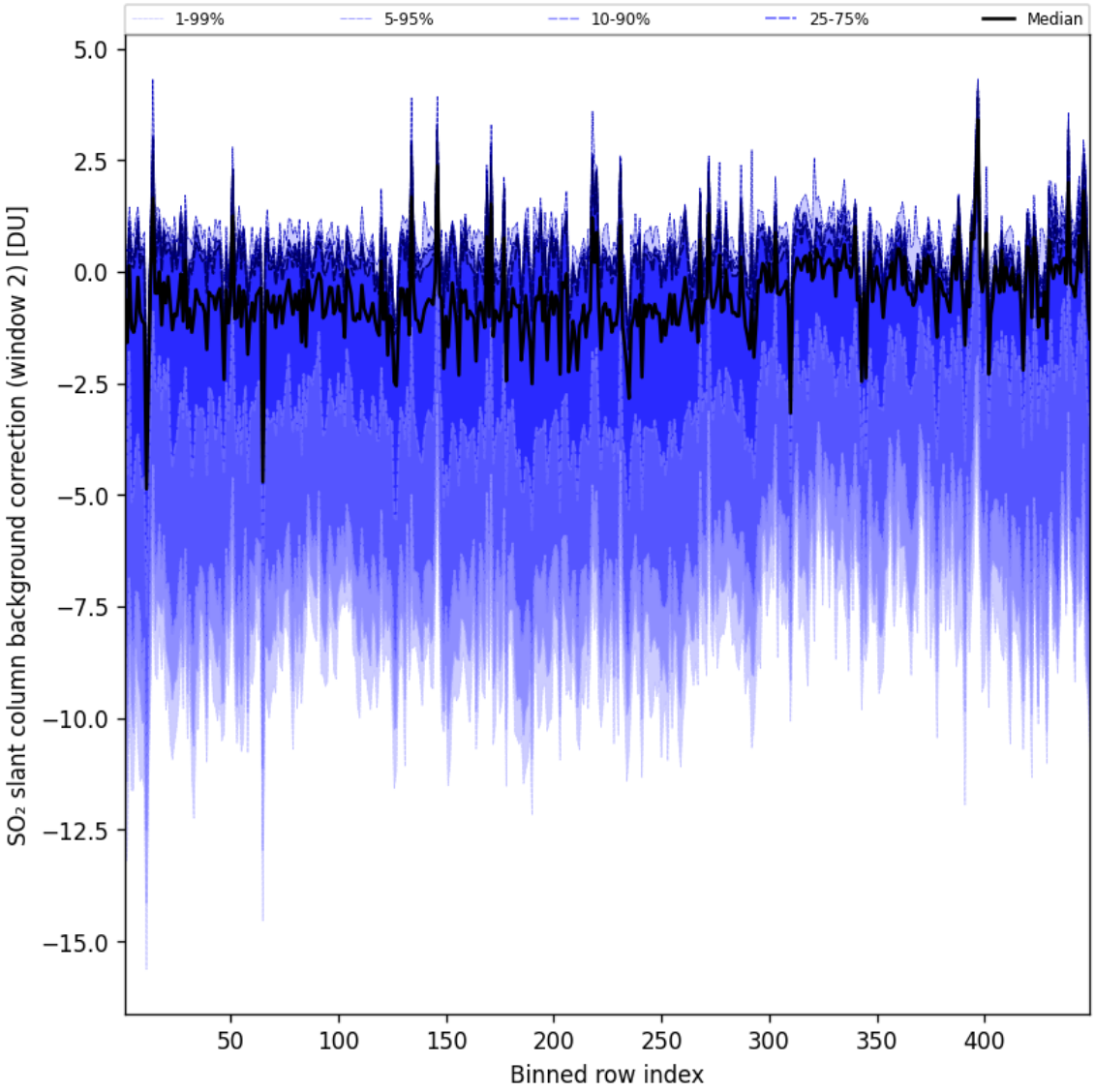

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-02-23 to 2025-02-24

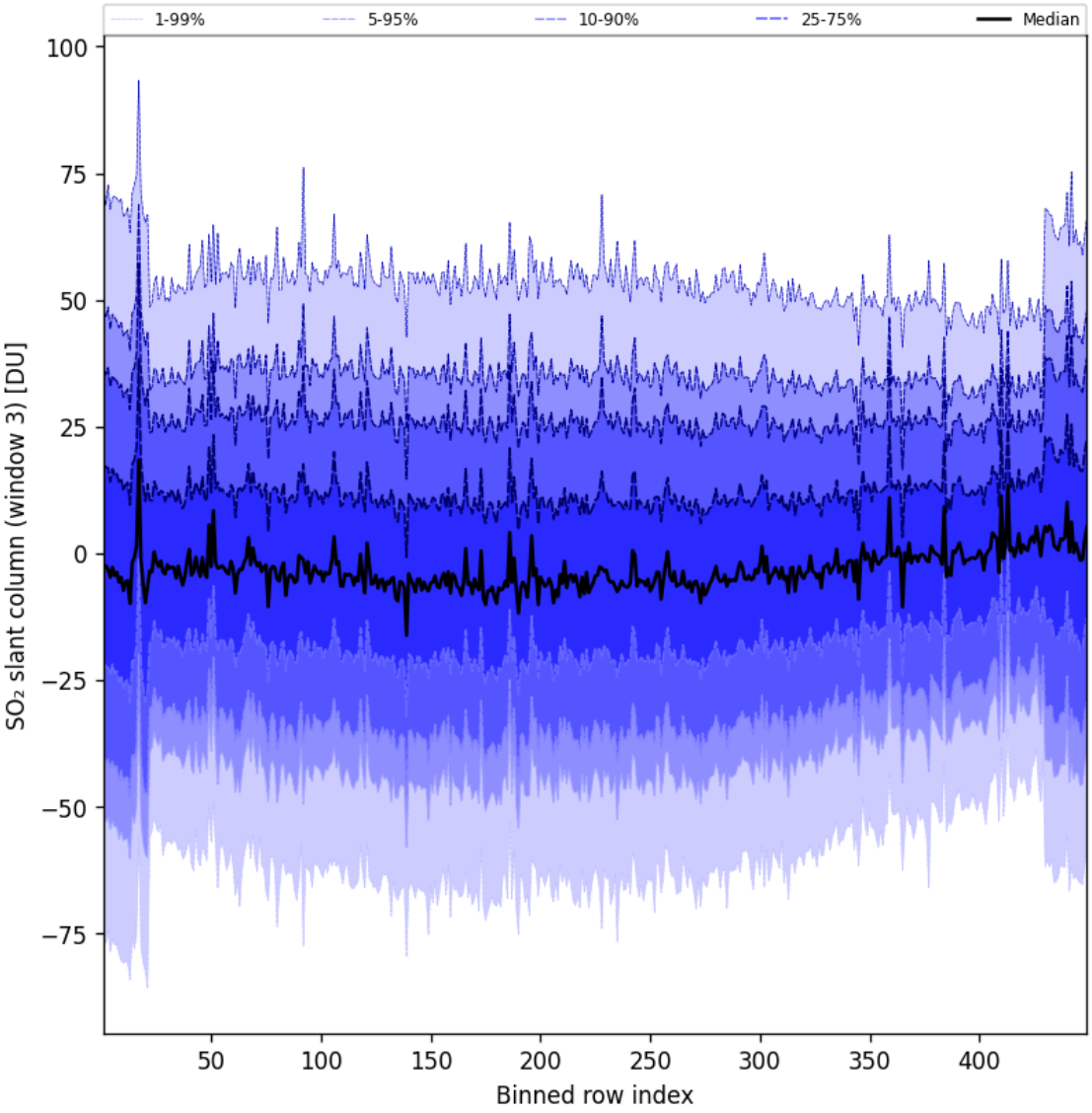

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-02-23 to 2025-02-24

