

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 $\frac{1}{2}$ in equation 3, other threshold values can be used. We report results for 1 %, 5 %, 10 %, 15.9 %, 25 %, 75 %, 84.1 %, 90 %, 95 % and 99 %. The inter quartile range is the difference between the 75 % and 25 % percentiles. Similarly the minimum and maximum values correspond to the 0 % and 100 % percentiles respectively.

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

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

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

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

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

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

Table 1: Parameterlist and basic statistics for the analysis

Variable	mean $\pm \sigma$	Count	Mode	IQR	Median	Minimum	Maximum
qa value [1]	0.630 ± 0.417	16909973	0.995	0.810	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.733 \pm 112.971) \times 10^{-2}$	16909973	0.249	0.435	8.347×10^{-3}	-84.9	585
sulfurdioxide total vertical column precision [DU]	0.554 ± 0.846	16909973	0.197	0.362	0.314	2.446×10^{-2}	32.8
sulfurdioxide slant column density corrected [DU]	$(1.338 \pm 37.320) \times 10^{-2}$	16909973	0.267	0.363	7.843×10^{-3}	-16.2	467
sulfurdioxide slant column density cobra [DU]	$(1.330 \pm 33.539) \times 10^{-2}$	16909973	0.267	0.363	7.843×10^{-3}	-16.2	50.7
sulfurdioxide slant column density cobra precision [DU]	0.287 ± 0.115	16909973	0.213	0.119	0.254	7.183×10^{-2}	18.0
sulfurdioxide slant column density window1 [DU]	0.111 ± 0.646	16909973	0.125	0.737	0.115	-70.2	62.2
sulfurdioxide slant column density window1 precision [DU]	0.287 ± 0.115	16909973	0.213	0.119	0.254	7.183×10^{-2}	18.0
sulfurdioxide slant column density corrected win1 [DU]	$(-8.030 \pm 639.050) \times 10^{-3}$	16909973	-2.500×10^{-2}	0.723	-1.992×10^{-2}	-70.2	62.0
background so2 slant column offset window1 [DU]	-0.119 ± 0.124	16909973	-0.140	0.150	-0.132	-1.12	3.58
sulfurdioxide slant column density window2 [DU]	0.726 ± 8.957	16909973	0.250	11.4	0.623	-1.054×10^3	640
sulfurdioxide slant column density window2 precision [DU]	8.11 ± 2.22	16909973	7.43	2.56	7.76	2.22	651
sulfurdioxide slant column density corrected win2 [DU]	-0.606 ± 8.781	16909973	-0.250	11.2	-0.611	-1.054×10^3	640
background so2 slant column offset window2 [DU]	-1.33 ± 2.31	16909973	0.750	3.53	-0.791	-14.0	6.43
sulfurdioxide slant column density window3 [DU]	-2.00 ± 24.15	16909973	-2.80	30.2	-2.15	-274	831
sulfurdioxide slant column density window3 precision [DU]	28.5 ± 13.2	16909973	22.5	9.87	24.9	10.6	247
sulfurdioxide slant column density corrected win3 [DU]	4.04 ± 23.38	16909973	2.80	29.0	4.12	-276	829
background so2 slant column offset window3 [DU]	6.04 ± 6.39	16909973	0.560	10.2	5.51	-10.3	29.0
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	16909973	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.464 \pm 8.979) \times 10^{-2}$	16909973	1.664×10^{-2}	1.853×10^{-2}	1.355×10^{-2}	7.306×10^{-4}	2.37
fitted radiance shift [nm]	$(-5.535 \pm 25.954) \times 10^{-4}$	16909973	-5.000×10^{-4}	1.827×10^{-3}	-5.896×10^{-4}	-6.864×10^{-2}	4.311×10^{-2}
fitted radiance squeeze [1]	$(-4.604 \pm 180.292) \times 10^{-6}$	16909973	1.000×10^{-5}	2.107×10^{-4}	1.358×10^{-6}	-1.434×10^{-2}	1.321×10^{-2}
fitted root mean square [1]	$(1.260 \pm 0.473) \times 10^{-3}$	16909973	9.750×10^{-4}	4.934×10^{-4}	1.138×10^{-3}	3.489×10^{-4}	5.144×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.916 ± 0.550	16909973	0.700	0.636	0.806	5.000×10^{-2}	3.41
sulfurdioxide total air mass factor polluted precision [1]	0.122 ± 0.115	16909973	3.500×10^{-2}	0.137	8.039×10^{-2}	2.819×10^{-3}	1.58
sulfurdioxide clear air mass factor polluted [1]	0.771 ± 0.437	16909973	0.580	0.412	0.688	5.307×10^{-2}	3.44
number of spectral points in retrieval [1]	73.4 ± 0.5	16909973	73.0	1.000	73.0	52.0	74.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	3.000×10^{-2}	8.000×10^{-2}	0.190	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.68	-0.928	-0.544	-0.358	-0.206	0.229	0.390	0.593	1.02	3.01
sulfurdioxide total vertical column precision [DU]	7.746×10^{-2}	0.114	0.144	0.170	0.205	0.567	0.789	1.09	1.66	4.33
sulfurdioxide slant column density corrected [DU]	-0.822	-0.484	-0.354	-0.266	-0.173	0.191	0.288	0.381	0.523	0.919
sulfurdioxide slant column density cobra [DU]	-0.822	-0.484	-0.354	-0.266	-0.173	0.191	0.288	0.381	0.523	0.919
sulfurdioxide slant column density cobra precision [DU]	0.148	0.173	0.186	0.197	0.211	0.330	0.378	0.426	0.504	0.699
sulfurdioxide slant column density window1 [DU]	-1.58	-0.906	-0.637	-0.453	-0.256	0.480	0.669	0.847	1.11	1.80
sulfurdioxide slant column density window1 precision [DU]	0.148	0.173	0.186	0.197	0.211	0.330	0.378	0.426	0.504	0.699
sulfurdioxide slant column density corrected win1 [DU]	-1.59	-0.983	-0.735	-0.564	-0.379	0.345	0.538	0.723	1.00	1.75
background so2 slant column offset window1 [DU]	-0.354	-0.294	-0.260	-0.234	-0.201	-5.107×10^{-2}	-7.771×10^{-3}	3.107×10^{-2}	9.600×10^{-2}	0.255
sulfurdioxide slant column density window2 [DU]	-20.4	-13.6	-10.3	-7.84	-5.05	6.38	9.27	11.9	15.4	22.9
sulfurdioxide slant column density window2 precision [DU]	4.43	5.26	5.75	6.15	6.63	9.19	10.1	10.9	12.2	14.9
sulfurdioxide slant column density corrected win2 [DU]	-21.8	-14.8	-11.5	-8.99	-6.20	4.97	7.76	10.3	13.7	20.7
background so2 slant column offset window2 [DU]	-7.06	-5.49	-4.63	-3.90	-3.01	0.513	0.831	1.07	1.44	2.65
sulfurdioxide slant column density window3 [DU]	-62.7	-41.2	-31.5	-24.6	-17.1	13.1	21.0	28.2	37.8	56.8
sulfurdioxide slant column density window3 precision [DU]	14.9	17.0	18.5	19.6	21.1	31.0	35.6	41.3	53.1	85.2
sulfurdioxide slant column density corrected win3 [DU]	-55.5	-34.4	-24.6	-17.7	-10.3	18.7	26.1	32.9	42.1	60.8
background so2 slant column offset window3 [DU]	-5.54	-3.05	-1.77	-0.680	0.727	10.9	13.3	15.0	16.9	20.0
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]	2.180×10^{-3}	3.651×10^{-3}	4.860×10^{-3}	5.867×10^{-3}	7.369×10^{-3}	2.589×10^{-2}	3.943×10^{-2}	6.501×10^{-2}	0.130	0.395
fitted radiance shift [nm]	-8.325×10^{-3}	-4.269×10^{-3}	-2.889×10^{-3}	-2.152×10^{-3}	-1.526×10^{-3}	3.010×10^{-4}	9.904×10^{-4}	1.884×10^{-3}	3.450×10^{-3}	7.757×10^{-3}
fitted radiance squeeze [1]	-4.936×10^{-4}	-3.028×10^{-4}	-2.209×10^{-4}	-1.648×10^{-4}	-1.064×10^{-4}	1.043×10^{-4}	1.563×10^{-4}	2.042×10^{-4}	2.723×10^{-4}	4.301×10^{-4}
fitted root mean square [1]	6.209×10^{-4}	7.509×10^{-4}	8.227×10^{-4}	8.797×10^{-4}	9.507×10^{-4}	1.444×10^{-3}	1.645×10^{-3}	1.845×10^{-3}	2.158×10^{-3}	2.973×10^{-3}
sulfurdioxide total air mass factor polluted [1]	7.448×10^{-2}	0.215	0.320	0.415	0.533	1.17	1.42	1.67	2.05	2.67
sulfurdioxide total air mass factor polluted precision [1]	9.832×10^{-3}	1.719×10^{-2}	2.356×10^{-2}	2.940×10^{-2}	3.775×10^{-2}	0.174	0.224	0.272	0.346	0.521
sulfurdioxide clear air mass factor polluted [1]	0.184	0.290	0.364	0.430	0.505	0.917	1.04	1.18	1.56	2.71
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]	0.712 $\pm$ 0.395	6880492	0.690	1.000	0.0	1.000	0.310	1.000
sulfurdioxide total vertical column [DU]	(4.242 $\pm$ 147.171) $\times 10^{-2}$	6880492	0.554	1.307 $\times 10^{-2}$	-69.9	97.9	-0.259	0.295
sulfurdioxide total vertical column precision [DU]	0.745 $\pm$ 1.101	6880492	0.537	0.396	4.832 $\times 10^{-2}$	25.8	0.247	0.785
sulfurdioxide slant column density corrected [DU]	(1.908 $\pm$ 36.185) $\times 10^{-2}$	6880492	0.382	1.006 $\times 10^{-2}$	-6.97	36.8	-0.179	0.203
sulfurdioxide slant column density cobra [DU]	(1.906 $\pm$ 36.085) $\times 10^{-2}$	6880492	0.382	1.006 $\times 10^{-2}$	-6.97	7.95	-0.179	0.203
sulfurdioxide slant column density cobra precision [DU]	0.303 $\pm$ 0.125	6880492	0.138	0.268	8.008 $\times 10^{-2}$	9.90	0.219	0.356
sulfurdioxide slant column density window1 [DU]	0.169 $\pm$ 0.676	6880492	0.762	0.166	-24.0	9.99	-0.214	0.548
sulfurdioxide slant column density window1 precision [DU]	0.303 $\pm$ 0.125	6880492	0.138	0.268	8.008 $\times 10^{-2}$	9.90	0.219	0.356
sulfurdioxide slant column density corrected win1 [DU]	(1.454 $\pm$ 67.519) $\times 10^{-2}$	6880492	0.756	-4.723 $\times 10^{-3}$	-24.0	9.86	-0.377	0.379
background so2 slant column offset window1 [DU]	-0.154 $\pm$ 0.114	6880492	0.119	-0.158	-1.12	3.58	-0.224	-0.105
sulfurdioxide slant column density window2 [DU]	0.446 $\pm$ 9.608	6880492	12.2	0.210	-933	127	-5.79	6.41
sulfurdioxide slant column density window2 precision [DU]	8.77 $\pm$ 2.33	6880492	2.88	8.45	2.22	454	7.17	10.0
sulfurdioxide slant column density corrected win2 [DU]	-0.480 $\pm$ 9.435	6880492	12.0	-0.483	-936	126	-6.50	5.53
background so2 slant column offset window2 [DU]	-0.926 $\pm$ 2.163	6880492	2.60	-0.285	-14.0	6.43	-2.03	0.568
sulfurdioxide slant column density window3 [DU]	-2.77 $\pm$ 26.29	6880492	33.0	-2.06	-204	194	-18.8	14.2
sulfurdioxide slant column density window3 precision [DU]	30.6 $\pm$ 13.2	6880492	10.5	27.3	11.2	247	23.3	33.8
sulfurdioxide slant column density corrected win3 [DU]	3.55 $\pm$ 25.73	6880492	32.4	3.88	-185	195	-12.4	20.0
background so2 slant column offset window3 [DU]	6.33 $\pm$ 5.70	6880492	9.04	5.10	-7.01	29.0	1.74	10.8
sulfurdioxide slant column cobra flag [1]	1.97 $\pm$ 0.24	6880492	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	(6.429 $\pm$ 13.253) $\times 10^{-2}$	6880492	4.469 $\times 10^{-2}$	2.320 $\times 10^{-2}$	7.306 $\times 10^{-4}$	2.37	1.310 $\times 10^{-2}$	5.779 $\times 10^{-2}$
fitted radiance shift [nm]	(-1.923 $\pm$ 26.586) $\times 10^{-4}$	6880492	1.707 $\times 10^{-3}$	-2.478 $\times 10^{-4}$	-3.969 $\times 10^{-2}$	4.100 $\times 10^{-2}$	-1.071 $\times 10^{-3}$	6.356 $\times 10^{-4}$
fitted radiance squeeze [1]	(3.130 $\pm$ 17.833) $\times 10^{-5}$	6880492	2.112 $\times 10^{-4}$	2.836 $\times 10^{-5}$	-2.017 $\times 10^{-3}$	7.559 $\times 10^{-3}$	-7.557 $\times 10^{-5}$	1.357 $\times 10^{-4}$
fitted root mean square [1]	(1.338 $\pm$ 0.516) $\times 10^{-3}$	6880492	5.856 $\times 10^{-4}$	1.204 $\times 10^{-3}$	3.542 $\times 10^{-4}$	2.686 $\times 10^{-2}$	9.868 $\times 10^{-4}$	1.573 $\times 10^{-3}$
sulfurdioxide total air mass factor polluted [1]	0.733 $\pm$ 0.395	6880492	0.545	0.700	5.000 $\times 10^{-2}$	2.94	0.432	0.978
sulfurdioxide total air mass factor polluted precision [1]	(9.276 $\pm$ 10.776) $\times 10^{-2}$	6880492	8.802 $\times 10^{-2}$	5.177 $\times 10^{-2}$	3.005 $\times 10^{-3}$	1.58	3.048 $\times 10^{-2}$	0.118
sulfurdioxide clear air mass factor polluted [1]	0.665 $\pm$ 0.273	6880492	0.429	0.657	5.307 $\times 10^{-2}$	2.18	0.448	0.877
number of spectral points in retrieval [1]	73.5 $\pm$ 0.5	6880492	1.000	73.0	71.0	74.0	73.0	74.0

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

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.573 ± 0.422	10029481	0.860	0.490	0.0	1.000	0.140	1.000
sulfurdioxide total vertical column [DU]	$(1.697 \pm 81.586) \times 10^{-2}$	10029481	0.373	6.148×10^{-3}	-84.9	585	-0.178	0.194
sulfurdioxide total vertical column precision [DU]	0.422 ± 0.577	10029481	0.284	0.276	2.446×10^{-2}	32.8	0.181	0.465
sulfurdioxide slant column density corrected [DU]	$(9.465 \pm 380.740) \times 10^{-3}$	10029481	0.352	6.435×10^{-3}	-16.2	467	-0.169	0.183
sulfurdioxide slant column density cobra [DU]	$(9.347 \pm 316.691) \times 10^{-3}$	10029481	0.352	6.435×10^{-3}	-16.2	50.7	-0.169	0.183
sulfurdioxide slant column density cobra precision [DU]	0.276 ± 0.106	10029481	0.107	0.246	7.183×10^{-2}	18.0	0.207	0.314
sulfurdioxide slant column density window1 [DU]	$(7.118 \pm 62.177) \times 10^{-2}$	10029481	0.718	8.231×10^{-2}	-70.2	62.2	-0.283	0.435
sulfurdioxide slant column density window1 precision [DU]	0.276 ± 0.106	10029481	0.107	0.246	7.183×10^{-2}	18.0	0.207	0.314
sulfurdioxide slant column density corrected win1 [DU]	$(-2.351 \pm 61.254) \times 10^{-2}$	10029481	0.703	-2.971×10^{-2}	-70.2	62.0	-0.380	0.322
background so2 slant column offset window1 [DU]	$(-9.469 \pm 12.459) \times 10^{-2}$	10029481	0.164	-0.103	-0.502	1.81	-0.184	-2.077×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.919 ± 8.476	10029481	10.9	0.877	-1.054×10^3	640	-4.56	6.35
sulfurdioxide slant column density window2 precision [DU]	7.67 ± 2.03	10029481	2.19	7.37	2.47	651	6.38	8.57
sulfurdioxide slant column density corrected win2 [DU]	-0.693 ± 8.301	10029481	10.6	-0.689	-1.054×10^3	640	-6.02	4.63
background so2 slant column offset window2 [DU]	-1.61 ± 2.36	10029481	3.88	-1.40	-13.3	6.12	-3.43	0.455
sulfurdioxide slant column density window3 [DU]	-1.48 ± 22.56	10029481	28.5	-2.20	-274	831	-16.1	12.5
sulfurdioxide slant column density window3 precision [DU]	27.0 ± 12.9	10029481	8.13	23.4	10.6	247	20.2	28.3
sulfurdioxide slant column density corrected win3 [DU]	4.37 ± 21.61	10029481	27.0	4.26	-276	829	-9.13	17.9
background so2 slant column offset window3 [DU]	5.85 ± 6.82	10029481	11.3	5.86	-10.3	27.7	-0.274	11.1
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	10029481	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.429 \pm 2.292) \times 10^{-2}$	10029481	1.048×10^{-2}	9.418×10^{-3}	7.783×10^{-4}	1.39	5.976×10^{-3}	1.645×10^{-2}
fitted radiance shift [nm]	$(-8.013 \pm 25.214) \times 10^{-4}$	10029481	1.761×10^{-3}	-8.383×10^{-4}	-6.864×10^{-2}	4.311×10^{-2}	-1.746×10^{-3}	1.585×10^{-5}
fitted radiance squeeze [1]	$(-2.923 \pm 17.747) \times 10^{-5}$	10029481	2.099×10^{-4}	-1.691×10^{-5}	-1.434×10^{-2}	1.321×10^{-2}	-1.270×10^{-4}	8.287×10^{-5}
fitted root mean square [1]	$(1.207 \pm 0.434) \times 10^{-3}$	10029481	4.322×10^{-4}	1.101×10^{-3}	3.489×10^{-4}	5.144×10^{-2}	9.312×10^{-4}	1.363×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.04 ± 0.60	10029481	0.751	0.894	5.000×10^{-2}	3.41	0.607	1.36
sulfurdioxide total air mass factor polluted precision [1]	0.142 ± 0.116	10029481	0.160	0.114	2.819×10^{-3}	1.18	4.527×10^{-2}	0.205
sulfurdioxide clear air mass factor polluted [1]	0.844 ± 0.508	10029481	0.432	0.703	6.724×10^{-2}	3.44	0.535	0.967
number of spectral points in retrieval [1]	73.4 ± 0.5	10029481	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]	0.641 ± 0.414	12282000	0.800	1.000	0.0	1.000	0.200	1.000
sulfurdioxide total vertical column [DU]	$(2.145 \pm 92.740) \times 10^{-2}$	12282000	0.416	7.843×10^{-3}	-84.9	195	-0.199	0.218
sulfurdioxide total vertical column precision [DU]	0.480 ± 0.687	12282000	0.299	0.297	4.102×10^{-2}	32.8	0.206	0.505
sulfurdioxide slant column density corrected [DU]	$(1.174 \pm 34.347) \times 10^{-2}$	12282000	0.352	7.206×10^{-3}	-16.2	465	-0.168	0.184
sulfurdioxide slant column density cobra [DU]	$(1.168 \pm 31.550) \times 10^{-2}$	12282000	0.352	7.206×10^{-3}	-16.2	20.5	-0.168	0.184
sulfurdioxide slant column density cobra precision [DU]	0.276 ± 0.106	12282000	0.106	0.246	8.008×10^{-2}	12.7	0.208	0.313
sulfurdioxide slant column density window1 [DU]	0.117 ± 0.613	12282000	0.708	0.121	-70.2	60.2	-0.236	0.472
sulfurdioxide slant column density window1 precision [DU]	0.276 ± 0.106	12282000	0.106	0.246	8.008×10^{-2}	12.7	0.208	0.313
sulfurdioxide slant column density corrected win1 [DU]	$(-2.263 \pm 607.288) \times 10^{-3}$	12282000	0.697	-1.378×10^{-2}	-70.2	60.1	-0.359	0.337
background so2 slant column offset window1 [DU]	-0.119 ± 0.122	12282000	0.151	-0.131	-0.990	3.55	-0.201	-5.002×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.644 ± 8.631	12282000	11.1	0.562	-933	640	-4.95	6.14
sulfurdioxide slant column density window2 precision [DU]	7.84 ± 2.03	12282000	2.34	7.54	2.30	454	6.49	8.84
sulfurdioxide slant column density corrected win2 [DU]	-0.666 ± 8.474	12282000	10.9	-0.668	-936	640	-6.11	4.77
background so2 slant column offset window2 [DU]	-1.31 ± 2.28	12282000	3.54	-0.809	-14.0	6.43	-3.00	0.535
sulfurdioxide slant column density window3 [DU]	0.689 ± 23.147	12282000	29.4	0.138	-240	223	-14.2	15.2
sulfurdioxide slant column density window3 precision [DU]	27.5 ± 12.3	12282000	8.60	24.2	10.9	220	20.8	29.4
sulfurdioxide slant column density corrected win3 [DU]	6.20 ± 22.25	12282000	28.1	5.88	-242	222	-7.94	20.1
background so2 slant column offset window3 [DU]	5.51 ± 5.98	12282000	9.43	5.10	-10.3	29.0	0.592	10.0
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.17	12282000	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.106 \pm 4.083) \times 10^{-2}$	12282000	1.348×10^{-2}	1.258×10^{-2}	7.783×10^{-4}	2.02	7.330×10^{-3}	2.081×10^{-2}
fitted radiance shift [nm]	$(-5.435 \pm 24.738) \times 10^{-4}$	12282000	1.849×10^{-3}	-5.569×10^{-4}	-6.864×10^{-2}	3.889×10^{-2}	-1.516×10^{-3}	3.329×10^{-4}
fitted radiance squeeze [1]	$(-3.584 \pm 170.184) \times 10^{-6}$	12282000	2.010×10^{-4}	2.843×10^{-6}	-1.434×10^{-2}	1.291×10^{-2}	-1.000×10^{-4}	1.009×10^{-4}
fitted root mean square [1]	$(1.208 \pm 0.439) \times 10^{-3}$	12282000	4.282×10^{-4}	1.097×10^{-3}	3.682×10^{-4}	5.144×10^{-2}	9.309×10^{-4}	1.359×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.902 ± 0.468	12282000	0.567	0.831	5.000×10^{-2}	2.86	0.576	1.14
sulfurdioxide total air mass factor polluted precision [1]	0.118 ± 0.103	12282000	0.128	8.180×10^{-2}	2.819×10^{-3}	1.24	4.126×10^{-2}	0.170
sulfurdioxide clear air mass factor polluted [1]	0.737 ± 0.292	12282000	0.366	0.699	6.724×10^{-2}	2.94	0.531	0.897
number of spectral points in retrieval [1]	73.4 ± 0.5	12282000	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]	0.605 ± 0.423	3879083	0.850	1.000	0.0	1.000	0.150	1.000
sulfurdioxide total vertical column [DU]	$(3.460 \pm 140.957) \times 10^{-2}$	3879083	0.468	8.191×10^{-3}	-69.9	585	-0.219	0.249
sulfurdioxide total vertical column precision [DU]	0.684 ± 1.045	3879083	0.564	0.372	2.446×10^{-2}	25.8	0.187	0.751
sulfurdioxide slant column density corrected [DU]	$(1.519 \pm 44.196) \times 10^{-2}$	3879083	0.392	8.610×10^{-3}	-8.69	467	-0.186	0.206
sulfurdioxide slant column density cobra [DU]	$(1.505 \pm 37.185) \times 10^{-2}$	3879083	0.392	8.610×10^{-3}	-8.69	50.7	-0.186	0.206
sulfurdioxide slant column density cobra precision [DU]	0.311 ± 0.126	3879083	0.144	0.278	7.183×10^{-2}	18.0	0.223	0.367
sulfurdioxide slant column density window1 [DU]	$(8.415 \pm 71.924) \times 10^{-2}$	3879083	0.819	8.956×10^{-2}	-30.6	62.2	-0.326	0.494
sulfurdioxide slant column density window1 precision [DU]	0.311 ± 0.126	3879083	0.144	0.278	7.183×10^{-2}	18.0	0.223	0.367
sulfurdioxide slant column density corrected win1 [DU]	$(-3.442 \pm 70.577) \times 10^{-2}$	3879083	0.796	-4.742×10^{-2}	-30.6	62.0	-0.443	0.353
background so2 slant column offset window1 [DU]	-0.119 ± 0.129	3879083	0.147	-0.135	-1.12	3.58	-0.203	-5.562×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.835 ± 9.659	3879083	12.3	0.718	-585	467	-5.37	6.92
sulfurdioxide slant column density window2 precision [DU]	8.77 ± 2.50	3879083	2.98	8.38	2.22	321	7.08	10.1
sulfurdioxide slant column density corrected win2 [DU]	-0.456 ± 9.451	3879083	12.0	-0.456	-586	467	-6.44	5.52
background so2 slant column offset window2 [DU]	-1.29 ± 2.32	3879083	3.29	-0.655	-14.0	6.43	-2.82	0.471
sulfurdioxide slant column density window3 [DU]	-9.32 ± 25.10	3879083	31.0	-8.91	-274	831	-24.6	6.43
sulfurdioxide slant column density window3 precision [DU]	30.9 ± 14.9	3879083	11.7	27.2	10.6	247	22.2	33.9
sulfurdioxide slant column density corrected win3 [DU]	-1.98 ± 25.10	3879083	30.8	-1.27	-276	829	-17.1	13.8
background so2 slant column offset window3 [DU]	7.34 ± 7.27	3879083	12.9	6.67	-10.3	29.0	1.01	13.9
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.28	3879083	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.515 \pm 13.940) \times 10^{-2}$	3879083	5.397×10^{-2}	1.808×10^{-2}	7.306×10^{-4}	2.36	7.005×10^{-3}	6.098×10^{-2}
fitted radiance shift [nm]	$(-6.185 \pm 28.709) \times 10^{-4}$	3879083	1.690×10^{-3}	-7.134×10^{-4}	-5.371×10^{-2}	4.100×10^{-2}	-1.559×10^{-3}	1.311×10^{-4}
fitted radiance squeeze [1]	$(-1.444 \pm 20.438) \times 10^{-5}$	3879083	2.405×10^{-4}	-9.091×10^{-6}	-1.285×10^{-2}	1.321×10^{-2}	-1.321×10^{-4}	1.085×10^{-4}
fitted root mean square [1]	$(1.383 \pm 0.516) \times 10^{-3}$	3879083	5.958×10^{-4}	1.270×10^{-3}	3.489×10^{-4}	4.743×10^{-2}	1.030×10^{-3}	1.626×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.00 ± 0.75	3879083	0.963	0.732	5.000×10^{-2}	3.41	0.443	1.41
sulfurdioxide total air mass factor polluted precision [1]	0.135 ± 0.144	3879083	0.168	8.018×10^{-2}	3.012×10^{-3}	1.58	2.976×10^{-2}	0.197
sulfurdioxide clear air mass factor polluted [1]	0.916 ± 0.714	3879083	0.677	0.668	5.307×10^{-2}	3.44	0.432	1.11
number of spectral points in retrieval [1]	73.4 ± 0.5	3879083	1.000	73.0	70.0	74.0	73.0	74.0

3 Granule outlines

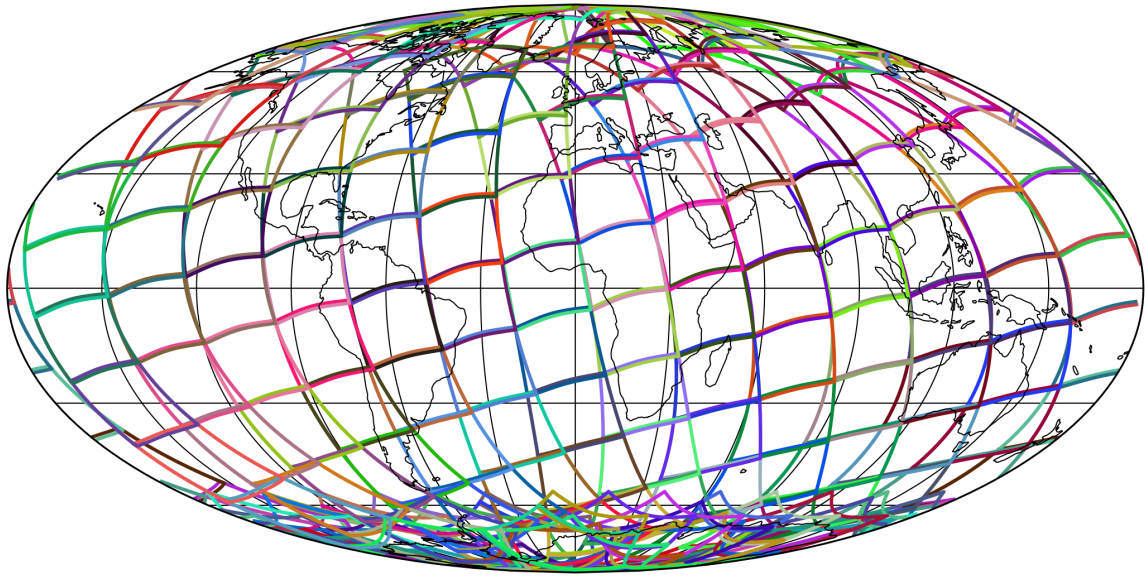


Figure 1: Outline of the granules.

