

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]	0.663 ± 0.401	16822686	0.995	0.770	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.705 \pm 121.163) \times 10^{-2}$	16822686	0.263	0.454	1.053×10^{-2}	-76.2	595
sulfurdioxide total vertical column precision [DU]	0.495 ± 0.627	16822686	0.222	0.322	0.333	4.242×10^{-2}	97.5
sulfurdioxide slant column density corrected [DU]	$(2.705 \pm 122.818) \times 10^{-2}$	16822686	0.250	0.363	9.172×10^{-3}	-24.5	924
sulfurdioxide slant column density cobra [DU]	$(2.070 \pm 41.677) \times 10^{-2}$	16822686	0.250	0.363	9.172×10^{-3}	-24.5	48.1
sulfurdioxide slant column density cobra precision [DU]	0.293 ± 0.138	16822686	0.213	0.135	0.250	8.223×10^{-2}	45.3
sulfurdioxide slant column density window1 [DU]	0.128 ± 0.706	16822686	0.125	0.735	0.128	-65.1	67.5
sulfurdioxide slant column density window1 precision [DU]	0.293 ± 0.138	16822686	0.213	0.135	0.250	8.223×10^{-2}	45.3
sulfurdioxide slant column density corrected win1 [DU]	$(5.304 \pm 69.851) \times 10^{-2}$	16822686	2.500×10^{-2}	0.720	3.299×10^{-2}	-65.1	67.4
background so2 slant column offset window1 [DU]	$(-7.451 \pm 13.826) \times 10^{-2}$	16822686	-0.180	0.169	-0.108	-1.23	4.06
sulfurdioxide slant column density window2 [DU]	1.72 ± 9.22	16822686	1.75	11.3	1.57	-1.693×10^3	3.130×10^3
sulfurdioxide slant column density window2 precision [DU]	8.29 ± 2.51	16822686	7.43	2.77	7.92	2.36	702
sulfurdioxide slant column density corrected win2 [DU]	0.709 ± 9.115	16822686	0.750	11.2	0.713	-1.696×10^3	3.130×10^3
background so2 slant column offset window2 [DU]	-1.01 ± 1.88	16822686	0.250	2.02	-0.639	-13.0	7.28
sulfurdioxide slant column density window3 [DU]	-10.0 ± 24.5	16822686	-9.52	30.2	-9.70	-493	1.408×10^3
sulfurdioxide slant column density window3 precision [DU]	29.2 ± 14.3	16822686	22.5	11.0	25.5	9.13	575
sulfurdioxide slant column density corrected win3 [DU]	-3.31 ± 24.14	16822686	-2.80	29.9	-3.06	-481	1.407×10^3
background so2 slant column offset window3 [DU]	6.70 ± 4.85	16822686	9.52	6.83	7.01	-13.1	29.0
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	16822686	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.211 \pm 5.992) \times 10^{-2}$	16822686	1.316×10^{-2}	2.469×10^{-2}	1.583×10^{-2}	1.849×10^{-4}	1.44
fitted radiance shift [nm]	$(-1.687 \pm 27.575) \times 10^{-4}$	16822686	1.000×10^{-4}	1.792×10^{-3}	-1.845×10^{-4}	-6.904×10^{-2}	5.566×10^{-2}
fitted radiance squeeze [1]	$(-5.004 \pm 19.083) \times 10^{-5}$	16822686	-3.000×10^{-5}	2.205×10^{-4}	-4.269×10^{-5}	-2.511×10^{-2}	1.618×10^{-2}
fitted root mean square [1]	$(1.285 \pm 0.541) \times 10^{-3}$	16822686	9.750×10^{-4}	5.405×10^{-4}	1.131×10^{-3}	2.926×10^{-4}	7.026×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.862 ± 0.441	16822686	0.780	0.511	0.788	5.000×10^{-2}	3.22
sulfurdioxide total air mass factor polluted precision [1]	0.119 ± 0.141	16822686	3.500×10^{-2}	0.114	6.663×10^{-2}	3.100×10^{-3}	2.23
sulfurdioxide clear air mass factor polluted [1]	0.736 ± 0.303	16822686	0.700	0.347	0.705	7.021×10^{-2}	2.90
number of spectral points in retrieval [1]	73.4 ± 0.5	16822686	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	6.000×10^{-2}	0.130	0.230	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.07	-0.840	-0.527	-0.360	-0.213	0.241	0.399	0.585	0.943	2.46
sulfurdioxide total vertical column precision [DU]	8.956×10^{-2}	0.126	0.158	0.188	0.225	0.547	0.709	0.909	1.32	2.96
sulfurdioxide slant column density corrected [DU]	-0.860	-0.491	-0.355	-0.264	-0.170	0.192	0.292	0.390	0.547	1.04
sulfurdioxide slant column density cobra [DU]	-0.860	-0.491	-0.355	-0.264	-0.170	0.192	0.292	0.390	0.547	1.04
sulfurdioxide slant column density cobra precision [DU]	0.138	0.165	0.181	0.193	0.207	0.342	0.401	0.454	0.542	0.794
sulfurdioxide slant column density window1 [DU]	-1.67	-0.914	-0.628	-0.439	-0.242	0.493	0.687	0.873	1.16	1.93
sulfurdioxide slant column density window1 precision [DU]	0.138	0.165	0.181	0.193	0.207	0.342	0.401	0.454	0.542	0.794
sulfurdioxide slant column density corrected win1 [DU]	-1.61	-0.936	-0.678	-0.505	-0.321	0.399	0.598	0.793	1.10	1.94
background so2 slant column offset window1 [DU]	-0.323	-0.238	-0.207	-0.188	-0.168	1.358×10^{-3}	6.030×10^{-2}	0.110	0.176	0.323
sulfurdioxide slant column density window2 [DU]	-19.7	-12.7	-9.34	-6.85	-4.05	7.30	10.2	12.9	16.6	24.8
sulfurdioxide slant column density window2 precision [DU]	4.24	5.13	5.70	6.16	6.70	9.47	10.4	11.3	12.7	15.6
sulfurdioxide slant column density corrected win2 [DU]	-21.2	-13.8	-10.3	-7.77	-4.93	6.32	9.14	11.7	15.2	22.7
background so2 slant column offset window2 [DU]	-6.86	-4.63	-3.39	-2.62	-1.88	0.139	0.372	0.607	1.13	3.93
sulfurdioxide slant column density window3 [DU]	-73.0	-50.6	-40.2	-32.8	-24.8	5.33	13.0	20.0	29.4	48.6
sulfurdioxide slant column density window3 precision [DU]	13.0	15.5	17.7	19.4	21.2	32.2	37.2	43.2	55.8	89.5
sulfurdioxide slant column density corrected win3 [DU]	-64.7	-43.2	-33.1	-25.9	-18.1	11.8	19.4	26.3	35.6	54.8
background so2 slant column offset window3 [DU]	-4.48	-1.29	0.270	1.72	3.27	10.1	11.3	12.5	14.2	17.9
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	5.105×10^{-4}	9.861×10^{-4}	1.809×10^{-3}	3.488×10^{-3}	7.737×10^{-3}	3.243×10^{-2}	4.972×10^{-2}	7.129×10^{-2}	0.113	0.281
fitted radiance shift [nm]	-8.574×10^{-3}	-4.206×10^{-3}	-2.675×10^{-3}	-1.806×10^{-3}	-1.095×10^{-3}	6.971×10^{-4}	1.443×10^{-3}	2.372×10^{-3}	4.000×10^{-3}	8.555×10^{-3}
fitted radiance squeeze [1]	-5.618×10^{-4}	-3.635×10^{-4}	-2.778×10^{-4}	-2.188×10^{-4}	-1.568×10^{-4}	6.378×10^{-5}	1.171×10^{-4}	1.663×10^{-4}	2.371×10^{-4}	4.104×10^{-4}
fitted root mean square [1]	5.811×10^{-4}	7.200×10^{-4}	8.048×10^{-4}	8.687×10^{-4}	9.427×10^{-4}	1.483×10^{-3}	1.736×10^{-3}	1.975×10^{-3}	2.317×10^{-3}	3.201×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.106	0.273	0.381	0.463	0.561	1.07	1.28	1.47	1.72	2.27
sulfurdioxide total air mass factor polluted precision [1]	1.036×10^{-2}	1.935×10^{-2}	2.505×10^{-2}	3.026×10^{-2}	3.732×10^{-2}	0.152	0.203	0.259	0.362	0.741
sulfurdioxide clear air mass factor polluted [1]	0.238	0.331	0.397	0.457	0.533	0.880	0.975	1.08	1.27	1.75
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]	0.616 ± 0.412	11655446	0.800	1.000	0.0	1.000	0.200	1.000
sulfurdioxide total vertical column [DU]	$(3.068 \pm 126.701) \times 10^{-2}$	11655446	0.413	8.408×10^{-3}	-64.5	595	-0.196	0.217
sulfurdioxide total vertical column precision [DU]	0.460 ± 0.638	11655446	0.276	0.300	4.242×10^{-2}	70.6	0.209	0.485
sulfurdioxide slant column density corrected [DU]	$(2.538 \pm 141.541) \times 10^{-2}$	11655446	0.337	7.432×10^{-3}	-6.61	924	-0.160	0.177
sulfurdioxide slant column density cobra [DU]	$(1.656 \pm 39.513) \times 10^{-2}$	11655446	0.337	7.432×10^{-3}	-6.61	47.6	-0.160	0.177
sulfurdioxide slant column density cobra precision [DU]	0.267 ± 0.111	11655446	0.104	0.233	8.223×10^{-2}	15.0	0.198	0.302
sulfurdioxide slant column density window1 [DU]	0.117 ± 0.654	11655446	0.690	0.119	-15.2	45.3	-0.229	0.461
sulfurdioxide slant column density window1 precision [DU]	0.267 ± 0.111	11655446	0.104	0.233	8.223×10^{-2}	15.0	0.198	0.302
sulfurdioxide slant column density corrected win1 [DU]	$(4.559 \pm 64.187) \times 10^{-2}$	11655446	0.672	2.959×10^{-2}	-15.1	45.3	-0.301	0.370
background so2 slant column offset window1 [DU]	$(-7.106 \pm 13.662) \times 10^{-2}$	11655446	0.186	-0.101	-0.763	1.07	-0.171	1.521×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.37 ± 8.46	11655446	10.7	1.33	-637	321	-4.01	6.69
sulfurdioxide slant column density window2 precision [DU]	7.85 ± 2.19	11655446	2.48	7.53	2.36	258	6.41	8.89
sulfurdioxide slant column density corrected win2 [DU]	0.699 ± 8.428	11655446	10.7	0.717	-640	319	-4.63	6.03
background so2 slant column offset window2 [DU]	-0.668 ± 1.511	11655446	1.80	-0.458	-8.19	7.16	-1.55	0.242
sulfurdioxide slant column density window3 [DU]	-9.04 ± 22.96	11655446	28.4	-9.03	-197	1.408×10^3	-23.1	5.22
sulfurdioxide slant column density window3 precision [DU]	27.9 ± 14.7	11655446	10.0	23.8	9.13	575	20.2	30.2
sulfurdioxide slant column density corrected win3 [DU]	-3.17 ± 22.64	11655446	28.2	-2.99	-197	1.407×10^3	-17.1	11.1
background so2 slant column offset window3 [DU]	5.87 ± 4.70	11655446	7.44	6.50	-13.1	19.6	2.27	9.71
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.17	11655446	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.226 \pm 6.439) \times 10^{-2}$	11655446	2.686×10^{-2}	1.347×10^{-2}	1.849×10^{-4}	1.41	4.092×10^{-3}	3.095×10^{-2}
fitted radiance shift [nm]	$(-2.065 \pm 288.210) \times 10^{-5}$	11655446	1.765×10^{-3}	-5.849×10^{-5}	-4.221×10^{-2}	3.988×10^{-2}	-9.159×10^{-4}	8.487×10^{-4}
fitted radiance squeeze [1]	$(-7.688 \pm 17.764) \times 10^{-5}$	11655446	2.138×10^{-4}	-6.314×10^{-5}	-4.535×10^{-3}	1.286×10^{-2}	-1.764×10^{-4}	3.742×10^{-5}
fitted root mean square [1]	$(1.193 \pm 0.459) \times 10^{-3}$	11655446	4.500×10^{-4}	1.070×10^{-3}	3.122×10^{-4}	5.205×10^{-2}	9.046×10^{-4}	1.355×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.891 ± 0.477	11655446	0.577	0.812	5.000×10^{-2}	3.22	0.557	1.13
sulfurdioxide total air mass factor polluted precision [1]	0.133 ± 0.157	11655446	0.129	7.696×10^{-2}	3.100×10^{-3}	2.23	3.958×10^{-2}	0.169
sulfurdioxide clear air mass factor polluted [1]	0.756 ± 0.338	11655446	0.396	0.722	7.021×10^{-2}	2.90	0.519	0.915
number of spectral points in retrieval [1]	73.5 ± 0.5	11655446	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]	0.770 ± 0.352	5167240	0.550	1.000	0.0	1.000	0.450	1.000
sulfurdioxide total vertical column [DU]	$(5.142 \pm 107.618) \times 10^{-2}$	5167240	0.565	1.707×10^{-2}	-76.2	505	-0.260	0.305
sulfurdioxide total vertical column precision [DU]	0.574 ± 0.593	5167240	0.393	0.420	5.479×10^{-2}	97.5	0.280	0.672
sulfurdioxide slant column density corrected [DU]	$(3.080 \pm 62.605) \times 10^{-2}$	5167240	0.434	1.419×10^{-2}	-24.5	565	-0.200	0.234
sulfurdioxide slant column density cobra [DU]	$(3.002 \pm 46.172) \times 10^{-2}$	5167240	0.434	1.419×10^{-2}	-24.5	48.1	-0.200	0.234
sulfurdioxide slant column density cobra precision [DU]	0.352 ± 0.172	5167240	0.180	0.308	8.965×10^{-2}	45.3	0.239	0.418
sulfurdioxide slant column density window1 [DU]	0.152 ± 0.811	5167240	0.853	0.152	-65.1	67.5	-0.275	0.578
sulfurdioxide slant column density window1 precision [DU]	0.352 ± 0.172	5167240	0.180	0.308	8.965×10^{-2}	45.3	0.239	0.418
sulfurdioxide slant column density corrected win1 [DU]	$(6.986 \pm 81.164) \times 10^{-2}$	5167240	0.850	4.256×10^{-2}	-65.1	67.4	-0.374	0.476
background so2 slant column offset window1 [DU]	$(-8.230 \pm 14.157) \times 10^{-2}$	5167240	0.130	-0.116	-1.23	4.06	-0.163	-3.242×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.52 ± 10.70	5167240	13.0	2.25	-1.693×10^3	3.130×10^3	-4.15	8.87
sulfurdioxide slant column density window2 precision [DU]	9.30 ± 2.85	5167240	2.99	8.92	2.45	702	7.61	10.6
sulfurdioxide slant column density corrected win2 [DU]	0.732 ± 10.500	5167240	12.8	0.702	-1.696×10^3	3.130×10^3	-5.69	7.10
background so2 slant column offset window2 [DU]	-1.79 ± 2.33	5167240	2.92	-1.10	-13.0	7.28	-3.11	-0.191
sulfurdioxide slant column density window3 [DU]	-12.2 ± 27.5	5167240	34.8	-11.6	-493	642	-29.2	5.60
sulfurdioxide slant column density window3 precision [DU]	32.0 ± 12.8	5167240	10.3	29.1	9.91	294	24.9	35.1
sulfurdioxide slant column density corrected win3 [DU]	-3.63 ± 27.20	5167240	34.4	-3.25	-481	644	-20.6	13.9
background so2 slant column offset window3 [DU]	8.56 ± 4.65	5167240	6.45	7.71	-12.1	29.0	5.29	11.7
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.27	5167240	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.179 \pm 4.834) \times 10^{-2}$	5167240	2.138×10^{-2}	1.982×10^{-2}	1.312×10^{-3}	1.44	1.304×10^{-2}	3.441×10^{-2}
fitted radiance shift [nm]	$(-5.027 \pm 24.203) \times 10^{-4}$	5167240	1.748×10^{-3}	-4.837×10^{-4}	-6.904×10^{-2}	5.566×10^{-2}	-1.414×10^{-3}	3.343×10^{-4}
fitted radiance squeeze [1]	$(1.050 \pm 20.515) \times 10^{-5}$	5167240	2.306×10^{-4}	8.182×10^{-6}	-2.511×10^{-2}	1.618×10^{-2}	-1.061×10^{-4}	1.245×10^{-4}
fitted root mean square [1]	$(1.493 \pm 0.643) \times 10^{-3}$	5167240	6.971×10^{-4}	1.310×10^{-3}	2.926×10^{-4}	7.026×10^{-2}	1.062×10^{-3}	1.759×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.797 ± 0.336	5167240	0.400	0.745	5.000×10^{-2}	2.63	0.567	0.967
sulfurdioxide total air mass factor polluted precision [1]	$(8.781 \pm 8.625) \times 10^{-2}$	5167240	7.732×10^{-2}	5.155×10^{-2}	3.714×10^{-3}	1.25	3.419×10^{-2}	0.112
sulfurdioxide clear air mass factor polluted [1]	0.691 ± 0.196	5167240	0.259	0.677	7.428×10^{-2}	1.70	0.555	0.814
number of spectral points in retrieval [1]	73.4 ± 0.5	5167240	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]	0.674 ± 0.389	10904136	0.730	1.000	0.0	1.000	0.270	1.000
sulfurdioxide total vertical column [DU]	$(4.138 \pm 126.348) \times 10^{-2}$	10904136	0.466	1.153×10^{-2}	-70.0	582	-0.218	0.248
sulfurdioxide total vertical column precision [DU]	0.500 ± 0.607	10904136	0.318	0.335	5.130×10^{-2}	97.5	0.232	0.550
sulfurdioxide slant column density corrected [DU]	$(3.048 \pm 132.045) \times 10^{-2}$	10904136	0.367	9.720×10^{-3}	-13.4	924	-0.172	0.195
sulfurdioxide slant column density cobra [DU]	$(2.230 \pm 43.841) \times 10^{-2}$	10904136	0.367	9.720×10^{-3}	-13.4	47.6	-0.172	0.195
sulfurdioxide slant column density cobra precision [DU]	0.299 ± 0.144	10904136	0.152	0.252	8.223×10^{-2}	21.9	0.206	0.358
sulfurdioxide slant column density window1 [DU]	0.129 ± 0.732	10904136	0.748	0.135	-65.1	67.5	-0.244	0.505
sulfurdioxide slant column density window1 precision [DU]	0.299 ± 0.144	10904136	0.152	0.252	8.223×10^{-2}	21.9	0.206	0.358
sulfurdioxide slant column density corrected win1 [DU]	$(5.989 \pm 72.393) \times 10^{-2}$	10904136	0.733	3.977×10^{-2}	-65.1	67.4	-0.321	0.412
background so2 slant column offset window1 [DU]	$(-6.909 \pm 14.762) \times 10^{-2}$	10904136	0.180	-0.108	-0.889	4.06	-0.168	1.252×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.88 ± 9.19	10904136	11.4	1.67	-977	659	-3.95	7.44
sulfurdioxide slant column density window2 precision [DU]	8.24 ± 2.34	10904136	2.72	7.87	2.36	552	6.69	9.41
sulfurdioxide slant column density corrected win2 [DU]	0.736 ± 9.052	10904136	11.3	0.723	-978	655	-4.91	6.35
background so2 slant column offset window2 [DU]	-1.15 ± 2.04	10904136	2.27	-0.641	-13.0	7.28	-2.13	0.140
sulfurdioxide slant column density window3 [DU]	-7.65 ± 24.36	10904136	30.2	-7.51	-493	913	-22.6	7.66
sulfurdioxide slant column density window3 precision [DU]	27.7 ± 11.8	10904136	9.89	24.8	9.23	255	21.0	30.9
sulfurdioxide slant column density corrected win3 [DU]	-0.978 ± 23.727	10904136	29.7	-0.991	-481	924	-15.7	13.9
background so2 slant column offset window3 [DU]	6.67 ± 4.95	10904136	6.79	6.73	-13.1	29.0	3.20	9.99
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	10904136	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.358 \pm 3.865) \times 10^{-2}$	10904136	1.690×10^{-2}	1.484×10^{-2}	3.516×10^{-4}	1.34	8.787×10^{-3}	2.569×10^{-2}
fitted radiance shift [nm]	$(-1.979 \pm 23.029) \times 10^{-4}$	10904136	1.696×10^{-3}	-1.880×10^{-4}	-4.495×10^{-2}	4.160×10^{-2}	-1.070×10^{-3}	6.267×10^{-4}
fitted radiance squeeze [1]	$(-4.117 \pm 19.378) \times 10^{-5}$	10904136	2.209×10^{-4}	-3.240×10^{-5}	-1.462×10^{-2}	1.428×10^{-2}	-1.473×10^{-4}	7.362×10^{-5}
fitted root mean square [1]	$(1.313 \pm 0.569) \times 10^{-3}$	10904136	6.159×10^{-4}	1.137×10^{-3}	3.122×10^{-4}	5.205×10^{-2}	9.382×10^{-4}	1.554×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.838 ± 0.383	10904136	0.454	0.795	5.000×10^{-2}	3.21	0.581	1.03
sulfurdioxide total air mass factor polluted precision [1]	0.111 ± 0.143	10904136	9.085×10^{-2}	6.132×10^{-2}	3.478×10^{-3}	2.23	3.864×10^{-2}	0.129
sulfurdioxide clear air mass factor polluted [1]	0.737 ± 0.258	10904136	0.323	0.731	8.661×10^{-2}	2.57	0.562	0.885
number of spectral points in retrieval [1]	73.4 ± 0.5	10904136	1.000	73.0	52.0	156	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]	0.661 ± 0.418	4129122	0.800	1.000	0.0	1.000	0.200	1.000
sulfurdioxide total vertical column [DU]	$(2.374 \pm 84.524) \times 10^{-2}$	4129122	0.404	7.918×10^{-3}	-46.5	301	-0.191	0.213
sulfurdioxide total vertical column precision [DU]	0.447 ± 0.560	4129122	0.315	0.311	4.242×10^{-2}	74.7	0.193	0.508
sulfurdioxide slant column density corrected [DU]	$(1.683 \pm 46.524) \times 10^{-2}$	4129122	0.347	7.586×10^{-3}	-24.5	556	-0.164	0.183
sulfurdioxide slant column density cobra [DU]	$(1.644 \pm 34.980) \times 10^{-2}$	4129122	0.347	7.586×10^{-3}	-24.5	48.1	-0.164	0.183
sulfurdioxide slant column density cobra precision [DU]	0.275 ± 0.126	4129122	9.312×10^{-2}	0.240	8.940×10^{-2}	45.3	0.206	0.299
sulfurdioxide slant column density window1 [DU]	0.142 ± 0.633	4129122	0.695	0.131	-58.2	64.6	-0.214	0.481
sulfurdioxide slant column density window1 precision [DU]	0.275 ± 0.126	4129122	9.312×10^{-2}	0.240	8.940×10^{-2}	45.3	0.206	0.299
sulfurdioxide slant column density corrected win1 [DU]	$(3.719 \pm 62.435) \times 10^{-2}$	4129122	0.681	1.958×10^{-2}	-58.2	64.6	-0.315	0.366
background so2 slant column offset window1 [DU]	-0.105 ± 0.114	4129122	0.131	-0.134	-1.23	1.14	-0.177	-4.603×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.26 ± 9.35	4129122	11.3	1.24	-1.693×10^3	3.130×10^3	-4.40	6.87
sulfurdioxide slant column density window2 precision [DU]	8.39 ± 2.88	4129122	2.85	7.99	2.36	702	6.71	9.56
sulfurdioxide slant column density corrected win2 [DU]	0.640 ± 9.305	4129122	11.2	0.676	-1.696×10^3	3.130×10^3	-4.95	6.24
background so2 slant column offset window2 [DU]	-0.617 ± 1.508	4129122	1.61	-0.410	-11.3	7.28	-1.38	0.225
sulfurdioxide slant column density window3 [DU]	-14.4 ± 24.2	4129122	29.5	-13.7	-304	1.408×10^3	-28.8	0.711
sulfurdioxide slant column density window3 precision [DU]	32.1 ± 18.2	4129122	13.6	27.1	9.13	575	21.8	35.4
sulfurdioxide slant column density corrected win3 [DU]	-8.42 ± 24.40	4129122	30.0	-7.67	-295	1.407×10^3	-23.1	6.93
background so2 slant column offset window3 [DU]	6.02 ± 4.71	4129122	7.03	6.47	-12.9	26.3	2.64	9.67
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.14	4129122	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.239 \pm 8.465) \times 10^{-2}$	4129122	5.397×10^{-2}	2.667×10^{-2}	1.849×10^{-4}	1.41	8.562×10^{-3}	6.254×10^{-2}
fitted radiance shift [nm]	$(-1.152 \pm 35.393) \times 10^{-4}$	4129122	1.925×10^{-3}	-1.802×10^{-4}	-6.904×10^{-2}	5.566×10^{-2}	-1.109×10^{-3}	8.168×10^{-4}
fitted radiance squeeze [1]	$(-5.222 \pm 18.098) \times 10^{-5}$	4129122	2.110×10^{-4}	-4.865×10^{-5}	-2.511×10^{-2}	1.618×10^{-2}	-1.560×10^{-4}	5.501×10^{-5}
fitted root mean square [1]	$(1.204 \pm 0.461) \times 10^{-3}$	4129122	3.994×10^{-4}	1.100×10^{-3}	3.290×10^{-4}	7.026×10^{-2}	9.368×10^{-4}	1.336×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.941 ± 0.546	4129122	0.664	0.784	5.000×10^{-2}	2.92	0.544	1.21
sulfurdioxide total air mass factor polluted precision [1]	0.133 ± 0.134	4129122	0.158	9.218×10^{-2}	3.339×10^{-3}	1.83	3.371×10^{-2}	0.192
sulfurdioxide clear air mass factor polluted [1]	0.765 ± 0.391	4129122	0.388	0.673	7.428×10^{-2}	2.90	0.507	0.894
number of spectral points in retrieval [1]	73.4 ± 0.5	4129122	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

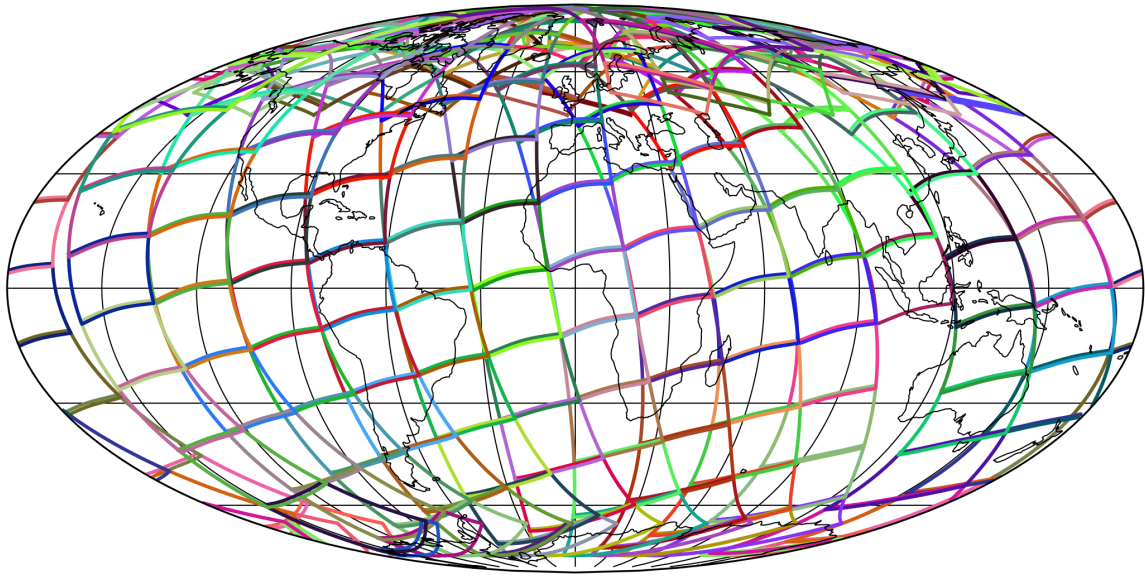


Figure 1: Outline of the granules.

4 Input data monitoring

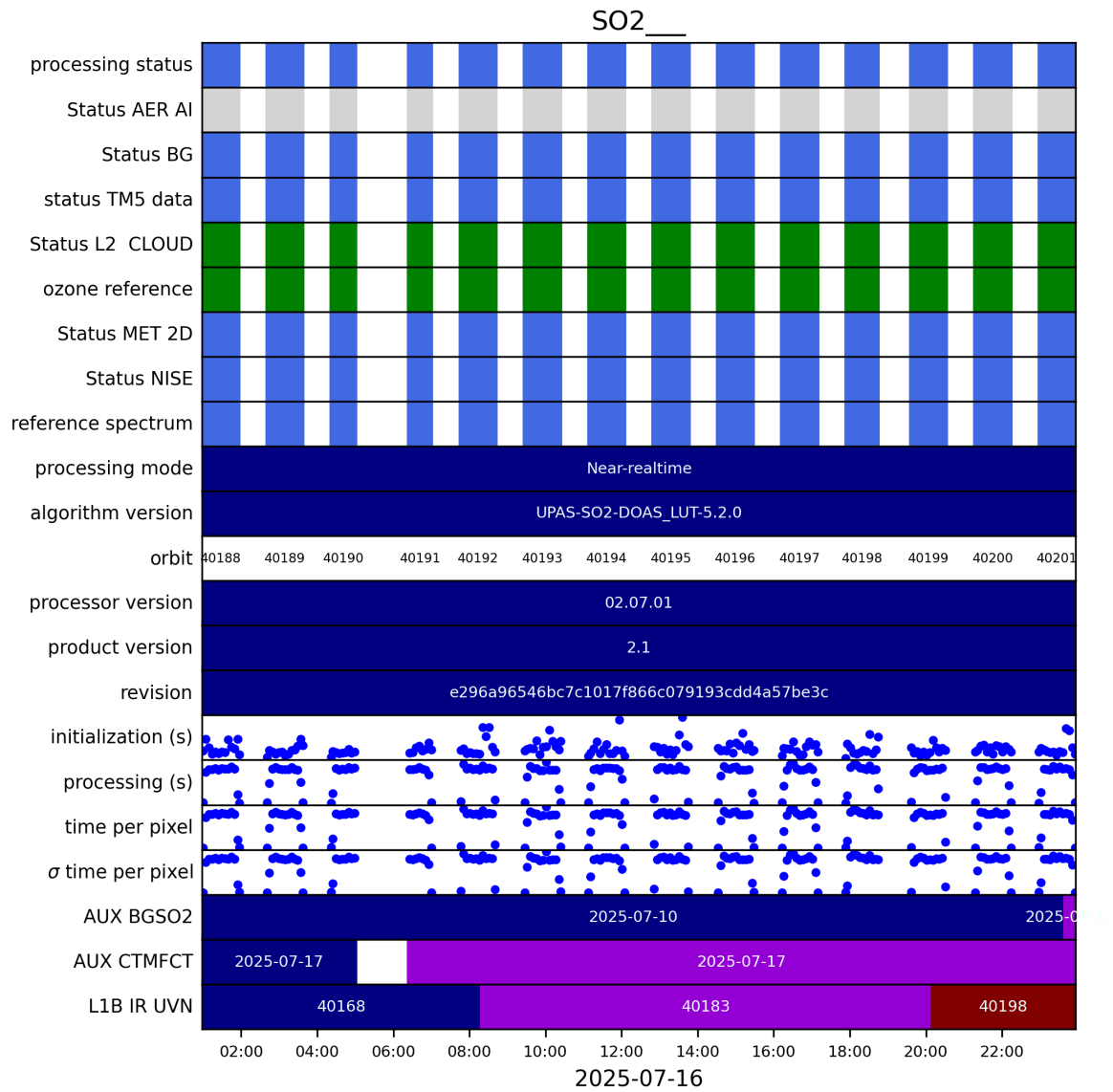


Figure 2: Input data per granule

5 Warnings and errors

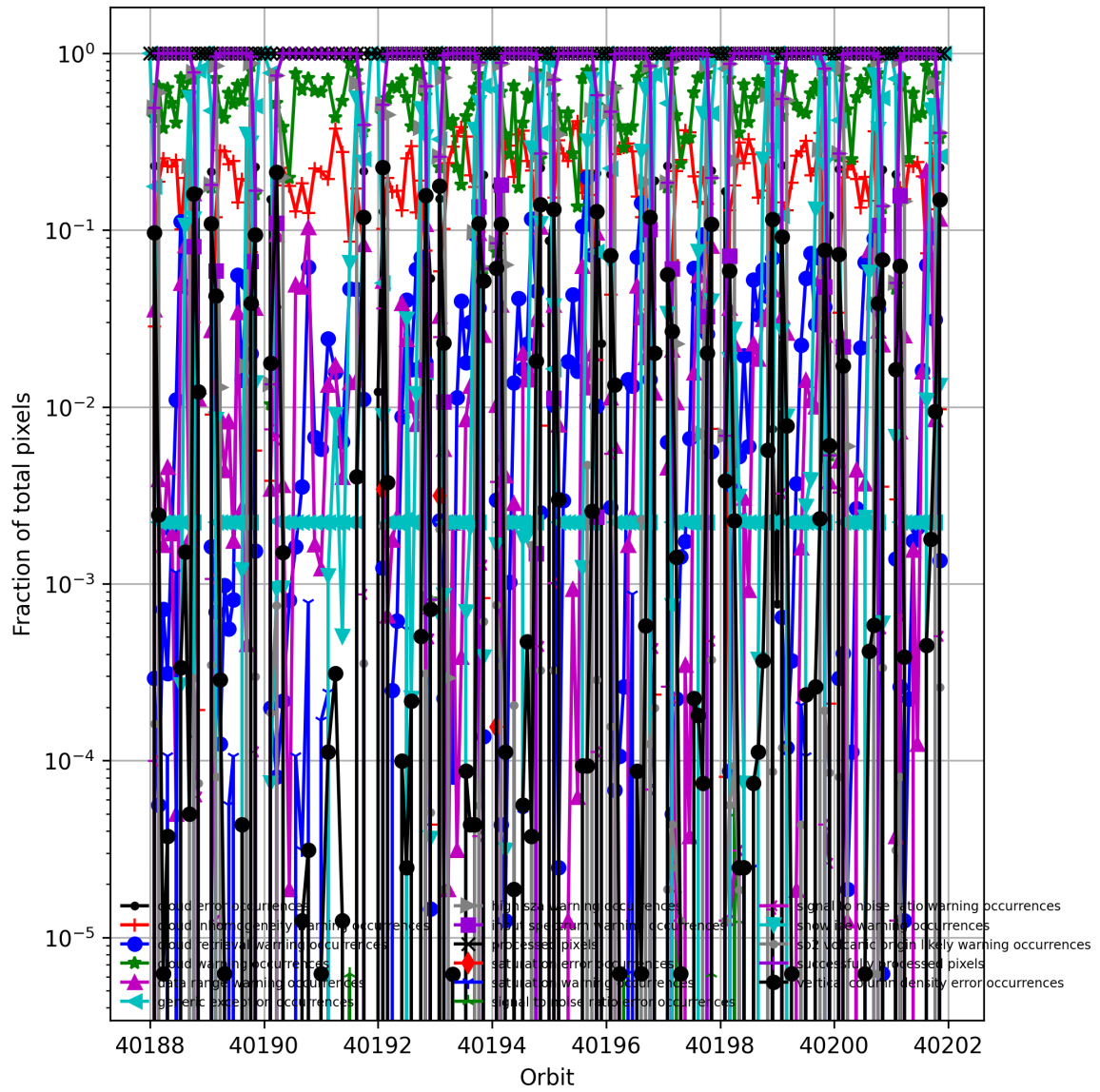


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

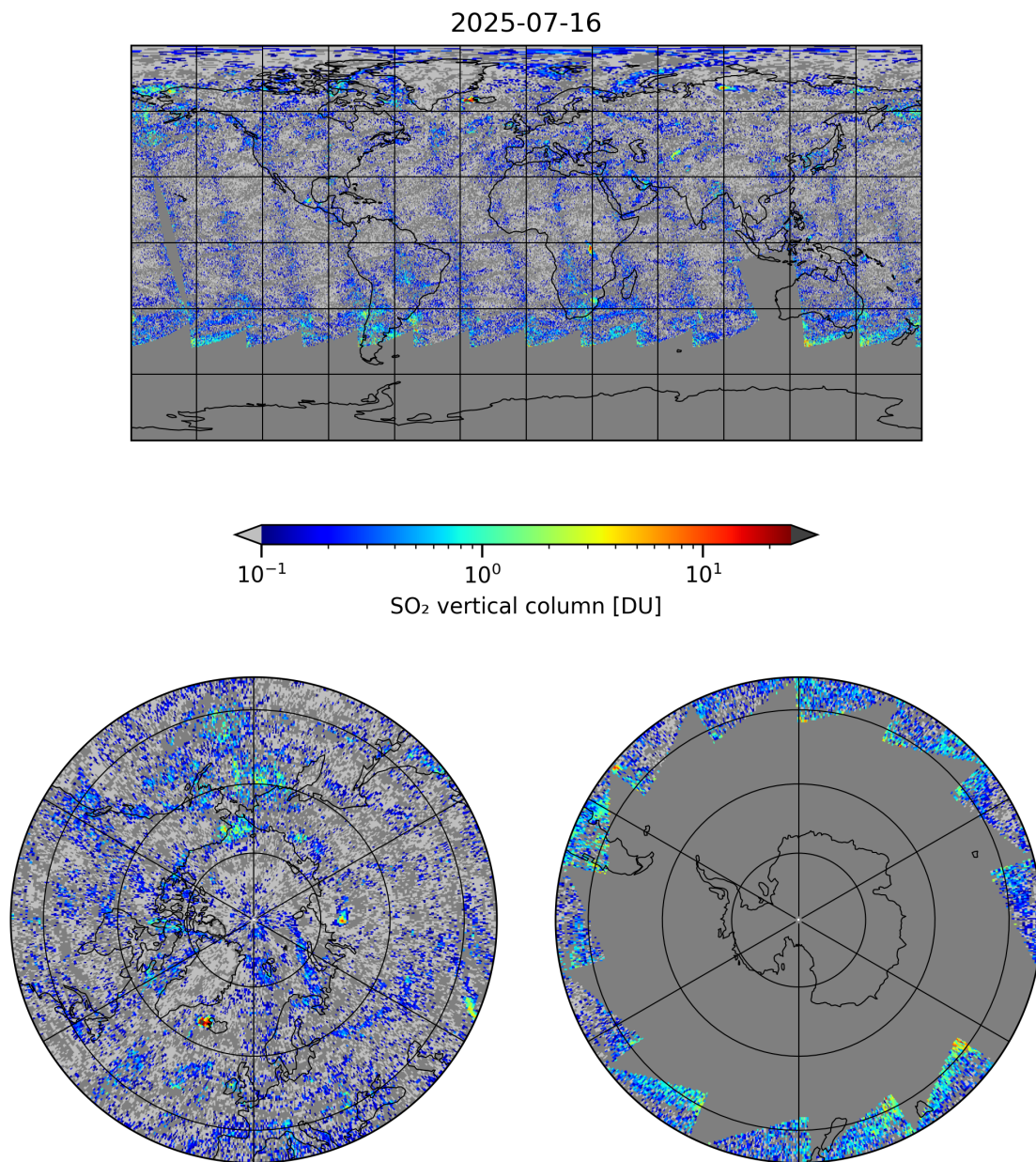


Figure 4: Map of “SO₂ vertical column” for 2025-07-16 to 2025-07-16

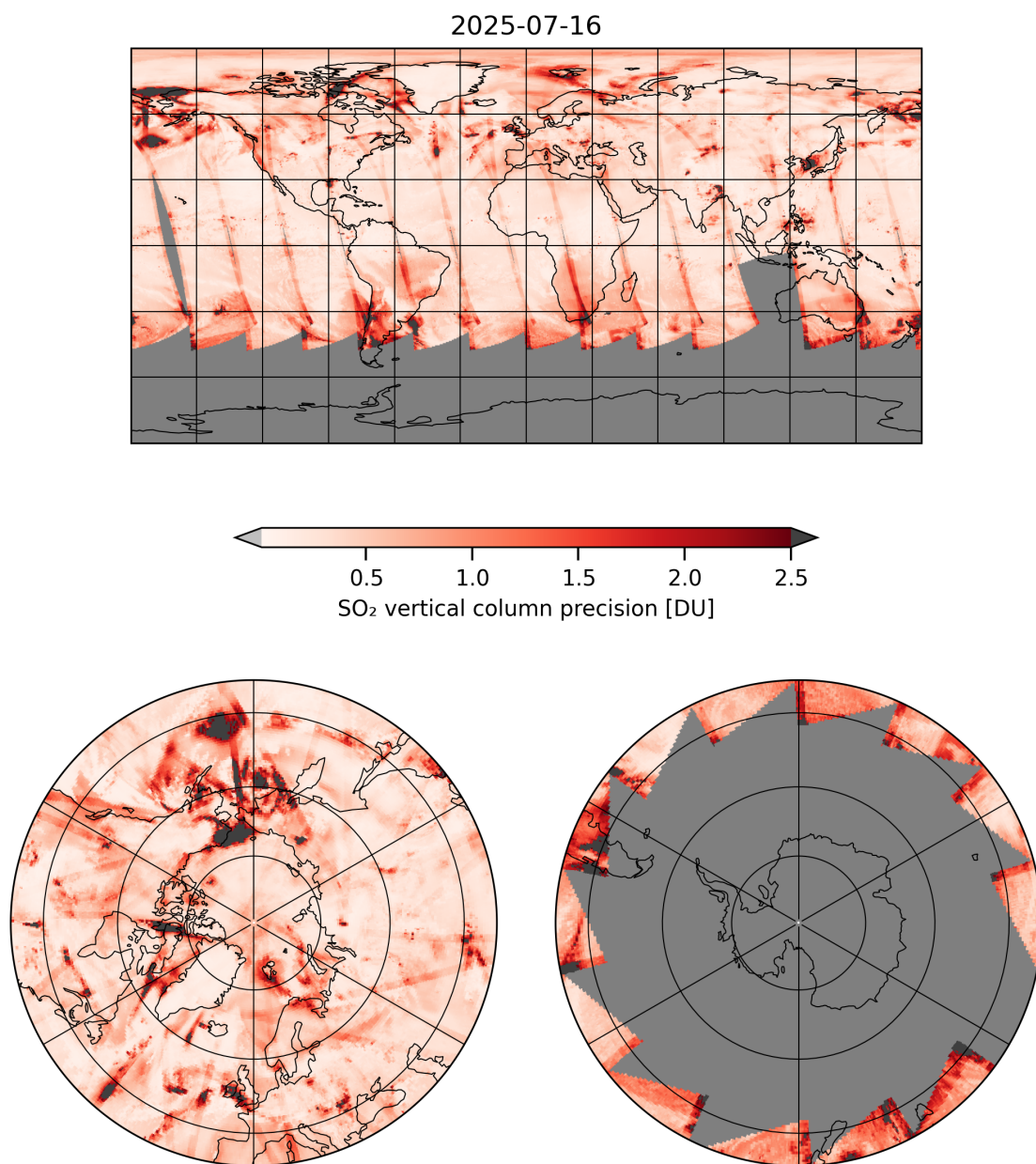


Figure 5: Map of “SO₂ vertical column precision” for 2025-07-16 to 2025-07-16

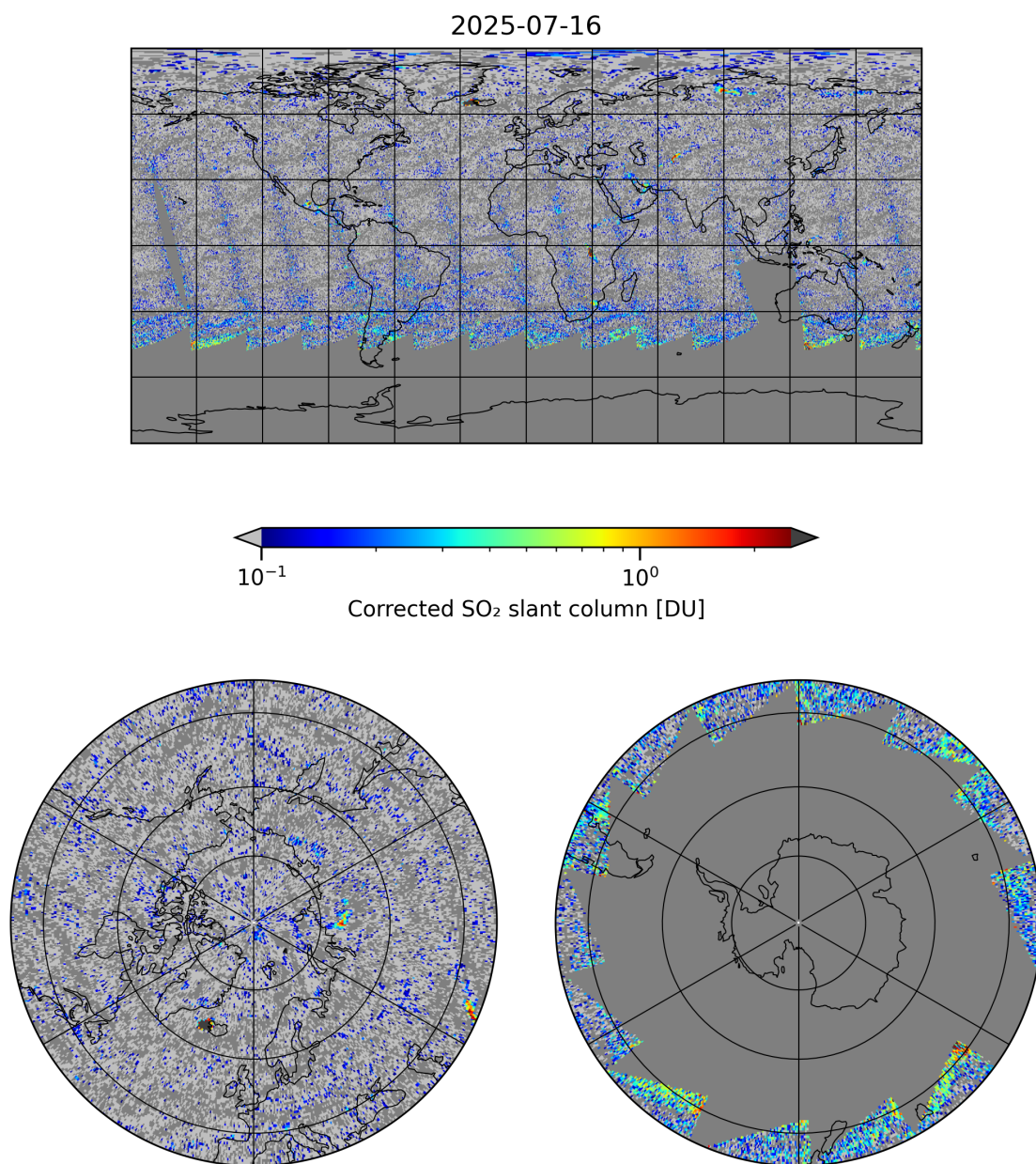


Figure 6: Map of “Corrected SO₂ slant column” for 2025-07-16 to 2025-07-16

2025-07-16

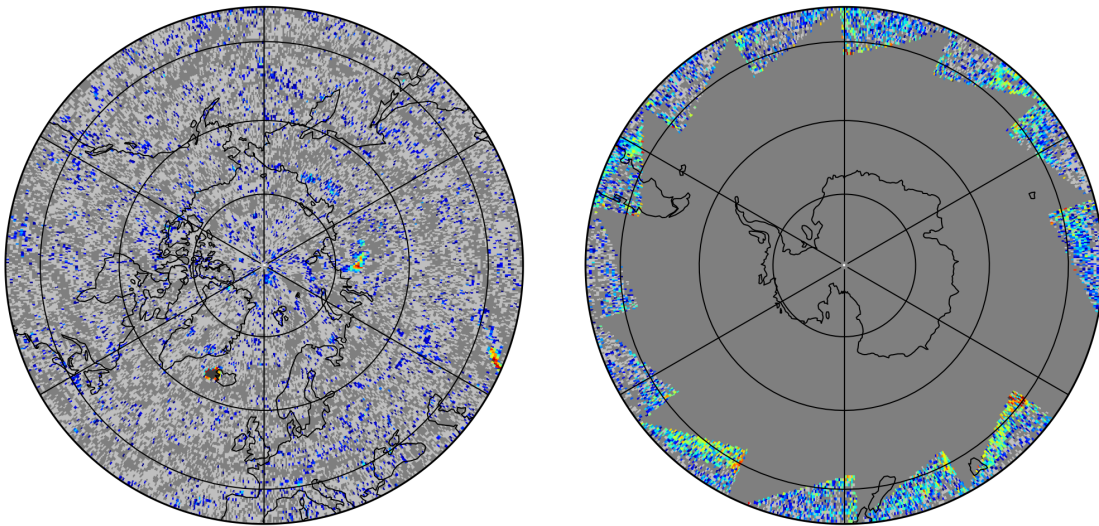
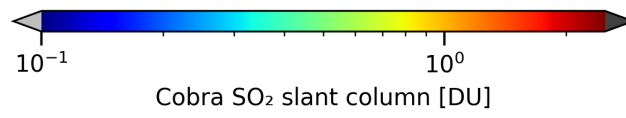
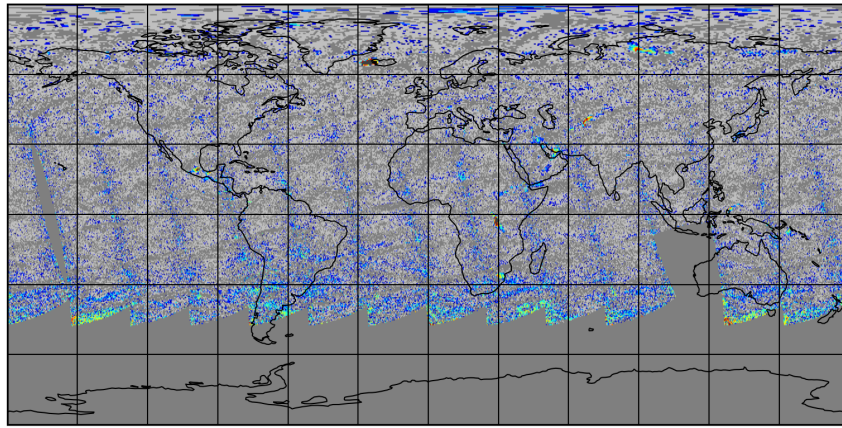