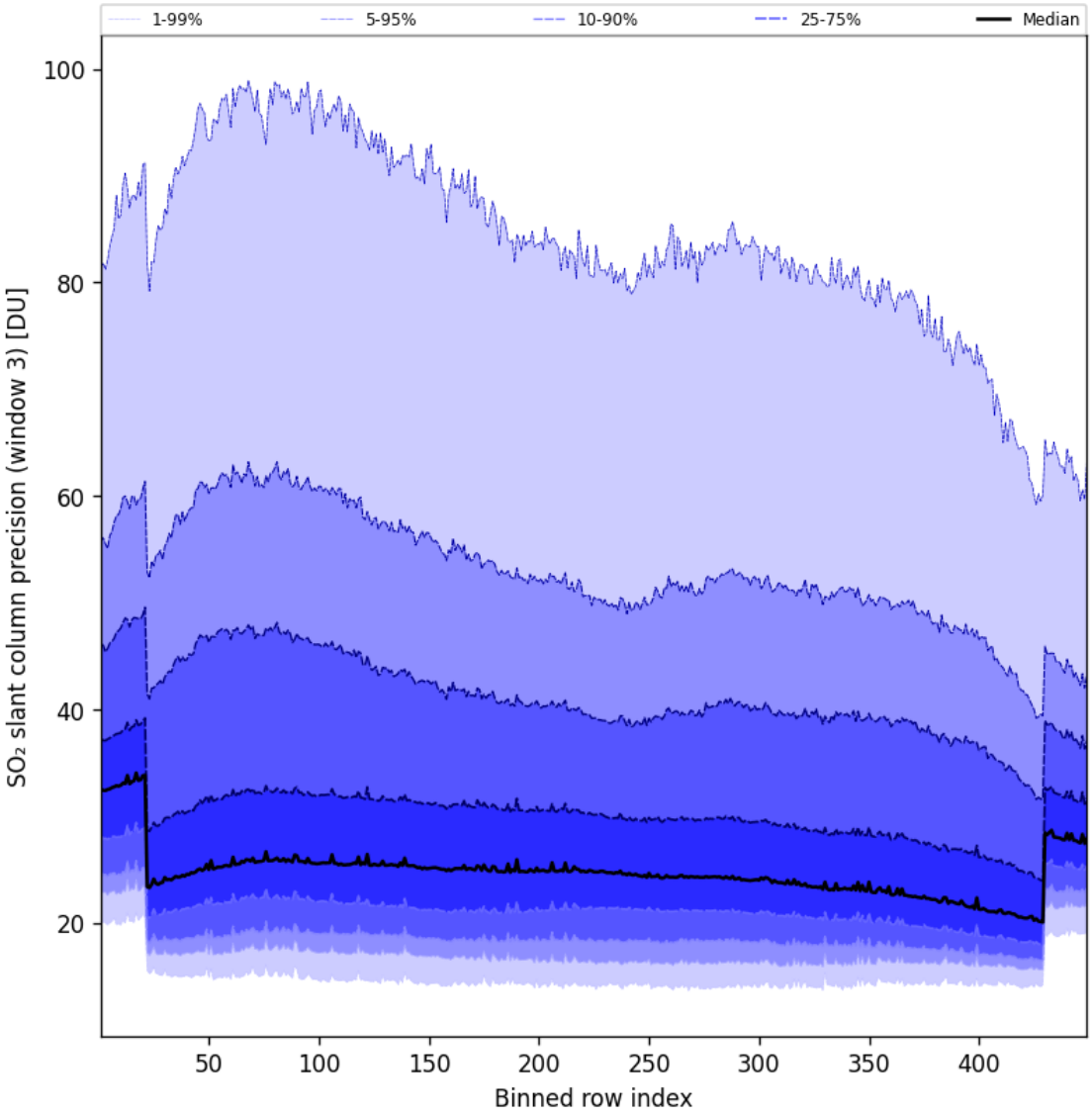

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-02-23 to 2025-02-24

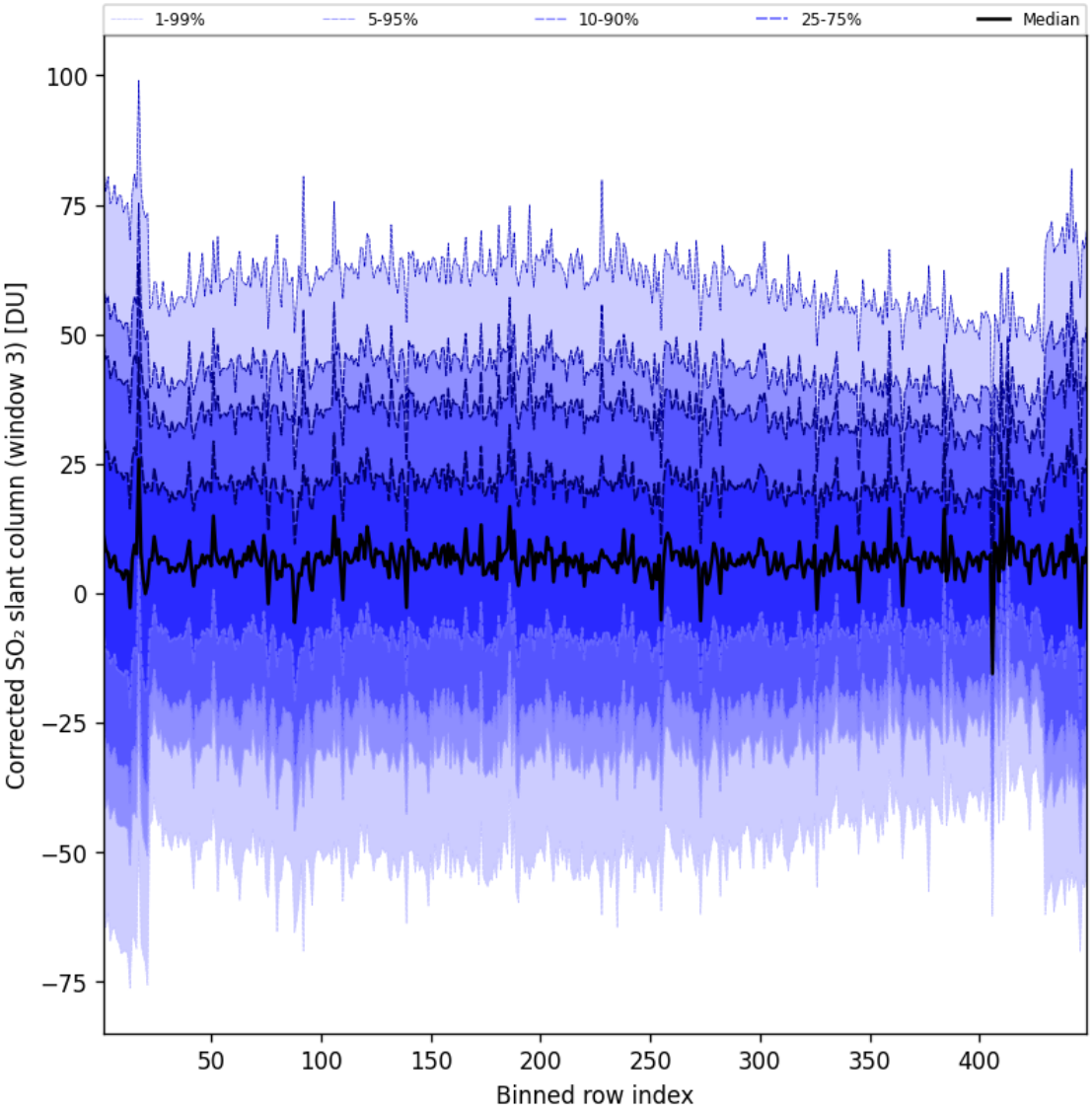

Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-02-23 to 2025-02-24

