

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]	0.632 ± 0.415	16906652	0.995	0.800	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.946 \pm 120.980) \times 10^{-2}$	16906652	0.249	0.436	8.188×10^{-3}	-84.3	105
sulfurdioxide total vertical column precision [DU]	0.569 ± 0.901	16906652	0.197	0.378	0.315	2.558×10^{-2}	64.1
sulfurdioxide slant column density corrected [DU]	$(1.344 \pm 33.726) \times 10^{-2}$	16906652	0.258	0.363	7.717×10^{-3}	-21.4	43.5
sulfurdioxide slant column density cobra [DU]	$(1.342 \pm 33.646) \times 10^{-2}$	16906652	0.258	0.363	7.717×10^{-3}	-21.4	35.2
sulfurdioxide slant column density cobra precision [DU]	0.287 ± 0.116	16906652	0.213	0.119	0.254	7.785×10^{-2}	22.1
sulfurdioxide slant column density window1 [DU]	0.114 ± 0.648	16906652	0.125	0.737	0.117	-30.9	75.7
sulfurdioxide slant column density window1 precision [DU]	0.287 ± 0.116	16906652	0.213	0.119	0.254	7.785×10^{-2}	22.1
sulfurdioxide slant column density corrected win1 [DU]	$(5.566 \pm 640.641) \times 10^{-3}$	16906652	-2.500×10^{-2}	0.724	-7.248×10^{-3}	-30.9	75.7
background so2 slant column offset window1 [DU]	-0.108 ± 0.128	16906652	-0.140	0.154	-0.123	-1.31	3.10
sulfurdioxide slant column density window2 [DU]	1.06 ± 8.95	16906652	0.750	11.4	0.937	-1.068×10^3	625
sulfurdioxide slant column density window2 precision [DU]	8.09 ± 2.23	16906652	7.43	2.59	7.74	2.24	494
sulfurdioxide slant column density corrected win2 [DU]	$(2.937 \pm 873.785) \times 10^{-2}$	16906652	0.250	11.1	1.587×10^{-2}	-1.070×10^3	626
background so2 slant column offset window2 [DU]	-1.03 ± 2.20	16906652	0.750	3.37	-0.516	-11.2	5.19
sulfurdioxide slant column density window3 [DU]	-3.46 ± 24.10	16906652	-3.92	30.1	-3.59	-495	406
sulfurdioxide slant column density window3 precision [DU]	28.2 ± 12.8	16906652	22.5	9.82	24.8	10.3	374
sulfurdioxide slant column density corrected win3 [DU]	1.11 ± 23.29	16906652	1.68	28.9	1.17	-479	409
background so2 slant column offset window3 [DU]	4.58 ± 6.35	16906652	-0.560	10.2	4.06	-12.0	26.5
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	16906652	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.592 \pm 9.742) \times 10^{-2}$	16906652	1.539×10^{-2}	1.928×10^{-2}	1.457×10^{-2}	7.912×10^{-4}	3.08
fitted radiance shift [nm]	$(-5.523 \pm 25.449) \times 10^{-4}$	16906652	-5.000×10^{-4}	1.816×10^{-3}	-5.870×10^{-4}	-4.383×10^{-2}	4.312×10^{-2}
fitted radiance squeeze [1]	$(-7.168 \pm 180.779) \times 10^{-6}$	16906652	1.000×10^{-5}	2.103×10^{-4}	-7.947×10^{-7}	-1.349×10^{-2}	1.478×10^{-2}
fitted root mean square [1]	$(1.259 \pm 0.476) \times 10^{-3}$	16906652	9.750×10^{-4}	4.909×10^{-4}	1.134×10^{-3}	3.271×10^{-4}	4.507×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.915 ± 0.555	16906652	0.540	0.659	0.810	5.000×10^{-2}	3.46
sulfurdioxide total air mass factor polluted precision [1]	0.121 ± 0.117	16906652	2.500×10^{-2}	0.136	7.837×10^{-2}	2.849×10^{-3}	1.57
sulfurdioxide clear air mass factor polluted [1]	0.772 ± 0.440	16906652	0.540	0.430	0.689	5.698×10^{-2}	3.47
number of spectral points in retrieval [1]	73.4 ± 0.5	16906652	73.0	1.000	73.0	70.0	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	4.000×10^{-2}	9.000×10^{-2}	0.200	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.81	-0.955	-0.554	-0.361	-0.207	0.229	0.393	0.604	1.05	3.20
sulfurdioxide total vertical column precision [DU]	7.860×10^{-2}	0.112	0.142	0.168	0.203	0.581	0.810	1.12	1.77	4.39
sulfurdioxide slant column density corrected [DU]	-0.824	-0.484	-0.354	-0.266	-0.173	0.190	0.288	0.381	0.524	0.925
sulfurdioxide slant column density cobra [DU]	-0.824	-0.484	-0.354	-0.266	-0.173	0.190	0.288	0.381	0.524	0.925
sulfurdioxide slant column density cobra precision [DU]	0.145	0.172	0.186	0.197	0.212	0.331	0.381	0.429	0.506	0.709
sulfurdioxide slant column density window1 [DU]	-1.58	-0.904	-0.635	-0.450	-0.254	0.483	0.672	0.851	1.12	1.81
sulfurdioxide slant column density window1 precision [DU]	0.145	0.172	0.186	0.197	0.212	0.331	0.381	0.429	0.506	0.709
sulfurdioxide slant column density corrected win1 [DU]	-1.58	-0.970	-0.722	-0.550	-0.366	0.358	0.552	0.739	1.02	1.77
background so2 slant column offset window1 [DU]	-0.357	-0.289	-0.252	-0.225	-0.191	-3.688×10^{-2}	4.166×10^{-3}	4.287×10^{-2}	0.111	0.287
sulfurdioxide slant column density window2 [DU]	-20.0	-13.3	-9.95	-7.48	-4.70	6.68	9.58	12.2	15.8	23.3
sulfurdioxide slant column density window2 precision [DU]	4.41	5.23	5.72	6.12	6.60	9.19	10.1	11.0	12.2	14.8
sulfurdioxide slant column density corrected win2 [DU]	-21.1	-14.1	-10.8	-8.30	-5.53	5.57	8.34	10.8	14.2	21.3
background so2 slant column offset window2 [DU]	-6.43	-5.03	-4.19	-3.51	-2.63	0.741	1.06	1.30	1.62	3.05
sulfurdioxide slant column density window3 [DU]	-64.0	-42.6	-32.9	-26.0	-18.5	11.6	19.5	26.6	36.2	55.3
sulfurdioxide slant column density window3 precision [DU]	14.6	16.8	18.3	19.5	20.9	30.8	35.4	40.7	51.9	82.9
sulfurdioxide slant column density corrected win3 [DU]	-58.1	-37.0	-27.4	-20.6	-13.2	15.7	23.1	29.8	39.0	57.9
background so2 slant column offset window3 [DU]	-6.69	-4.41	-3.22	-2.17	-0.733	9.44	11.7	13.5	15.4	18.5
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]	2.570×10^{-3}	3.892×10^{-3}	4.960×10^{-3}	6.091×10^{-3}	7.990×10^{-3}	2.727×10^{-2}	4.145×10^{-2}	6.486×10^{-2}	0.128	0.409
fitted radiance shift [nm]	-8.096×10^{-3}	-4.197×10^{-3}	-2.870×10^{-3}	-2.145×10^{-3}	-1.518×10^{-3}	2.981×10^{-4}	9.755×10^{-4}	1.853×10^{-3}	3.374×10^{-3}	7.544×10^{-3}
fitted radiance squeeze [1]	-5.018×10^{-4}	-3.072×10^{-4}	-2.236×10^{-4}	-1.671×10^{-4}	-1.085×10^{-4}	1.018×10^{-4}	1.538×10^{-4}	2.017×10^{-4}	2.696×10^{-4}	4.280×10^{-4}
fitted root mean square [1]	6.121×10^{-4}	7.469×10^{-4}	8.210×10^{-4}	8.788×10^{-4}	9.498×10^{-4}	1.441×10^{-3}	1.653×10^{-3}	1.863×10^{-3}	2.173×10^{-3}	2.970×10^{-3}
sulfurdioxide total air mass factor polluted [1]	6.166×10^{-2}	0.212	0.309	0.404	0.519	1.18	1.43	1.68	2.04	2.66
sulfurdioxide total air mass factor polluted precision [1]	9.422×10^{-3}	1.649×10^{-2}	2.260×10^{-2}	2.811×10^{-2}	3.692×10^{-2}	0.173	0.227	0.279	0.352	0.525
sulfurdioxide clear air mass factor polluted [1]	0.184	0.282	0.359	0.424	0.500	0.930	1.06	1.18	1.54	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]	0.710 ± 0.394	6832917	0.680	1.000	0.0	1.000	0.320	1.000
sulfurdioxide total vertical column [DU]	$(5.022 \pm 163.452) \times 10^{-2}$	6832917	0.563	1.337×10^{-2}	-84.3	105	-0.262	0.301
sulfurdioxide total vertical column precision [DU]	0.771 ± 1.175	6832917	0.577	0.406	4.682×10^{-2}	32.7	0.248	0.824
sulfurdioxide slant column density corrected [DU]	$(1.922 \pm 36.506) \times 10^{-2}$	6832917	0.381	1.029×10^{-2}	-7.14	43.5	-0.178	0.202
sulfurdioxide slant column density cobra [DU]	$(1.919 \pm 36.344) \times 10^{-2}$	6832917	0.381	1.029×10^{-2}	-7.14	8.08	-0.178	0.202
sulfurdioxide slant column density cobra precision [DU]	0.304 ± 0.127	6832917	0.142	0.268	8.867×10^{-2}	22.1	0.218	0.360
sulfurdioxide slant column density window1 [DU]	0.174 ± 0.681	6832917	0.761	0.171	-9.08	12.8	-0.209	0.552
sulfurdioxide slant column density window1 precision [DU]	0.304 ± 0.127	6832917	0.142	0.268	8.867×10^{-2}	22.1	0.218	0.360
sulfurdioxide slant column density corrected win1 [DU]	$(2.719 \pm 67.964) \times 10^{-2}$	6832917	0.756	7.334×10^{-3}	-8.40	12.7	-0.364	0.392
background so2 slant column offset window1 [DU]	-0.147 ± 0.113	6832917	0.115	-0.149	-1.31	2.09	-0.213	-9.864×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.803 ± 9.604	6832917	12.2	0.541	-269	134	-5.42	6.74
sulfurdioxide slant column density window2 precision [DU]	8.76 ± 2.36	6832917	2.95	8.45	2.24	493	7.13	10.1
sulfurdioxide slant column density corrected win2 [DU]	0.149 ± 9.388	6832917	11.9	0.121	-271	135	-5.84	6.11
background so2 slant column offset window2 [DU]	-0.654 ± 2.077	6832917	2.51	-2.539×10^{-2}	-11.2	5.19	-1.72	0.788
sulfurdioxide slant column density window3 [DU]	-4.46 ± 26.27	6832917	32.9	-3.76	-495	183	-20.5	12.4
sulfurdioxide slant column density window3 precision [DU]	30.5 ± 13.2	6832917	10.6	27.4	10.7	242	23.1	33.7
sulfurdioxide slant column density corrected win3 [DU]	0.436 ± 25.686	6832917	32.2	0.736	-479	195	-15.4	16.8
background so2 slant column offset window3 [DU]	4.89 ± 5.66	6832917	8.98	3.64	-9.84	26.5	0.349	9.33
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	6832917	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.624 \pm 14.492) \times 10^{-2}$	6832917	4.511×10^{-2}	2.461×10^{-2}	9.184×10^{-4}	3.08	1.369×10^{-2}	5.879×10^{-2}
fitted radiance shift [nm]	$(-1.972 \pm 26.485) \times 10^{-4}$	6832917	1.709×10^{-3}	-2.421×10^{-4}	-4.383×10^{-2}	4.312×10^{-2}	-1.079×10^{-3}	6.306×10^{-4}
fitted radiance squeeze [1]	$(3.006 \pm 17.815) \times 10^{-5}$	6832917	2.101×10^{-4}	2.728×10^{-5}	-1.855×10^{-3}	1.111×10^{-2}	-7.621×10^{-5}	1.339×10^{-4}
fitted root mean square [1]	$(1.339 \pm 0.523) \times 10^{-3}$	6832917	5.942×10^{-4}	1.204×10^{-3}	3.390×10^{-4}	2.176×10^{-2}	9.837×10^{-4}	1.578×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.724 ± 0.401	6832917	0.563	0.690	5.000×10^{-2}	2.97	0.410	0.972
sulfurdioxide total air mass factor polluted precision [1]	$(8.606 \pm 9.852) \times 10^{-2}$	6832917	7.929×10^{-2}	5.095×10^{-2}	2.849×10^{-3}	1.57	2.934×10^{-2}	0.109
sulfurdioxide clear air mass factor polluted [1]	0.671 ± 0.281	6832917	0.450	0.673	5.698×10^{-2}	2.02	0.441	0.891
number of spectral points in retrieval [1]	73.4 ± 0.5	6832917	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]	0.580 ± 0.420	10073735	0.850	0.490	0.0	1.000	0.150	1.000
sulfurdioxide total vertical column [DU]	$(1.538 \pm 80.232) \times 10^{-2}$	10073735	0.371	5.779×10^{-3}	-60.9	98.7	-0.178	0.193
sulfurdioxide total vertical column precision [DU]	0.432 ± 0.616	10073735	0.293	0.273	2.558×10^{-2}	64.1	0.179	0.473
sulfurdioxide slant column density corrected [DU]	$(9.515 \pm 316.955) \times 10^{-3}$	10073735	0.352	6.082×10^{-3}	-21.4	35.2	-0.169	0.183
sulfurdioxide slant column density cobra [DU]	$(9.513 \pm 316.803) \times 10^{-3}$	10073735	0.352	6.082×10^{-3}	-21.4	35.2	-0.169	0.183
sulfurdioxide slant column density cobra precision [DU]	0.276 ± 0.106	10073735	0.104	0.246	7.785×10^{-2}	19.7	0.209	0.313
sulfurdioxide slant column density window1 [DU]	$(7.293 \pm 62.181) \times 10^{-2}$	10073735	0.719	8.308×10^{-2}	-30.9	75.7	-0.282	0.437
sulfurdioxide slant column density window1 precision [DU]	0.276 ± 0.106	10073735	0.104	0.246	7.785×10^{-2}	19.7	0.209	0.313
sulfurdioxide slant column density corrected win1 [DU]	$(-9.103 \pm 612.344) \times 10^{-3}$	10073735	0.704	-1.652×10^{-2}	-30.9	75.7	-0.367	0.337
background so2 slant column offset window1 [DU]	$(-8.203 \pm 13.025) \times 10^{-2}$	10073735	0.167	-9.060×10^{-2}	-1.25	3.10	-0.174	-7.418×10^{-3}
sulfurdioxide slant column density window2 [DU]	1.23 ± 8.47	10073735	10.9	1.18	-1.068×10^3	625	-4.24	6.65
sulfurdioxide slant column density window2 precision [DU]	7.64 ± 2.02	10073735	2.18	7.35	2.36	494	6.37	8.55
sulfurdioxide slant column density corrected win2 [DU]	$(-5.183 \pm 826.682) \times 10^{-2}$	10073735	10.6	-4.787×10^{-2}	-1.070×10^3	626	-5.34	5.24
background so2 slant column offset window2 [DU]	-1.28 ± 2.24	10073735	3.71	-1.09	-10.8	4.92	-3.02	0.685
sulfurdioxide slant column density window3 [DU]	-2.79 ± 22.49	10073735	28.5	-3.50	-296	406	-17.3	11.1
sulfurdioxide slant column density window3 precision [DU]	26.6 ± 12.3	10073735	7.92	23.2	10.3	374	20.1	28.0
sulfurdioxide slant column density corrected win3 [DU]	1.57 ± 21.50	10073735	27.0	1.41	-301	409	-11.9	15.0
background so2 slant column offset window3 [DU]	4.36 ± 6.77	10073735	11.3	4.42	-12.0	25.4	-1.76	9.51
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	10073735	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.536 \pm 2.523) \times 10^{-2}$	10073735	1.190×10^{-2}	1.037×10^{-2}	7.912×10^{-4}	2.15	6.185×10^{-3}	1.808×10^{-2}
fitted radiance shift [nm]	$(-7.931 \pm 24.430) \times 10^{-4}$	10073735	1.744×10^{-3}	-8.296×10^{-4}	-4.140×10^{-2}	4.123×10^{-2}	-1.728×10^{-3}	1.610×10^{-5}
fitted radiance squeeze [1]	$(-3.242 \pm 17.816) \times 10^{-5}$	10073735	2.098×10^{-4}	-1.970×10^{-5}	-1.349×10^{-2}	1.478×10^{-2}	-1.298×10^{-4}	8.004×10^{-5}
fitted root mean square [1]	$(1.205 \pm 0.433) \times 10^{-3}$	10073735	4.242×10^{-4}	1.096×10^{-3}	3.271×10^{-4}	4.507×10^{-2}	9.330×10^{-4}	1.357×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.04 ± 0.61	10073735	0.774	0.907	5.000×10^{-2}	3.46	0.595	1.37
sulfurdioxide total air mass factor polluted precision [1]	0.145 ± 0.122	10073735	0.166	0.114	3.906×10^{-3}	1.36	4.476×10^{-2}	0.211
sulfurdioxide clear air mass factor polluted [1]	0.841 ± 0.510	10073735	0.452	0.700	8.238×10^{-2}	3.47	0.525	0.978
number of spectral points in retrieval [1]	73.4 ± 0.5	10073735	1.000	73.0	70.0	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]	0.649 ± 0.410	12273693	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(2.162 \pm 88.227) \times 10^{-2}$	12273693	0.413	7.988×10^{-3}	-60.9	98.7	-0.197	0.217
sulfurdioxide total vertical column precision [DU]	0.476 ± 0.649	12273693	0.312	0.296	3.655×10^{-2}	64.1	0.203	0.515
sulfurdioxide slant column density corrected [DU]	$(1.252 \pm 31.698) \times 10^{-2}$	12273693	0.352	7.433×10^{-3}	-7.63	43.5	-0.168	0.185
sulfurdioxide slant column density cobra [DU]	$(1.250 \pm 31.603) \times 10^{-2}$	12273693	0.352	7.433×10^{-3}	-7.63	26.7	-0.168	0.185
sulfurdioxide slant column density cobra precision [DU]	0.277 ± 0.108	12273693	0.104	0.247	8.646×10^{-2}	22.1	0.209	0.313
sulfurdioxide slant column density window1 [DU]	0.118 ± 0.615	12273693	0.710	0.121	-30.7	75.7	-0.236	0.474
sulfurdioxide slant column density window1 precision [DU]	0.277 ± 0.108	12273693	0.104	0.247	8.646×10^{-2}	22.1	0.209	0.313
sulfurdioxide slant column density corrected win1 [DU]	$(9.444 \pm 609.198) \times 10^{-3}$	12273693	0.698	-2.449×10^{-3}	-30.7	75.7	-0.348	0.350
background so2 slant column offset window1 [DU]	-0.109 ± 0.123	12273693	0.156	-0.122	-1.31	2.09	-0.190	-3.466×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.971 ± 8.638	12273693	11.1	0.887	-1.068×10^3	625	-4.62	6.46
sulfurdioxide slant column density window2 precision [DU]	7.85 ± 2.04	12273693	2.36	7.54	2.26	493	6.49	8.85
sulfurdioxide slant column density corrected win2 [DU]	$(-2.328 \pm 845.190) \times 10^{-2}$	12273693	10.8	-2.504×10^{-2}	-1.070×10^3	626	-5.44	5.38
background so2 slant column offset window2 [DU]	-0.994 ± 2.154	12273693	3.38	-0.520	-11.2	5.19	-2.62	0.763
sulfurdioxide slant column density window3 [DU]	-0.801 ± 23.185	12273693	29.4	-1.33	-296	406	-15.7	13.7
sulfurdioxide slant column density window3 precision [DU]	27.3 ± 12.0	12273693	8.69	24.1	10.4	233	20.7	29.4
sulfurdioxide slant column density corrected win3 [DU]	3.22 ± 22.27	12273693	28.1	2.89	-301	409	-10.9	17.2
background so2 slant column offset window3 [DU]	4.02 ± 5.92	12273693	9.31	3.62	-12.0	26.5	-0.878	8.44
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.14	12273693	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.115 \pm 3.853) \times 10^{-2}$	12273693	1.419×10^{-2}	1.355×10^{-2}	1.016×10^{-3}	2.15	8.040×10^{-3}	2.223×10^{-2}
fitted radiance shift [nm]	$(-5.498 \pm 24.399) \times 10^{-4}$	12273693	1.843×10^{-3}	-5.684×10^{-4}	-4.383×10^{-2}	4.312×10^{-2}	-1.521×10^{-3}	3.212×10^{-4}
fitted radiance squeeze [1]	$(-5.906 \pm 171.525) \times 10^{-6}$	12273693	2.016×10^{-4}	7.631×10^{-7}	-1.310×10^{-2}	1.478×10^{-2}	-1.025×10^{-4}	9.907×10^{-5}
fitted root mean square [1]	$(1.210 \pm 0.444) \times 10^{-3}$	12273693	4.214×10^{-4}	1.097×10^{-3}	3.390×10^{-4}	4.507×10^{-2}	9.336×10^{-4}	1.355×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.908 ± 0.470	12273693	0.590	0.839	5.000×10^{-2}	3.07	0.567	1.16
sulfurdioxide total air mass factor polluted precision [1]	0.119 ± 0.106	12273693	0.128	8.029×10^{-2}	3.792×10^{-3}	1.40	4.087×10^{-2}	0.169
sulfurdioxide clear air mass factor polluted [1]	0.739 ± 0.292	12273693	0.382	0.703	7.905×10^{-2}	3.11	0.528	0.910
number of spectral points in retrieval [1]	73.4 ± 0.5	12273693	1.000	73.0	70.0	74.0	73.0	74.0

Table 6: Parameterlist and basic statistics for the analysis for observations over land

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.590 ± 0.424	3891463	0.870	0.490	0.0	1.000	0.130	1.000
sulfurdioxide total vertical column [DU]	$(4.071 \pm 160.361) \times 10^{-2}$	3891463	0.482	7.572×10^{-3}	-84.3	105	-0.228	0.255
sulfurdioxide total vertical column precision [DU]	0.738 ± 1.201	3891463	0.599	0.376	2.558×10^{-2}	32.7	0.190	0.789
sulfurdioxide slant column density corrected [DU]	$(1.381 \pm 37.971) \times 10^{-2}$	3891463	0.391	7.810×10^{-3}	-21.4	35.2	-0.187	0.205
sulfurdioxide slant column density cobra [DU]	$(1.380 \pm 37.939) \times 10^{-2}$	3891463	0.391	7.810×10^{-3}	-21.4	35.2	-0.187	0.205
sulfurdioxide slant column density cobra precision [DU]	0.311 ± 0.127	3891463	0.150	0.277	7.785×10^{-2}	16.0	0.221	0.371
sulfurdioxide slant column density window1 [DU]	$(9.182 \pm 71.972) \times 10^{-2}$	3891463	0.819	9.650×10^{-2}	-23.5	44.1	-0.319	0.500
sulfurdioxide slant column density window1 precision [DU]	0.311 ± 0.127	3891463	0.150	0.277	7.785×10^{-2}	16.0	0.221	0.371
sulfurdioxide slant column density corrected win1 [DU]	$(-1.457 \pm 70.638) \times 10^{-2}$	3891463	0.796	-2.968×10^{-2}	-23.5	44.3	-0.424	0.372
background so2 slant column offset window1 [DU]	-0.106 ± 0.141	3891463	0.149	-0.127	-1.25	3.10	-0.194	-4.482×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.21 ± 9.64	3891463	12.2	1.04	-610	520	-4.99	7.24
sulfurdioxide slant column density window2 precision [DU]	8.69 ± 2.52	3891463	3.02	8.31	2.36	494	7.00	10.0
sulfurdioxide slant column density corrected win2 [DU]	0.177 ± 9.387	3891463	11.8	0.144	-608	519	-5.75	6.08
background so2 slant column offset window2 [DU]	-1.03 ± 2.24	3891463	3.20	-0.428	-11.1	5.19	-2.51	0.697
sulfurdioxide slant column density window3 [DU]	-10.6 ± 24.8	3891463	30.5	-10.1	-495	183	-25.6	4.93
sulfurdioxide slant column density window3 precision [DU]	30.2 ± 14.5	3891463	11.6	26.7	10.3	242	21.7	33.3
sulfurdioxide slant column density corrected win3 [DU]	-4.64 ± 24.71	3891463	30.3	-3.95	-479	195	-19.4	10.9
background so2 slant column offset window3 [DU]	5.99 ± 7.21	3891463	12.9	5.42	-12.0	26.5	-0.371	12.5
sulfurdioxide slant column cobra flag [1]	1.95 ± 0.32	3891463	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.959 \pm 16.120) \times 10^{-2}$	3891463	5.566×10^{-2}	1.983×10^{-2}	7.924×10^{-4}	3.08	7.134×10^{-3}	6.279×10^{-2}
fitted radiance shift [nm]	$(-5.972 \pm 27.861) \times 10^{-4}$	3891463	1.693×10^{-3}	-6.748×10^{-4}	-3.846×10^{-2}	3.973×10^{-2}	-1.527×10^{-3}	1.661×10^{-4}
fitted radiance squeeze [1]	$(-1.780 \pm 20.284) \times 10^{-5}$	3891463	2.375×10^{-4}	-1.139×10^{-5}	-1.349×10^{-2}	1.237×10^{-2}	-1.333×10^{-4}	1.043×10^{-4}
fitted root mean square [1]	$(1.374 \pm 0.512) \times 10^{-3}$	3891463	6.146×10^{-4}	1.263×10^{-3}	3.271×10^{-4}	3.963×10^{-2}	1.018×10^{-3}	1.633×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.992 ± 0.761	3891463	1.00	0.726	5.000×10^{-2}	3.46	0.411	1.41
sulfurdioxide total air mass factor polluted precision [1]	0.134 ± 0.144	3891463	0.167	7.822×10^{-2}	2.850×10^{-3}	1.57	2.834×10^{-2}	0.195
sulfurdioxide clear air mass factor polluted [1]	0.913 ± 0.721	3891463	0.708	0.664	5.699×10^{-2}	3.47	0.420	1.13
number of spectral points in retrieval [1]	73.4 ± 0.5	3891463	1.000	73.0	71.0	74.0	73.0	74.0

3 Granule outlines

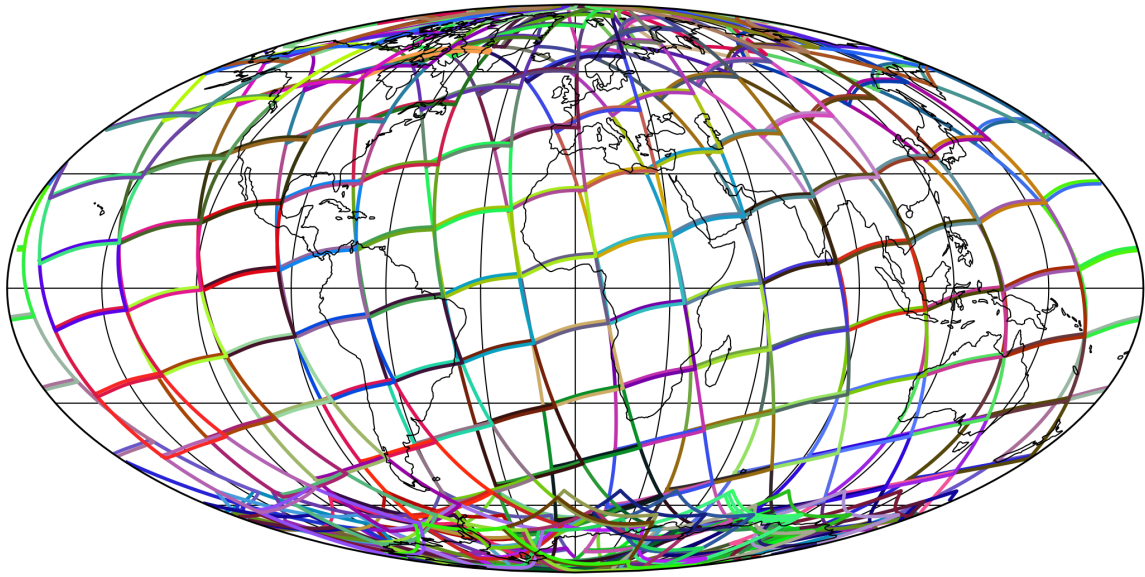


Figure 1: Outline of the granules.