Figure 7: Map of “Cobra SO₂ slant column” for 2025-07-16 to 2025-07-16

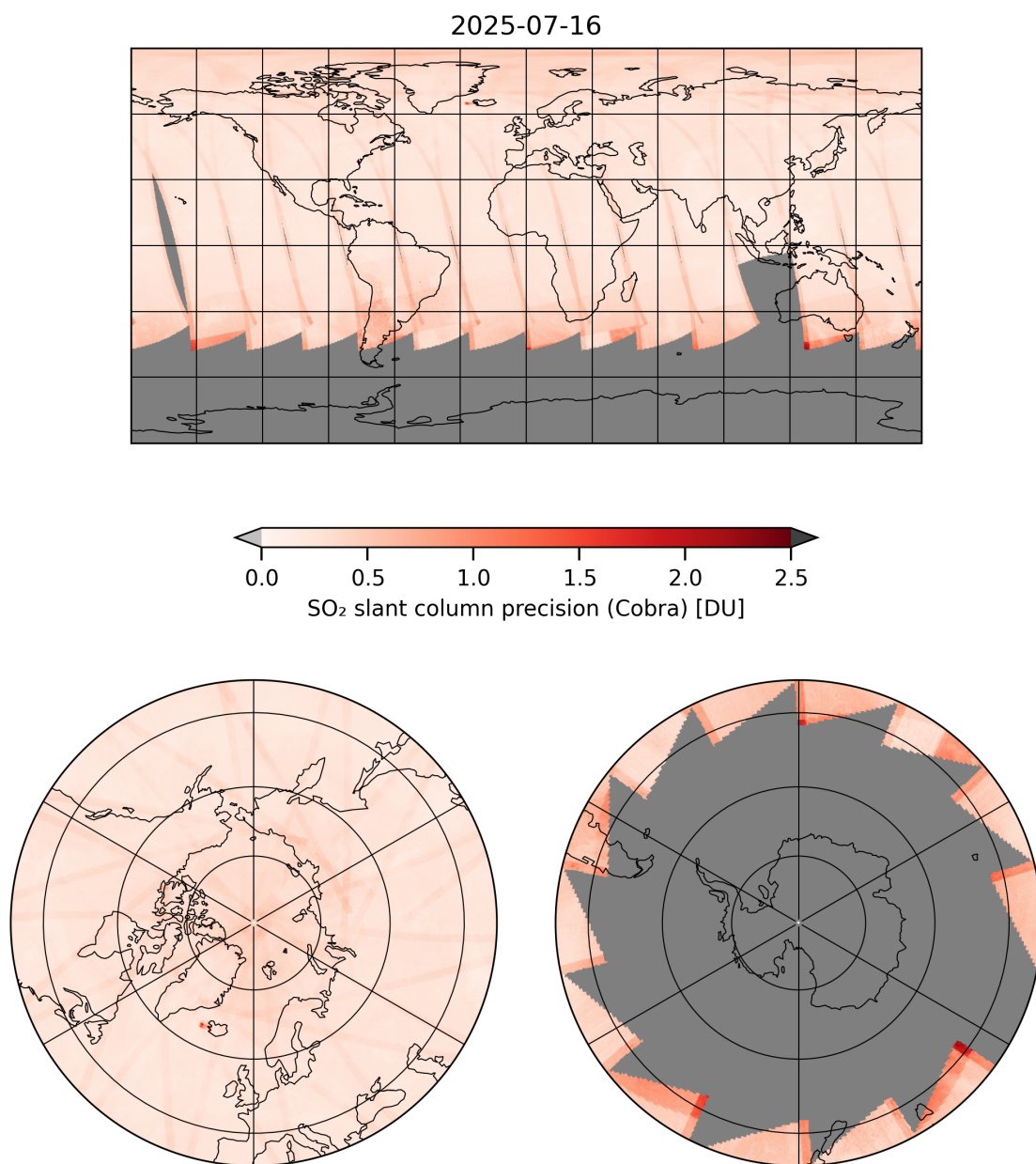


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-07-16 to 2025-07-16

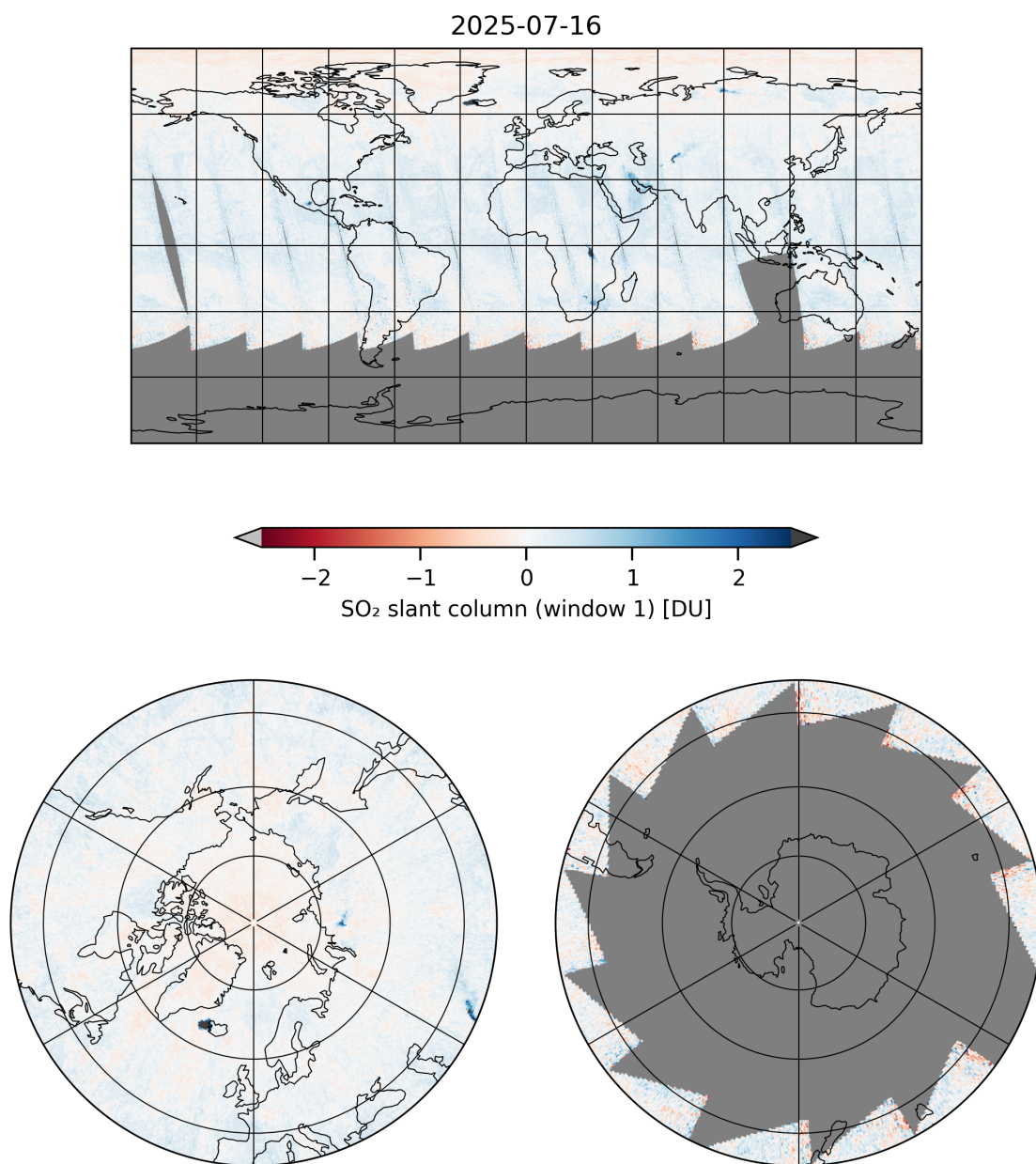


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-07-16 to 2025-07-16

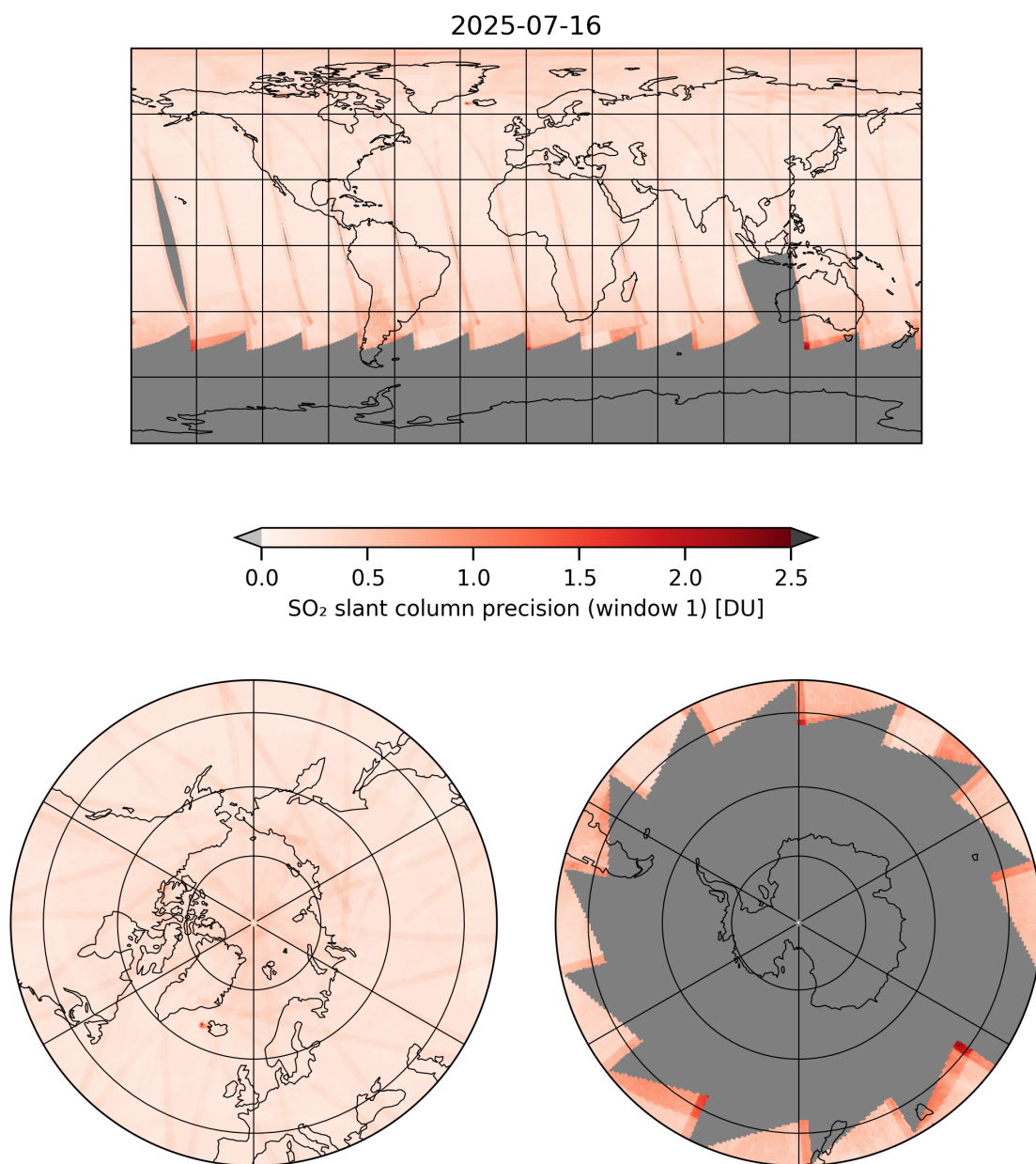


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-07-16 to 2025-07-16

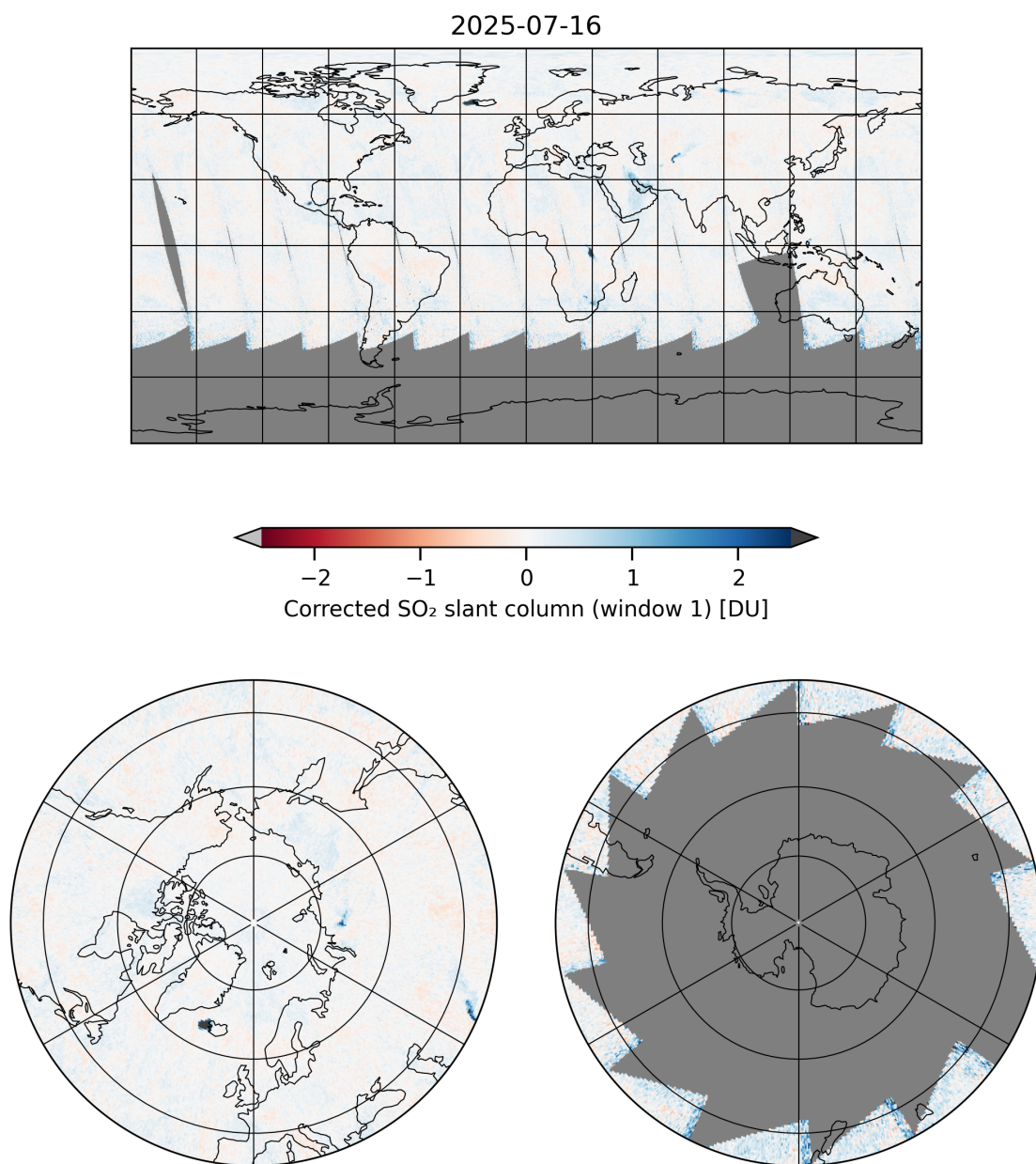


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-07-16 to 2025-07-16

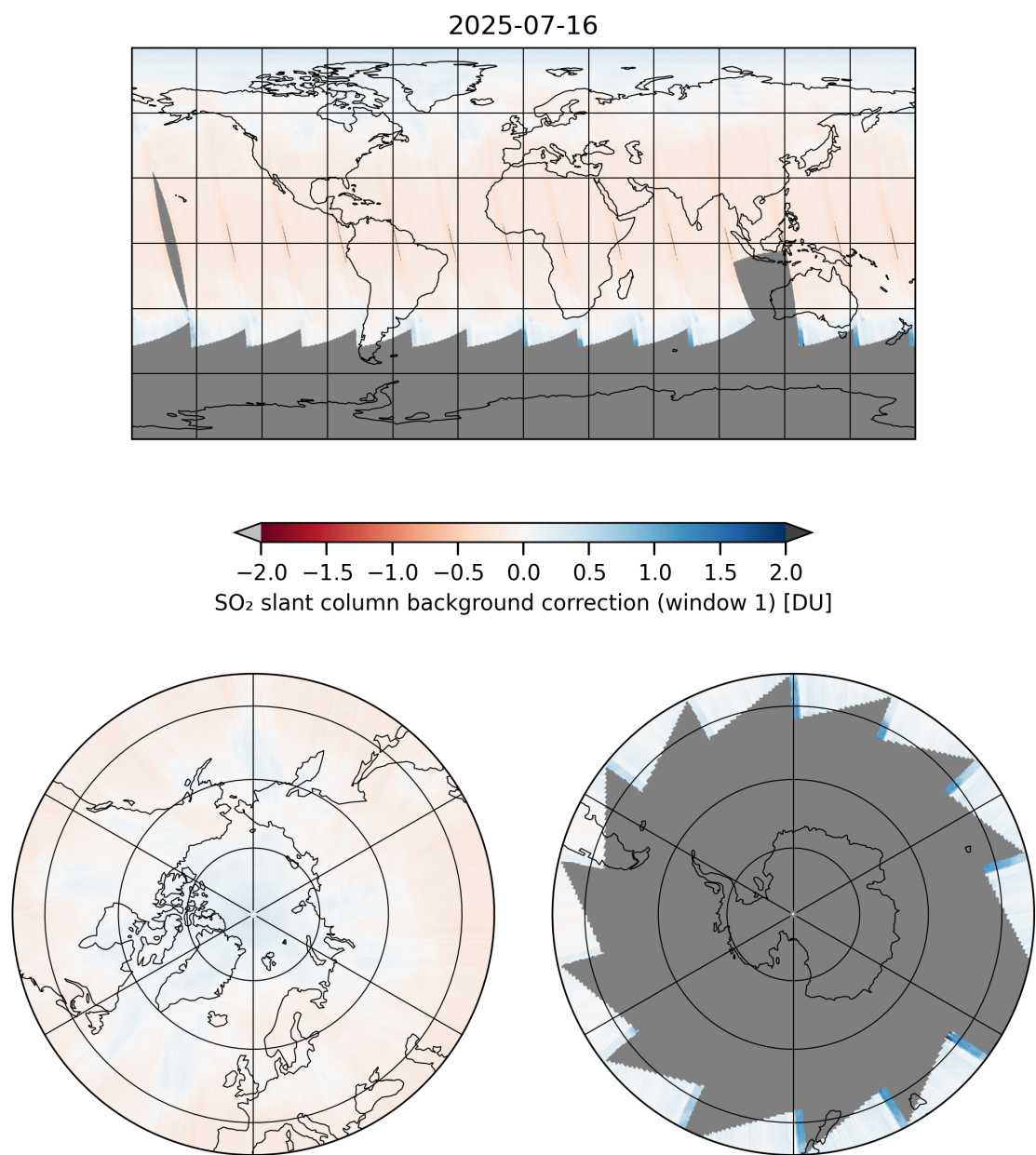


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-07-16 to 2025-07-16

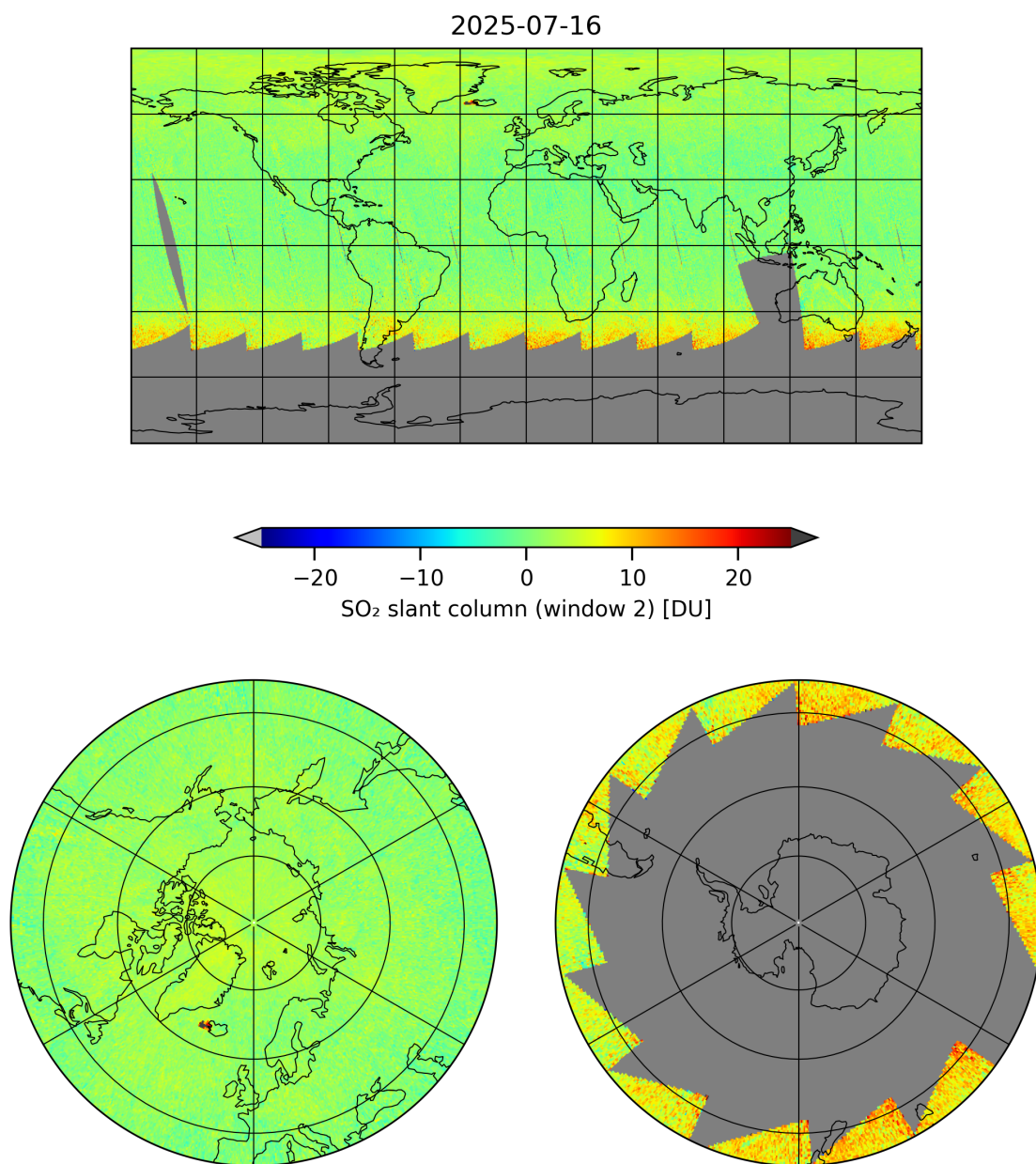


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-07-16 to 2025-07-16

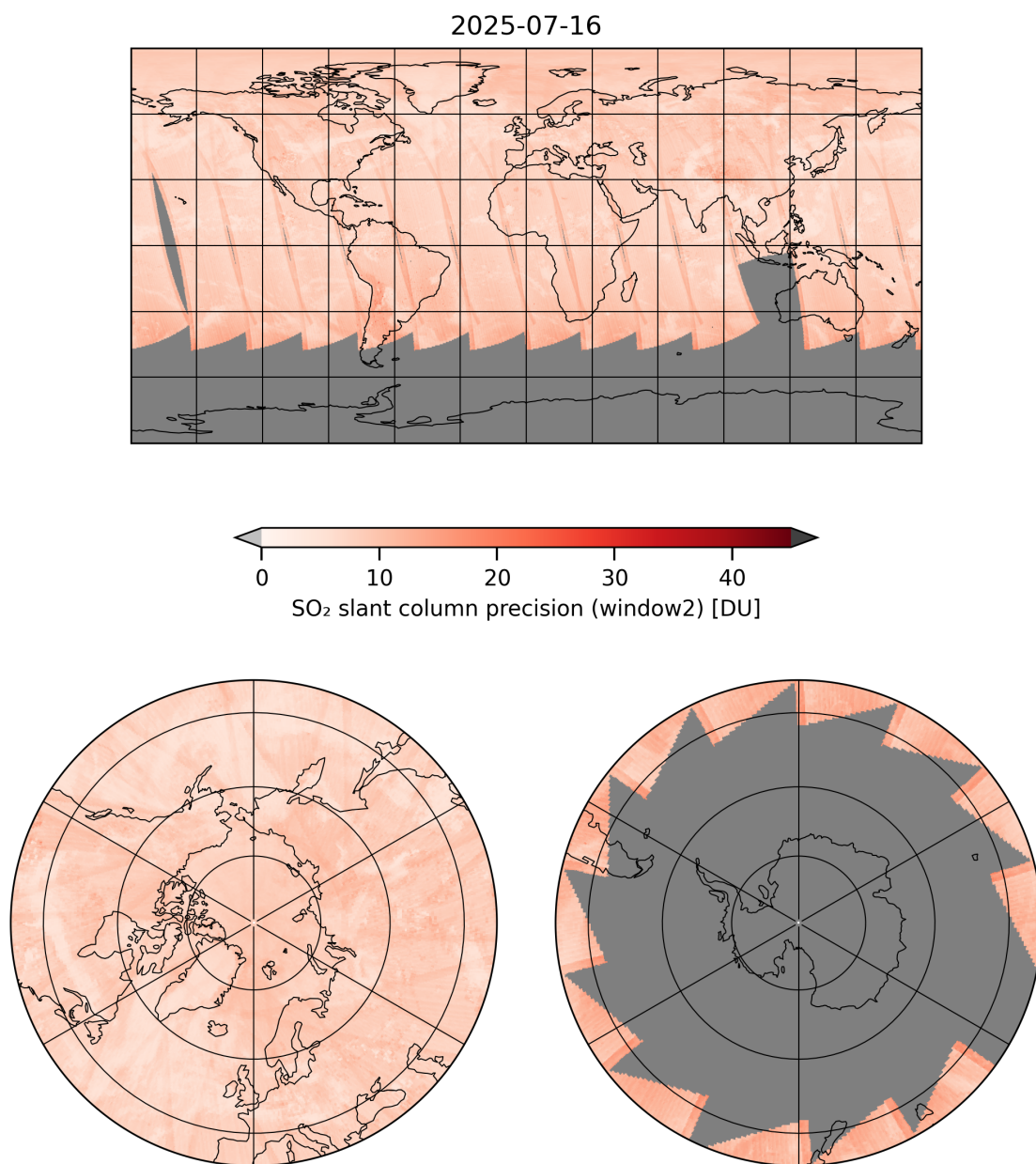


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-07-16 to 2025-07-16

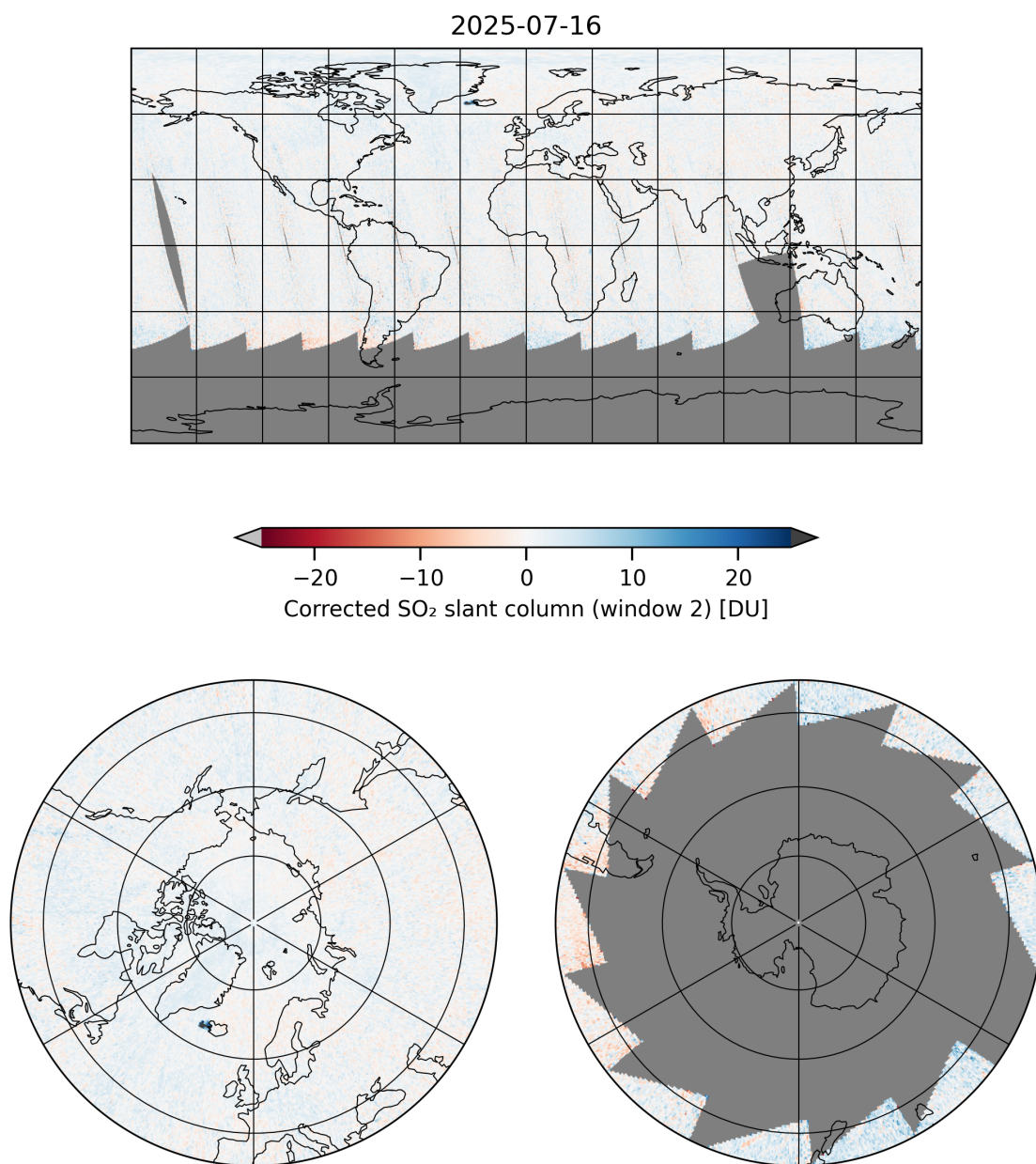


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-07-16 to 2025-07-16

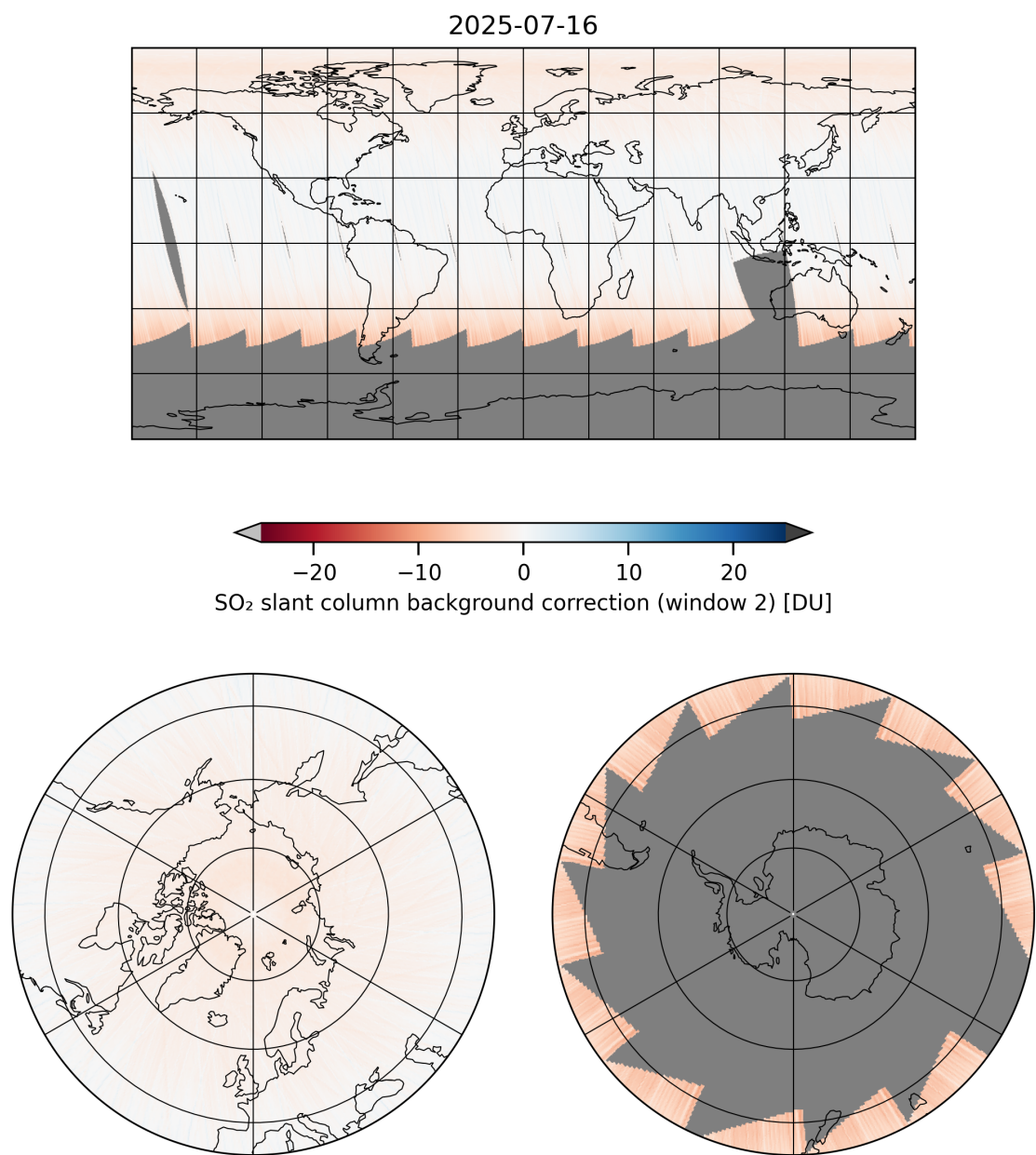


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-07-16 to 2025-07-16

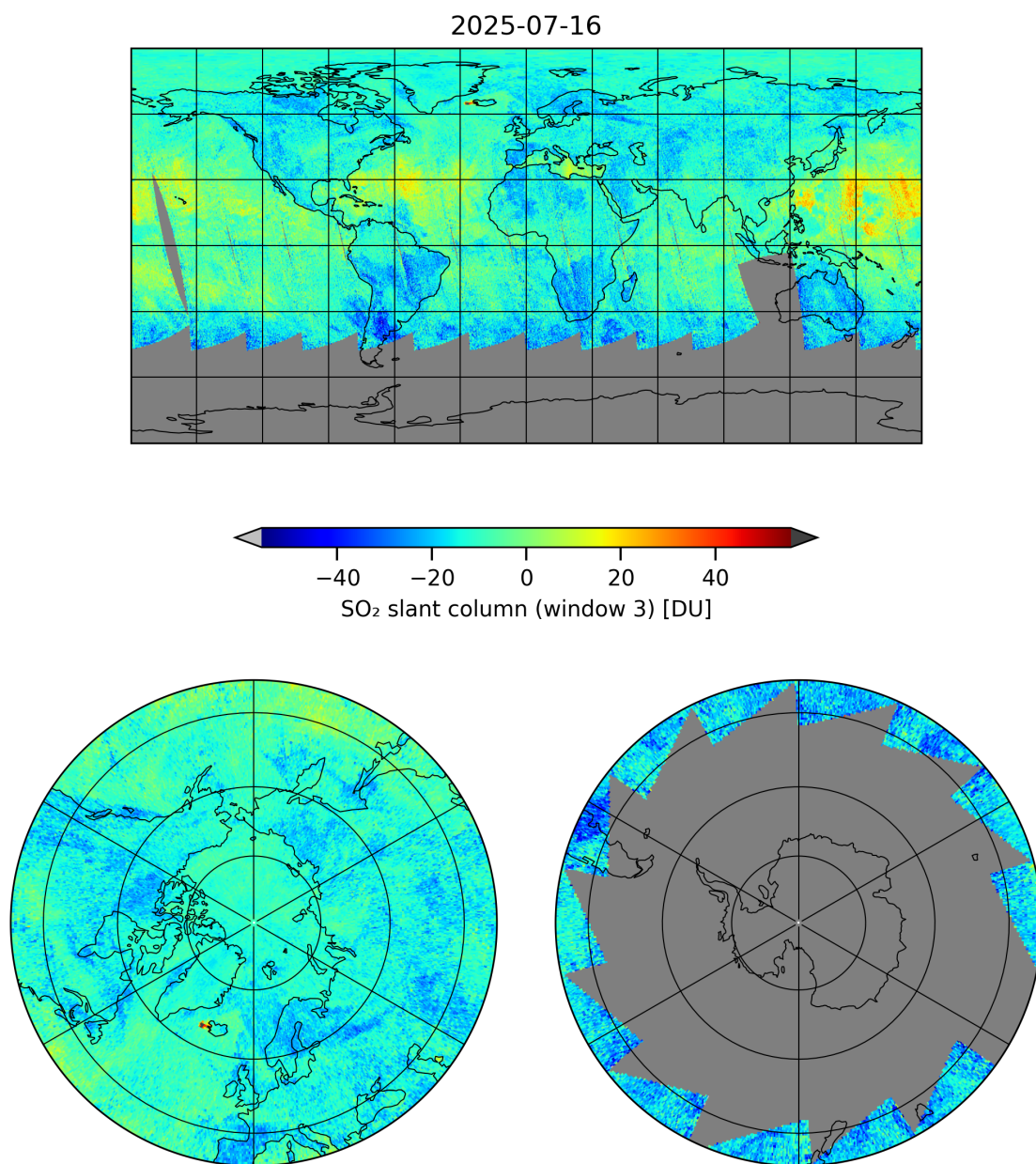


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-07-16 to 2025-07-16

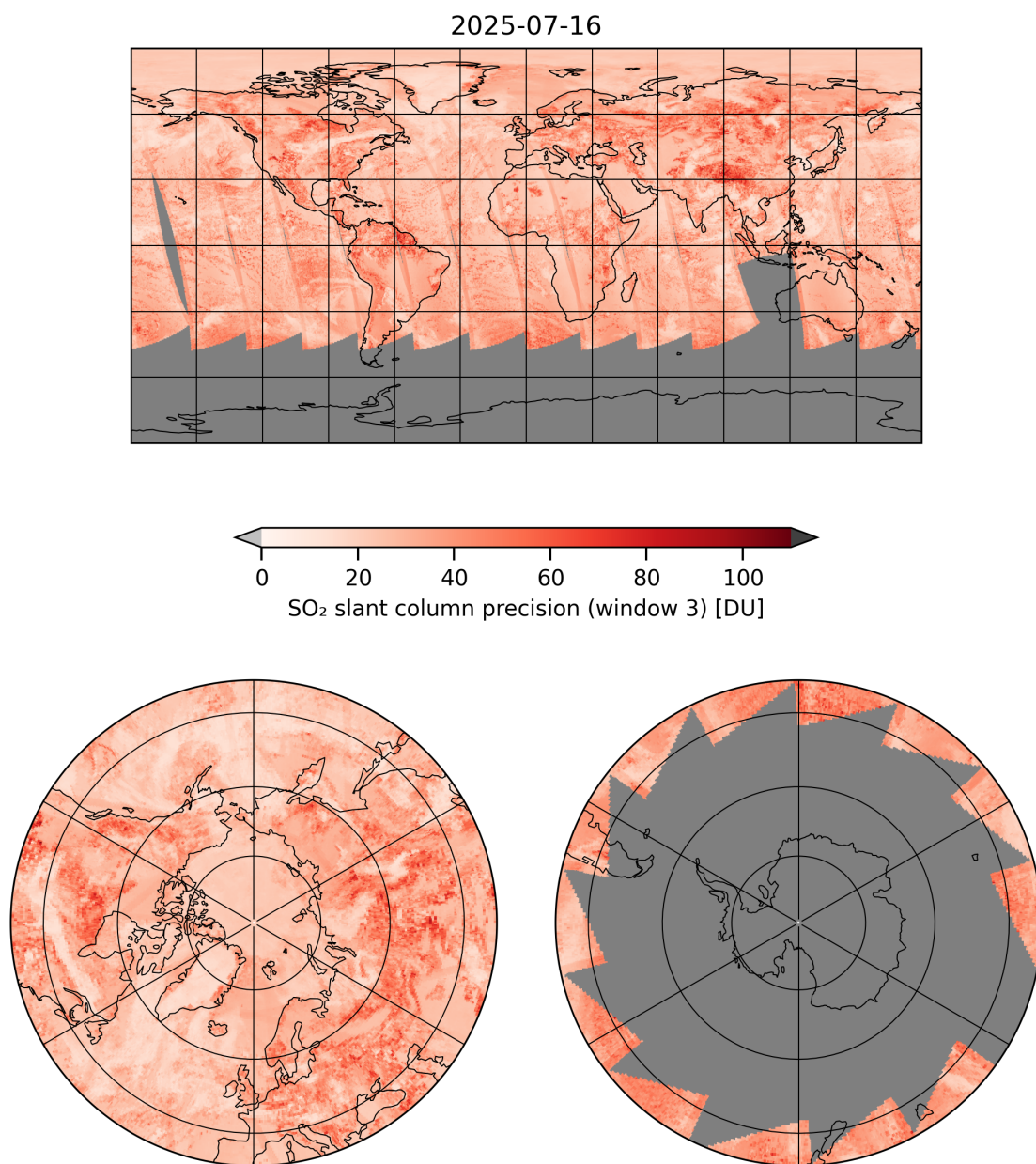


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-07-16 to 2025-07-16

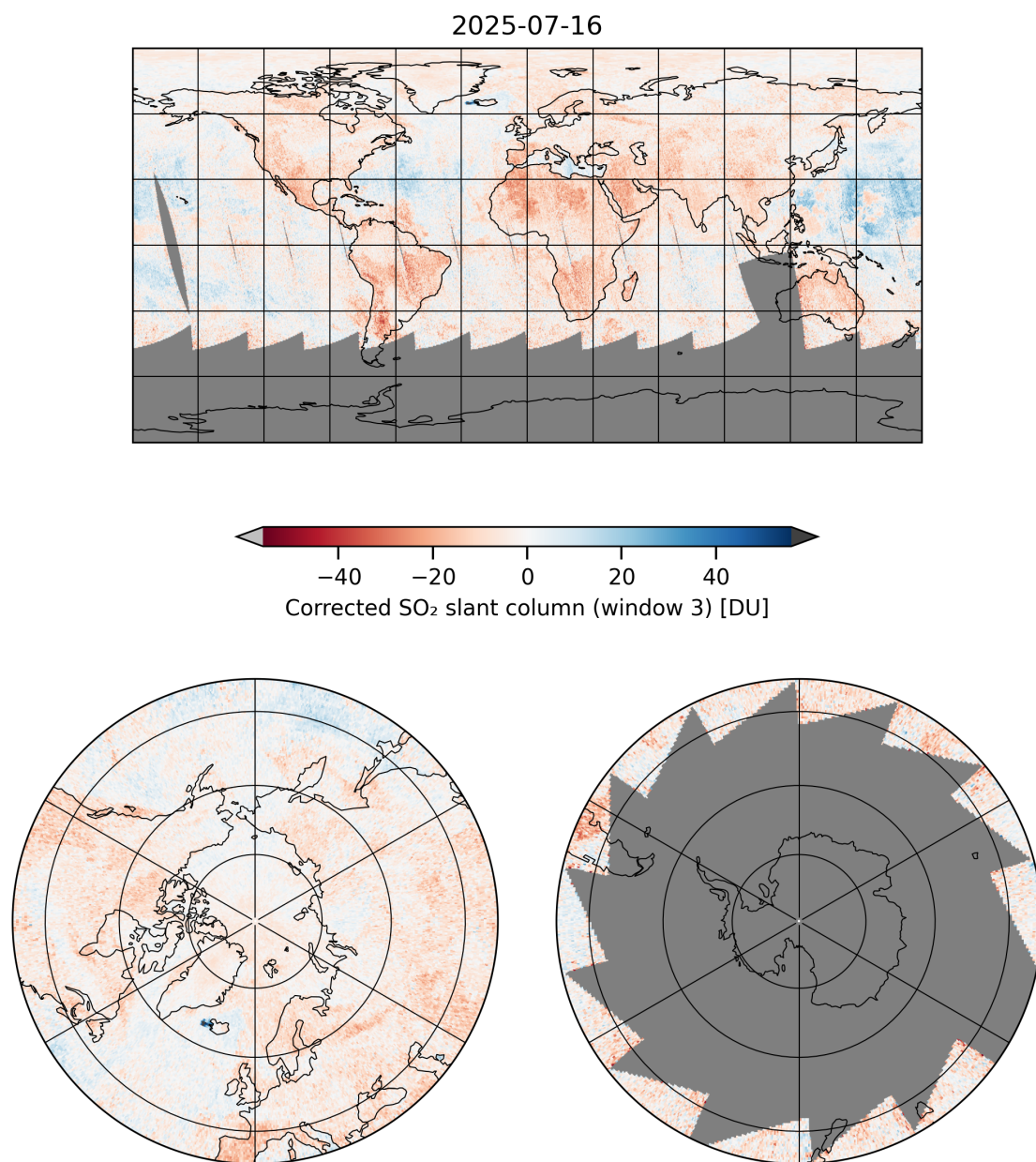


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-07-16 to 2025-07-16

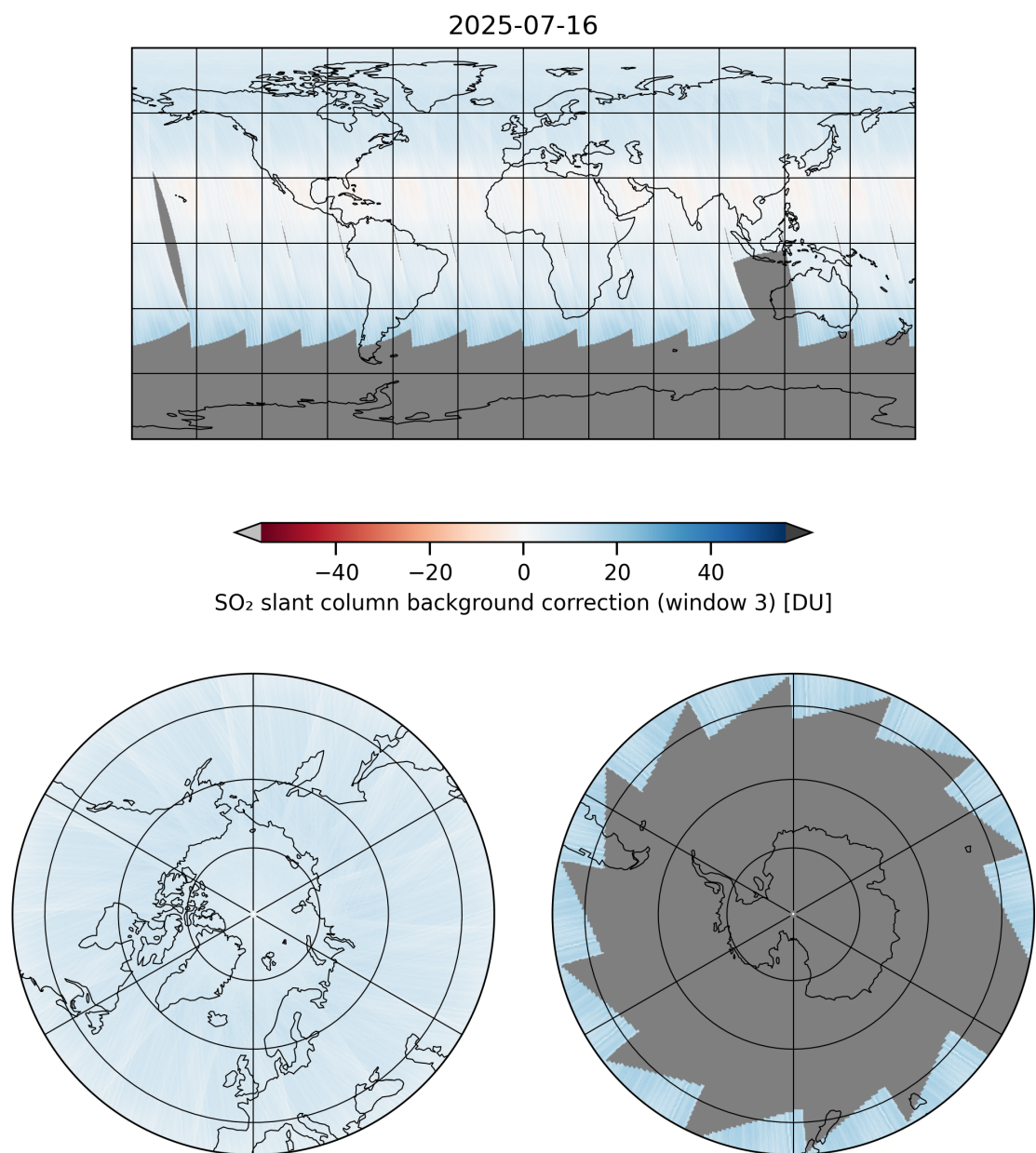


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-07-16 to 2025-07-16

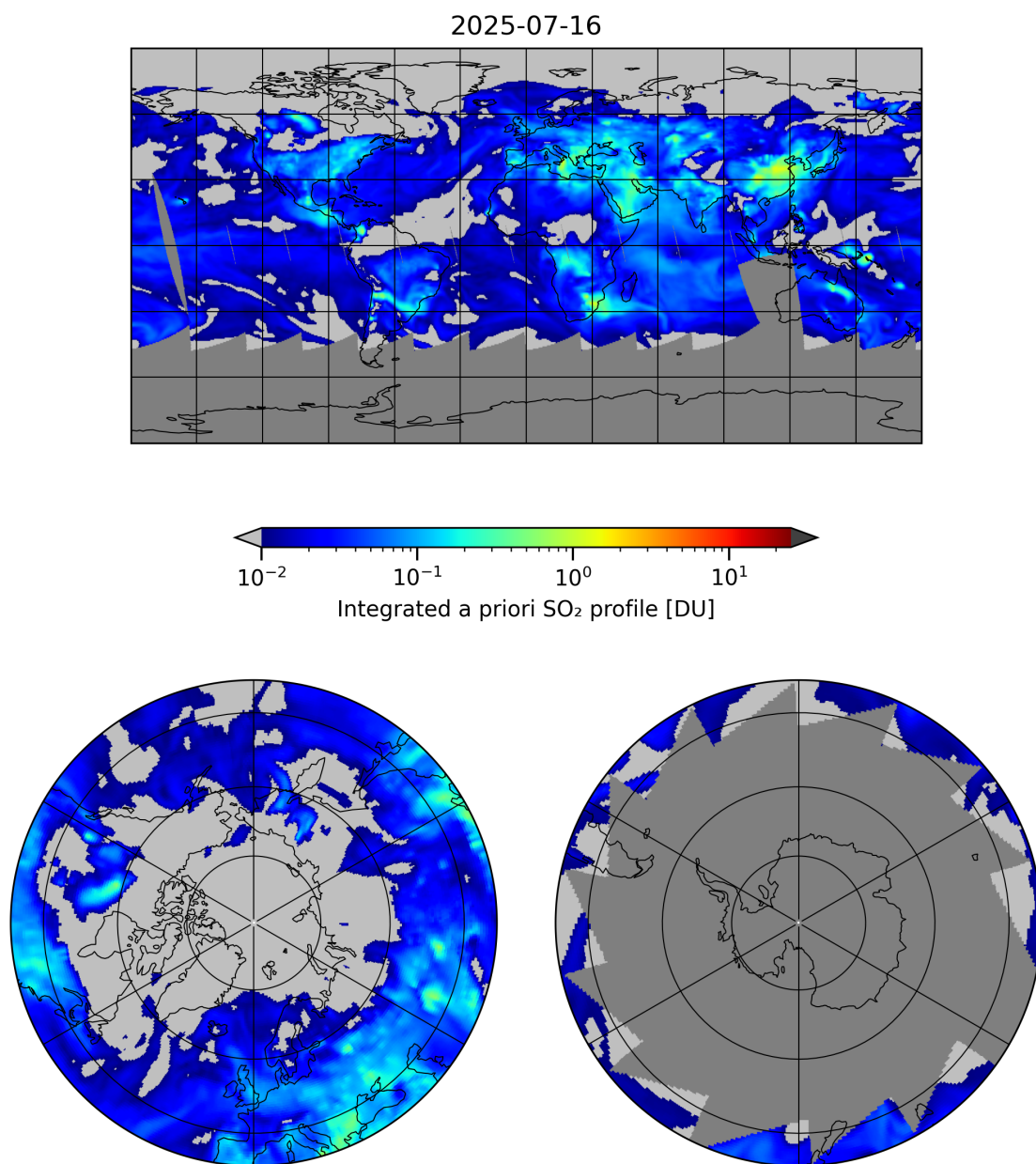


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-07-16 to 2025-07-16

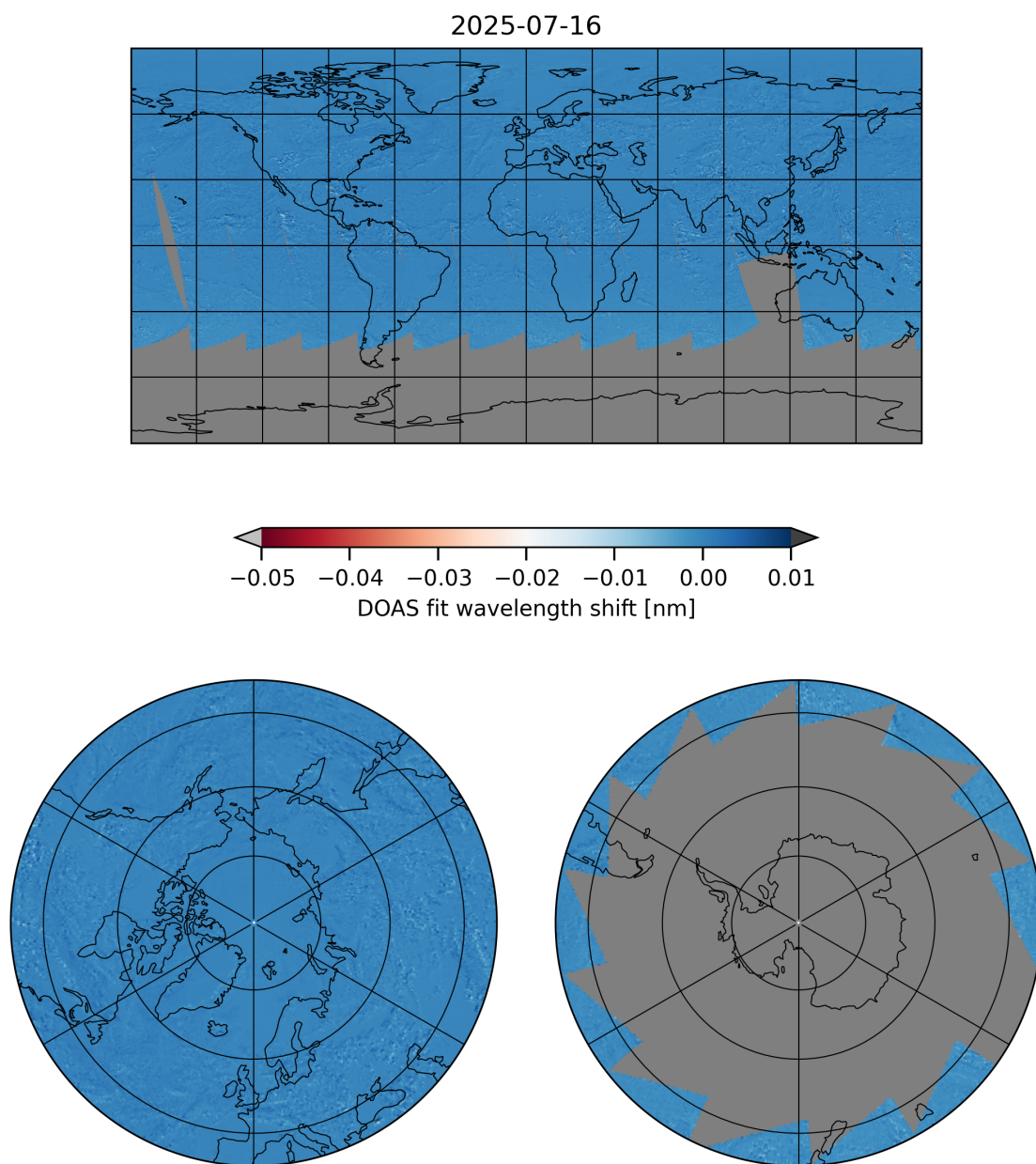


