

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]	0.605 ± 0.420	16557714	0.995	0.830	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.509 \pm 124.091) \times 10^{-2}$	16557714	0.249	0.416	8.845×10^{-3}	-99.7	275
sulfurdioxide total vertical column precision [DU]	0.534 ± 0.872	16557714	0.122	0.340	0.315	3.310×10^{-2}	41.5
sulfurdioxide slant column density corrected [DU]	$(1.637 \pm 35.996) \times 10^{-2}$	16557714	0.235	0.346	8.368×10^{-3}	-17.3	448
sulfurdioxide slant column density cobra [DU]	$(1.629 \pm 33.342) \times 10^{-2}$	16557714	0.235	0.346	8.368×10^{-3}	-17.3	42.5
sulfurdioxide slant column density cobra precision [DU]	0.274 ± 0.117	16557714	0.213	0.104	0.238	8.426×10^{-2}	23.1
sulfurdioxide slant column density window1 [DU]	$(6.958 \pm 63.710) \times 10^{-2}$	16557714	7.500×10^{-2}	0.718	7.364×10^{-2}	-81.4	75.5
sulfurdioxide slant column density window1 precision [DU]	0.274 ± 0.117	16557714	0.213	0.104	0.238	8.426×10^{-2}	23.1
sulfurdioxide slant column density corrected win1 [DU]	$(2.342 \pm 62.059) \times 10^{-2}$	16557714	2.500×10^{-2}	0.692	1.264×10^{-2}	-81.4	75.6
background so2 slant column offset window1 [DU]	$(-4.616 \pm 14.621) \times 10^{-2}$	16557714	-0.140	0.185	-8.599×10^{-2}	-1.15	4.18
sulfurdioxide slant column density window2 [DU]	1.23 ± 8.67	16557714	1.25	10.9	1.13	-1.350×10^3	1.683×10^3
sulfurdioxide slant column density window2 precision [DU]	7.79 ± 2.22	16557714	6.97	2.55	7.43	2.18	915
sulfurdioxide slant column density corrected win2 [DU]	0.769 ± 8.528	16557714	0.750	10.7	0.763	-1.349×10^3	1.685×10^3
background so2 slant column offset window2 [DU]	-0.457 ± 1.967	16557714	0.750	2.48	-8.646×10^{-2}	-12.1	8.06
sulfurdioxide slant column density window3 [DU]	-4.31 ± 23.19	16557714	-6.16	28.6	-4.66	-379	359
sulfurdioxide slant column density window3 precision [DU]	26.7 ± 12.8	16557714	21.5	10.3	23.5	9.25	246
sulfurdioxide slant column density corrected win3 [DU]	-1.61 ± 22.41	16557714	-1.68	27.5	-1.51	-380	352
background so2 slant column offset window3 [DU]	2.71 ± 6.58	16557714	-0.560	9.66	2.54	-27.6	22.2
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	16557714	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.592 \pm 8.676) \times 10^{-2}$	16557714	1.800×10^{-2}	2.363×10^{-2}	1.859×10^{-2}	1.868×10^{-4}	2.73
fitted radiance shift [nm]	$(-4.286 \pm 24.693) \times 10^{-4}$	16557714	-5.000×10^{-4}	1.721×10^{-3}	-4.905×10^{-4}	-9.894×10^{-2}	7.938×10^{-2}
fitted radiance squeeze [1]	$(-5.359 \pm 18.114) \times 10^{-5}$	16557714	-3.000×10^{-5}	2.144×10^{-4}	-4.530×10^{-5}	-1.561×10^{-2}	3.872×10^{-2}
fitted root mean square [1]	$(1.207 \pm 0.474) \times 10^{-3}$	16557714	9.750×10^{-4}	4.485×10^{-4}	1.075×10^{-3}	3.390×10^{-4}	5.636×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.934 ± 0.611	16557714	0.580	0.671	0.761	5.000×10^{-2}	3.20
