

PyCAMA report generated by tropl2-proc

tropl2-proc

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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:

$$\bar{x} = \frac{1}{N} \sum_{i=1}^N x_i \quad (1)$$

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 $\sigma(x) = \sqrt{V(x)}$.

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

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 :

$$P(x \leq m) = P(x \geq m) = \int_{-\infty}^m f(x) dx = \frac{1}{2} \quad (3)$$

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

The median is a special case of a percentile. Instead of 1/2 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} .

$$C_{kl} = C(x_{(k)}, x_{(l)}) = \frac{1}{N-1} \sum_{i=1}^N (x_{(k),i} - \bar{x}_{(k)})(x_{(l),i} - \bar{x}_{(l)}) \quad (4)$$

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

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

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]	0.656 ± 0.407	16937103	0.995	0.780	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.834 \pm 116.068) \times 10^{-2}$	16937103	0.278	0.459	9.161×10^{-3}	-92.8	510
sulfurdioxide total vertical column precision [DU]	0.571 ± 0.867	16937103	0.222	0.376	0.334	1.989×10^{-2}	80.2
sulfurdioxide slant column density corrected [DU]	$(1.465 \pm 36.112) \times 10^{-2}$	16937103	0.250	0.369	8.303×10^{-3}	-10.7	377
sulfurdioxide slant column density cobra [DU]	$(1.458 \pm 34.325) \times 10^{-2}$	16937103	0.250	0.369	8.303×10^{-3}	-10.7	39.2
sulfurdioxide slant column density cobra precision [DU]	0.293 ± 0.120	16937103	0.213	0.128	0.258	5.810×10^{-2}	20.6
sulfurdioxide slant column density window1 [DU]	0.171 ± 0.657	16937103	0.175	0.743	0.174	-46.3	75.6
sulfurdioxide slant column density window1 precision [DU]	0.293 ± 0.120	16937103	0.213	0.128	0.258	5.810×10^{-2}	20.6
sulfurdioxide slant column density corrected win1 [DU]	$(3.264 \pm 65.203) \times 10^{-2}$	16937103	2.500×10^{-2}	0.731	1.759×10^{-2}	-46.3	75.5
background so2 slant column offset window1 [DU]	-0.139 ± 0.119	16937103	-0.140	0.135	-0.150	-1.42	2.28
sulfurdioxide slant column density window2 [DU]	2.08 ± 9.11	16937103	1.75	11.6	1.92	-882	1.348×10^3
sulfurdioxide slant column density window2 precision [DU]	8.22 ± 2.27	16937103	7.43	2.61	7.86	2.36	480
sulfurdioxide slant column density corrected win2 [DU]	-0.158 ± 8.881	16937103	-0.750	11.3	-0.183	-881	1.348×10^3
background so2 slant column offset window2 [DU]	-2.24 ± 2.50	16937103	-0.250	3.96	-1.63	-12.6	6.68
sulfurdioxide slant column density window3 [DU]	-11.3 ± 24.3	16937103	-11.8	30.5	-11.3	-672	491
sulfurdioxide slant column density window3 precision [DU]	28.6 ± 13.8	16937103	22.5	10.3	24.9	9.49	258
sulfurdioxide slant column density corrected win3 [DU]	-2.94 ± 23.62	16937103	-3.92	29.4	-2.84	-659	495
background so2 slant column offset window3 [DU]	8.37 ± 6.11	16937103	2.80	10.1	7.82	-10.6	36.4
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	16937103	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.605 \pm 8.859) \times 10^{-2}$	16937103	1.125×10^{-2}	2.038×10^{-2}	1.400×10^{-2}	2.244×10^{-4}	3.18
fitted radiance shift [nm]	$(-5.211 \pm 26.820) \times 10^{-4}$	16937103	-5.000×10^{-4}	1.889×10^{-3}	-5.405×10^{-4}	-9.410×10^{-2}	5.141×10^{-2}
fitted radiance squeeze [1]	$(8.913 \pm 1761.568) \times 10^{-7}$	16937103	1.000×10^{-5}	2.045×10^{-4}	4.864×10^{-6}	-1.667×10^{-2}	1.672×10^{-2}
fitted root mean square [1]	$(1.283 \pm 0.492) \times 10^{-3}$	16937103	1.025×10^{-3}	5.072×10^{-4}	1.152×10^{-3}	3.200×10^{-4}	6.591×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.883 ± 0.522	16937103	0.660	0.588	0.777	5.000×10^{-2}	3.45
sulfurdioxide total air mass factor polluted precision [1]	0.110 ± 0.106	16937103	3.500×10^{-2}	0.119	7.144×10^{-2}	3.227×10^{-3}	2.10
sulfurdioxide clear air mass factor polluted [1]	0.762 ± 0.425	16937103	0.580	0.388	0.682	5.911×10^{-2}	3.46
number of spectral points in retrieval [1]	73.4 ± 0.5	16937103	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]	-2.70	-0.951	-0.567	-0.375	-0.217	0.242	0.411	0.621	1.05	3.04
sulfurdioxide total vertical column precision [DU]	8.043×10^{-2}	0.118	0.151	0.181	0.218	0.594	0.803	1.07	1.66	4.57
sulfurdioxide slant column density corrected [DU]	-0.838	-0.494	-0.361	-0.270	-0.175	0.194	0.294	0.390	0.538	0.950
sulfurdioxide slant column density cobra [DU]	-0.838	-0.494	-0.361	-0.270	-0.175	0.194	0.294	0.390	0.538	0.950
sulfurdioxide slant column density cobra precision [DU]	0.145	0.172	0.186	0.198	0.214	0.342	0.393	0.442	0.519	0.721
sulfurdioxide slant column density window1 [DU]	-1.55	-0.854	-0.581	-0.396	-0.200	0.543	0.735	0.917	1.19	1.90
sulfurdioxide slant column density window1 precision [DU]	0.145	0.172	0.186	0.198	0.214	0.342	0.393	0.442	0.519	0.721
sulfurdioxide slant column density corrected win1 [DU]	-1.58	-0.953	-0.703	-0.530	-0.344	0.387	0.585	0.776	1.07	1.85
background so2 slant column offset window1 [DU]	-0.372	-0.304	-0.271	-0.244	-0.214	-7.845×10^{-2}	-4.099×10^{-2}	7.893×10^{-6}	6.773×10^{-2}	0.232
sulfurdioxide slant column density window2 [DU]	-19.1	-12.4	-9.09	-6.61	-3.81	7.79	10.8	13.5	17.1	24.9
sulfurdioxide slant column density window2 precision [DU]	4.45	5.30	5.81	6.22	6.71	9.33	10.2	11.1	12.3	15.0
sulfurdioxide slant column density corrected win2 [DU]	-21.5	-14.5	-11.1	-8.62	-5.81	5.47	8.29	10.8	14.3	21.4
background so2 slant column offset window2 [DU]	-8.04	-6.64	-5.87	-5.15	-4.19	-0.237	9.484×10^{-2}	0.333	0.737	2.61
sulfurdioxide slant column density window3 [DU]	-72.8	-51.1	-41.2	-34.2	-26.5	4.05	11.9	18.9	28.4	47.4
sulfurdioxide slant column density window3 precision [DU]	13.7	16.2	17.9	19.3	20.9	31.2	36.1	42.1	54.7	88.0
sulfurdioxide slant column density corrected win3 [DU]	-62.8	-41.8	-32.0	-25.0	-17.5	11.9	19.4	26.2	35.4	54.3
background so2 slant column offset window3 [DU]	-2.42	0.363	1.36	2.06	3.01	13.1	15.2	16.8	18.8	22.1
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]	1.572×10^{-3}	3.290×10^{-3}	4.566×10^{-3}	5.955×10^{-3}	7.980×10^{-3}	2.836×10^{-2}	4.586×10^{-2}	7.640×10^{-2}	0.139	0.381
fitted radiance shift [nm]	-8.515×10^{-3}	-4.385×10^{-3}	-2.979×10^{-3}	-2.201×10^{-3}	-1.521×10^{-3}	3.685×10^{-4}	1.073×10^{-3}	1.988×10^{-3}	3.592×10^{-3}	8.022×10^{-3}
fitted radiance squeeze [1]	-4.740×10^{-4}	-2.844×10^{-4}	-2.065×10^{-4}	-1.539×10^{-4}	-9.875×10^{-5}	1.058×10^{-4}	1.574×10^{-4}	2.050×10^{-4}	2.728×10^{-4}	4.314×10^{-4}
fitted root mean square [1]	6.159×10^{-4}	7.546×10^{-4}	8.317×10^{-4}	8.916×10^{-4}	9.648×10^{-4}	1.472×10^{-3}	1.690×10^{-3}	1.903×10^{-3}	2.221×10^{-3}	3.043×10^{-3}
sulfurdioxide total air mass factor polluted [1]	7.204×10^{-2}	0.217	0.329	0.420	0.524	1.11	1.35	1.60	1.96	2.56
sulfurdioxide total air mass factor polluted precision [1]	9.777×10^{-3}	1.760×10^{-2}	2.360×10^{-2}	2.873×10^{-2}	3.618×10^{-2}	0.155	0.200	0.242	0.304	0.492
sulfurdioxide clear air mass factor polluted [1]	0.183	0.298	0.379	0.439	0.509	0.898	1.01	1.13	1.50	2.59
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]	0.707 ± 0.394	7377077	0.690	1.000	0.0	1.000	0.310	1.000
sulfurdioxide total vertical column [DU]	$(4.069 \pm 150.241) \times 10^{-2}$	7377077	0.558	1.351×10^{-2}	-92.8	103	-0.261	0.297
sulfurdioxide total vertical column precision [DU]	0.737 ± 1.121	7377077	0.514	0.402	5.315×10^{-2}	28.0	0.251	0.765
sulfurdioxide slant column density corrected [DU]	$(1.839 \pm 36.375) \times 10^{-2}$	7377077	0.379	1.018×10^{-2}	-8.54	42.9	-0.178	0.202
sulfurdioxide slant column density cobra [DU]	$(1.834 \pm 36.119) \times 10^{-2}$	7377077	0.379	1.018×10^{-2}	-8.54	19.7	-0.178	0.202
sulfurdioxide slant column density cobra precision [DU]	0.304 ± 0.128	7377077	0.144	0.267	8.465×10^{-2}	6.52	0.216	0.360
sulfurdioxide slant column density window1 [DU]	0.211 ± 0.680	7377077	0.758	0.211	-8.88	22.4	-0.168	0.590
sulfurdioxide slant column density window1 precision [DU]	0.304 ± 0.128	7377077	0.144	0.267	8.465×10^{-2}	6.52	0.216	0.360
sulfurdioxide slant column density corrected win1 [DU]	$(4.571 \pm 67.818) \times 10^{-2}$	7377077	0.751	2.709×10^{-2}	-8.54	22.3	-0.342	0.409
background so2 slant column offset window1 [DU]	-0.165 ± 0.109	7377077	0.114	-0.173	-1.42	2.28	-0.231	-0.117
sulfurdioxide slant column density window2 [DU]	1.80 ± 9.54	7377077	12.1	1.52	-598	98.8	-4.39	7.68
sulfurdioxide slant column density window2 precision [DU]	8.72 ± 2.40	7377077	2.97	8.39	2.36	205	7.07	10.0
sulfurdioxide slant column density corrected win2 [DU]	$(4.229 \pm 932.540) \times 10^{-2}$	7377077	11.8	1.481×10^{-2}	-597	94.4	-5.90	5.95
background so2 slant column offset window2 [DU]	-1.76 ± 2.29	7377077	2.84	-1.12	-12.6	6.68	-3.02	-0.187
sulfurdioxide slant column density window3 [DU]	-12.1 ± 26.1	7377077	32.6	-11.4	-213	181	-28.0	4.63
sulfurdioxide slant column density window3 precision [DU]	30.7 ± 14.5	7377077	11.2	27.1	9.49	258	22.6	33.8
sulfurdioxide slant column density corrected win3 [DU]	-3.96 ± 25.49	7377077	31.9	-3.76	-212	189	-19.7	12.2
background so2 slant column offset window3 [DU]	8.11 ± 5.87	7377077	9.51	7.23	-10.6	29.1	3.14	12.7
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	7377077	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.184 \pm 12.497) \times 10^{-2}$	7377077	4.719×10^{-2}	2.389×10^{-2}	2.244×10^{-4}	3.18	1.348×10^{-2}	6.067×10^{-2}
fitted radiance shift [nm]	$(-1.710 \pm 28.640) \times 10^{-4}$	7377077	1.818×10^{-3}	-2.168×10^{-4}	-5.045×10^{-2}	4.569×10^{-2}	-1.102×10^{-3}	7.157×10^{-4}
fitted radiance squeeze [1]	$(1.960 \pm 17.804) \times 10^{-5}$	7377077	2.078×10^{-4}	1.821×10^{-5}	-9.745×10^{-3}	7.894×10^{-3}	-8.481×10^{-5}	1.230×10^{-4}
fitted root mean square [1]	$(1.335 \pm 0.529) \times 10^{-3}$	7377077	5.999×10^{-4}	1.197×10^{-3}	3.200×10^{-4}	3.447×10^{-2}	9.753×10^{-4}	1.575×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.724 ± 0.380	7377077	0.517	0.690	5.000×10^{-2}	2.96	0.444	0.961
sulfurdioxide total air mass factor polluted precision [1]	$(9.067 \pm 11.018) \times 10^{-2}$	7377077	7.929×10^{-2}	5.250×10^{-2}	3.227×10^{-3}	2.10	3.055×10^{-2}	0.110
sulfurdioxide clear air mass factor polluted [1]	0.675 ± 0.275	7377077	0.428	0.662	5.911×10^{-2}	2.51	0.460	0.888
number of spectral points in retrieval [1]	73.4 ± 0.5	7377077	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]	0.616 ± 0.413	9560026	0.810	1.000	0.0	1.000	0.190	1.000
sulfurdioxide total vertical column [DU]	$(1.881 \pm 80.293) \times 10^{-2}$	9560026	0.396	6.748×10^{-3}	-49.0	510	-0.189	0.207
sulfurdioxide total vertical column precision [DU]	0.442 ± 0.571	9560026	0.301	0.298	1.989×10^{-2}	80.2	0.194	0.495
sulfurdioxide slant column density corrected [DU]	$(1.177 \pm 35.904) \times 10^{-2}$	9560026	0.362	6.916×10^{-3}	-10.7	377	-0.173	0.189
sulfurdioxide slant column density cobra [DU]	$(1.167 \pm 32.871) \times 10^{-2}$	9560026	0.362	6.916×10^{-3}	-10.7	39.2	-0.173	0.189
sulfurdioxide slant column density cobra precision [DU]	0.285 ± 0.114	9560026	0.116	0.252	5.810×10^{-2}	20.6	0.212	0.328
sulfurdioxide slant column density window1 [DU]	0.141 ± 0.637	9560026	0.729	0.146	-46.3	75.6	-0.222	0.507
sulfurdioxide slant column density window1 precision [DU]	0.285 ± 0.114	9560026	0.116	0.252	5.810×10^{-2}	20.6	0.212	0.328
sulfurdioxide slant column density corrected win1 [DU]	$(2.256 \pm 63.093) \times 10^{-2}$	9560026	0.717	1.054×10^{-2}	-46.3	75.5	-0.345	0.372
background so2 slant column offset window1 [DU]	-0.118 ± 0.123	9560026	0.140	-0.129	-0.982	2.08	-0.197	-5.734×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.30 ± 8.76	9560026	11.2	2.21	-882	1.348×10^3	-3.36	7.86
sulfurdioxide slant column density window2 precision [DU]	7.83 ± 2.08	9560026	2.24	7.54	2.38	480	6.53	8.77
sulfurdioxide slant column density corrected win2 [DU]	-0.313 ± 8.518	9560026	10.9	-0.326	-881	1.348×10^3	-5.76	5.12
background so2 slant column offset window2 [DU]	-2.61 ± 2.59	9560026	4.44	-2.40	-12.1	5.83	-4.73	-0.291
sulfurdioxide slant column density window3 [DU]	-10.7 ± 22.9	9560026	29.1	-11.2	-672	491	-25.5	3.63
sulfurdioxide slant column density window3 precision [DU]	27.0 ± 13.1	9560026	8.59	23.5	9.83	228	20.1	28.7
sulfurdioxide slant column density corrected win3 [DU]	-2.16 ± 22.03	9560026	27.7	-2.23	-659	495	-16.0	11.7
background so2 slant column offset window3 [DU]	8.58 ± 6.29	9560026	10.5	8.35	-10.5	36.4	2.91	13.4
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	9560026	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.614 \pm 3.069) \times 10^{-2}$	9560026	1.067×10^{-2}	9.900×10^{-3}	2.950×10^{-4}	1.53	6.141×10^{-3}	1.681×10^{-2}
fitted radiance shift [nm]	$(-7.913 \pm 24.993) \times 10^{-4}$	9560026	1.811×10^{-3}	-7.947×10^{-4}	-9.410×10^{-2}	5.141×10^{-2}	-1.754×10^{-3}	5.754×10^{-5}
fitted radiance squeeze [1]	$(-1.354 \pm 17.332) \times 10^{-5}$	9560026	2.022×10^{-4}	-5.204×10^{-6}	-1.667×10^{-2}	1.672×10^{-2}	-1.092×10^{-4}	9.301×10^{-5}
fitted root mean square [1]	$(1.242 \pm 0.457) \times 10^{-3}$	9560026	4.414×10^{-4}	1.125×10^{-3}	3.463×10^{-4}	6.591×10^{-2}	9.586×10^{-4}	1.400×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.01 ± 0.58	9560026	0.724	0.852	5.000×10^{-2}	3.45	0.587	1.31
sulfurdioxide total air mass factor polluted precision [1]	0.125 ± 0.101	9560026	0.141	0.101	4.423×10^{-3}	1.18	4.141×10^{-2}	0.182
sulfurdioxide clear air mass factor polluted [1]	0.829 ± 0.501	9560026	0.369	0.694	8.415×10^{-2}	3.46	0.539	0.908
number of spectral points in retrieval [1]	73.4 ± 0.5	9560026	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]	0.659 ± 0.406	12345338	0.770	1.000	0.0	1.000	0.230	1.000
sulfurdioxide total vertical column [DU]	$(2.360 \pm 92.899) \times 10^{-2}$	12345338	0.435	9.092×10^{-3}	-63.8	510	-0.206	0.229
sulfurdioxide total vertical column precision [DU]	0.495 ± 0.676	12345338	0.323	0.313	3.813×10^{-2}	26.2	0.215	0.538
sulfurdioxide slant column density corrected [DU]	$(1.416 \pm 34.997) \times 10^{-2}$	12345338	0.360	8.262×10^{-3}	-10.7	377	-0.170	0.190
sulfurdioxide slant column density cobra [DU]	$(1.409 \pm 33.017) \times 10^{-2}$	12345338	0.360	8.262×10^{-3}	-10.7	23.2	-0.170	0.190
sulfurdioxide slant column density cobra precision [DU]	0.286 ± 0.118	12345338	0.119	0.251	8.465×10^{-2}	12.6	0.210	0.329
sulfurdioxide slant column density window1 [DU]	0.170 ± 0.637	12345338	0.721	0.174	-46.3	75.6	-0.189	0.532
sulfurdioxide slant column density window1 precision [DU]	0.286 ± 0.118	12345338	0.119	0.251	8.465×10^{-2}	12.6	0.210	0.329
sulfurdioxide slant column density corrected win1 [DU]	$(3.398 \pm 63.307) \times 10^{-2}$	12345338	0.710	1.972×10^{-2}	-46.3	75.5	-0.332	0.379
background so2 slant column offset window1 [DU]	-0.136 ± 0.120	12345338	0.137	-0.148	-1.42	2.28	-0.212	-7.445×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.09 ± 8.80	12345338	11.3	1.93	-815	727	-3.63	7.63
sulfurdioxide slant column density window2 precision [DU]	7.95 ± 2.09	12345338	2.41	7.64	2.36	480	6.56	8.97
sulfurdioxide slant column density corrected win2 [DU]	-0.219 ± 8.572	12345338	11.0	-0.245	-815	720	-5.72	5.24
background so2 slant column offset window2 [DU]	-2.31 ± 2.53	12345338	4.11	-1.72	-12.6	6.68	-4.34	-0.230
sulfurdioxide slant column density window3 [DU]	-8.89 ± 23.41	12345338	29.6	-9.23	-405	491	-23.8	5.84
sulfurdioxide slant column density window3 precision [DU]	27.4 ± 12.6	12345338	9.16	24.1	9.83	228	20.5	29.6
sulfurdioxide slant column density corrected win3 [DU]	-0.825 ± 22.502	12345338	28.4	-1.13	-399	495	-15.1	13.3
background so2 slant column offset window3 [DU]	8.06 ± 5.86	12345338	9.70	7.60	-10.6	32.6	2.93	12.6
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.15	12345338	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.998 \pm 3.388) \times 10^{-2}$	12345338	1.310×10^{-2}	1.213×10^{-2}	3.105×10^{-4}	1.60	7.612×10^{-3}	2.071×10^{-2}
fitted radiance shift [nm]	$(-5.487 \pm 25.006) \times 10^{-4}$	12345338	1.912×10^{-3}	-5.550×10^{-4}	-4.591×10^{-2}	4.139×10^{-2}	-1.559×10^{-3}	3.531×10^{-4}
fitted radiance squeeze [1]	$(-7.702 \pm 1712.340) \times 10^{-7}$	12345338	1.978×10^{-4}	4.670×10^{-6}	-1.610×10^{-2}	1.497×10^{-2}	-9.594×10^{-5}	1.018×10^{-4}
fitted root mean square [1]	$(1.245 \pm 0.482) \times 10^{-3}$	12345338	4.638×10^{-4}	1.119×10^{-3}	3.200×10^{-4}	6.591×10^{-2}	9.438×10^{-4}	1.408×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.892 ± 0.478	12345338	0.554	0.809	5.000×10^{-2}	2.92	0.560	1.11
sulfurdioxide total air mass factor polluted precision [1]	0.106 ± 0.091	12345338	0.111	7.313×10^{-2}	4.418×10^{-3}	1.31	3.945×10^{-2}	0.151
sulfurdioxide clear air mass factor polluted [1]	0.754 ± 0.328	12345338	0.360	0.705	8.415×10^{-2}	2.97	0.539	0.899
number of spectral points in retrieval [1]	73.4 ± 0.5	12345338	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]	0.665 ± 0.407	3718579	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(3.621 \pm 151.270) \times 10^{-2}$	3718579	0.511	7.989×10^{-3}	-92.8	157	-0.242	0.269
sulfurdioxide total vertical column precision [DU]	0.715 ± 1.144	3718579	0.499	0.390	1.989×10^{-2}	80.2	0.225	0.723
sulfurdioxide slant column density corrected [DU]	$(1.426 \pm 38.484) \times 10^{-2}$	3718579	0.390	7.476×10^{-3}	-10.5	186	-0.186	0.204
sulfurdioxide slant column density cobra [DU]	$(1.415 \pm 36.882) \times 10^{-2}$	3718579	0.390	7.476×10^{-3}	-10.5	39.2	-0.186	0.204
sulfurdioxide slant column density cobra precision [DU]	0.307 ± 0.121	3718579	0.138	0.274	5.810×10^{-2}	20.6	0.225	0.363
sulfurdioxide slant column density window1 [DU]	0.171 ± 0.693	3718579	0.793	0.170	-16.3	49.6	-0.226	0.566
sulfurdioxide slant column density window1 precision [DU]	0.307 ± 0.121	3718579	0.138	0.274	5.810×10^{-2}	20.6	0.225	0.363
sulfurdioxide slant column density corrected win1 [DU]	$(2.105 \pm 68.575) \times 10^{-2}$	3718579	0.779	4.657×10^{-3}	-16.3	49.4	-0.379	0.400
background so2 slant column offset window1 [DU]	-0.150 ± 0.117	3718579	0.126	-0.159	-0.997	2.28	-0.223	-9.679×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.87 ± 9.80	3718579	12.5	1.70	-882	1.215×10^3	-4.45	8.00
sulfurdioxide slant column density window2 precision [DU]	8.88 ± 2.53	3718579	2.89	8.50	2.47	419	7.23	10.1
sulfurdioxide slant column density corrected win2 [DU]	$(8.258 \pm 9579.247) \times 10^{-3}$	3718579	12.1	8.964×10^{-4}	-881	1.215×10^3	-6.06	6.08
background so2 slant column offset window2 [DU]	-1.86 ± 2.30	3718579	3.00	-1.28	-12.6	6.68	-3.20	-0.203
sulfurdioxide slant column density window3 [DU]	-17.9 ± 25.5	3718579	31.9	-17.4	-672	357	-33.6	-1.70
sulfurdioxide slant column density window3 precision [DU]	31.8 ± 16.4	3718579	11.8	27.4	9.49	258	22.6	34.4
sulfurdioxide slant column density corrected win3 [DU]	-9.04 ± 25.41	3718579	31.8	-8.42	-659	361	-24.6	7.13
background so2 slant column offset window3 [DU]	8.89 ± 6.71	3718579	11.2	7.76	-10.6	36.4	3.05	14.3
sulfurdioxide slant column cobra flag [1]	1.95 ± 0.31	3718579	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(7.650 \pm 15.158) \times 10^{-2}$	3718579	7.327×10^{-2}	3.099×10^{-2}	2.245×10^{-4}	3.18	9.987×10^{-3}	8.326×10^{-2}
fitted radiance shift [nm]	$(-4.824 \pm 31.234) \times 10^{-4}$	3718579	1.766×10^{-3}	-5.405×10^{-4}	-9.410×10^{-2}	5.141×10^{-2}	-1.430×10^{-3}	3.365×10^{-4}
fitted radiance squeeze [1]	$(1.783 \pm 1857.528) \times 10^{-7}$	3718579	2.221×10^{-4}	1.502×10^{-6}	-1.465×10^{-2}	1.672×10^{-2}	-1.101×10^{-4}	1.120×10^{-4}
fitted root mean square [1]	$(1.358 \pm 0.486) \times 10^{-3}$	3718579	5.547×10^{-4}	1.234×10^{-3}	3.745×10^{-4}	6.058×10^{-2}	1.029×10^{-3}	1.583×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.893 ± 0.645	3718579	0.695	0.692	5.000×10^{-2}	3.45	0.453	1.15
sulfurdioxide total air mass factor polluted precision [1]	0.122 ± 0.141	3718579	0.141	6.308×10^{-2}	3.227×10^{-3}	2.10	2.915×10^{-2}	0.170
sulfurdioxide clear air mass factor polluted [1]	0.829 ± 0.652	3718579	0.493	0.633	5.911×10^{-2}	3.46	0.432	0.926
number of spectral points in retrieval [1]	73.4 ± 0.5	3718579	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

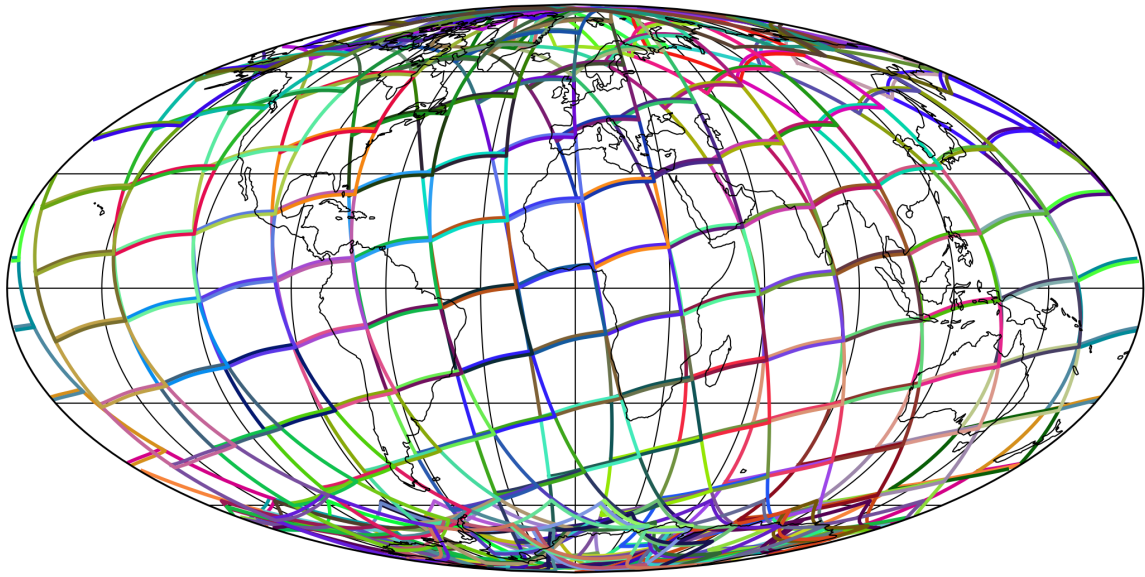


Figure 1: Outline of the granules.

