

PyCAMA report generated by tropl2-proc

tropl2-proc

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1 Short Introduction

1.1 The list of parameters

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

2 Definitions

The averages shown here are *unweighed* averages:

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

with N the number of observations in the dataset.

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

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

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

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

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

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

The median is a special case of a percentile. Instead of 1/2 in equation 3, other threshold values can be used. We report results for 1 %, 5 %, 10 %, 15.9 %, 25 %, 75 %, 84.1 %, 90 %, 95 % and 99 %. The inter quartile range is the difference between the 75 % and 25 % percentiles. Similarly the minimum and maximum values correspond to the 0 % and 100 % percentiles respectively.

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

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

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

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

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

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

Table 1: Parameterlist and basic statistics for the analysis

Variable	mean $\pm \sigma$	Count	Mode	IQR	Median	Minimum	Maximum
qa value [1]	0.691 ± 0.398	18488699	0.995	0.730	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.997 \pm 95.485) \times 10^{-2}$	18488699	0.278	0.449	1.062×10^{-2}	-73.7	1.060×10^3
sulfurdioxide total vertical column precision [DU]	0.476 ± 0.563	18488699	0.222	0.313	0.332	4.324×10^{-2}	133
sulfurdioxide slant column density corrected [DU]	$(2.028 \pm 51.380) \times 10^{-2}$	18488699	0.235	0.375	9.570×10^{-3}	-25.2	855
sulfurdioxide slant column density cobra [DU]	$(1.989 \pm 37.677) \times 10^{-2}$	18488699	0.235	0.375	9.570×10^{-3}	-25.2	86.8
sulfurdioxide slant column density cobra precision [DU]	0.302 ± 0.138	18488699	0.213	0.144	0.260	8.207×10^{-2}	44.3
sulfurdioxide slant column density window1 [DU]	0.158 ± 0.702	18488699	0.175	0.750	0.161	-115	101
sulfurdioxide slant column density window1 precision [DU]	0.302 ± 0.138	18488699	0.213	0.144	0.260	8.207×10^{-2}	44.3
sulfurdioxide slant column density corrected win1 [DU]	$(1.141 \pm 69.943) \times 10^{-2}$	18488699	-2.500×10^{-2}	0.743	-1.150×10^{-2}	-115	101
background so2 slant column offset window1 [DU]	-0.146 ± 0.139	18488699	-0.220	0.138	-0.174	-1.20	2.68
sulfurdioxide slant column density window2 [DU]	0.640 ± 9.357	18488699	-0.250	11.8	0.413	-1.062×10^3	978
sulfurdioxide slant column density window2 precision [DU]	8.46 ± 2.38	18488699	7.43	2.78	8.11	2.35	559
sulfurdioxide slant column density corrected win2 [DU]	-2.03 ± 9.15	18488699	-1.75	11.6	-2.02	-1.066×10^3	976
background so2 slant column offset window2 [DU]	-2.67 ± 2.36	18488699	-0.750	2.98	-2.00	-15.3	7.15
sulfurdioxide slant column density window3 [DU]	-0.470 ± 25.158	18488699	-0.560	31.7	-0.215	-799	880
sulfurdioxide slant column density window3 precision [DU]	29.9 ± 13.9	18488699	23.7	10.6	26.1	9.89	1.309×10^3
sulfurdioxide slant column density corrected win3 [DU]	12.6 ± 24.5	18488699	12.9	30.9	12.8	-784	887
background so2 slant column offset window3 [DU]	13.0 ± 5.9	18488699	9.52	9.18	12.8	-25.5	33.5
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	18488699	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.182 \pm 6.218) \times 10^{-2}$	18488699	1.316×10^{-2}	1.979×10^{-2}	1.468×10^{-2}	1.522×10^{-4}	1.61
fitted radiance shift [nm]	$(-3.269 \pm 27.482) \times 10^{-4}$	18488699	-5.000×10^{-4}	1.907×10^{-3}	-3.305×10^{-4}	-0.104	8.045×10^{-2}
fitted radiance squeeze [1]	$(-1.049 \pm 18.894) \times 10^{-5}$	18488699	-1.000×10^{-5}	2.128×10^{-4}	-7.664×10^{-6}	-1.988×10^{-2}	2.070×10^{-2}
fitted root mean square [1]	$(1.322 \pm 0.568) \times 10^{-3}$	18488699	9.750×10^{-4}	5.820×10^{-4}	1.159×10^{-3}	3.345×10^{-4}	6.843×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.889 ± 0.429	18488699	0.660	0.523	0.812	5.000×10^{-2}	2.96
sulfurdioxide total air mass factor polluted precision [1]	0.107 ± 0.106	18488699	3.500×10^{-2}	0.105	7.121×10^{-2}	3.892×10^{-3}	1.71
sulfurdioxide clear air mass factor polluted [1]	0.741 ± 0.272	18488699	0.660	0.338	0.710	7.137×10^{-2}	2.89
number of spectral points in retrieval [1]	73.4 ± 0.5	18488699	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	1.000×10^{-2}	7.000×10^{-2}	0.140	0.270	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-1.91	-0.809	-0.516	-0.354	-0.211	0.239	0.393	0.572	0.908	2.26
sulfurdioxide total vertical column precision [DU]	9.510×10^{-2}	0.131	0.160	0.187	0.221	0.535	0.683	0.858	1.23	2.69
sulfurdioxide slant column density corrected [DU]	-0.883	-0.508	-0.366	-0.273	-0.176	0.199	0.302	0.404	0.567	1.07
sulfurdioxide slant column density cobra [DU]	-0.883	-0.508	-0.366	-0.273	-0.176	0.199	0.302	0.404	0.567	1.07
sulfurdioxide slant column density cobra precision [DU]	0.143	0.170	0.185	0.196	0.211	0.355	0.413	0.469	0.558	0.792
sulfurdioxide slant column density window1 [DU]	-1.72	-0.912	-0.614	-0.418	-0.216	0.534	0.731	0.922	1.21	2.02
sulfurdioxide slant column density window1 precision [DU]	0.143	0.170	0.185	0.196	0.211	0.355	0.413	0.469	0.558	0.792
sulfurdioxide slant column density corrected win1 [DU]	-1.71	-1.01	-0.743	-0.565	-0.376	0.367	0.574	0.780	1.11	2.02
background so2 slant column offset window1 [DU]	-0.384	-0.297	-0.272	-0.253	-0.230	-9.208×10^{-2}	-3.638×10^{-2}	1.813×10^{-2}	9.889×10^{-2}	0.292
sulfurdioxide slant column density window2 [DU]	-21.0	-14.1	-10.7	-8.22	-5.38	6.40	9.48	12.3	16.2	24.5
sulfurdioxide slant column density window2 precision [DU]	4.42	5.37	5.92	6.36	6.89	9.67	10.6	11.5	12.7	15.3
sulfurdioxide slant column density corrected win2 [DU]	-24.2	-16.9	-13.3	-10.7	-7.80	3.75	6.64	9.23	12.8	20.2
background so2 slant column offset window2 [DU]	-9.41	-7.50	-6.12	-5.06	-3.95	-0.974	-0.712	-0.473	-0.135	1.74
sulfurdioxide slant column density window3 [DU]	-64.1	-42.2	-31.8	-24.3	-16.1	15.6	23.6	30.8	40.3	59.2
sulfurdioxide slant column density window3 precision [DU]	14.4	17.2	19.0	20.4	22.1	32.7	37.4	43.7	56.3	89.0
sulfurdioxide slant column density corrected win3 [DU]	-49.0	-27.9	-17.9	-10.6	-2.69	28.2	36.0	42.9	52.2	71.0
background so2 slant column offset window3 [DU]	-0.182	4.11	5.75	7.03	8.58	17.8	19.3	20.6	22.2	25.3
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]	1.110×10^{-3}	2.387×10^{-3}	4.101×10^{-3}	6.048×10^{-3}	8.554×10^{-3}	2.834×10^{-2}	4.458×10^{-2}	6.750×10^{-2}	0.115	0.307
fitted radiance shift [nm]	-8.549×10^{-3}	-4.397×10^{-3}	-2.926×10^{-3}	-2.063×10^{-3}	-1.316×10^{-3}	5.913×10^{-4}	1.343×10^{-3}	2.273×10^{-3}	3.876×10^{-3}	8.276×10^{-3}
fitted radiance squeeze [1]	-5.222×10^{-4}	-3.099×10^{-4}	-2.274×10^{-4}	-1.723×10^{-4}	-1.149×10^{-4}	9.785×10^{-5}	1.530×10^{-4}	2.051×10^{-4}	2.818×10^{-4}	4.677×10^{-4}
fitted root mean square [1]	6.005×10^{-4}	7.442×10^{-4}	8.223×10^{-4}	8.818×10^{-4}	9.551×10^{-4}	1.537×10^{-3}	1.787×10^{-3}	2.030×10^{-3}	2.398×10^{-3}	3.361×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.135	0.316	0.416	0.494	0.590	1.11	1.31	1.50	1.73	2.12
sulfurdioxide total air mass factor polluted precision [1]	1.304×10^{-2}	2.160×10^{-2}	2.695×10^{-2}	3.165×10^{-2}	3.845×10^{-2}	0.144	0.182	0.221	0.289	0.506
sulfurdioxide clear air mass factor polluted [1]	0.270	0.366	0.430	0.486	0.556	0.894	0.983	1.06	1.17	1.59
number of spectral points in retrieval [1]	73.0	73.0	73.0	73.0	73.0	74.0	74.0	74.0	74.0	74.0

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

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.663 ± 0.410	10807597	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(2.160 \pm 81.422) \times 10^{-2}$	10807597	0.418	8.951×10^{-3}	-62.0	775	-0.198	0.220
sulfurdioxide total vertical column precision [DU]	0.444 ± 0.531	10807597	0.292	0.304	4.324×10^{-2}	79.2	0.207	0.499
sulfurdioxide slant column density corrected [DU]	$(1.620 \pm 45.627) \times 10^{-2}$	10807597	0.351	8.091×10^{-3}	-6.54	855	-0.166	0.185
sulfurdioxide slant column density cobra [DU]	$(1.593 \pm 34.113) \times 10^{-2}$	10807597	0.351	8.091×10^{-3}	-6.54	26.6	-0.166	0.185
sulfurdioxide slant column density cobra precision [DU]	0.278 ± 0.114	10807597	0.119	0.242	8.207×10^{-2}	24.0	0.203	0.322
sulfurdioxide slant column density window1 [DU]	0.154 ± 0.634	10807597	0.708	0.156	-39.7	36.7	-0.200	0.508
sulfurdioxide slant column density window1 precision [DU]	0.278 ± 0.114	10807597	0.119	0.242	8.207×10^{-2}	24.0	0.203	0.322
sulfurdioxide slant column density corrected win1 [DU]	$(-2.108 \pm 628.438) \times 10^{-3}$	10807597	0.699	-1.843×10^{-2}	-39.7	36.8	-0.363	0.336
background so2 slant column offset window1 [DU]	-0.156 ± 0.116	10807597	0.138	-0.177	-1.20	2.10	-0.233	-9.459×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.232 ± 8.879	10807597	11.3	0.113	-651	858	-5.48	5.81
sulfurdioxide slant column density window2 precision [DU]	8.19 ± 2.27	10807597	2.70	7.84	2.36	278	6.66	9.36
sulfurdioxide slant column density corrected win2 [DU]	-1.90 ± 8.76	10807597	11.1	-1.89	-655	855	-7.46	3.68
background so2 slant column offset window2 [DU]	-2.13 ± 1.70	10807597	2.34	-1.73	-9.30	7.15	-3.28	-0.936
sulfurdioxide slant column density window3 [DU]	0.253 ± 24.849	10807597	31.0	0.408	-192	880	-15.0	16.0
sulfurdioxide slant column density window3 precision [DU]	29.3 ± 14.1	10807597	10.9	25.4	9.89	726	21.4	32.3
sulfurdioxide slant column density corrected win3 [DU]	12.5 ± 24.1	10807597	30.2	12.7	-179	887	-2.33	27.8
background so2 slant column offset window3 [DU]	12.3 ± 6.0	10807597	10.0	12.1	-15.6	33.2	7.47	17.5
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.20	10807597	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.693 \pm 7.317) \times 10^{-2}$	10807597	2.792×10^{-2}	1.537×10^{-2}	1.522×10^{-4}	1.61	7.414×10^{-3}	3.534×10^{-2}
fitted radiance shift [nm]	$(-6.264 \pm 283.458) \times 10^{-5}$	10807597	1.841×10^{-3}	-1.090×10^{-4}	-5.783×10^{-2}	4.446×10^{-2}	-1.005×10^{-3}	8.362×10^{-4}
fitted radiance squeeze [1]	$(-2.919 \pm 16.711) \times 10^{-5}$	10807597	1.990×10^{-4}	-2.290×10^{-5}	-1.175×10^{-2}	1.096×10^{-2}	-1.251×10^{-4}	7.390×10^{-5}
fitted root mean square [1]	$(1.227 \pm 0.467) \times 10^{-3}$	10807597	5.022×10^{-4}	1.097×10^{-3}	3.345×10^{-4}	5.191×10^{-2}	9.189×10^{-4}	1.421×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.904 ± 0.455	10807597	0.572	0.840	5.000×10^{-2}	2.96	0.575	1.15
sulfurdioxide total air mass factor polluted precision [1]	0.116 ± 0.122	10807597	0.115	7.426×10^{-2}	3.892×10^{-3}	1.71	3.968×10^{-2}	0.155
sulfurdioxide clear air mass factor polluted [1]	0.763 ± 0.309	10807597	0.400	0.731	7.144×10^{-2}	2.89	0.542	0.942
number of spectral points in retrieval [1]	73.5 ± 0.5	10807597	1.000	73.0	52.0	74.0	73.0	74.0

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

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.730 ± 0.378	7681102	0.640	1.000	0.0	1.000	0.360	1.000
sulfurdioxide total vertical column [DU]	$(4.175 \pm 112.319) \times 10^{-2}$	7681102	0.499	1.340×10^{-2}	-73.7	1.060×10^3	-0.231	0.268
sulfurdioxide total vertical column precision [DU]	0.521 ± 0.603	7681102	0.334	0.368	4.667×10^{-2}	133	0.251	0.585
sulfurdioxide slant column density corrected [DU]	$(2.603 \pm 58.521) \times 10^{-2}$	7681102	0.413	1.202×10^{-2}	-25.2	589	-0.192	0.221
sulfurdioxide slant column density cobra [DU]	$(2.548 \pm 42.178) \times 10^{-2}$	7681102	0.413	1.202×10^{-2}	-25.2	86.8	-0.192	0.221
sulfurdioxide slant column density cobra precision [DU]	0.336 ± 0.160	7681102	0.171	0.293	9.409×10^{-2}	44.3	0.228	0.399
sulfurdioxide slant column density window1 [DU]	0.163 ± 0.787	7681102	0.816	0.169	-115	101	-0.242	0.574
sulfurdioxide slant column density window1 precision [DU]	0.336 ± 0.160	7681102	0.171	0.293	9.409×10^{-2}	44.3	0.228	0.399
sulfurdioxide slant column density corrected win1 [DU]	$(3.044 \pm 78.818) \times 10^{-2}$	7681102	0.813	-2.745×10^{-4}	-115	101	-0.397	0.415
background so2 slant column offset window1 [DU]	-0.132 ± 0.165	7681102	0.139	-0.170	-0.654	2.68	-0.226	-8.714×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.21 ± 9.96	7681102	12.5	0.885	-1.062×10^3	978	-5.23	7.29
sulfurdioxide slant column density window2 precision [DU]	8.84 ± 2.48	7681102	2.79	8.48	2.35	559	7.26	10.0
sulfurdioxide slant column density corrected win2 [DU]	-2.21 ± 9.68	7681102	12.2	-2.22	-1.066×10^3	976	-8.32	3.86
background so2 slant column offset window2 [DU]	-3.43 ± 2.89	7681102	4.67	-2.56	-15.3	7.02	-5.72	-1.05
sulfurdioxide slant column density window3 [DU]	-1.49 ± 25.55	7681102	32.6	-1.14	-799	772	-17.6	15.1
sulfurdioxide slant column density window3 precision [DU]	30.7 ± 13.5	7681102	10.1	27.1	10.4	1.309×10^3	23.2	33.3
sulfurdioxide slant column density corrected win3 [DU]	12.6 ± 25.1	7681102	32.0	12.8	-784	782	-3.23	28.8
background so2 slant column offset window3 [DU]	14.1 ± 5.6	7681102	8.32	13.5	-25.5	33.5	9.93	18.2
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	7681102	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.463 \pm 4.105) \times 10^{-2}$	7681102	1.250×10^{-2}	1.422×10^{-2}	1.323×10^{-3}	0.986	9.545×10^{-3}	2.204×10^{-2}
fitted radiance shift [nm]	$(-6.988 \pm 25.763) \times 10^{-4}$	7681102	1.876×10^{-3}	-6.520×10^{-4}	-0.104	8.045×10^{-2}	-1.679×10^{-3}	1.975×10^{-4}
fitted radiance squeeze [1]	$(1.583 \pm 21.319) \times 10^{-5}$	7681102	2.323×10^{-4}	1.728×10^{-5}	-1.988×10^{-2}	2.070×10^{-2}	-9.790×10^{-5}	1.344×10^{-4}
fitted root mean square [1]	$(1.456 \pm 0.661) \times 10^{-3}$	7681102	6.867×10^{-4}	1.261×10^{-3}	3.434×10^{-4}	6.843×10^{-2}	1.020×10^{-3}	1.707×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.869 ± 0.390	7681102	0.459	0.784	5.000×10^{-2}	2.76	0.604	1.06
sulfurdioxide total air mass factor polluted precision [1]	$(9.376 \pm 7.458) \times 10^{-2}$	7681102	9.343×10^{-2}	6.753×10^{-2}	3.897×10^{-3}	1.51	3.732×10^{-2}	0.131
sulfurdioxide clear air mass factor polluted [1]	0.709 ± 0.203	7681102	0.264	0.690	7.137×10^{-2}	2.39	0.570	0.834
number of spectral points in retrieval [1]	73.4 ± 0.5	7681102	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]	0.706 ± 0.389	12671690	0.700	1.000	0.0	1.000	0.300	1.000
sulfurdioxide total vertical column [DU]	$(3.255 \pm 86.635) \times 10^{-2}$	12671690	0.438	1.066×10^{-2}	-73.7	580	-0.205	0.233
sulfurdioxide total vertical column precision [DU]	0.460 ± 0.553	12671690	0.287	0.317	5.225×10^{-2}	133	0.219	0.506
sulfurdioxide slant column density corrected [DU]	$(2.134 \pm 42.804) \times 10^{-2}$	12671690	0.373	9.670×10^{-3}	-9.05	461	-0.175	0.198
sulfurdioxide slant column density cobra [DU]	$(2.105 \pm 38.666) \times 10^{-2}$	12671690	0.373	9.670×10^{-3}	-9.05	25.8	-0.175	0.198
sulfurdioxide slant column density cobra precision [DU]	0.305 ± 0.147	12671690	0.156	0.255	8.207×10^{-2}	44.3	0.208	0.364
sulfurdioxide slant column density window1 [DU]	0.165 ± 0.719	12671690	0.749	0.171	-115	66.7	-0.206	0.543
sulfurdioxide slant column density window1 precision [DU]	0.305 ± 0.147	12671690	0.156	0.255	8.207×10^{-2}	44.3	0.208	0.364
sulfurdioxide slant column density corrected win1 [DU]	$(2.171 \pm 71.789) \times 10^{-2}$	12671690	0.743	-3.558×10^{-3}	-115	66.4	-0.368	0.375
background so2 slant column offset window1 [DU]	-0.144 ± 0.150	12671690	0.140	-0.177	-1.20	2.68	-0.232	-9.207×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.740 ± 9.318	12671690	11.7	0.448	-742	978	-5.30	6.44
sulfurdioxide slant column density window2 precision [DU]	8.36 ± 2.27	12671690	2.72	8.00	2.35	476	6.83	9.54
sulfurdioxide slant column density corrected win2 [DU]	-2.05 ± 9.07	12671690	11.5	-2.04	-744	976	-7.79	3.69
background so2 slant column offset window2 [DU]	-2.78 ± 2.59	12671690	3.39	-1.87	-15.3	7.15	-4.31	-0.920
sulfurdioxide slant column density window3 [DU]	2.11 ± 24.83	12671690	31.6	2.20	-799	353	-13.5	18.1
sulfurdioxide slant column density window3 precision [DU]	28.8 ± 12.5	12671690	9.80	25.5	10.2	1.309×10^3	21.8	31.6
sulfurdioxide slant column density corrected win3 [DU]	14.9 ± 23.9	12671690	30.5	14.9	-784	365	-0.236	30.2
background so2 slant column offset window3 [DU]	12.8 ± 6.0	12671690	9.26	12.2	-25.5	33.5	8.37	17.6
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	12671690	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.111 \pm 2.964) \times 10^{-2}$	12671690	1.358×10^{-2}	1.397×10^{-2}	4.203×10^{-4}	1.05	9.114×10^{-3}	2.269×10^{-2}
fitted radiance shift [nm]	$(-3.888 \pm 24.990) \times 10^{-4}$	12671690	1.904×10^{-3}	-3.535×10^{-4}	-0.104	4.203×10^{-2}	-1.376×10^{-3}	5.277×10^{-4}
fitted radiance squeeze [1]	$(-1.909 \pm 192.558) \times 10^{-6}$	12671690	2.117×10^{-4}	1.166×10^{-6}	-1.310×10^{-2}	2.061×10^{-2}	-1.052×10^{-4}	1.065×10^{-4}
fitted root mean square [1]	$(1.335 \pm 0.606) \times 10^{-3}$	12671690	6.323×10^{-4}	1.140×10^{-3}	3.345×10^{-4}	6.843×10^{-2}	9.413×10^{-4}	1.574×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.893 ± 0.389	12671690	0.474	0.834	5.000×10^{-2}	2.63	0.627	1.10
sulfurdioxide total air mass factor polluted precision [1]	0.100 ± 0.092	12671690	9.333×10^{-2}	7.010×10^{-2}	4.209×10^{-3}	1.71	4.063×10^{-2}	0.134
sulfurdioxide clear air mass factor polluted [1]	0.745 ± 0.223	12671690	0.304	0.731	8.354×10^{-2}	2.39	0.591	0.895
number of spectral points in retrieval [1]	73.4 ± 0.5	12671690	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]	0.693 ± 0.409	4090213	0.760	1.000	0.0	1.000	0.240	1.000
sulfurdioxide total vertical column [DU]	$(2.065 \pm 115.451) \times 10^{-2}$	4090213	0.460	8.770×10^{-3}	-35.2	1.060×10^3	-0.218	0.243
sulfurdioxide total vertical column precision [DU]	0.485 ± 0.529	4090213	0.349	0.365	4.324×10^{-2}	63.1	0.221	0.570
sulfurdioxide slant column density corrected [DU]	$(1.586 \pm 73.050) \times 10^{-2}$	4090213	0.364	7.848×10^{-3}	-25.2	855	-0.173	0.192
sulfurdioxide slant column density cobra [DU]	$(1.514 \pm 34.339) \times 10^{-2}$	4090213	0.364	7.848×10^{-3}	-25.2	86.8	-0.173	0.192
sulfurdioxide slant column density cobra precision [DU]	0.285 ± 0.113	4090213	0.107	0.257	9.088×10^{-2}	25.3	0.216	0.323
sulfurdioxide slant column density window1 [DU]	0.154 ± 0.639	4090213	0.725	0.149	-97.4	101	-0.213	0.512
sulfurdioxide slant column density window1 precision [DU]	0.285 ± 0.113	4090213	0.107	0.257	9.088×10^{-2}	25.3	0.216	0.323
sulfurdioxide slant column density corrected win1 [DU]	$(-1.476 \pm 63.507) \times 10^{-2}$	4090213	0.717	-3.100×10^{-2}	-97.4	101	-0.384	0.333
background so2 slant column offset window1 [DU]	-0.168 ± 0.106	4090213	0.116	-0.186	-0.765	1.30	-0.234	-0.118
sulfurdioxide slant column density window2 [DU]	0.150 ± 9.352	4090213	11.8	7.886×10^{-2}	-1.062×10^3	898	-5.77	5.99
sulfurdioxide slant column density window2 precision [DU]	8.61 ± 2.63	4090213	2.76	8.25	2.36	559	7.01	9.77
sulfurdioxide slant column density corrected win2 [DU]	-1.96 ± 9.25	4090213	11.6	-1.95	-1.066×10^3	895	-7.76	3.85
background so2 slant column offset window2 [DU]	-2.11 ± 1.62	4090213	2.15	-1.77	-11.3	5.47	-3.13	-0.984
sulfurdioxide slant column density window3 [DU]	-6.03 ± 24.79	4090213	30.9	-5.34	-626	860	-21.2	9.76
sulfurdioxide slant column density window3 precision [DU]	32.2 ± 16.8	4090213	11.8	27.5	10.0	726	23.0	34.9
sulfurdioxide slant column density corrected win3 [DU]	6.55 ± 24.82	4090213	31.1	7.18	-615	868	-8.71	22.4
background so2 slant column offset window3 [DU]	12.6 ± 5.5	4090213	8.69	12.4	-9.98	33.2	8.42	17.1
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.15	4090213	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.947 \pm 9.941) \times 10^{-2}$	4090213	6.106×10^{-2}	2.275×10^{-2}	1.522×10^{-4}	1.61	8.171×10^{-3}	6.923×10^{-2}
fitted radiance shift [nm]	$(-2.191 \pm 33.295) \times 10^{-4}$	4090213	1.857×10^{-3}	-3.188×10^{-4}	-5.247×10^{-2}	8.045×10^{-2}	-1.181×10^{-3}	6.753×10^{-4}
fitted radiance squeeze [1]	$(-2.338 \pm 17.436) \times 10^{-5}$	4090213	2.062×10^{-4}	-2.193×10^{-5}	-1.988×10^{-2}	2.070×10^{-2}	-1.259×10^{-4}	8.033×10^{-5}
fitted root mean square [1]	$(1.250 \pm 0.450) \times 10^{-3}$	4090213	4.365×10^{-4}	1.156×10^{-3}	3.442×10^{-4}	6.408×10^{-2}	9.730×10^{-4}	1.409×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.876 ± 0.504	4090213	0.606	0.731	5.000×10^{-2}	2.96	0.517	1.12
sulfurdioxide total air mass factor polluted precision [1]	0.121 ± 0.135	4090213	0.137	6.805×10^{-2}	3.892×10^{-3}	1.68	3.170×10^{-2}	0.168
sulfurdioxide clear air mass factor polluted [1]	0.731 ± 0.363	4090213	0.388	0.646	7.137×10^{-2}	2.89	0.493	0.881
number of spectral points in retrieval [1]	73.4 ± 0.5	4090213	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

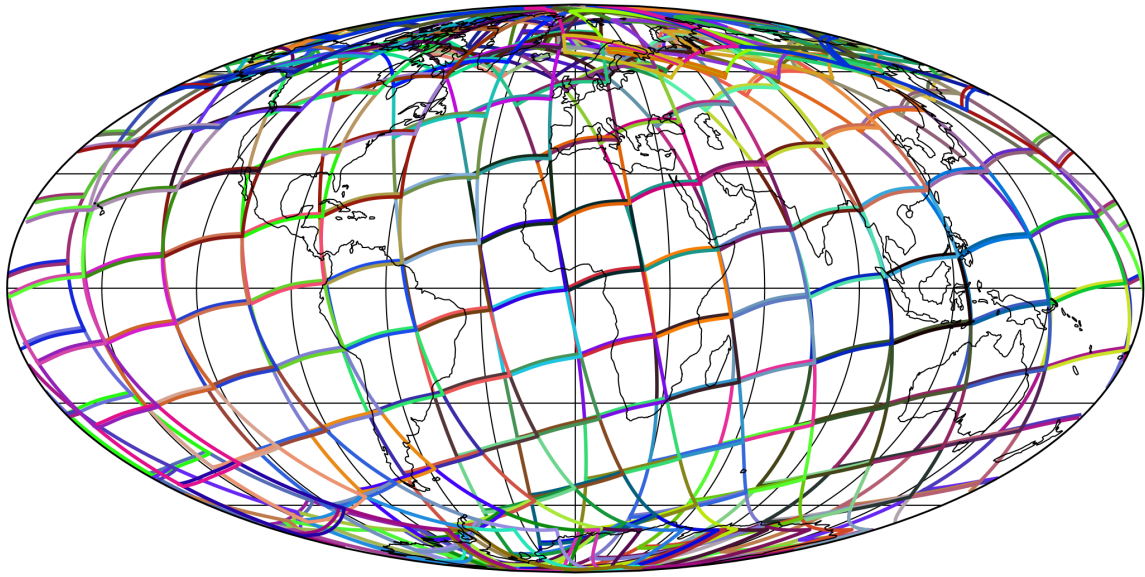


Figure 1: Outline of the granules.