sulfurdioxide total air mass factor polluted precision [1]	0.156 ± 0.179	16557714	3.500×10^{-2}	0.181	8.702×10^{-2}	2.500×10^{-3}	1.70
sulfurdioxide clear air mass factor polluted [1]	0.772 ± 0.507	16557714	0.580	0.377	0.642	1.905×10^{-2}	3.24
number of spectral points in retrieval [1]	73.4 ± 0.5	16557714	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	2.000×10^{-2}	7.000×10^{-2}	0.170	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.57	-0.886	-0.523	-0.343	-0.195	0.221	0.381	0.580	0.996	3.00
sulfurdioxide total vertical column precision [DU]	7.881×10^{-2}	0.103	0.125	0.151	0.194	0.534	0.747	1.04	1.64	3.89
sulfurdioxide slant column density corrected [DU]	-0.793	-0.458	-0.335	-0.252	-0.163	0.183	0.276	0.366	0.506	0.938
sulfurdioxide slant column density cobra [DU]	-0.793	-0.458	-0.335	-0.252	-0.163	0.183	0.276	0.366	0.506	0.938
sulfurdioxide slant column density cobra precision [DU]	0.145	0.167	0.180	0.190	0.203	0.307	0.365	0.422	0.503	0.706
sulfurdioxide slant column density window1 [DU]	-1.59	-0.921	-0.660	-0.481	-0.290	0.429	0.611	0.784	1.04	1.76
sulfurdioxide slant column density window1 precision [DU]	0.145	0.167	0.180	0.190	0.203	0.307	0.365	0.422	0.503	0.706
sulfurdioxide slant column density corrected win1 [DU]	-1.53	-0.912	-0.673	-0.508	-0.331	0.361	0.544	0.721	0.989	1.74
background so2 slant column offset window1 [DU]	-0.305	-0.228	-0.196	-0.169	-0.143	4.198×10^{-2}	0.104	0.161	0.230	0.361
sulfurdioxide slant column density window2 [DU]	-19.3	-12.6	-9.37	-6.96	-4.27	6.59	9.35	11.9	15.3	23.1
sulfurdioxide slant column density window2 precision [DU]	4.24	4.98	5.44	5.83	6.31	8.86	9.73	10.6	11.9	14.4
sulfurdioxide slant column density corrected win2 [DU]	-19.9	-13.0	-9.68	-7.27	-4.58	6.10	8.78	11.2	14.5	21.7
background so2 slant column offset window2 [DU]	-6.45	-4.15	-3.00	-2.27	-1.56	0.925	1.22	1.46	1.85	3.55
sulfurdioxide slant column density window3 [DU]	-62.7	-41.5	-32.2	-25.7	-18.6	9.92	17.6	24.7	34.3	53.3
sulfurdioxide slant column density window3 precision [DU]	13.1	15.0	16.4	17.6	19.3	29.6	34.2	39.4	50.2	80.8
sulfurdioxide slant column density corrected win3 [DU]	-59.2	-38.3	-28.9	-22.3	-15.2	12.3	19.3	25.8	34.8	53.3
background so2 slant column offset window3 [DU]	-11.3	-7.99	-5.96	-4.20	-2.01	7.64	9.90	11.6	13.5	15.9
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	8.281×10^{-4}	3.319×10^{-3}	5.144×10^{-3}	7.124×10^{-3}	1.006×10^{-2}	3.368×10^{-2}	4.378×10^{-2}	5.972×10^{-2}	0.106	0.372
fitted radiance shift [nm]	-7.853×10^{-3}	-3.966×10^{-3}	-2.631×10^{-3}	-1.914×10^{-3}	-1.337×10^{-3}	3.842×10^{-4}	1.067×10^{-3}	1.918×10^{-3}	3.401×10^{-3}	7.444×10^{-3}
fitted radiance squeeze [1]	-5.451×10^{-4}	-3.550×10^{-4}	-2.733×10^{-4}	-2.167×10^{-4}	-1.566×10^{-4}	5.774×10^{-5}	1.085×10^{-4}	1.546×10^{-4}	2.197×10^{-4}	3.732×10^{-4}