4 Input data monitoring

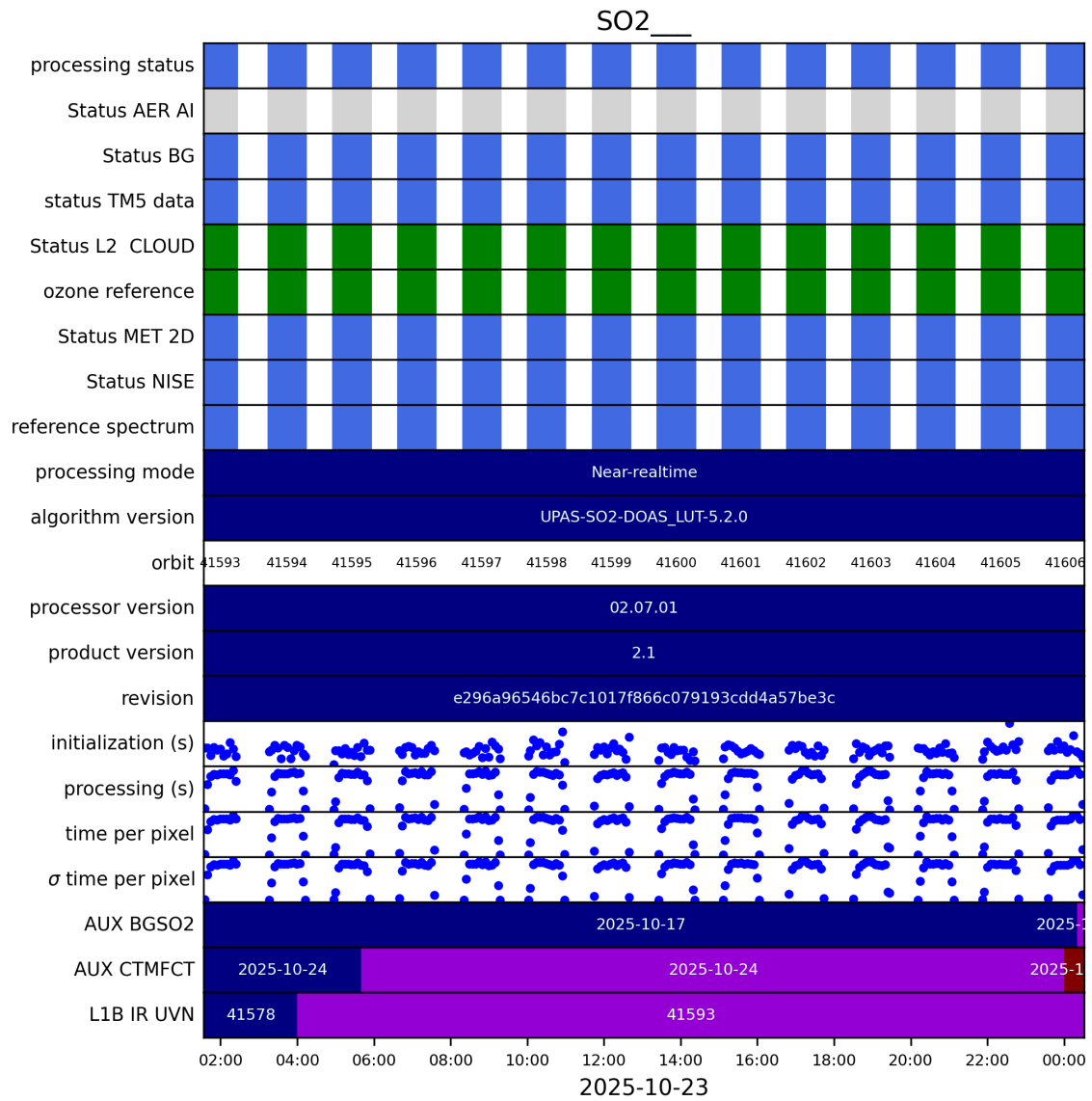


Figure 2: Input data per granule

5 Warnings and errors

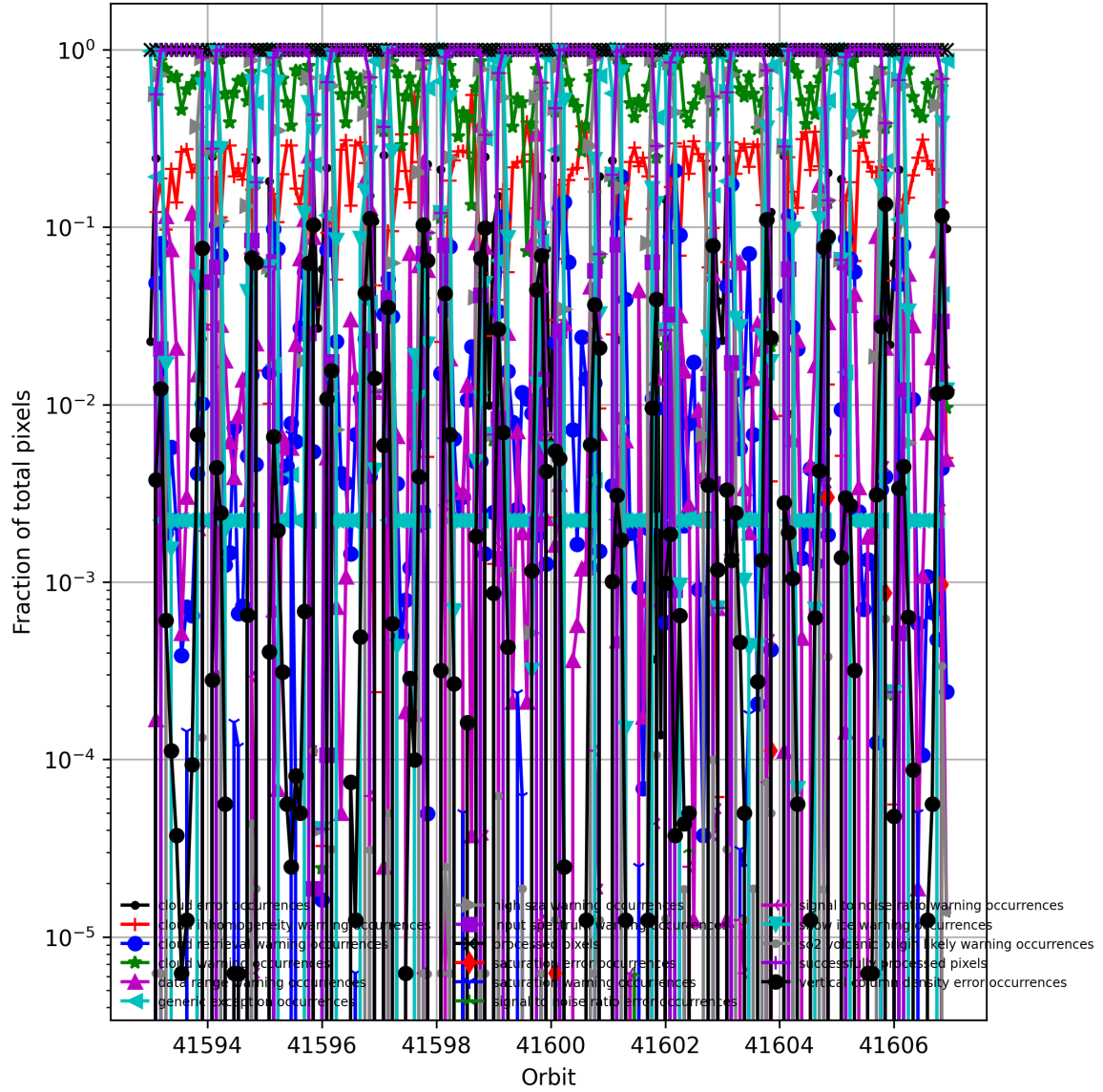


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

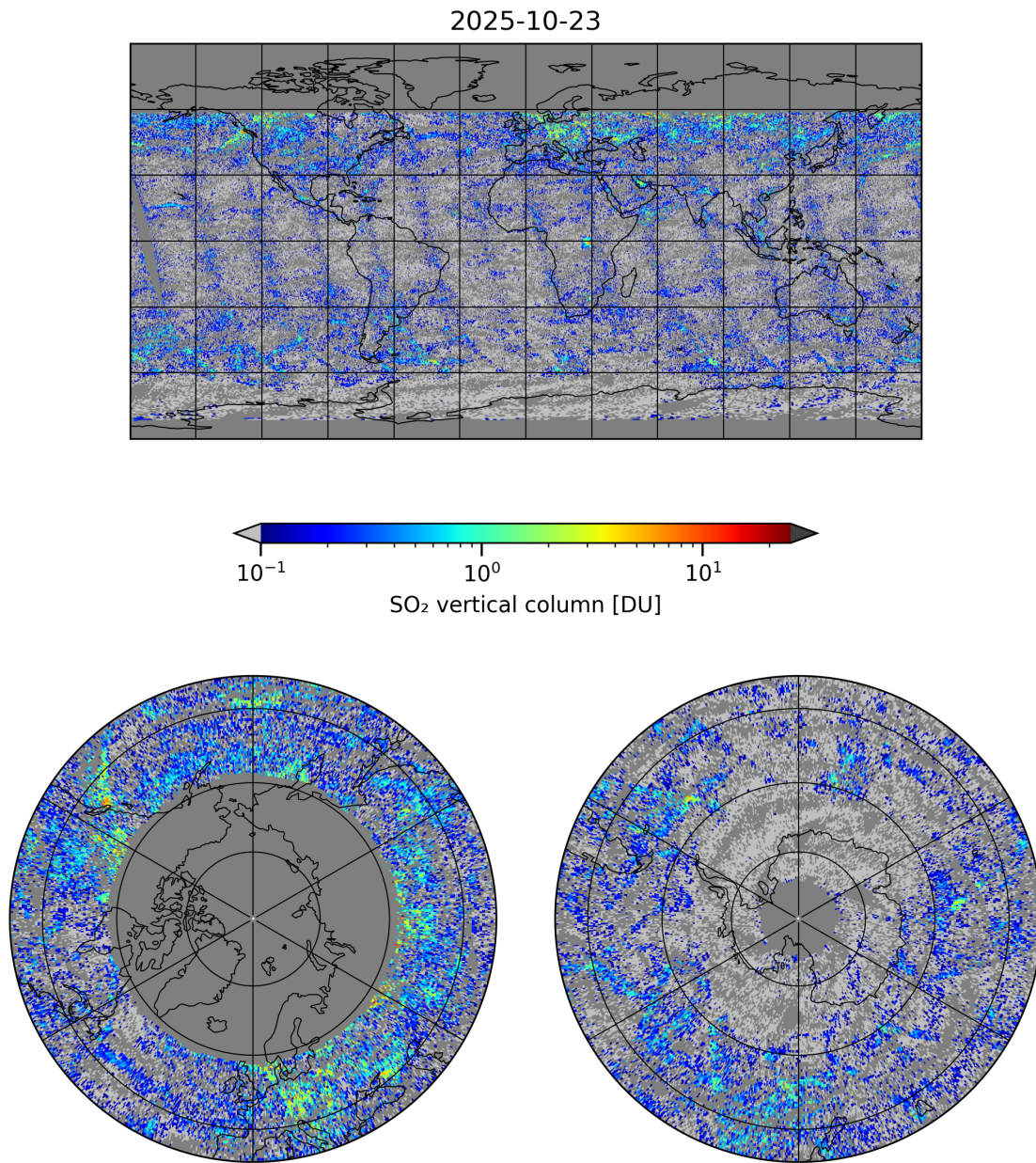


Figure 4: Map of “SO₂ vertical column” for 2025-10-23 to 2025-10-24

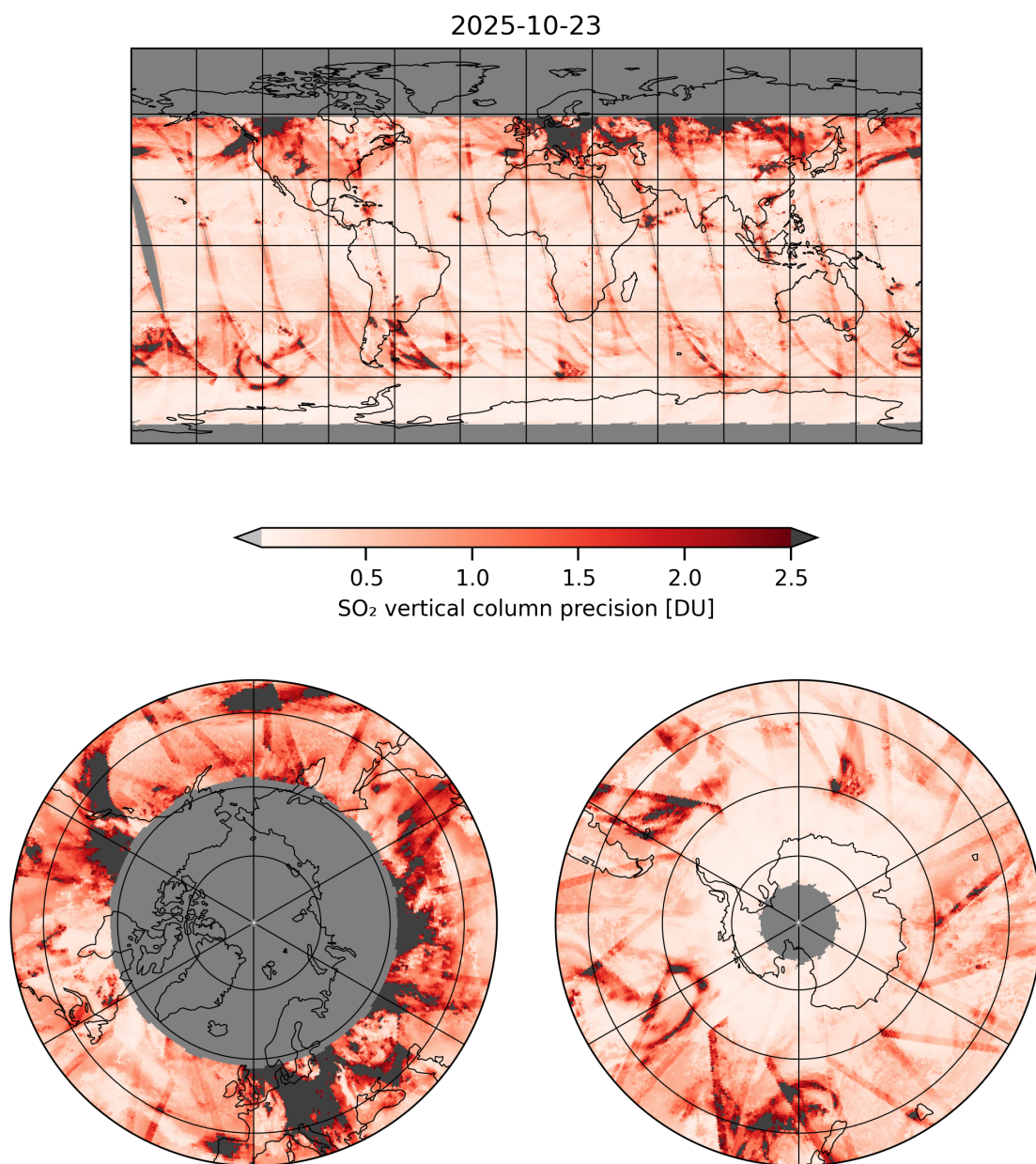


Figure 5: Map of “SO₂ vertical column precision” for 2025-10-23 to 2025-10-24

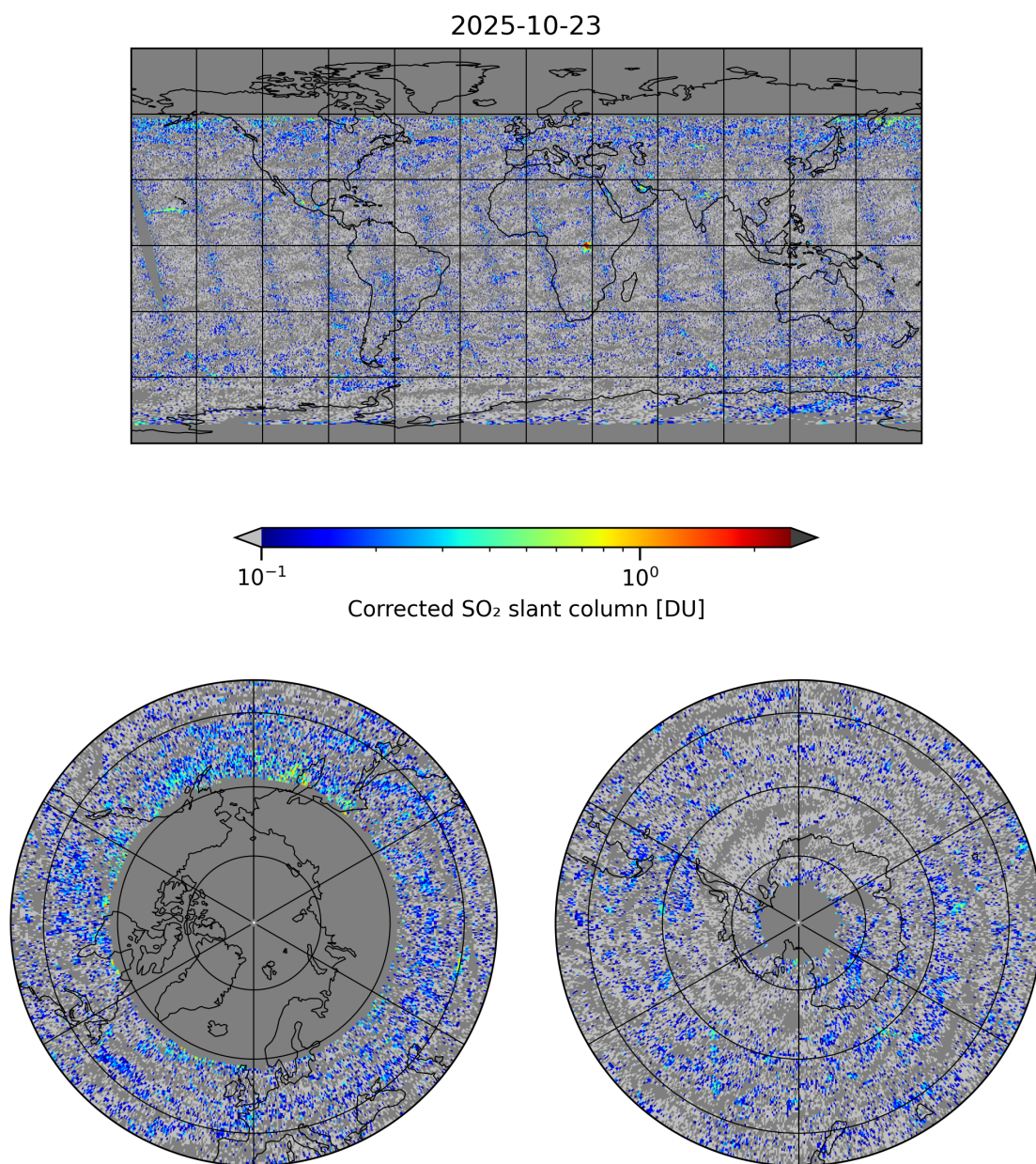


Figure 6: Map of “Corrected SO₂ slant column” for 2025-10-23 to 2025-10-24

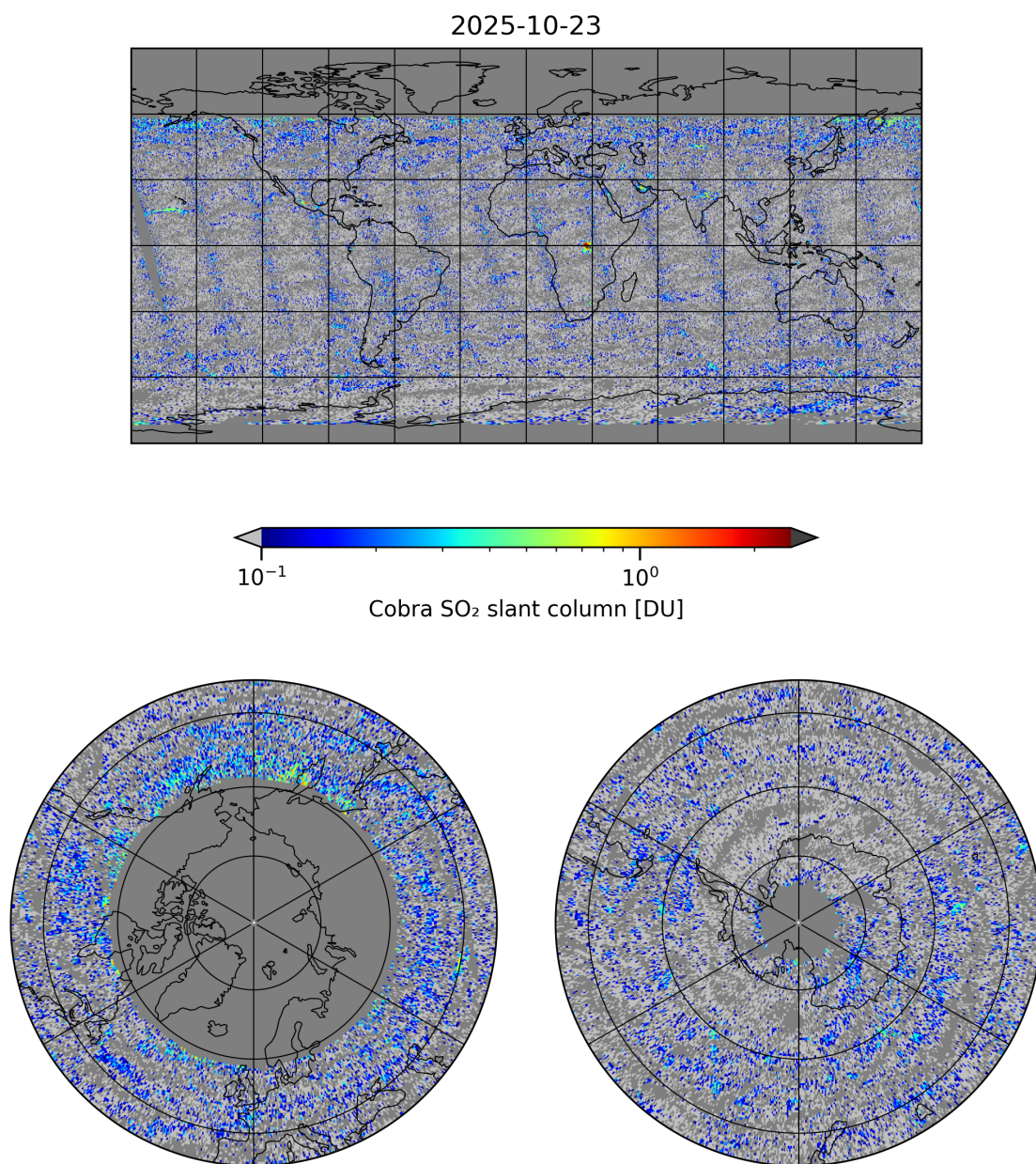


Figure 7: Map of “Cobra SO₂ slant column” for 2025-10-23 to 2025-10-24

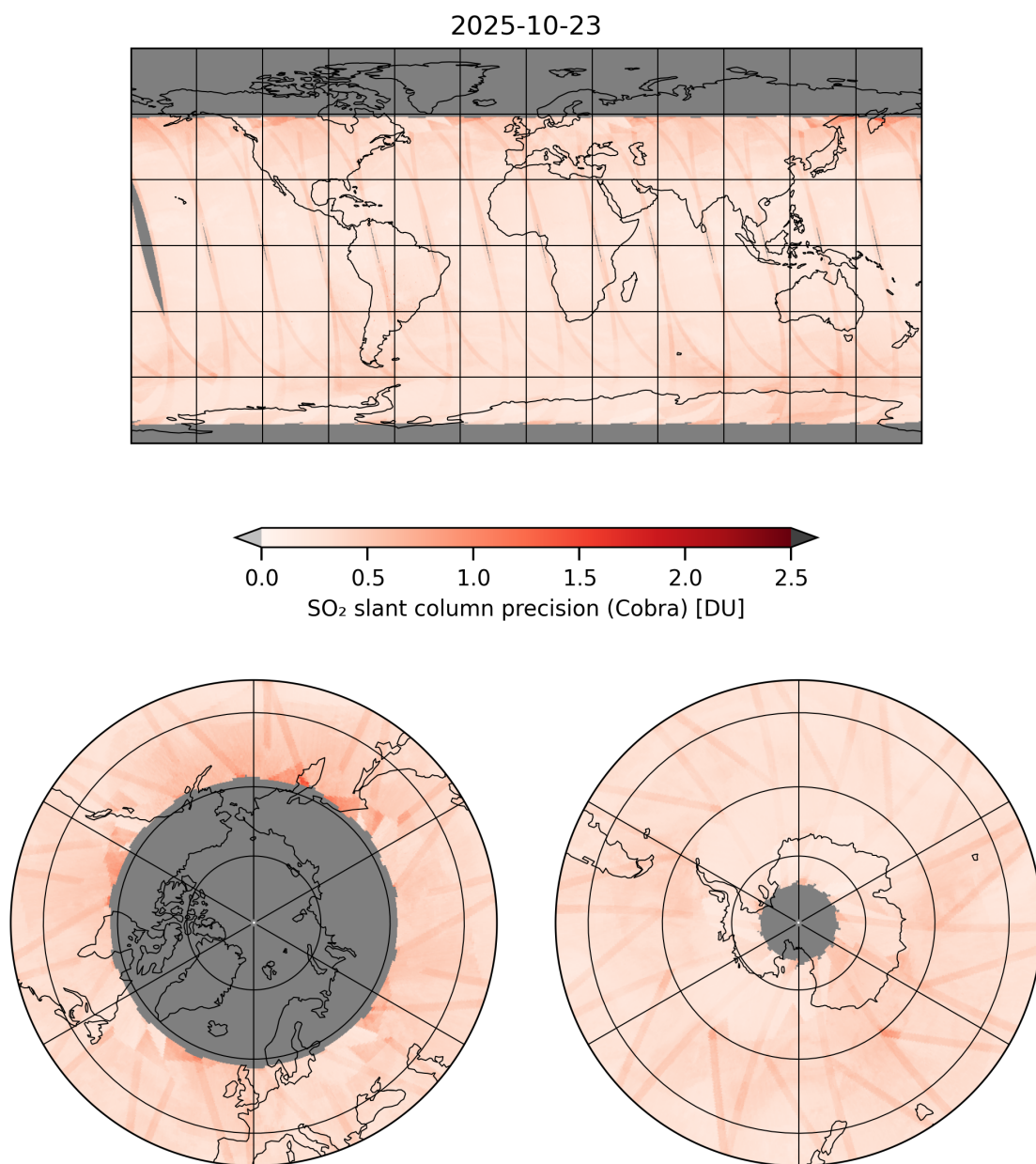


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-10-23 to 2025-10-24

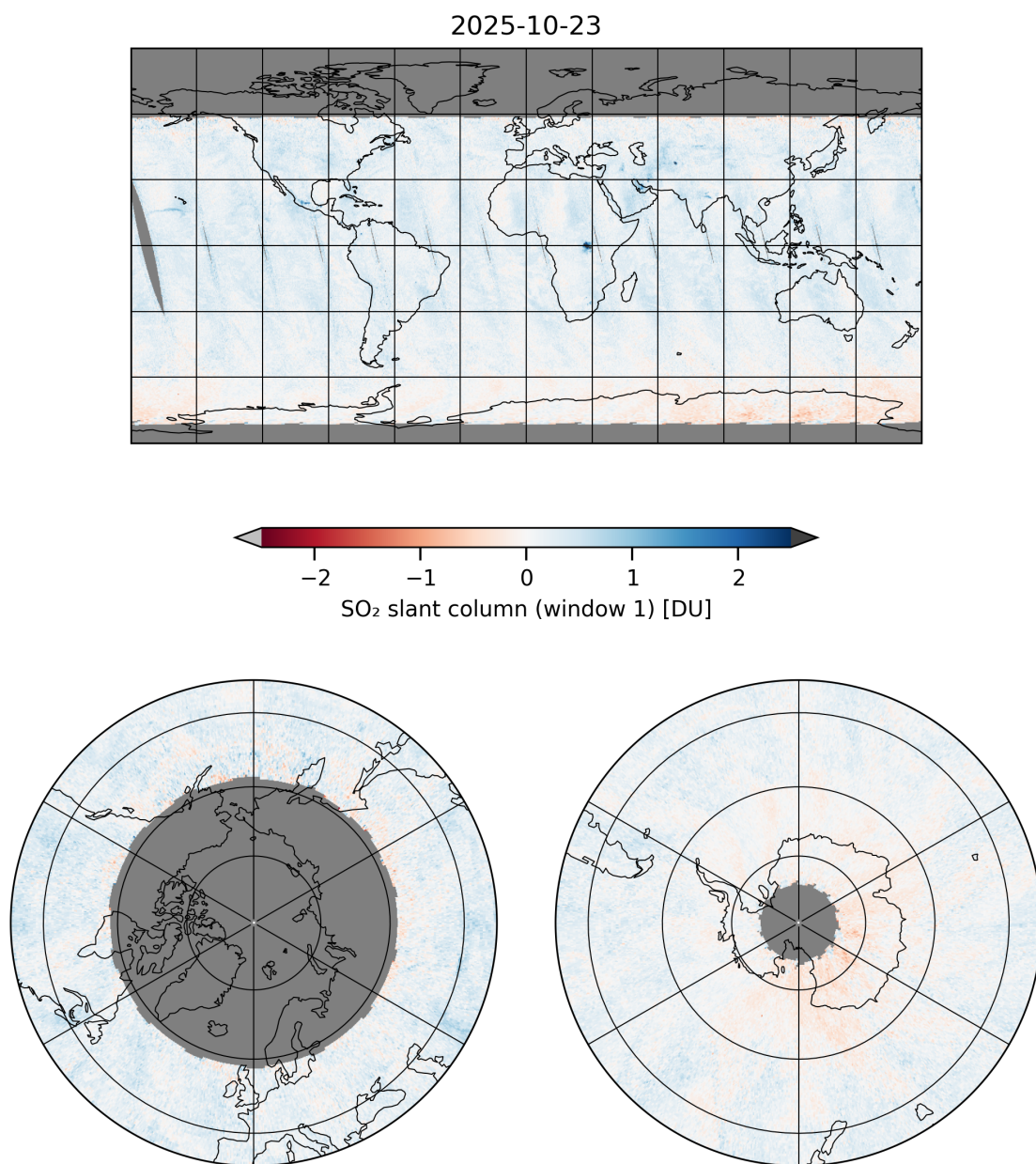


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-10-23 to 2025-10-24

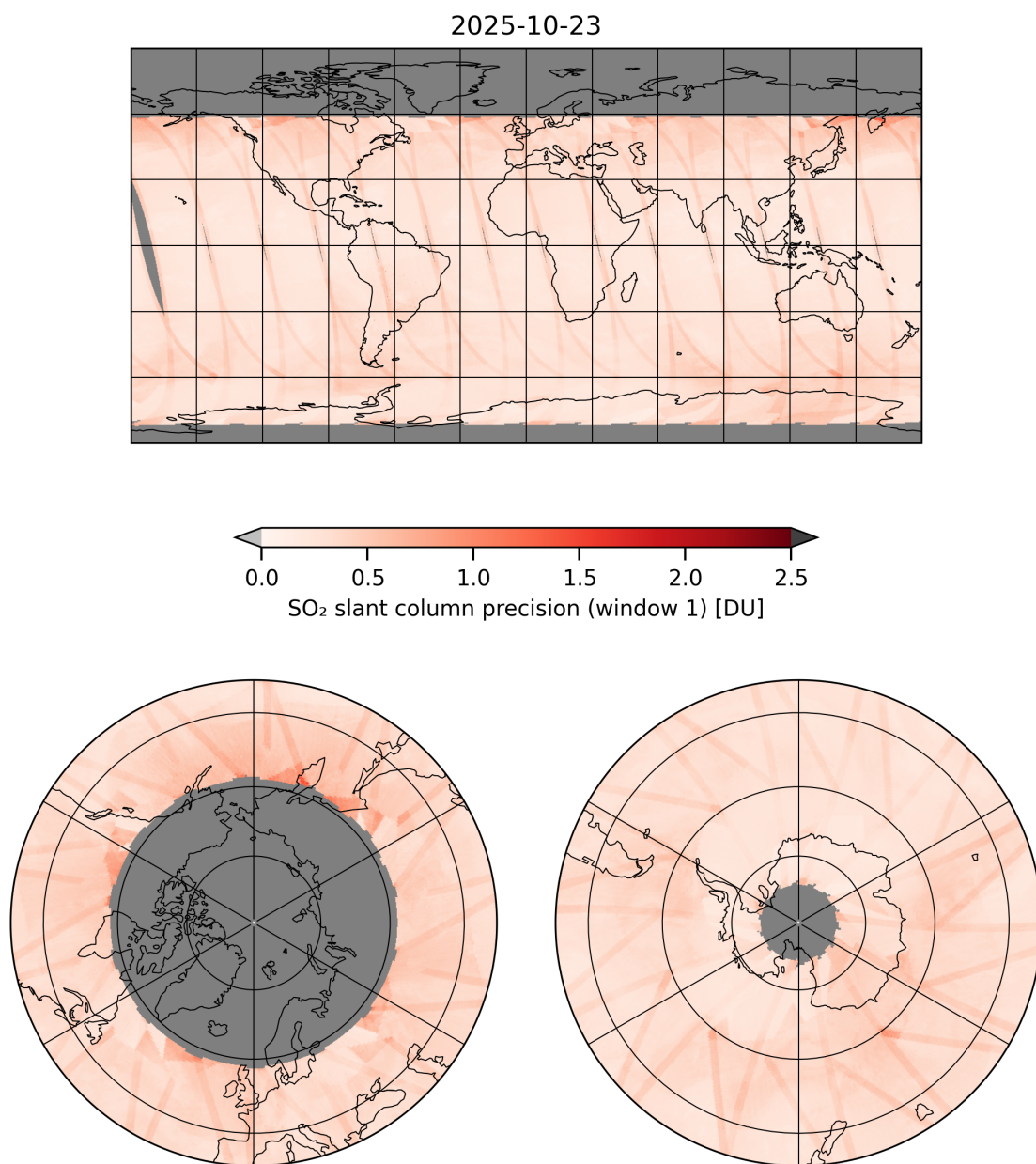


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-10-23 to 2025-10-24

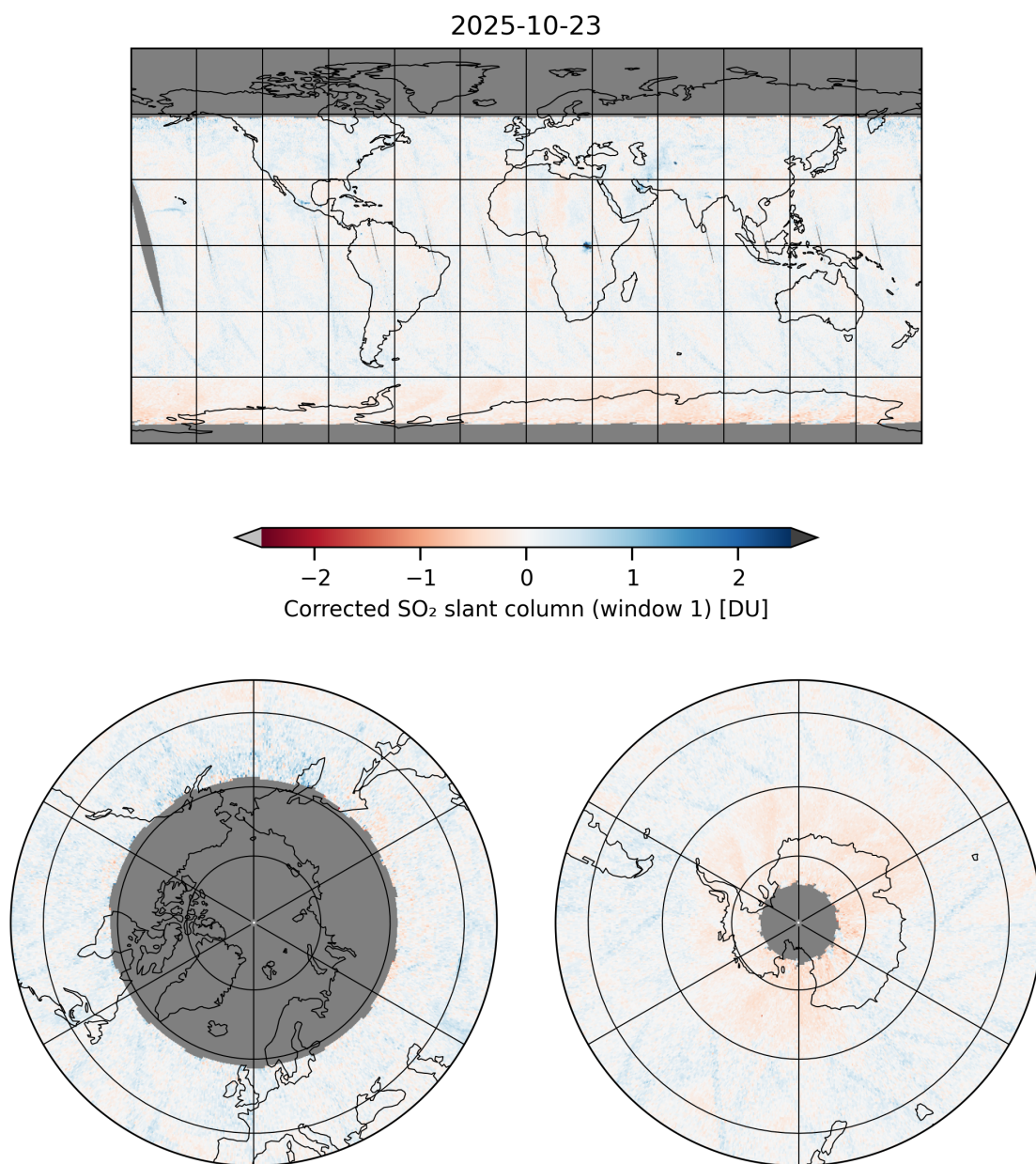


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-10-23 to 2025-10-24

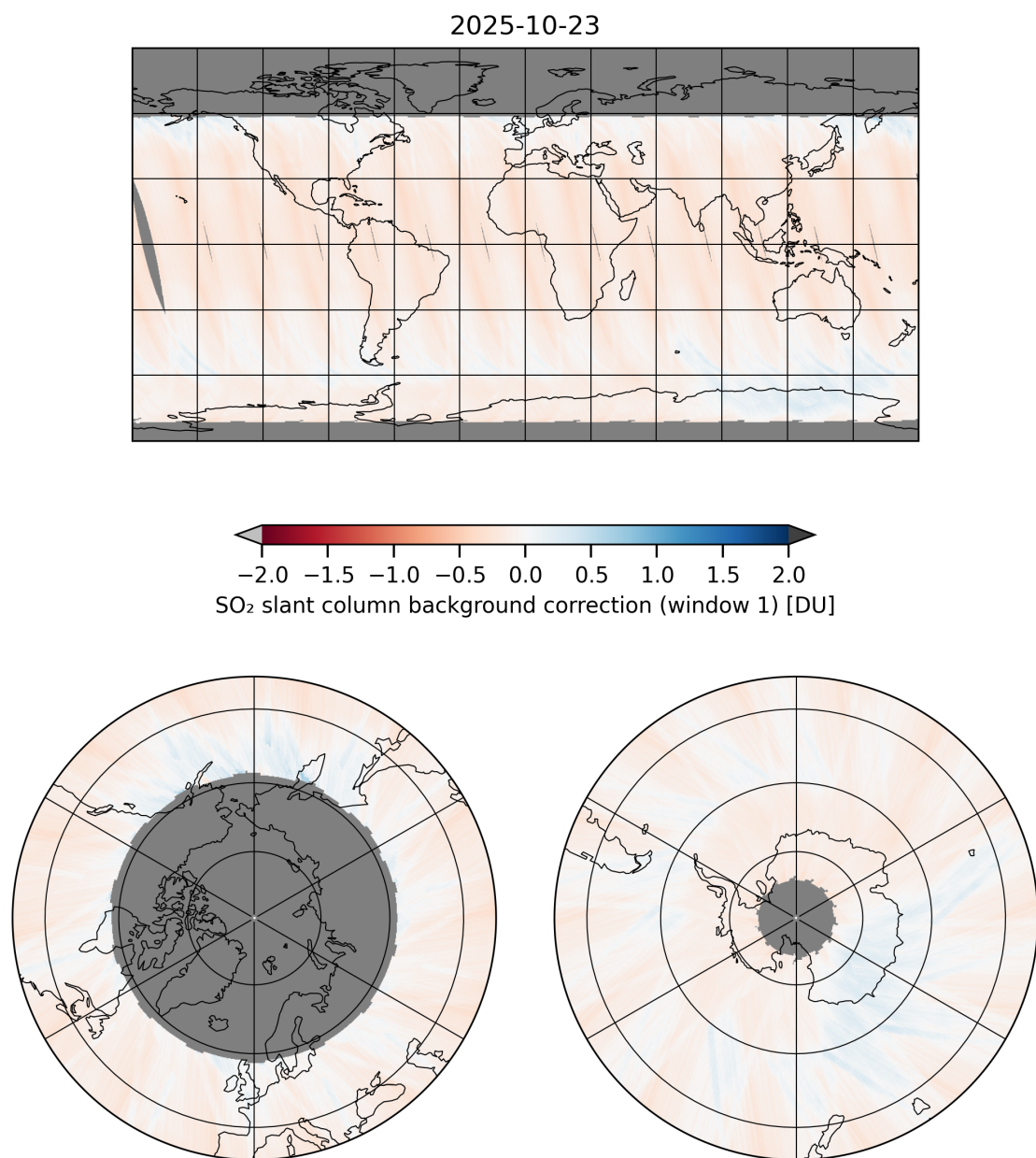


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-10-23 to 2025-10-24

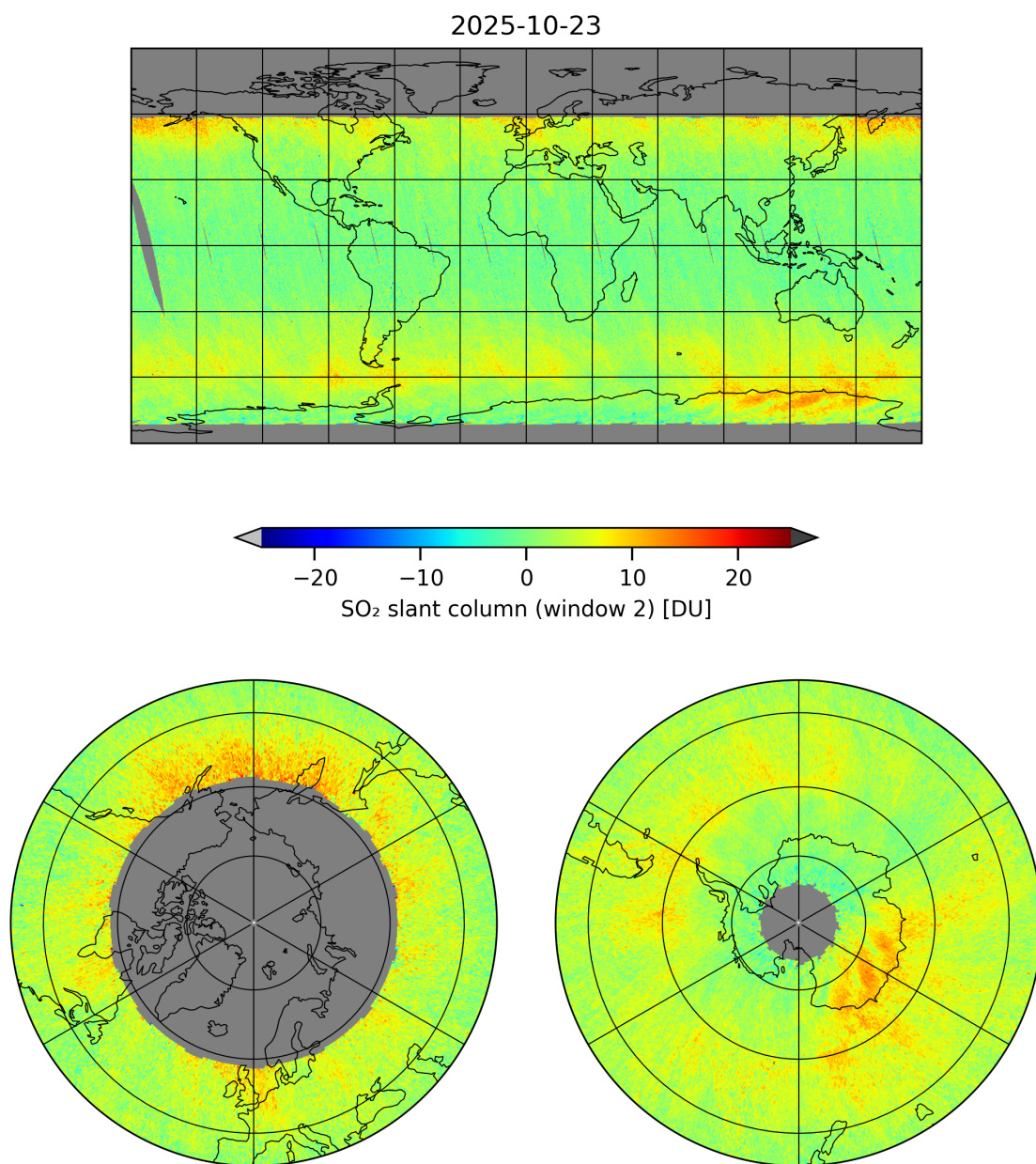


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-10-23 to 2025-10-24

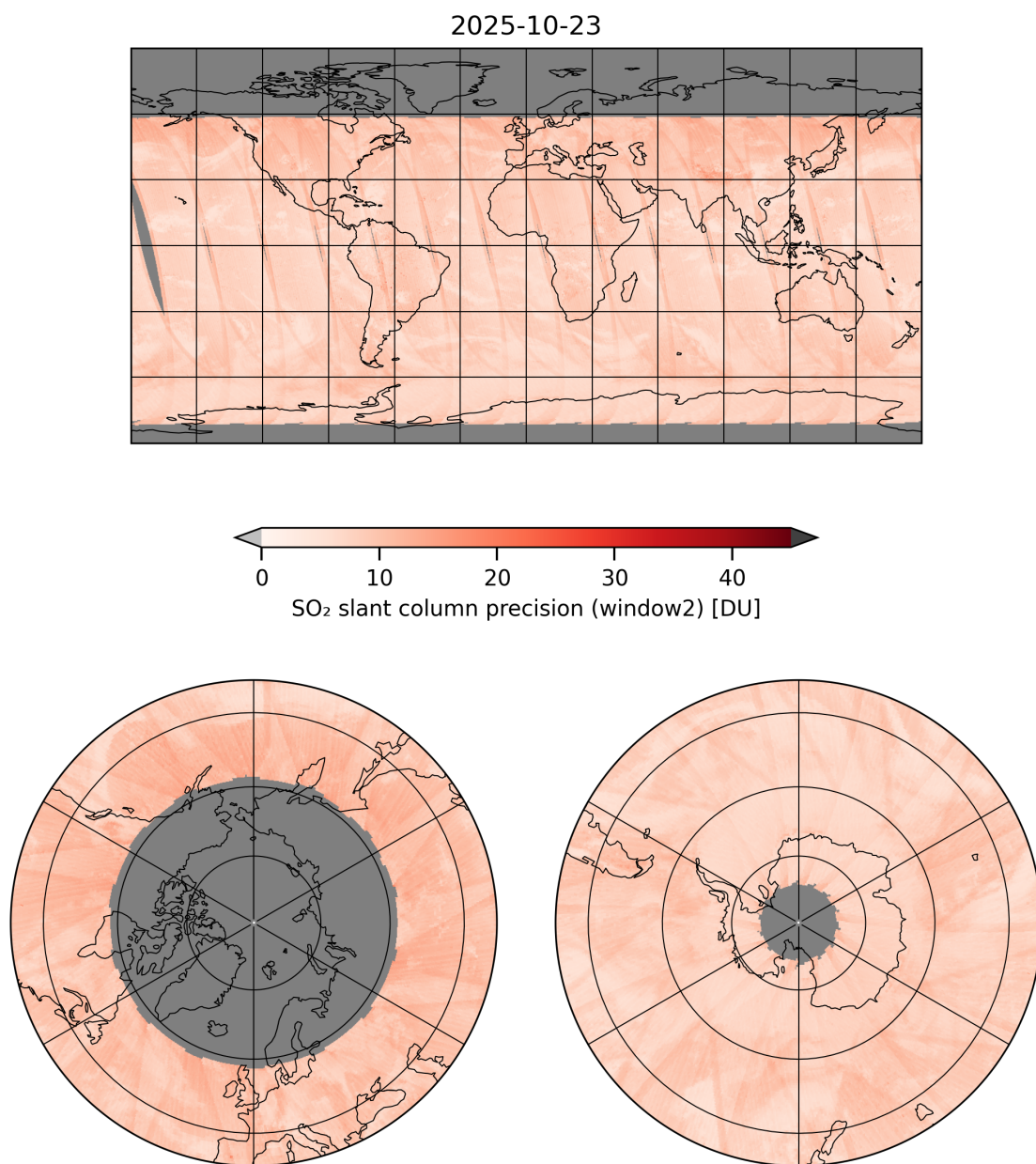


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-10-23 to 2025-10-24

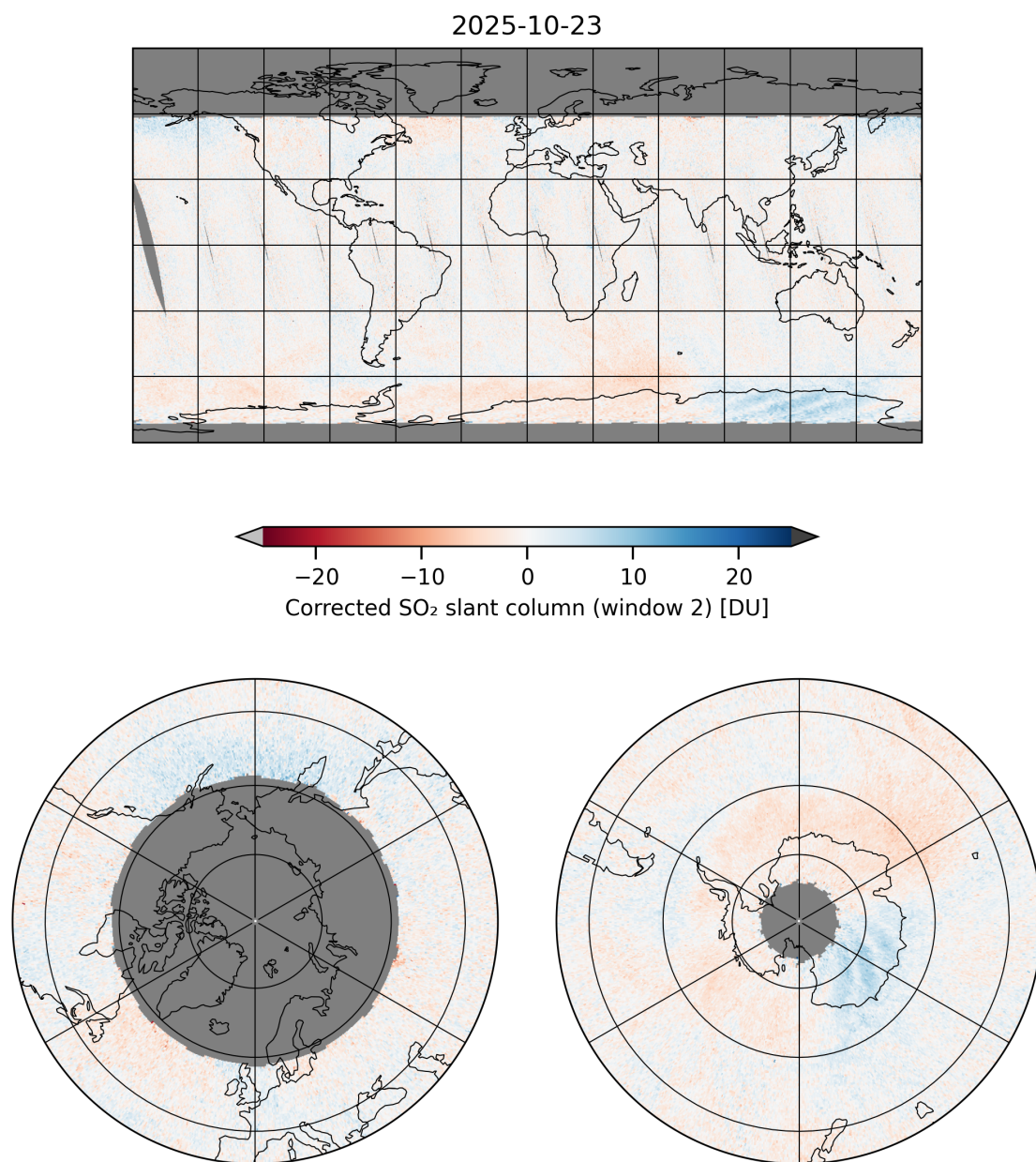


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-10-23 to 2025-10-24

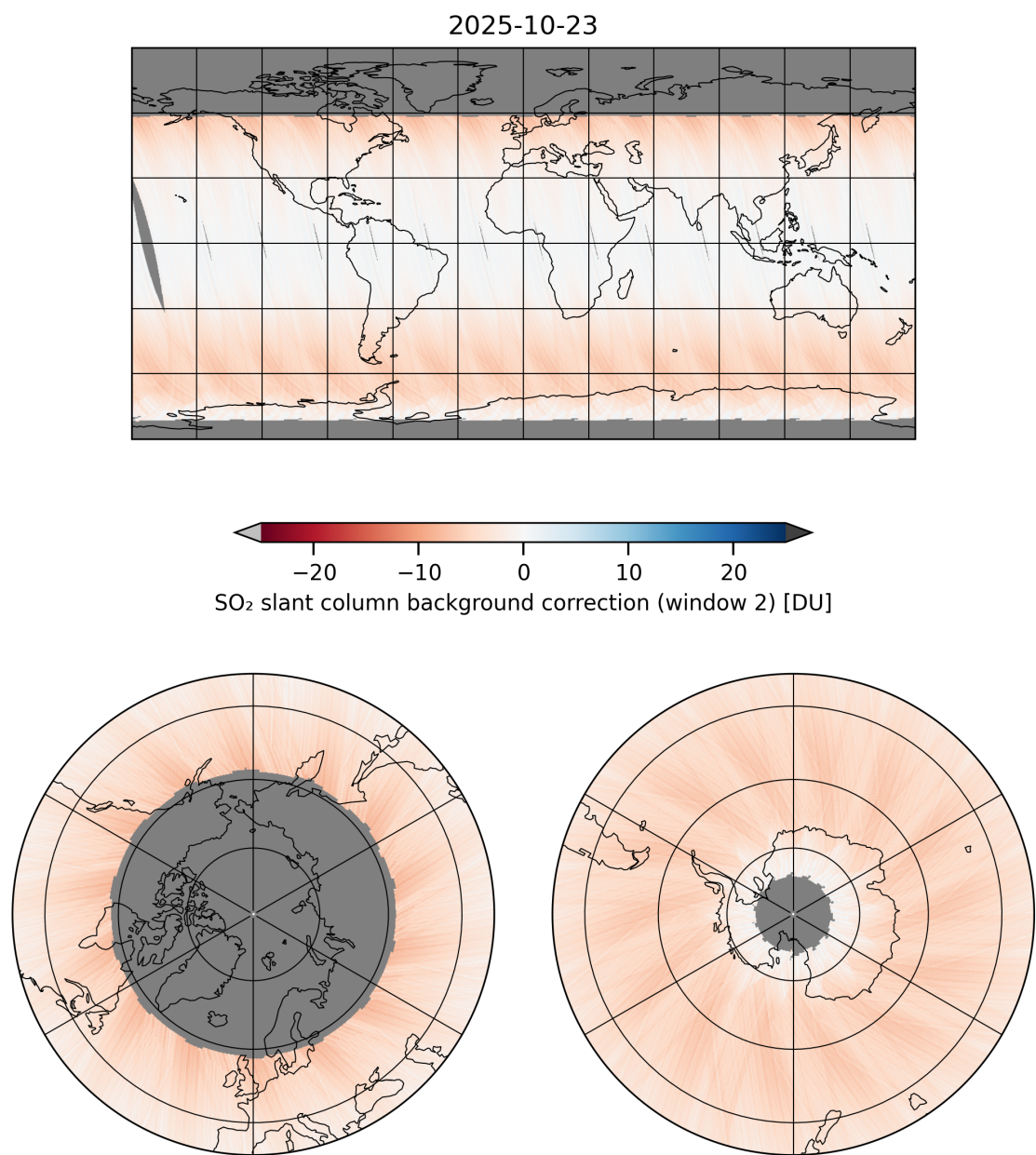


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-10-23 to 2025-10-24

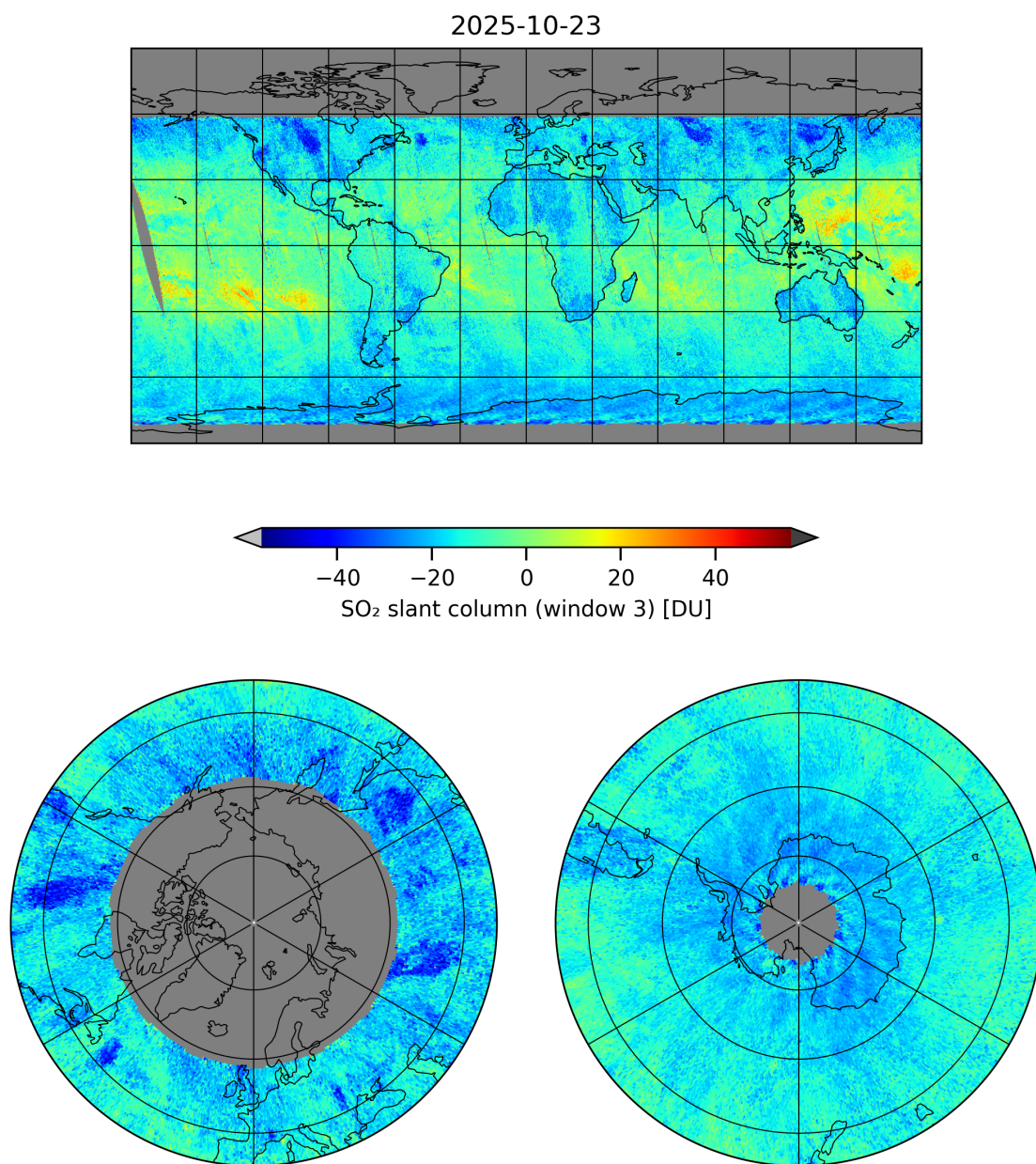


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-10-23 to 2025-10-24

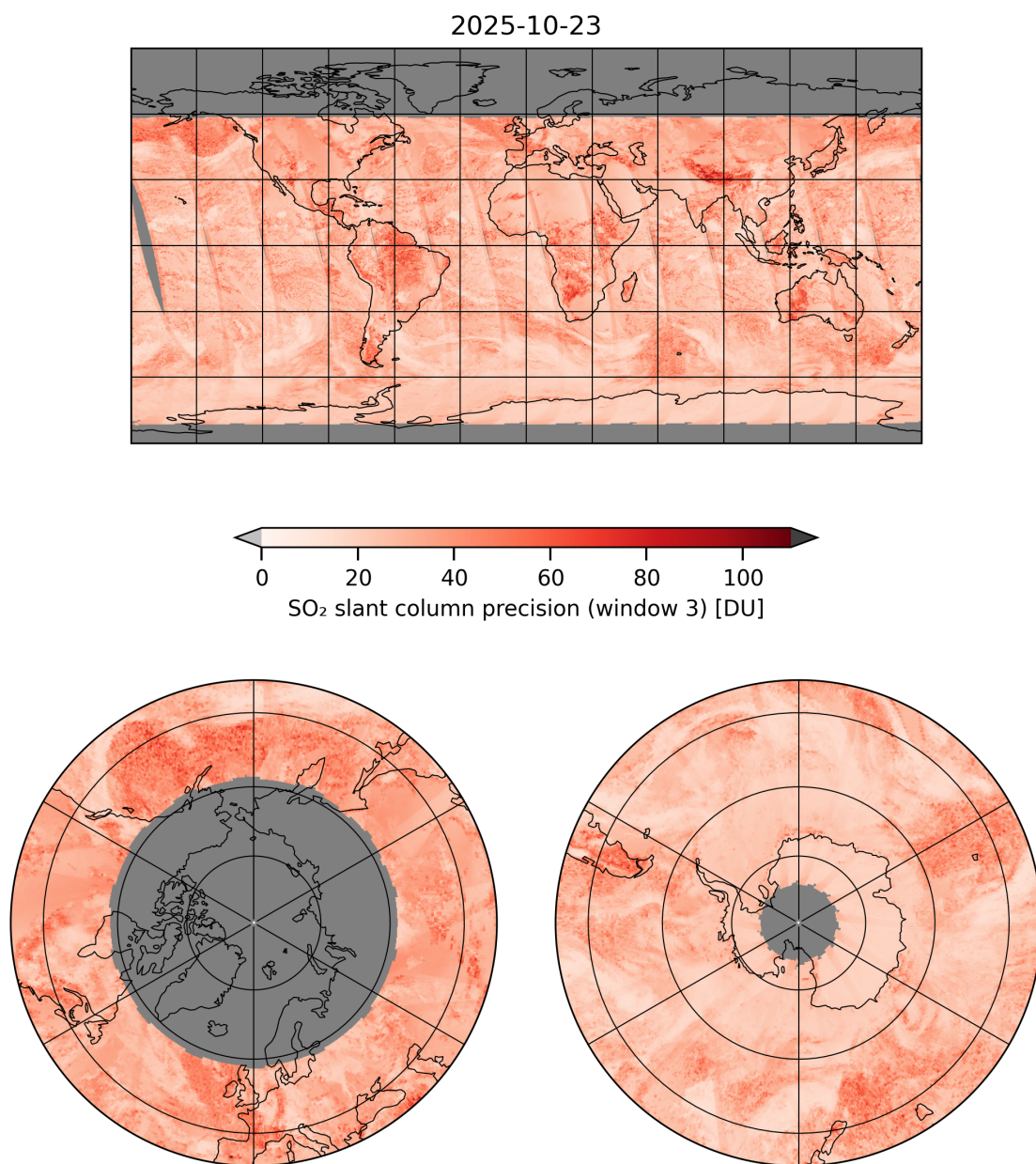


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-10-23 to 2025-10-24

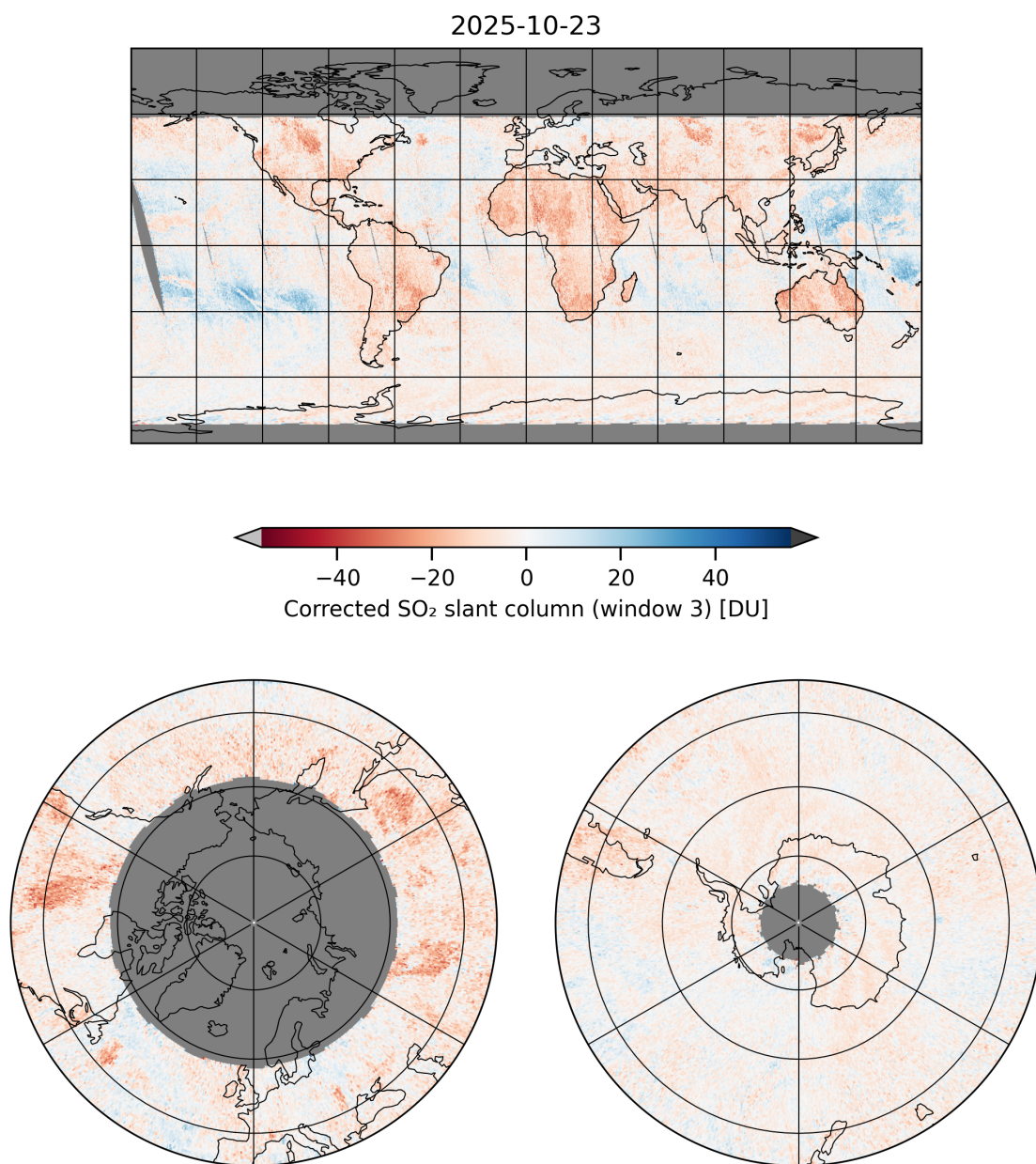


