

PyCAMA report generated by tropl2-proc

tropl2-proc

2025-09-23 (03:55)

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]	0.680 ± 0.404	15565253	0.995	0.760	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.511 \pm 108.328) \times 10^{-2}$	15565253	0.278	0.464	1.113×10^{-2}	-102	350
sulfurdioxide total vertical column precision [DU]	0.540 ± 0.757	15565253	0.222	0.359	0.333	4.327×10^{-2}	221
sulfurdioxide slant column density corrected [DU]	$(2.043 \pm 39.890) \times 10^{-2}$	15565253	0.250	0.376	9.815×10^{-3}	-24.0	333
sulfurdioxide slant column density cobra [DU]	$(2.022 \pm 37.231) \times 10^{-2}$	15565253	0.250	0.376	9.815×10^{-3}	-24.0	28.8
sulfurdioxide slant column density cobra precision [DU]	0.305 ± 0.141	15565253	0.213	0.149	0.261	8.442×10^{-2}	27.1
sulfurdioxide slant column density window1 [DU]	0.200 ± 0.705	15565253	0.225	0.755	0.211	-114	124
sulfurdioxide slant column density window1 precision [DU]	0.305 ± 0.141	15565253	0.213	0.149	0.261	8.442×10^{-2}	27.1
sulfurdioxide slant column density corrected win1 [DU]	$(7.522 \pm 69.918) \times 10^{-2}$	15565253	2.500×10^{-2}	0.744	5.682×10^{-2}	-114	124
background so2 slant column offset window1 [DU]	-0.125 ± 0.153	15565253	-0.180	0.148	-0.153	-0.926	3.60
sulfurdioxide slant column density window2 [DU]	3.61 ± 9.38	15565253	3.25	11.9	3.35	-1.427×10^3	1.291×10^3
sulfurdioxide slant column density window2 precision [DU]	8.42 ± 2.32	15565253	7.43	2.71	8.08	2.08	518
sulfurdioxide slant column density corrected win2 [DU]	0.212 ± 9.094	15565253	0.250	11.5	0.201	-1.428×10^3	1.290×10^3
background so2 slant column offset window2 [DU]	-3.40 ± 2.53	15565253	-1.25	3.81	-2.61	-18.9	4.41
sulfurdioxide slant column density window3 [DU]	-16.7 ± 24.8	15565253	-17.4	31.2	-16.5	-392	1.319×10^3
sulfurdioxide slant column density window3 precision [DU]	29.5 ± 13.9	15565253	23.7	10.3	25.9	9.75	1.178×10^3
sulfurdioxide slant column density corrected win3 [DU]	-0.471 ± 24.155	15565253	-0.560	30.5	-0.359	-378	1.326×10^3
background so2 slant column offset window3 [DU]	16.2 ± 6.1	15565253	10.6	10.1	15.4	-9.67	42.6
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	15565253	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.386 \pm 7.263) \times 10^{-2}$	15565253	1.539×10^{-2}	2.330×10^{-2}	1.377×10^{-2}	1.999×10^{-4}	2.94
fitted radiance shift [nm]	$(-4.837 \pm 27.457) \times 10^{-4}$	15565253	-5.000×10^{-4}	1.975×10^{-3}	-4.690×10^{-4}	-0.110	4.675×10^{-2}
fitted radiance squeeze [1]	$(-1.795 \pm 19.054) \times 10^{-5}$	15565253	1.000×10^{-5}	2.114×10^{-4}	-7.662×10^{-6}	-1.695×10^{-2}	2.174×10^{-2}
fitted root mean square [1]	$(1.330 \pm 0.576) \times 10^{-3}$	15565253	9.750×10^{-4}	5.849×10^{-4}	1.166×10^{-3}	3.404×10^{-4}	9.081×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.867 ± 0.433	15565253	0.780	0.534	0.812	5.000×10^{-2}	3.19
sulfurdioxide total air mass factor polluted precision [1]	0.101 ± 0.095	15565253	3.500×10^{-2}	9.868×10^{-2}	7.028×10^{-2}	2.734×10^{-3}	1.72
sulfurdioxide clear air mass factor polluted [1]	0.742 ± 0.293	15565253	0.740	0.353	0.722	4.394×10^{-2}	3.23
number of spectral points in retrieval [1]	73.4 ± 0.5	15565253	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}	0.120	0.240	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.40	-0.907	-0.551	-0.370	-0.217	0.248	0.414	0.618	1.03	2.81
sulfurdioxide total vertical column precision [DU]	9.483×10^{-2}	0.133	0.162	0.188	0.224	0.582	0.776	1.01	1.49	3.65
sulfurdioxide slant column density corrected [DU]	-0.892	-0.512	-0.369	-0.274	-0.176	0.200	0.304	0.408	0.574	1.09
sulfurdioxide slant column density cobra [DU]	-0.892	-0.512	-0.369	-0.274	-0.176	0.200	0.304	0.408	0.574	1.09
sulfurdioxide slant column density cobra precision [DU]	0.143	0.169	0.184	0.195	0.211	0.360	0.418	0.479	0.571	0.806
sulfurdioxide slant column density window1 [DU]	-1.76	-0.897	-0.581	-0.377	-0.170	0.585	0.781	0.969	1.25	2.04
sulfurdioxide slant column density window1 precision [DU]	0.143	0.169	0.184	0.195	0.211	0.360	0.418	0.479	0.571	0.806
sulfurdioxide slant column density corrected win1 [DU]	-1.69	-0.958	-0.683	-0.501	-0.310	0.435	0.641	0.845	1.17	2.08
background so2 slant column offset window1 [DU]	-0.379	-0.293	-0.267	-0.246	-0.219	-7.091×10^{-2}	-1.348×10^{-2}	5.651×10^{-2}	0.155	0.375
sulfurdioxide slant column density window2 [DU]	-17.9	-11.1	-7.80	-5.30	-2.47	9.40	12.5	15.4	19.3	27.5
sulfurdioxide slant column density window2 precision [DU]	4.42	5.36	5.92	6.36	6.88	9.60	10.5	11.4	12.5	15.1
sulfurdioxide slant column density corrected win2 [DU]	-21.7	-14.5	-11.0	-8.44	-5.56	5.96	8.85	11.4	15.0	22.3
background so2 slant column offset window2 [DU]	-9.66	-8.20	-7.25	-6.39	-5.20	-1.39	-1.10	-0.889	-0.578	0.711
sulfurdioxide slant column density window3 [DU]	-78.9	-57.6	-47.5	-40.1	-32.1	-0.870	7.01	14.1	23.6	42.5
sulfurdioxide slant column density window3 precision [DU]	14.0	16.7	18.6	20.1	21.9	32.2	37.1	43.4	56.1	88.6
sulfurdioxide slant column density corrected win3 [DU]	-60.9	-40.3	-30.5	-23.3	-15.6	14.9	22.6	29.5	38.8	57.6
background so2 slant column offset window3 [DU]	5.15	8.11	9.17	10.0	11.1	21.1	22.9	24.4	26.2	29.4
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]	1.274×10^{-3}	2.729×10^{-3}	3.869×10^{-3}	4.984×10^{-3}	6.800×10^{-3}	3.010×10^{-2}	4.906×10^{-2}	7.608×10^{-2}	0.130	0.339
fitted radiance shift [nm]	-8.637×10^{-3}	-4.545×10^{-3}	-3.122×10^{-3}	-2.282×10^{-3}	-1.517×10^{-3}	4.579×10^{-4}	1.190×10^{-3}	2.118×10^{-3}	3.723×10^{-3}	8.140×10^{-3}
fitted radiance squeeze [1]	-5.850×10^{-4}	-3.335×10^{-4}	-2.375×10^{-4}	-1.768×10^{-4}	-1.162×10^{-4}	9.519×10^{-5}	1.472×10^{-4}	1.950×10^{-4}	2.621×10^{-4}	4.150×10^{-4}
fitted root mean square [1]	6.036×10^{-4}	7.407×10^{-4}	8.189×10^{-4}	8.799×10^{-4}	9.555×10^{-4}	1.540×10^{-3}	1.799×10^{-3}	2.060×10^{-3}	2.443×10^{-3}	3.370×10^{-3}
sulfurdioxide total air mass factor polluted [1]	7.876×10^{-2}	0.244	0.354	0.451	0.570	1.10	1.28	1.46	1.69	2.10
sulfurdioxide total air mass factor polluted precision [1]	1.027×10^{-2}	1.853×10^{-2}	2.530×10^{-2}	3.135×10^{-2}	3.863×10^{-2}	0.137	0.172	0.206	0.262	0.437
sulfurdioxide clear air mass factor polluted [1]	0.235	0.326	0.396	0.462	0.548	0.901	0.991	1.07	1.18	1.73
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]	0.698 ± 0.404	8146796	0.740	1.000	0.0	1.000	0.260	1.000
sulfurdioxide total vertical column [DU]	$(2.598 \pm 106.202) \times 10^{-2}$	8146796	0.473	1.043×10^{-2}	-84.6	95.3	-0.222	0.251
sulfurdioxide total vertical column precision [DU]	0.574 ± 0.786	8146796	0.407	0.338	4.327×10^{-2}	28.4	0.219	0.626
sulfurdioxide slant column density corrected [DU]	$(1.582 \pm 33.188) \times 10^{-2}$	8146796	0.356	8.661×10^{-3}	-6.71	52.4	-0.168	0.188
sulfurdioxide slant column density cobra [DU]	$(1.577 \pm 32.886) \times 10^{-2}$	8146796	0.356	8.661×10^{-3}	-6.71	10.6	-0.168	0.188
sulfurdioxide slant column density cobra precision [DU]	0.282 ± 0.114	8146796	0.128	0.249	8.442×10^{-2}	7.56	0.205	0.333
sulfurdioxide slant column density window1 [DU]	0.224 ± 0.631	8146796	0.720	0.229	-16.9	12.7	-0.133	0.587
sulfurdioxide slant column density window1 precision [DU]	0.282 ± 0.114	8146796	0.128	0.249	8.442×10^{-2}	7.56	0.205	0.333
sulfurdioxide slant column density corrected win1 [DU]	$(7.354 \pm 62.489) \times 10^{-2}$	8146796	0.710	6.026×10^{-2}	-17.0	12.2	-0.290	0.420
background so2 slant column offset window1 [DU]	-0.151 ± 0.116	8146796	0.135	-0.167	-0.926	2.14	-0.227	-9.219×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.08 ± 9.13	8146796	11.6	2.88	-215	484	-2.85	8.78
sulfurdioxide slant column density window2 precision [DU]	8.40 ± 2.30	8146796	2.75	8.06	2.08	268	6.85	9.60
sulfurdioxide slant column density corrected win2 [DU]	0.254 ± 8.958	8146796	11.4	0.260	-216	484	-5.45	5.97
background so2 slant column offset window2 [DU]	-2.82 ± 2.02	8146796	2.75	-2.23	-10.9	4.41	-4.08	-1.34
sulfurdioxide slant column density window3 [DU]	-16.3 ± 25.5	8146796	32.0	-16.0	-269	1.319×10^3	-32.1	-0.129
sulfurdioxide slant column density window3 precision [DU]	30.2 ± 14.7	8146796	11.0	26.2	9.84	1.178×10^3	22.1	33.1
sulfurdioxide slant column density corrected win3 [DU]	-0.772 ± 24.716	8146796	31.1	-0.631	-251	1.326×10^3	-16.2	14.9
background so2 slant column offset window3 [DU]	15.6 ± 6.2	8146796	10.4	14.3	-9.67	35.3	10.4	20.8
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	8146796	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(4.728 \pm 8.947) \times 10^{-2}$	8146796	3.719×10^{-2}	2.129×10^{-2}	1.999×10^{-4}	2.94	1.063×10^{-2}	4.782×10^{-2}
fitted radiance shift [nm]	$(-1.675 \pm 29.067) \times 10^{-4}$	8146796	1.852×10^{-3}	-2.118×10^{-4}	-4.248×10^{-2}	4.675×10^{-2}	-1.115×10^{-3}	7.366×10^{-4}
fitted radiance squeeze [1]	$(-9.145 \pm 166.861) \times 10^{-6}$	8146796	1.985×10^{-4}	-5.544×10^{-6}	-2.072×10^{-3}	9.426×10^{-3}	-1.061×10^{-4}	9.238×10^{-5}
fitted root mean square [1]	$(1.250 \pm 0.469) \times 10^{-3}$	8146796	5.252×10^{-4}	1.129×10^{-3}	3.404×10^{-4}	2.013×10^{-2}	9.334×10^{-4}	1.459×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.811 ± 0.435	8146796	0.560	0.771	5.000×10^{-2}	3.19	0.491	1.05
sulfurdioxide total air mass factor polluted precision [1]	$(9.979 \pm 10.963) \times 10^{-2}$	8146796	9.713×10^{-2}	6.067×10^{-2}	2.734×10^{-3}	1.72	3.509×10^{-2}	0.132
sulfurdioxide clear air mass factor polluted [1]	0.729 ± 0.307	8146796	0.434	0.719	6.782×10^{-2}	3.23	0.493	0.926
number of spectral points in retrieval [1]	73.5 ± 0.5	8146796	1.000	73.0	71.0	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]	0.660 ± 0.403	7418457	0.770	1.000	0.0	1.000	0.230	1.000
sulfurdioxide total vertical column [DU]	$(4.513 \pm 110.607) \times 10^{-2}$	7418457	0.456	1.186×10^{-2}	-102	350	-0.211	0.244
sulfurdioxide total vertical column precision [DU]	0.503 ± 0.722	7418457	0.311	0.329	4.629×10^{-2}	221	0.230	0.541
sulfurdioxide slant column density corrected [DU]	$(2.550 \pm 46.136) \times 10^{-2}$	7418457	0.401	1.124×10^{-2}	-24.0	333	-0.186	0.214
sulfurdioxide slant column density cobra [DU]	$(2.511 \pm 41.476) \times 10^{-2}$	7418457	0.401	1.124×10^{-2}	-24.0	28.8	-0.186	0.214
sulfurdioxide slant column density cobra precision [DU]	0.329 ± 0.163	7418457	0.178	0.276	8.779×10^{-2}	27.1	0.219	0.397
sulfurdioxide slant column density window1 [DU]	0.173 ± 0.777	7418457	0.797	0.190	-114	124	-0.215	0.583
sulfurdioxide slant column density window1 precision [DU]	0.329 ± 0.163	7418457	0.178	0.276	8.779×10^{-2}	27.1	0.219	0.397
sulfurdioxide slant column density corrected win1 [DU]	$(7.708 \pm 77.258) \times 10^{-2}$	7418457	0.785	5.269×10^{-2}	-114	124	-0.333	0.452
background so2 slant column offset window1 [DU]	$(-9.635 \pm 18.190) \times 10^{-2}$	7418457	0.169	-0.137	-0.895	3.60	-0.208	-3.863×10^{-2}
sulfurdioxide slant column density window2 [DU]	4.20 ± 9.61	7418457	12.1	3.88	-1.427×10^3	1.291×10^3	-2.04	10.1
sulfurdioxide slant column density window2 precision [DU]	8.44 ± 2.33	7418457	2.67	8.10	2.40	518	6.92	9.60
sulfurdioxide slant column density corrected win2 [DU]	0.167 ± 9.241	7418457	11.6	0.136	-1.428×10^3	1.290×10^3	-5.68	5.96
background so2 slant column offset window2 [DU]	-4.03 ± 2.85	7418457	5.00	-3.42	-18.9	4.30	-6.48	-1.47
sulfurdioxide slant column density window3 [DU]	-17.0 ± 24.0	7418457	30.5	-16.9	-392	513	-32.1	-1.67
sulfurdioxide slant column density window3 precision [DU]	28.8 ± 13.0	7418457	9.51	25.6	9.75	237	21.7	31.2
sulfurdioxide slant column density corrected win3 [DU]	-0.141 ± 23.518	7418457	29.8	-7.196×10^{-2}	-378	525	-14.9	14.9
background so2 slant column offset window3 [DU]	16.9 ± 5.8	7418457	9.49	16.4	-7.54	42.6	12.0	21.5
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	7418457	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.913 \pm 4.316) \times 10^{-2}$	7418457	1.119×10^{-2}	8.972×10^{-3}	5.221×10^{-4}	1.71	5.273×10^{-3}	1.646×10^{-2}
fitted radiance shift [nm]	$(-8.310 \pm 25.117) \times 10^{-4}$	7418457	1.993×10^{-3}	-7.791×10^{-4}	-0.110	4.018×10^{-2}	-1.878×10^{-3}	1.150×10^{-4}
fitted radiance squeeze [1]	$(-2.762 \pm 21.312) \times 10^{-5}$	7418457	2.277×10^{-4}	-1.029×10^{-5}	-1.695×10^{-2}	2.174×10^{-2}	-1.292×10^{-4}	9.849×10^{-5}
fitted root mean square [1]	$(1.417 \pm 0.663) \times 10^{-3}$	7418457	6.767×10^{-4}	1.210×10^{-3}	3.569×10^{-4}	9.081×10^{-2}	9.831×10^{-4}	1.660×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.929 ± 0.422	7418457	0.522	0.851	5.000×10^{-2}	2.80	0.646	1.17
sulfurdioxide total air mass factor polluted precision [1]	0.102 ± 0.077	7418457	9.977×10^{-2}	8.234×10^{-2}	2.772×10^{-3}	1.47	4.174×10^{-2}	0.142
sulfurdioxide clear air mass factor polluted [1]	0.756 ± 0.276	7418457	0.278	0.724	4.394×10^{-2}	2.76	0.594	0.873
number of spectral points in retrieval [1]	73.4 ± 0.5	7418457	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]	0.693 ± 0.396	10432520	0.730	1.000	0.0	1.000	0.270	1.000
sulfurdioxide total vertical column [DU]	$(3.797 \pm 103.420) \times 10^{-2}$	10432520	0.436	1.095×10^{-2}	-102	350	-0.203	0.232
sulfurdioxide total vertical column precision [DU]	0.490 ± 0.694	10432520	0.315	0.308	4.629×10^{-2}	137	0.215	0.530
sulfurdioxide slant column density corrected [DU]	$(2.182 \pm 41.693) \times 10^{-2}$	10432520	0.374	1.004×10^{-2}	-24.0	333	-0.175	0.199
sulfurdioxide slant column density cobra [DU]	$(2.157 \pm 38.239) \times 10^{-2}$	10432520	0.374	1.004×10^{-2}	-24.0	28.8	-0.175	0.199
sulfurdioxide slant column density cobra precision [DU]	0.307 ± 0.152	10432520	0.159	0.255	8.442×10^{-2}	27.1	0.207	0.367
sulfurdioxide slant column density window1 [DU]	0.195 ± 0.721	10432520	0.752	0.211	-114	42.9	-0.171	0.581
sulfurdioxide slant column density window1 precision [DU]	0.307 ± 0.152	10432520	0.159	0.255	8.442×10^{-2}	27.1	0.207	0.367
sulfurdioxide slant column density corrected win1 [DU]	$(7.730 \pm 71.503) \times 10^{-2}$	10432520	0.741	5.723×10^{-2}	-114	42.7	-0.308	0.433
background so2 slant column offset window1 [DU]	-0.118 ± 0.166	10432520	0.153	-0.153	-0.895	3.60	-0.218	-6.523×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.74 ± 9.27	10432520	11.8	3.43	-808	553	-2.32	9.44
sulfurdioxide slant column density window2 precision [DU]	8.25 ± 2.20	10432520	2.59	7.92	2.08	518	6.79	9.37
sulfurdioxide slant column density corrected win2 [DU]	0.203 ± 8.941	10432520	11.4	0.182	-811	551	-5.51	5.87
background so2 slant column offset window2 [DU]	-3.54 ± 2.70	10432520	4.33	-2.58	-18.9	4.41	-5.68	-1.36
sulfurdioxide slant column density window3 [DU]	-14.2 ± 24.3	10432520	30.9	-14.2	-349	1.319×10^3	-29.5	1.32
sulfurdioxide slant column density window3 precision [DU]	28.2 ± 12.3	10432520	9.08	25.1	9.75	1.178×10^3	21.5	30.6
sulfurdioxide slant column density corrected win3 [DU]	1.84 ± 23.37	10432520	29.8	1.67	-336	1.326×10^3	-13.0	16.7
background so2 slant column offset window3 [DU]	16.0 ± 6.1	10432520	9.98	15.0	-9.67	42.6	11.0	21.0
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	10432520	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.820 \pm 3.635) \times 10^{-2}$	10432520	1.292×10^{-2}	1.061×10^{-2}	3.758×10^{-4}	2.89	5.921×10^{-3}	1.885×10^{-2}
fitted radiance shift [nm]	$(-5.655 \pm 24.662) \times 10^{-4}$	10432520	1.949×10^{-3}	-5.080×10^{-4}	-0.110	4.675×10^{-2}	-1.589×10^{-3}	3.604×10^{-4}
fitted radiance squeeze [1]	$(-1.941 \pm 19.602) \times 10^{-5}$	10432520	2.115×10^{-4}	-5.626×10^{-6}	-1.369×10^{-2}	2.174×10^{-2}	-1.151×10^{-4}	9.642×10^{-5}
fitted root mean square [1]	$(1.336 \pm 0.615) \times 10^{-3}$	10432520	6.065×10^{-4}	1.142×10^{-3}	3.404×10^{-4}	9.081×10^{-2}	9.423×10^{-4}	1.549×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.902 ± 0.404	10432520	0.489	0.854	5.000×10^{-2}	2.73	0.634	1.12
sulfurdioxide total air mass factor polluted precision [1]	$(9.407 \pm 7.247) \times 10^{-2}$	10432520	8.766×10^{-2}	7.078×10^{-2}	2.772×10^{-3}	1.11	4.141×10^{-2}	0.129
sulfurdioxide clear air mass factor polluted [1]	0.772 ± 0.270	10432520	0.319	0.754	4.394×10^{-2}	2.76	0.601	0.921
number of spectral points in retrieval [1]	73.4 ± 0.5	10432520	1.000	73.0	52.0	74.0	73.0	74.0

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

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.690 ± 0.408	3745423	0.760	1.000	0.0	1.000	0.240	1.000
sulfurdioxide total vertical column [DU]	$(2.285 \pm 100.365) \times 10^{-2}$	3745423	0.505	9.755×10^{-3}	-64.8	130	-0.238	0.267
sulfurdioxide total vertical column precision [DU]	0.585 ± 0.736	3745423	0.398	0.367	4.327×10^{-2}	221	0.249	0.647
sulfurdioxide slant column density corrected [DU]	$(1.526 \pm 34.201) \times 10^{-2}$	3745423	0.367	8.008×10^{-3}	-8.57	103	-0.174	0.193
sulfurdioxide slant column density cobra [DU]	$(1.515 \pm 33.344) \times 10^{-2}$	3745423	0.367	8.008×10^{-3}	-12.2	26.1	-0.174	0.193
sulfurdioxide slant column density cobra precision [DU]	0.288 ± 0.111	3745423	0.119	0.260	9.373×10^{-2}	23.1	0.215	0.333
sulfurdioxide slant column density window1 [DU]	0.219 ± 0.642	3745423	0.734	0.220	-23.1	124	-0.147	0.587
sulfurdioxide slant column density window1 precision [DU]	0.288 ± 0.111	3745423	0.119	0.260	9.373×10^{-2}	23.1	0.215	0.333
sulfurdioxide slant column density corrected win1 [DU]	$(6.617 \pm 63.605) \times 10^{-2}$	3745423	0.724	5.264×10^{-2}	-23.1	124	-0.304	0.420
background so2 slant column offset window1 [DU]	-0.153 ± 0.115	3745423	0.131	-0.167	-0.926	2.14	-0.228	-9.665×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.00 ± 9.44	3745423	11.9	2.86	-1.427×10^3	1.291×10^3	-3.02	8.86
sulfurdioxide slant column density window2 precision [DU]	8.65 ± 2.51	3745423	2.79	8.32	2.50	480	7.06	9.85
sulfurdioxide slant column density corrected win2 [DU]	0.260 ± 9.289	3745423	11.7	0.264	-1.428×10^3	1.290×10^3	-5.57	6.10
background so2 slant column offset window2 [DU]	-2.74 ± 1.93	3745423	2.51	-2.25	-15.2	4.41	-3.86	-1.34
sulfurdioxide slant column density window3 [DU]	-21.6 ± 24.8	3745423	31.1	-21.0	-392	220	-36.9	-5.74
sulfurdioxide slant column density window3 precision [DU]	32.4 ± 16.9	3745423	12.2	27.7	9.84	243	23.0	35.2
sulfurdioxide slant column density corrected win3 [DU]	-6.06 ± 24.82	3745423	31.2	-5.60	-378	231	-21.5	9.75
background so2 slant column offset window3 [DU]	15.5 ± 5.8	3745423	9.37	14.4	-9.67	38.4	10.8	20.2
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.12	3745423	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.803 \pm 11.161) \times 10^{-2}$	3745423	6.532×10^{-2}	3.280×10^{-2}	1.999×10^{-4}	2.94	1.310×10^{-2}	7.842×10^{-2}
fitted radiance shift [nm]	$(-3.306 \pm 33.408) \times 10^{-4}$	3745423	2.024×10^{-3}	-4.134×10^{-4}	-4.248×10^{-2}	4.285×10^{-2}	-1.357×10^{-3}	6.669×10^{-4}
fitted radiance squeeze [1]	$(-1.407 \pm 17.379) \times 10^{-5}$	3745423	2.052×10^{-4}	-1.101×10^{-5}	-1.695×10^{-2}	2.009×10^{-2}	-1.146×10^{-4}	9.057×10^{-5}
fitted root mean square [1]	$(1.265 \pm 0.458) \times 10^{-3}$	3745423	4.832×10^{-4}	1.165×10^{-3}	3.685×10^{-4}	5.703×10^{-2}	9.665×10^{-4}	1.450×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.809 ± 0.474	3745423	0.554	0.718	5.000×10^{-2}	3.19	0.481	1.04
sulfurdioxide total air mass factor polluted precision [1]	0.114 ± 0.129	3745423	0.127	6.629×10^{-2}	2.734×10^{-3}	1.69	3.284×10^{-2}	0.159
sulfurdioxide clear air mass factor polluted [1]	0.687 ± 0.327	3745423	0.386	0.646	6.782×10^{-2}	3.23	0.463	0.849
number of spectral points in retrieval [1]	73.4 ± 0.5	3745423	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

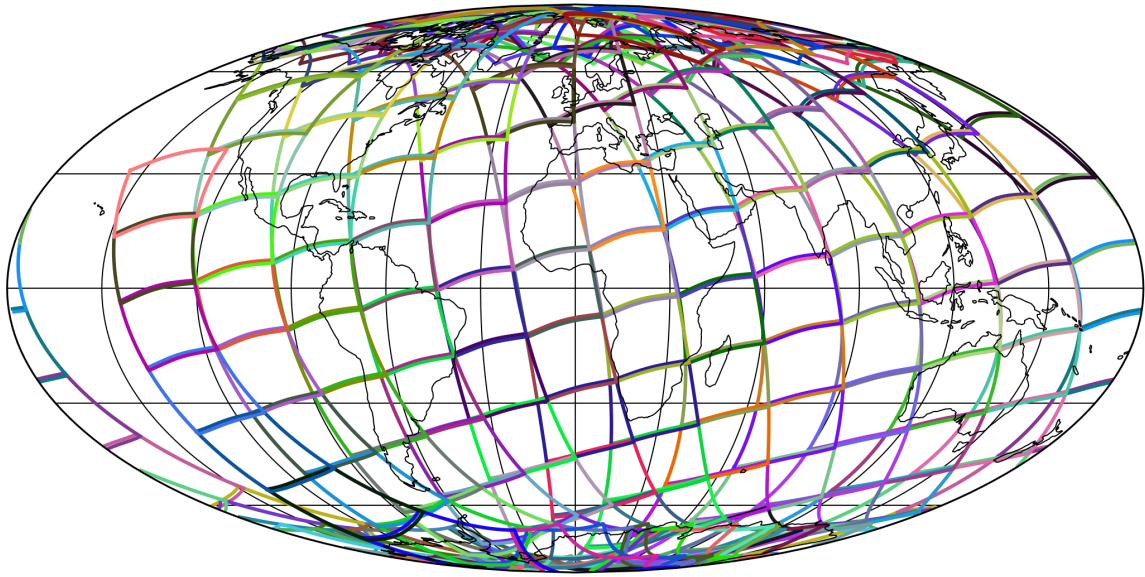


Figure 1: Outline of the granules.