4 Input data monitoring

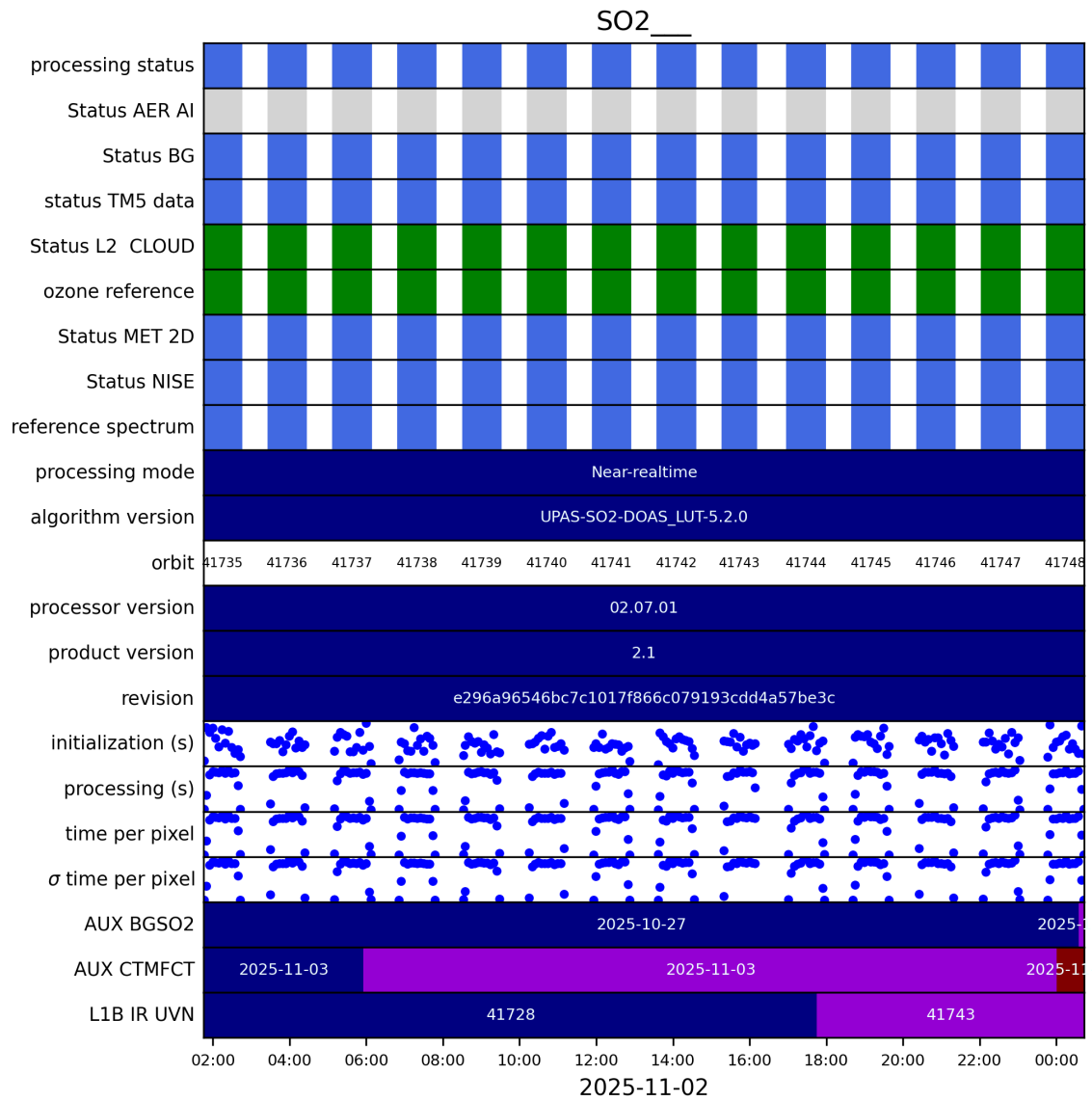


Figure 2: Input data per granule

5 Warnings and errors

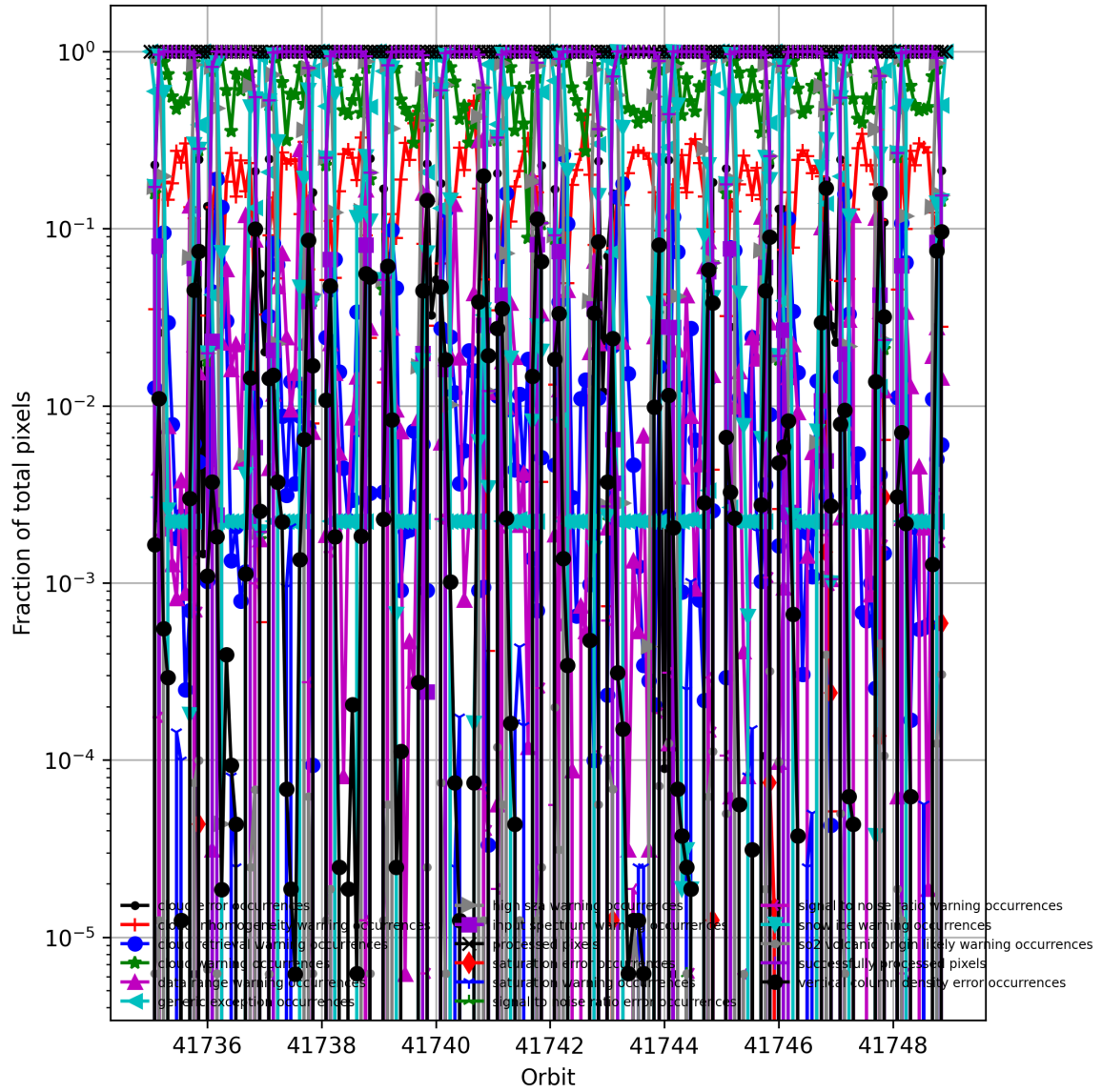


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

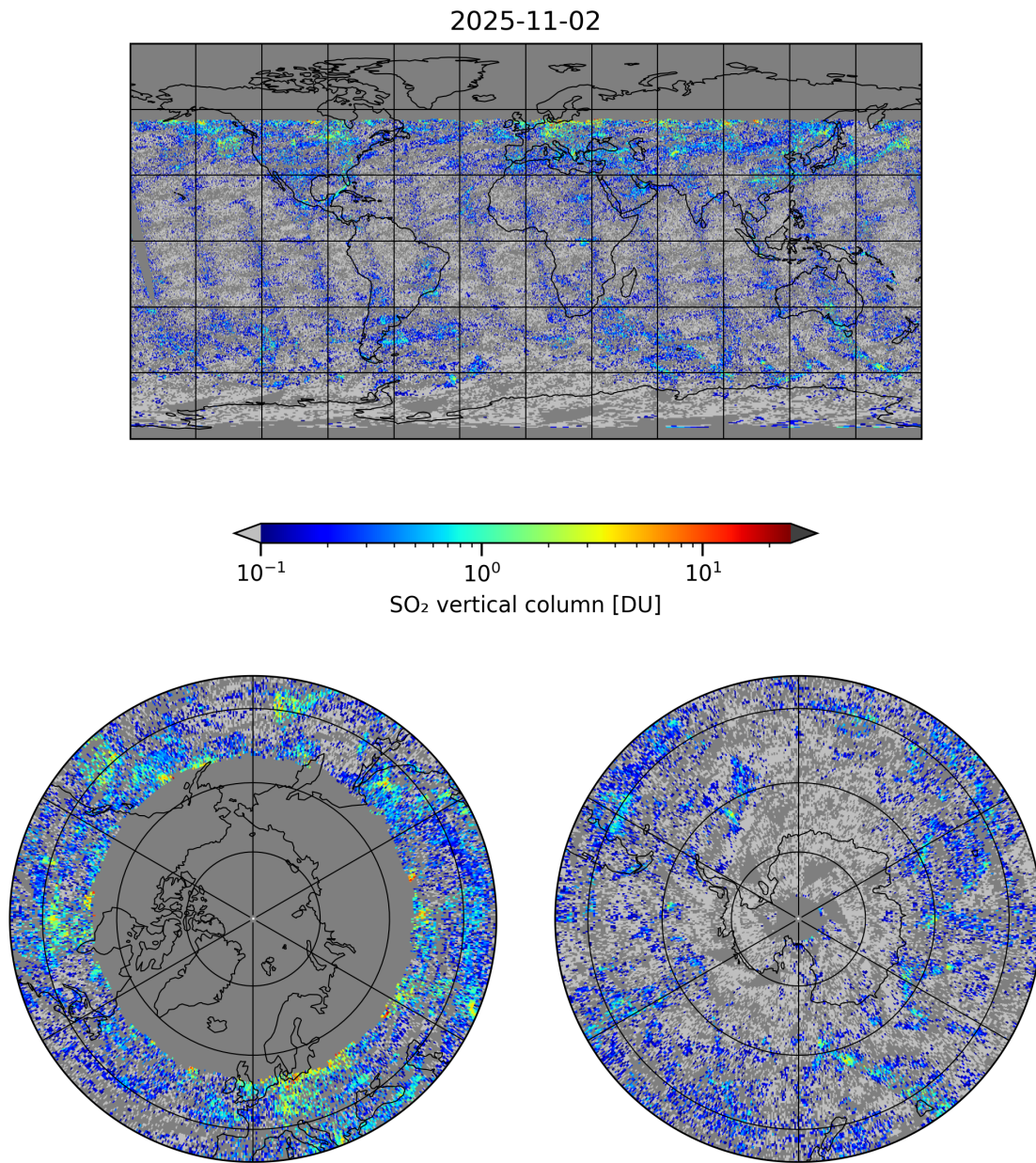


Figure 4: Map of “SO₂ vertical column” for 2025-11-02 to 2025-11-03

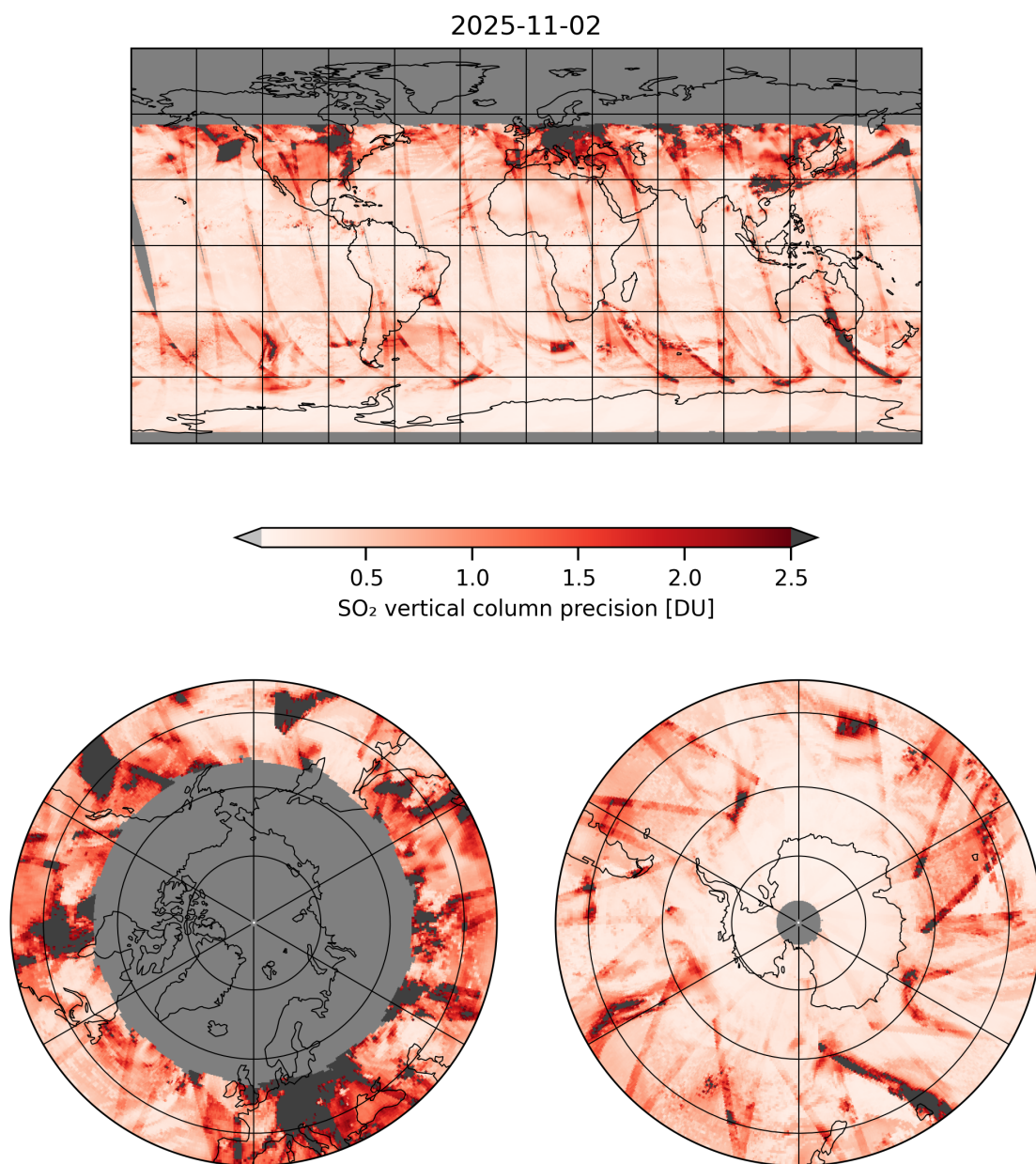


Figure 5: Map of “SO₂ vertical column precision” for 2025-11-02 to 2025-11-03

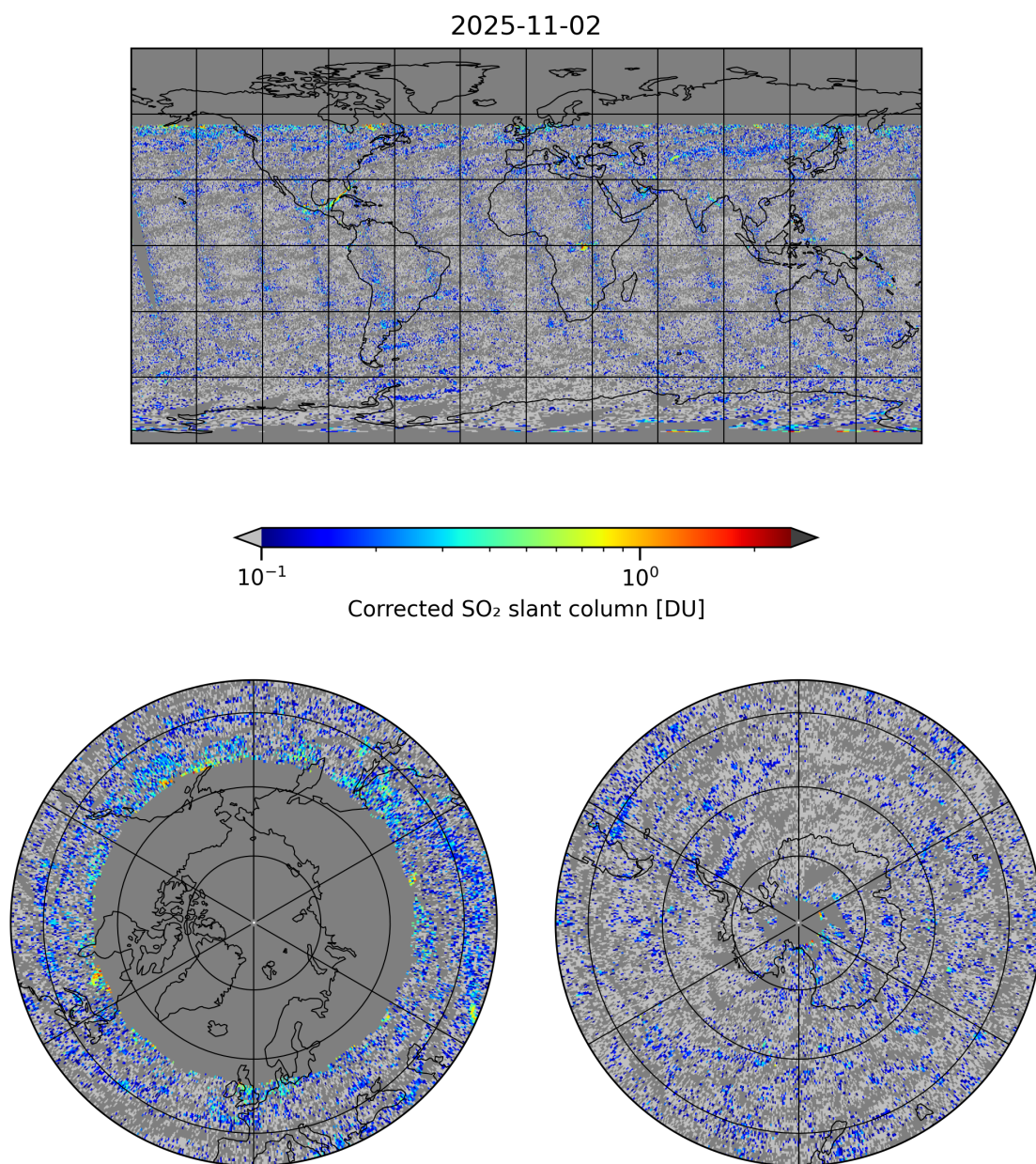


Figure 6: Map of “Corrected SO₂ slant column” for 2025-11-02 to 2025-11-03

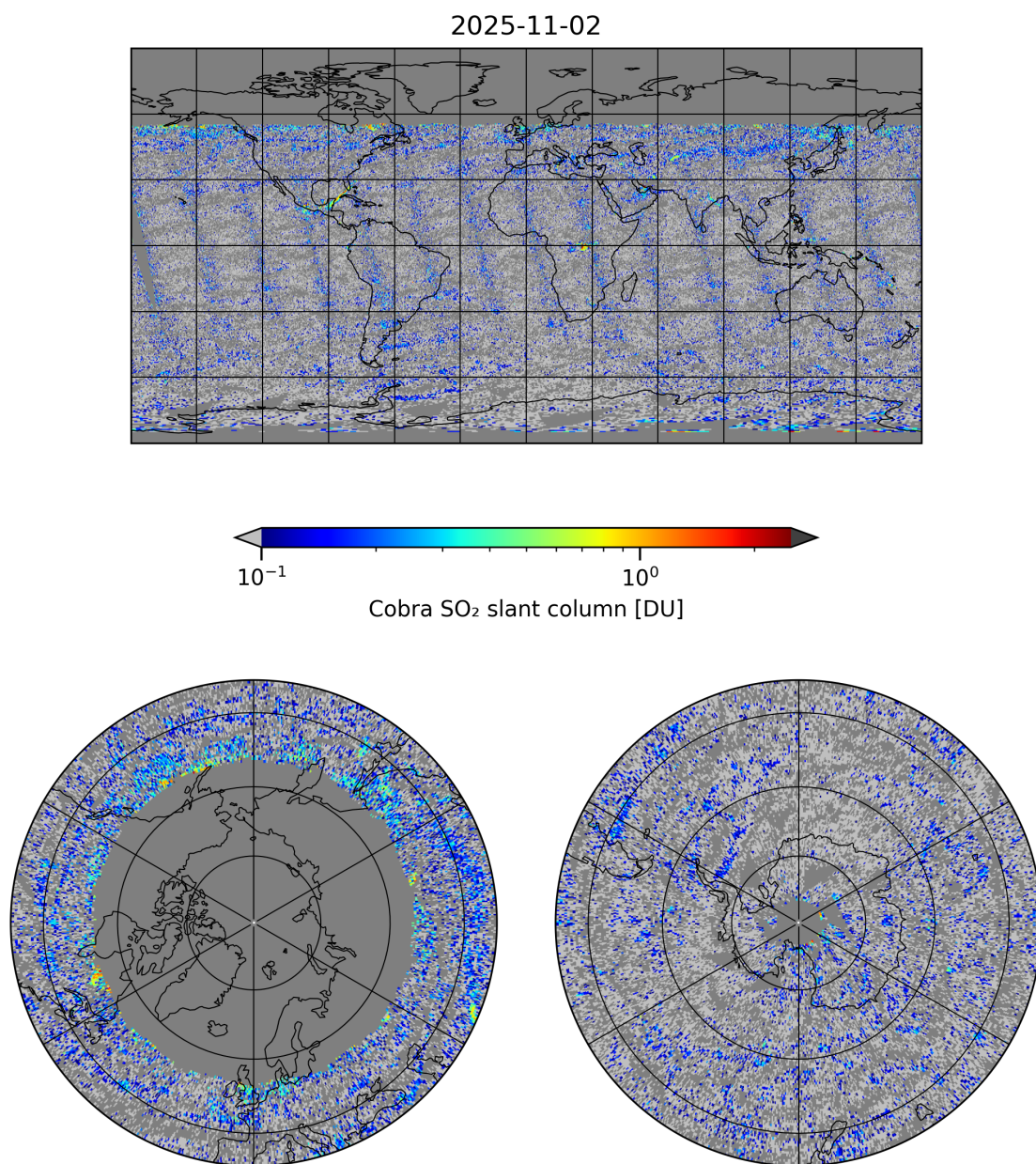


Figure 7: Map of “Cobra SO₂ slant column” for 2025-11-02 to 2025-11-03

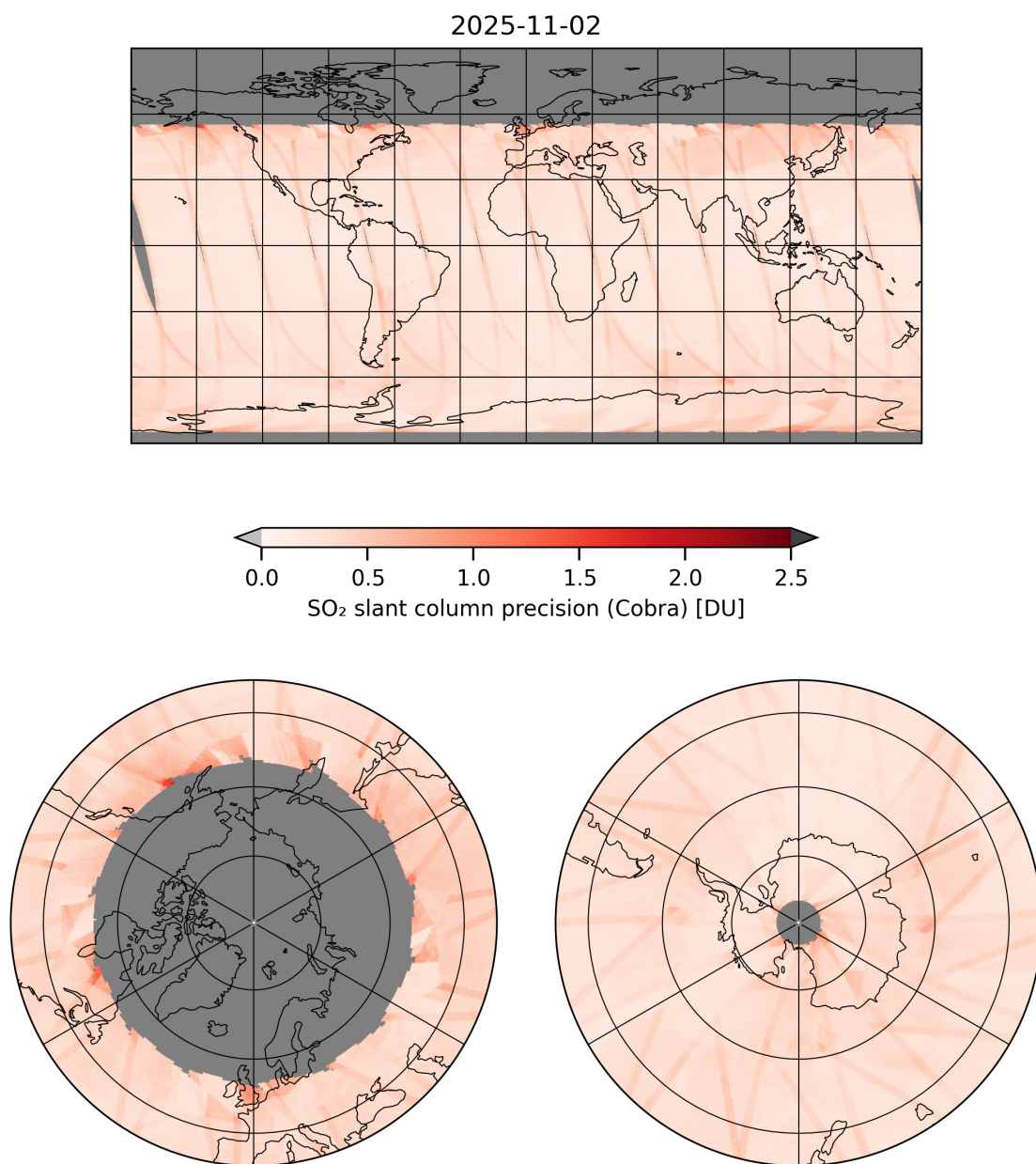


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-11-02 to 2025-11-03

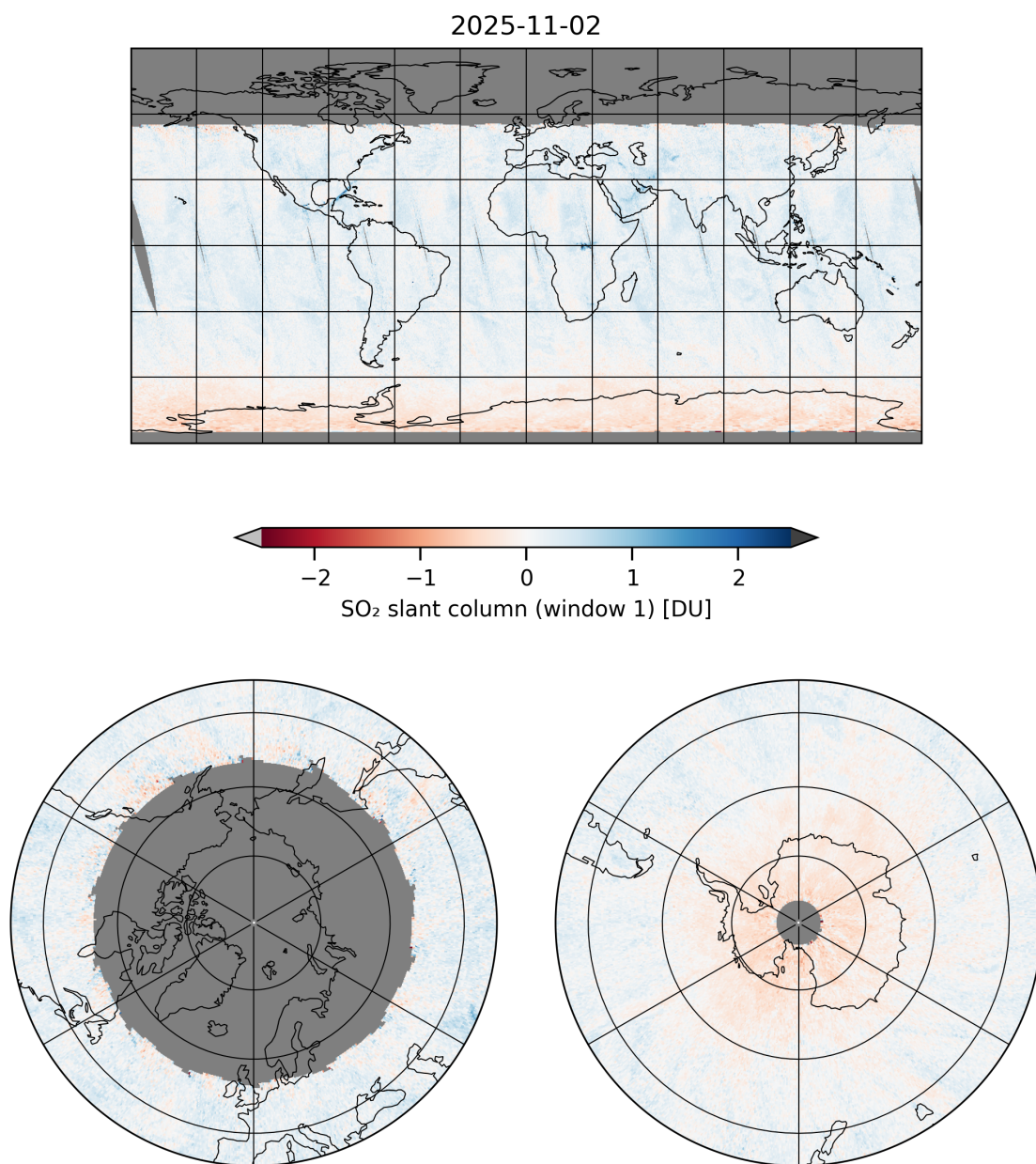


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-11-02 to 2025-11-03

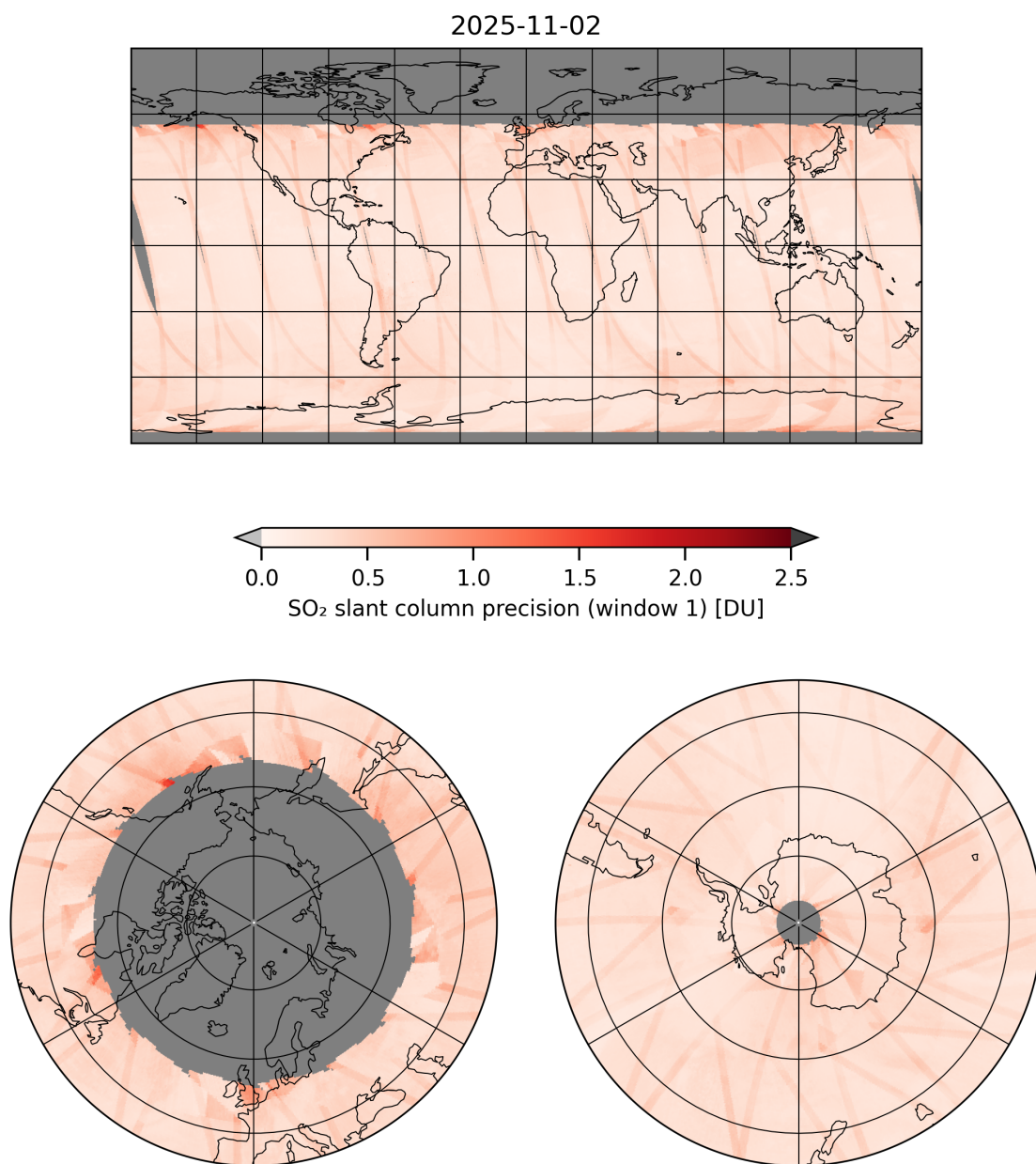


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-11-02 to 2025-11-03

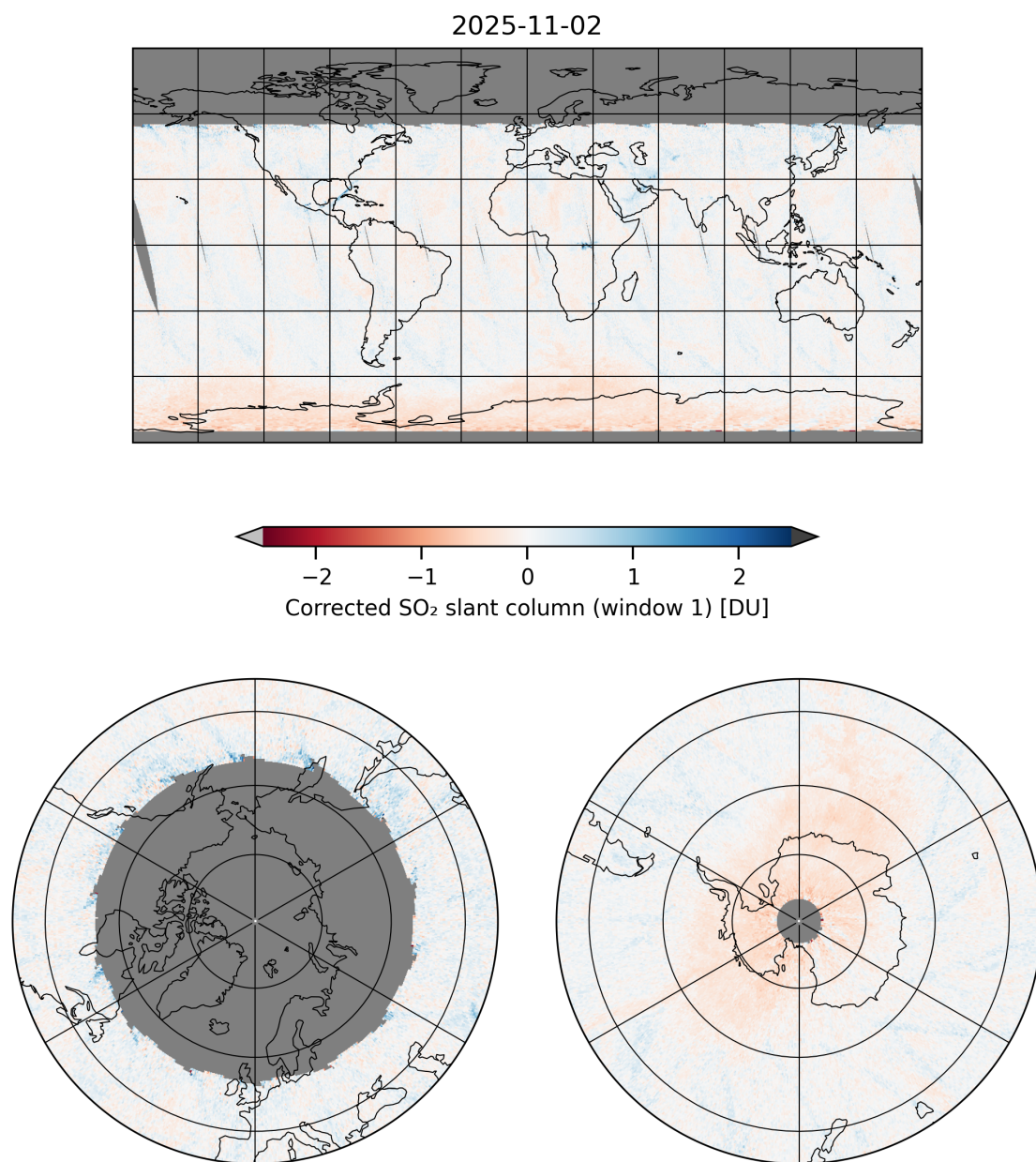


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-11-02 to 2025-11-03

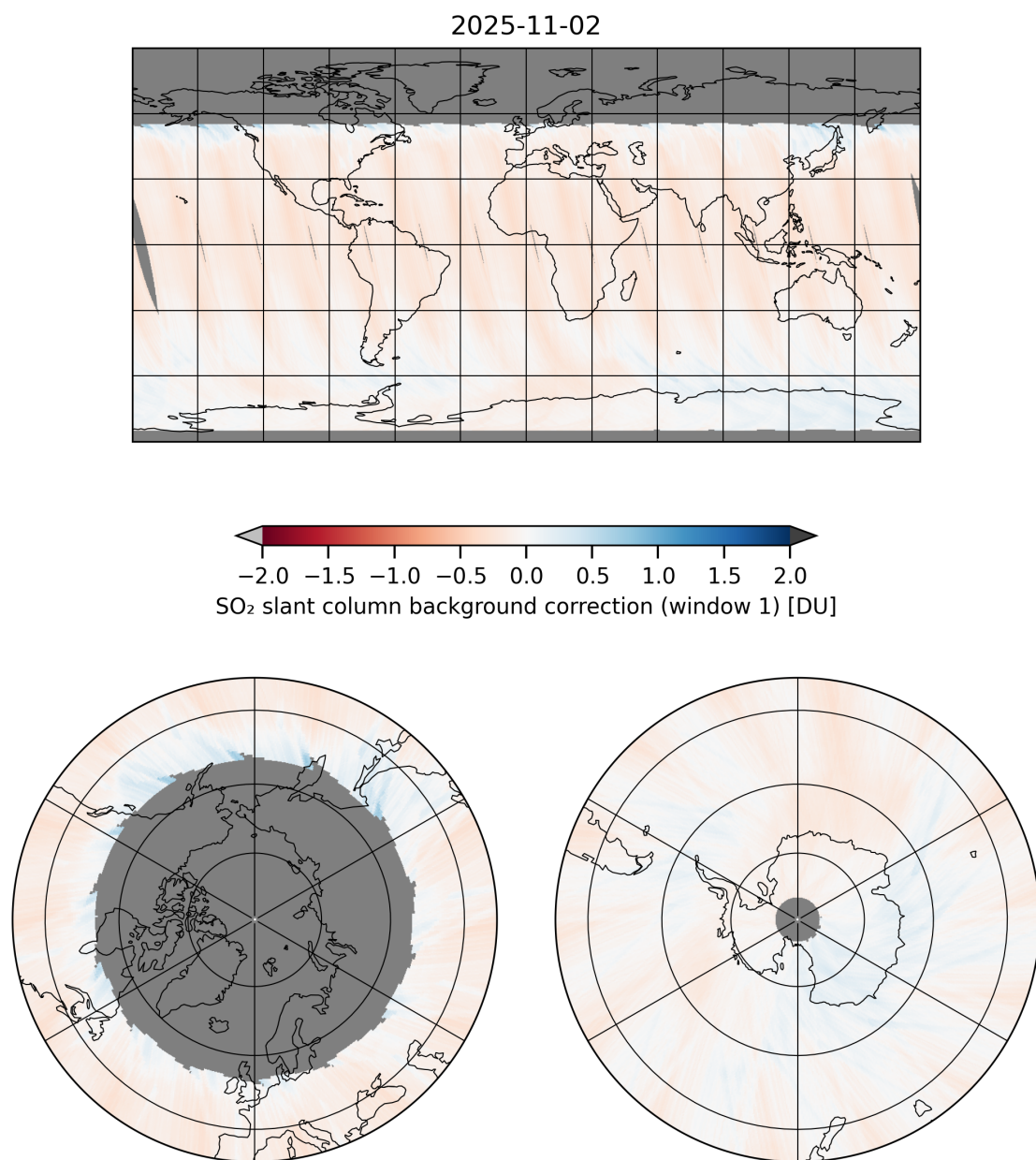


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-11-02 to 2025-11-03

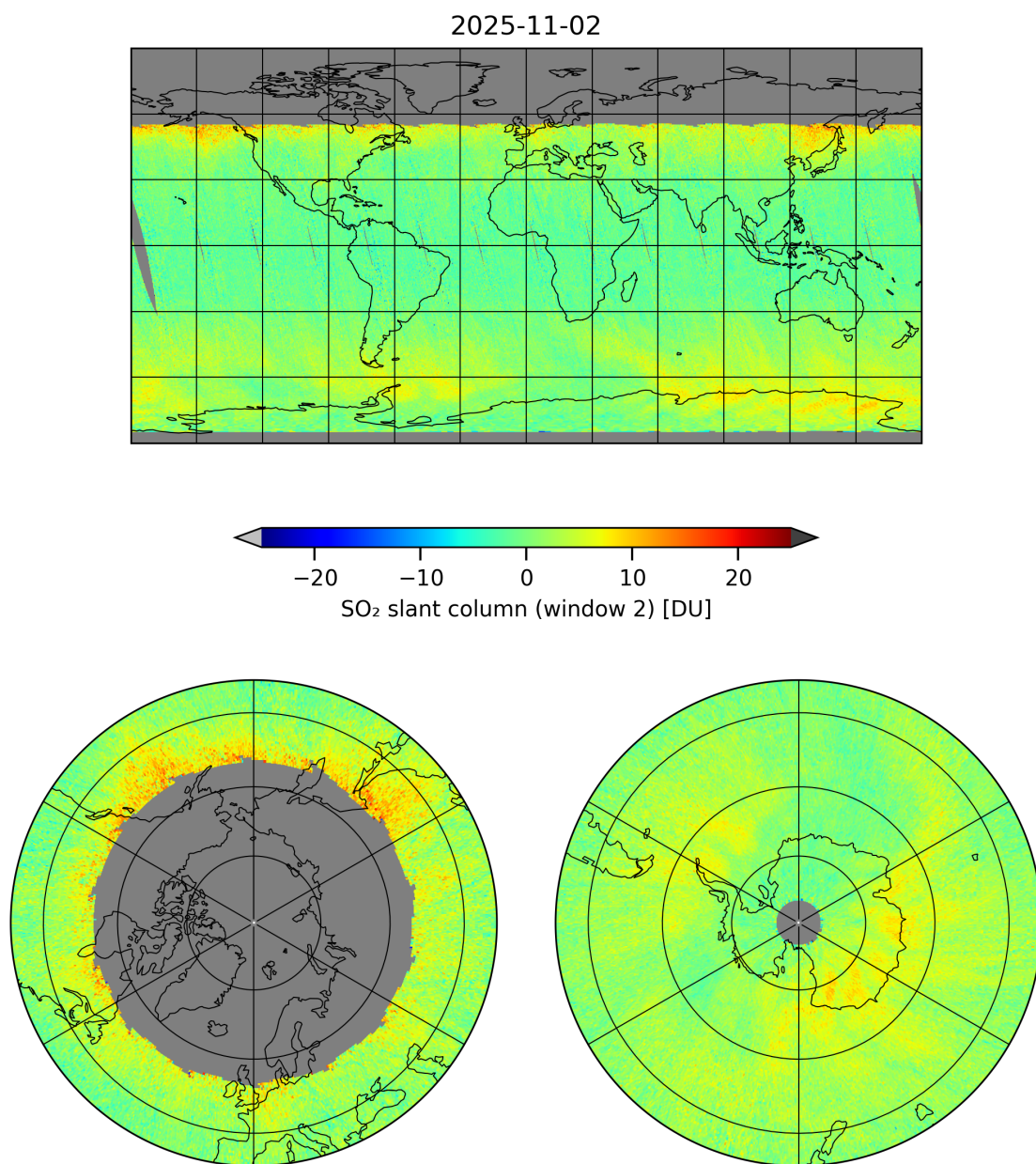


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-11-02 to 2025-11-03

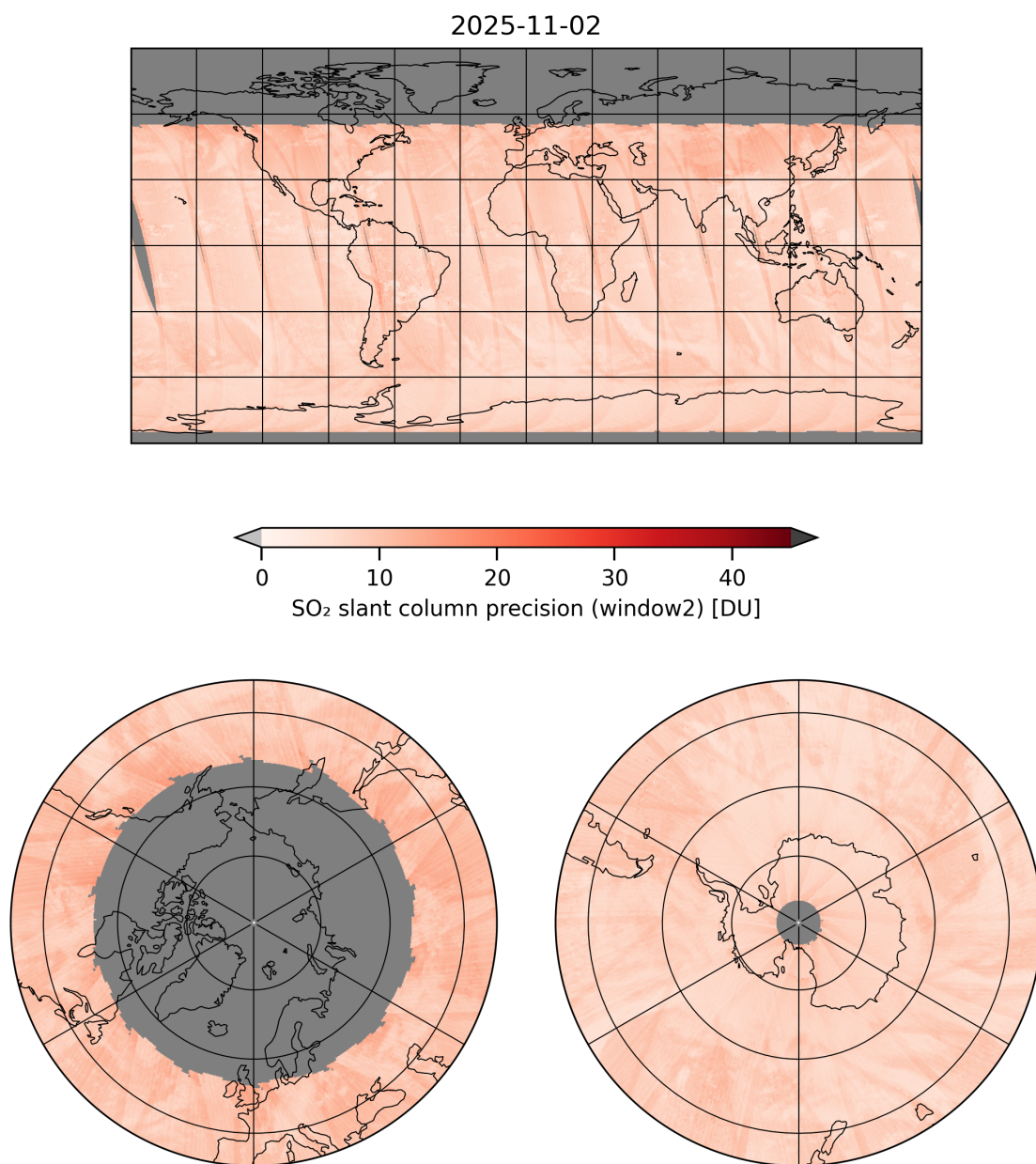


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-11-02 to 2025-11-03

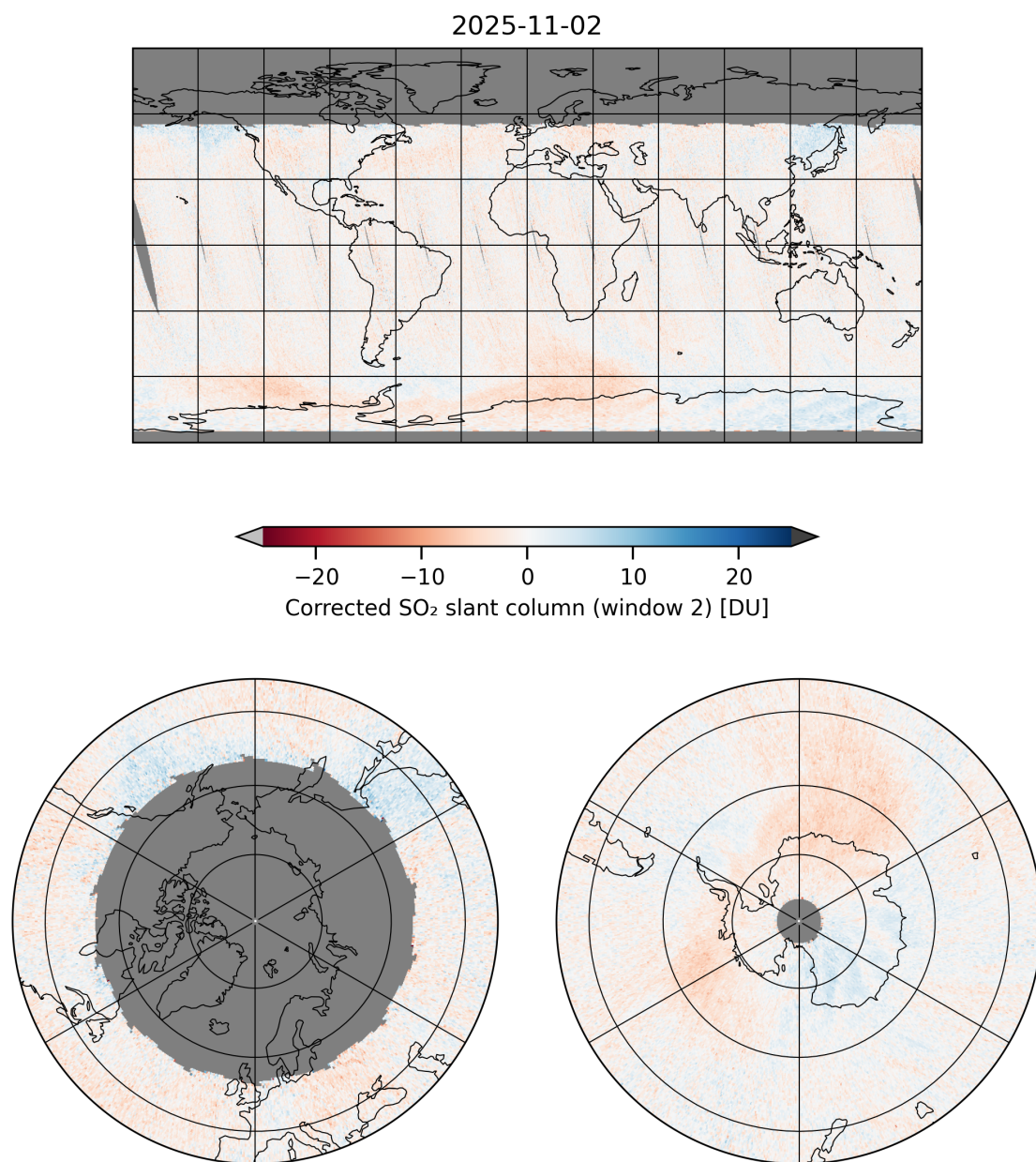


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-11-02 to 2025-11-03

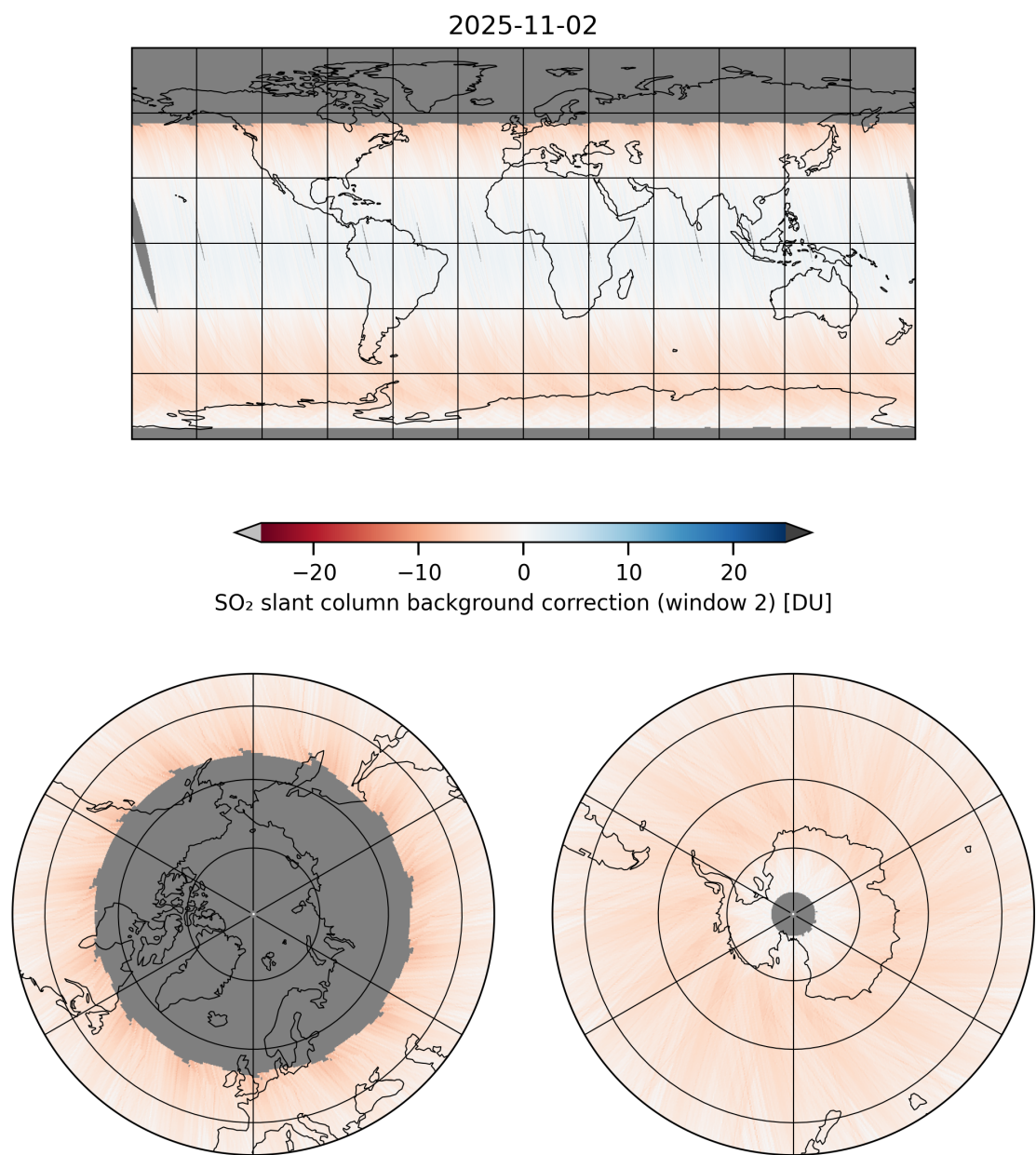


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-11-02 to 2025-11-03

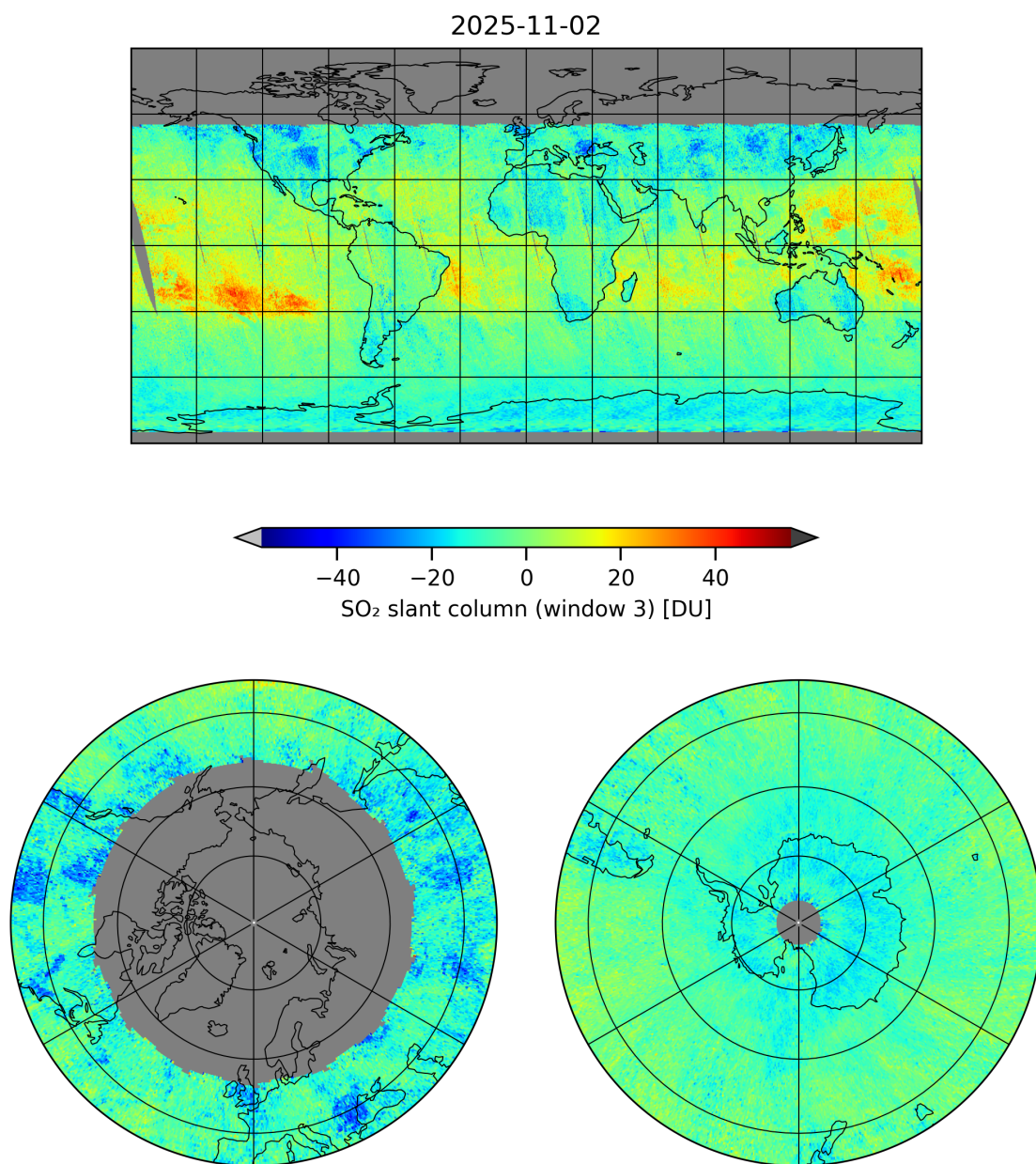


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-11-02 to 2025-11-03

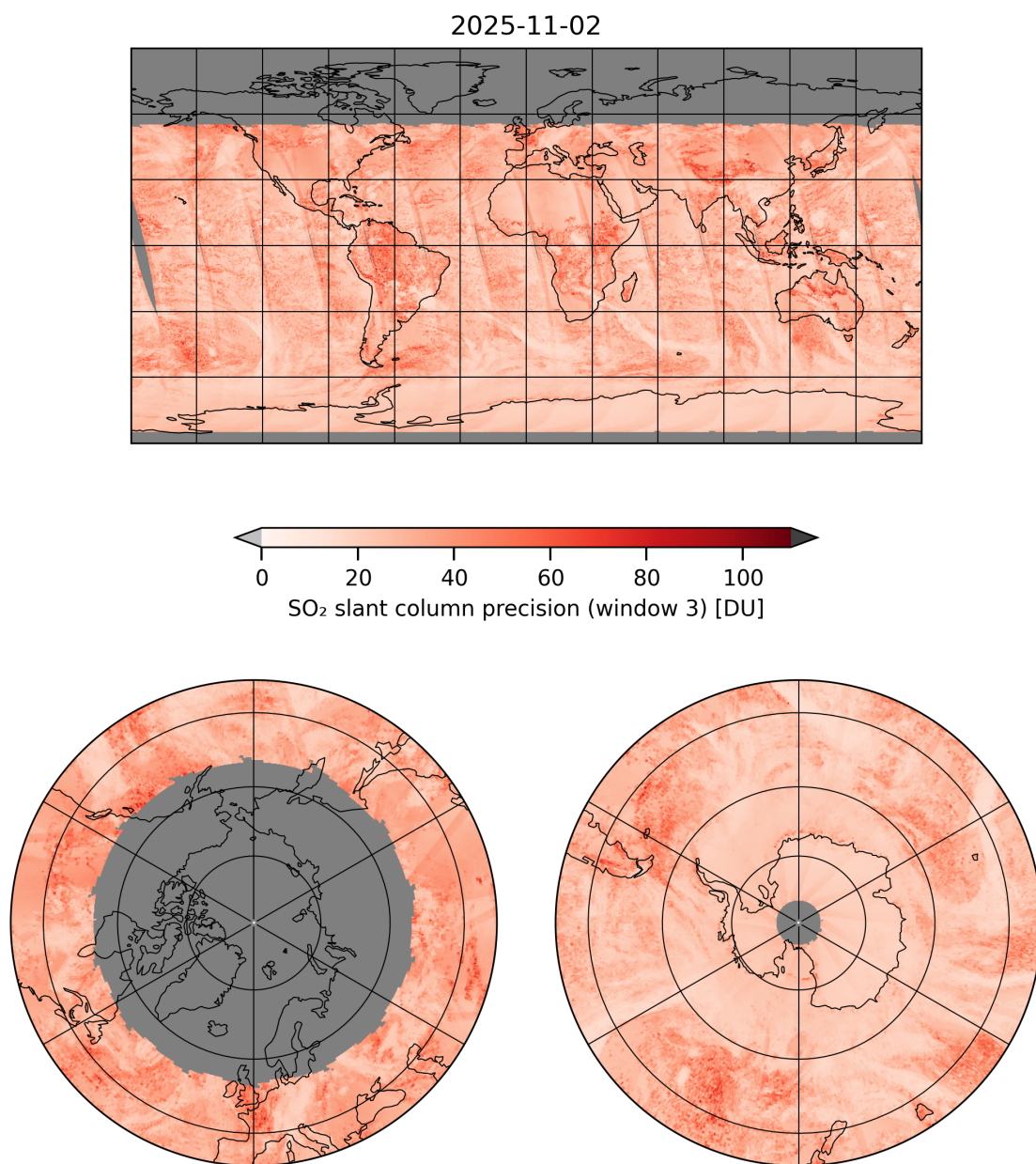


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-11-02 to 2025-11-03

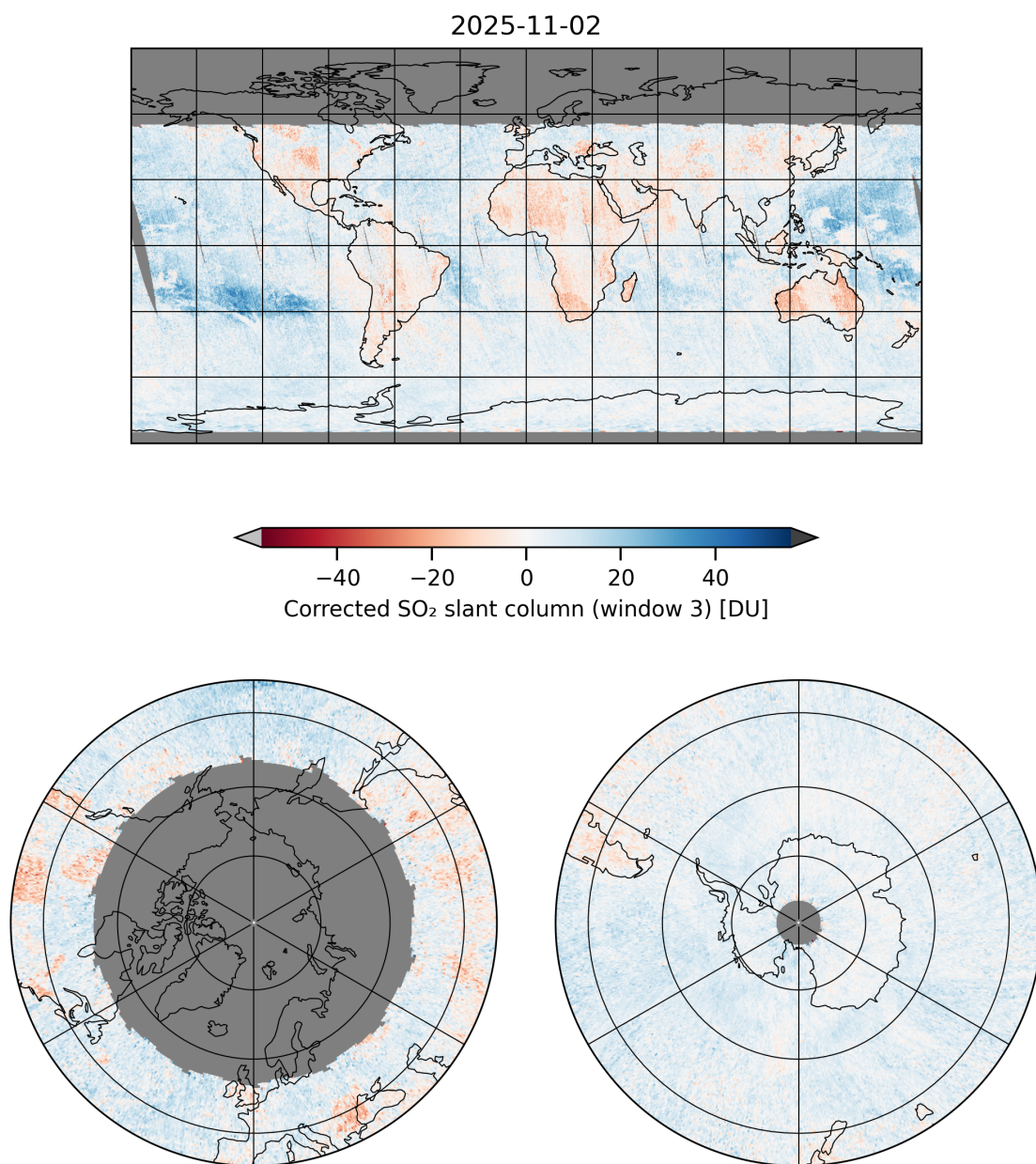


