

PyCAMA report generated by tropl2-proc

tropl2-proc

2025-03-11 (04:46)

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 $\frac{1}{2}$ 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]	0.663 $\pm$ 0.405	17336297	0.995	0.770	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(4.981 \pm 162.216) \times 10^{-2}$	17336297	0.263	0.478	1.126×10^{-2}	-198	233
sulfurdioxide total vertical column precision [DU]	0.661 $\pm$ 1.151	17336297	0.197	0.435	0.340	3.885×10^{-2}	61.2
sulfurdioxide slant column density corrected [DU]	$(2.084 \pm 38.970) \times 10^{-2}$	17336297	0.258	0.360	9.413×10^{-3}	-35.4	77.4
sulfurdioxide slant column density cobra [DU]	$(2.066 \pm 38.033) \times 10^{-2}$	17336297	0.258	0.360	9.413×10^{-3}	-35.4	24.0
sulfurdioxide slant column density cobra precision [DU]	0.295 $\pm$ 0.149	17336297	0.213	0.150	0.247	8.440×10^{-2}	30.0
sulfurdioxide slant column density window1 [DU]	0.171 $\pm$ 0.717	17336297	0.225	0.737	0.190	-110	71.3
sulfurdioxide slant column density window1 precision [DU]	0.295 $\pm$ 0.149	17336297	0.213	0.150	0.247	8.440×10^{-2}	30.0
sulfurdioxide slant column density corrected win1 [DU]	$(2.679 \pm 70.311) \times 10^{-2}$	17336297	-2.500×10^{-2}	0.719	7.130×10^{-3}	-110	71.5
background so2 slant column offset window1 [DU]	-0.145 ± 0.196	17336297	-0.260	0.203	-0.190	-1.34	3.97
sulfurdioxide slant column density window2 [DU]	0.685 $\pm$ 9.033	17336297	0.250	11.4	0.490	-1.412×10^3	944
sulfurdioxide slant column density window2 precision [DU]	8.15 $\pm$ 2.22	17336297	7.43	2.60	7.82	2.32	516
sulfurdioxide slant column density corrected win2 [DU]	-0.608 ± 8.784	17336297	-0.250	11.1	-0.549	-1.411×10^3	944
background so2 slant column offset window2 [DU]	-1.29 ± 2.68	17336297	0.750	3.45	-0.445	-27.0	7.40
sulfurdioxide slant column density window3 [DU]	-5.51 ± 24.49	17336297	-6.16	31.1	-5.55	-2.180×10^3	671
sulfurdioxide slant column density window3 precision [DU]	28.5 $\pm$ 13.1	17336297	22.5	9.60	25.0	10.1	1.774×10^3
sulfurdioxide slant column density corrected win3 [DU]	0.933 $\pm$ 23.494	17336297	0.560	29.7	0.934	-2.178×10^3	671
background so2 slant column offset window3 [DU]	6.44 $\pm$ 7.40	17336297	1.68	11.9	5.94	-25.8	39.5
sulfurdioxide slant column cobra flag [1]	1.98 $\pm$ 0.22	17336297	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.629 \pm 9.860) \times 10^{-2}$	17336297	1.423×10^{-2}	1.738×10^{-2}	1.527×10^{-2}	2.149×10^{-4}	2.50
fitted radiance shift [nm]	$(-3.710 \pm 25.931) \times 10^{-4}$	17336297	-5.000×10^{-4}	1.804×10^{-3}	-3.535×10^{-4}	-5.474×10^{-2}	4.450×10^{-2}
fitted radiance squeeze [1]	$(-2.425 \pm 20.965) \times 10^{-5}$	17336297	1.000×10^{-5}	2.084×10^{-4}	-8.442×10^{-6}	-1.718×10^{-2}	1.287×10^{-2}
fitted root mean square [1]	$(1.300 \pm 0.622) \times 10^{-3}$	17336297	9.250×10^{-4}	6.059×10^{-4}	1.104×10^{-3}	3.287×10^{-4}	5.608×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.804 $\pm$ 0.439	17336297	0.660	0.561	0.750	5.000×10^{-2}	2.92
sulfurdioxide total air mass factor polluted precision [1]	0.112 $\pm$ 0.128	17336297	3.500×10^{-2}	0.116	6.371×10^{-2}	2.500×10^{-3}	1.86
sulfurdioxide clear air mass factor polluted [1]	0.694 $\pm$ 0.328	17336297	0.660	0.410	0.658	3.595×10^{-2}	2.91
number of spectral points in retrieval [1]	73.4 $\pm$ 0.5	17336297	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	0.230	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-3.34	-1.10	-0.613	-0.392	-0.223	0.255	0.441	0.693	1.26	3.99
sulfurdioxide total vertical column precision [DU]	9.525×10^{-2}	0.130	0.158	0.183	0.216	0.650	0.960	1.35	2.08	5.40
sulfurdioxide slant column density corrected [DU]	-0.885	-0.496	-0.355	-0.263	-0.169	0.191	0.292	0.393	0.558	1.10
sulfurdioxide slant column density cobra [DU]	-0.885	-0.496	-0.355	-0.263	-0.169	0.191	0.292	0.393	0.558	1.10
sulfurdioxide slant column density cobra precision [DU]	0.136	0.162	0.175	0.185	0.200	0.350	0.406	0.465	0.569	0.841
sulfurdioxide slant column density window1 [DU]	-1.87	-0.926	-0.597	-0.392	-0.186	0.551	0.741	0.924	1.21	2.01
sulfurdioxide slant column density window1 precision [DU]	0.136	0.162	0.175	0.185	0.200	0.350	0.406	0.465	0.569	0.841
sulfurdioxide slant column density corrected win1 [DU]	-1.76	-0.981	-0.709	-0.532	-0.347	0.372	0.573	0.775	1.10	2.06
background so2 slant column offset window1 [DU]	-0.447	-0.344	-0.312	-0.293	-0.270	-6.684×10^{-2}	1.069×10^{-2}	9.384×10^{-2}	0.213	0.491
sulfurdioxide slant column density window2 [DU]	-20.3	-13.6	-10.3	-7.90	-5.14	6.30	9.27	12.0	15.7	23.4
sulfurdioxide slant column density window2 precision [DU]	4.36	5.25	5.77	6.19	6.68	9.28	10.1	11.0	12.1	14.7
sulfurdioxide slant column density corrected win2 [DU]	-22.2	-14.9	-11.5	-8.95	-6.13	4.99	7.74	10.2	13.5	20.4
background so2 slant column offset window2 [DU]	-8.72	-6.63	-5.36	-4.23	-2.81	0.637	0.931	1.19	1.58	3.02
sulfurdioxide slant column density window3 [DU]	-65.9	-45.7	-35.9	-28.8	-21.0	10.1	18.0	25.2	34.7	53.5
sulfurdioxide slant column density window3 precision [DU]	14.3	16.9	18.6	19.8	21.3	30.9	35.4	41.3	53.3	84.9
sulfurdioxide slant column density corrected win3 [DU]	-57.4	-37.6	-28.1	-21.3	-13.9	15.9	23.4	30.2	39.3	57.6
background so2 slant column offset window3 [DU]	-7.12	-4.27	-2.75	-1.30	0.446	12.3	14.7	16.5	18.6	21.9
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]	1.314×10^{-3}	3.253×10^{-3}	4.940×10^{-3}	6.782×10^{-3}	9.139×10^{-3}	2.652×10^{-2}	3.598×10^{-2}	5.654×10^{-2}	0.123	0.468
fitted radiance shift [nm]	-8.191×10^{-3}	-4.222×10^{-3}	-2.840×10^{-3}	-2.031×10^{-3}	-1.312×10^{-3}	4.914×10^{-4}	1.184×10^{-3}	2.061×10^{-3}	3.587×10^{-3}	7.825×10^{-3}
fitted radiance squeeze [1]	-7.420×10^{-4}	-3.595×10^{-4}	-2.429×10^{-4}	-1.776×10^{-4}	-1.159×10^{-4}	9.251×10^{-5}	1.441×10^{-4}	1.925×10^{-4}	2.631×10^{-4}	4.345×10^{-4}
fitted root mean square [1]	5.875×10^{-4}	7.196×10^{-4}	7.895×10^{-4}	8.436×10^{-4}	9.111×10^{-4}	1.517×10^{-3}	1.768×10^{-3}	2.018×10^{-3}	2.474×10^{-3}	3.578×10^{-3}
sulfurdioxide total air mass factor polluted [1]	6.983×10^{-2}	0.187	0.274	0.365	0.484	1.04	1.23	1.41	1.65	2.06
sulfurdioxide total air mass factor polluted precision [1]	8.459×10^{-3}	1.434×10^{-2}	2.031×10^{-2}	2.619×10^{-2}	3.391×10^{-2}	0.150	0.201	0.253	0.344	0.607
sulfurdioxide clear air mass factor polluted [1]	0.157	0.250	0.315	0.379	0.467	0.877	0.978	1.06	1.21	1.86
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]	0.678 ± 0.399	8501073	0.760	1.000	0.0	1.000	0.240	1.000
sulfurdioxide total vertical column [DU]	$(8.185 \pm 221.472) \times 10^{-2}$	8501073	0.615	1.517×10^{-2}	-198	233	-0.282	0.332
sulfurdioxide total vertical column precision [DU]	0.930 ± 1.533	8501073	0.774	0.459	4.602×10^{-2}	61.2	0.247	1.02
sulfurdioxide slant column density corrected [DU]	$(2.712 \pm 44.286) \times 10^{-2}$	8501073	0.388	1.123×10^{-2}	-35.4	77.4	-0.180	0.208
sulfurdioxide slant column density cobra [DU]	$(2.682 \pm 42.967) \times 10^{-2}$	8501073	0.388	1.123×10^{-2}	-35.4	21.1	-0.180	0.208
sulfurdioxide slant column density cobra precision [DU]	0.325 ± 0.175	8501073	0.182	0.274	8.712×10^{-2}	30.0	0.207	0.388
sulfurdioxide slant column density window1 [DU]	0.187 ± 0.807	8501073	0.792	0.211	-25.9	23.0	-0.192	0.601
sulfurdioxide slant column density window1 precision [DU]	0.325 ± 0.175	8501073	0.182	0.274	8.712×10^{-2}	30.0	0.207	0.388
sulfurdioxide slant column density corrected win1 [DU]	$(4.314 \pm 79.317) \times 10^{-2}$	8501073	0.778	1.744×10^{-2}	-25.9	22.7	-0.364	0.414
background so2 slant column offset window1 [DU]	-0.144 ± 0.223	8501073	0.213	-0.199	-0.774	3.97	-0.280	-6.761×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.26 ± 9.32	8501073	11.9	1.01	-287	824	-4.84	7.09
sulfurdioxide slant column density window2 precision [DU]	8.35 ± 2.19	8501073	2.70	8.02	2.32	175	6.84	9.54
sulfurdioxide slant column density corrected win2 [DU]	-0.837 ± 8.982	8501073	11.4	-0.745	-289	817	-6.51	4.93
background so2 slant column offset window2 [DU]	-2.09 ± 3.14	8501073	5.10	-1.28	-27.0	7.40	-4.55	0.550
sulfurdioxide slant column density window3 [DU]	-8.21 ± 24.55	8501073	31.3	-8.12	-995	671	-23.8	7.55
sulfurdioxide slant column density window3 precision [DU]	28.6 ± 12.8	8501073	9.27	25.2	10.6	825	21.7	31.0
sulfurdioxide slant column density corrected win3 [DU]	0.868 ± 23.640	8501073	29.9	1.01	-992	671	-14.0	15.9
background so2 slant column offset window3 [DU]	9.08 ± 7.11	8501073	12.4	9.21	-22.0	39.5	2.63	15.0
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	8501073	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.380 \pm 13.493) \times 10^{-2}$	8501073	2.892×10^{-2}	1.772×10^{-2}	2.149×10^{-4}	2.50	8.126×10^{-3}	3.704×10^{-2}
fitted radiance shift [nm]	$(-2.057 \pm 25.022) \times 10^{-4}$	8501073	1.615×10^{-3}	-2.068×10^{-4}	-3.771×10^{-2}	3.794×10^{-2}	-1.034×10^{-3}	5.805×10^{-4}
fitted radiance squeeze [1]	$(-2.676 \pm 24.997) \times 10^{-5}$	8501073	2.291×10^{-4}	5.375×10^{-7}	-6.093×10^{-3}	6.436×10^{-3}	-1.190×10^{-4}	1.100×10^{-4}
fitted root mean square [1]	$(1.425 \pm 0.739) \times 10^{-3}$	8501073	7.332×10^{-4}	1.190×10^{-3}	3.360×10^{-4}	2.995×10^{-2}	9.435×10^{-4}	1.677×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.689 ± 0.421	8501073	0.557	0.629	5.000×10^{-2}	2.92	0.364	0.921
sulfurdioxide total air mass factor polluted precision [1]	0.101 ± 0.147	8501073	9.306×10^{-2}	4.736×10^{-2}	2.500×10^{-3}	1.86	2.546×10^{-2}	0.119
sulfurdioxide clear air mass factor polluted [1]	0.591 ± 0.302	8501073	0.453	0.537	3.595×10^{-2}	2.91	0.353	0.806
number of spectral points in retrieval [1]	73.5 ± 0.5	8501073	1.000	73.0	53.0	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]	0.649 ± 0.410	8835224	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(1.898 \pm 66.475) \times 10^{-2}$	8835224	0.391	8.601×10^{-3}	-50.5	71.4	-0.185	0.206
sulfurdioxide total vertical column precision [DU]	0.402 ± 0.449	8835224	0.255	0.286	3.885×10^{-2}	27.5	0.196	0.451
sulfurdioxide slant column density corrected [DU]	$(1.479 \pm 33.047) \times 10^{-2}$	8835224	0.336	7.899×10^{-3}	-16.1	47.6	-0.159	0.177
sulfurdioxide slant column density cobra [DU]	$(1.473 \pm 32.577) \times 10^{-2}$	8835224	0.336	7.899×10^{-3}	-16.1	24.0	-0.159	0.177
sulfurdioxide slant column density cobra precision [DU]	0.267 ± 0.111	8835224	0.118	0.233	8.440×10^{-2}	20.4	0.195	0.313
sulfurdioxide slant column density window1 [DU]	0.157 ± 0.619	8835224	0.690	0.171	-110	71.3	-0.181	0.509
sulfurdioxide slant column density window1 precision [DU]	0.267 ± 0.111	8835224	0.118	0.233	8.440×10^{-2}	20.4	0.195	0.313
sulfurdioxide slant column density corrected win1 [DU]	$(1.106 \pm 60.349) \times 10^{-2}$	8835224	0.668	-1.462×10^{-3}	-110	71.5	-0.333	0.336
background so2 slant column offset window1 [DU]	-0.145 ± 0.166	8835224	0.195	-0.183	-1.34	3.88	-0.261	-6.616×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.136 ± 8.714	8835224	11.0	2.949×10^{-2}	-1.412×10^3	944	-5.41	5.58
sulfurdioxide slant column density window2 precision [DU]	7.96 ± 2.23	8835224	2.48	7.64	2.33	516	6.55	9.02
sulfurdioxide slant column density corrected win2 [DU]	-0.387 ± 8.583	8835224	10.8	-0.369	-1.411×10^3	944	-5.79	5.04
background so2 slant column offset window2 [DU]	-0.523 ± 1.841	8835224	2.21	-6.140×10^{-2}	-8.77	7.13	-1.52	0.693
sulfurdioxide slant column density window3 [DU]	-2.91 ± 24.16	8835224	30.5	-3.15	-2.180×10^3	510	-18.2	12.3
sulfurdioxide slant column density window3 precision [DU]	28.4 ± 13.4	8835224	9.93	24.7	10.1	1.774×10^3	20.9	30.9
sulfurdioxide slant column density corrected win3 [DU]	0.995 ± 23.352	8835224	29.5	0.861	-2.178×10^3	489	-13.7	15.8
background so2 slant column offset window3 [DU]	3.90 ± 6.76	8835224	11.3	2.99	-25.8	24.1	-1.70	9.63
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.20	8835224	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.944 \pm 3.130) \times 10^{-2}$	8835224	1.176×10^{-2}	1.419×10^{-2}	5.395×10^{-4}	2.05	9.692×10^{-3}	2.145×10^{-2}
fitted radiance shift [nm]	$(-5.301 \pm 26.680) \times 10^{-4}$	8835224	1.948×10^{-3}	-5.189×10^{-4}	-5.474×10^{-2}	4.450×10^{-2}	-1.566×10^{-3}	3.821×10^{-4}
fitted radiance squeeze [1]	$(-2.183 \pm 16.158) \times 10^{-5}$	8835224	1.908×10^{-4}	-1.579×10^{-5}	-1.718×10^{-2}	1.287×10^{-2}	-1.136×10^{-4}	7.723×10^{-5}
fitted root mean square [1]	$(1.179 \pm 0.452) \times 10^{-3}$	8835224	4.720×10^{-4}	1.049×10^{-3}	3.287×10^{-4}	5.608×10^{-2}	8.866×10^{-4}	1.359×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.915 ± 0.427	8835224	0.539	0.855	5.000×10^{-2}	2.68	0.614	1.15
sulfurdioxide total air mass factor polluted precision [1]	0.123 ± 0.106	8835224	0.131	8.677×10^{-2}	5.598×10^{-3}	1.54	4.296×10^{-2}	0.174
sulfurdioxide clear air mass factor polluted [1]	0.792 ± 0.321	8835224	0.353	0.723	0.133	2.70	0.585	0.938
number of spectral points in retrieval [1]	73.4 ± 0.5	8835224	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]	0.697 ± 0.396	12330245	0.720	1.000	0.0	1.000	0.280	1.000
sulfurdioxide total vertical column [DU]	$(3.043 \pm 114.956) \times 10^{-2}$	12330245	0.430	9.155×10^{-3}	-107	203	-0.203	0.226
sulfurdioxide total vertical column precision [DU]	0.526 ± 0.835	12330245	0.323	0.303	5.123×10^{-2}	52.3	0.207	0.530
sulfurdioxide slant column density corrected [DU]	$(1.486 \pm 33.048) \times 10^{-2}$	12330245	0.345	7.938×10^{-3}	-35.4	59.0	-0.163	0.182
sulfurdioxide slant column density cobra [DU]	$(1.483 \pm 32.860) \times 10^{-2}$	12330245	0.345	7.938×10^{-3}	-35.4	24.0	-0.163	0.182
sulfurdioxide slant column density cobra precision [DU]	0.279 ± 0.124	12330245	0.133	0.237	8.440×10^{-2}	30.0	0.196	0.330
sulfurdioxide slant column density window1 [DU]	0.168 ± 0.654	12330245	0.708	0.183	-110	71.3	-0.177	0.531
sulfurdioxide slant column density window1 precision [DU]	0.279 ± 0.124	12330245	0.133	0.237	8.440×10^{-2}	30.0	0.196	0.330
sulfurdioxide slant column density corrected win1 [DU]	$(1.500 \pm 64.069) \times 10^{-2}$	12330245	0.691	5.024×10^{-4}	-110	71.5	-0.341	0.350
background so2 slant column offset window1 [DU]	-0.153 ± 0.174	12330245	0.193	-0.190	-1.34	3.97	-0.268	-7.510×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.346 ± 8.750	12330245	11.1	0.203	-1.412×10^3	431	-5.31	5.84
sulfurdioxide slant column density window2 precision [DU]	8.00 ± 2.10	12330245	2.47	7.67	2.32	516	6.59	9.06
sulfurdioxide slant column density corrected win2 [DU]	-0.551 ± 8.582	12330245	10.9	-0.502	-1.411×10^3	432	-5.99	4.95
background so2 slant column offset window2 [DU]	-0.898 ± 2.296	12330245	2.77	-0.256	-26.4	7.40	-2.09	0.676
sulfurdioxide slant column density window3 [DU]	-2.60 ± 24.25	12330245	30.9	-2.75	-995	671	-18.0	12.9
sulfurdioxide slant column density window3 precision [DU]	27.9 ± 12.5	12330245	9.37	24.4	10.2	1.774×10^3	21.0	30.4
sulfurdioxide slant column density corrected win3 [DU]	2.99 ± 23.10	12330245	29.4	2.80	-992	671	-11.7	17.7
background so2 slant column offset window3 [DU]	5.58 ± 6.90	12330245	10.8	4.96	-25.8	39.0	0.161	11.0
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.16	12330245	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.264 \pm 4.434) \times 10^{-2}$	12330245	1.359×10^{-2}	1.486×10^{-2}	3.333×10^{-4}	1.75	9.719×10^{-3}	2.331×10^{-2}
fitted radiance shift [nm]	$(-3.879 \pm 24.587) \times 10^{-4}$	12330245	1.795×10^{-3}	-3.570×10^{-4}	-5.020×10^{-2}	3.824×10^{-2}	-1.323×10^{-3}	4.714×10^{-4}
fitted radiance squeeze [1]	$(-1.914 \pm 18.839) \times 10^{-5}$	12330245	1.983×10^{-4}	-8.410×10^{-6}	-1.718×10^{-2}	1.287×10^{-2}	-1.099×10^{-4}	8.833×10^{-5}
fitted root mean square [1]	$(1.230 \pm 0.538) \times 10^{-3}$	12330245	5.237×10^{-4}	1.062×10^{-3}	3.360×10^{-4}	4.961×10^{-2}	8.959×10^{-4}	1.420×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.842 ± 0.404	12330245	0.506	0.808	5.000×10^{-2}	2.54	0.561	1.07
sulfurdioxide total air mass factor polluted precision [1]	0.110 ± 0.103	12330245	0.111	6.900×10^{-2}	2.795×10^{-3}	1.37	3.898×10^{-2}	0.150
sulfurdioxide clear air mass factor polluted [1]	0.728 ± 0.287	12330245	0.370	0.697	4.694×10^{-2}	2.55	0.531	0.901
number of spectral points in retrieval [1]	73.5 ± 0.5	12330245	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]	0.613 $\pm$ 0.415	3771961	0.810	1.000	0.0	1.000	0.190	1.000
sulfurdioxide total vertical column [DU]	$(8.549 \pm 222.690) \times 10^{-2}$	3771961	0.617	1.598×10^{-2}	-198	233	-0.279	0.337
sulfurdioxide total vertical column precision [DU]	0.923 $\pm$ 1.550	3771961	0.752	0.456	3.885×10^{-2}	61.2	0.258	1.01
sulfurdioxide slant column density corrected [DU]	$(3.196 \pm 47.839) \times 10^{-2}$	3771961	0.384	1.226×10^{-2}	-16.1	52.4	-0.177	0.207
sulfurdioxide slant column density cobra [DU]	$(3.144 \pm 45.664) \times 10^{-2}$	3771961	0.384	1.226×10^{-2}	-16.1	23.1	-0.177	0.207
sulfurdioxide slant column density cobra precision [DU]	0.320 $\pm$ 0.177	3771961	0.169	0.268	8.586×10^{-2}	20.4	0.209	0.378
sulfurdioxide slant column density window1 [DU]	0.191 $\pm$ 0.807	3771961	0.779	0.214	-32.6	30.5	-0.184	0.595
sulfurdioxide slant column density window1 precision [DU]	0.320 $\pm$ 0.177	3771961	0.169	0.268	8.586×10^{-2}	20.4	0.209	0.378
sulfurdioxide slant column density corrected win1 [DU]	$(4.711 \pm 79.056) \times 10^{-2}$	3771961	0.757	2.009×10^{-2}	-32.6	30.6	-0.352	0.406
background so2 slant column offset window1 [DU]	-0.144 $\pm$ 0.225	3771961	0.206	-0.207	-1.07	3.97	-0.281	-7.509×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.06 $\pm$ 9.50	3771961	12.0	0.835	-1.175×10^3	944	-5.04	6.93
sulfurdioxide slant column density window2 precision [DU]	8.48 $\pm$ 2.48	3771961	2.77	8.18	2.33	478	6.92	9.69
sulfurdioxide slant column density corrected win2 [DU]	-0.713 $\pm$ 9.176	3771961	11.5	-0.645	-1.176×10^3	944	-6.42	5.06
background so2 slant column offset window2 [DU]	-1.77 $\pm$ 3.04	3771961	4.70	-0.715	-26.8	7.40	-4.09	0.614
sulfurdioxide slant column density window3 [DU]	-12.4 $\pm$ 23.7	3771961	29.8	-11.9	-2.180×10^3	476	-27.1	2.77
sulfurdioxide slant column density window3 precision [DU]	30.2 $\pm$ 15.0	3771961	9.94	26.3	10.1	825	22.3	32.3
sulfurdioxide slant column density corrected win3 [DU]	-4.87 $\pm$ 23.86	3771961	29.9	-4.39	-2.178×10^3	477	-19.6	10.3
background so2 slant column offset window3 [DU]	7.52 $\pm$ 7.96	3771961	13.6	7.51	-25.8	39.1	0.719	14.3
sulfurdioxide slant column cobra flag [1]	1.96 $\pm$ 0.29	3771961	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.821 \pm 16.033) \times 10^{-2}$	3771961	4.227×10^{-2}	1.883×10^{-2}	2.149×10^{-4}	2.50	7.650×10^{-3}	4.992×10^{-2}
fitted radiance shift [nm]	$(-3.179 \pm 30.198) \times 10^{-4}$	3771961	1.809×10^{-3}	-3.445×10^{-4}	-5.474×10^{-2}	4.223×10^{-2}	-1.272×10^{-3}	5.371×10^{-4}
fitted radiance squeeze [1]	$(-3.171 \pm 23.763) \times 10^{-5}$	3771961	2.256×10^{-4}	-7.431×10^{-6}	-1.427×10^{-2}	1.167×10^{-2}	-1.254×10^{-4}	1.002×10^{-4}
fitted root mean square [1]	$(1.399 \pm 0.718) \times 10^{-3}$	3771961	6.715×10^{-4}	1.188×10^{-3}	3.287×10^{-4}	5.608×10^{-2}	9.506×10^{-4}	1.622×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.719 $\pm$ 0.506	3771961	0.585	0.589	5.000×10^{-2}	2.92	0.355	0.939
sulfurdioxide total air mass factor polluted precision [1]	0.124 $\pm$ 0.184	3771961	0.133	4.523×10^{-2}	2.500×10^{-3}	1.86	2.324×10^{-2}	0.157
sulfurdioxide clear air mass factor polluted [1]	0.619 $\pm$ 0.403	3771961	0.424	0.536	3.805×10^{-2}	2.91	0.347	0.771
number of spectral points in retrieval [1]	73.4 $\pm$ 0.5	3771961	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

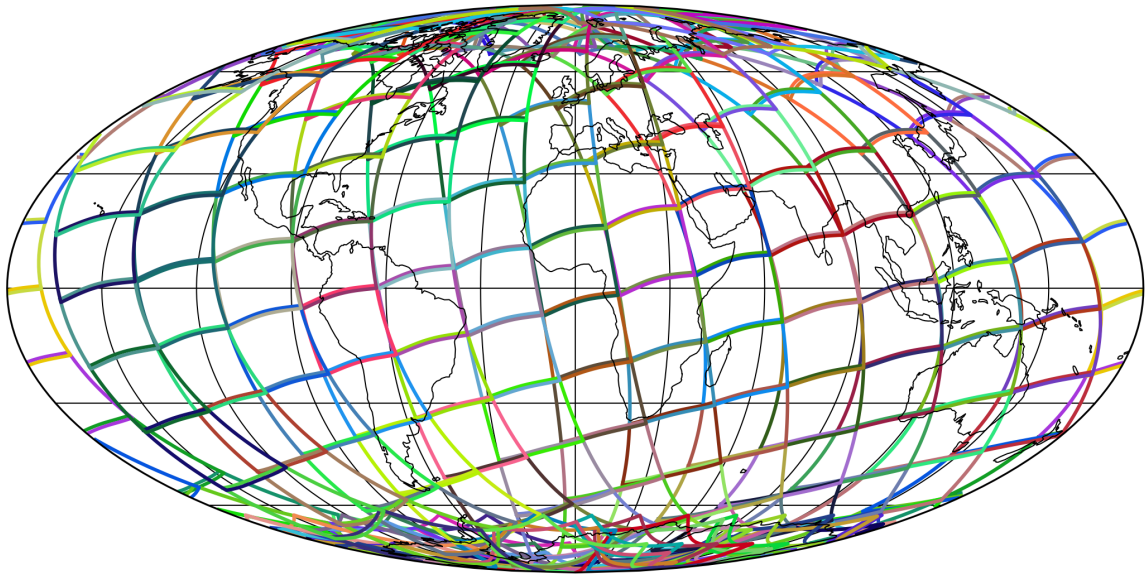


Figure 1: Outline of the granules.