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-10-23 to 2025-10-24

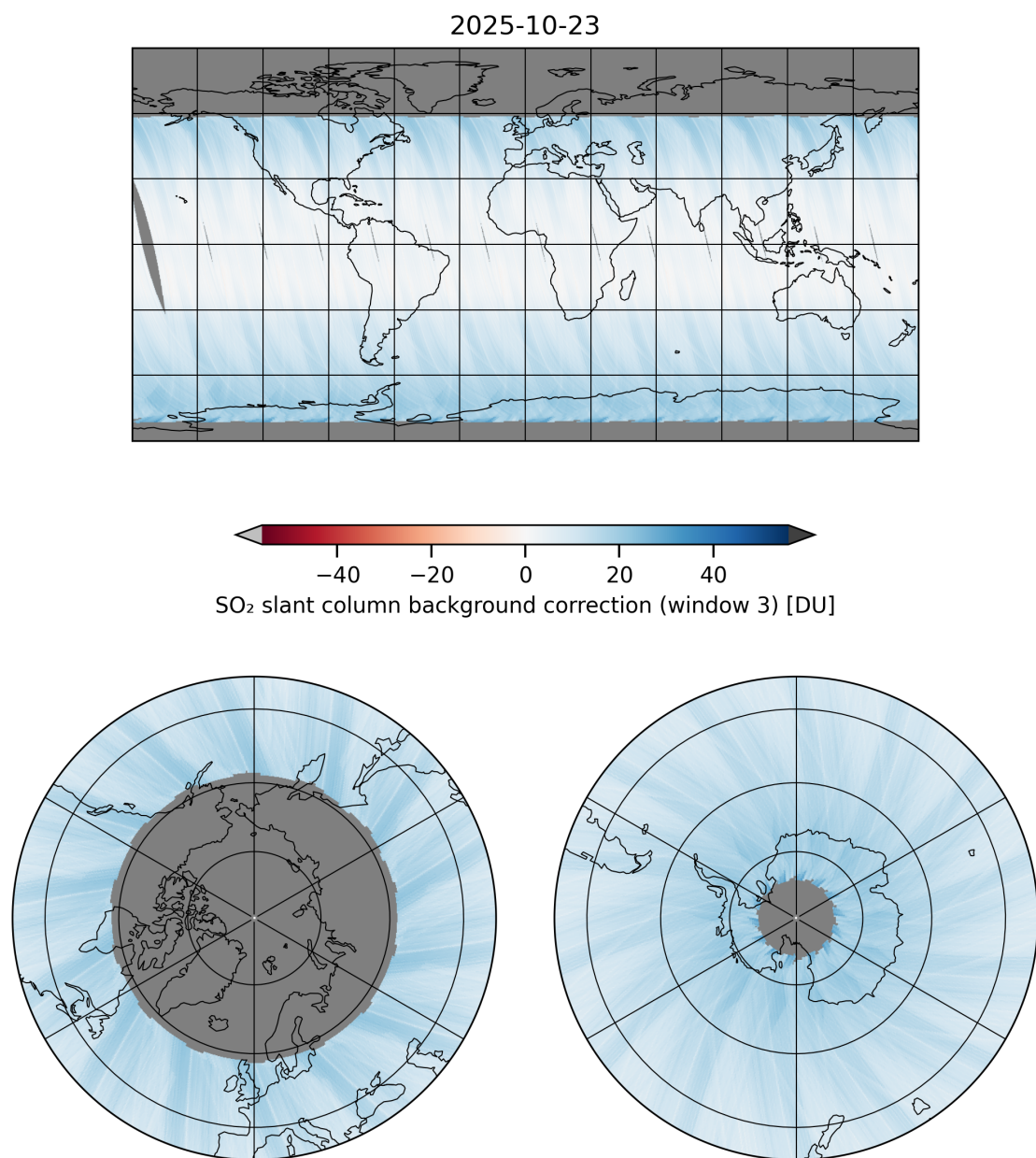


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-10-23 to 2025-10-24

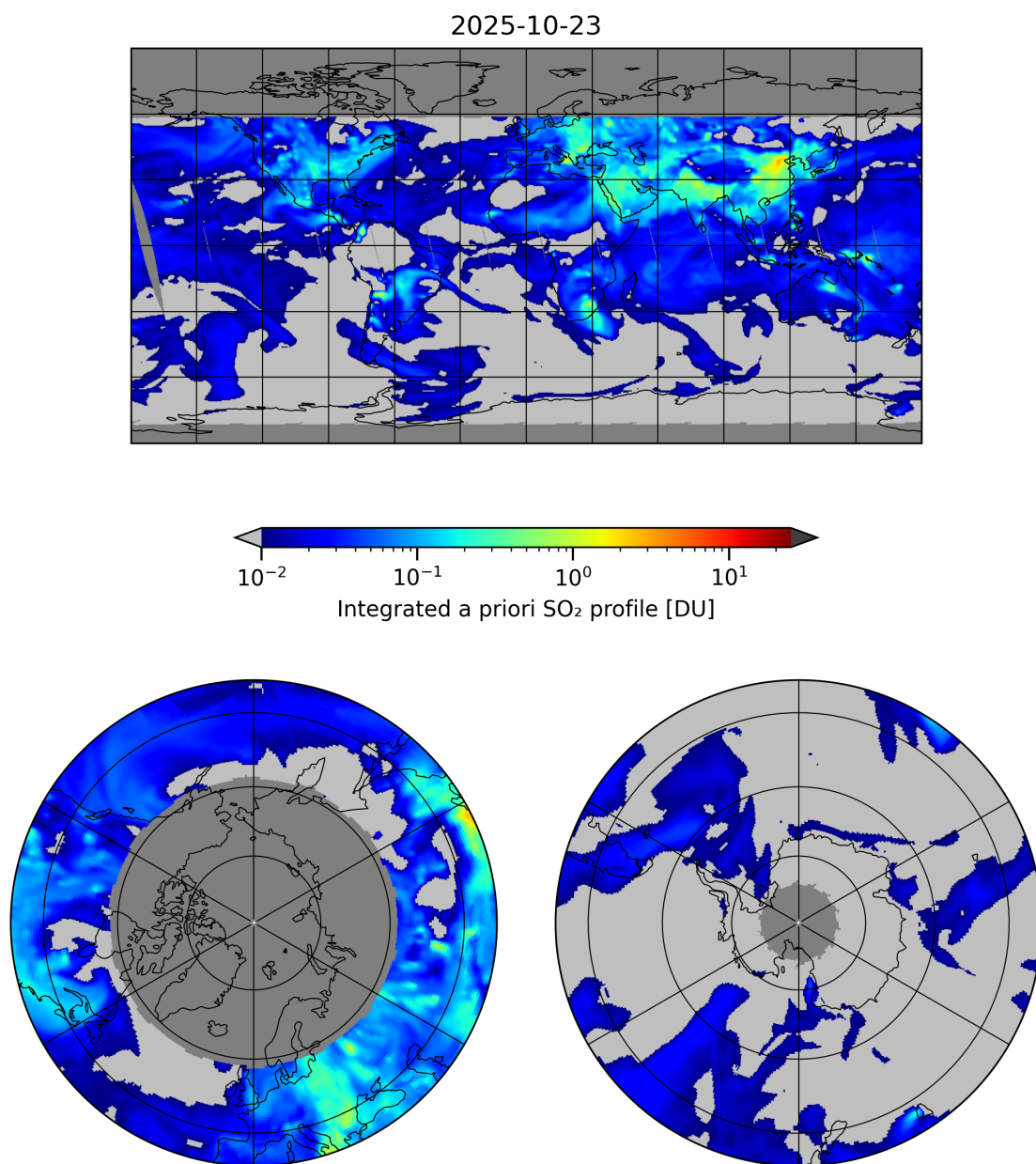


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-10-23 to 2025-10-24

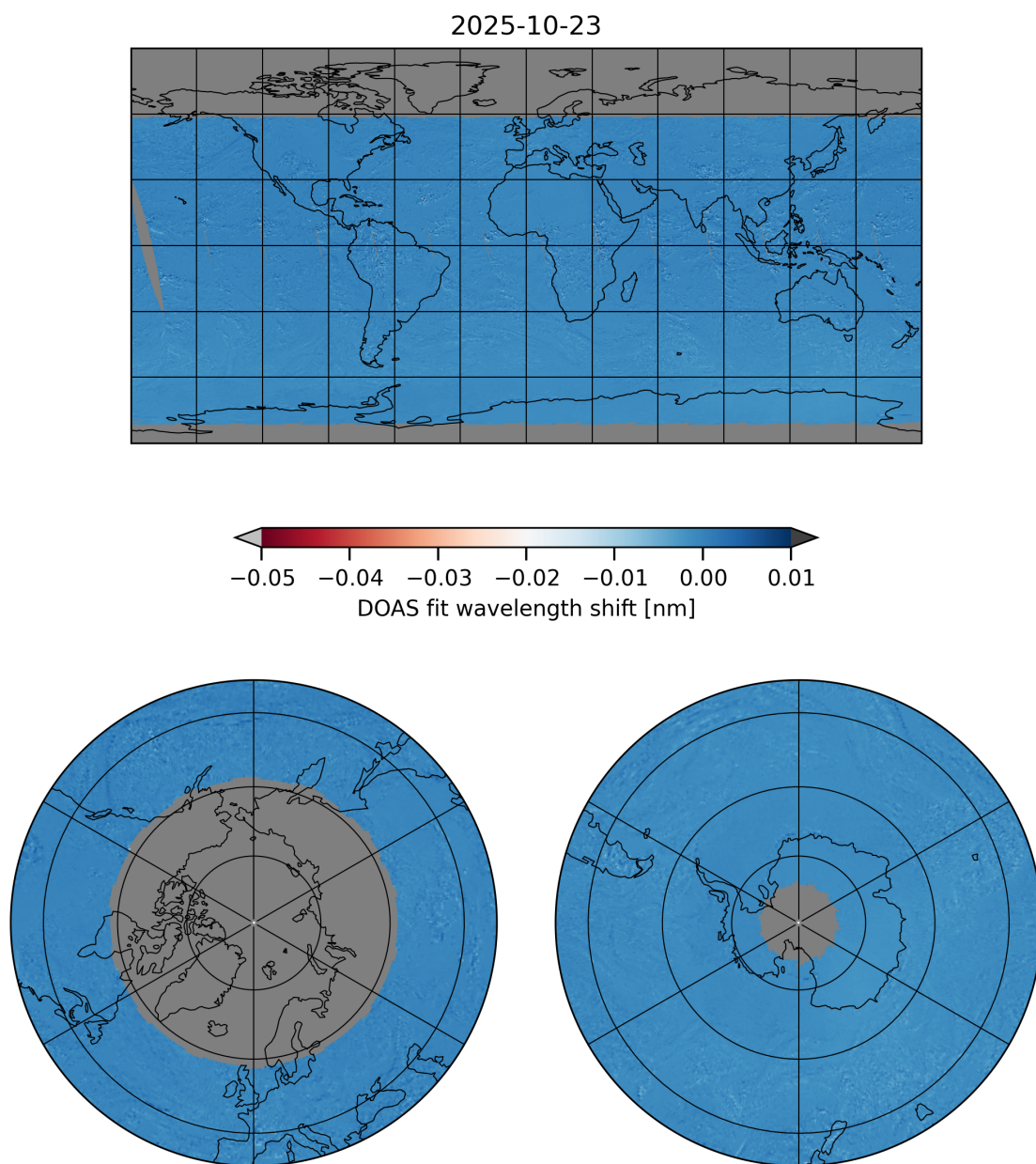


Figure 22: Map of “DOAS fit wavelength shift” for 2025-10-23 to 2025-10-24

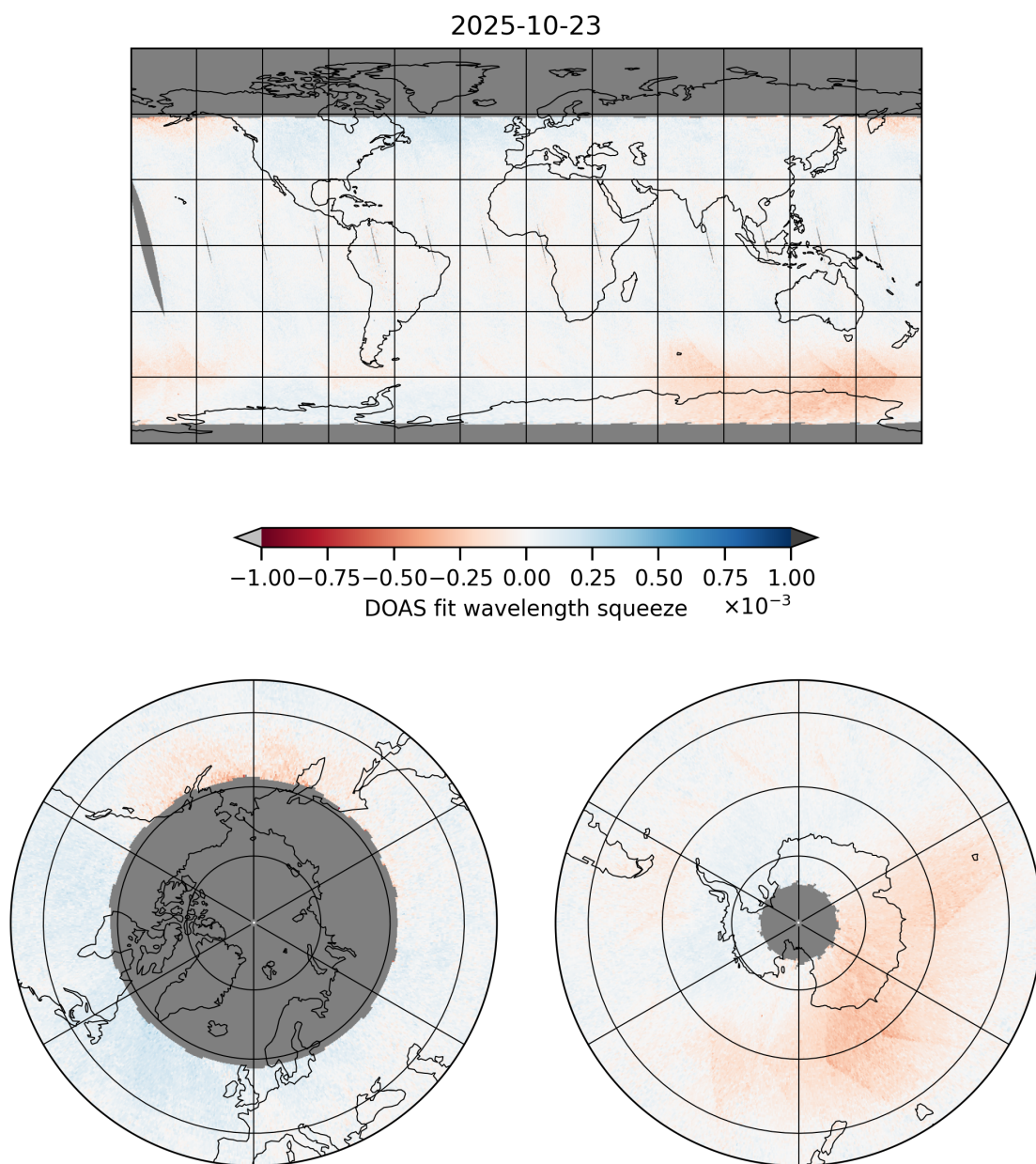


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-10-23 to 2025-10-24

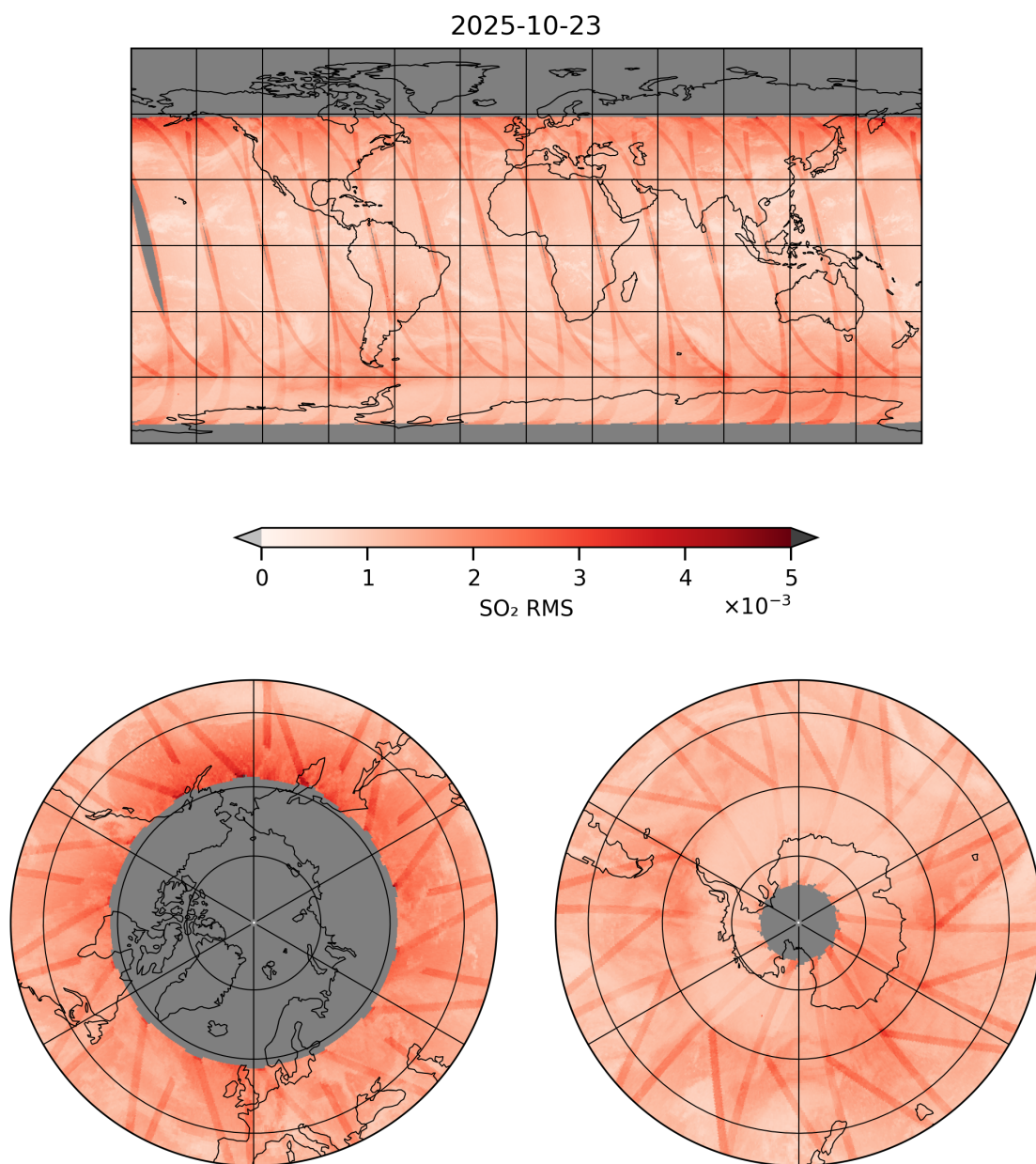


Figure 24: Map of “SO₂ RMS” for 2025-10-23 to 2025-10-24

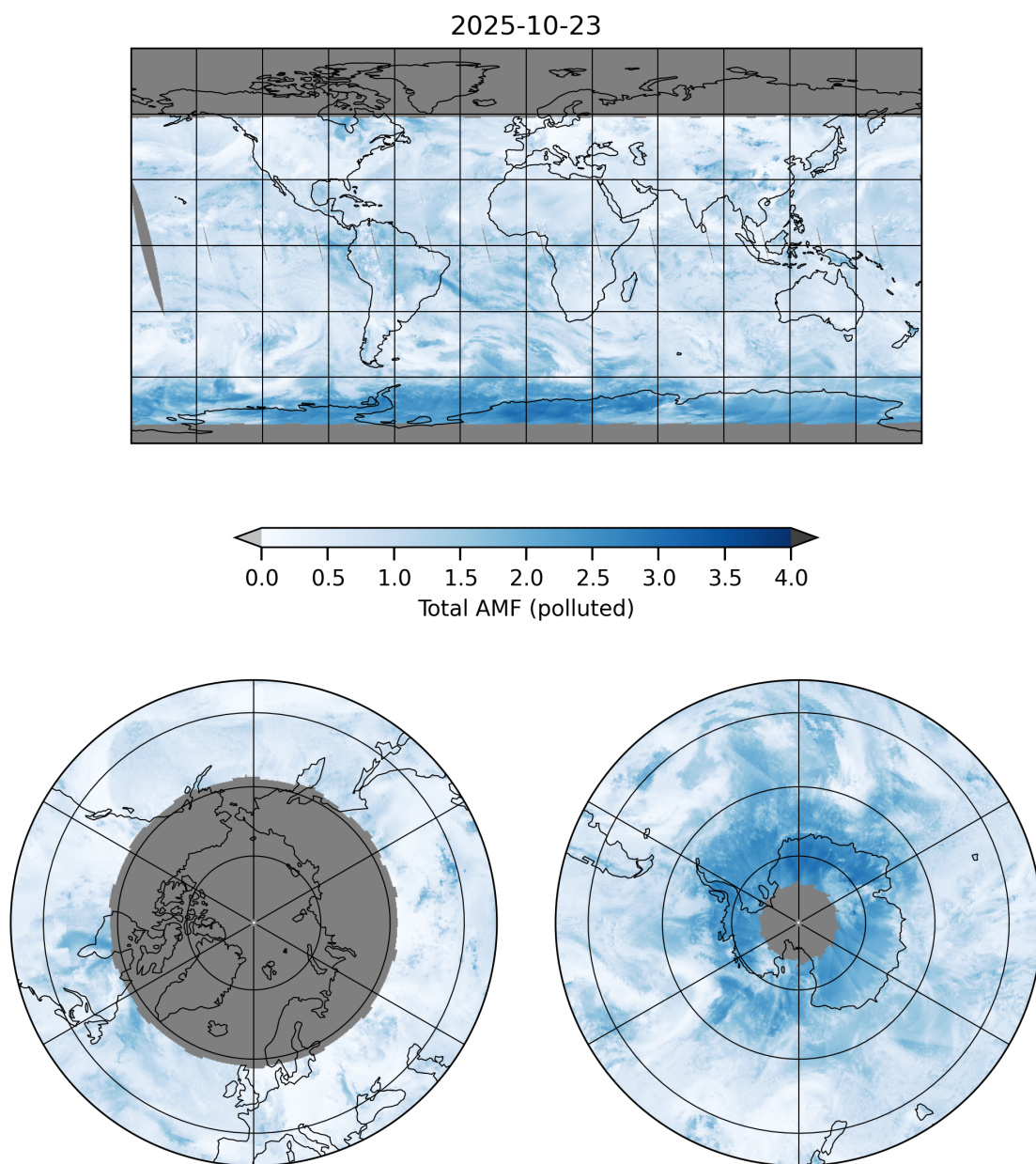


Figure 25: Map of “Total AMF (polluted)” for 2025-10-23 to 2025-10-24

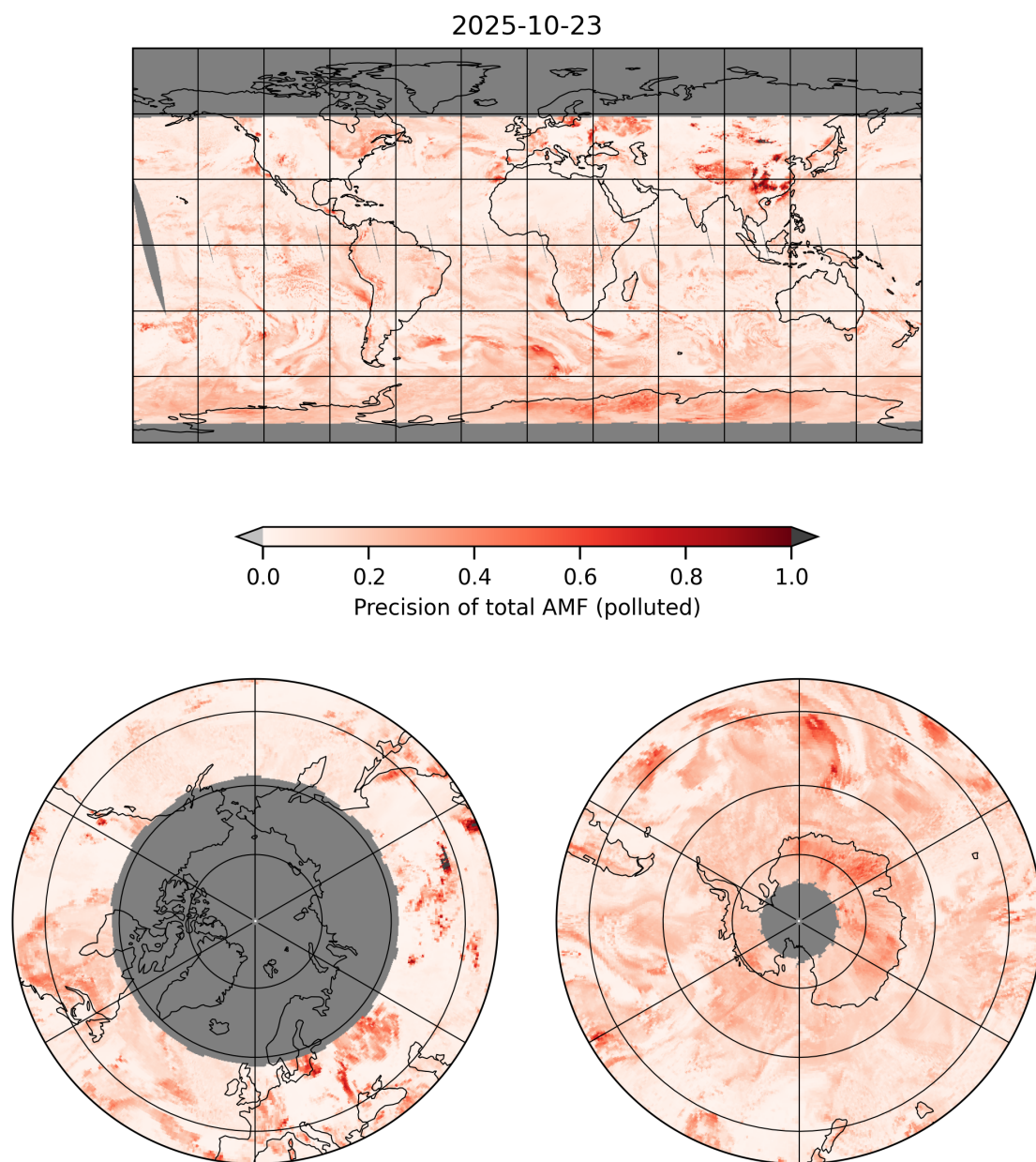


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-10-23 to 2025-10-24

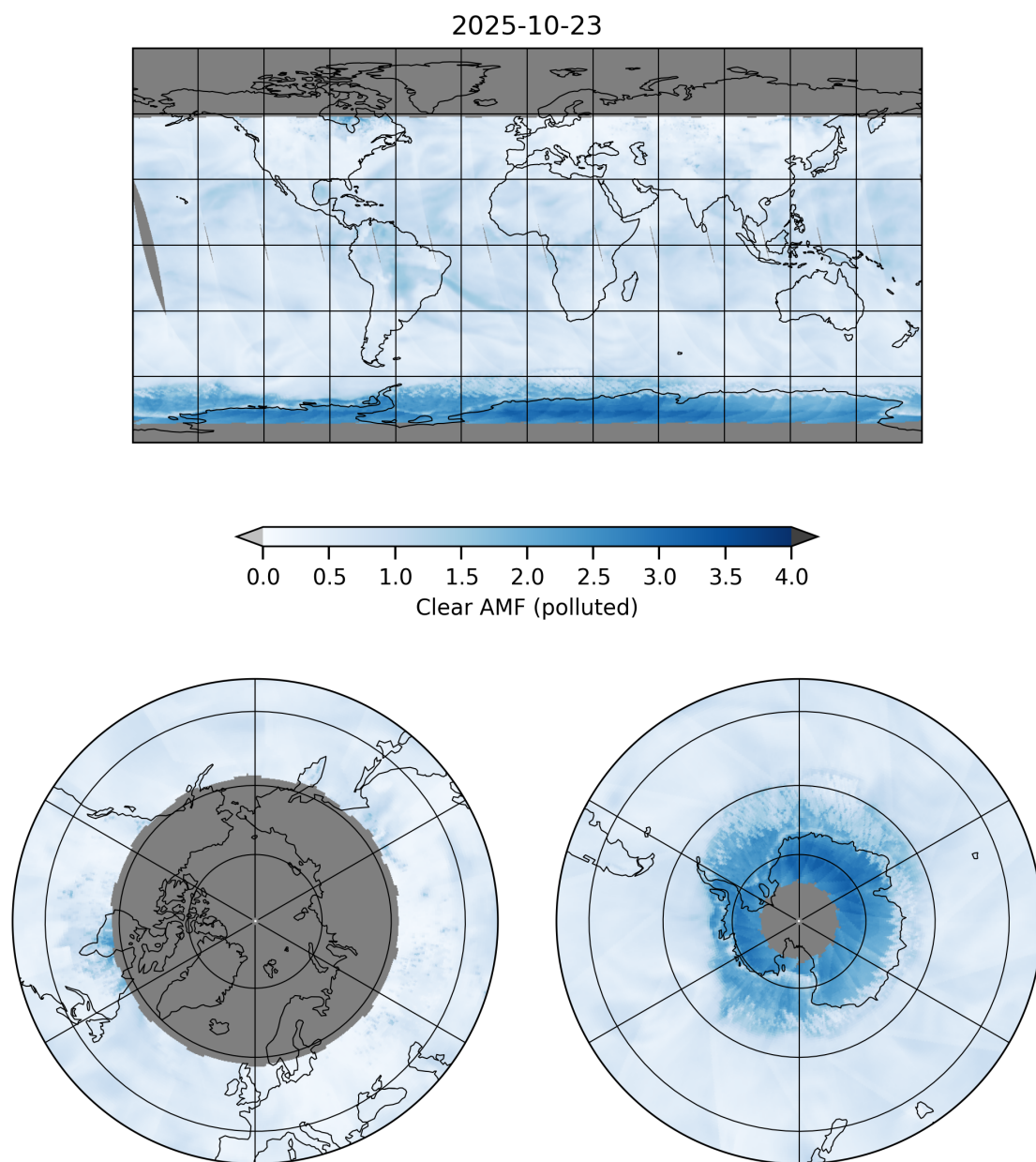


Figure 27: Map of “Clear AMF (polluted)” for 2025-10-23 to 2025-10-24

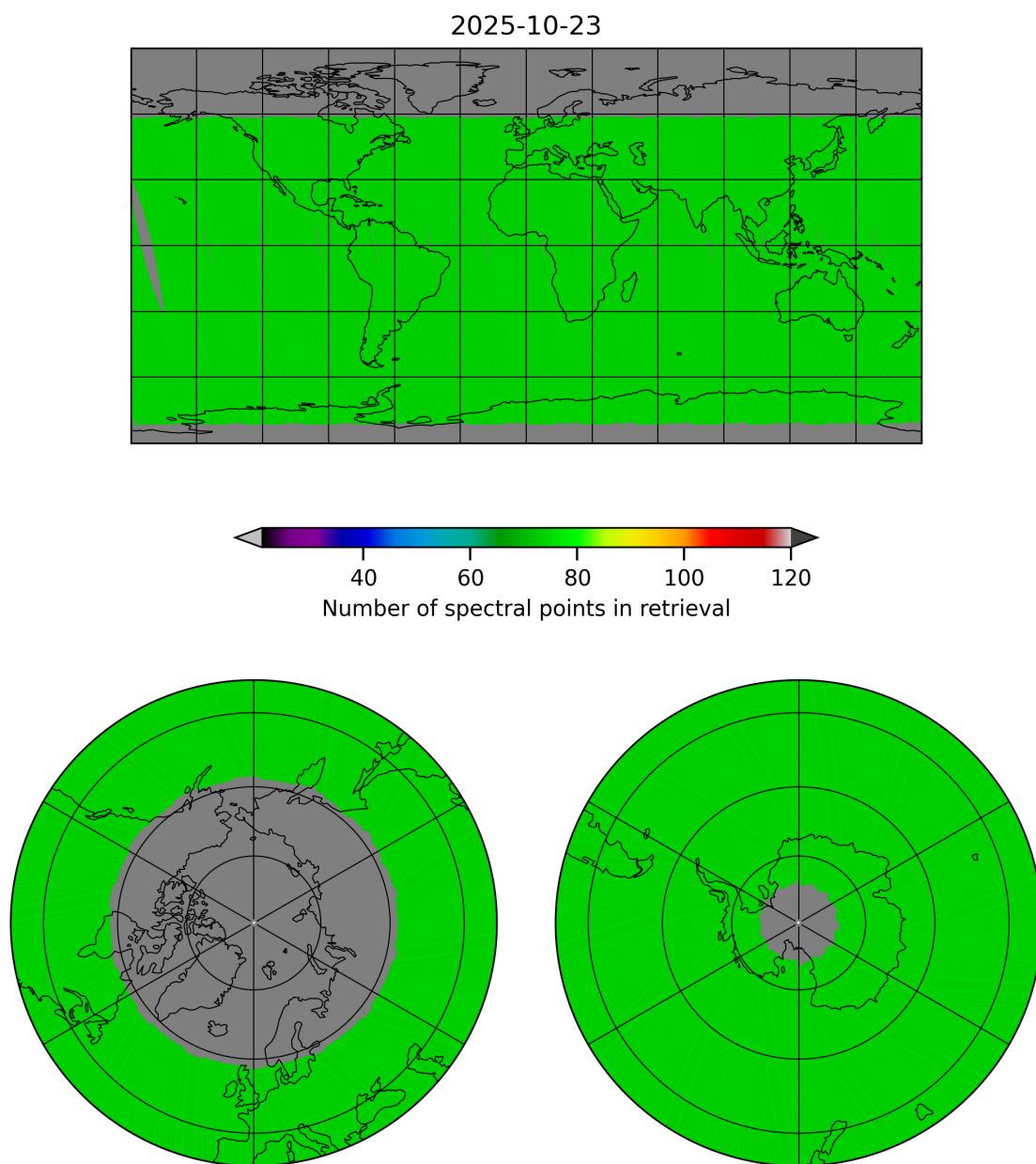


Figure 28: Map of “Number of spectral points in retrieval” for 2025-10-23 to 2025-10-24

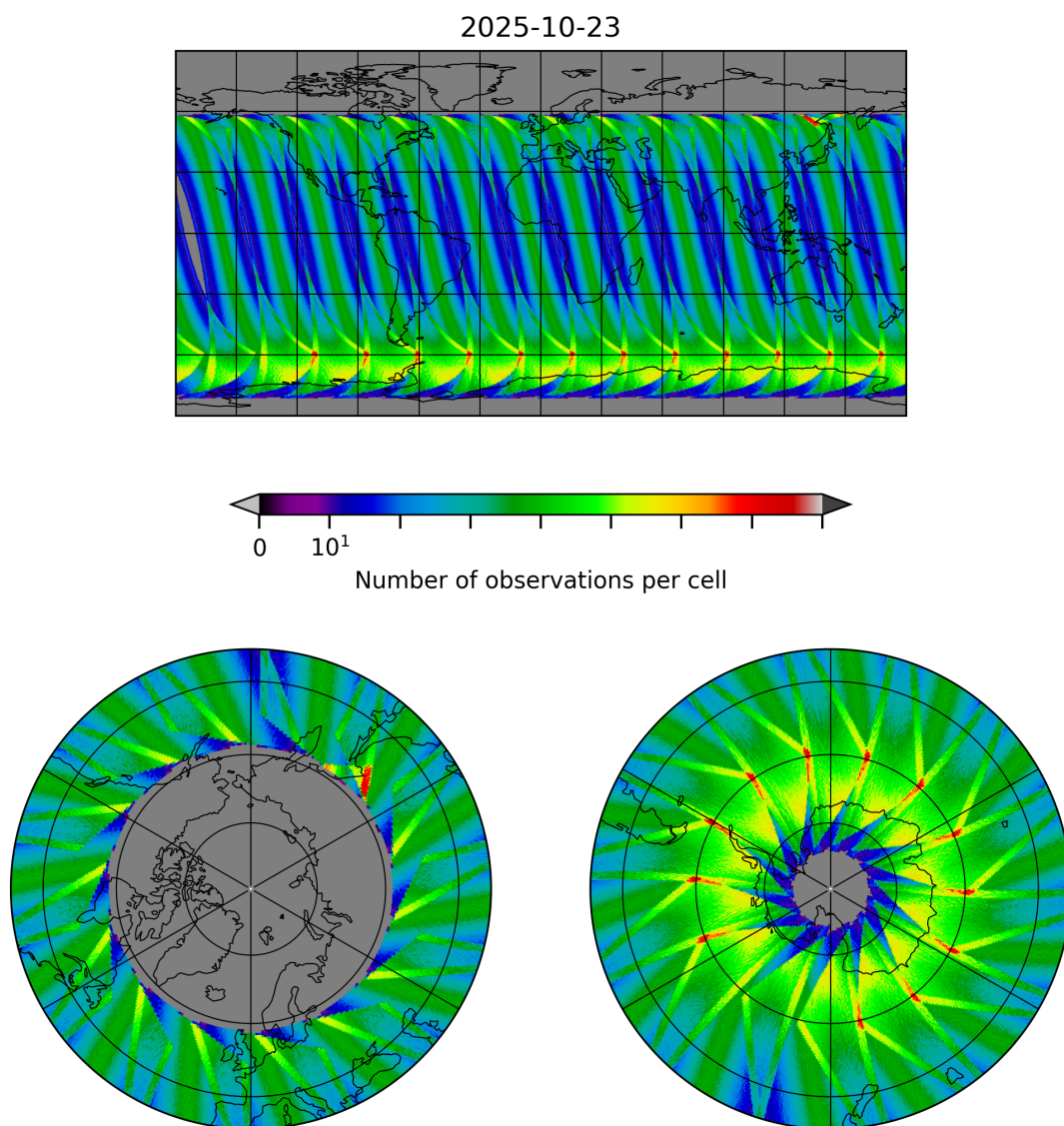


Figure 29: Map of the number of observations for 2025-10-23 to 2025-10-24

7 Zonal average

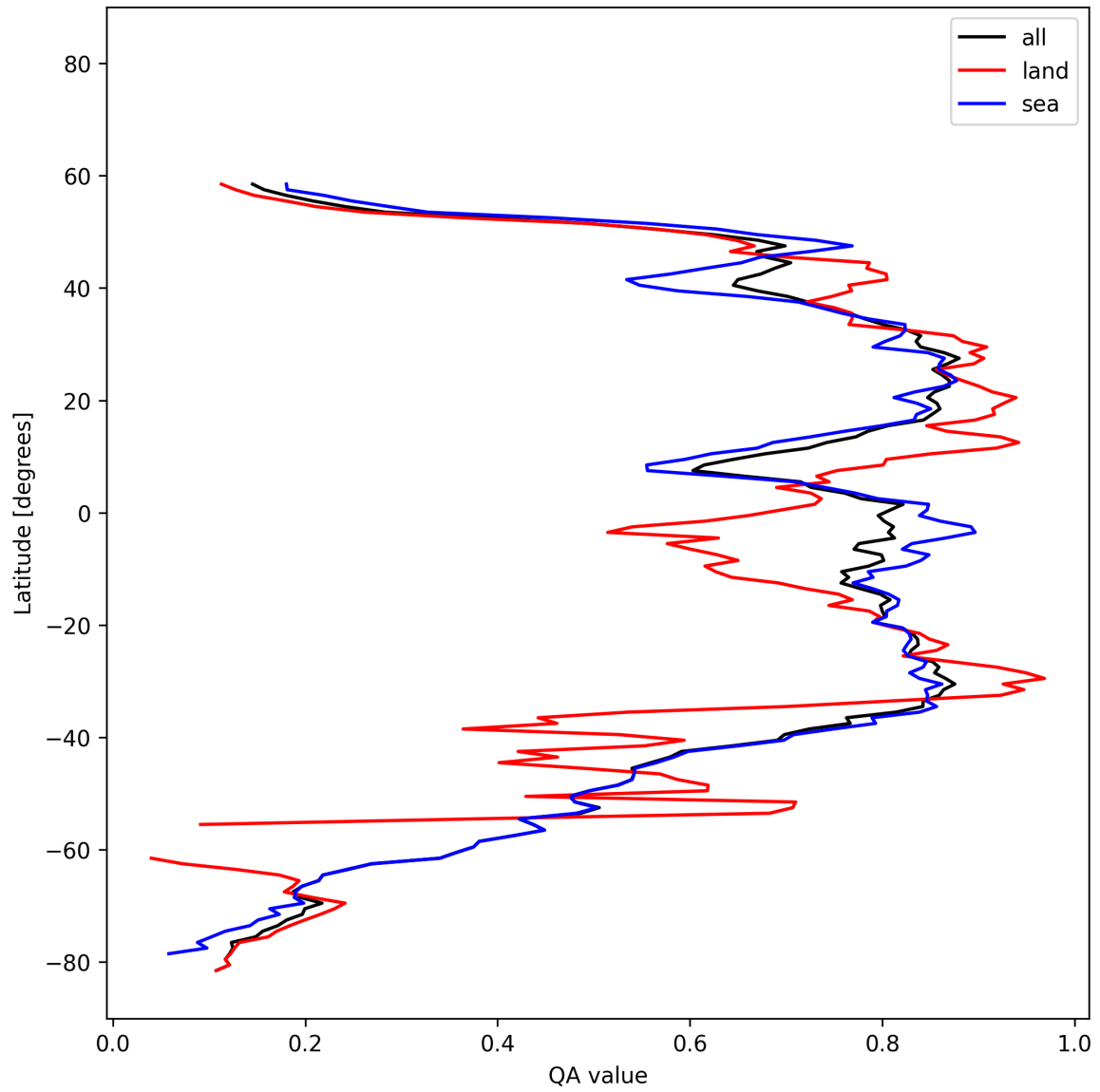


Figure 30: Zonal average of “QA value” for 2025-10-23 to 2025-10-24.

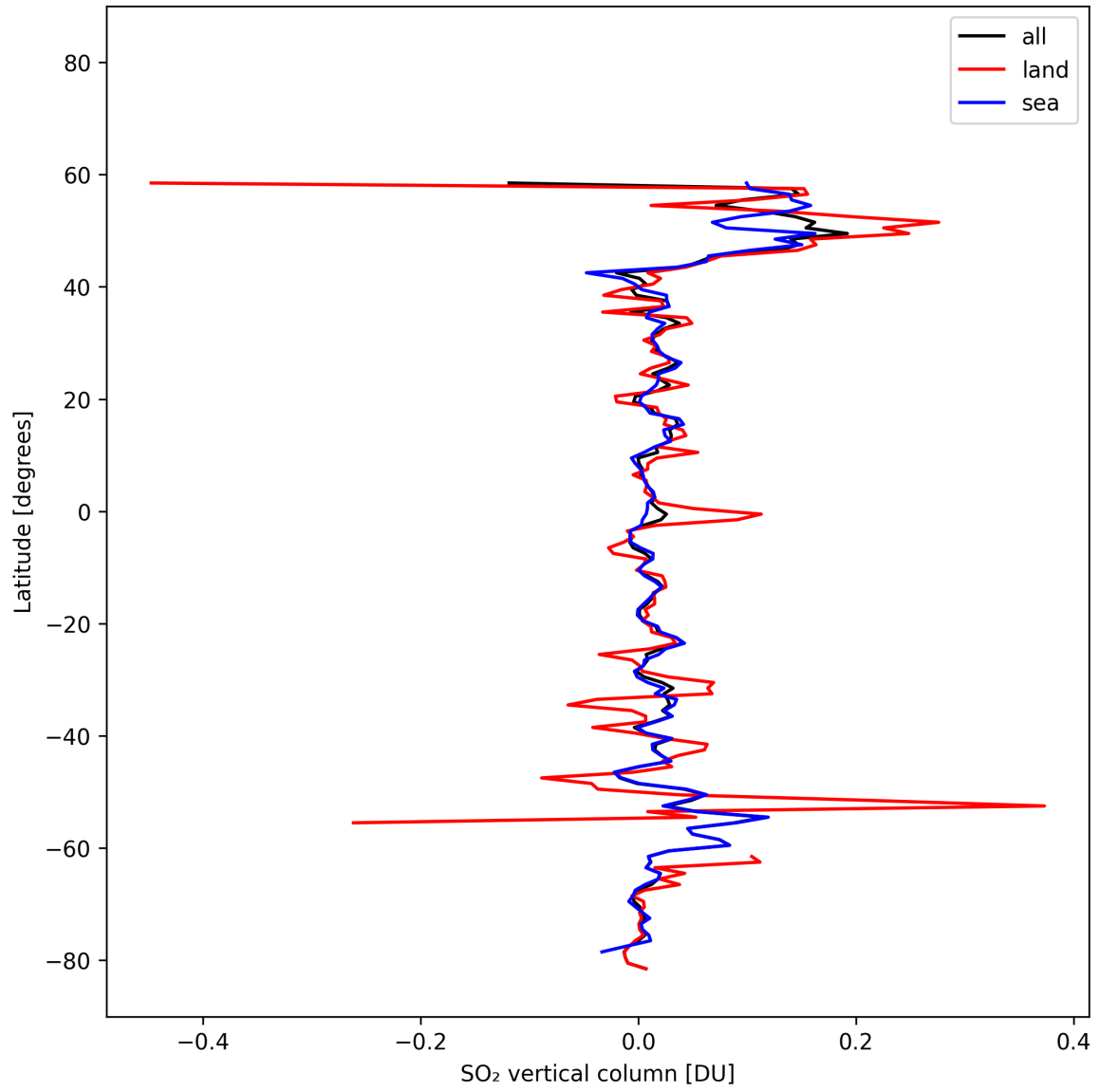


Figure 31: Zonal average of “SO₂ vertical column” for 2025-10-23 to 2025-10-24.

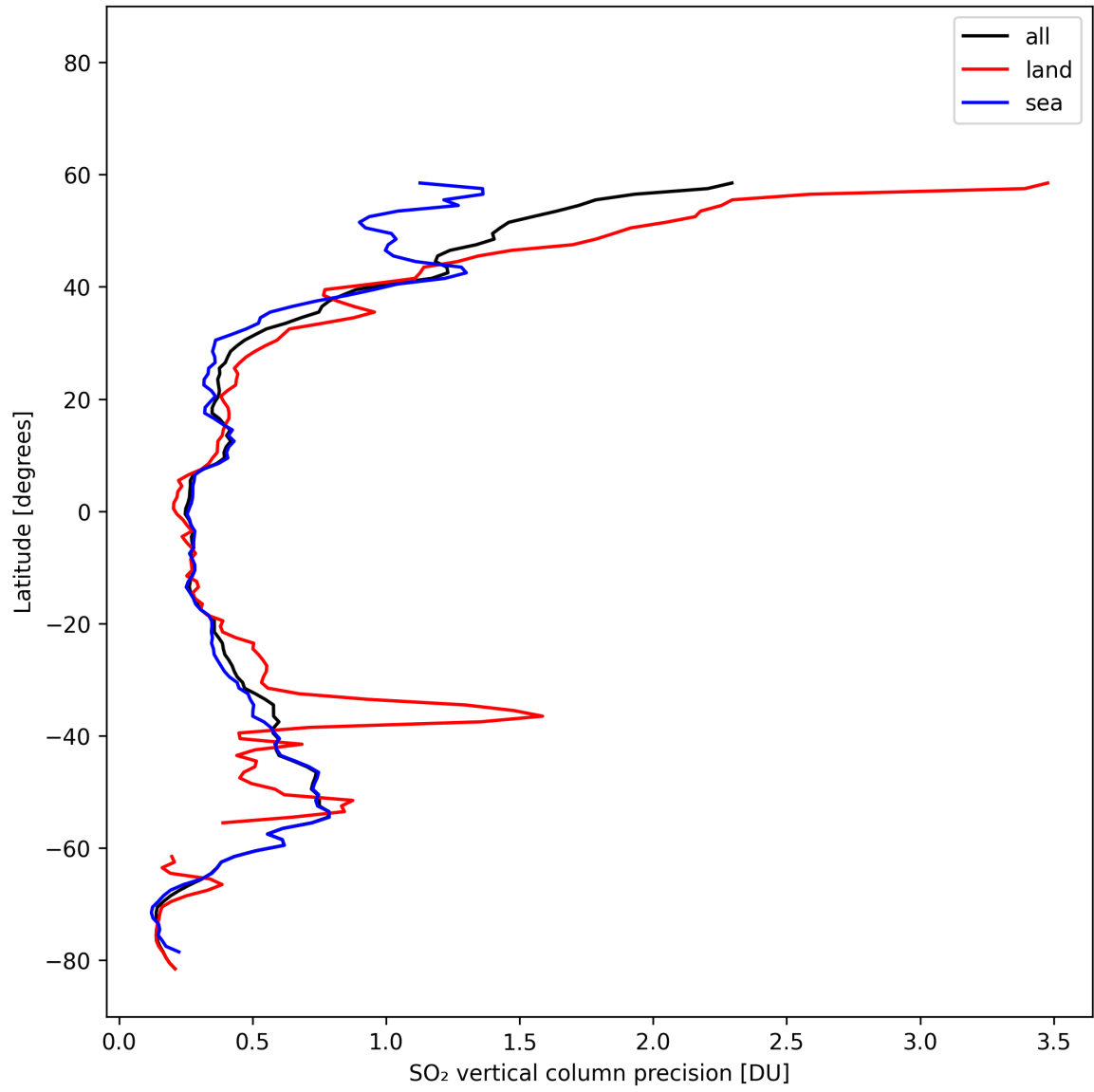


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-10-23 to 2025-10-24.

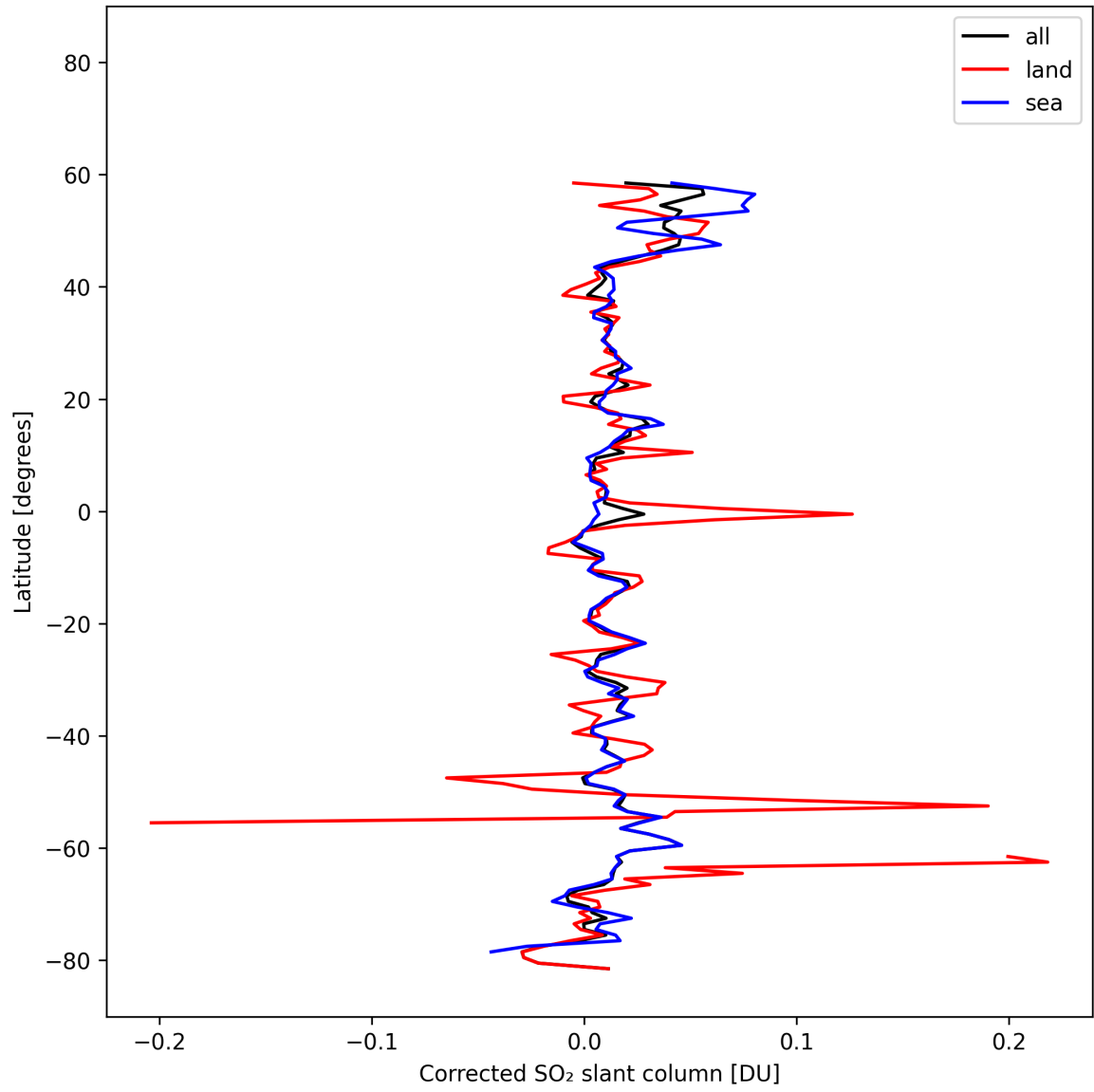


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-10-23 to 2025-10-24.

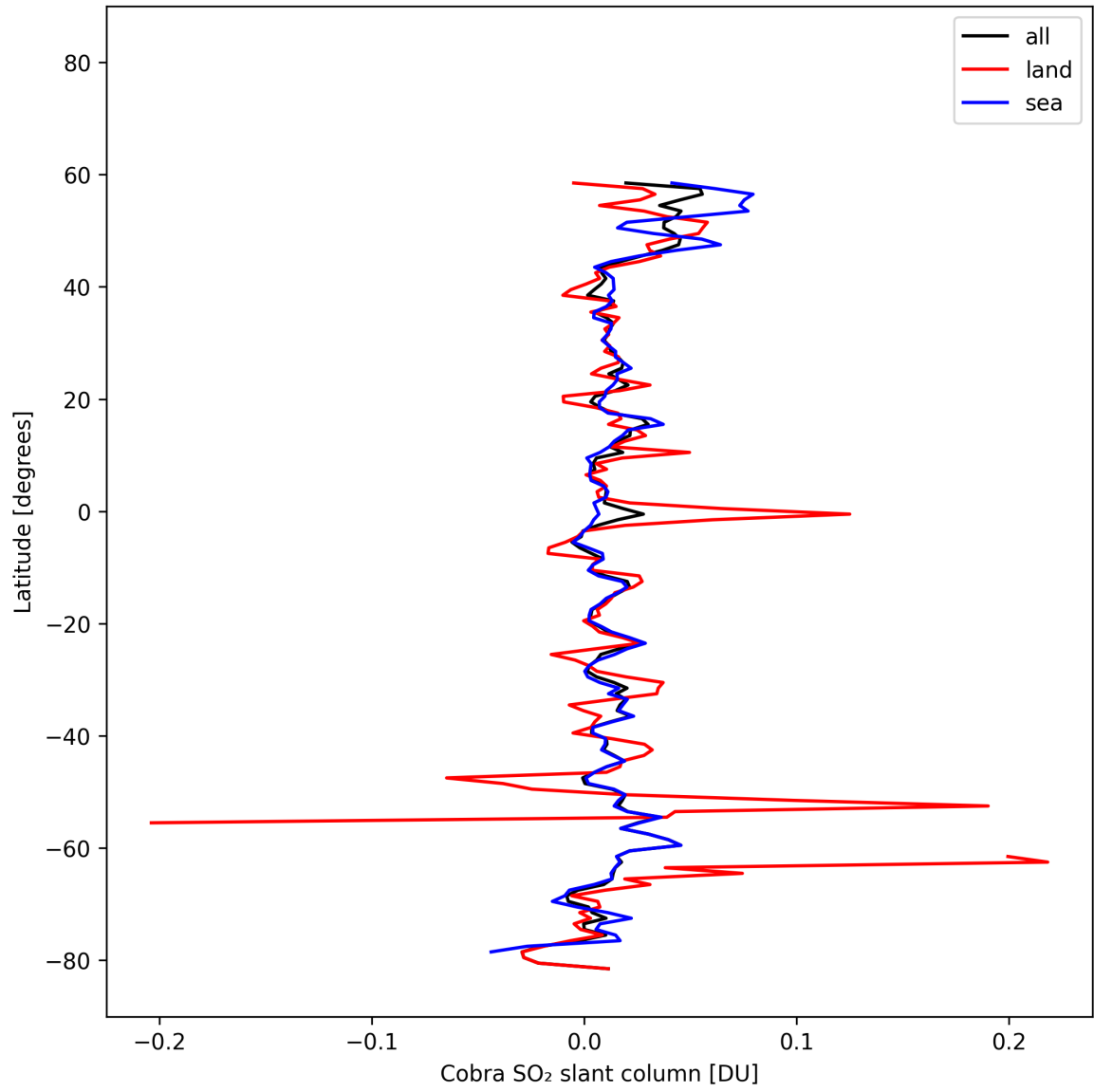


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-10-23 to 2025-10-24.

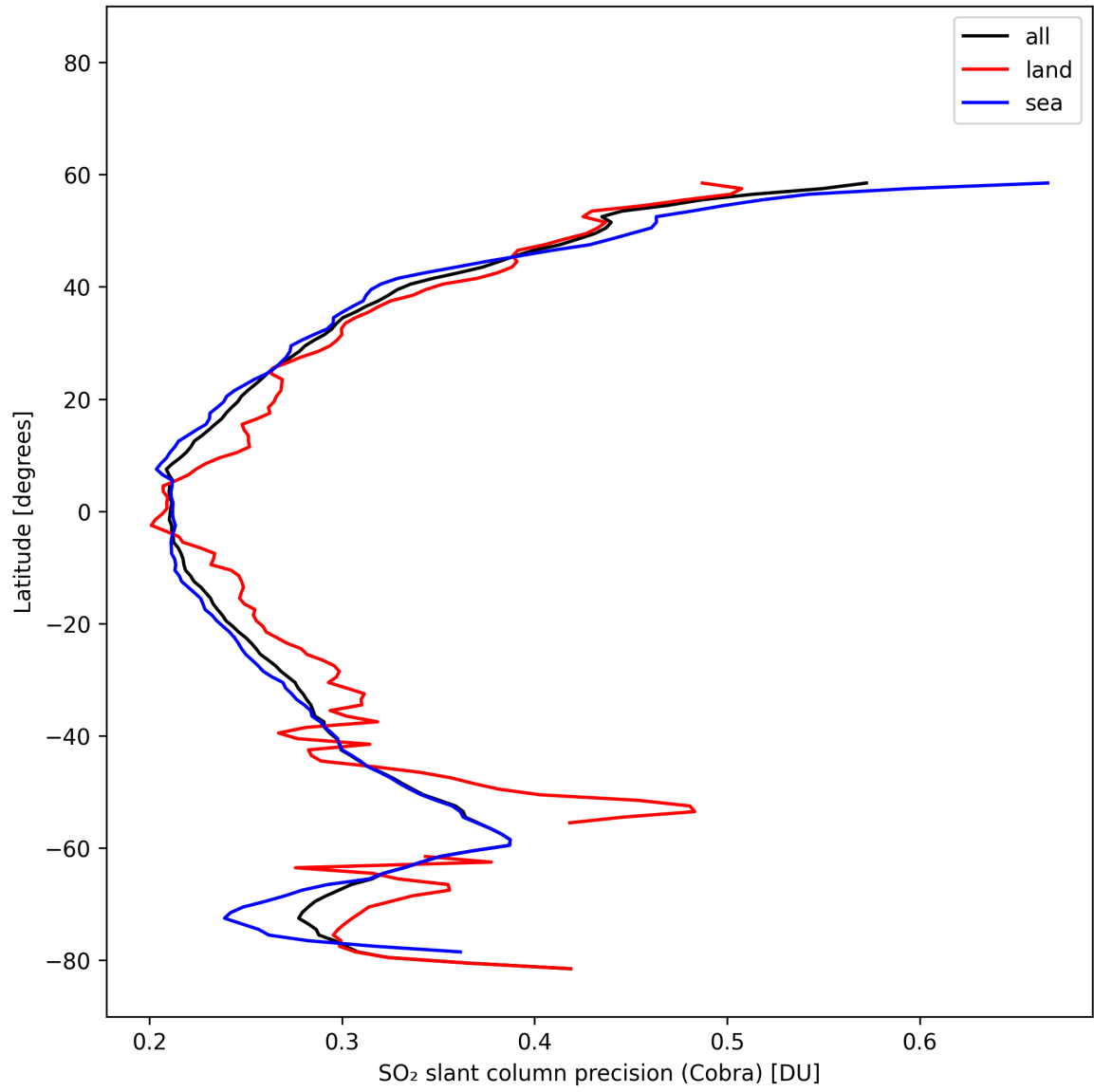


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-10-23 to 2025-10-24.

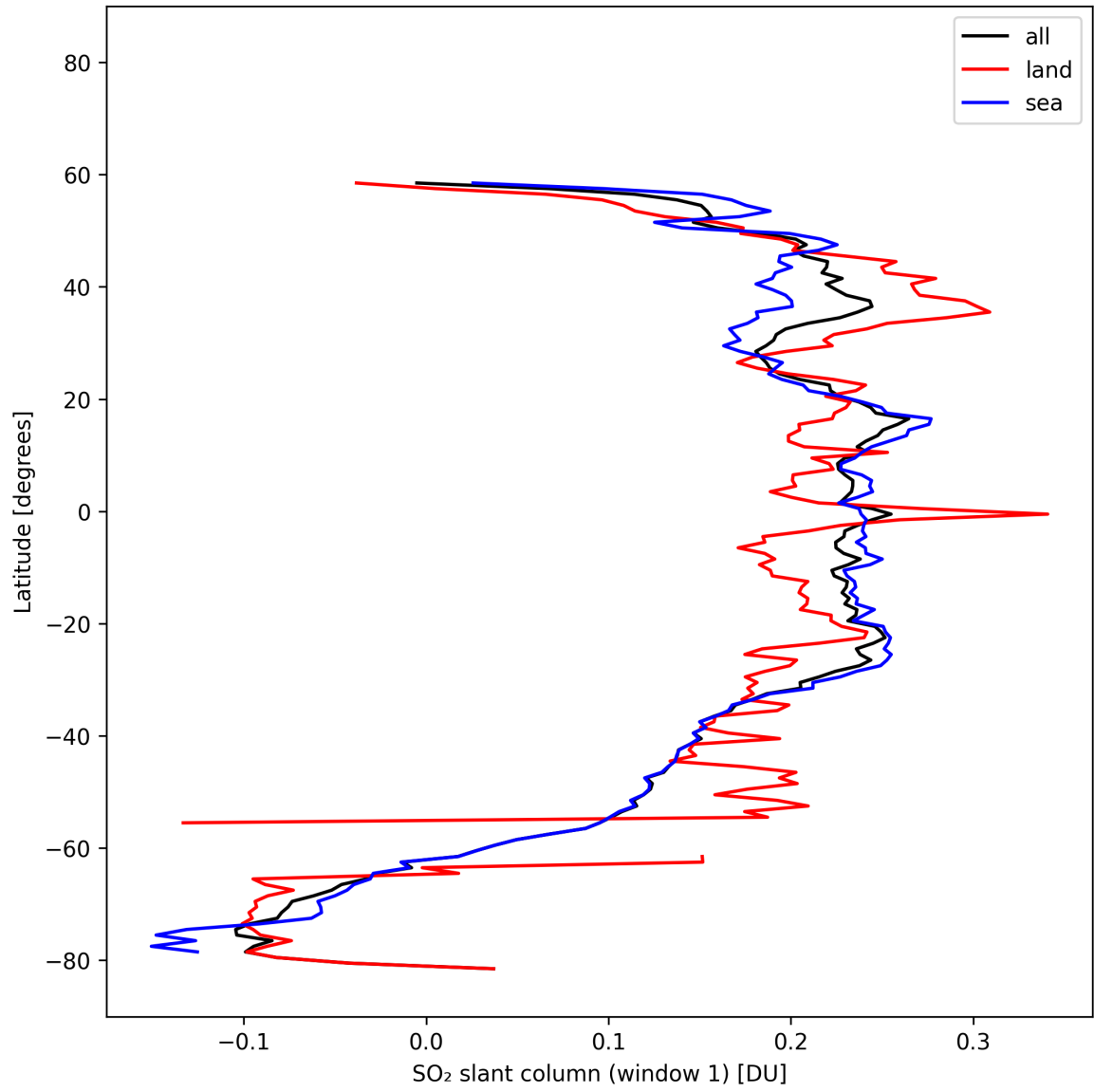


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-10-23 to 2025-10-24.

