

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]	0.649 ± 0.402	17438400	0.995	0.770	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.141 \pm 104.371) \times 10^{-2}$	17438400	0.263	0.436	1.030×10^{-2}	-121	590
sulfurdioxide total vertical column precision [DU]	0.498 ± 0.723	17438400	0.222	0.329	0.317	4.192×10^{-2}	703
sulfurdioxide slant column density corrected [DU]	$(1.881 \pm 41.093) \times 10^{-2}$	17438400	0.250	0.368	9.464×10^{-3}	-42.2	304
sulfurdioxide slant column density cobra [DU]	$(1.851 \pm 36.586) \times 10^{-2}$	17438400	0.250	0.368	9.464×10^{-3}	-42.2	111
sulfurdioxide slant column density cobra precision [DU]	0.295 ± 0.138	17438400	0.213	0.130	0.254	8.606×10^{-2}	42.3
sulfurdioxide slant column density window1 [DU]	0.129 ± 0.679	17438400	0.125	0.739	0.133	-105	139
sulfurdioxide slant column density window1 precision [DU]	0.295 ± 0.138	17438400	0.213	0.130	0.254	8.606×10^{-2}	42.3
sulfurdioxide slant column density corrected win1 [DU]	$(3.702 \pm 67.047) \times 10^{-2}$	17438400	2.500×10^{-2}	0.723	1.972×10^{-2}	-105	139
background so2 slant column offset window1 [DU]	$(-9.233 \pm 14.046) \times 10^{-2}$	17438400	-0.180	0.175	-0.122	-0.971	2.71
sulfurdioxide slant column density window2 [DU]	1.48 ± 9.17	17438400	1.25	11.3	1.36	-1.486×10^3	1.513×10^3
sulfurdioxide slant column density window2 precision [DU]	8.25 ± 2.55	17438400	7.43	2.73	7.87	2.05	938
sulfurdioxide slant column density corrected win2 [DU]	0.419 ± 9.086	17438400	0.250	11.2	0.419	-1.487×10^3	1.511×10^3
background so2 slant column offset window2 [DU]	-1.06 ± 1.98	17438400	0.250	2.29	-0.753	-15.2	11.3
sulfurdioxide slant column density window3 [DU]	-7.39 ± 24.27	17438400	-6.16	29.8	-7.15	-702	1.488×10^3
sulfurdioxide slant column density window3 precision [DU]	28.8 ± 14.0	17438400	22.5	11.1	25.2	9.18	602
sulfurdioxide slant column density corrected win3 [DU]	-1.68 ± 23.92	17438400	-1.68	29.6	-1.49	-694	1.488×10^3
background so2 slant column offset window3 [DU]	5.71 ± 4.49	17438400	7.28	6.24	5.88	-13.2	35.2
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.20	17438400	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(2.842 \pm 5.389) \times 10^{-2}$	17438400	1.800×10^{-2}	2.213×10^{-2}	1.561×10^{-2}	1.487×10^{-4}	2.97
fitted radiance shift [nm]	$(-1.246 \pm 27.001) \times 10^{-4}$	17438400	1.000×10^{-4}	1.773×10^{-3}	-1.362×10^{-4}	-7.457×10^{-2}	8.502×10^{-2}
fitted radiance squeeze [1]	$(-5.443 \pm 19.237) \times 10^{-5}$	17438400	-3.000×10^{-5}	2.227×10^{-4}	-4.806×10^{-5}	-2.103×10^{-2}	2.581×10^{-2}
fitted root mean square [1]	$(1.290 \pm 0.540) \times 10^{-3}$	17438400	1.025×10^{-3}	5.241×10^{-4}	1.139×10^{-3}	3.293×10^{-4}	0.160
sulfurdioxide total air mass factor polluted [1]	0.911 ± 0.479	17438400	0.700	0.594	0.828	5.000×10^{-2}	2.82
sulfurdioxide total air mass factor polluted precision [1]	0.116 ± 0.132	17438400	3.500×10^{-2}	0.110	7.246×10^{-2}	2.819×10^{-3}	2.15
sulfurdioxide clear air mass factor polluted [1]	0.772 ± 0.340	17438400	0.700	0.385	0.722	5.314×10^{-2}	2.84
number of spectral points in retrieval [1]	73.5 ± 0.5	17438400	73.0	1.000	73.0	52.0	156

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	5.000×10^{-2}	0.120	0.230	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.16	-0.839	-0.516	-0.348	-0.205	0.232	0.386	0.573	0.941	2.54
sulfurdioxide total vertical column precision [DU]	8.992×10^{-2}	0.124	0.152	0.177	0.212	0.541	0.712	0.920	1.37	3.25
sulfurdioxide slant column density corrected [DU]	-0.860	-0.494	-0.358	-0.268	-0.173	0.195	0.296	0.394	0.550	1.03
sulfurdioxide slant column density cobra [DU]	-0.860	-0.494	-0.358	-0.268	-0.173	0.195	0.296	0.394	0.550	1.03
sulfurdioxide slant column density cobra precision [DU]	0.143	0.169	0.184	0.196	0.210	0.340	0.400	0.456	0.547	0.794
sulfurdioxide slant column density window1 [DU]	-1.66	-0.914	-0.628	-0.438	-0.240	0.500	0.692	0.877	1.16	1.93
sulfurdioxide slant column density window1 precision [DU]	0.143	0.169	0.184	0.196	0.210	0.340	0.400	0.456	0.547	0.794
sulfurdioxide slant column density corrected win1 [DU]	-1.63	-0.952	-0.694	-0.520	-0.336	0.387	0.585	0.779	1.08	1.92
background so2 slant column offset window1 [DU]	-0.324	-0.260	-0.233	-0.214	-0.191	-1.536×10^{-2}	4.005×10^{-2}	9.311×10^{-2}	0.168	0.312
sulfurdioxide slant column density window2 [DU]	-19.9	-12.9	-9.56	-7.06	-4.26	7.06	9.96	12.6	16.3	24.3
sulfurdioxide slant column density window2 precision [DU]	4.27	5.14	5.70	6.15	6.68	9.41	10.4	11.3	12.6	15.5
sulfurdioxide slant column density corrected win2 [DU]	-21.4	-14.1	-10.6	-8.04	-5.21	6.03	8.84	11.4	14.9	22.4
background so2 slant column offset window2 [DU]	-6.80	-4.54	-3.47	-2.81	-2.12	0.177	0.473	0.723	1.22	4.06
sulfurdioxide slant column density window3 [DU]	-70.0	-47.6	-37.2	-29.9	-22.1	7.76	15.4	22.4	31.9	51.0
sulfurdioxide slant column density window3 precision [DU]	13.0	15.4	17.4	19.1	20.9	31.9	36.7	42.7	54.9	87.8
sulfurdioxide slant column density corrected win3 [DU]	-62.6	-41.2	-31.1	-24.0	-16.3	13.3	20.8	27.7	37.0	56.3
background so2 slant column offset window3 [DU]	-4.43	-1.61	-8.052×10^{-2}	1.14	2.55	8.79	9.97	11.1	12.8	16.4
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	3.364×10^{-4}	5.992×10^{-4}	1.037×10^{-3}	2.640×10^{-3}	6.530×10^{-3}	2.866×10^{-2}	4.181×10^{-2}	6.198×10^{-2}	0.104	0.231
fitted radiance shift [nm]	-8.355×10^{-3}	-4.082×10^{-3}	-2.588×10^{-3}	-1.738×10^{-3}	-1.037×10^{-3}	7.366×10^{-4}	1.459×10^{-3}	2.361×10^{-3}	3.946×10^{-3}	8.406×10^{-3}
fitted radiance squeeze [1]	-5.624×10^{-4}	-3.667×10^{-4}	-2.829×10^{-4}	-2.245×10^{-4}	-1.628×10^{-4}	5.990×10^{-5}	1.139×10^{-4}	1.639×10^{-4}	2.356×10^{-4}	4.113×10^{-4}
fitted root mean square [1]	5.951×10^{-4}	7.318×10^{-4}	8.147×10^{-4}	8.782×10^{-4}	9.522×10^{-4}	1.476×10^{-3}	1.726×10^{-3}	1.973×10^{-3}	2.327×10^{-3}	3.214×10^{-3}
sulfurdioxide total air mass factor polluted [1]	9.847×10^{-2}	0.259	0.366	0.460	0.571	1.17	1.40	1.61	1.87	2.26
sulfurdioxide total air mass factor polluted precision [1]	1.059×10^{-2}	1.906×10^{-2}	2.541×10^{-2}	3.090×10^{-2}	3.861×10^{-2}	0.149	0.195	0.245	0.342	0.669
sulfurdioxide clear air mass factor polluted [1]	0.236	0.329	0.394	0.460	0.544	0.928	1.04	1.17	1.45	1.92
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]	0.602 ± 0.412	12158852	0.810	0.490	0.0	1.000	0.190	1.000
sulfurdioxide total vertical column [DU]	$(2.328 \pm 98.939) \times 10^{-2}$	12158852	0.397	8.724×10^{-3}	-107	301	-0.188	0.209
sulfurdioxide total vertical column precision [DU]	0.461 ± 0.706	12158852	0.279	0.284	4.192×10^{-2}	61.1	0.197	0.476
sulfurdioxide slant column density corrected [DU]	$(1.480 \pm 33.096) \times 10^{-2}$	12158852	0.343	8.171×10^{-3}	-7.18	146	-0.162	0.181
sulfurdioxide slant column density cobra [DU]	$(1.472 \pm 31.893) \times 10^{-2}$	12158852	0.343	8.171×10^{-3}	-7.18	26.8	-0.162	0.181
sulfurdioxide slant column density cobra precision [DU]	0.271 ± 0.111	12158852	0.104	0.237	8.606×10^{-2}	16.3	0.202	0.305
sulfurdioxide slant column density window1 [DU]	0.118 ± 0.616	12158852	0.697	0.125	-33.7	57.0	-0.228	0.470
sulfurdioxide slant column density window1 precision [DU]	0.271 ± 0.111	12158852	0.104	0.237	8.606×10^{-2}	16.3	0.202	0.305
sulfurdioxide slant column density corrected win1 [DU]	$(2.822 \pm 60.112) \times 10^{-2}$	12158852	0.678	1.598×10^{-2}	-33.7	57.0	-0.318	0.359
background so2 slant column offset window1 [DU]	$(-8.999 \pm 14.169) \times 10^{-2}$	12158852	0.194	-0.116	-0.882	1.63	-0.197	-3.208×10^{-3}
sulfurdioxide slant column density window2 [DU]	1.17 ± 8.36	12158852	10.7	1.16	-611	826	-4.19	6.51
sulfurdioxide slant column density window2 precision [DU]	7.79 ± 2.15	12158852	2.39	7.48	2.05	346	6.40	8.78
sulfurdioxide slant column density corrected win2 [DU]	0.375 ± 8.345	12158852	10.6	0.398	-610	822	-4.94	5.70
background so2 slant column offset window2 [DU]	-0.797 ± 1.740	12158852	2.20	-0.615	-9.71	11.3	-1.90	0.300
sulfurdioxide slant column density window3 [DU]	-6.69 ± 22.68	12158852	28.0	-6.73	-196	1.488×10^3	-20.7	7.39
sulfurdioxide slant column density window3 precision [DU]	27.3 ± 14.2	12158852	9.60	23.4	9.23	602	19.9	29.5
sulfurdioxide slant column density corrected win3 [DU]	-1.62 ± 22.33	12158852	27.8	-1.50	-192	1.488×10^3	-15.4	12.4
background so2 slant column offset window3 [DU]	5.08 ± 4.34	12158852	6.70	5.65	-13.2	22.7	1.74	8.44
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.17	12158852	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.904 \pm 5.940) \times 10^{-2}$	12158852	2.661×10^{-2}	1.212×10^{-2}	1.487×10^{-4}	2.97	3.247×10^{-3}	2.986×10^{-2}
fitted radiance shift [nm]	$(1.115 \pm 279.618) \times 10^{-5}$	12158852	1.722×10^{-3}	-2.628×10^{-5}	-4.081×10^{-2}	8.502×10^{-2}	-8.632×10^{-4}	8.587×10^{-4}
fitted radiance squeeze [1]	$(-8.185 \pm 17.835) \times 10^{-5}$	12158852	2.159×10^{-4}	-6.924×10^{-5}	-1.555×10^{-2}	1.554×10^{-2}	-1.829×10^{-4}	3.299×10^{-5}
fitted root mean square [1]	$(1.203 \pm 0.465) \times 10^{-3}$	12158852	4.400×10^{-4}	1.081×10^{-3}	3.293×10^{-4}	4.383×10^{-2}	9.157×10^{-4}	1.356×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.948 ± 0.517	12158852	0.690	0.862	5.000×10^{-2}	2.82	0.565	1.26
sulfurdioxide total air mass factor polluted precision [1]	0.128 ± 0.145	12158852	0.120	8.229×10^{-2}	2.892×10^{-3}	2.15	4.150×10^{-2}	0.162
sulfurdioxide clear air mass factor polluted [1]	0.804 ± 0.380	12158852	0.449	0.747	6.245×10^{-2}	2.84	0.532	0.981
number of spectral points in retrieval [1]	73.5 ± 0.5	12158852	1.000	73.0	52.0	156	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]	0.757 ± 0.357	5279548	0.570	1.000	0.0	1.000	0.430	1.000
sulfurdioxide total vertical column [DU]	$(5.013 \pm 115.894) \times 10^{-2}$	5279548	0.550	1.525×10^{-2}	-121	590	-0.254	0.296
sulfurdioxide total vertical column precision [DU]	0.583 ± 0.754	5279548	0.401	0.412	4.847×10^{-2}	703	0.267	0.668
sulfurdioxide slant column density corrected [DU]	$(2.803 \pm 55.261) \times 10^{-2}$	5279548	0.436	1.324×10^{-2}	-42.2	304	-0.202	0.233
sulfurdioxide slant column density cobra [DU]	$(2.725 \pm 45.580) \times 10^{-2}$	5279548	0.436	1.324×10^{-2}	-42.2	111	-0.202	0.233
sulfurdioxide slant column density cobra precision [DU]	0.352 ± 0.173	5279548	0.172	0.306	8.930×10^{-2}	42.3	0.243	0.415
sulfurdioxide slant column density window1 [DU]	0.155 ± 0.807	5279548	0.852	0.155	-105	139	-0.272	0.580
sulfurdioxide slant column density window1 precision [DU]	0.352 ± 0.173	5279548	0.172	0.306	8.930×10^{-2}	42.3	0.243	0.415
sulfurdioxide slant column density corrected win1 [DU]	$(5.728 \pm 80.746) \times 10^{-2}$	5279548	0.849	3.044×10^{-2}	-105	139	-0.385	0.463
background so2 slant column offset window1 [DU]	$(-9.772 \pm 13.744) \times 10^{-2}$	5279548	0.132	-0.129	-0.971	2.71	-0.177	-4.511×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.19 ± 10.76	5279548	13.0	1.92	-1.486×10^3	1.513×10^3	-4.46	8.53
sulfurdioxide slant column density window2 precision [DU]	9.31 ± 3.04	5279548	3.01	8.94	2.58	938	7.62	10.6
sulfurdioxide slant column density corrected win2 [DU]	0.521 ± 10.596	5279548	12.8	0.477	-1.487×10^3	1.511×10^3	-5.91	6.89
background so2 slant column offset window2 [DU]	-1.66 ± 2.34	5279548	2.83	-1.05	-15.2	10.9	-2.96	-0.125
sulfurdioxide slant column density window3 [DU]	-9.01 ± 27.52	5279548	34.7	-8.36	-702	727	-26.0	8.74
sulfurdioxide slant column density window3 precision [DU]	32.0 ± 12.9	5279548	10.6	29.1	9.18	350	24.7	35.3
sulfurdioxide slant column density corrected win3 [DU]	-1.84 ± 27.23	5279548	34.4	-1.46	-694	738	-18.8	15.6
background so2 slant column offset window3 [DU]	7.17 ± 4.50	5279548	6.19	6.27	-7.26	35.2	3.94	10.1
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.26	5279548	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.699 \pm 3.825) \times 10^{-2}$	5279548	1.363×10^{-2}	1.893×10^{-2}	1.094×10^{-3}	1.38	1.383×10^{-2}	2.745×10^{-2}
fitted radiance shift [nm]	$(-4.373 \pm 24.362) \times 10^{-4}$	5279548	1.808×10^{-3}	-4.156×10^{-4}	-7.457×10^{-2}	7.926×10^{-2}	-1.375×10^{-3}	4.326×10^{-4}
fitted radiance squeeze [1]	$(8.714 \pm 207.979) \times 10^{-6}$	5279548	2.318×10^{-4}	5.248×10^{-6}	-2.103×10^{-2}	2.581×10^{-2}	-1.092×10^{-4}	1.226×10^{-4}
fitted root mean square [1]	$(1.491 \pm 0.639) \times 10^{-3}$	5279548	6.906×10^{-4}	1.311×10^{-3}	3.798×10^{-4}	0.160	1.069×10^{-3}	1.760×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.824 ± 0.362	5279548	0.429	0.766	5.000×10^{-2}	2.64	0.581	1.01
sulfurdioxide total air mass factor polluted precision [1]	$(9.075 \pm 8.860) \times 10^{-2}$	5279548	8.153×10^{-2}	5.493×10^{-2}	2.819×10^{-3}	1.37	3.518×10^{-2}	0.117
sulfurdioxide clear air mass factor polluted [1]	0.698 ± 0.203	5279548	0.272	0.685	5.314×10^{-2}	1.69	0.560	0.832
number of spectral points in retrieval [1]	73.4 ± 0.5	5279548	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]	0.655 ± 0.392	11325200	0.760	1.000	0.0	1.000	0.240	1.000
sulfurdioxide total vertical column [DU]	$(3.136 \pm 94.083) \times 10^{-2}$	11325200	0.440	1.083×10^{-2}	-107	265	-0.206	0.234
sulfurdioxide total vertical column precision [DU]	0.485 ± 0.634	11325200	0.314	0.311	5.058×10^{-2}	147	0.216	0.530
sulfurdioxide slant column density corrected [DU]	$(1.929 \pm 39.082) \times 10^{-2}$	11325200	0.372	9.759×10^{-3}	-18.4	252	-0.174	0.197
sulfurdioxide slant column density cobra [DU]	$(1.915 \pm 37.203) \times 10^{-2}$	11325200	0.372	9.759×10^{-3}	-18.4	111	-0.174	0.197
sulfurdioxide slant column density cobra precision [DU]	0.299 ± 0.141	11325200	0.140	0.257	8.606×10^{-2}	42.3	0.210	0.350
sulfurdioxide slant column density window1 [DU]	0.128 ± 0.691	11325200	0.750	0.136	-45.2	139	-0.244	0.506
sulfurdioxide slant column density window1 precision [DU]	0.299 ± 0.141	11325200	0.140	0.257	8.606×10^{-2}	42.3	0.210	0.350
sulfurdioxide slant column density corrected win1 [DU]	$(4.195 \pm 68.184) \times 10^{-2}$	11325200	0.733	2.487×10^{-2}	-45.2	139	-0.336	0.396
background so2 slant column offset window1 [DU]	$(-8.586 \pm 14.763) \times 10^{-2}$	11325200	0.185	-0.119	-0.954	2.71	-0.190	-4.779×10^{-3}
sulfurdioxide slant column density window2 [DU]	1.60 ± 9.08	11325200	11.3	1.43	-1.423×10^3	1.344×10^3	-4.17	7.14
sulfurdioxide slant column density window2 precision [DU]	8.17 ± 2.33	11325200	2.63	7.80	2.05	732	6.66	9.29
sulfurdioxide slant column density corrected win2 [DU]	0.448 ± 8.970	11325200	11.2	0.436	-1.423×10^3	1.343×10^3	-5.17	6.04
background so2 slant column offset window2 [DU]	-1.15 ± 2.10	11325200	2.51	-0.711	-15.2	11.3	-2.32	0.195
sulfurdioxide slant column density window3 [DU]	-4.94 ± 23.96	11325200	29.8	-4.94	-304	288	-19.7	10.1
sulfurdioxide slant column density window3 precision [DU]	27.4 ± 11.8	11325200	9.83	24.4	9.23	274	20.6	30.5
sulfurdioxide slant column density corrected win3 [DU]	0.629 ± 23.424	11325200	29.3	0.524	-299	295	-14.0	15.3
background so2 slant column offset window3 [DU]	5.57 ± 4.62	11325200	6.21	5.45	-13.2	35.2	2.36	8.57
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	11325200	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.074 \pm 3.976) \times 10^{-2}$	11325200	1.498×10^{-2}	1.452×10^{-2}	2.437×10^{-4}	2.86	7.318×10^{-3}	2.229×10^{-2}
fitted radiance shift [nm]	$(-1.426 \pm 22.665) \times 10^{-4}$	11325200	1.682×10^{-3}	-1.276×10^{-4}	-5.688×10^{-2}	8.502×10^{-2}	-9.990×10^{-4}	6.831×10^{-4}
fitted radiance squeeze [1]	$(-4.624 \pm 19.325) \times 10^{-5}$	11325200	2.228×10^{-4}	-3.932×10^{-5}	-2.103×10^{-2}	2.138×10^{-2}	-1.546×10^{-4}	6.820×10^{-5}
fitted root mean square [1]	$(1.307 \pm 0.556) \times 10^{-3}$	11325200	5.715×10^{-4}	1.143×10^{-3}	3.293×10^{-4}	0.160	9.486×10^{-4}	1.520×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.898 ± 0.428	11325200	0.516	0.845	5.000×10^{-2}	2.48	0.611	1.13
sulfurdioxide total air mass factor polluted precision [1]	0.113 ± 0.136	11325200	9.095×10^{-2}	6.893×10^{-2}	2.925×10^{-3}	2.15	4.114×10^{-2}	0.132
sulfurdioxide clear air mass factor polluted [1]	0.785 ± 0.328	11325200	0.356	0.744	6.969×10^{-2}	2.53	0.576	0.932
number of spectral points in retrieval [1]	73.5 ± 0.5	11325200	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]	0.651 ± 0.421	4241503	0.820	1.000	0.0	1.000	0.180	1.000
sulfurdioxide total vertical column [DU]	$(2.716 \pm 102.467) \times 10^{-2}$	4241503	0.413	8.947×10^{-3}	-121	457	-0.194	0.219
sulfurdioxide total vertical column precision [DU]	0.481 ± 0.655	4241503	0.342	0.321	4.192×10^{-2}	69.6	0.192	0.534
sulfurdioxide slant column density corrected [DU]	$(1.729 \pm 43.835) \times 10^{-2}$	4241503	0.352	8.610×10^{-3}	-42.2	284	-0.166	0.186
sulfurdioxide slant column density cobra [DU]	$(1.672 \pm 34.553) \times 10^{-2}$	4241503	0.352	8.610×10^{-3}	-42.2	50.2	-0.166	0.186
sulfurdioxide slant column density cobra precision [DU]	0.281 ± 0.131	4241503	0.106	0.243	8.930×10^{-2}	24.4	0.207	0.313
sulfurdioxide slant column density window1 [DU]	0.150 ± 0.643	4241503	0.706	0.143	-105	59.6	-0.208	0.498
sulfurdioxide slant column density window1 precision [DU]	0.281 ± 0.131	4241503	0.106	0.243	8.930×10^{-2}	24.4	0.207	0.313
sulfurdioxide slant column density corrected win1 [DU]	$(2.898 \pm 63.327) \times 10^{-2}$	4241503	0.690	1.236×10^{-2}	-105	59.4	-0.327	0.363
background so2 slant column offset window1 [DU]	-0.121 ± 0.124	4241503	0.142	-0.150	-0.971	1.46	-0.203	-6.087×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.13 ± 9.37	4241503	11.3	1.11	-1.486×10^3	1.513×10^3	-4.56	6.77
sulfurdioxide slant column density window2 precision [DU]	8.40 ± 2.99	4241503	2.91	7.99	2.29	891	6.69	9.60
sulfurdioxide slant column density corrected win2 [DU]	0.413 ± 9.335	4241503	11.2	0.428	-1.487×10^3	1.511×10^3	-5.21	6.03
background so2 slant column offset window2 [DU]	-0.715 ± 1.719	4241503	1.93	-0.511	-14.3	11.3	-1.66	0.268
sulfurdioxide slant column density window3 [DU]	-12.0 ± 24.3	4241503	29.5	-11.2	-702	1.488×10^3	-26.3	3.17
sulfurdioxide slant column density window3 precision [DU]	31.5 ± 17.6	4241503	13.5	26.9	9.32	602	21.5	34.9
sulfurdioxide slant column density corrected win3 [DU]	-6.65 ± 24.33	4241503	29.7	-5.90	-694	1.488×10^3	-21.2	8.56
background so2 slant column offset window3 [DU]	5.33 ± 4.28	4241503	6.32	5.70	-11.8	28.0	2.20	8.52
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.10	4241503	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(4.691 \pm 7.099) \times 10^{-2}$	4241503	4.788×10^{-2}	2.621×10^{-2}	1.487×10^{-4}	2.95	7.576×10^{-3}	5.545×10^{-2}
fitted radiance shift [nm]	$(-9.633 \pm 345.666) \times 10^{-5}$	4241503	1.884×10^{-3}	-1.624×10^{-4}	-7.457×10^{-2}	7.926×10^{-2}	-1.077×10^{-3}	8.069×10^{-4}
fitted radiance squeeze [1]	$(-5.493 \pm 18.605) \times 10^{-5}$	4241503	2.156×10^{-4}	-5.075×10^{-5}	-1.554×10^{-2}	2.562×10^{-2}	-1.605×10^{-4}	5.509×10^{-5}
fitted root mean square [1]	$(1.229 \pm 0.486) \times 10^{-3}$	4241503	4.273×10^{-4}	1.110×10^{-3}	3.514×10^{-4}	5.595×10^{-2}	9.438×10^{-4}	1.371×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.944 ± 0.567	4241503	0.726	0.774	5.000×10^{-2}	2.81	0.532	1.26
sulfurdioxide total air mass factor polluted precision [1]	0.125 ± 0.124	4241503	0.152	8.584×10^{-2}	2.819×10^{-3}	1.85	3.285×10^{-2}	0.185
sulfurdioxide clear air mass factor polluted [1]	0.760 ± 0.365	4241503	0.387	0.675	5.341×10^{-2}	2.84	0.521	0.907
number of spectral points in retrieval [1]	73.4 ± 0.5	4241503	1.000	73.0	52.0	156	73.0	74.0

3 Granule outlines

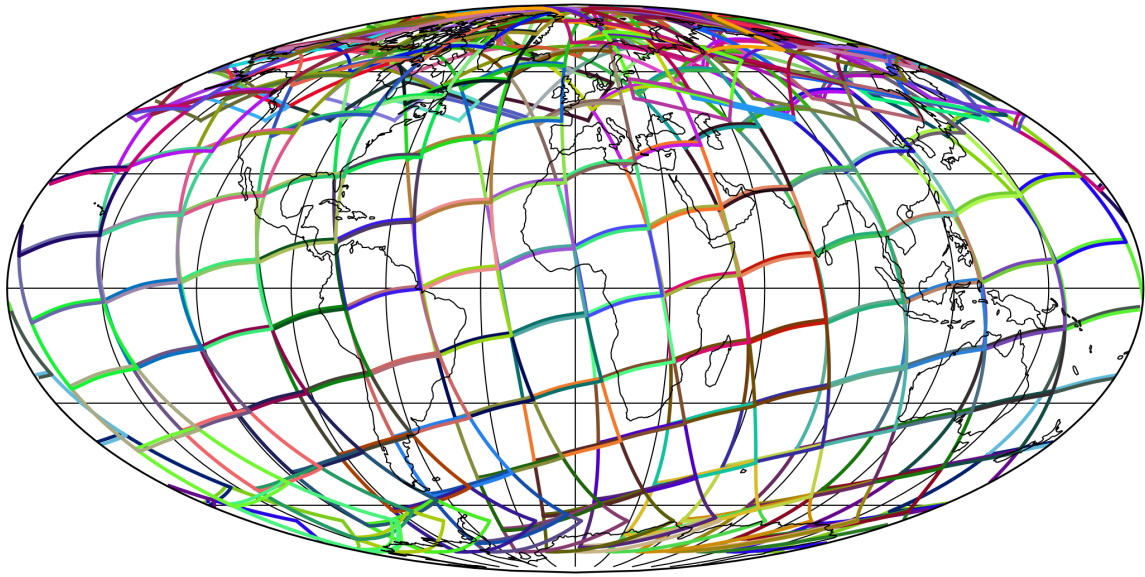


Figure 1: Outline of the granules.