4 Input data monitoring

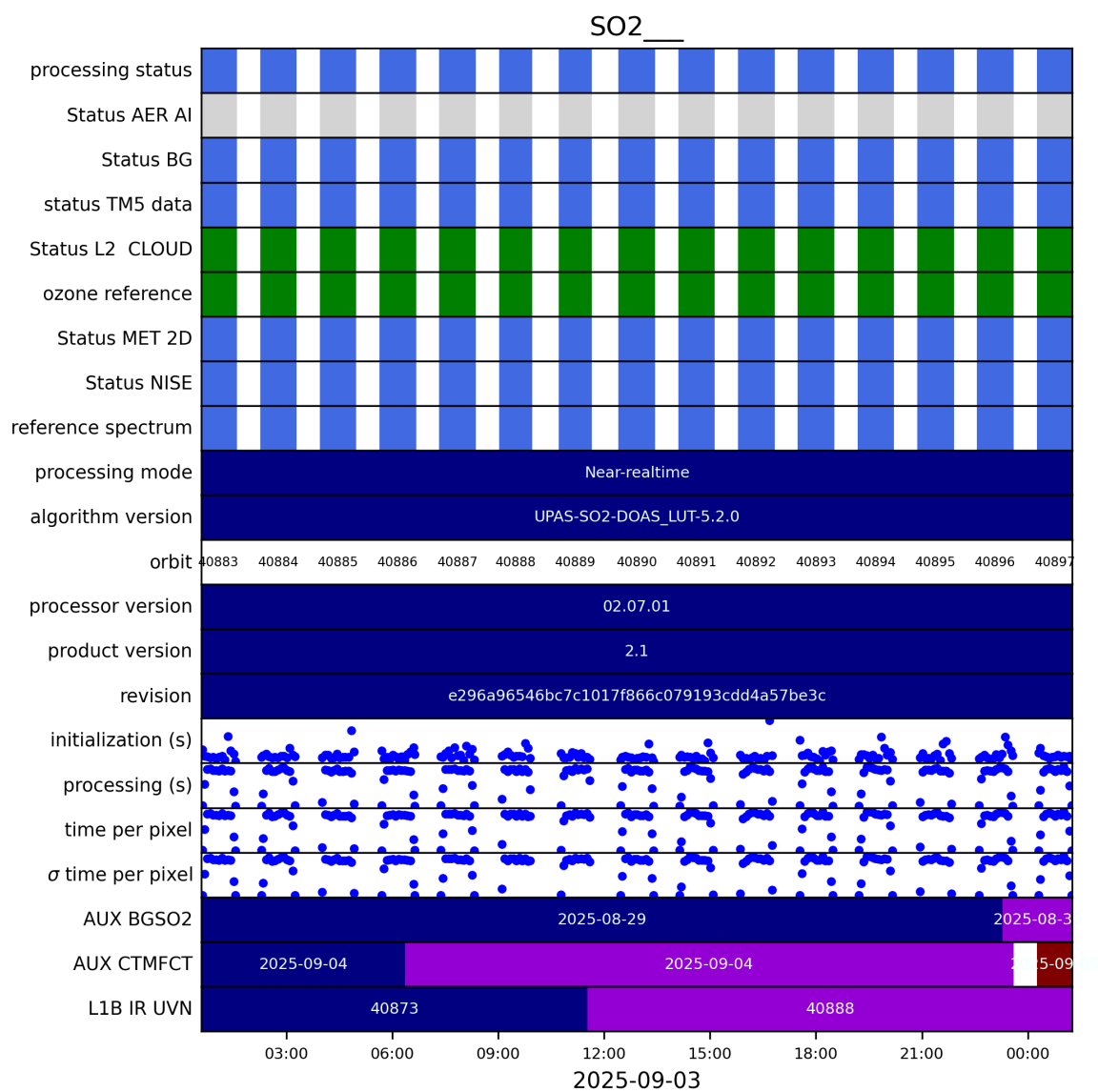


Figure 2: Input data per granule

5 Warnings and errors

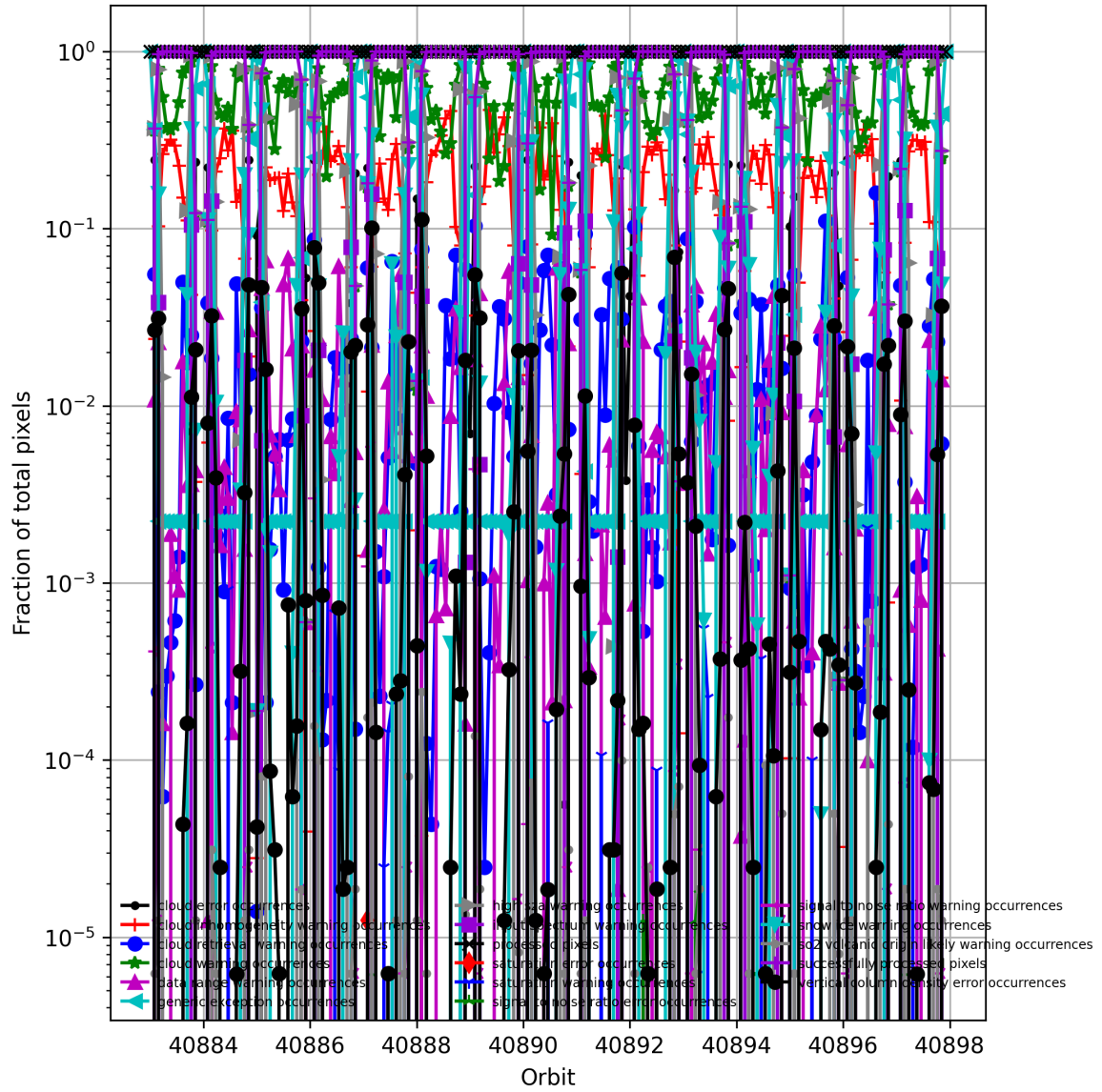


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

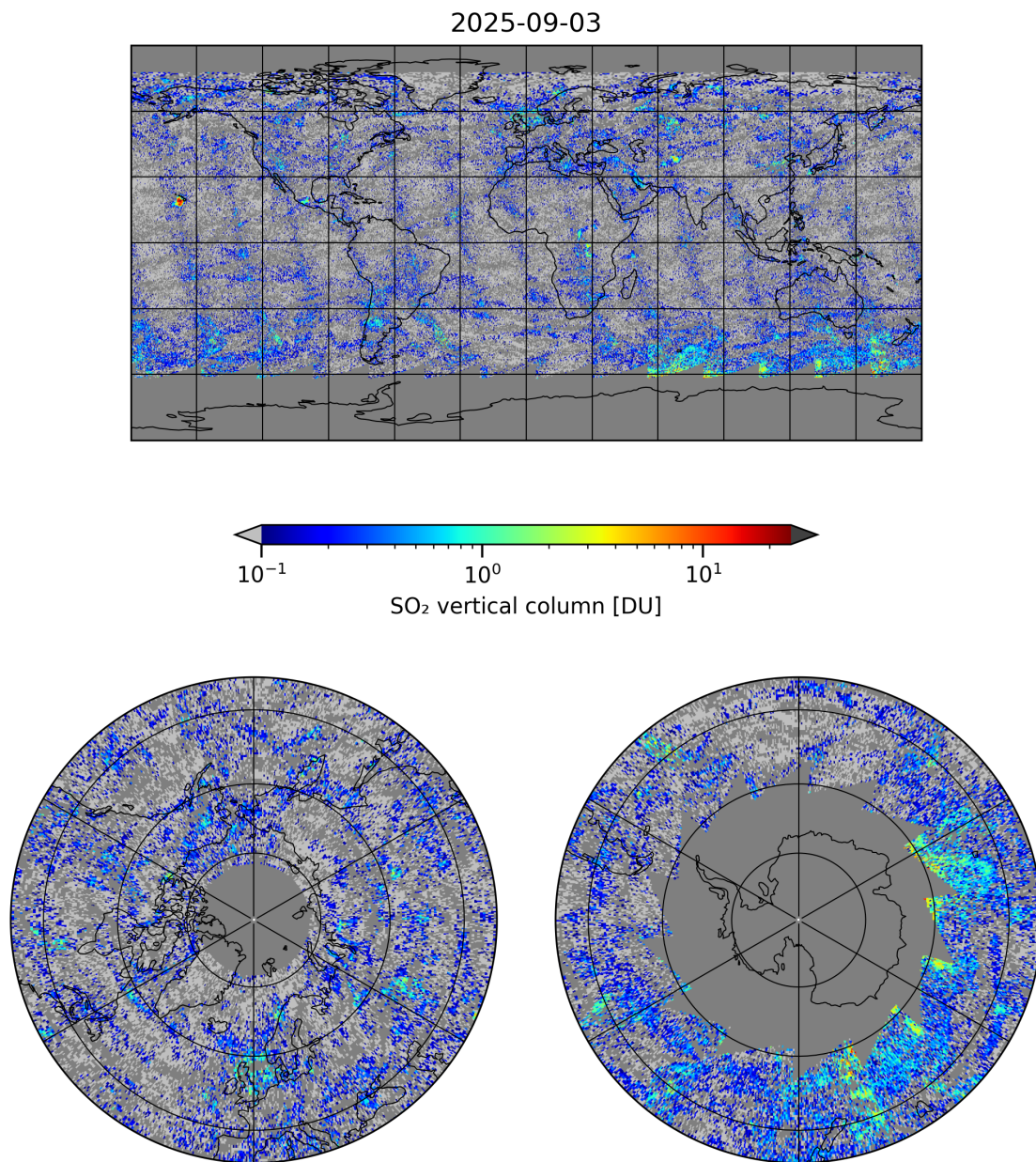


Figure 4: Map of “SO₂ vertical column” for 2025-09-03 to 2025-09-04

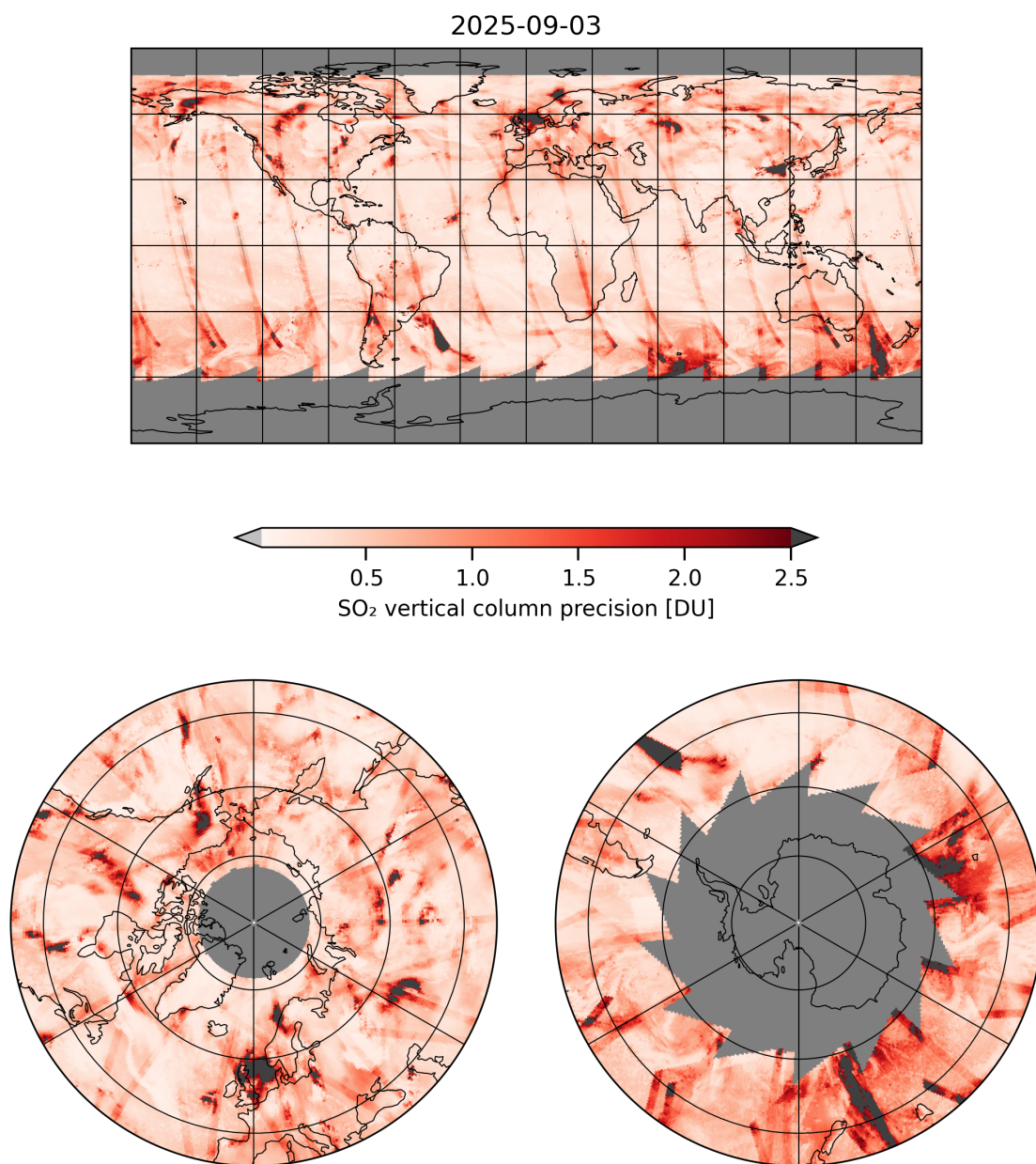


Figure 5: Map of “SO₂ vertical column precision” for 2025-09-03 to 2025-09-04

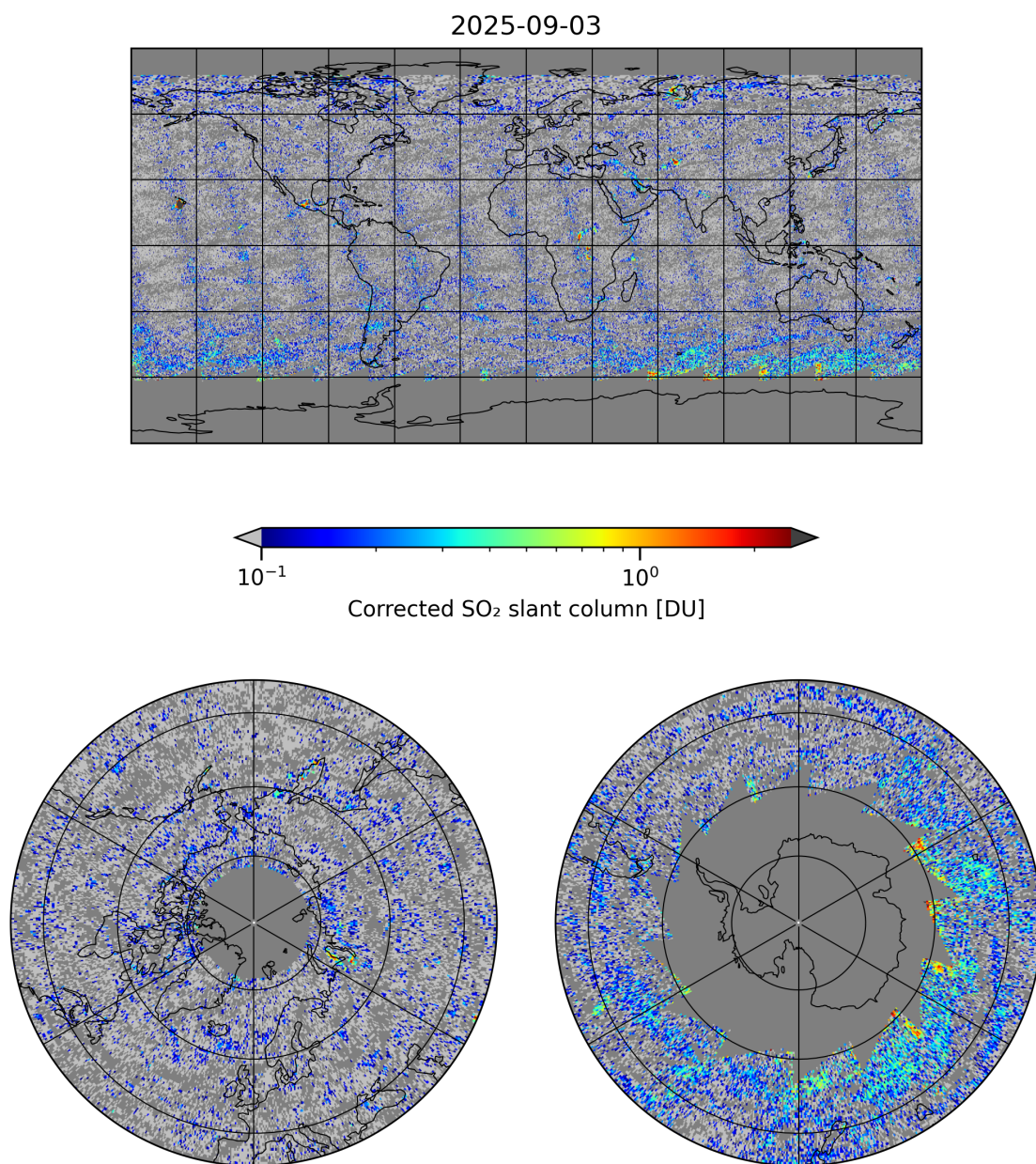


Figure 6: Map of “Corrected SO₂ slant column” for 2025-09-03 to 2025-09-04

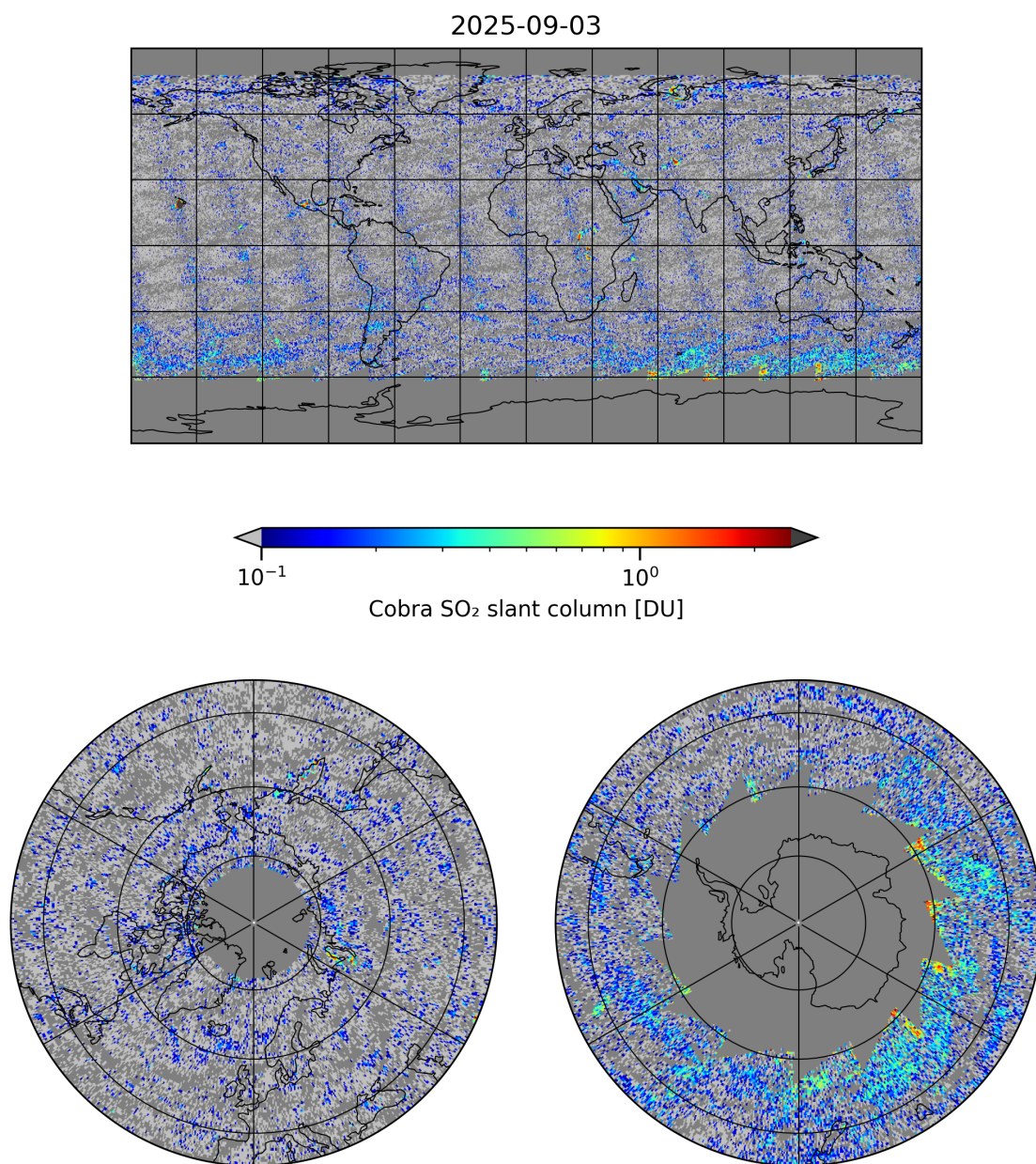


Figure 7: Map of “Cobra SO₂ slant column” for 2025-09-03 to 2025-09-04

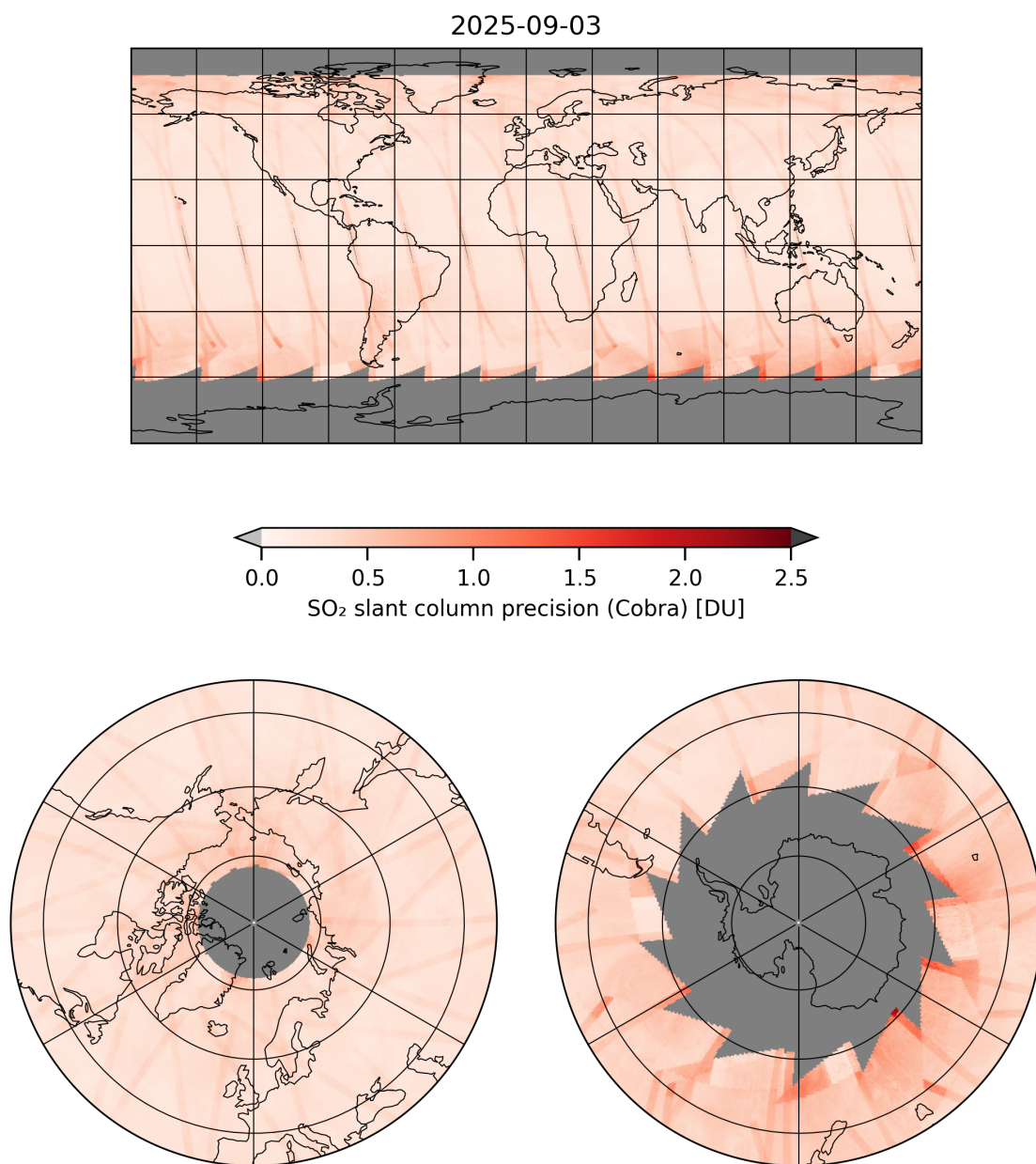


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-09-03 to 2025-09-04

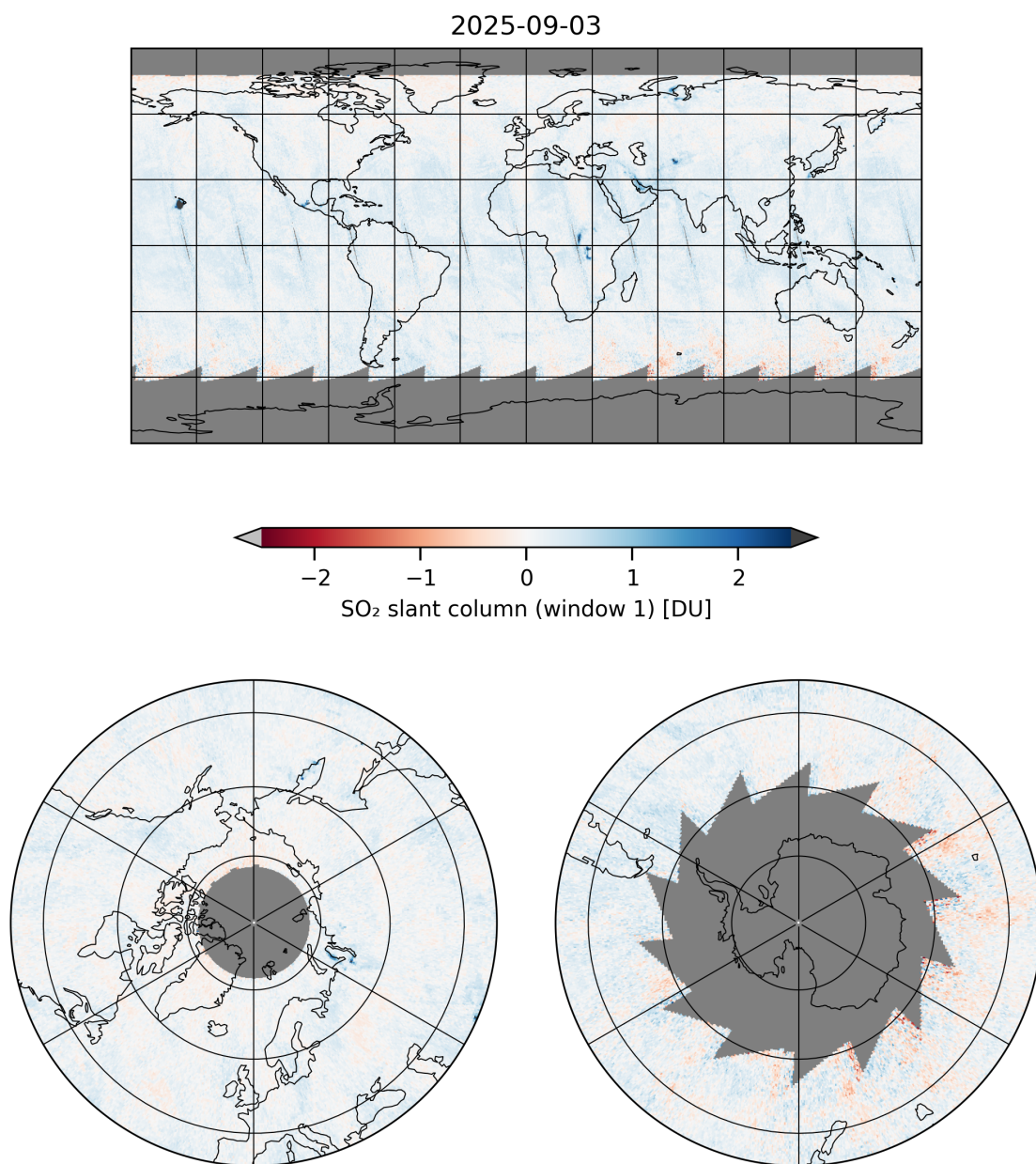


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-09-03 to 2025-09-04

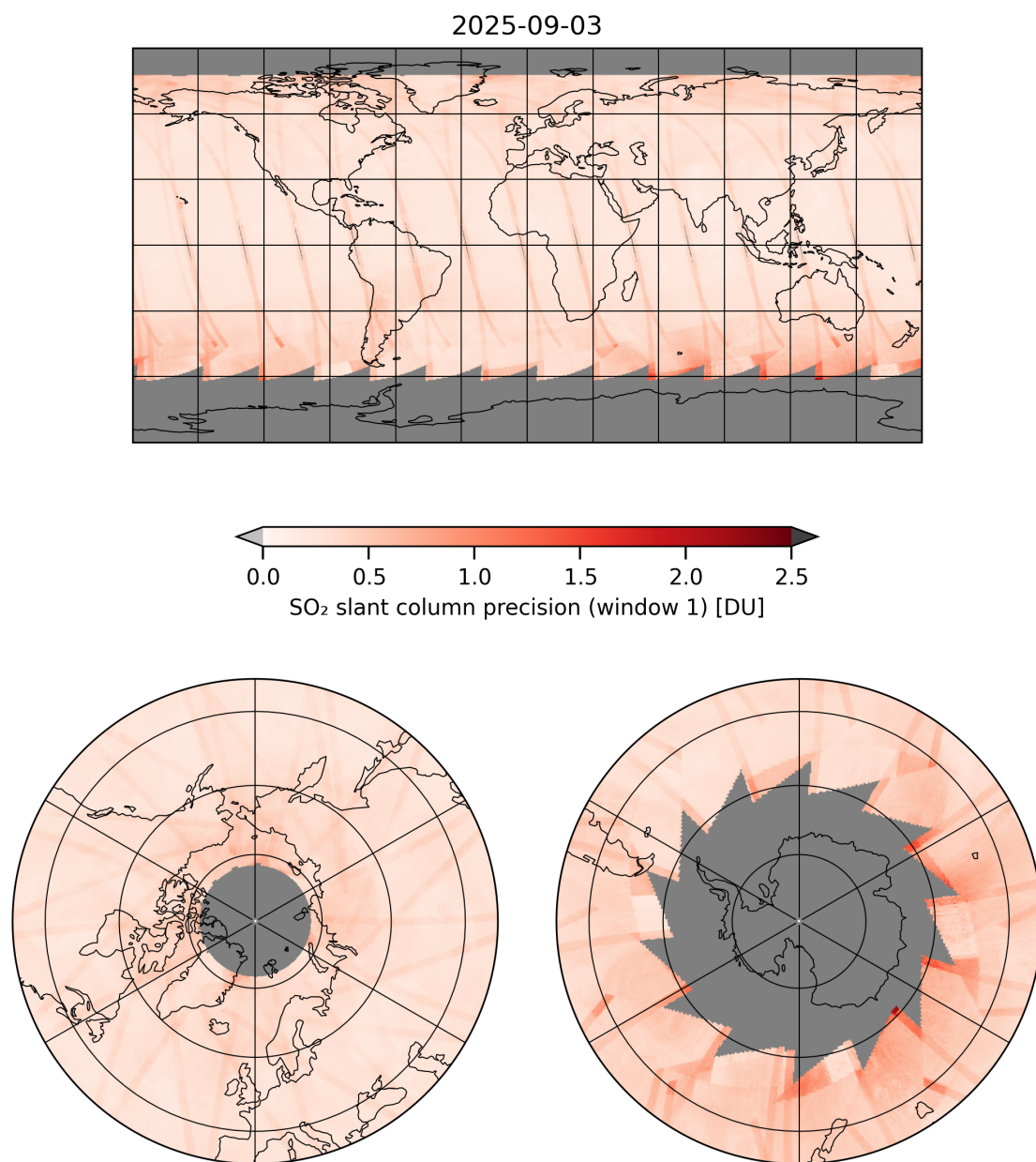


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-09-03 to 2025-09-04

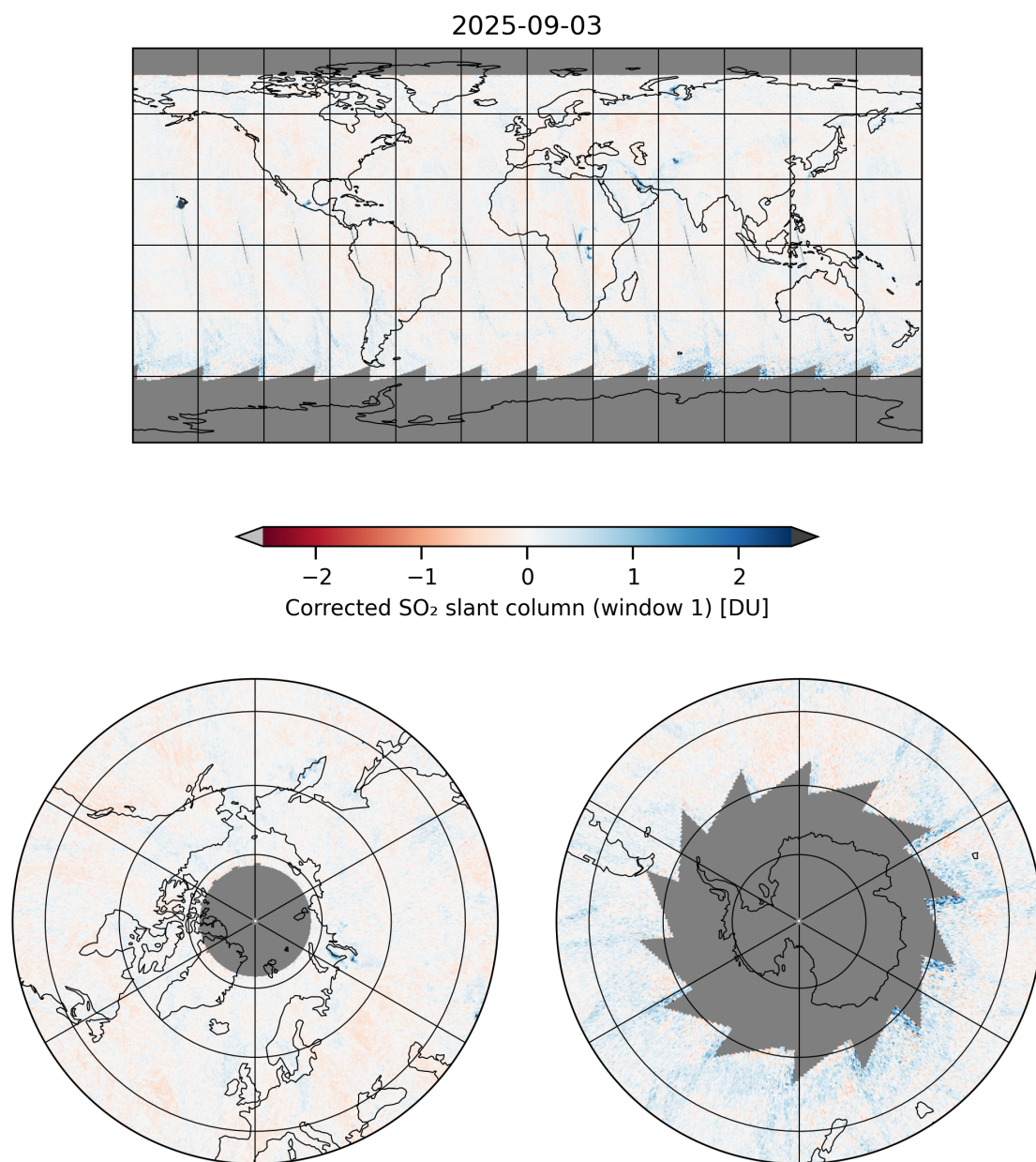


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-09-03 to 2025-09-04

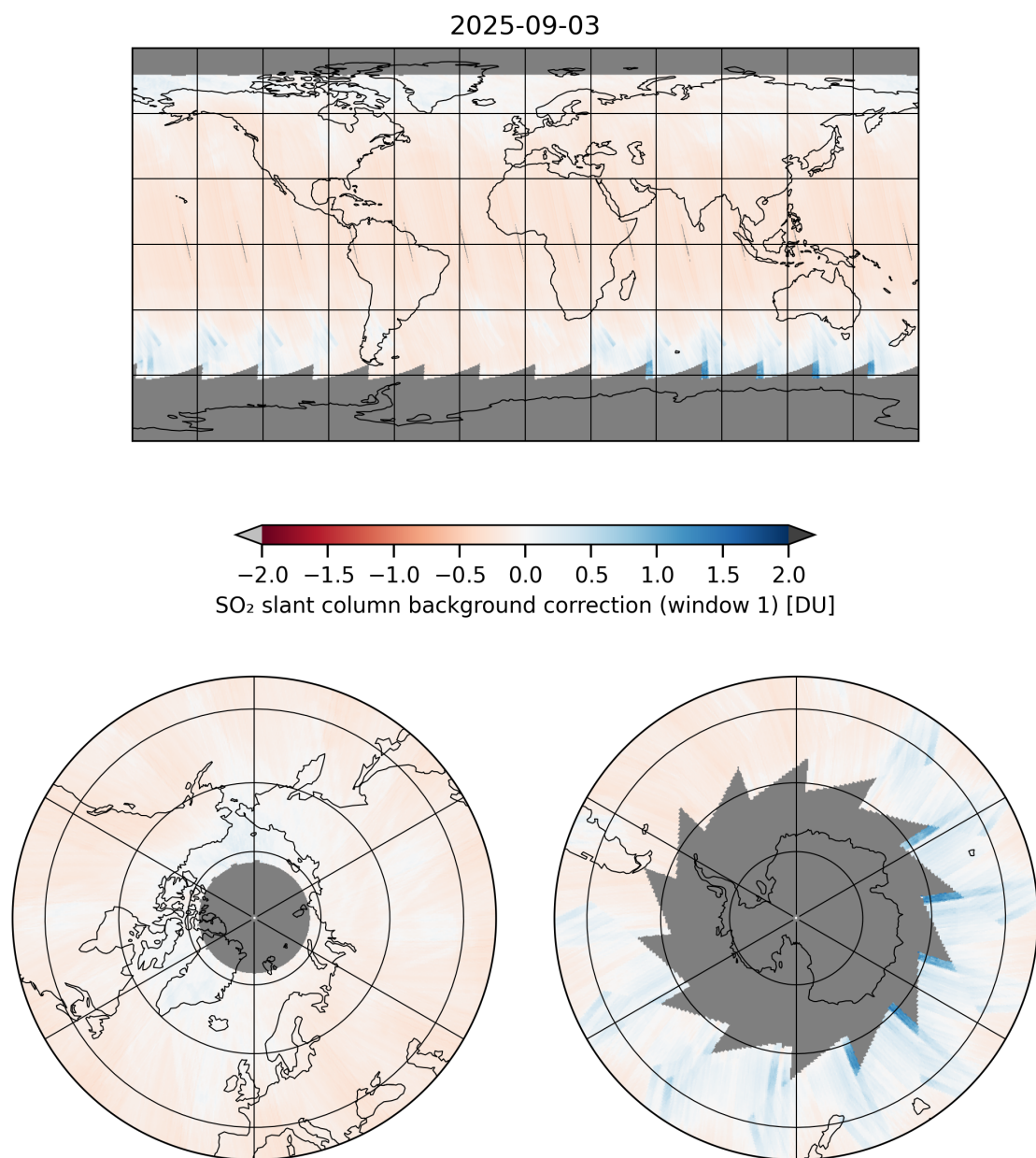


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-09-03 to 2025-09-04

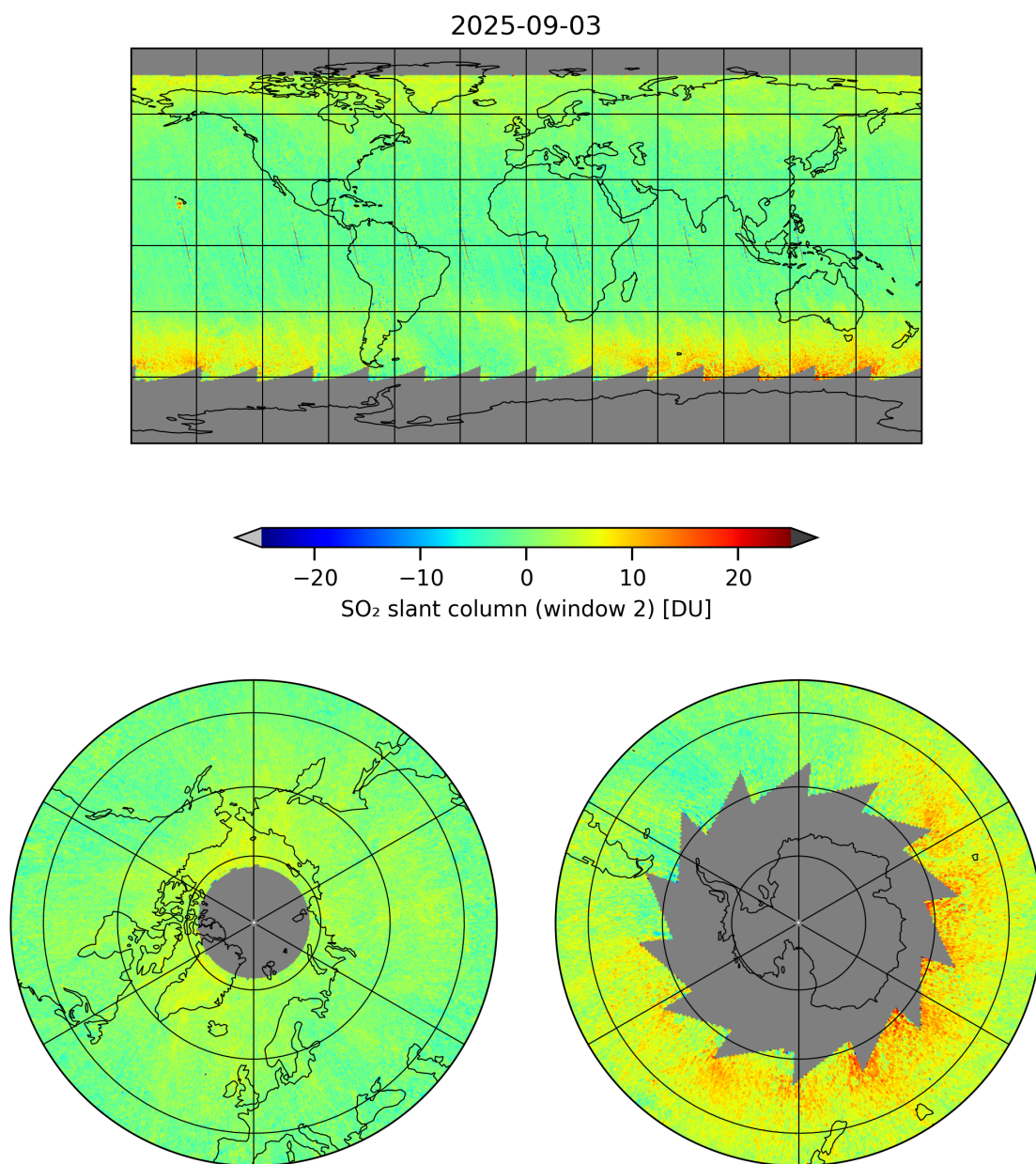


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-09-03 to 2025-09-04

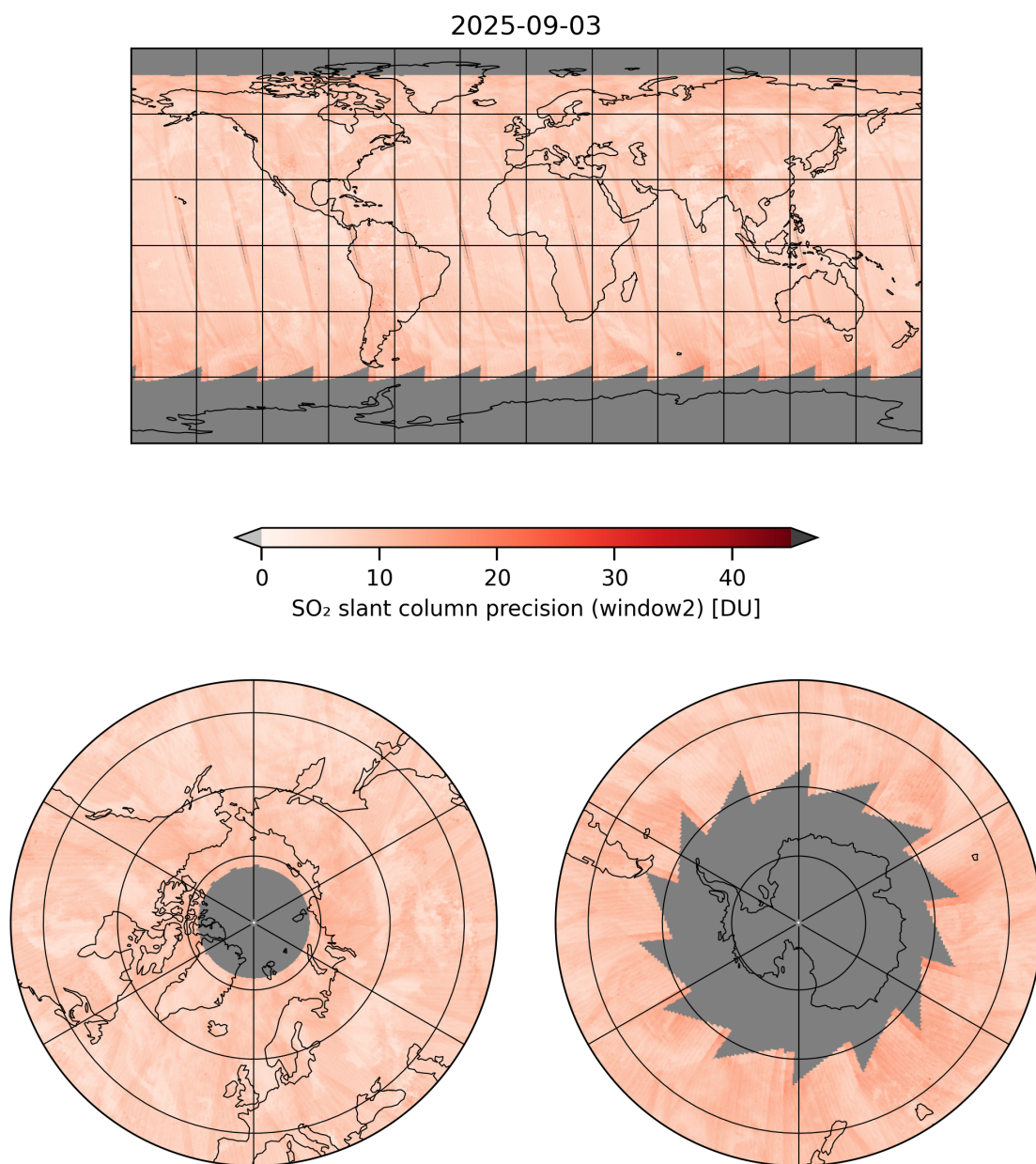


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-09-03 to 2025-09-04

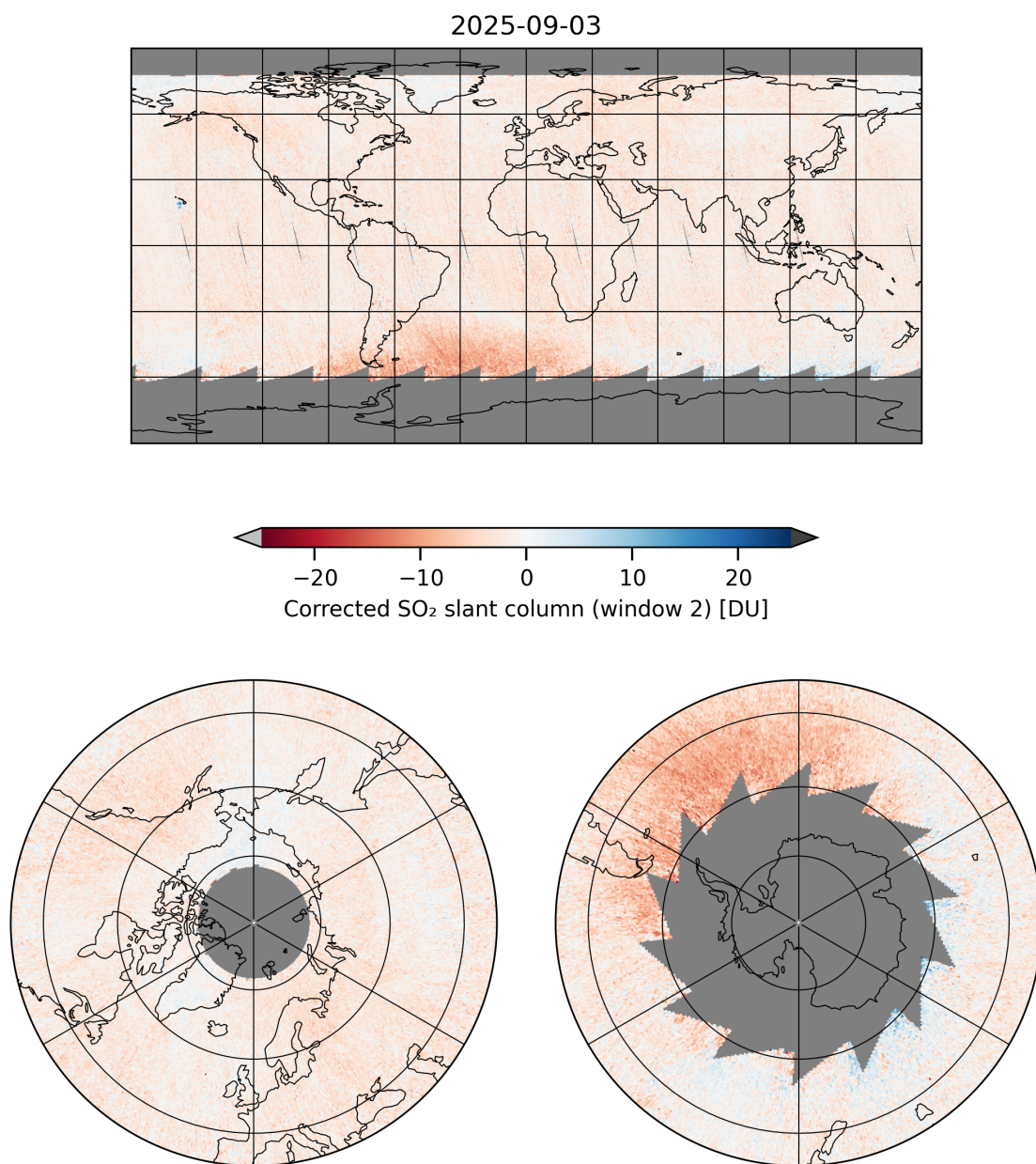


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-09-03 to 2025-09-04

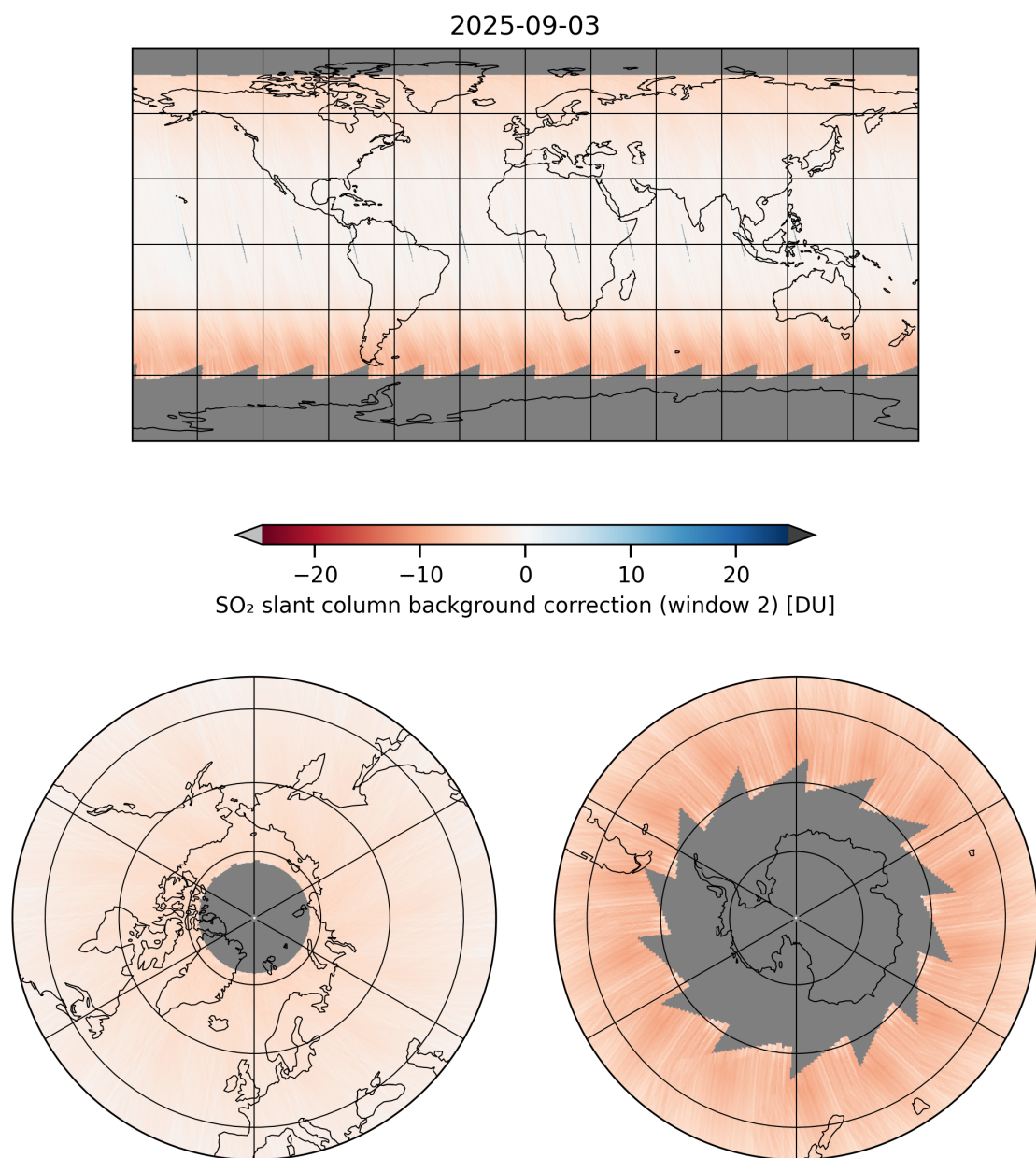


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-09-03 to 2025-09-04

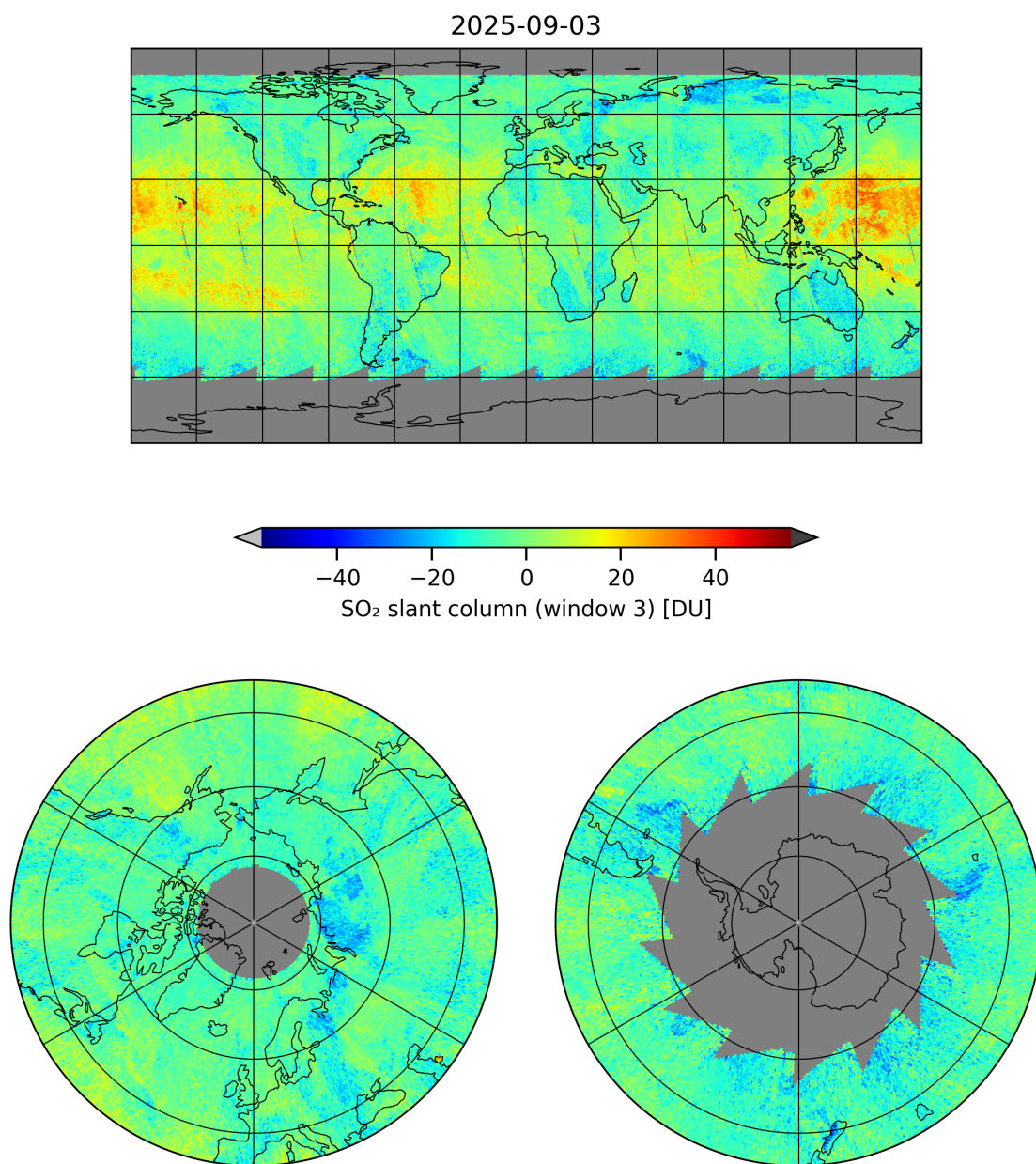


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-09-03 to 2025-09-04

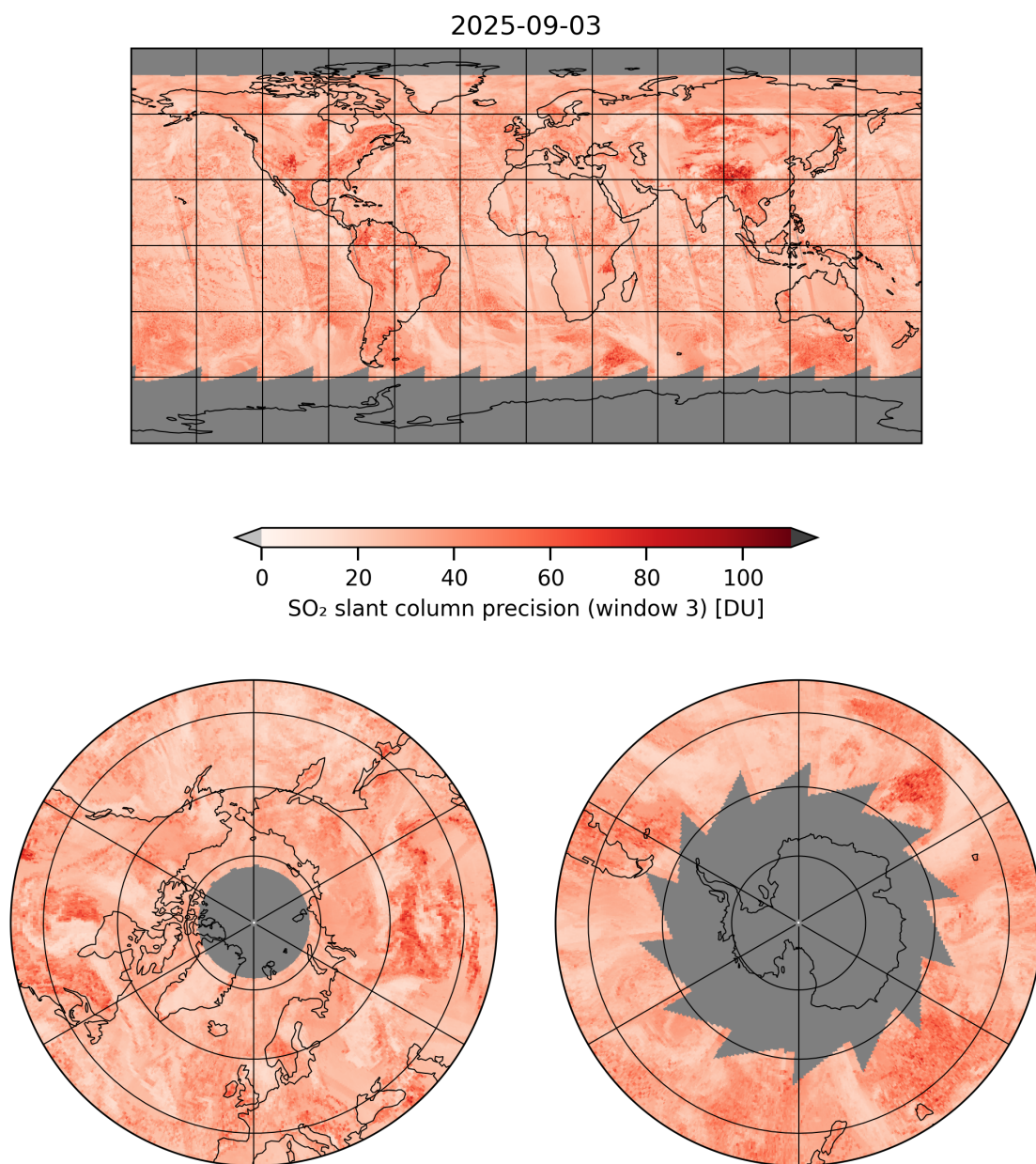


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-09-03 to 2025-09-04

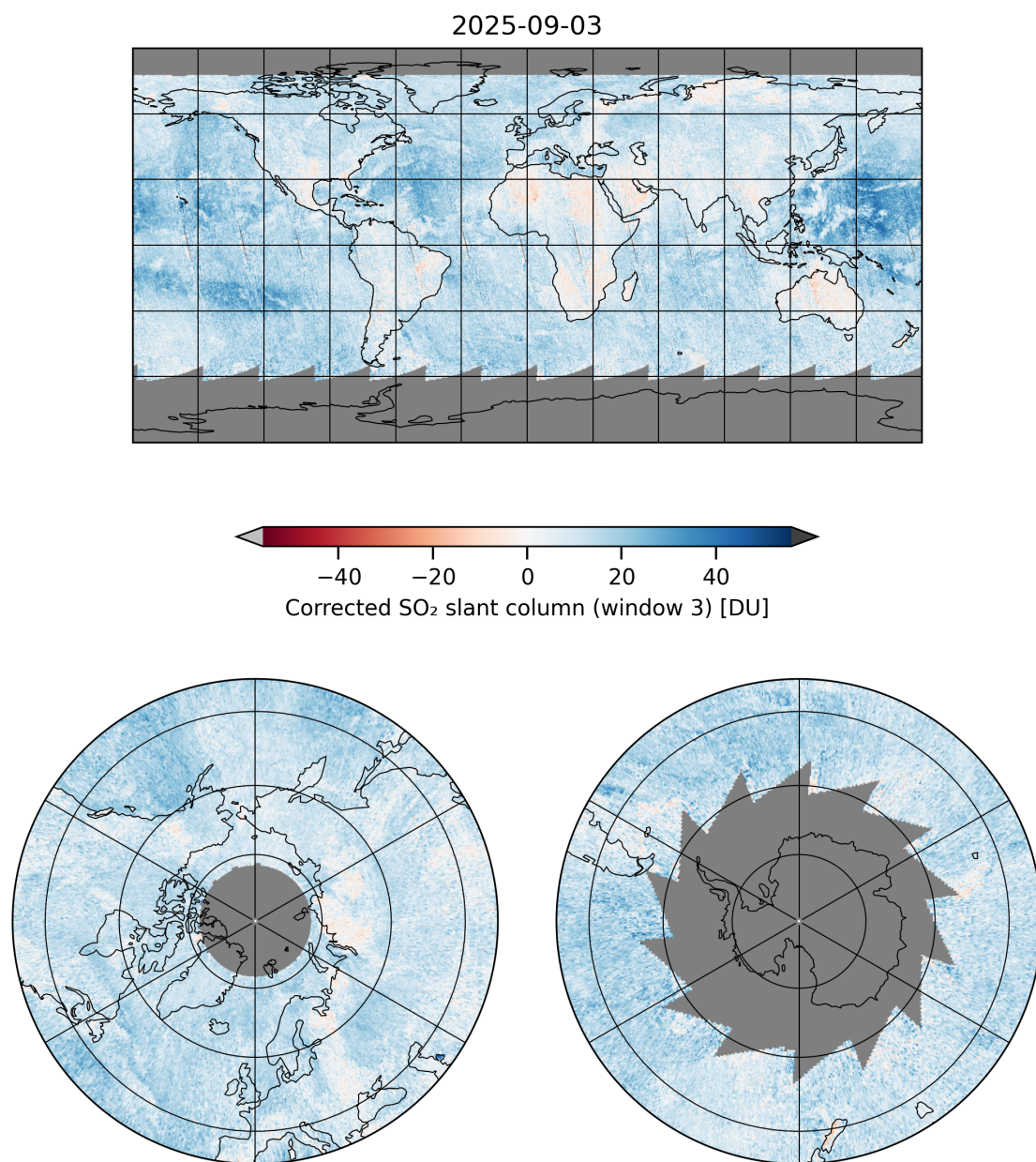