Figure 22: Map of “DOAS fit wavelength shift” for 2025-07-16 to 2025-07-16

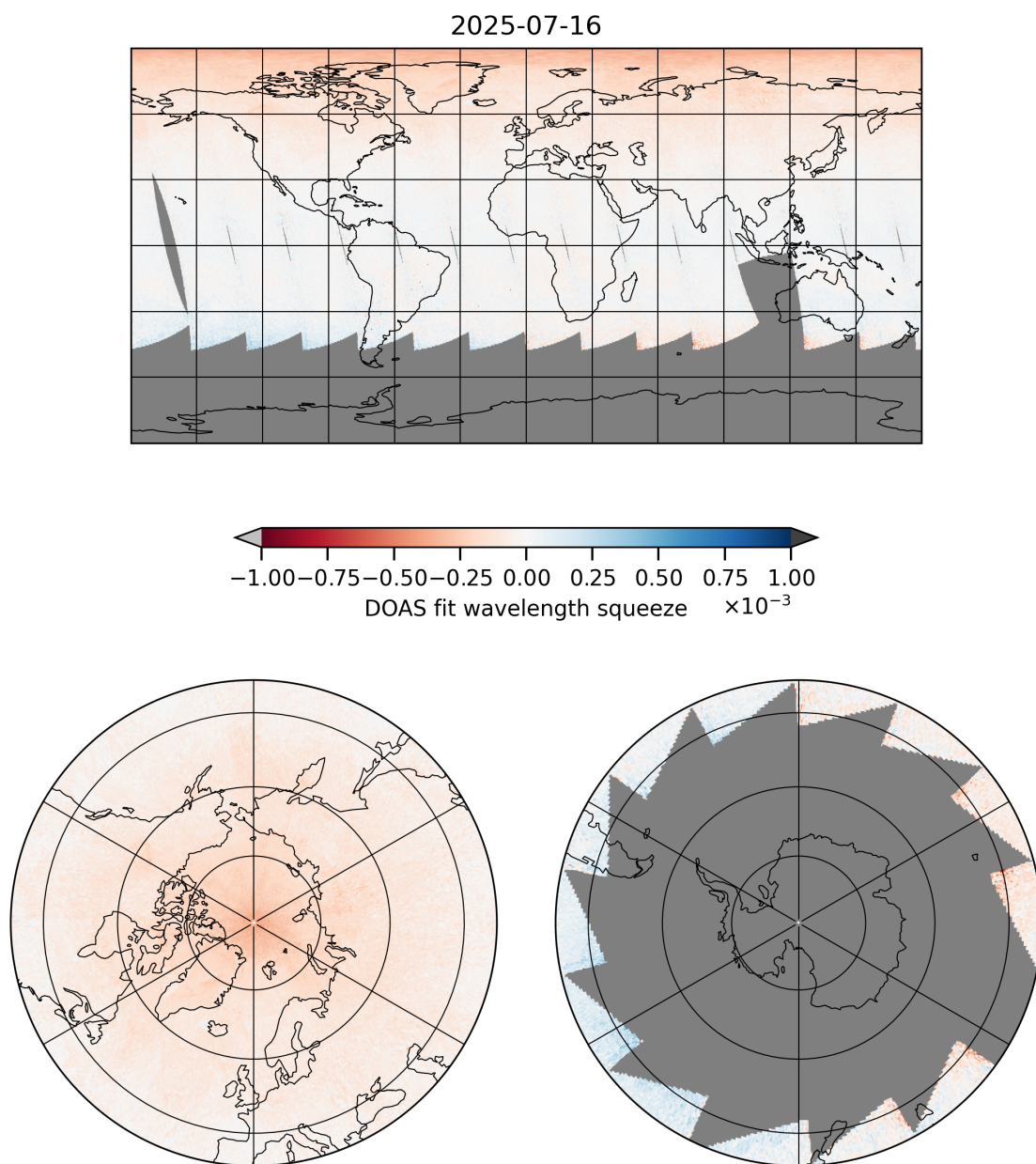


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-07-16 to 2025-07-16

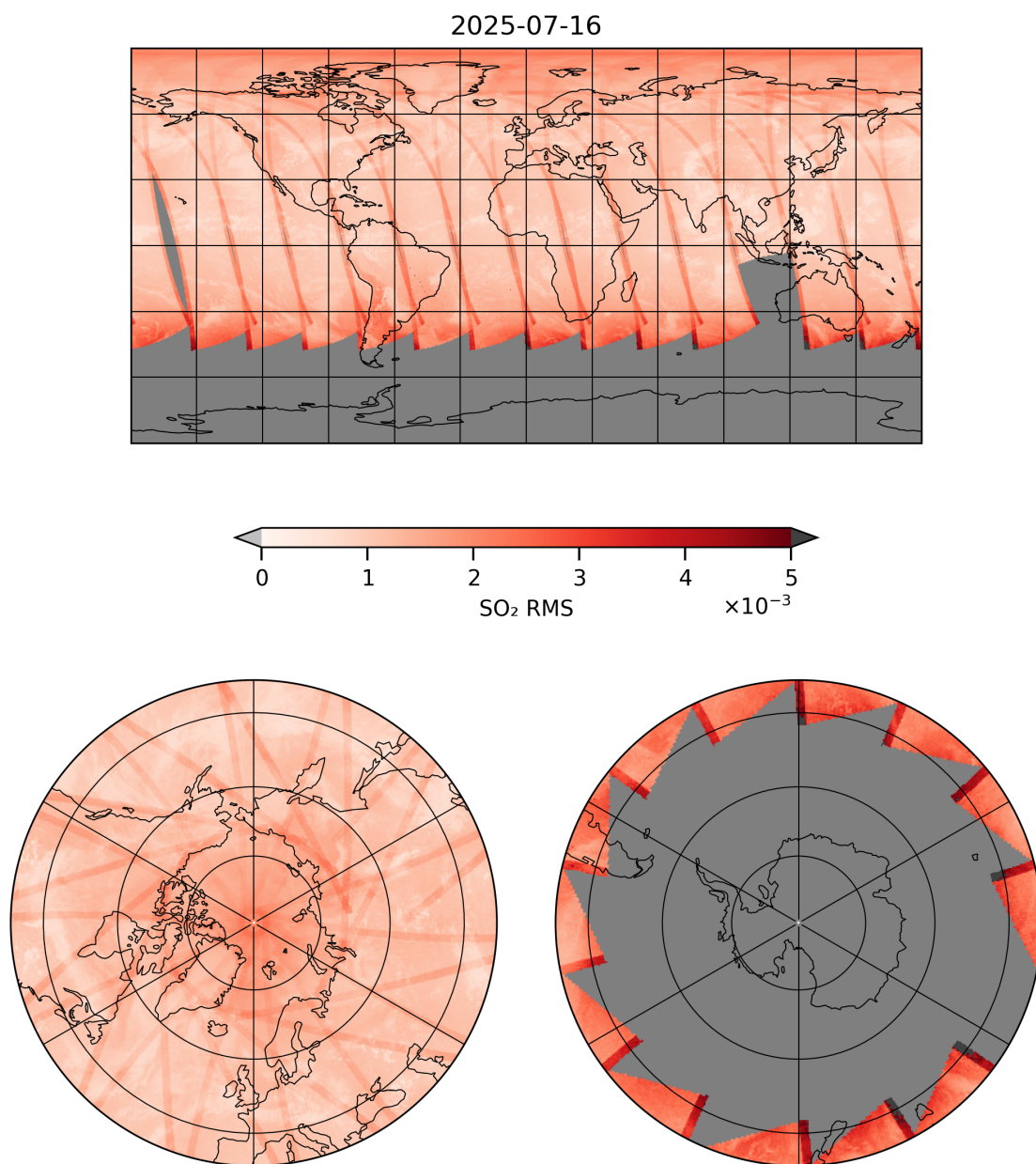


Figure 24: Map of “SO₂ RMS” for 2025-07-16 to 2025-07-16

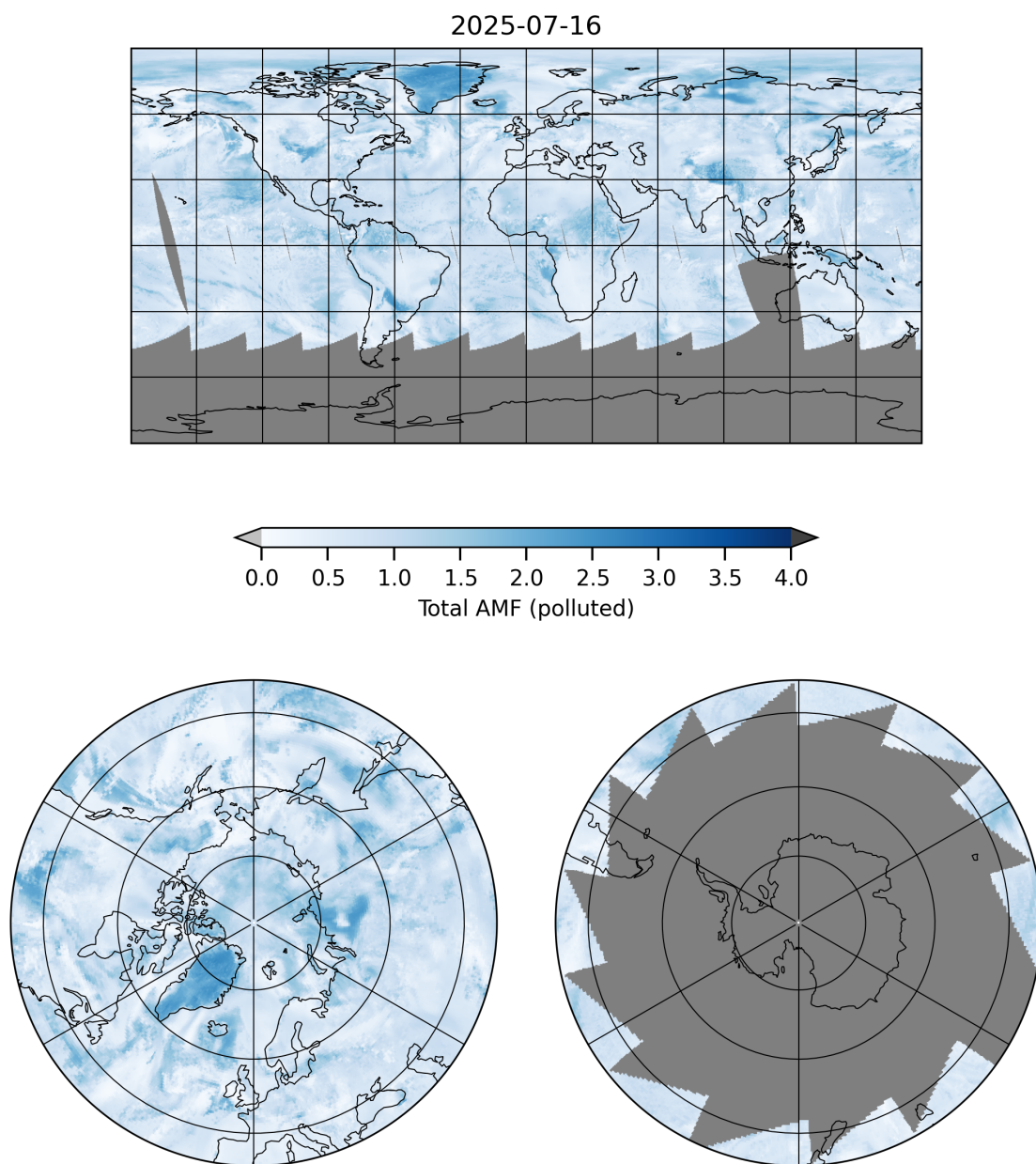


Figure 25: Map of “Total AMF (polluted)” for 2025-07-16 to 2025-07-16

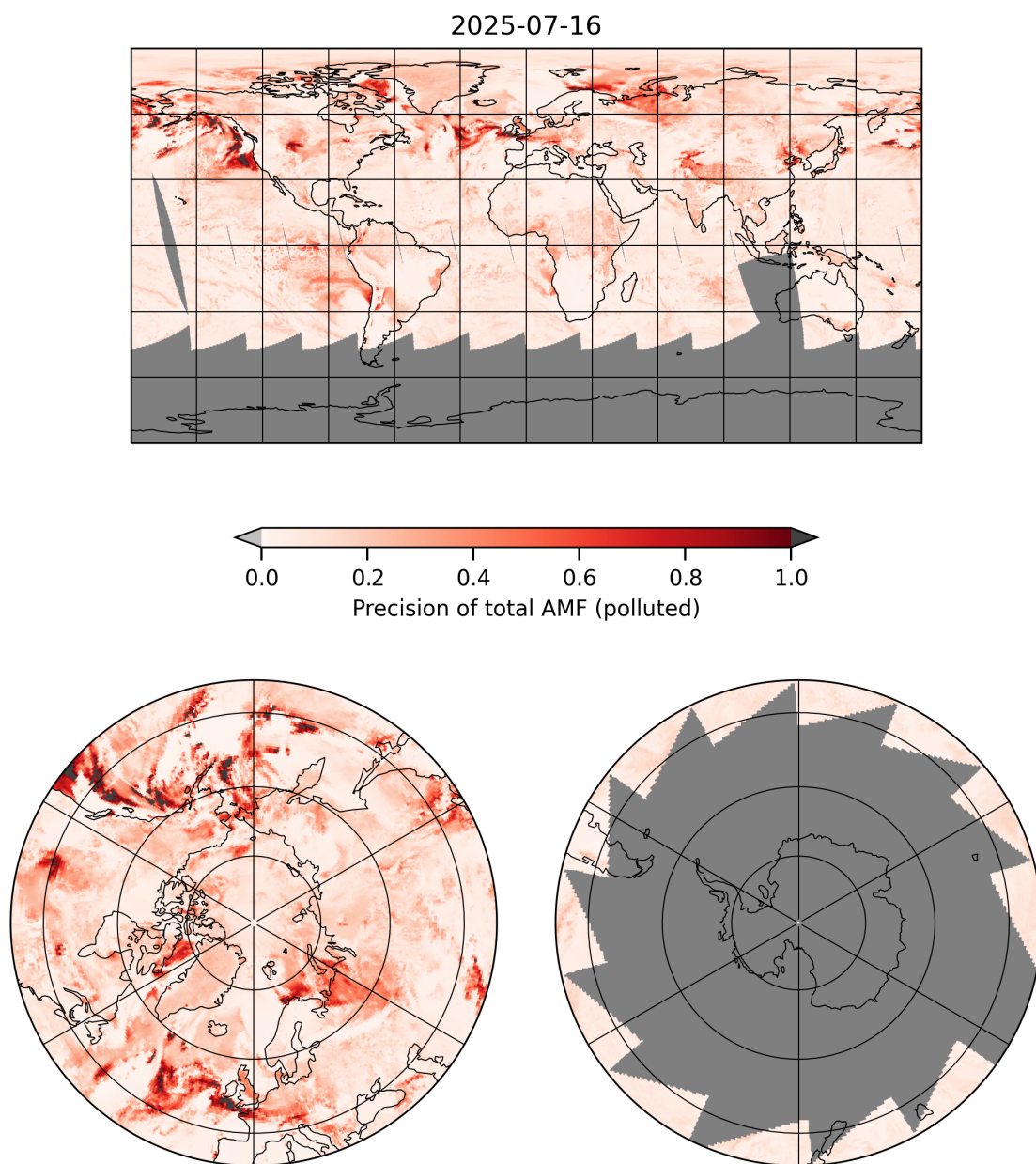


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-07-16 to 2025-07-16

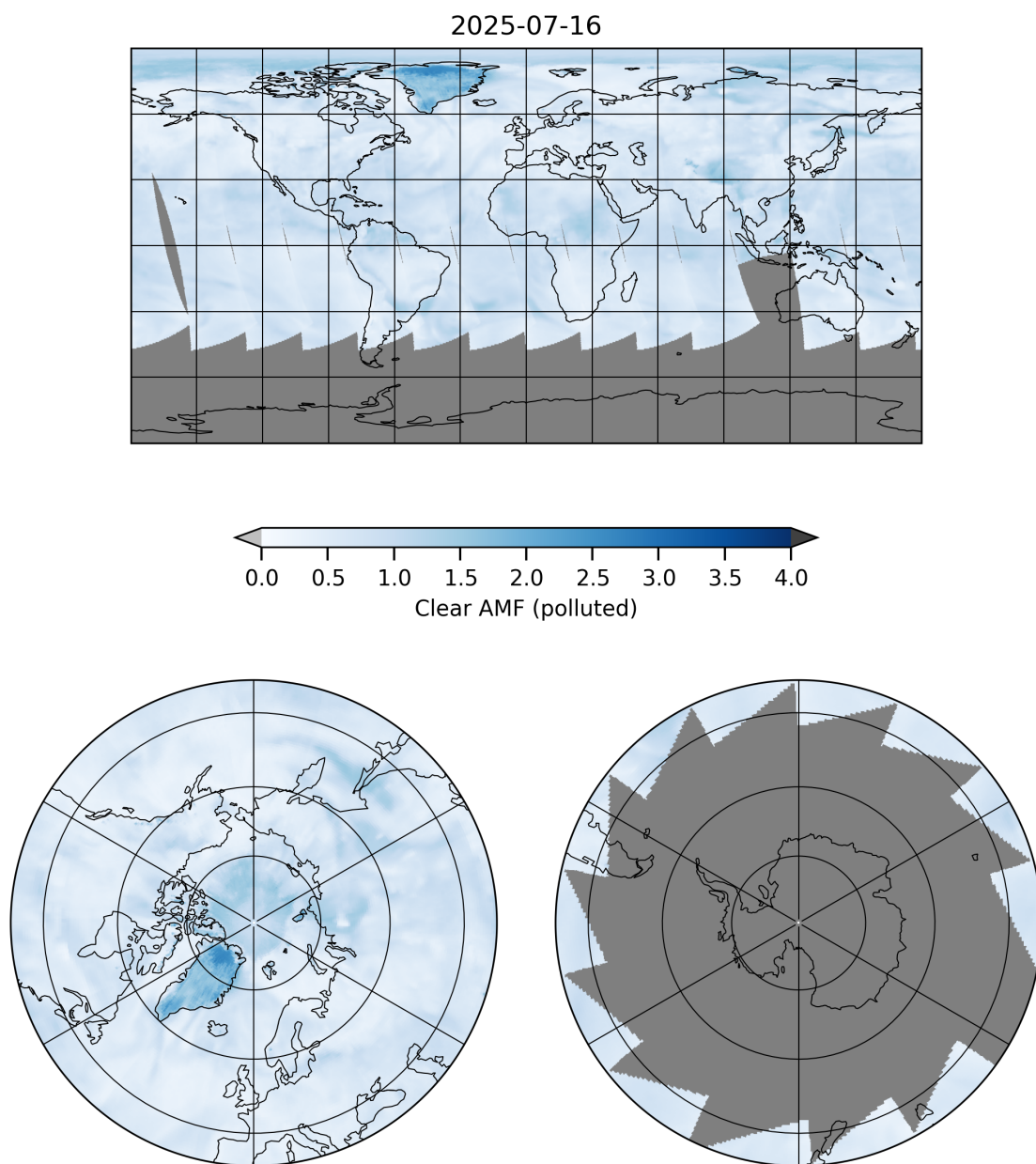


Figure 27: Map of “Clear AMF (polluted)” for 2025-07-16 to 2025-07-16

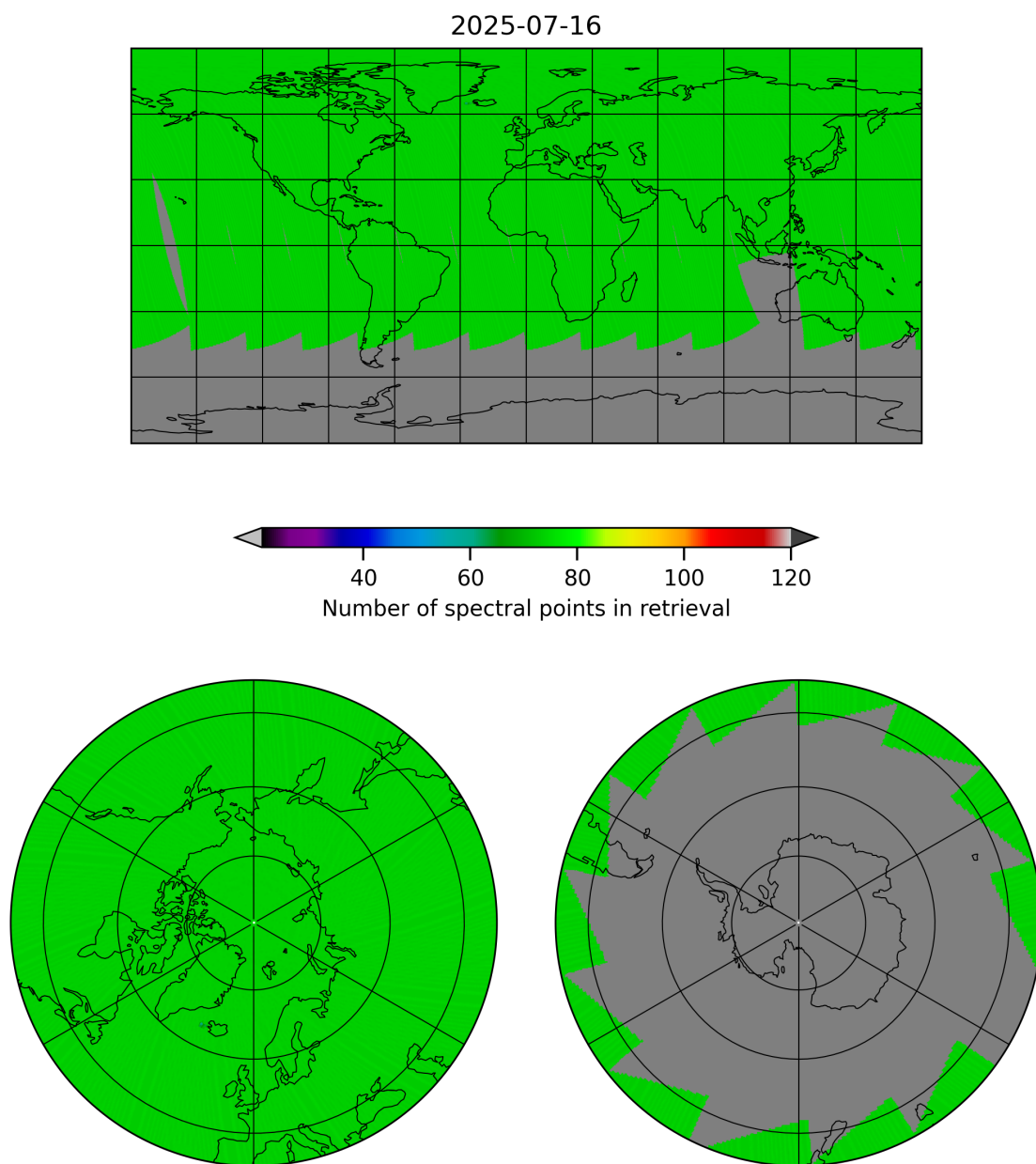


Figure 28: Map of “Number of spectral points in retrieval” for 2025-07-16 to 2025-07-16

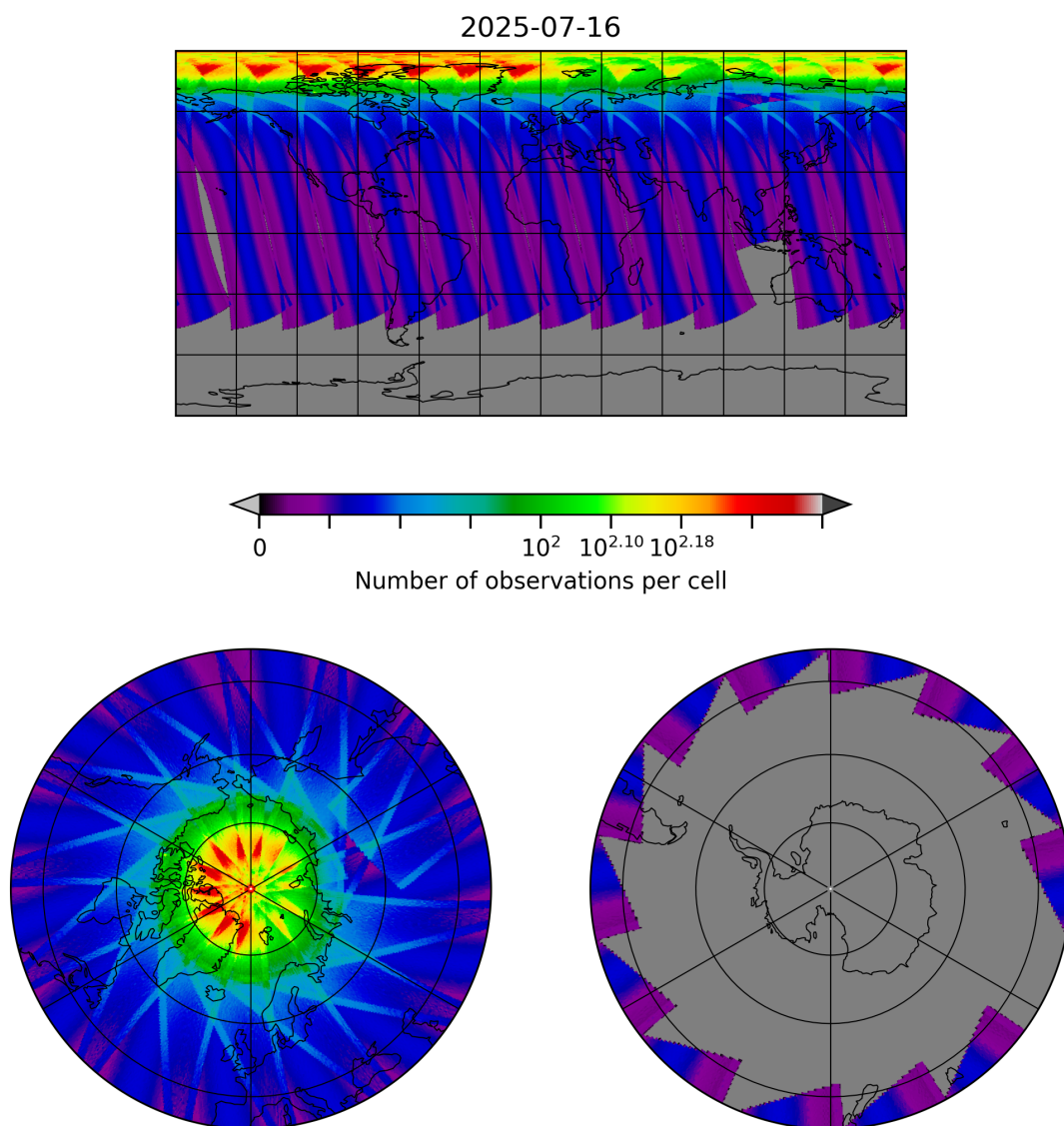


Figure 29: Map of the number of observations for 2025-07-16 to 2025-07-16

7 Zonal average

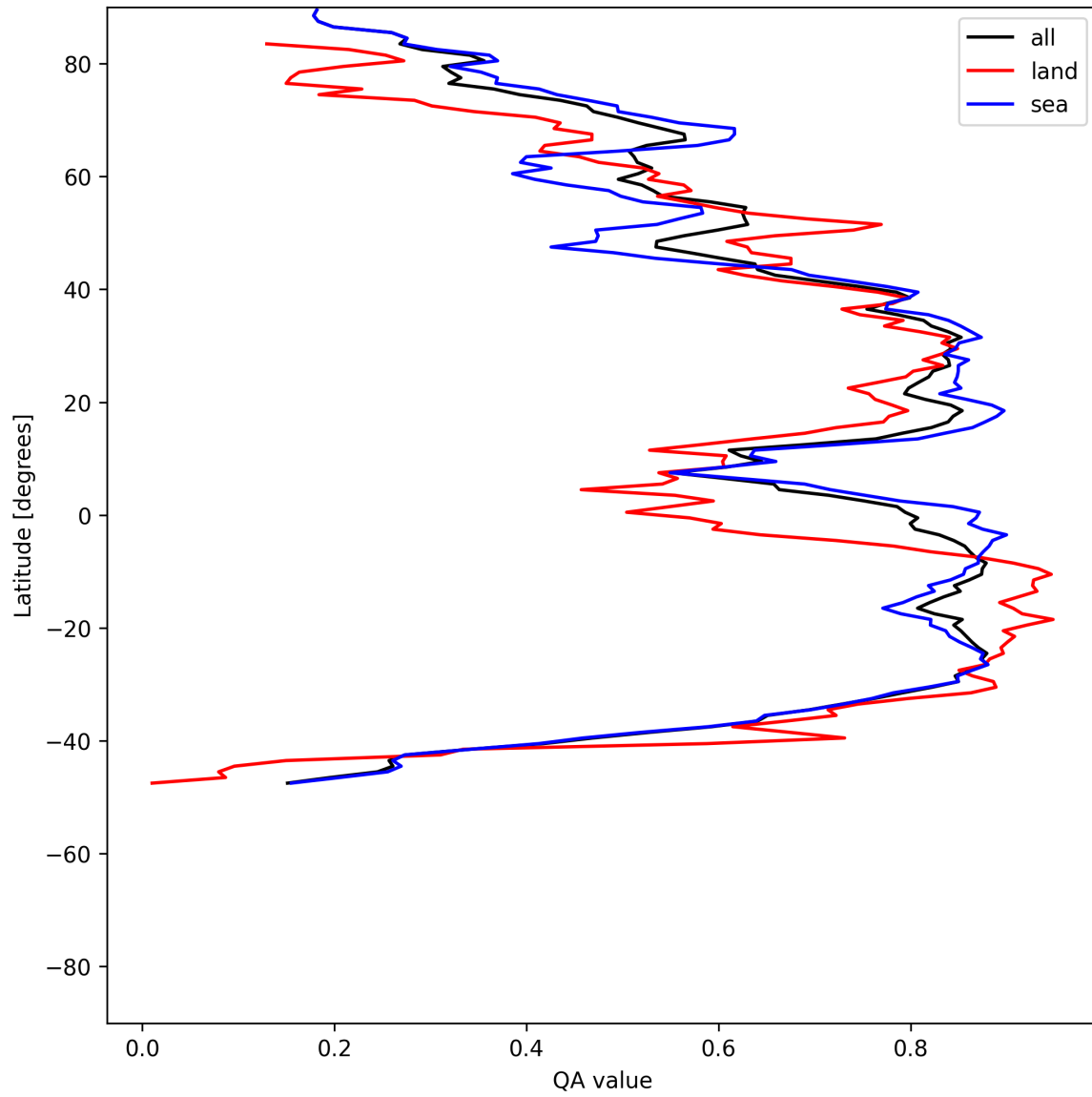


Figure 30: Zonal average of “QA value” for 2025-07-16 to 2025-07-16.

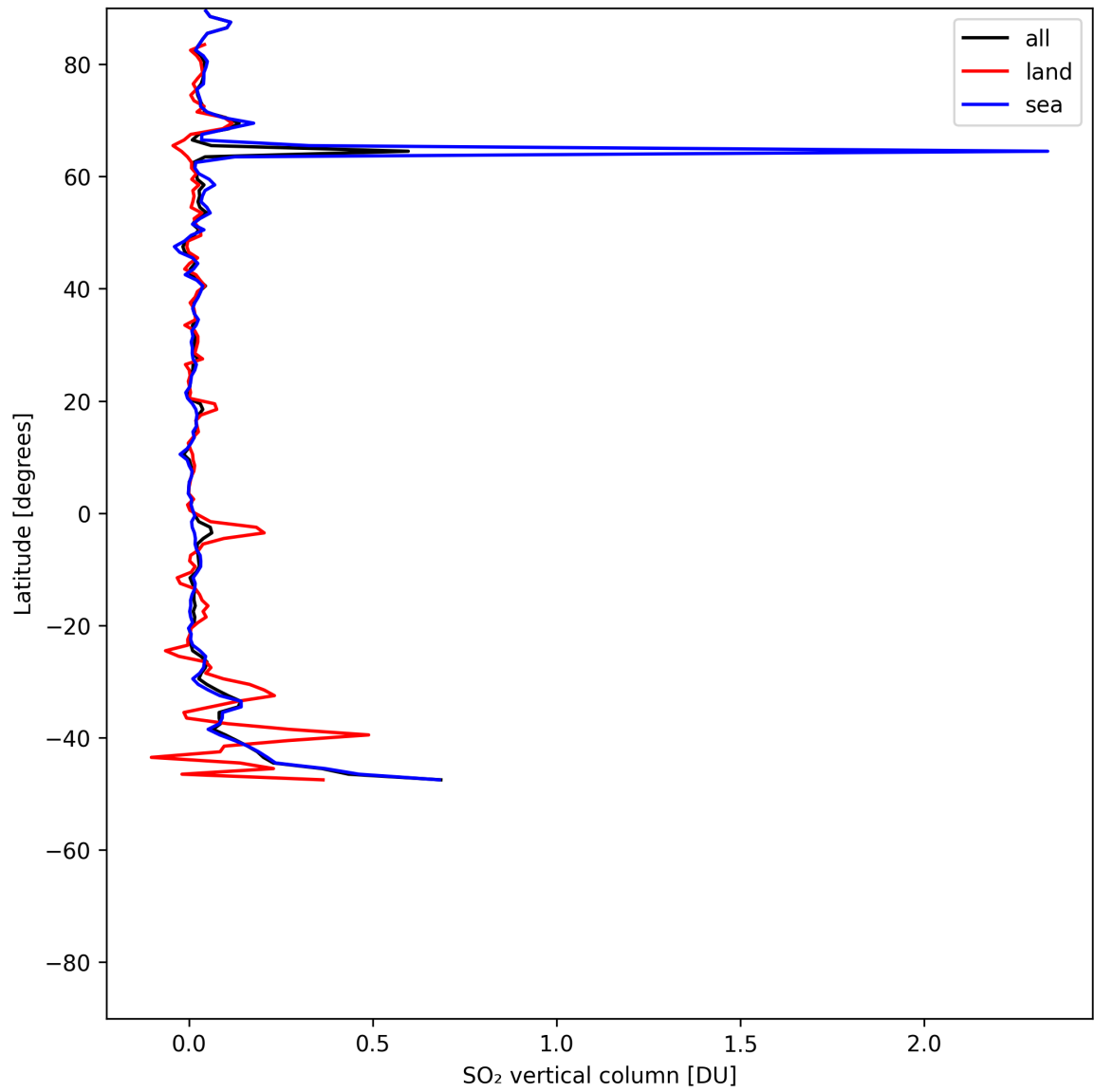


Figure 31: Zonal average of “SO₂ vertical column” for 2025-07-16 to 2025-07-16.

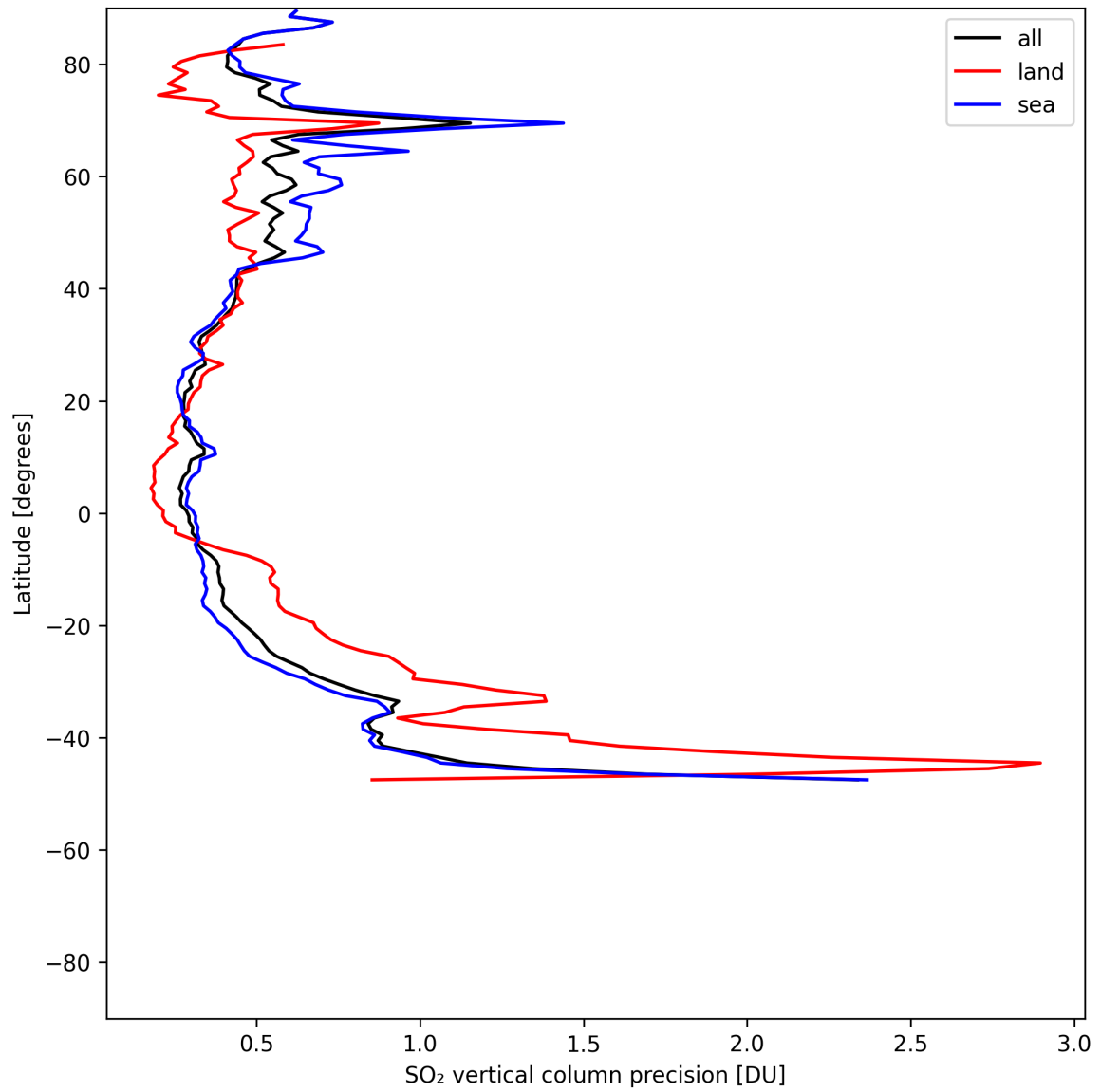


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-07-16 to 2025-07-16.

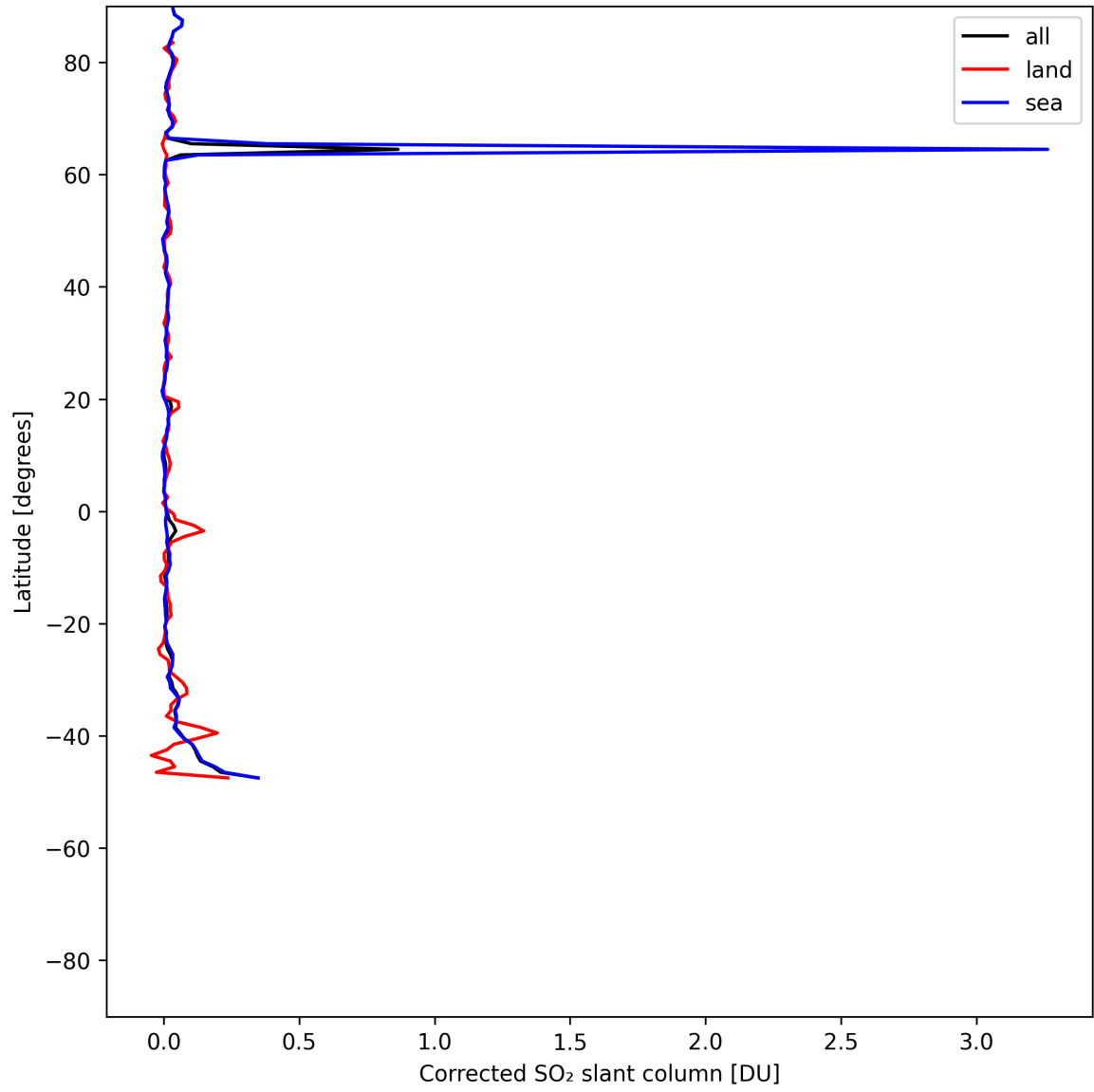


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-07-16 to 2025-07-16.

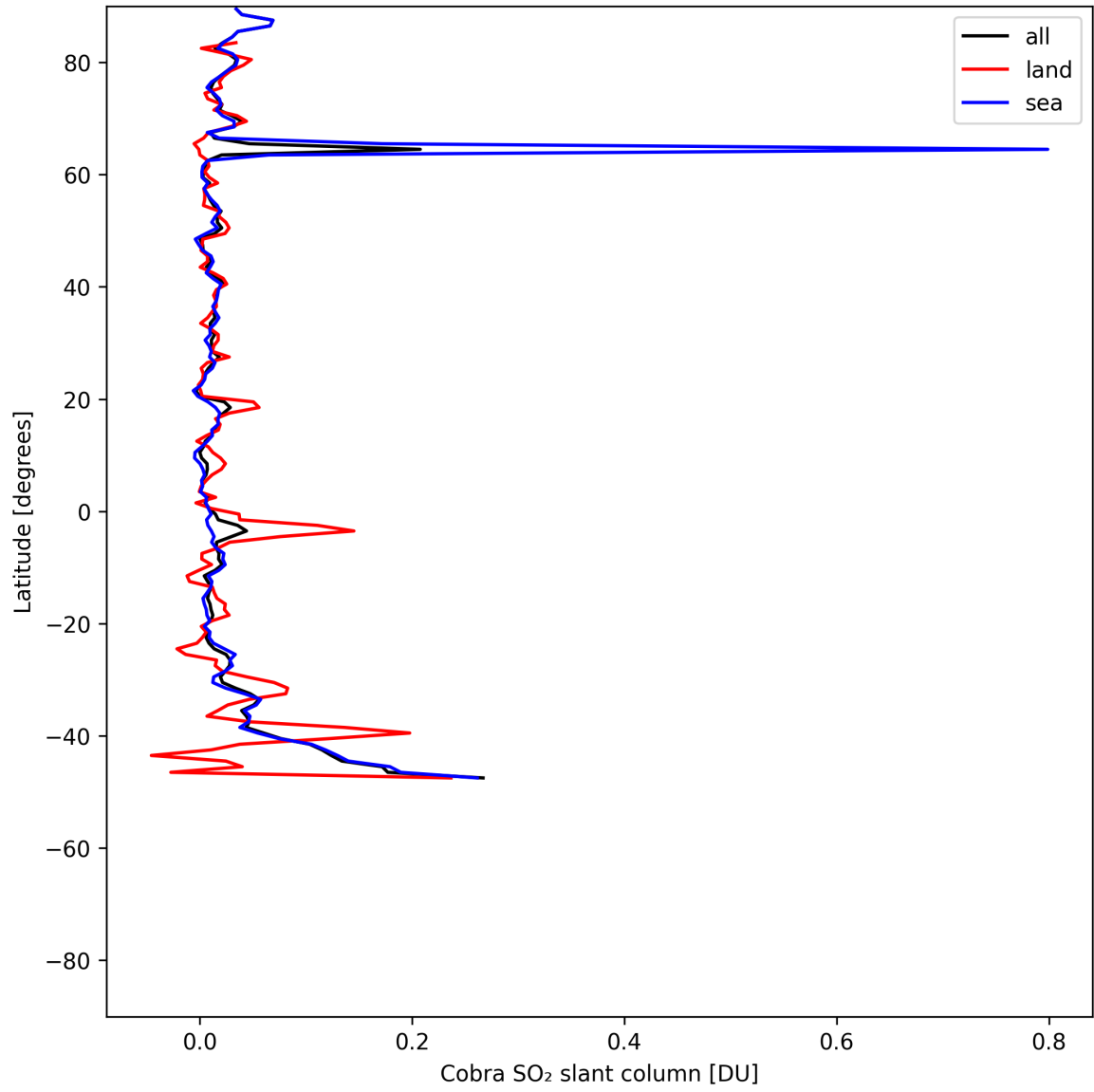


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-07-16 to 2025-07-16.

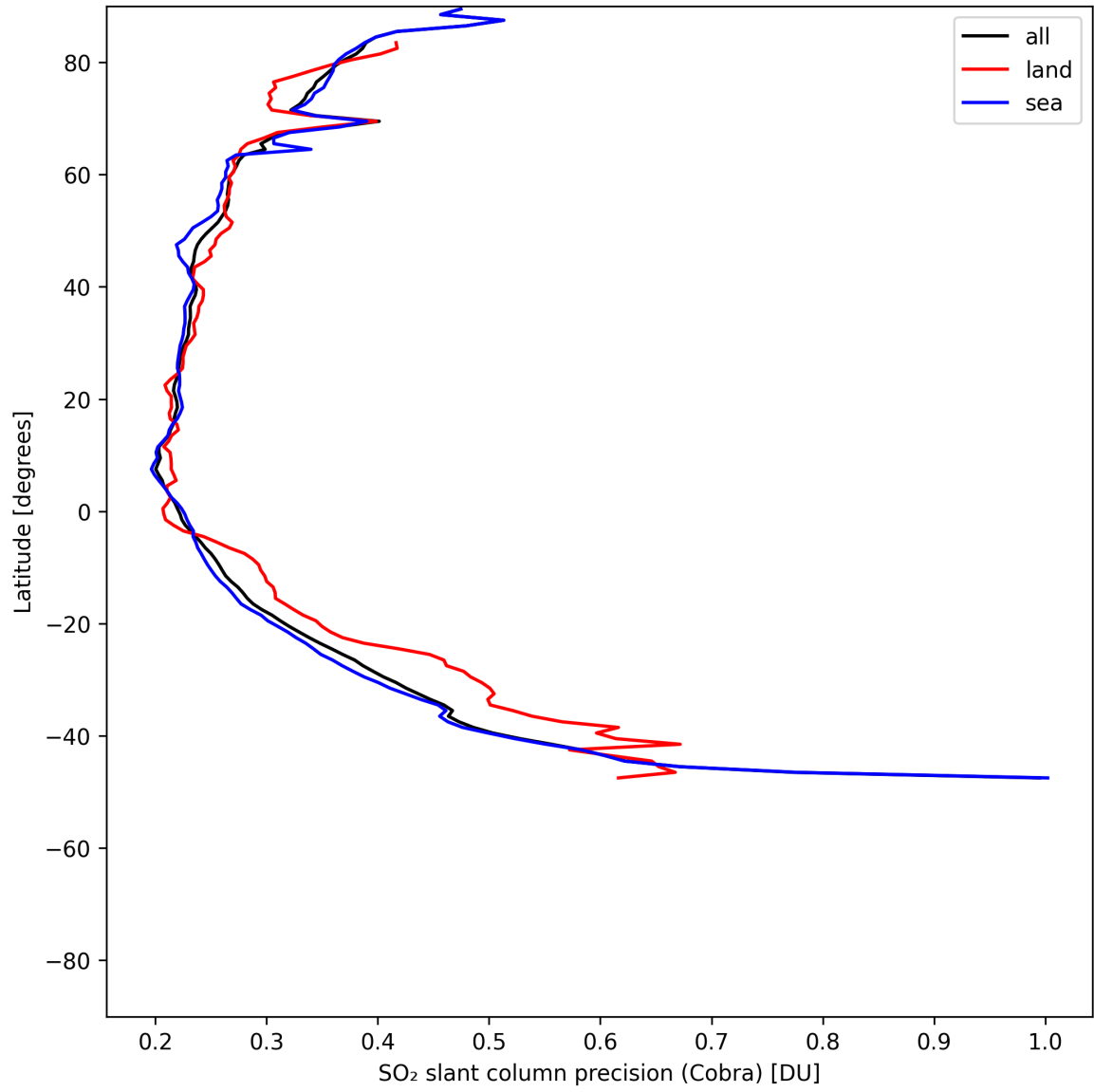


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-07-16 to 2025-07-16.

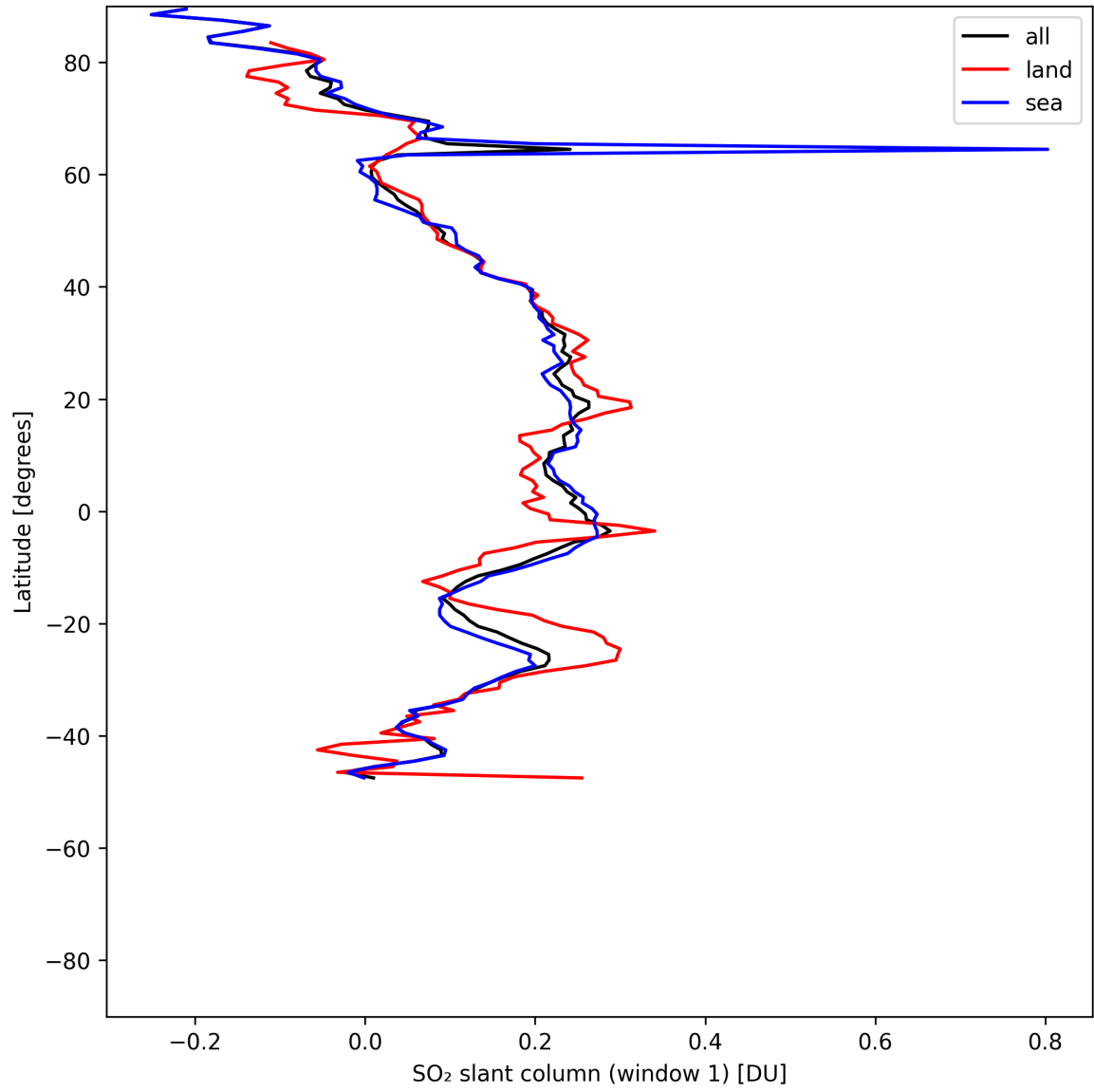


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-07-16 to 2025-07-16.