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-11-02 to 2025-11-03

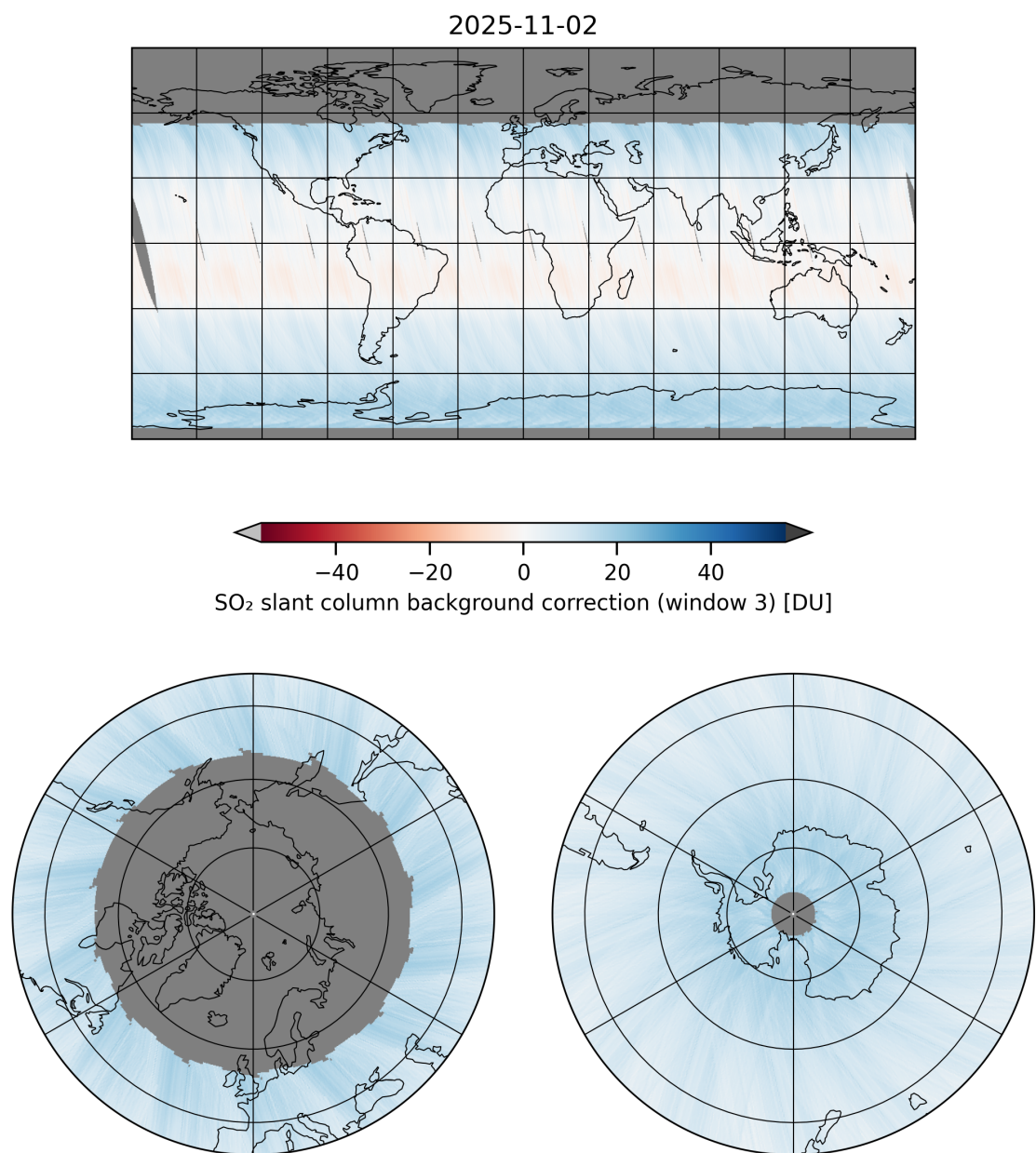


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-11-02 to 2025-11-03

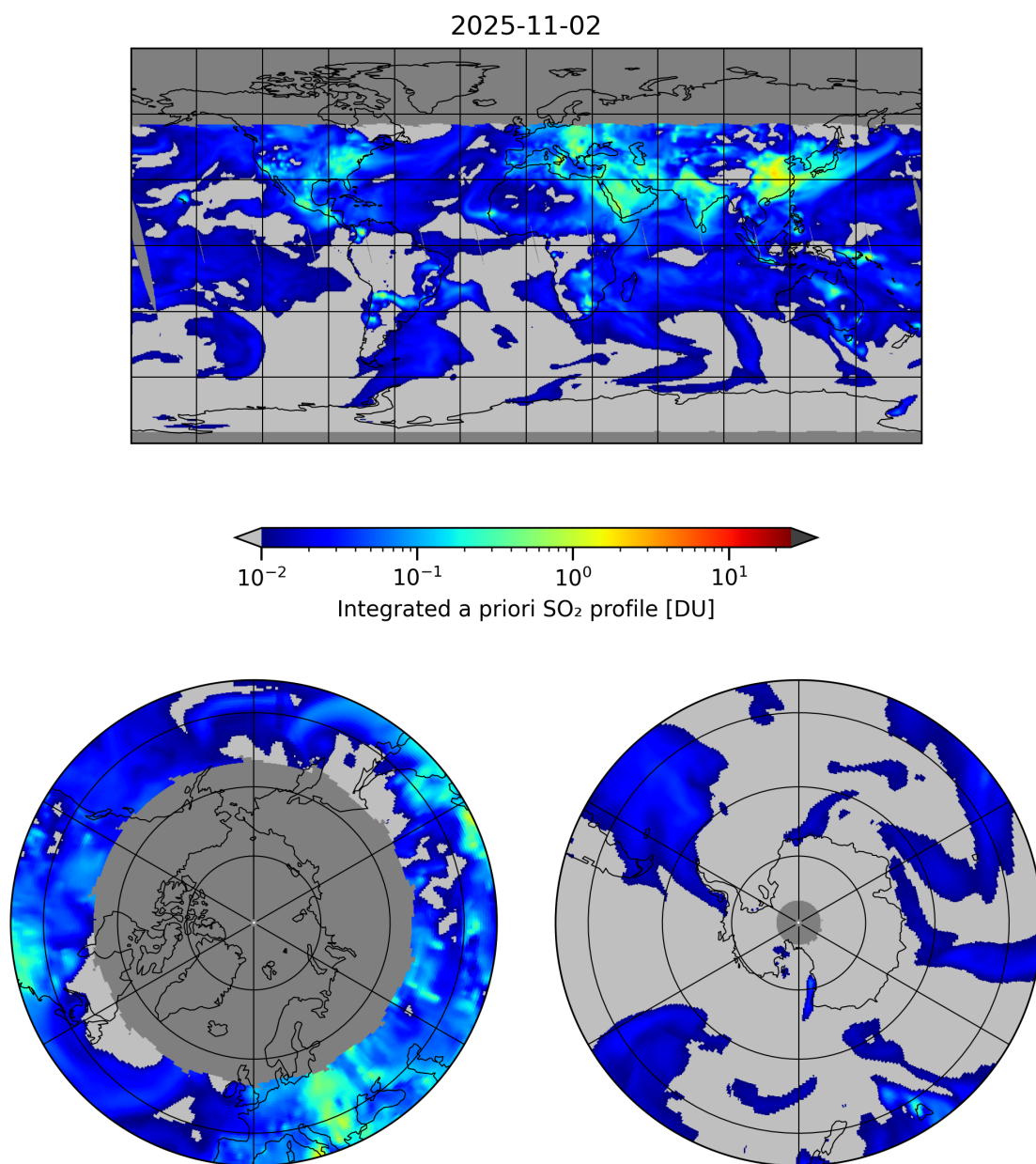


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-11-02 to 2025-11-03

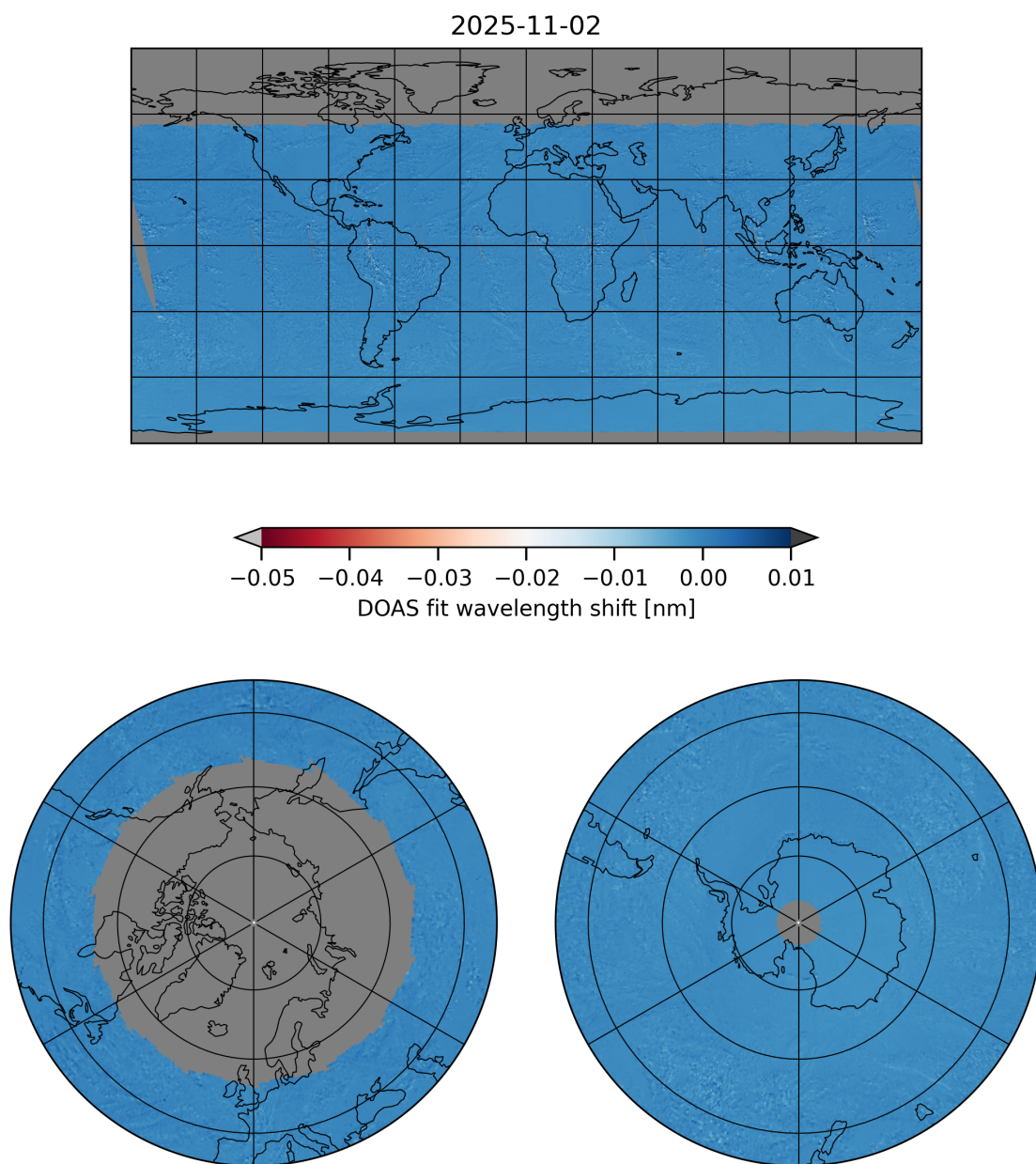


Figure 22: Map of “DOAS fit wavelength shift” for 2025-11-02 to 2025-11-03

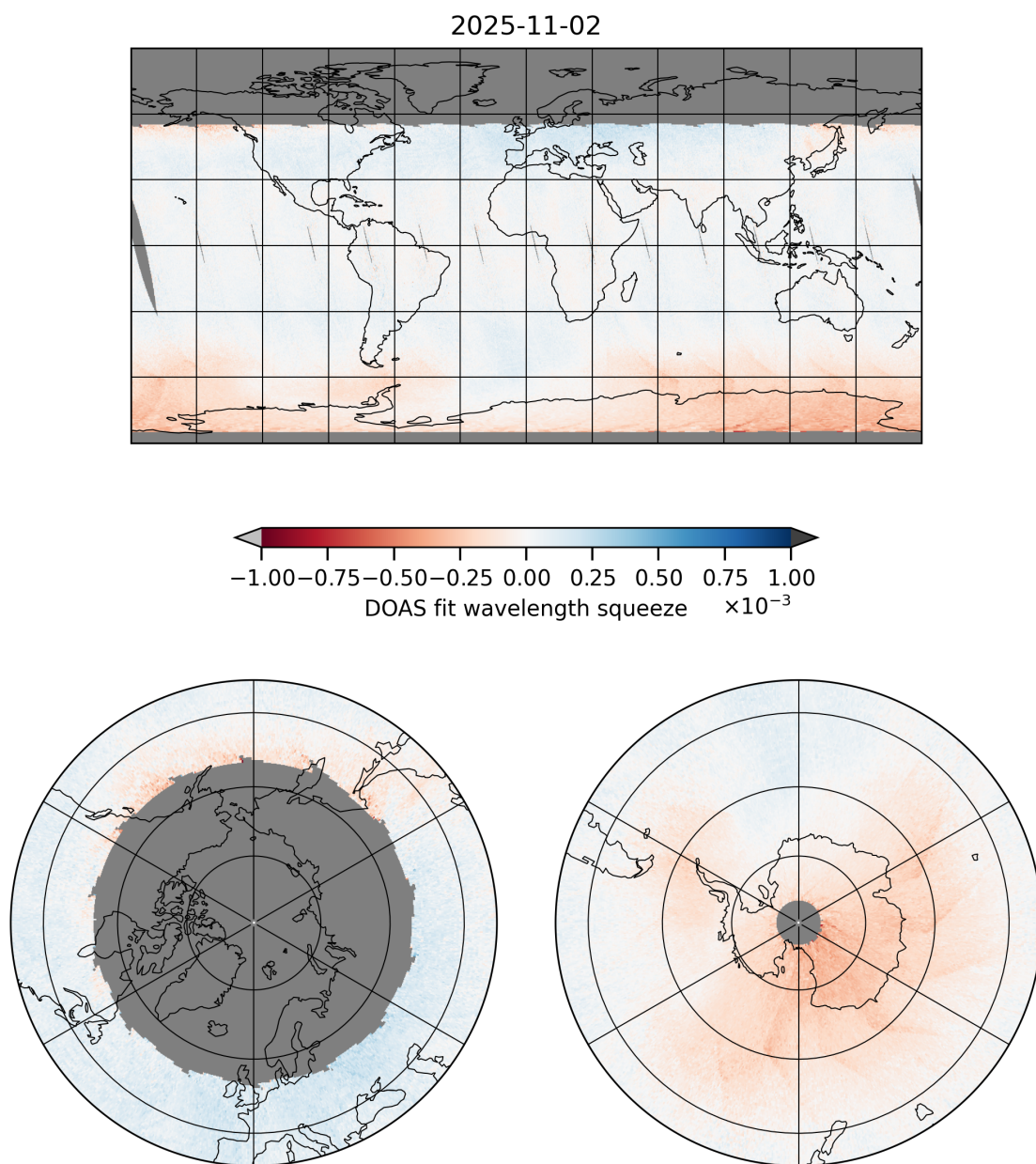


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-11-02 to 2025-11-03

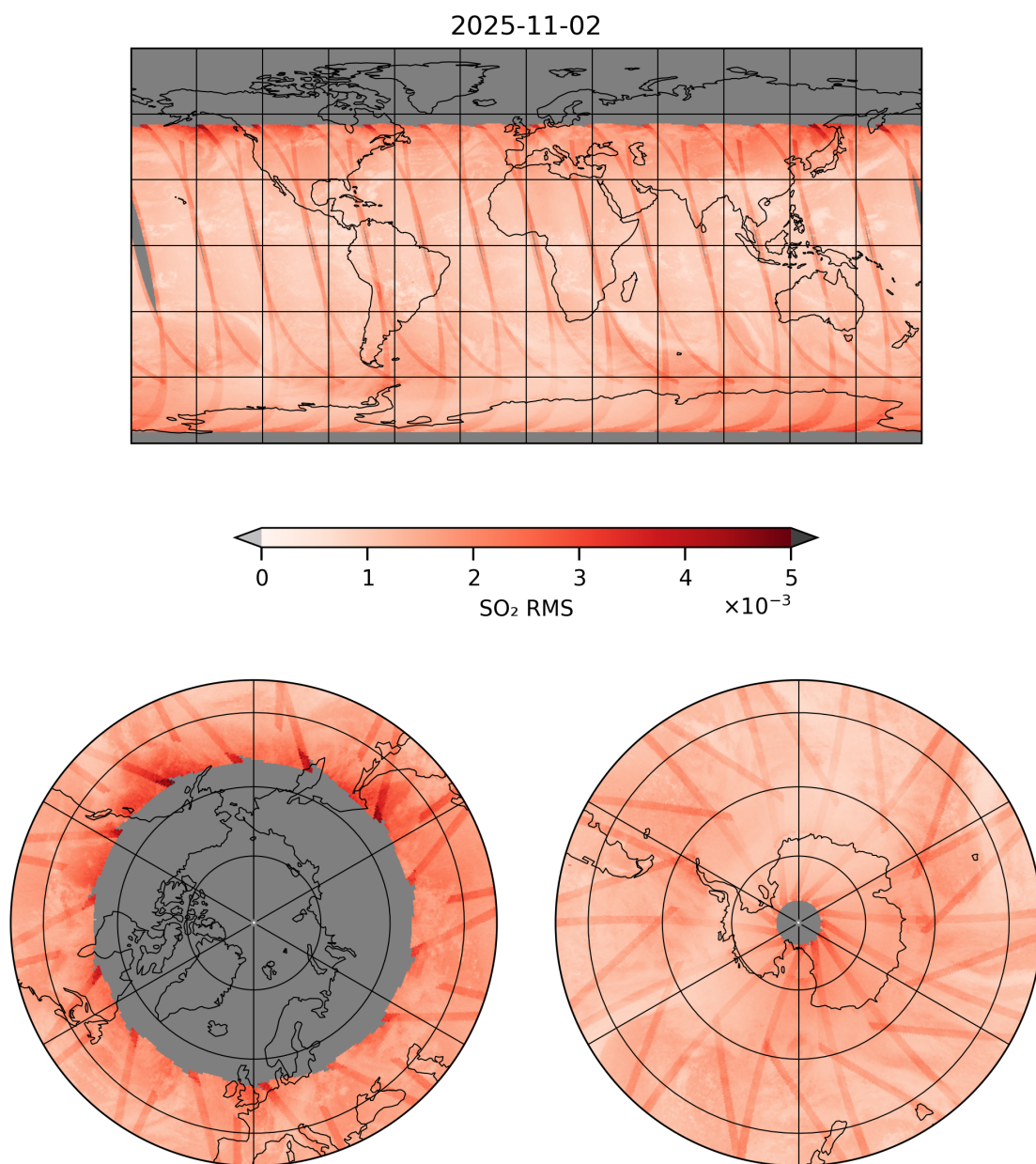


Figure 24: Map of “SO₂ RMS” for 2025-11-02 to 2025-11-03

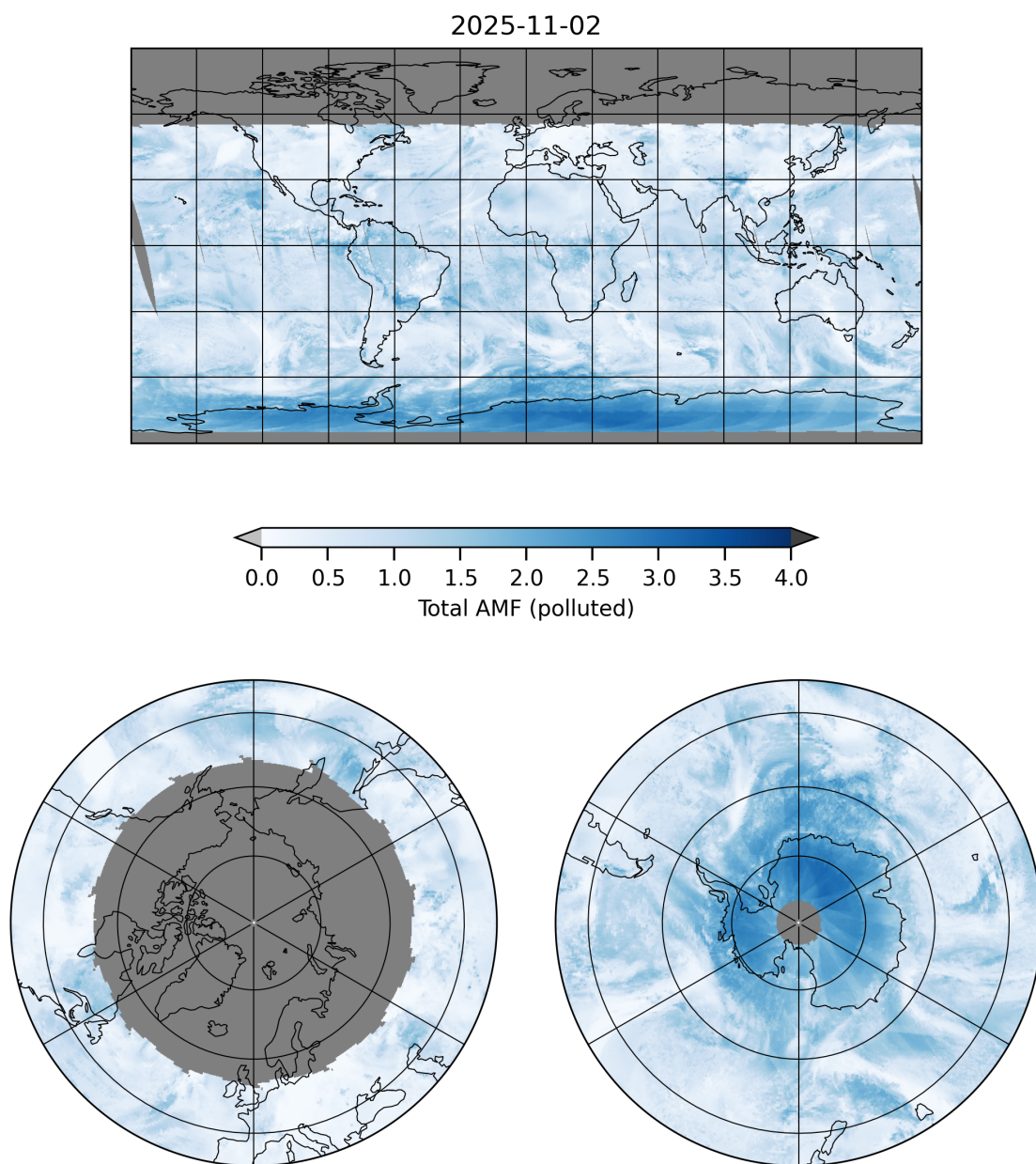


Figure 25: Map of “Total AMF (polluted)” for 2025-11-02 to 2025-11-03

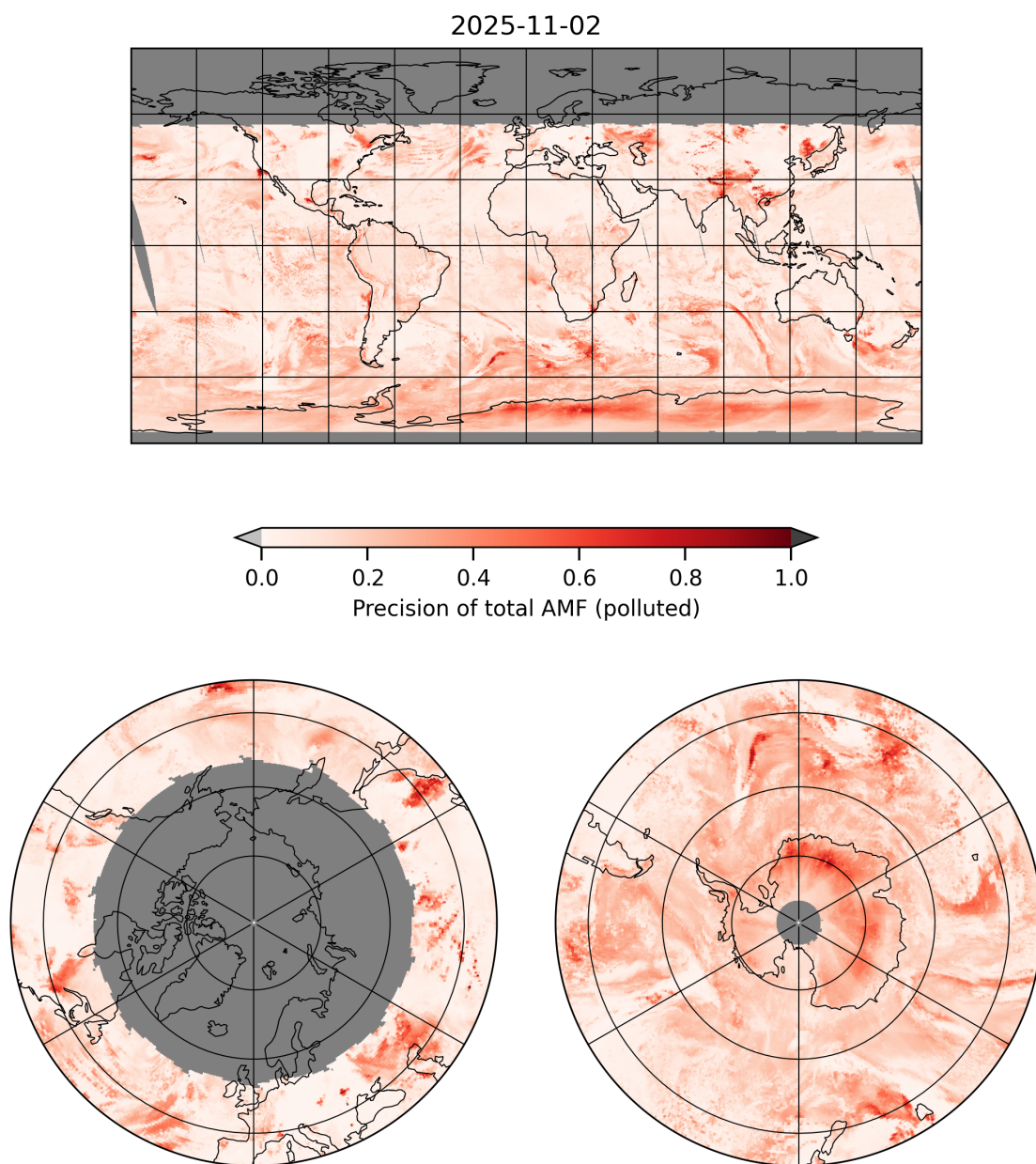


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-11-02 to 2025-11-03

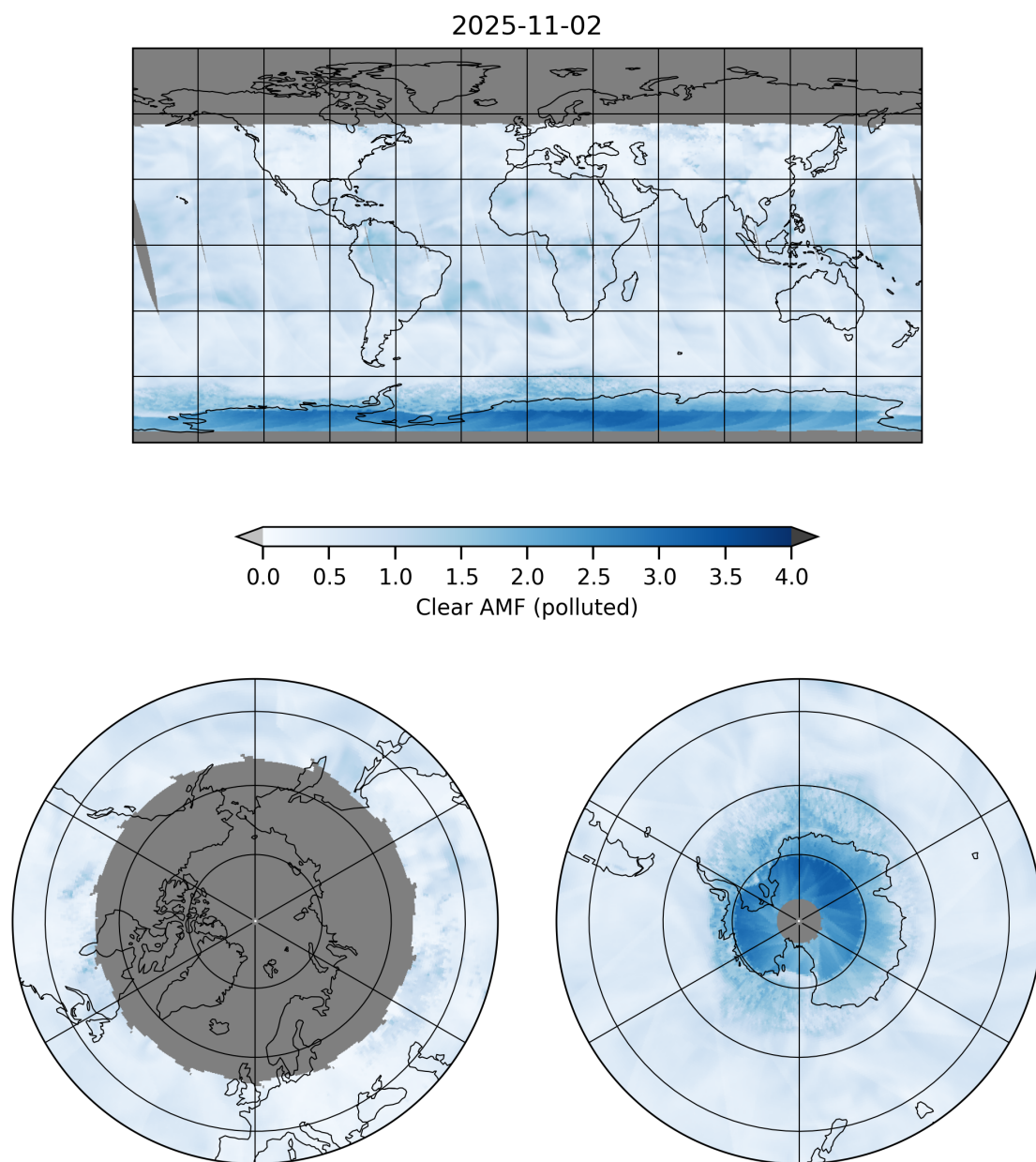


Figure 27: Map of “Clear AMF (polluted)” for 2025-11-02 to 2025-11-03

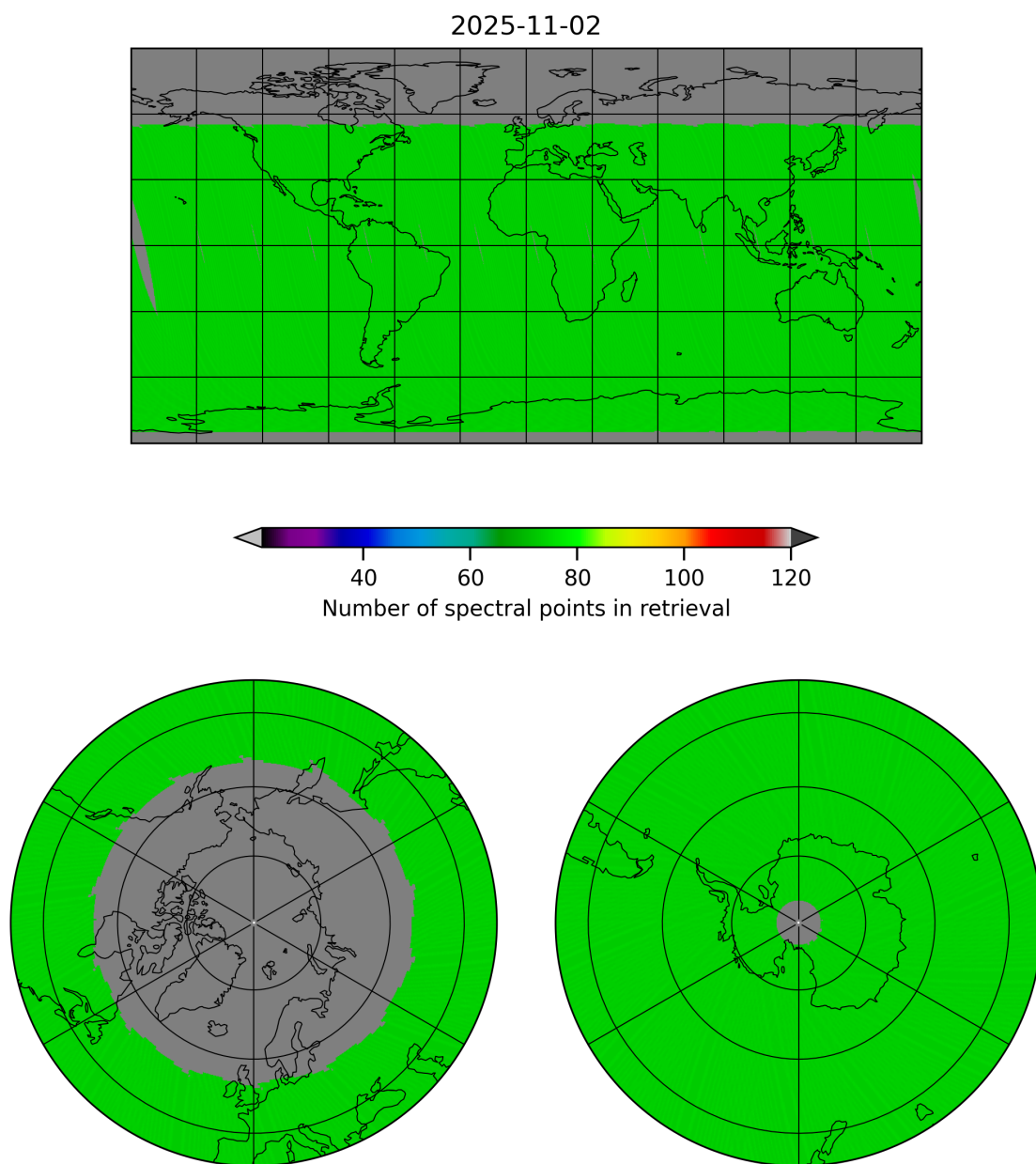


Figure 28: Map of “Number of spectral points in retrieval” for 2025-11-02 to 2025-11-03

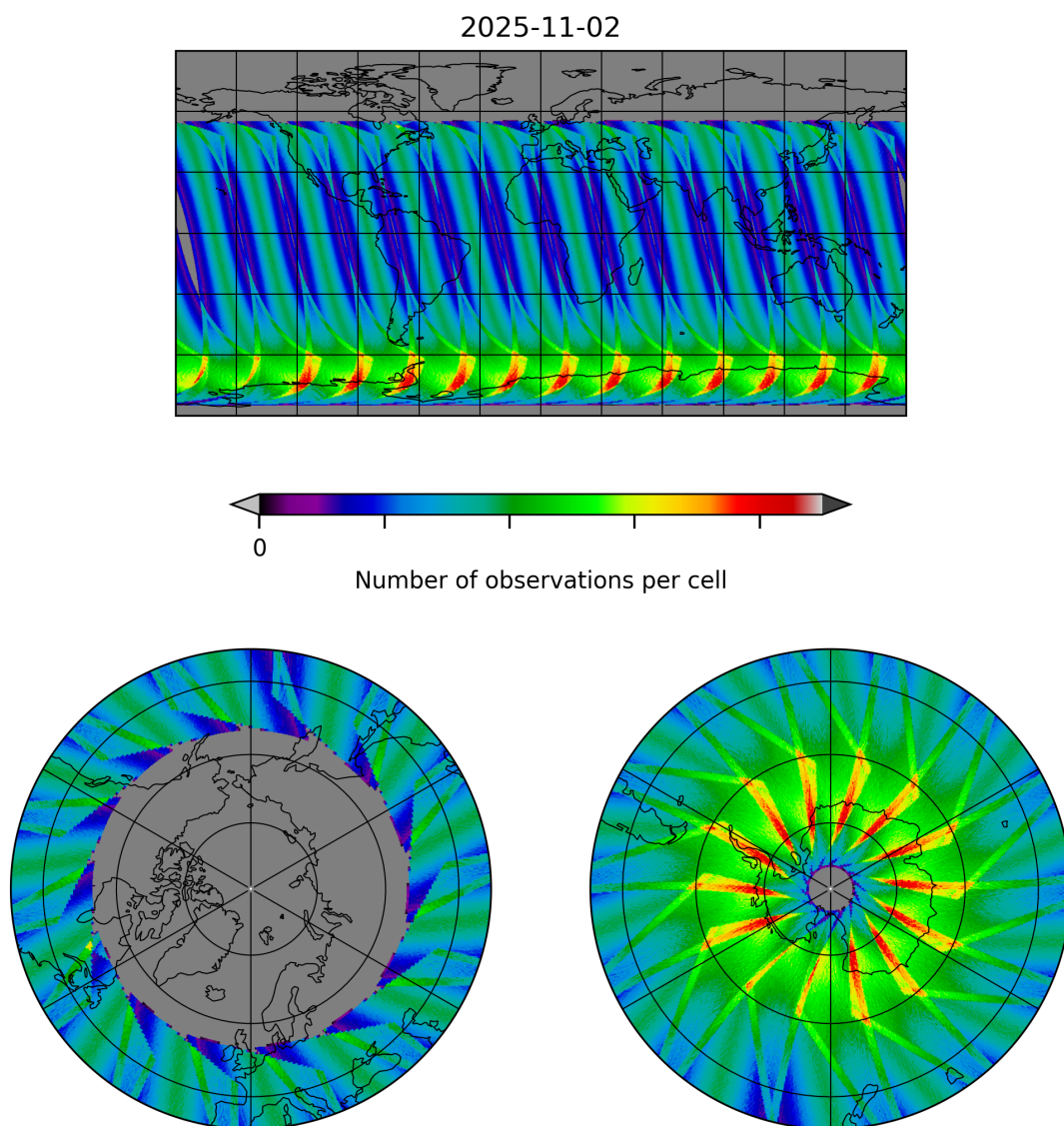


Figure 29: Map of the number of observations for 2025-11-02 to 2025-11-03

7 Zonal average

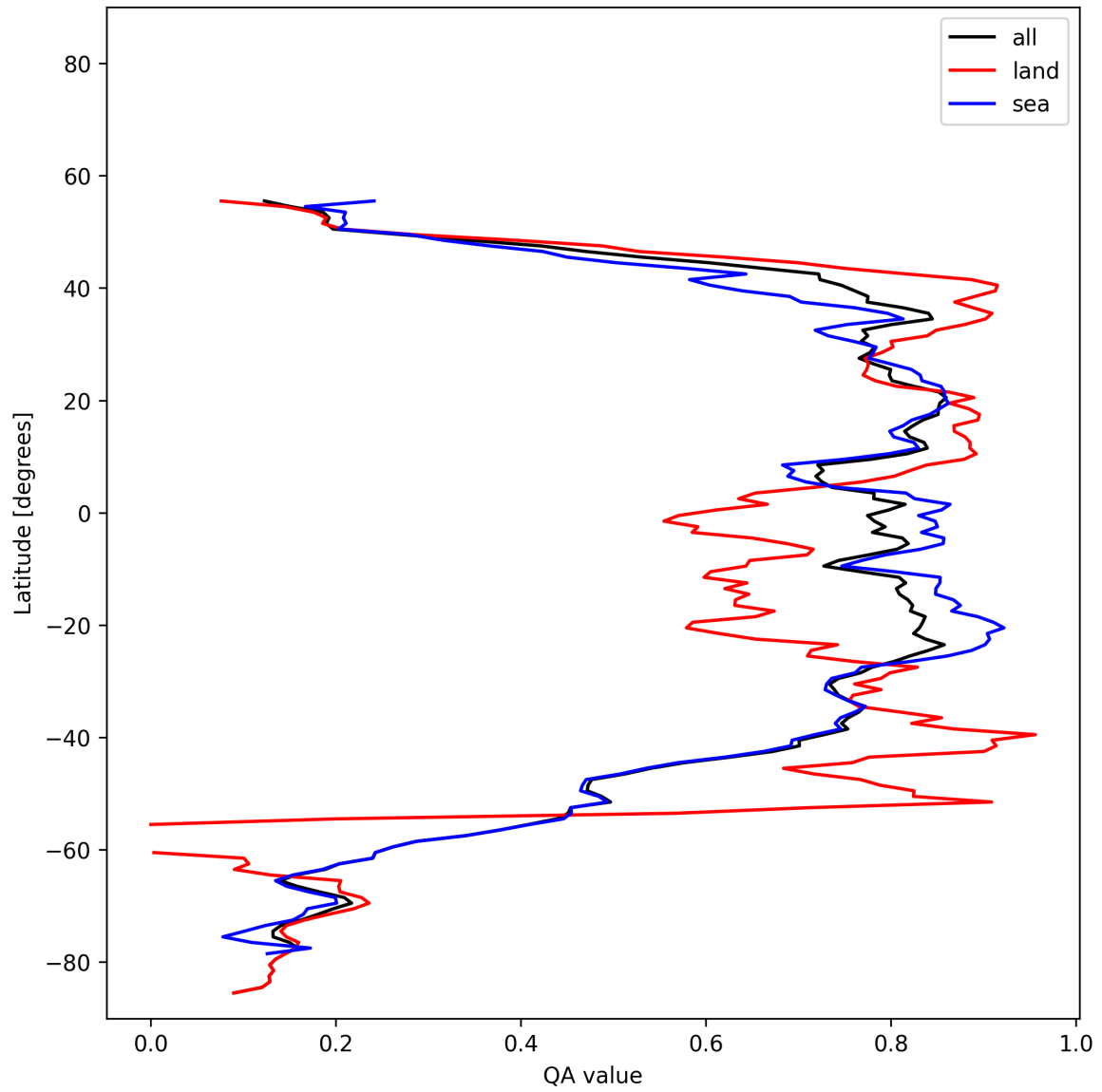


Figure 30: Zonal average of “QA value” for 2025-11-02 to 2025-11-03.

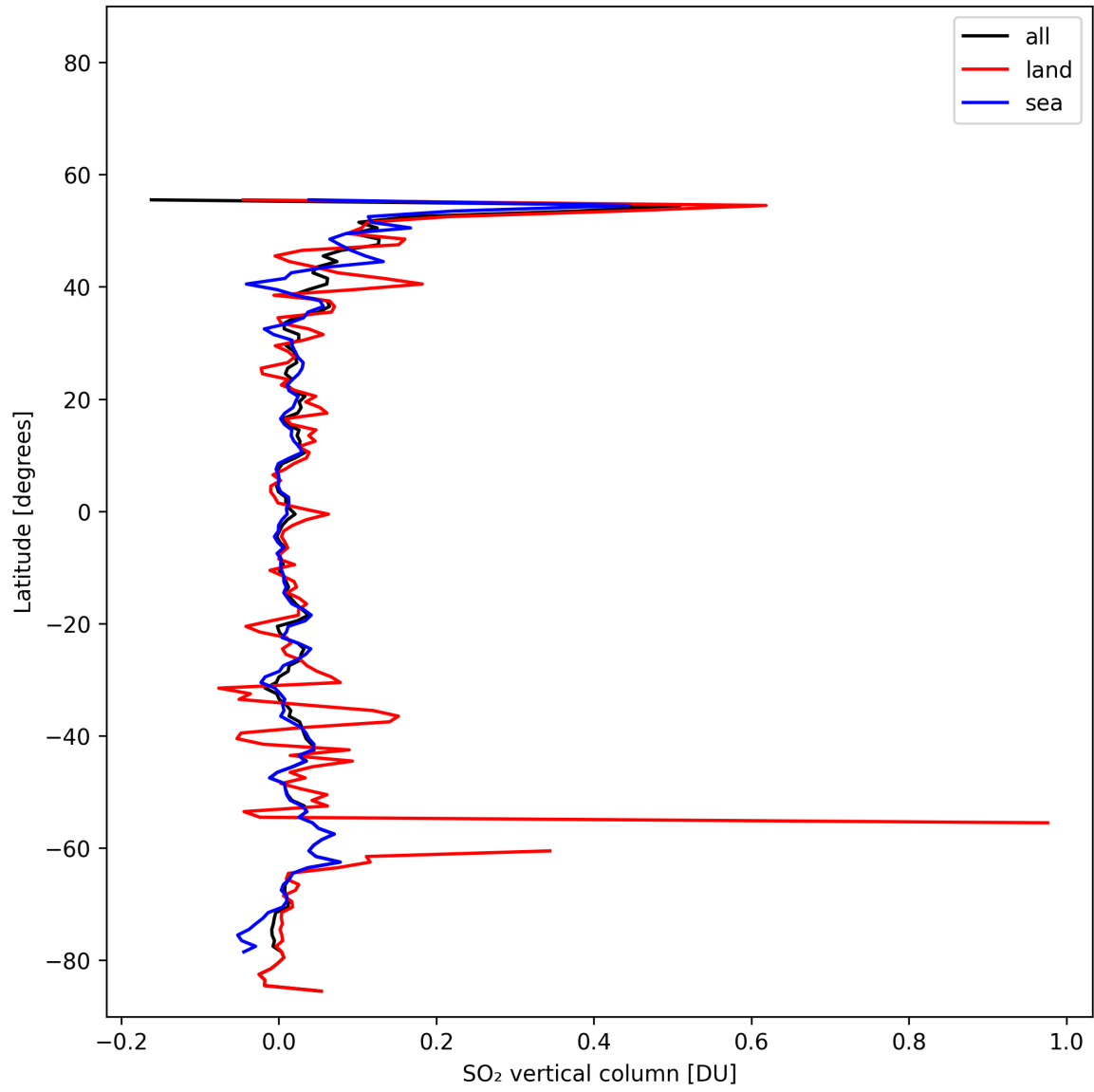


Figure 31: Zonal average of “SO₂ vertical column” for 2025-11-02 to 2025-11-03.

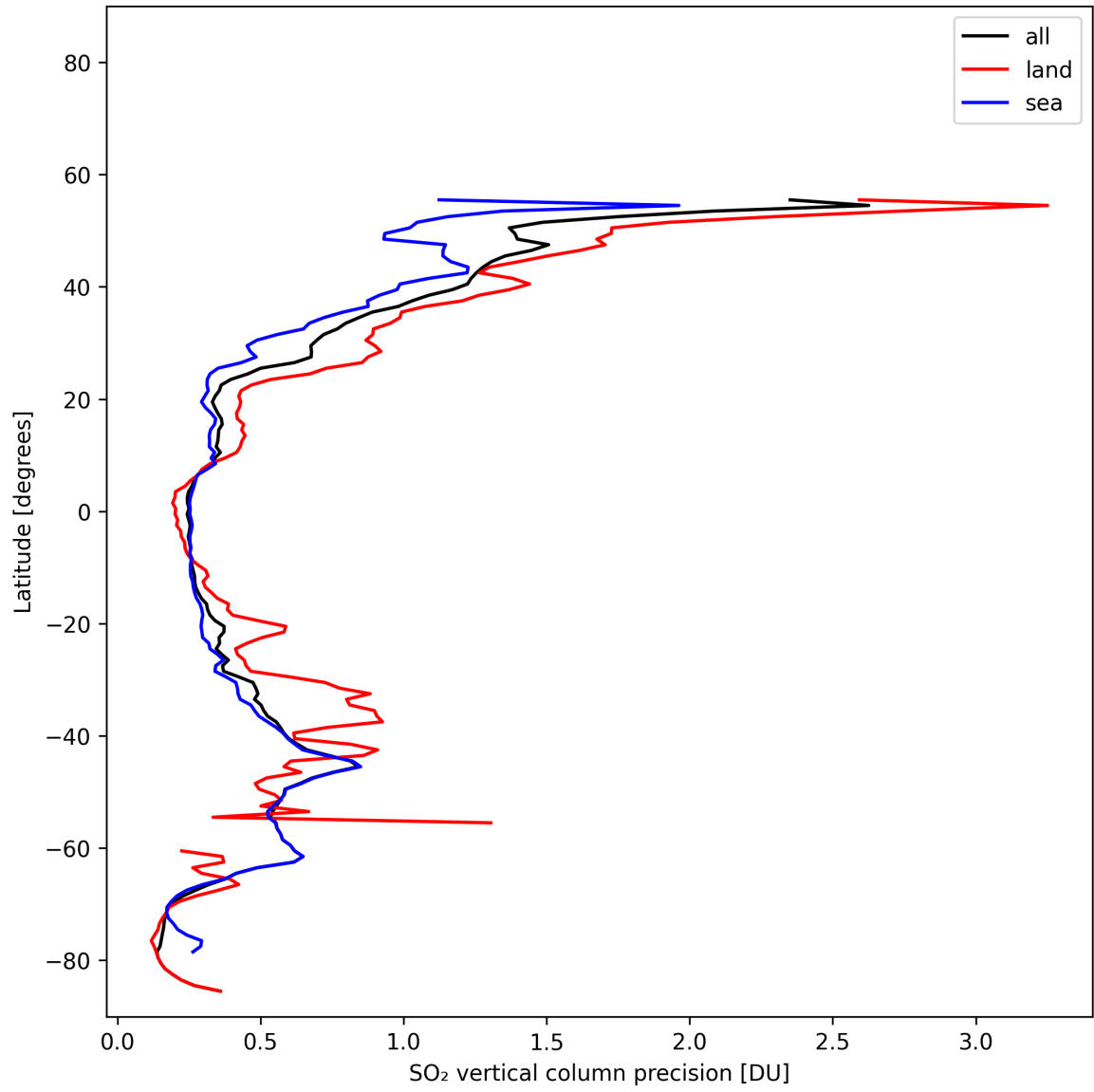


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-11-02 to 2025-11-03.

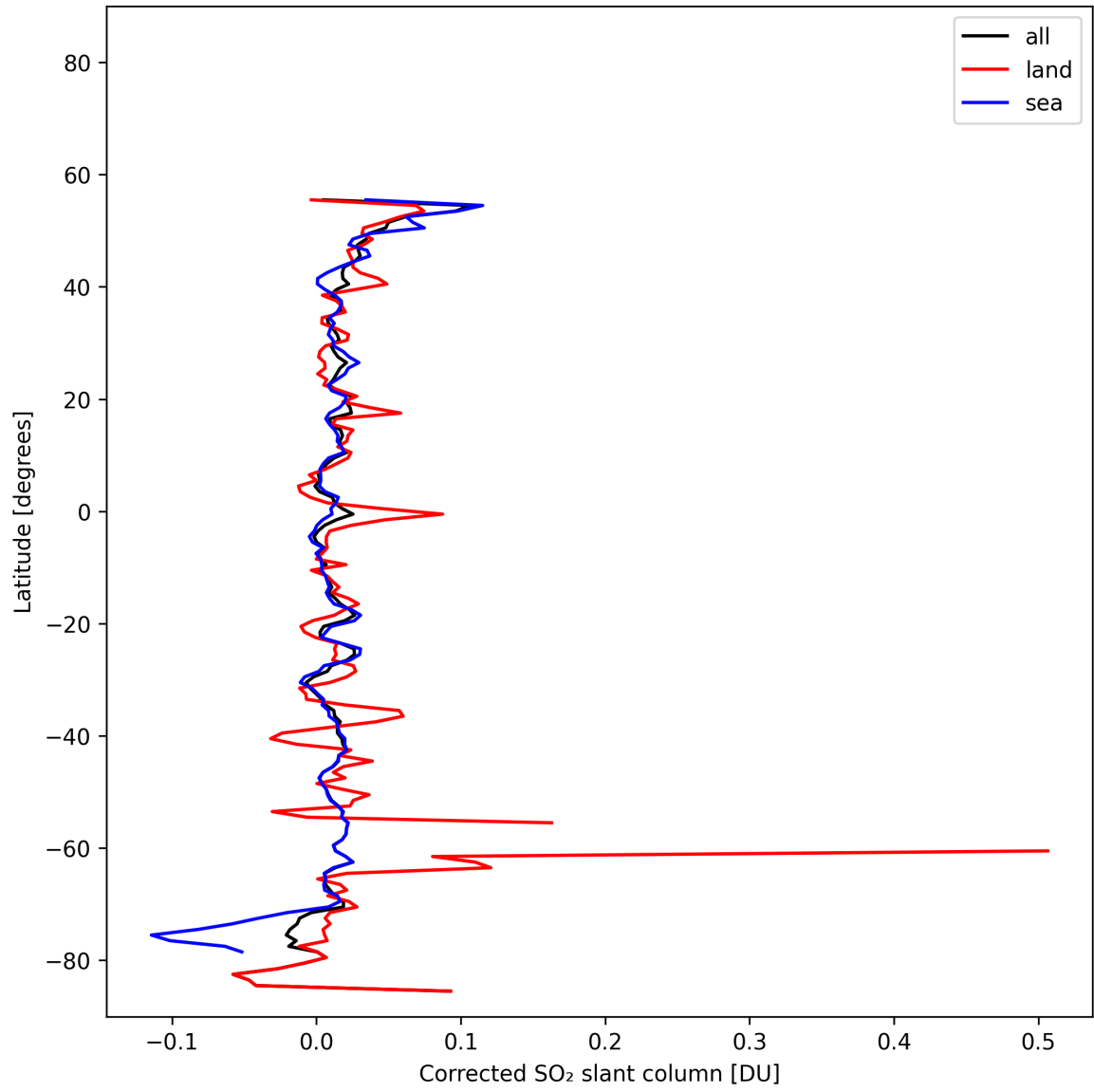


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-11-02 to 2025-11-03.

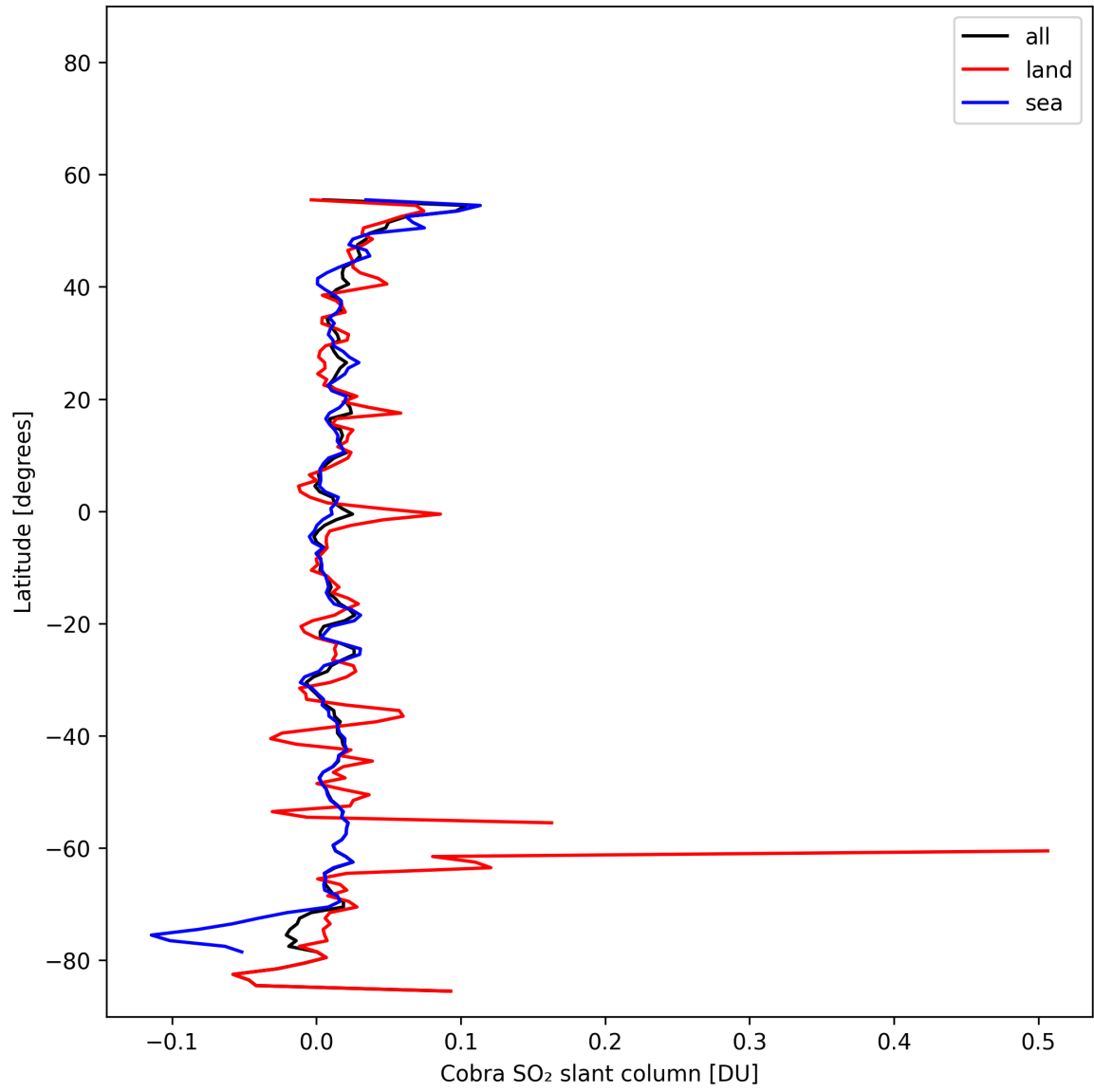


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-11-02 to 2025-11-03.

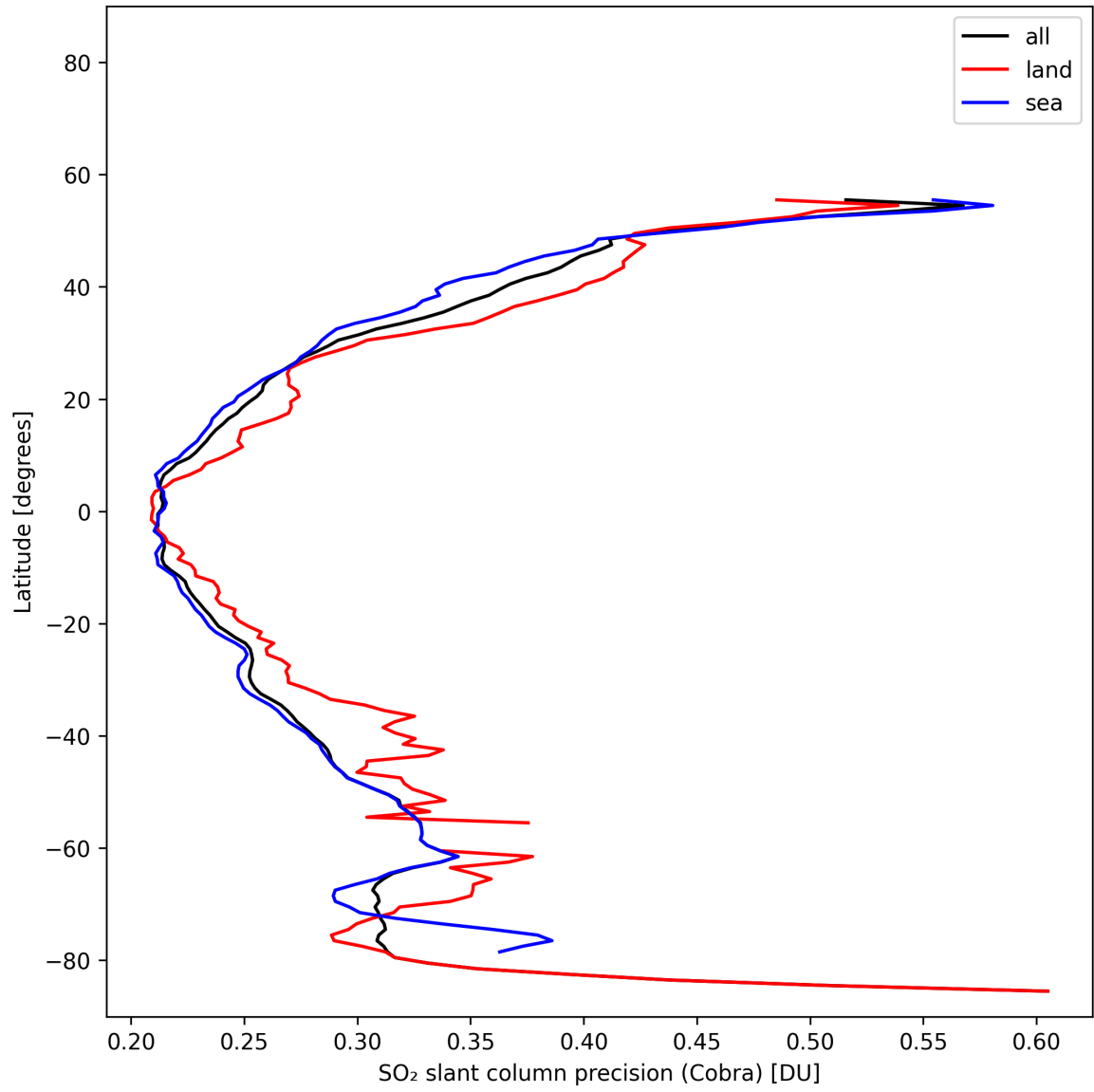


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-11-02 to 2025-11-03.

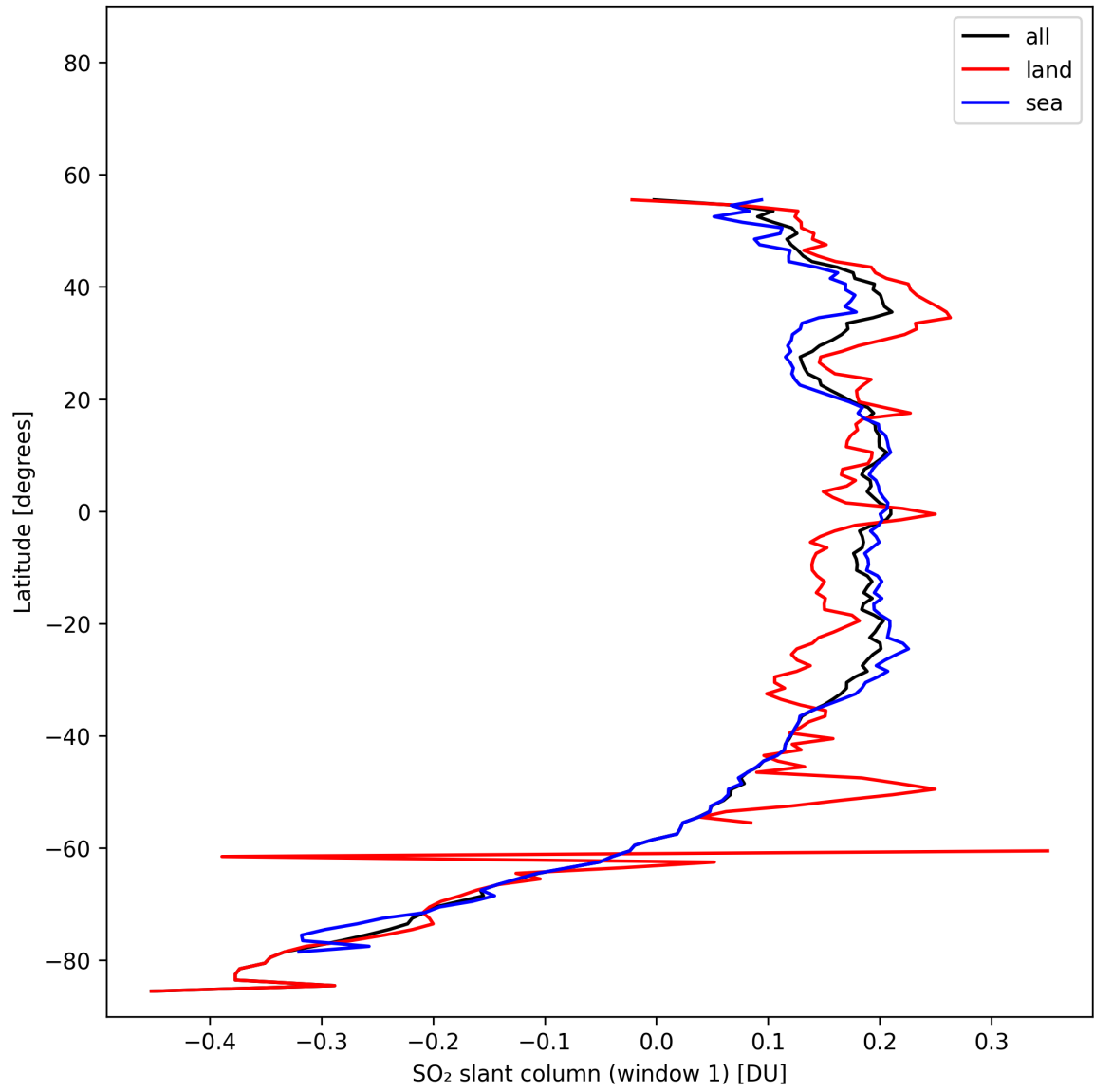


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-11-02 to 2025-11-03.