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-09-03 to 2025-09-04

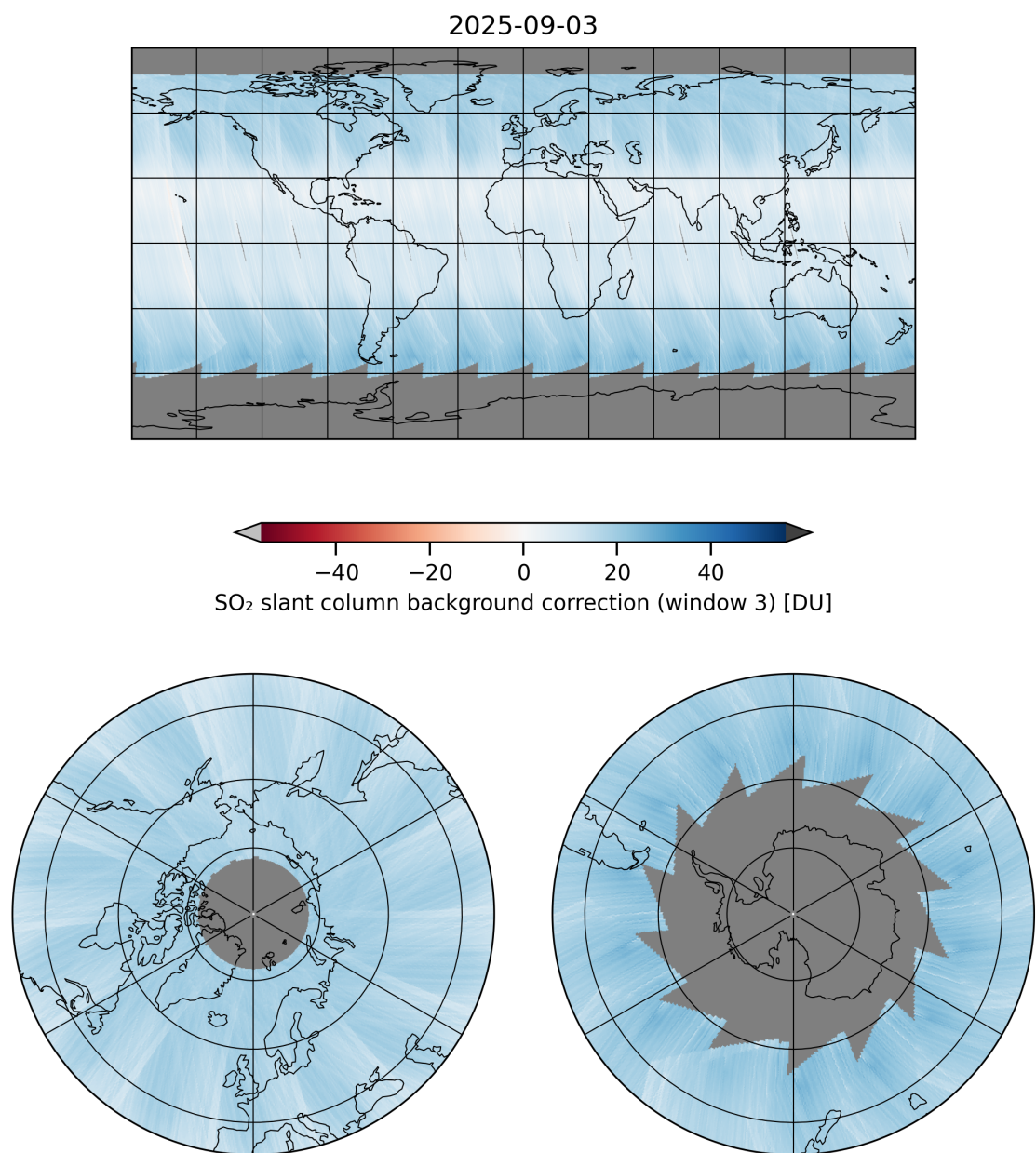


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-09-03 to 2025-09-04

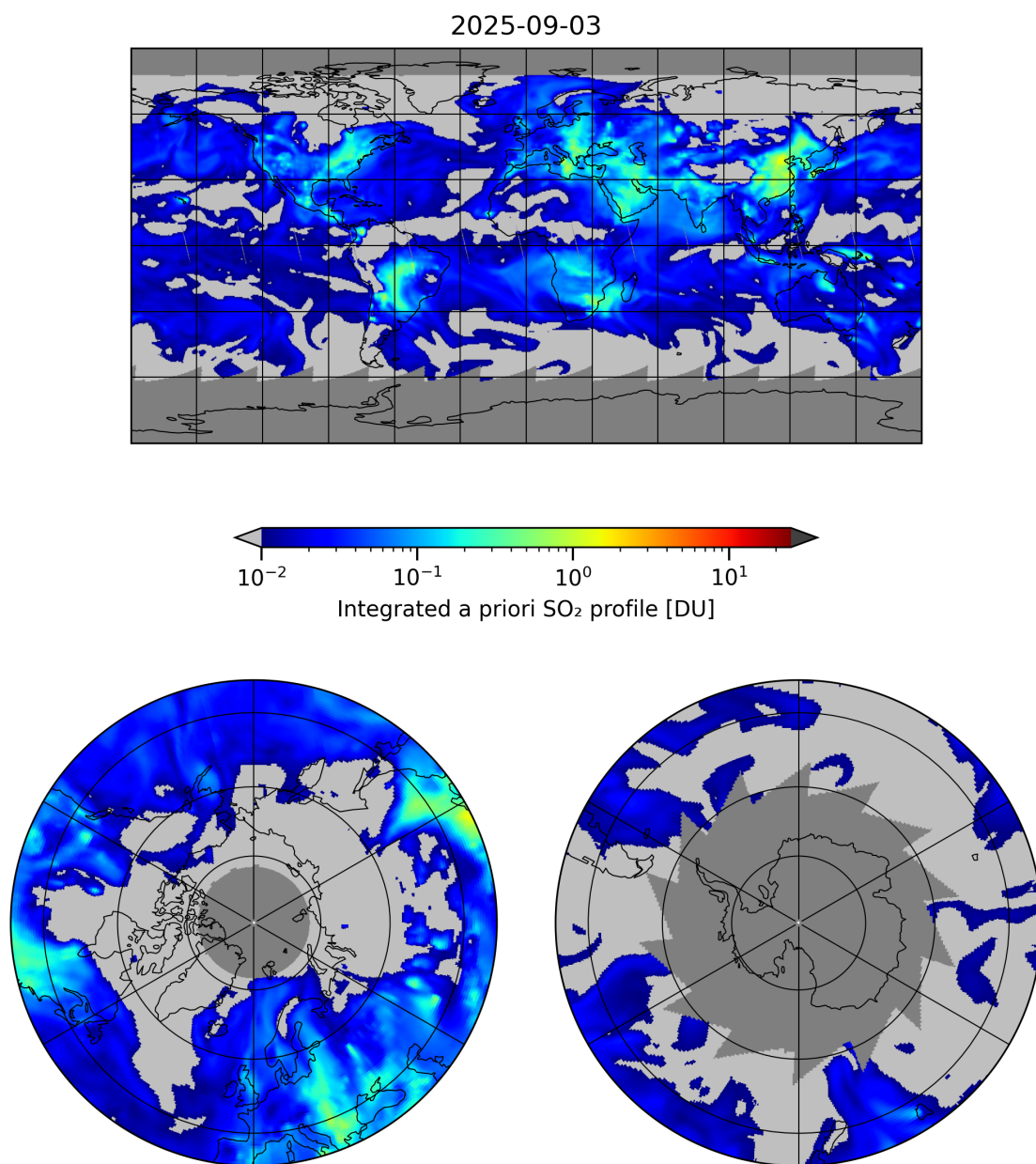


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-09-03 to 2025-09-04

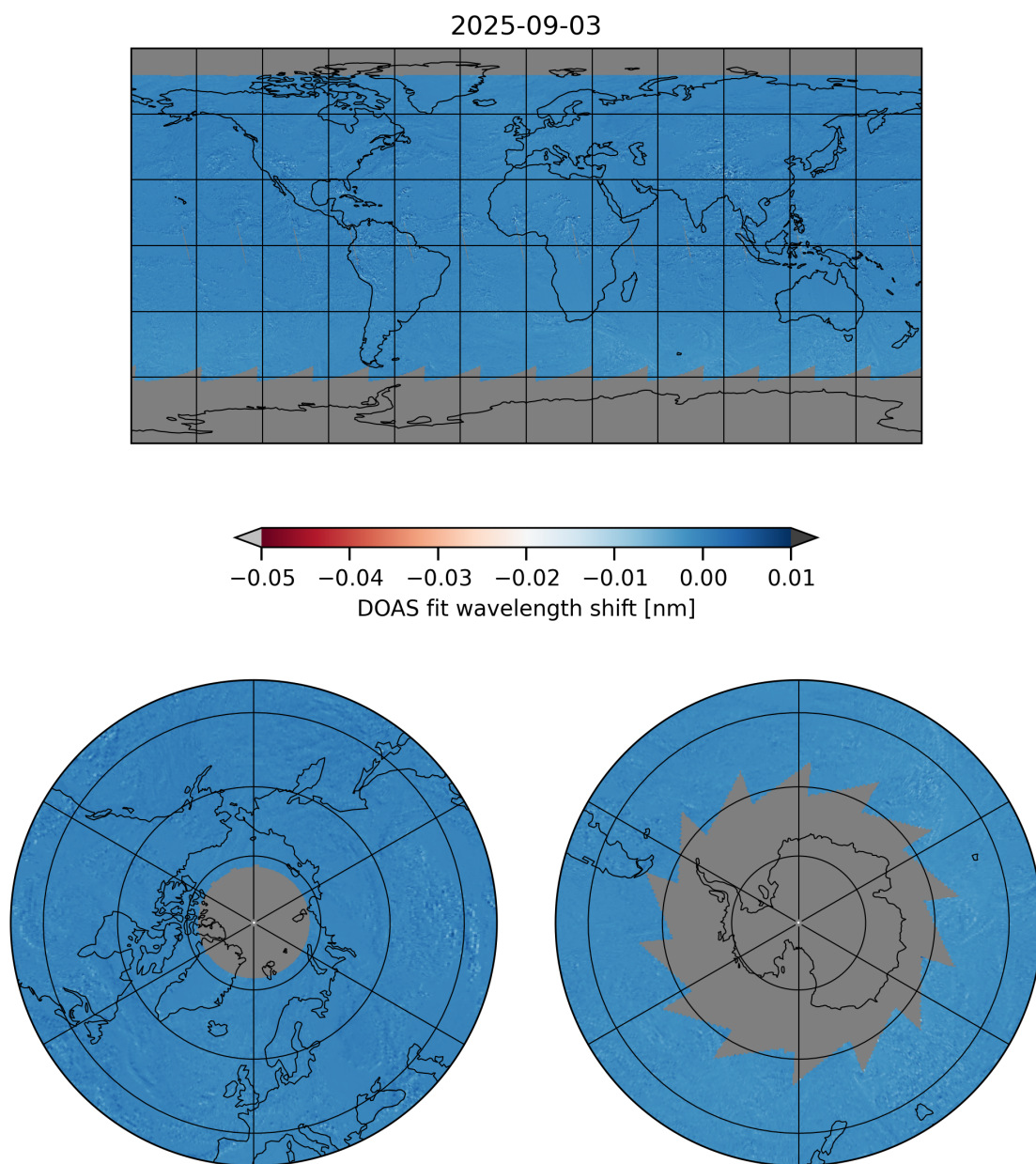


Figure 22: Map of “DOAS fit wavelength shift” for 2025-09-03 to 2025-09-04

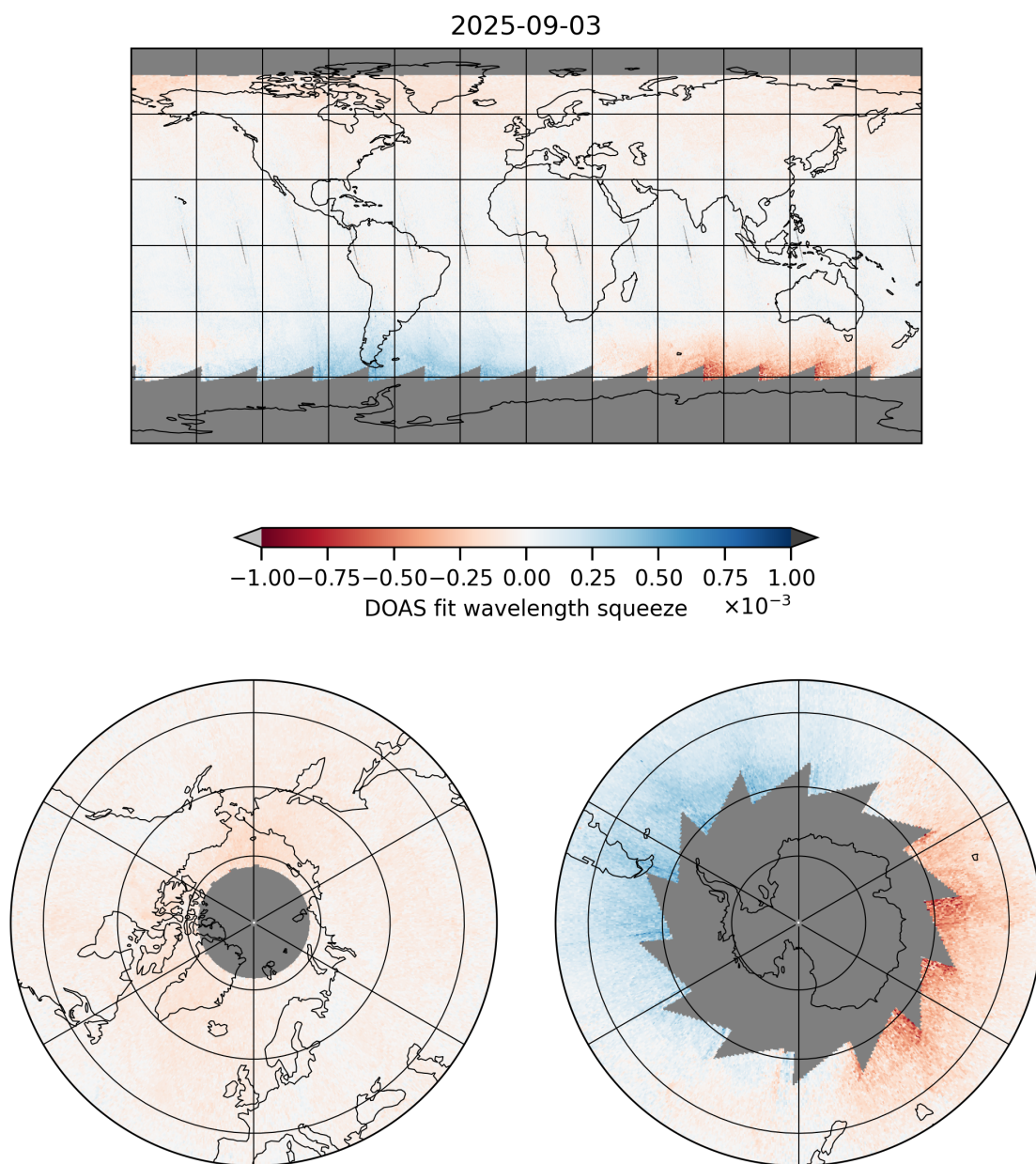


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-09-03 to 2025-09-04

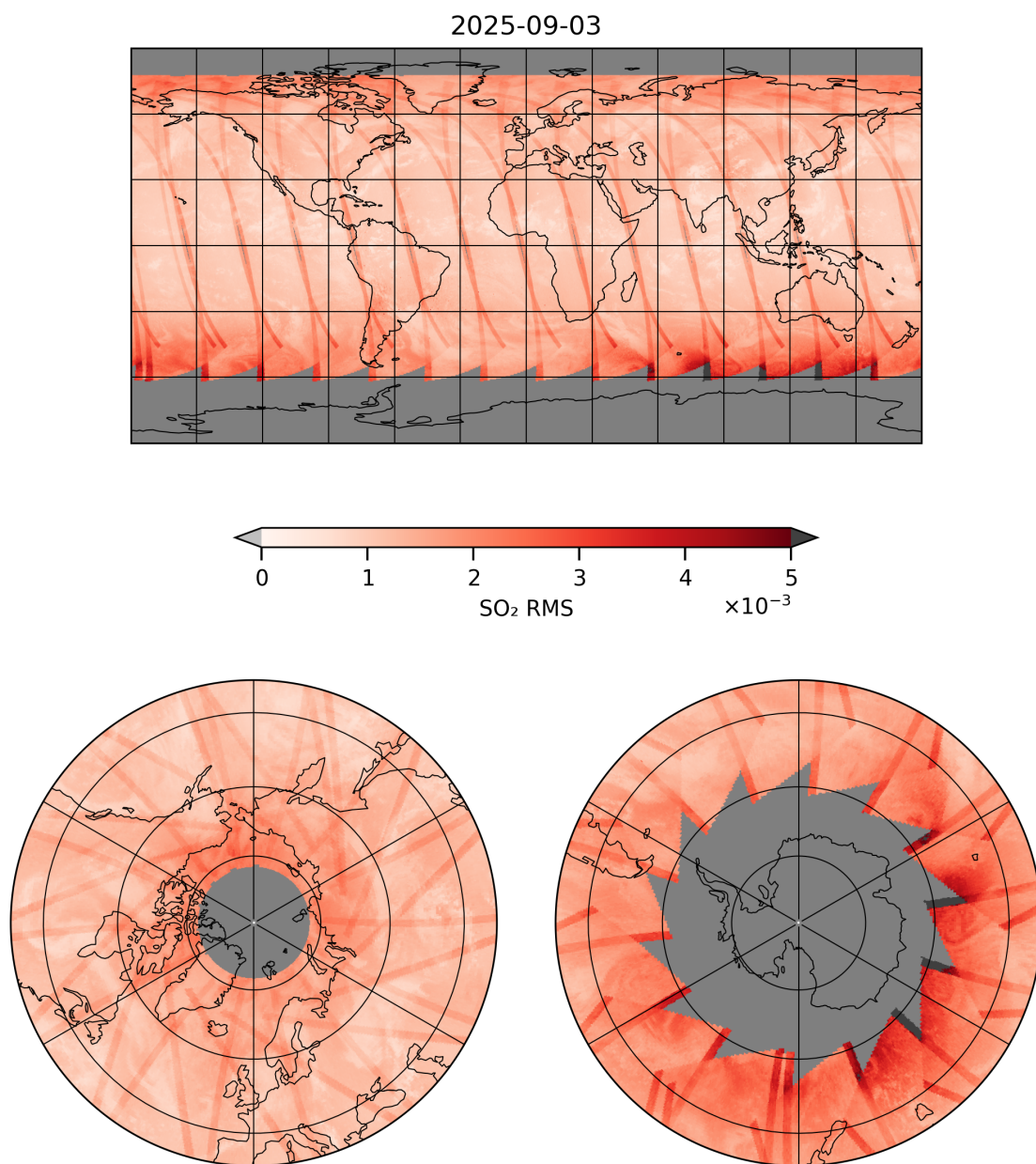


Figure 24: Map of “SO₂ RMS” for 2025-09-03 to 2025-09-04

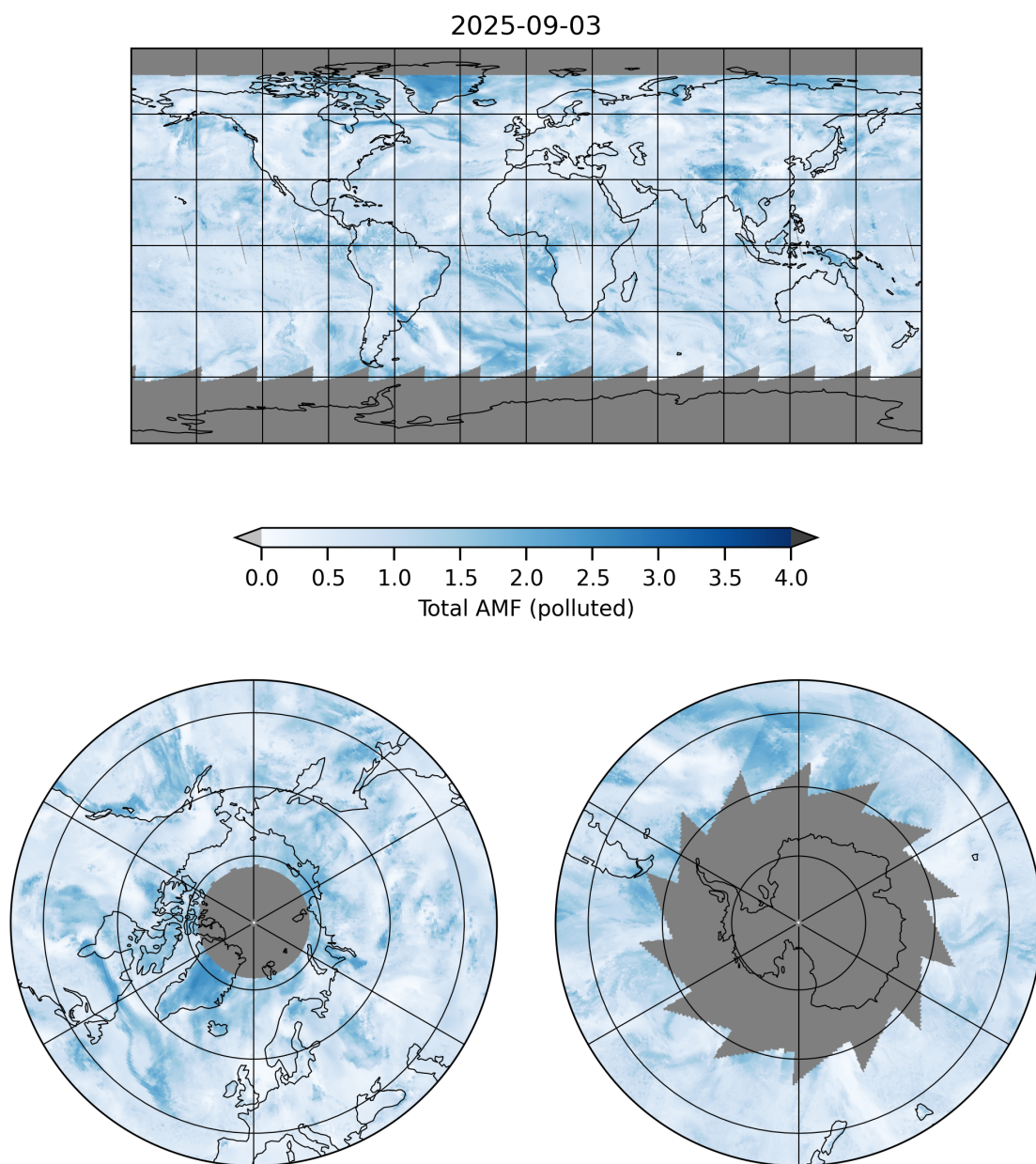


Figure 25: Map of “Total AMF (polluted)” for 2025-09-03 to 2025-09-04

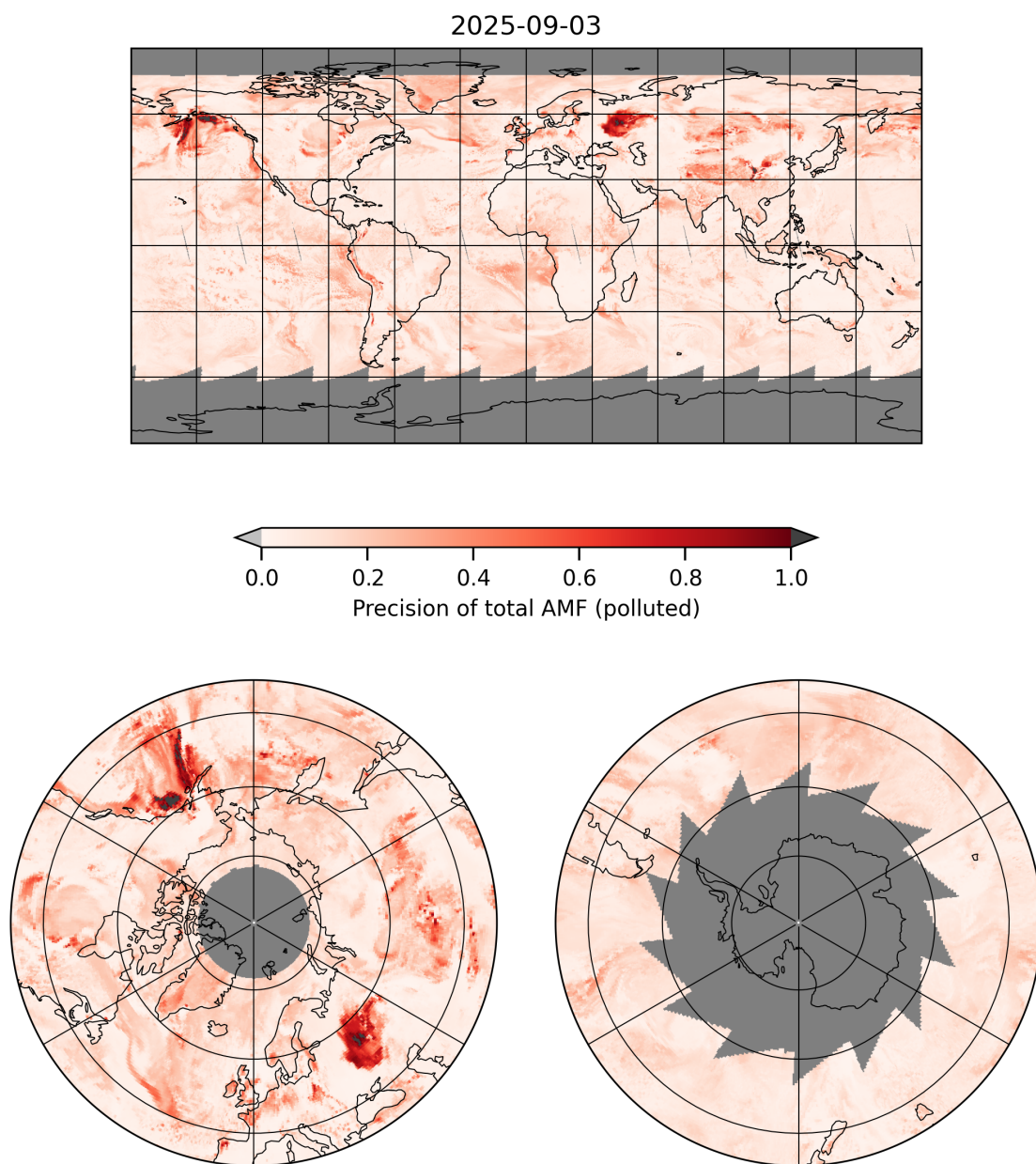


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-09-03 to 2025-09-04

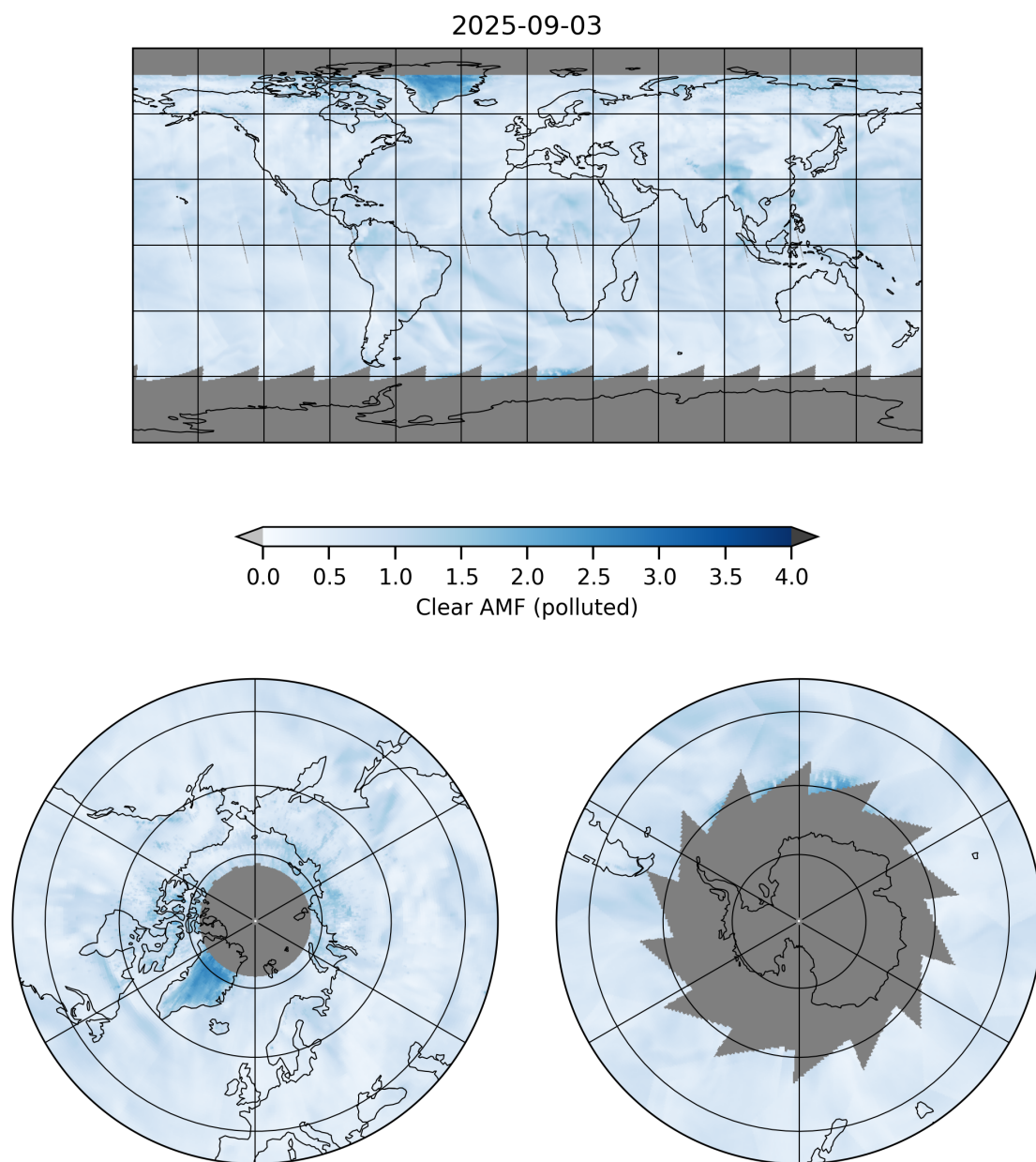


Figure 27: Map of “Clear AMF (polluted)” for 2025-09-03 to 2025-09-04

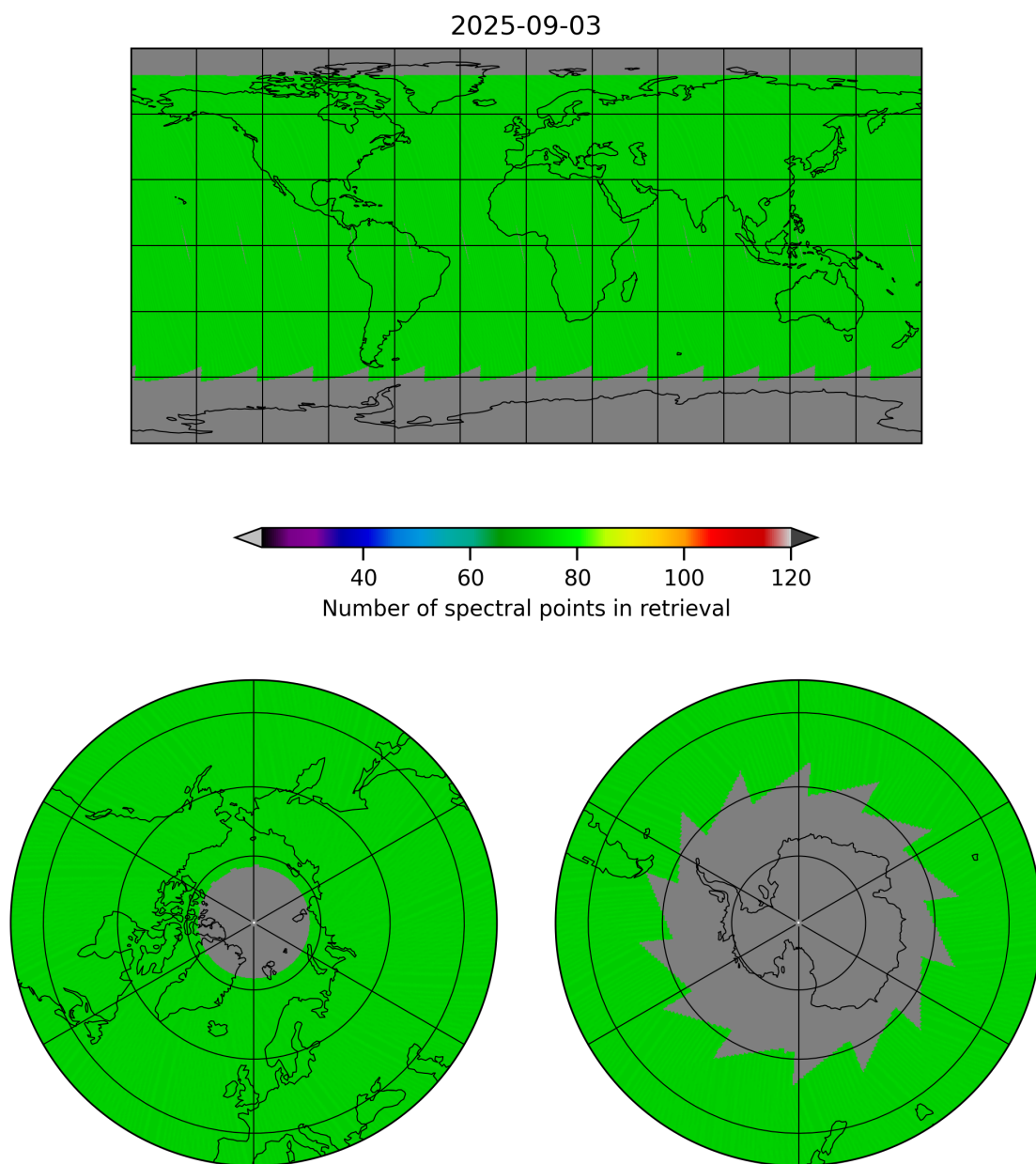


Figure 28: Map of “Number of spectral points in retrieval” for 2025-09-03 to 2025-09-04

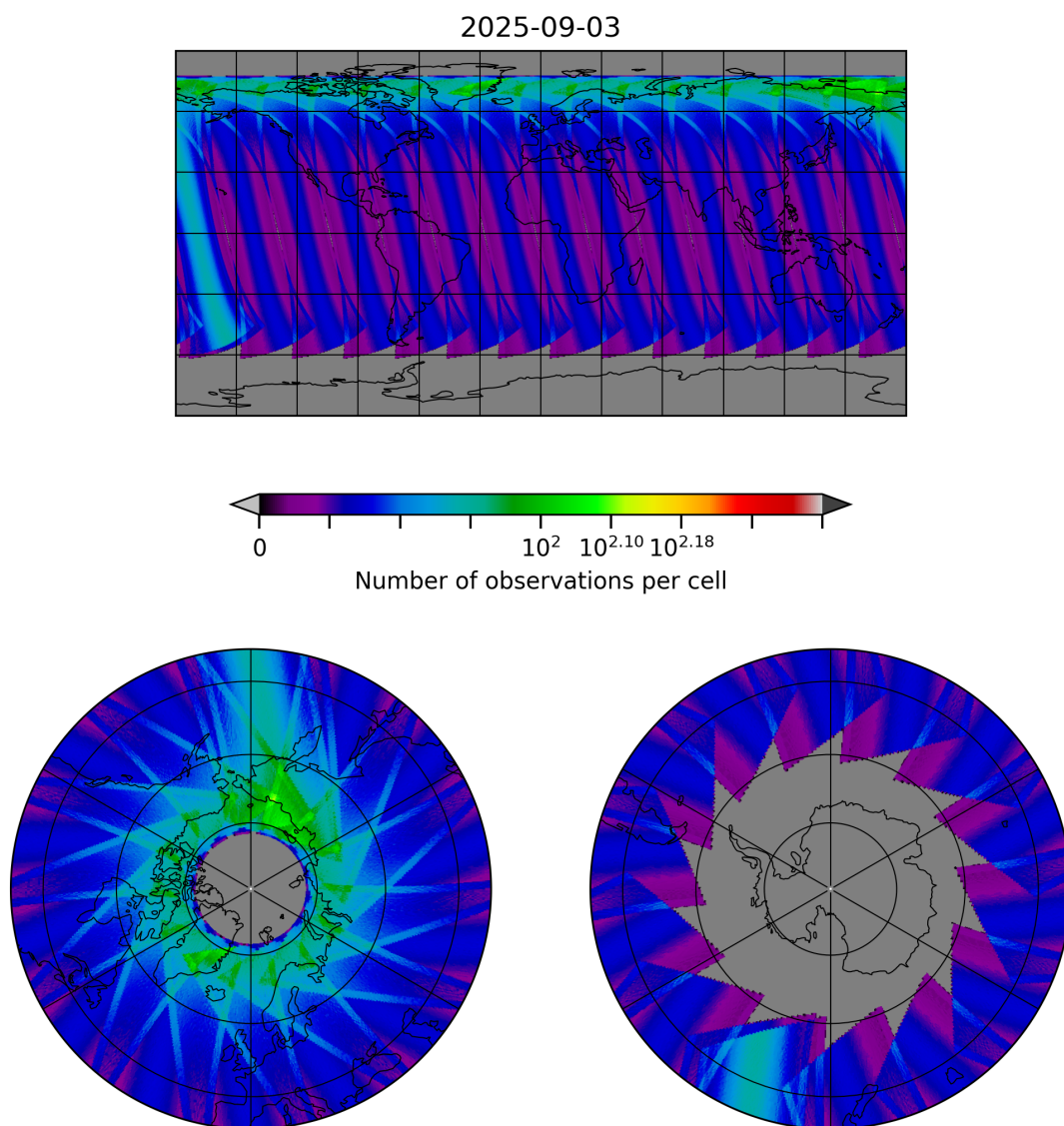


Figure 29: Map of the number of observations for 2025-09-03 to 2025-09-04

7 Zonal average

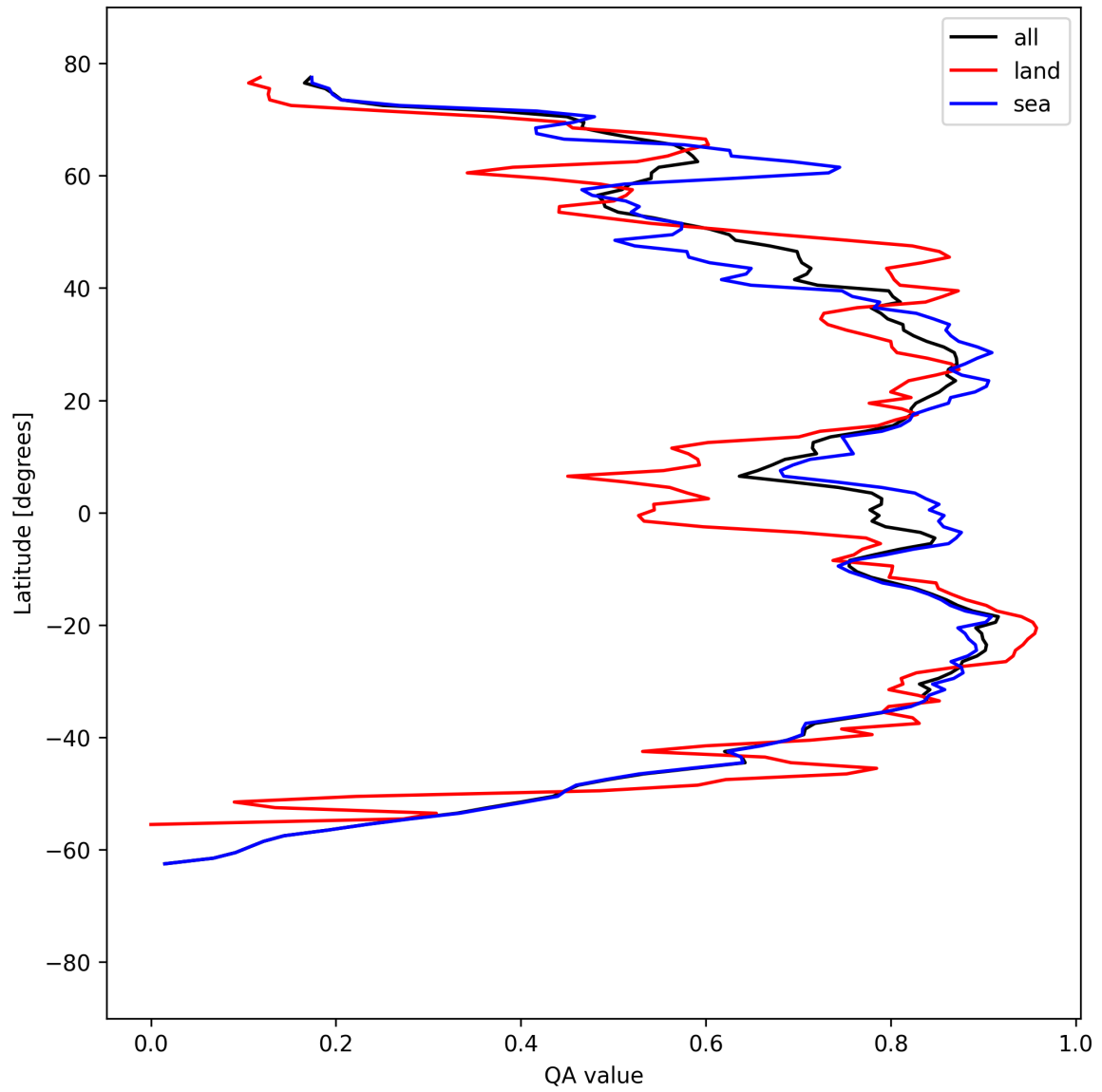


Figure 30: Zonal average of “QA value” for 2025-09-03 to 2025-09-04.

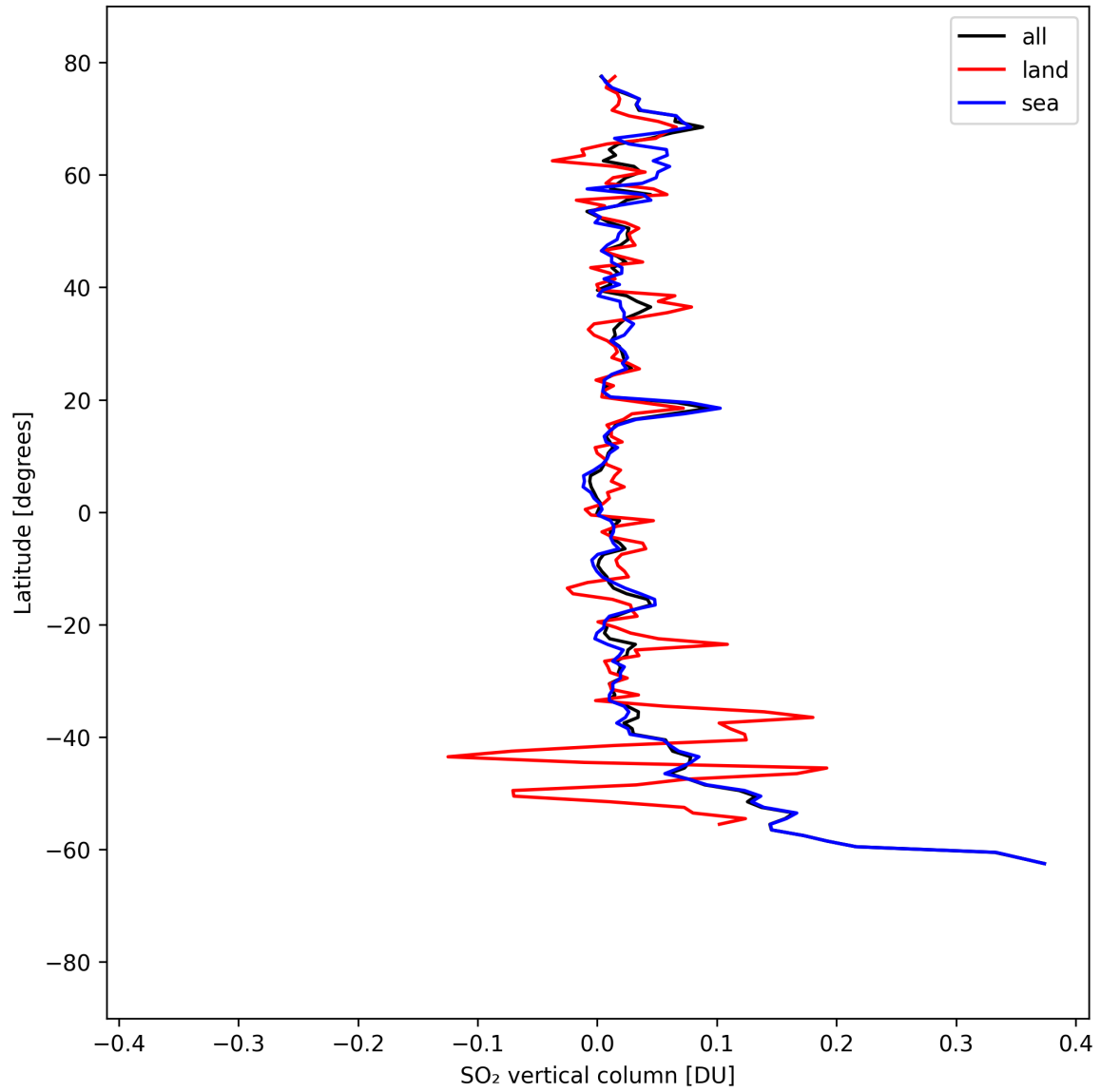


Figure 31: Zonal average of “SO₂ vertical column” for 2025-09-03 to 2025-09-04.

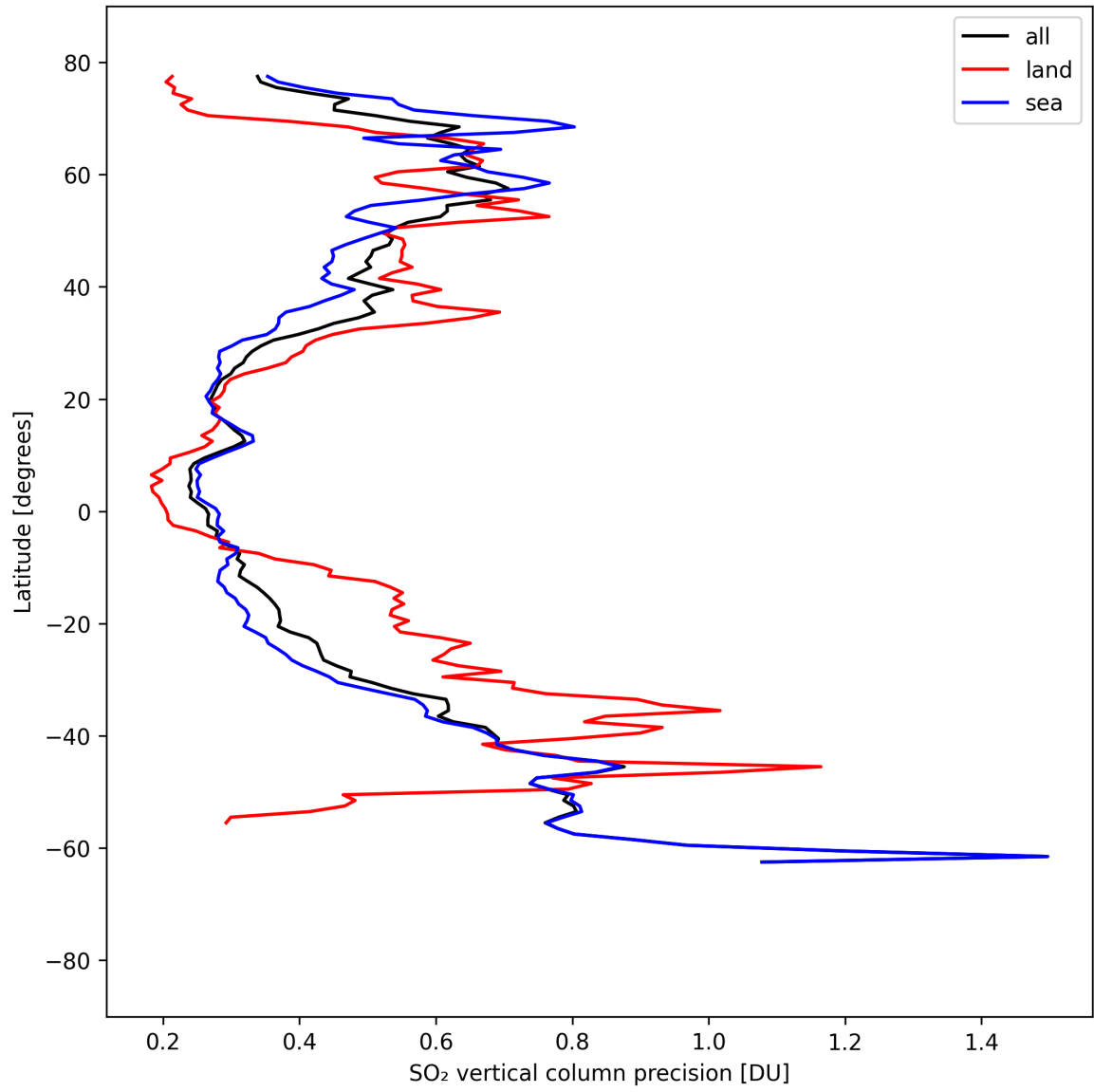


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-09-03 to 2025-09-04.

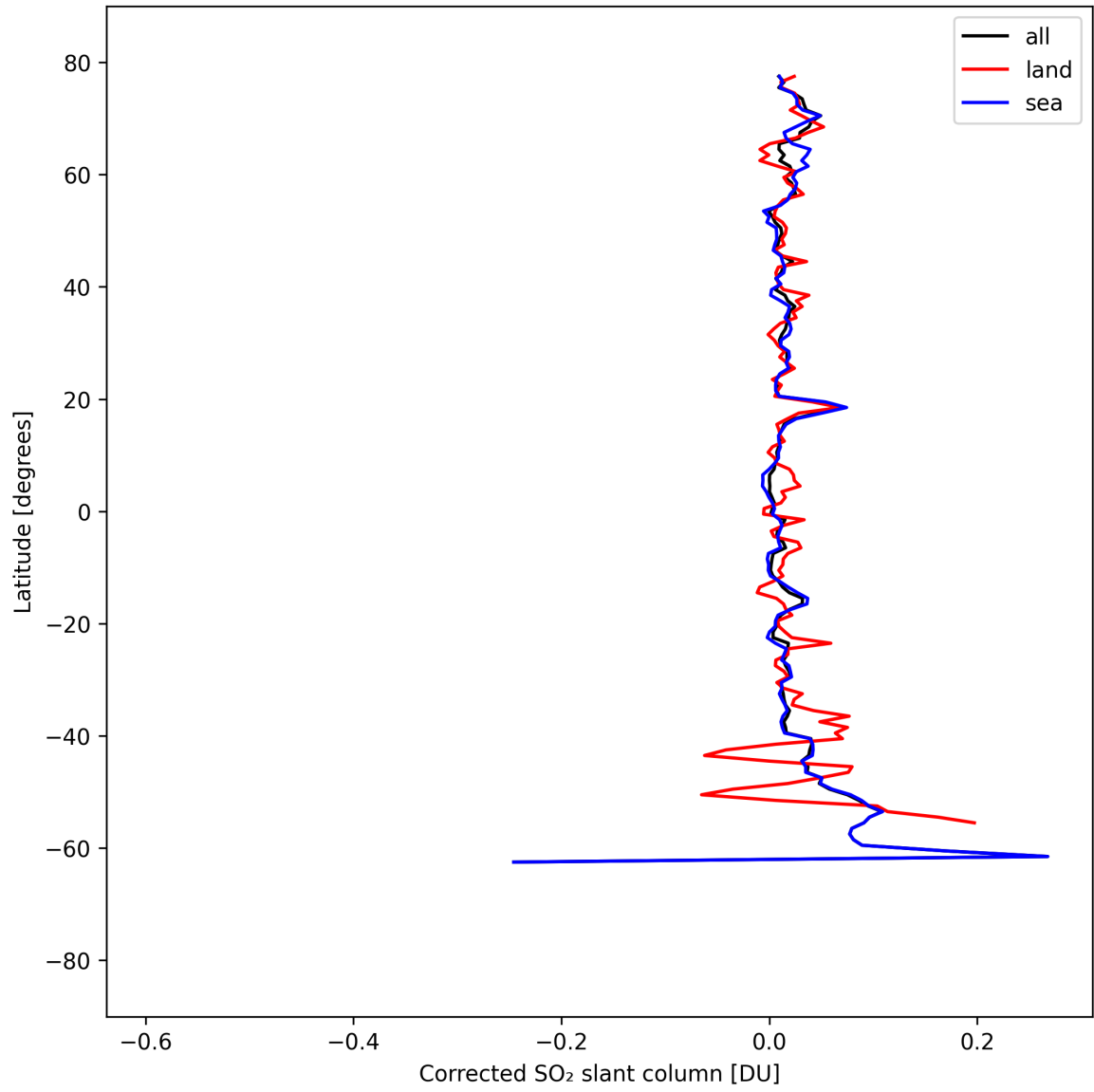


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-09-03 to 2025-09-04.

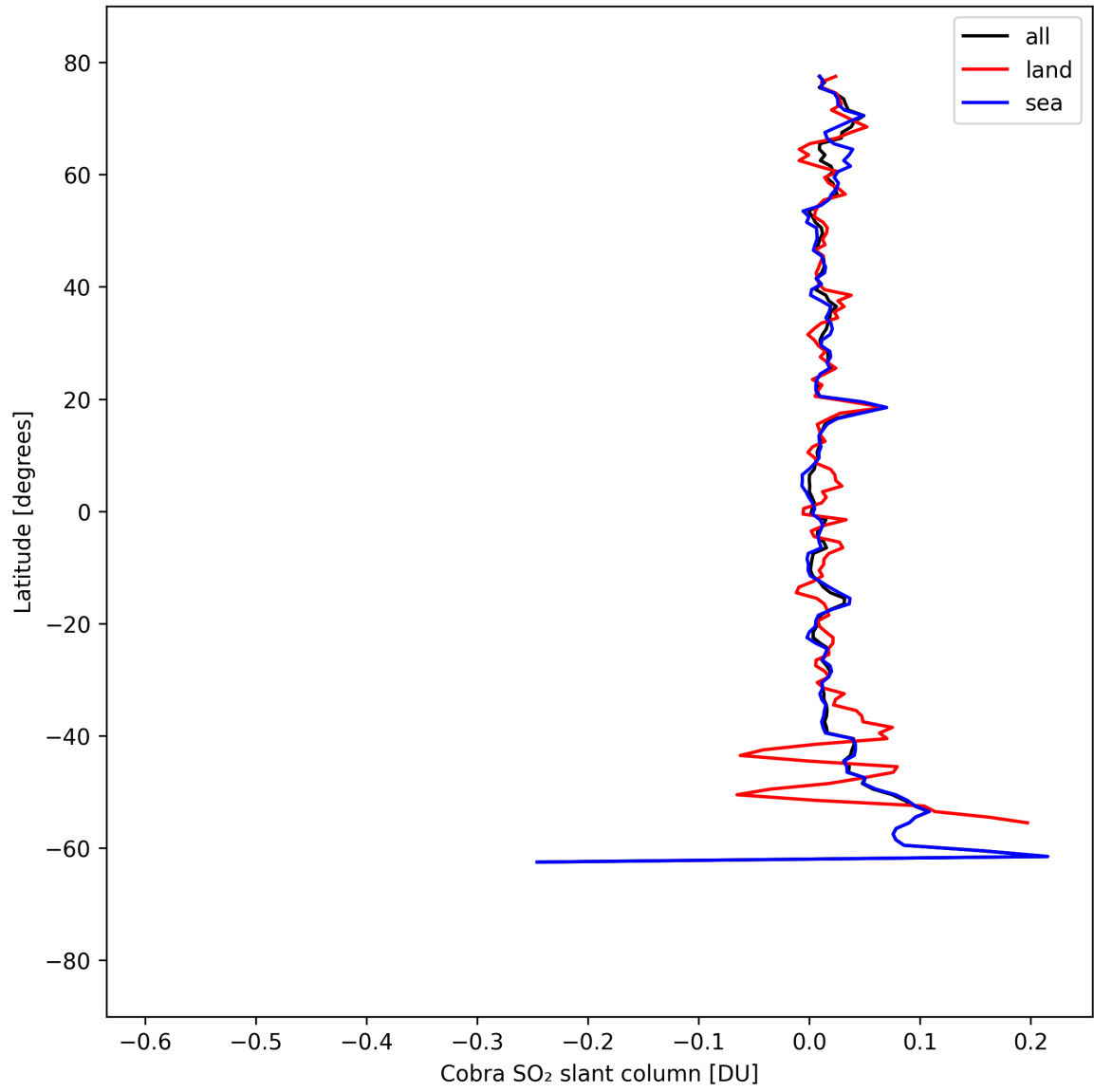


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-09-03 to 2025-09-04.

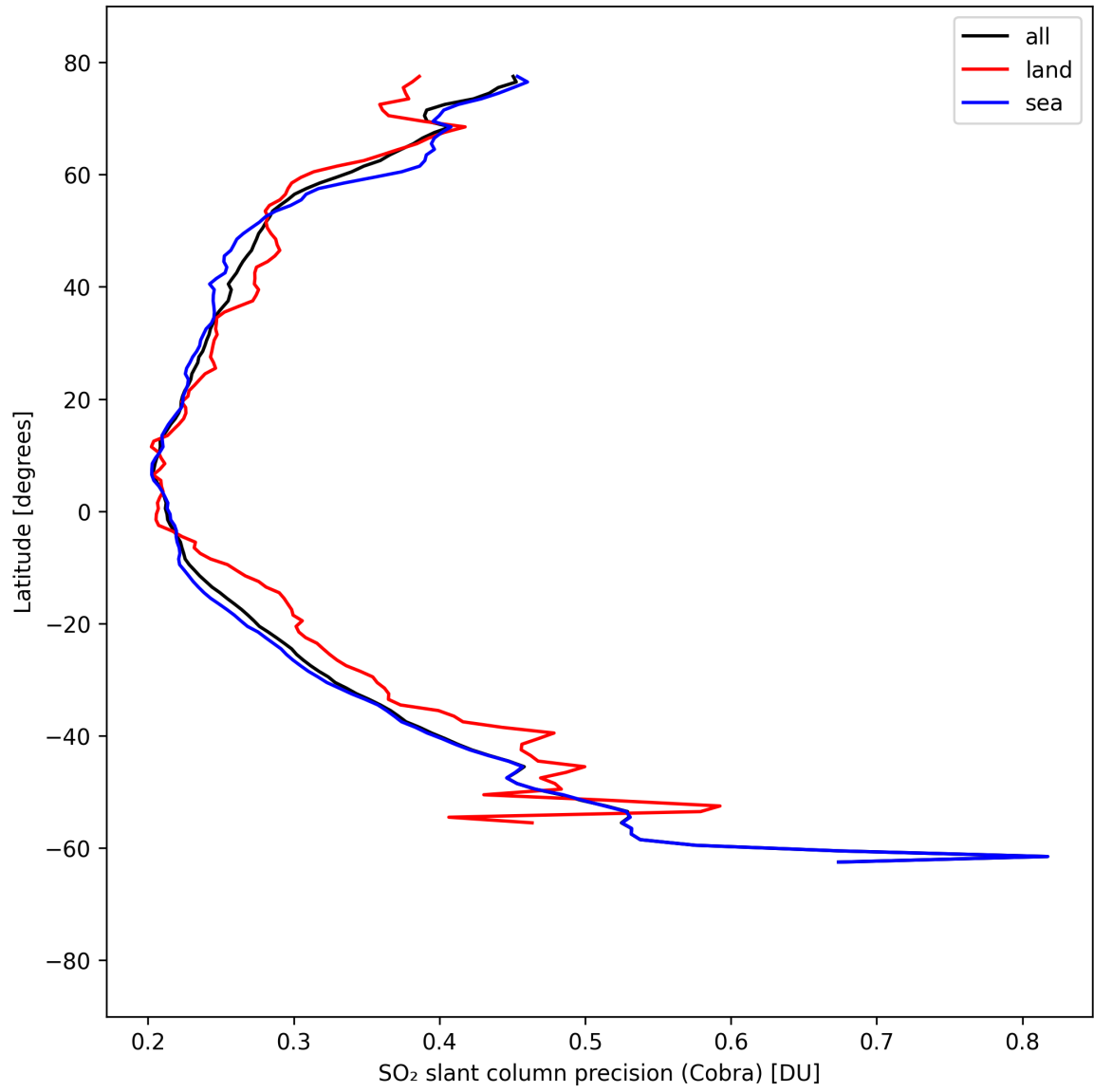


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-09-03 to 2025-09-04.

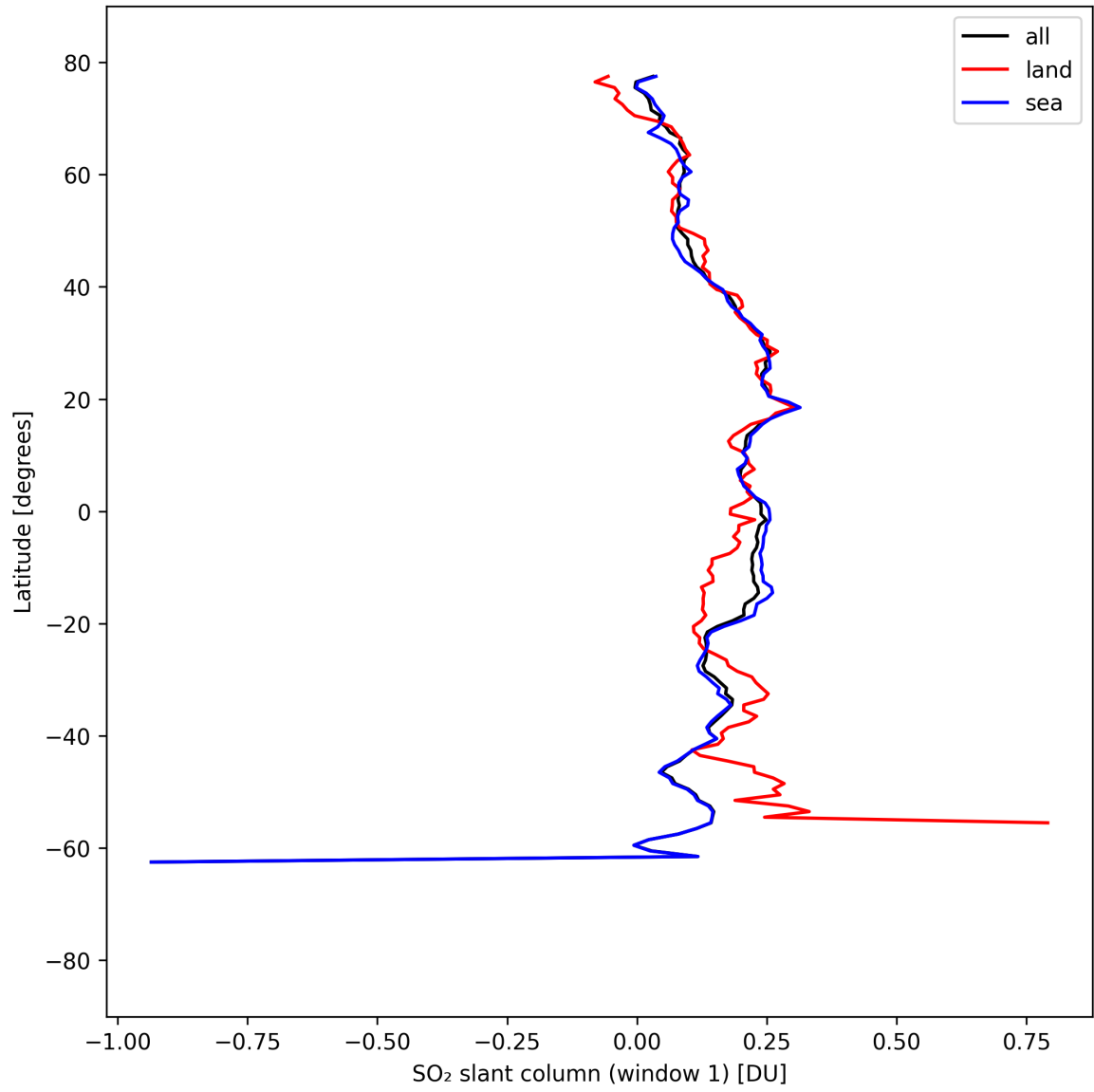


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-09-03 to 2025-09-04.