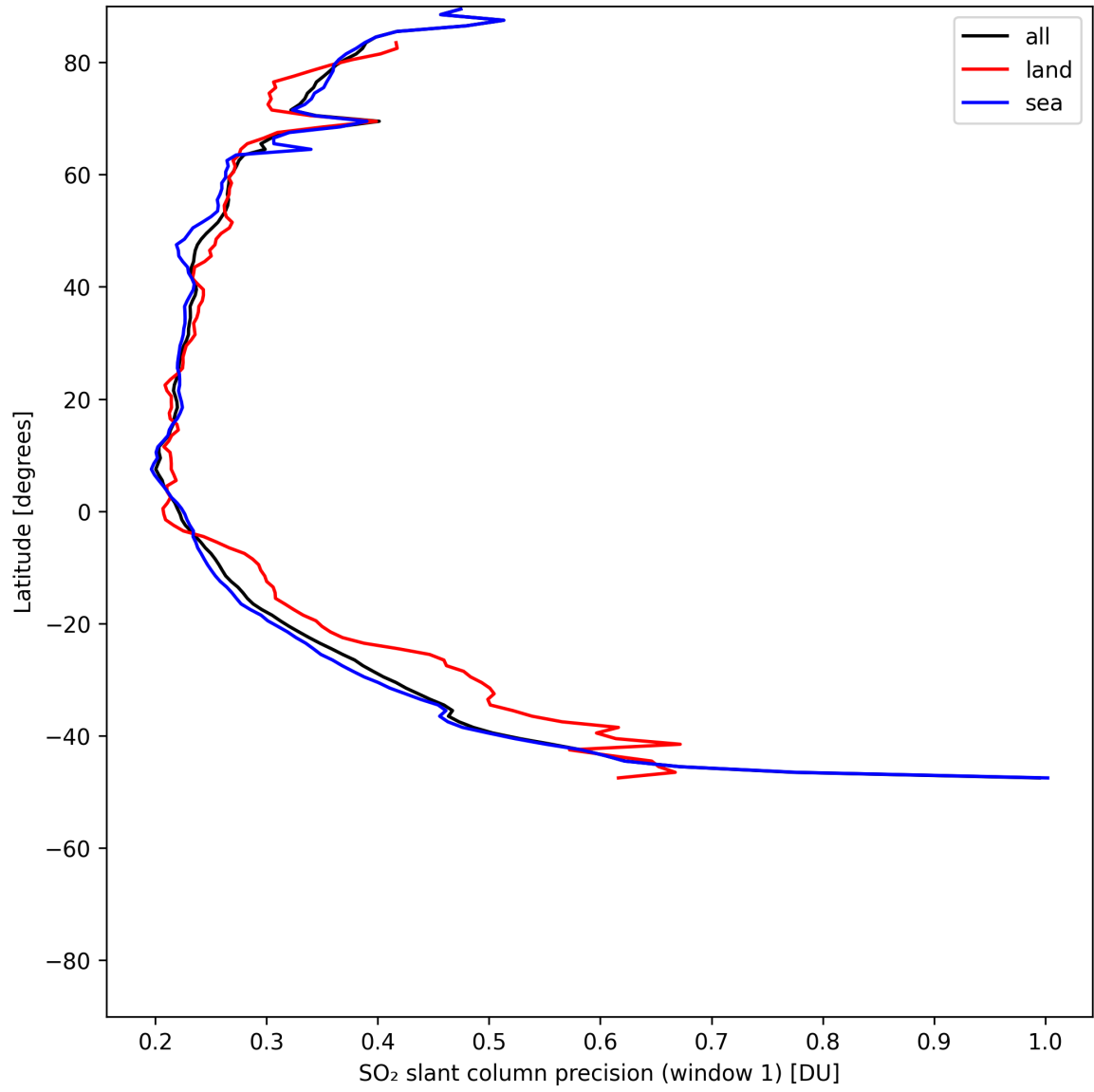


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-07-16 to 2025-07-16.

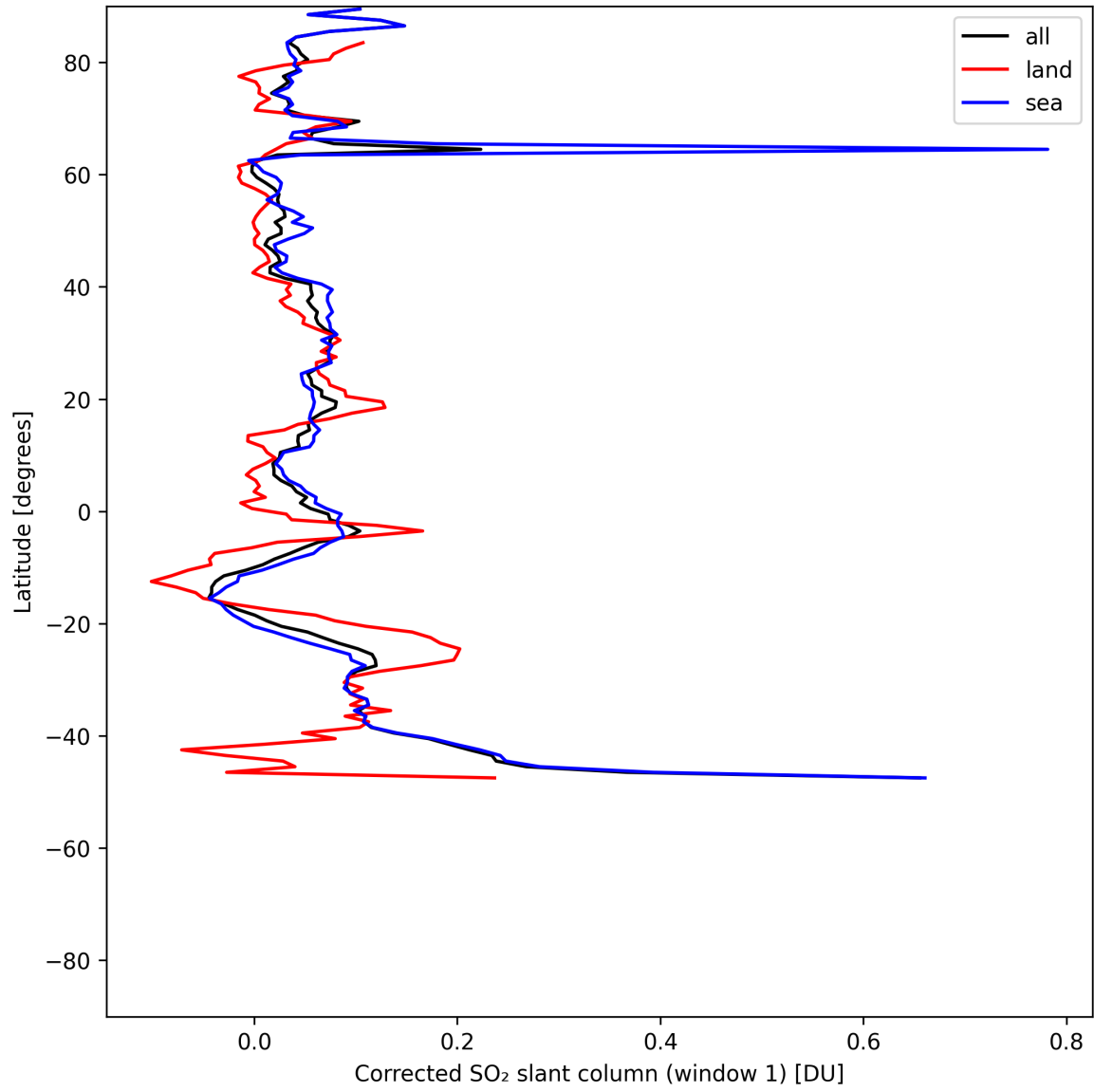


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-07-16 to 2025-07-16.

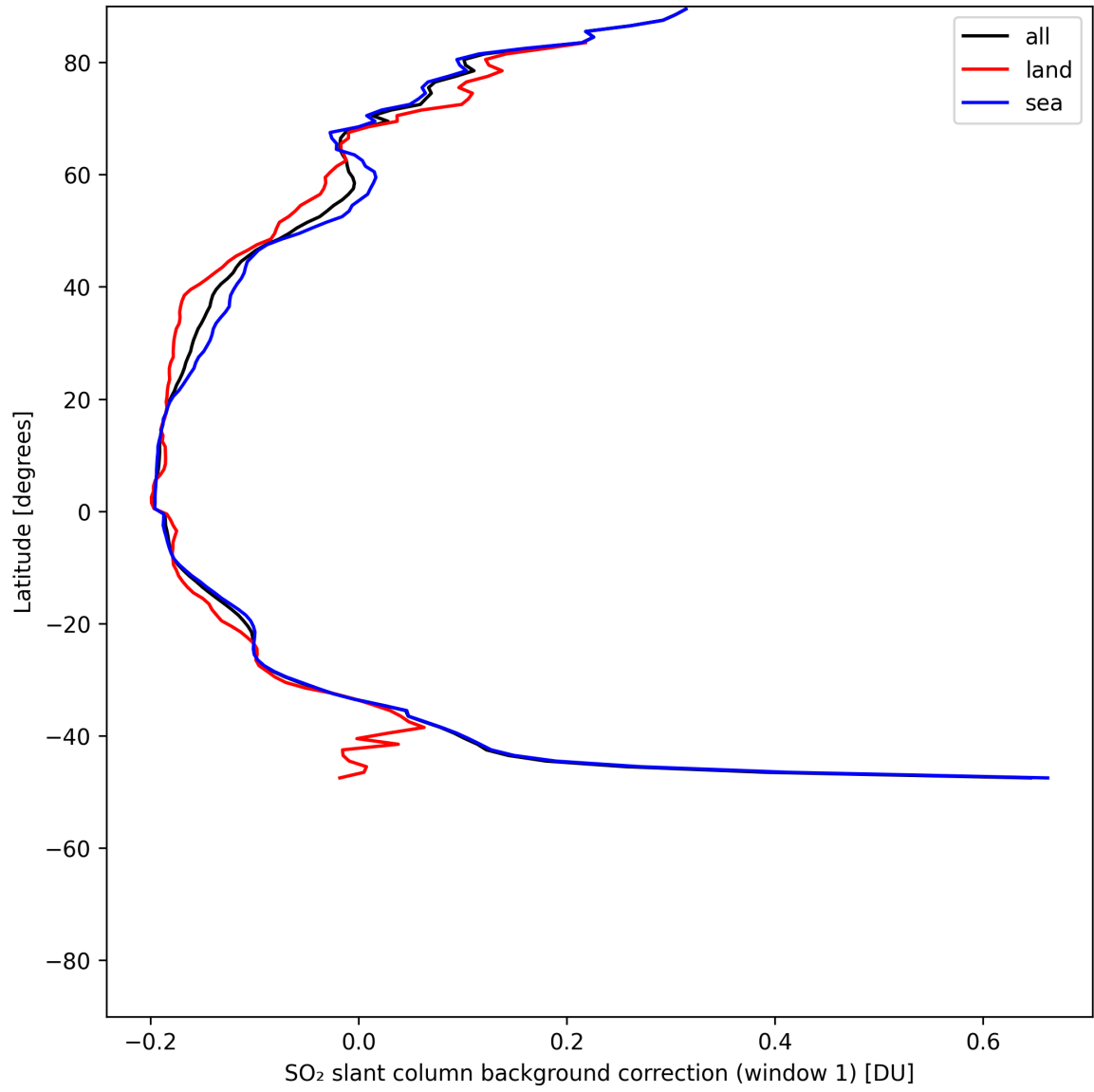


Figure 39: Zonal average of "SO₂ slant column background correction (window 1)" for 2025-07-16 to 2025-07-16.

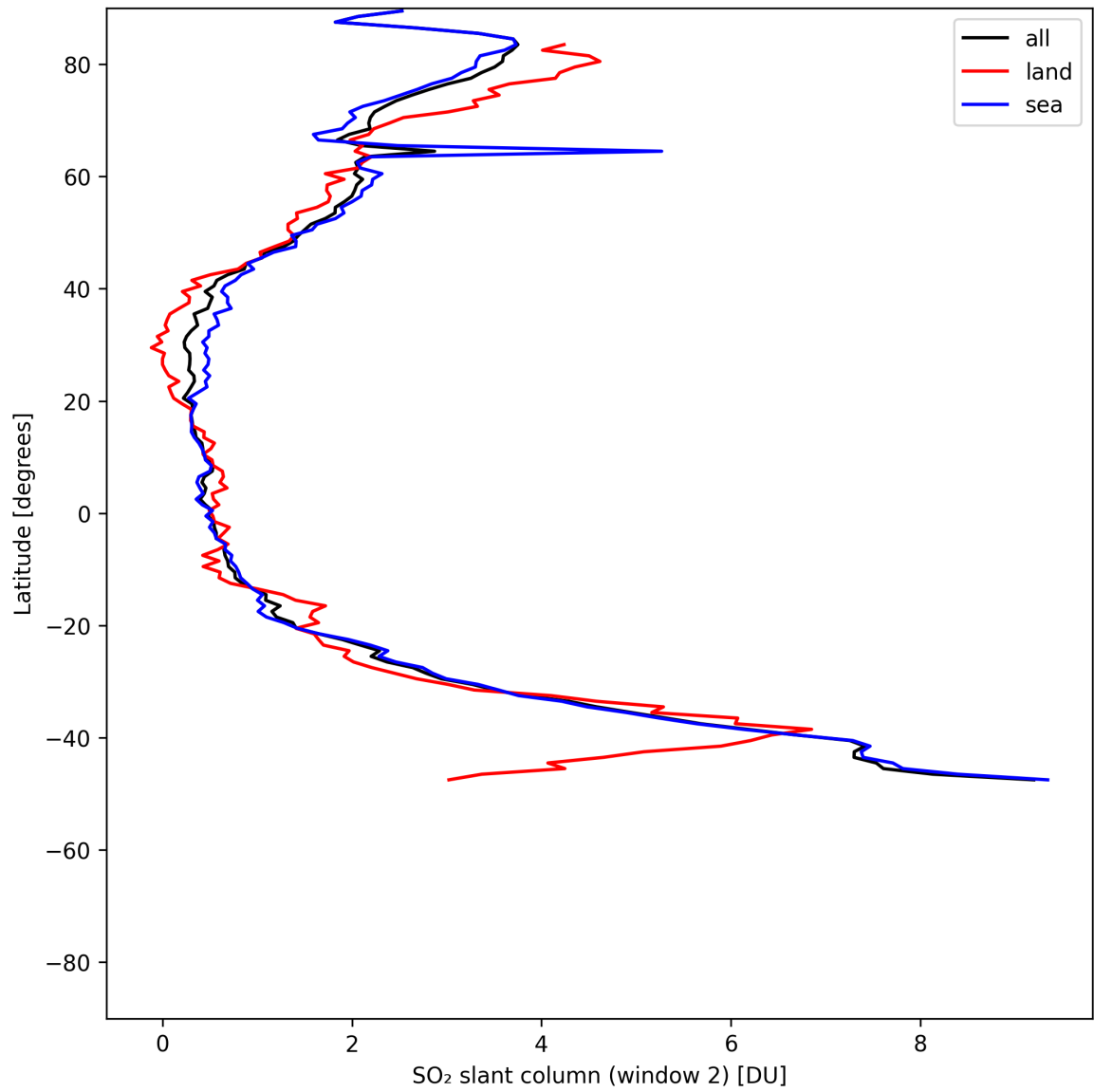


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-07-16 to 2025-07-16.

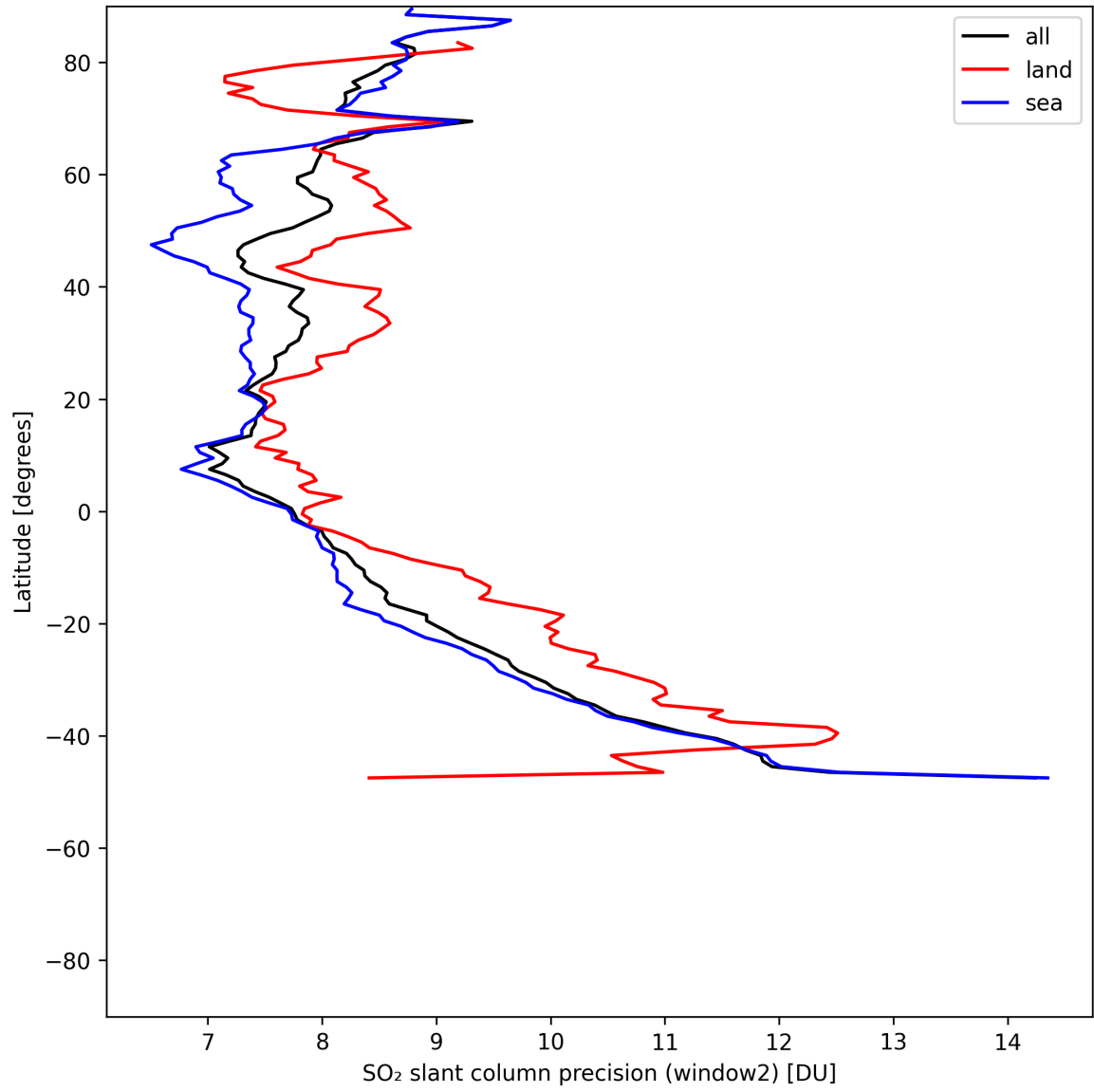


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-07-16 to 2025-07-16.

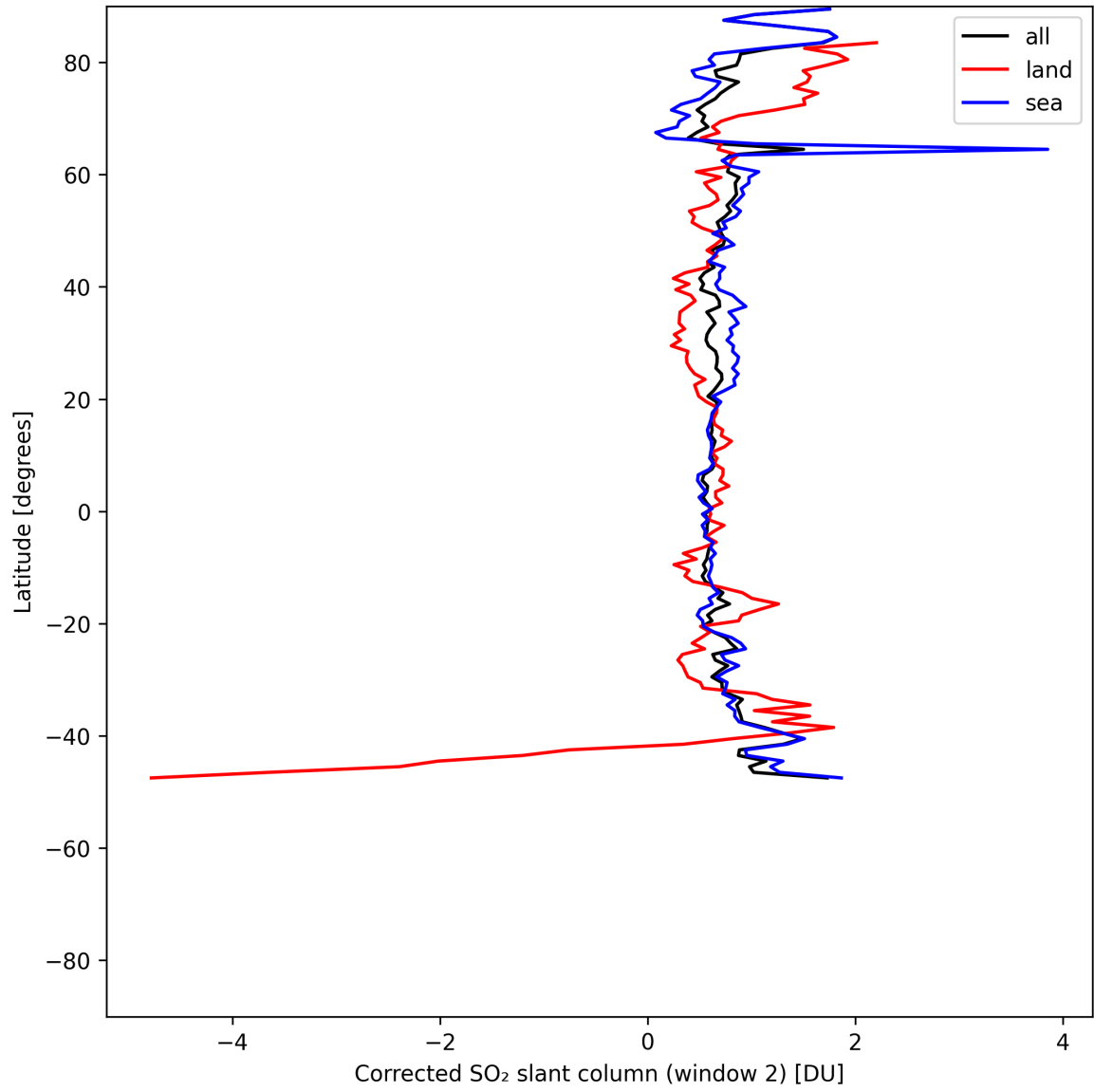


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-07-16 to 2025-07-16.

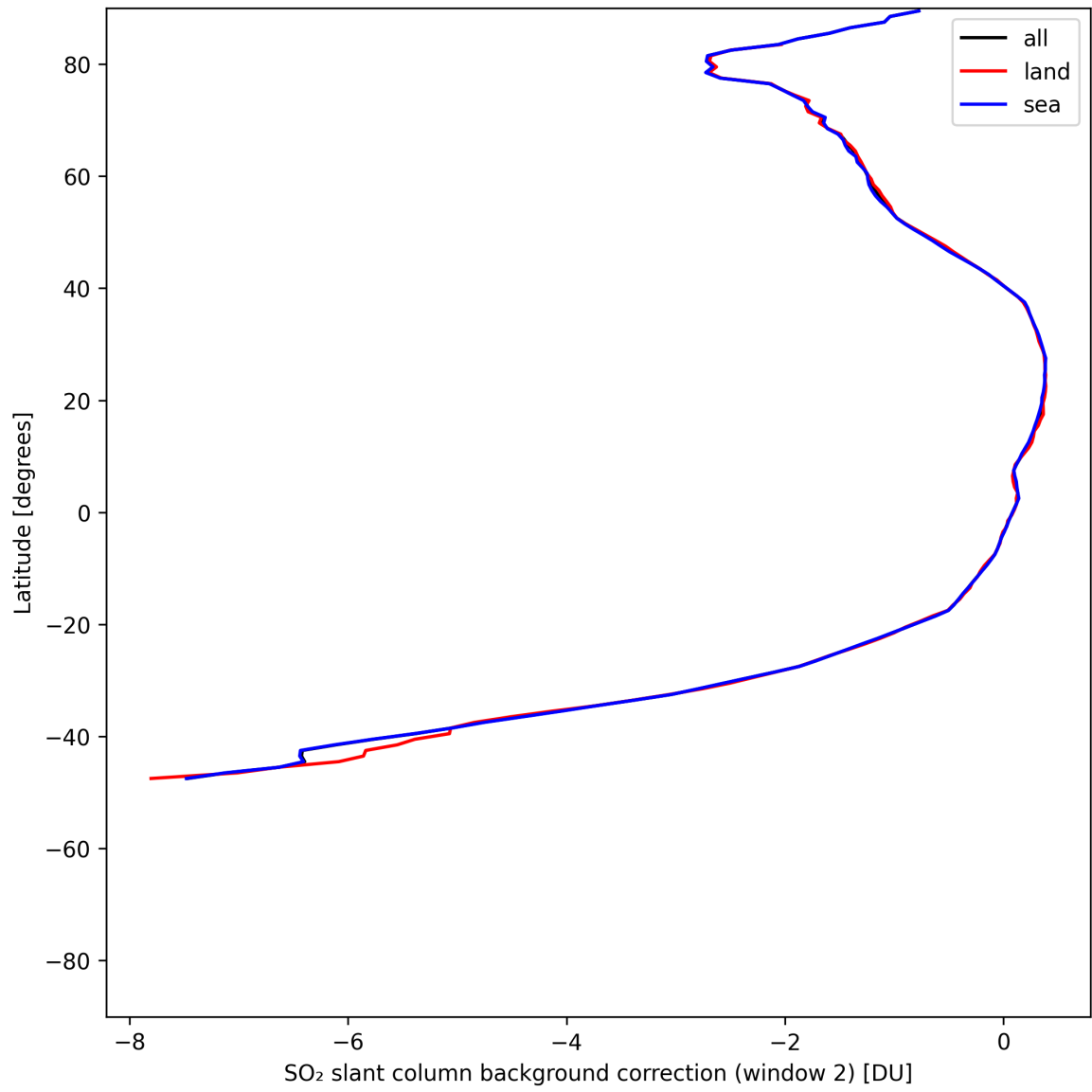


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-07-16 to 2025-07-16.

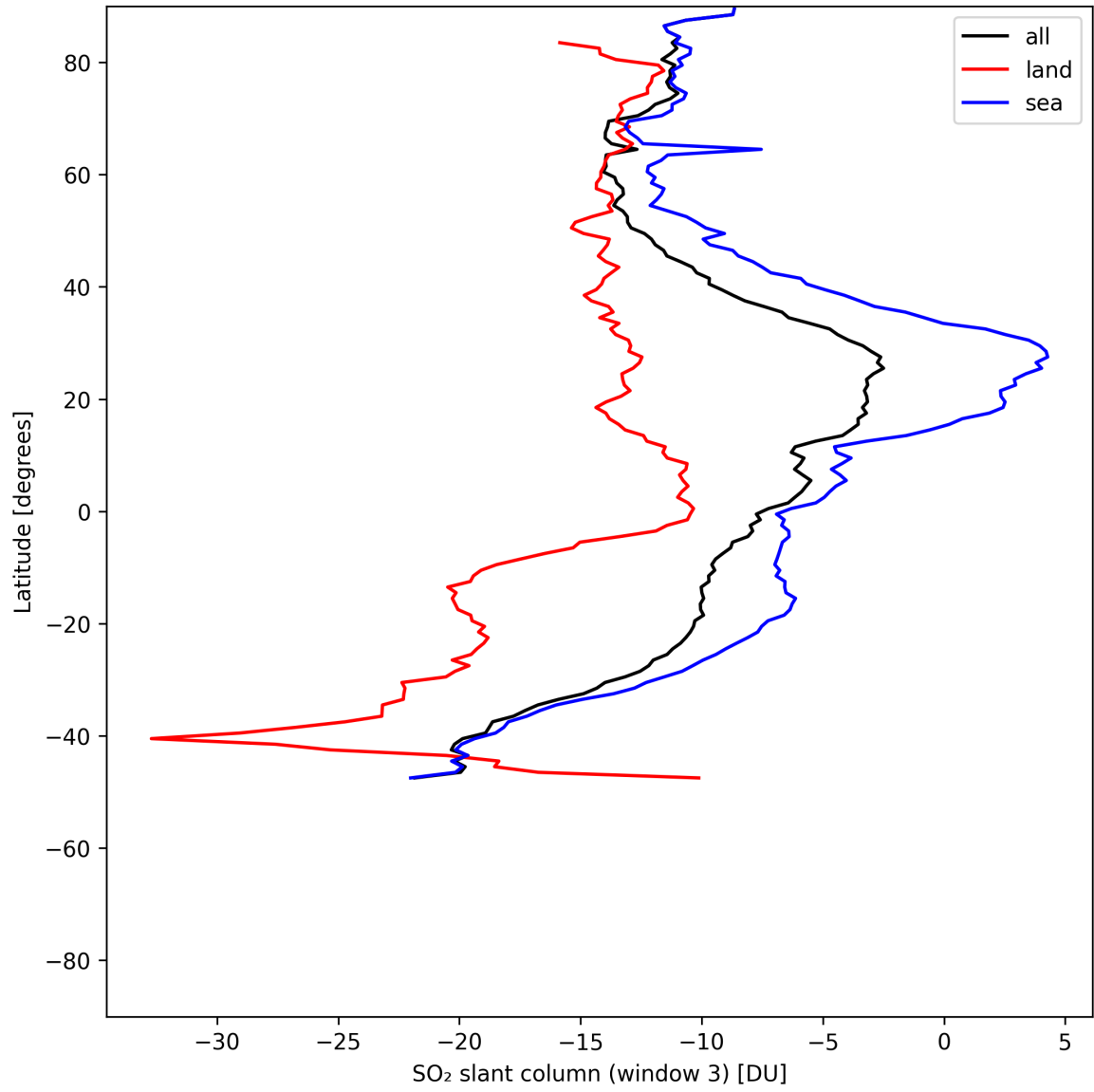


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-07-16 to 2025-07-16.

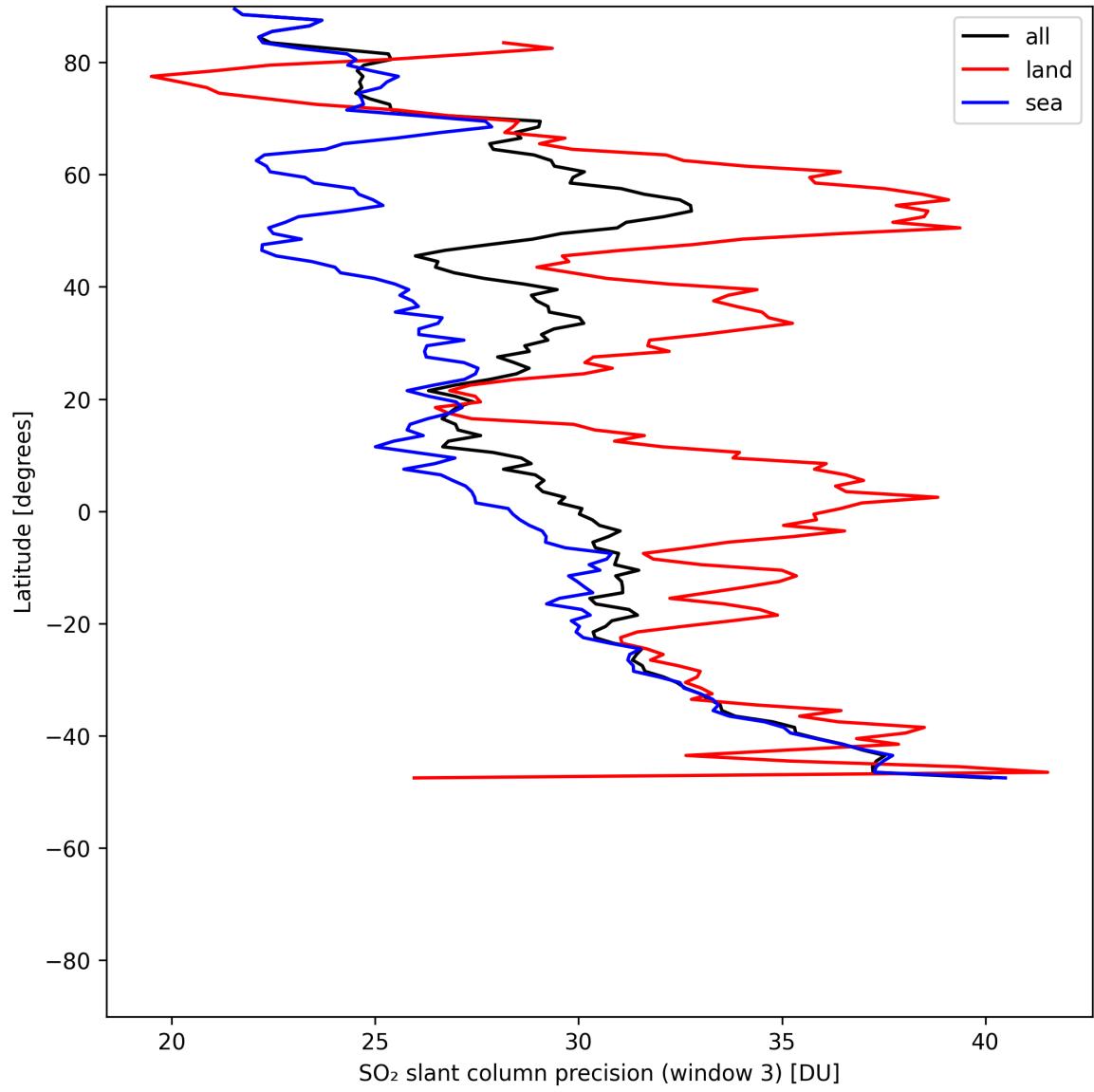


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-07-16 to 2025-07-16.

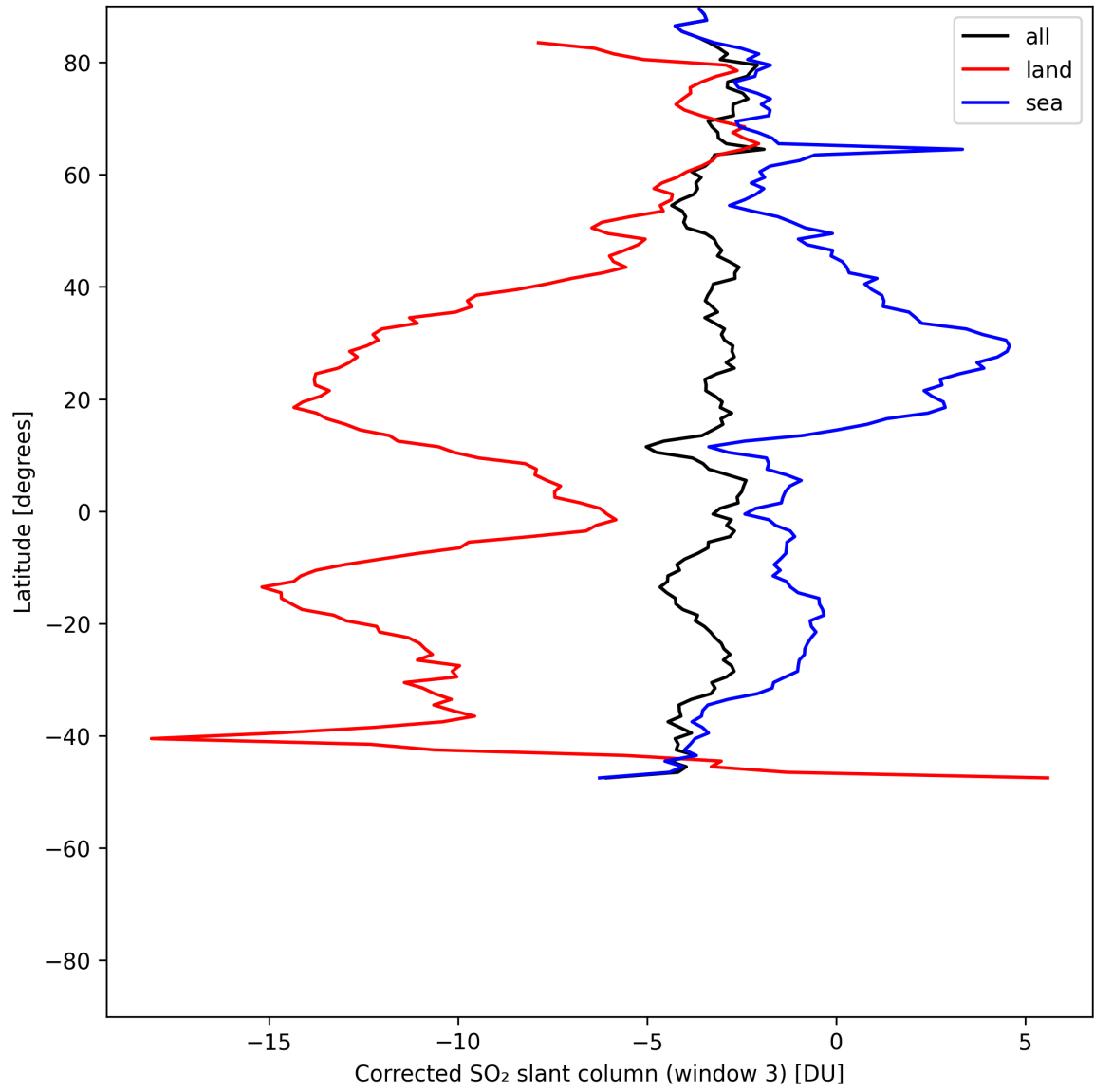


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-07-16 to 2025-07-16.

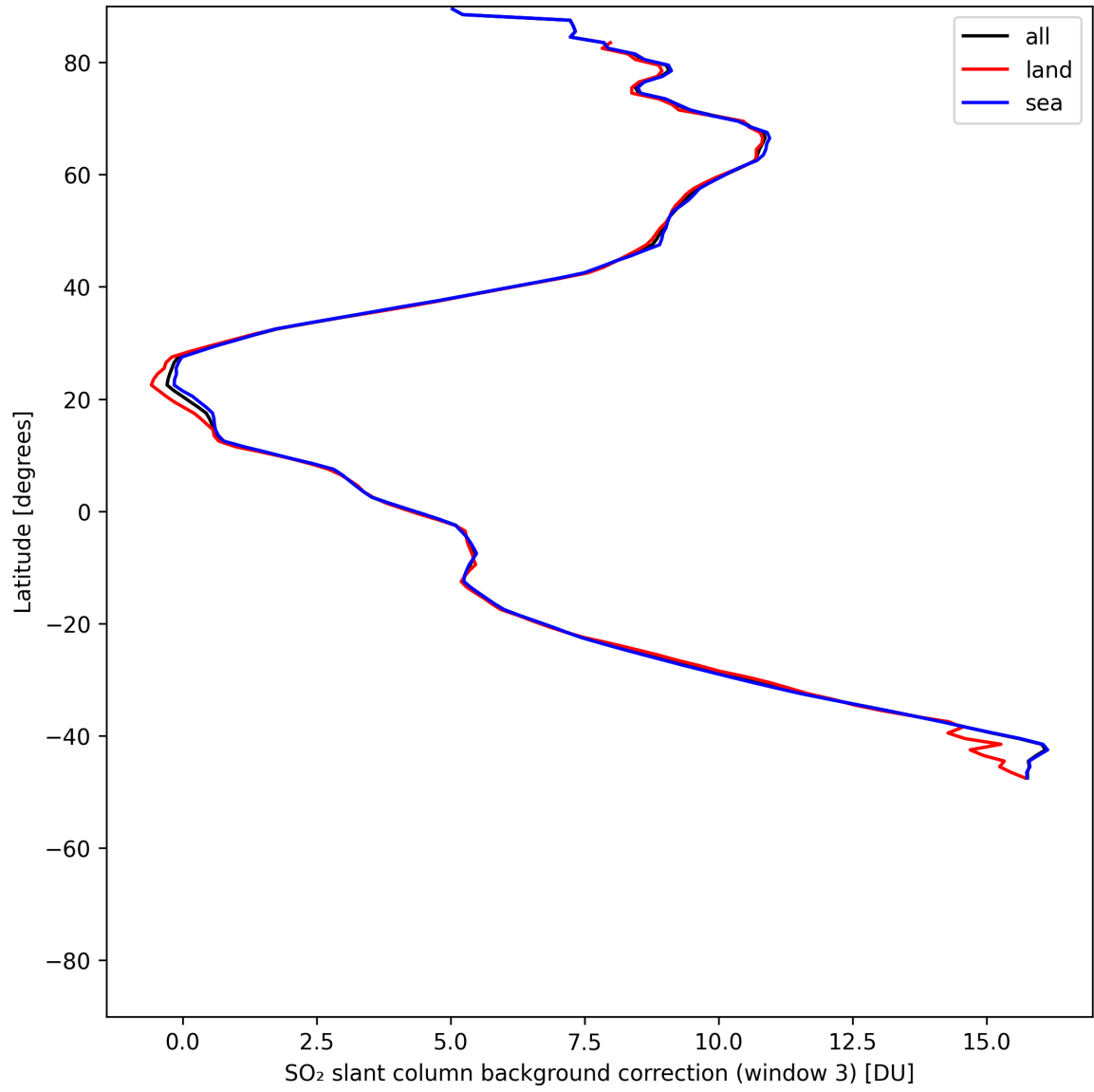


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-07-16 to 2025-07-16.

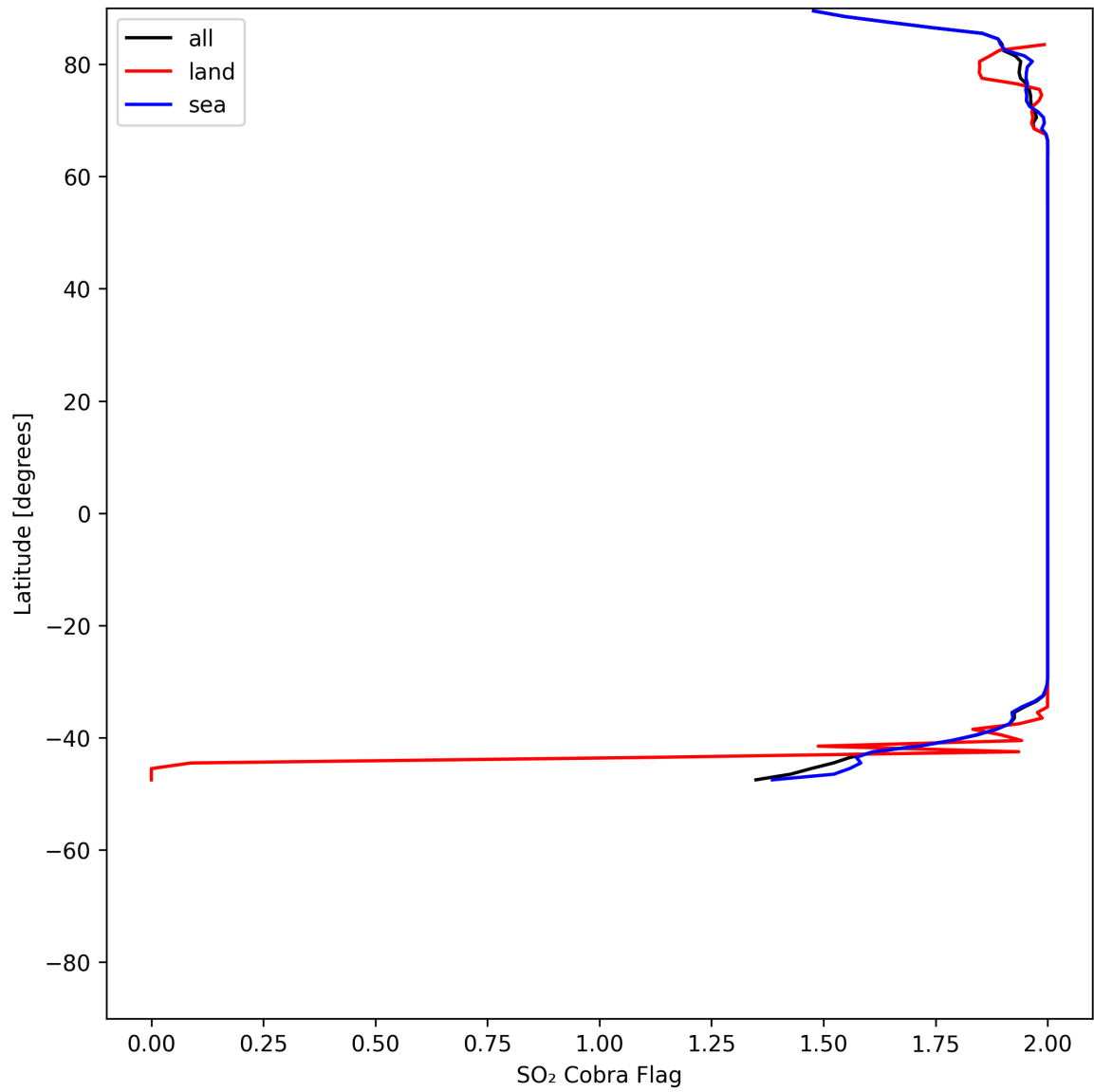


Figure 48: Zonal average of “SO₂ Cobra Flag” for 2025-07-16 to 2025-07-16.

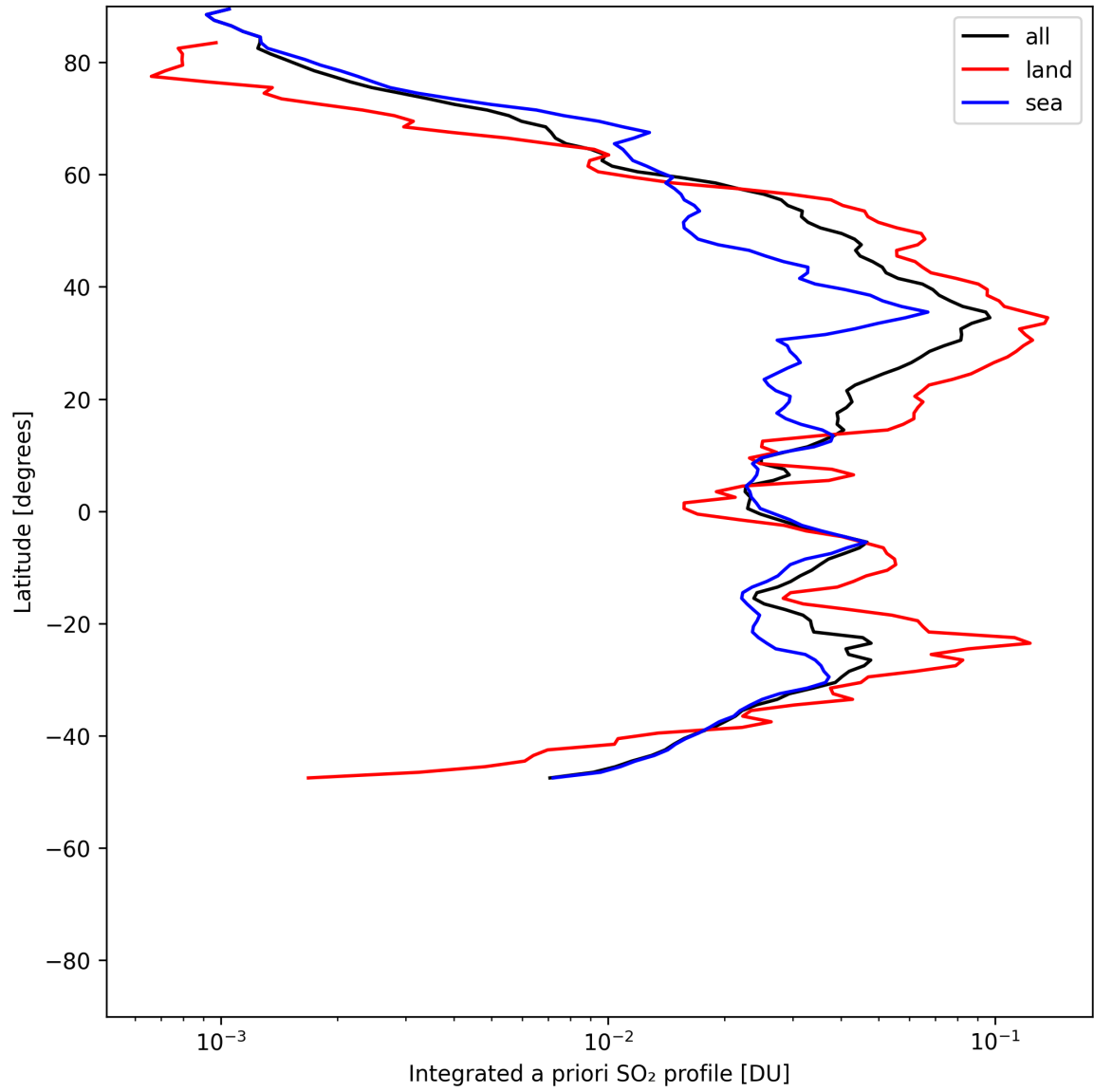


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-07-16 to 2025-07-16.

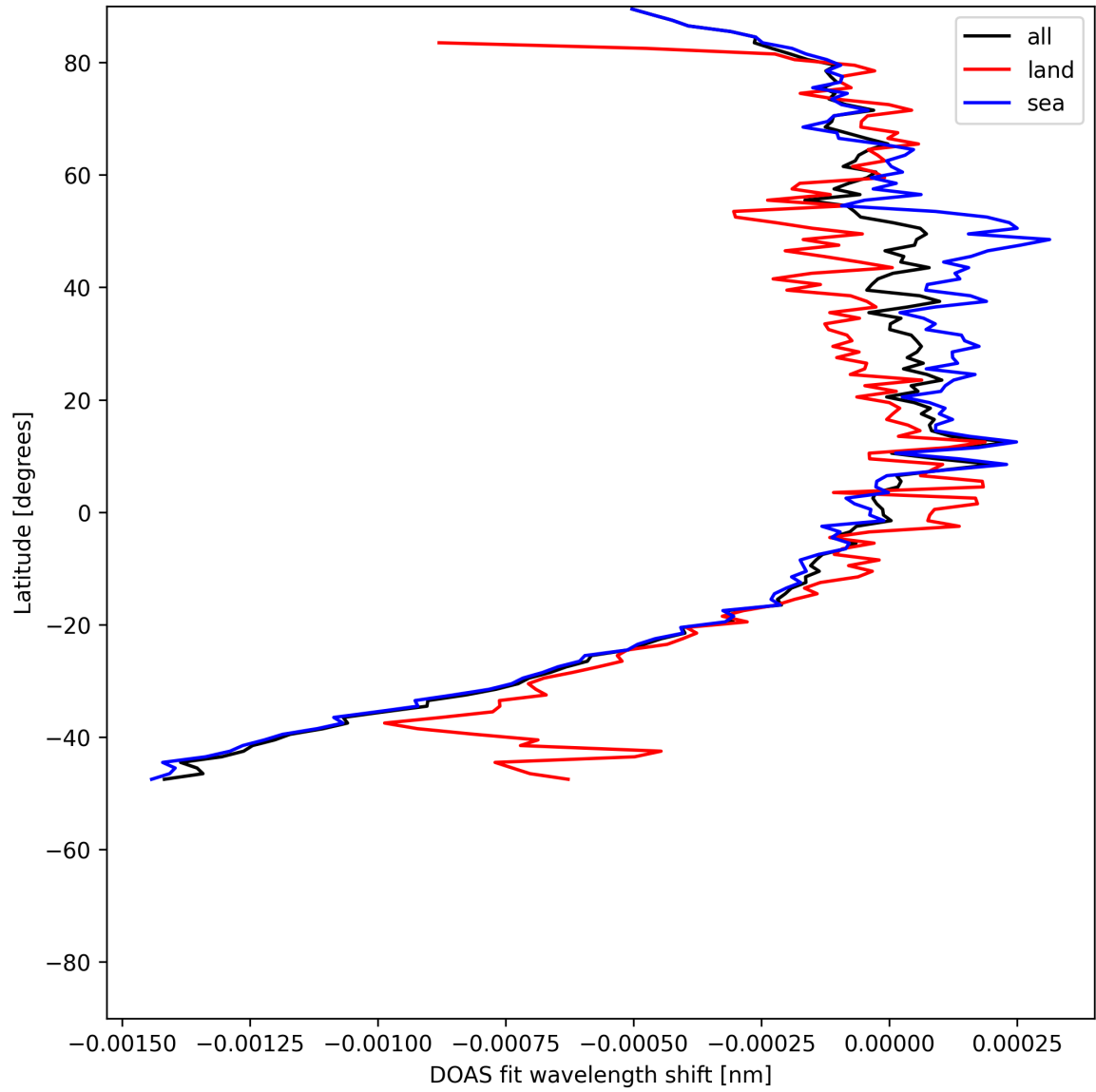


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-07-16 to 2025-07-16.

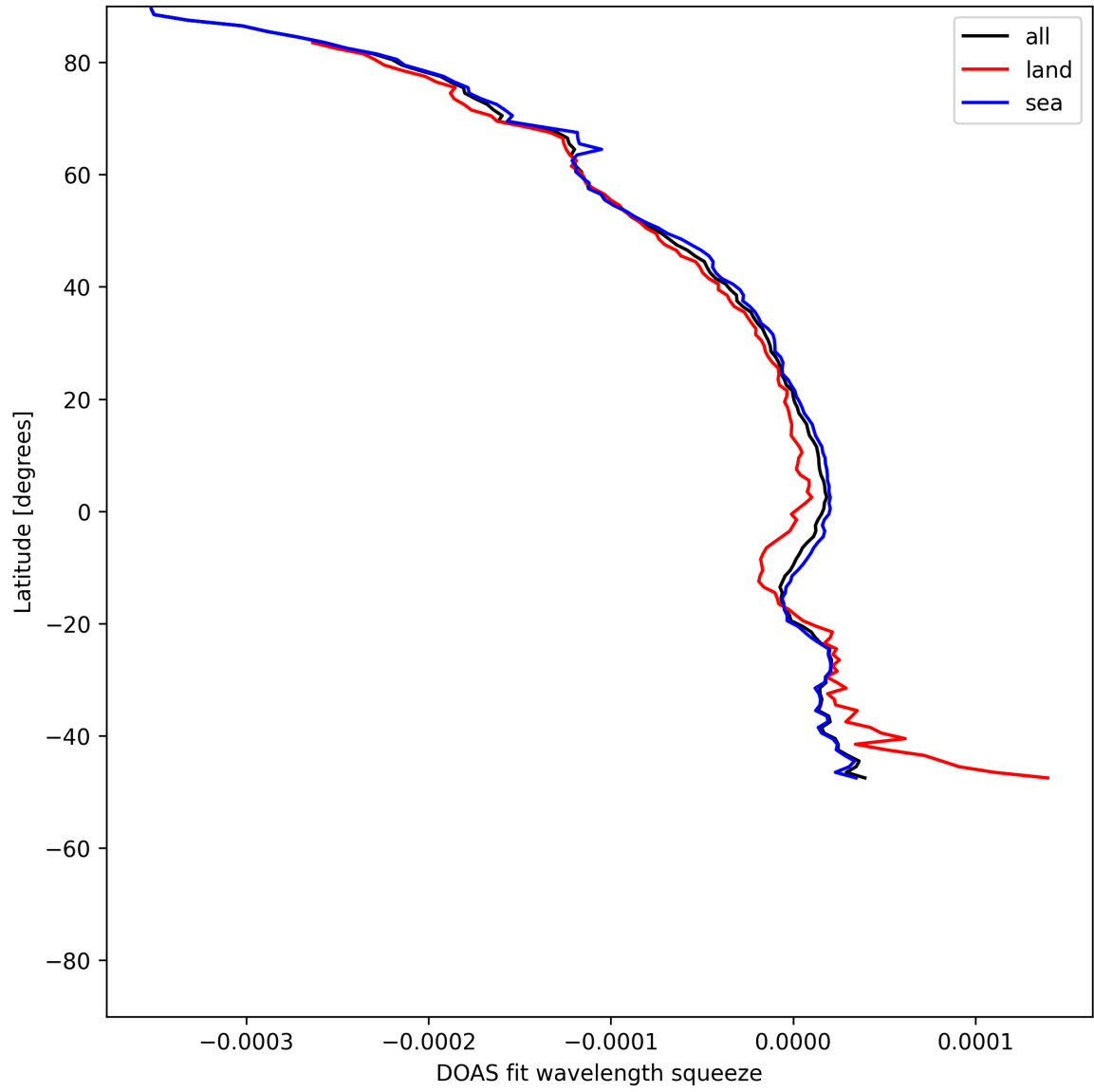


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-07-16 to 2025-07-16.