4 Input data monitoring

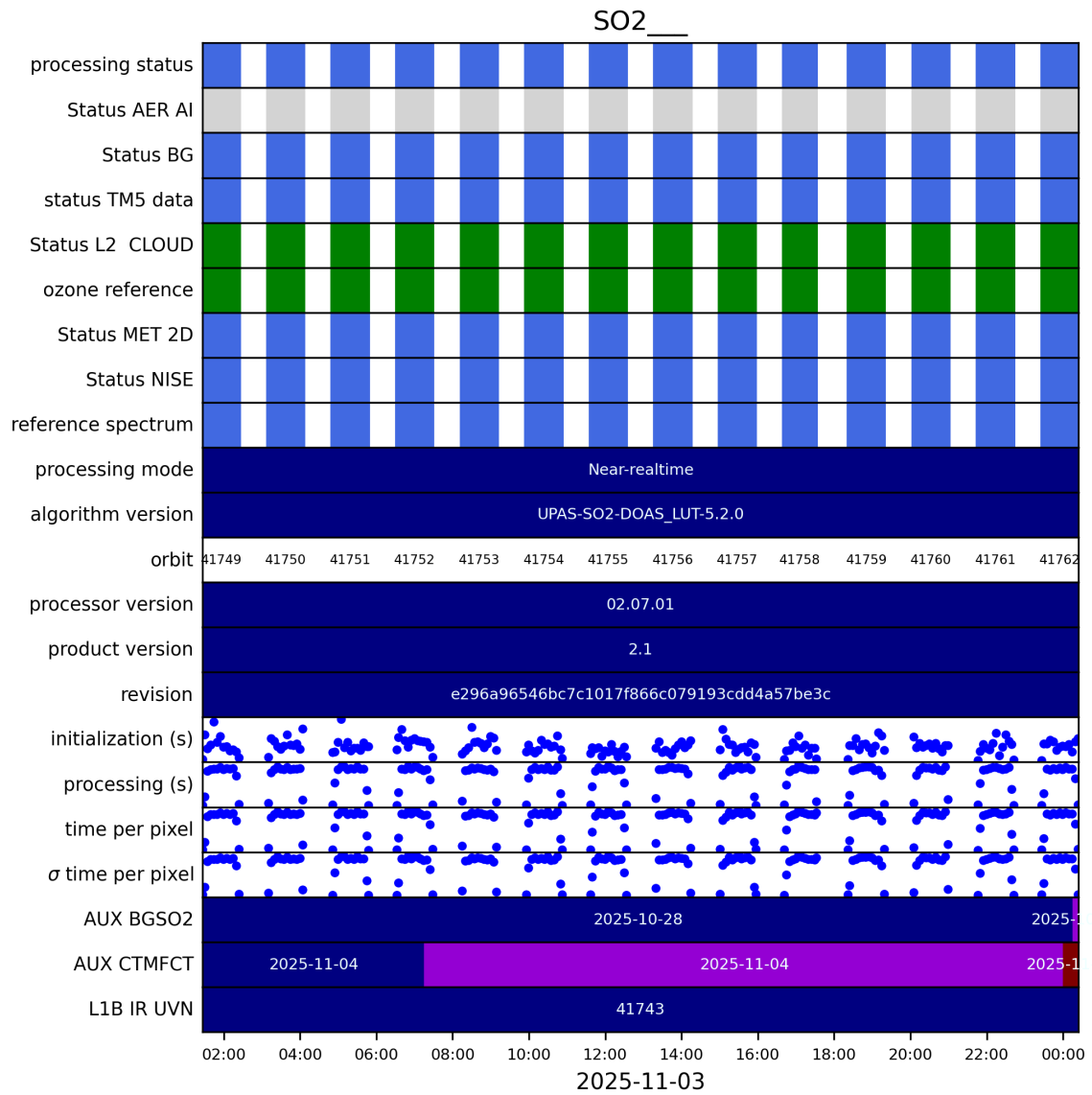


Figure 2: Input data per granule

5 Warnings and errors

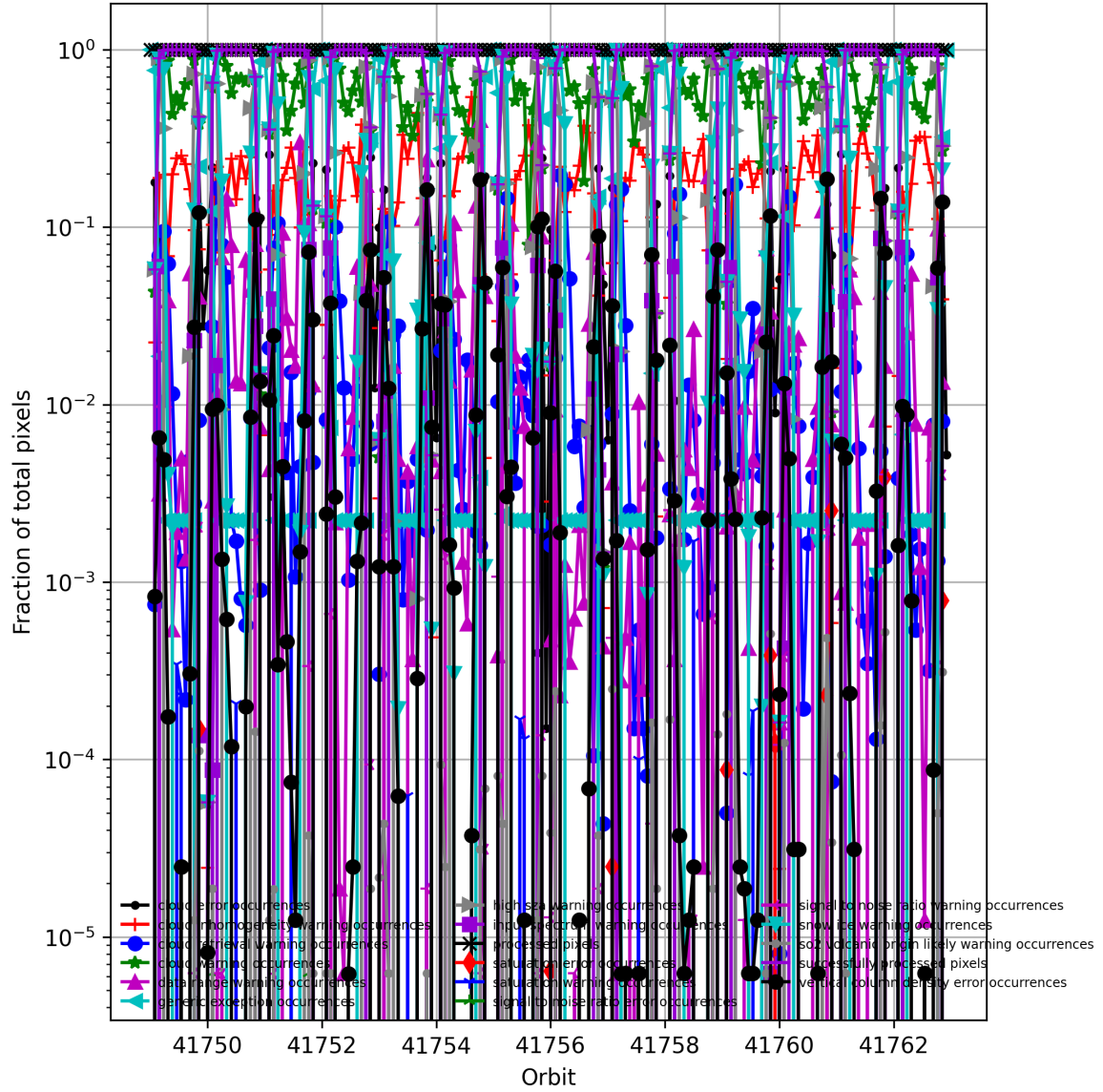


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

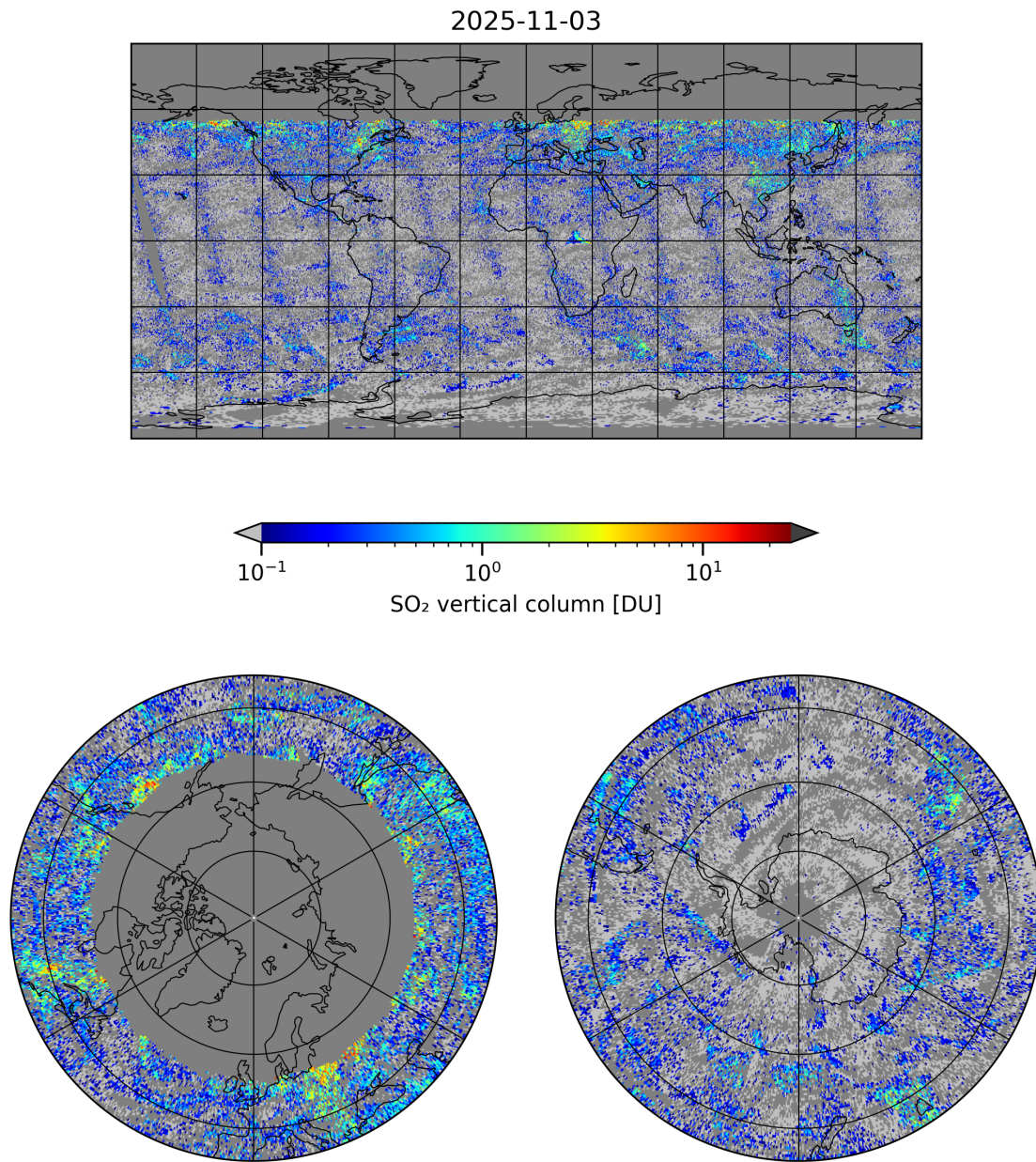


Figure 4: Map of “SO₂ vertical column” for 2025-11-03 to 2025-11-04

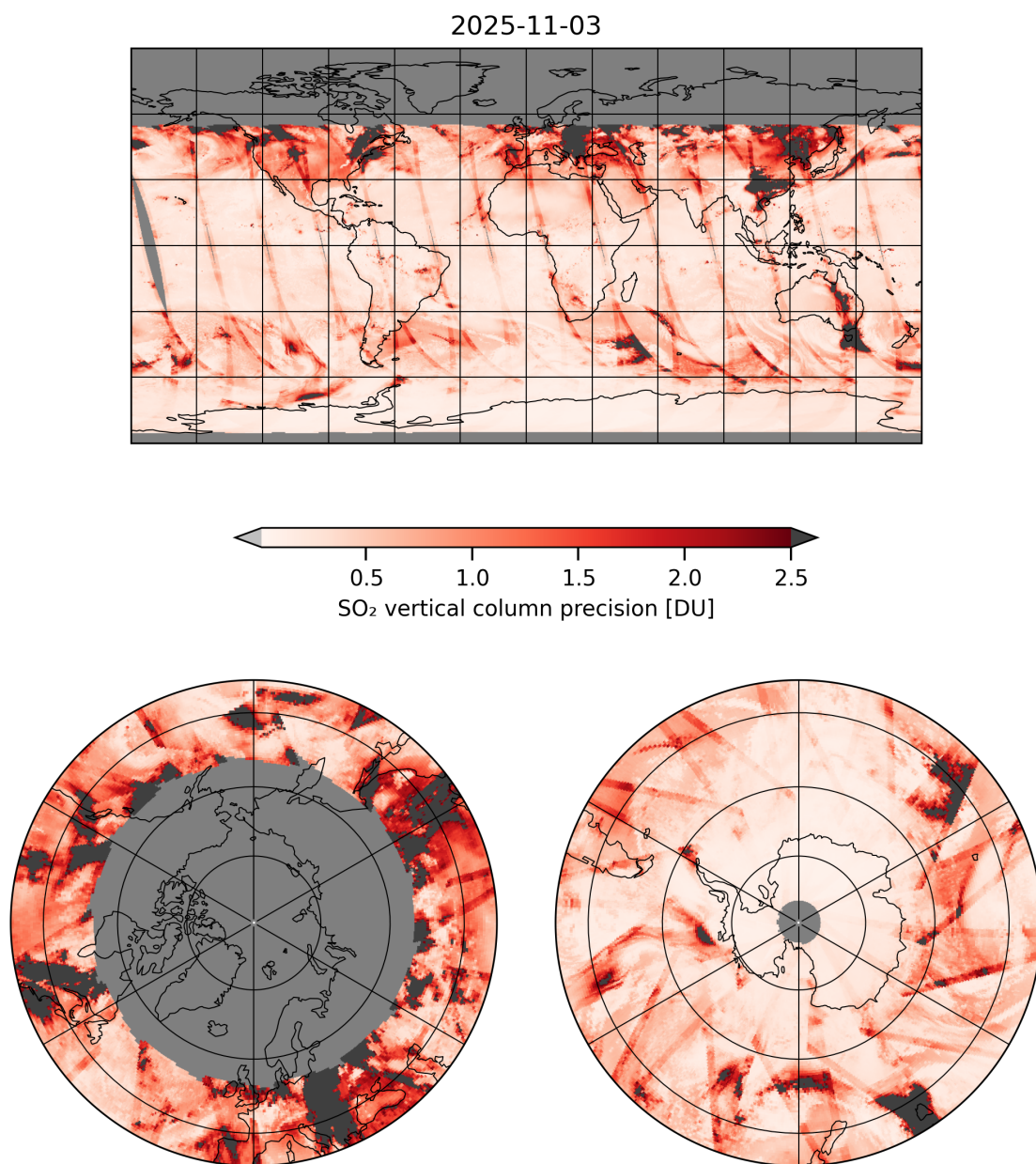


Figure 5: Map of “SO₂ vertical column precision” for 2025-11-03 to 2025-11-04

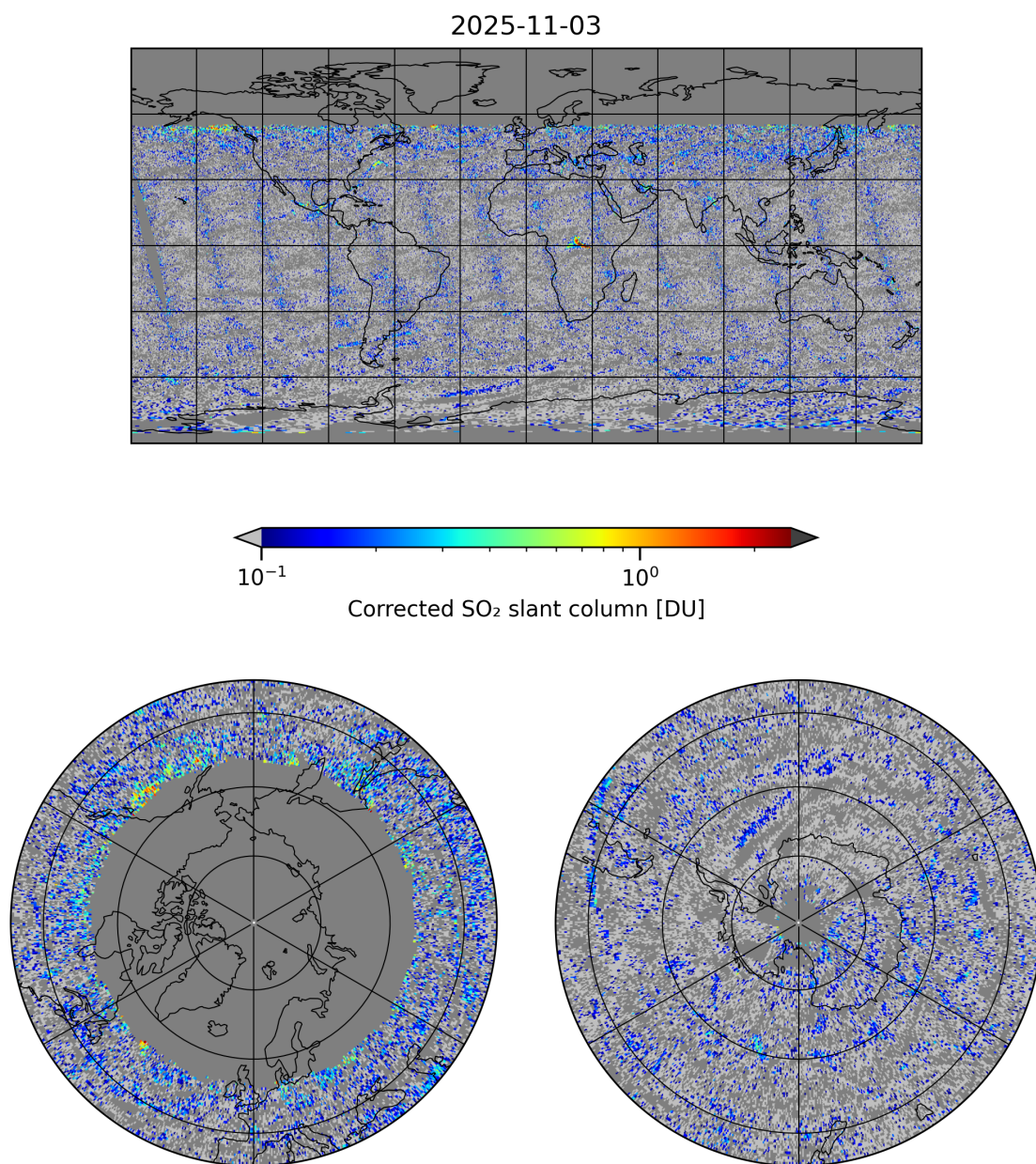


Figure 6: Map of "Corrected SO₂ slant column" for 2025-11-03 to 2025-11-04

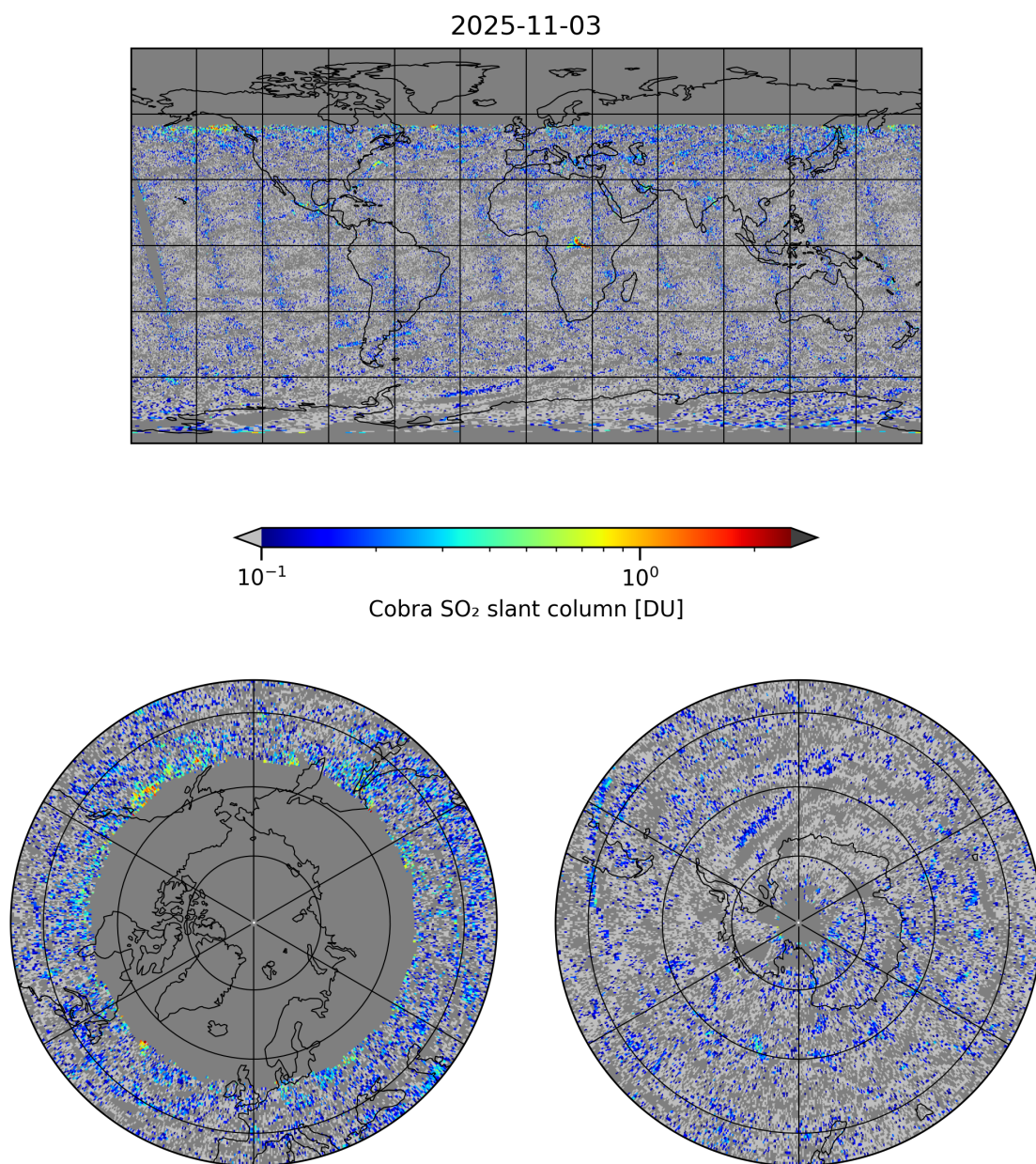


Figure 7: Map of “Cobra SO₂ slant column” for 2025-11-03 to 2025-11-04

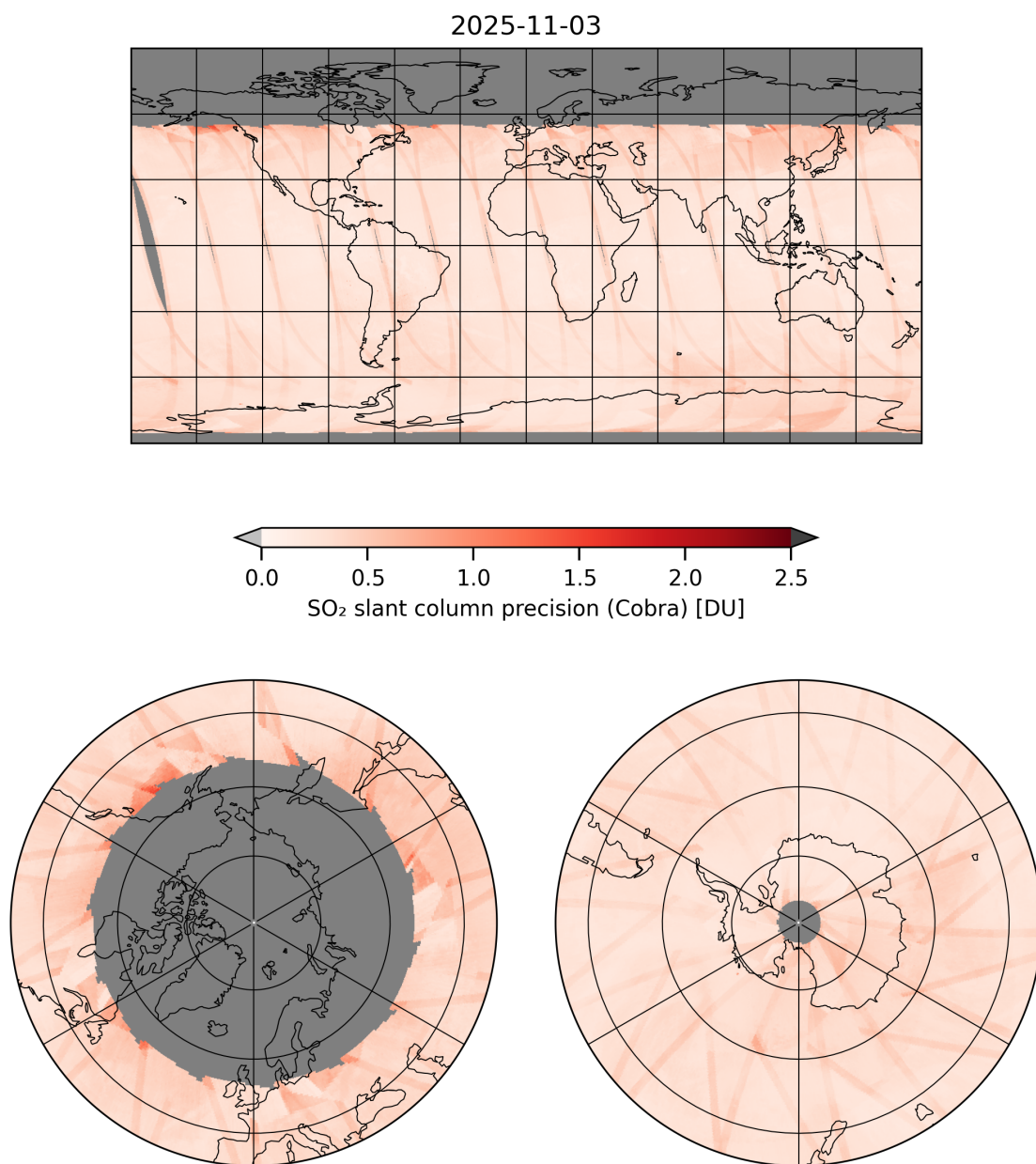


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-11-03 to 2025-11-04

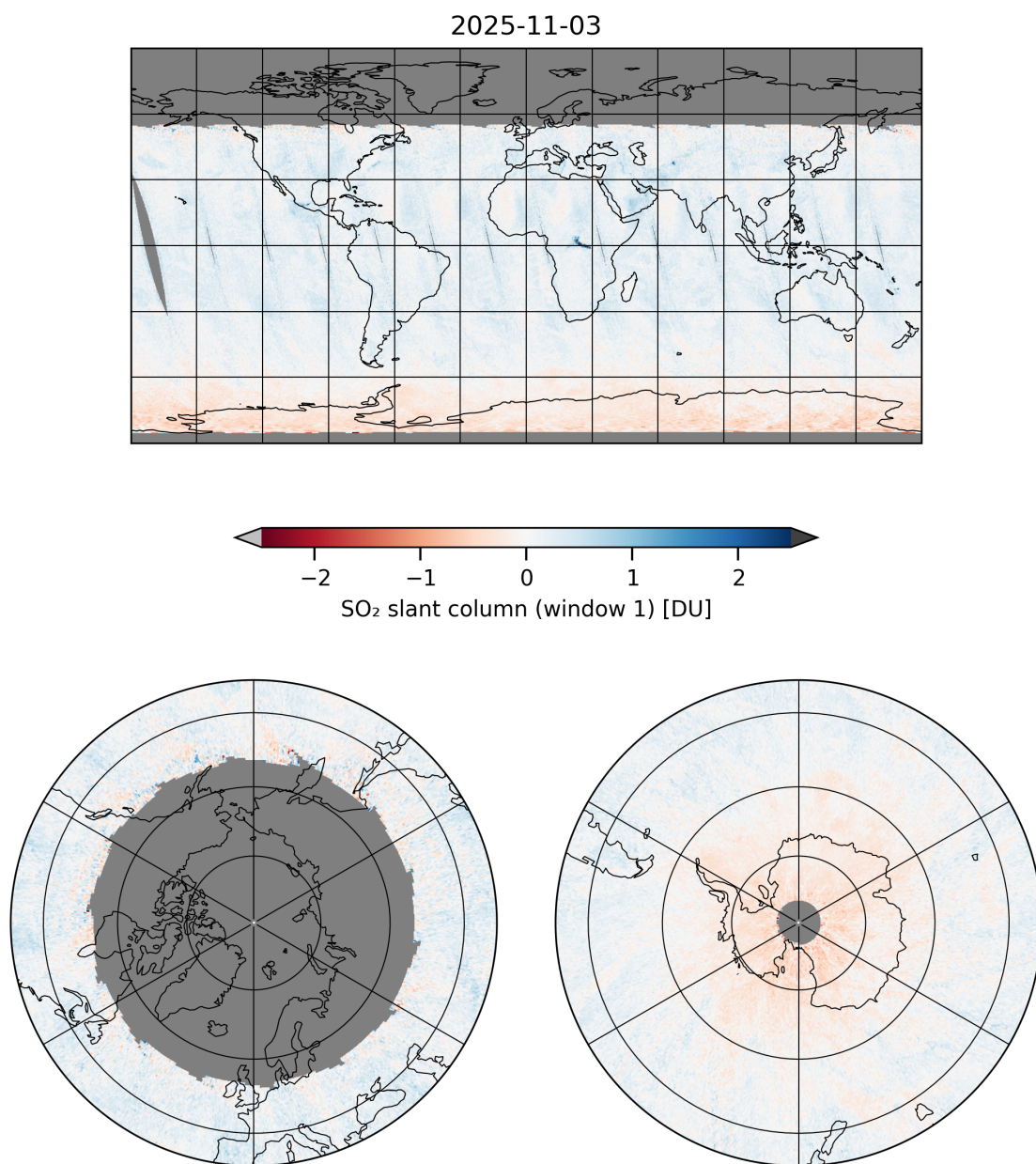


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-11-03 to 2025-11-04

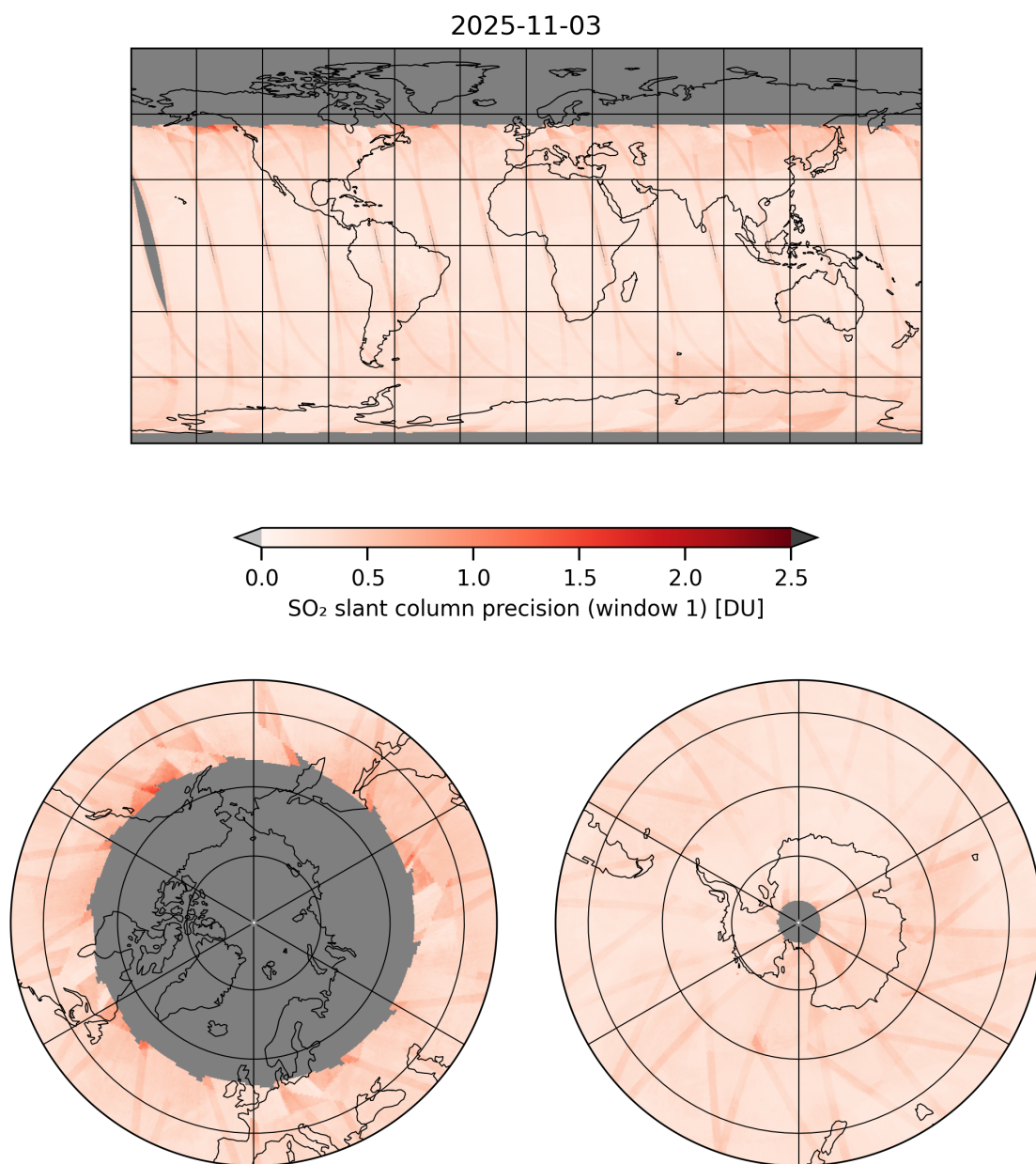


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-11-03 to 2025-11-04

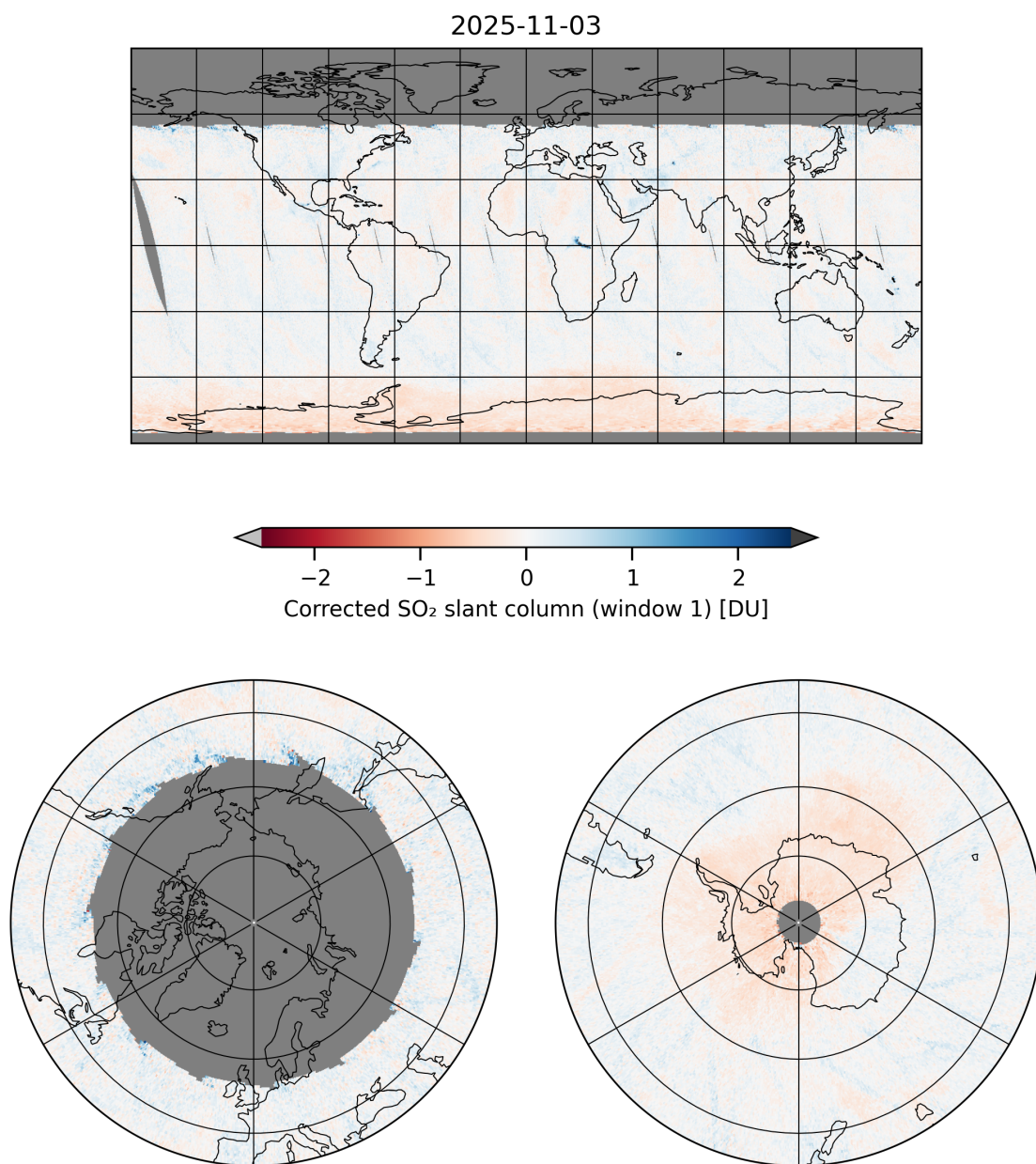


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-11-03 to 2025-11-04

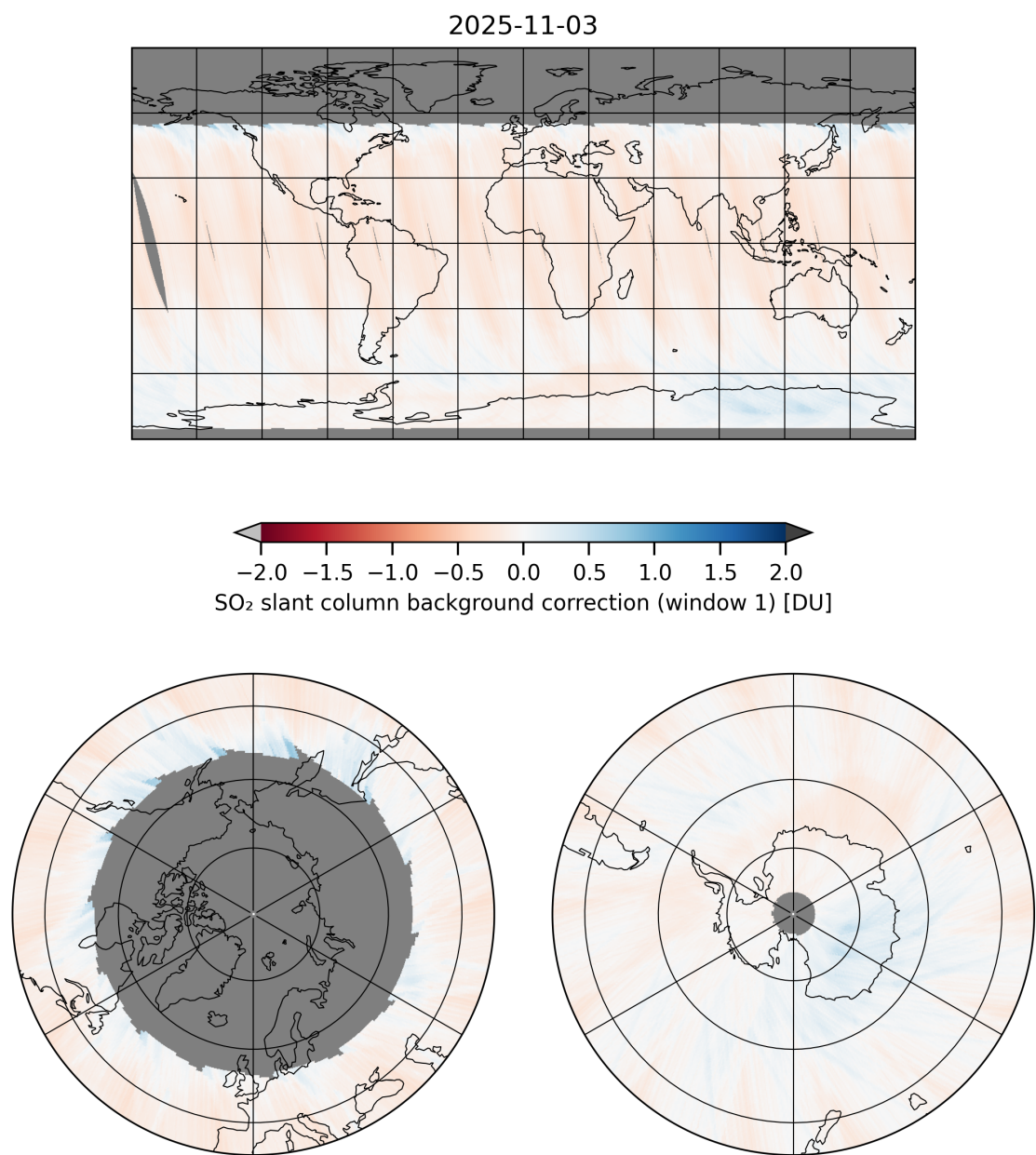


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-11-03 to 2025-11-04

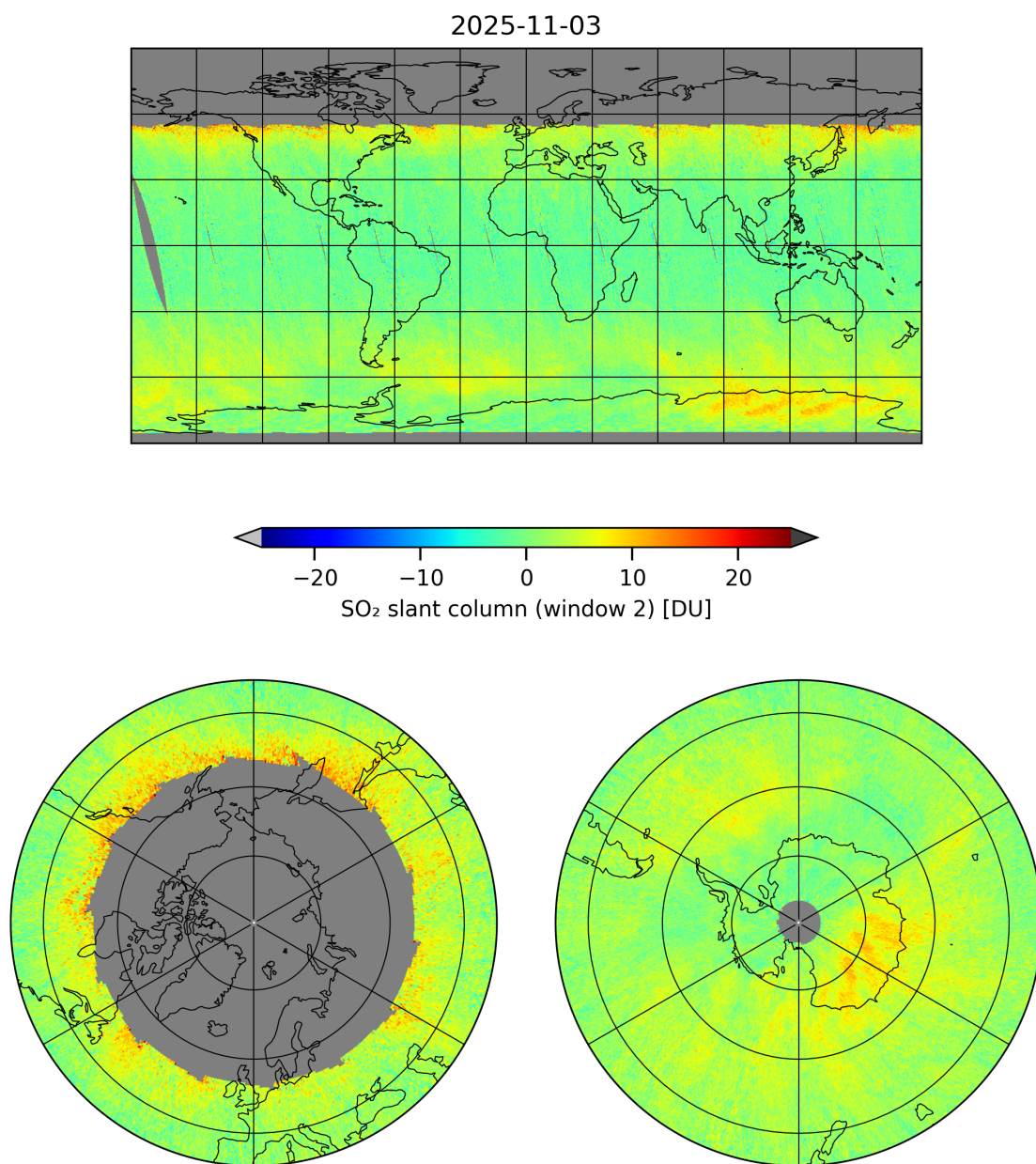


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-11-03 to 2025-11-04

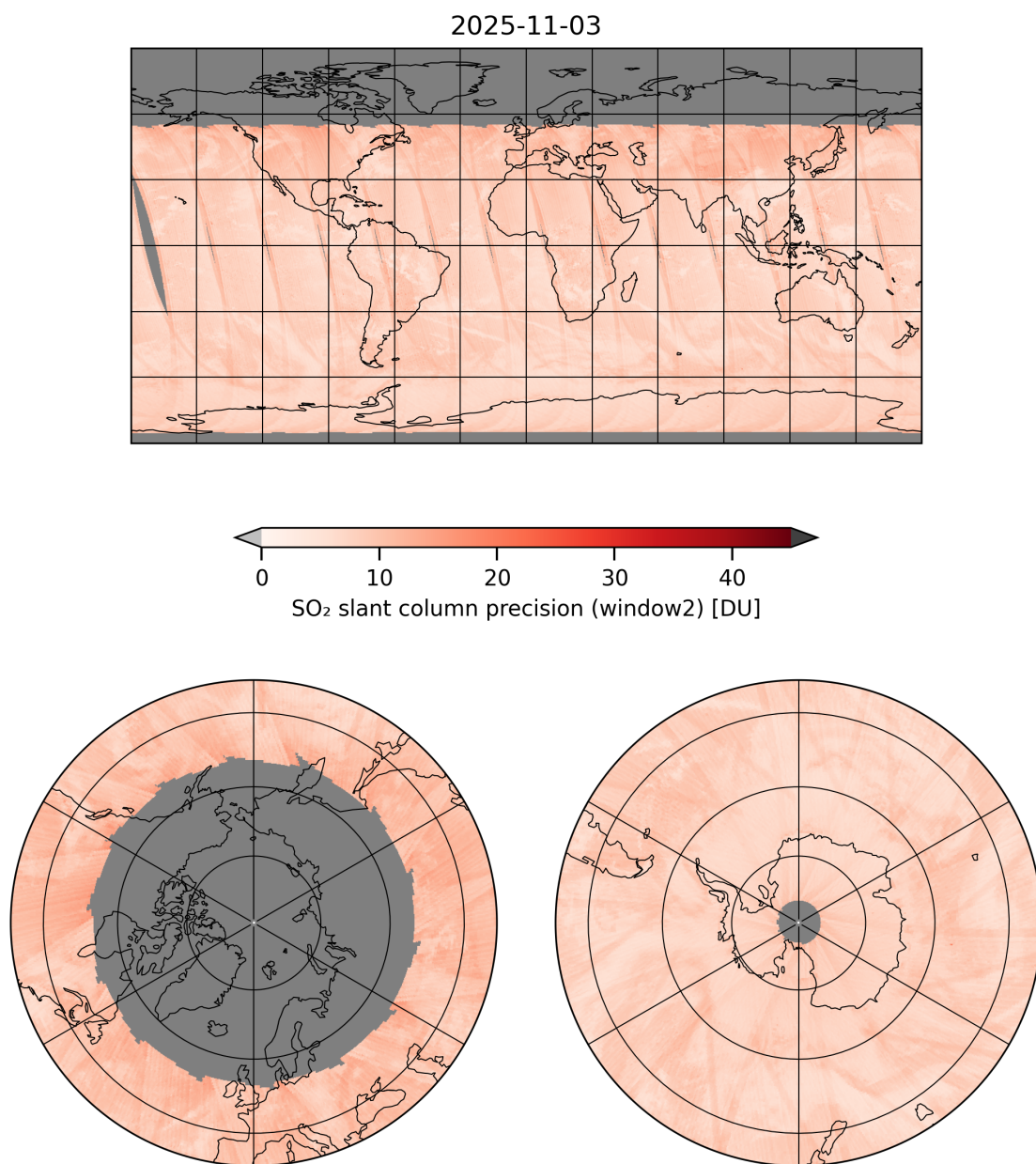


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-11-03 to 2025-11-04

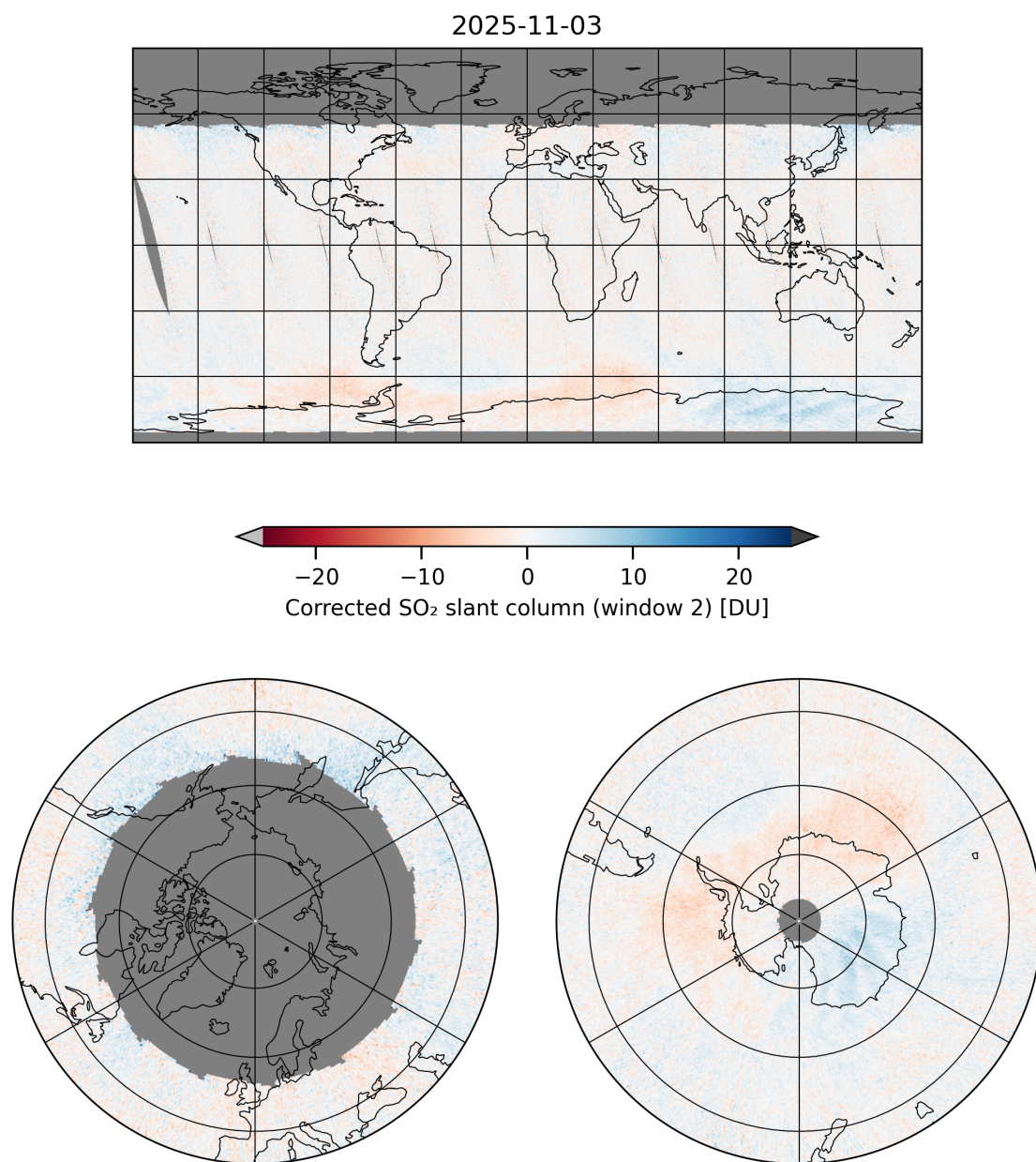


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-11-03 to 2025-11-04

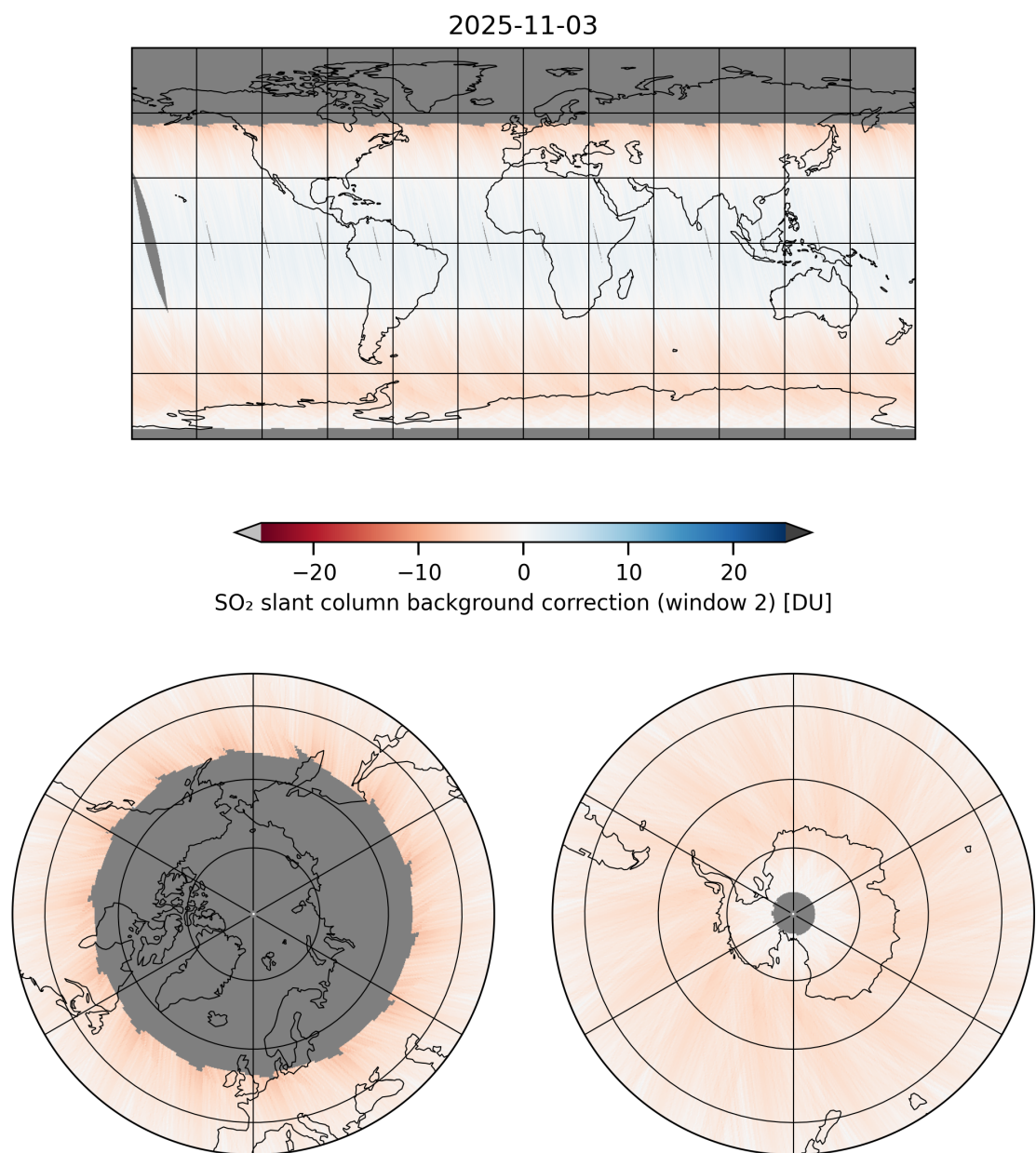


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-11-03 to 2025-11-04

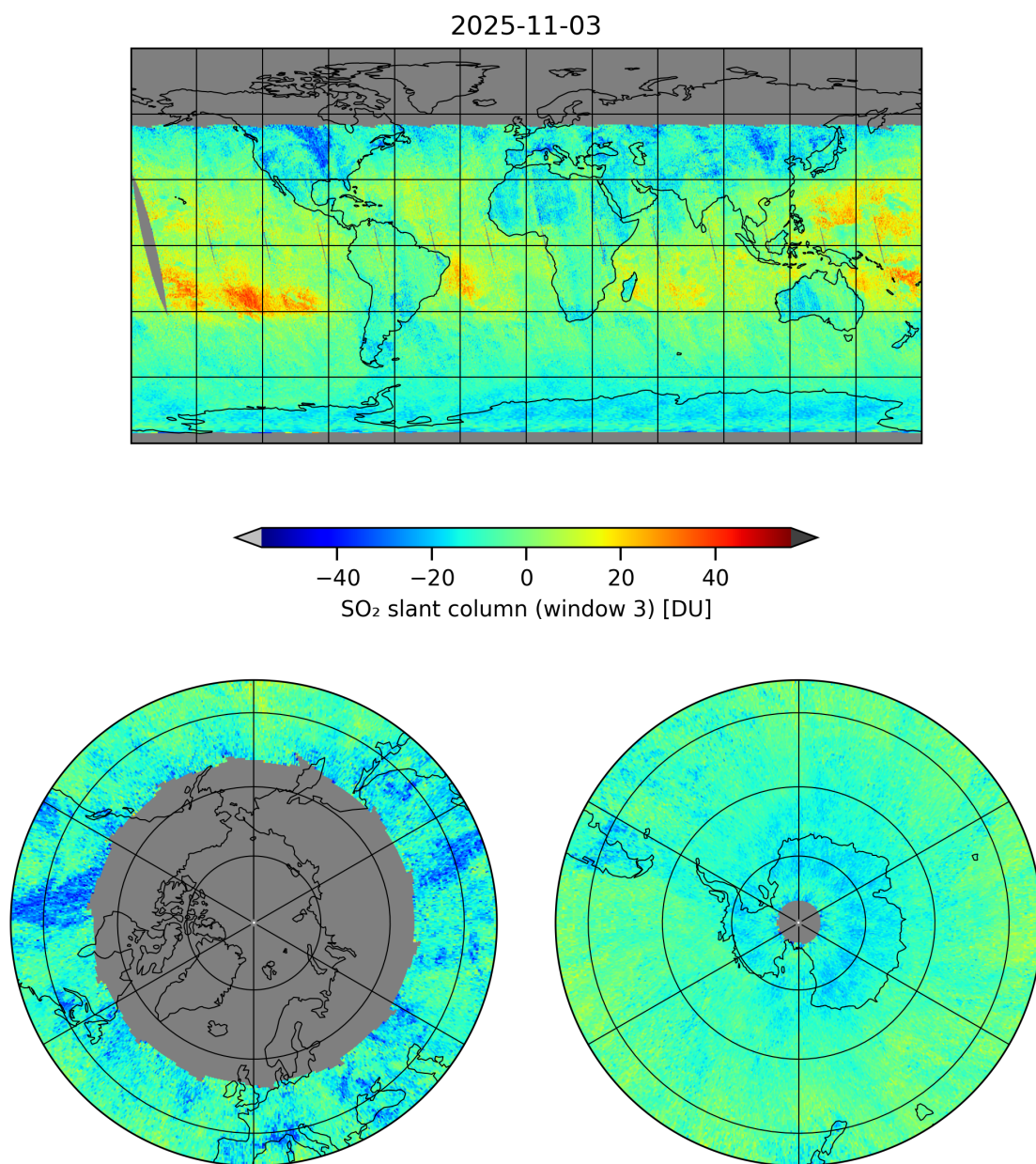


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-11-03 to 2025-11-04

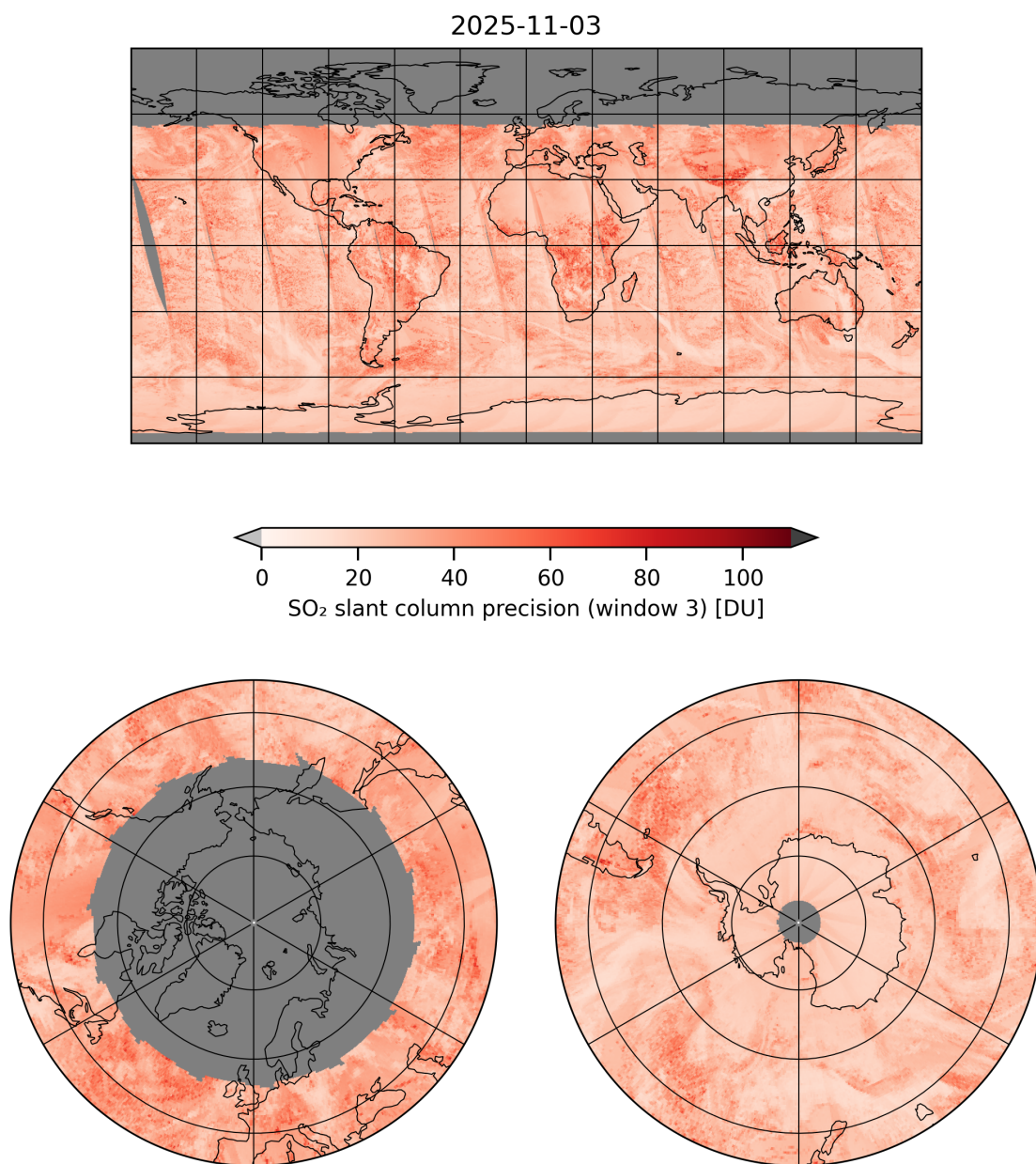


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-11-03 to 2025-11-04

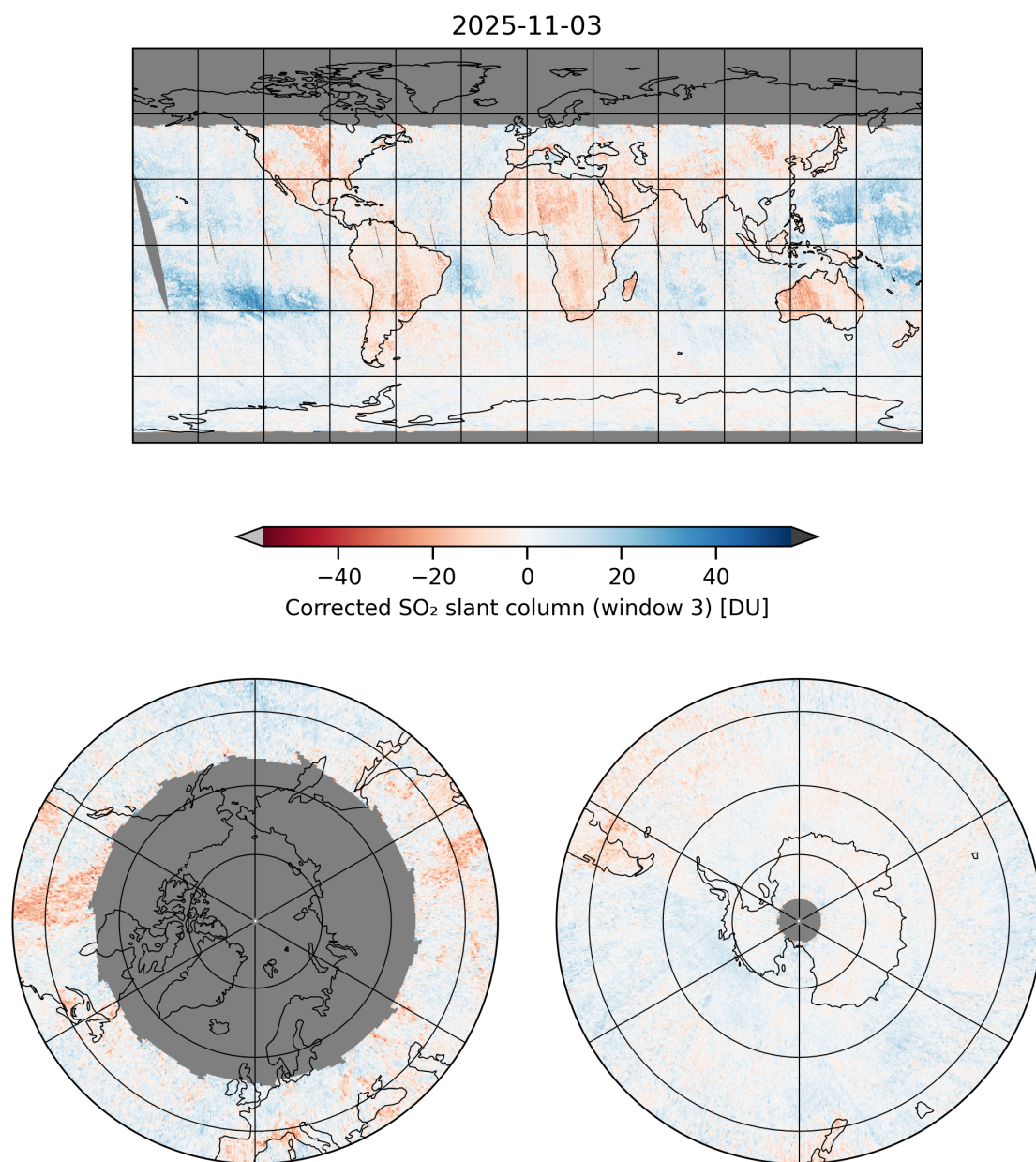