4 Input data monitoring

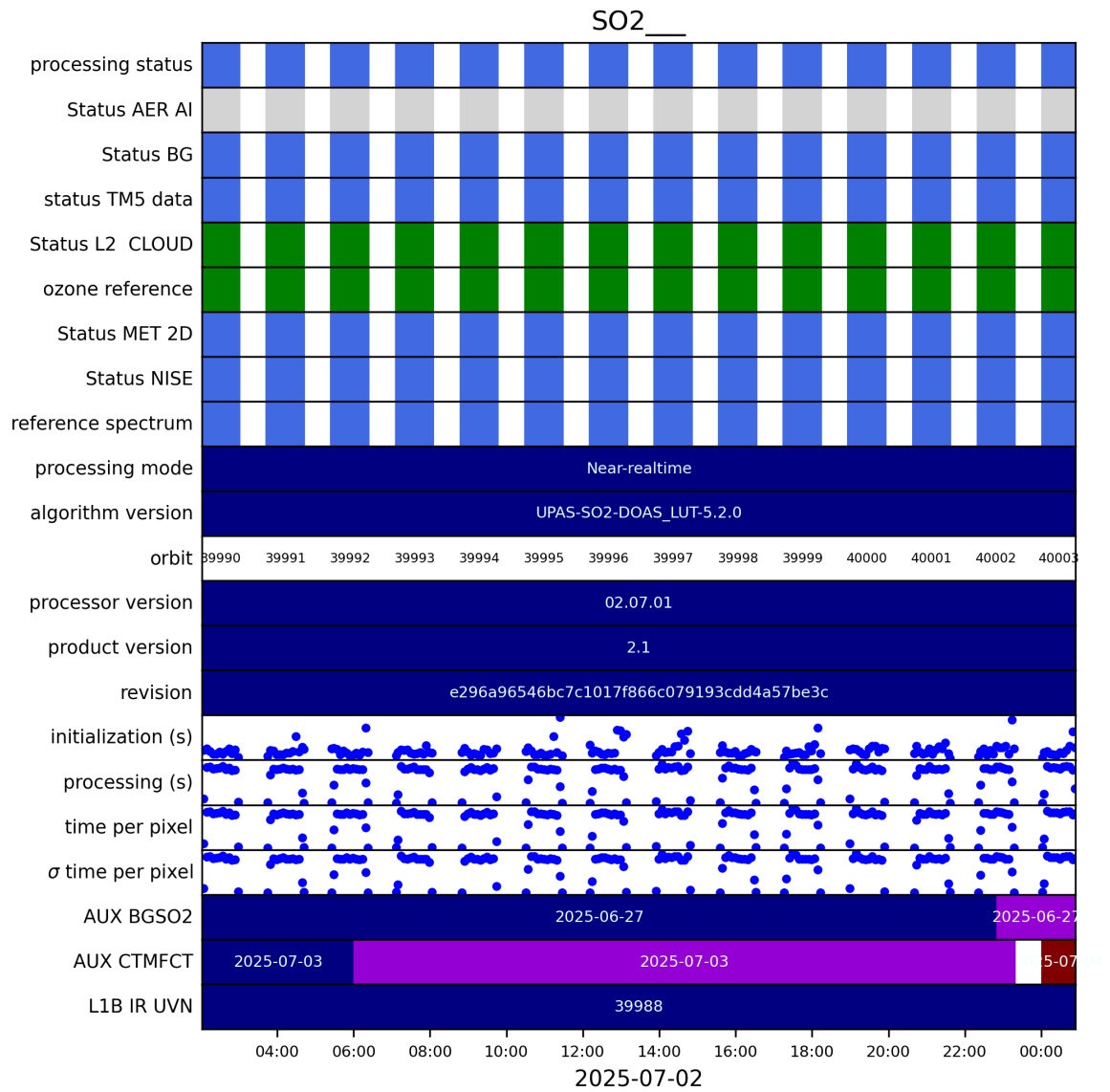


Figure 2: Input data per granule

5 Warnings and errors

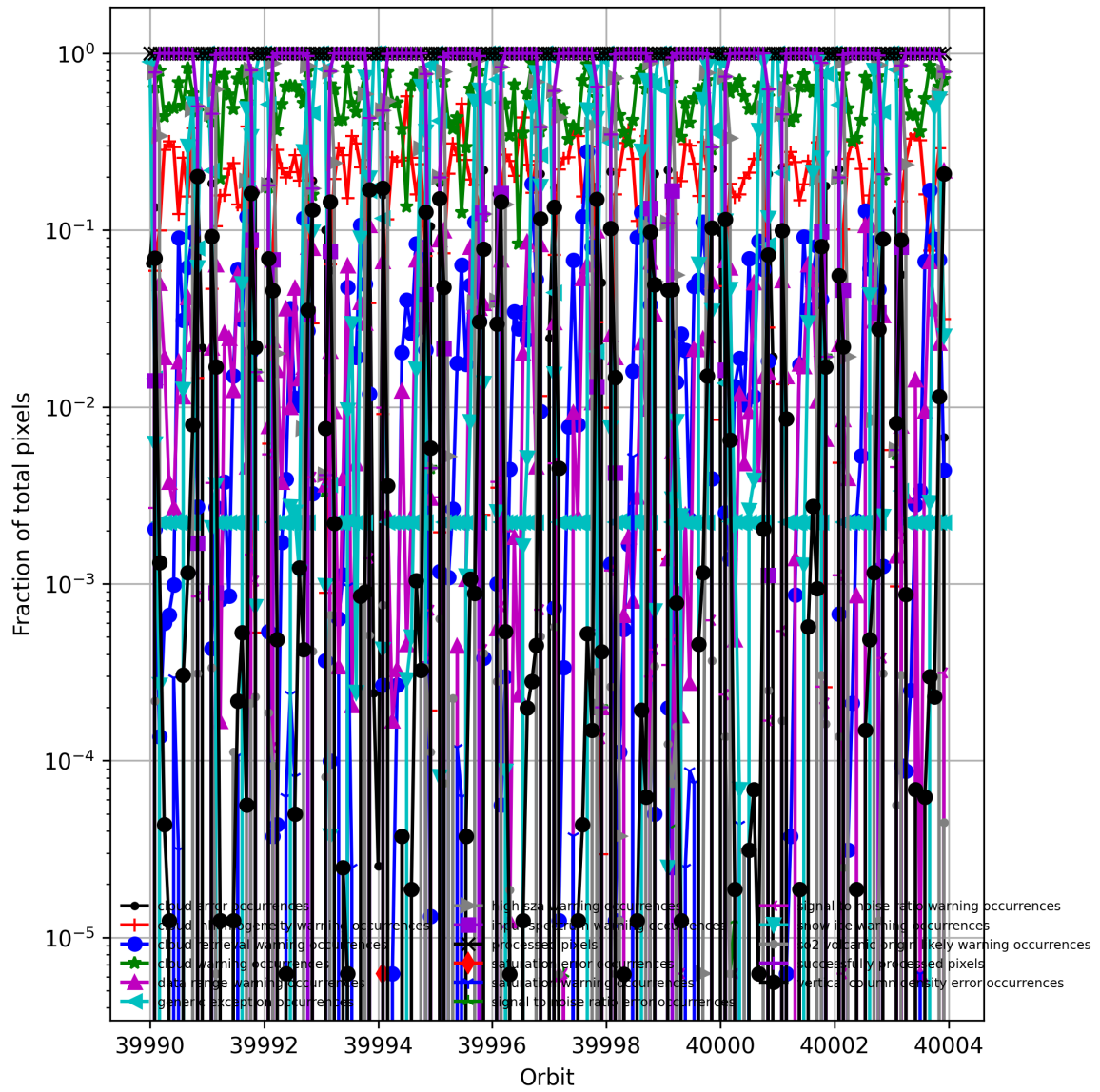


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

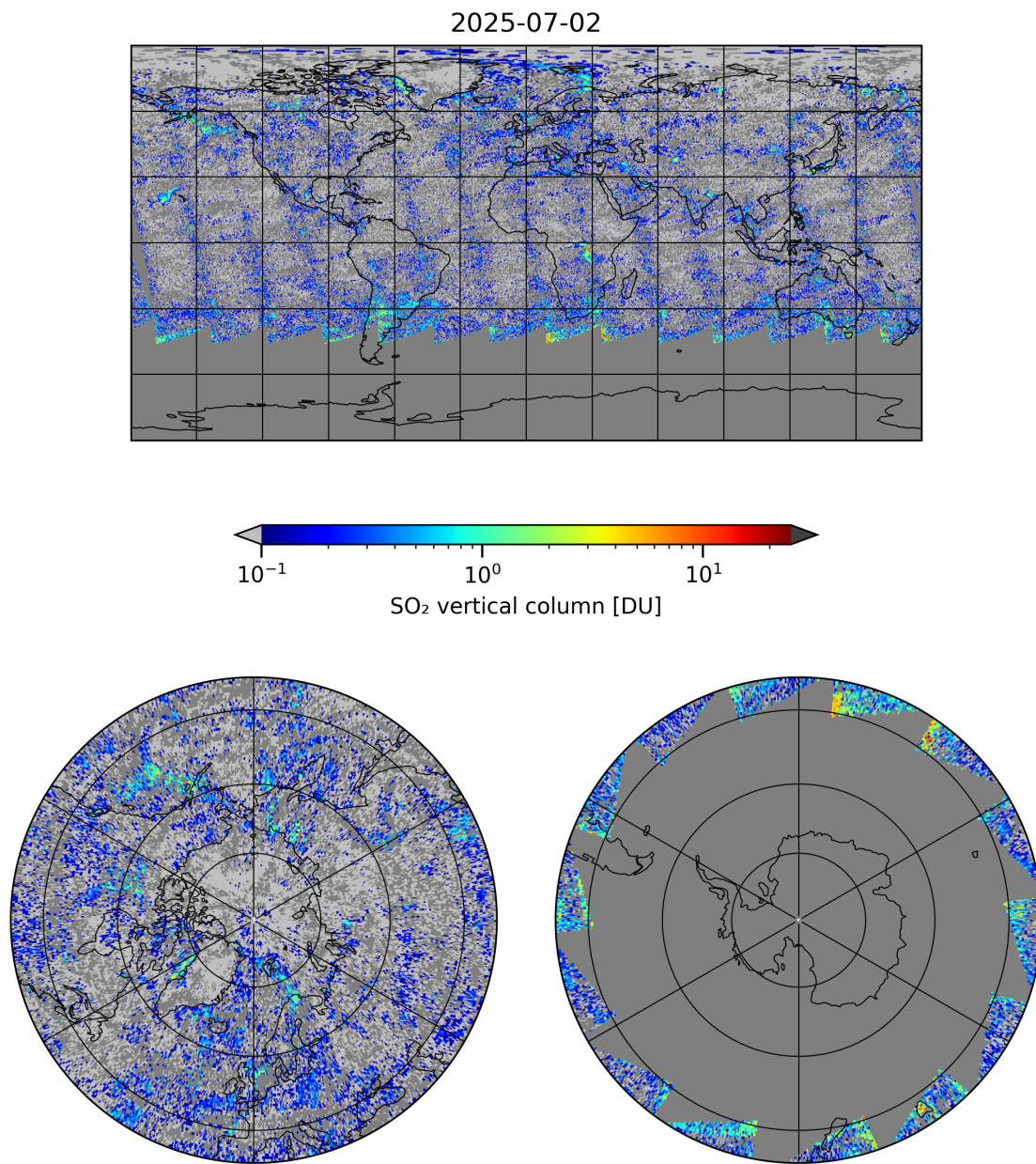


Figure 4: Map of “SO₂ vertical column” for 2025-07-02 to 2025-07-03

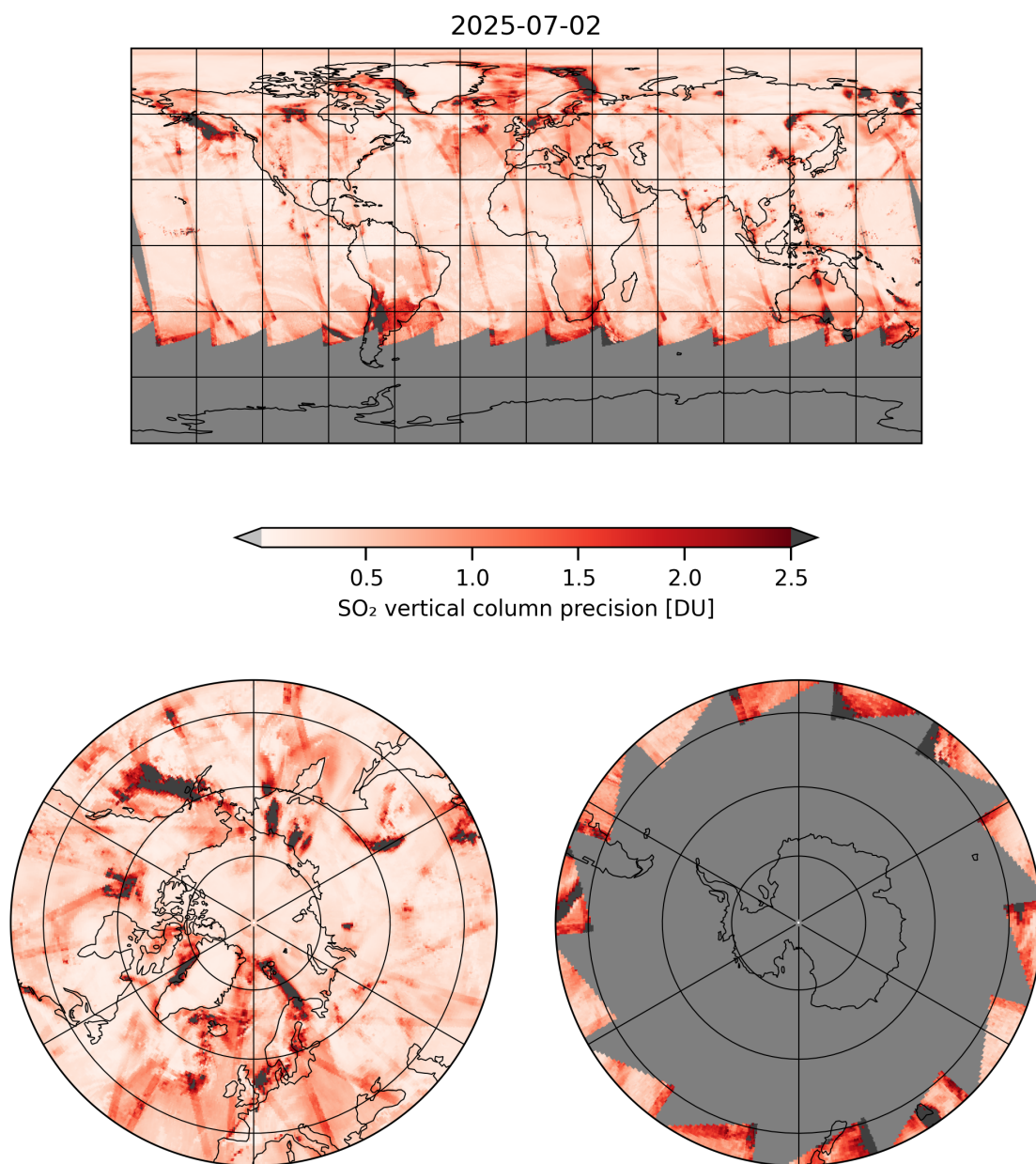


Figure 5: Map of “SO₂ vertical column precision” for 2025-07-02 to 2025-07-03

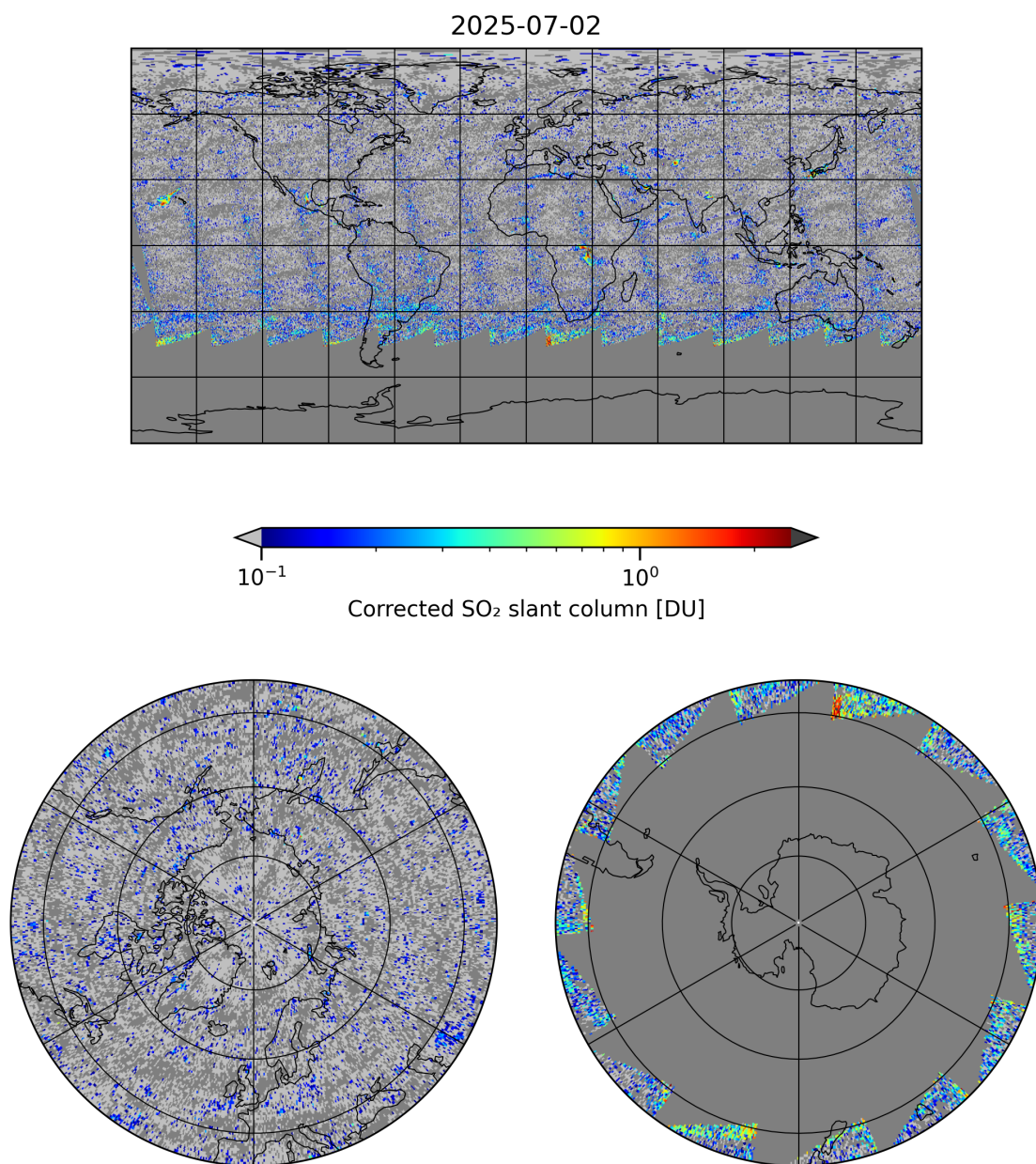


Figure 6: Map of “Corrected SO₂ slant column” for 2025-07-02 to 2025-07-03

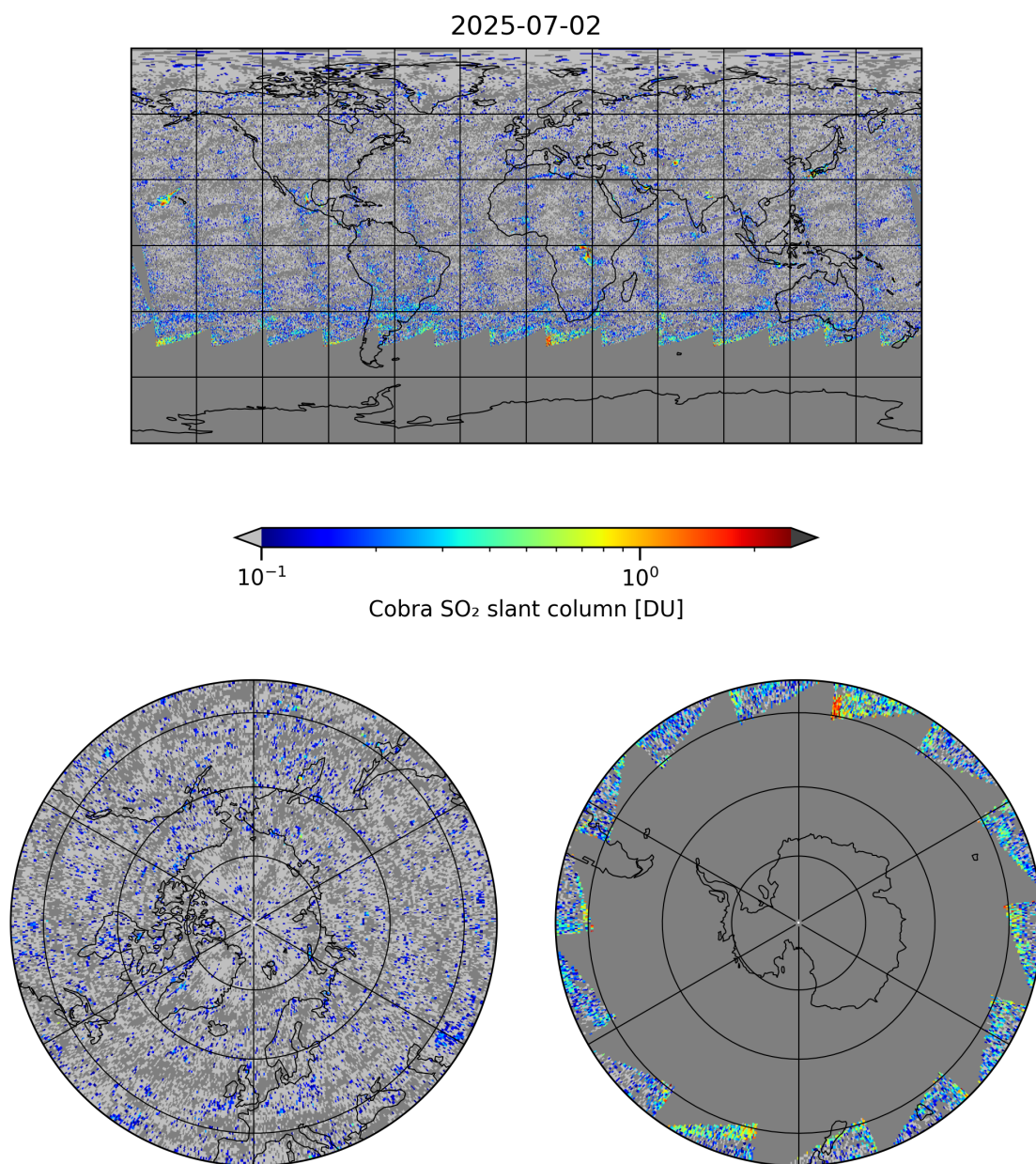


Figure 7: Map of “Cobra SO₂ slant column” for 2025-07-02 to 2025-07-03

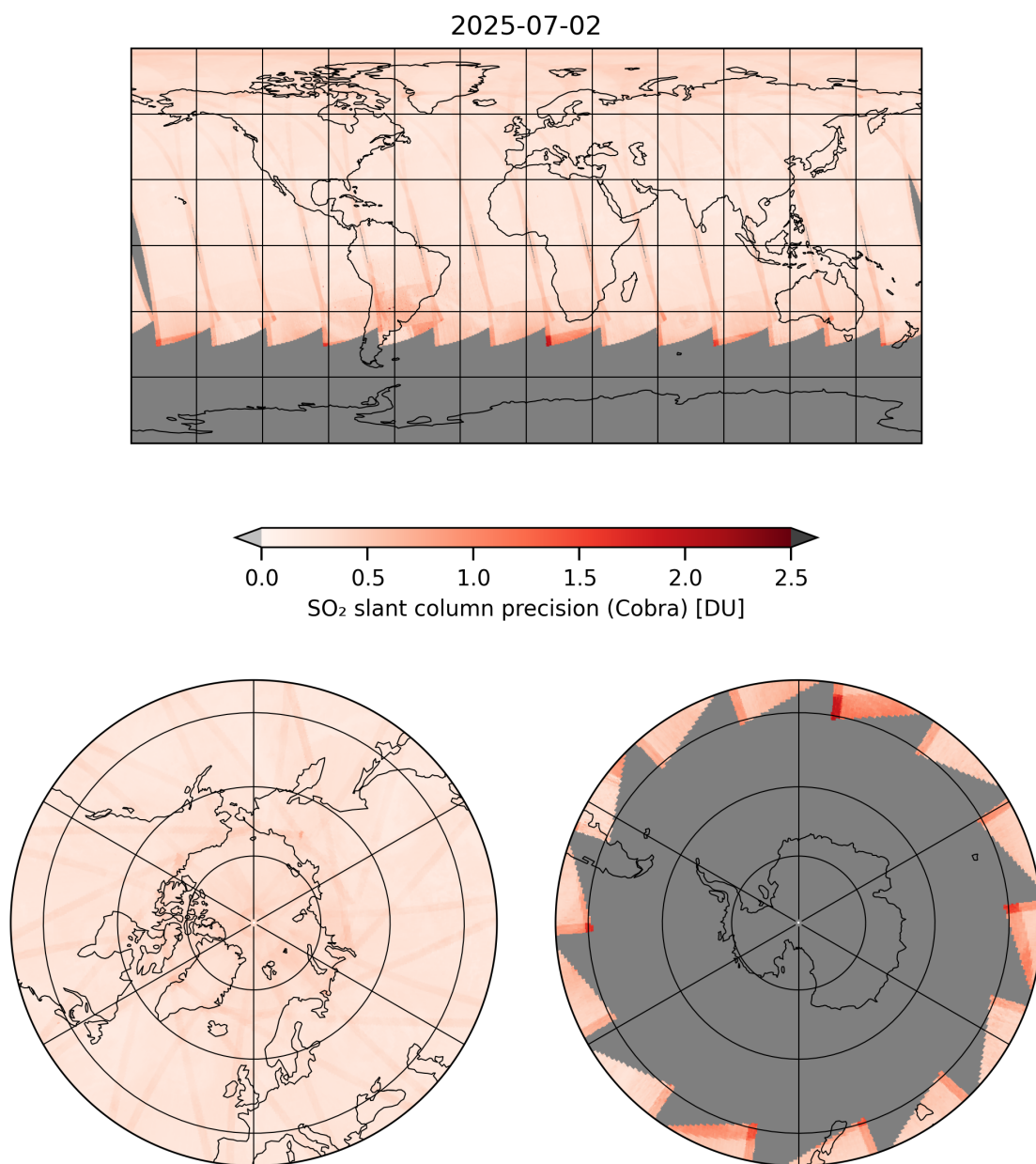


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-07-02 to 2025-07-03

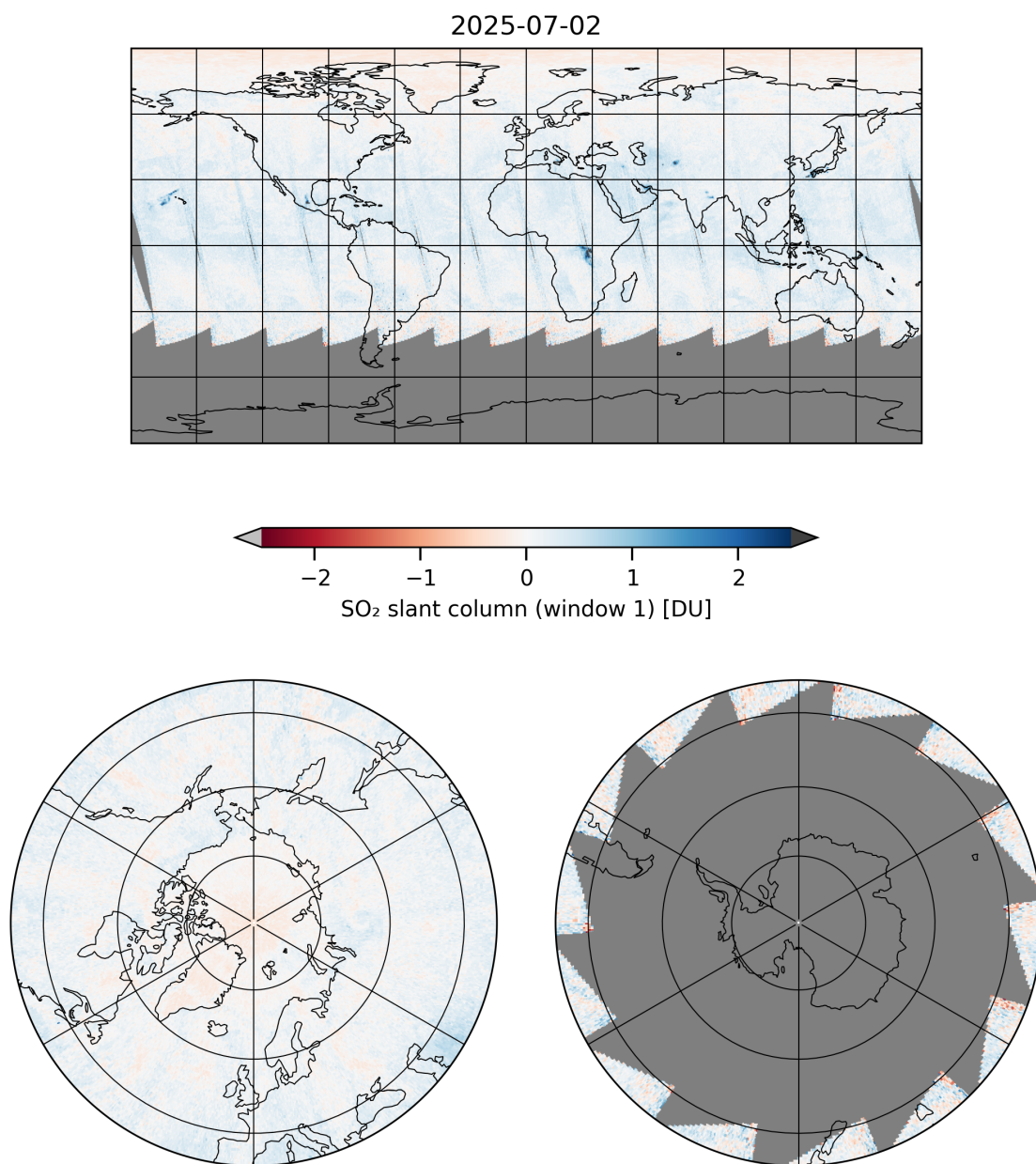


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-07-02 to 2025-07-03

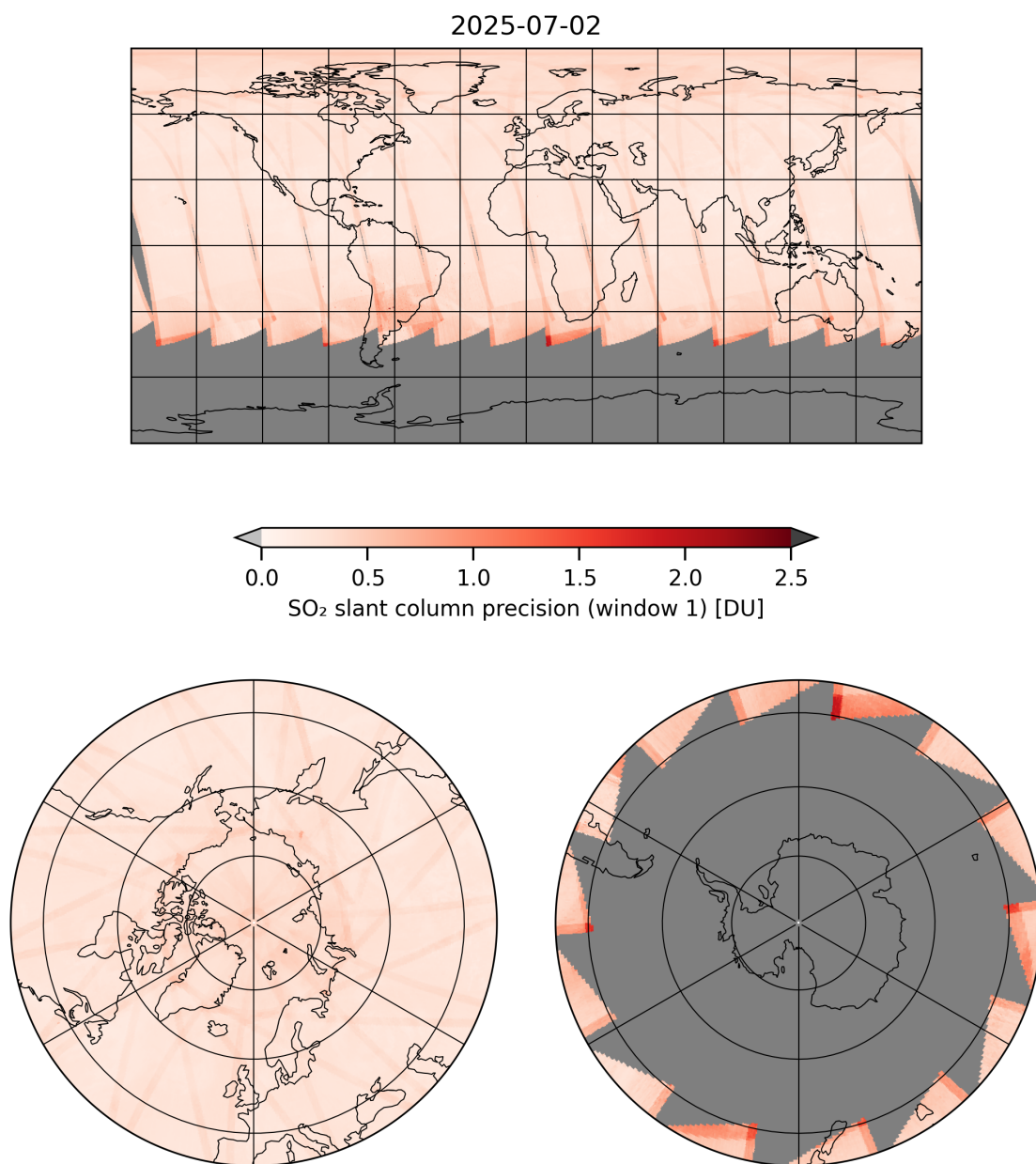


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-07-02 to 2025-07-03

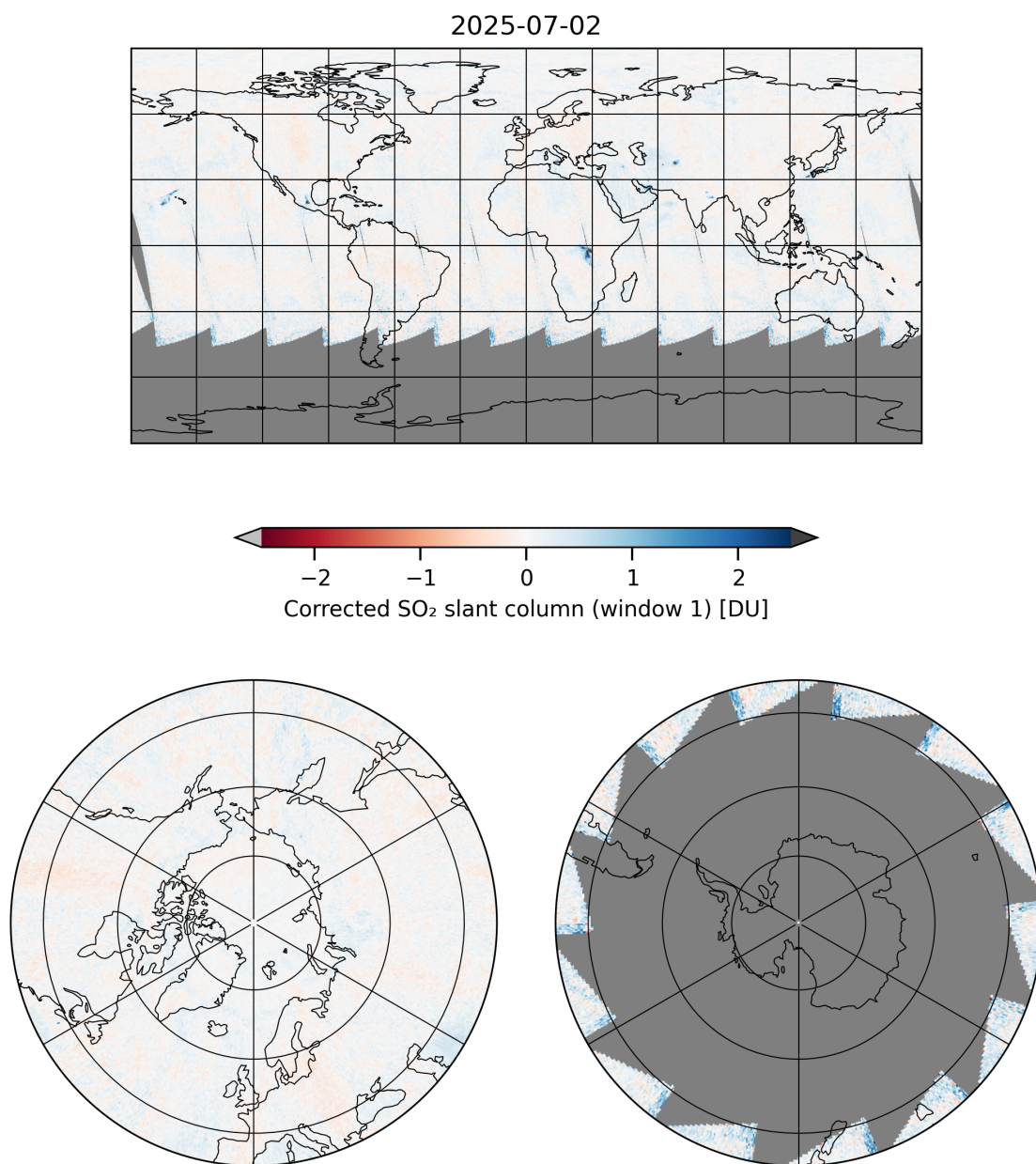


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-07-02 to 2025-07-03

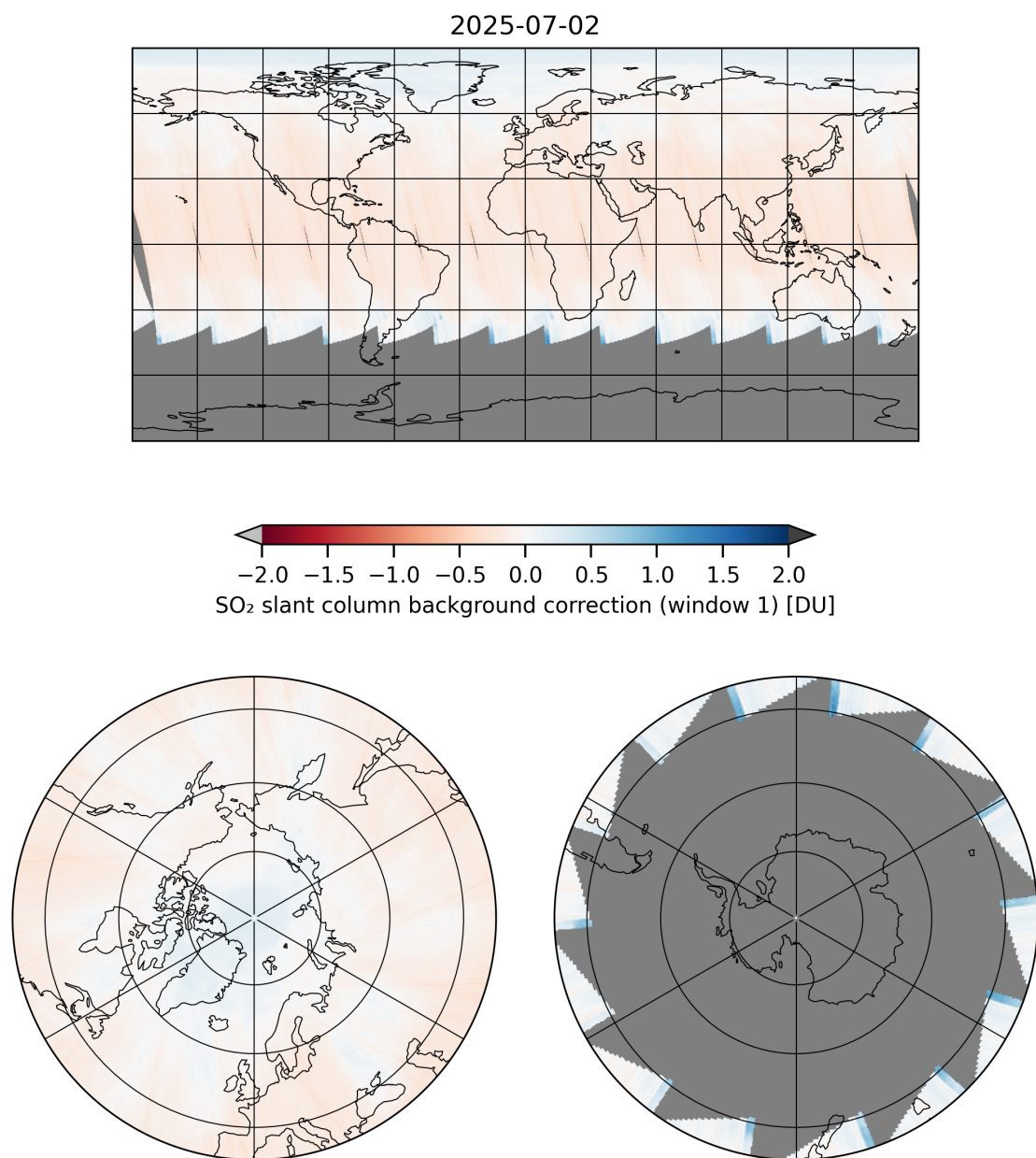


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-07-02 to 2025-07-03

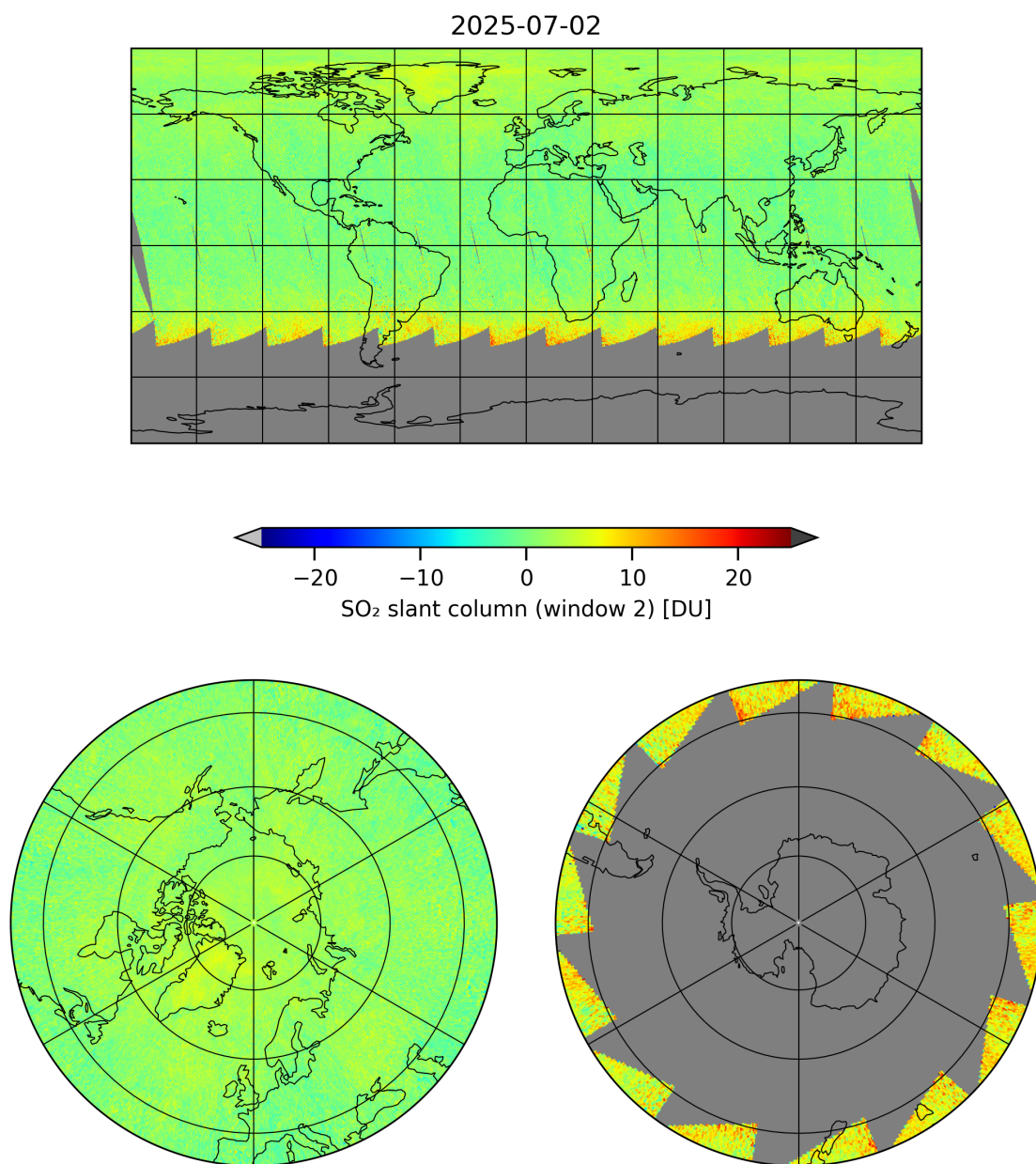


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-07-02 to 2025-07-03

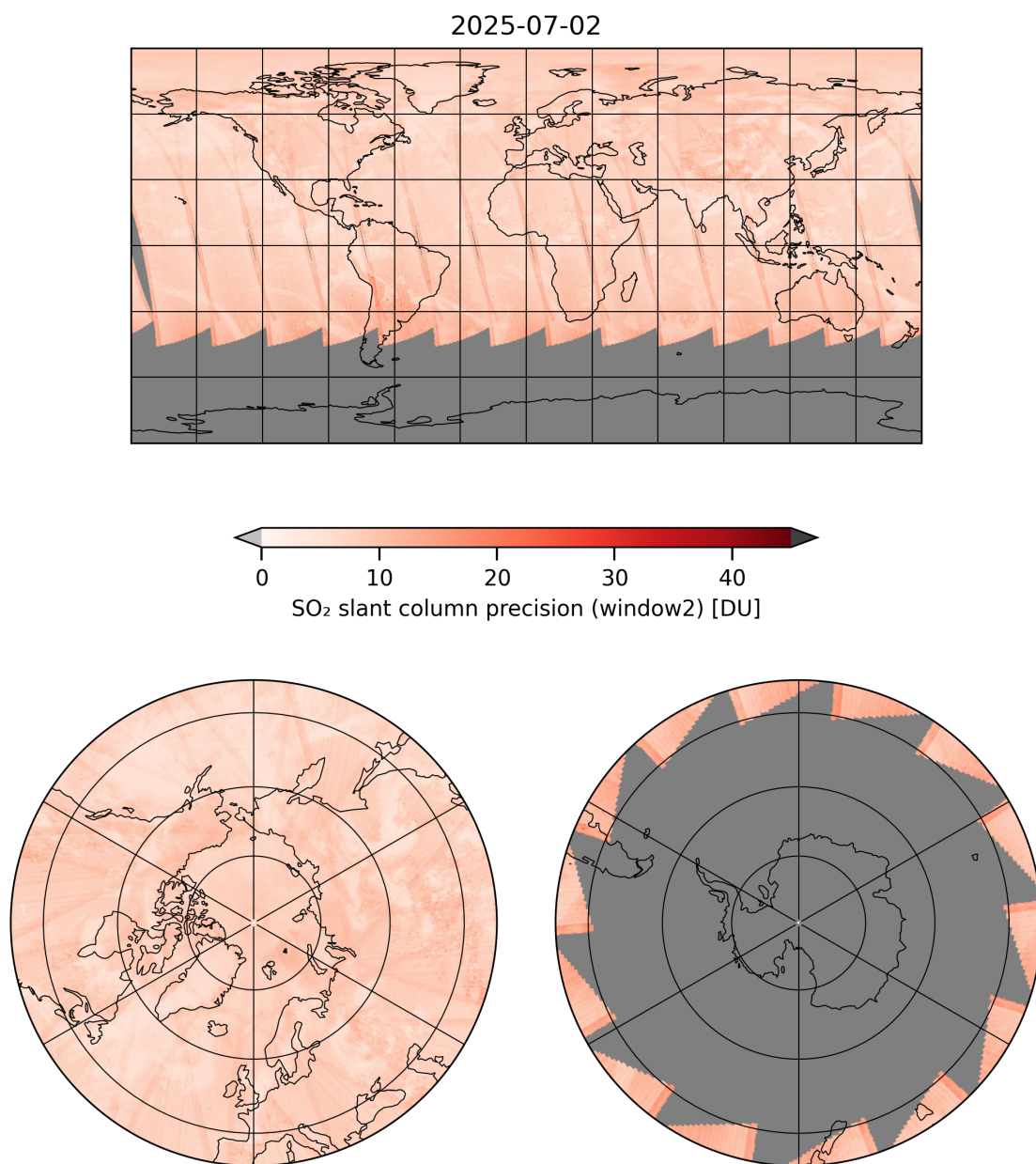


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-07-02 to 2025-07-03

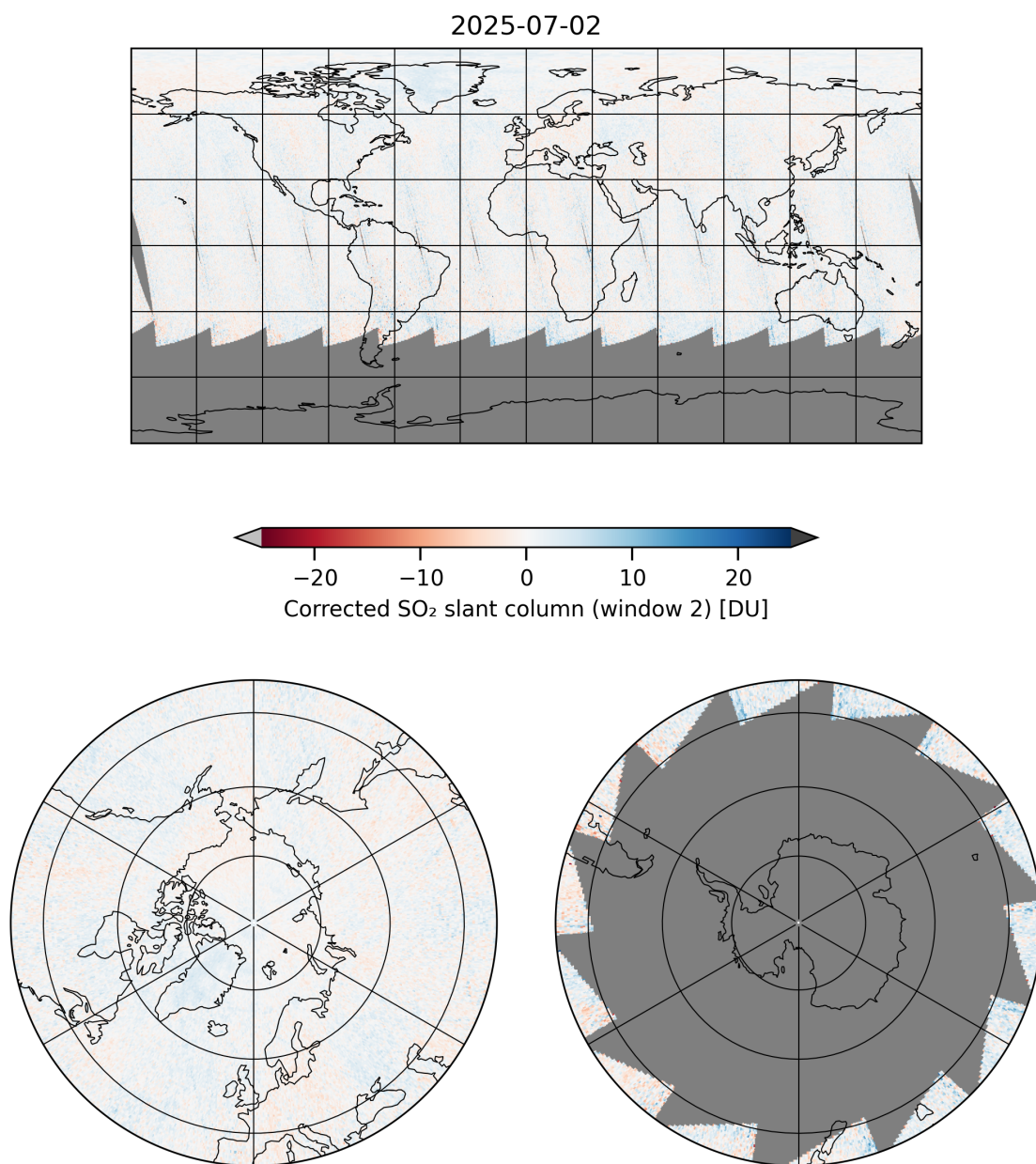


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-07-02 to 2025-07-03

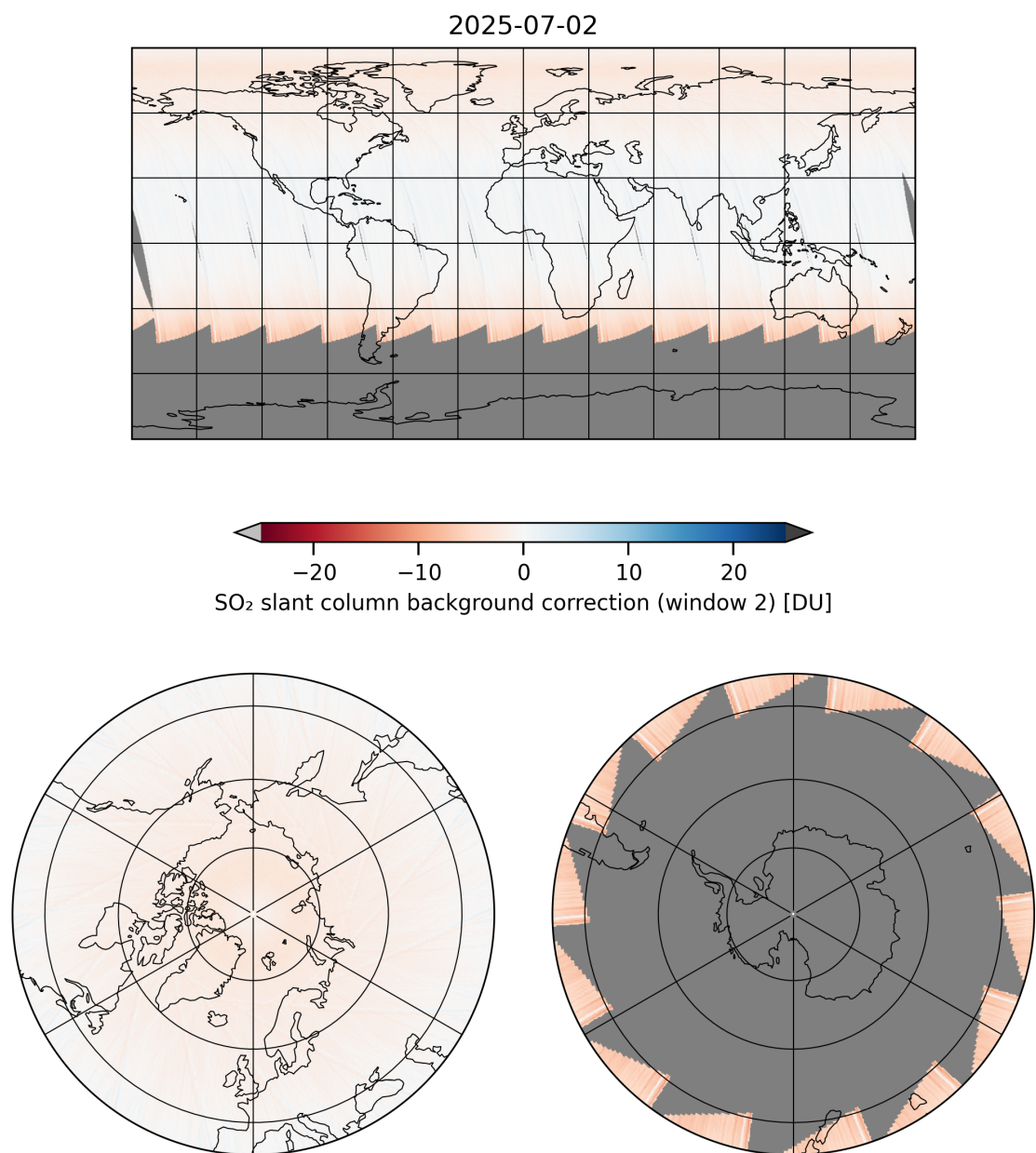


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-07-02 to 2025-07-03

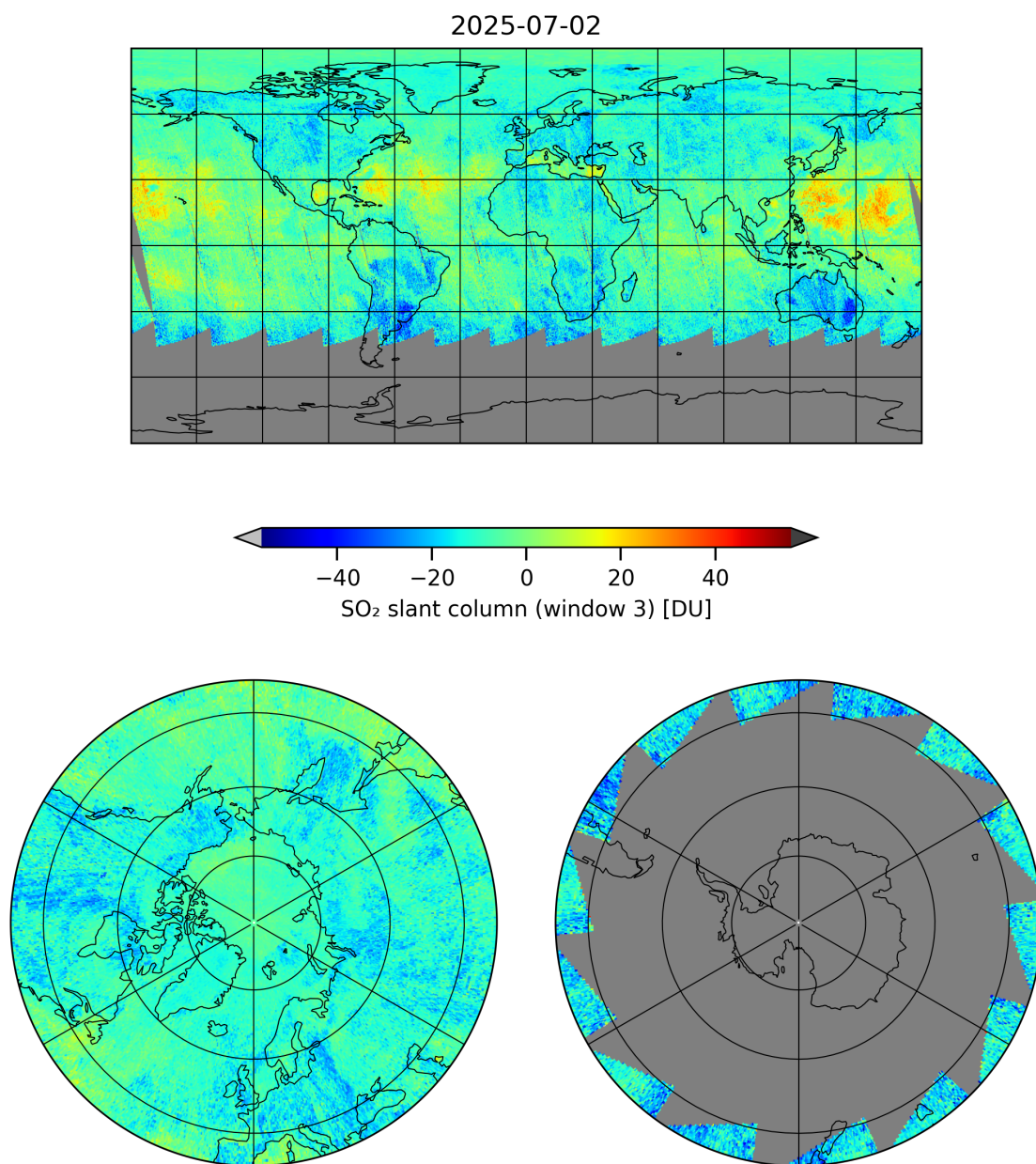


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-07-02 to 2025-07-03

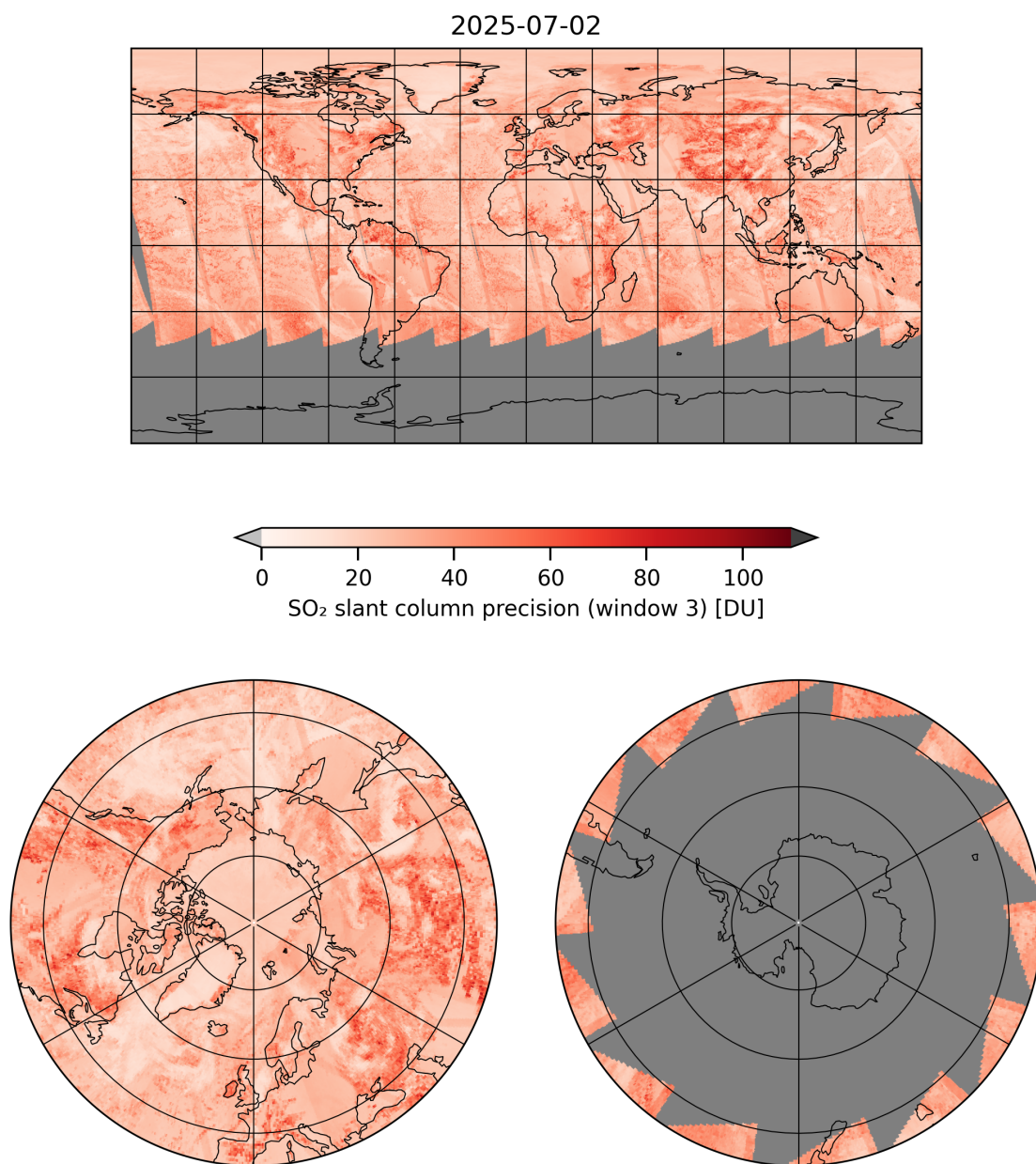


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-07-02 to 2025-07-03

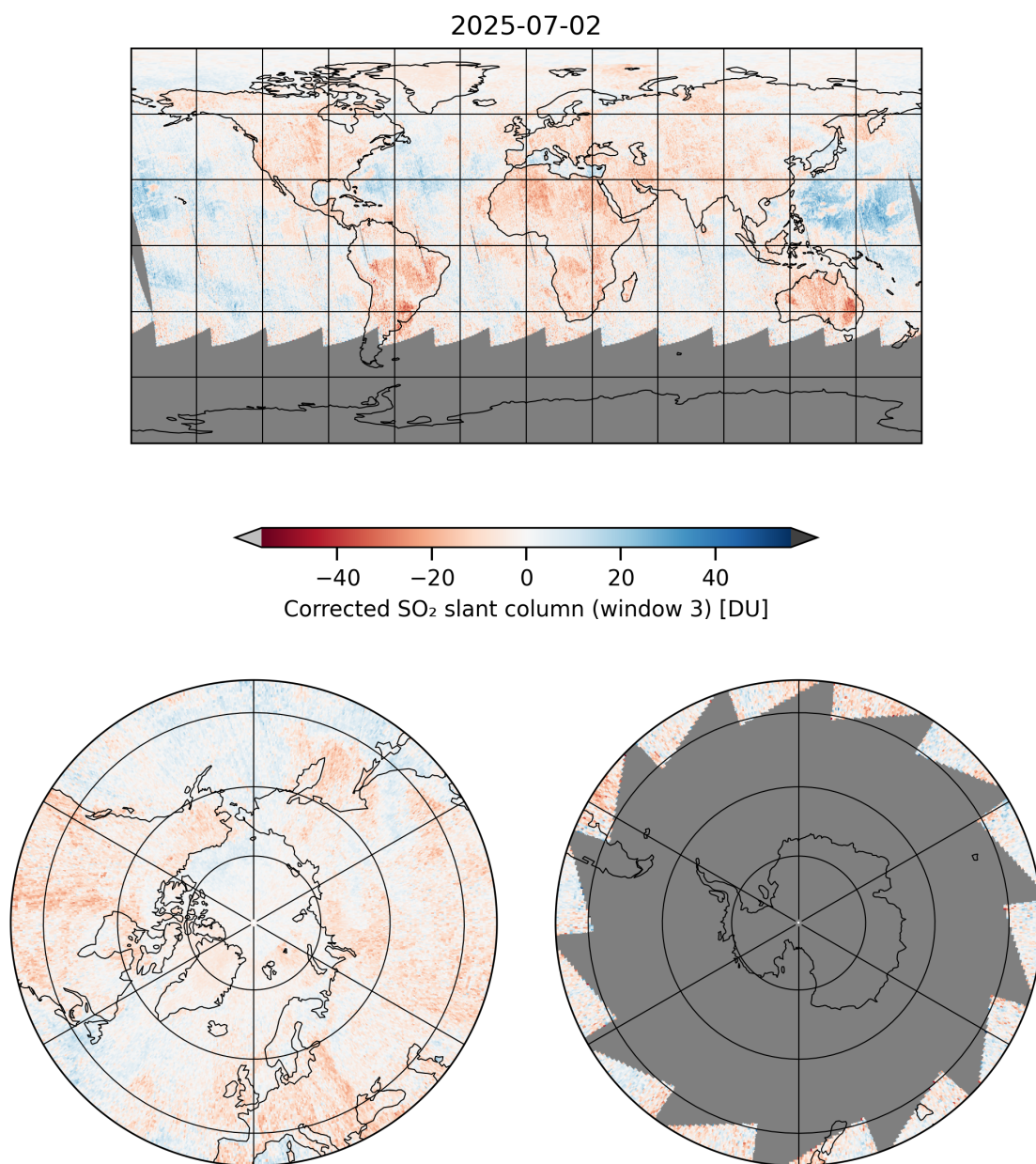
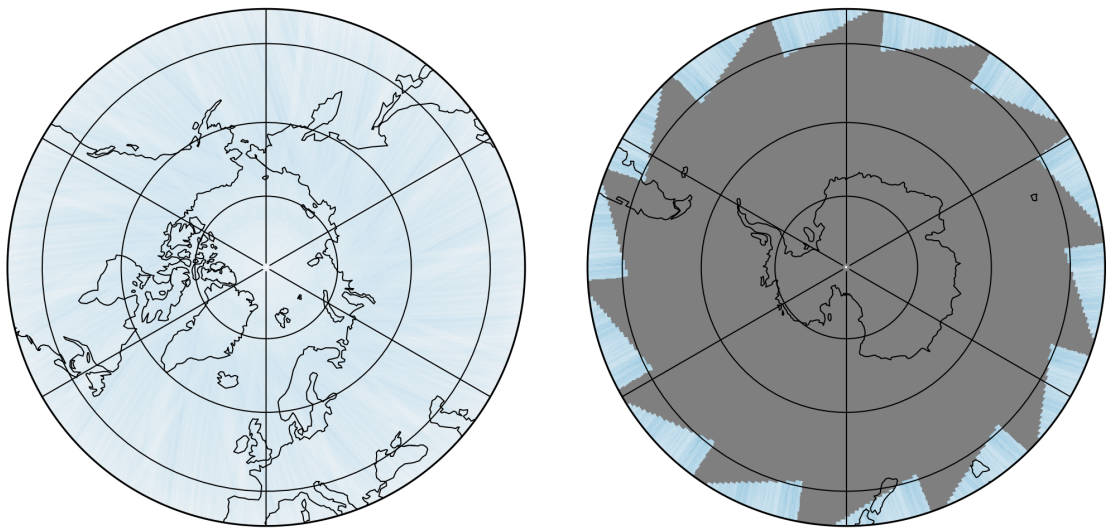


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-07-02 to 2025-07-03



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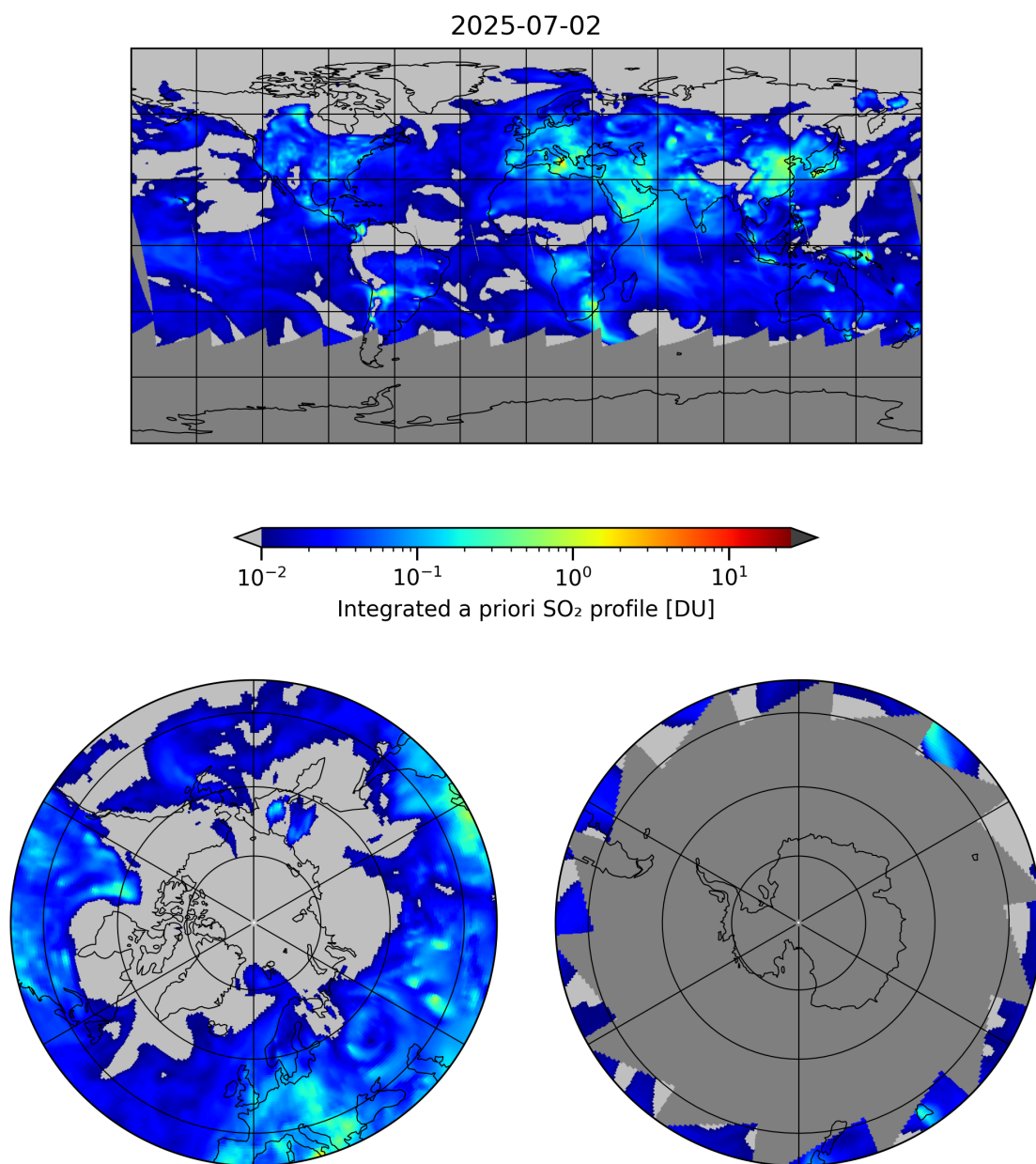