fitted root mean square [1]	5.977×10^{-4}	7.186×10^{-4}	7.885×10^{-4}	8.435×10^{-4}	9.104×10^{-4}	1.359×10^{-3}	1.594×10^{-3}	1.821×10^{-3}	2.130×10^{-3}	2.931×10^{-3}
sulfurdioxide total air mass factor polluted [1]	7.969×10^{-2}	0.215	0.321	0.410	0.515	1.19	1.53	1.92	2.30	2.69
sulfurdioxide total air mass factor polluted precision [1]	9.818×10^{-3}	1.740×10^{-2}	2.334×10^{-2}	2.851×10^{-2}	3.565×10^{-2}	0.216	0.294	0.380	0.506	0.862
sulfurdioxide clear air mass factor polluted [1]	0.175	0.293	0.367	0.423	0.486	0.863	1.01	1.22	2.12	2.79
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]	0.732 ± 0.381	5466139	0.610	1.000	0.0	1.000	0.390	1.000
sulfurdioxide total vertical column [DU]	$(7.428 \pm 188.226) \times 10^{-2}$	5466139	0.623	1.917×10^{-2}	-99.7	134	-0.284	0.339
sulfurdioxide total vertical column precision [DU]	0.817 ± 1.267	5466139	0.589	0.437	5.192×10^{-2}	38.9	0.281	0.870
sulfurdioxide slant column density corrected [DU]	$(2.846 \pm 40.724) \times 10^{-2}$	5466139	0.405	1.402×10^{-2}	-5.93	37.1	-0.186	0.219
sulfurdioxide slant column density cobra [DU]	$(2.843 \pm 40.578) \times 10^{-2}$	5466139	0.405	1.402×10^{-2}	-5.93	9.24	-0.186	0.219
sulfurdioxide slant column density cobra precision [DU]	0.323 ± 0.139	5466139	0.157	0.281	9.803×10^{-2}	1.96	0.227	0.384
sulfurdioxide slant column density window1 [DU]	0.143 ± 0.734	5466139	0.807	0.141	-11.1	10.6	-0.263	0.544
sulfurdioxide slant column density window1 precision [DU]	0.323 ± 0.139	5466139	0.157	0.281	9.803×10^{-2}	1.96	0.227	0.384
sulfurdioxide slant column density corrected win1 [DU]	$(4.407 \pm 73.114) \times 10^{-2}$	5466139	0.800	2.187×10^{-2}	-10.5	10.4	-0.372	0.428
background so2 slant column offset window1 [DU]	$(-9.883 \pm 11.775) \times 10^{-2}$	5466139	0.102	-0.111	-1.12	2.08	-0.163	-6.115×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.57 ± 9.86	5466139	12.5	1.28	-924	283	-4.84	7.65
sulfurdioxide slant column density window2 precision [DU]	8.88 ± 2.29	5466139	2.89	8.57	2.30	436	7.29	10.2
sulfurdioxide slant column density corrected win2 [DU]	0.760 ± 9.626	5466139	12.3	0.747	-929	277	-5.38	6.87
background so2 slant column offset window2 [DU]	-0.807 ± 2.422	5466139	2.93	7.174×10^{-2}	-12.1	7.30	-2.09	0.839
sulfurdioxide slant column density window3 [DU]	-6.31 ± 26.30	5466139	33.1	-5.68	-190	193	-22.5	10.6
sulfurdioxide slant column density window3 precision [DU]	30.3 ± 12.5	5466139	10.3	27.5	9.70	210	23.3	33.5
sulfurdioxide slant column density corrected win3 [DU]	-2.43 ± 25.88	5466139	32.7	-2.13	-185	199	-18.6	14.1
background so2 slant column offset window3 [DU]	3.89 ± 5.32	5466139	8.34	2.81	-24.1	22.2	-0.214	8.13
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.28	5466139	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.726 \pm 14.144) \times 10^{-2}$	5466139	4.283×10^{-2}	2.869×10^{-2}	5.269×10^{-4}	2.73	1.592×10^{-2}	5.874×10^{-2}