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-11-03 to 2025-11-04

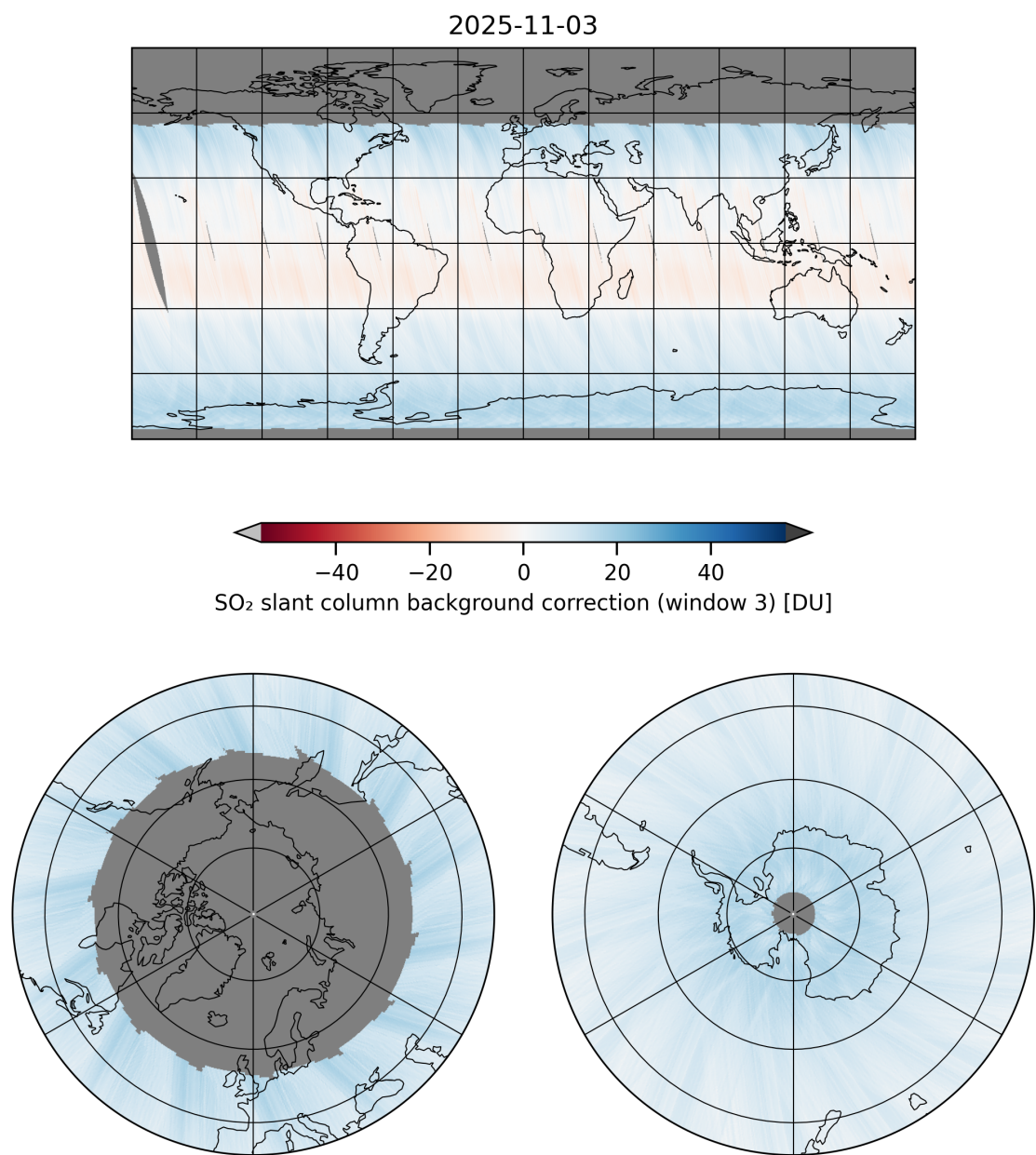


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-11-03 to 2025-11-04

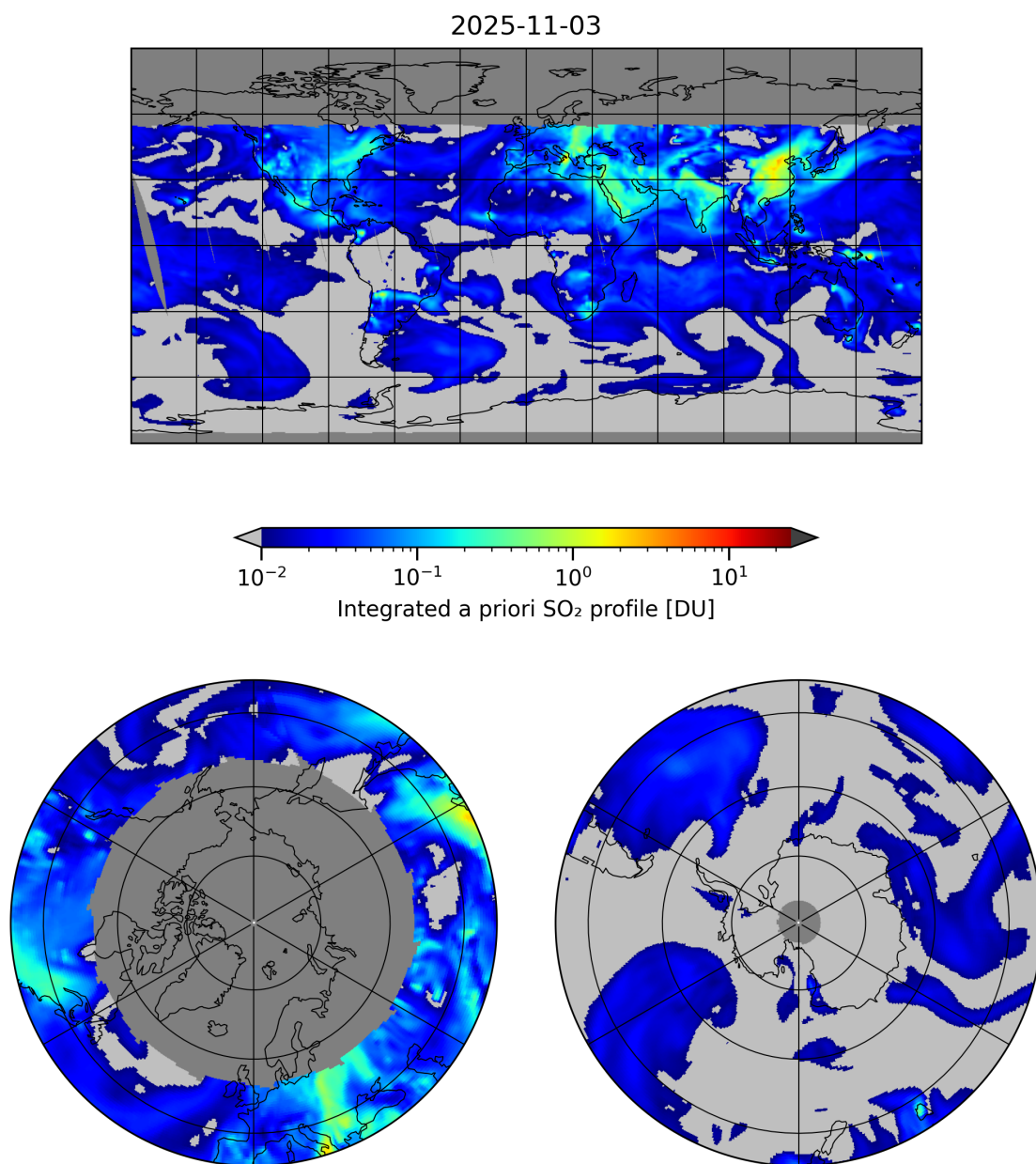


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-11-03 to 2025-11-04

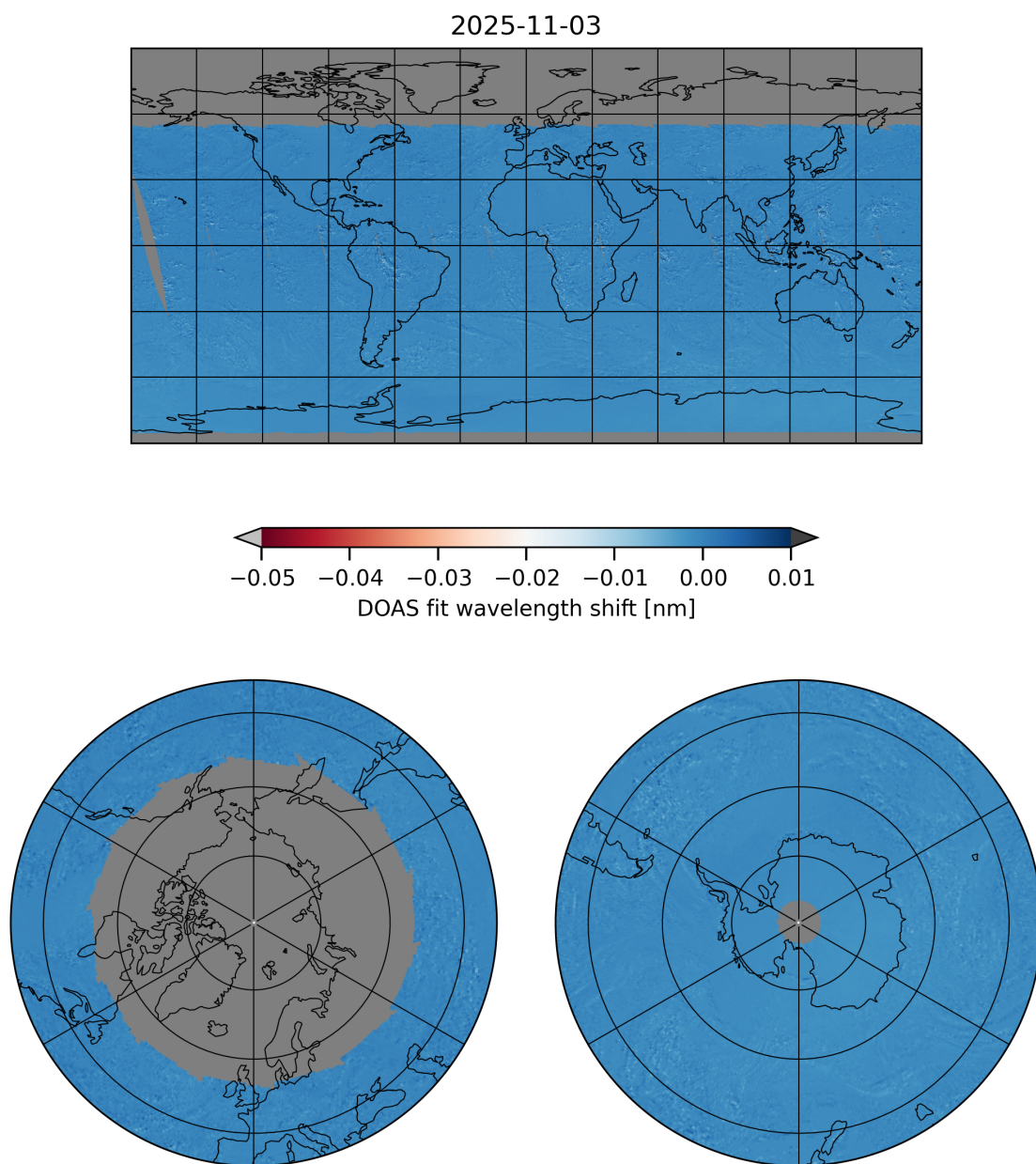


Figure 22: Map of “DOAS fit wavelength shift” for 2025-11-03 to 2025-11-04

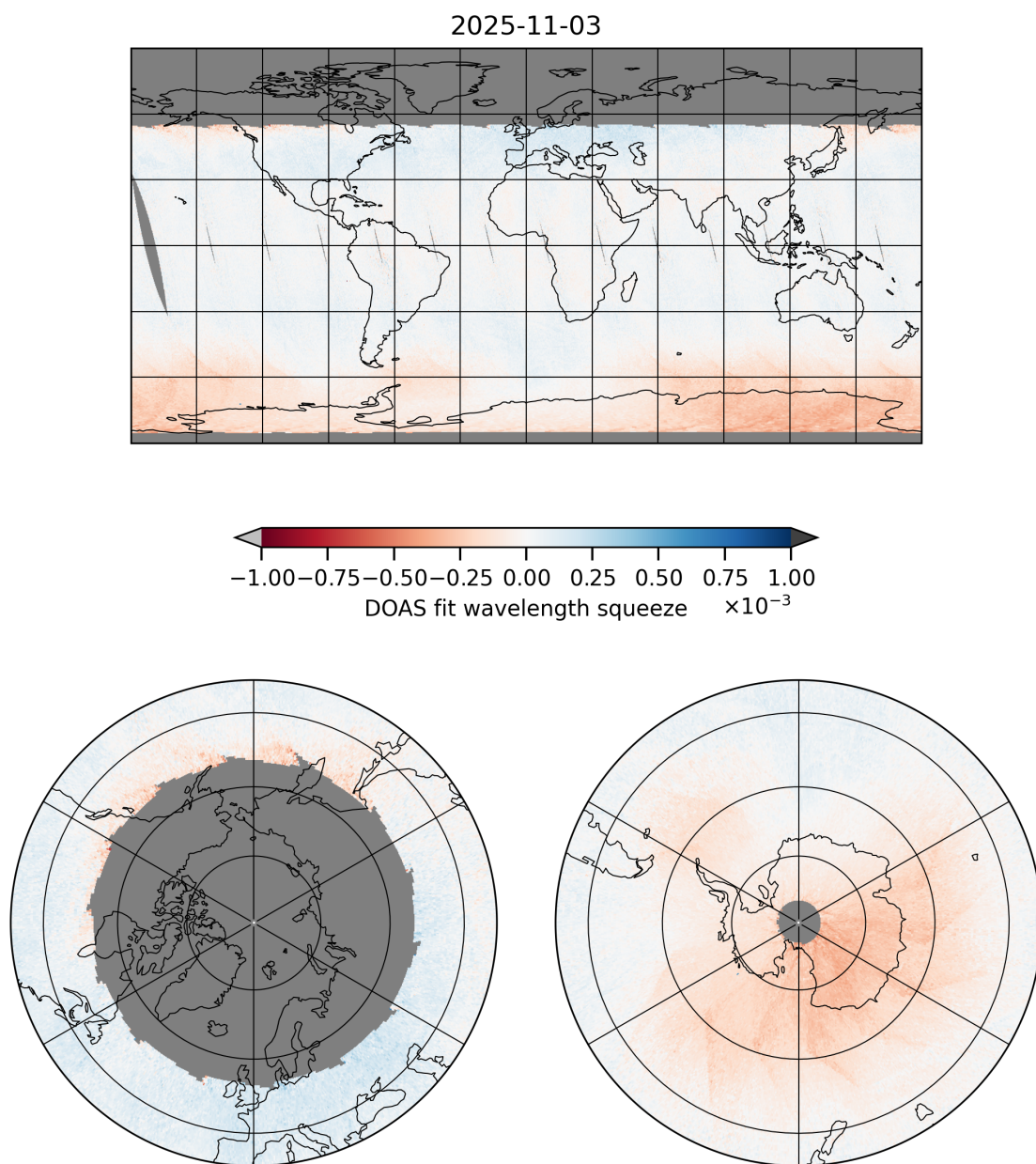


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-11-03 to 2025-11-04

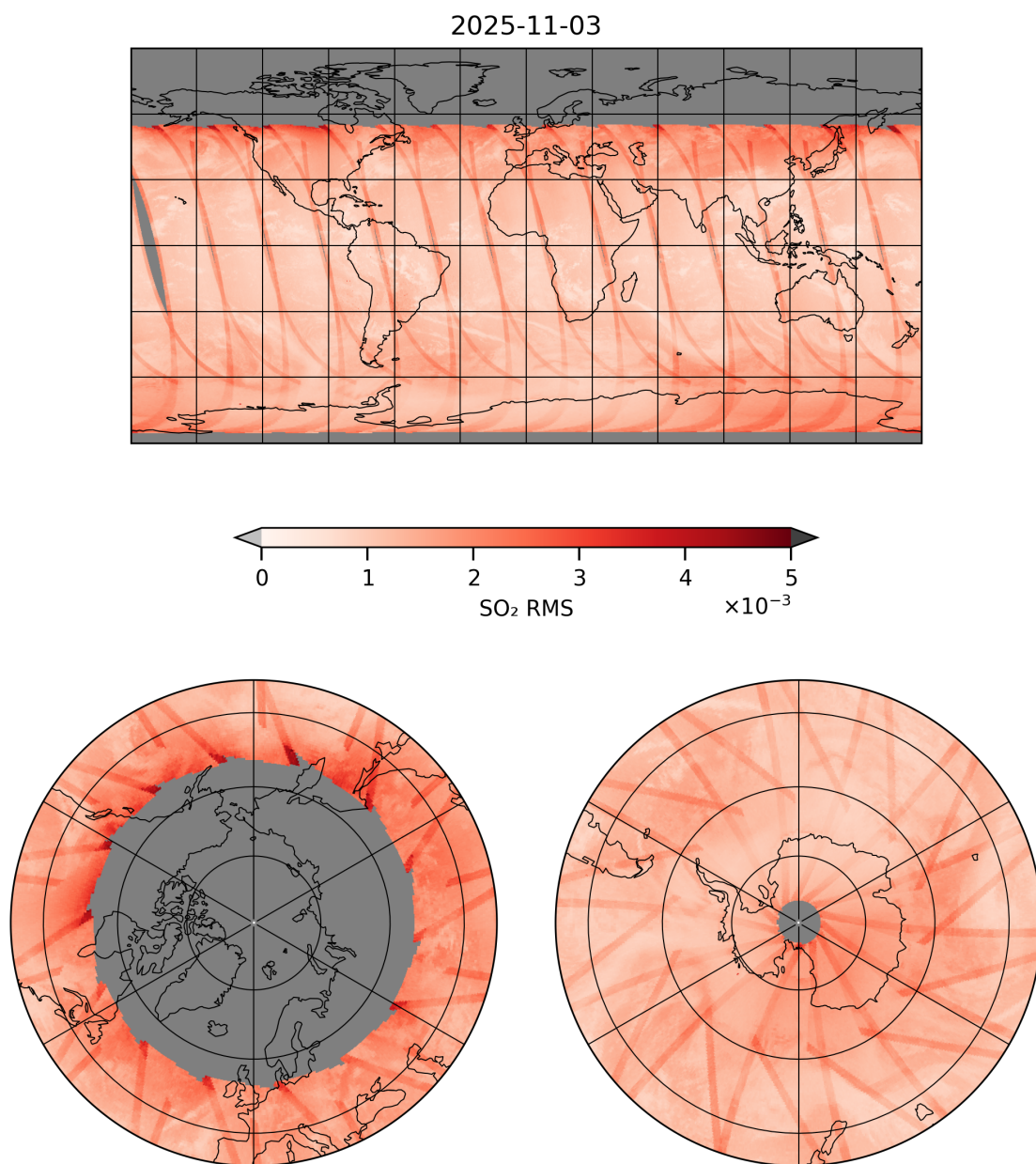


Figure 24: Map of “SO₂ RMS” for 2025-11-03 to 2025-11-04

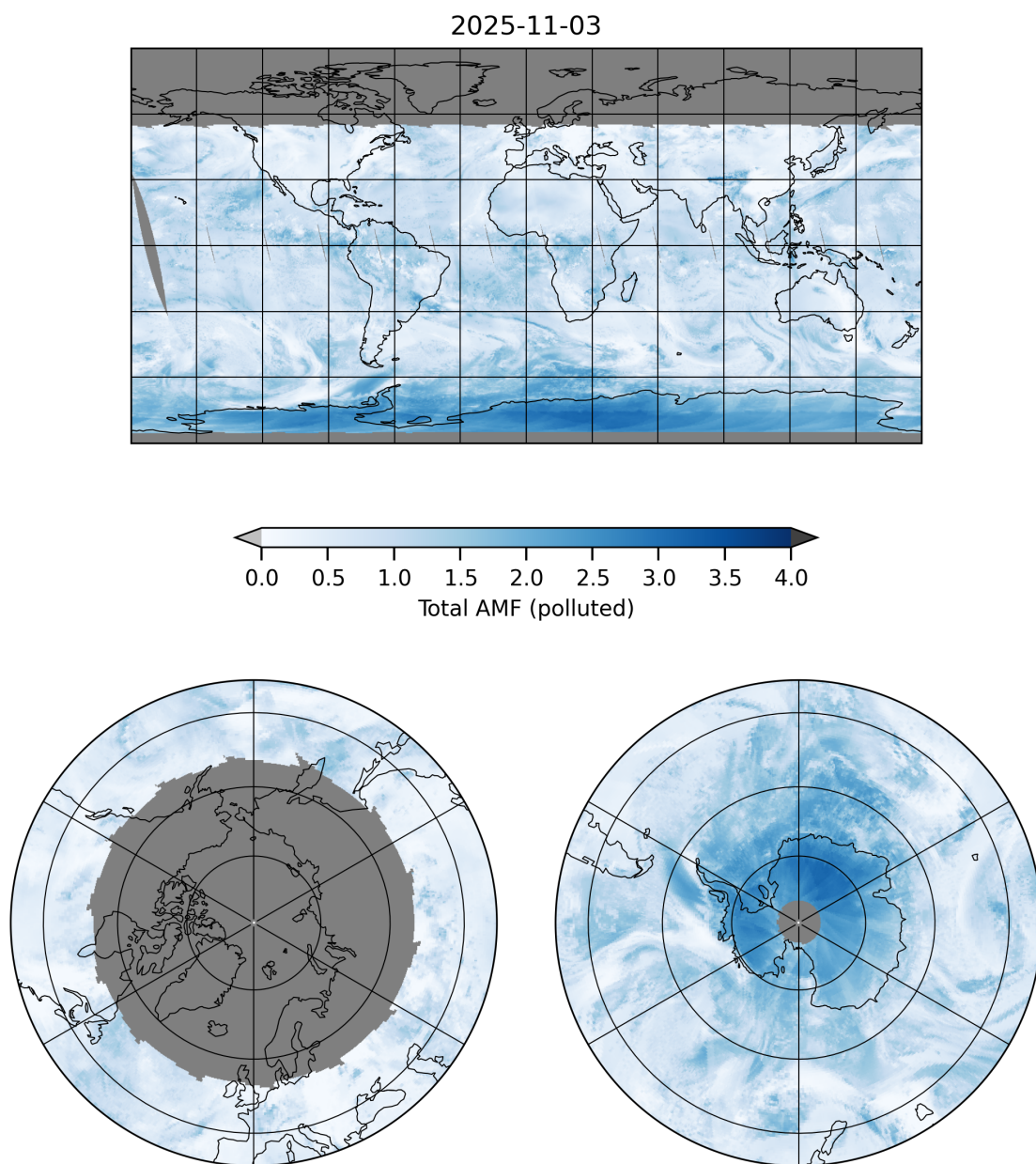


Figure 25: Map of “Total AMF (polluted)” for 2025-11-03 to 2025-11-04

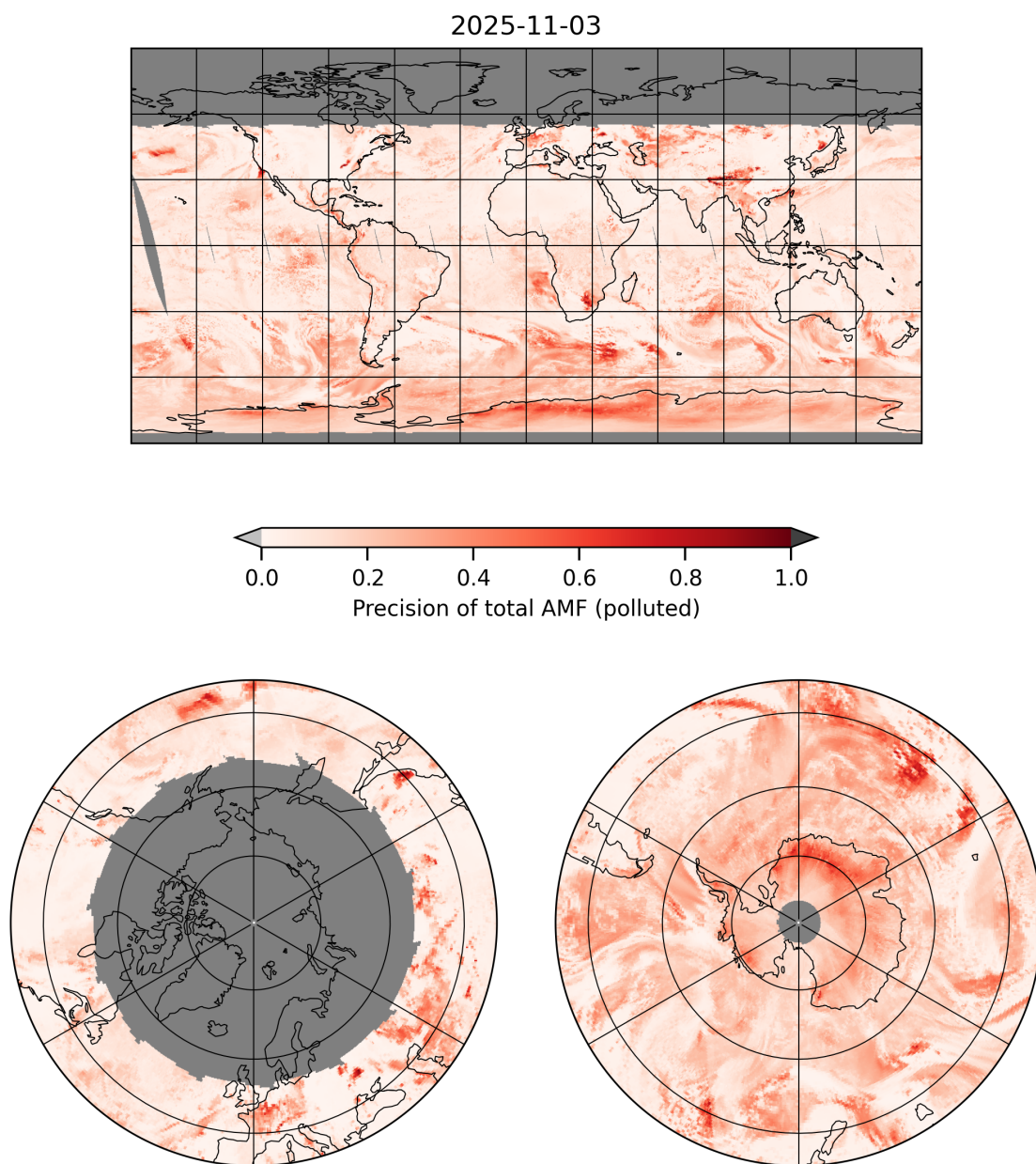


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-11-03 to 2025-11-04

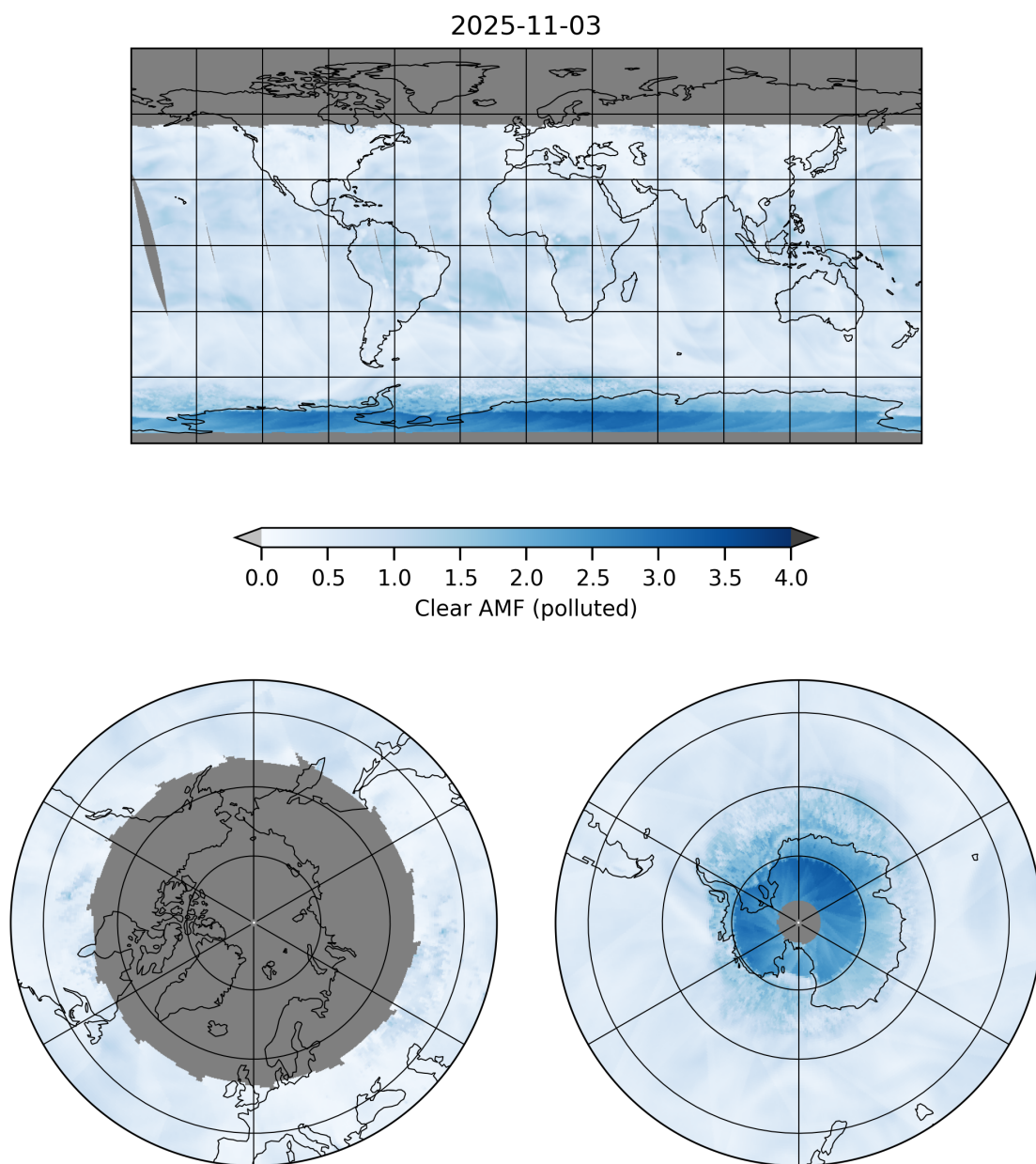


Figure 27: Map of “Clear AMF (polluted)” for 2025-11-03 to 2025-11-04

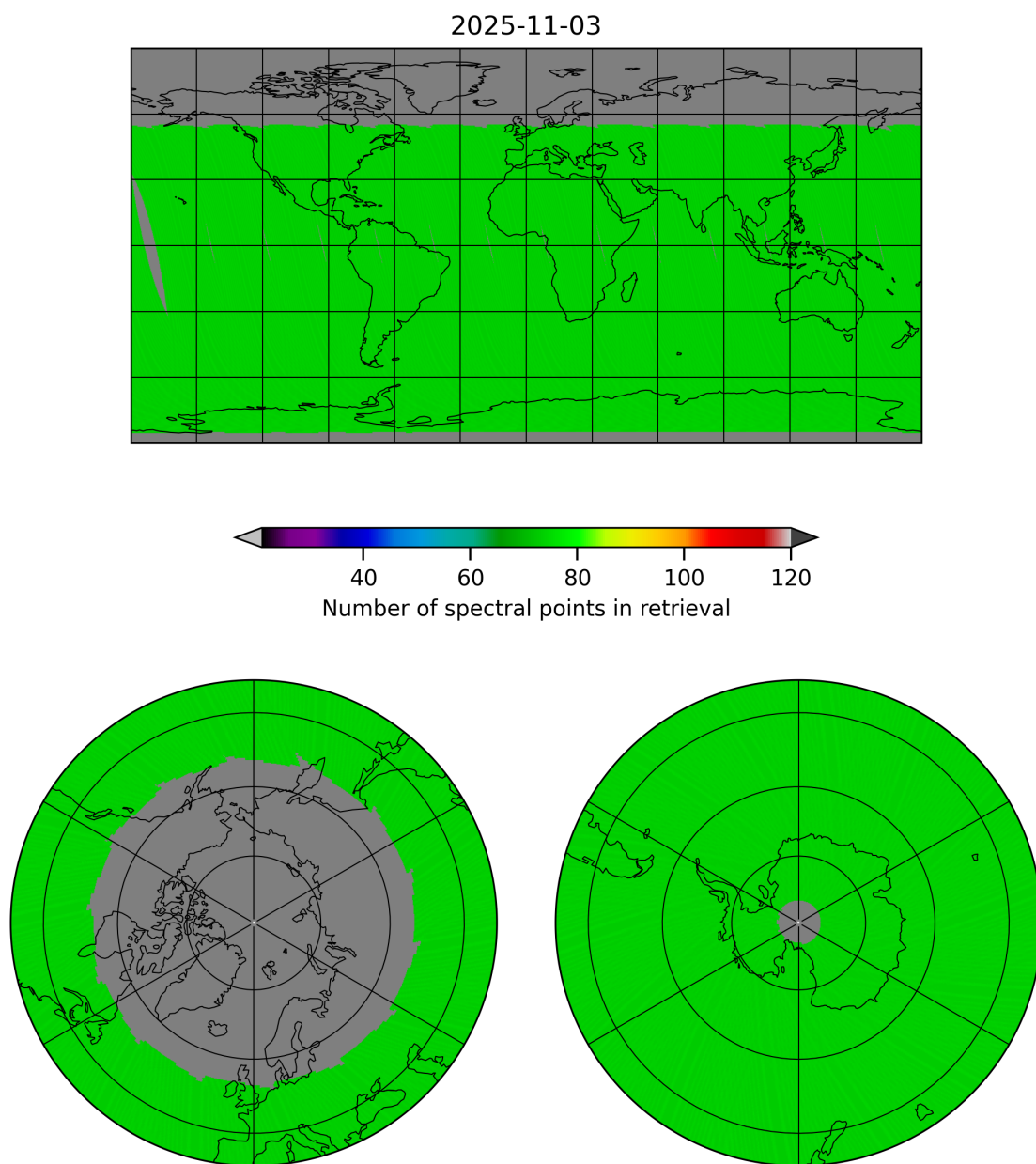


Figure 28: Map of “Number of spectral points in retrieval” for 2025-11-03 to 2025-11-04

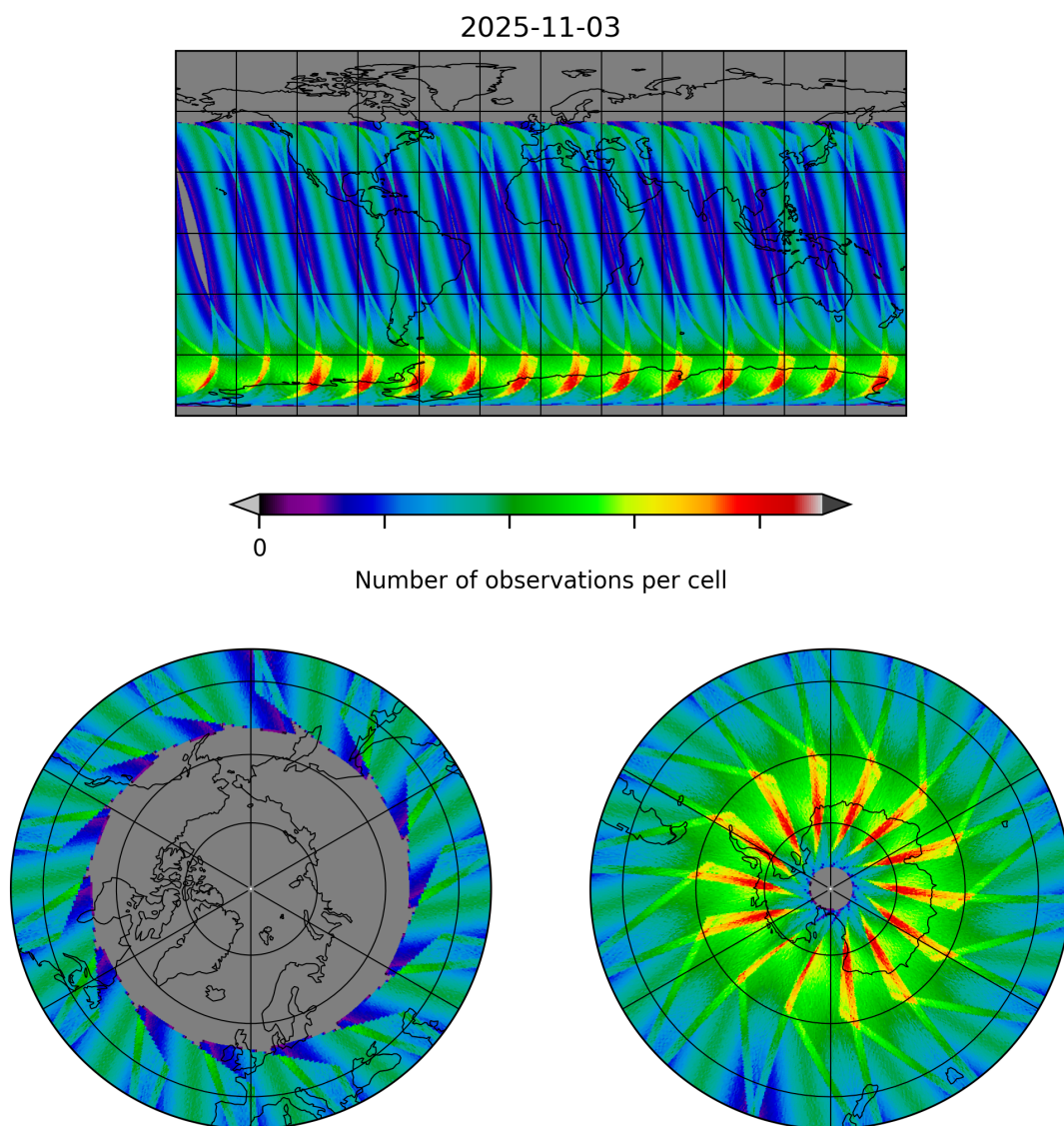


Figure 29: Map of the number of observations for 2025-11-03 to 2025-11-04

7 Zonal average

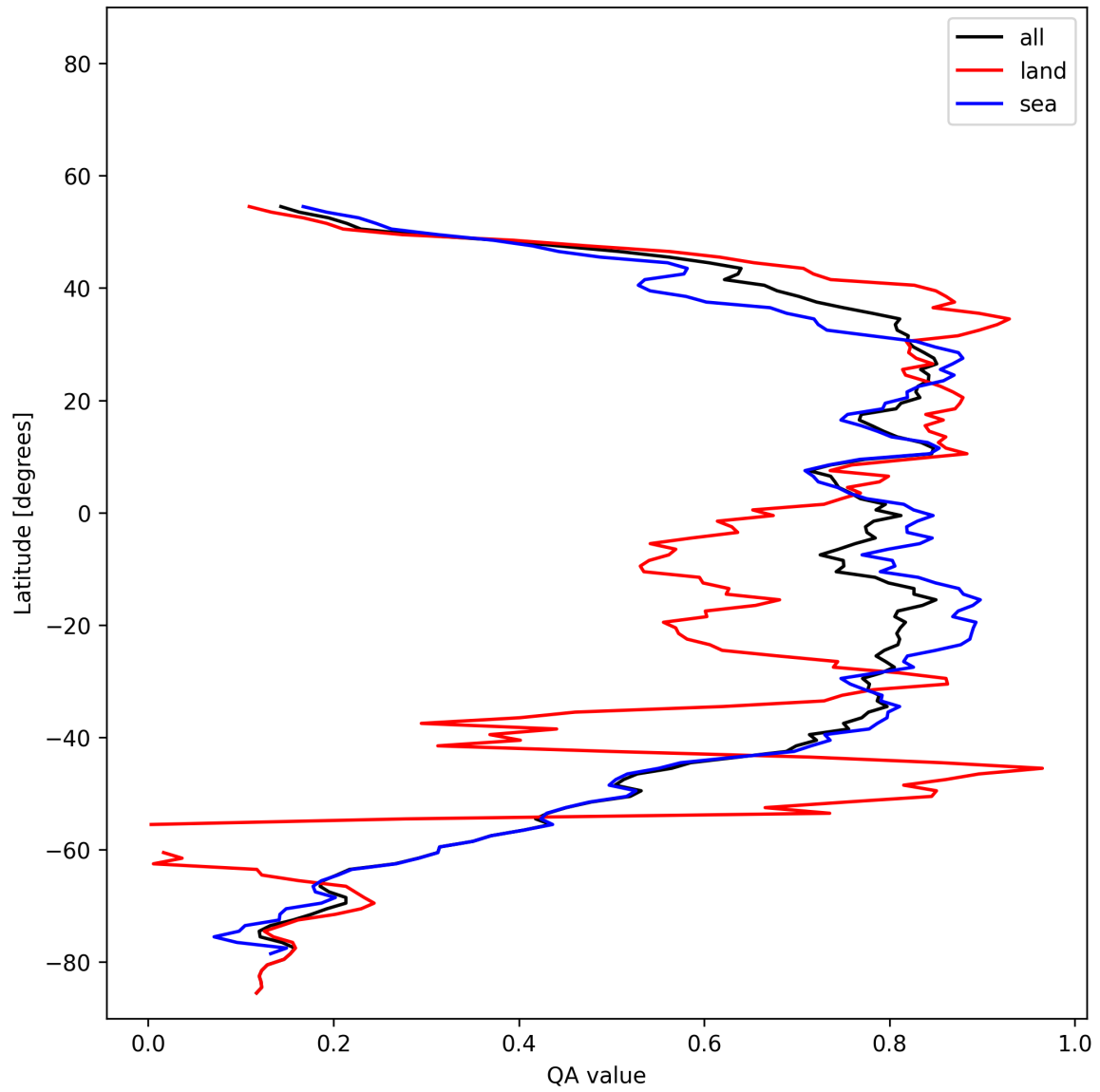


Figure 30: Zonal average of “QA value” for 2025-11-03 to 2025-11-04.

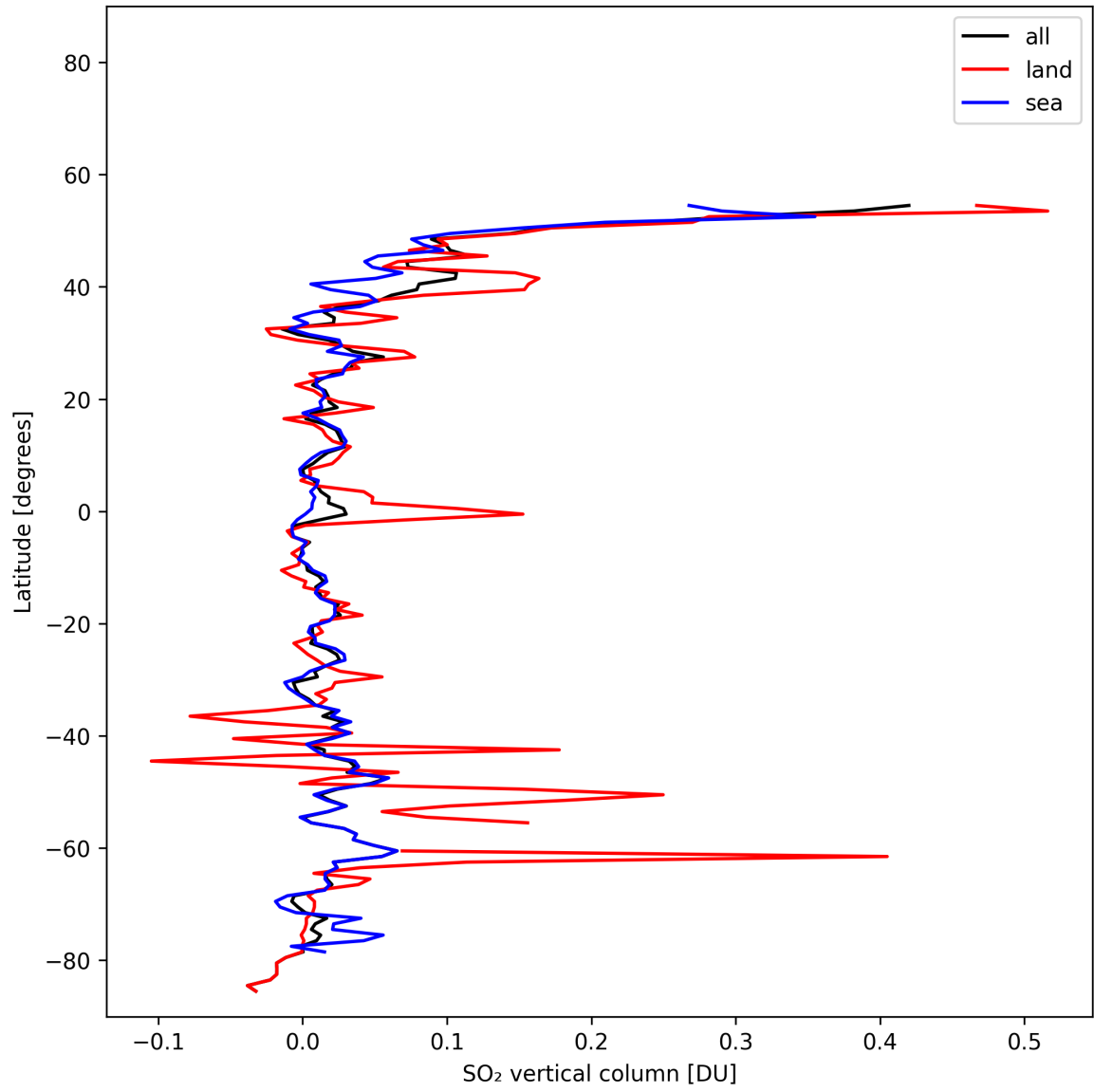


Figure 31: Zonal average of “SO₂ vertical column” for 2025-11-03 to 2025-11-04.

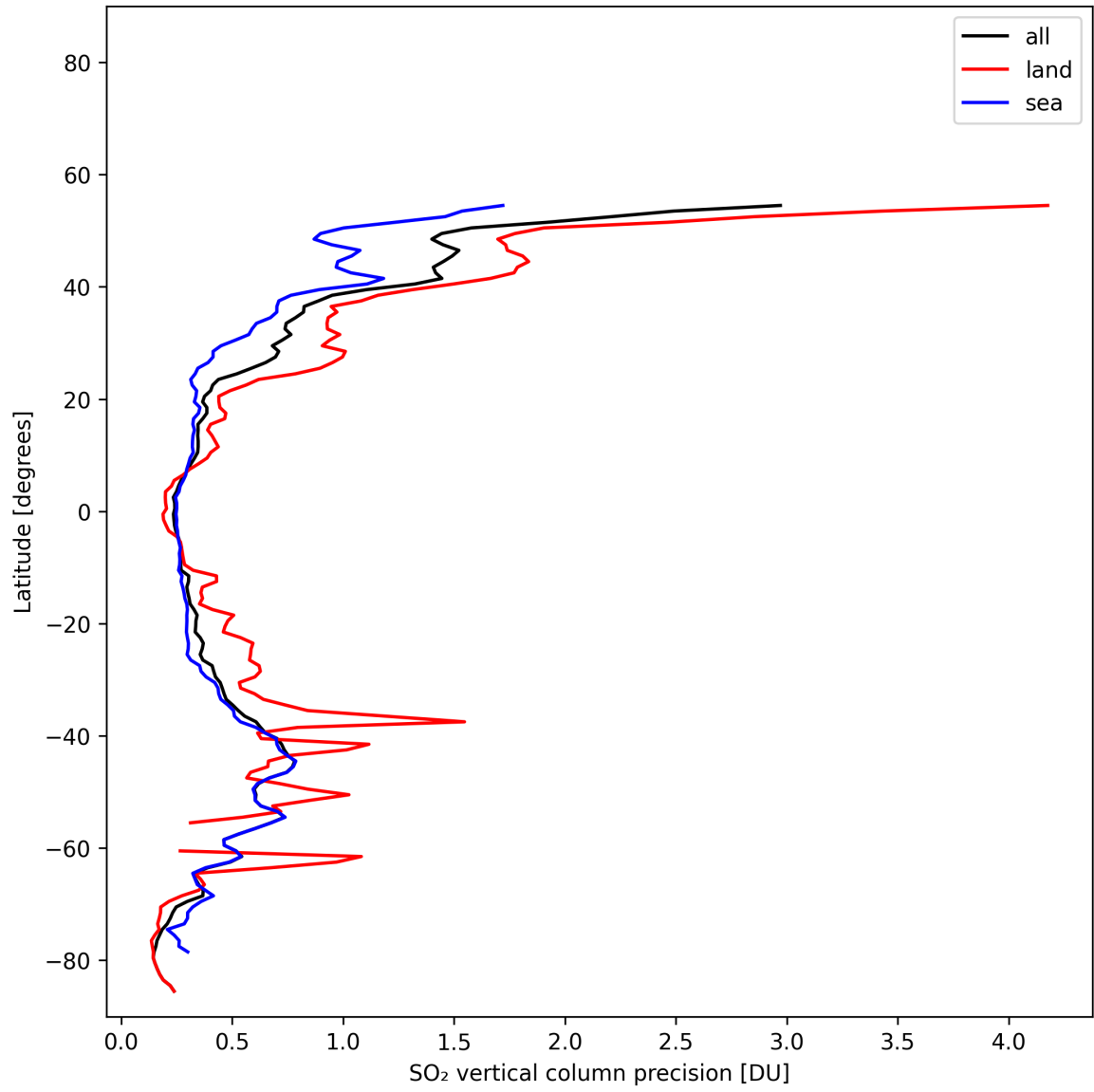


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-11-03 to 2025-11-04.

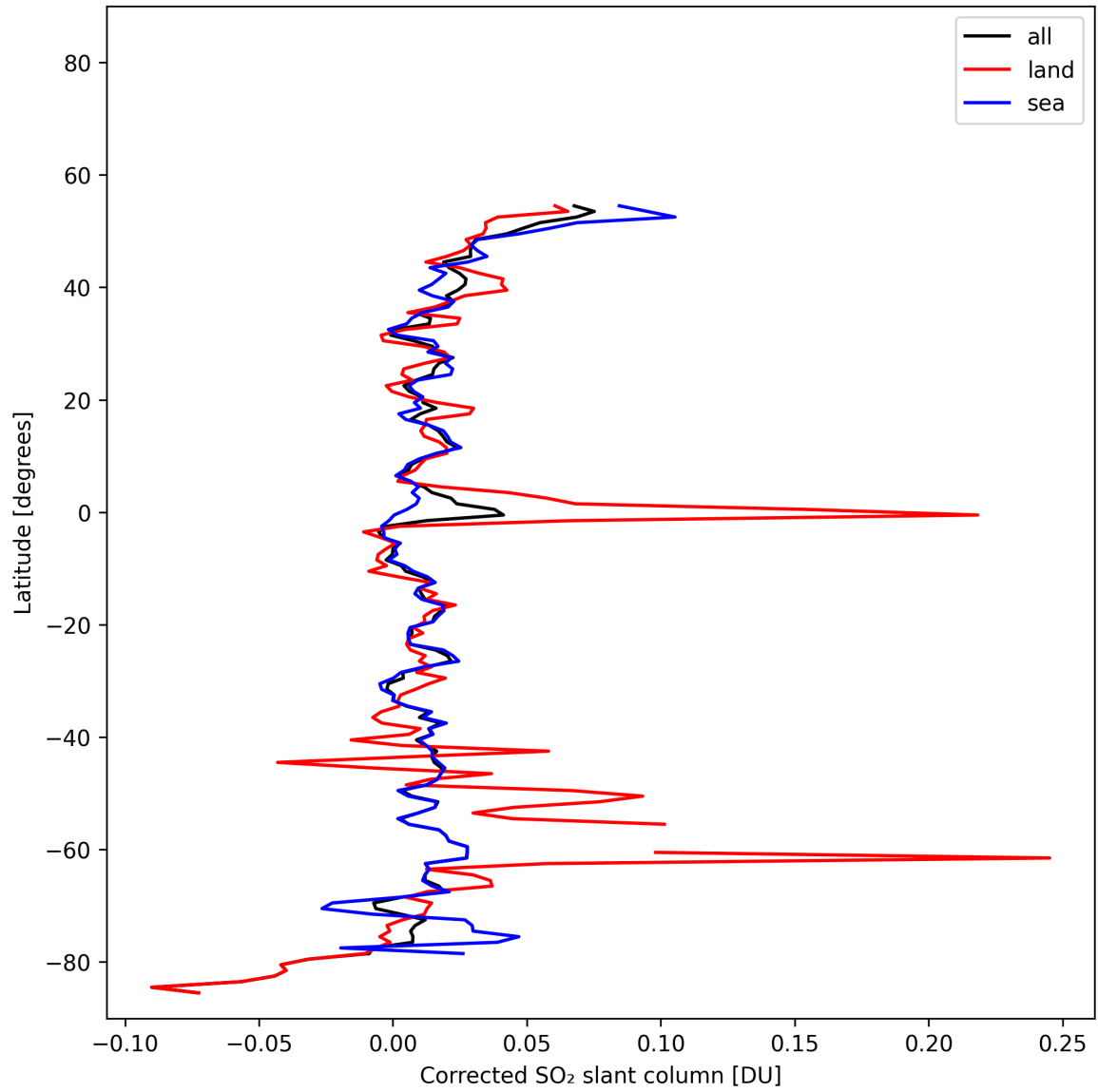


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-11-03 to 2025-11-04.

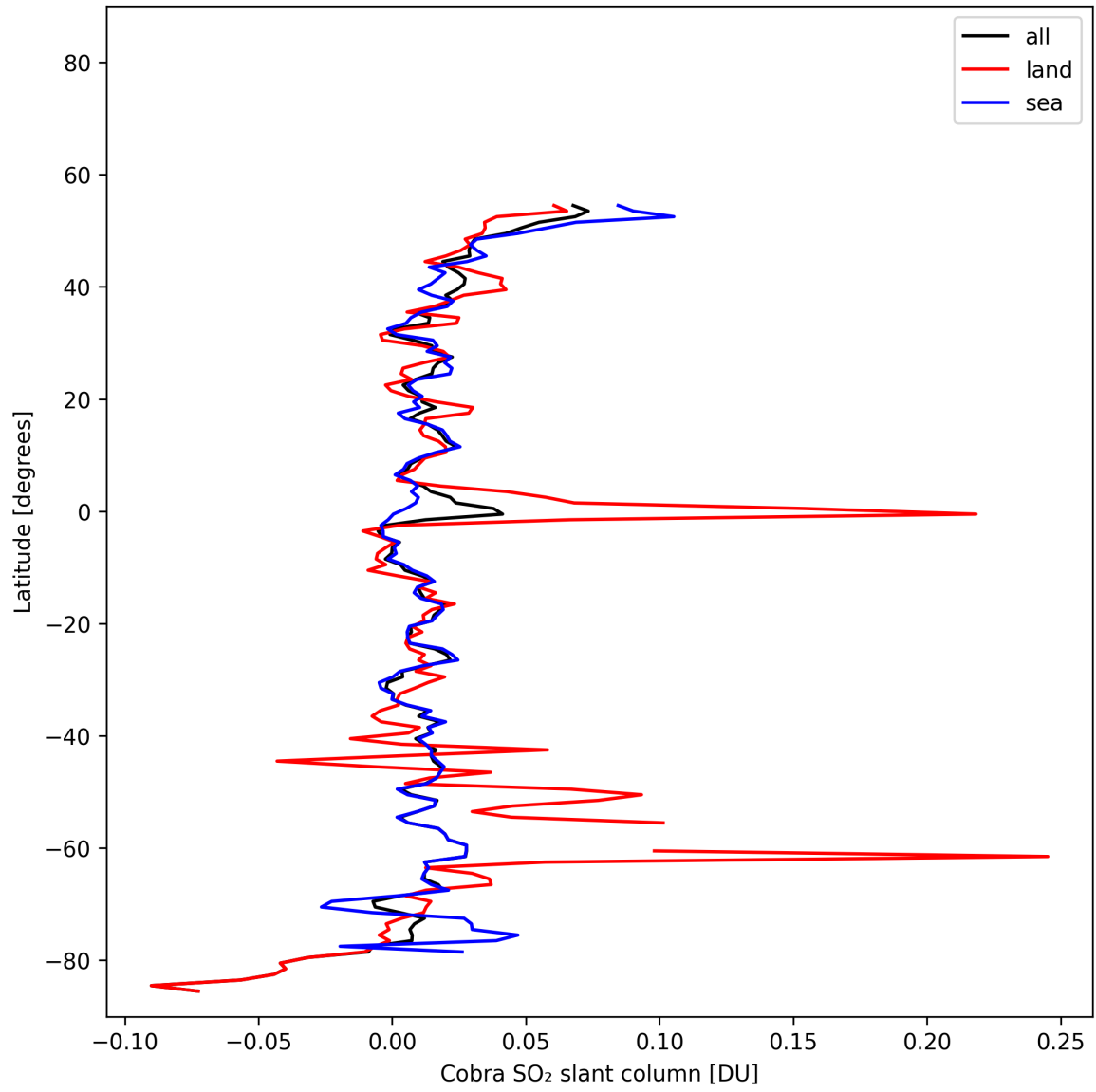


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-11-03 to 2025-11-04.

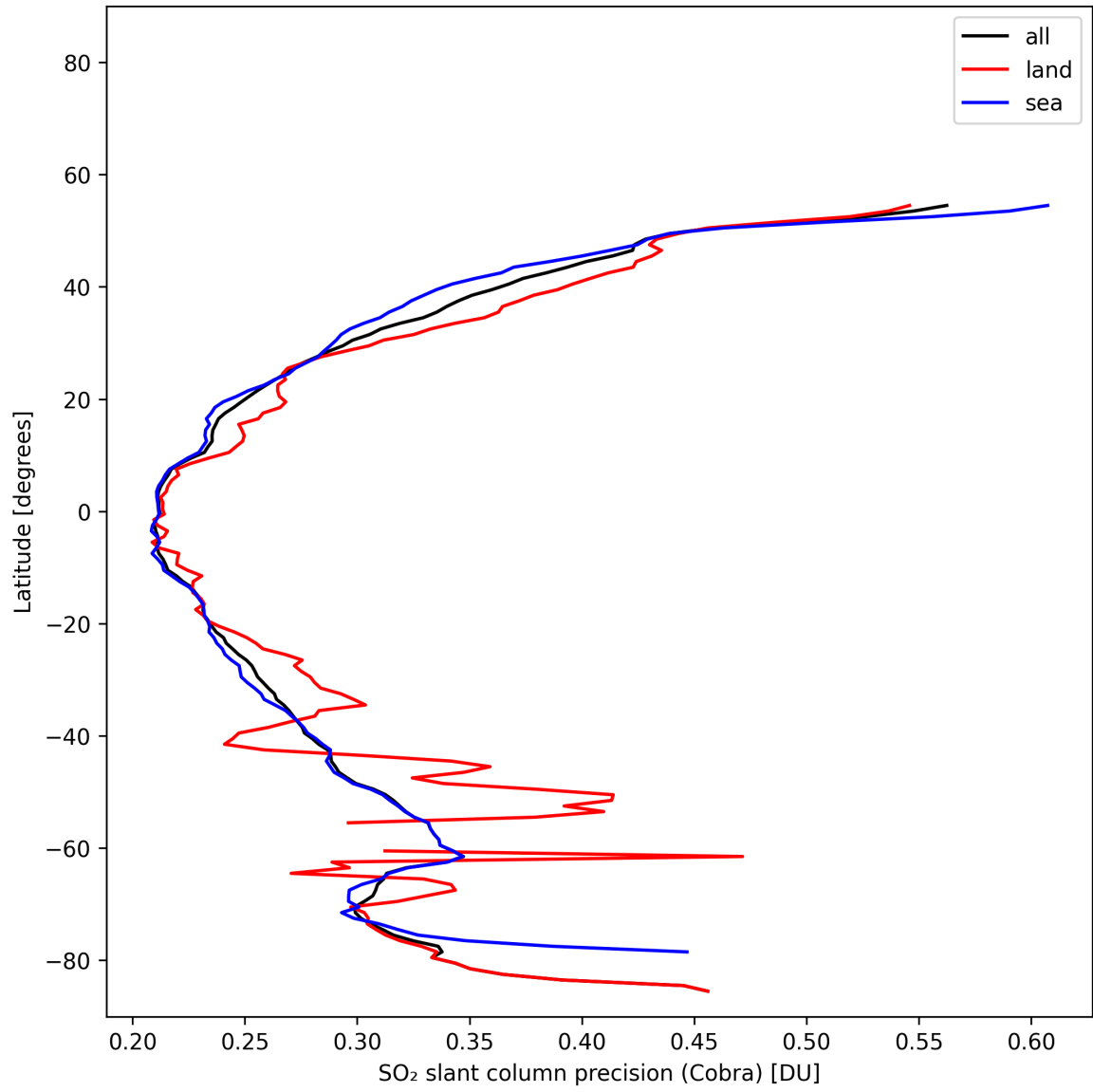


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-11-03 to 2025-11-04.

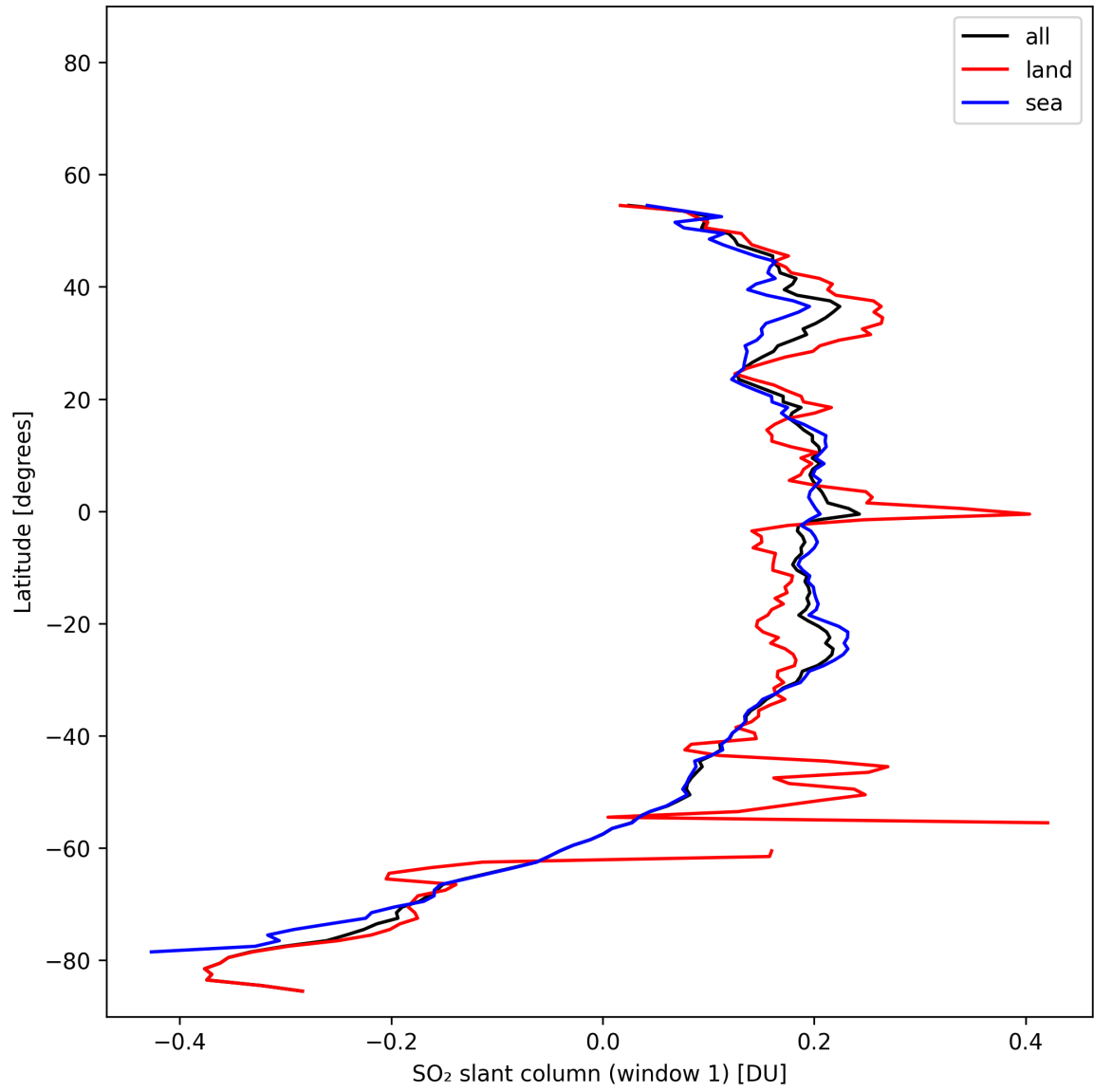


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-11-03 to 2025-11-04.