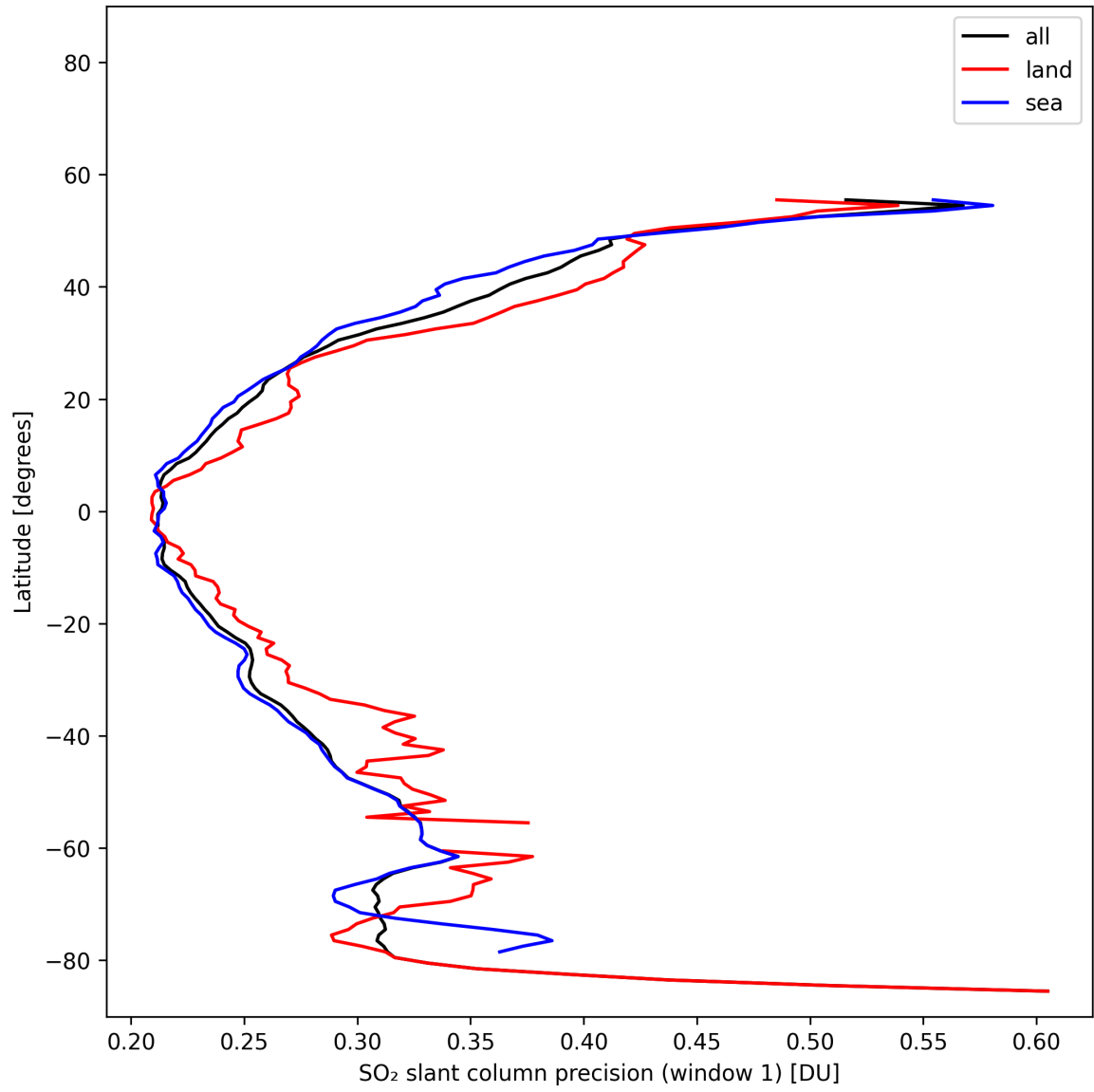


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-11-02 to 2025-11-03.

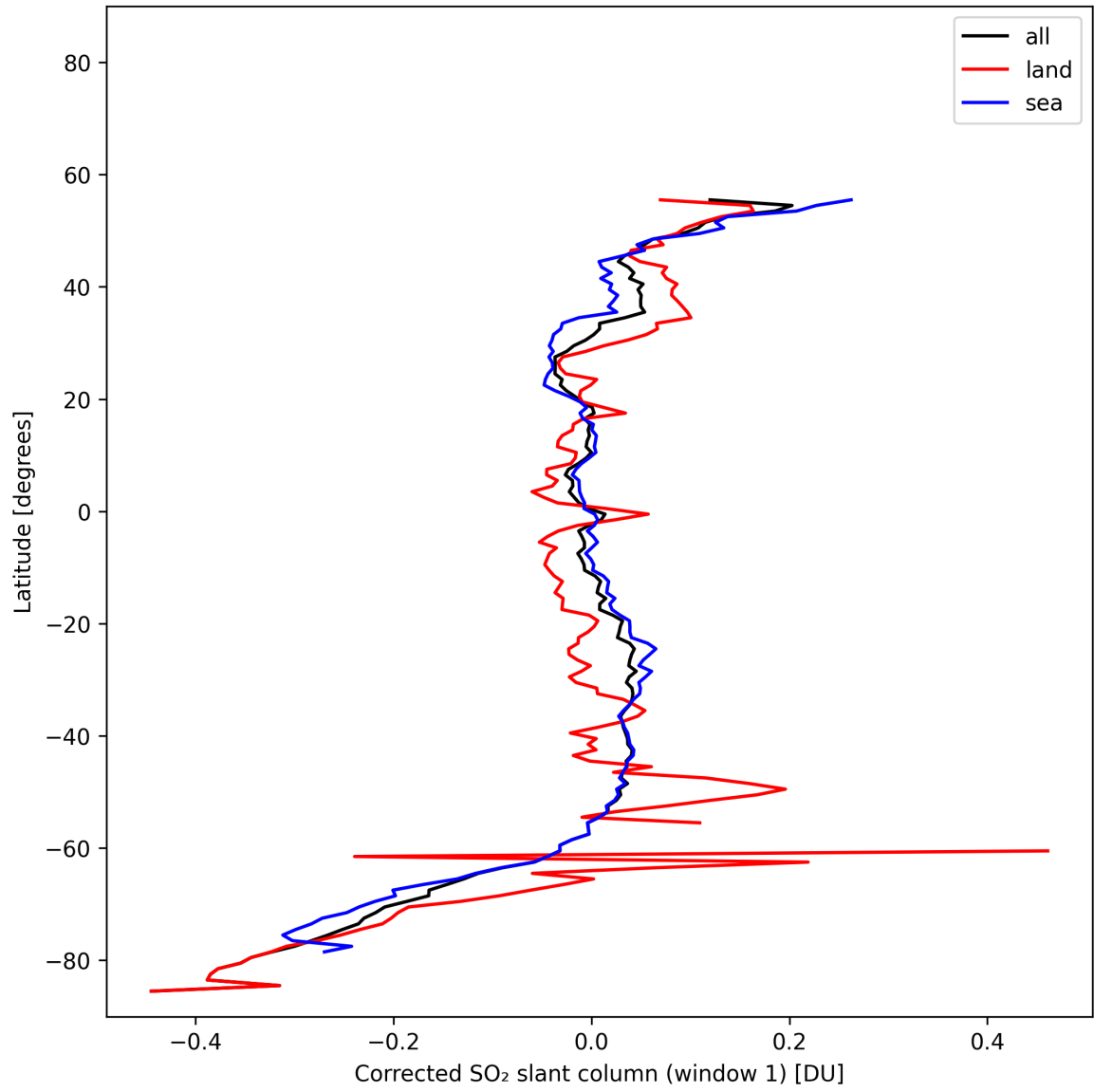


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-11-02 to 2025-11-03.

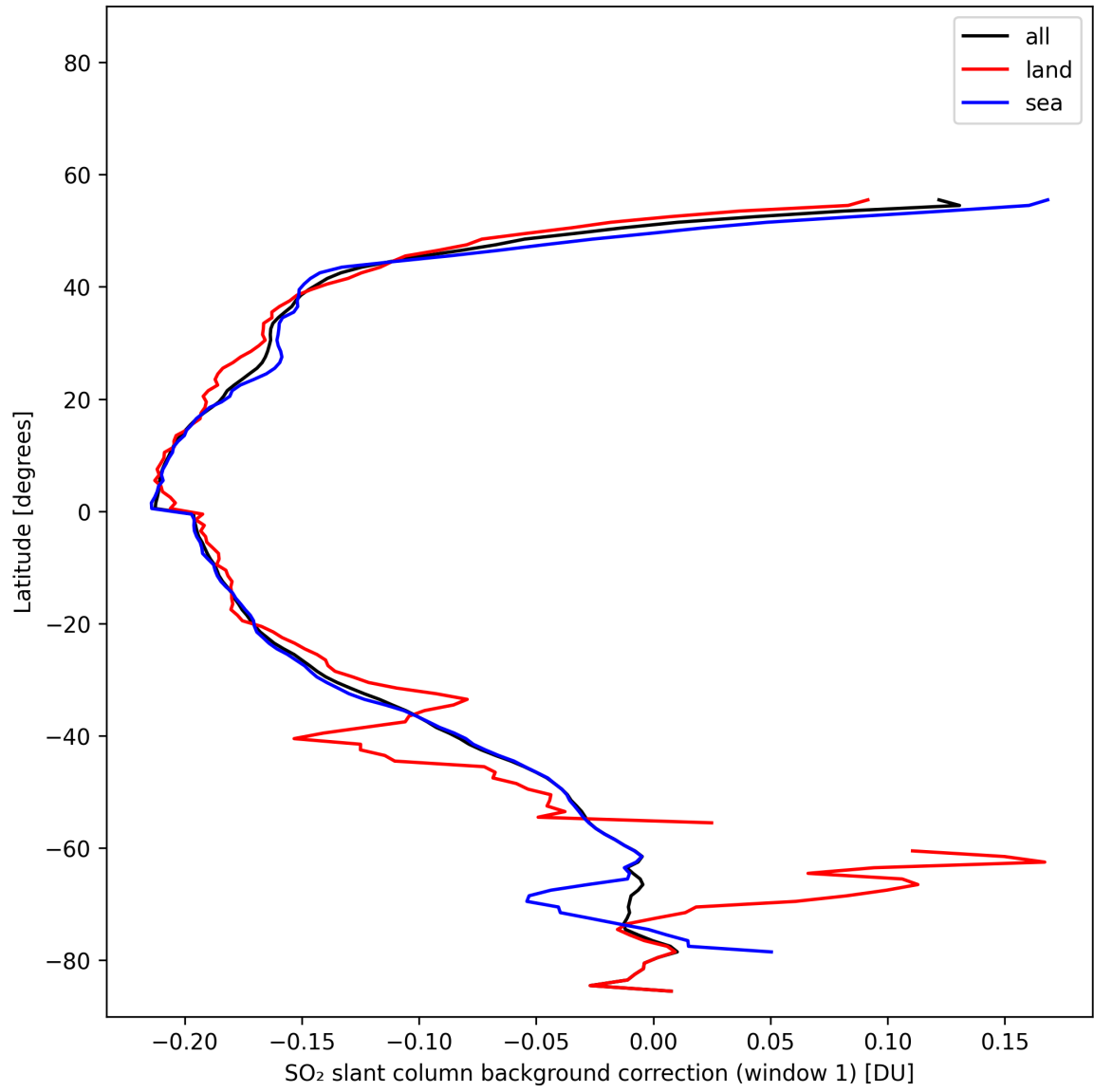


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-11-02 to 2025-11-03.

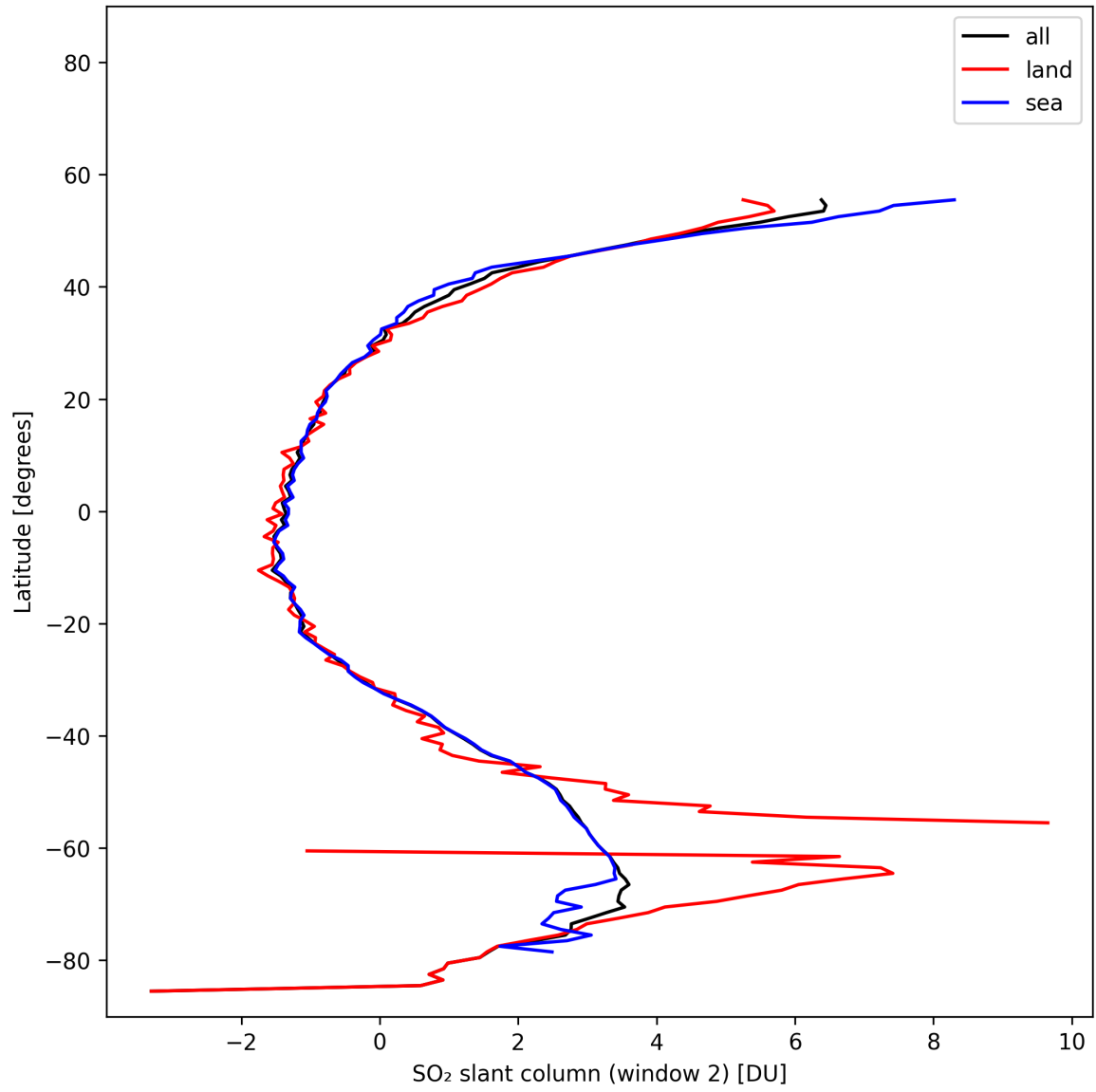


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-11-02 to 2025-11-03.

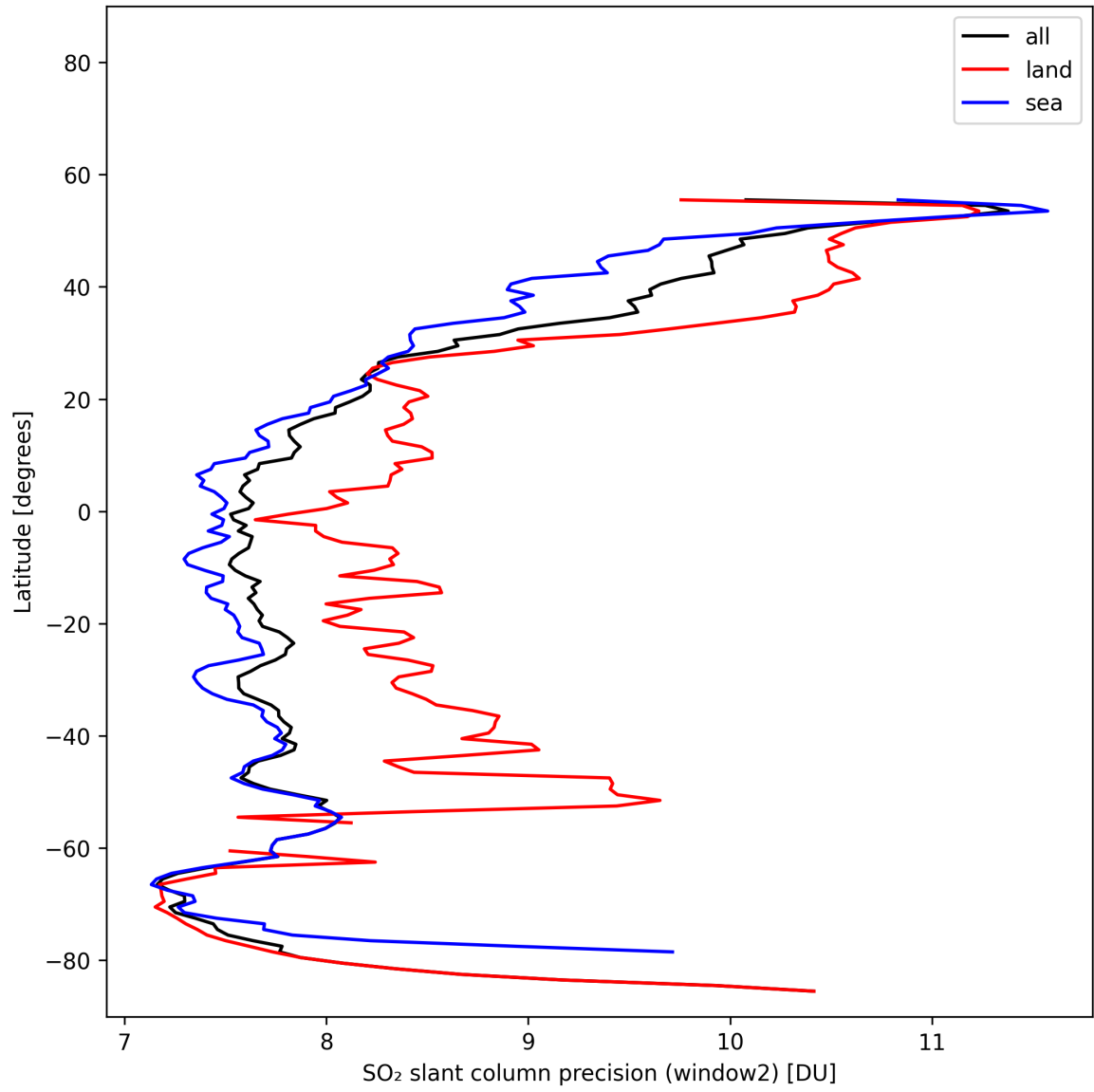


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-11-02 to 2025-11-03.

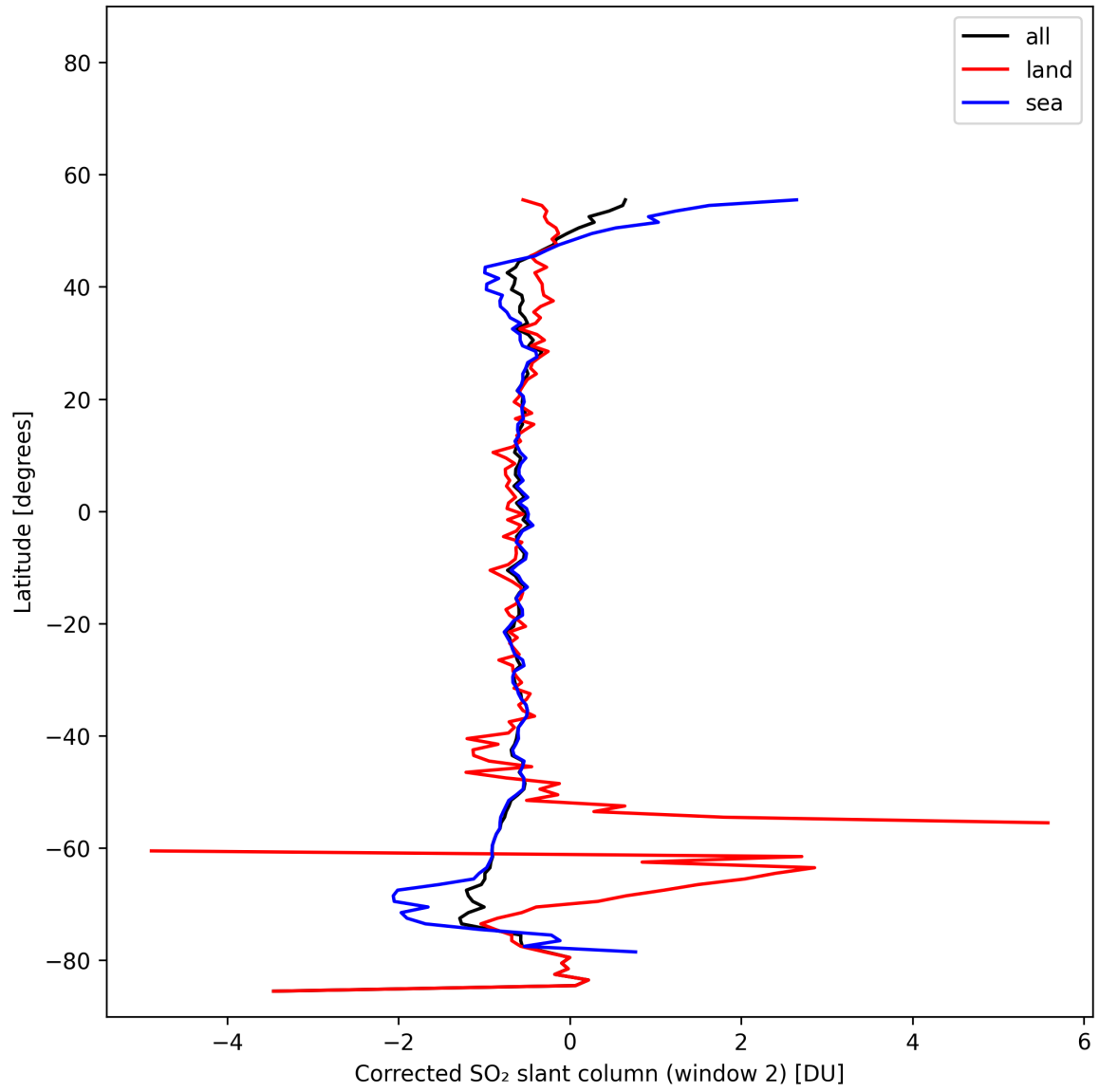


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-11-02 to 2025-11-03.

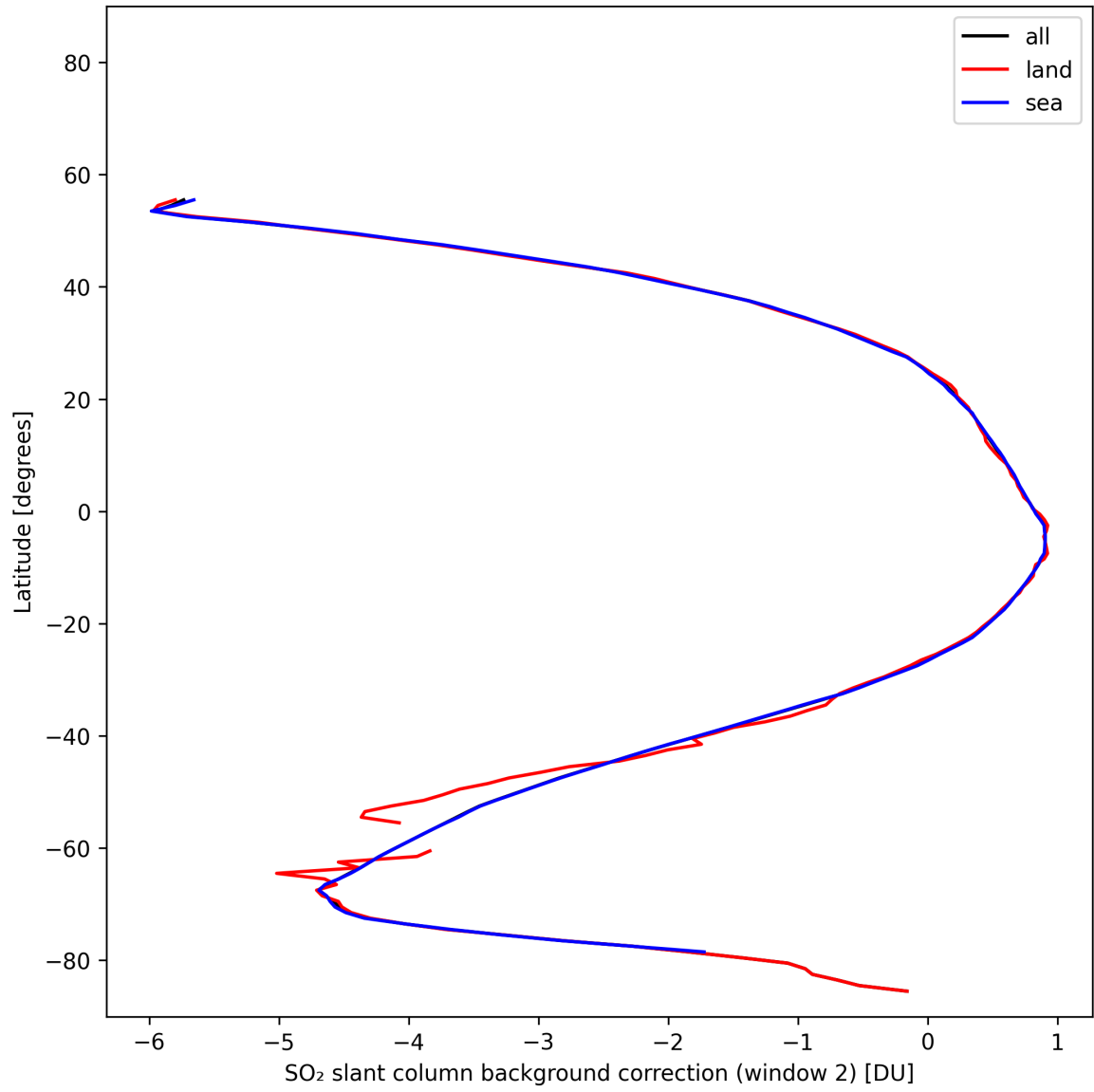


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-11-02 to 2025-11-03.

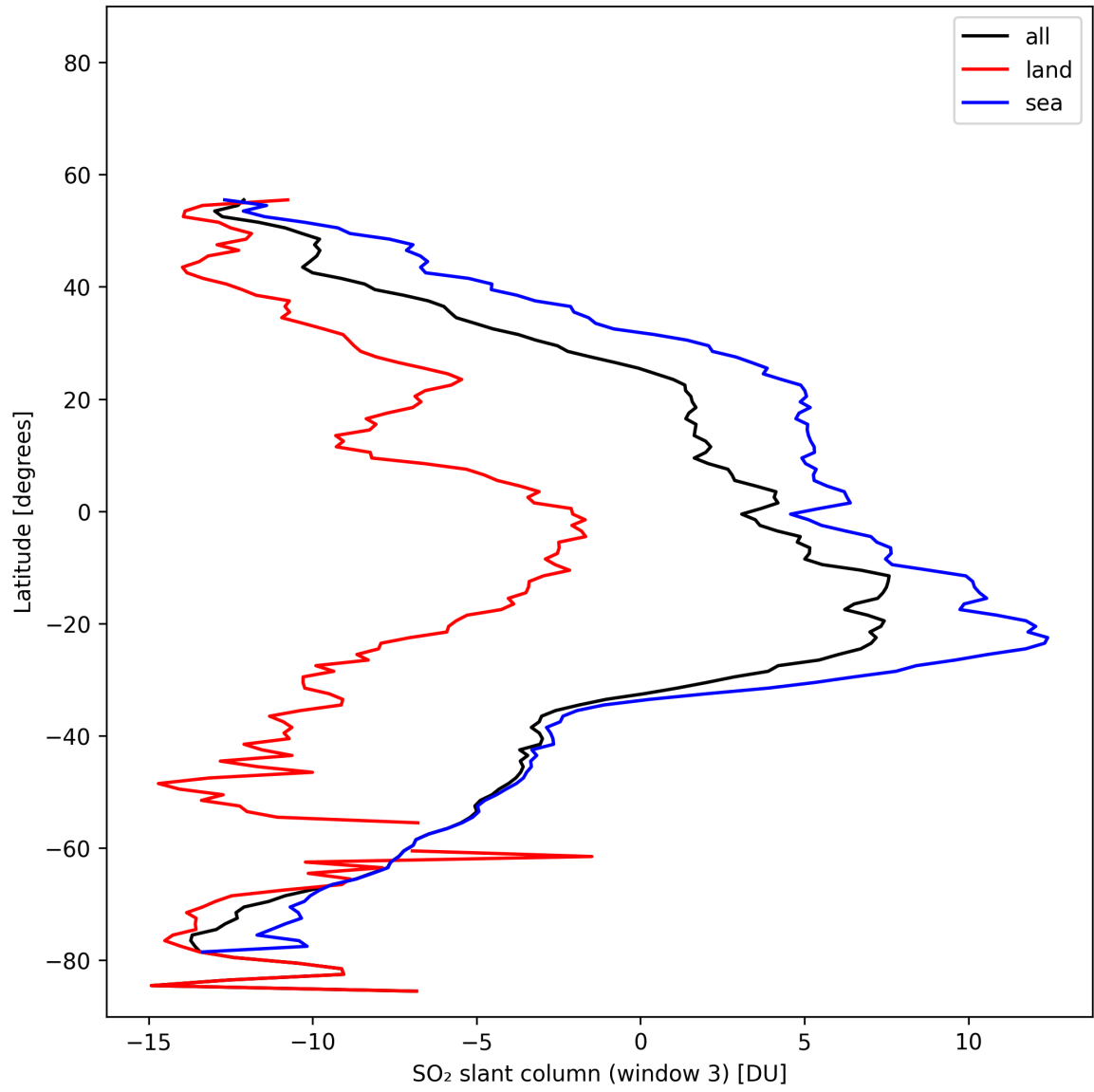


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-11-02 to 2025-11-03.

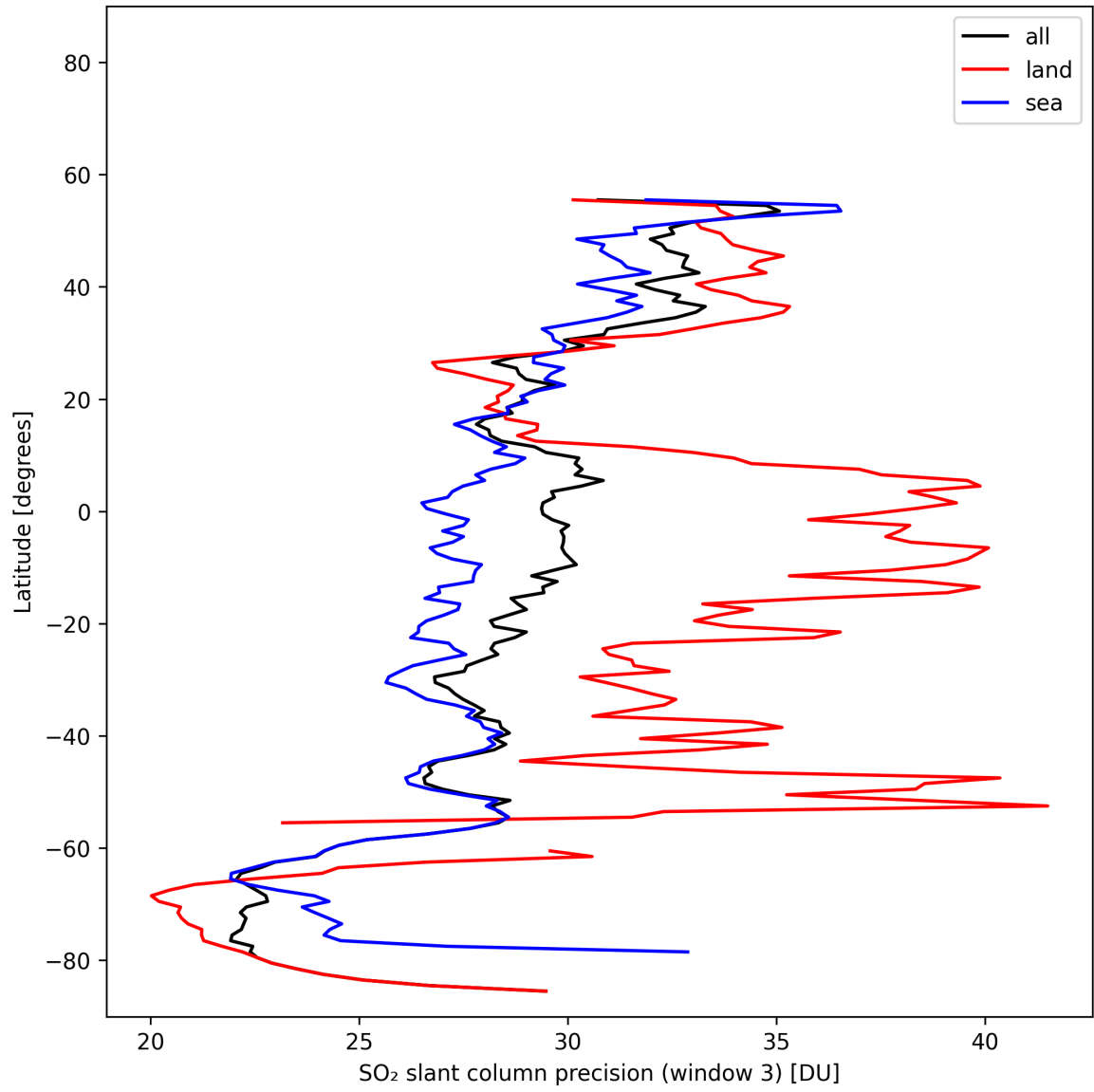


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-11-02 to 2025-11-03.

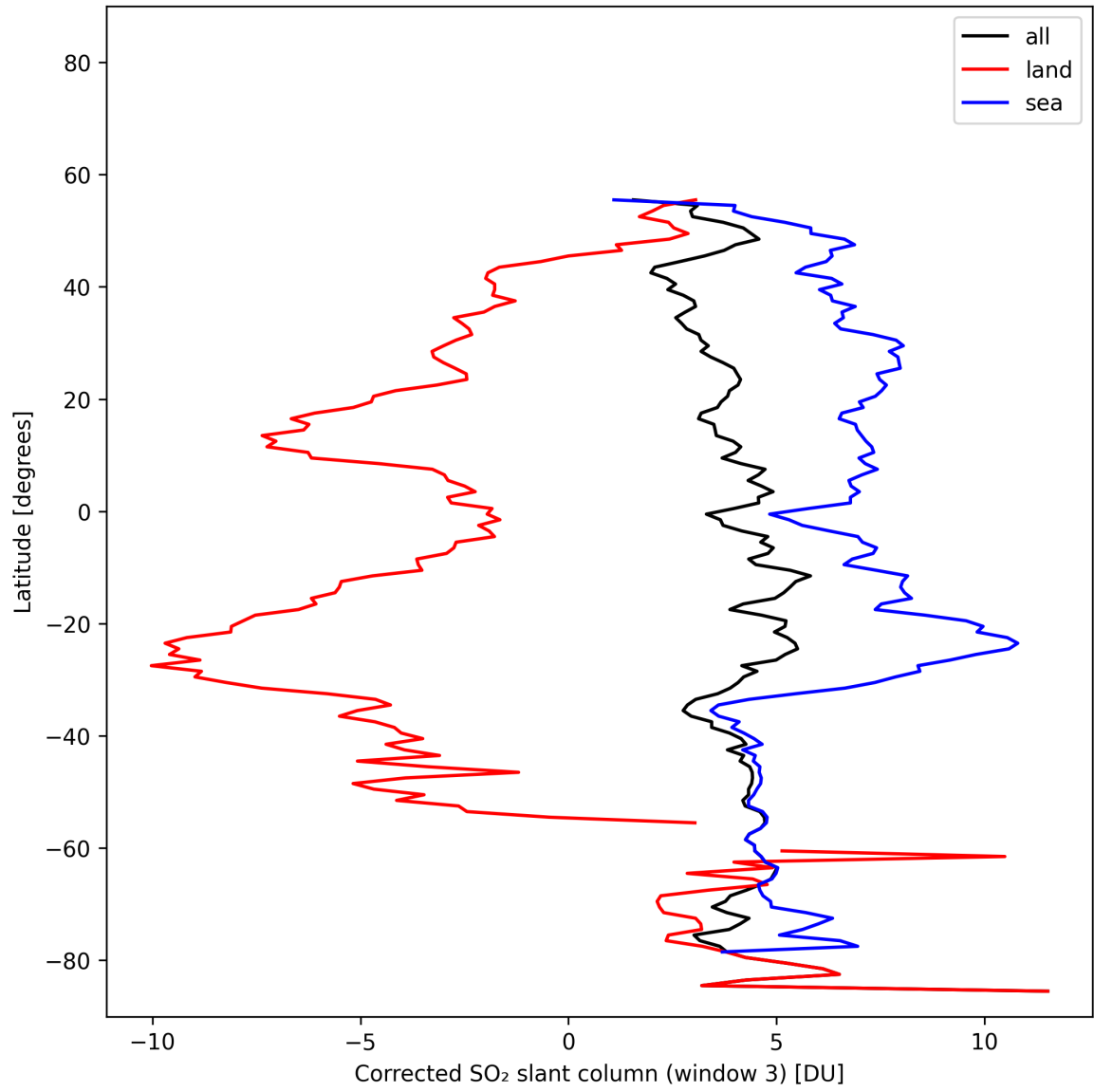


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-11-02 to 2025-11-03.

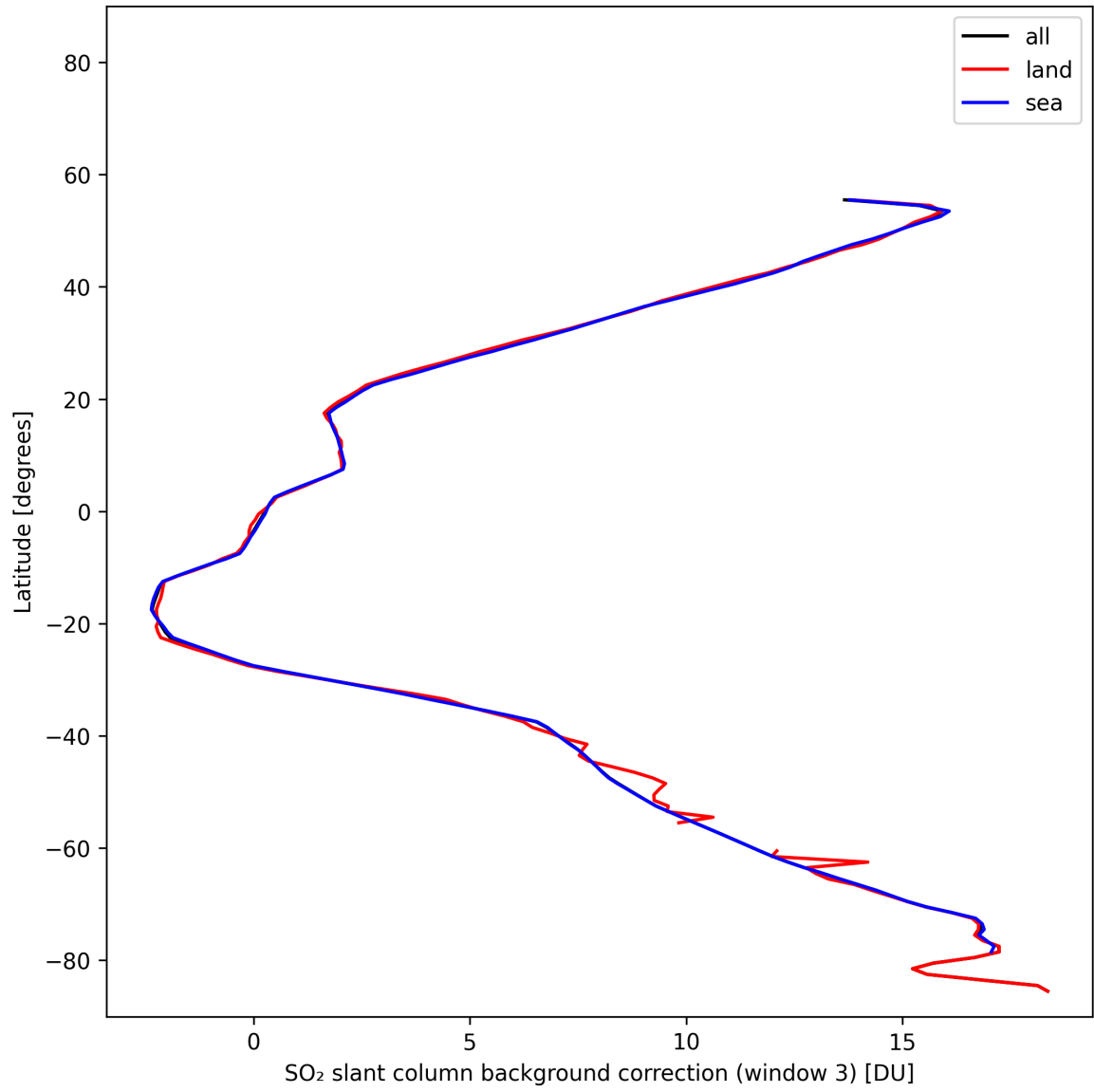


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-11-02 to 2025-11-03.

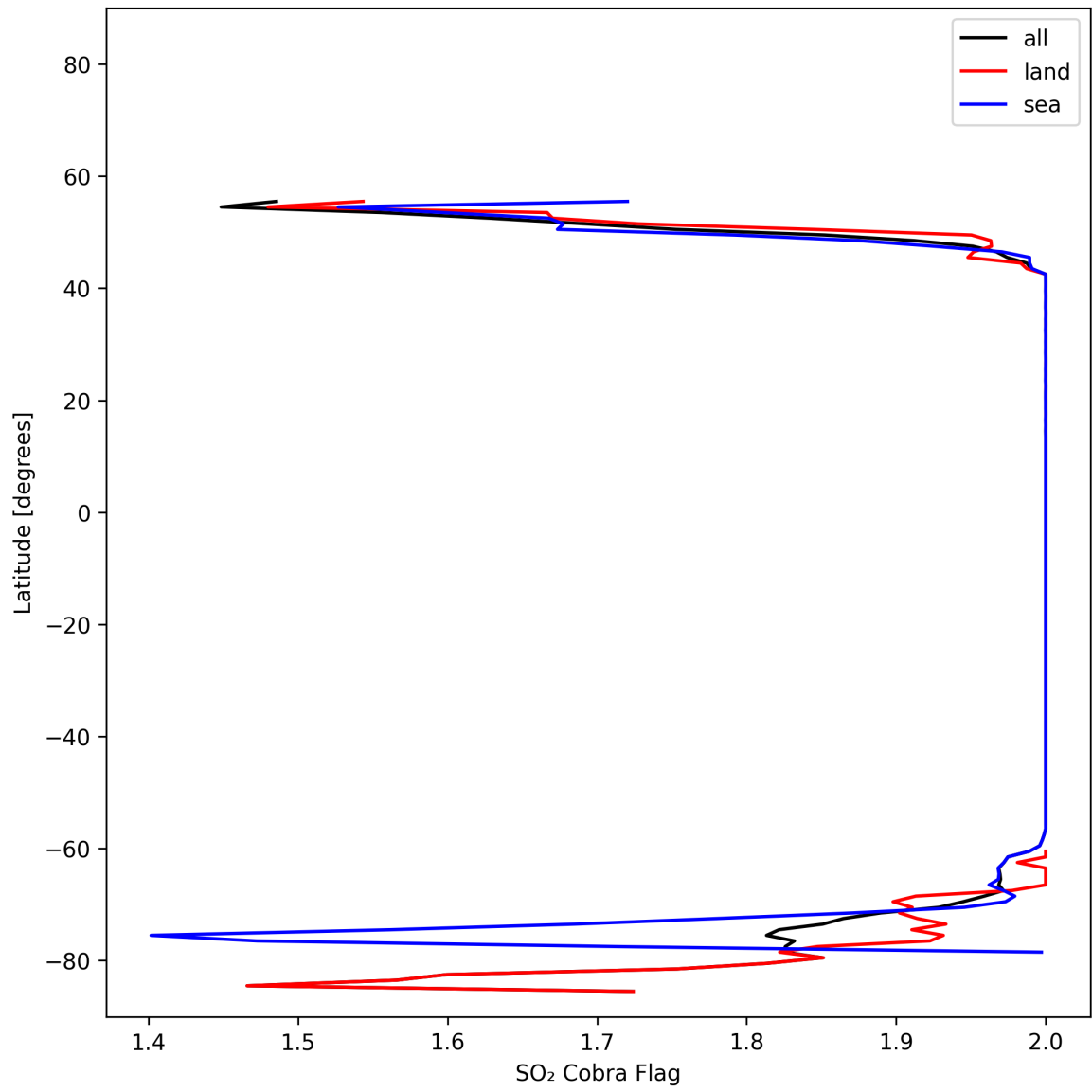


Figure 48: Zonal average of “SO₂ Cobra Flag” for 2025-11-02 to 2025-11-03.

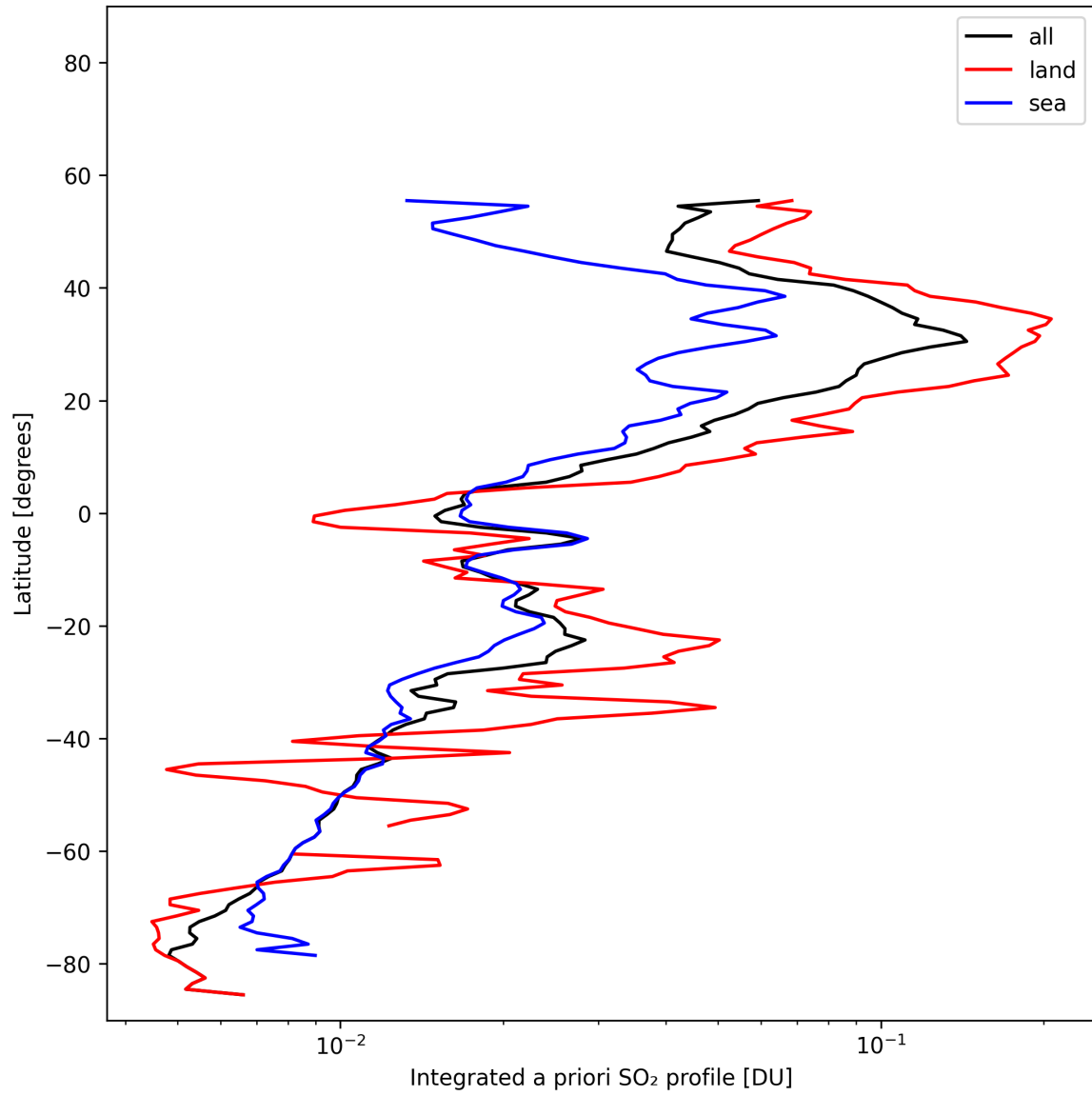


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-11-02 to 2025-11-03.

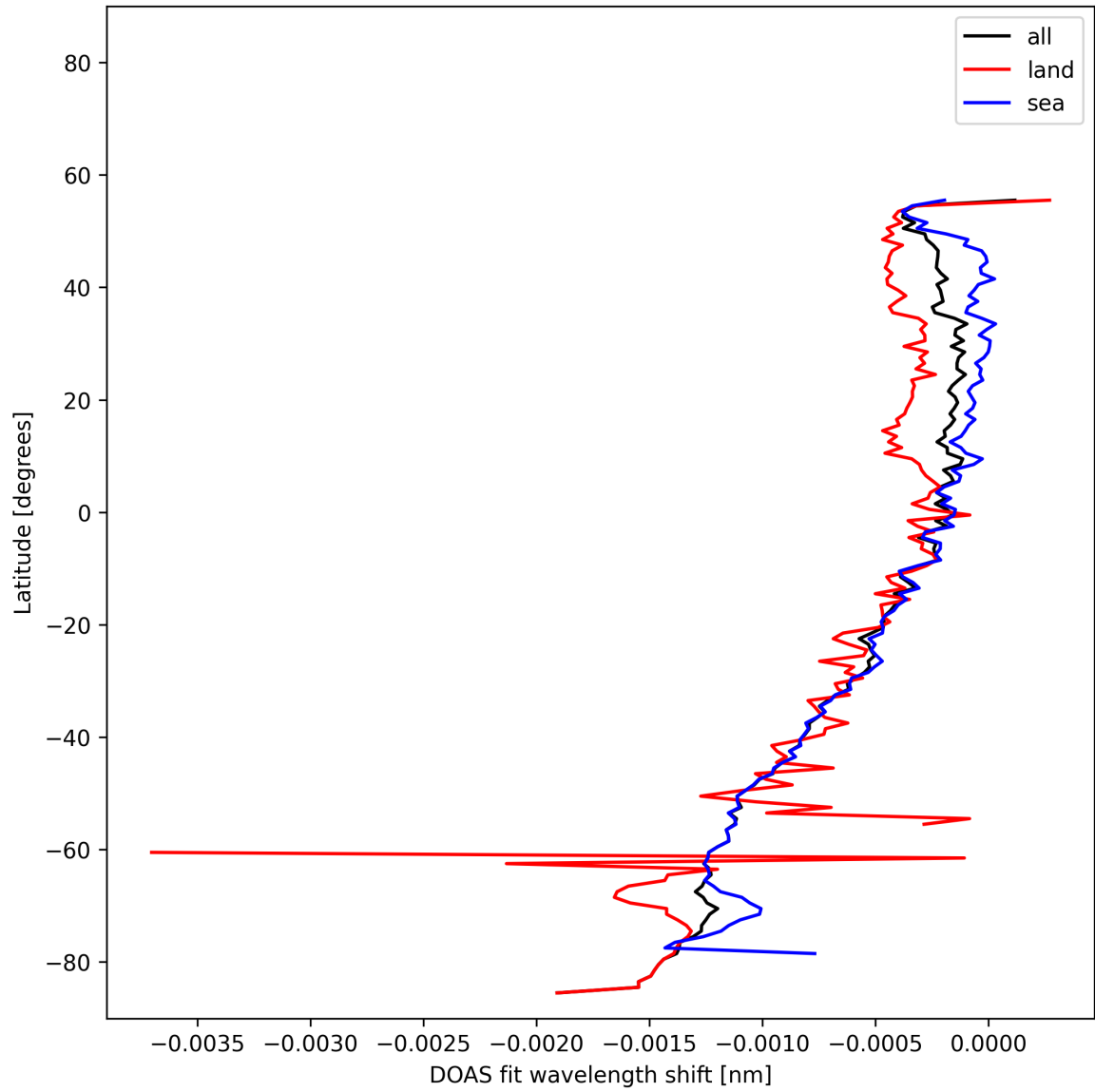


Figure 50: Zonal average of "DOAS fit wavelength shift" for 2025-11-02 to 2025-11-03.