4 Input data monitoring

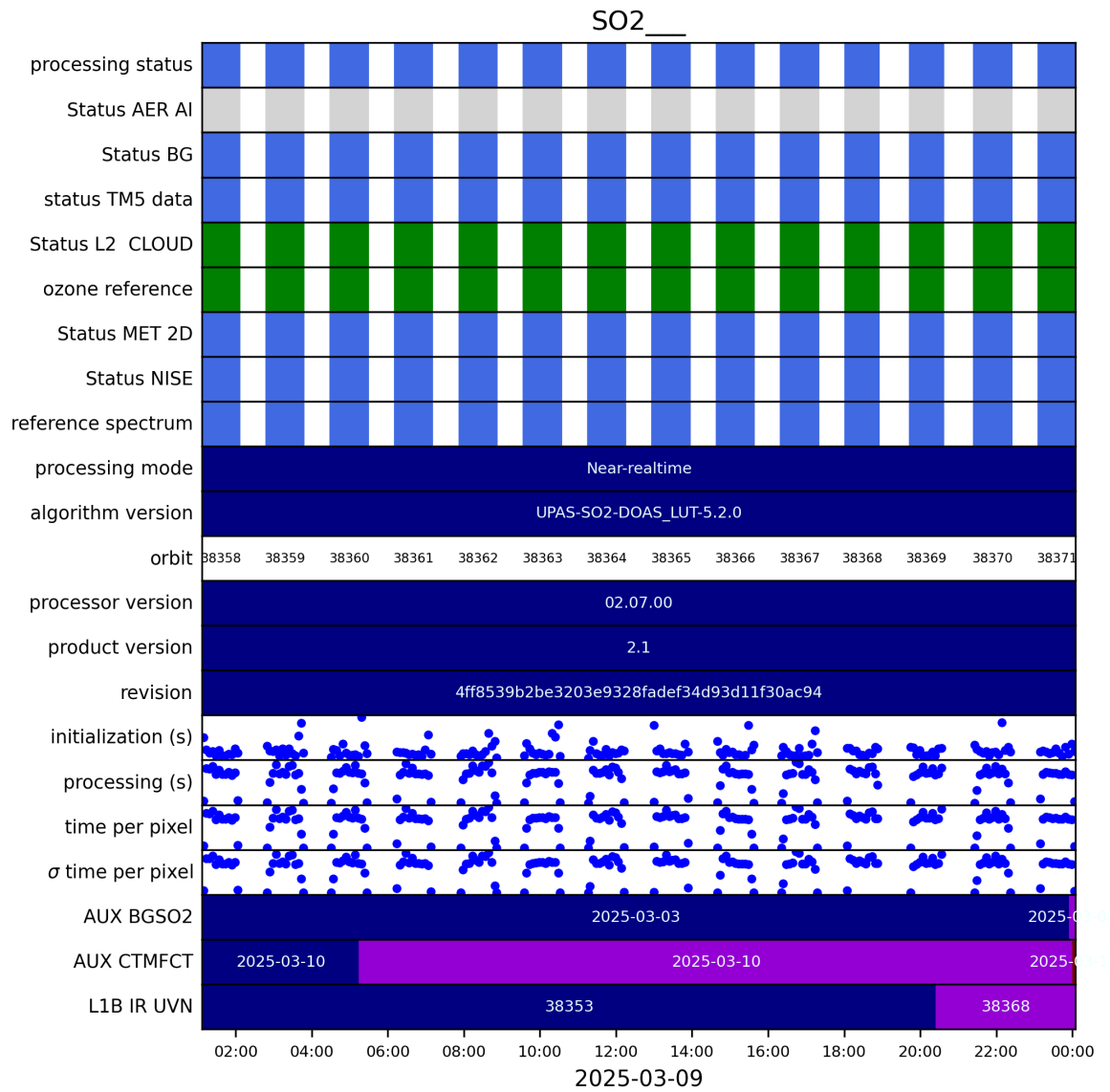


Figure 2: Input data per granule

5 Warnings and errors

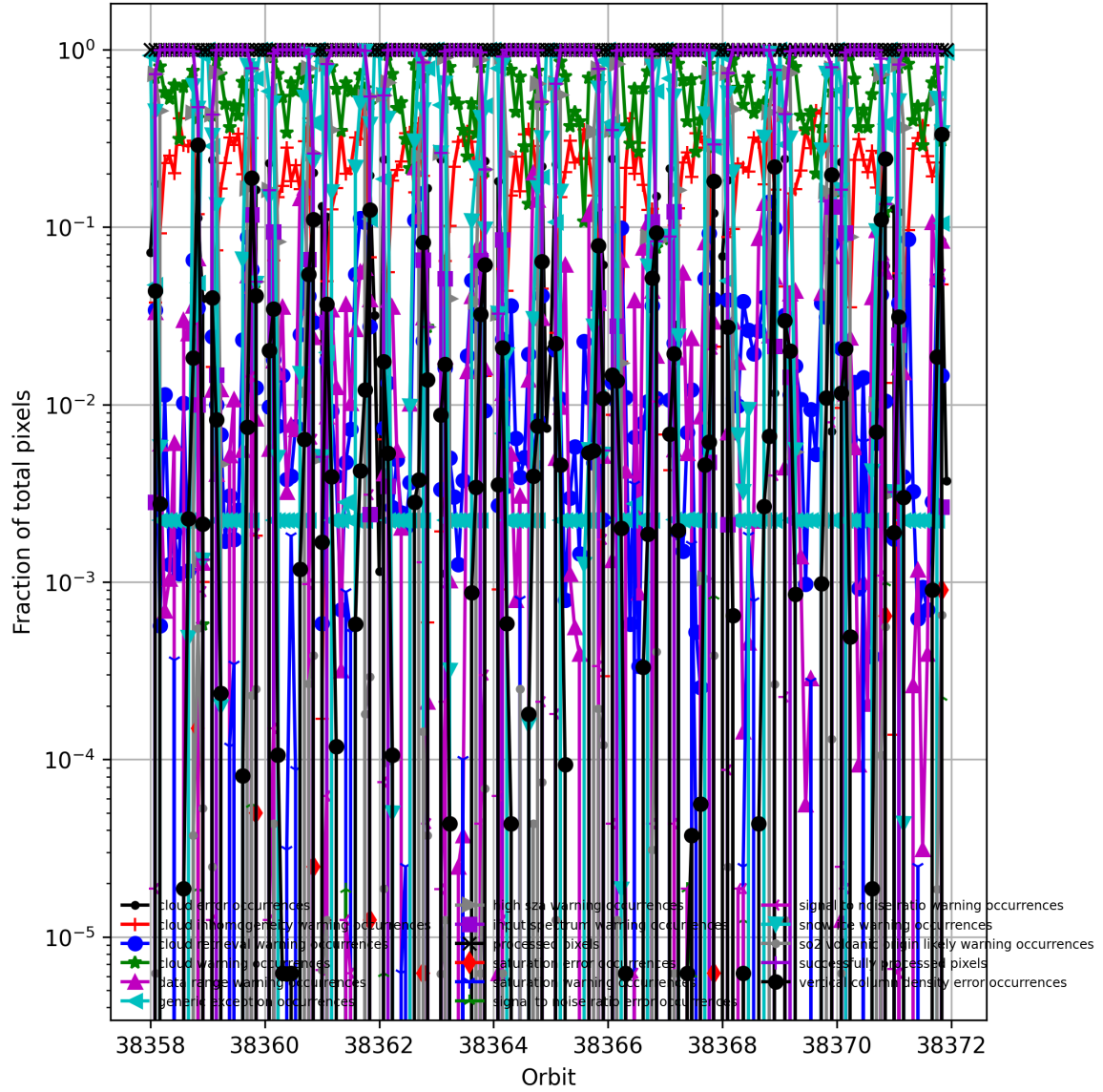


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

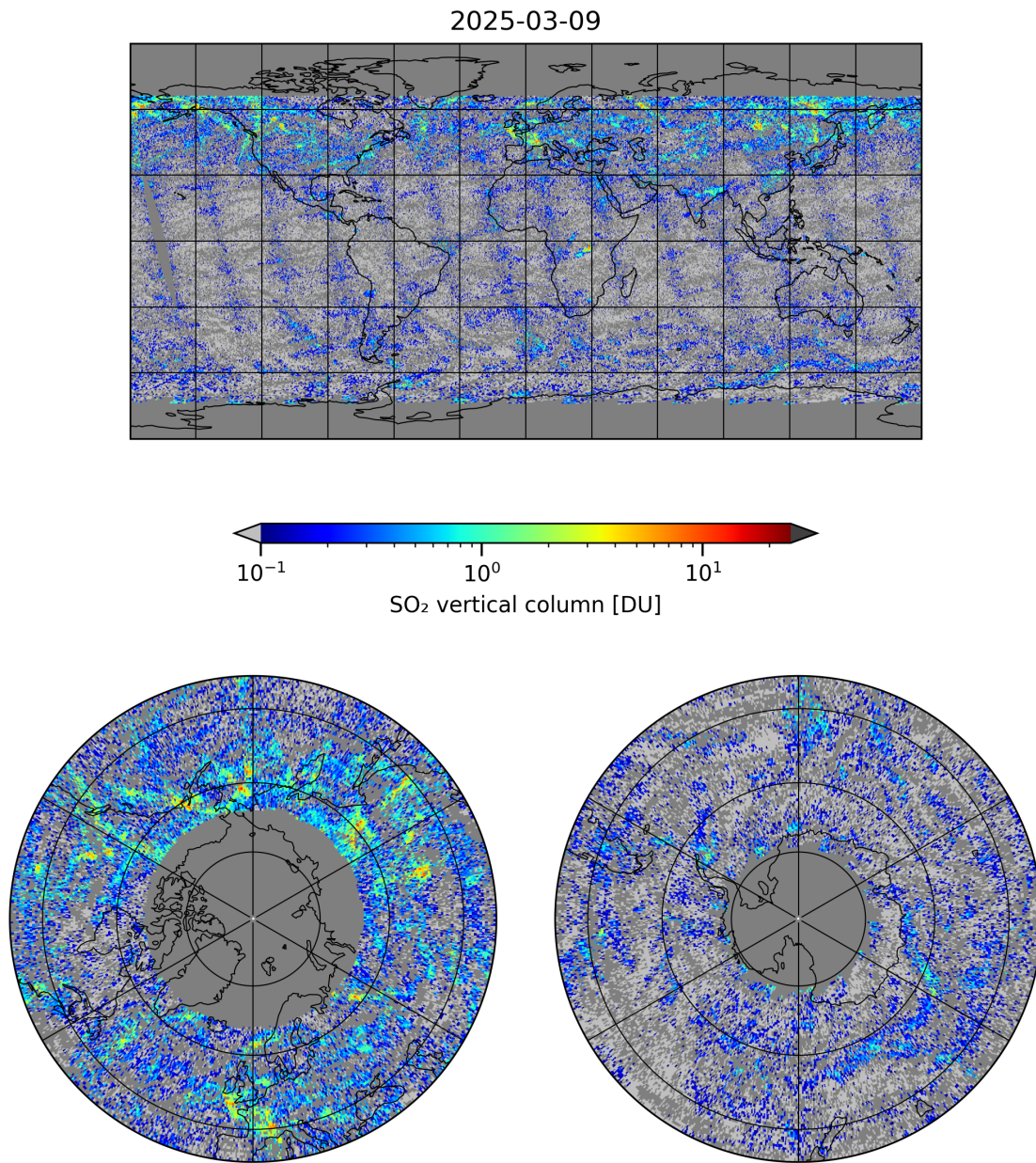


Figure 4: Map of “SO₂ vertical column” for 2025-03-09 to 2025-03-10

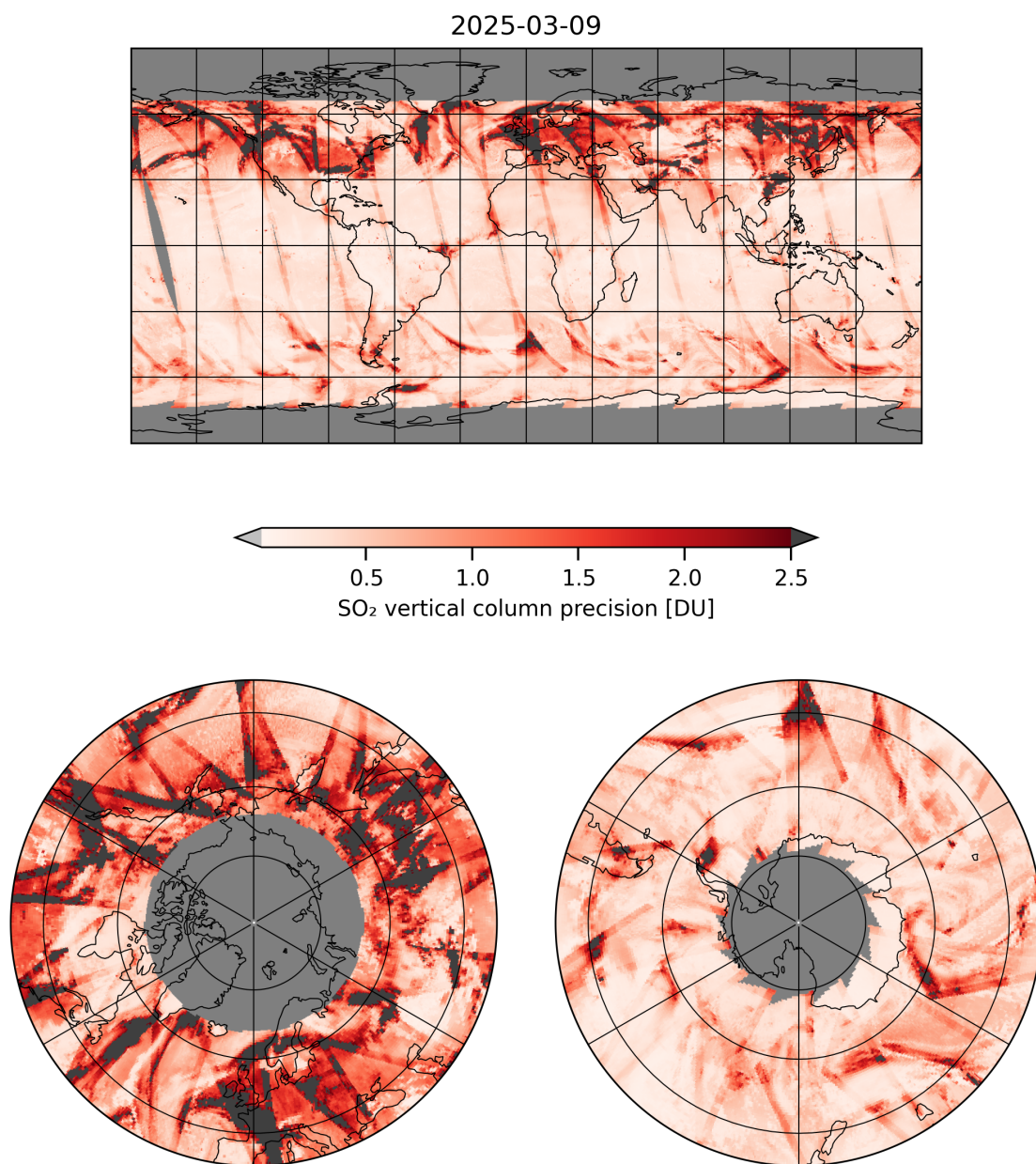


Figure 5: Map of “SO₂ vertical column precision” for 2025-03-09 to 2025-03-10

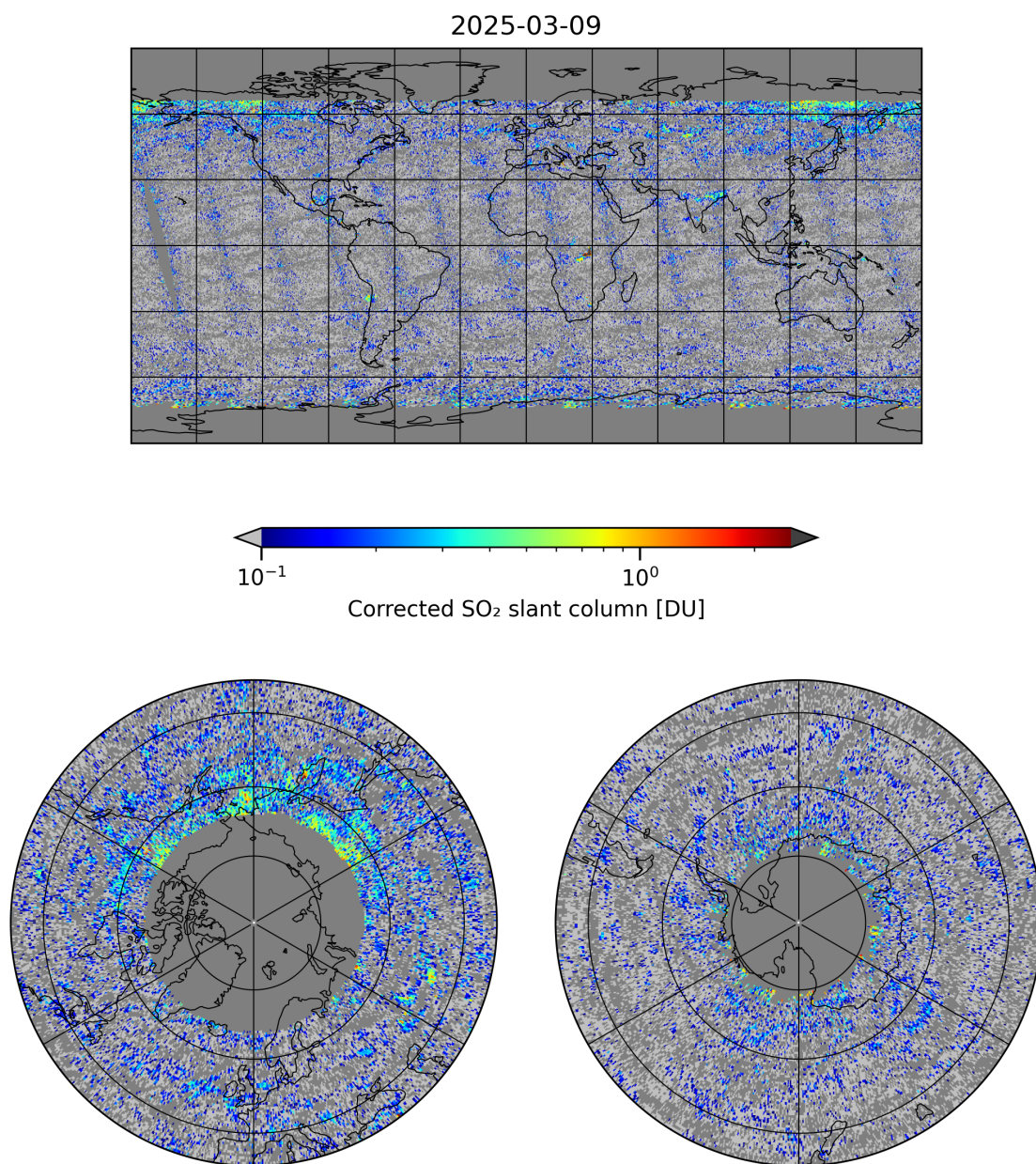


Figure 6: Map of “Corrected SO₂ slant column” for 2025-03-09 to 2025-03-10

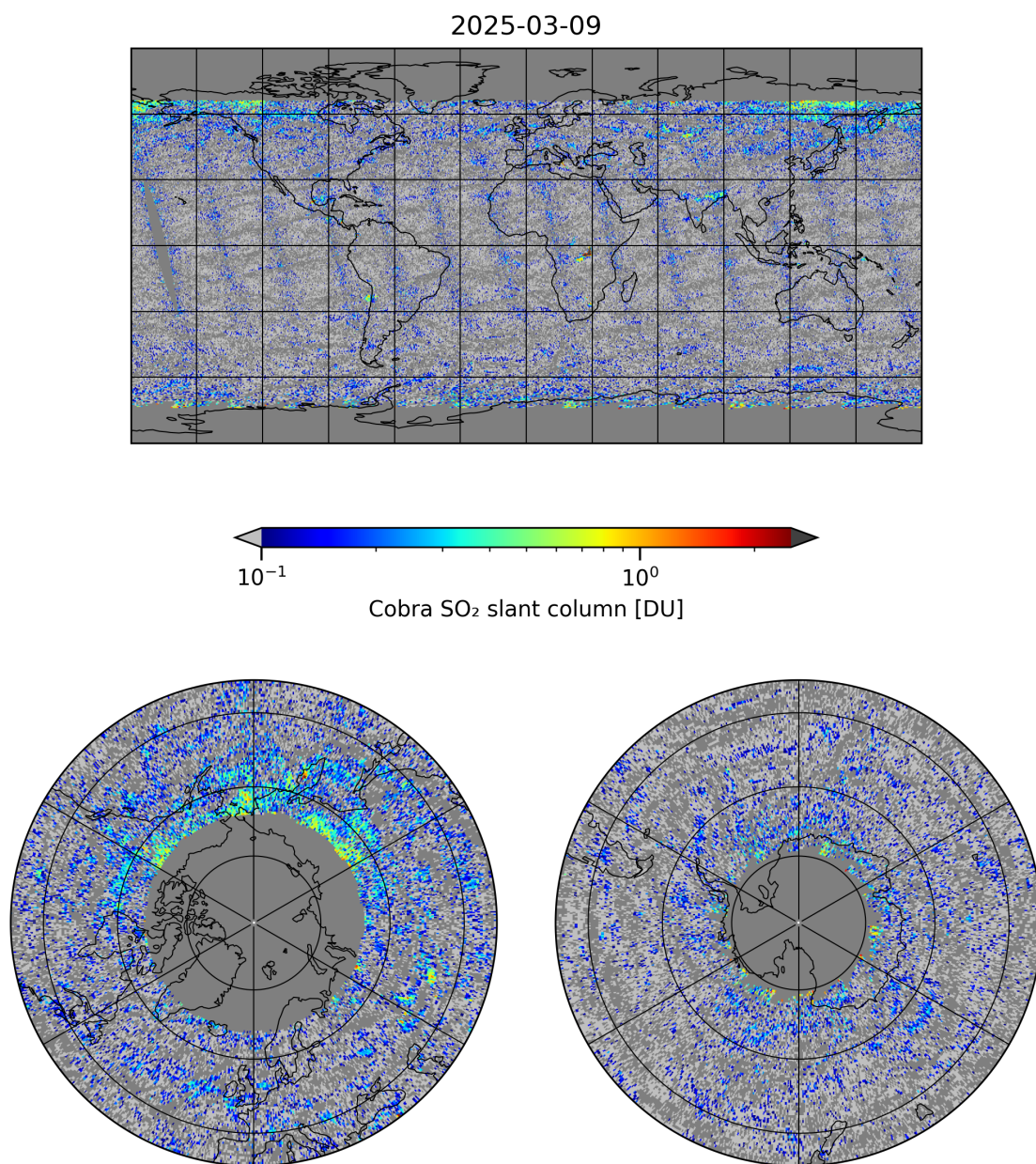


Figure 7: Map of “Cobra SO₂ slant column” for 2025-03-09 to 2025-03-10

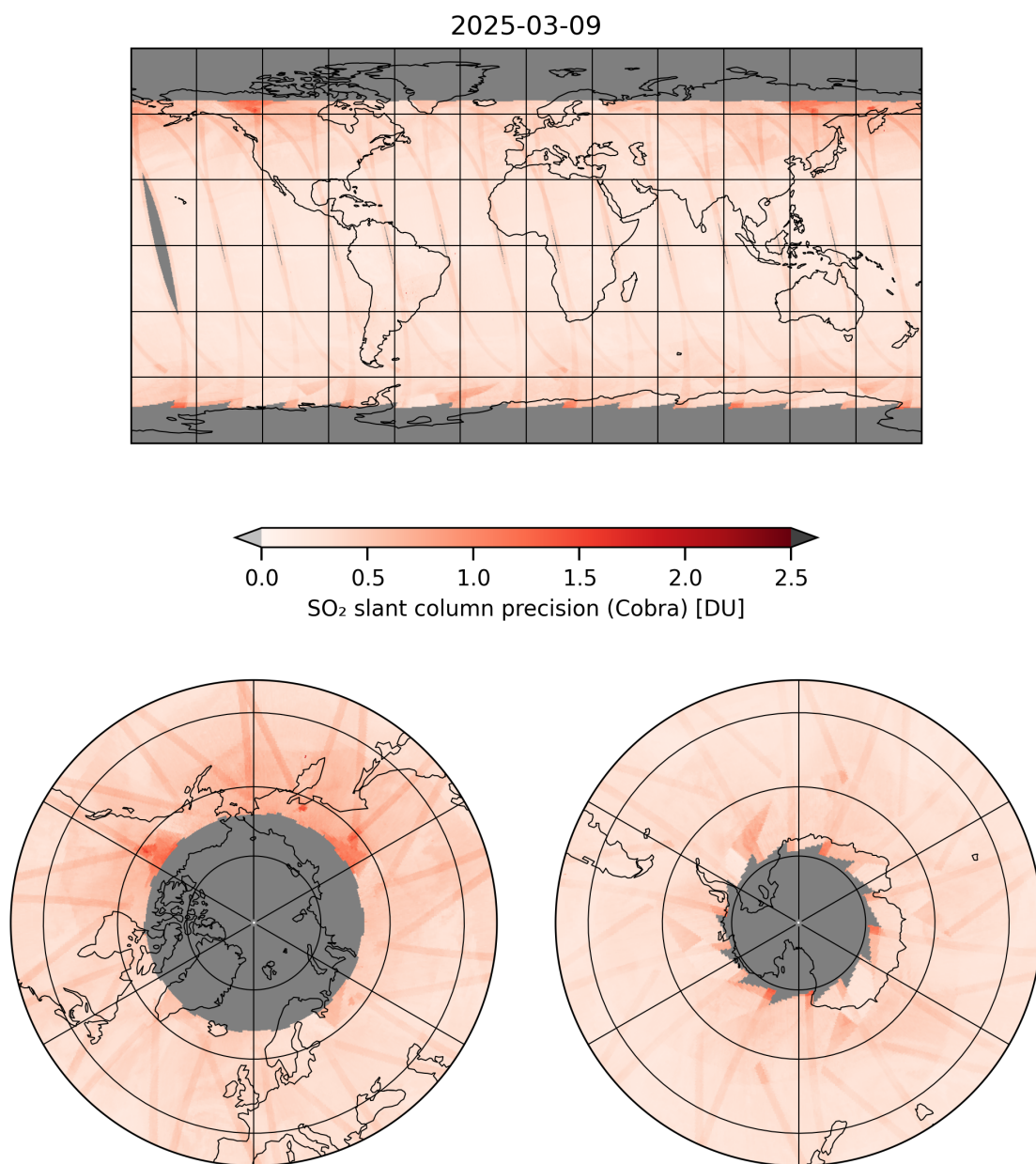


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-03-09 to 2025-03-10

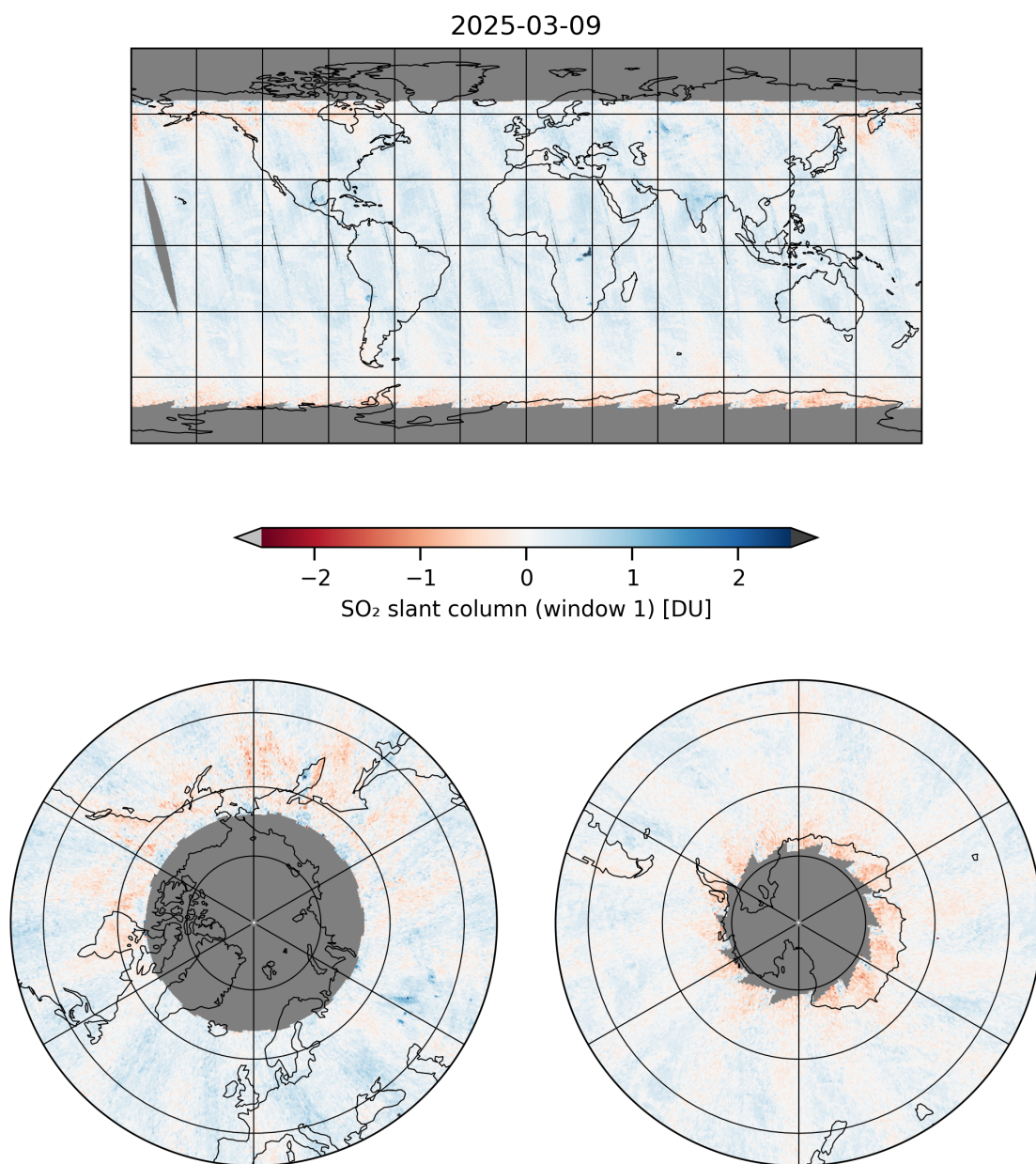


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-03-09 to 2025-03-10

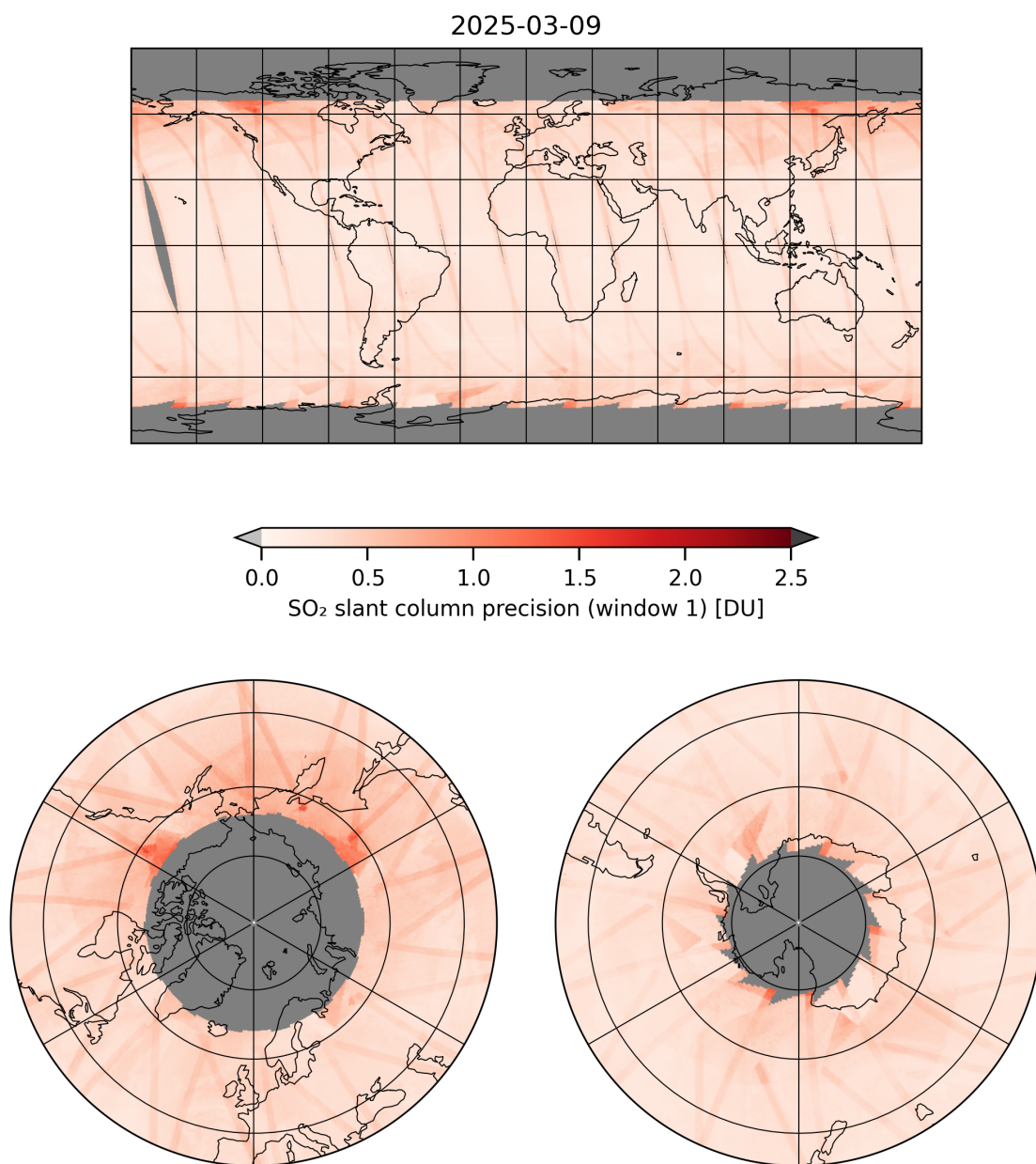


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-03-09 to 2025-03-10

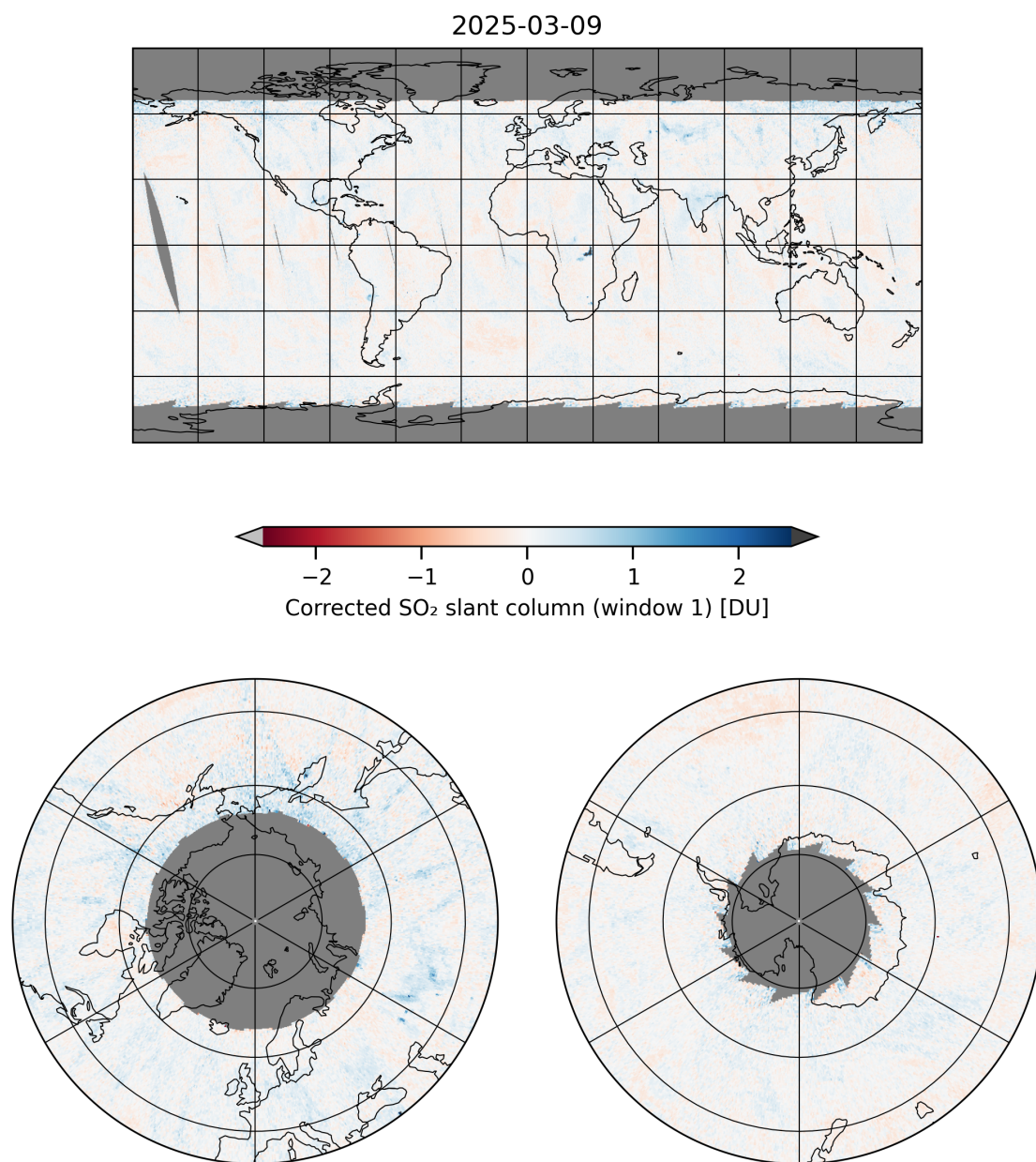


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-03-09 to 2025-03-10

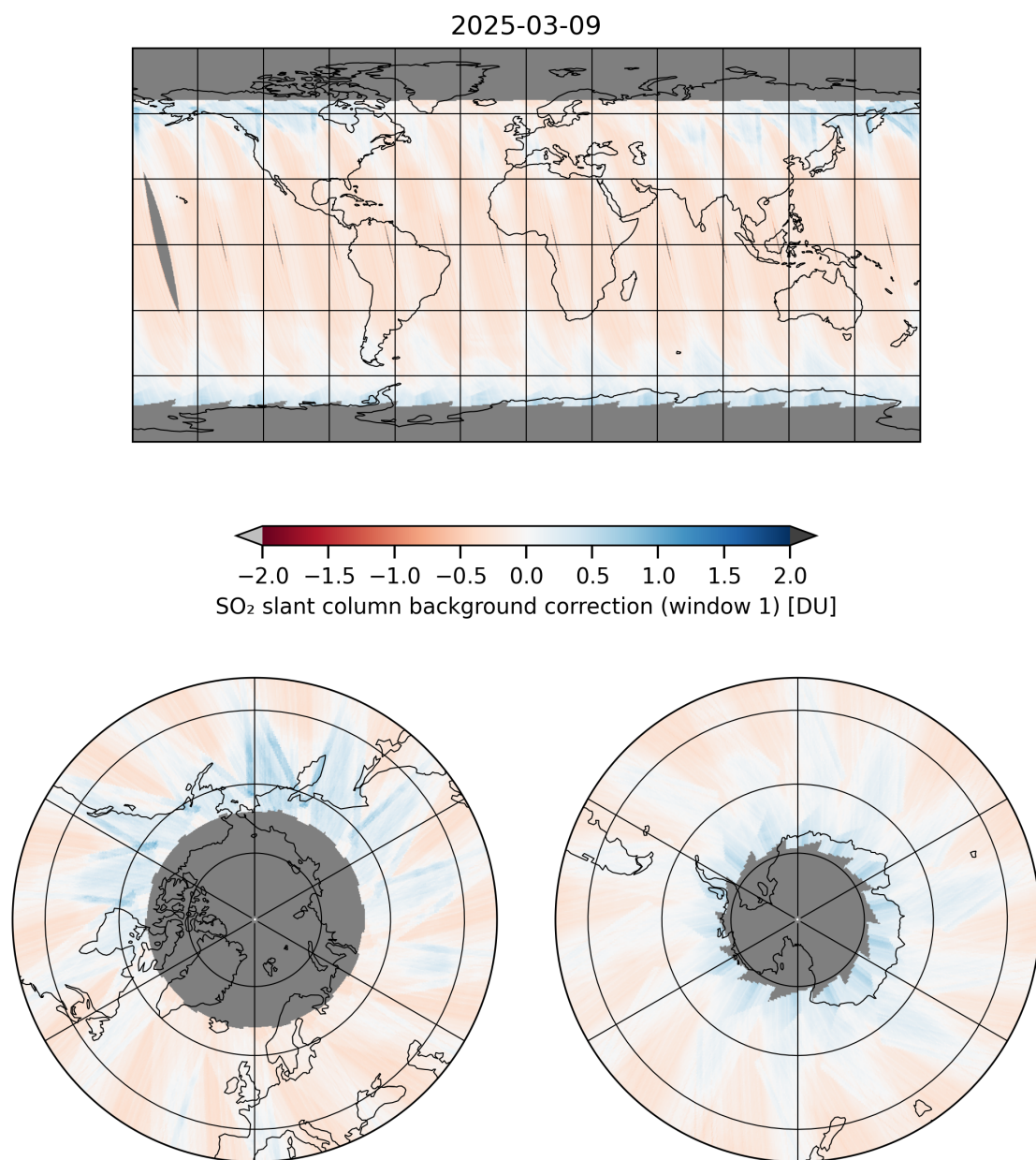


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-03-09 to 2025-03-10

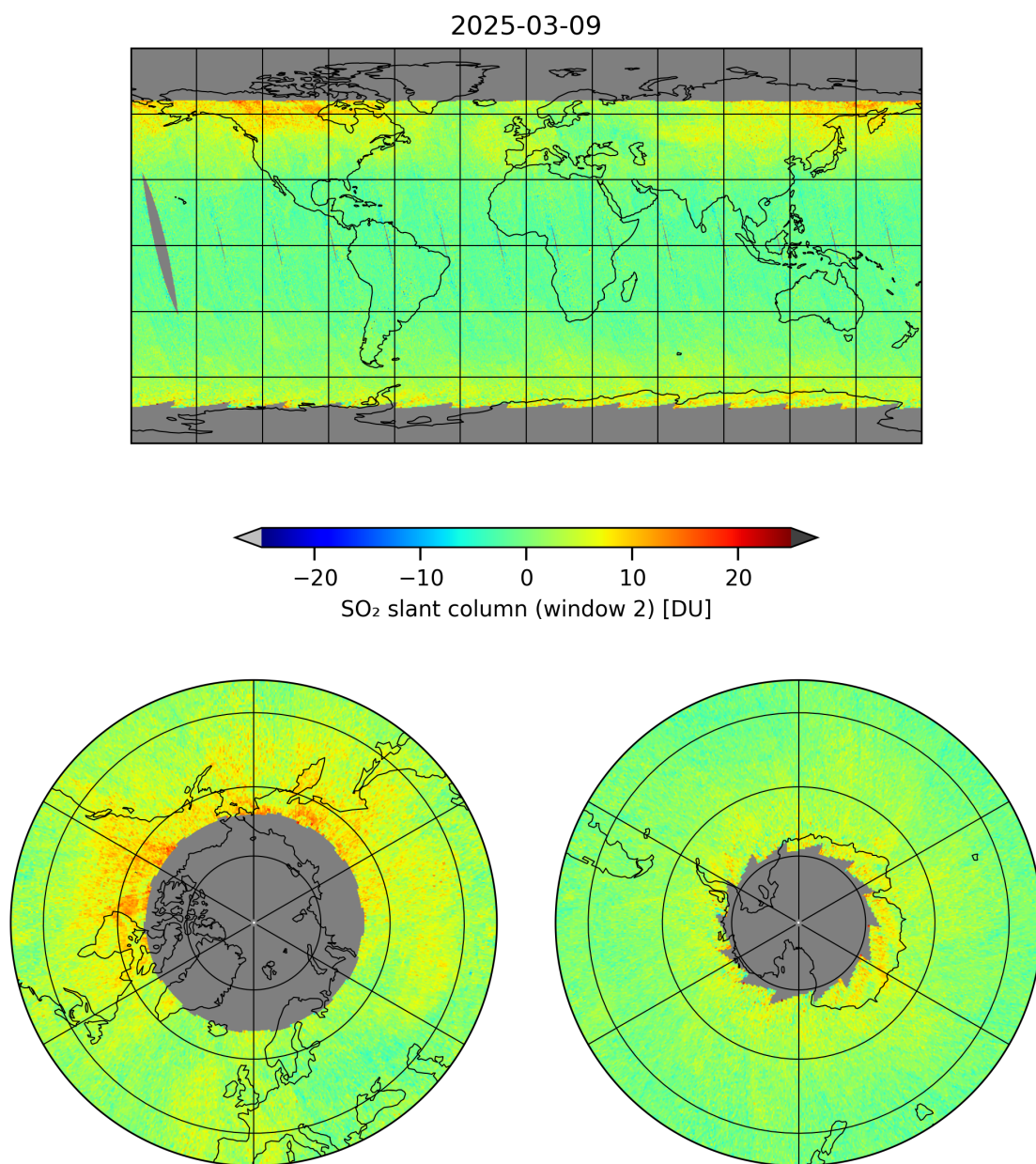


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-03-09 to 2025-03-10

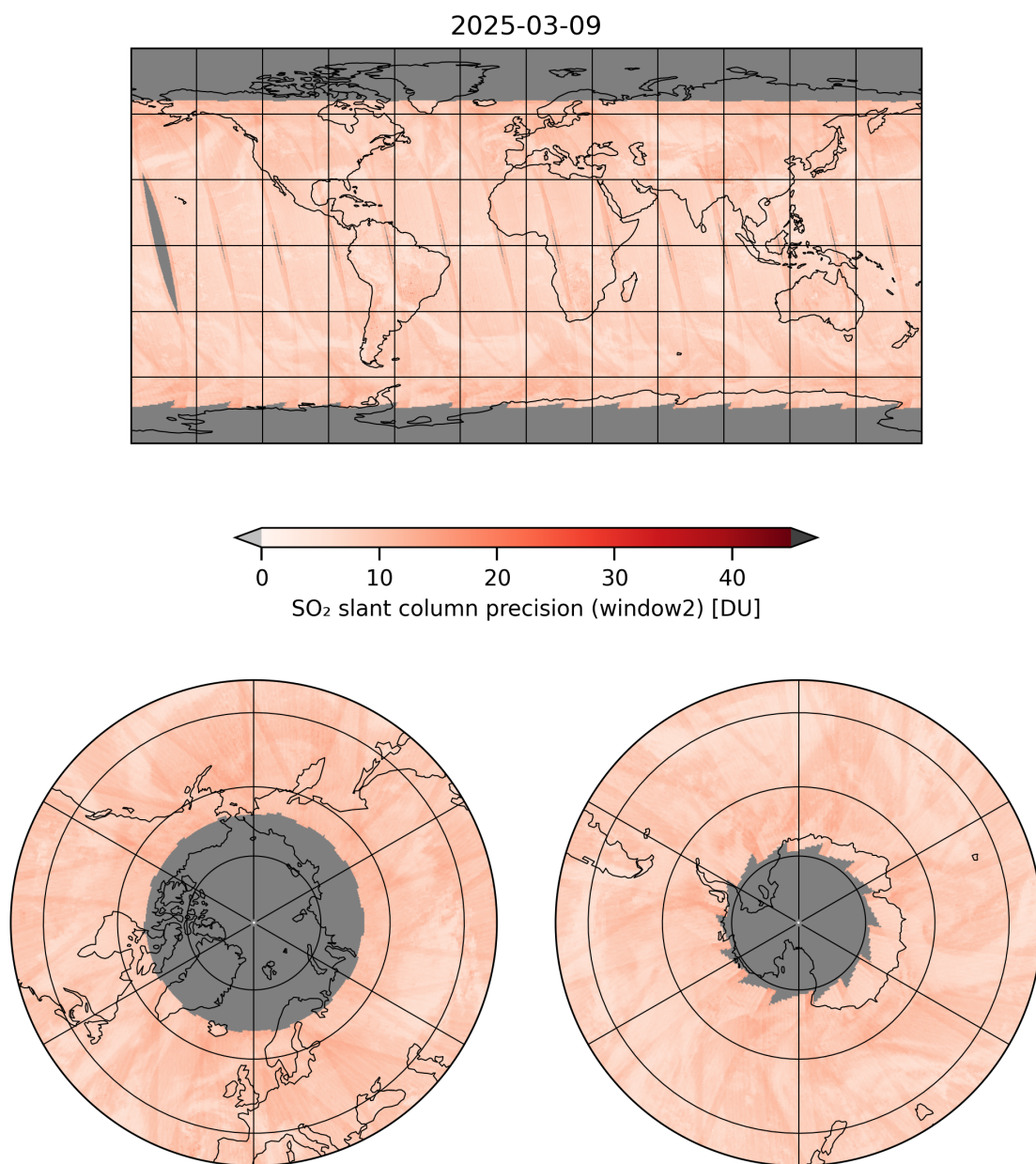


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-03-09 to 2025-03-10

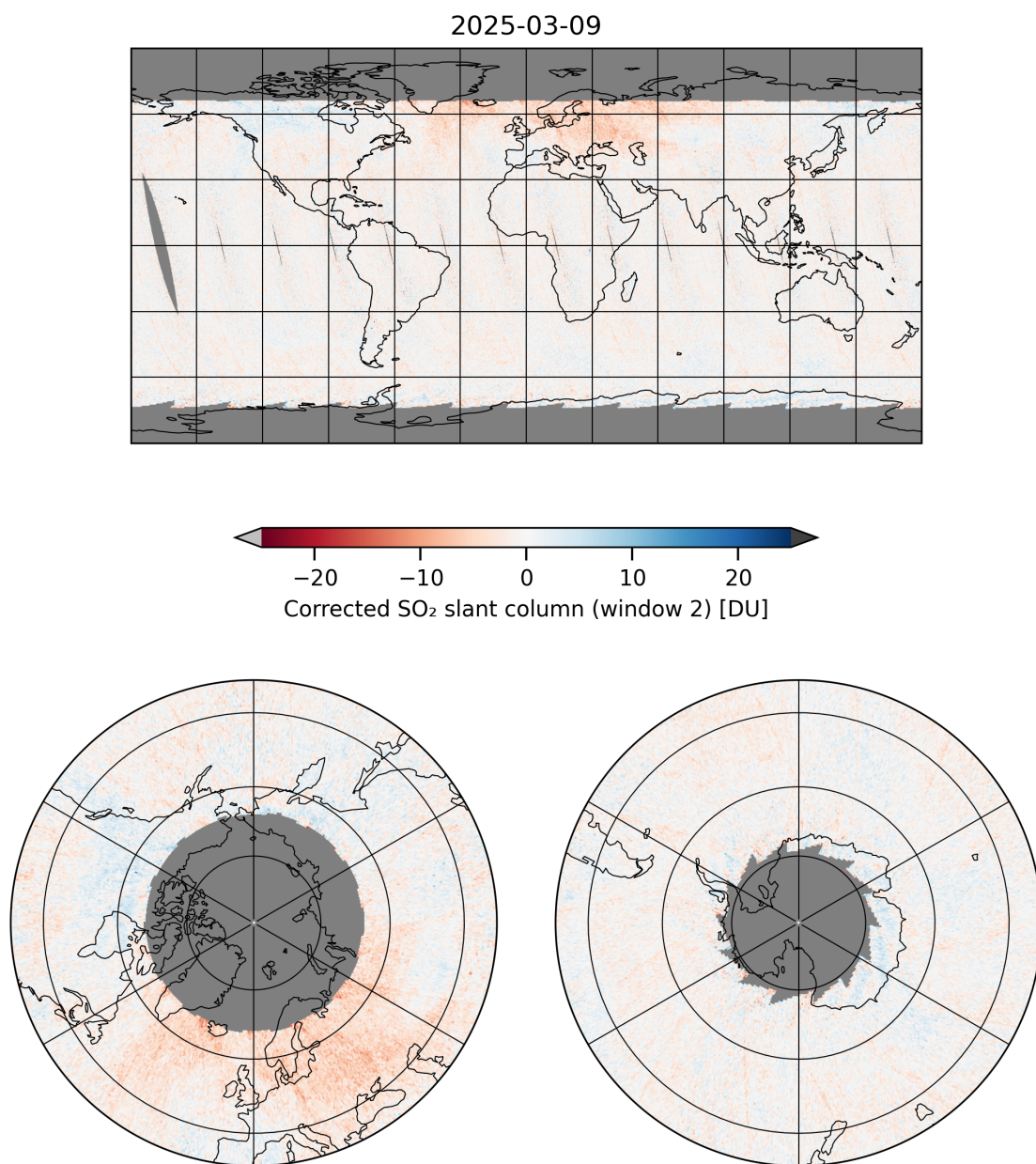


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-03-09 to 2025-03-10

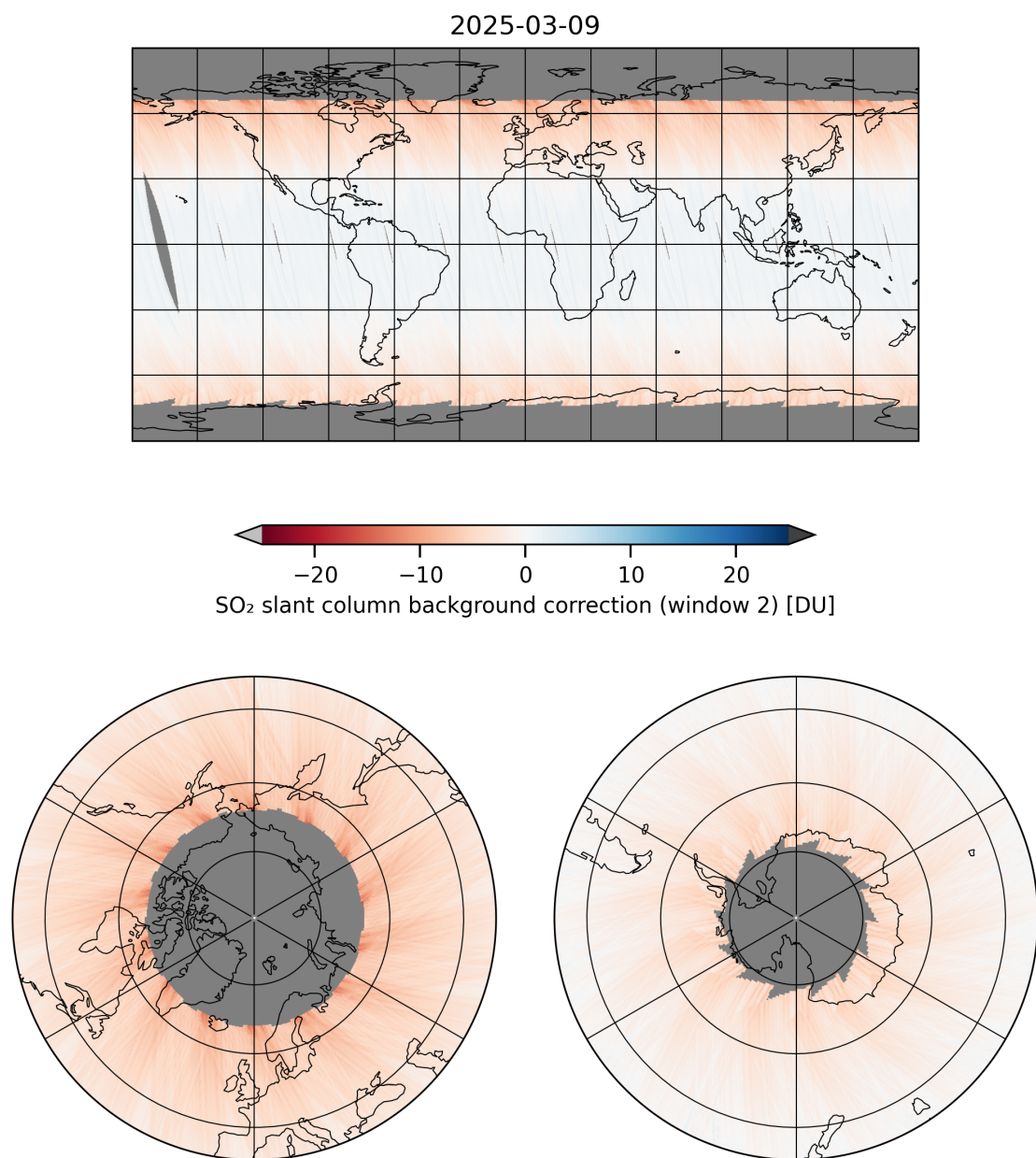


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-03-09 to 2025-03-10

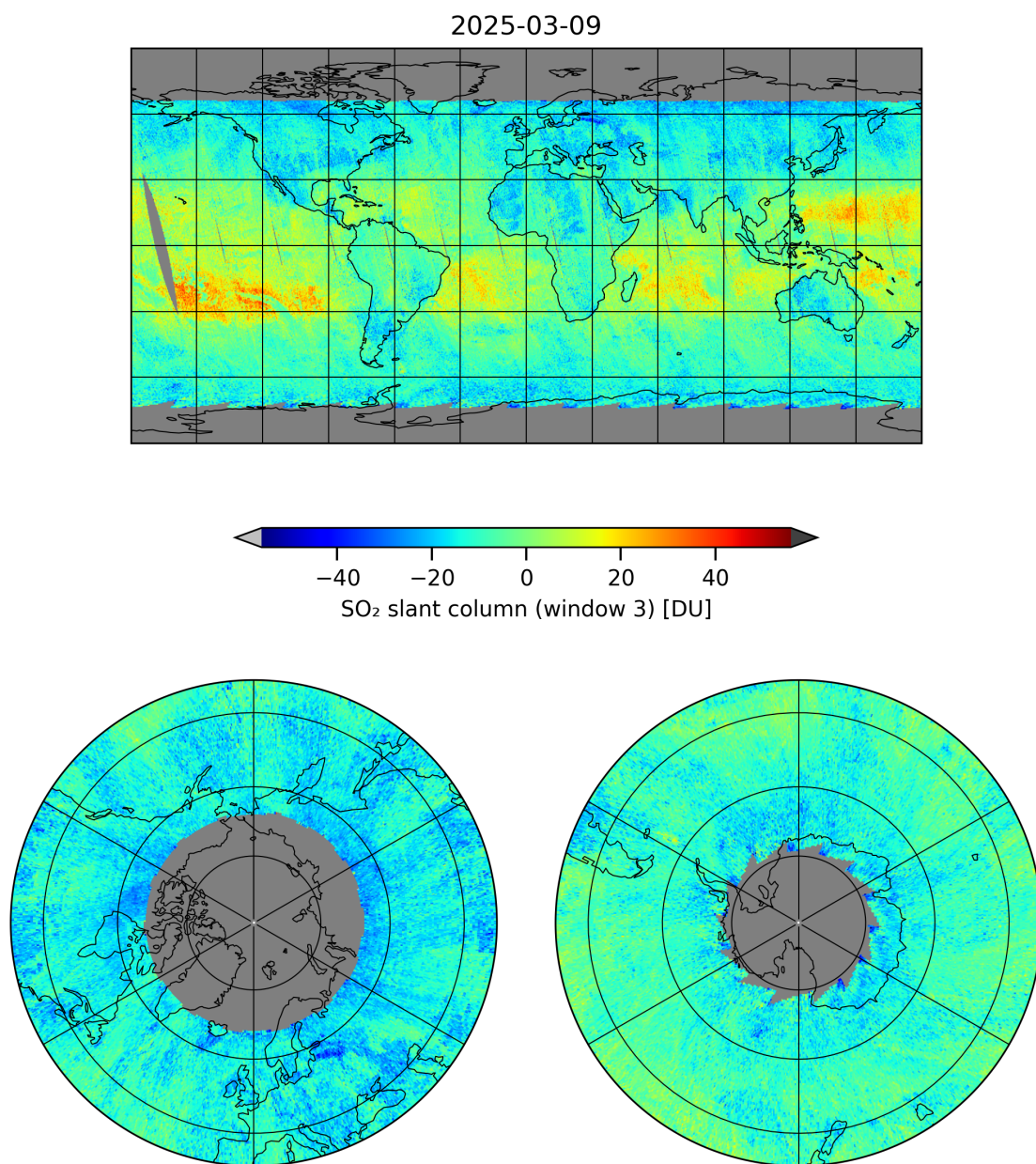


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-03-09 to 2025-03-10

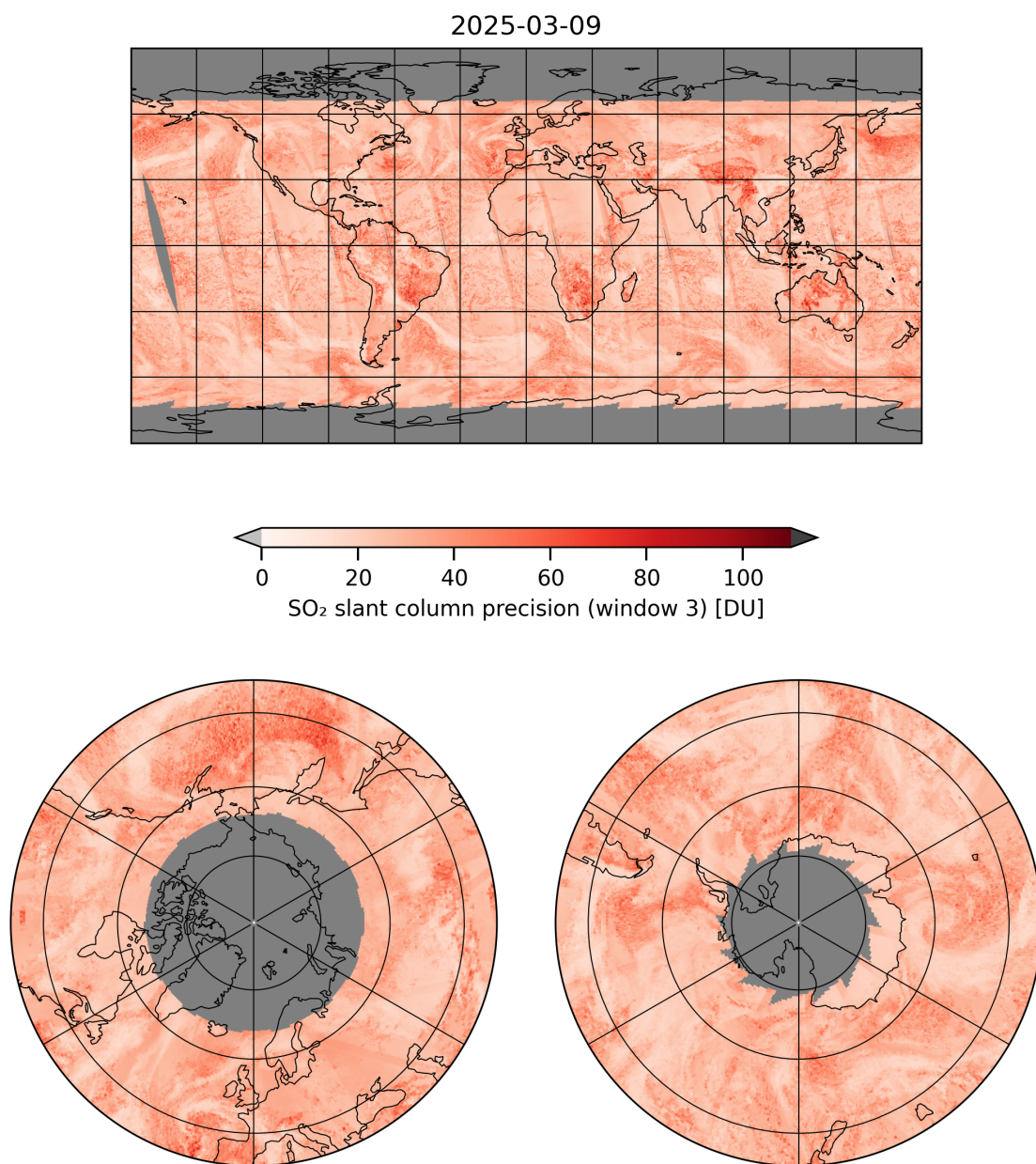


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-03-09 to 2025-03-10

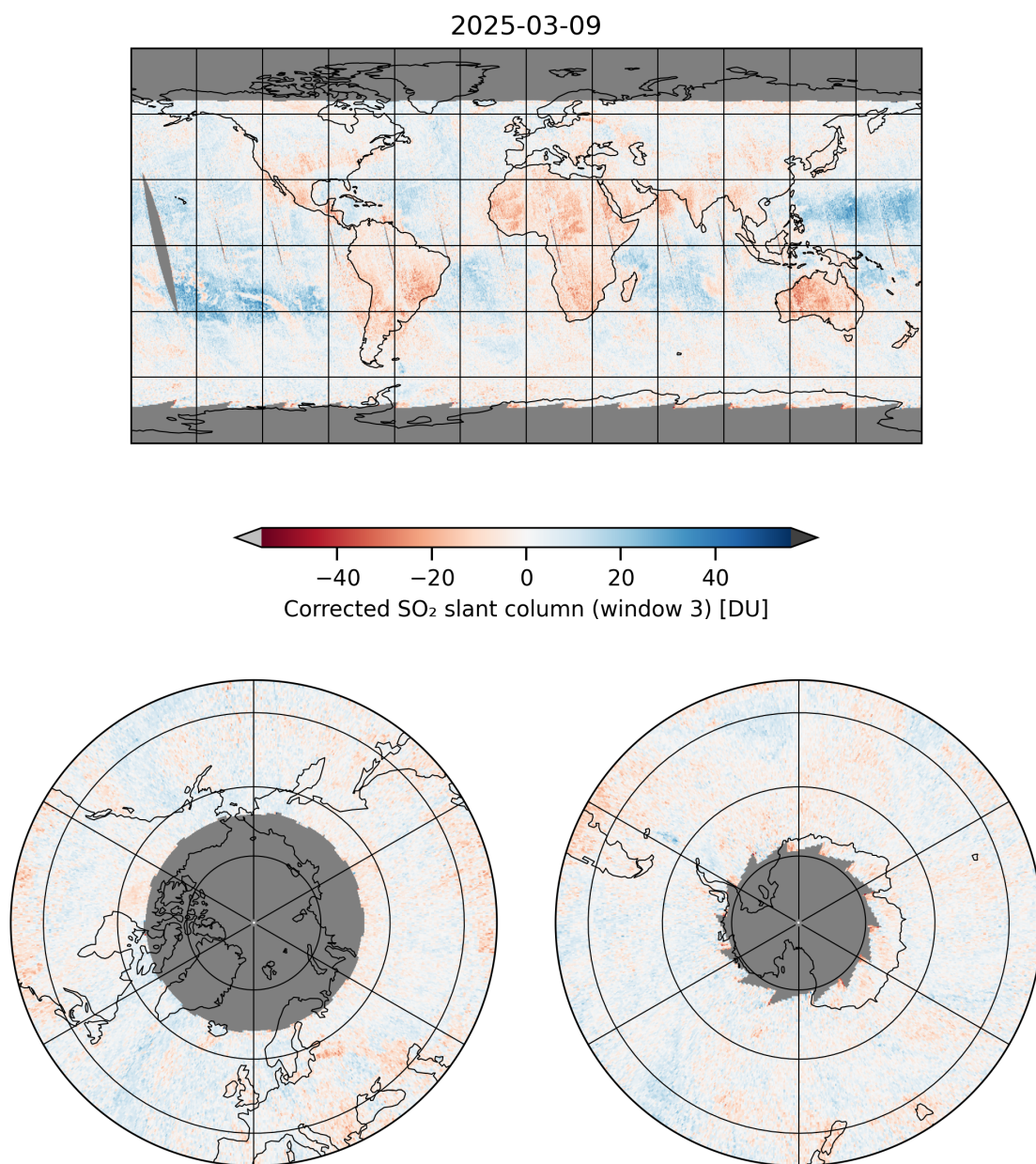