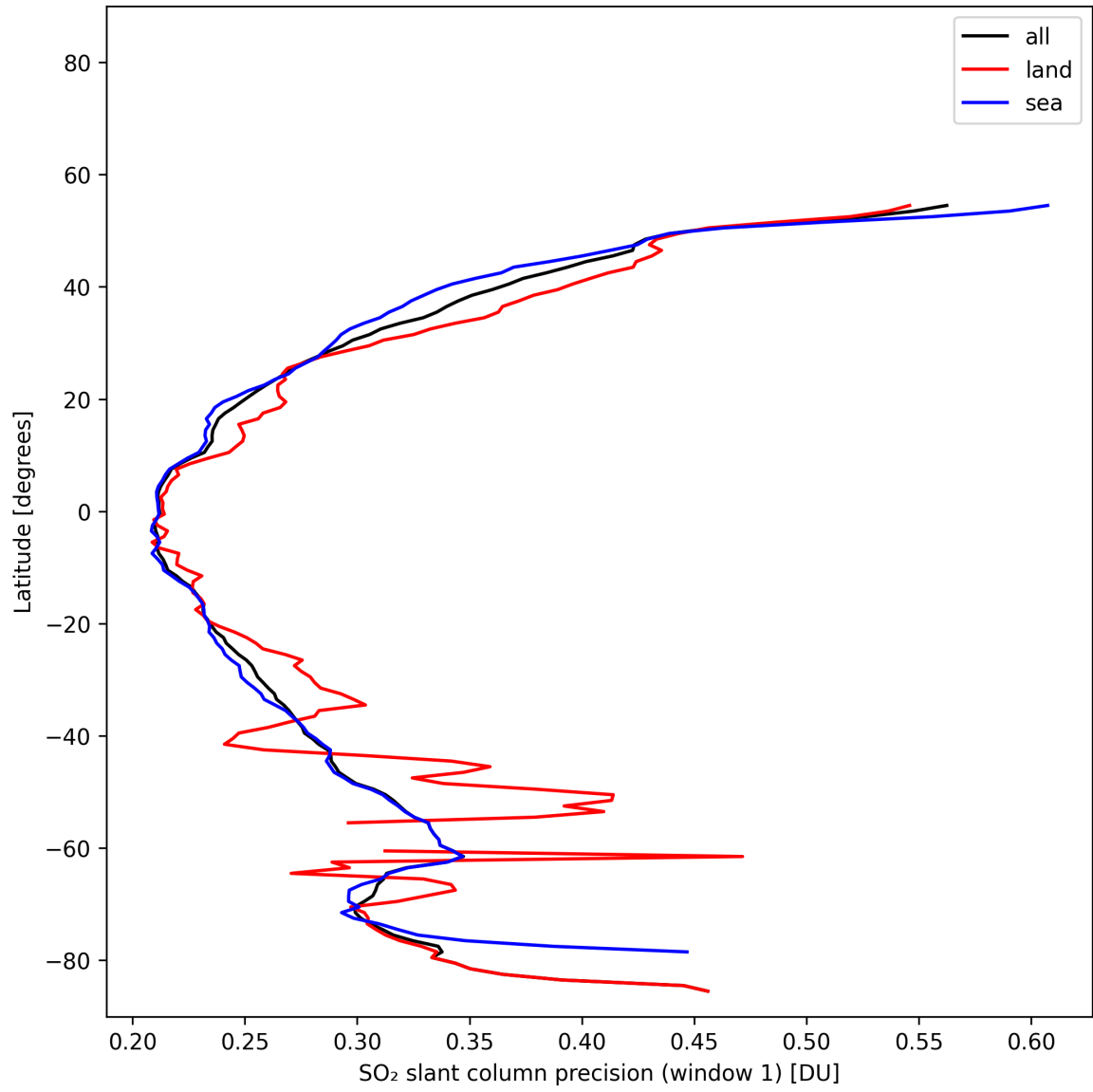


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-11-03 to 2025-11-04.

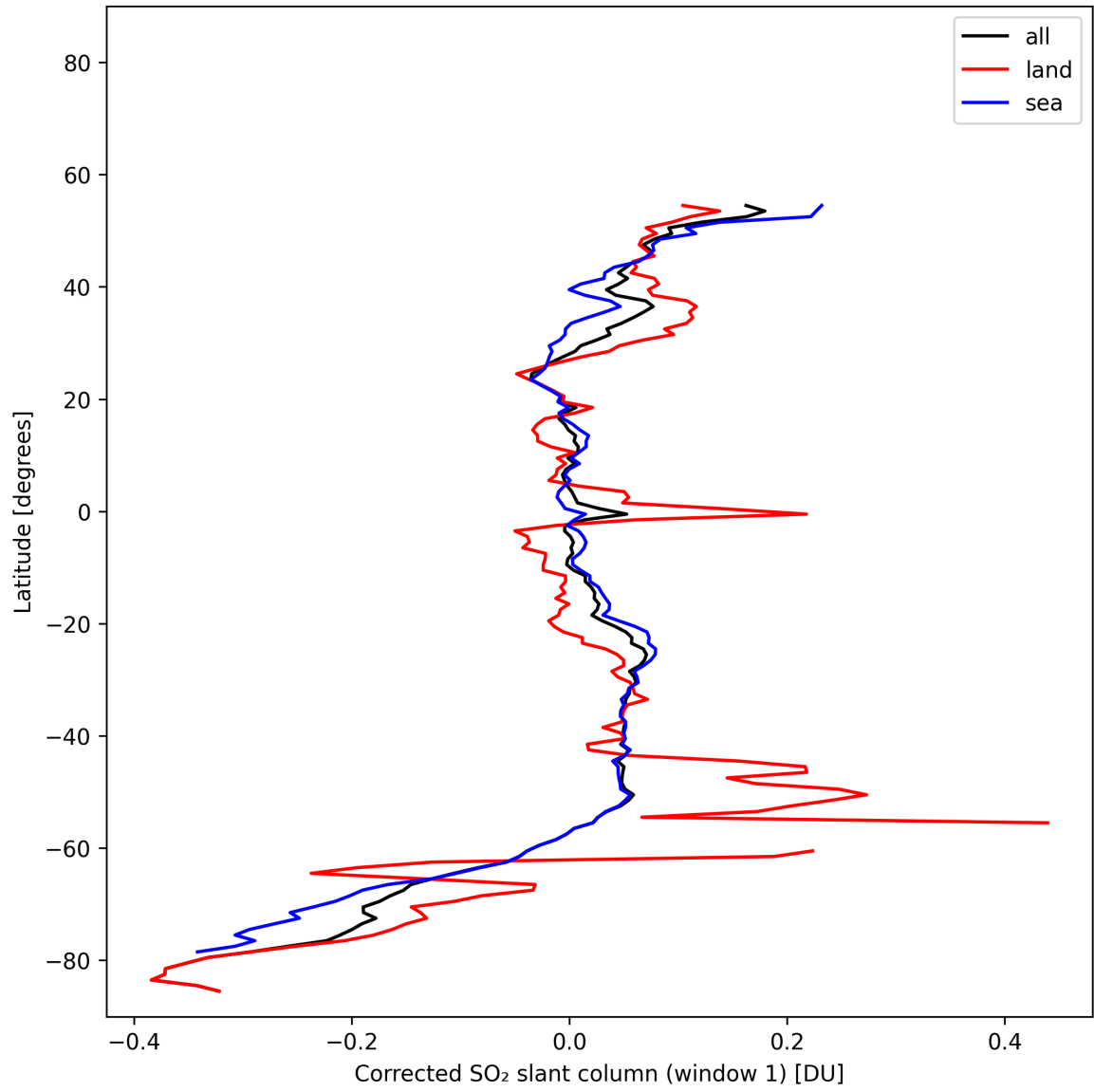


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-11-03 to 2025-11-04.

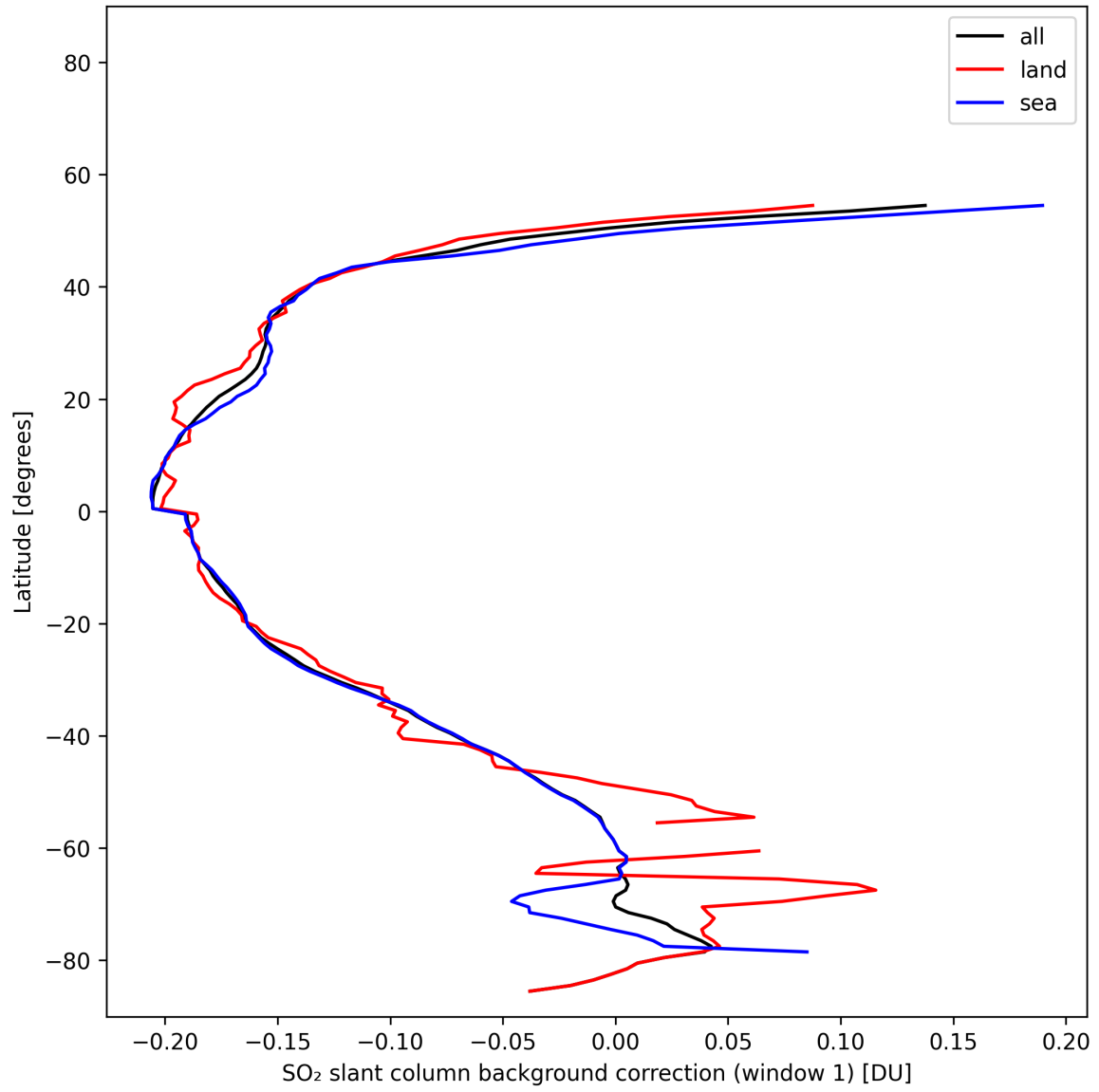


Figure 39: Zonal average of "SO₂ slant column background correction (window 1)" for 2025-11-03 to 2025-11-04.

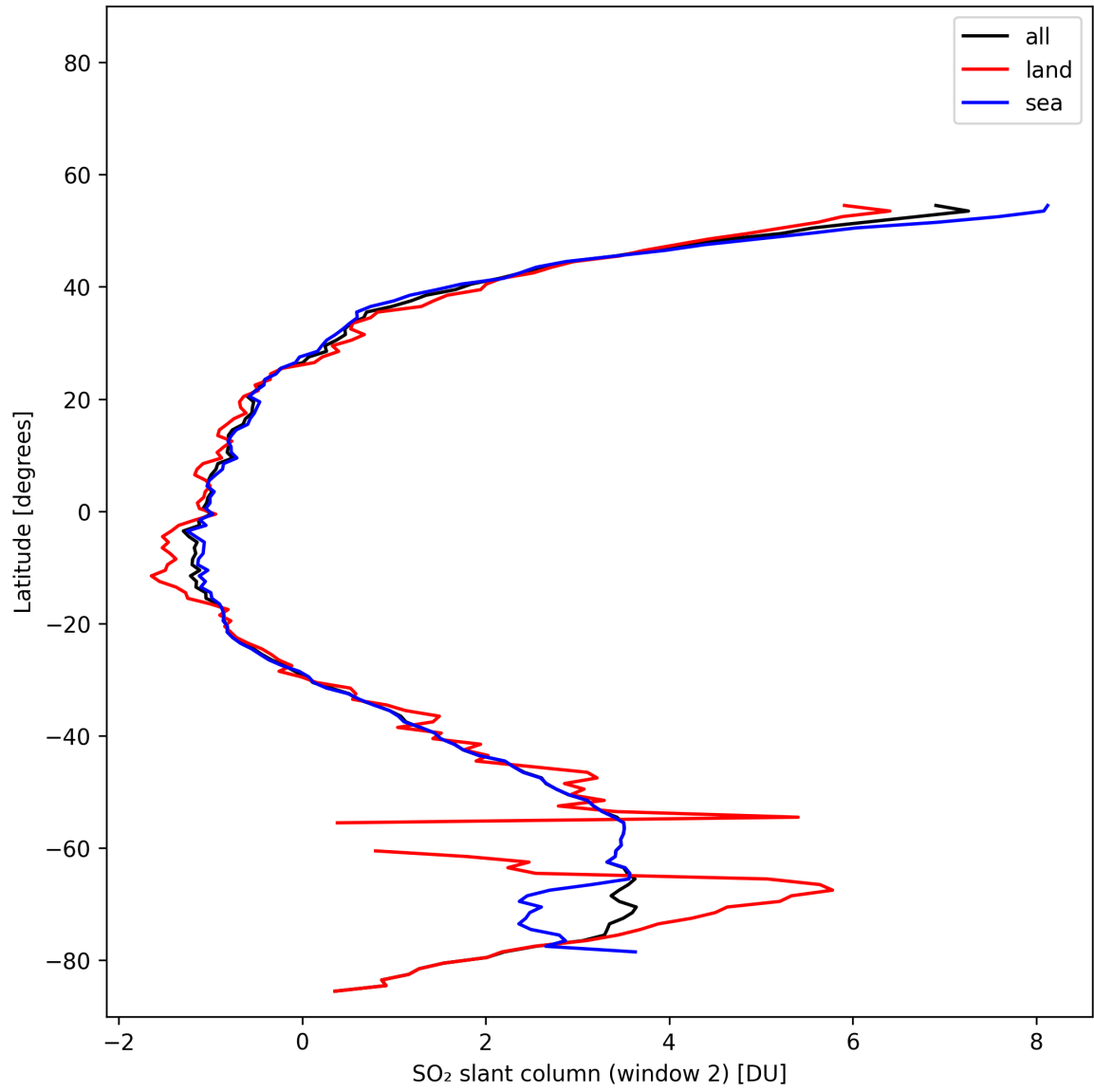


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-11-03 to 2025-11-04.

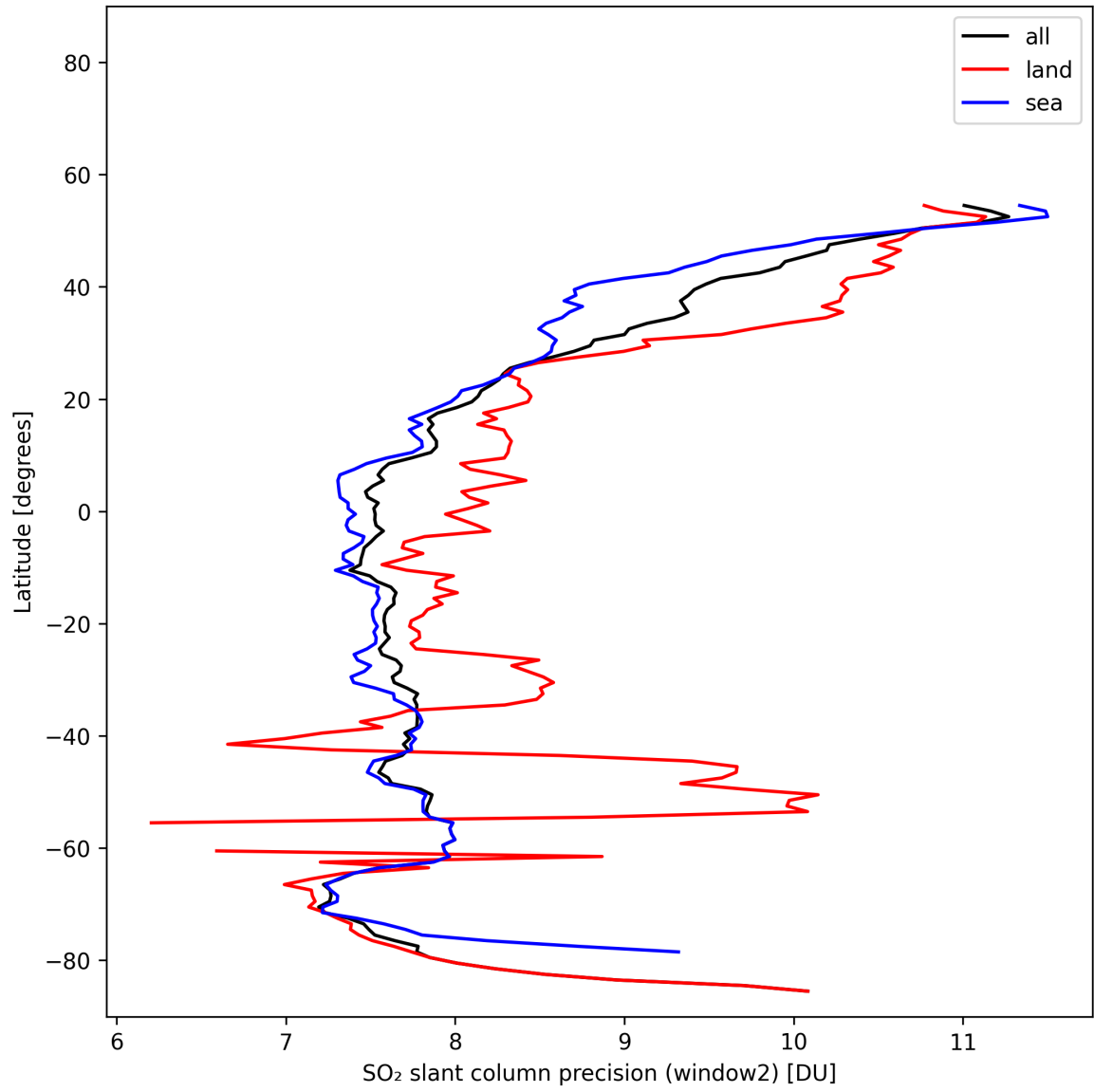


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-11-03 to 2025-11-04.

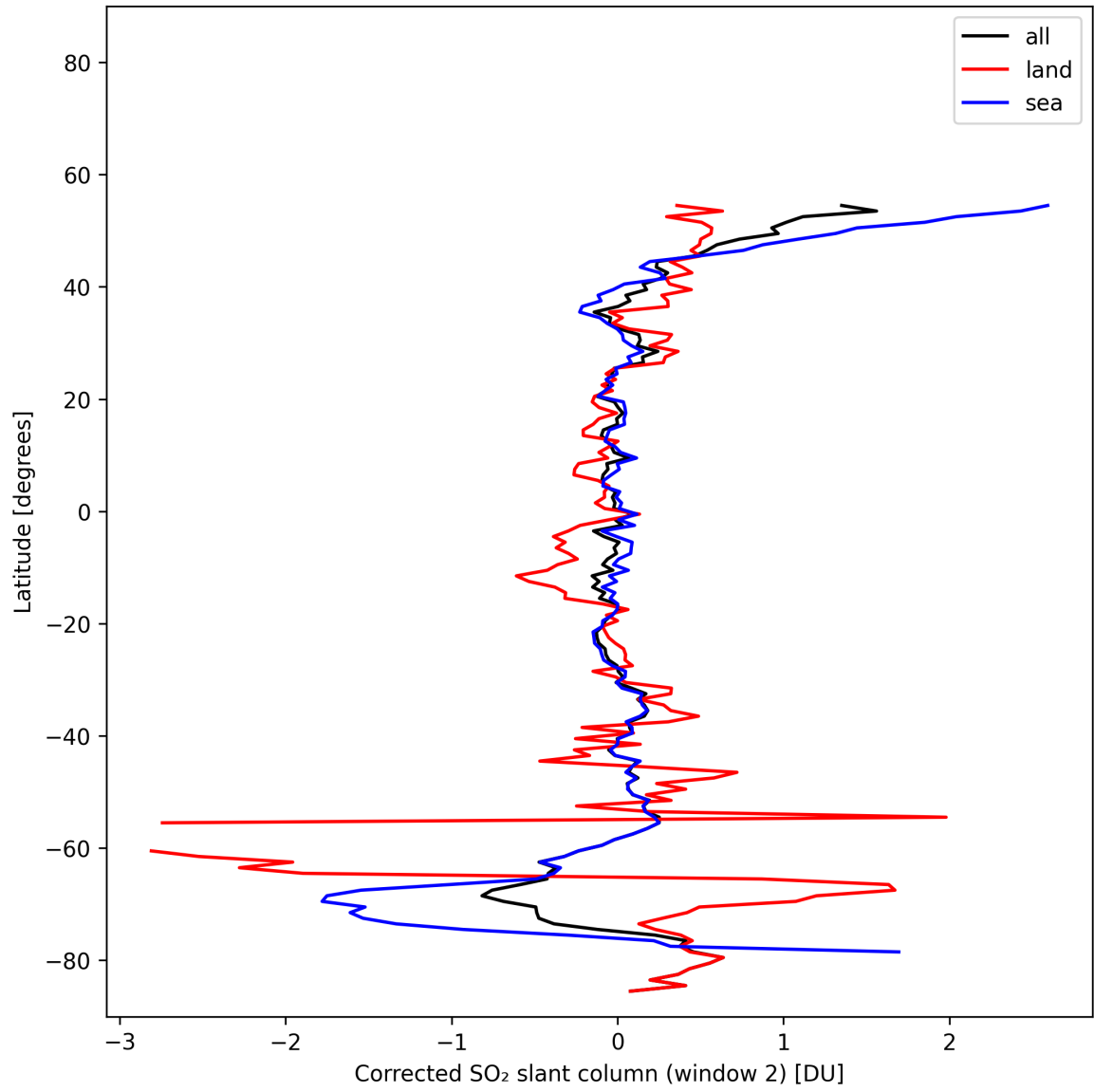


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-11-03 to 2025-11-04.

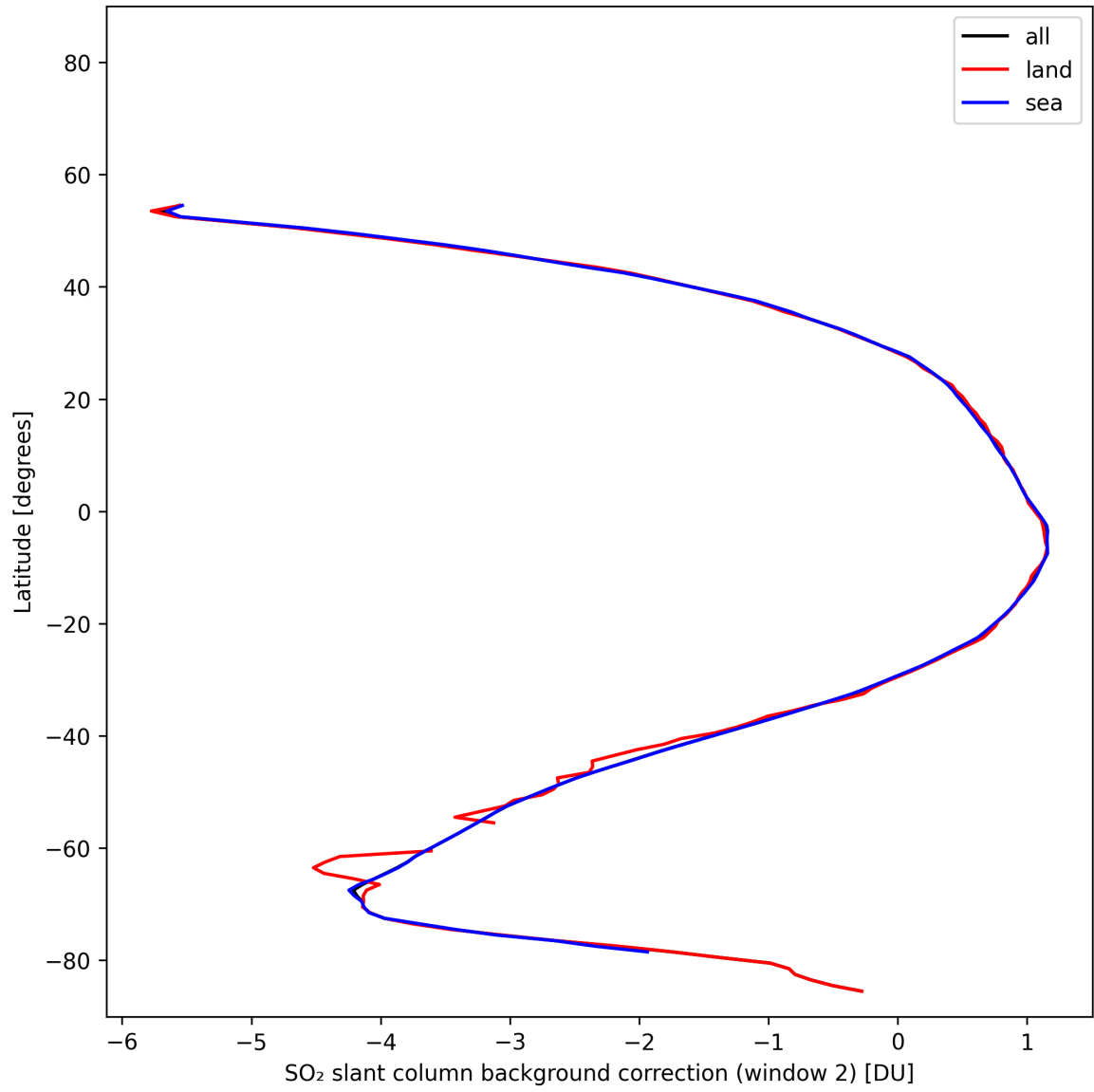


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-11-03 to 2025-11-04.

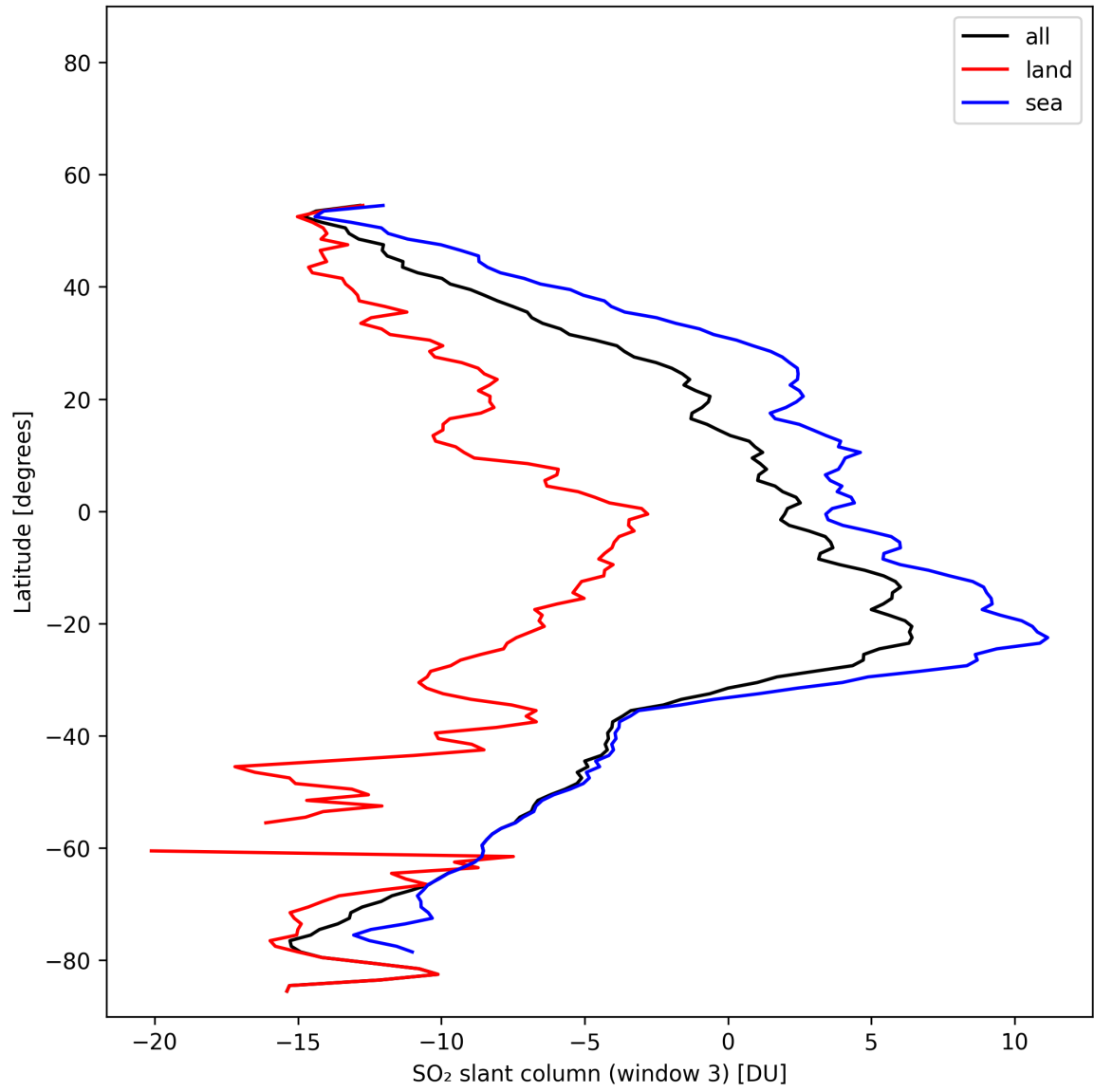


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-11-03 to 2025-11-04.

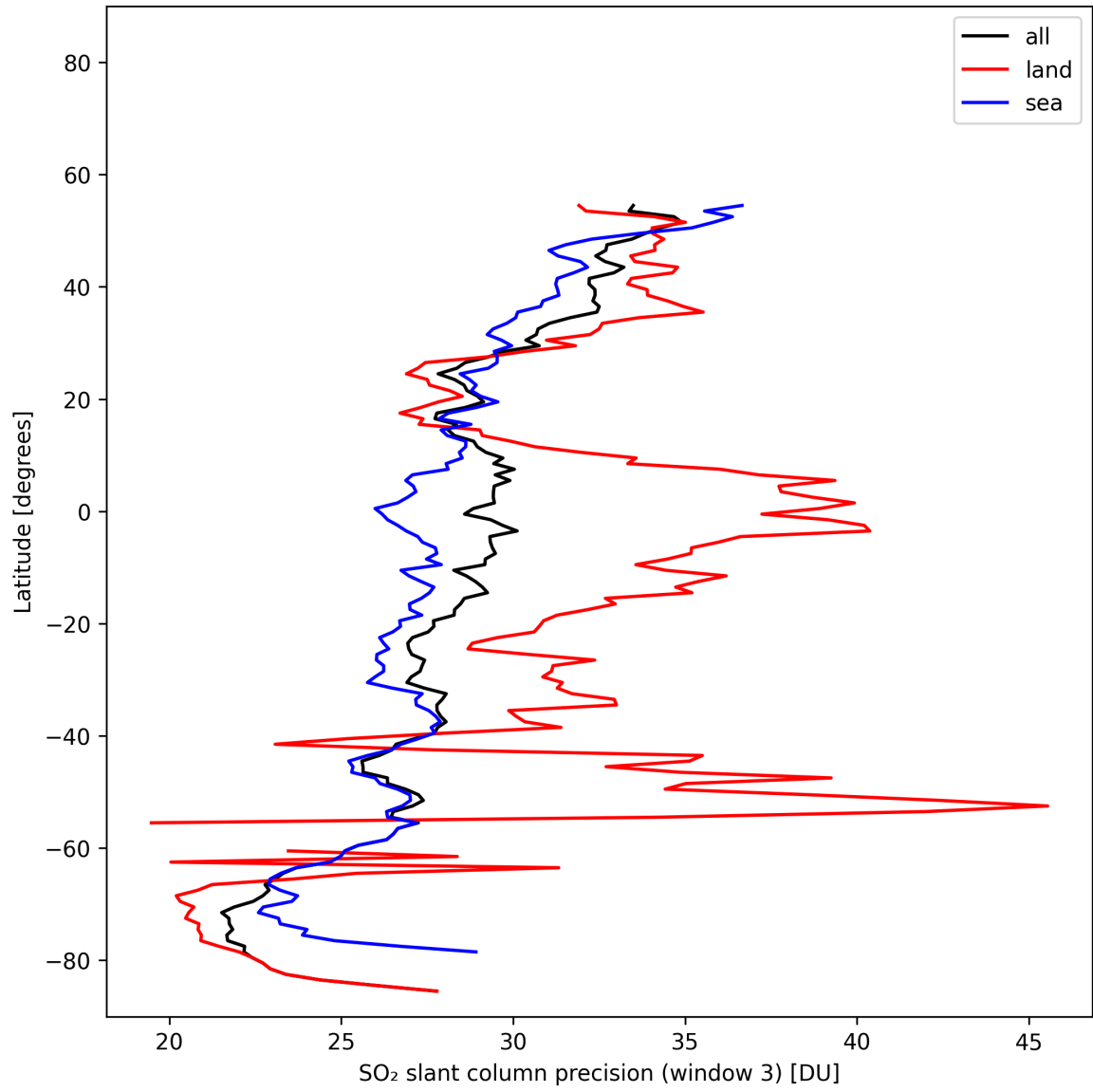


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-11-03 to 2025-11-04.

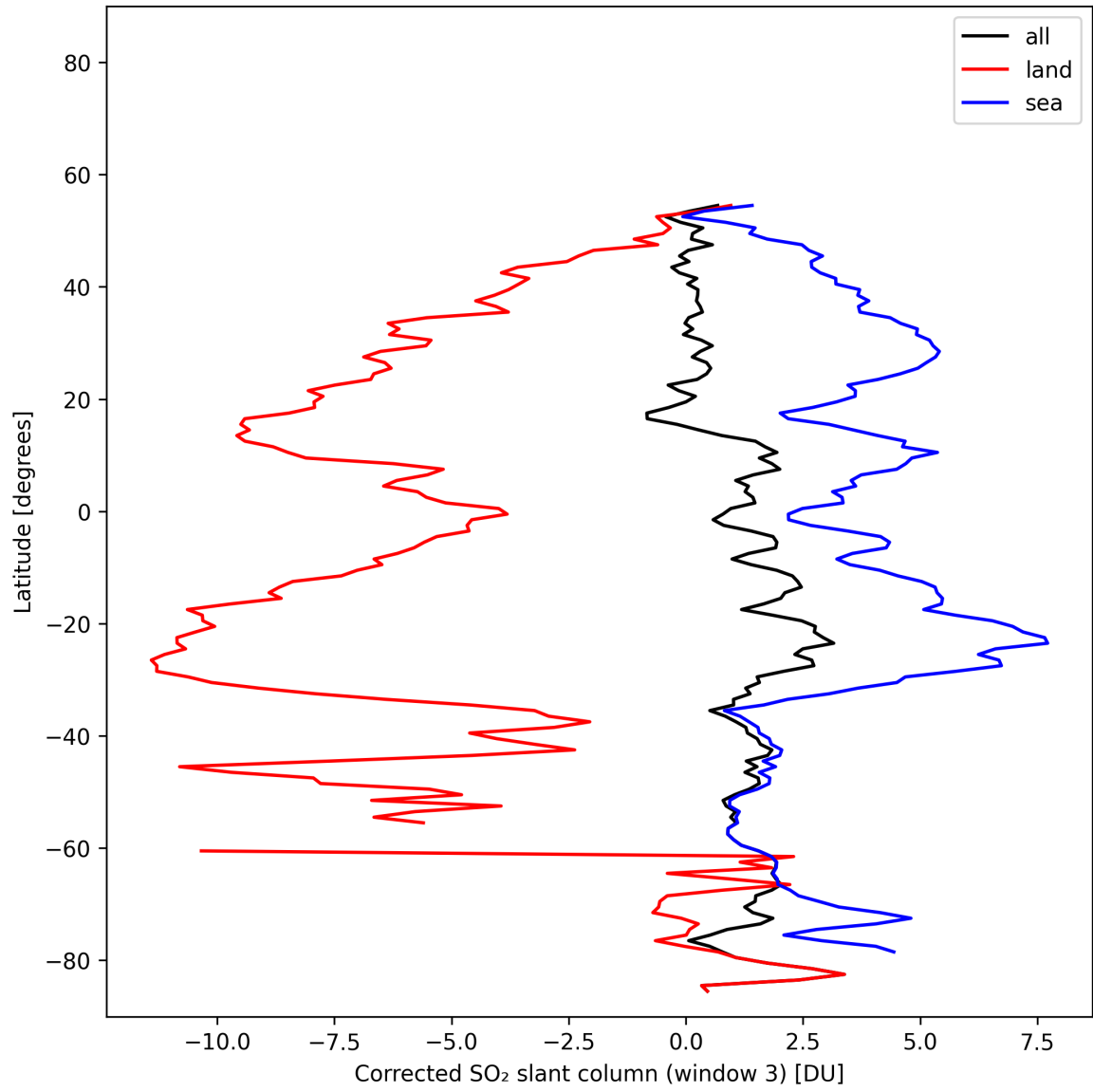


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-11-03 to 2025-11-04.

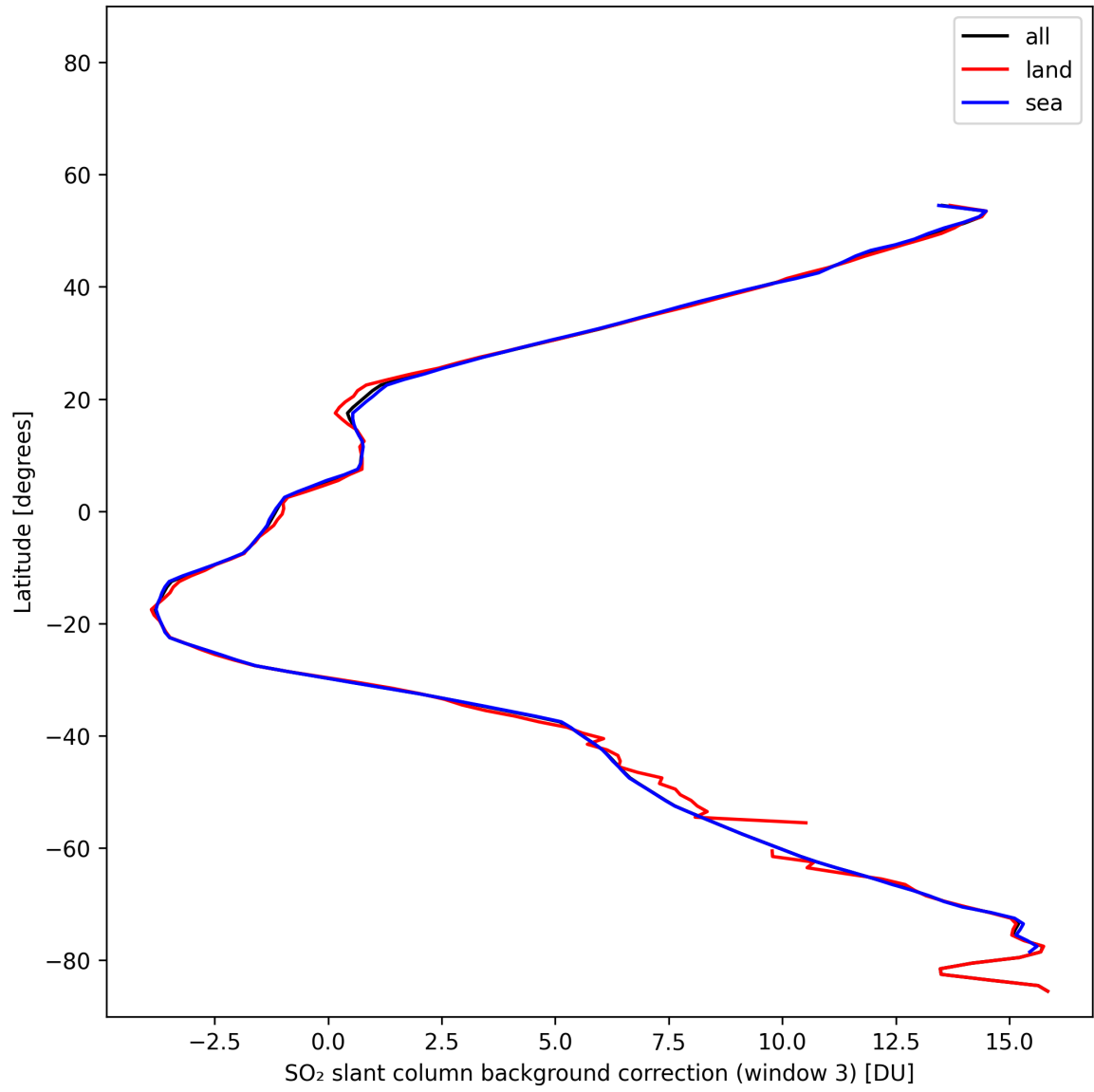


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-11-03 to 2025-11-04.

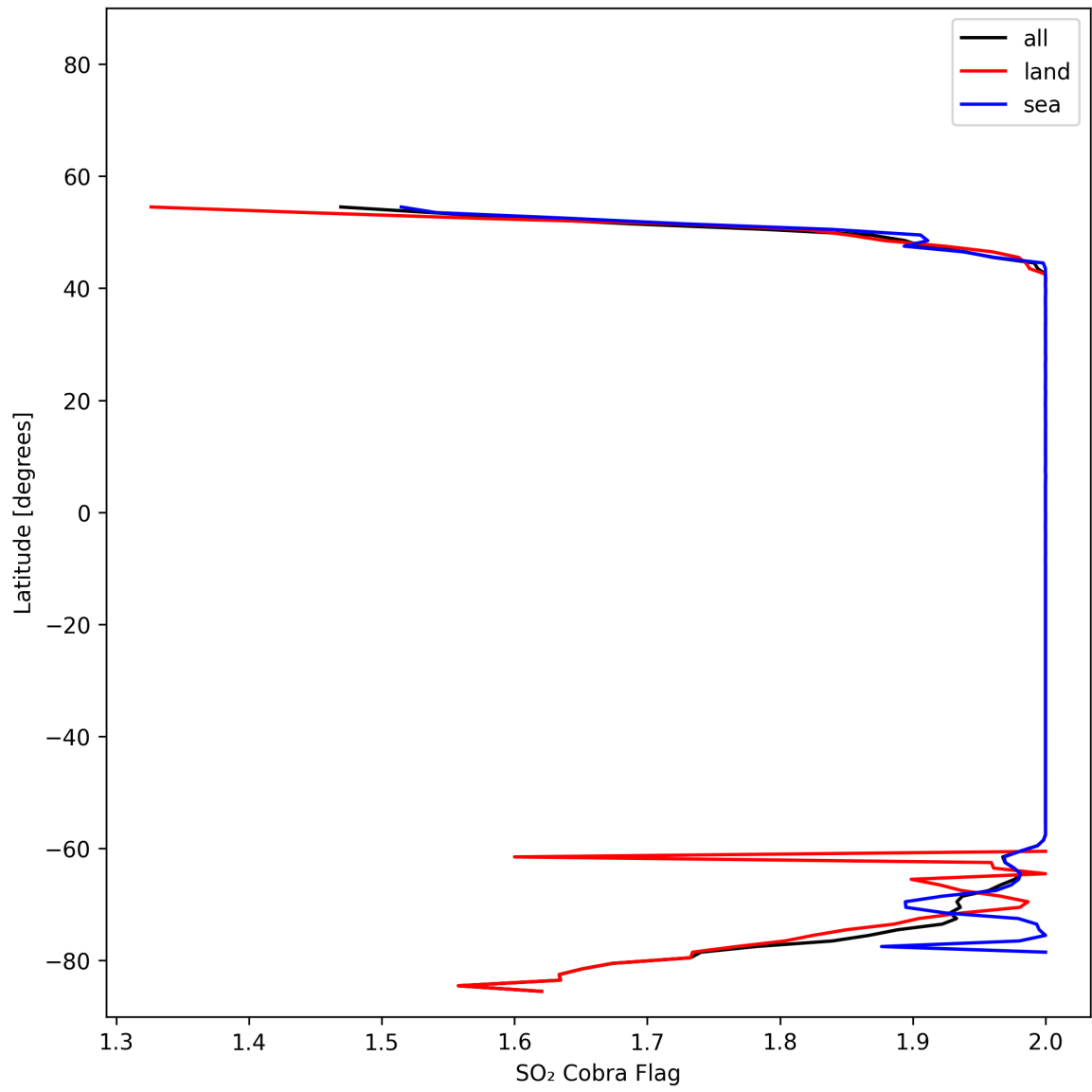


Figure 48: Zonal average of “SO₂ Cobra Flag” for 2025-11-03 to 2025-11-04.

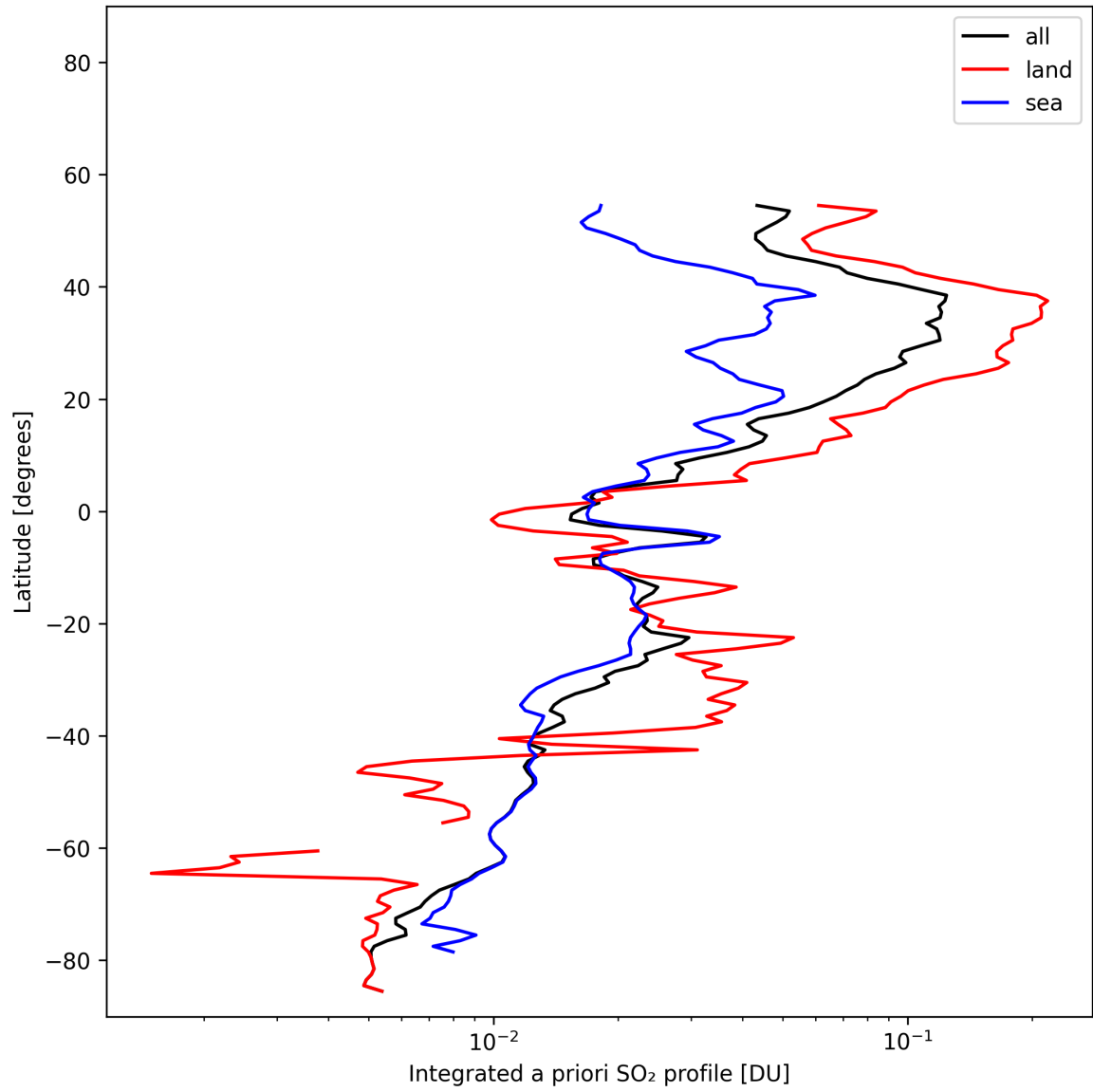


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-11-03 to 2025-11-04.

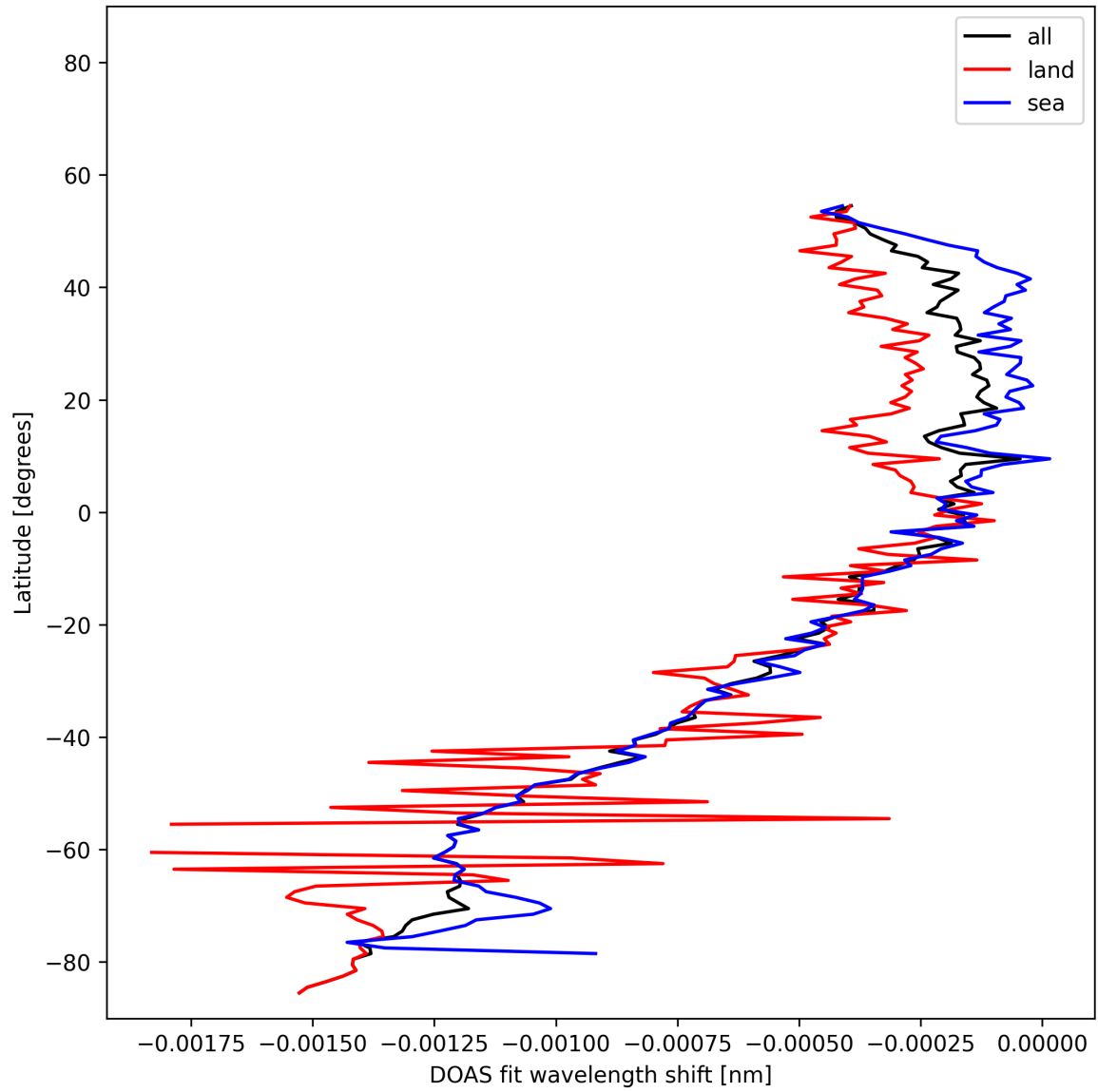


Figure 50: Zonal average of "DOAS fit wavelength shift" for 2025-11-03 to 2025-11-04.

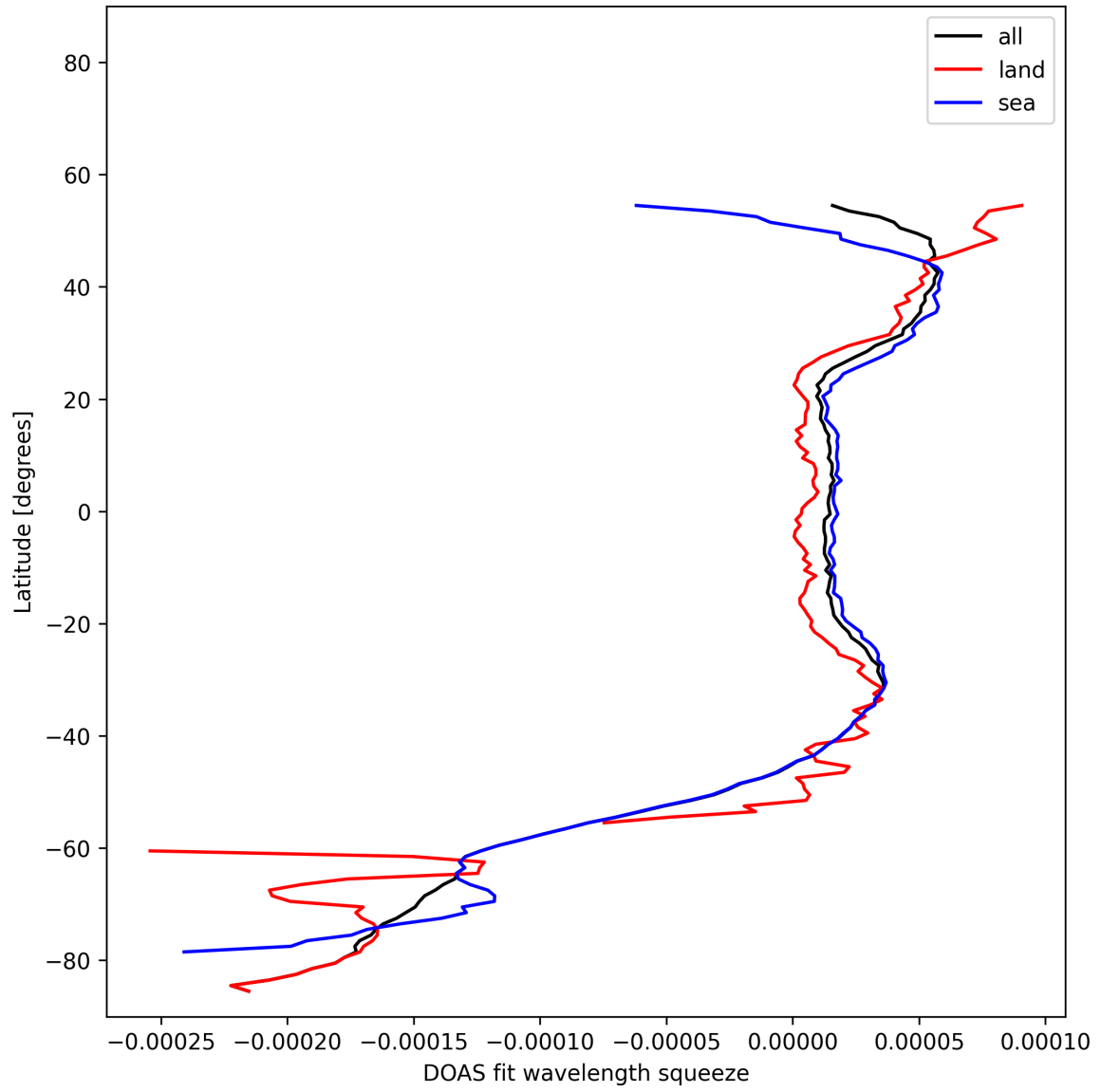


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-11-03 to 2025-11-04.