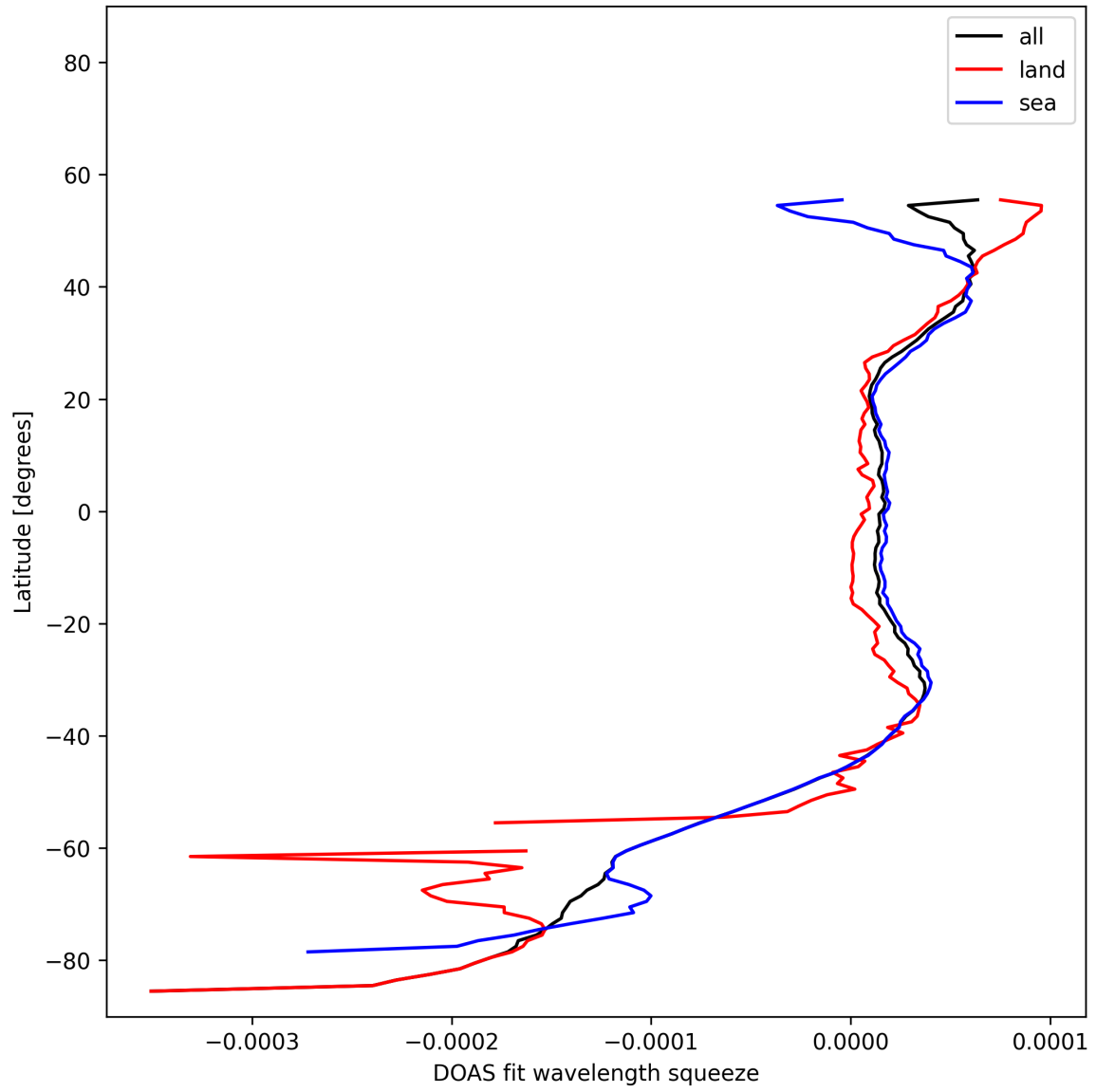


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-11-02 to 2025-11-03.

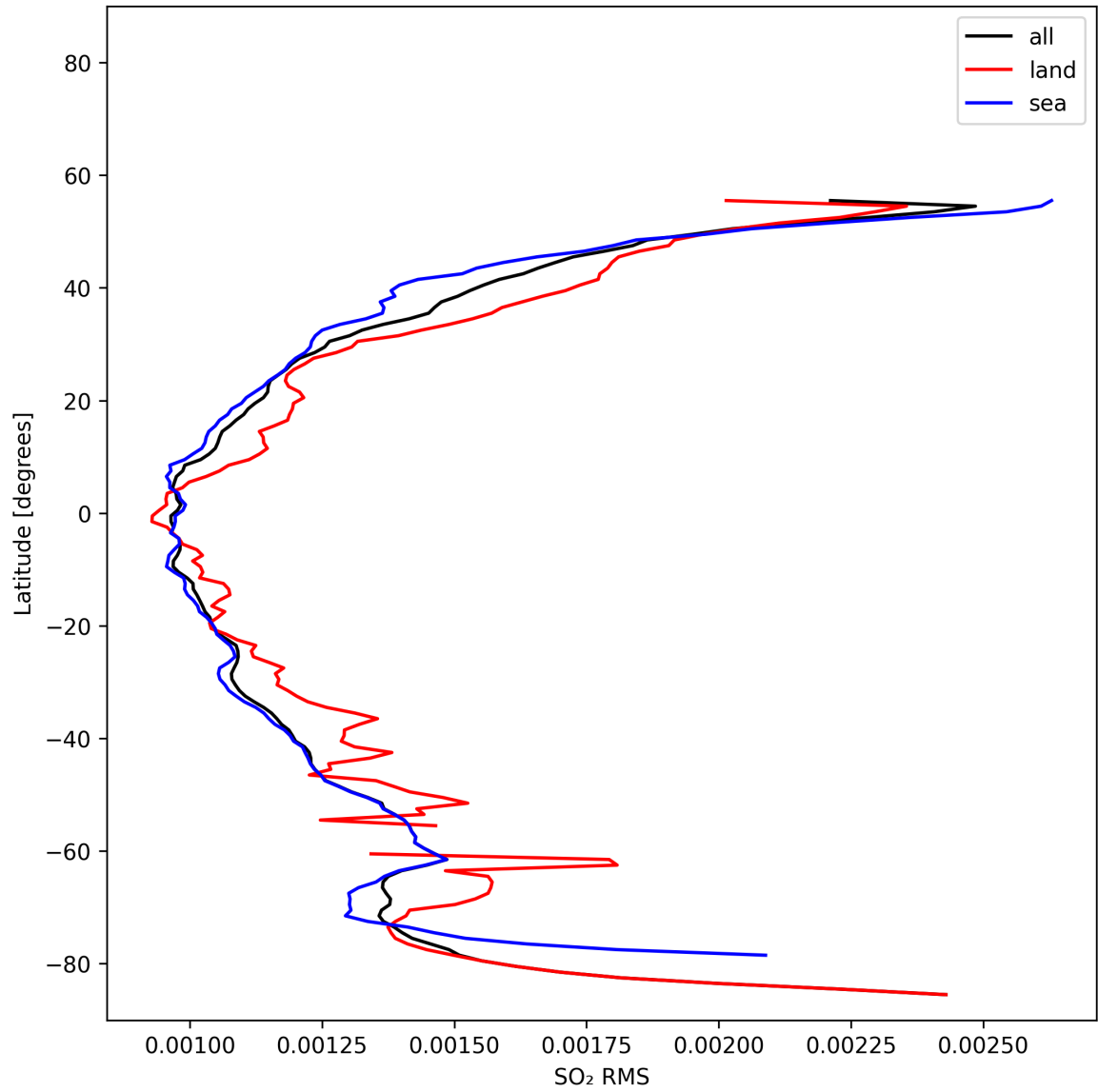


Figure 52: Zonal average of “SO₂ RMS” for 2025-11-02 to 2025-11-03.

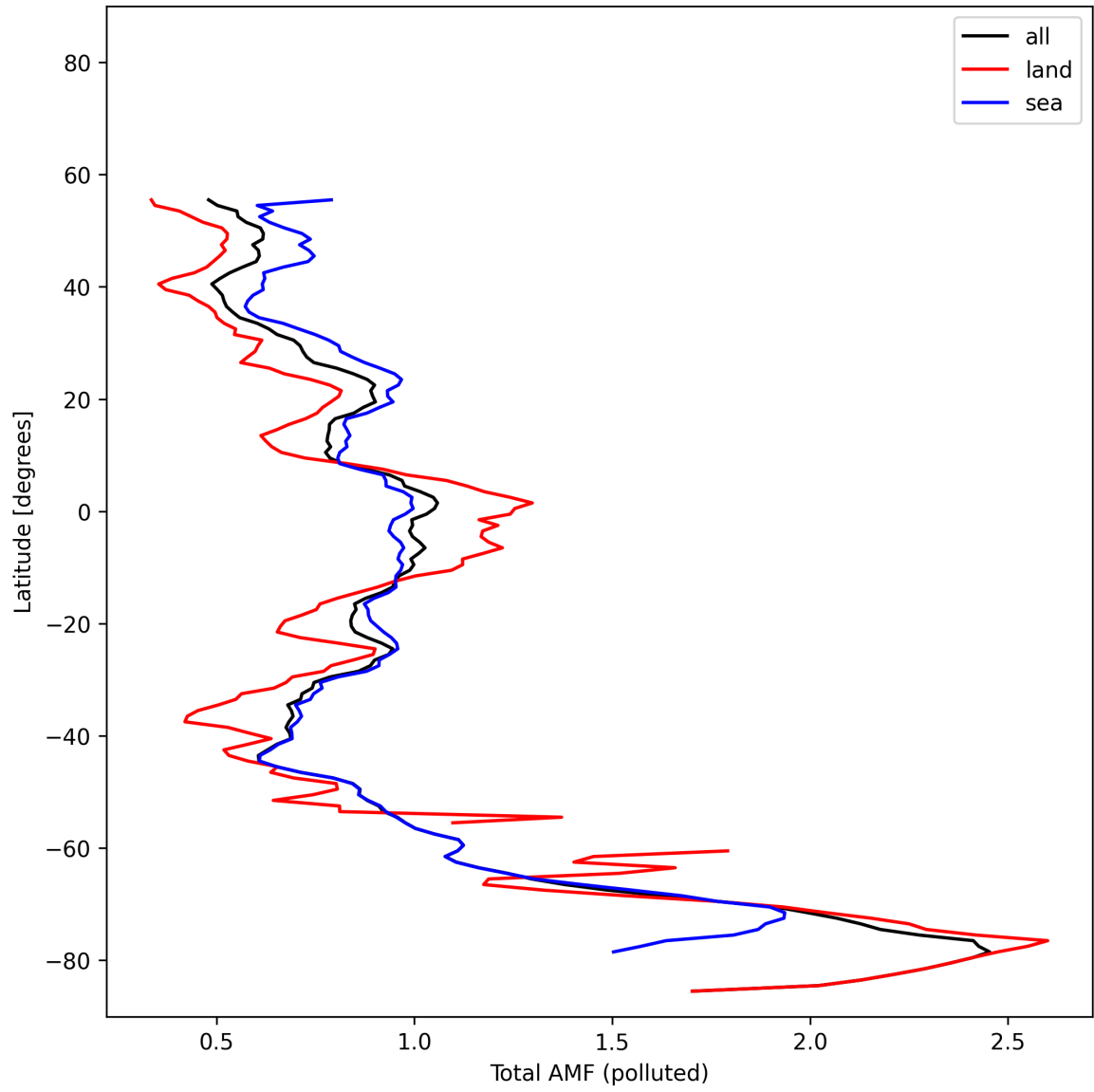


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-11-02 to 2025-11-03.

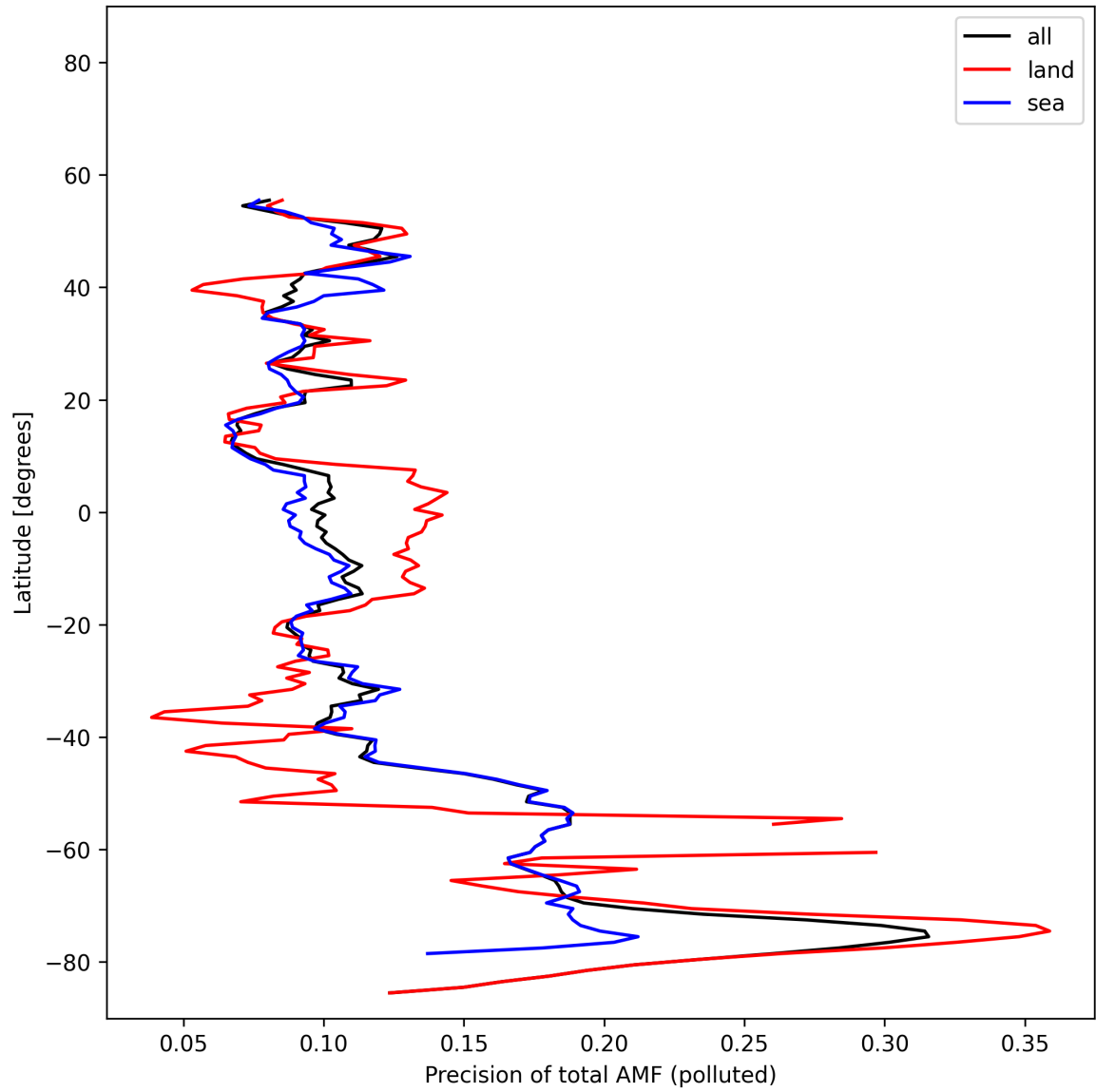


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-11-02 to 2025-11-03.

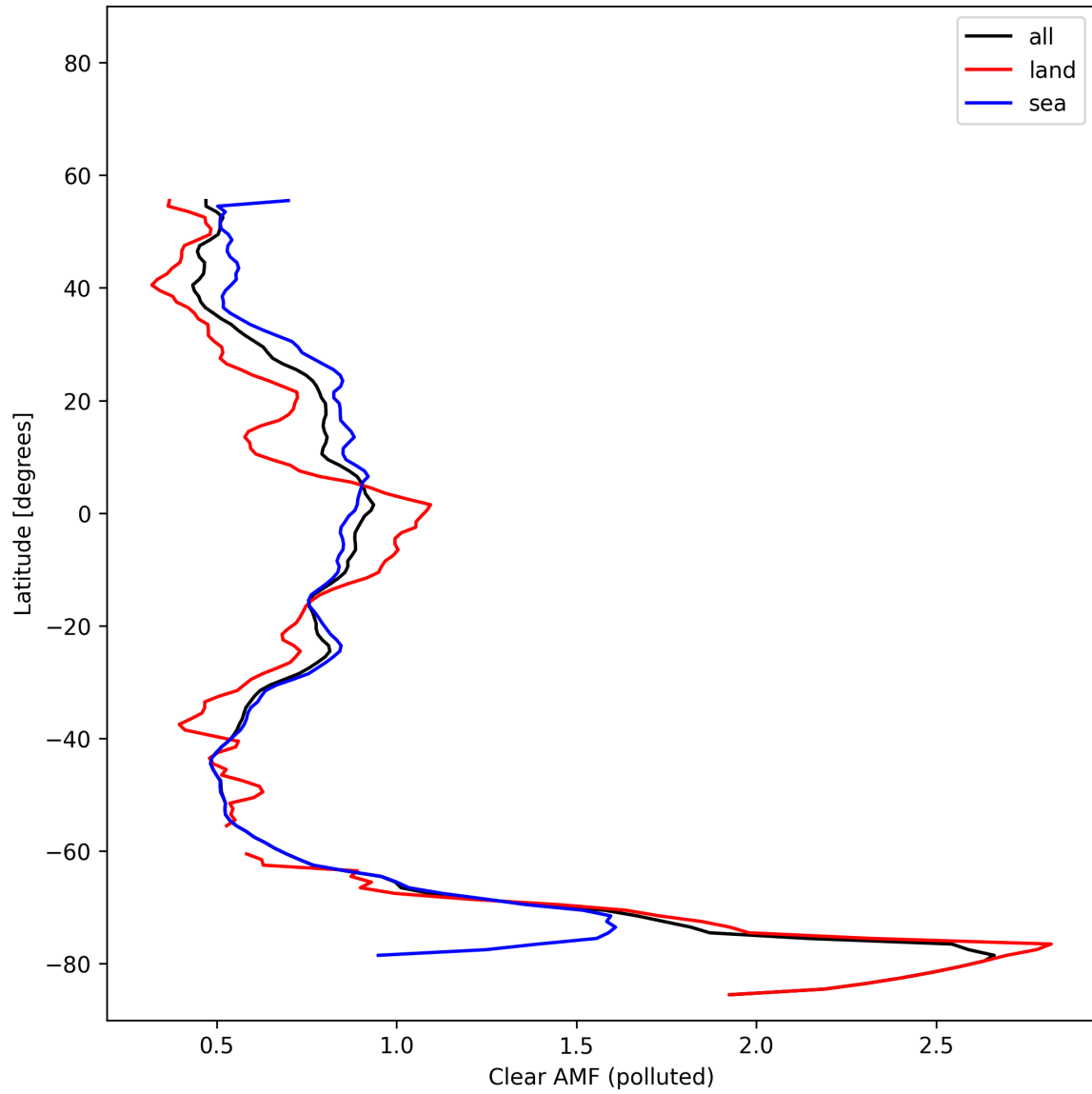


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-11-02 to 2025-11-03.

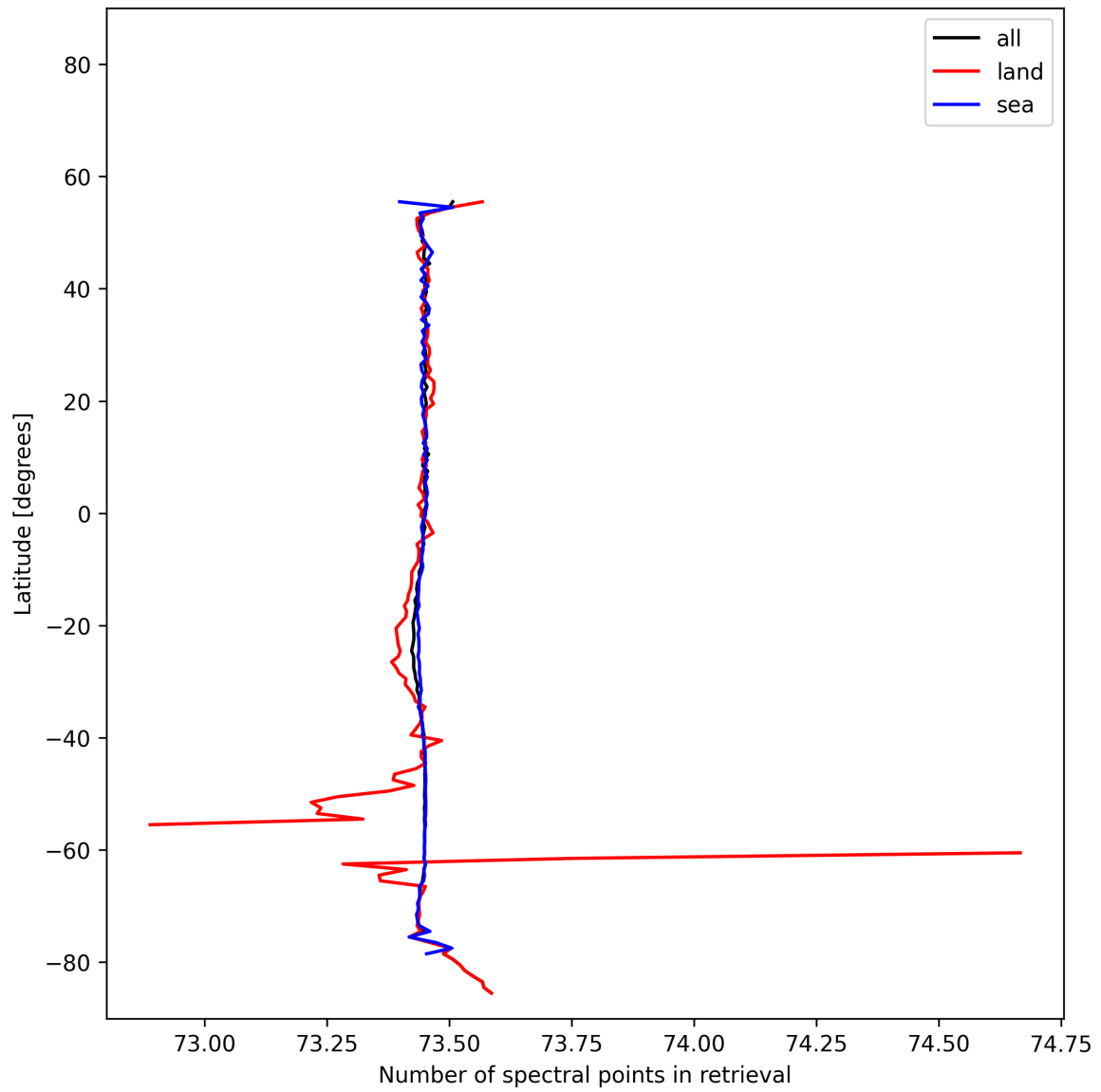


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-11-02 to 2025-11-03.