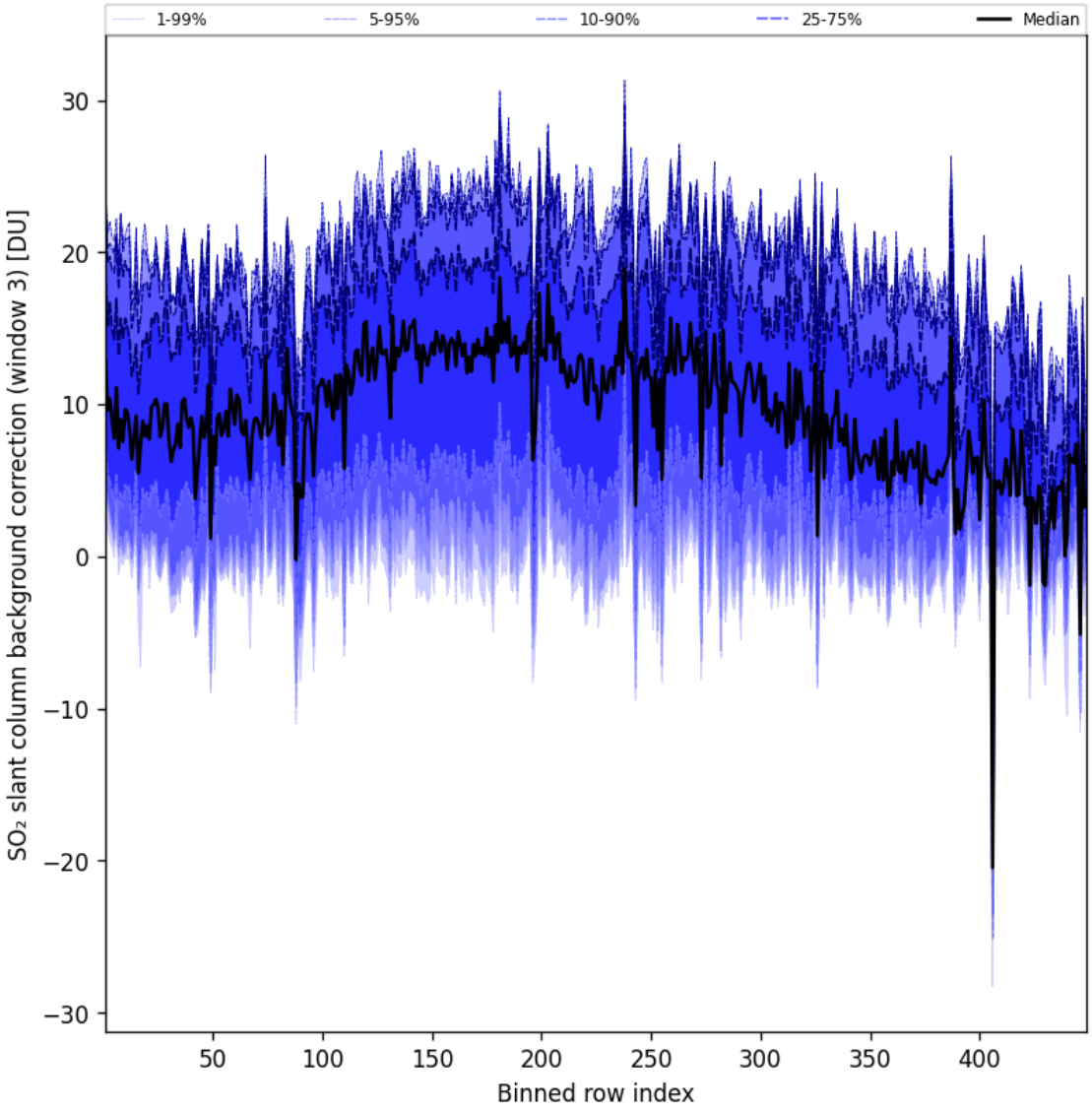

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-02-23 to 2025-02-24

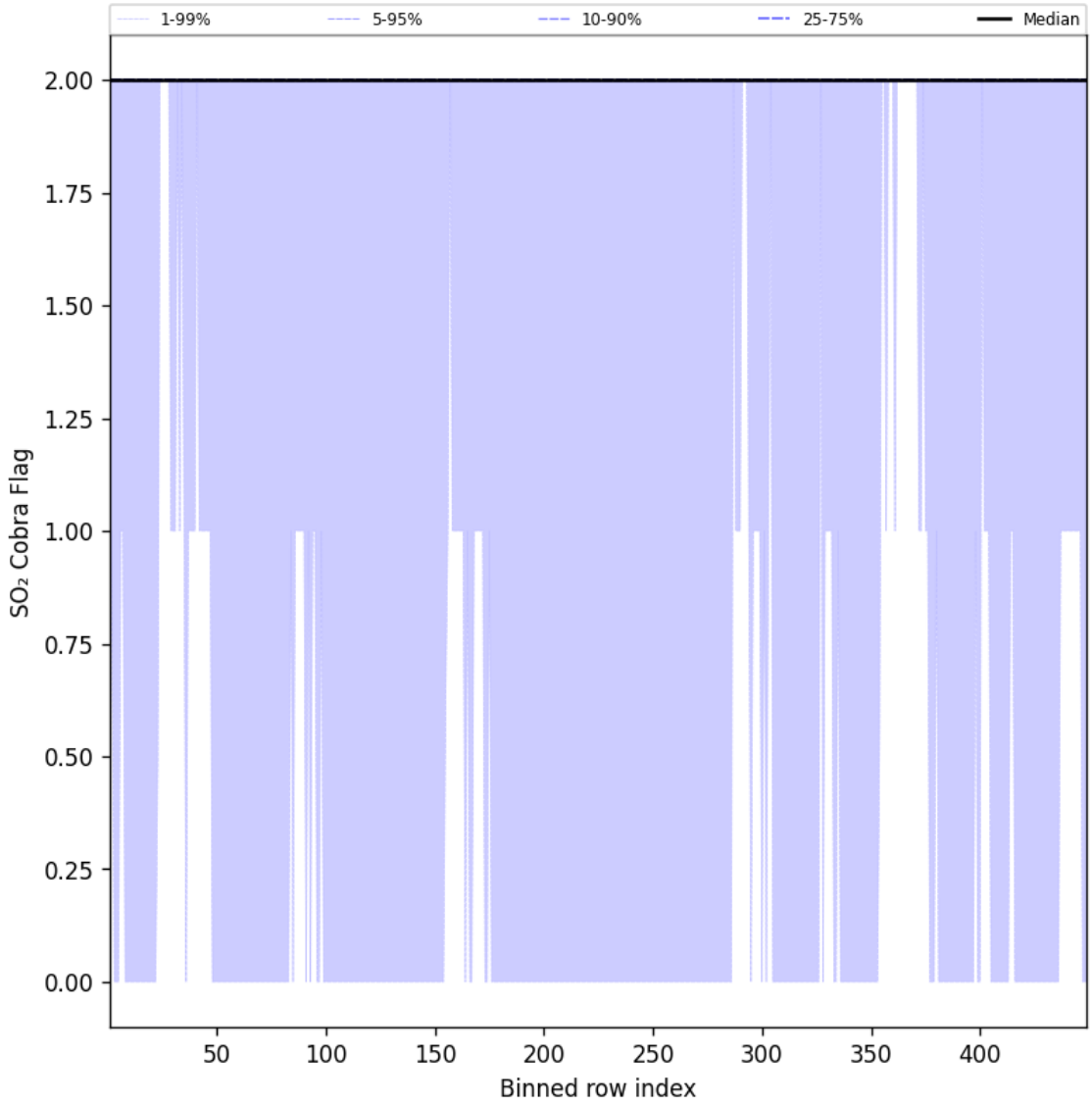