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-03-09 to 2025-03-10

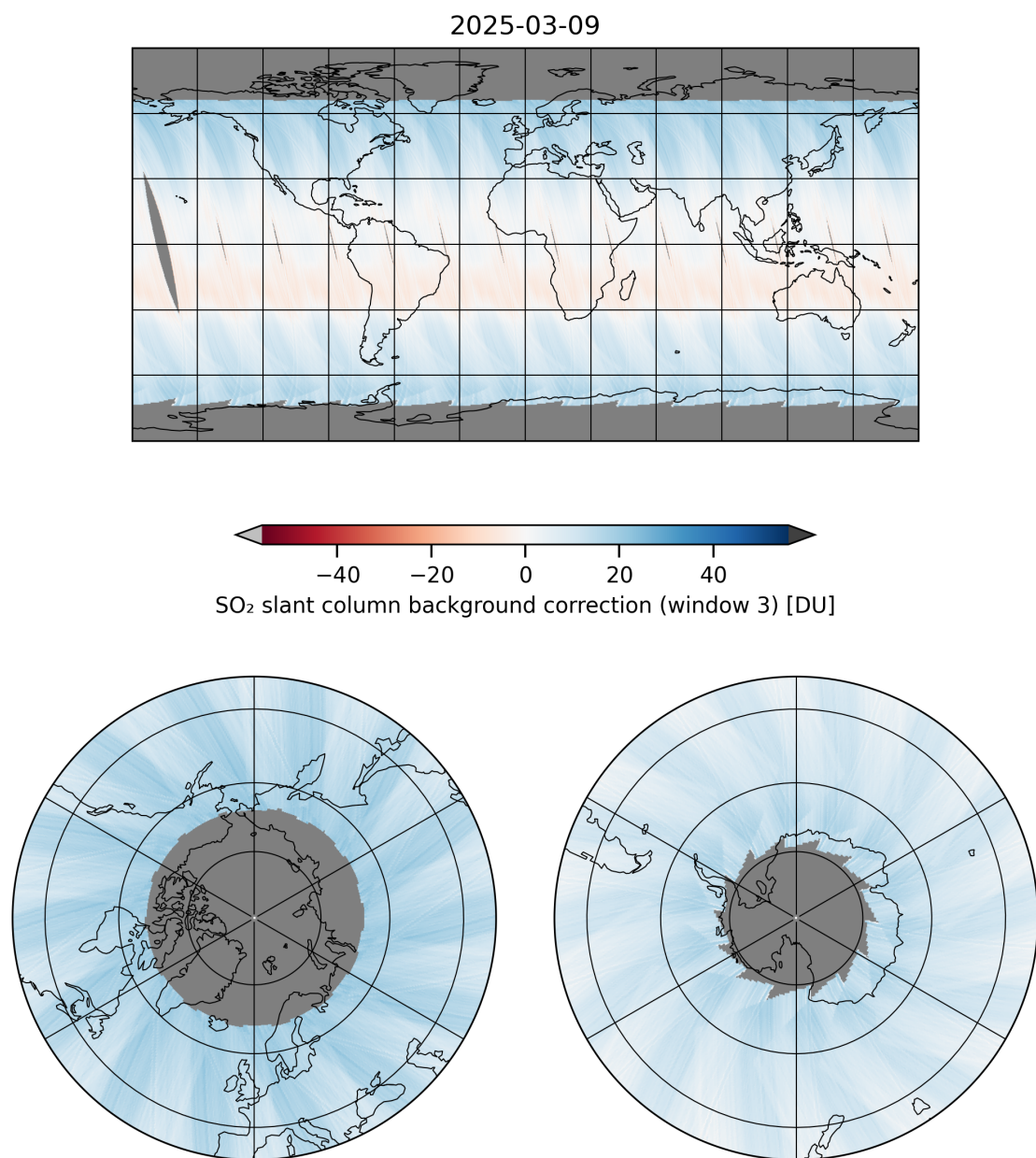


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-03-09 to 2025-03-10

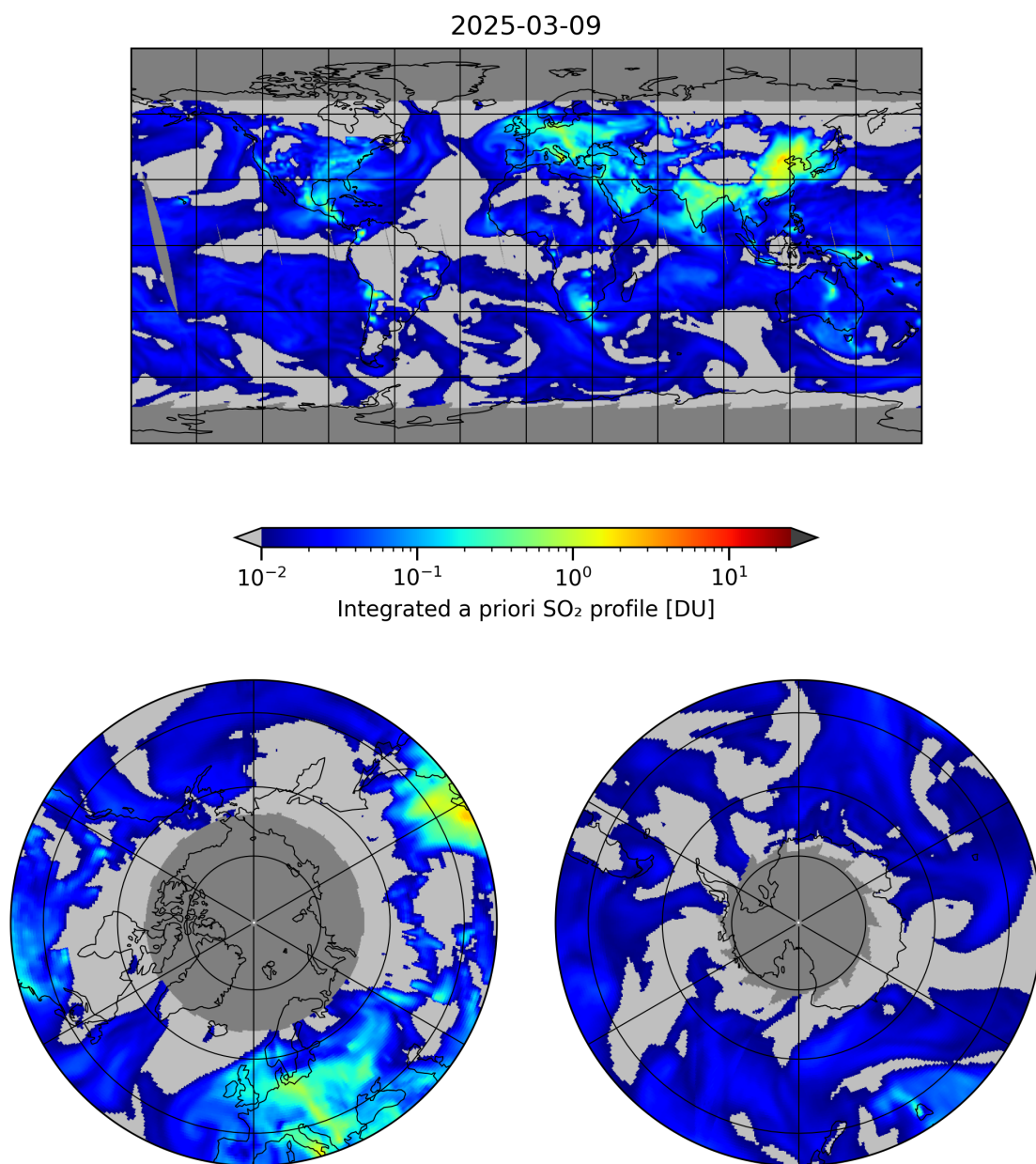


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-03-09 to 2025-03-10

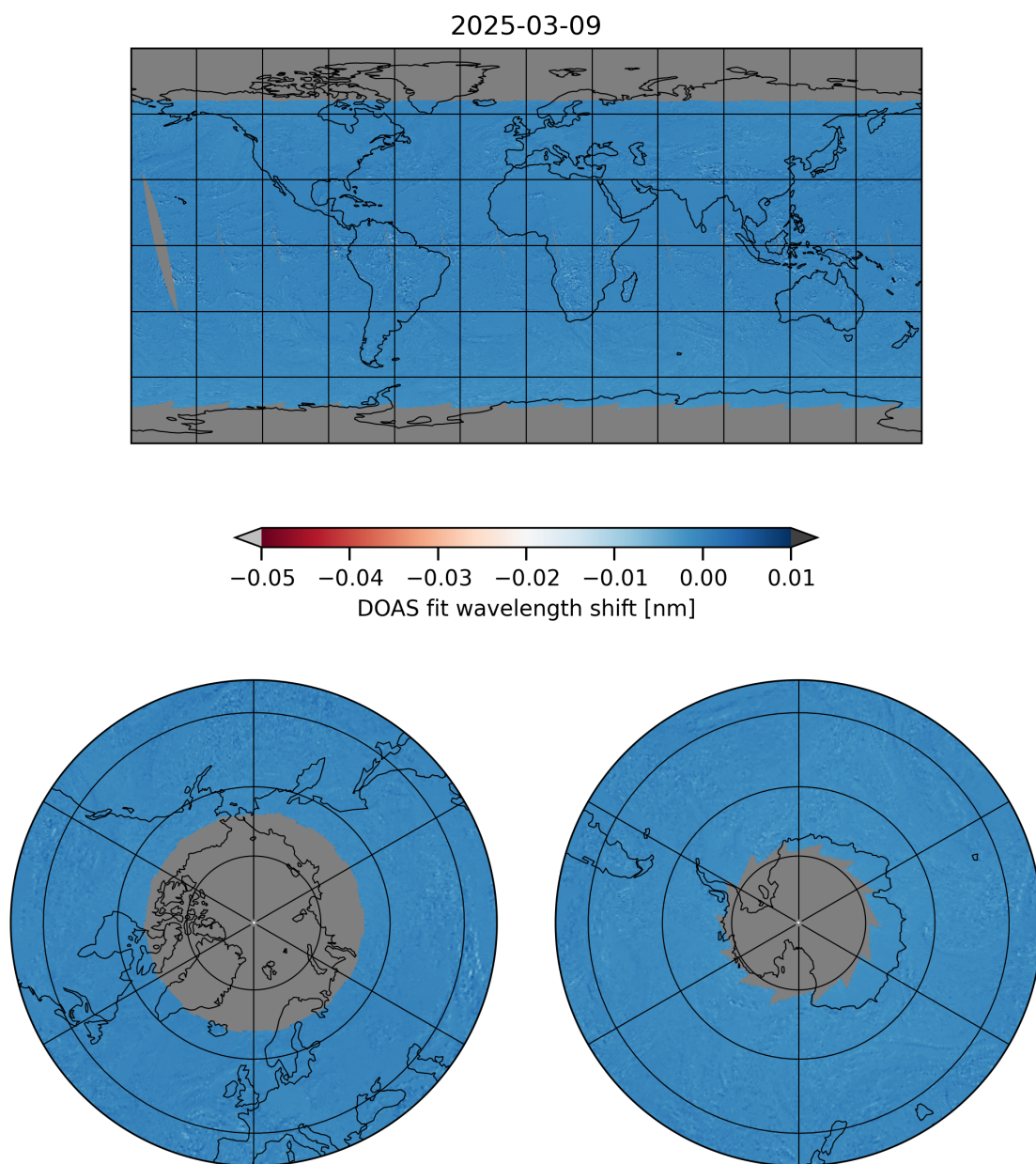


Figure 22: Map of “DOAS fit wavelength shift” for 2025-03-09 to 2025-03-10

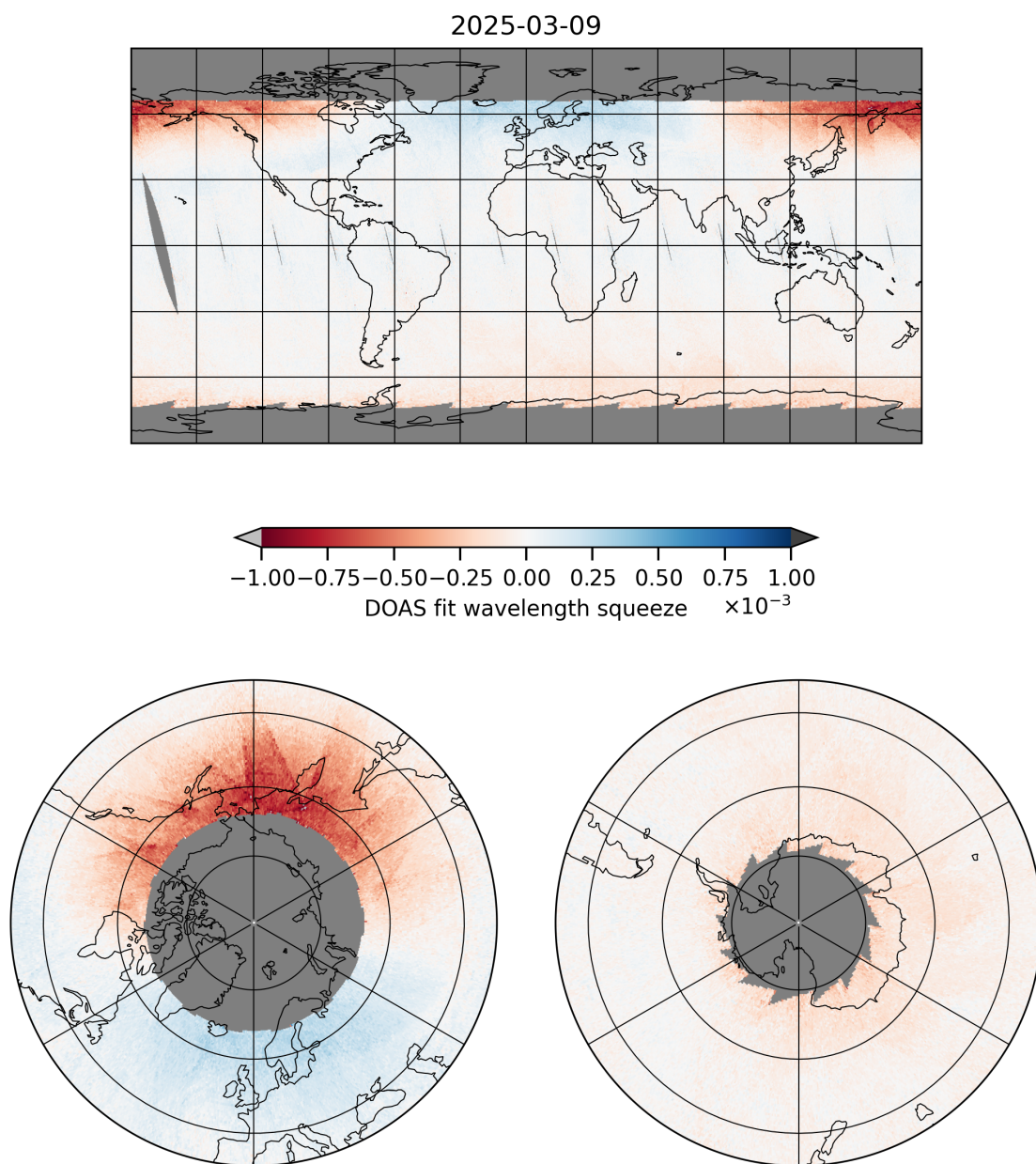


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-03-09 to 2025-03-10

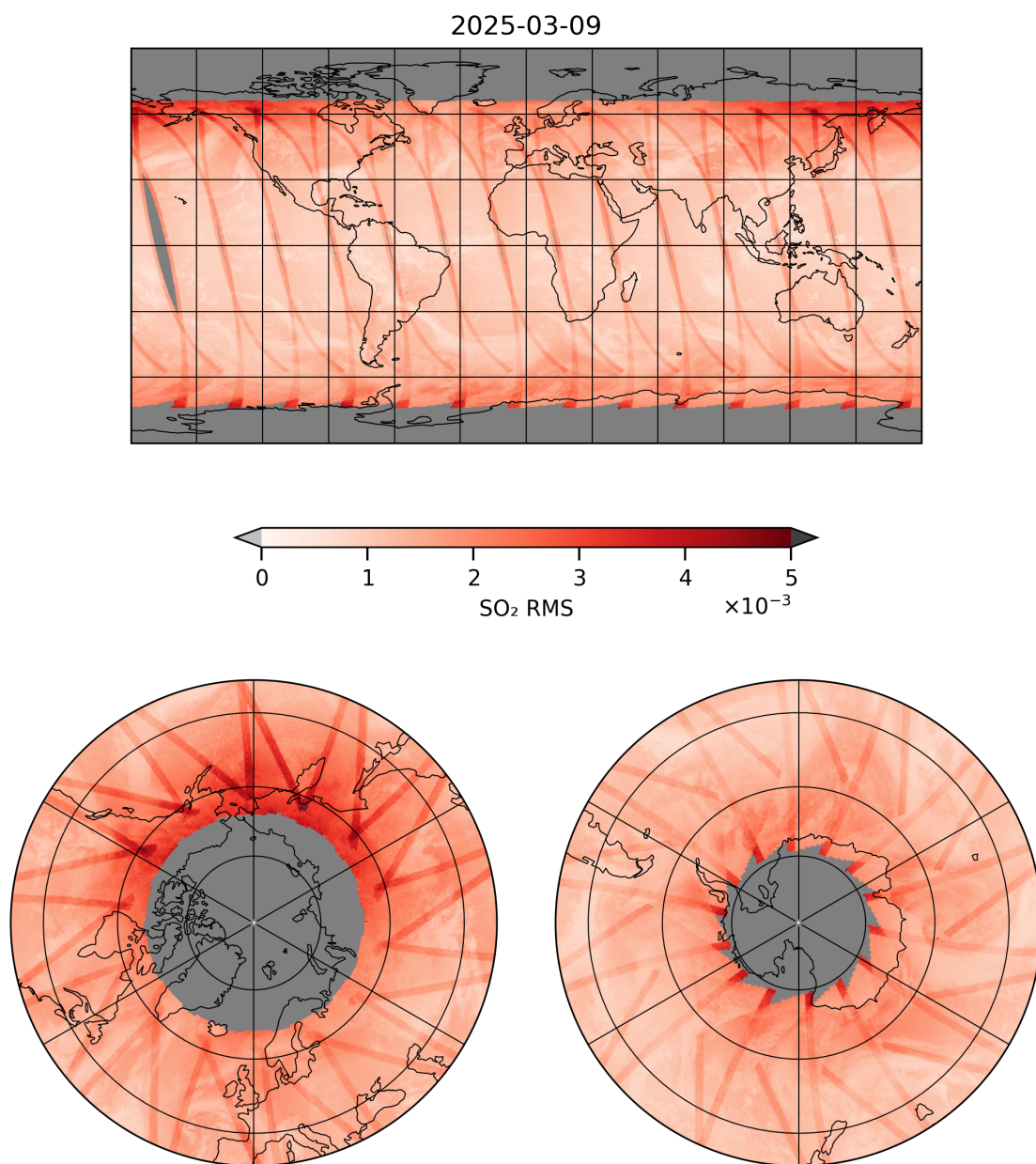


Figure 24: Map of “SO₂ RMS” for 2025-03-09 to 2025-03-10

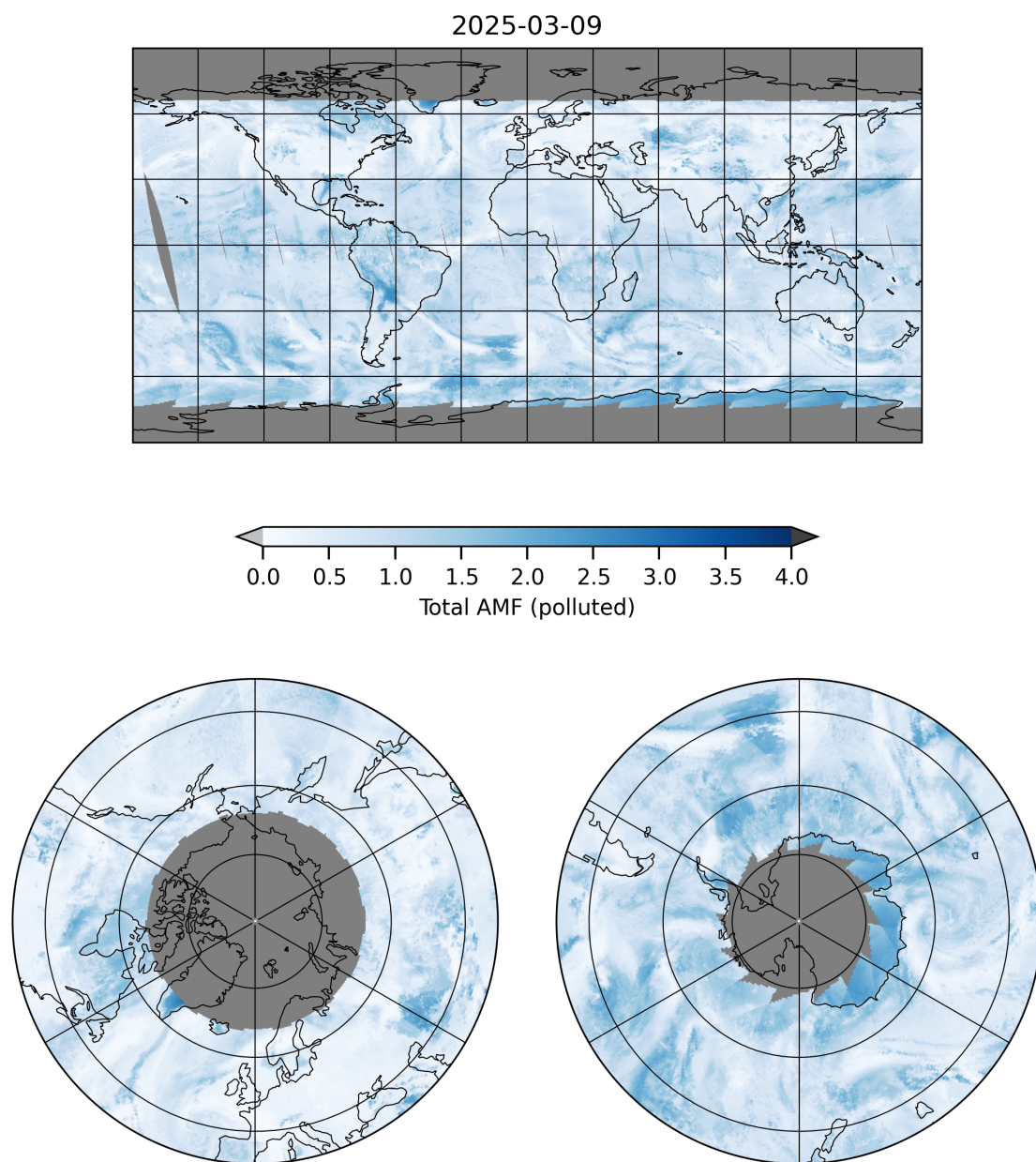


Figure 25: Map of “Total AMF (polluted)” for 2025-03-09 to 2025-03-10

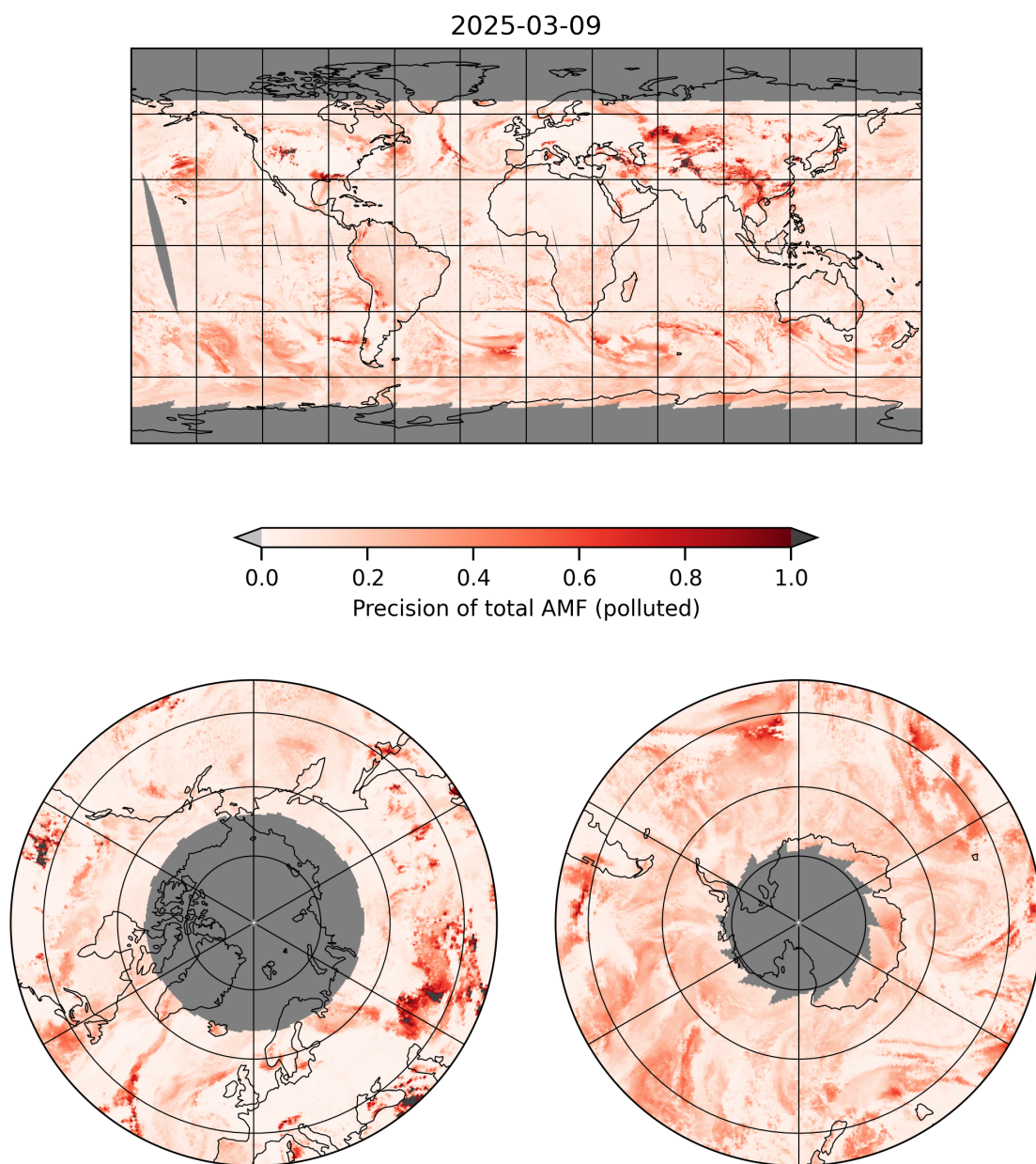


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-03-09 to 2025-03-10

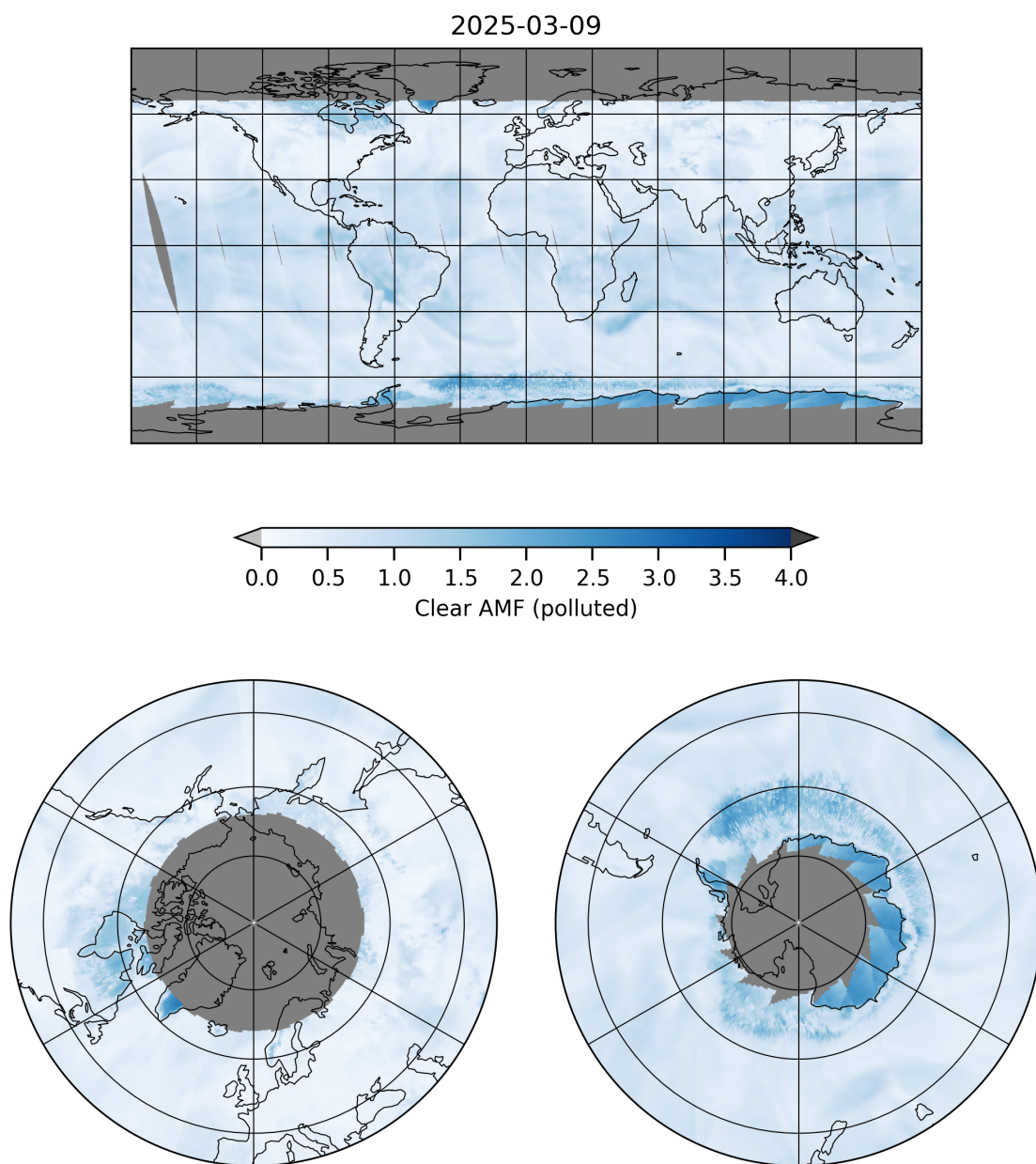


Figure 27: Map of “Clear AMF (polluted)” for 2025-03-09 to 2025-03-10

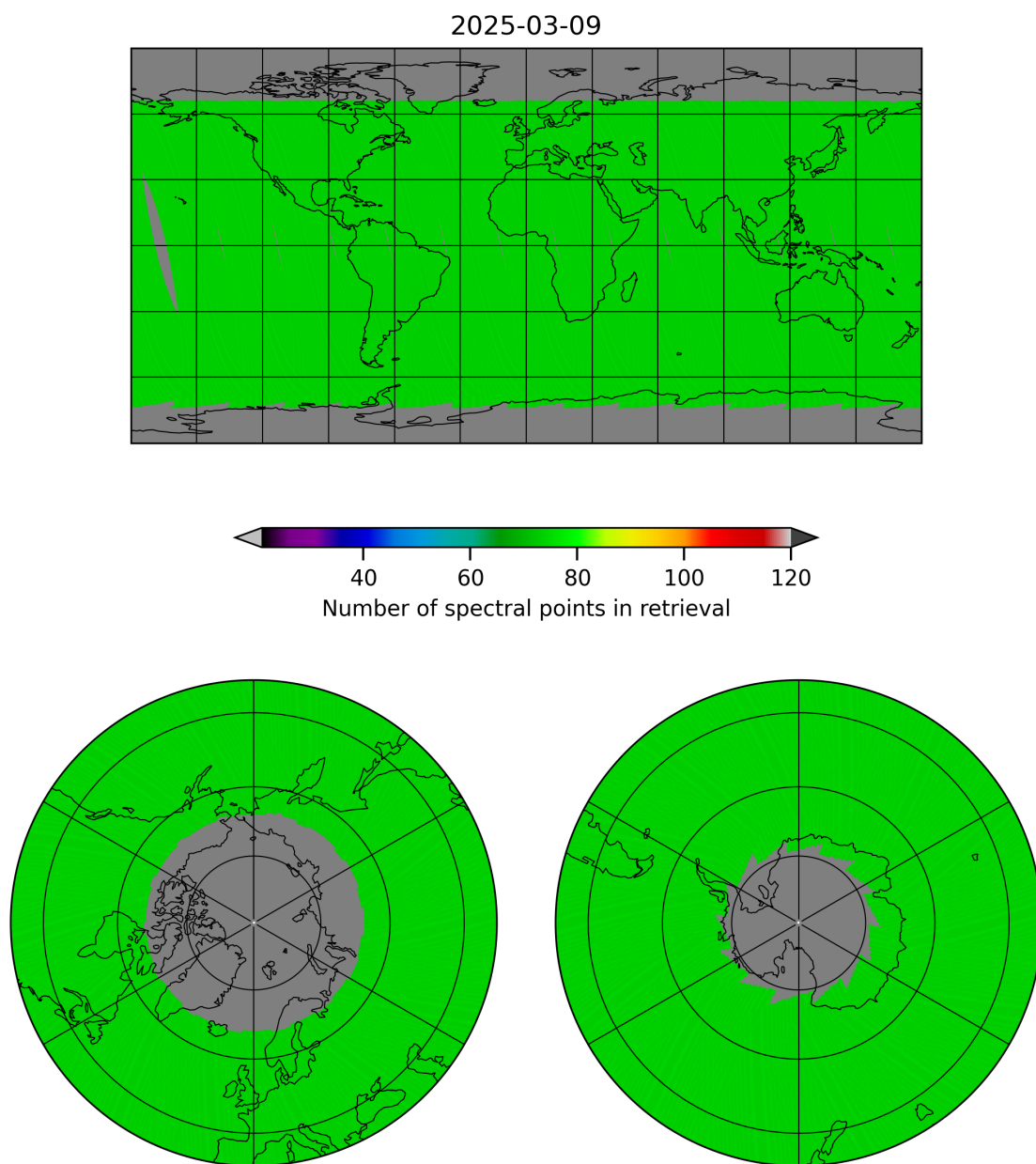


Figure 28: Map of “Number of spectral points in retrieval” for 2025-03-09 to 2025-03-10

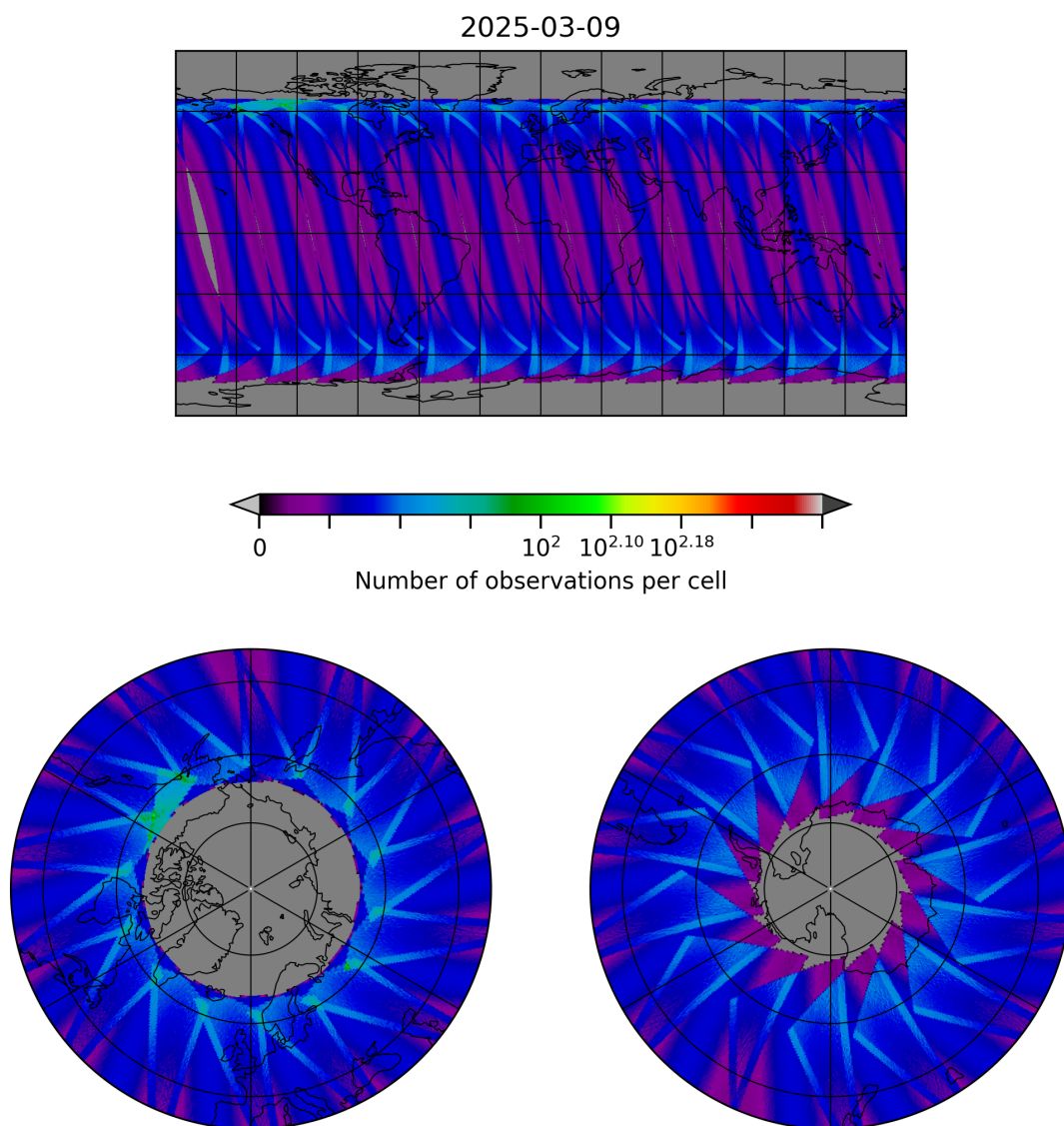


Figure 29: Map of the number of observations for 2025-03-09 to 2025-03-10

7 Zonal average

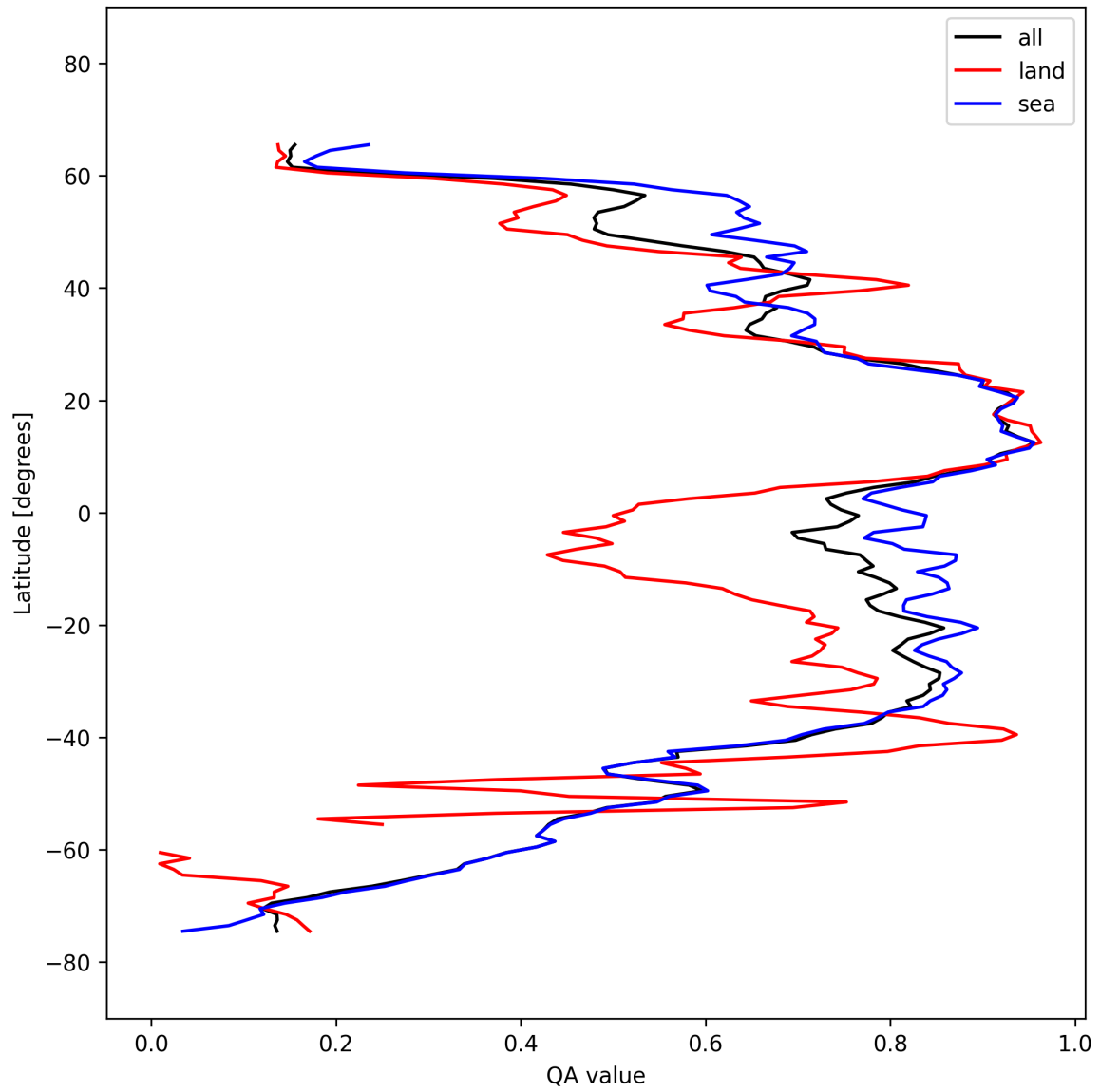


Figure 30: Zonal average of “QA value” for 2025-03-09 to 2025-03-10.

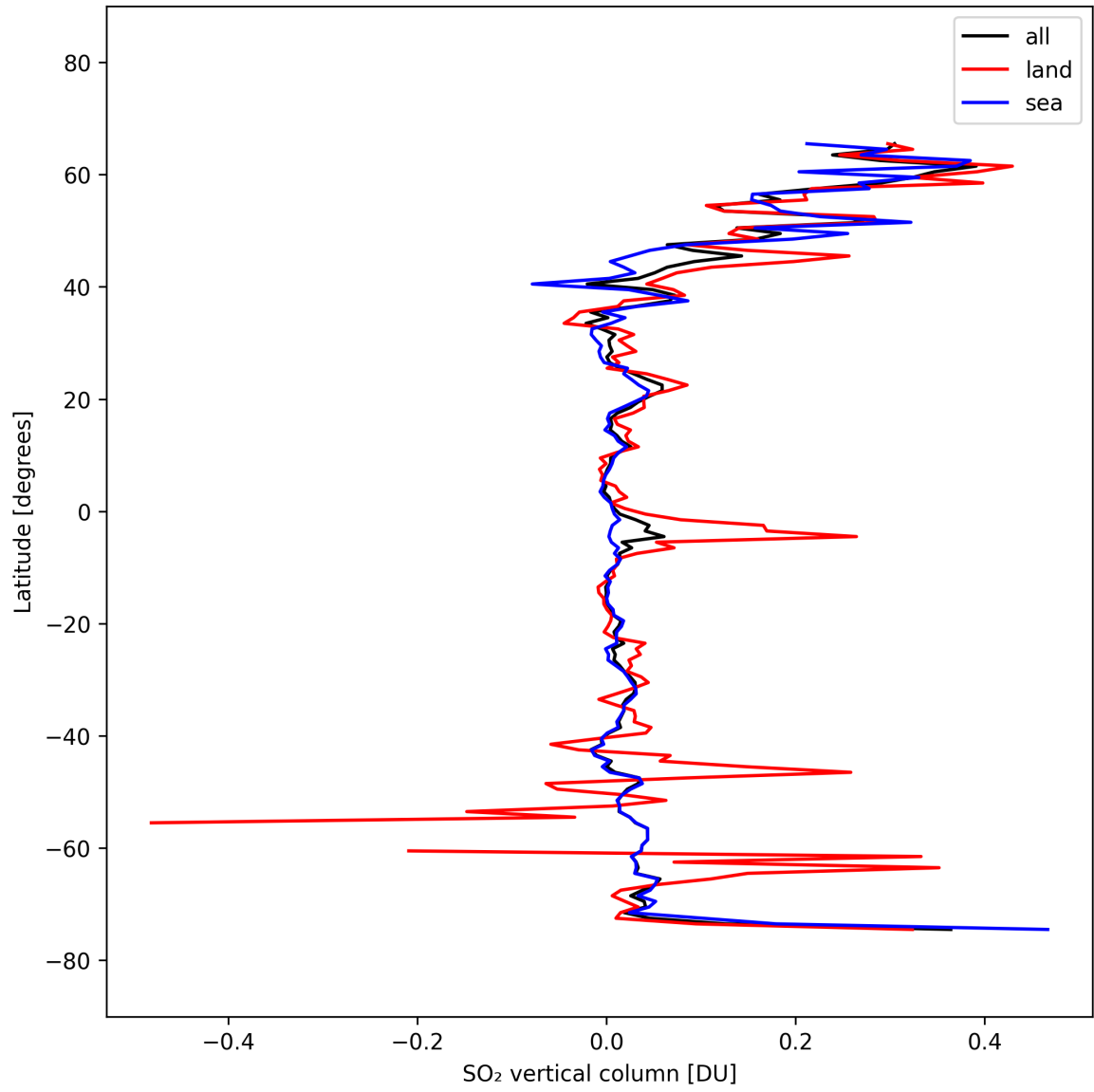


Figure 31: Zonal average of “SO₂ vertical column” for 2025-03-09 to 2025-03-10.

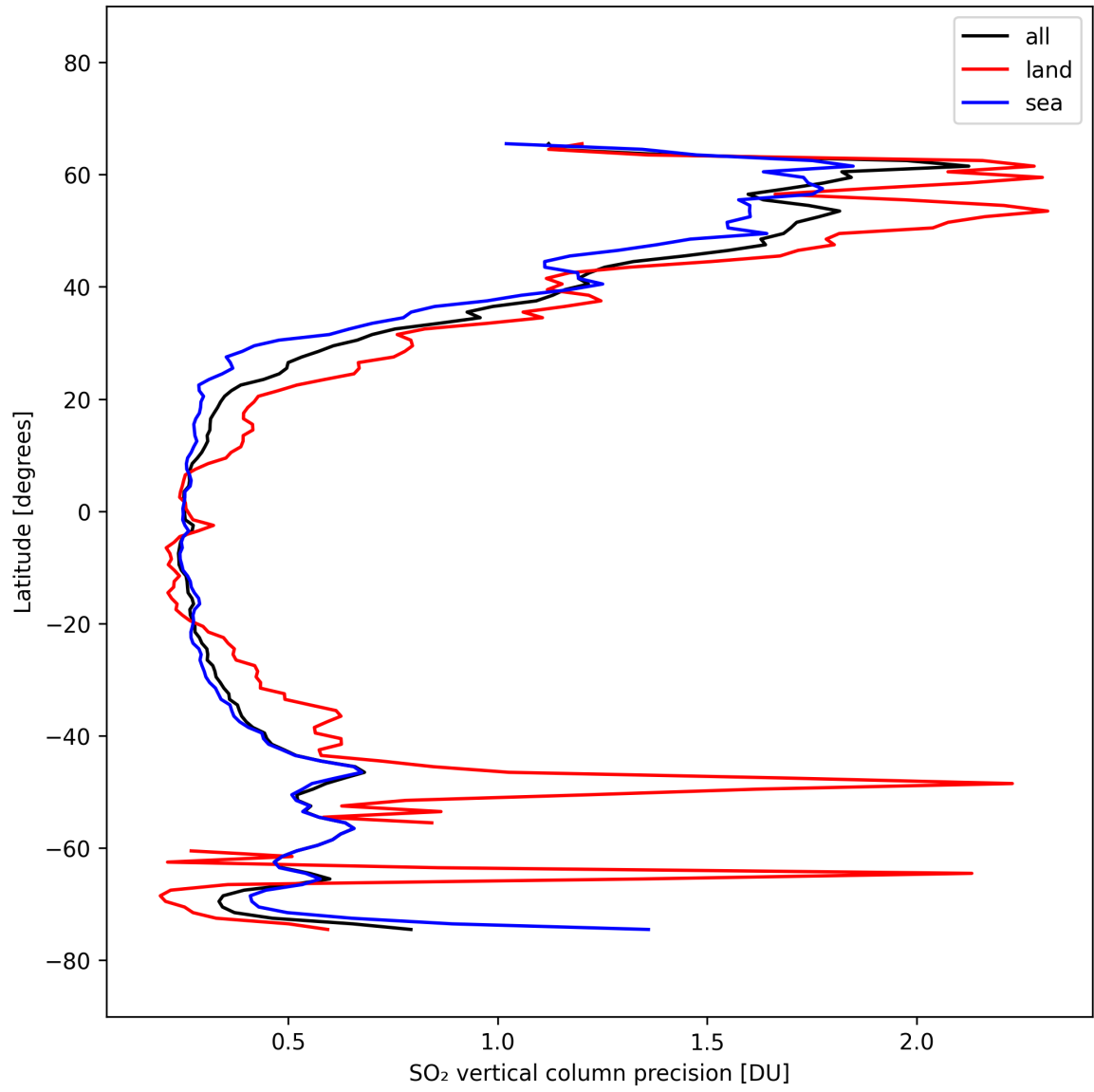


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-03-09 to 2025-03-10.

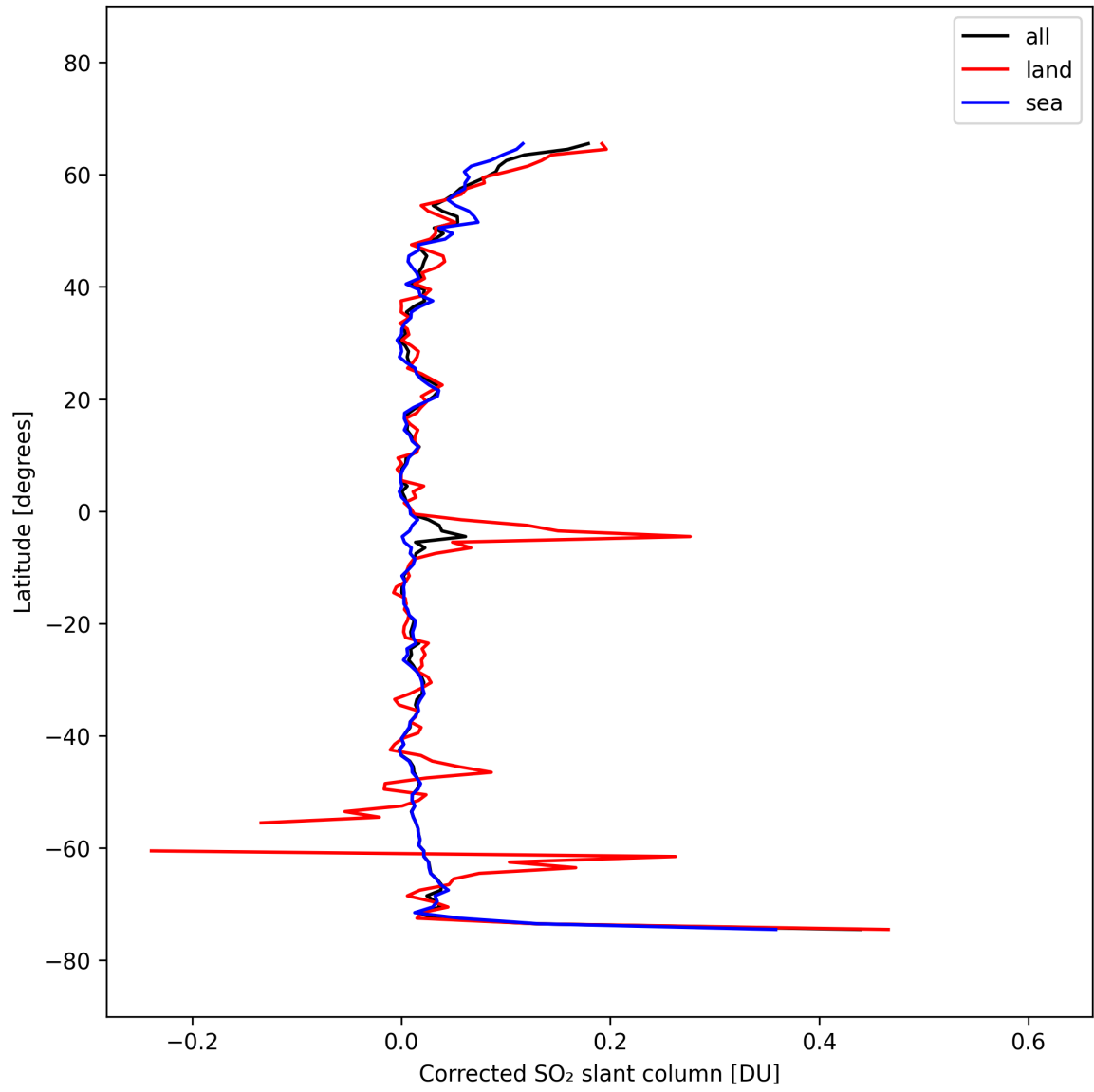


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-03-09 to 2025-03-10.

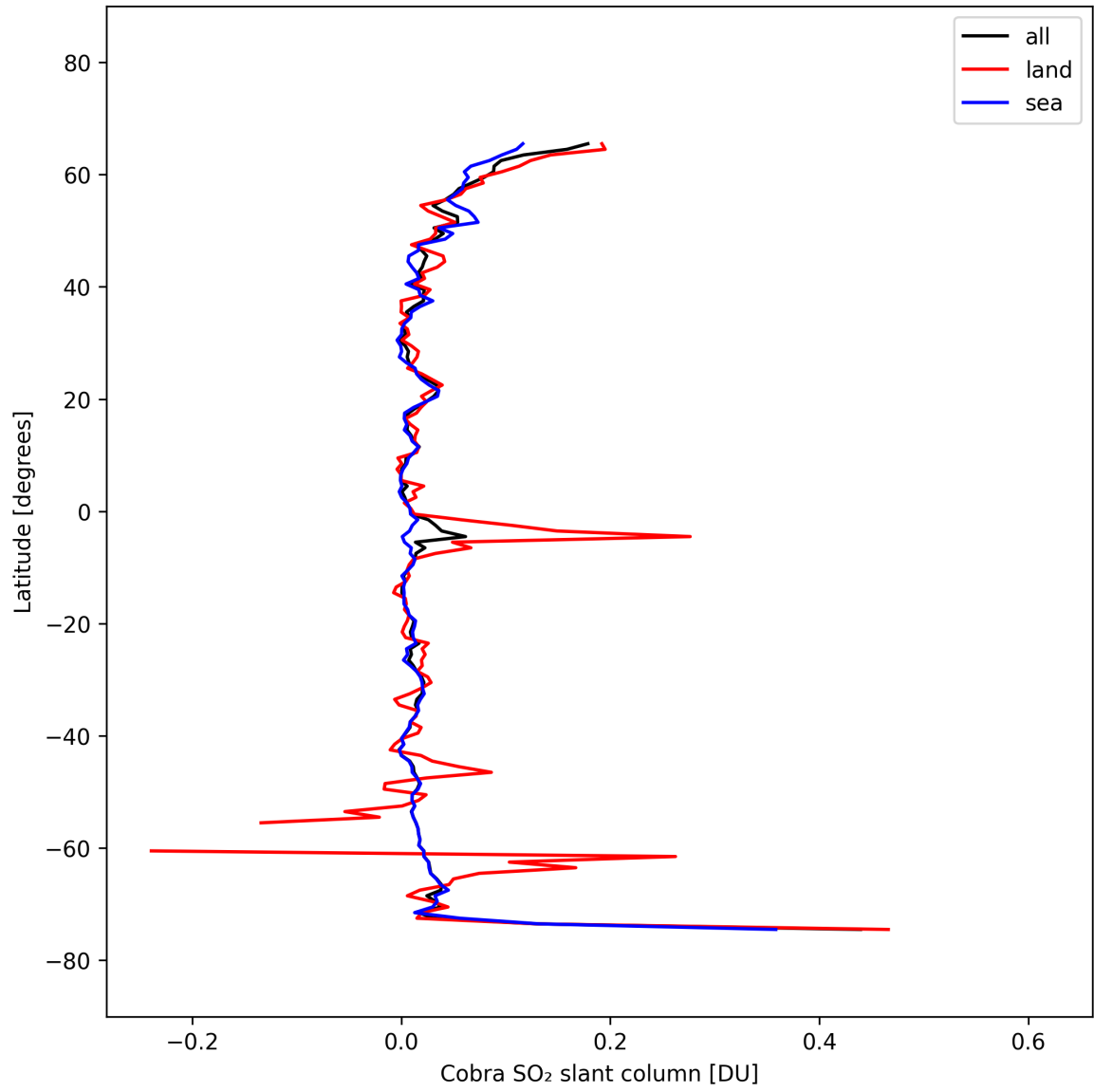


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-03-09 to 2025-03-10.

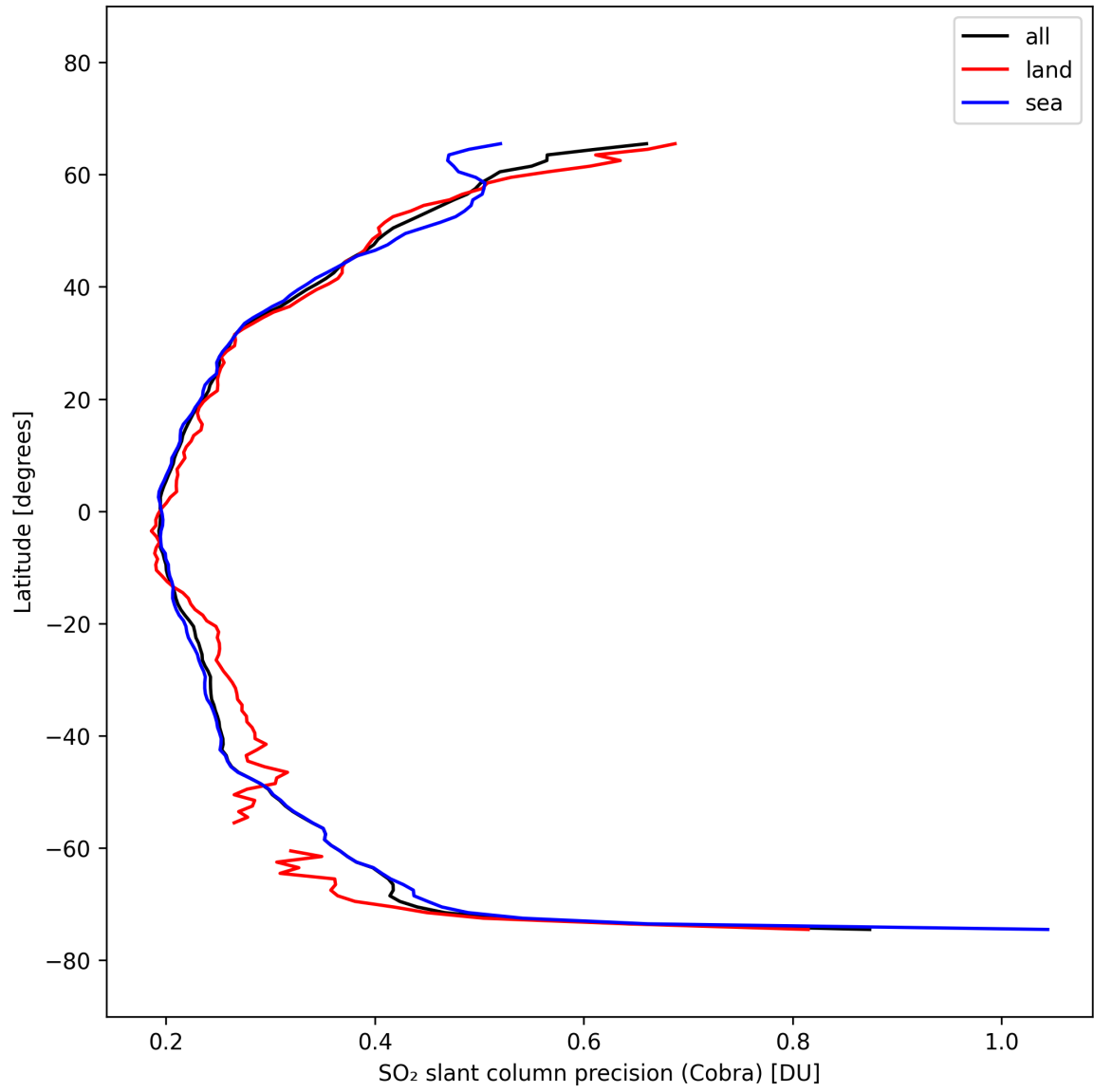


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-03-09 to 2025-03-10.

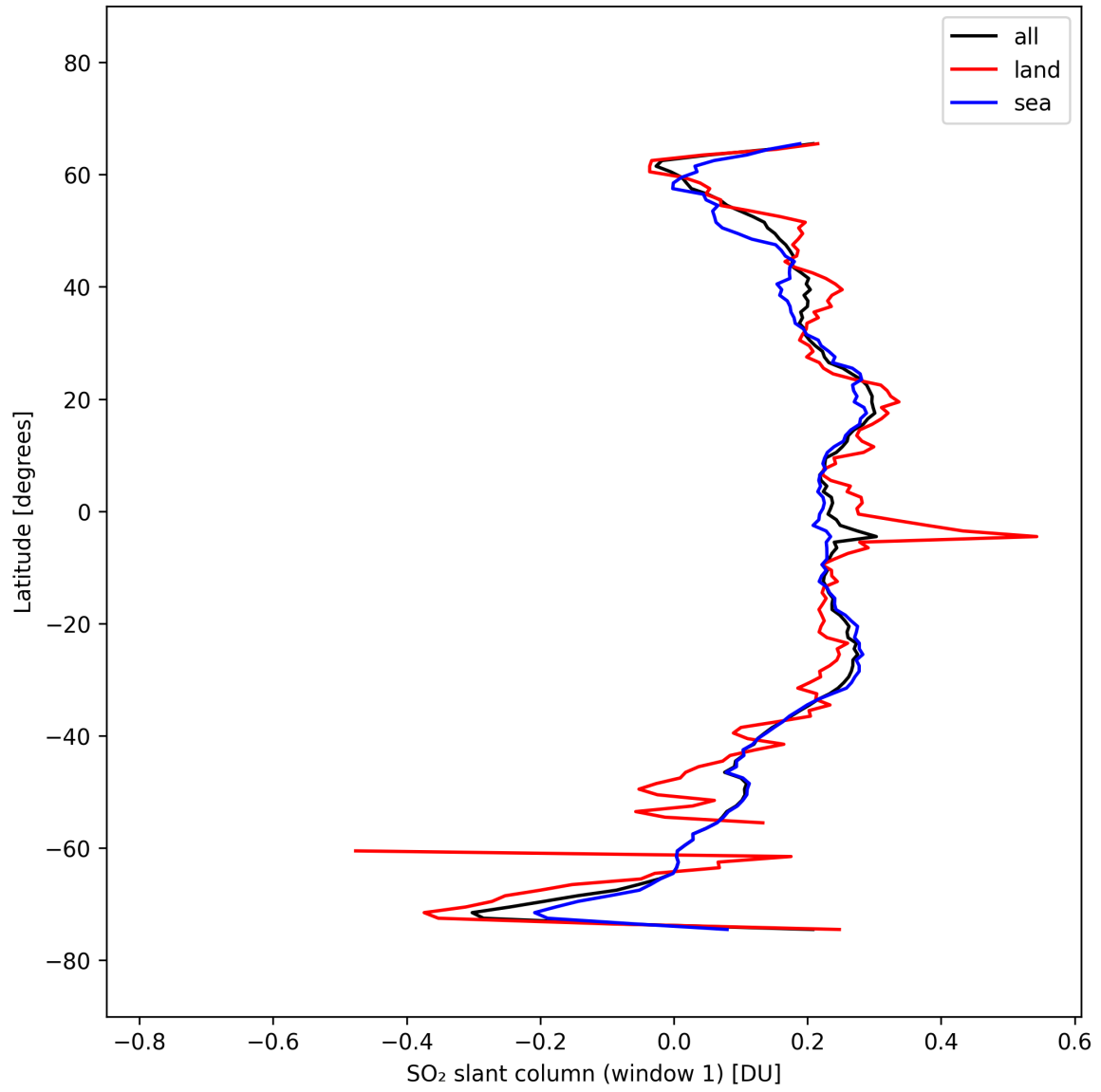


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-03-09 to 2025-03-10.