8 Histograms

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

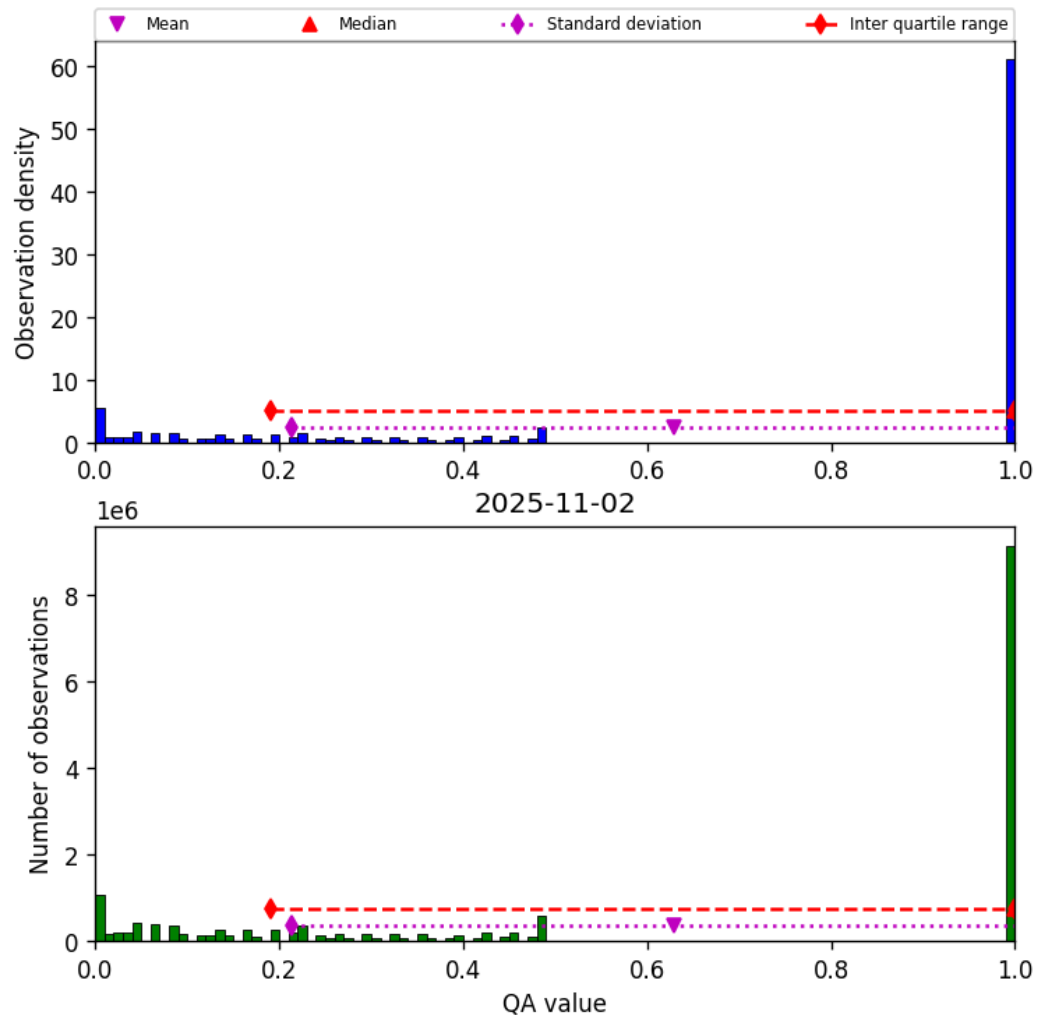


Figure 57: Histogram of “QA value” for 2025-11-02 to 2025-11-03

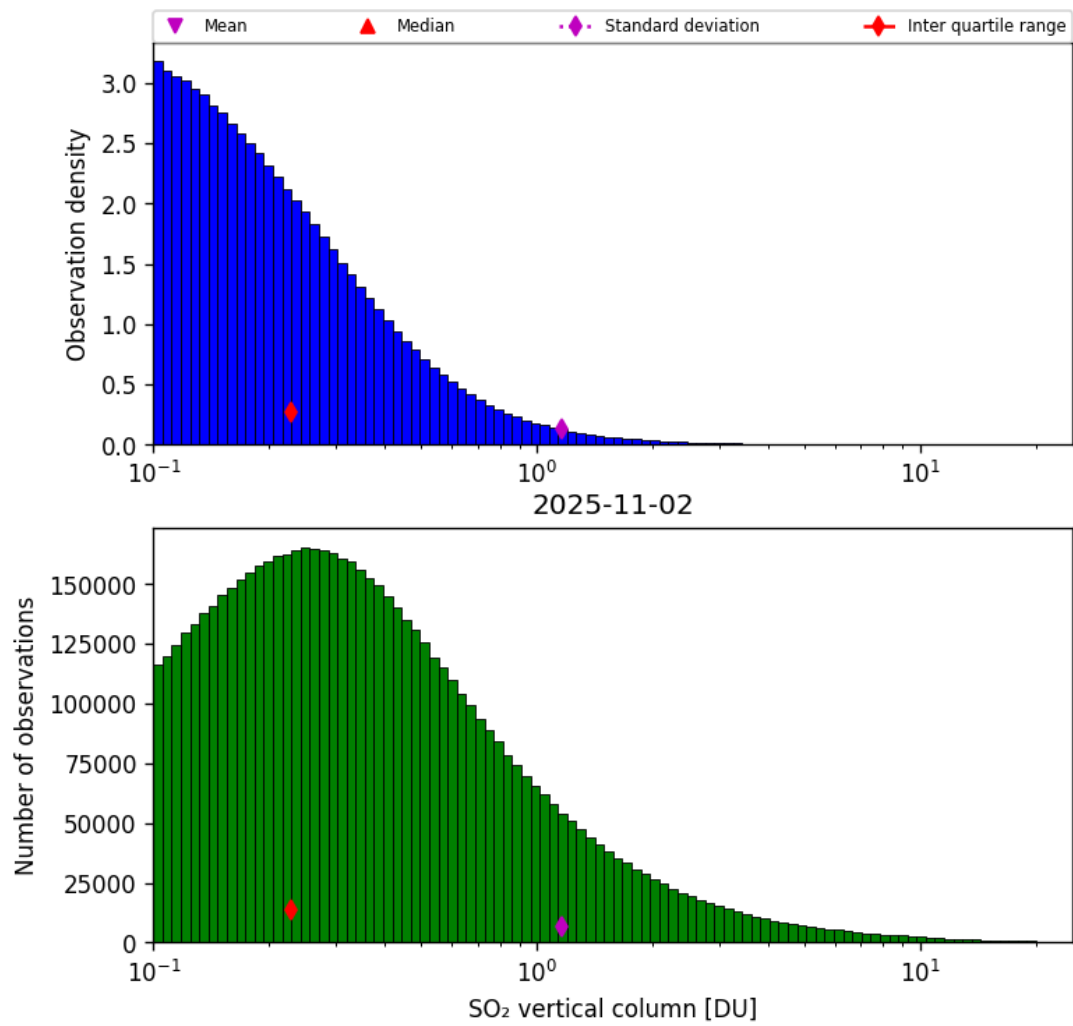


Figure 58: Histogram of “SO₂ vertical column” for 2025-11-02 to 2025-11-03

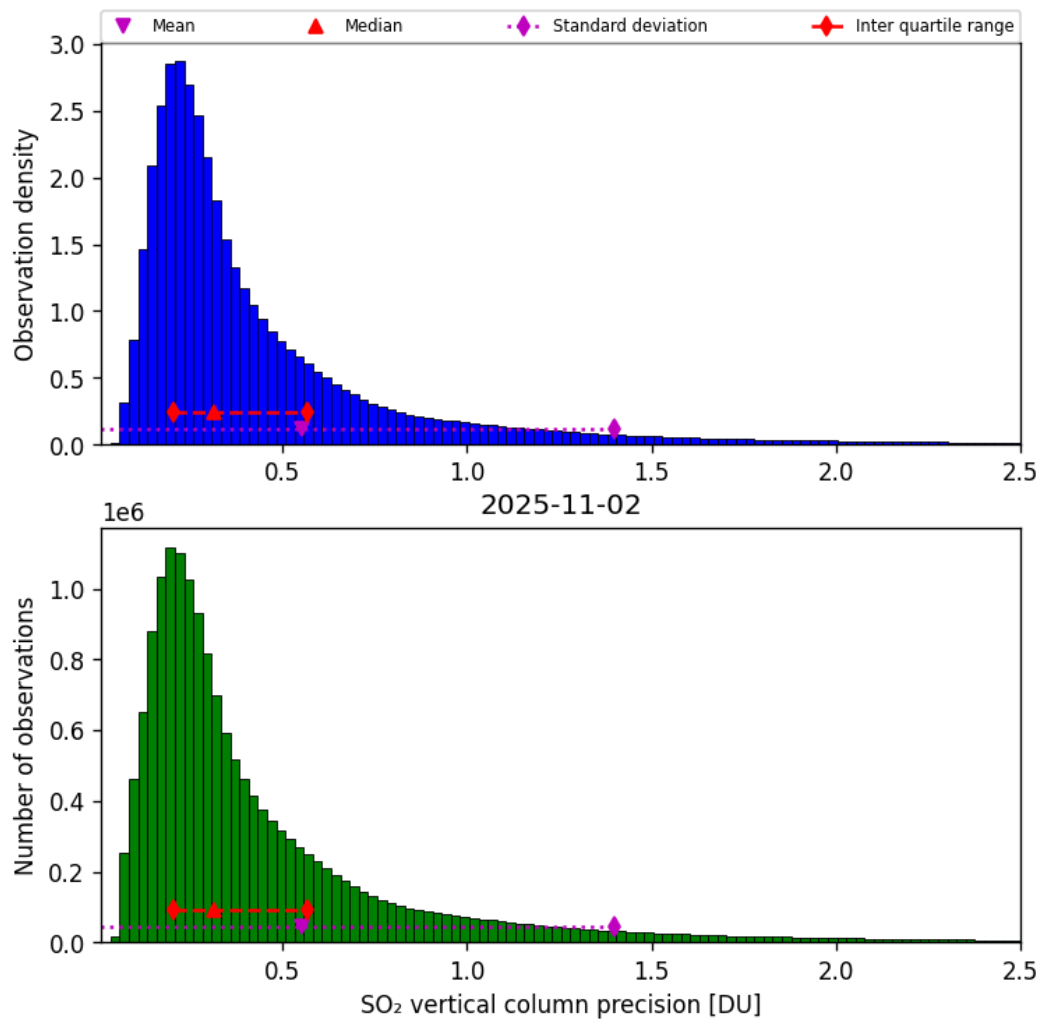


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-11-02 to 2025-11-03

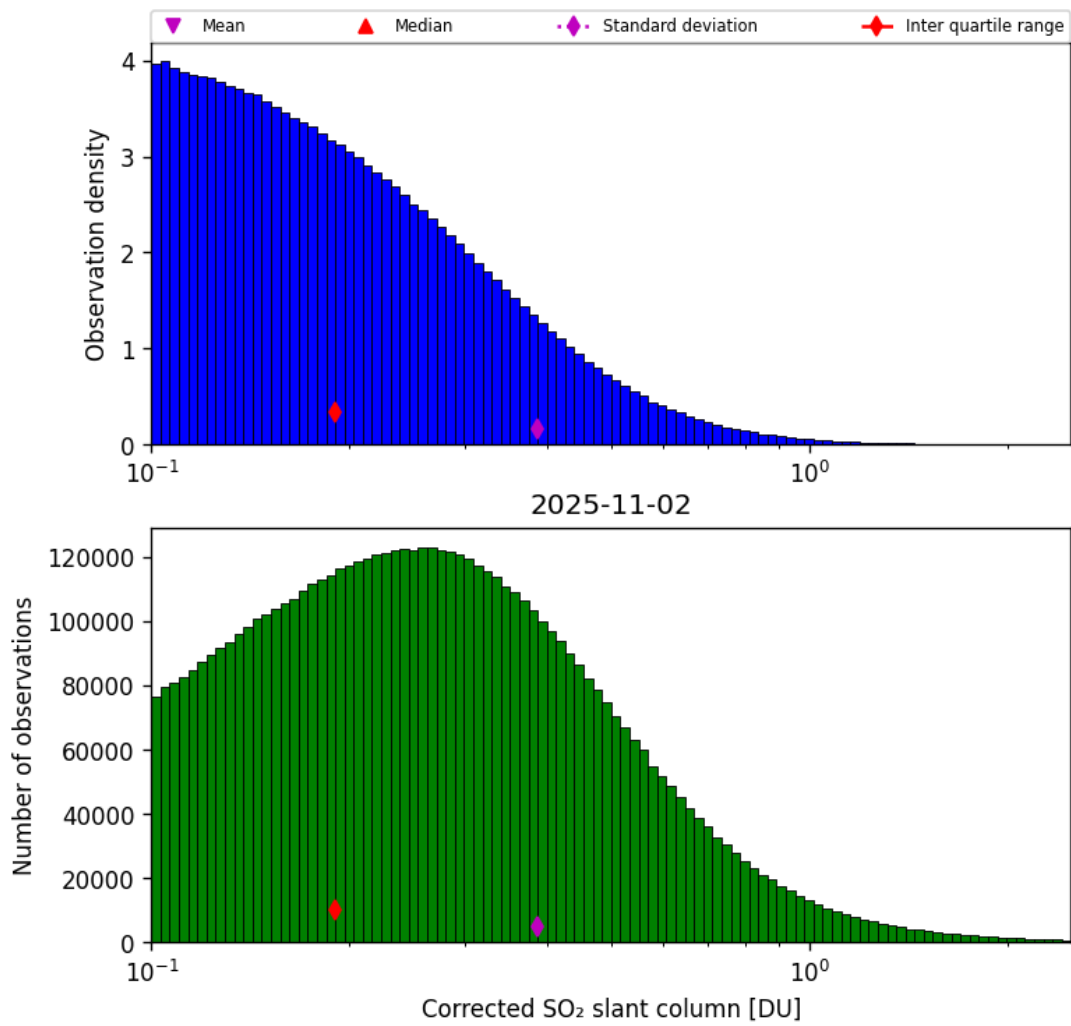


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-11-02 to 2025-11-03

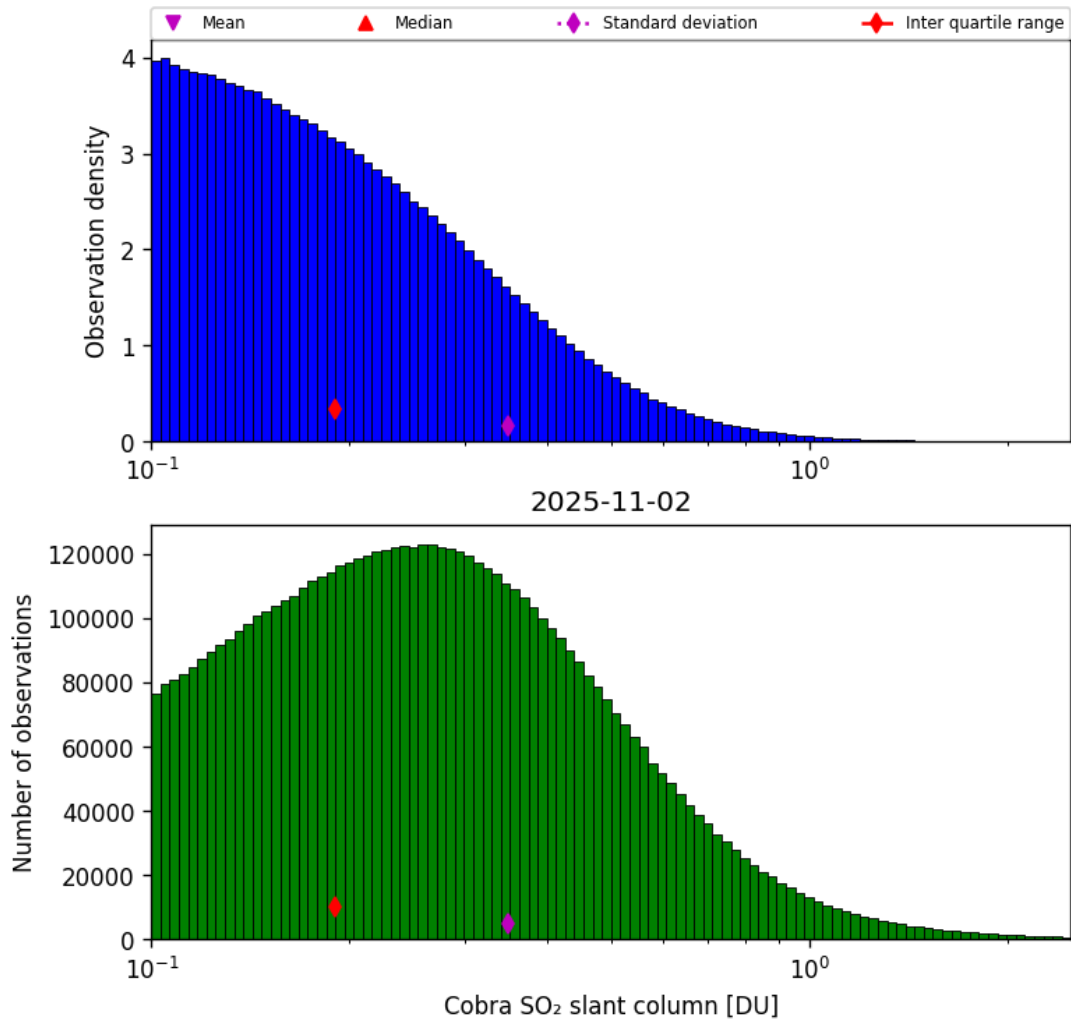


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-11-02 to 2025-11-03

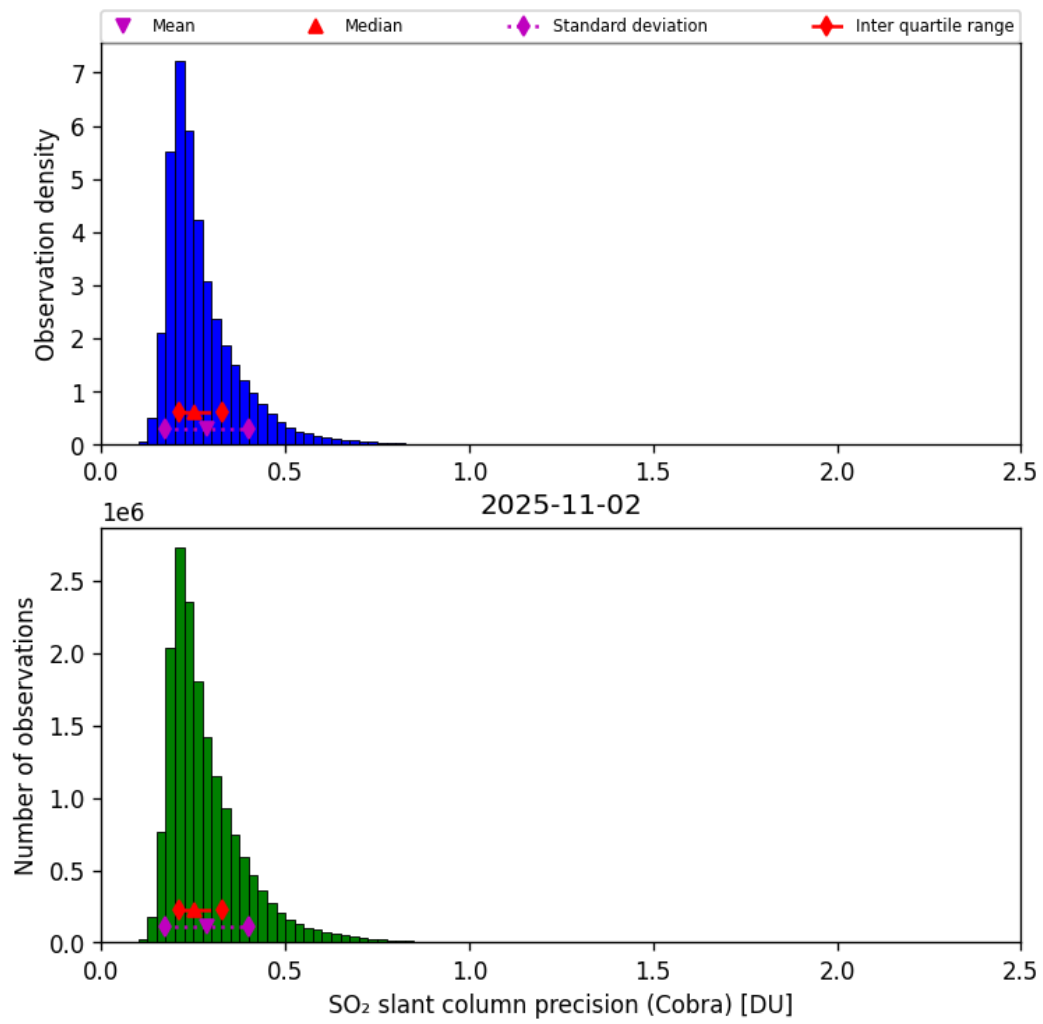


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-11-02 to 2025-11-03

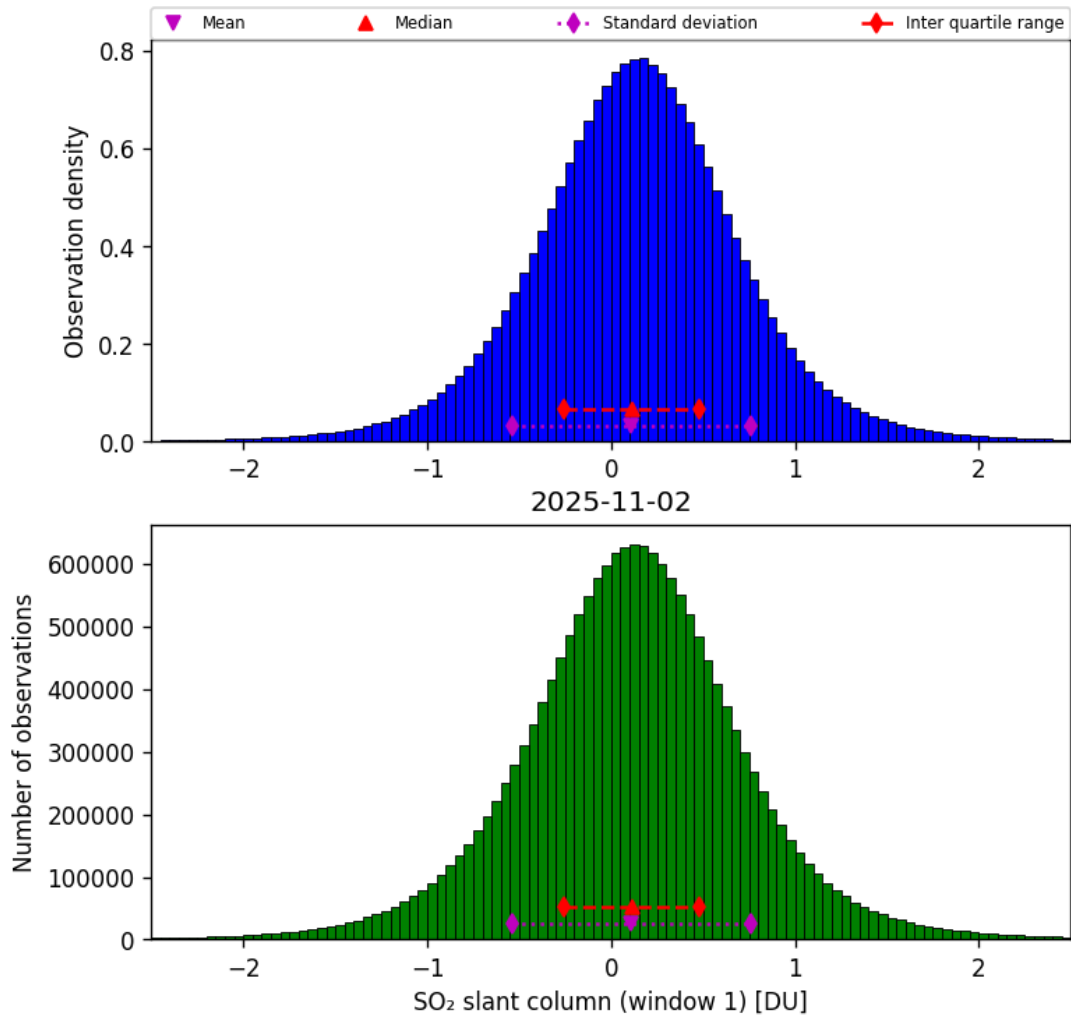


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-11-02 to 2025-11-03

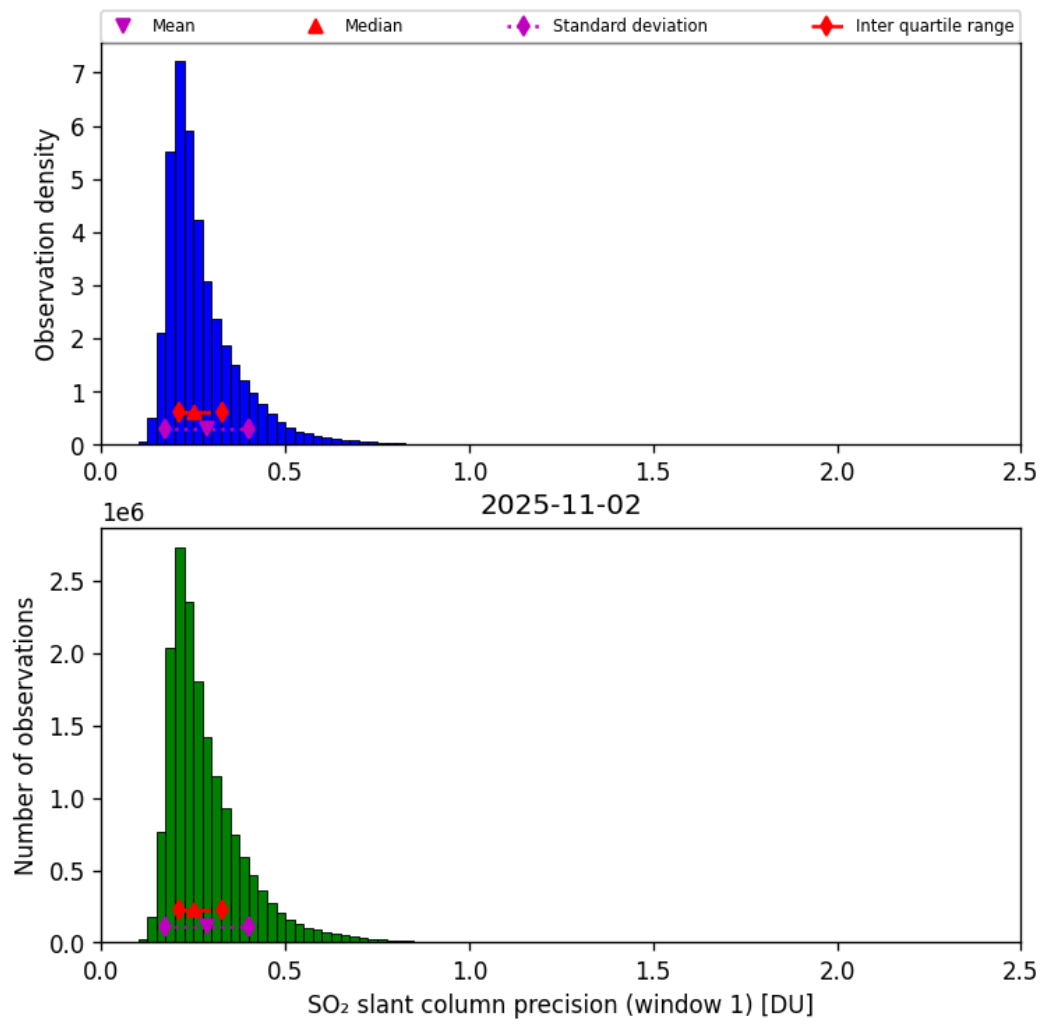


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-11-02 to 2025-11-03

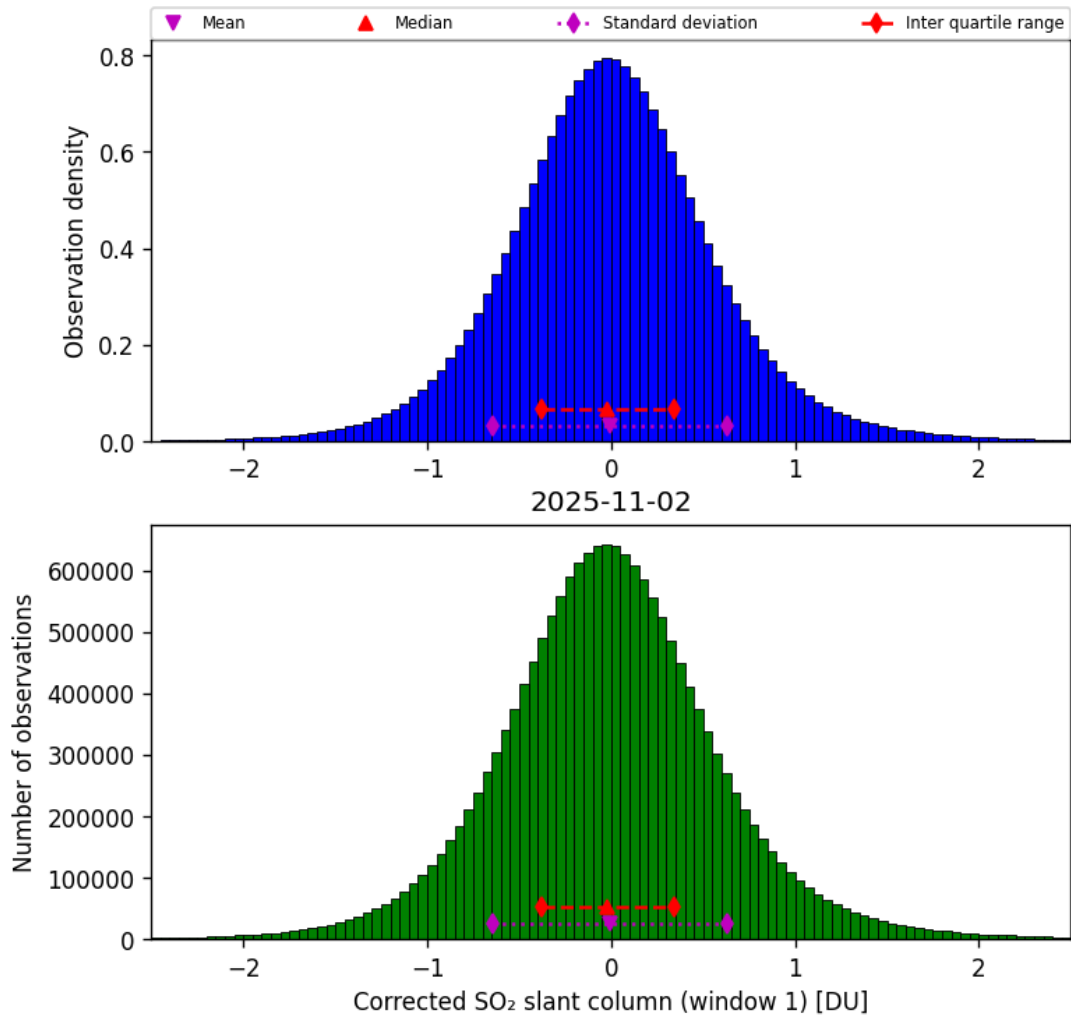


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-11-02 to 2025-11-03

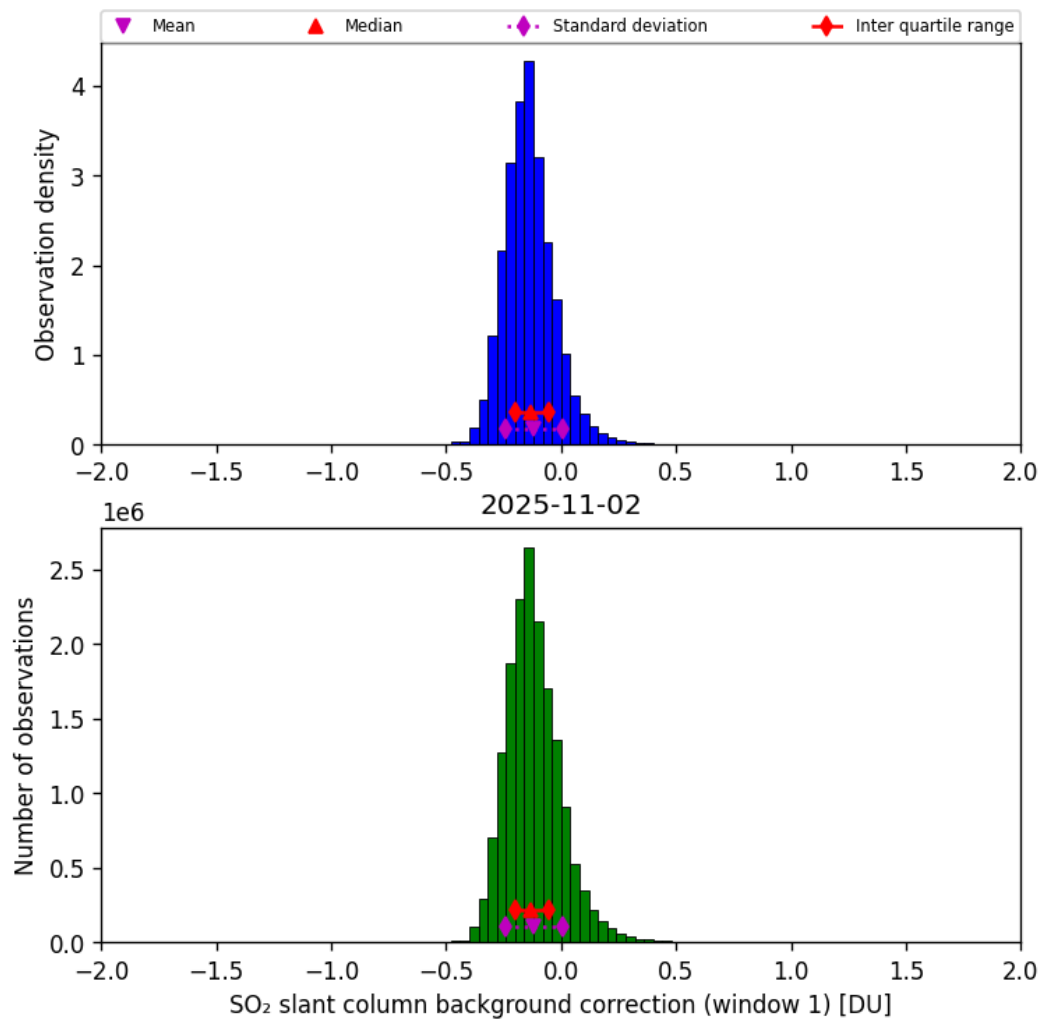


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-11-02 to 2025-11-03

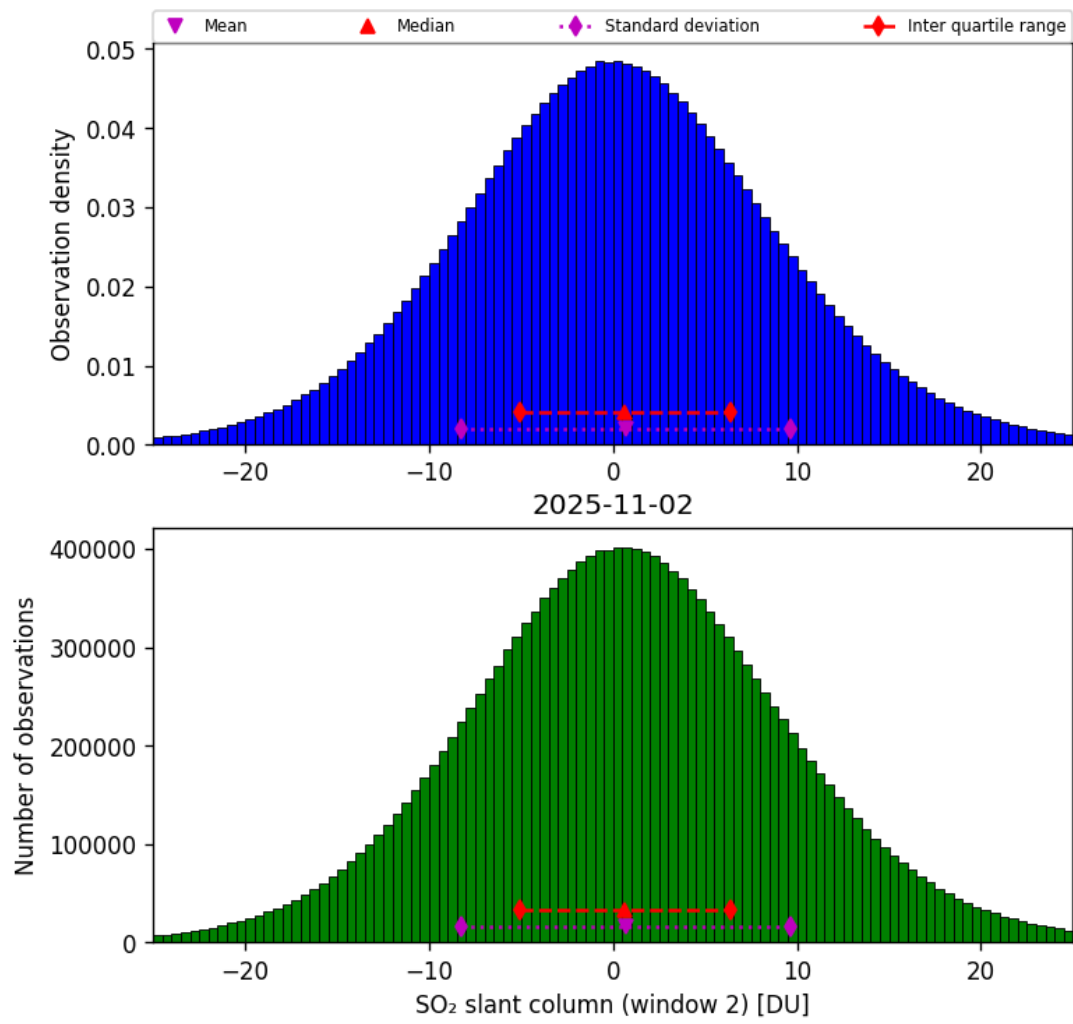


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-11-02 to 2025-11-03

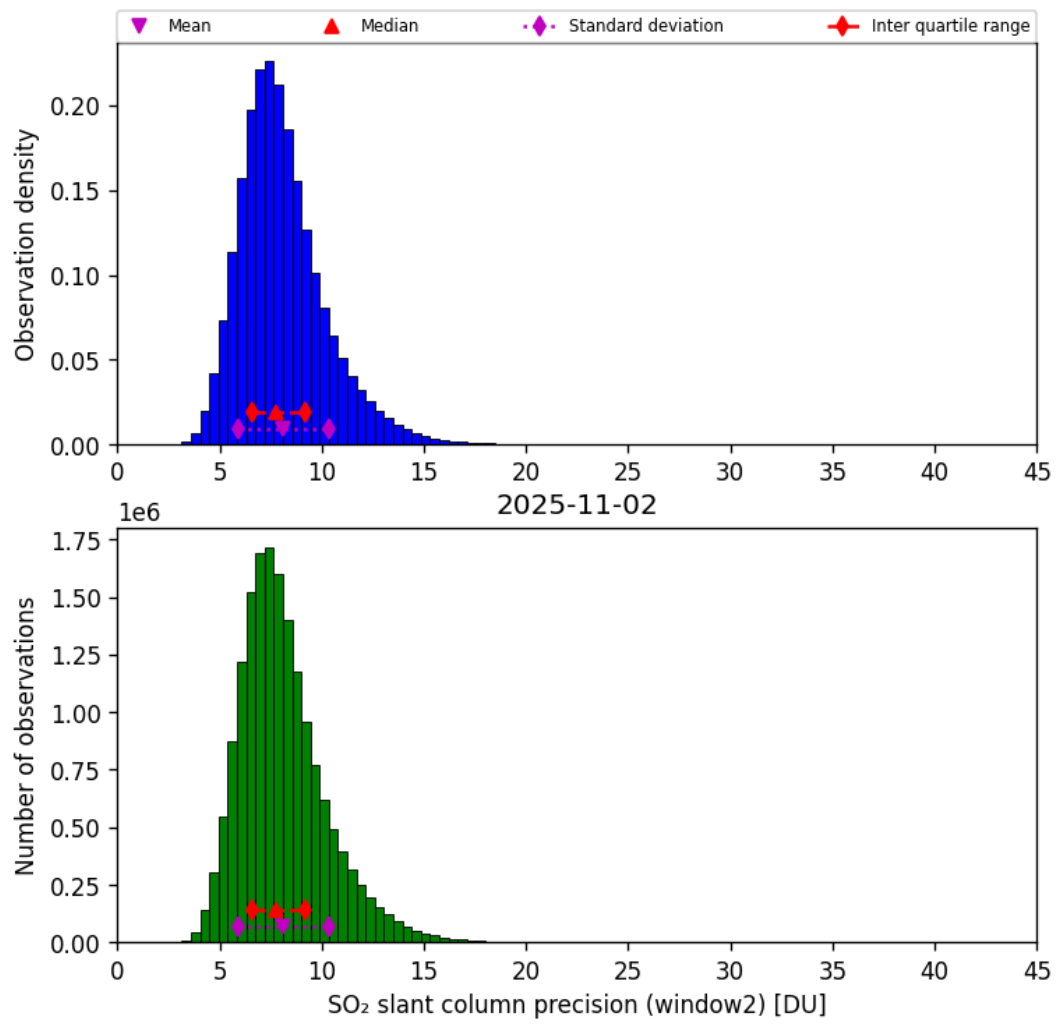


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-11-02 to 2025-11-03

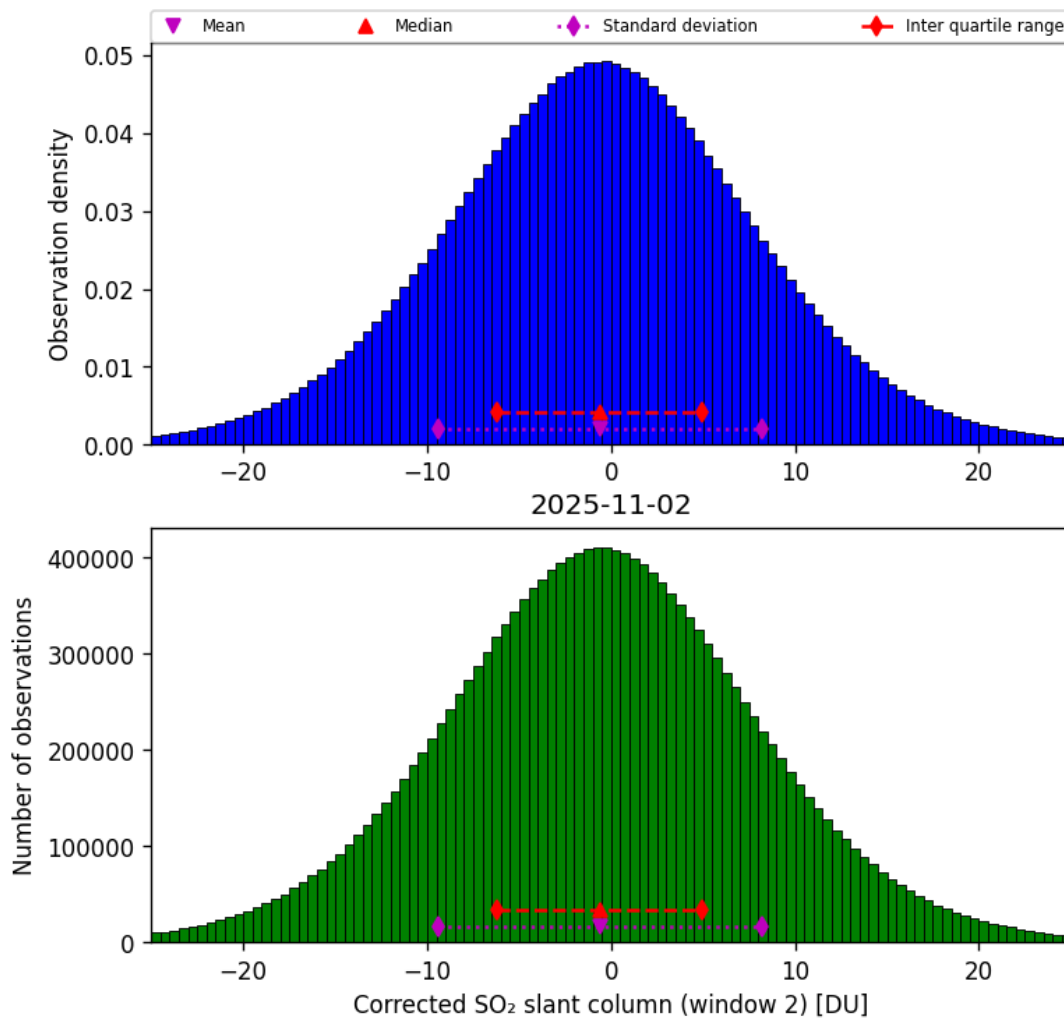


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-11-02 to 2025-11-03

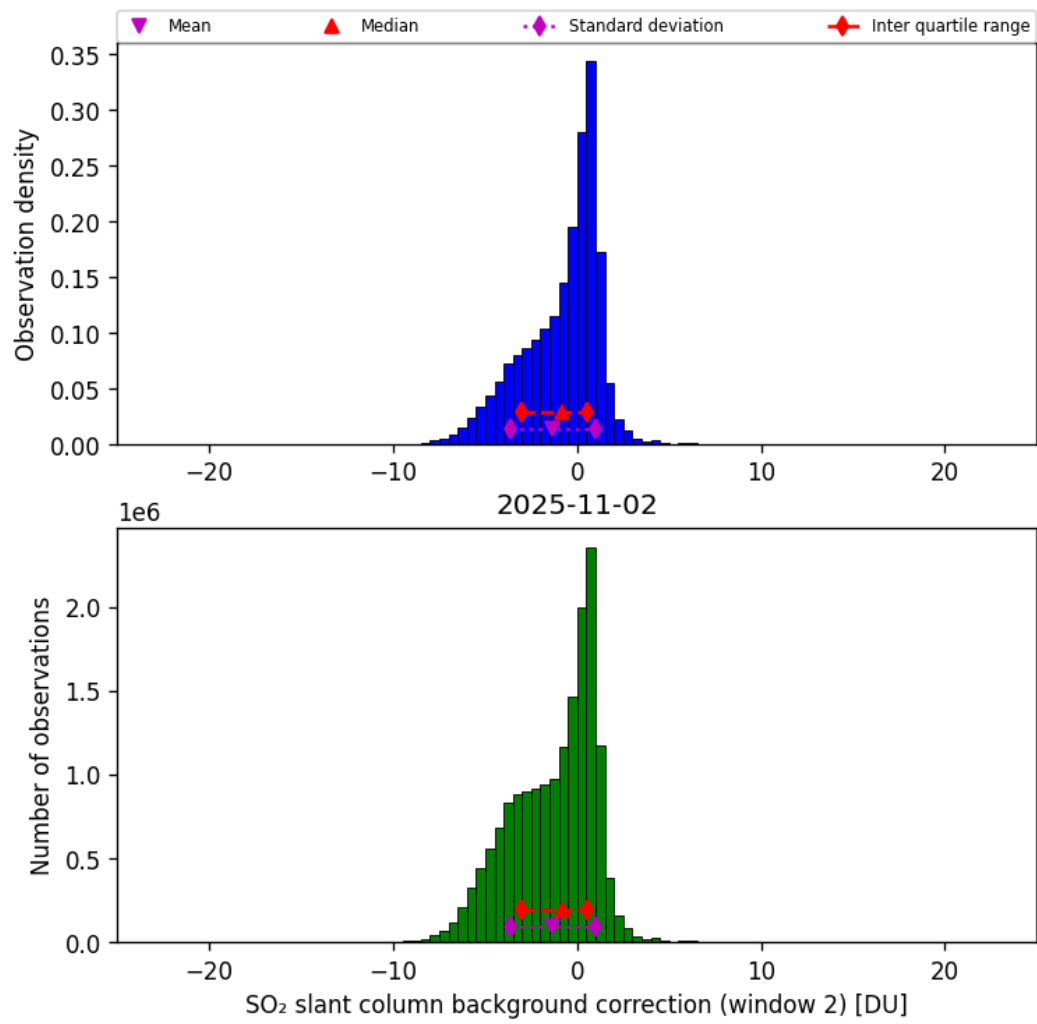


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-11-02 to 2025-11-03

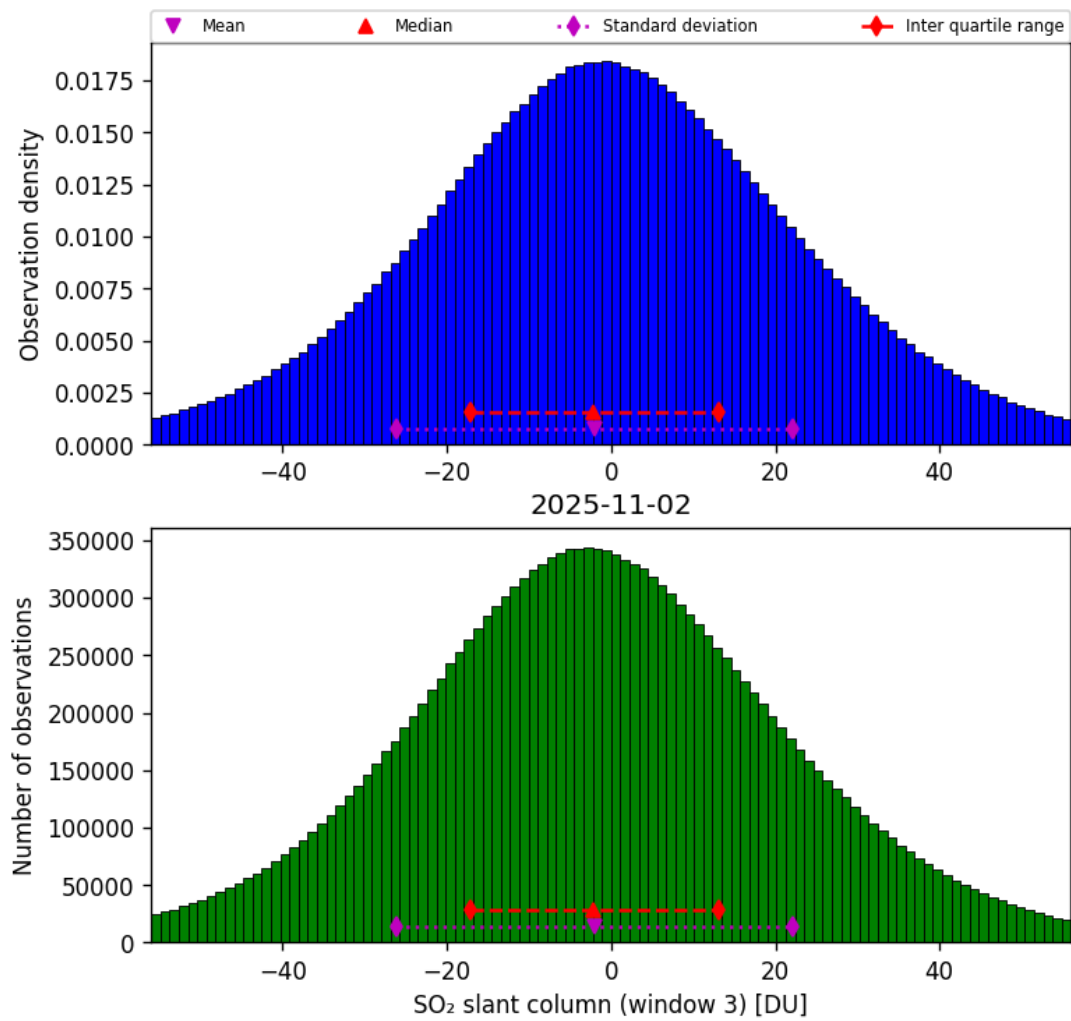


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-11-02 to 2025-11-03

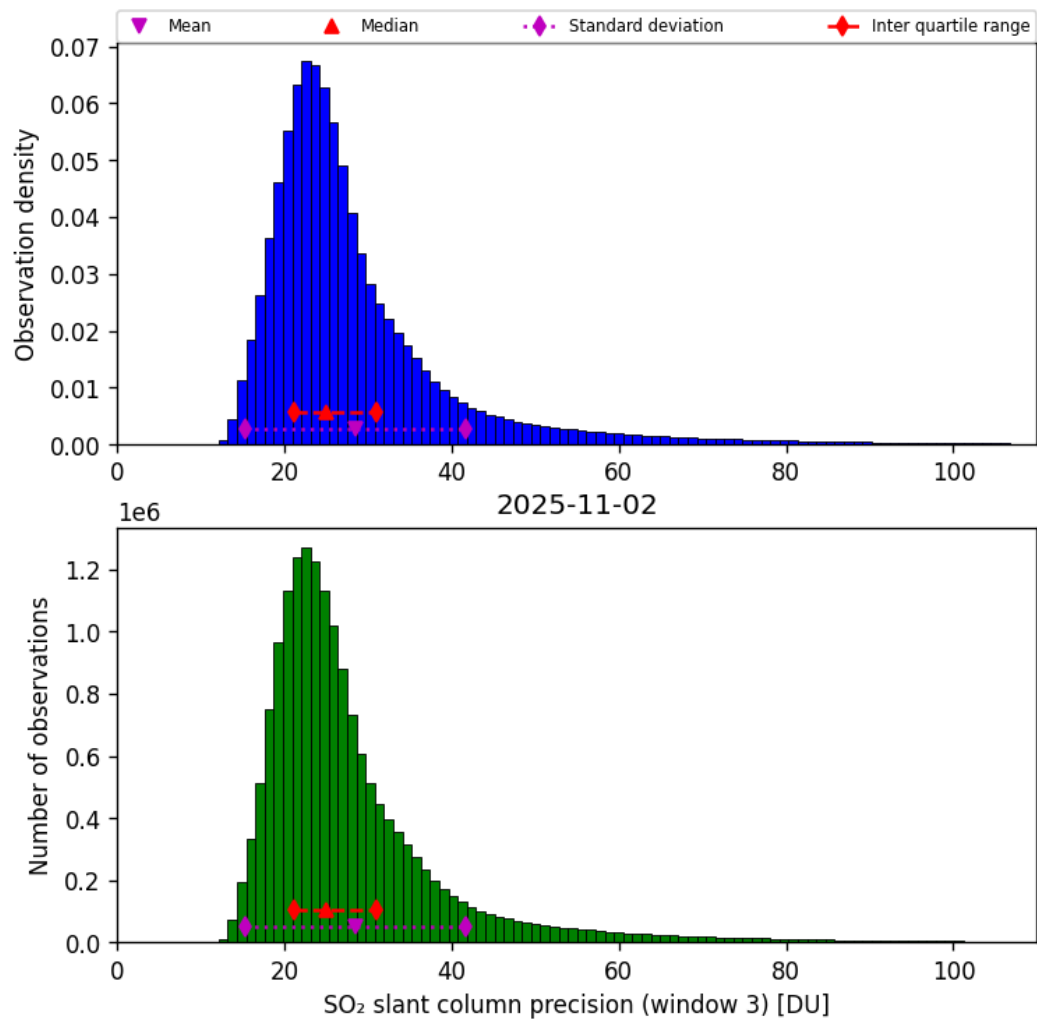


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-11-02 to 2025-11-03

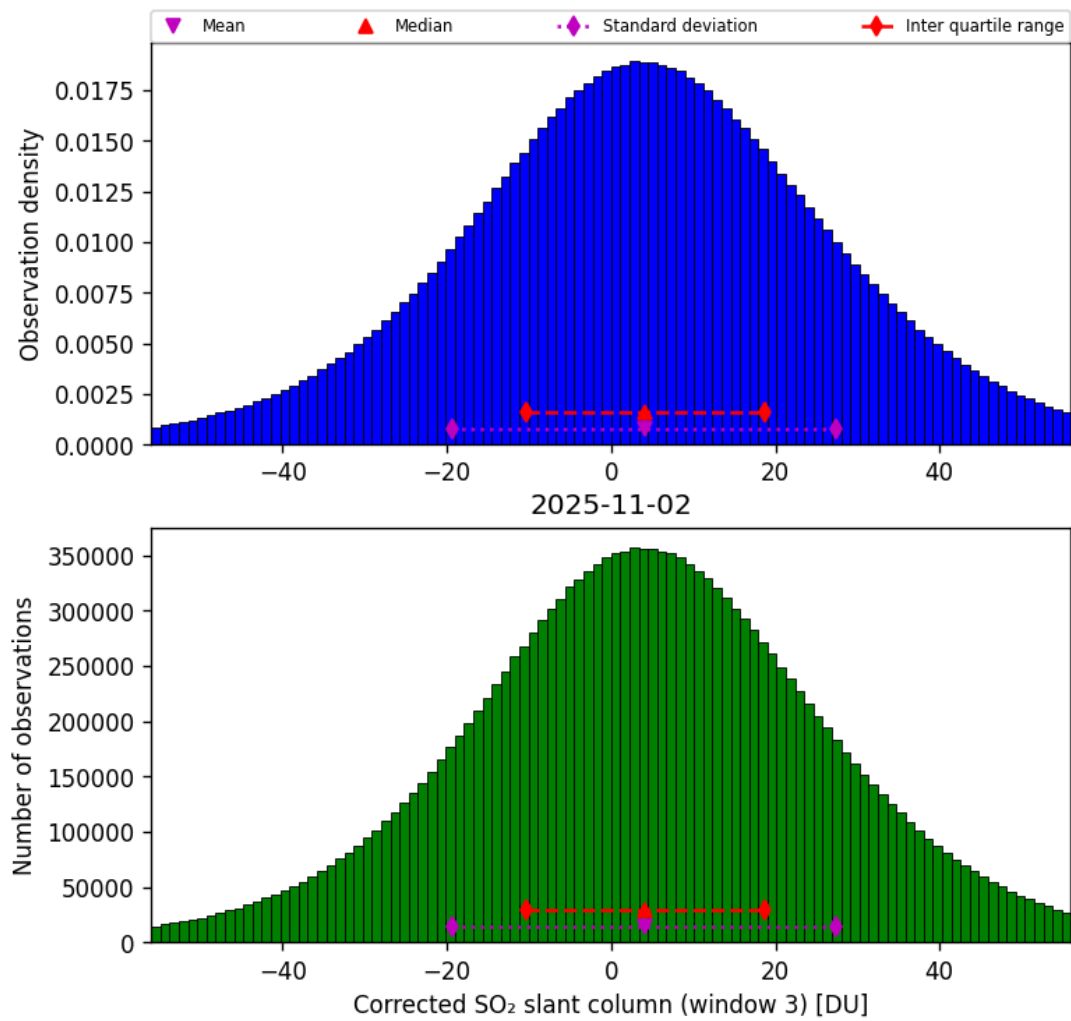


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-11-02 to 2025-11-03

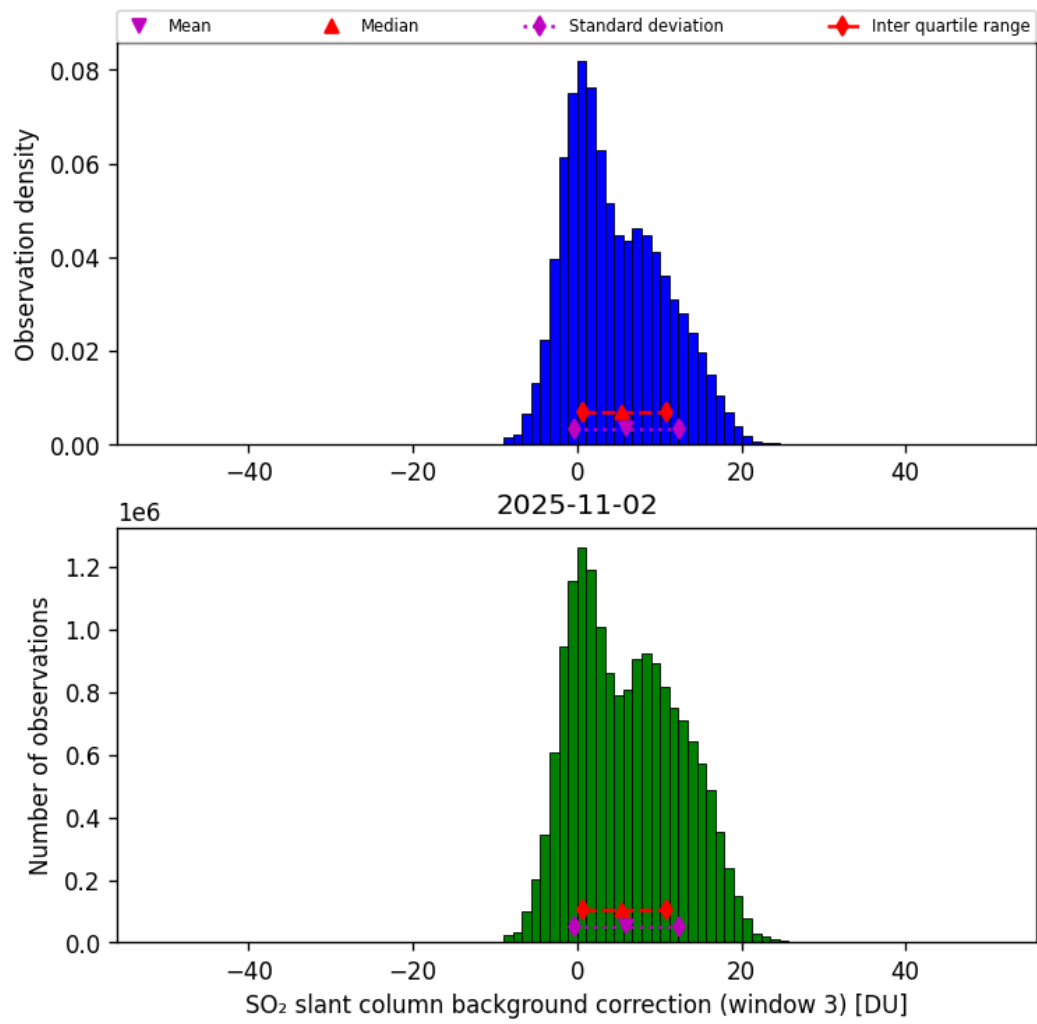


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-11-02 to 2025-11-03

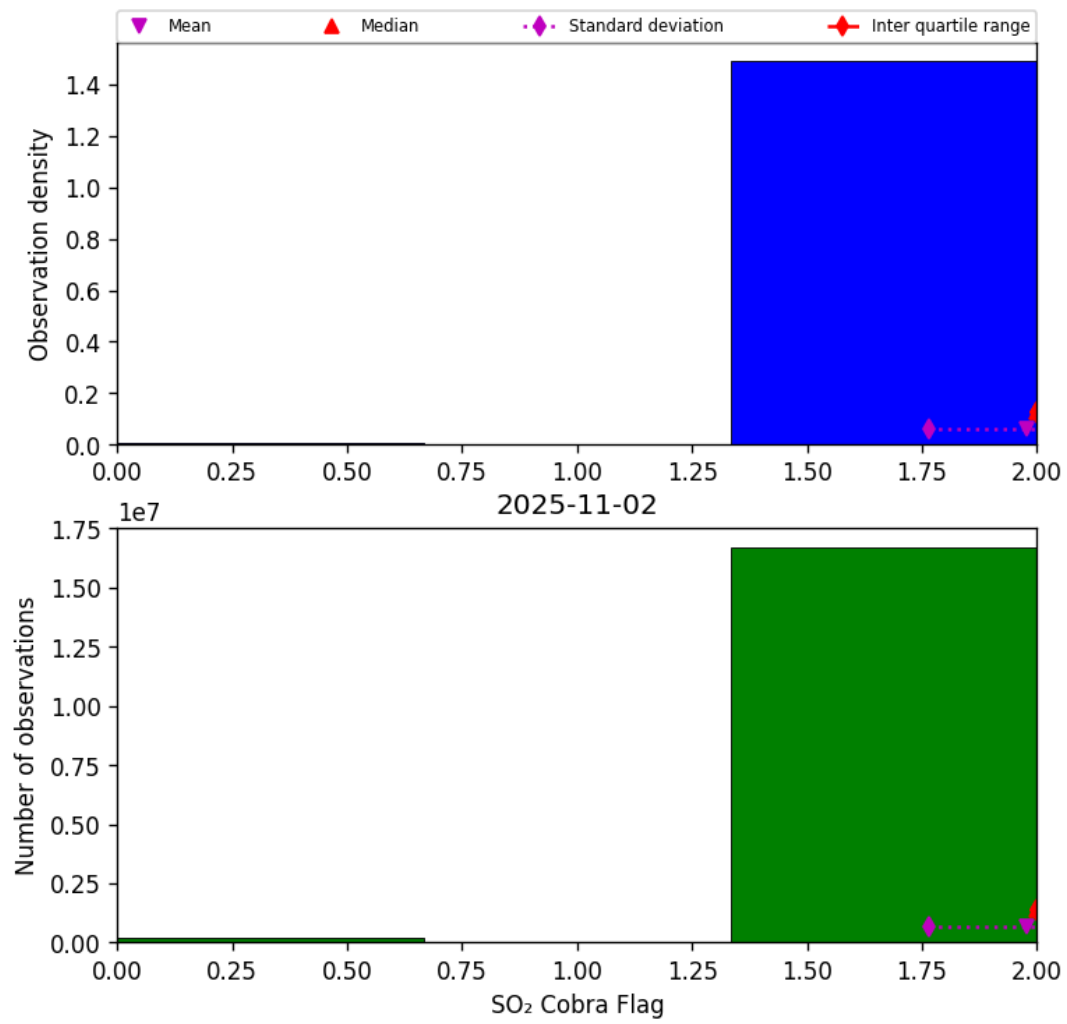


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-11-02 to 2025-11-03

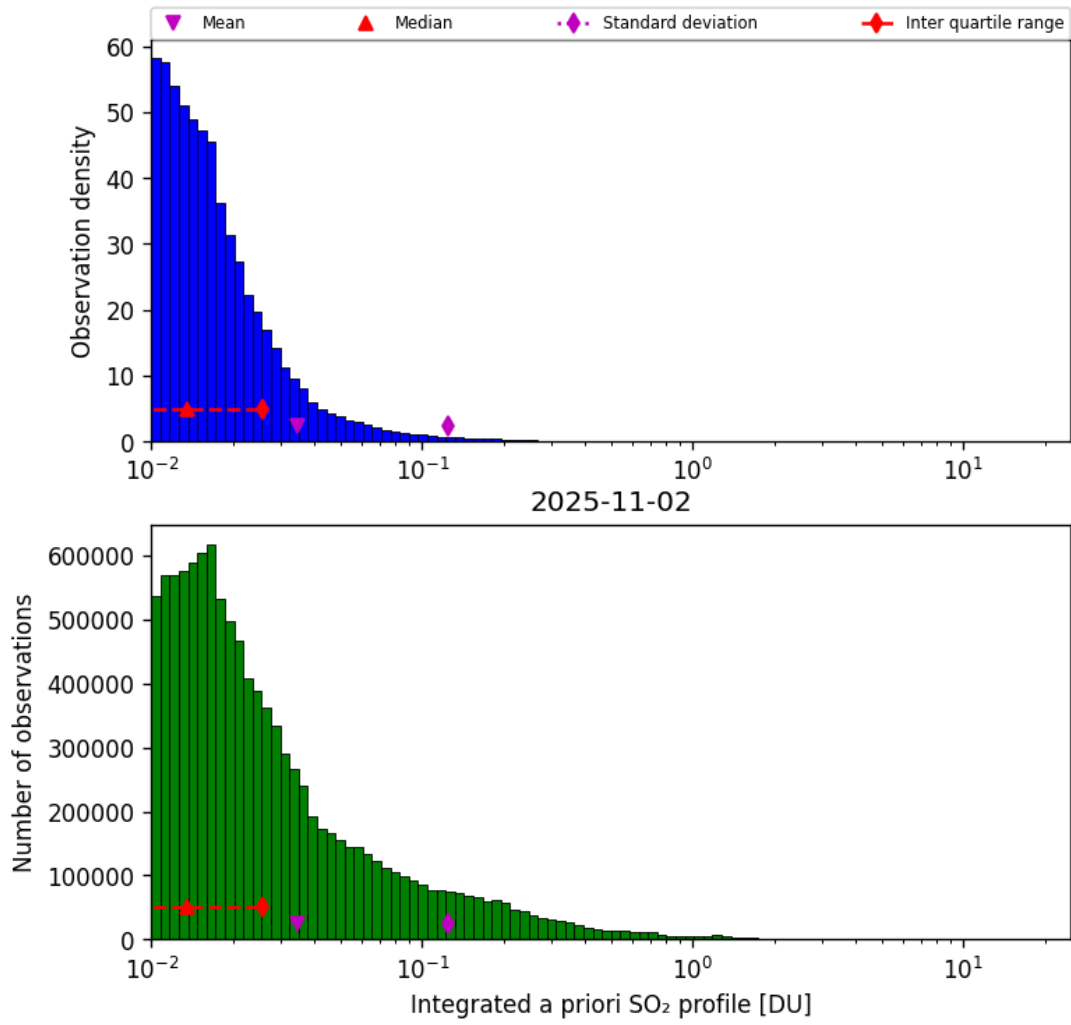


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-11-02 to 2025-11-03

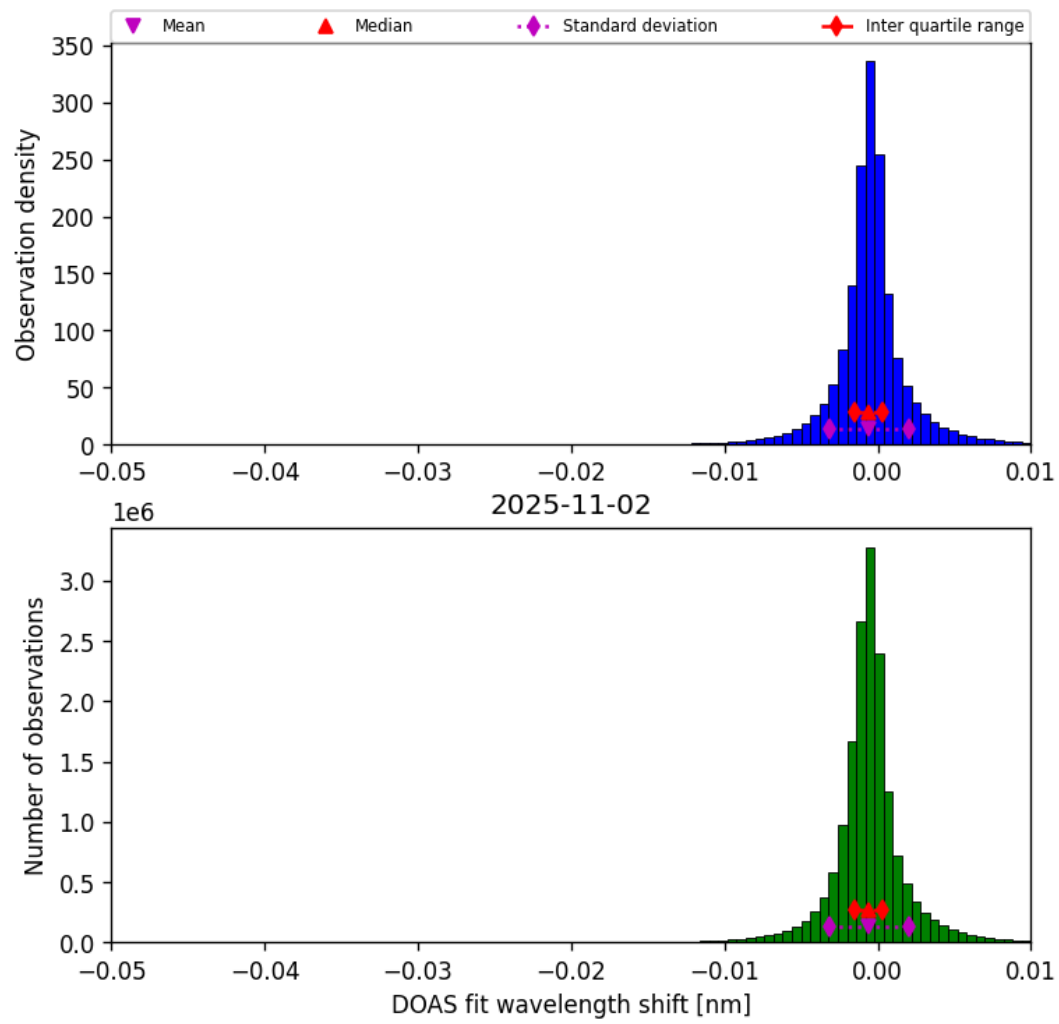


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-11-02 to 2025-11-03

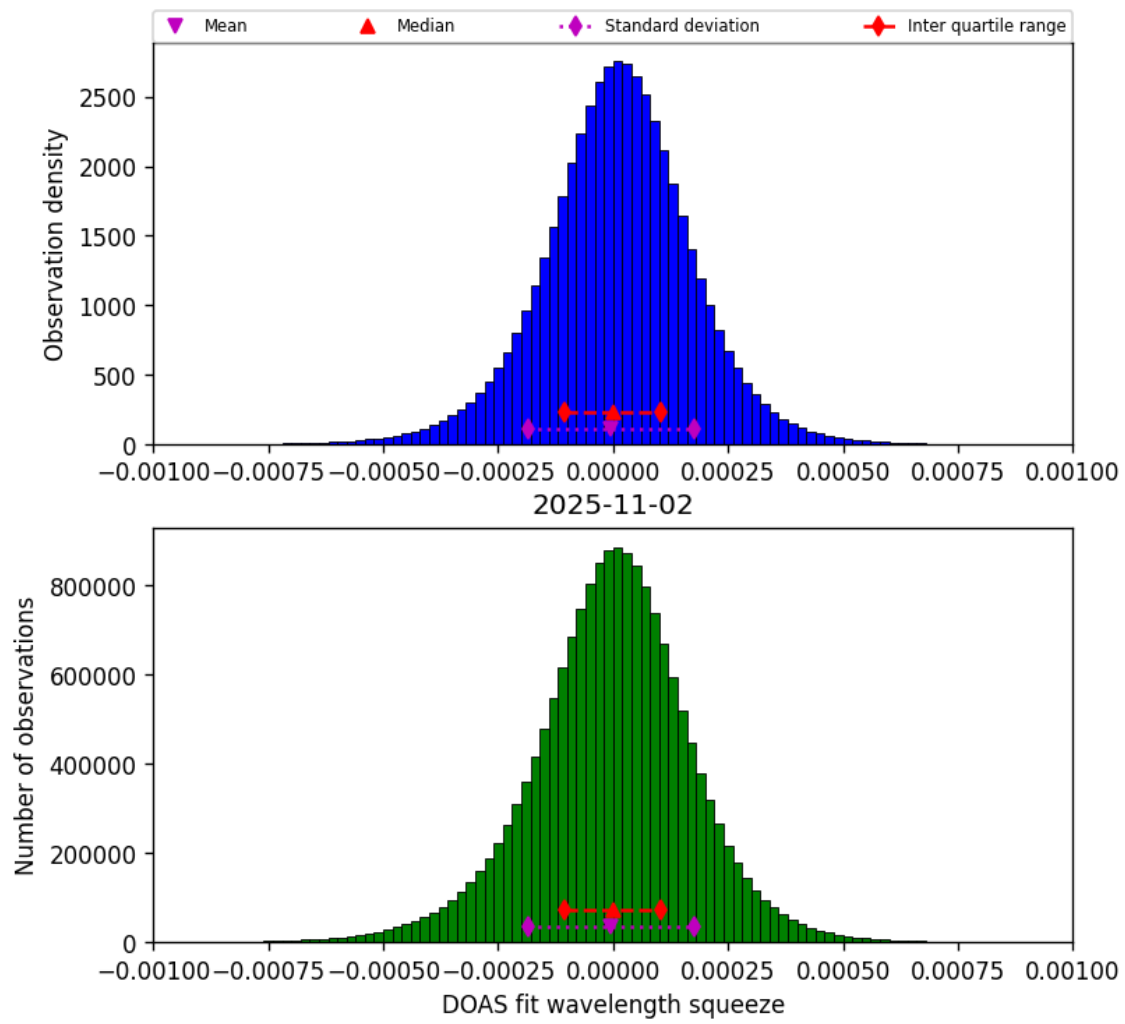


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-11-02 to 2025-11-03

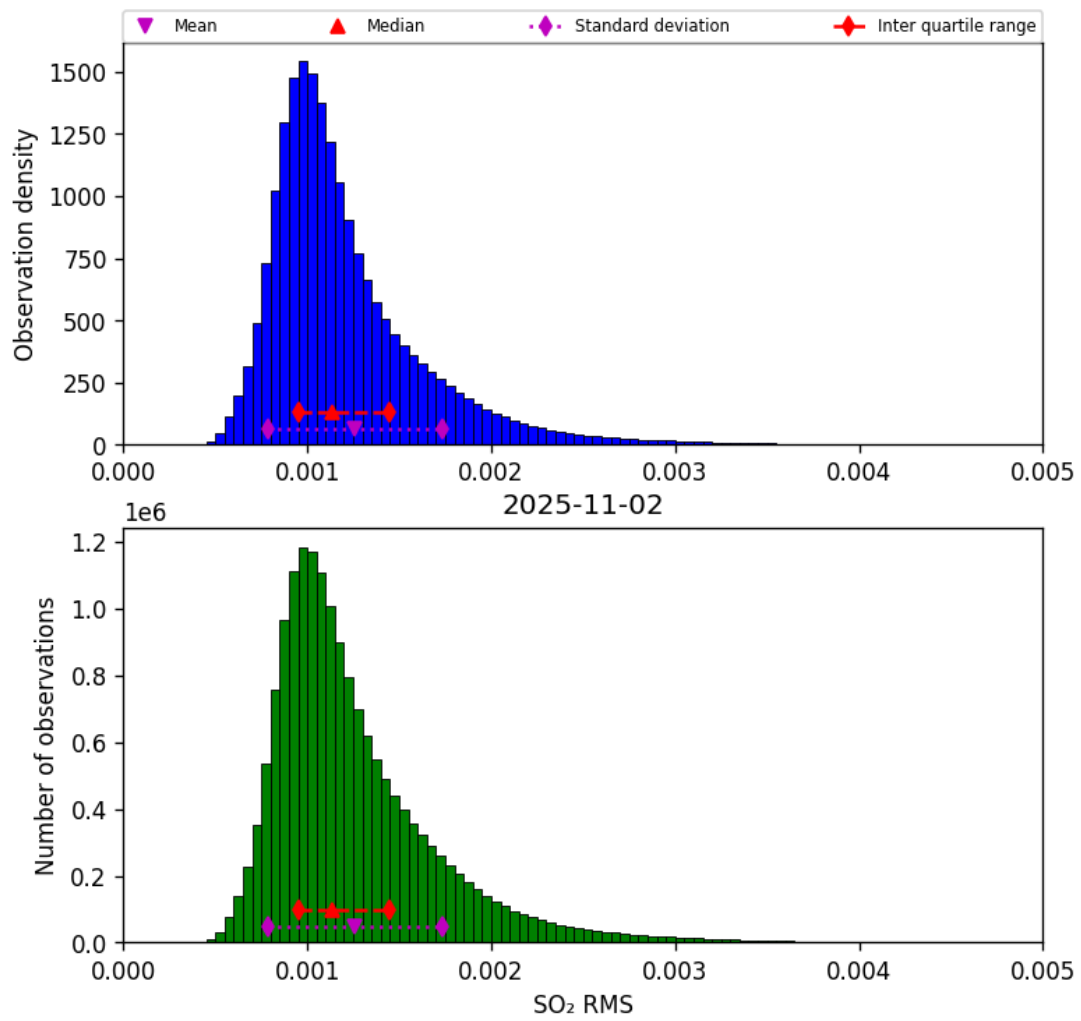


Figure 79: Histogram of “SO₂ RMS” for 2025-11-02 to 2025-11-03

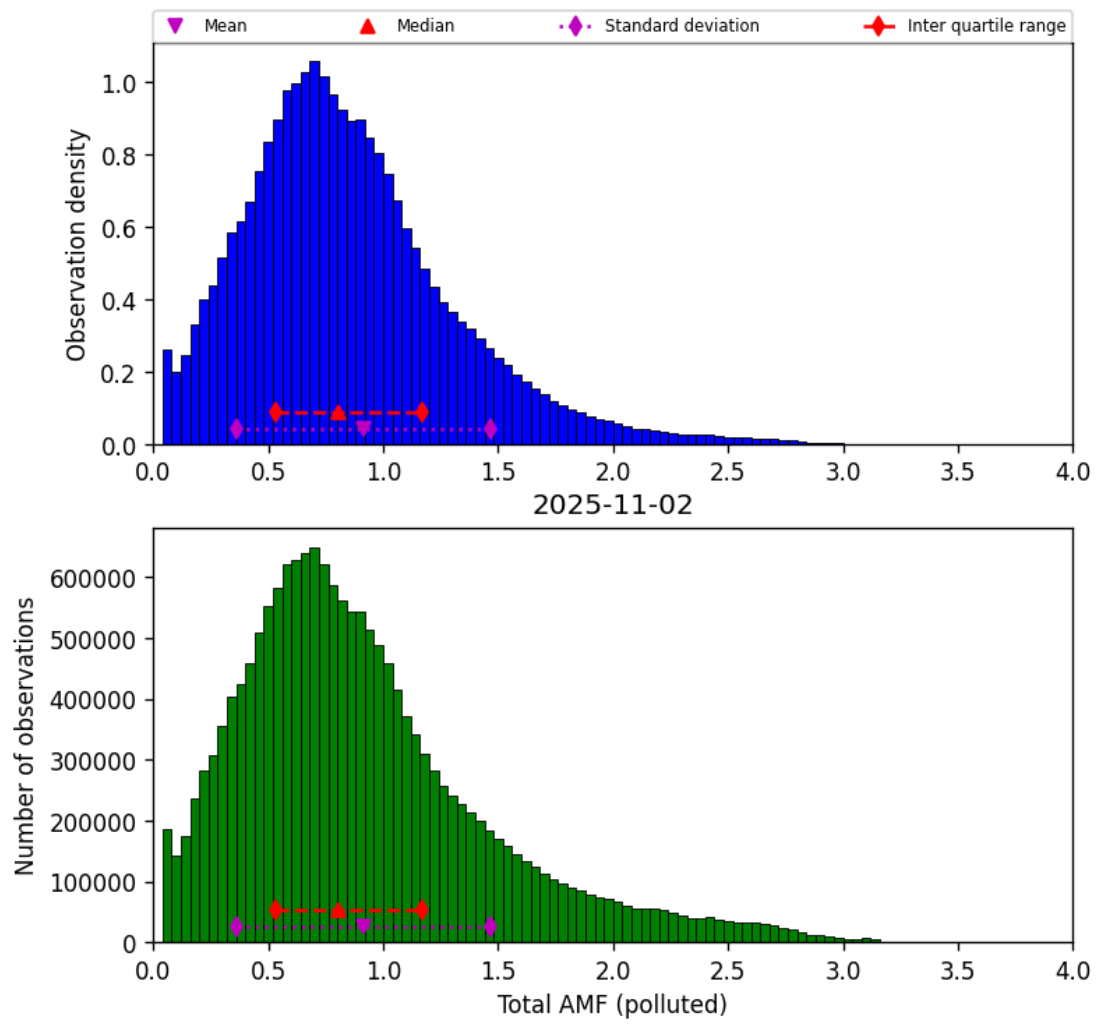


Figure 80: Histogram of “Total AMF (polluted)” for 2025-11-02 to 2025-11-03

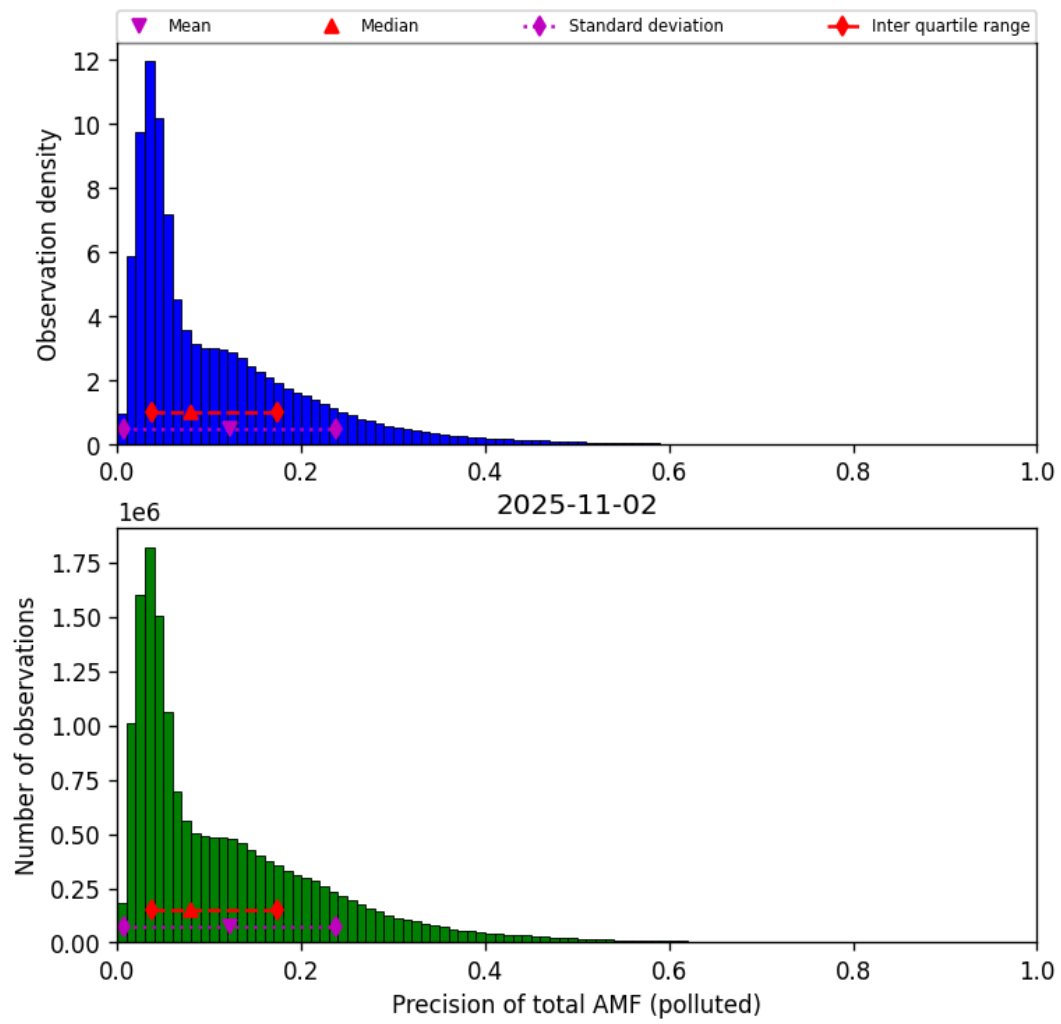


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-11-02 to 2025-11-03

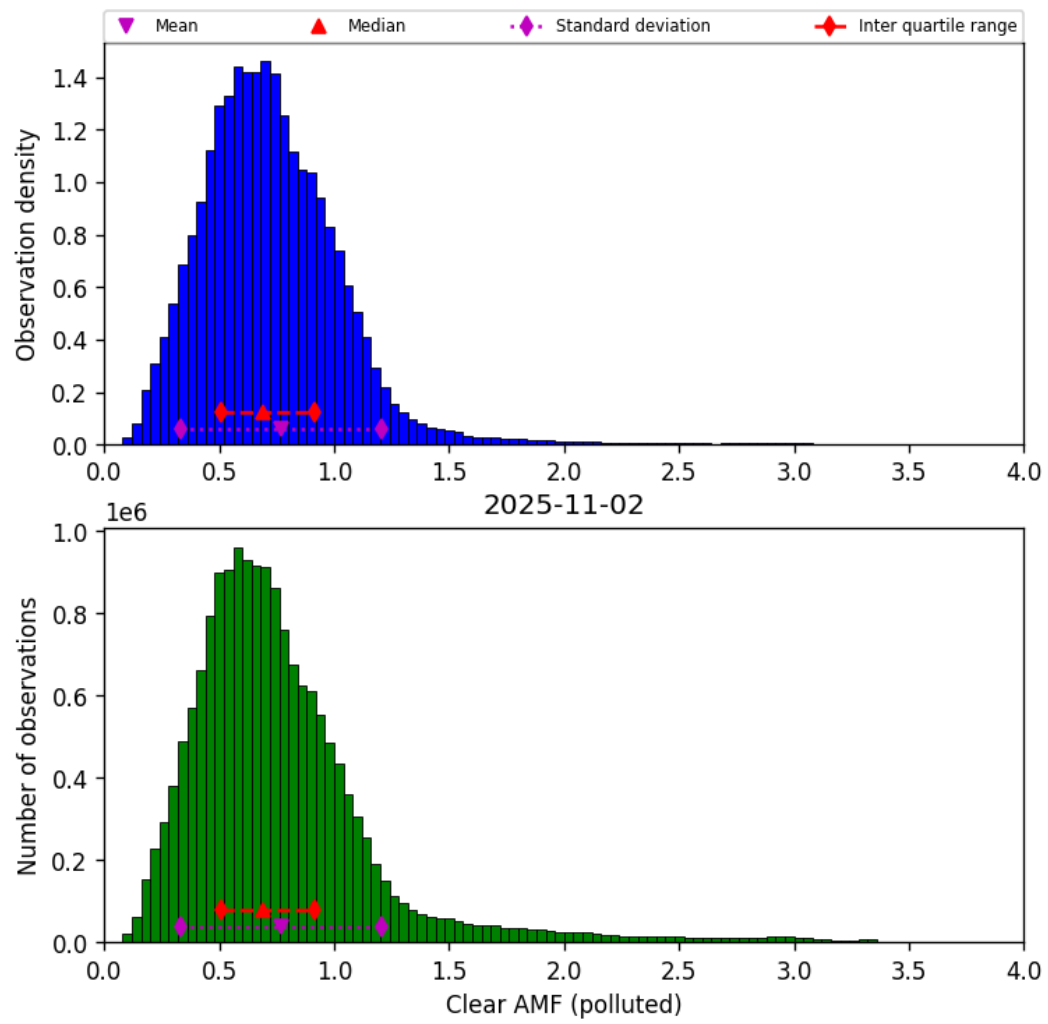


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-11-02 to 2025-11-03

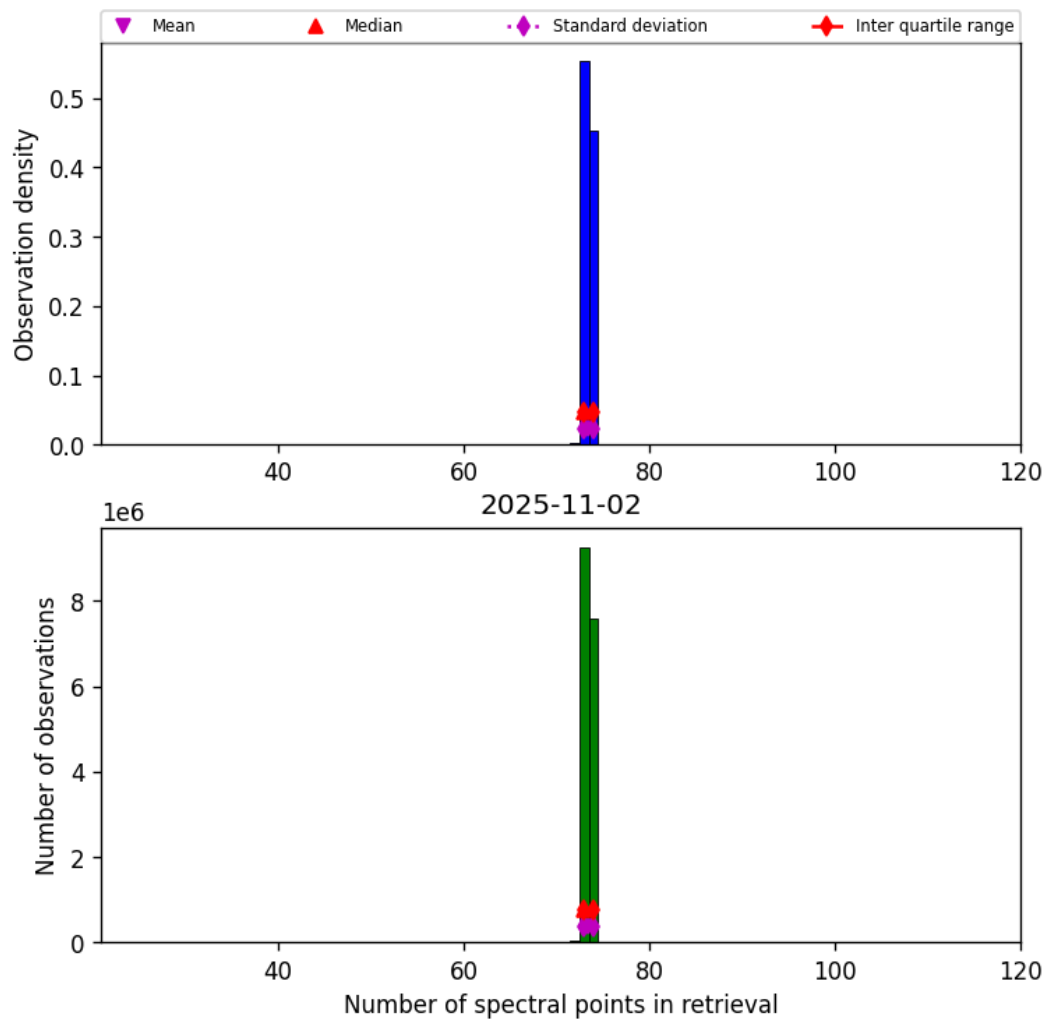


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-11-02 to 2025-11-03

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.