fitted radiance shift [nm]	$(-1.838 \pm 25.160) \times 10^{-4}$	5466139	1.694×10^{-3}	-2.197×10^{-4}	-3.252×10^{-2}	3.668×10^{-2}	-1.054×10^{-3}	6.405×10^{-4}
fitted radiance squeeze [1]	$(-6.950 \pm 185.621) \times 10^{-6}$	5466139	2.171×10^{-4}	-6.495×10^{-6}	-4.907×10^{-3}	1.709×10^{-3}	-1.151×10^{-4}	1.020×10^{-4}
fitted root mean square [1]	$(1.395 \pm 0.564) \times 10^{-3}$	5466139	6.457×10^{-4}	1.231×10^{-3}	3.515×10^{-4}	4.263×10^{-2}	1.011×10^{-3}	1.657×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.686 ± 0.360	5466139	0.478	0.664	5.000×10^{-2}	2.85	0.418	0.896
sulfurdioxide total air mass factor polluted precision [1]	$(8.704 \pm 10.951) \times 10^{-2}$	5466139	7.796×10^{-2}	4.622×10^{-2}	2.500×10^{-3}	1.66	2.873×10^{-2}	0.107
sulfurdioxide clear air mass factor polluted [1]	0.621 ± 0.252	5466139	0.381	0.630	1.905×10^{-2}	2.11	0.422	0.804
number of spectral points in retrieval [1]	73.5 ± 0.5	5466139	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]	0.542 $\pm$ 0.424	11091575	0.890	0.460	0.0	1.000	0.110	1.000
sulfurdioxide total vertical column [DU]	(1.578 $\pm$ 74.269) $\times 10^{-2}$	11091575	0.347	5.936 $\times 10^{-3}$	-38.6	275	-0.166	0.181
sulfurdioxide total vertical column precision [DU]	0.394 $\pm$ 0.534	11091575	0.271	0.269	3.310 $\times 10^{-2}$	41.5	0.162	0.434
sulfurdioxide slant column density corrected [DU]	(1.040 $\pm$ 33.404) $\times 10^{-2}$	11091575	0.323	6.133 $\times 10^{-3}$	-17.3	448	-0.154	0.168
sulfurdioxide slant column density cobra [DU]	(1.030 $\pm$ 29.102) $\times 10^{-2}$	11091575	0.323	6.133 $\times 10^{-3}$	-17.3	42.5	-0.154	0.168
sulfurdioxide slant column density cobra precision [DU]	0.251 $\pm$ 0.095	11091575	7.465 $\times 10^{-2}$	0.224	8.426 $\times 10^{-2}$	23.1	0.196	0.270
sulfurdioxide slant column density window1 [DU]	(3.345 $\pm$ 58.006) $\times 10^{-2}$	11091575	0.679	4.569 $\times 10^{-2}$	-81.4	75.5	-0.301	0.378
sulfurdioxide slant column density window1 precision [DU]	0.251 $\pm$ 0.095	11091575	7.465 $\times 10^{-2}$	0.224	8.426 $\times 10^{-2}$	23.1	0.196	0.270
sulfurdioxide slant column density corrected win1 [DU]	(1.324 $\pm$ 55.783) $\times 10^{-2}$	11091575	0.648	8.931 $\times 10^{-3}$	-81.4	75.6	-0.314	0.333
background so2 slant column offset window1 [DU]	(-2.021 $\pm$ 15.178) $\times 10^{-2}$	11091575	0.218	-5.465 $\times 10^{-2}$	-1.15	4.18	-0.135	8.240 $\times 10^{-2}$
sulfurdioxide slant column density window2 [DU]	1.06 $\pm$ 8.02	11091575	10.2	1.07	-1.350 $\times 10^3$	1.683 $\times 10^3$	-4.03	6.15
sulfurdioxide slant column density window2 precision [DU]	7.25 $\pm$ 1.97	11091575	2.12	6.99	2.18	915	6.02	8.14
sulfurdioxide slant column density corrected win2 [DU]	0.773 $\pm$ 7.931	11091575	10.0	0.769	-1.349 $\times 10^3$	1.685 $\times 10^3$	-4.25	5.78
background so2 slant column offset window2 [DU]	-0.285 $\pm$ 1.672	11091575	2.40	-0.167	-8.19	8.06	-1.43	0.974