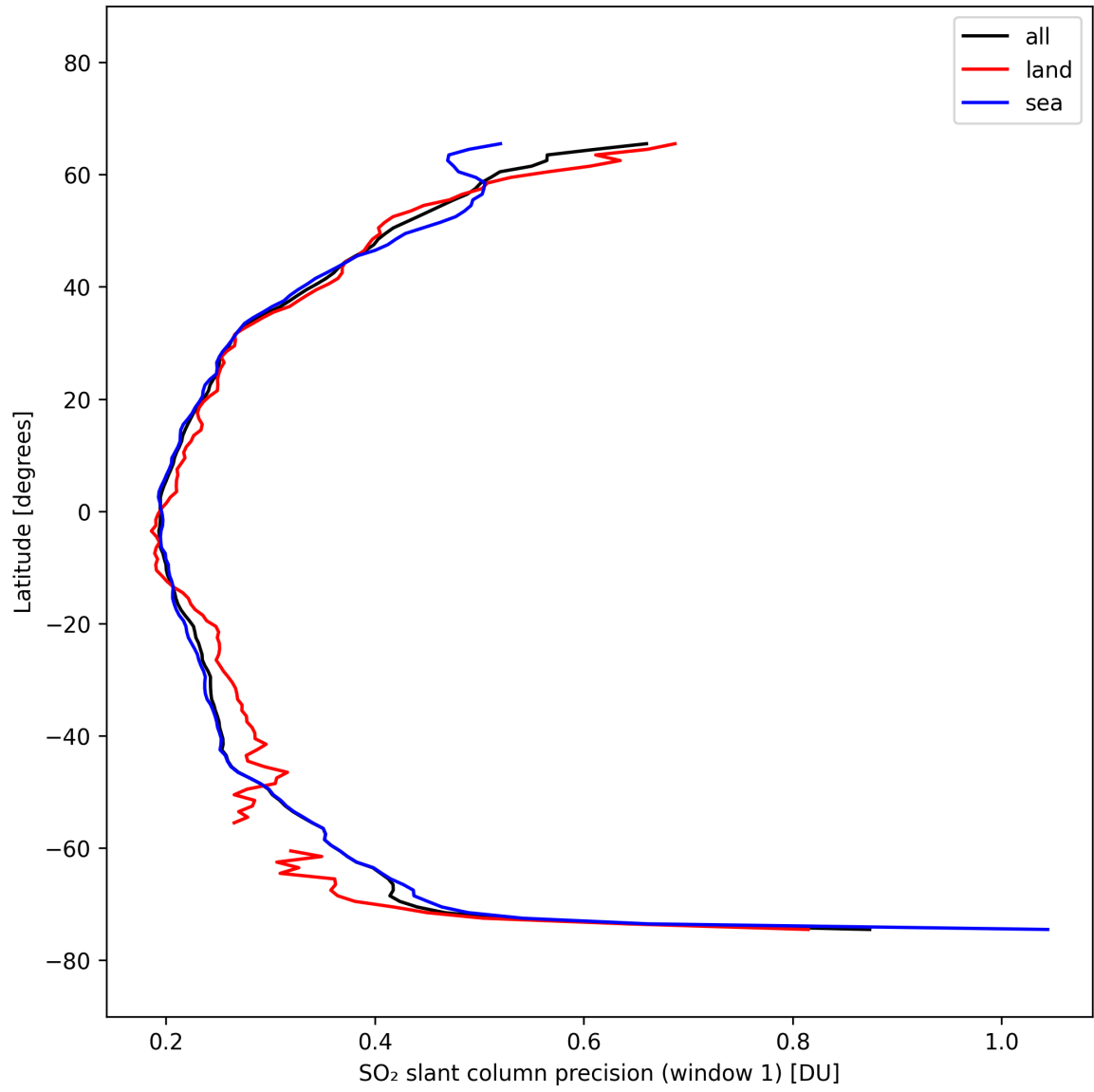


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-03-09 to 2025-03-10.

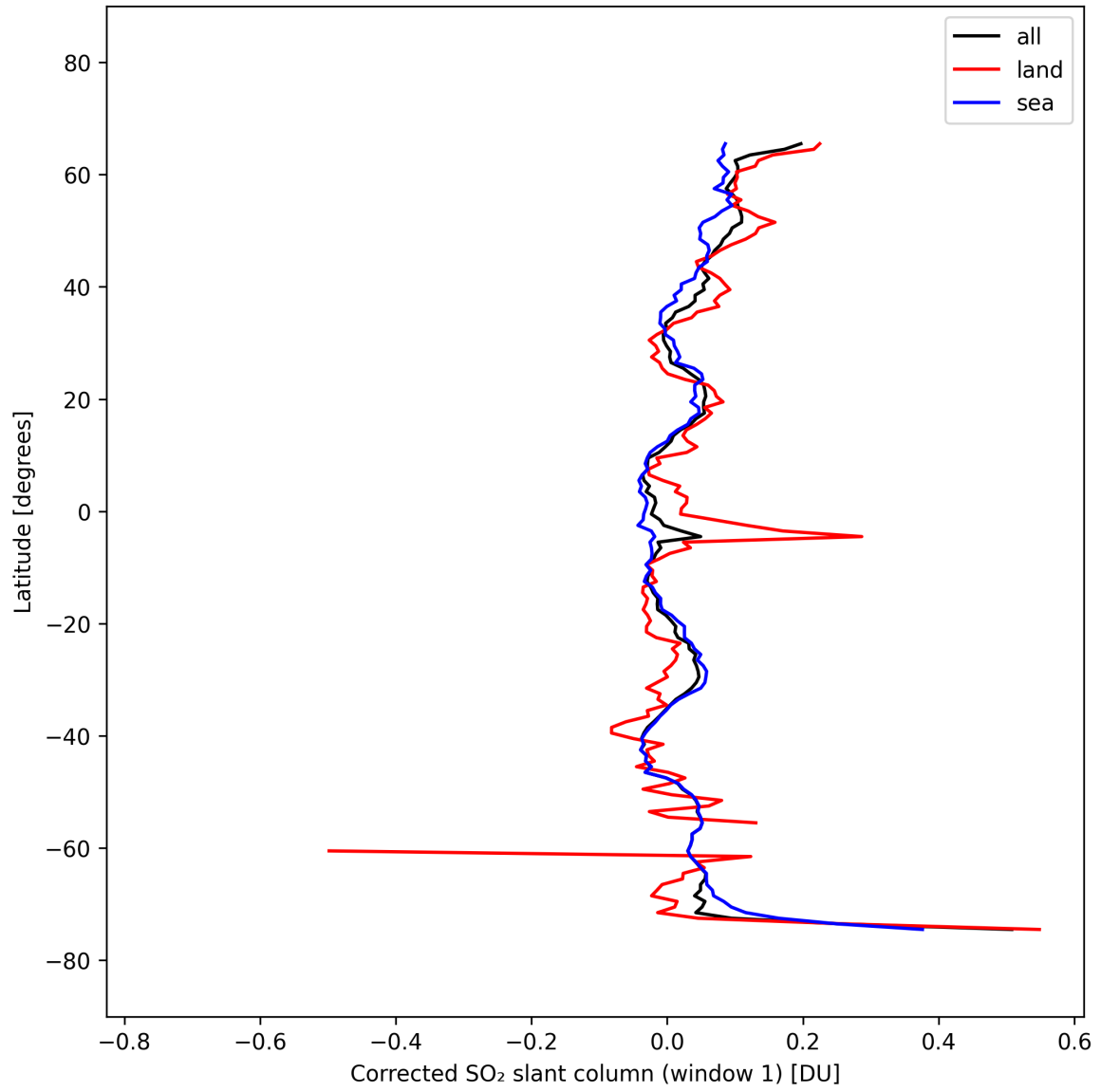


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-03-09 to 2025-03-10.

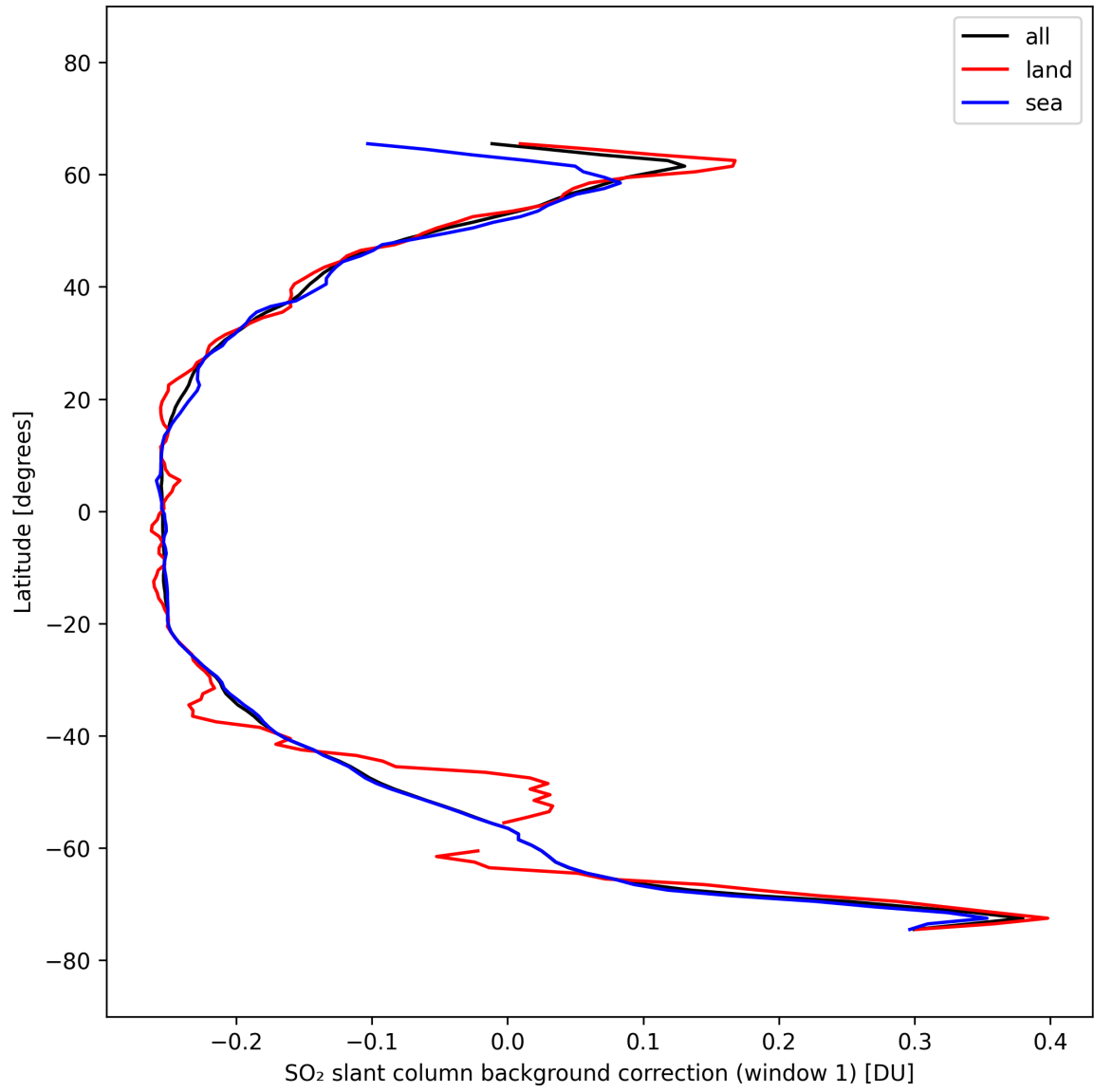


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-03-09 to 2025-03-10.

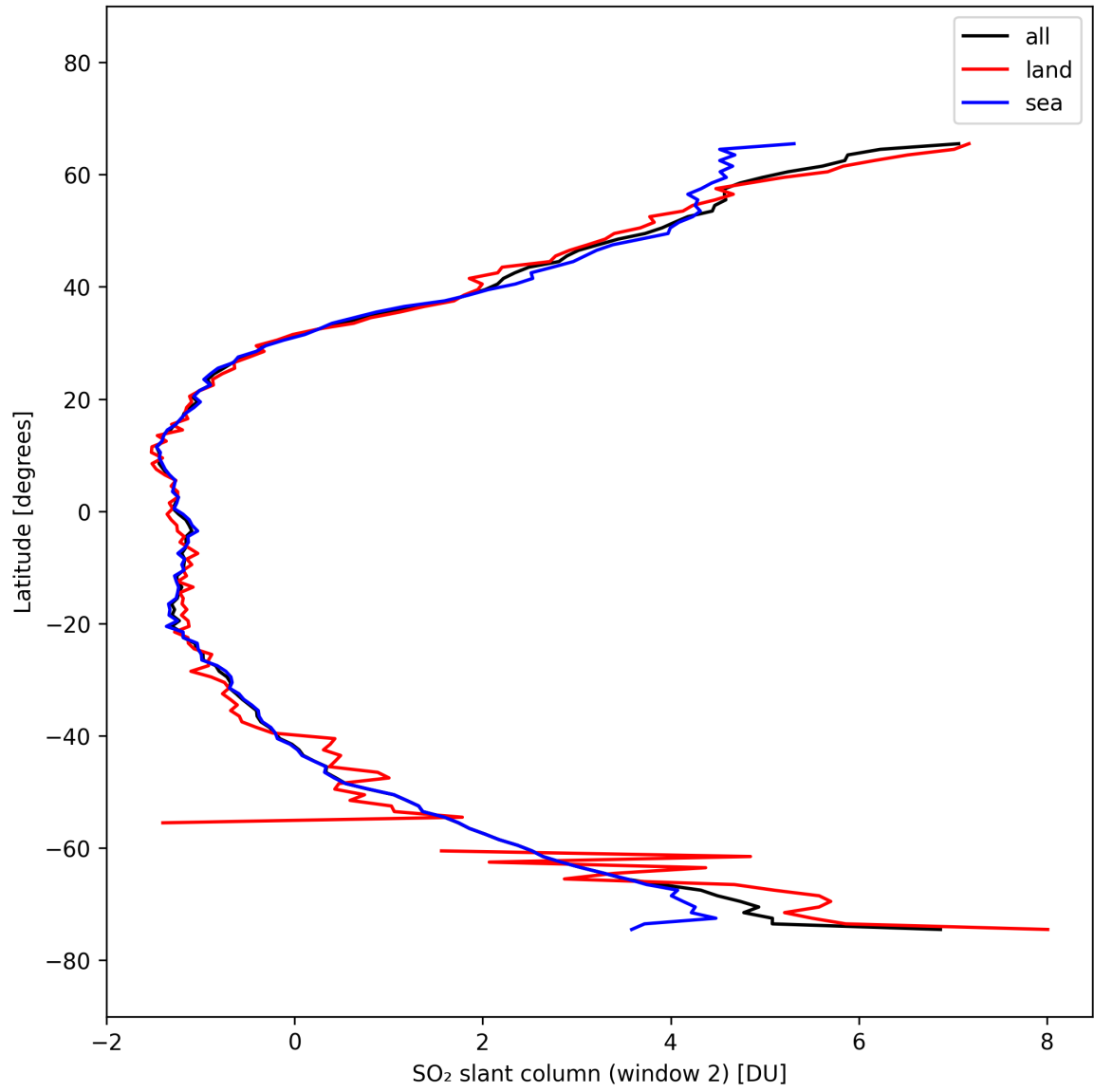


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-03-09 to 2025-03-10.

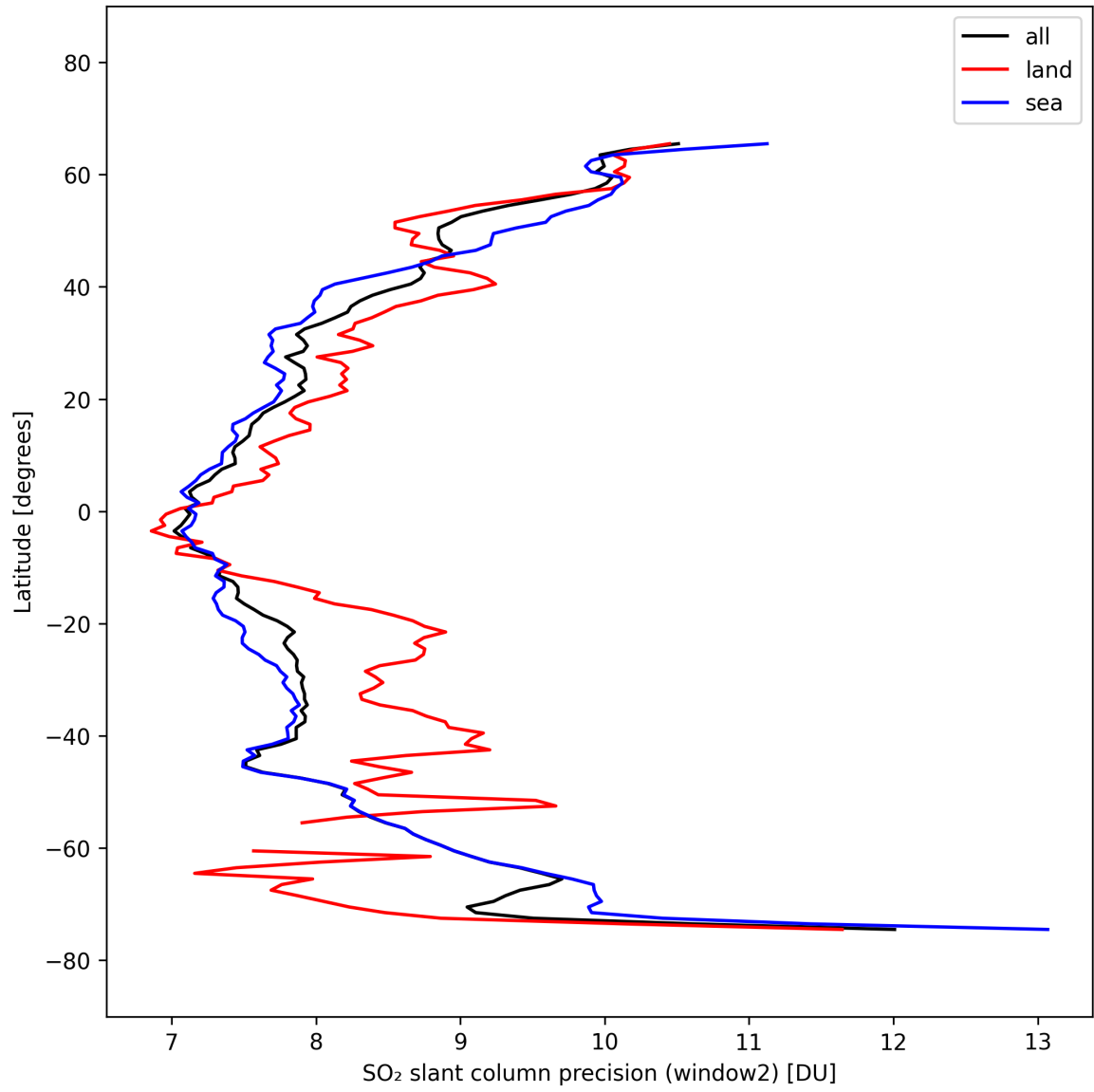


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-03-09 to 2025-03-10.

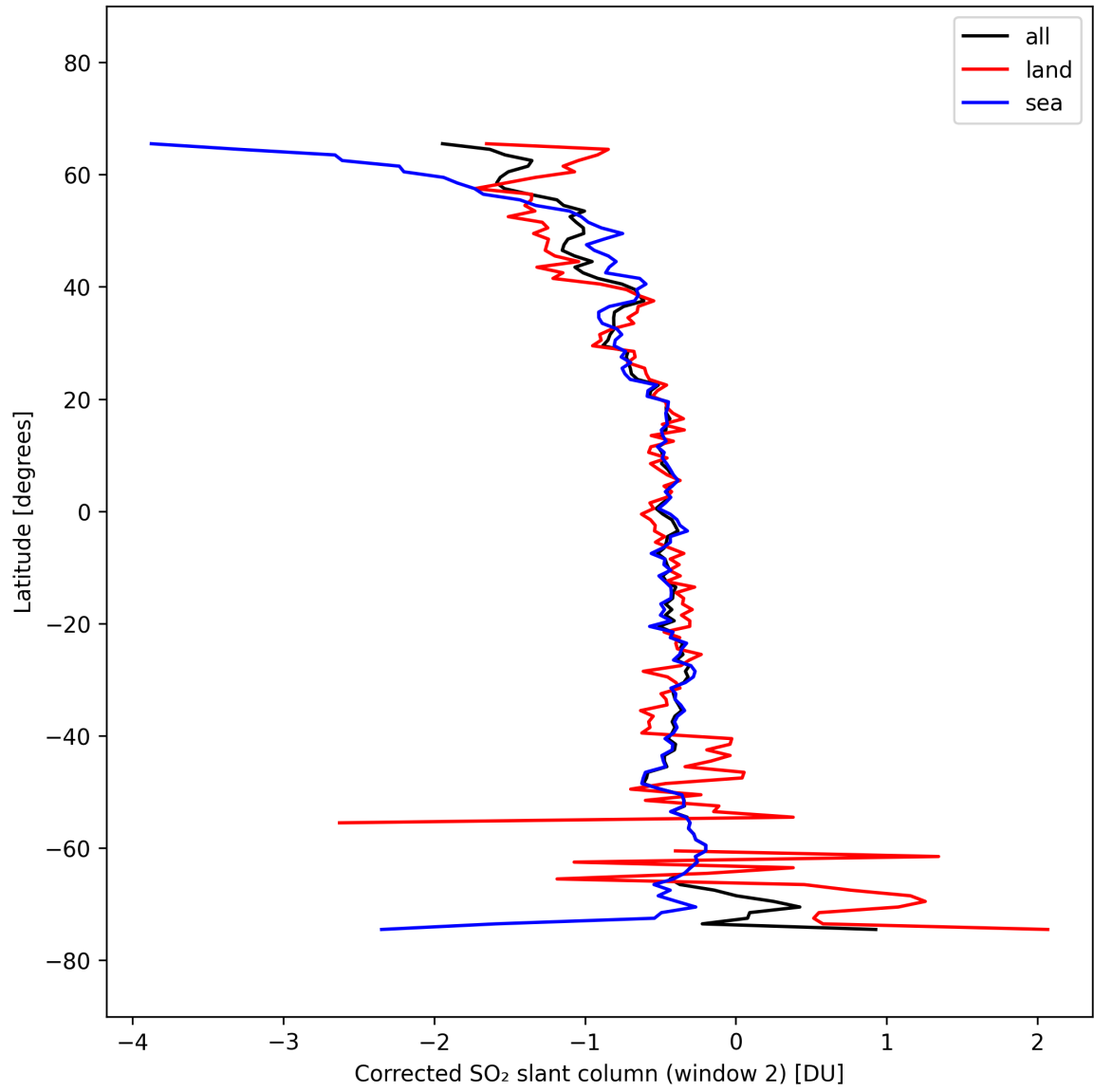


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-03-09 to 2025-03-10.

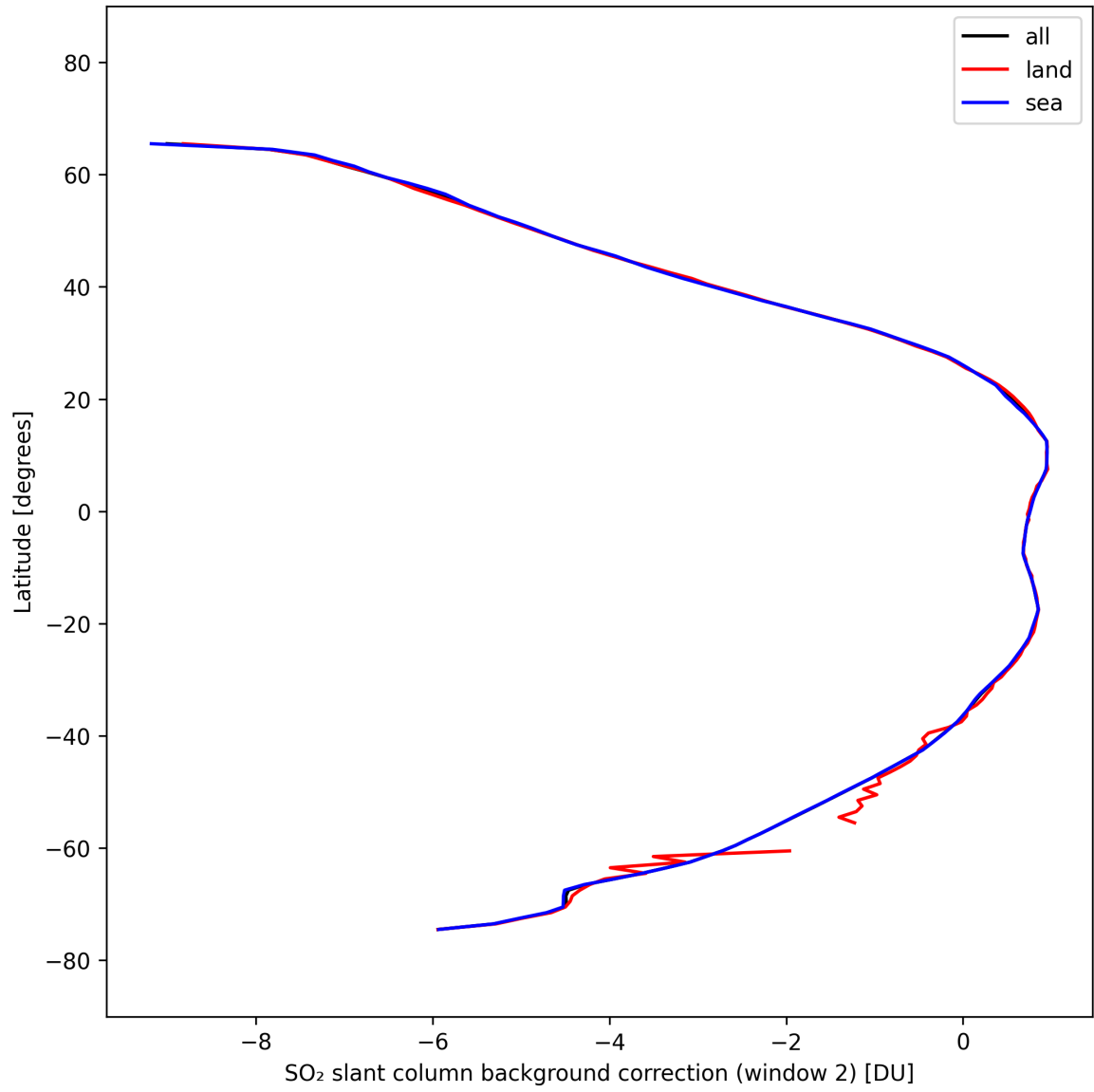


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-03-09 to 2025-03-10.

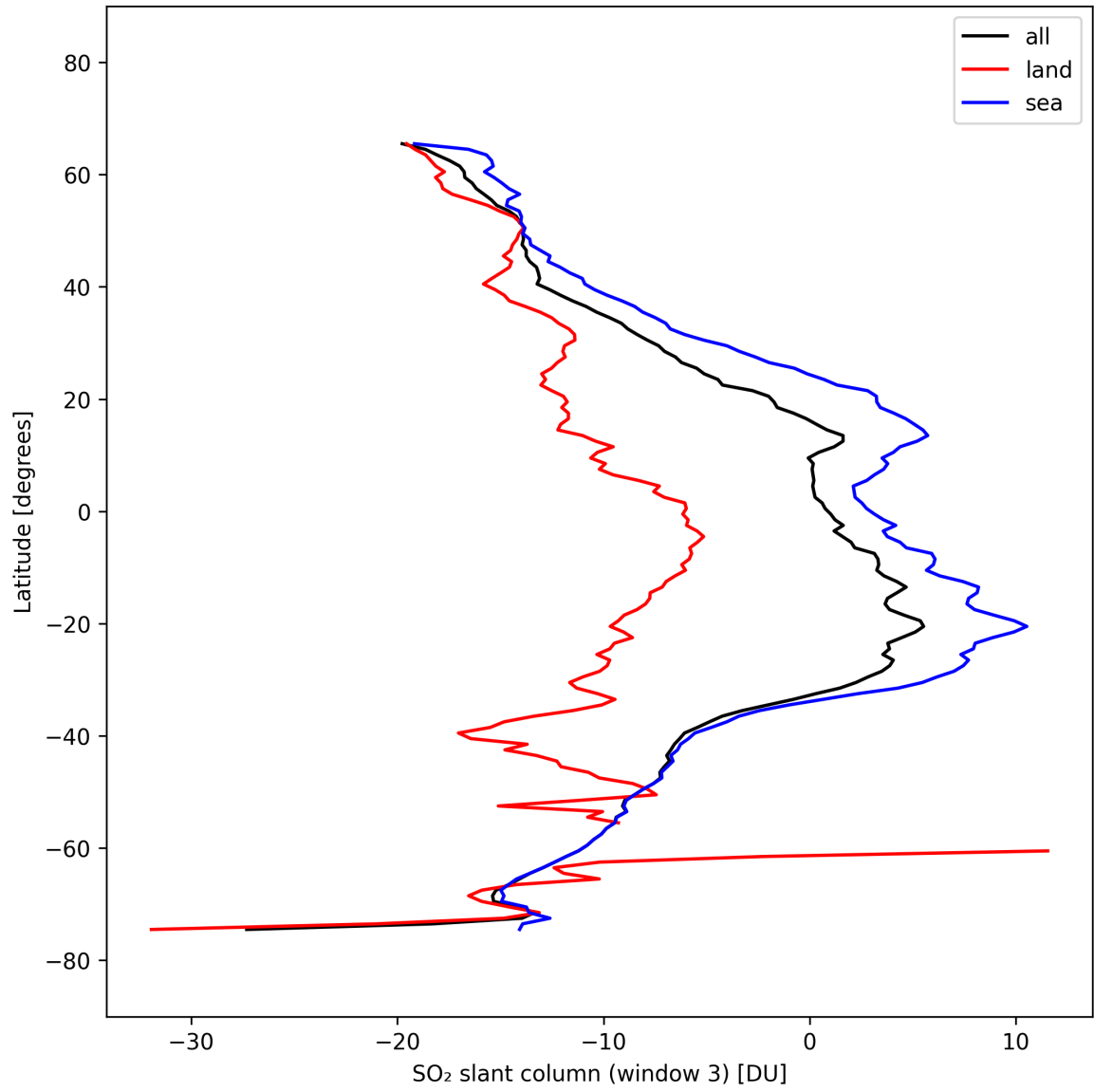


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-03-09 to 2025-03-10.

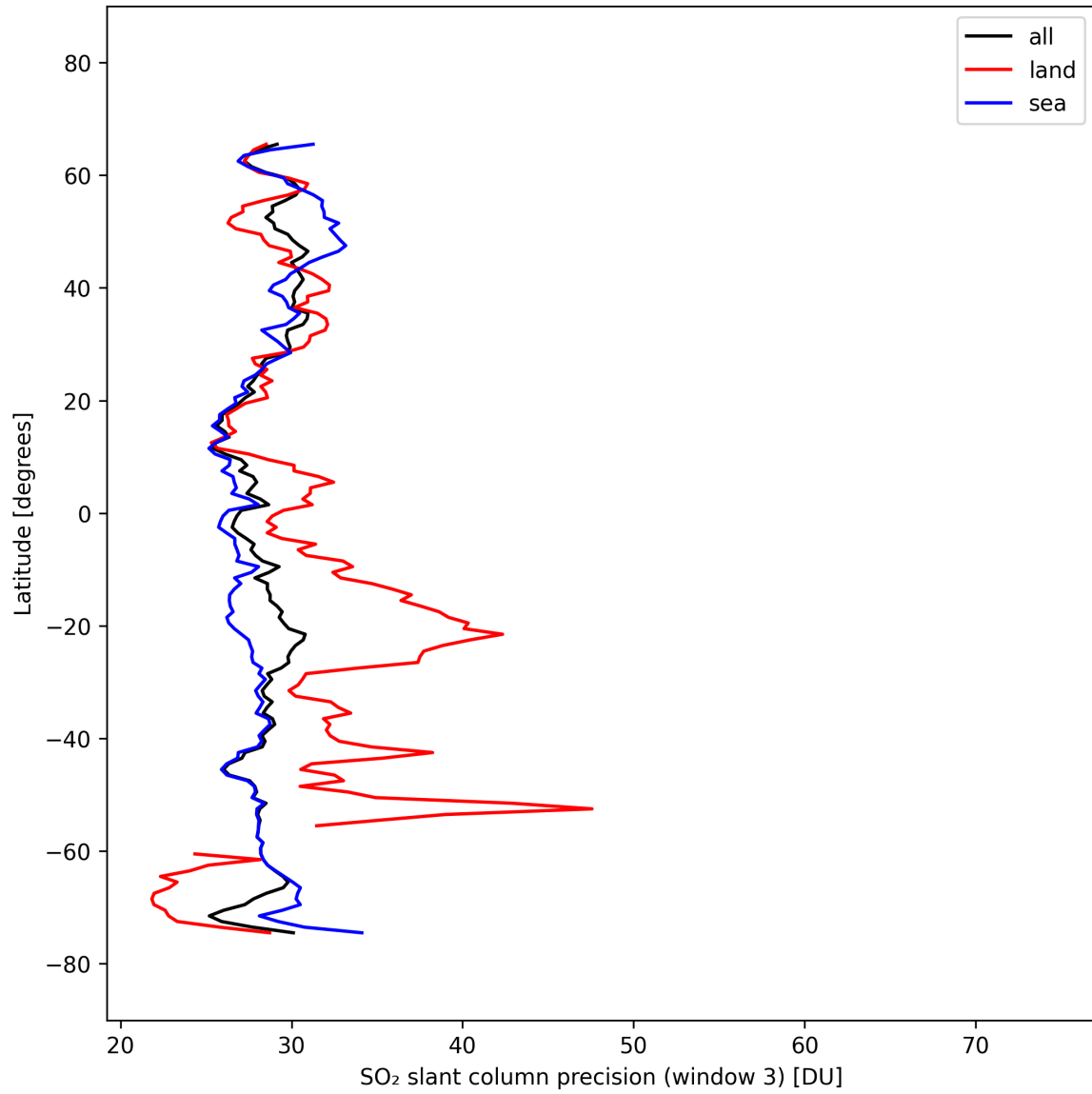


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-03-09 to 2025-03-10.

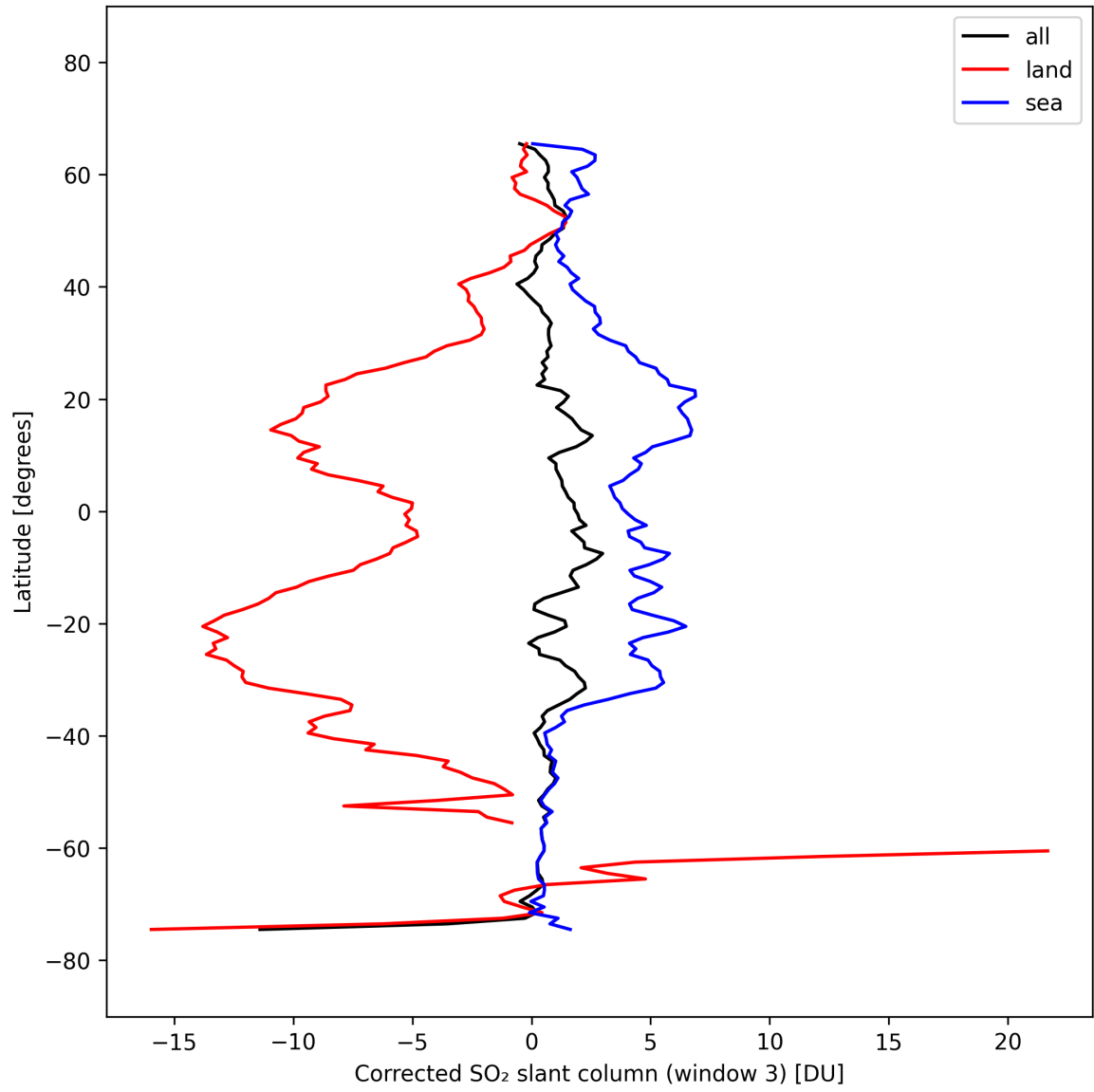


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-03-09 to 2025-03-10.

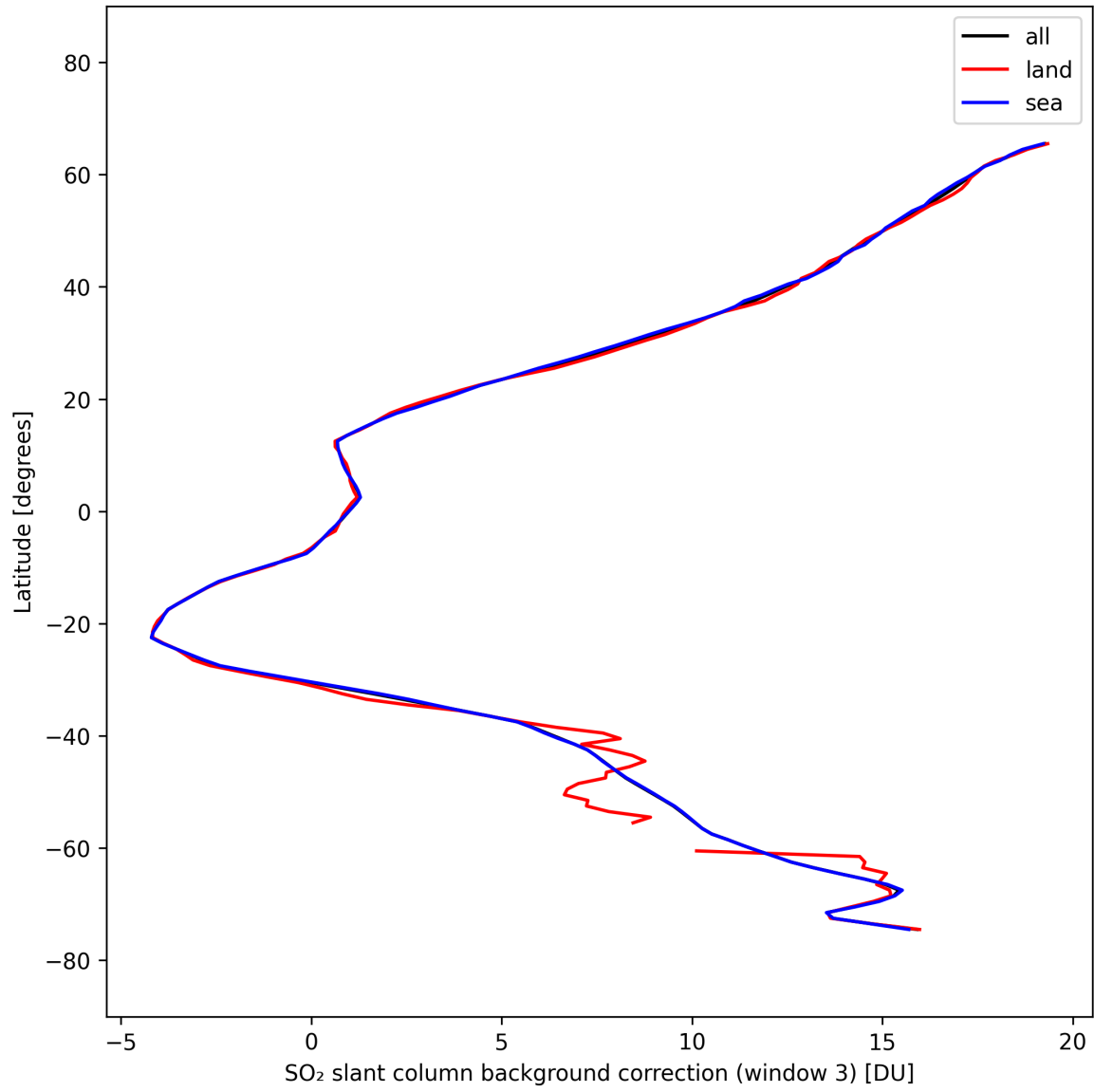


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-03-09 to 2025-03-10.

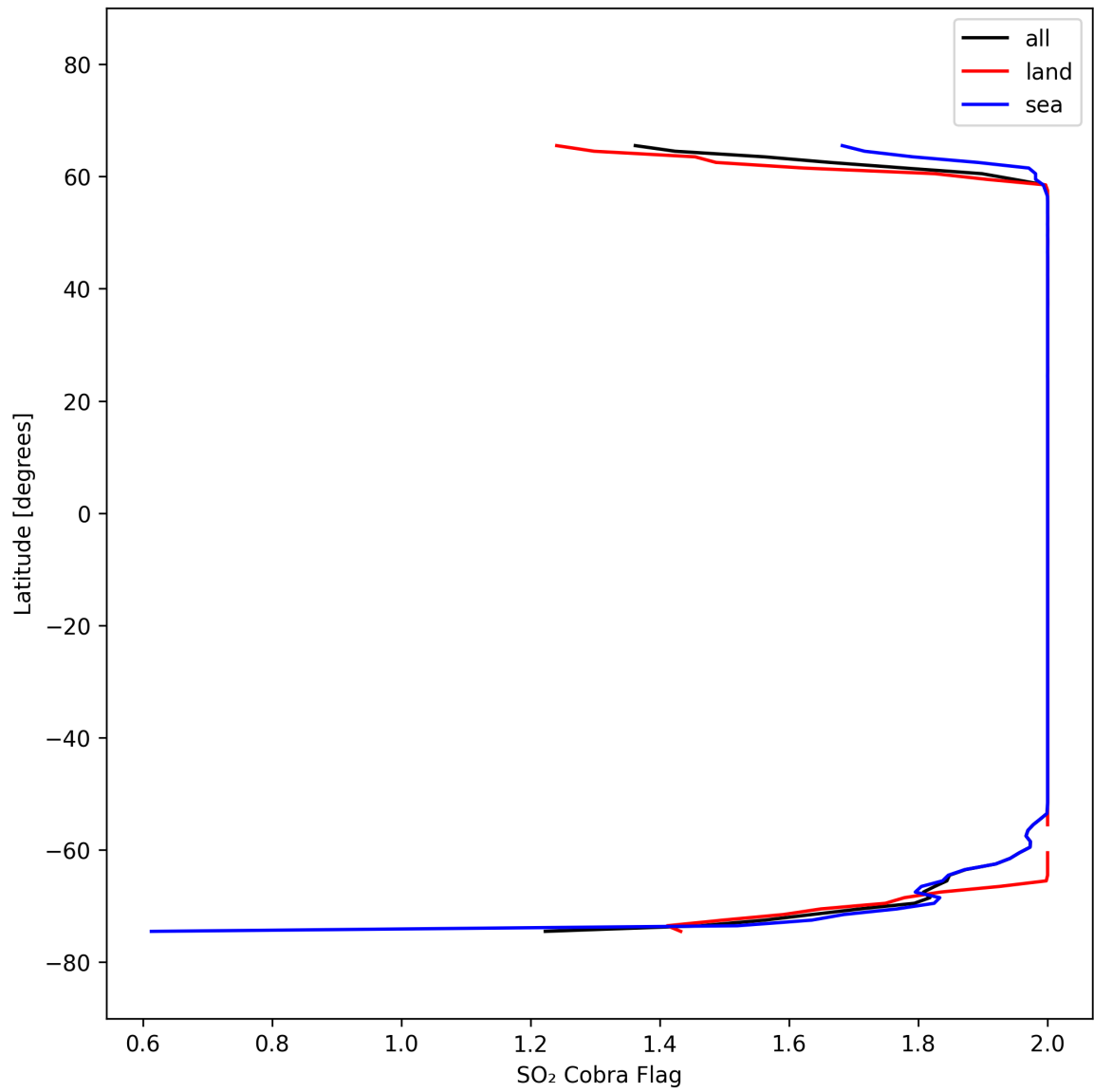


Figure 48: Zonal average of “SO₂ Cobra Flag” for 2025-03-09 to 2025-03-10.

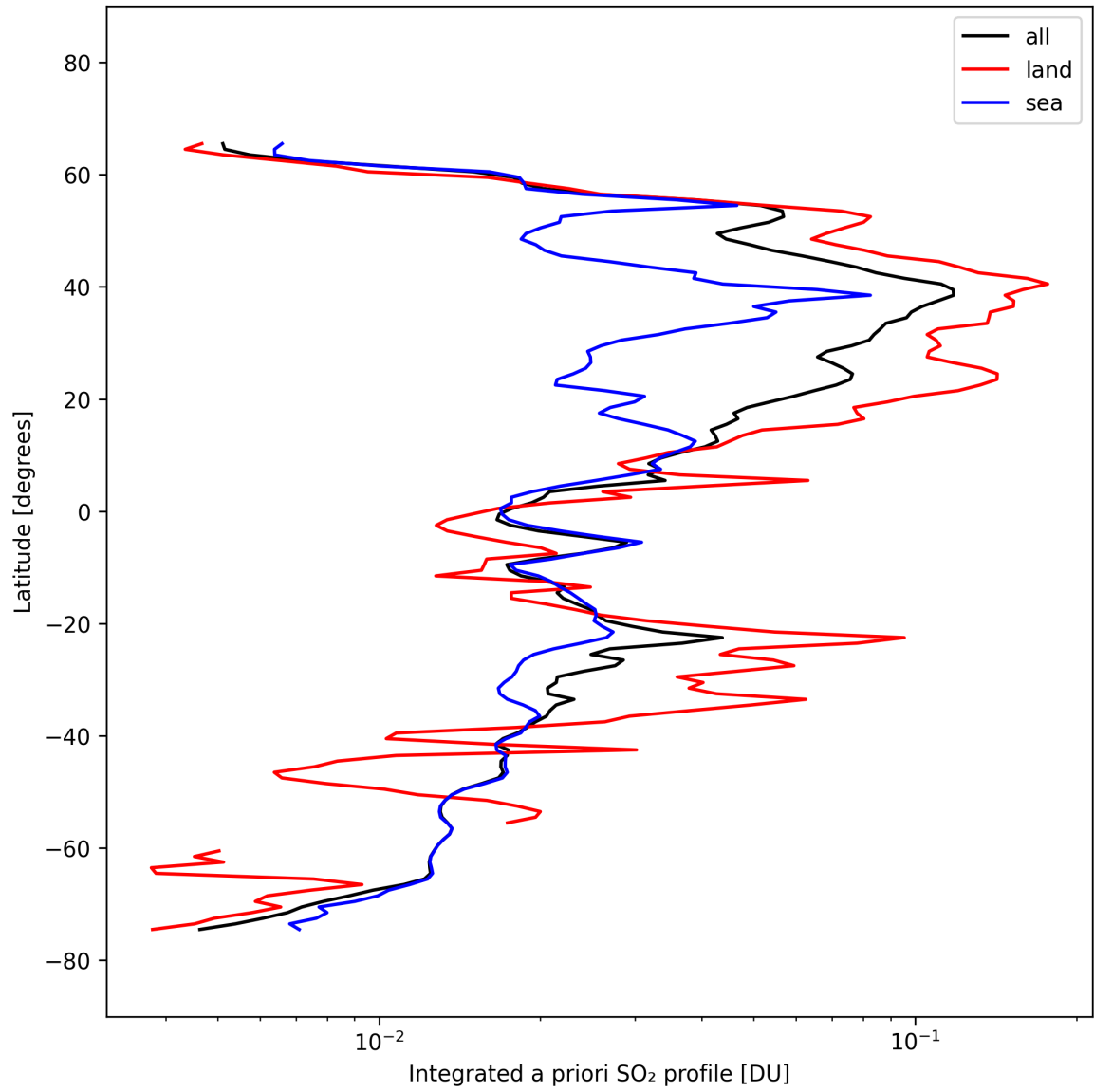


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-03-09 to 2025-03-10.

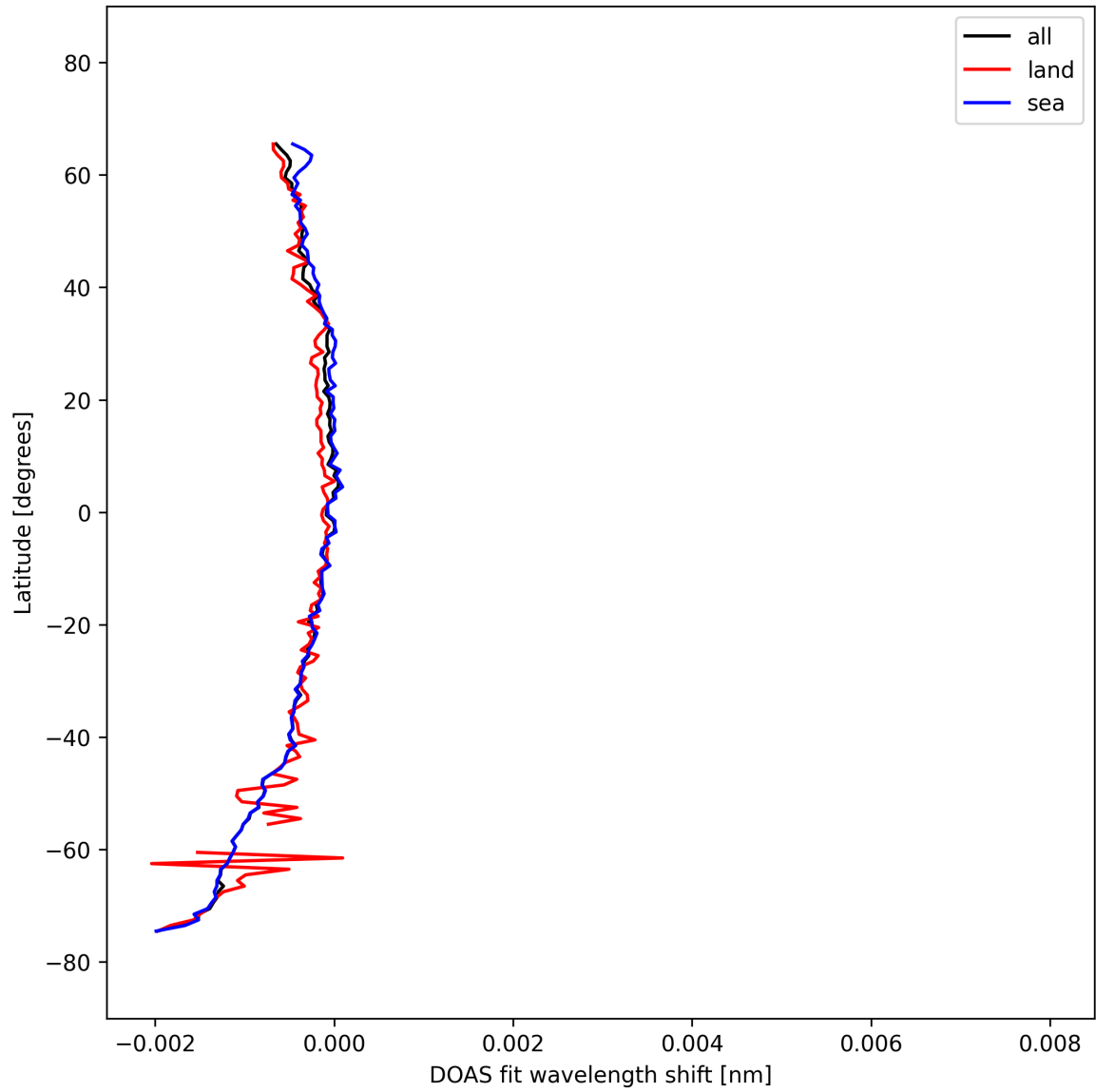


Figure 50: Zonal average of "DOAS fit wavelength shift" for 2025-03-09 to 2025-03-10.

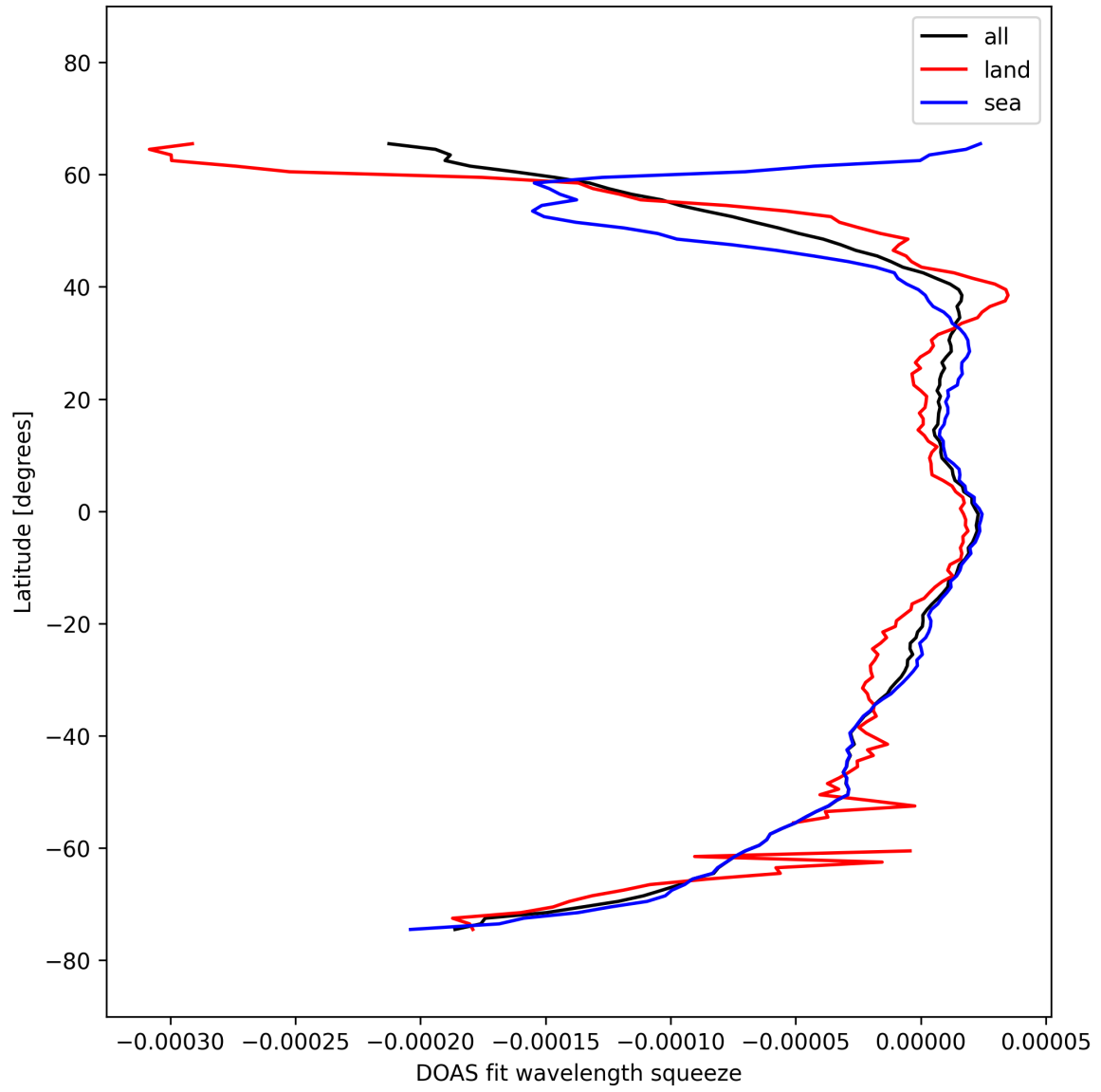


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-03-09 to 2025-03-10.