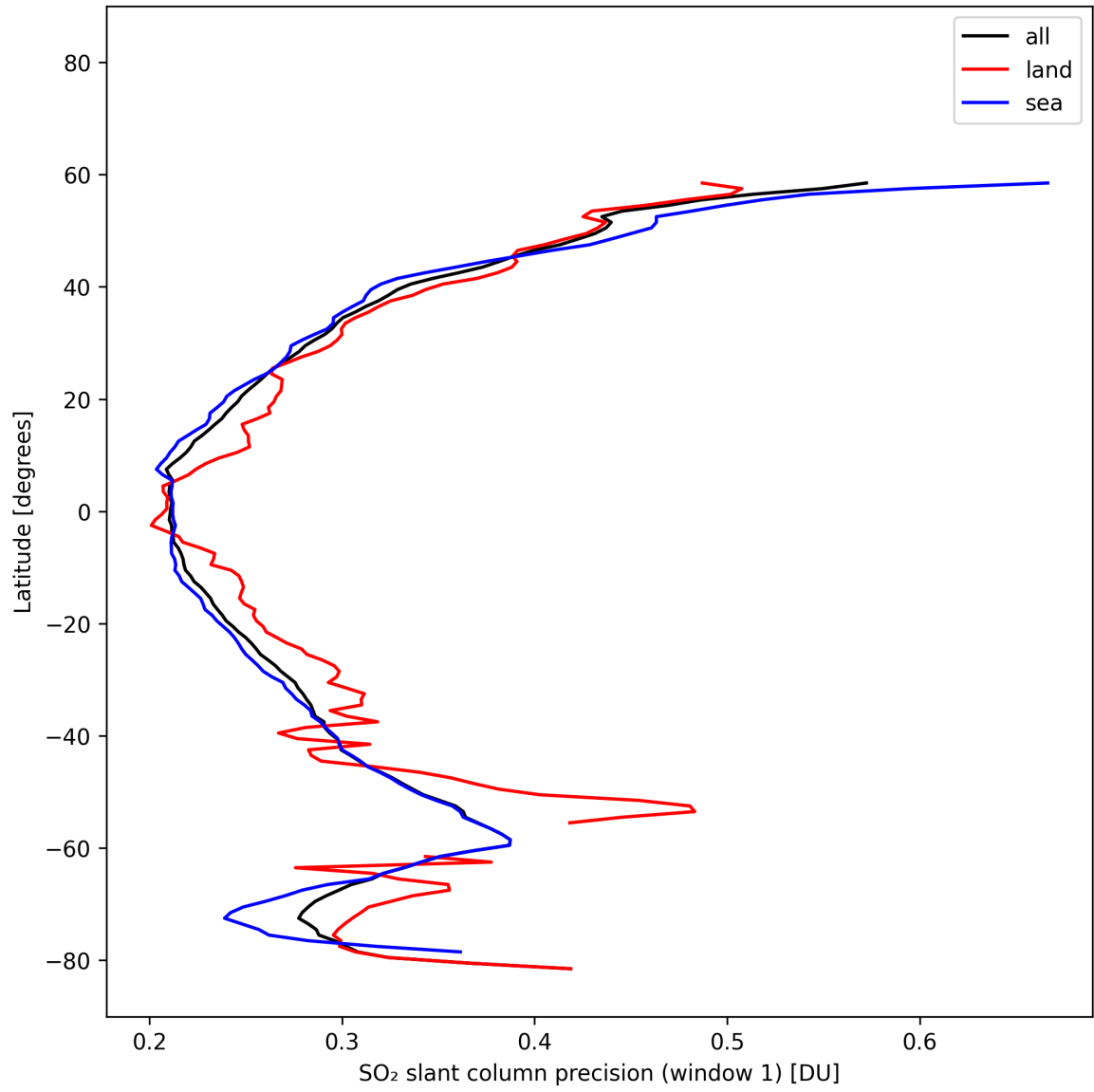


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-10-23 to 2025-10-24.

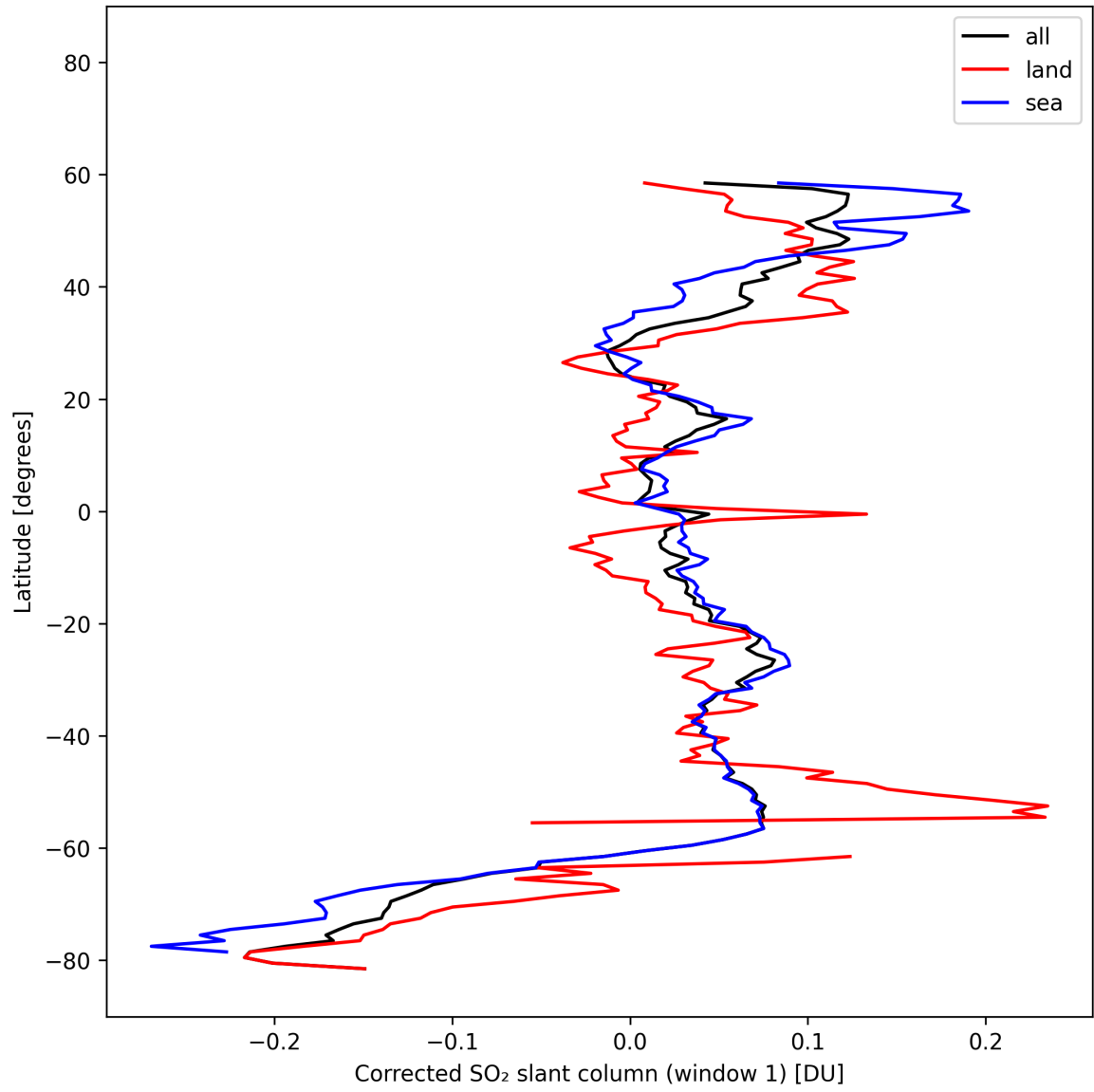


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-10-23 to 2025-10-24.

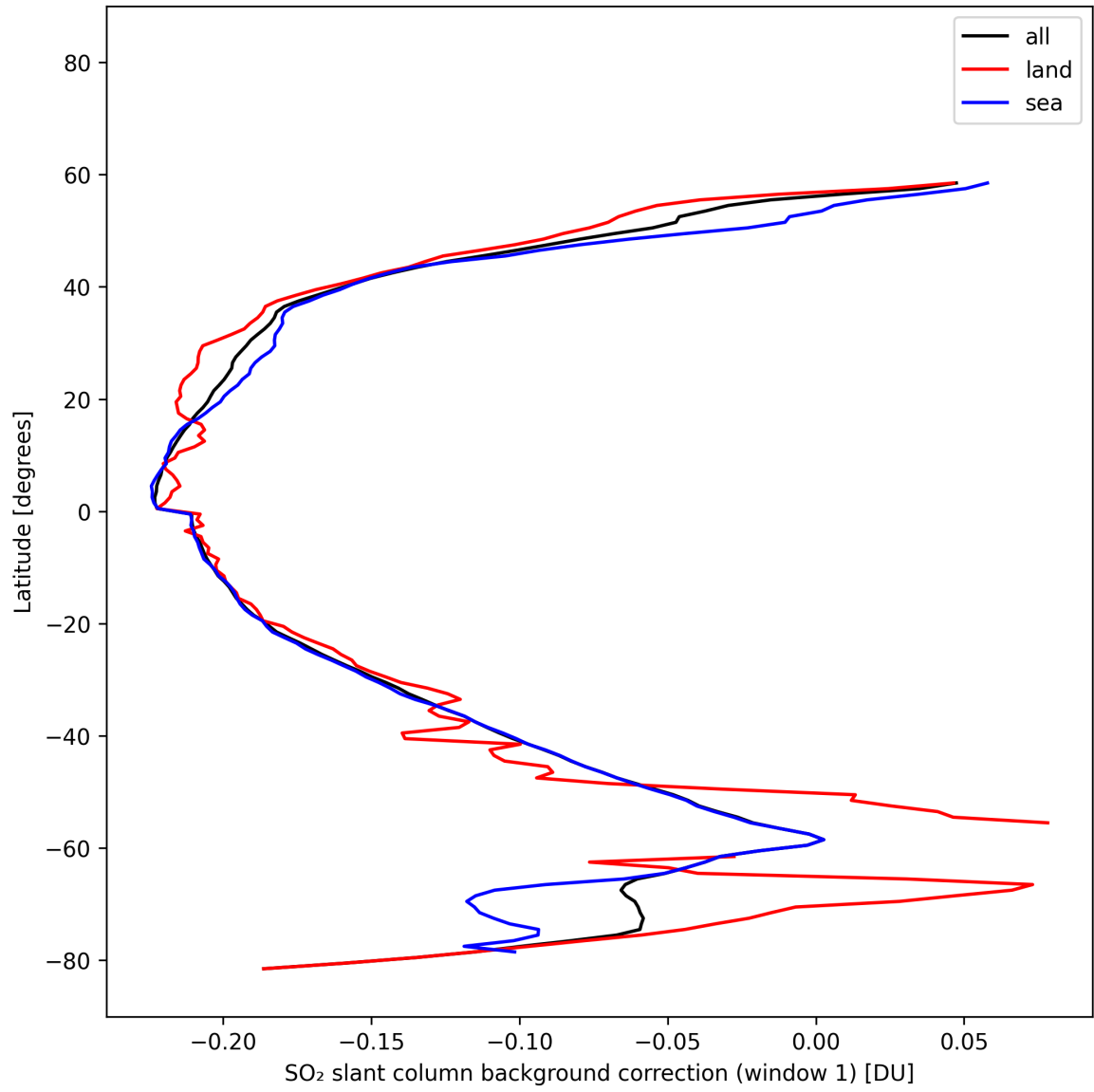


Figure 39: Zonal average of "SO₂ slant column background correction (window 1)" for 2025-10-23 to 2025-10-24.

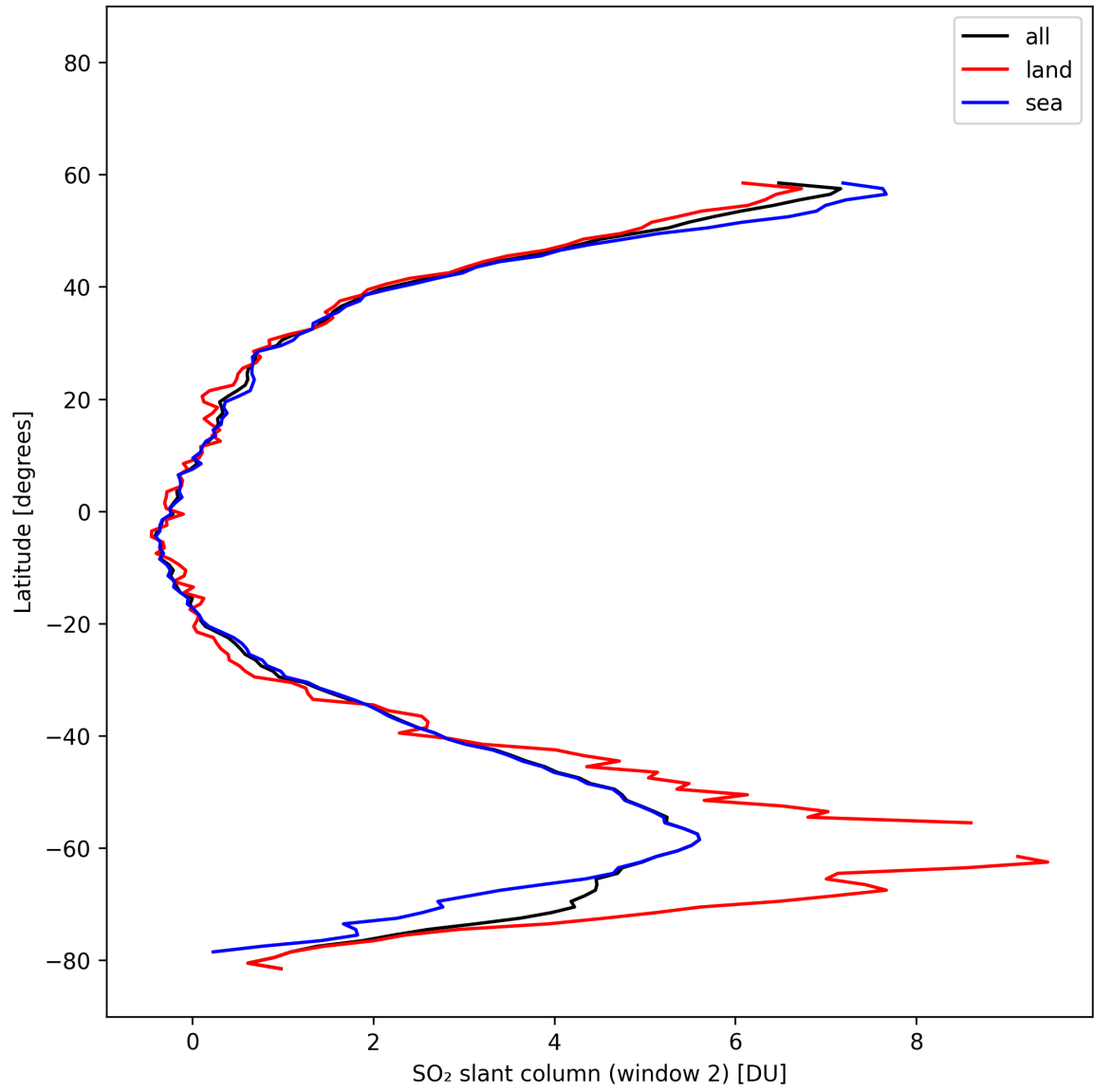


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-10-23 to 2025-10-24.

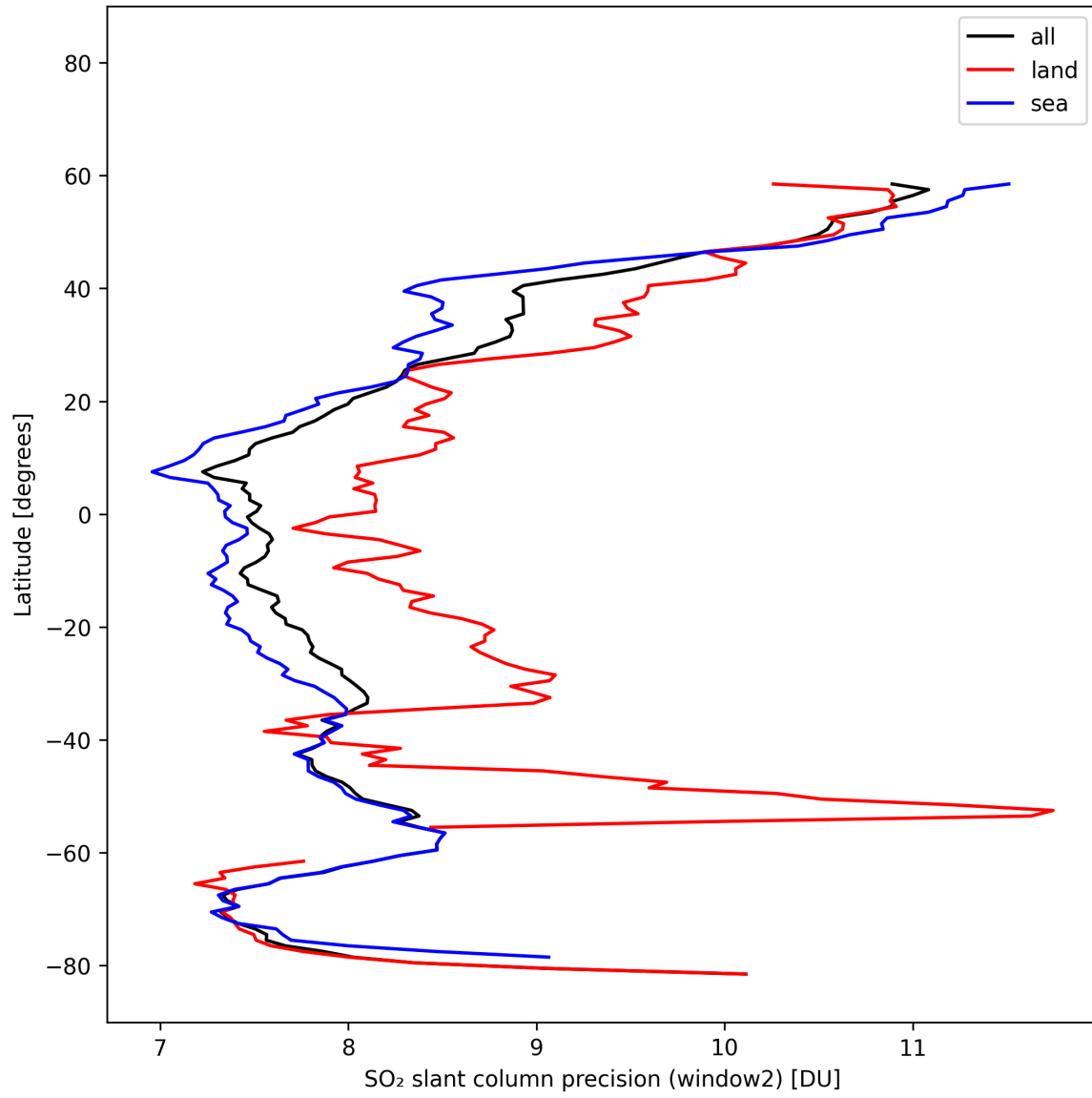


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-10-23 to 2025-10-24.

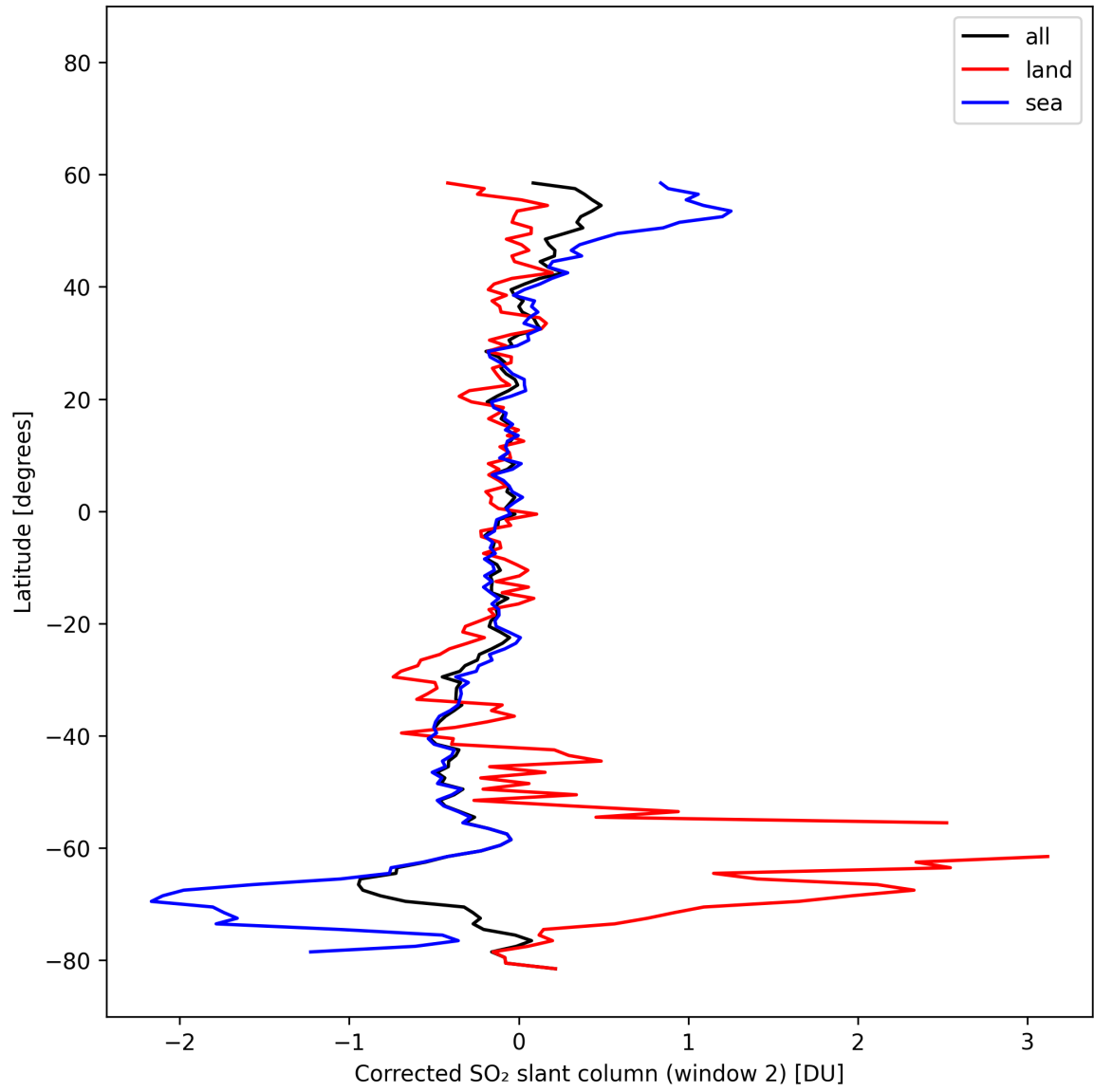


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-10-23 to 2025-10-24.

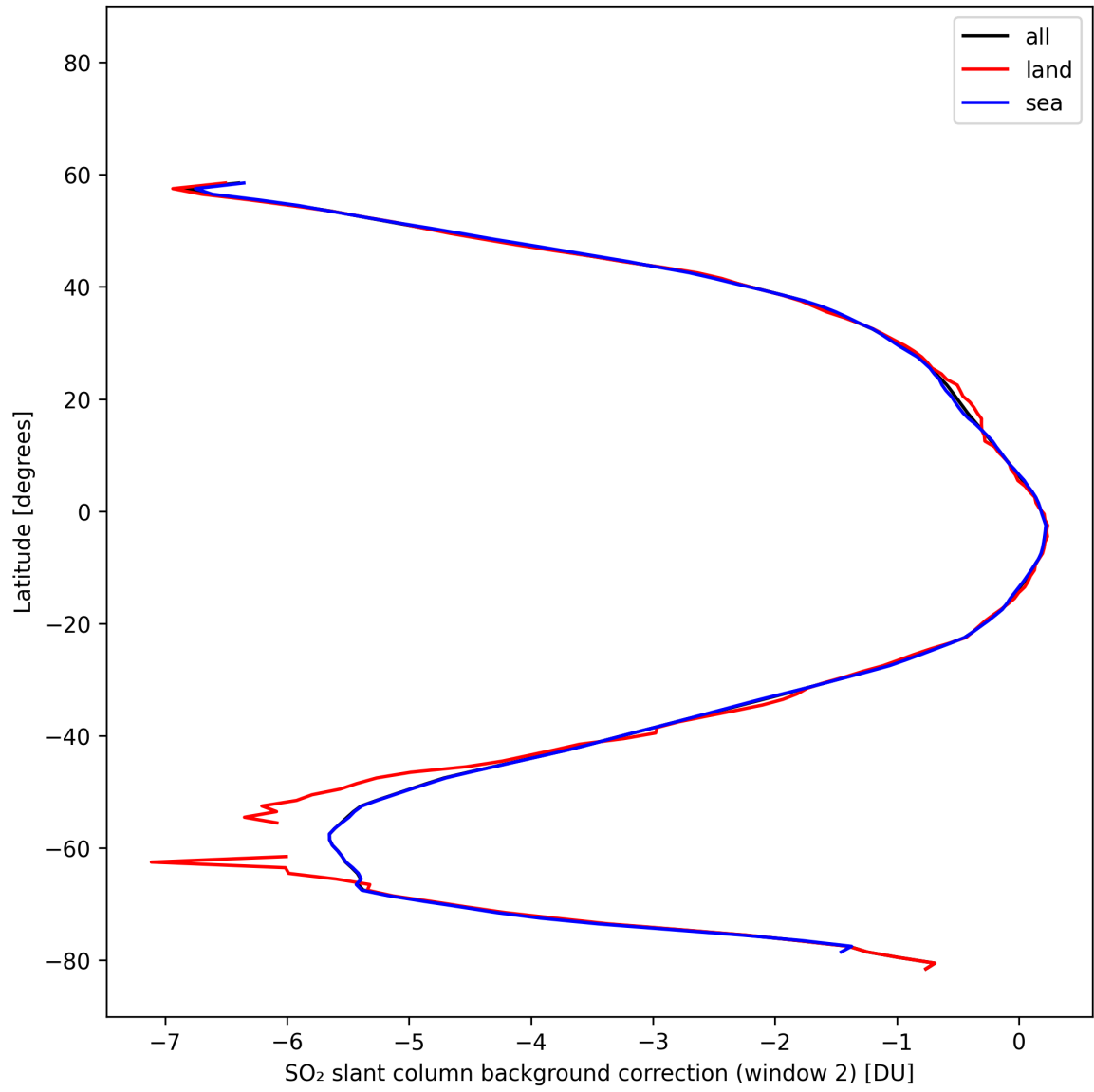


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-10-23 to 2025-10-24.

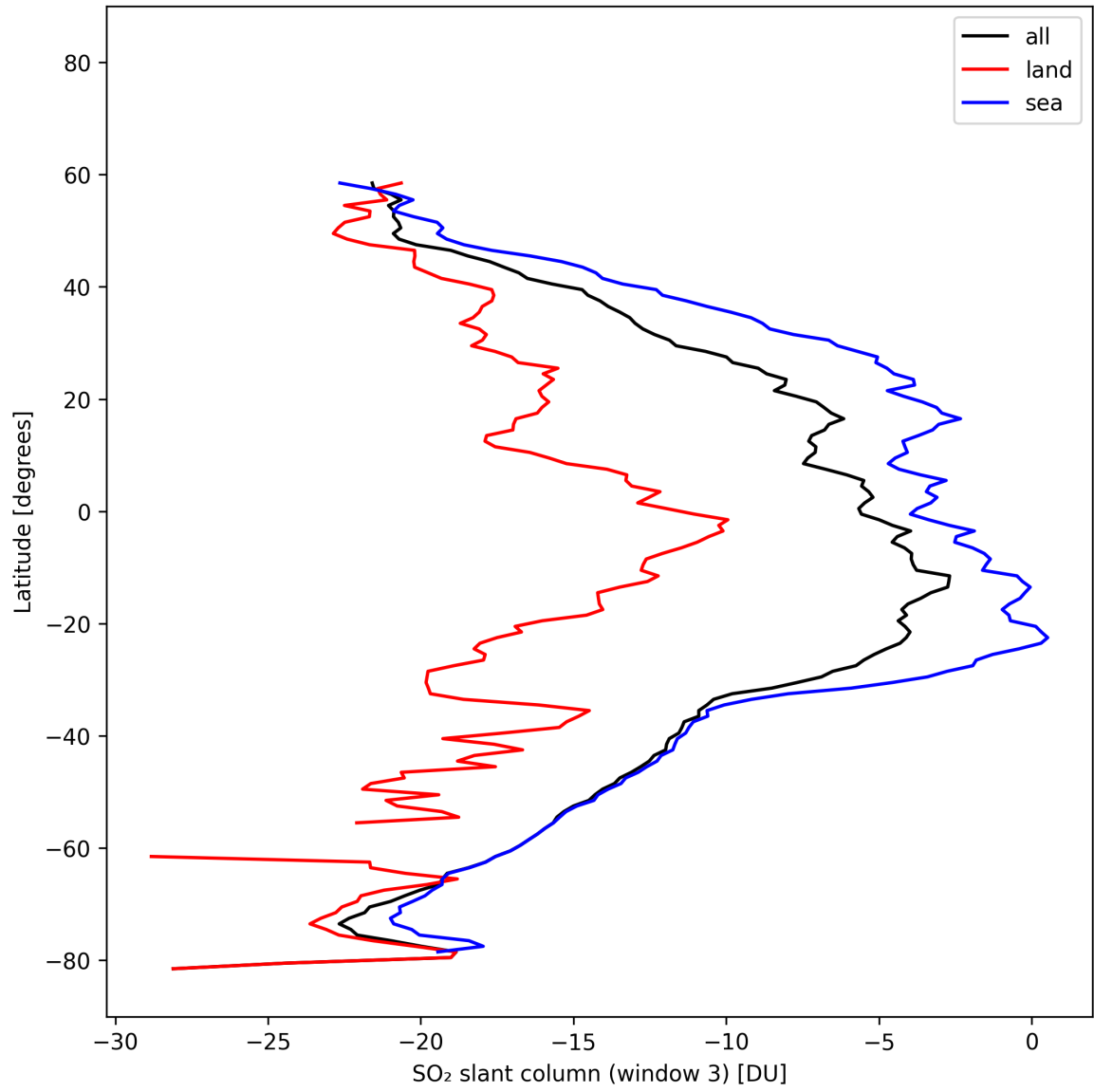


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-10-23 to 2025-10-24.

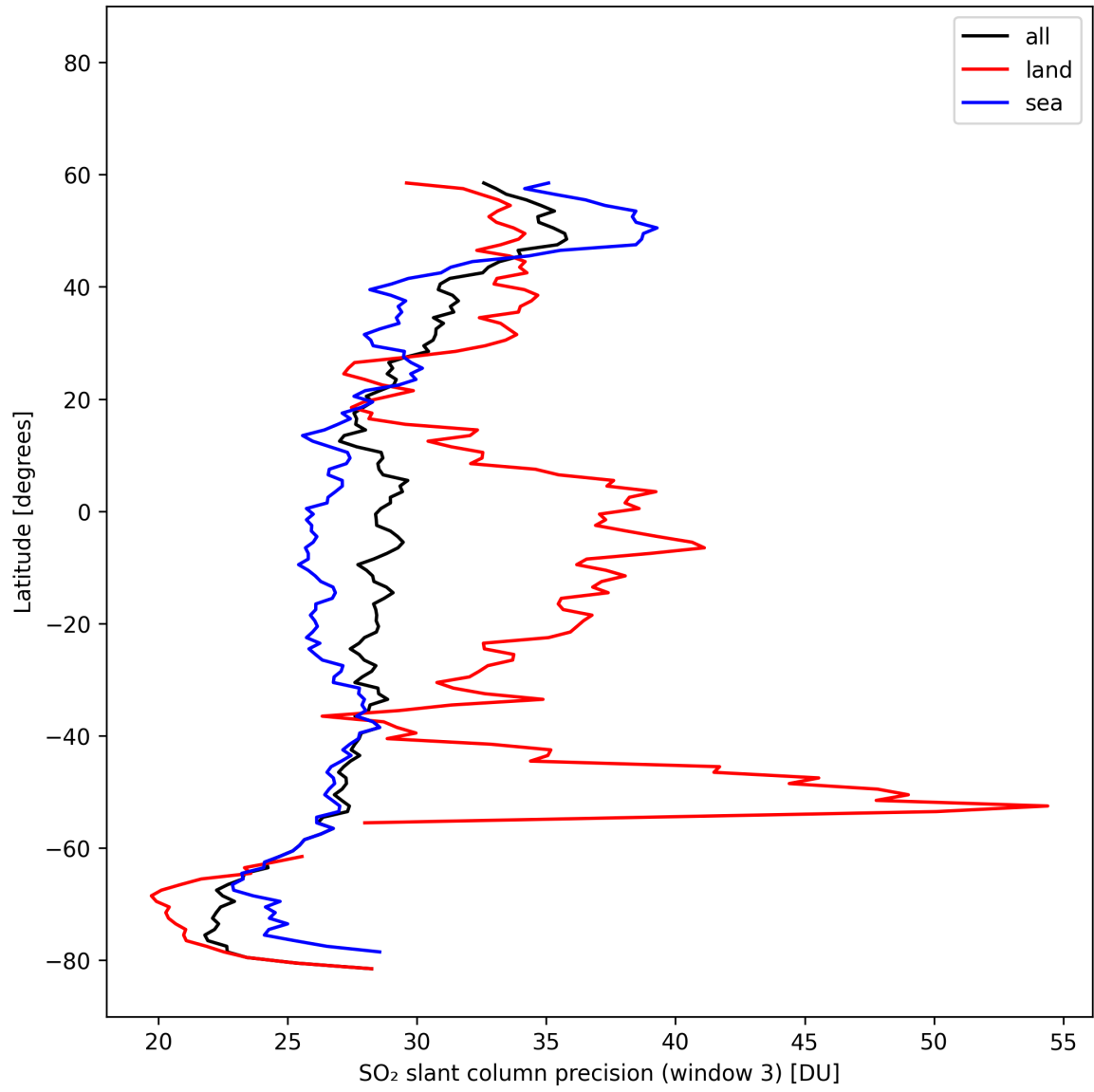


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-10-23 to 2025-10-24.

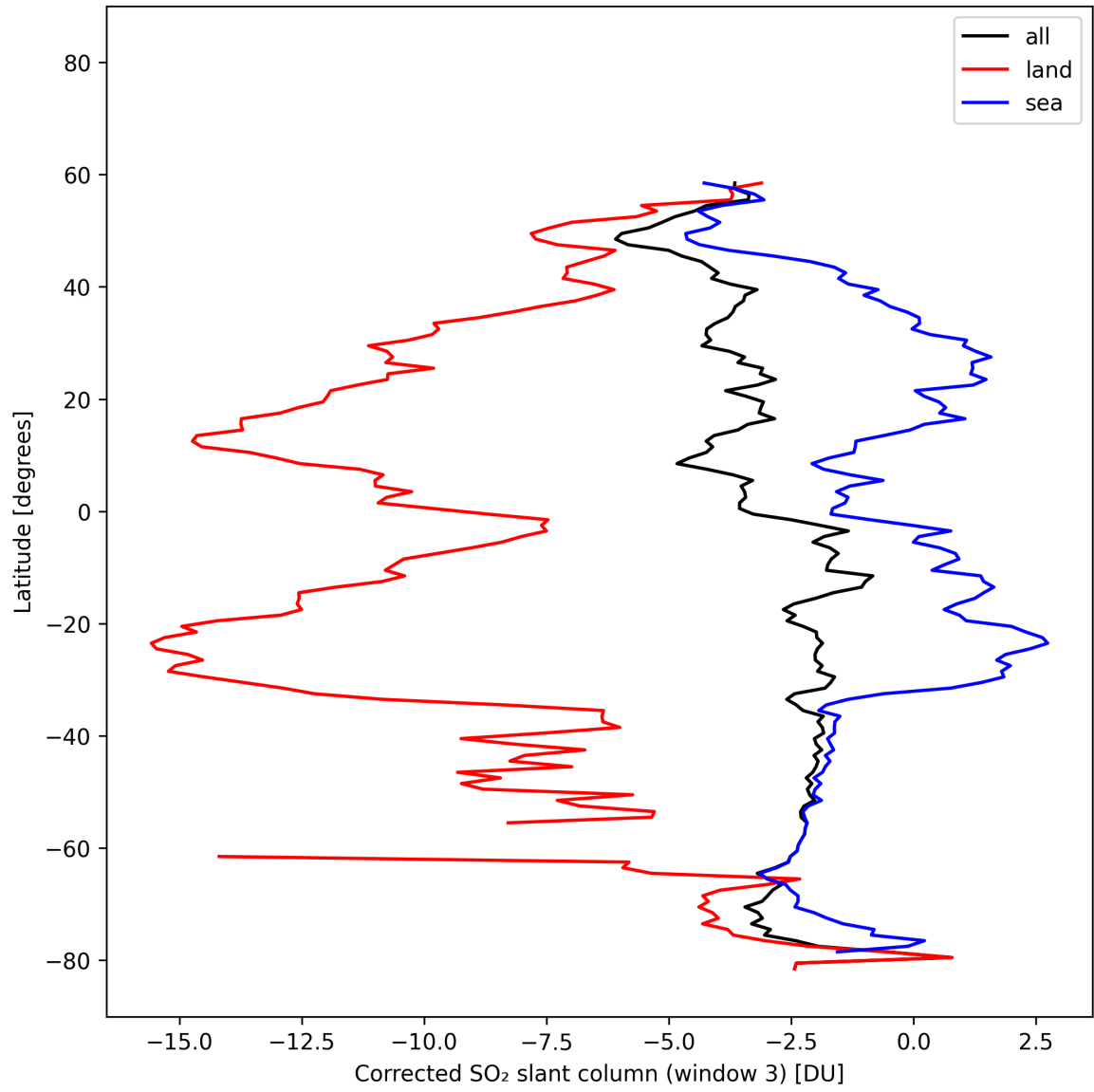


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-10-23 to 2025-10-24.

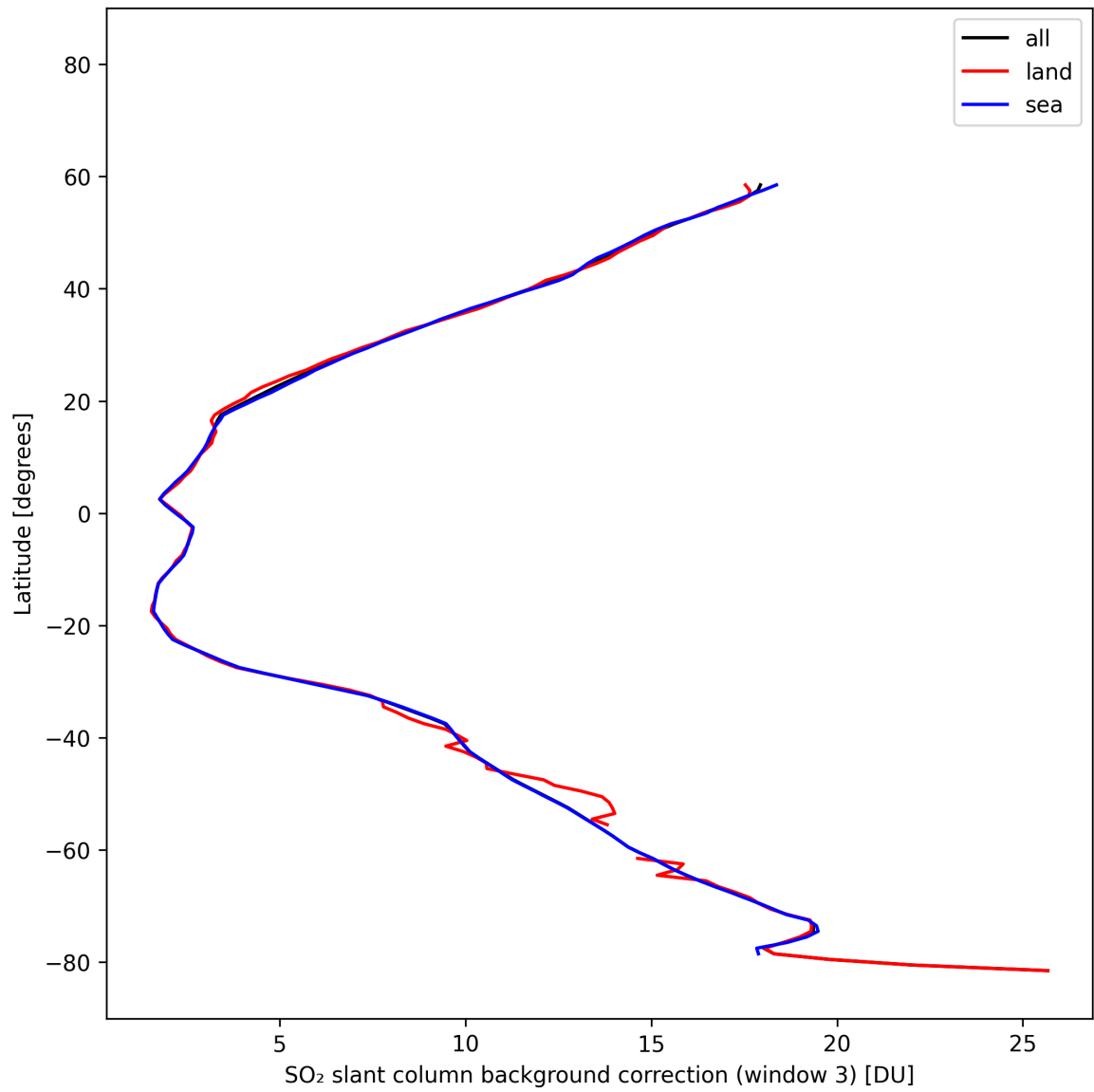


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-10-23 to 2025-10-24.

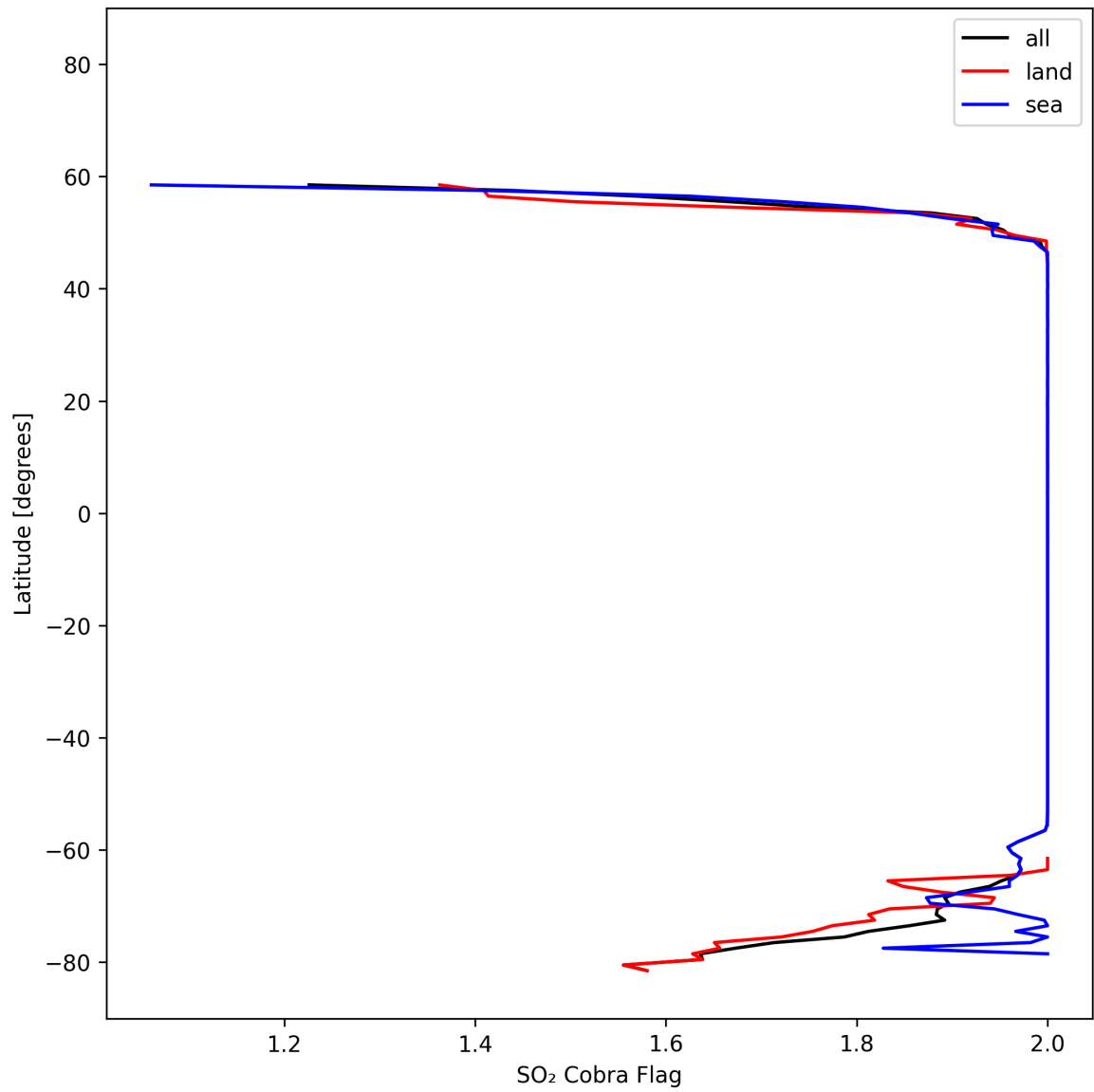


Figure 48: Zonal average of "SO₂ Cobra Flag" for 2025-10-23 to 2025-10-24.

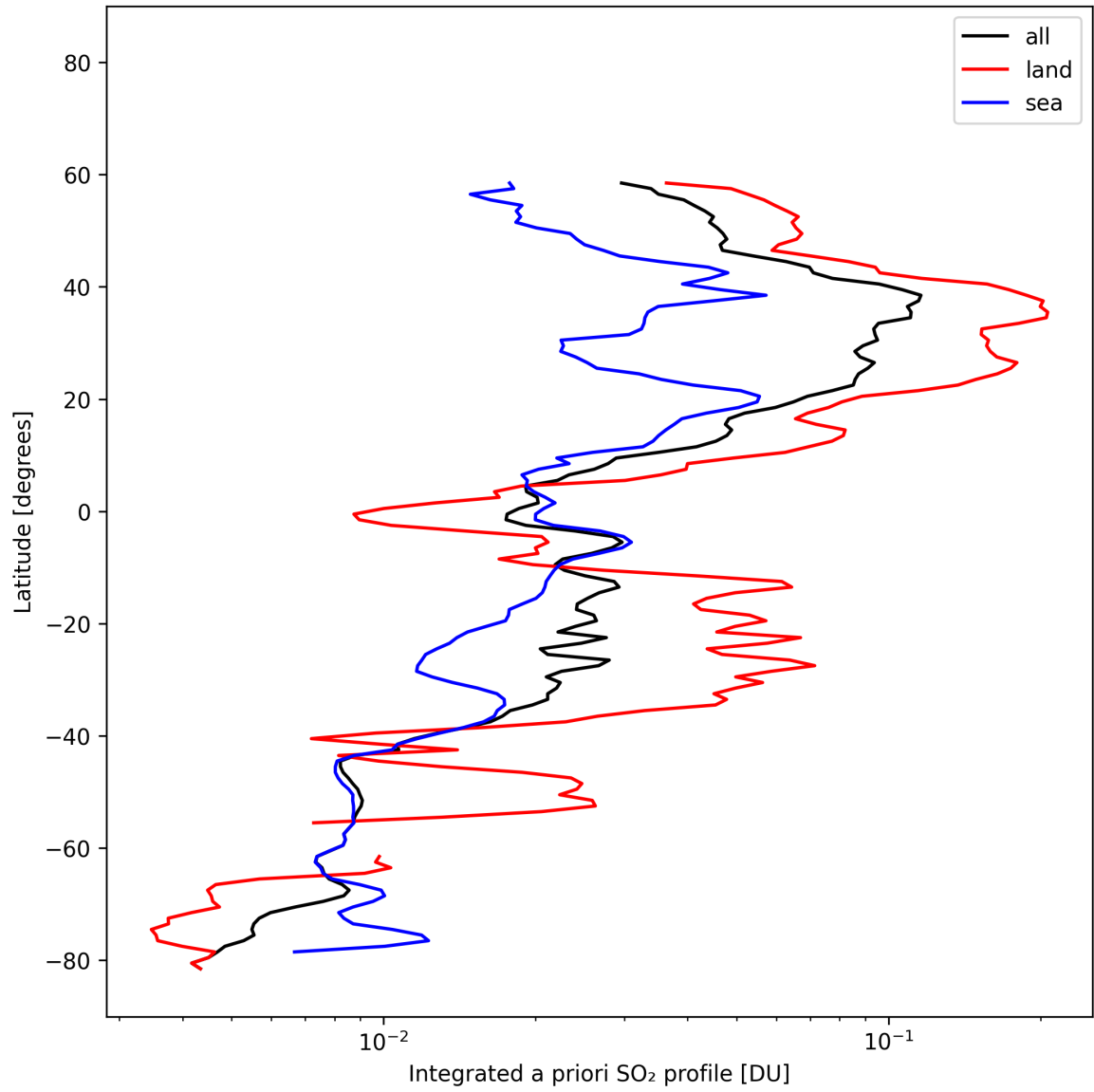


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-10-23 to 2025-10-24.

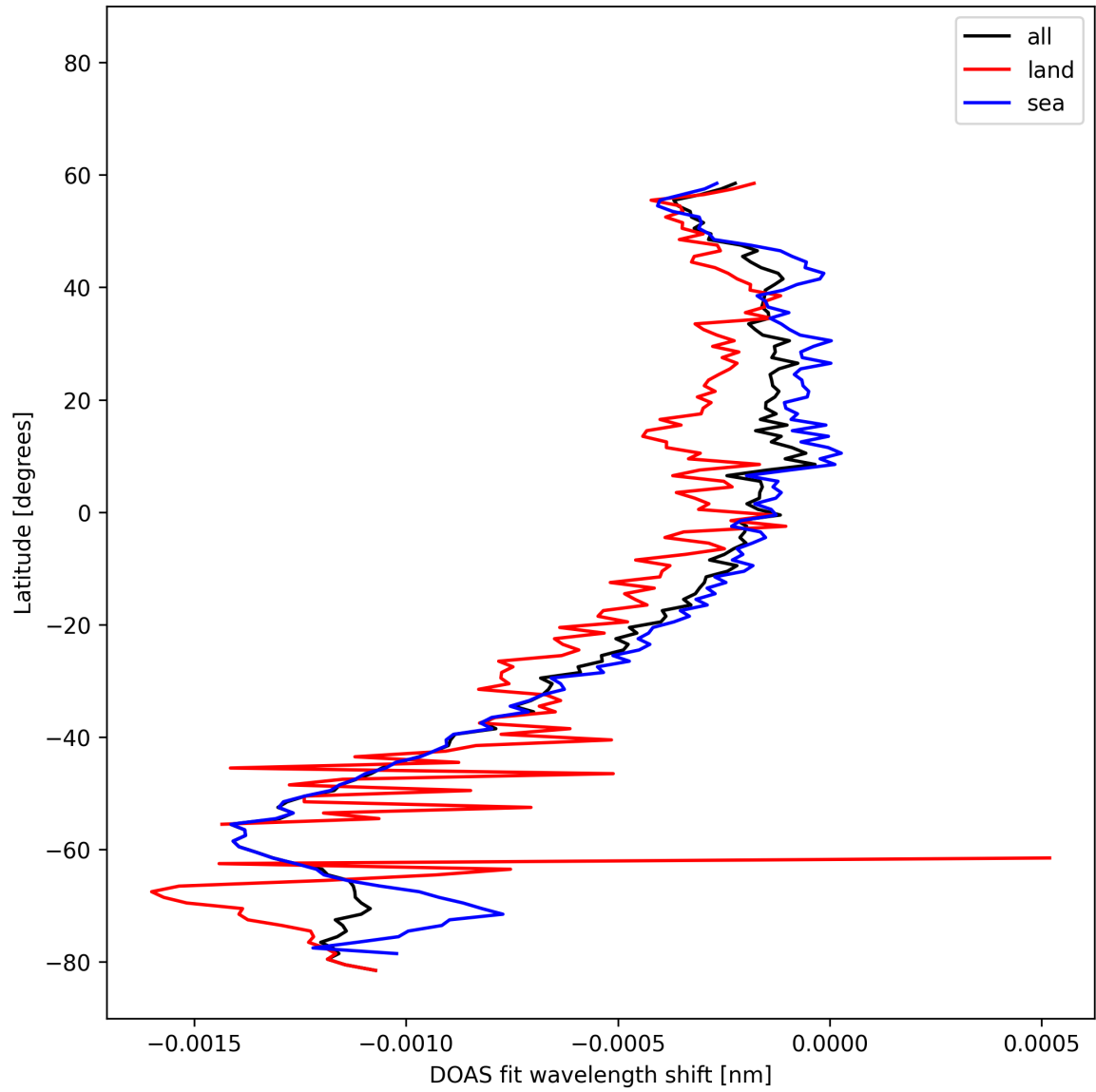


Figure 50: Zonal average of "DOAS fit wavelength shift" for 2025-10-23 to 2025-10-24.

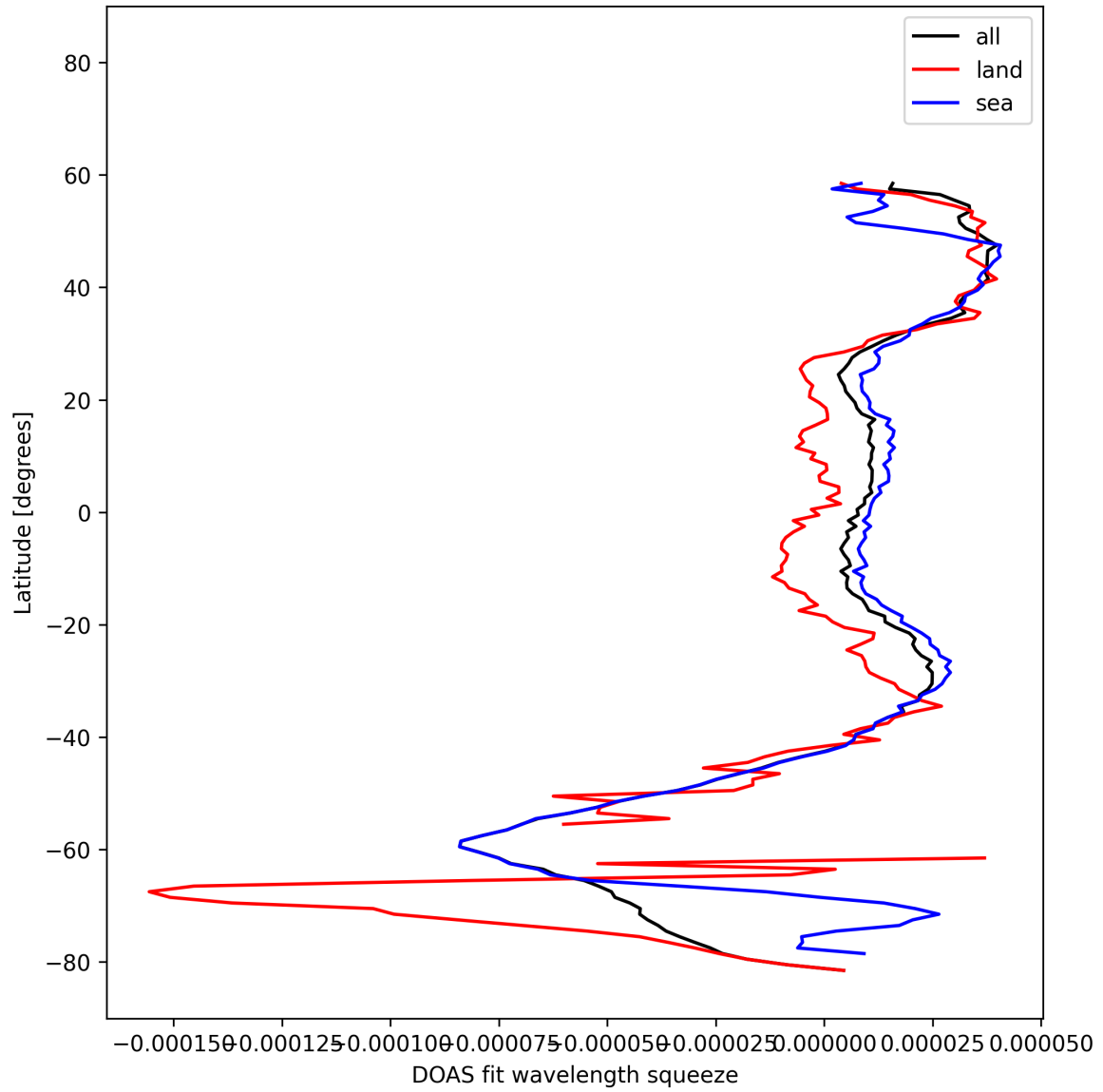


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-10-23 to 2025-10-24.