4 Input data monitoring

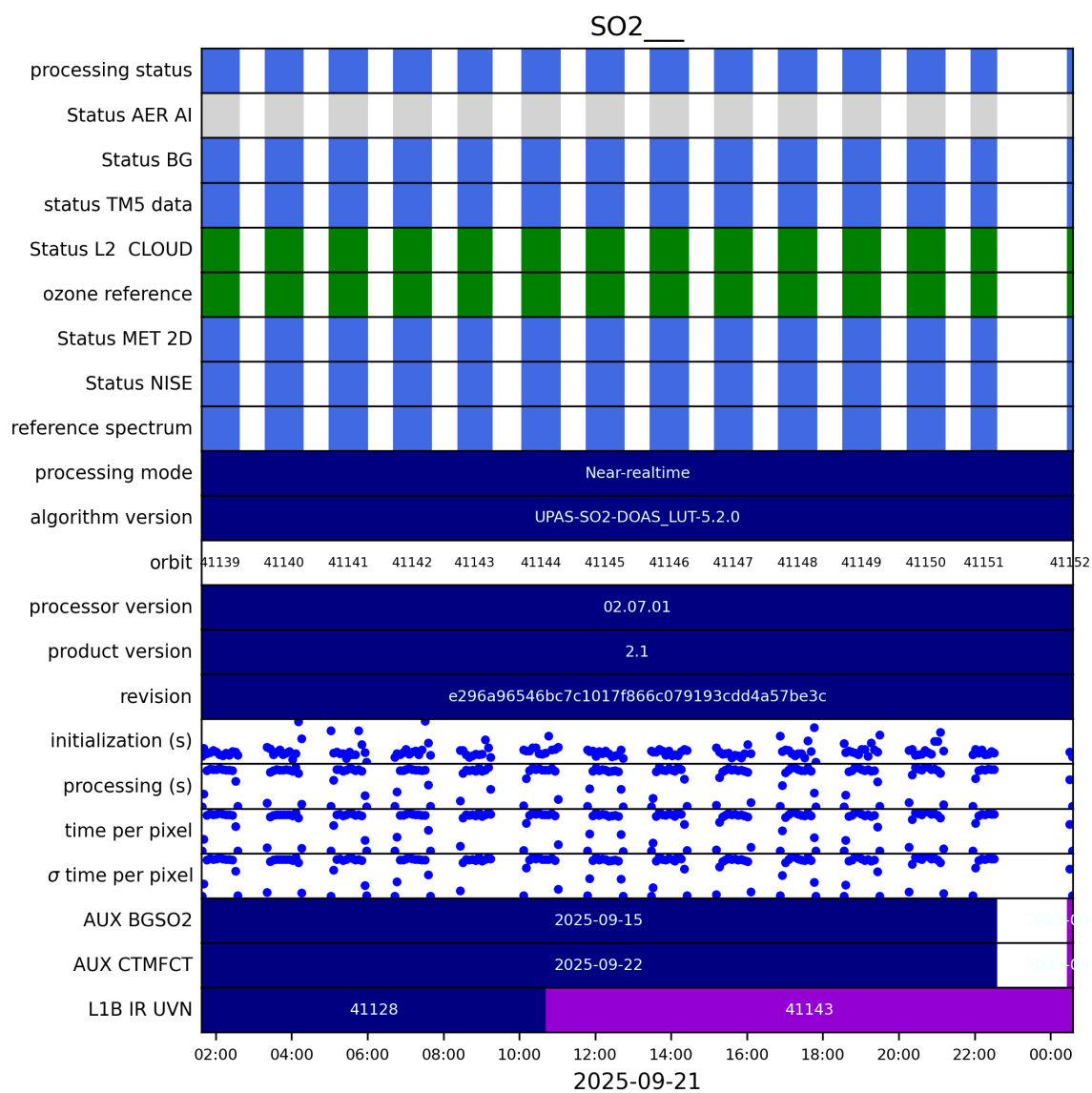


Figure 2: Input data per granule

5 Warnings and errors

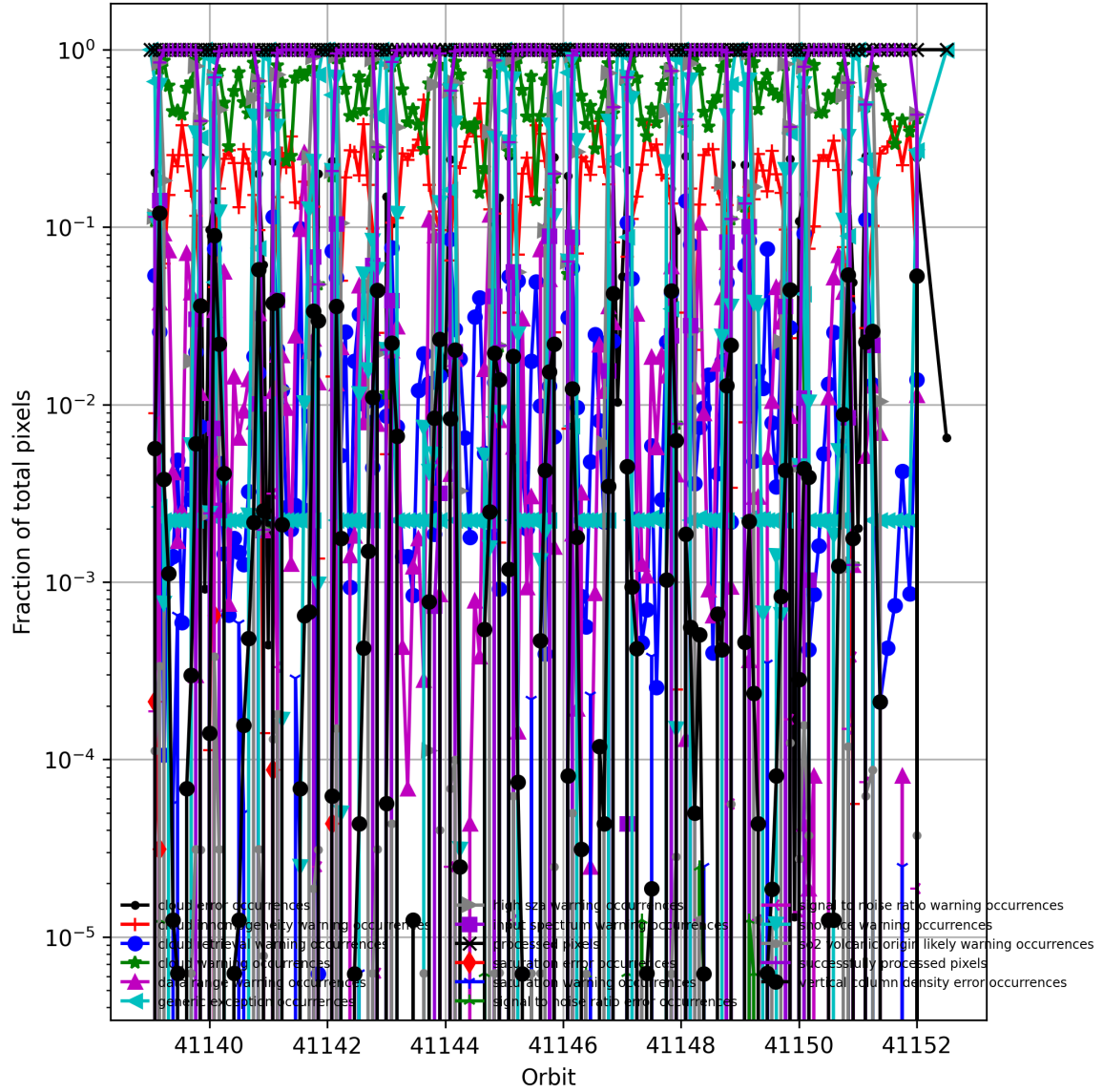


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

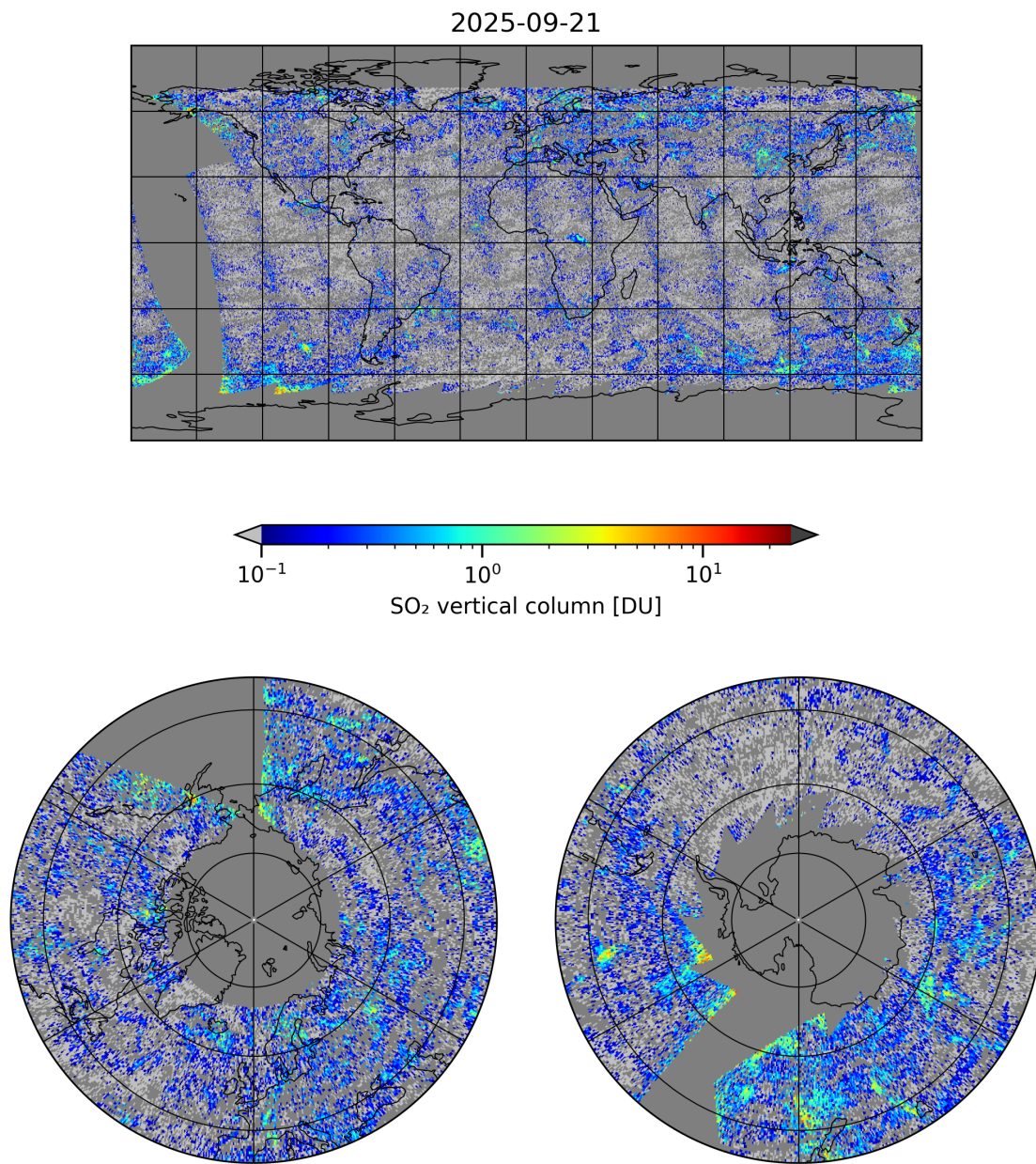


Figure 4: Map of “SO₂ vertical column” for 2025-09-21 to 2025-09-22

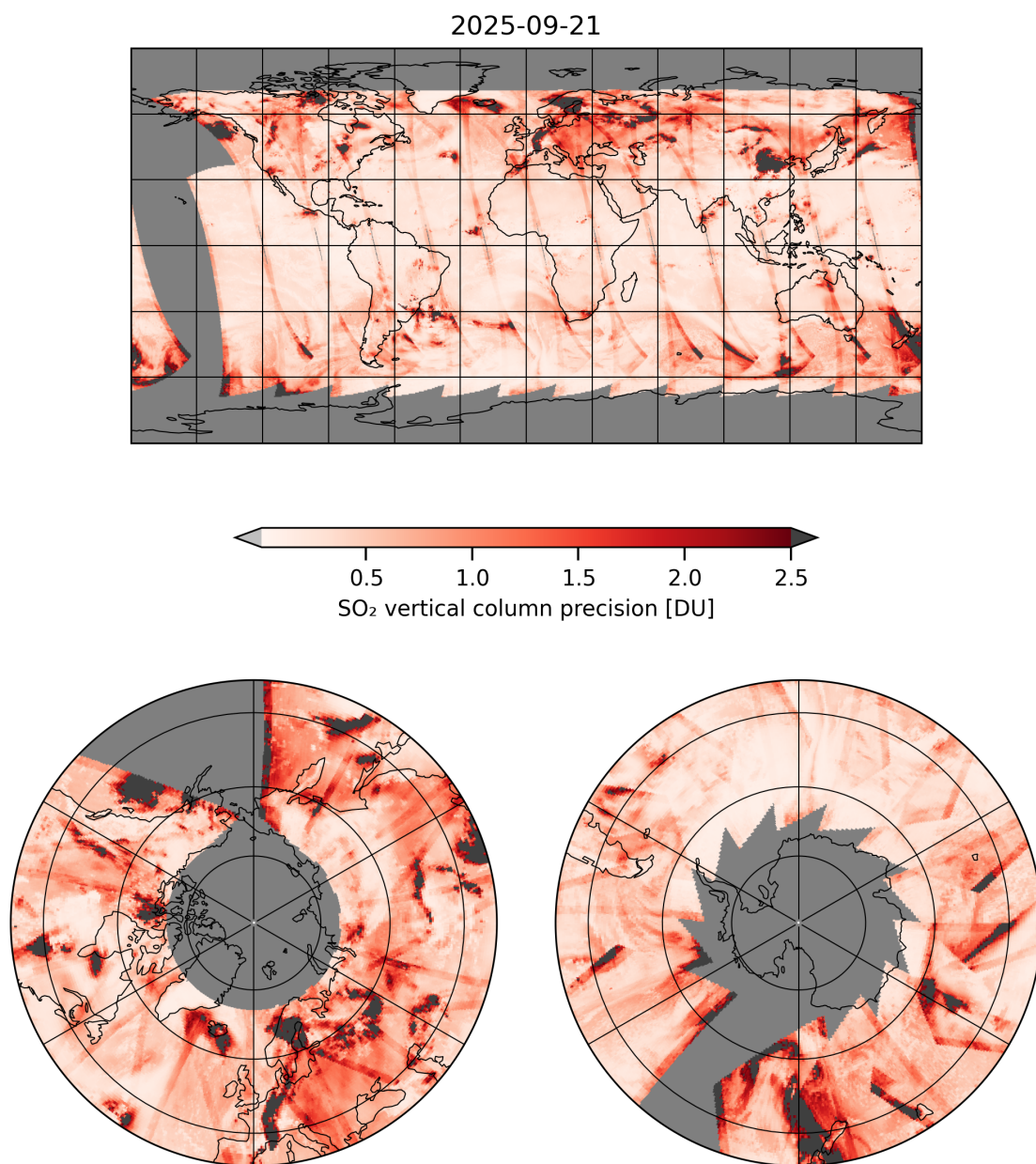


Figure 5: Map of “SO₂ vertical column precision” for 2025-09-21 to 2025-09-22

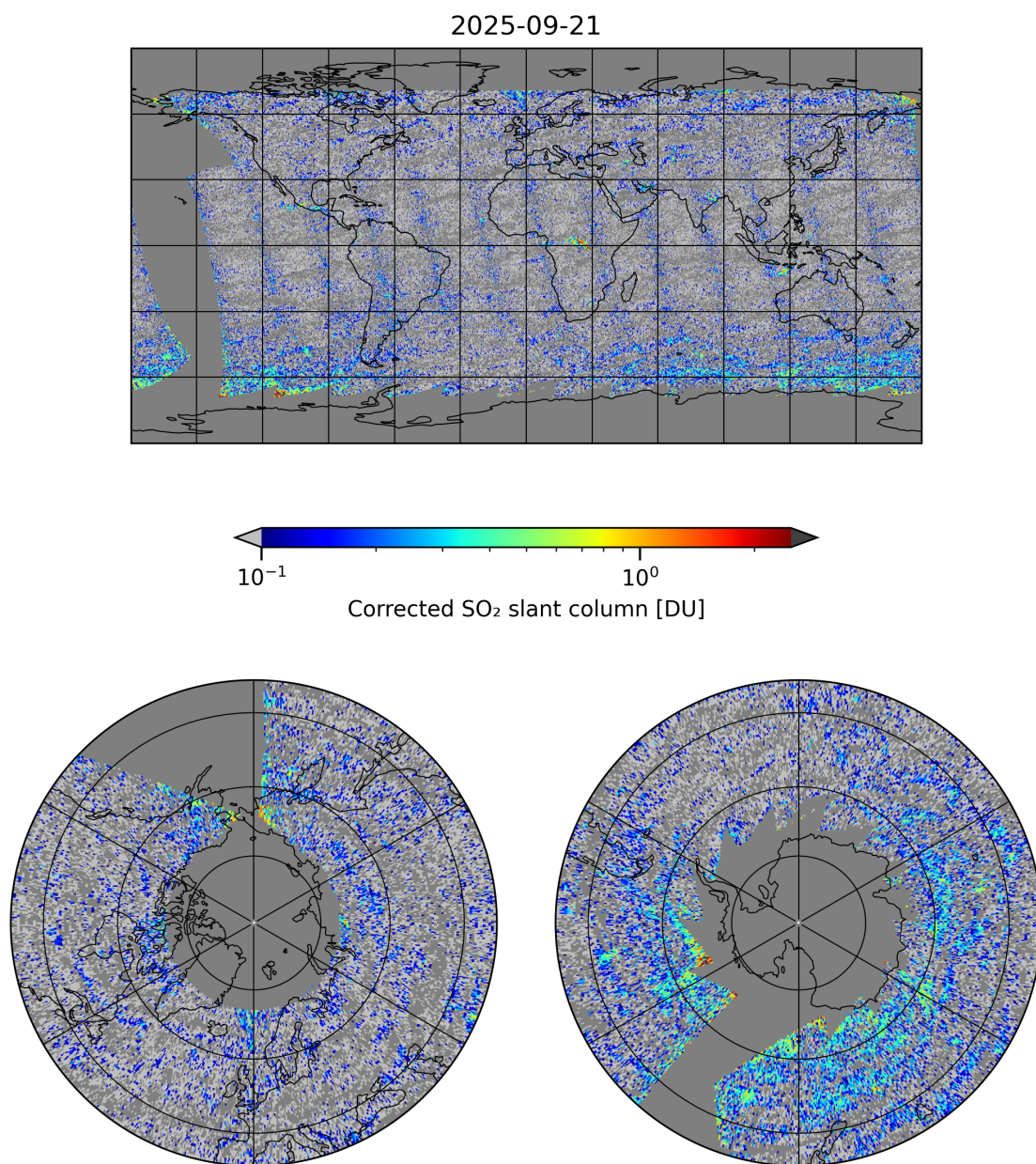


Figure 6: Map of “Corrected SO₂ slant column” for 2025-09-21 to 2025-09-22

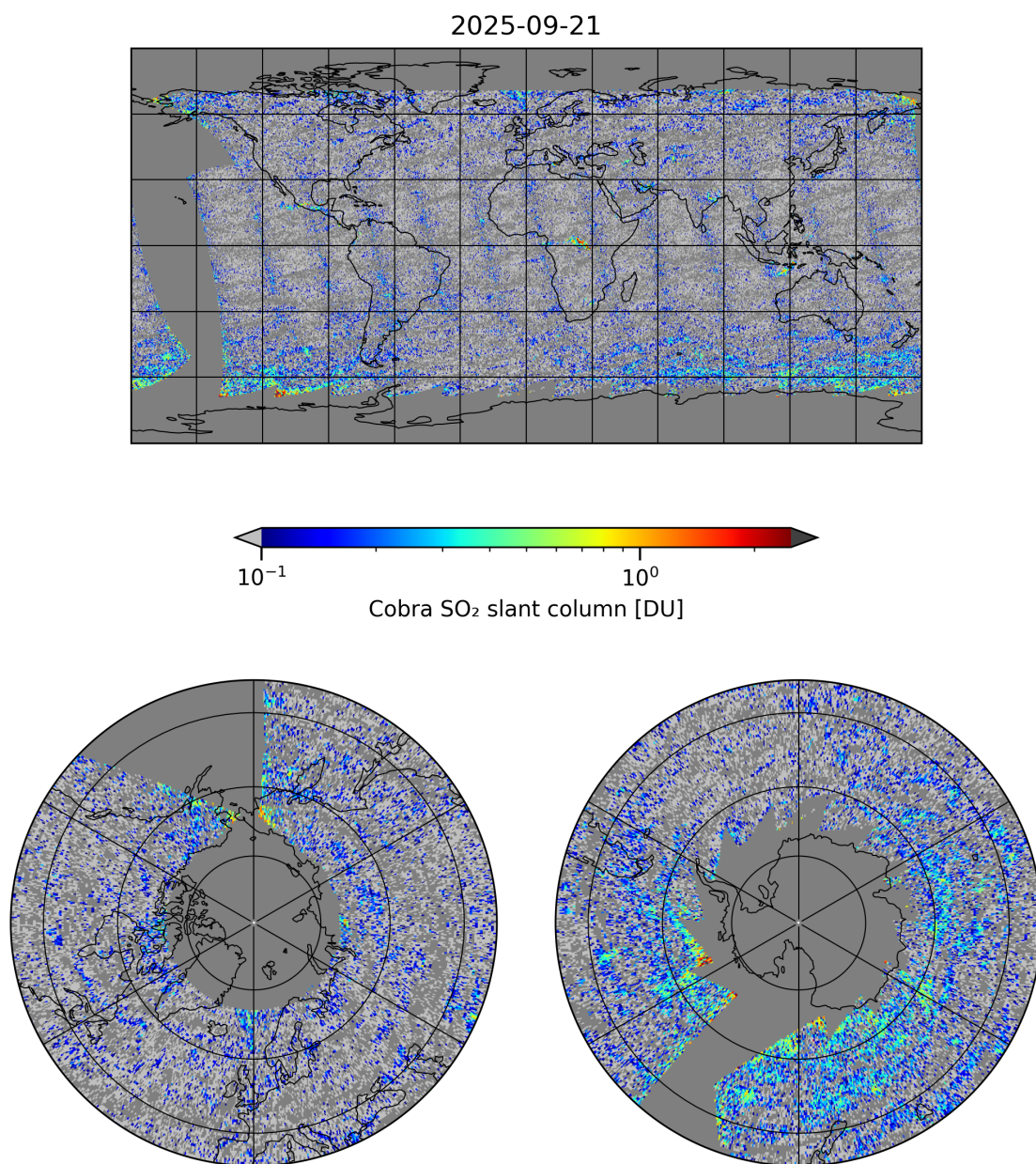


Figure 7: Map of “Cobra SO₂ slant column” for 2025-09-21 to 2025-09-22

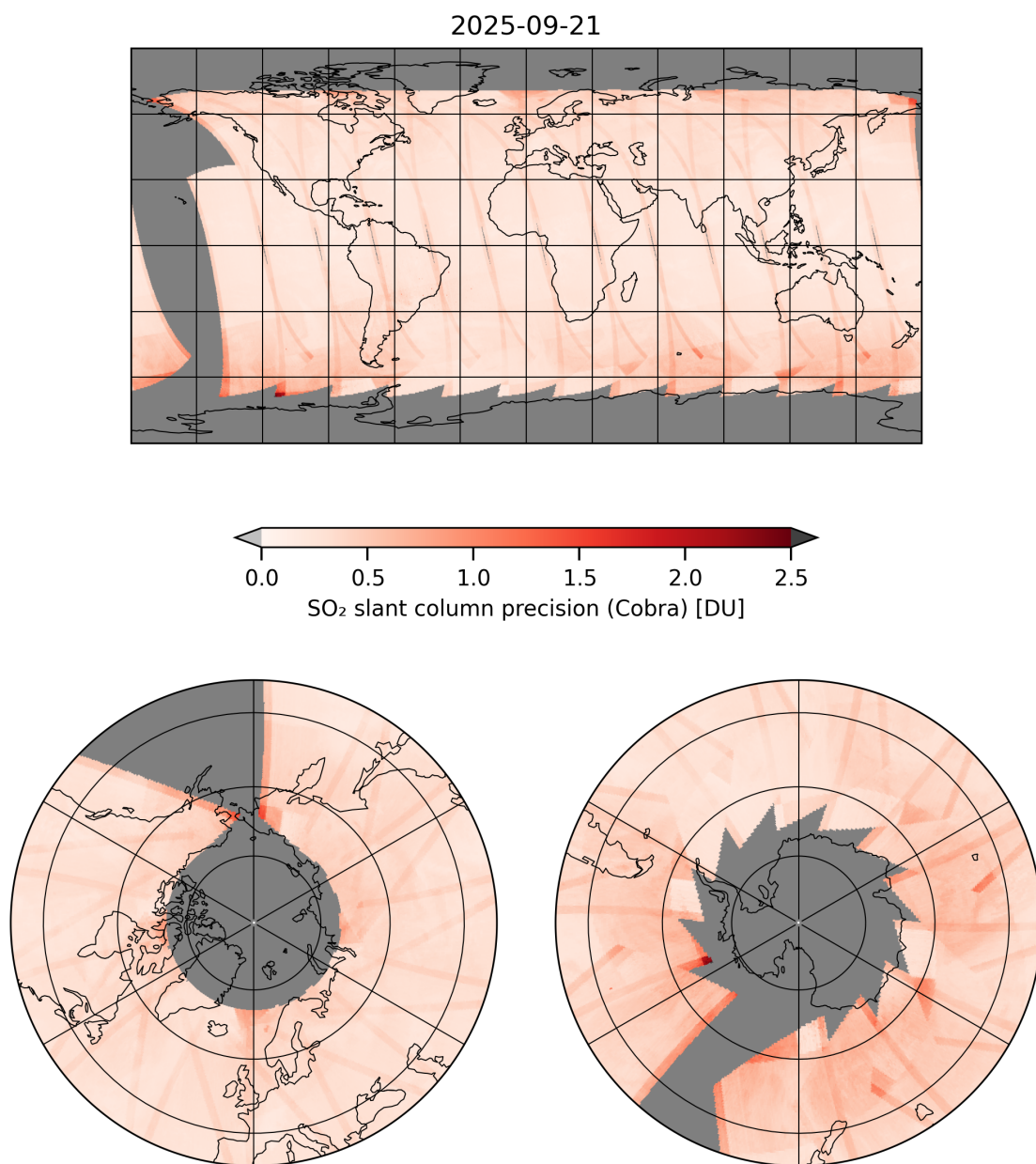


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-09-21 to 2025-09-22

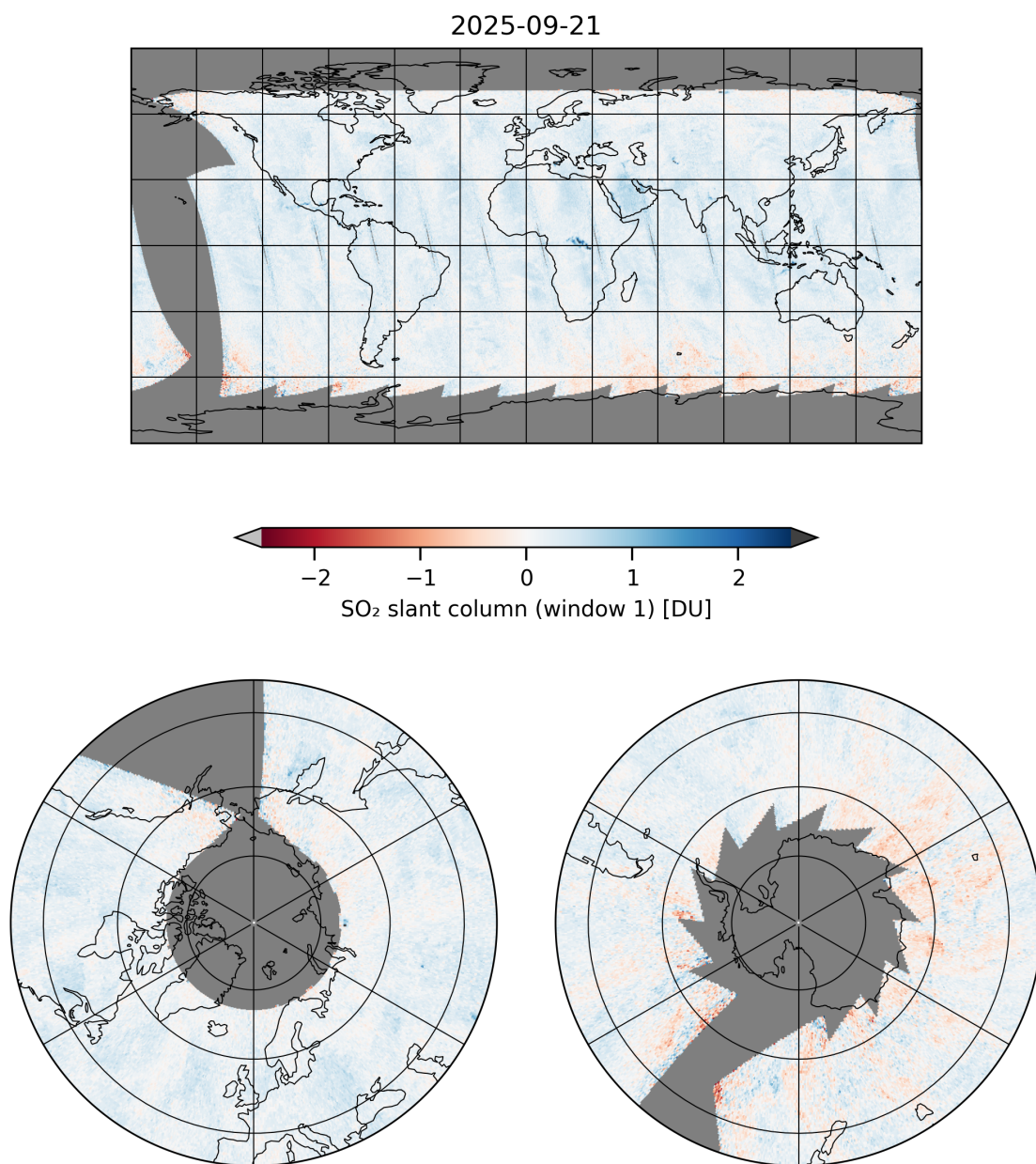


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-09-21 to 2025-09-22

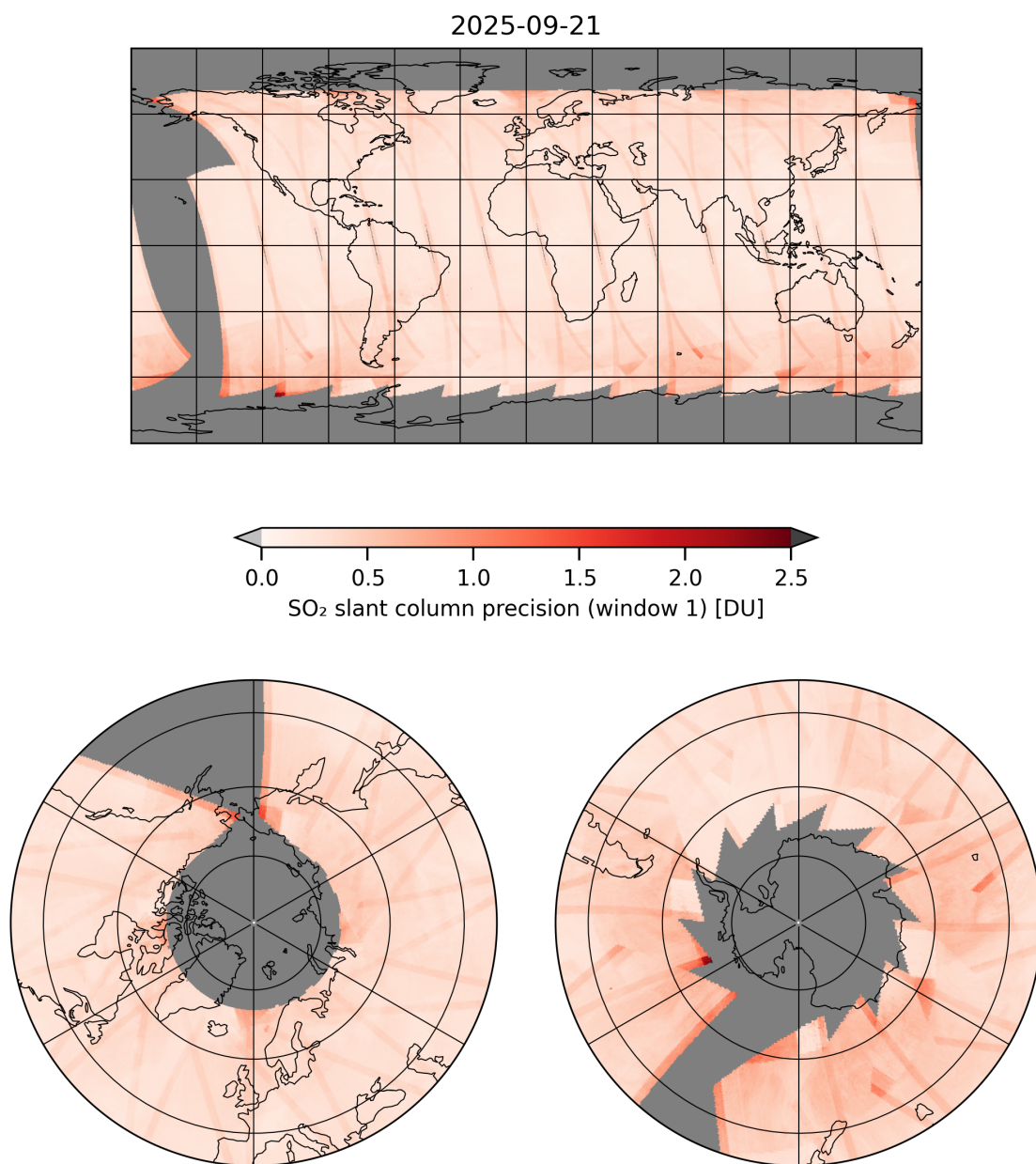


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-09-21 to 2025-09-22

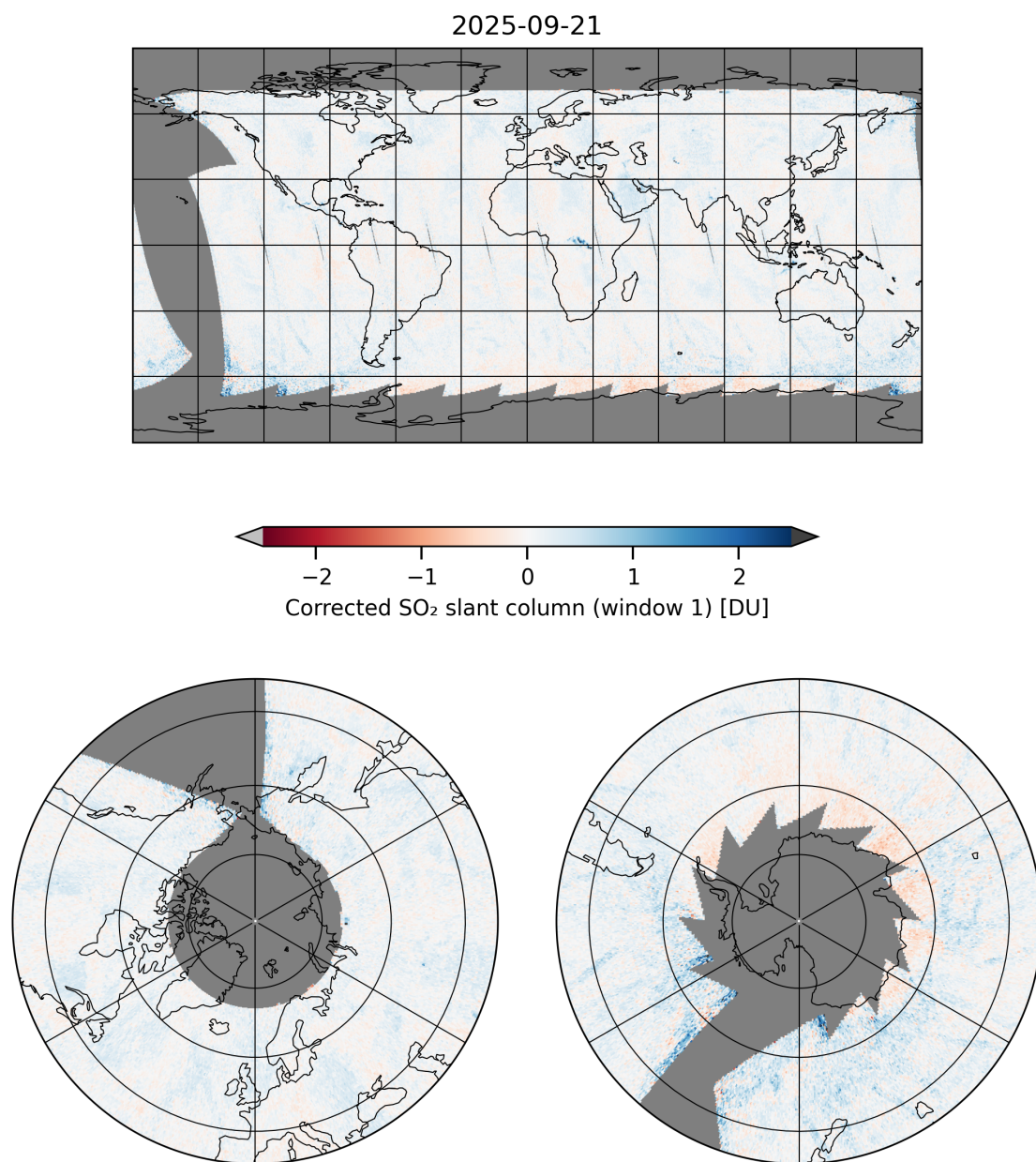


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-09-21 to 2025-09-22

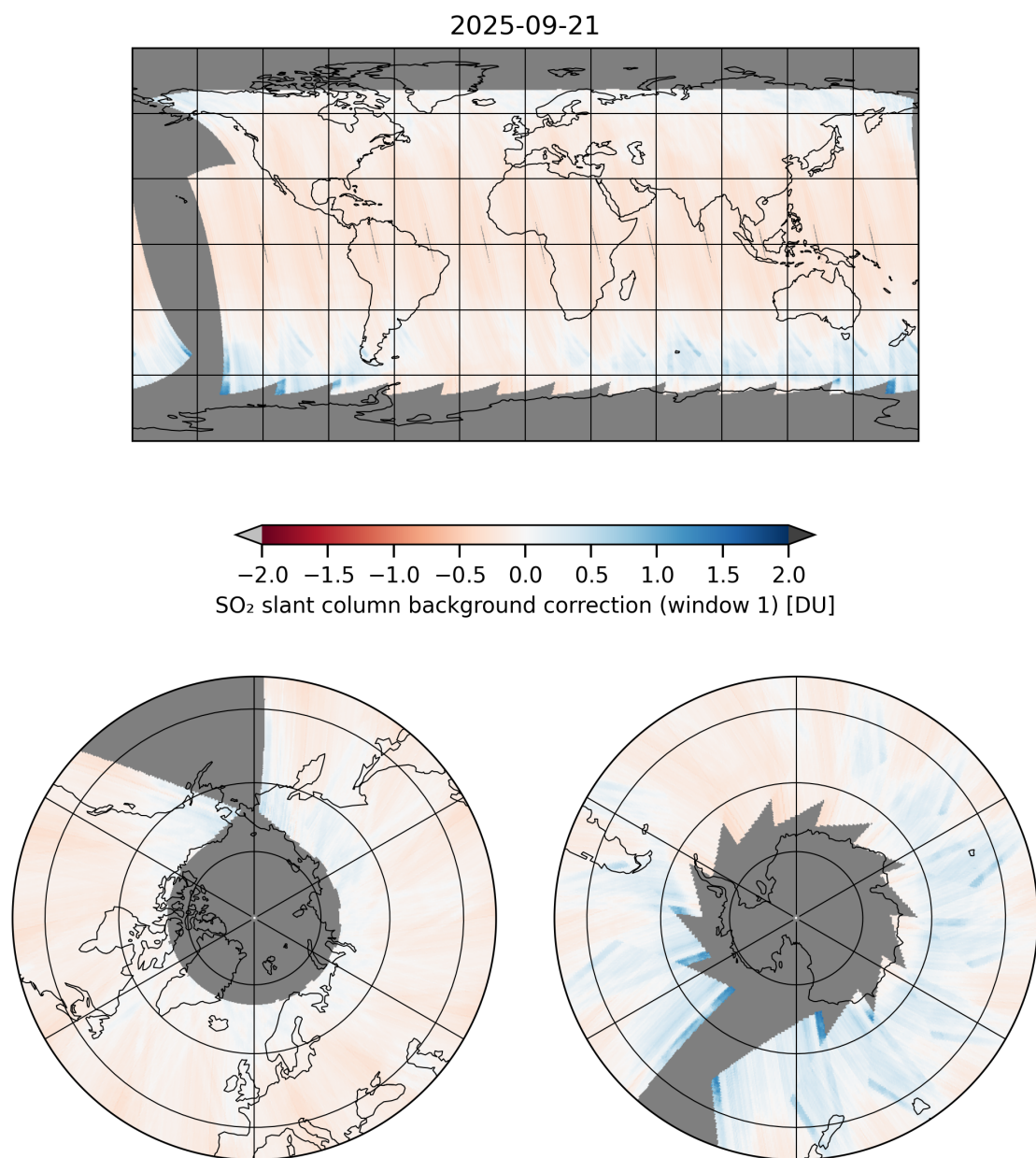


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-09-21 to 2025-09-22

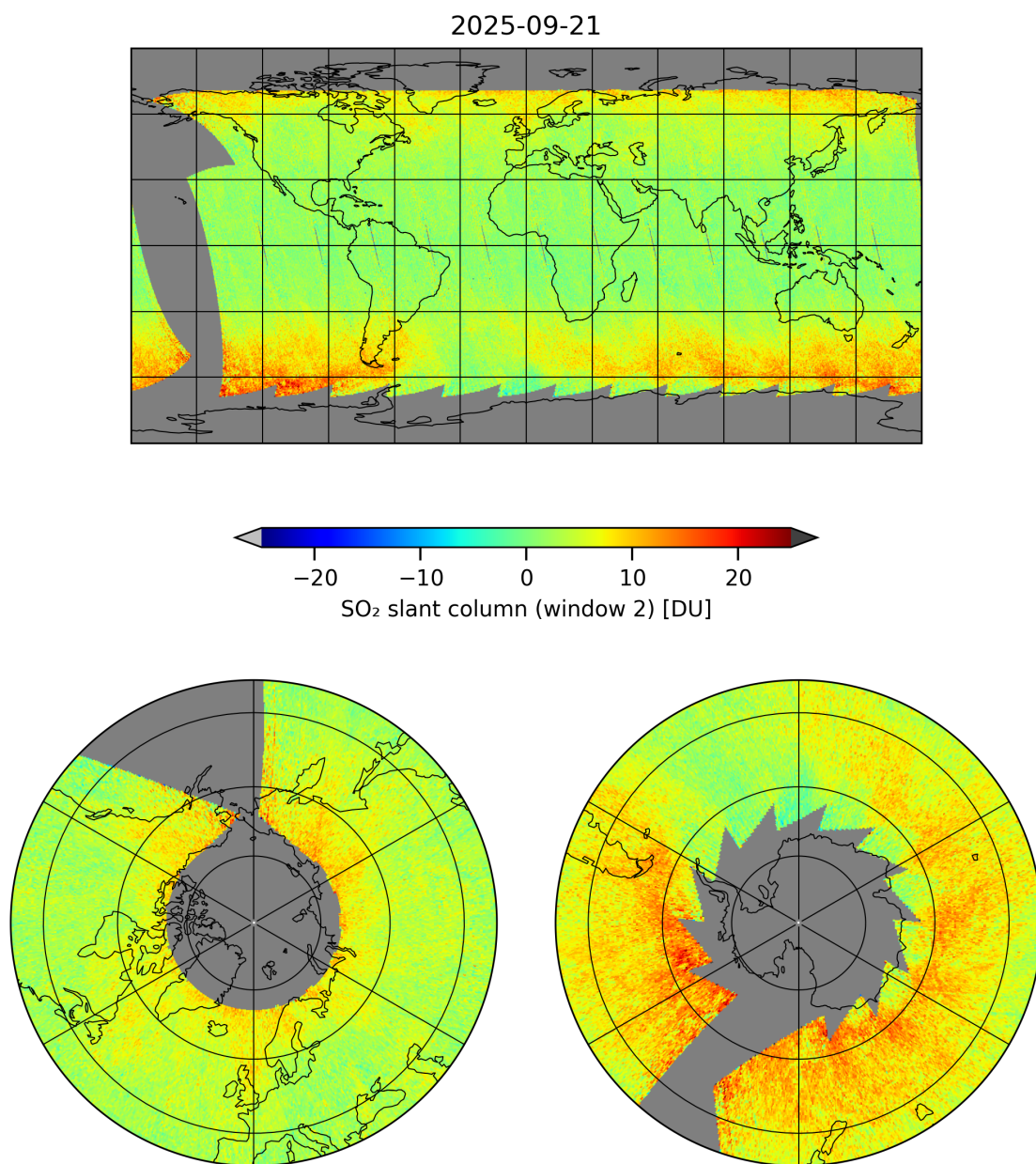


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-09-21 to 2025-09-22

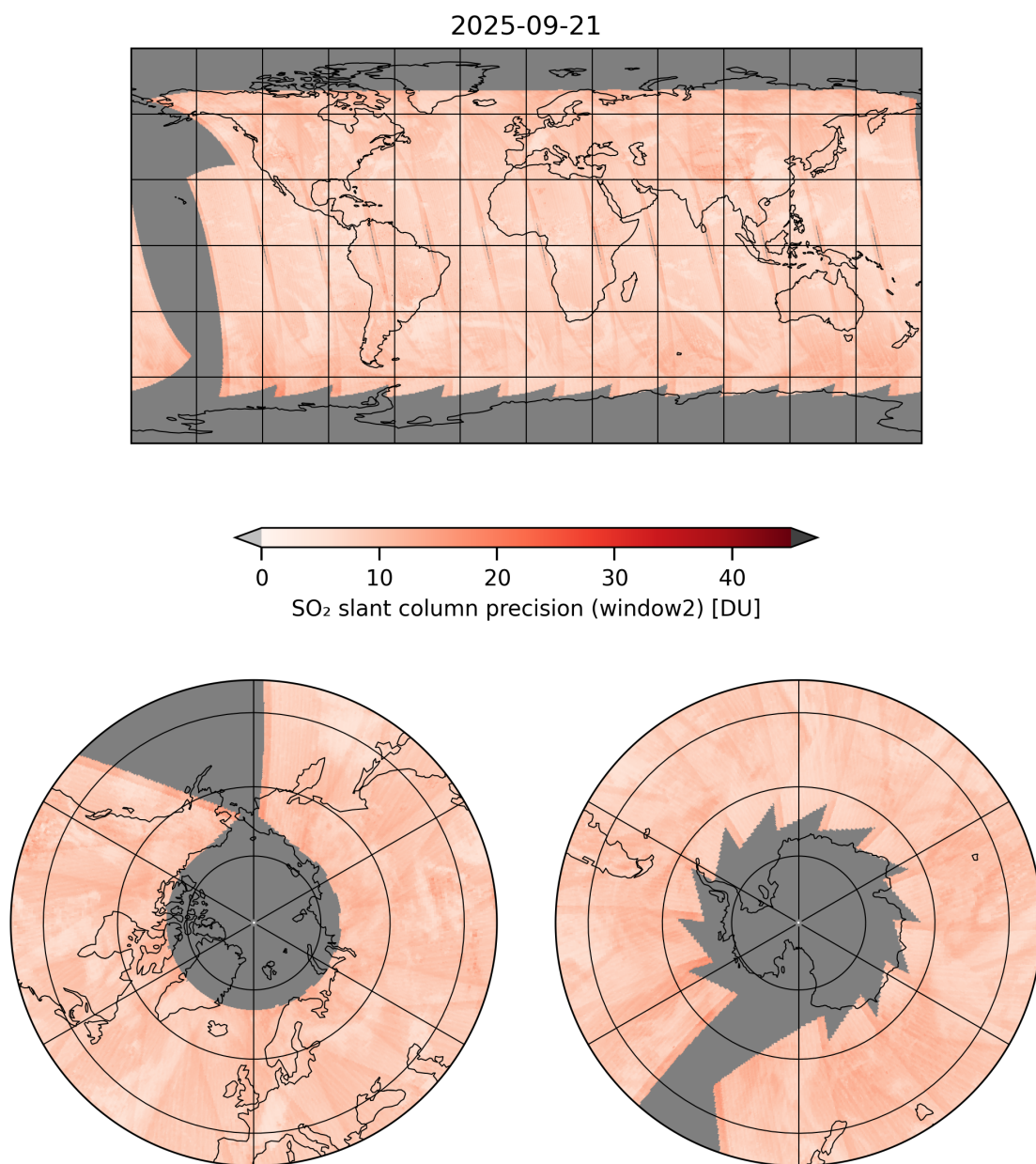


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-09-21 to 2025-09-22

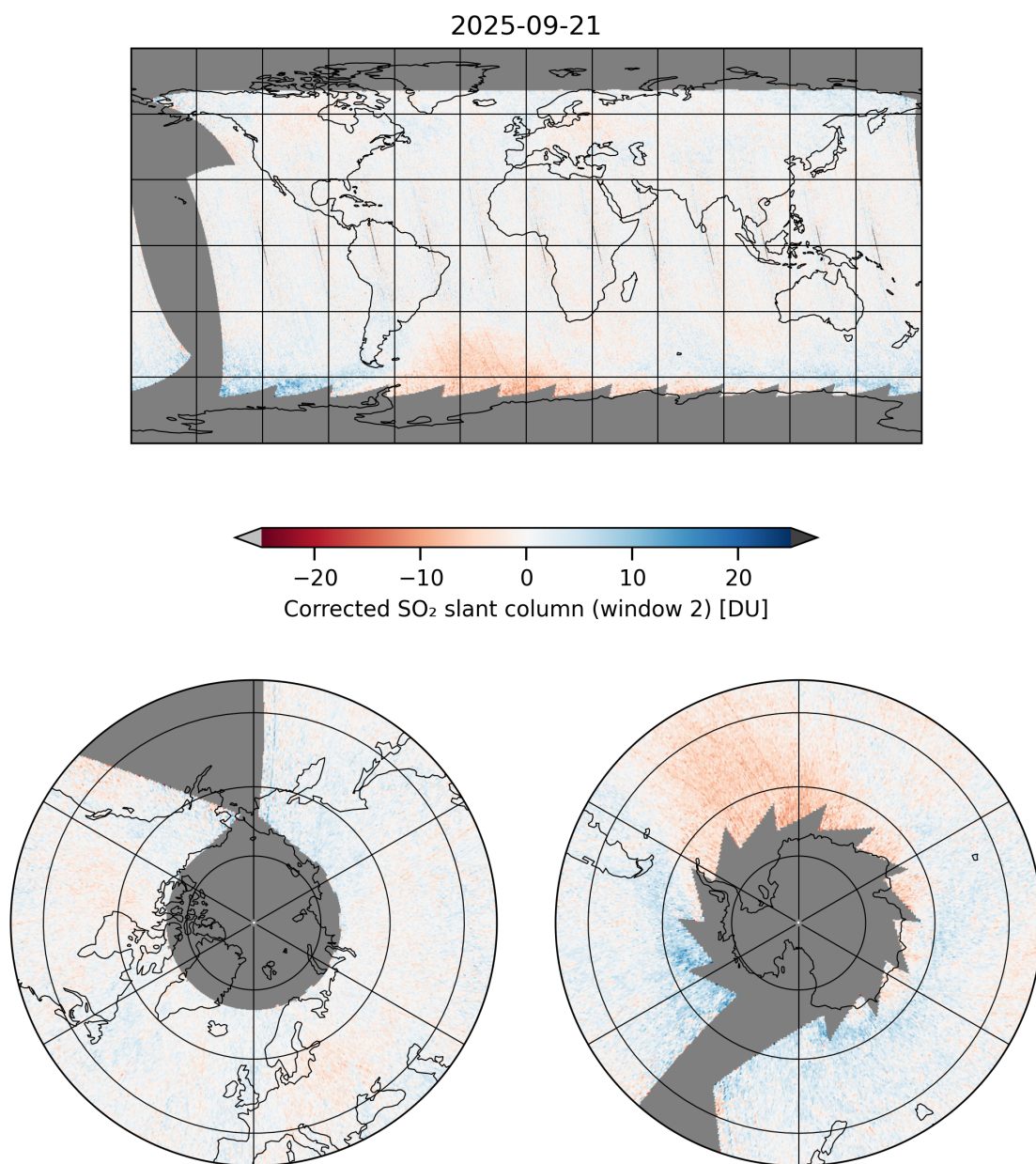


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-09-21 to 2025-09-22

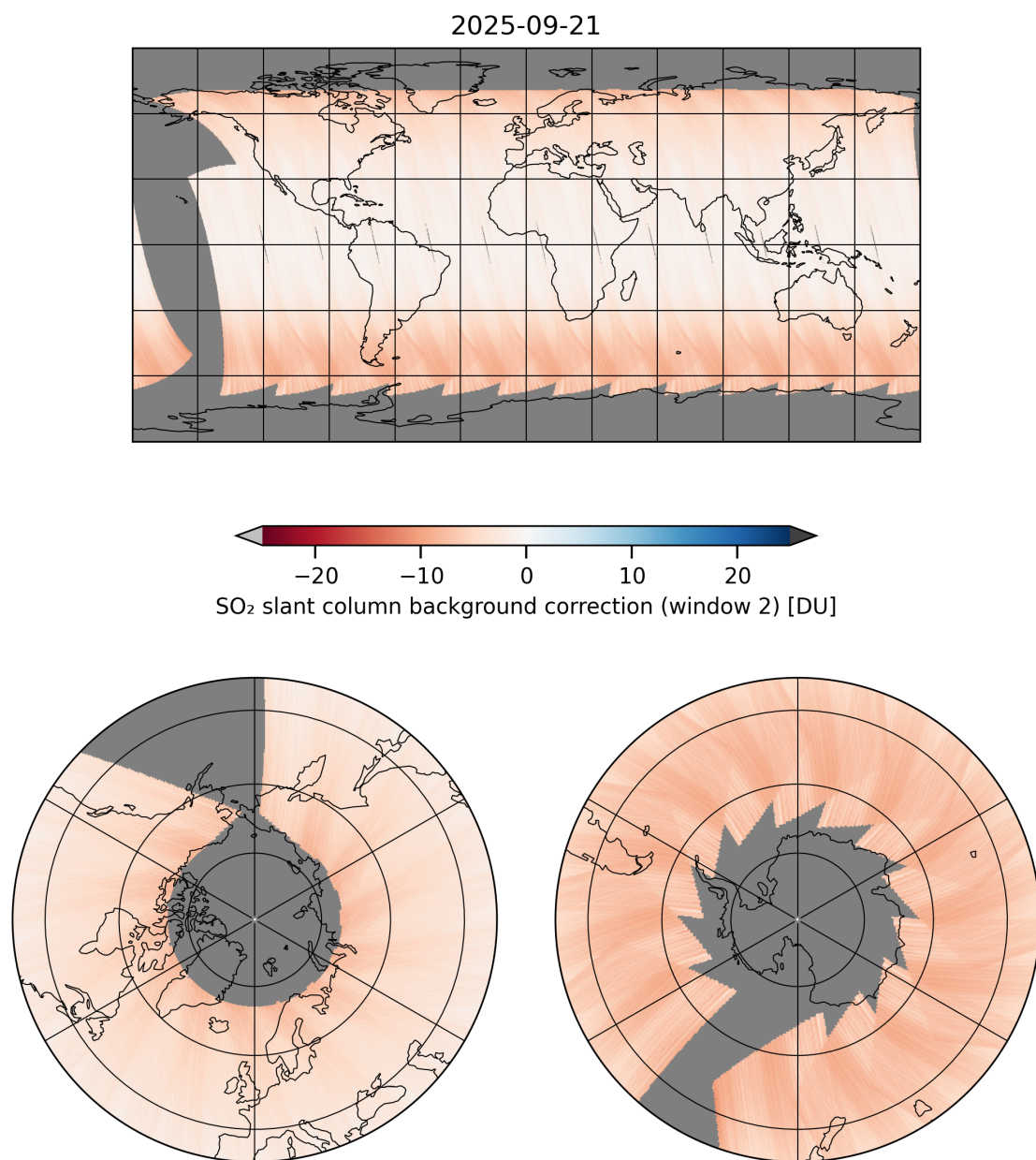


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-09-21 to 2025-09-22

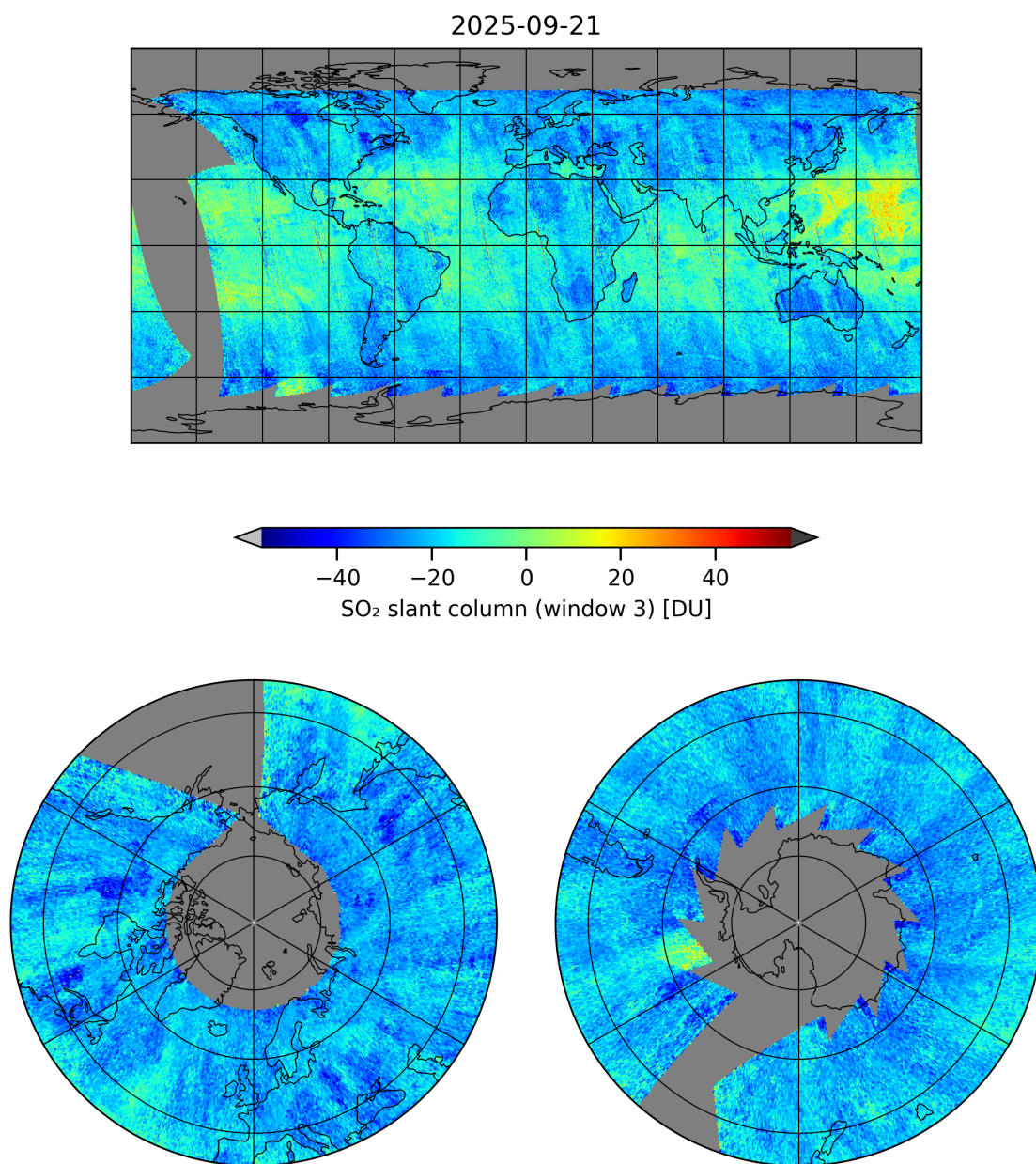


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-09-21 to 2025-09-22

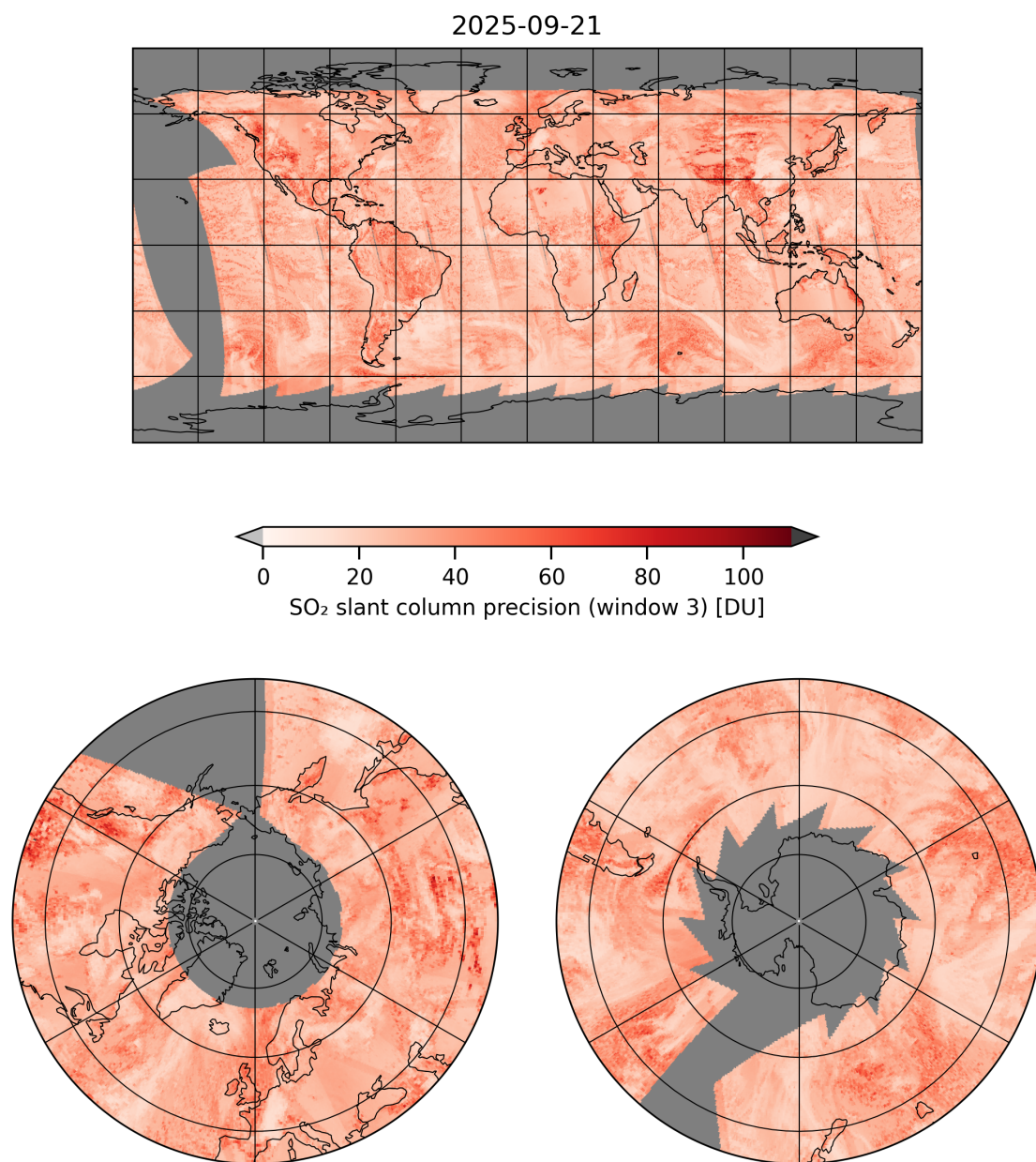


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-09-21 to 2025-09-22

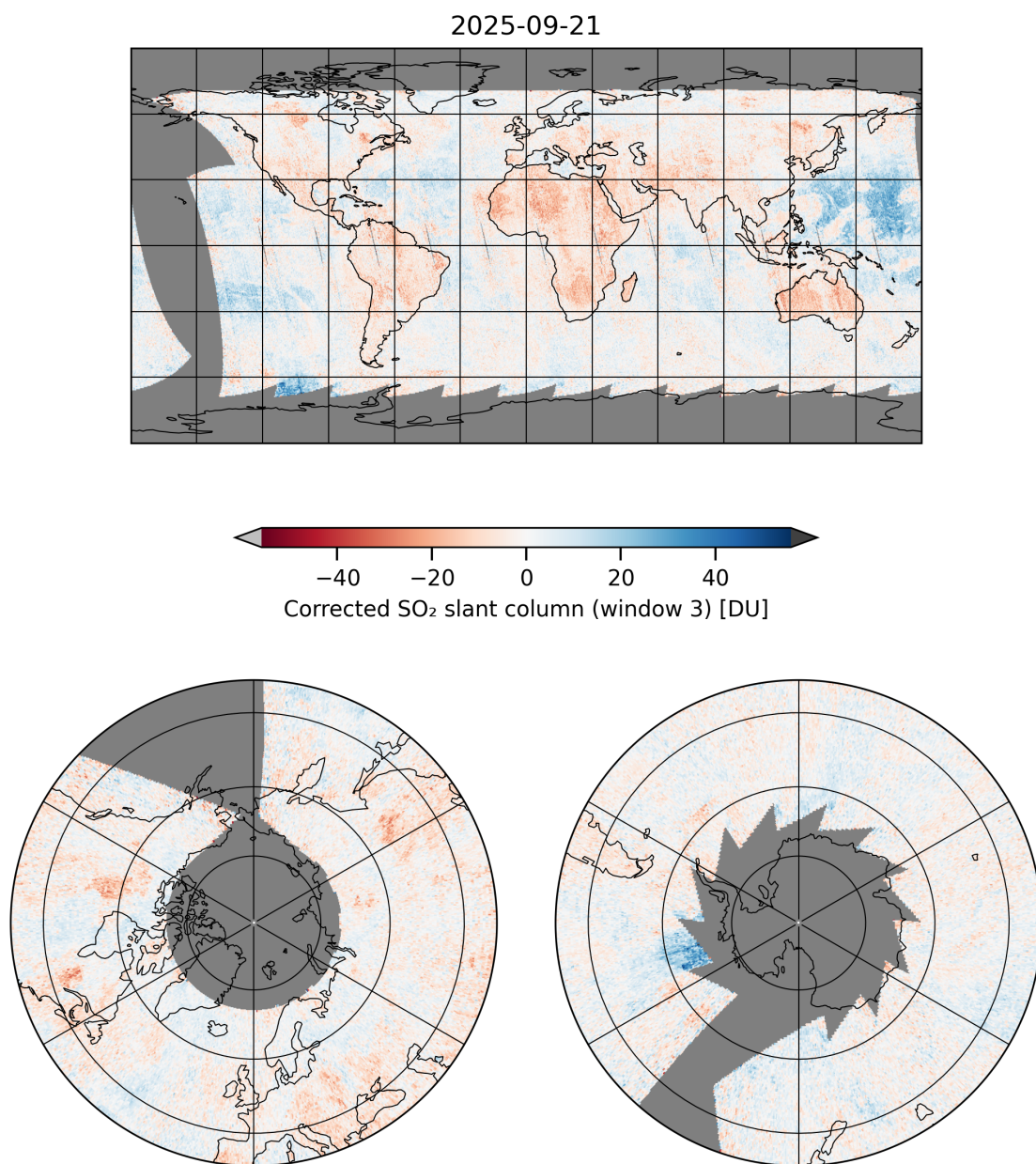