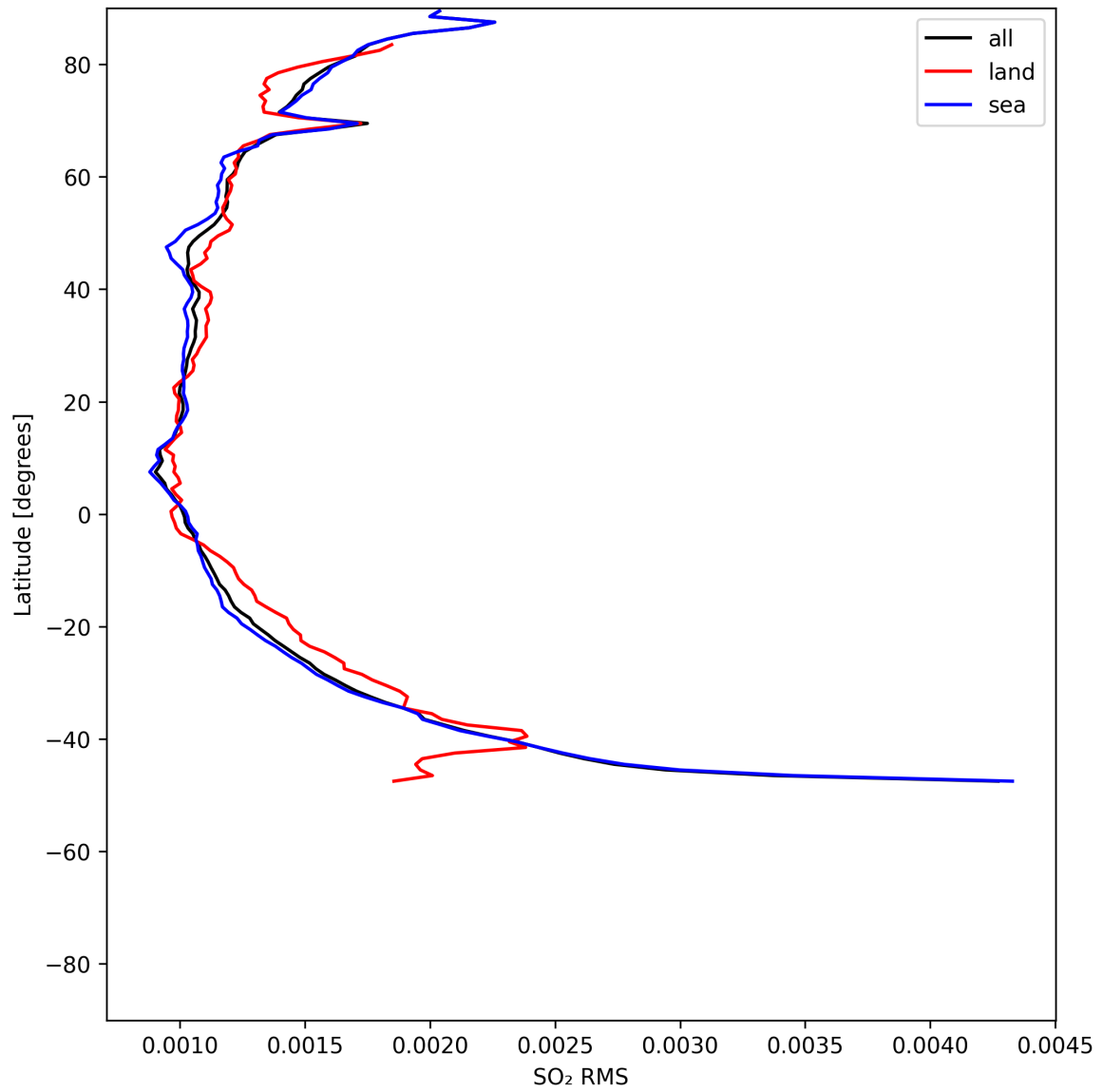


Figure 52: Zonal average of “SO₂ RMS” for 2025-07-16 to 2025-07-16.

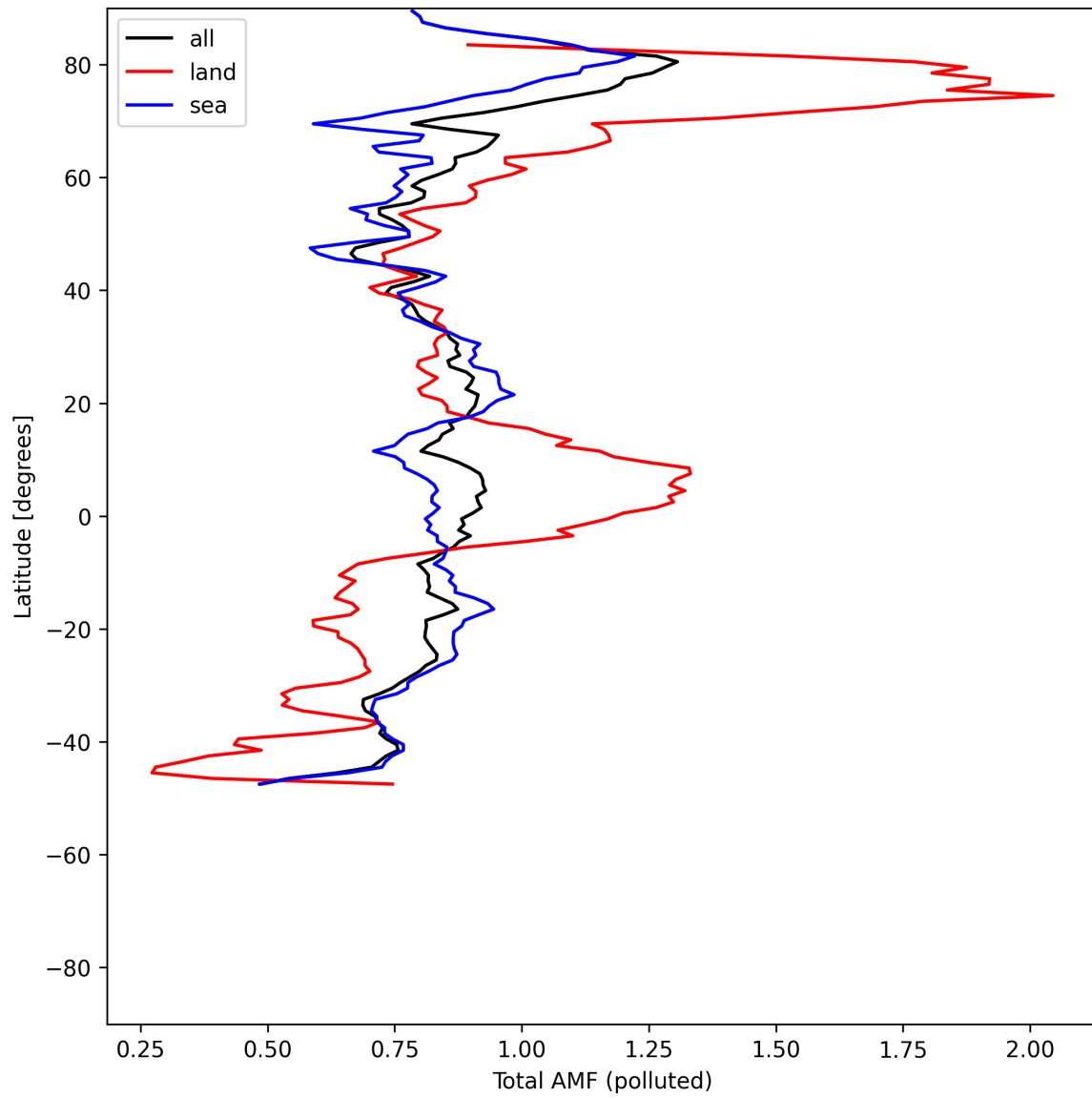


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-07-16 to 2025-07-16.

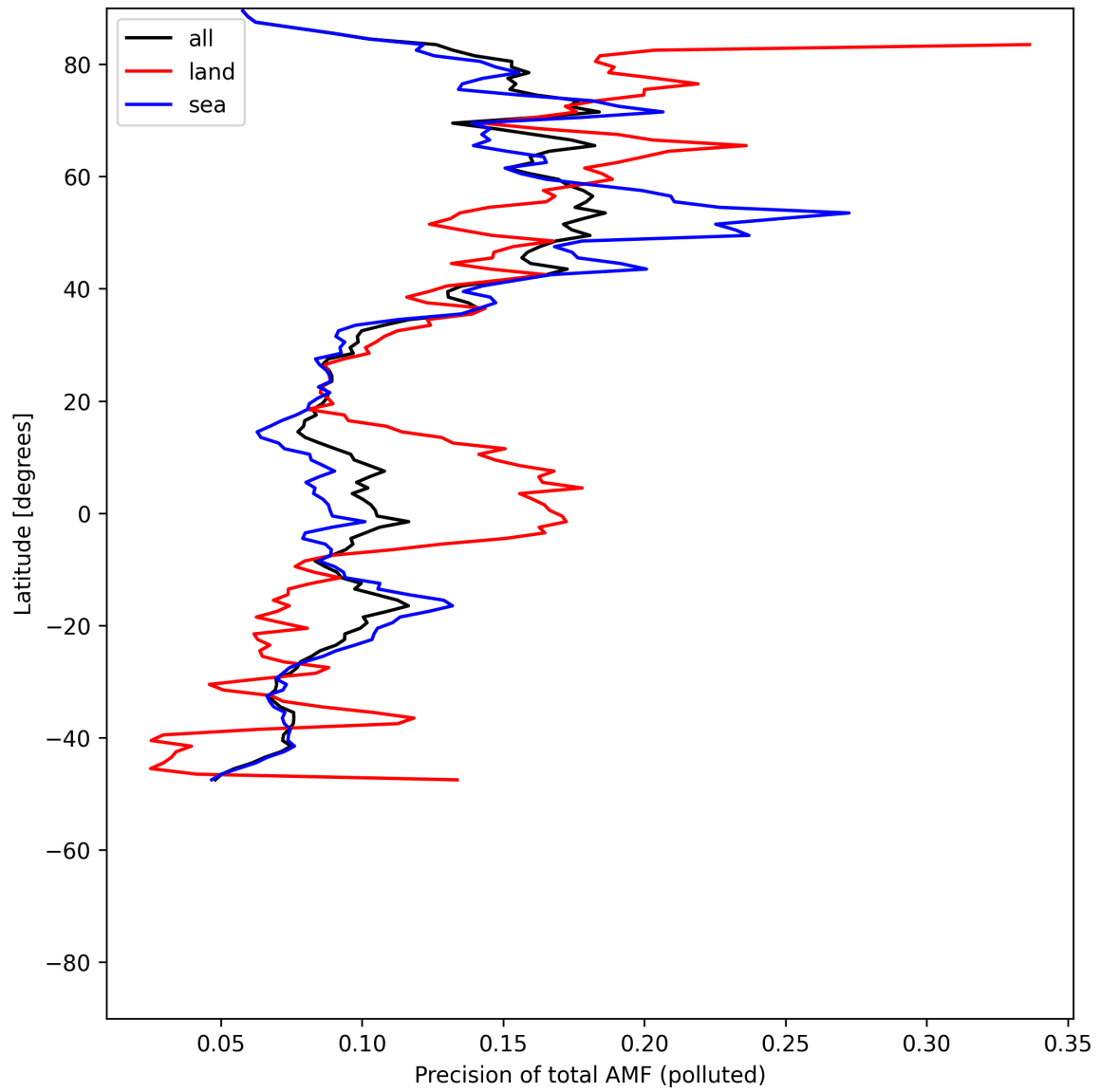


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-07-16 to 2025-07-16.

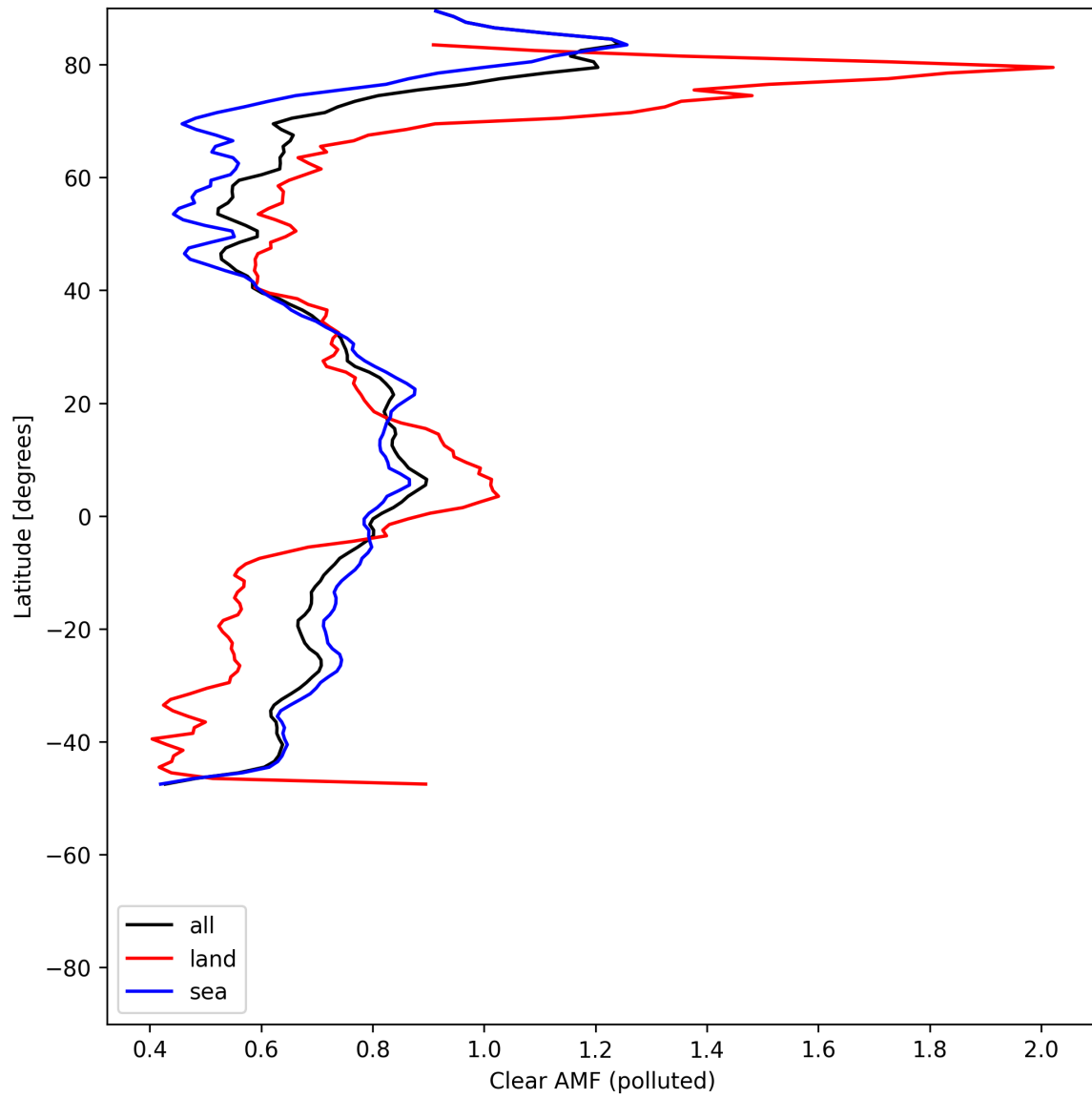


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-07-16 to 2025-07-16.

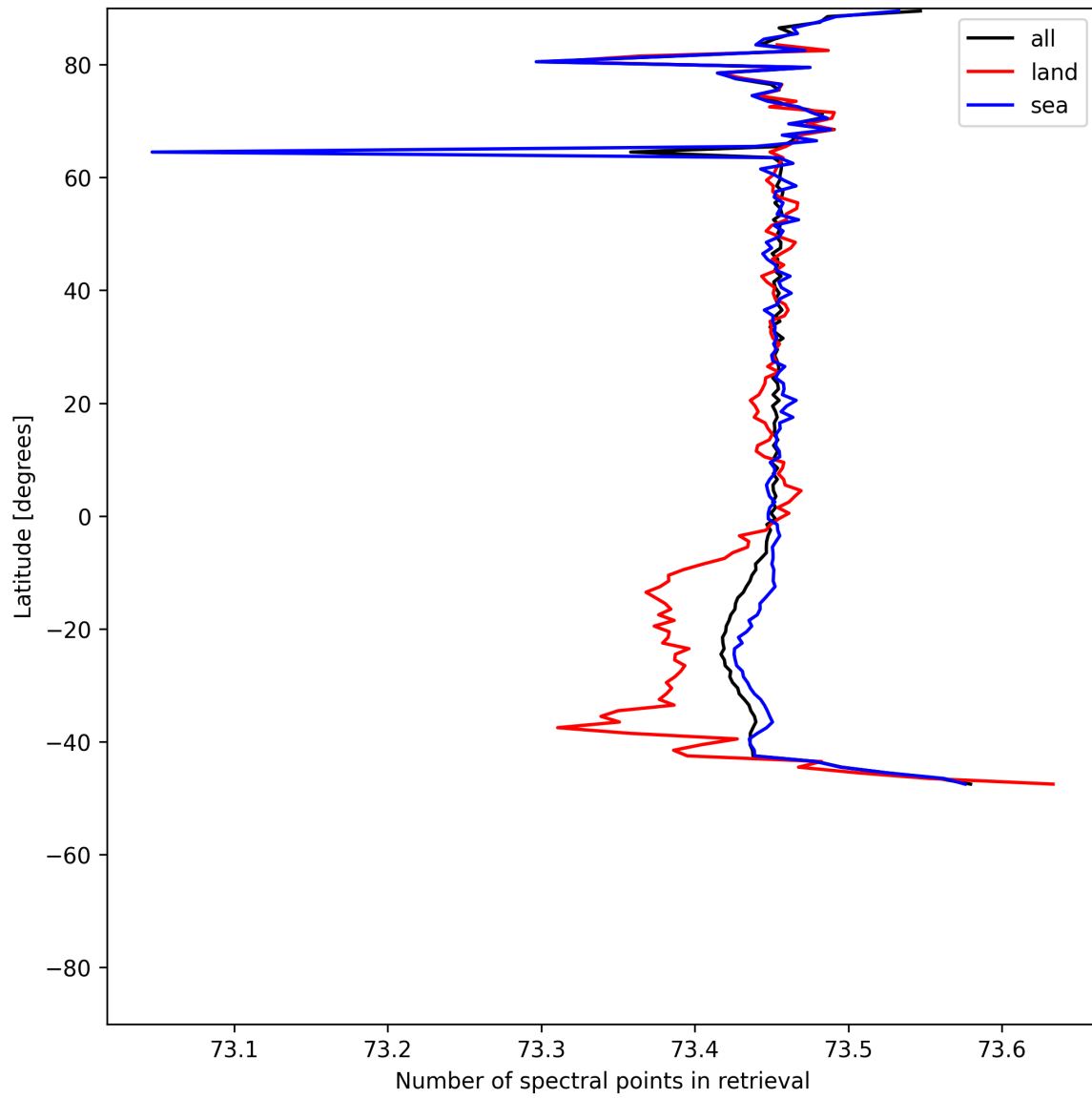


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-07-16 to 2025-07-16.