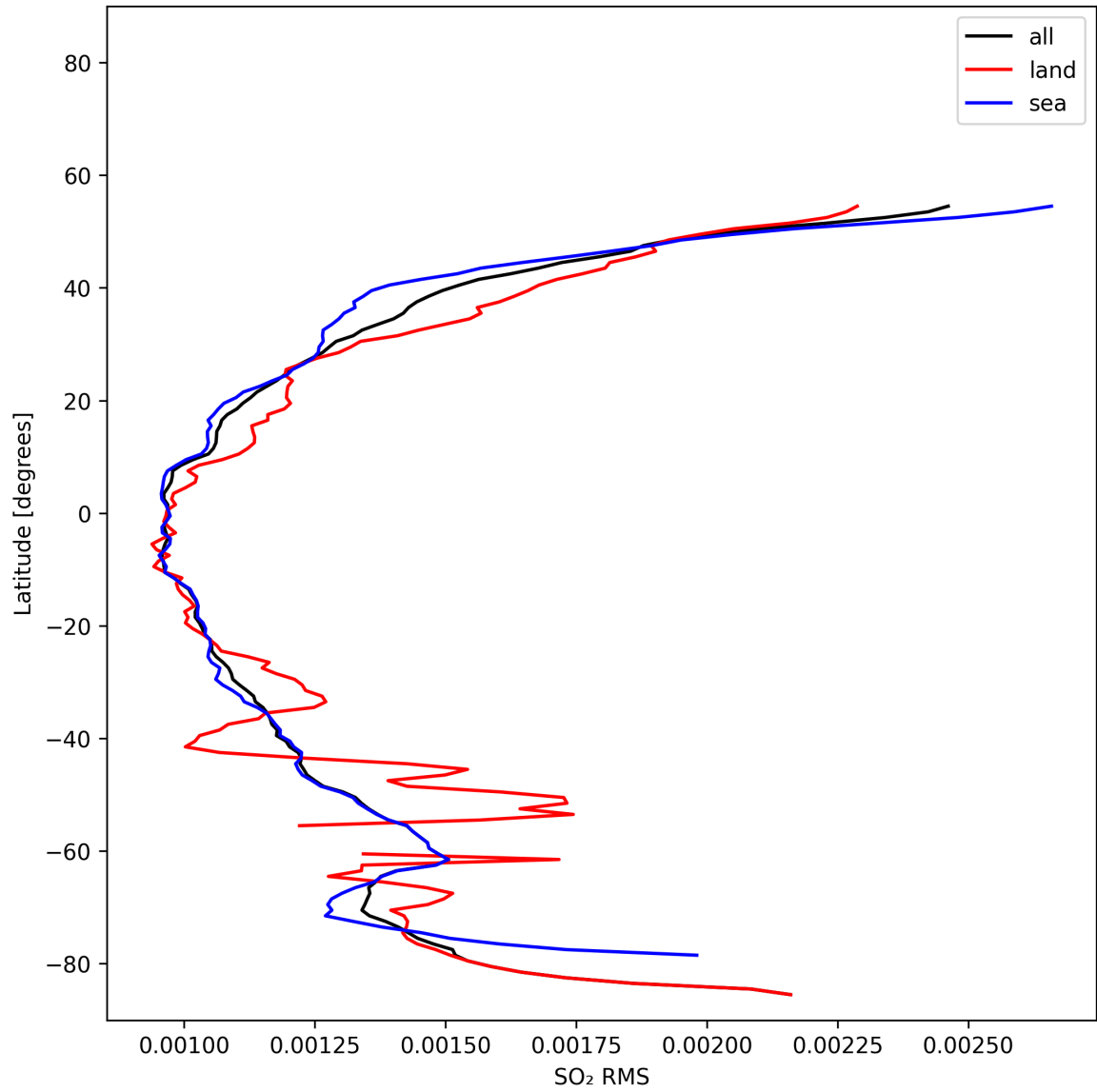


Figure 52: Zonal average of “SO₂ RMS” for 2025-11-03 to 2025-11-04.

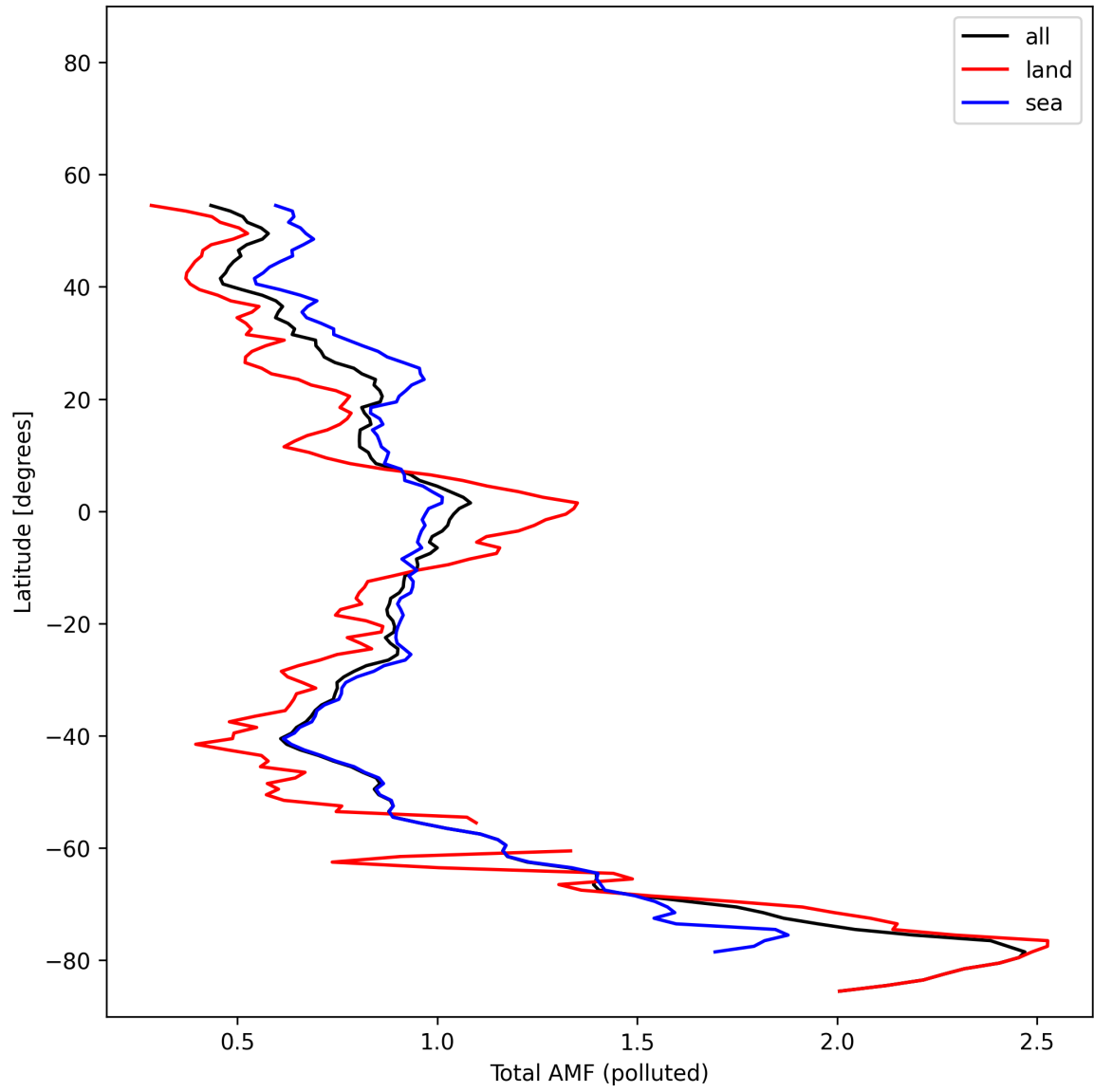


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-11-03 to 2025-11-04.

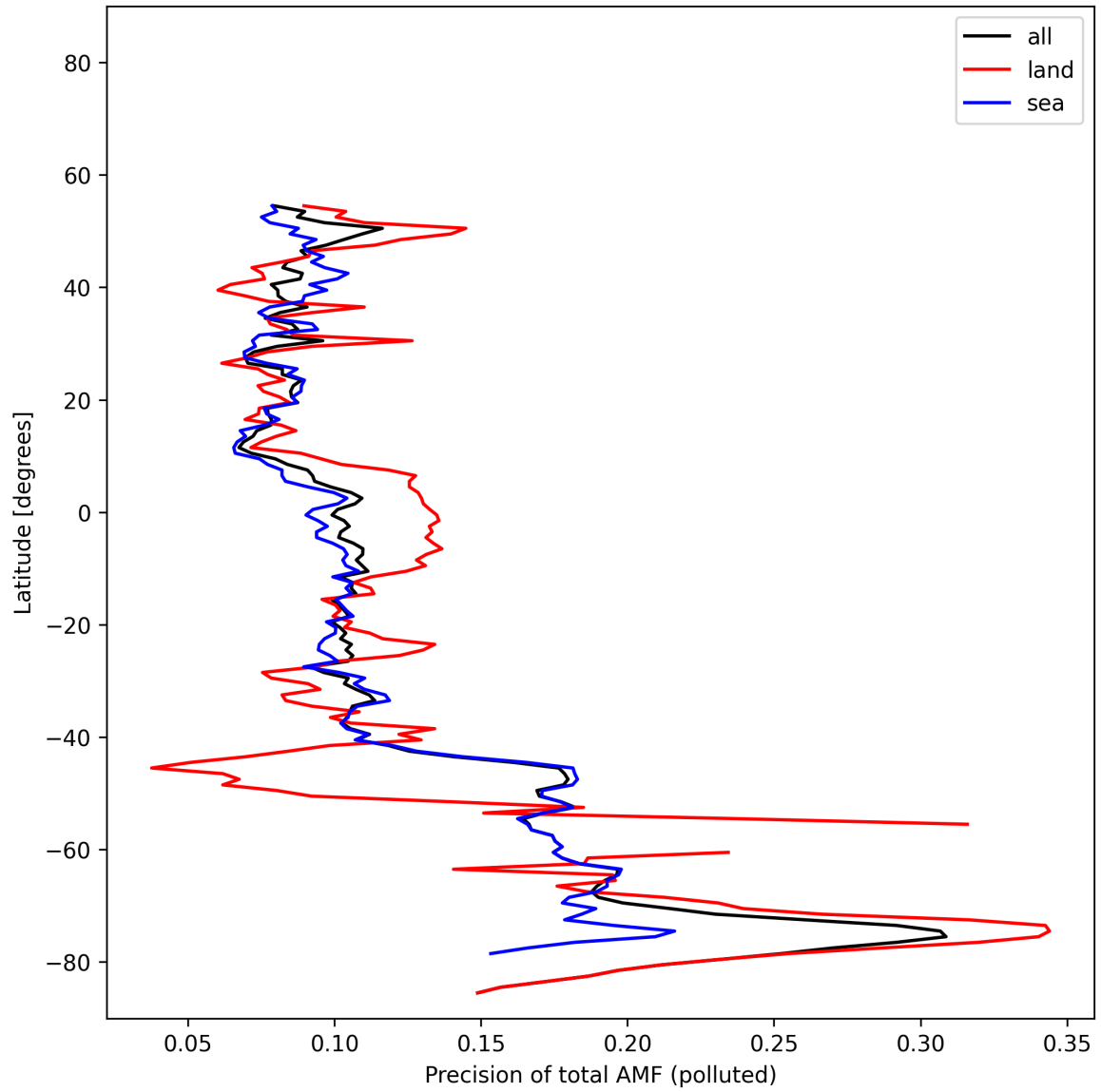


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-11-03 to 2025-11-04.

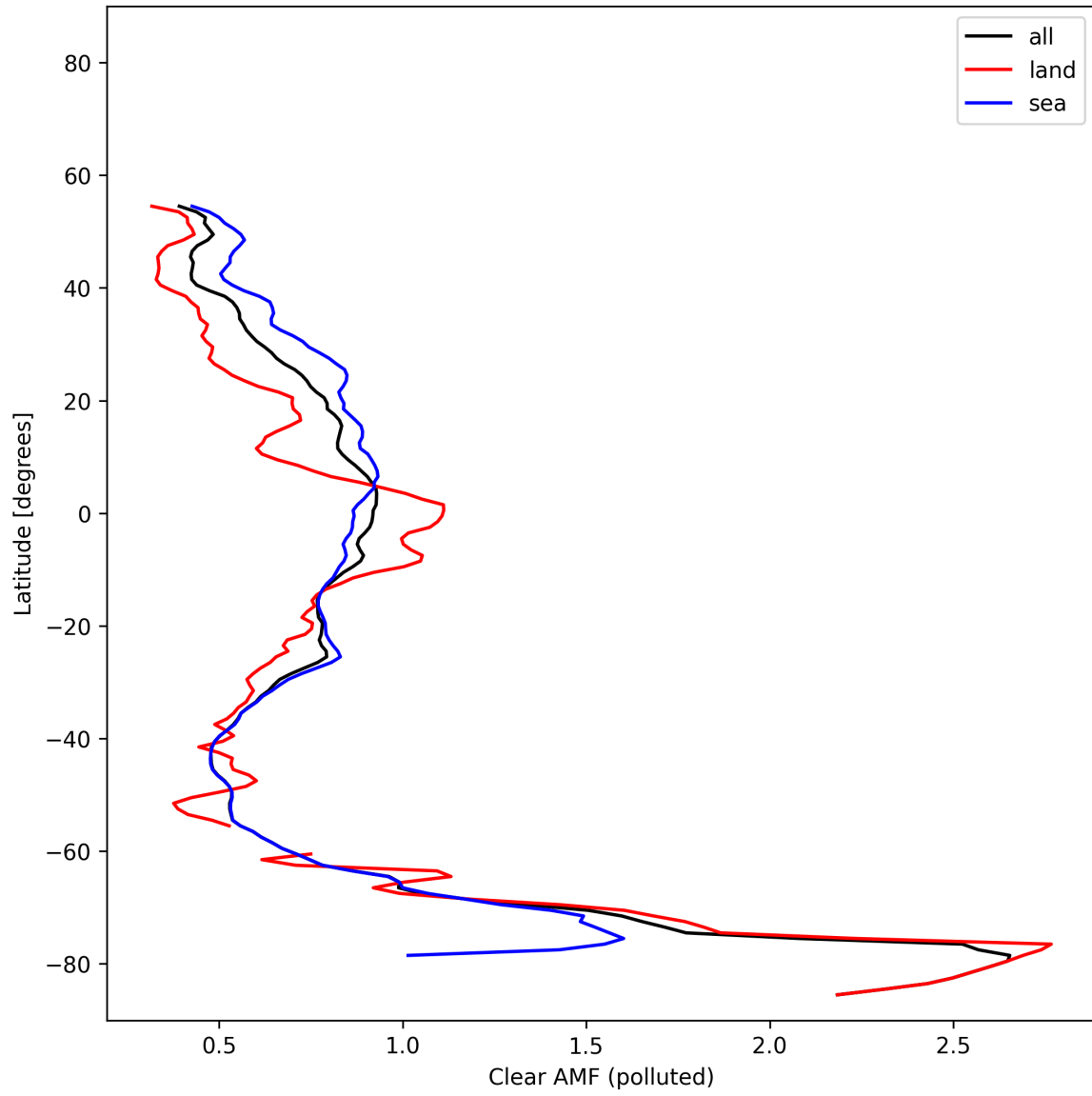


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-11-03 to 2025-11-04.

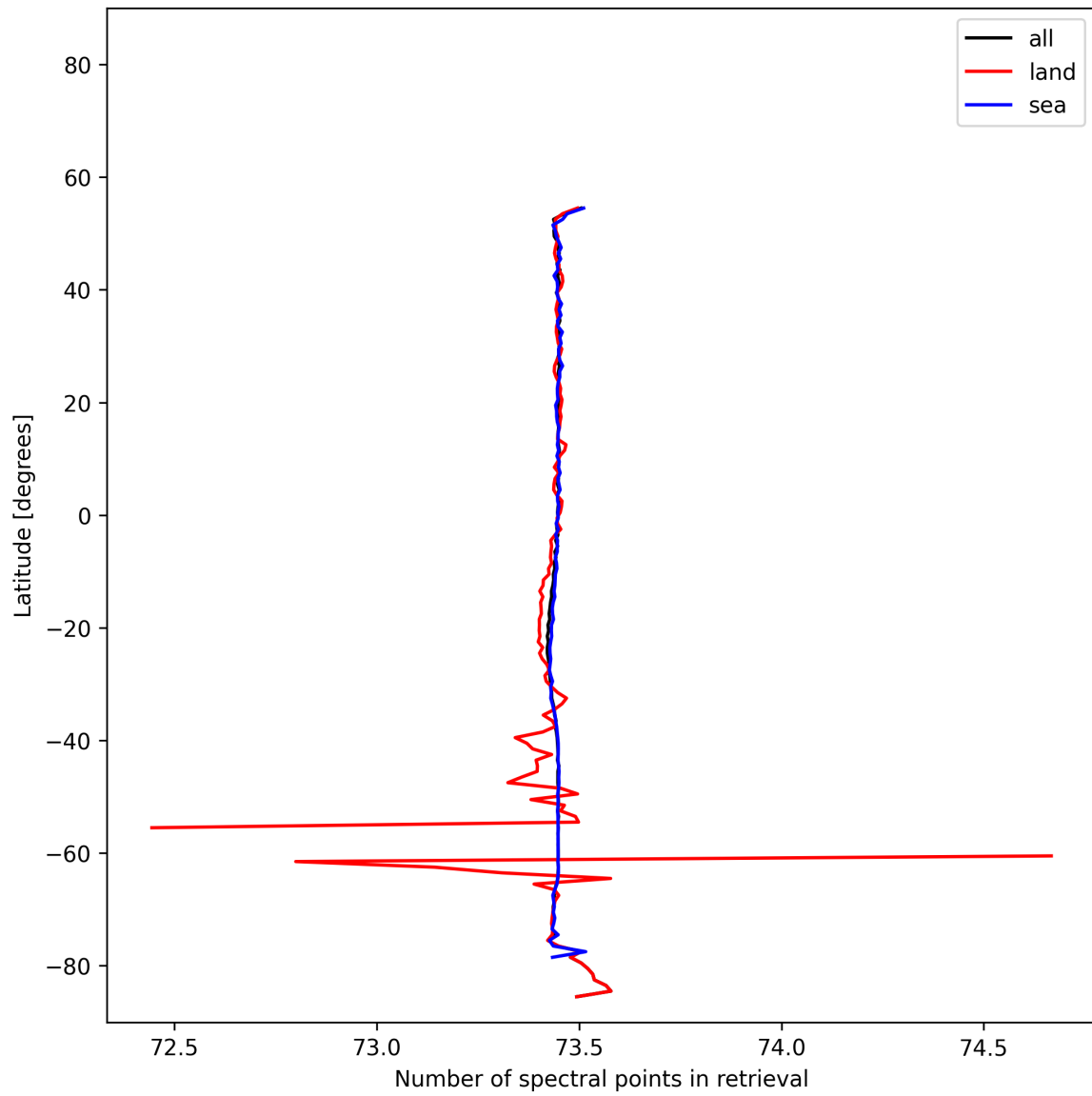


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-11-03 to 2025-11-04.