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-09-21 to 2025-09-22

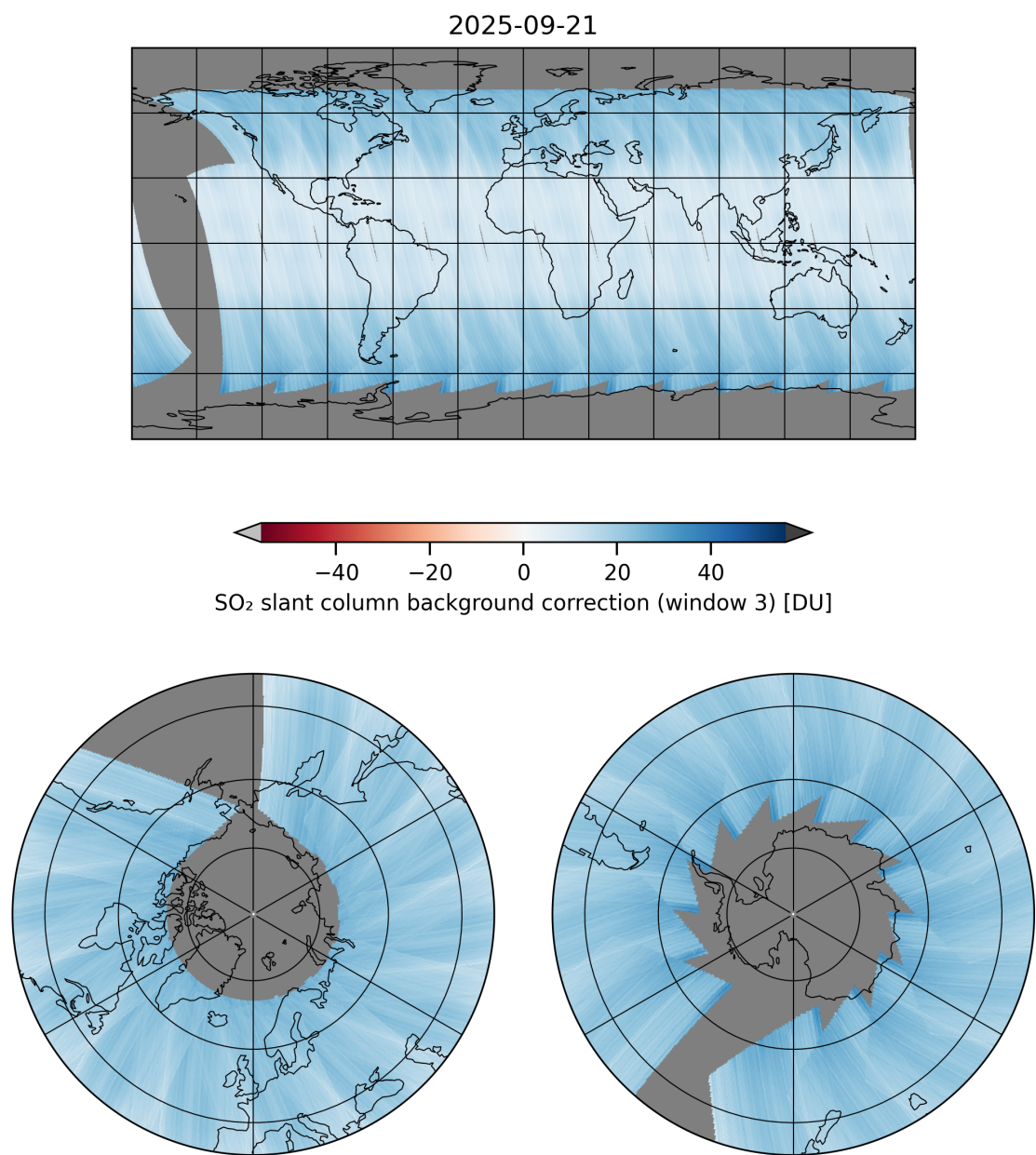


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-09-21 to 2025-09-22

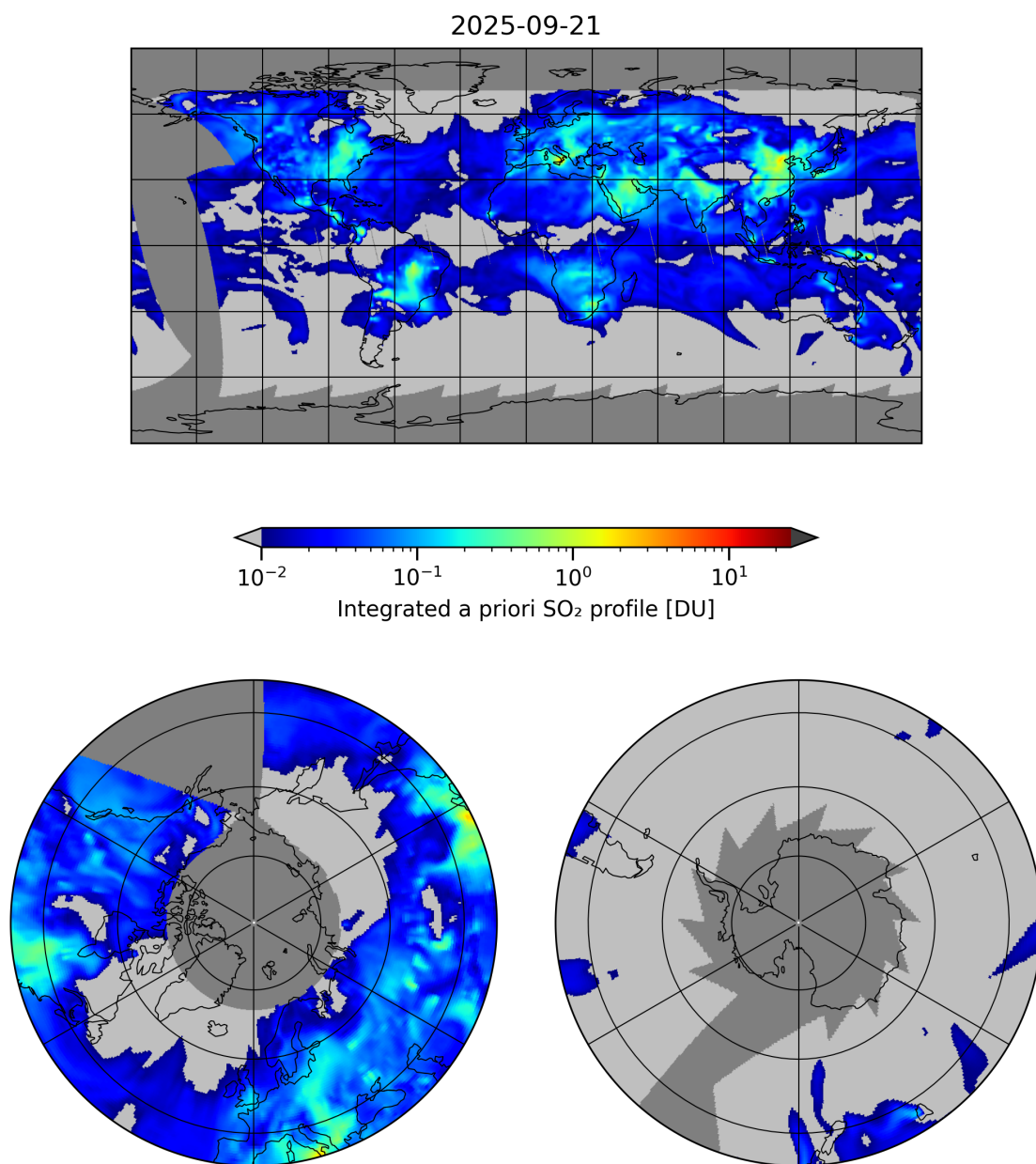


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-09-21 to 2025-09-22

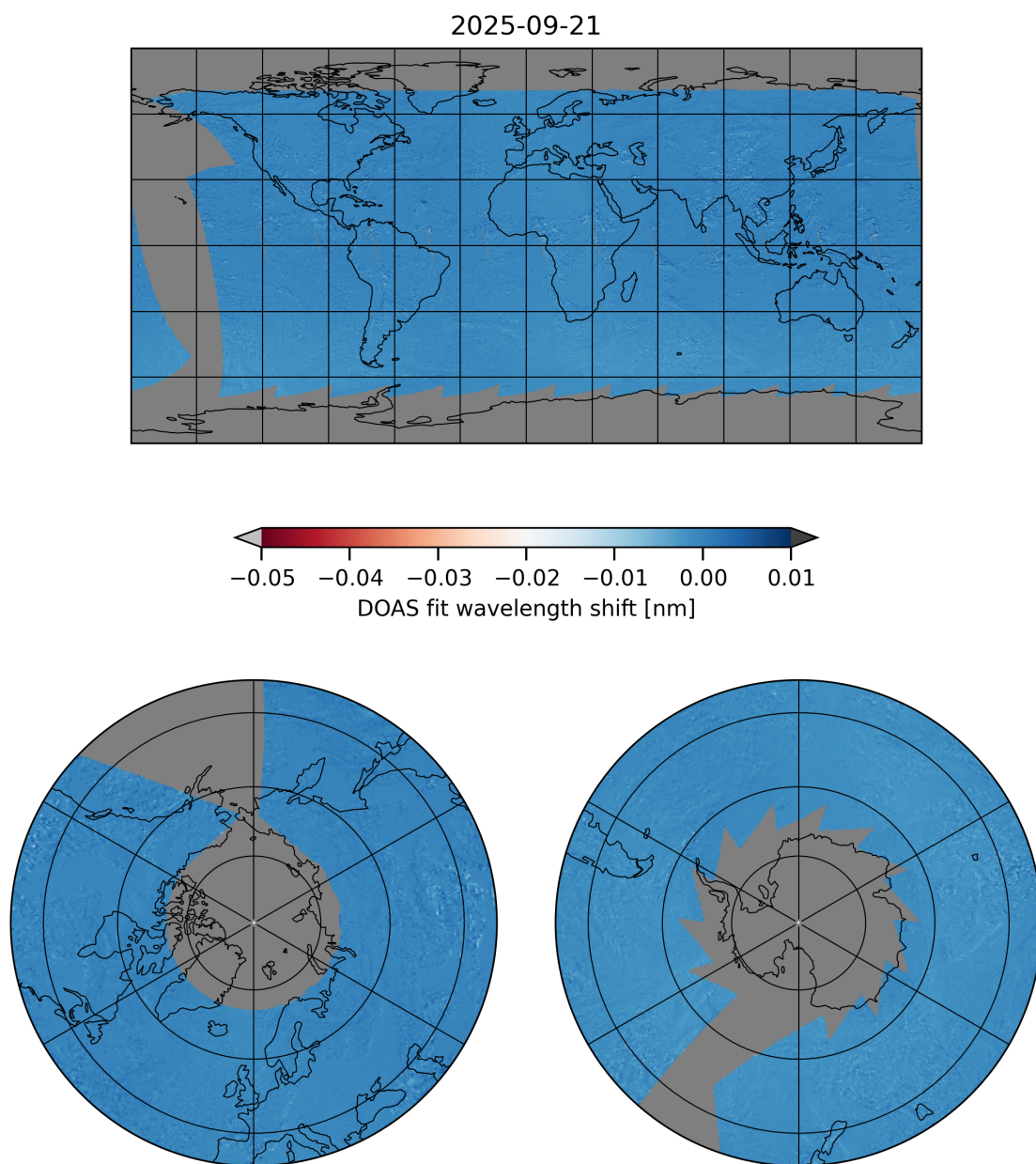


Figure 22: Map of “DOAS fit wavelength shift” for 2025-09-21 to 2025-09-22

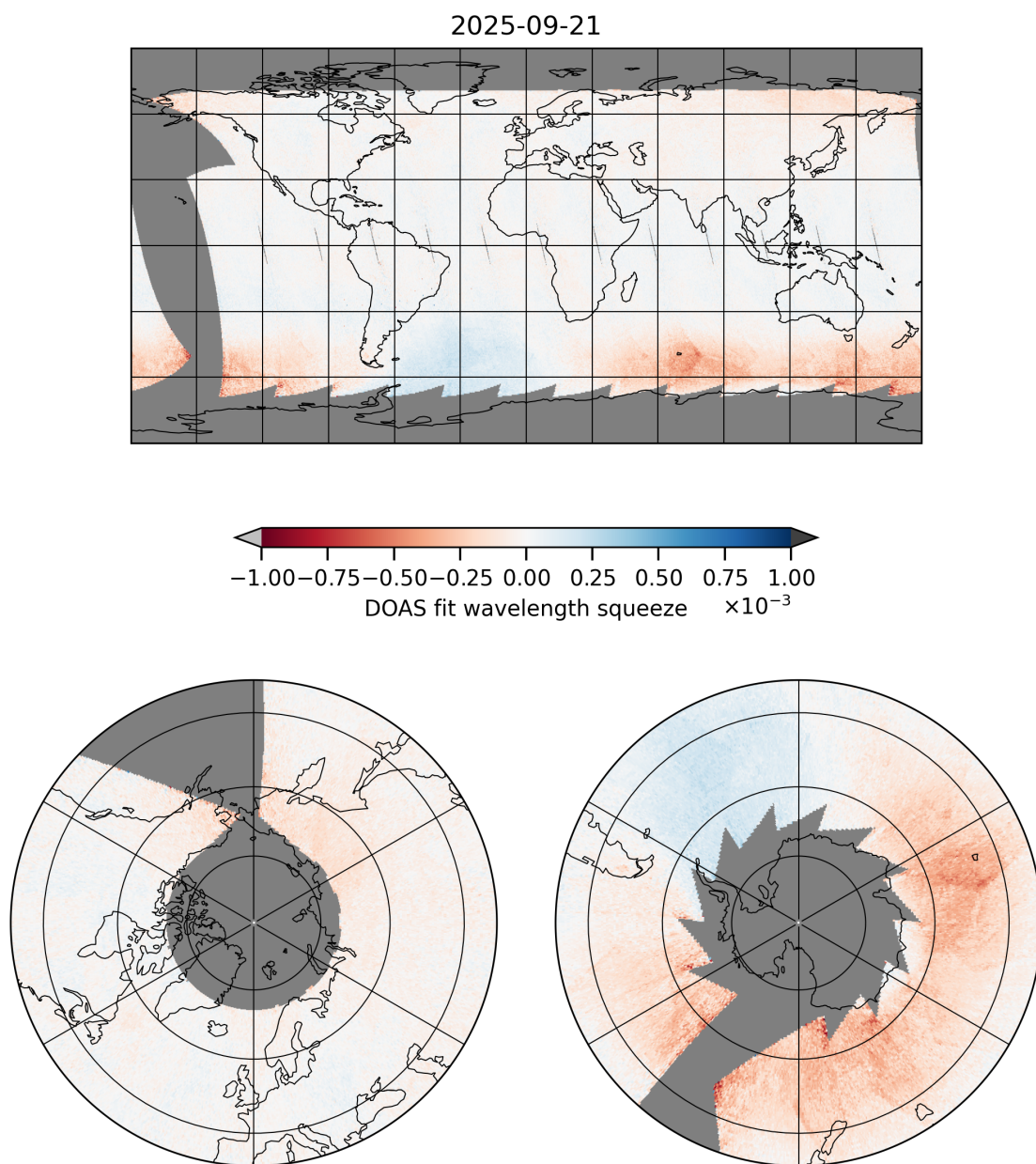


Figure 23: Map of "DOAS fit wavelength squeeze" for 2025-09-21 to 2025-09-22

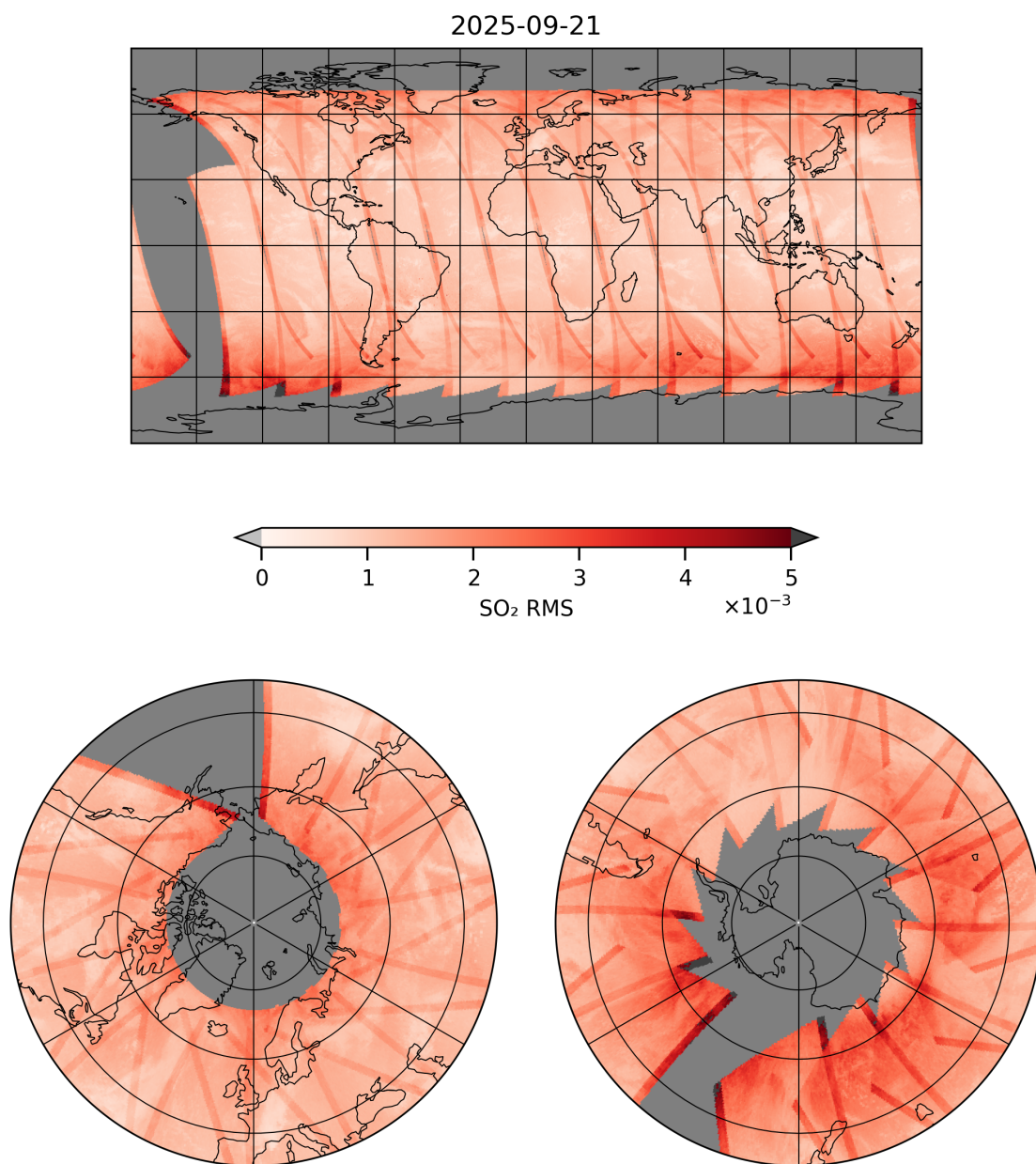


Figure 24: Map of “SO₂ RMS” for 2025-09-21 to 2025-09-22

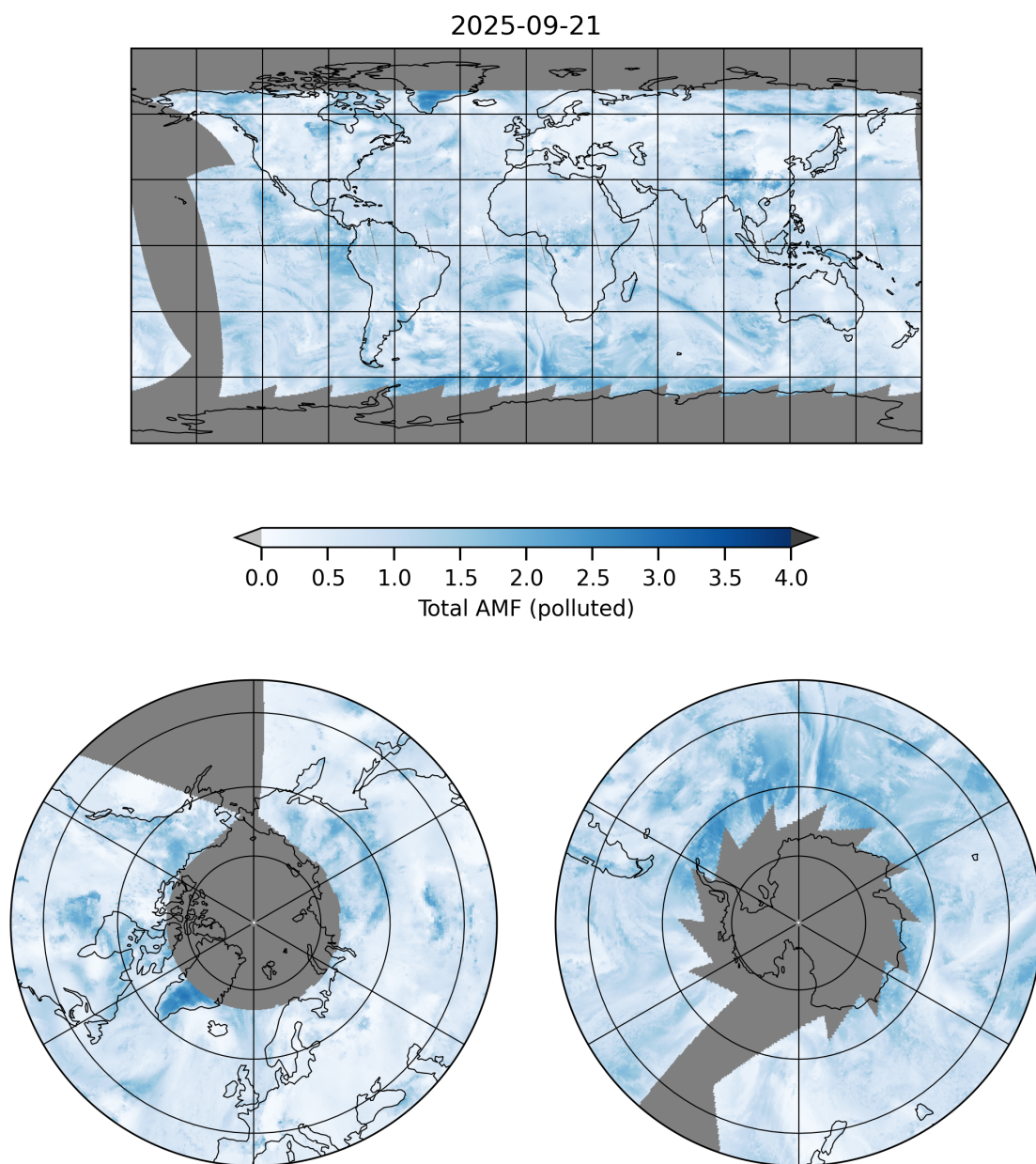


Figure 25: Map of “Total AMF (polluted)” for 2025-09-21 to 2025-09-22

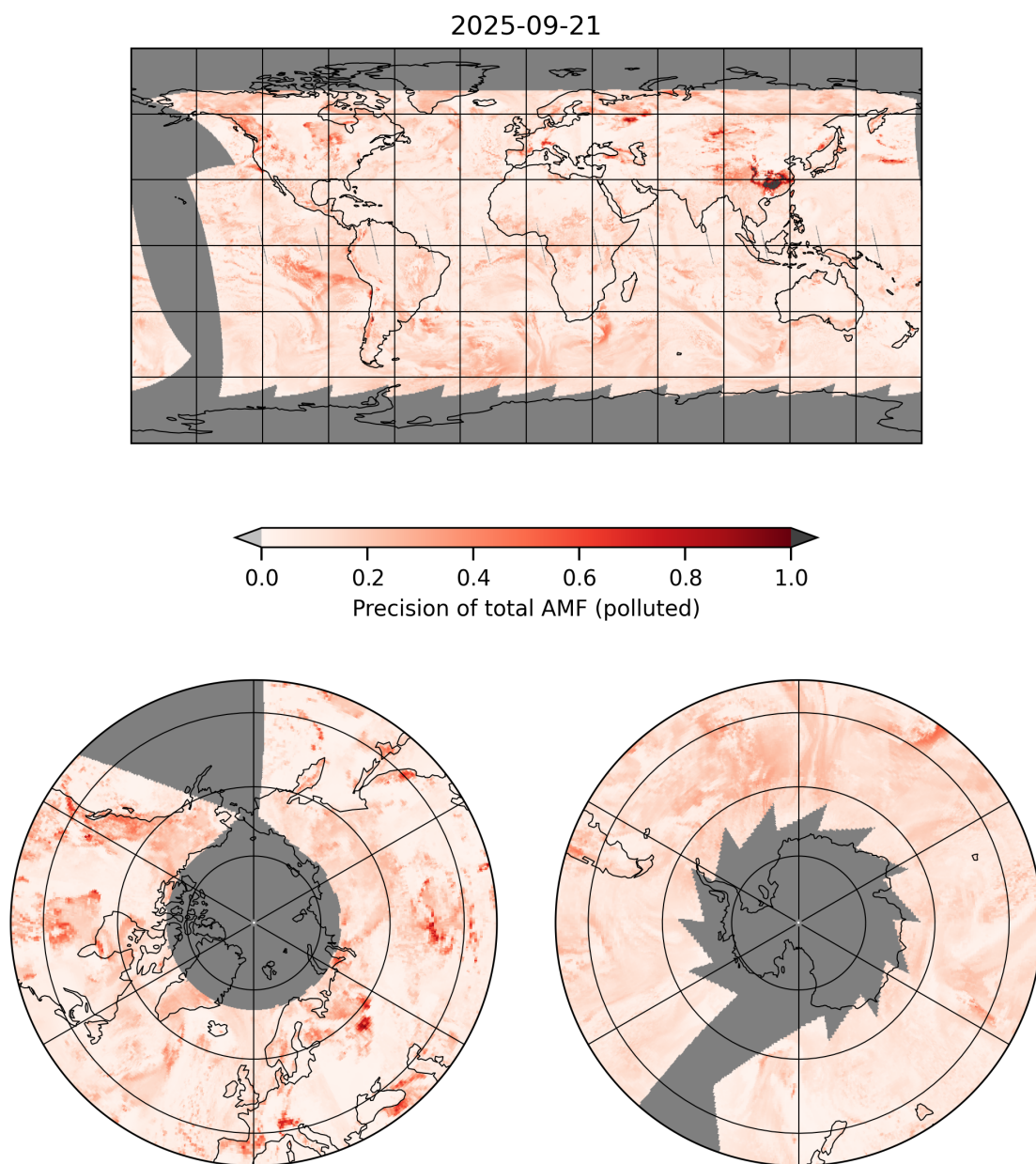


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-09-21 to 2025-09-22

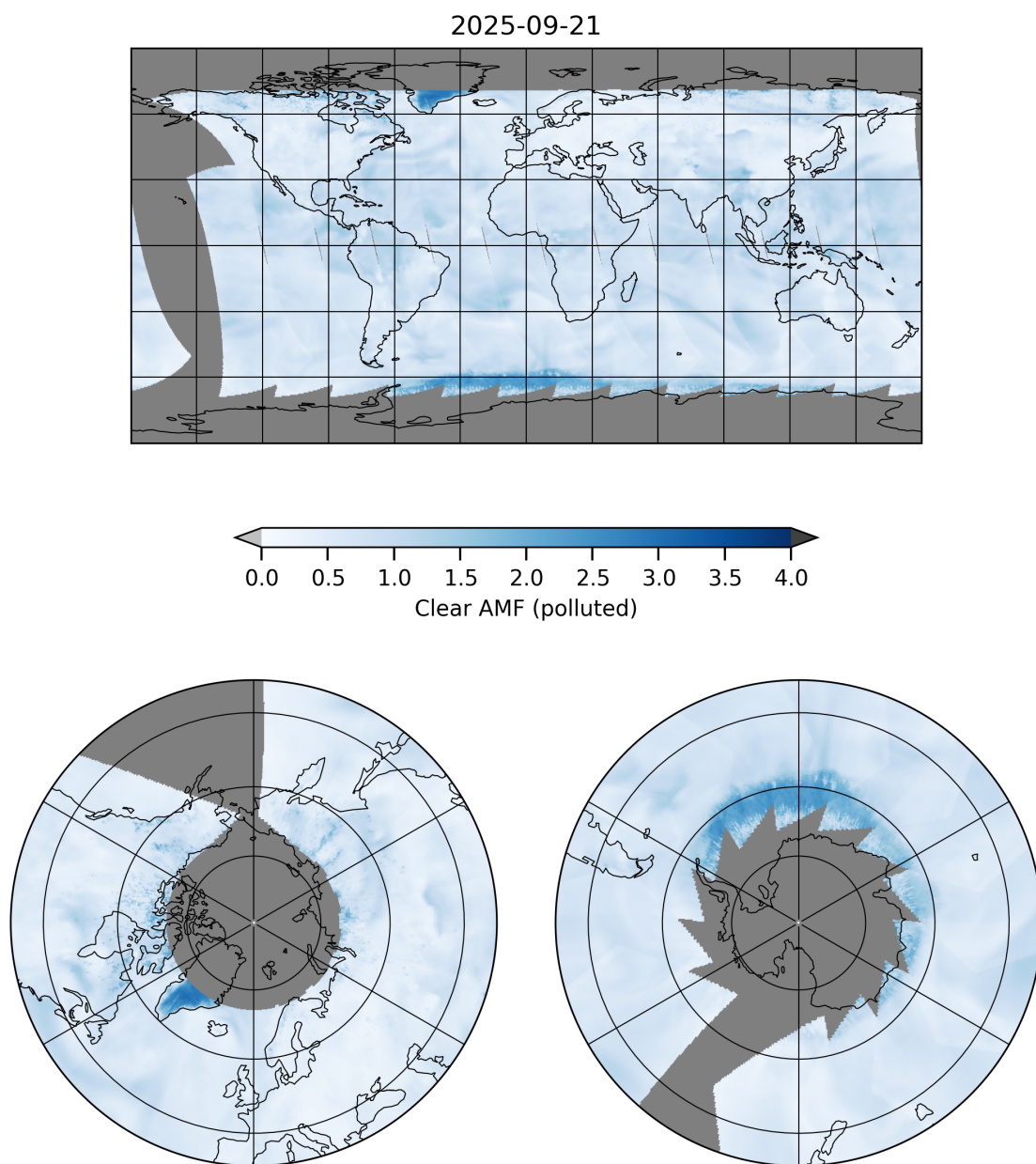


Figure 27: Map of “Clear AMF (polluted)” for 2025-09-21 to 2025-09-22

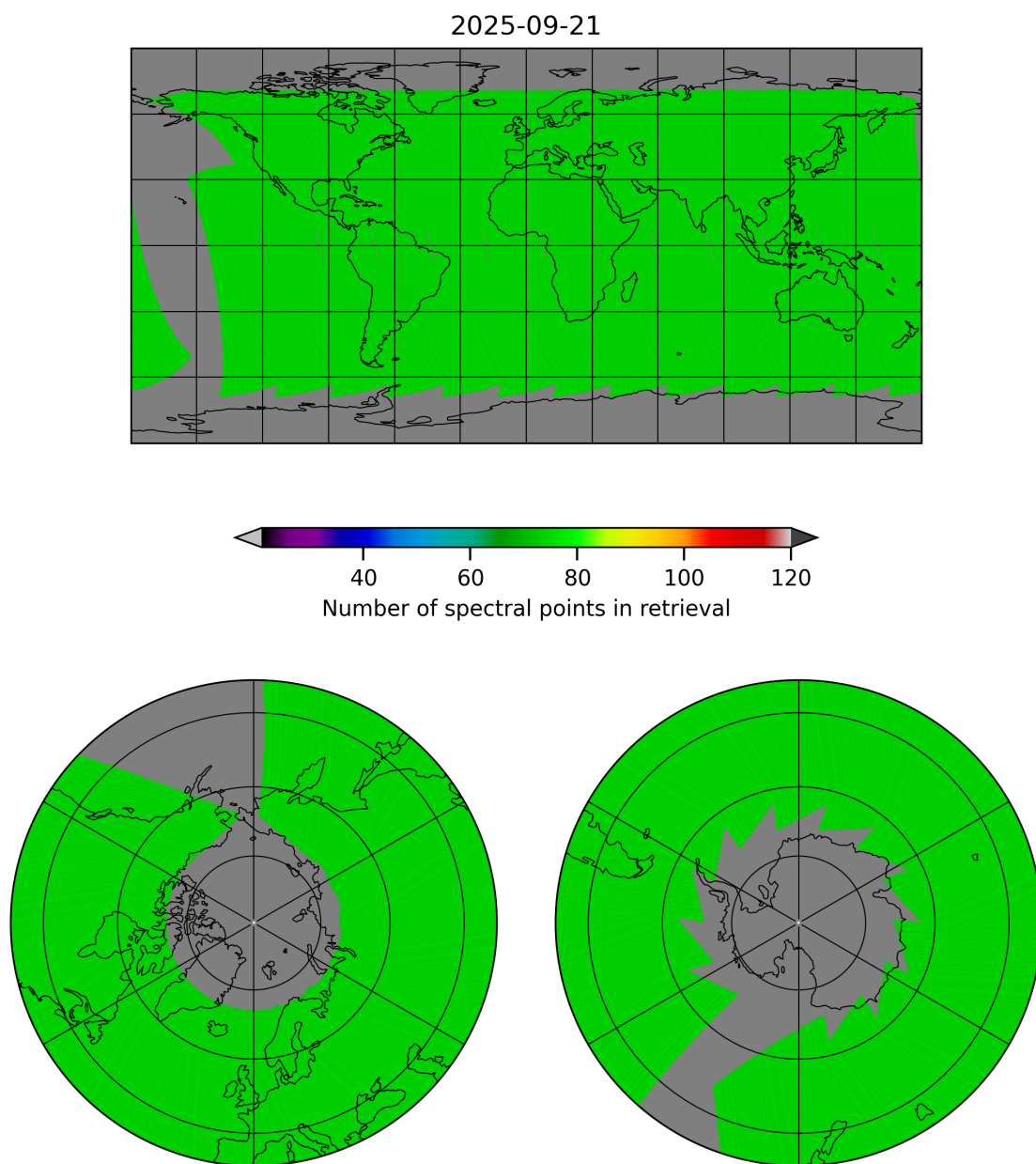


Figure 28: Map of “Number of spectral points in retrieval” for 2025-09-21 to 2025-09-22

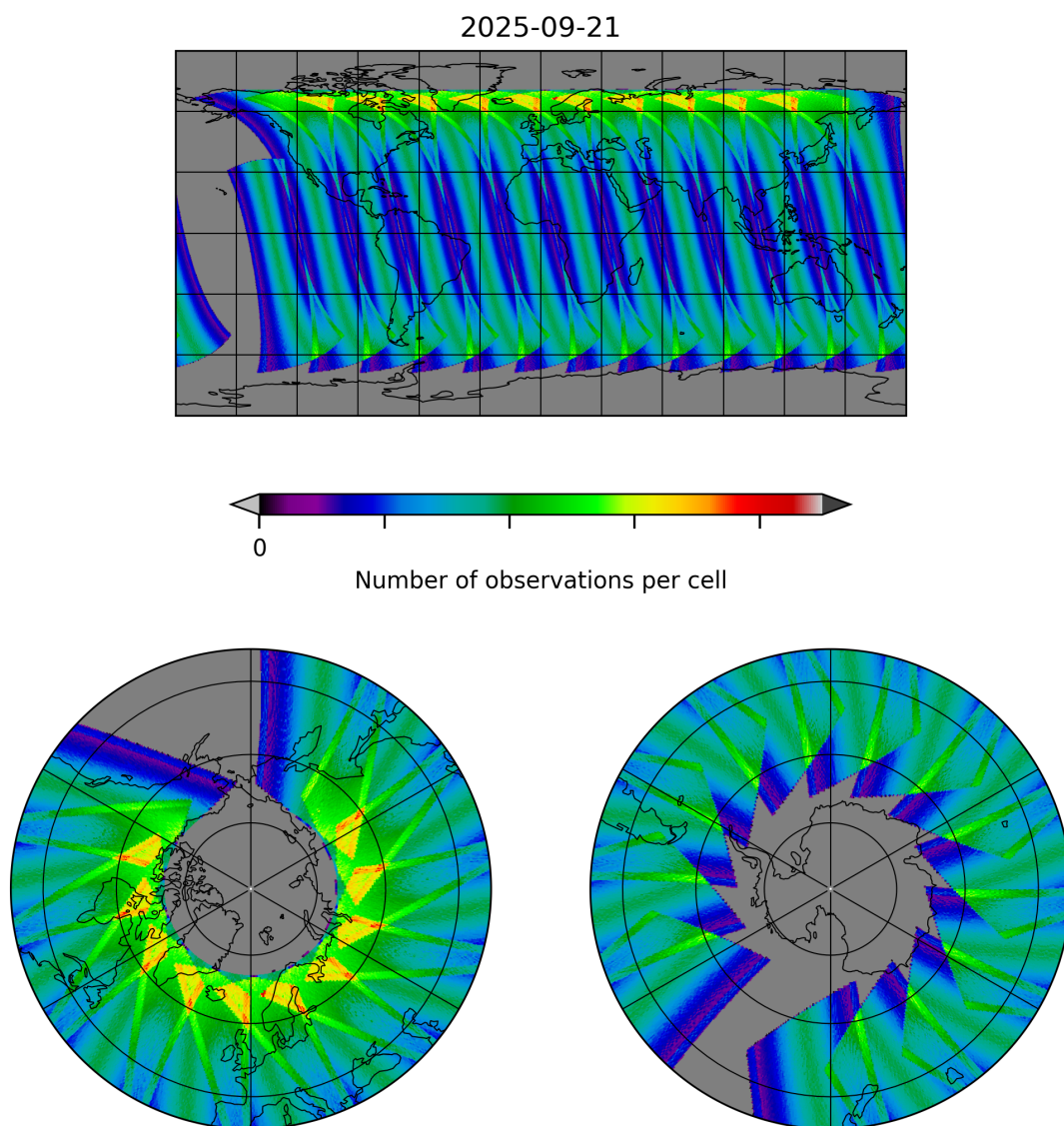


Figure 29: Map of the number of observations for 2025-09-21 to 2025-09-22

7 Zonal average

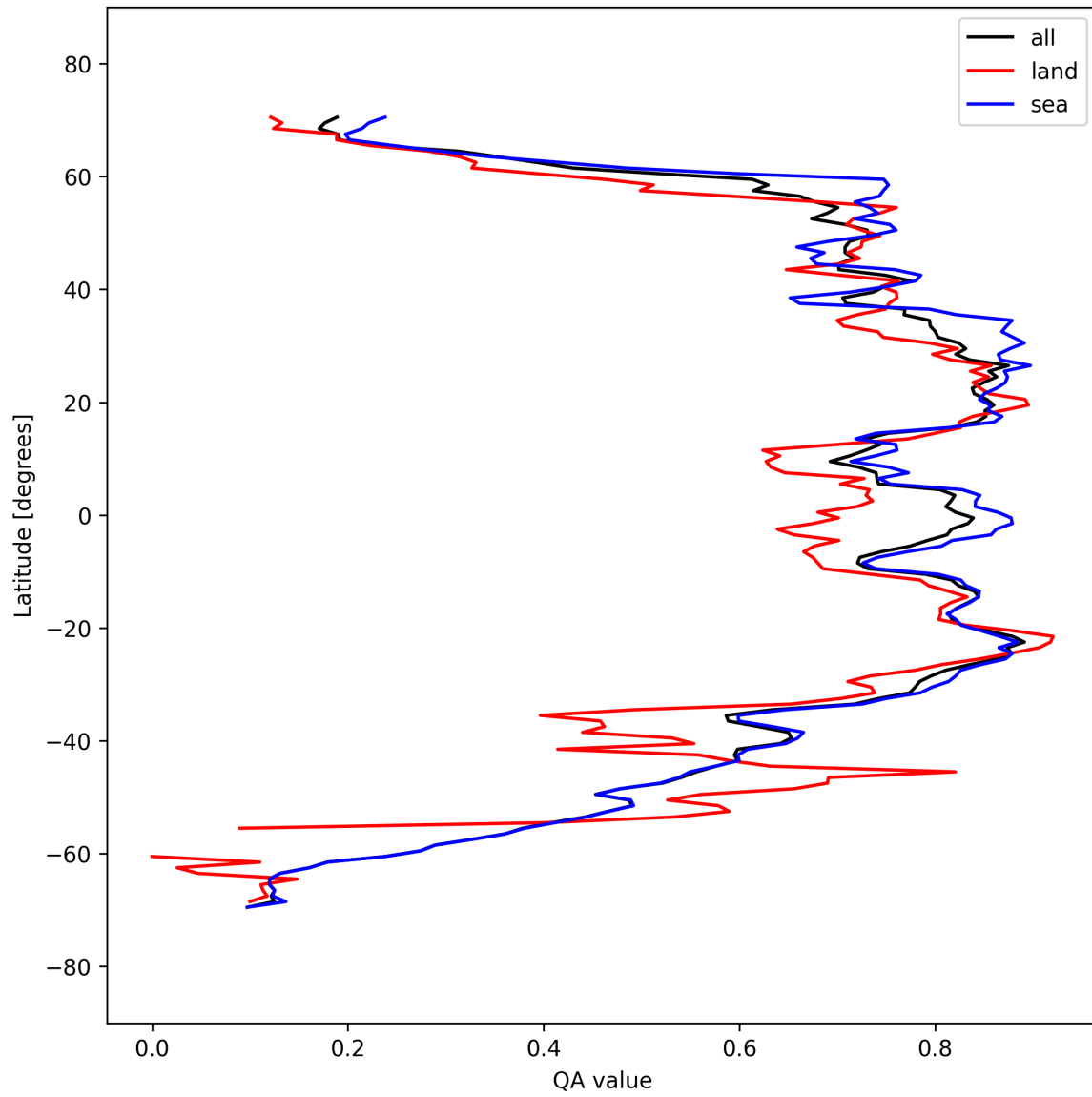


Figure 30: Zonal average of “QA value” for 2025-09-21 to 2025-09-22.

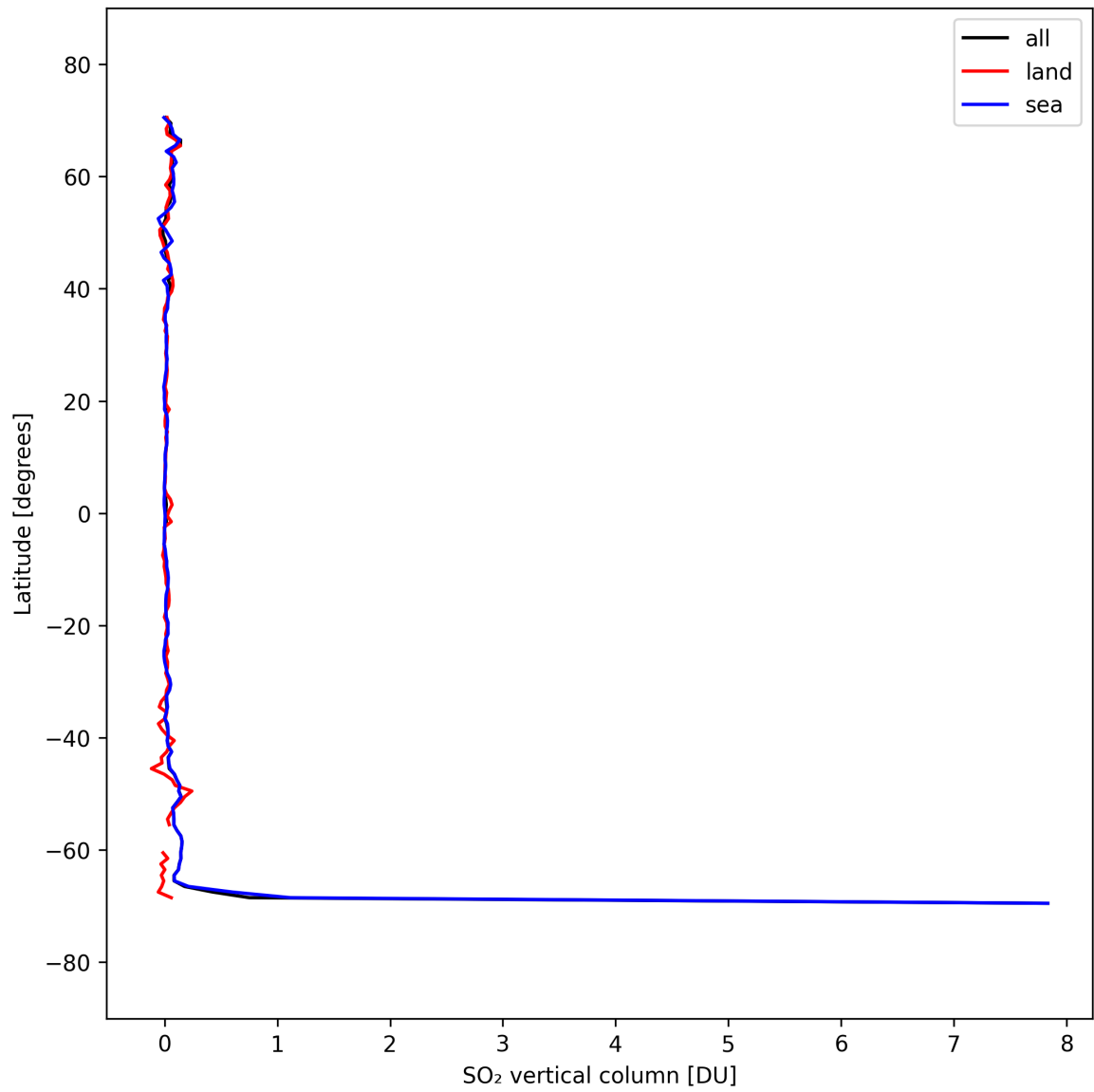


Figure 31: Zonal average of “SO₂ vertical column” for 2025-09-21 to 2025-09-22.

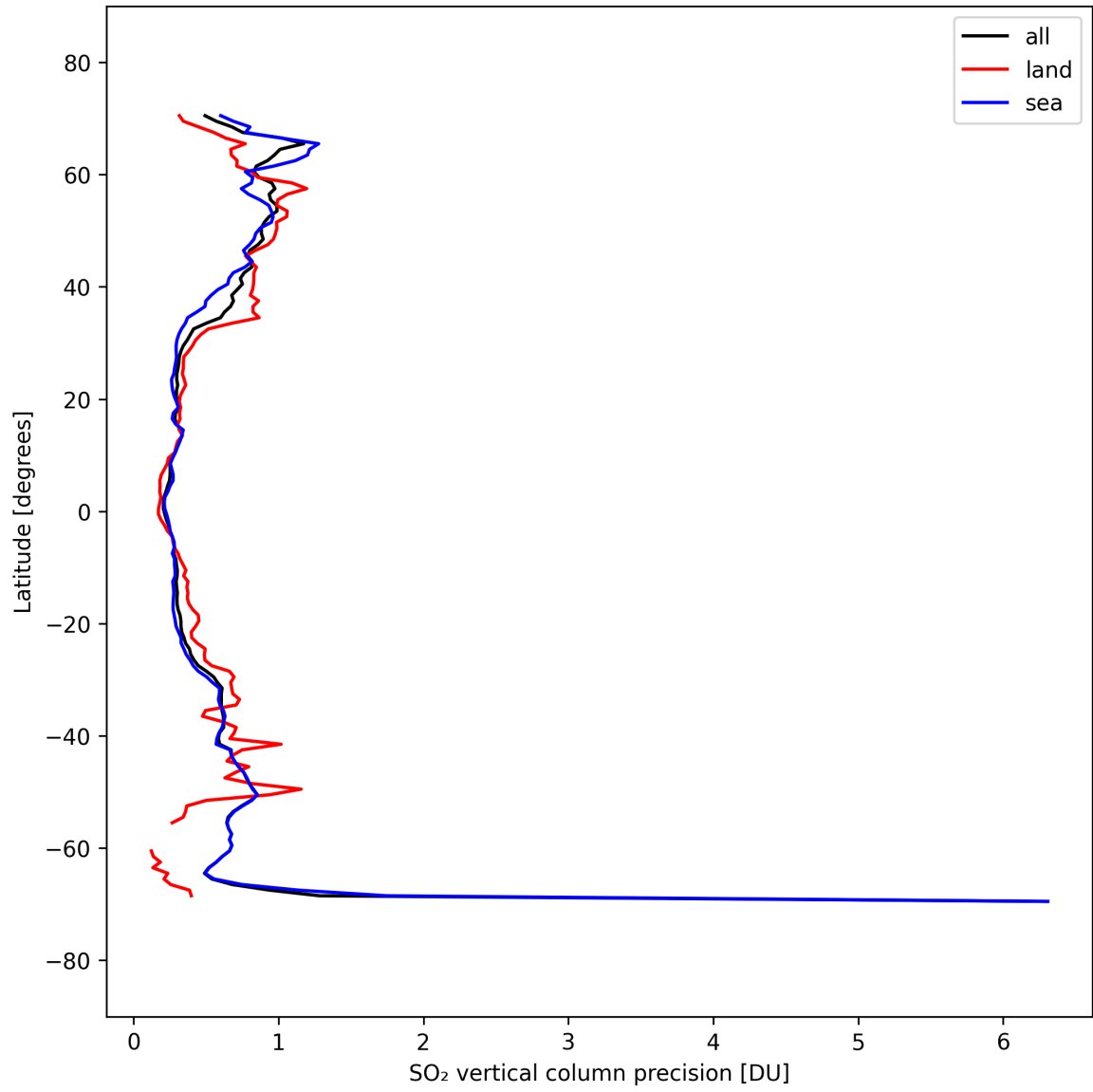


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-09-21 to 2025-09-22.

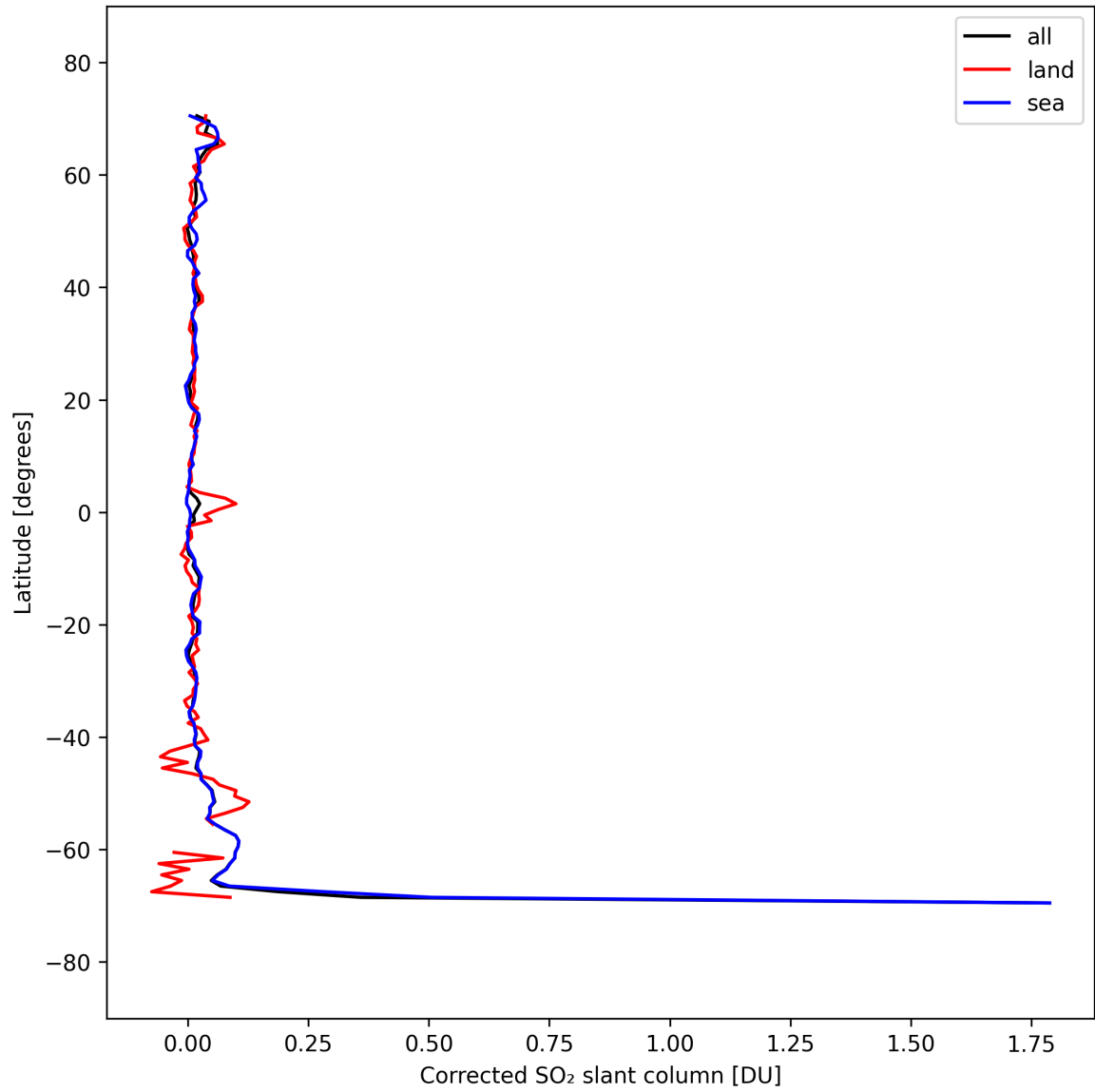


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-09-21 to 2025-09-22.

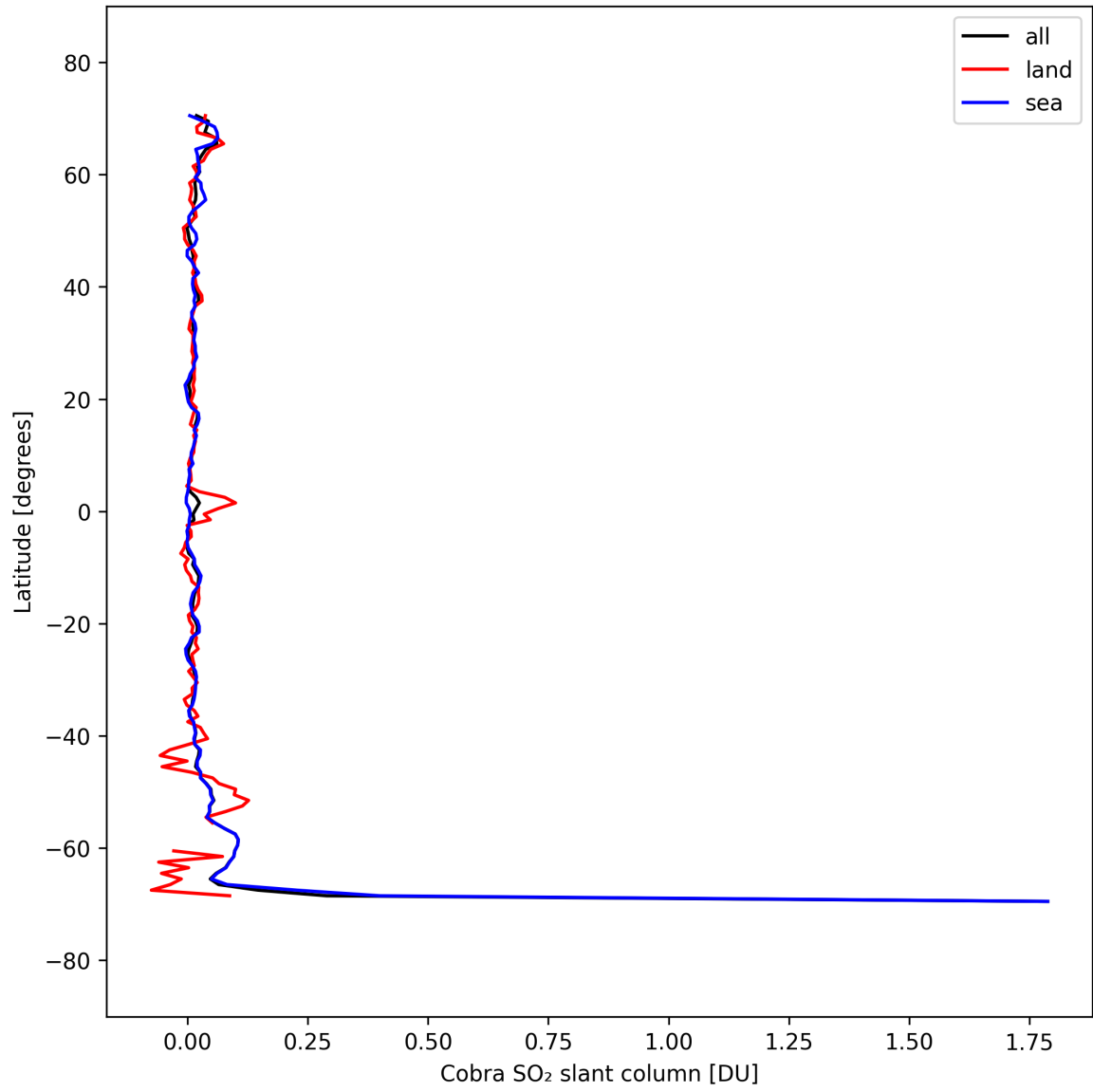


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-09-21 to 2025-09-22.

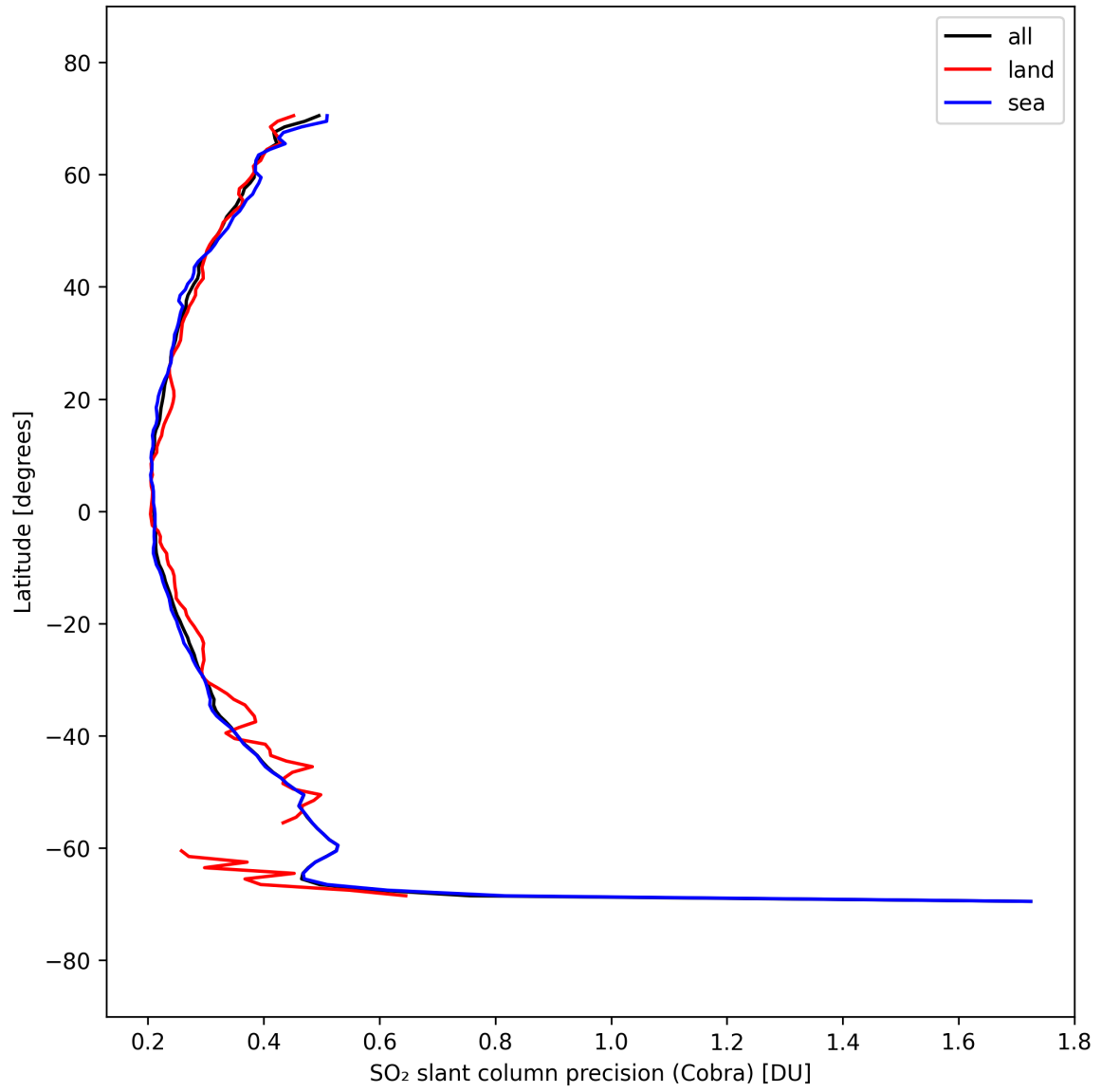


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-09-21 to 2025-09-22.

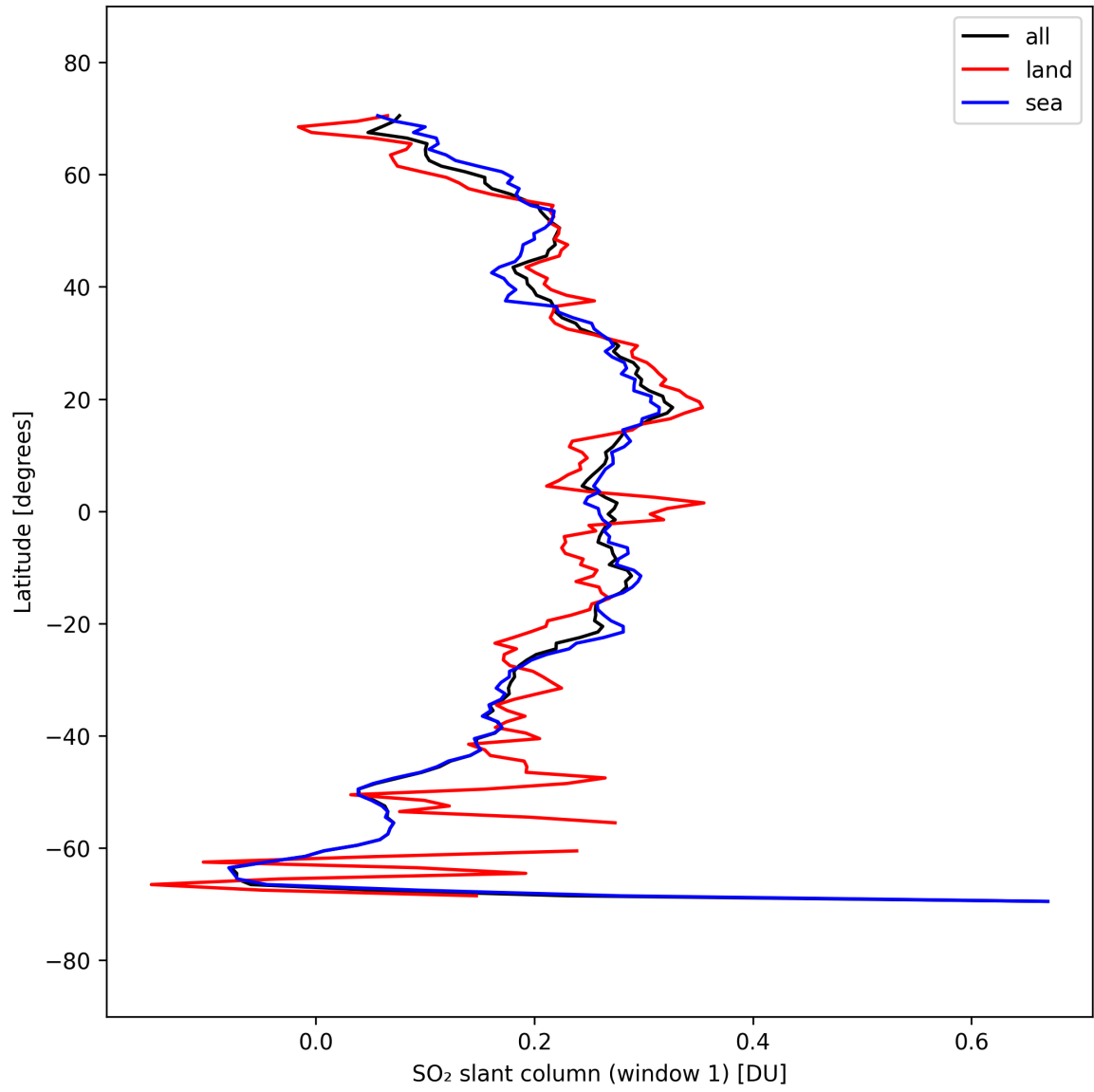


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-09-21 to 2025-09-22.