8 Histograms

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

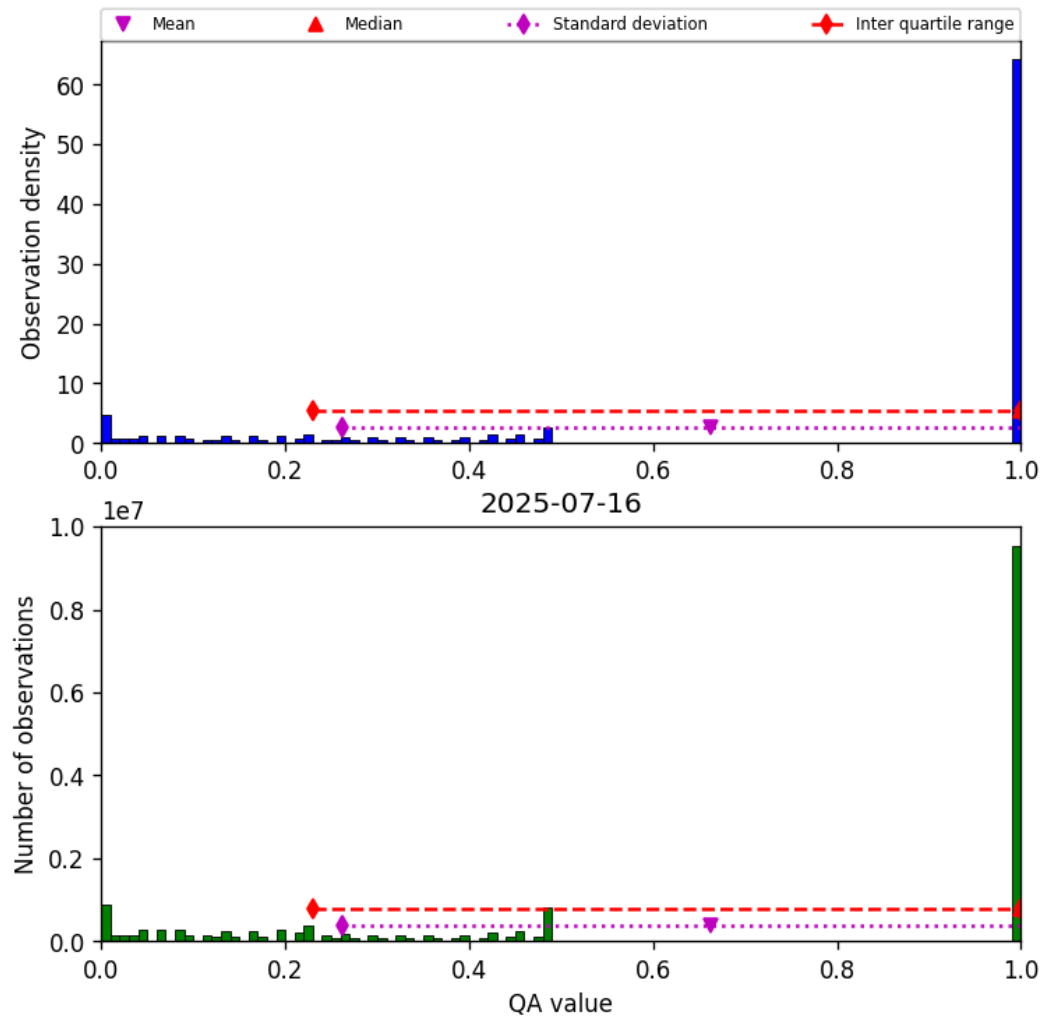


Figure 57: Histogram of “QA value” for 2025-07-16 to 2025-07-16

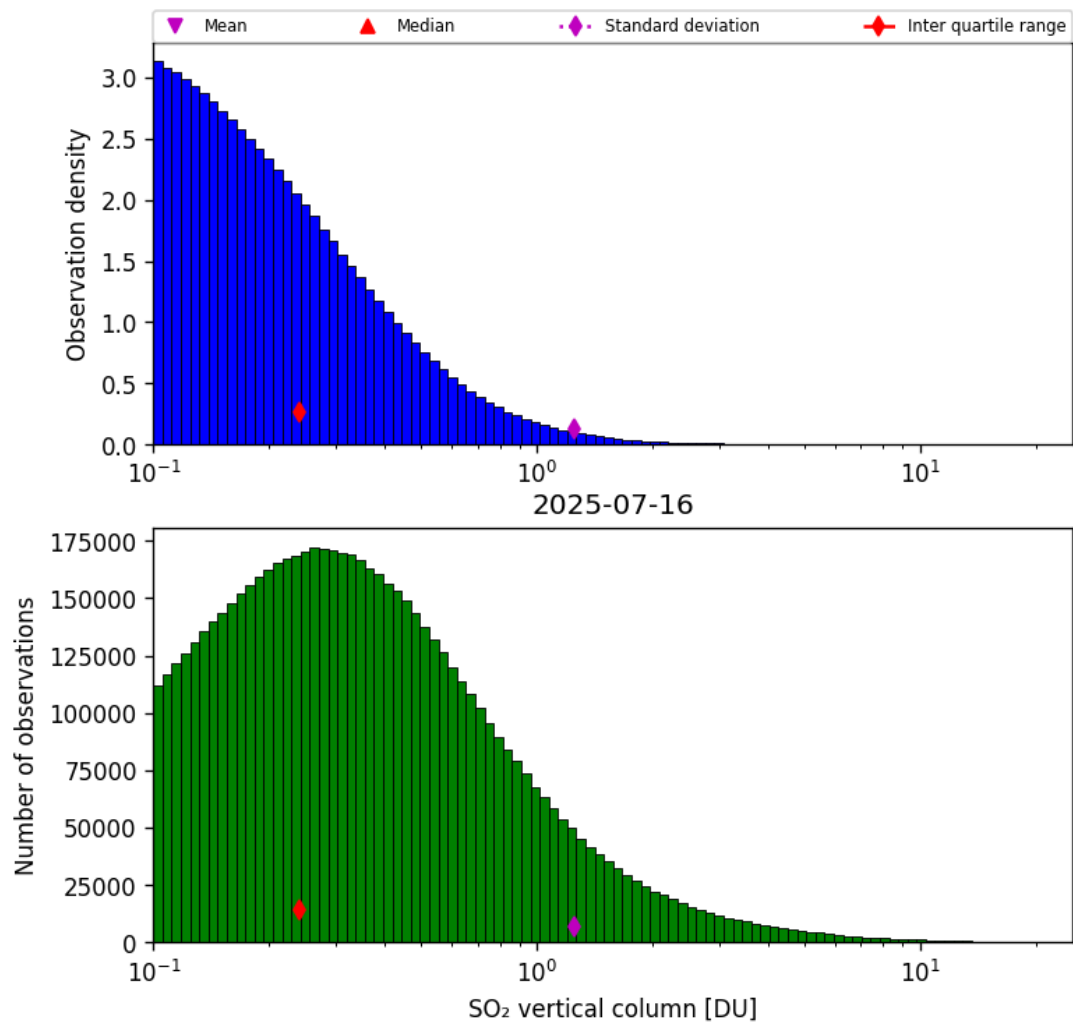


Figure 58: Histogram of “SO₂ vertical column” for 2025-07-16 to 2025-07-16

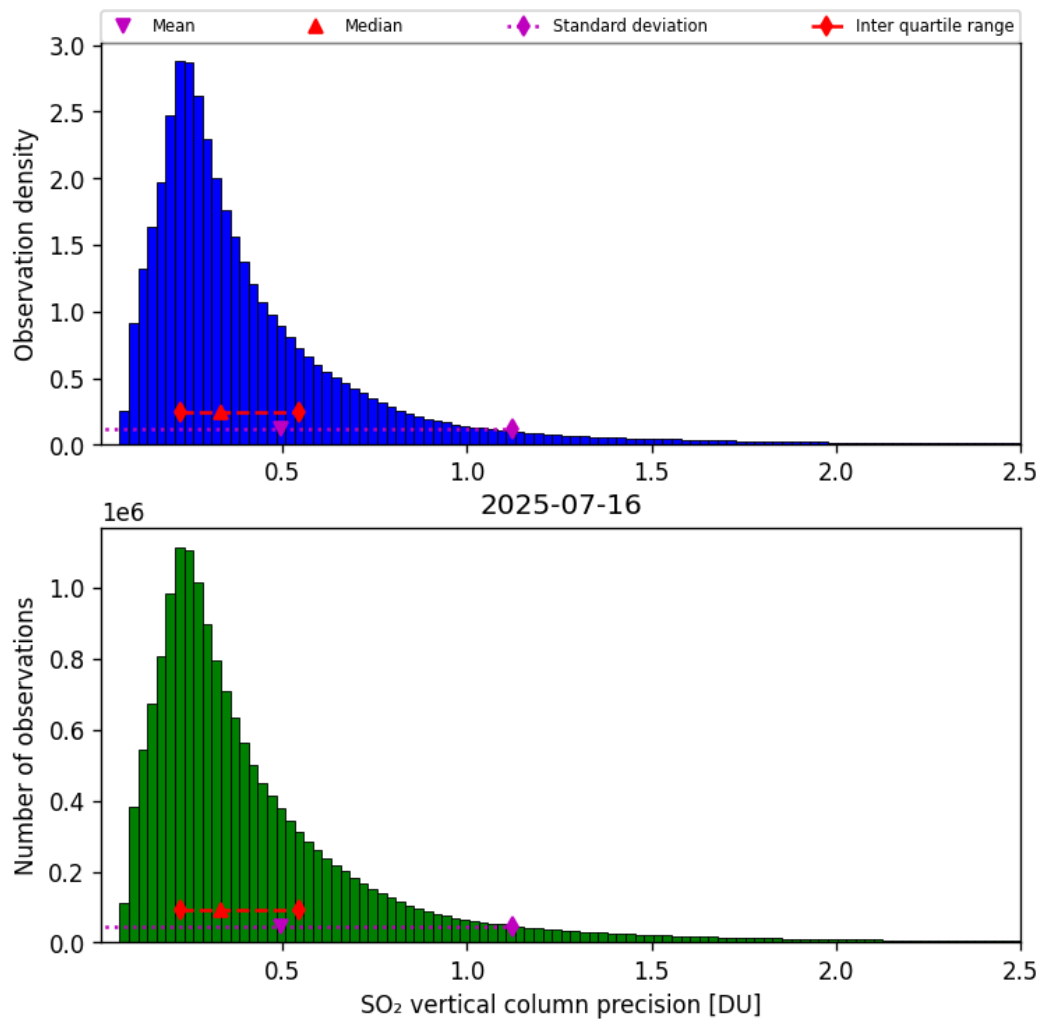


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-07-16 to 2025-07-16

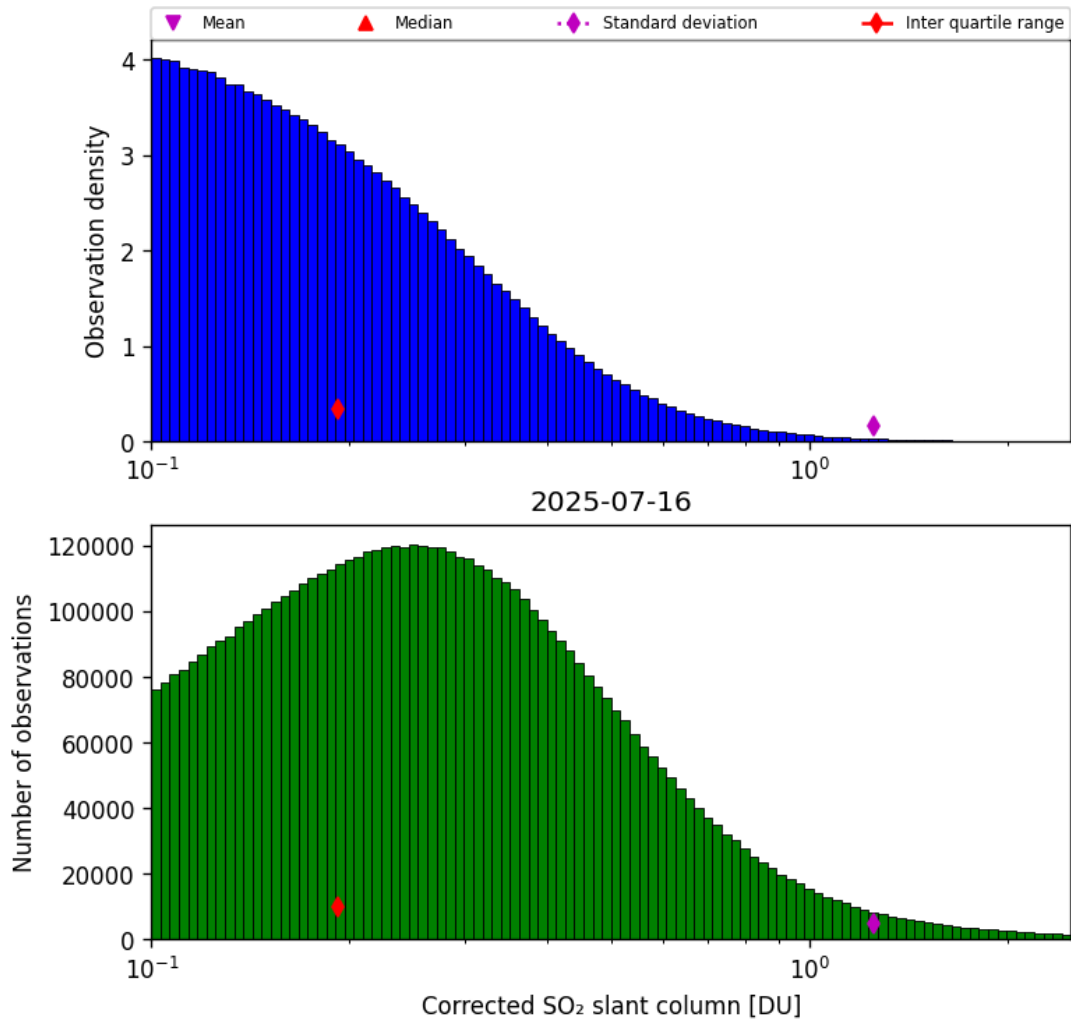


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-07-16 to 2025-07-16

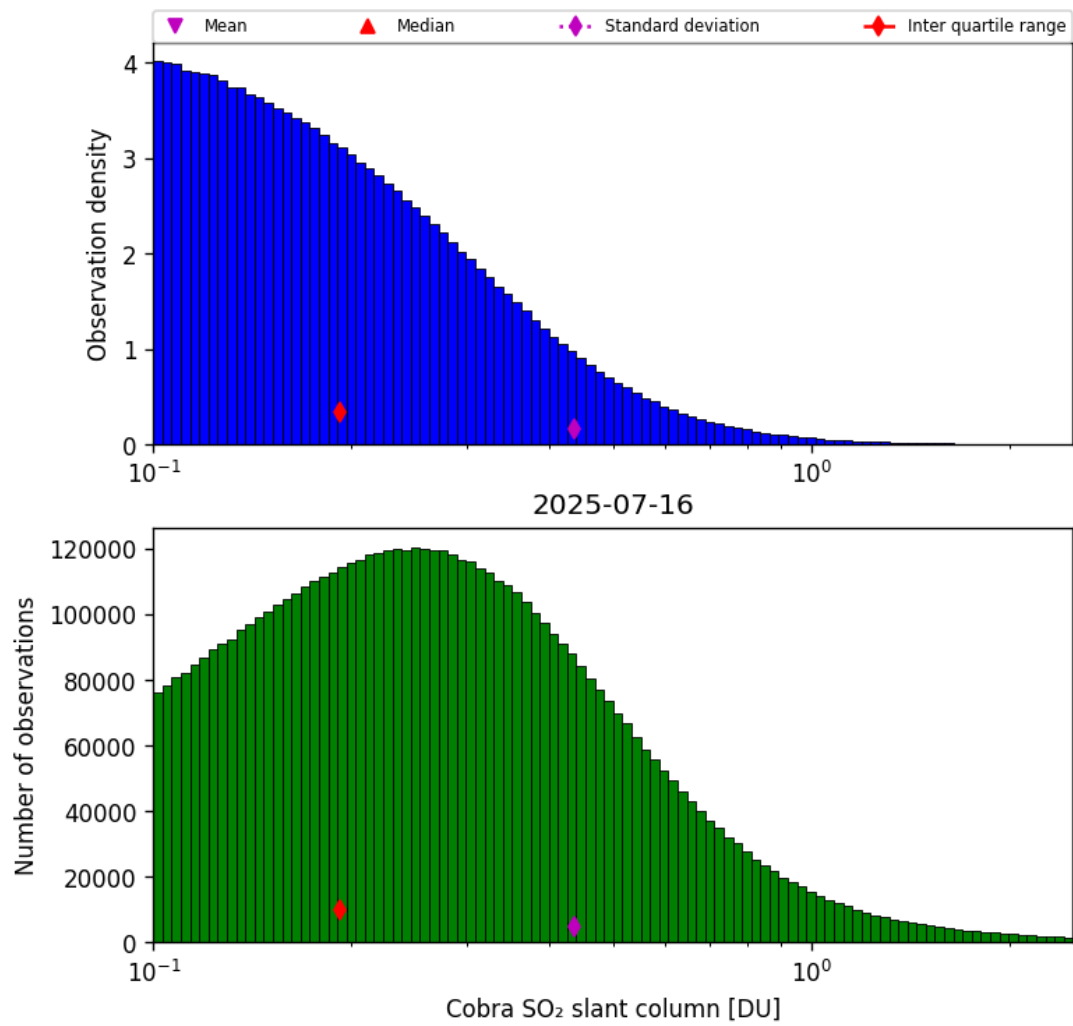


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-07-16 to 2025-07-16

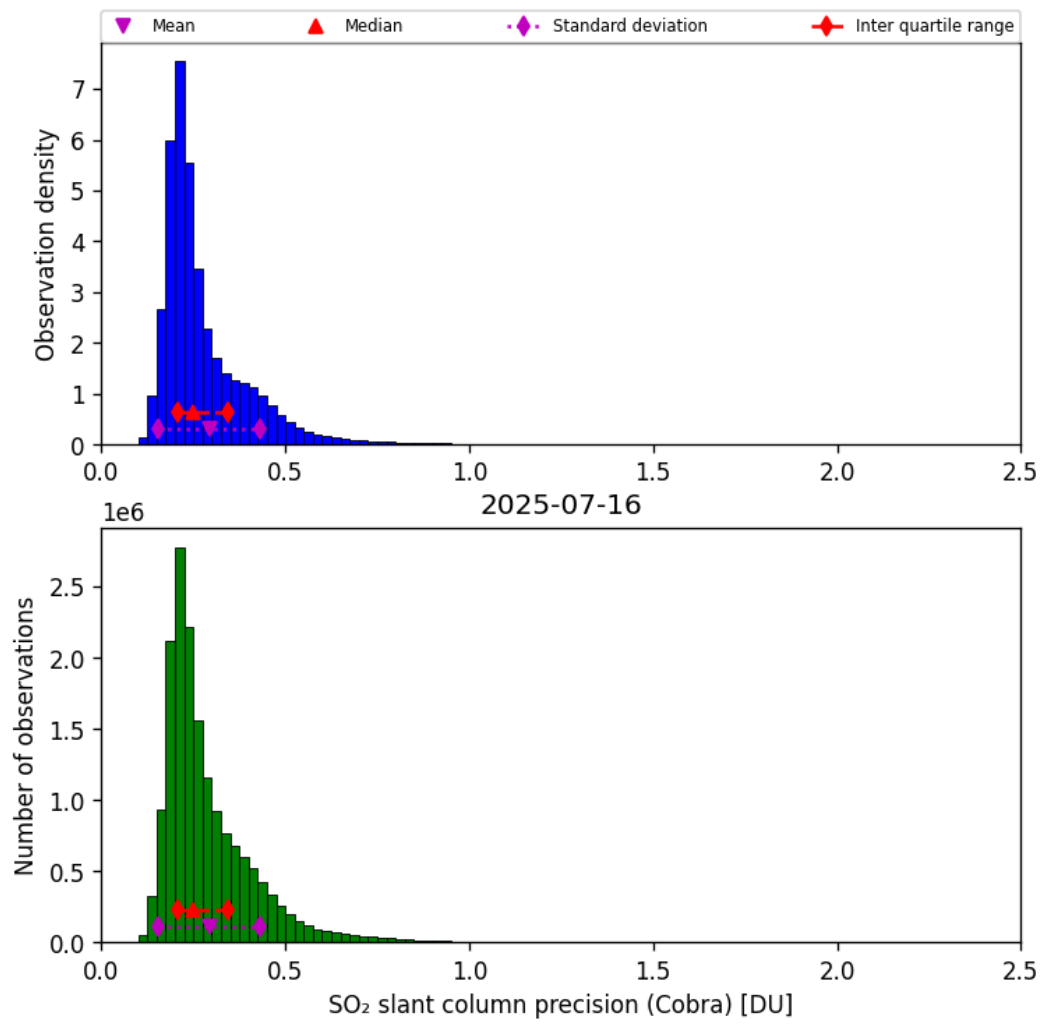


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-07-16 to 2025-07-16

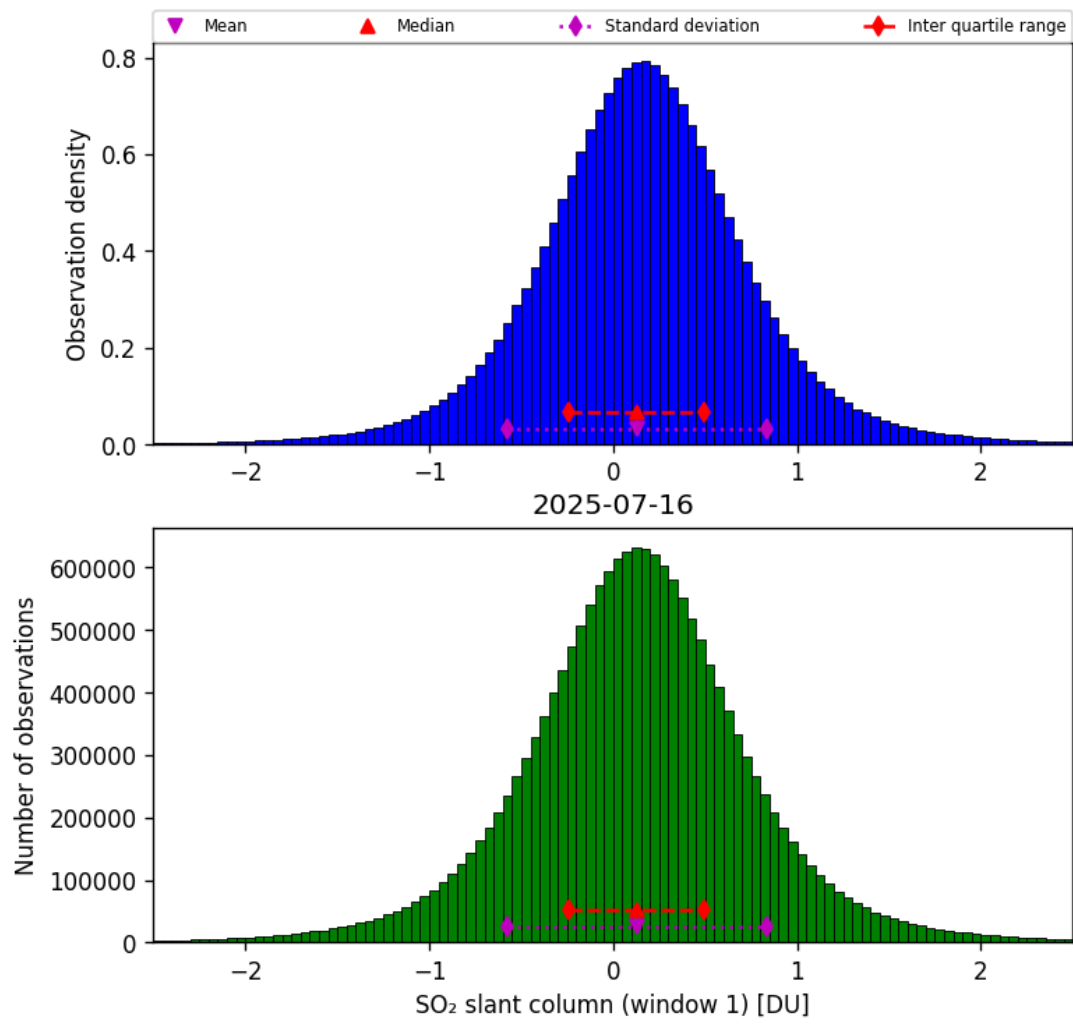


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-07-16 to 2025-07-16

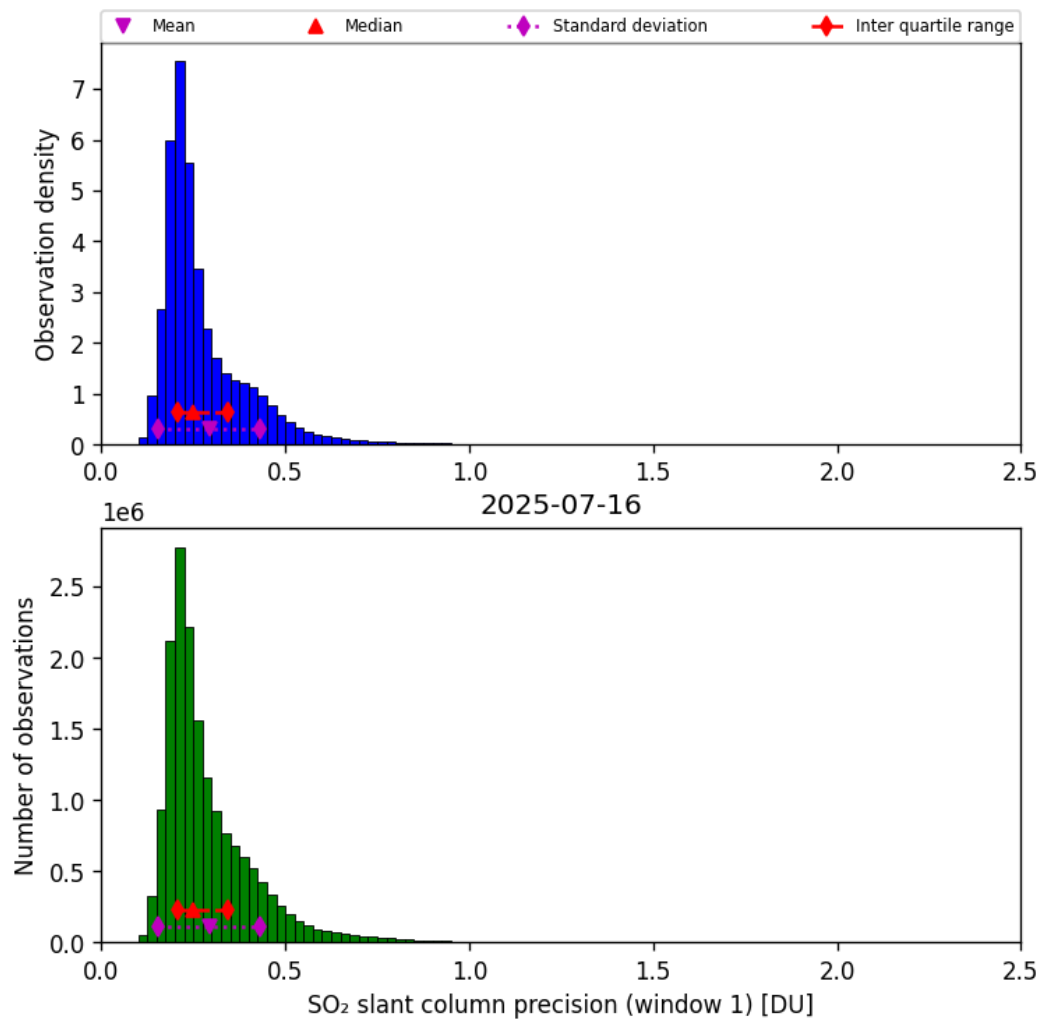


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-07-16 to 2025-07-16

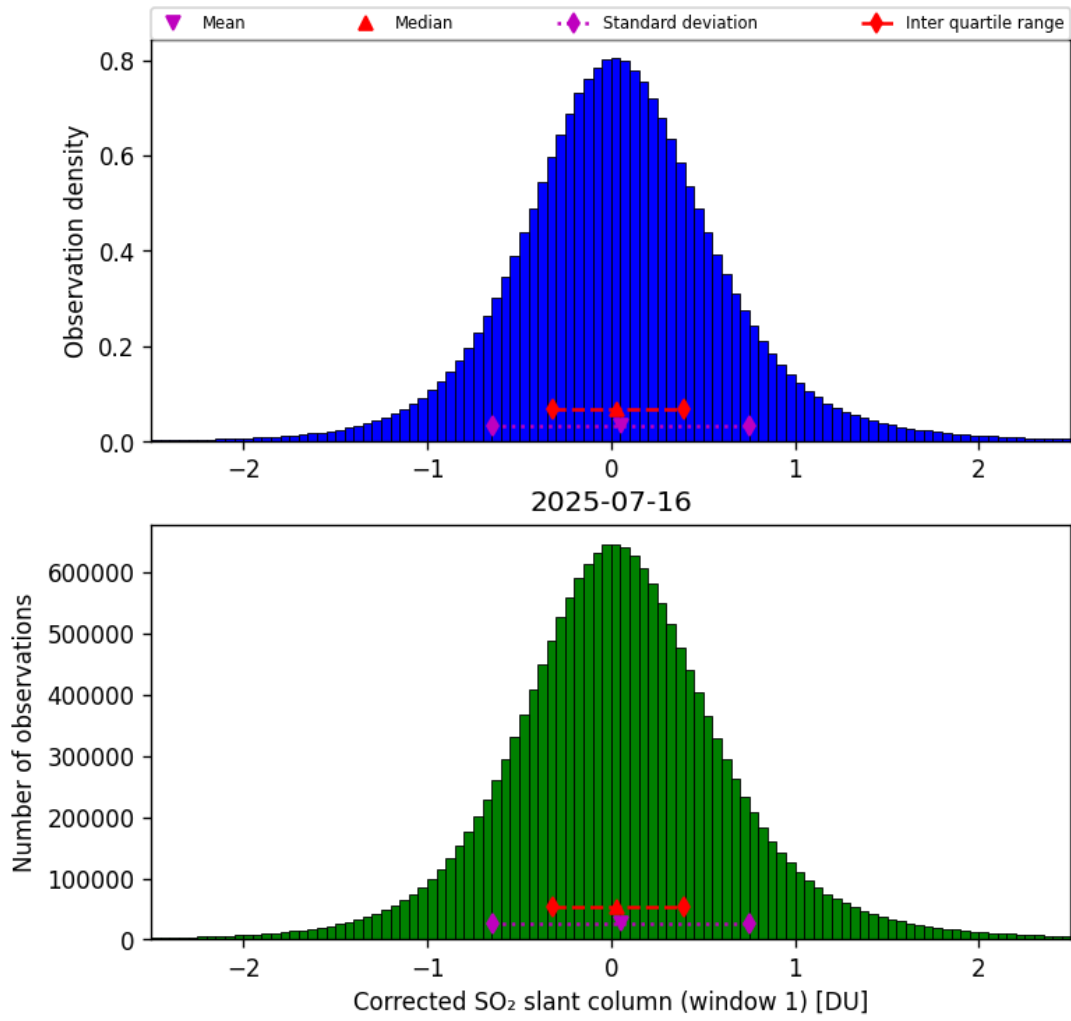


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-07-16 to 2025-07-16

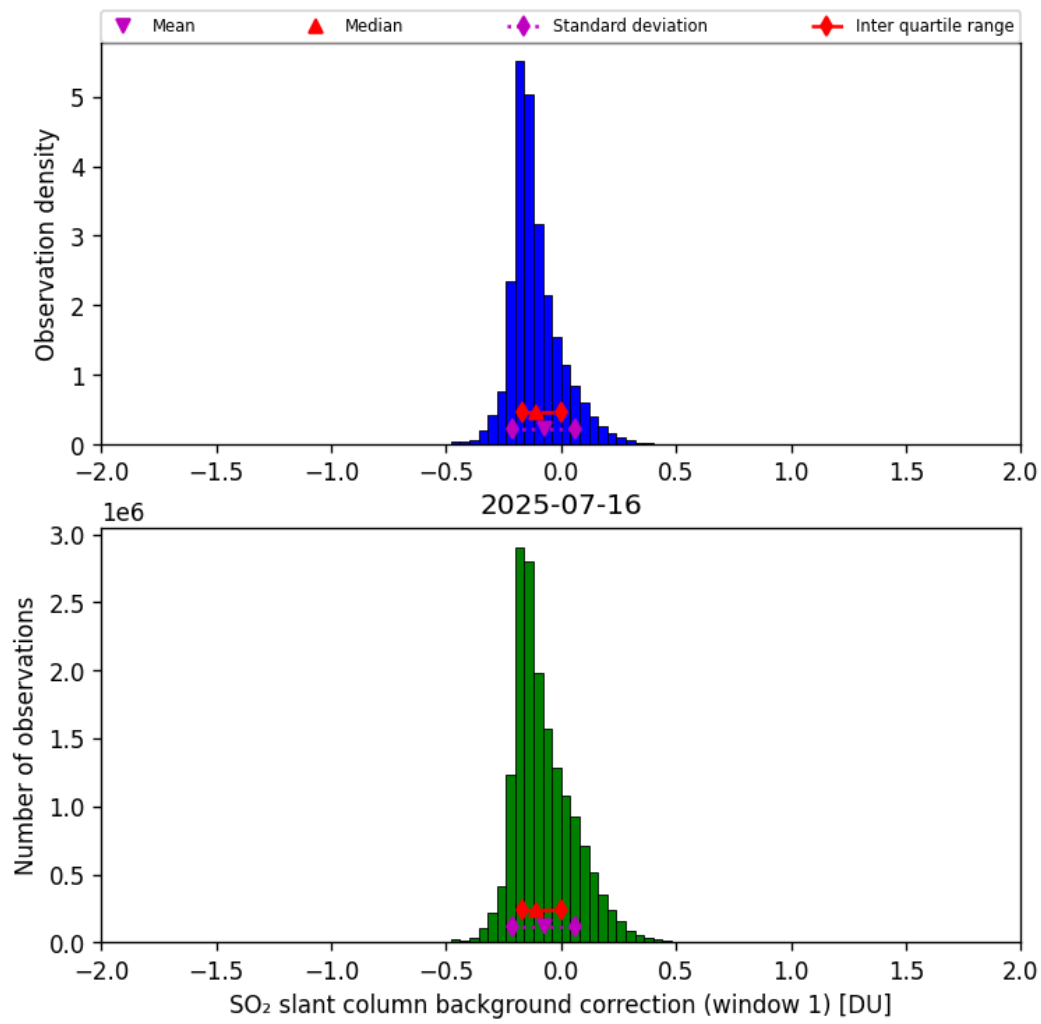


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-07-16 to 2025-07-16

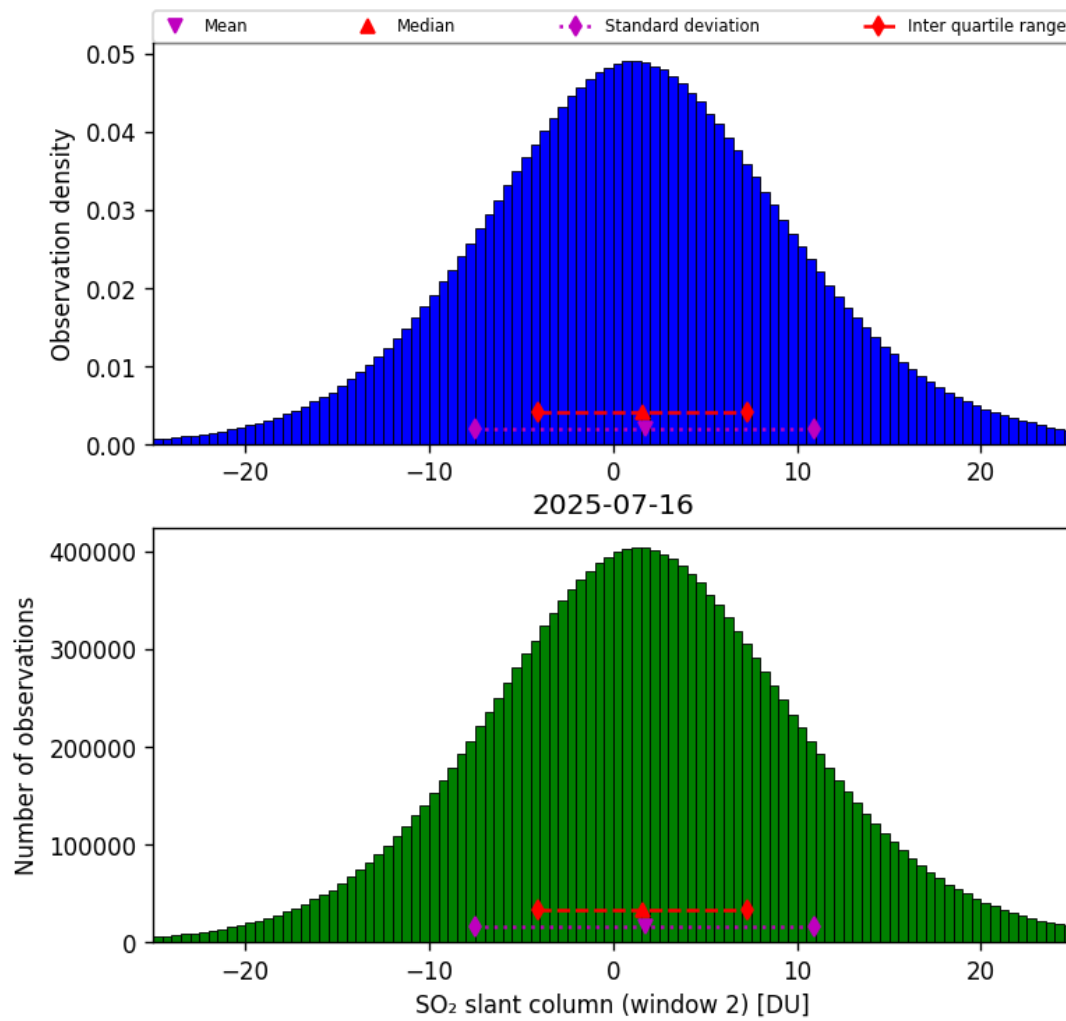


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-07-16 to 2025-07-16

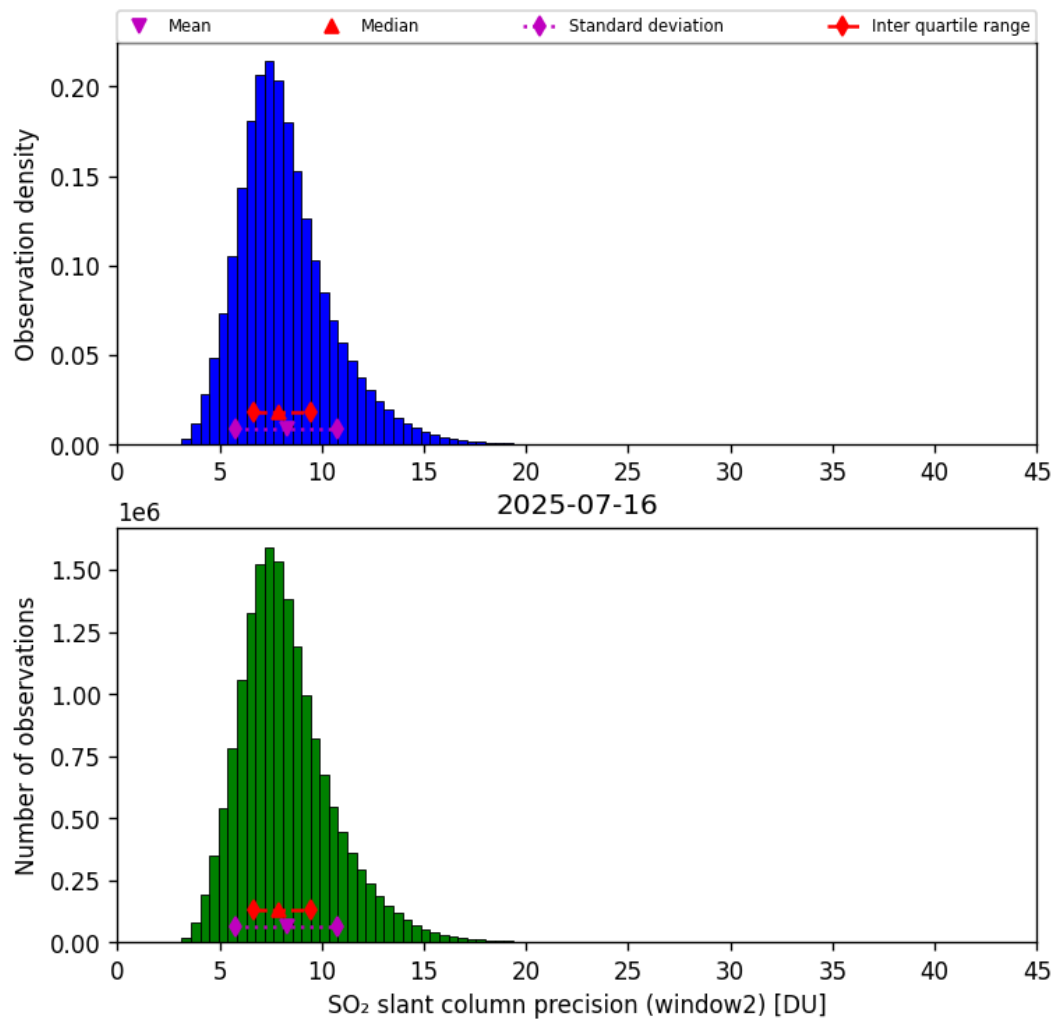


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-07-16 to 2025-07-16

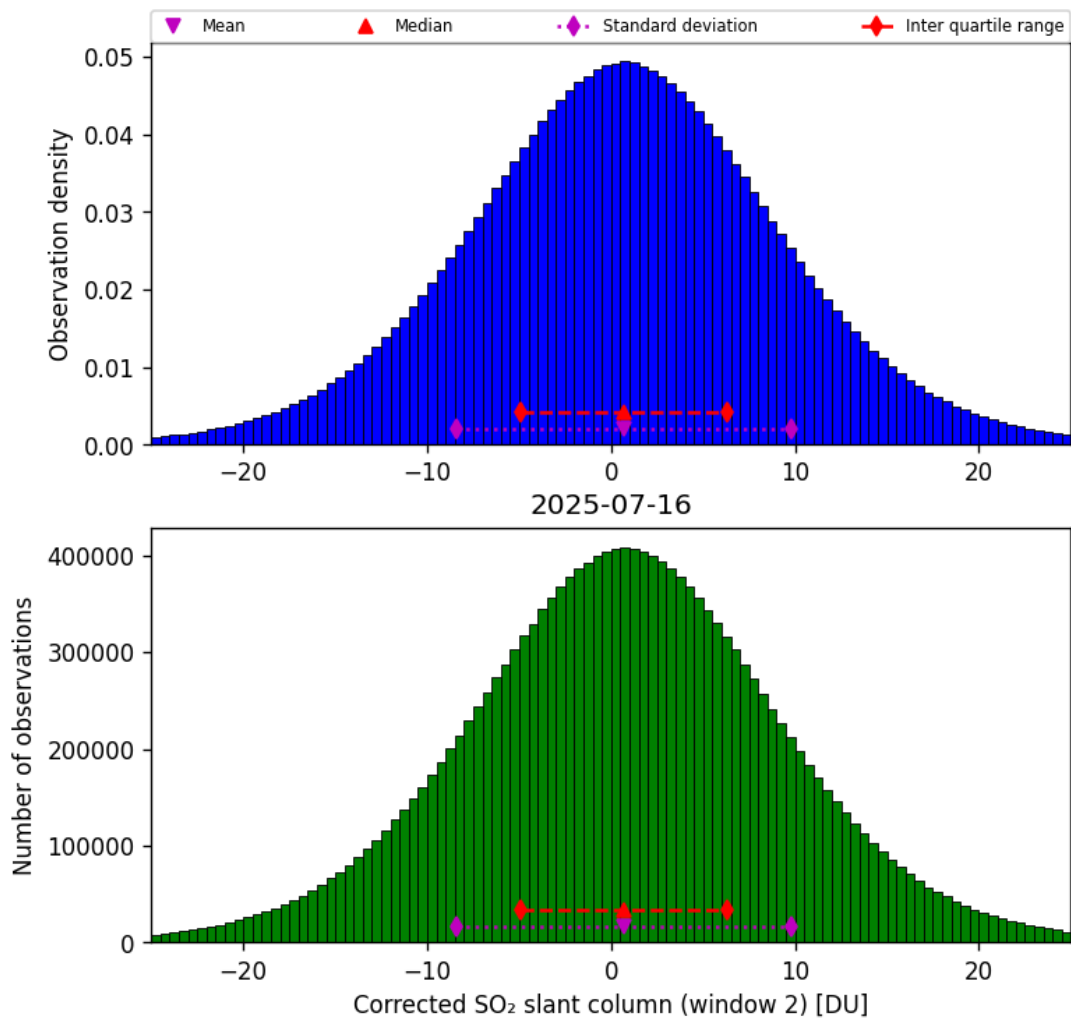


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-07-16 to 2025-07-16

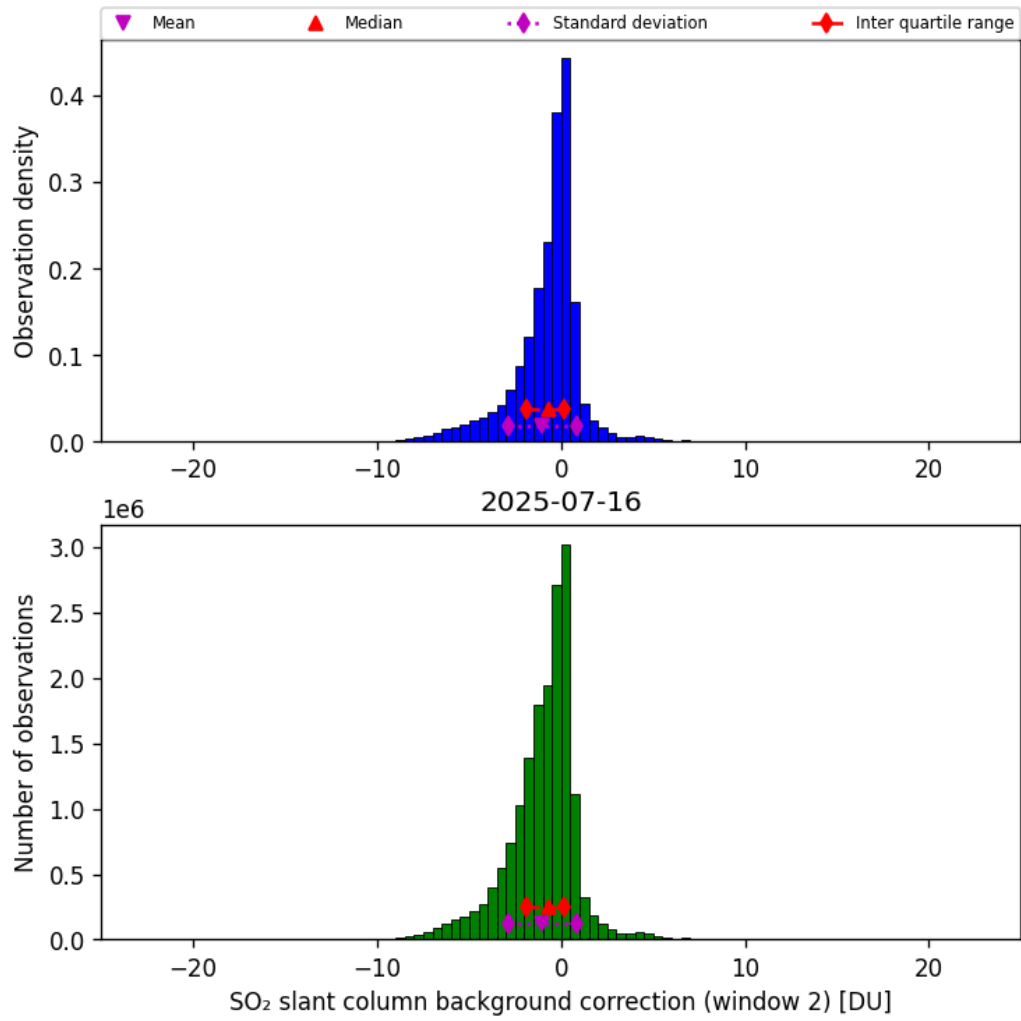


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-07-16 to 2025-07-16

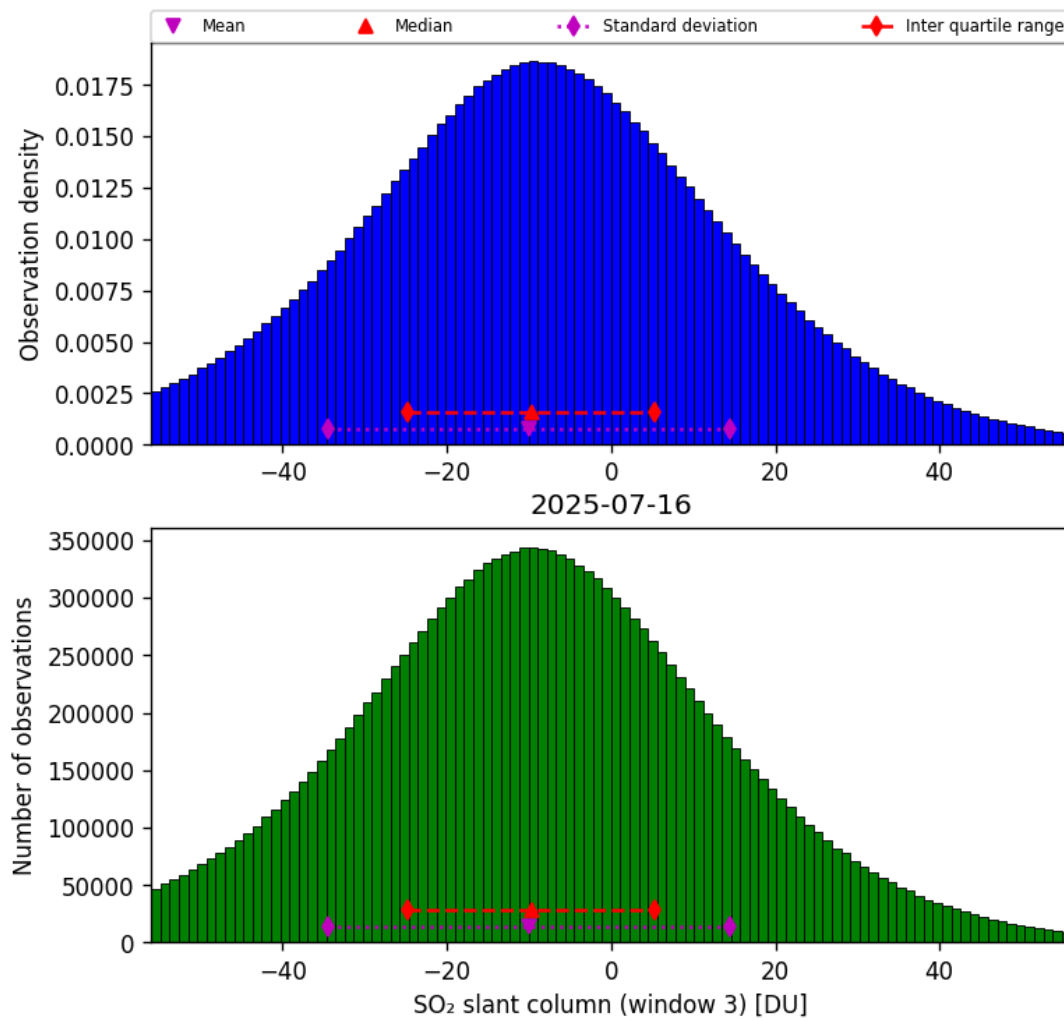


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-07-16 to 2025-07-16

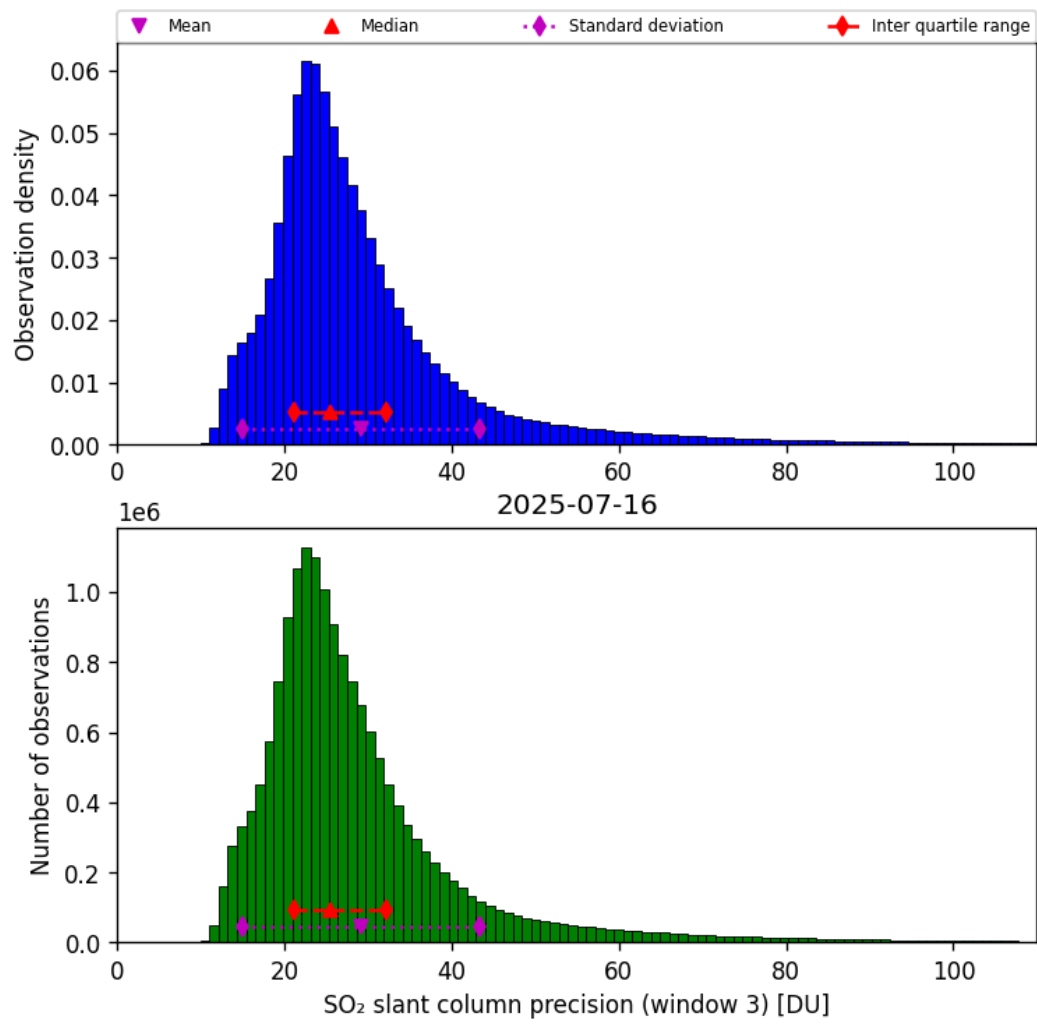


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-07-16 to 2025-07-16

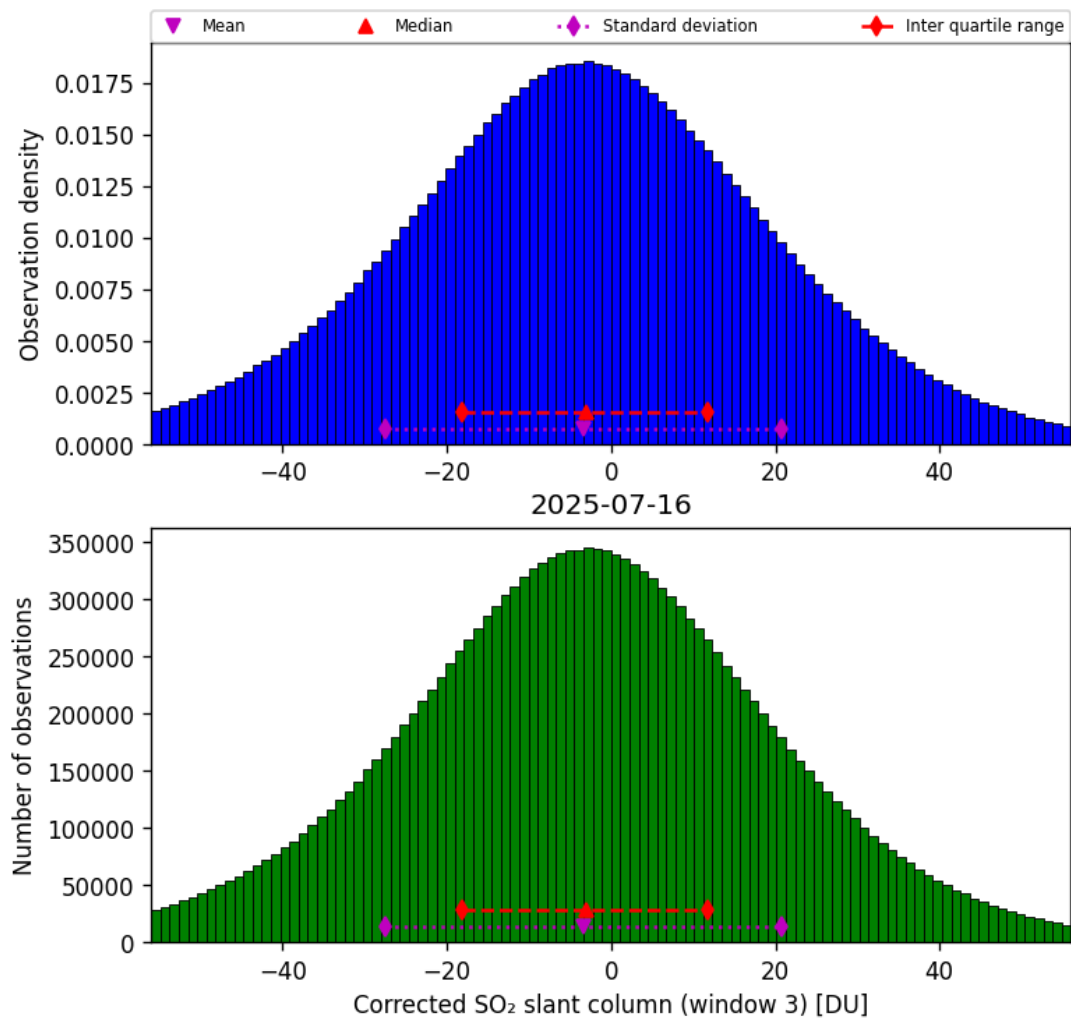


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-07-16 to 2025-07-16

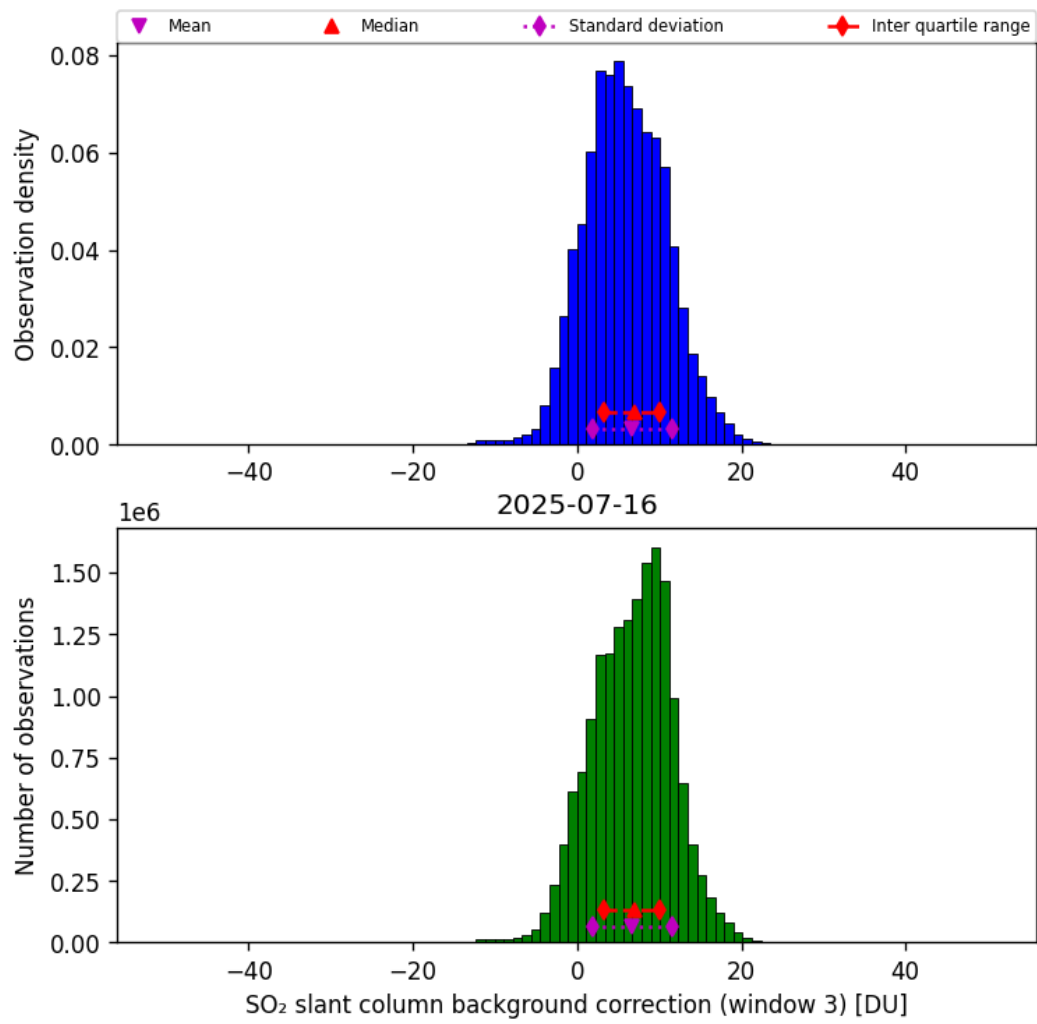


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-07-16 to 2025-07-16

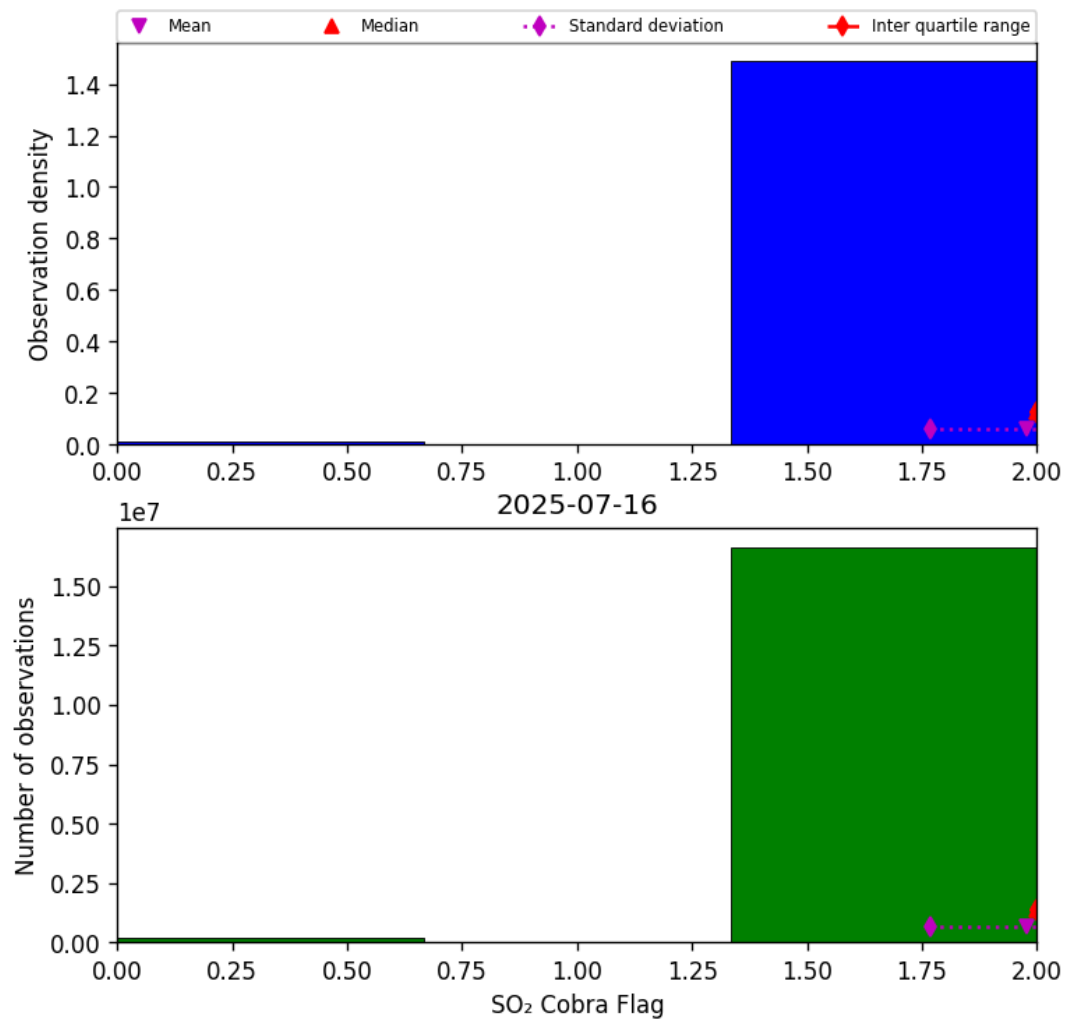


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-07-16 to 2025-07-16

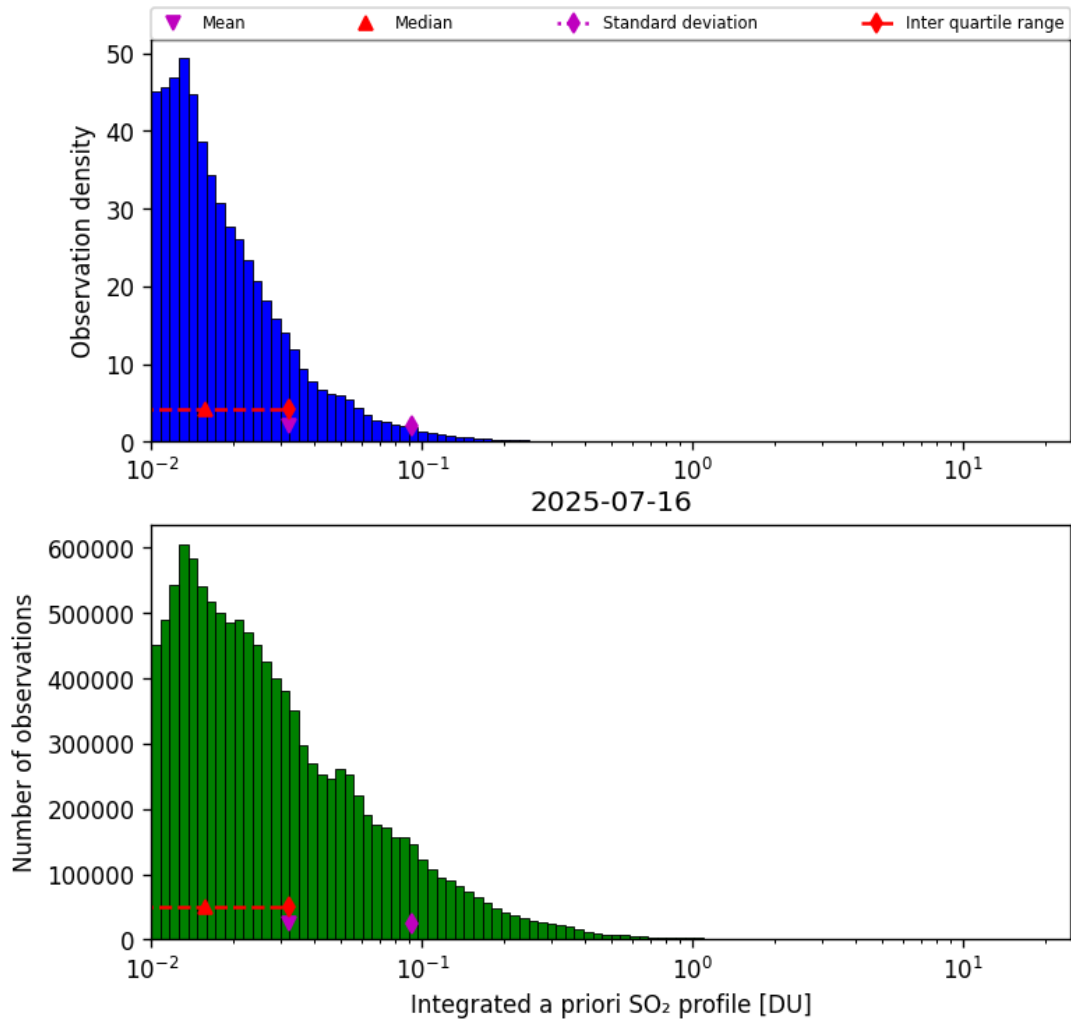


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-07-16 to 2025-07-16

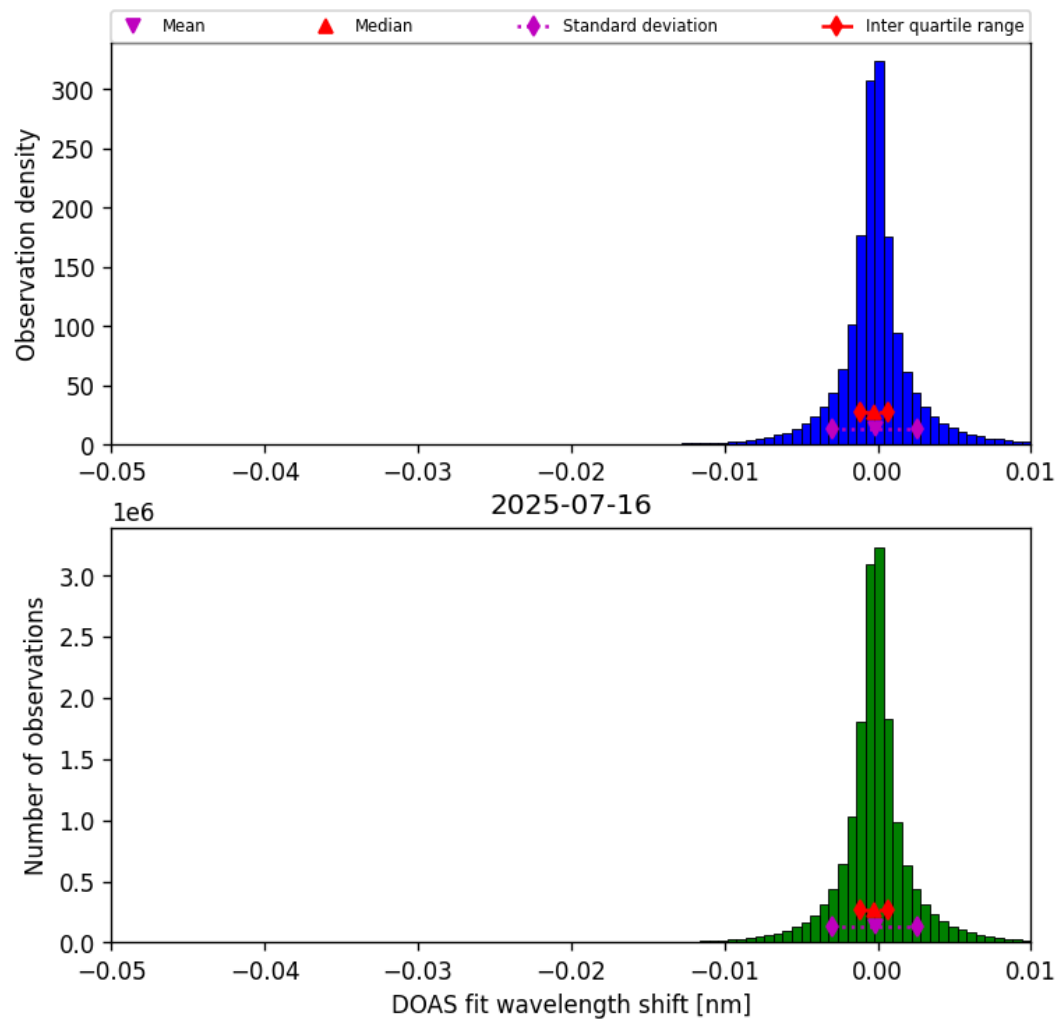


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-07-16 to 2025-07-16

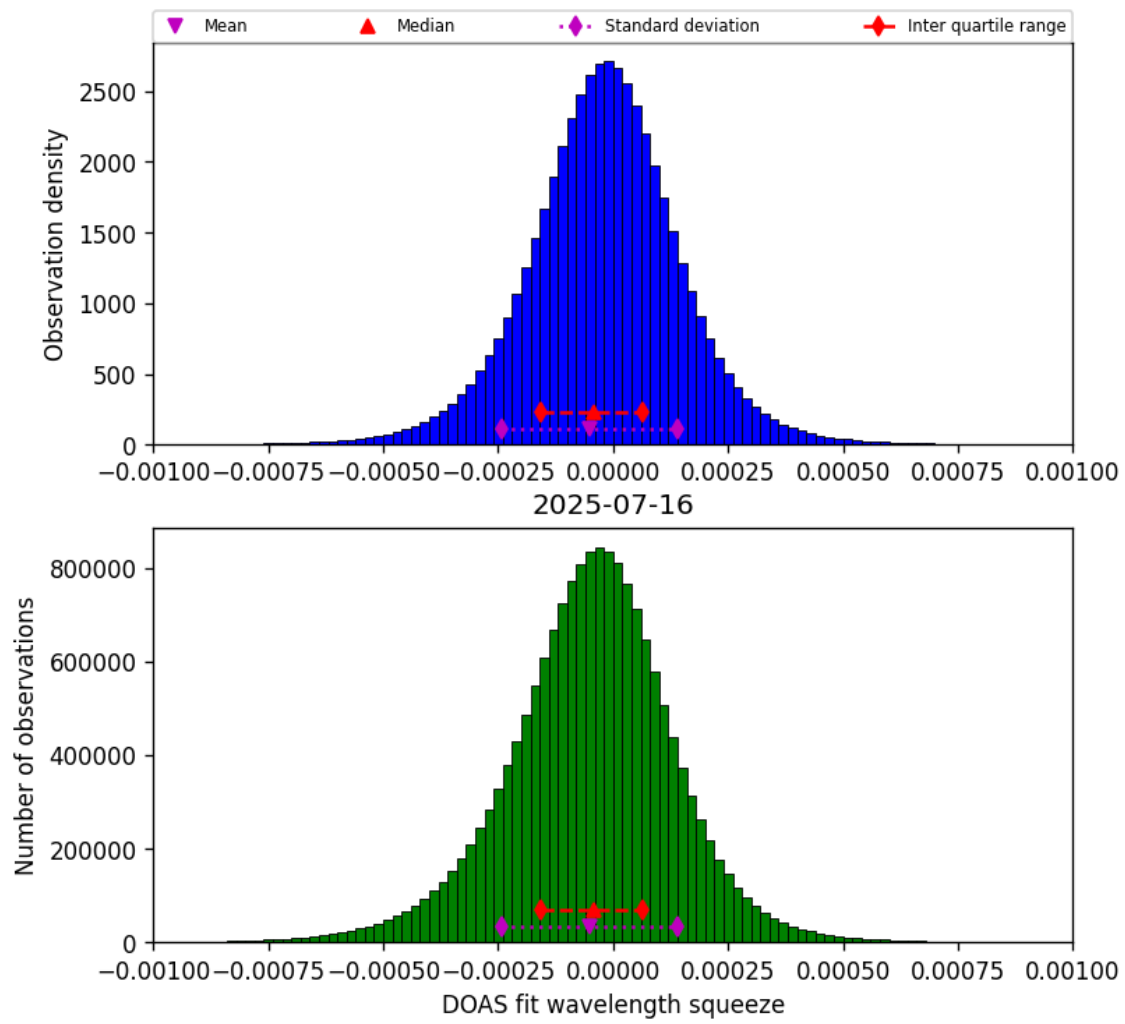


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-07-16 to 2025-07-16

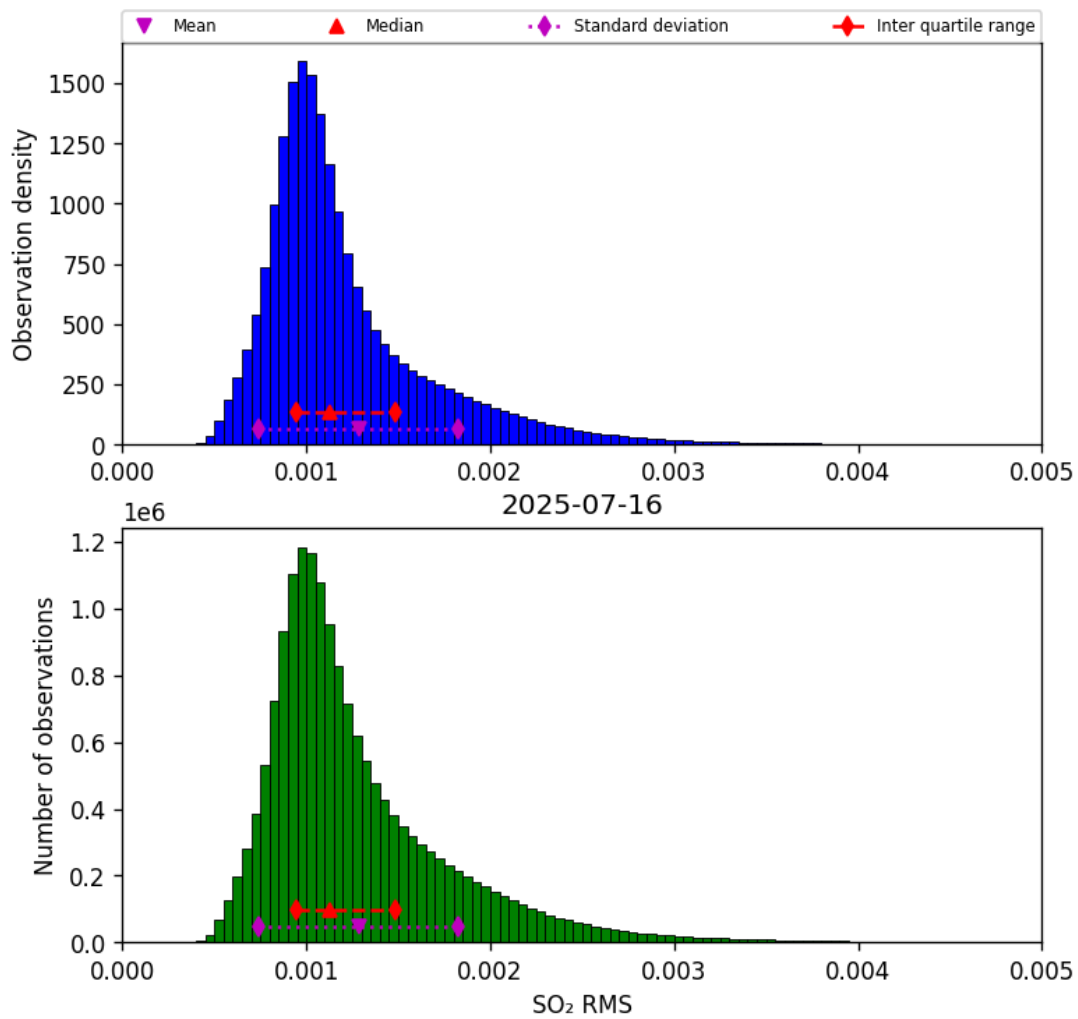


Figure 79: Histogram of “SO₂ RMS” for 2025-07-16 to 2025-07-16

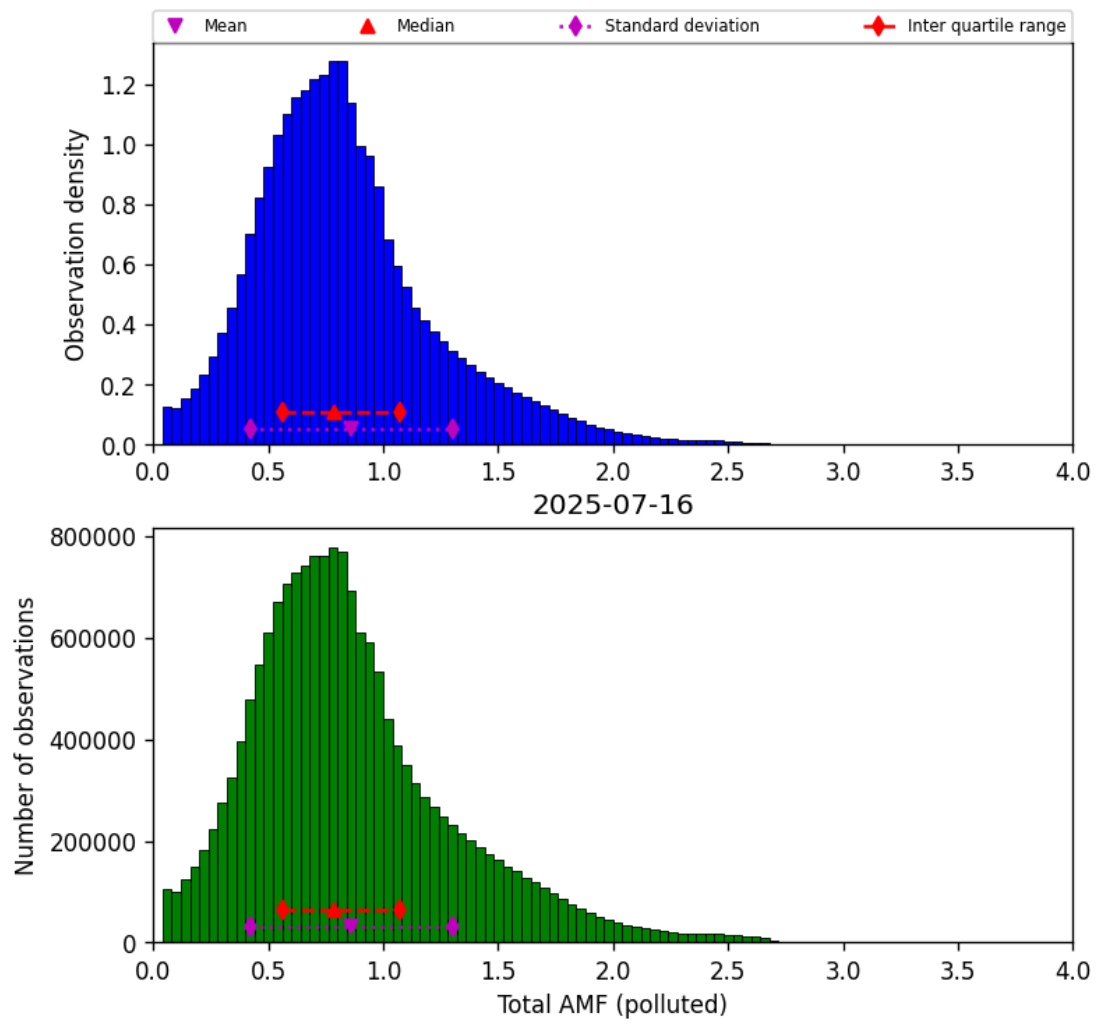


Figure 80: Histogram of “Total AMF (polluted)” for 2025-07-16 to 2025-07-16

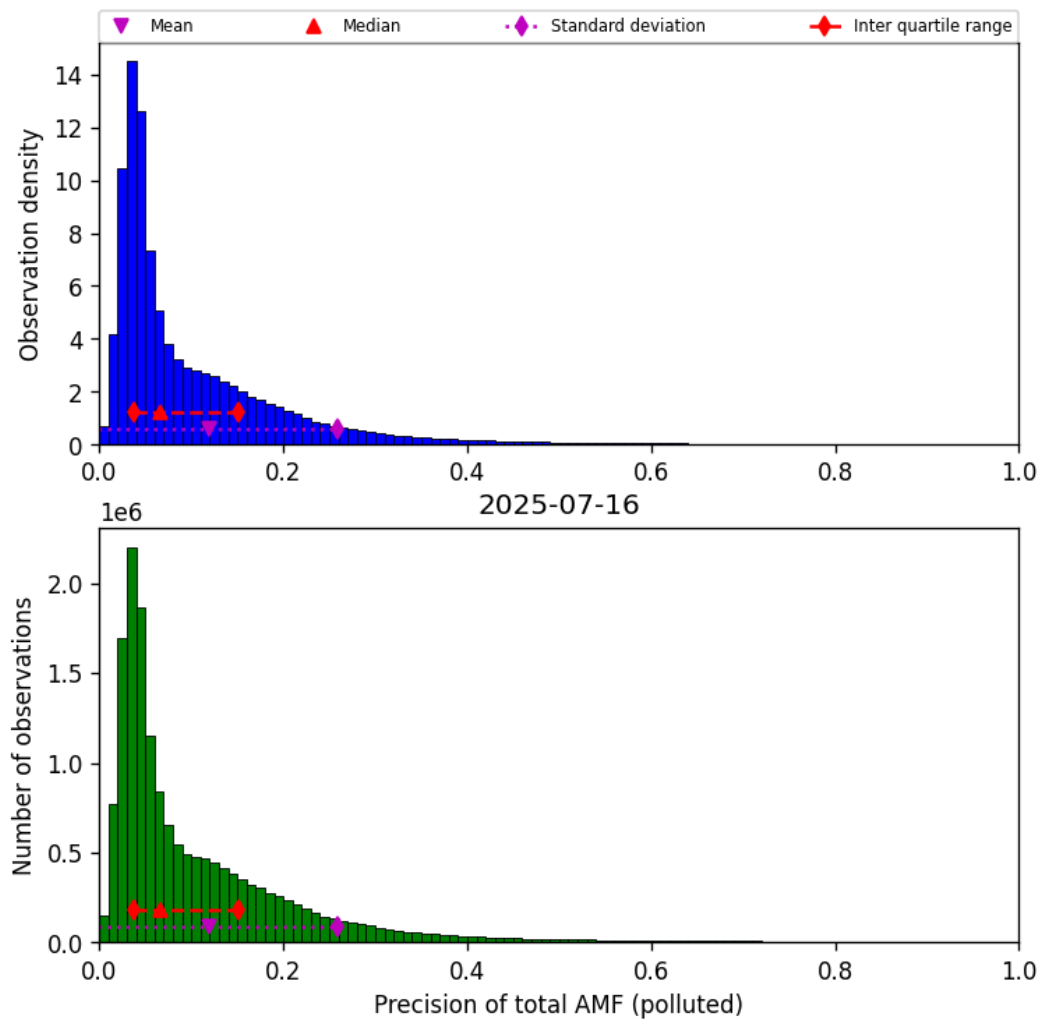


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-07-16 to 2025-07-16

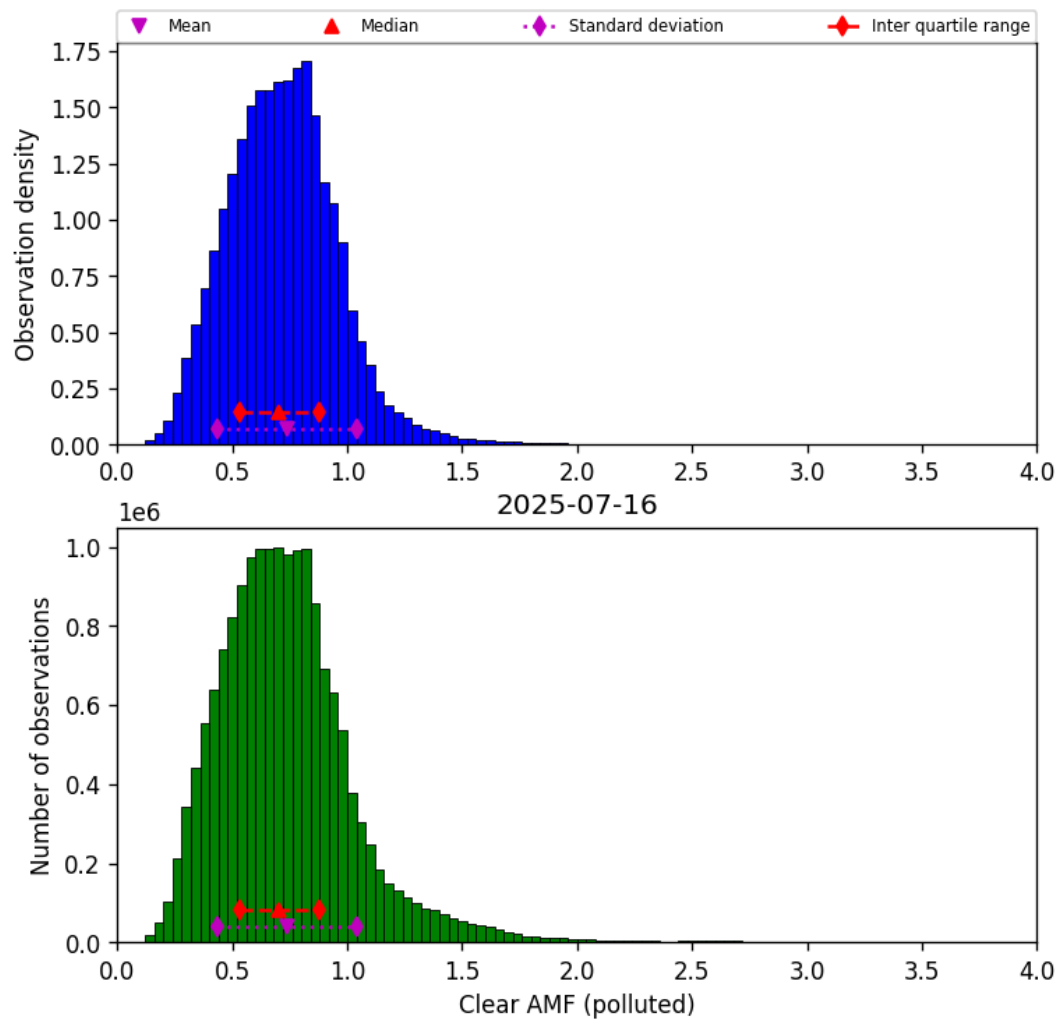


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-07-16 to 2025-07-16

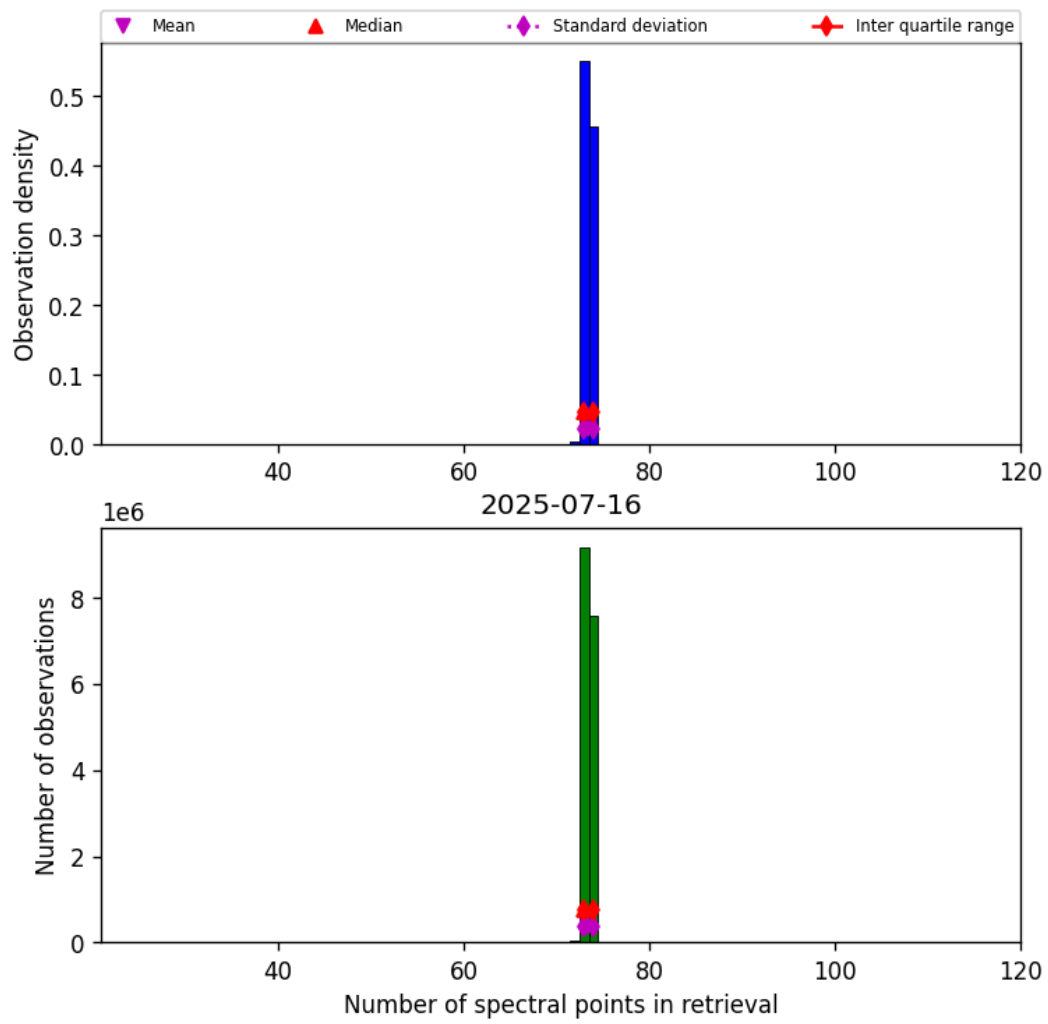


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-07-16 to 2025-07-16

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.