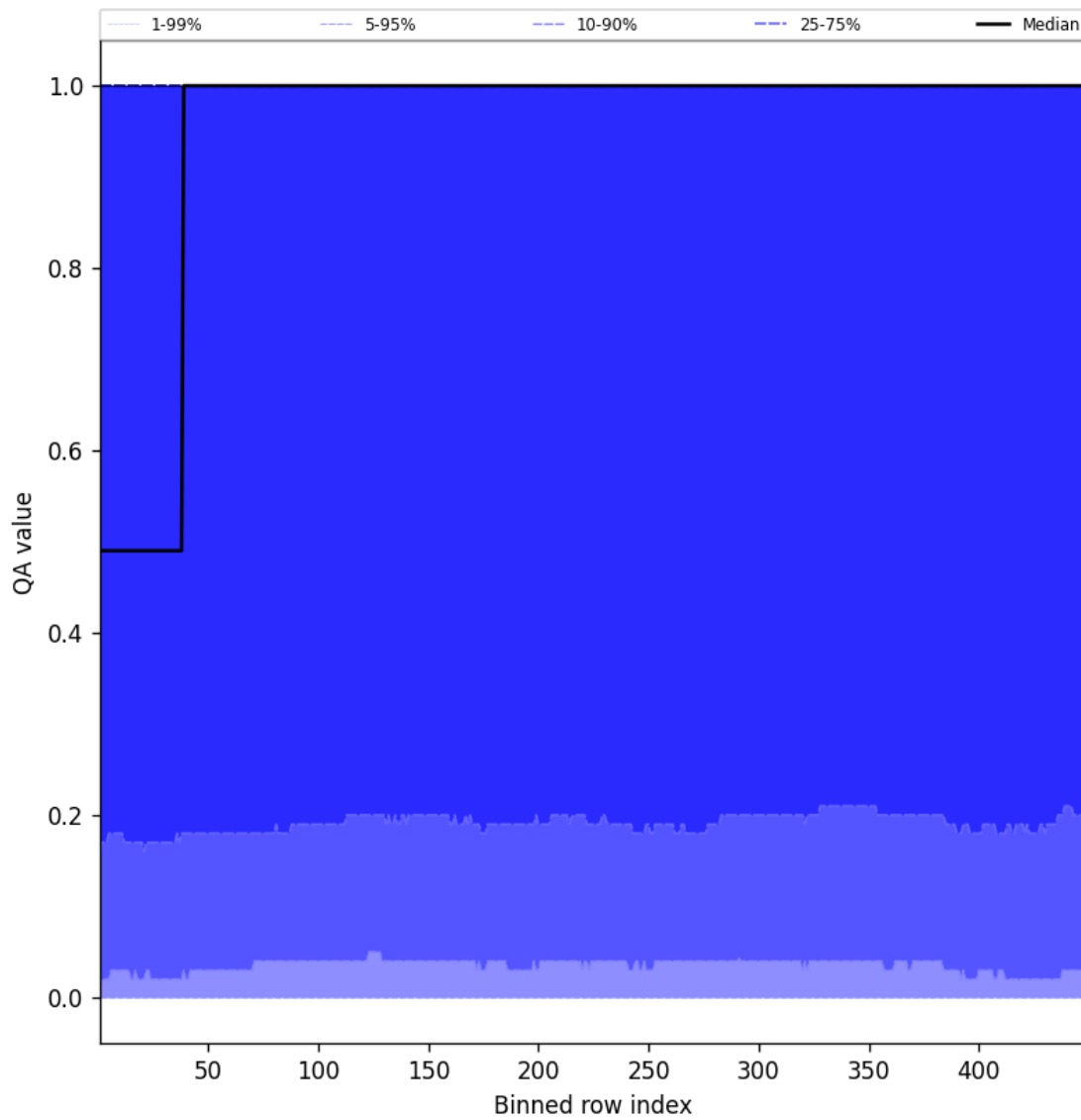


Figure 84: Along track statistics of “QA value” for 2025-11-02 to 2025-11-03

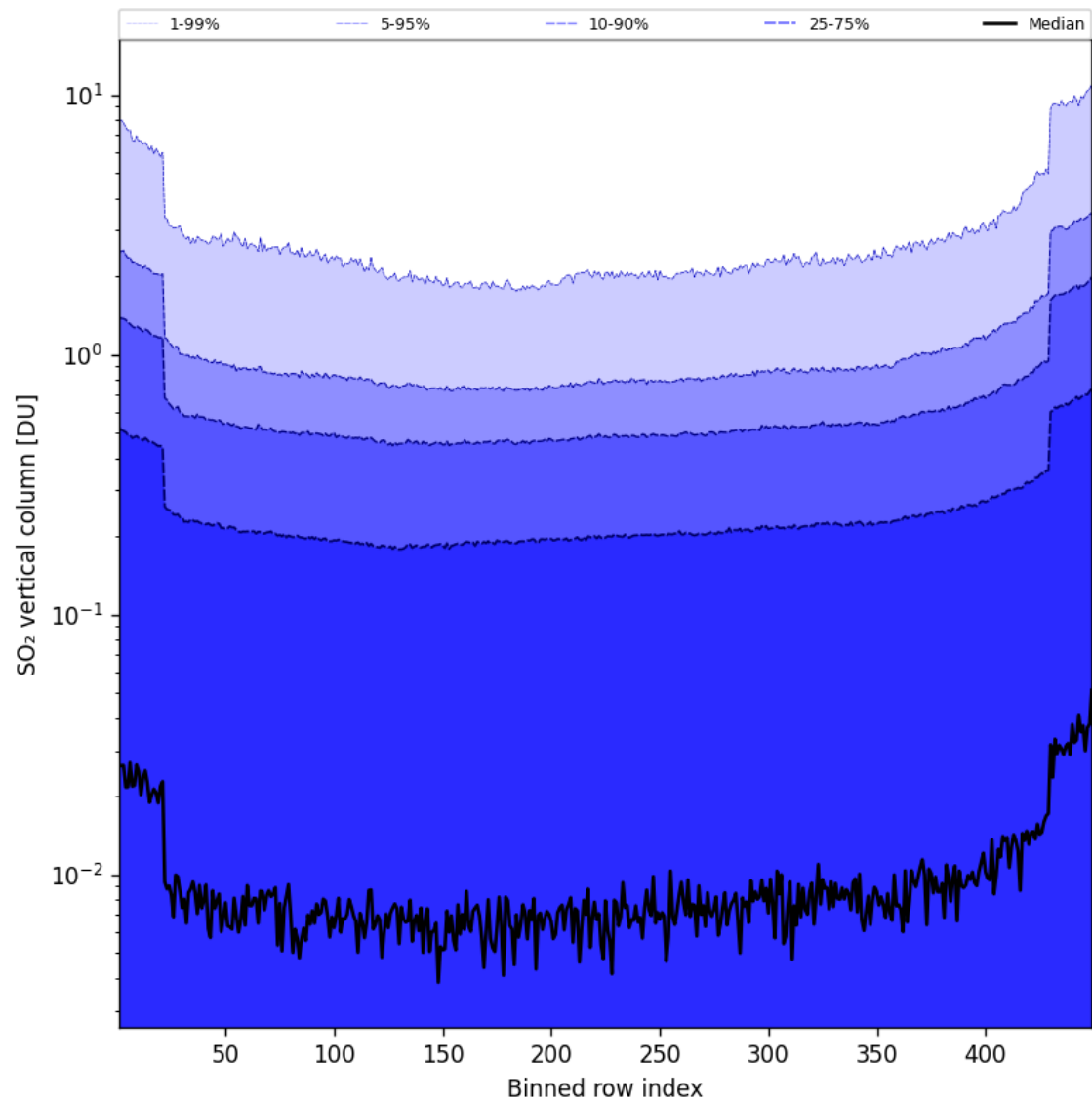


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-11-02 to 2025-11-03

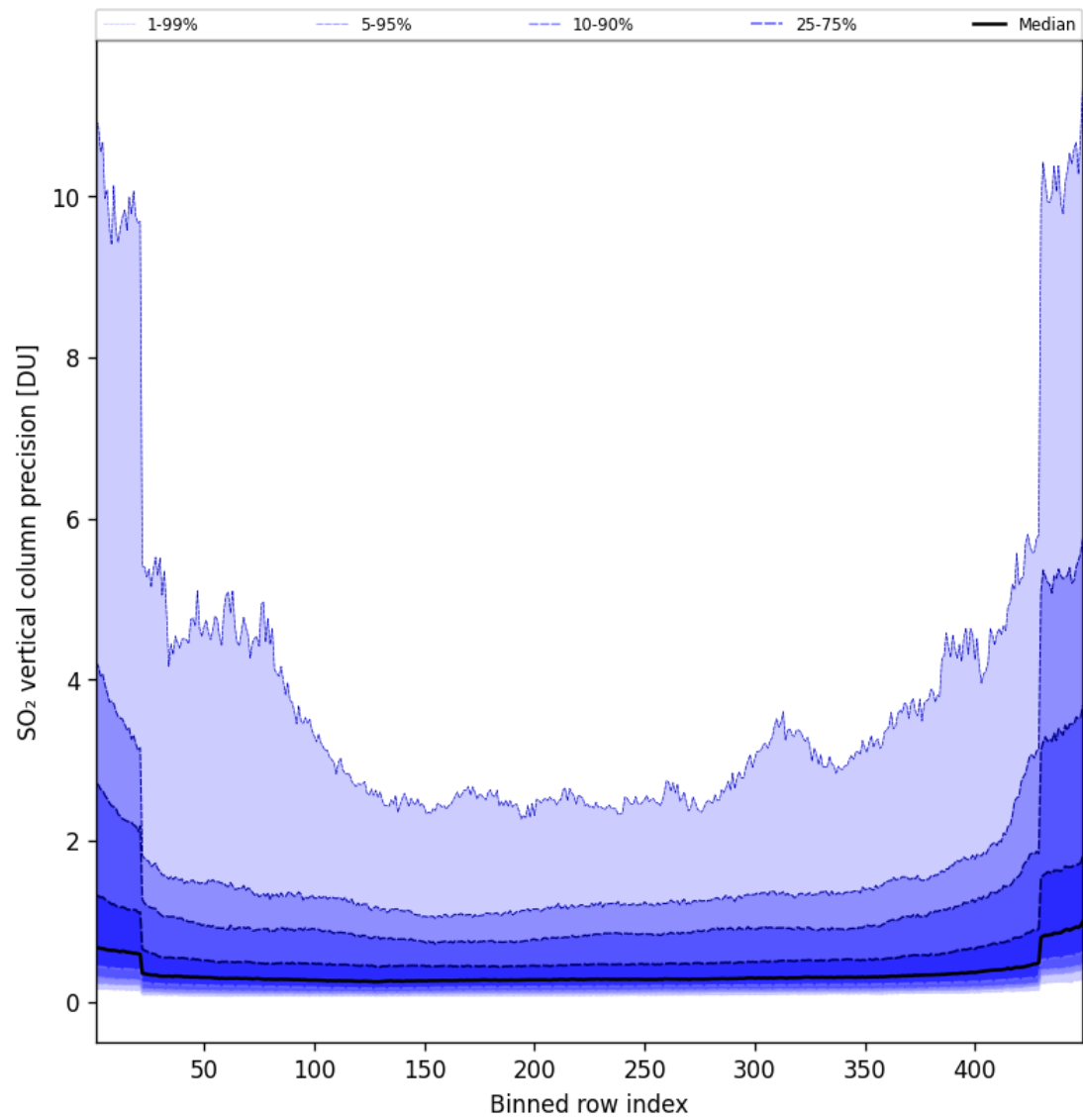


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-11-02 to 2025-11-03

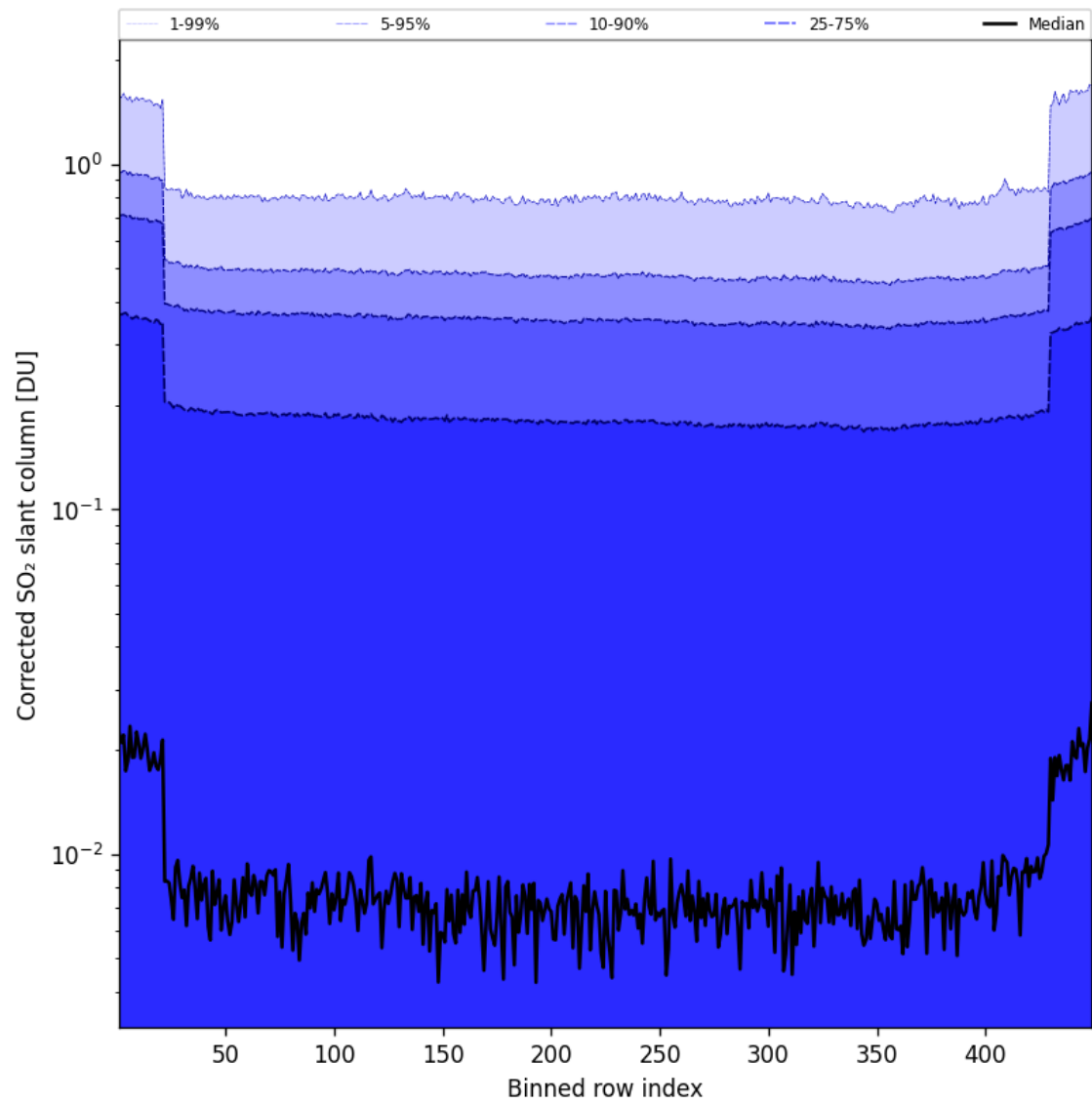


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-11-02 to 2025-11-03

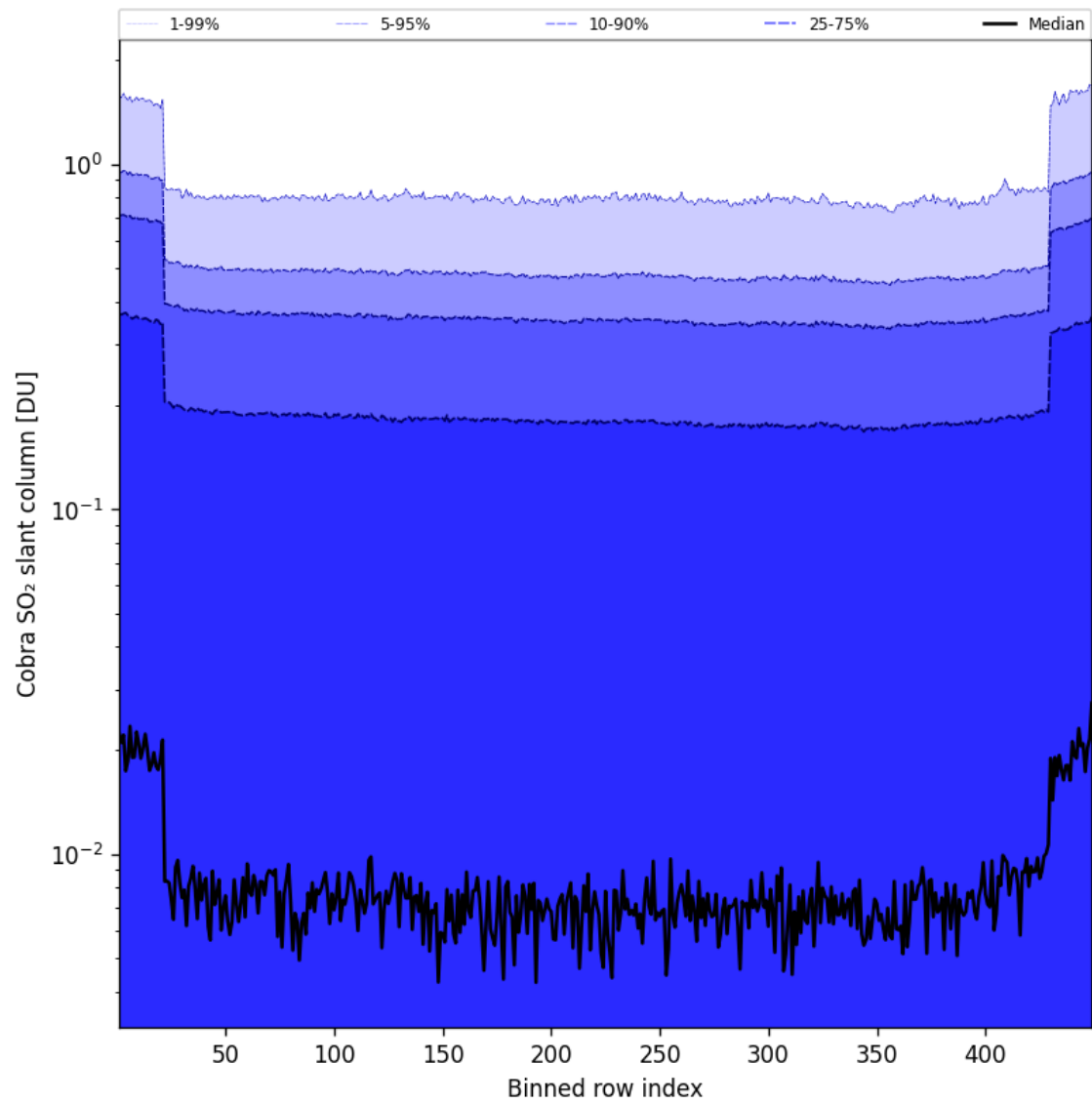


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-11-02 to 2025-11-03

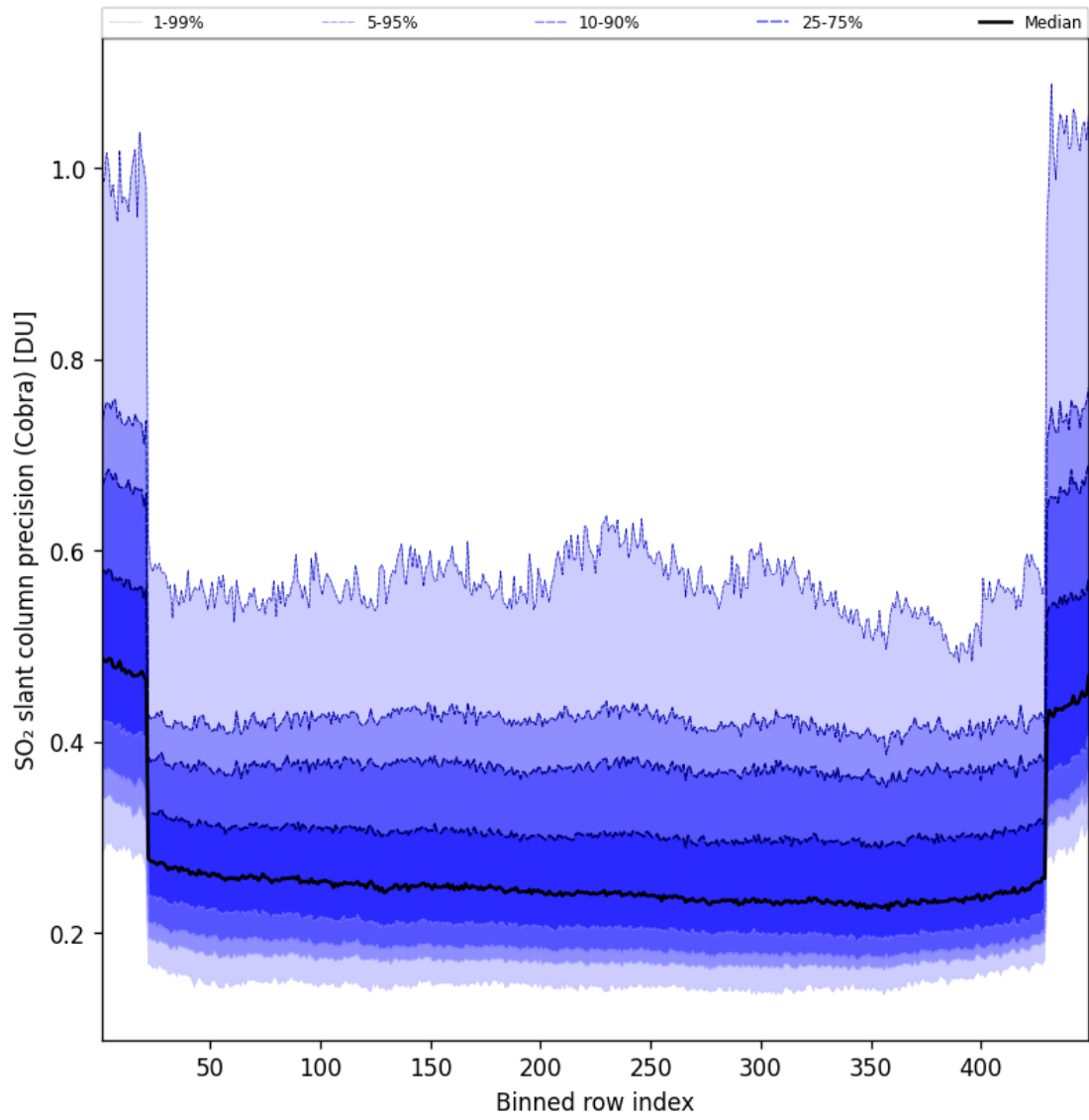


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-11-02 to 2025-11-03

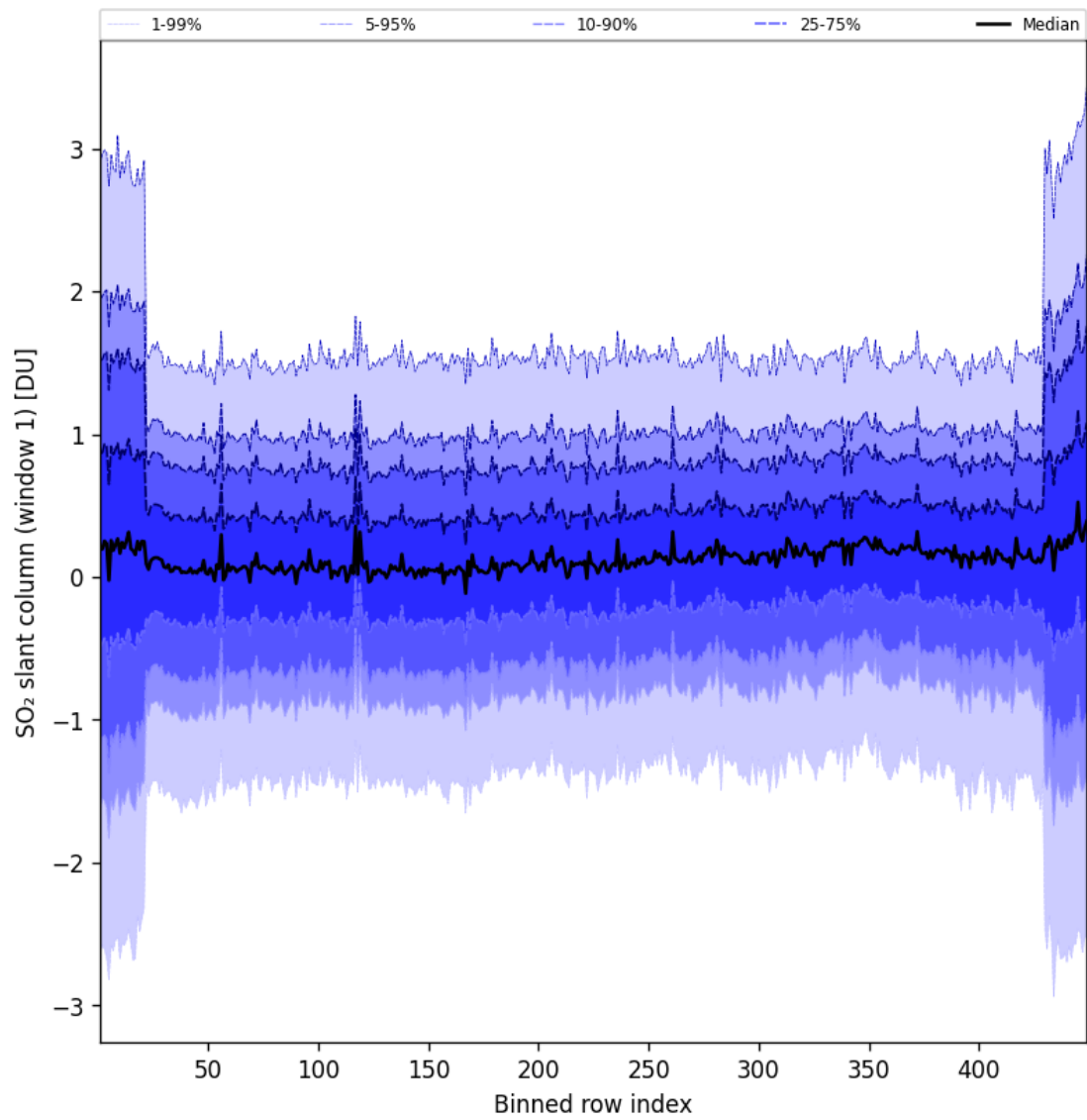


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-11-02 to 2025-11-03

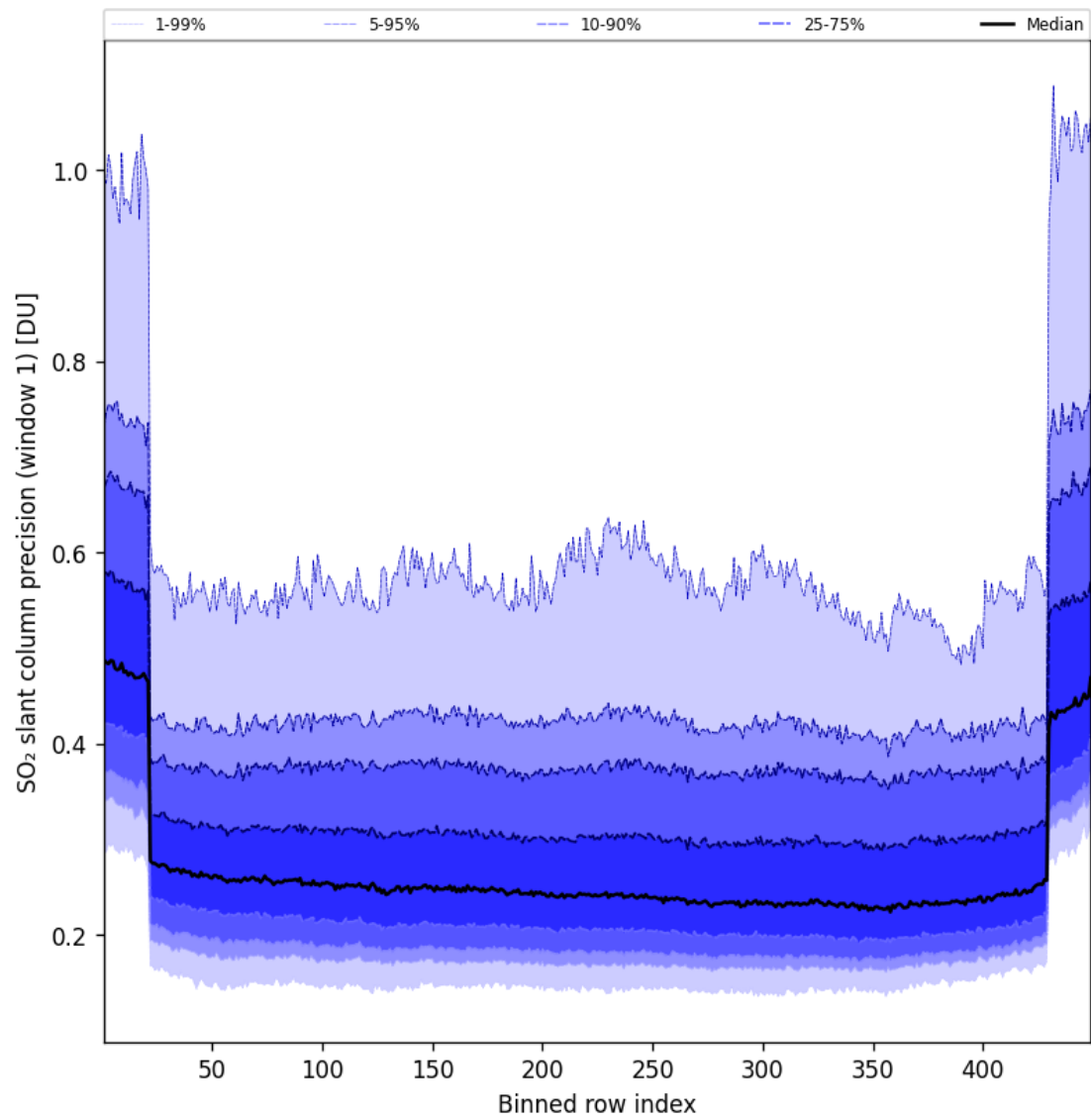


Figure 91: Along track statistics of "SO₂ slant column precision (window 1)" for 2025-11-02 to 2025-11-03