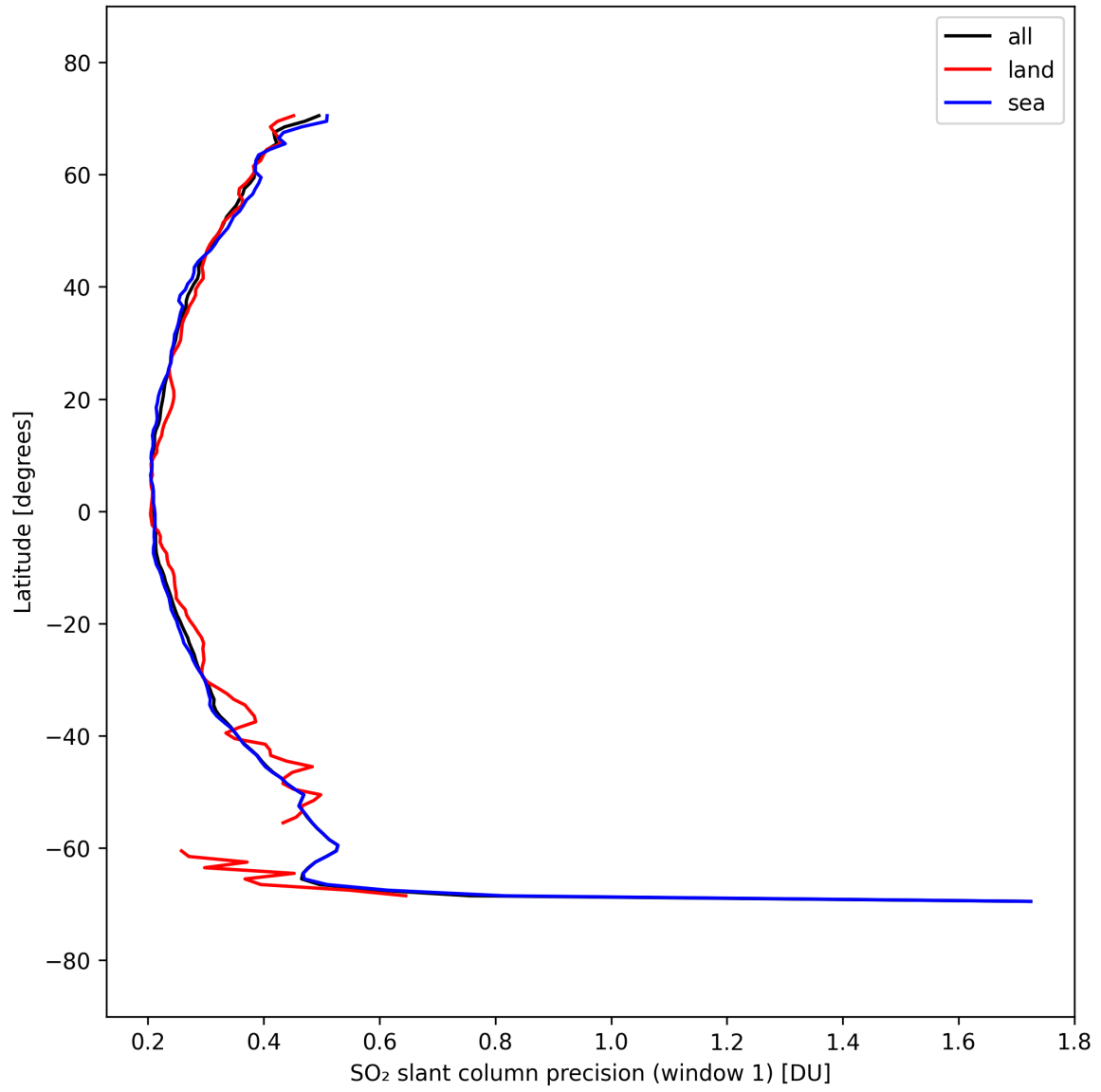


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-09-21 to 2025-09-22.

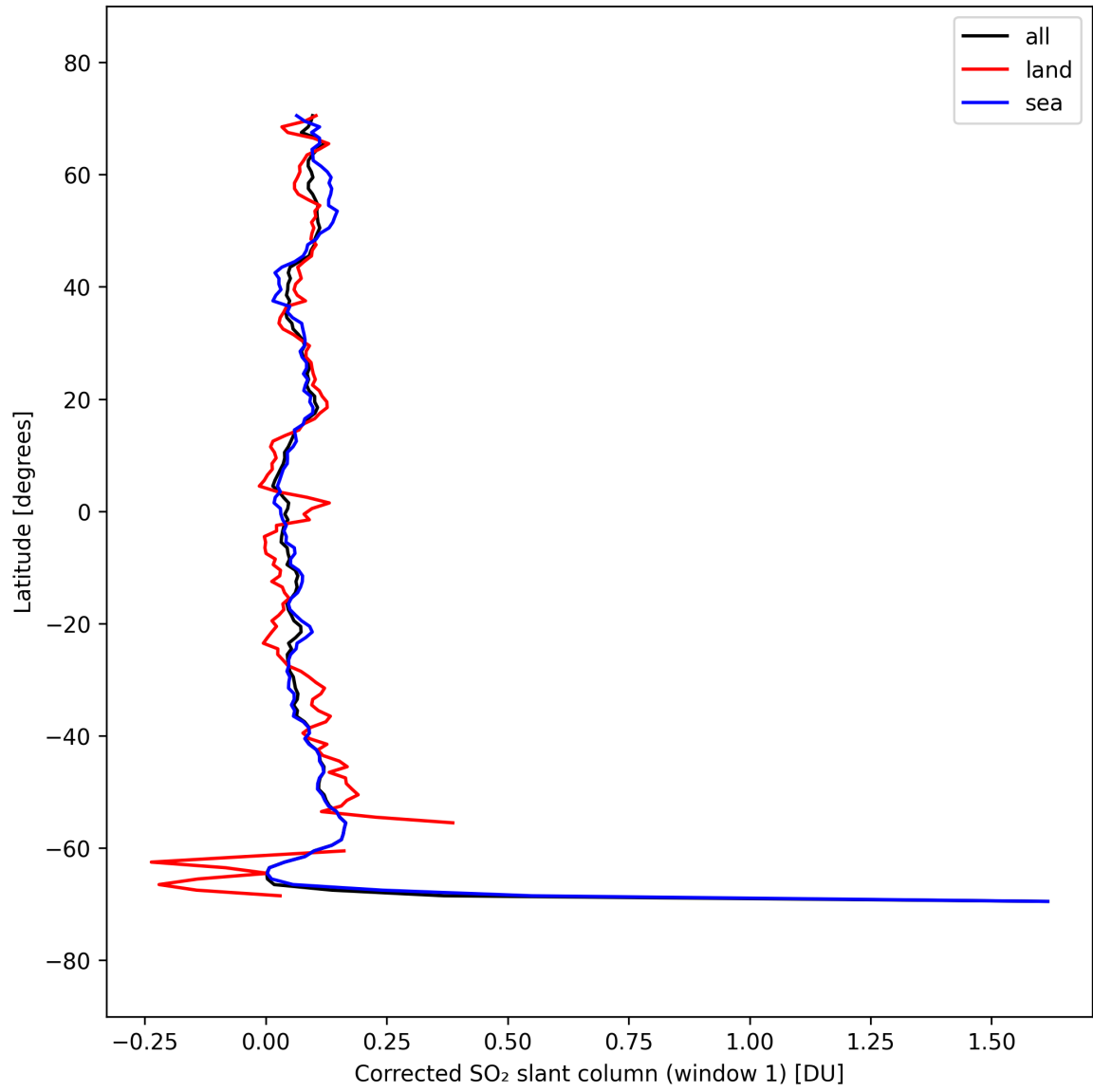


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-09-21 to 2025-09-22.

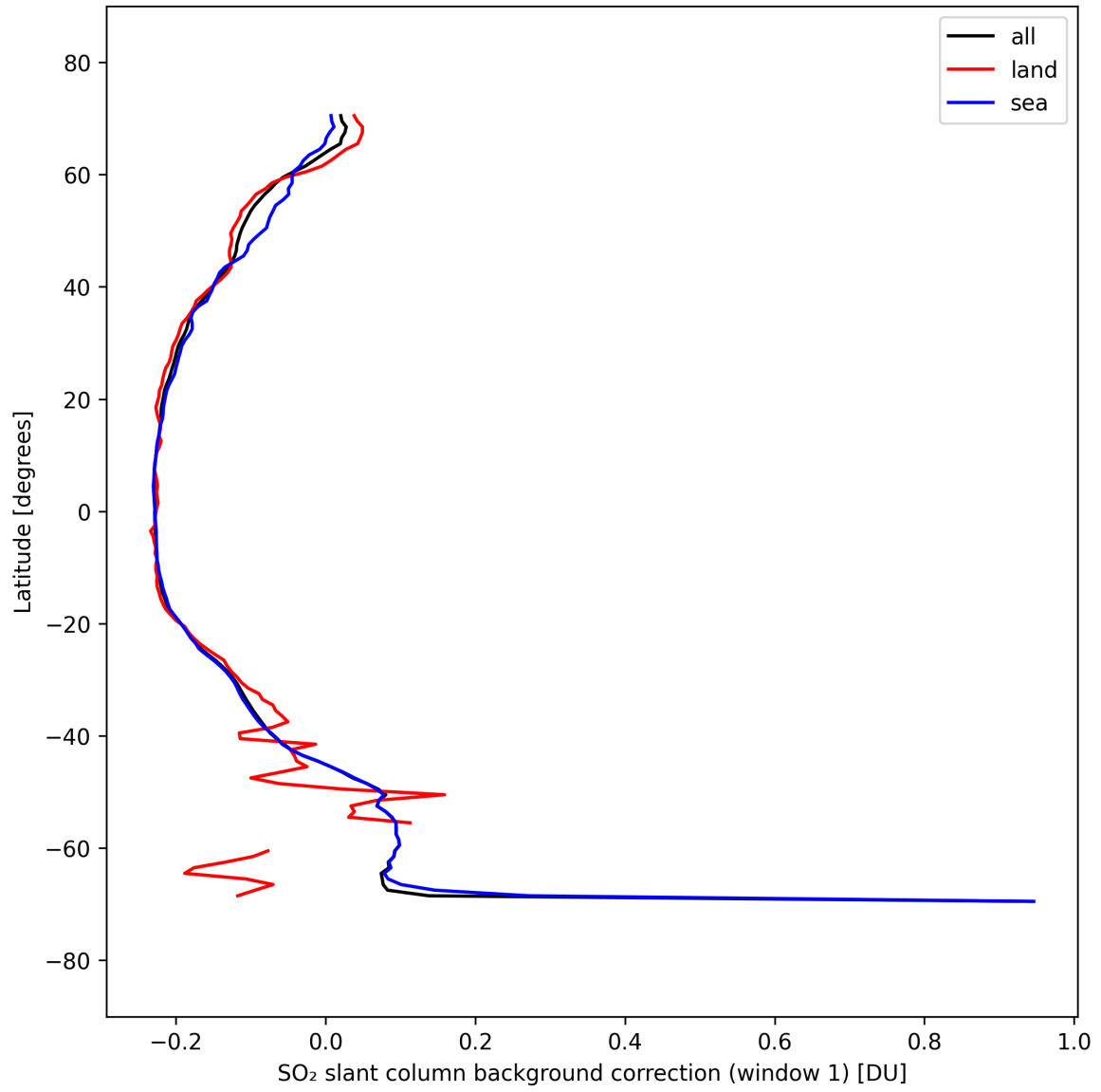


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-09-21 to 2025-09-22.

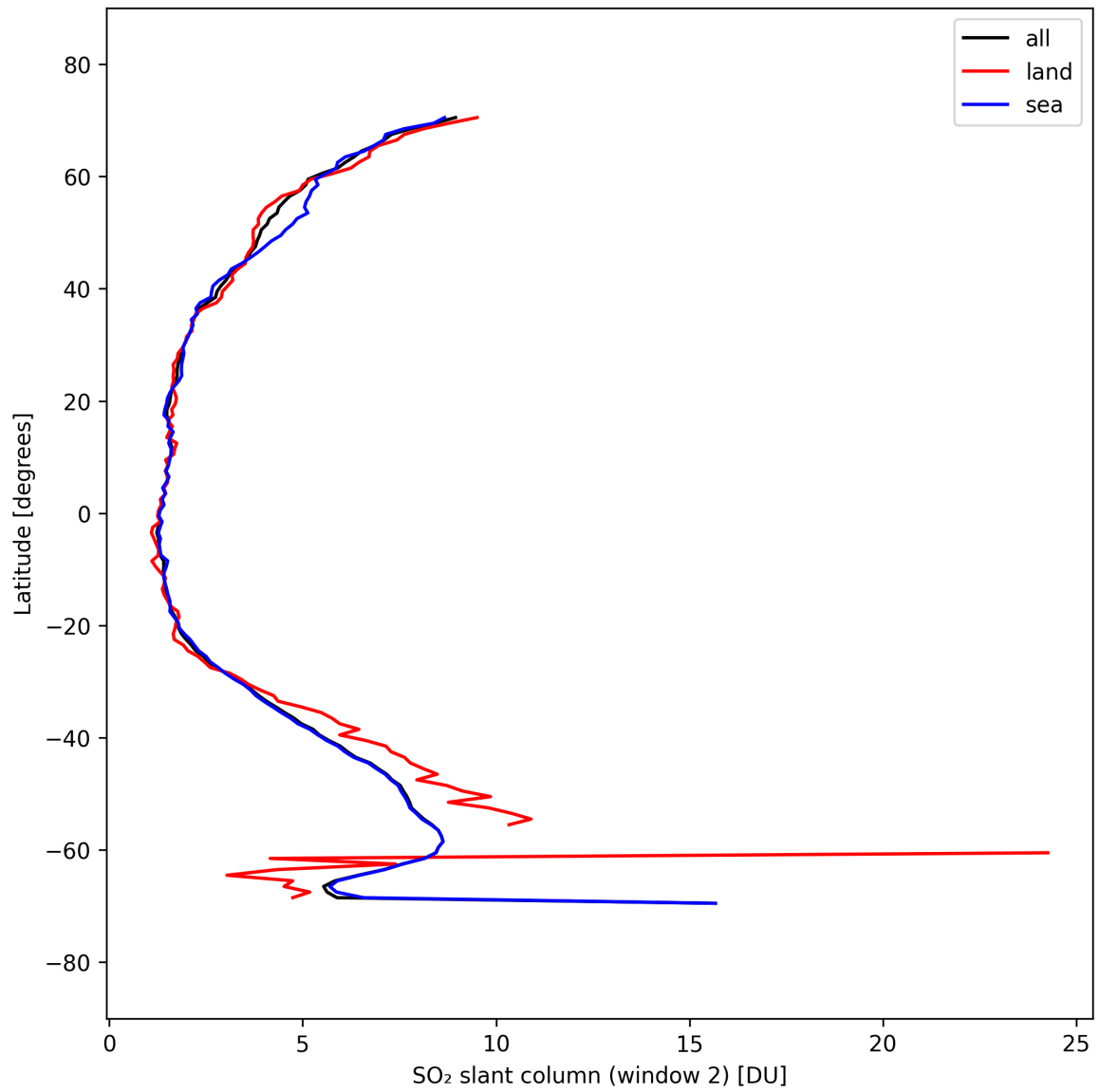


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-09-21 to 2025-09-22.

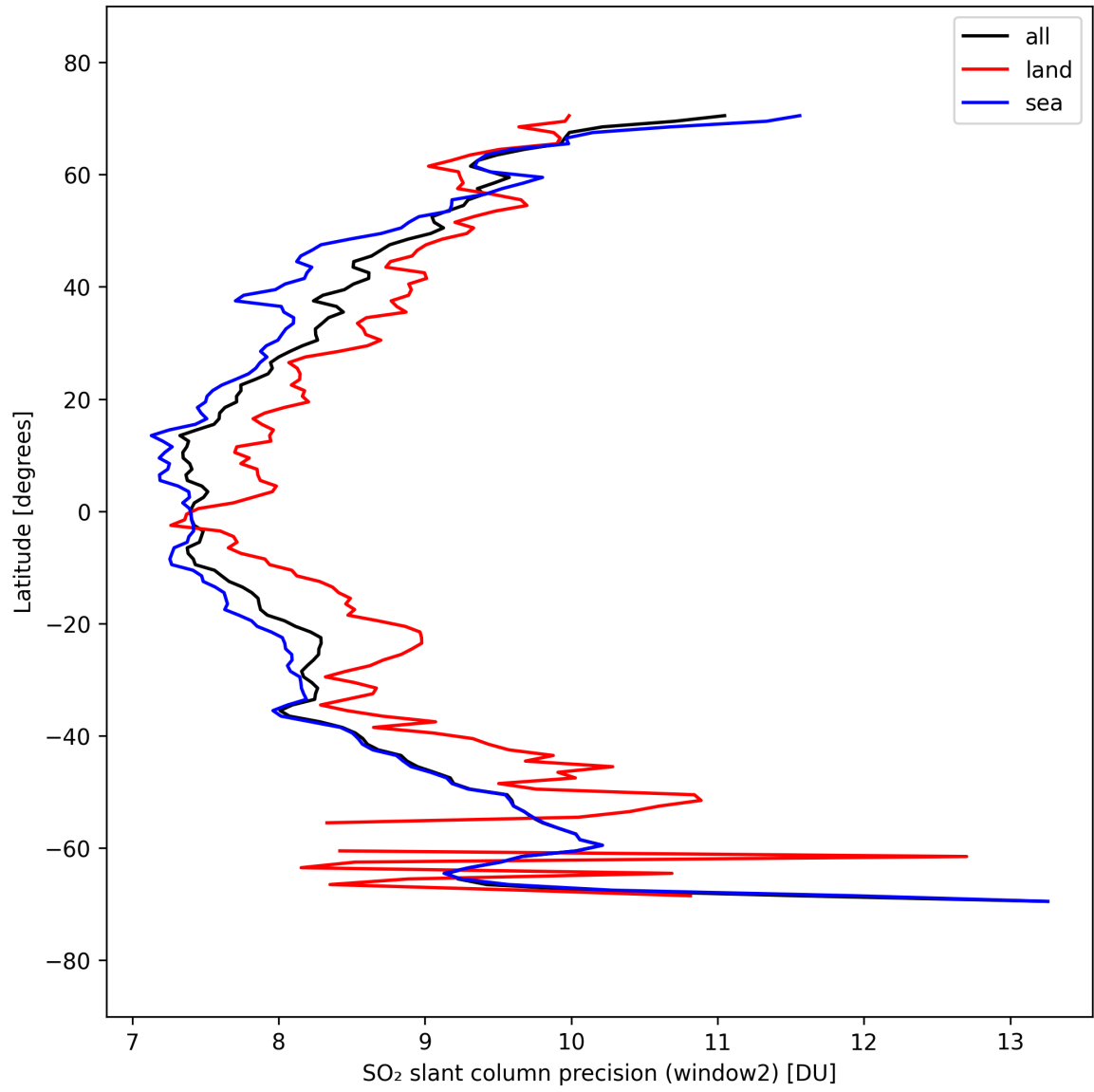


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-09-21 to 2025-09-22.

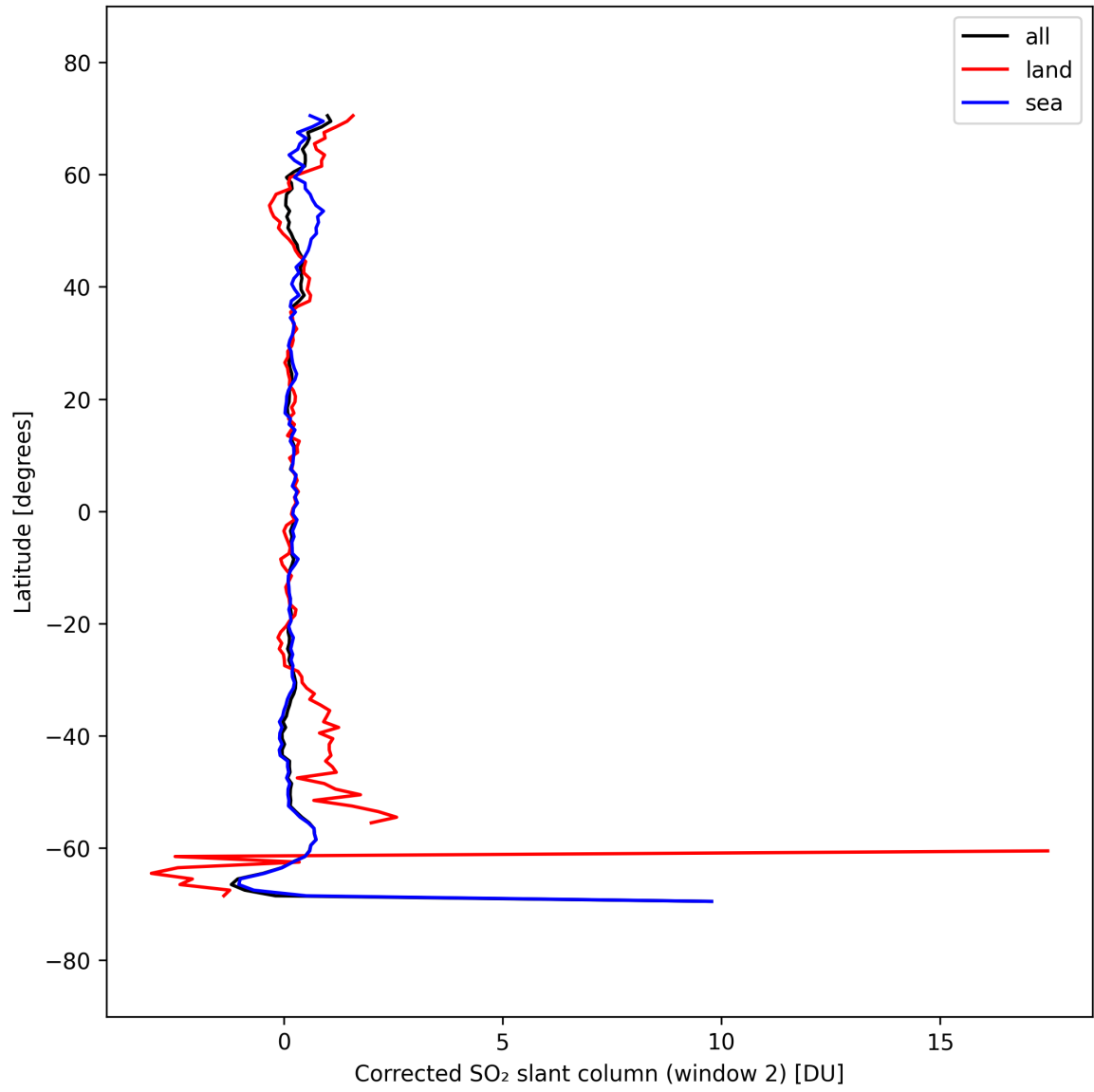


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-09-21 to 2025-09-22.

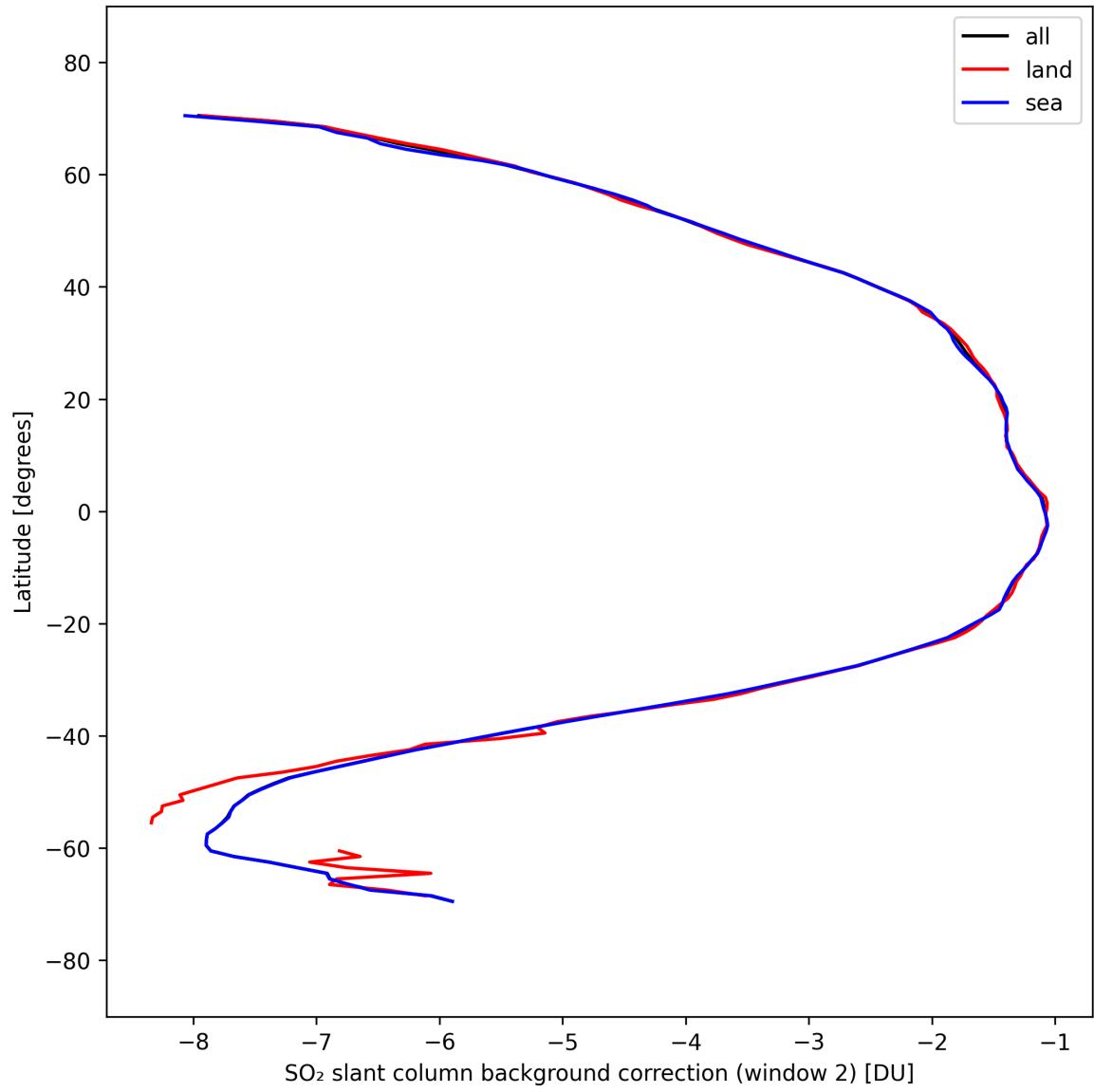


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-09-21 to 2025-09-22.

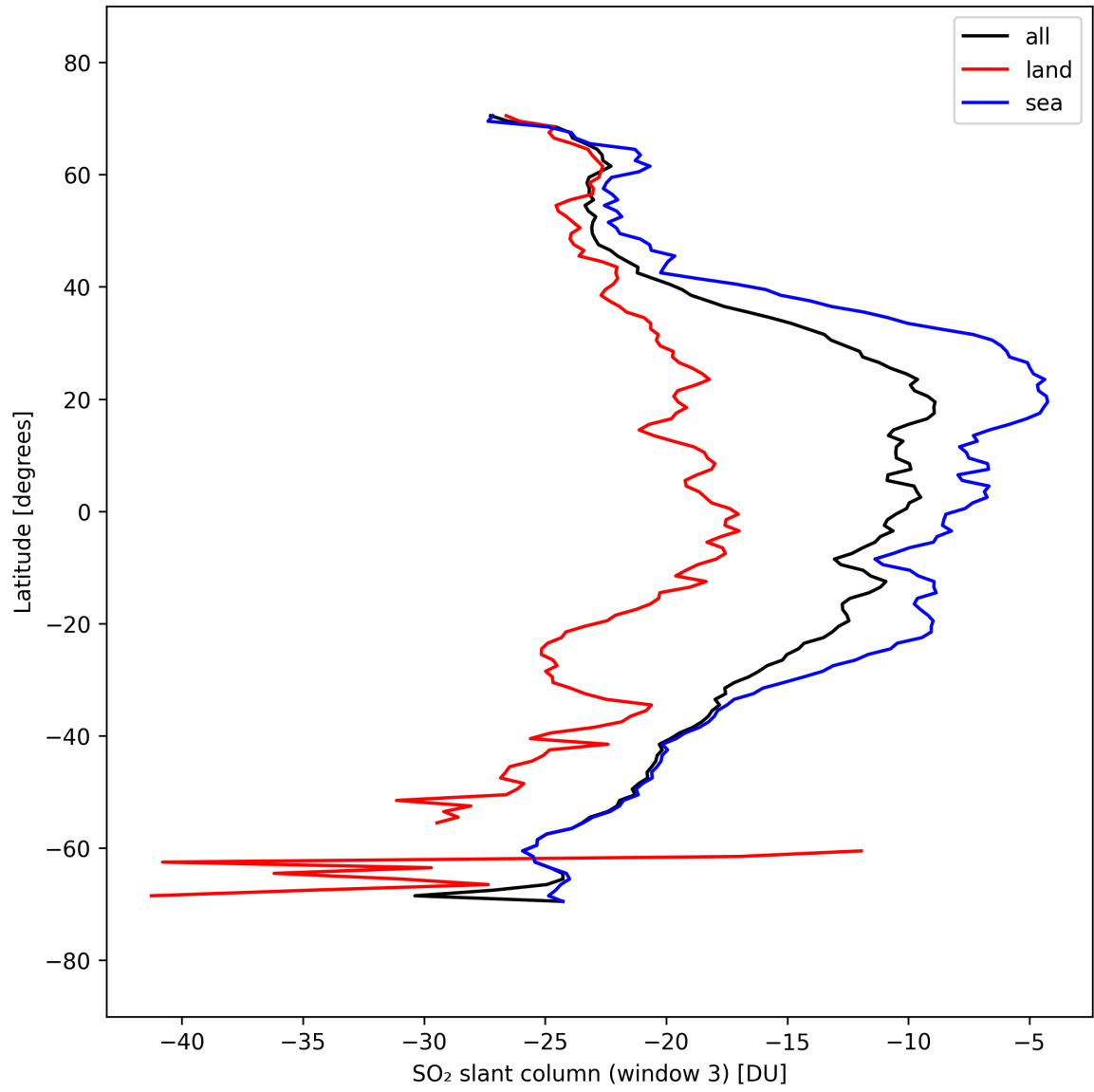


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-09-21 to 2025-09-22.

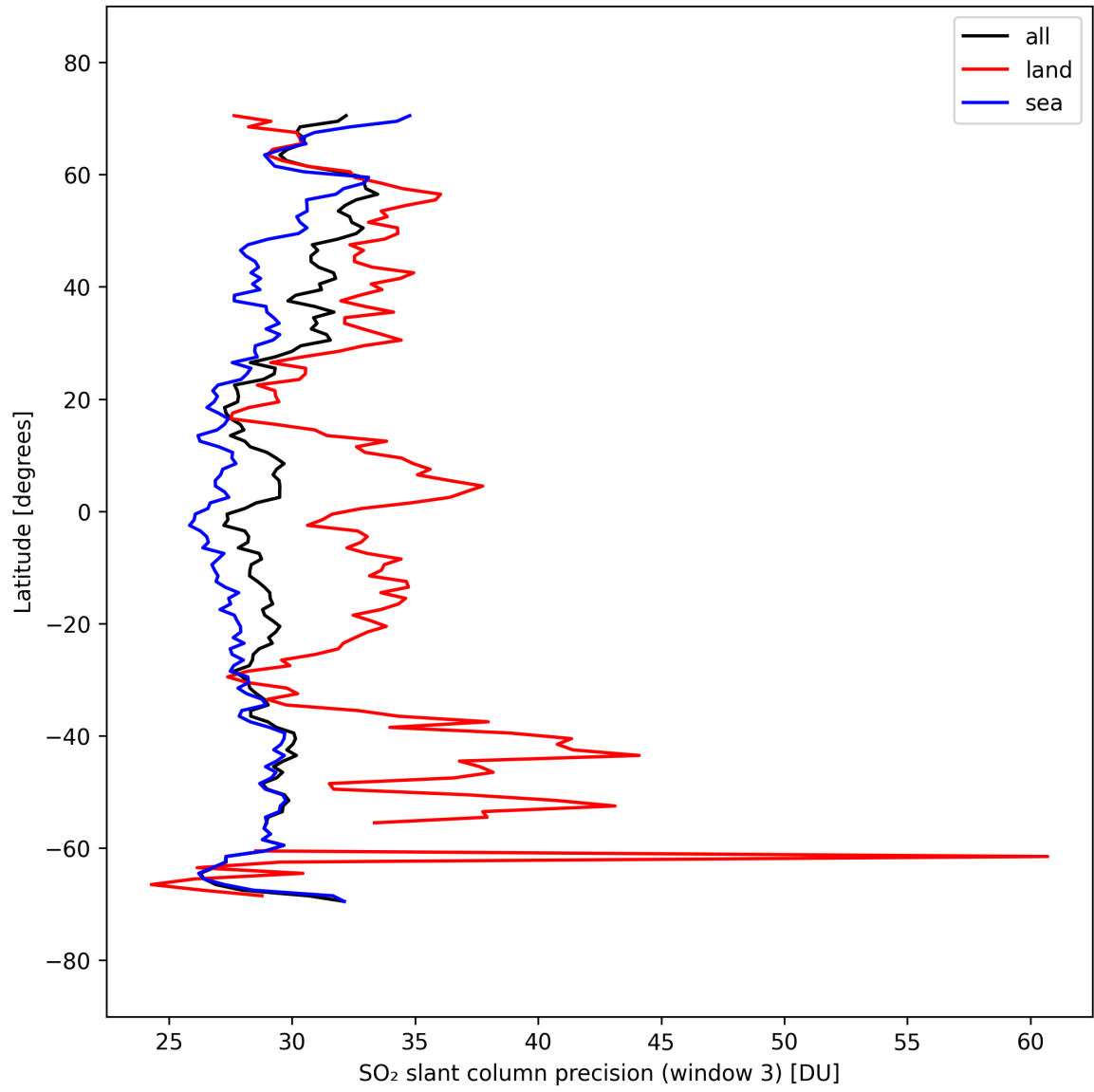


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-09-21 to 2025-09-22.

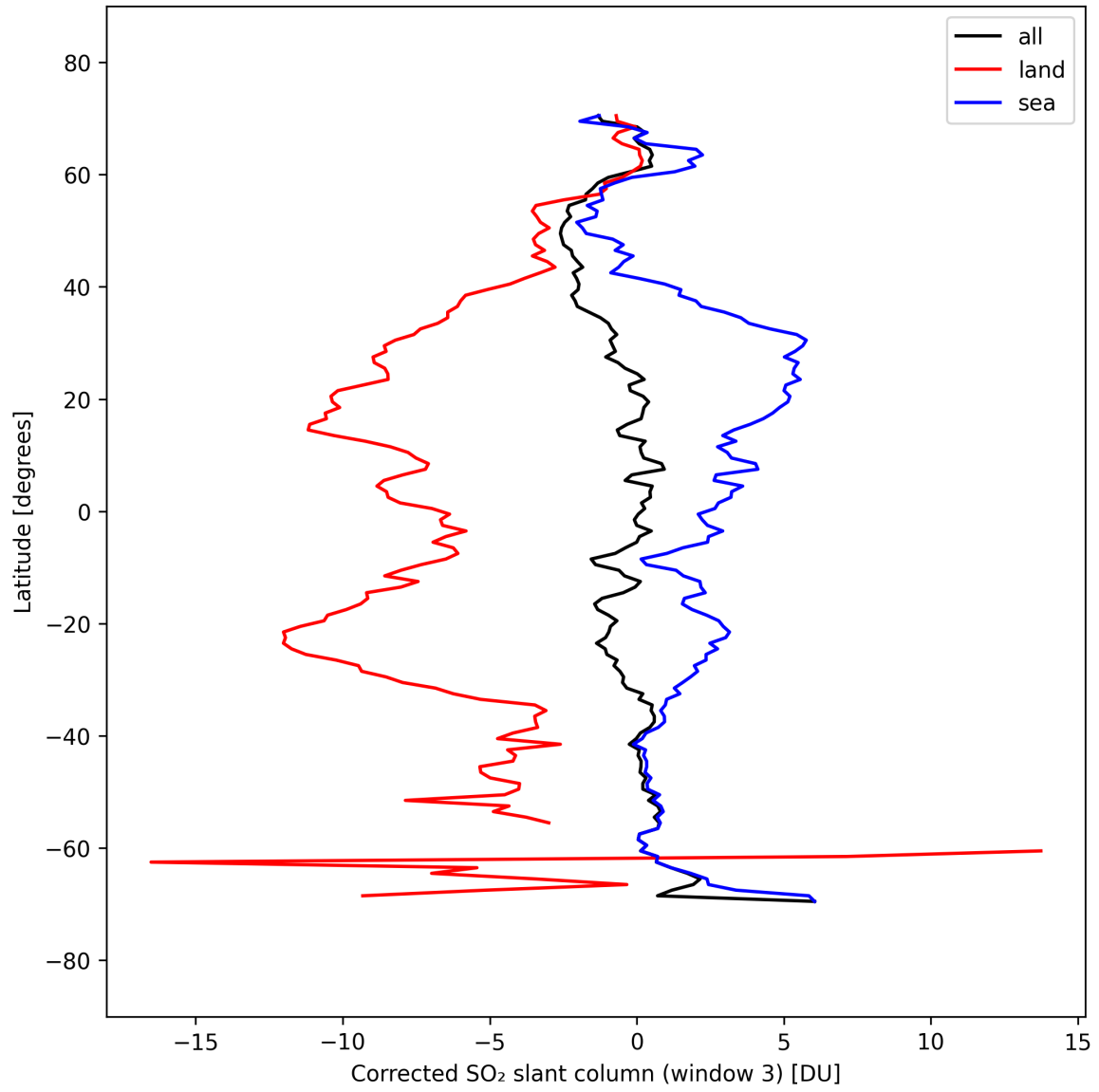


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-09-21 to 2025-09-22.

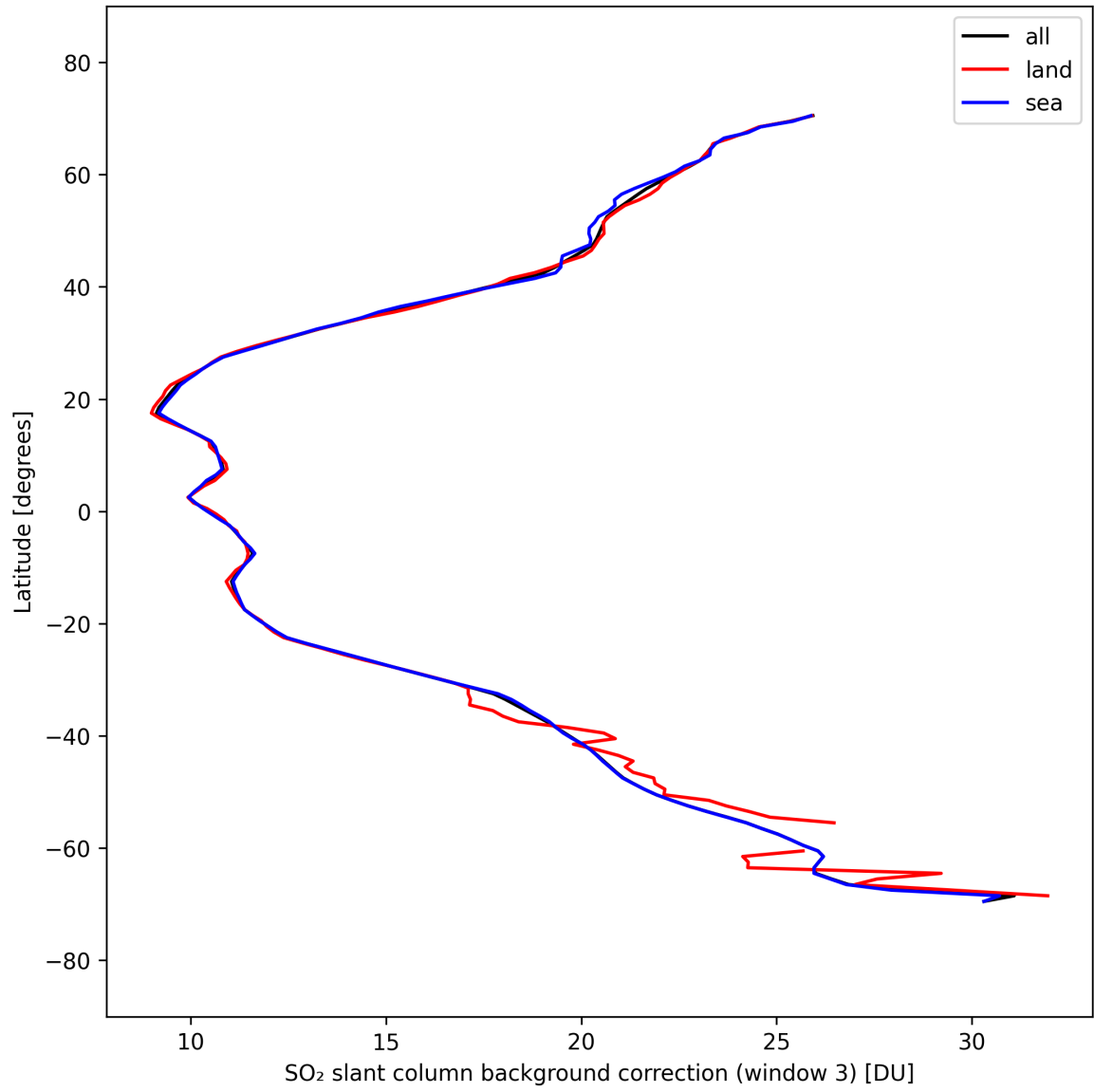


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-09-21 to 2025-09-22.

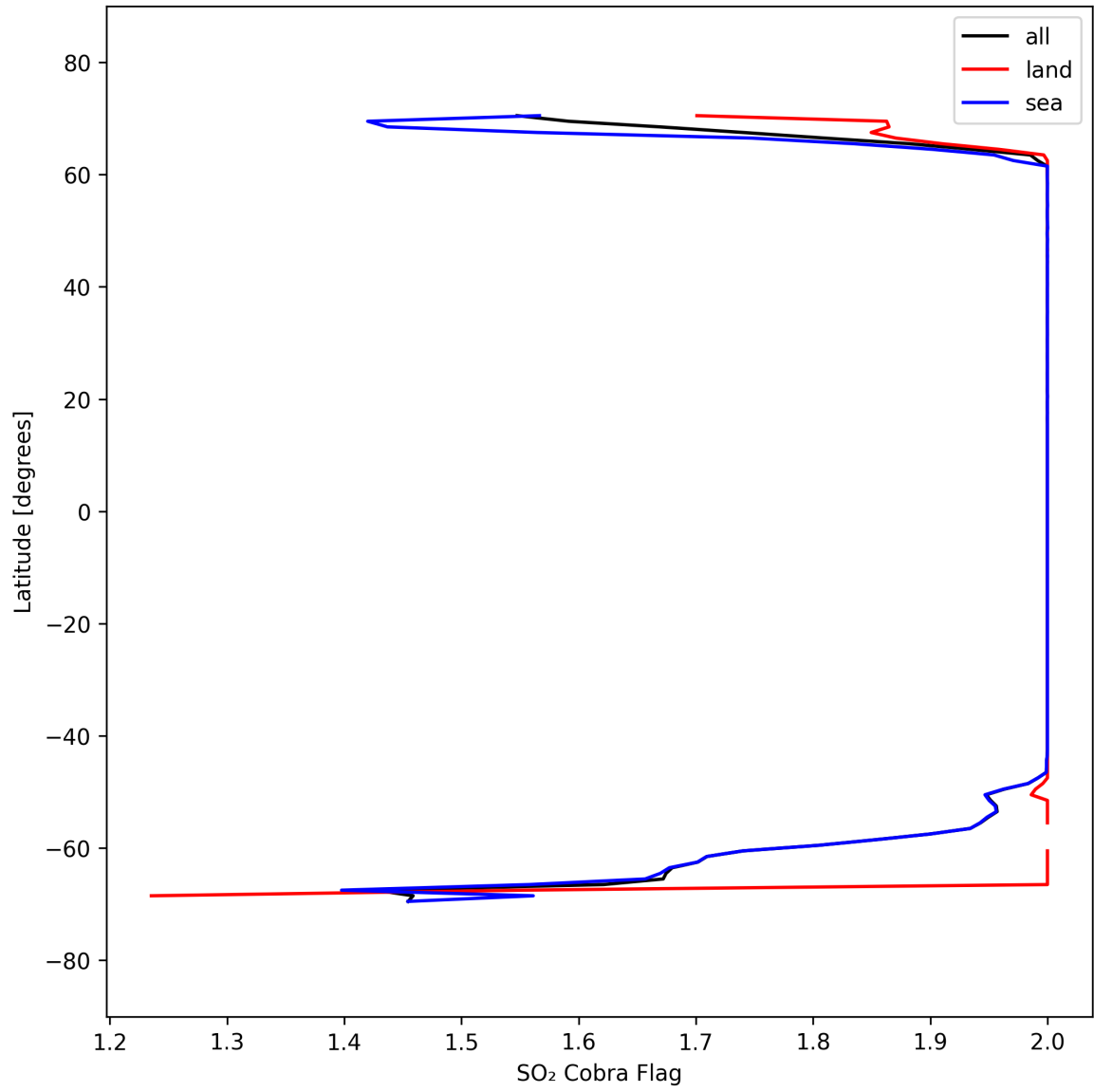


Figure 48: Zonal average of "SO₂ Cobra Flag" for 2025-09-21 to 2025-09-22.

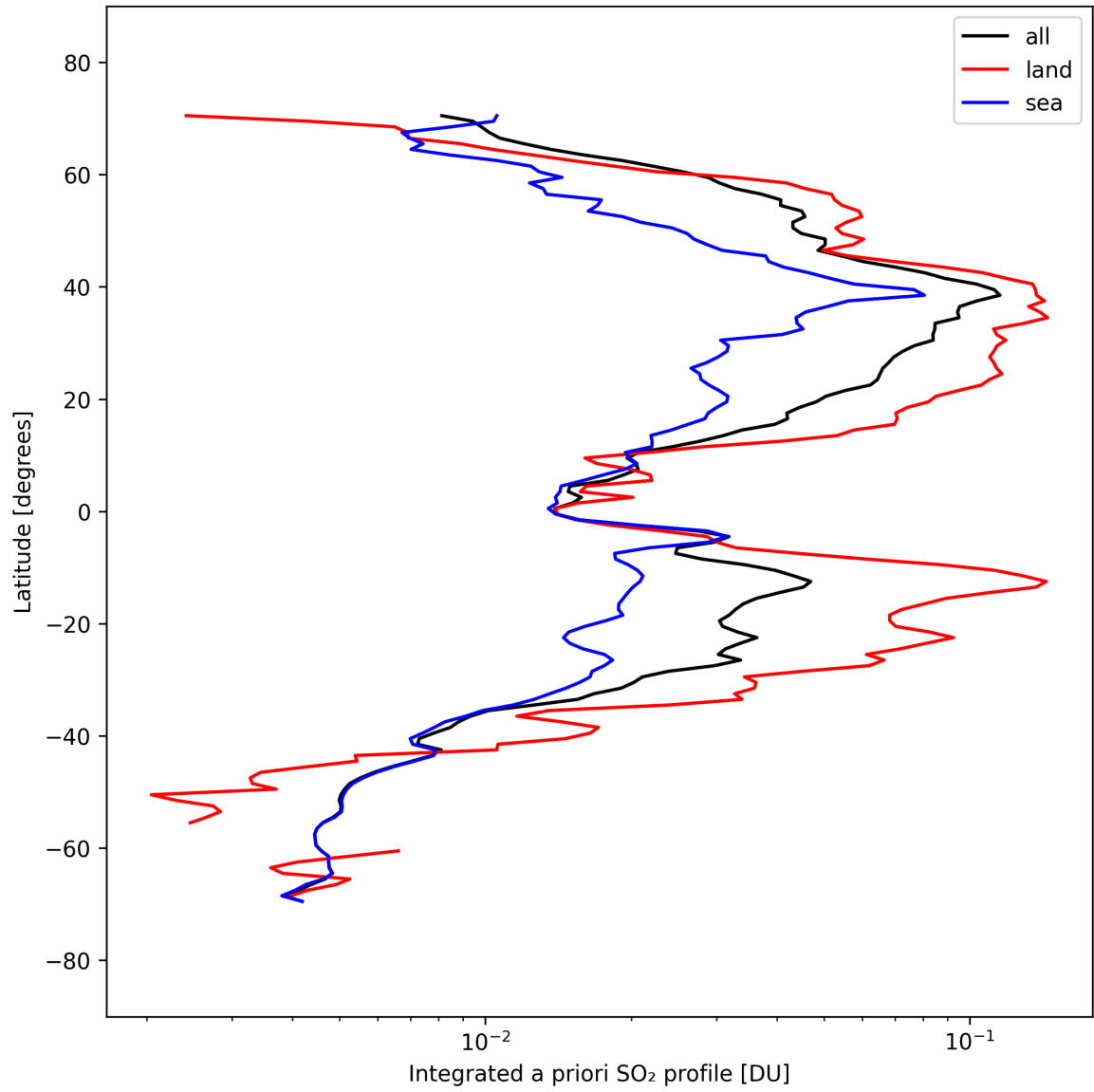


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-09-21 to 2025-09-22.

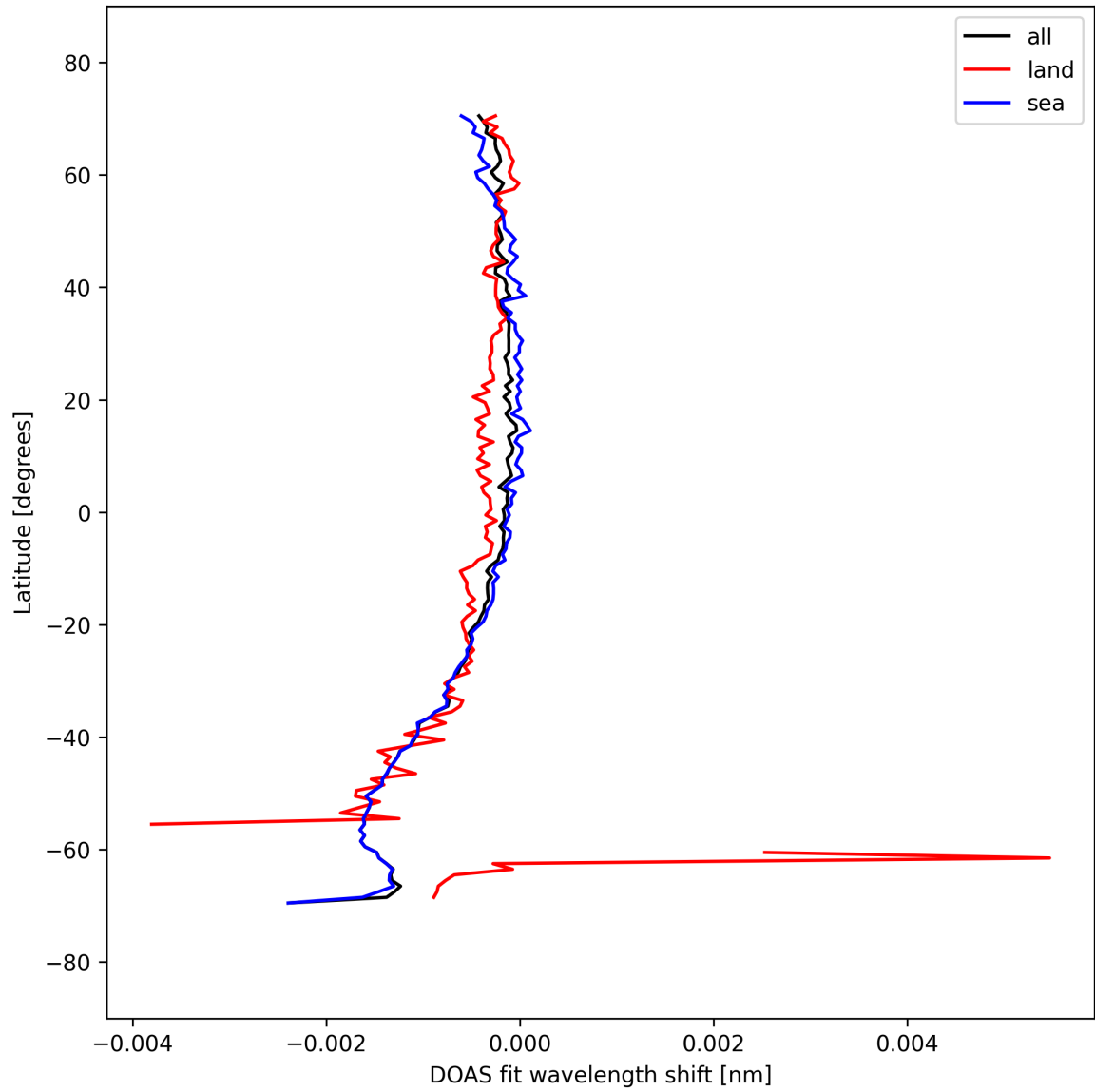


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-09-21 to 2025-09-22.

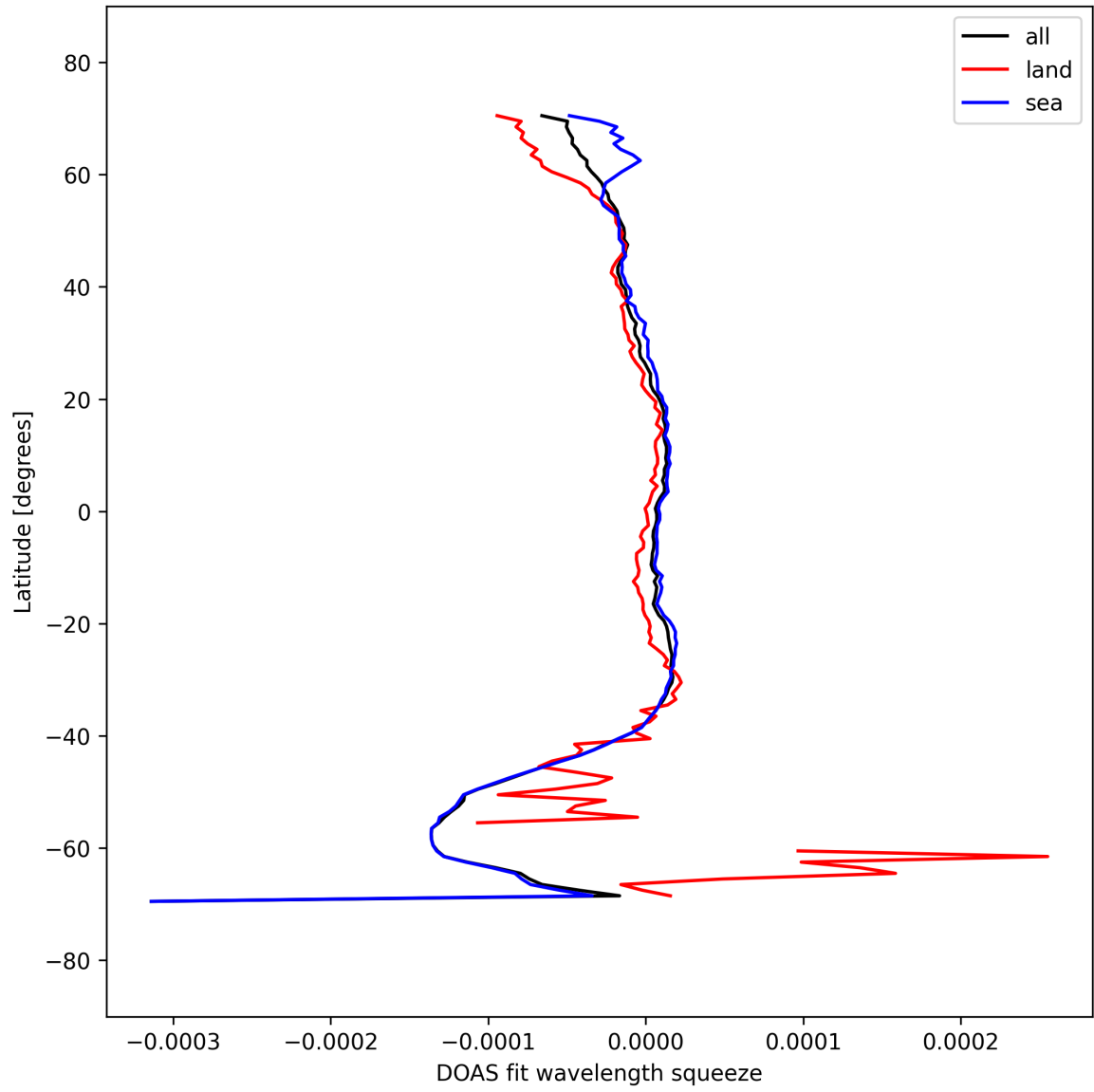


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-09-21 to 2025-09-22.