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-02-23 to 2025-02-24

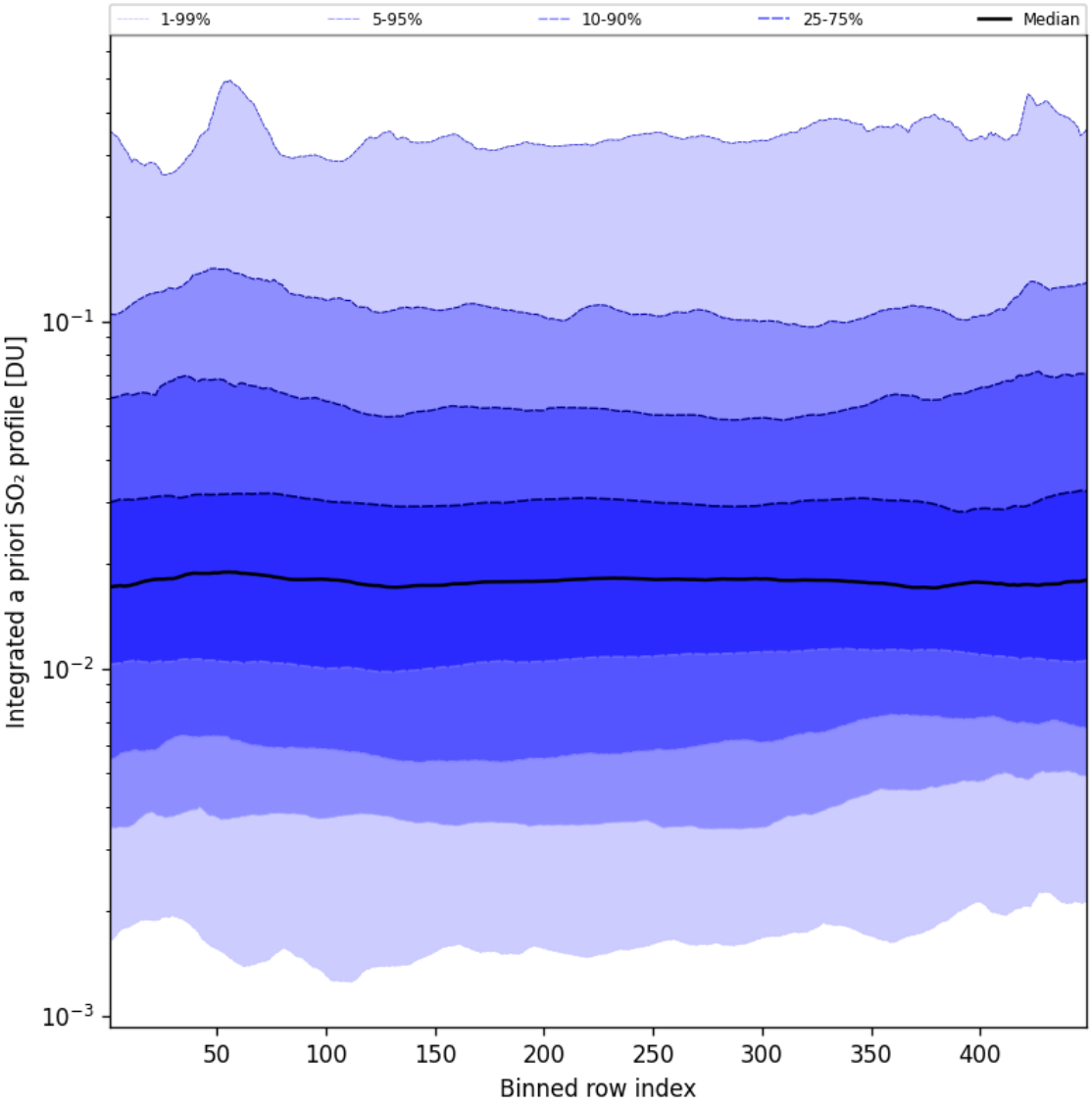

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-02-23 to 2025-02-24

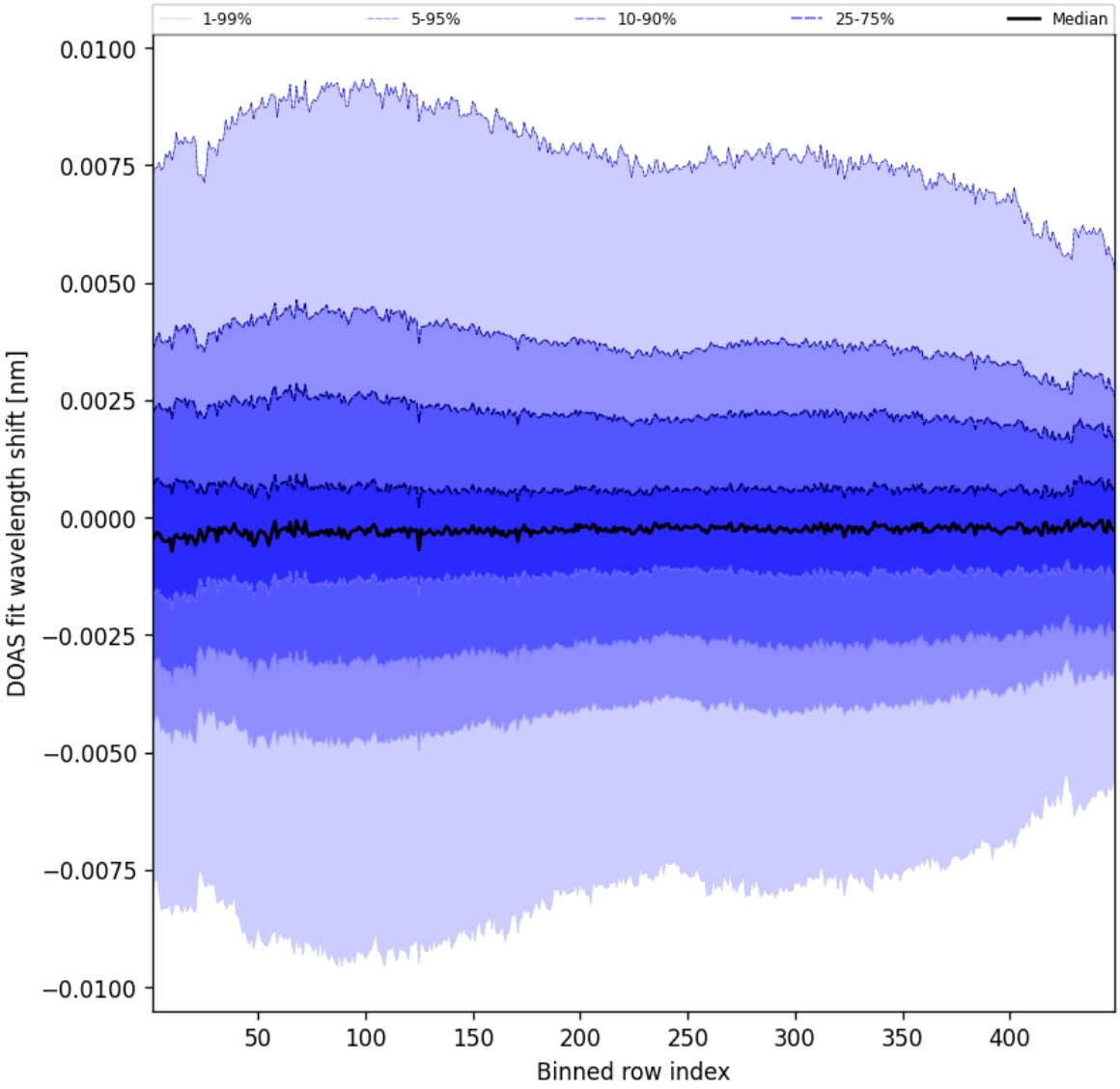