8 Histograms

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

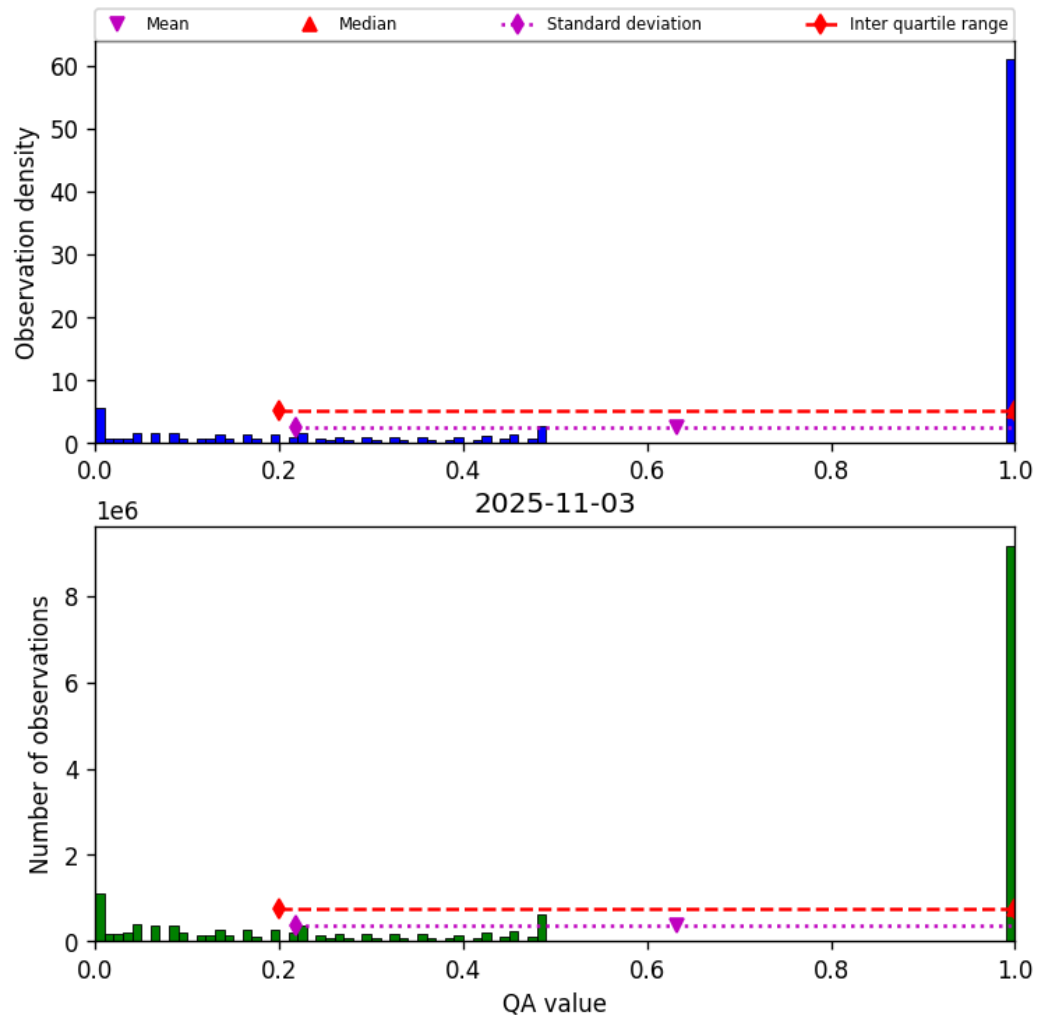


Figure 57: Histogram of “QA value” for 2025-11-03 to 2025-11-04

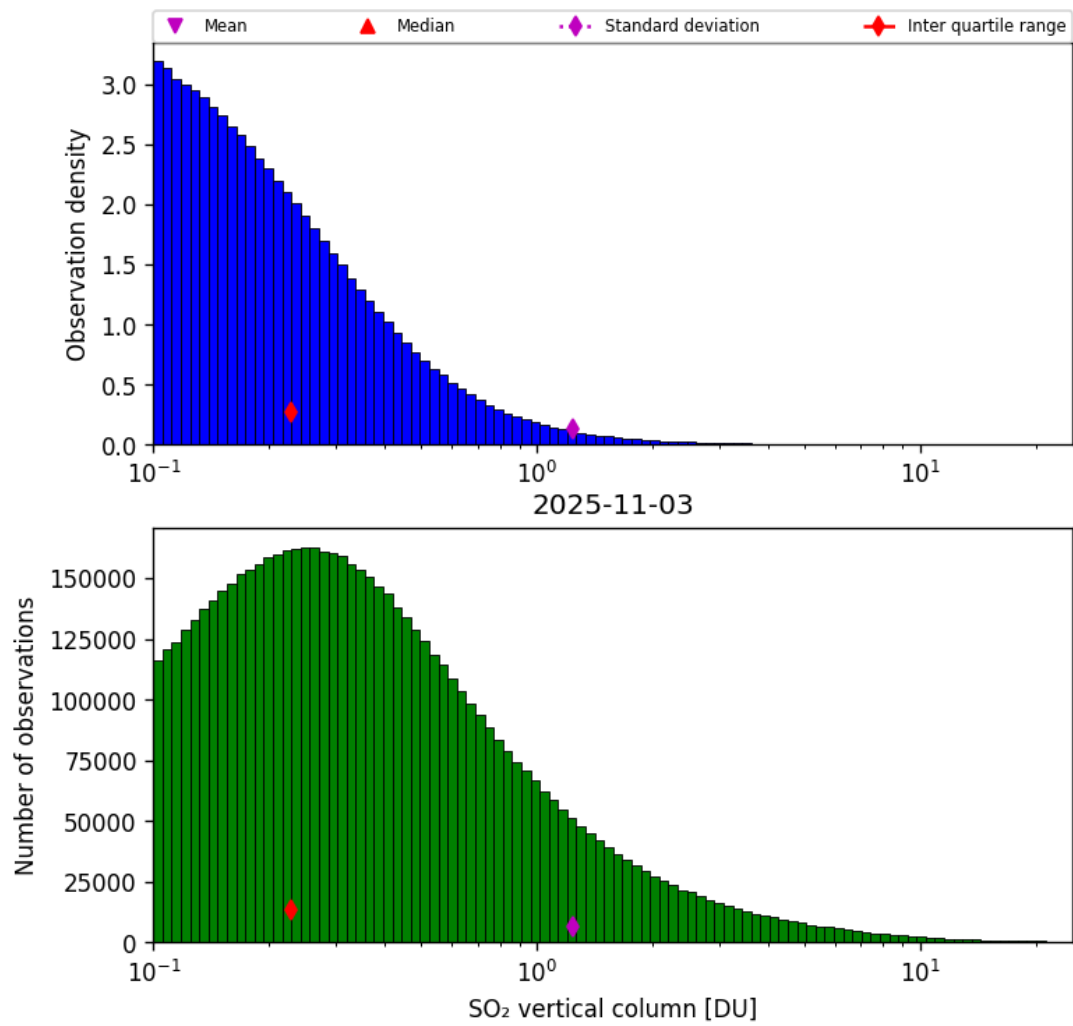


Figure 58: Histogram of “SO₂ vertical column” for 2025-11-03 to 2025-11-04

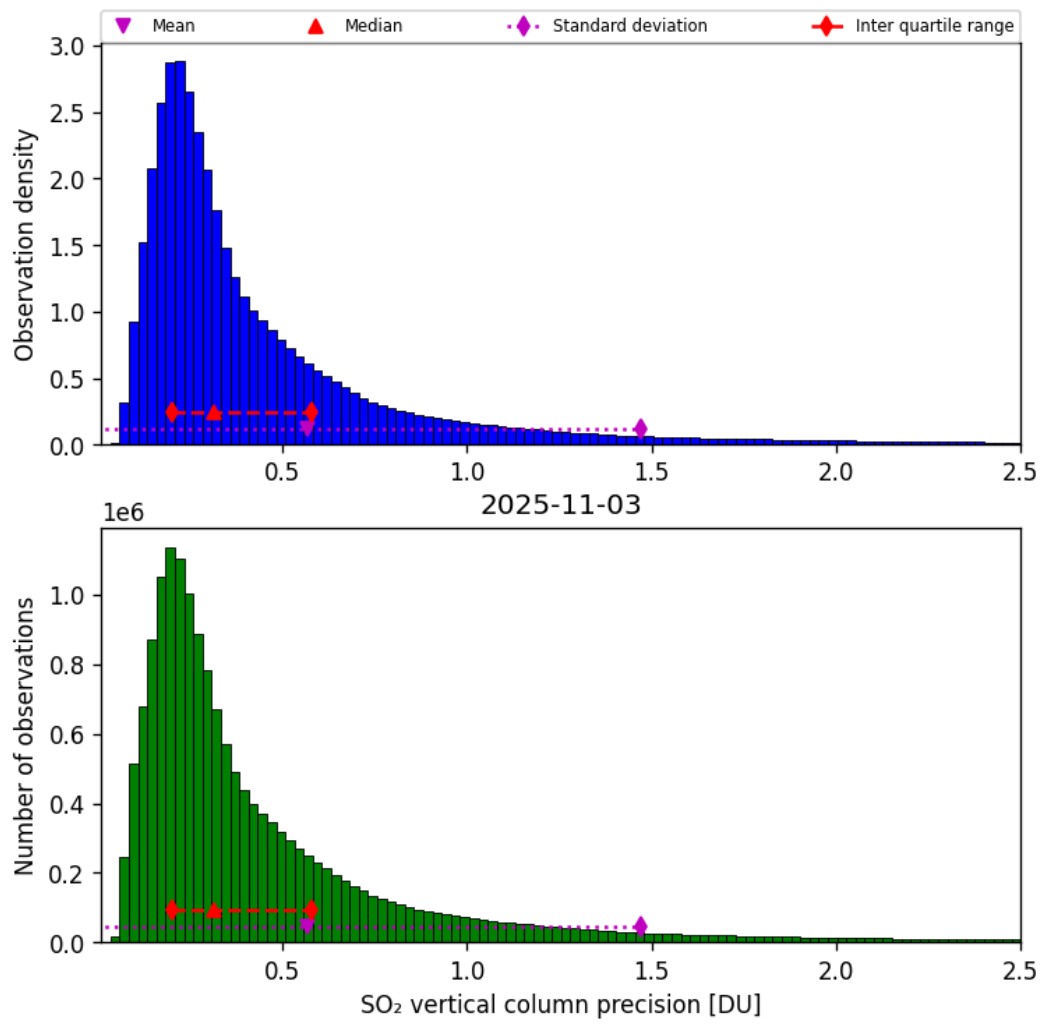


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-11-03 to 2025-11-04

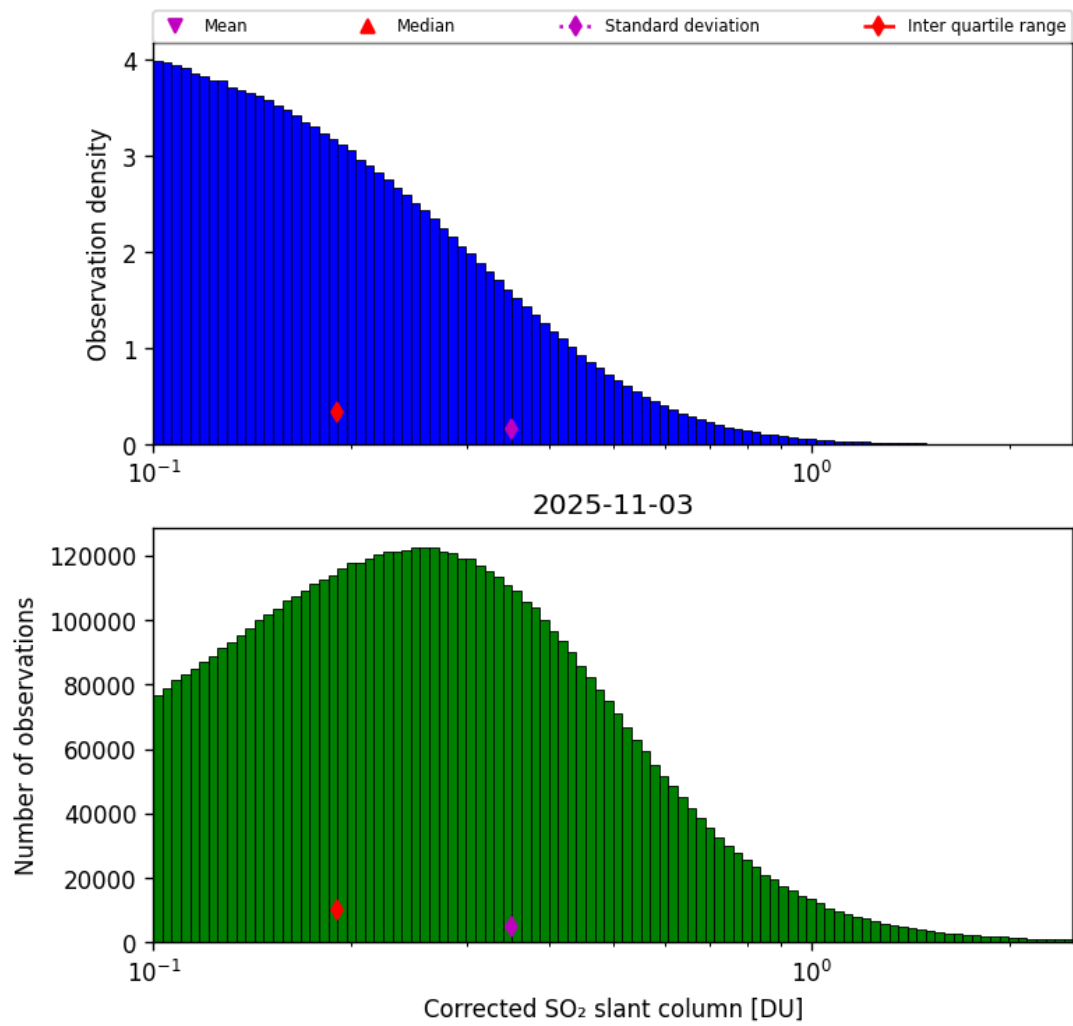


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-11-03 to 2025-11-04

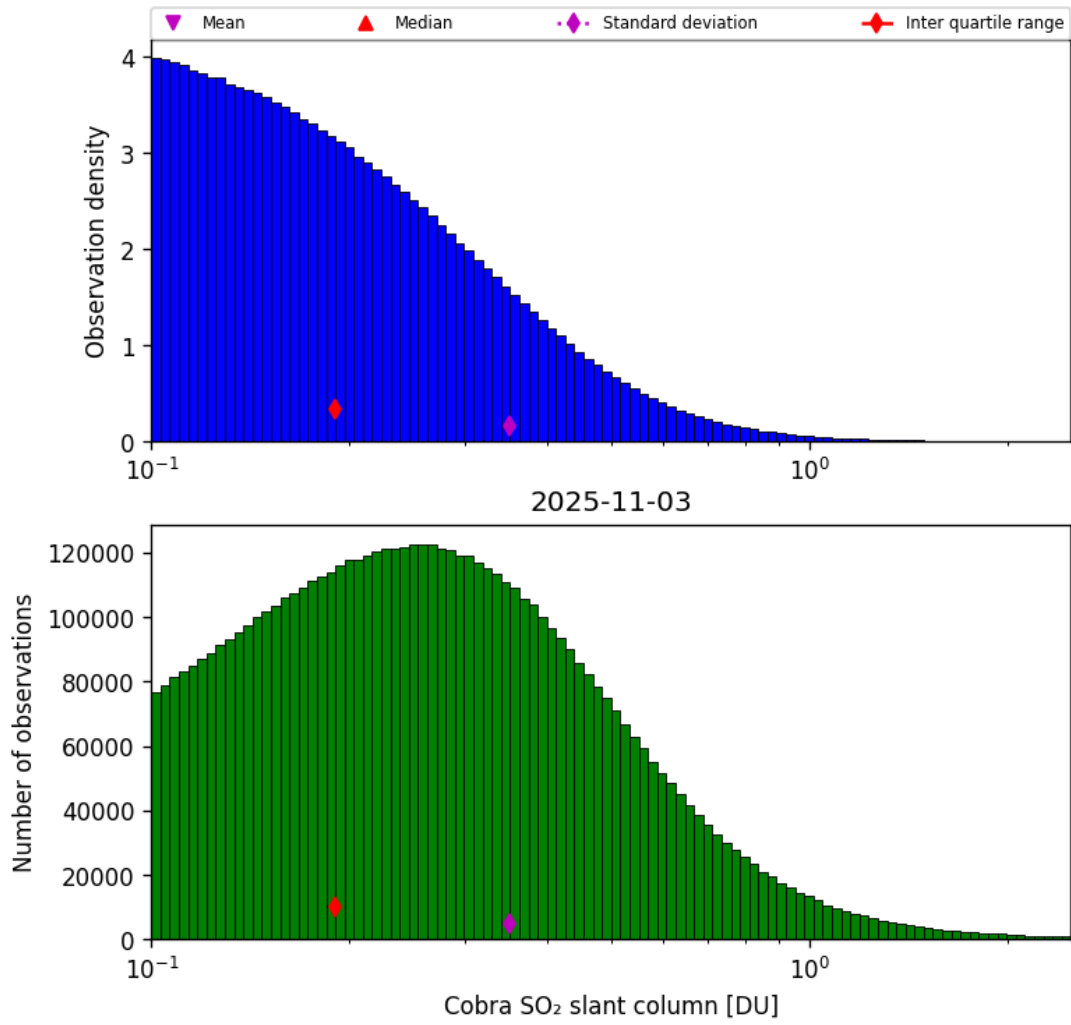


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-11-03 to 2025-11-04

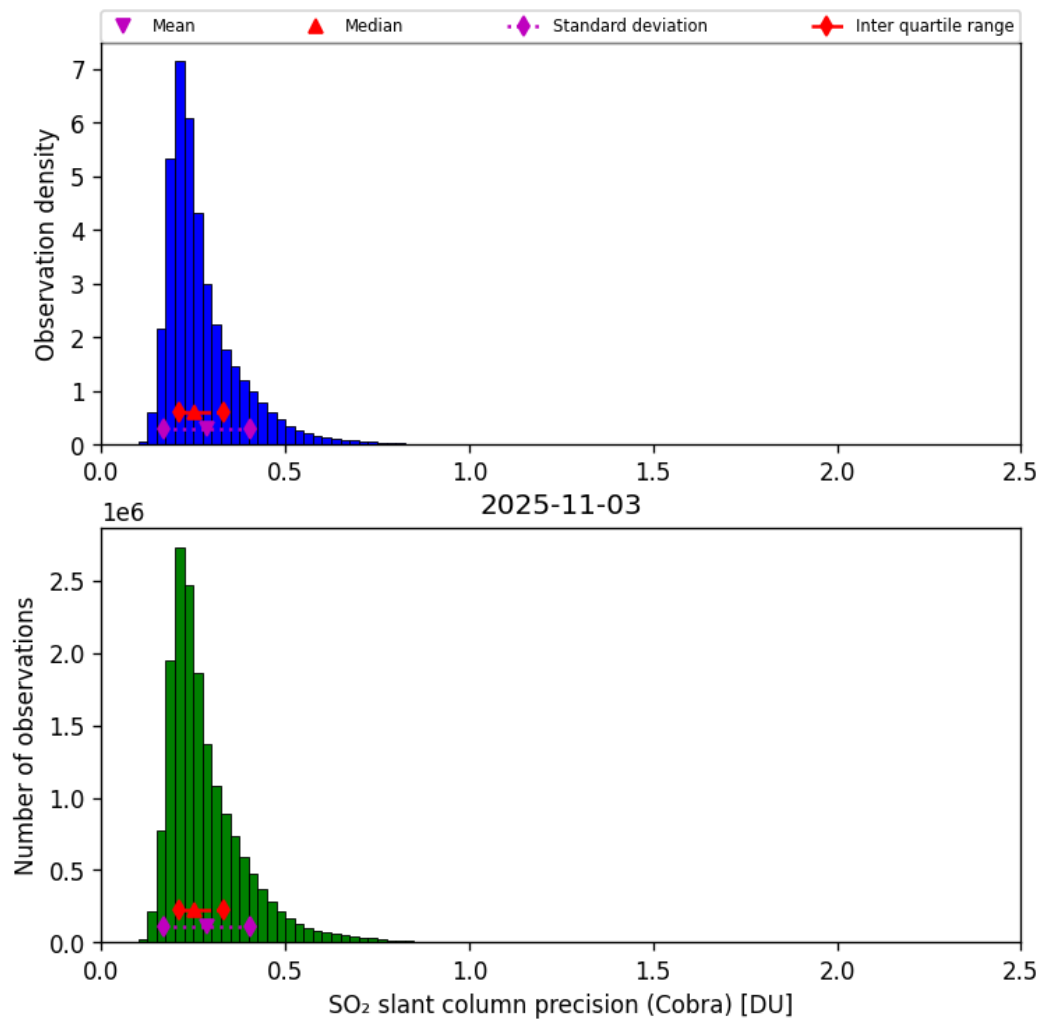


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-11-03 to 2025-11-04

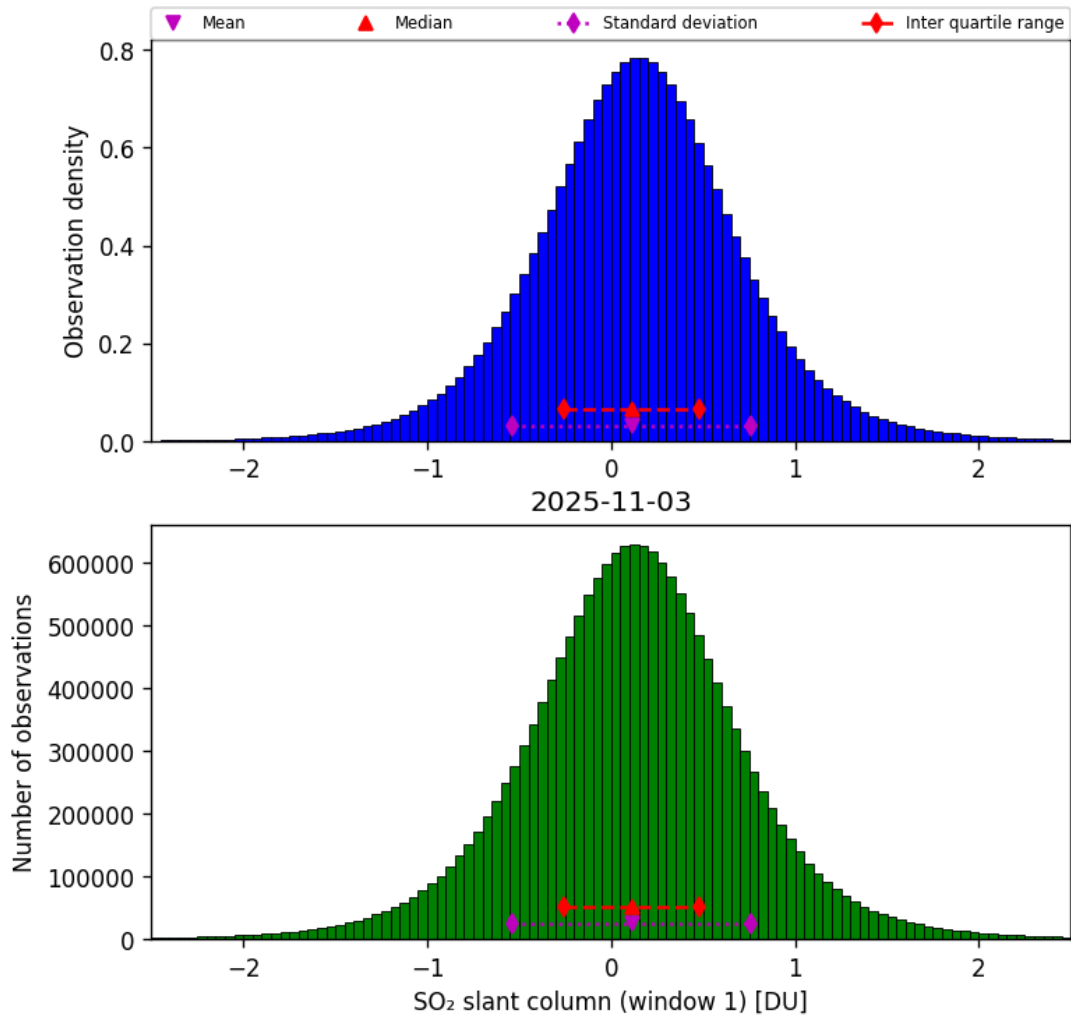


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-11-03 to 2025-11-04

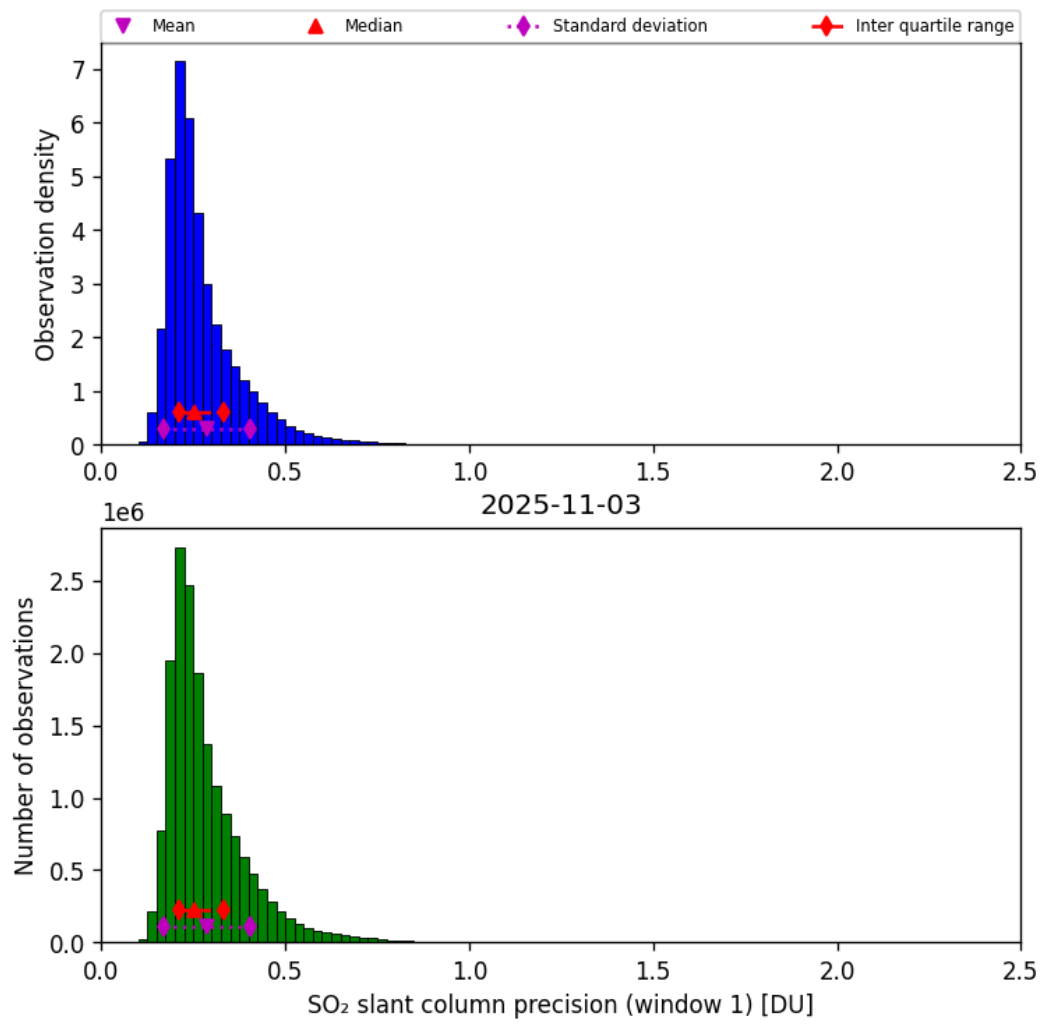


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-11-03 to 2025-11-04

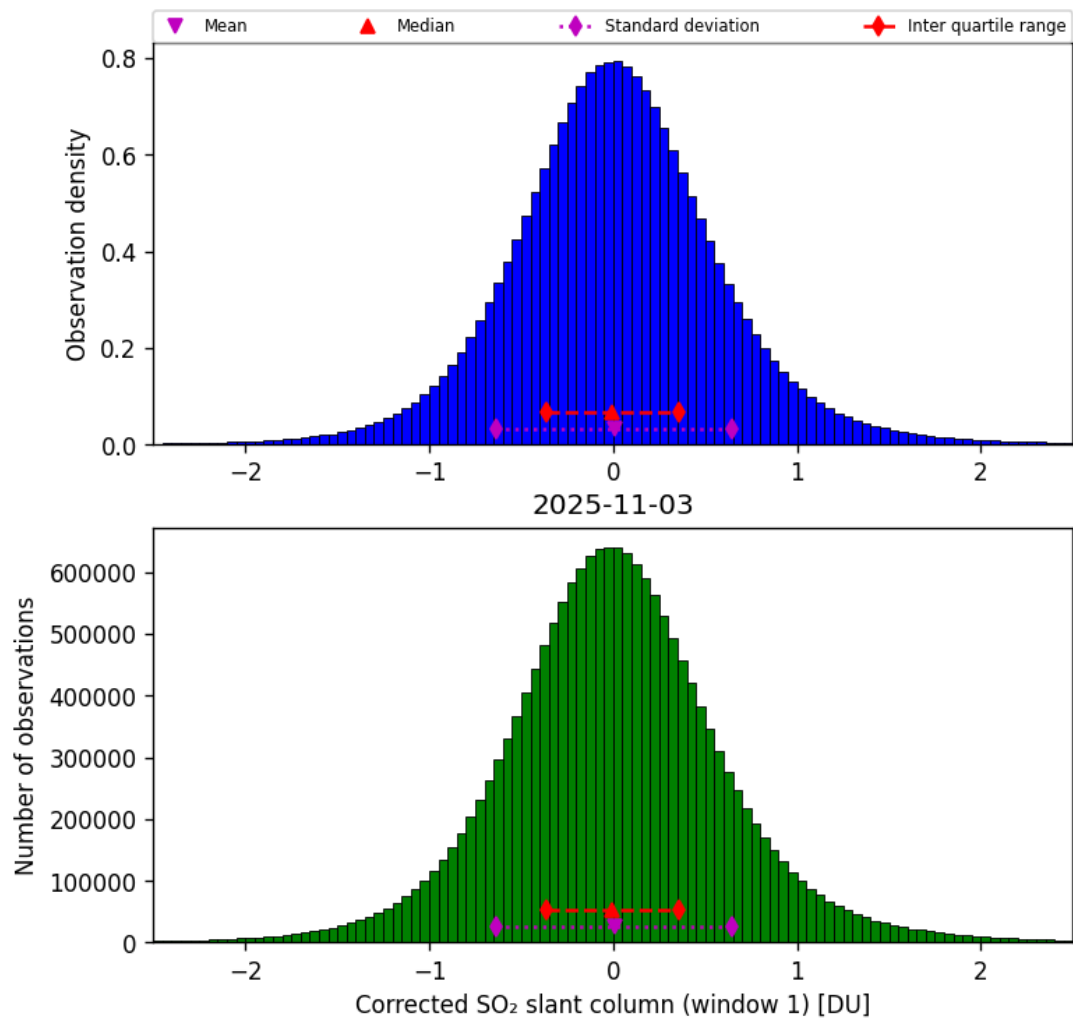


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-11-03 to 2025-11-04

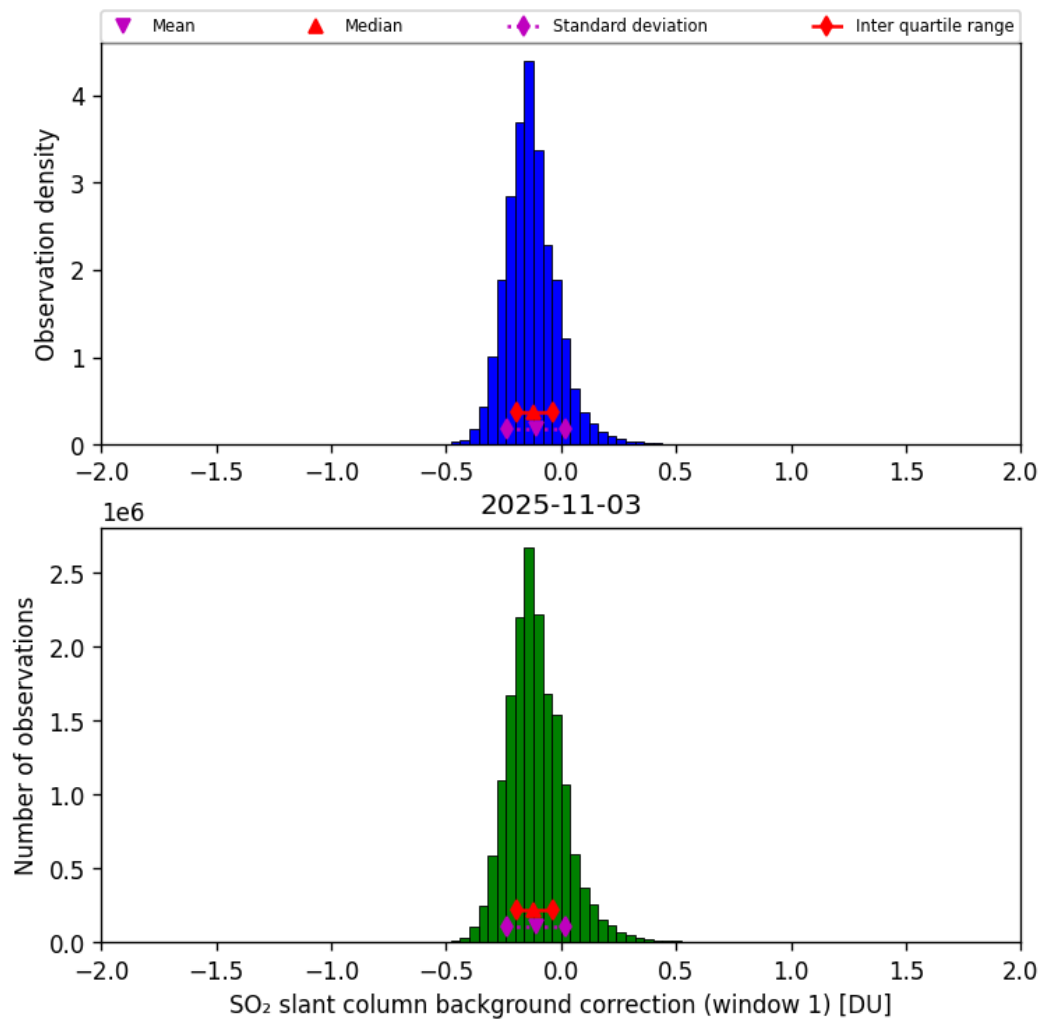


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-11-03 to 2025-11-04

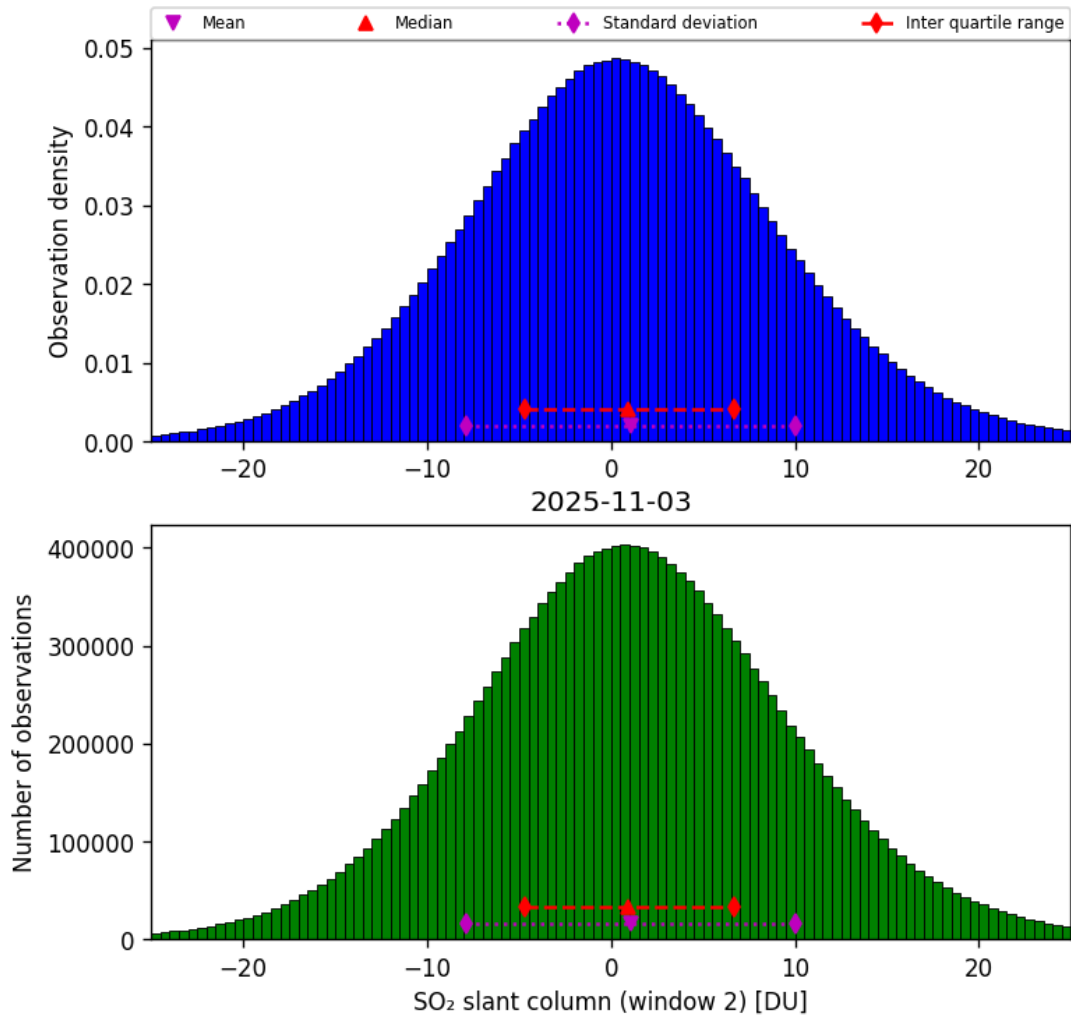


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-11-03 to 2025-11-04

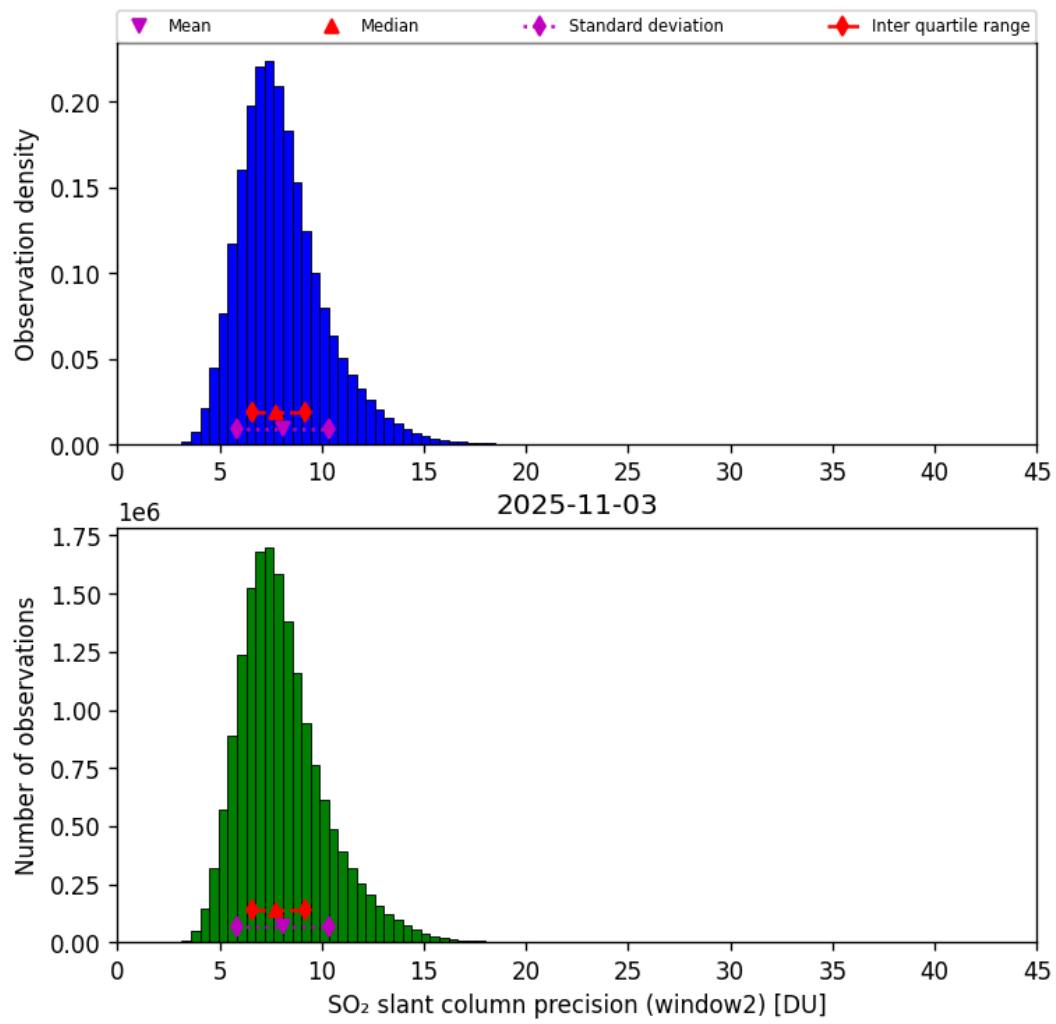


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-11-03 to 2025-11-04

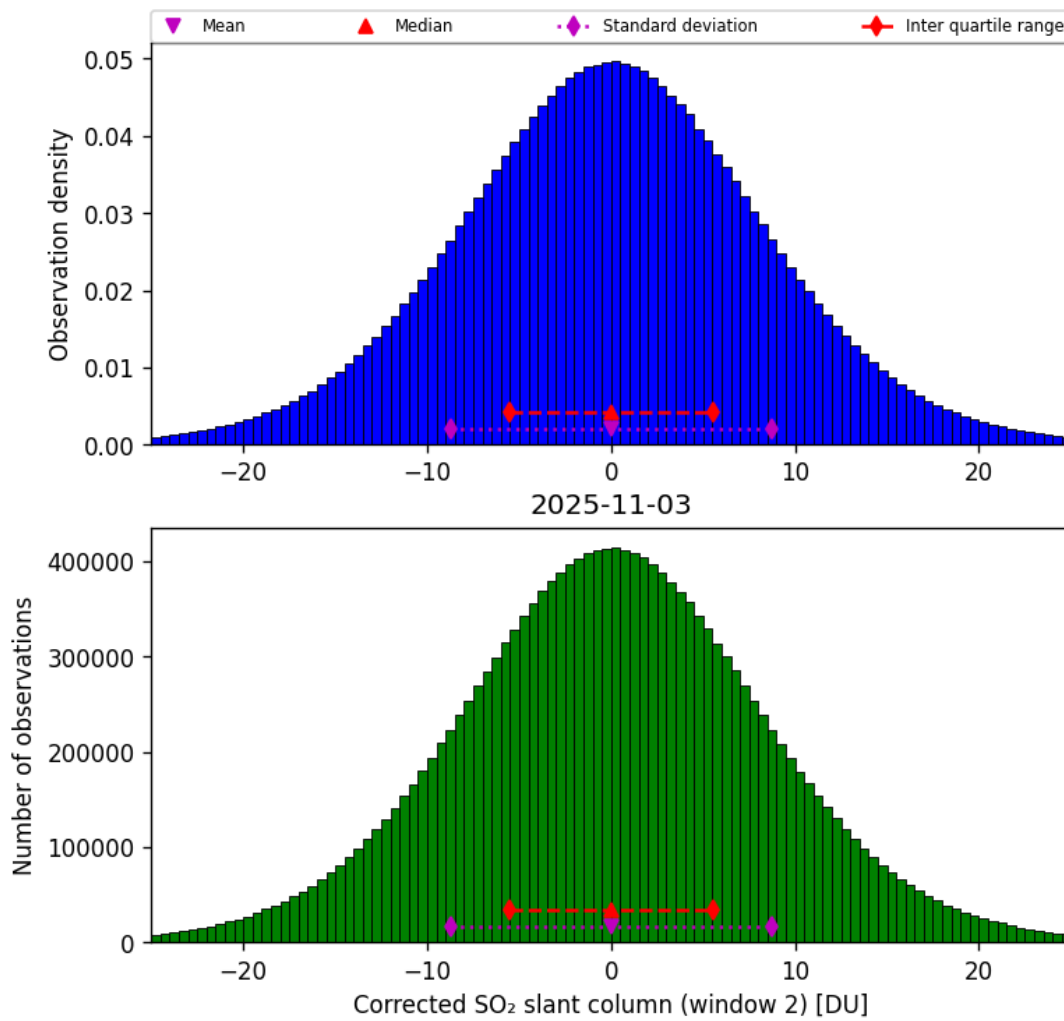


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-11-03 to 2025-11-04

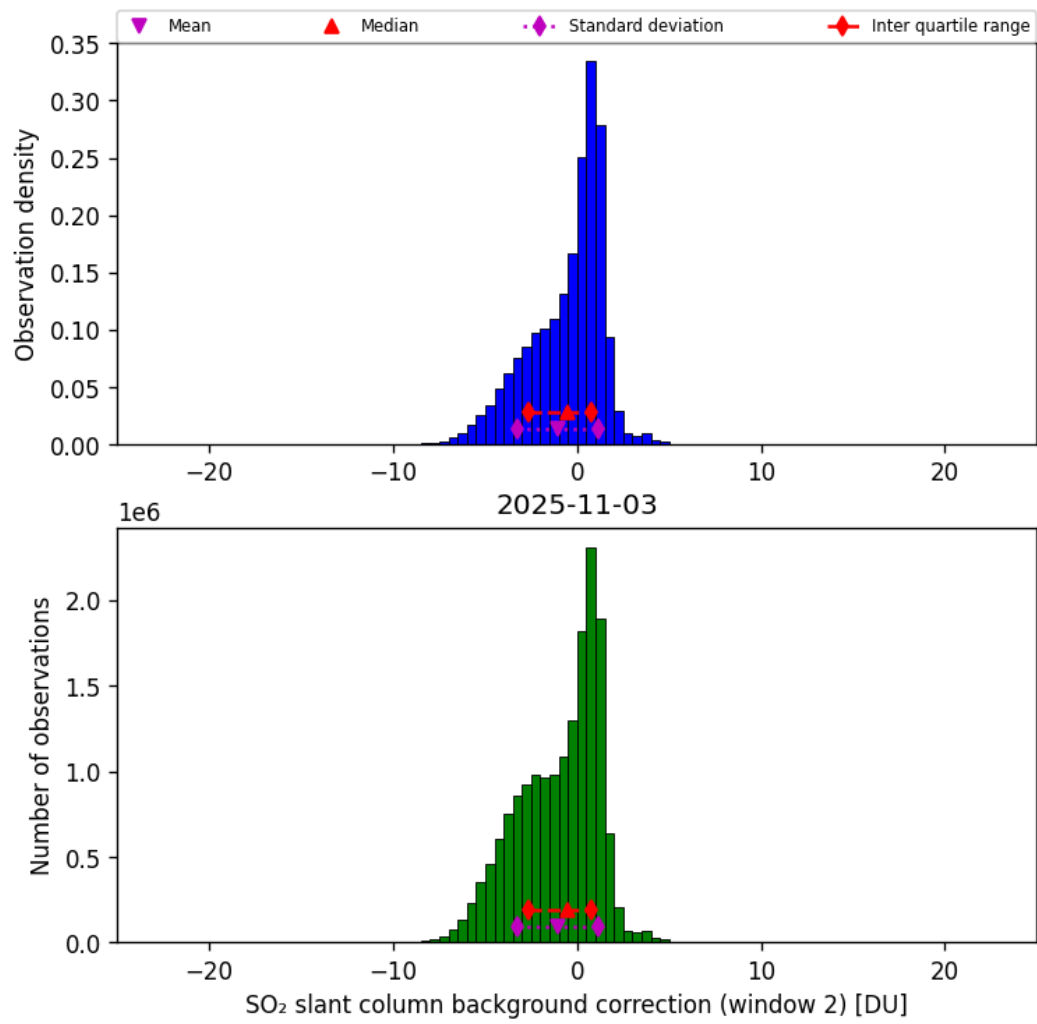


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-11-03 to 2025-11-04

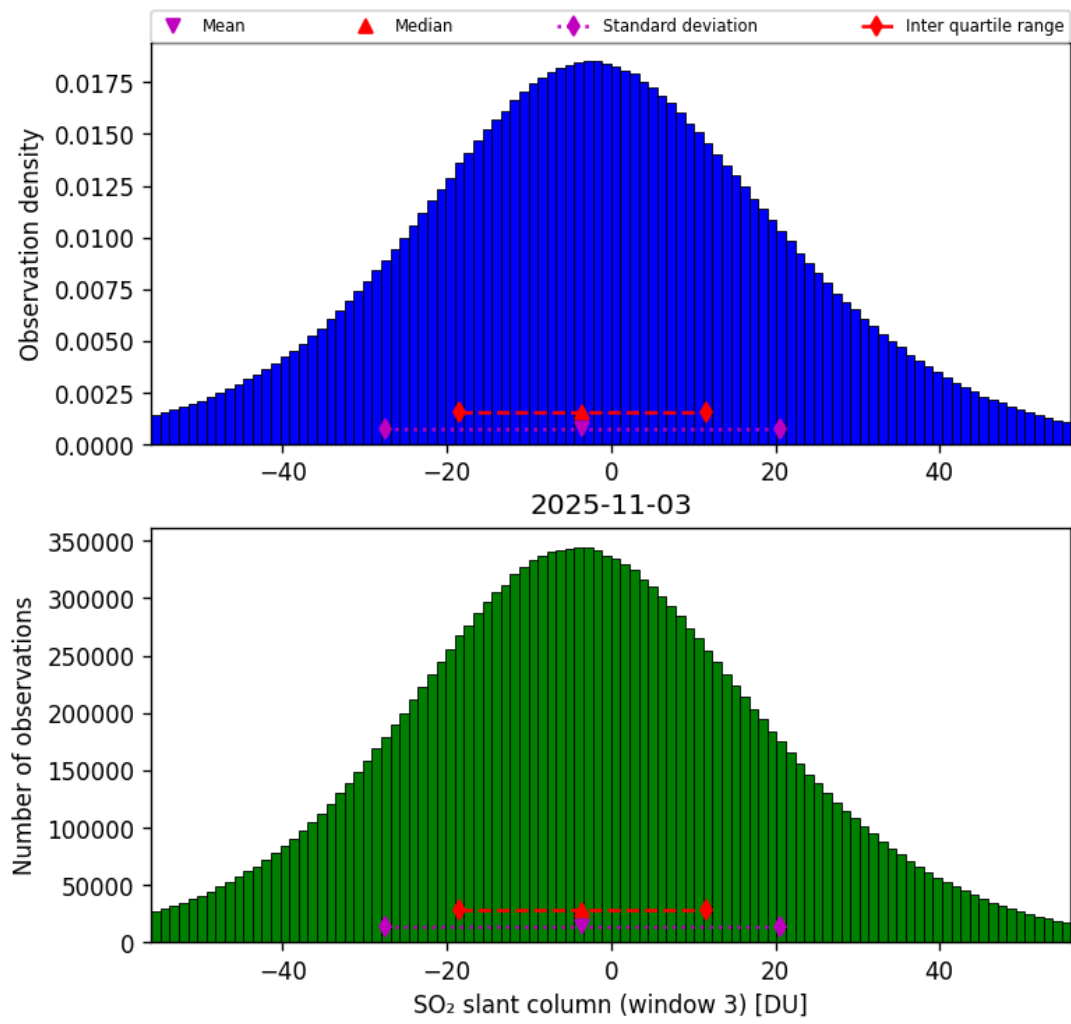


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-11-03 to 2025-11-04

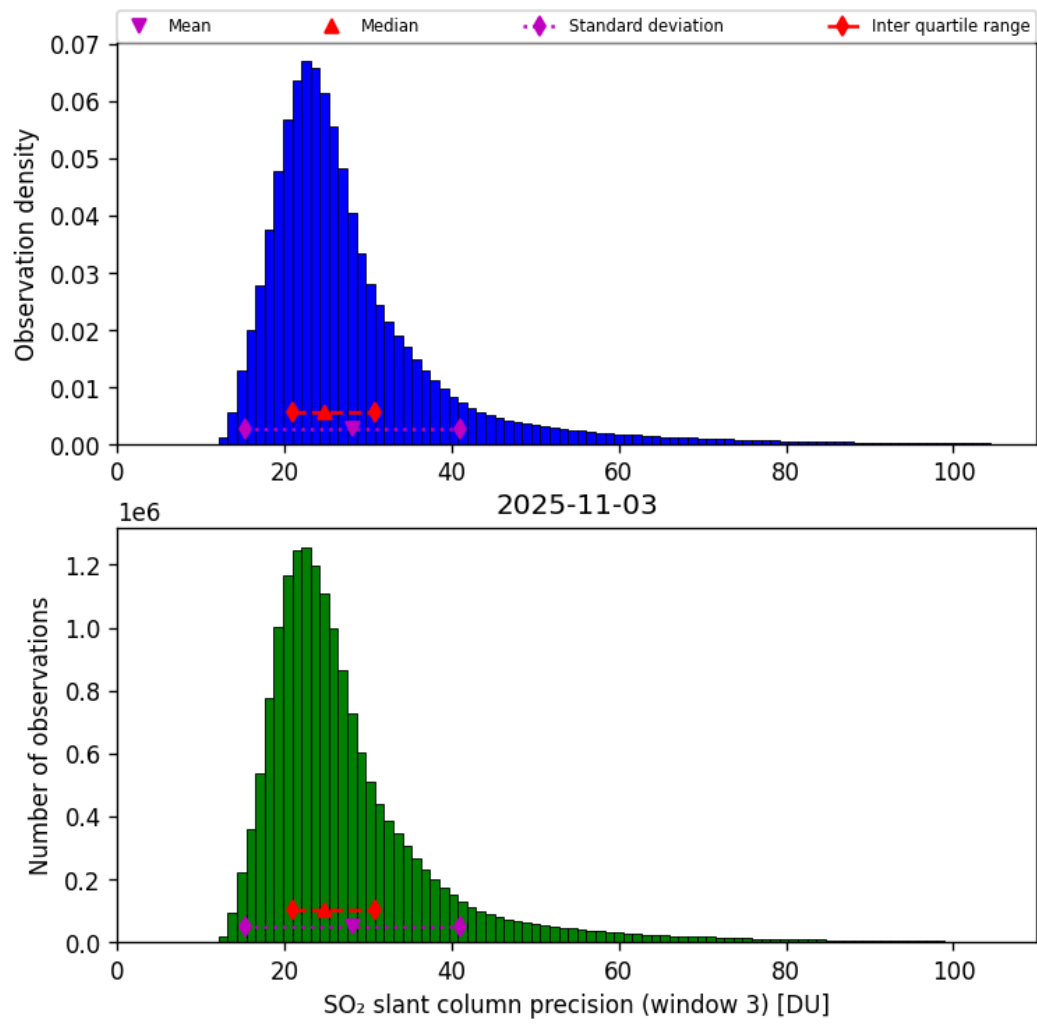


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-11-03 to 2025-11-04

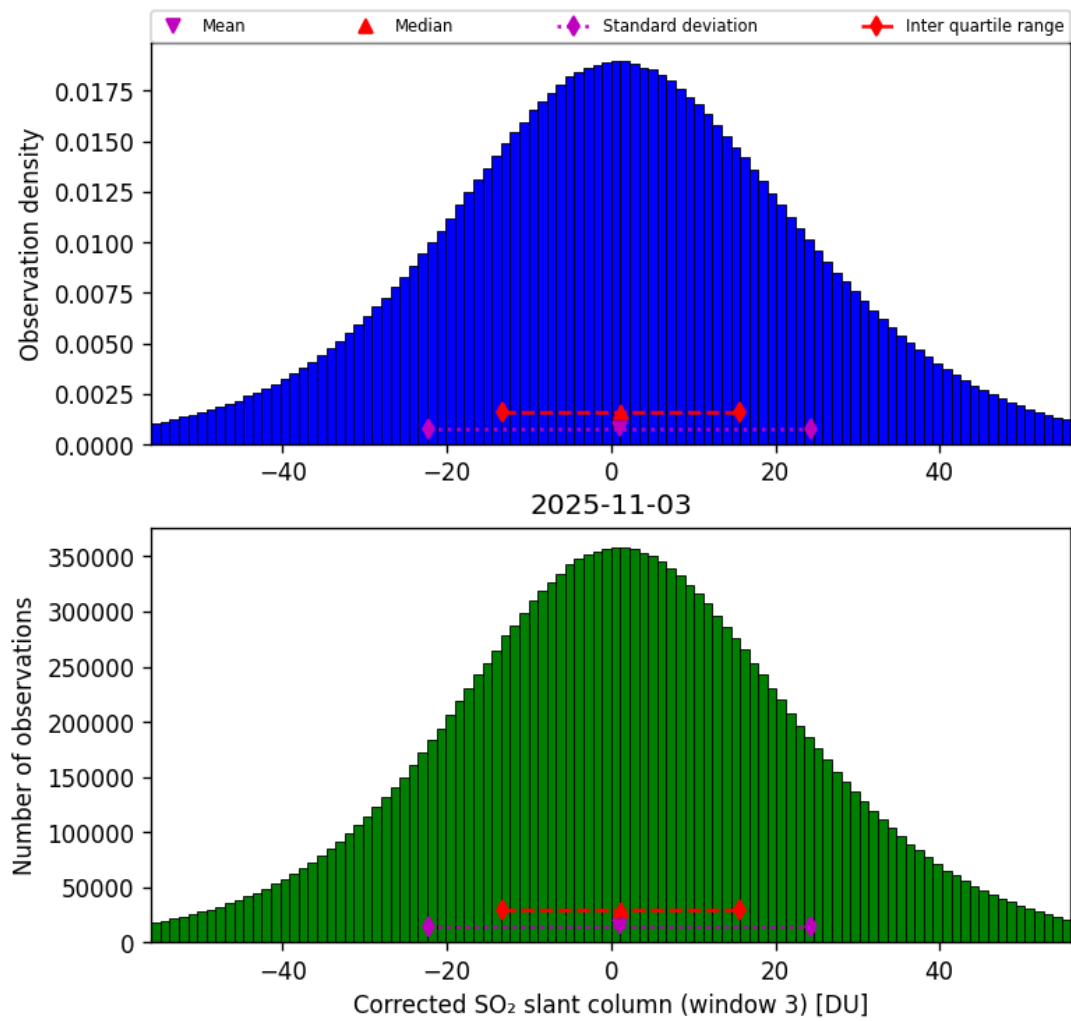


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-11-03 to 2025-11-04

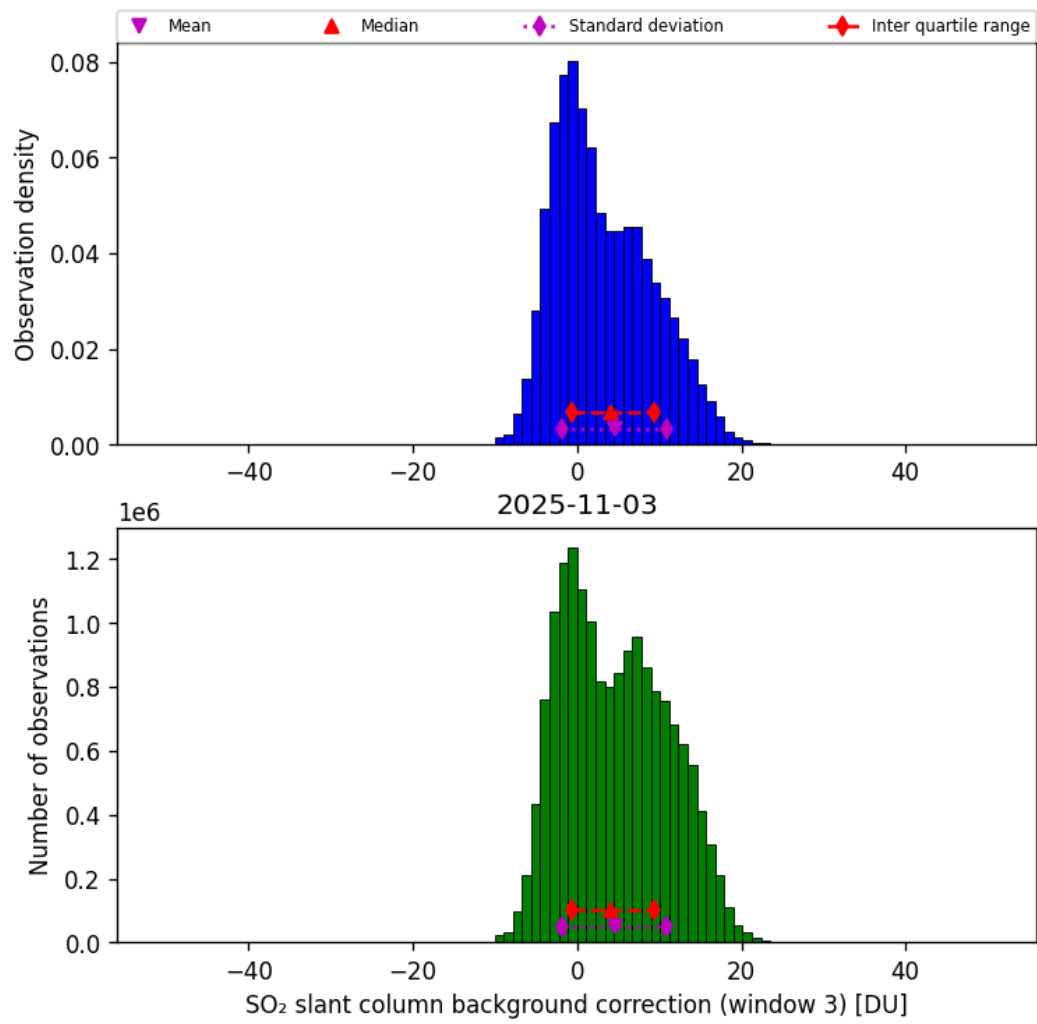


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-11-03 to 2025-11-04

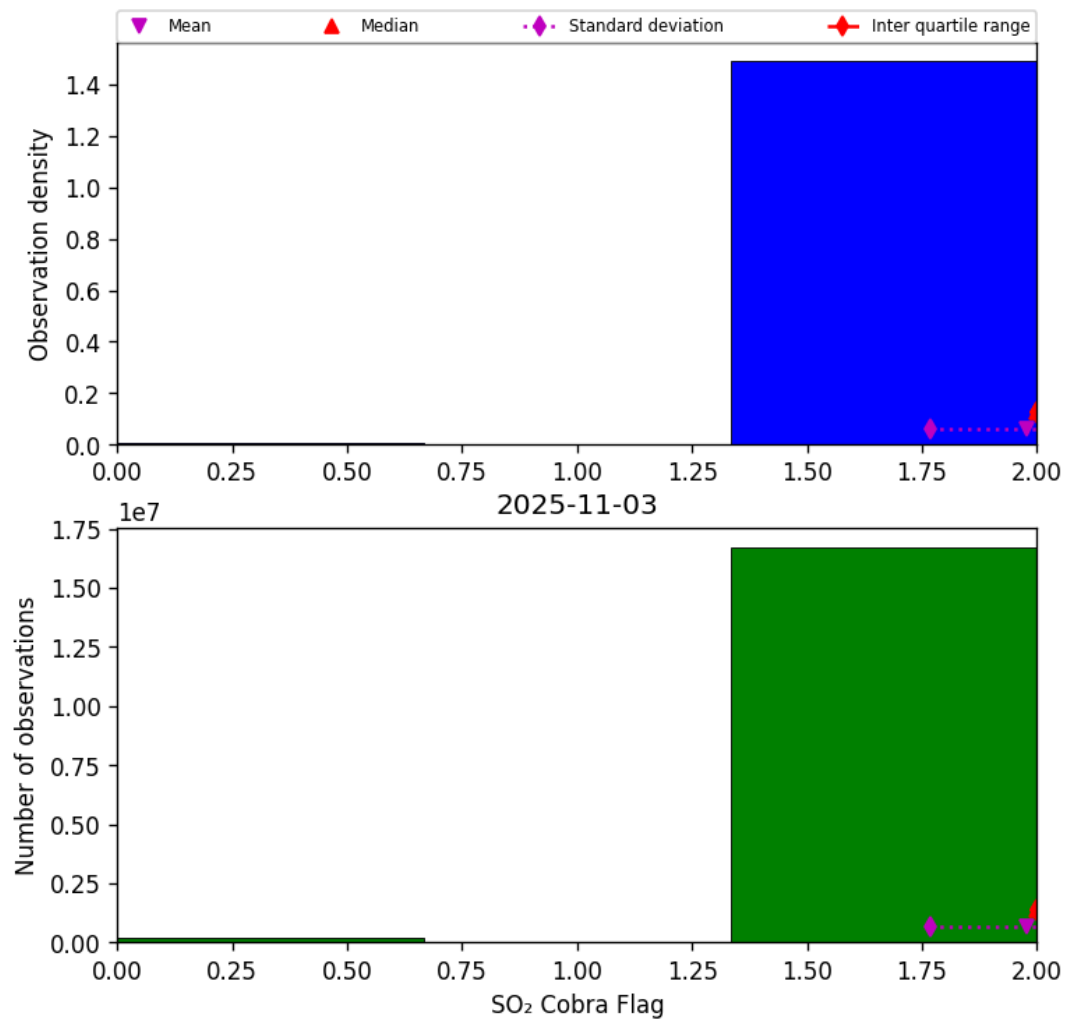


Figure 75: Histogram of "SO₂ Cobra Flag" for 2025-11-03 to 2025-11-04

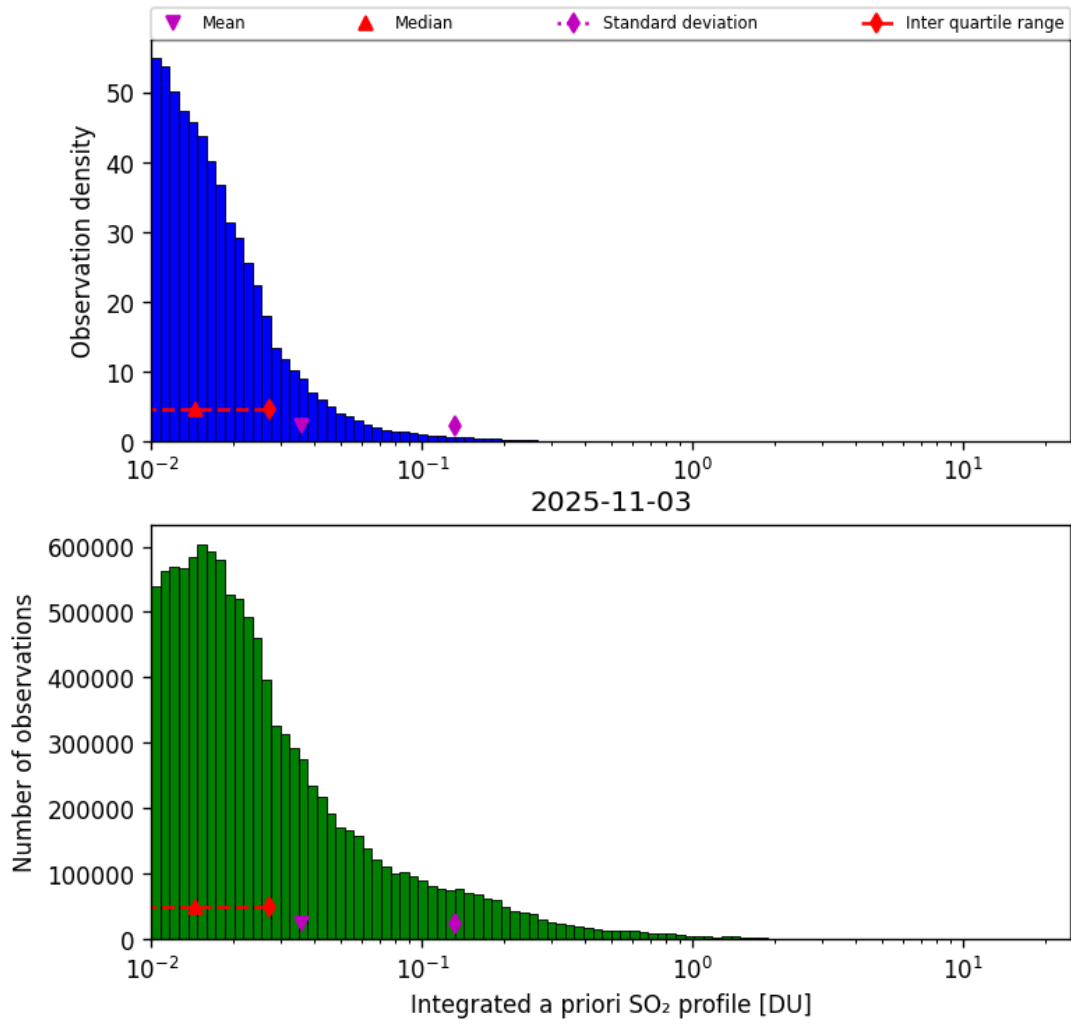


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-11-03 to 2025-11-04

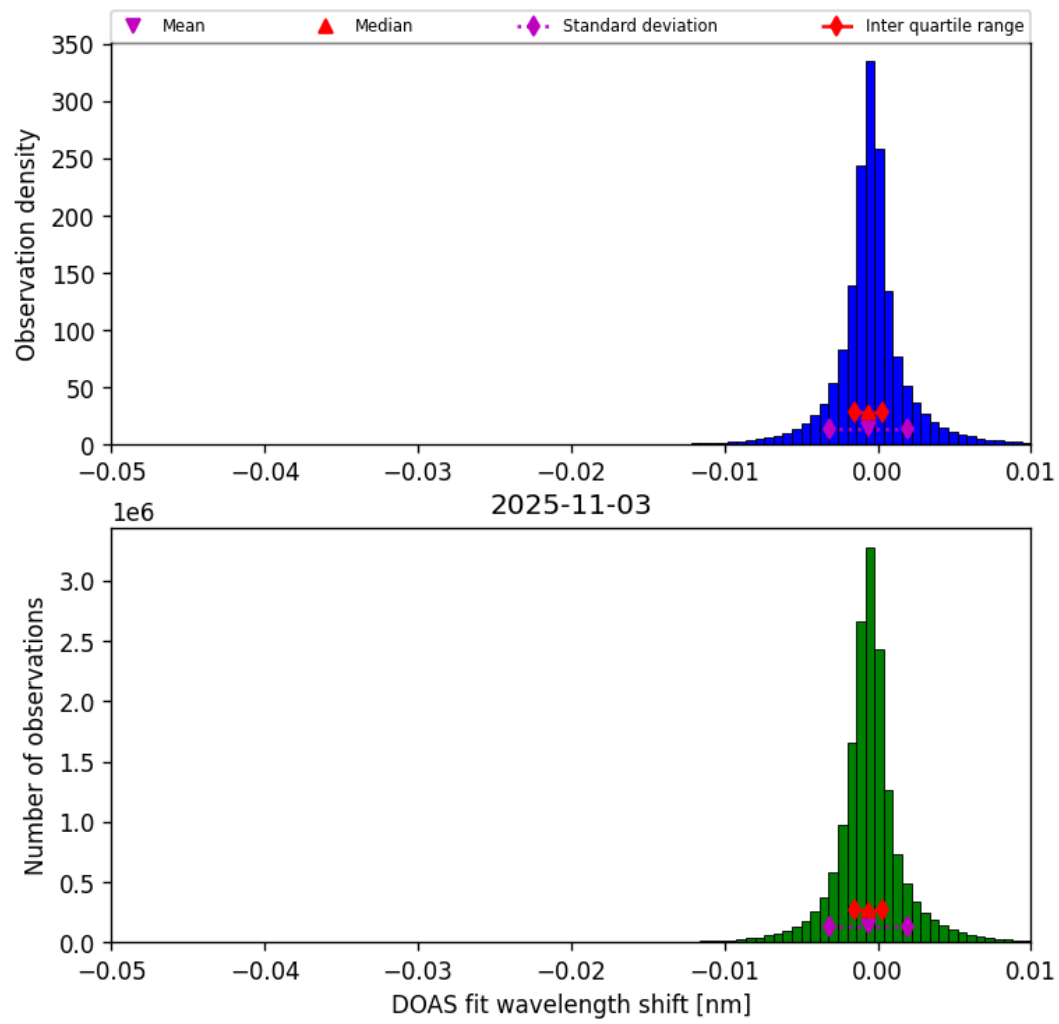


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-11-03 to 2025-11-04

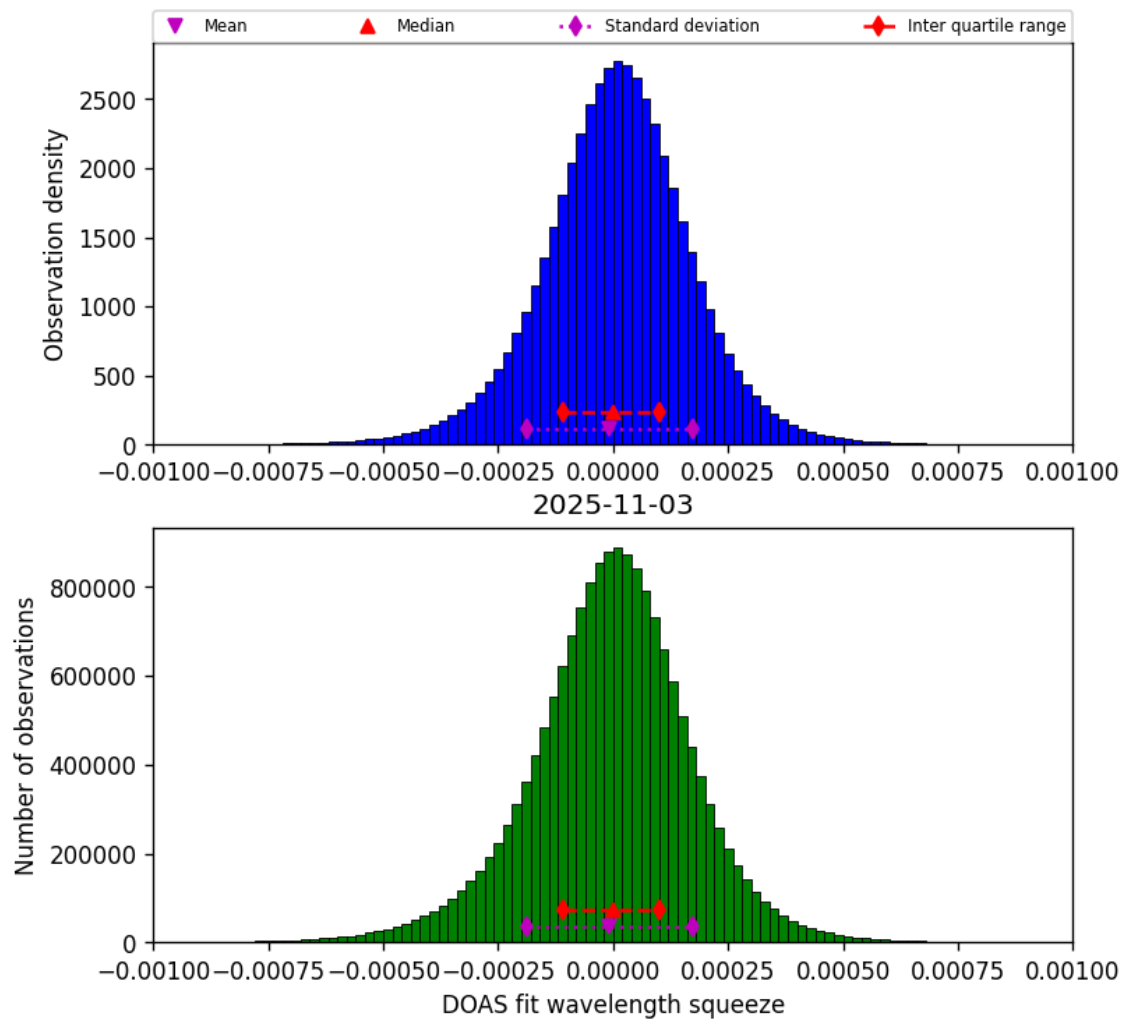


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-11-03 to 2025-11-04

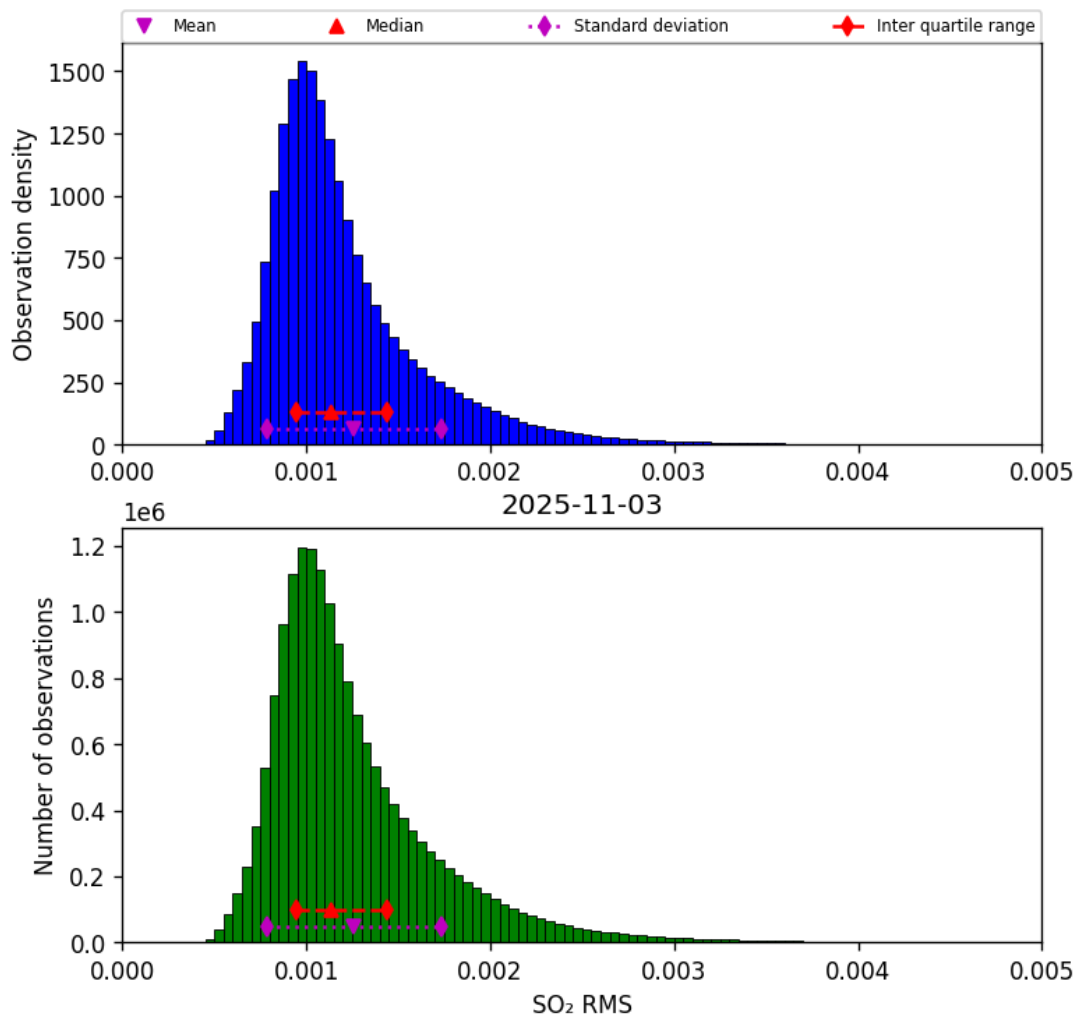


Figure 79: Histogram of “SO₂ RMS” for 2025-11-03 to 2025-11-04

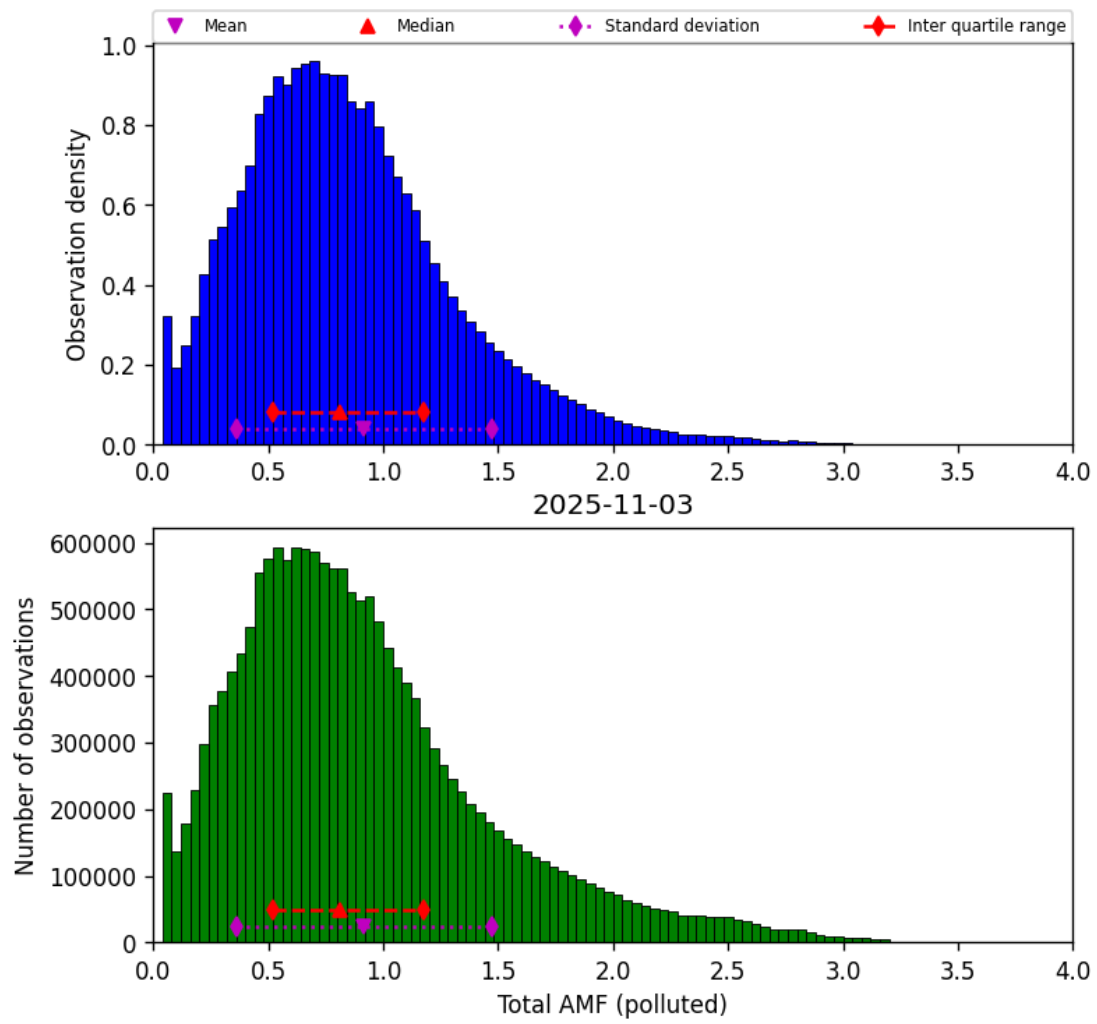


Figure 80: Histogram of “Total AMF (polluted)” for 2025-11-03 to 2025-11-04

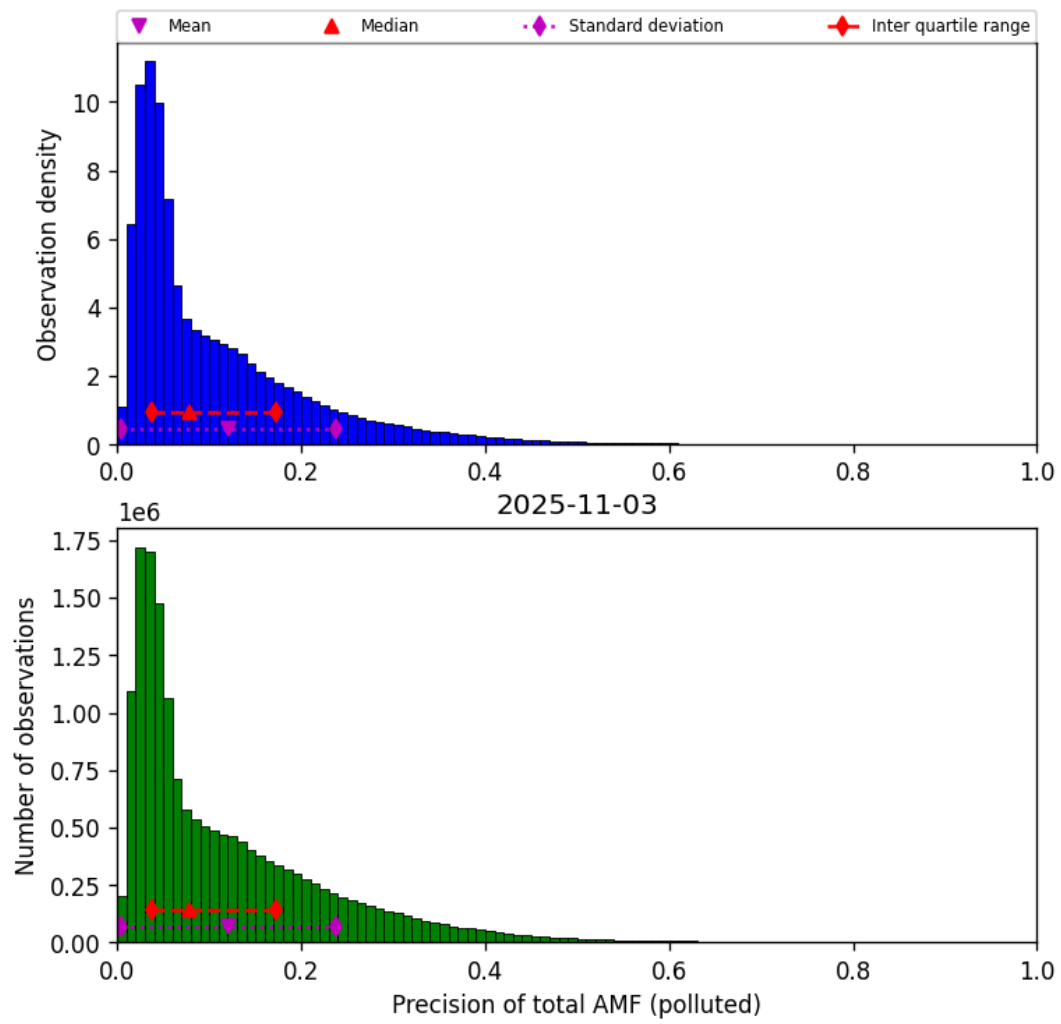


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-11-03 to 2025-11-04

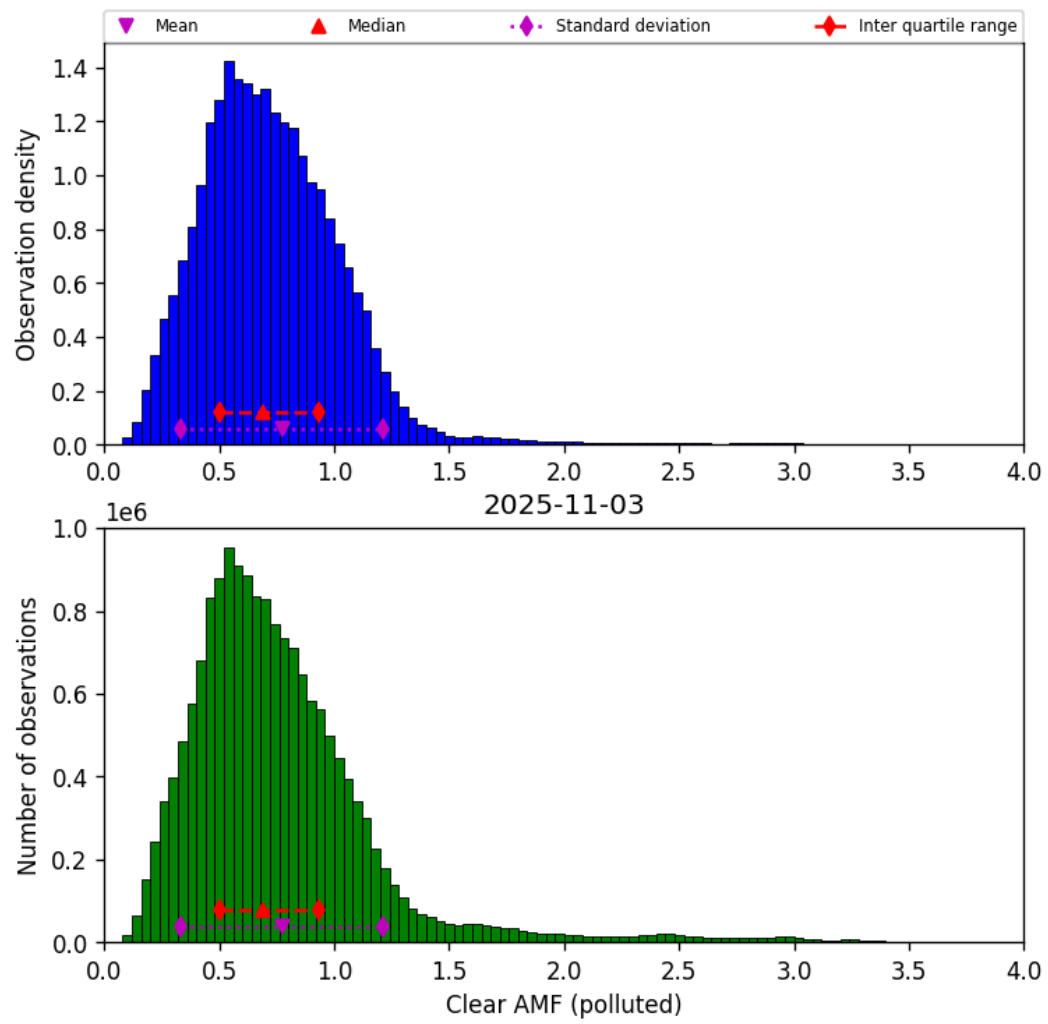


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-11-03 to 2025-11-04

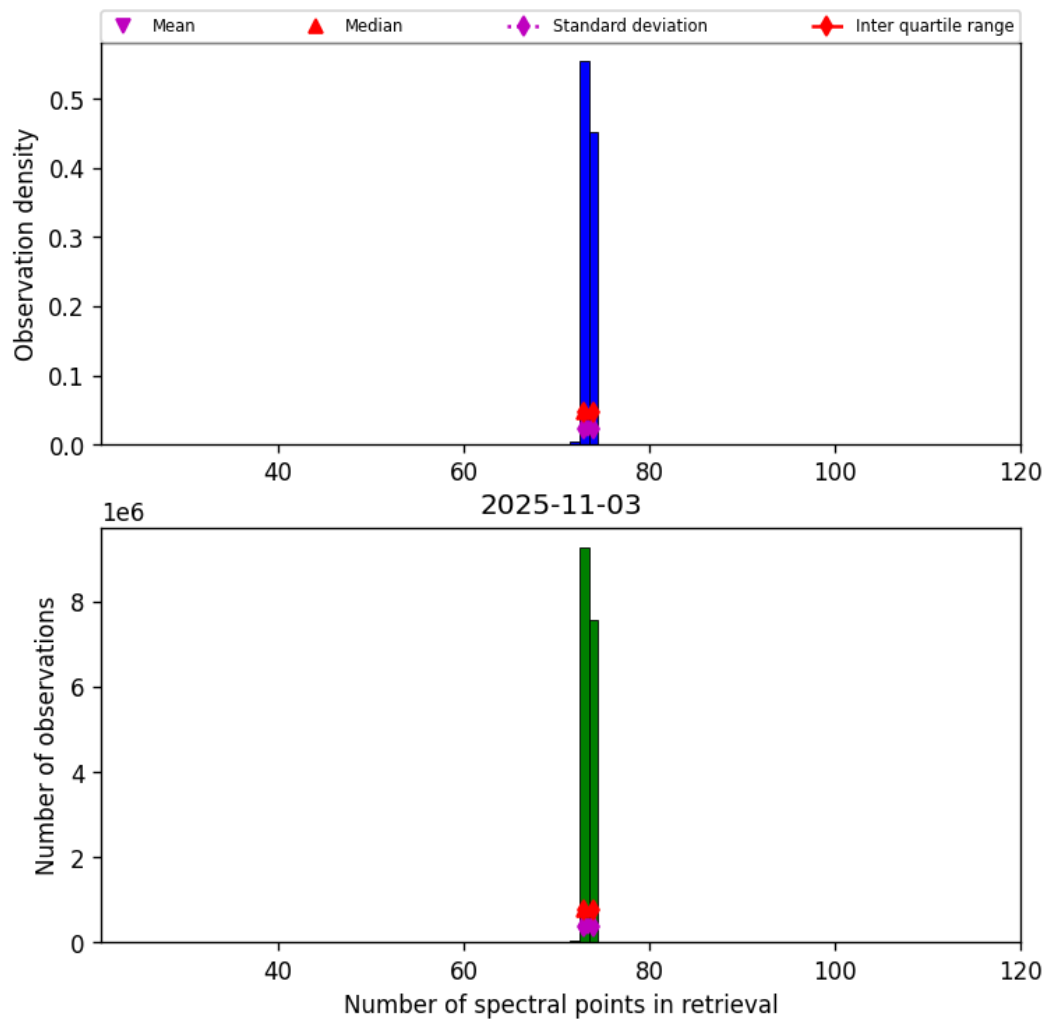


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-11-03 to 2025-11-04

9 Along track statistics

The TROPOMI instrument uses different binned detector rows for different viewing directions. In this section statistics are presented for each of the binned rows in the instrument.