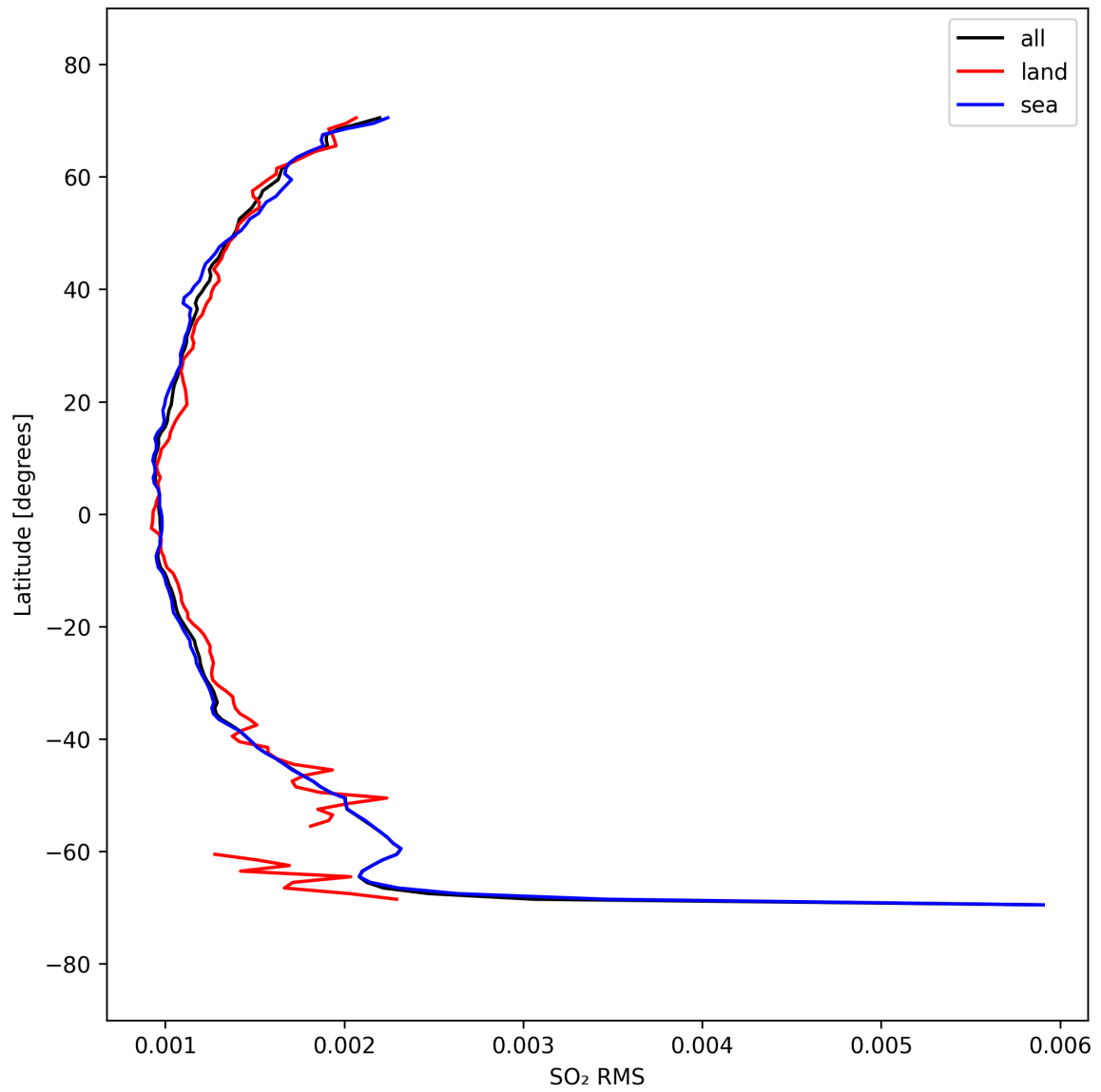


Figure 52: Zonal average of “SO₂ RMS” for 2025-09-21 to 2025-09-22.

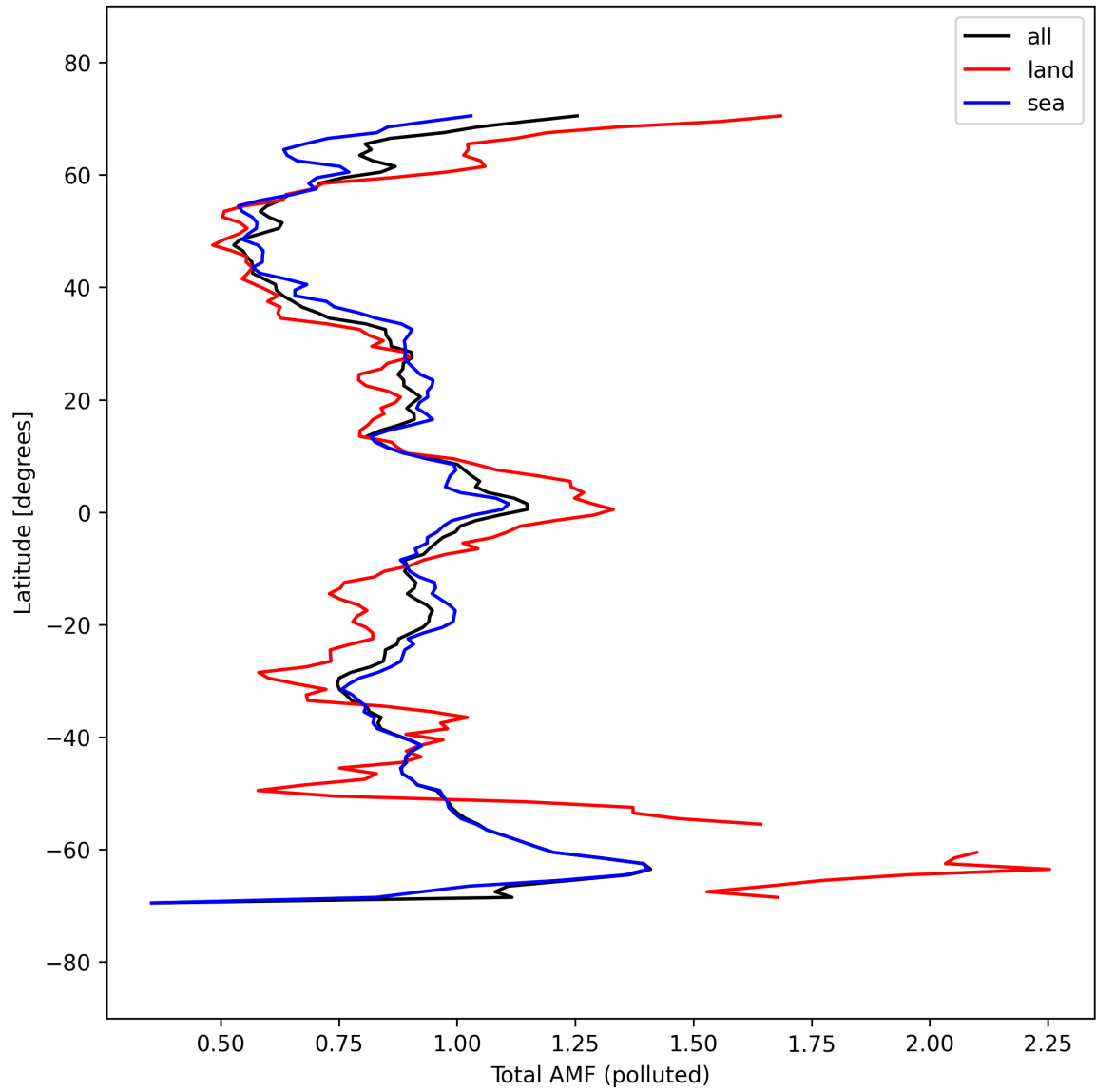


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-09-21 to 2025-09-22.

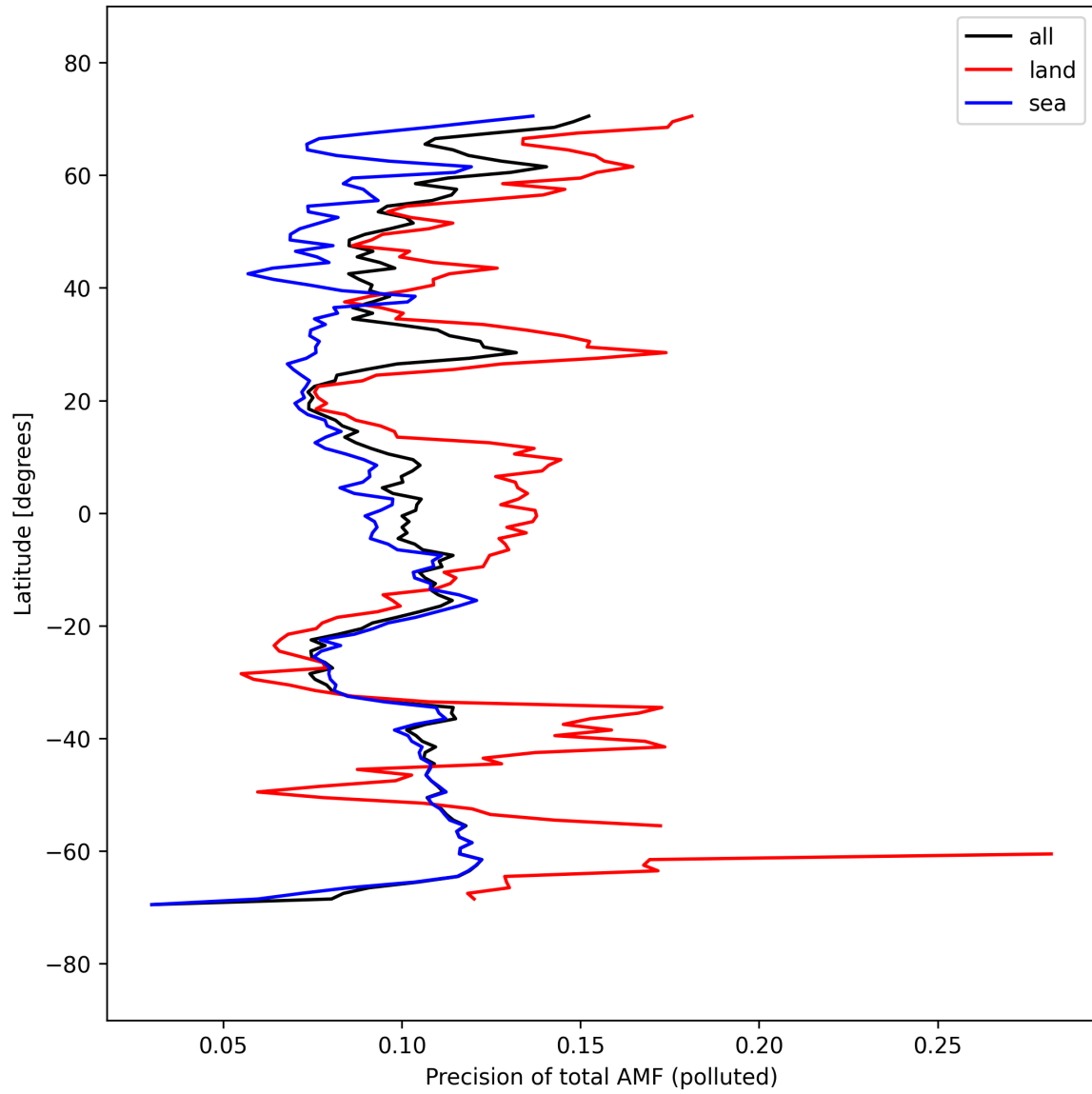


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-09-21 to 2025-09-22.

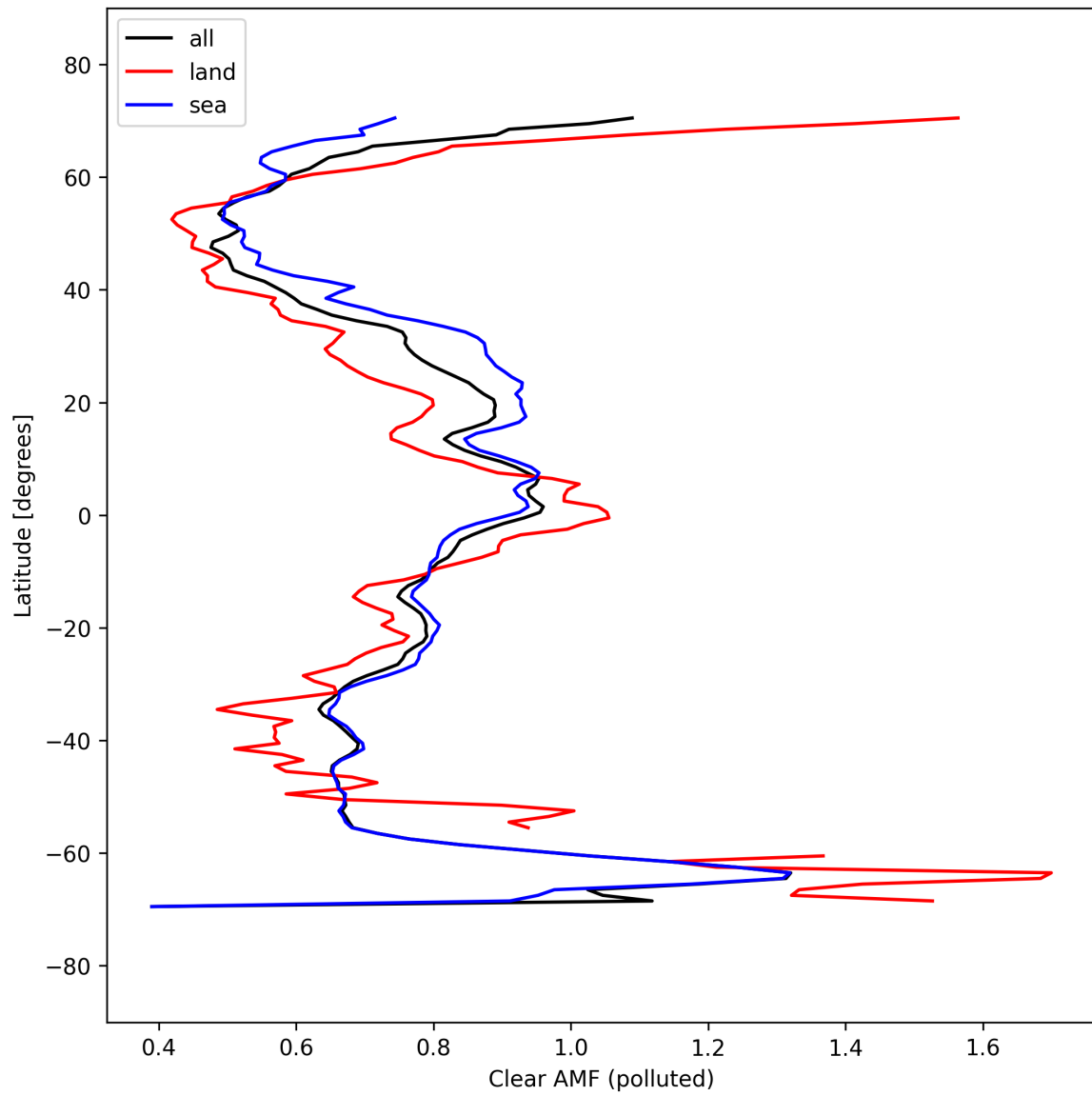


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-09-21 to 2025-09-22.

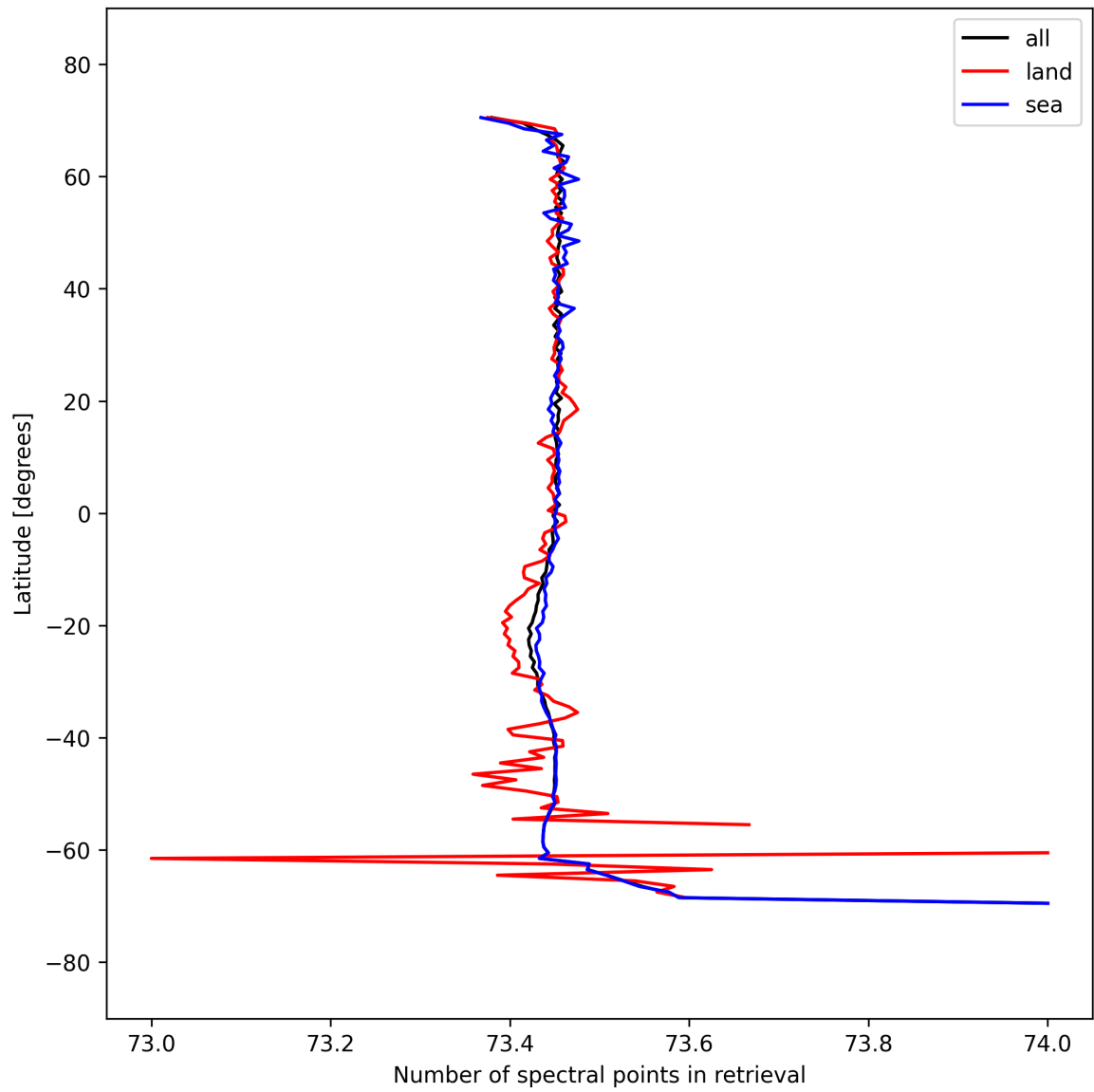


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-09-21 to 2025-09-22.