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-02-23 to 2025-02-24

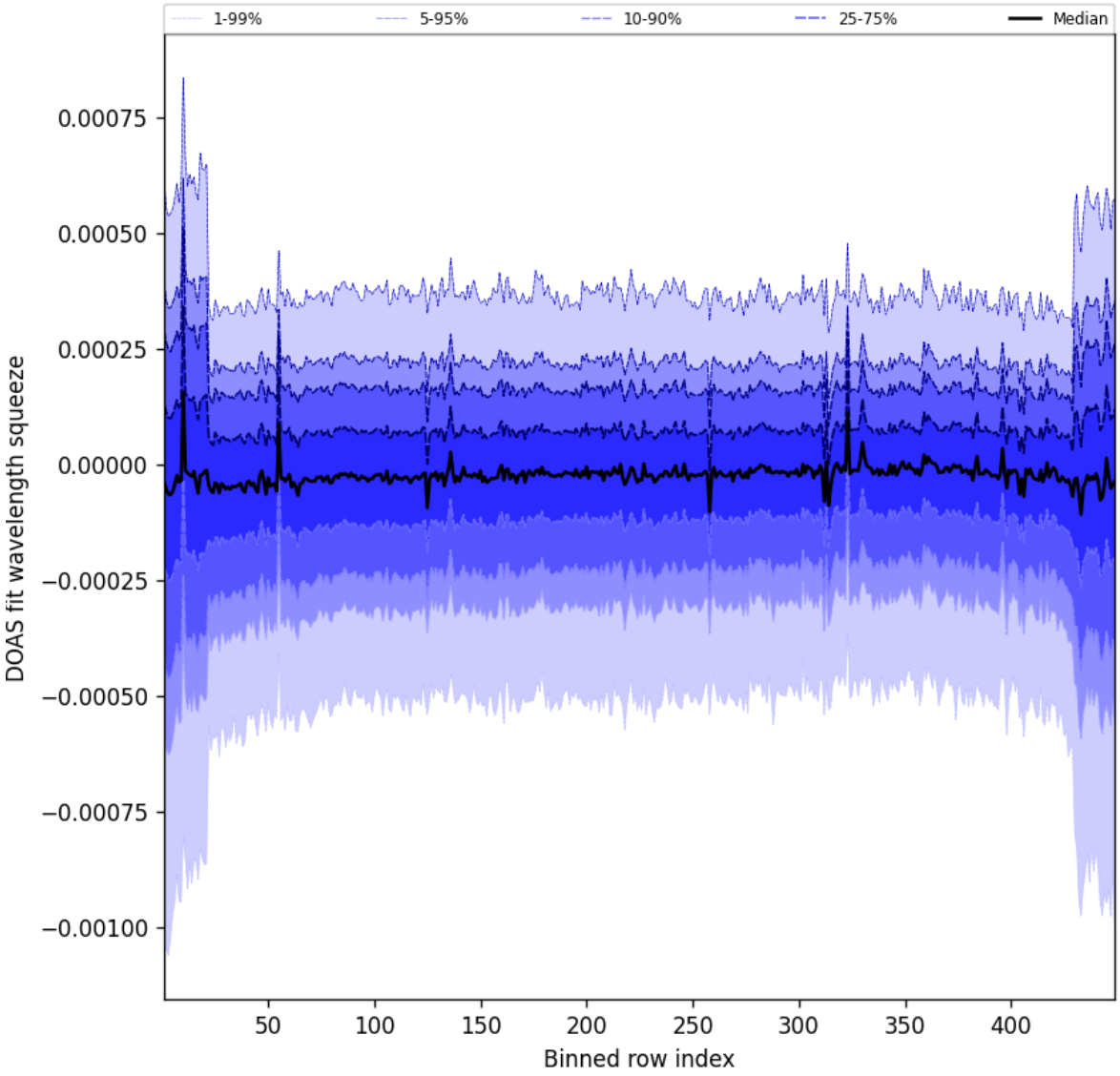

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-02-23 to 2025-02-24

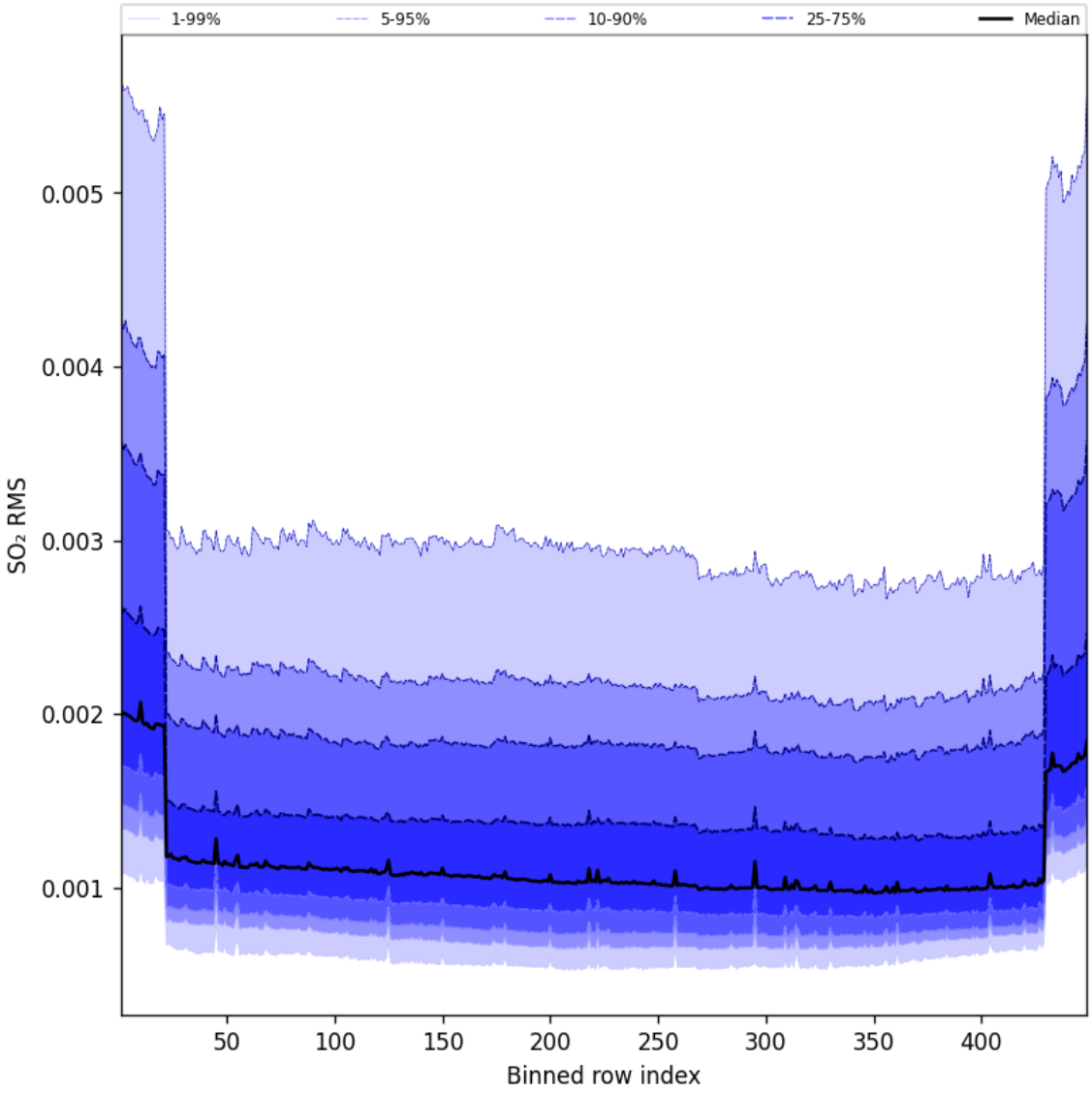