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-07-02 to 2025-07-03

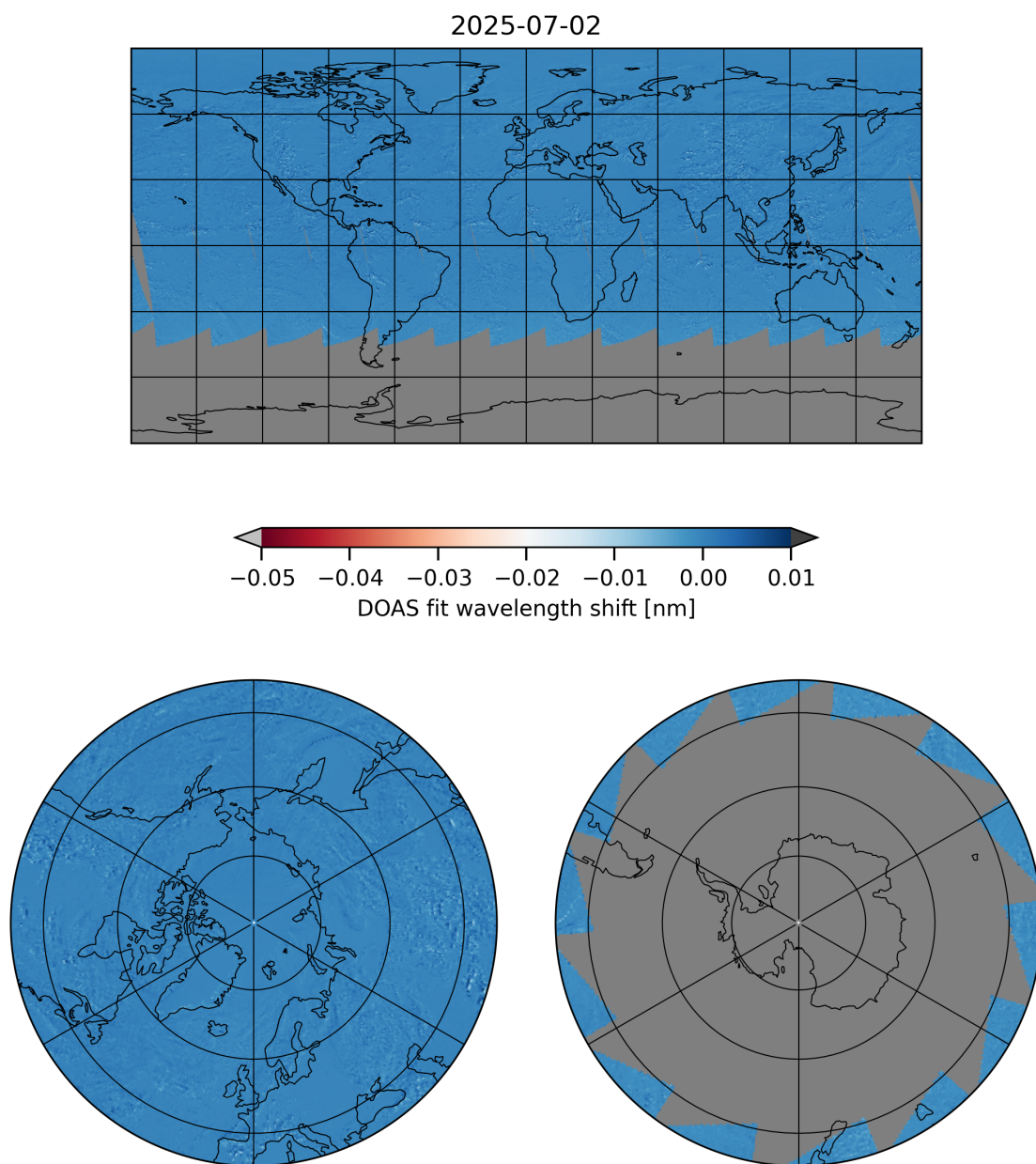


Figure 22: Map of “DOAS fit wavelength shift” for 2025-07-02 to 2025-07-03

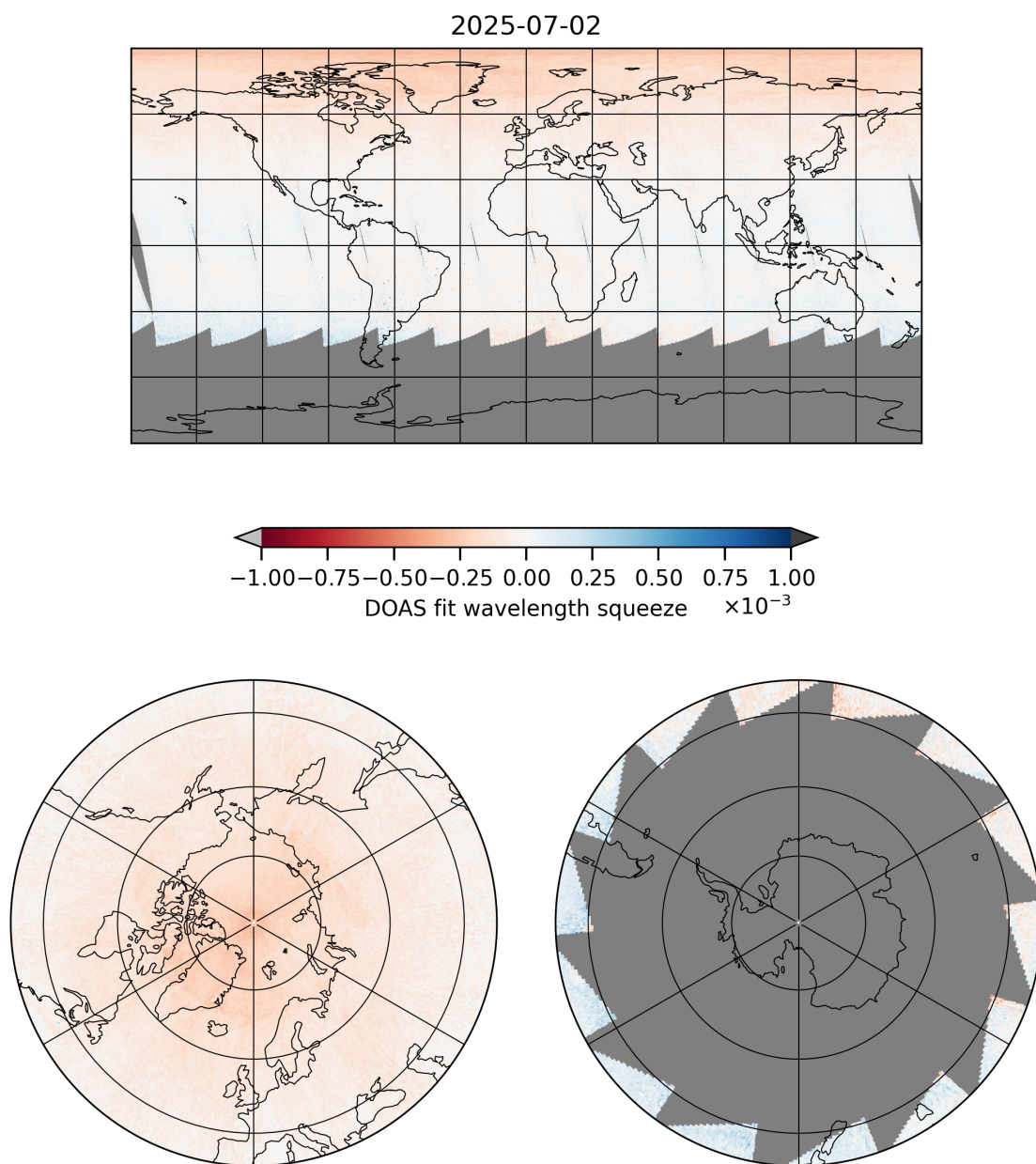


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-07-02 to 2025-07-03

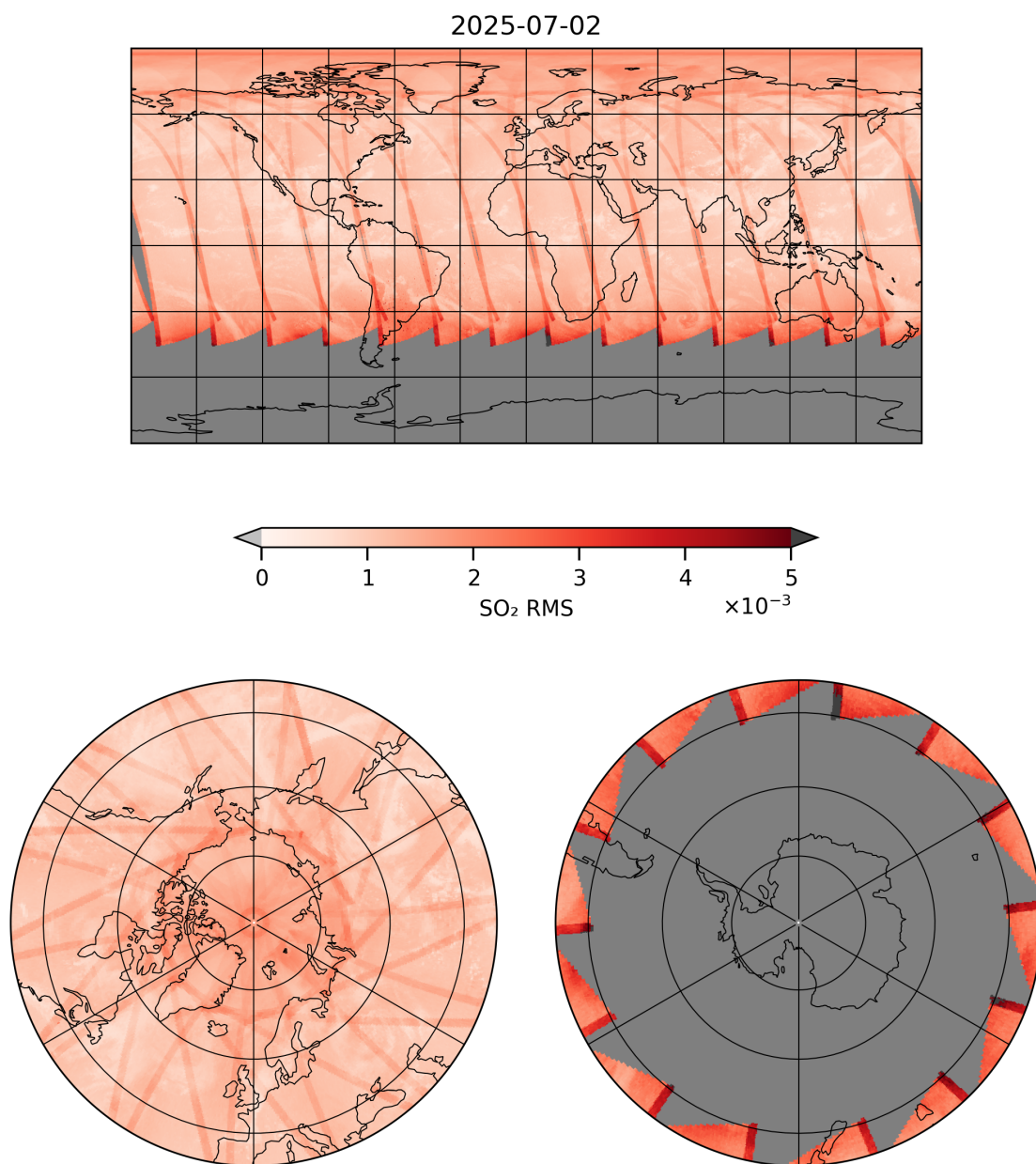


Figure 24: Map of “SO₂ RMS” for 2025-07-02 to 2025-07-03

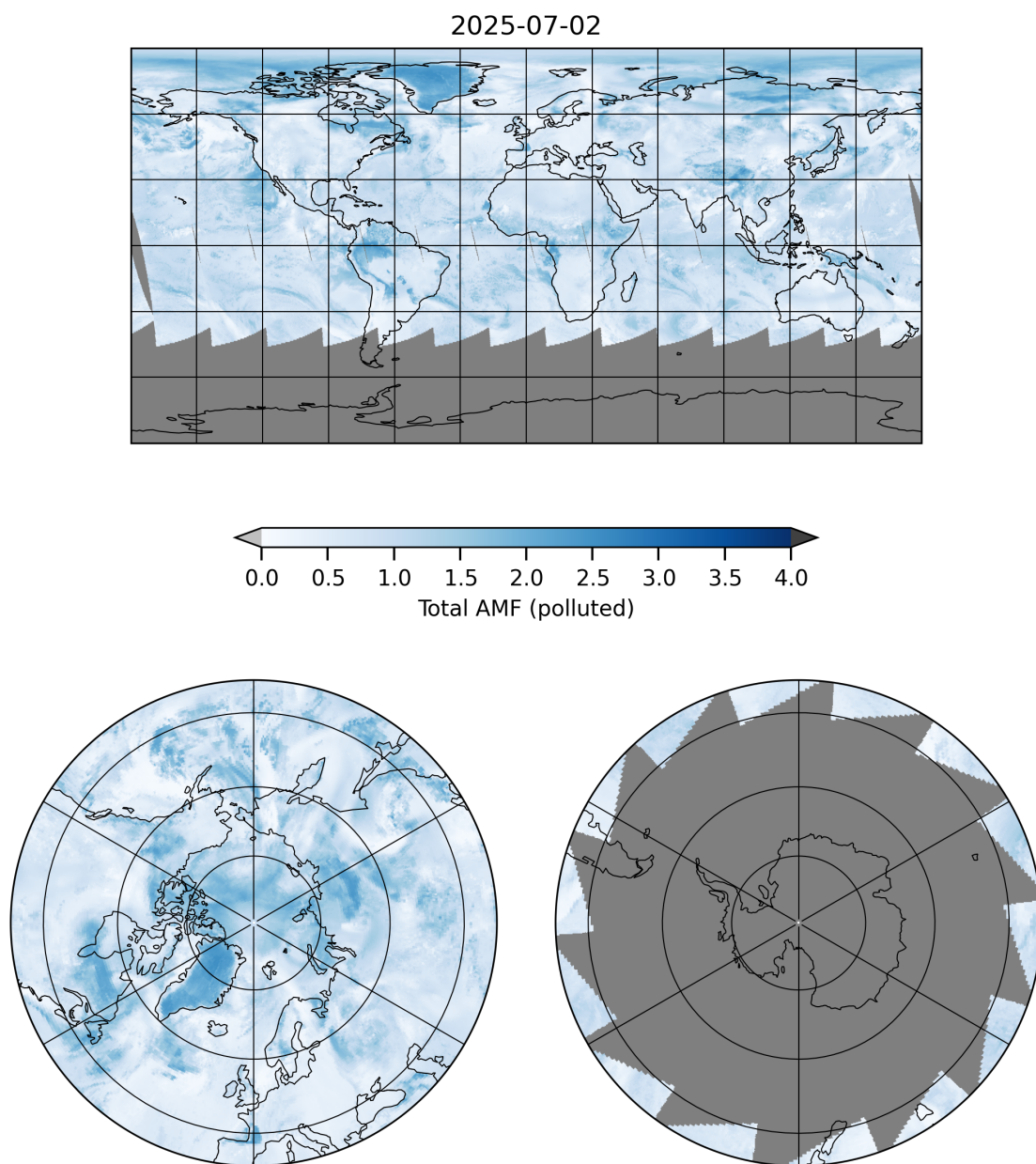


Figure 25: Map of “Total AMF (polluted)” for 2025-07-02 to 2025-07-03

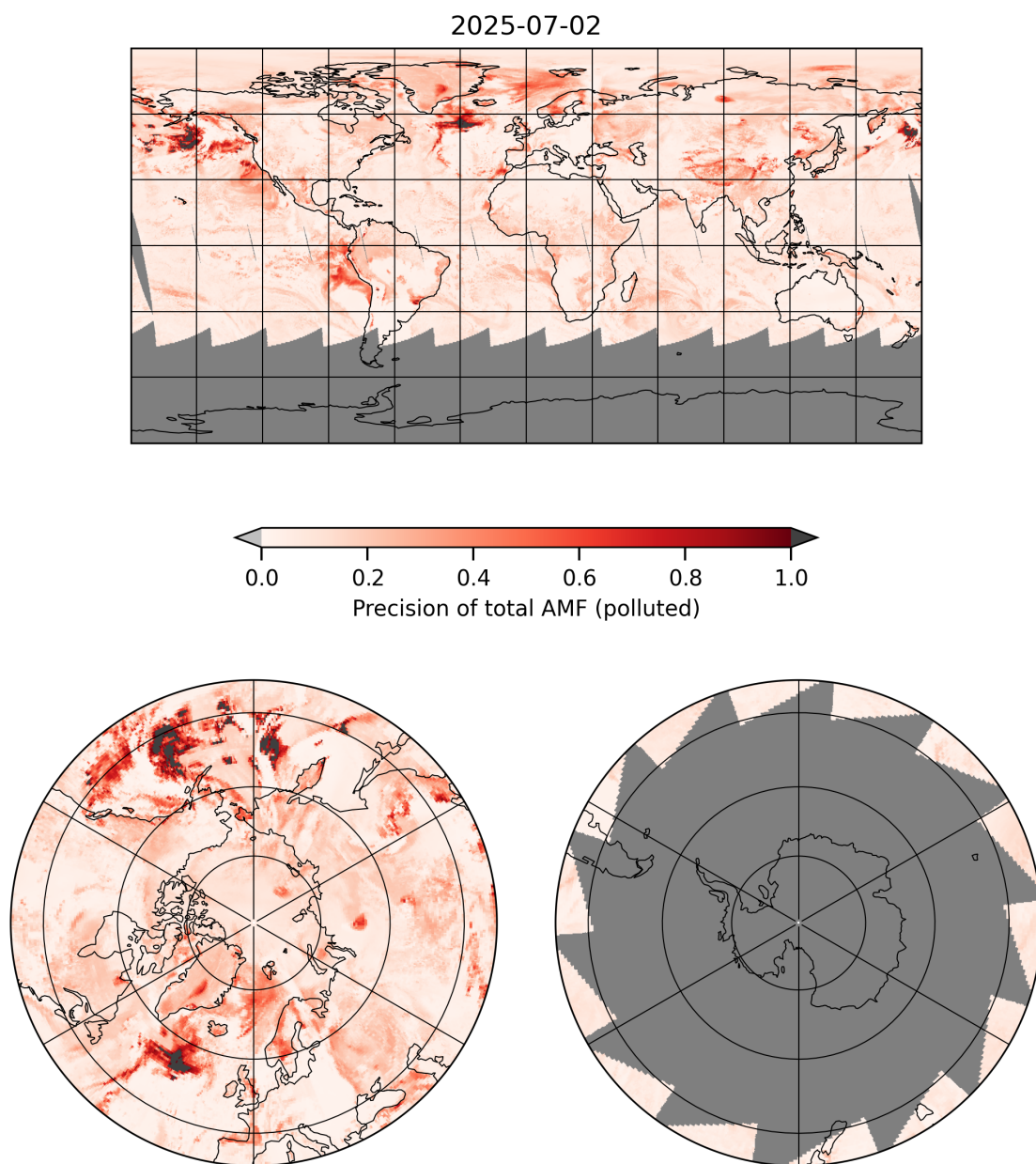


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-07-02 to 2025-07-03

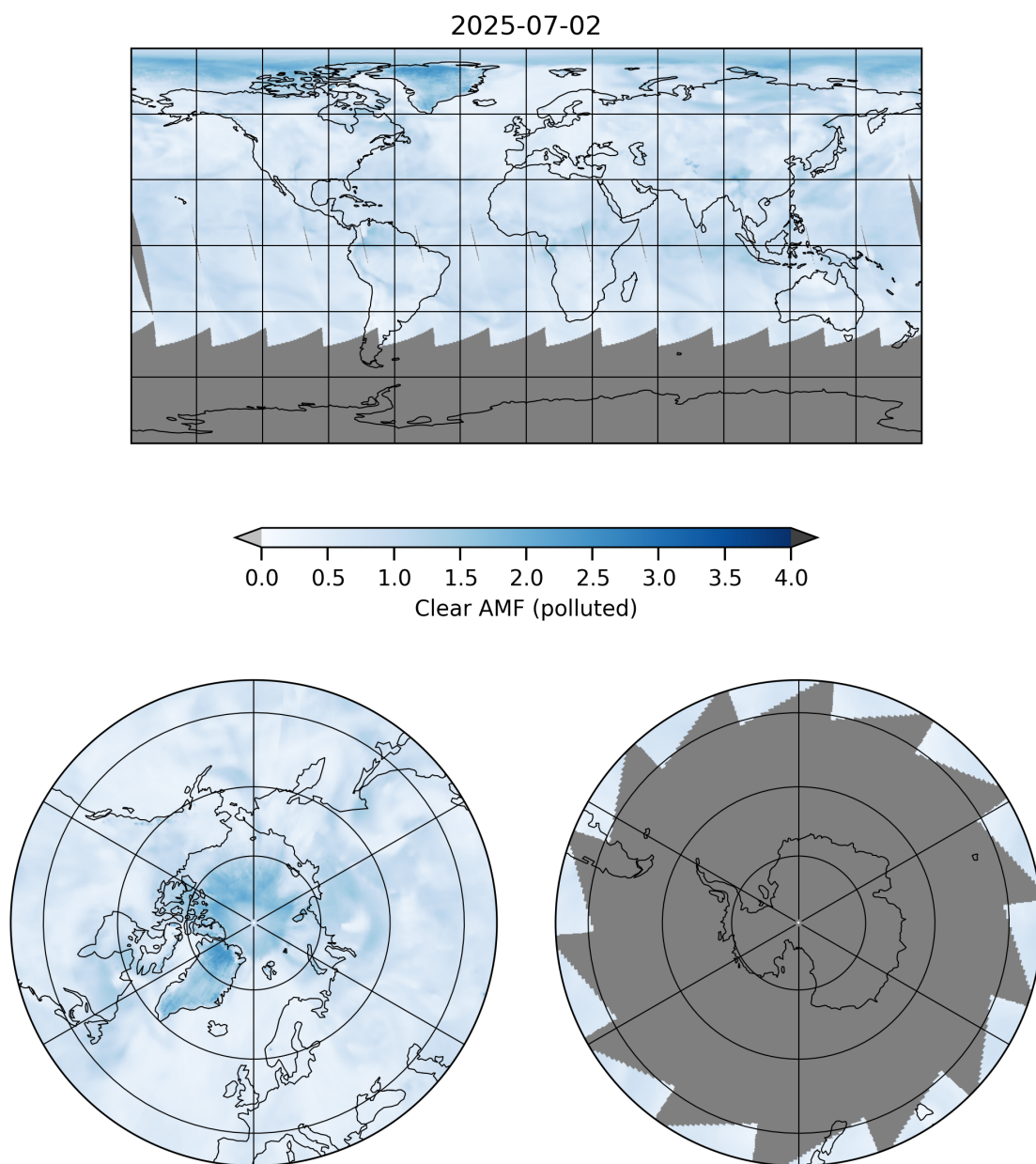


Figure 27: Map of “Clear AMF (polluted)” for 2025-07-02 to 2025-07-03

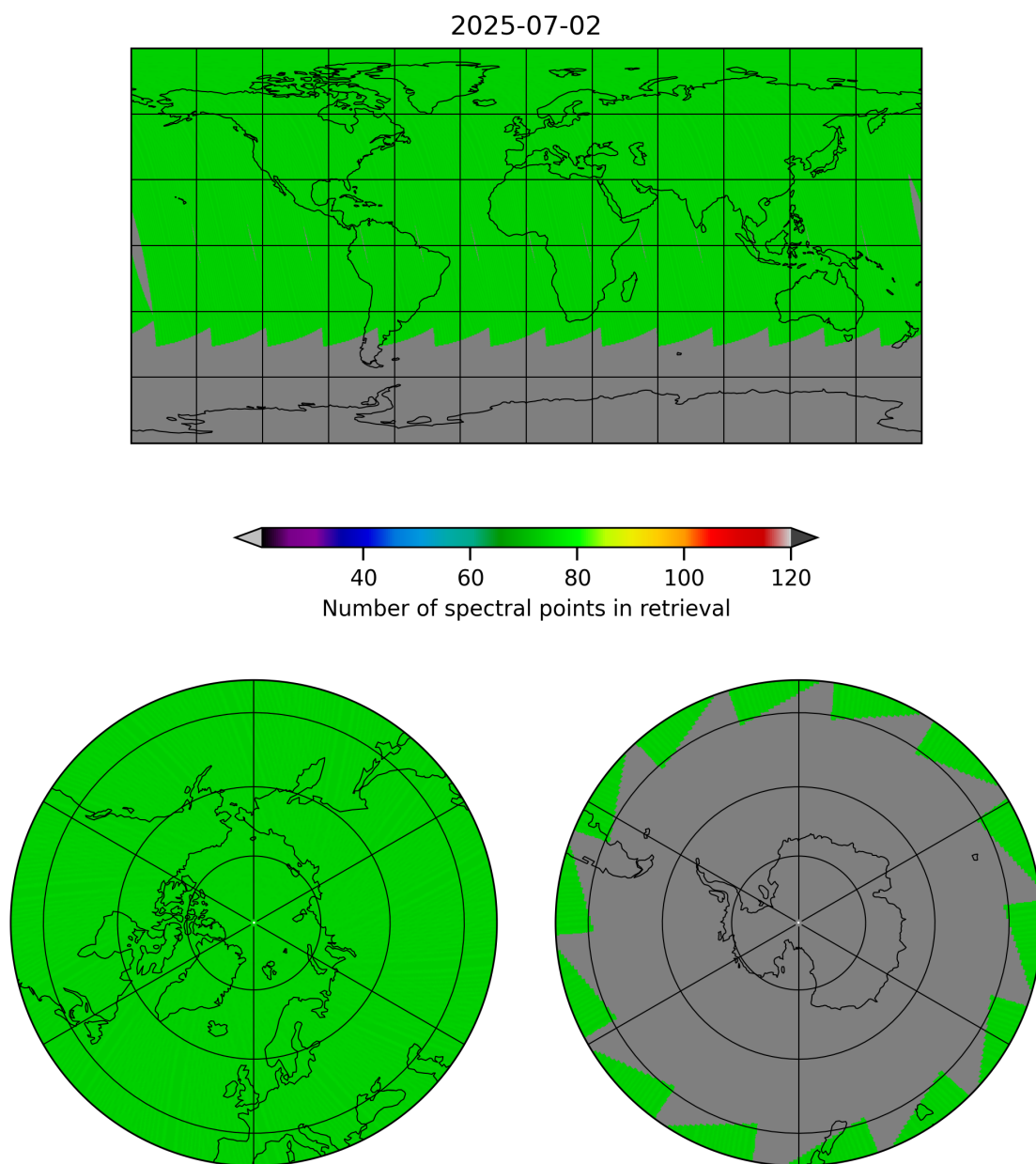


Figure 28: Map of “Number of spectral points in retrieval” for 2025-07-02 to 2025-07-03

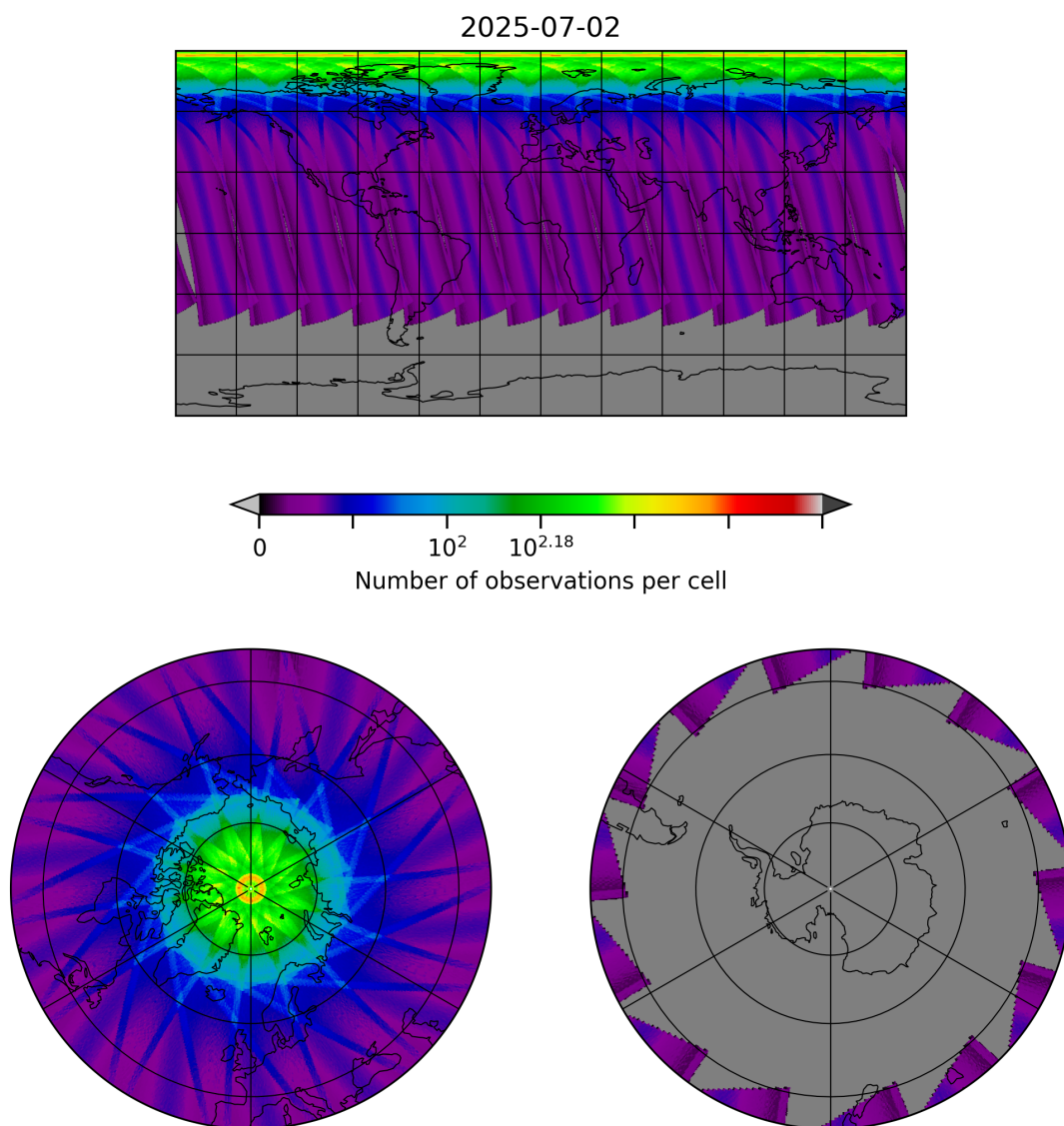


Figure 29: Map of the number of observations for 2025-07-02 to 2025-07-03

7 Zonal average

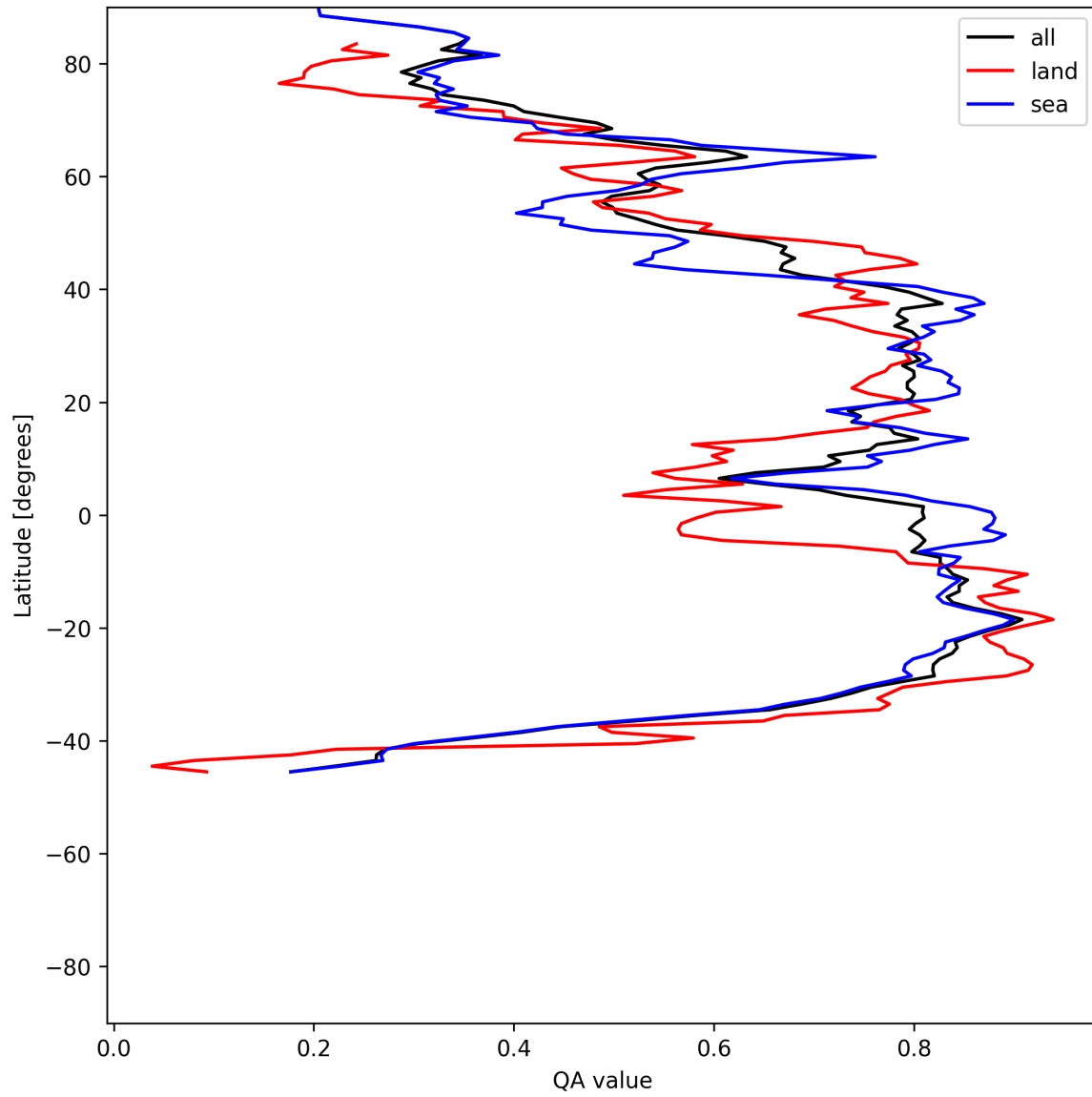


Figure 30: Zonal average of “QA value” for 2025-07-02 to 2025-07-03.

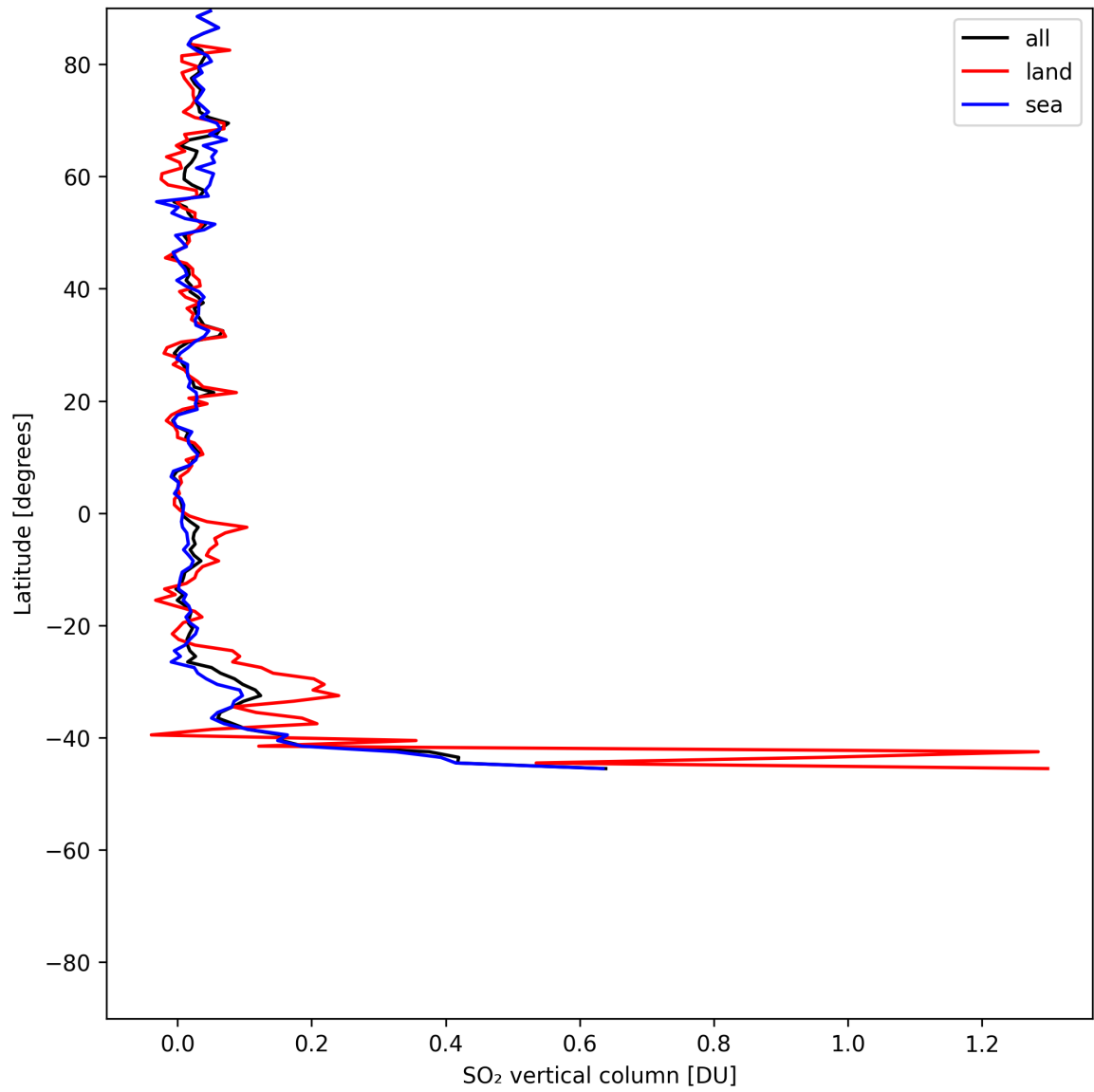


Figure 31: Zonal average of “SO₂ vertical column” for 2025-07-02 to 2025-07-03.

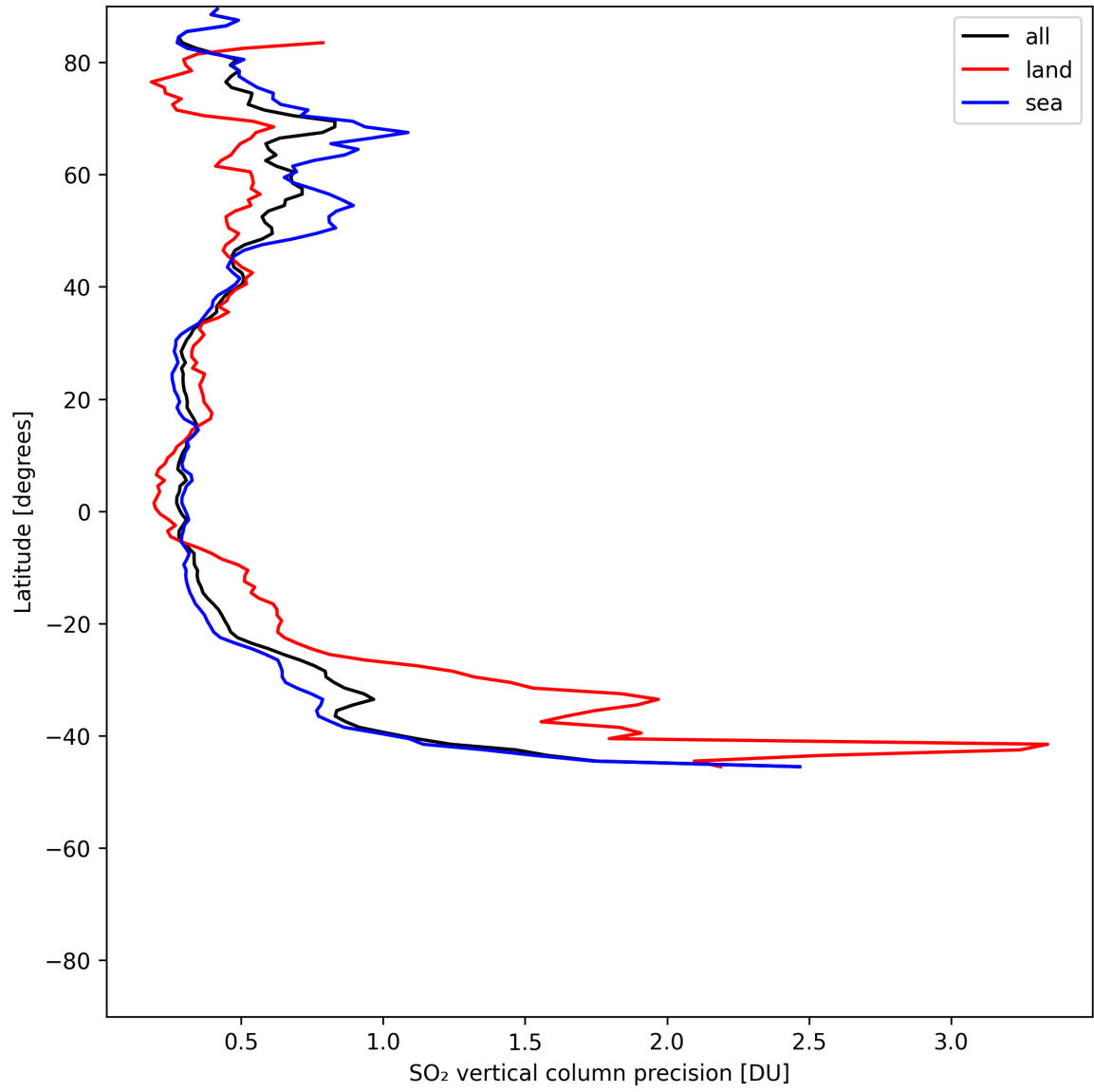


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-07-02 to 2025-07-03.

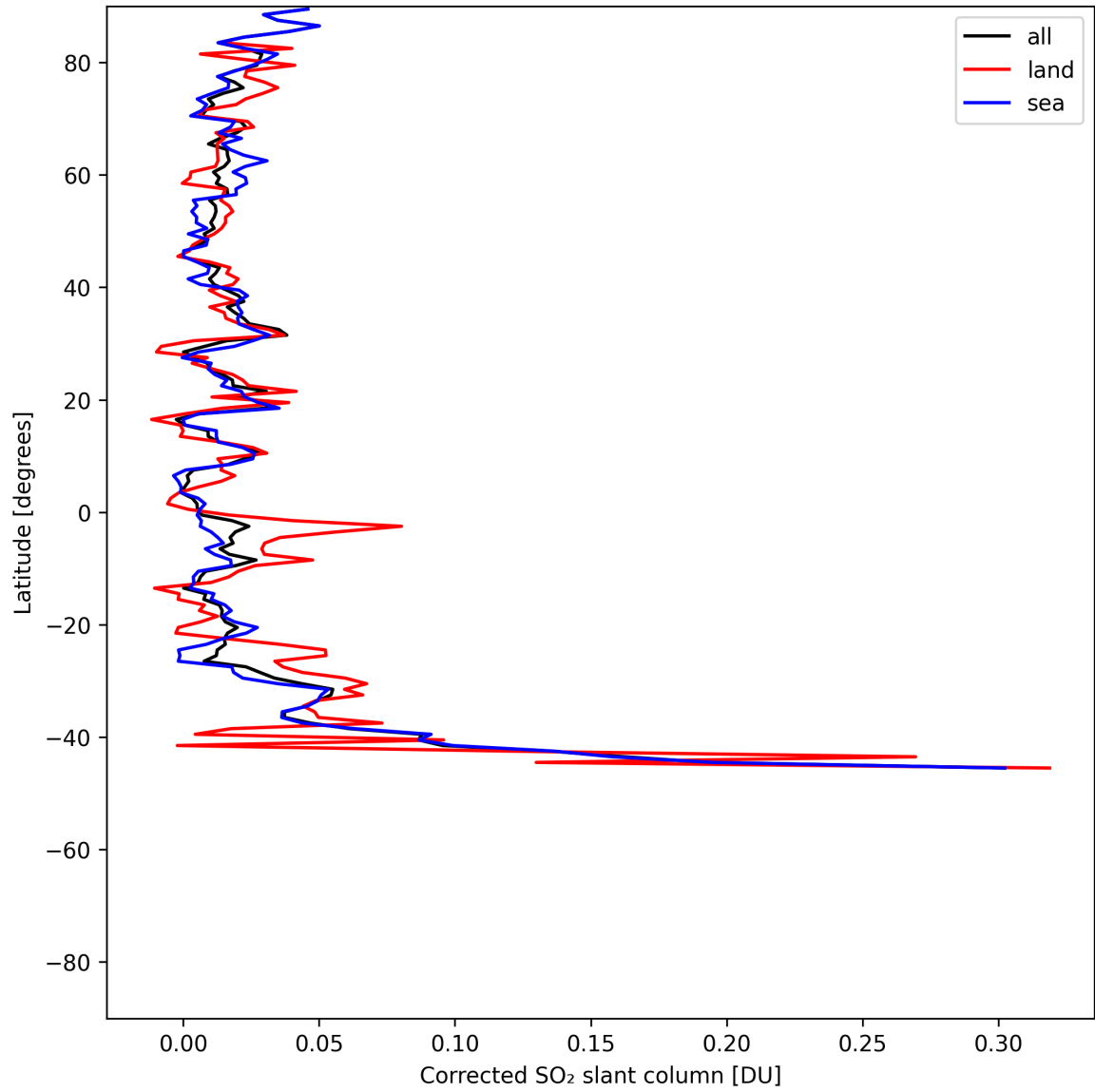


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-07-02 to 2025-07-03.

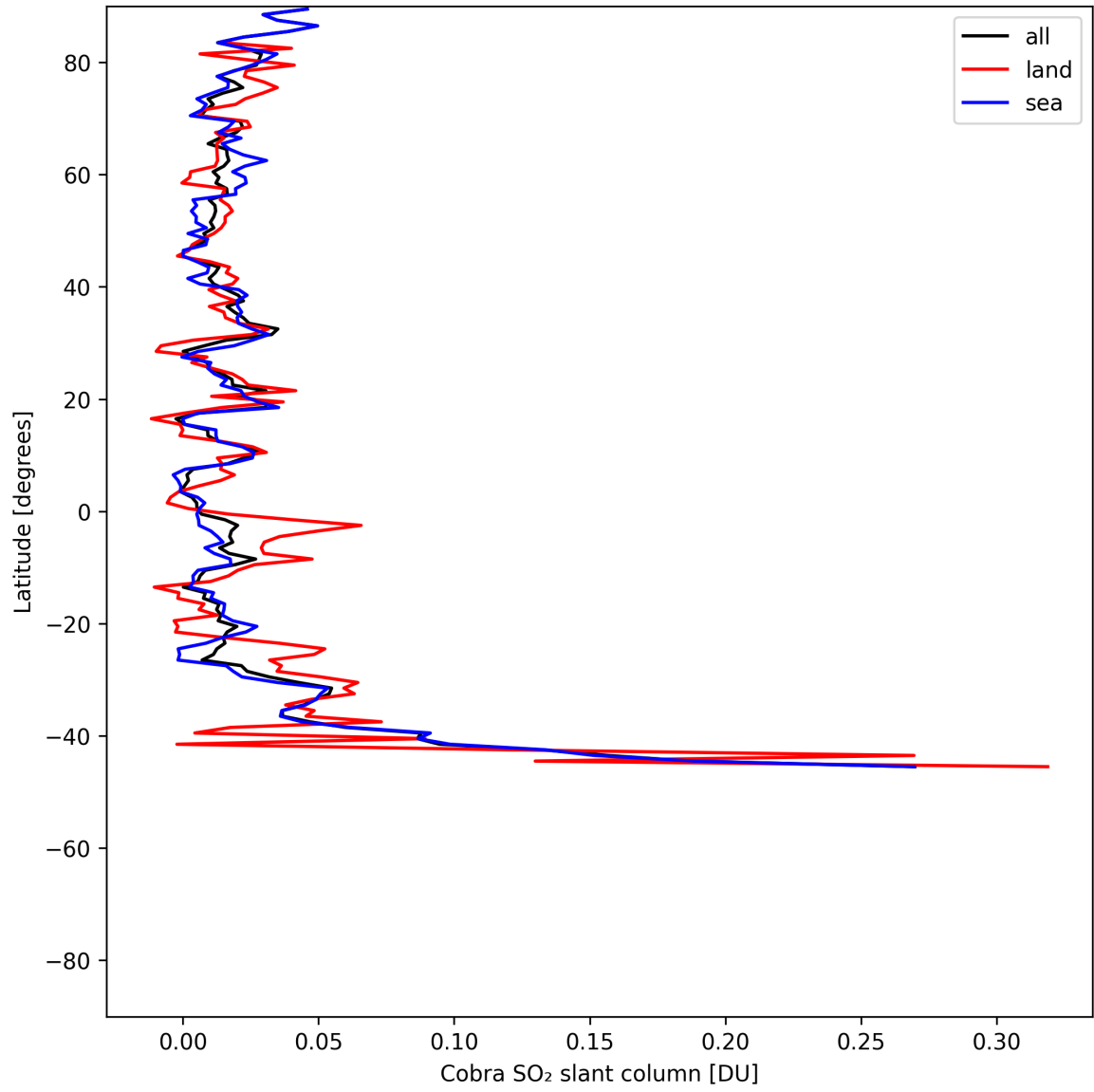


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-07-02 to 2025-07-03.

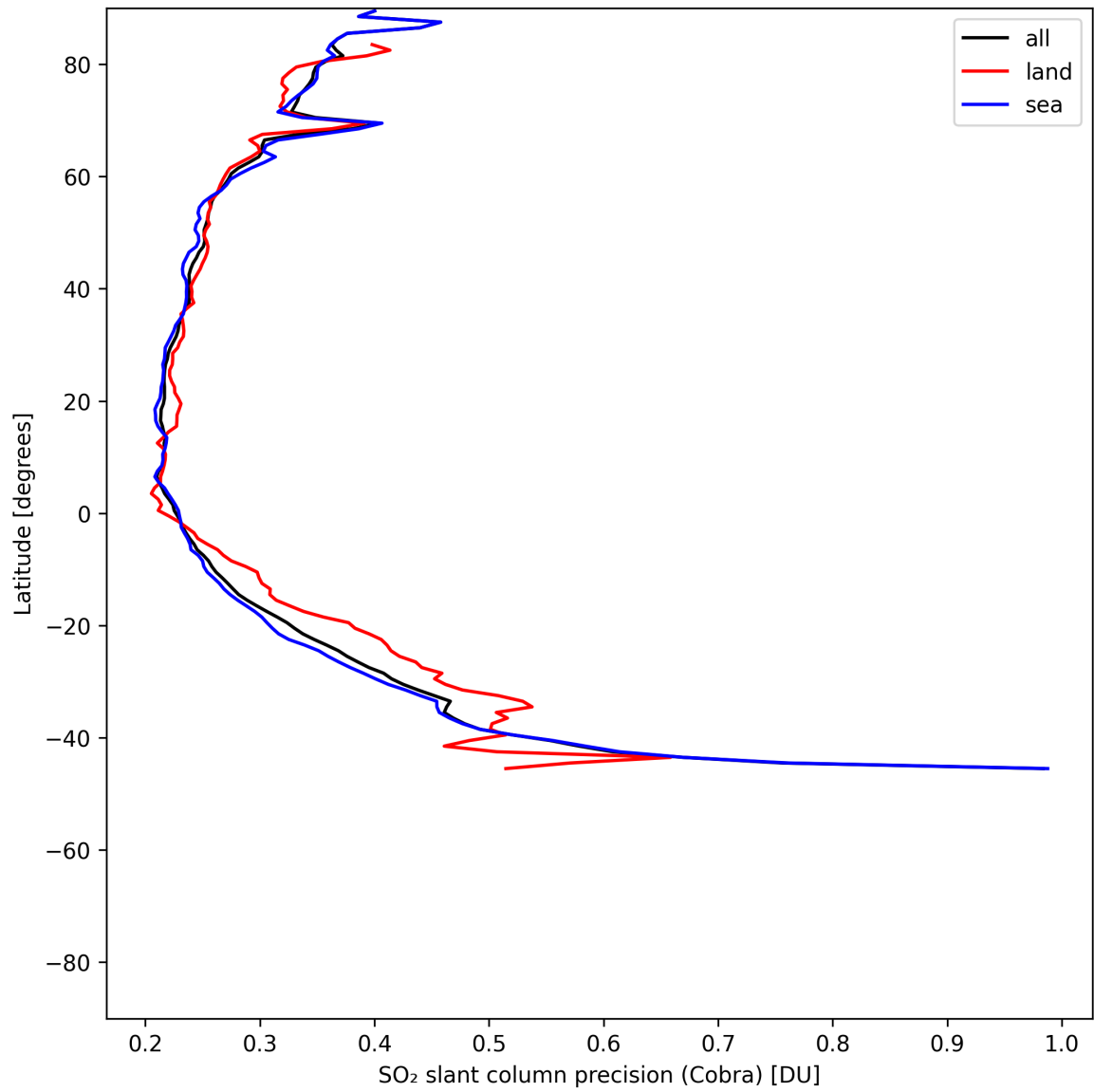


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-07-02 to 2025-07-03.

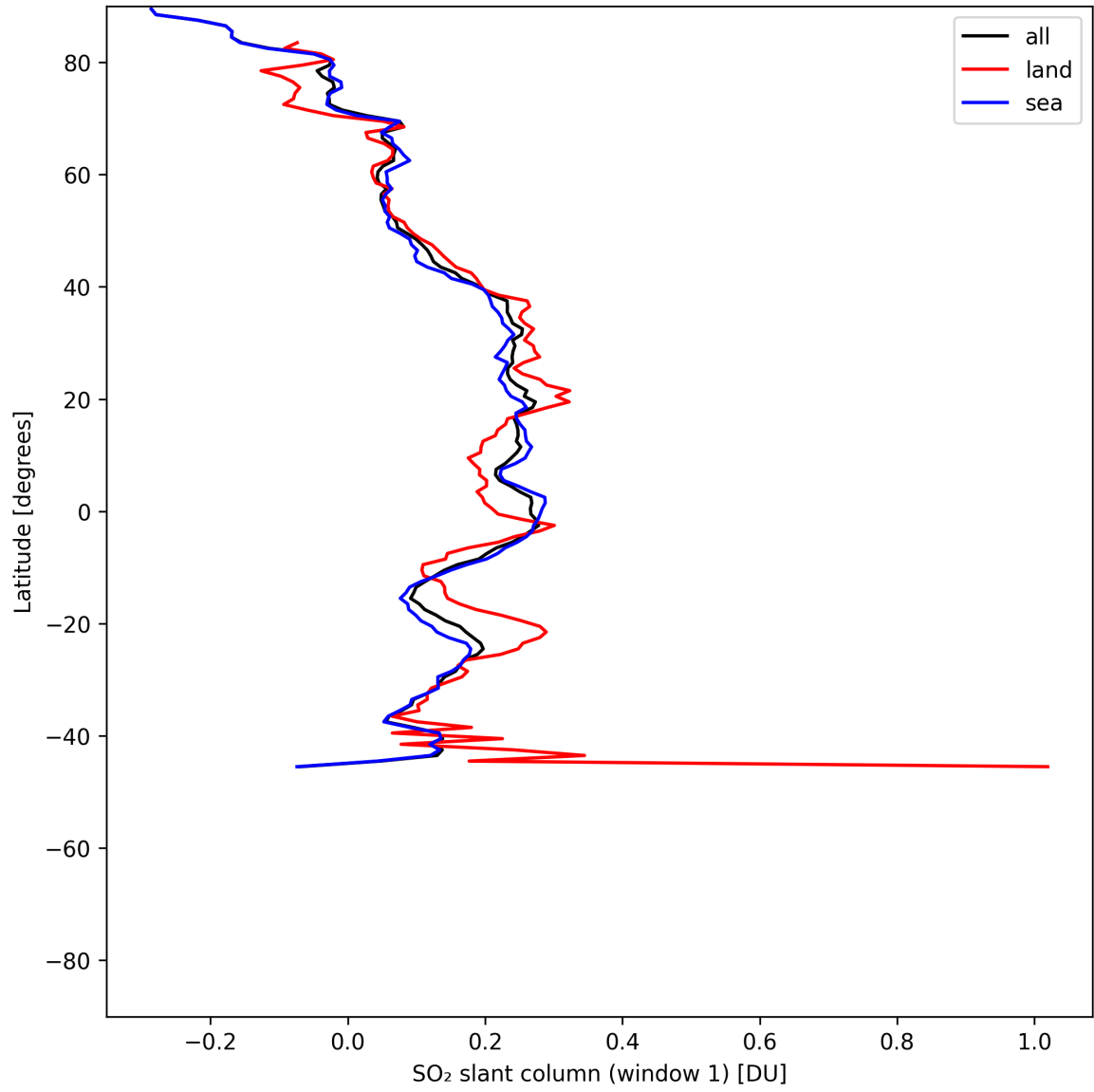


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-07-02 to 2025-07-03.

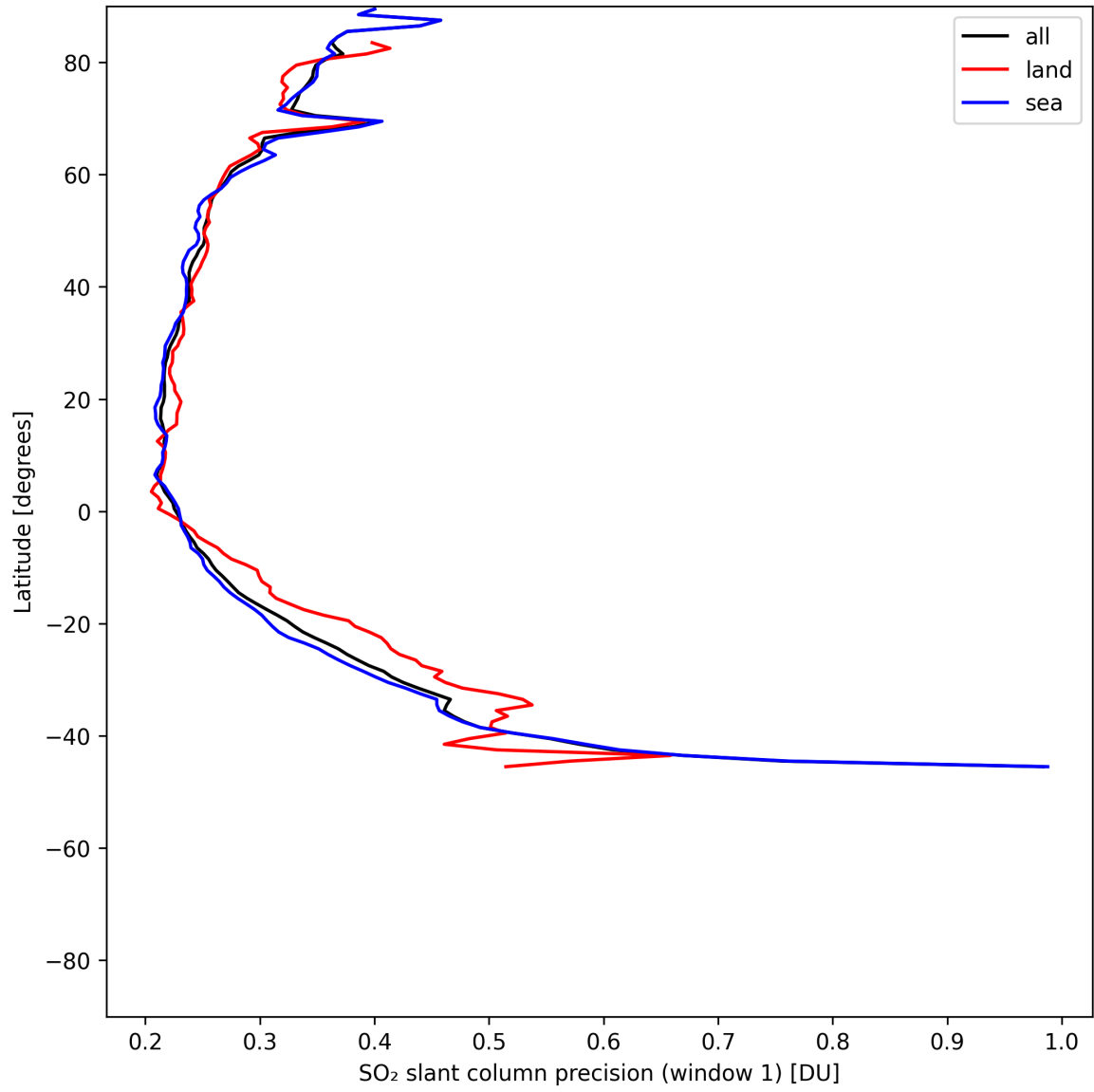


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-07-02 to 2025-07-03.