sulfurdioxide slant column density window3 [DU]	-3.33 $\pm$ 21.42	11091575	26.7	-4.26	-379	359	-17.1	9.60
sulfurdioxide slant column density window3 precision [DU]	25.0 $\pm$ 12.5	11091575	8.38	21.7	9.25	246	18.2	26.6
sulfurdioxide slant column density corrected win3 [DU]	-1.21 $\pm$ 20.47	11091575	25.4	-1.28	-380	352	-13.9	11.5
background so2 slant column offset window3 [DU]	2.12 $\pm$ 7.04	11091575	11.0	2.39	-27.6	20.9	-3.63	7.41
sulfurdioxide slant column cobra flag [1]	1.98 $\pm$ 0.17	11091575	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	(2.048 $\pm$ 2.561) $\times 10^{-2}$	11091575	1.921 $\times 10^{-2}$	1.506 $\times 10^{-2}$	1.868 $\times 10^{-4}$	1.99	7.945 $\times 10^{-3}$	2.716 $\times 10^{-2}$
fitted radiance shift [nm]	(-5.492 $\pm$ 24.370) $\times 10^{-4}$	11091575	1.667 $\times 10^{-3}$	-6.243 $\times 10^{-4}$	-9.894 $\times 10^{-2}$	7.938 $\times 10^{-2}$	-1.438 $\times 10^{-3}$	2.287 $\times 10^{-4}$
fitted radiance squeeze [1]	(-7.657 $\pm$ 17.437) $\times 10^{-5}$	11091575	2.111 $\times 10^{-4}$	-6.362 $\times 10^{-5}$	-1.561 $\times 10^{-2}$	3.872 $\times 10^{-2}$	-1.752 $\times 10^{-4}$	3.592 $\times 10^{-5}$
fitted root mean square [1]	(1.115 $\pm$ 0.391) $\times 10^{-3}$	11091575	3.518 $\times 10^{-4}$	1.021 $\times 10^{-3}$	3.390 $\times 10^{-4}$	5.636 $\times 10^{-2}$	8.784 $\times 10^{-4}$	1.230 $\times 10^{-3}$
sulfurdioxide total air mass factor polluted [1]	1.06 $\pm$ 0.67	11091575	0.875	0.842	5.000 $\times 10^{-2}$	3.20	0.561	1.44
sulfurdioxide total air mass factor polluted precision [1]	0.190 $\pm$ 0.195	11091575	0.226	0.130	4.587 $\times 10^{-3}$	1.70	4.174 $\times 10^{-2}$	0.268
sulfurdioxide clear air mass factor polluted [1]	0.847 $\pm$ 0.579	11091575	0.407	0.647	0.104	3.24	0.505	0.913
number of spectral points in retrieval [1]	73.4 $\pm$ 0.5	11091575	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]	0.650 ± 0.409	11717789	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(2.722 \pm 109.863) \times 10^{-2}$	11717789	0.429	8.935×10^{-3}	-99.7	275	-0.203	0.226
sulfurdioxide total vertical column precision [DU]	0.498 ± 0.766	11717789	0.296	0.320	4.978×10^{-2}	41.5	0.213	0.509
sulfurdioxide slant column density corrected [DU]	$(1.304 \pm 30.509) \times 10^{-2}$	11717789	0.329	7.560×10^{-3}	-17.3	192	-0.156	0.173
sulfurdioxide slant column density cobra [DU]	$(1.302 \pm 29.947) \times 10^{-2}$	11717789	0.329	7.560×10^{-3}	-17.3	40.8	-0.156	0.173
sulfurdioxide slant column density cobra precision [DU]	0.258 ± 0.103	11717789	8.142×10^{-2}	0.227	8.426×10^{-2}	23.1	0.198	0.280
sulfurdioxide slant column density window1 [DU]	$(9.521 \pm 58.045) \times 10^{-2}$	11717789	0.674	9.645×10^{-2}	-81.4	75.5	-0.242	0.432
sulfurdioxide slant column density window1 precision [DU]	0.258 ± 0.103	11717789	8.142×10^{-2}	0.227	8.426×10^{-2}	23.1	0.198	0.280