8 Histograms

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

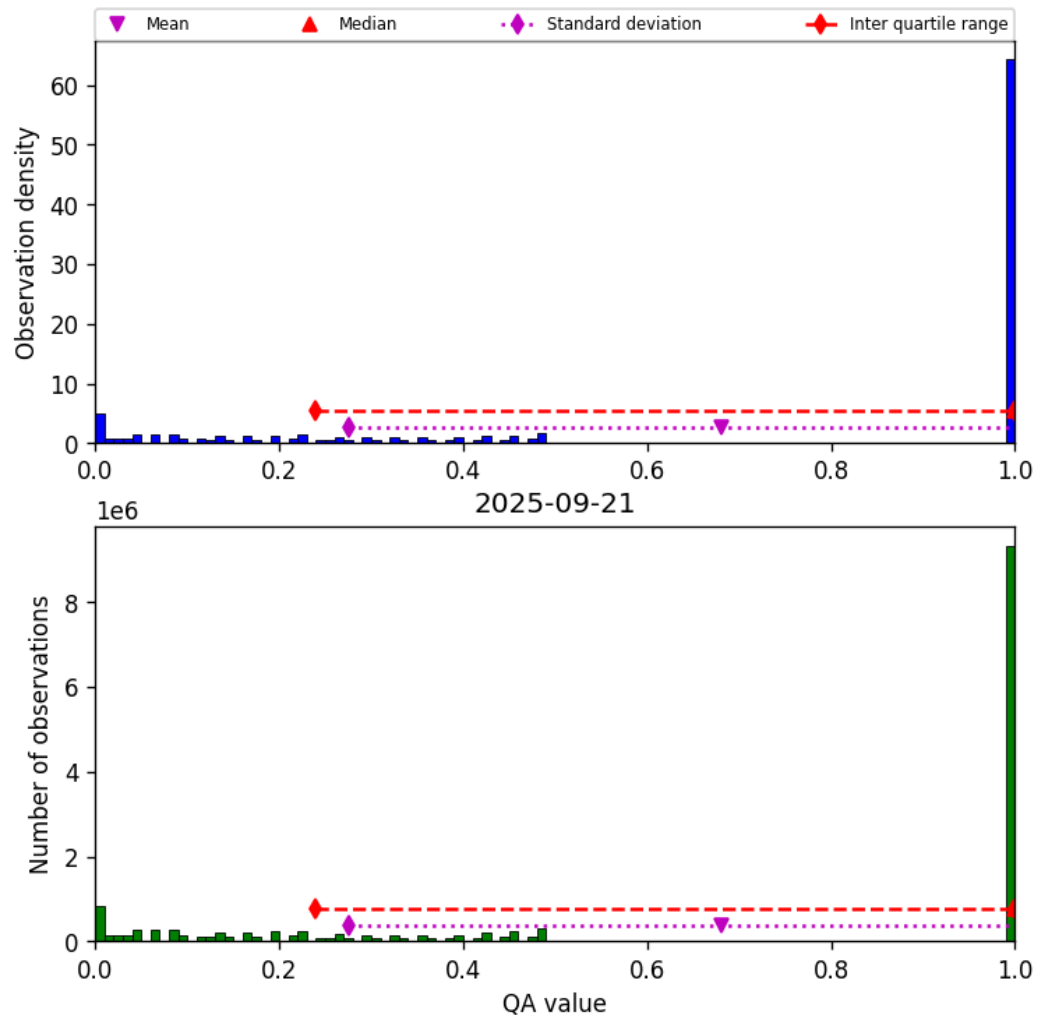


Figure 57: Histogram of “QA value” for 2025-09-21 to 2025-09-22

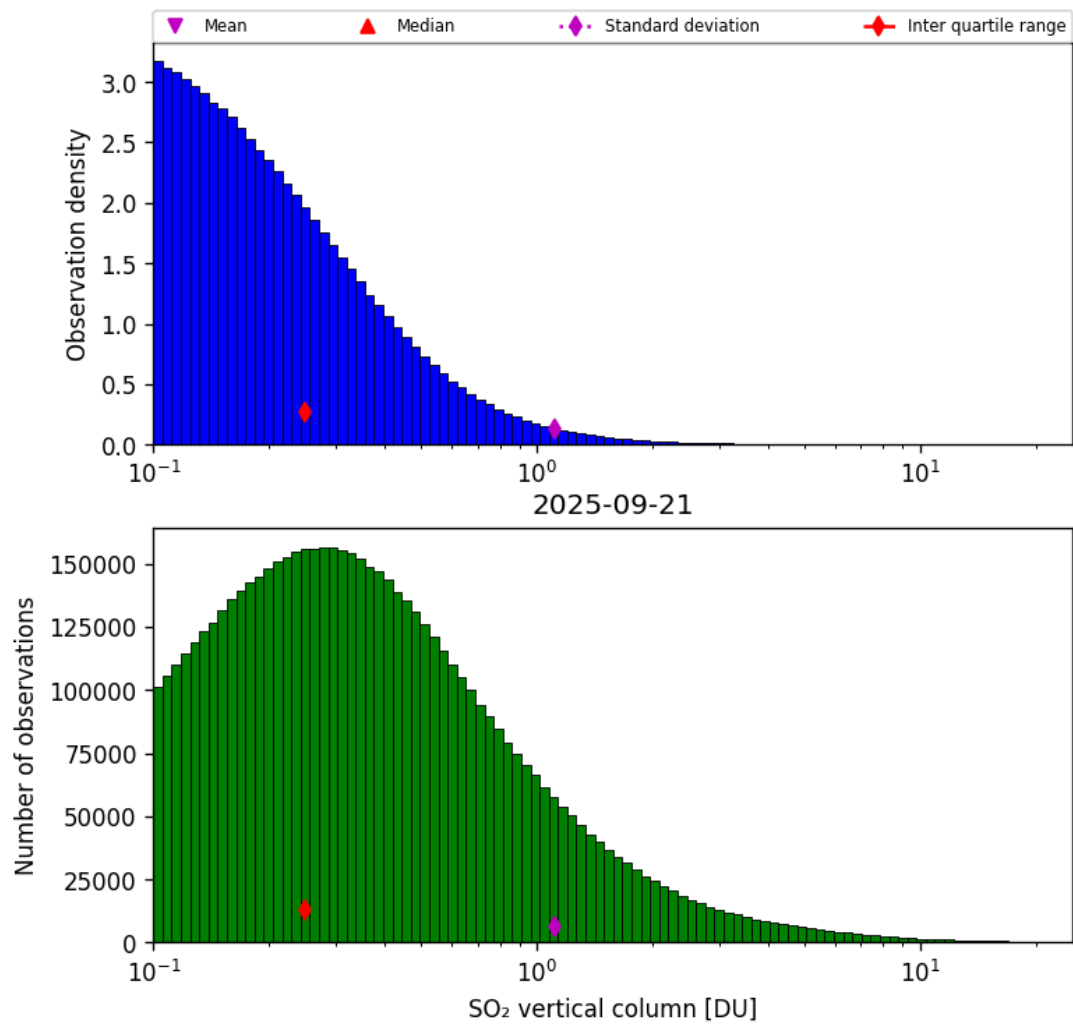


Figure 58: Histogram of “SO₂ vertical column” for 2025-09-21 to 2025-09-22

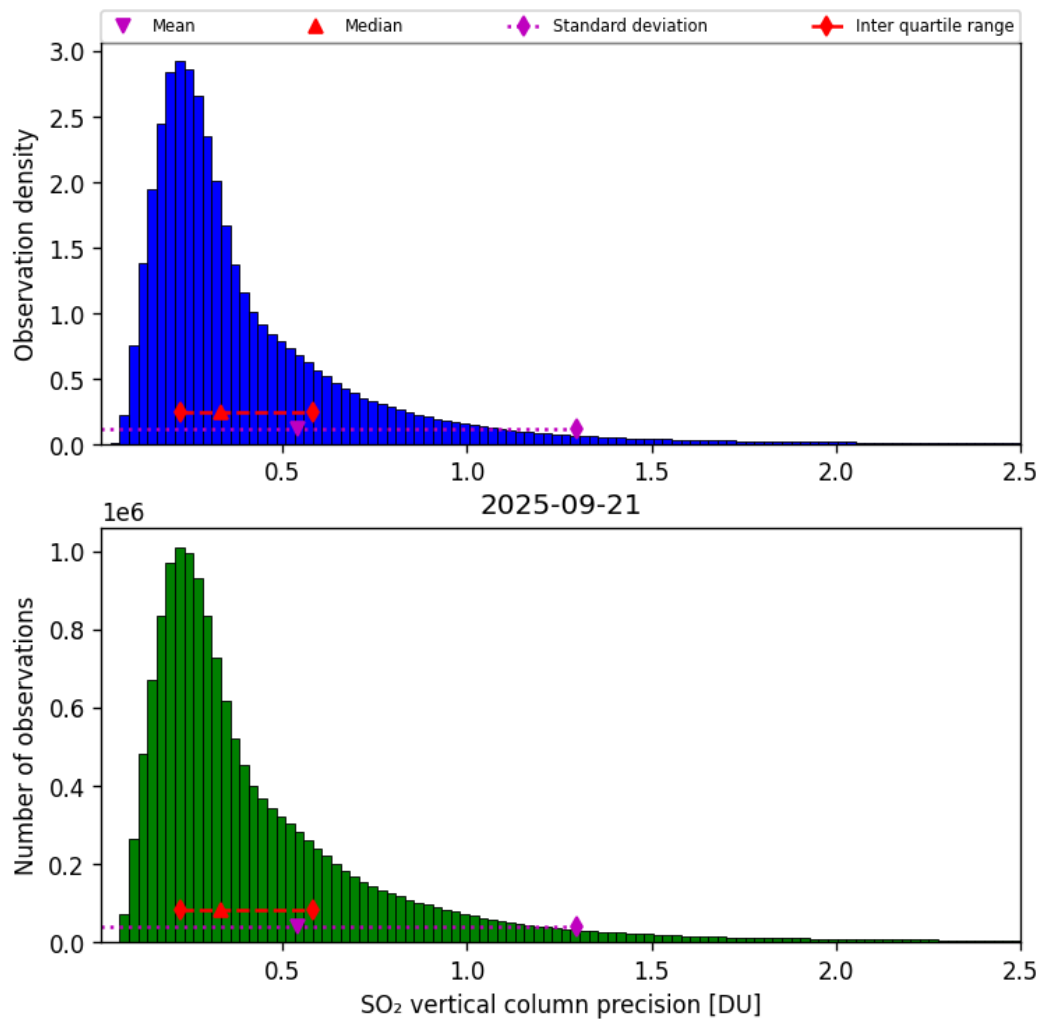


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-09-21 to 2025-09-22

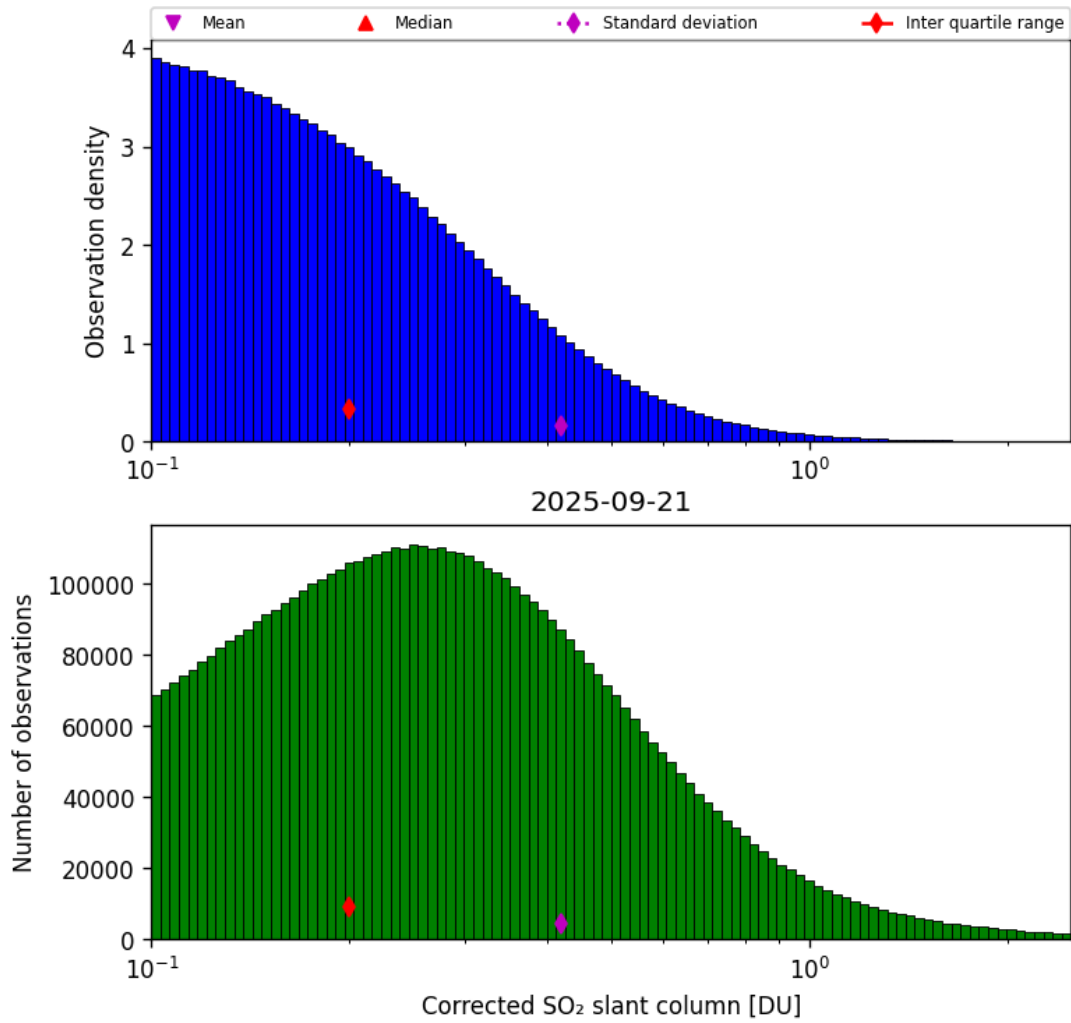


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-09-21 to 2025-09-22

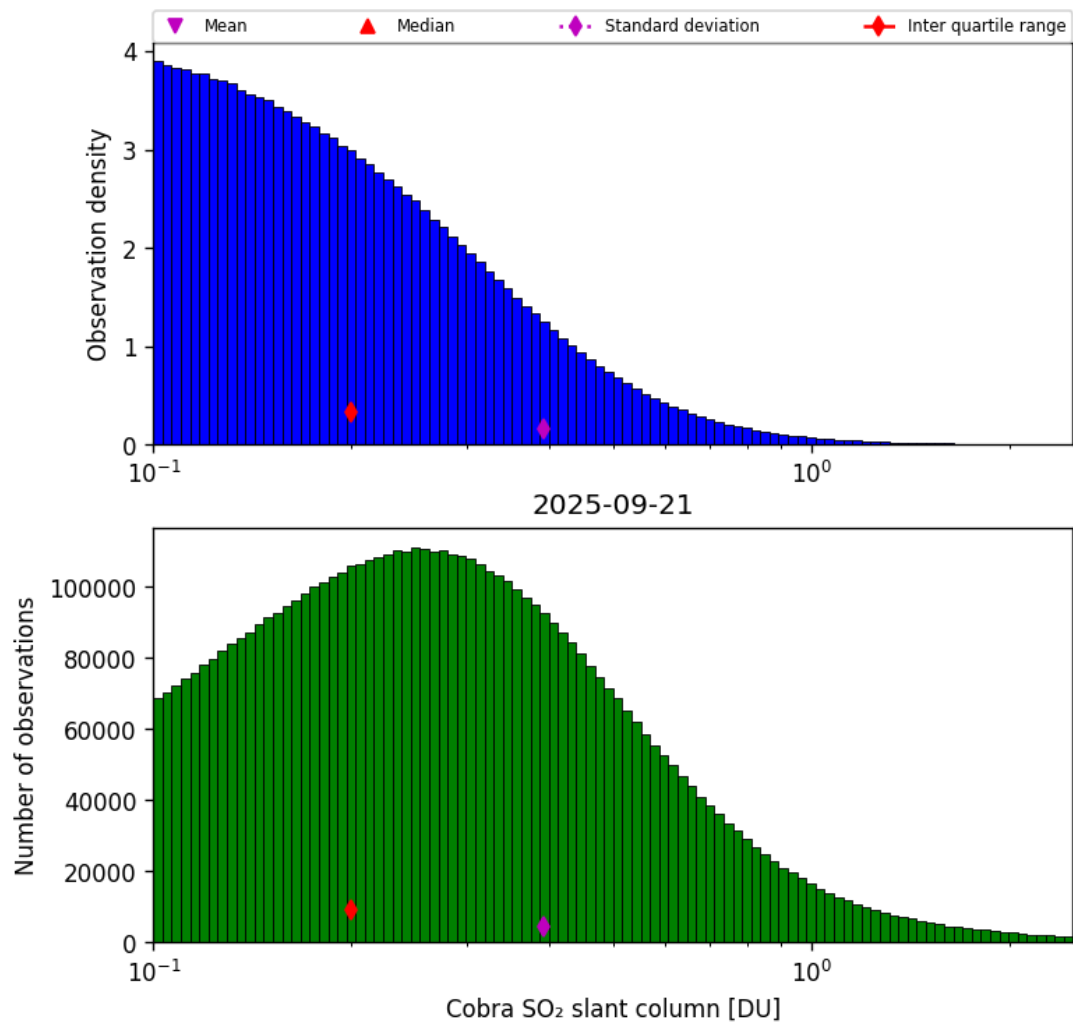


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-09-21 to 2025-09-22

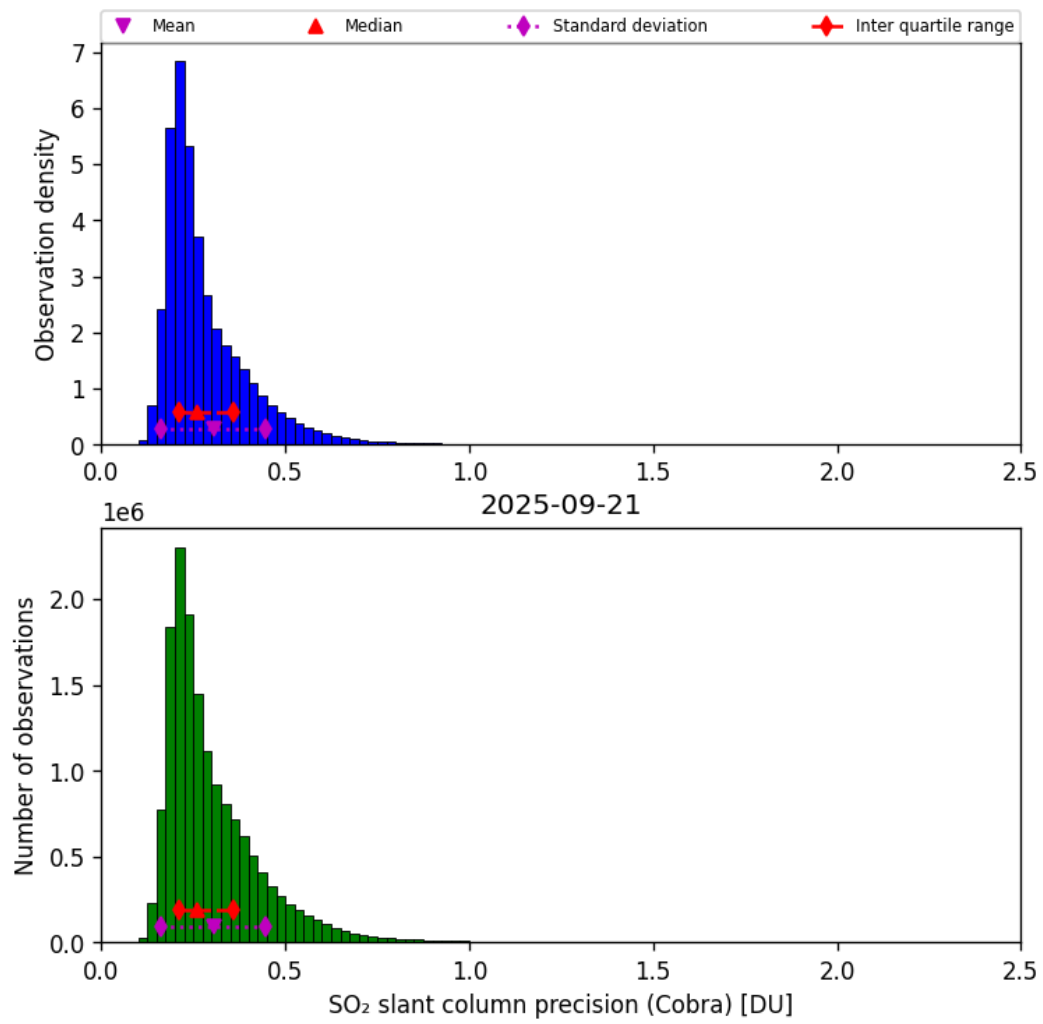


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-09-21 to 2025-09-22

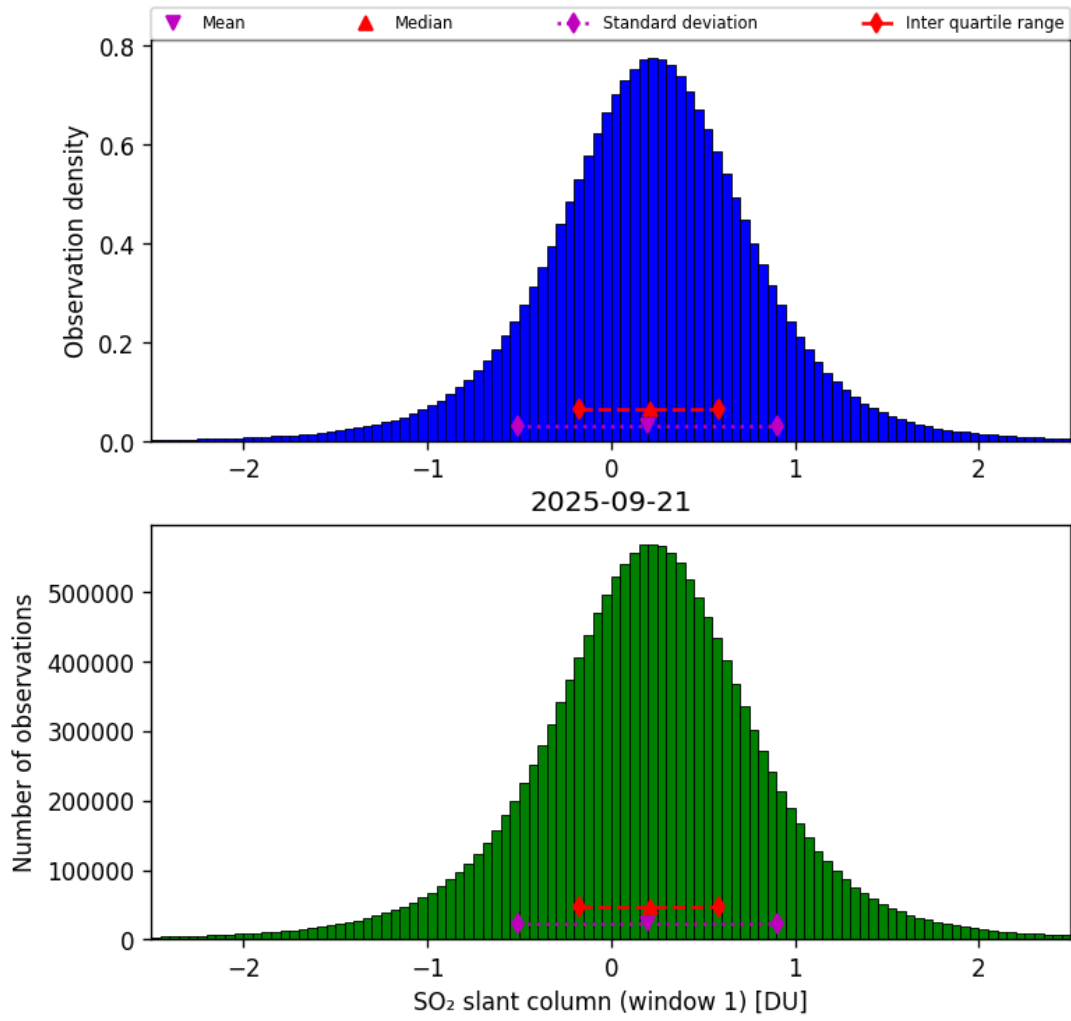


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-09-21 to 2025-09-22

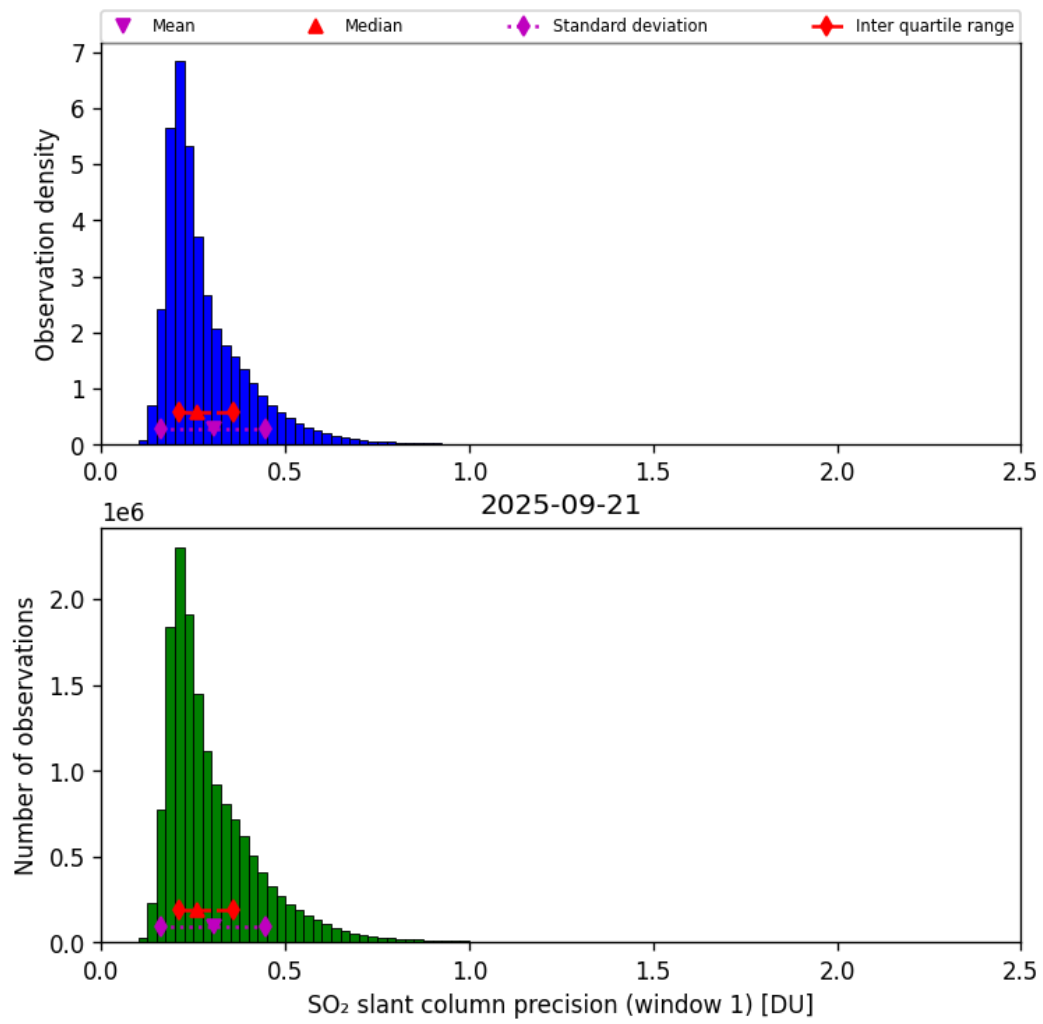


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-09-21 to 2025-09-22

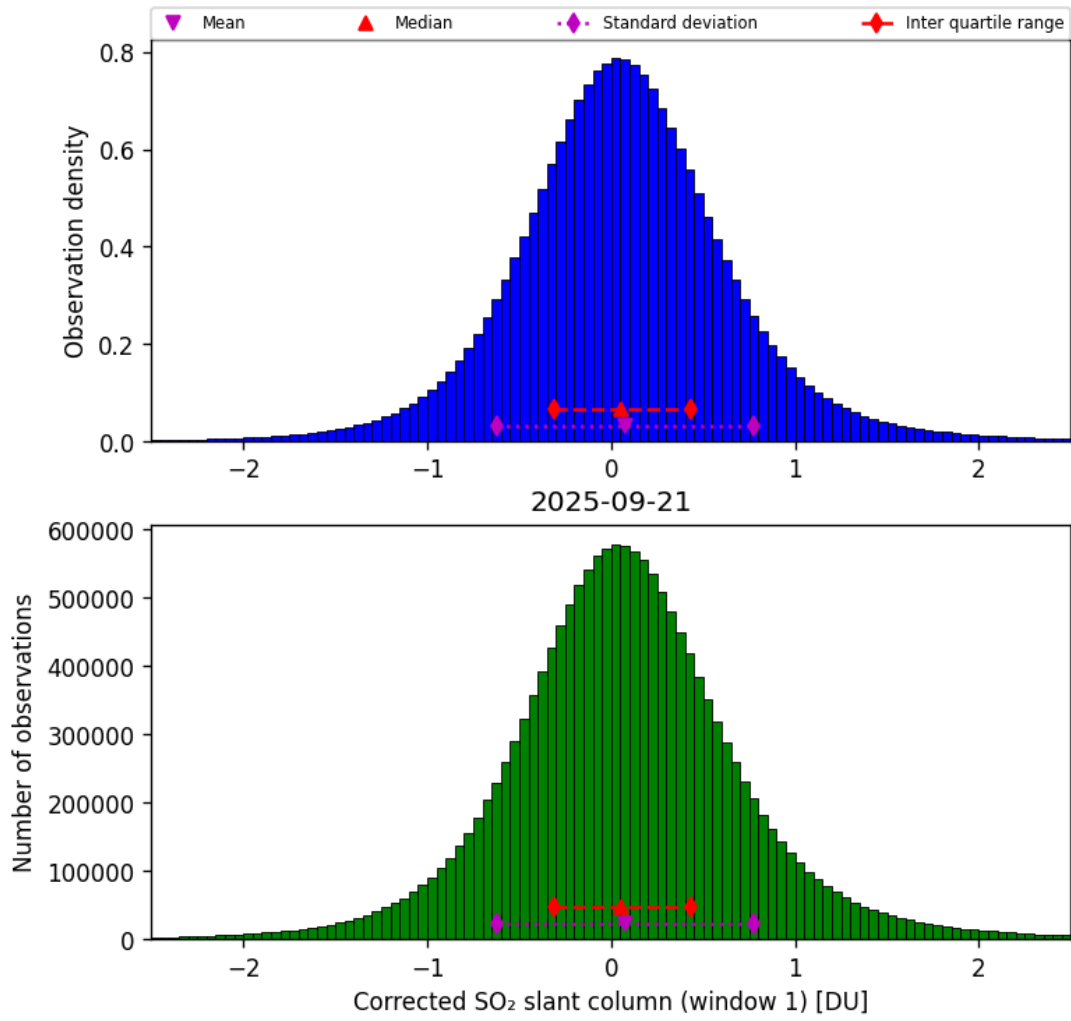


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-09-21 to 2025-09-22

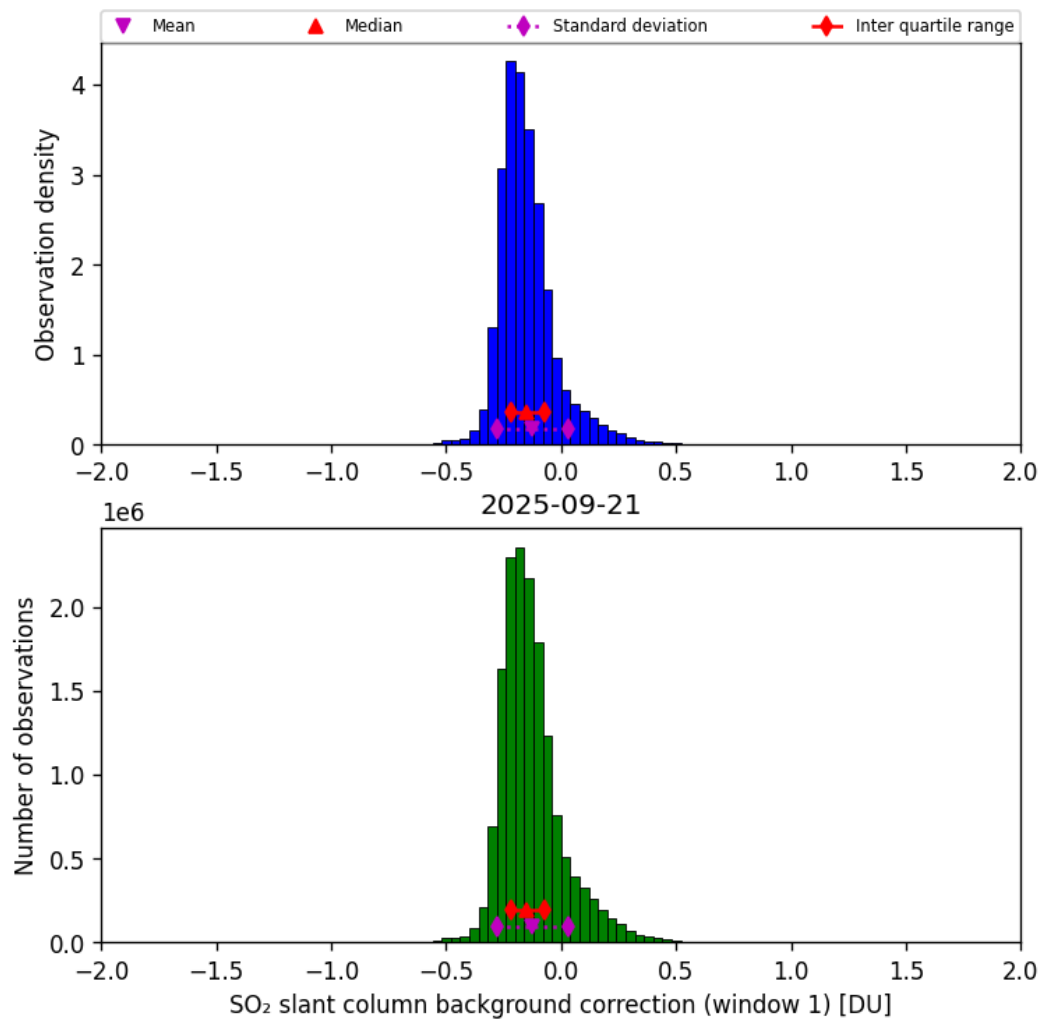


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-09-21 to 2025-09-22

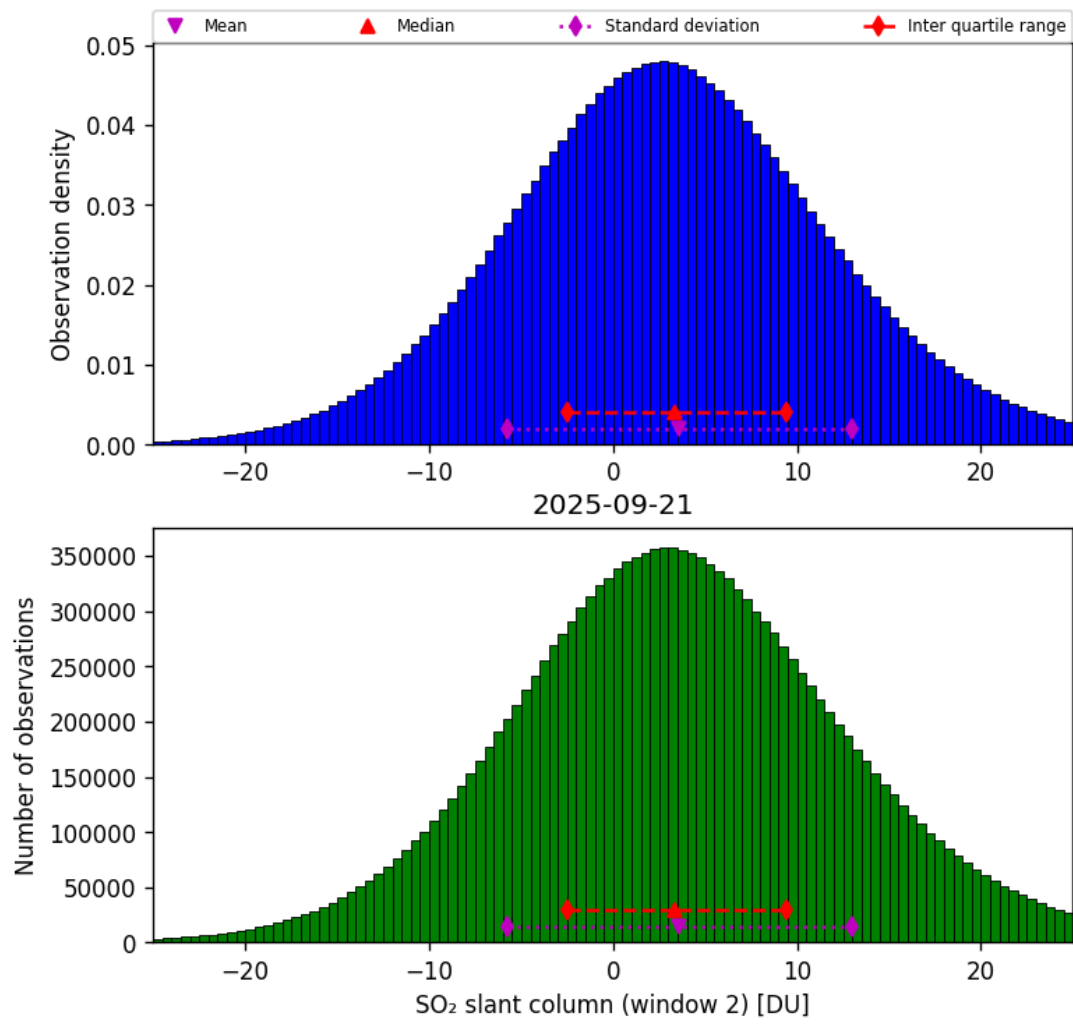


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-09-21 to 2025-09-22

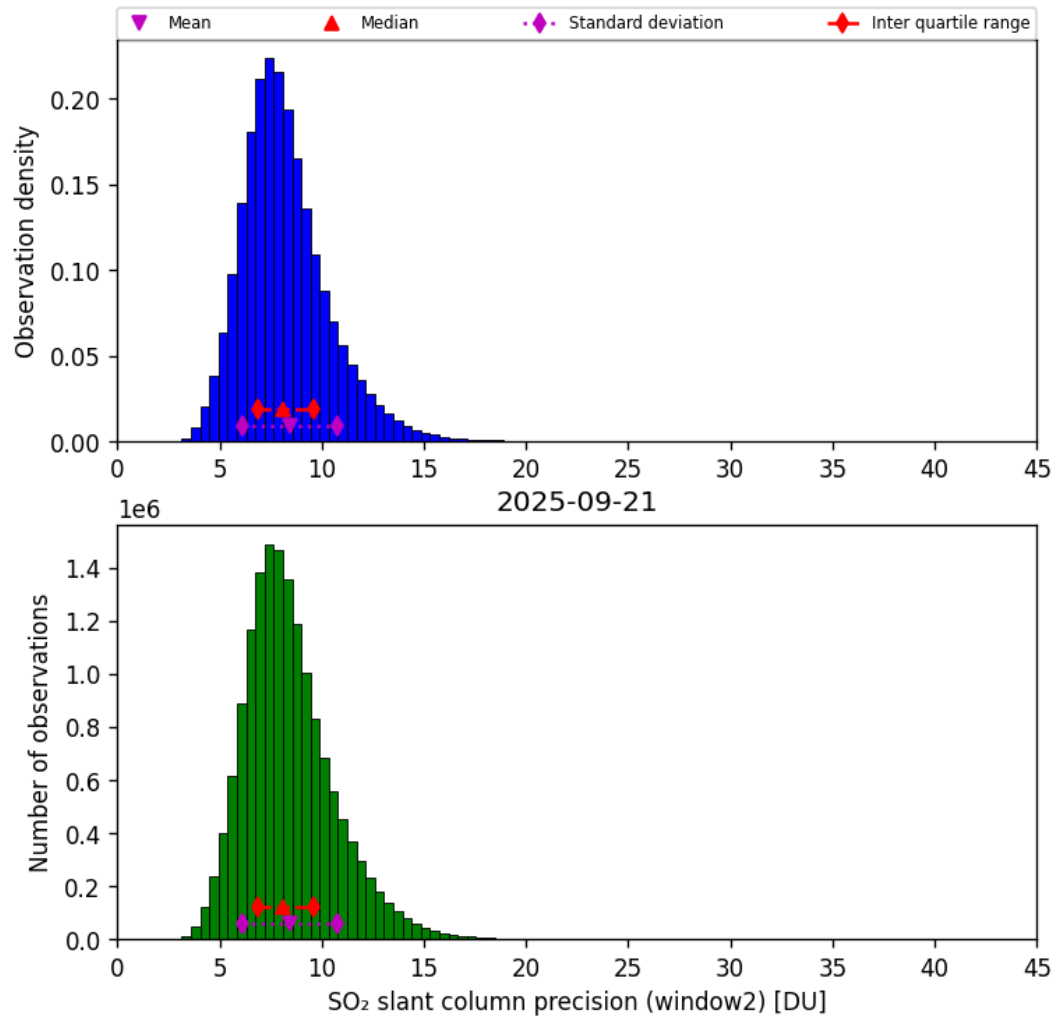


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-09-21 to 2025-09-22

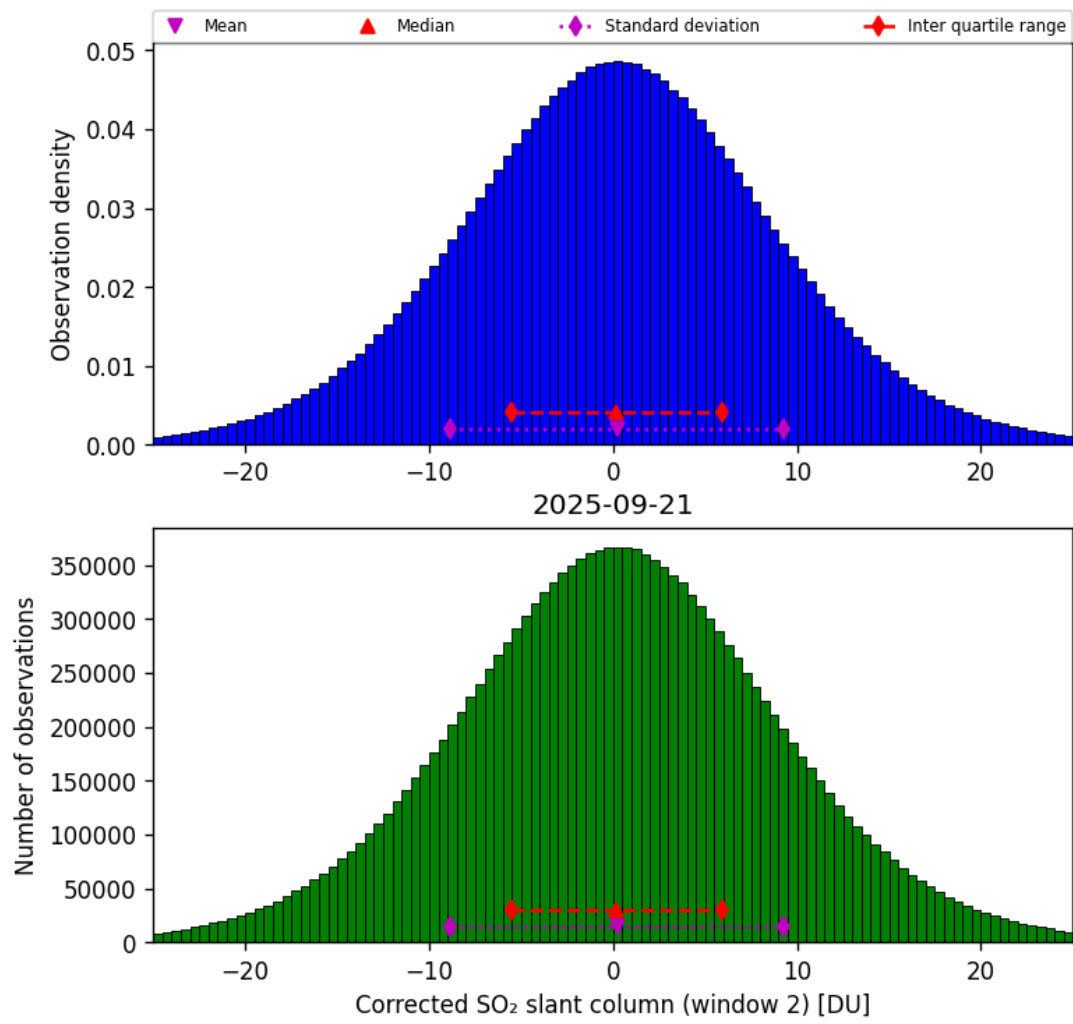


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-09-21 to 2025-09-22

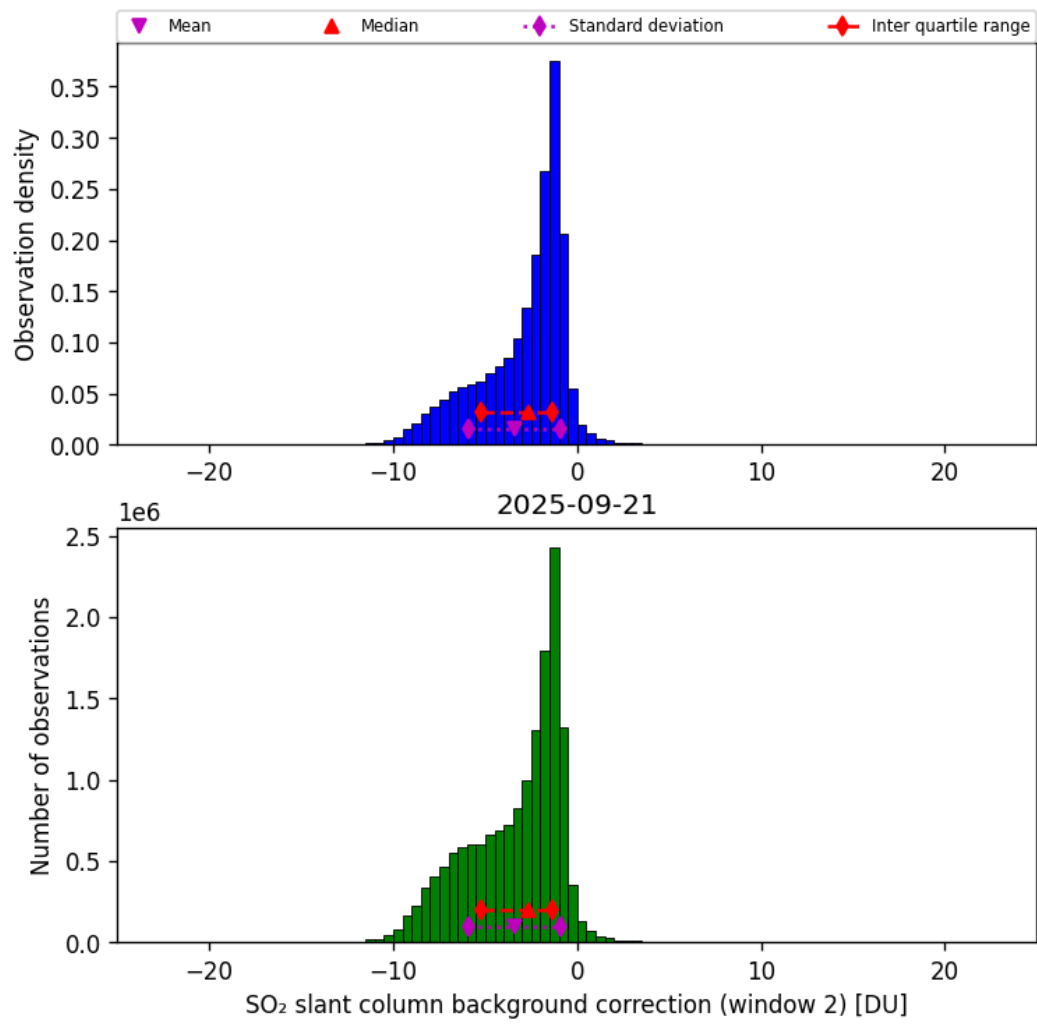


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-09-21 to 2025-09-22

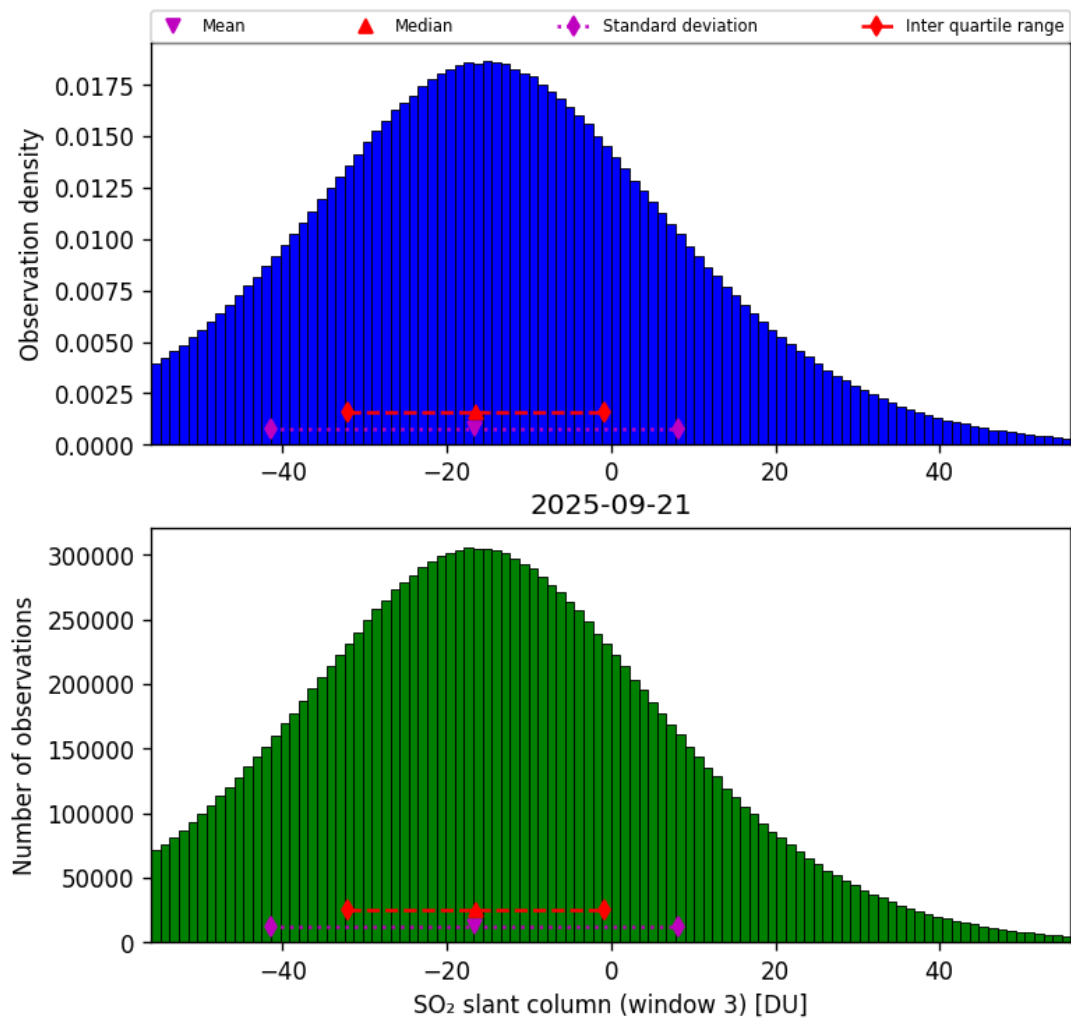


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-09-21 to 2025-09-22

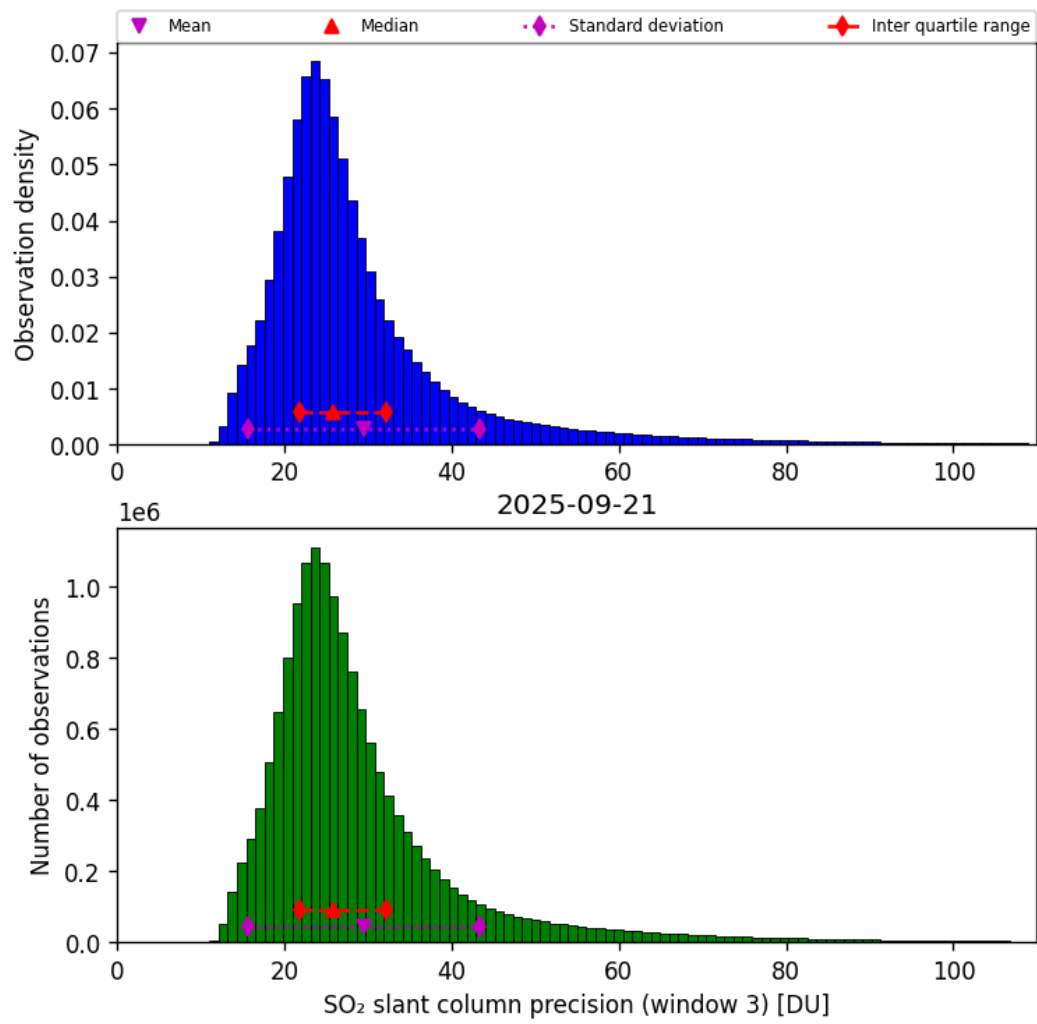


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-09-21 to 2025-09-22

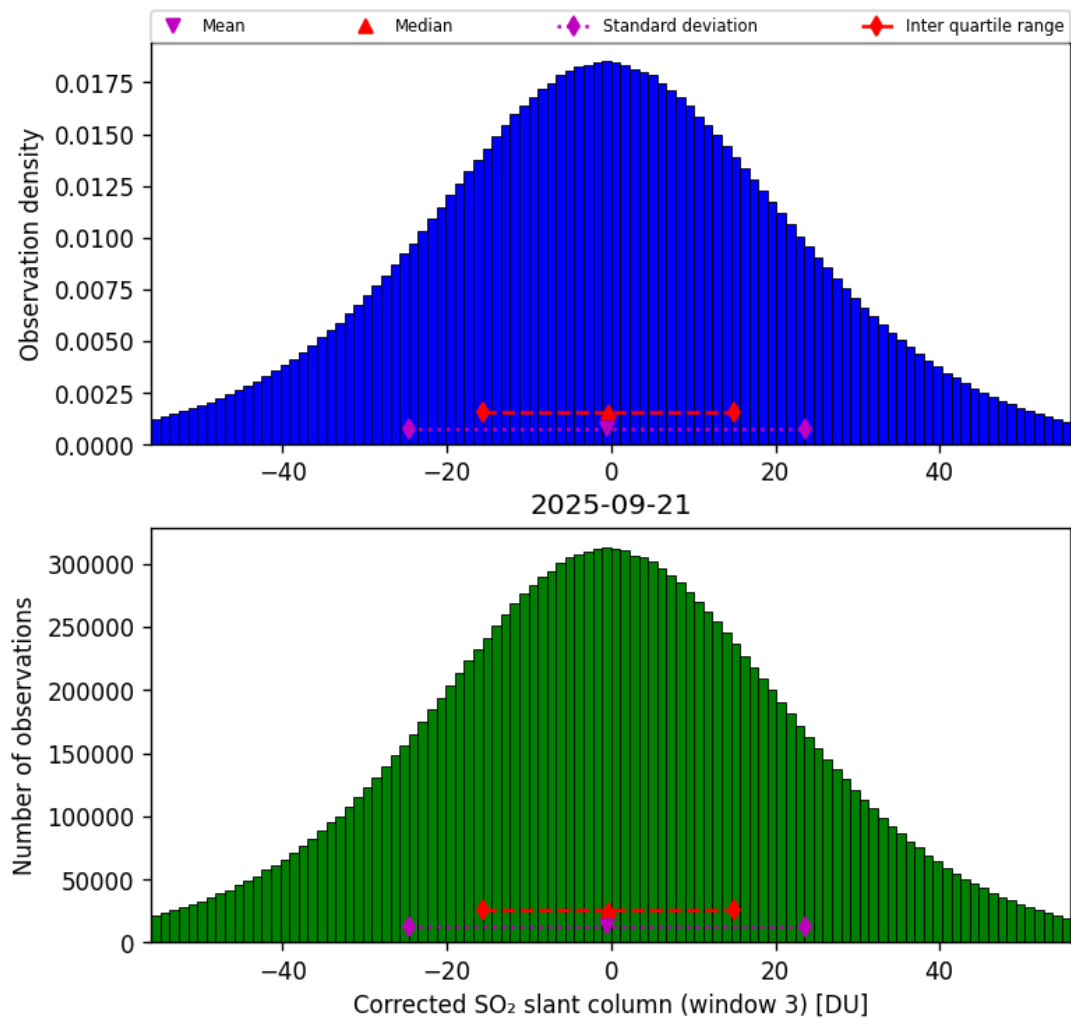


Figure 73: Histogram of "Corrected SO₂ slant column (window 3)" for 2025-09-21 to 2025-09-22

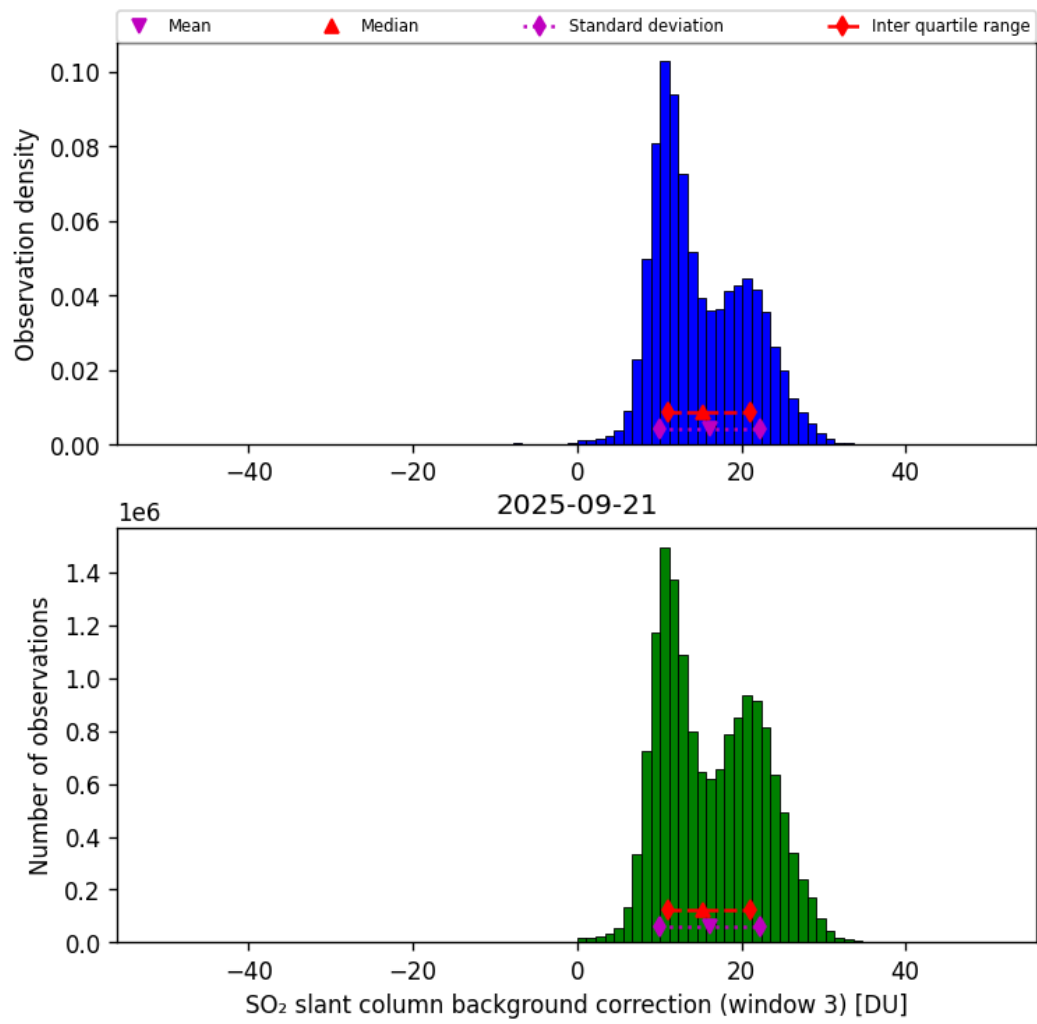


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-09-21 to 2025-09-22

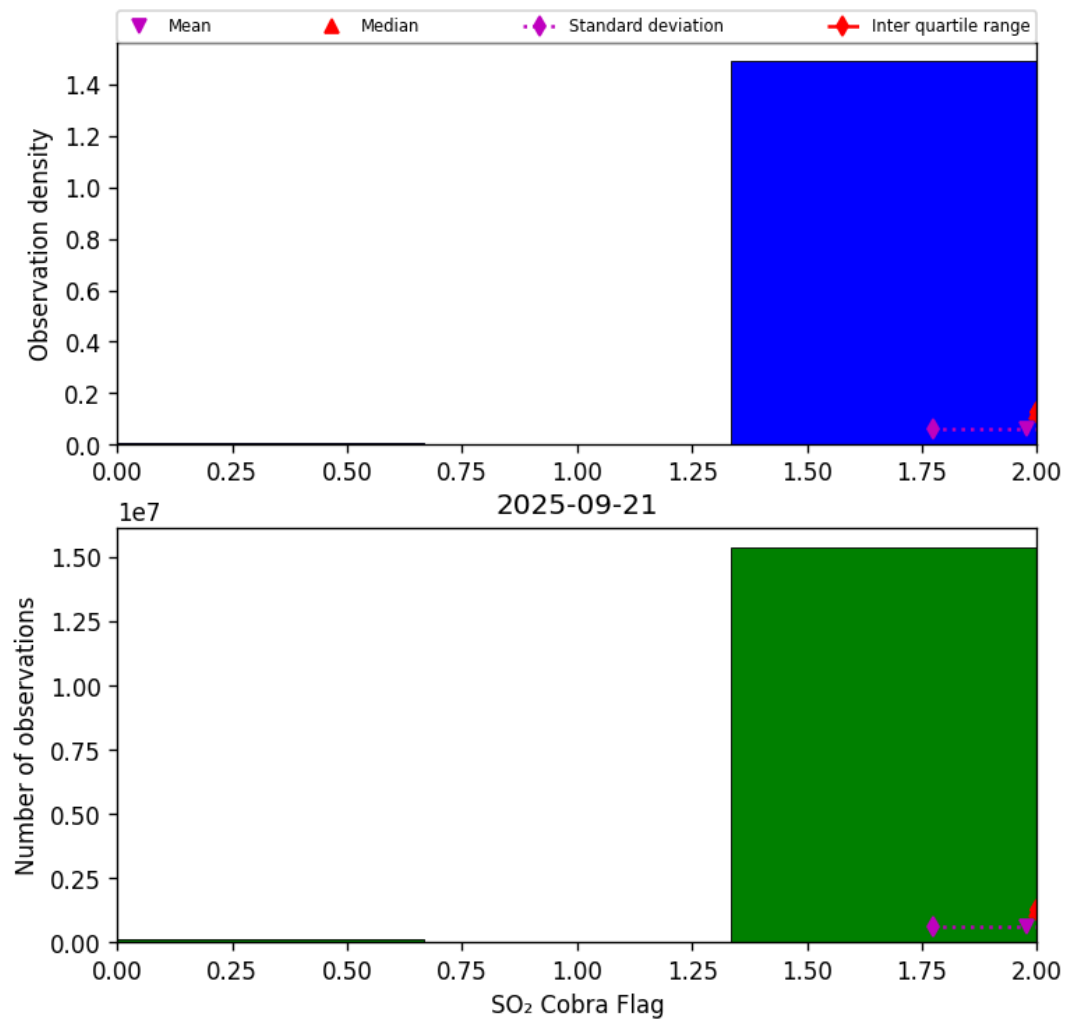


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-09-21 to 2025-09-22

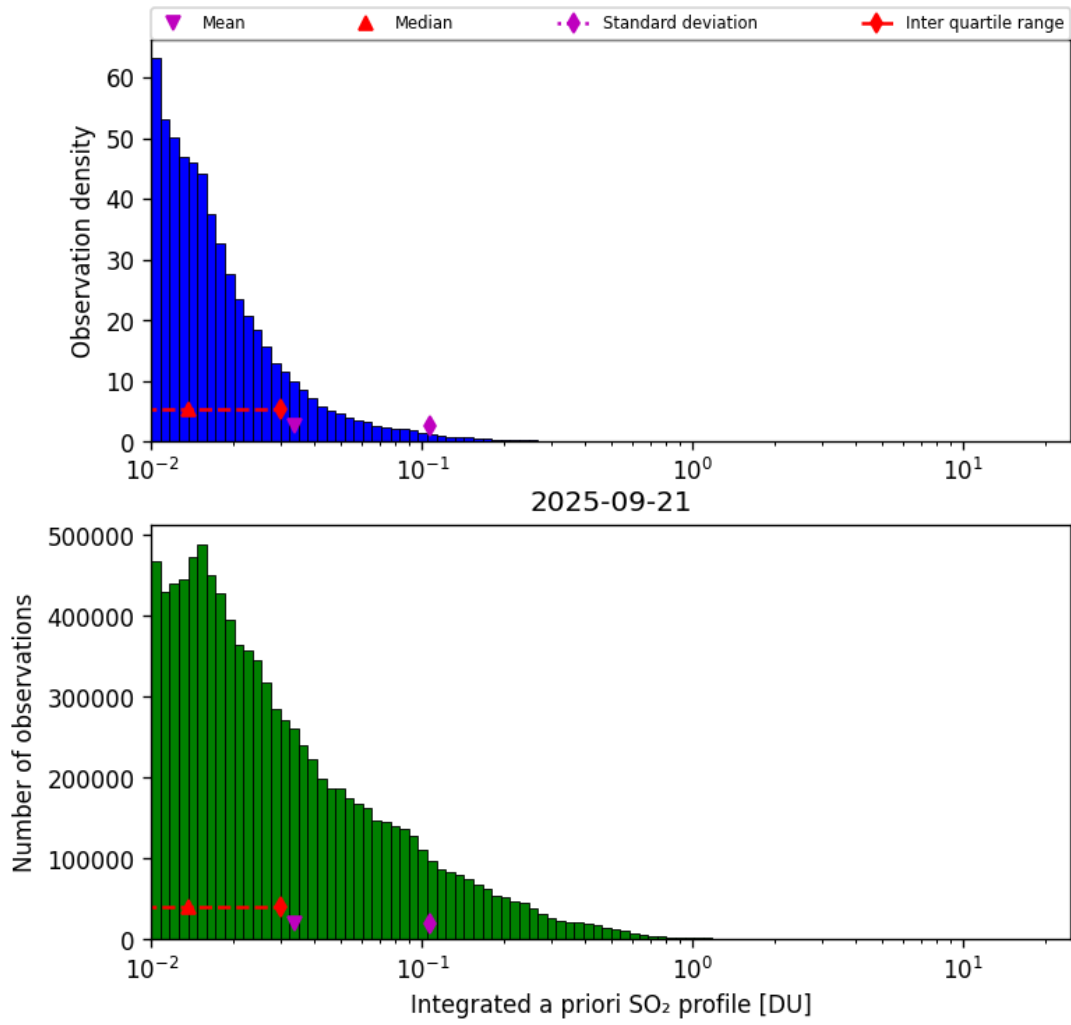


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-09-21 to 2025-09-22

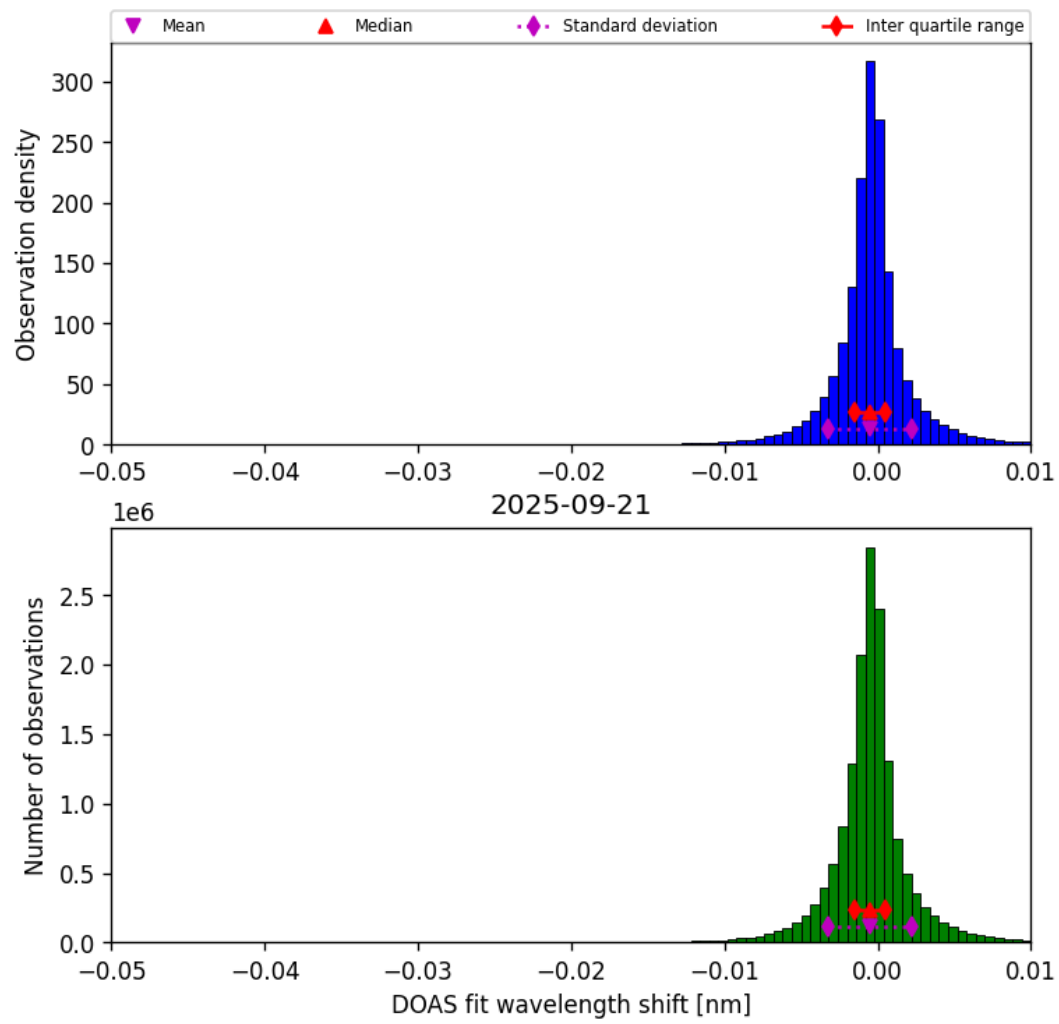


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-09-21 to 2025-09-22

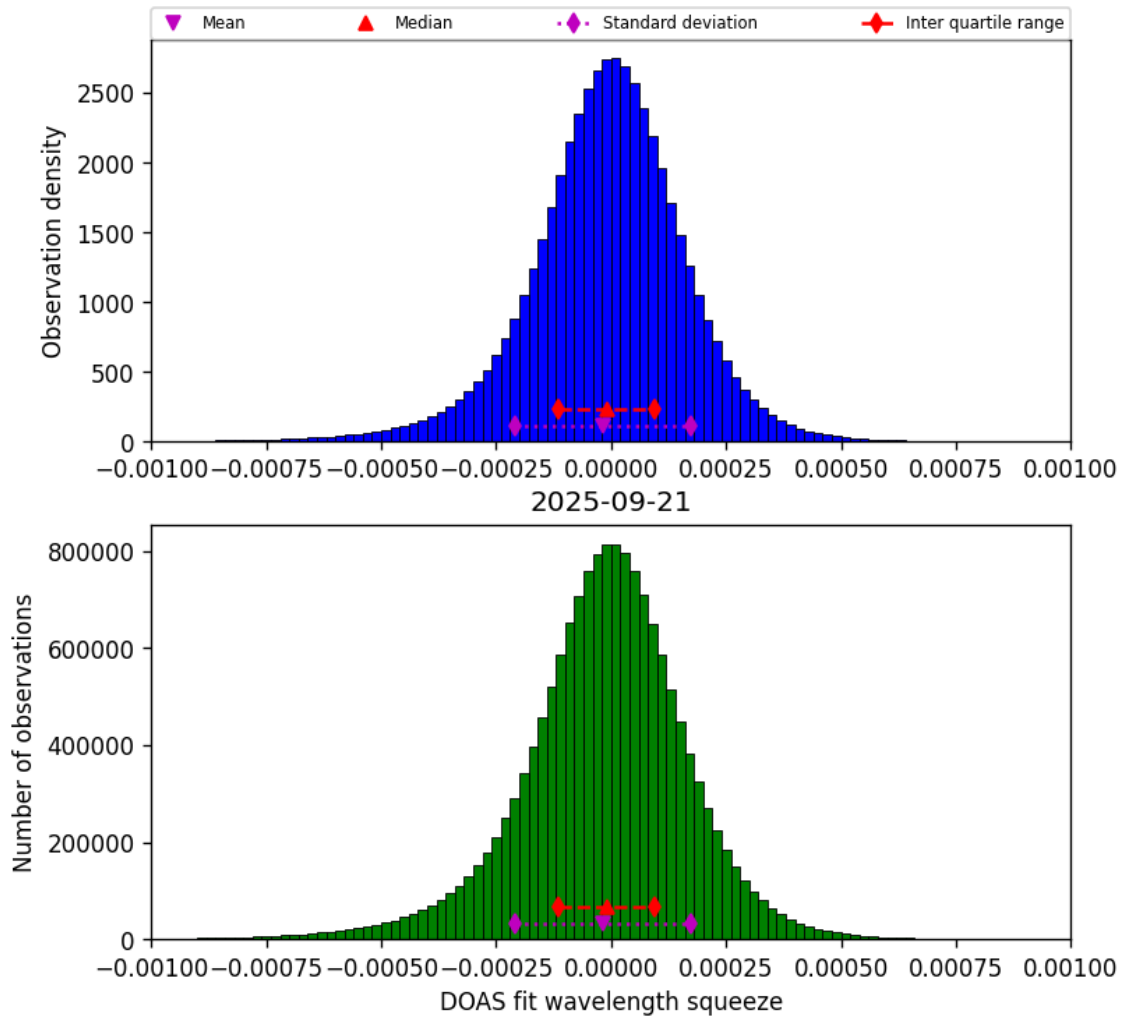


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-09-21 to 2025-09-22

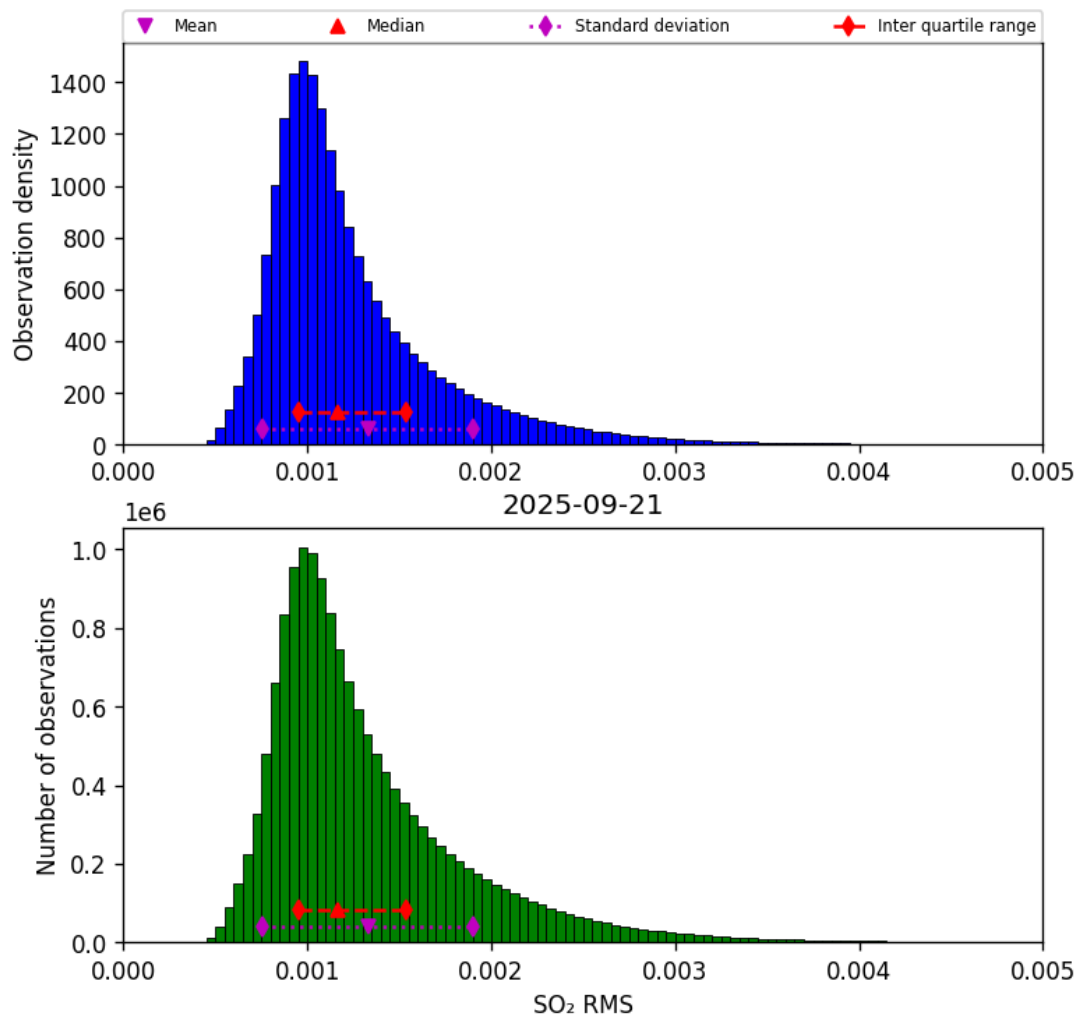


Figure 79: Histogram of “SO₂ RMS” for 2025-09-21 to 2025-09-22

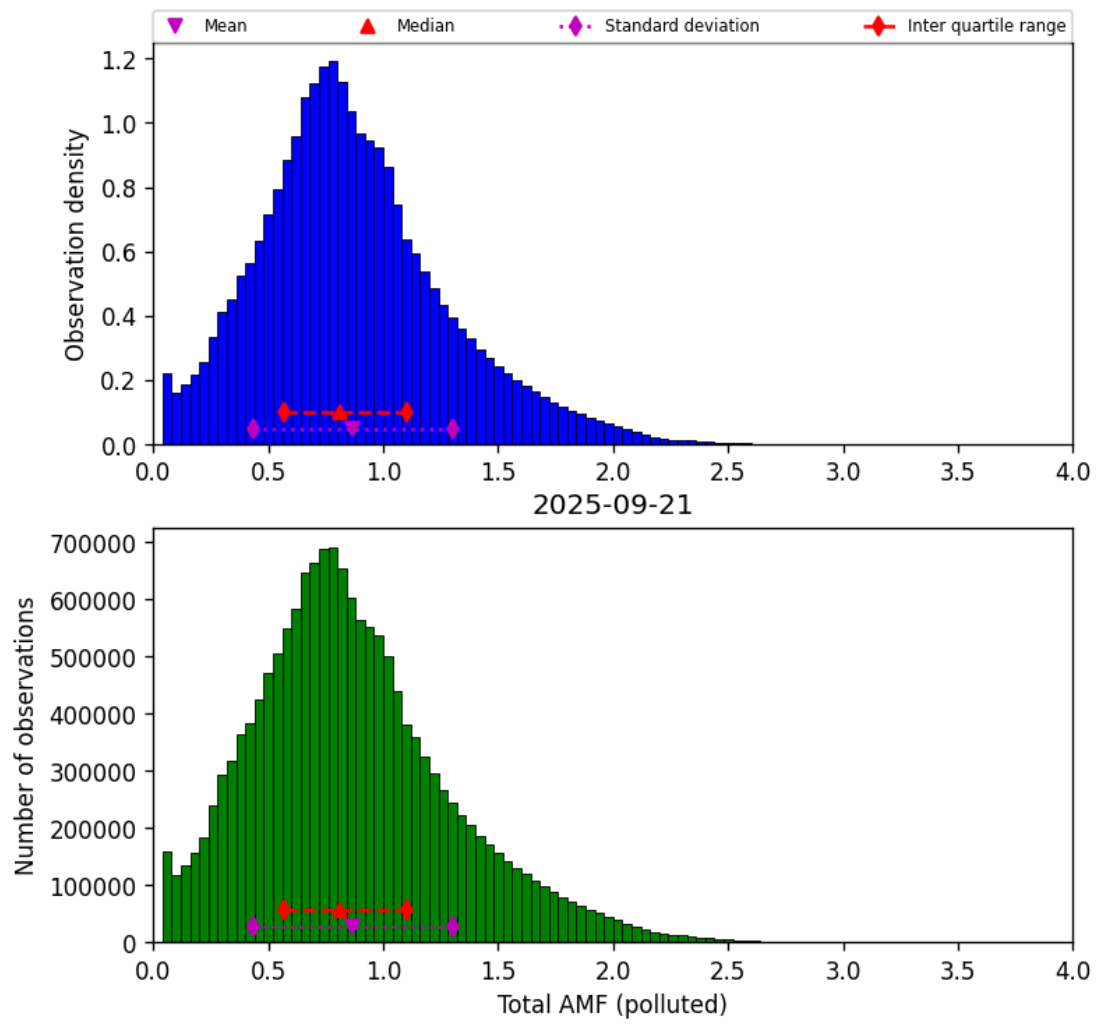


Figure 80: Histogram of “Total AMF (polluted)” for 2025-09-21 to 2025-09-22

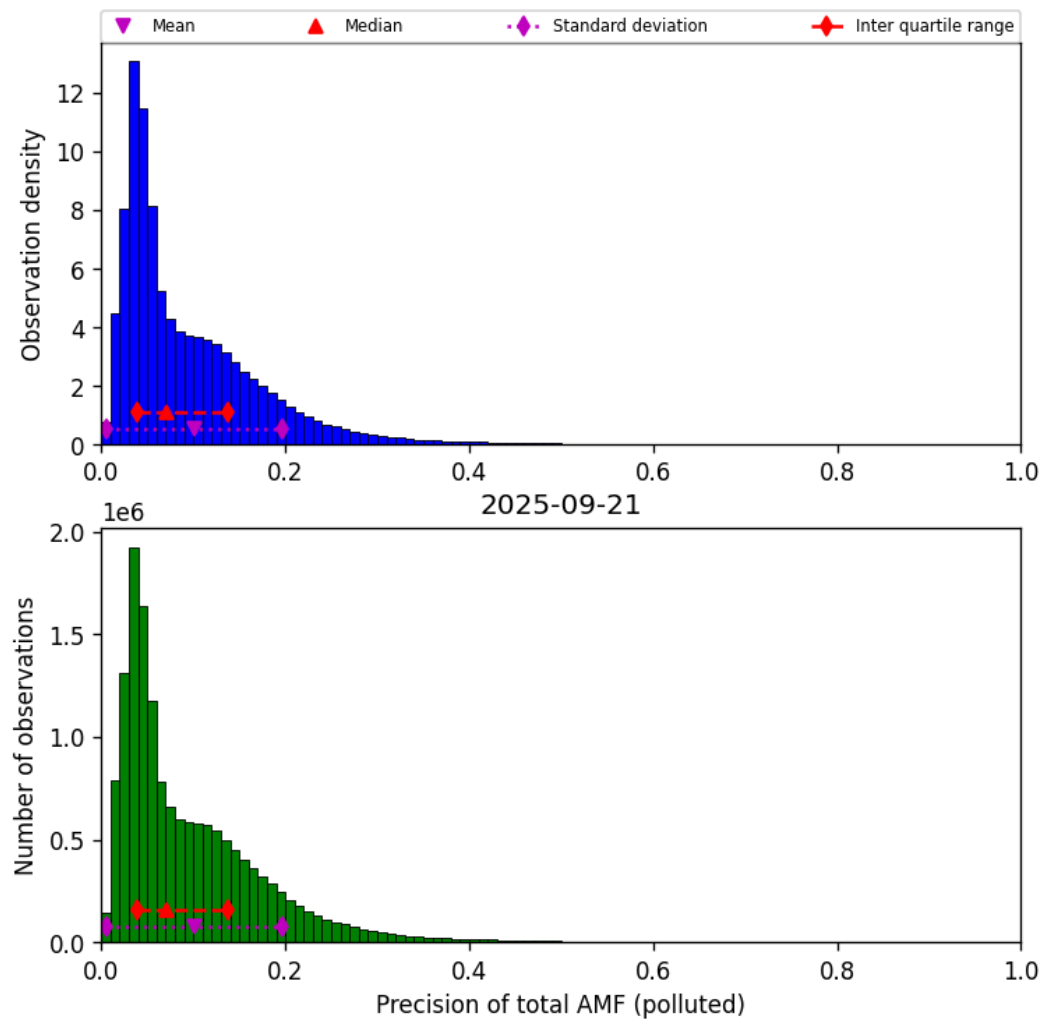


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-09-21 to 2025-09-22

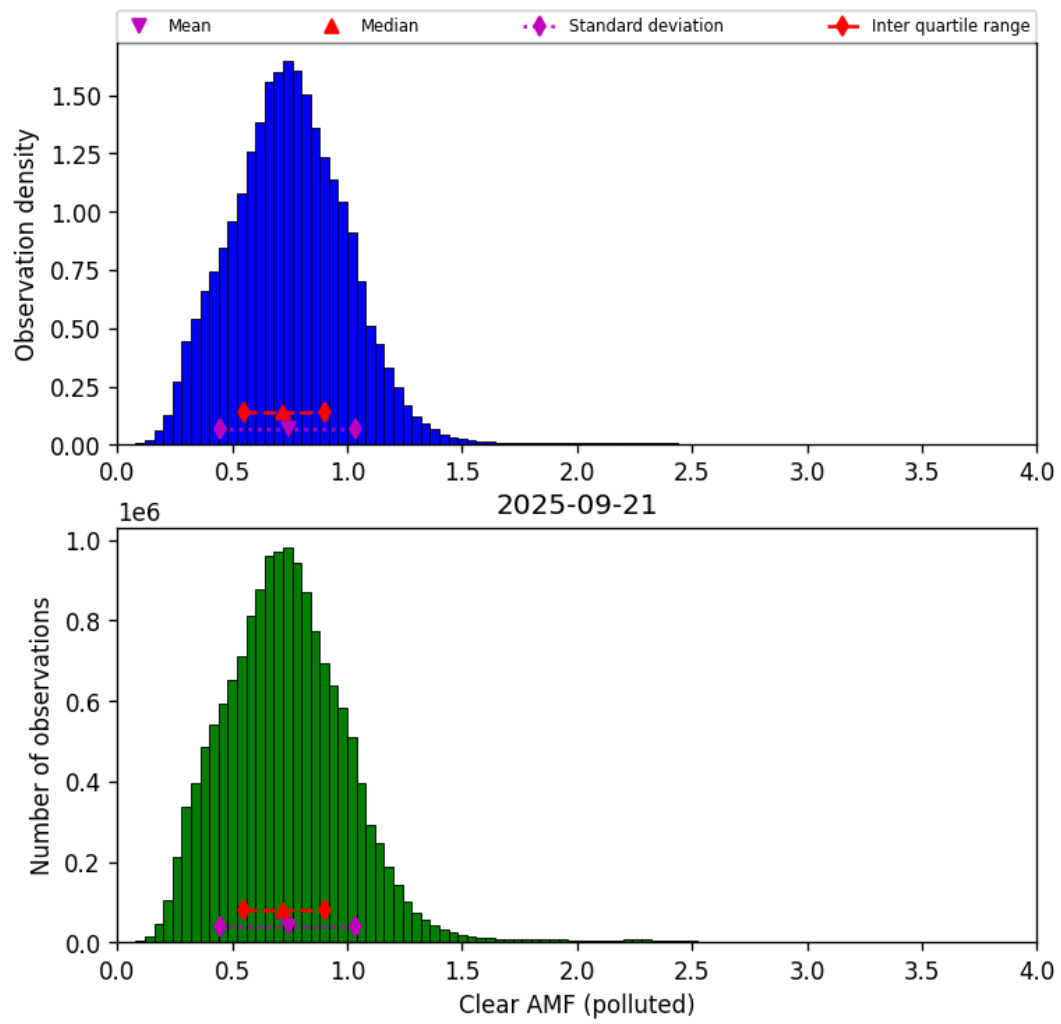


Figure 82: Histogram of "Clear AMF (polluted)" for 2025-09-21 to 2025-09-22

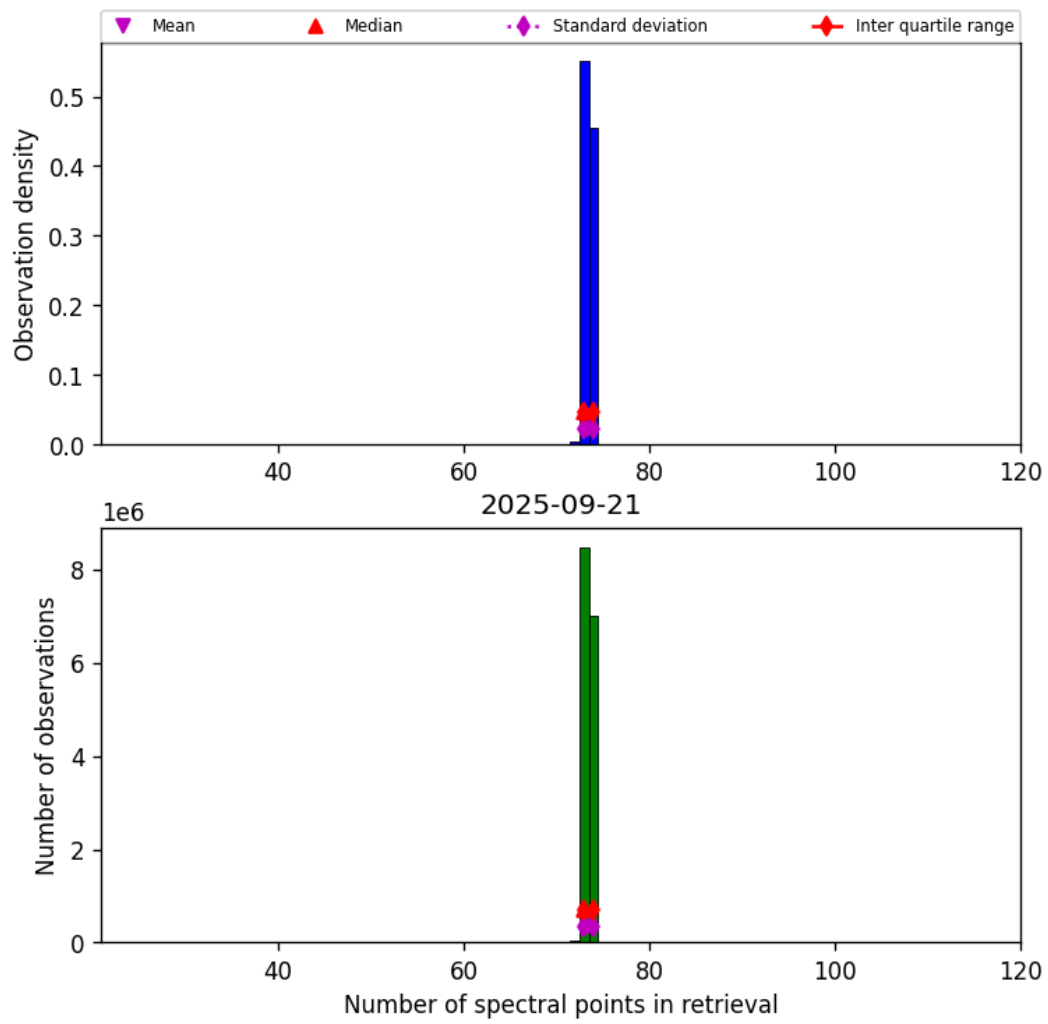


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-09-21 to 2025-09-22

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.