Figure 106: Along track statistics of "SO_2 RMS" for 2025-02-23 to 2025-02-24

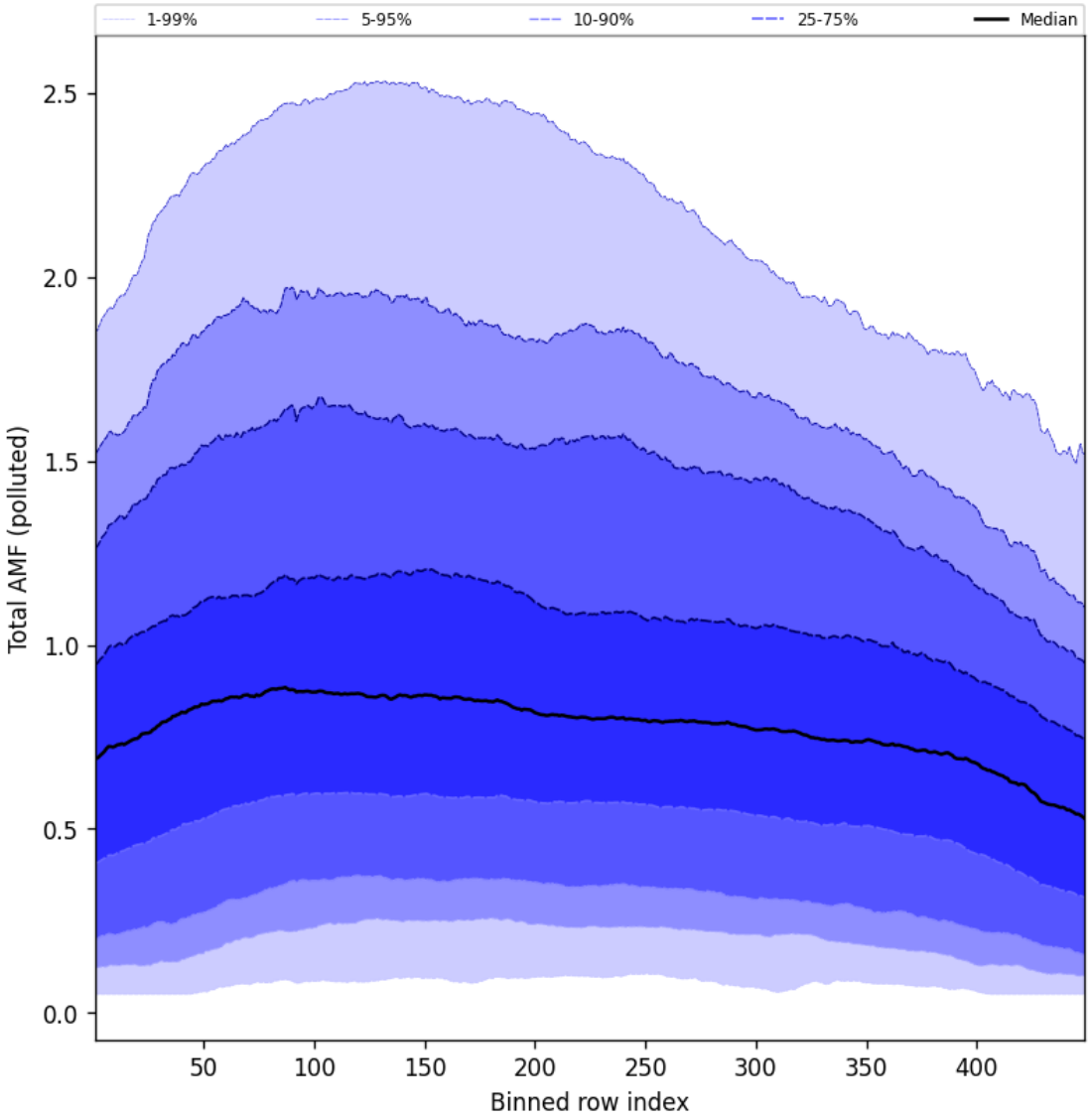

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-02-23 to 2025-02-24

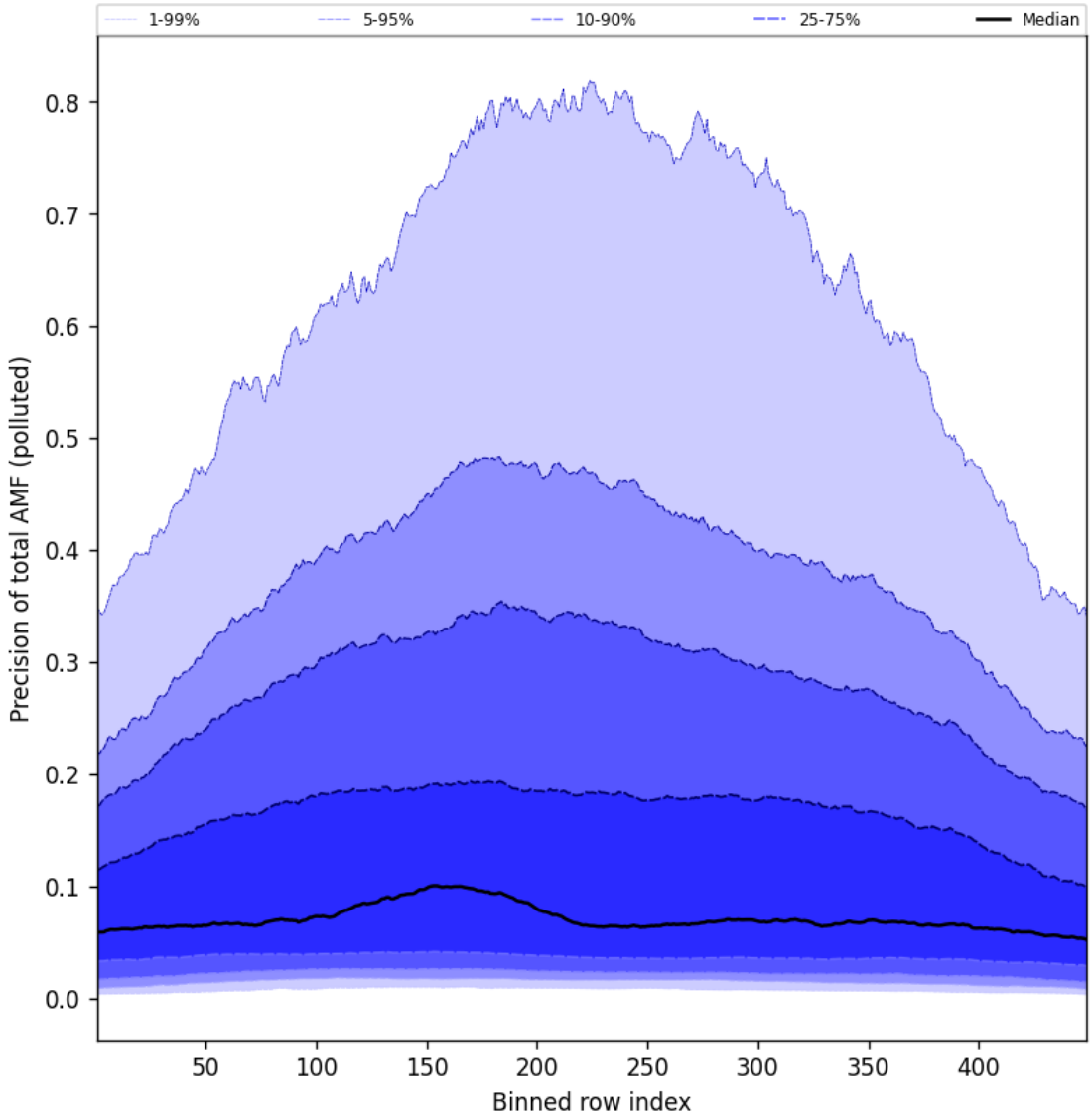