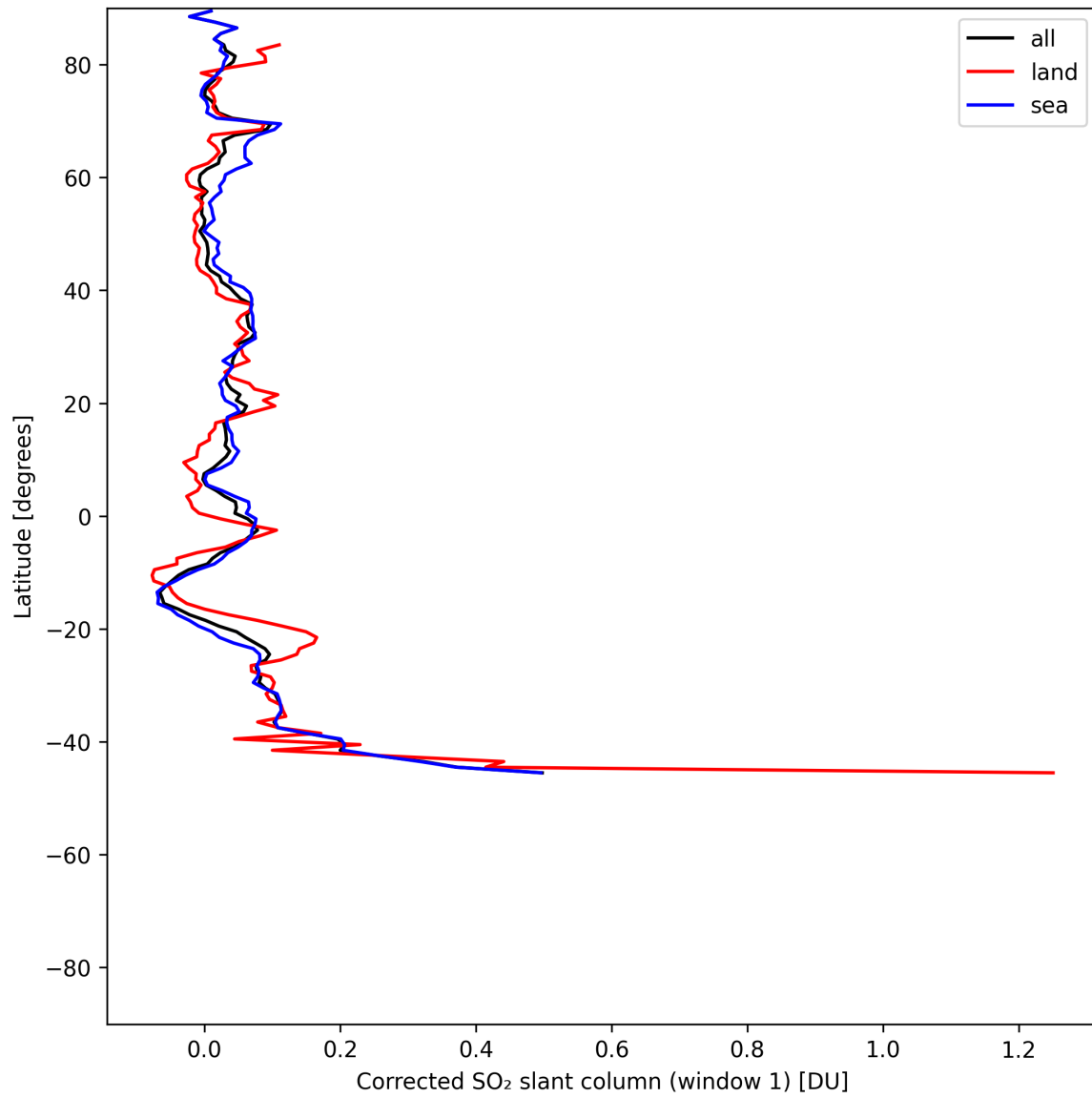


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-07-02 to 2025-07-03.

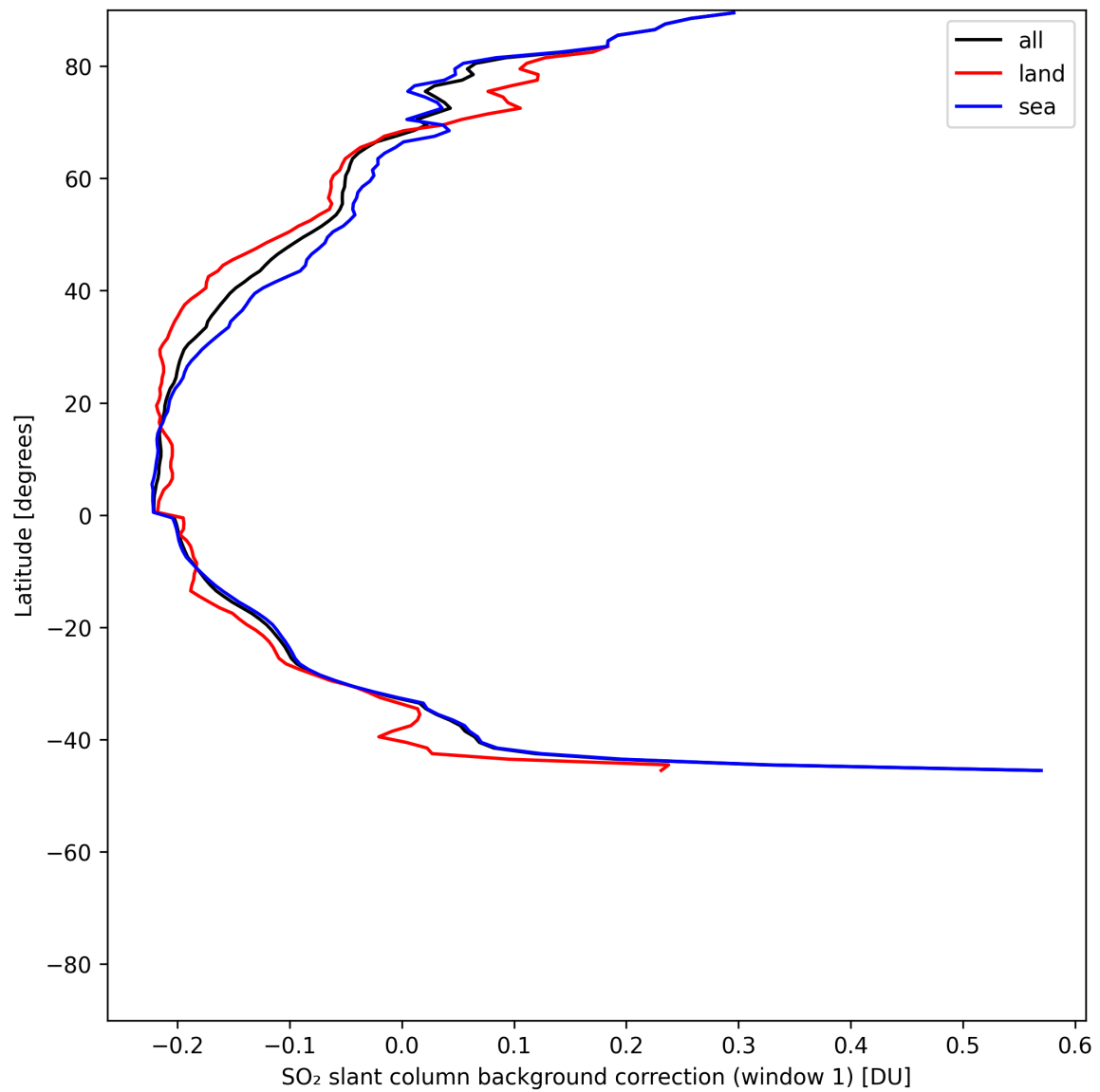


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-07-02 to 2025-07-03.

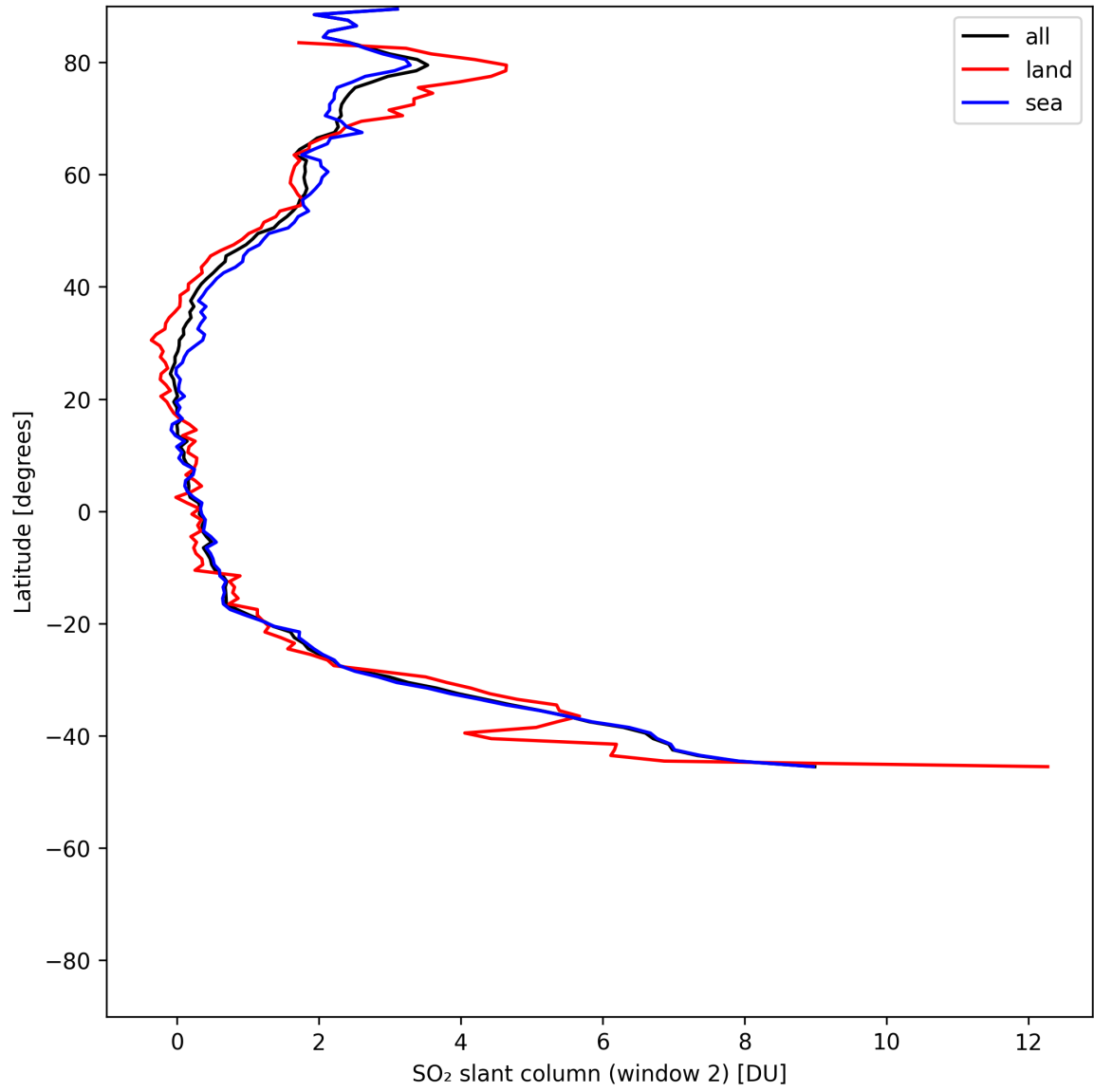


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-07-02 to 2025-07-03.

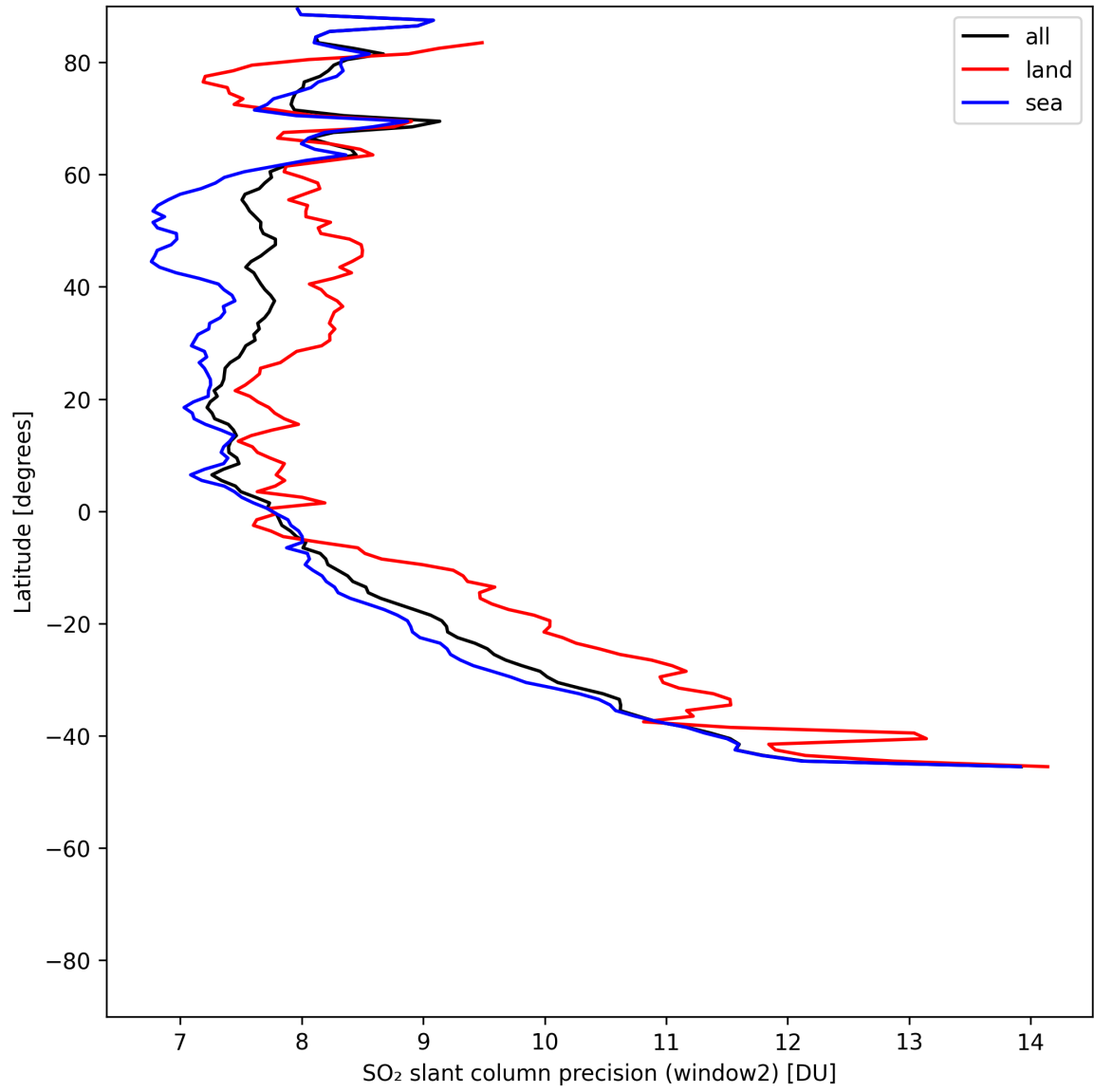


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-07-02 to 2025-07-03.

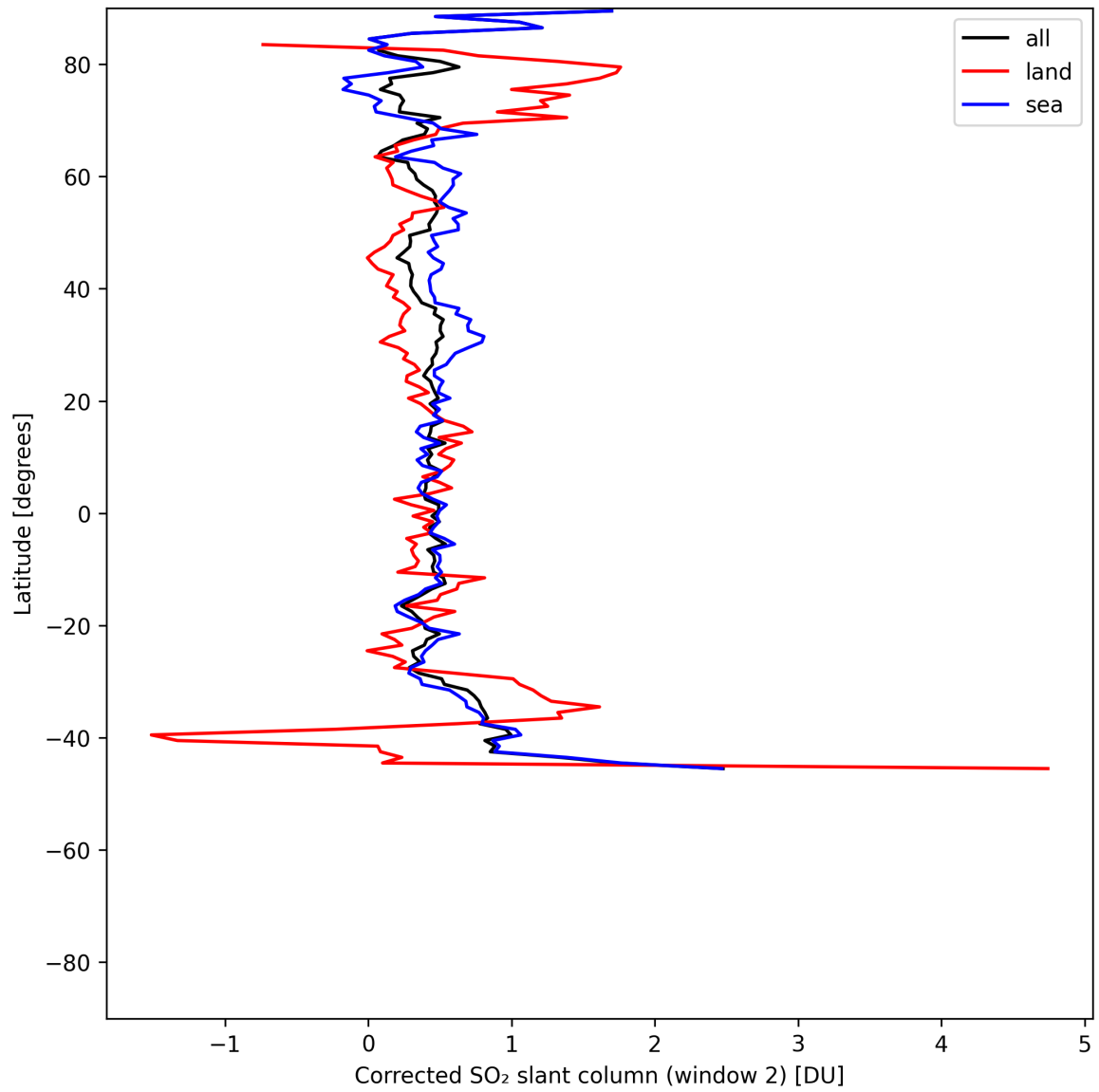


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-07-02 to 2025-07-03.

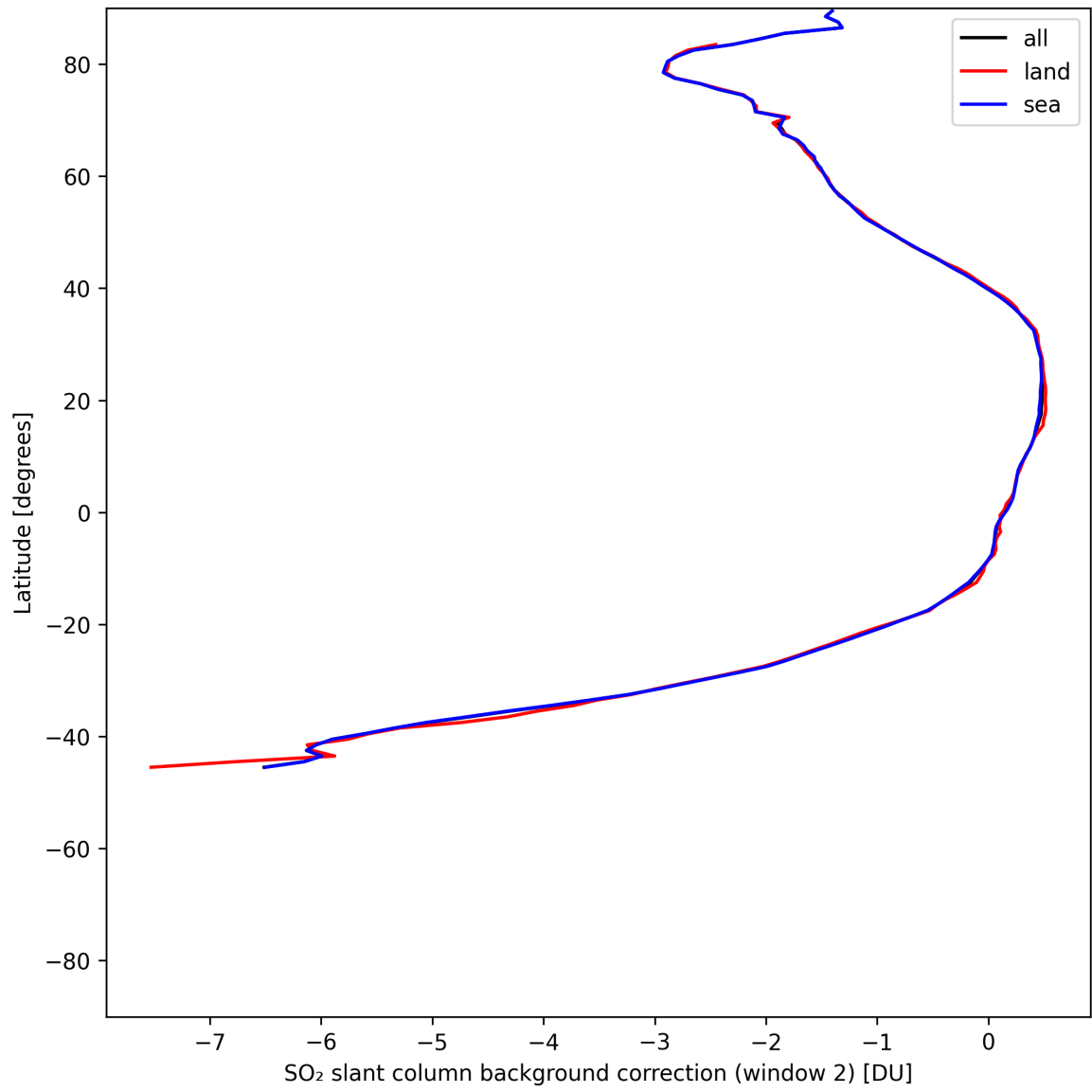


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-07-02 to 2025-07-03.

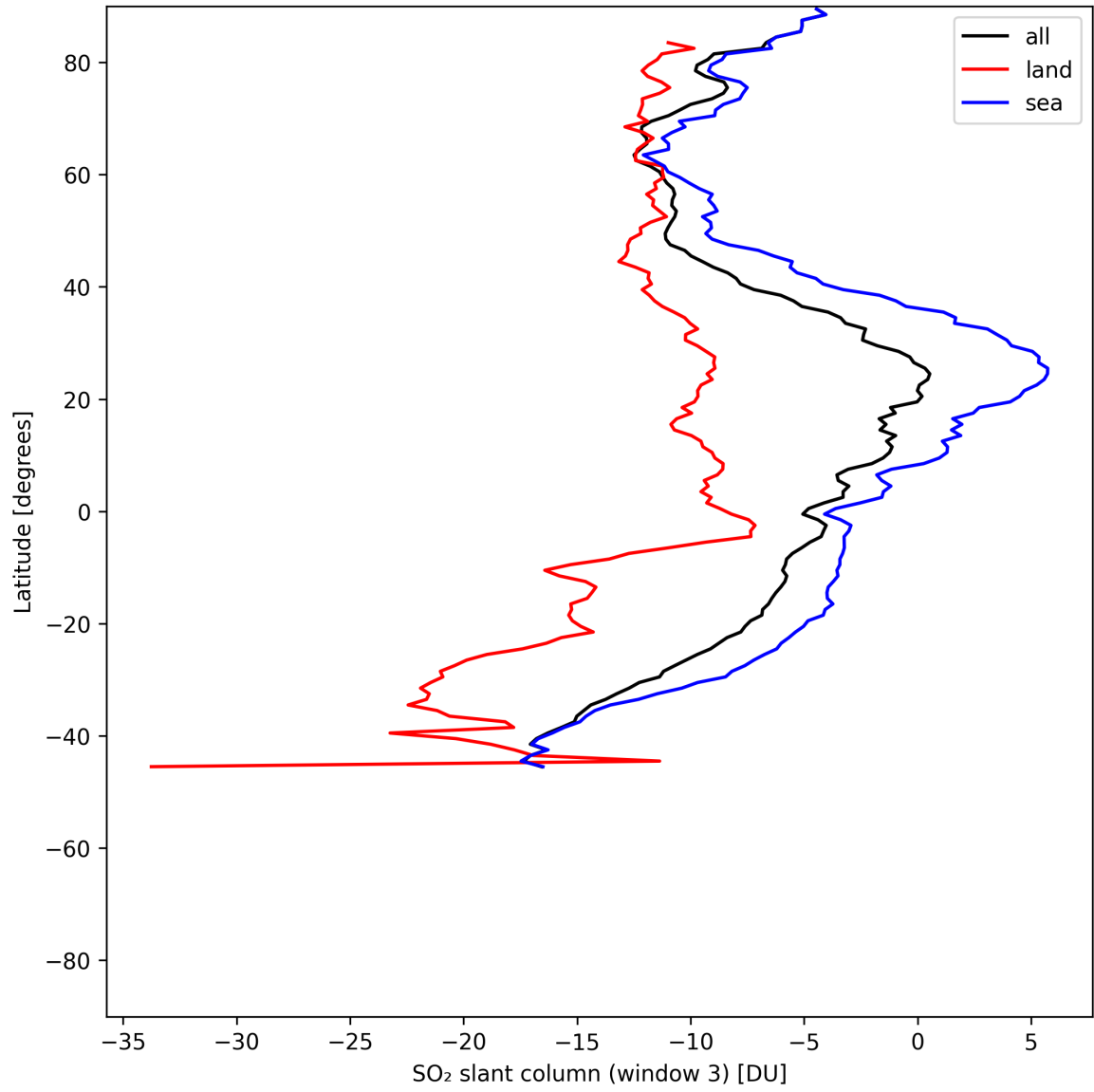


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-07-02 to 2025-07-03.

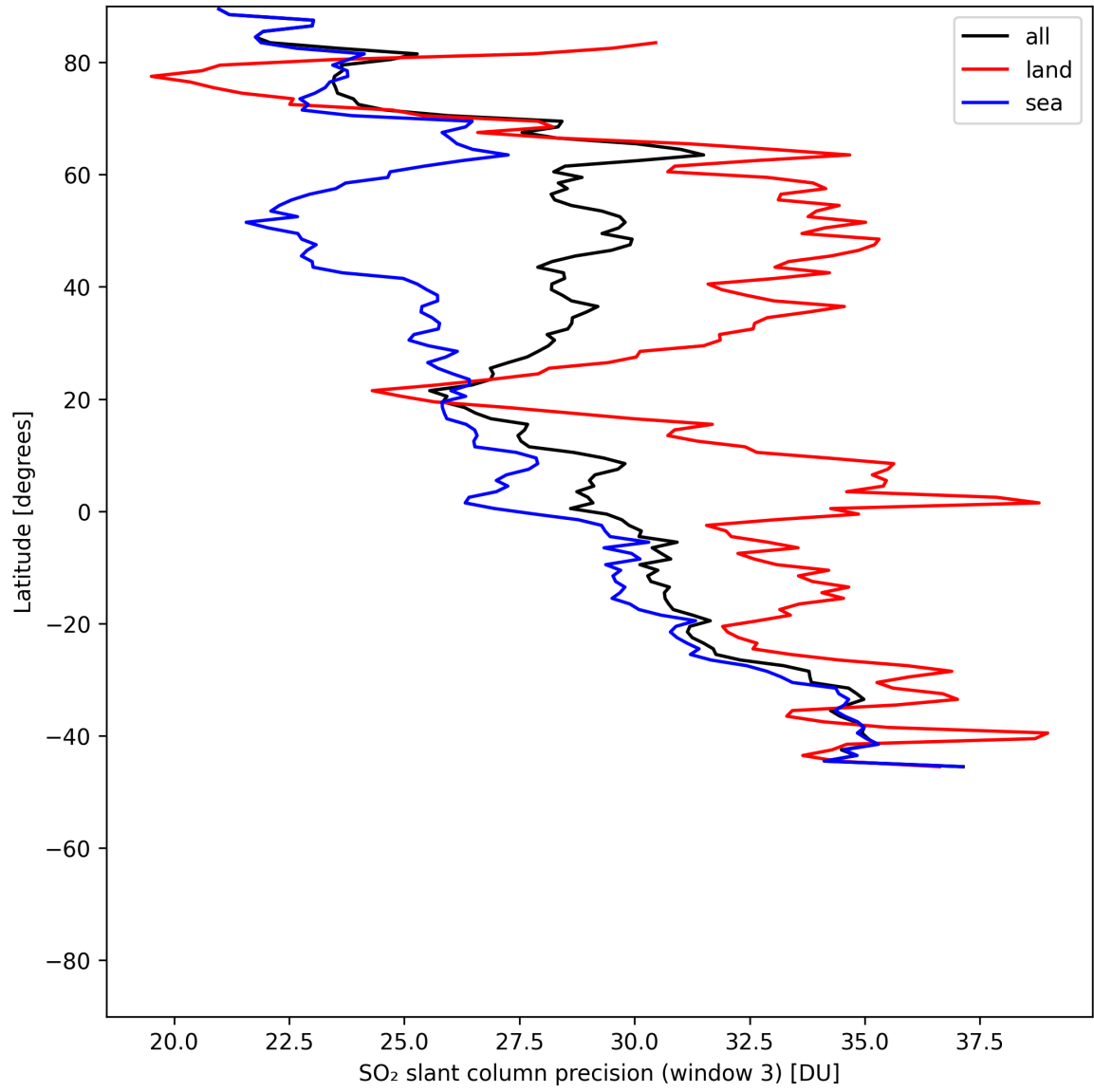


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-07-02 to 2025-07-03.

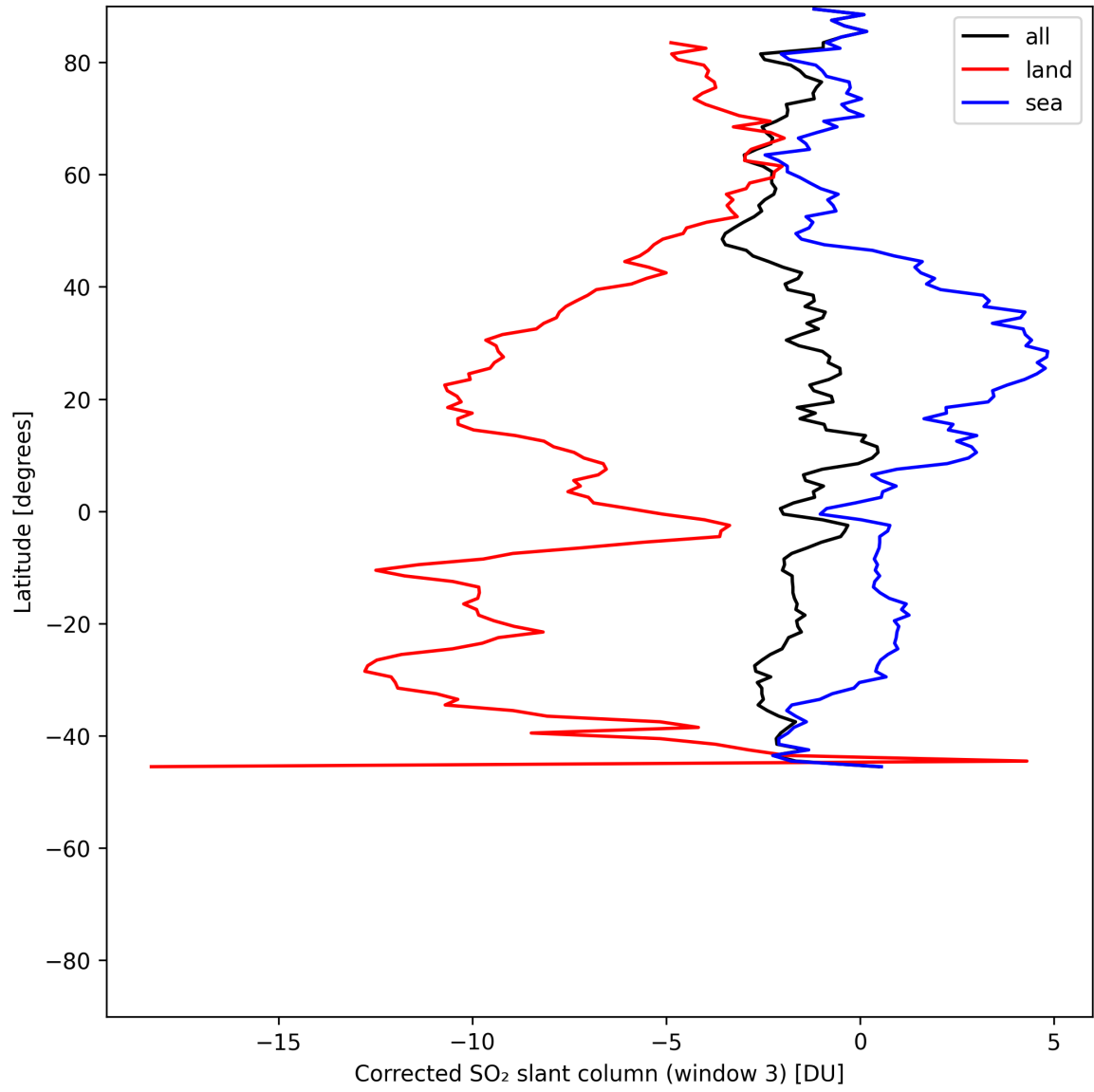


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-07-02 to 2025-07-03.

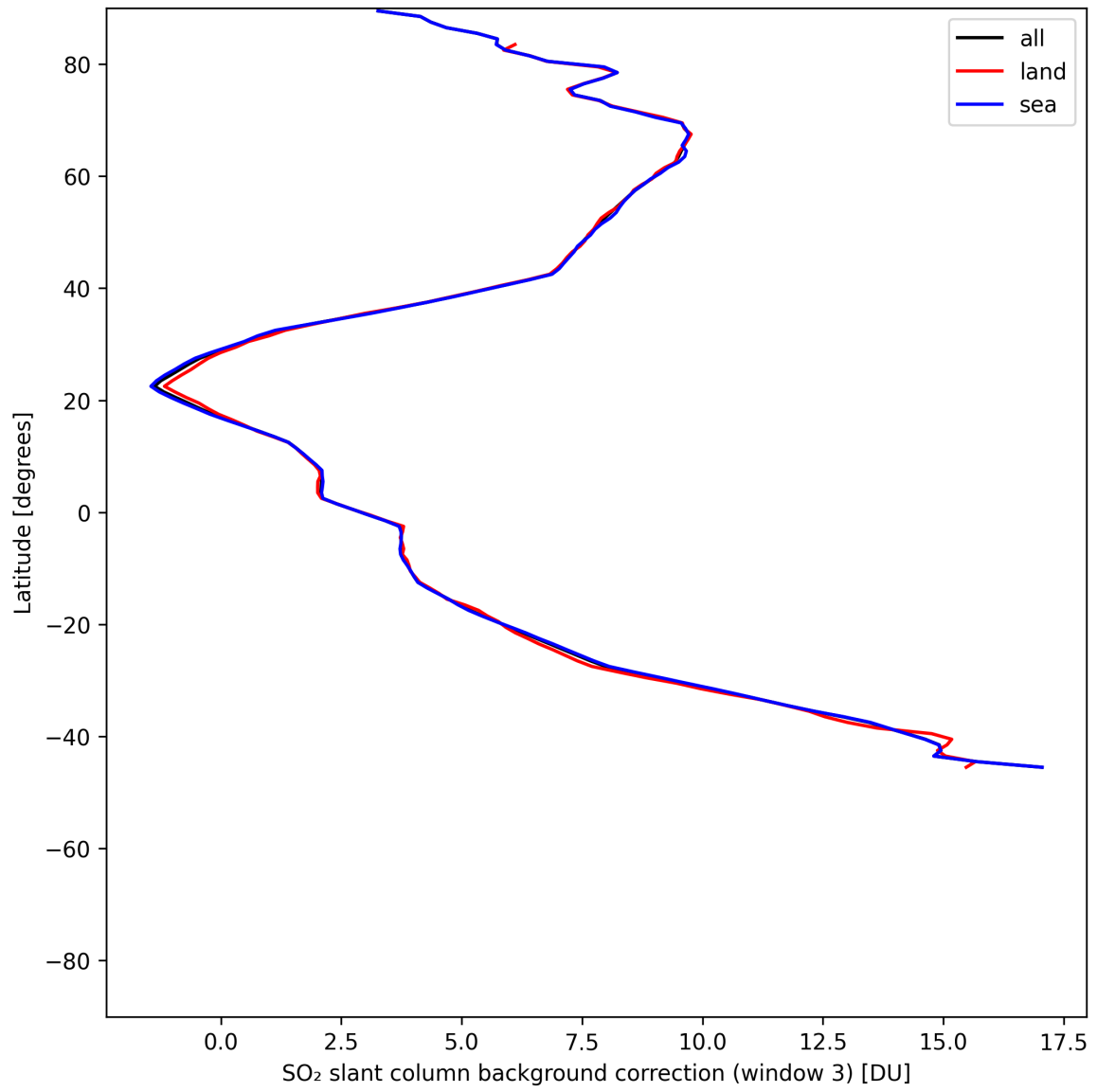


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-07-02 to 2025-07-03.

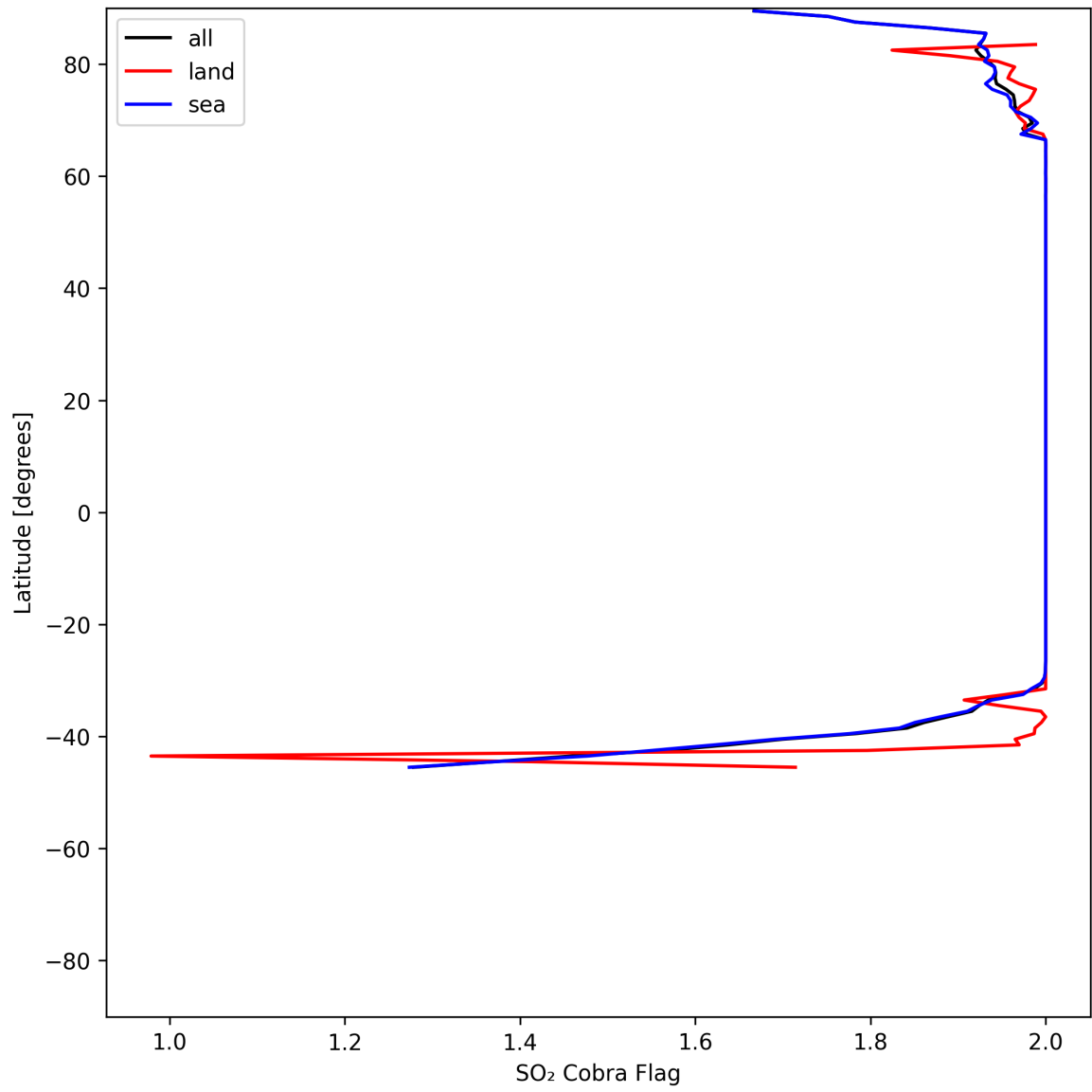


Figure 48: Zonal average of “SO₂ Cobra Flag” for 2025-07-02 to 2025-07-03.

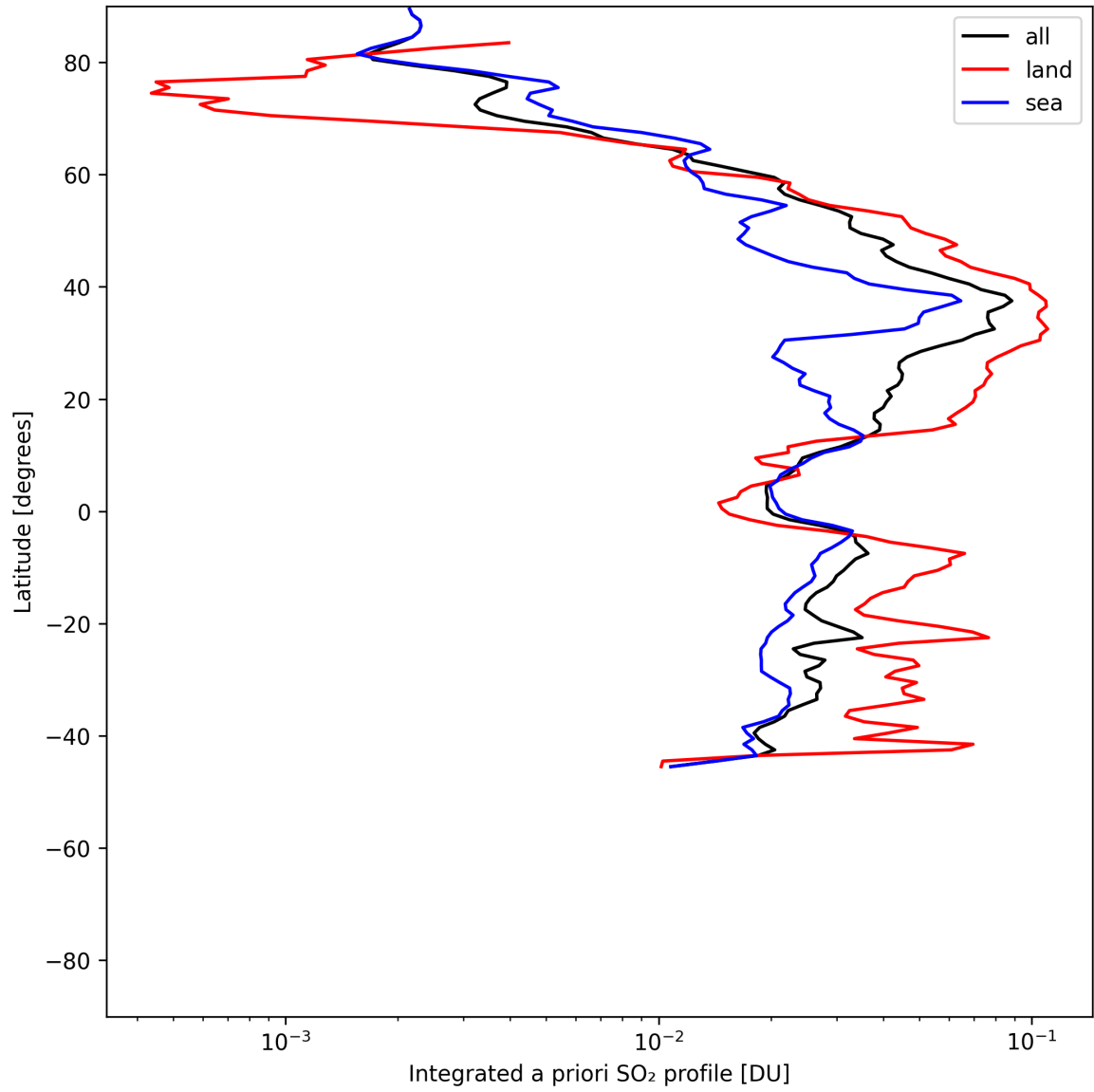


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-07-02 to 2025-07-03.

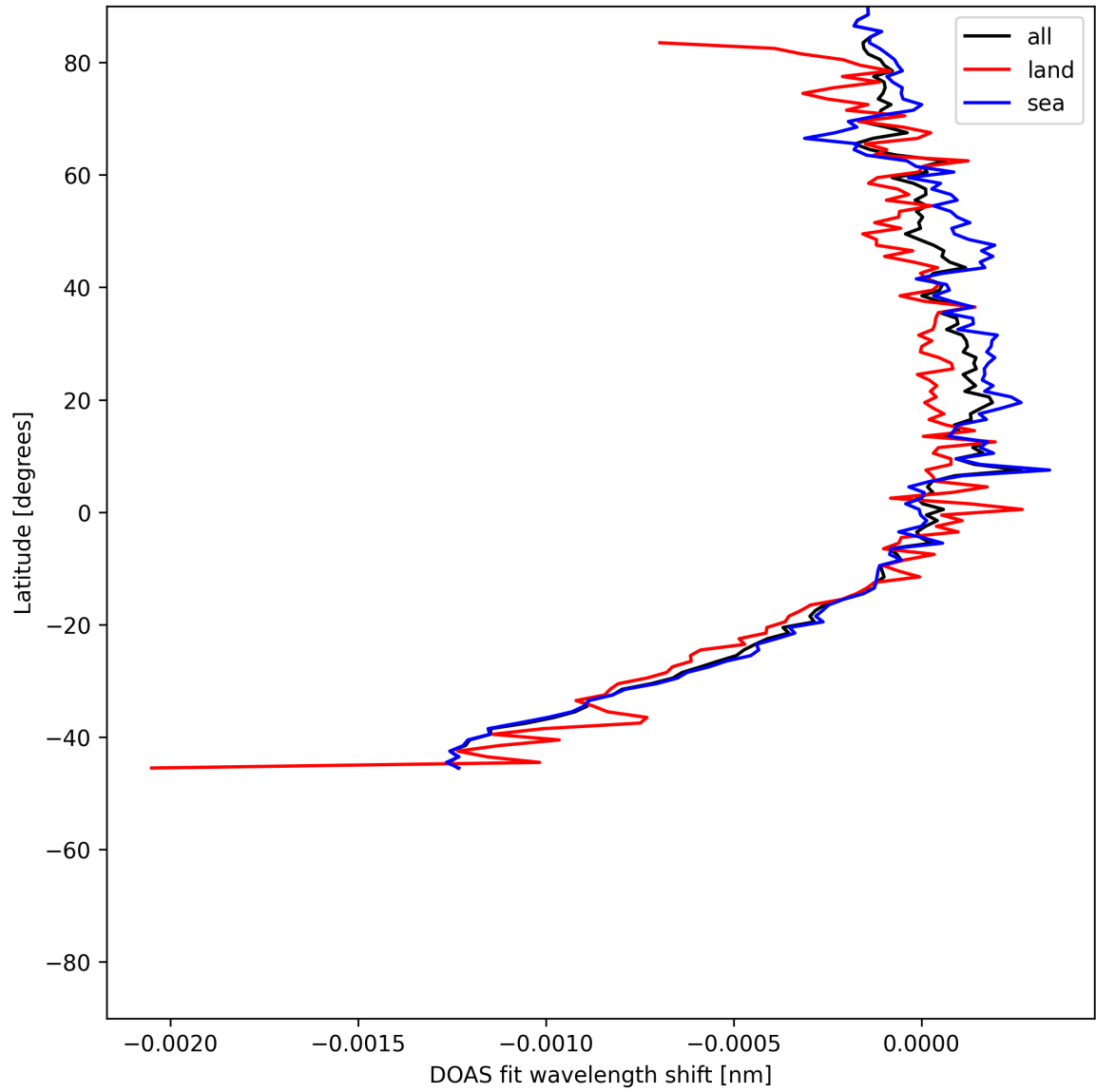


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-07-02 to 2025-07-03.

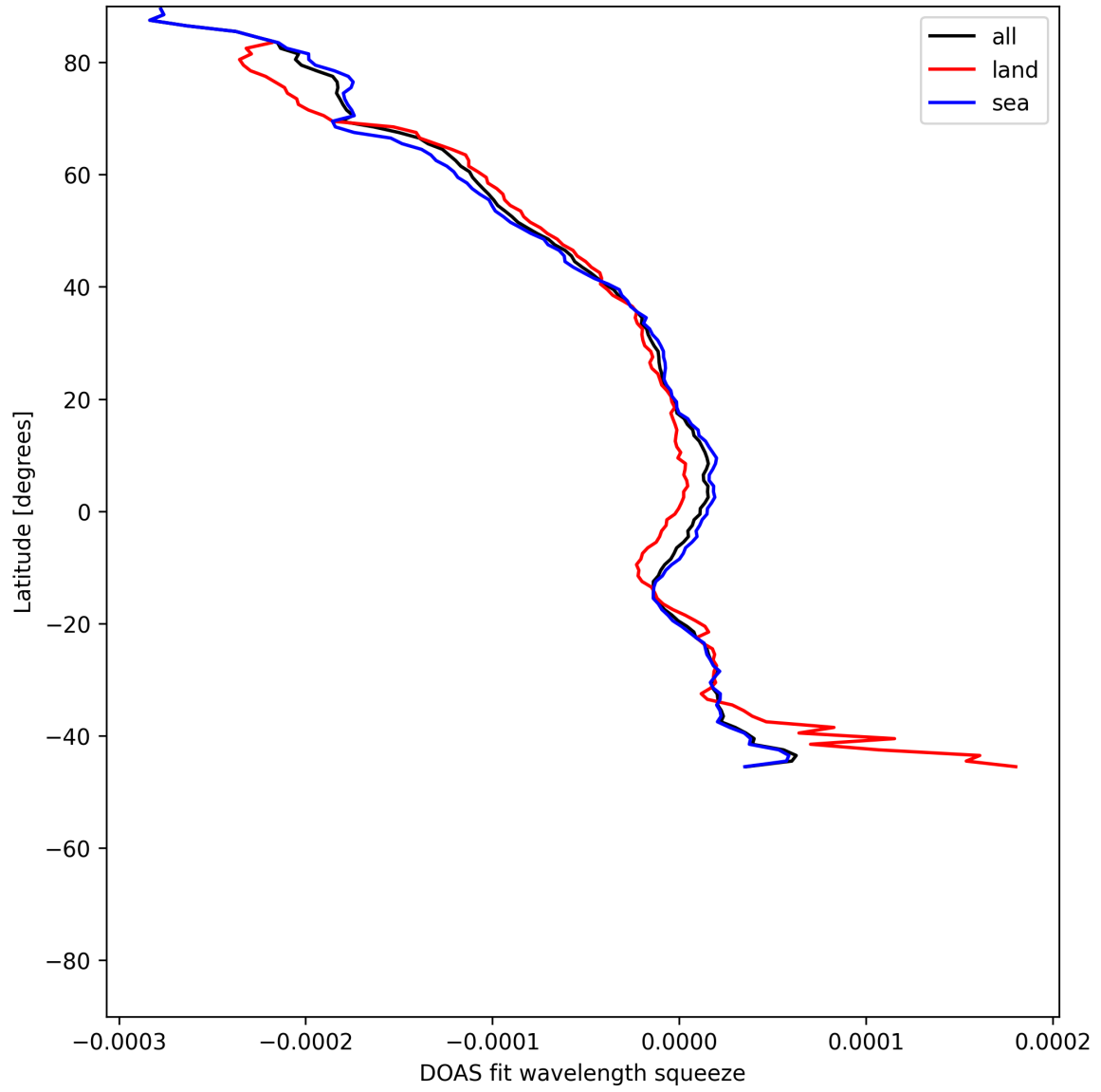


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-07-02 to 2025-07-03.