sulfurdioxide slant column density corrected win1 [DU]	$(2.800 \pm 57.103) \times 10^{-2}$	11717789	0.658	2.092×10^{-2}	-81.4	75.6	-0.307	0.352
background so2 slant column offset window1 [DU]	$(-6.721 \pm 12.138) \times 10^{-2}$	11717789	0.156	-9.329×10^{-2}	-1.00	4.18	-0.146	1.023×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.859 ± 8.355	11717789	10.6	0.797	-1.350×10^3	1.180×10^3	-4.49	6.10
sulfurdioxide slant column density window2 precision [DU]	7.60 ± 2.01	11717789	2.38	7.30	2.18	485	6.23	8.61
sulfurdioxide slant column density corrected win2 [DU]	0.575 ± 8.259	11717789	10.5	0.581	-1.349×10^3	1.184×10^3	-4.67	5.81
background so2 slant column offset window2 [DU]	-0.284 ± 1.838	11717789	2.28	5.920×10^{-2}	-12.1	8.06	-1.31	0.975
sulfurdioxide slant column density window3 [DU]	-1.48 ± 22.63	11717789	28.4	-2.09	-379	359	-15.9	12.5
sulfurdioxide slant column density window3 precision [DU]	26.5 ± 12.1	11717789	9.29	23.4	9.25	213	19.7	28.9
sulfurdioxide slant column density corrected win3 [DU]	$(9.533 \pm 2174.371) \times 10^{-2}$	11717789	27.3	-0.252	-380	352	-13.7	13.6
background so2 slant column offset window3 [DU]	1.57 ± 5.87	11717789	8.37	1.65	-27.6	22.2	-2.49	5.88
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.15	11717789	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.640 \pm 3.625) \times 10^{-2}$	11717789	2.072×10^{-2}	1.880×10^{-2}	1.884×10^{-3}	2.25	1.113×10^{-2}	3.186×10^{-2}
fitted radiance shift [nm]	$(-3.518 \pm 24.192) \times 10^{-4}$	11717789	1.785×10^{-3}	-3.853×10^{-4}	-9.894×10^{-2}	7.938×10^{-2}	-1.270×10^{-3}	5.154×10^{-4}
fitted radiance squeeze [1]	$(-3.823 \pm 16.326) \times 10^{-5}$	11717789	1.952×10^{-4}	-3.285×10^{-5}	-1.561×10^{-2}	3.872×10^{-2}	-1.328×10^{-4}	6.240×10^{-5}
fitted root mean square [1]	$(1.135 \pm 0.419) \times 10^{-3}$	11717789	3.556×10^{-4}	1.029×10^{-3}	3.415×10^{-4}	5.636×10^{-2}	8.850×10^{-4}	1.241×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.828 ± 0.453	11717789	0.525	0.739	5.000×10^{-2}	2.67	0.517	1.04
sulfurdioxide total air mass factor polluted precision [1]	0.138 ± 0.147	11717789	0.162	7.412×10^{-2}	3.222×10^{-3}	1.50	3.610×10^{-2}	0.199
sulfurdioxide clear air mass factor polluted [1]	0.651 ± 0.229	11717789	0.304	0.615	4.723×10^{-2}	2.89	0.485	0.790
number of spectral points in retrieval [1]	73.4 ± 0.5	11717789	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]	0.483 ± 0.423	4325170	0.930	0.350	0.0	1.000	7.000×10^{-2}	1.000
sulfurdioxide total vertical column [DU]	$(4.654 \pm 136.050) \times 10^{-2}$	4325170	0.360	7.930×10^{-3}	-83.4	140	-0.166	0.194
sulfurdioxide total vertical column precision [DU]	0.568 ± 0.970	4325170	0.470	0.280	3.310×10^{-2}	37.0	0.137	0.607
sulfurdioxide slant column density corrected [DU]	$(2.311 \pm 41.883) \times 10^{-2}$	4325170	0.396	1.025×10^{-2}	-6.97	216	-0.185	0.210