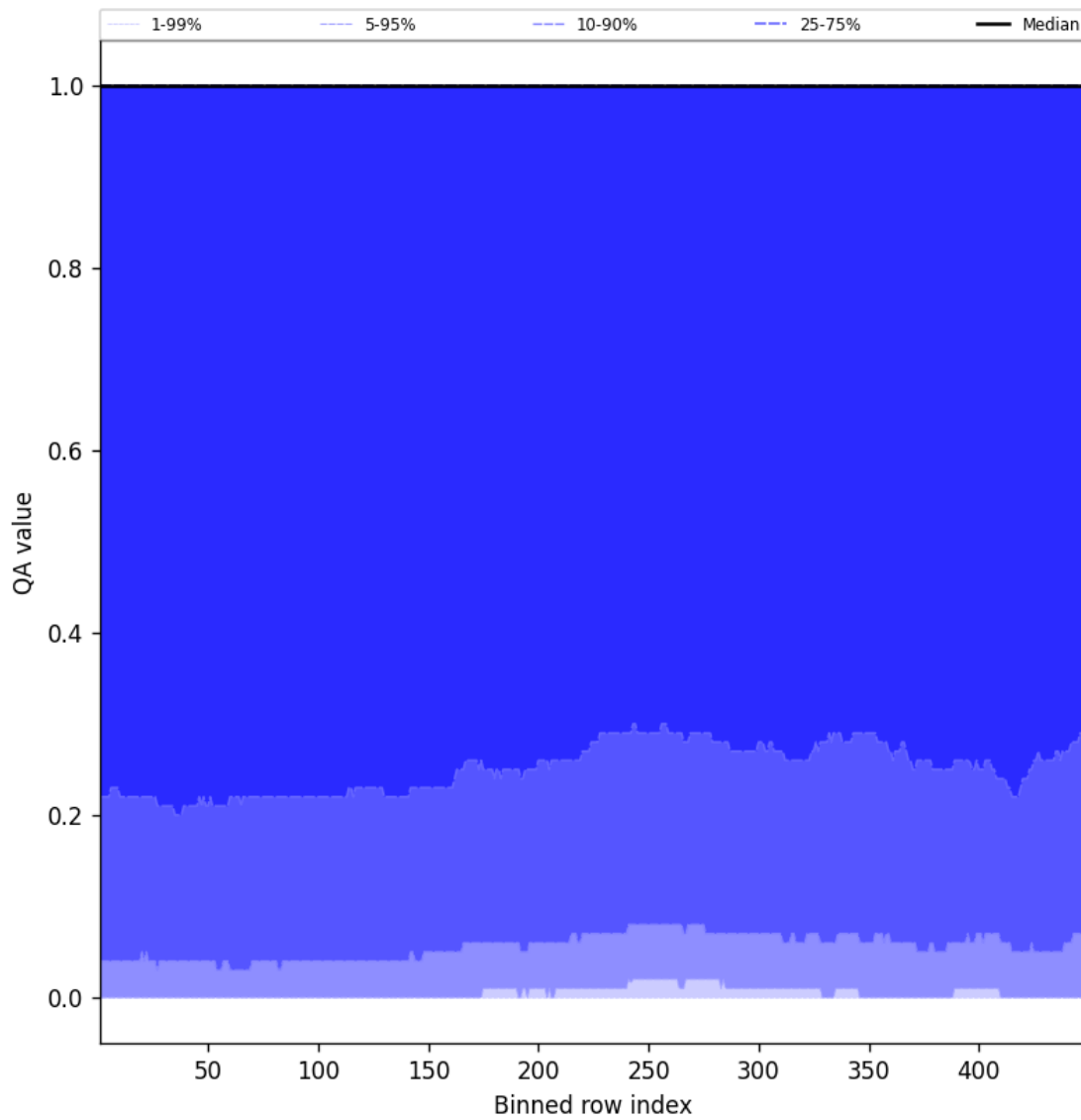


Figure 84: Along track statistics of “QA value” for 2025-09-21 to 2025-09-22

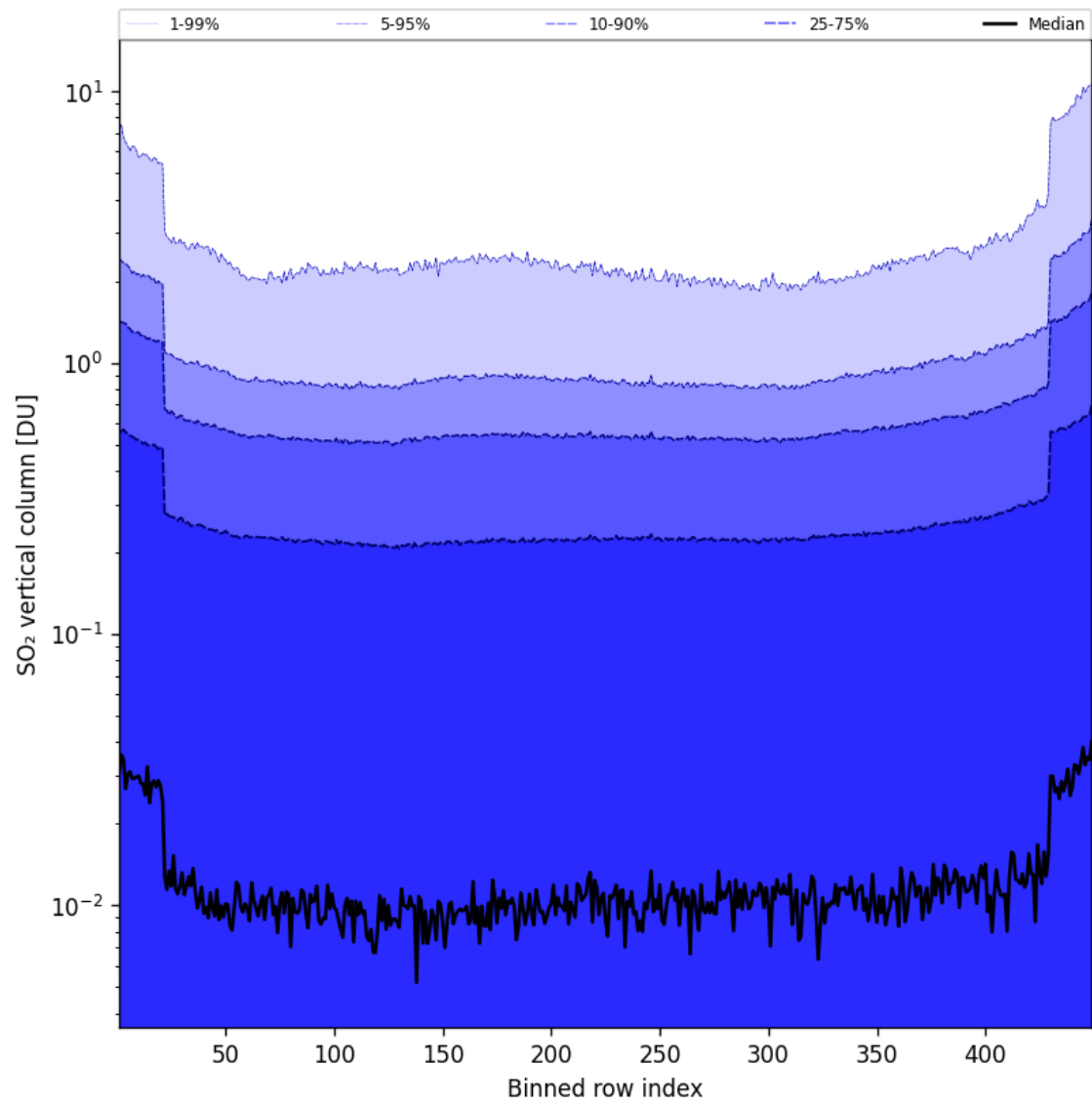


Figure 85: Along track statistics of "SO₂ vertical column" for 2025-09-21 to 2025-09-22

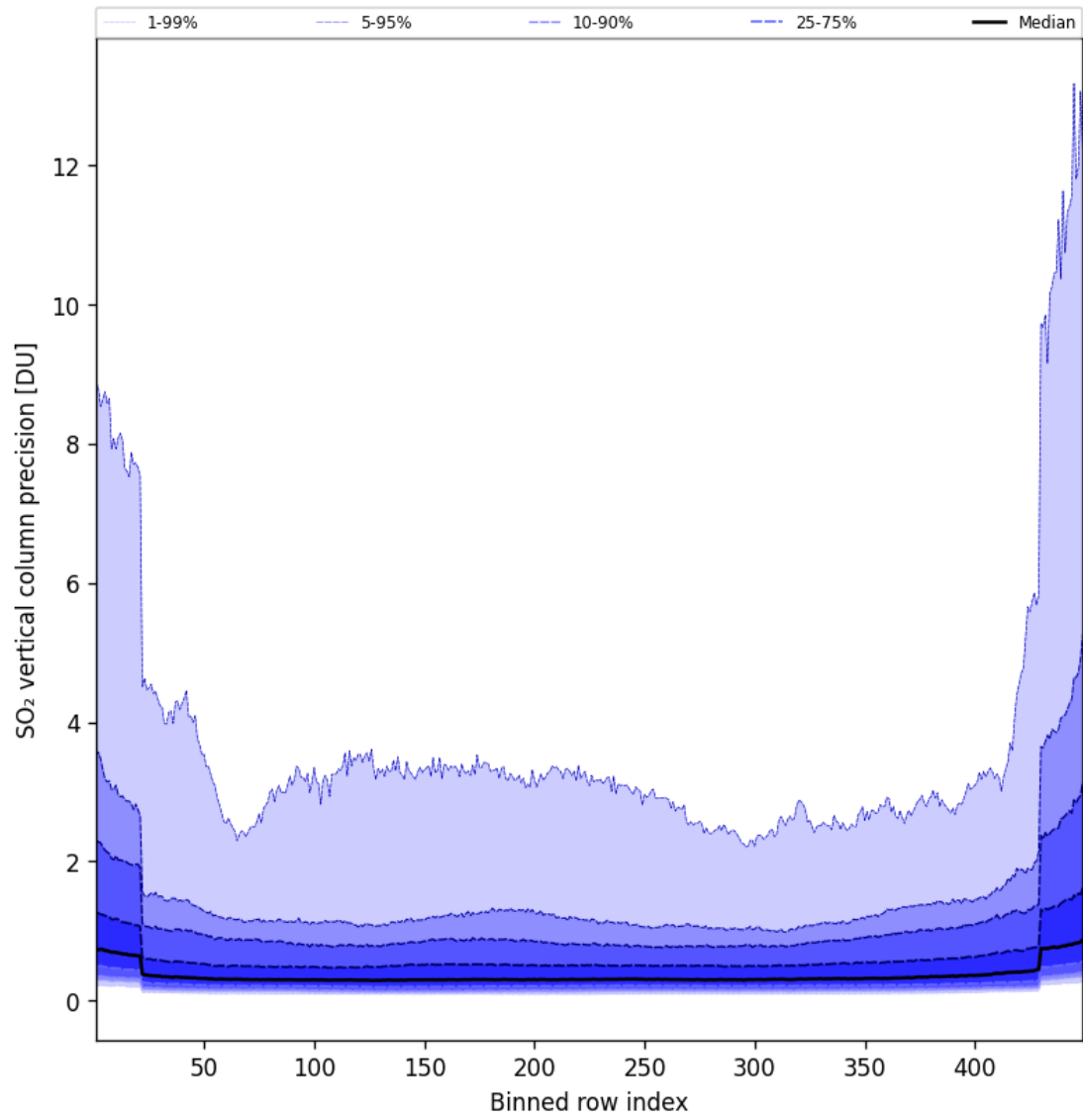


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-09-21 to 2025-09-22

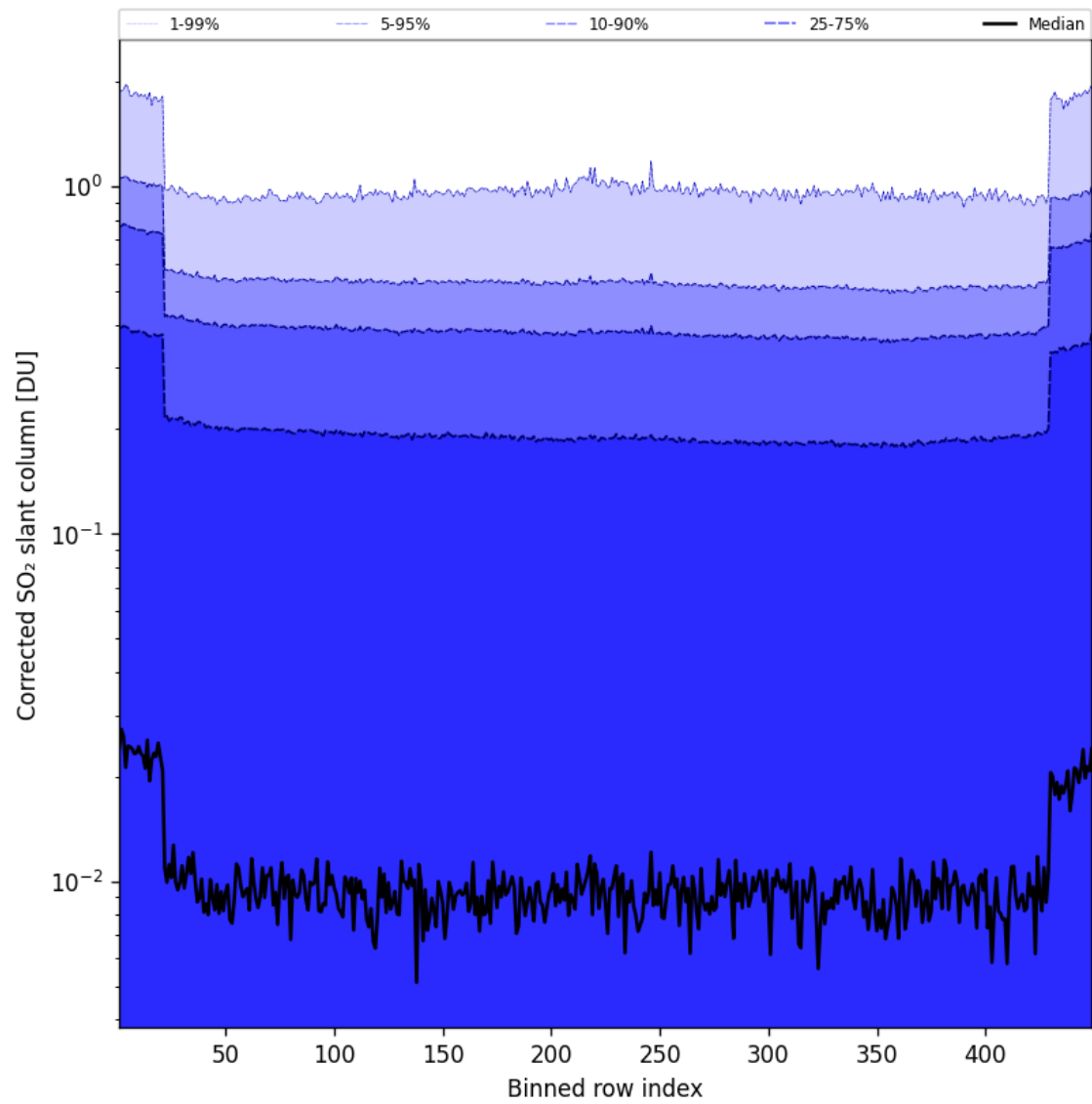


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-09-21 to 2025-09-22

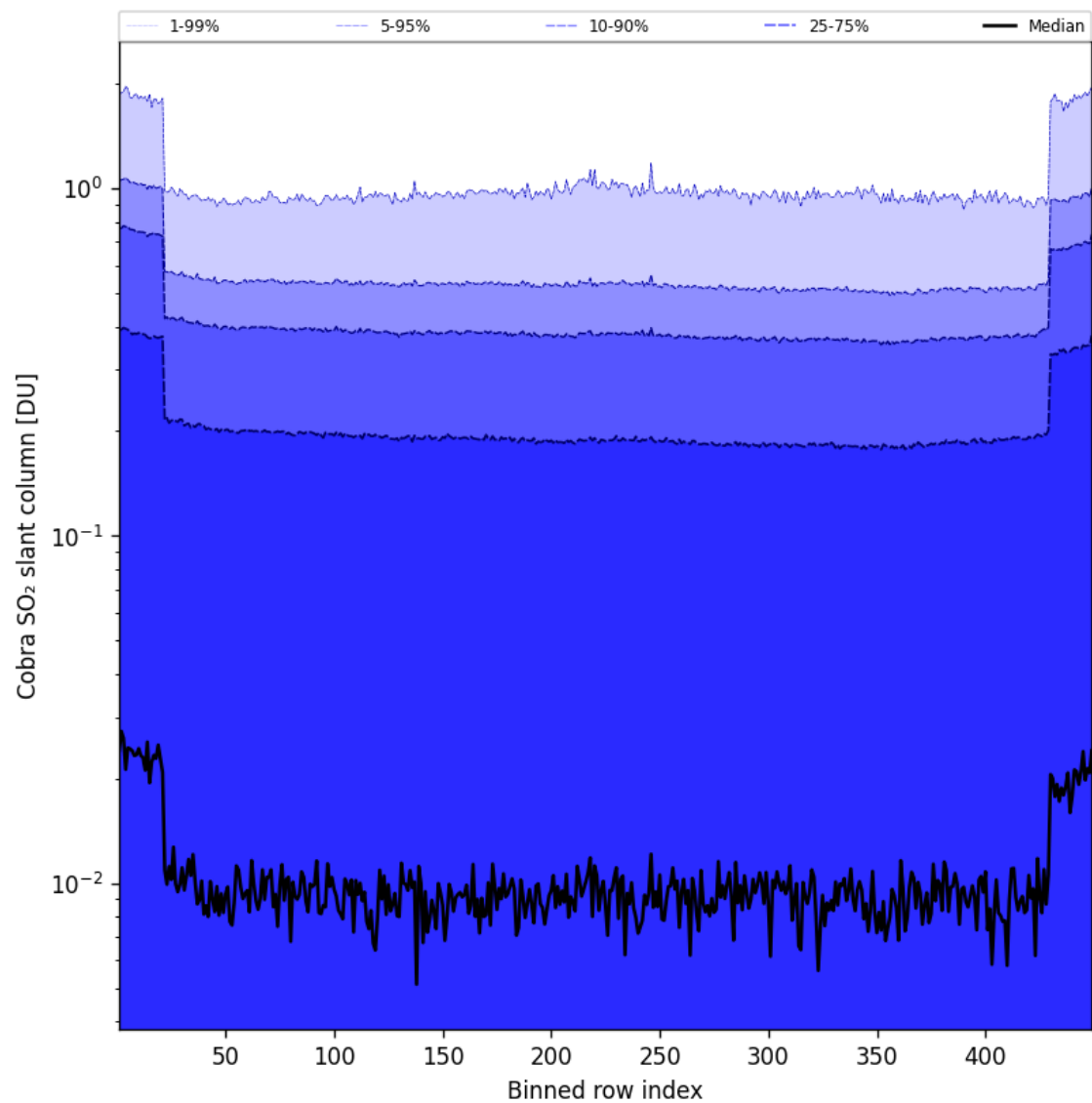


Figure 88: Along track statistics of "Cobra SO₂ slant column" for 2025-09-21 to 2025-09-22