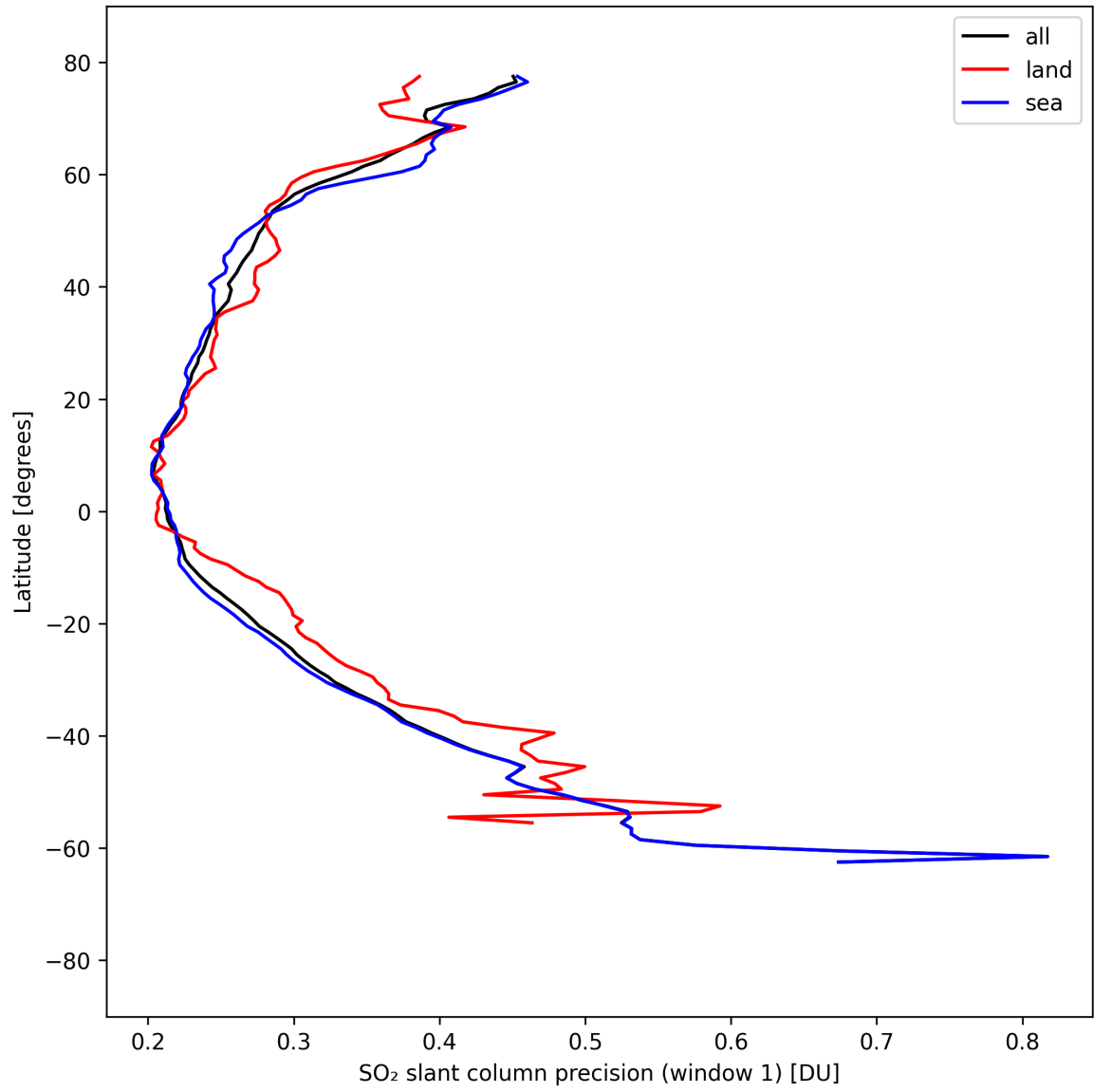


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-09-03 to 2025-09-04.

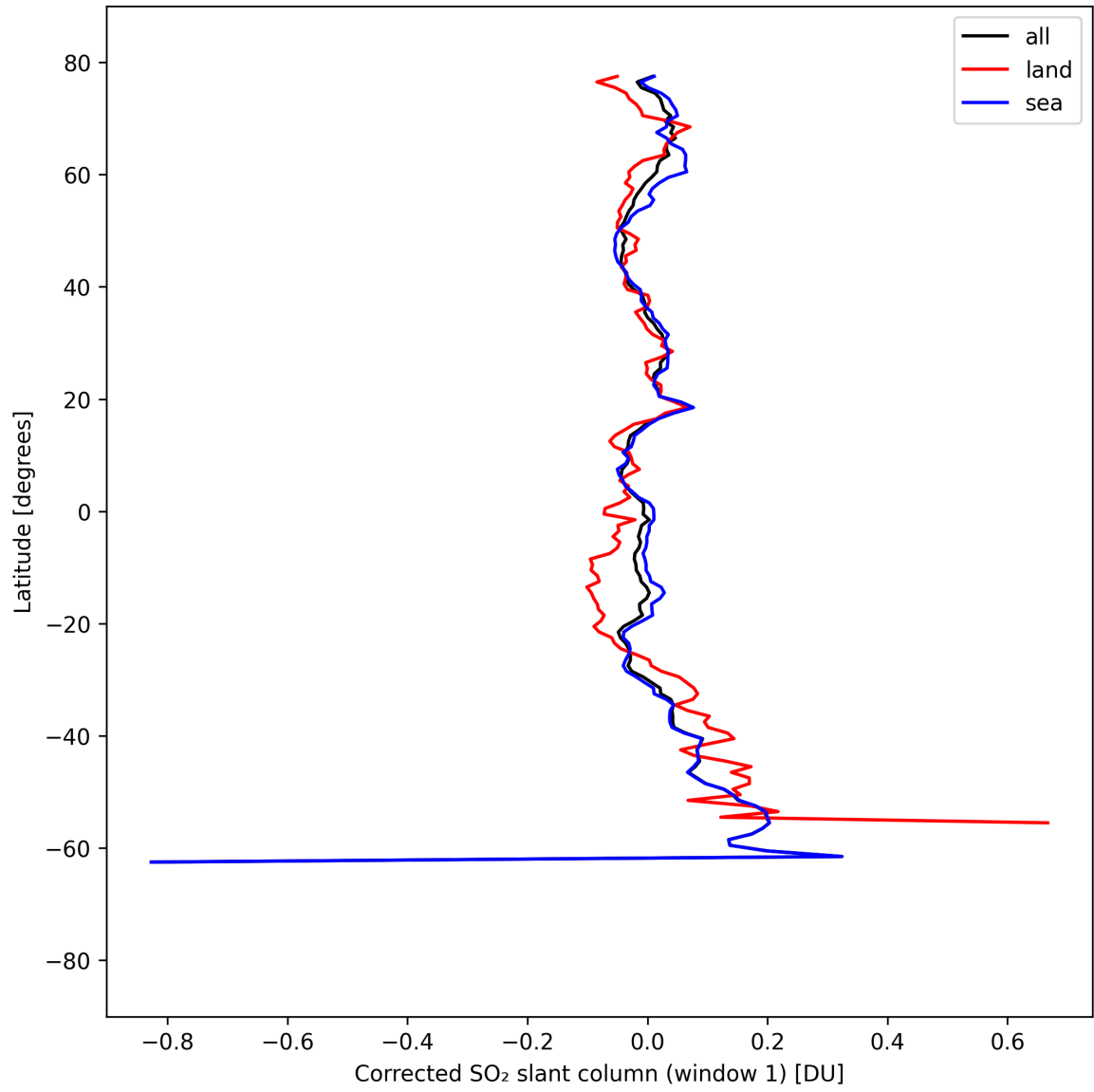


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-09-03 to 2025-09-04.

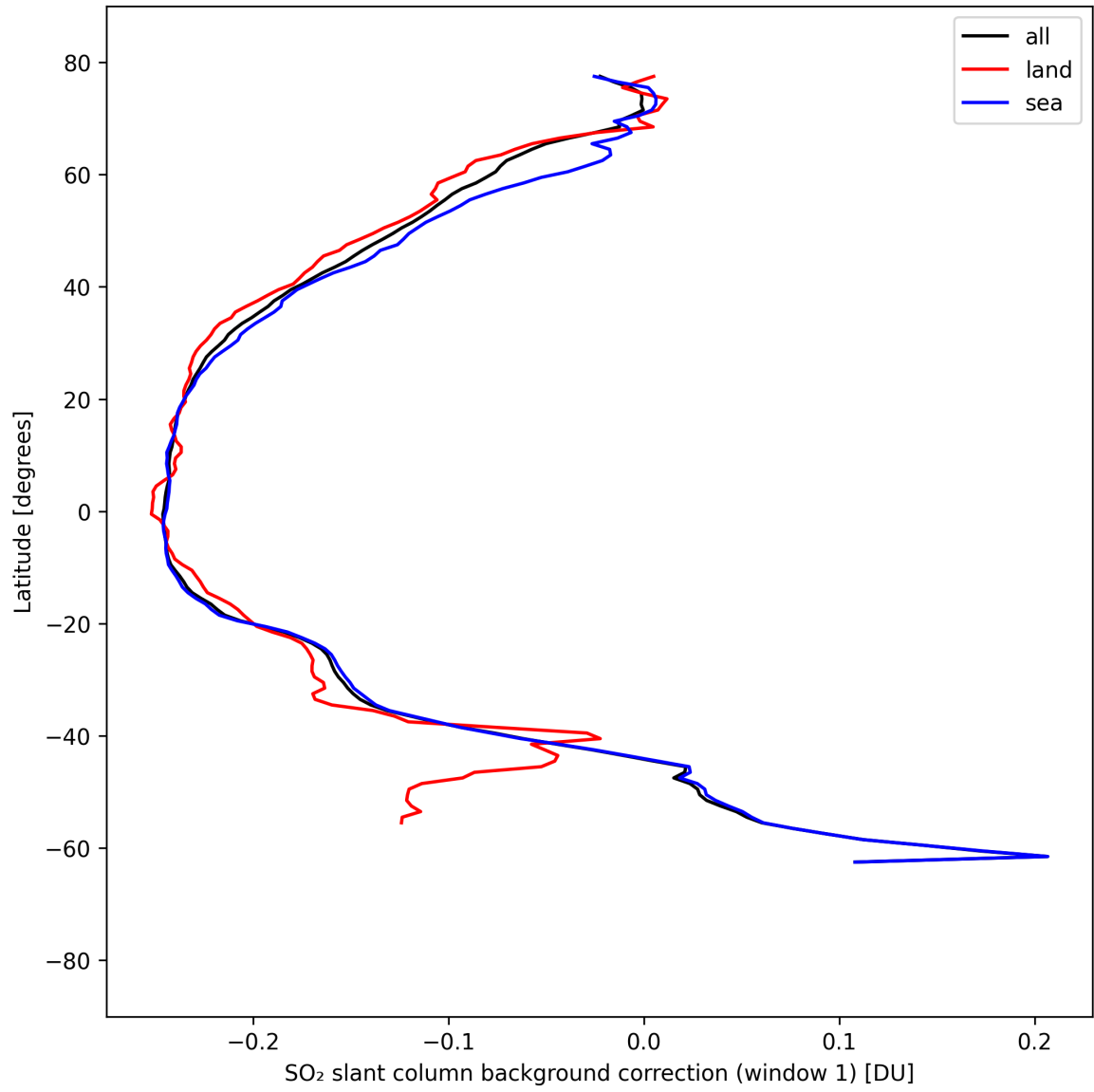


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-09-03 to 2025-09-04.

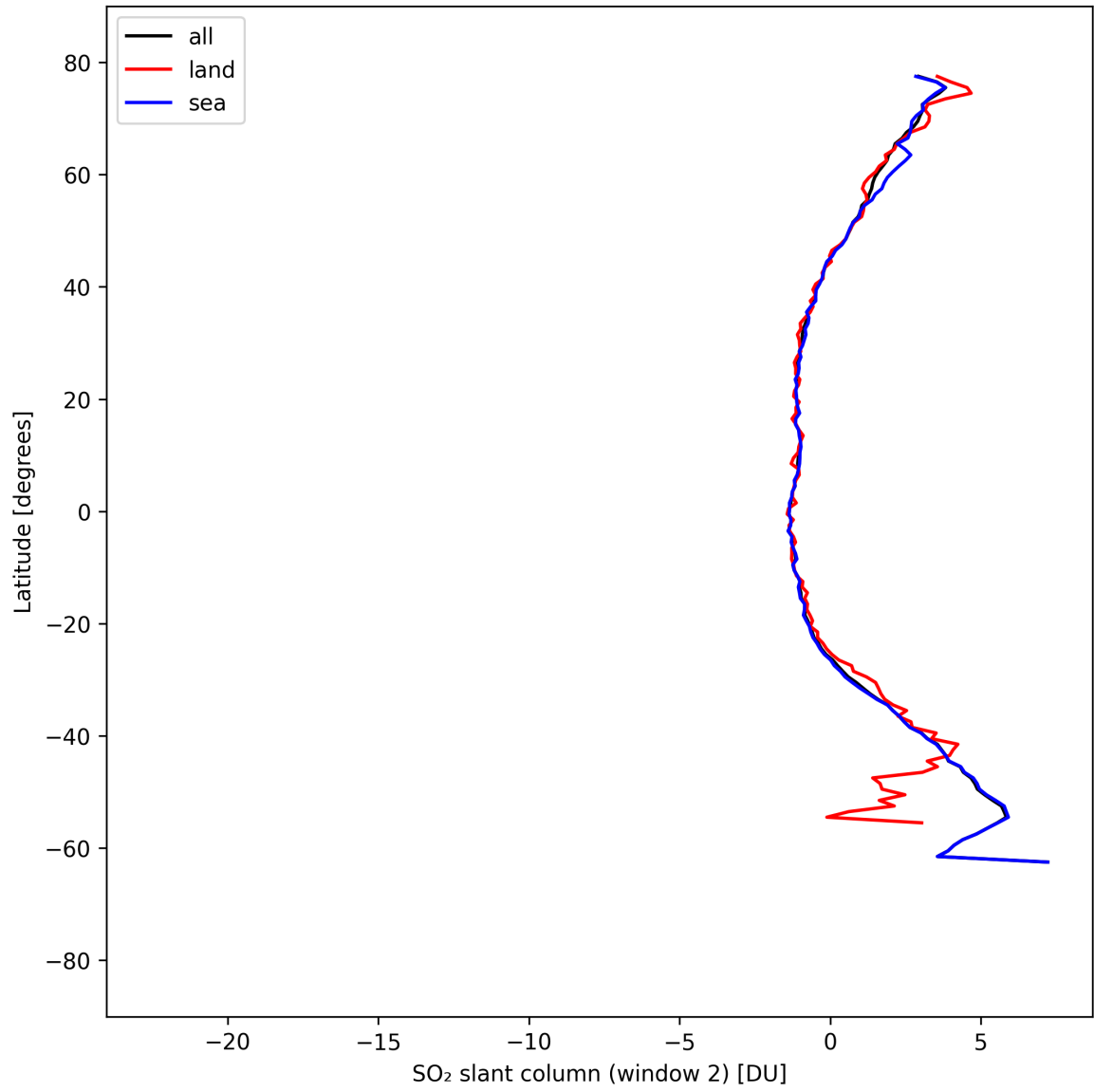


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-09-03 to 2025-09-04.

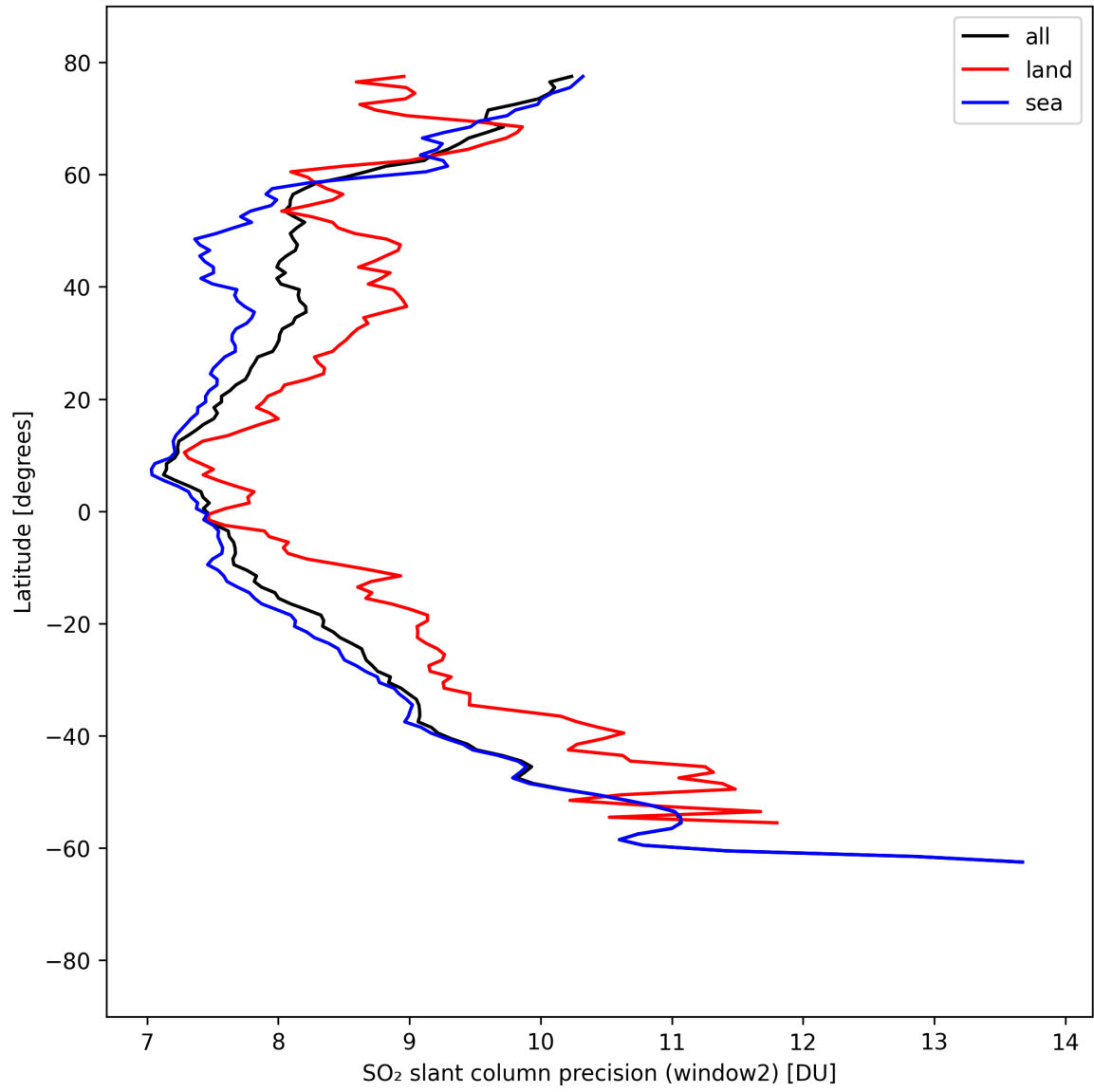


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-09-03 to 2025-09-04.

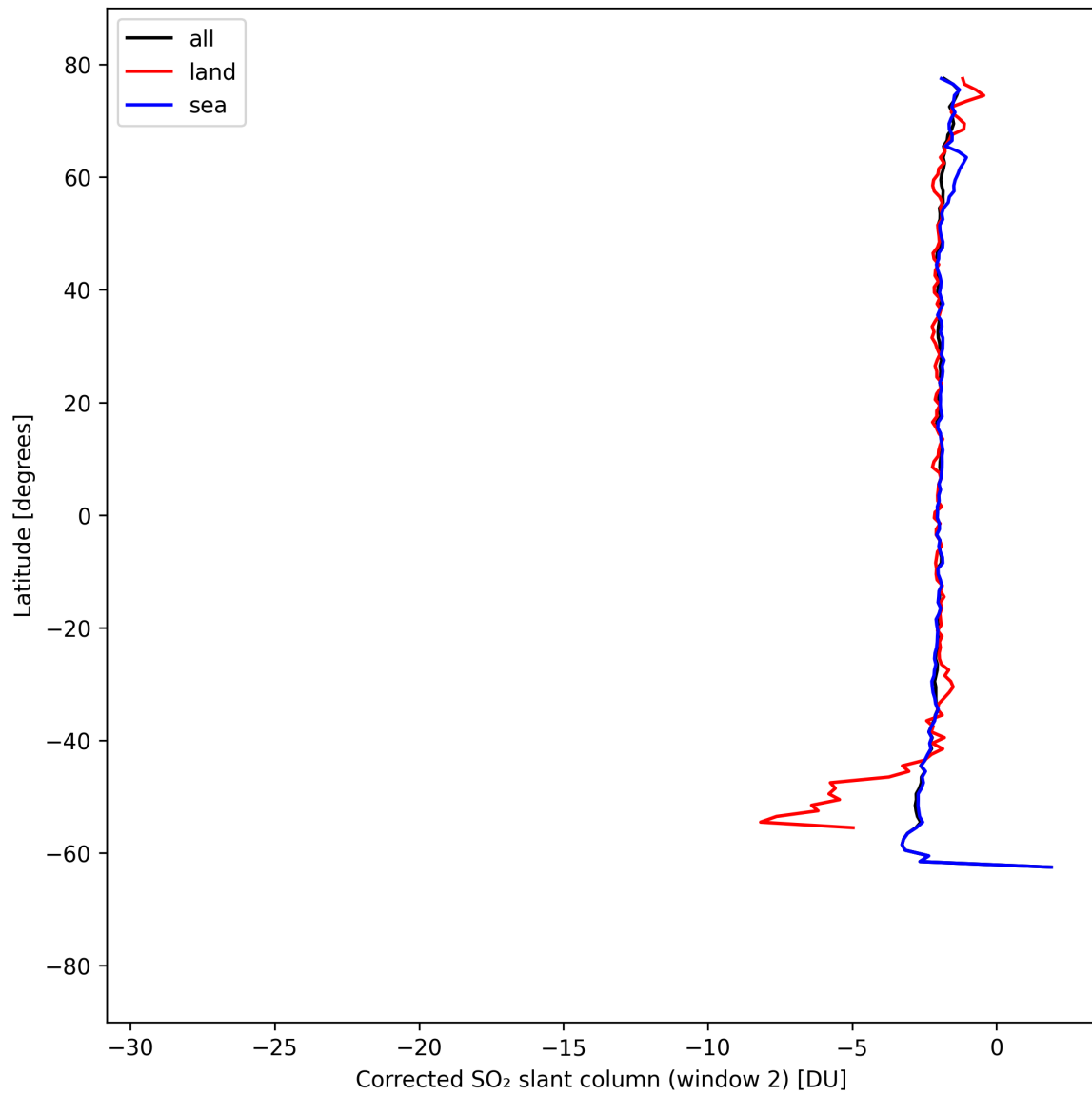


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-09-03 to 2025-09-04.

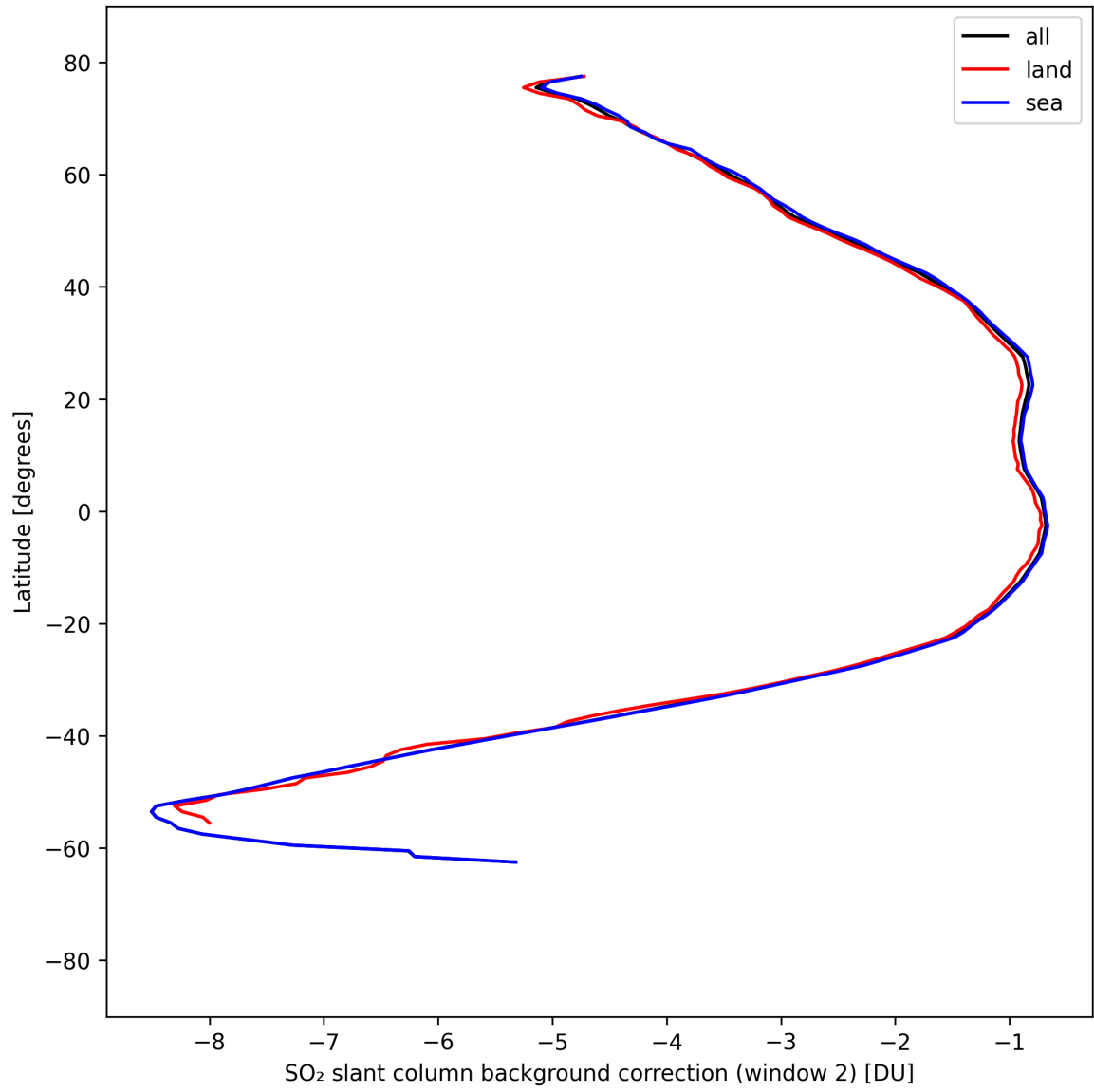


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-09-03 to 2025-09-04.

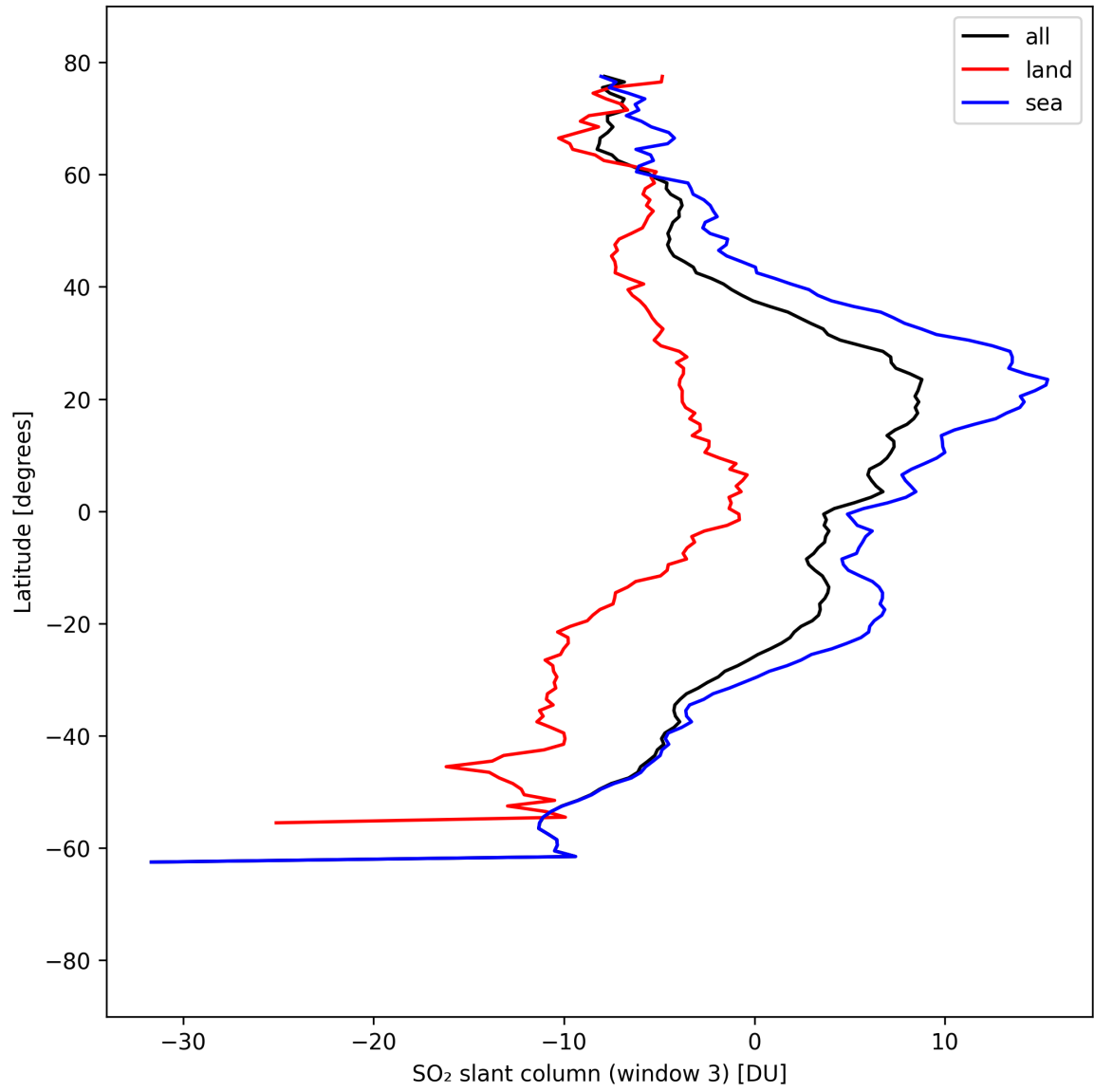


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-09-03 to 2025-09-04.

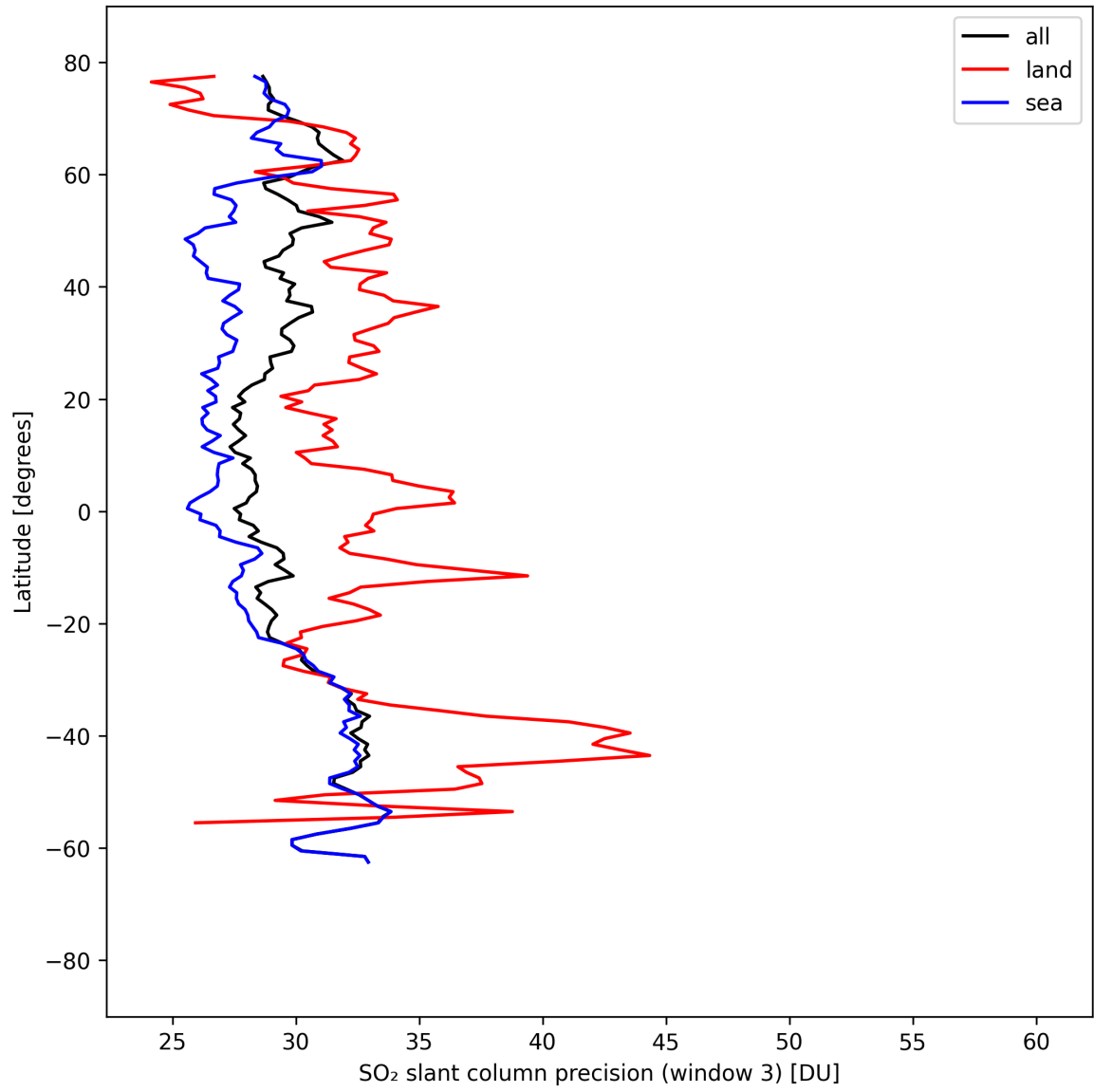


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-09-03 to 2025-09-04.

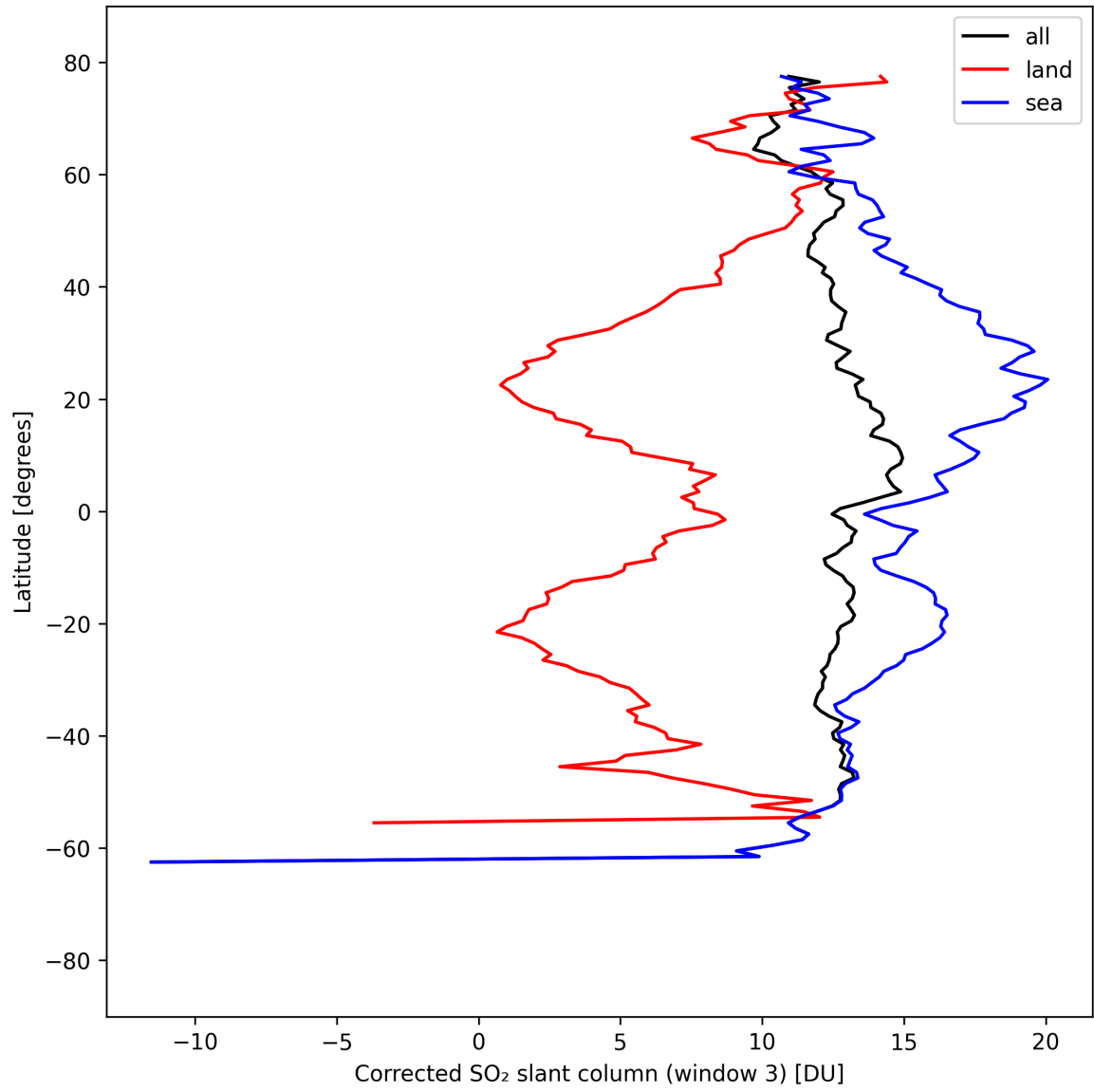


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-09-03 to 2025-09-04.

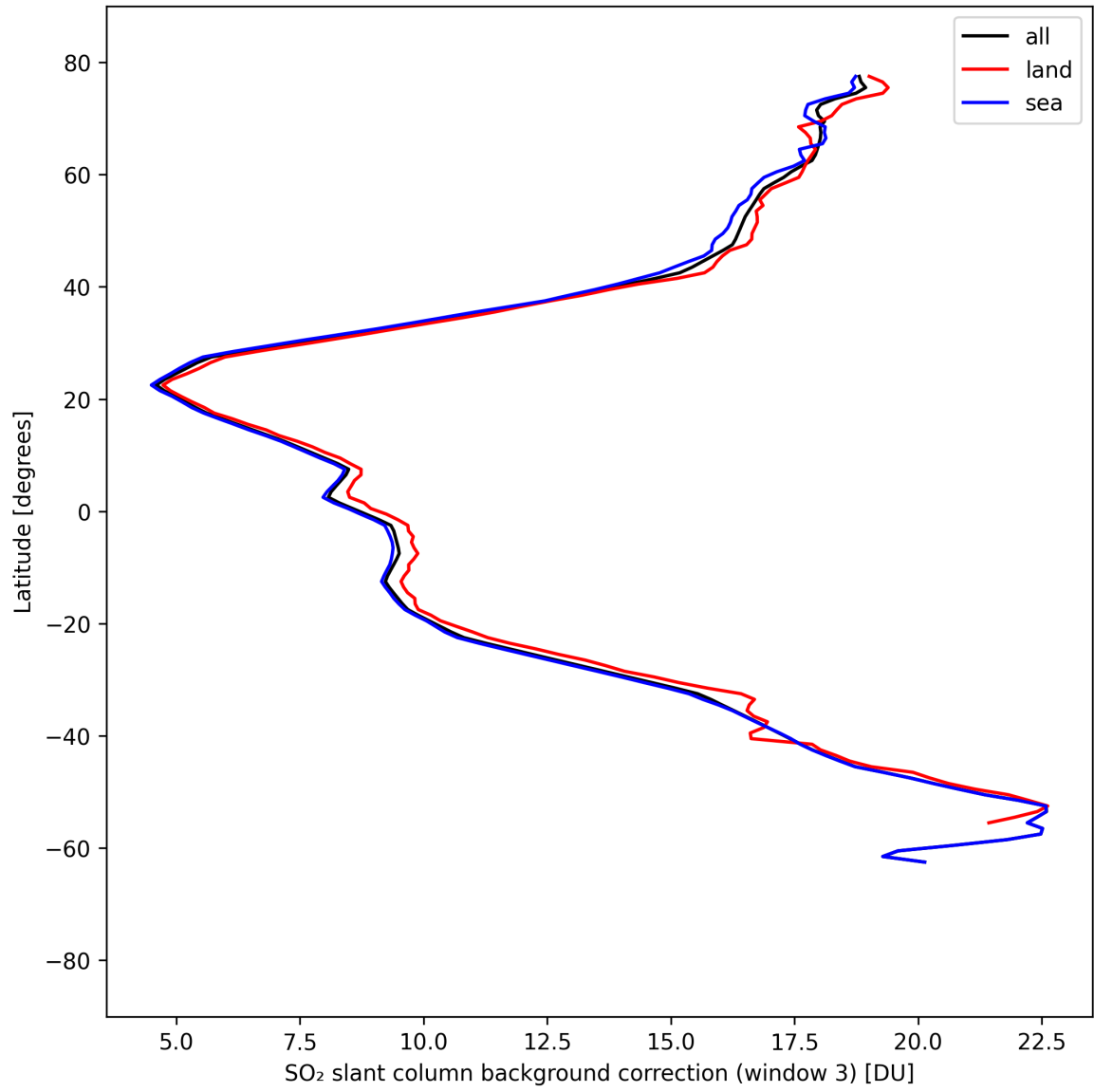


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-09-03 to 2025-09-04.

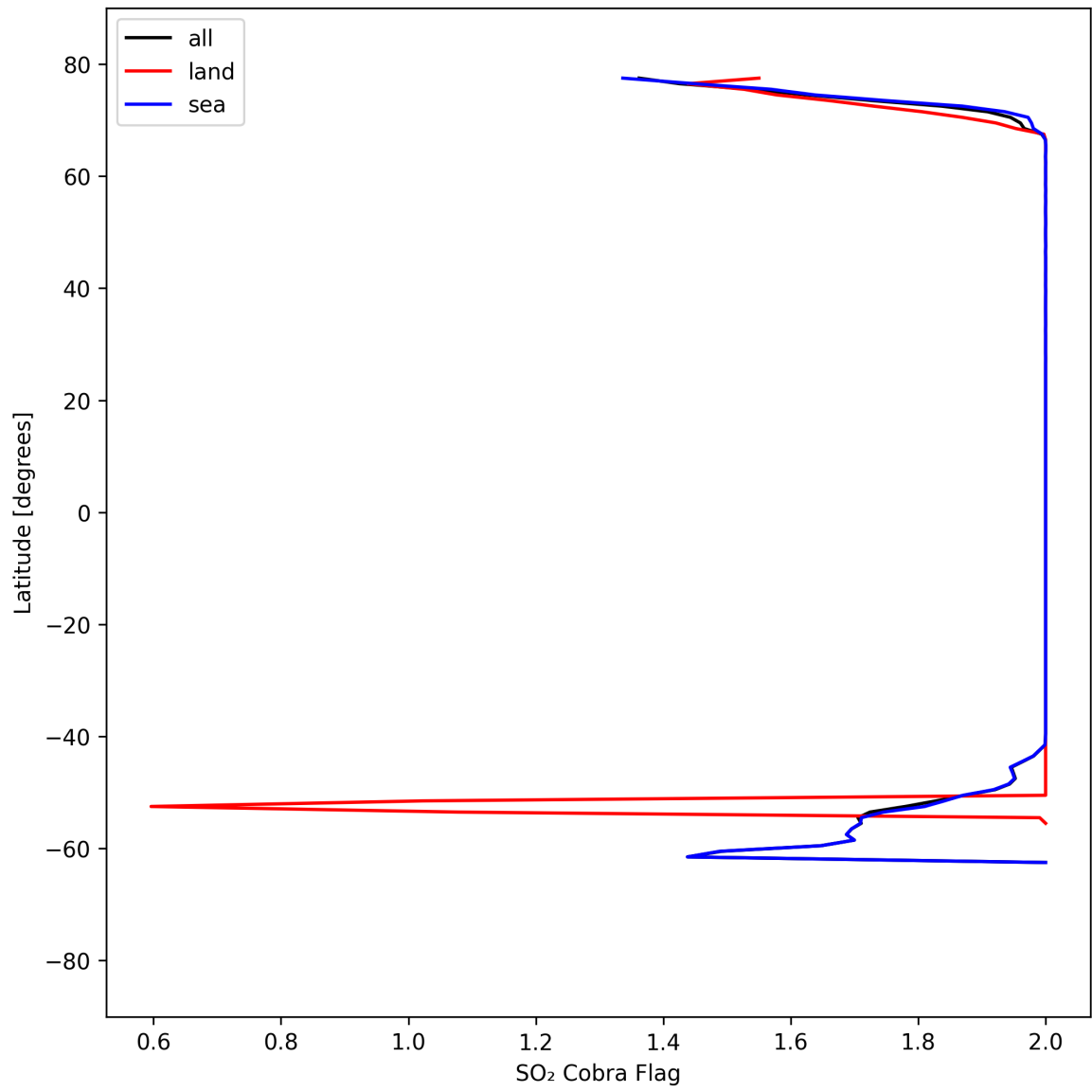


Figure 48: Zonal average of "SO₂ Cobra Flag" for 2025-09-03 to 2025-09-04.

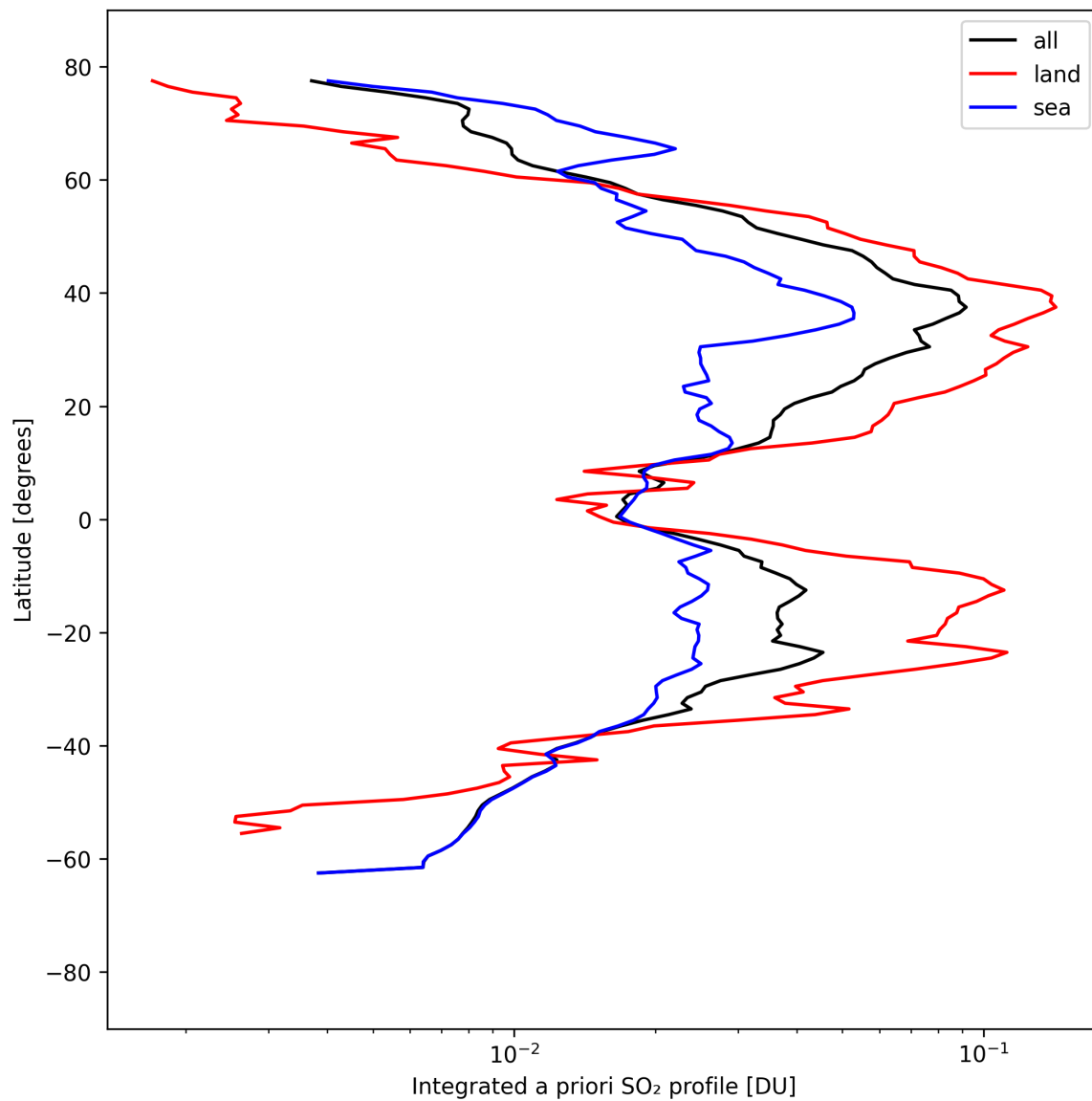


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-09-03 to 2025-09-04.

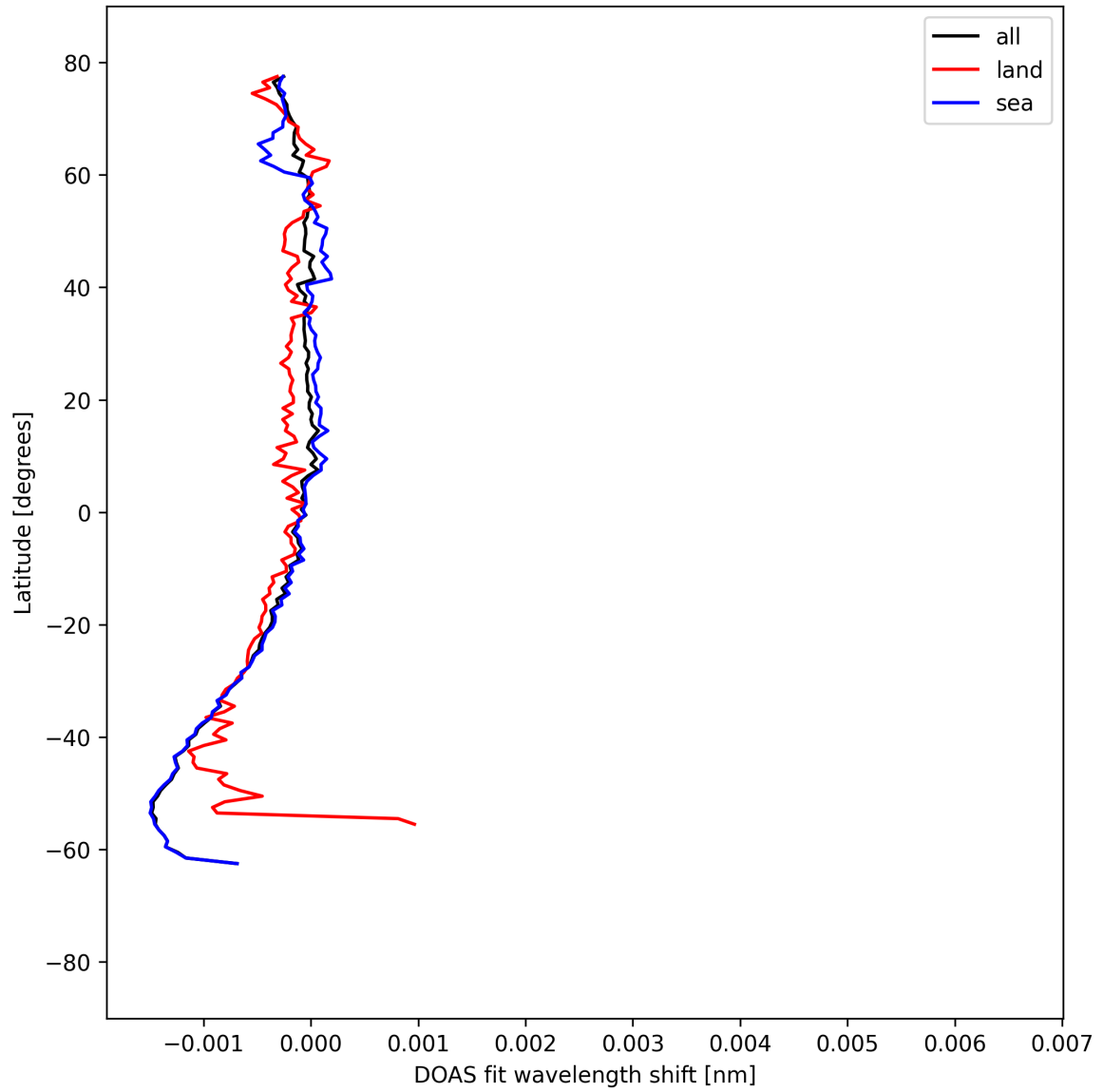


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-09-03 to 2025-09-04.

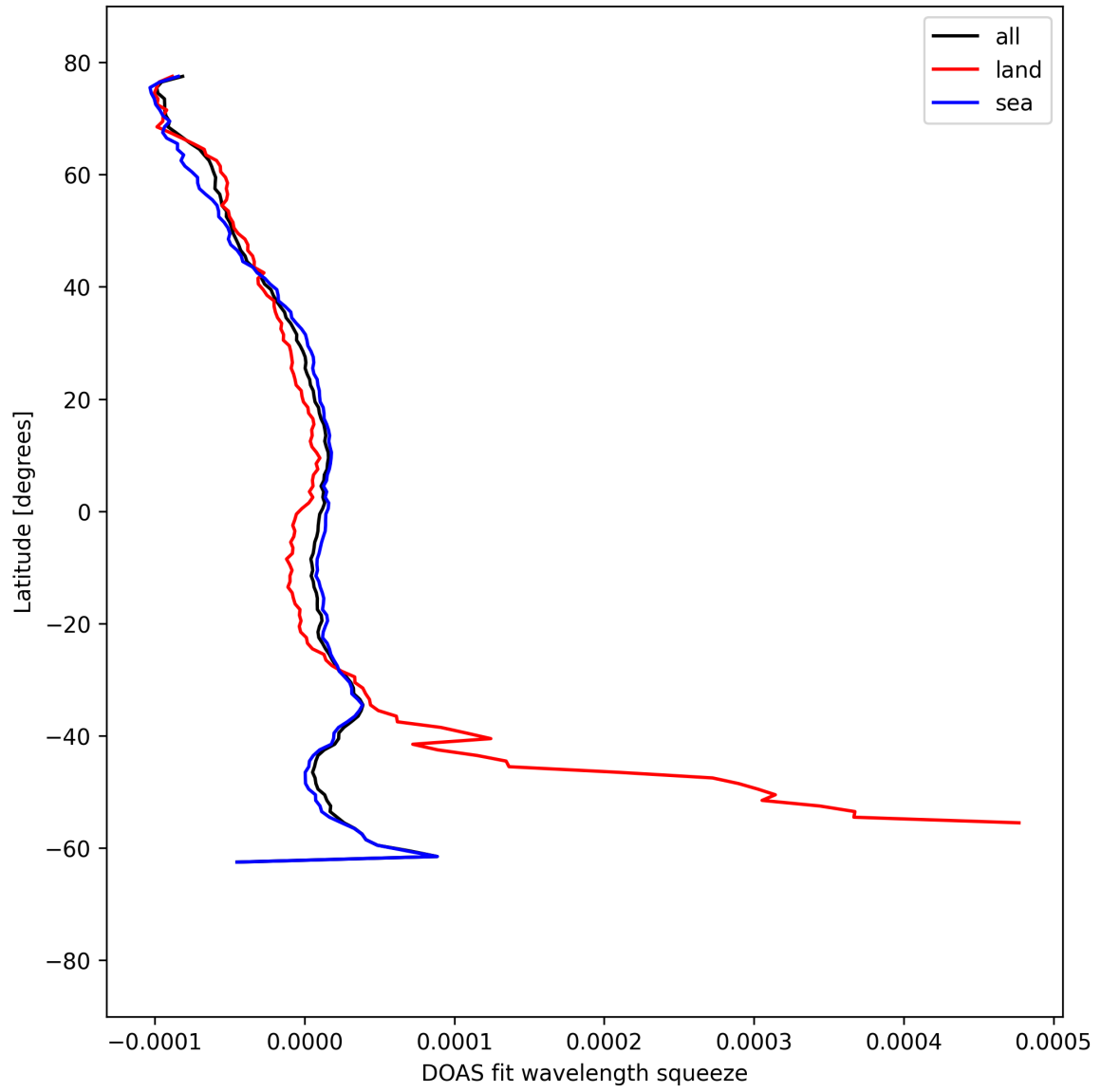


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-09-03 to 2025-09-04.