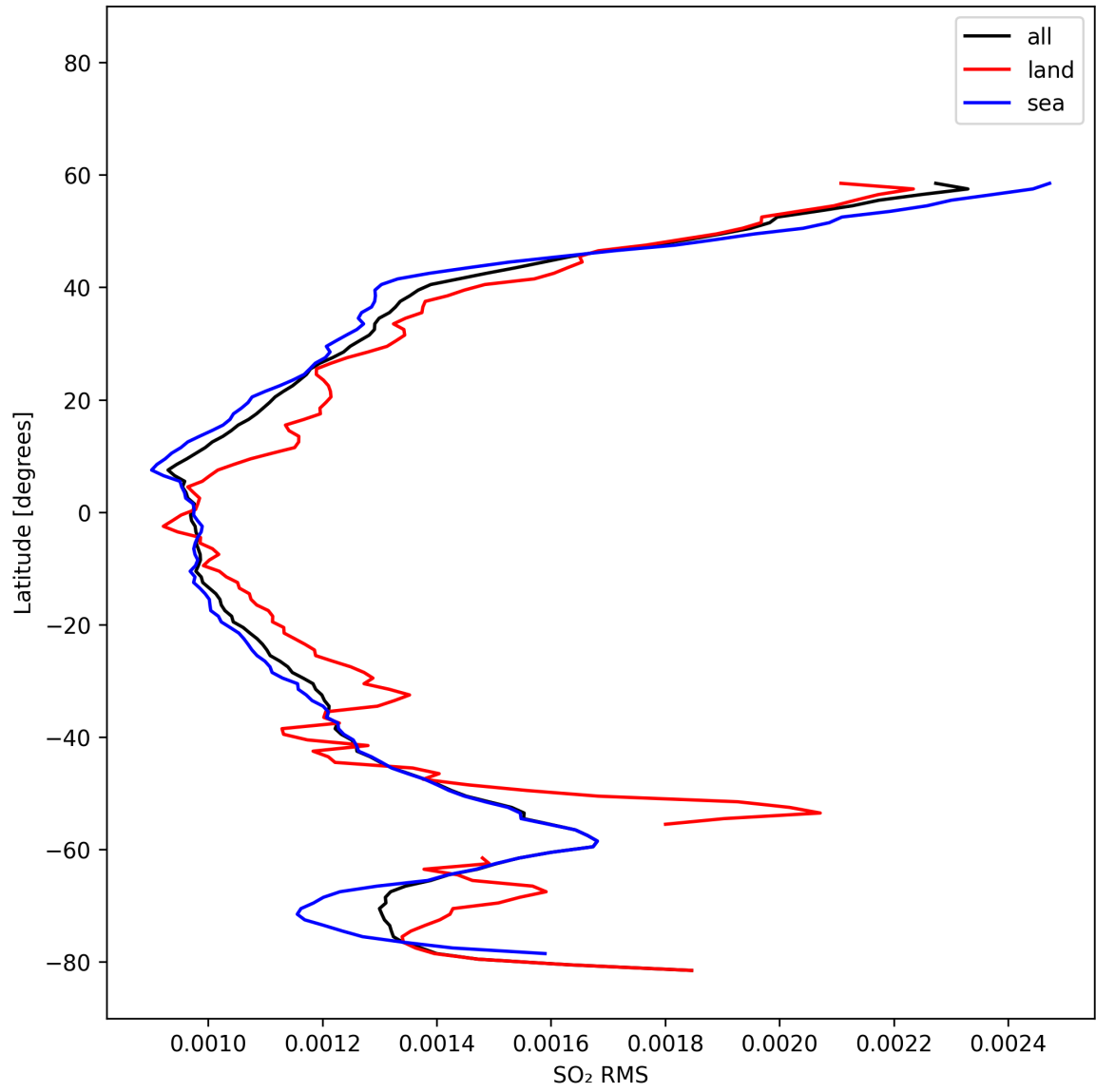


Figure 52: Zonal average of “SO₂ RMS” for 2025-10-23 to 2025-10-24.

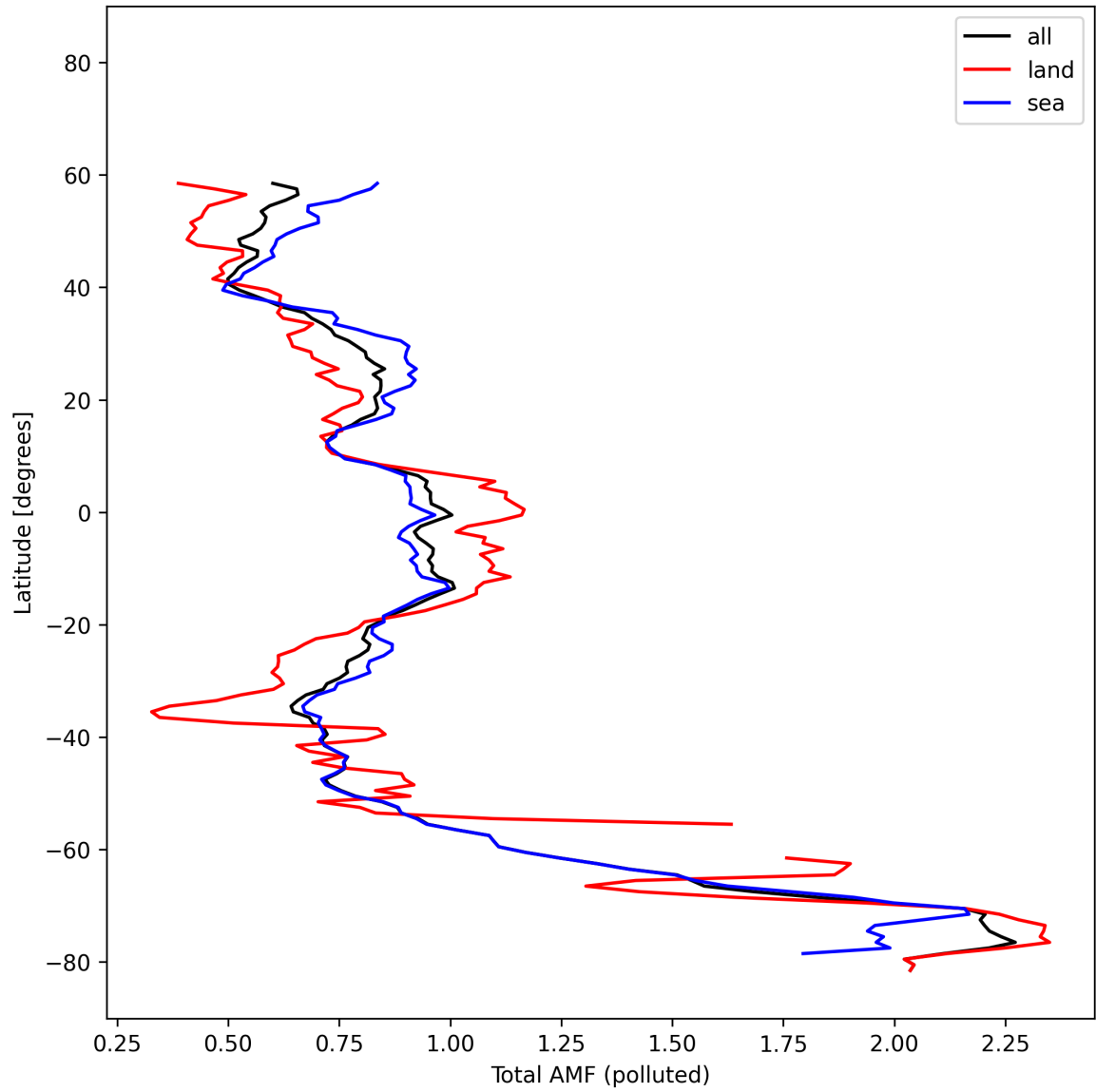


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-10-23 to 2025-10-24.

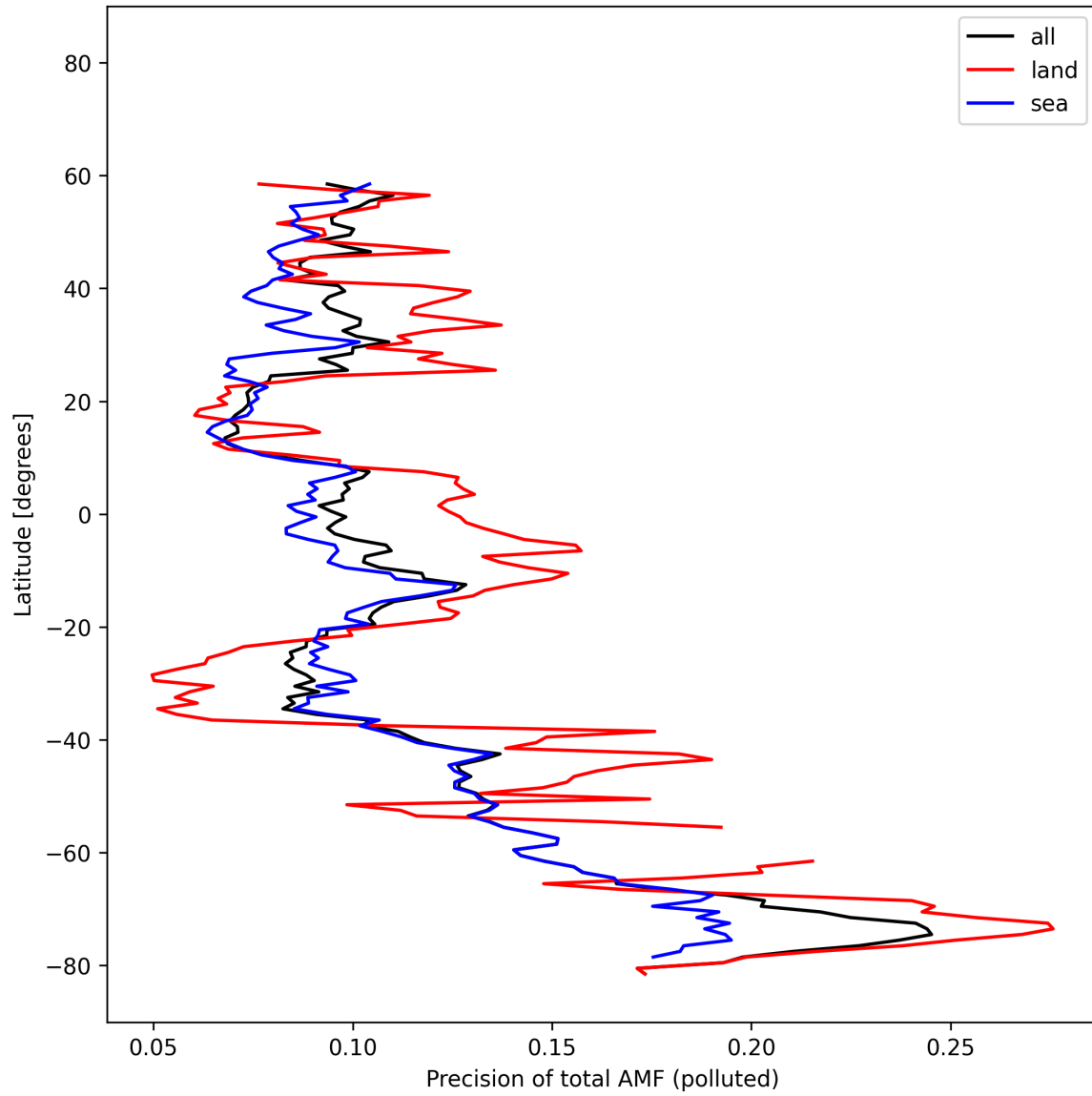


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-10-23 to 2025-10-24.

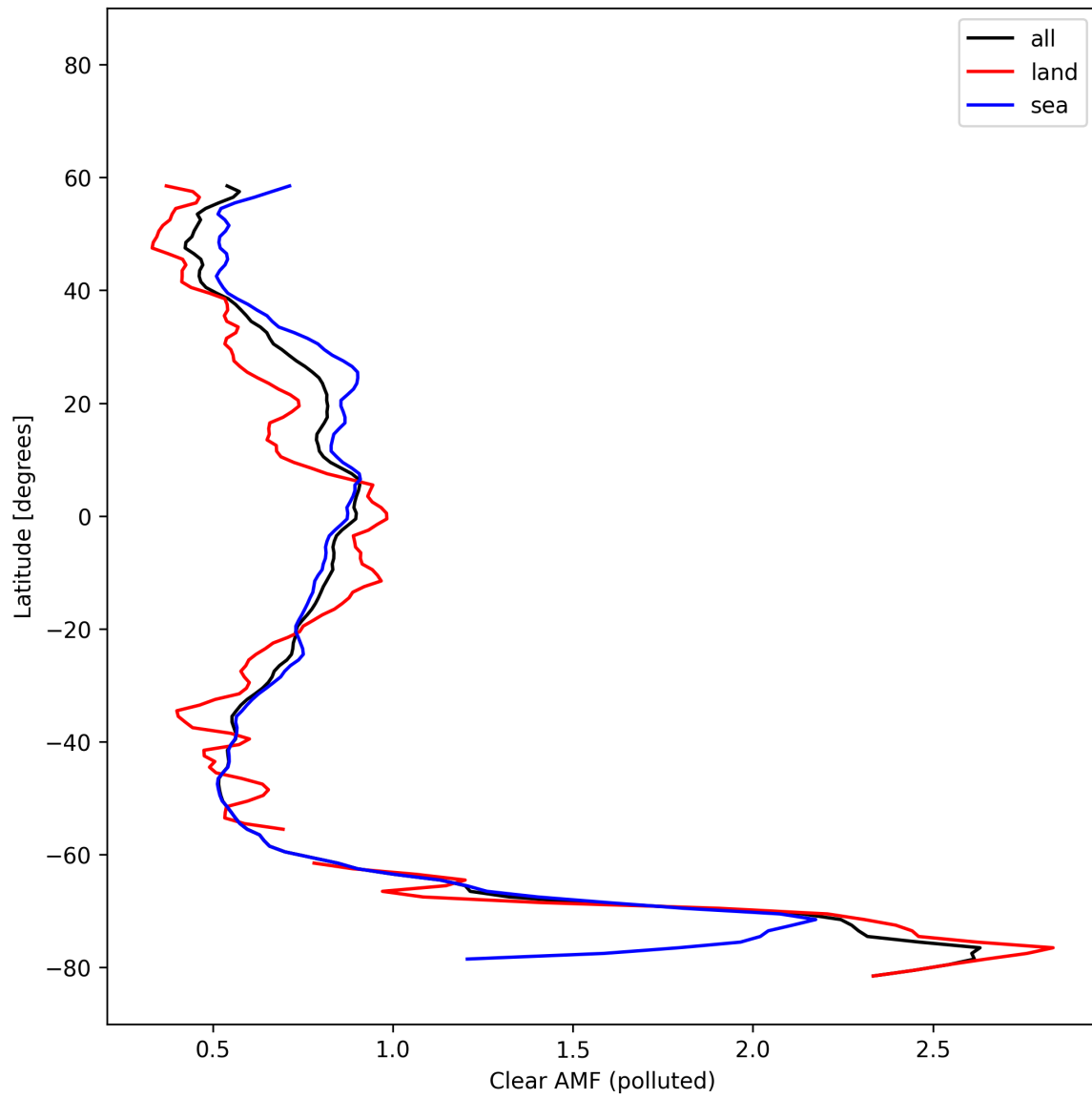


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-10-23 to 2025-10-24.

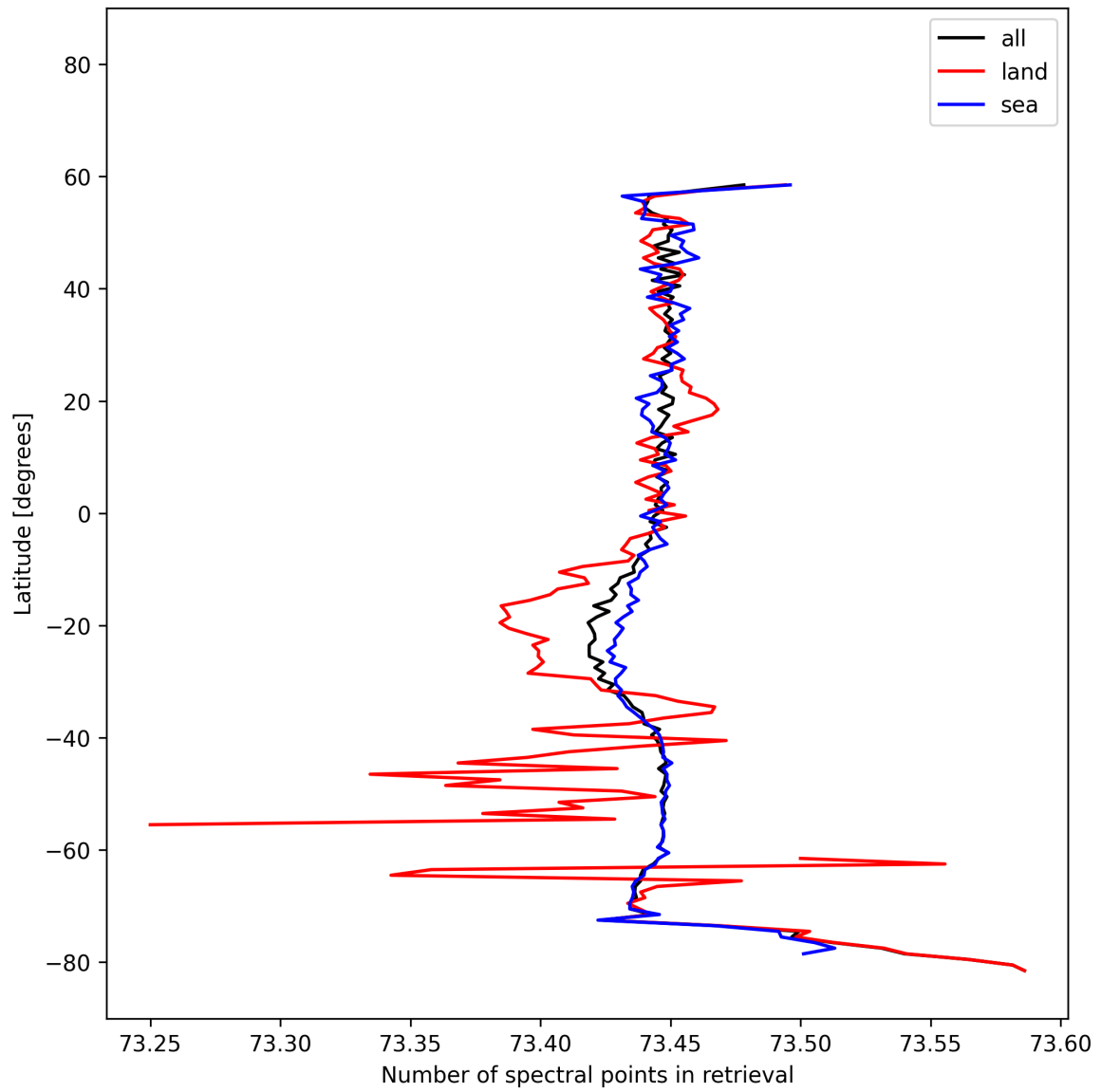


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-10-23 to 2025-10-24.