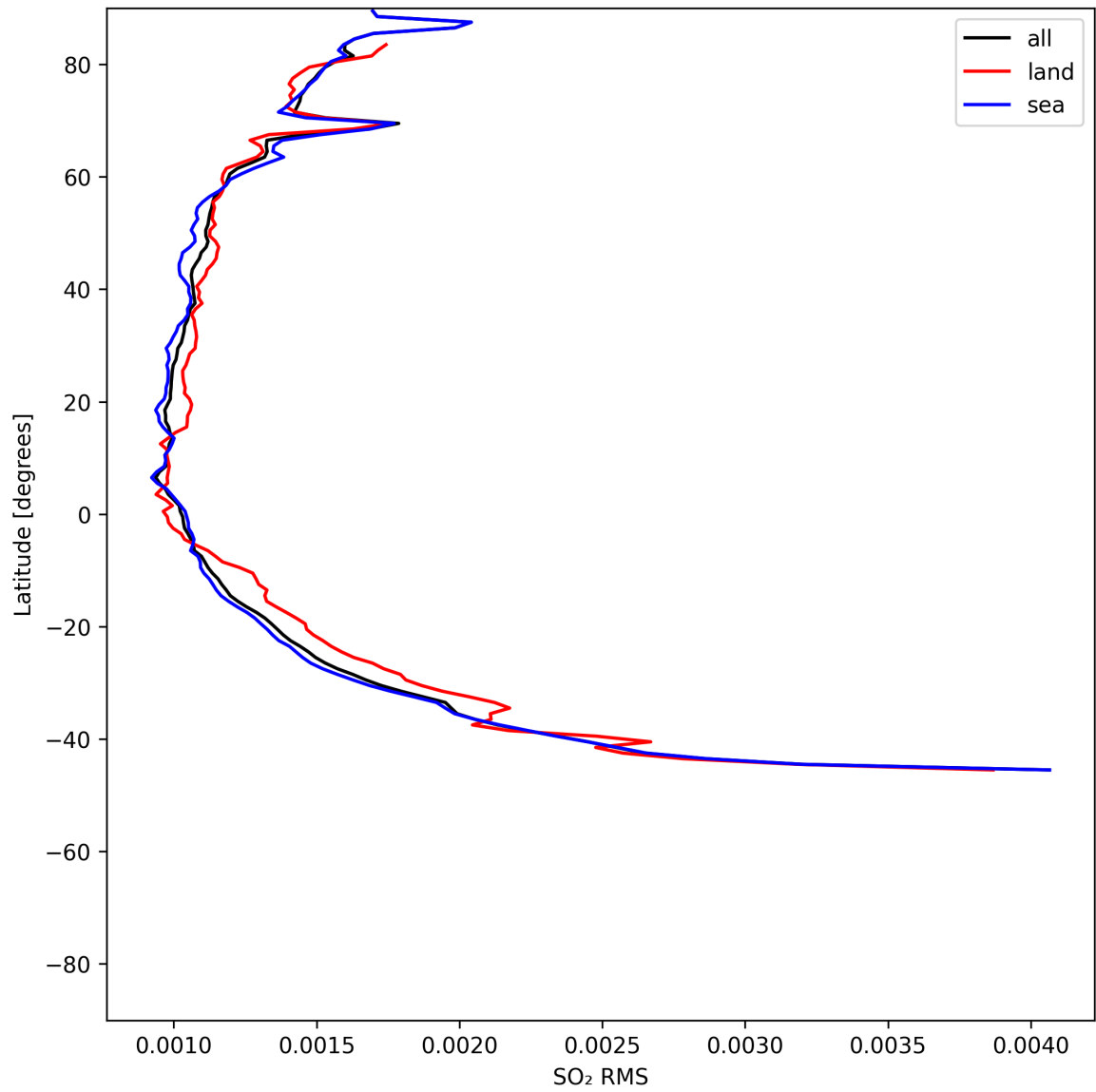


Figure 52: Zonal average of “SO₂ RMS” for 2025-07-02 to 2025-07-03.

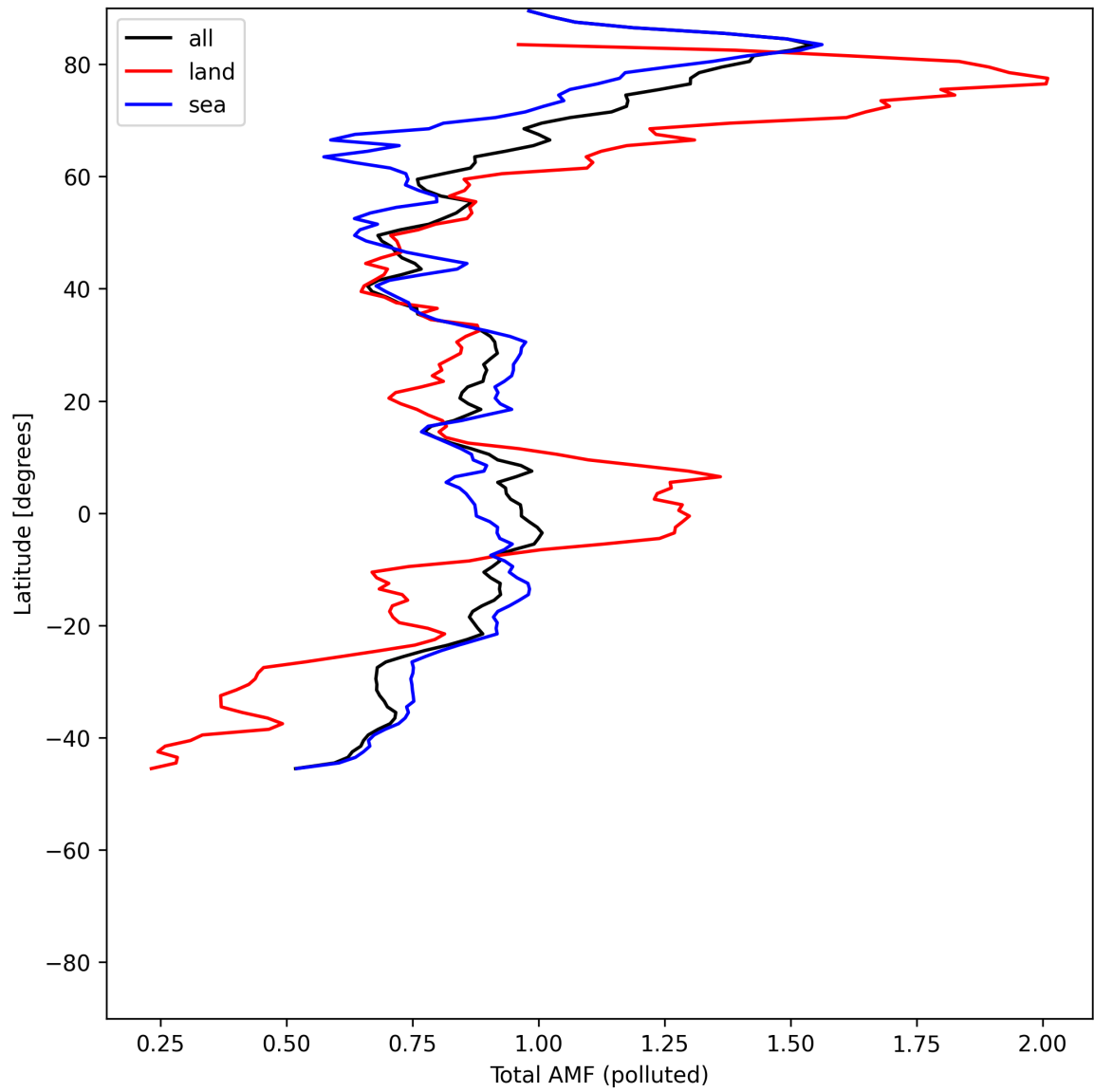


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-07-02 to 2025-07-03.

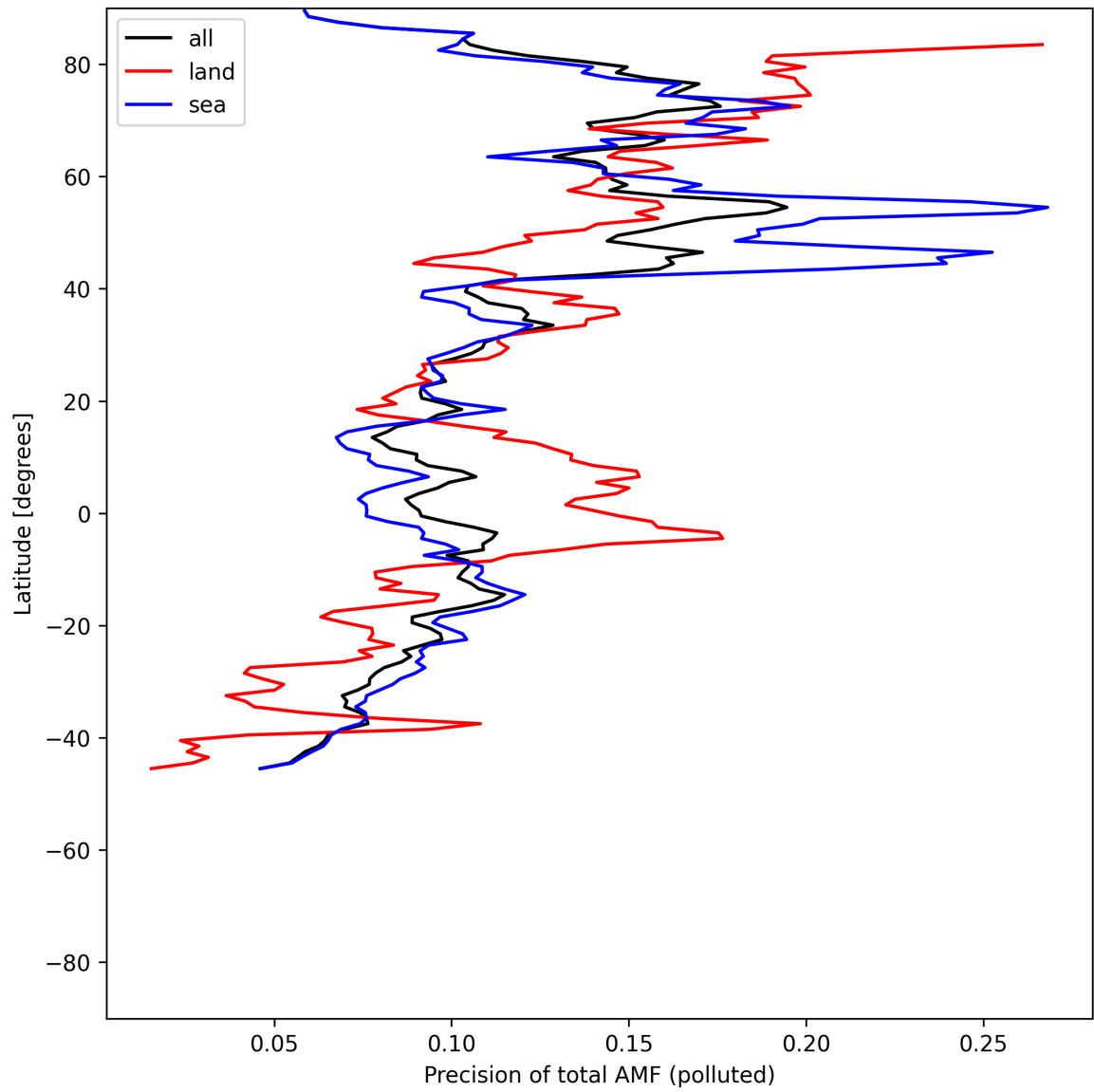


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-07-02 to 2025-07-03.

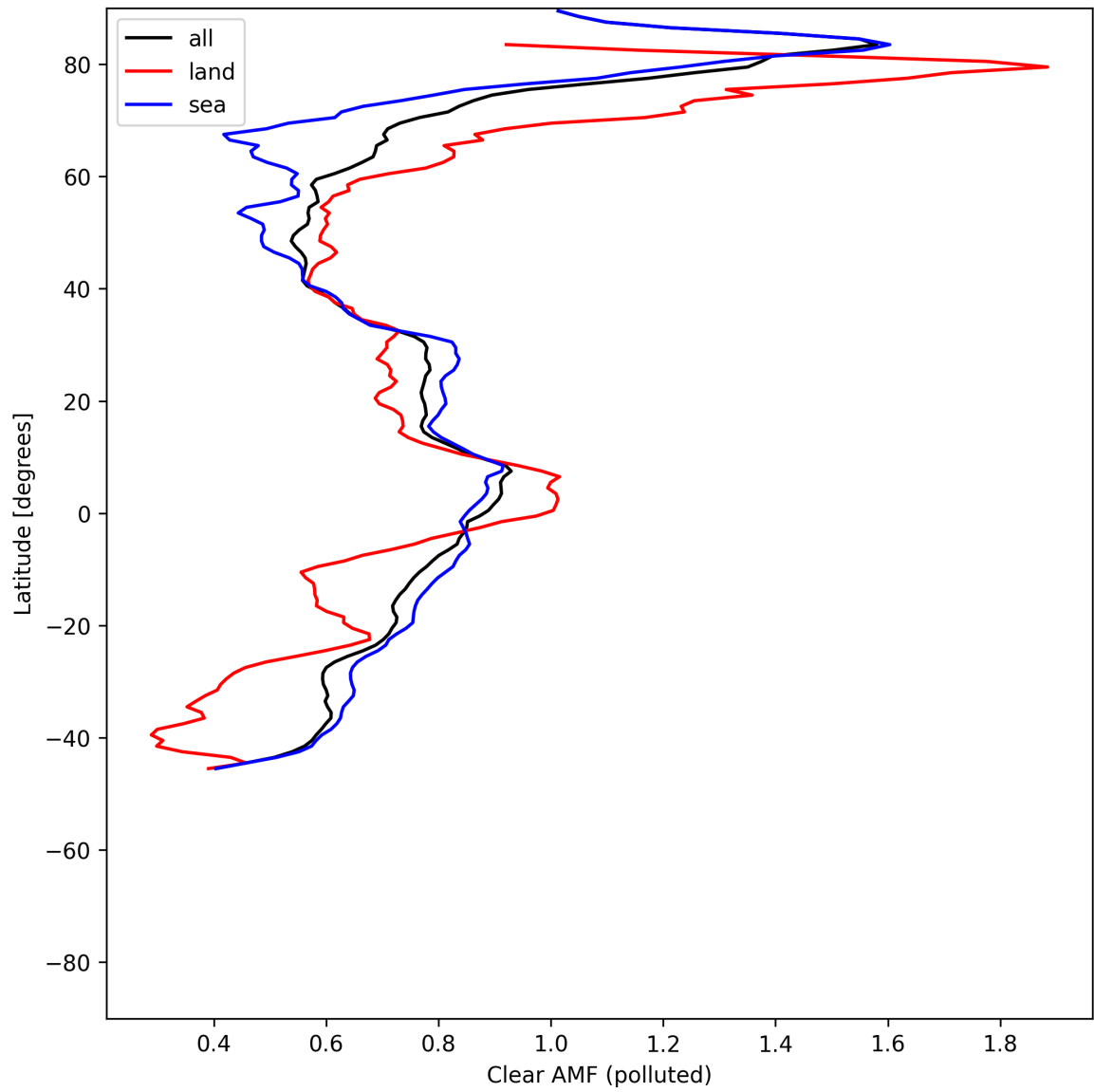


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-07-02 to 2025-07-03.

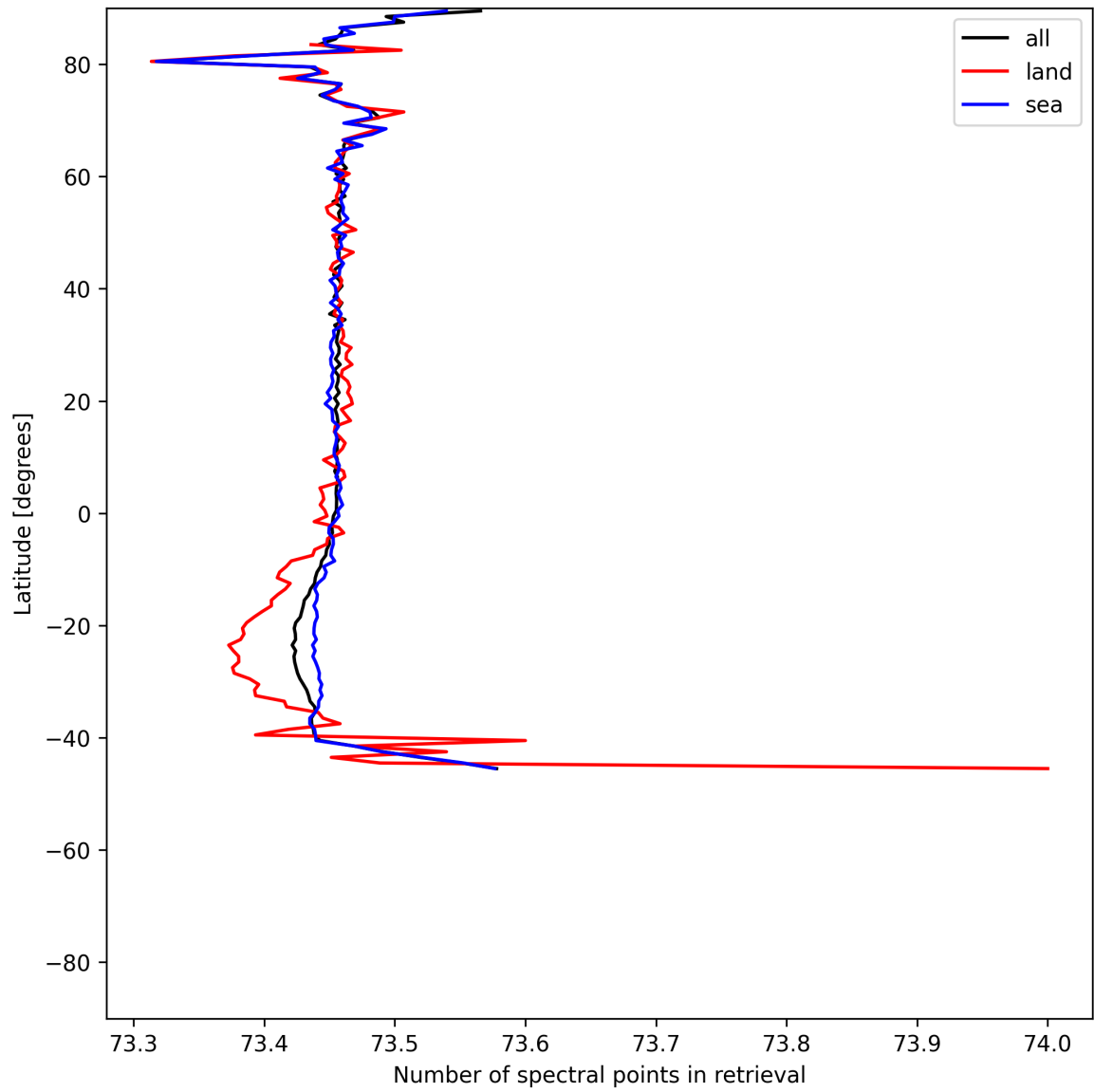


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-07-02 to 2025-07-03.