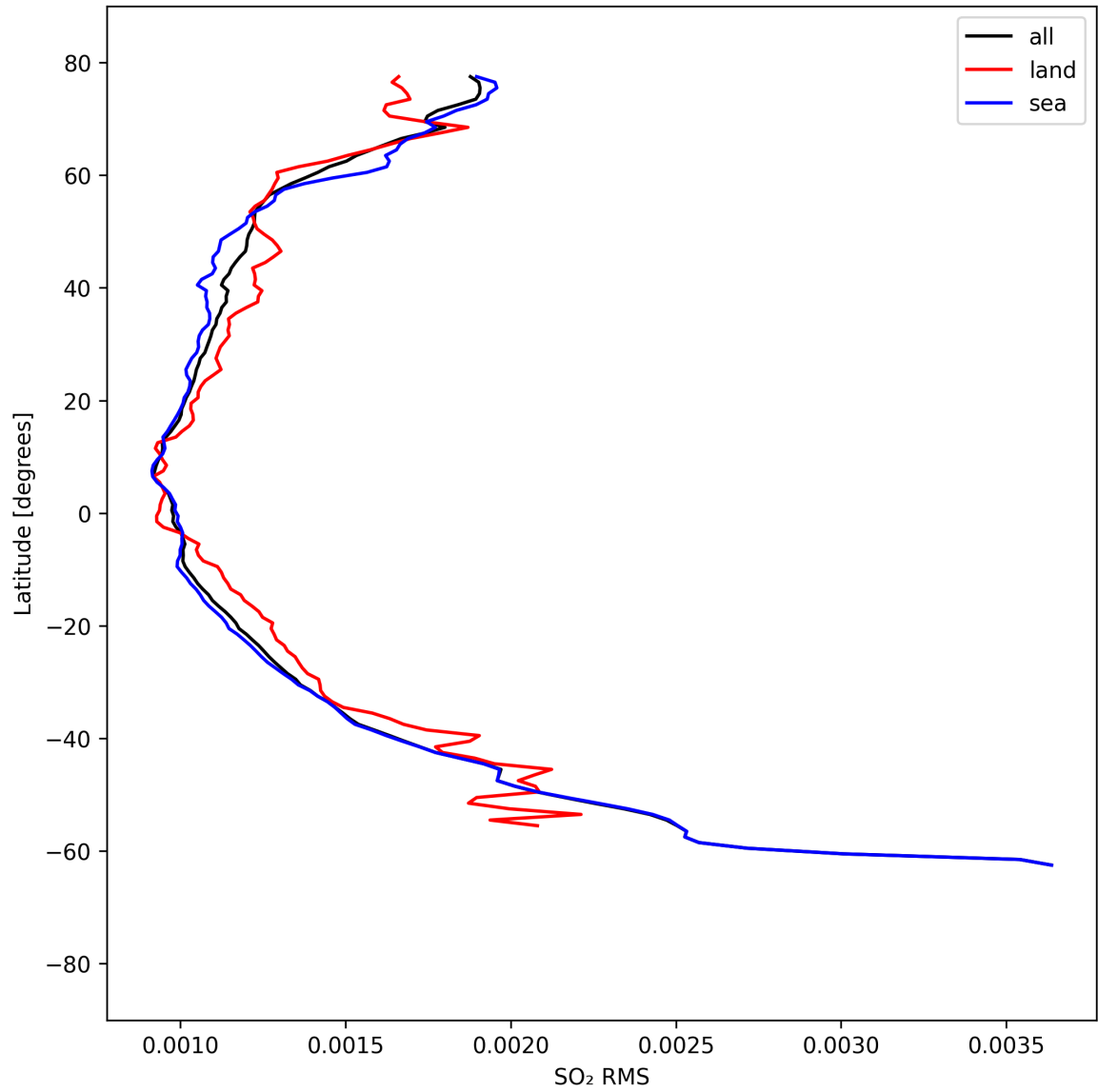


Figure 52: Zonal average of “SO₂ RMS” for 2025-09-03 to 2025-09-04.

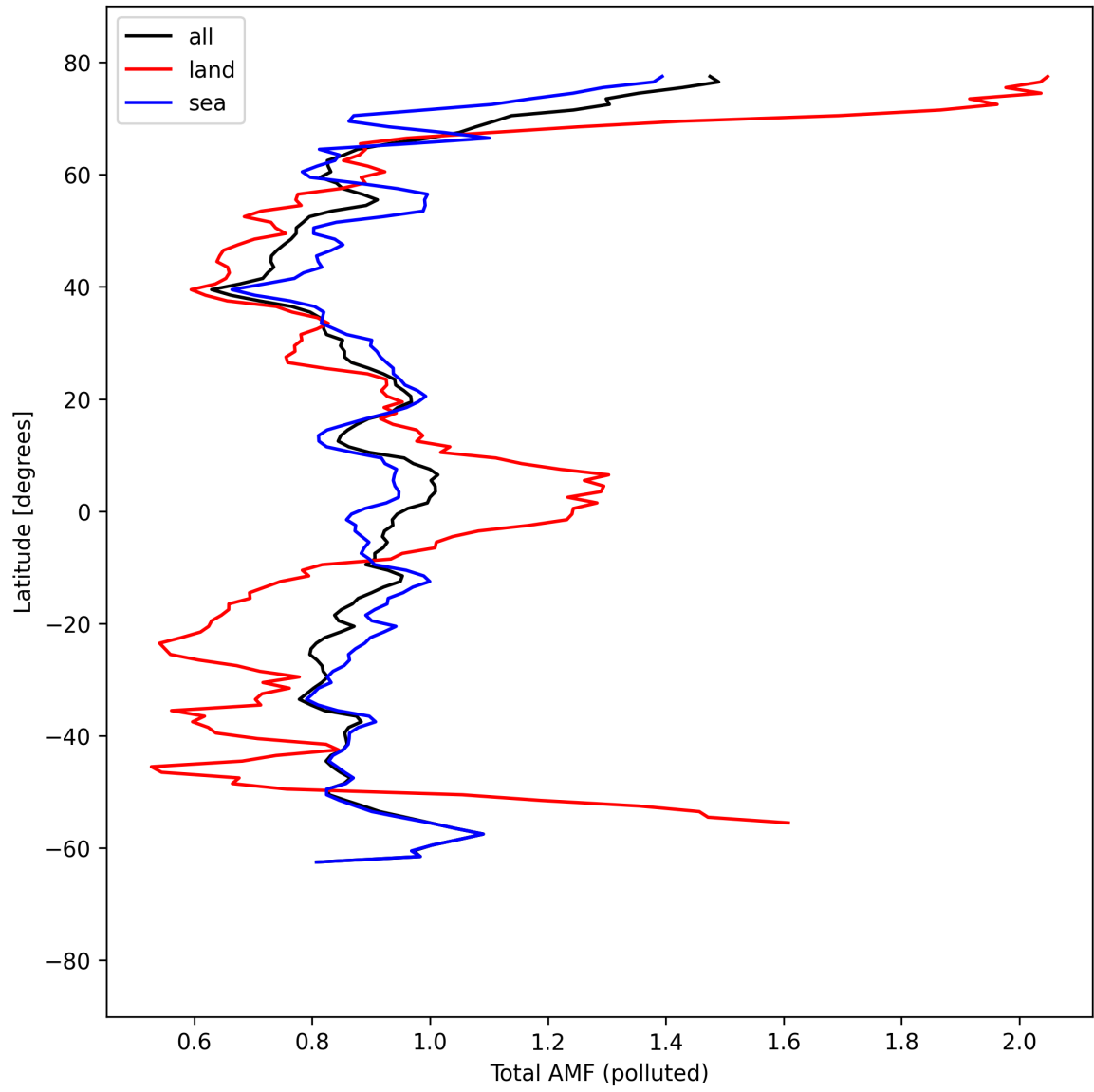


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-09-03 to 2025-09-04.

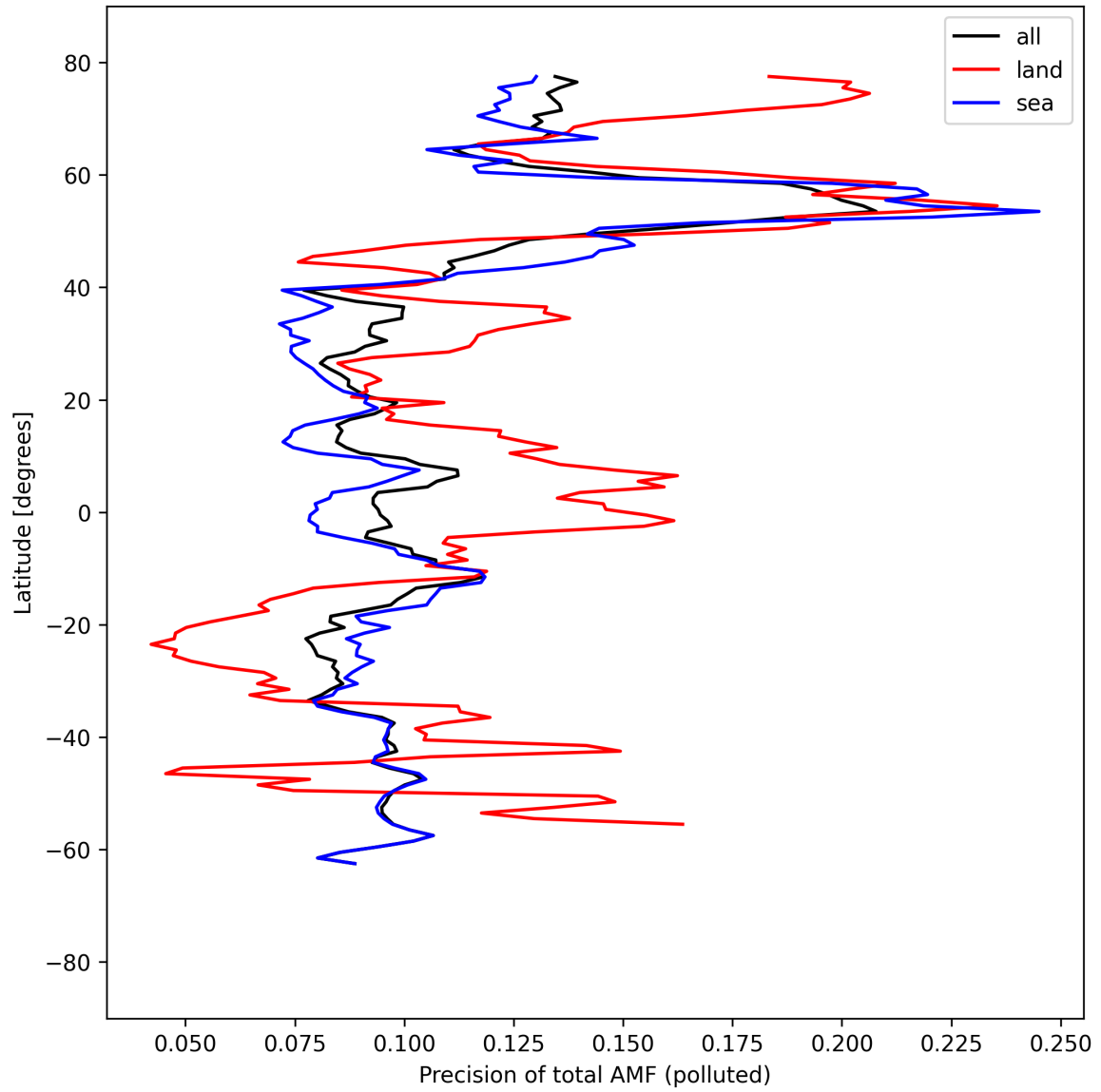


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-09-03 to 2025-09-04.

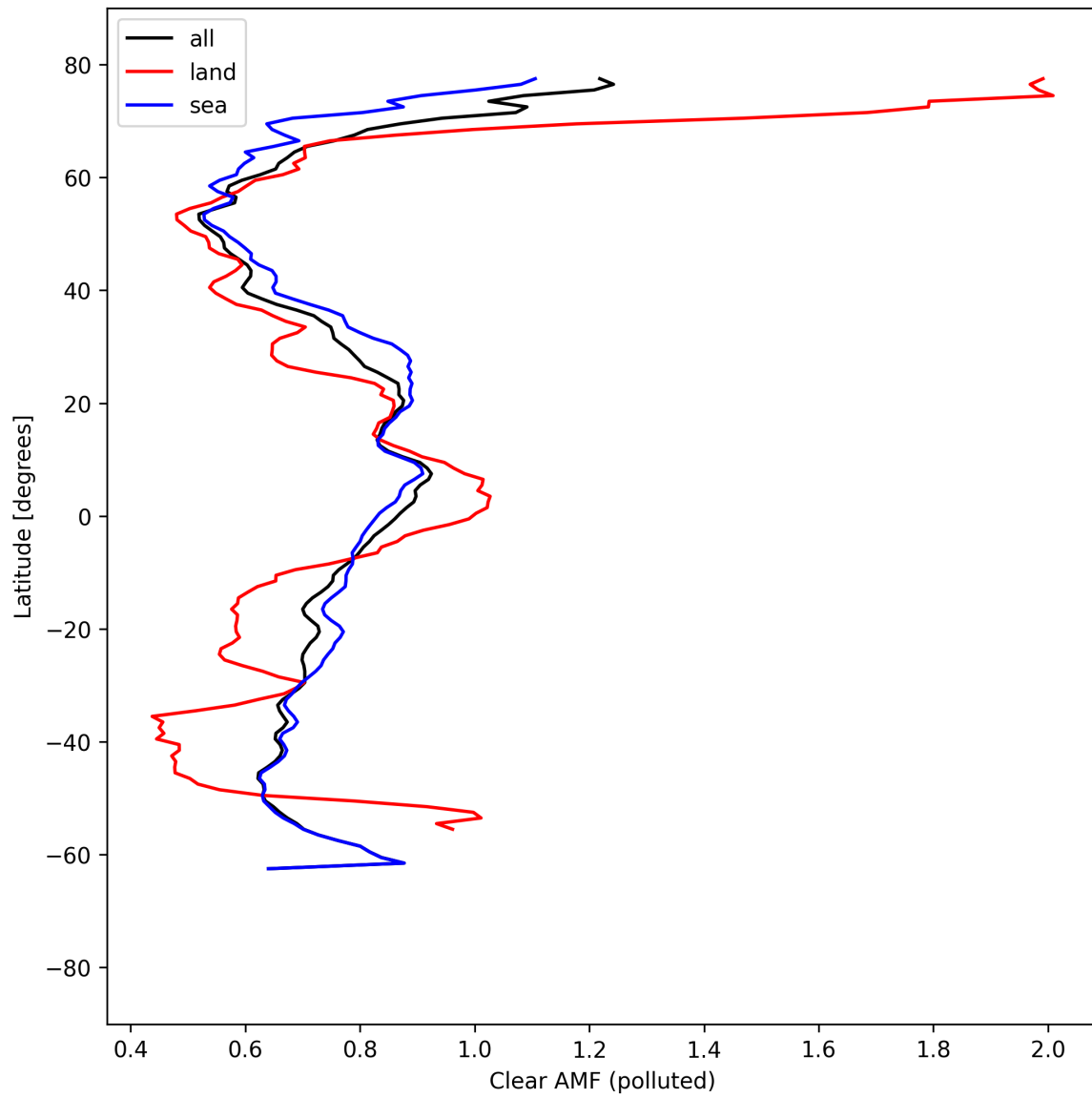


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-09-03 to 2025-09-04.

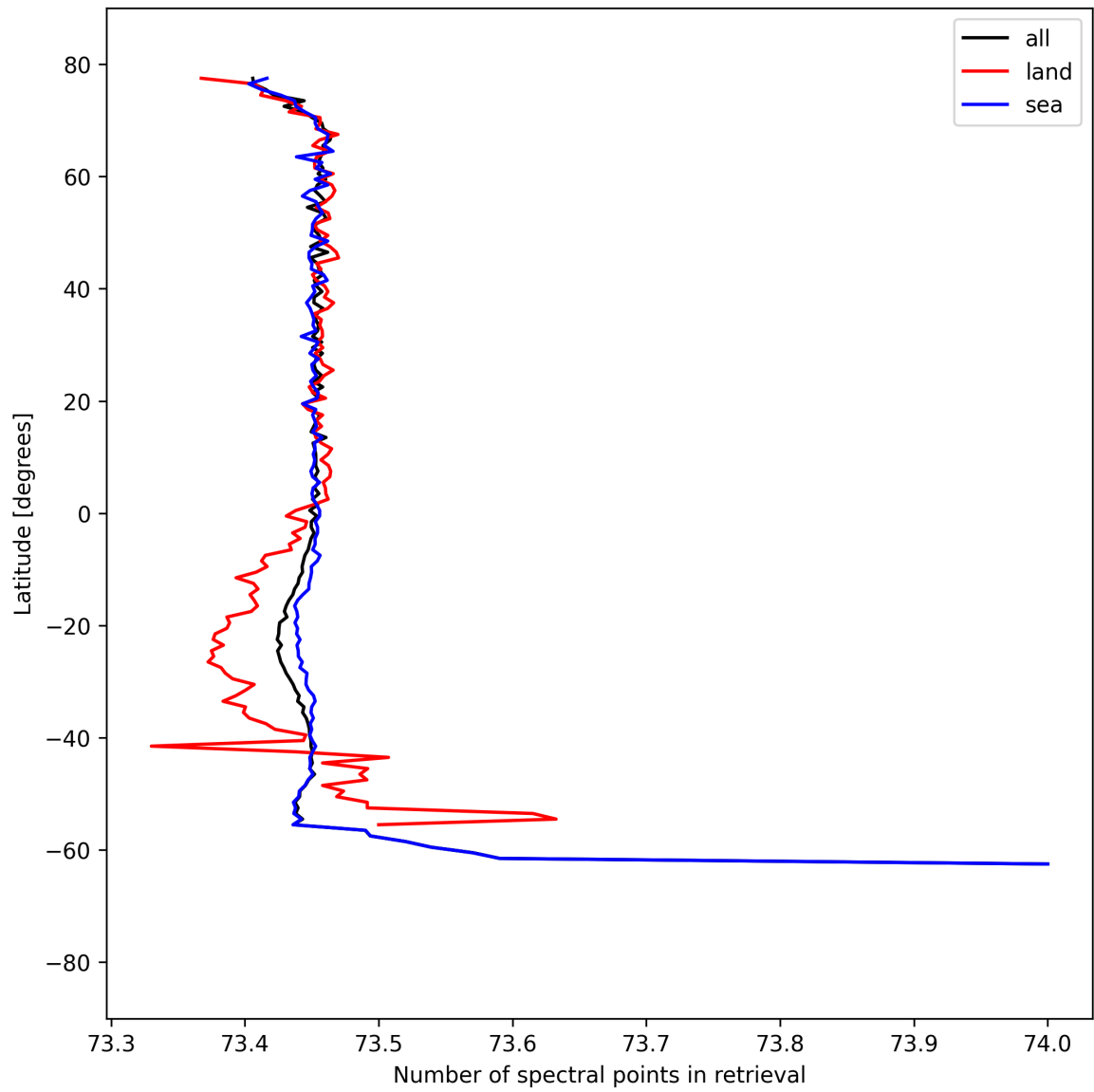


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-09-03 to 2025-09-04.