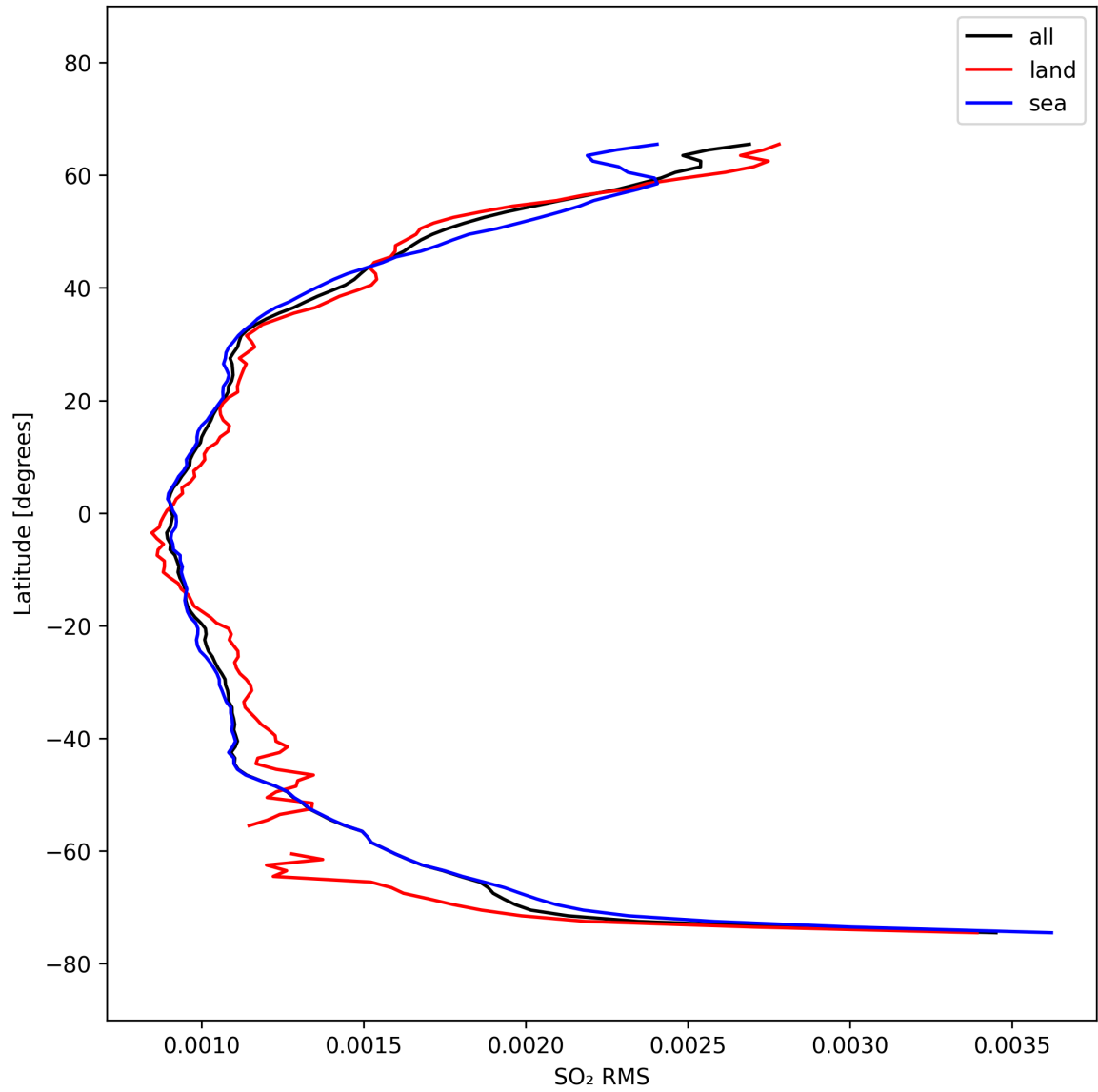


Figure 52: Zonal average of “SO₂ RMS” for 2025-03-09 to 2025-03-10.

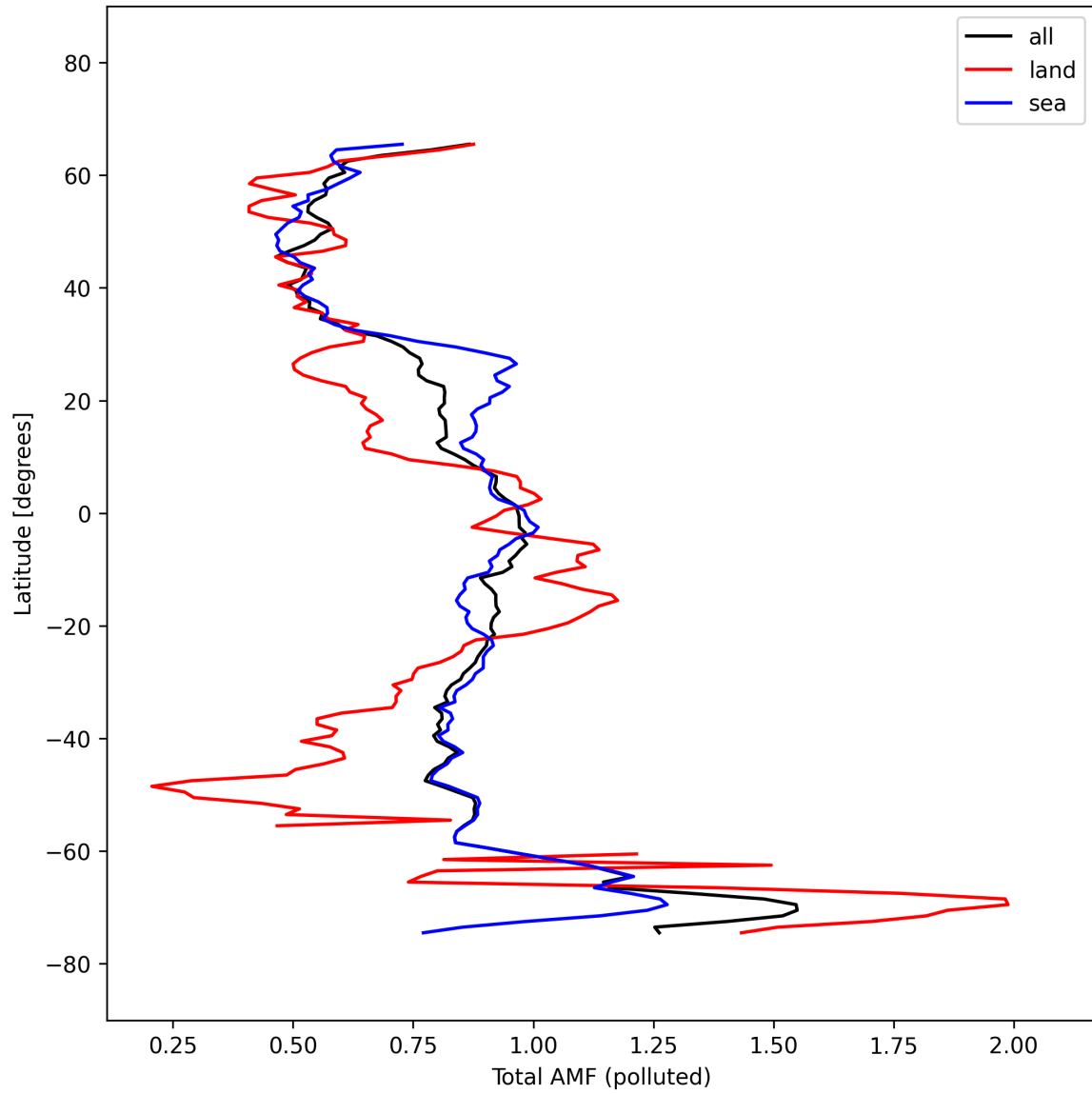


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-03-09 to 2025-03-10.

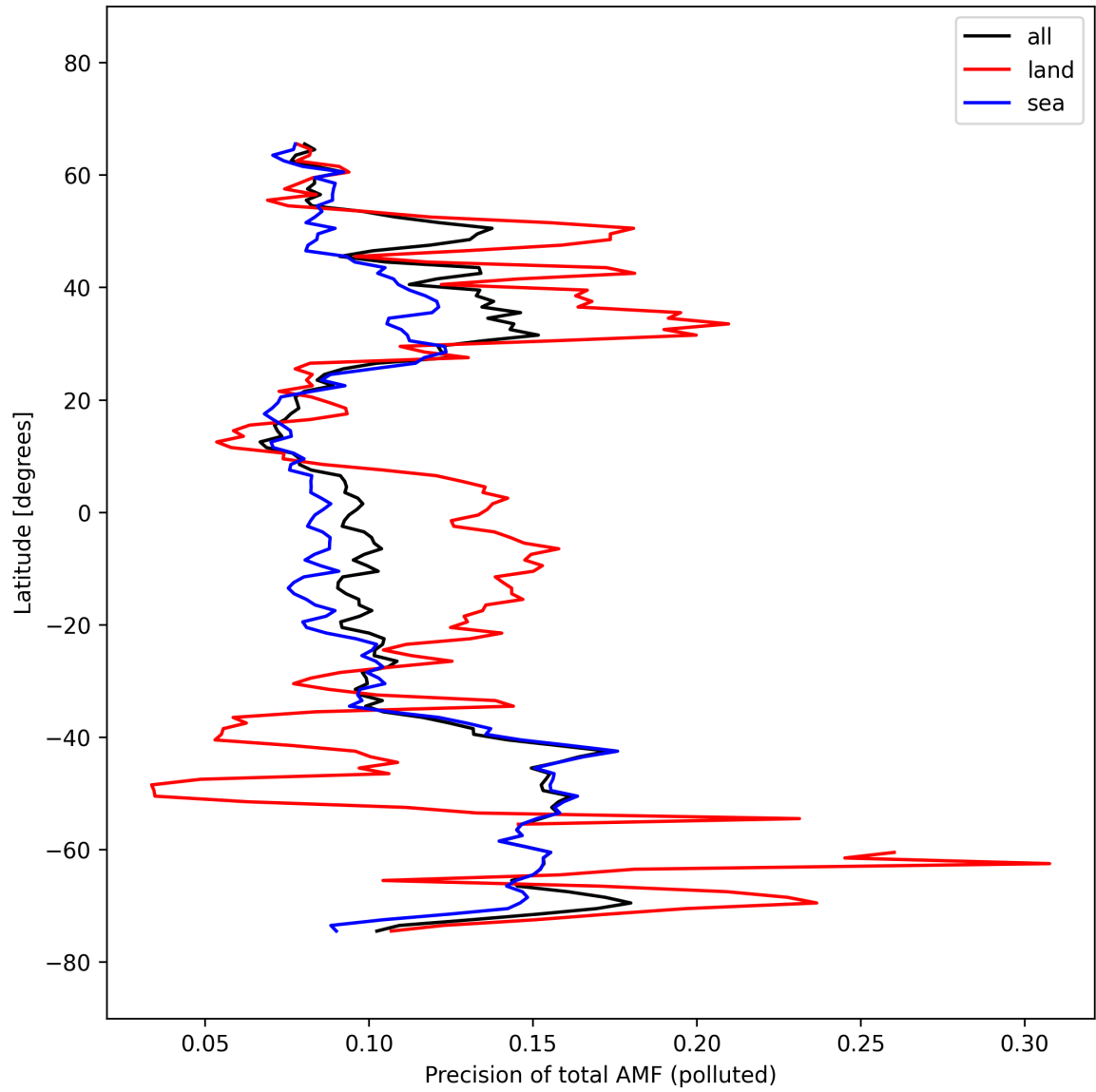


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-03-09 to 2025-03-10.

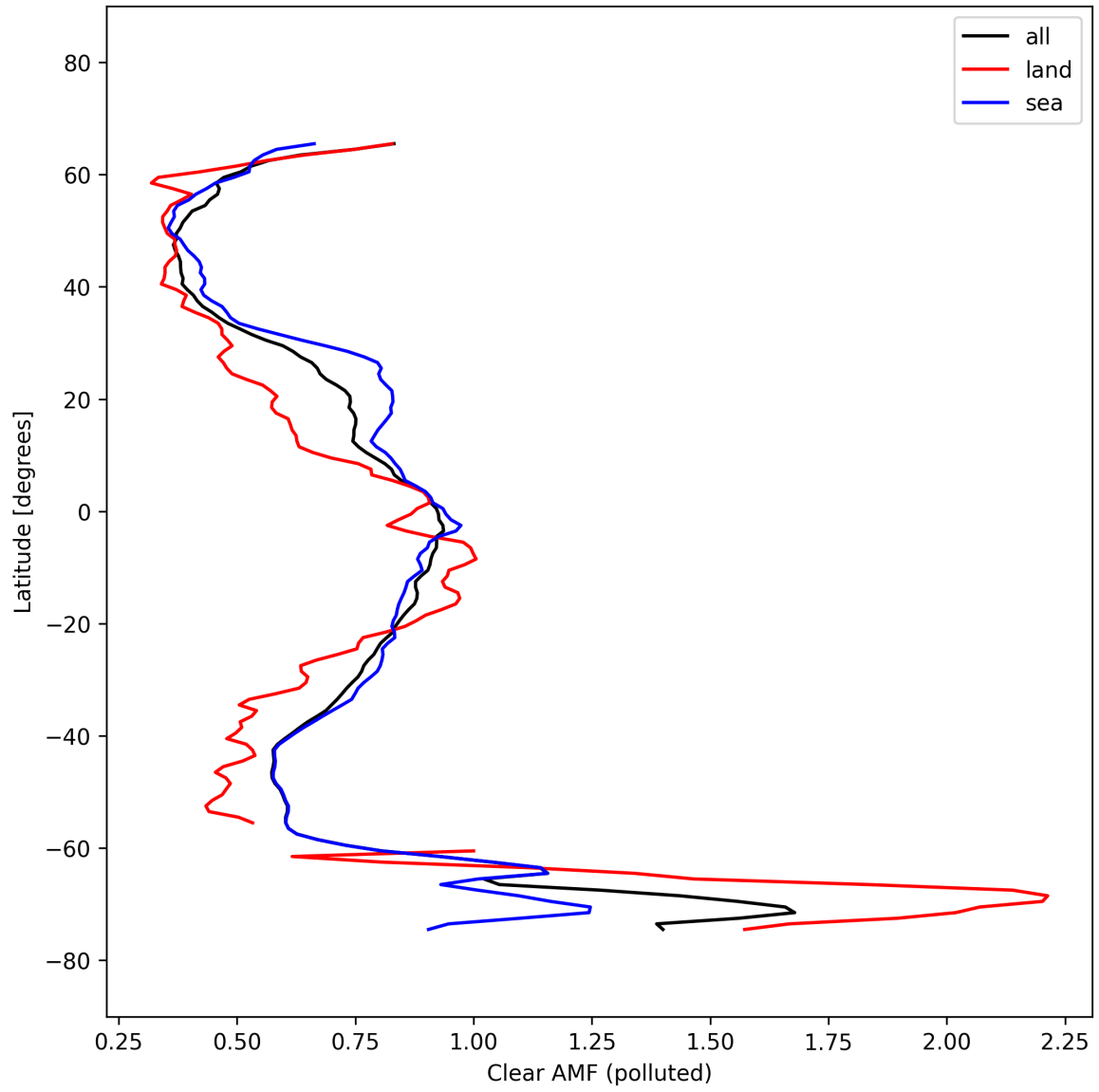


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-03-09 to 2025-03-10.

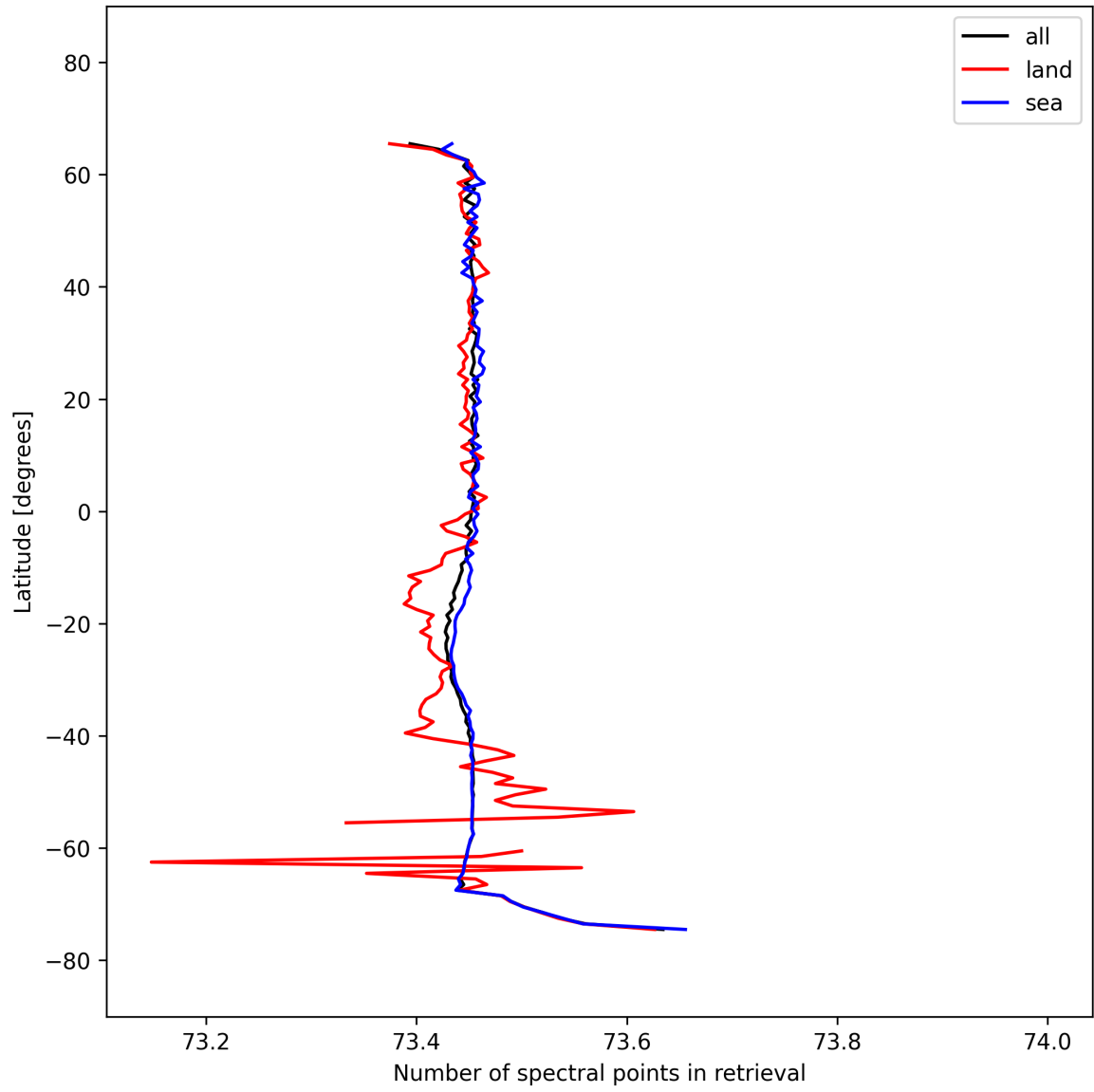


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-03-09 to 2025-03-10.