8 Histograms

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

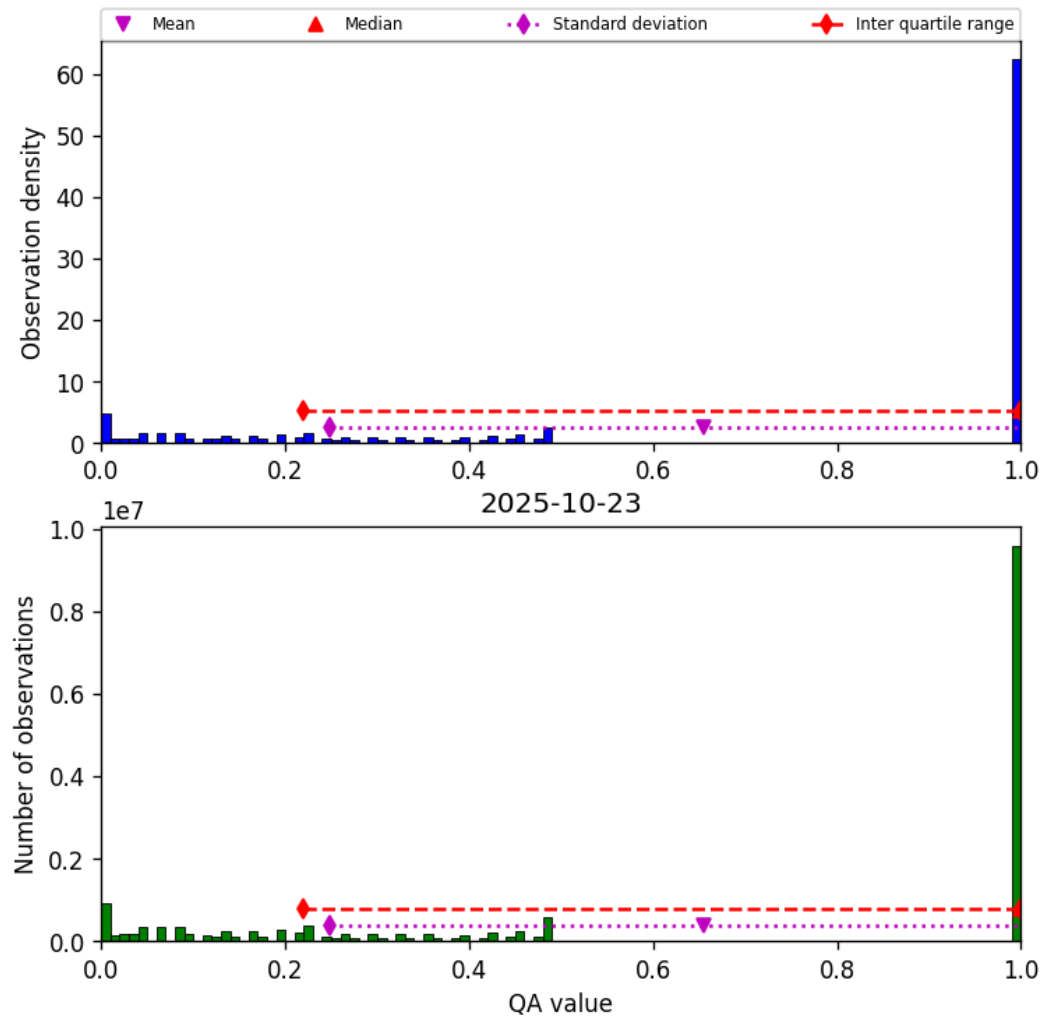


Figure 57: Histogram of “QA value” for 2025-10-23 to 2025-10-24

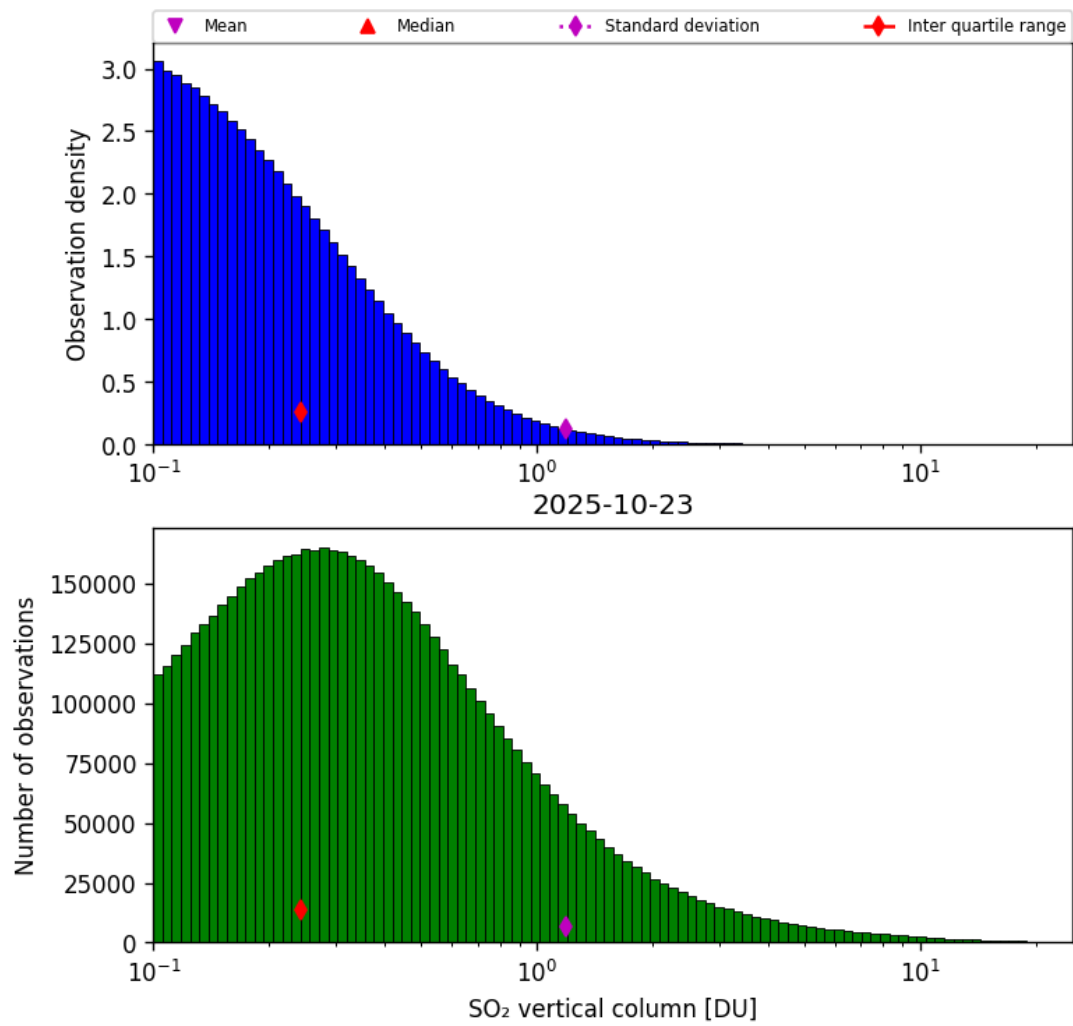


Figure 58: Histogram of “SO₂ vertical column” for 2025-10-23 to 2025-10-24

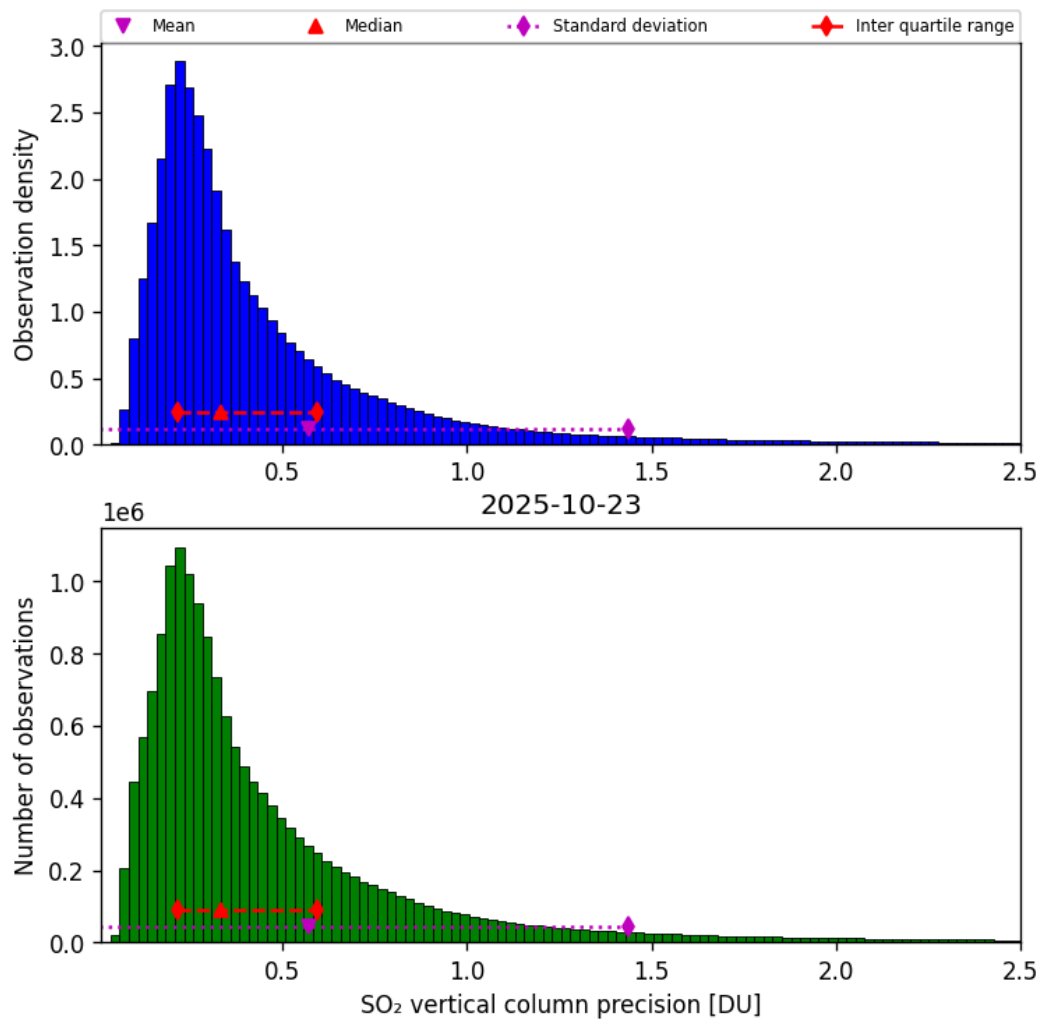


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-10-23 to 2025-10-24

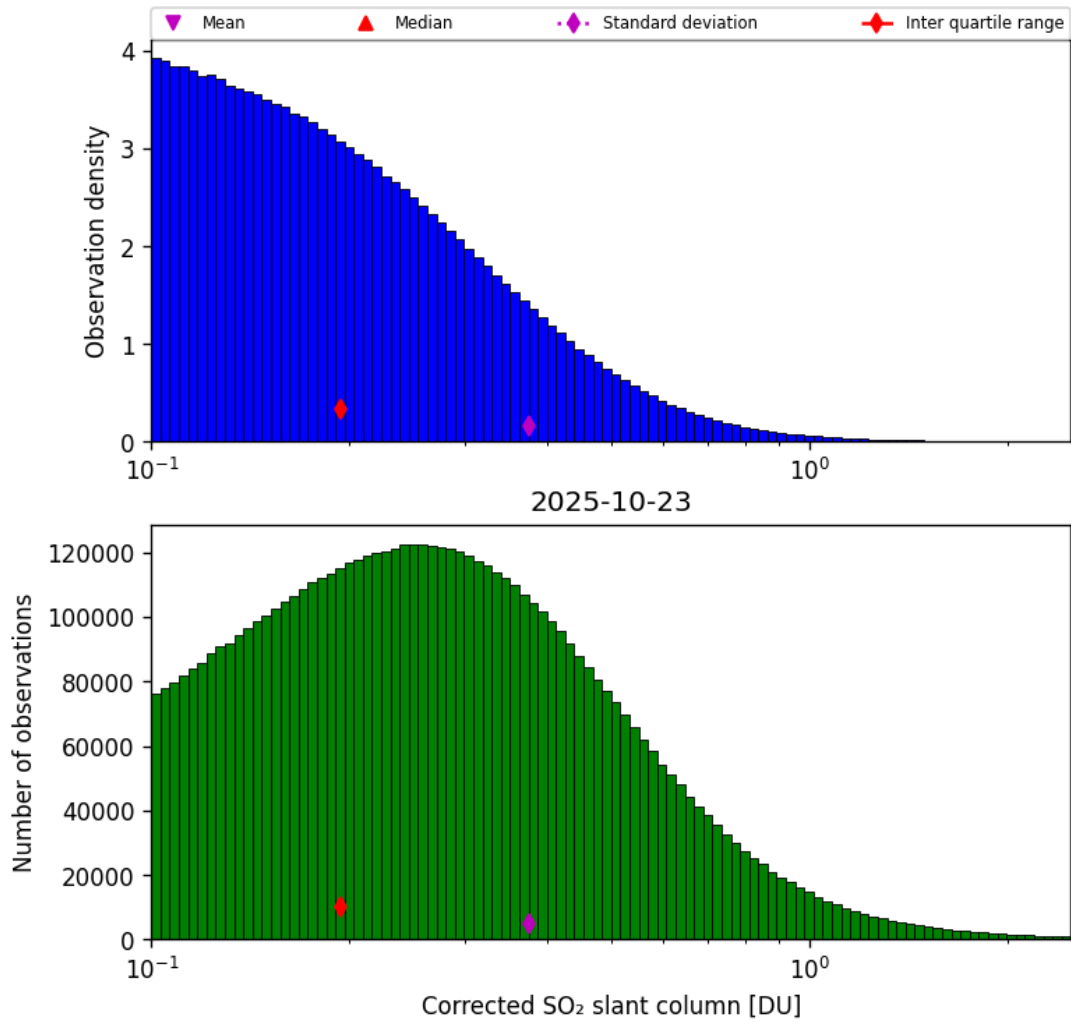


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-10-23 to 2025-10-24

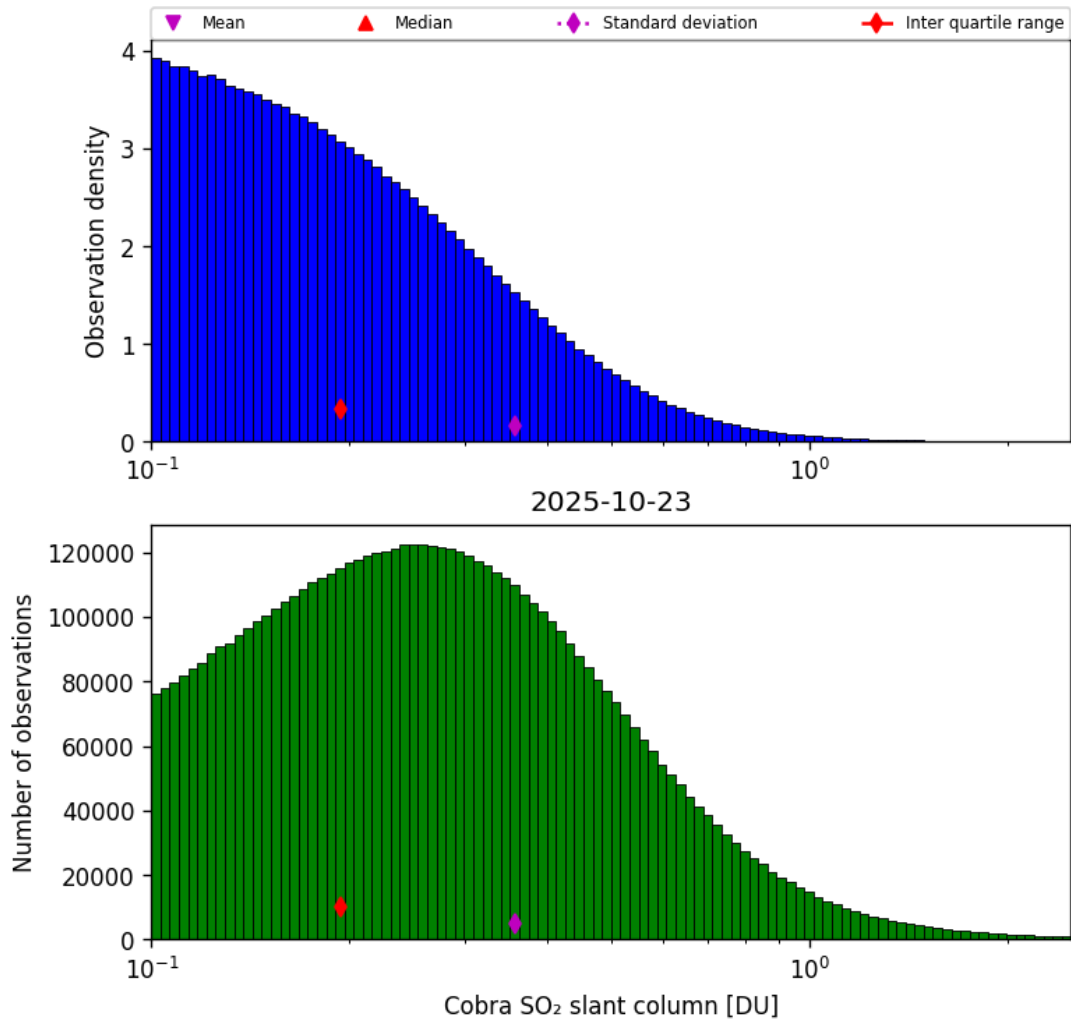


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-10-23 to 2025-10-24

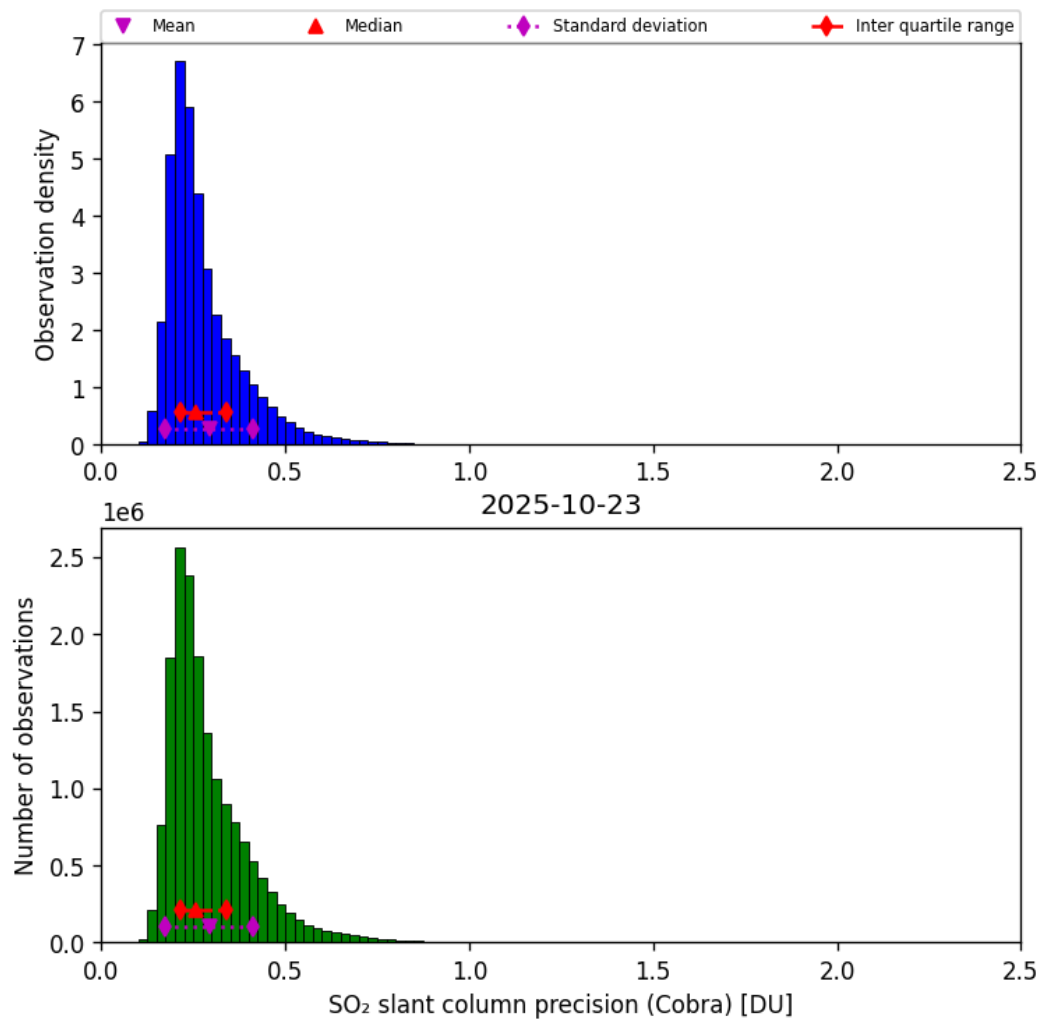


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-10-23 to 2025-10-24

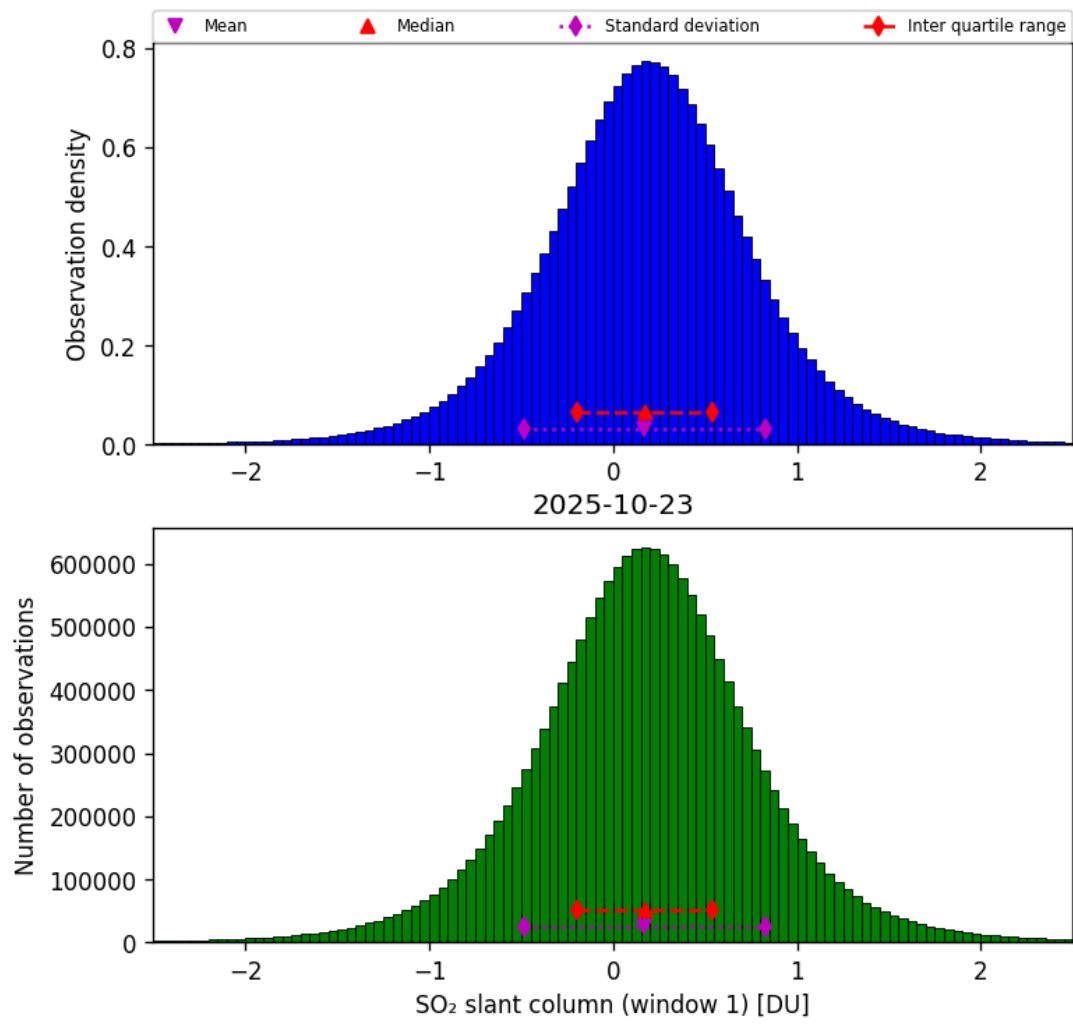


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-10-23 to 2025-10-24

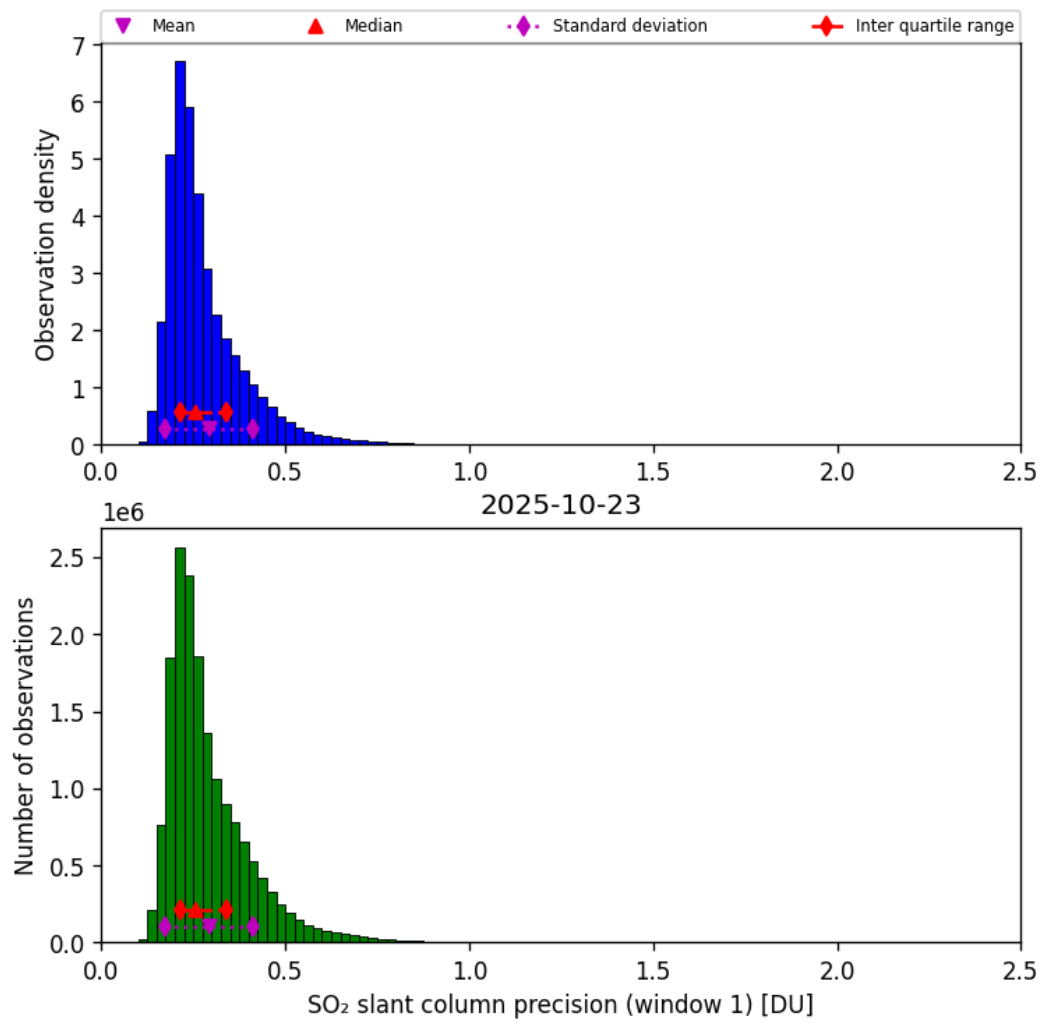


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-10-23 to 2025-10-24

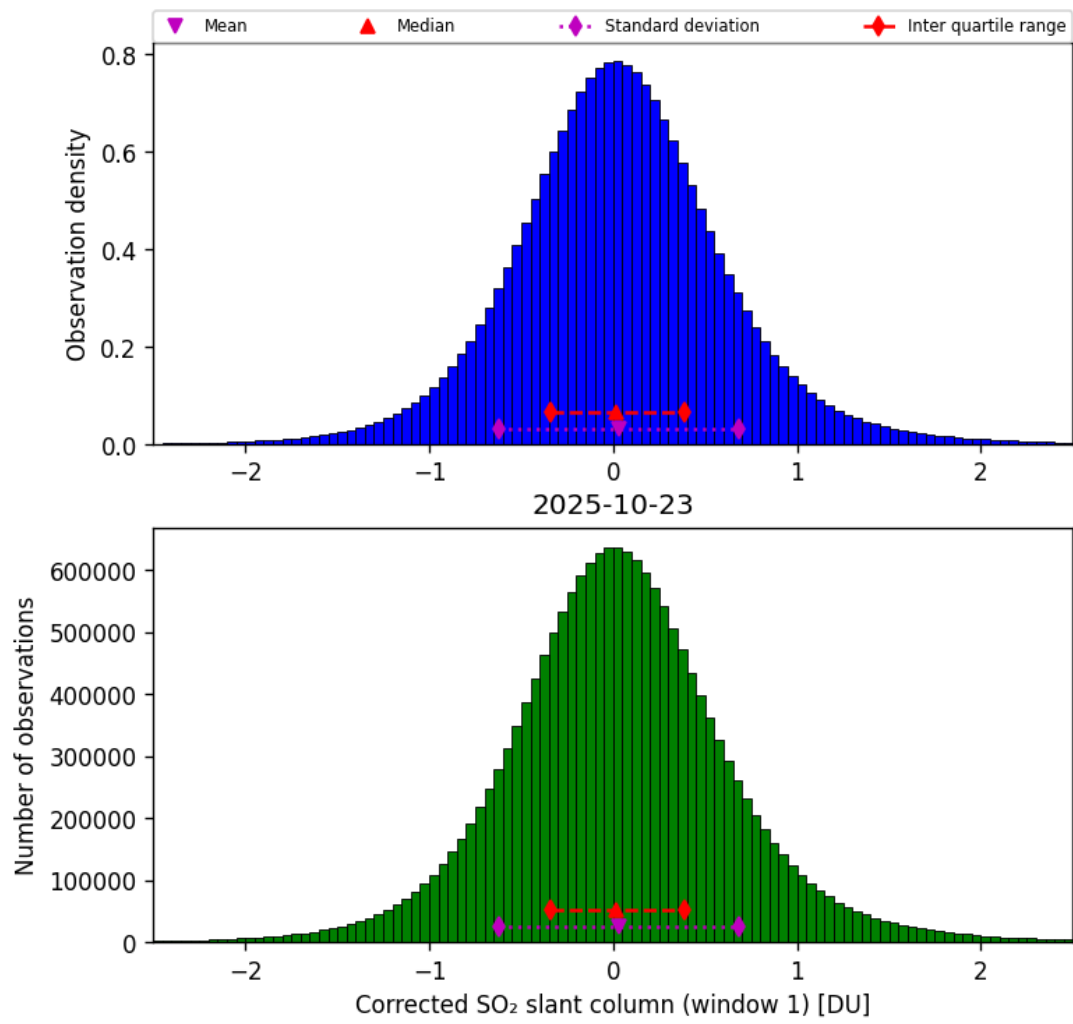


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-10-23 to 2025-10-24

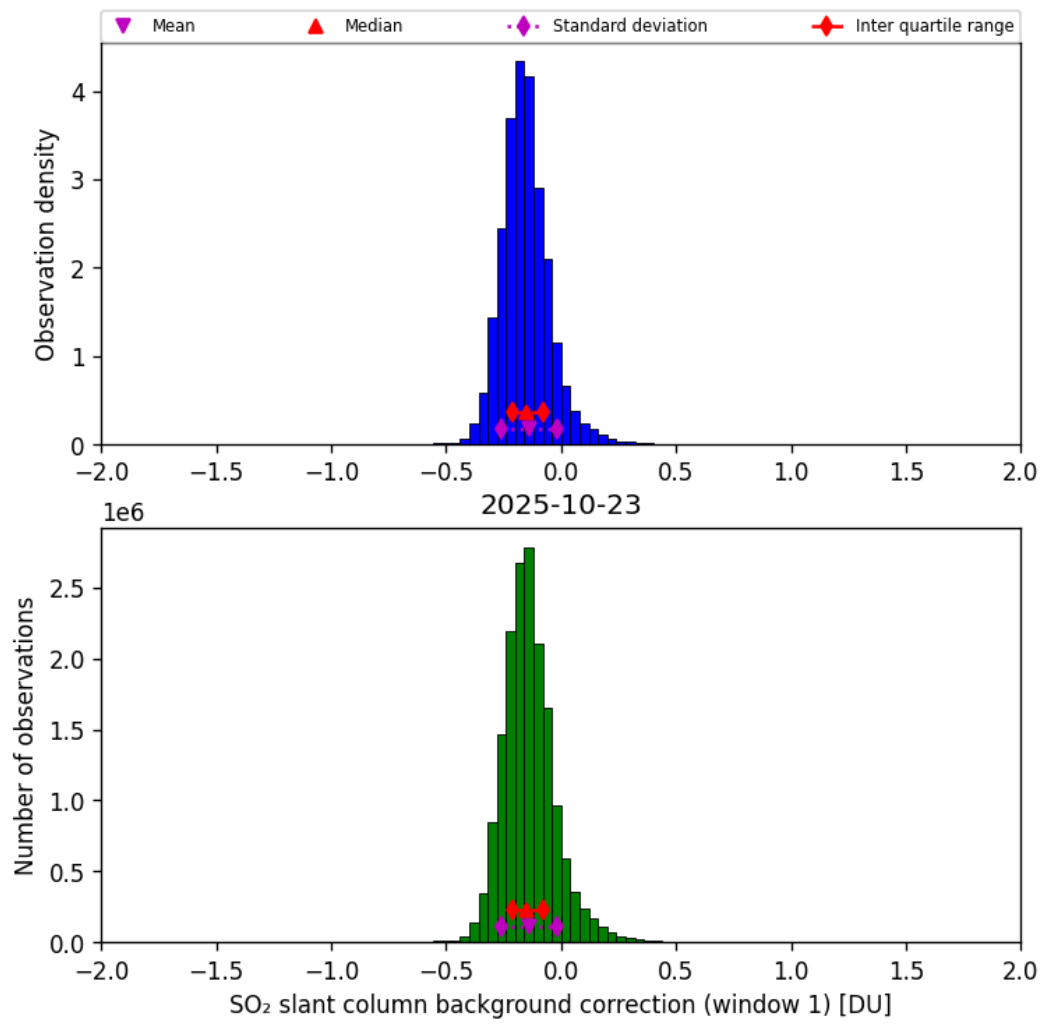


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-10-23 to 2025-10-24

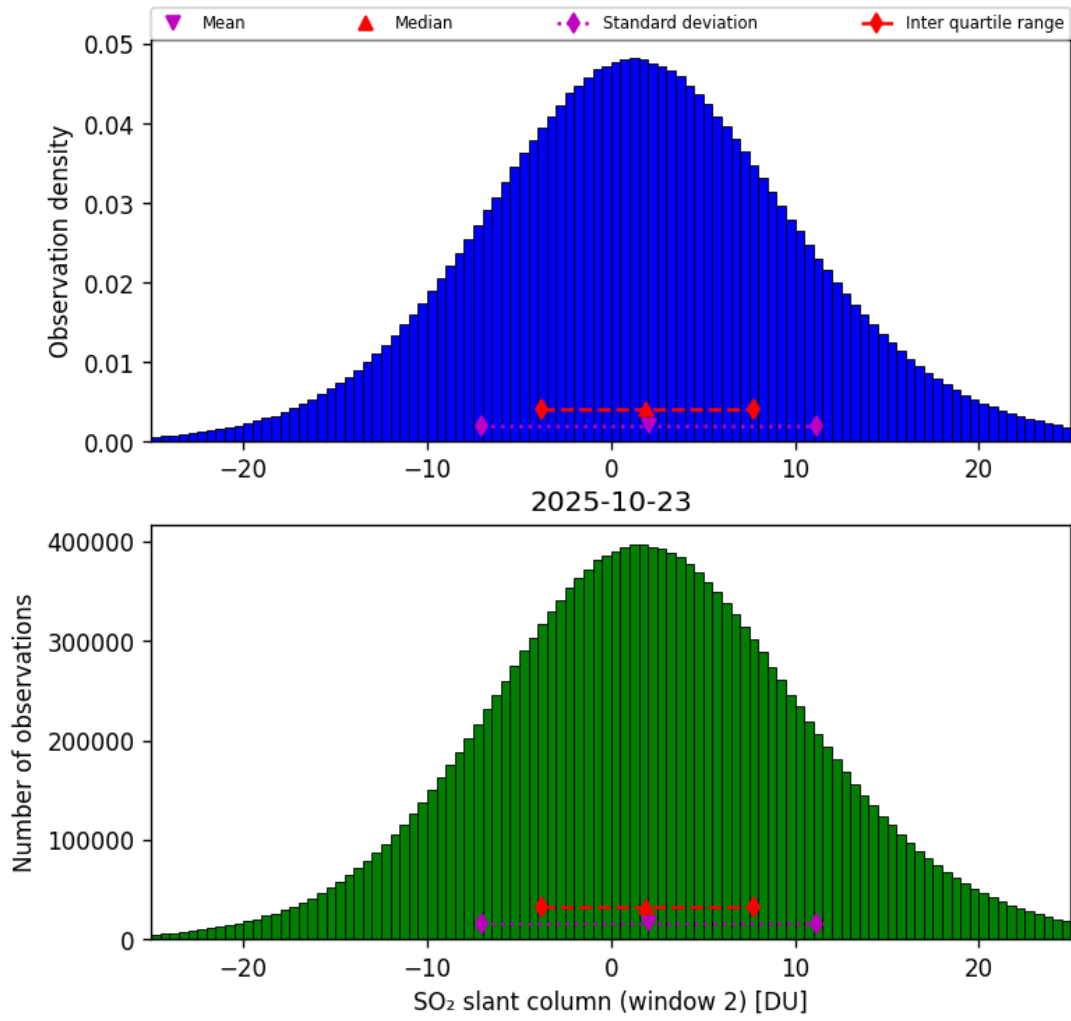


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-10-23 to 2025-10-24

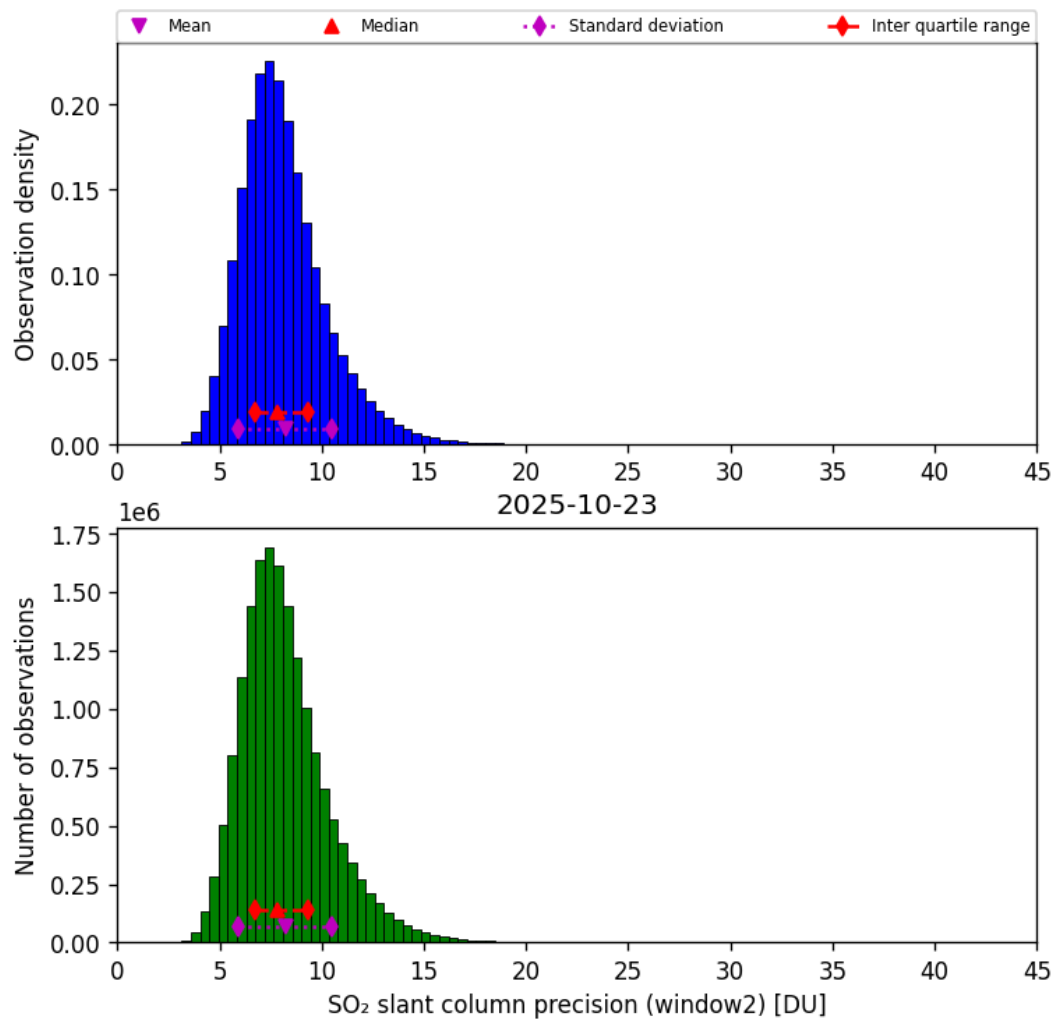


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-10-23 to 2025-10-24

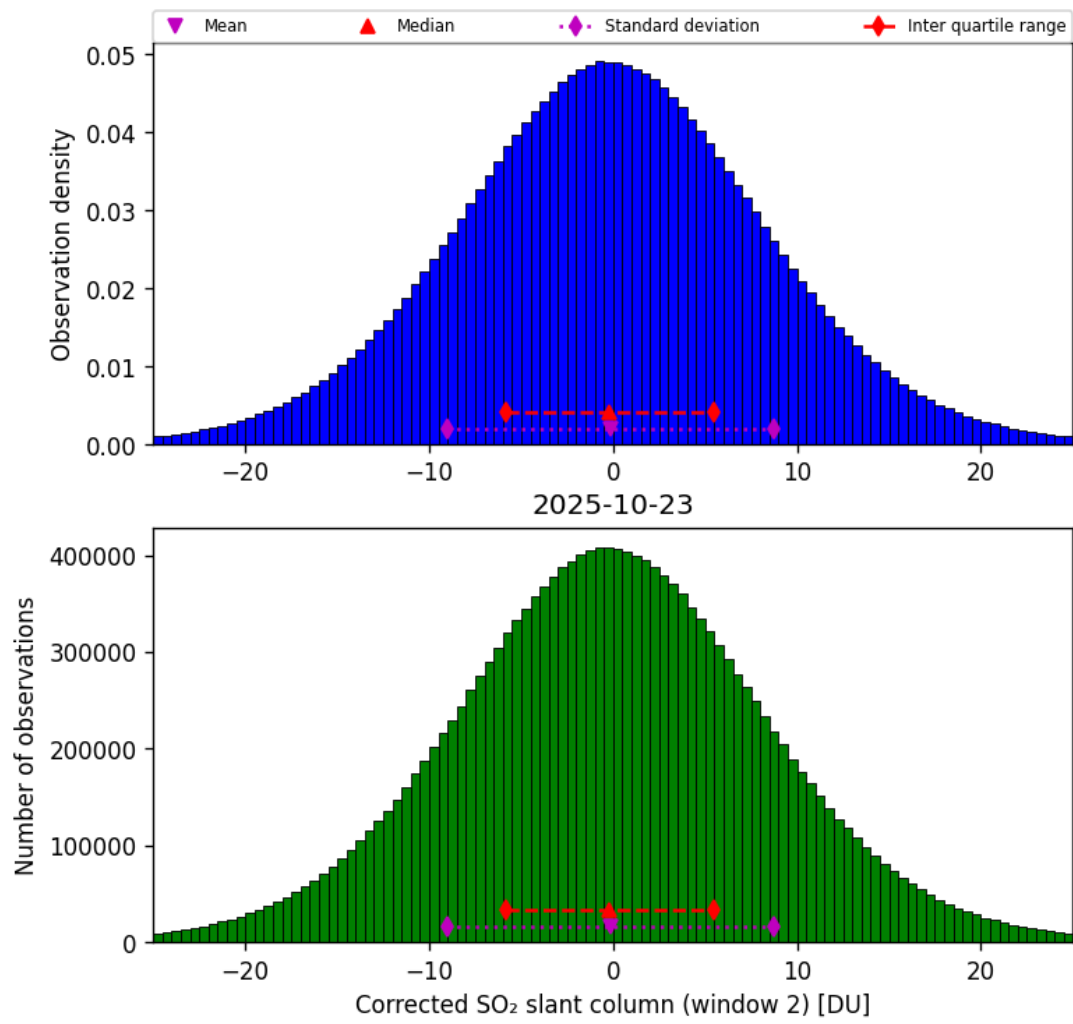


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-10-23 to 2025-10-24

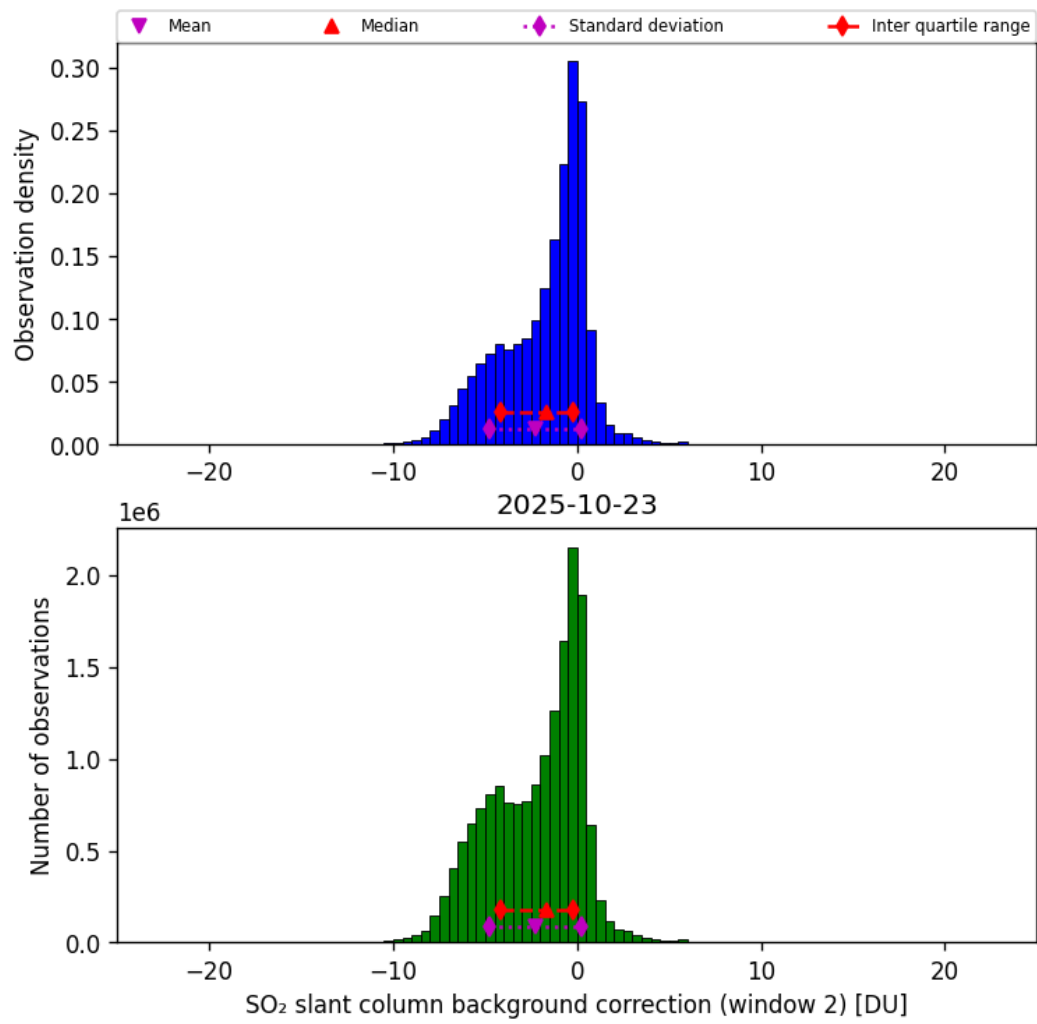


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-10-23 to 2025-10-24

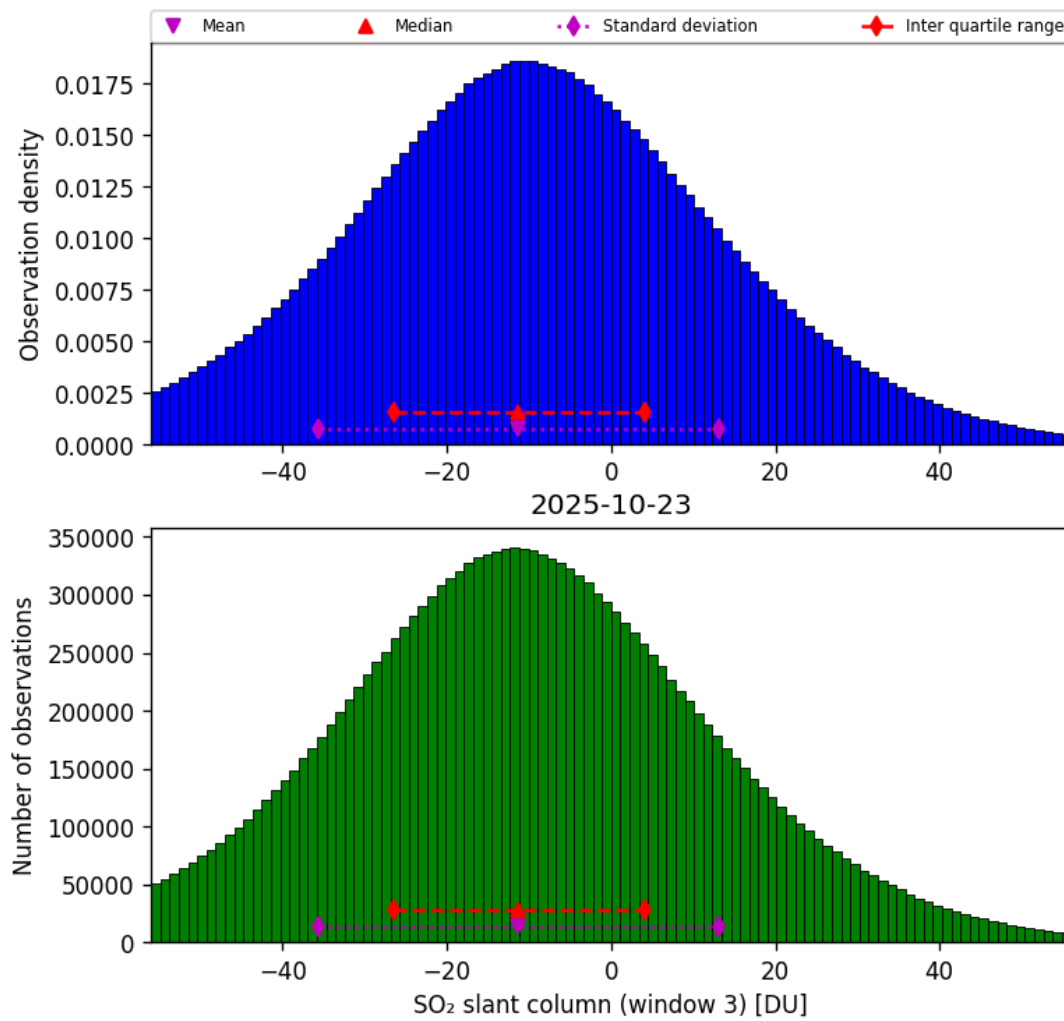


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-10-23 to 2025-10-24

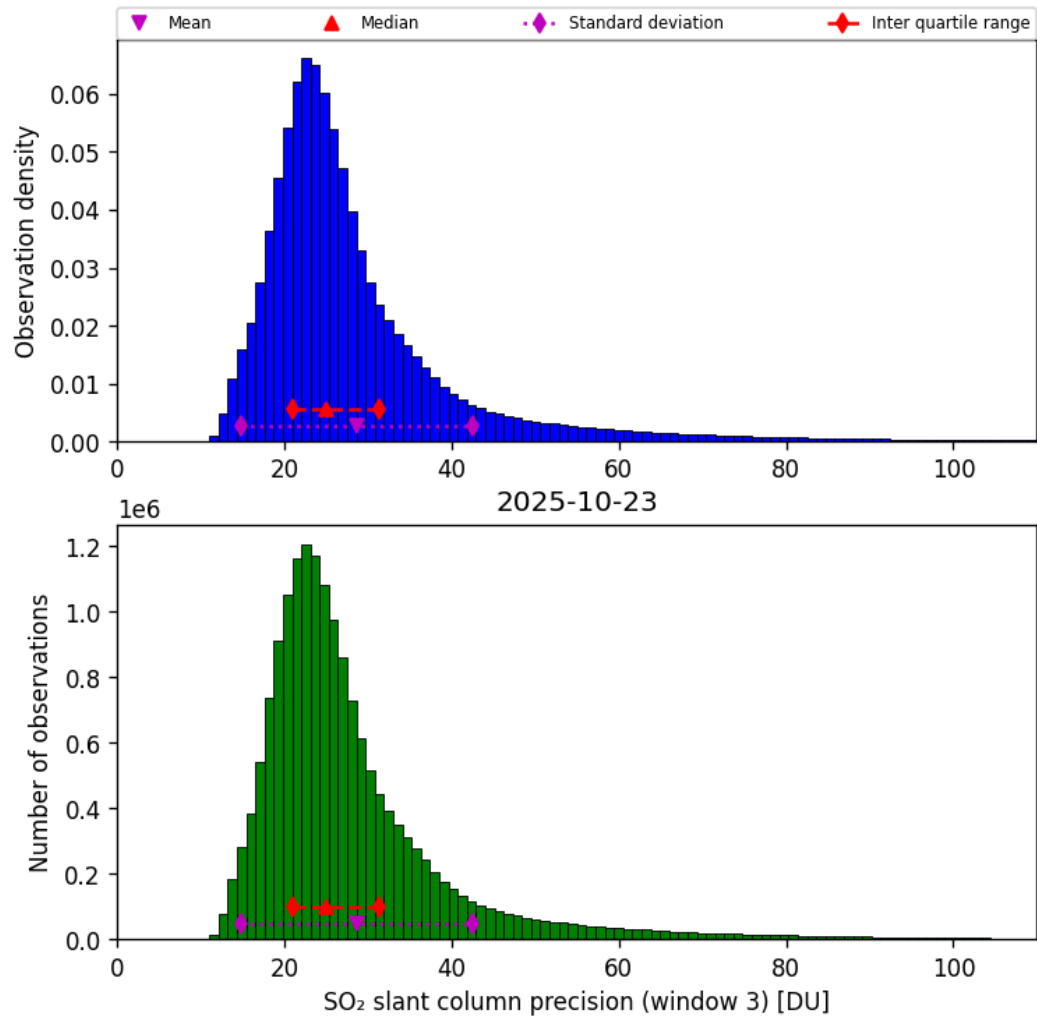


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-10-23 to 2025-10-24

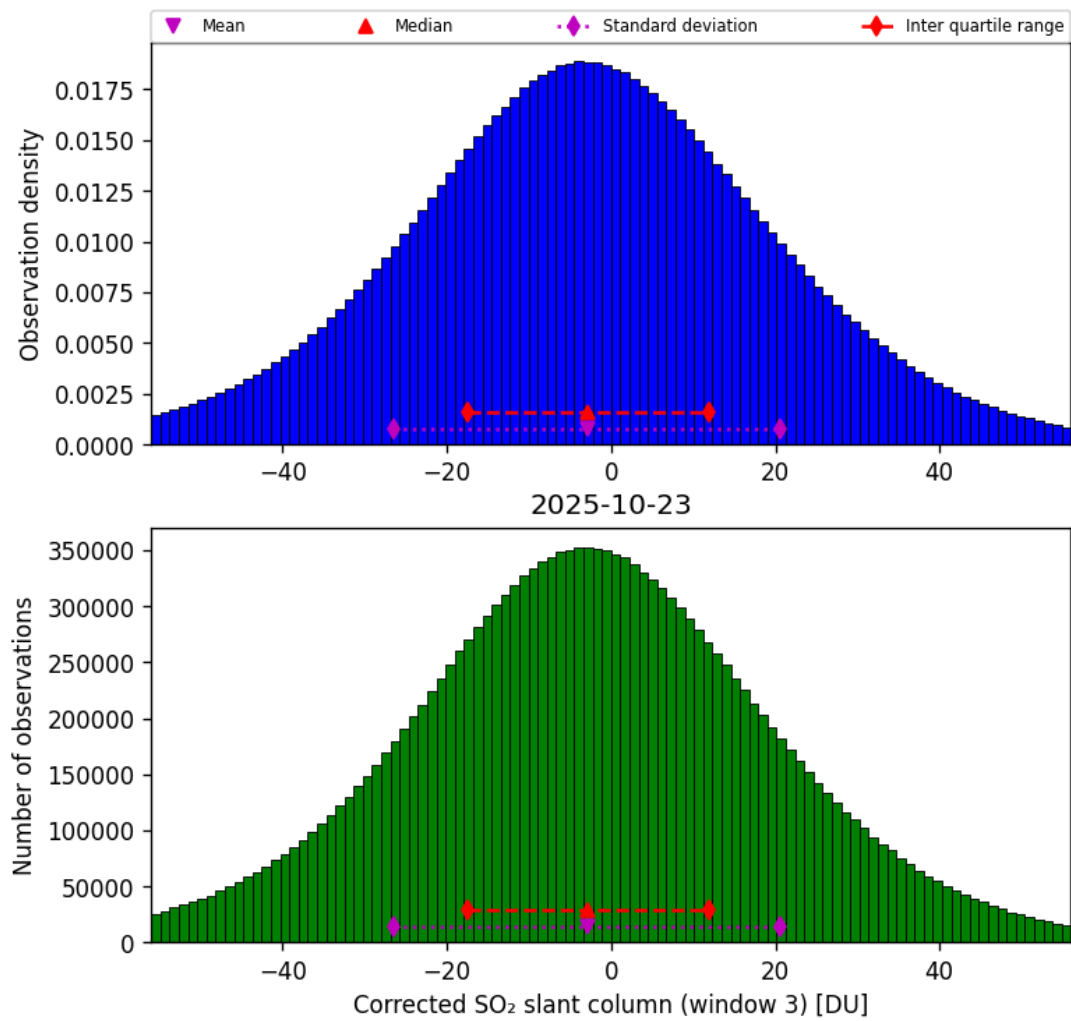


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-10-23 to 2025-10-24

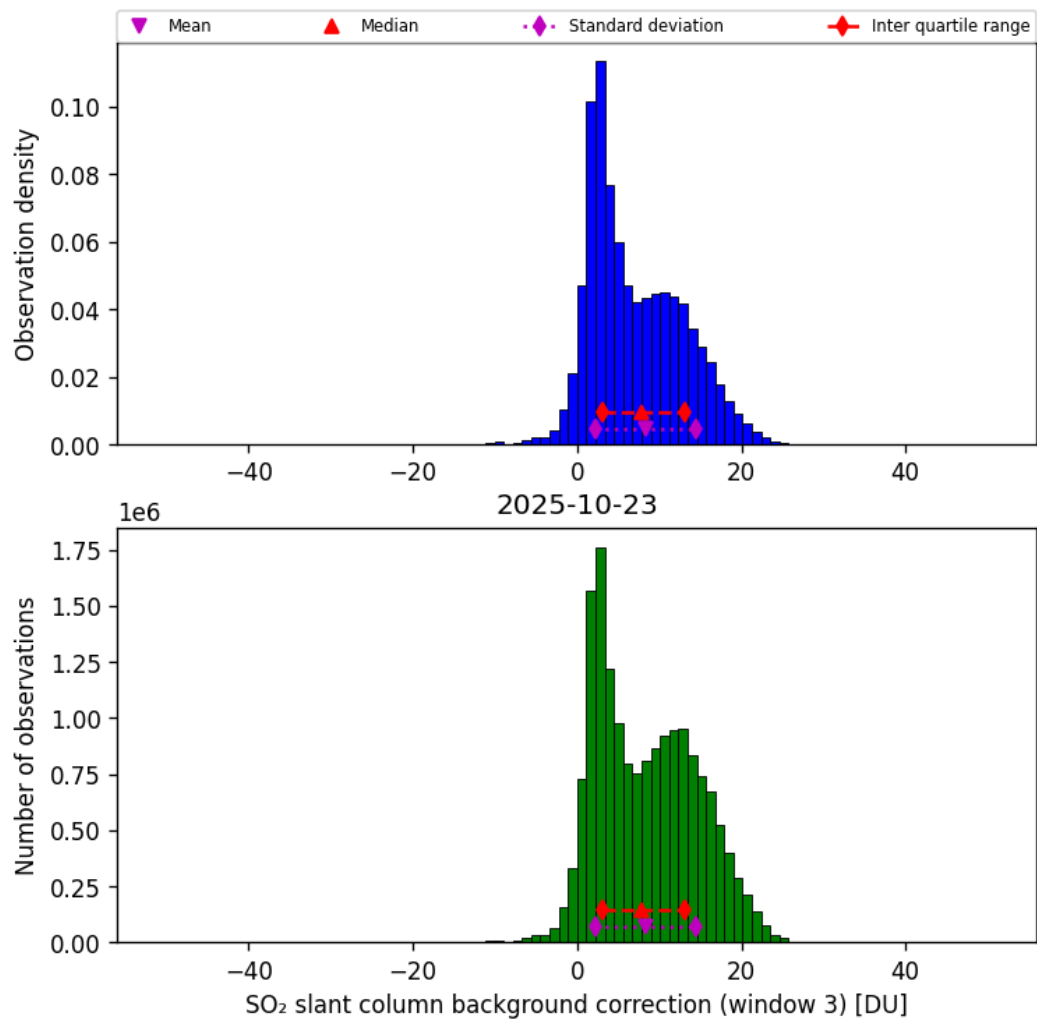


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-10-23 to 2025-10-24

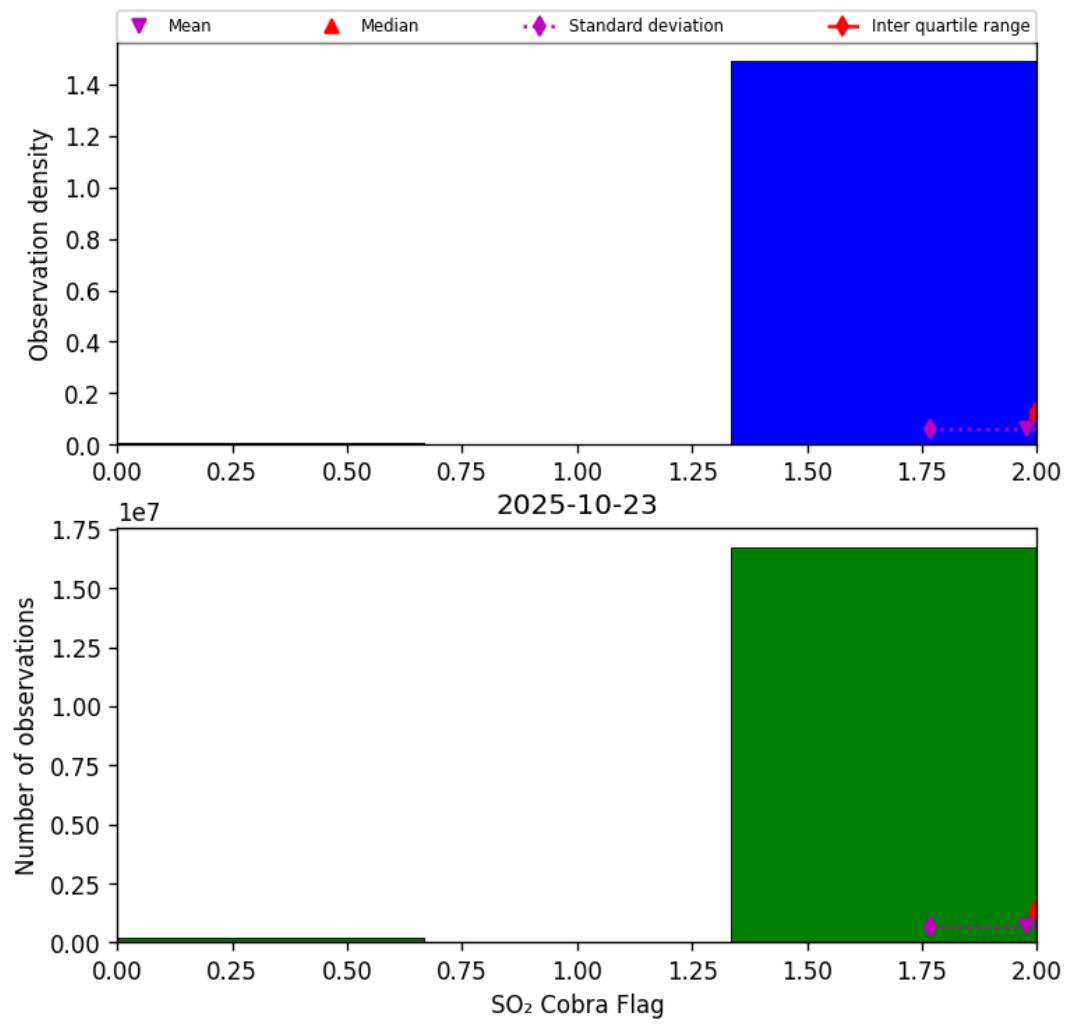


Figure 75: Histogram of "SO₂ Cobra Flag" for 2025-10-23 to 2025-10-24

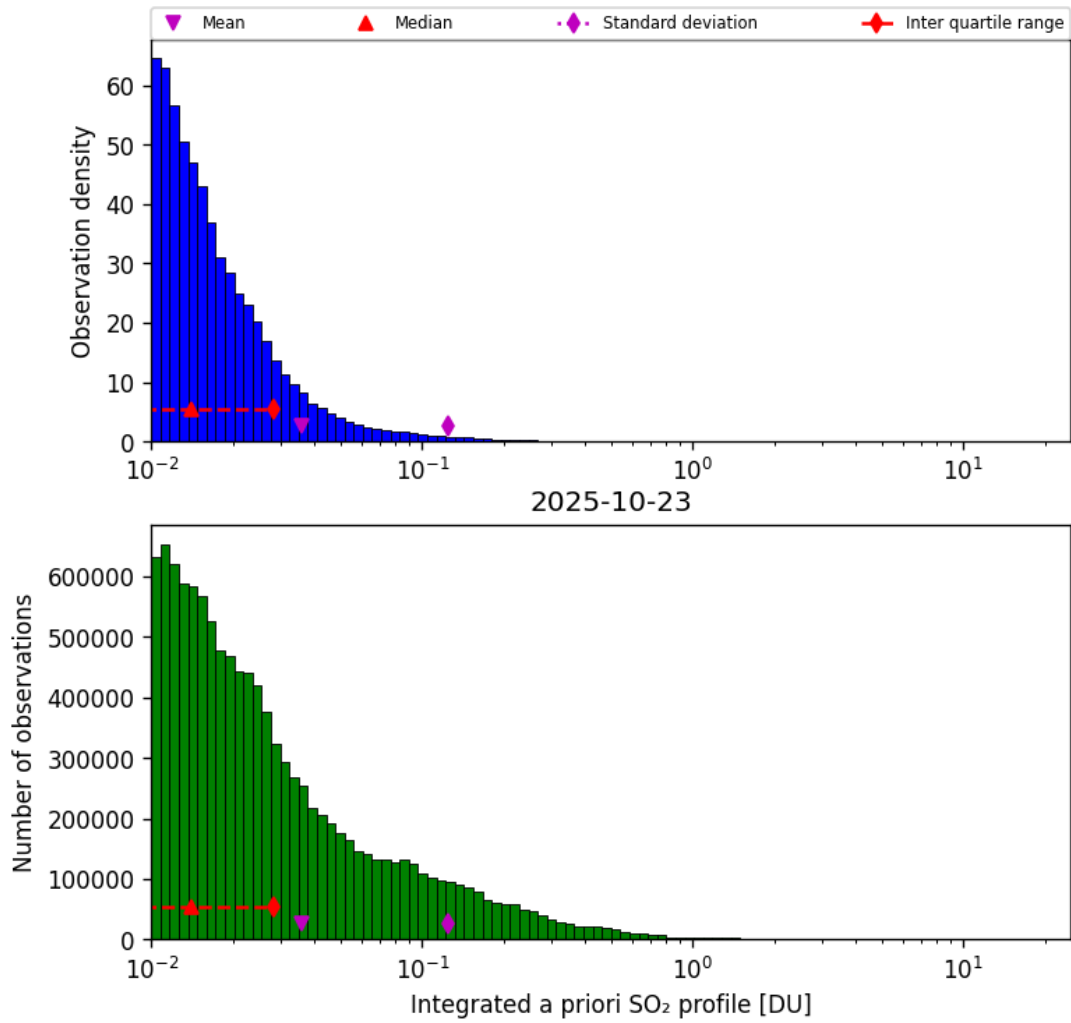


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-10-23 to 2025-10-24

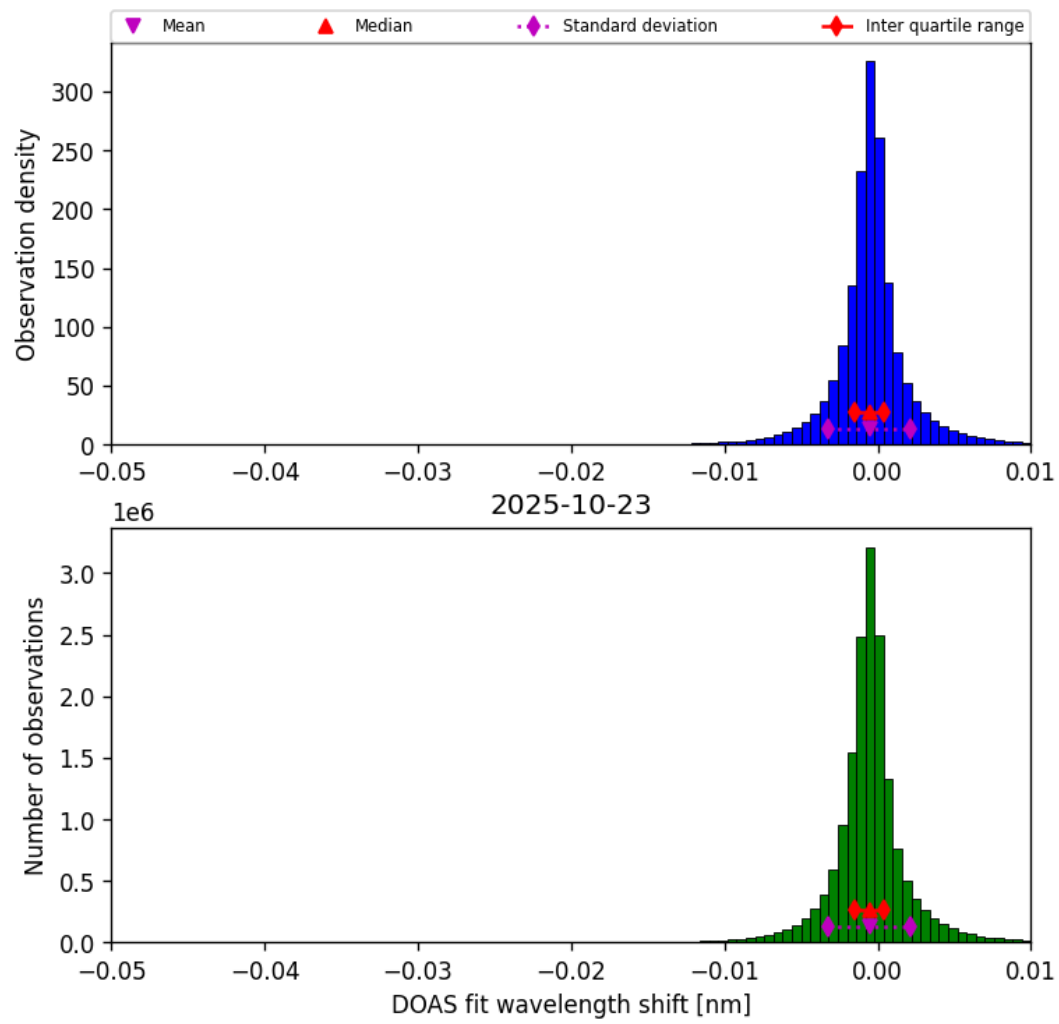


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-10-23 to 2025-10-24

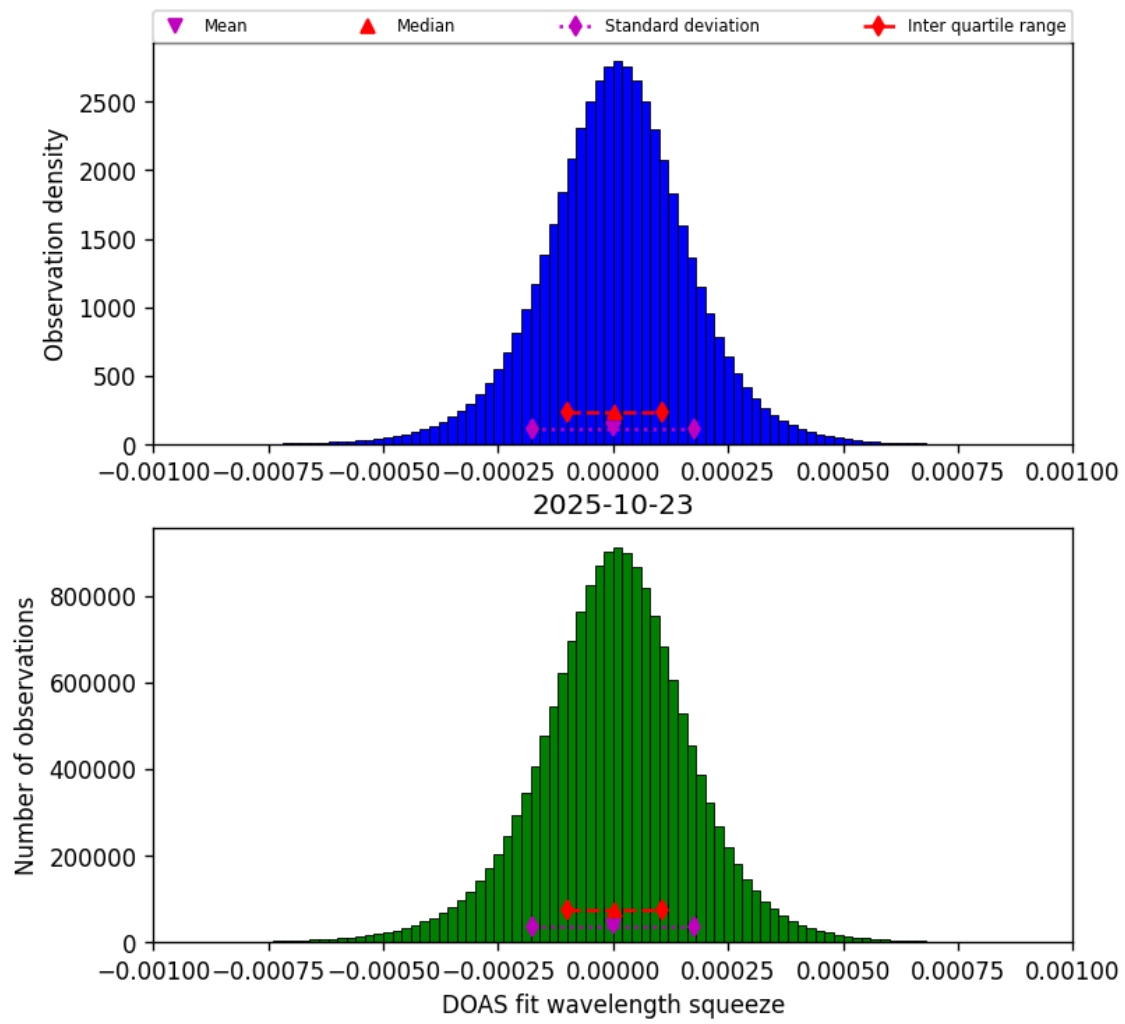


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-10-23 to 2025-10-24

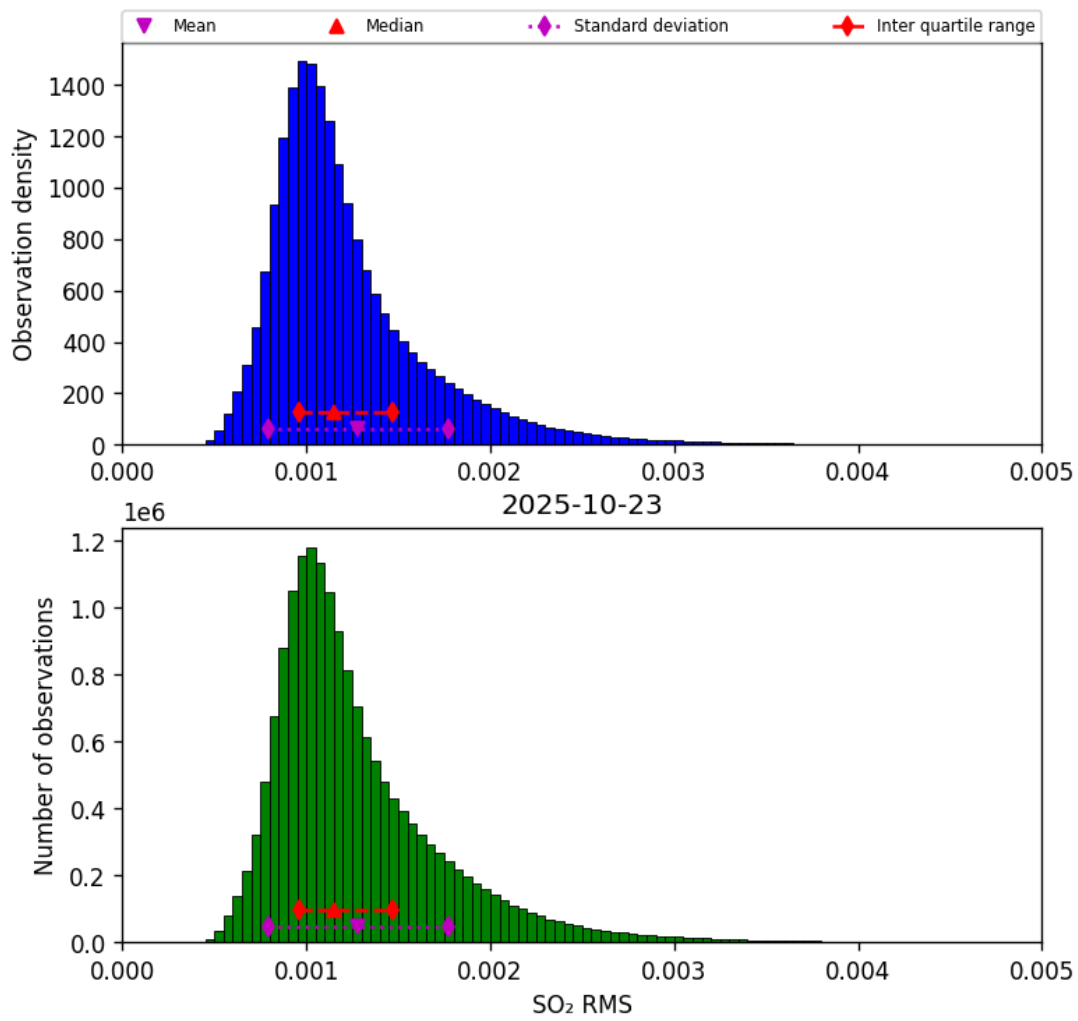


Figure 79: Histogram of “SO₂ RMS” for 2025-10-23 to 2025-10-24

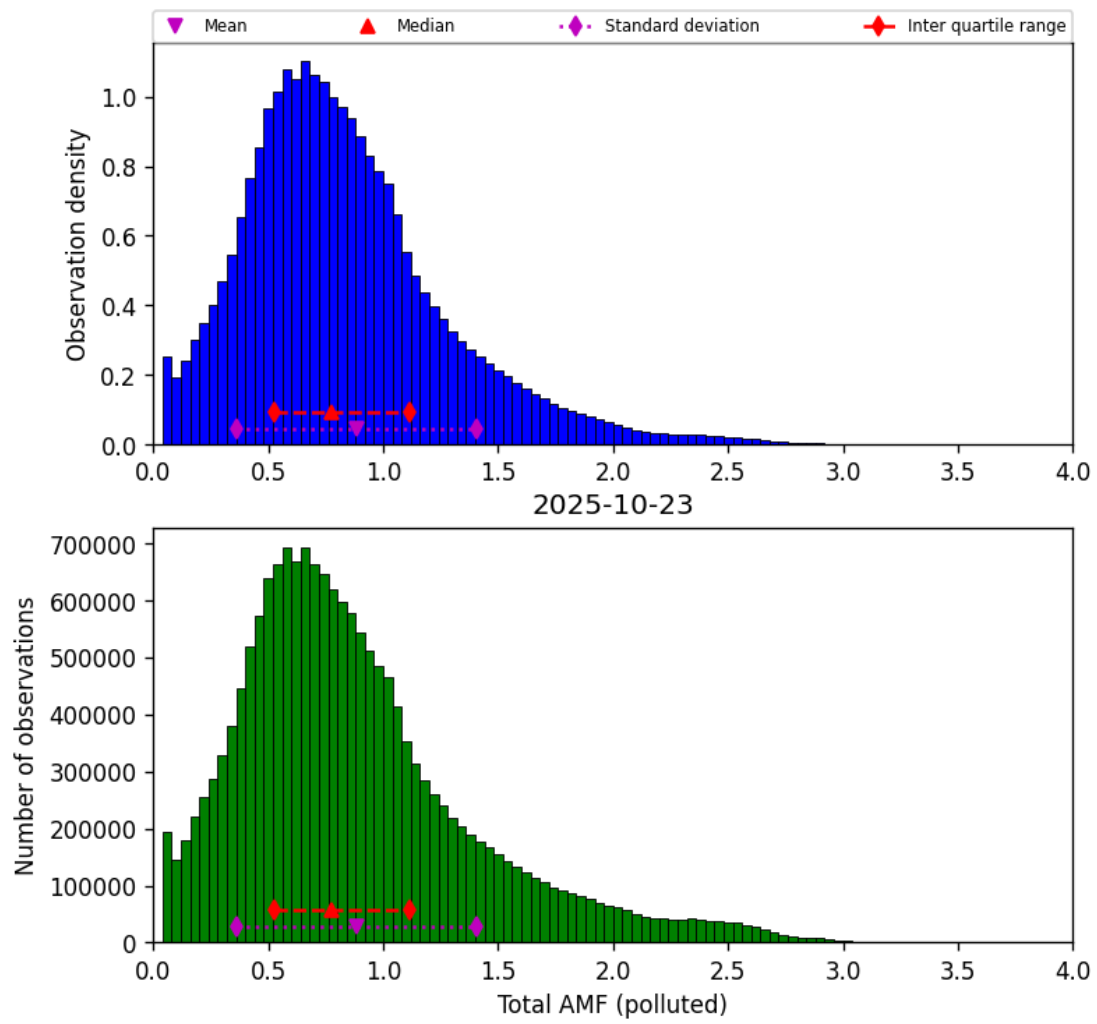


Figure 80: Histogram of “Total AMF (polluted)” for 2025-10-23 to 2025-10-24

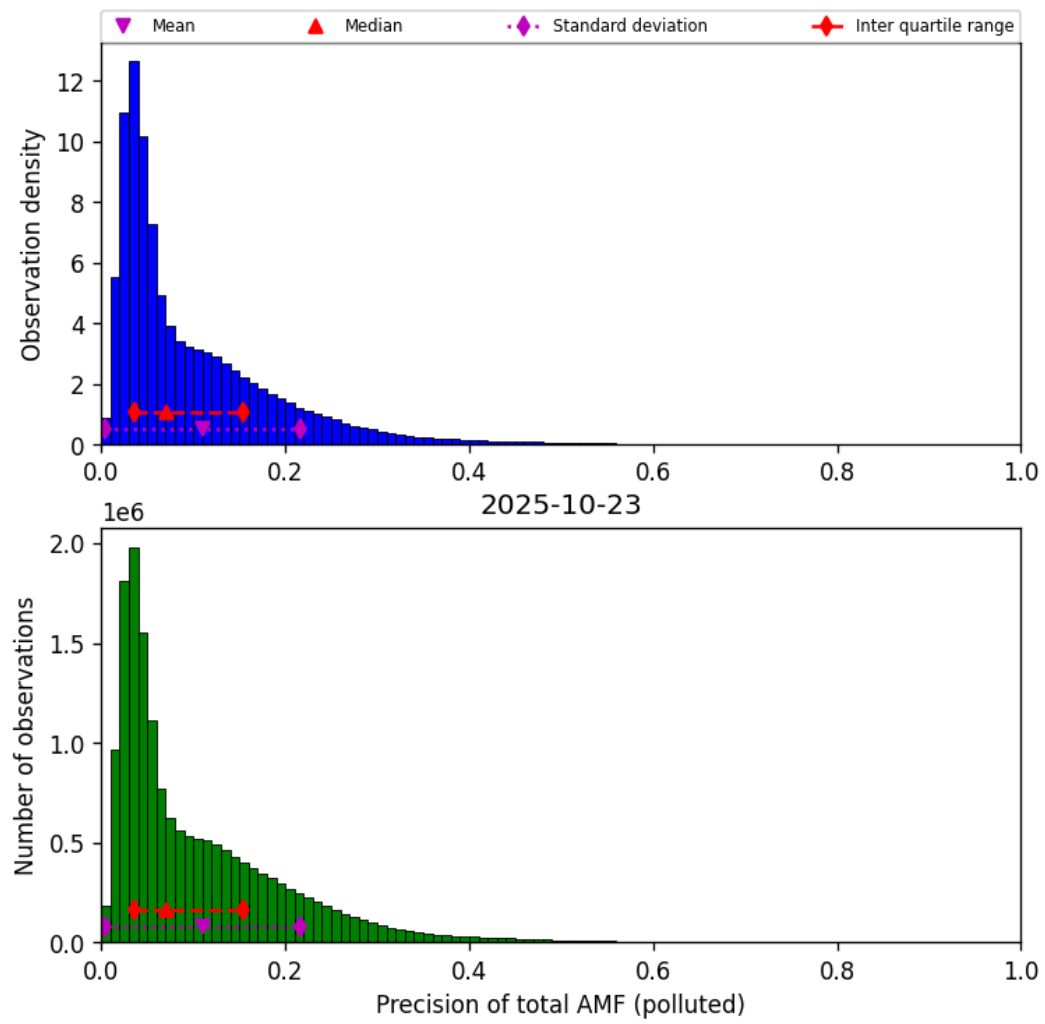


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-10-23 to 2025-10-24

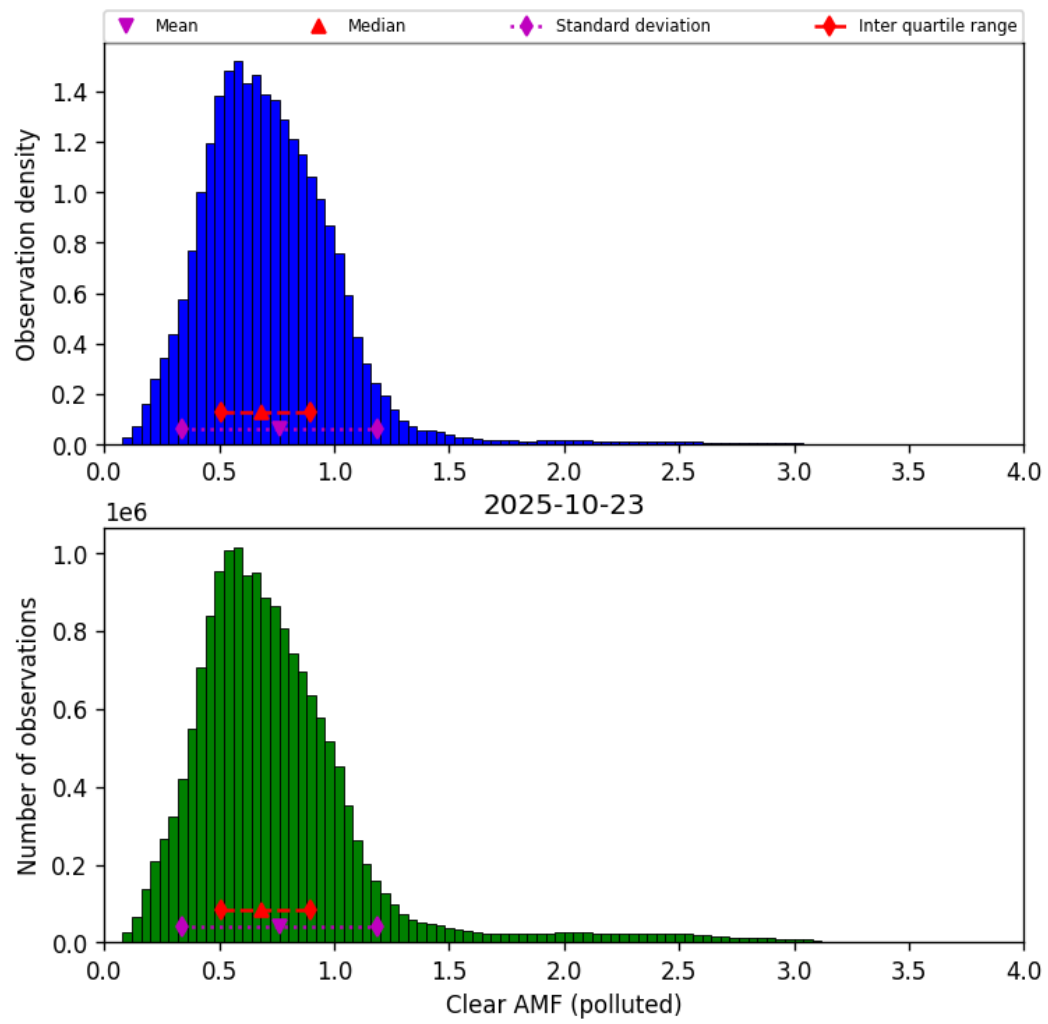


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-10-23 to 2025-10-24

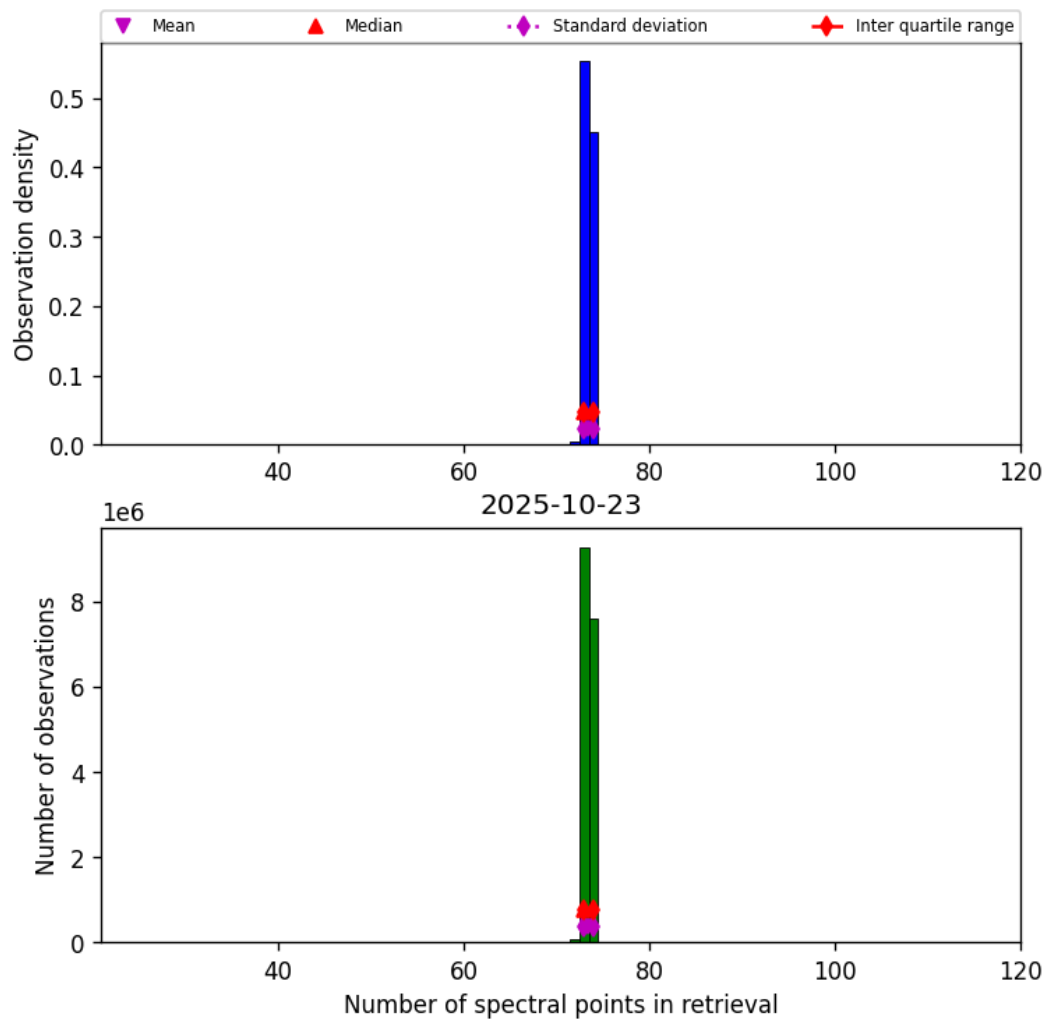


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-10-23 to 2025-10-24

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.