8 Histograms

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

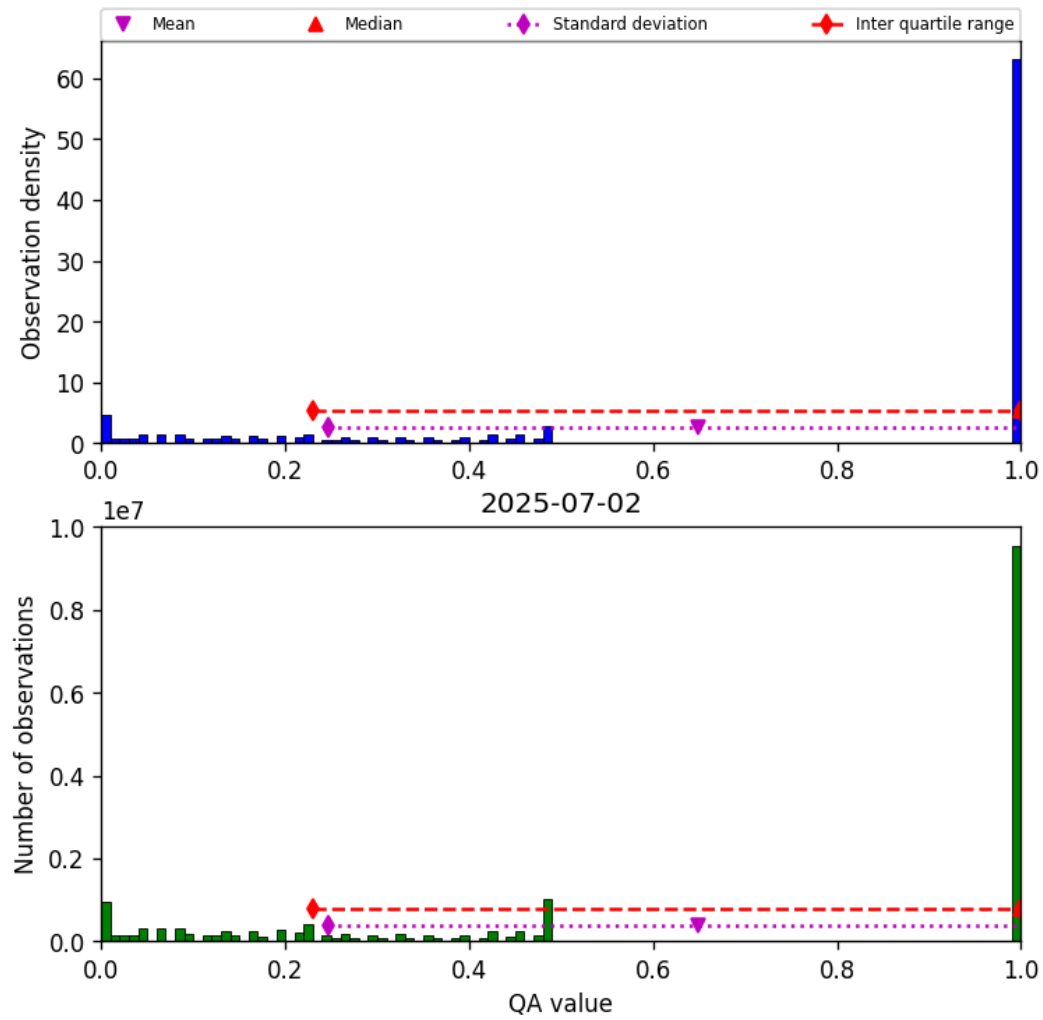


Figure 57: Histogram of “QA value” for 2025-07-02 to 2025-07-03

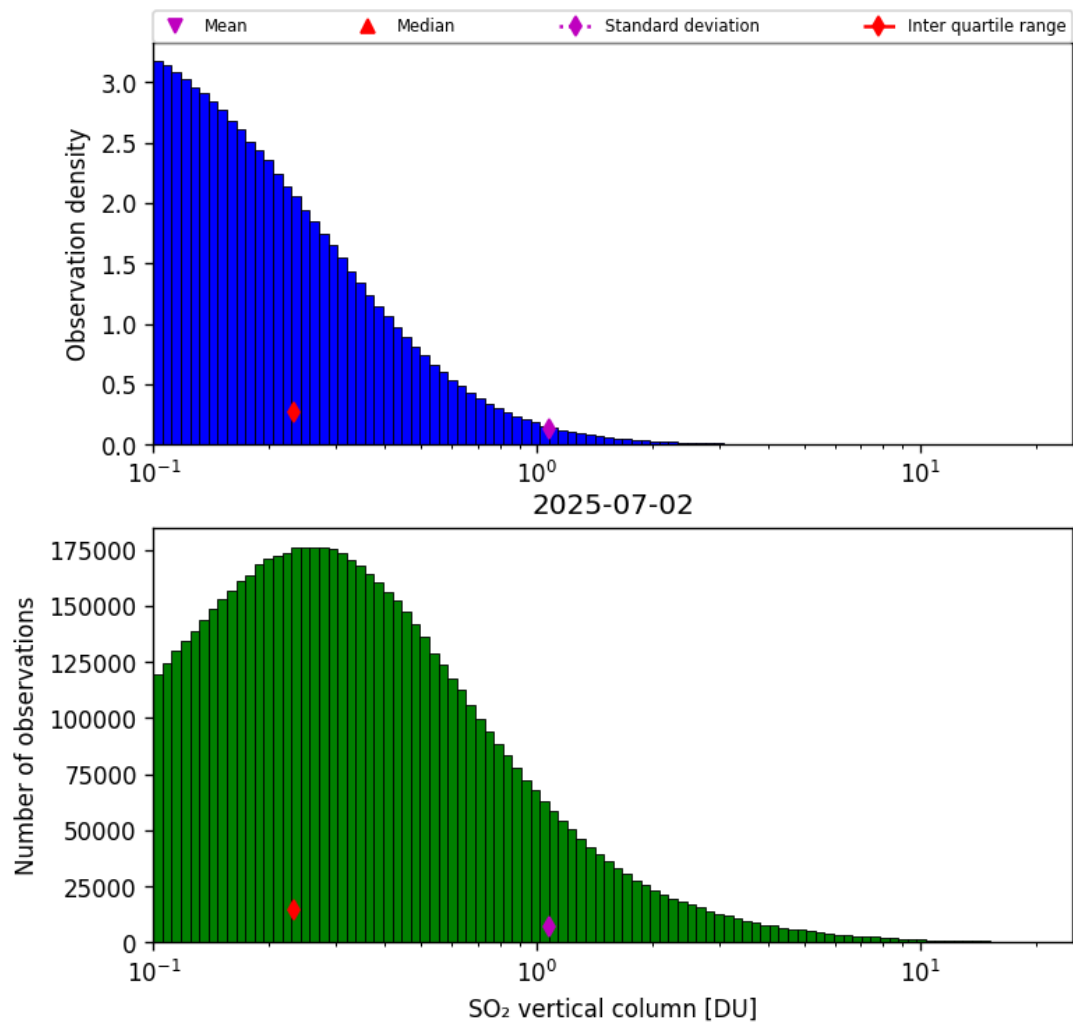


Figure 58: Histogram of “SO₂ vertical column” for 2025-07-02 to 2025-07-03

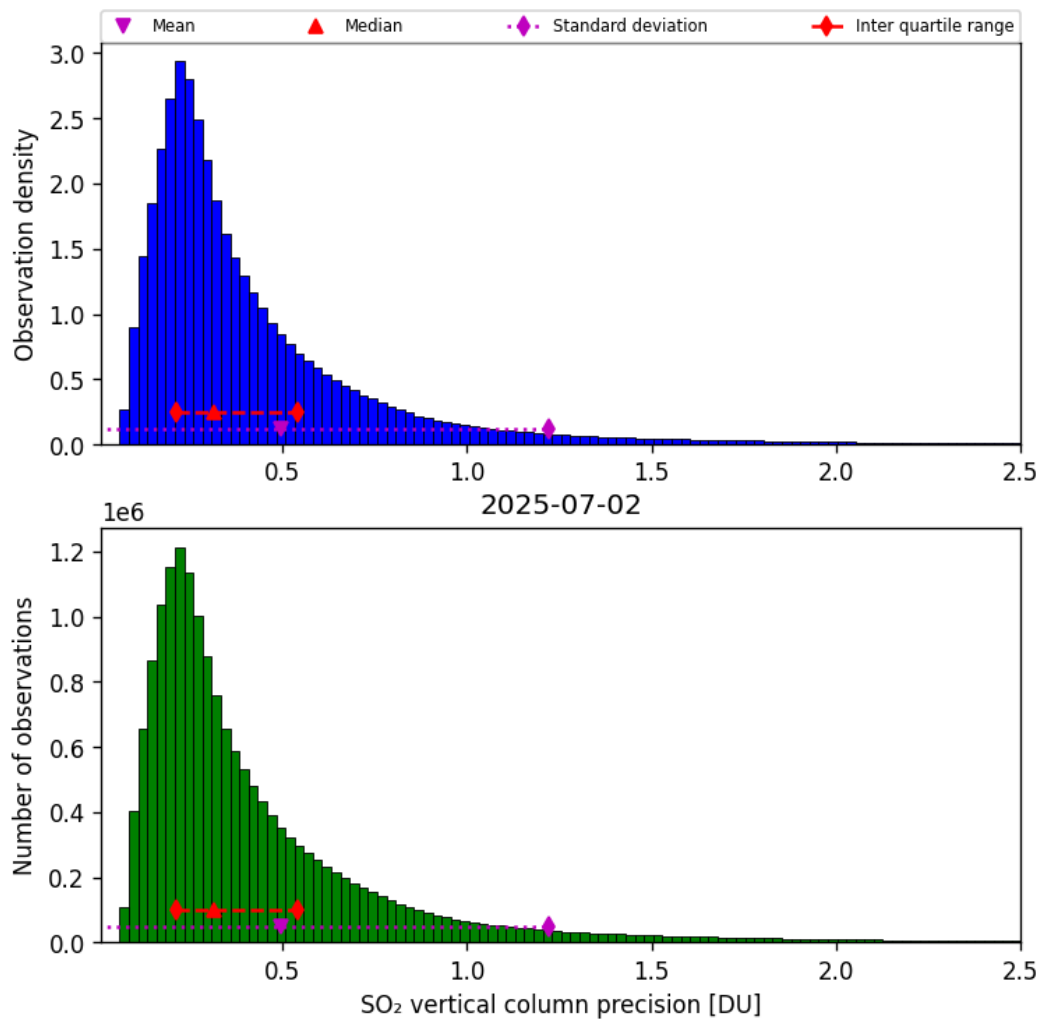


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-07-02 to 2025-07-03

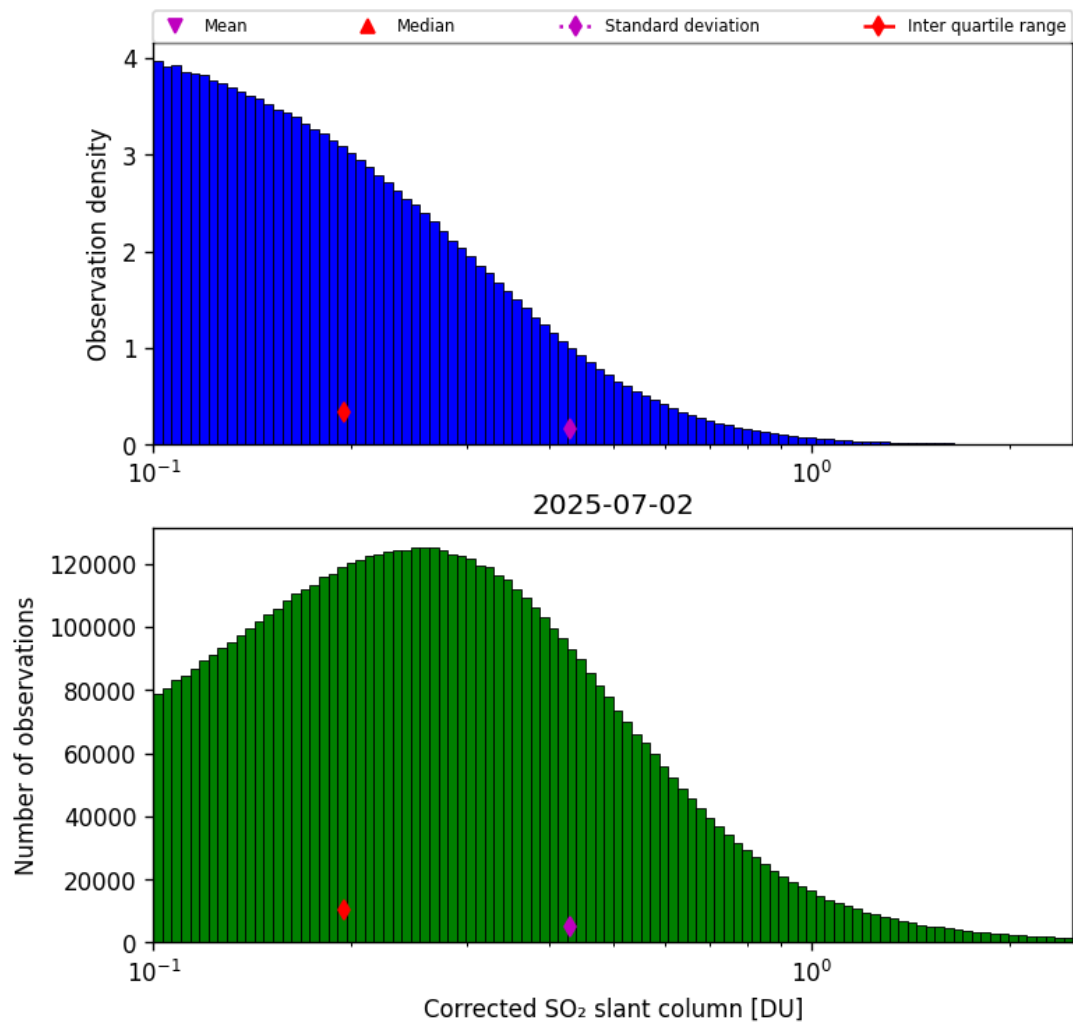


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-07-02 to 2025-07-03

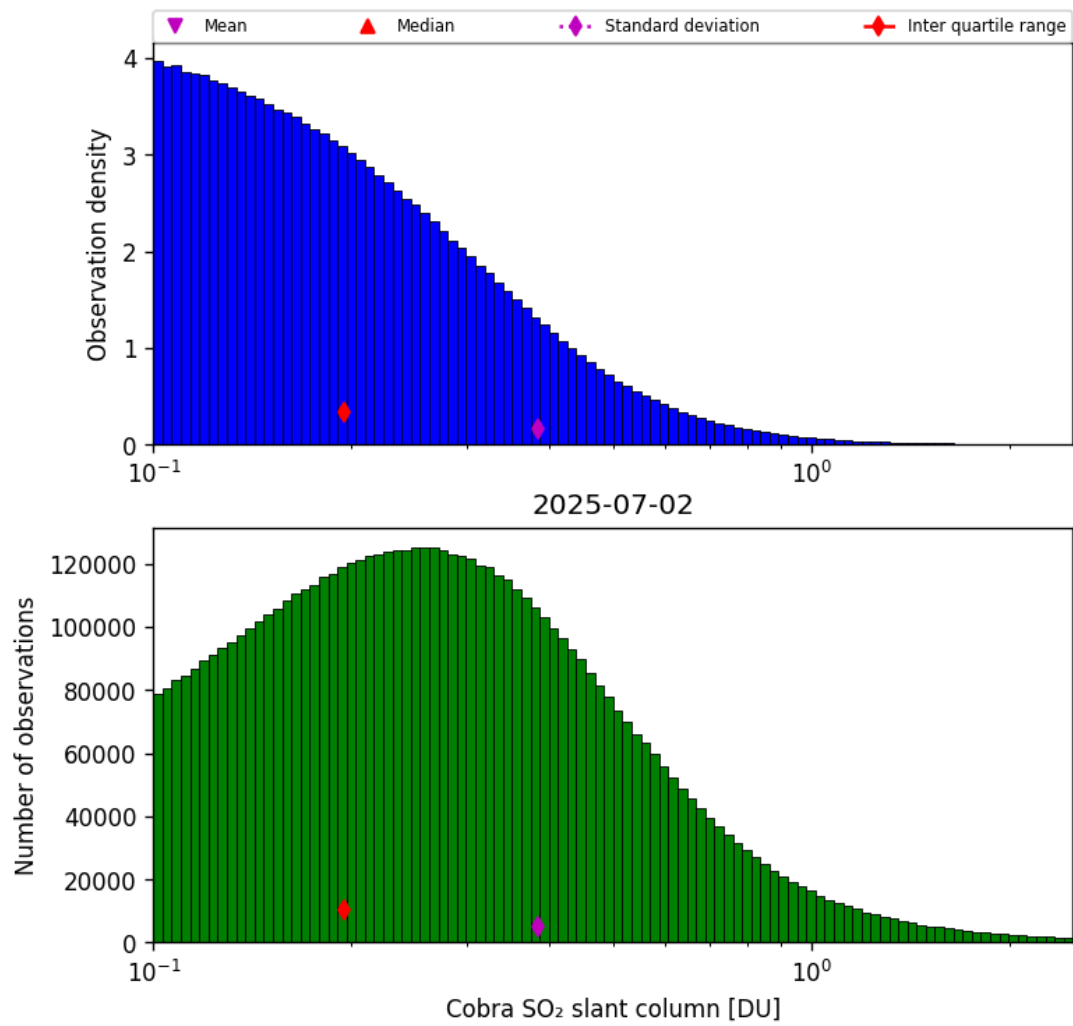


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-07-02 to 2025-07-03

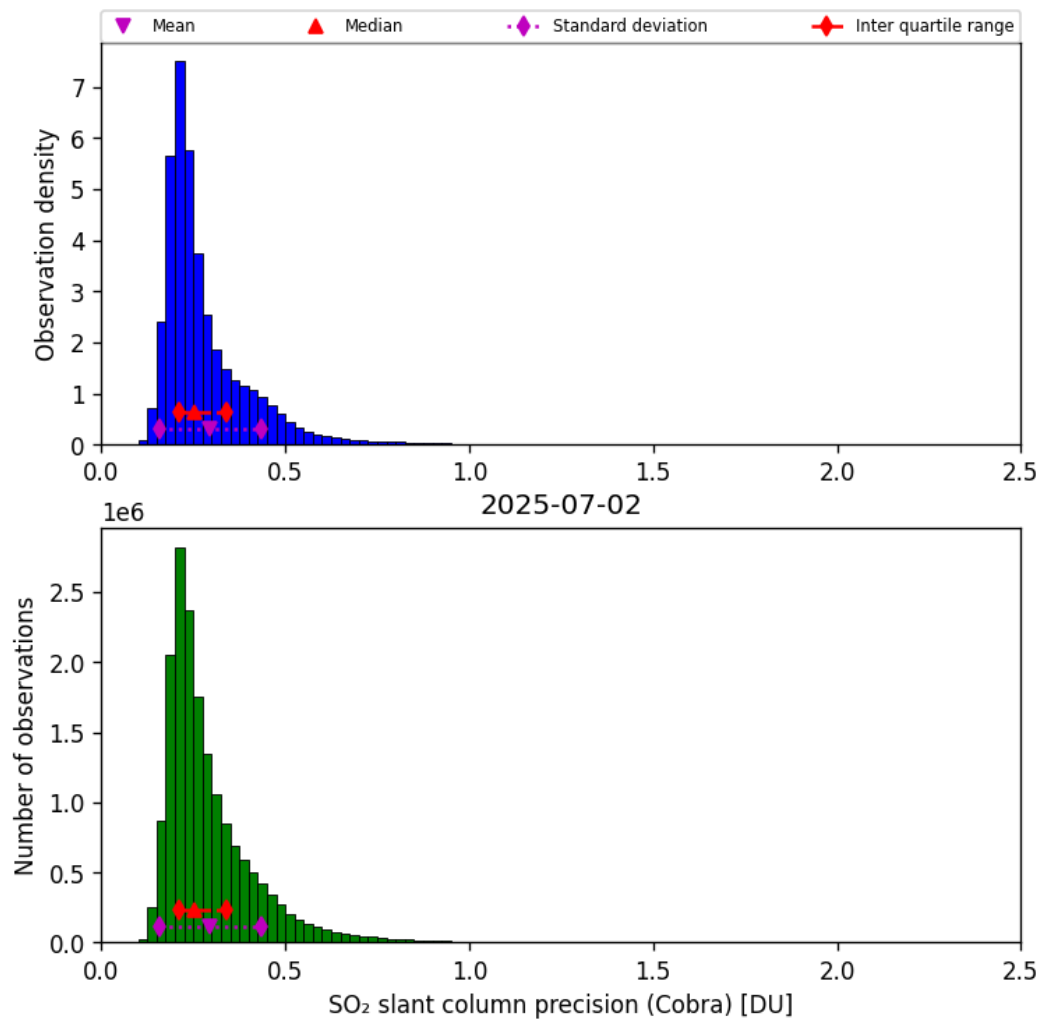


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-07-02 to 2025-07-03

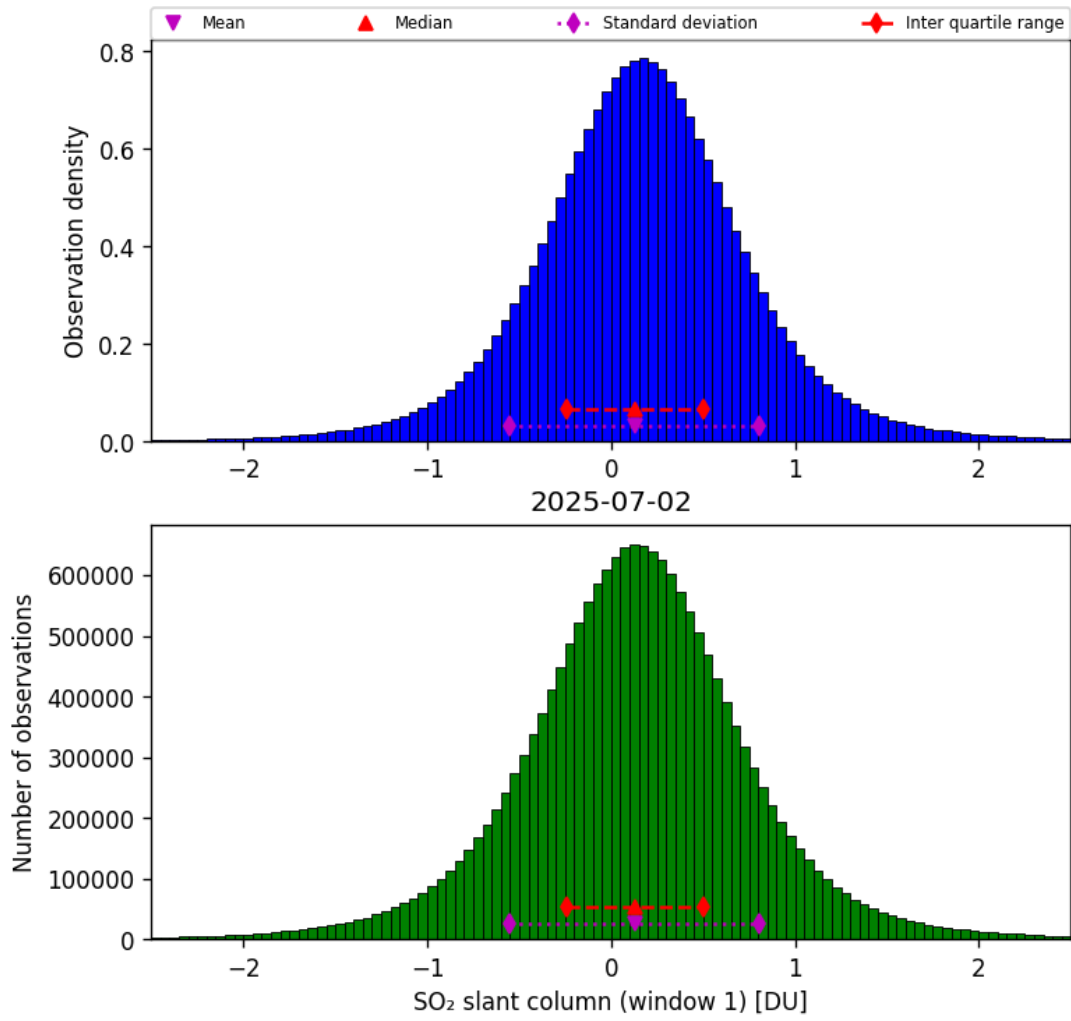


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-07-02 to 2025-07-03

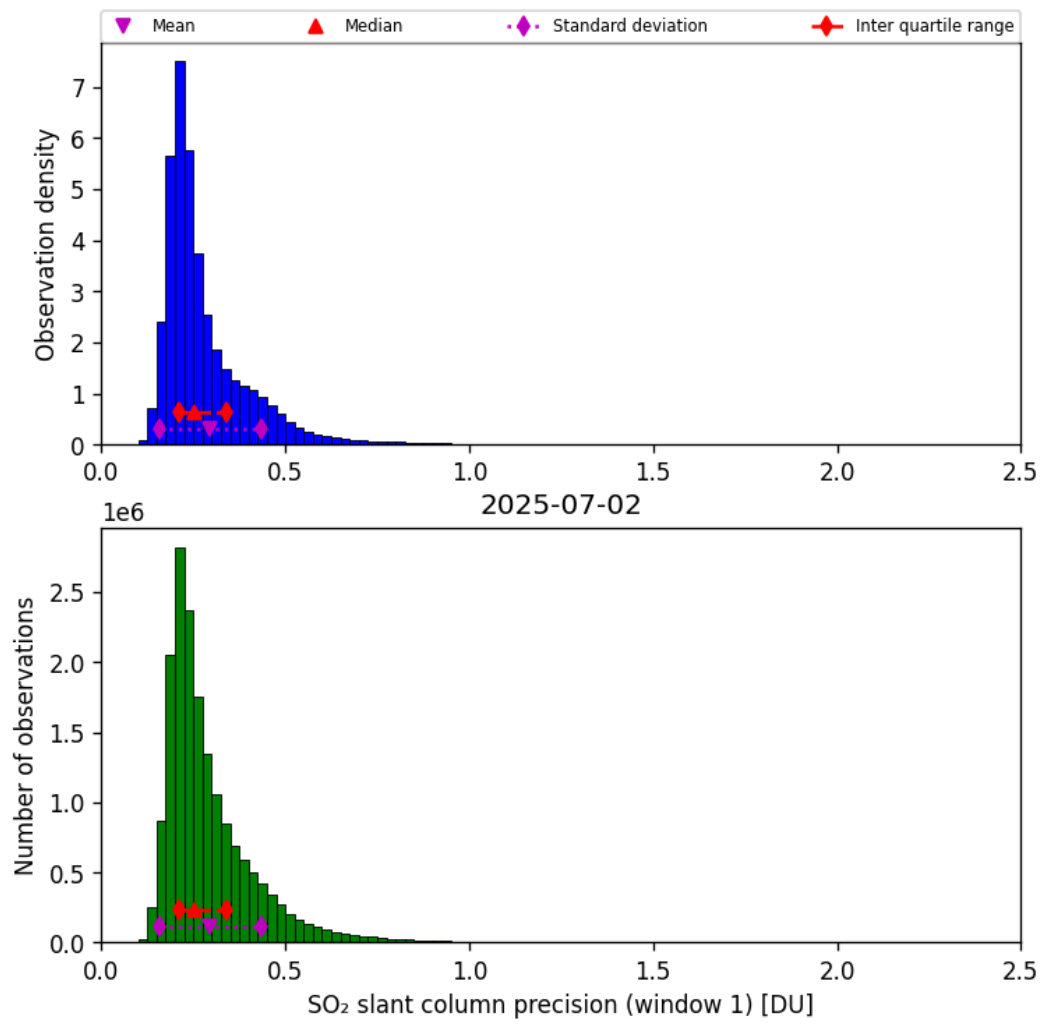


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-07-02 to 2025-07-03

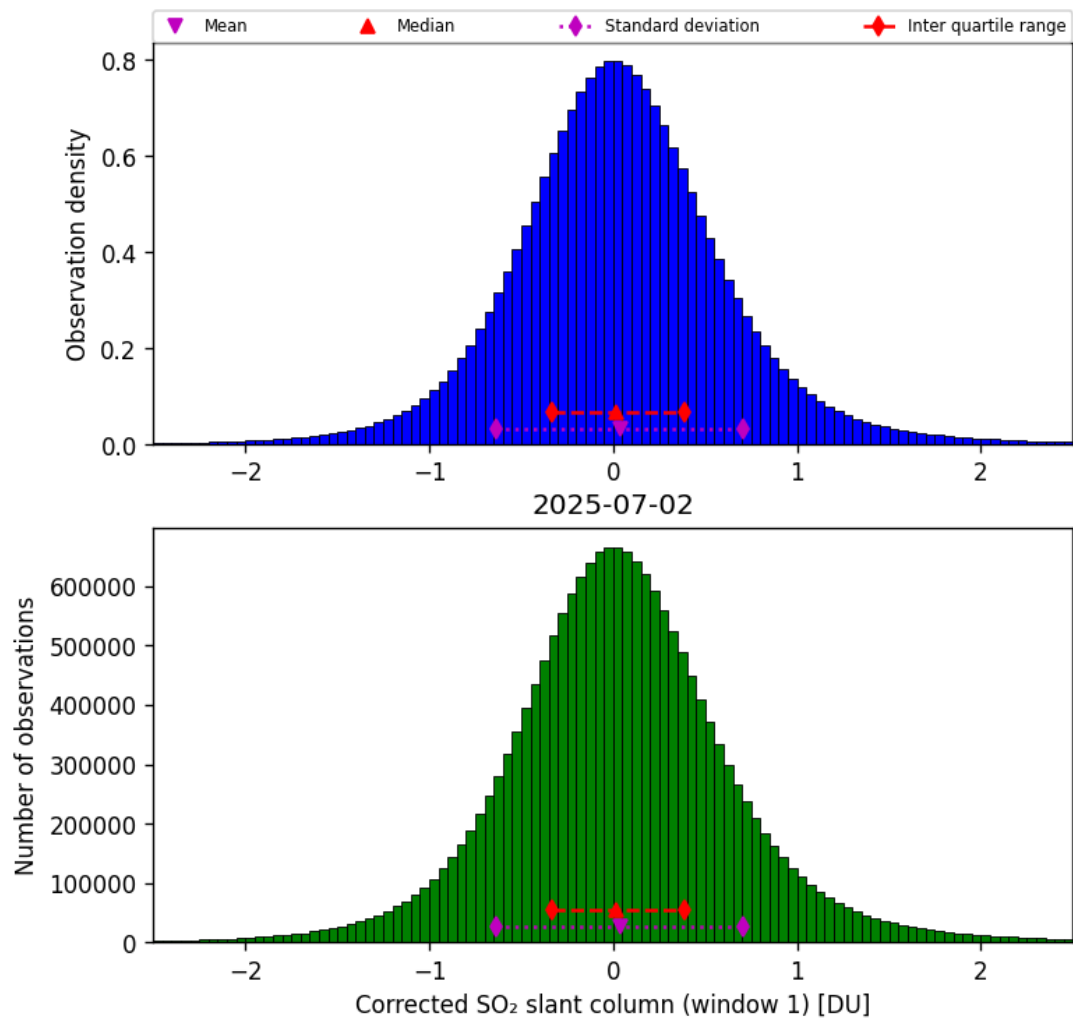


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-07-02 to 2025-07-03

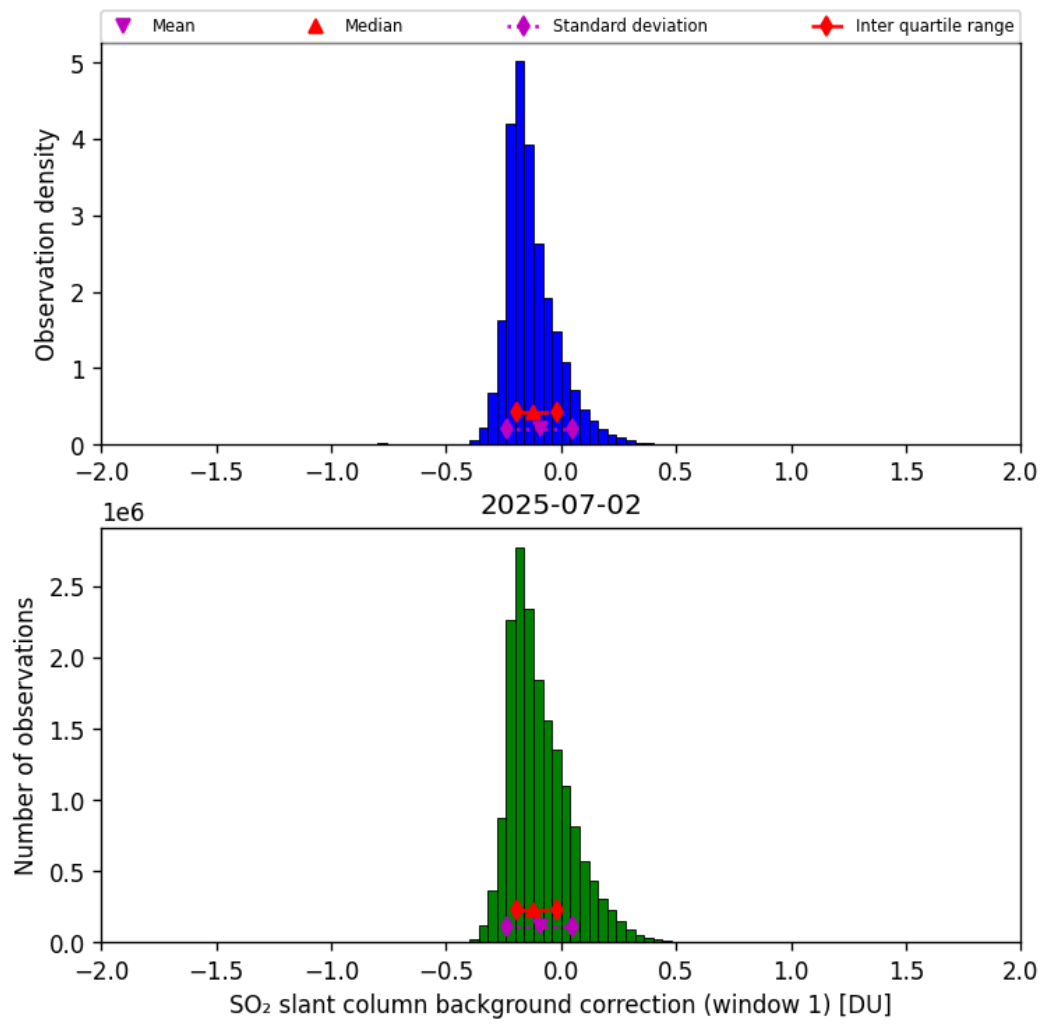


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-07-02 to 2025-07-03

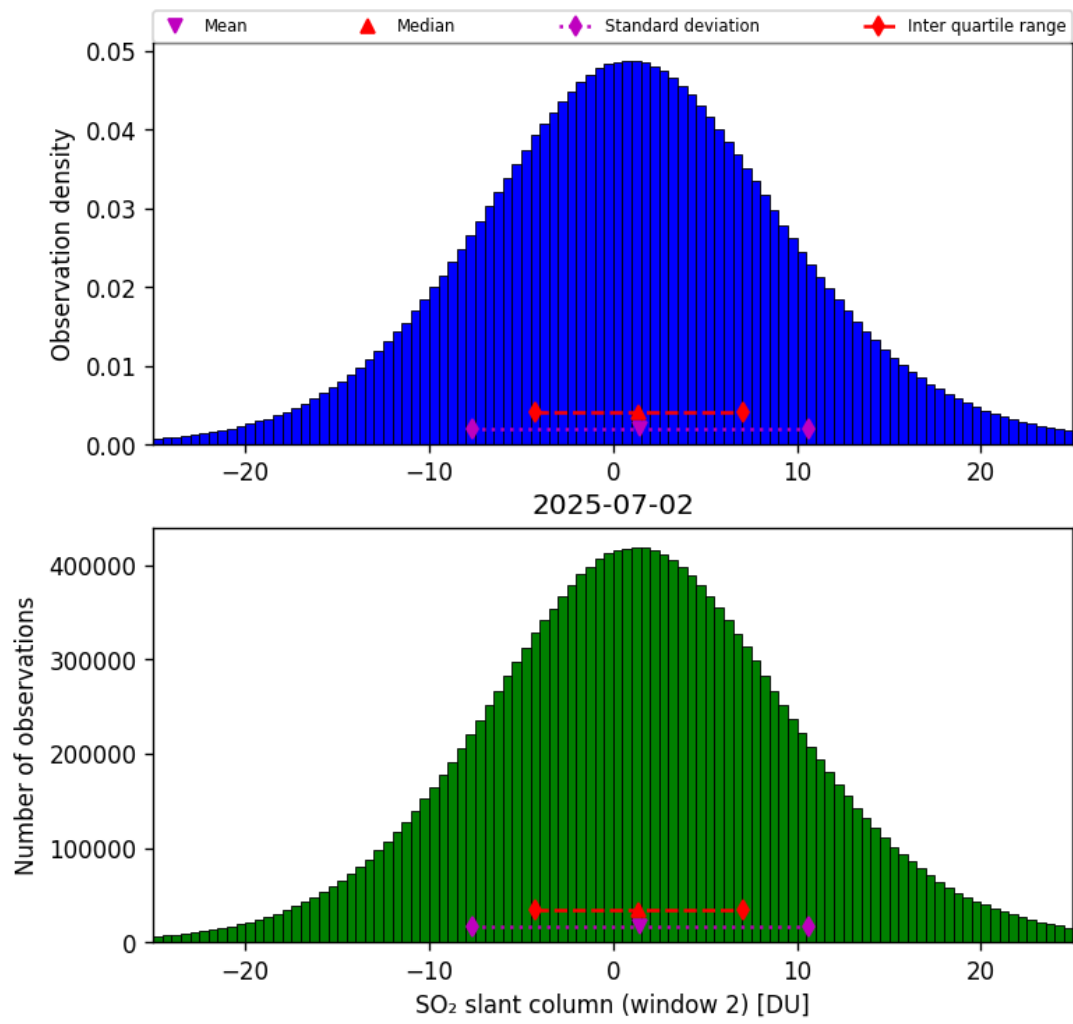


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-07-02 to 2025-07-03

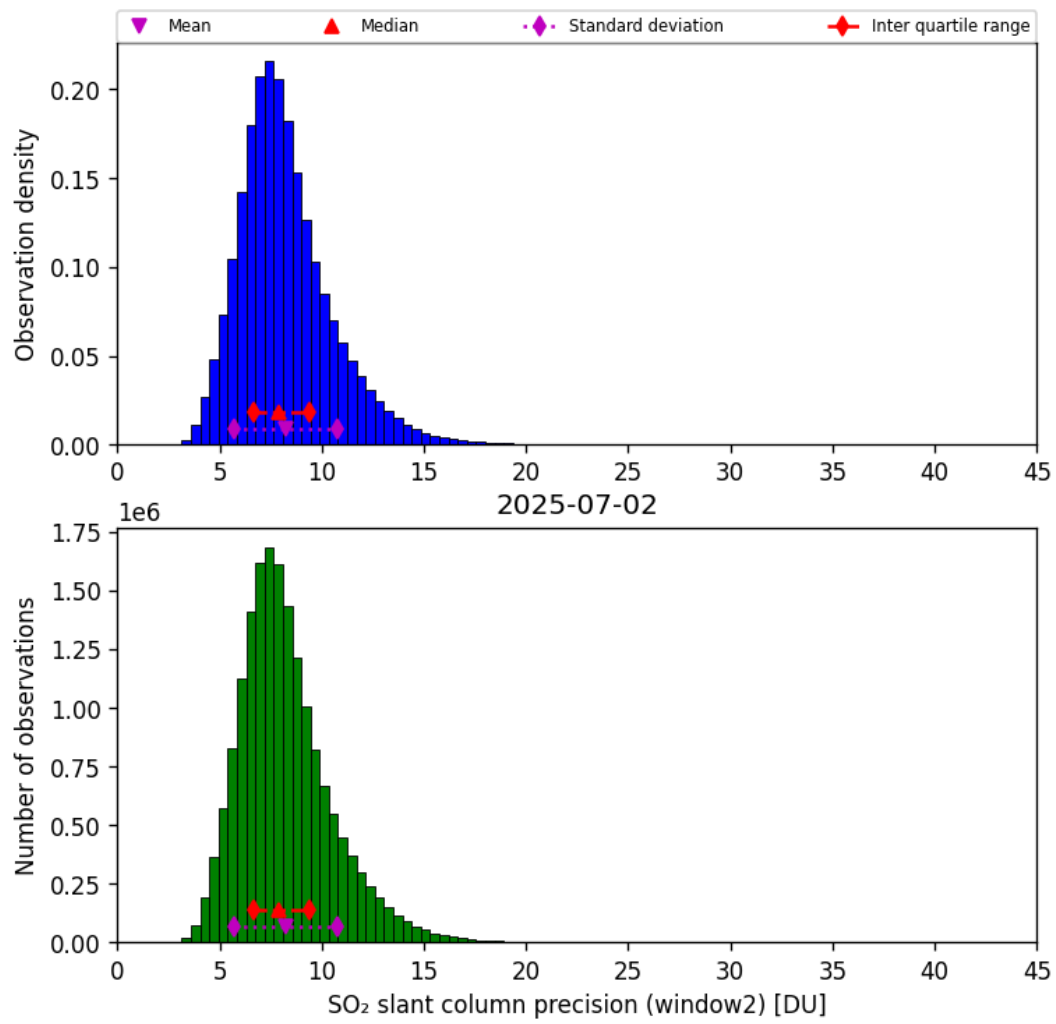


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-07-02 to 2025-07-03

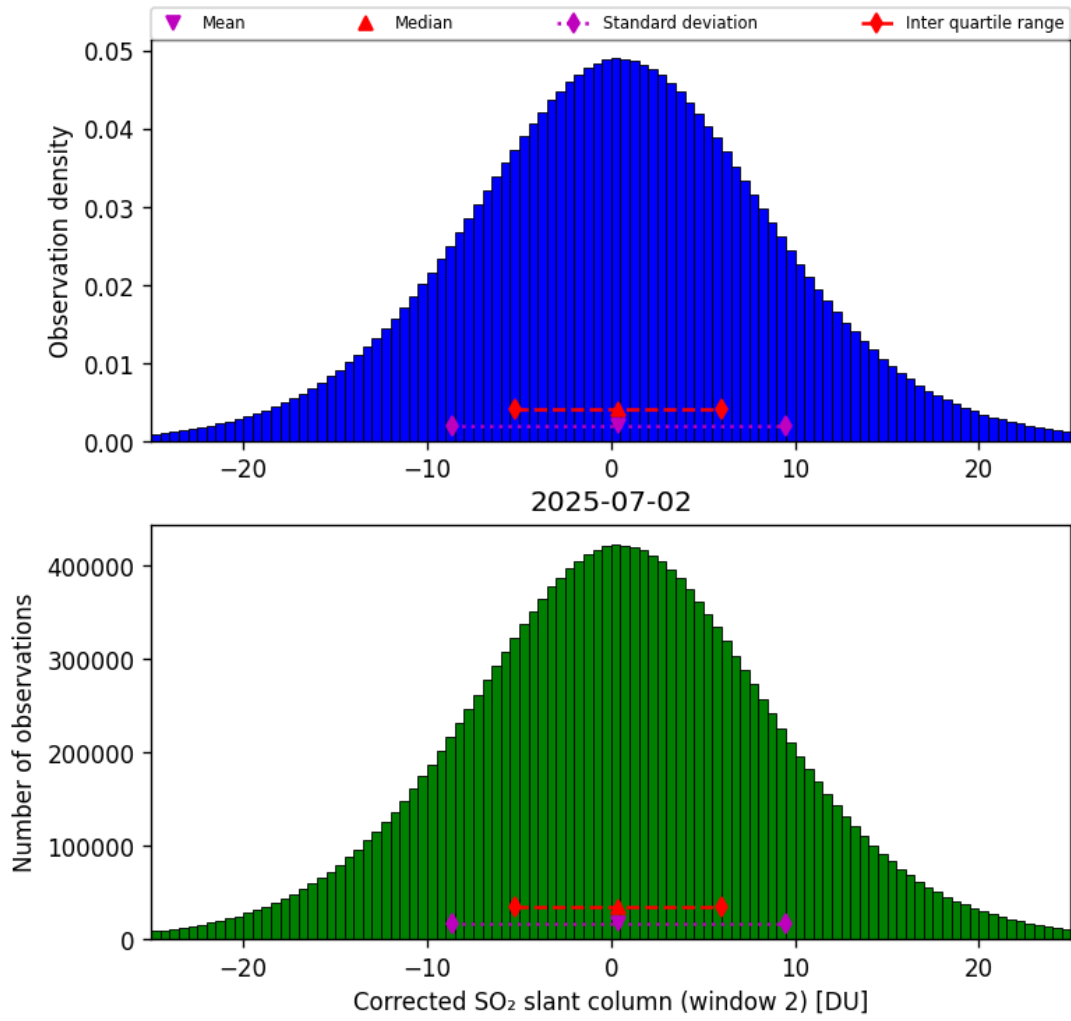


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-07-02 to 2025-07-03

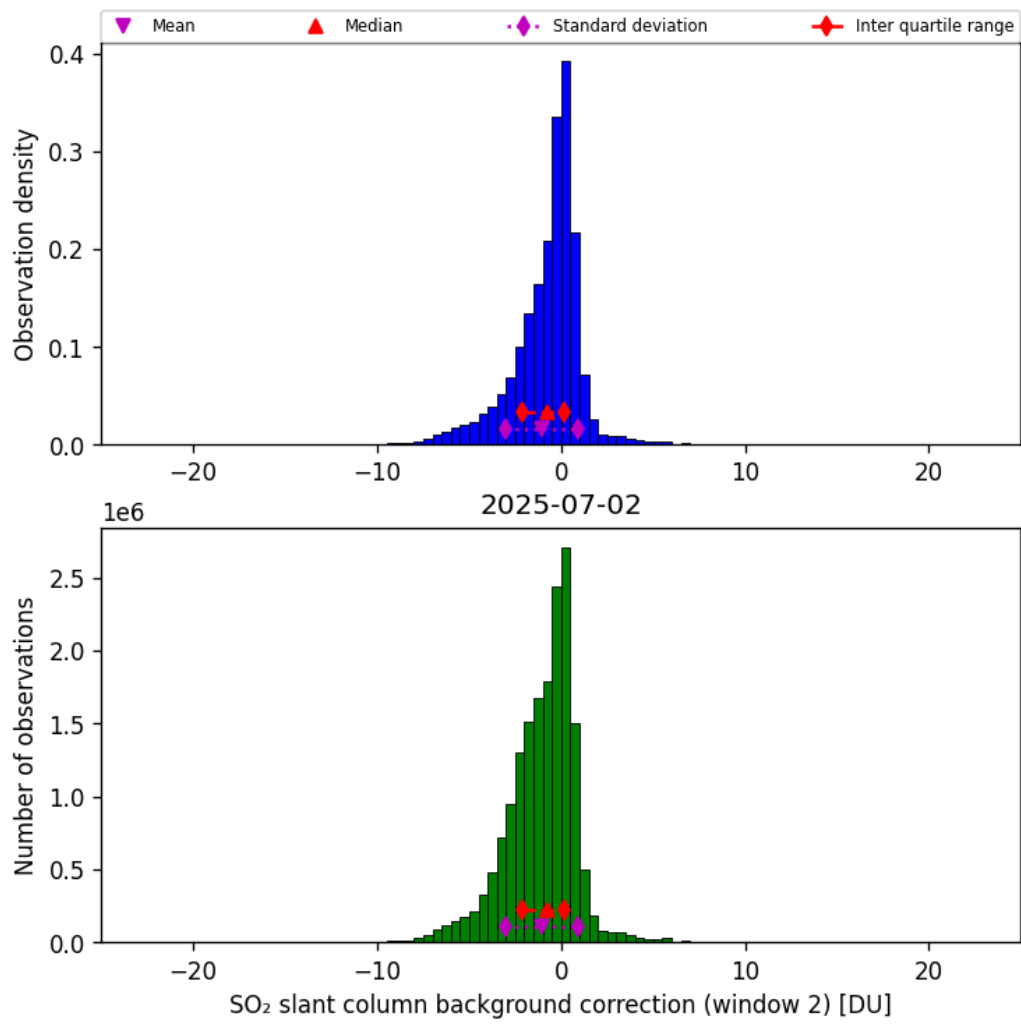


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-07-02 to 2025-07-03

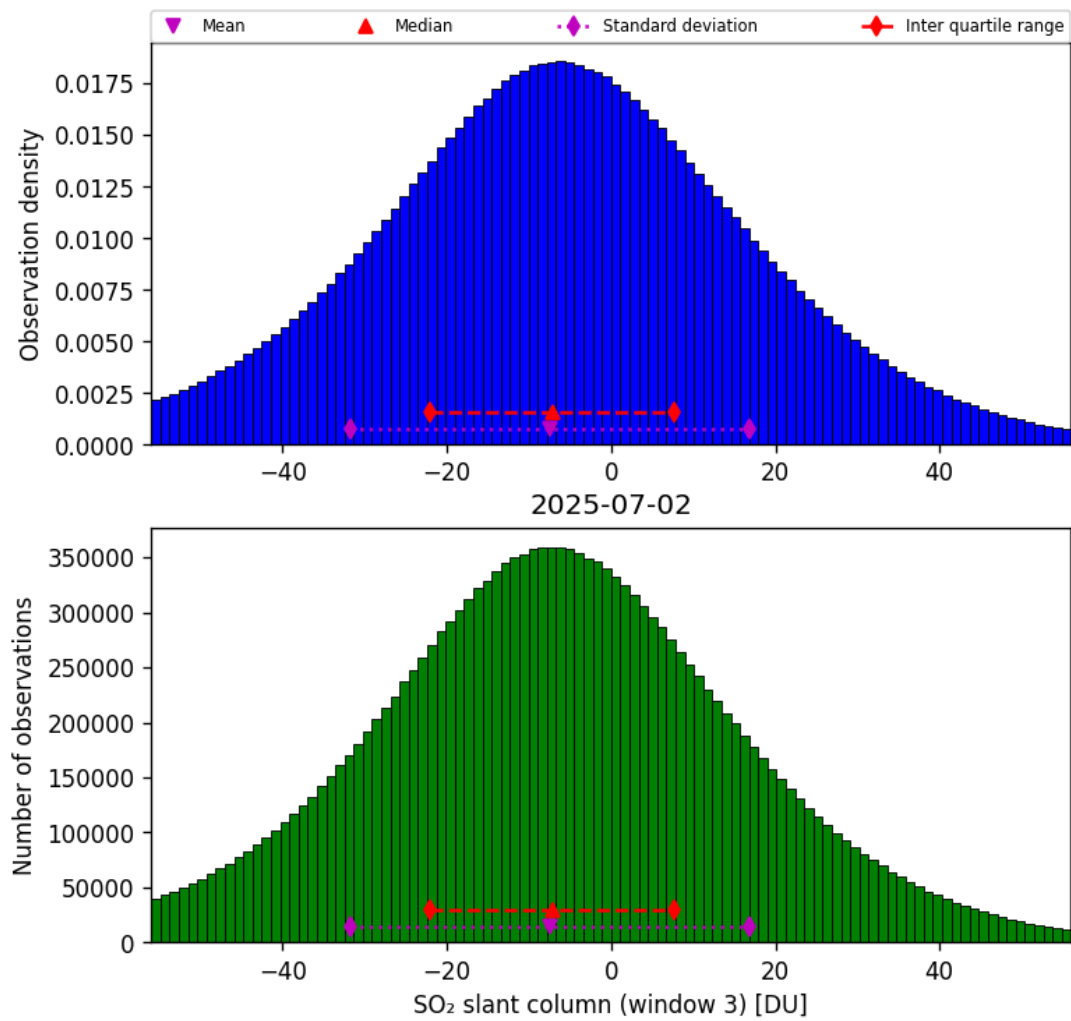


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-07-02 to 2025-07-03

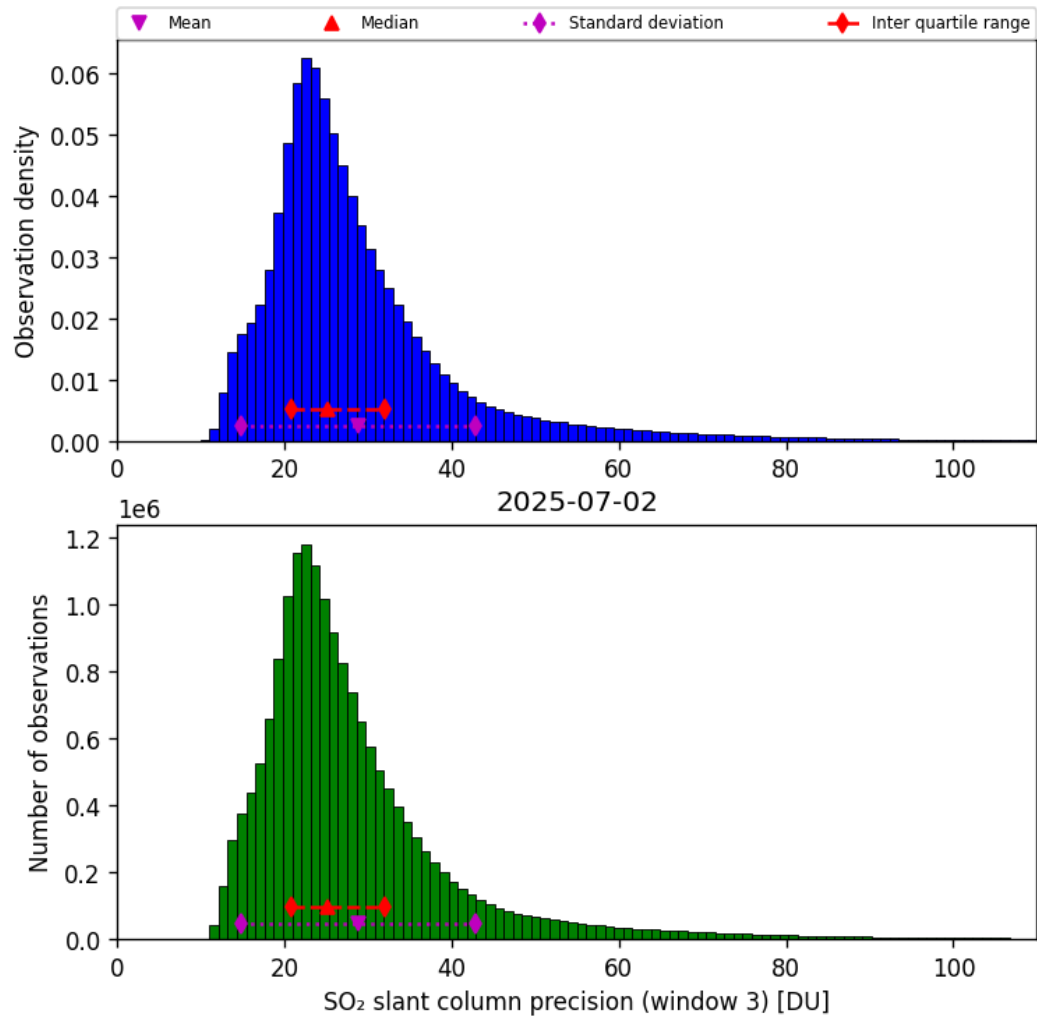


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-07-02 to 2025-07-03

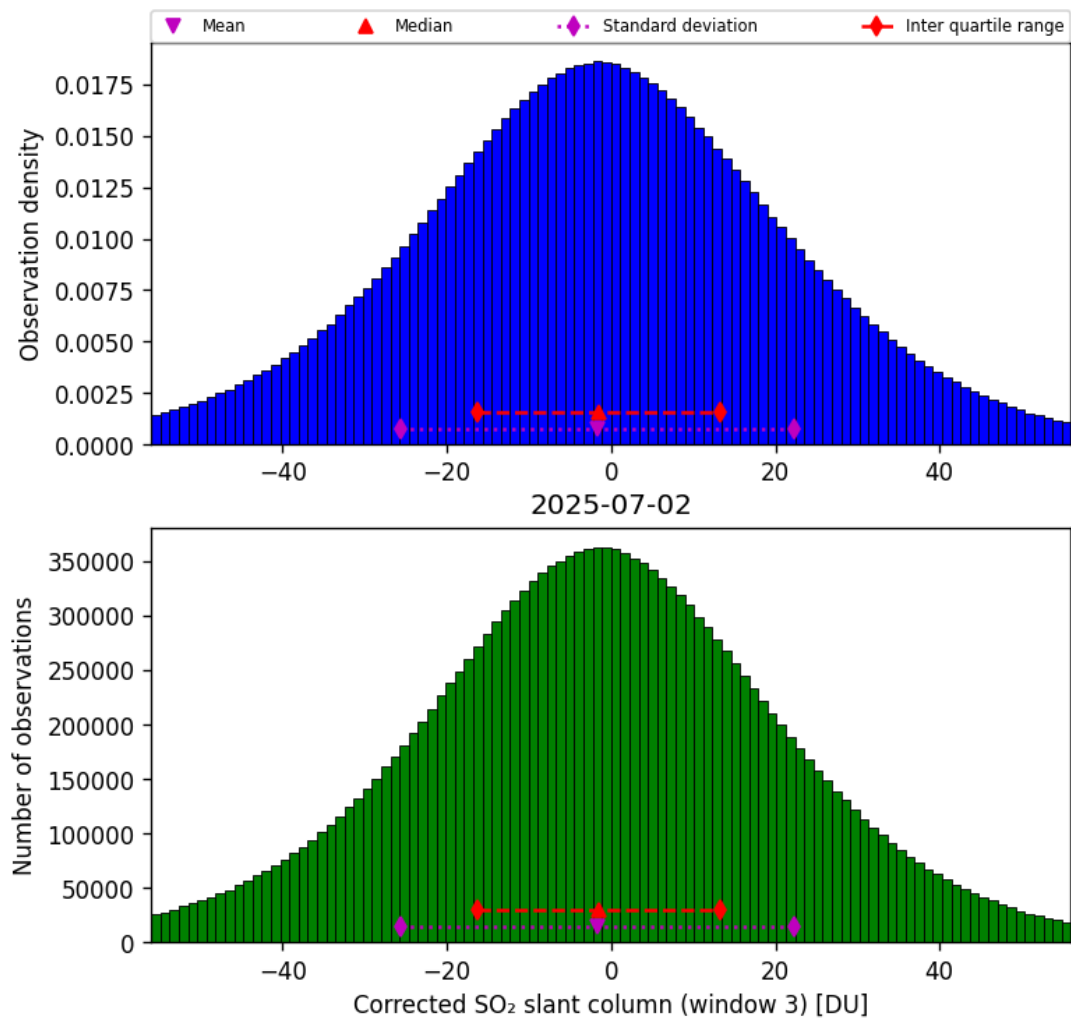


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-07-02 to 2025-07-03

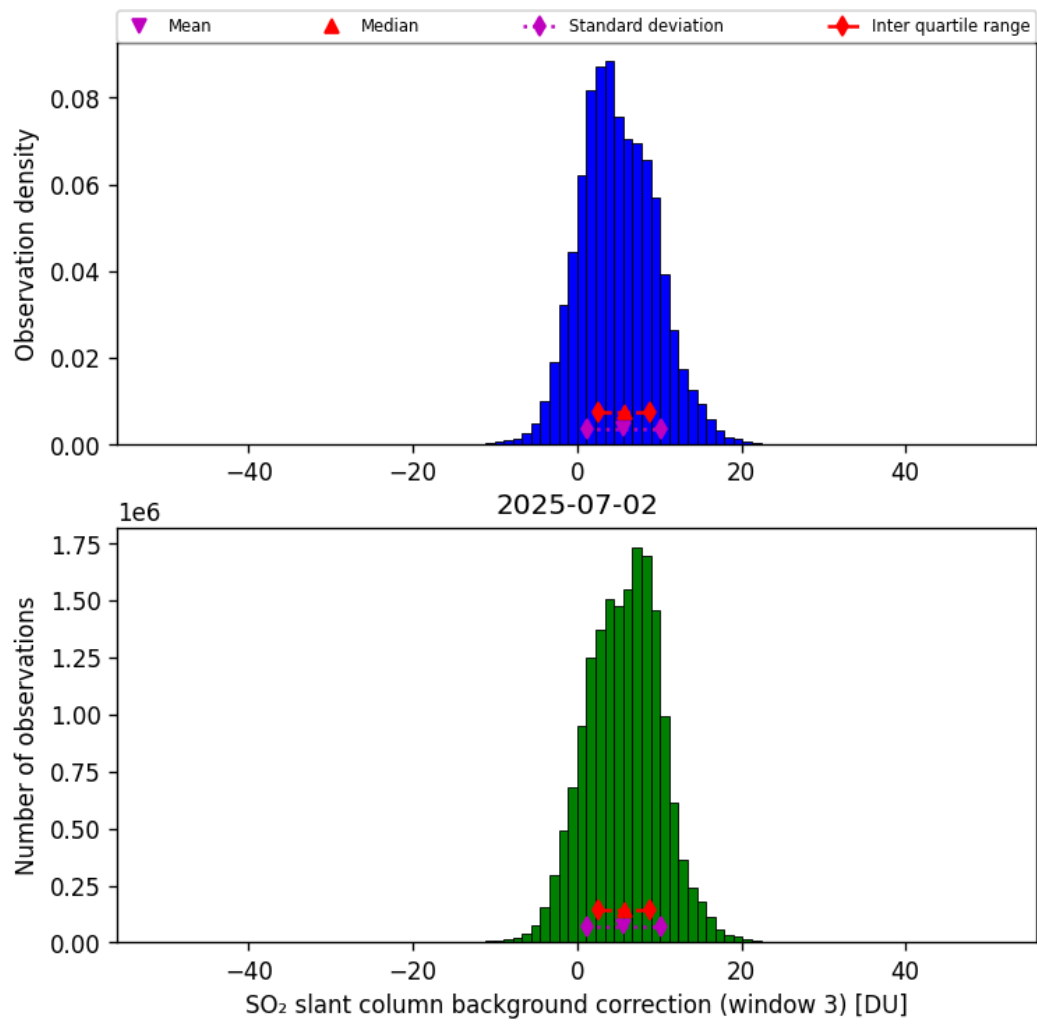


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-07-02 to 2025-07-03

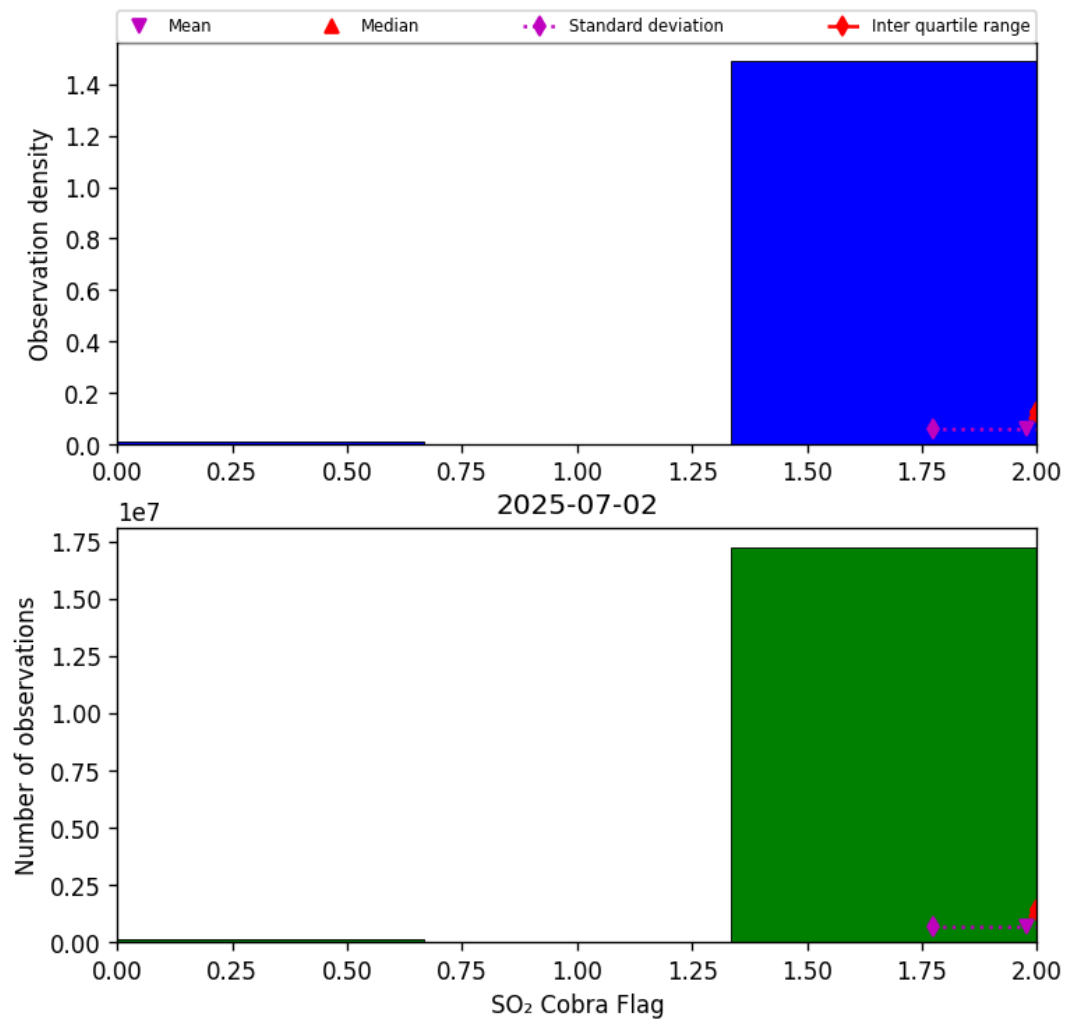


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-07-02 to 2025-07-03

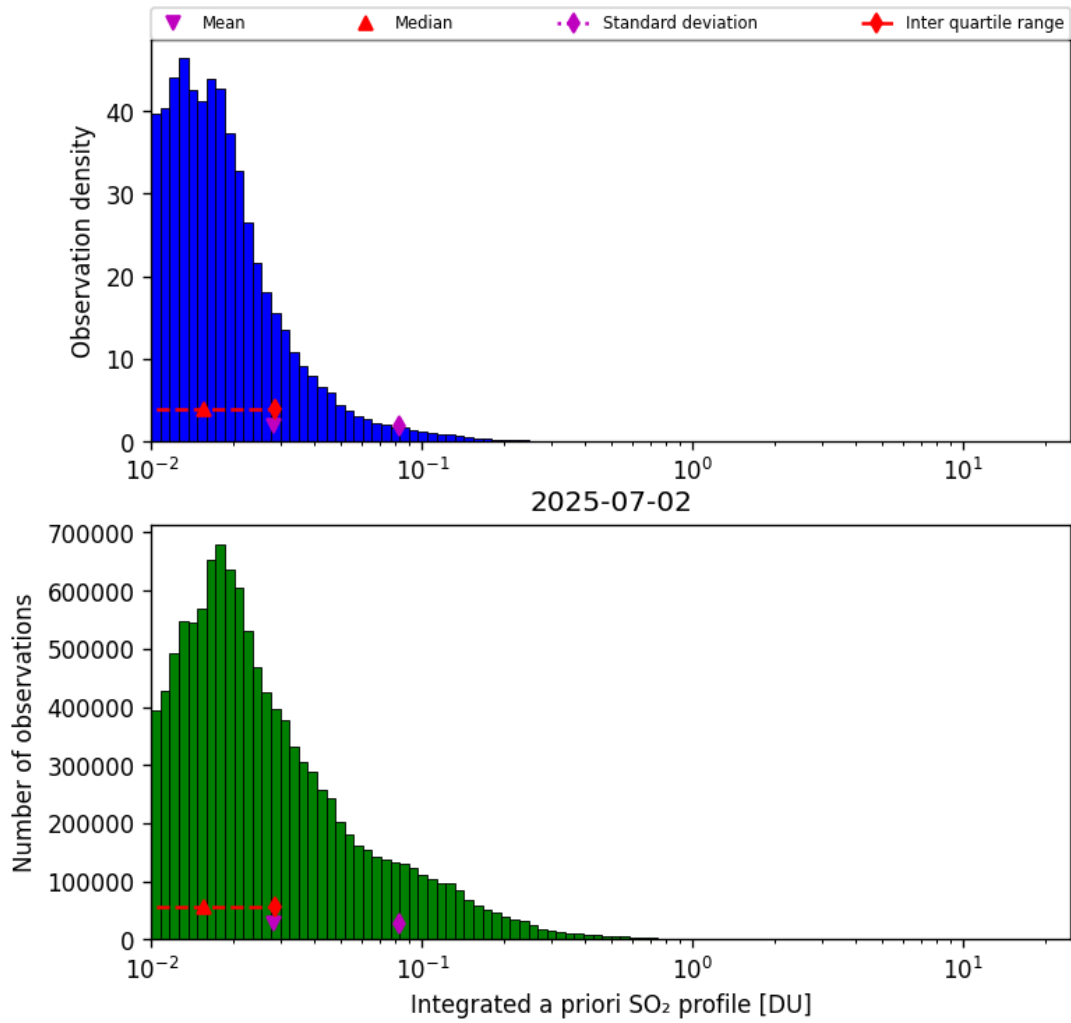


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-07-02 to 2025-07-03

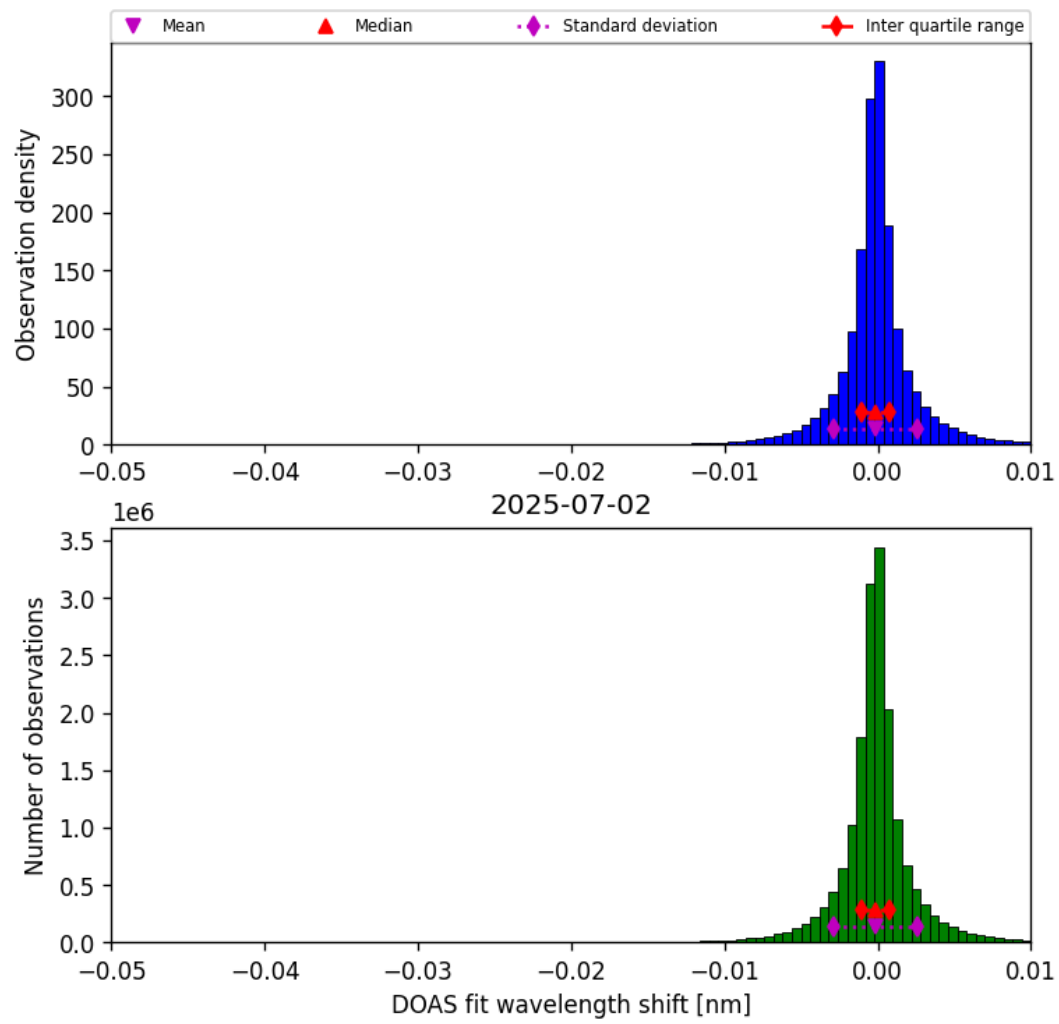


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-07-02 to 2025-07-03

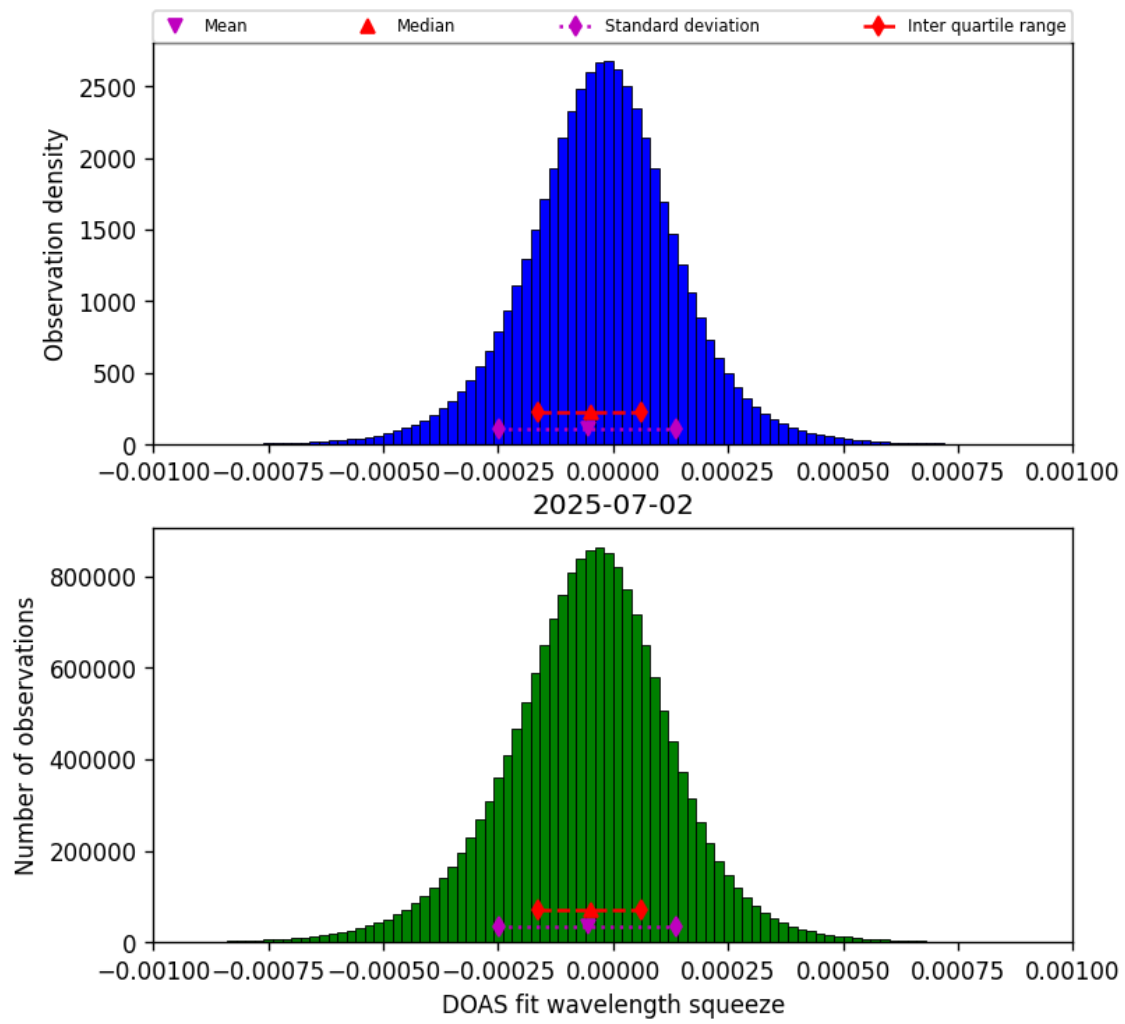


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-07-02 to 2025-07-03

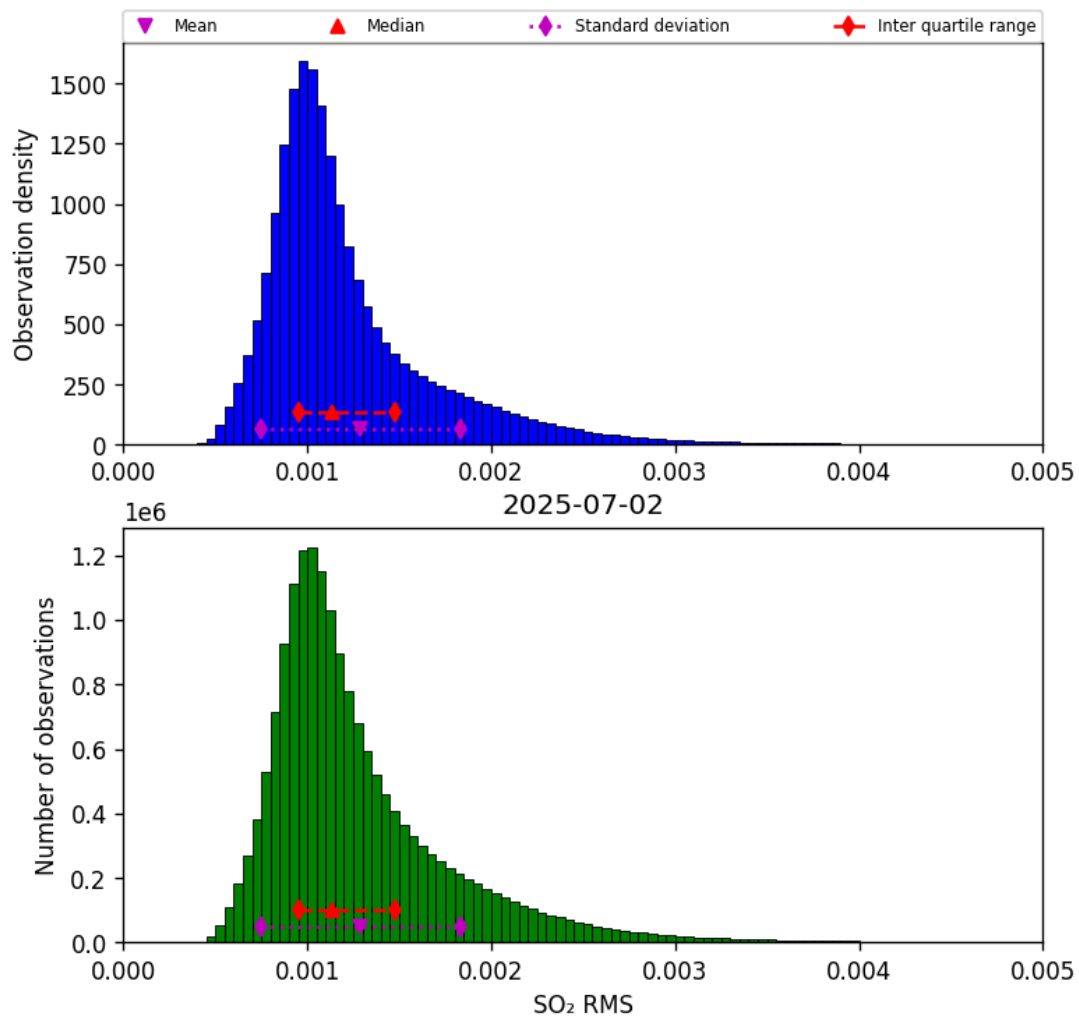


Figure 79: Histogram of “SO₂ RMS” for 2025-07-02 to 2025-07-03

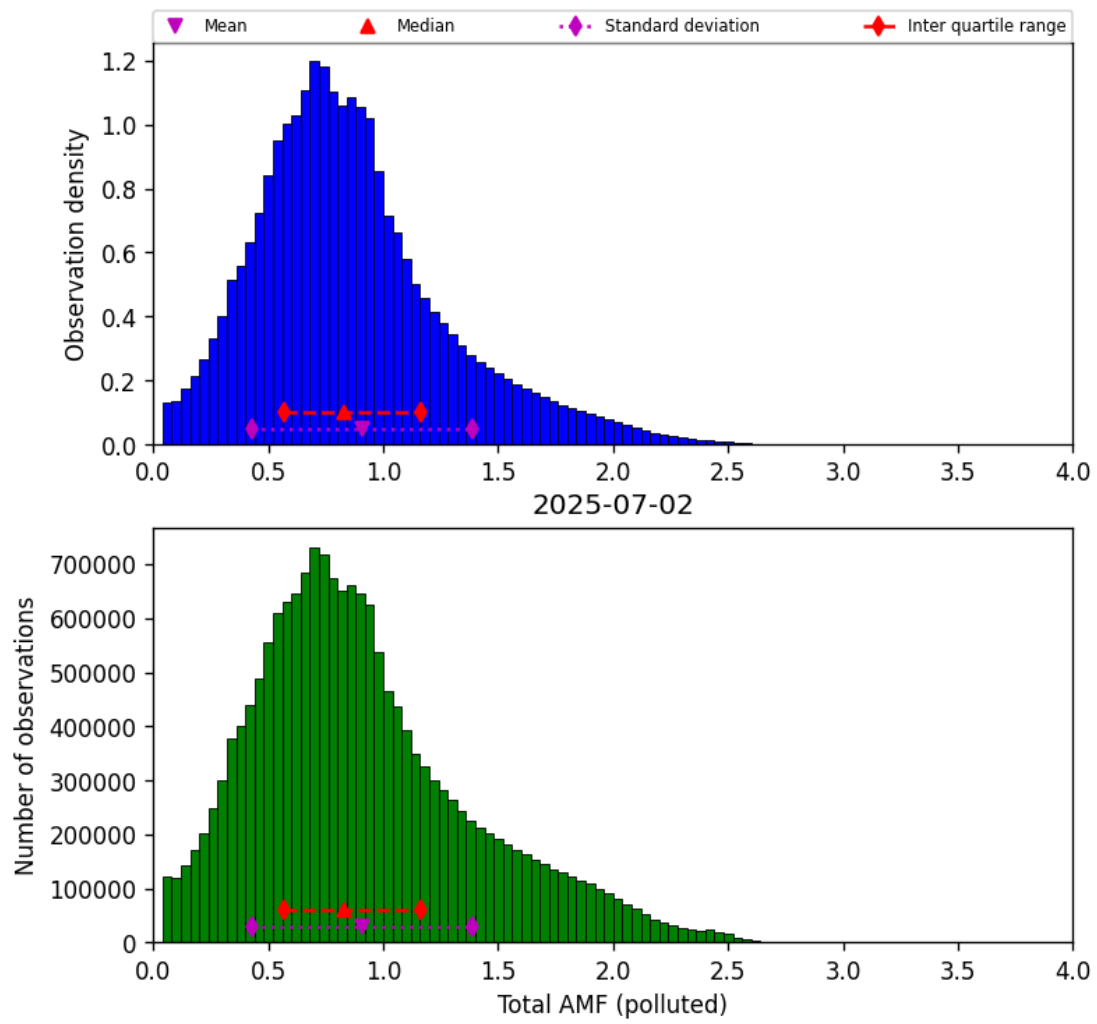


Figure 80: Histogram of “Total AMF (polluted)” for 2025-07-02 to 2025-07-03

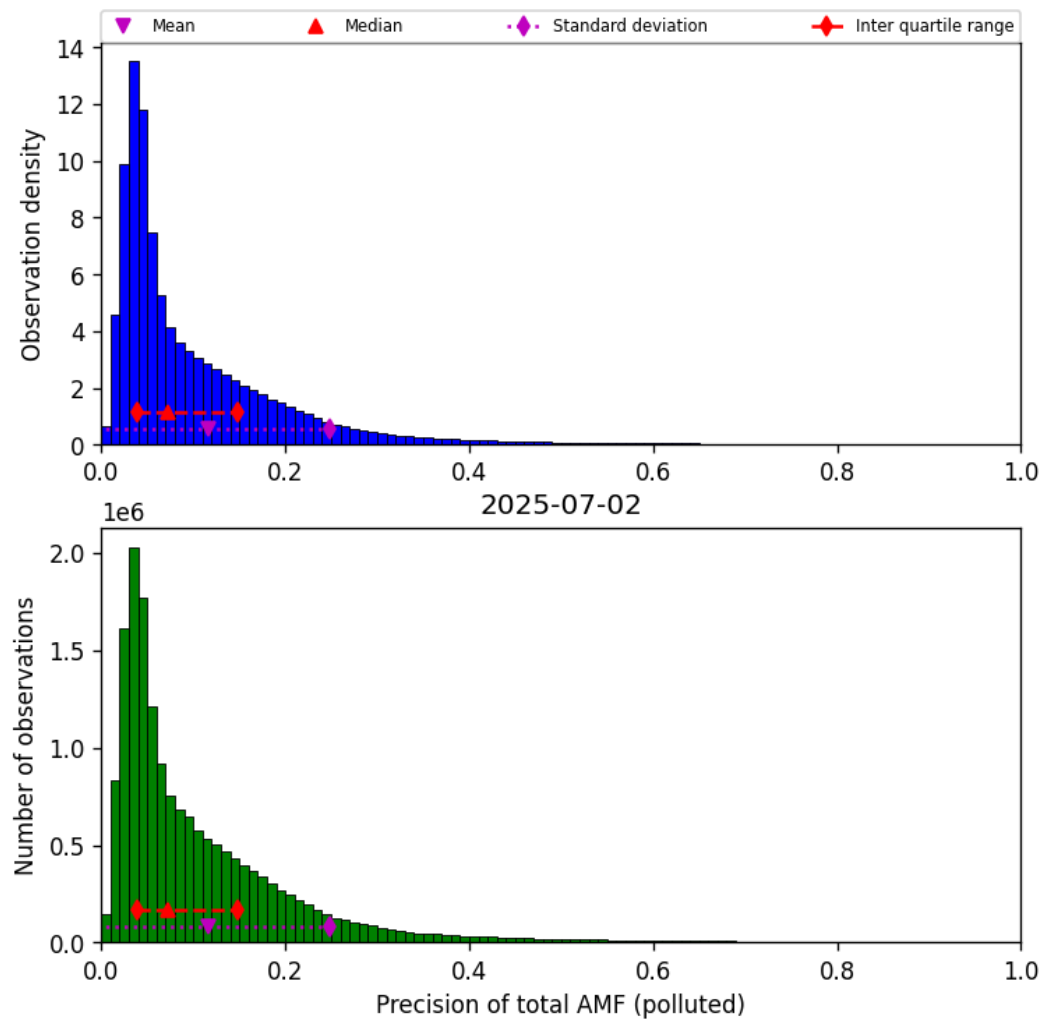


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-07-02 to 2025-07-03

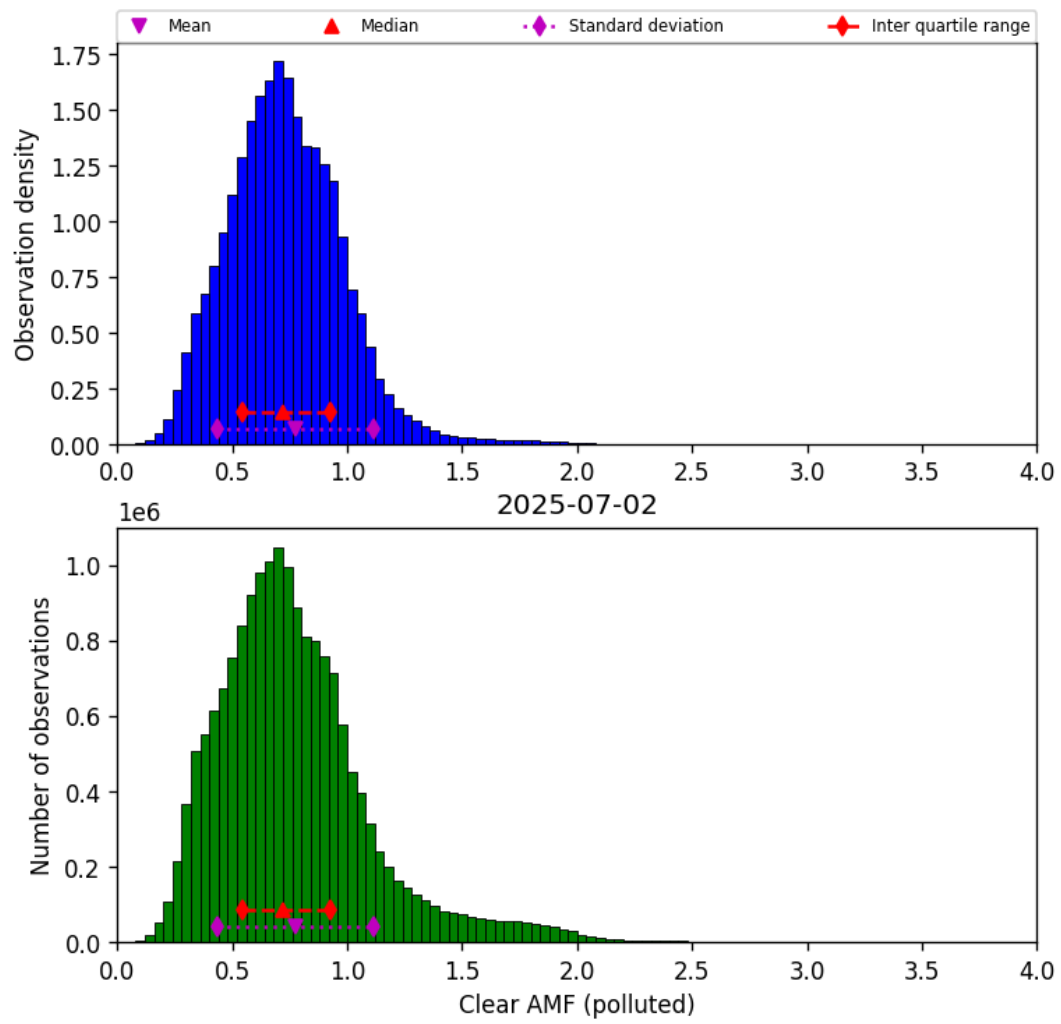


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-07-02 to 2025-07-03

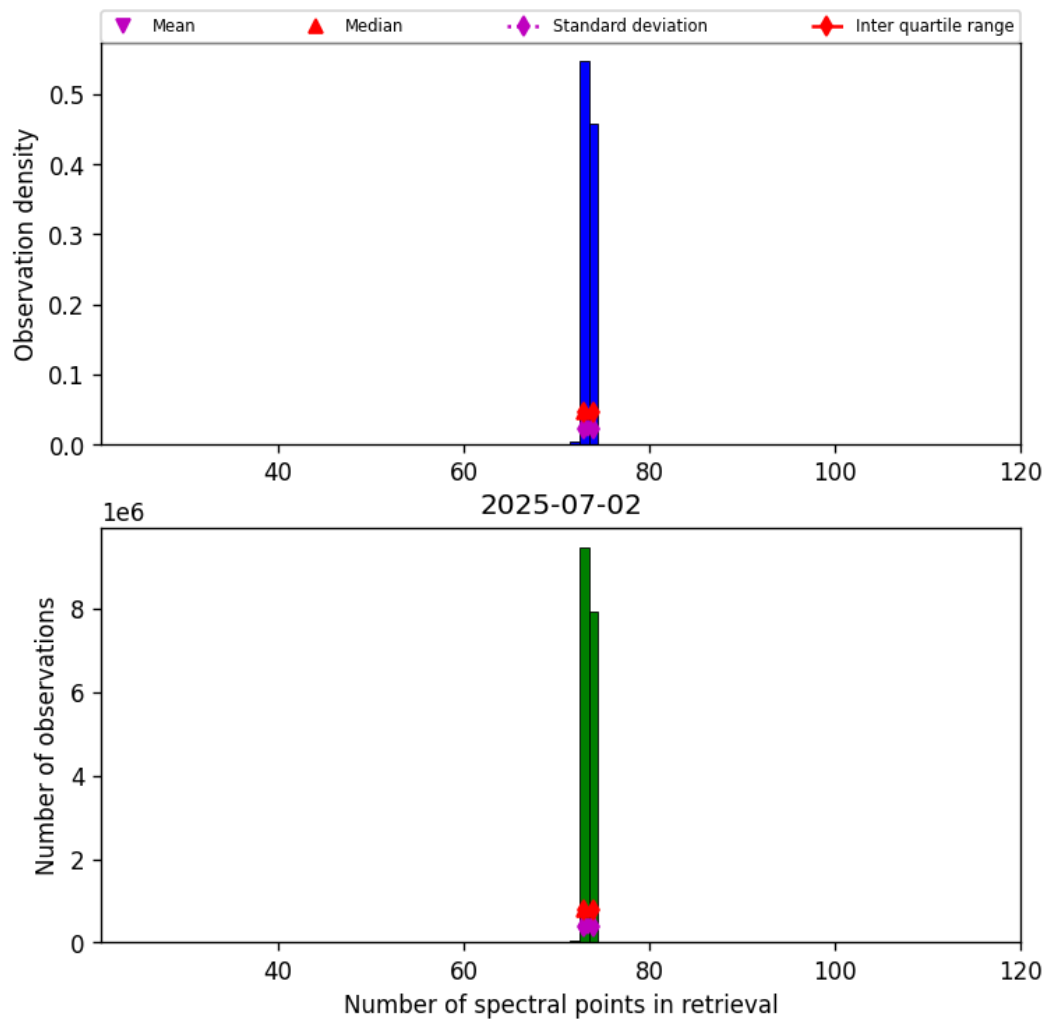


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-07-02 to 2025-07-03

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.