8 Histograms

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

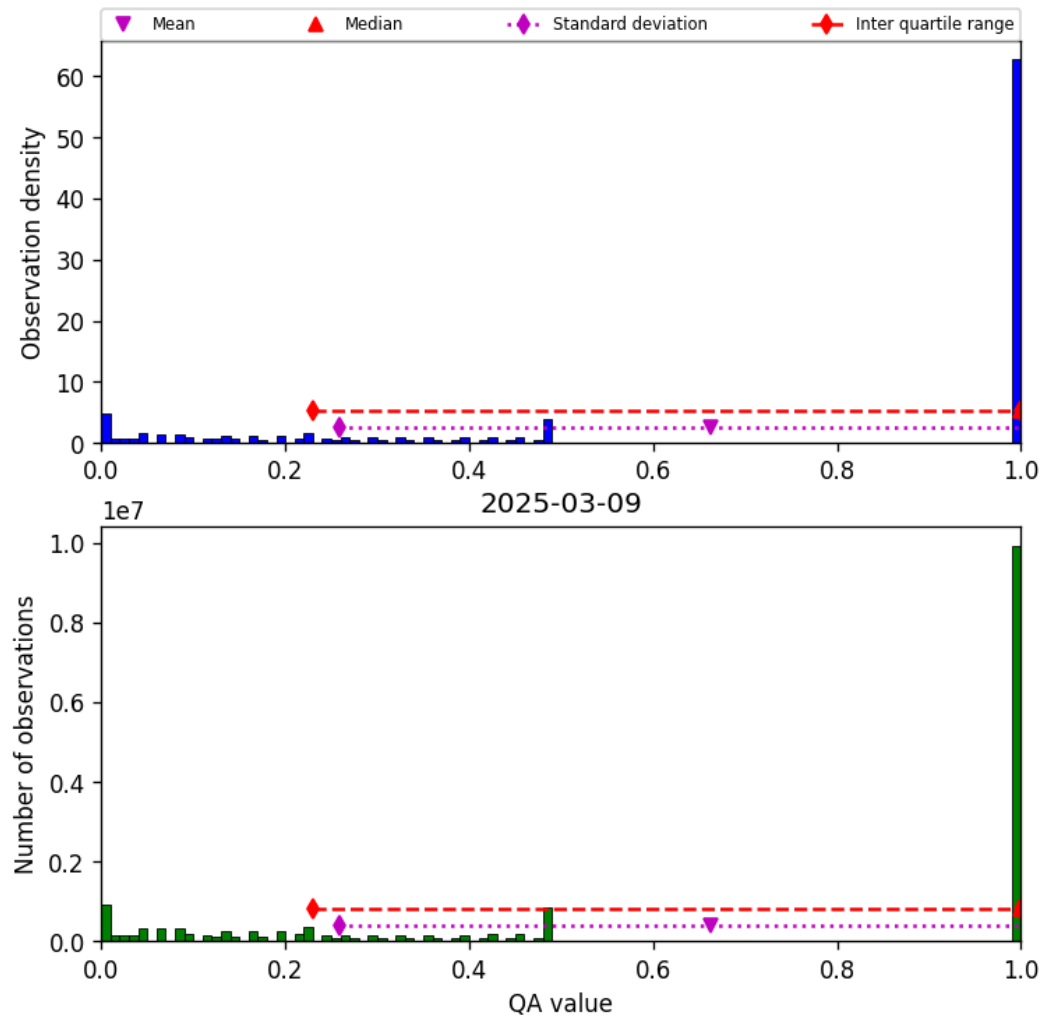


Figure 57: Histogram of “QA value” for 2025-03-09 to 2025-03-10

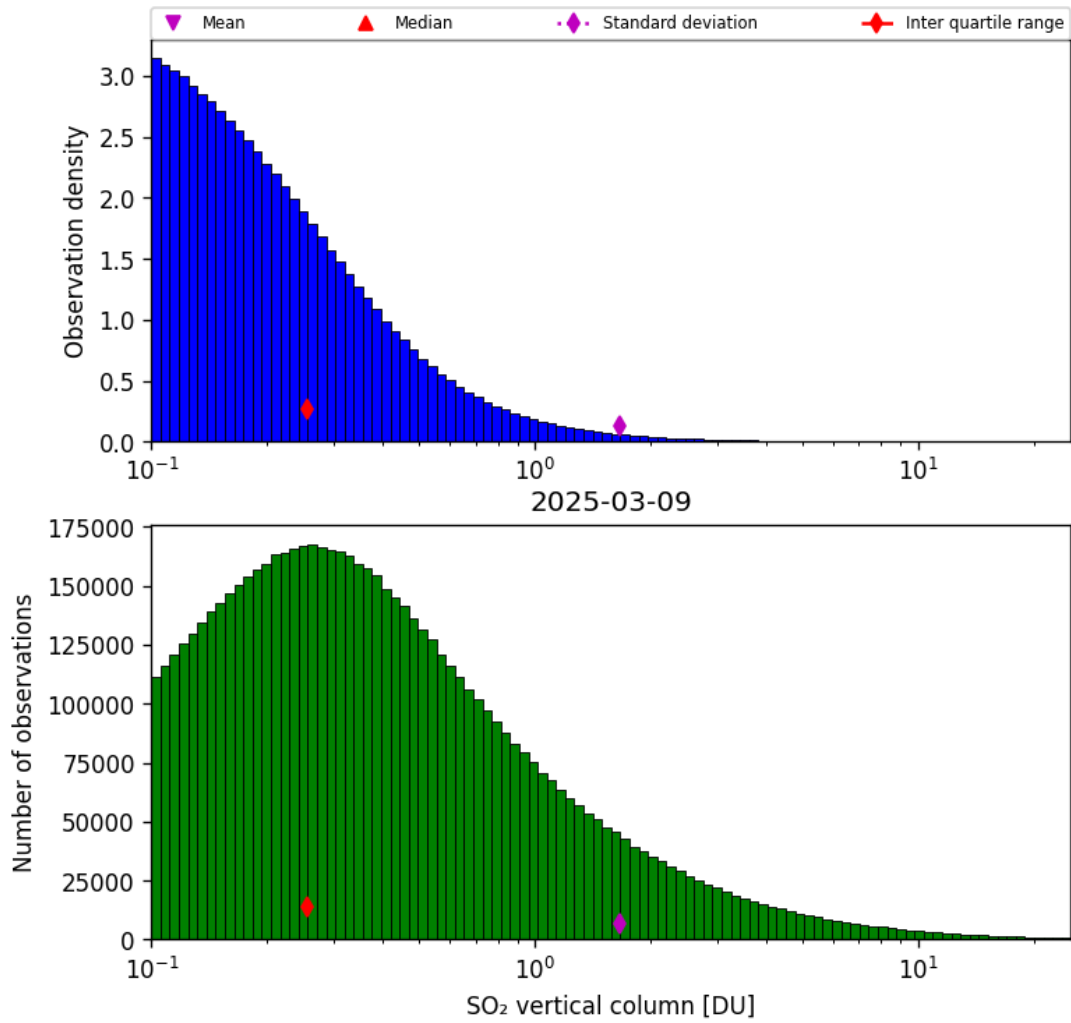


Figure 58: Histogram of “SO₂ vertical column” for 2025-03-09 to 2025-03-10

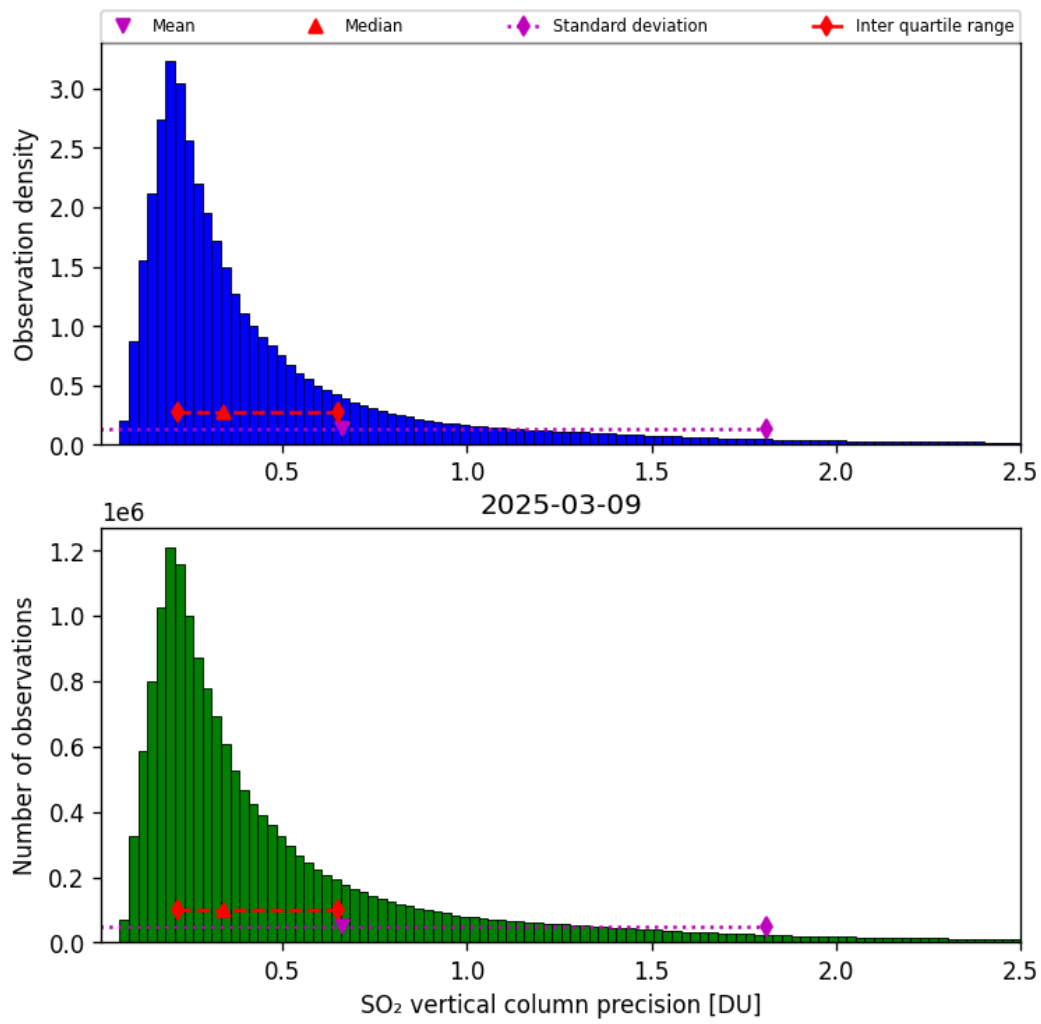


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-03-09 to 2025-03-10

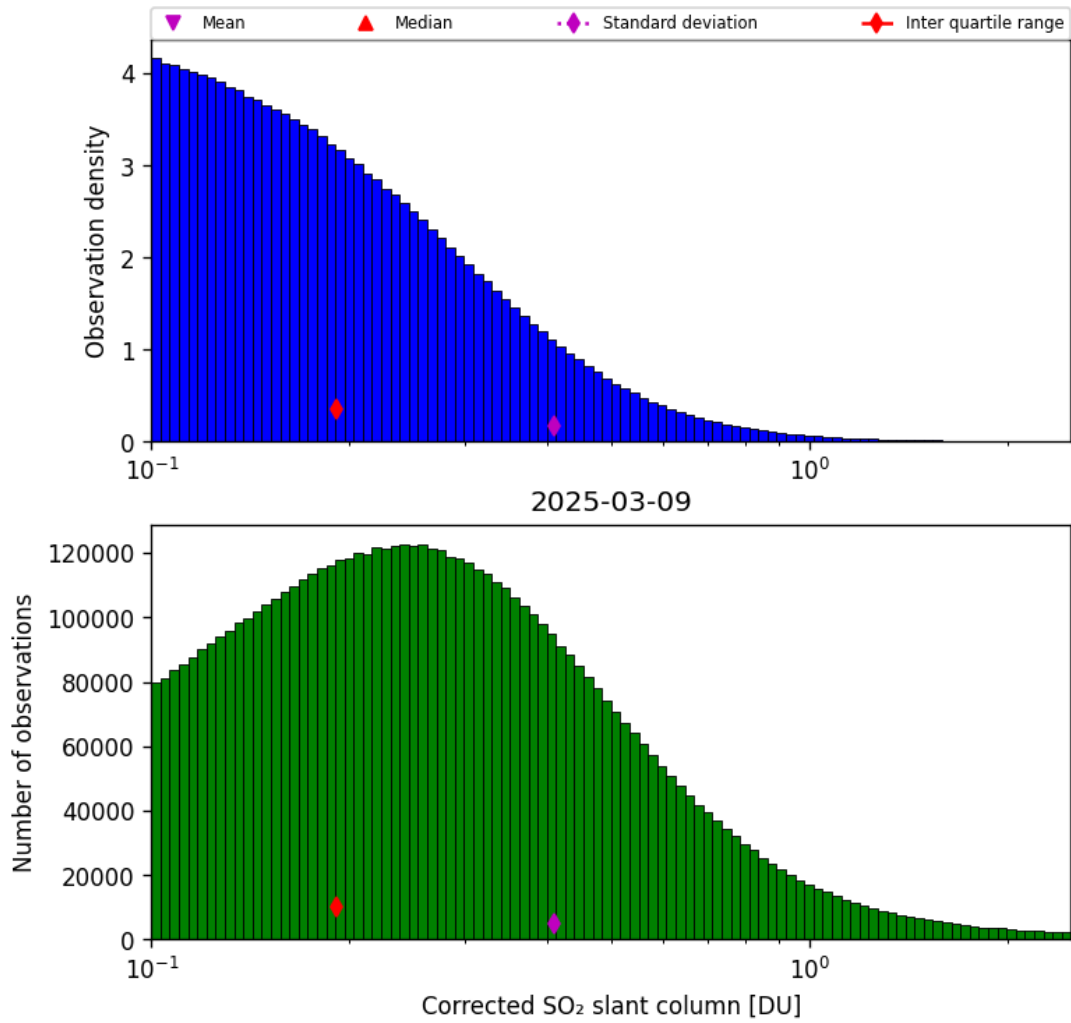


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-03-09 to 2025-03-10

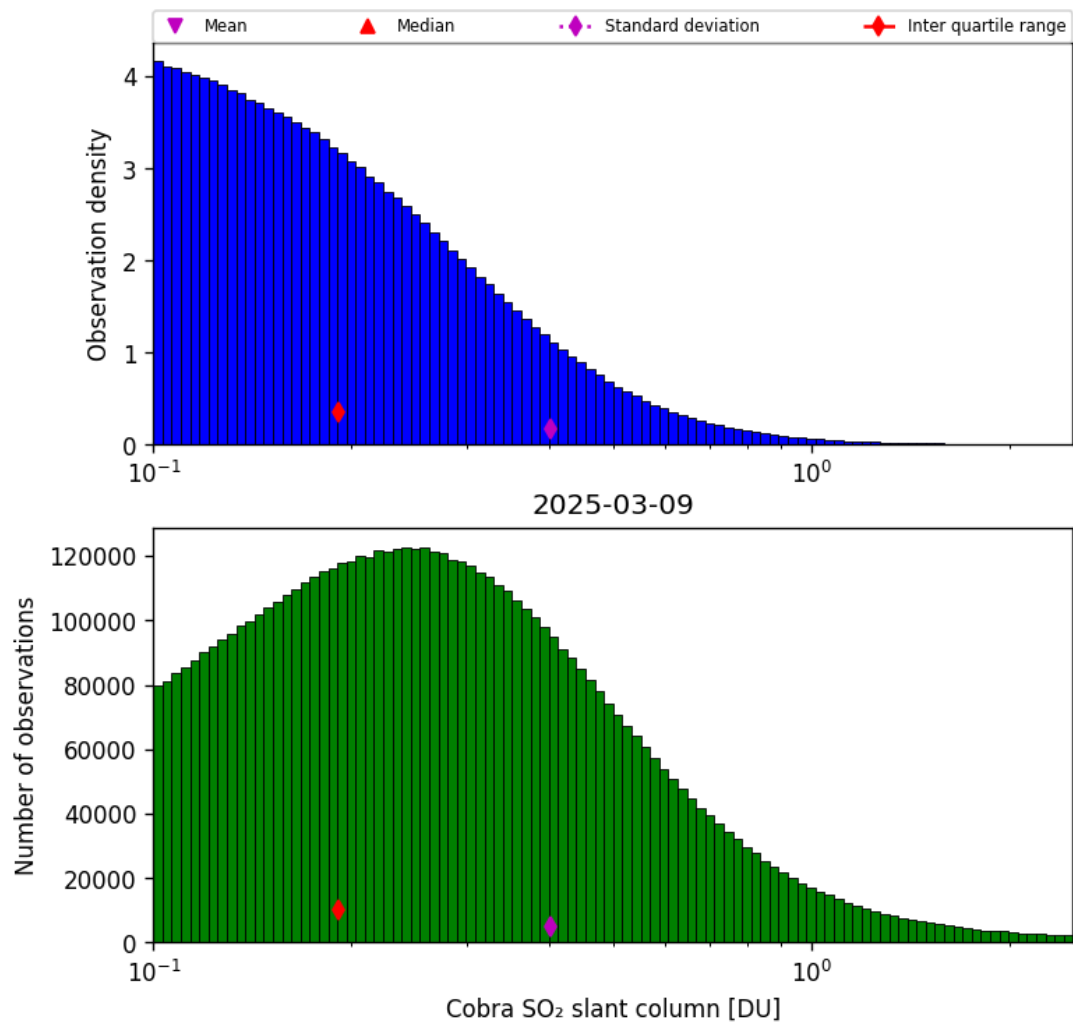


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-03-09 to 2025-03-10

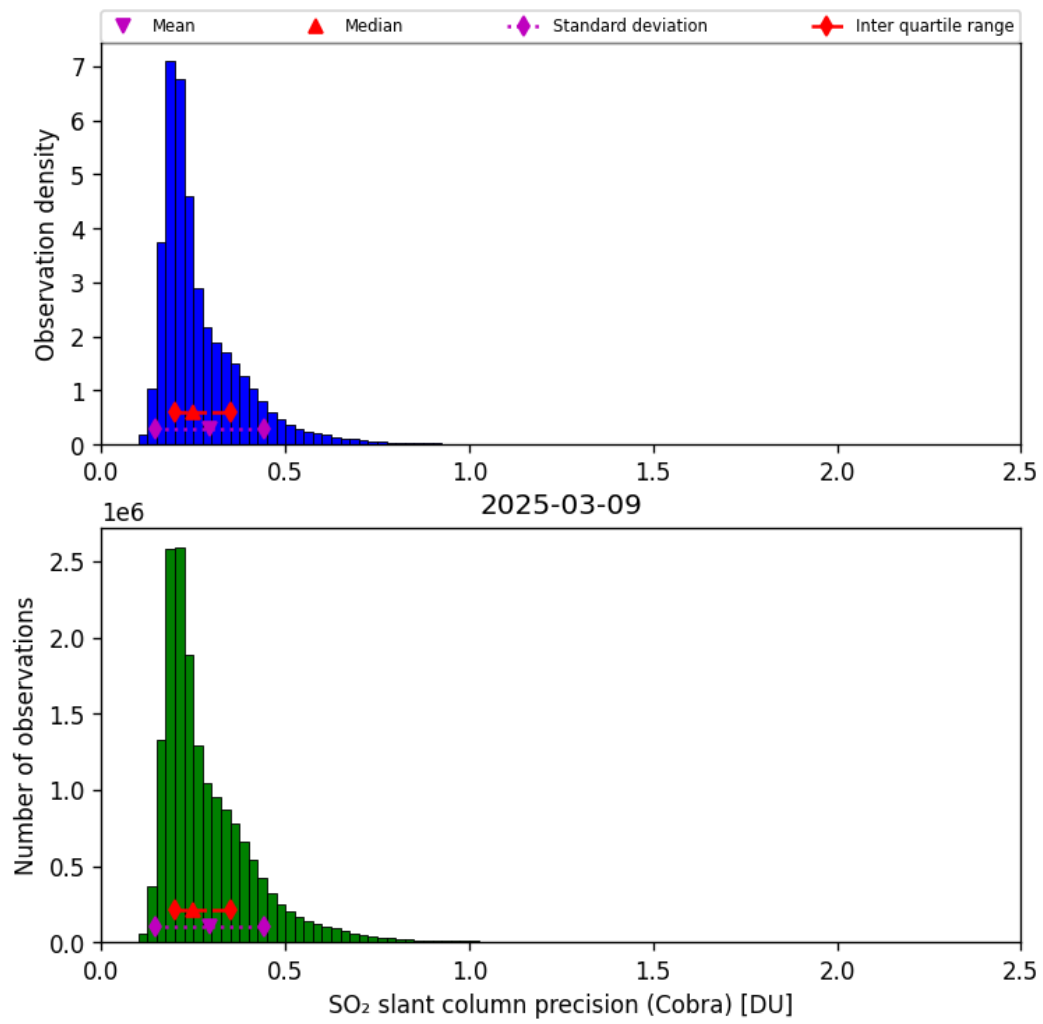


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-03-09 to 2025-03-10

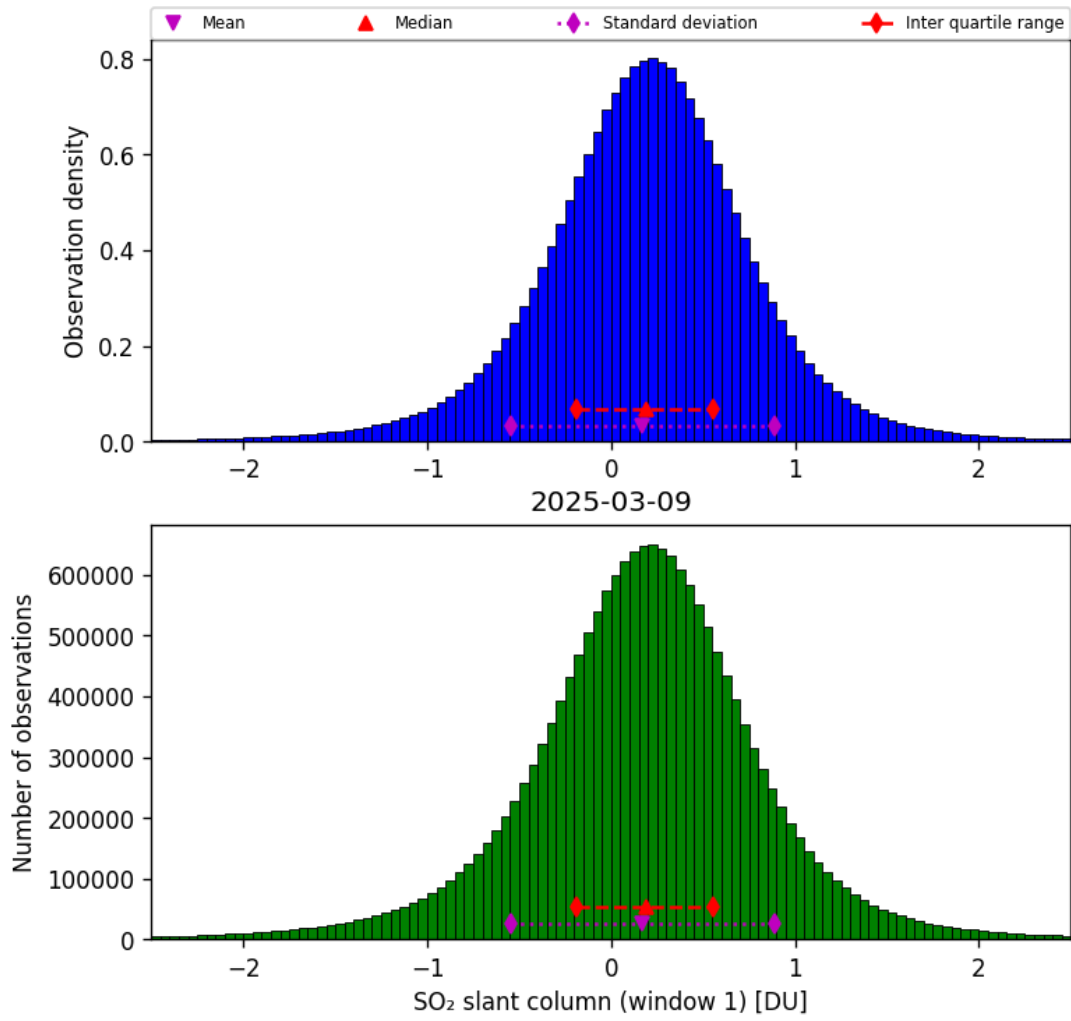


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-03-09 to 2025-03-10

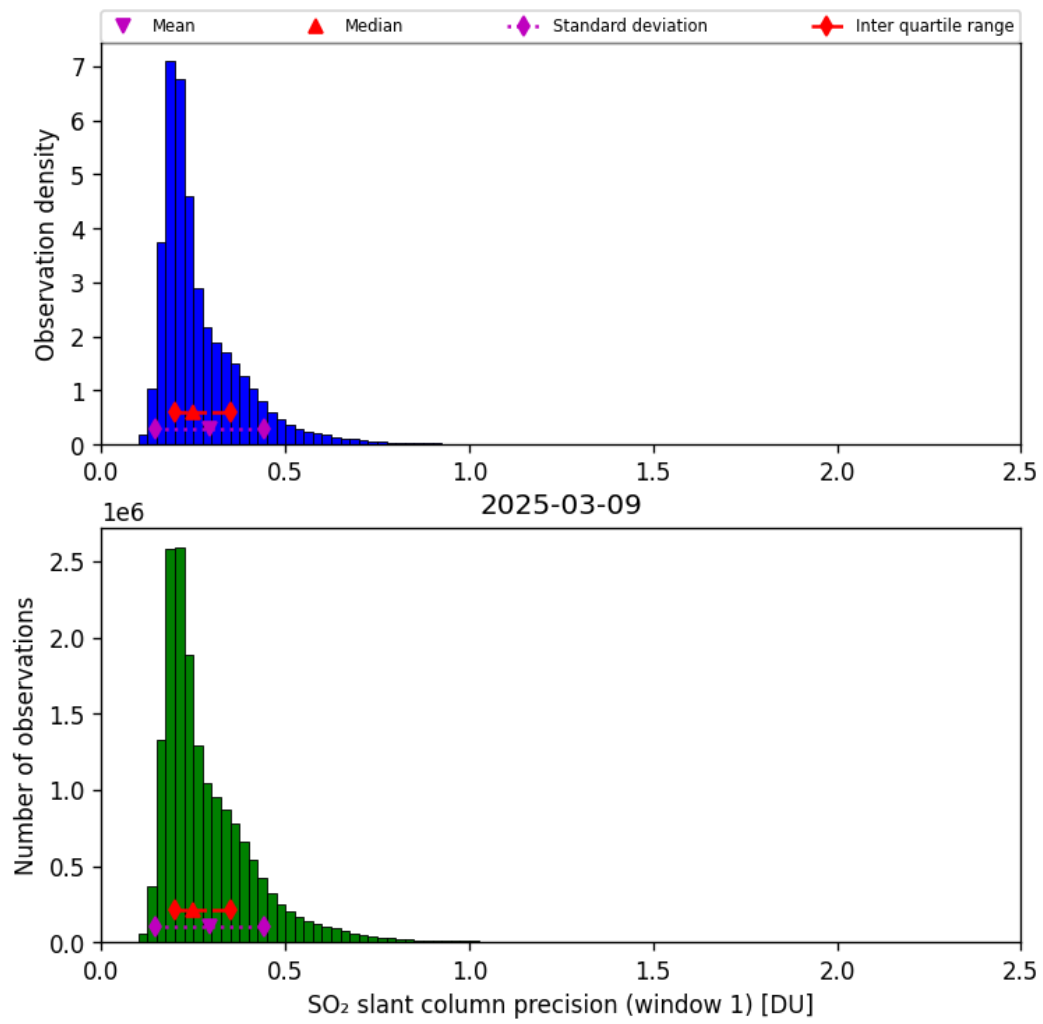


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-03-09 to 2025-03-10

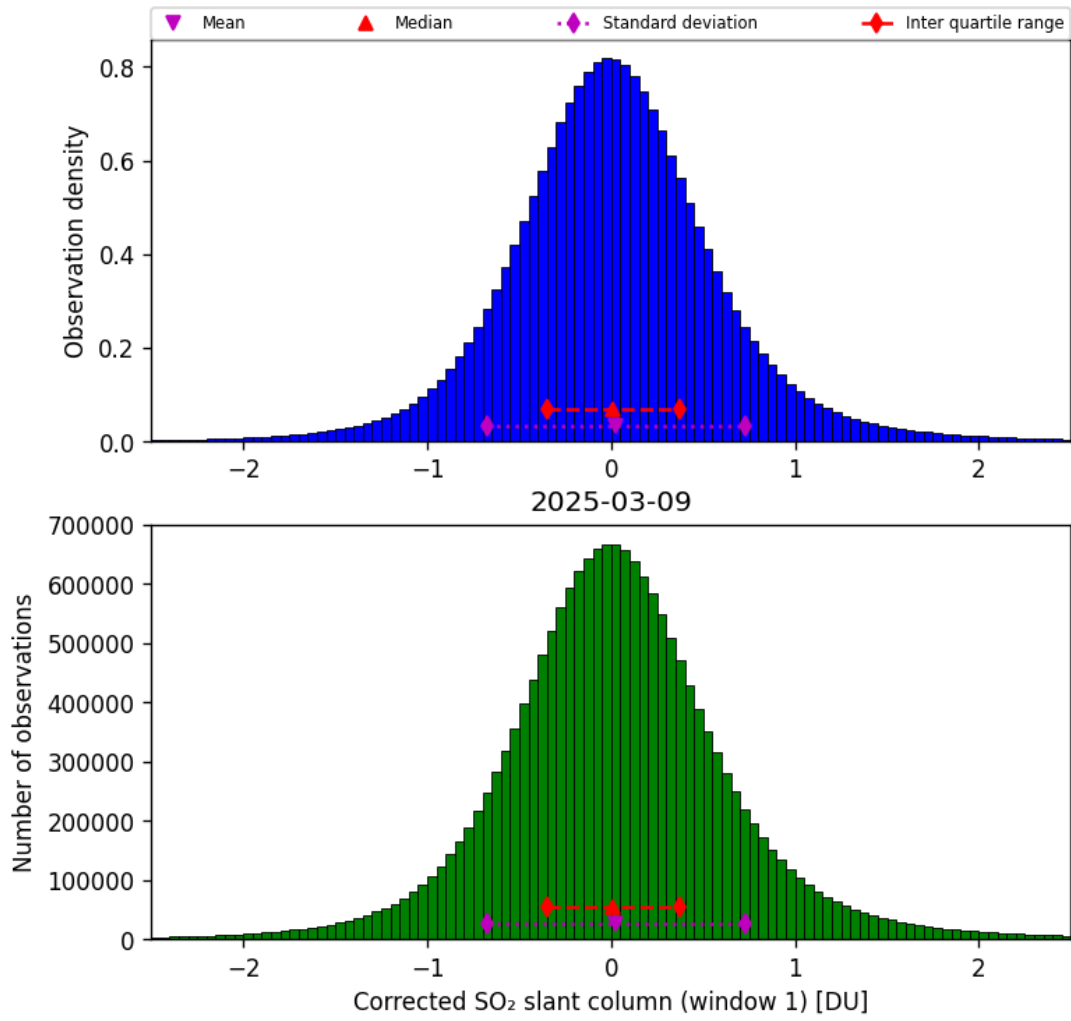


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-03-09 to 2025-03-10

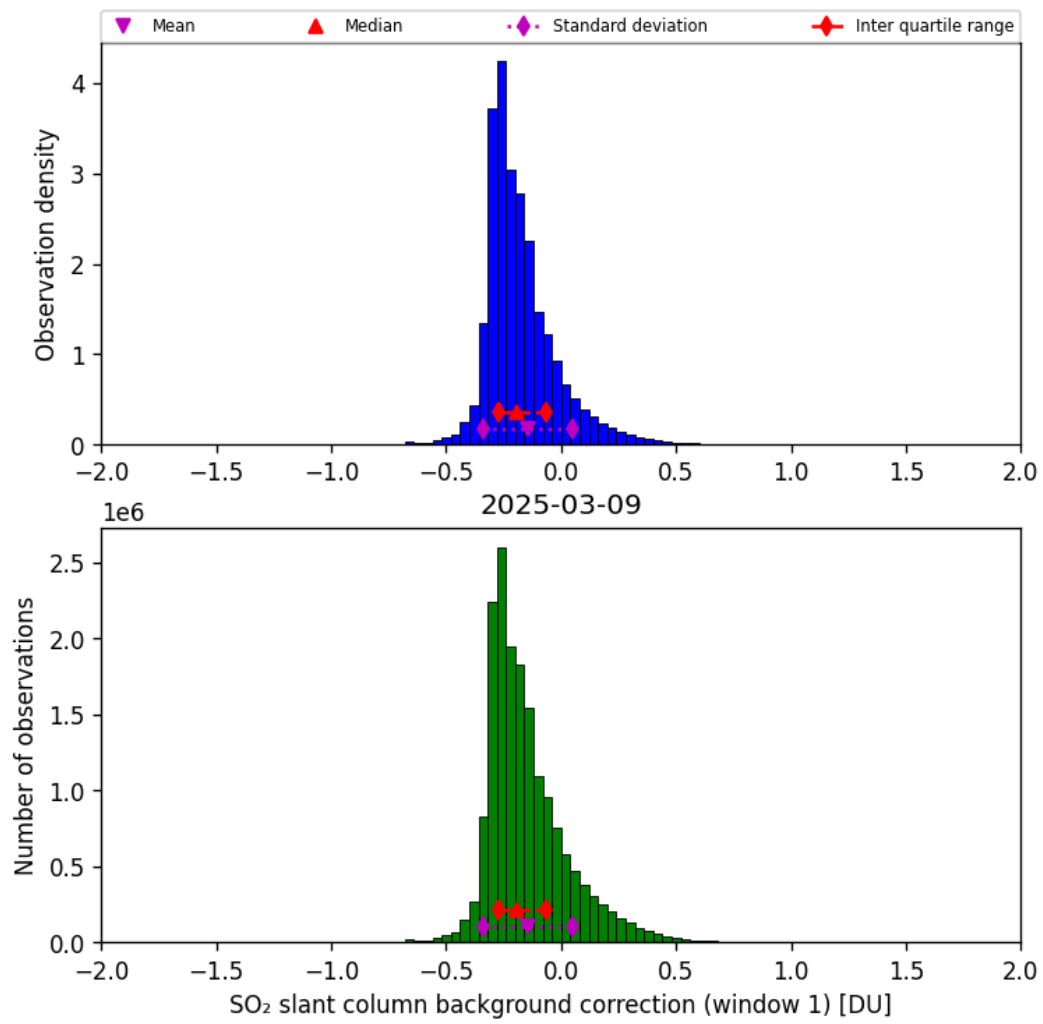


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-03-09 to 2025-03-10

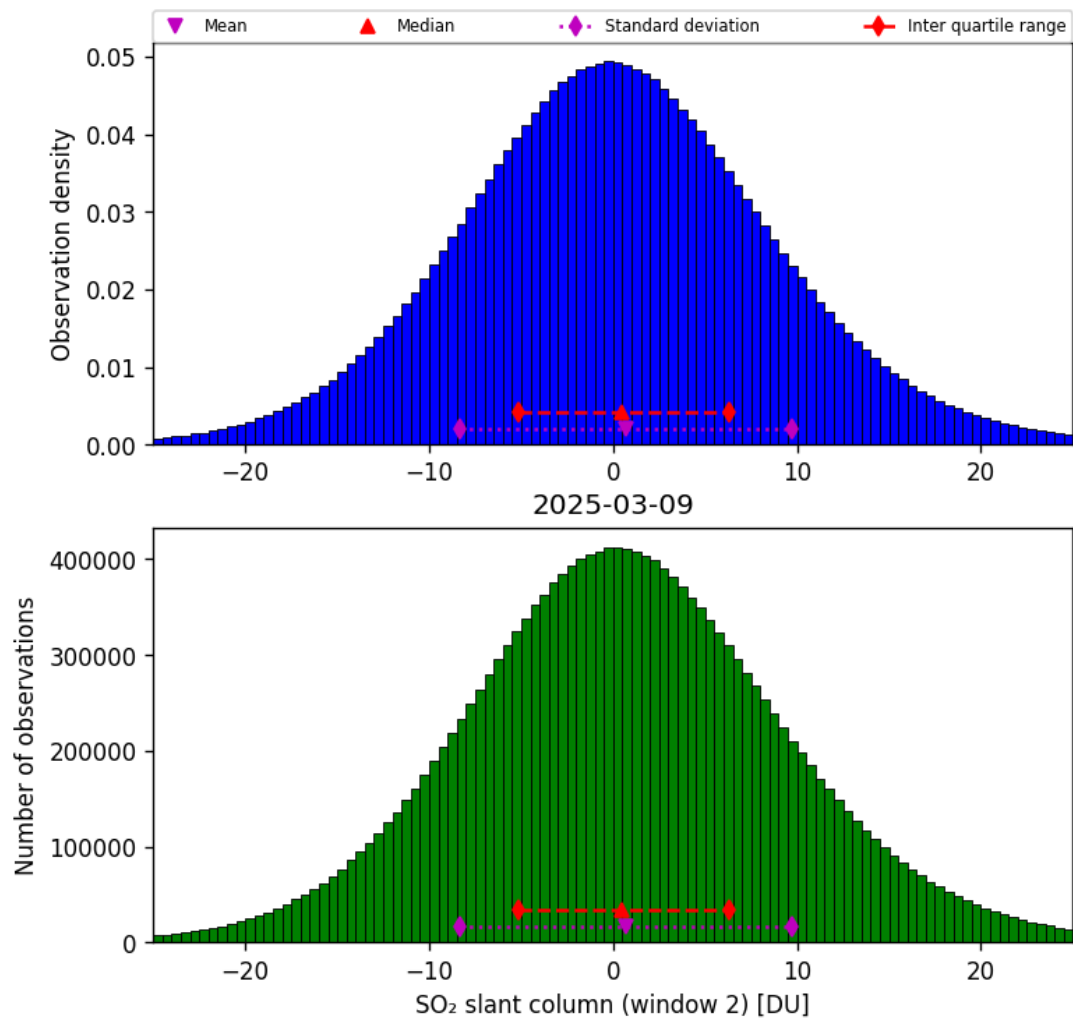


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-03-09 to 2025-03-10

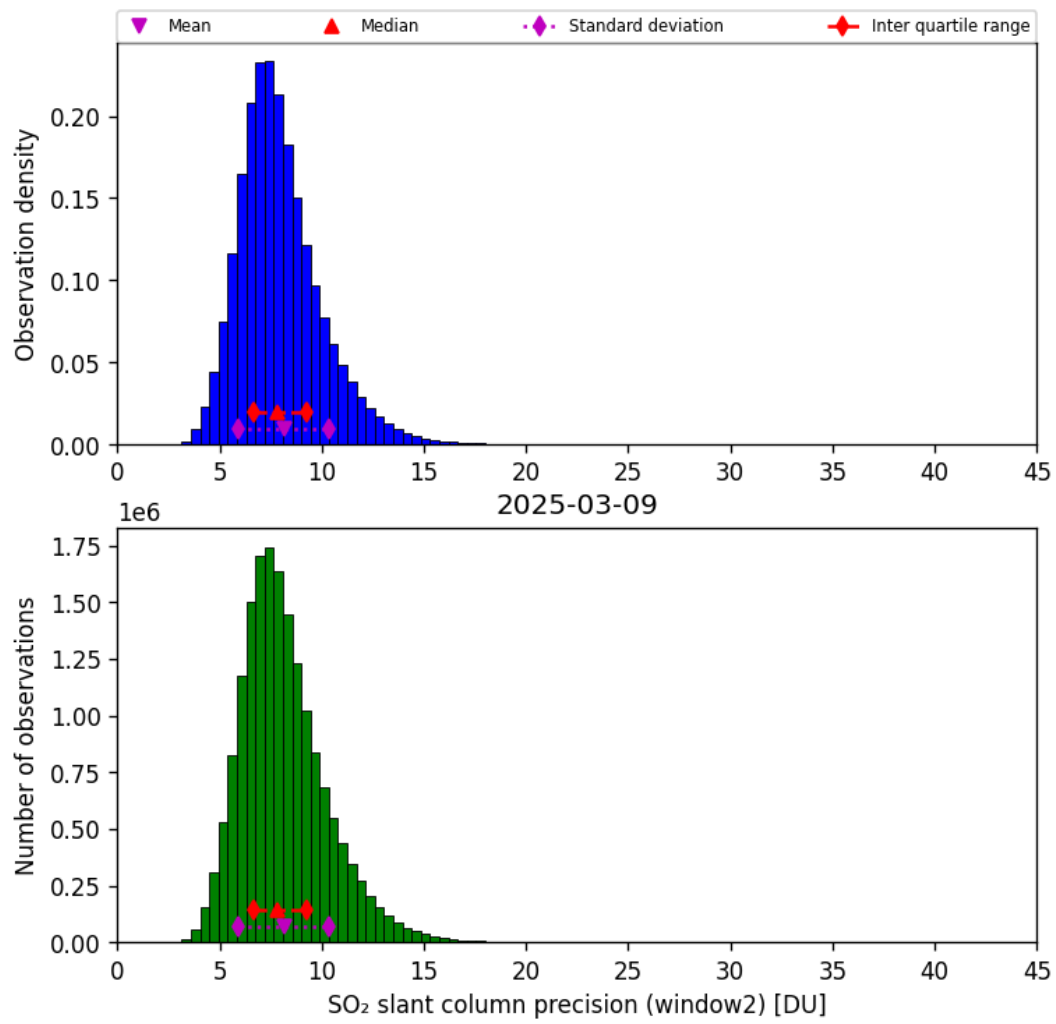


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-03-09 to 2025-03-10

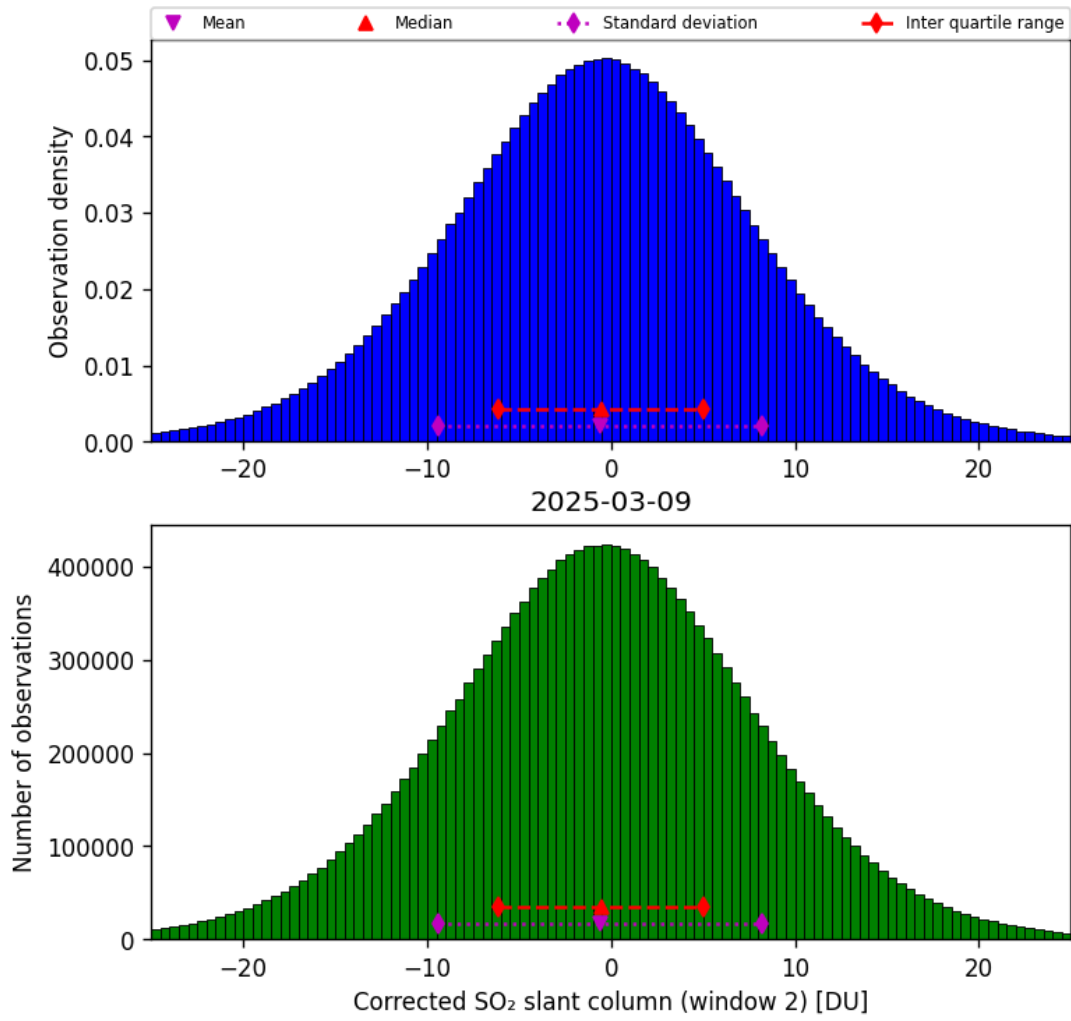


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-03-09 to 2025-03-10

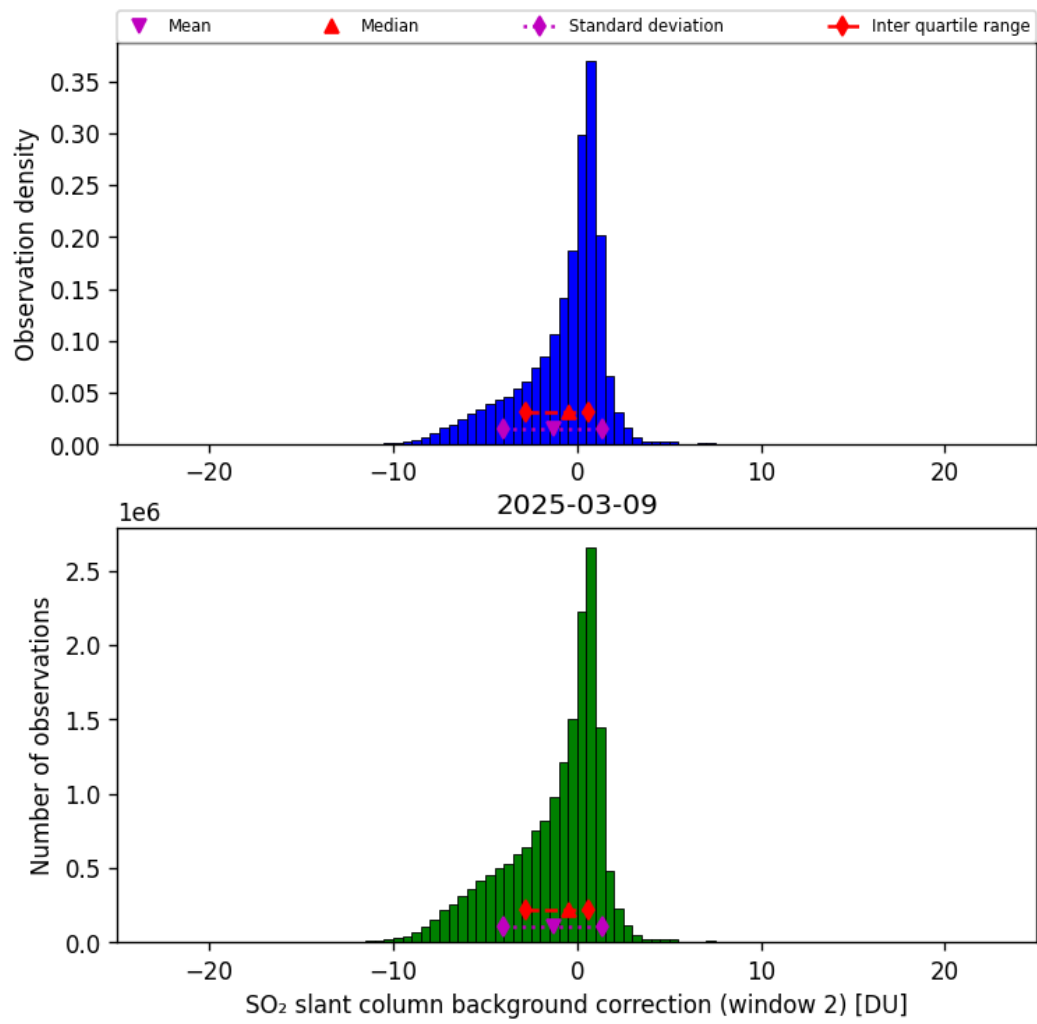


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-03-09 to 2025-03-10

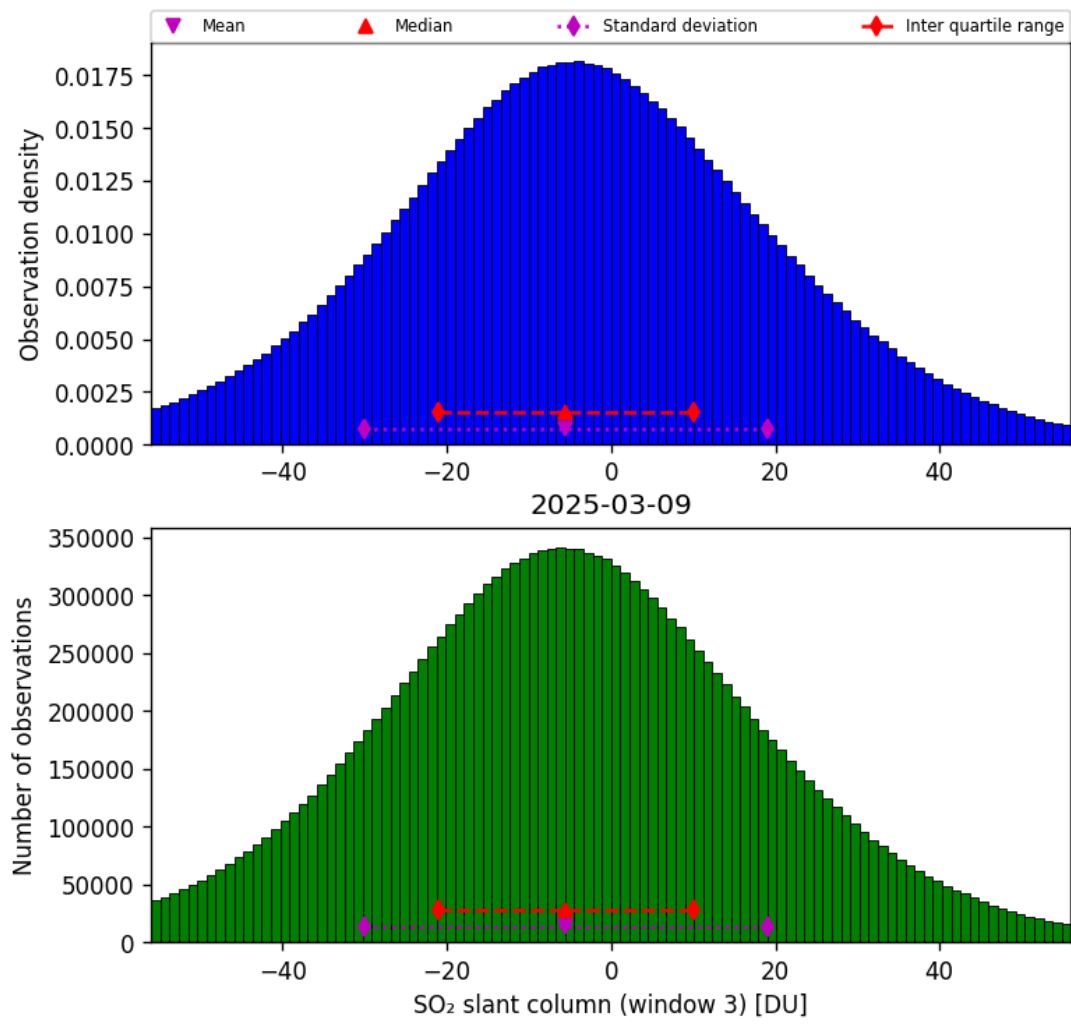


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-03-09 to 2025-03-10

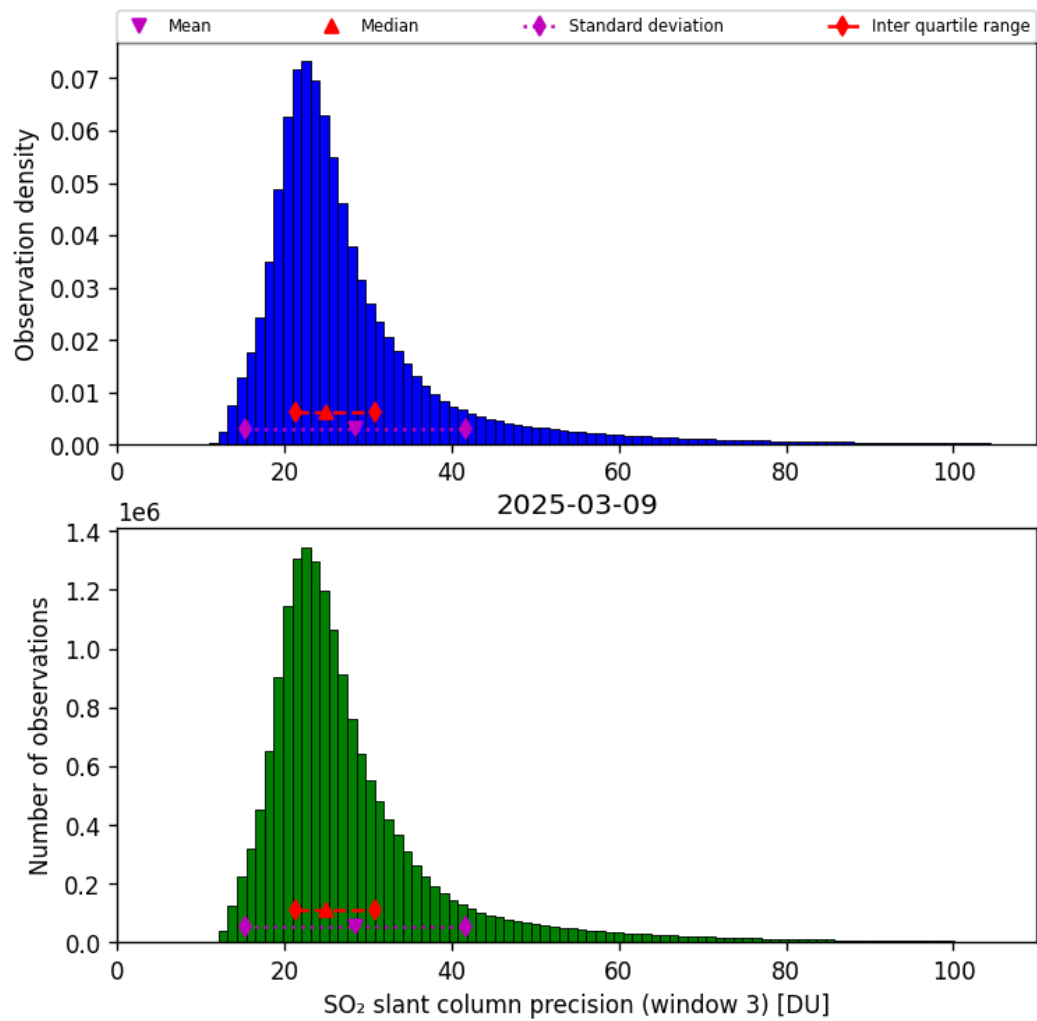


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-03-09 to 2025-03-10

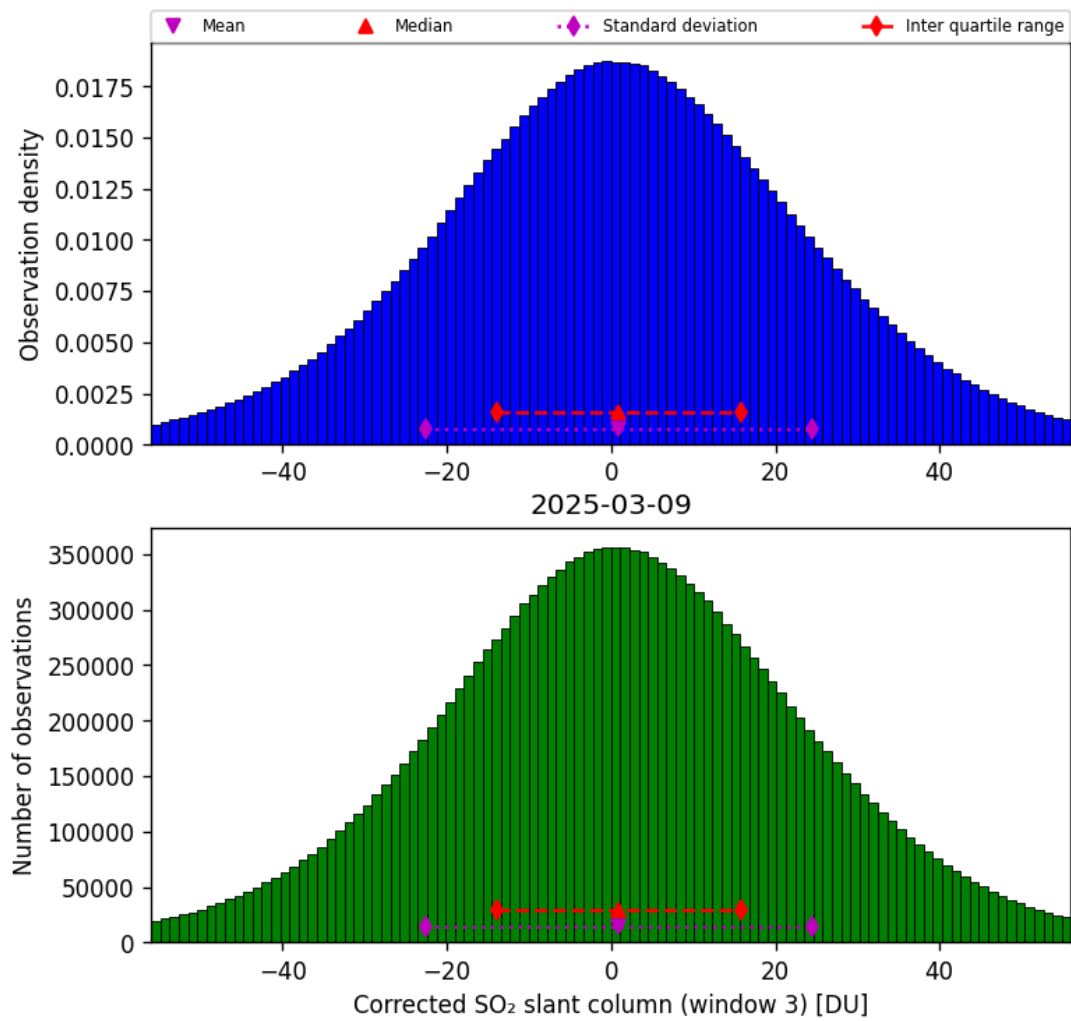


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-03-09 to 2025-03-10

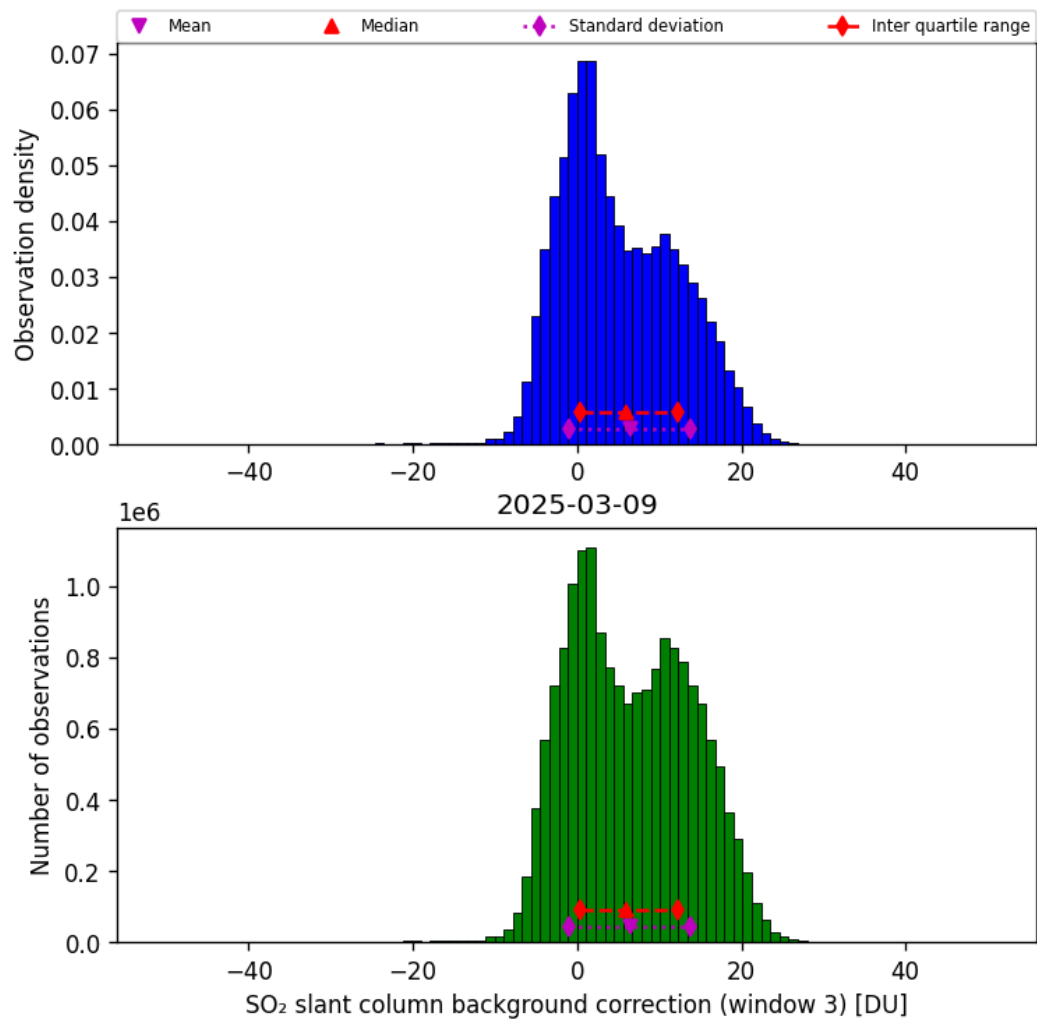


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-03-09 to 2025-03-10

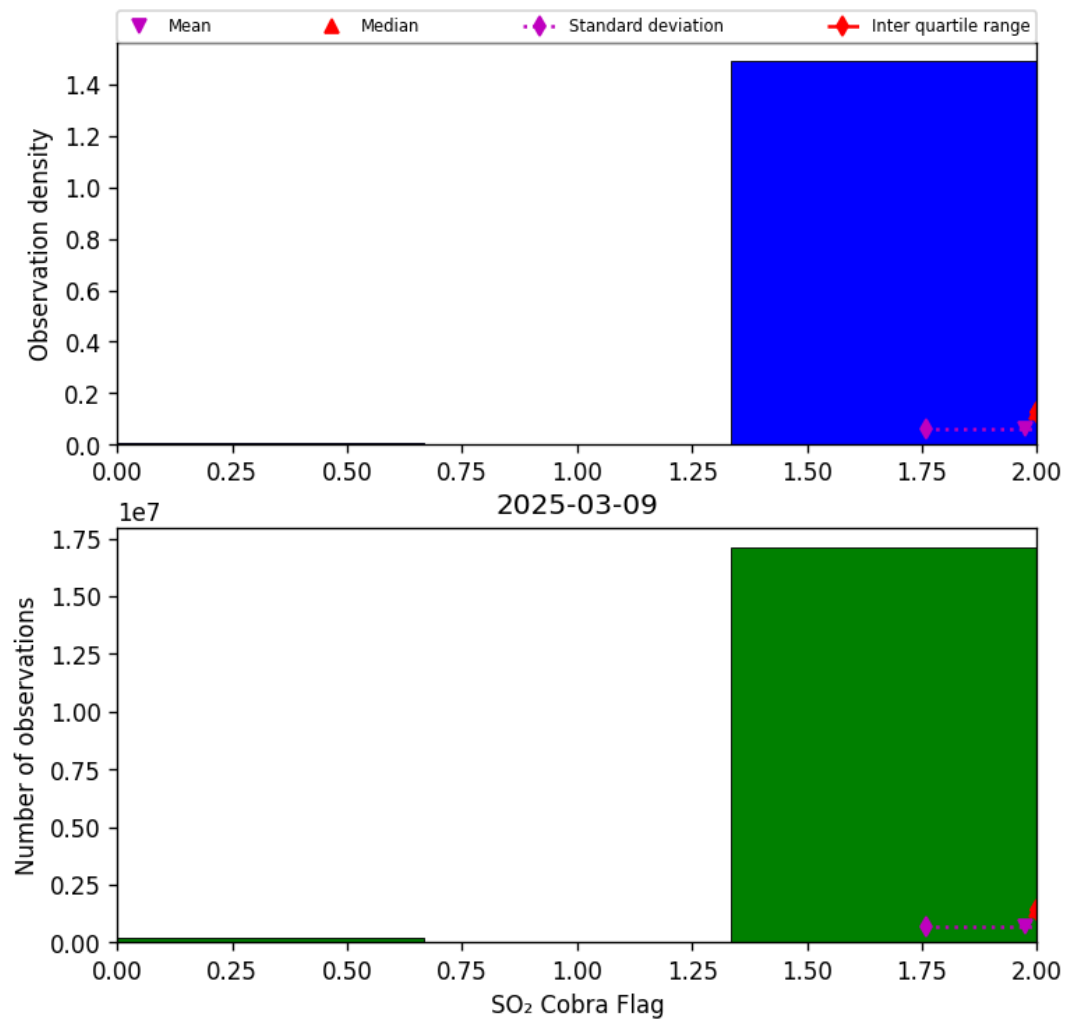


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-03-09 to 2025-03-10

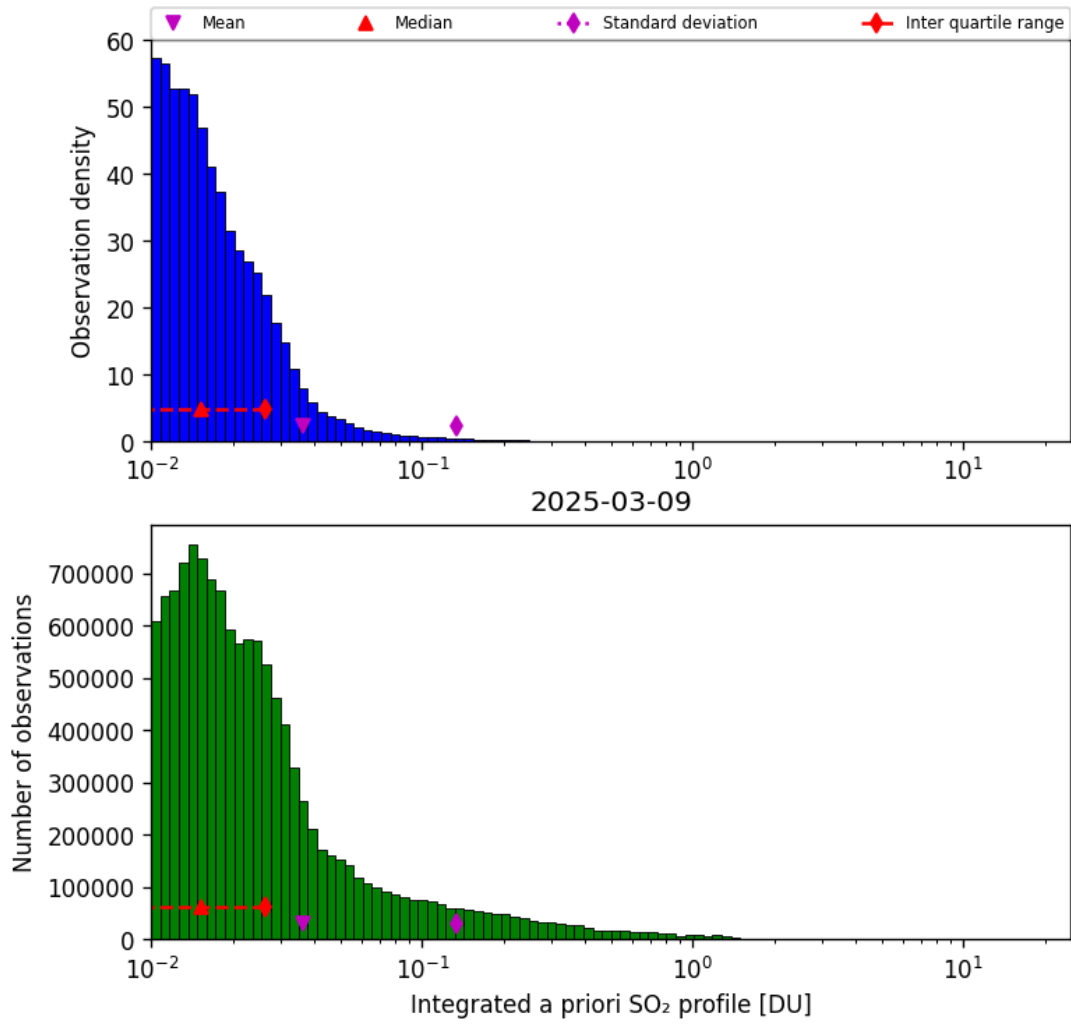


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-03-09 to 2025-03-10

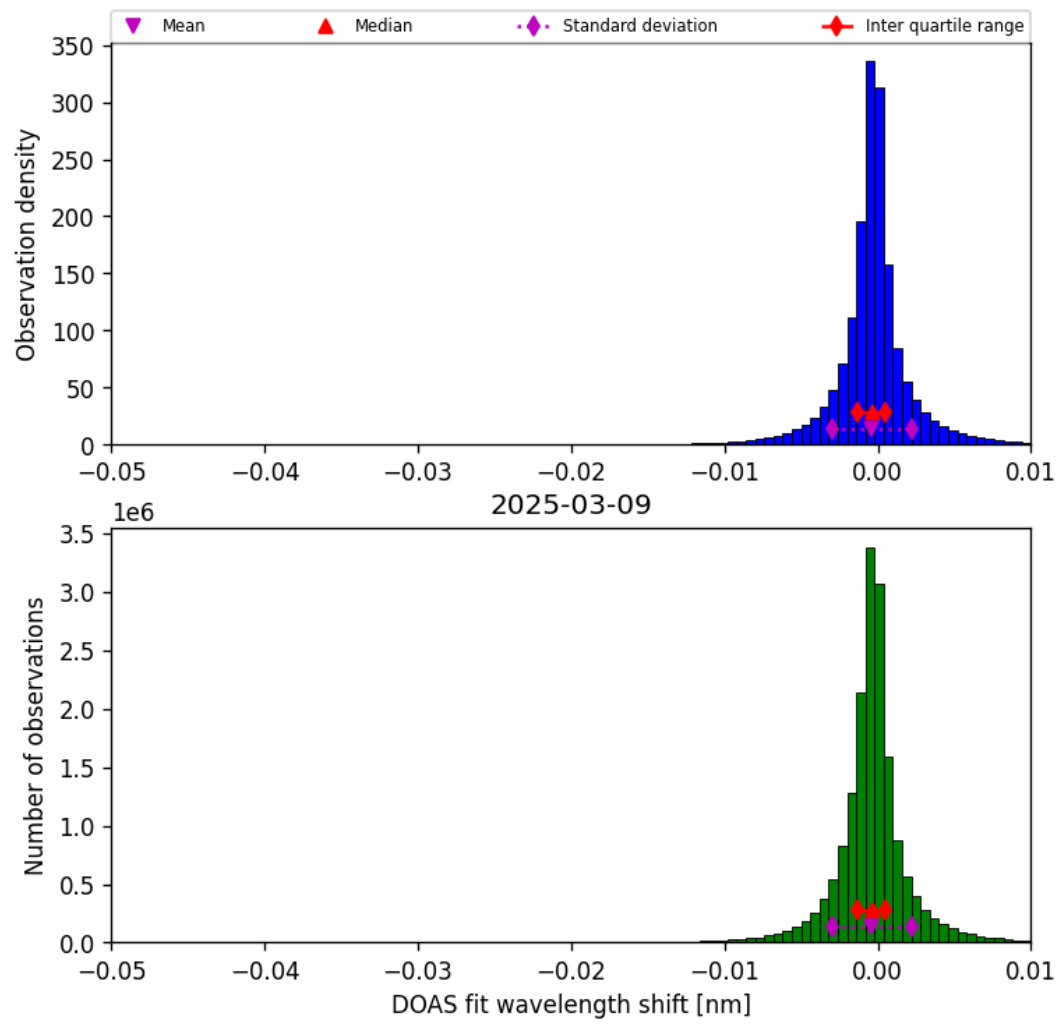


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-03-09 to 2025-03-10

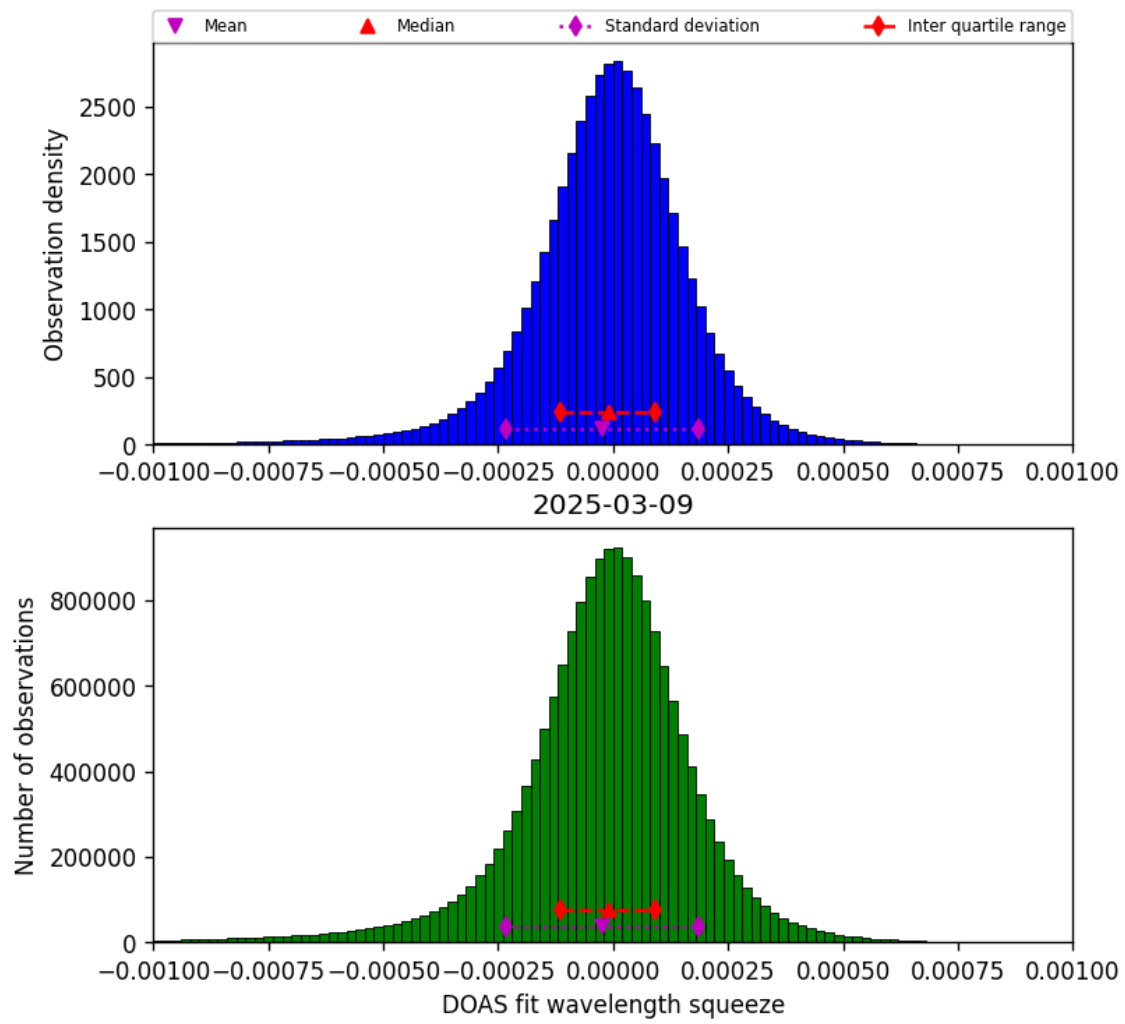


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-03-09 to 2025-03-10

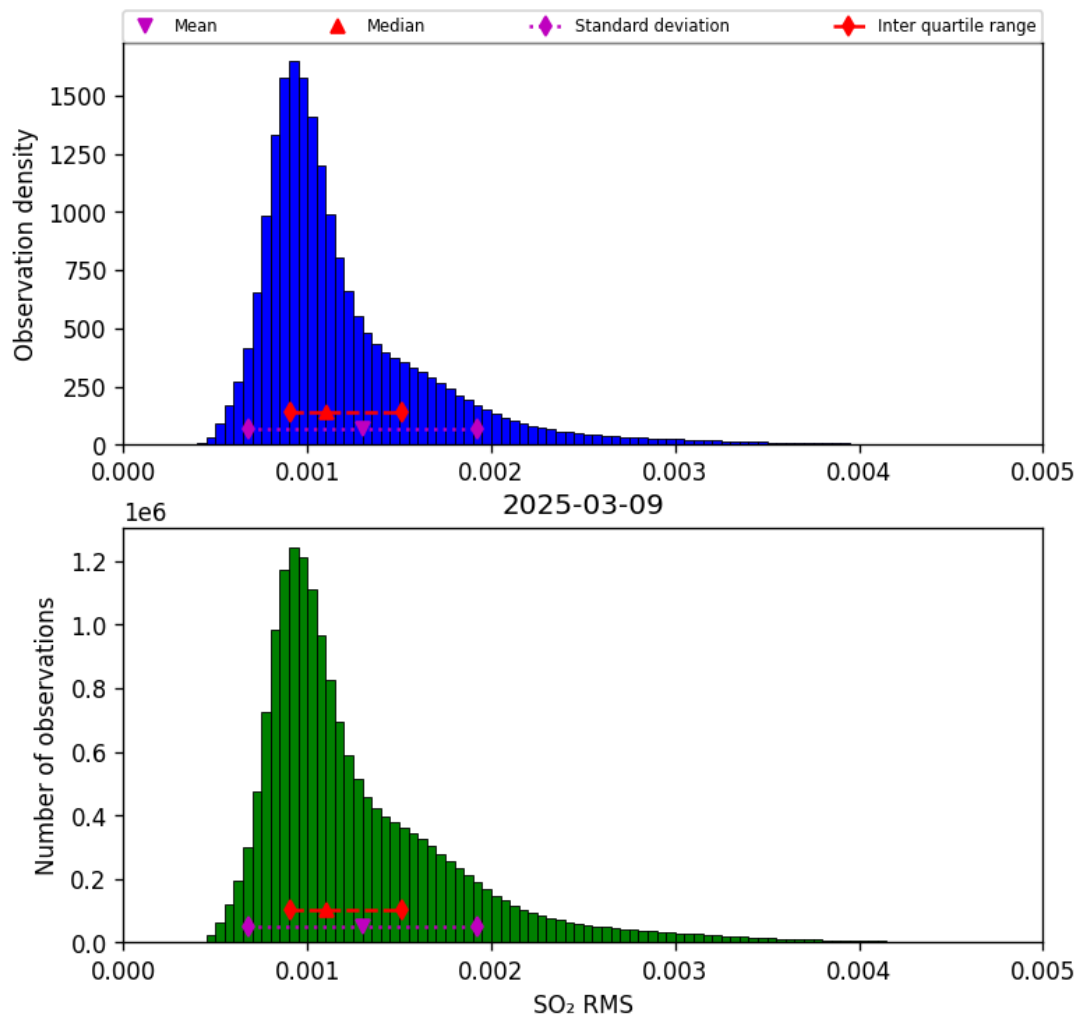


Figure 79: Histogram of “SO₂ RMS” for 2025-03-09 to 2025-03-10

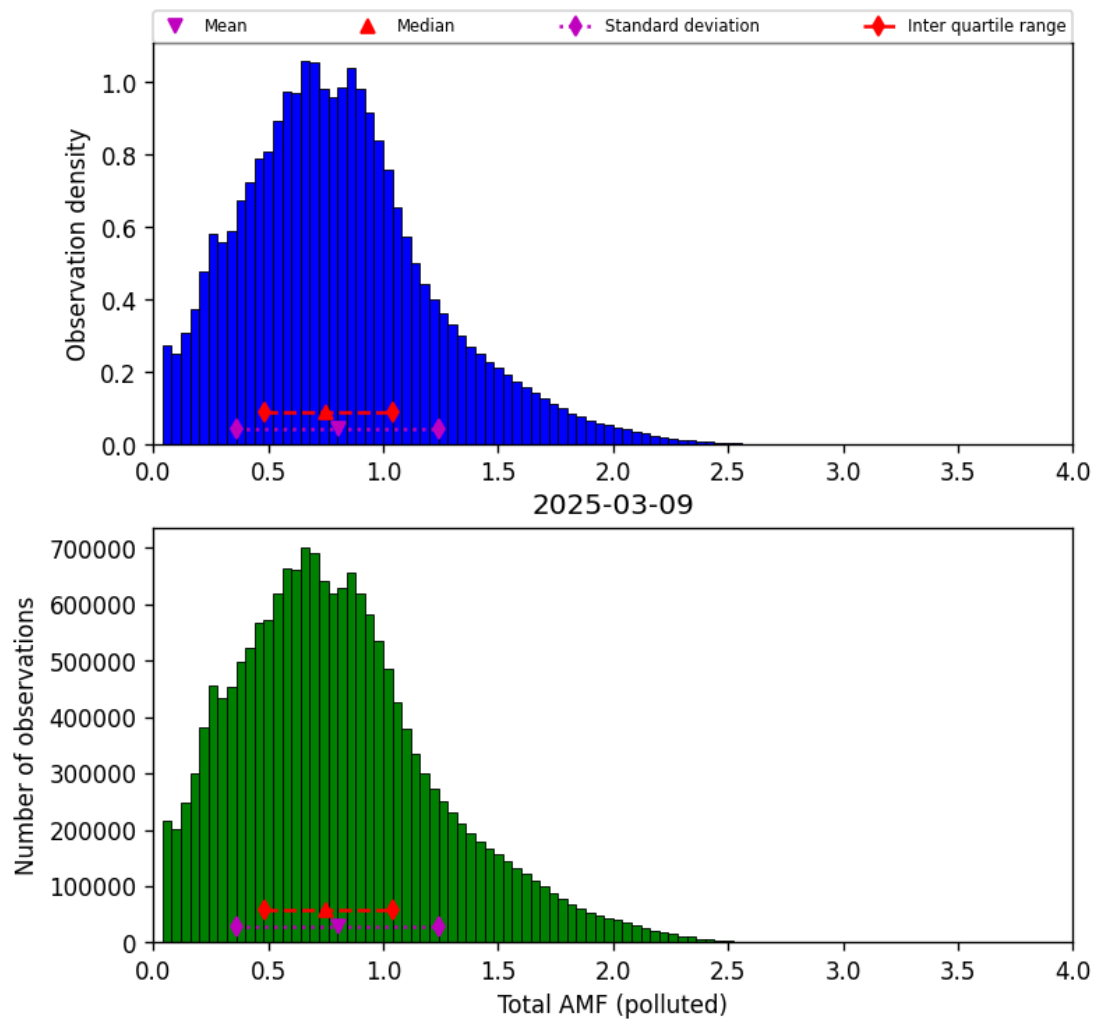


Figure 80: Histogram of “Total AMF (polluted)” for 2025-03-09 to 2025-03-10

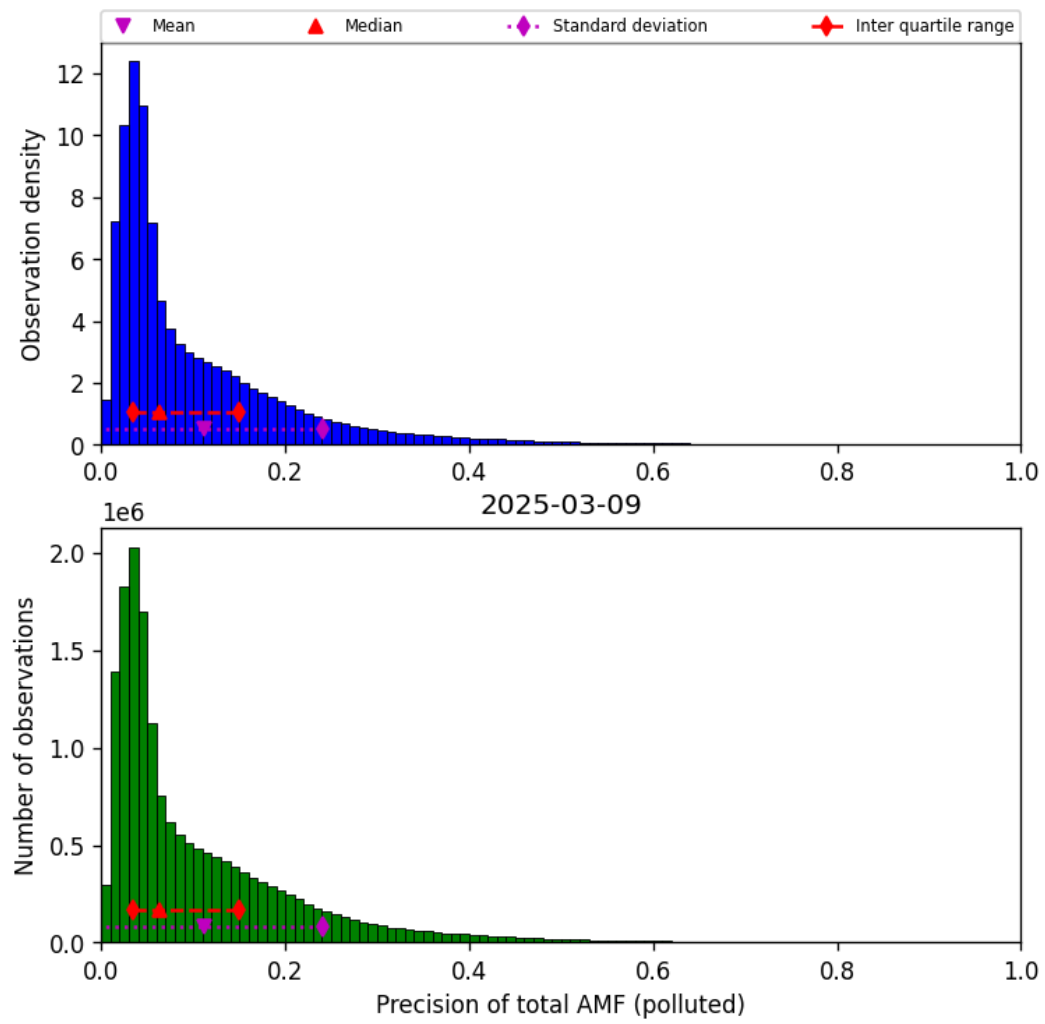


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-03-09 to 2025-03-10

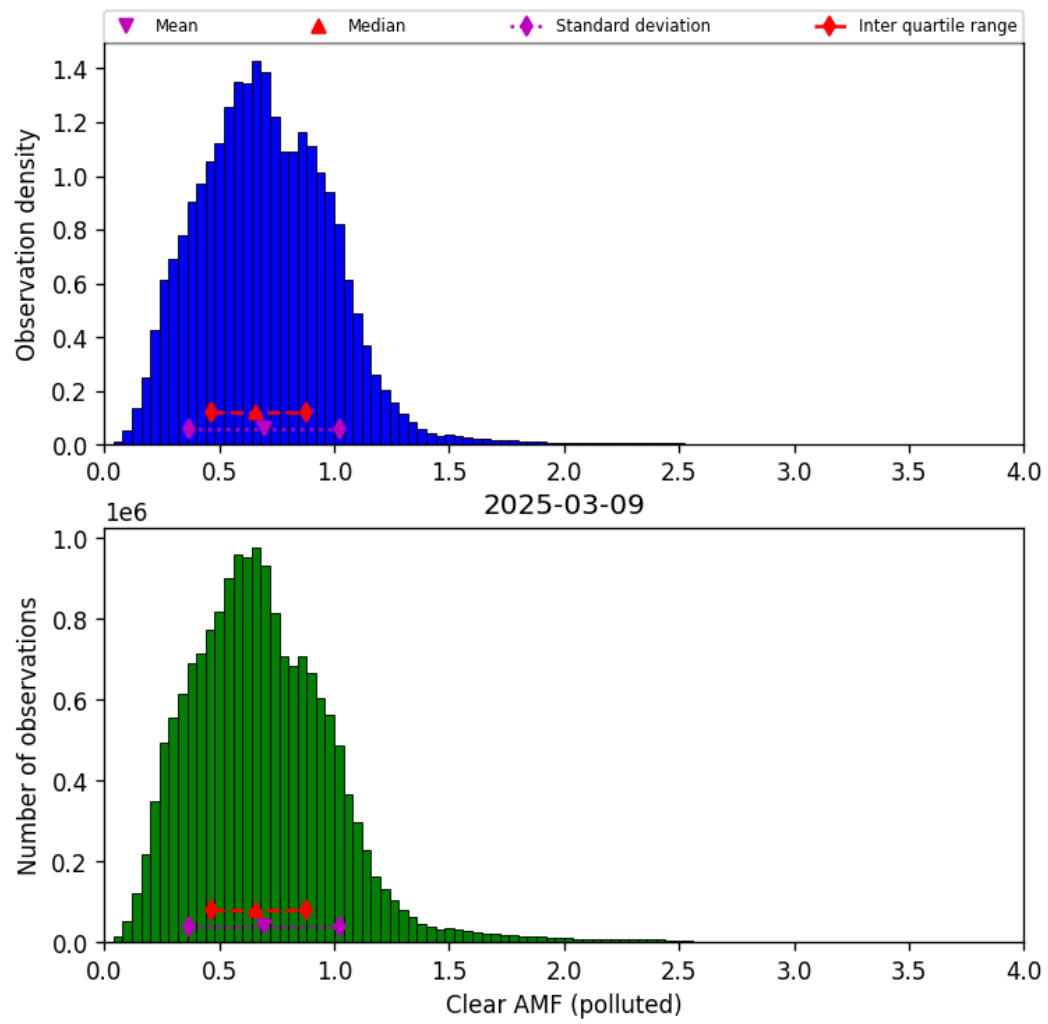


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-03-09 to 2025-03-10

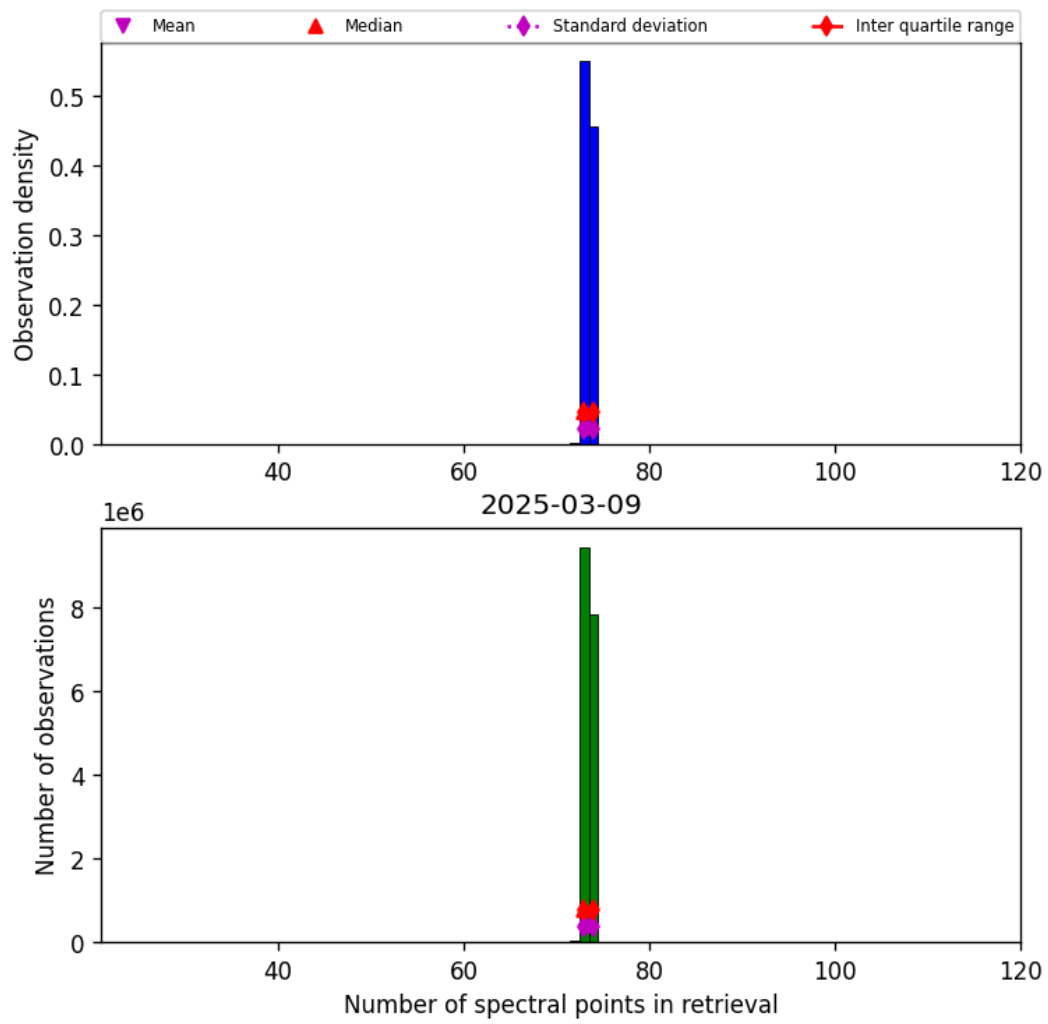


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-03-09 to 2025-03-10

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.