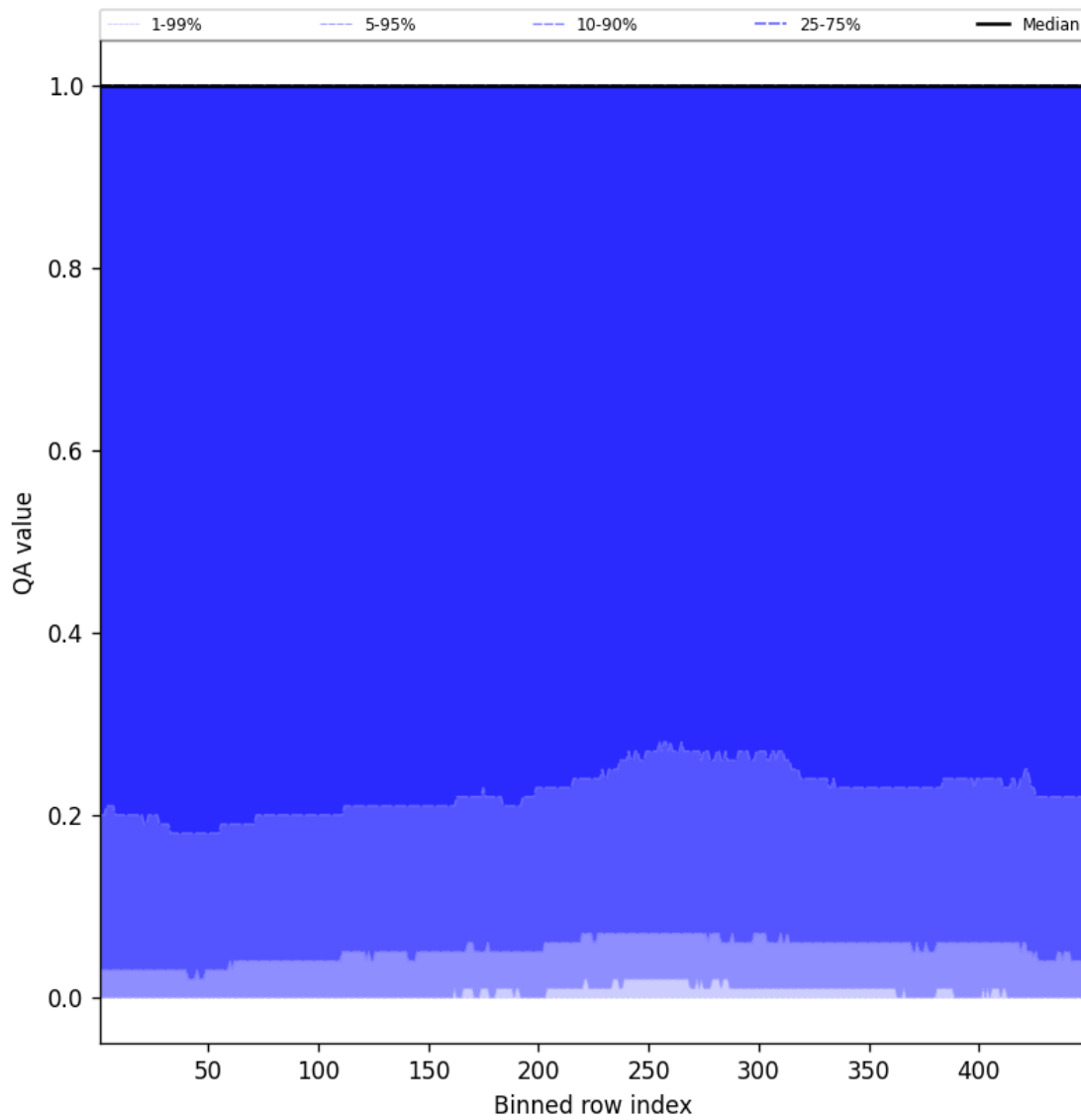


Figure 84: Along track statistics of “QA value” for 2025-10-23 to 2025-10-24

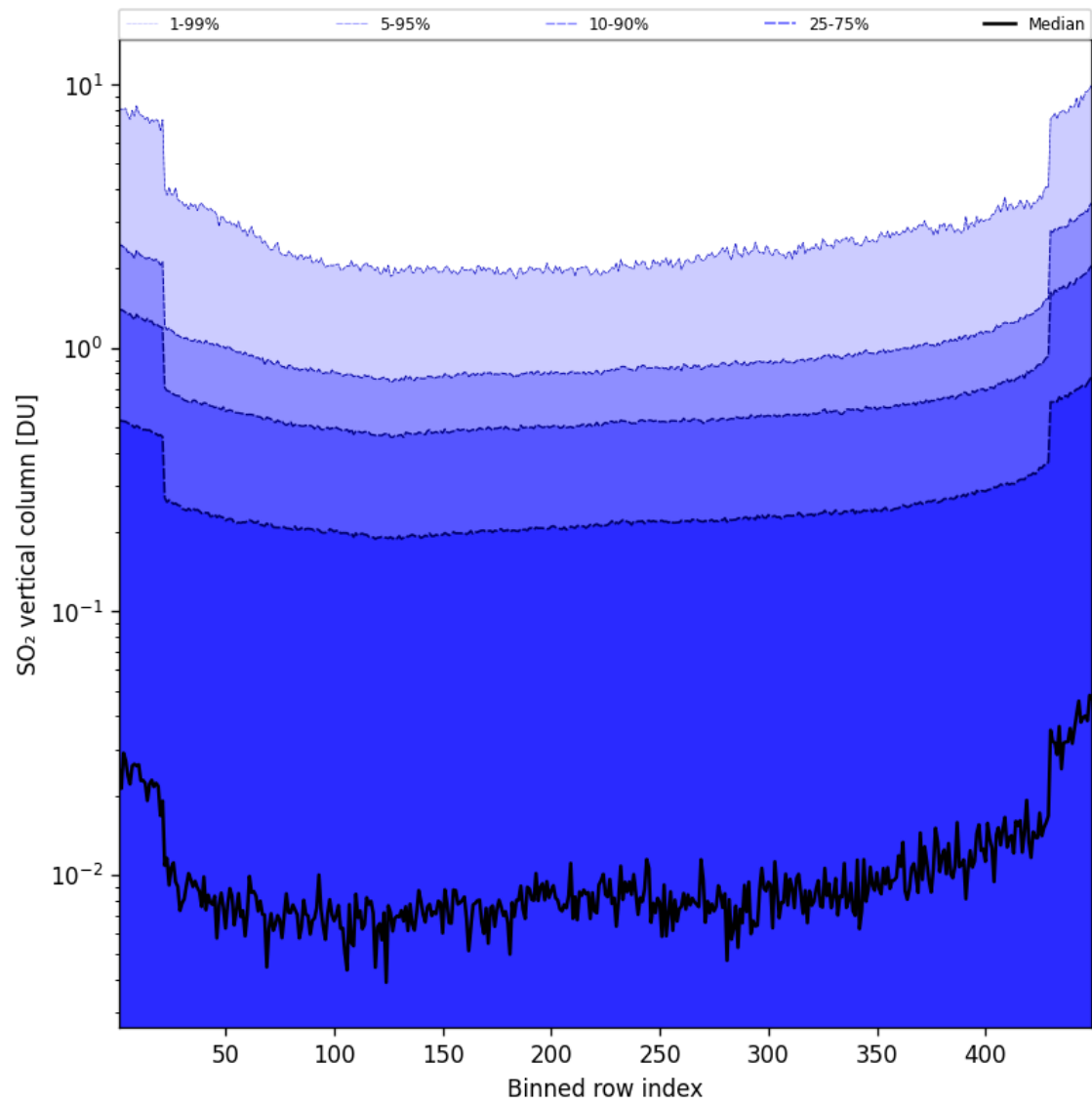


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-10-23 to 2025-10-24

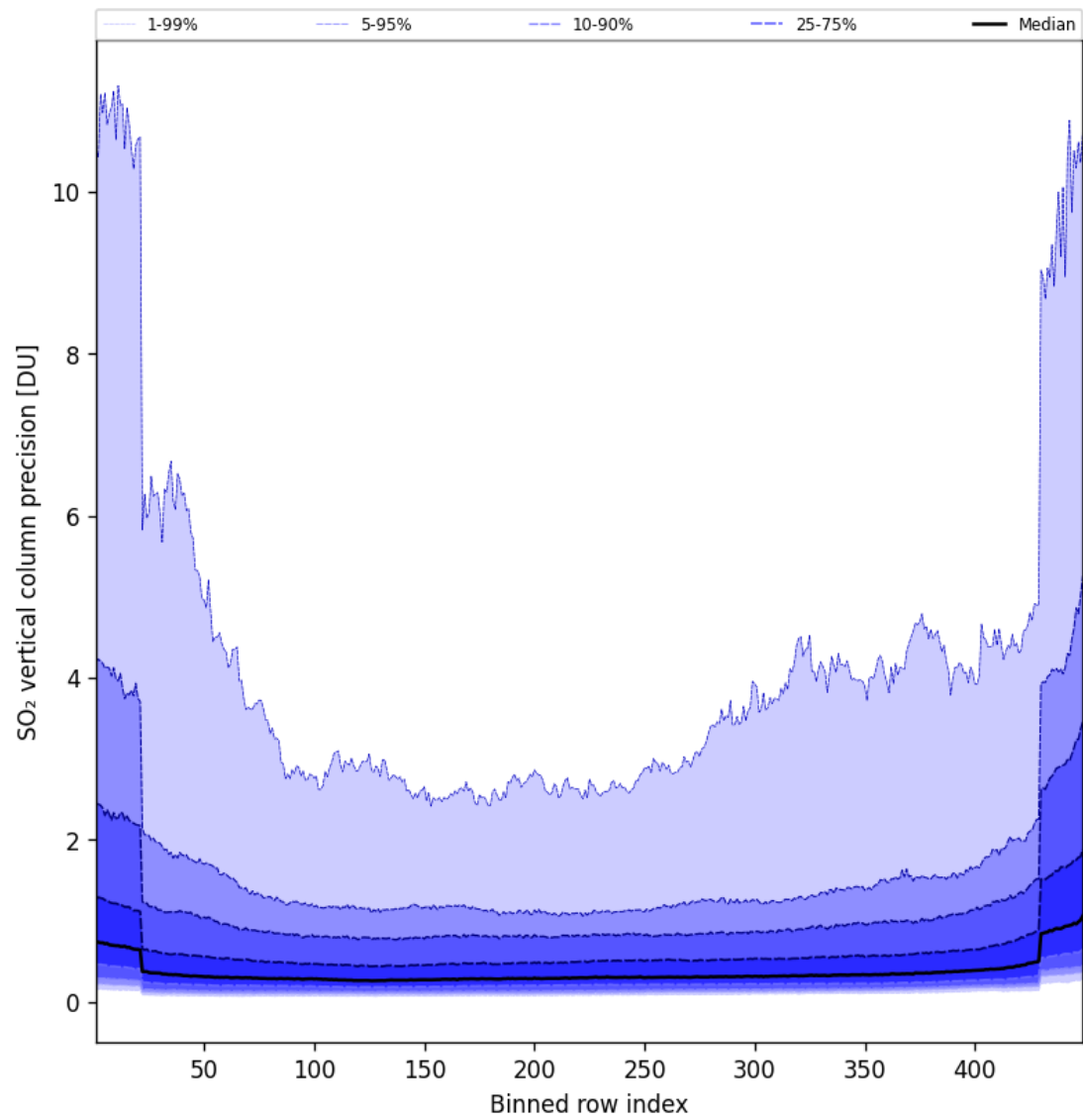


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-10-23 to 2025-10-24

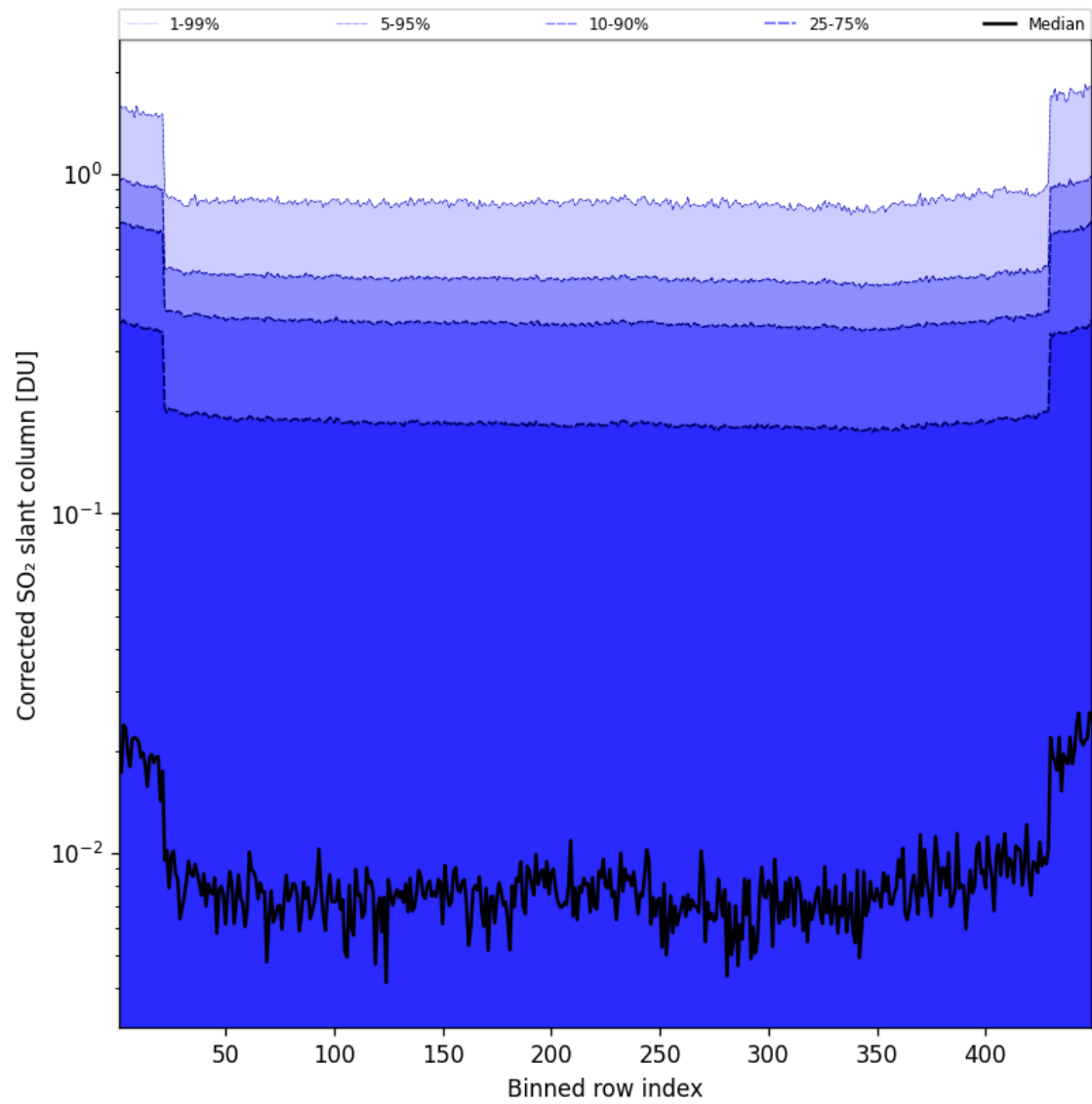


Figure 87: Along track statistics of "Corrected SO₂ slant column" for 2025-10-23 to 2025-10-24