8 Histograms

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

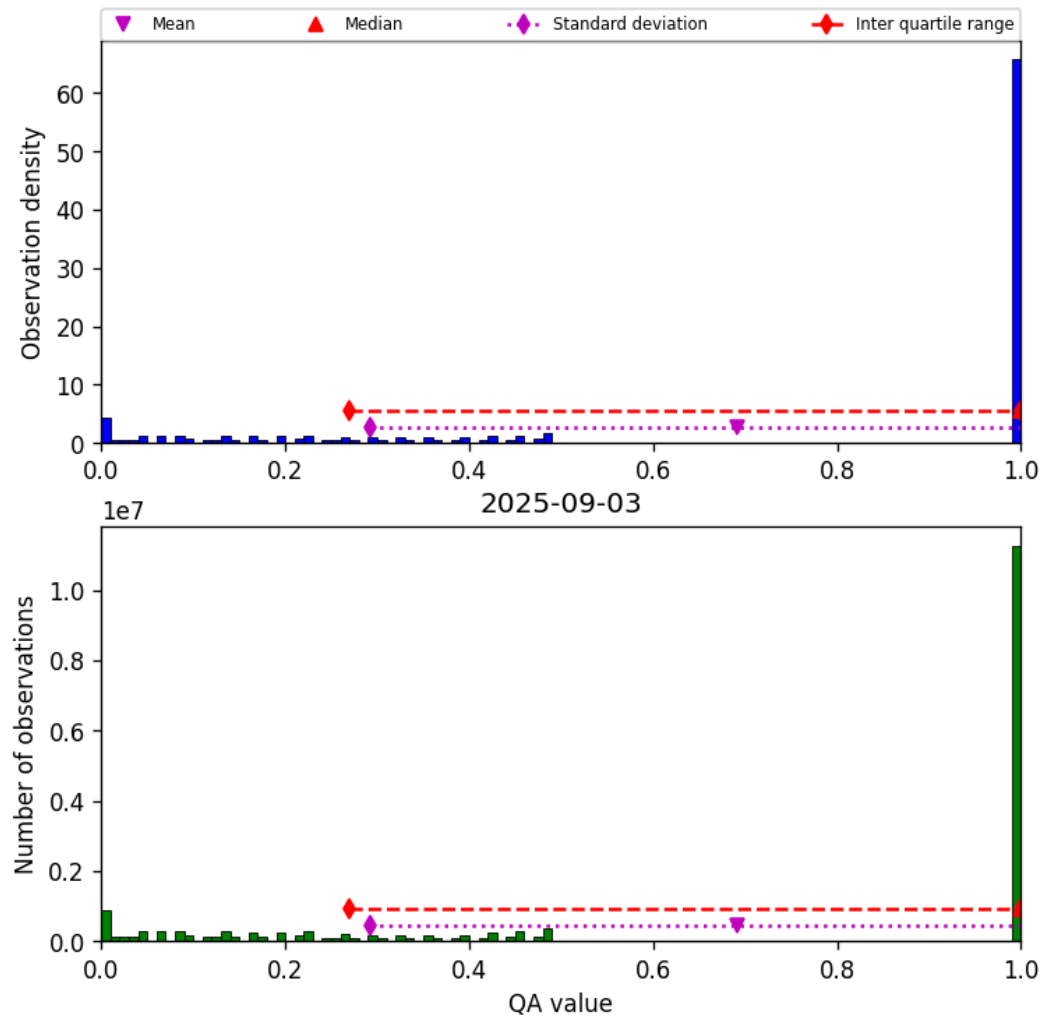


Figure 57: Histogram of “QA value” for 2025-09-03 to 2025-09-04

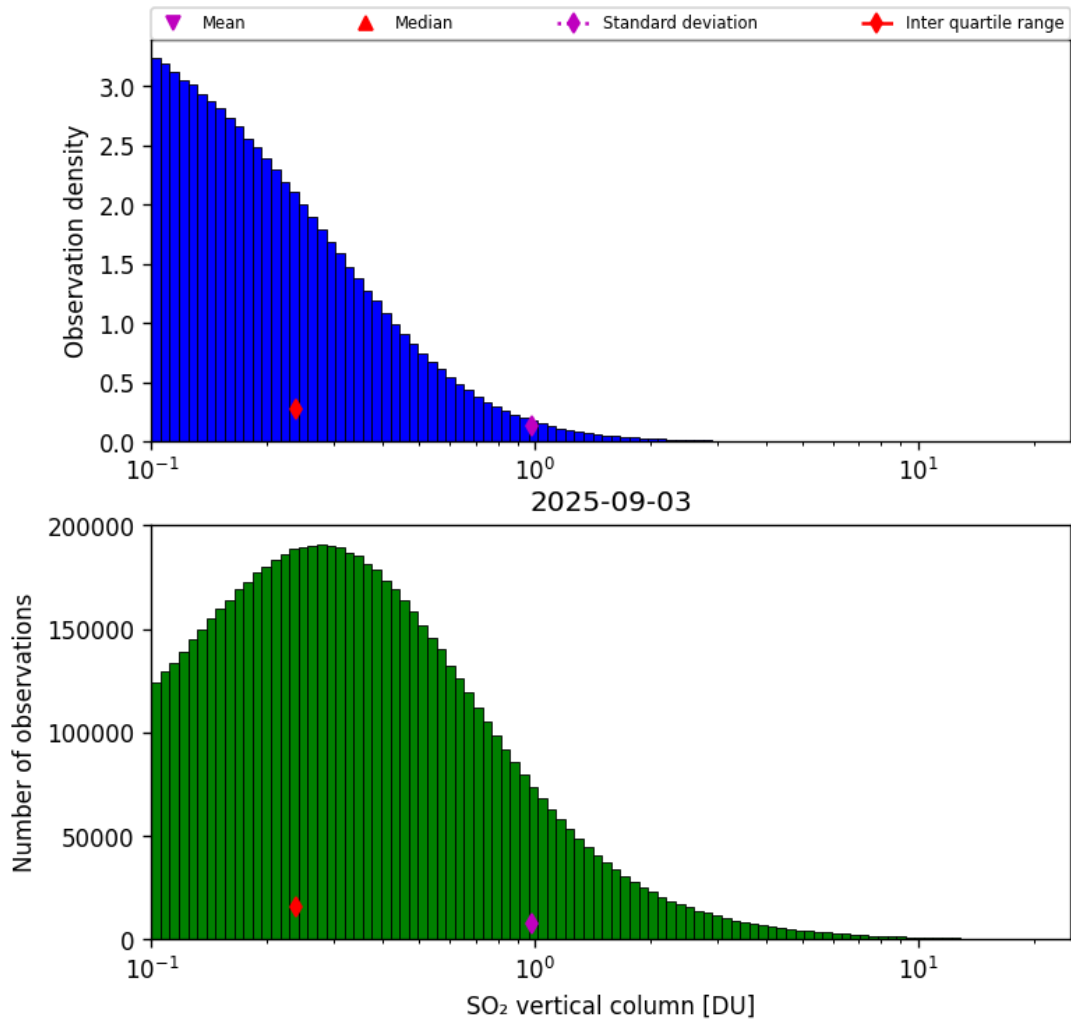


Figure 58: Histogram of “SO₂ vertical column” for 2025-09-03 to 2025-09-04

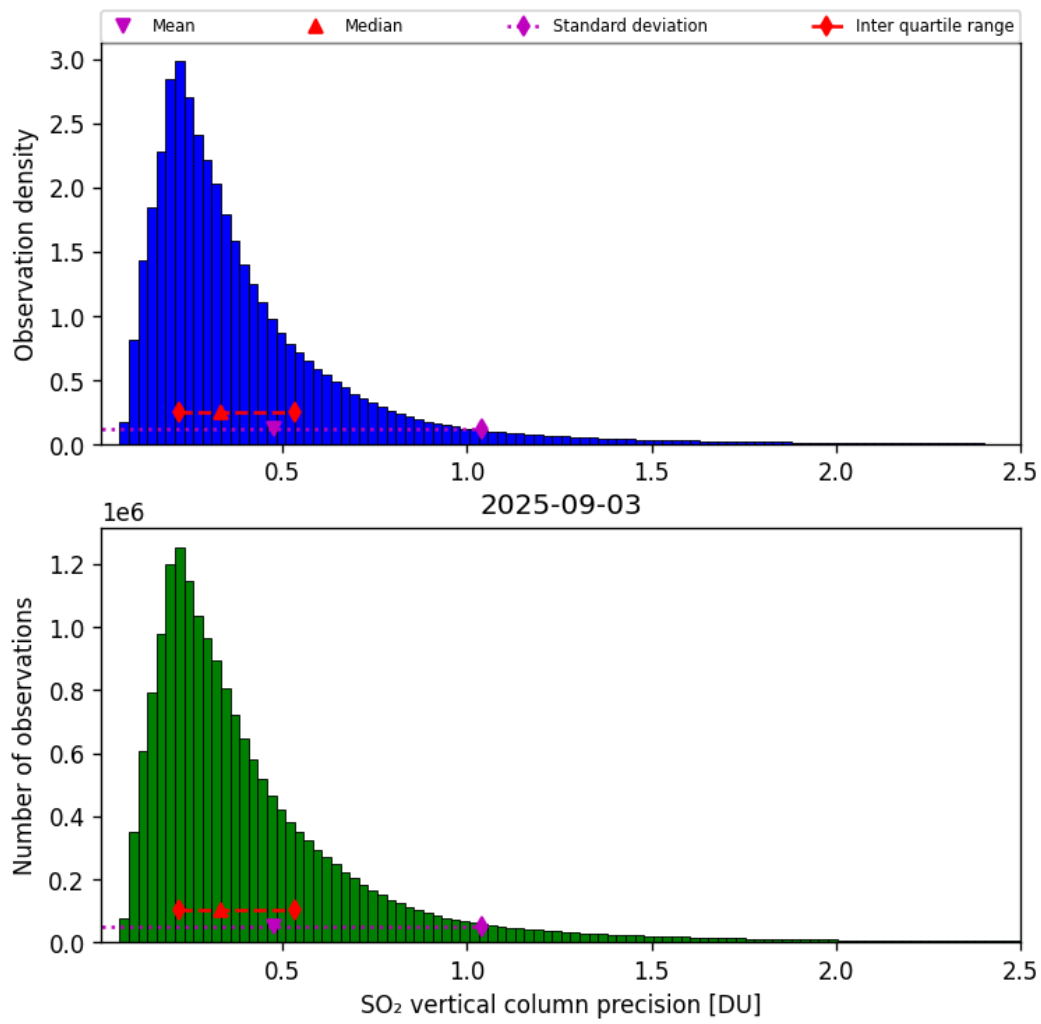


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-09-03 to 2025-09-04

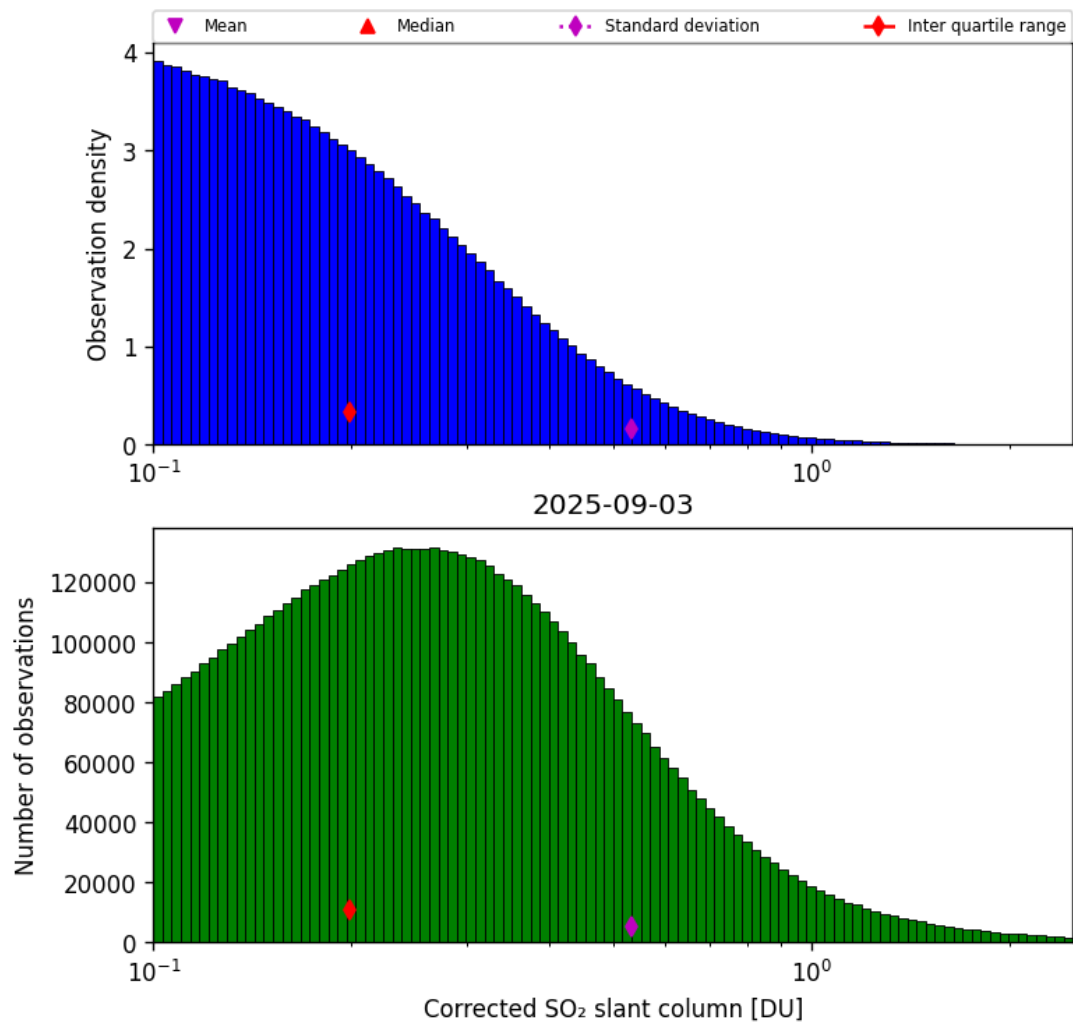


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-09-03 to 2025-09-04

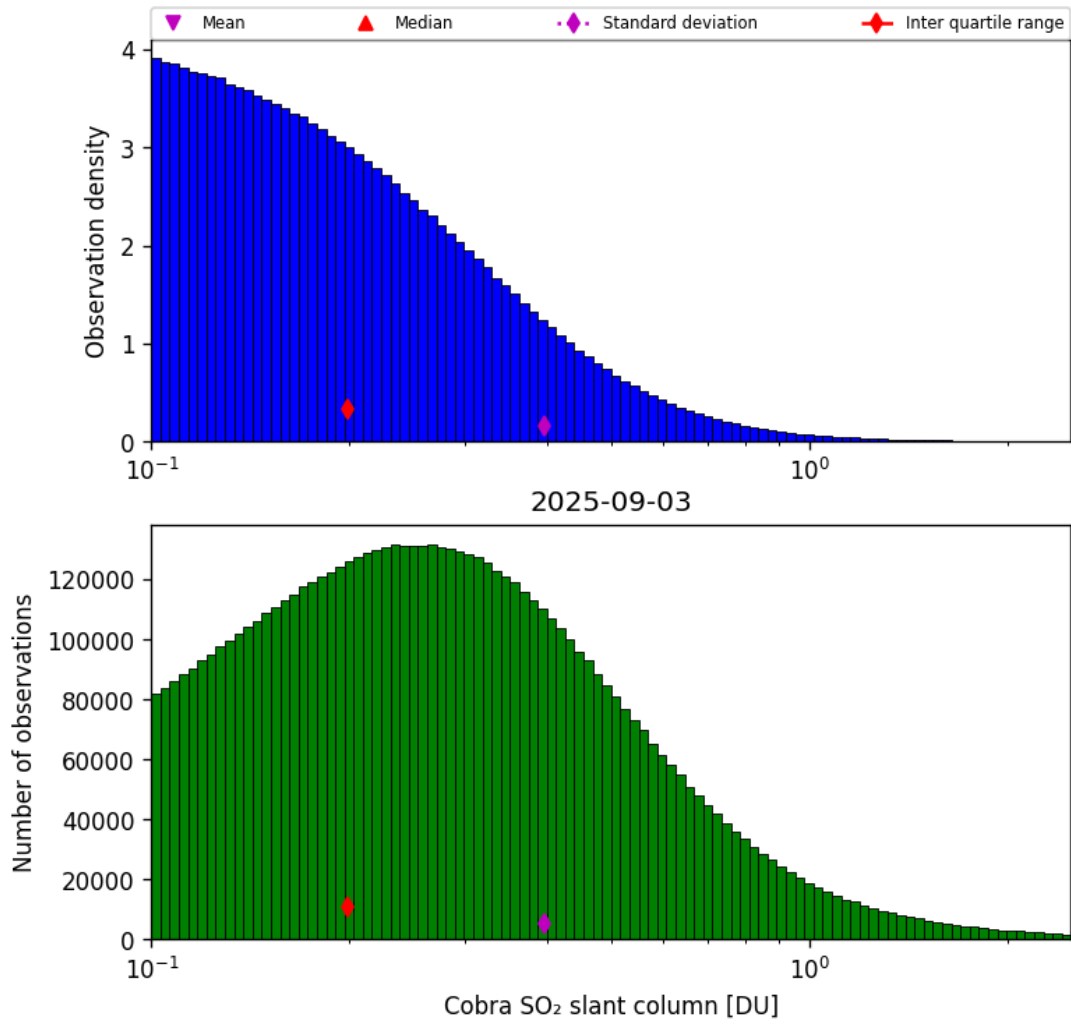


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-09-03 to 2025-09-04

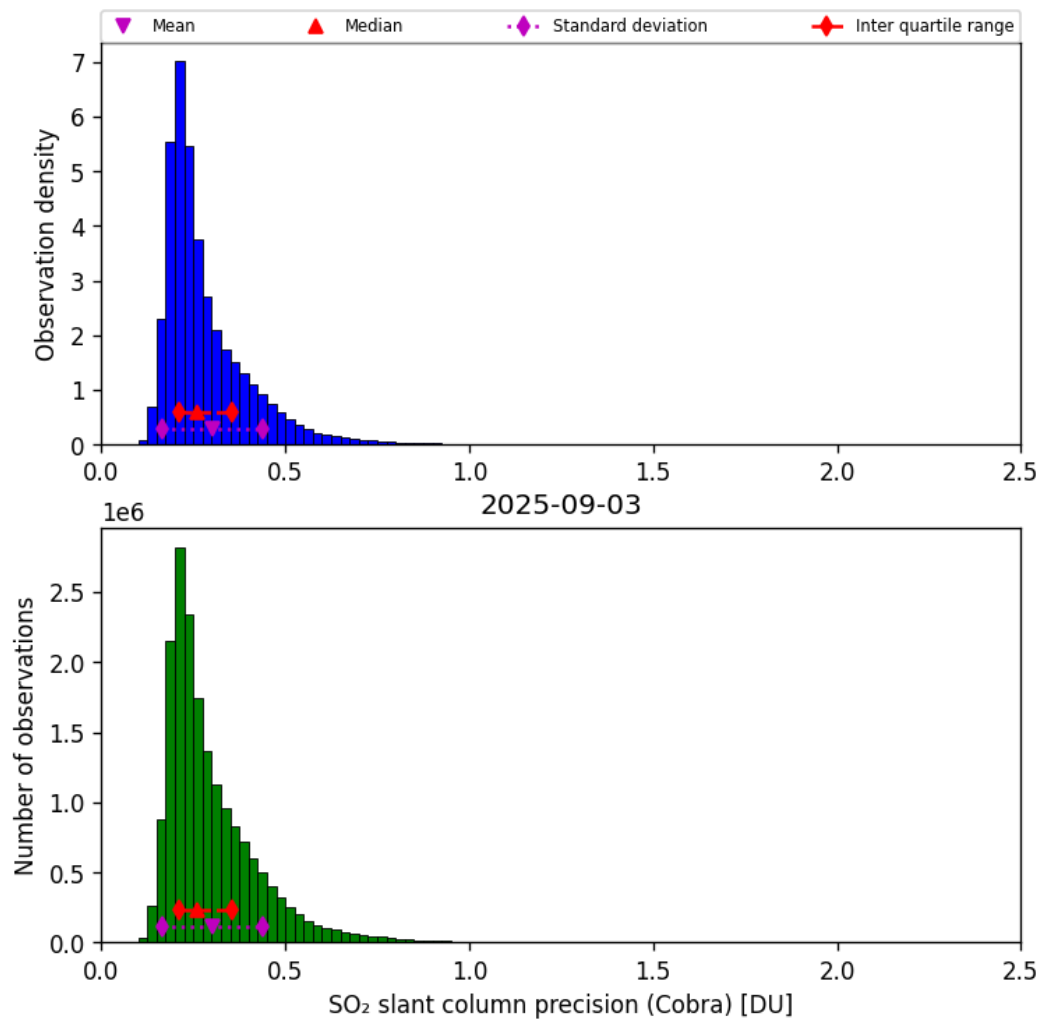


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-09-03 to 2025-09-04

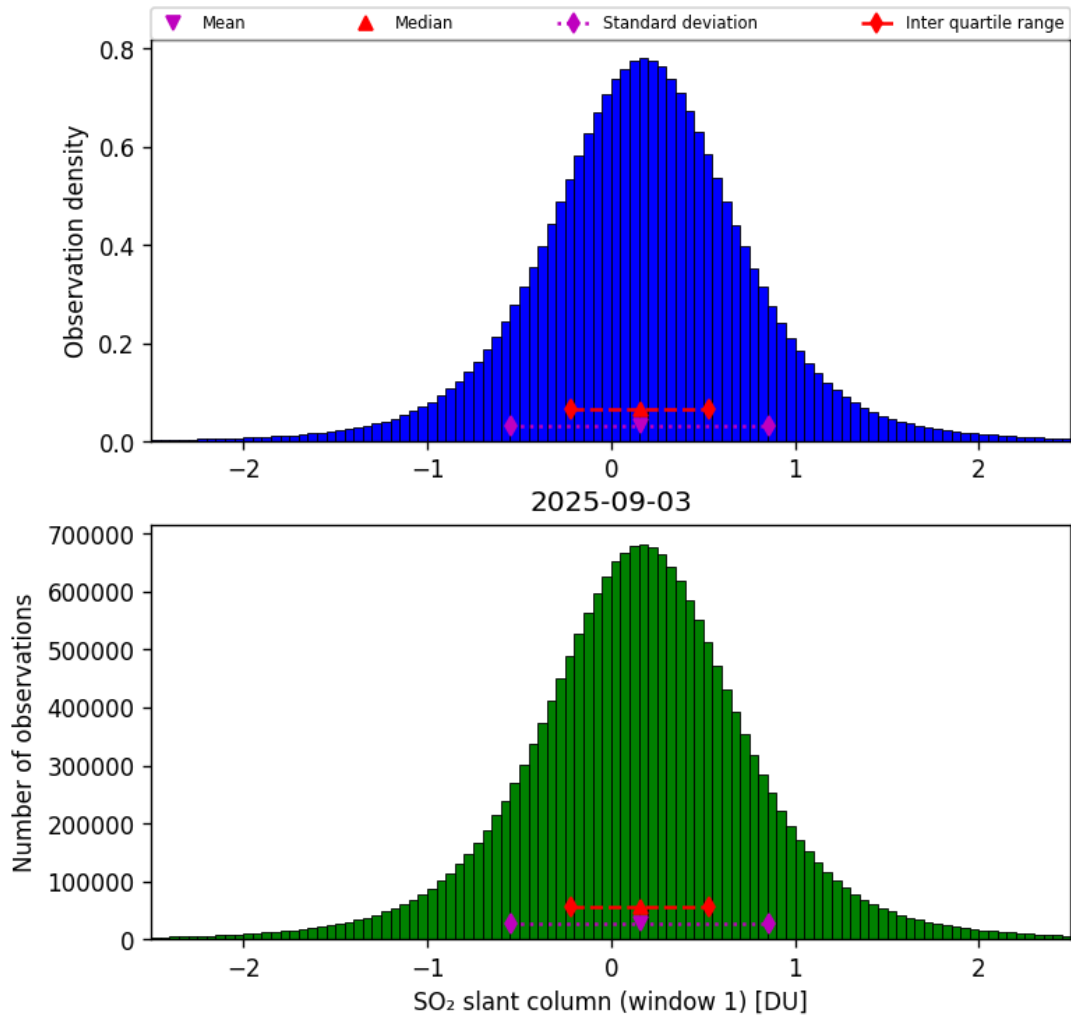


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-09-03 to 2025-09-04

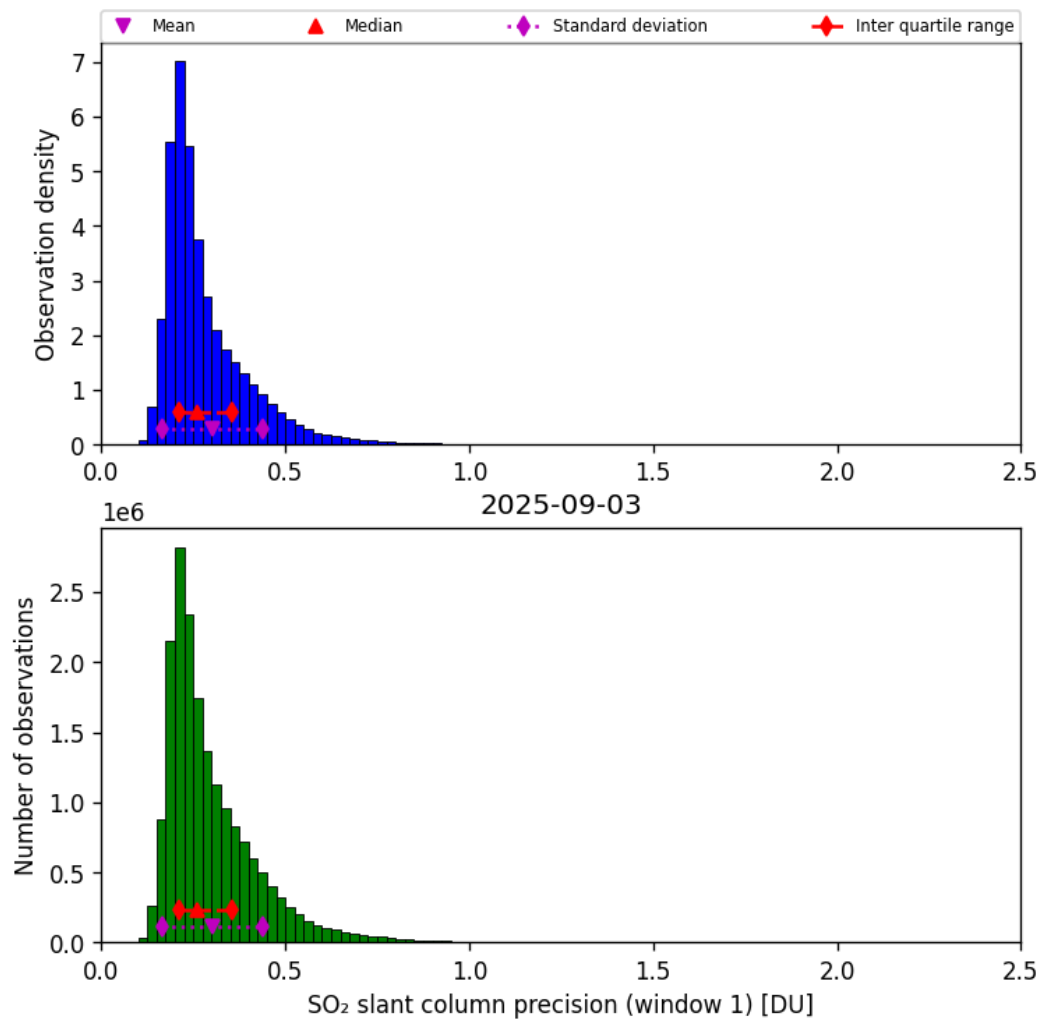


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-09-03 to 2025-09-04

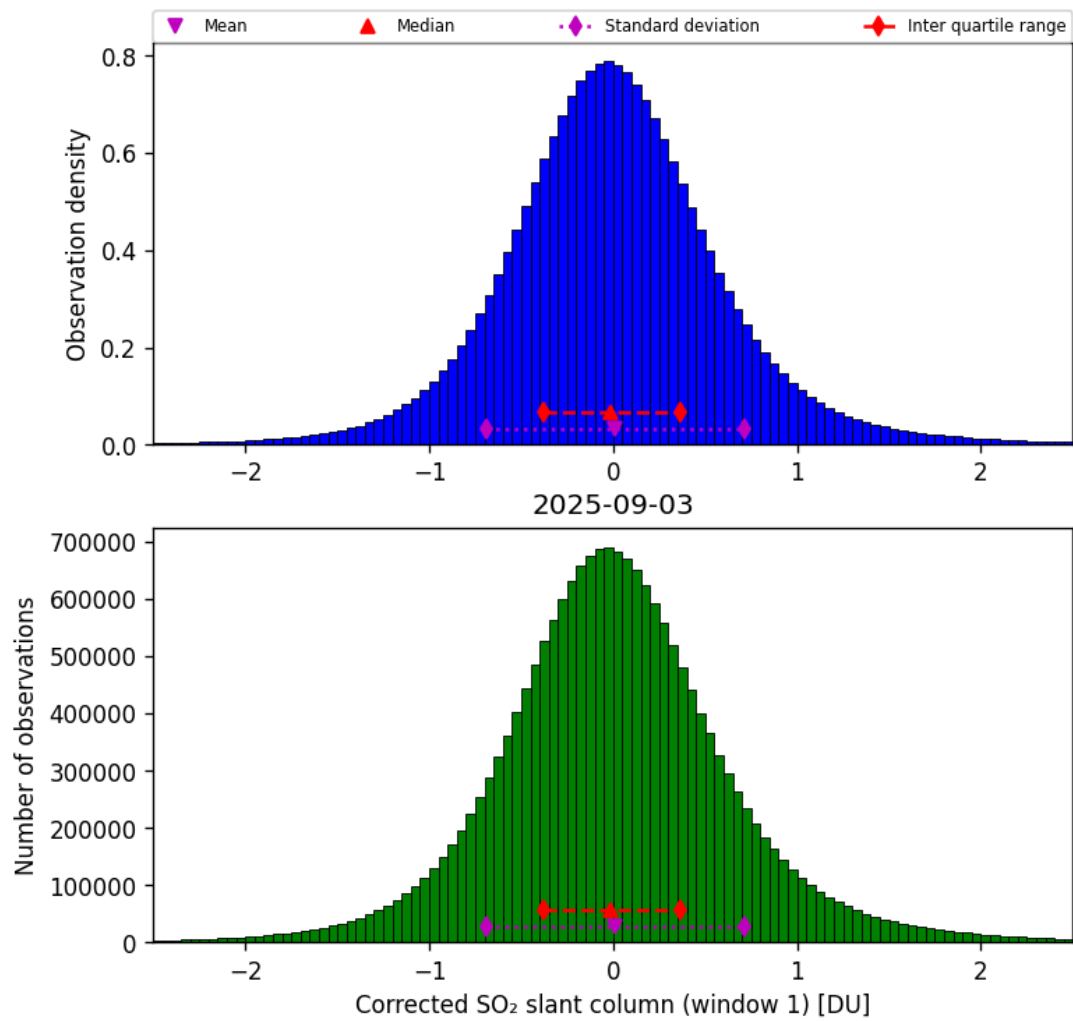


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-09-03 to 2025-09-04

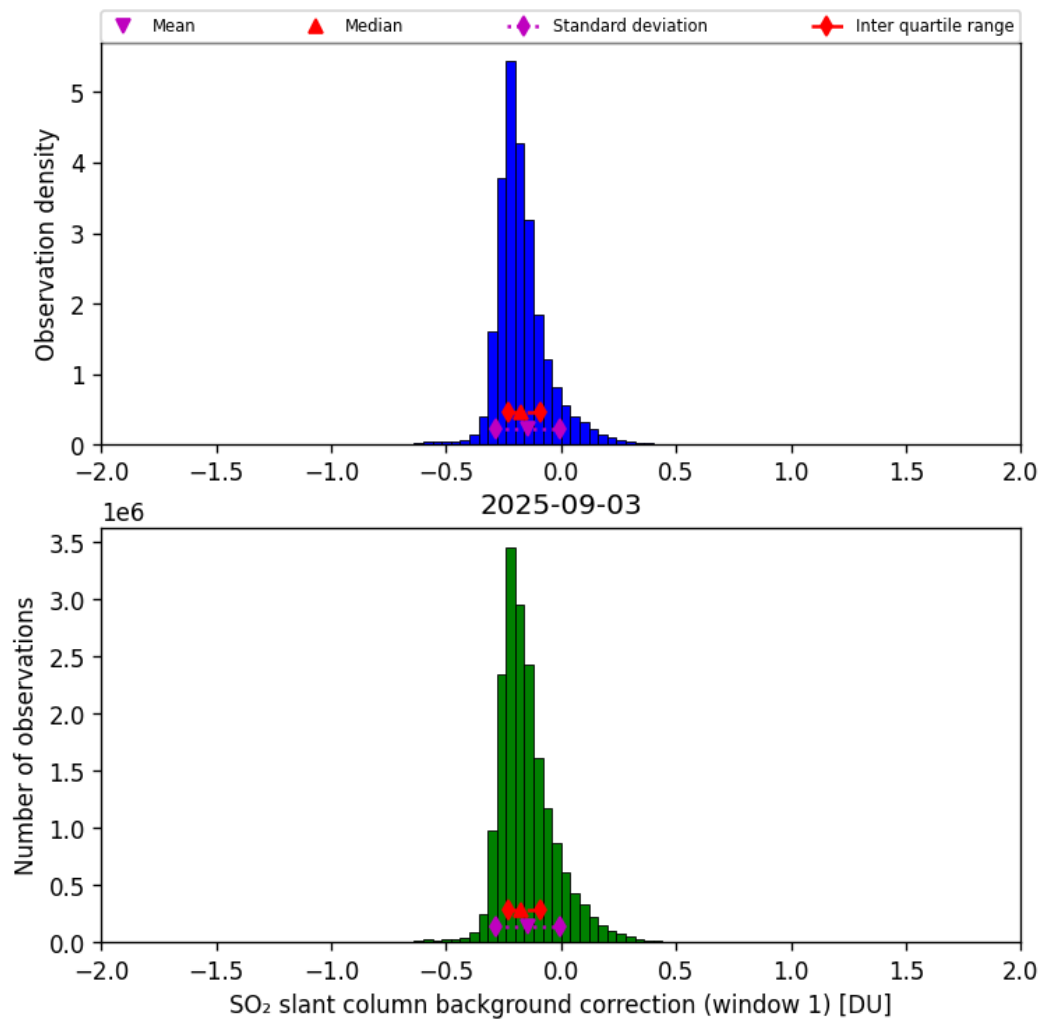


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-09-03 to 2025-09-04

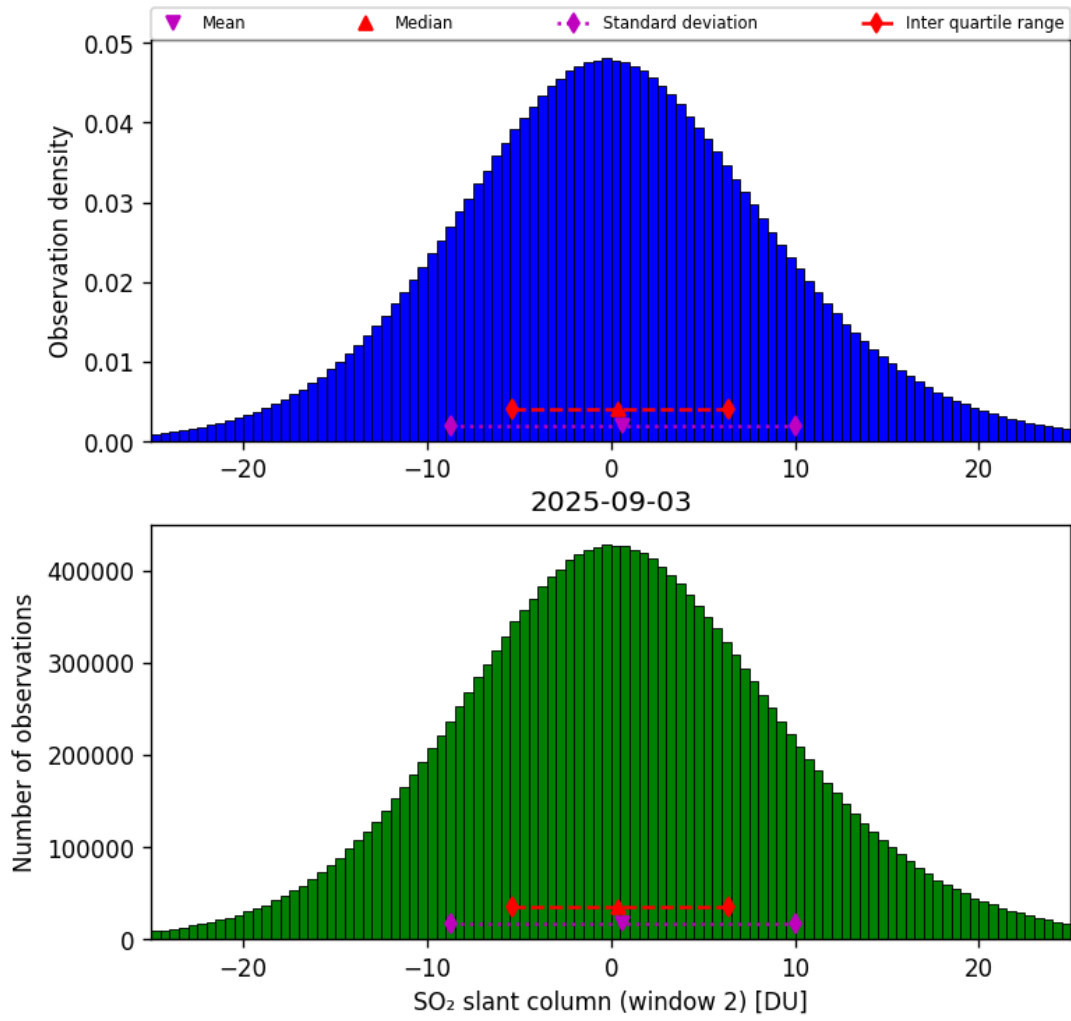


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-09-03 to 2025-09-04

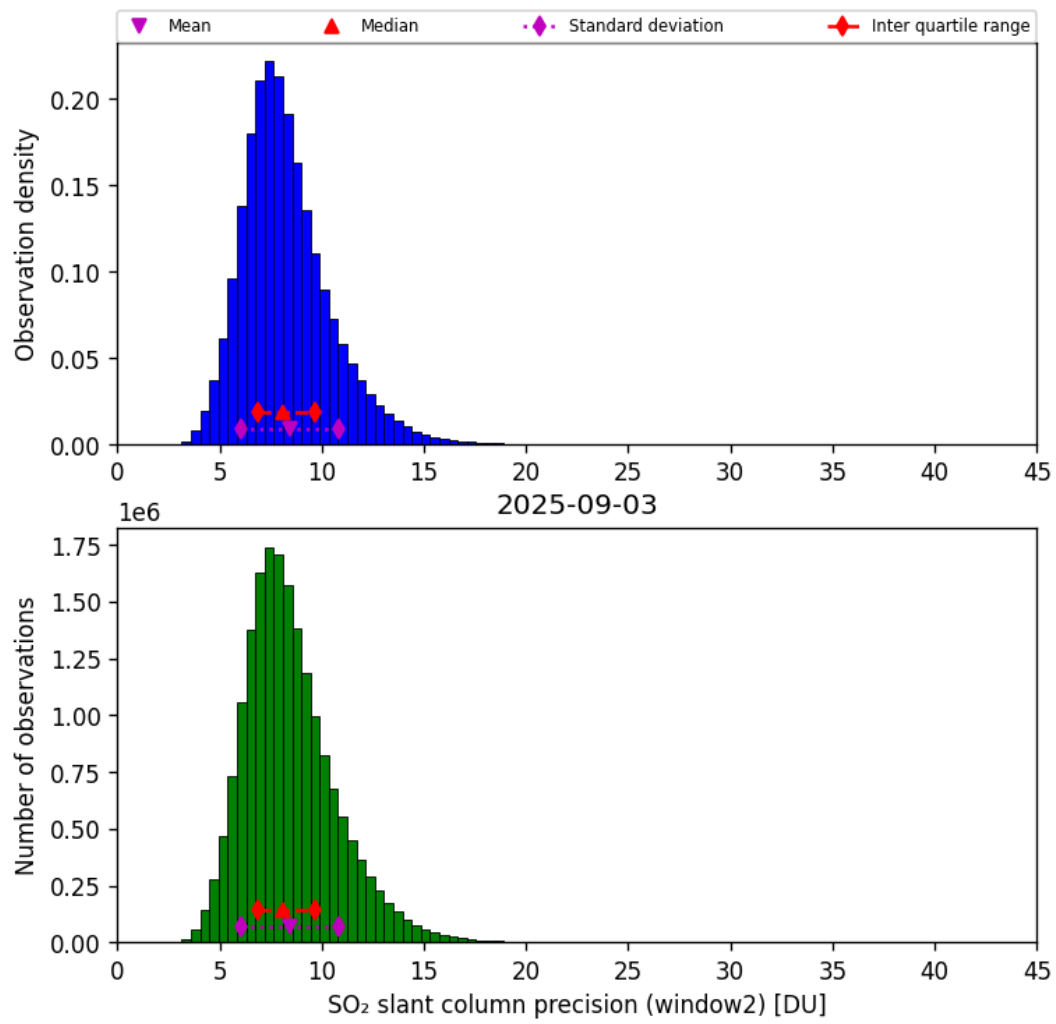


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-09-03 to 2025-09-04

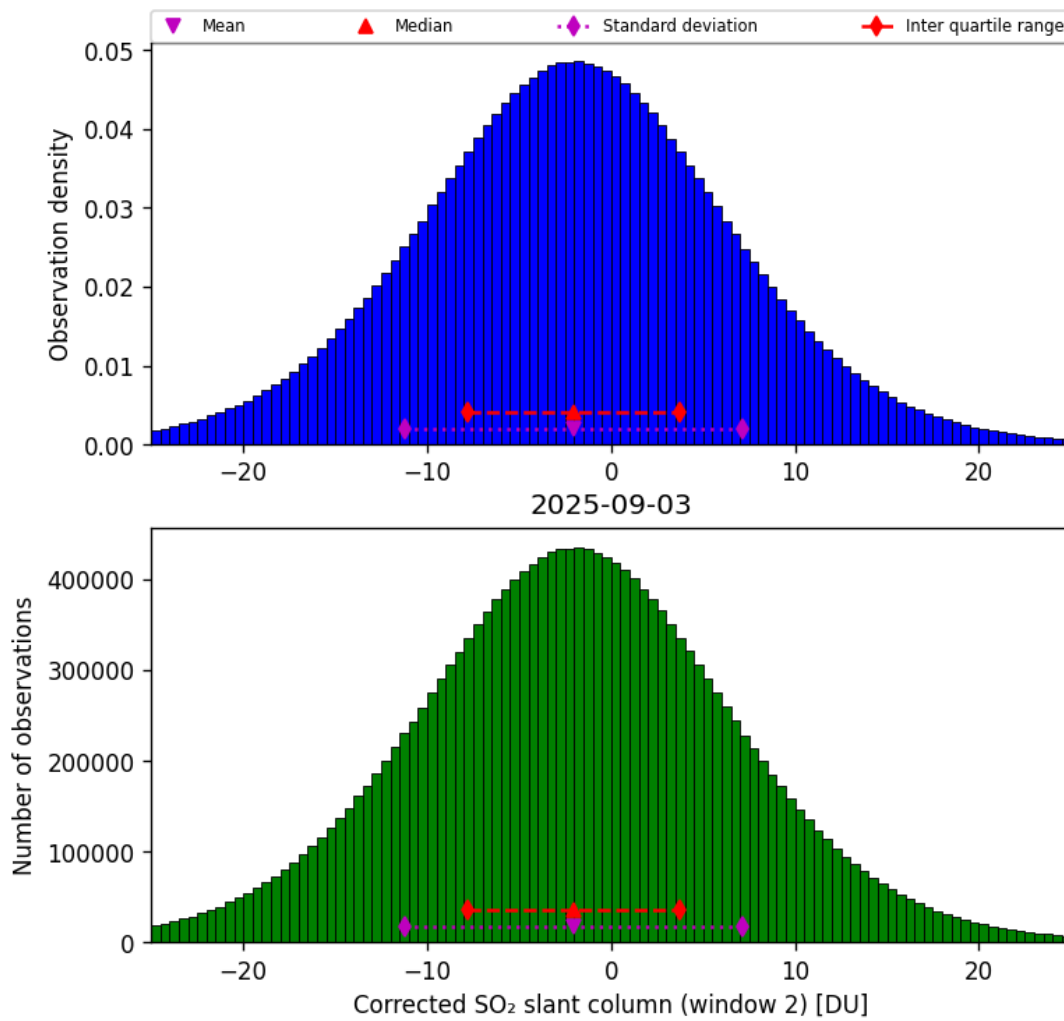


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-09-03 to 2025-09-04

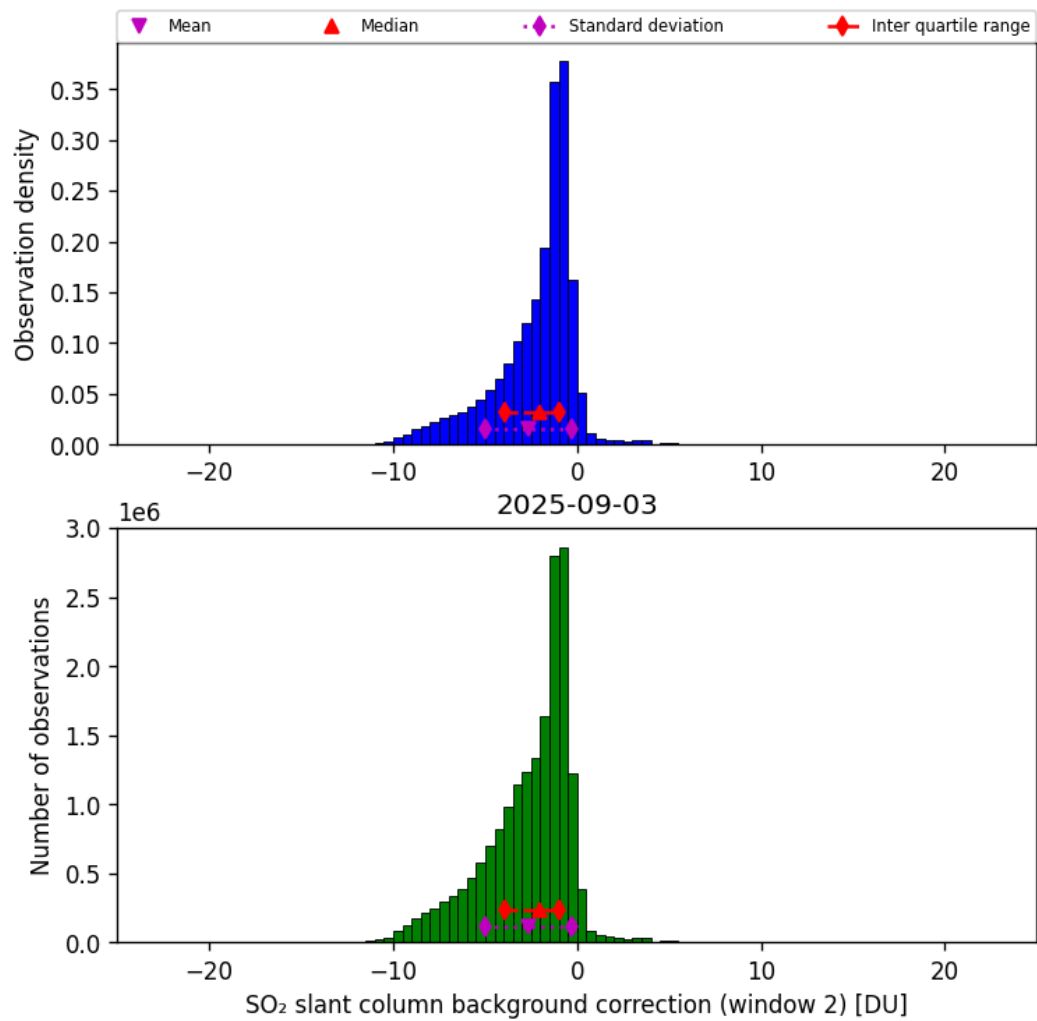


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-09-03 to 2025-09-04

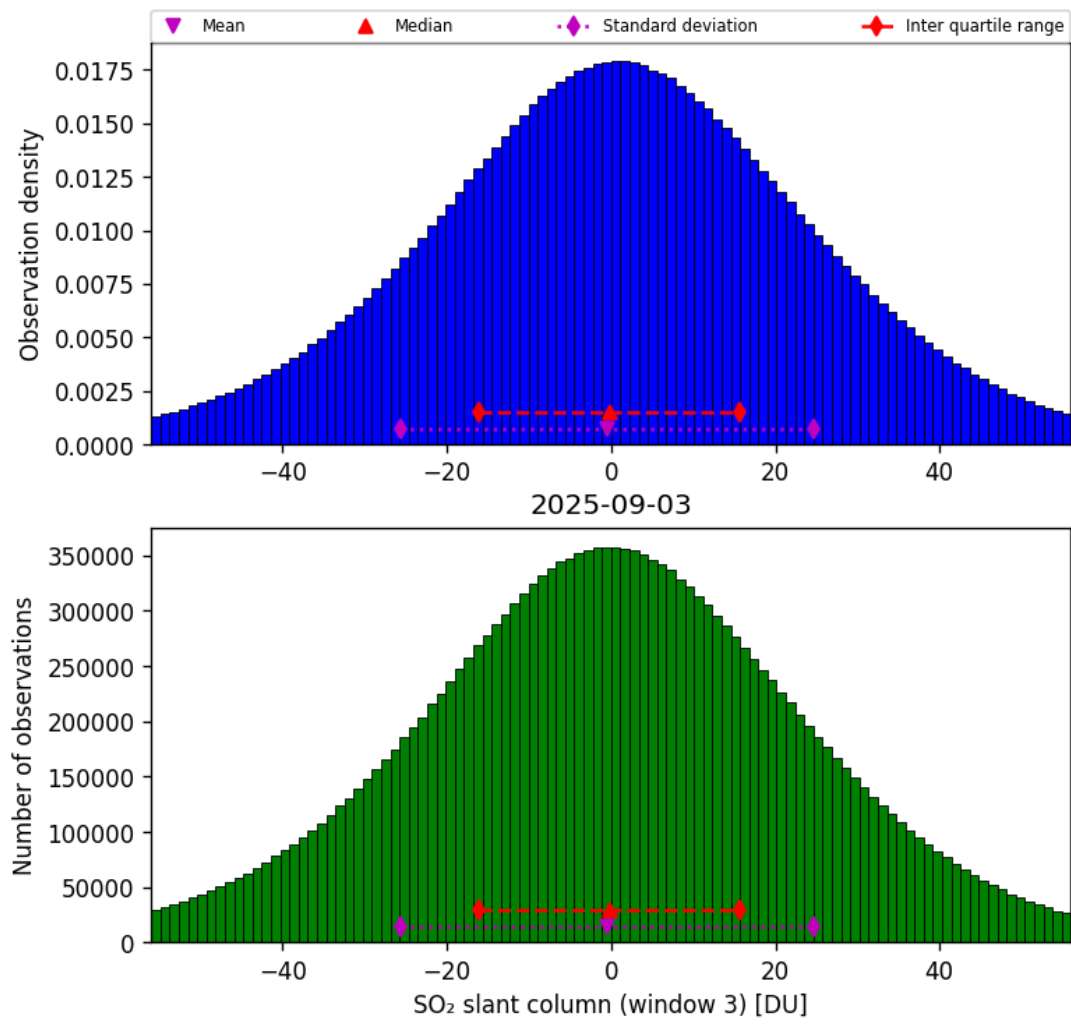


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-09-03 to 2025-09-04

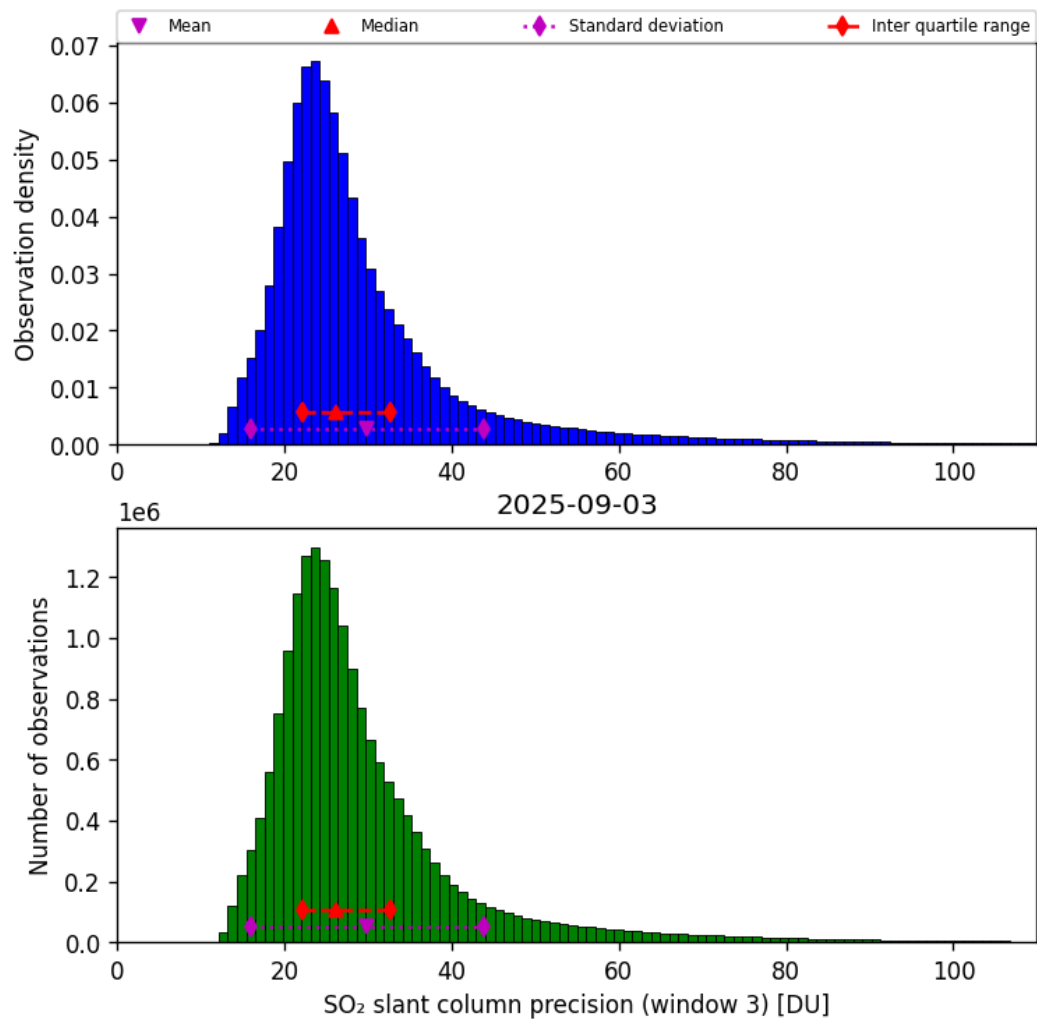


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-09-03 to 2025-09-04

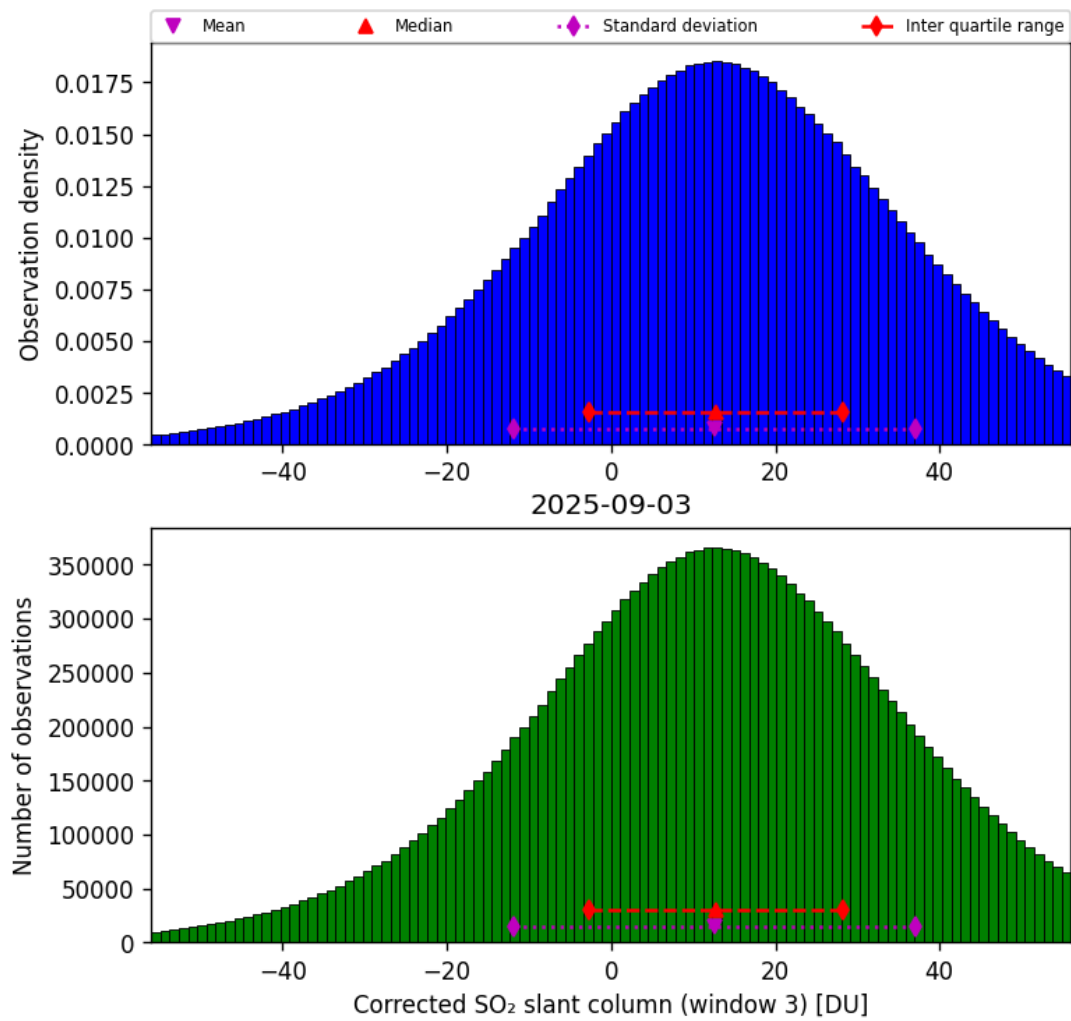


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-09-03 to 2025-09-04

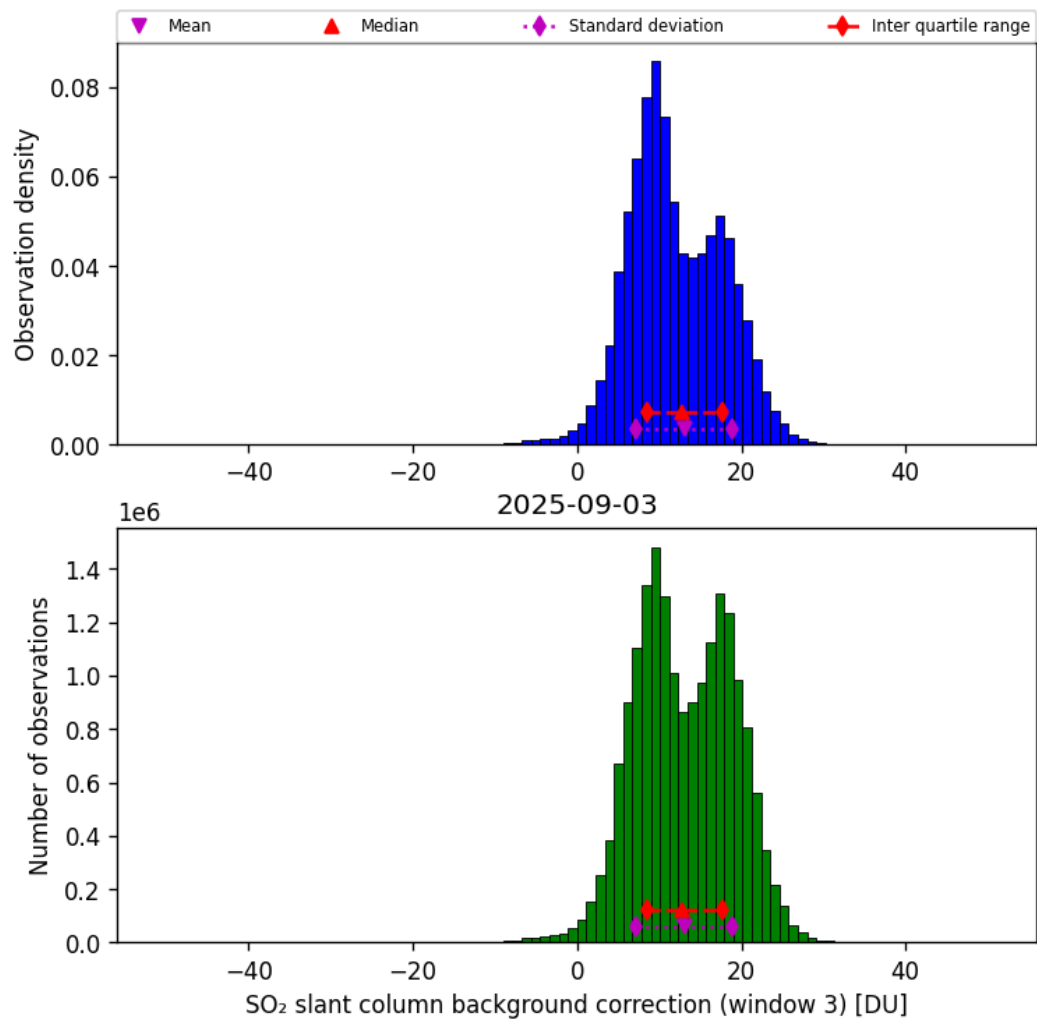


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-09-03 to 2025-09-04

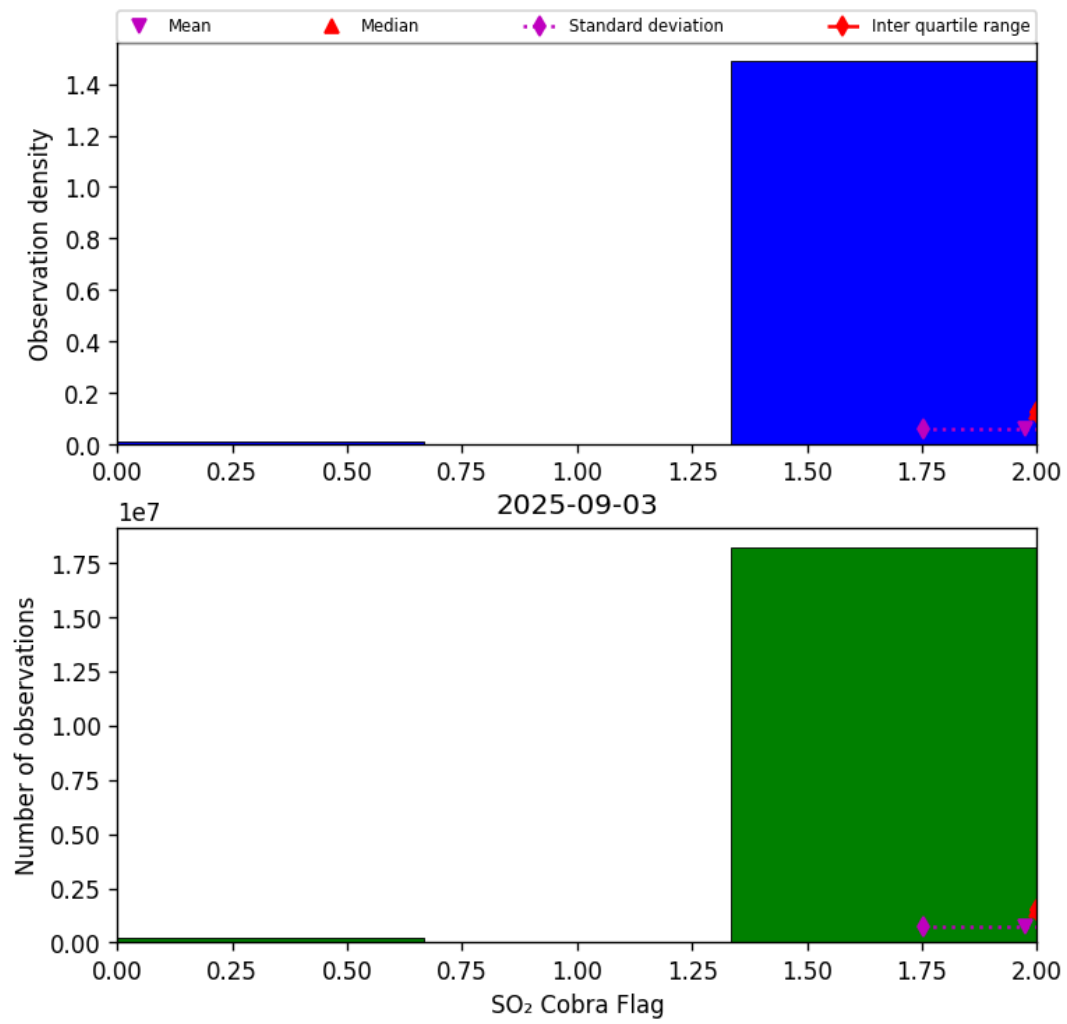


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-09-03 to 2025-09-04

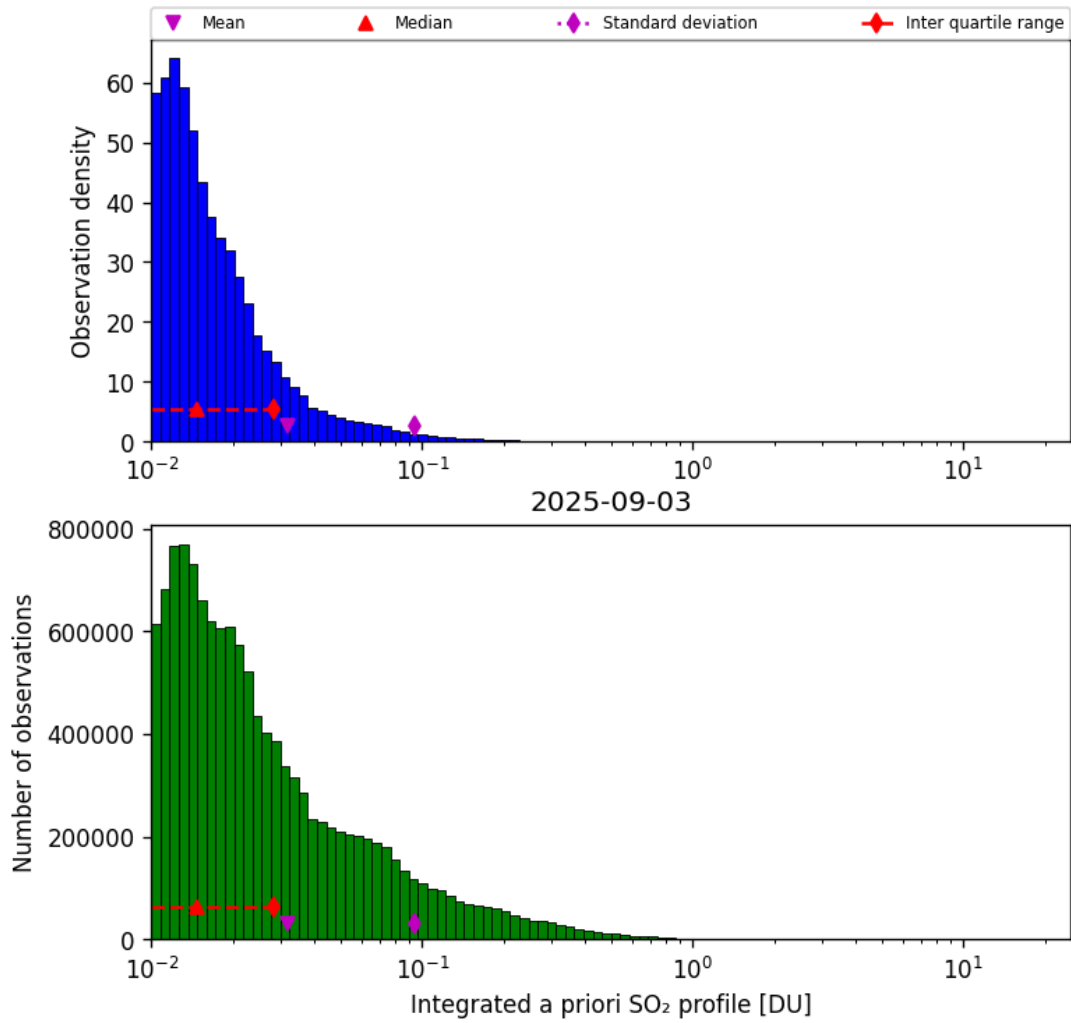


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-09-03 to 2025-09-04

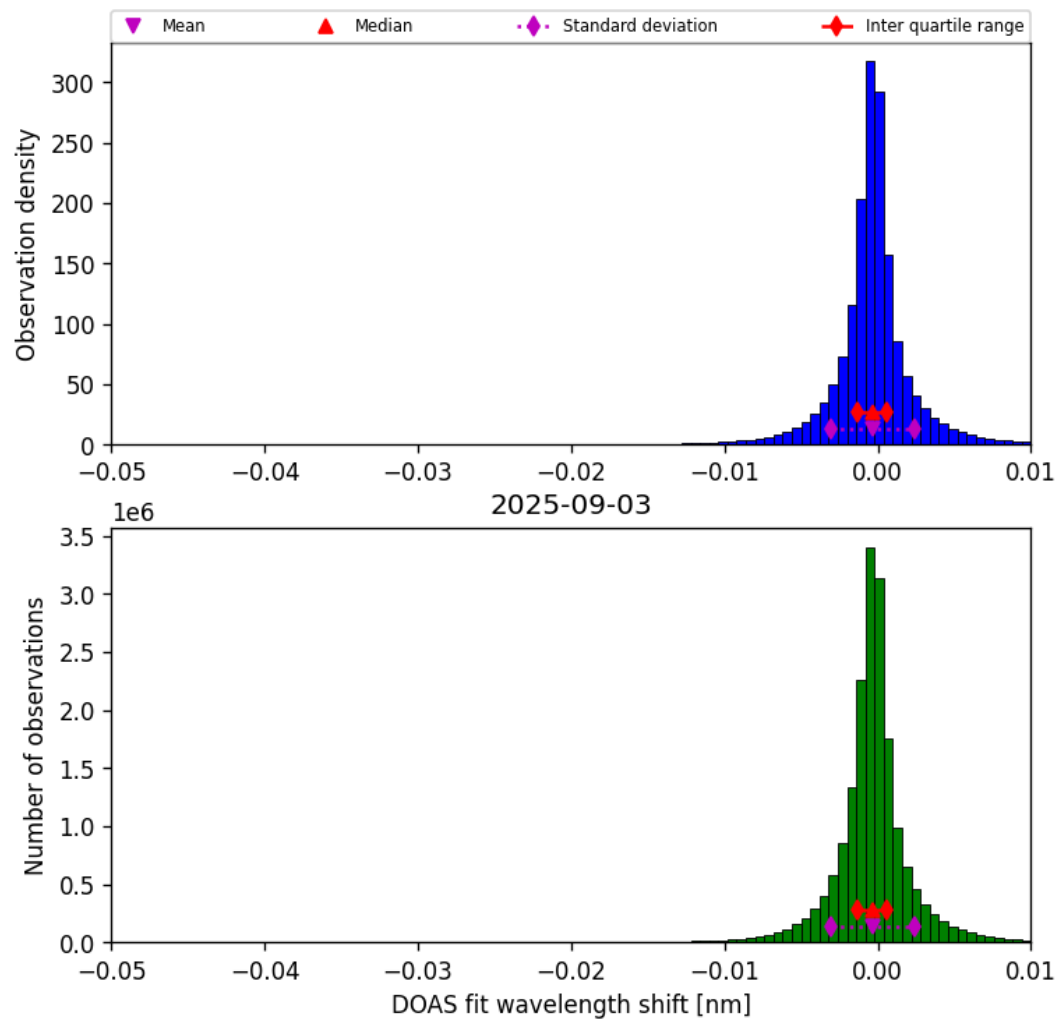


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-09-03 to 2025-09-04

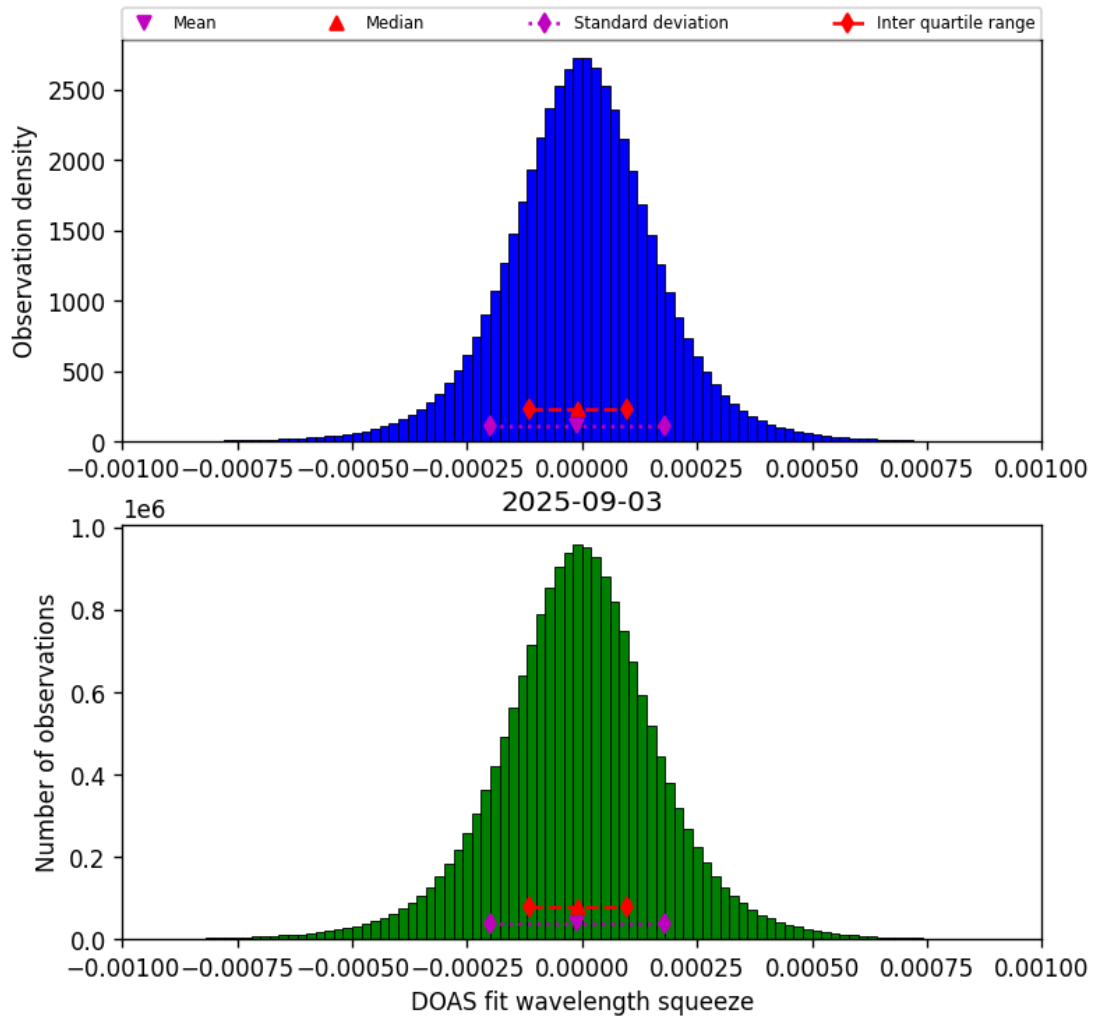


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-09-03 to 2025-09-04

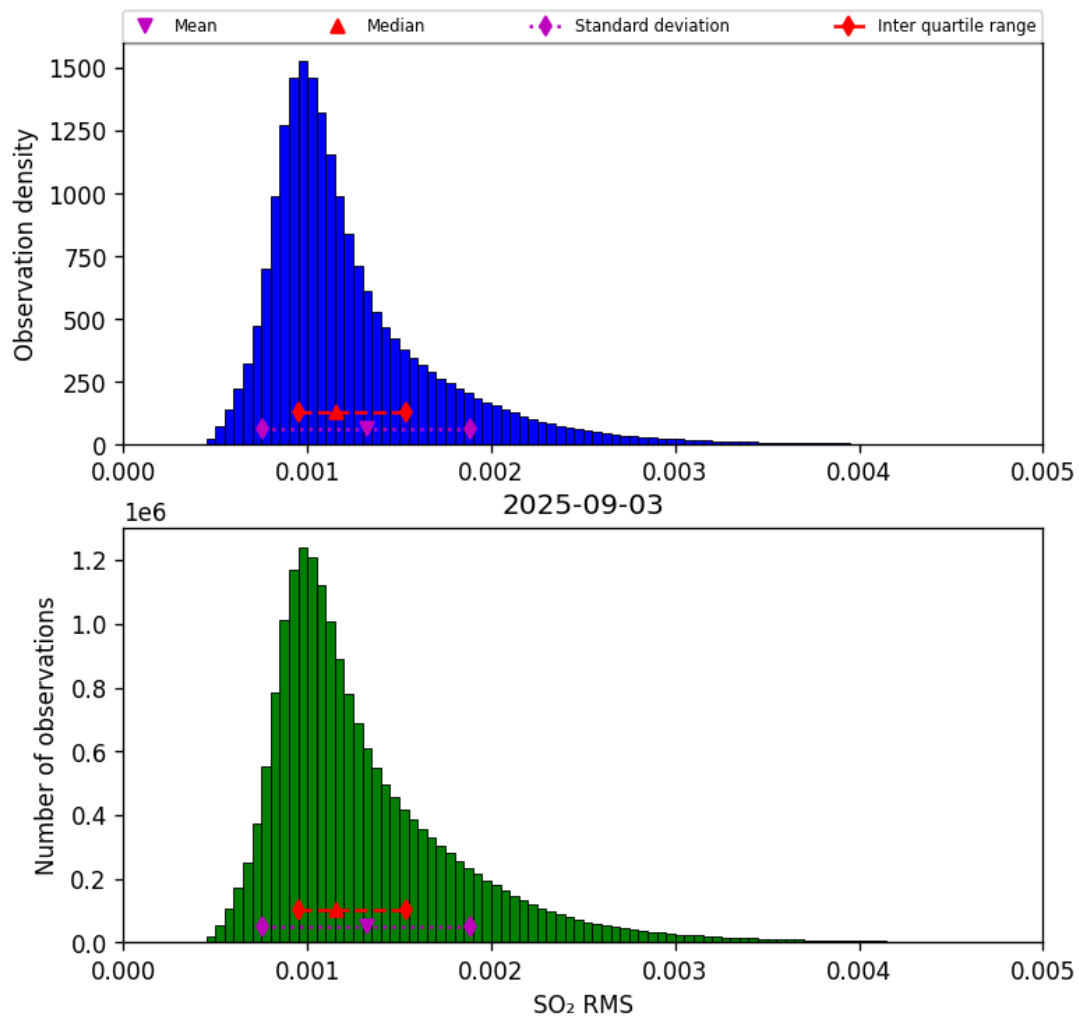


Figure 79: Histogram of “SO₂ RMS” for 2025-09-03 to 2025-09-04

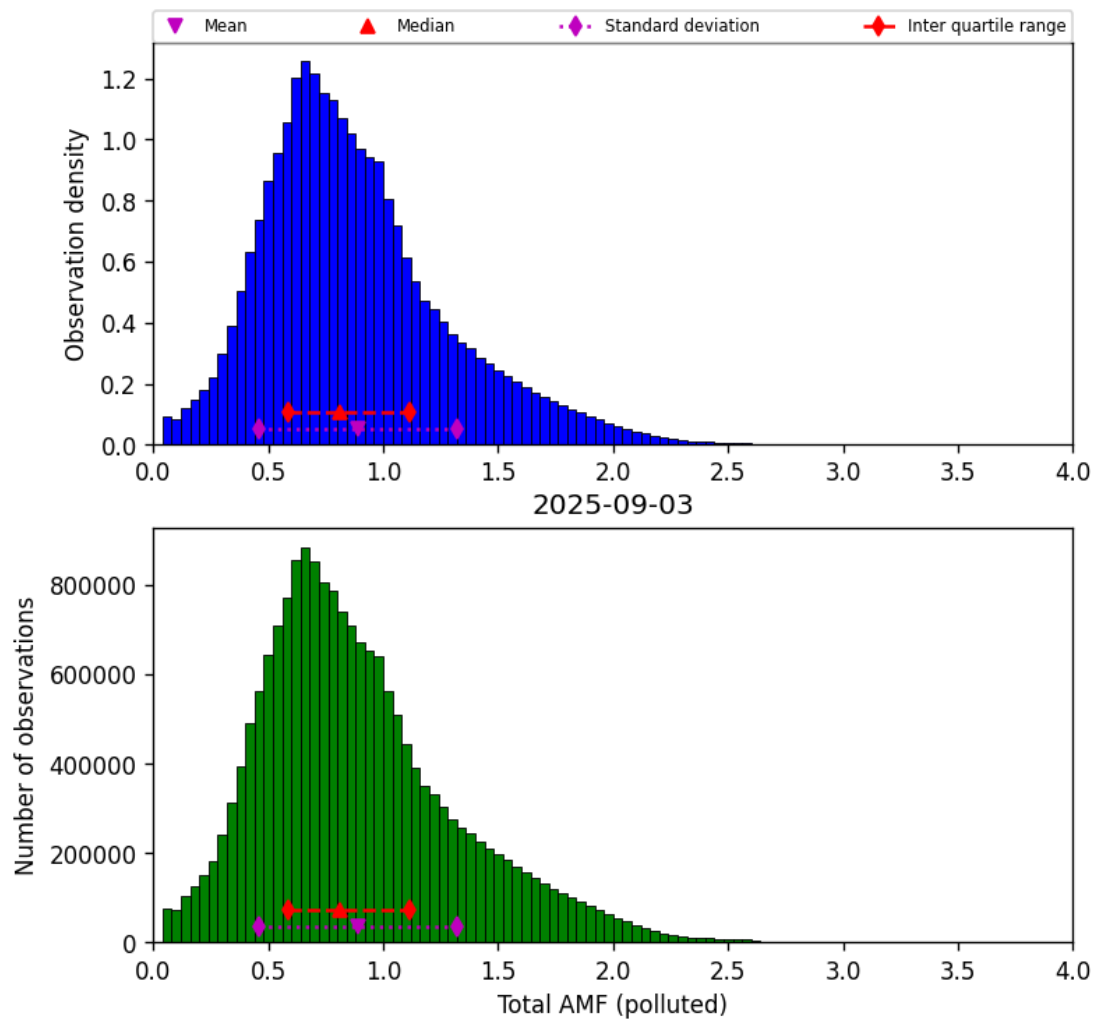


Figure 80: Histogram of “Total AMF (polluted)” for 2025-09-03 to 2025-09-04

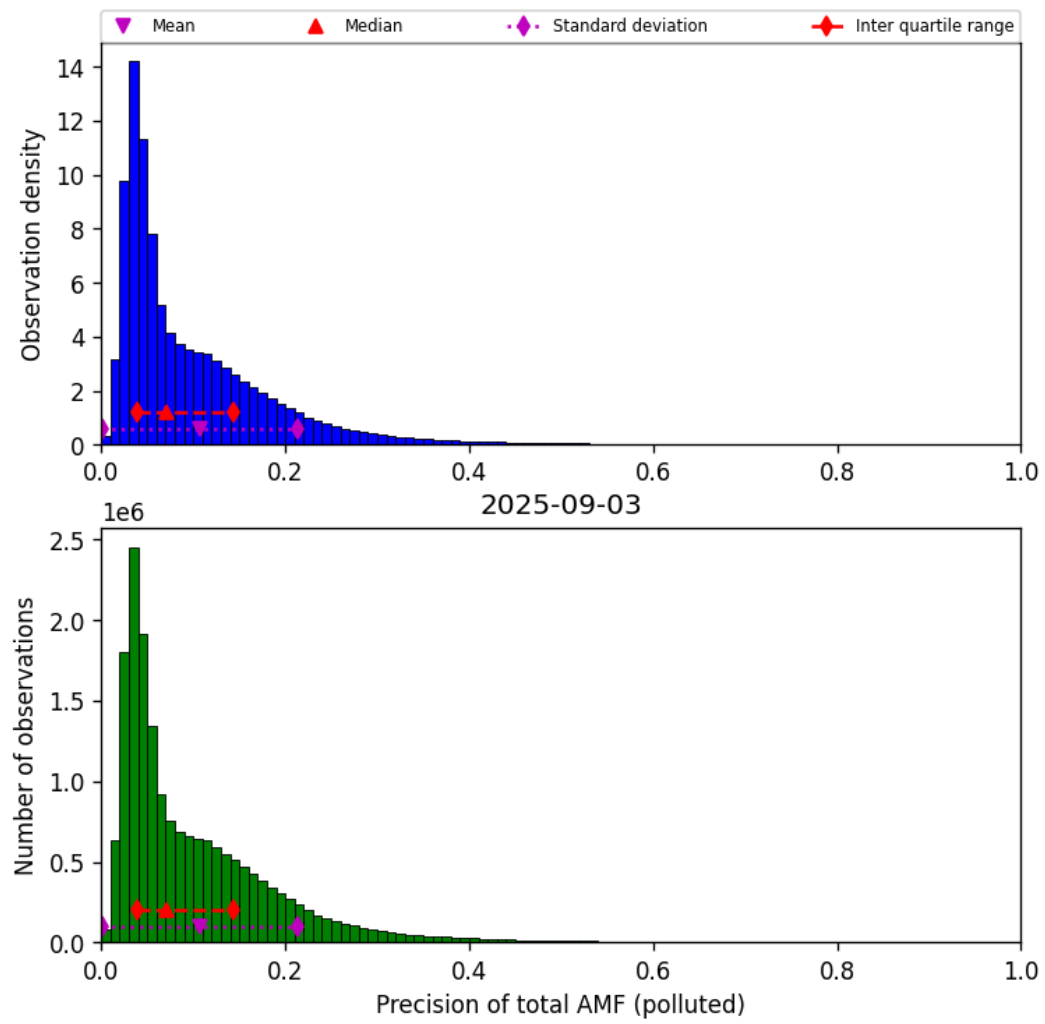


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-09-03 to 2025-09-04

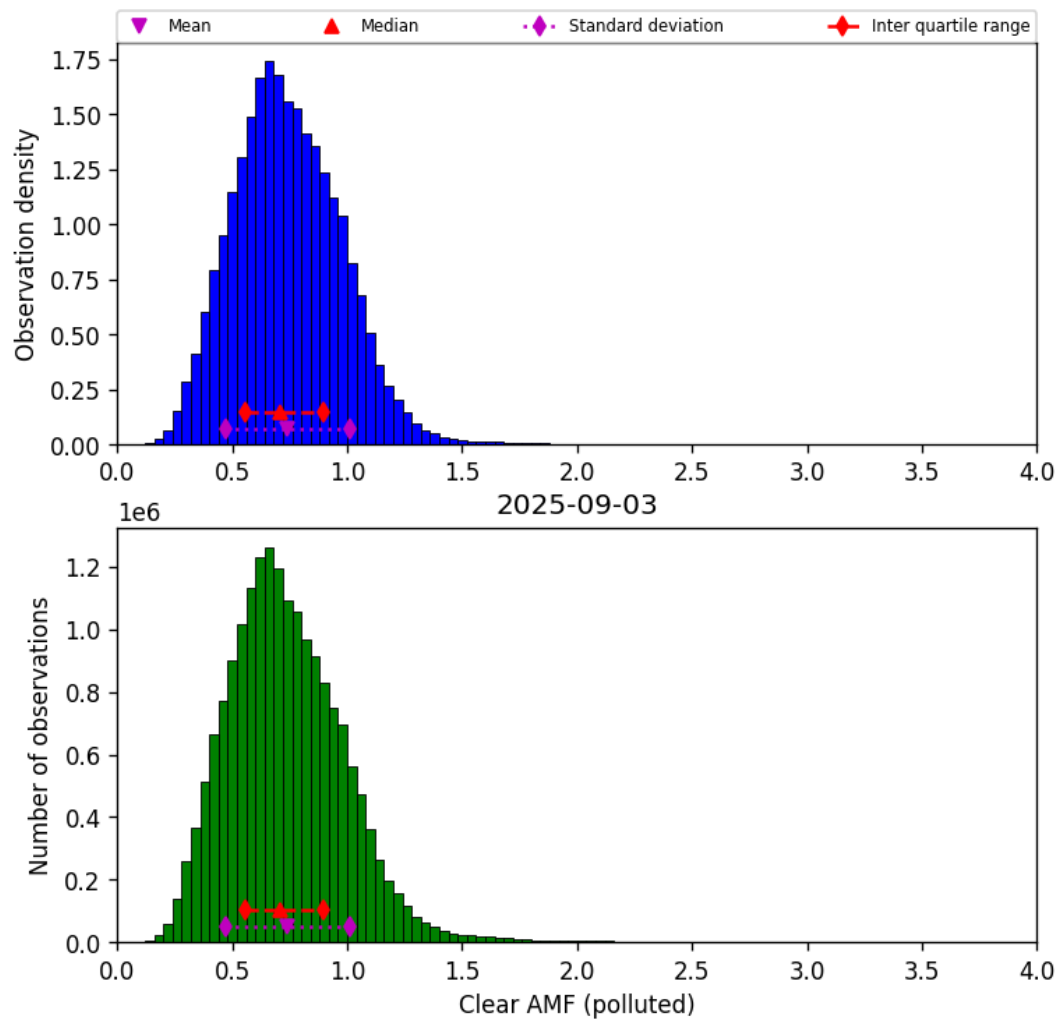


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-09-03 to 2025-09-04

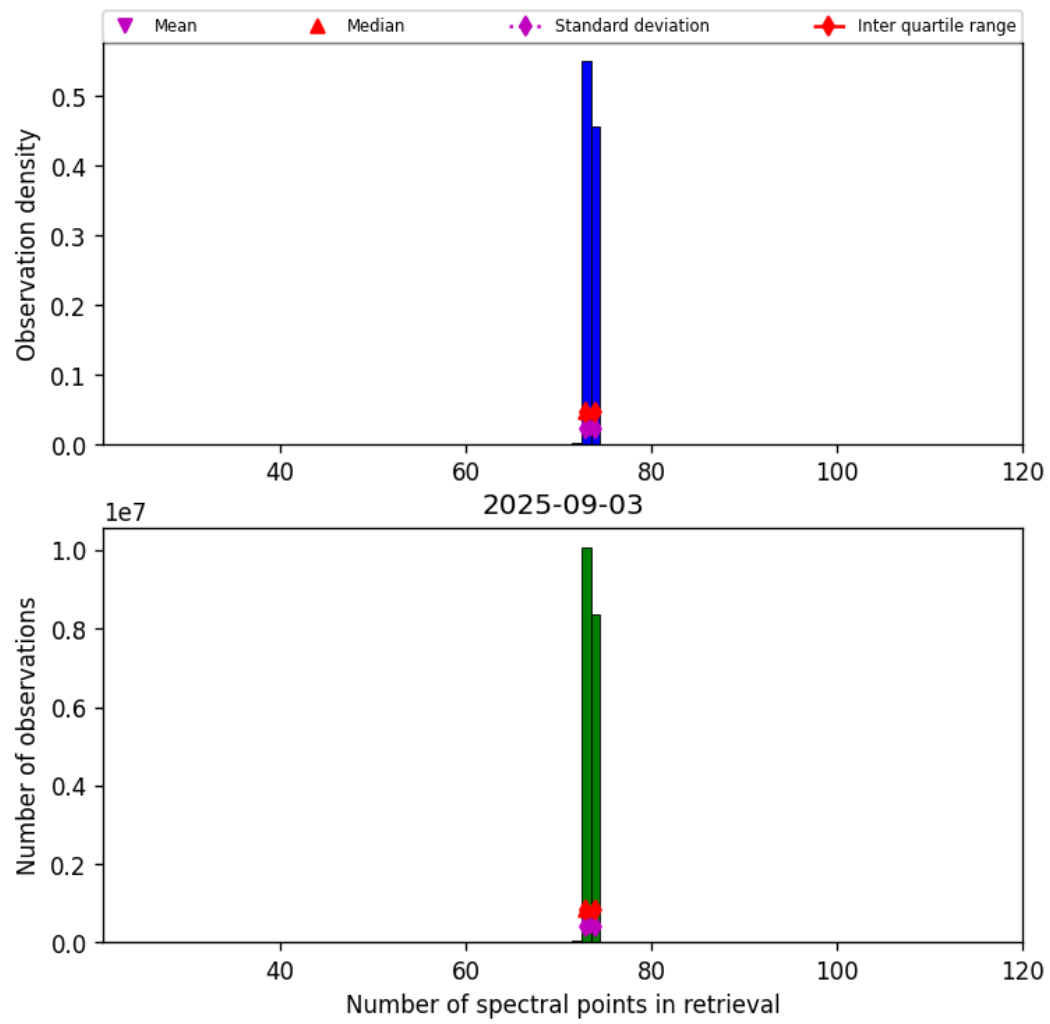


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-09-03 to 2025-09-04

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.