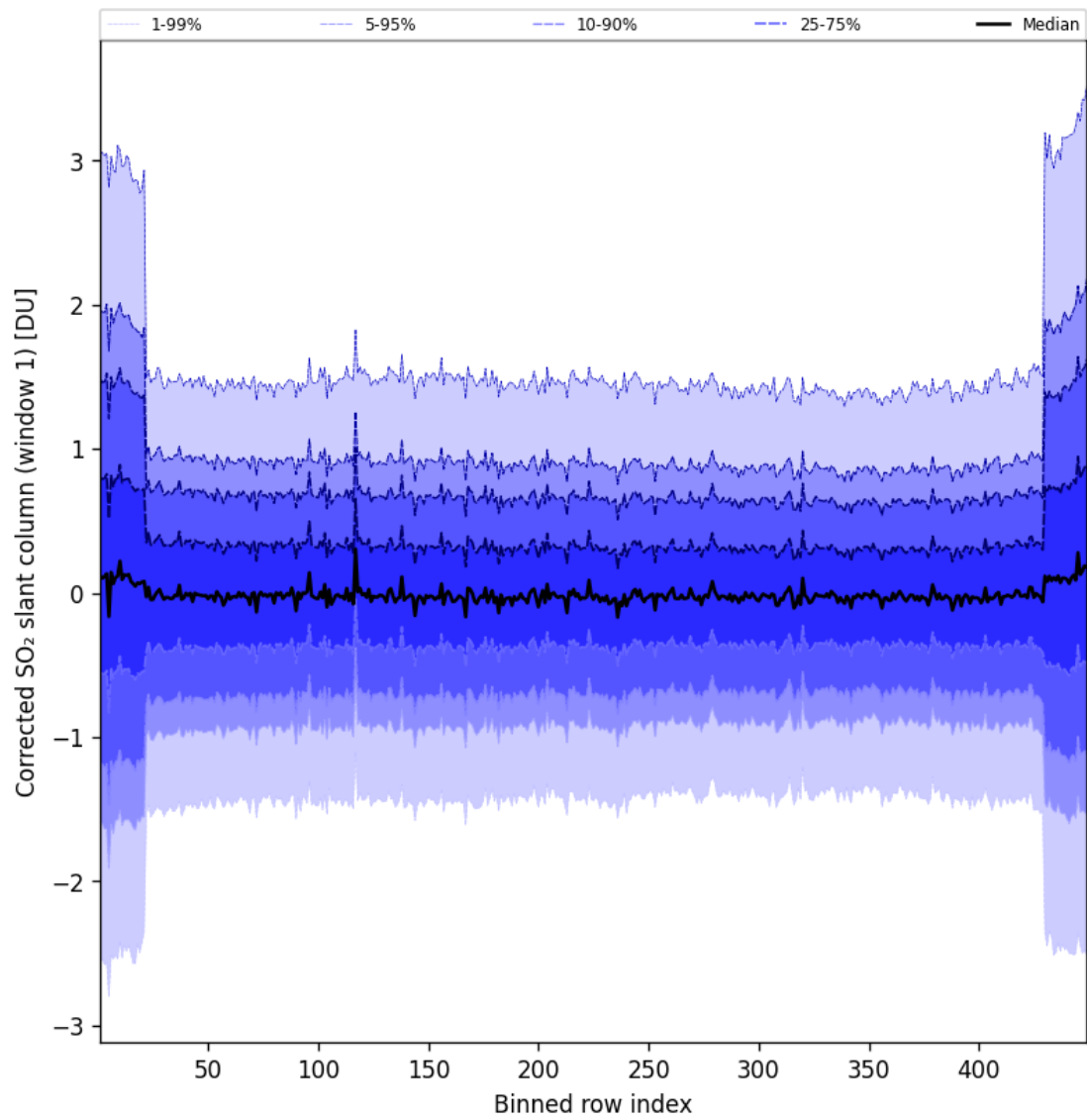


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-11-02 to 2025-11-03

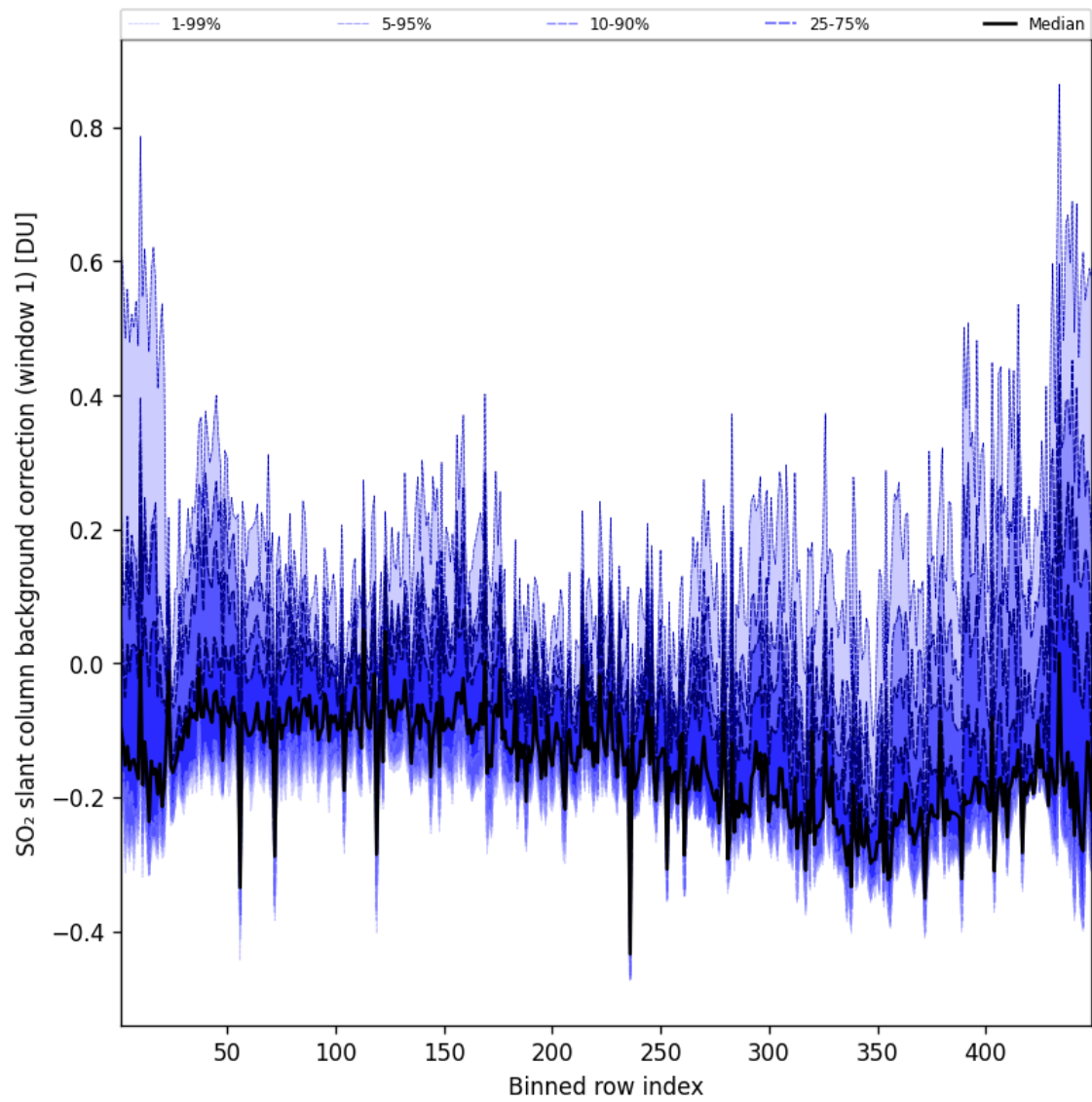


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-11-02 to 2025-11-03

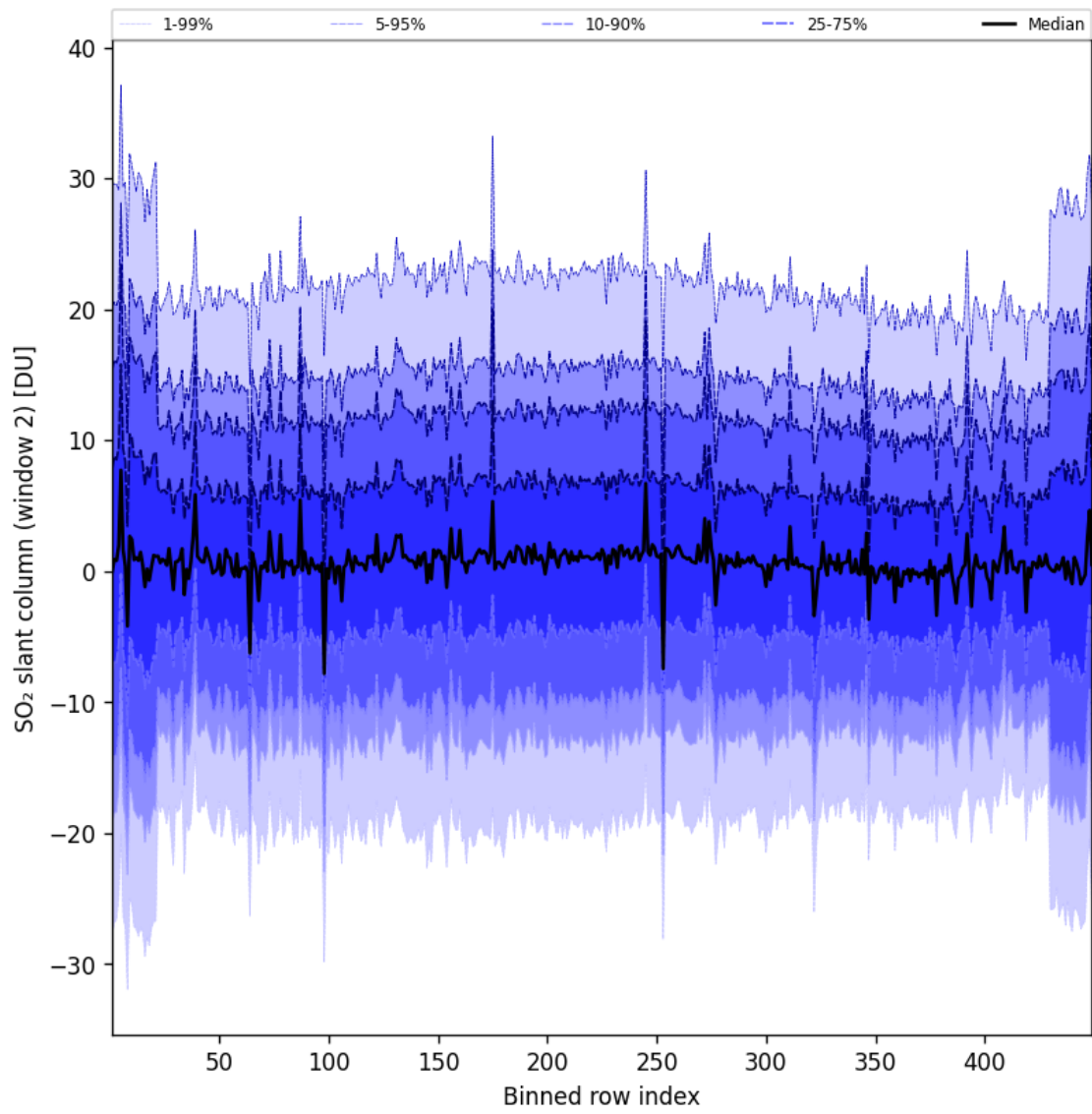


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-11-02 to 2025-11-03

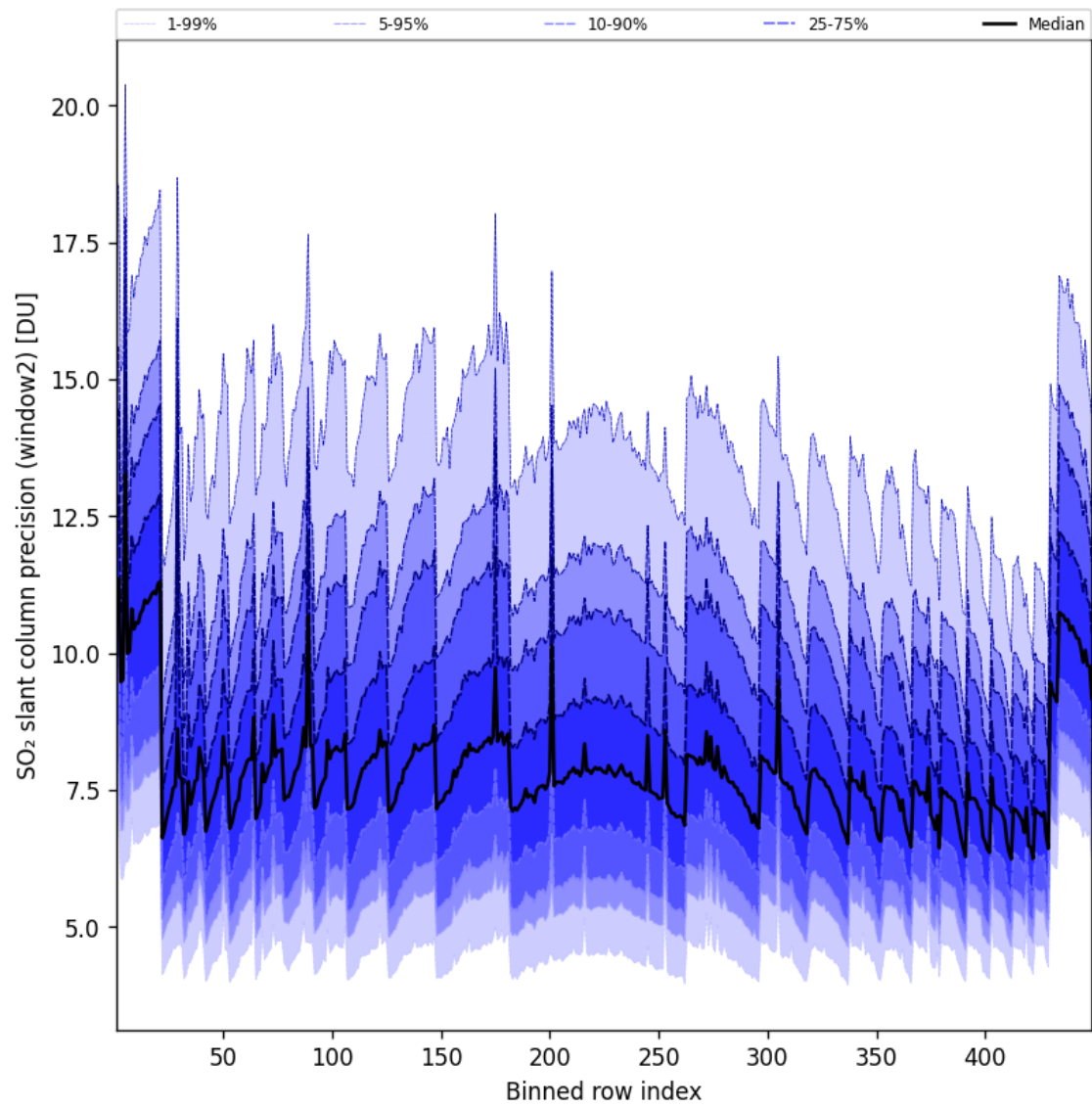


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-11-02 to 2025-11-03

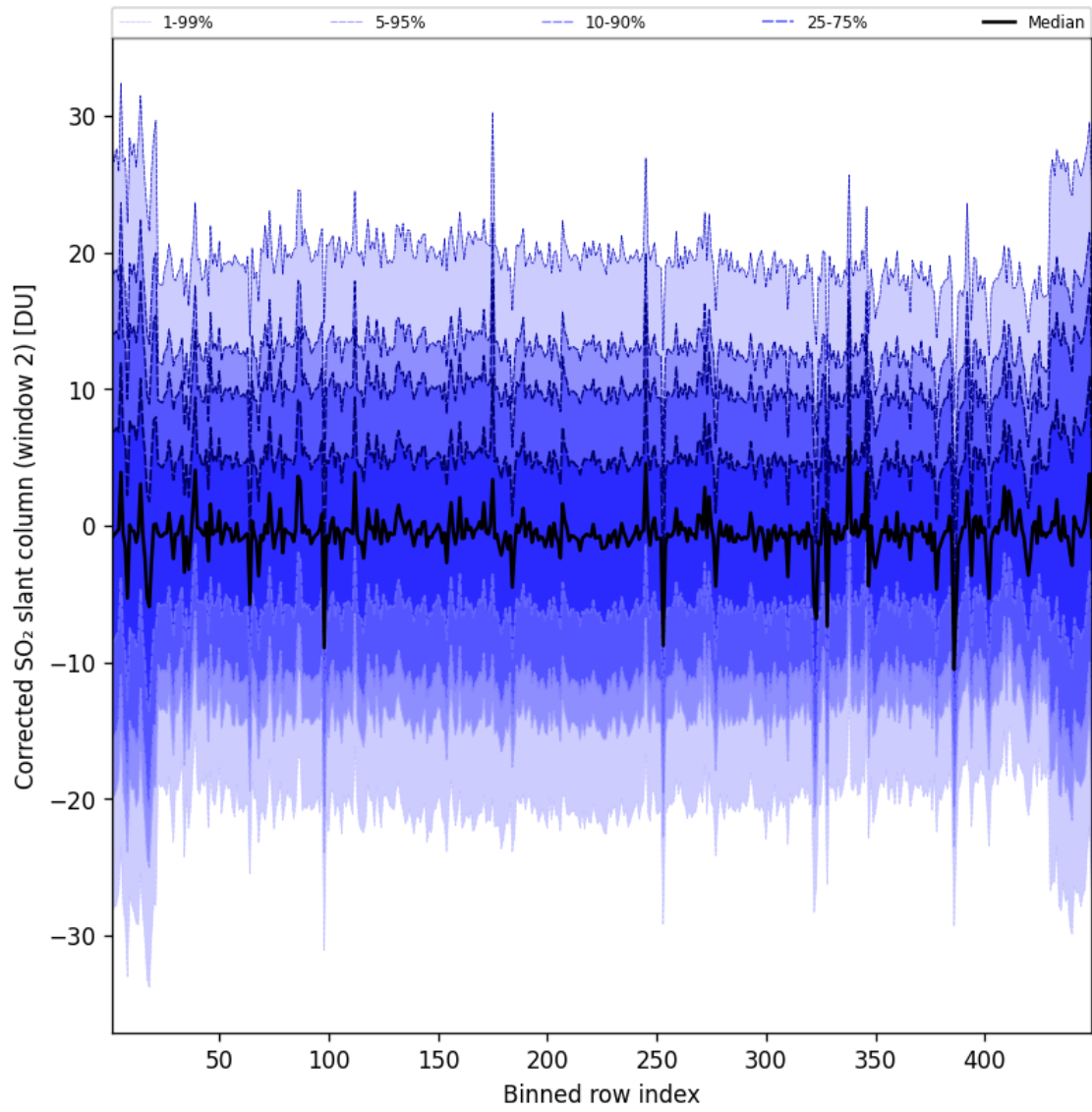


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-11-02 to 2025-11-03

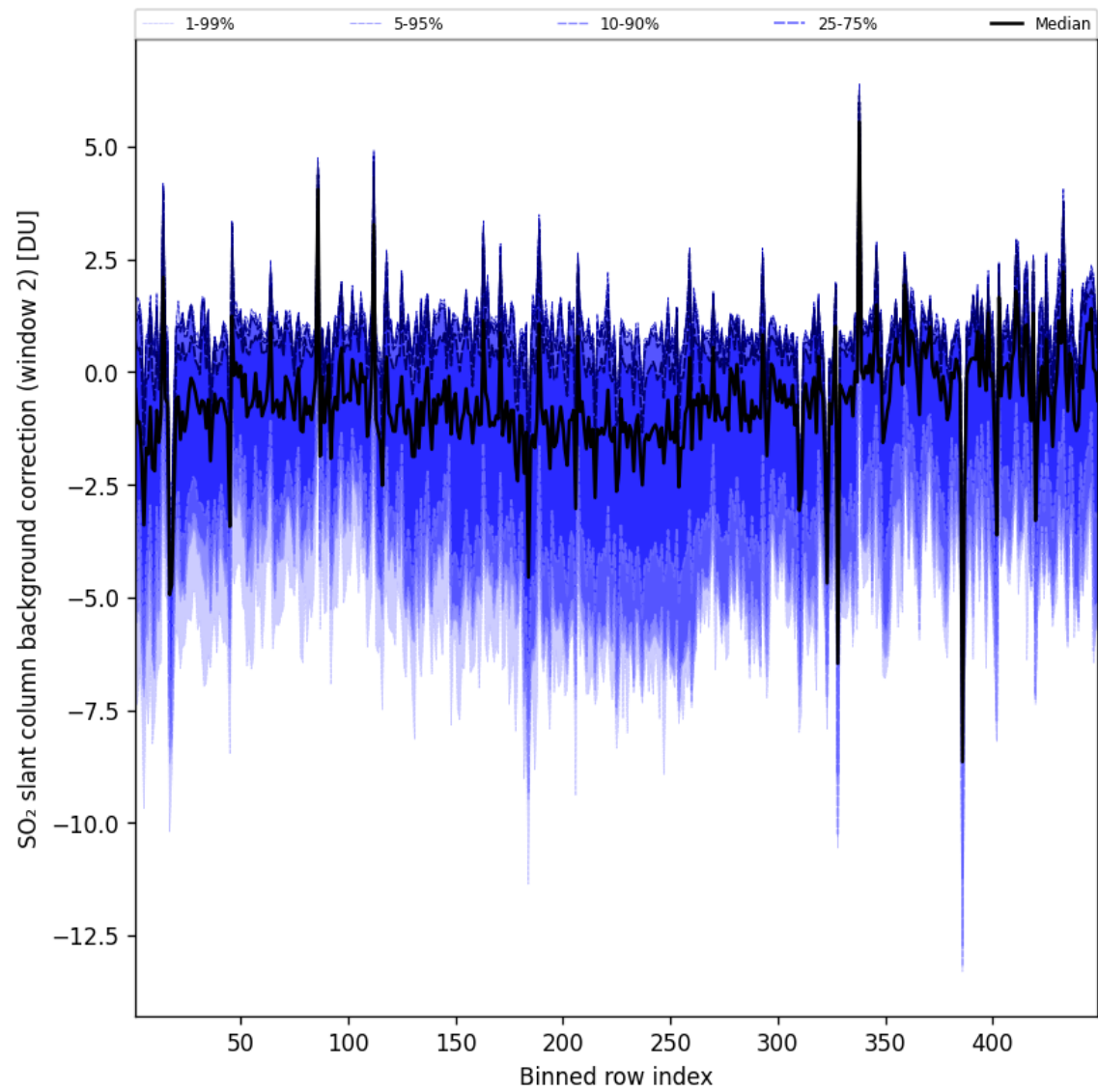


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-11-02 to 2025-11-03

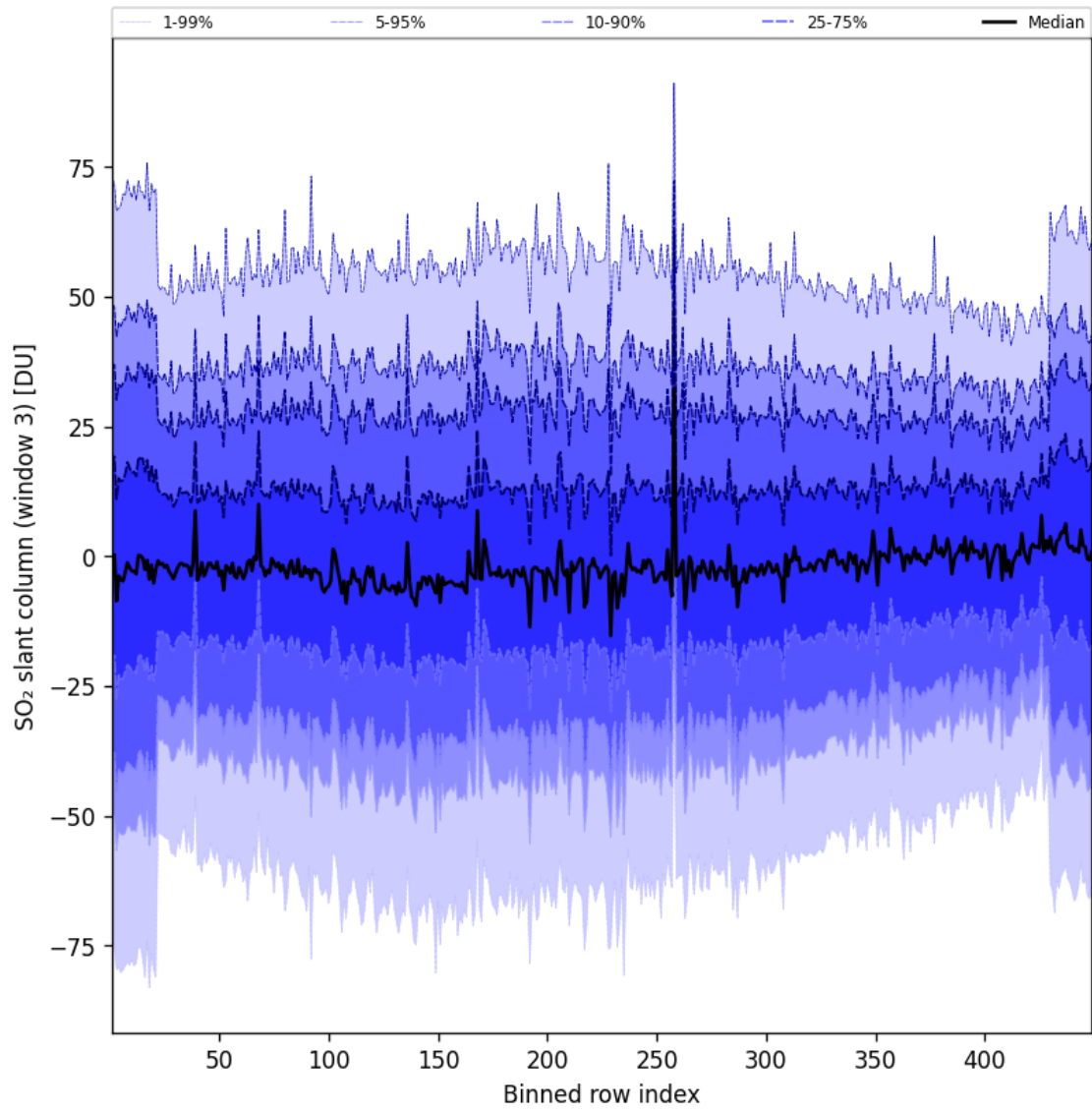


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-11-02 to 2025-11-03

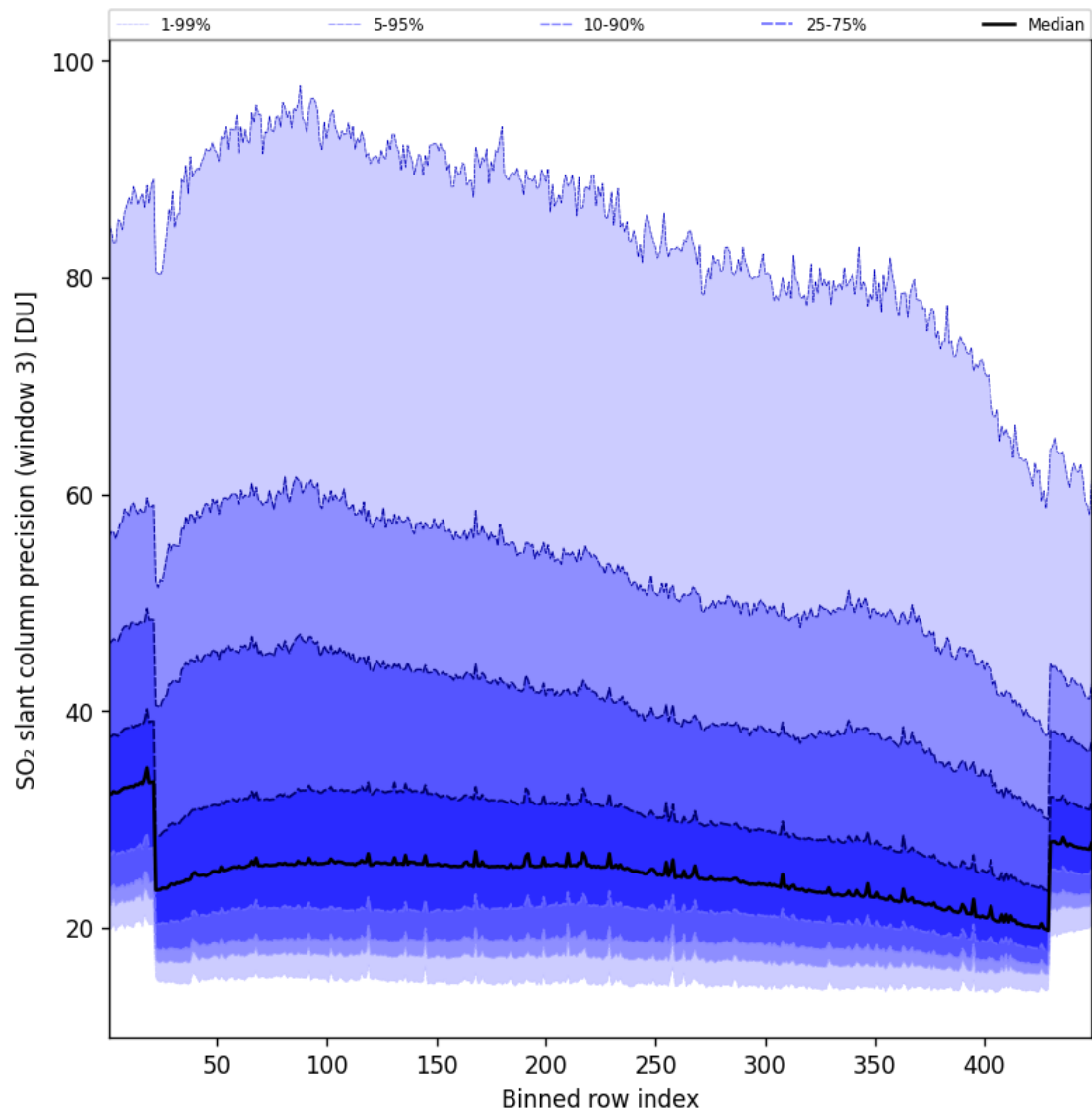


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-11-02 to 2025-11-03

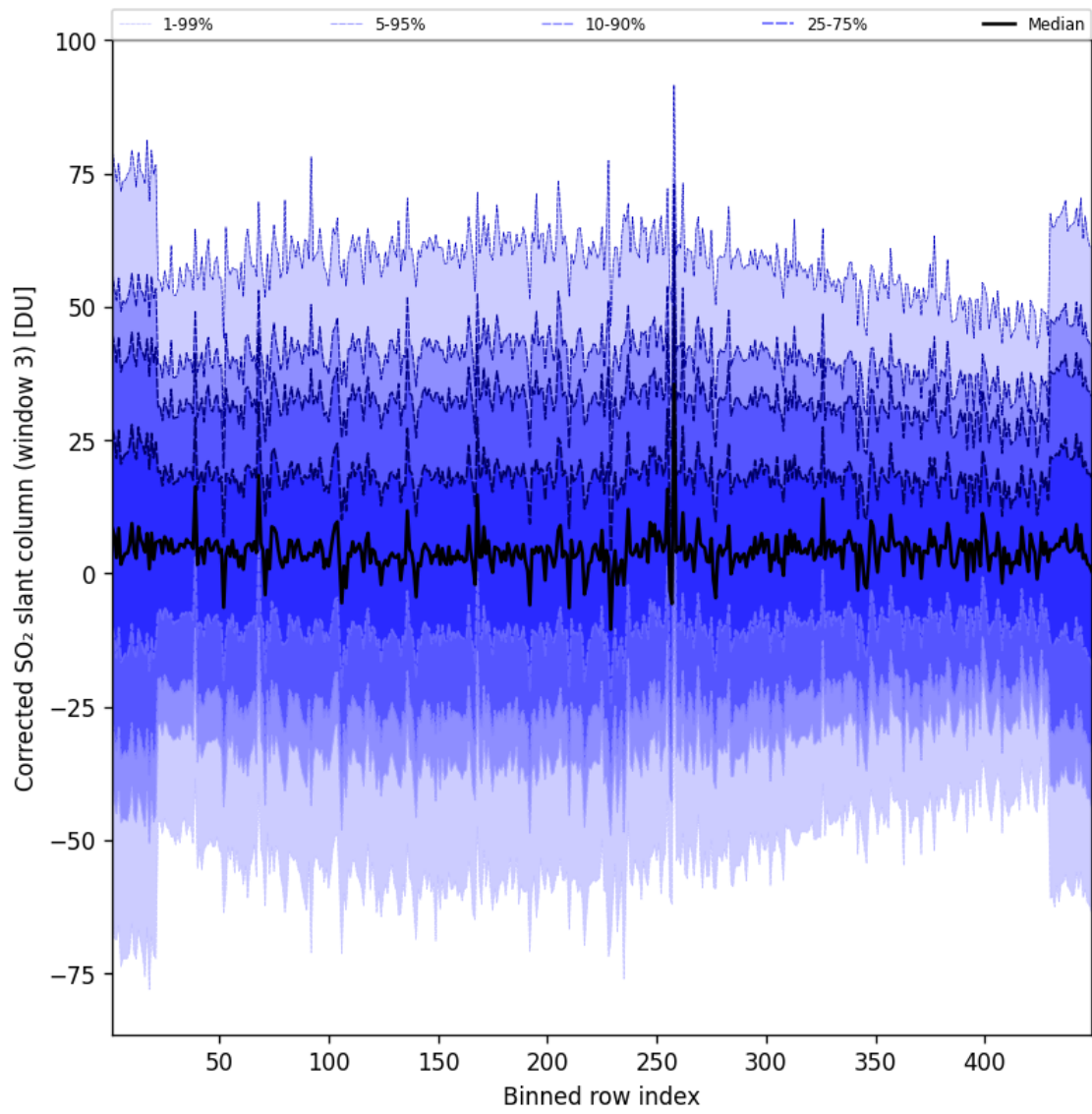


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-11-02 to 2025-11-03

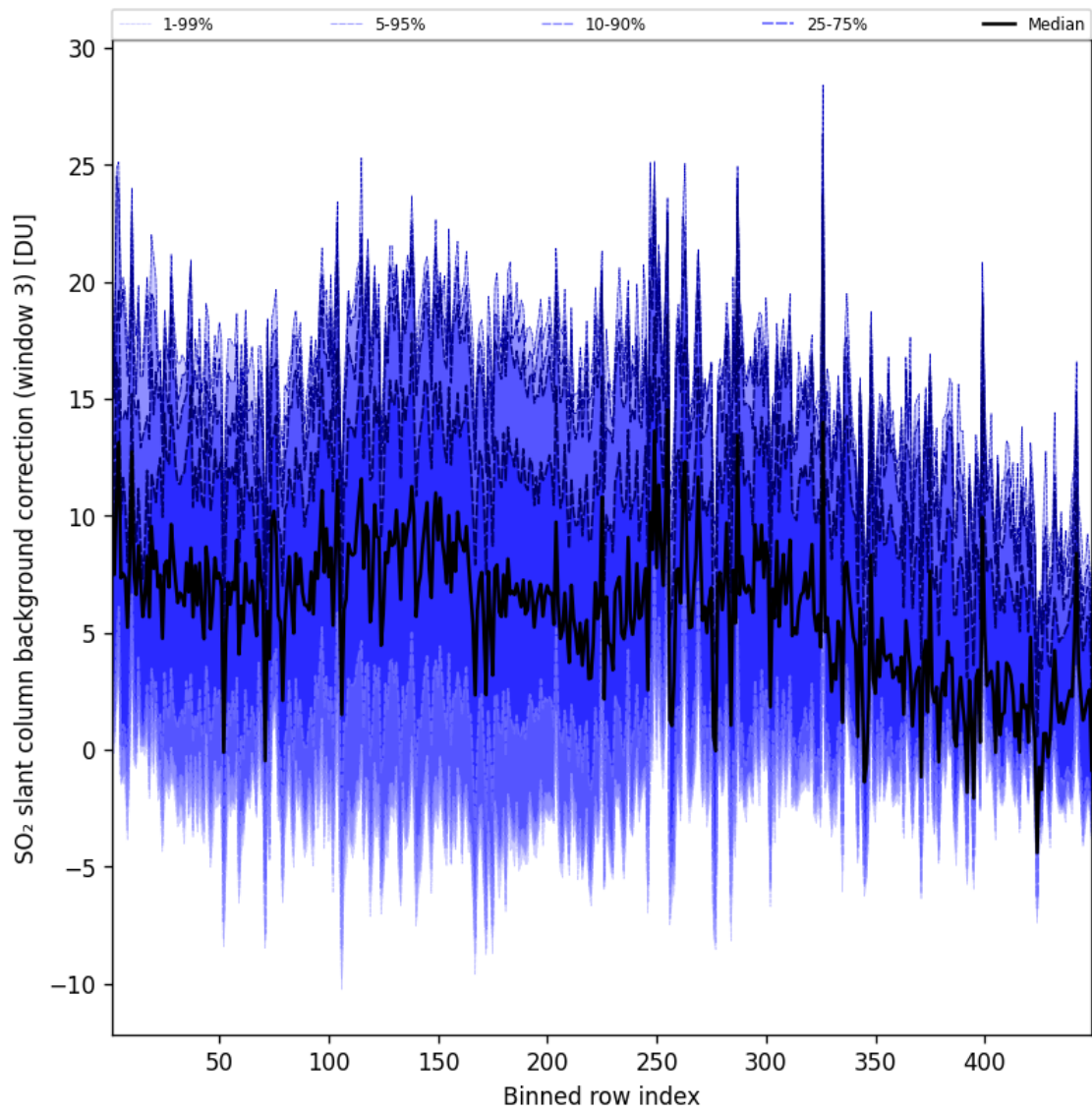


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-11-02 to 2025-11-03

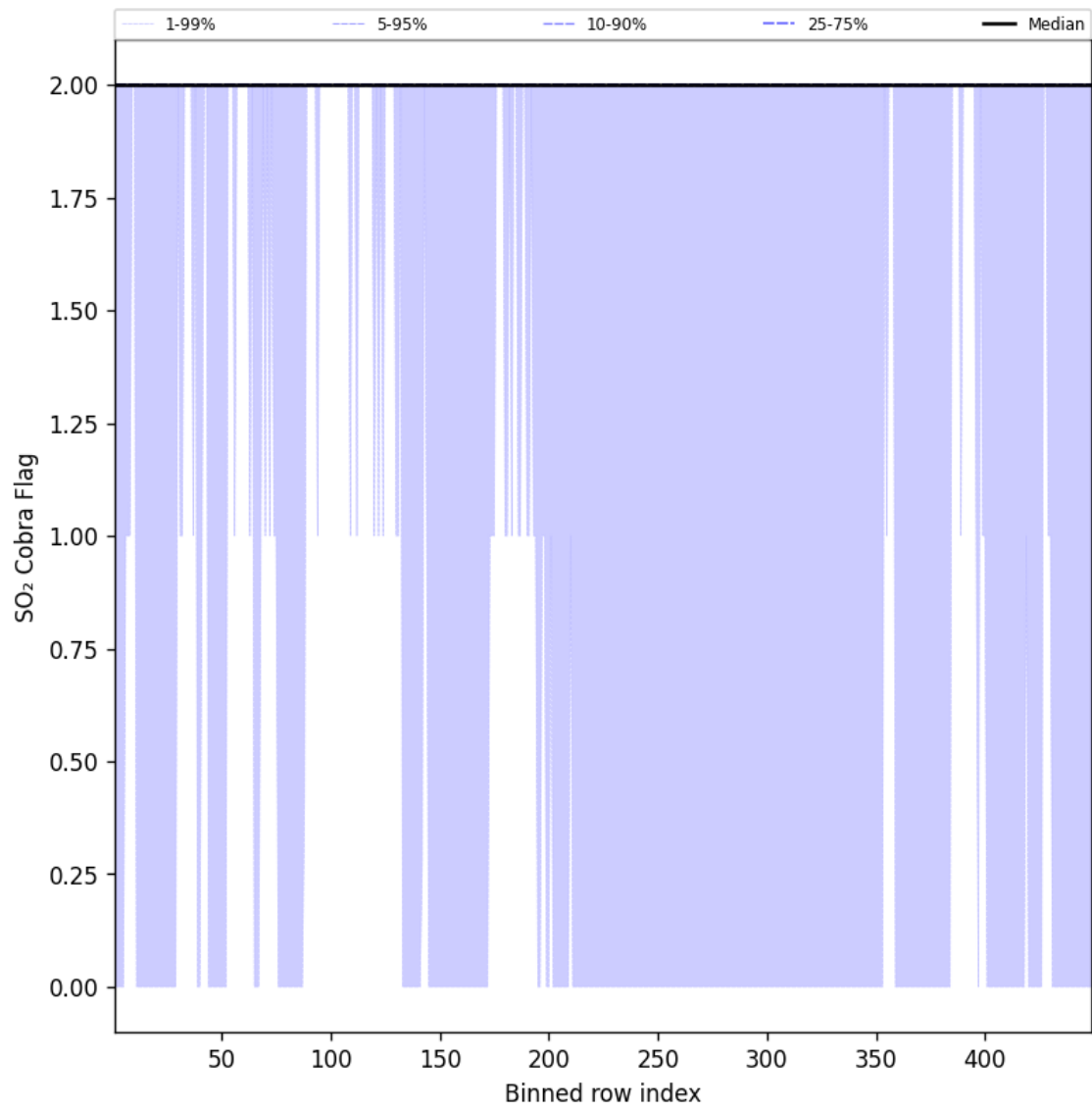


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-11-02 to 2025-11-03

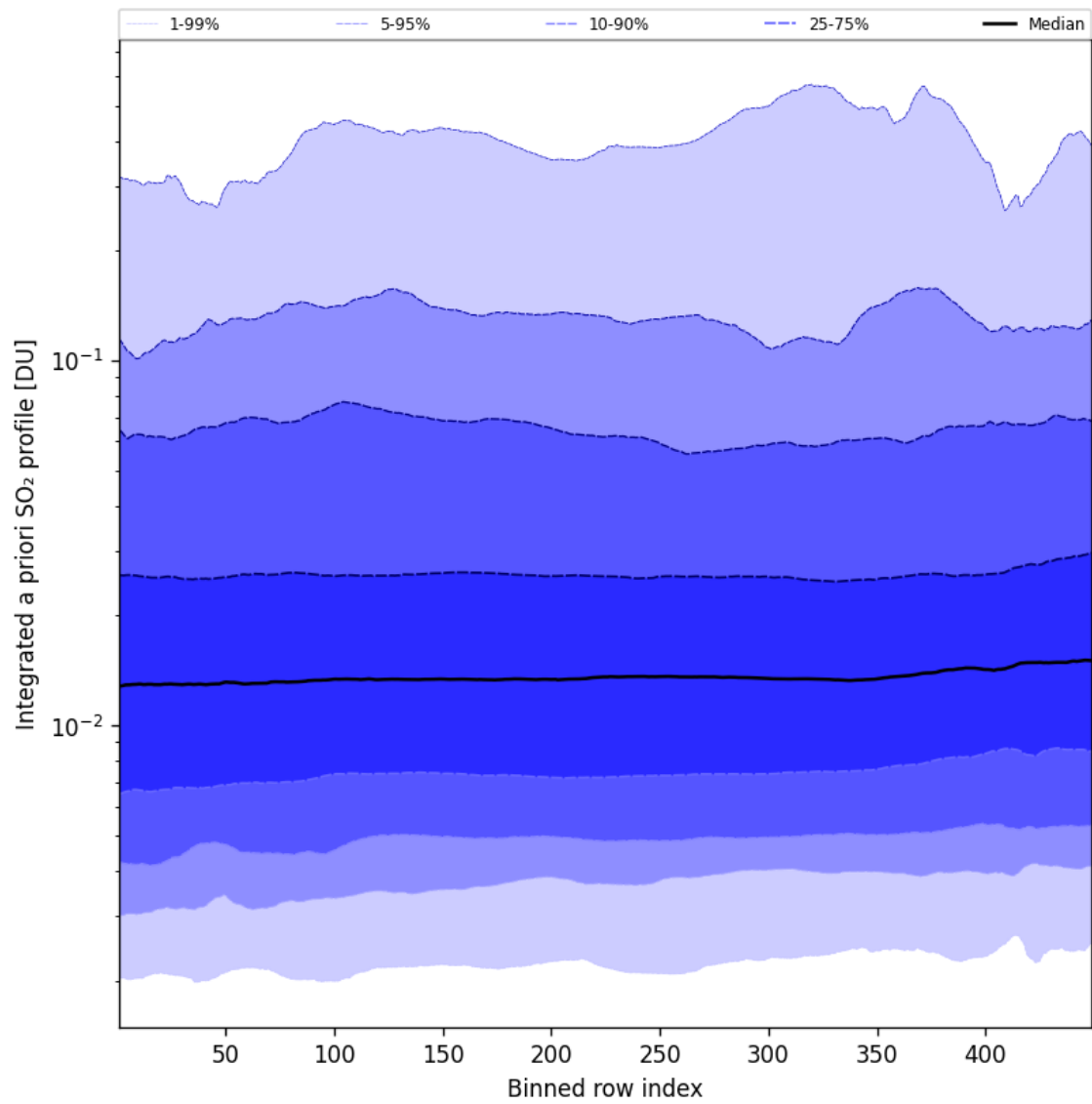


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-11-02 to 2025-11-03

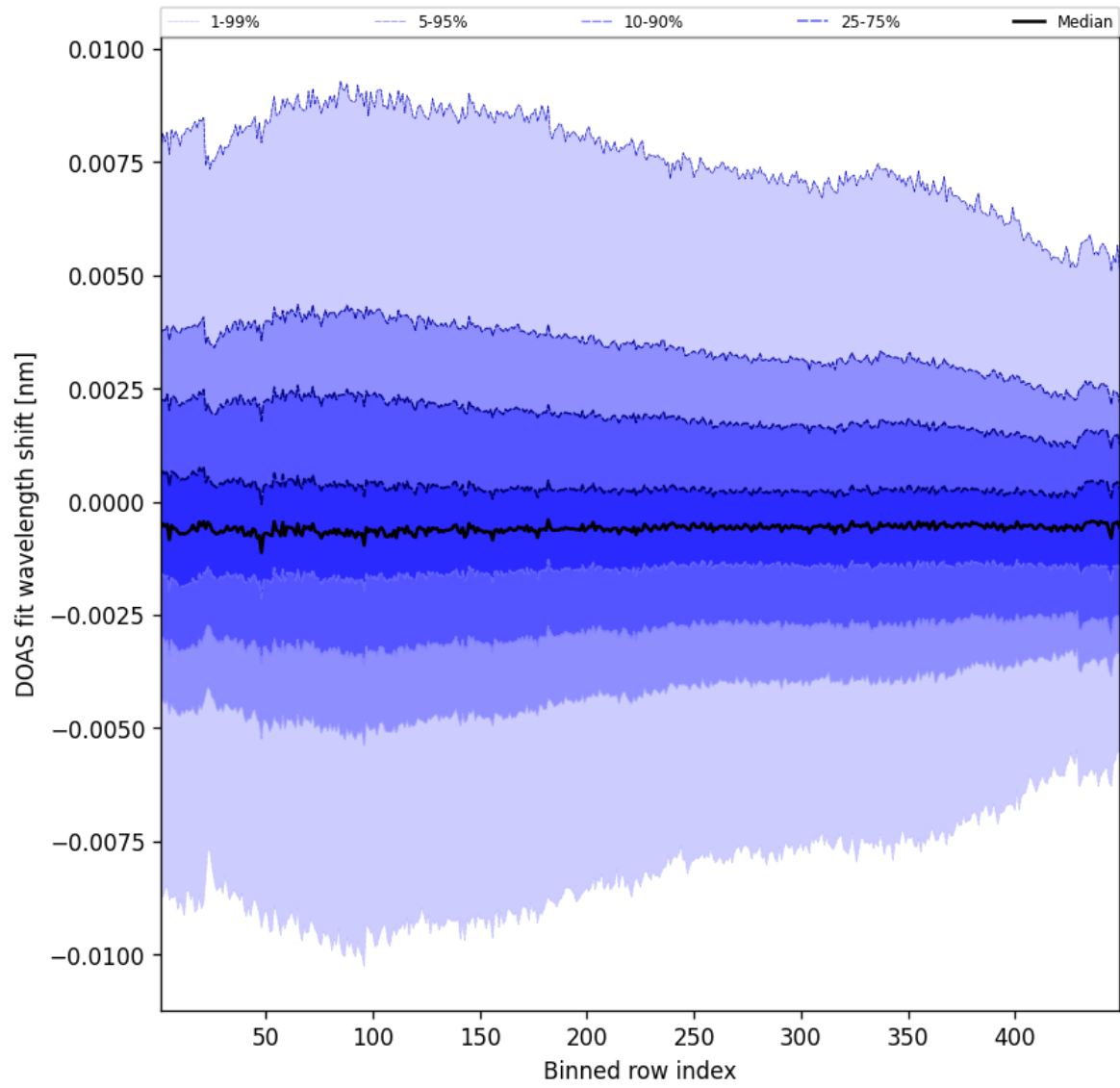


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-11-02 to 2025-11-03

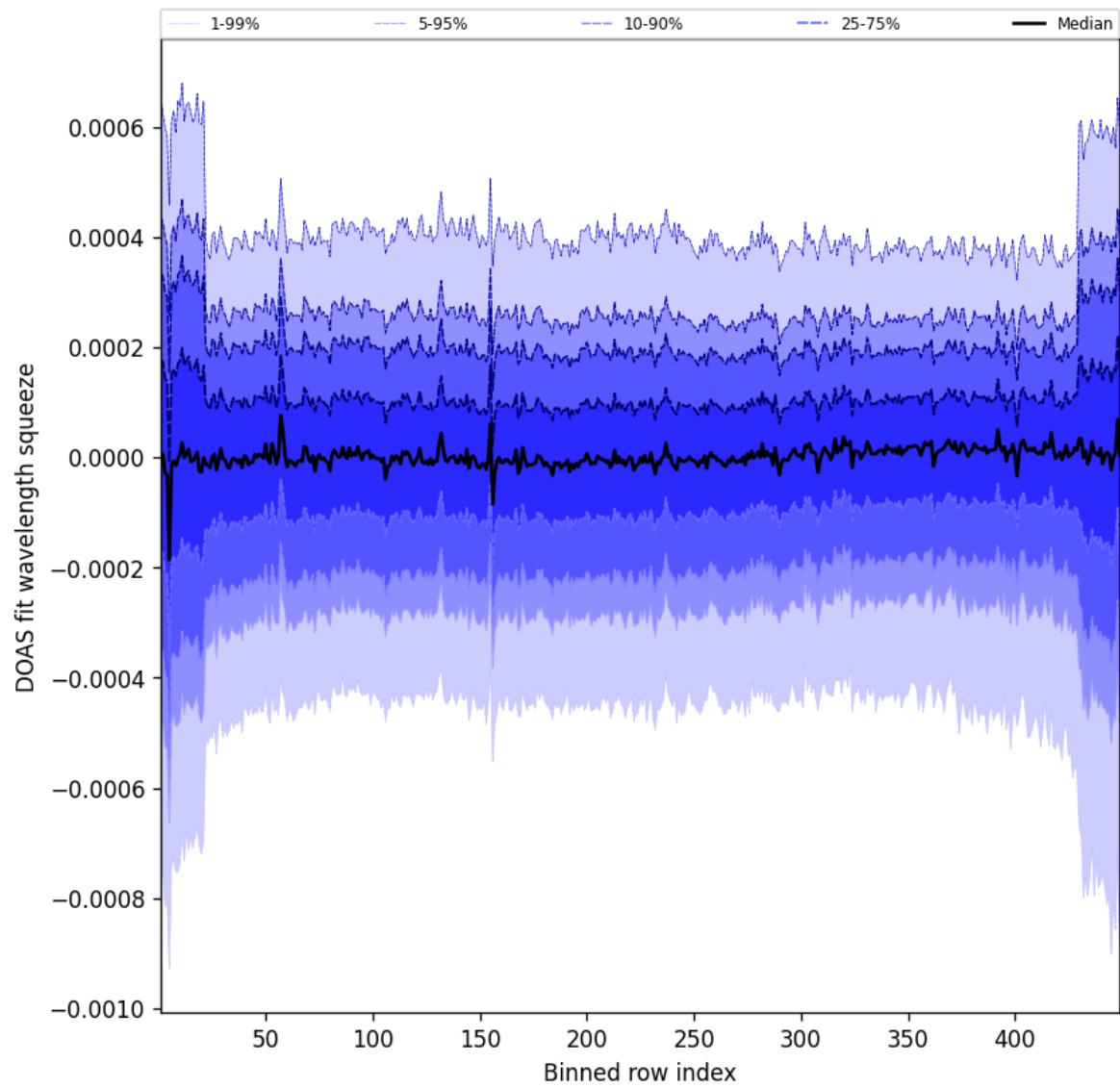


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-11-02 to 2025-11-03

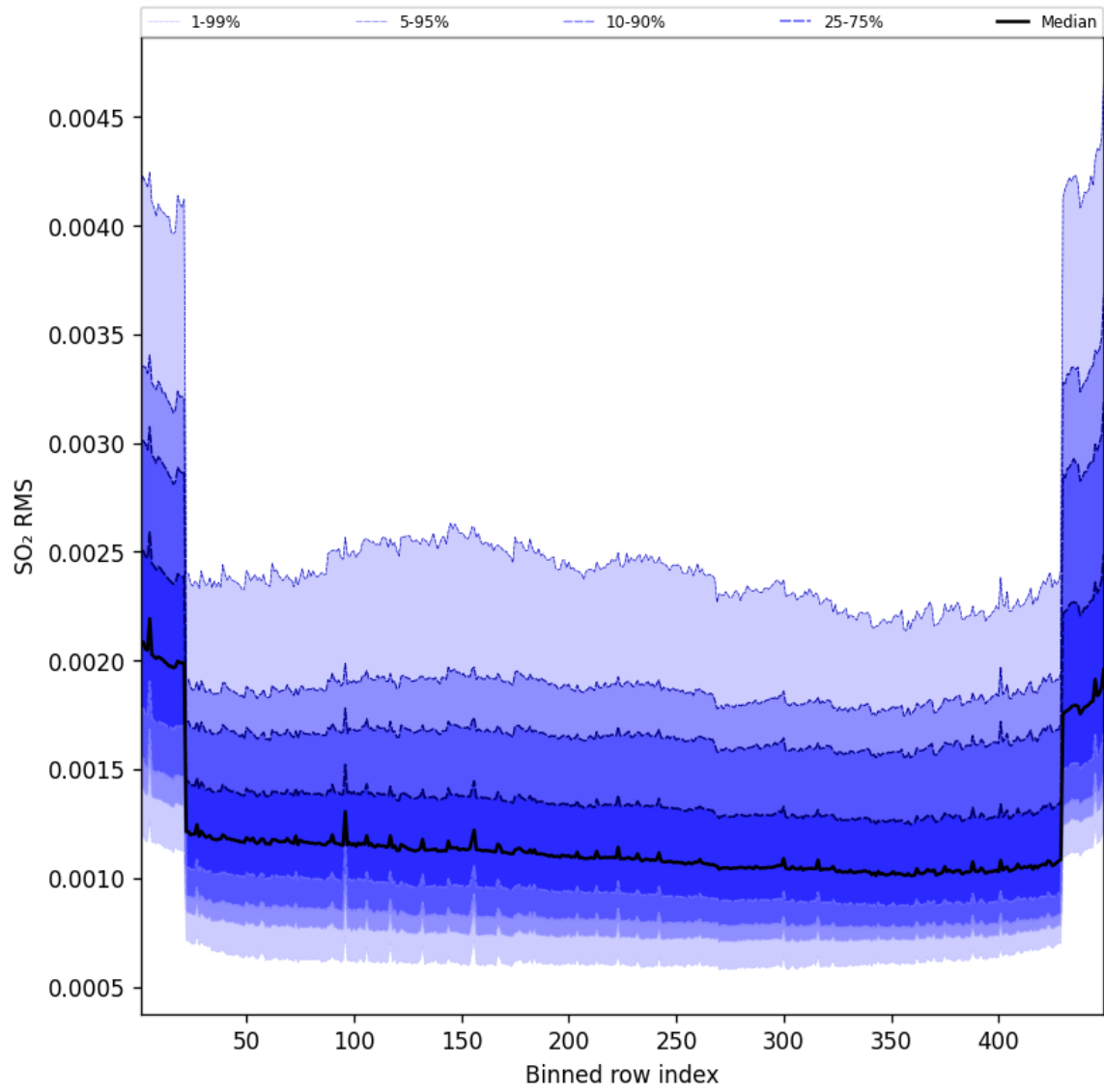


Figure 106: Along track statistics of “SO₂ RMS” for 2025-11-02 to 2025-11-03

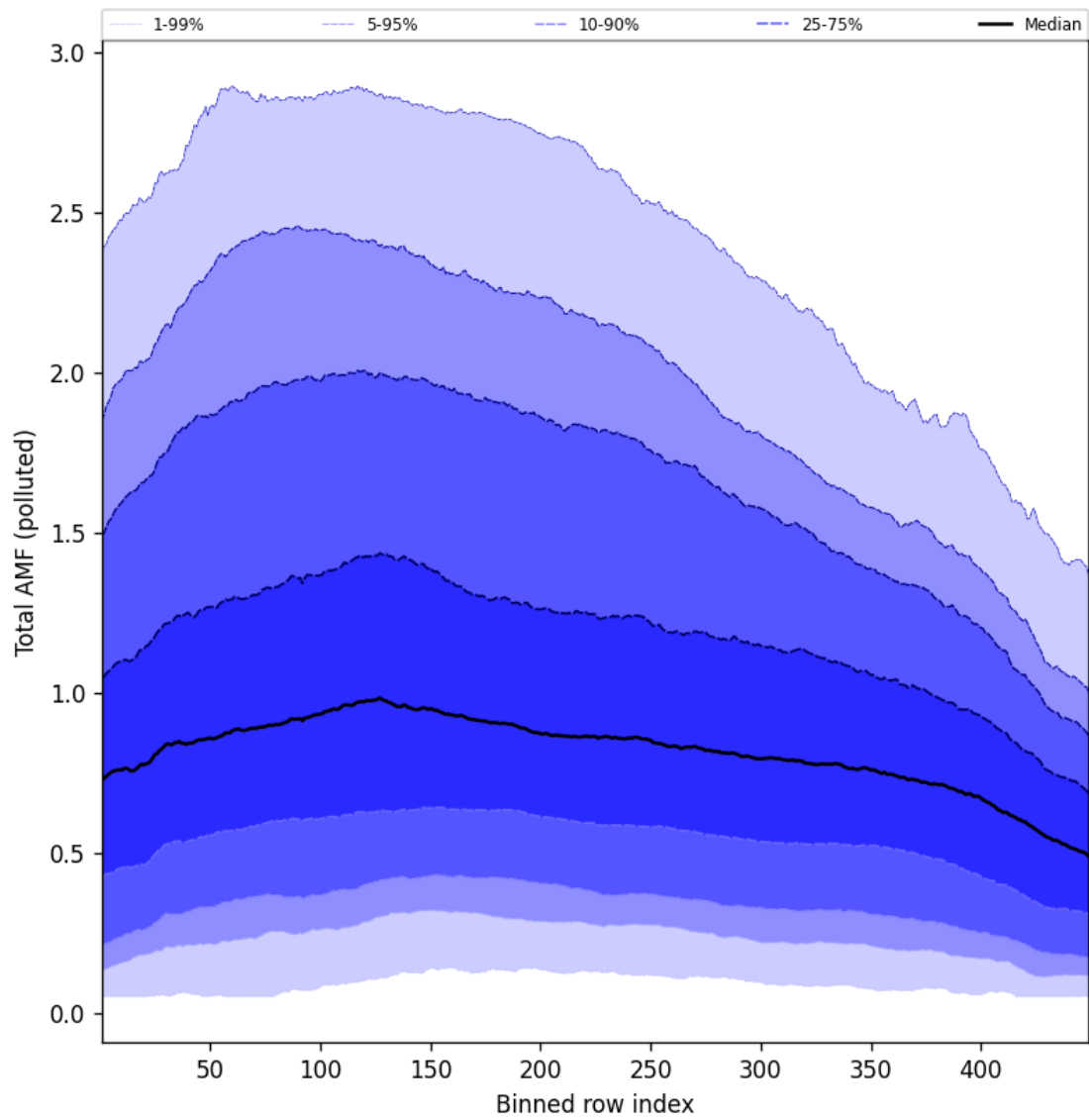


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-11-02 to 2025-11-03

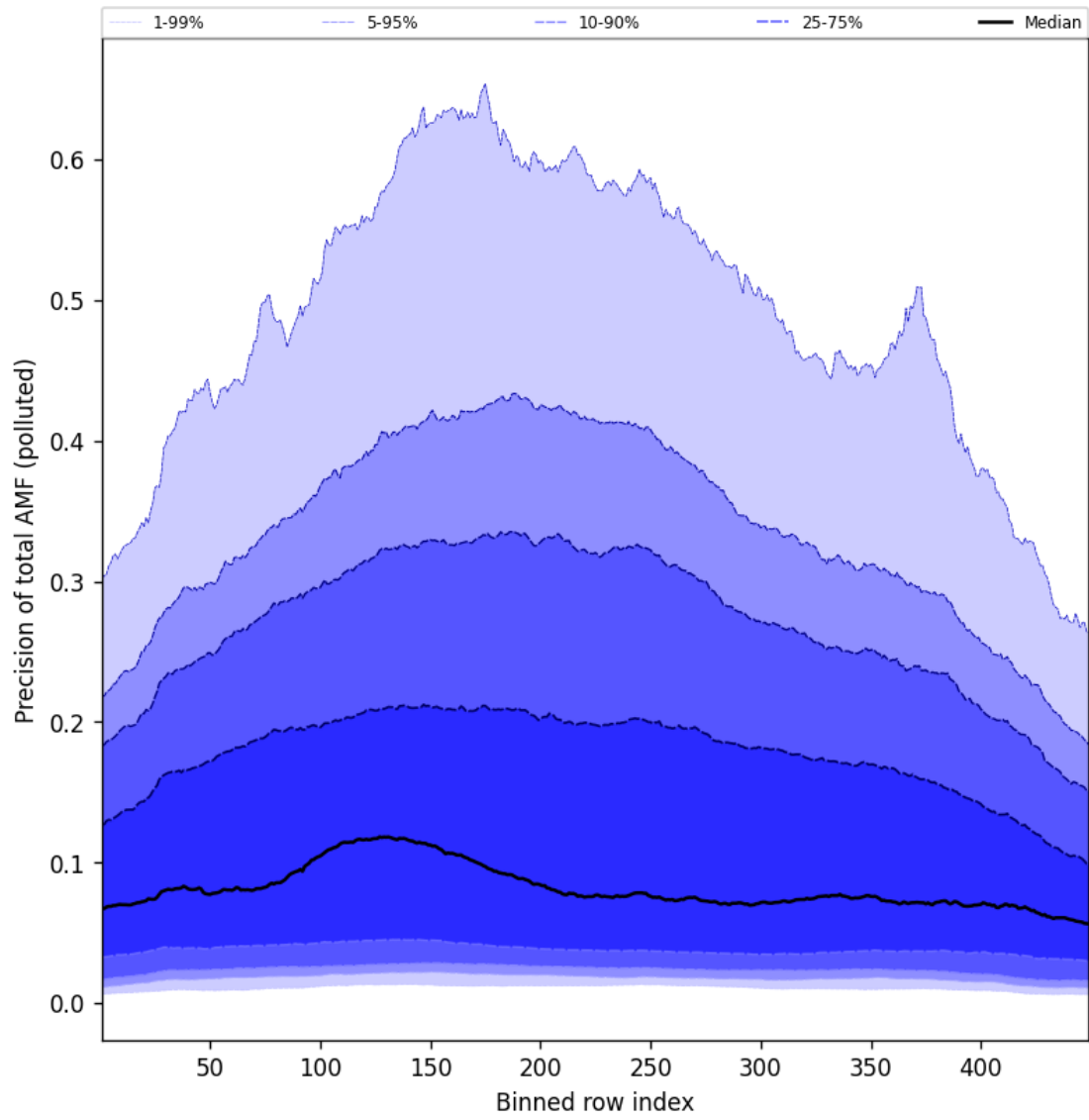


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-11-02 to 2025-11-03

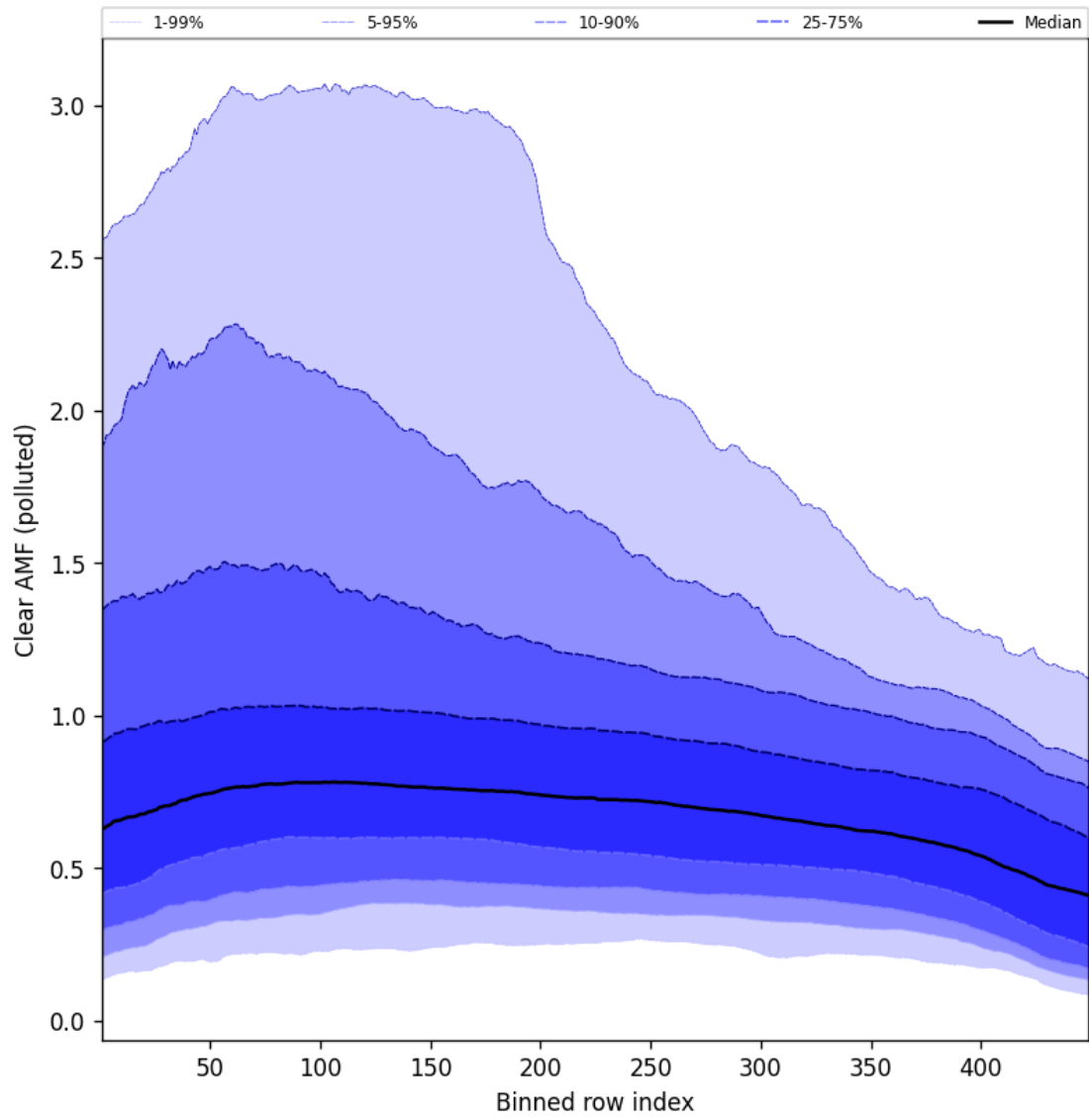


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-11-02 to 2025-11-03

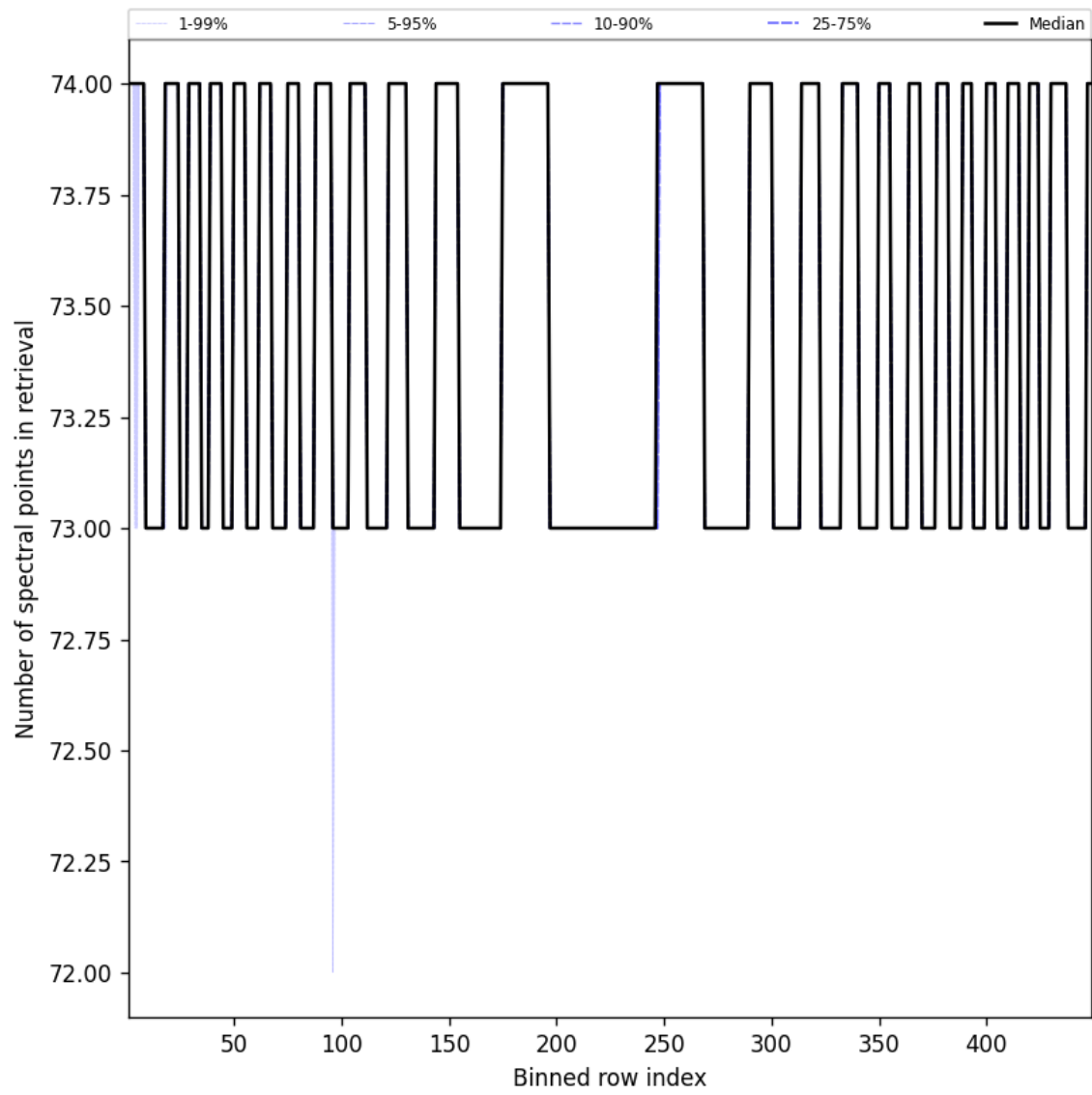


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-11-02 to 2025-11-03

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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