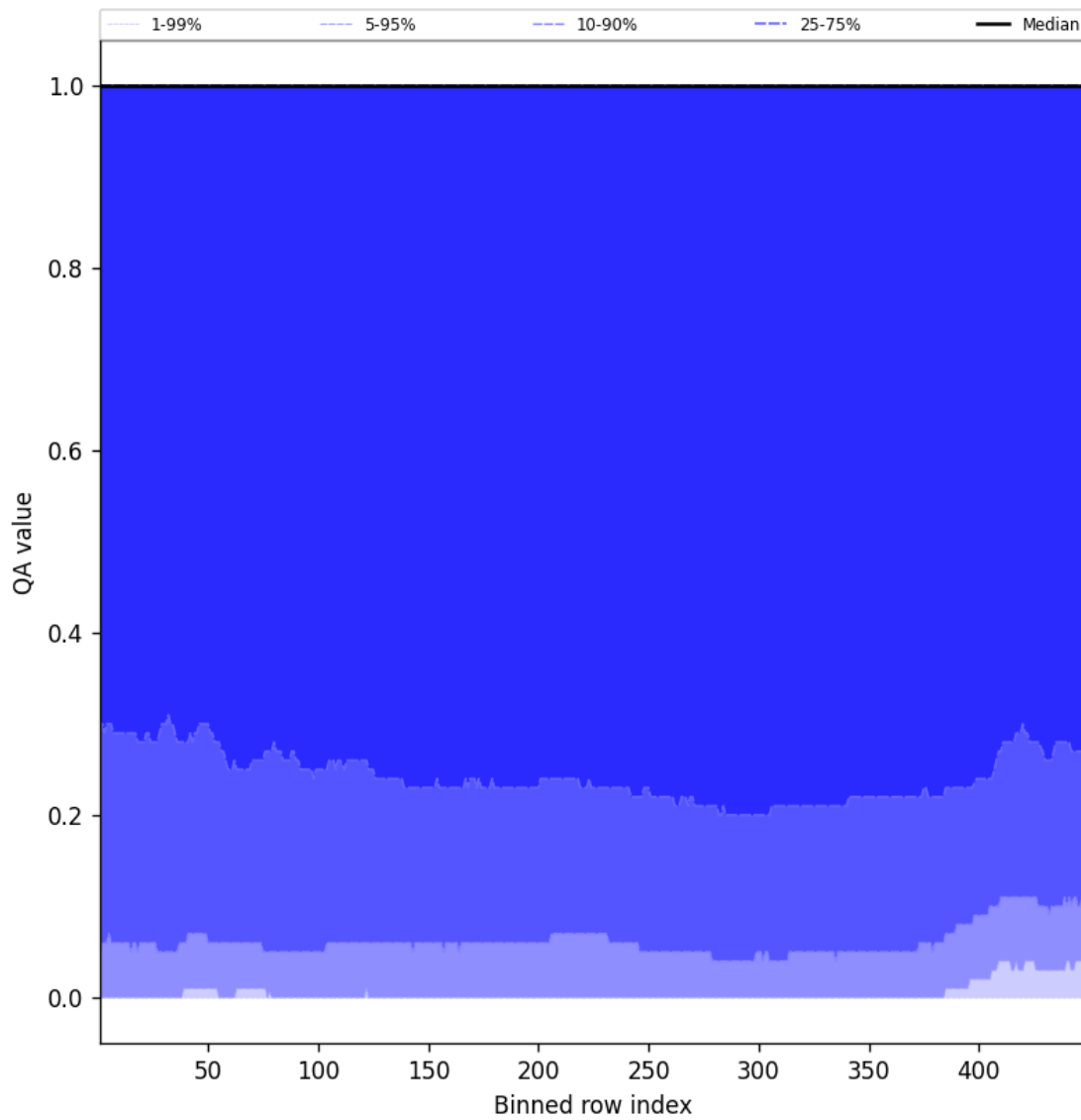


Figure 84: Along track statistics of “QA value” for 2025-07-16 to 2025-07-16

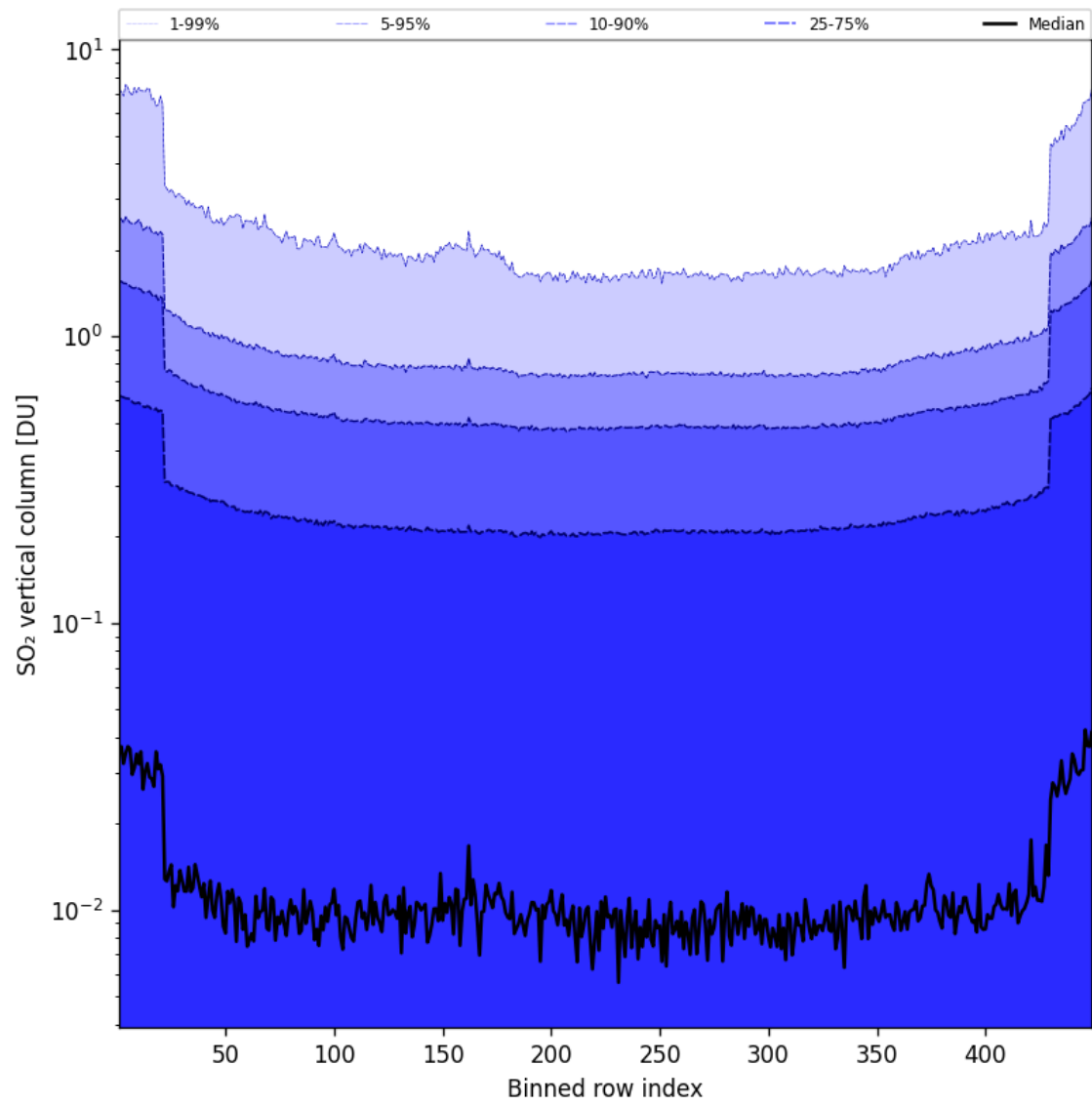


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-07-16 to 2025-07-16

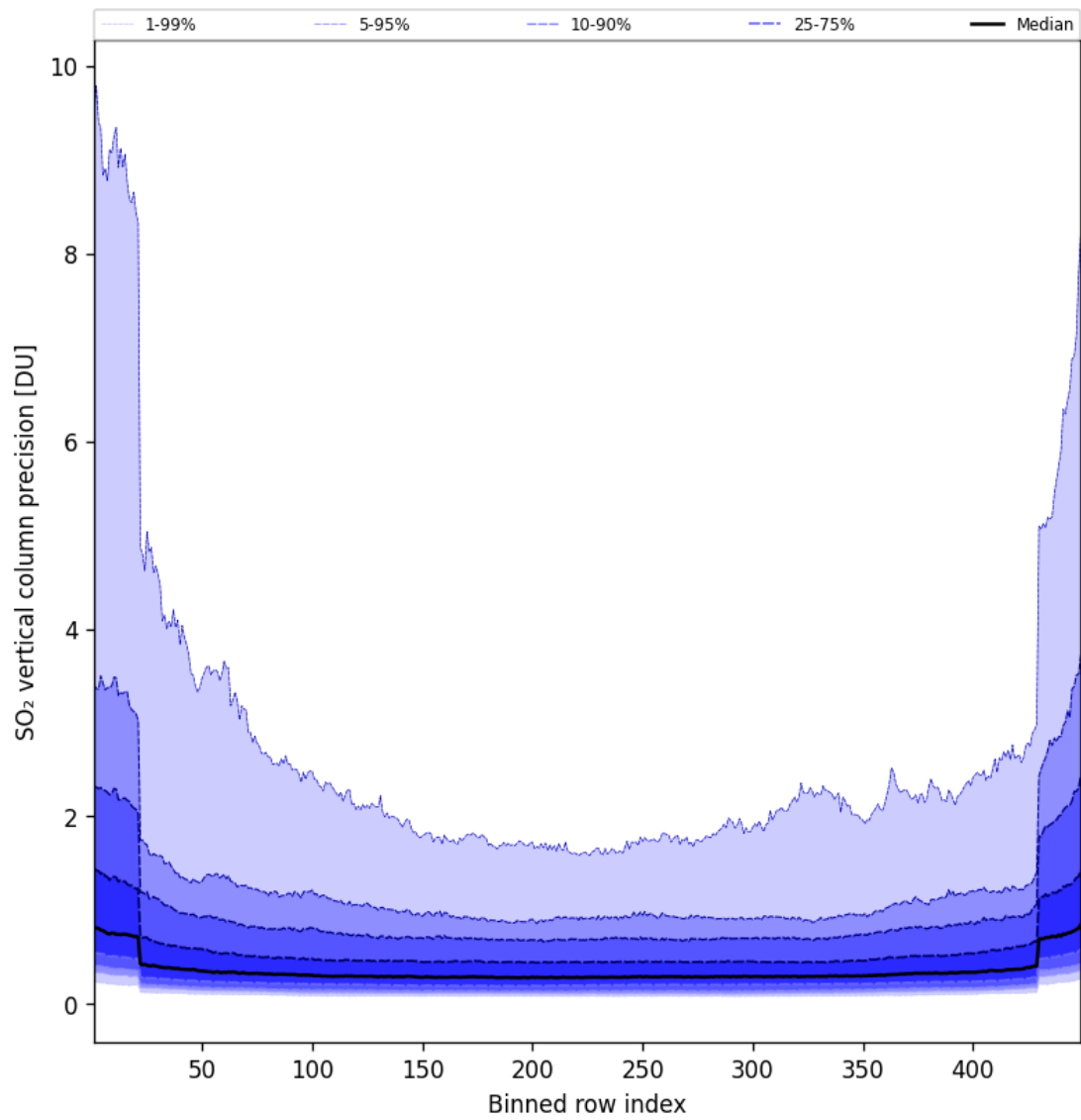


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-07-16 to 2025-07-16

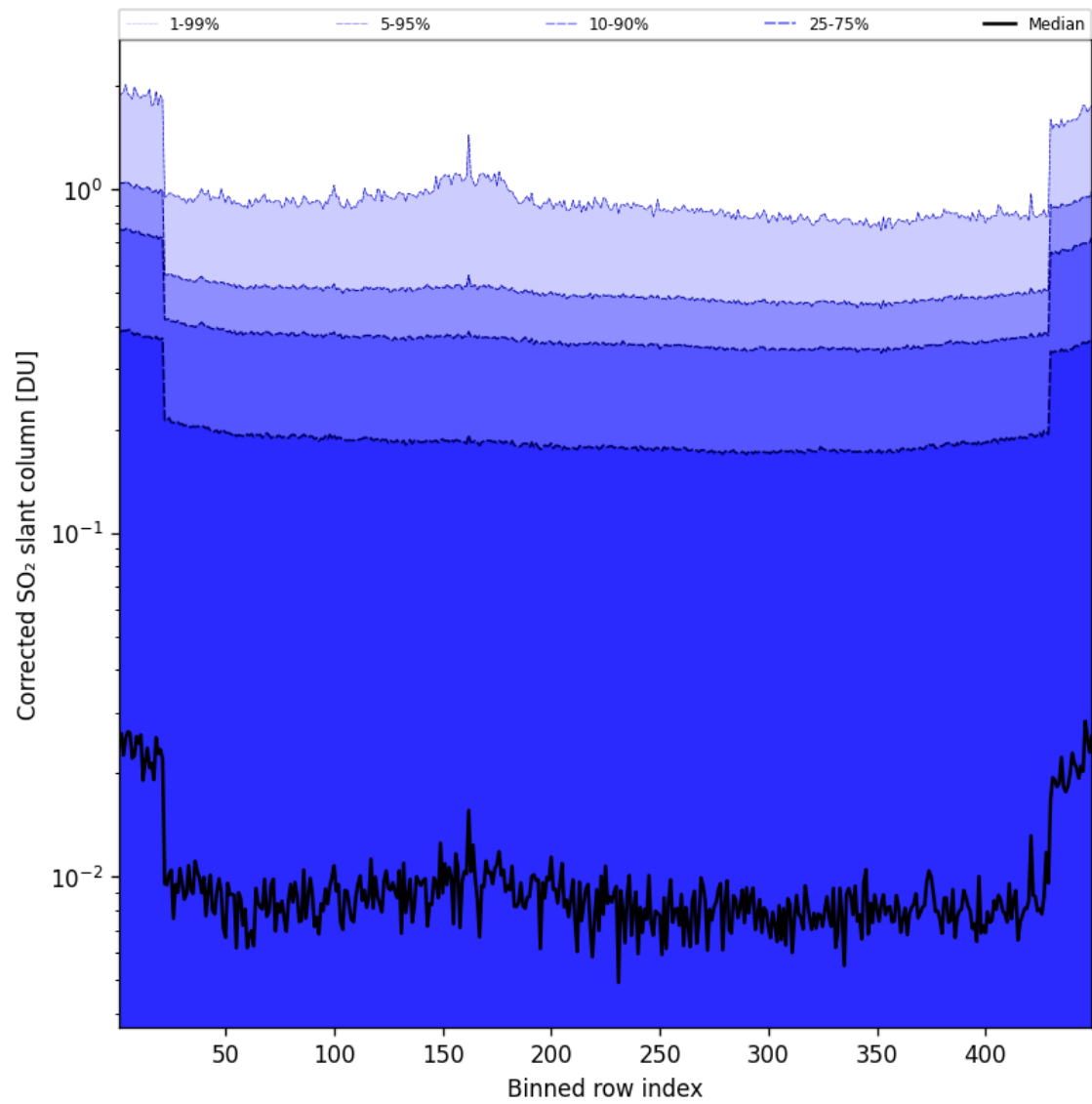


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-07-16 to 2025-07-16

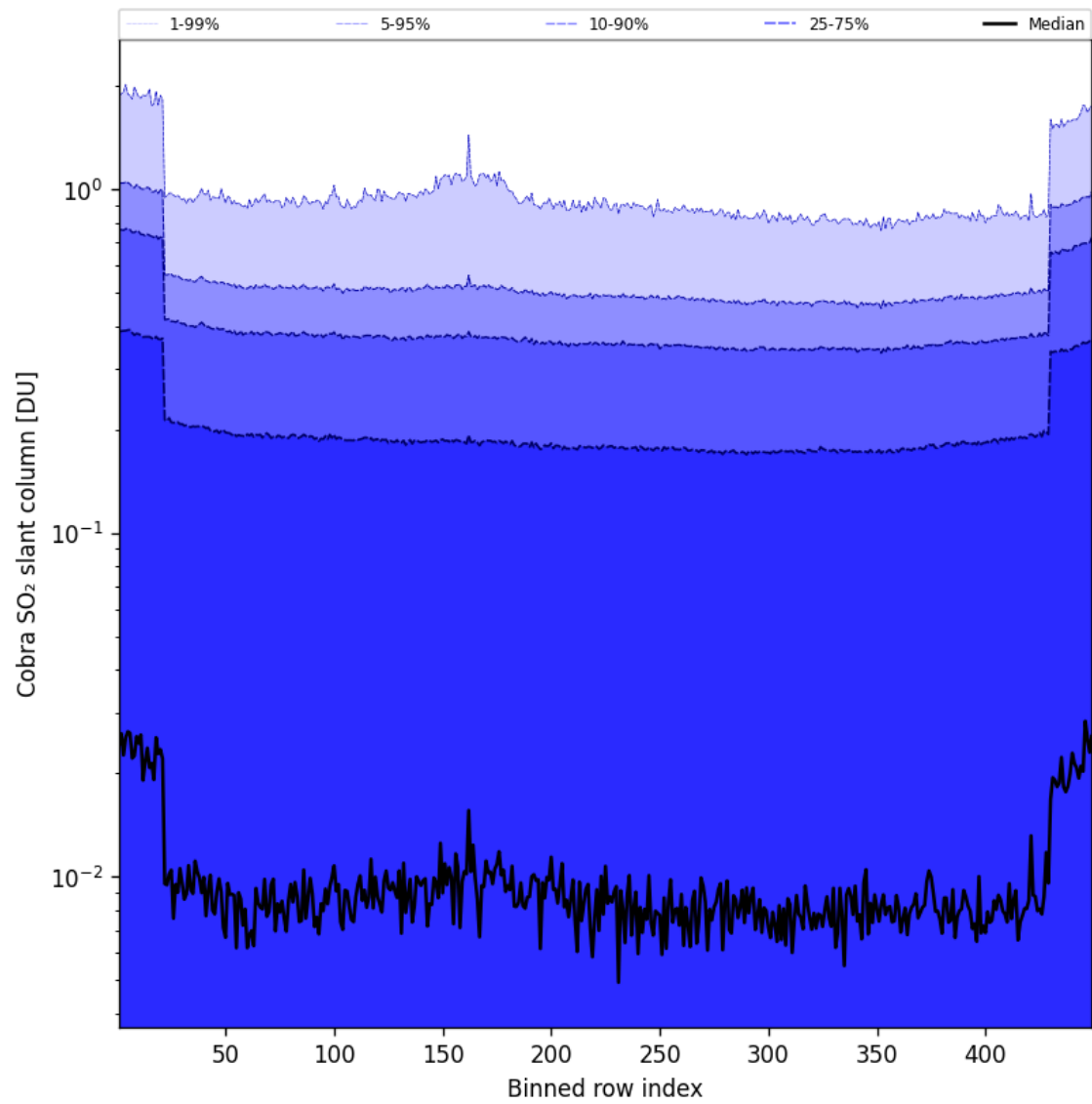


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-07-16 to 2025-07-16

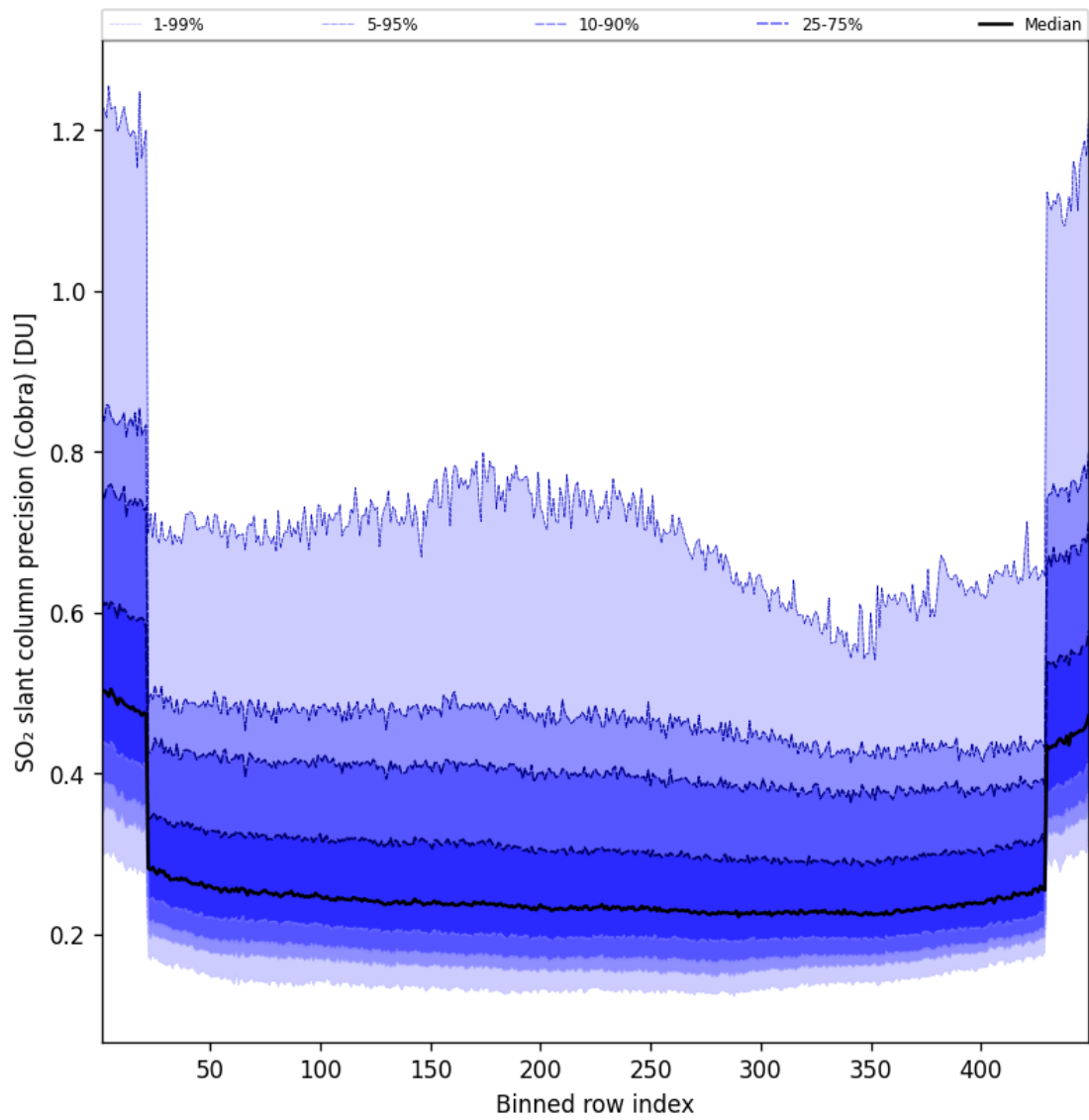


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-07-16 to 2025-07-16

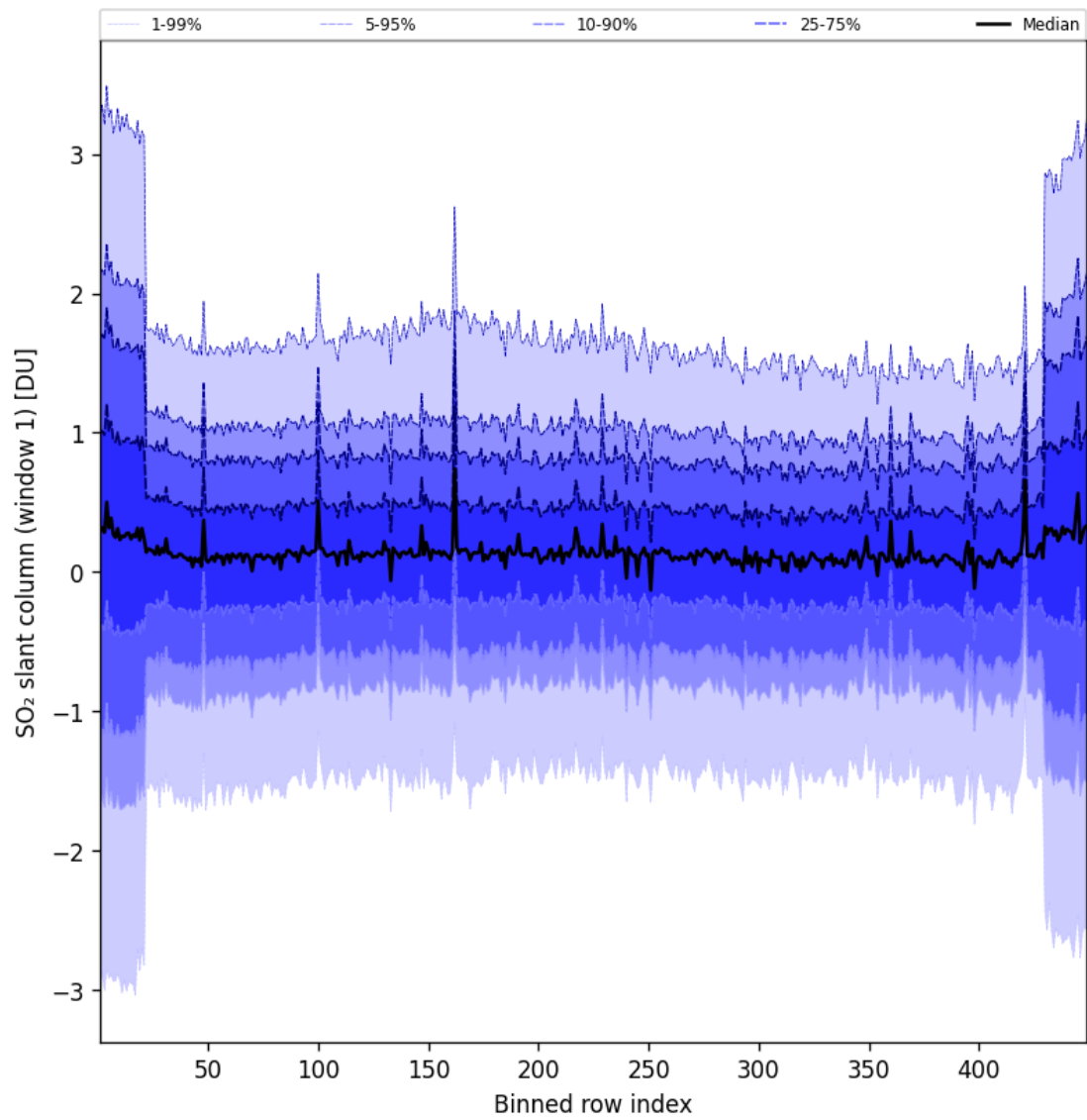


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-07-16 to 2025-07-16

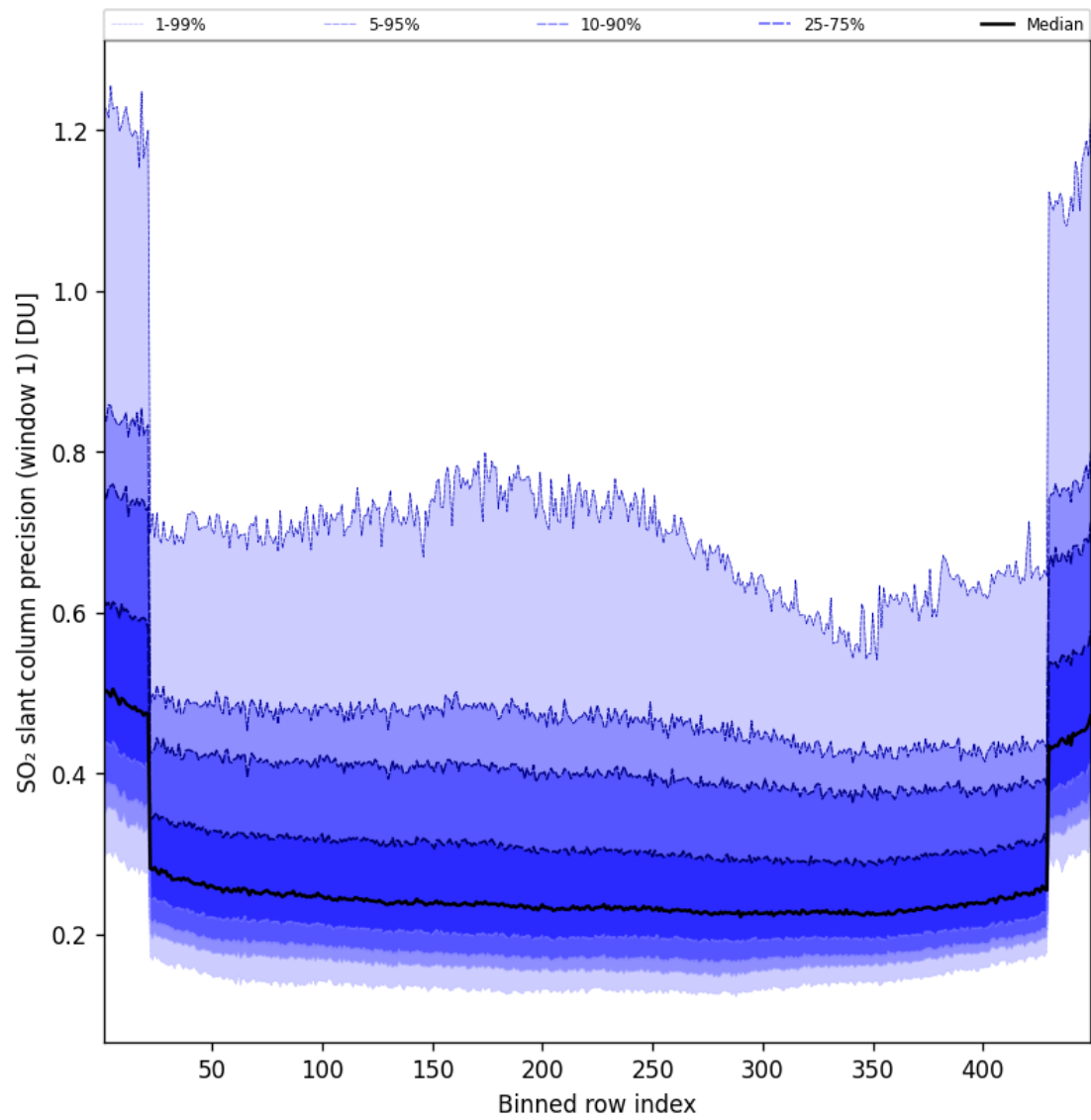


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-07-16 to 2025-07-16

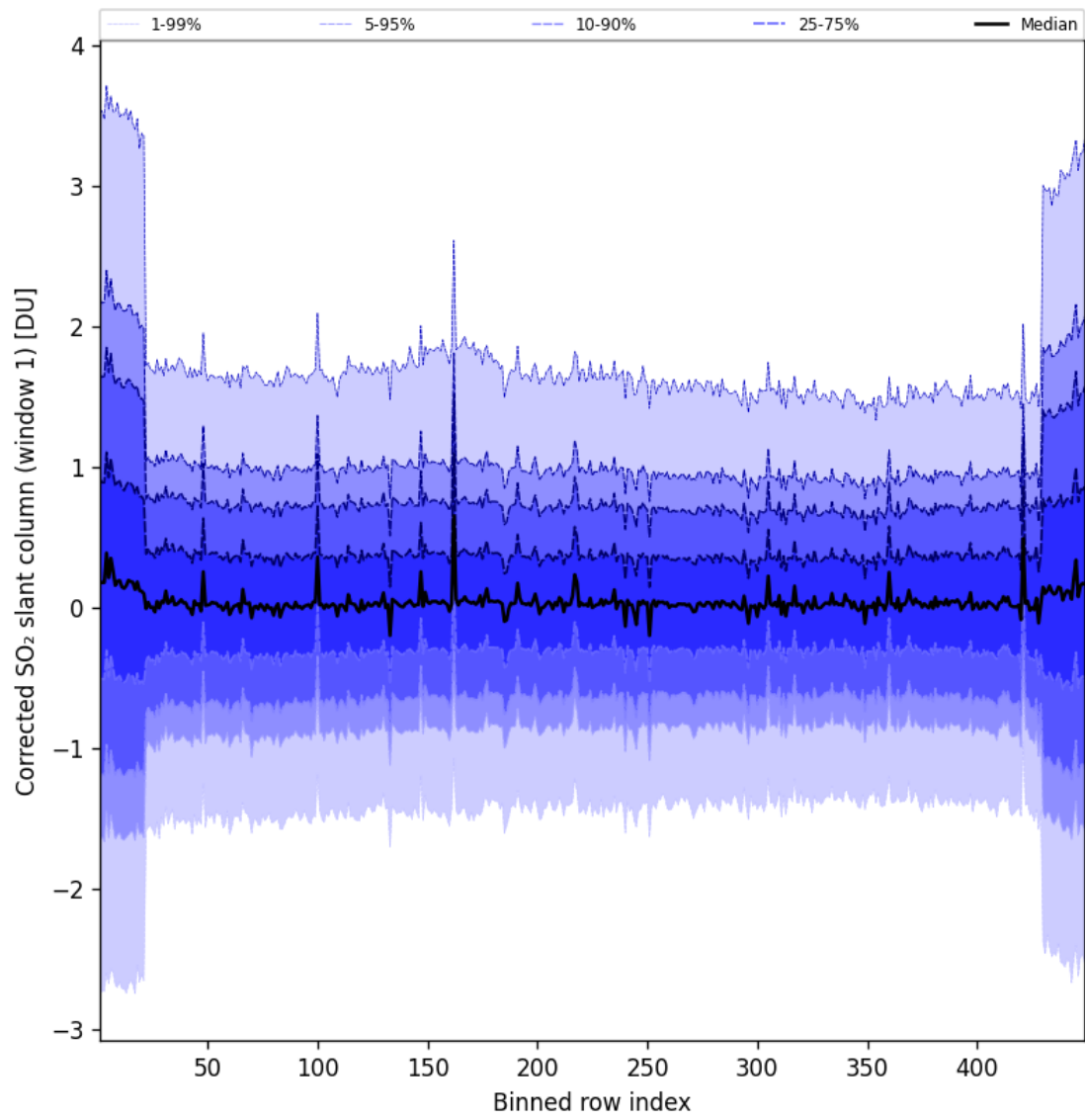


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-07-16 to 2025-07-16

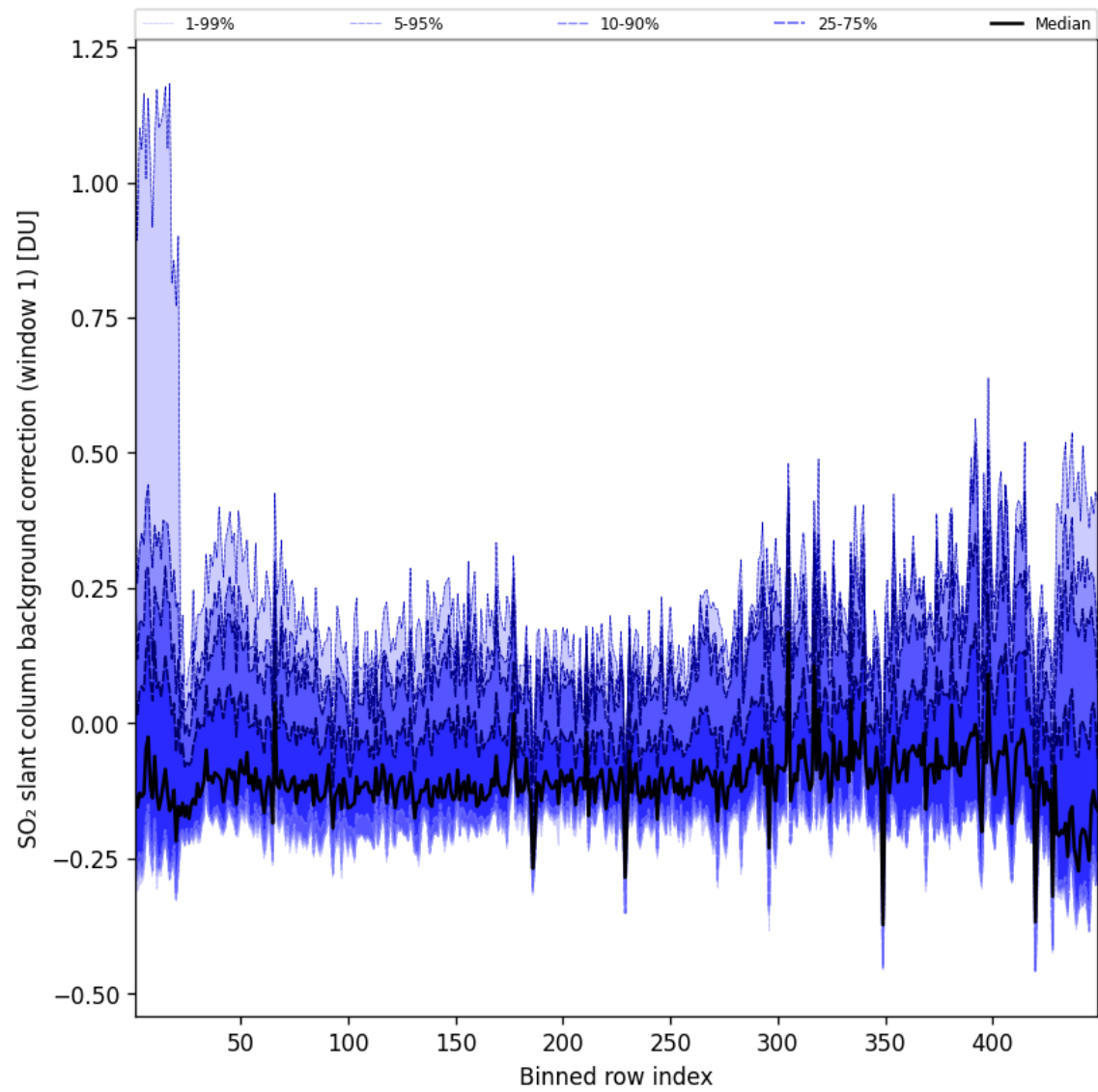


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-07-16 to 2025-07-16

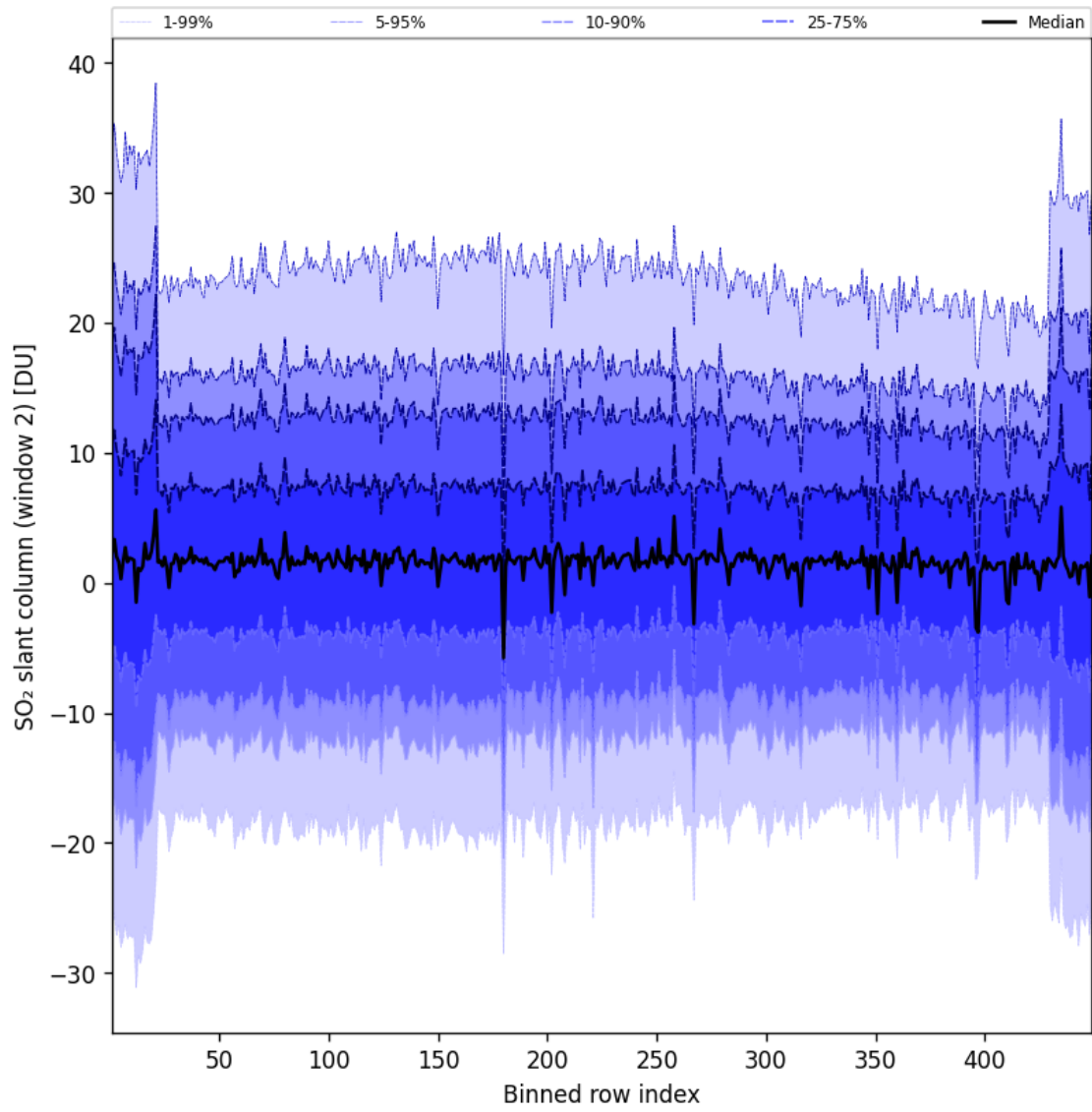


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-07-16 to 2025-07-16

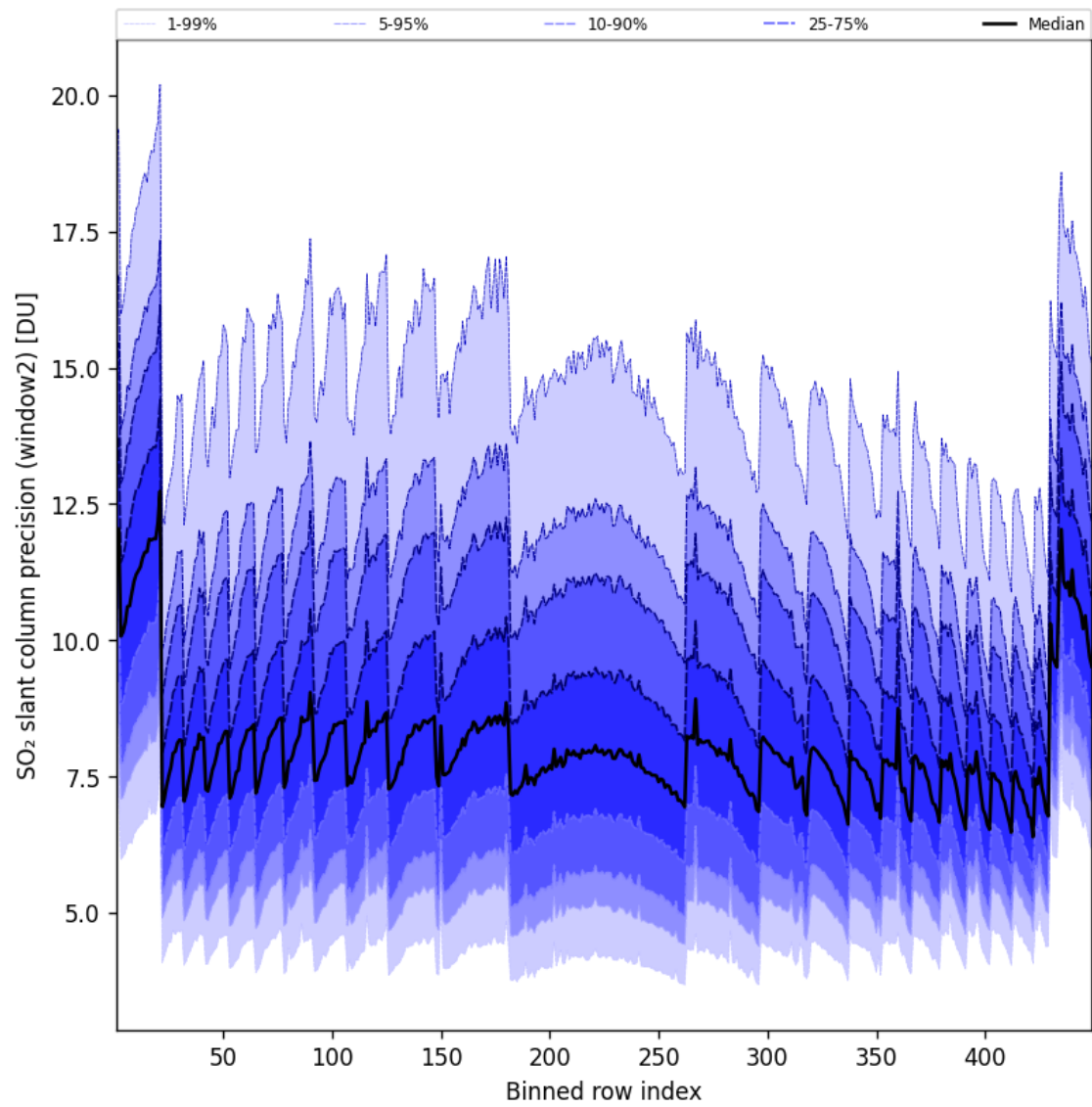


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-07-16 to 2025-07-16

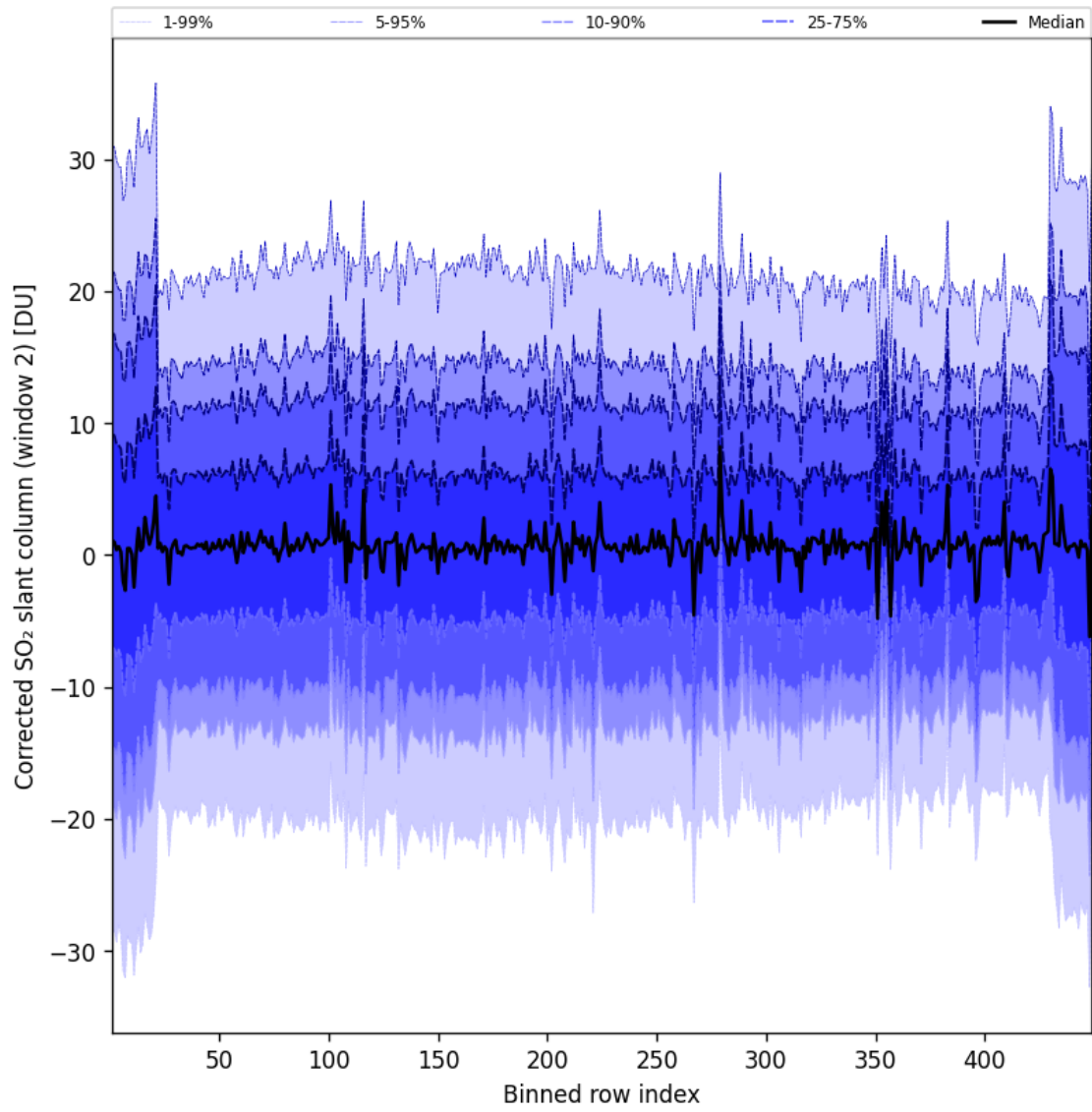


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-07-16 to 2025-07-16

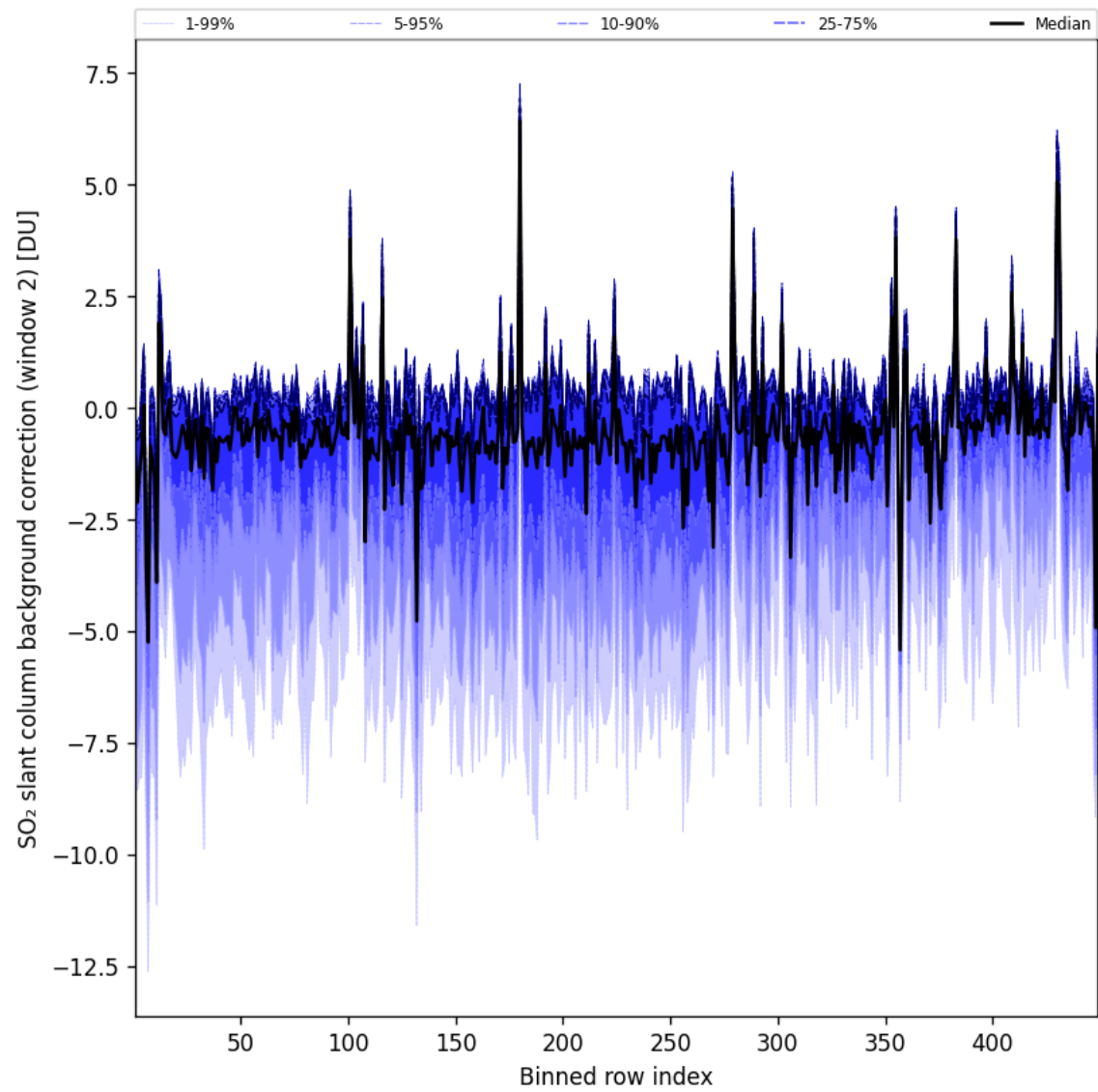


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-07-16 to 2025-07-16