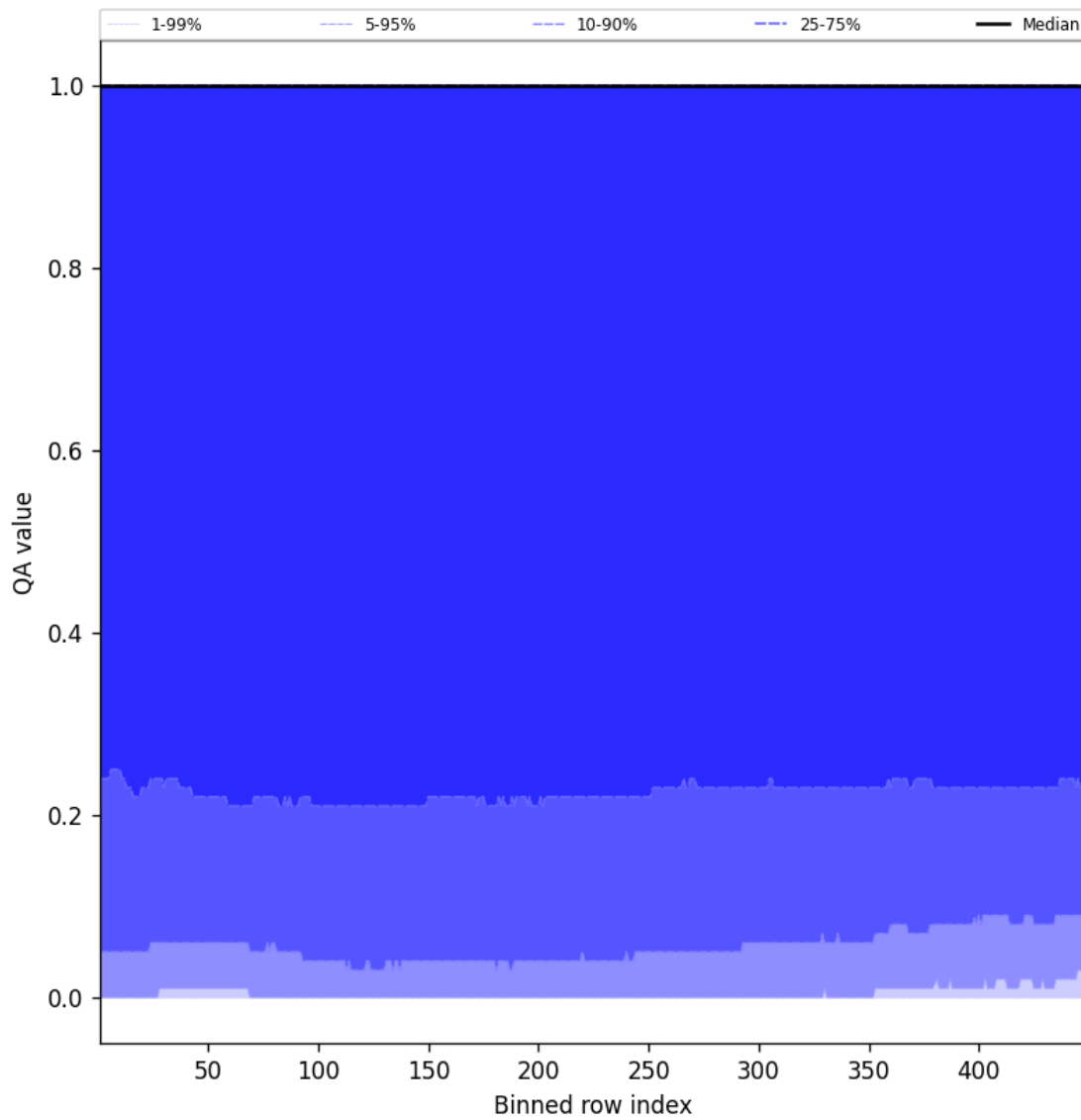


Figure 84: Along track statistics of “QA value” for 2025-07-02 to 2025-07-03

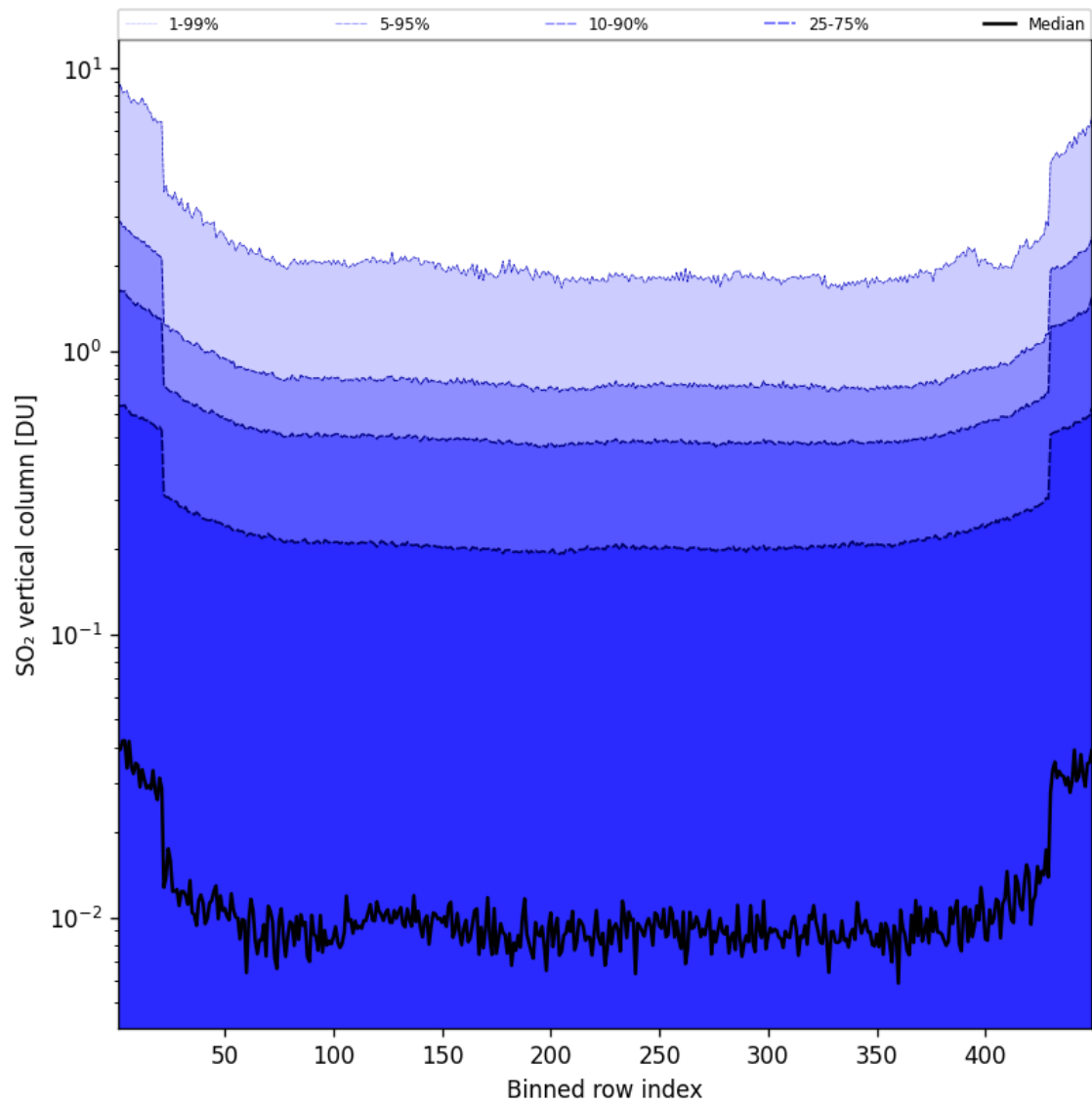


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-07-02 to 2025-07-03

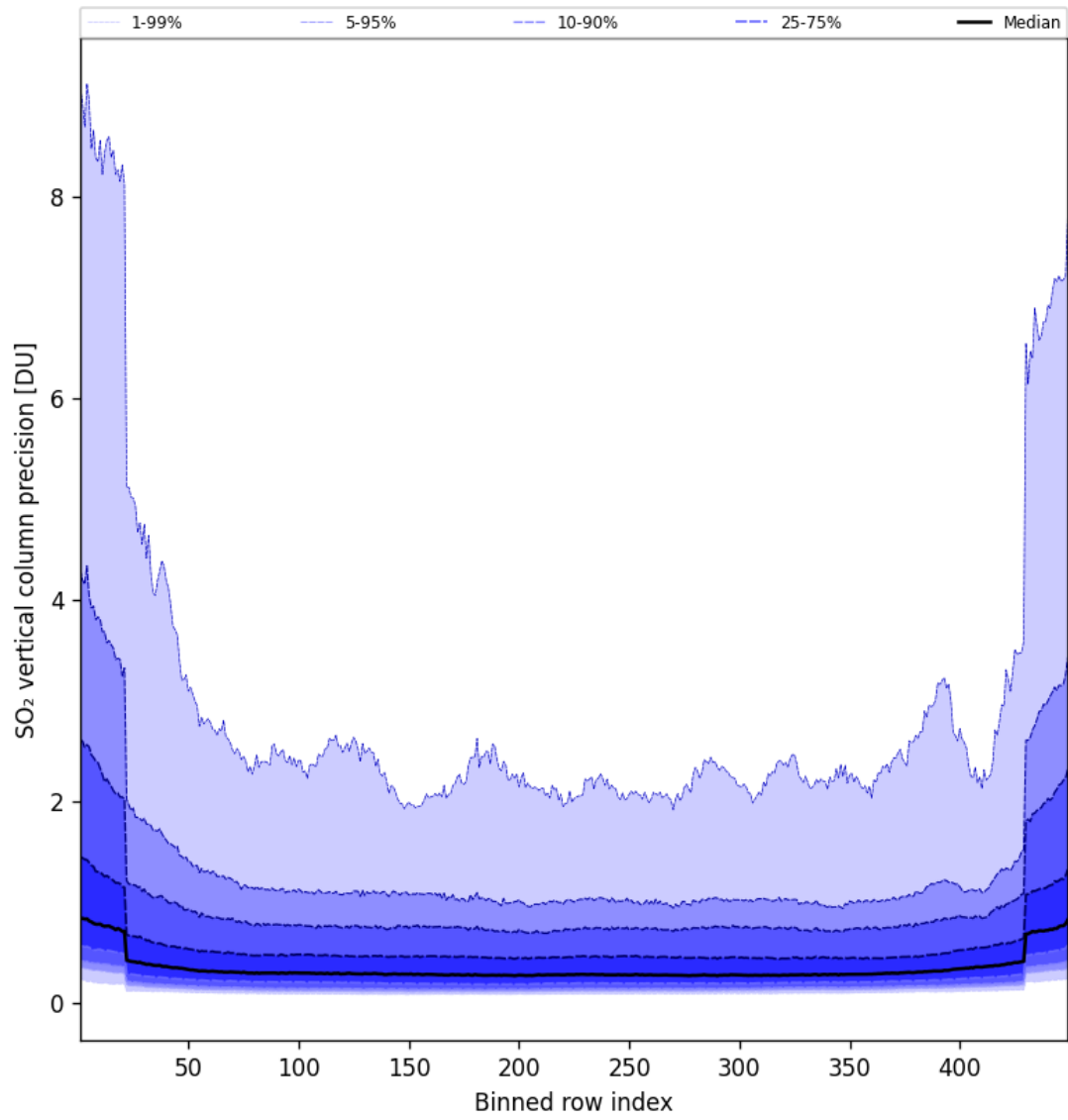


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-07-02 to 2025-07-03

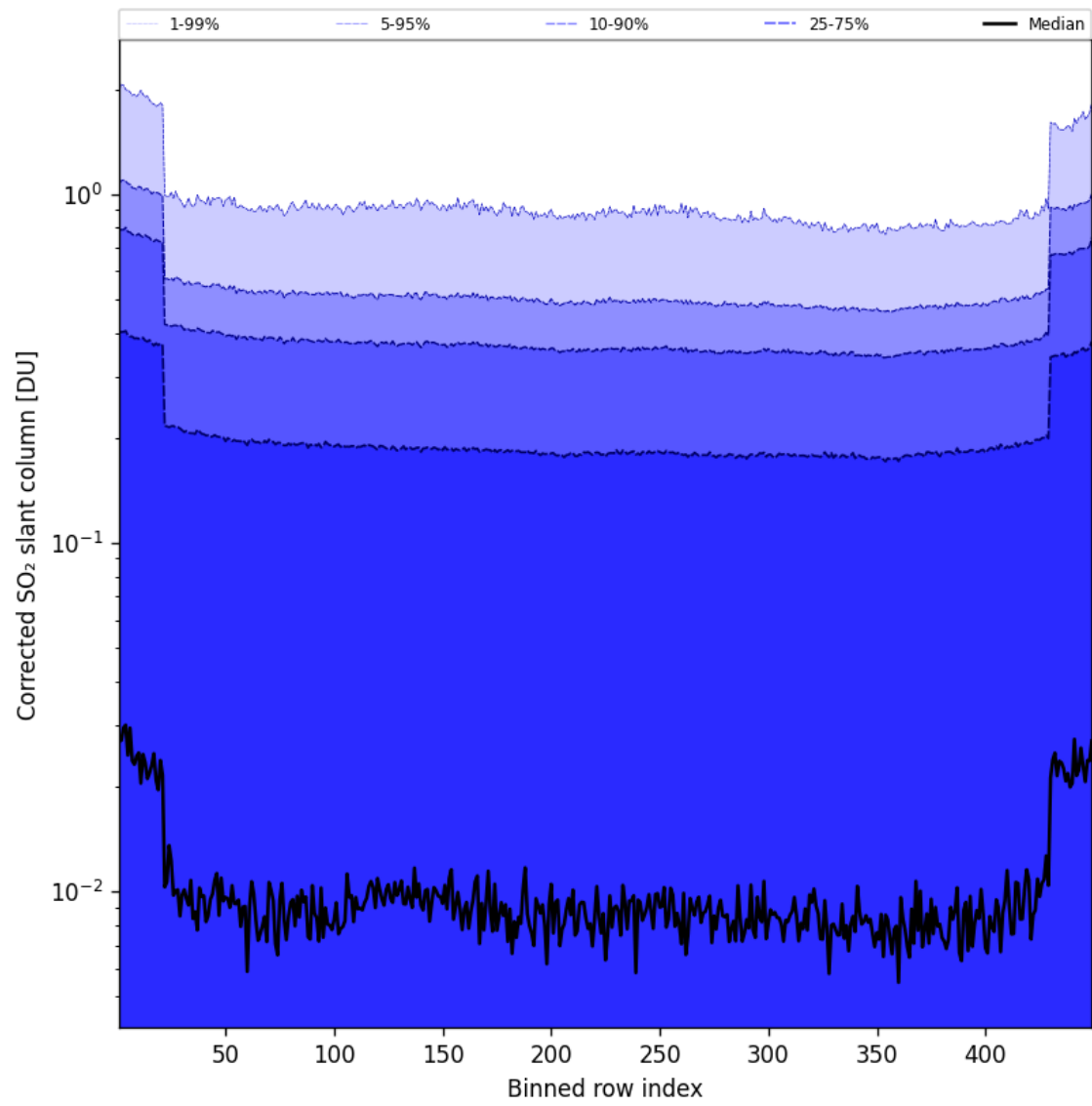


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-07-02 to 2025-07-03

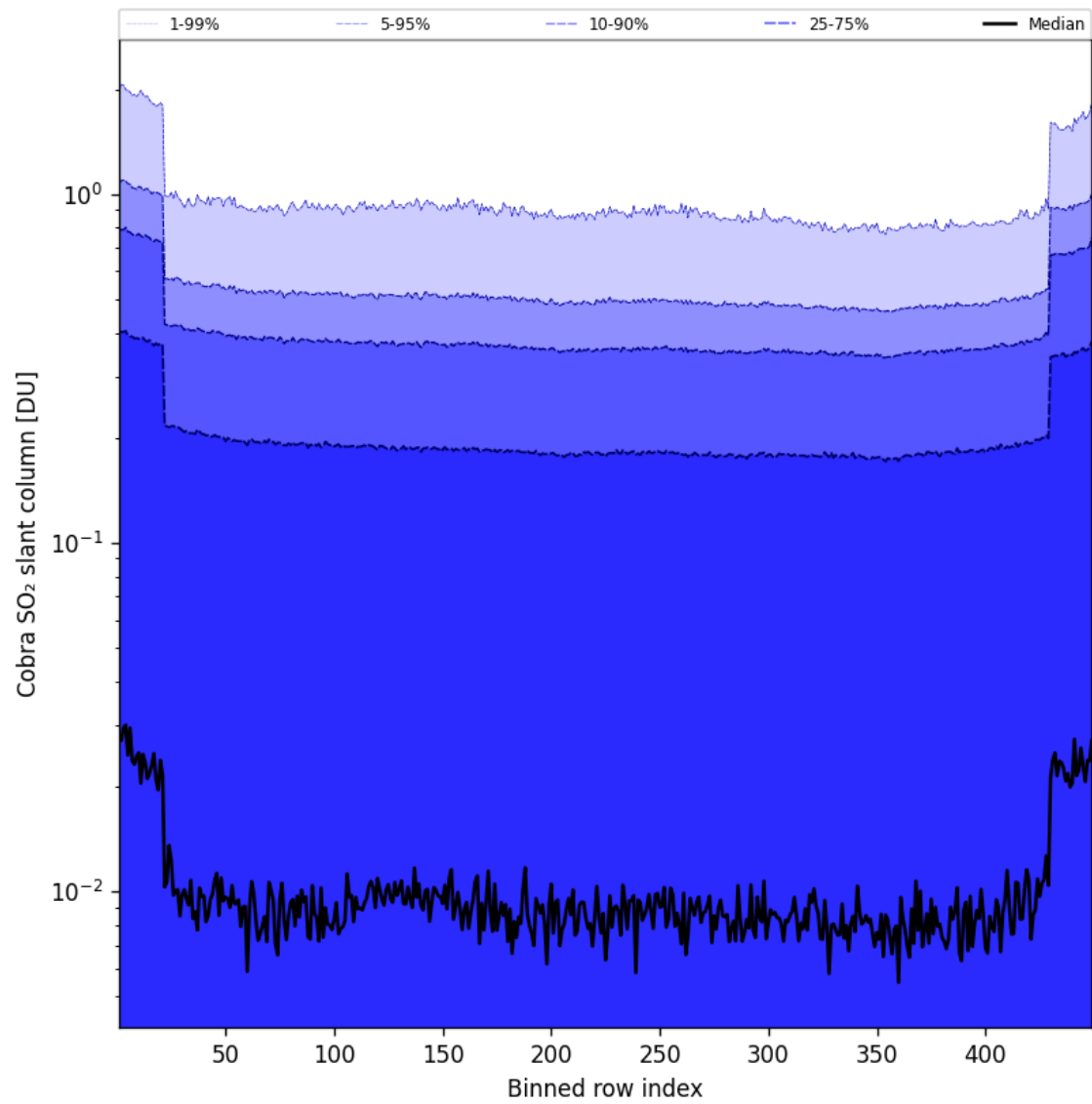


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-07-02 to 2025-07-03

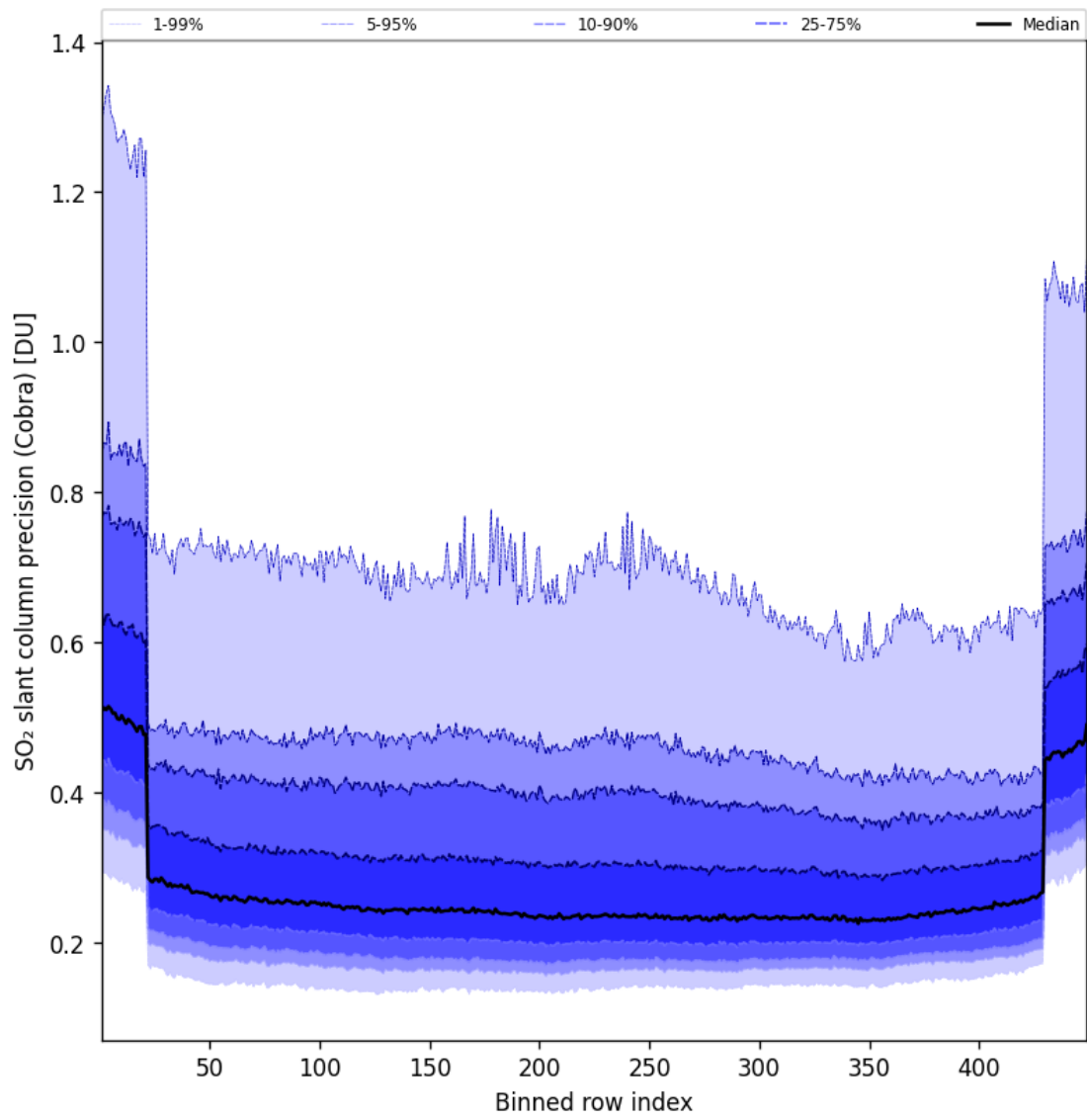


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-07-02 to 2025-07-03

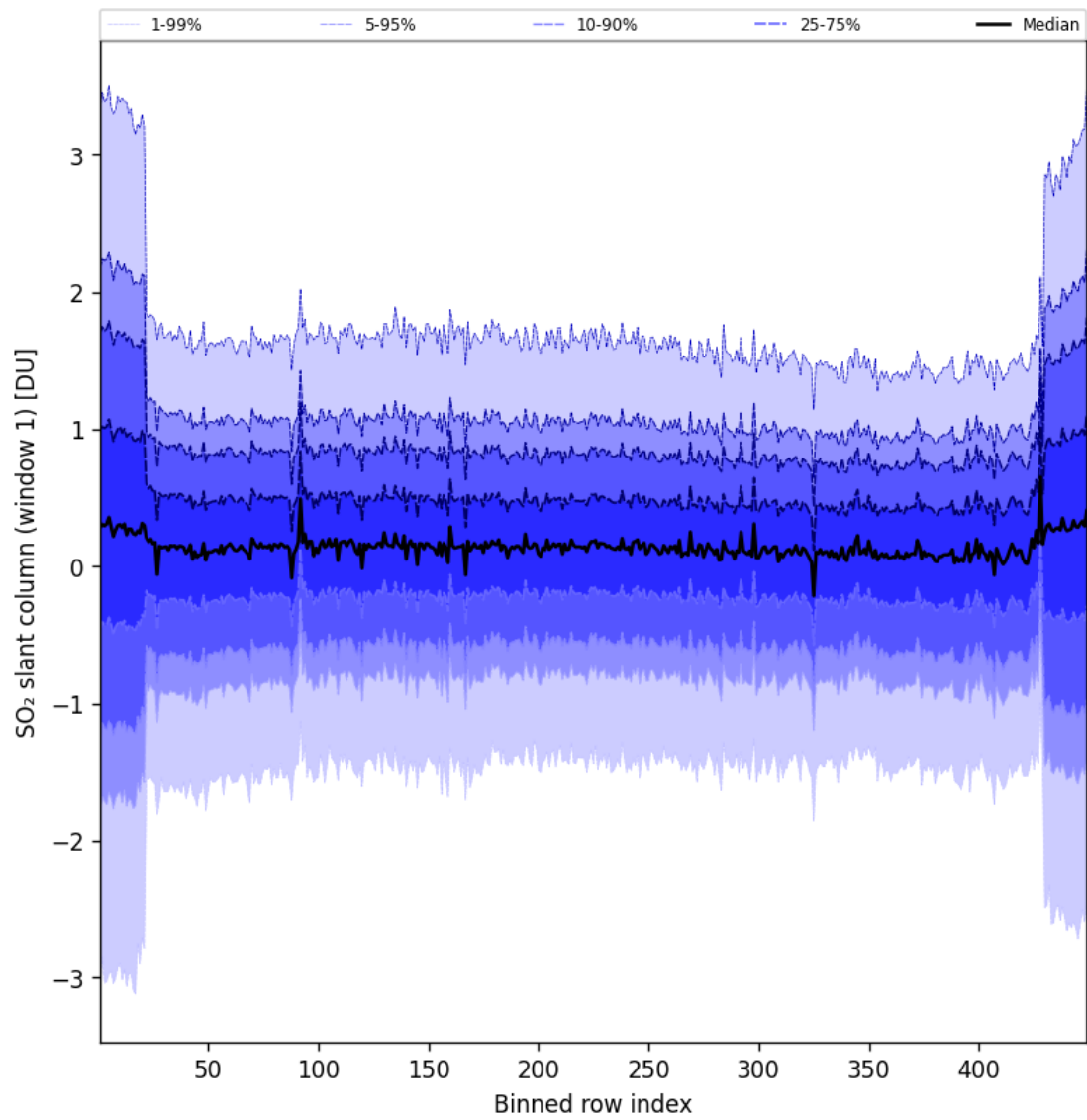


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-07-02 to 2025-07-03

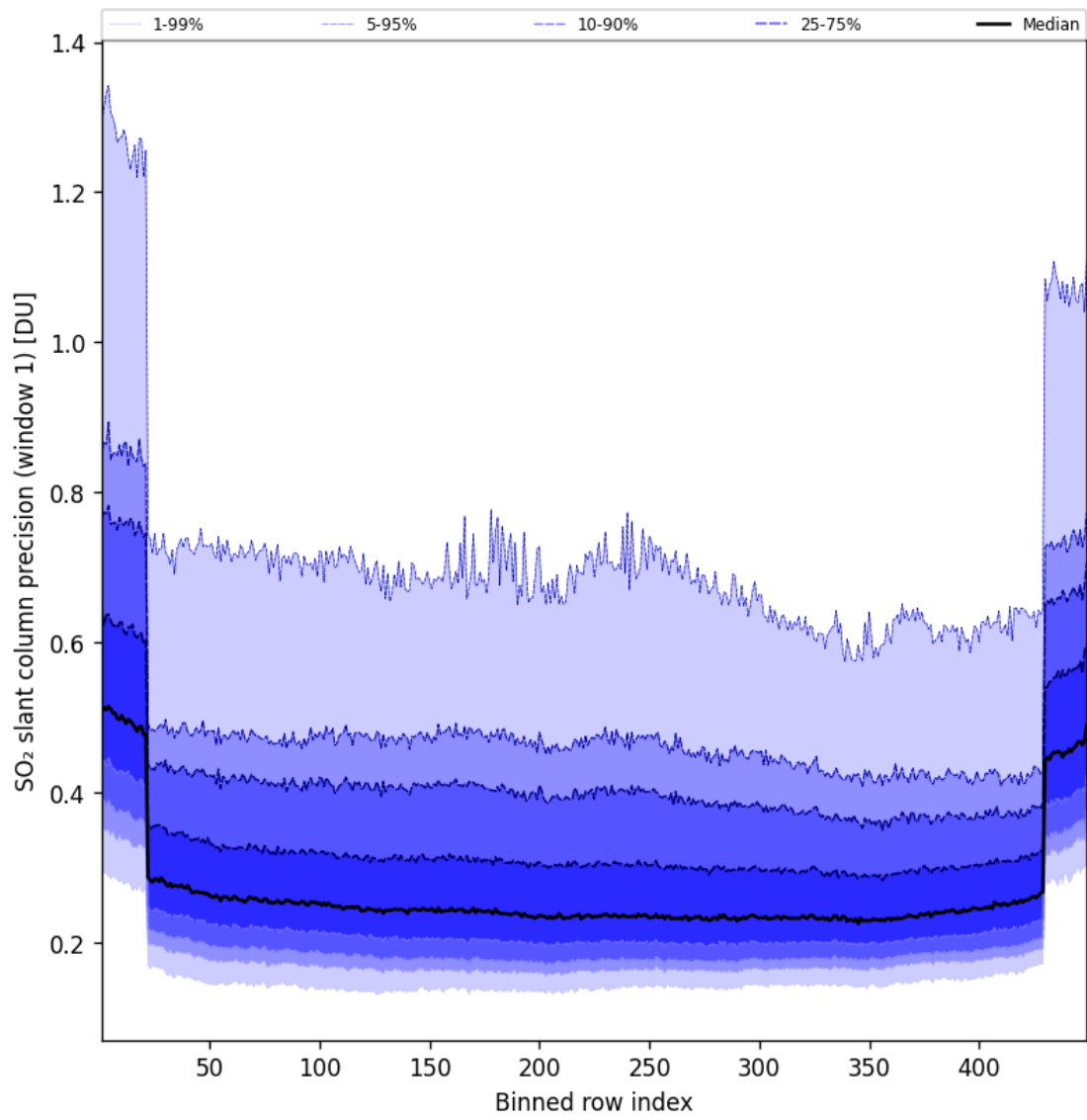


Figure 91: Along track statistics of "SO₂ slant column precision (window 1)" for 2025-07-02 to 2025-07-03