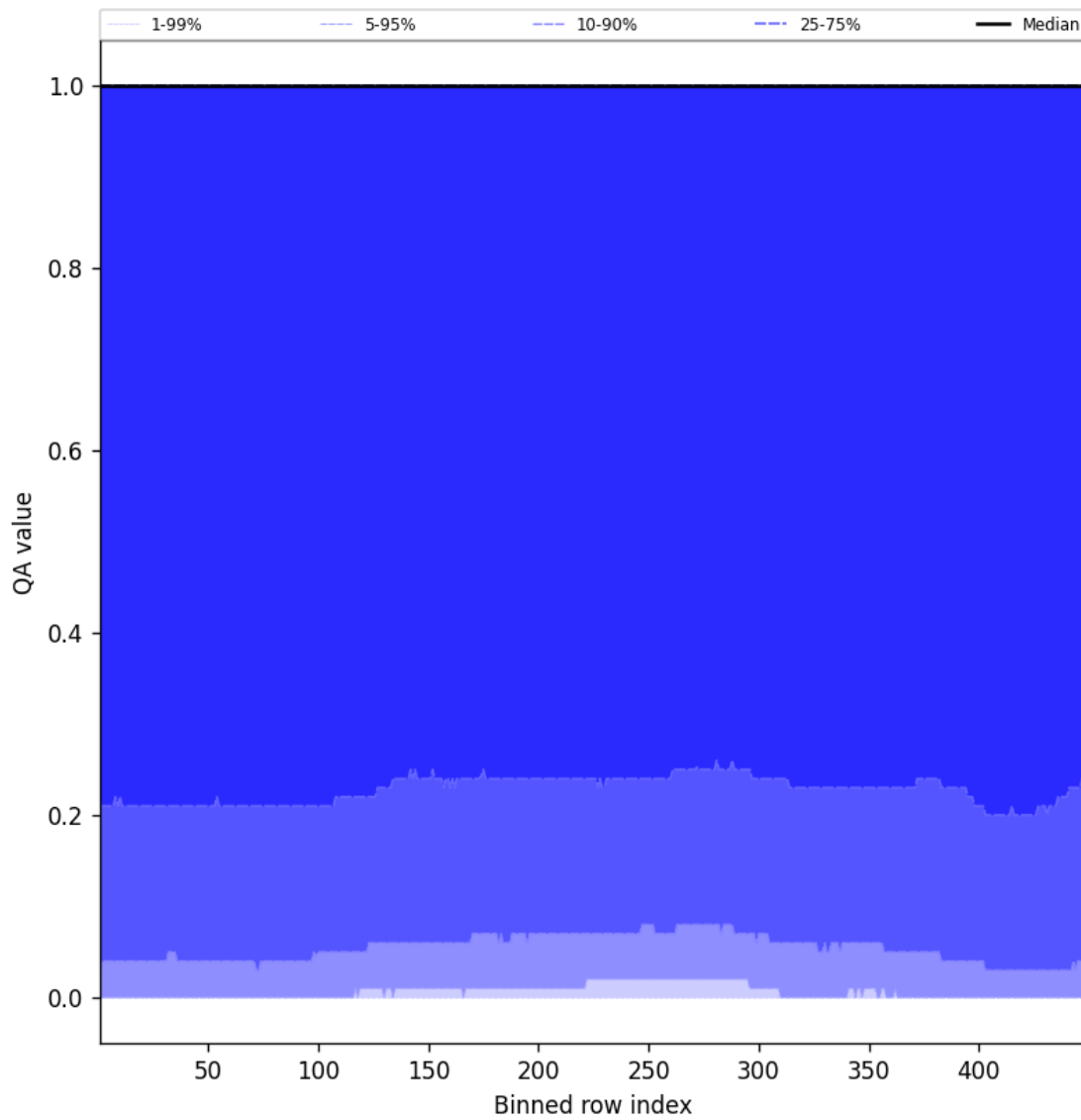


Figure 84: Along track statistics of “QA value” for 2025-03-09 to 2025-03-10

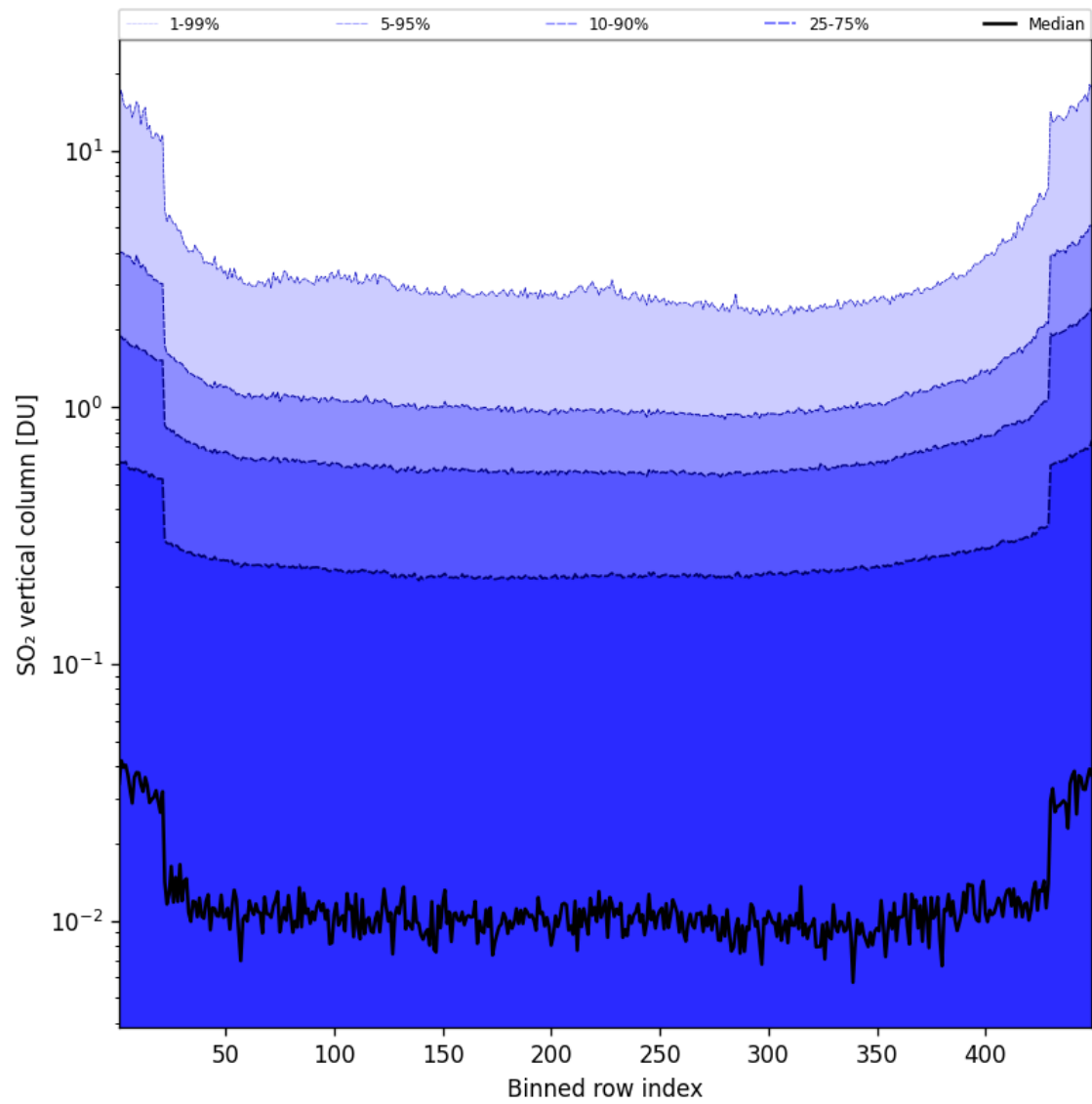


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-03-09 to 2025-03-10

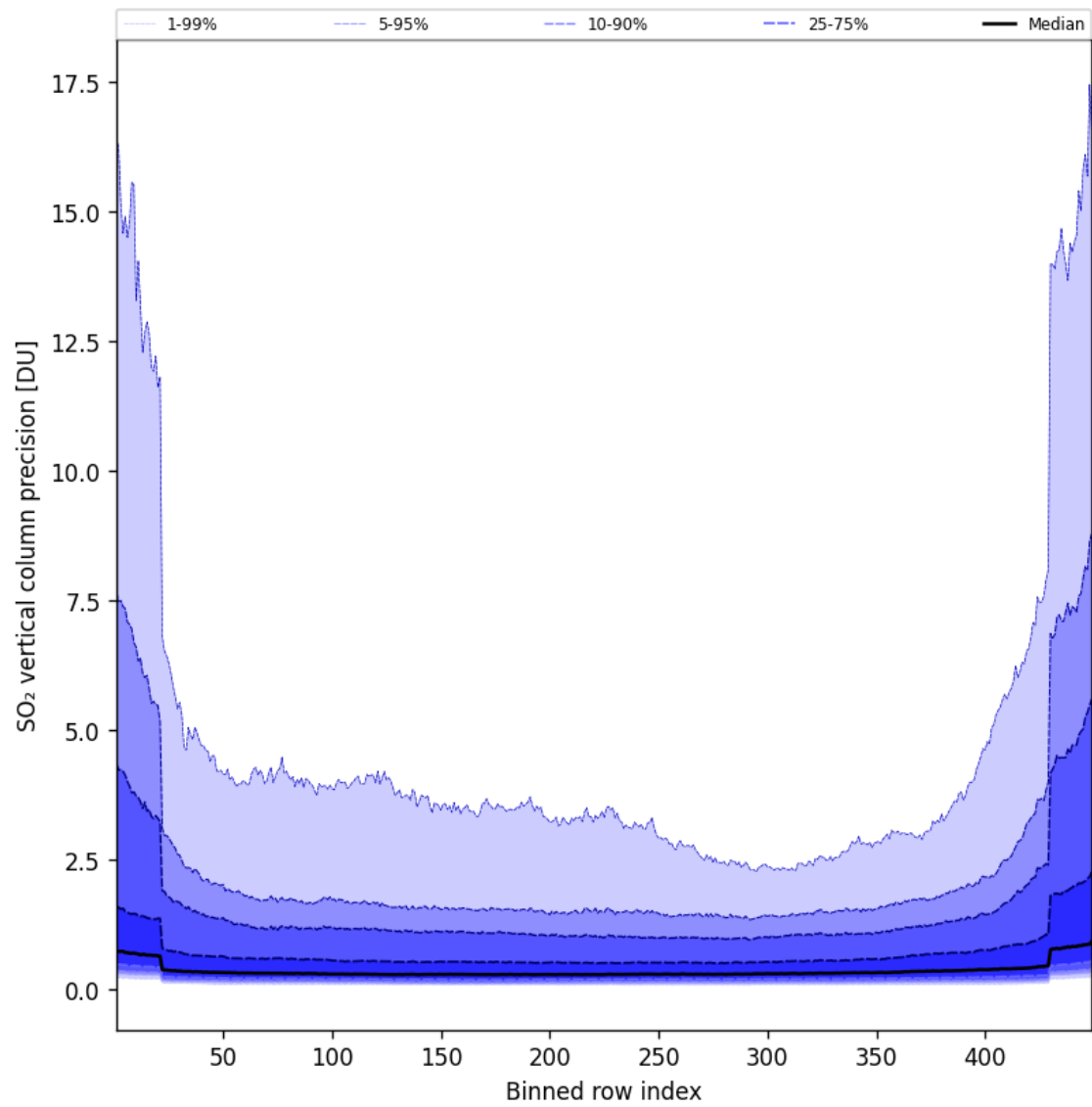


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-03-09 to 2025-03-10

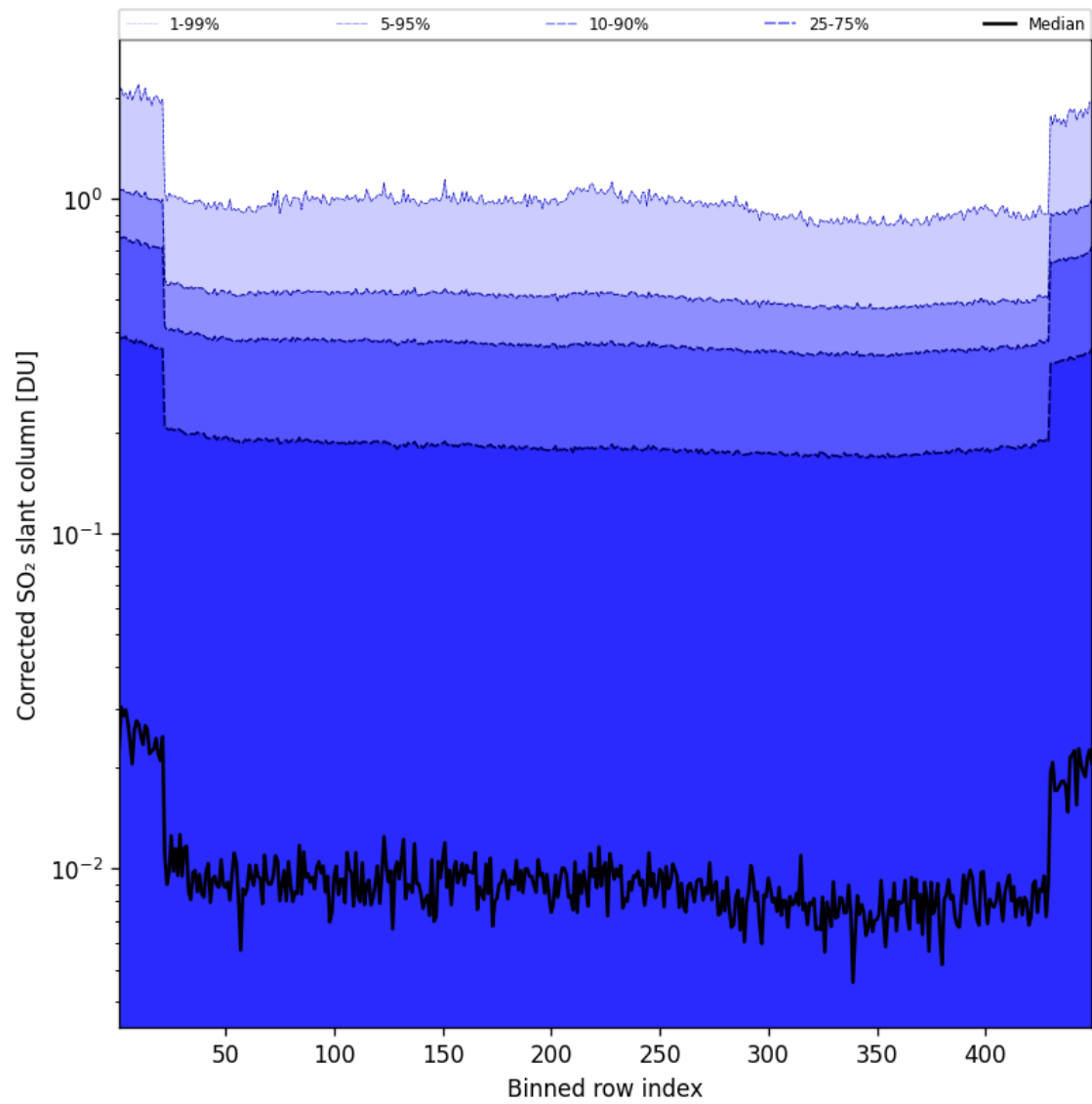


Figure 87: Along track statistics of "Corrected SO₂ slant column" for 2025-03-09 to 2025-03-10