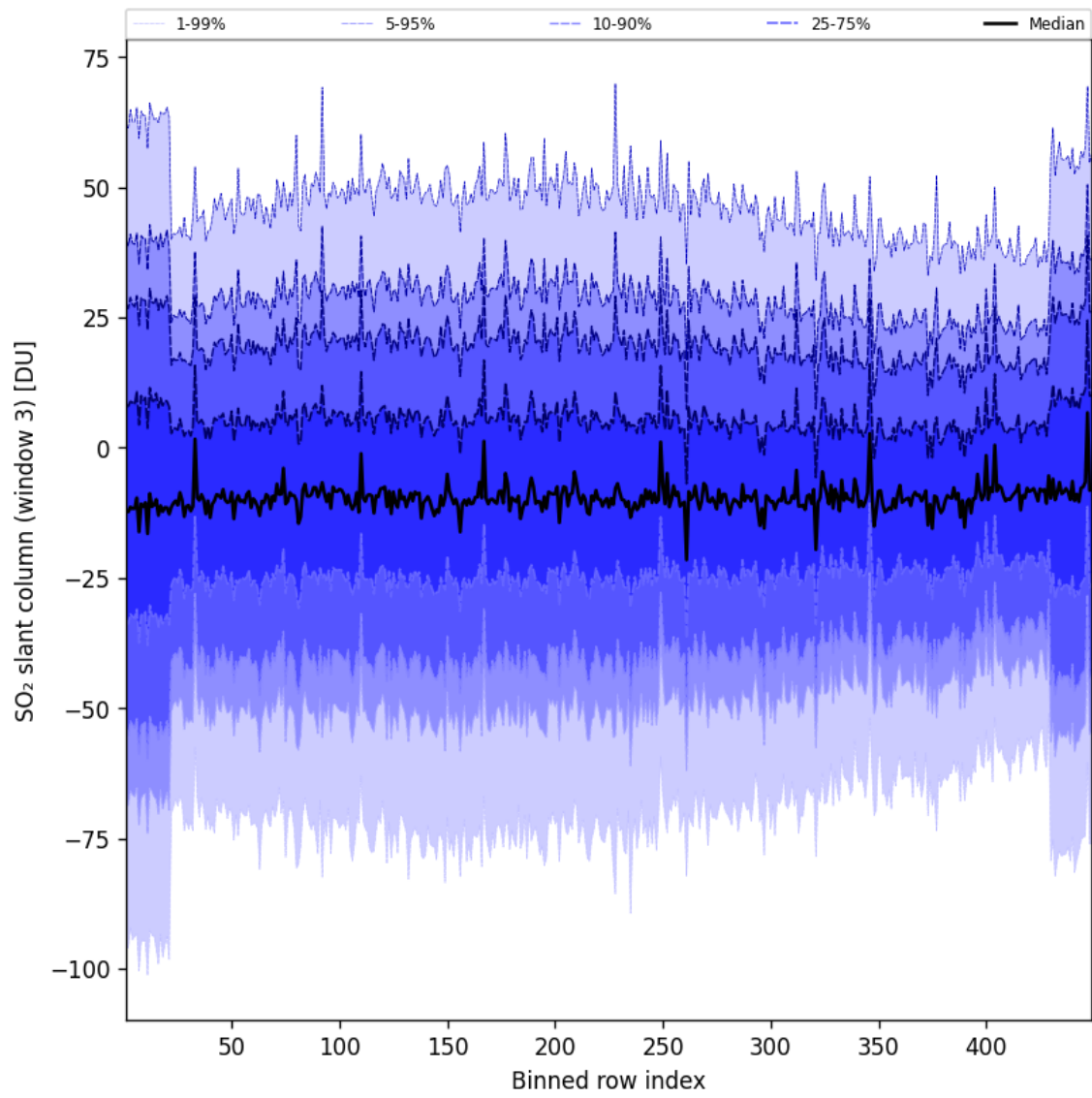


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-07-16 to 2025-07-16

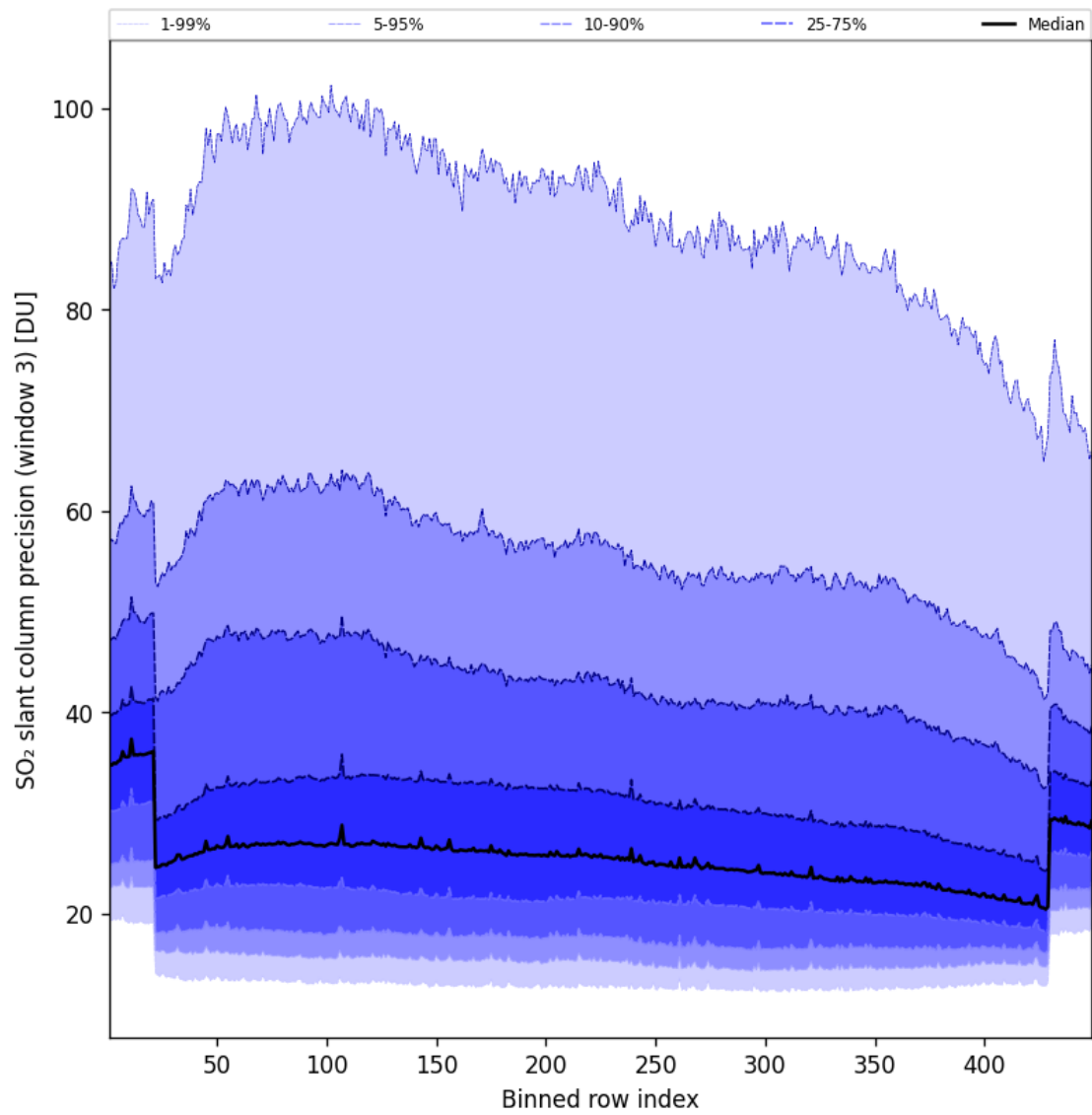


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-07-16 to 2025-07-16

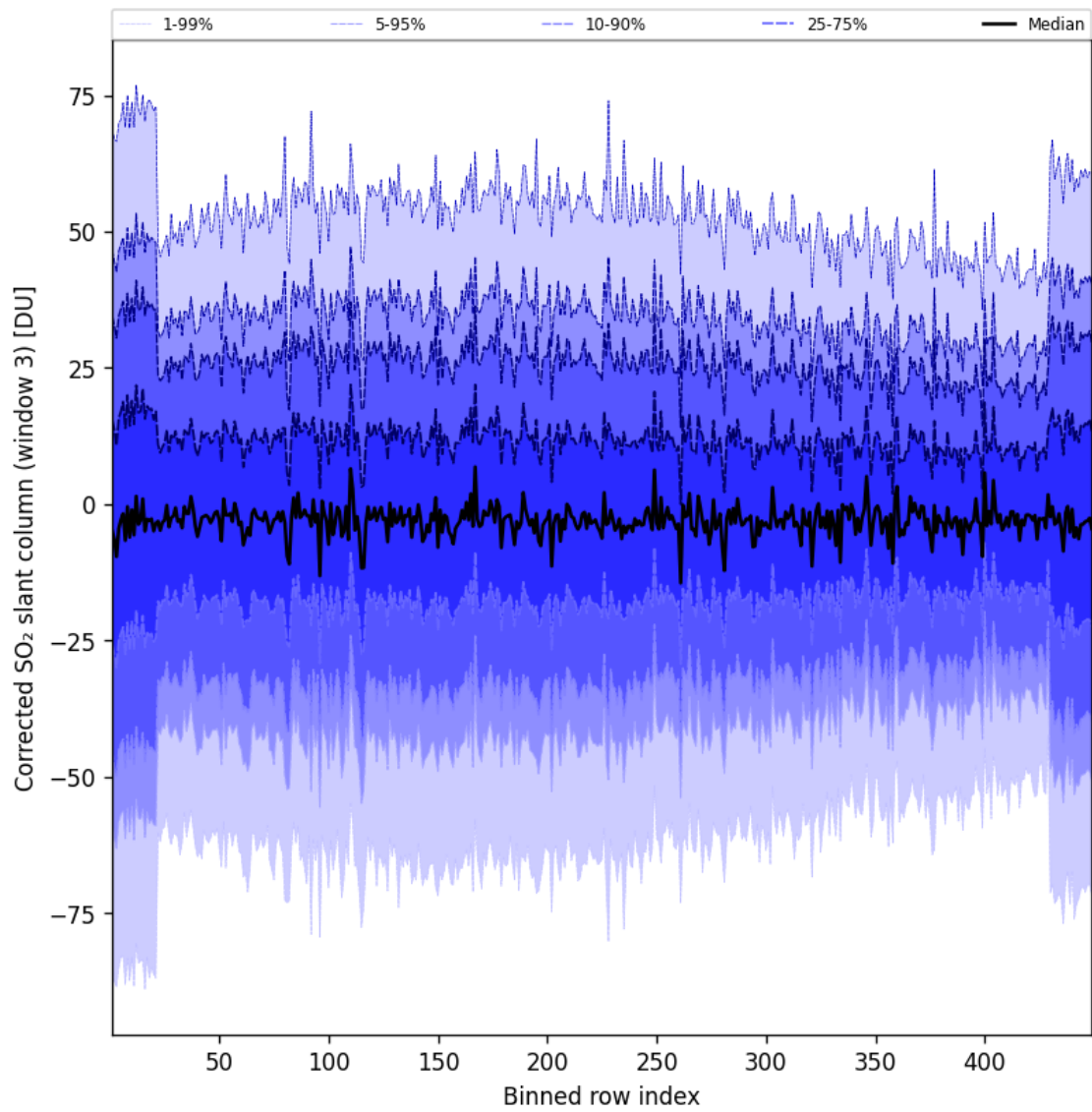


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-07-16 to 2025-07-16

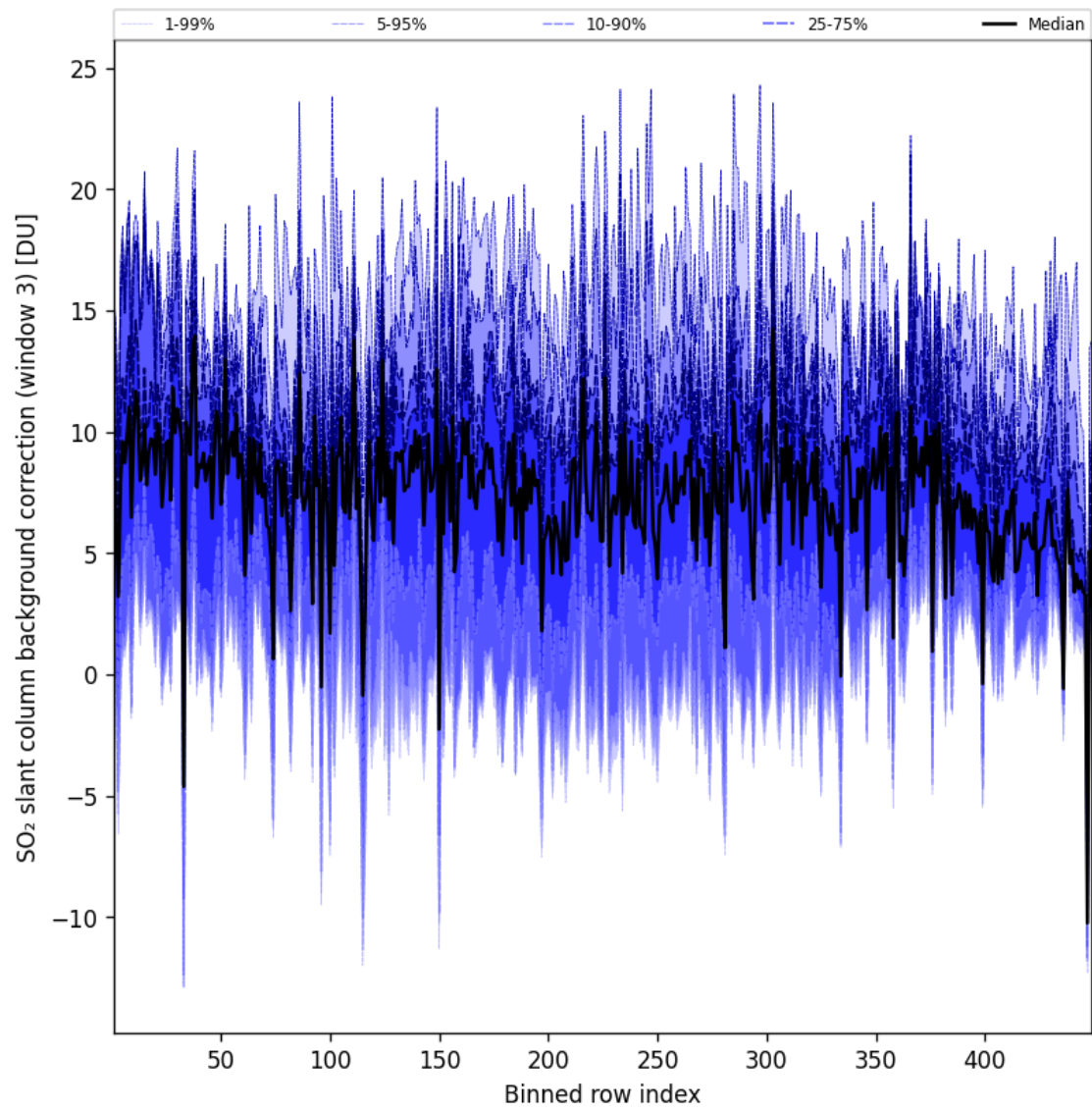


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-07-16 to 2025-07-16

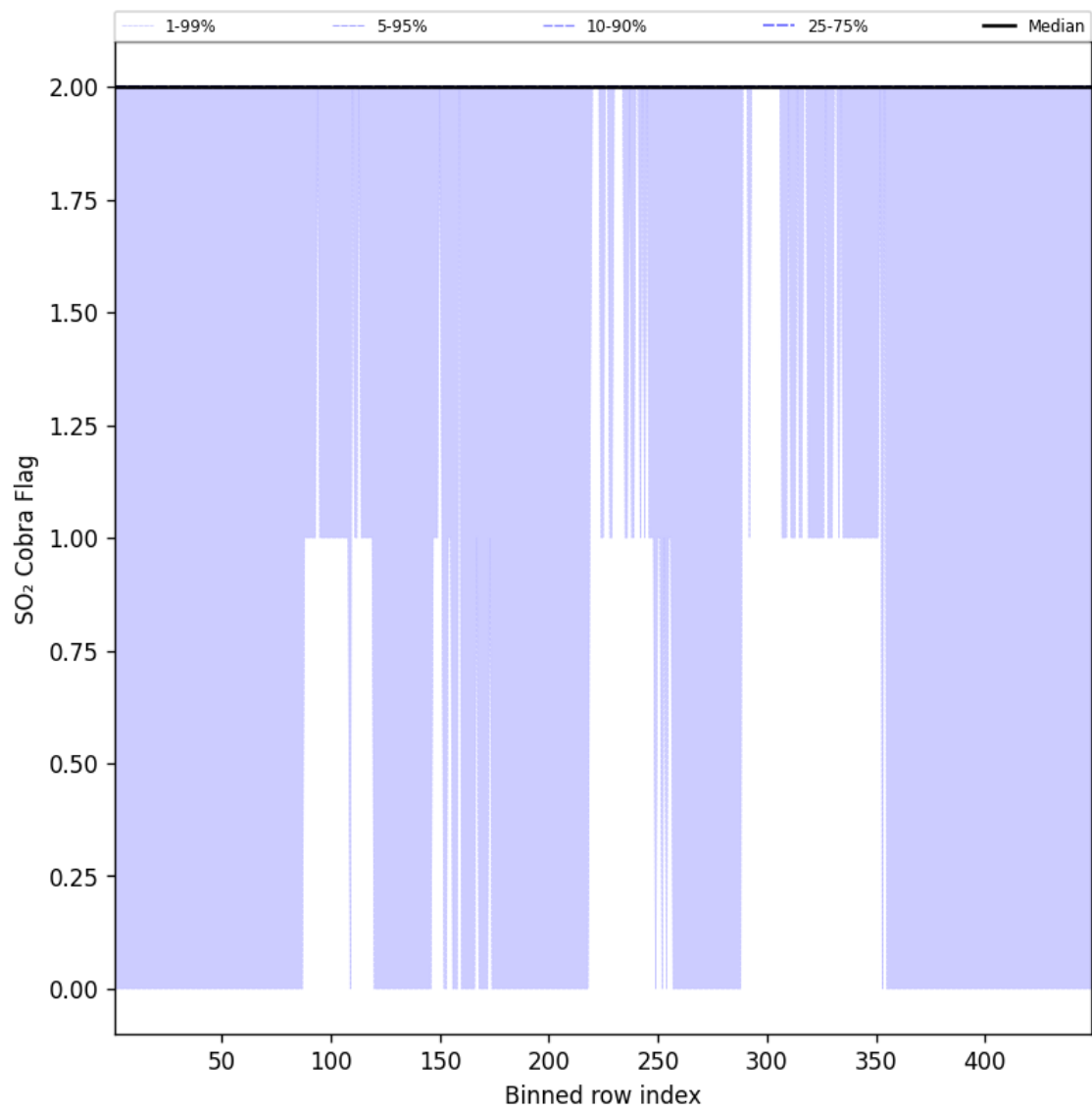


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-07-16 to 2025-07-16

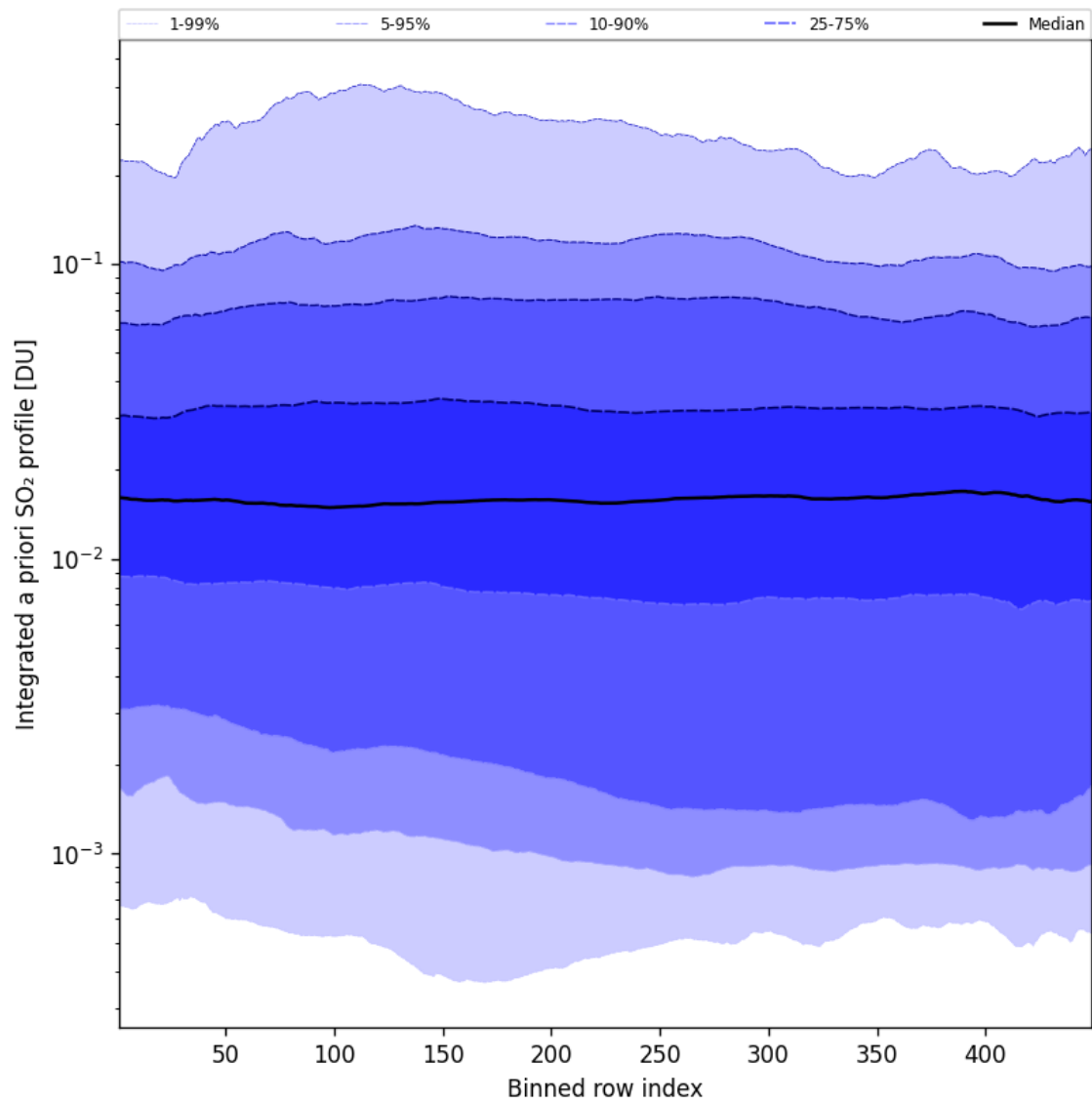


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-07-16 to 2025-07-16

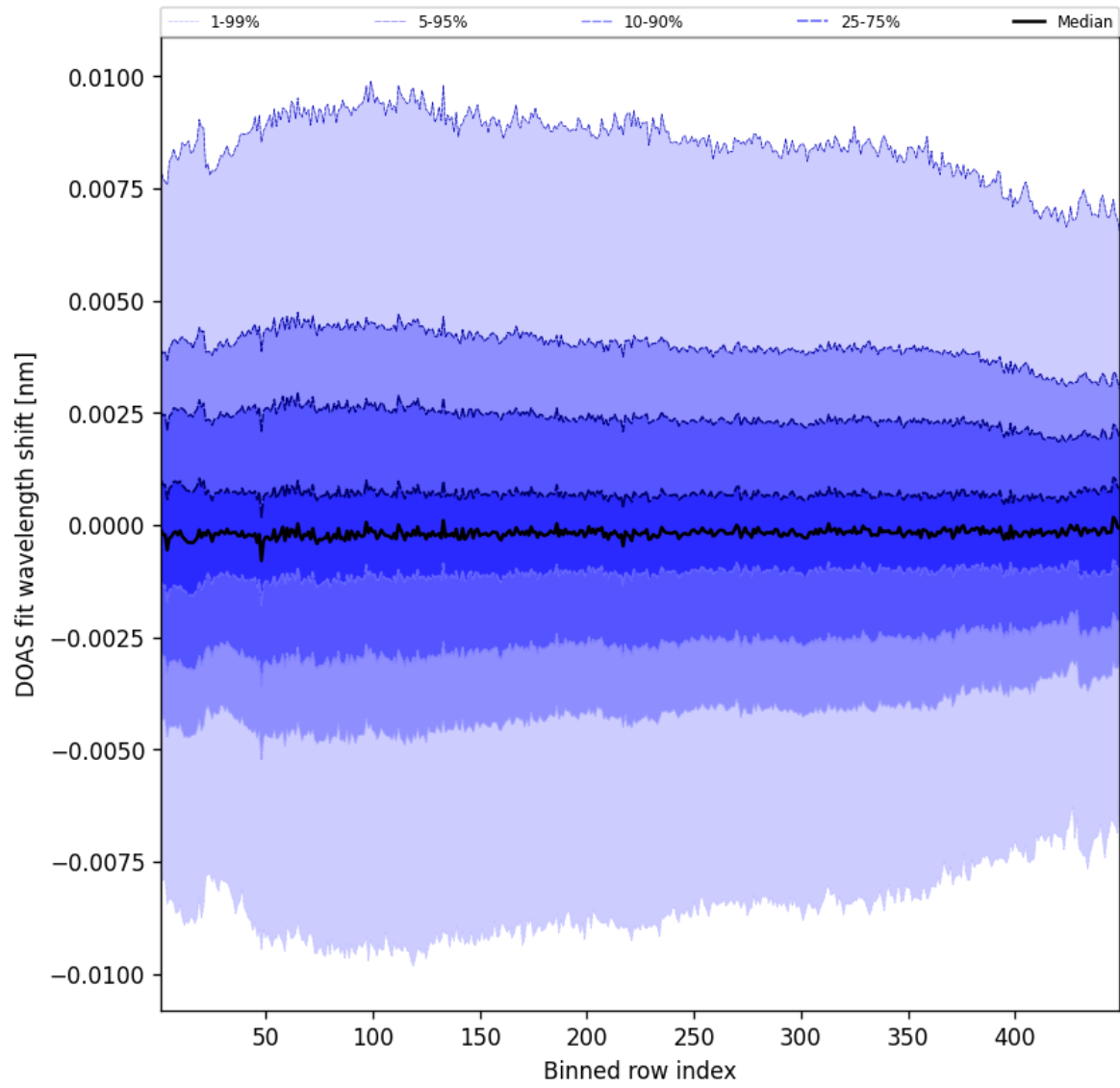


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-07-16 to 2025-07-16

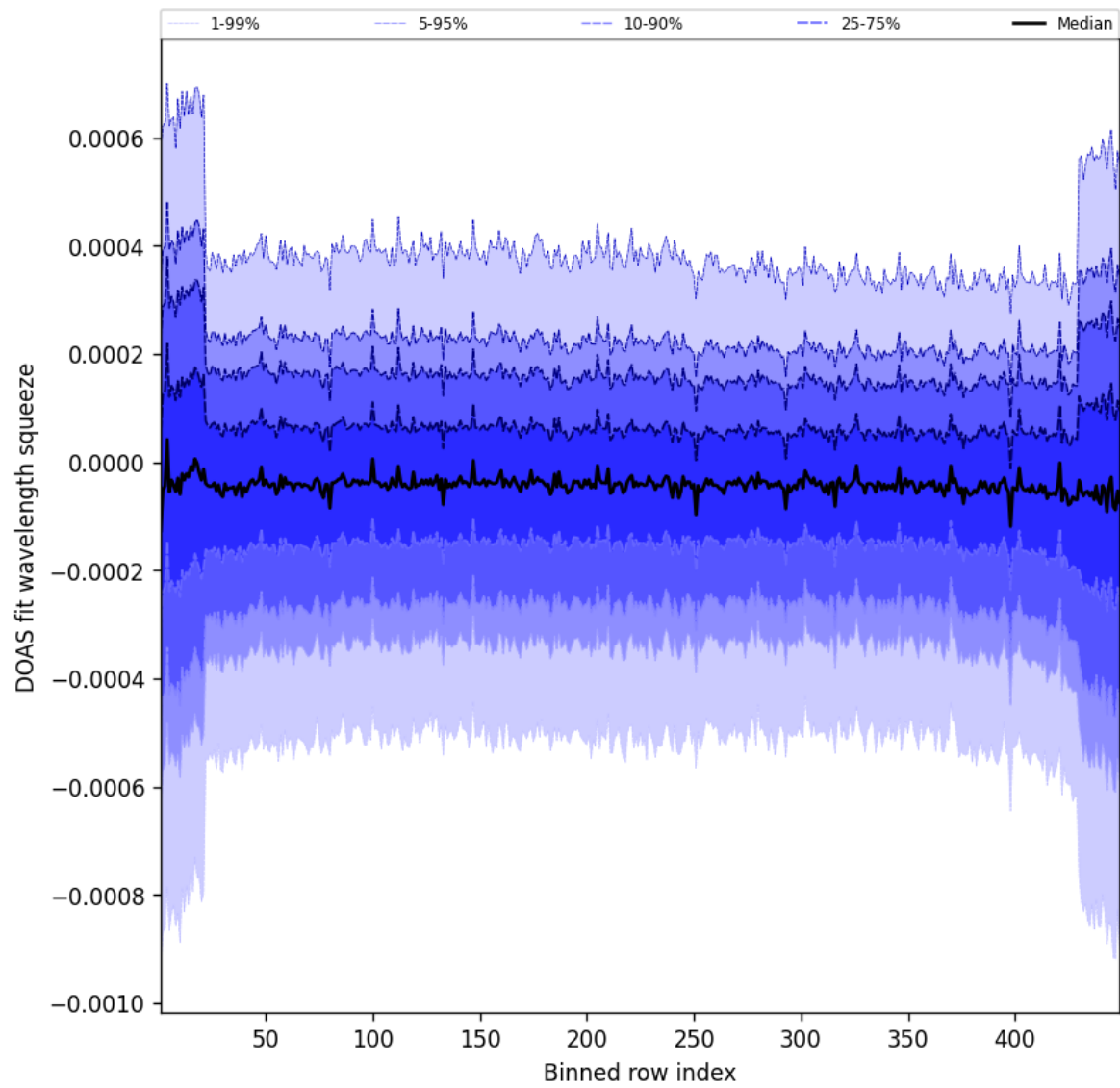


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-07-16 to 2025-07-16

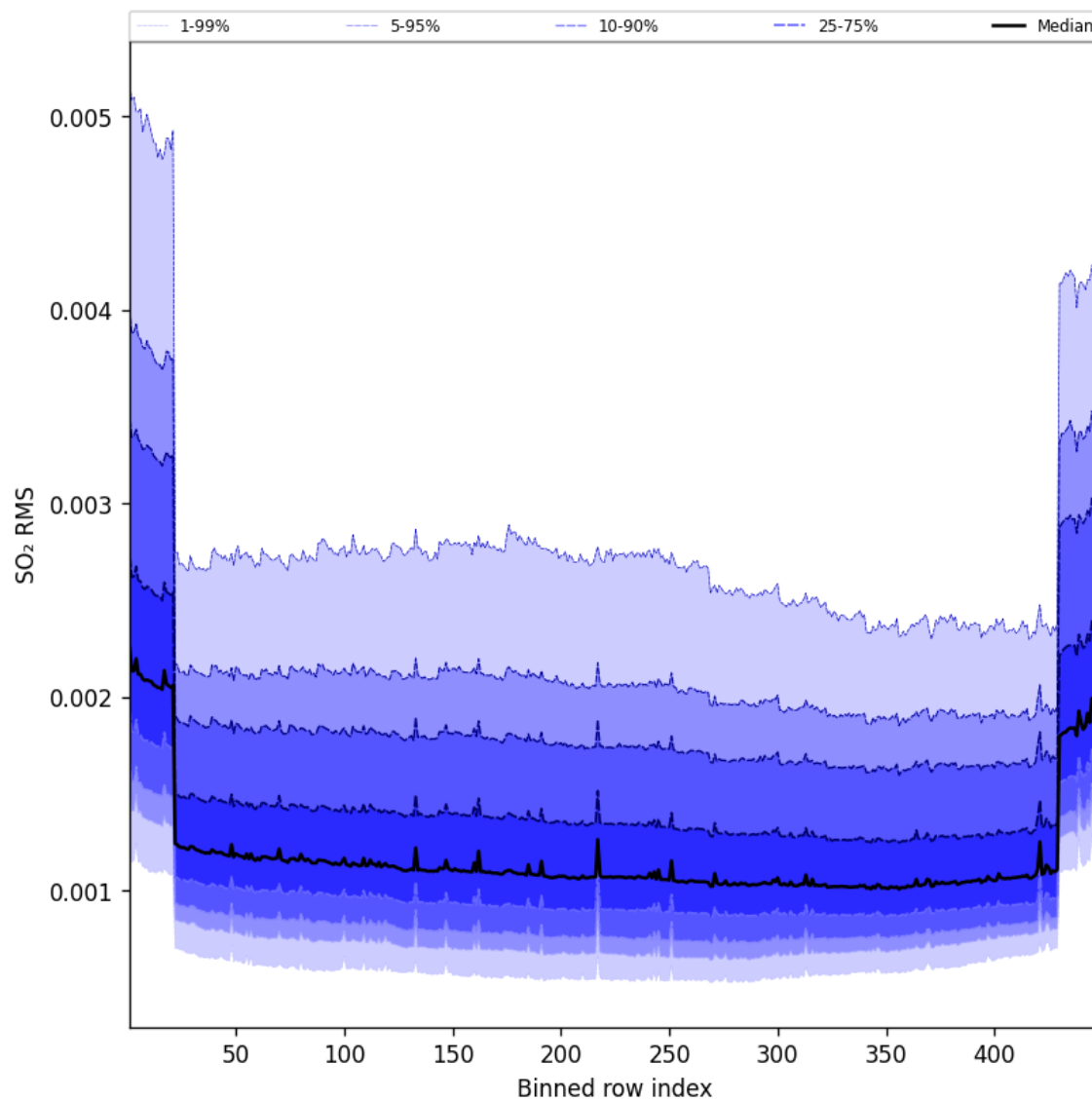


Figure 106: Along track statistics of “SO₂ RMS” for 2025-07-16 to 2025-07-16

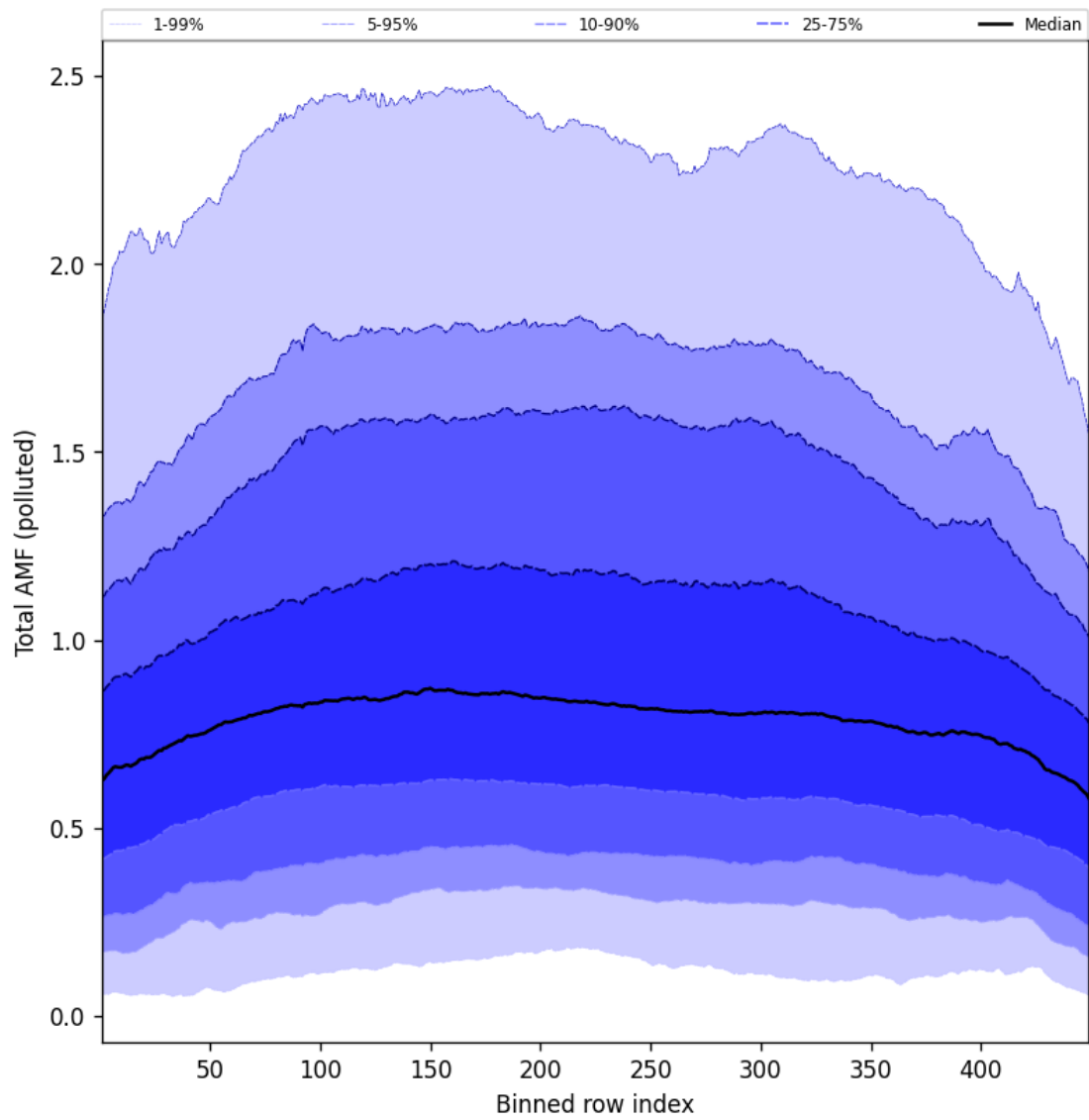


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-07-16 to 2025-07-16

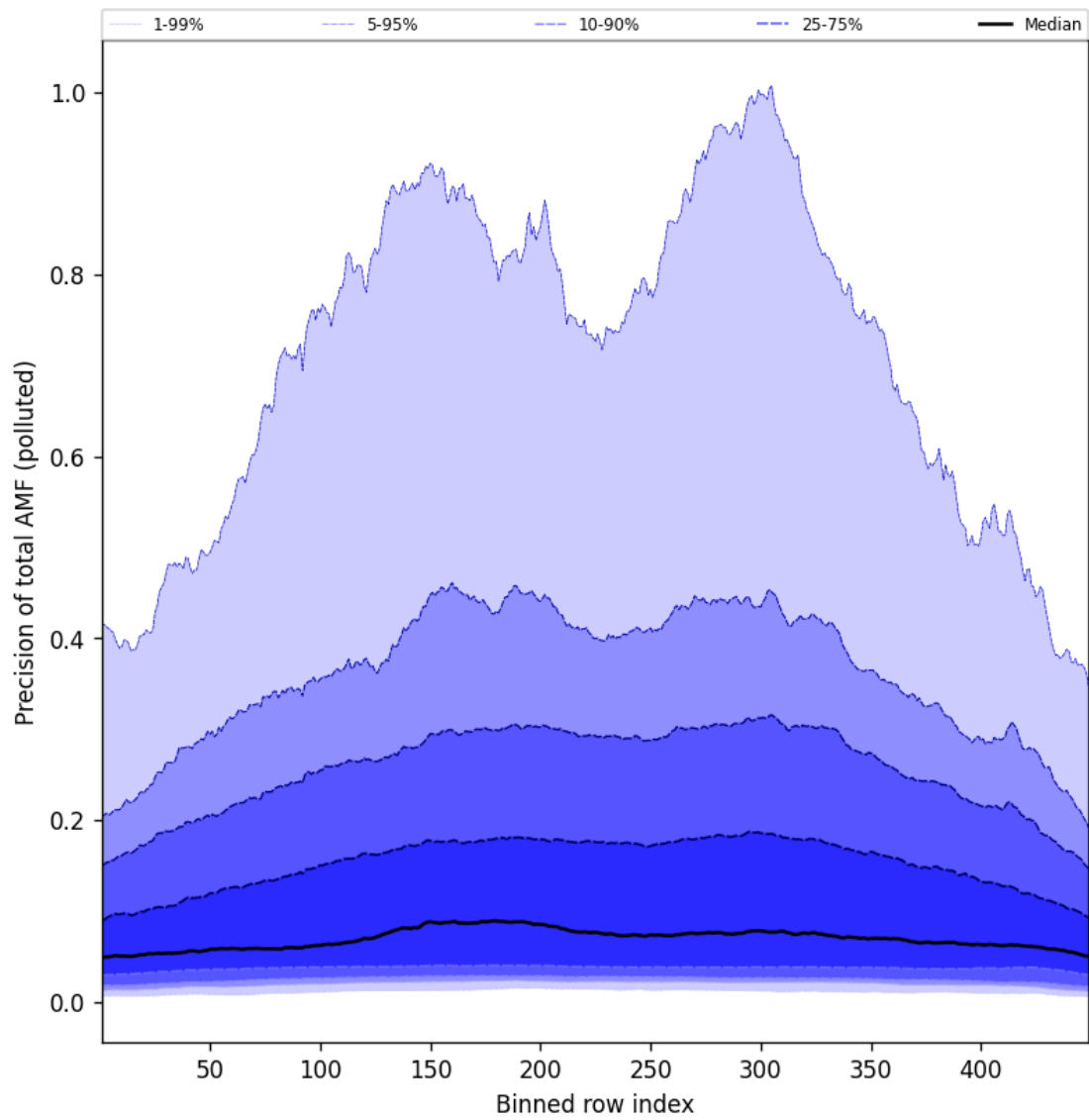


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-07-16 to 2025-07-16

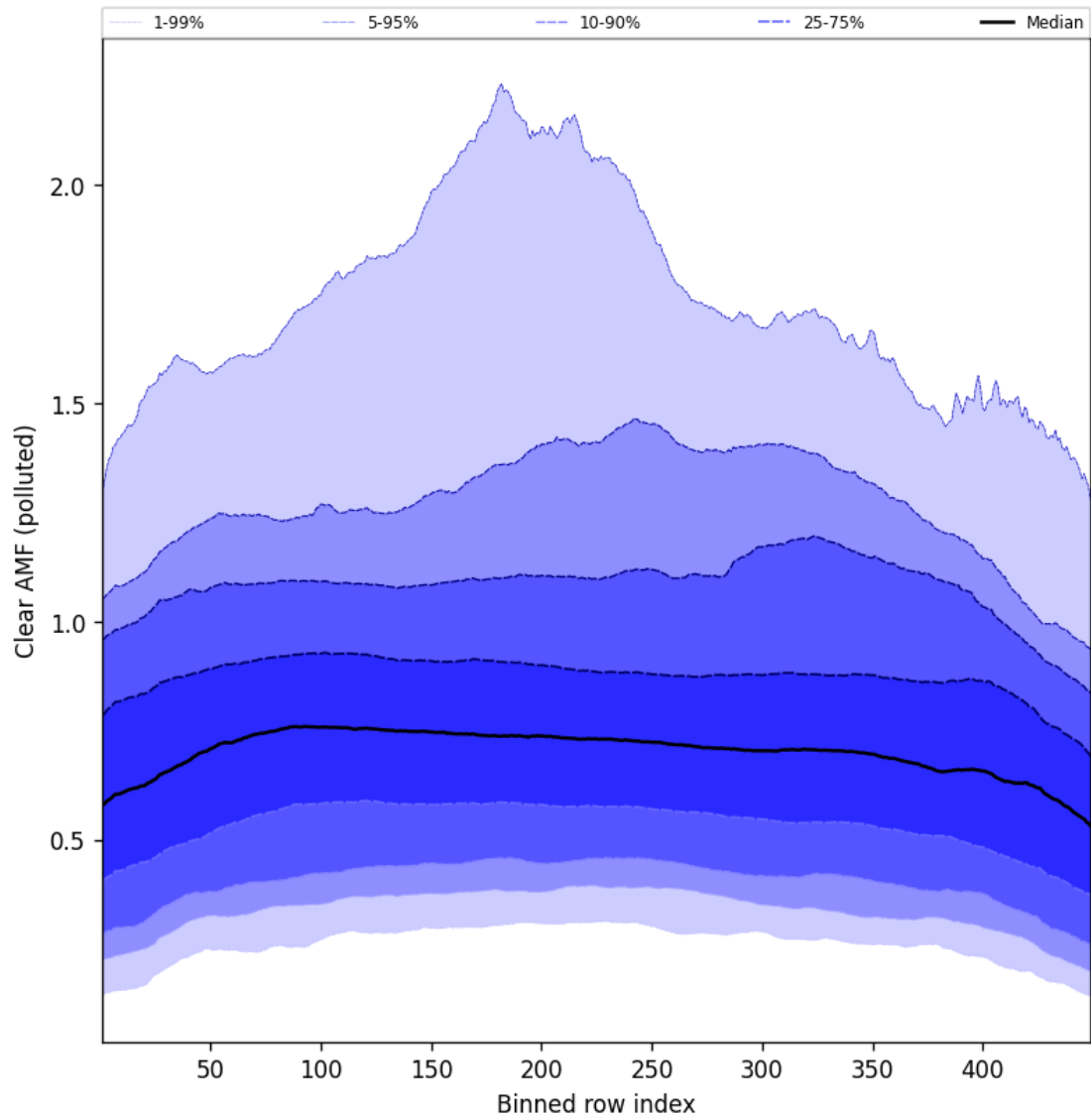


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-07-16 to 2025-07-16

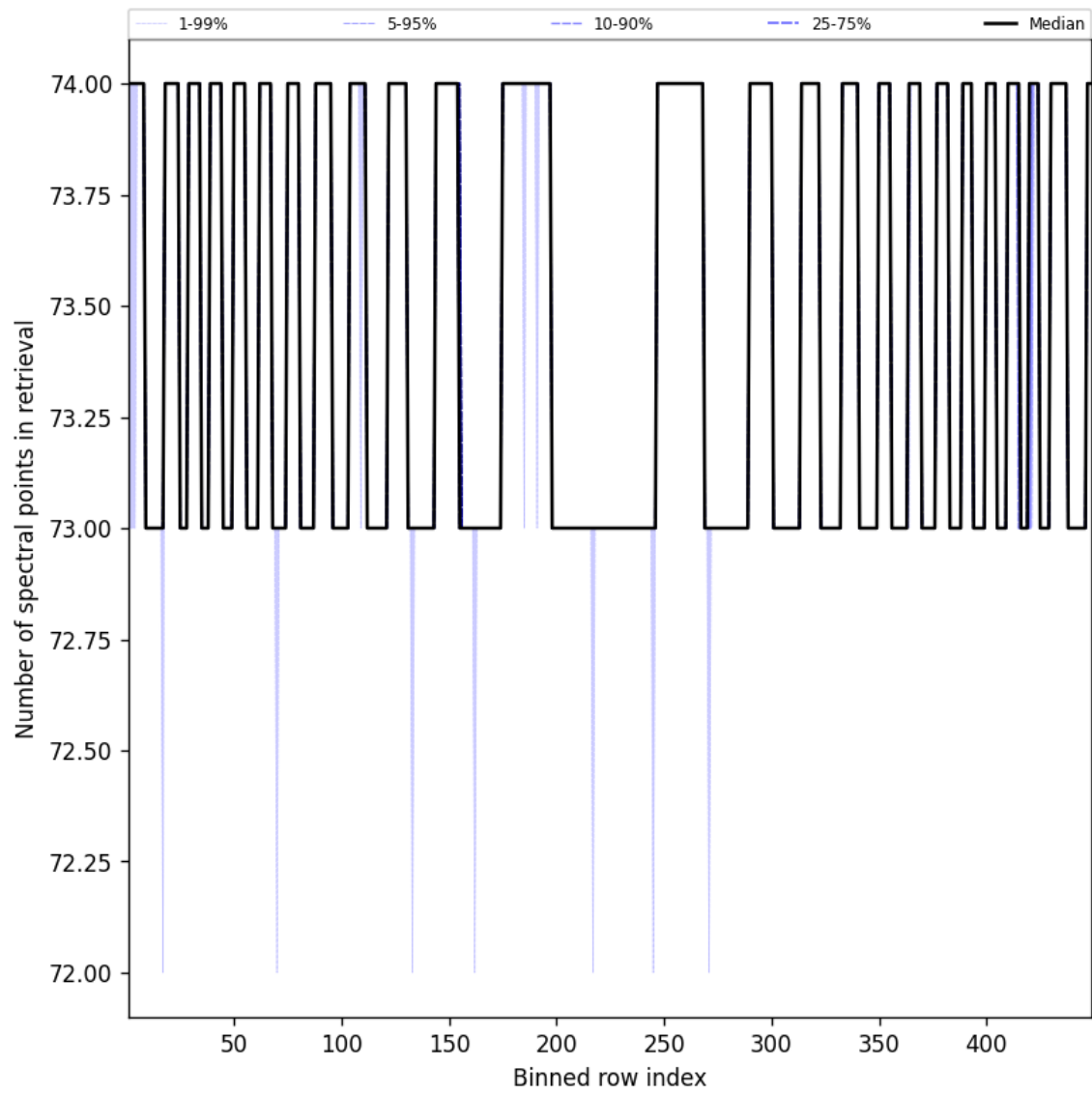


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-07-16 to 2025-07-16

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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