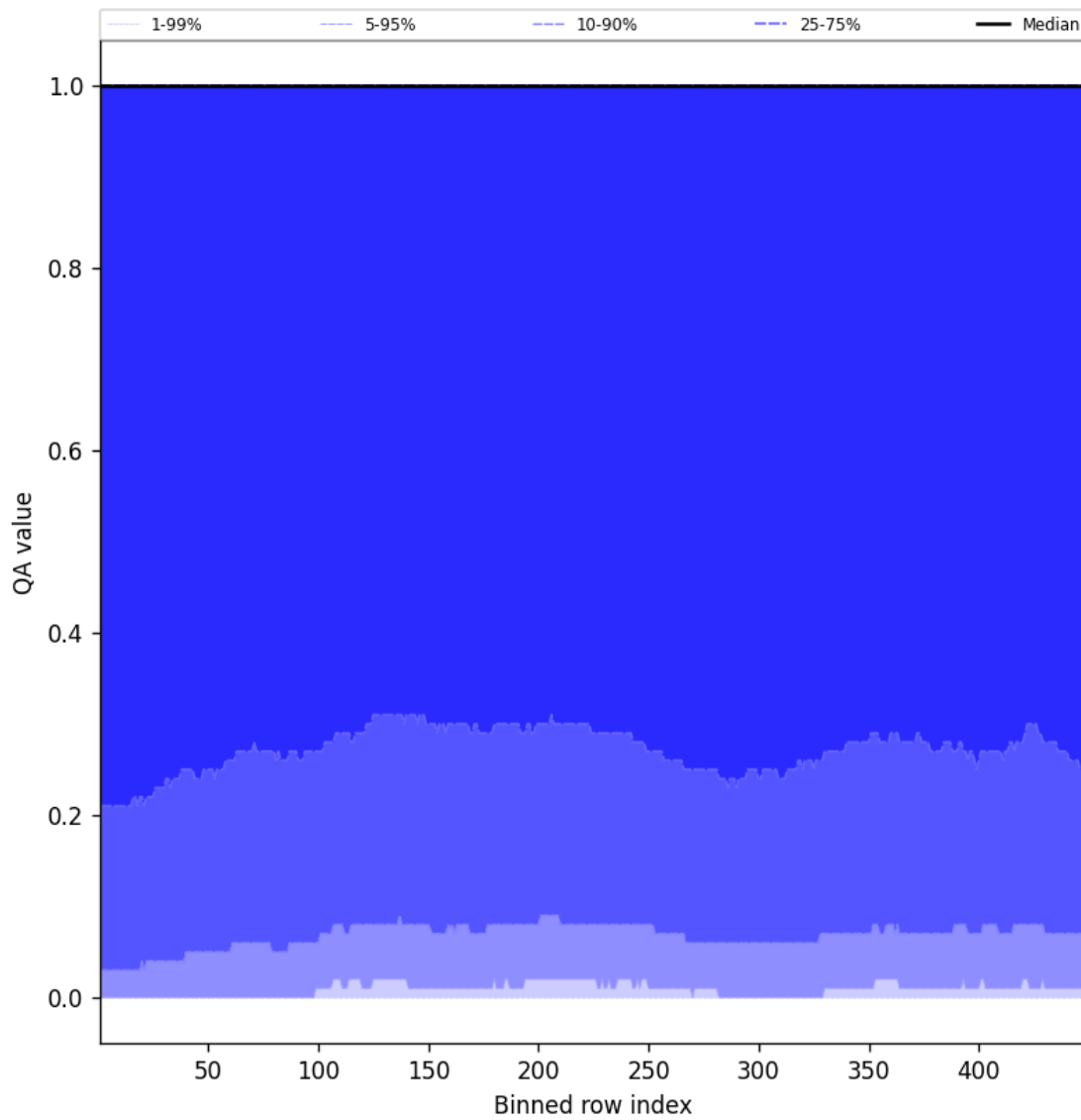


Figure 84: Along track statistics of “QA value” for 2025-09-03 to 2025-09-04

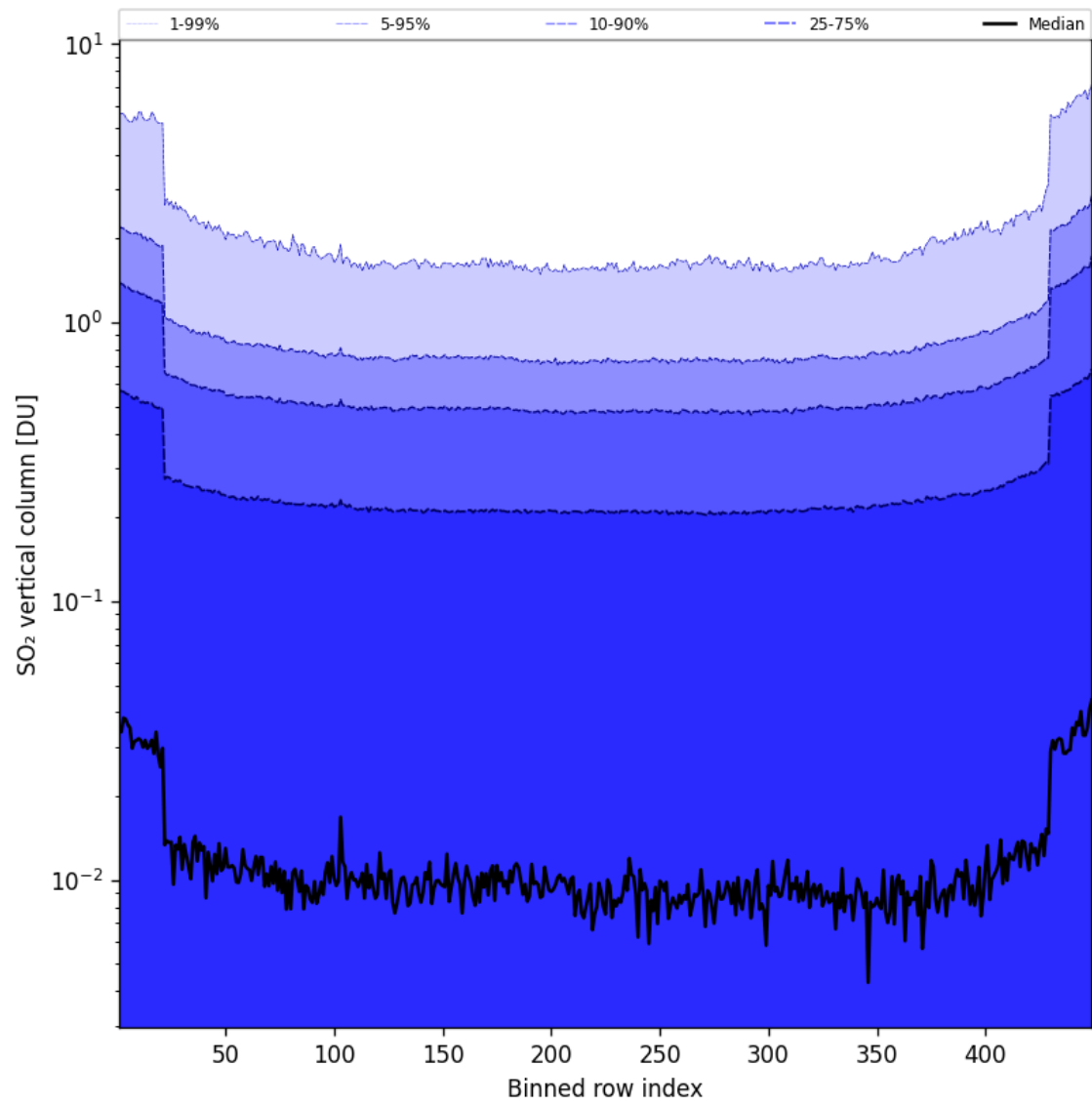


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-09-03 to 2025-09-04

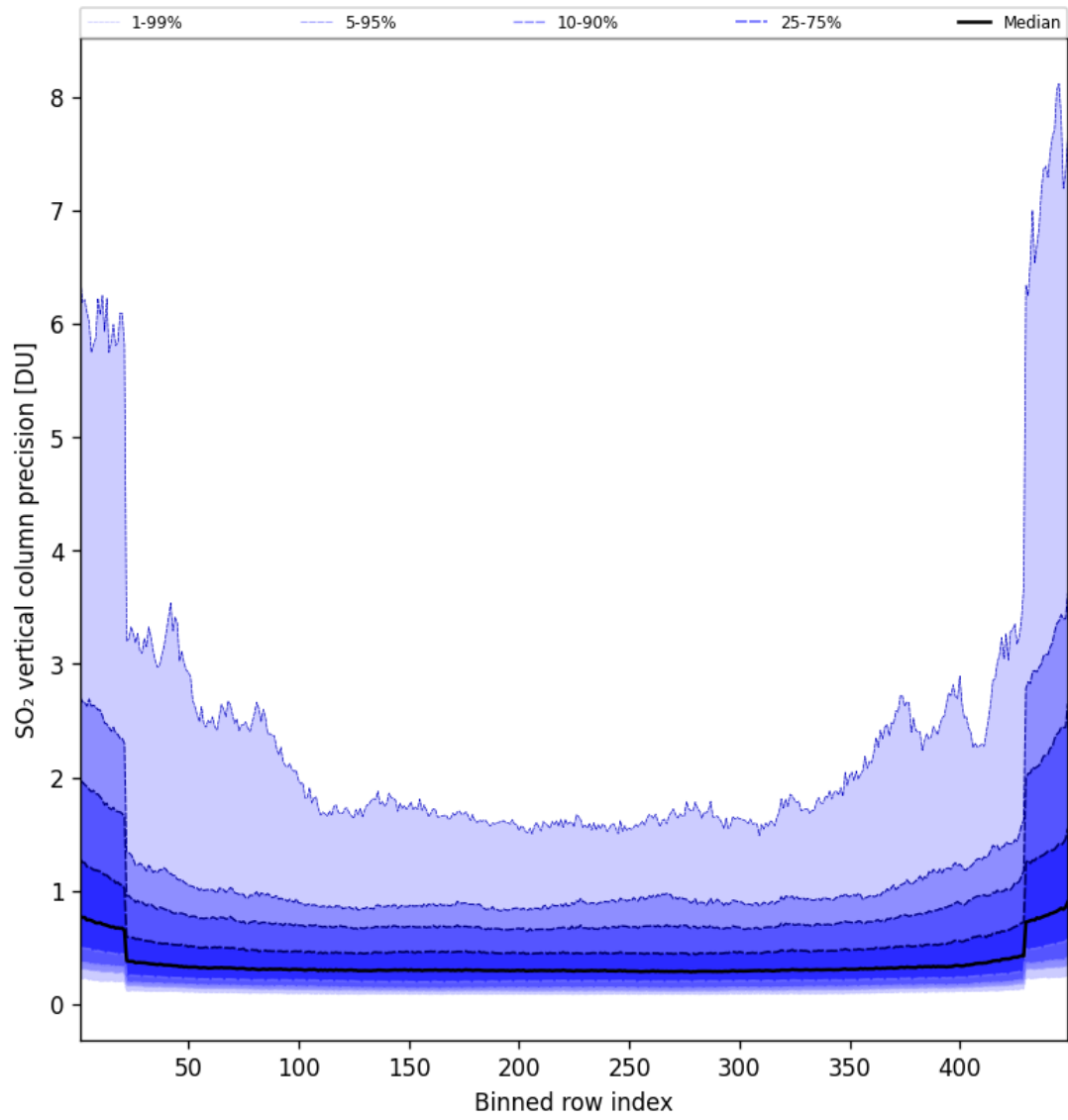


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-09-03 to 2025-09-04

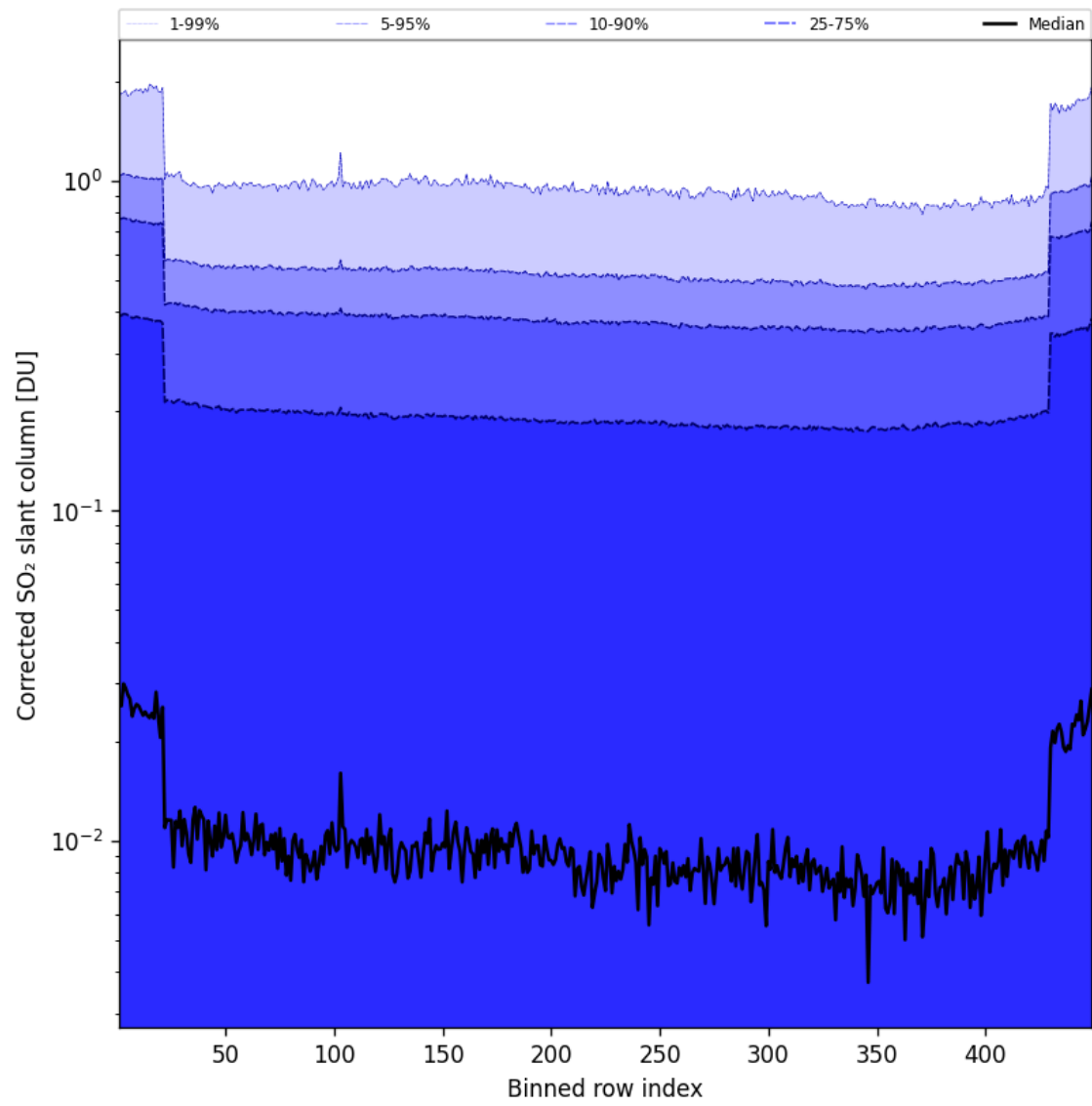


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-09-03 to 2025-09-04

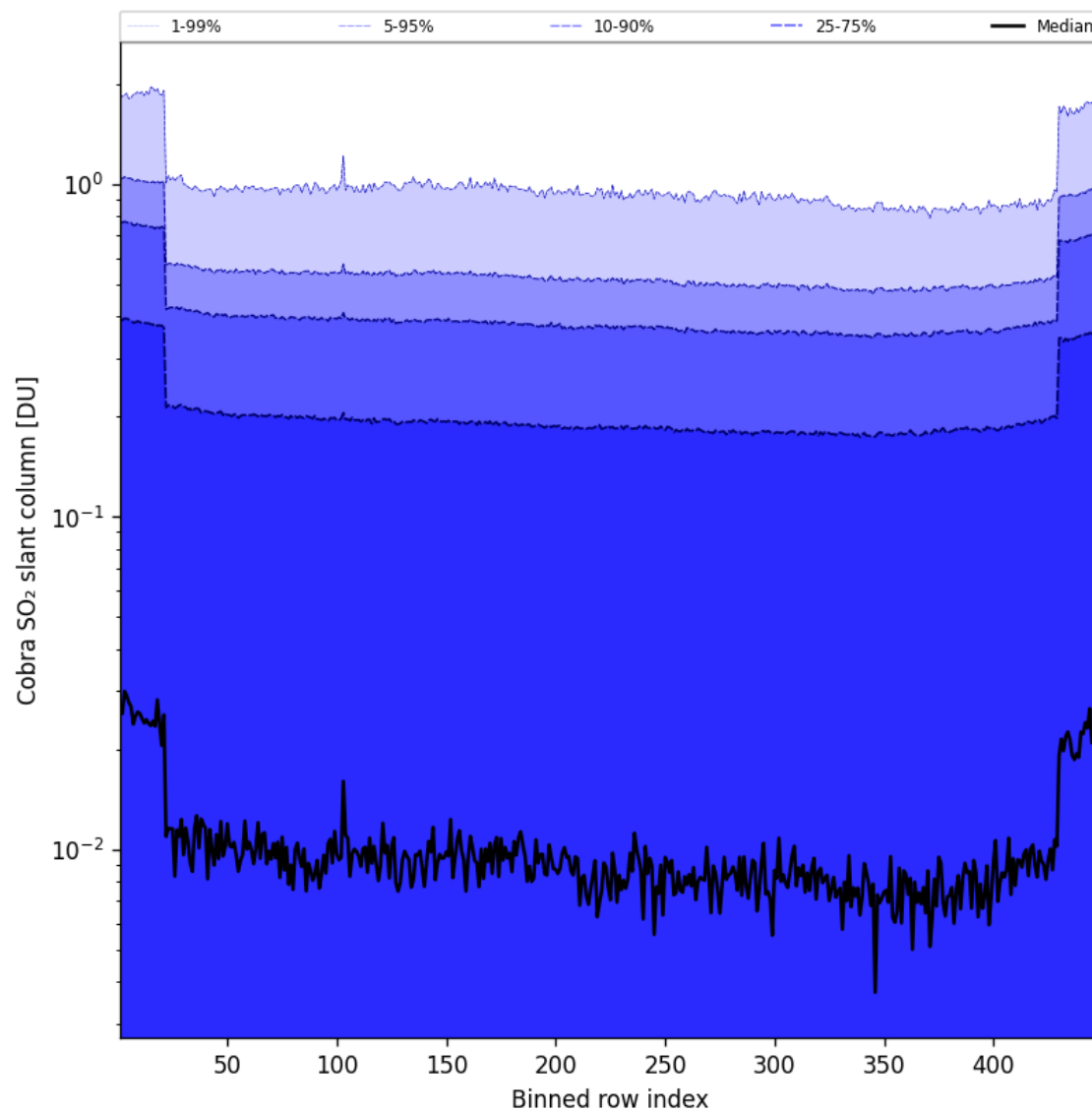


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-09-03 to 2025-09-04

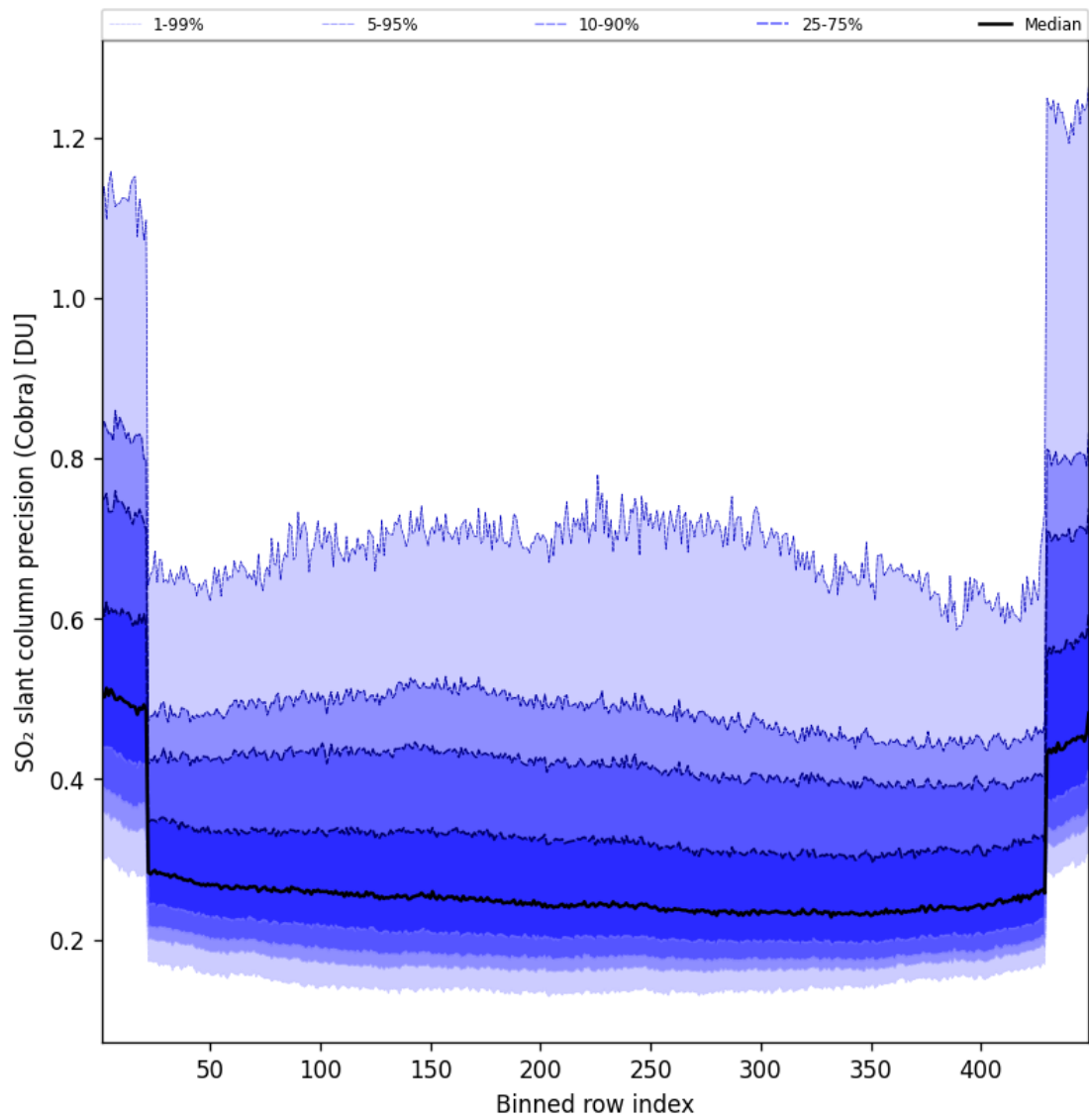


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-09-03 to 2025-09-04

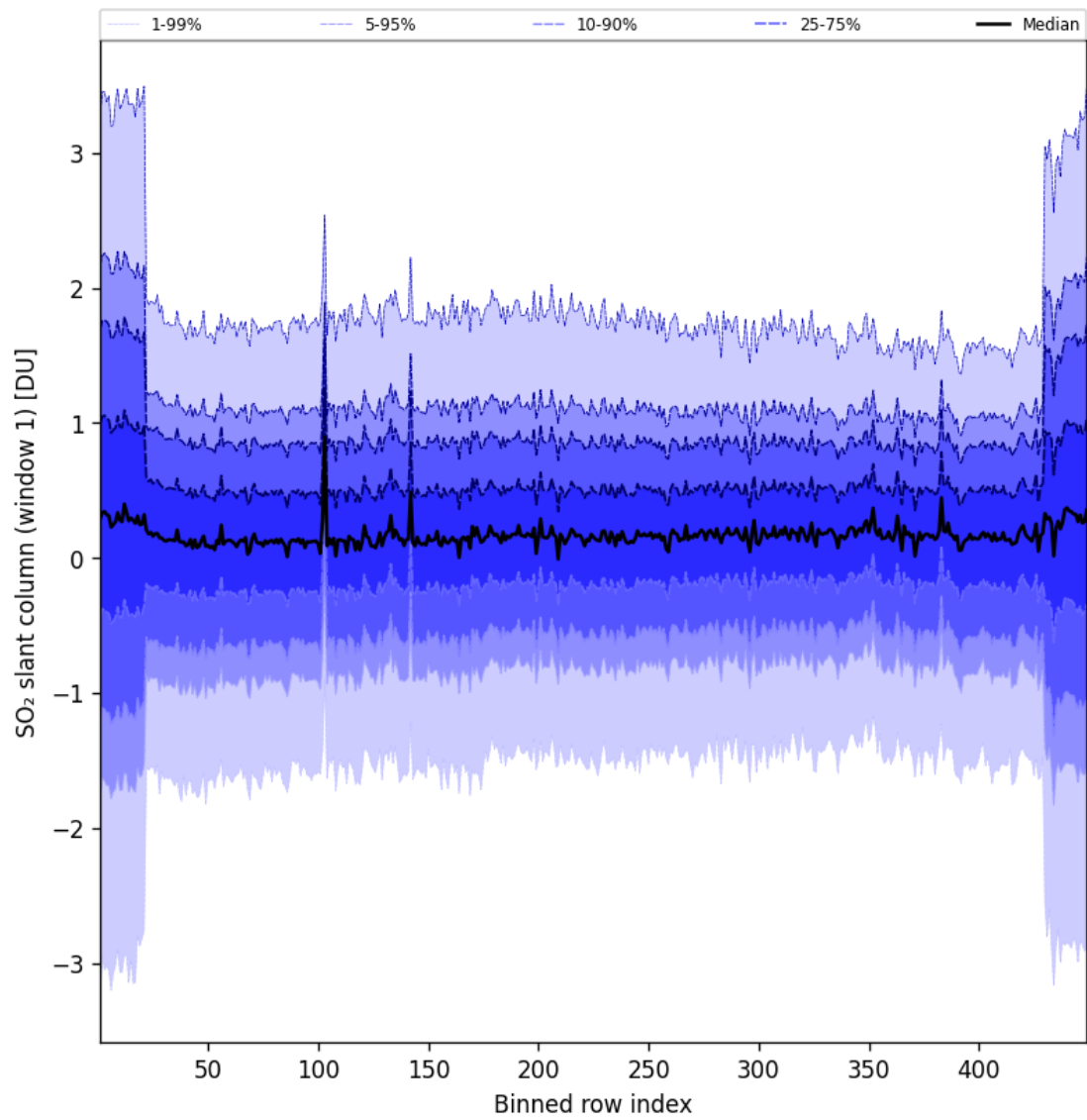


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-09-03 to 2025-09-04

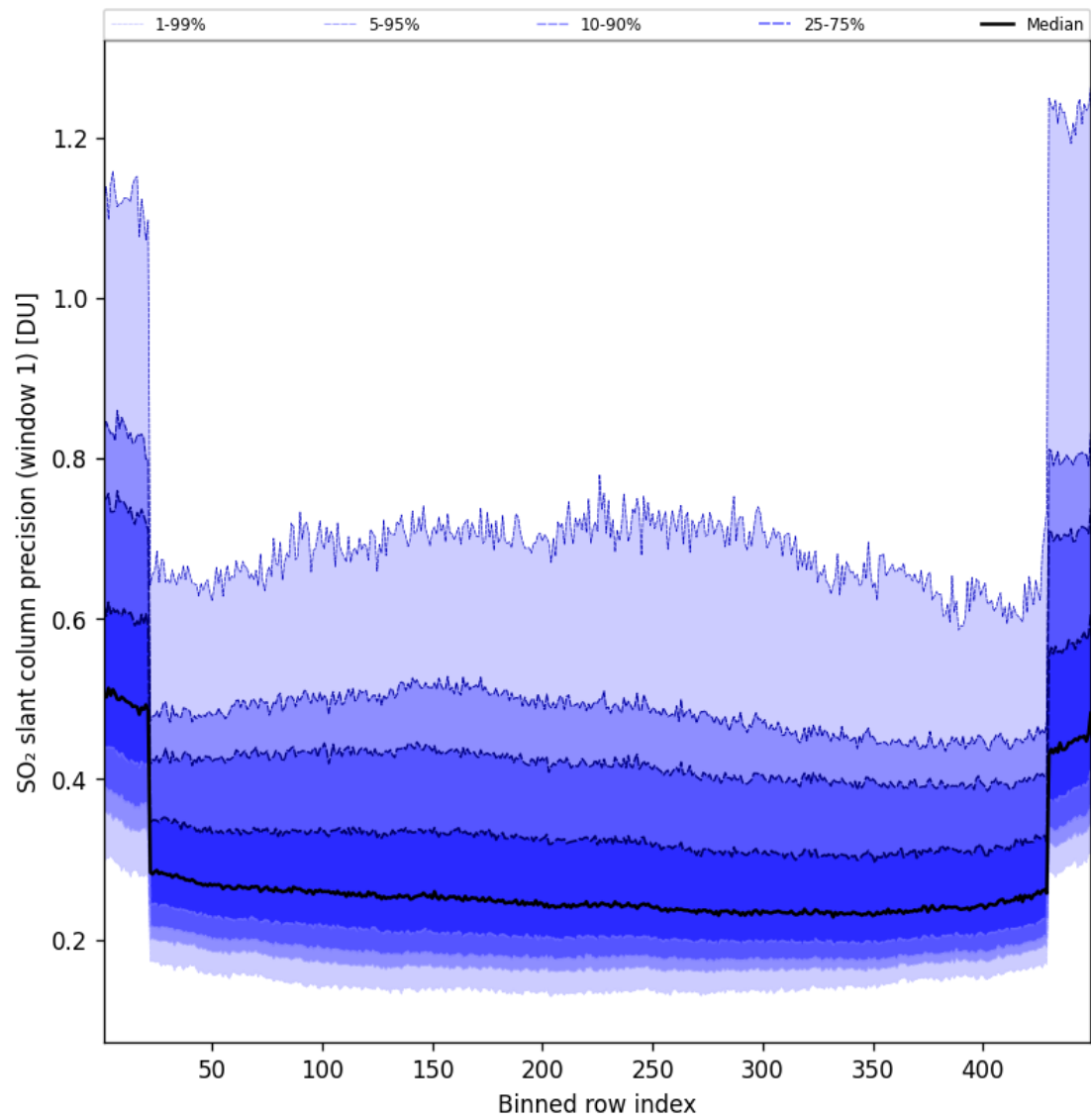


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-09-03 to 2025-09-04

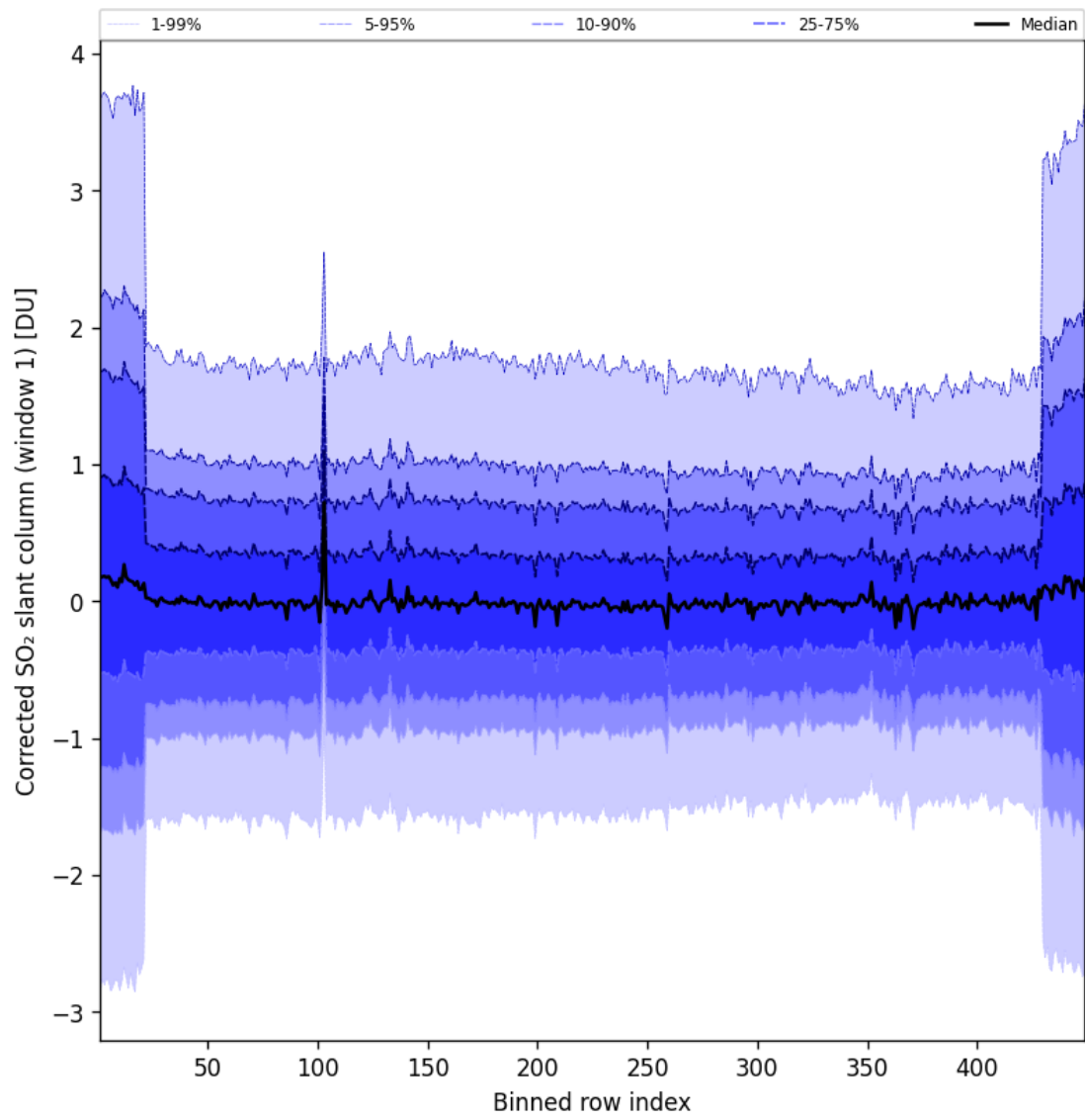


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-09-03 to 2025-09-04

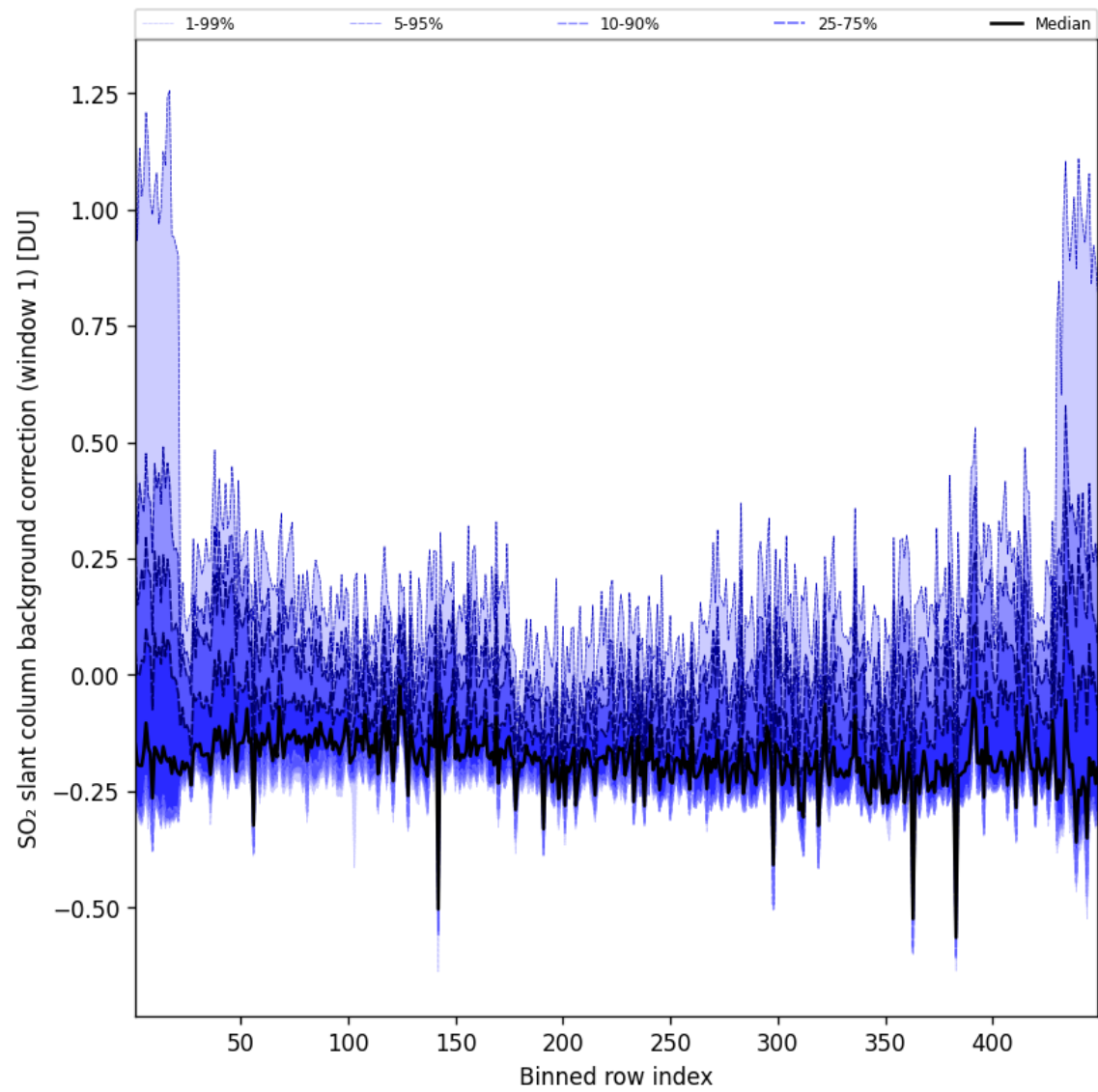


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-09-03 to 2025-09-04

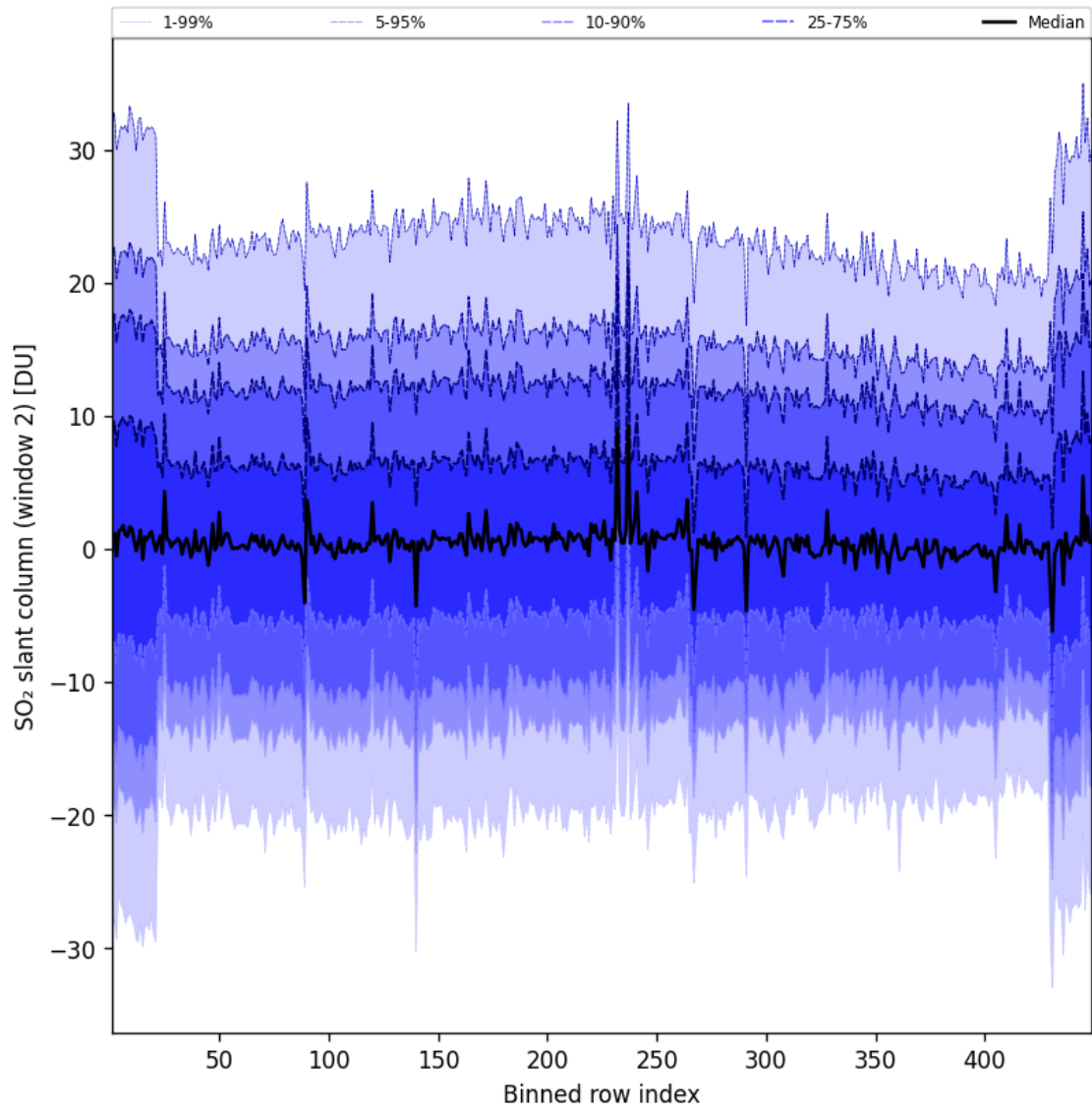


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-09-03 to 2025-09-04

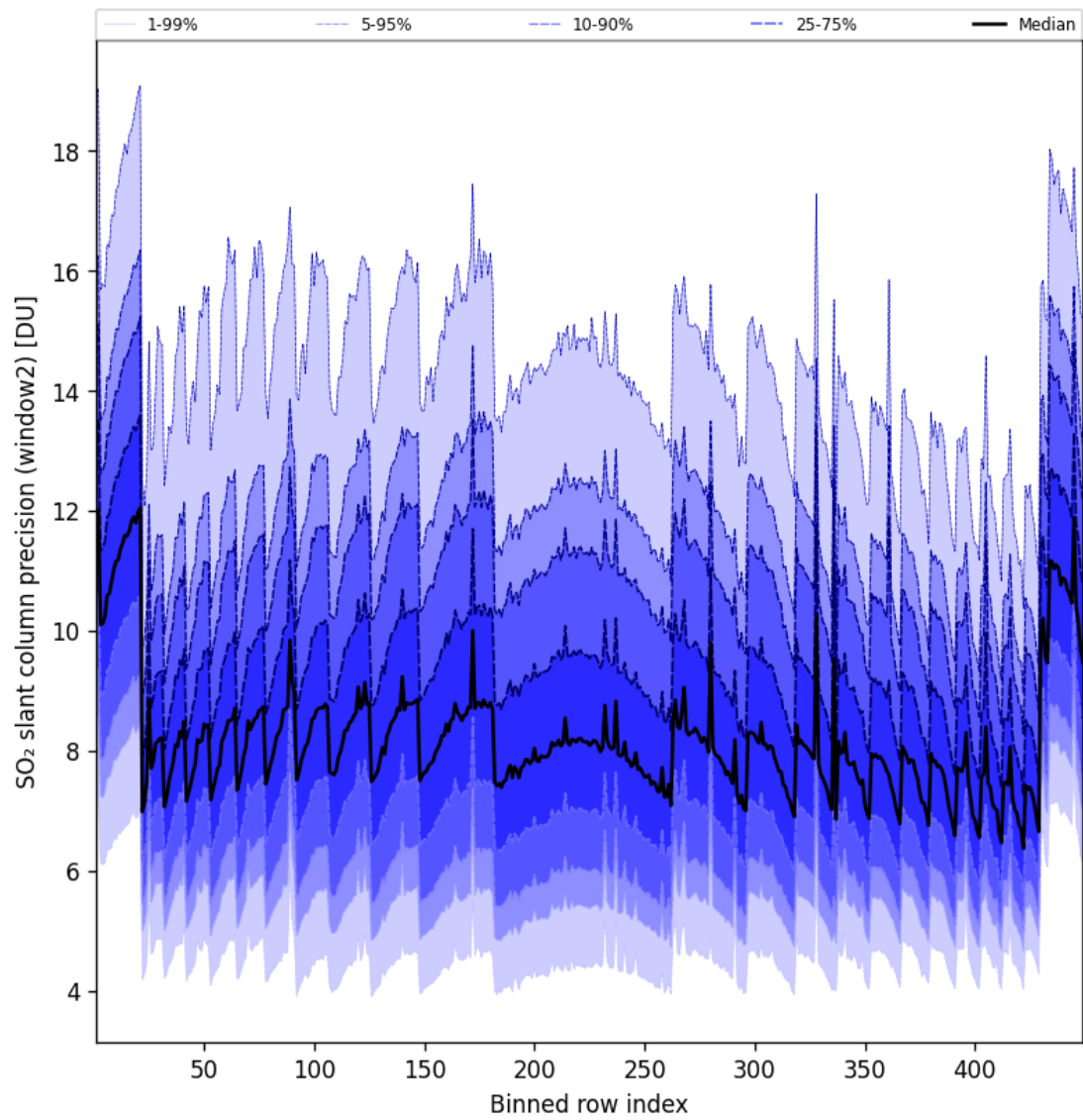


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-09-03 to 2025-09-04

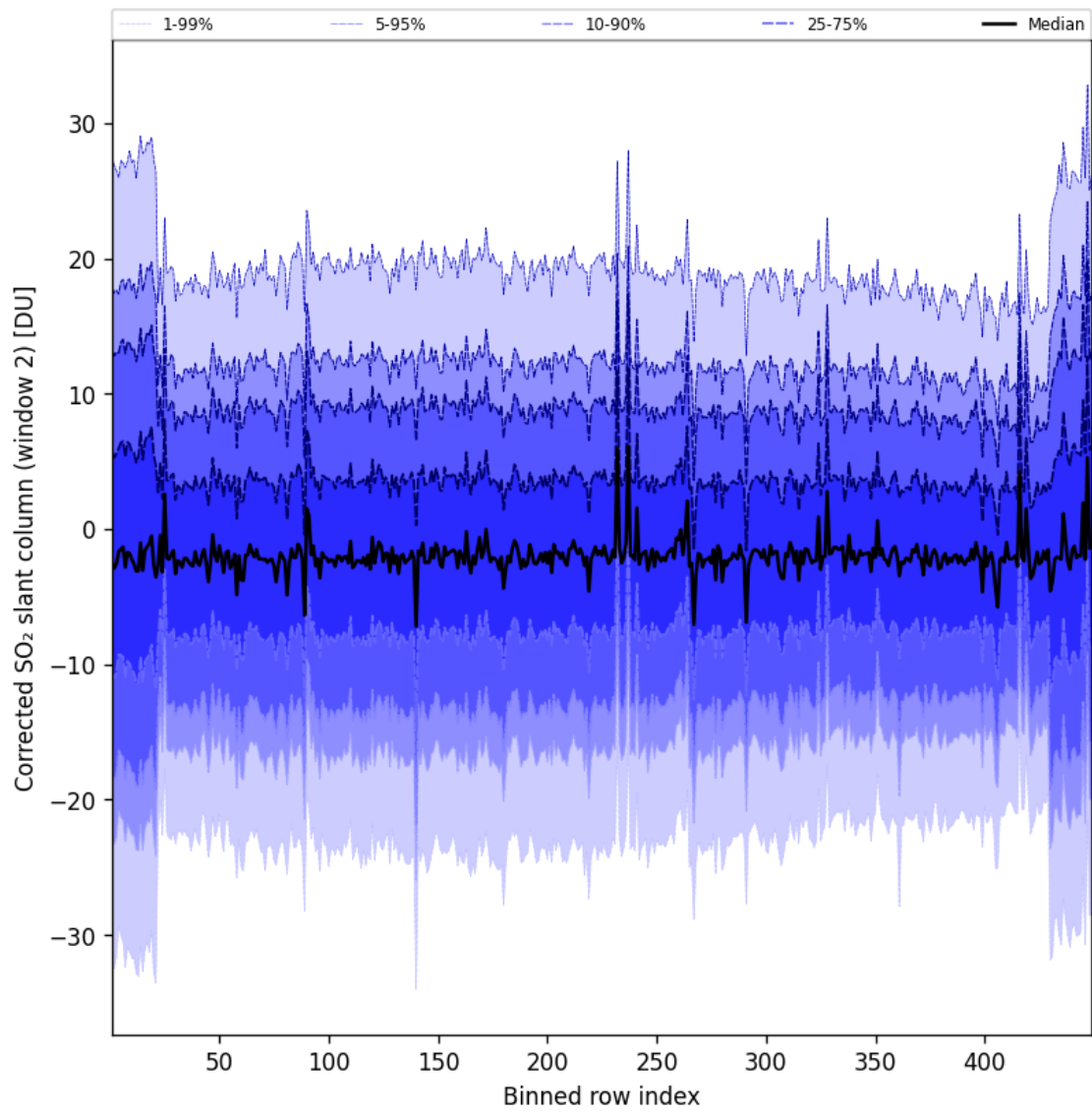


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-09-03 to 2025-09-04

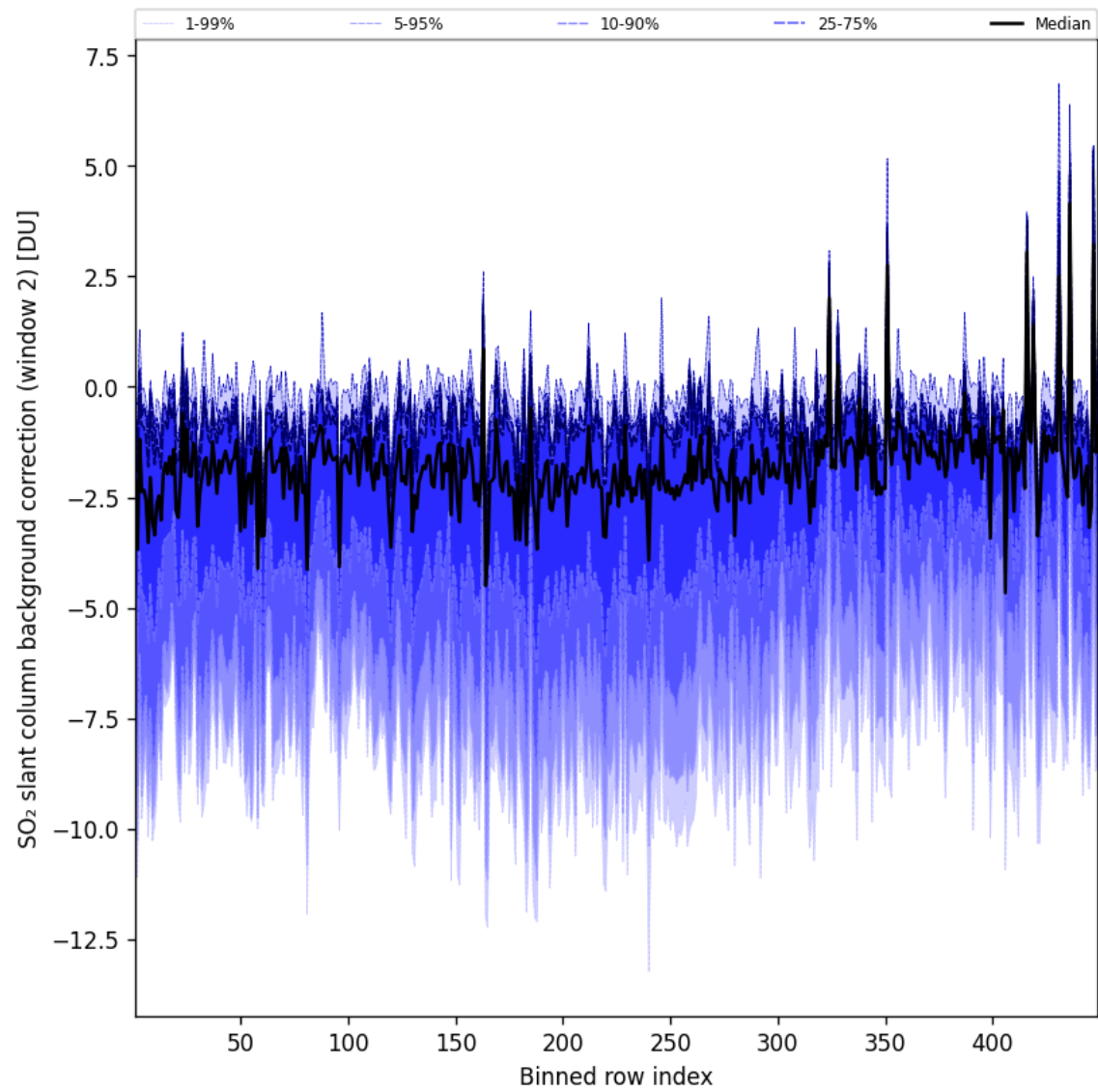


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-09-03 to 2025-09-04

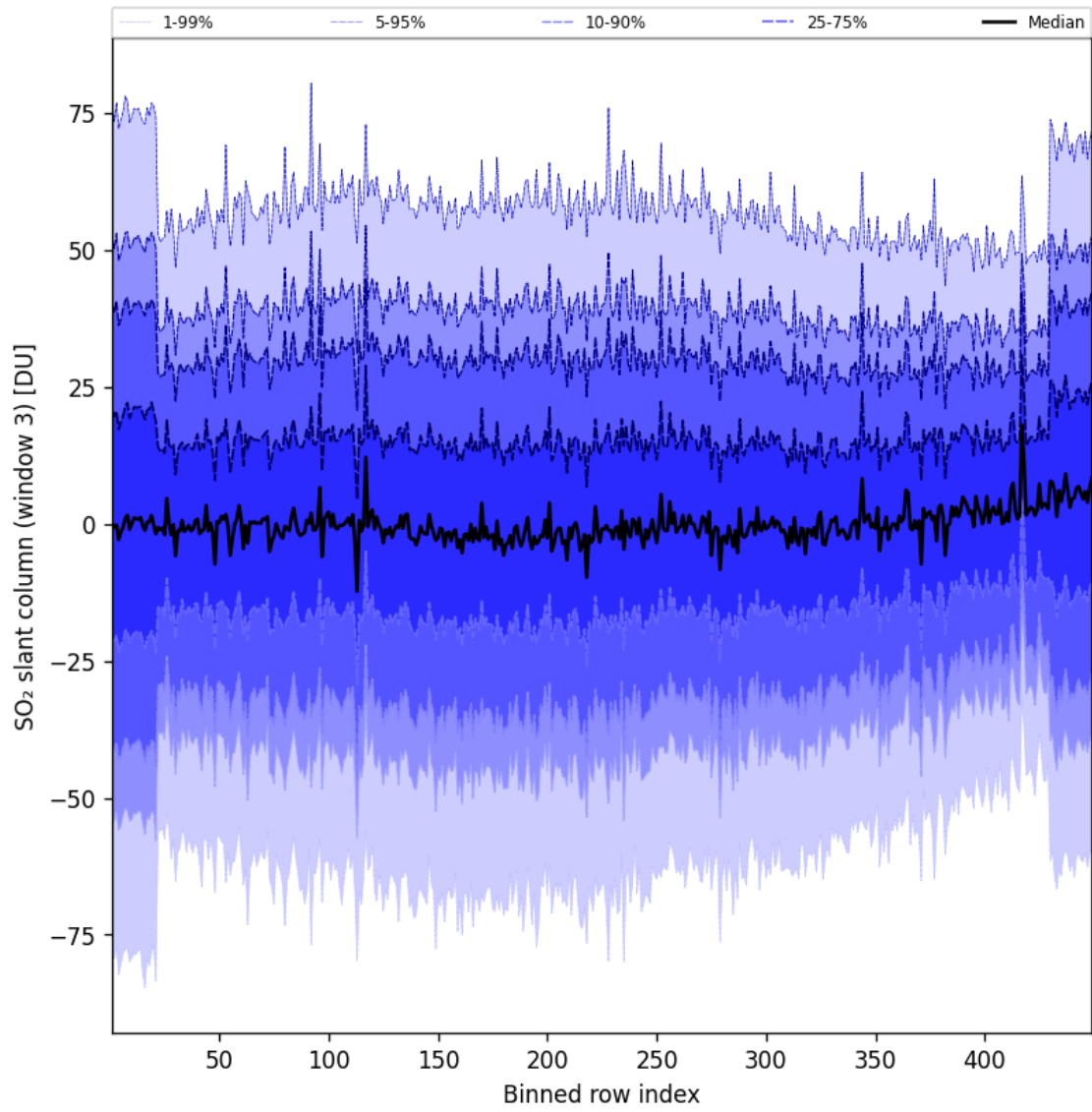