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-02-23 to 2025-02-24

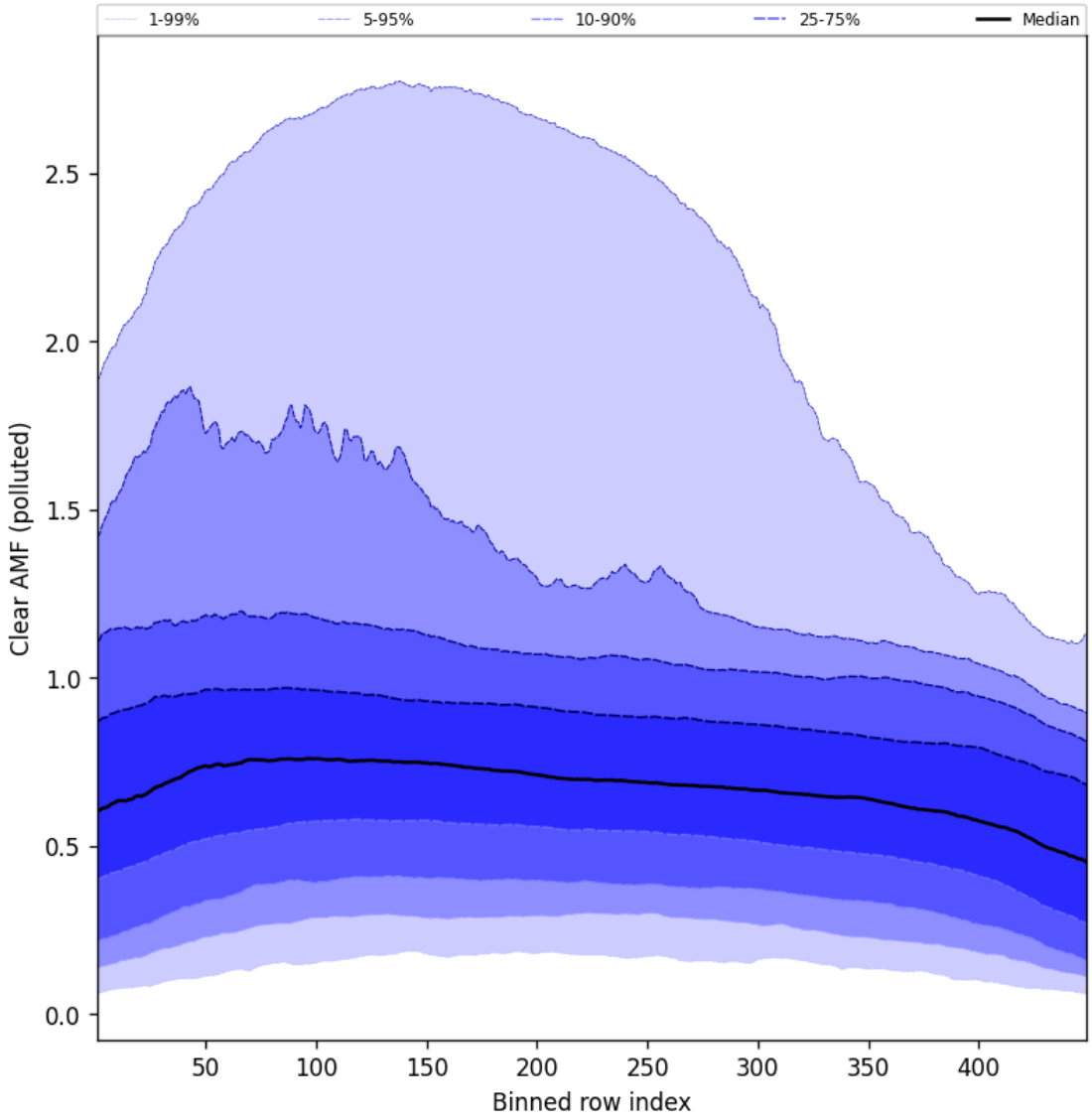

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-02-23 to 2025-02-24