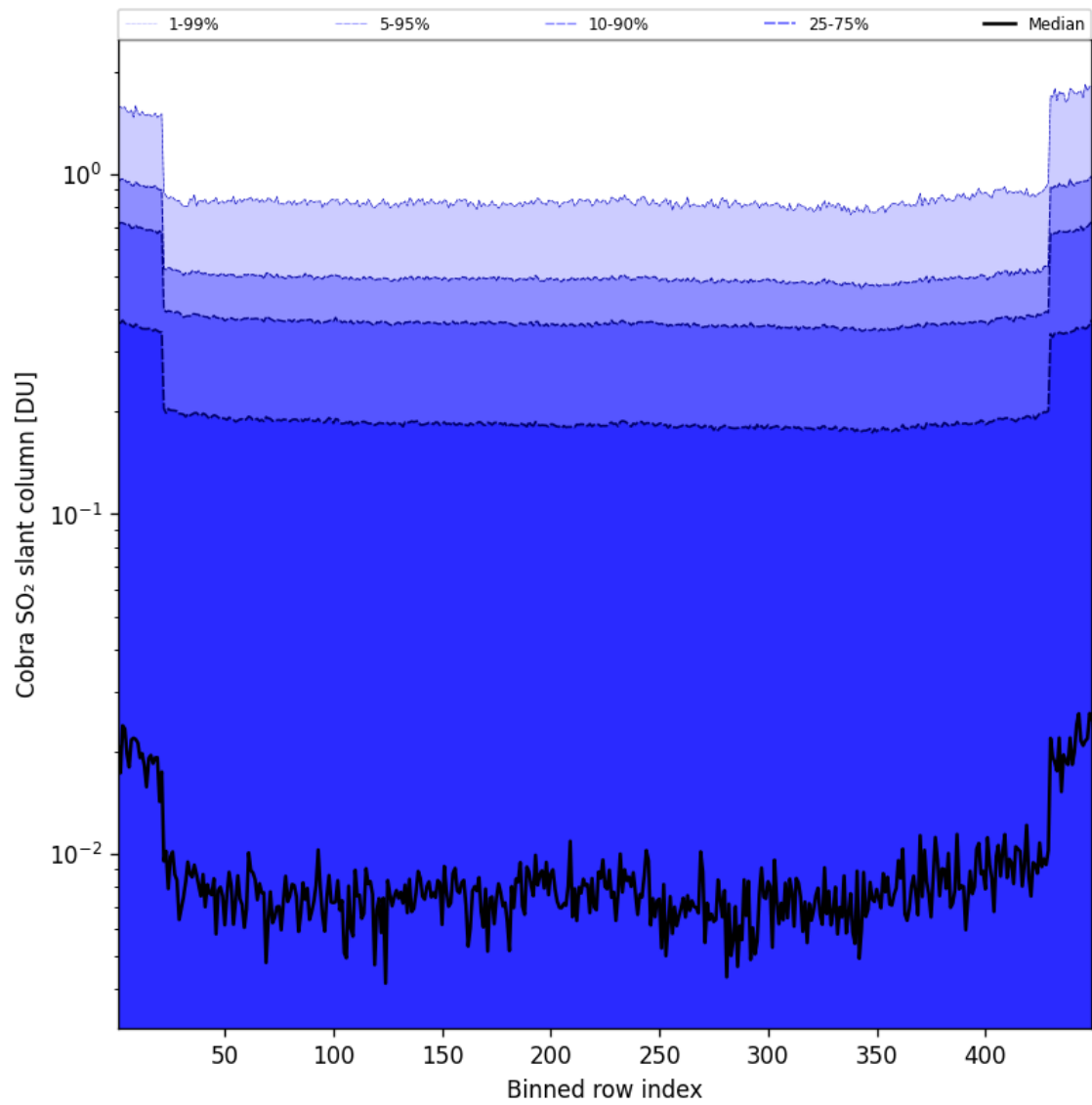


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-10-23 to 2025-10-24

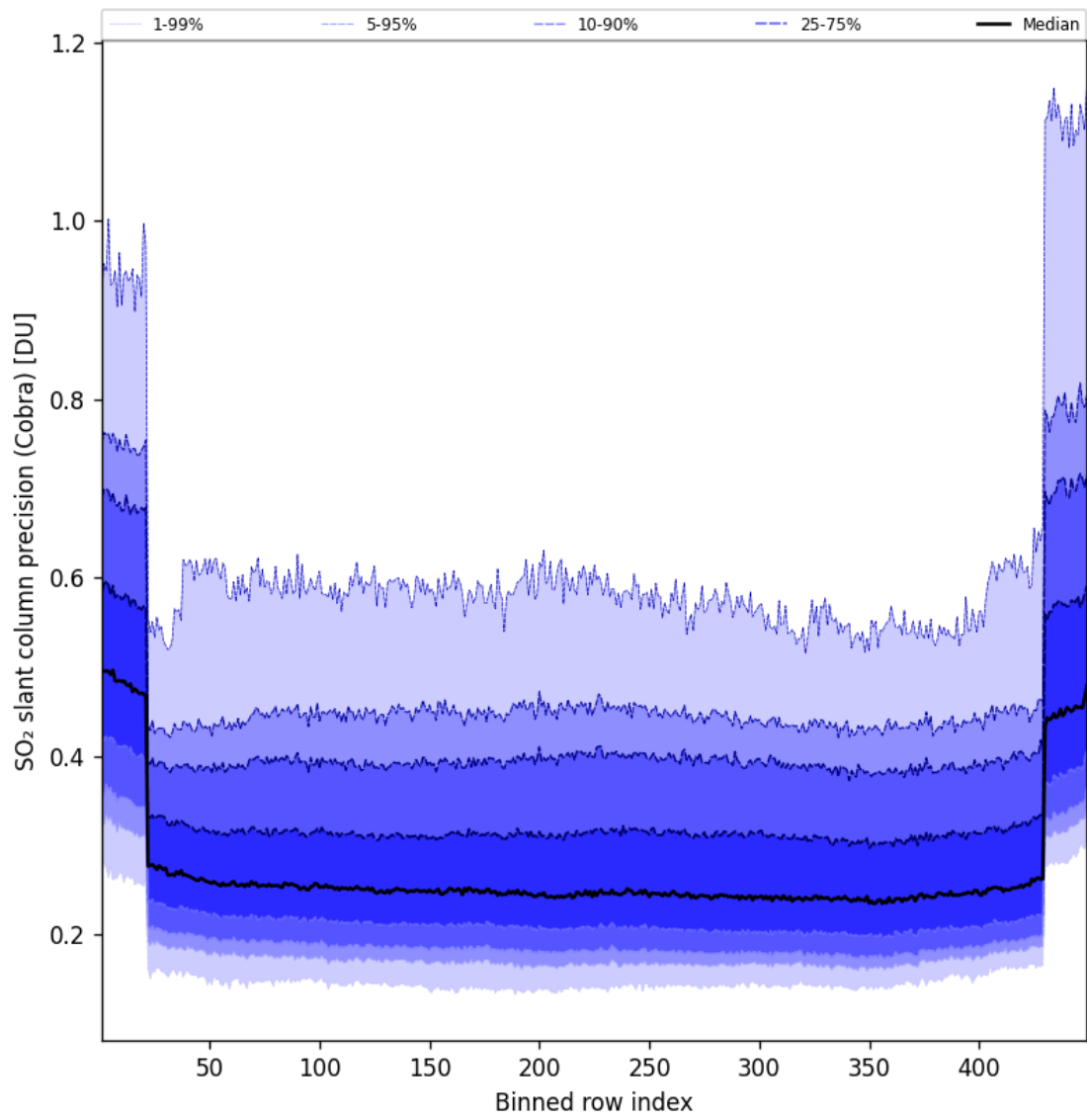


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-10-23 to 2025-10-24

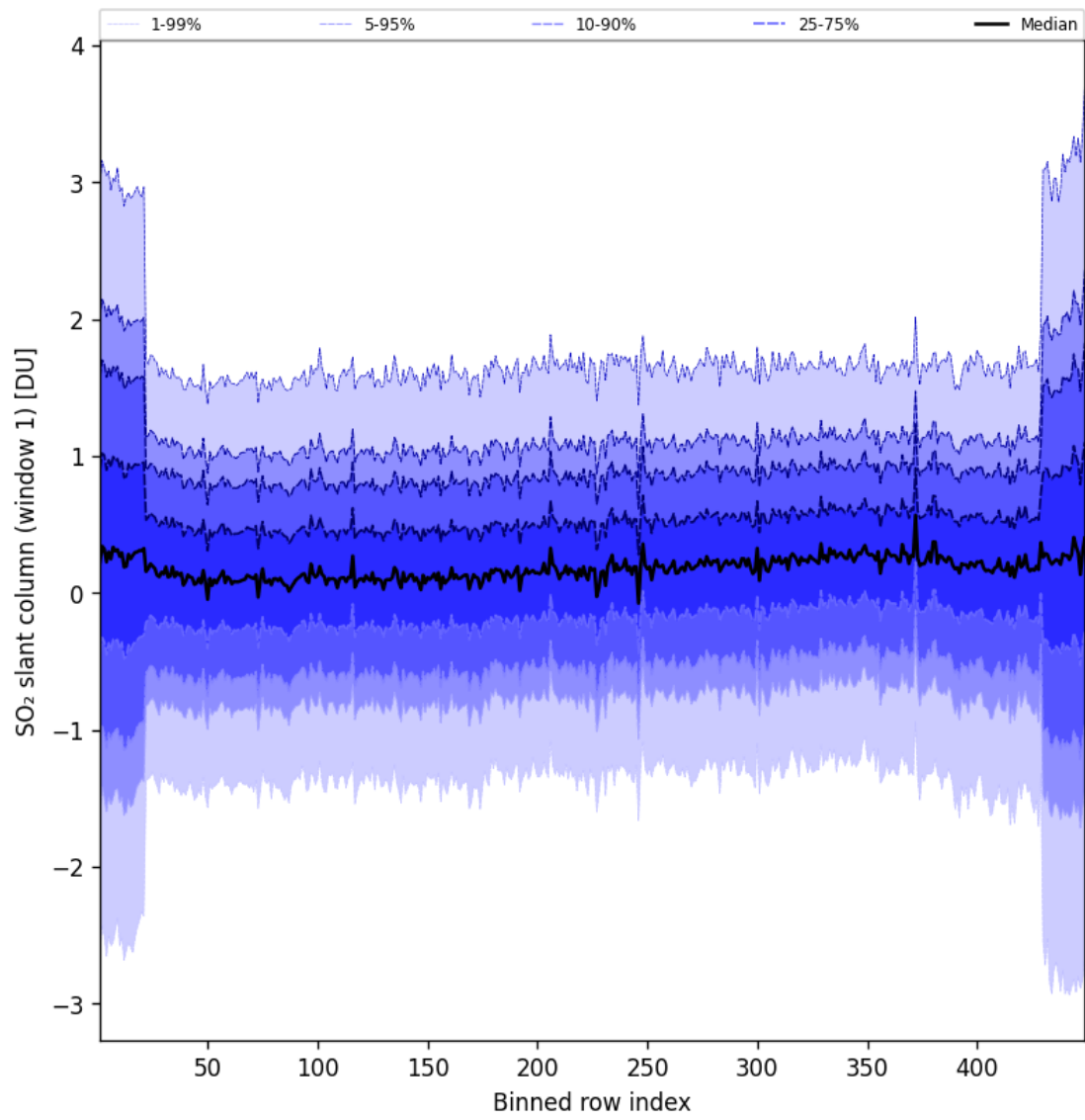


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-10-23 to 2025-10-24

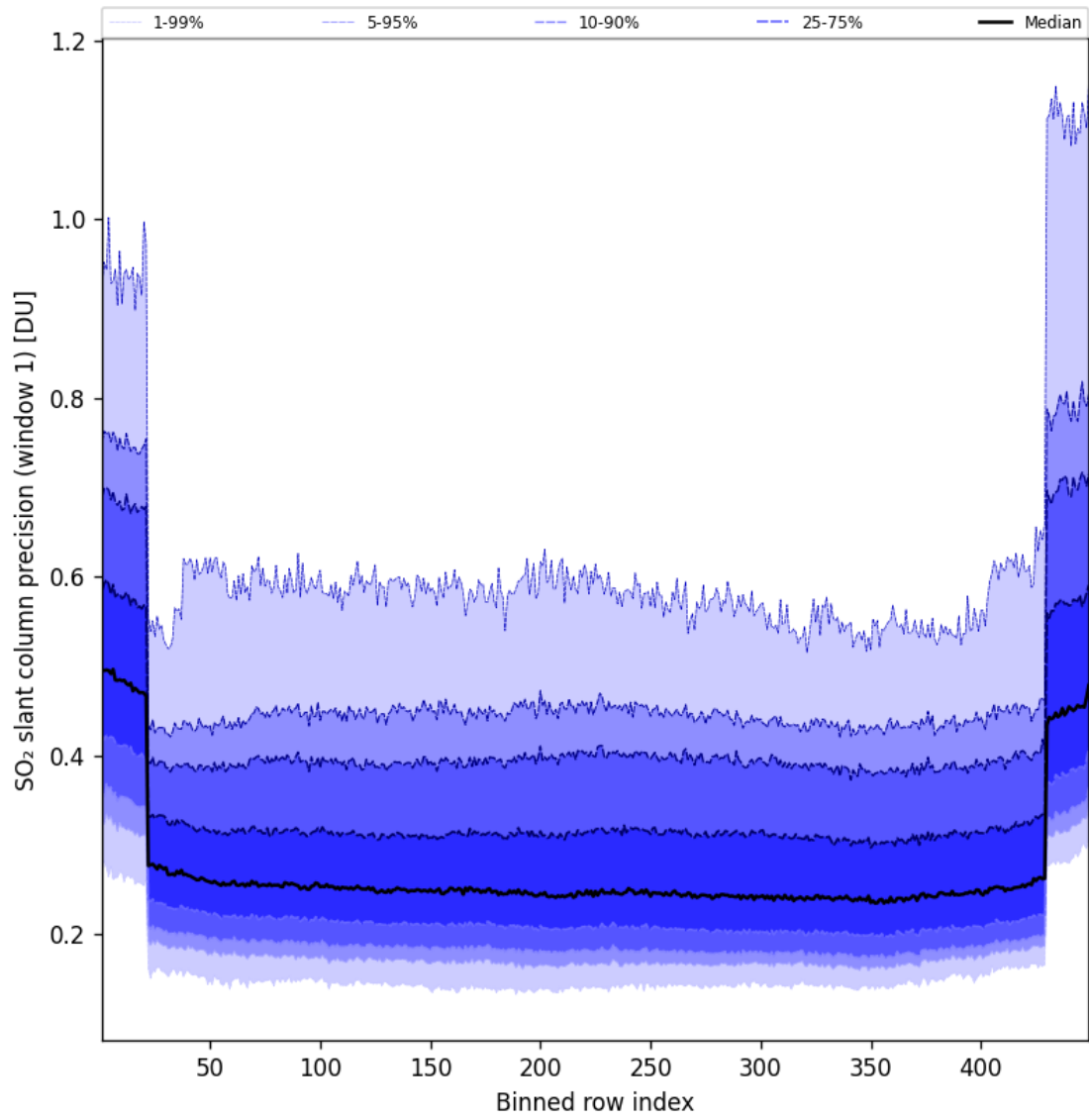


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-10-23 to 2025-10-24

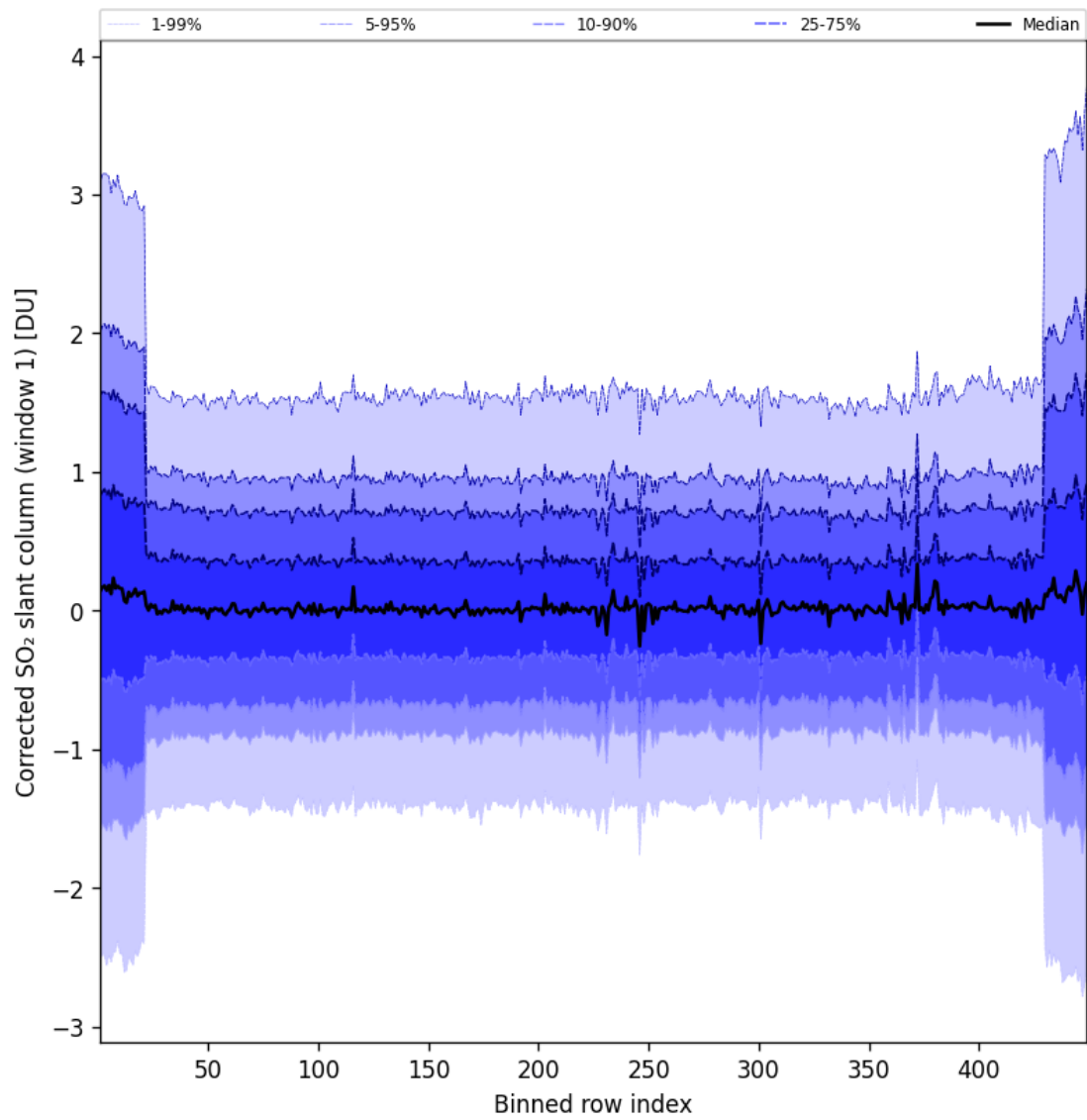


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-10-23 to 2025-10-24

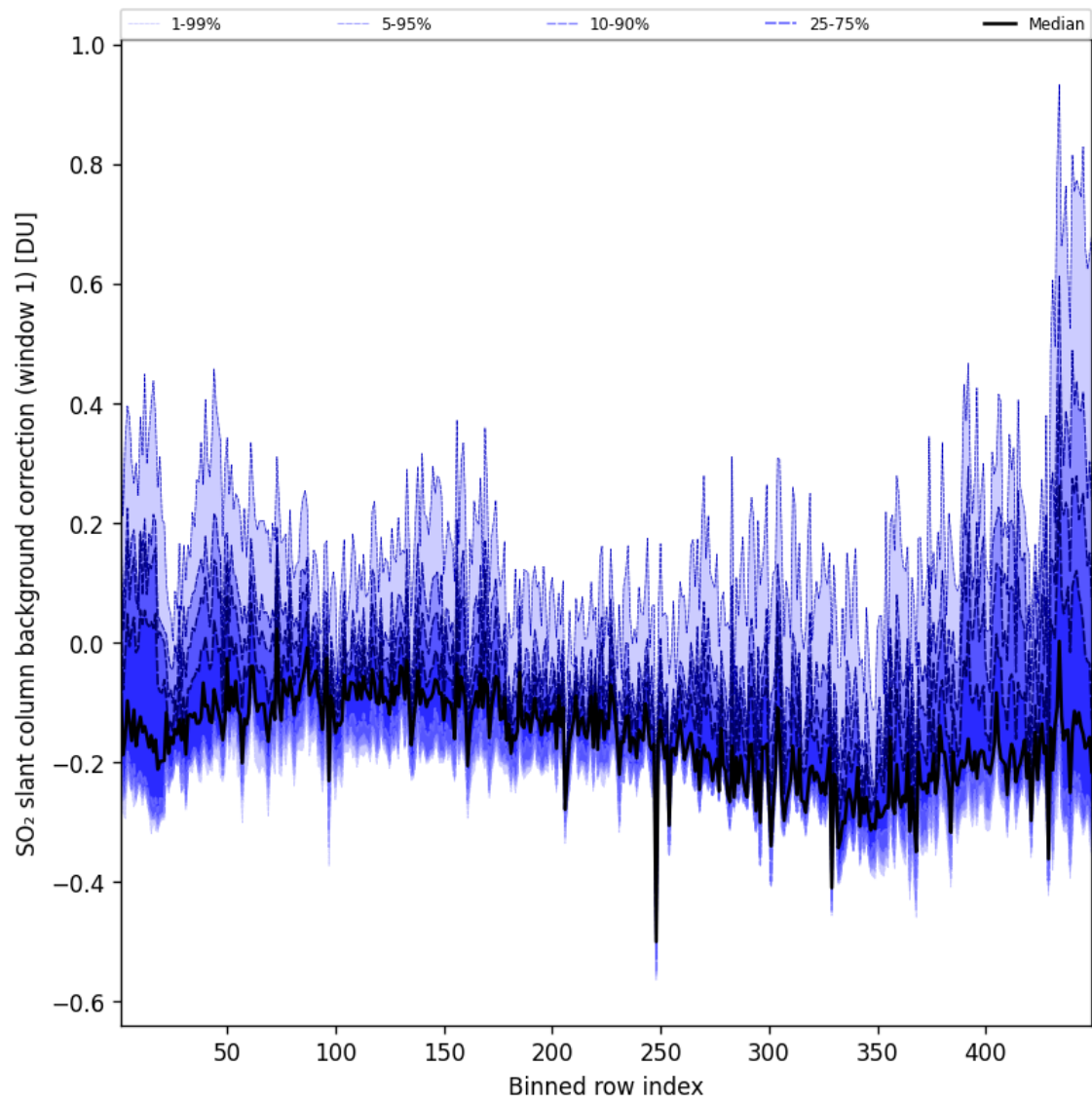


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-10-23 to 2025-10-24

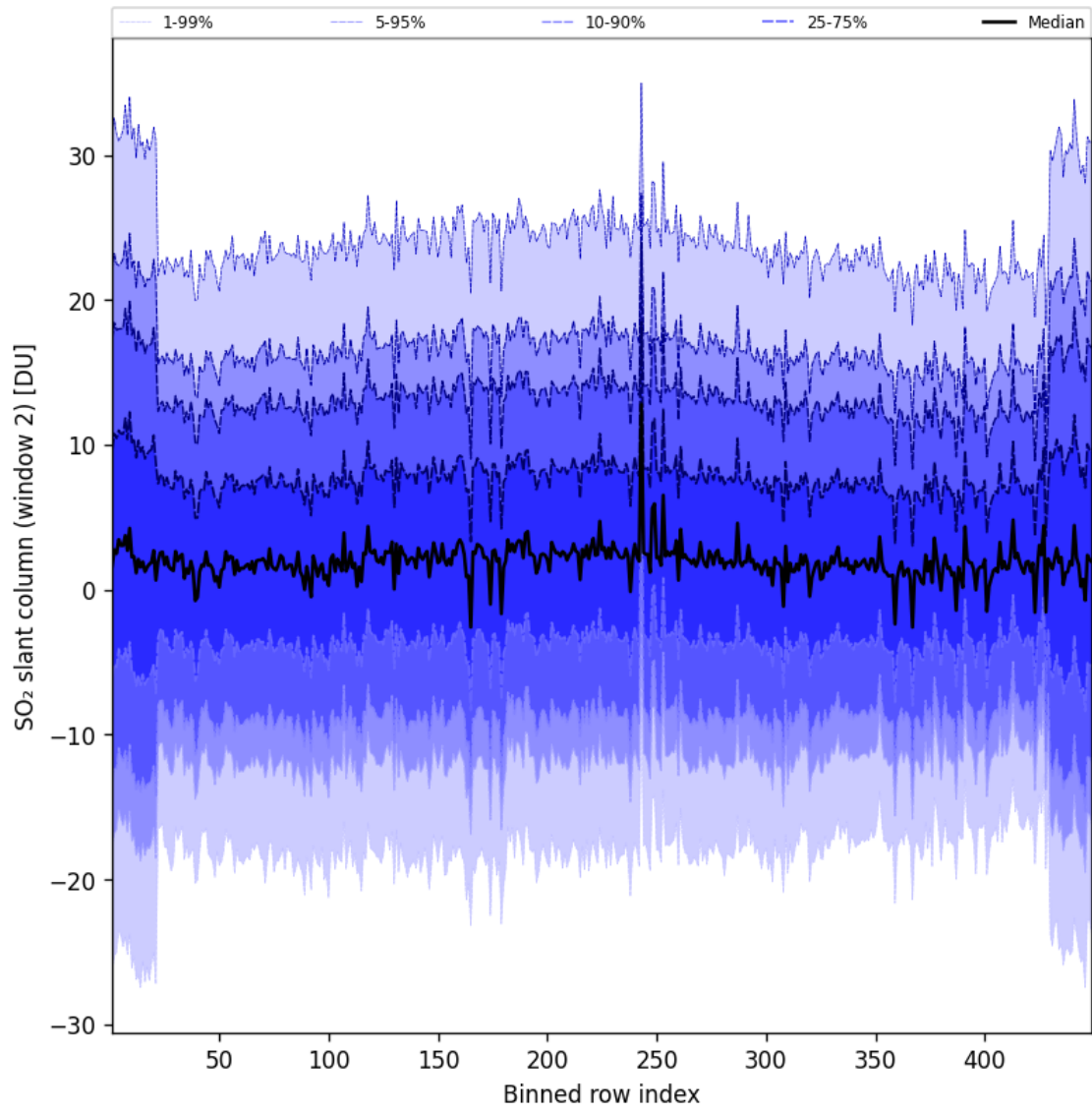


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-10-23 to 2025-10-24

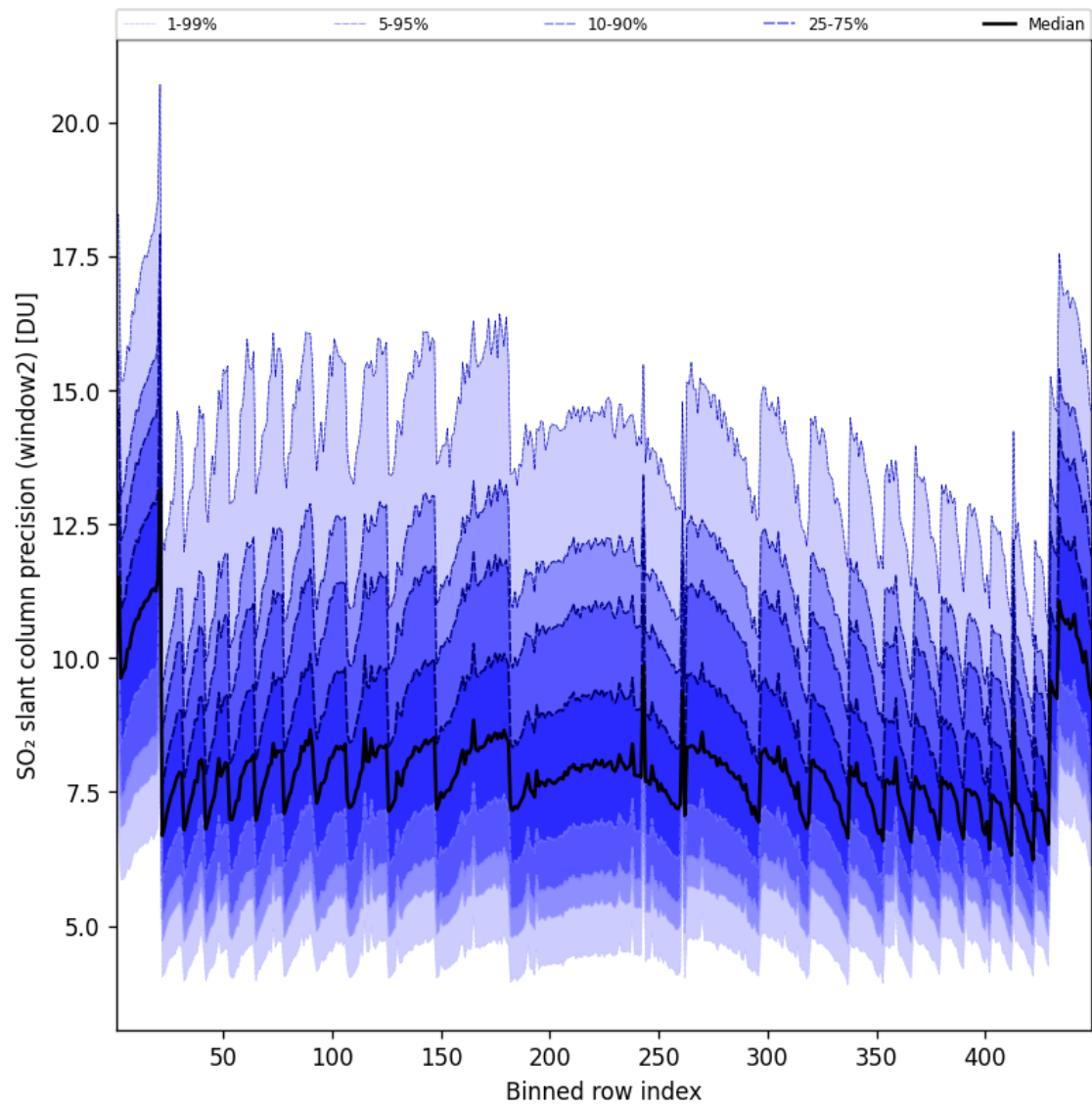


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-10-23 to 2025-10-24

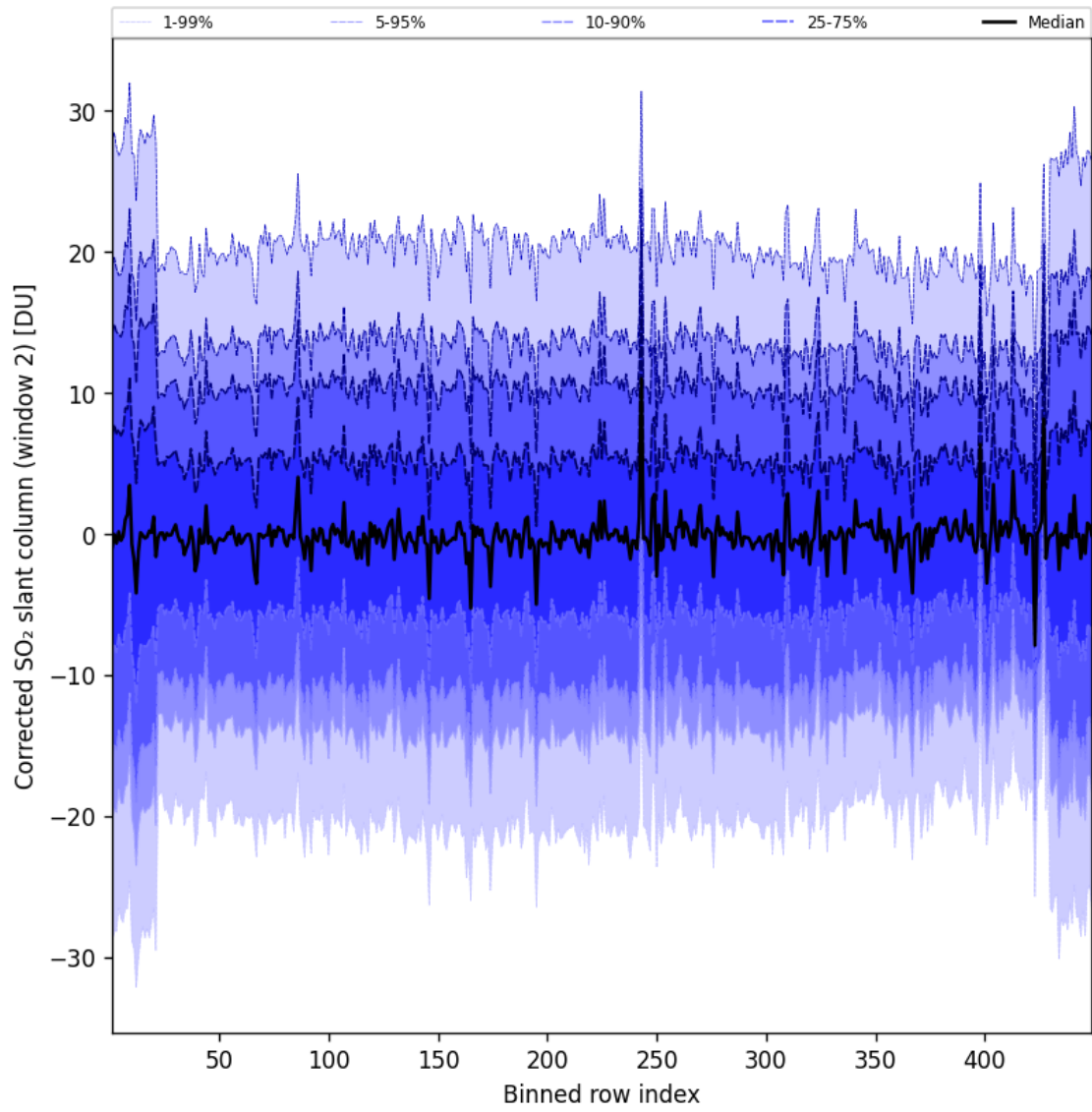


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-10-23 to 2025-10-24

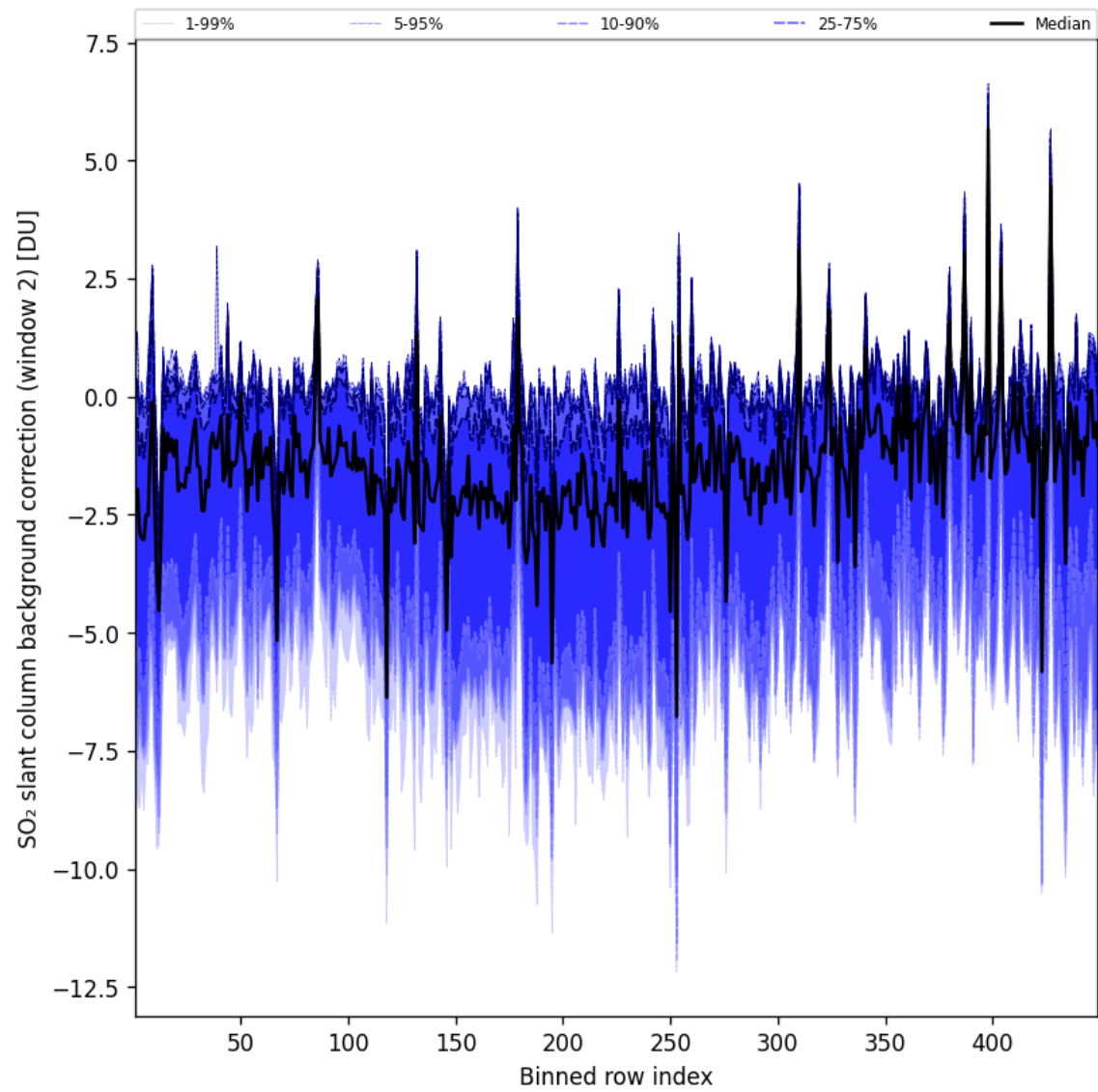


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-10-23 to 2025-10-24

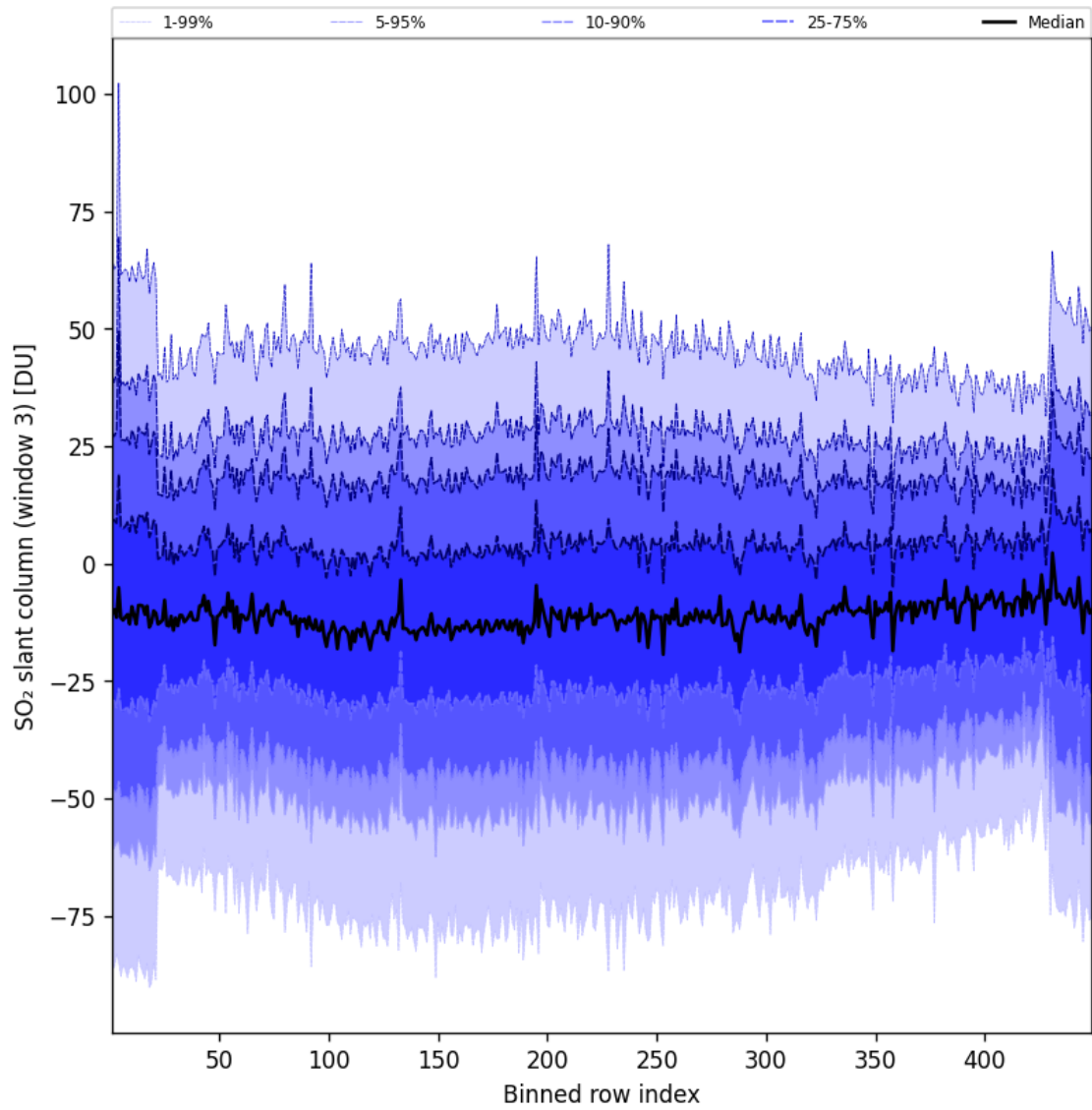


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-10-23 to 2025-10-24

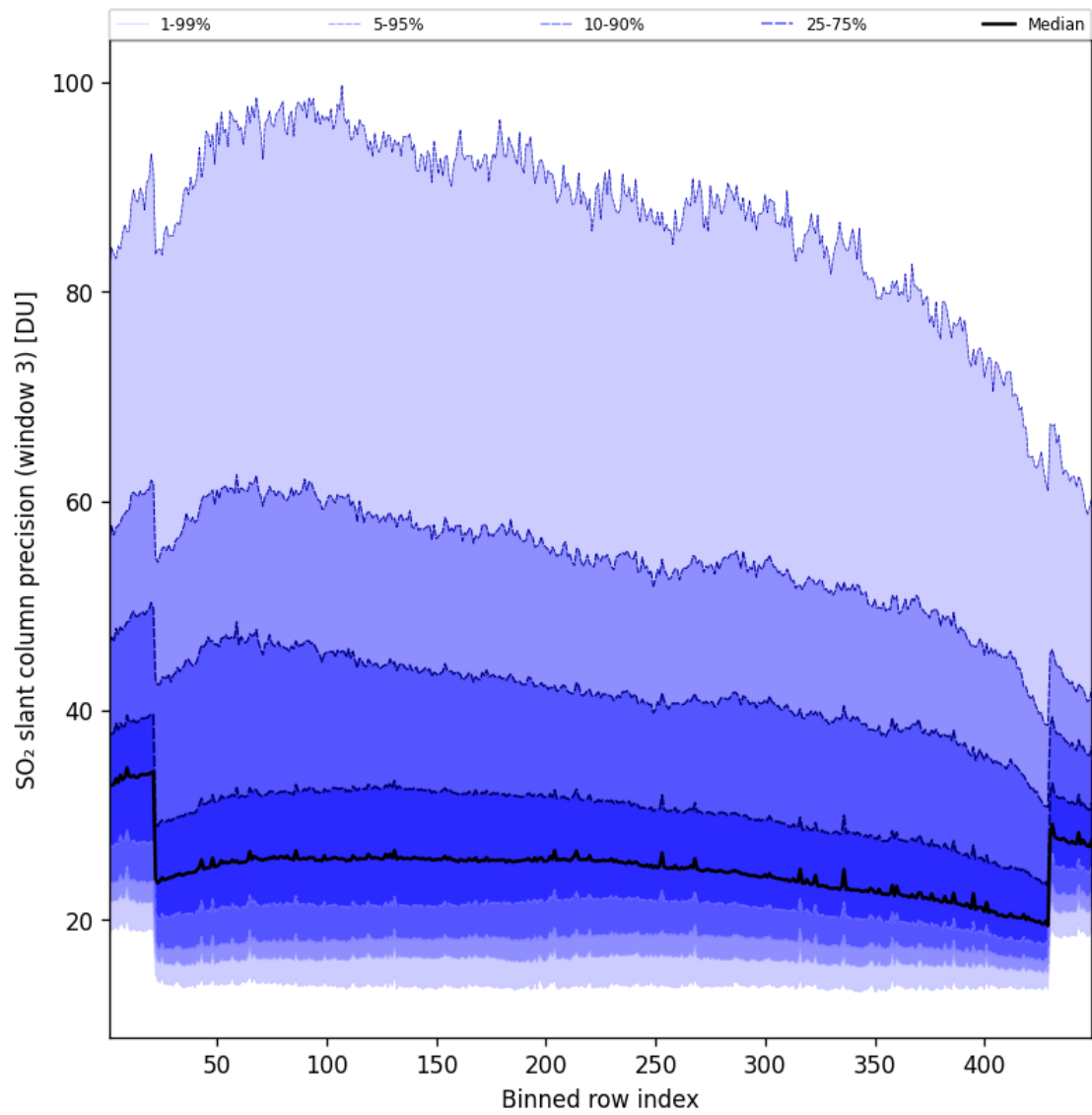


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-10-23 to 2025-10-24

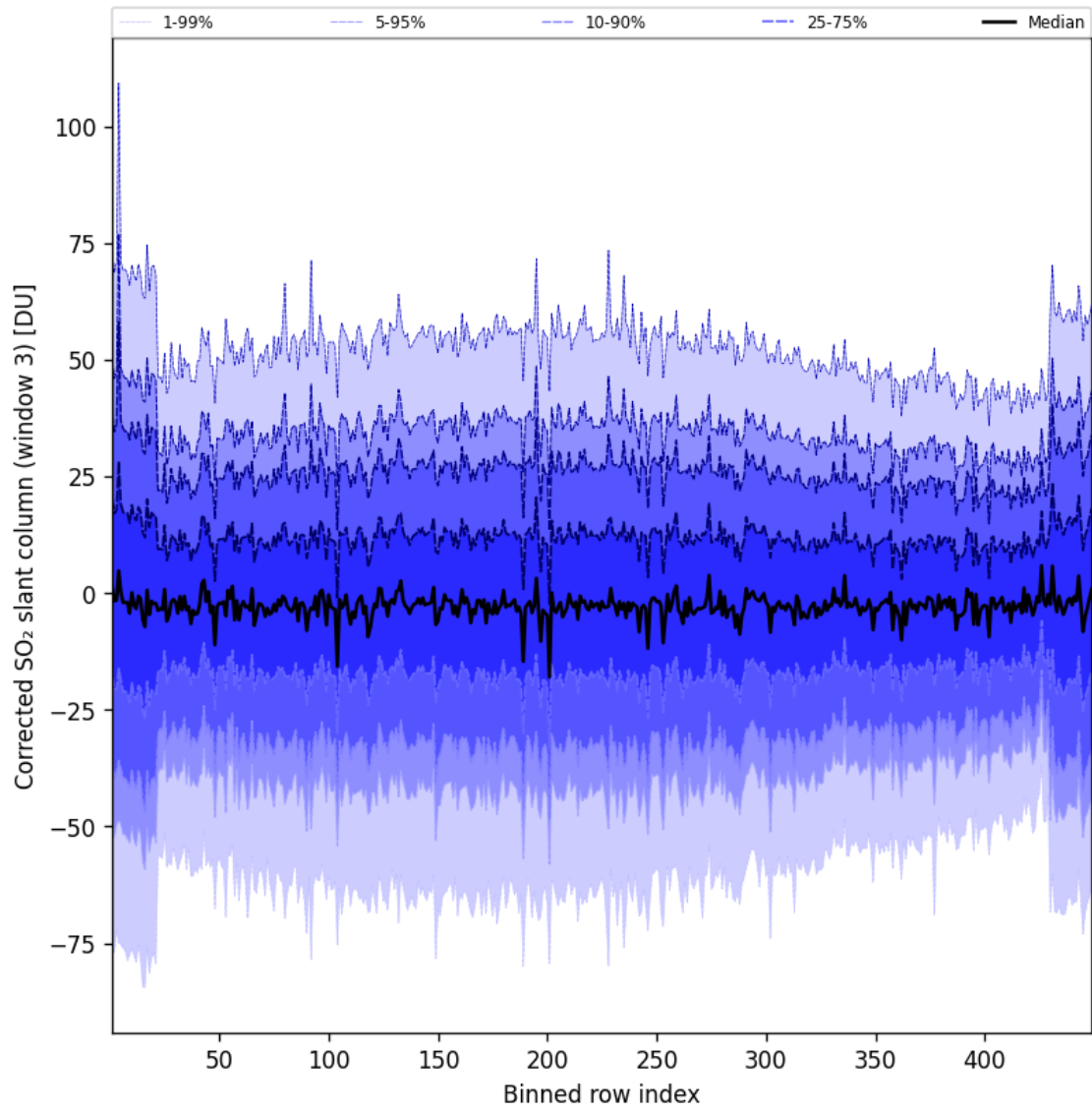


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-10-23 to 2025-10-24

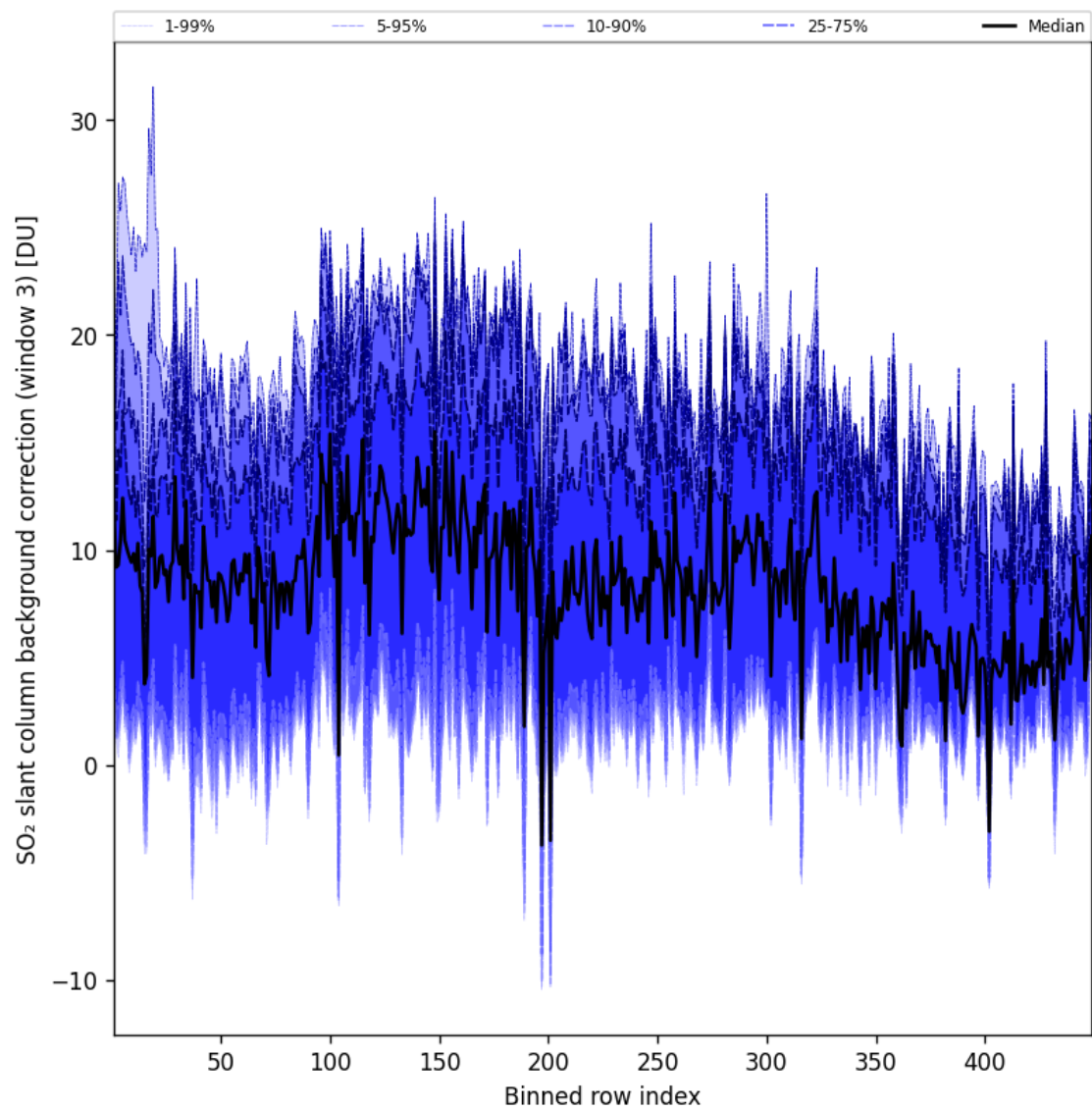


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-10-23 to 2025-10-24

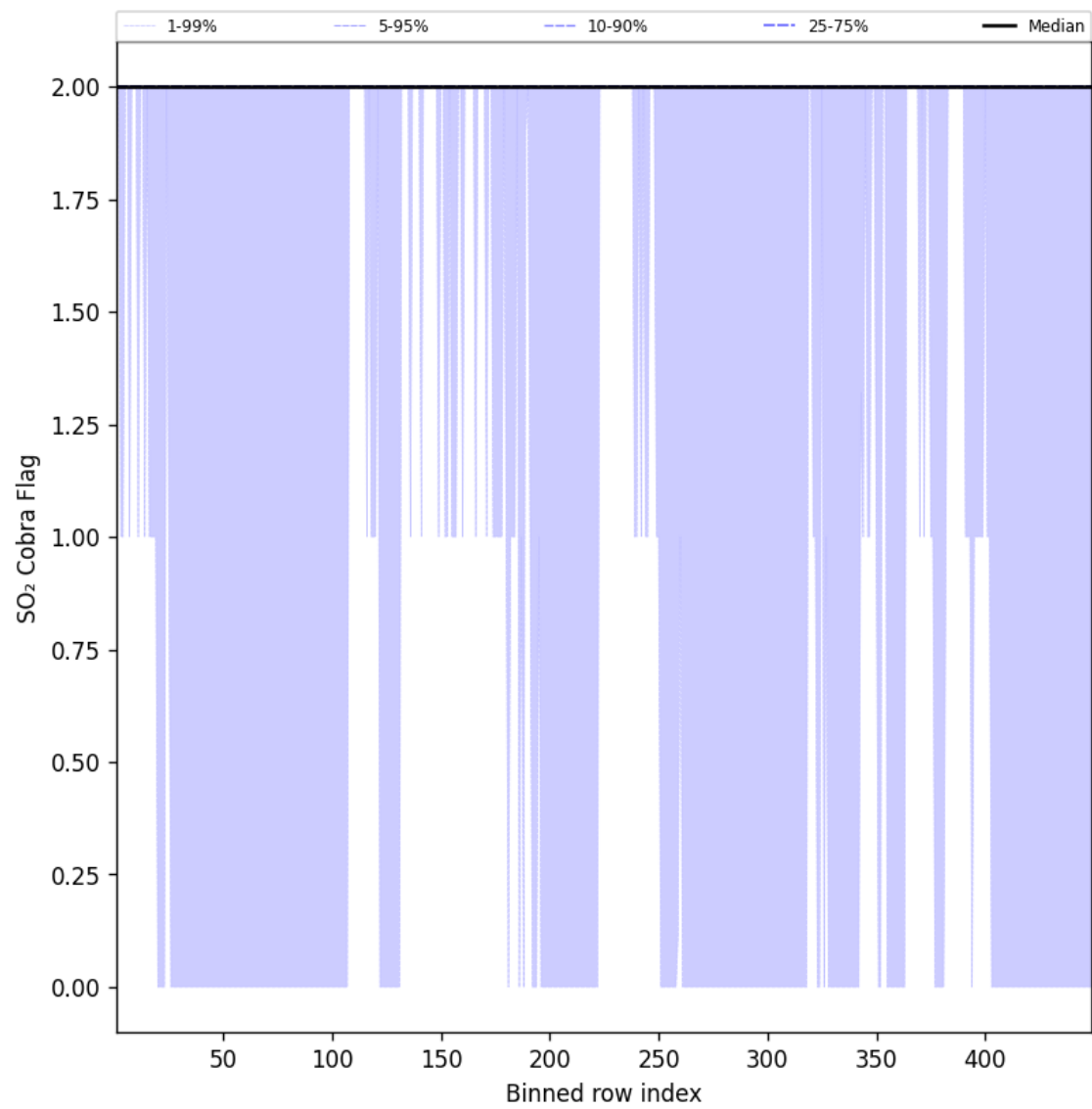


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-10-23 to 2025-10-24

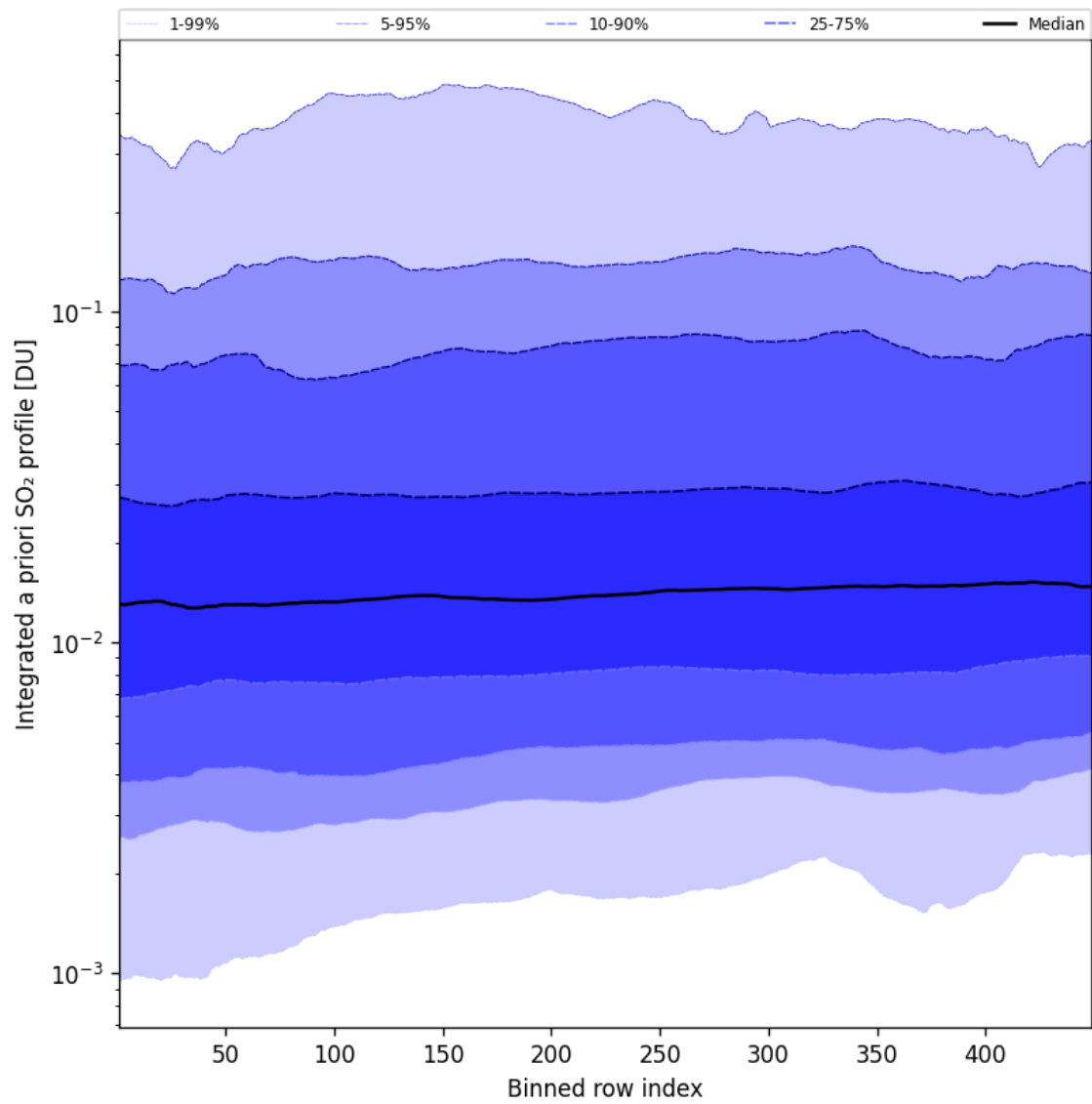


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-10-23 to 2025-10-24

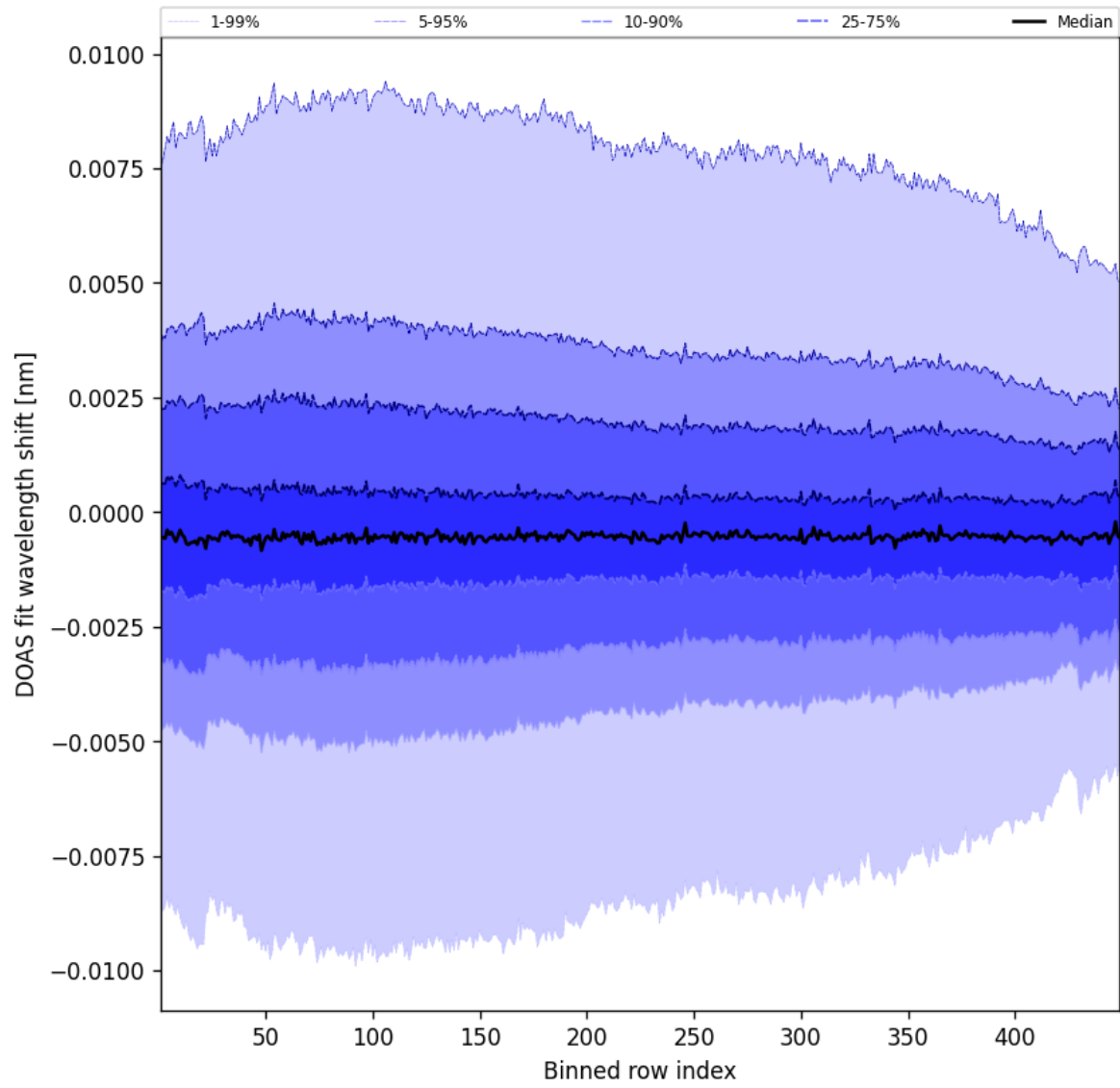


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-10-23 to 2025-10-24

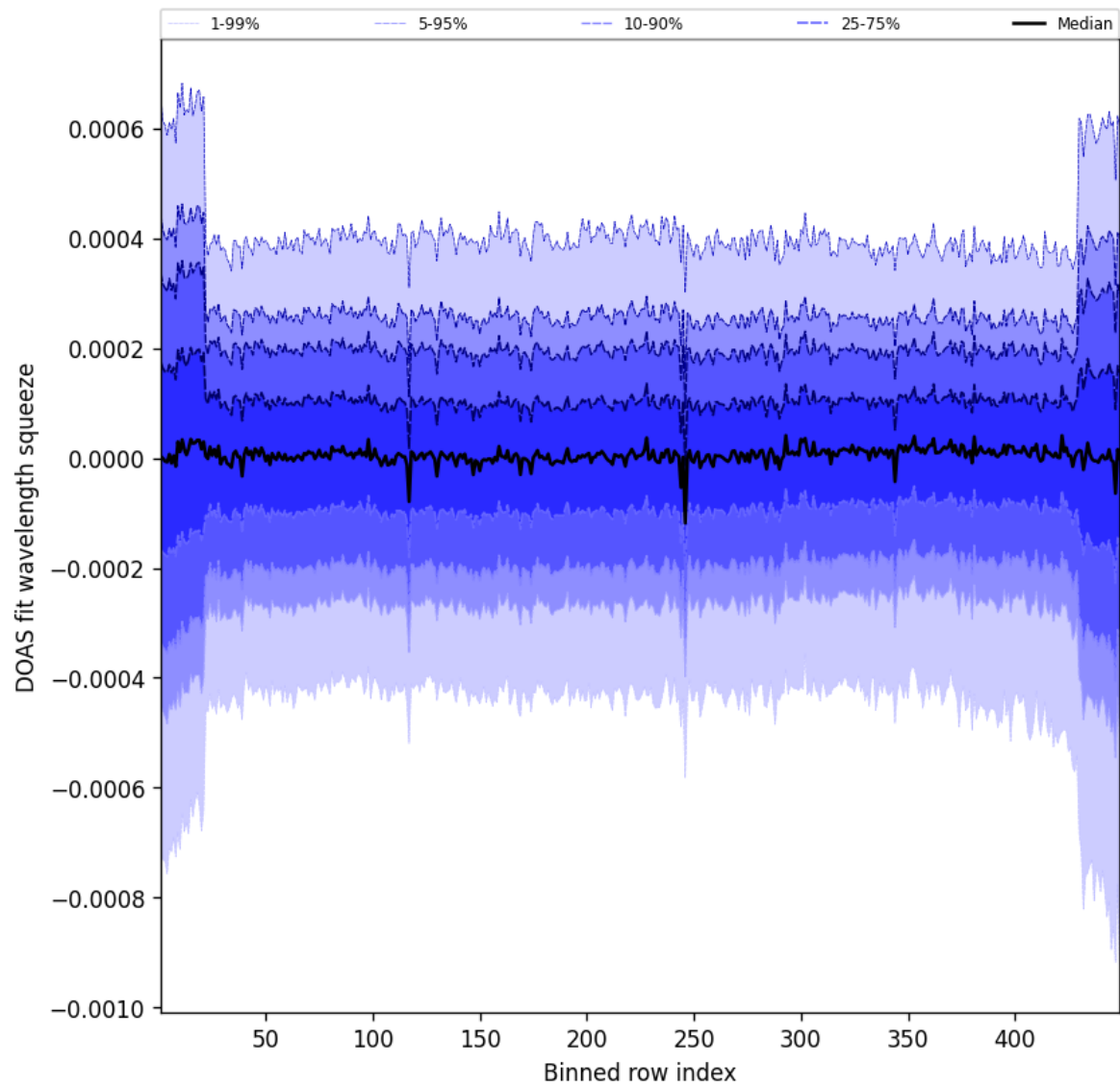


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-10-23 to 2025-10-24

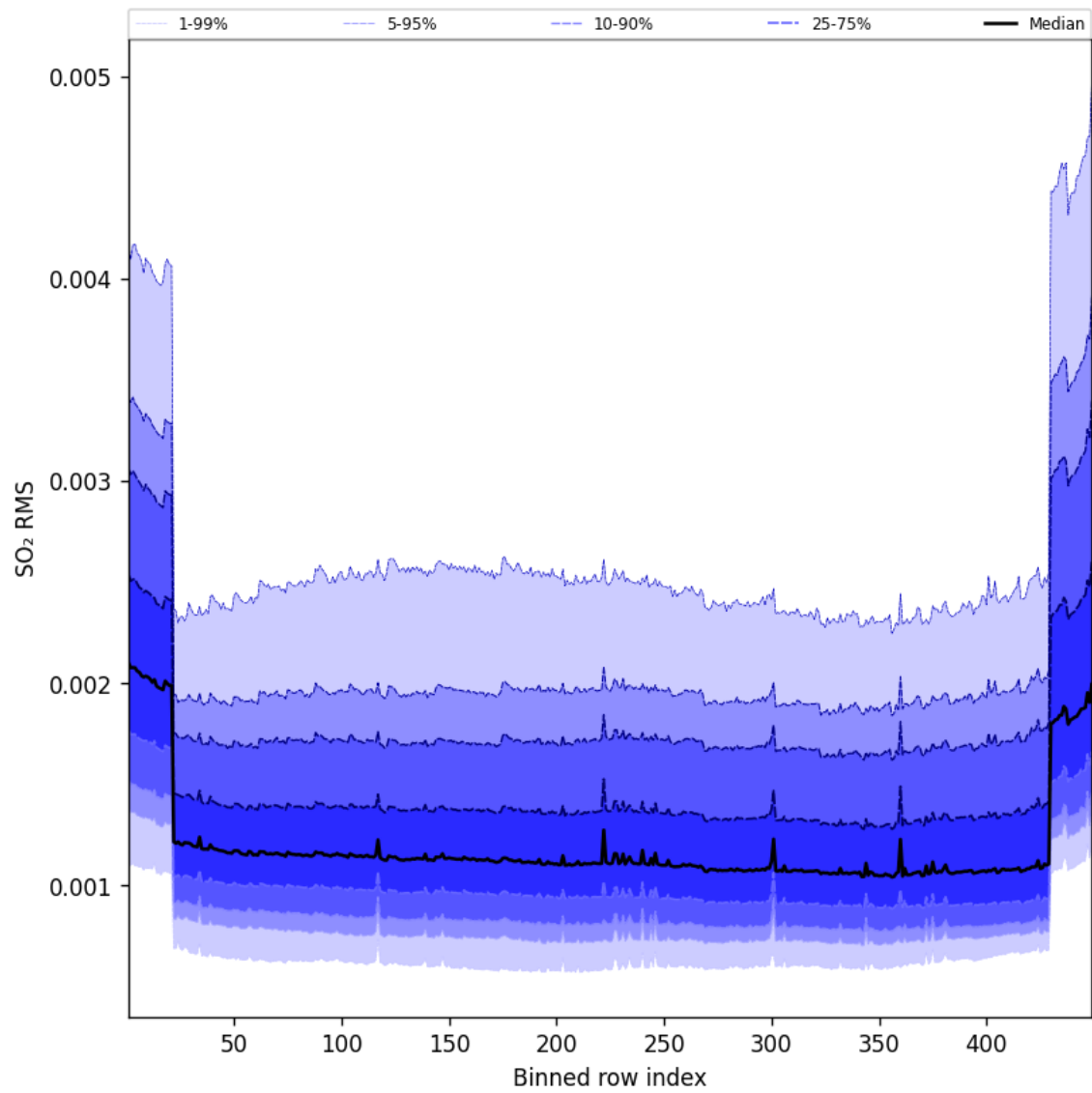


Figure 106: Along track statistics of “SO₂ RMS” for 2025-10-23 to 2025-10-24

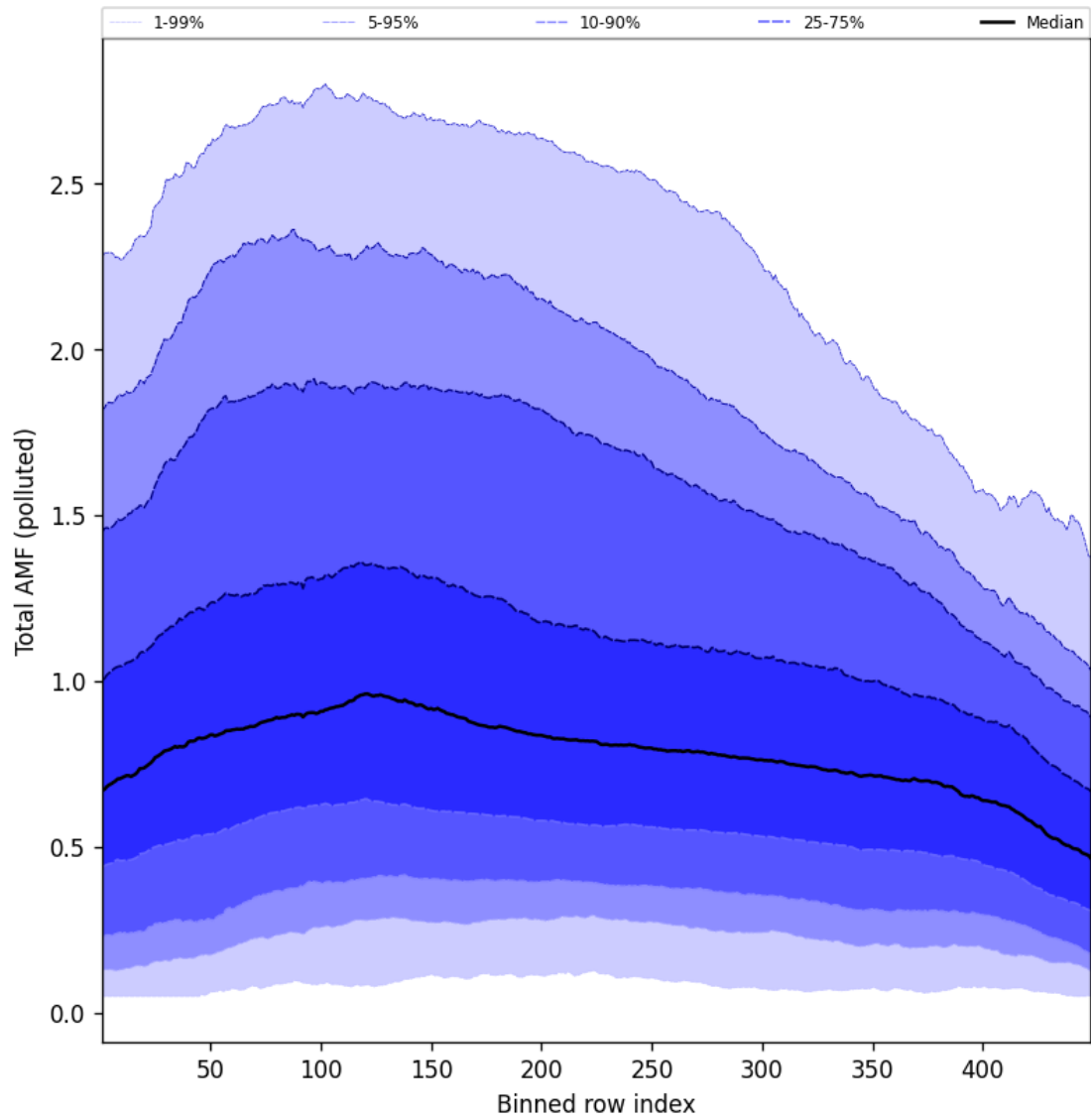


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-10-23 to 2025-10-24

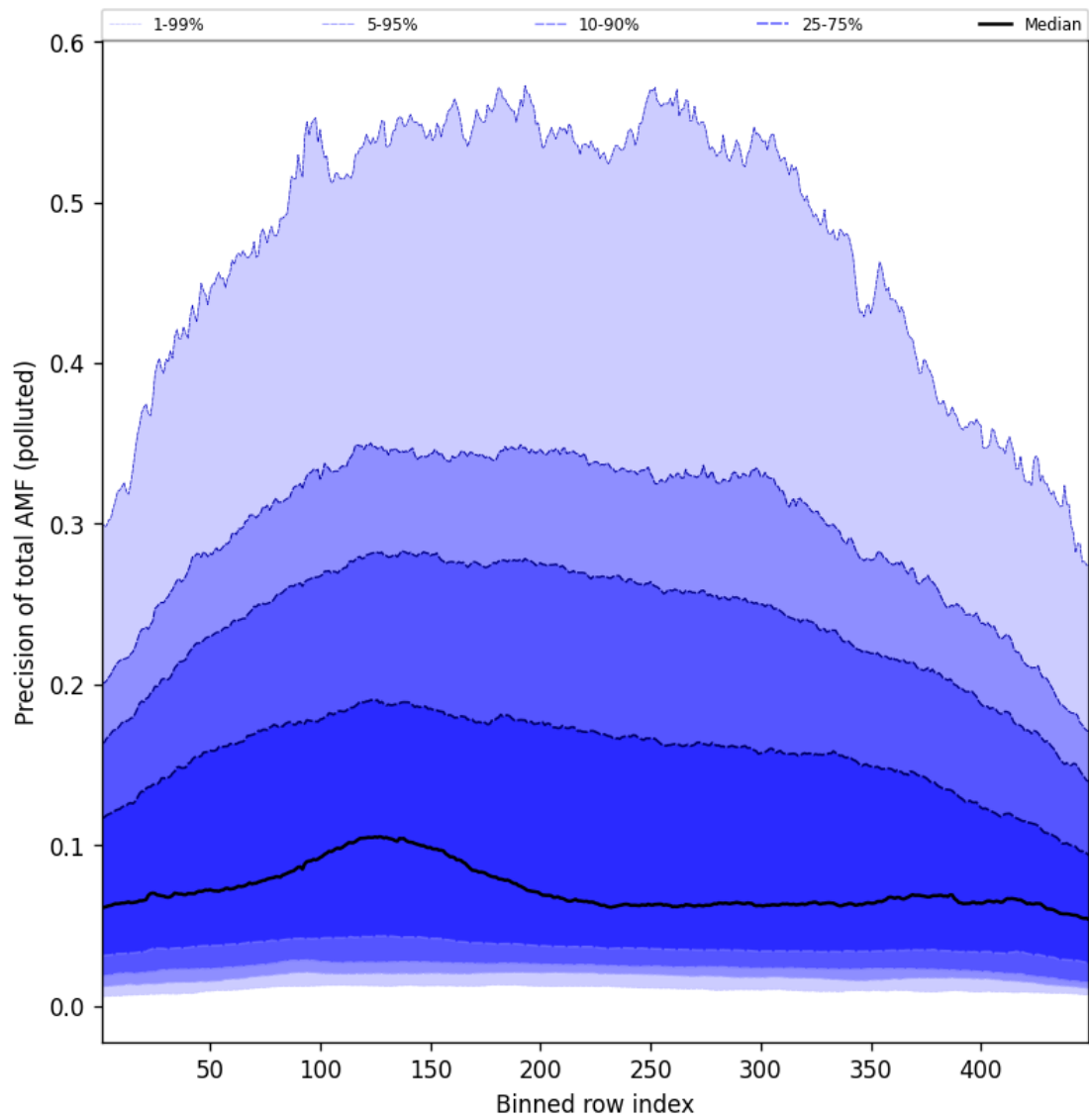


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-10-23 to 2025-10-24

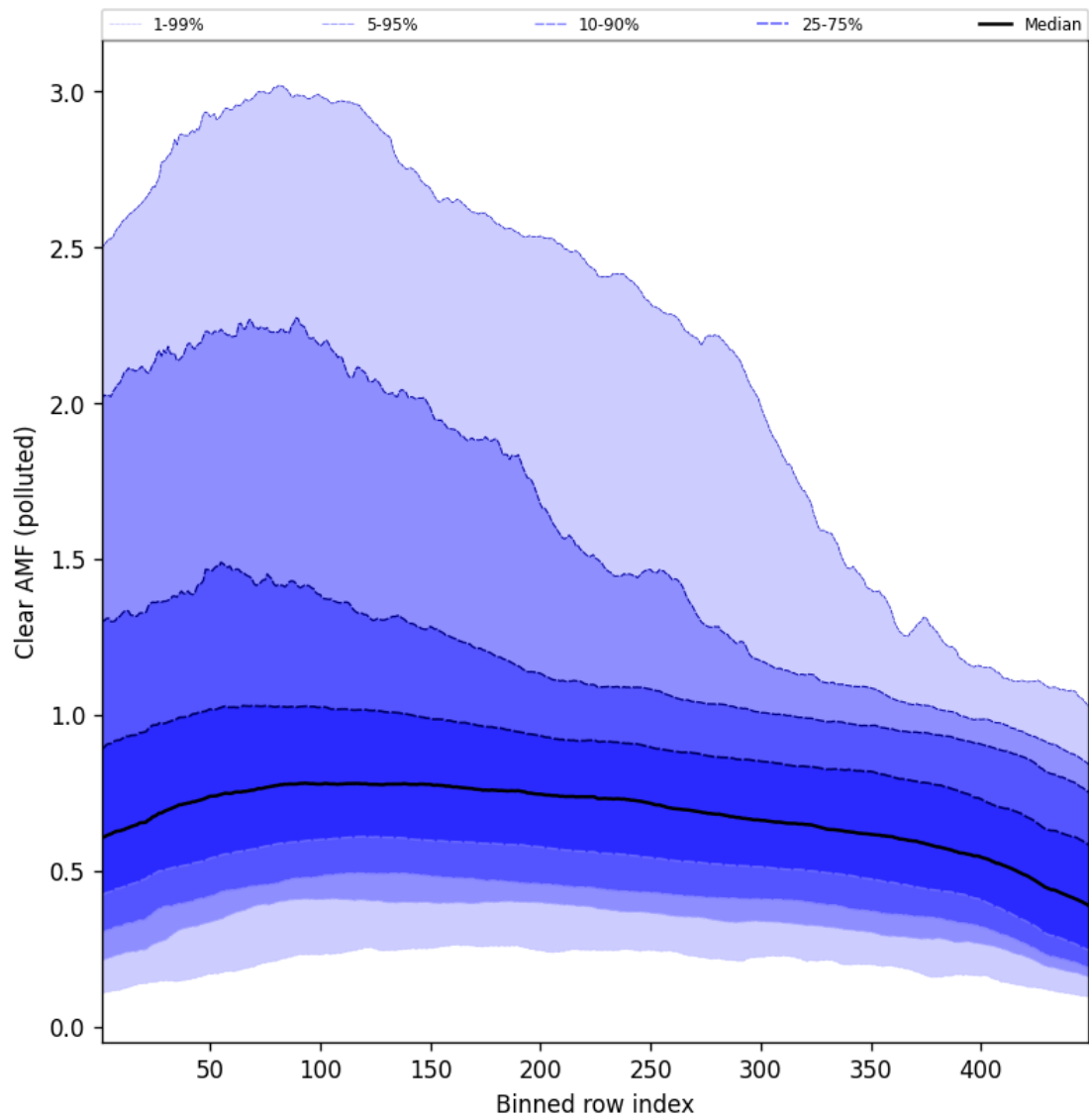


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-10-23 to 2025-10-24

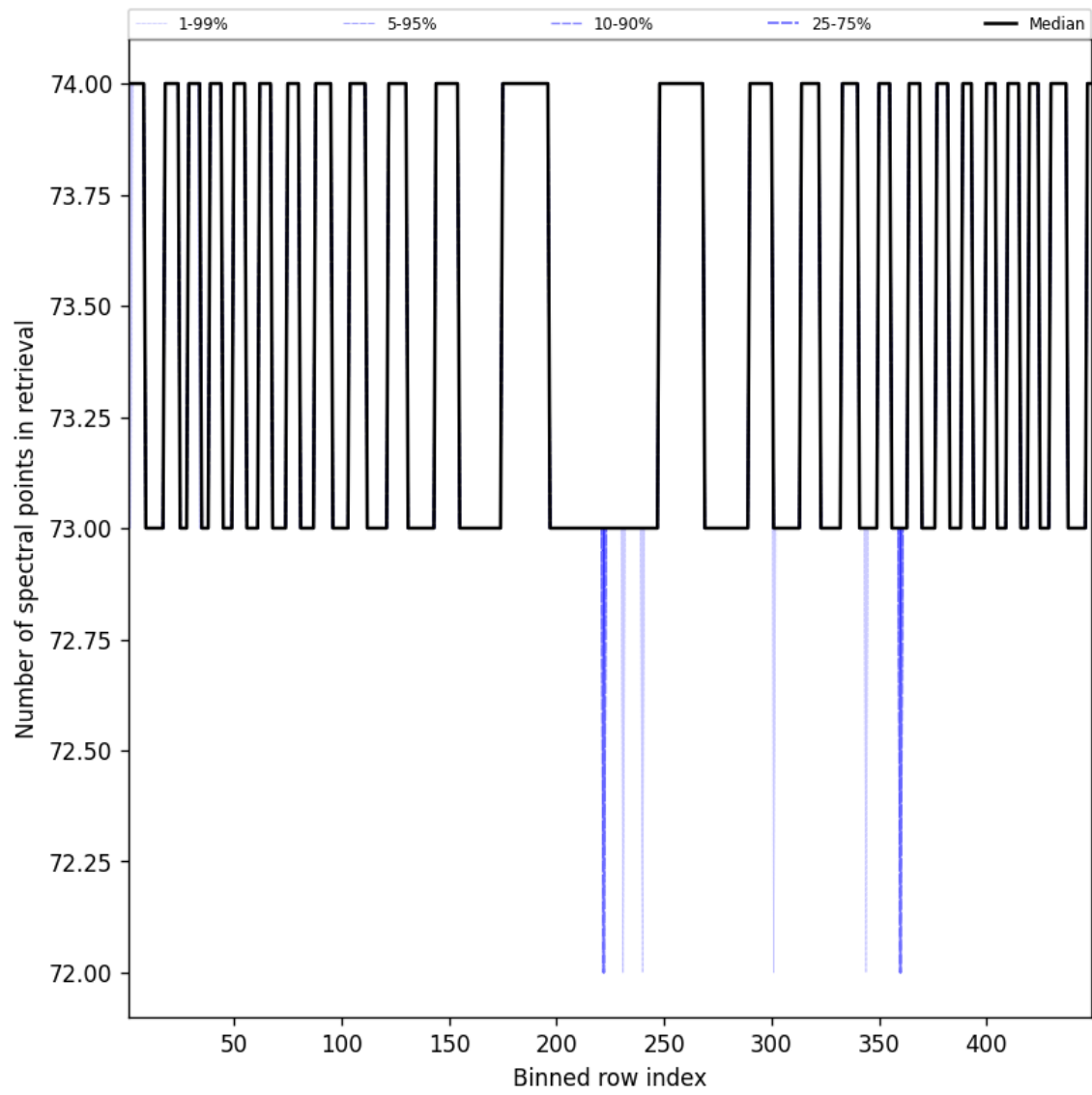


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-10-23 to 2025-10-24

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.

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