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-09-03 to 2025-09-04

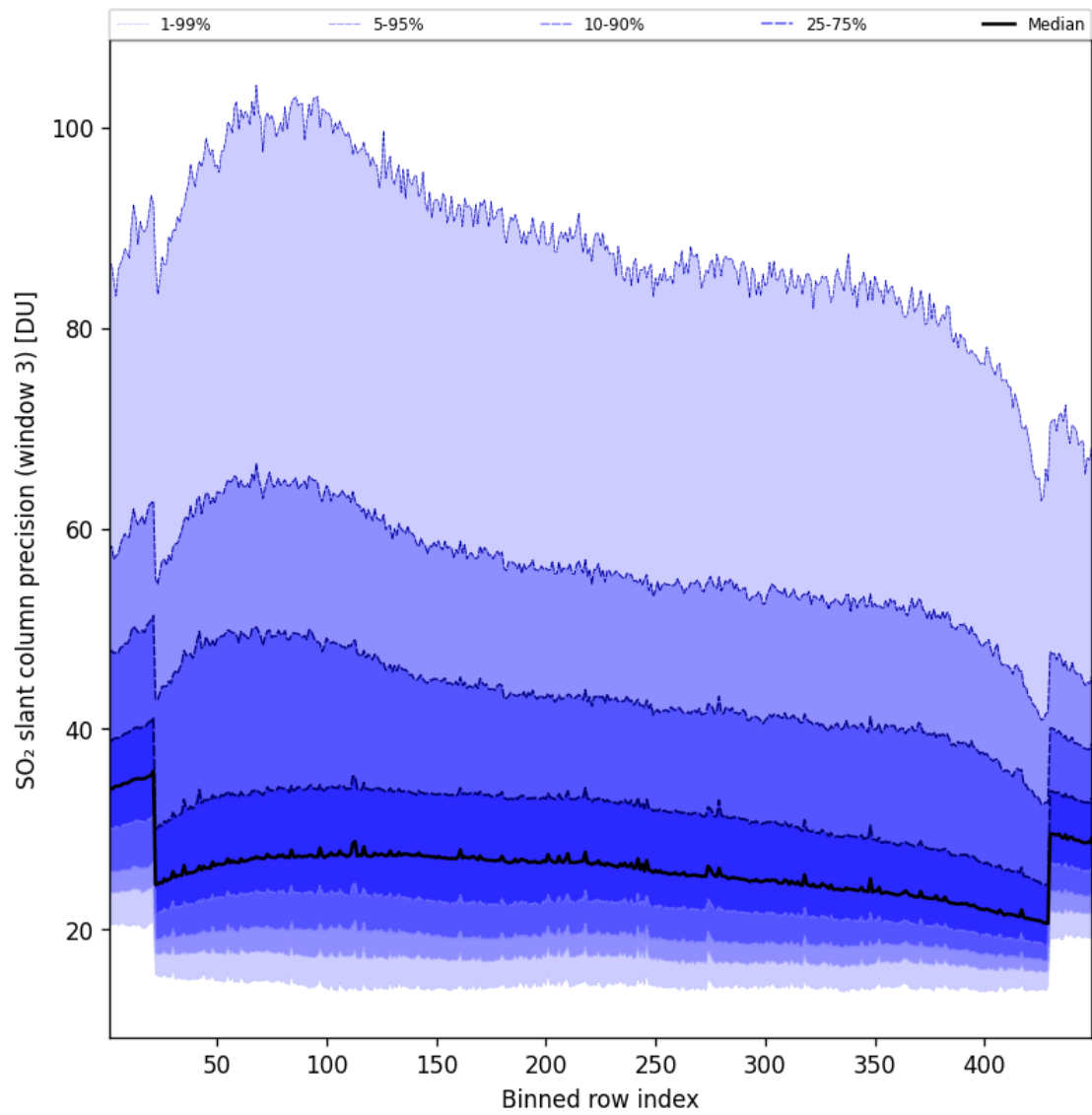


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-09-03 to 2025-09-04

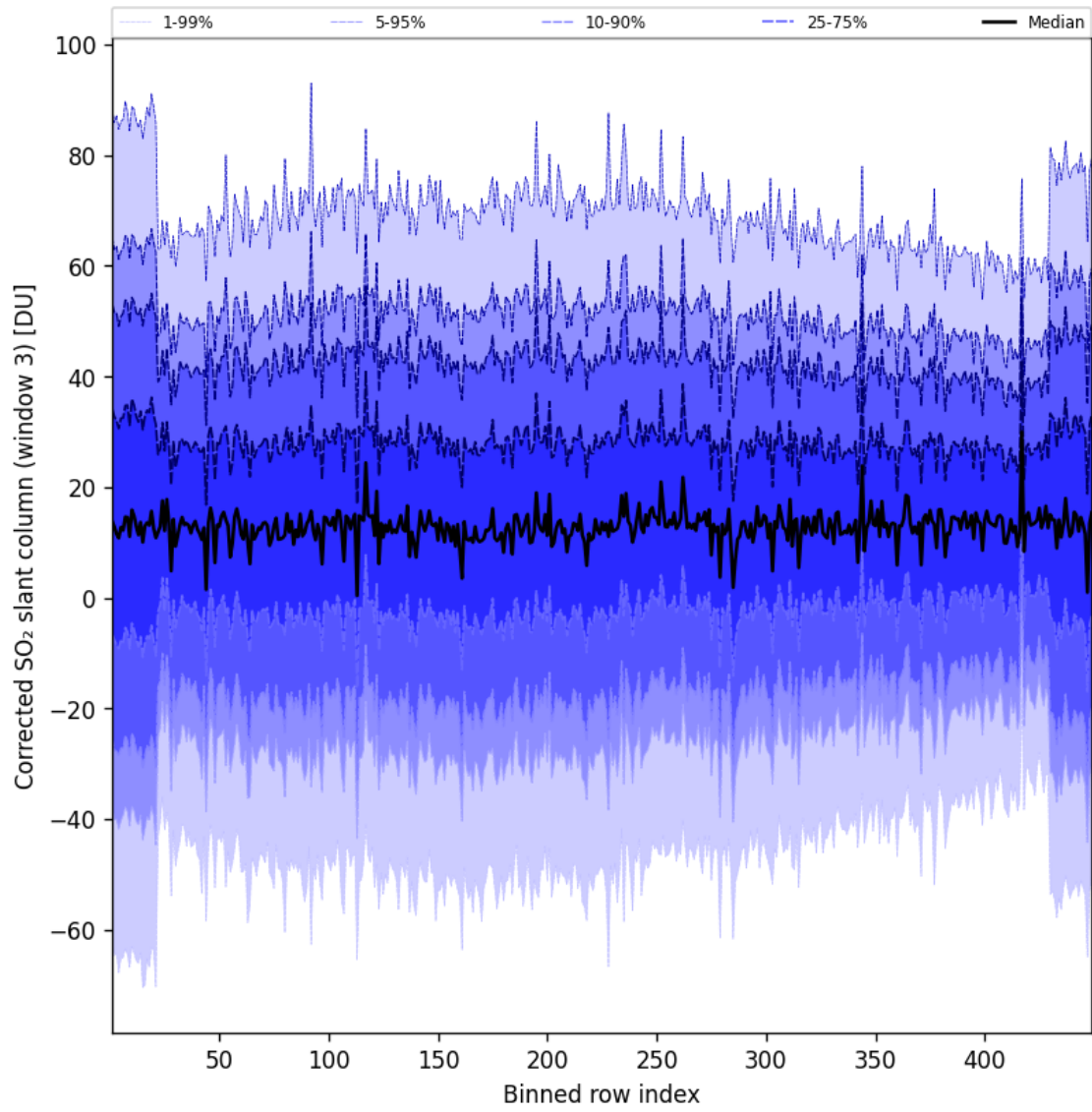


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-09-03 to 2025-09-04

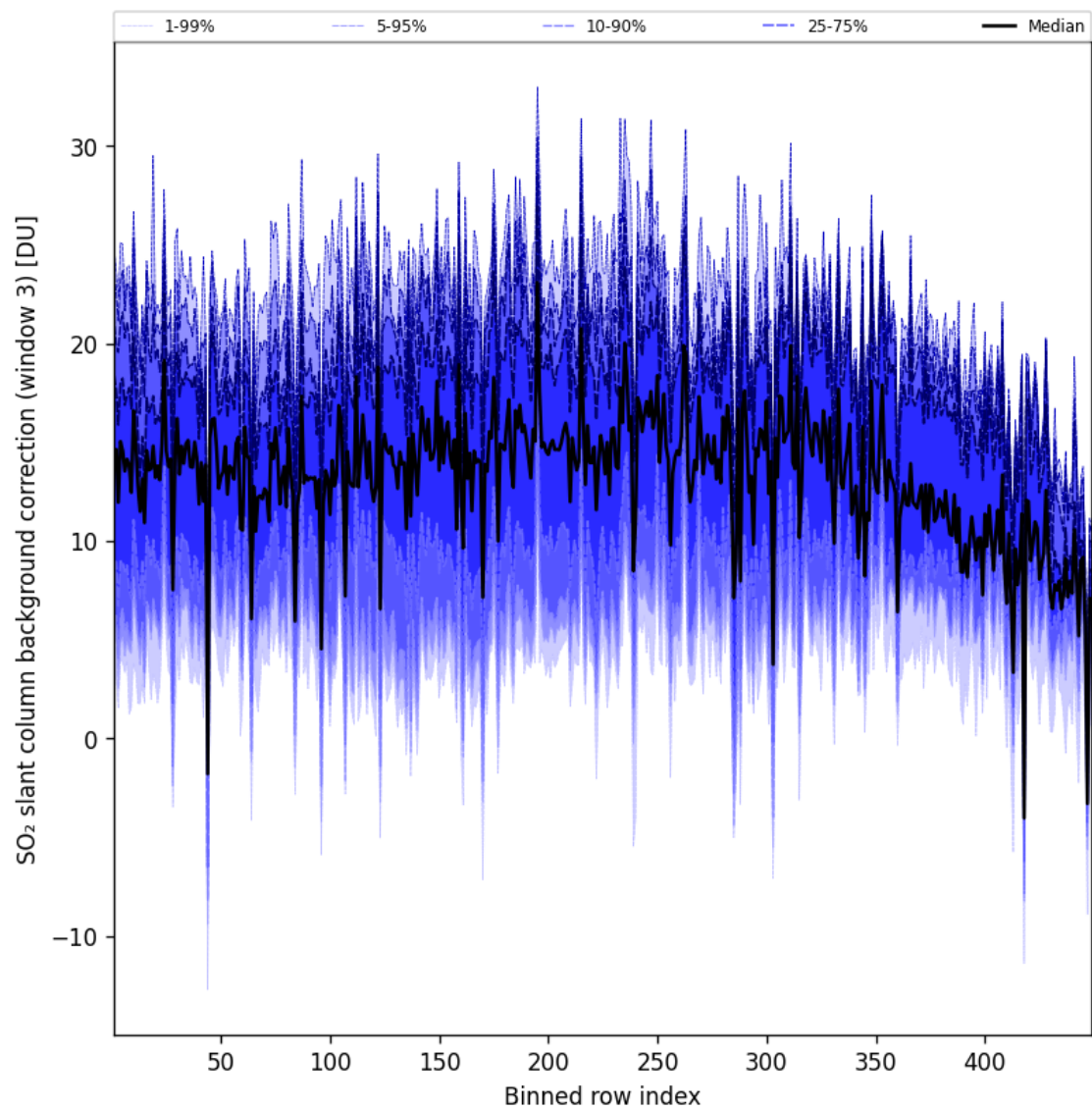


Figure 101: Along track statistics of "SO₂ slant column background correction (window 3)" for 2025-09-03 to 2025-09-04

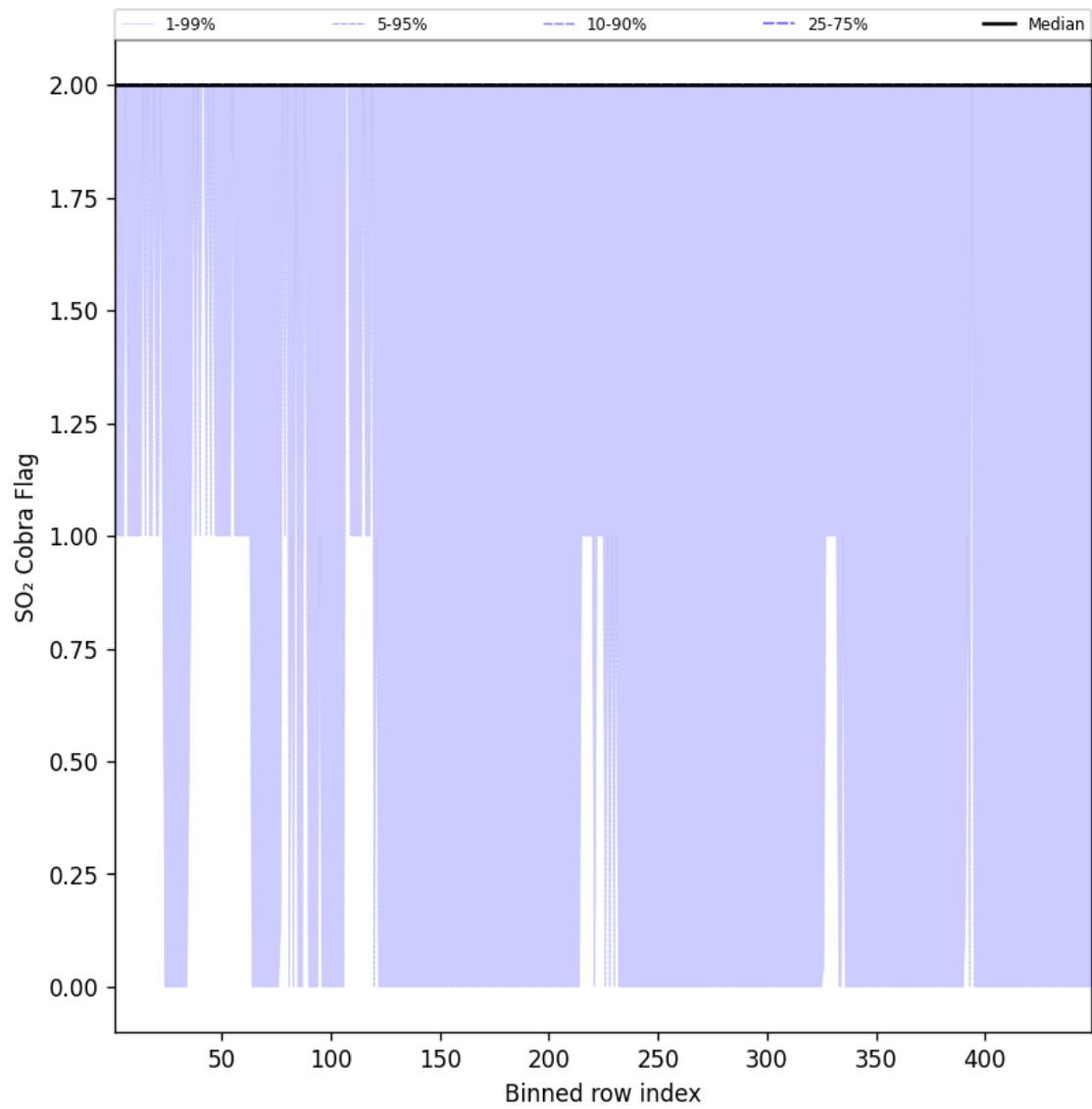


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-09-03 to 2025-09-04

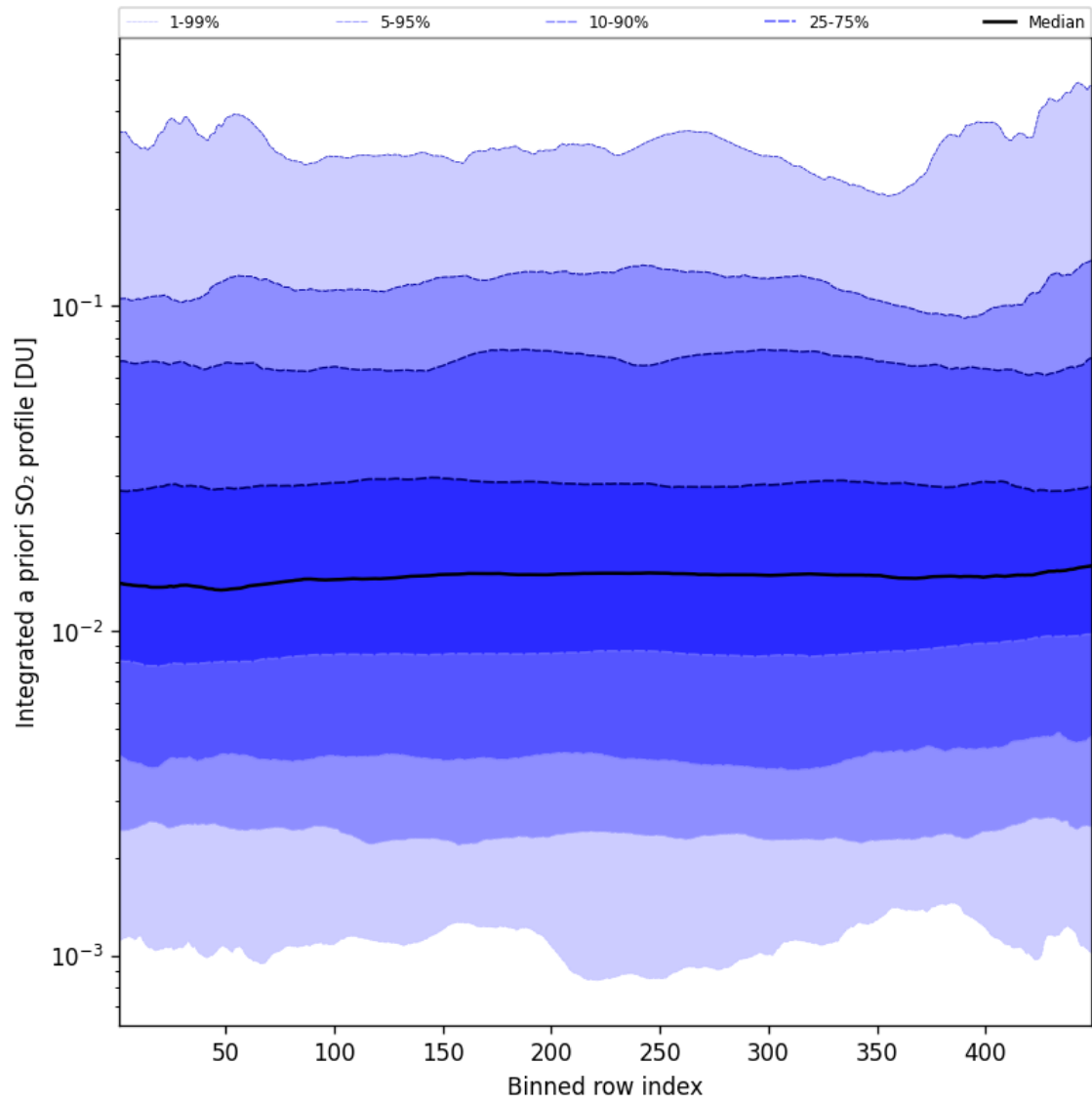


Figure 103: Along track statistics of "Integrated a priori SO₂ profile" for 2025-09-03 to 2025-09-04

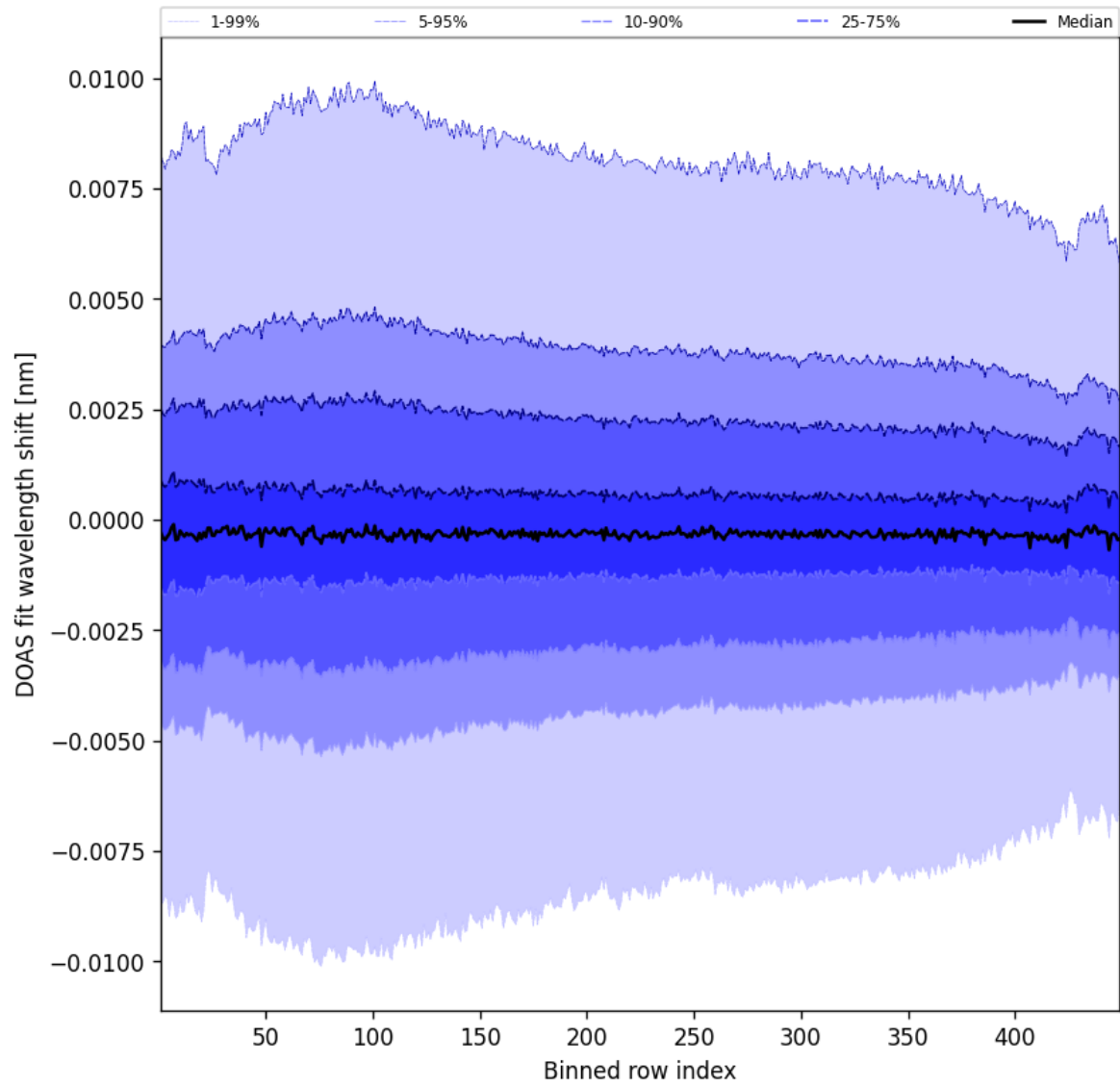


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-09-03 to 2025-09-04

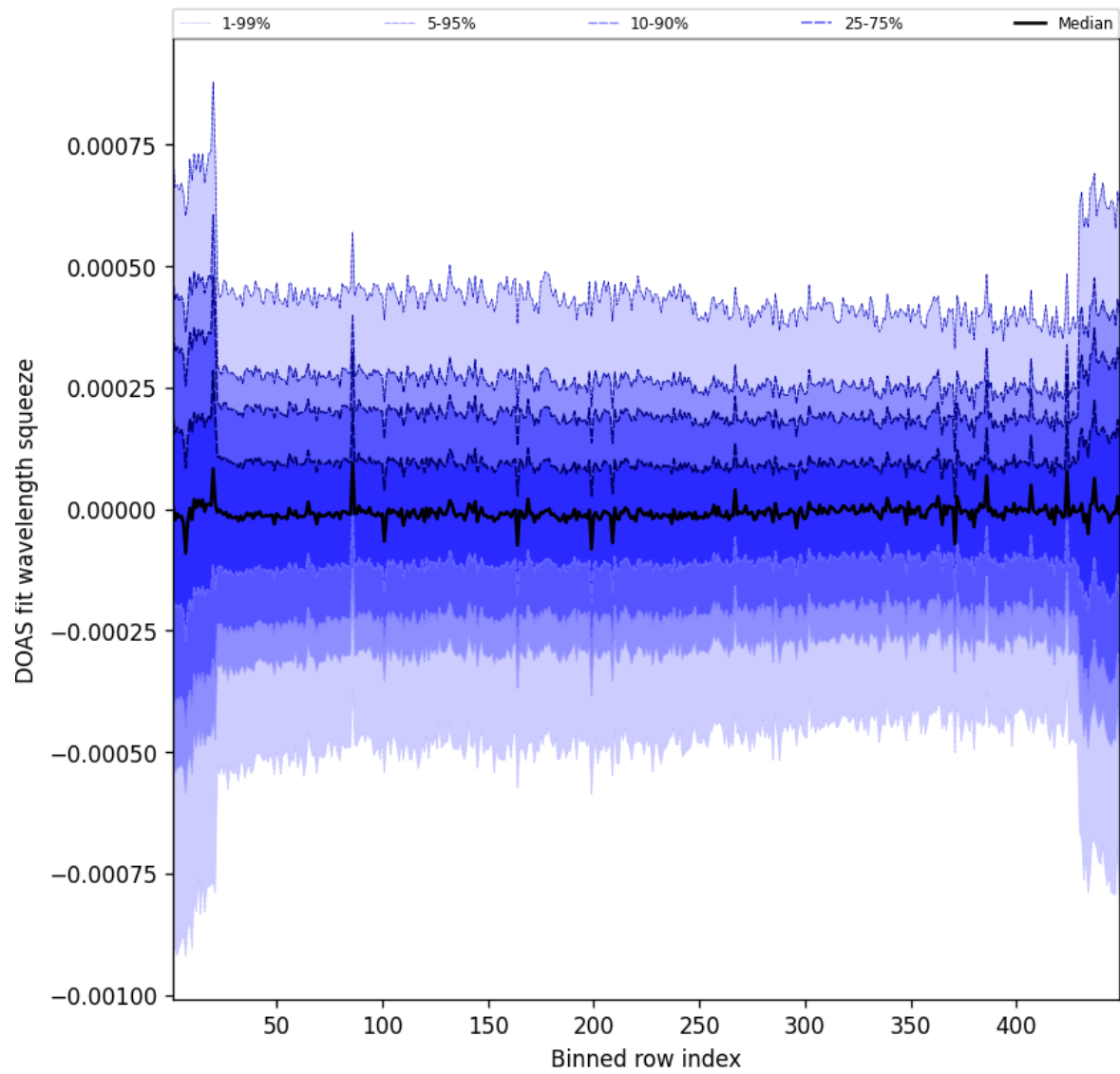


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-09-03 to 2025-09-04

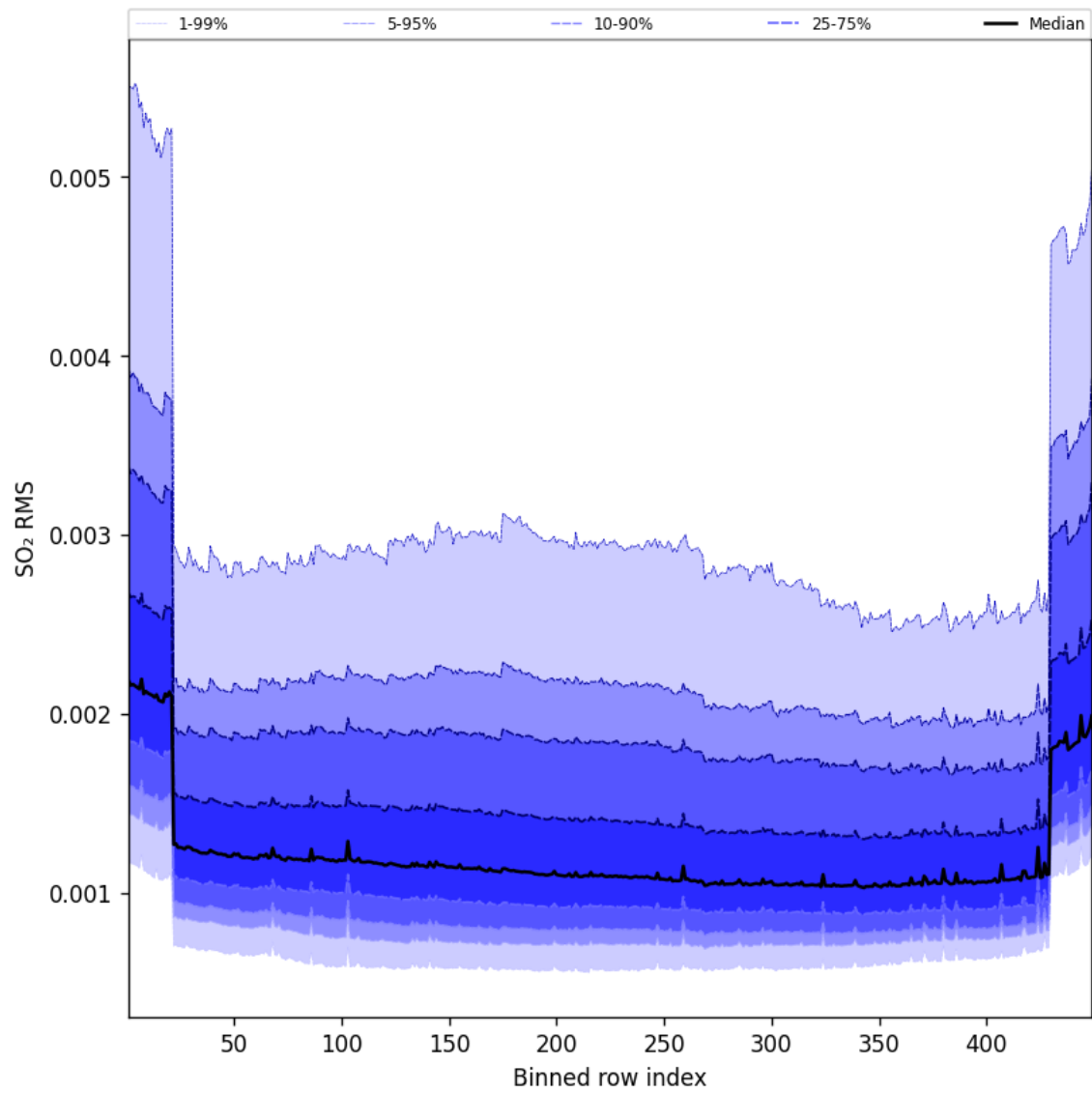


Figure 106: Along track statistics of “SO₂ RMS” for 2025-09-03 to 2025-09-04

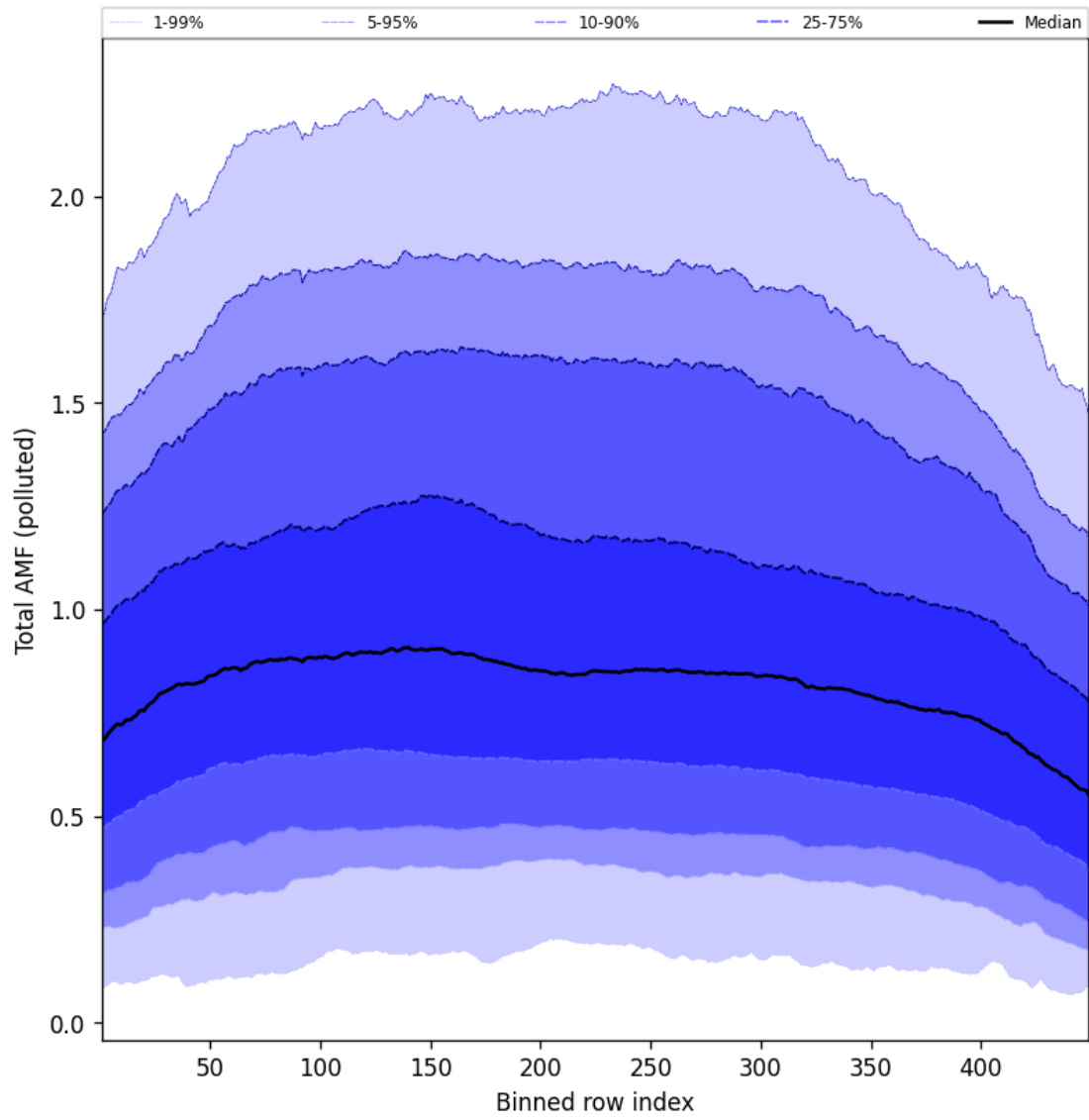


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-09-03 to 2025-09-04

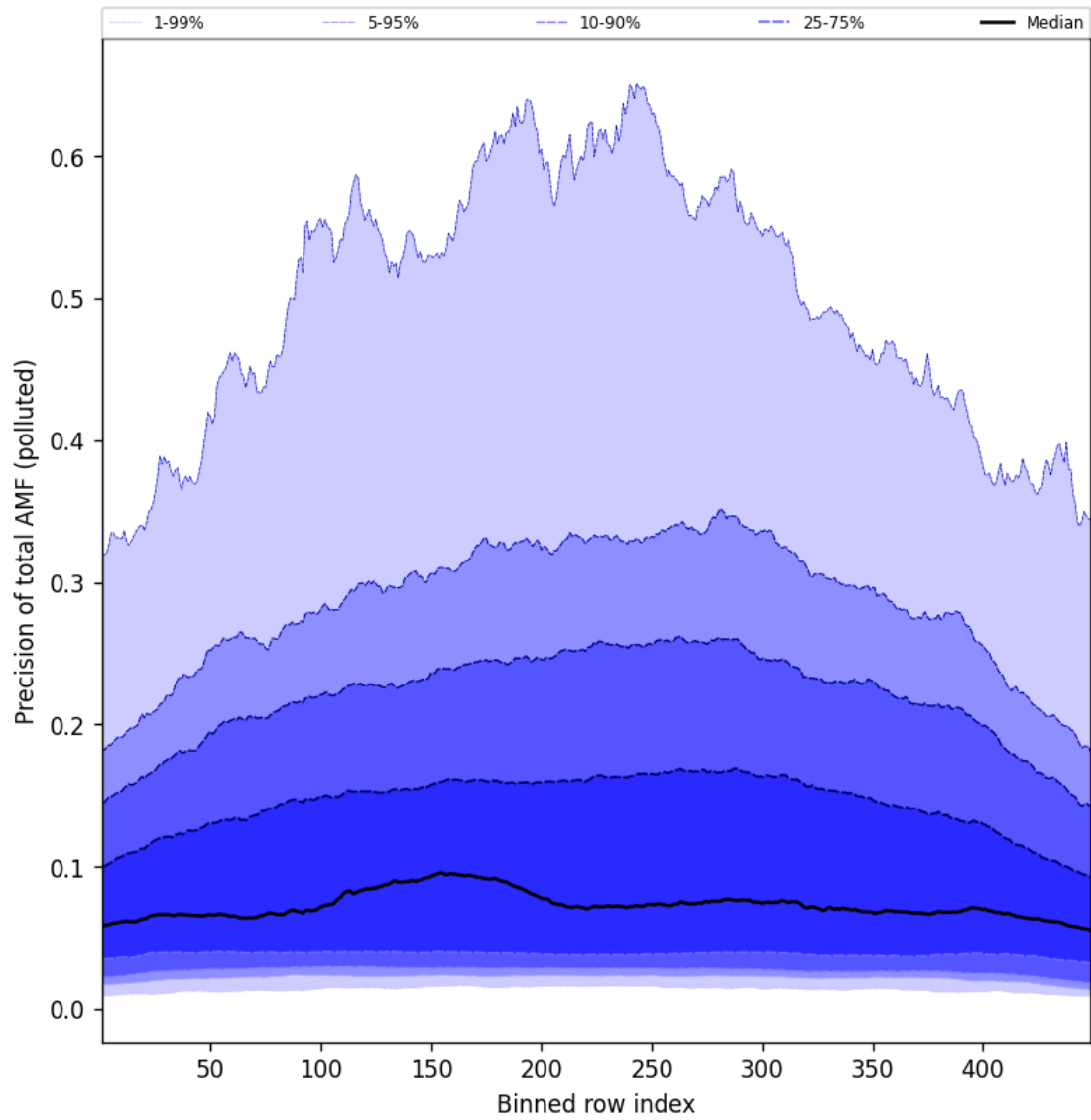


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-09-03 to 2025-09-04

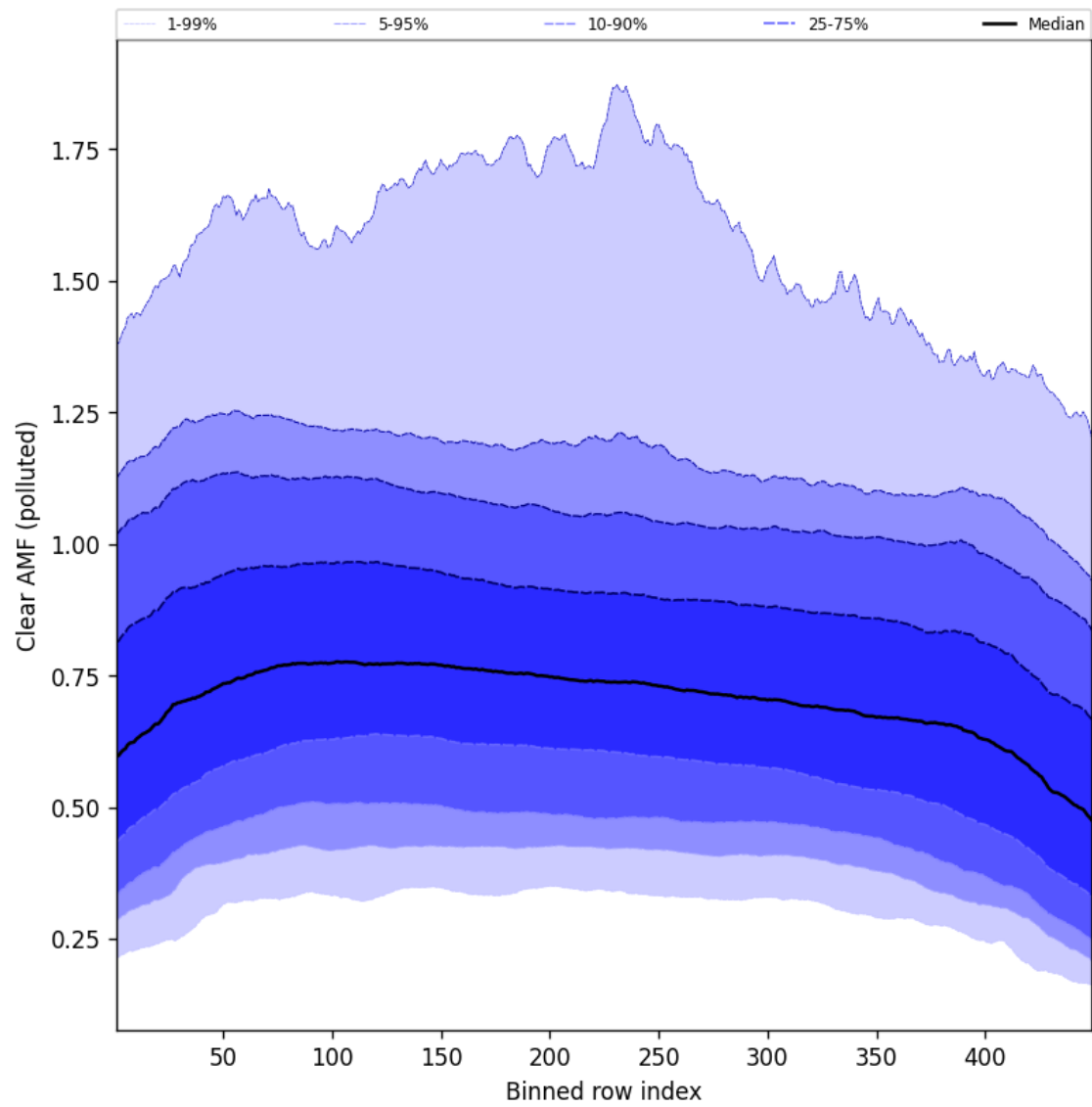


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-09-03 to 2025-09-04

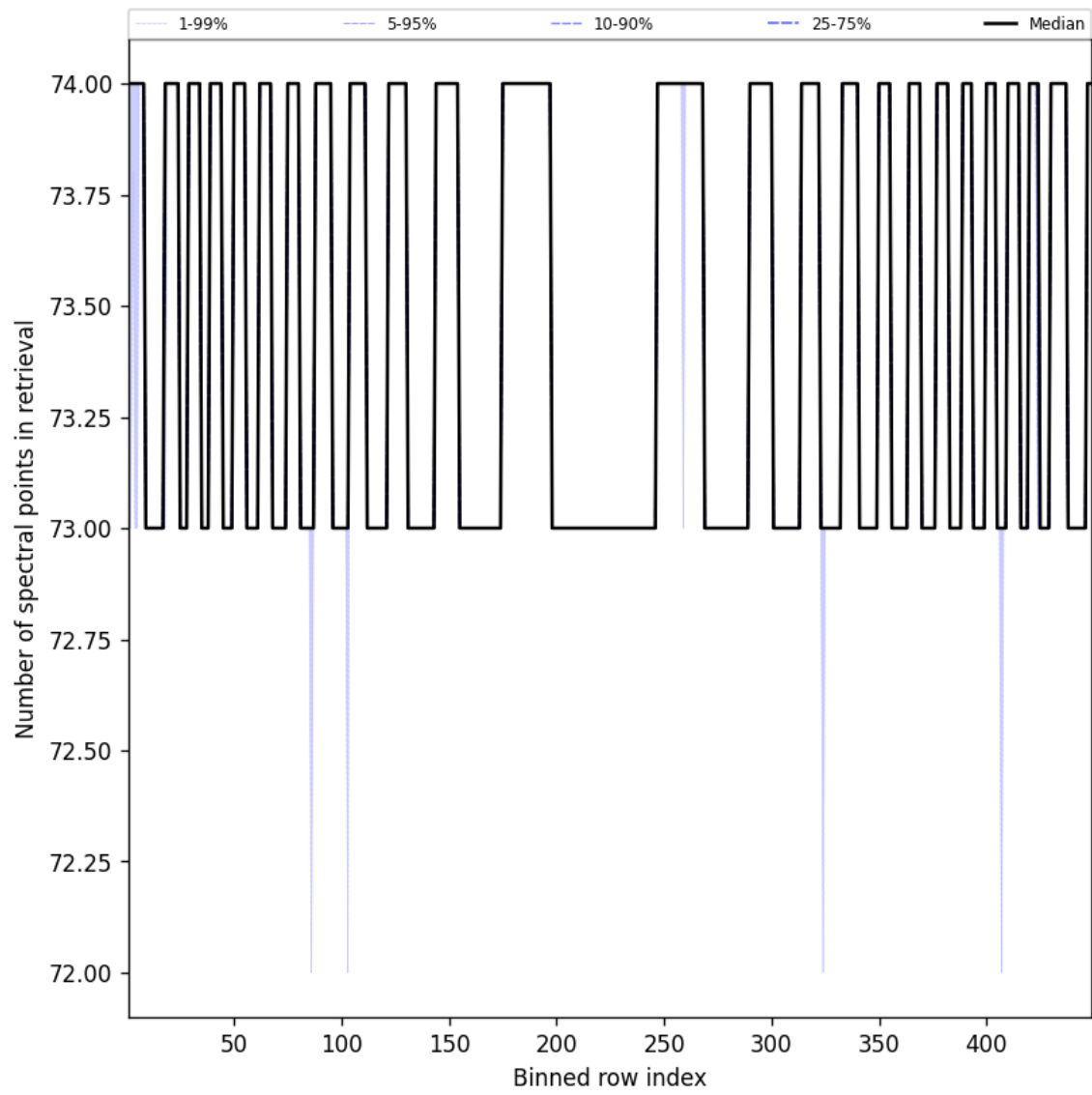


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-09-03 to 2025-09-04

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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