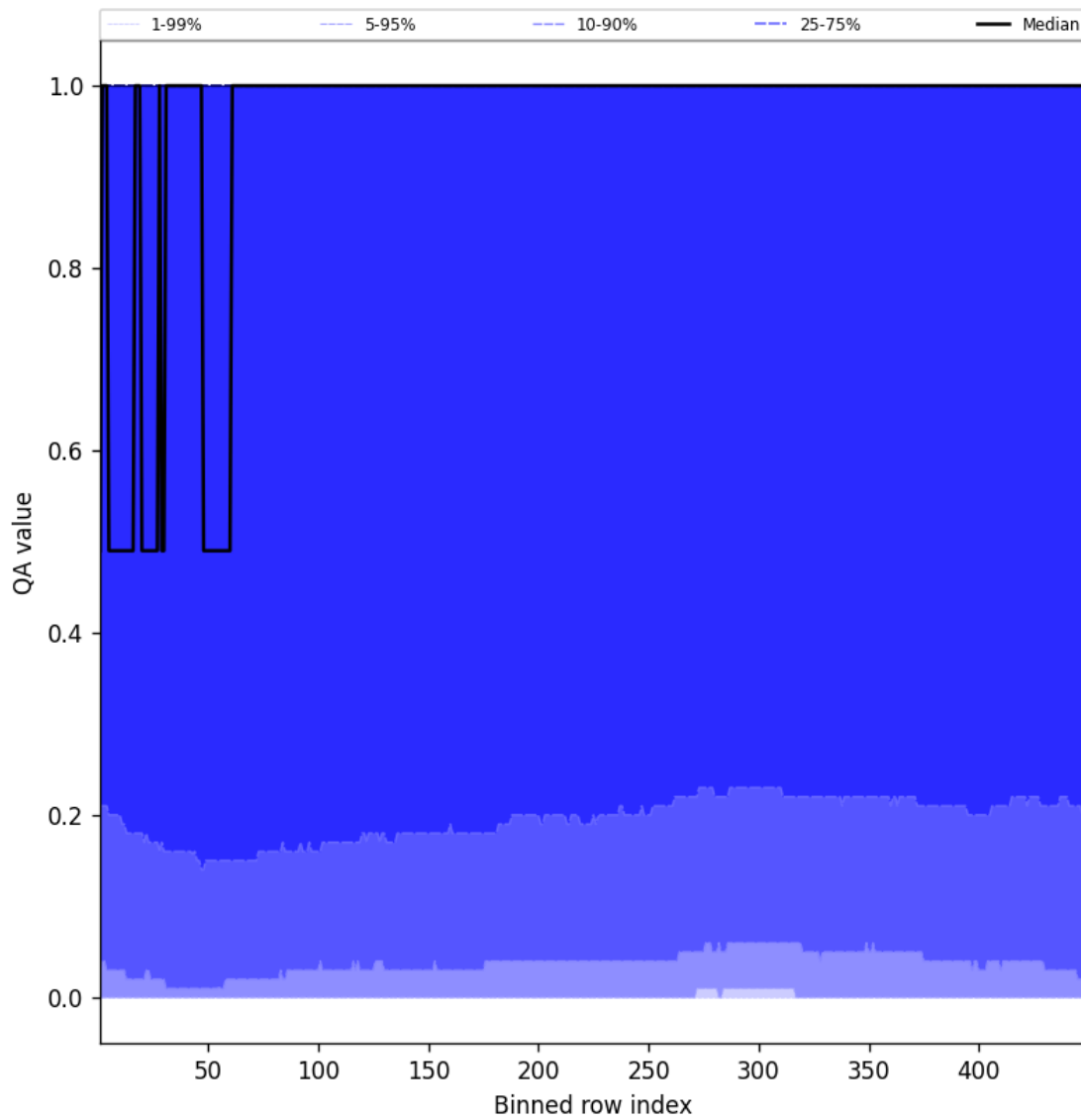


Figure 84: Along track statistics of “QA value” for 2025-11-03 to 2025-11-04

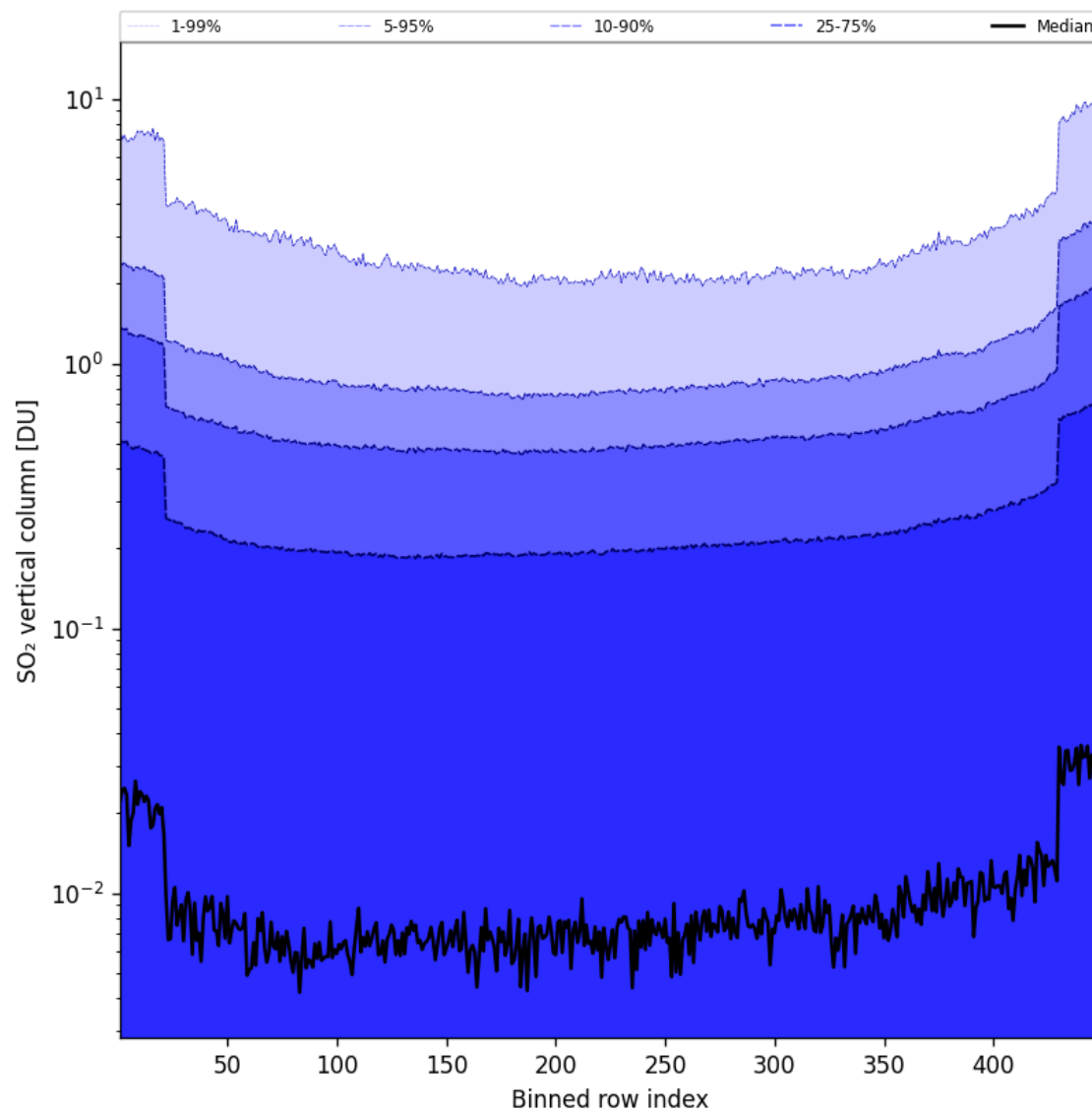


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-11-03 to 2025-11-04

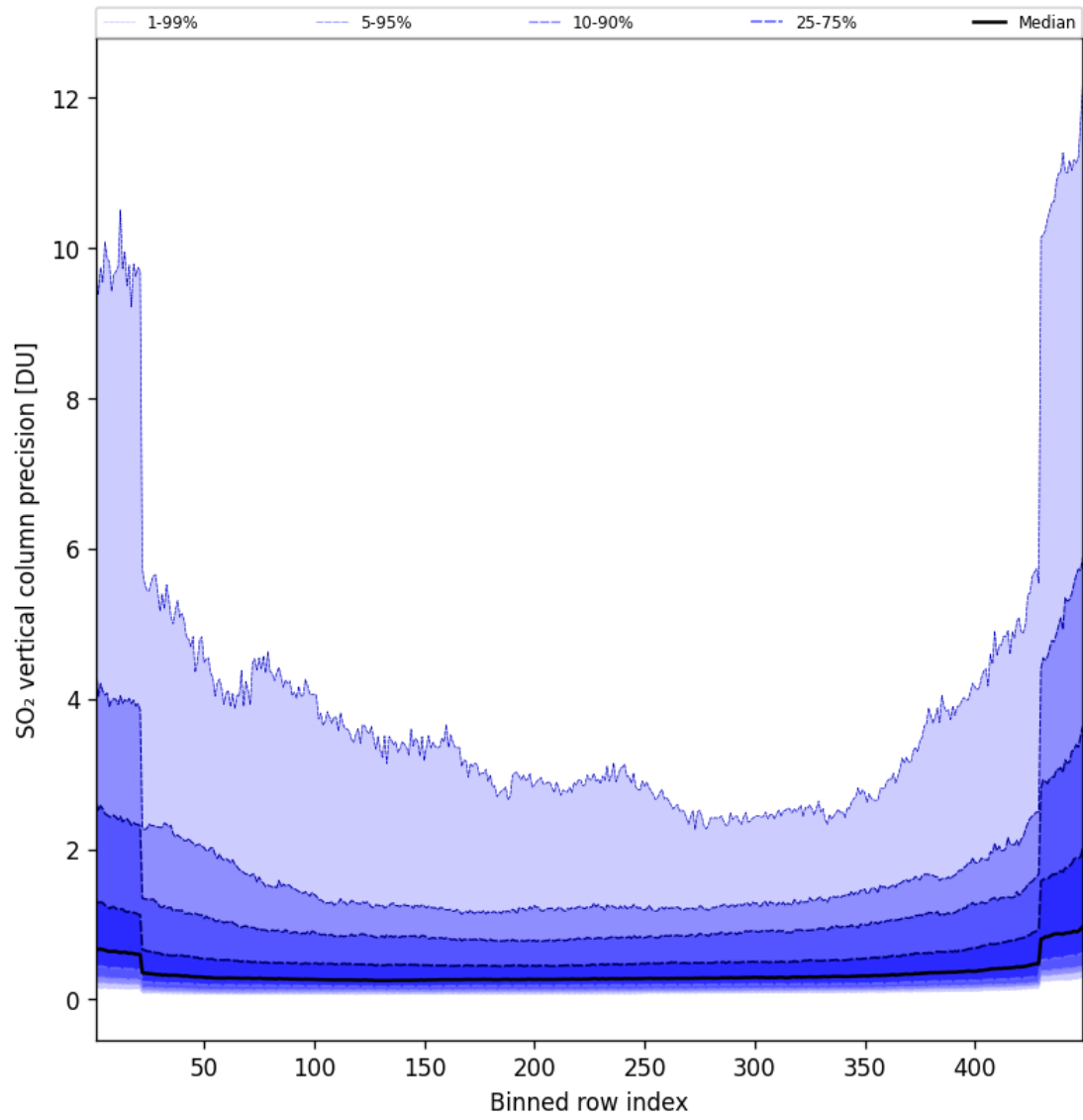


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-11-03 to 2025-11-04

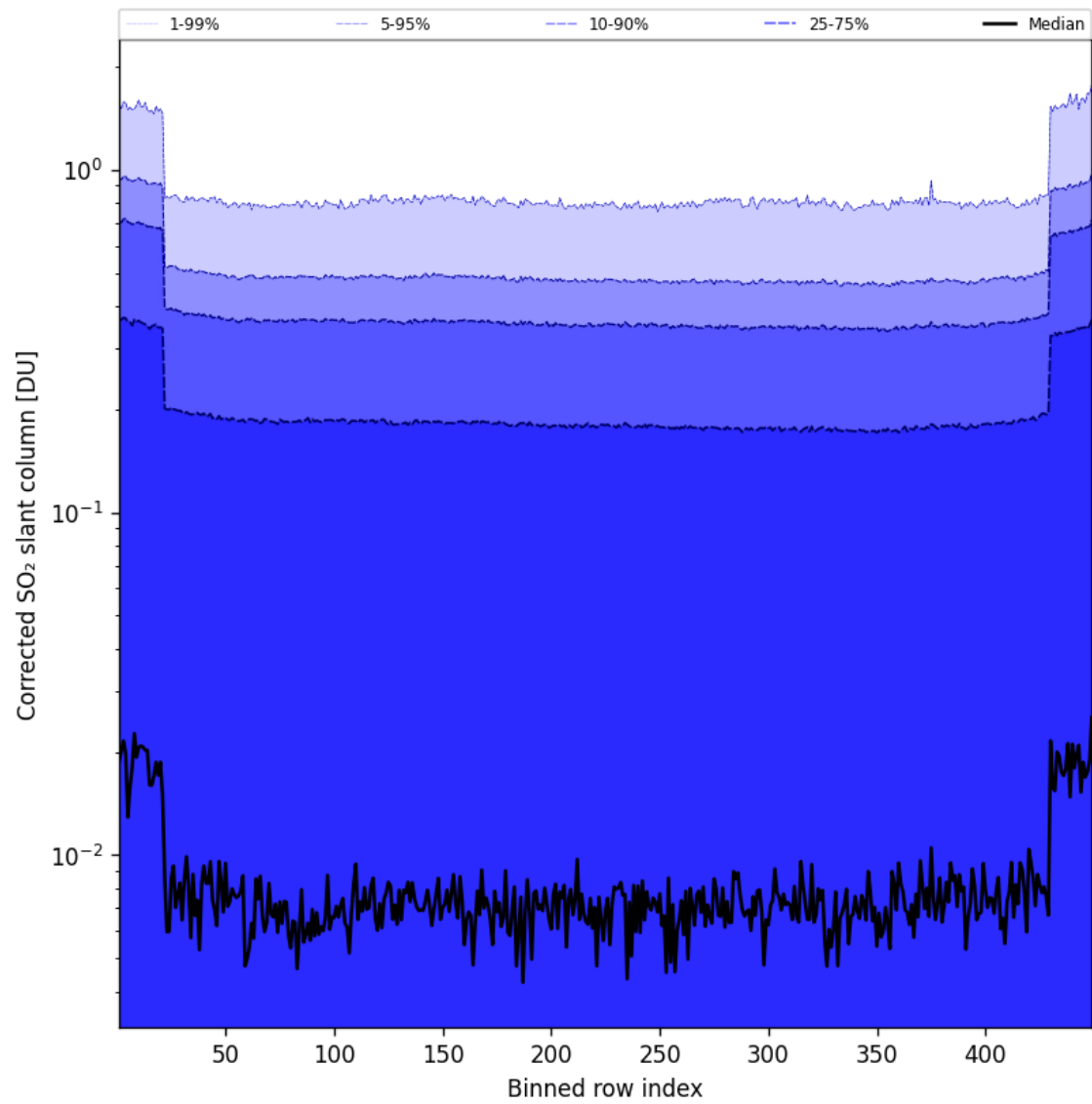


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-11-03 to 2025-11-04

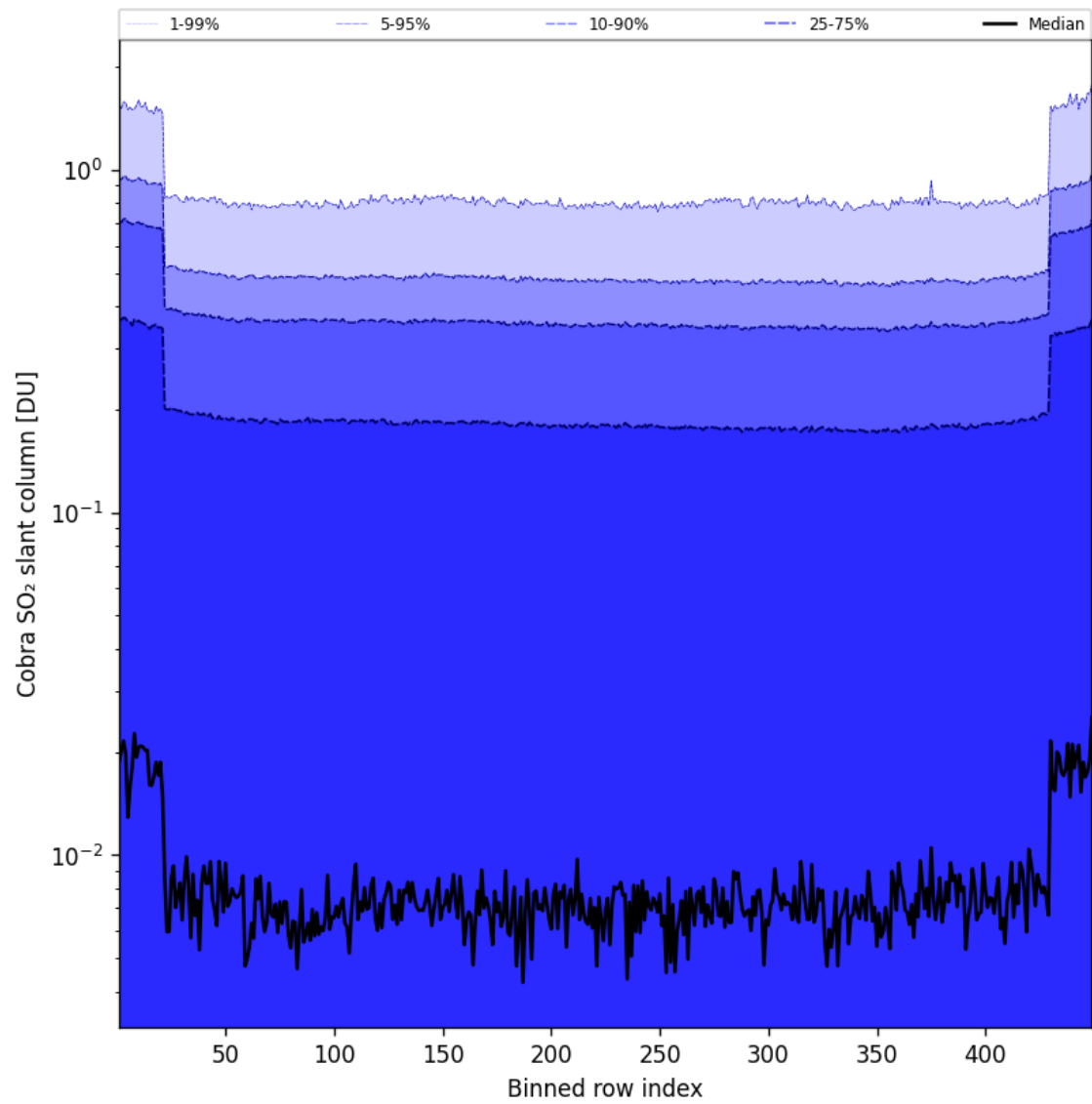


Figure 88: Along track statistics of "Cobra SO₂ slant column" for 2025-11-03 to 2025-11-04