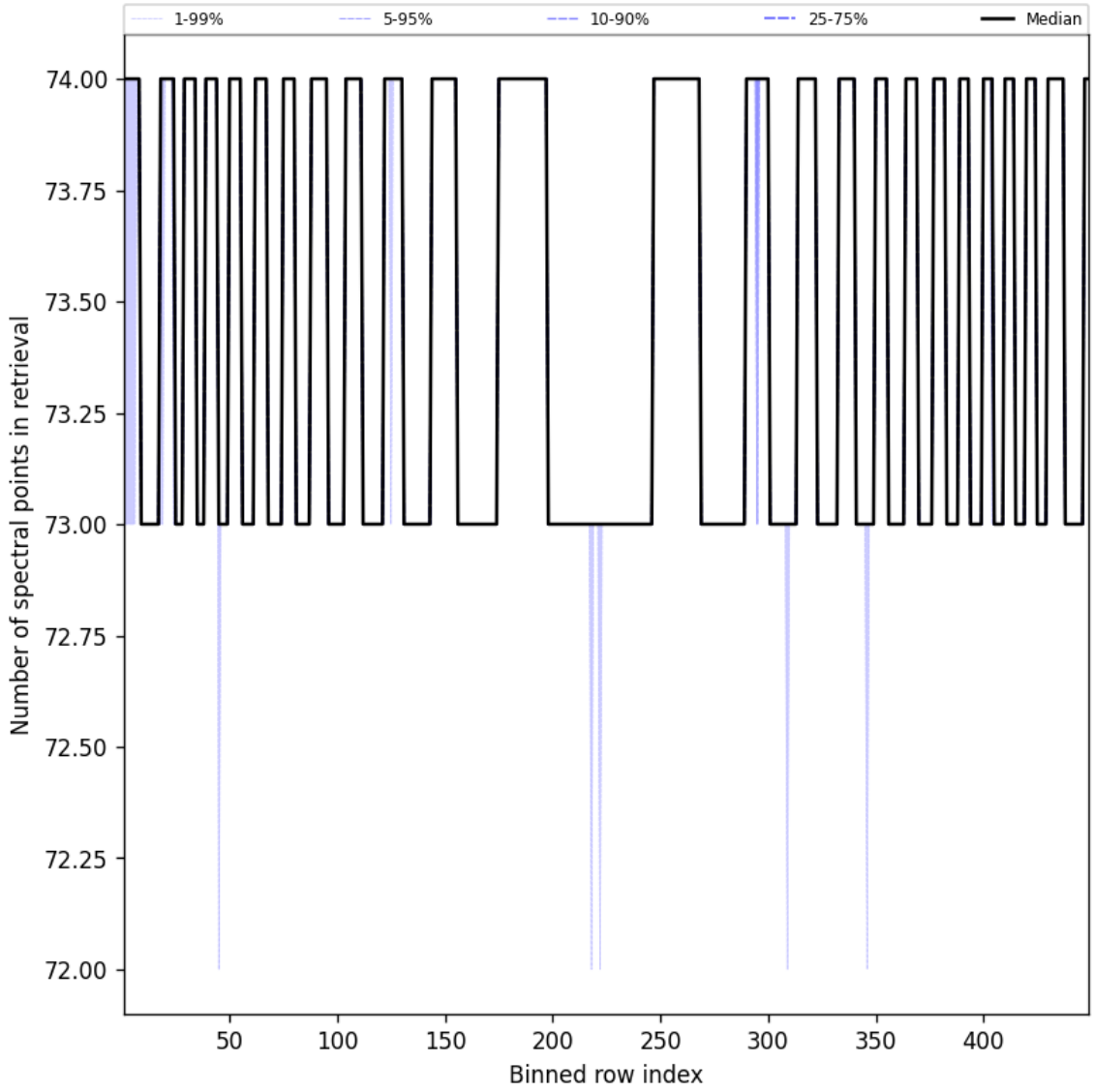

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-02-23 to 2025-02-24

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'

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