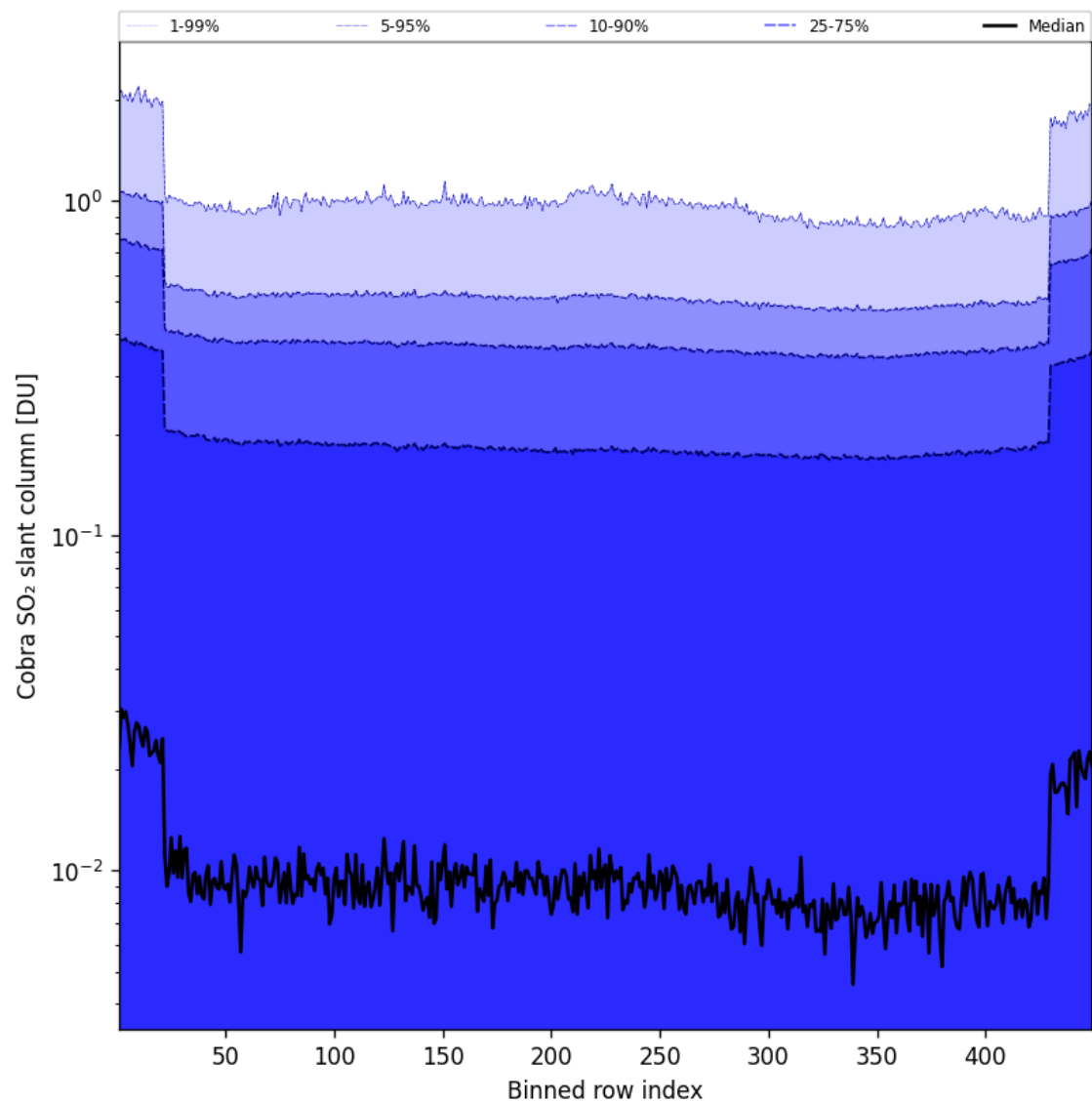


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-03-09 to 2025-03-10

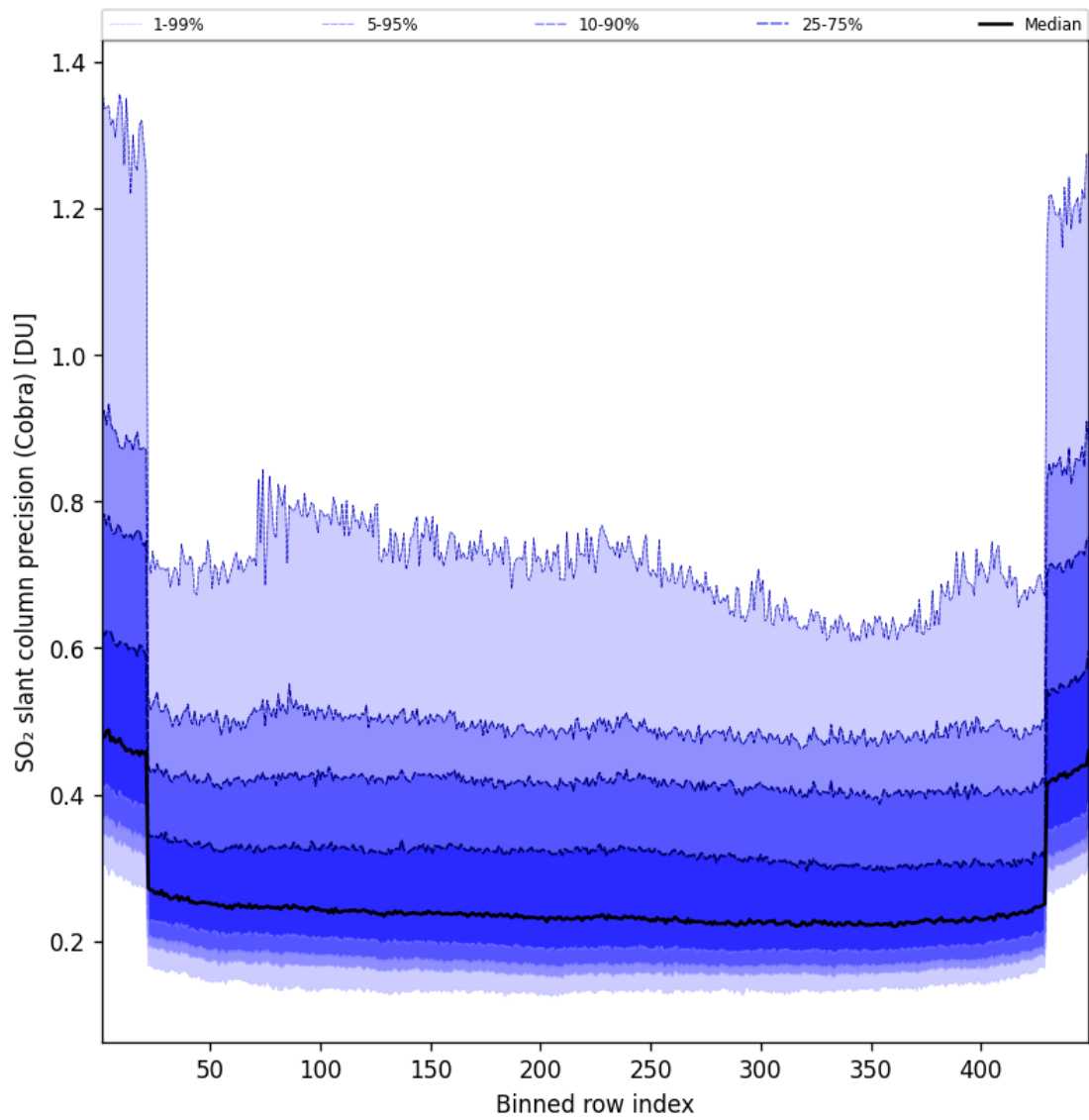


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-03-09 to 2025-03-10

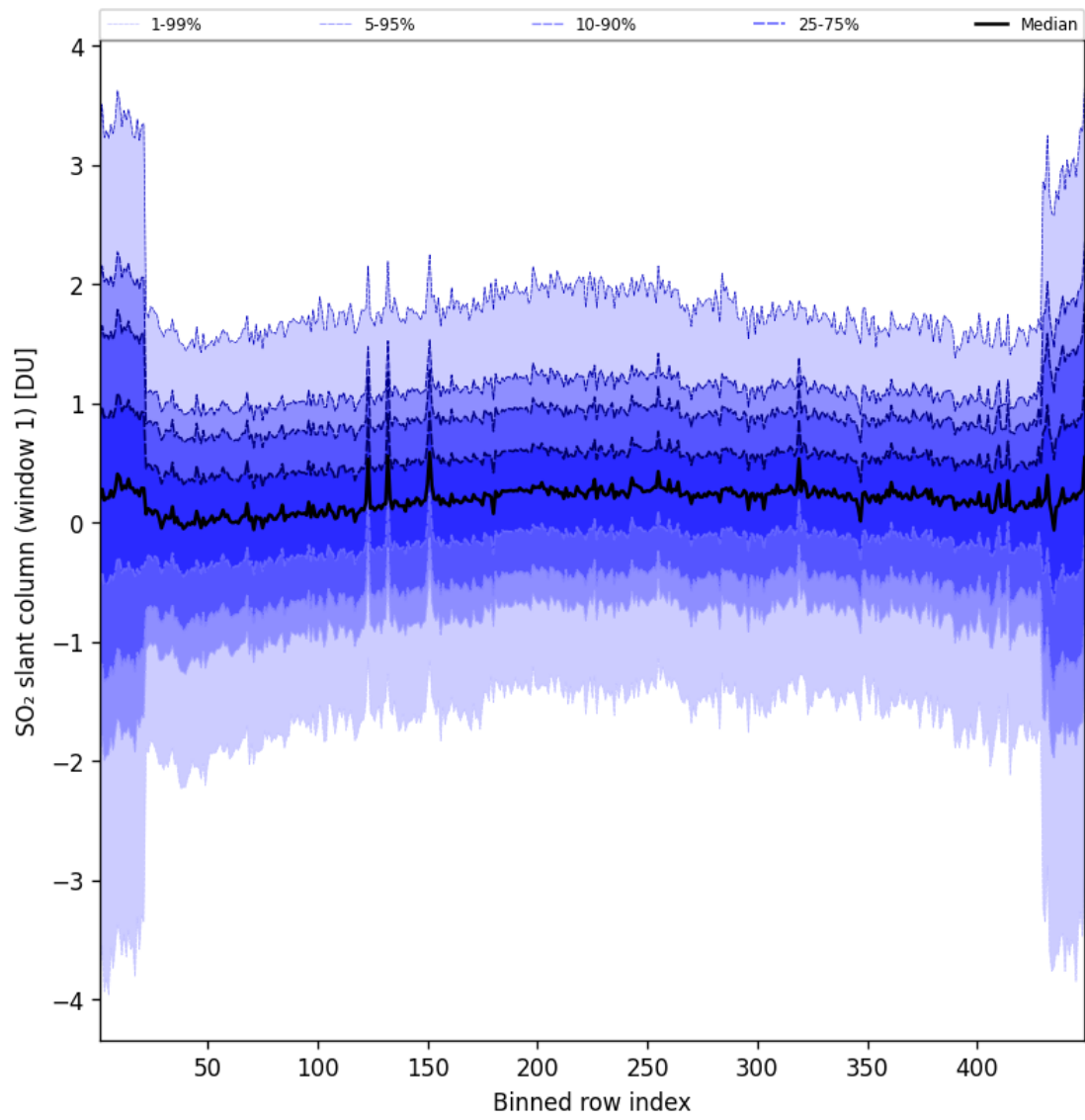


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-03-09 to 2025-03-10

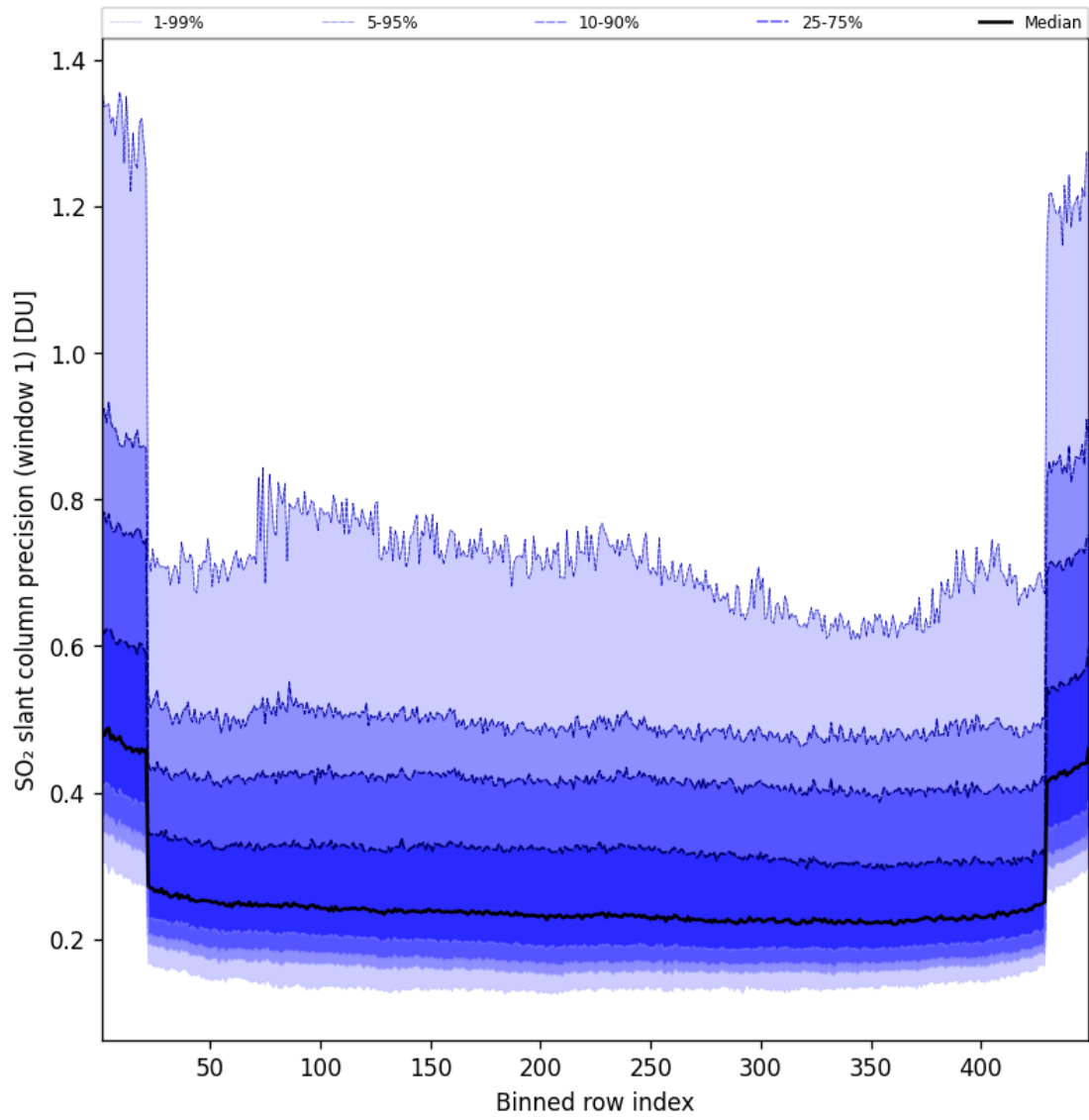


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-03-09 to 2025-03-10

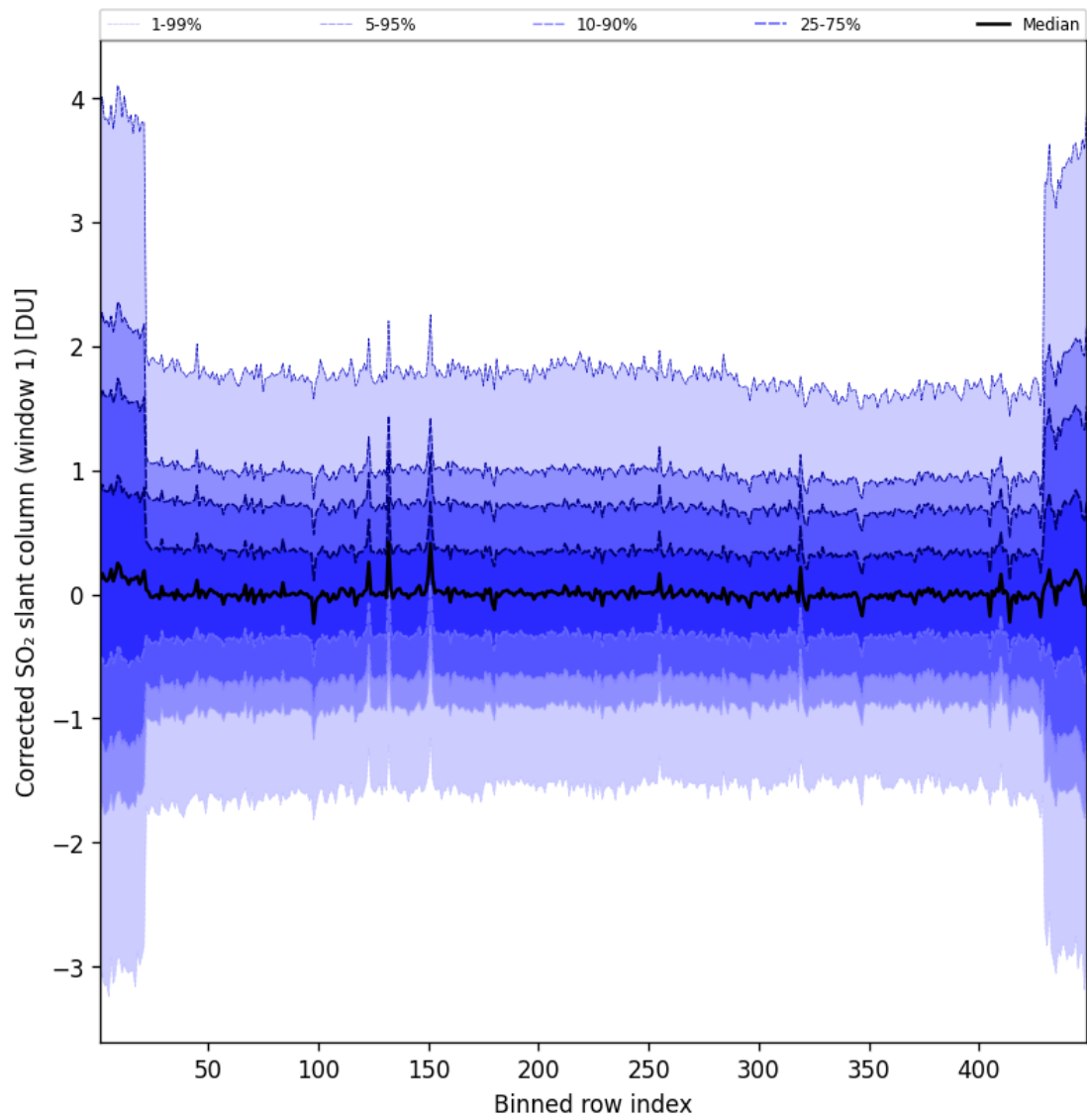


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-03-09 to 2025-03-10

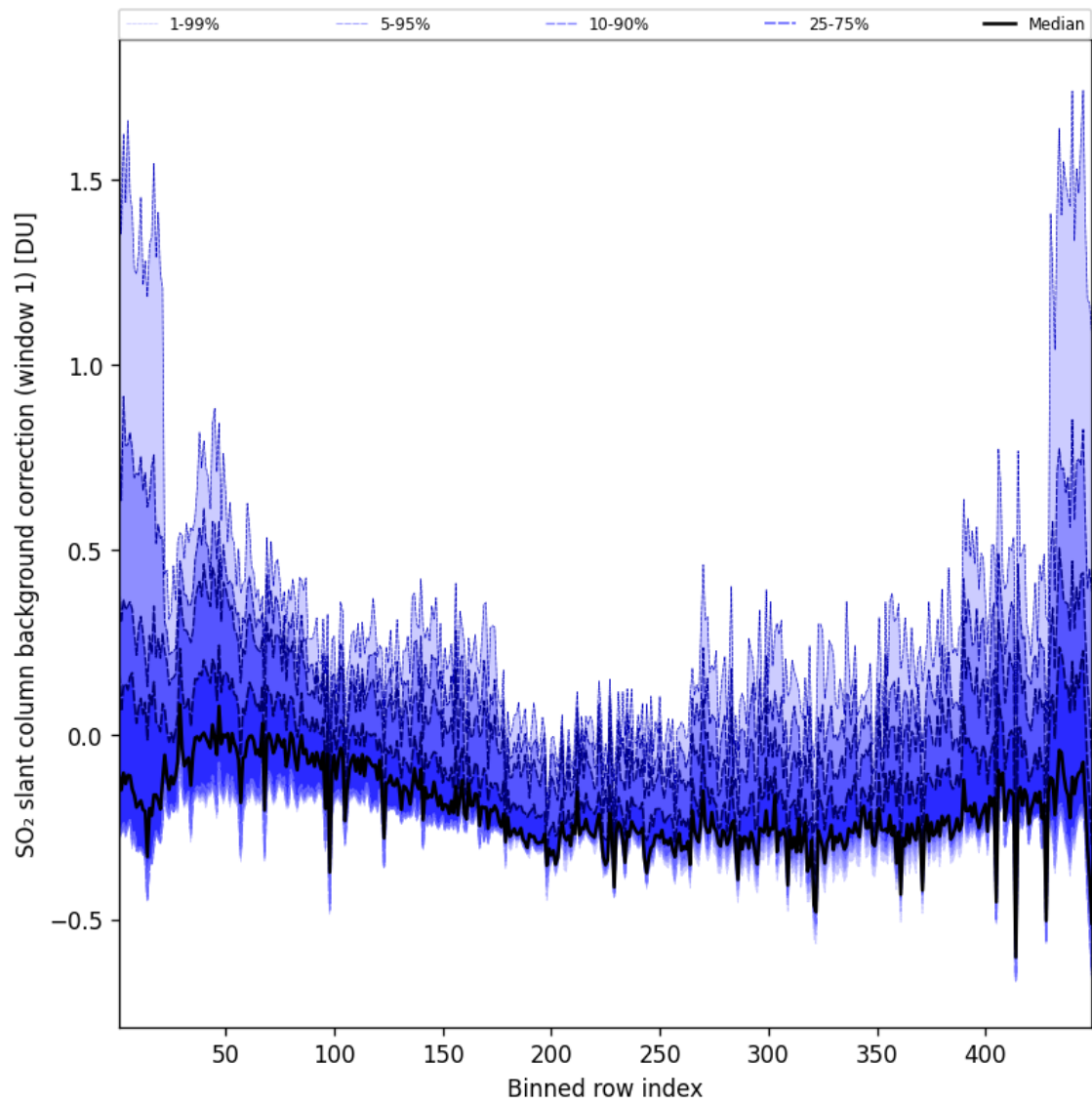


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-03-09 to 2025-03-10

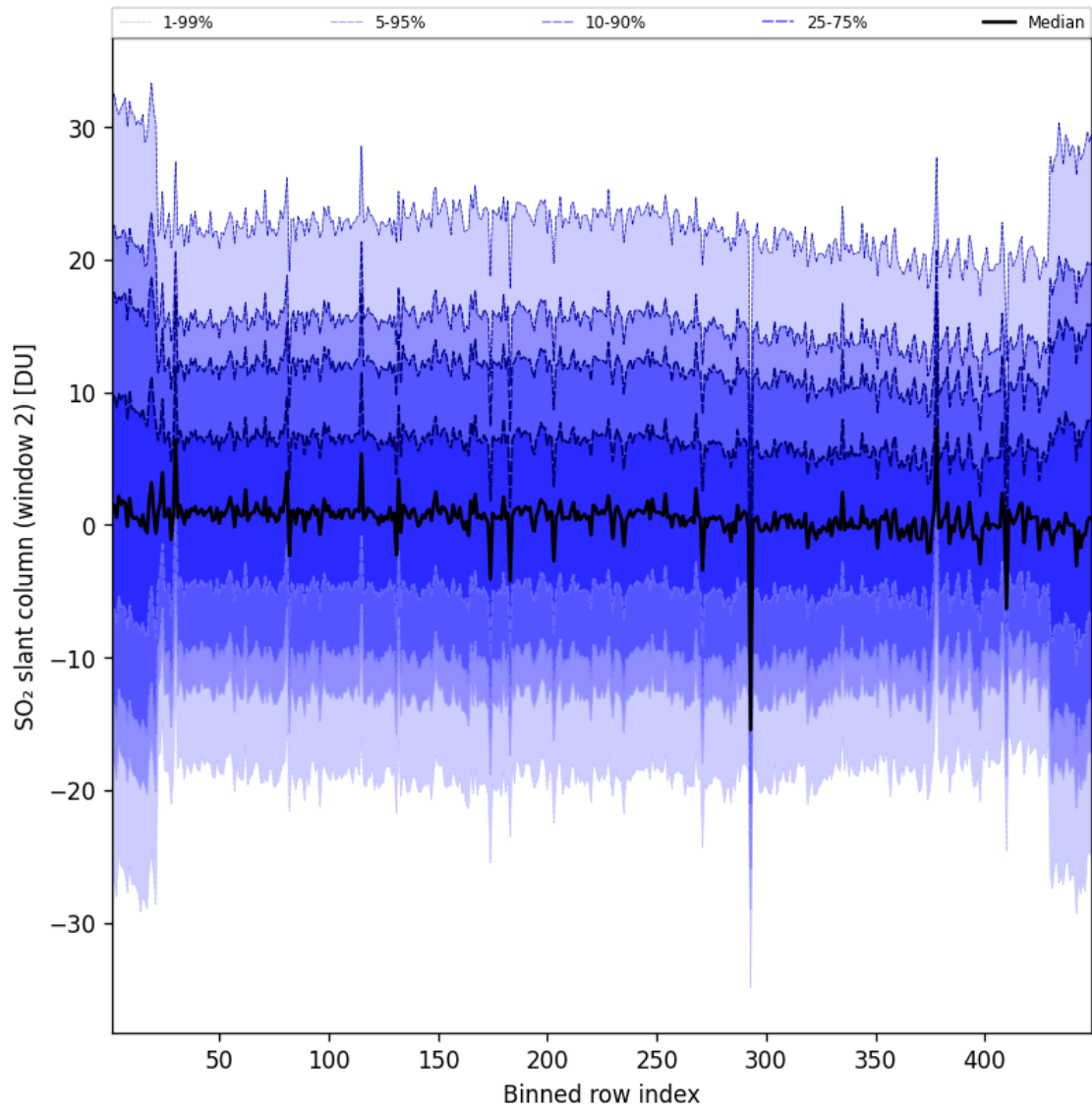


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-03-09 to 2025-03-10

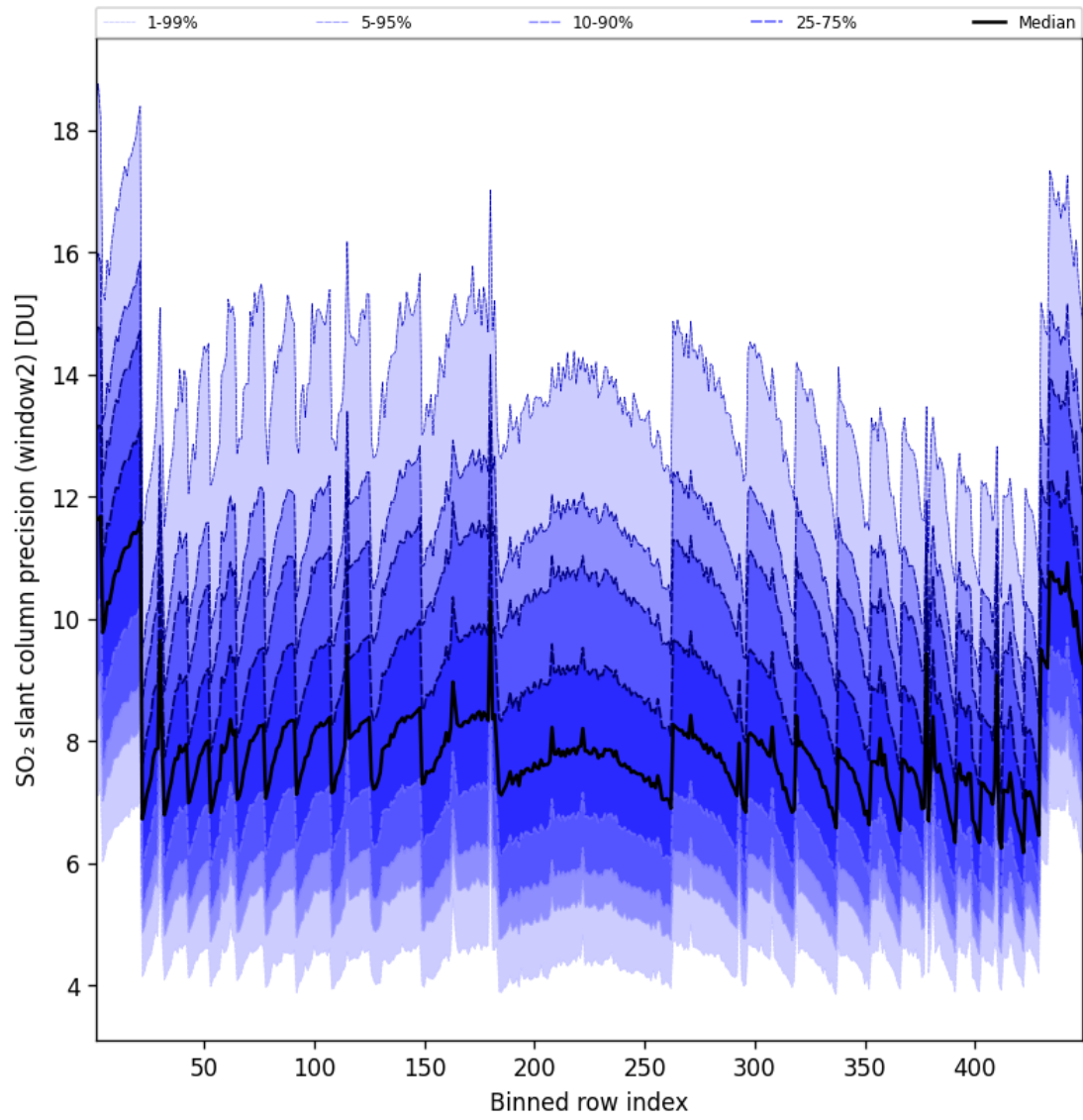


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-03-09 to 2025-03-10

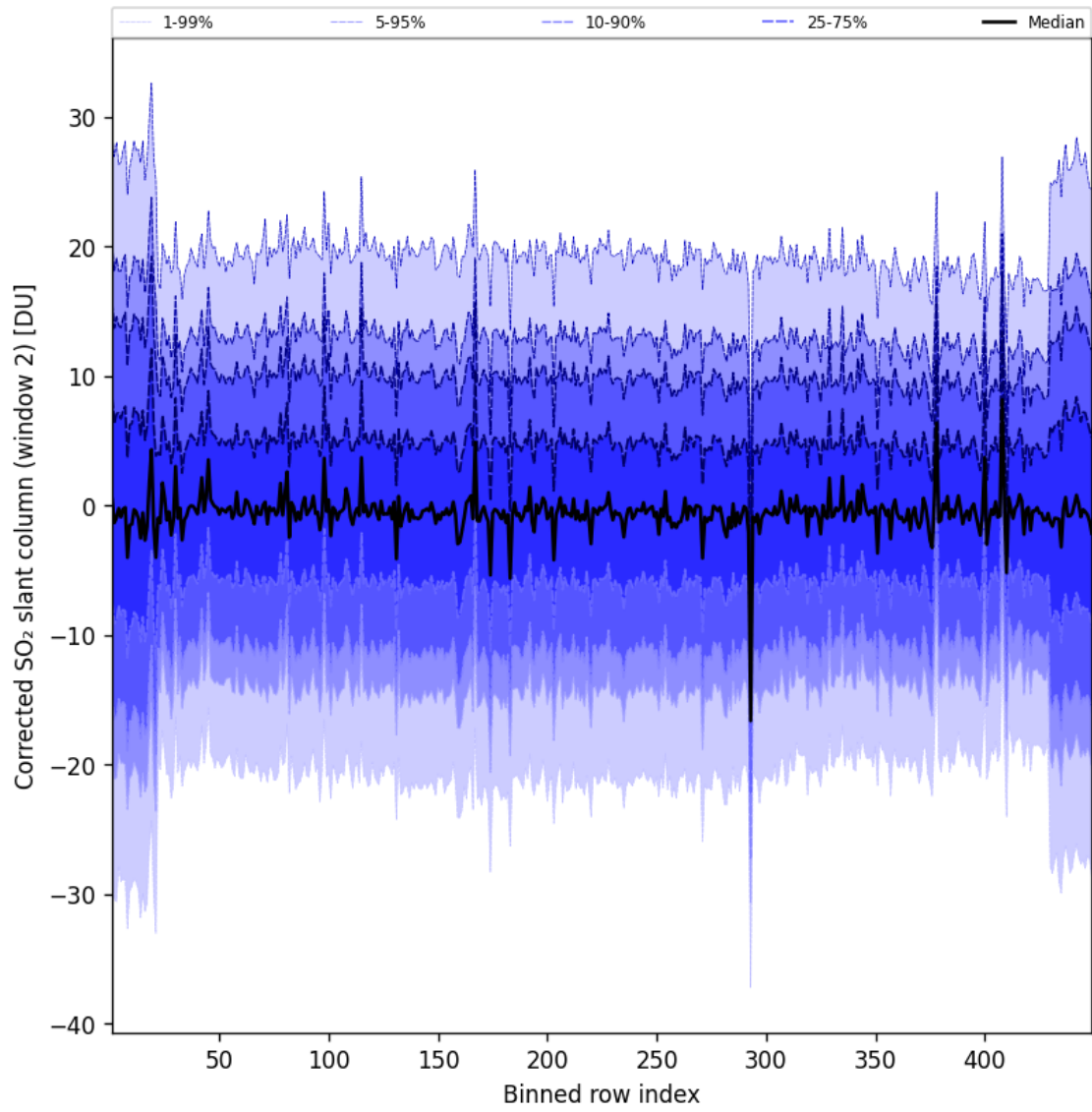


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-03-09 to 2025-03-10

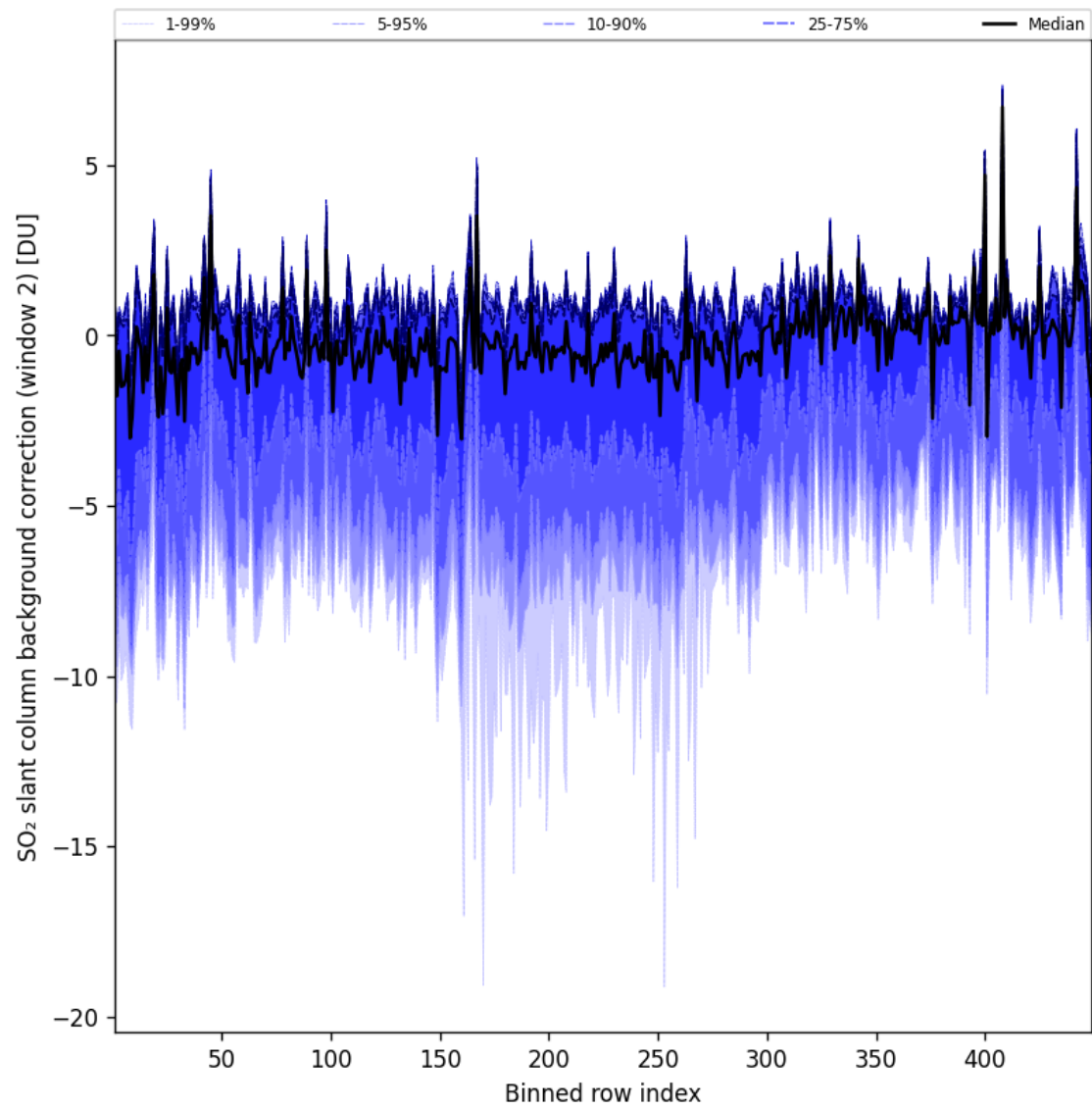


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-03-09 to 2025-03-10

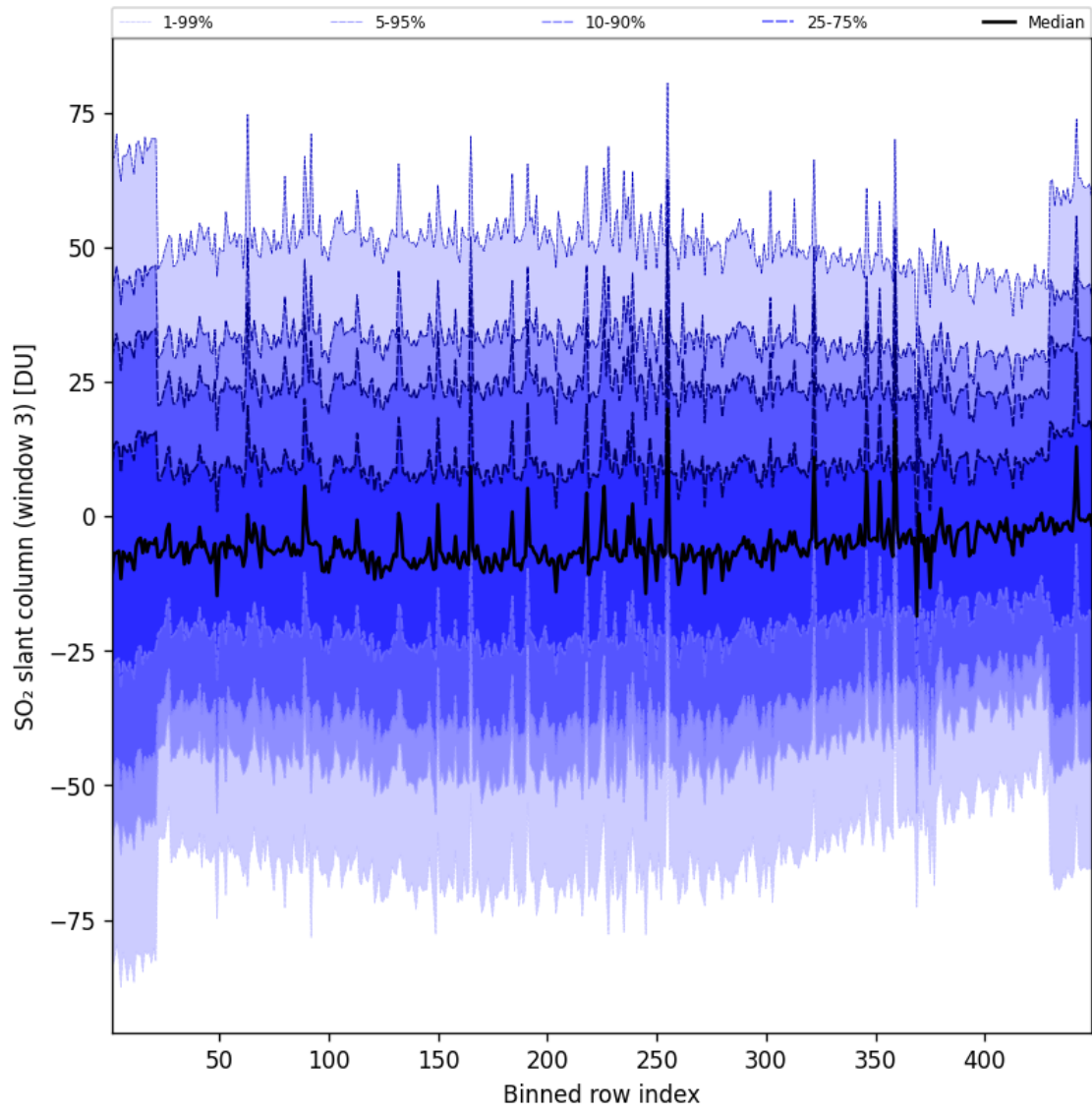


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-03-09 to 2025-03-10

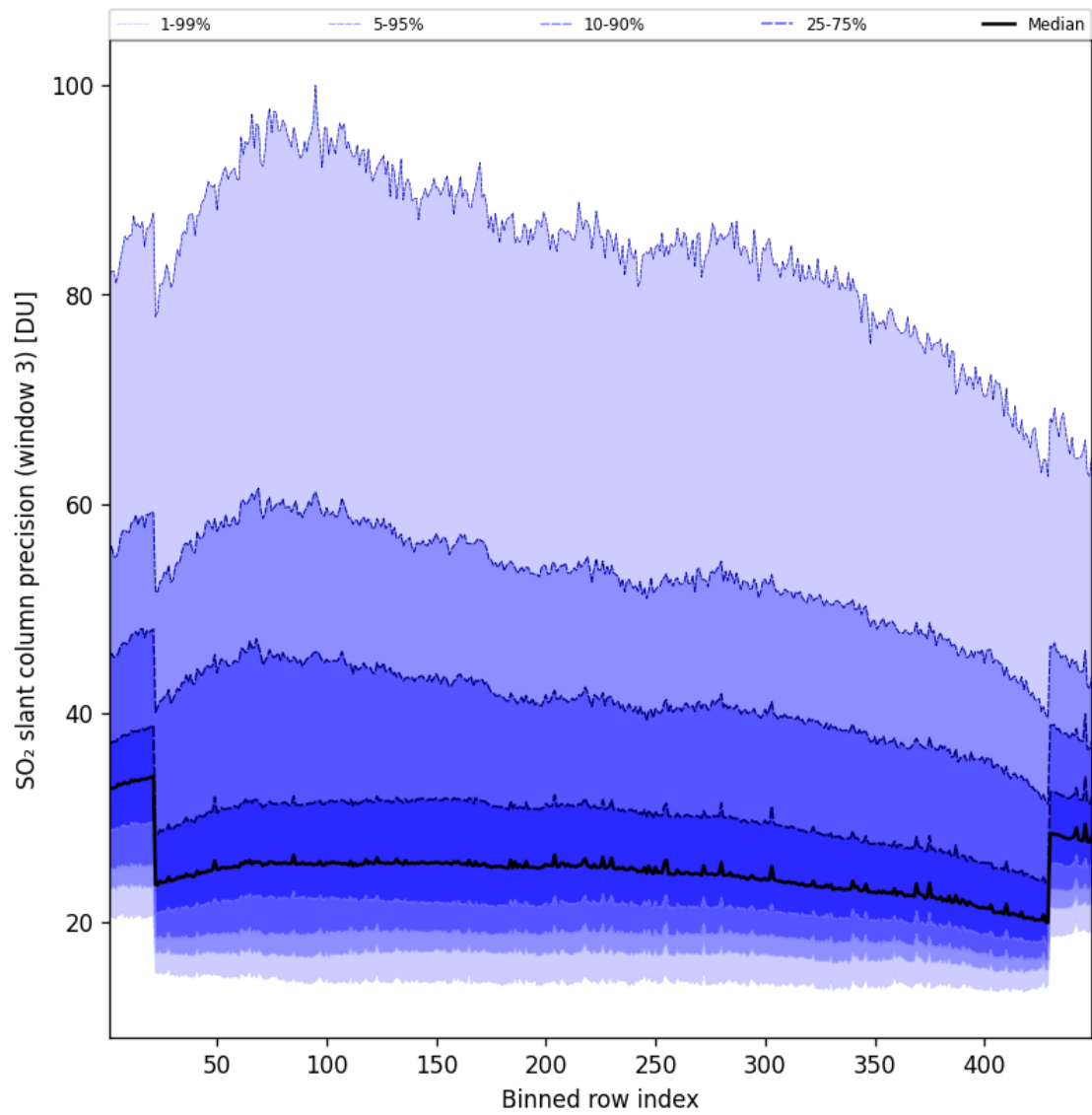


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-03-09 to 2025-03-10

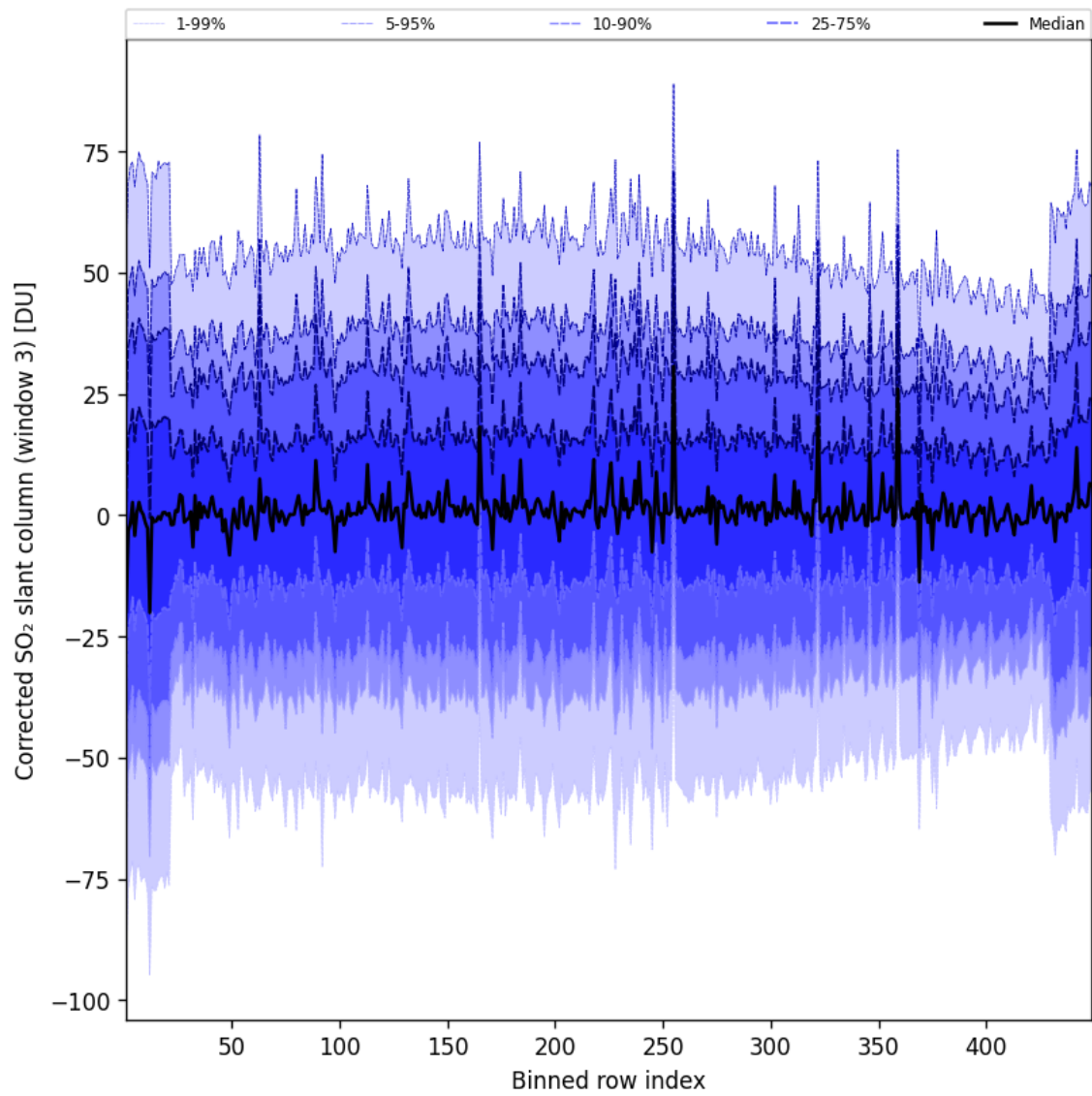


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-03-09 to 2025-03-10

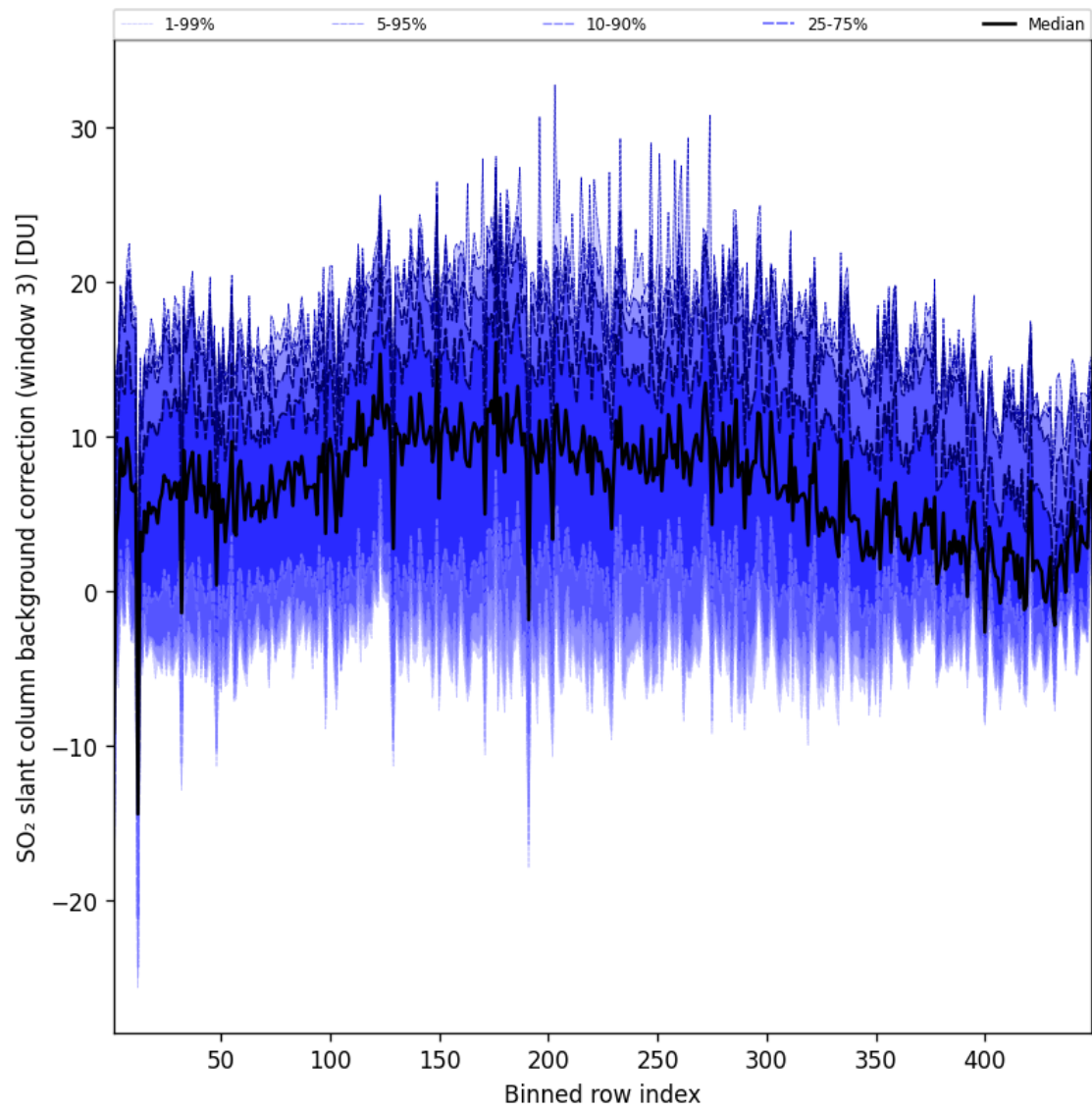


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-03-09 to 2025-03-10

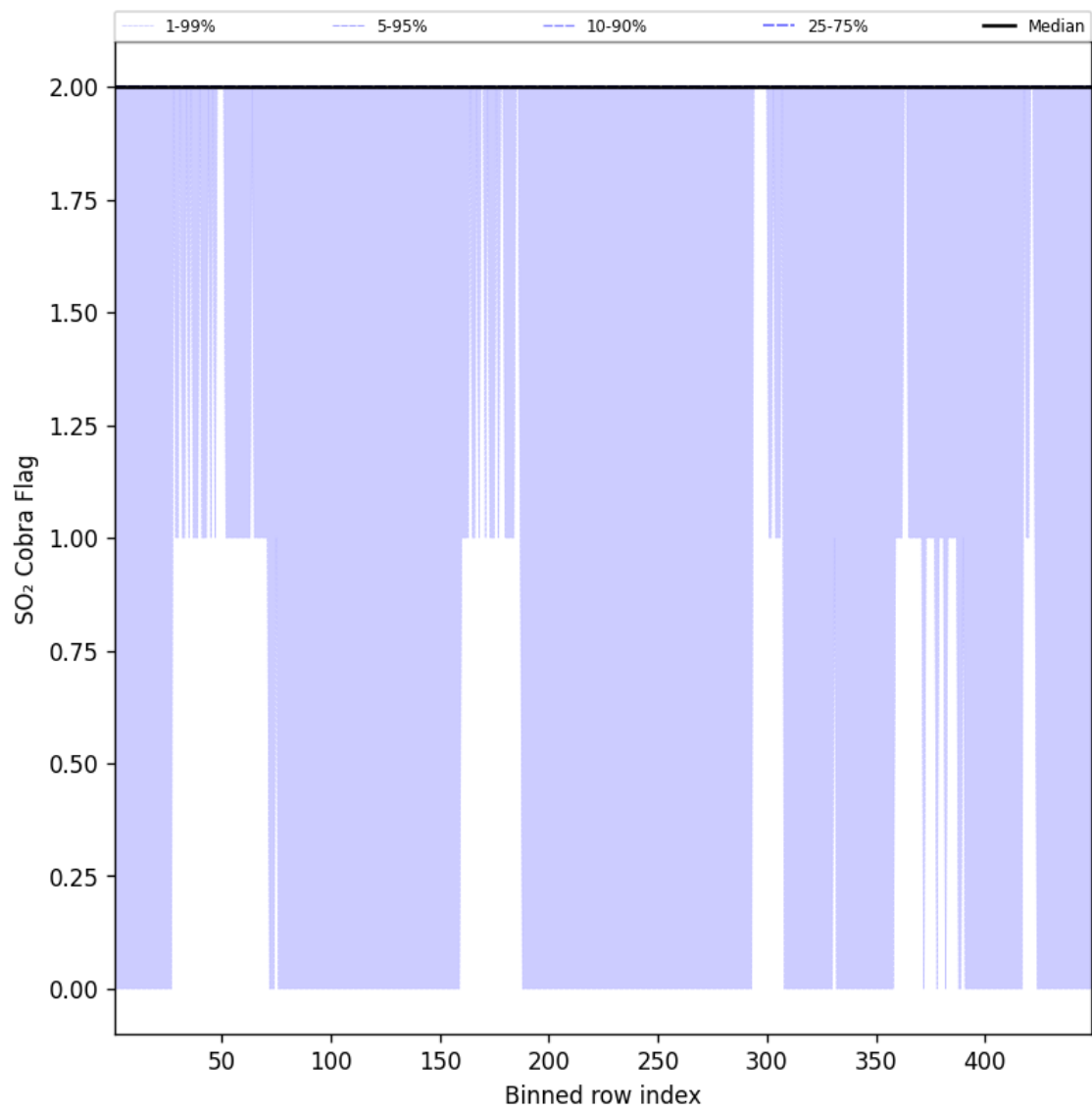


Figure 102: Along track statistics of "SO₂ Cobra Flag" for 2025-03-09 to 2025-03-10

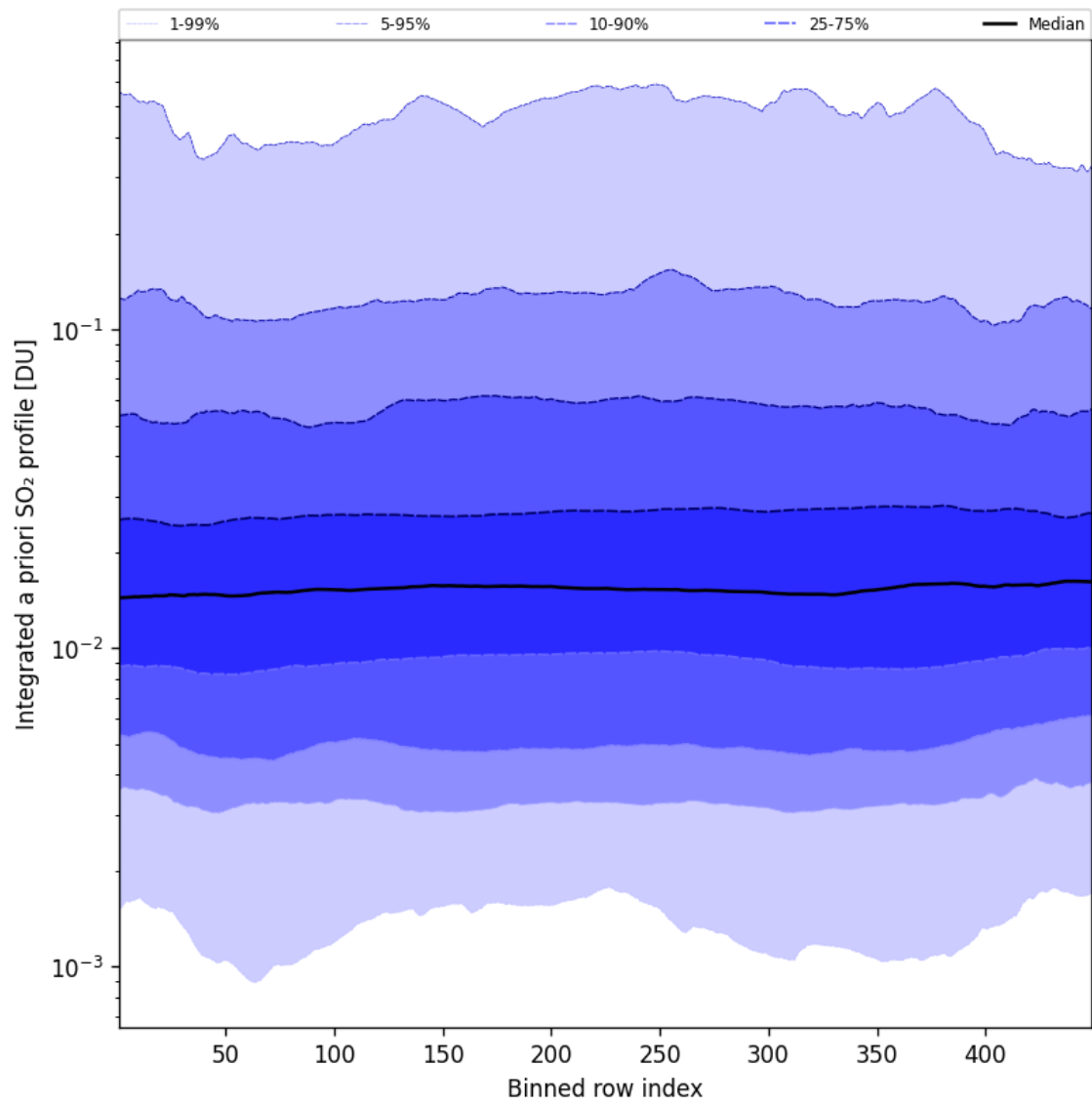


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-03-09 to 2025-03-10

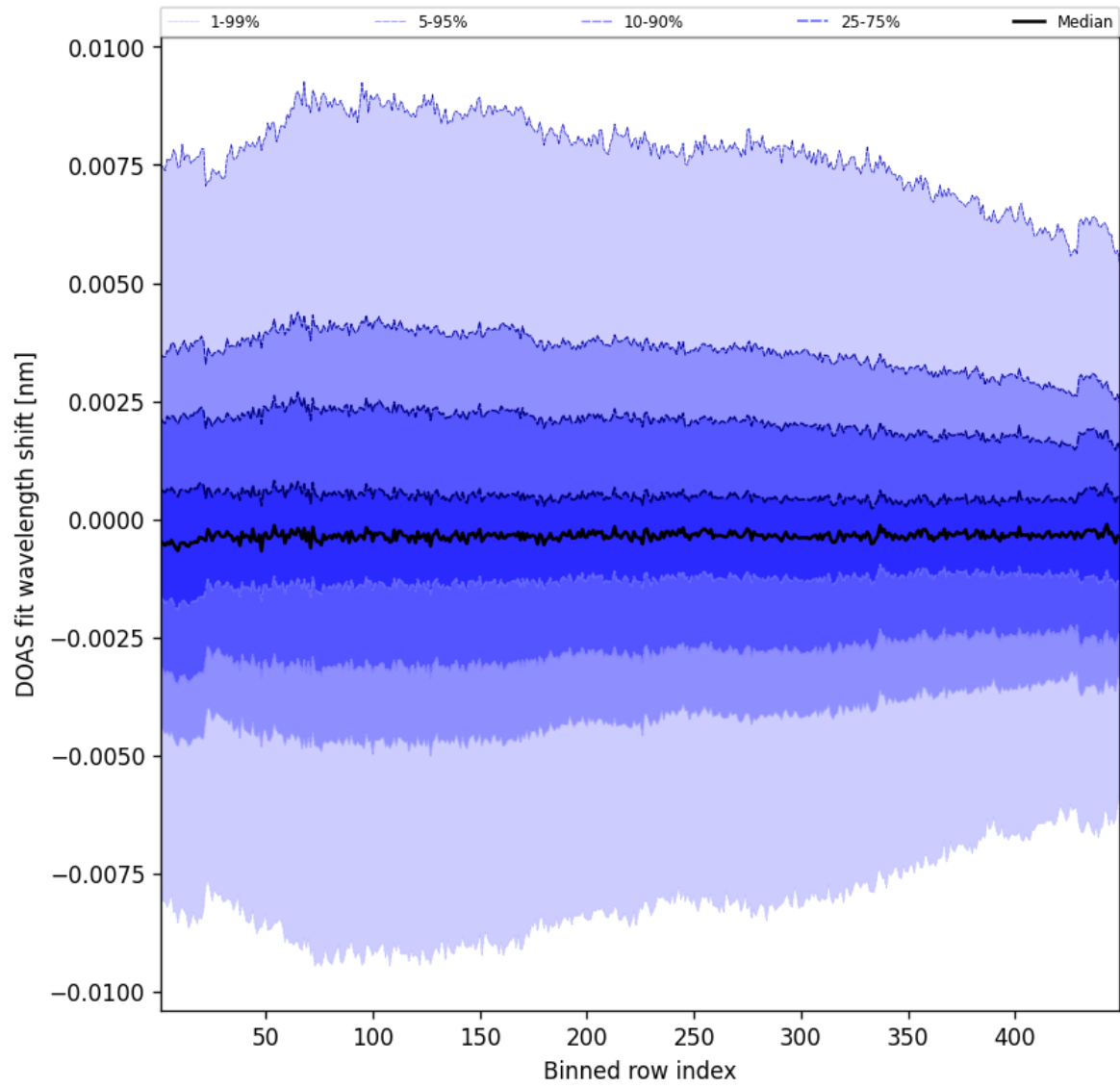


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-03-09 to 2025-03-10

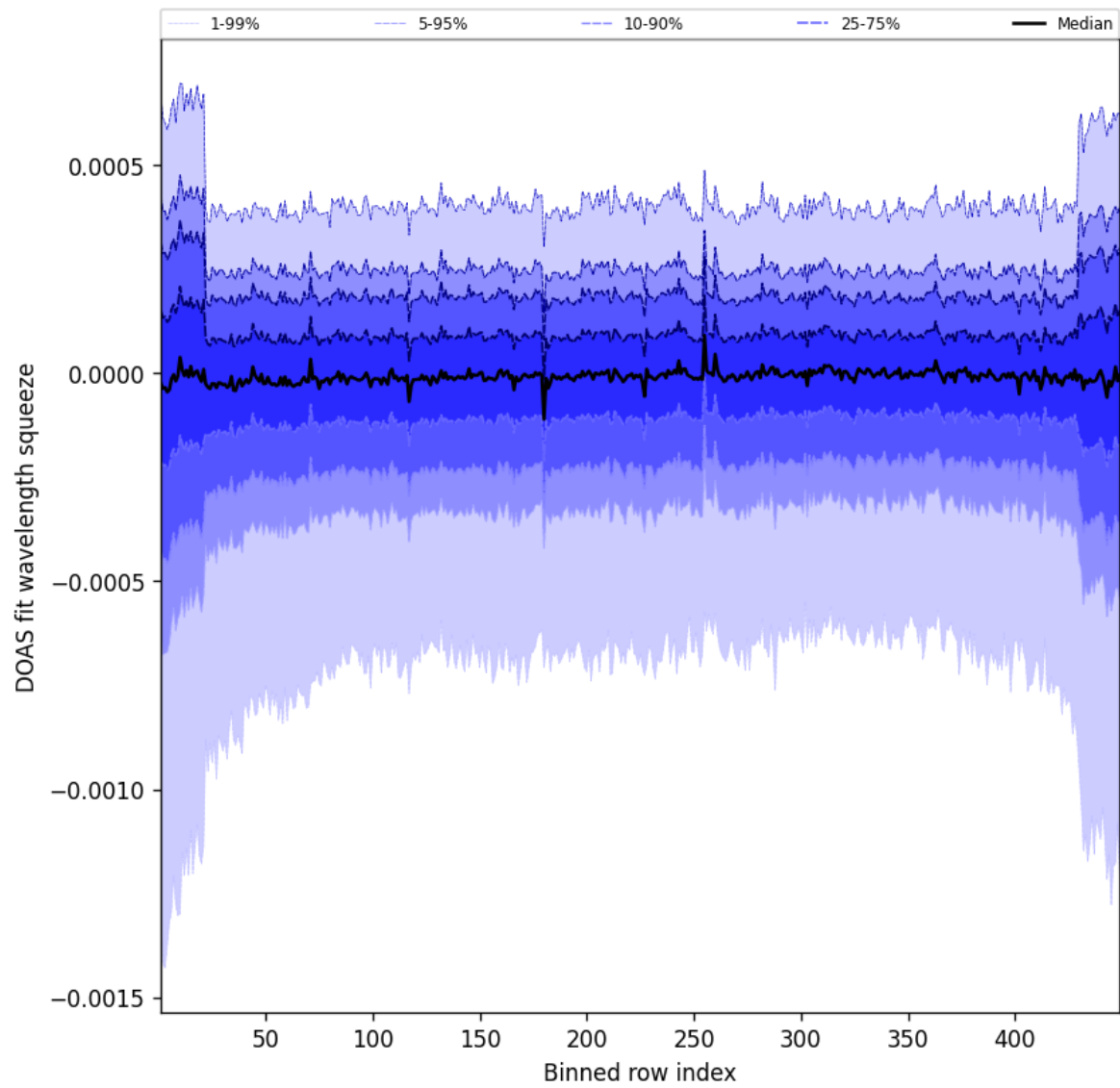


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-03-09 to 2025-03-10

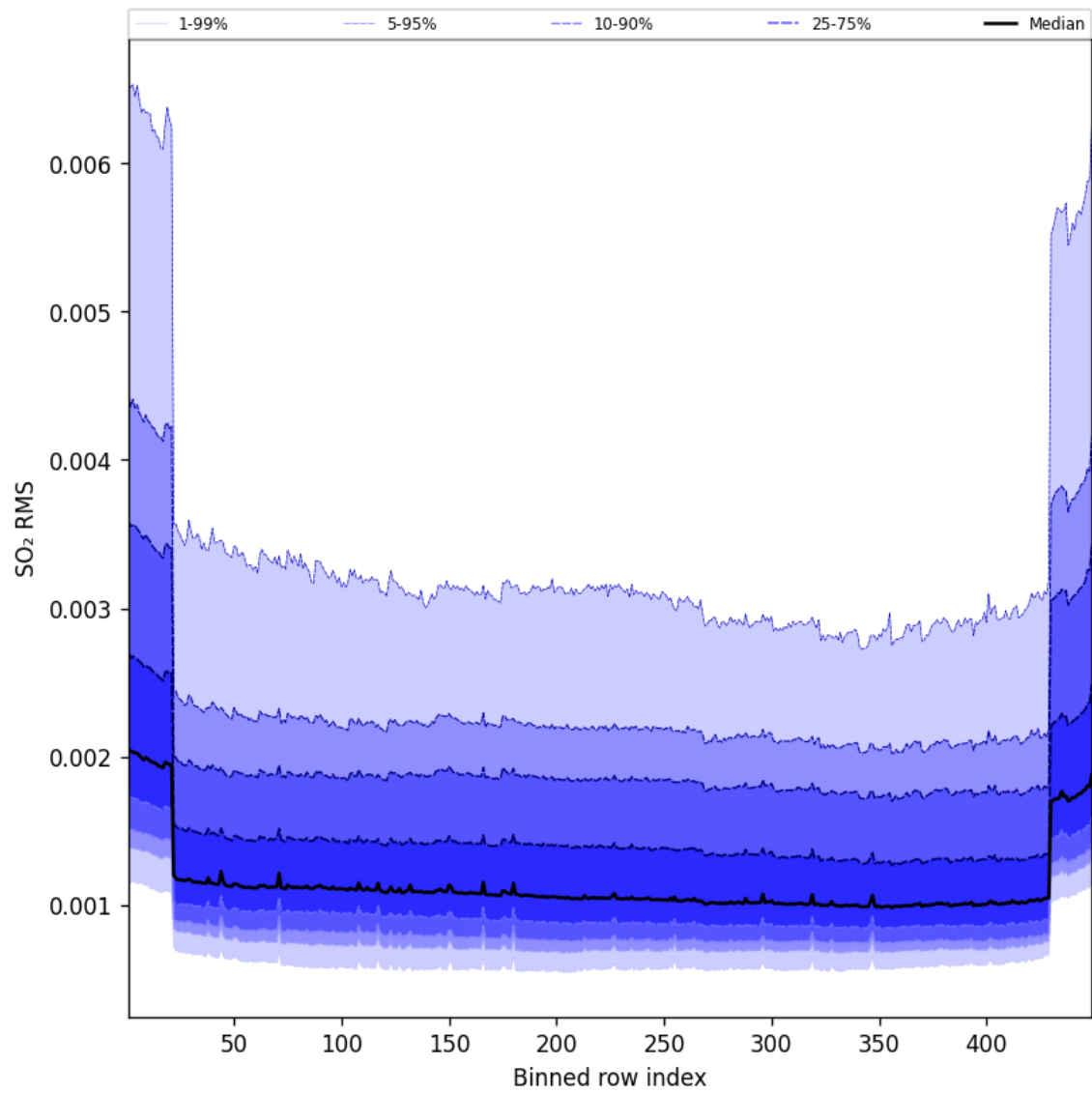


Figure 106: Along track statistics of “SO₂ RMS” for 2025-03-09 to 2025-03-10

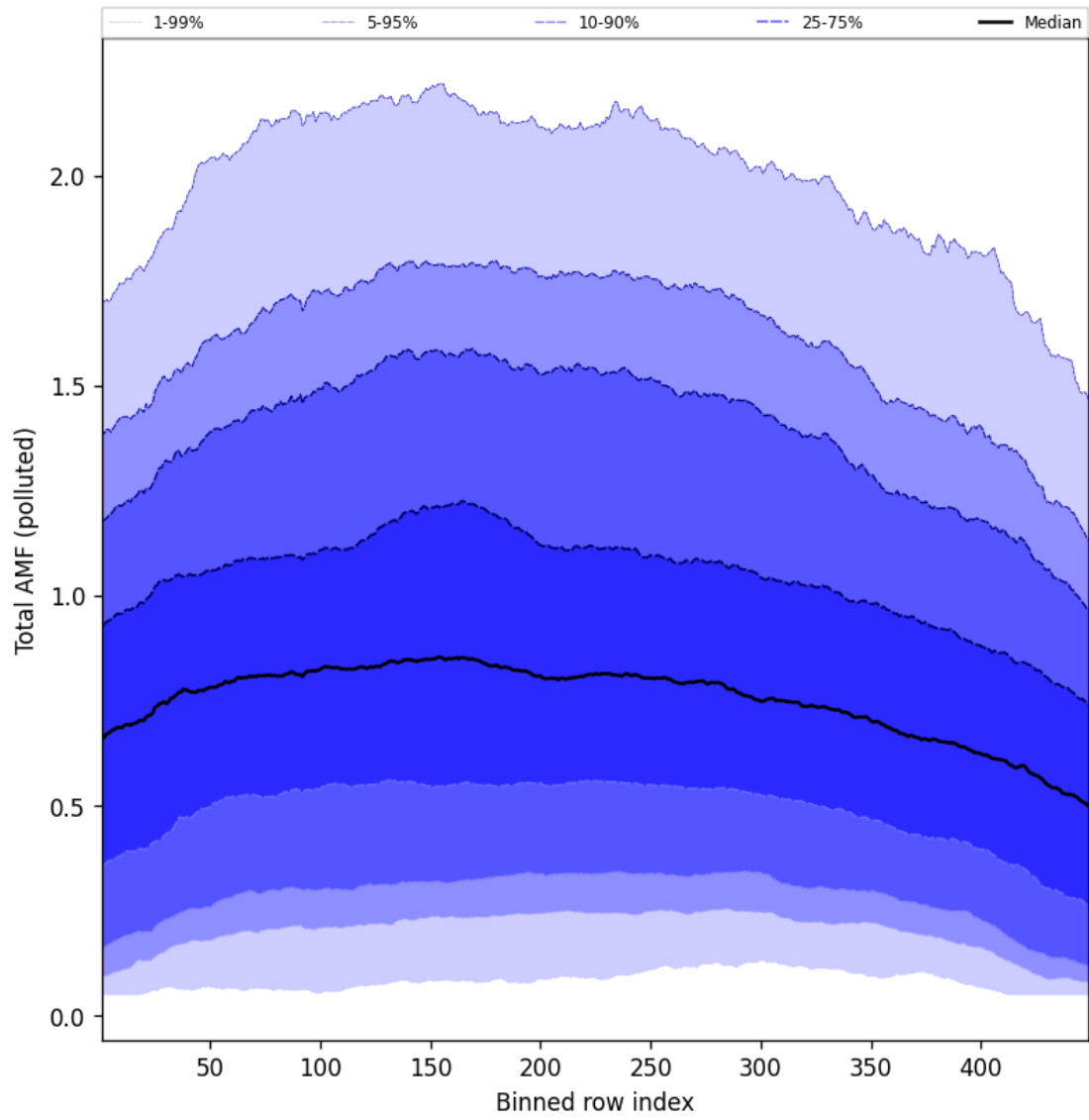


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-03-09 to 2025-03-10

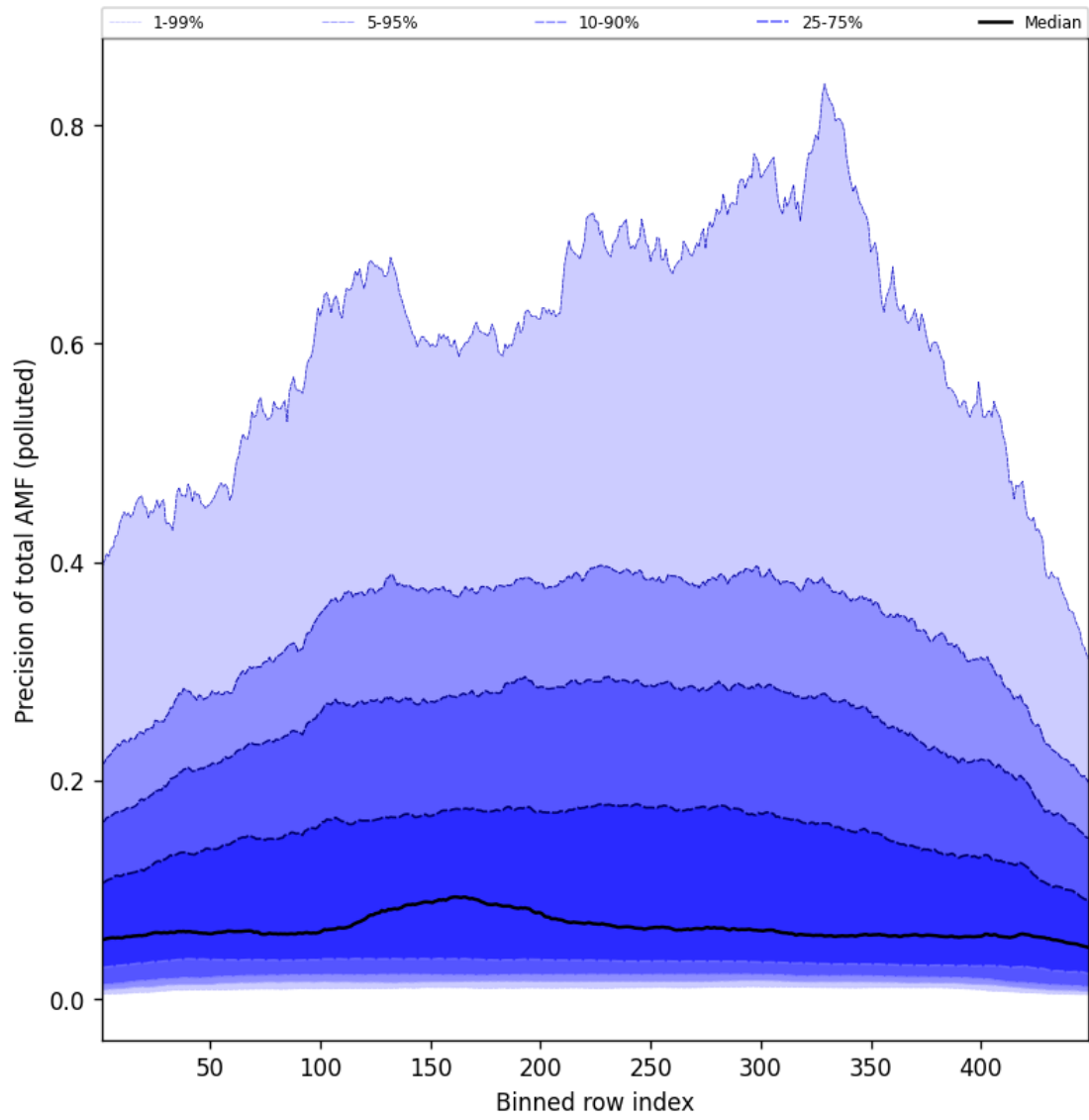


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-03-09 to 2025-03-10

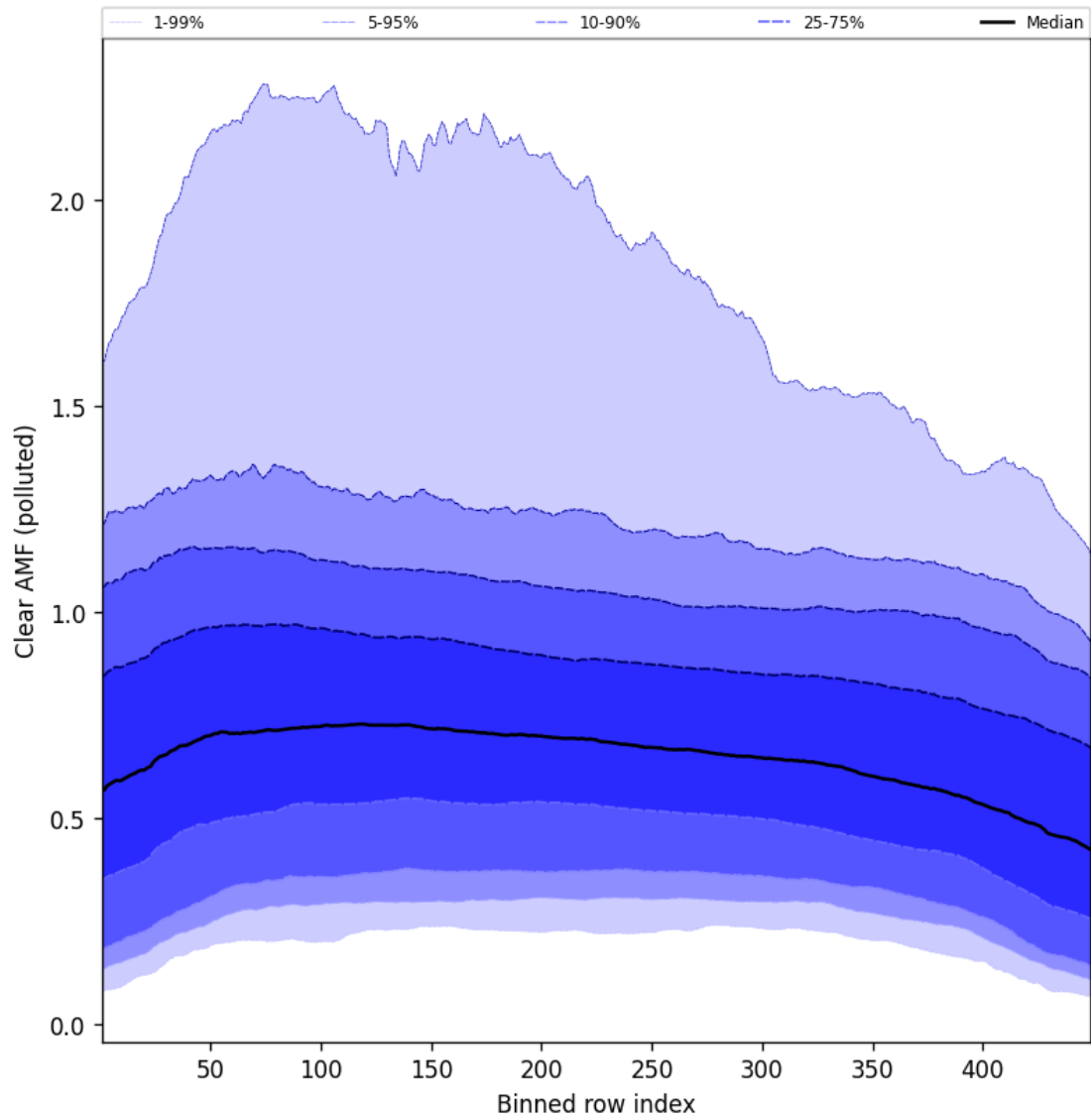


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-03-09 to 2025-03-10

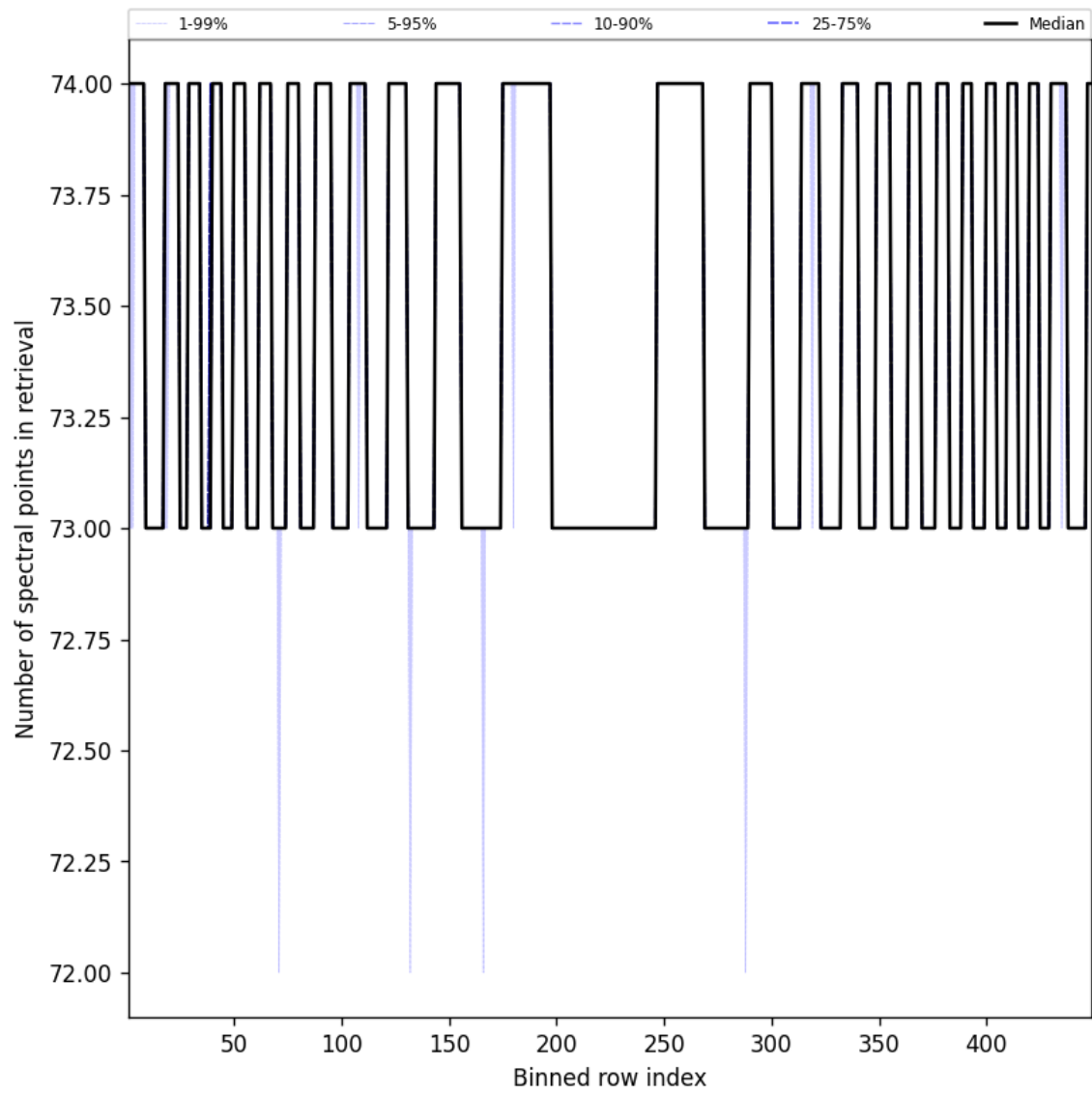


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-03-09 to 2025-03-10

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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