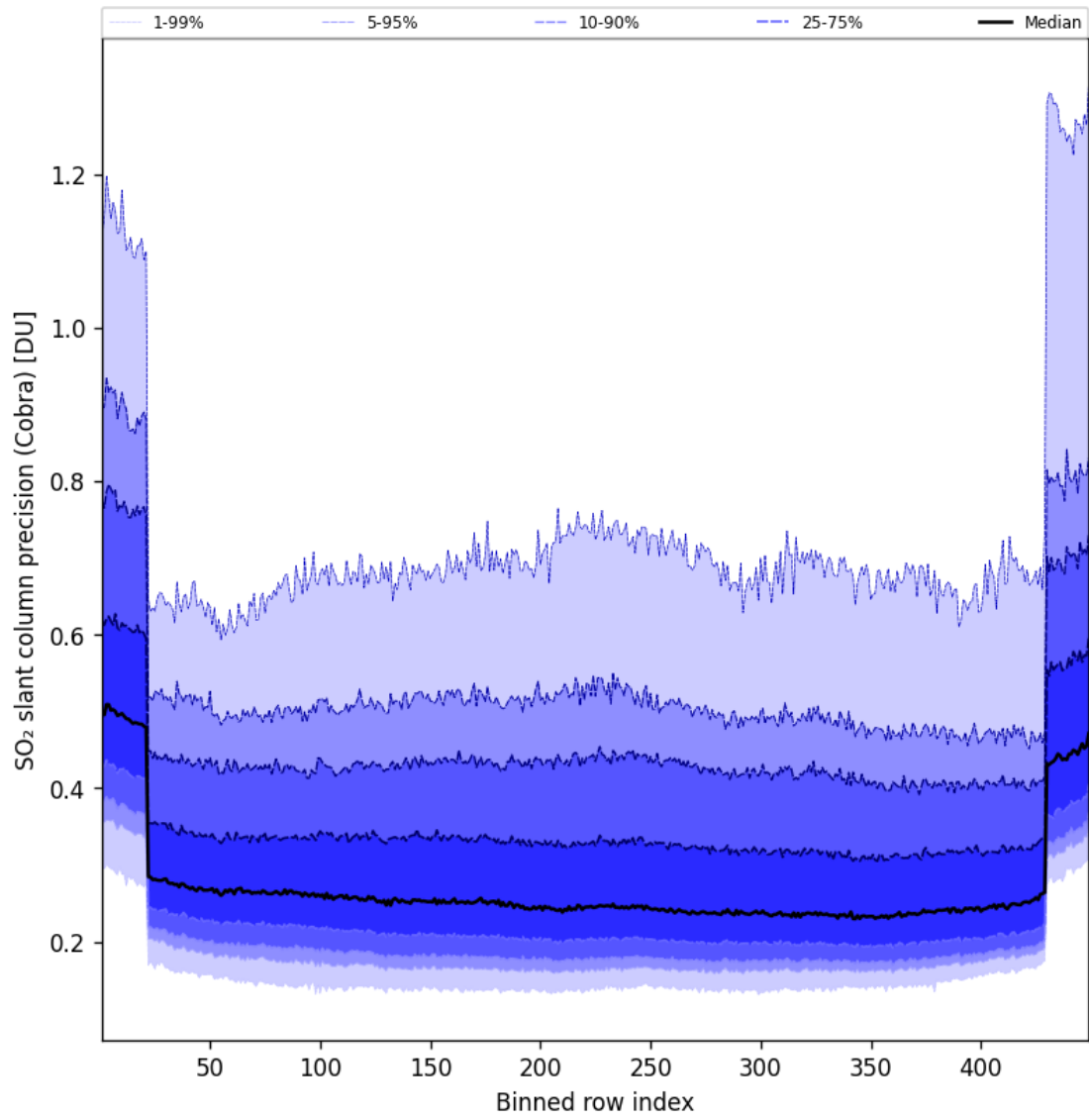


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-09-21 to 2025-09-22

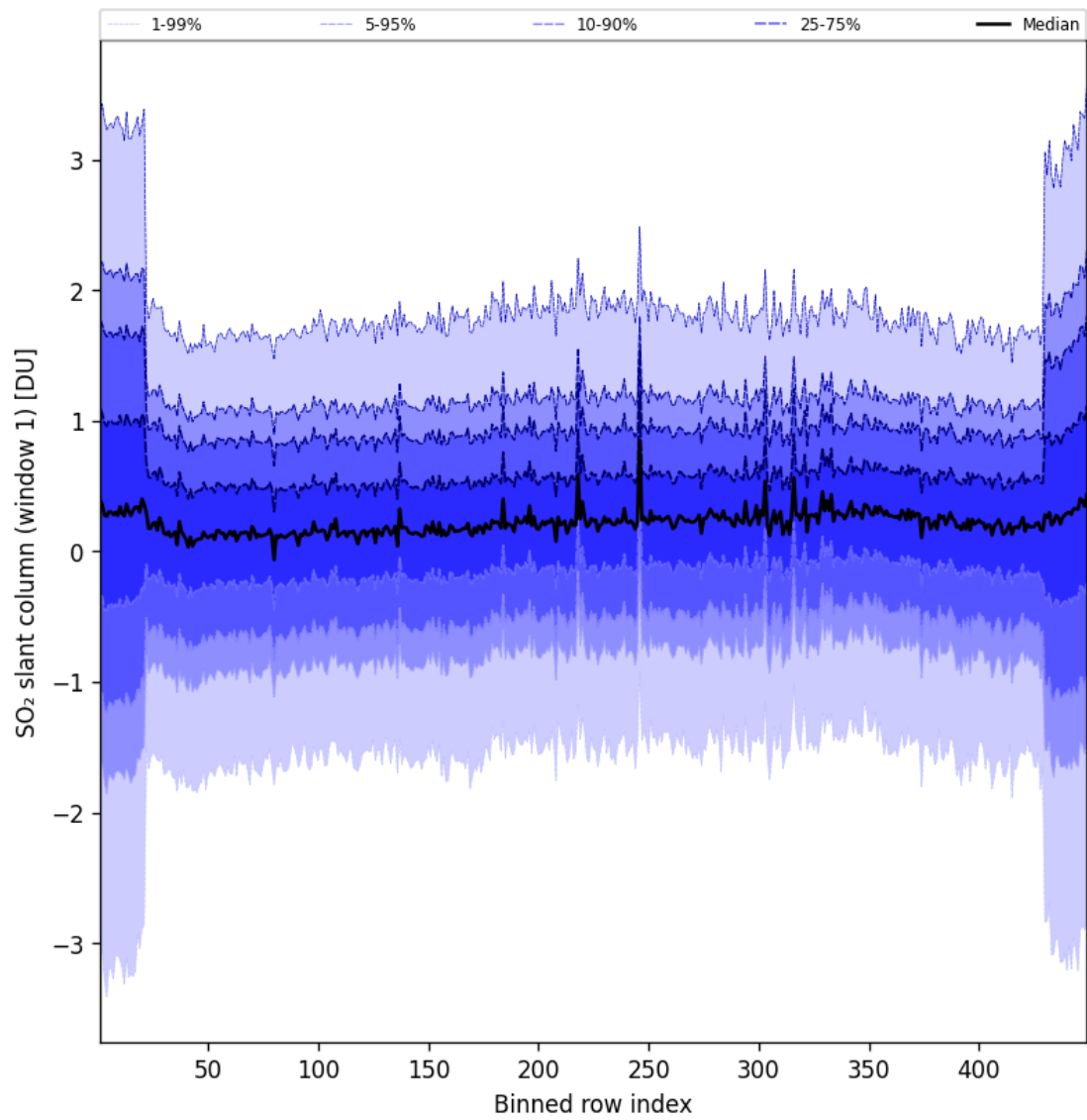


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-09-21 to 2025-09-22

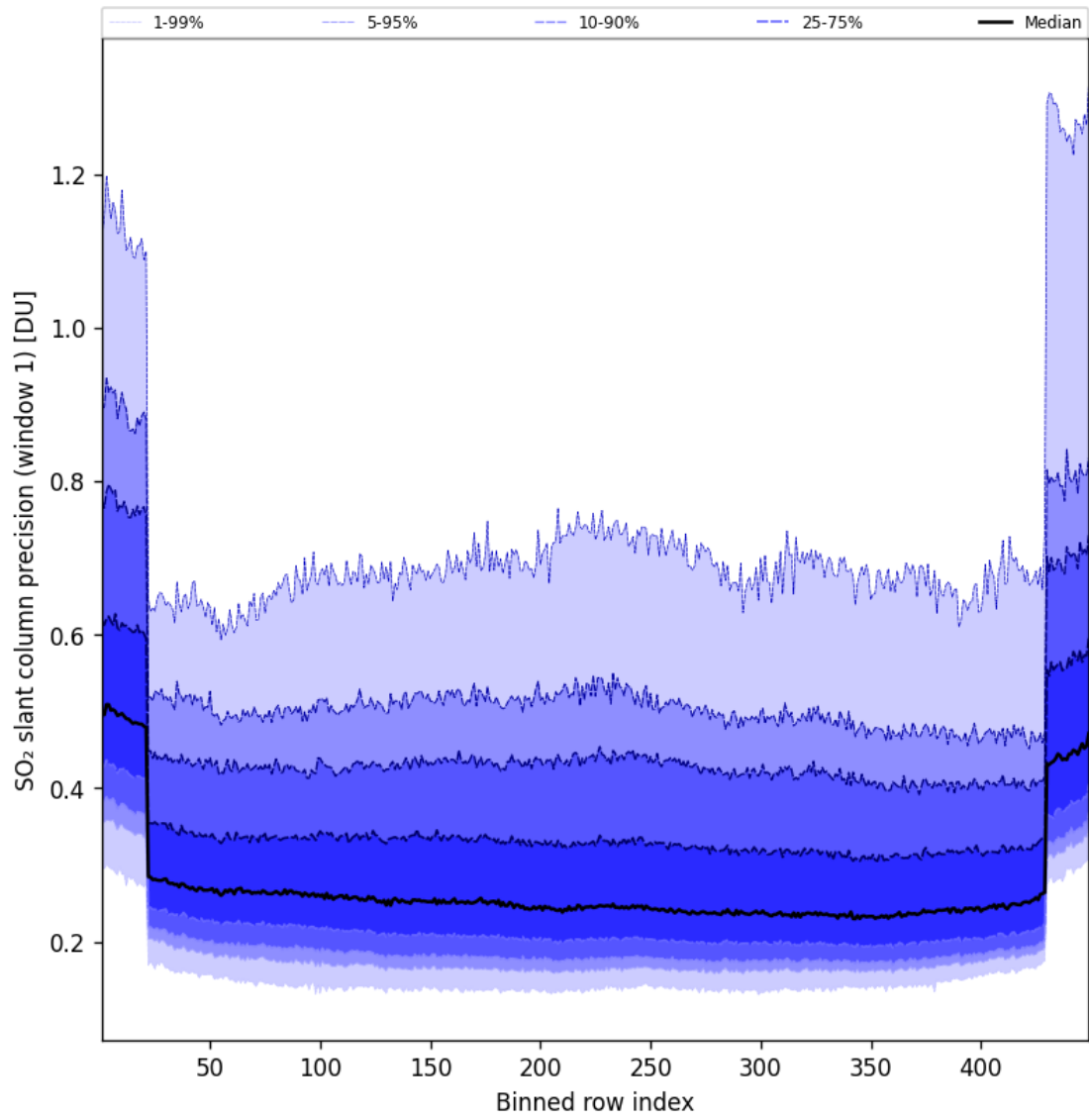


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-09-21 to 2025-09-22

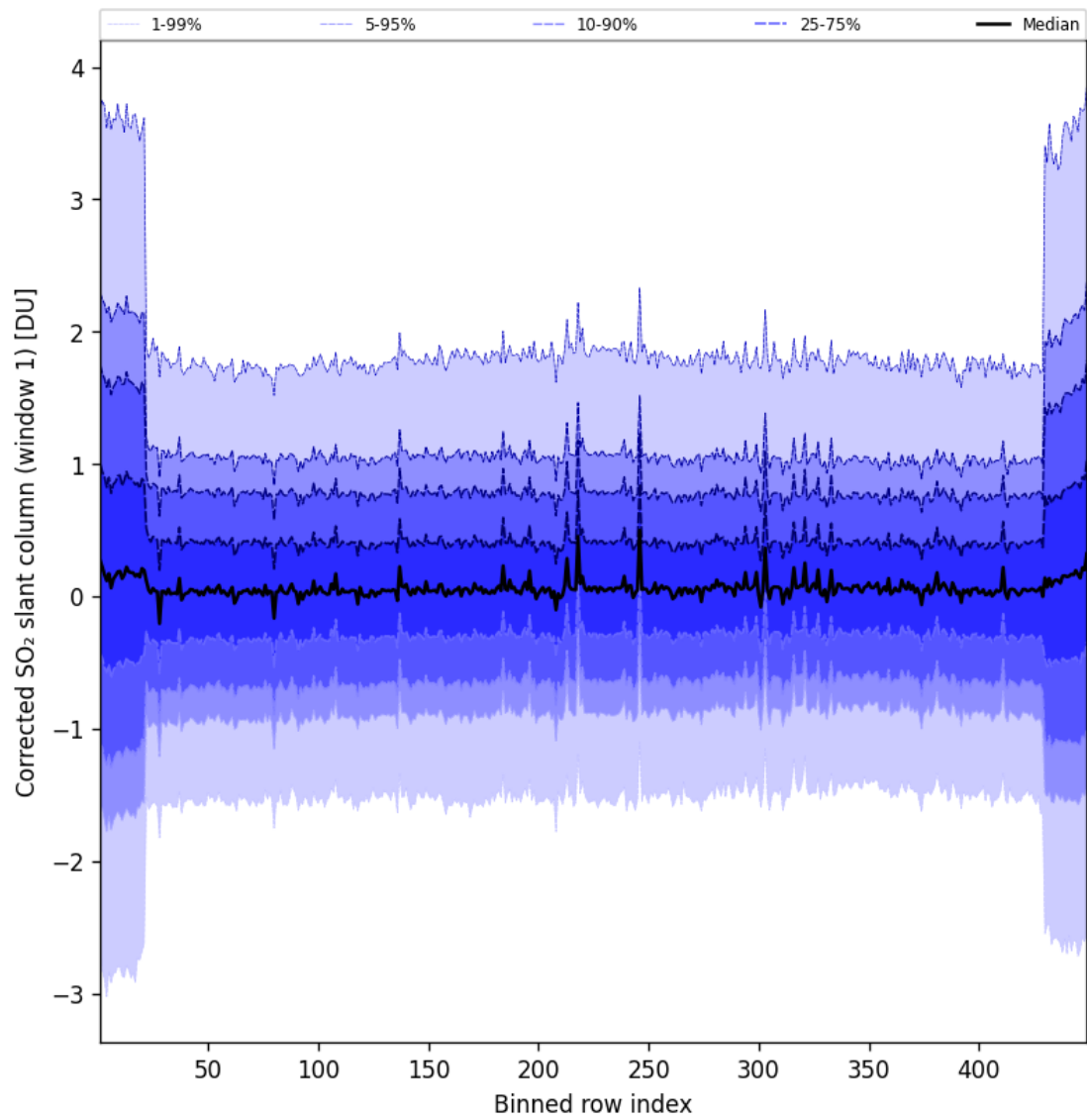


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-09-21 to 2025-09-22

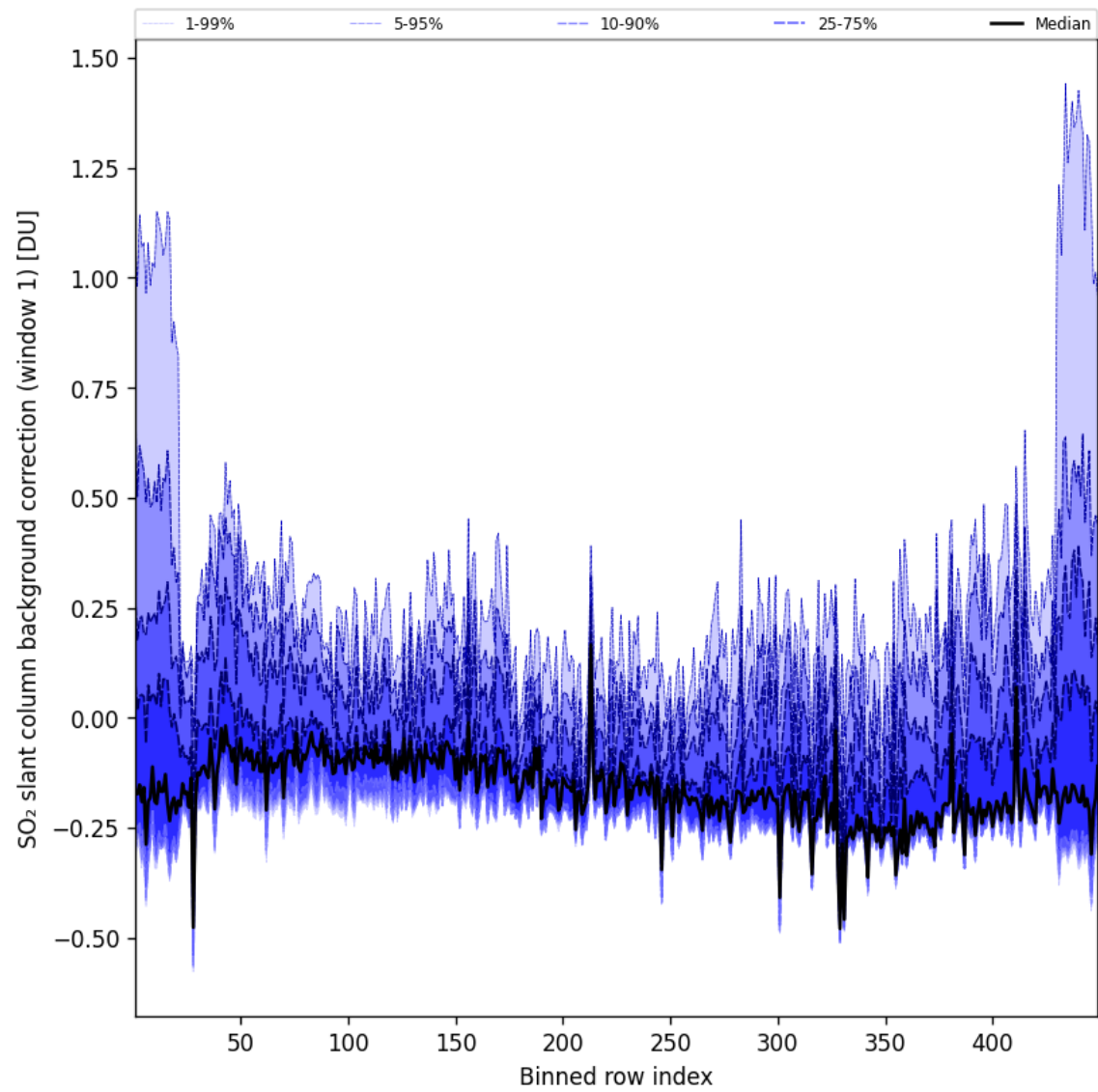


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-09-21 to 2025-09-22

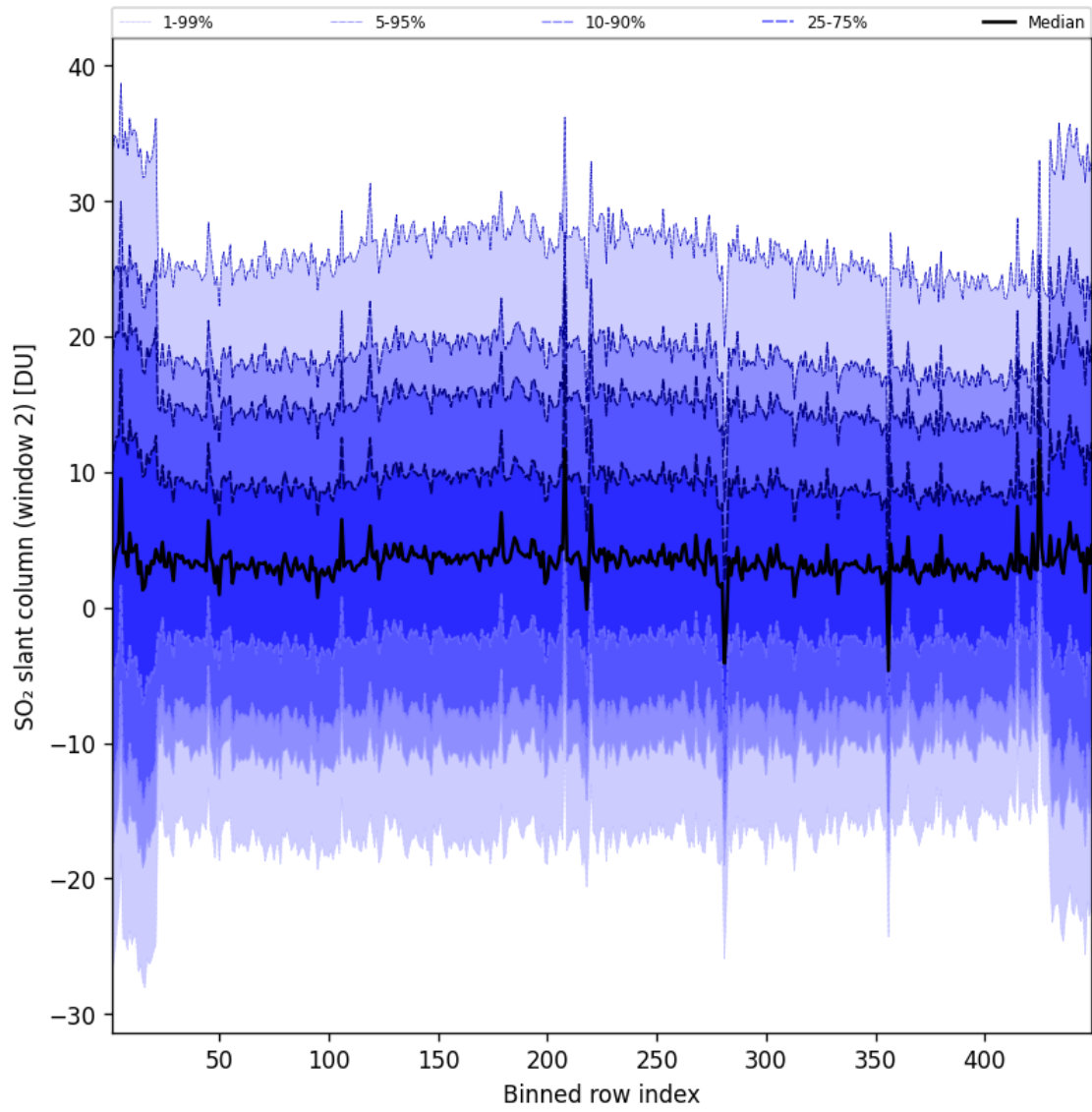


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-09-21 to 2025-09-22

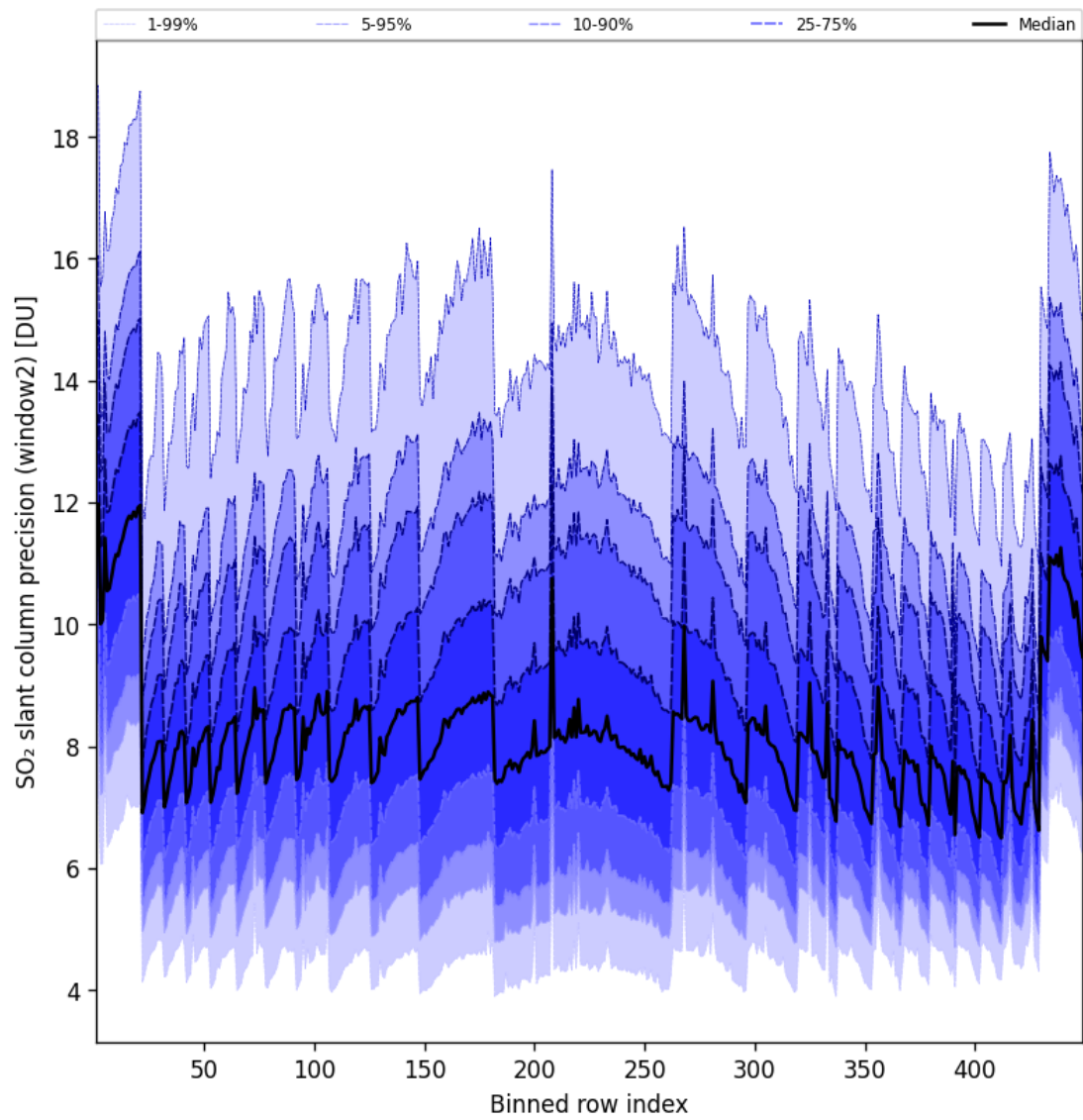


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-09-21 to 2025-09-22

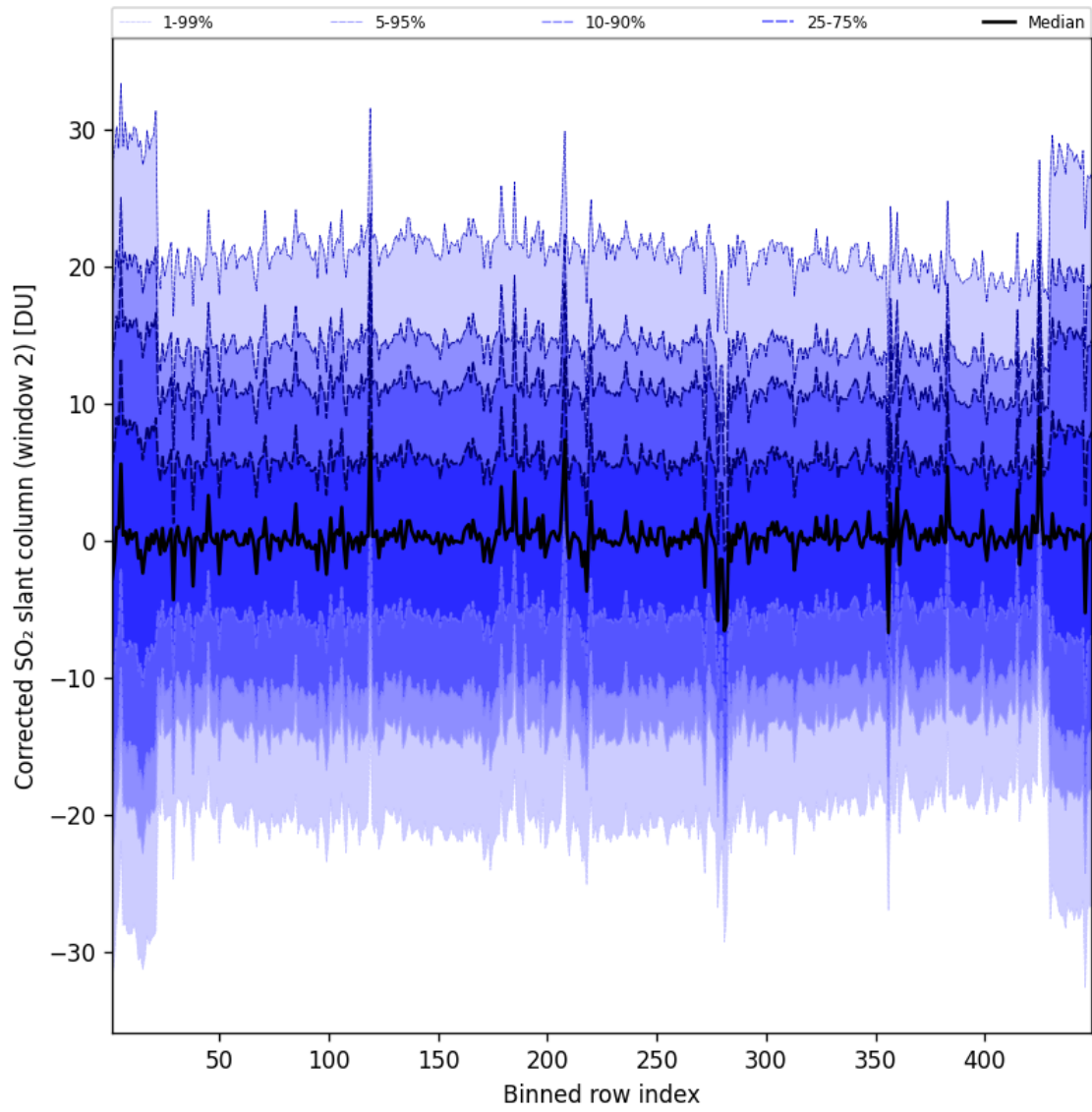


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-09-21 to 2025-09-22

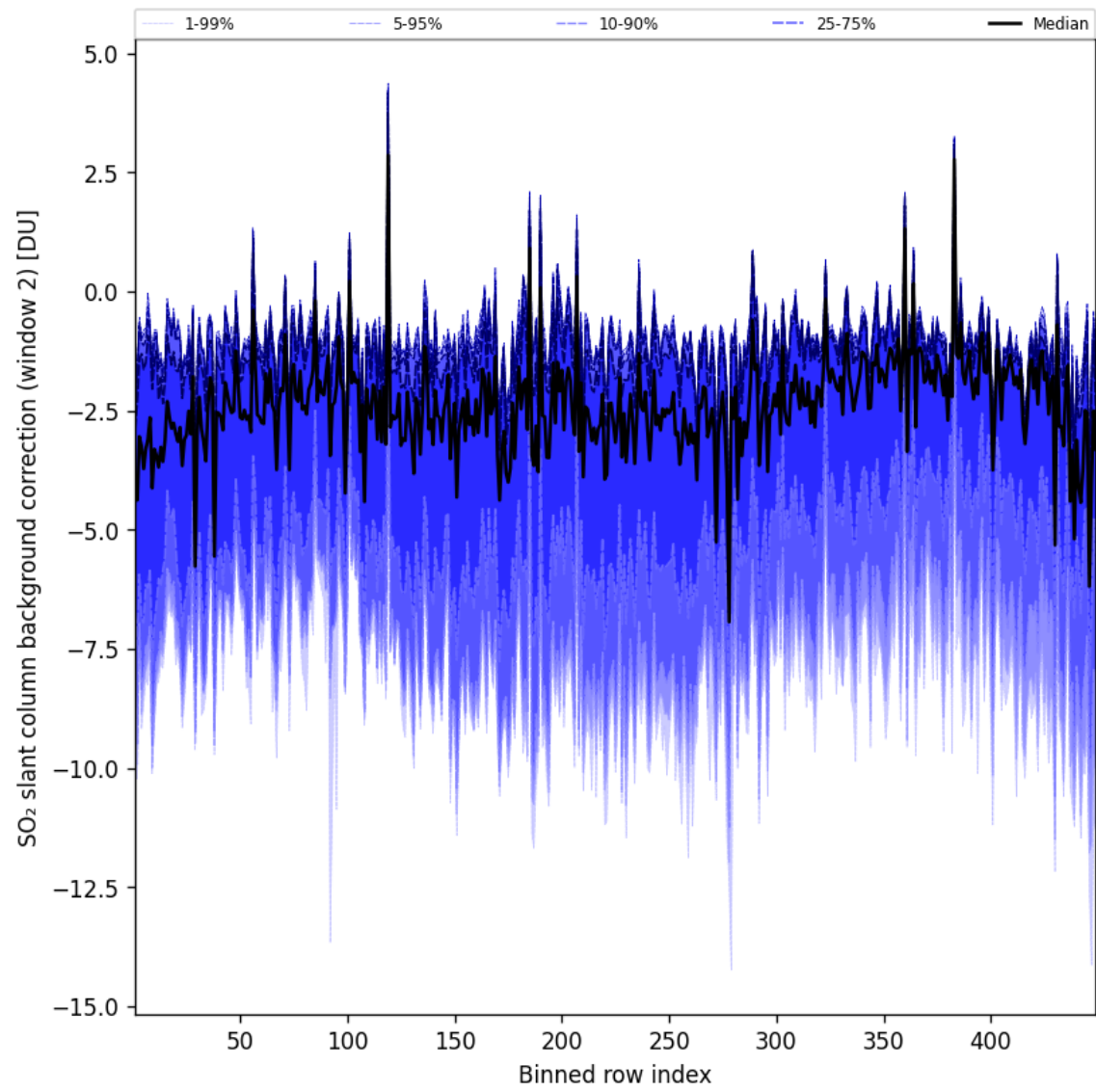


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-09-21 to 2025-09-22

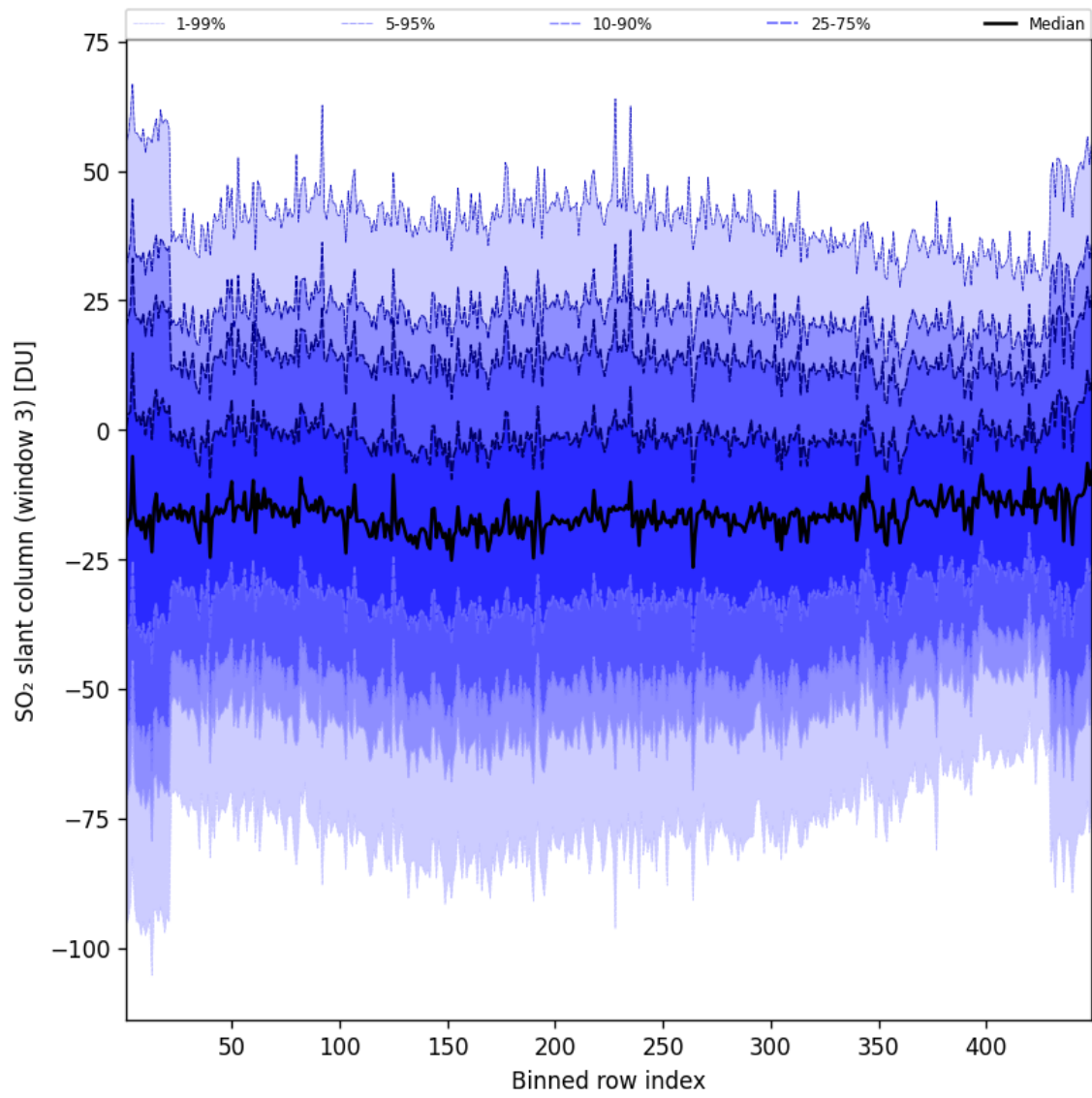


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-09-21 to 2025-09-22

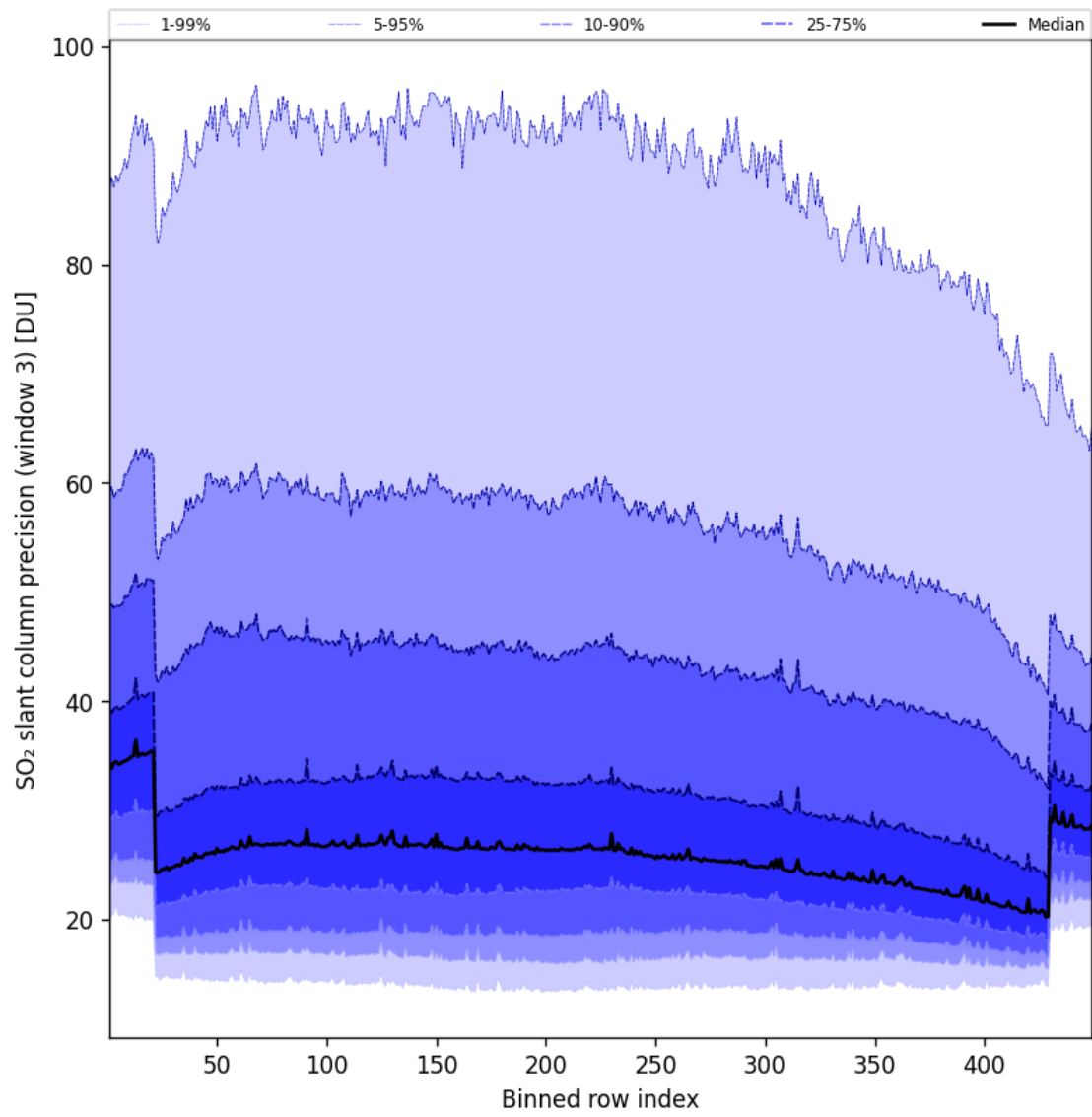


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-09-21 to 2025-09-22

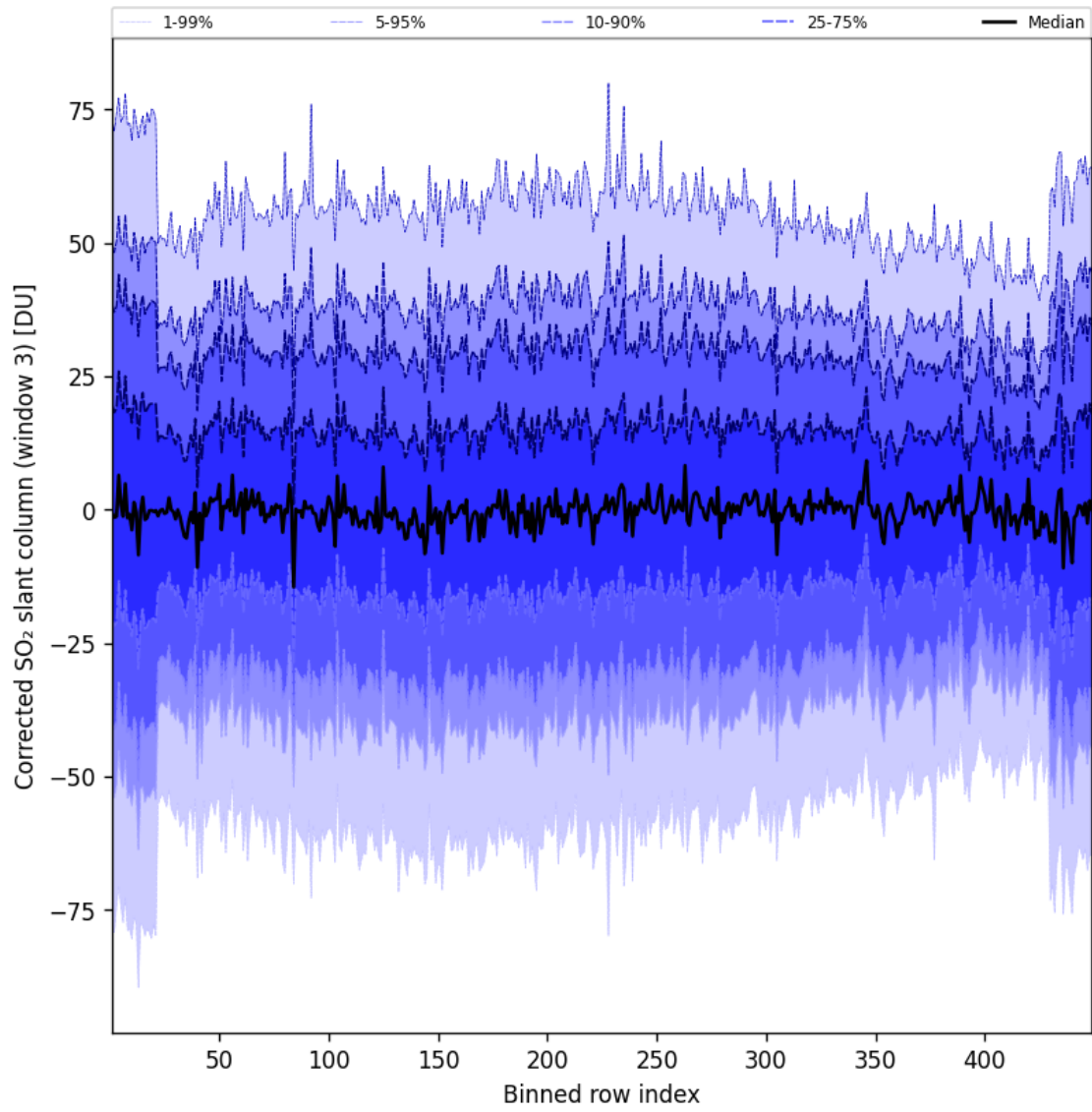


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-09-21 to 2025-09-22

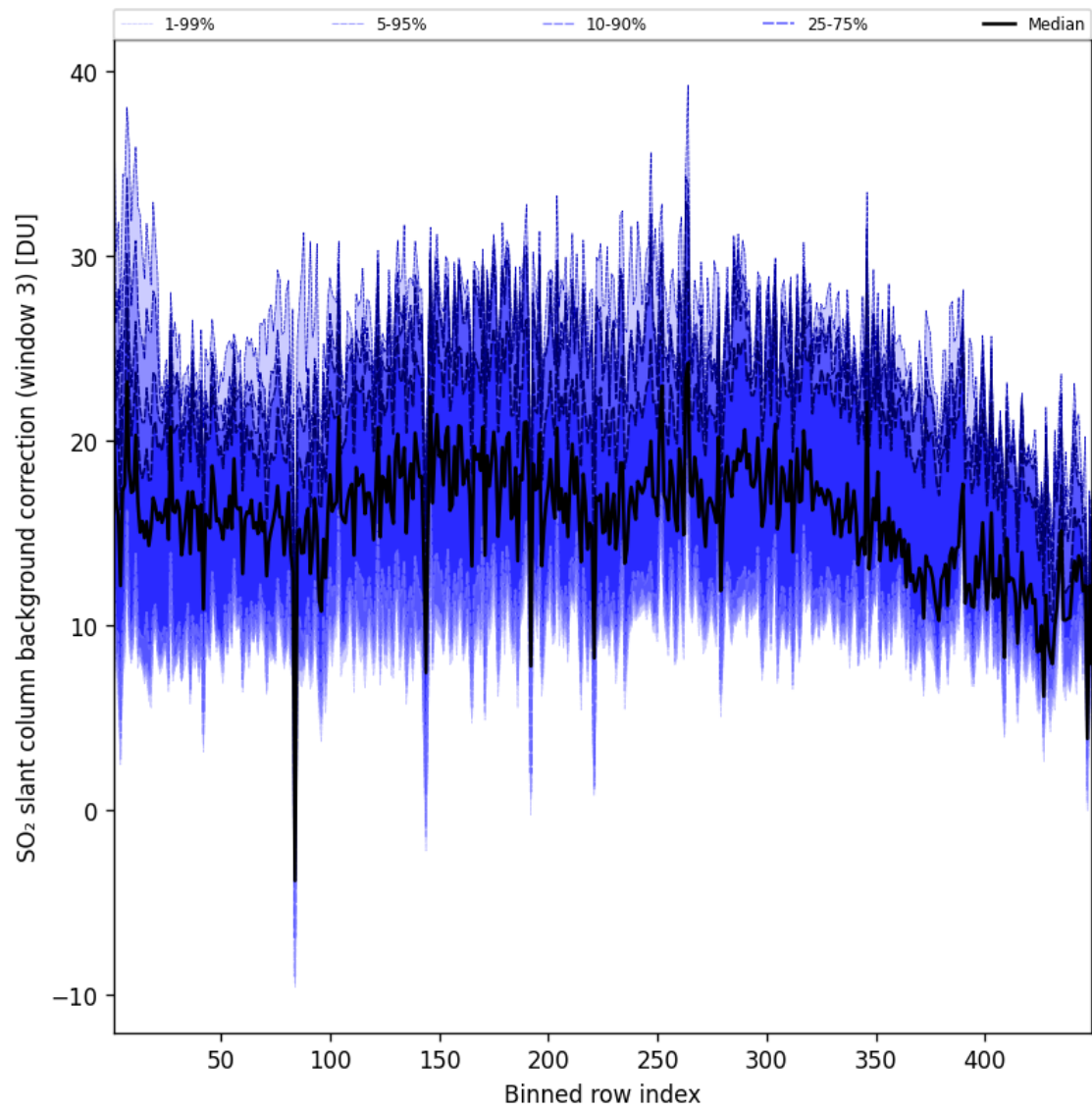


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-09-21 to 2025-09-22

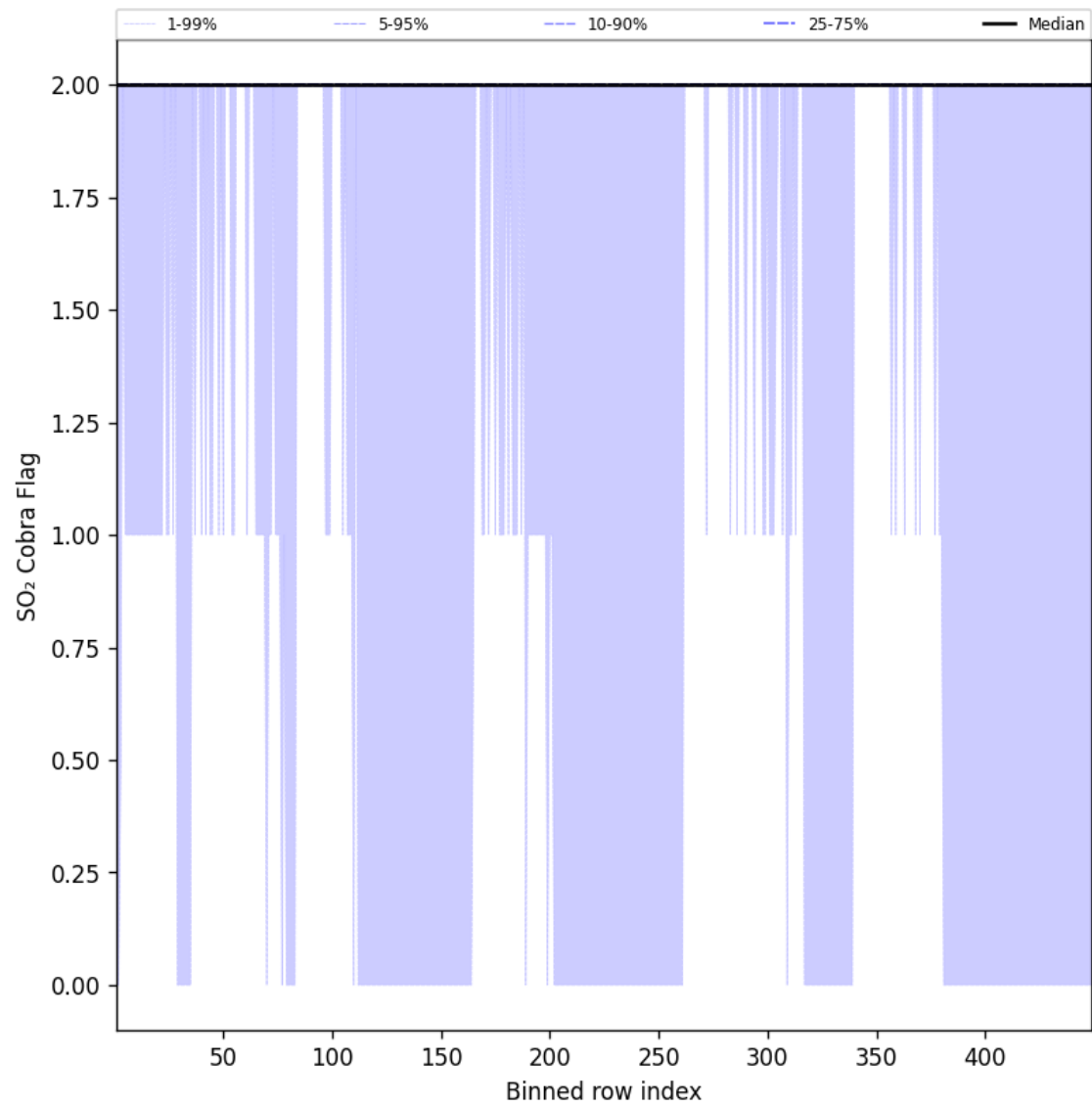


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-09-21 to 2025-09-22

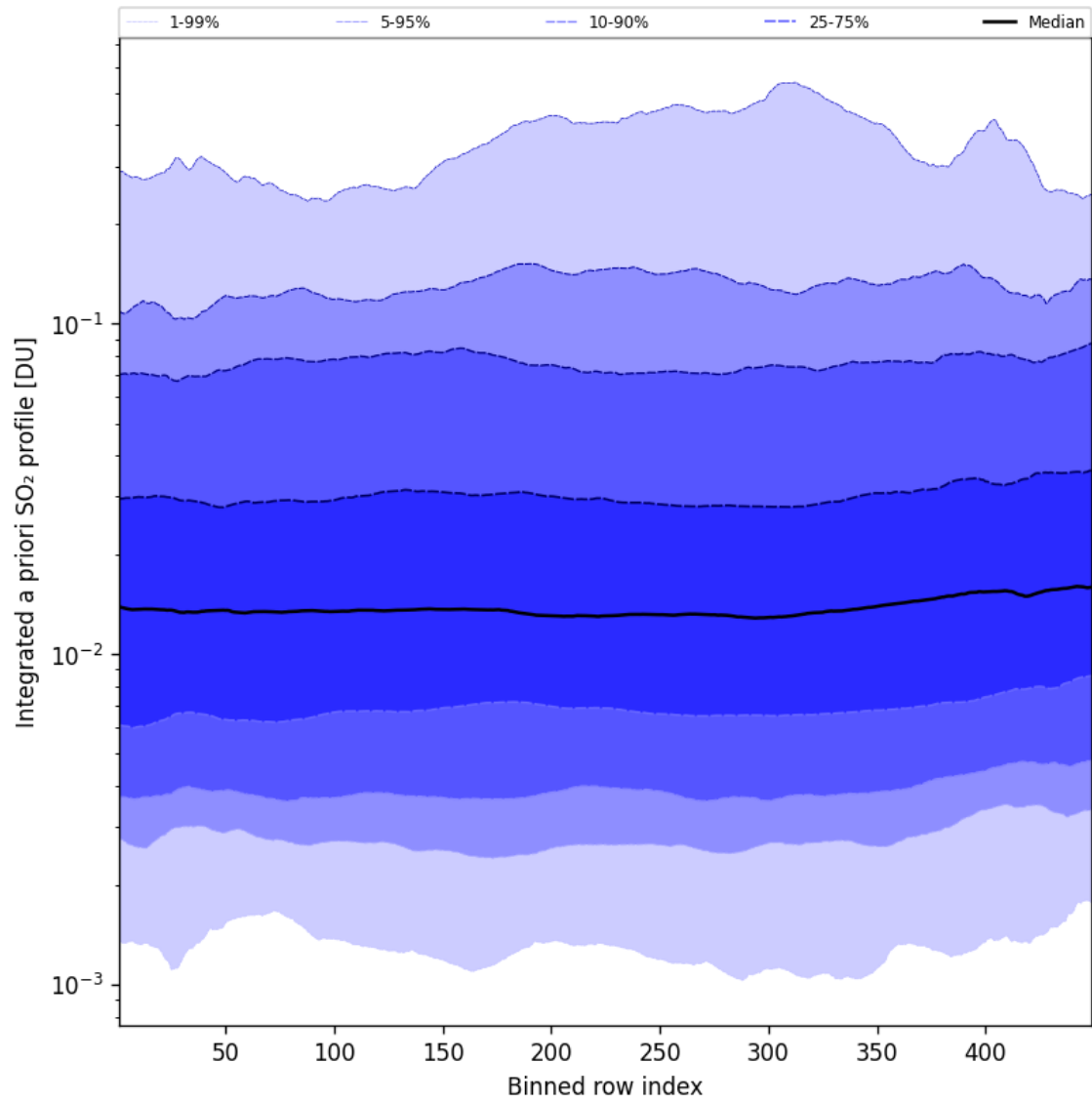


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-09-21 to 2025-09-22

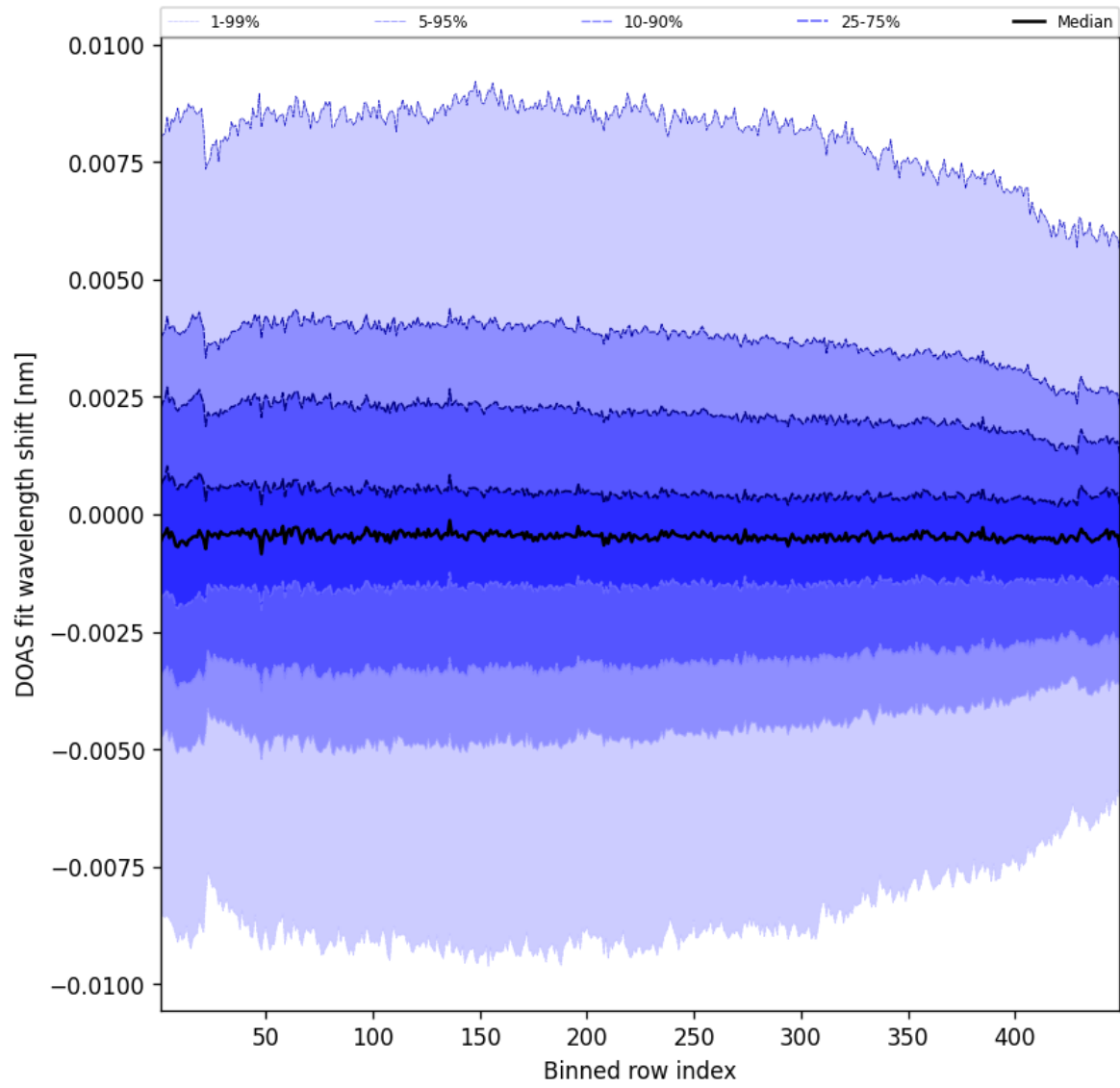


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-09-21 to 2025-09-22

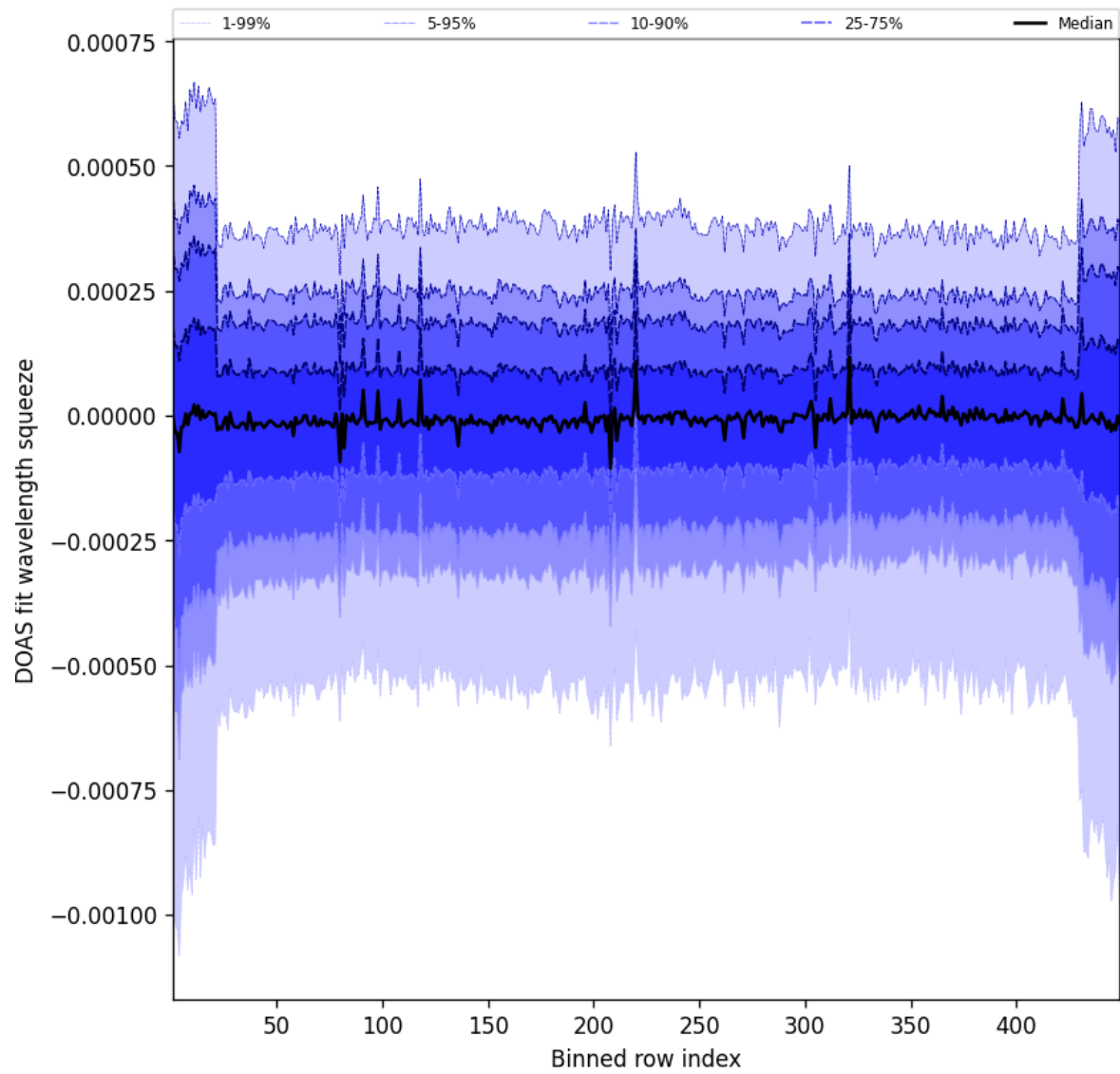


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-09-21 to 2025-09-22

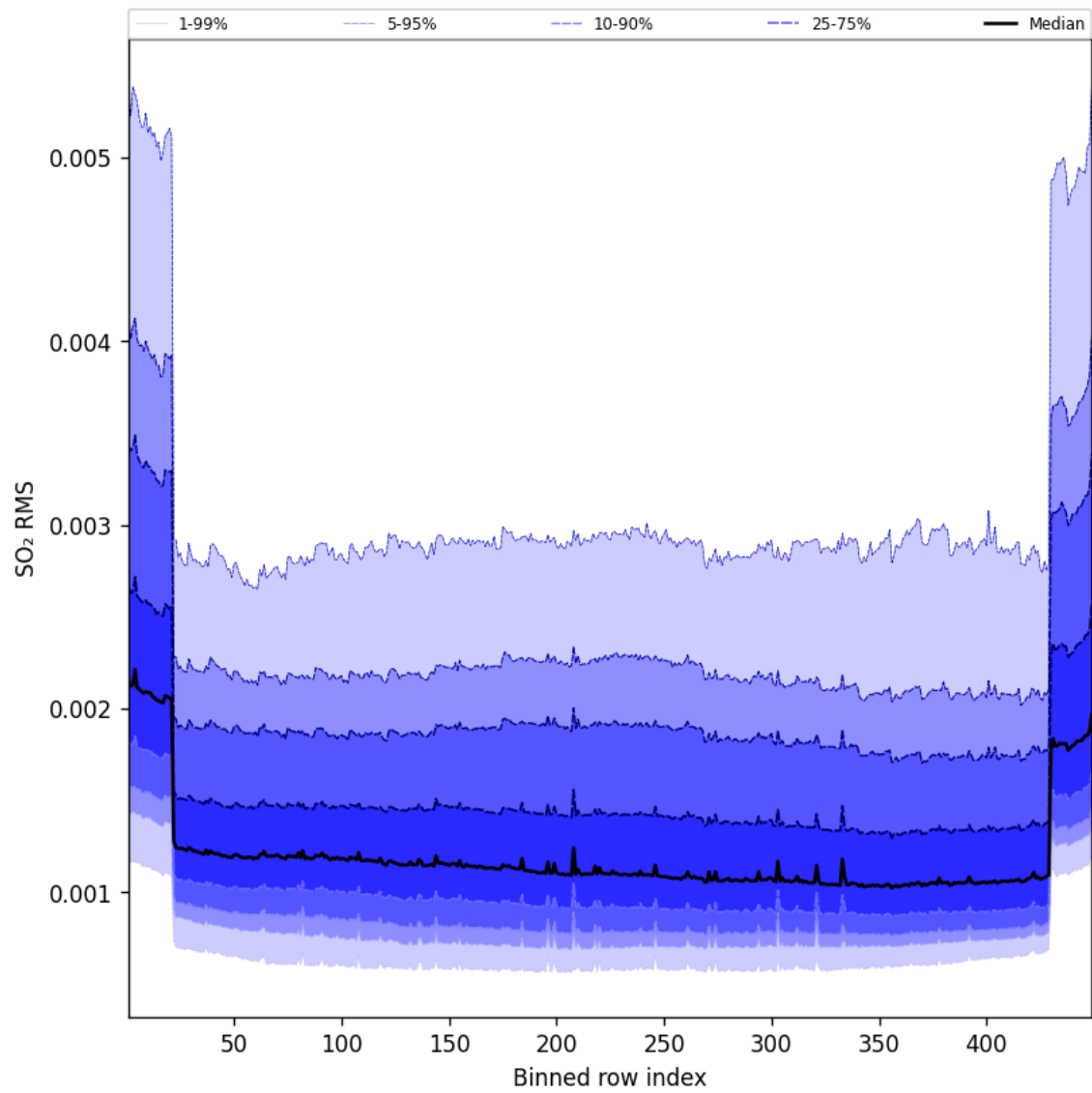


Figure 106: Along track statistics of “SO₂ RMS” for 2025-09-21 to 2025-09-22

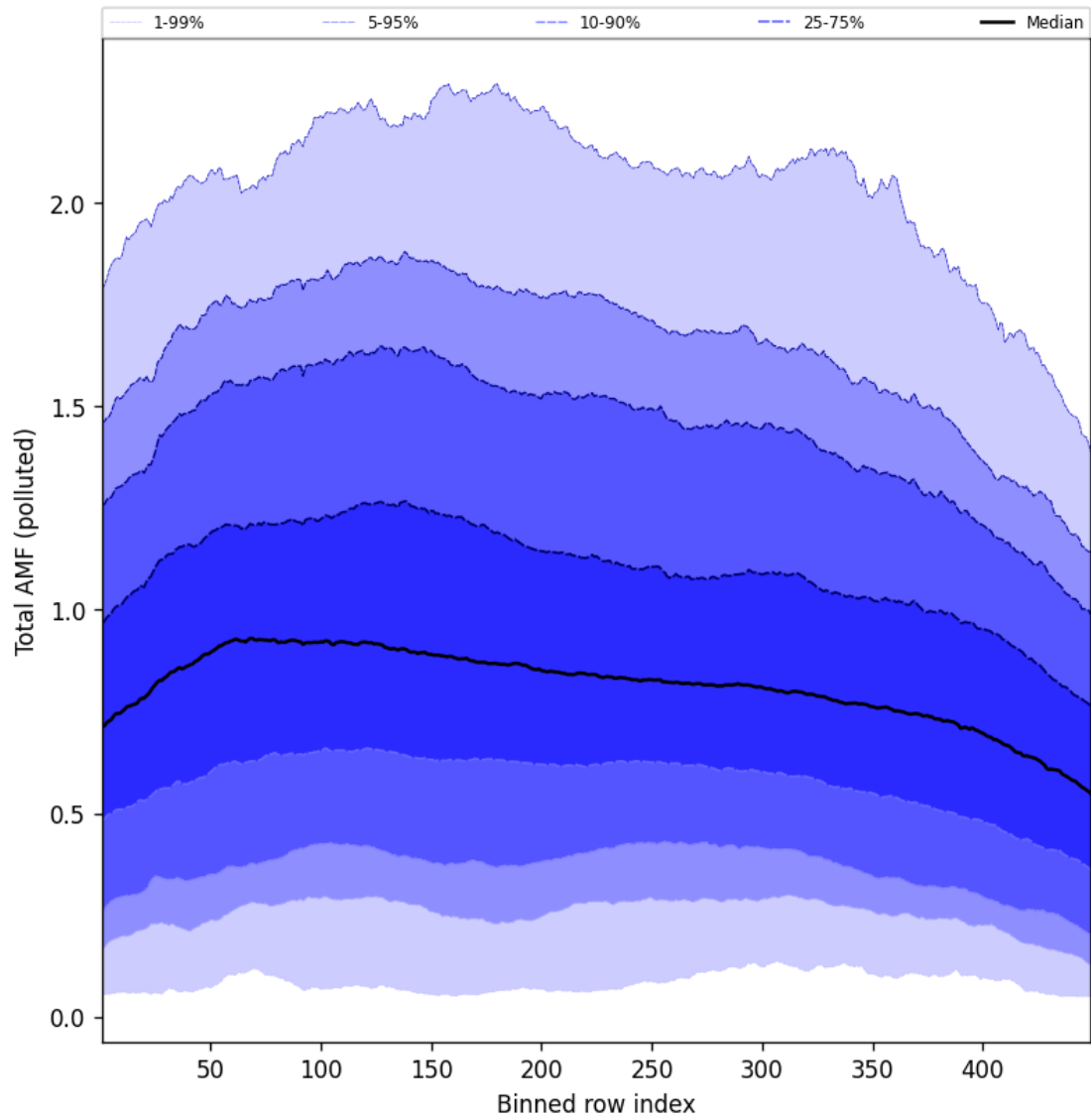


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-09-21 to 2025-09-22

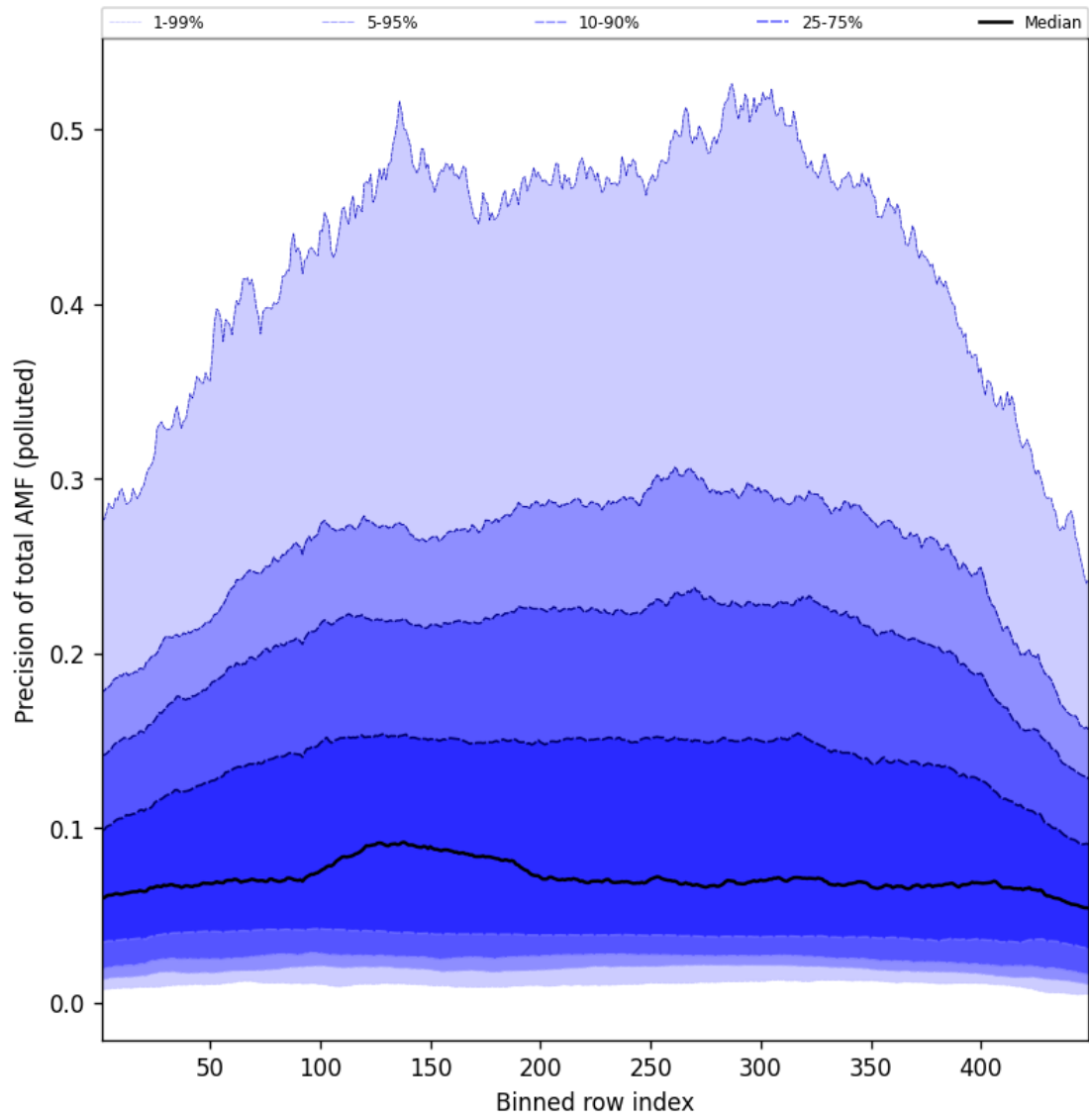


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-09-21 to 2025-09-22

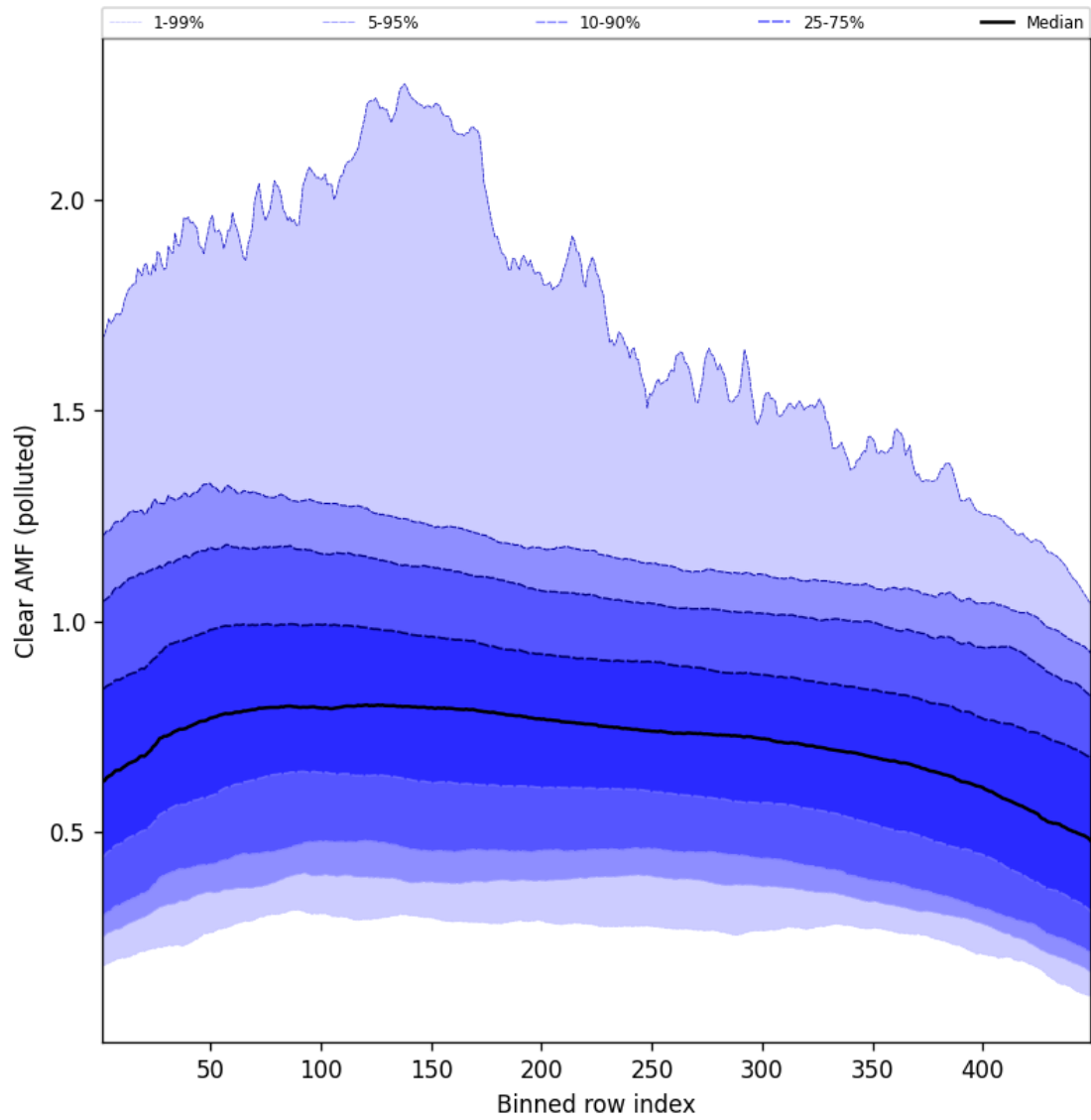


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-09-21 to 2025-09-22

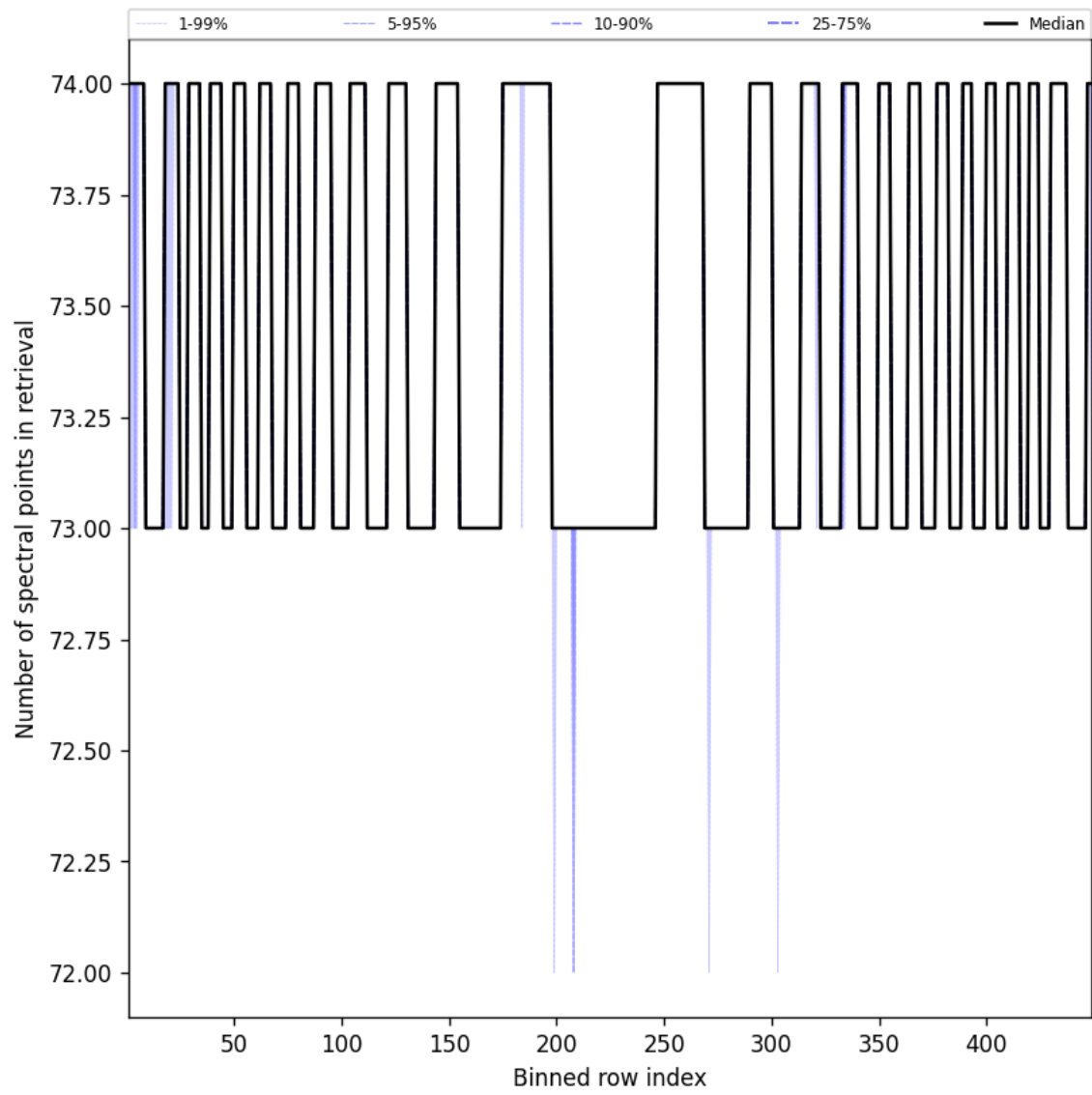


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-09-21 to 2025-09-22

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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