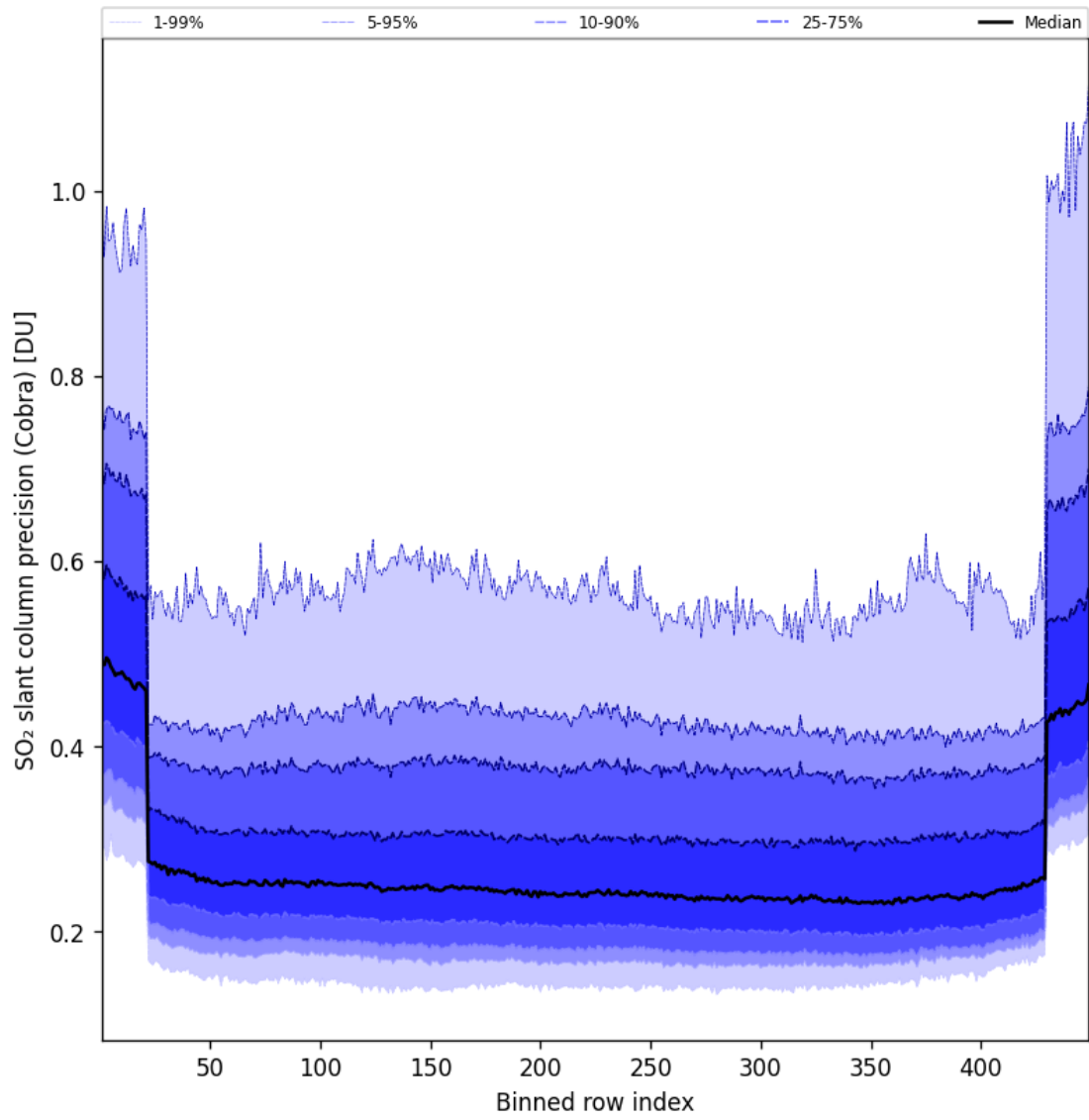


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-11-03 to 2025-11-04

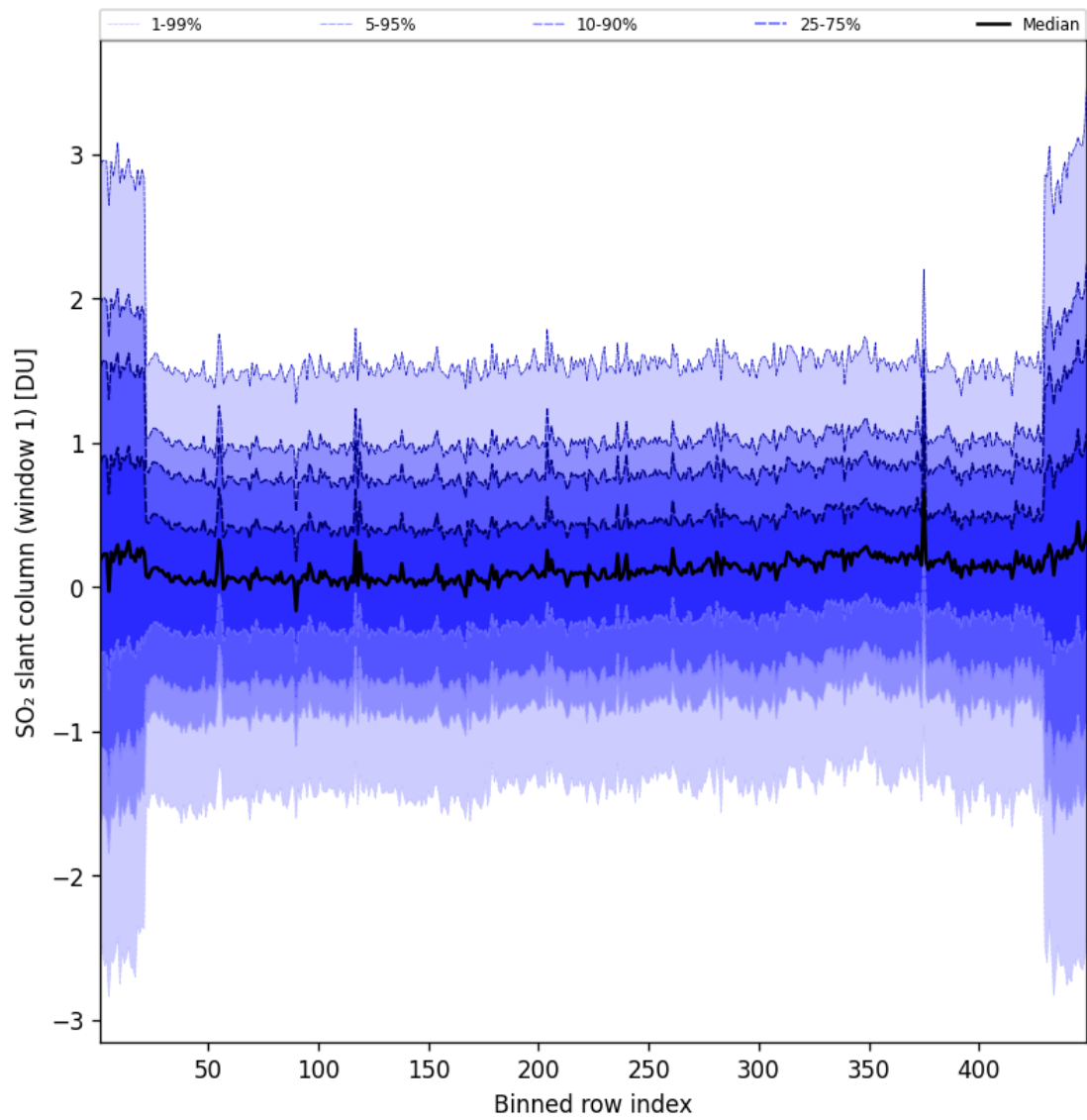


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-11-03 to 2025-11-04

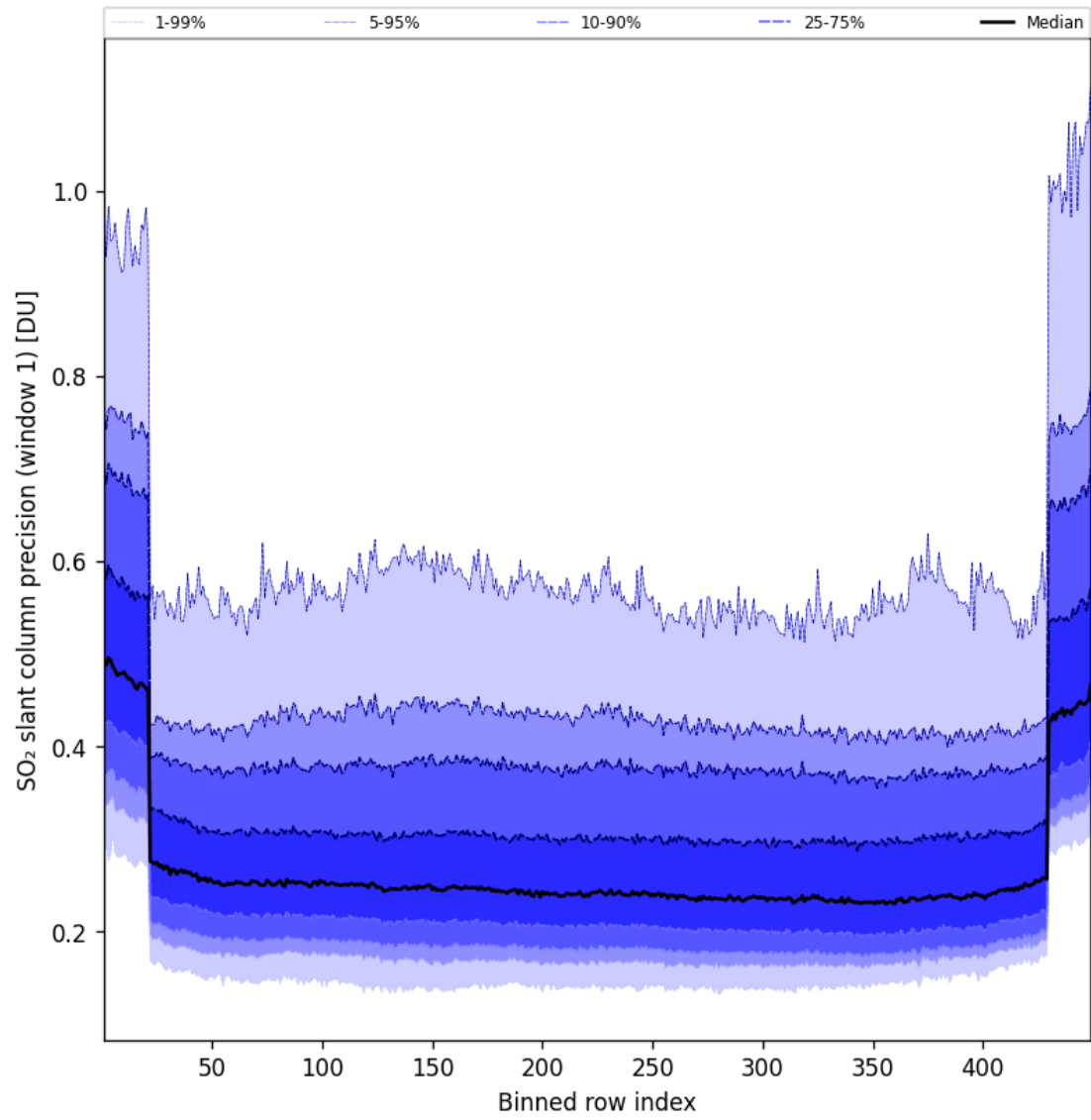


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-11-03 to 2025-11-04

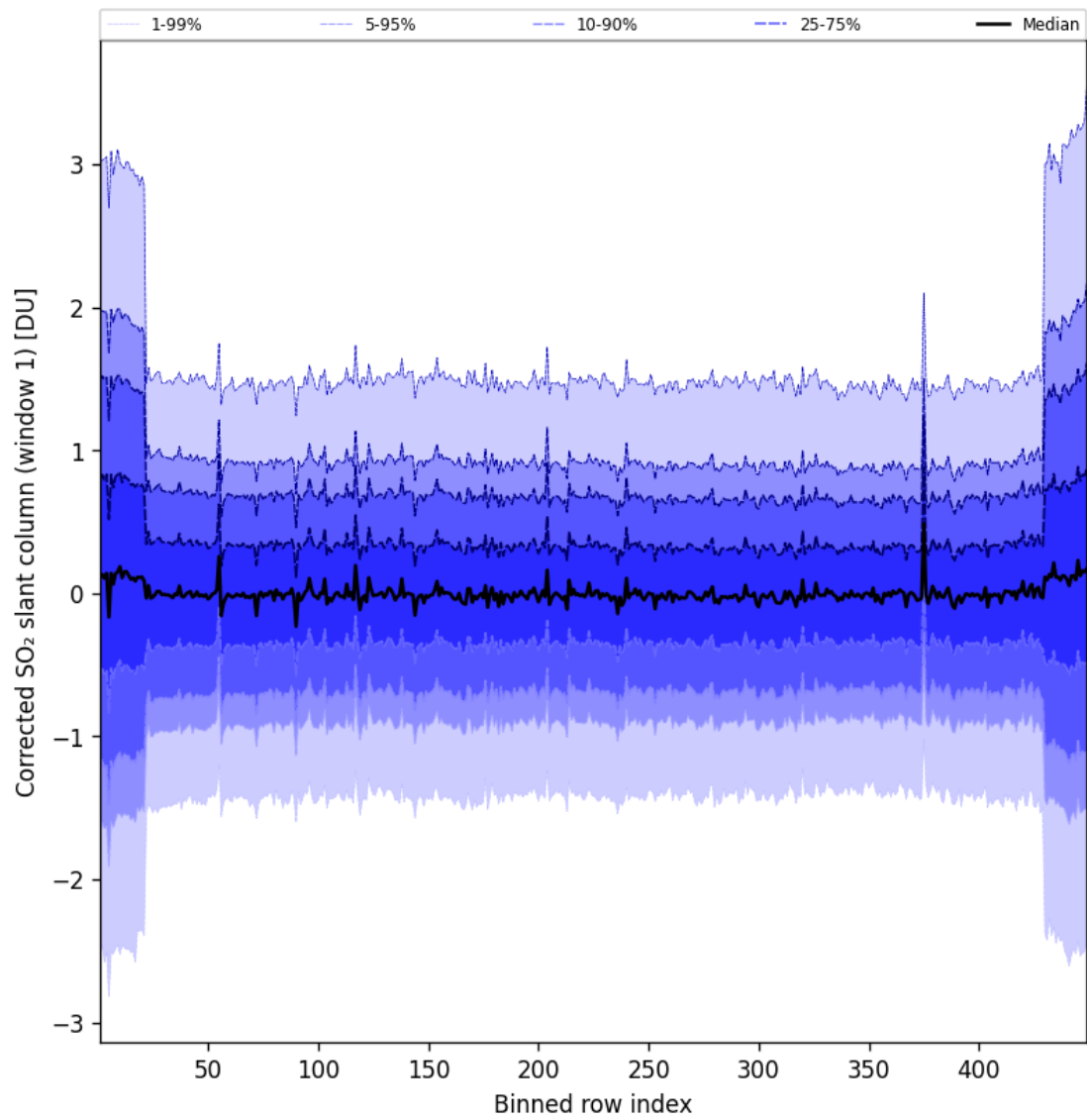


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-11-03 to 2025-11-04

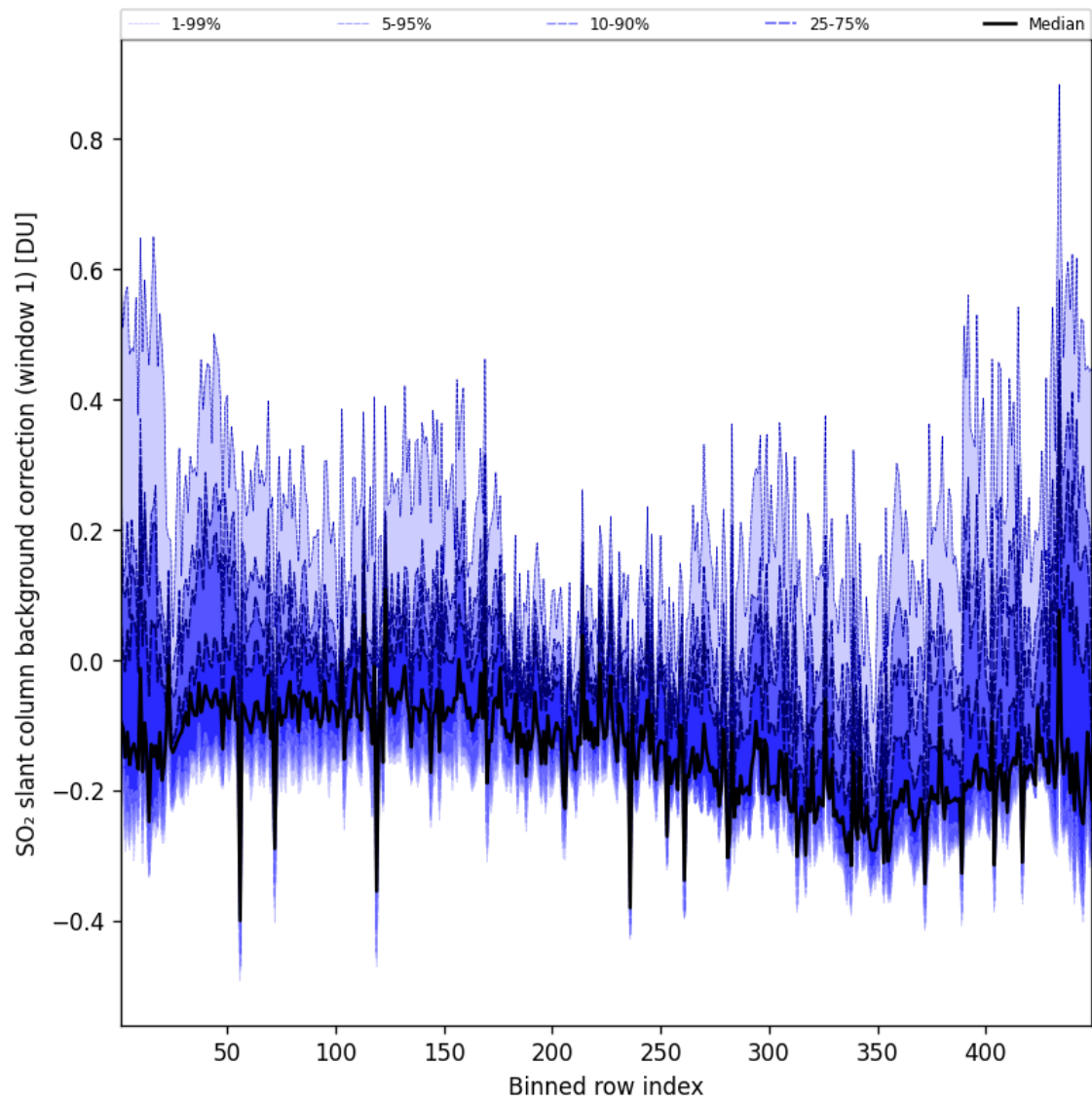


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-11-03 to 2025-11-04

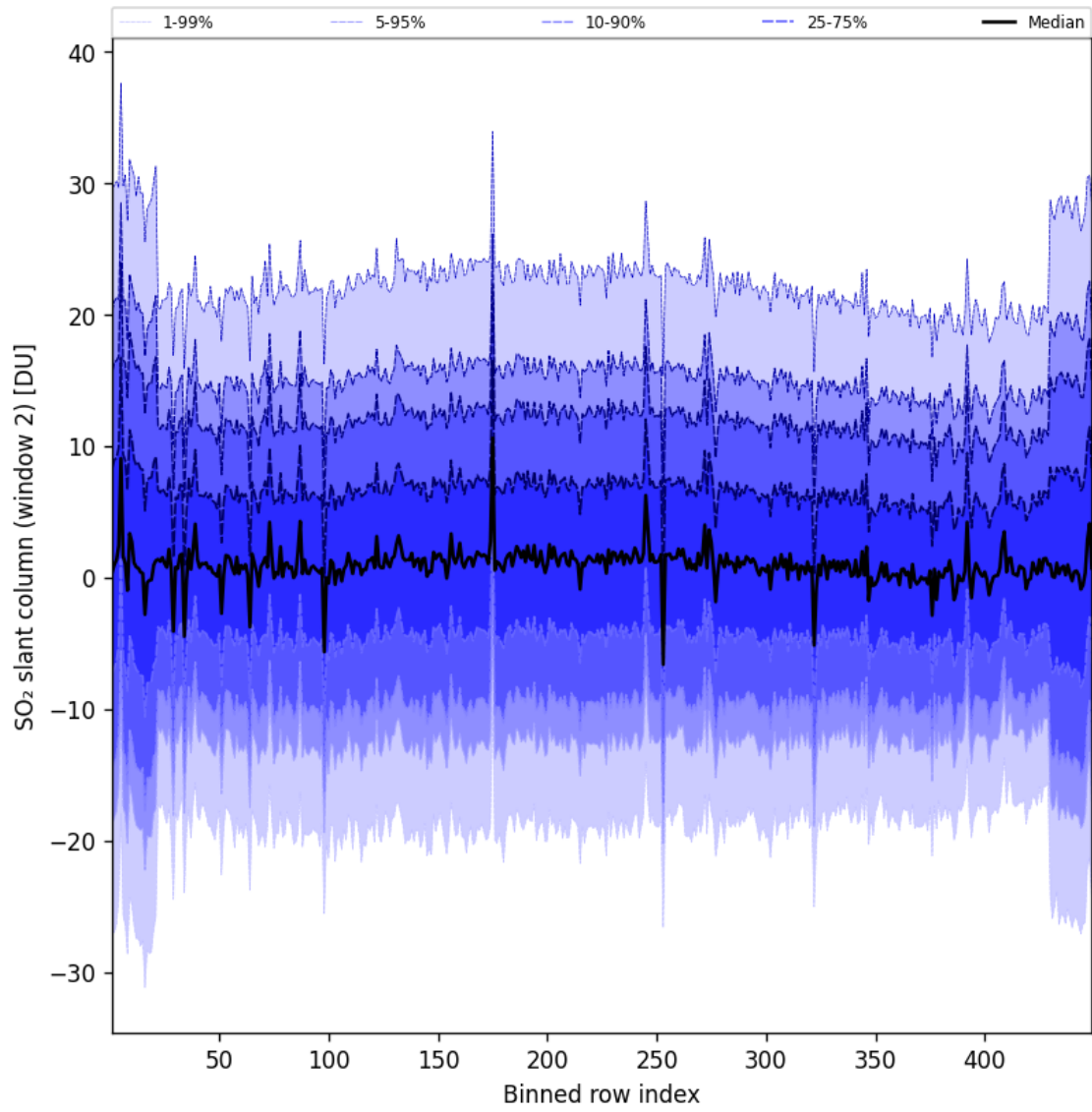


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-11-03 to 2025-11-04

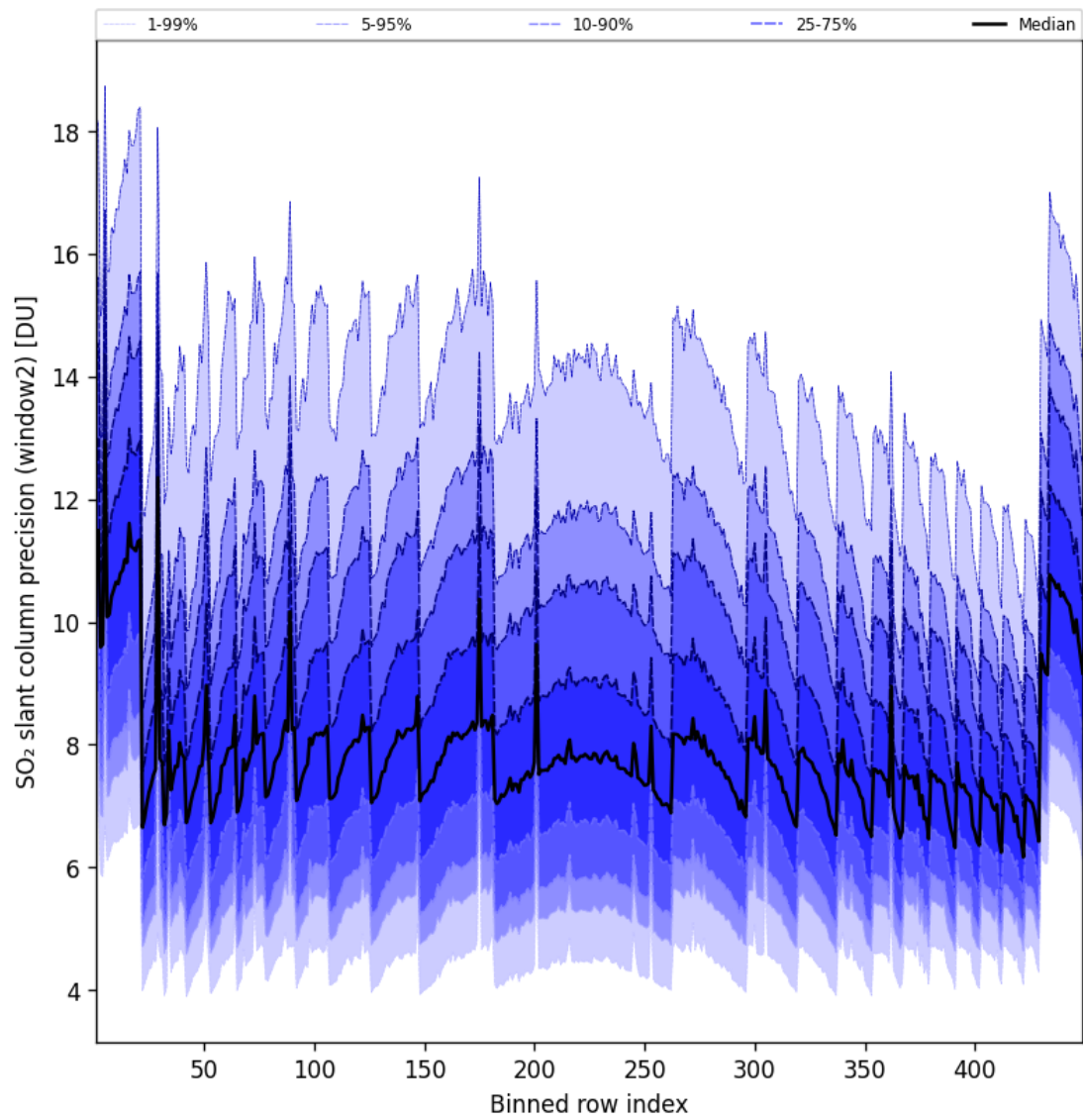


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-11-03 to 2025-11-04

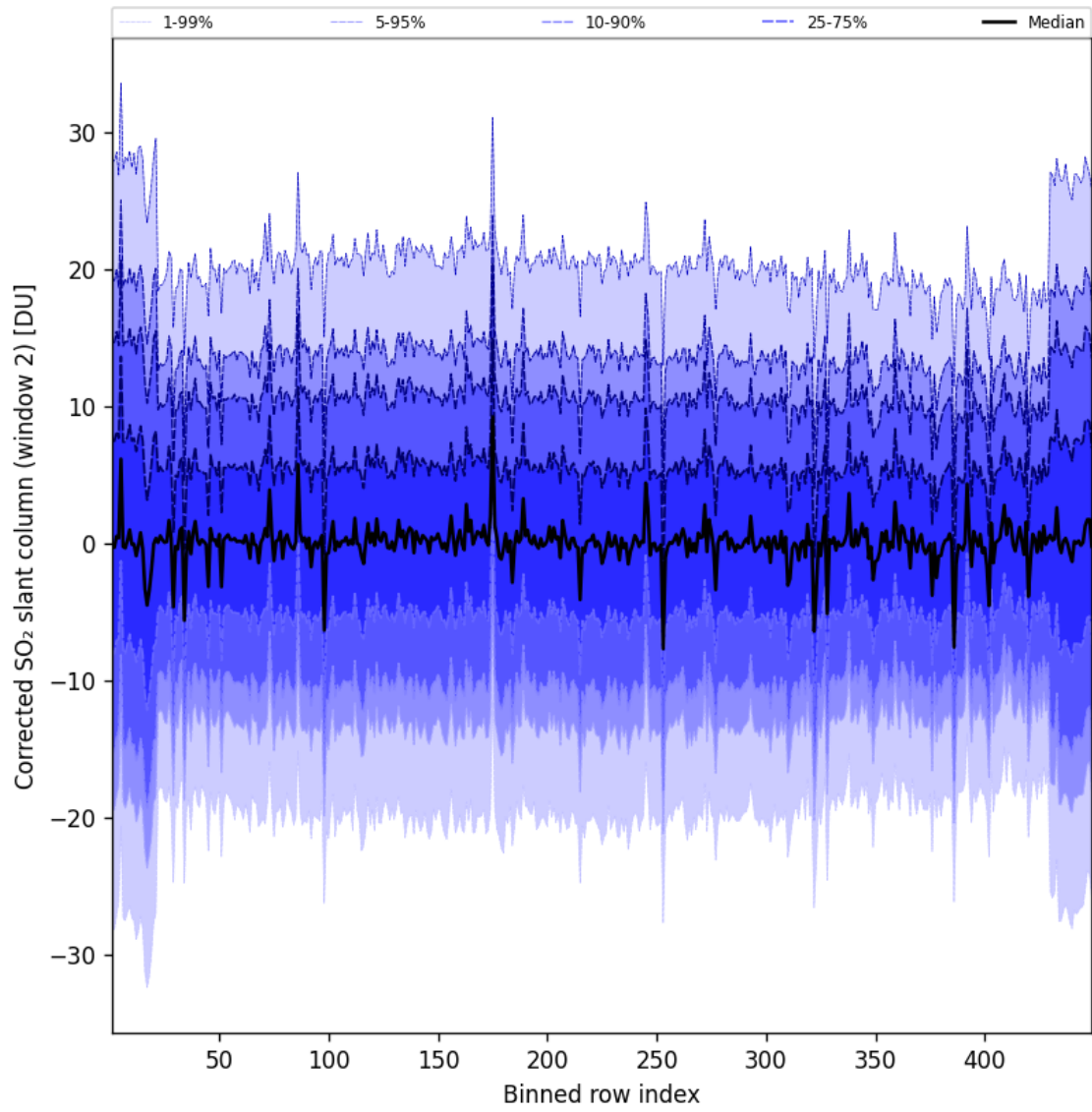


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-11-03 to 2025-11-04

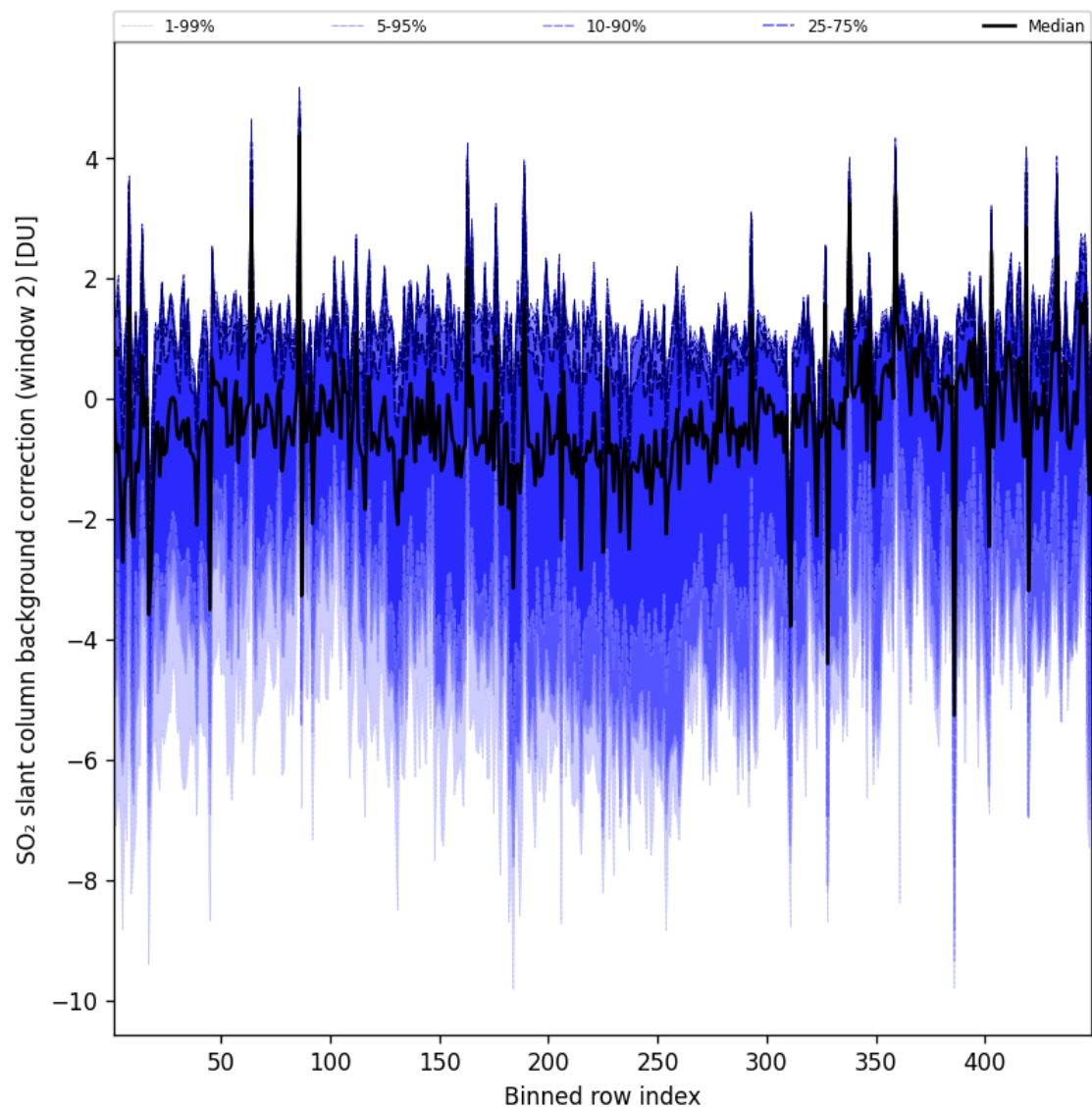


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-11-03 to 2025-11-04

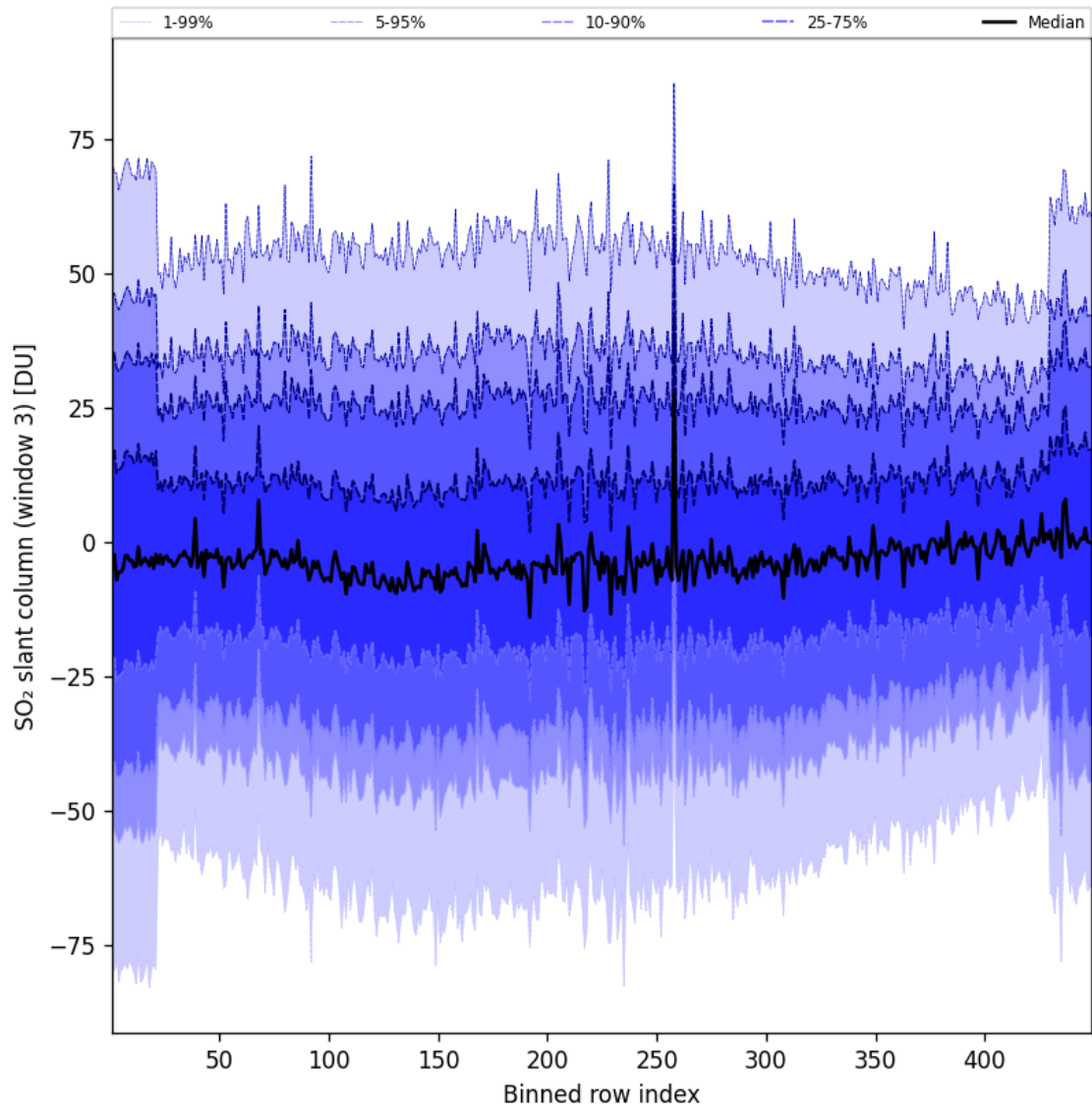


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-11-03 to 2025-11-04

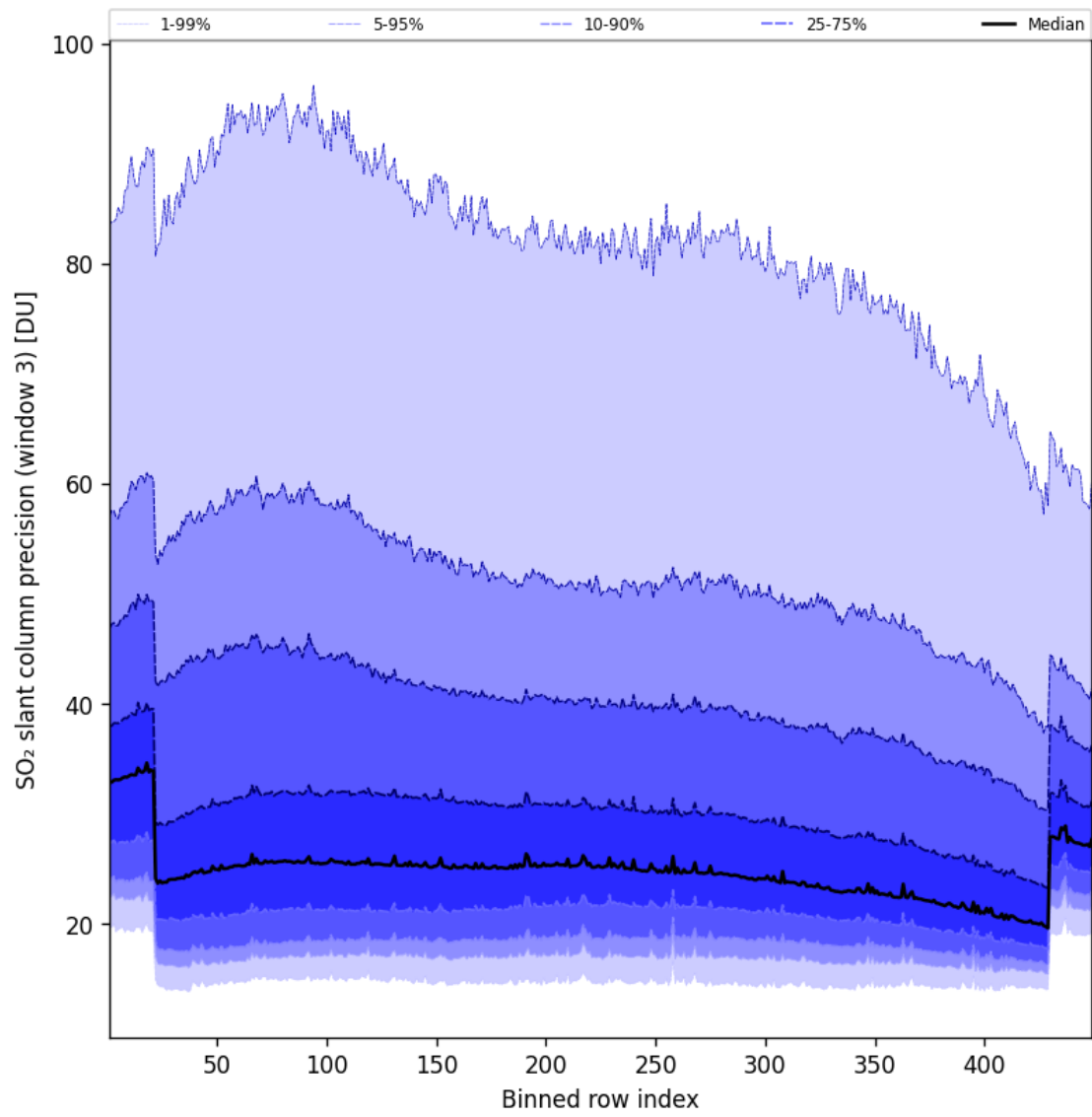


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-11-03 to 2025-11-04

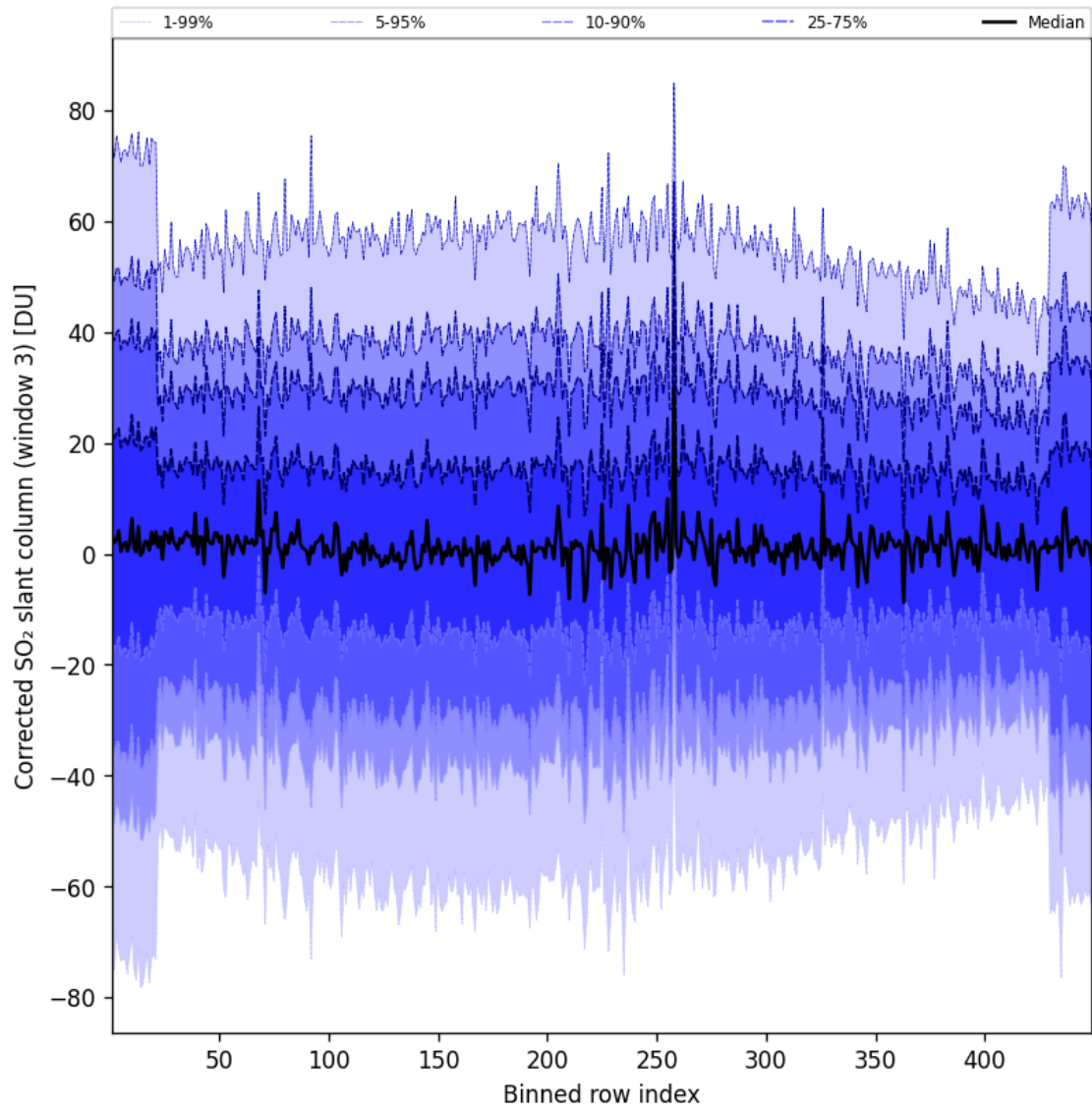


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-11-03 to 2025-11-04

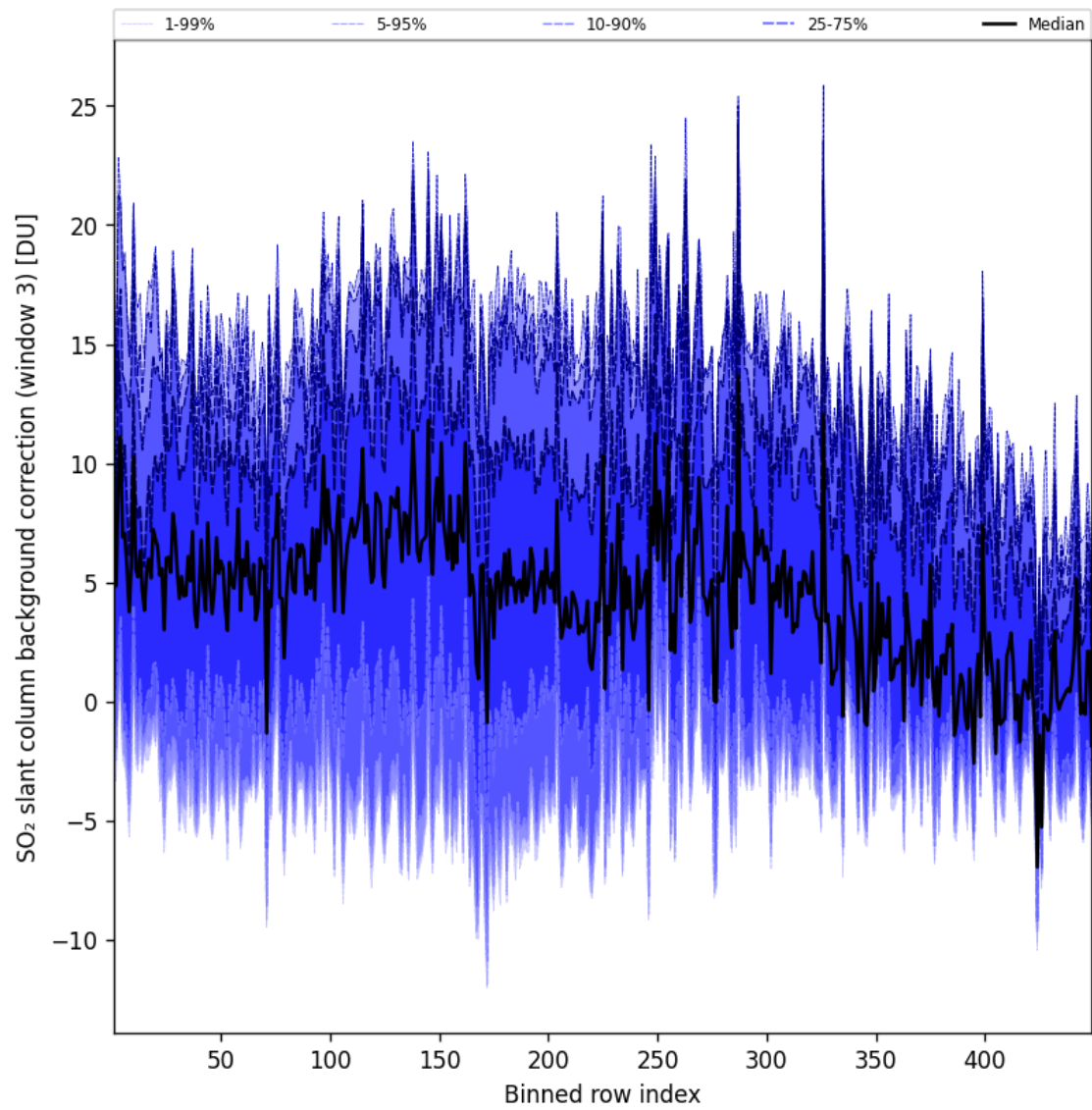


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-11-03 to 2025-11-04

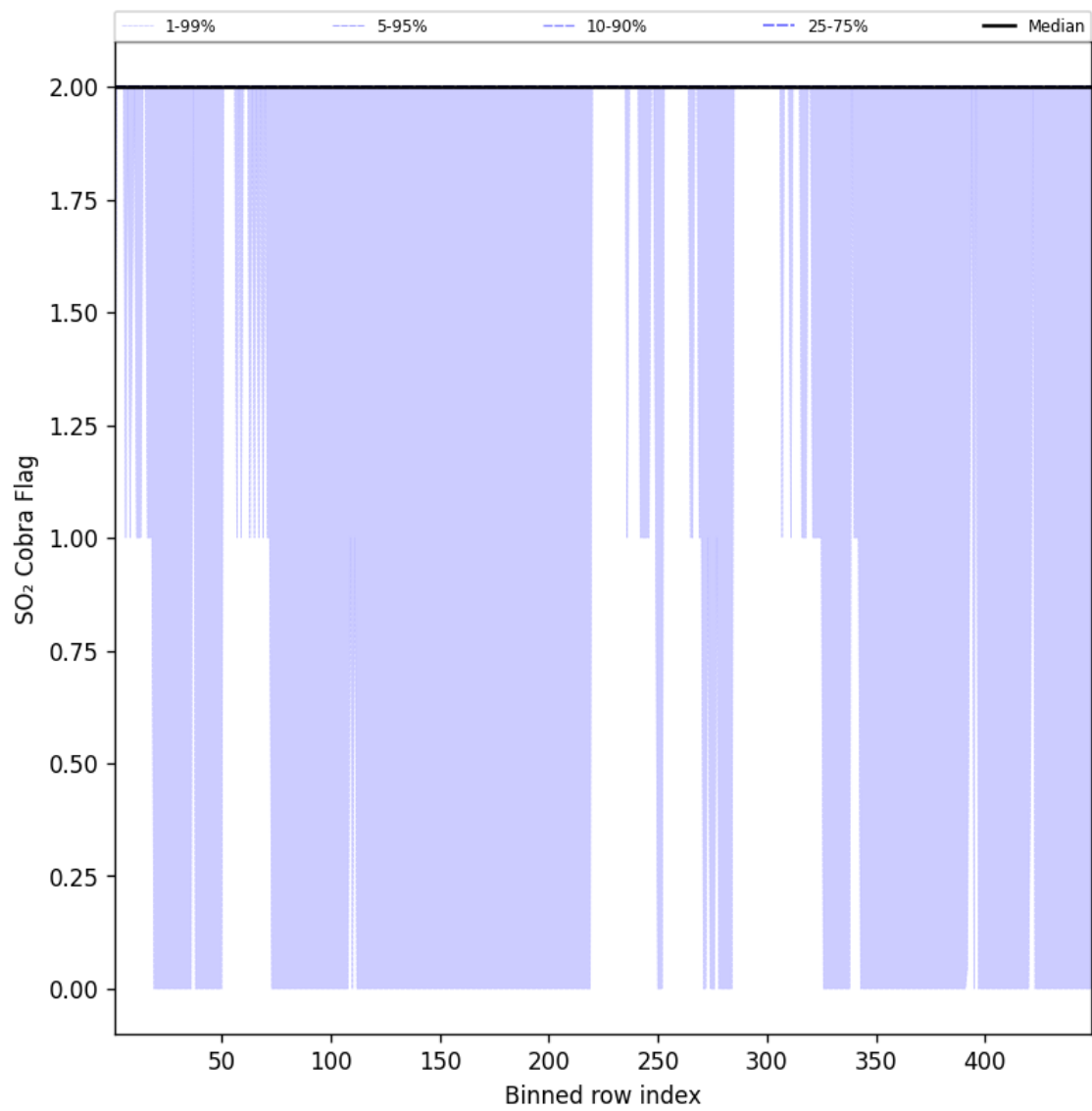


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-11-03 to 2025-11-04

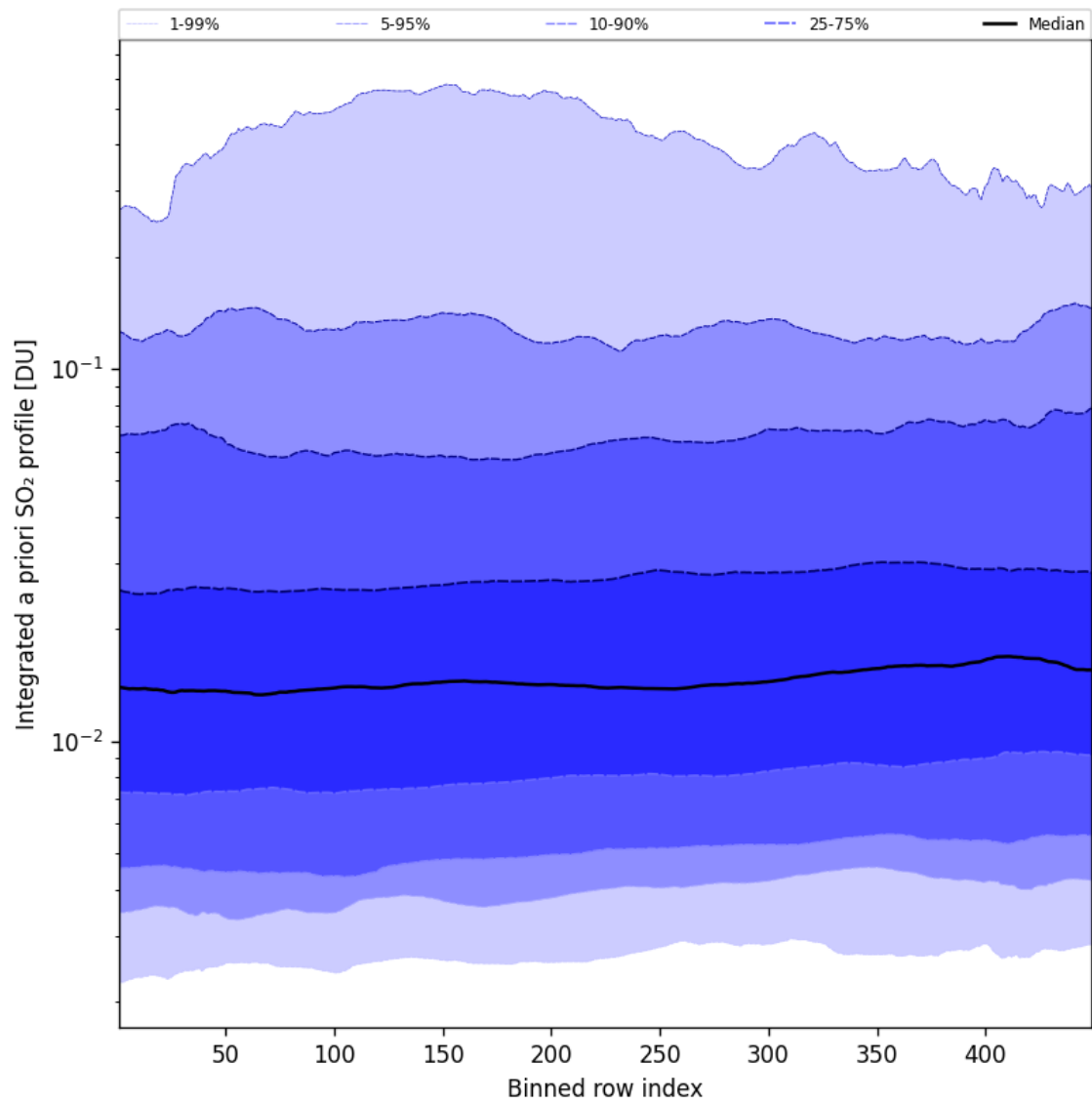


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-11-03 to 2025-11-04

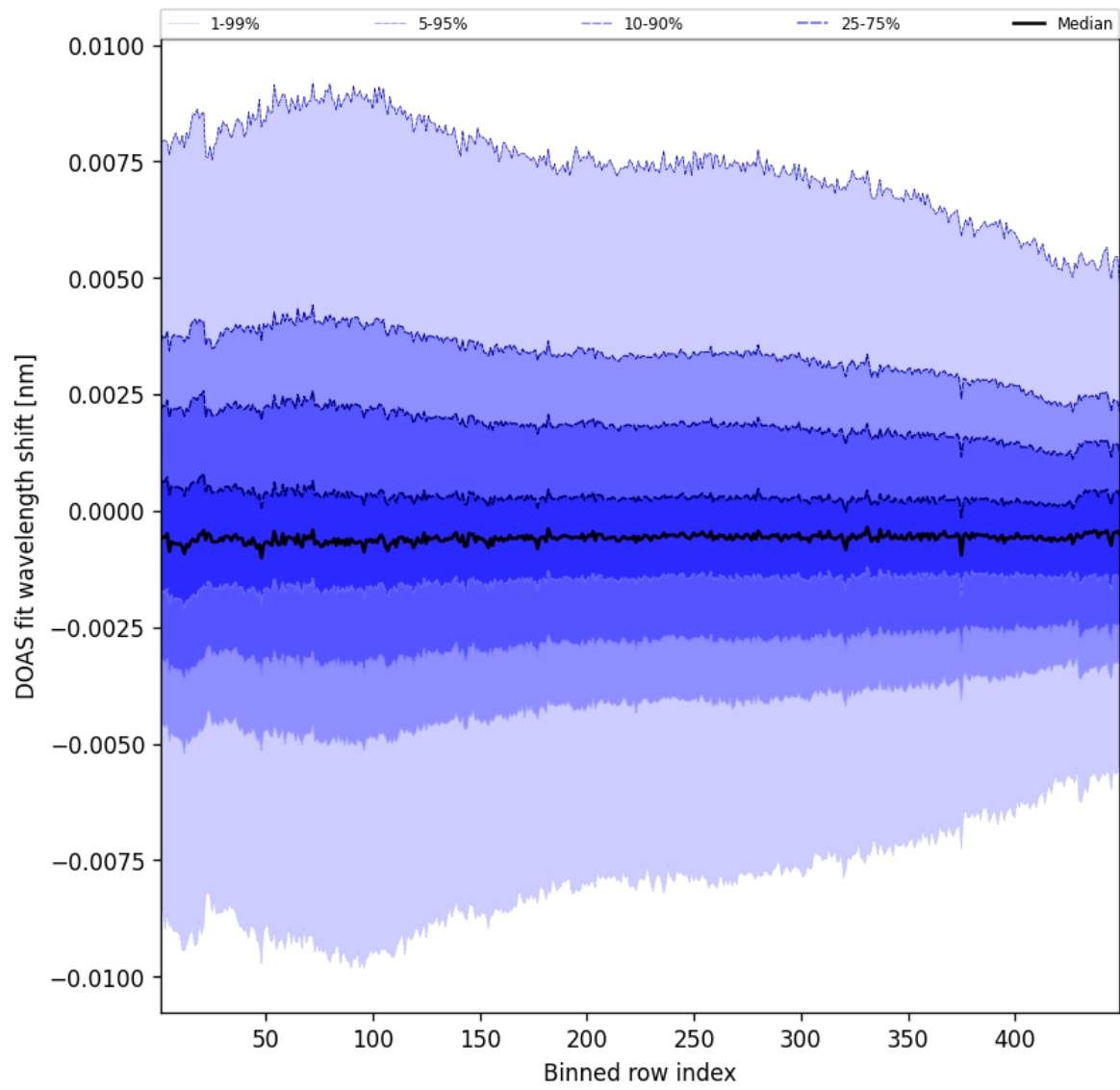


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-11-03 to 2025-11-04

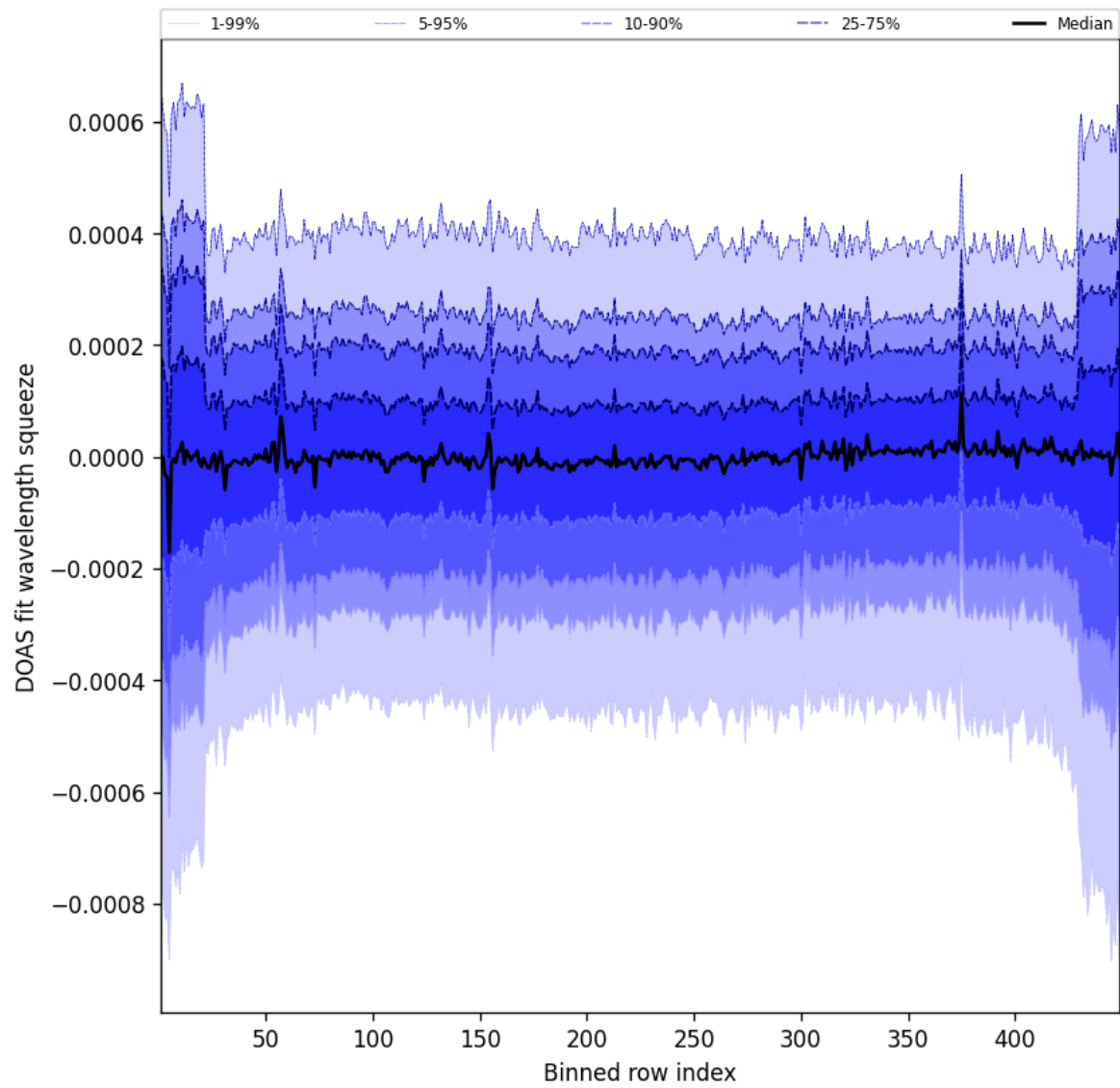


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-11-03 to 2025-11-04

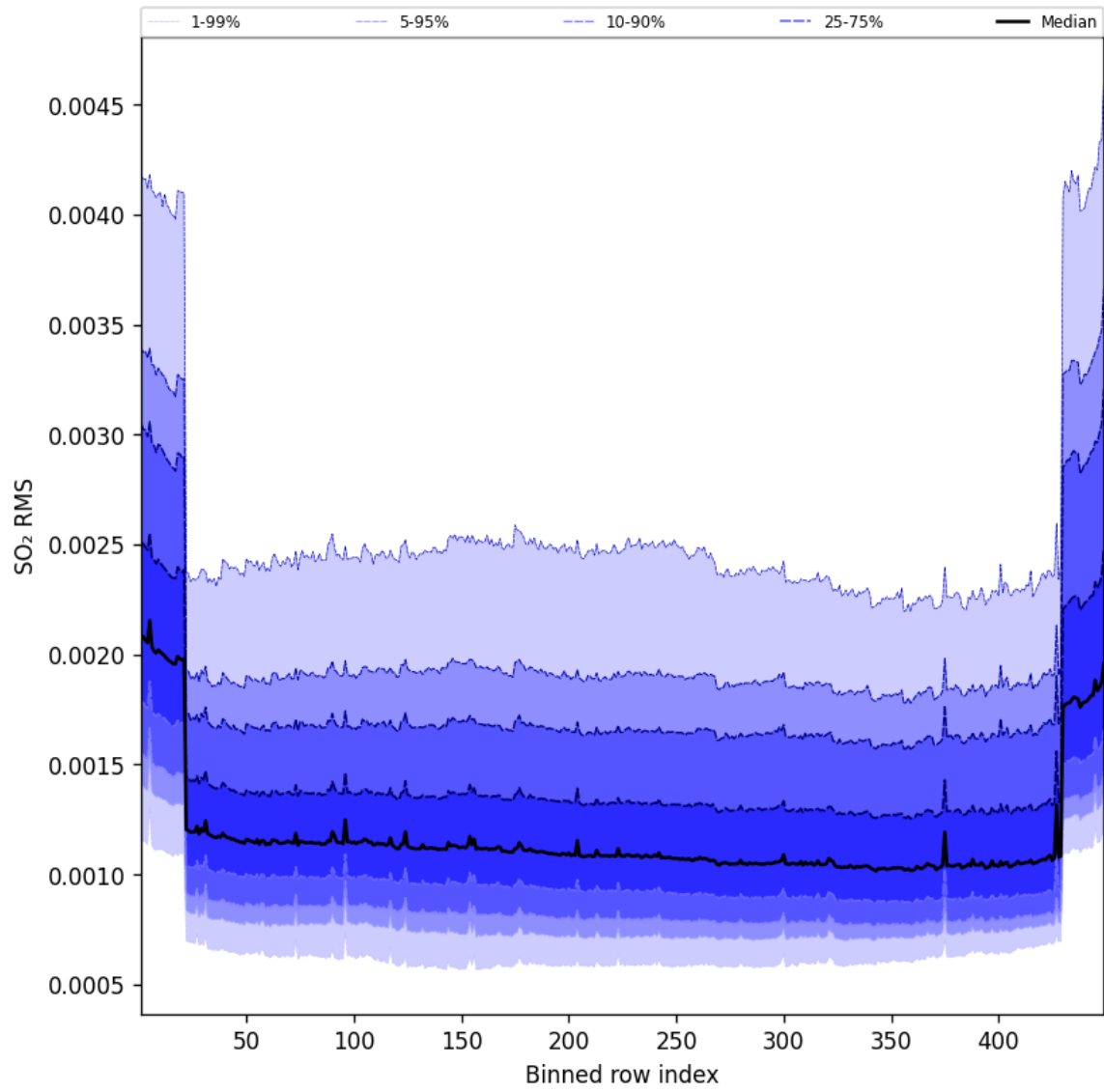


Figure 106: Along track statistics of “SO₂ RMS” for 2025-11-03 to 2025-11-04

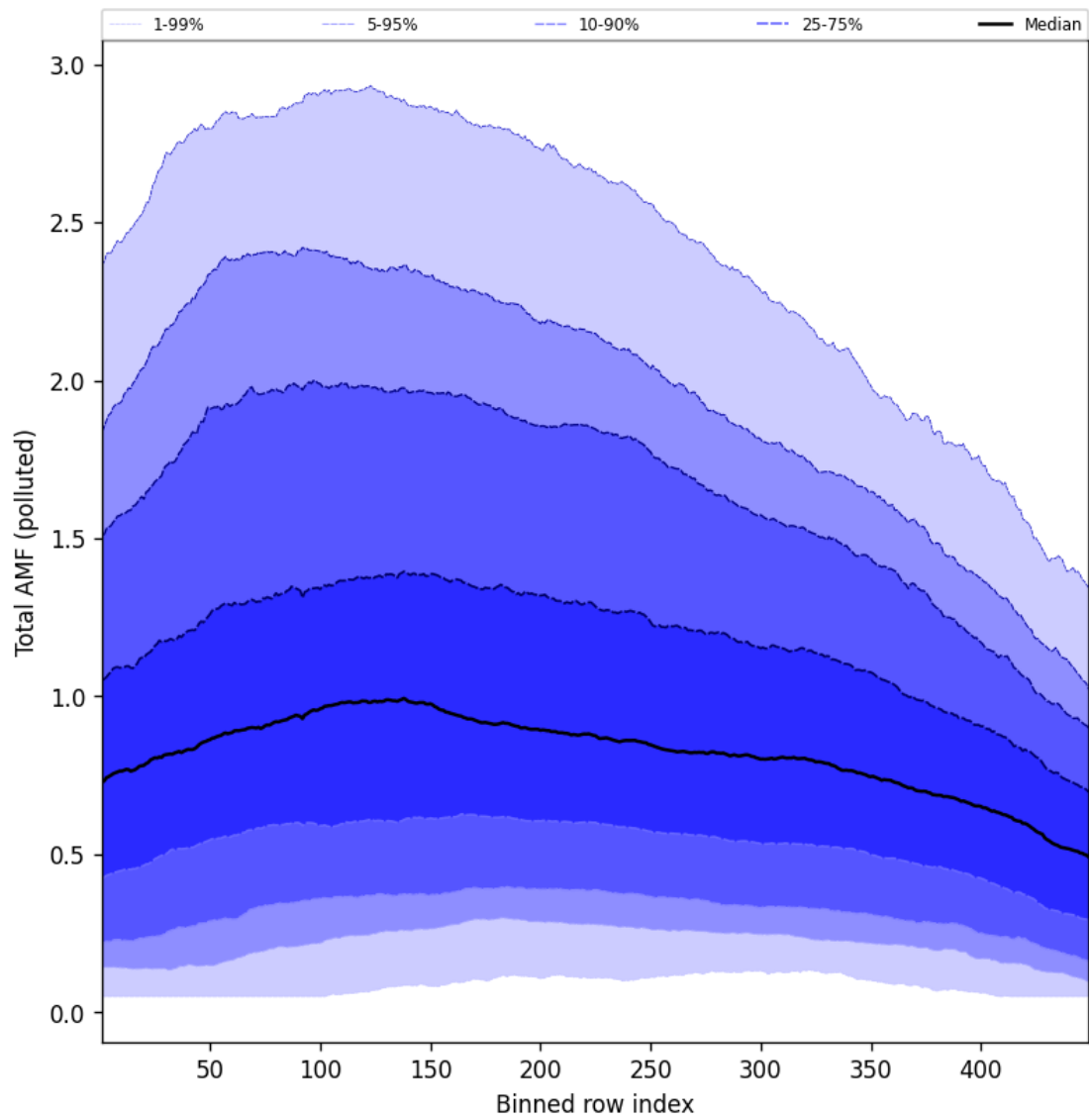


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-11-03 to 2025-11-04

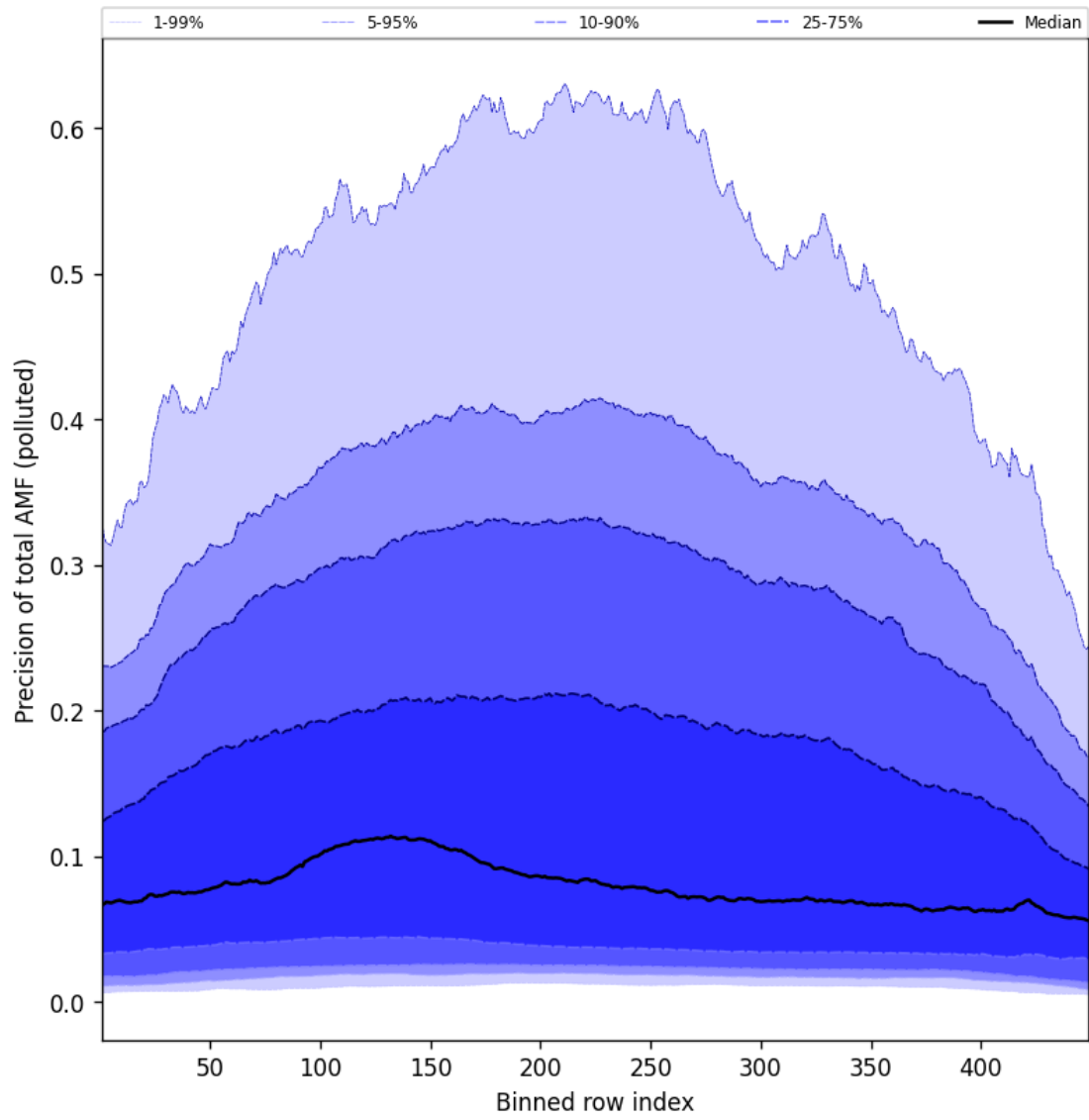


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-11-03 to 2025-11-04

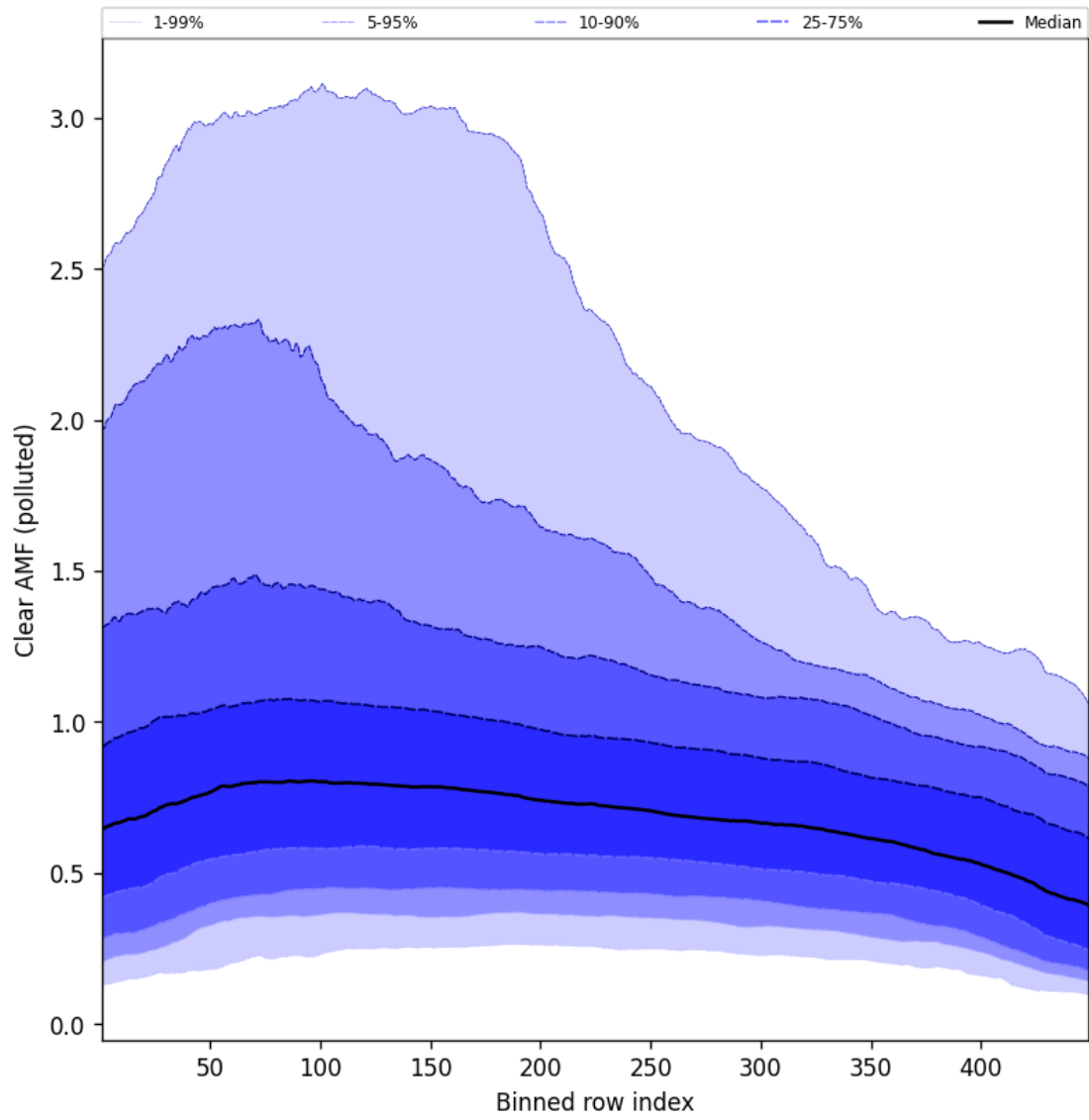


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-11-03 to 2025-11-04

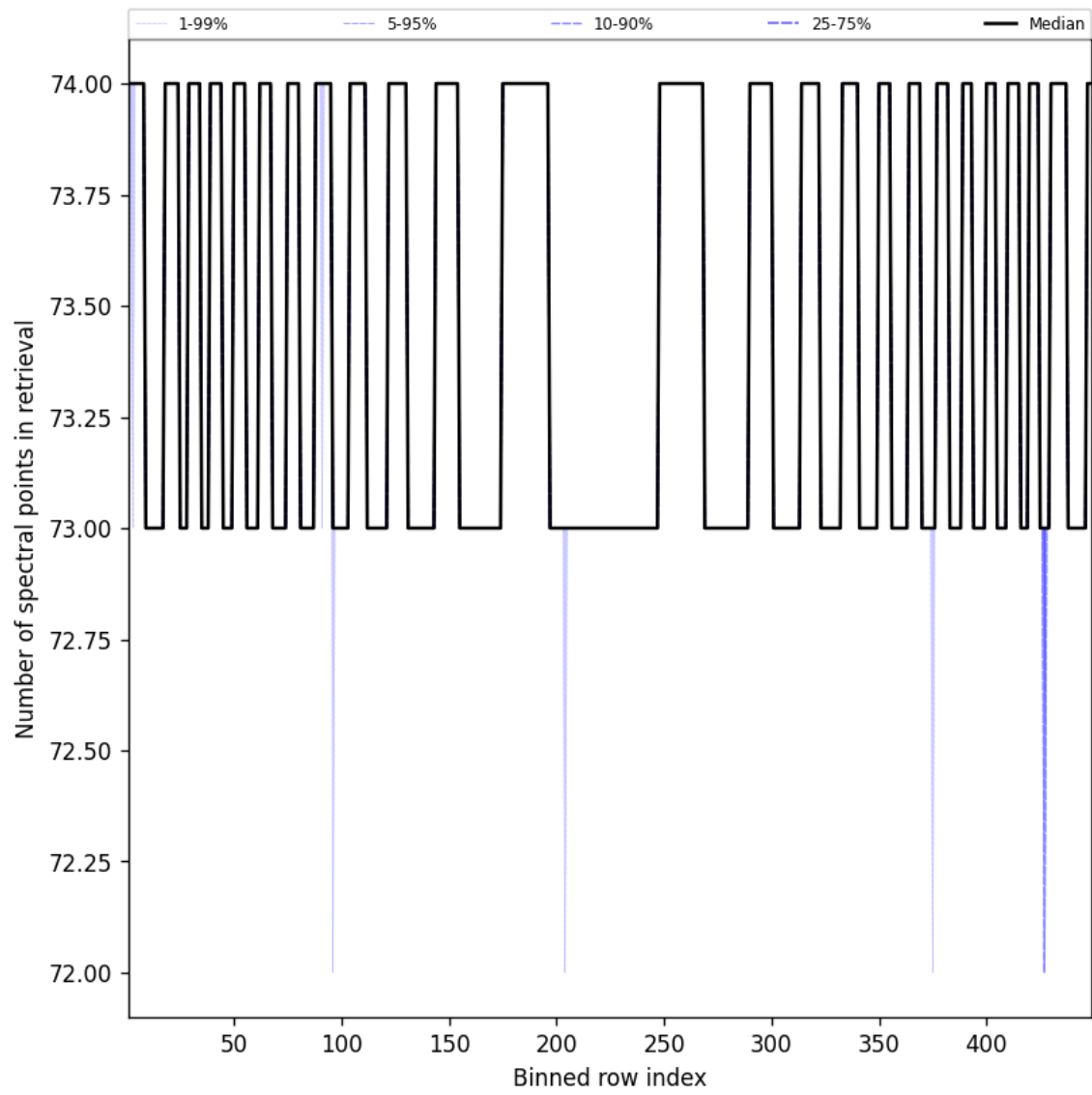


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-11-03 to 2025-11-04

10 Coincidence density

To investigate the relation between parameters scatter density plots are produced. These include some ‘hidden’ parameters, latitude and the solar- and viewing geometries, in addition to all configured parameters. All combinations of pairs of parameters are included *once*, in one direction alone.

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