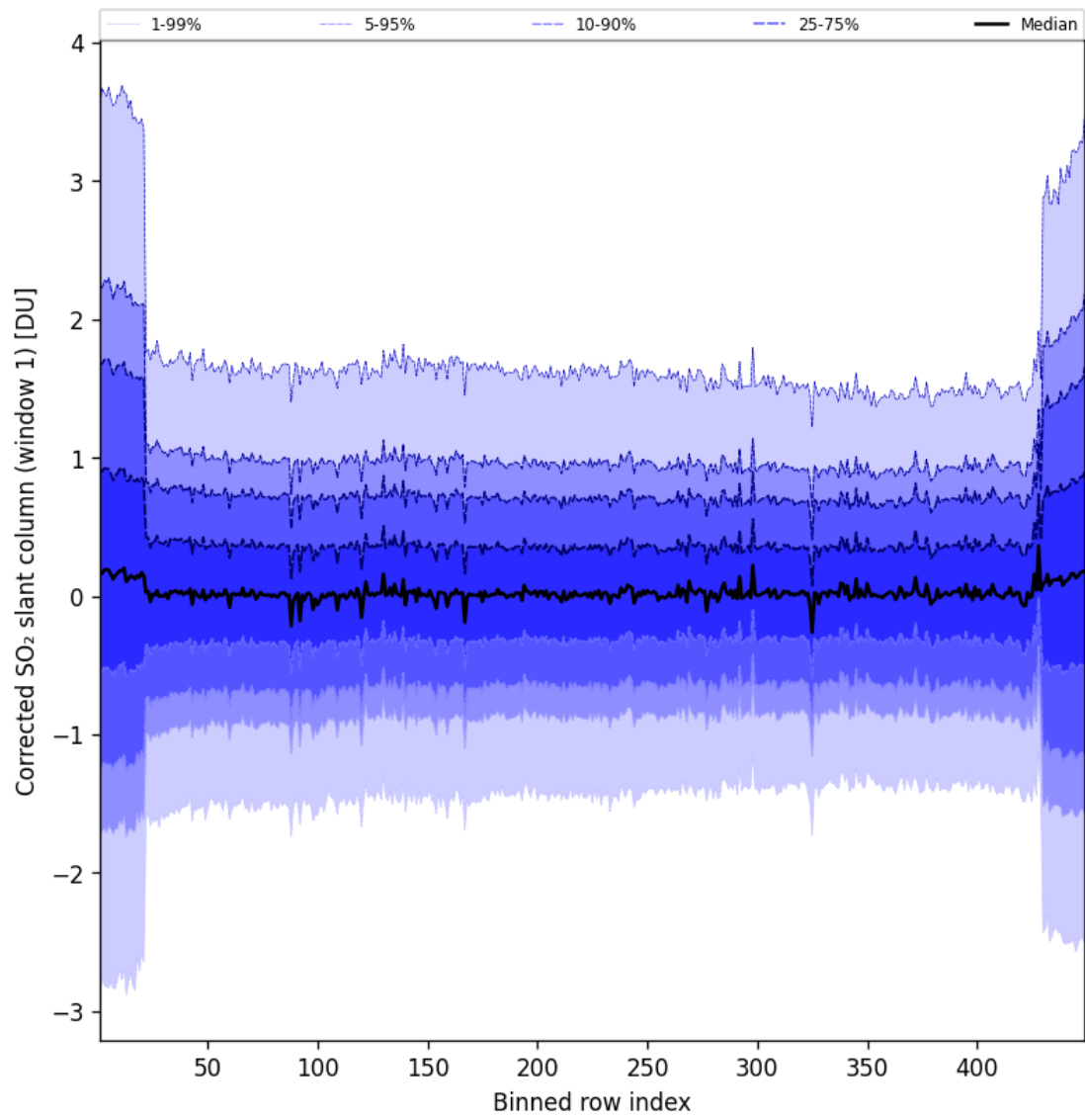


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-07-02 to 2025-07-03

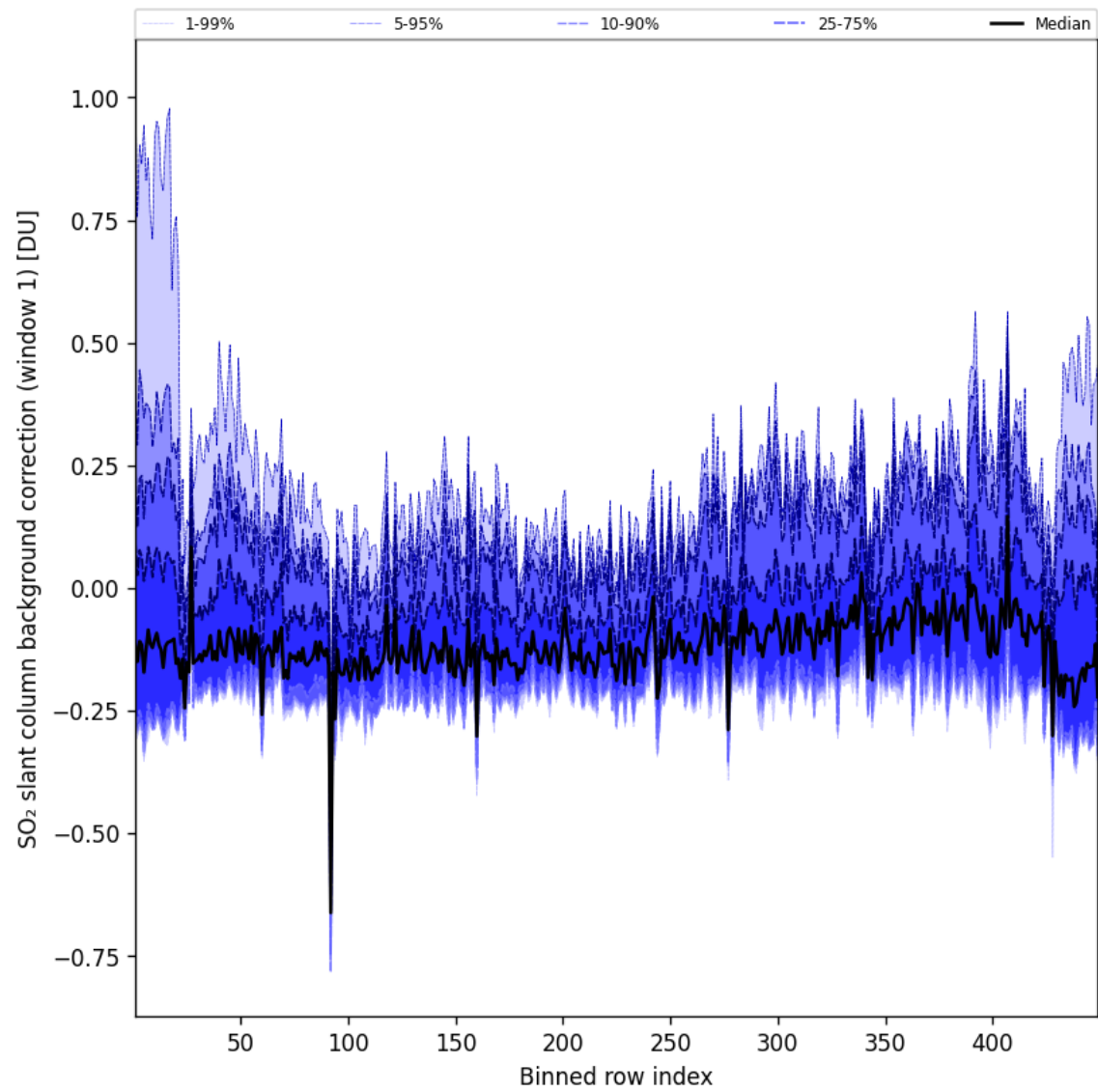


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-07-02 to 2025-07-03

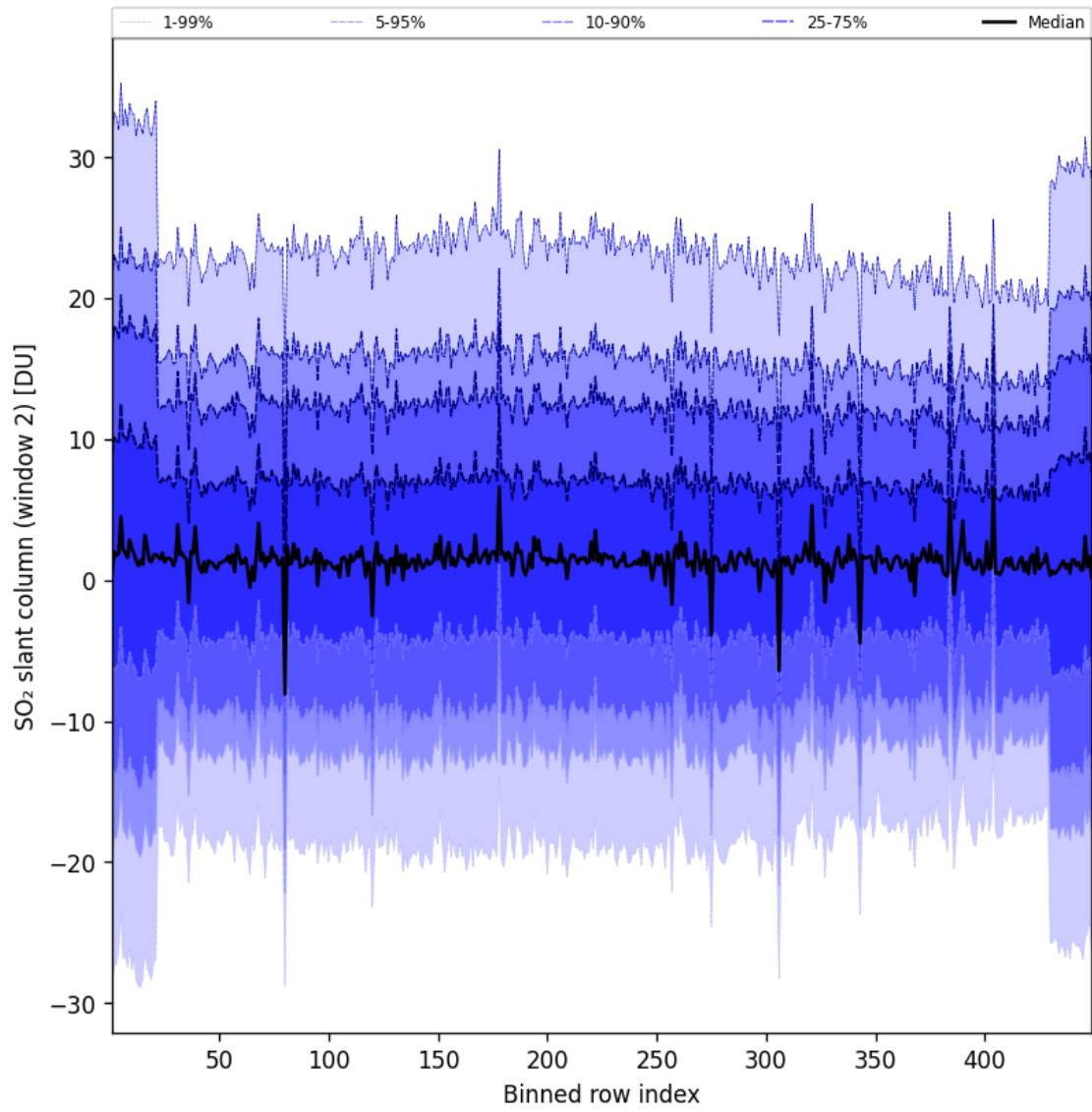


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-07-02 to 2025-07-03

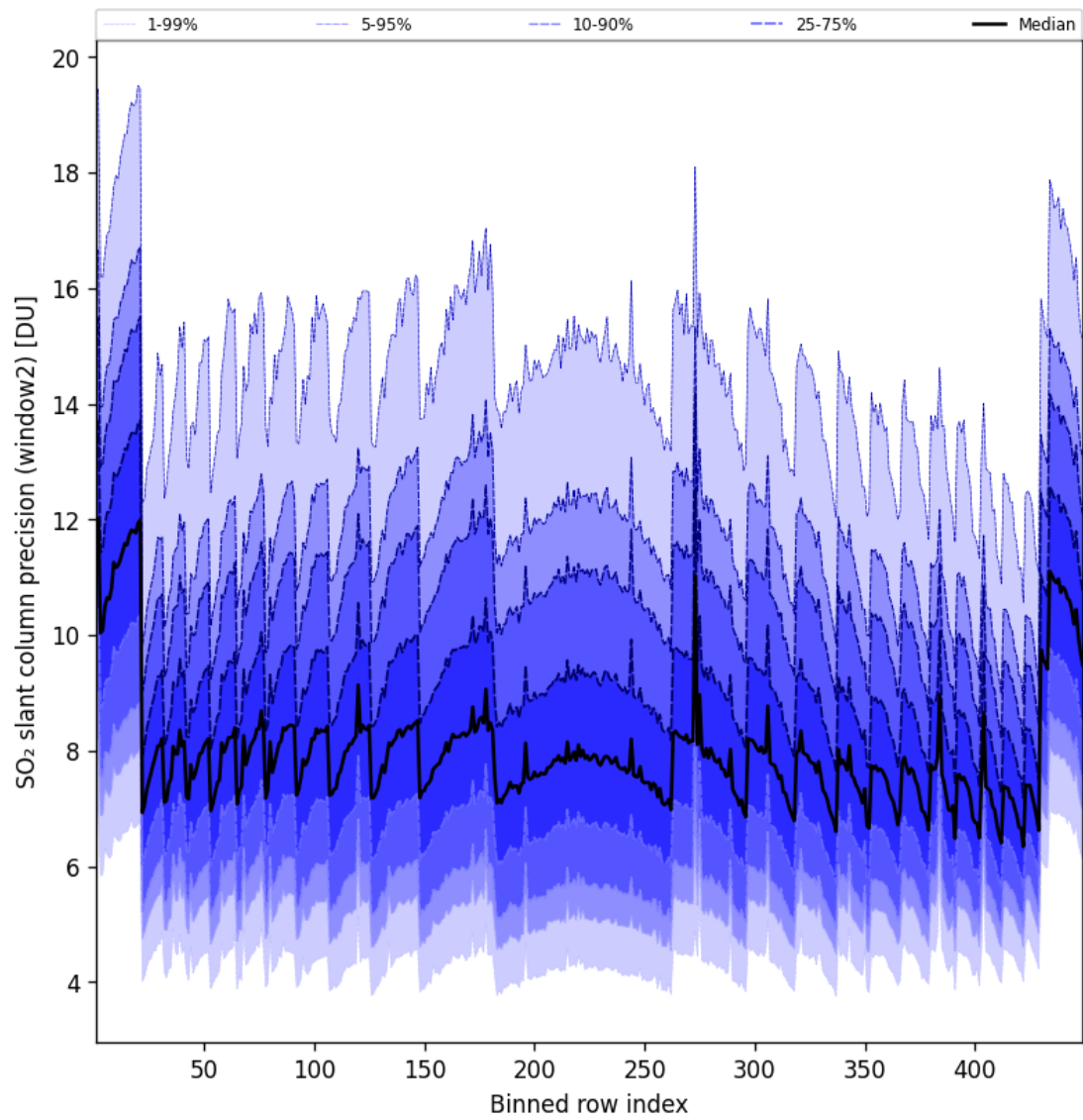


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-07-02 to 2025-07-03

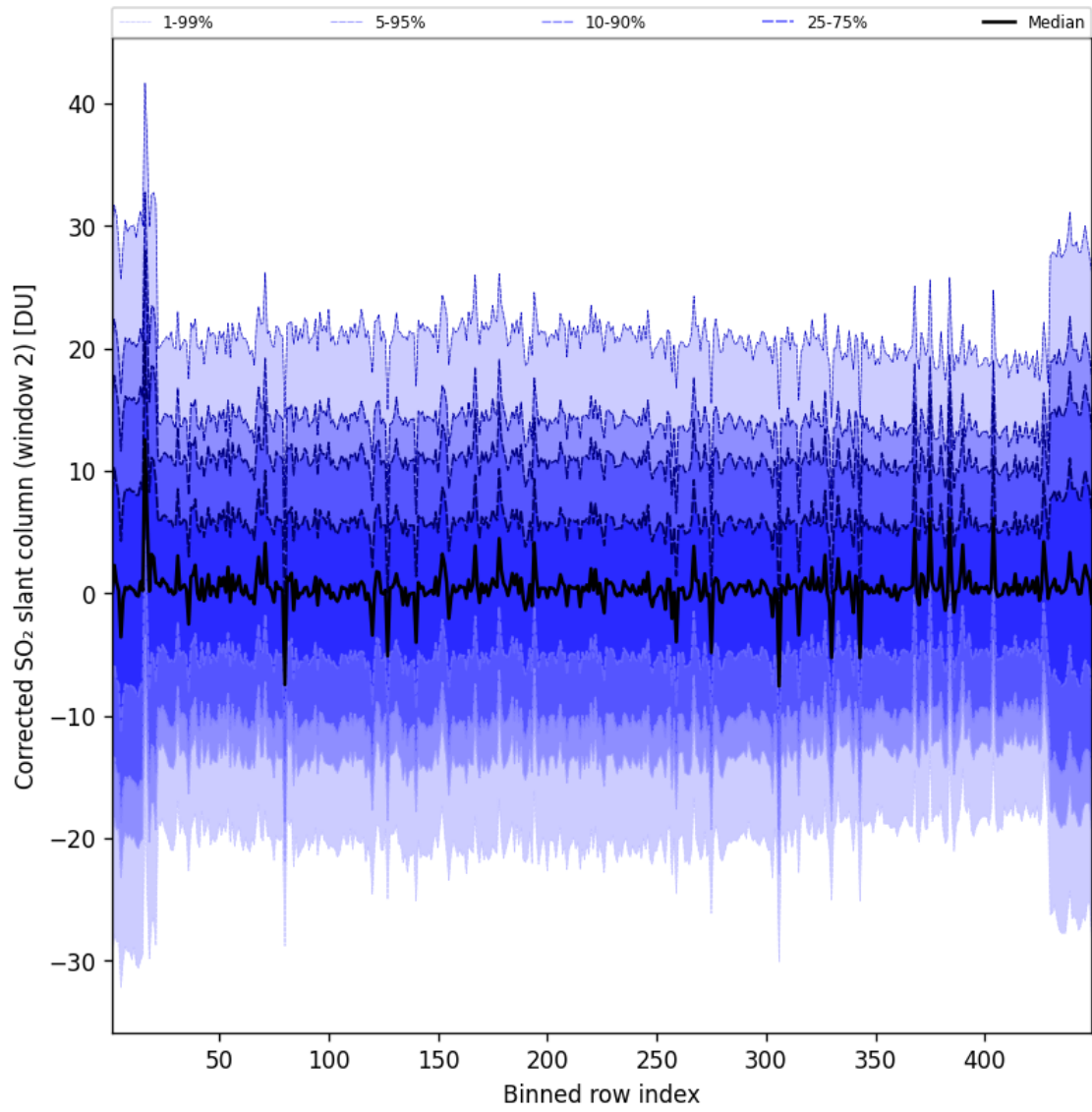


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-07-02 to 2025-07-03

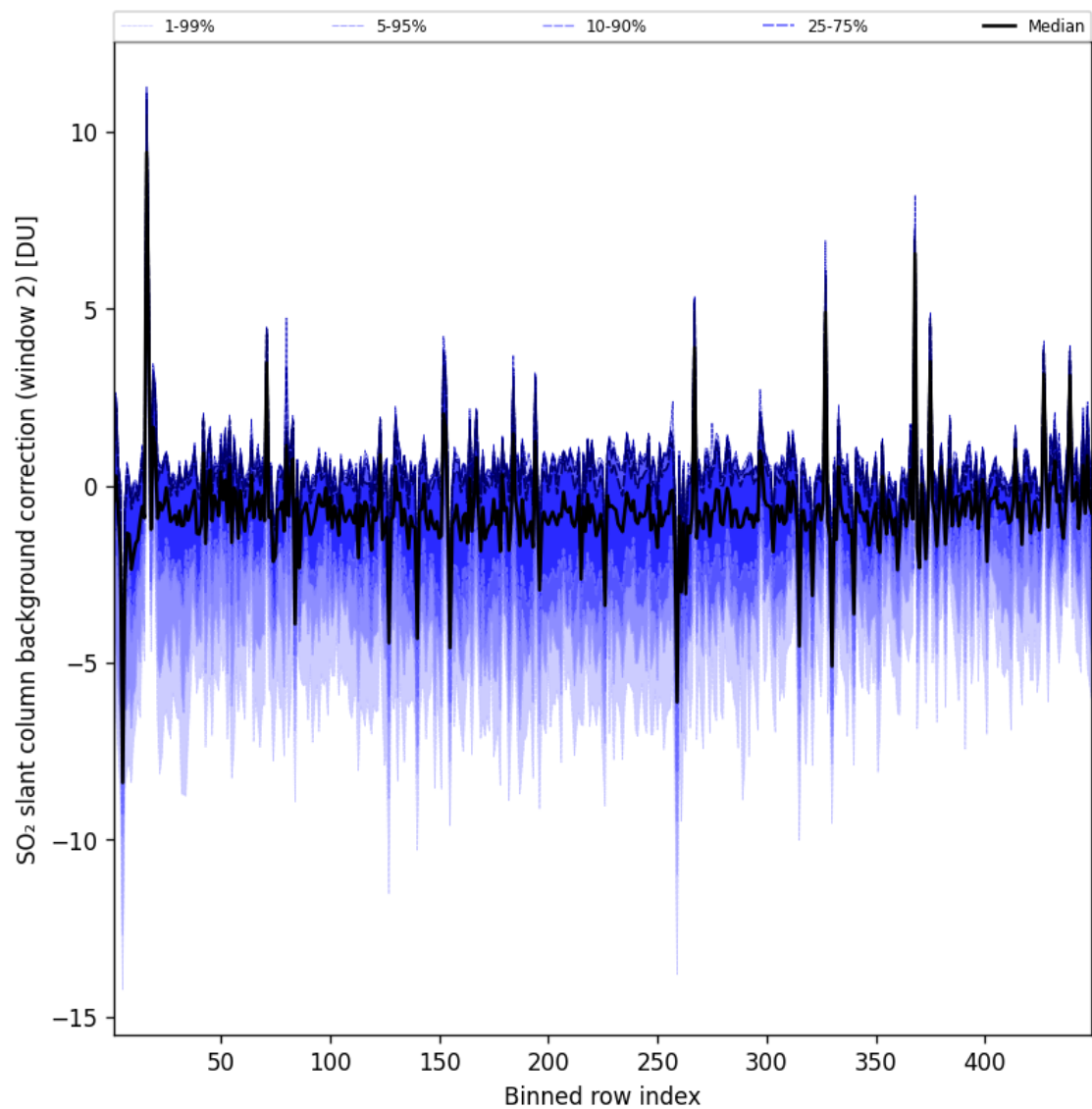


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-07-02 to 2025-07-03

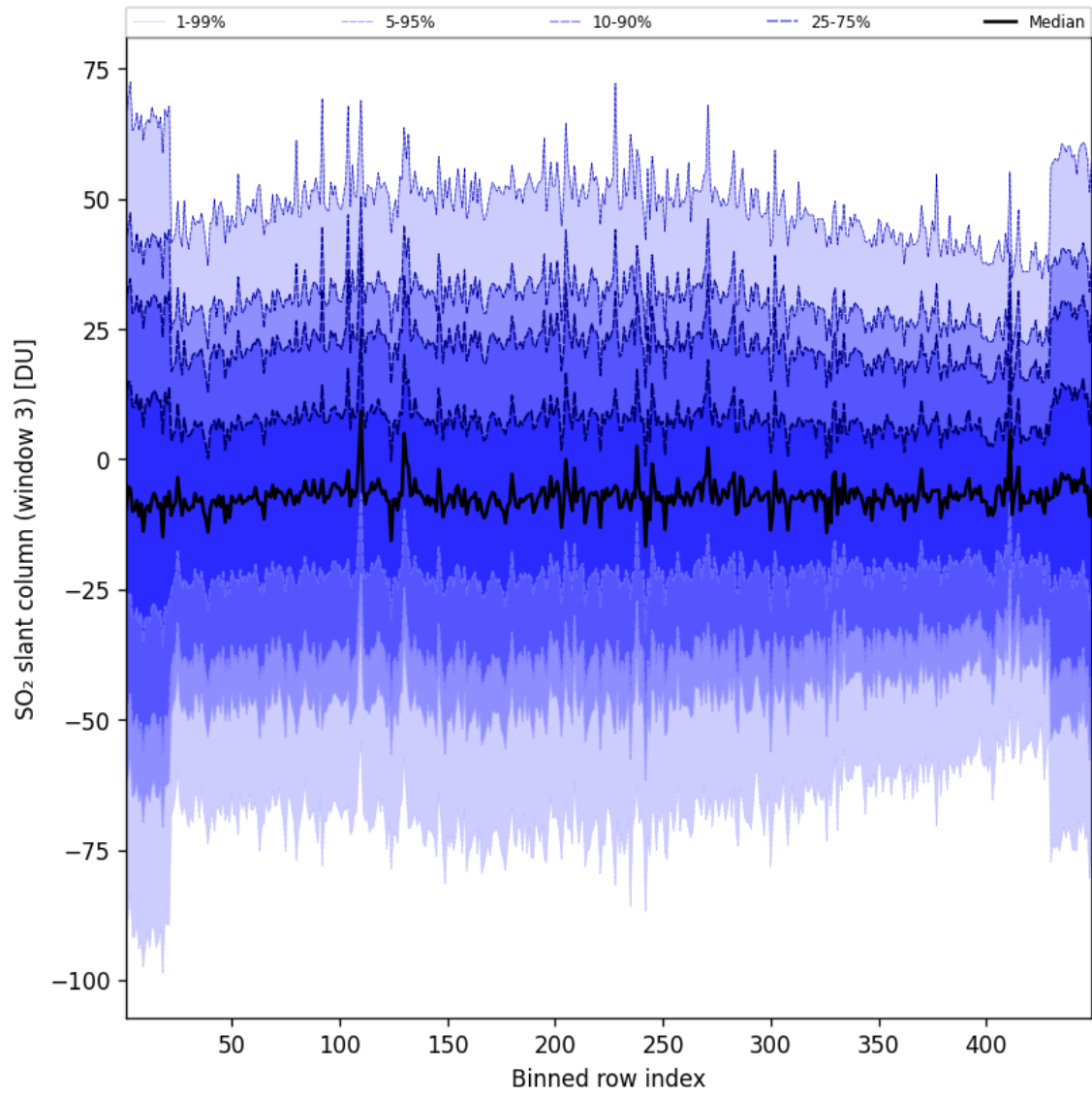


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-07-02 to 2025-07-03

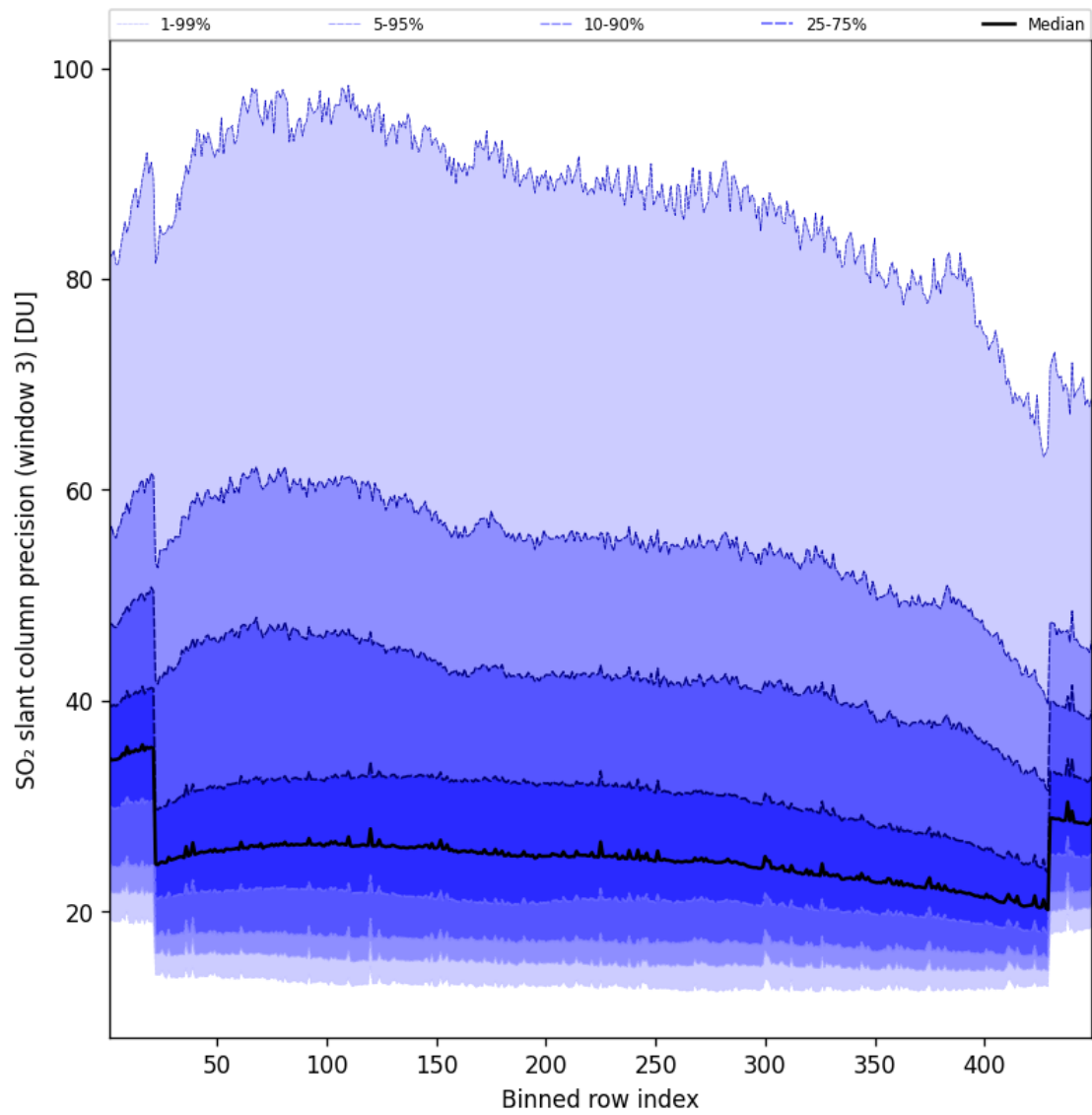


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-07-02 to 2025-07-03

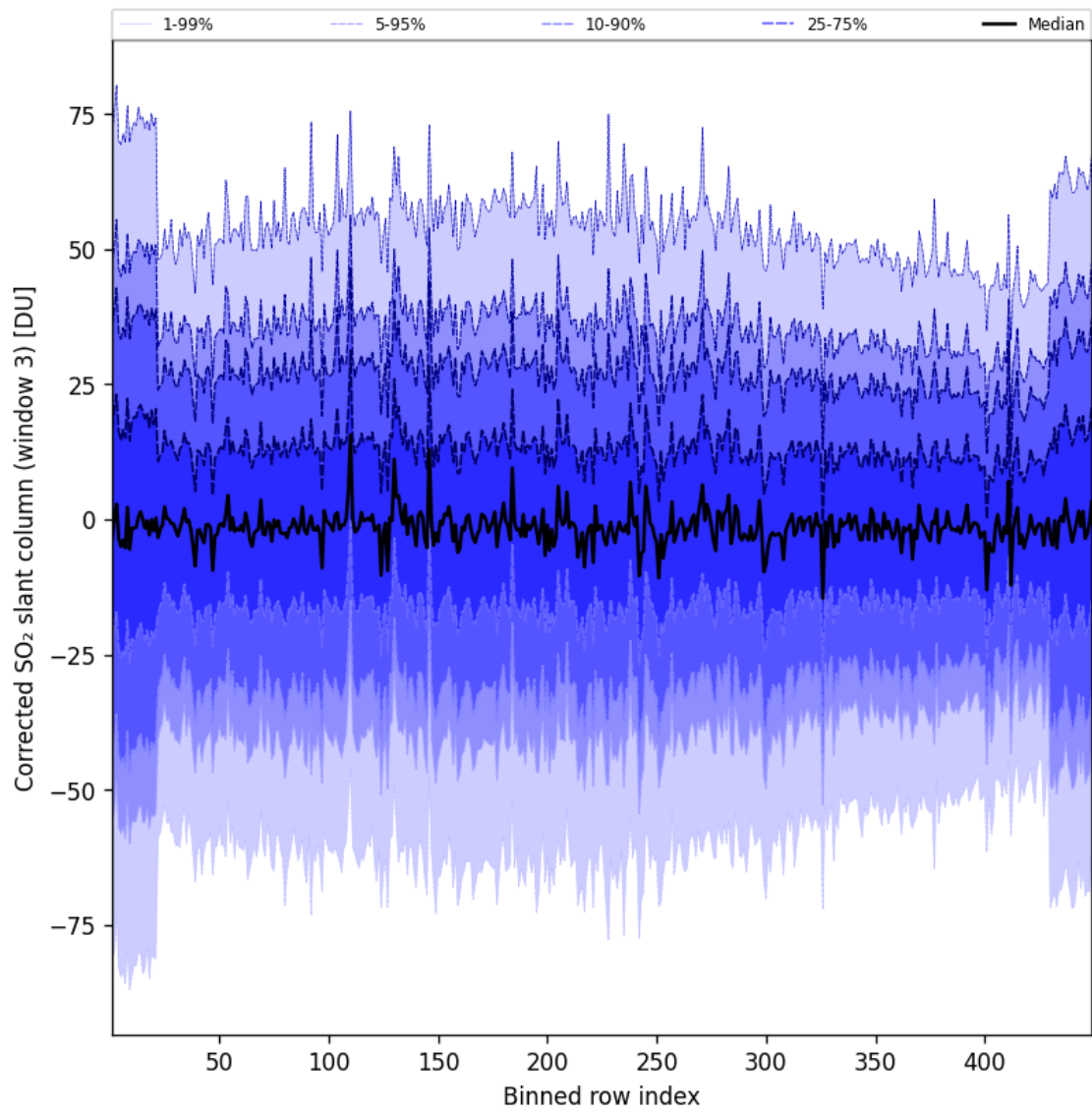


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-07-02 to 2025-07-03

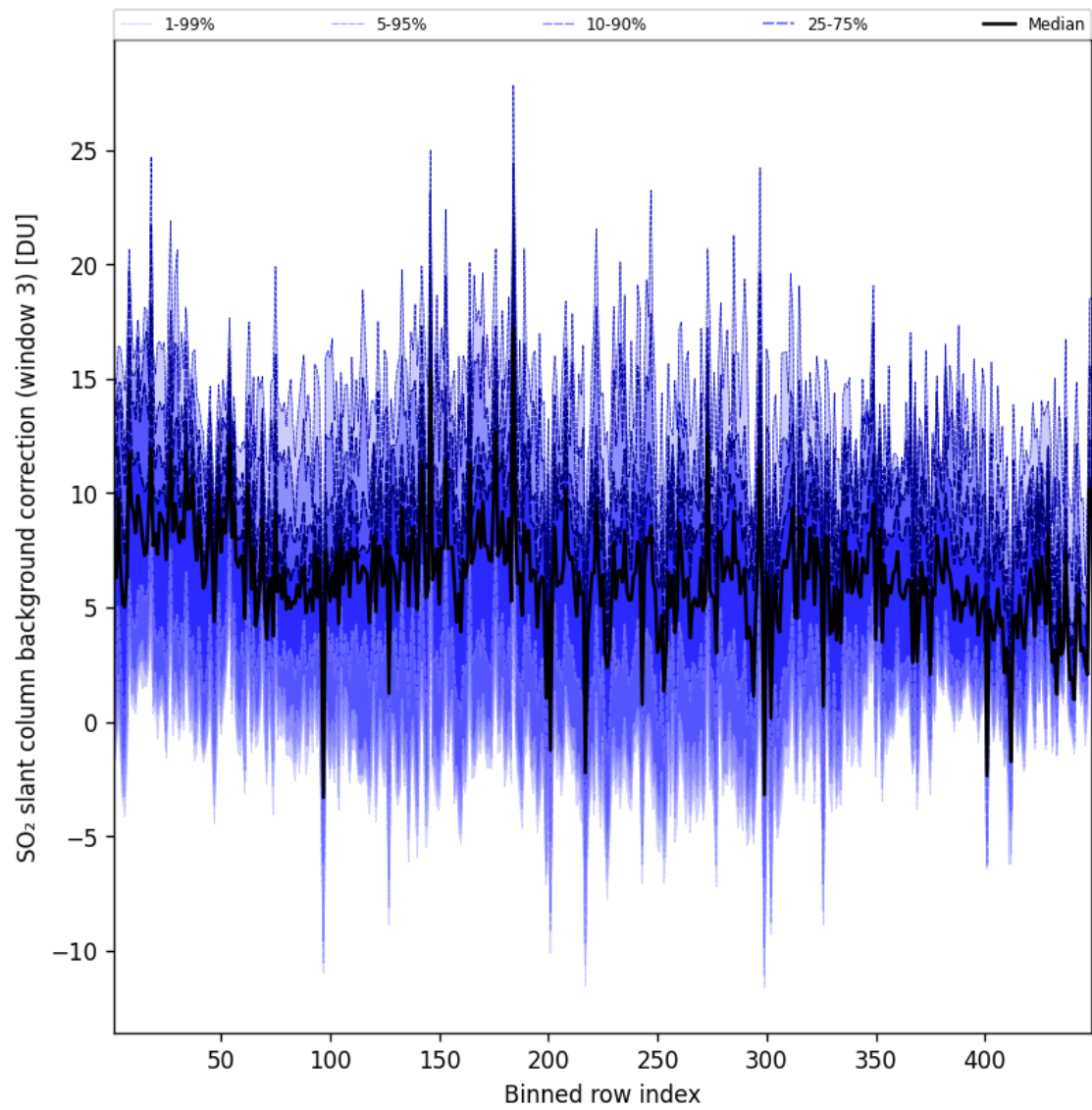


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-07-02 to 2025-07-03

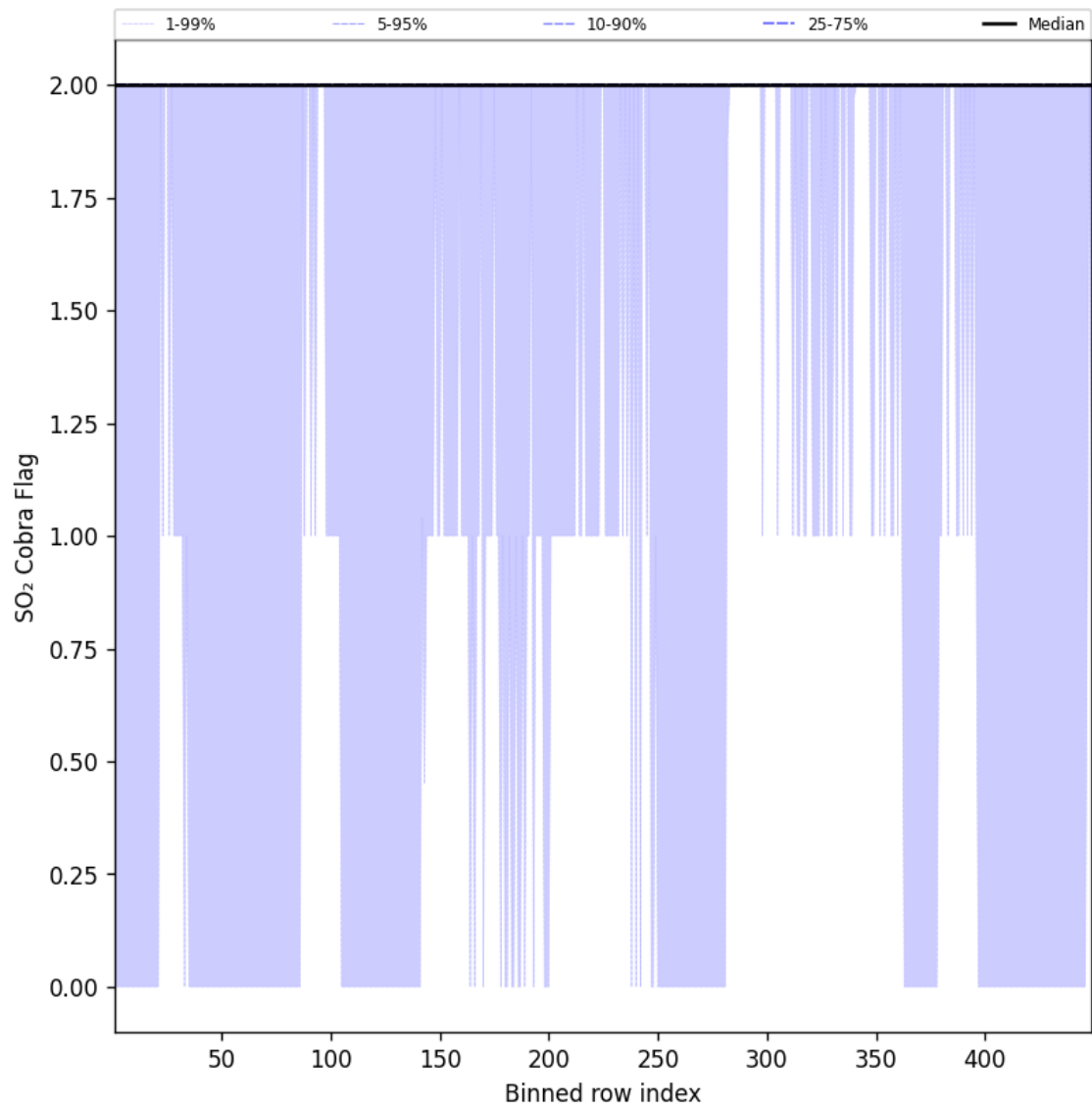


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-07-02 to 2025-07-03

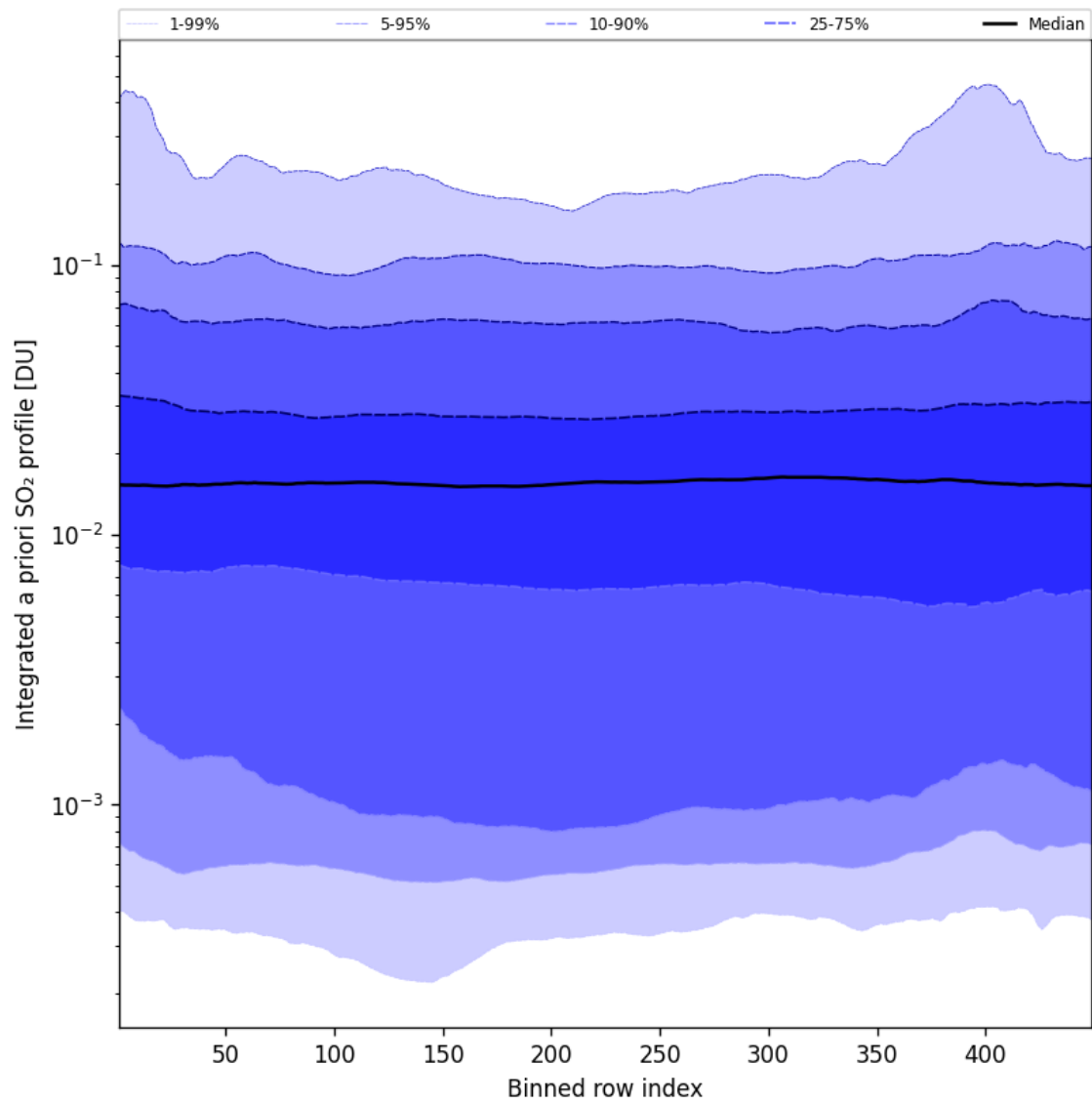


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-07-02 to 2025-07-03

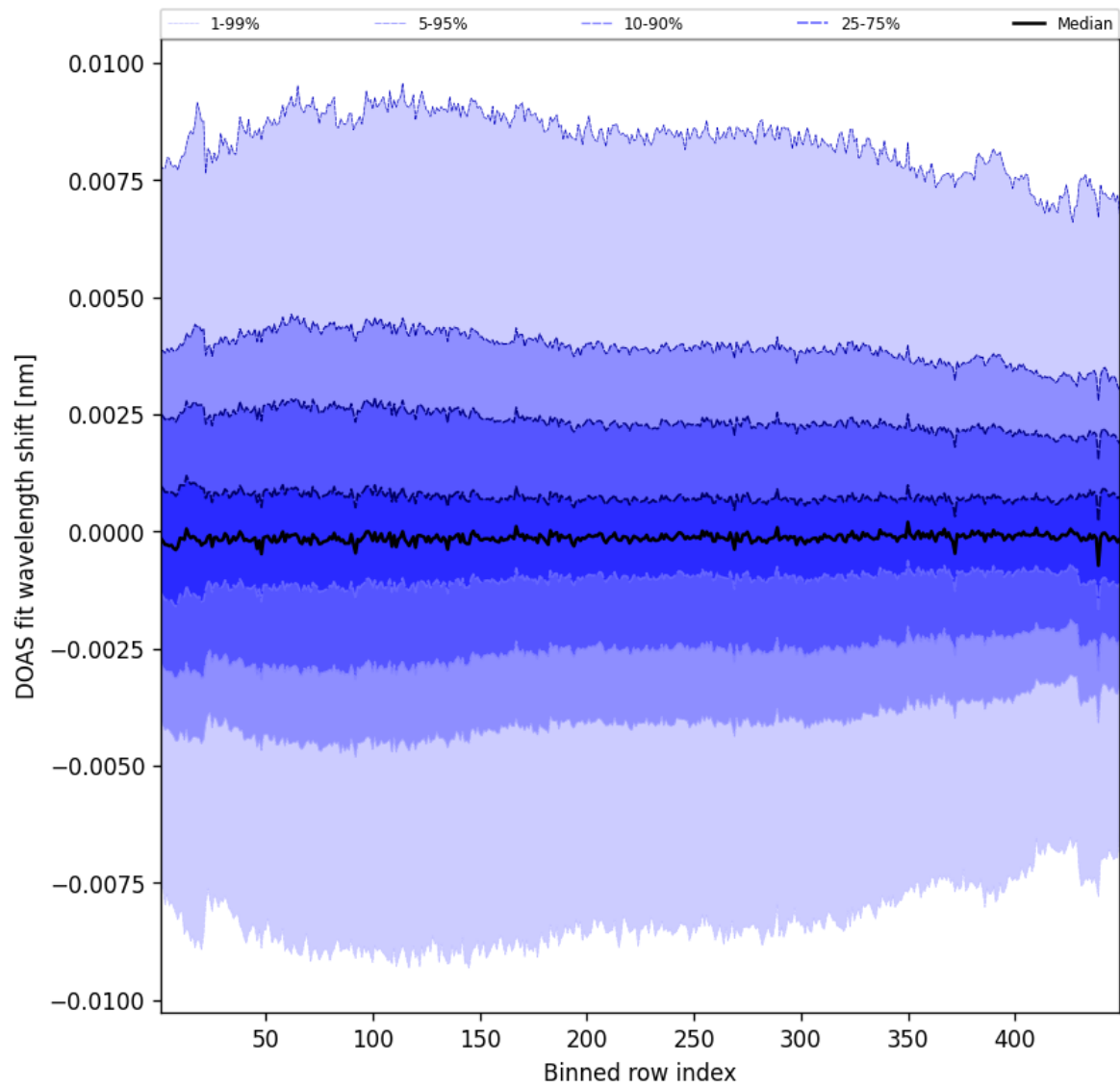


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-07-02 to 2025-07-03

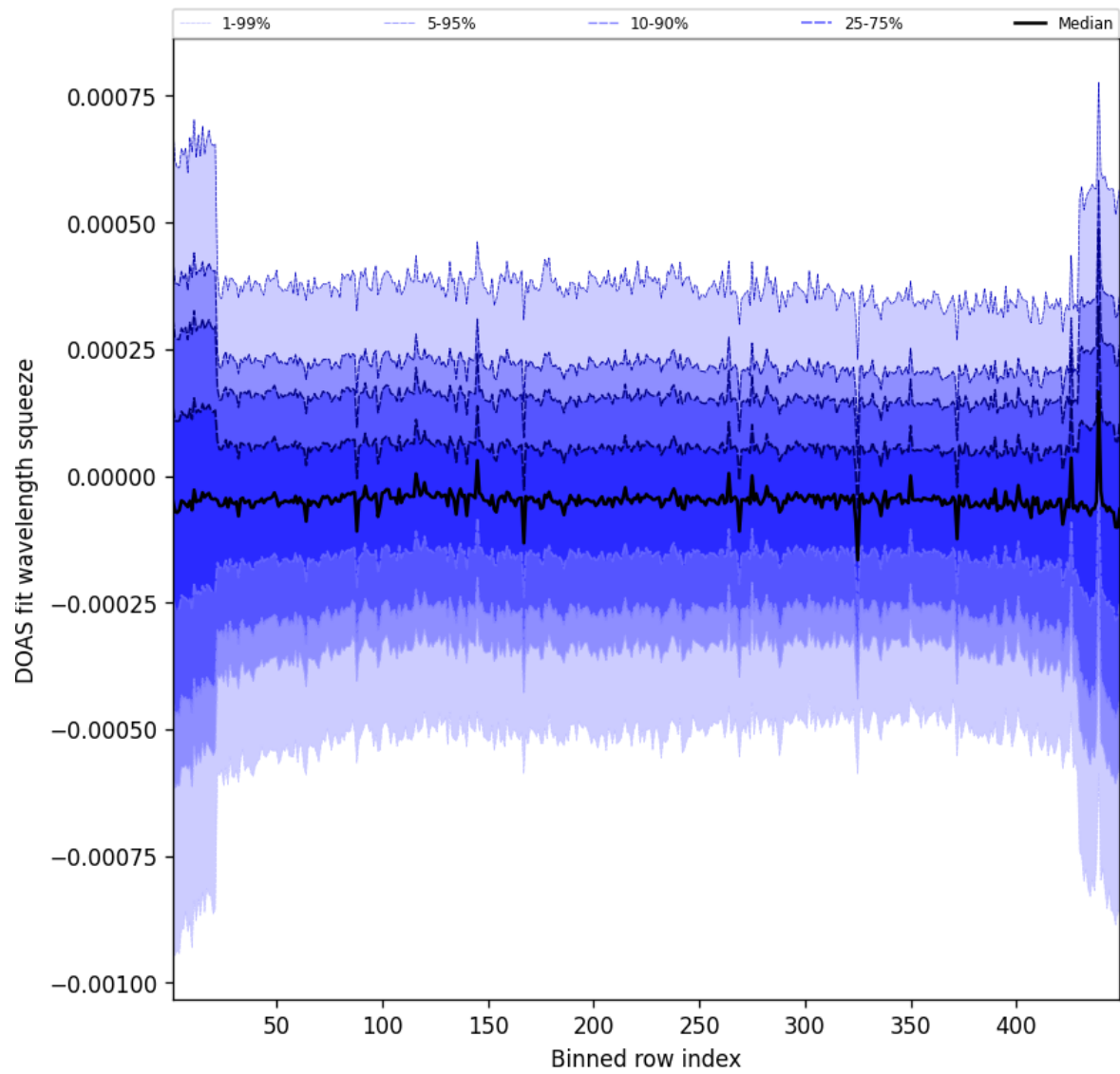


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-07-02 to 2025-07-03

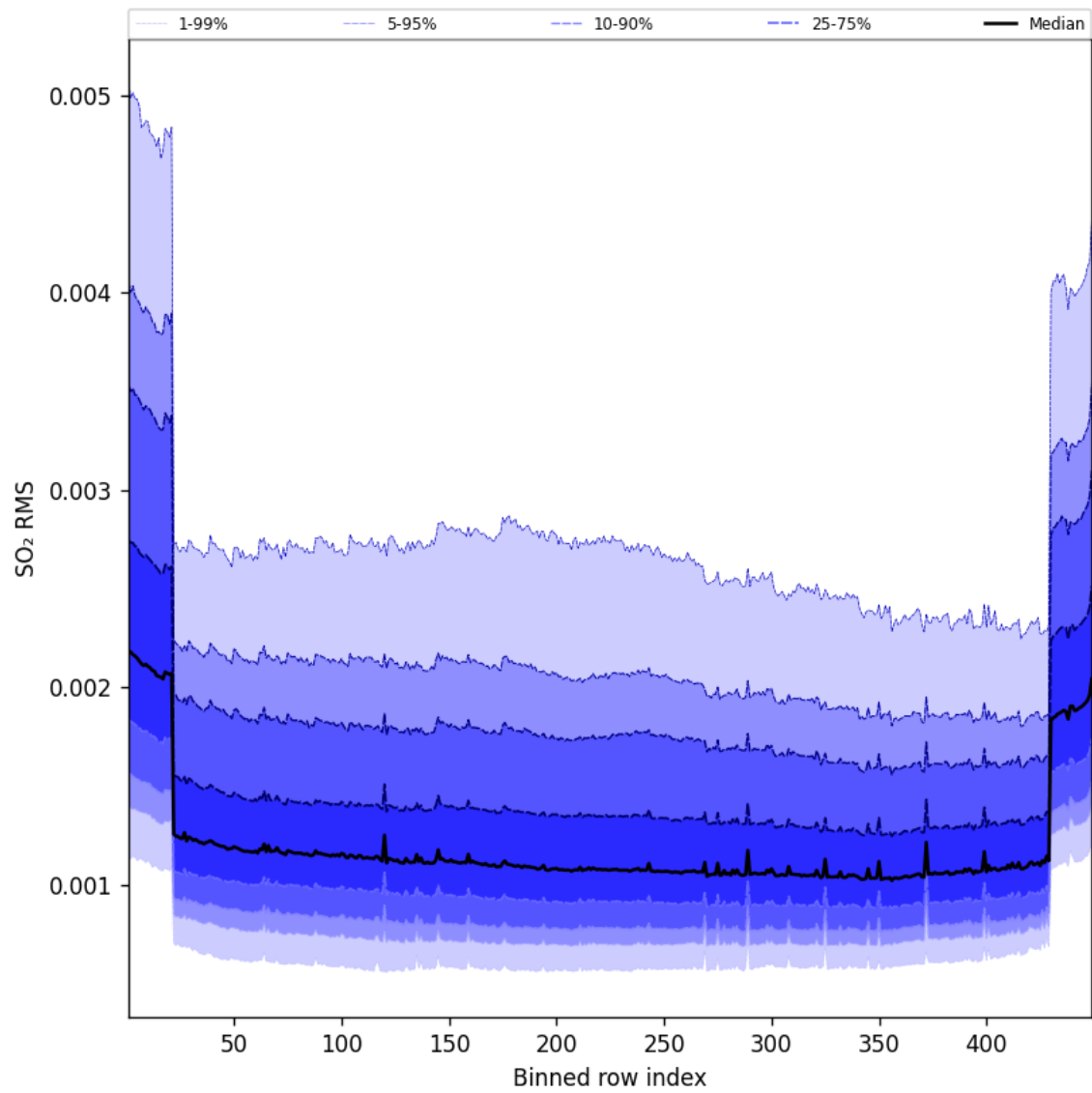


Figure 106: Along track statistics of “SO₂ RMS” for 2025-07-02 to 2025-07-03

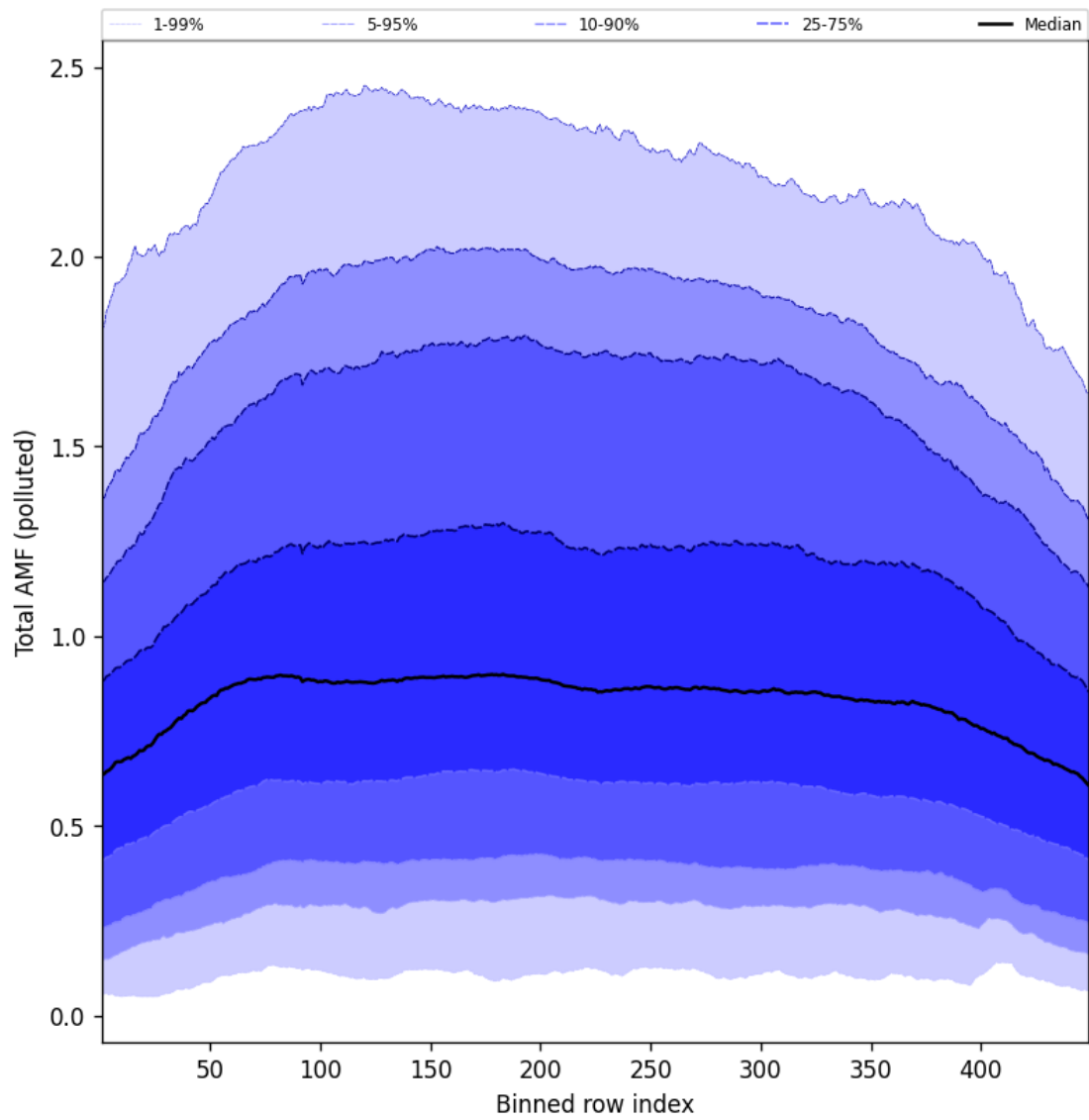


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-07-02 to 2025-07-03

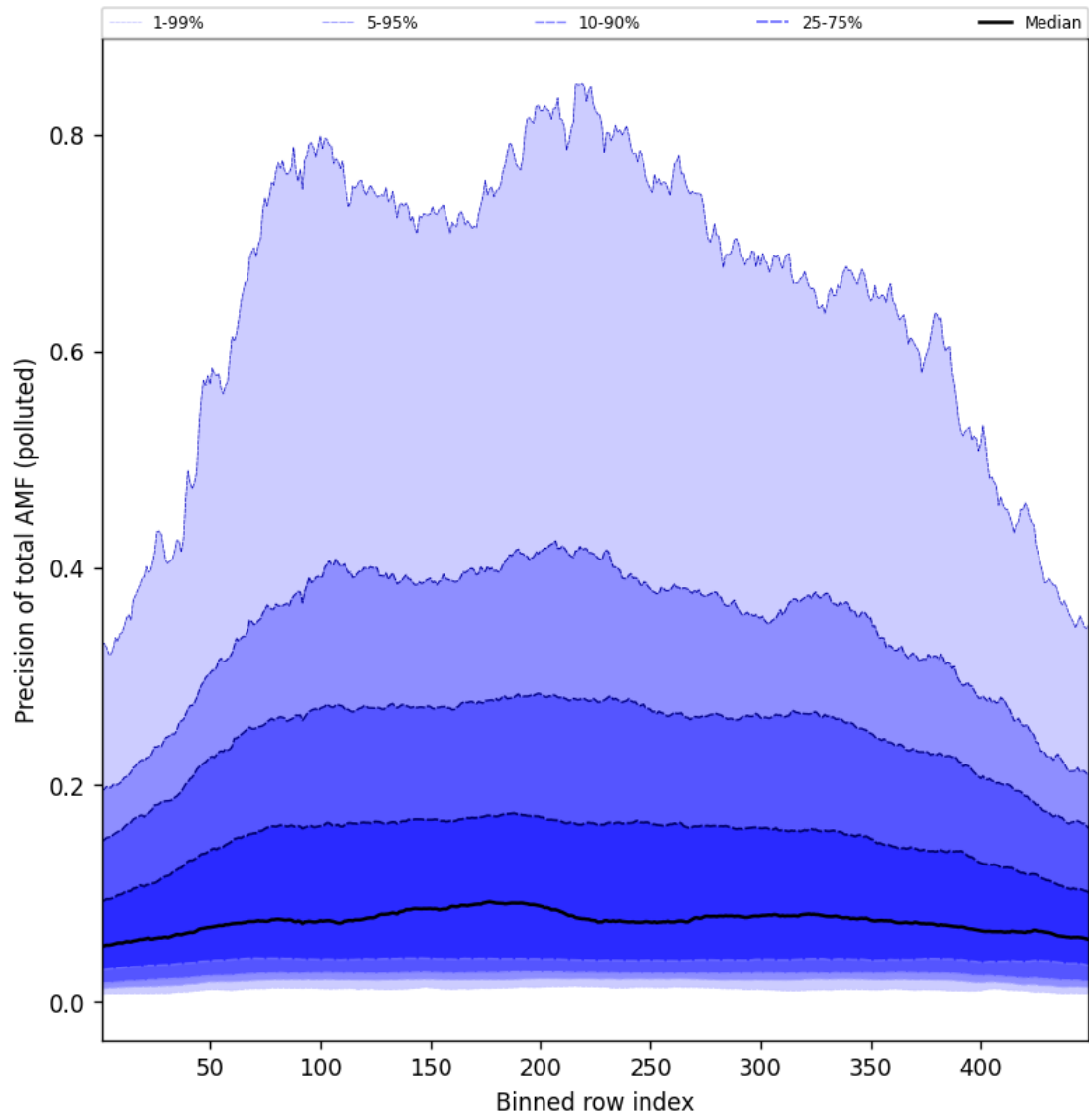


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-07-02 to 2025-07-03

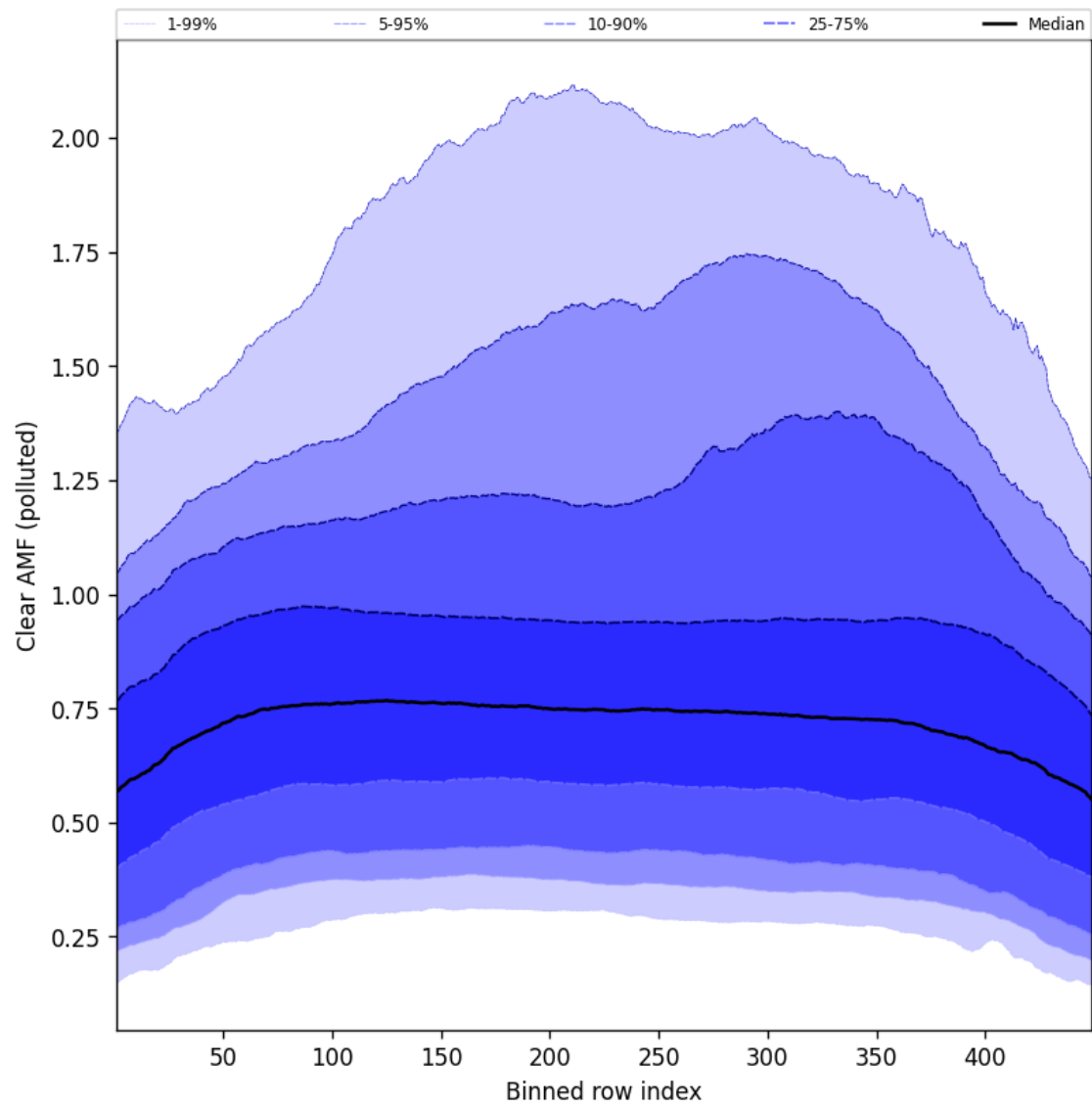


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-07-02 to 2025-07-03

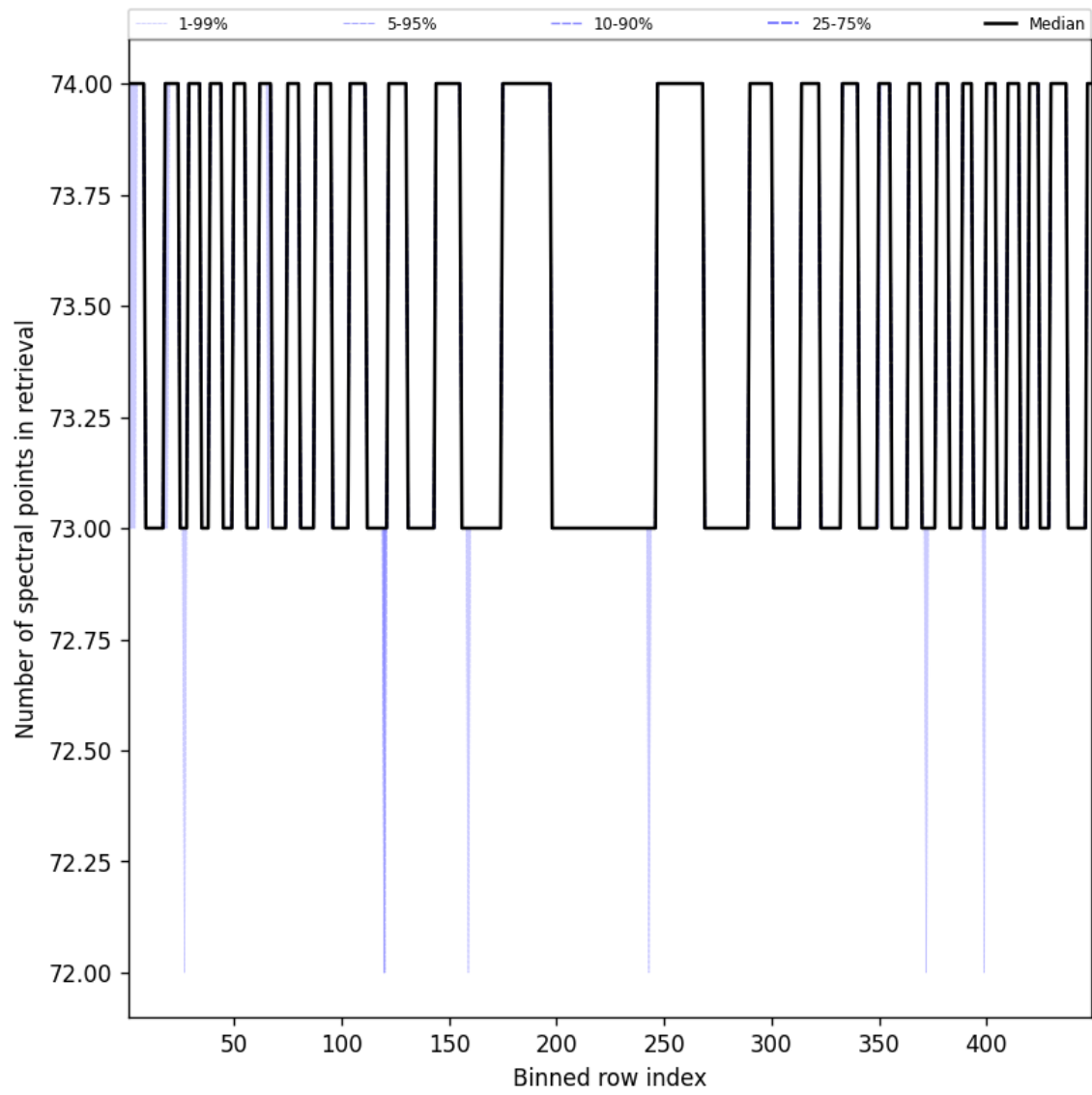


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-07-02 to 2025-07-03

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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