sulfurdioxide slant column density cobra [DU]	$(2.298 \pm 40.097) \times 10^{-2}$	4325170	0.396	1.025×10^{-2}	-6.97	42.5	-0.185	0.210
sulfurdioxide slant column density cobra precision [DU]	0.313 ± 0.136	4325170	0.138	0.275	8.961×10^{-2}	21.9	0.224	0.361
sulfurdioxide slant column density window1 [DU]	$(-6.648 \pm 753.449) \times 10^{-3}$	4325170	0.844	-9.290×10^{-3}	-31.4	47.0	-0.437	0.407
sulfurdioxide slant column density window1 precision [DU]	0.313 ± 0.136	4325170	0.138	0.275	8.961×10^{-2}	21.9	0.224	0.361
sulfurdioxide slant column density corrected win1 [DU]	$(7.197 \pm 725.487) \times 10^{-3}$	4325170	0.789	-1.549×10^{-2}	-31.4	47.1	-0.404	0.385
background so2 slant column offset window1 [DU]	$(1.384 \pm 18.661) \times 10^{-2}$	4325170	0.300	-4.316×10^{-2}	-1.15	2.31	-0.132	0.168
sulfurdioxide slant column density window2 [DU]	2.17 ± 9.28	4325170	11.4	2.10	-778	1.683×10^3	-3.59	7.83
sulfurdioxide slant column density window2 precision [DU]	8.21 ± 2.57	4325170	2.96	7.77	2.30	915	6.49	9.46
sulfurdioxide slant column density corrected win2 [DU]	1.30 ± 9.07	4325170	11.1	1.29	-776	1.685×10^3	-4.27	6.86
background so2 slant column offset window2 [DU]	-0.873 ± 2.142	4325170	3.02	-0.537	-12.1	8.06	-2.26	0.765
sulfurdioxide slant column density window3 [DU]	-11.3 ± 22.8	4325170	27.1	-11.0	-307	197	-24.6	2.48
sulfurdioxide slant column density window3 precision [DU]	27.0 ± 14.1	4325170	12.4	23.5	9.66	237	18.2	30.6
sulfurdioxide slant column density corrected win3 [DU]	-5.60 ± 23.24	4325170	27.7	-4.45	-312	199	-18.9	8.89
background so2 slant column offset window3 [DU]	5.73 ± 7.37	4325170	12.3	7.46	-26.5	22.2	-0.359	11.9
sulfurdioxide slant column cobra flag [1]	1.95 ± 0.32	4325170	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.220 \pm 13.025) \times 10^{-2}$	4325170	3.609×10^{-2}	1.651×10^{-2}	1.868×10^{-4}	2.73	4.805×10^{-3}	4.090×10^{-2}
fitted radiance shift [nm]	$(-6.505 \pm 25.278) \times 10^{-4}$	4325170	1.436×10^{-3}	-7.606×10^{-4}	-5.100×10^{-2}	3.938×10^{-2}	-1.449×10^{-3}	-1.274×10^{-5}
fitted radiance squeeze [1]	$(-9.945 \pm 21.464) \times 10^{-5}$	4325170	2.650×10^{-4}	-9.545×10^{-5}	-1.166×10^{-2}	1.597×10^{-2}	-2.302×10^{-4}	3.474×10^{-5}
fitted root mean square [1]	$(1.387 \pm 0.541) \times 10^{-3}$	4325170	6.135×10^{-4}	1.253×10^{-3}	3.390×10^{-4}	4.533×10^{-2}	1.019×10^{-3}	1.632×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.25 ± 0.84	4325170	1.55	0.966	5.000×10^{-2}	3.20	0.535	2.08
sulfurdioxide total air mass factor polluted precision [1]	0.211 ± 0.239	4325170	0.241	0.133	2.500×10^{-3}	1.70	3.541×10^{-2}	0.276
sulfurdioxide clear air mass factor polluted [1]	1.12 ± 0.81	4325170	1.10	0.791	1.905×10^{-2}	3.24	0.514	1.62
number of spectral points in retrieval [1]	73.4 ± 0.5	4325170	1.000	73.0	70.0	74.0	73.0	74.0

3 Granule outlines

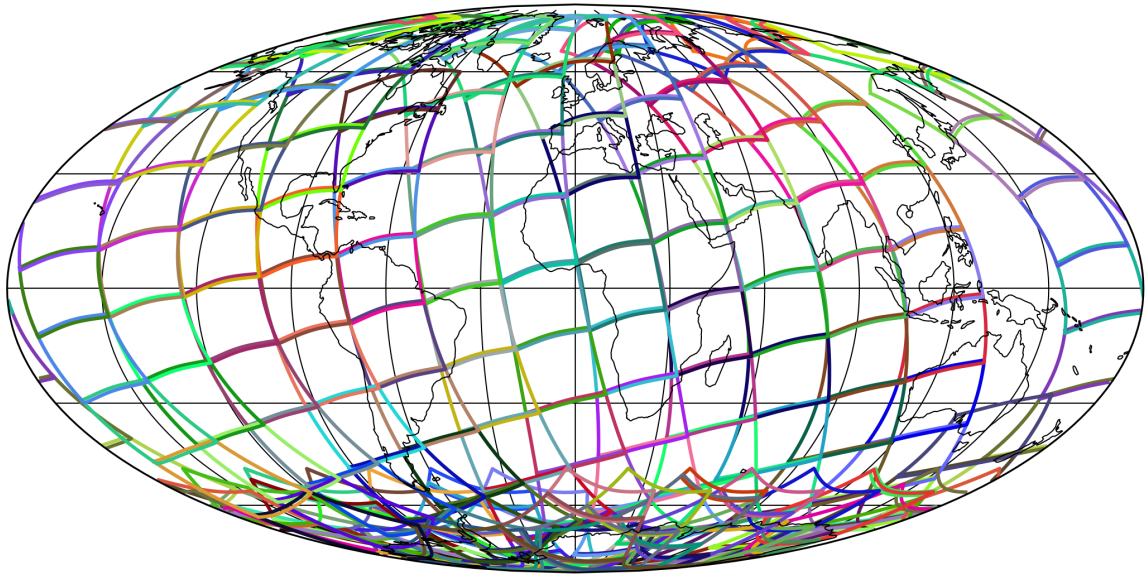


Figure 1: Outline of the granules.

4 Input data monitoring

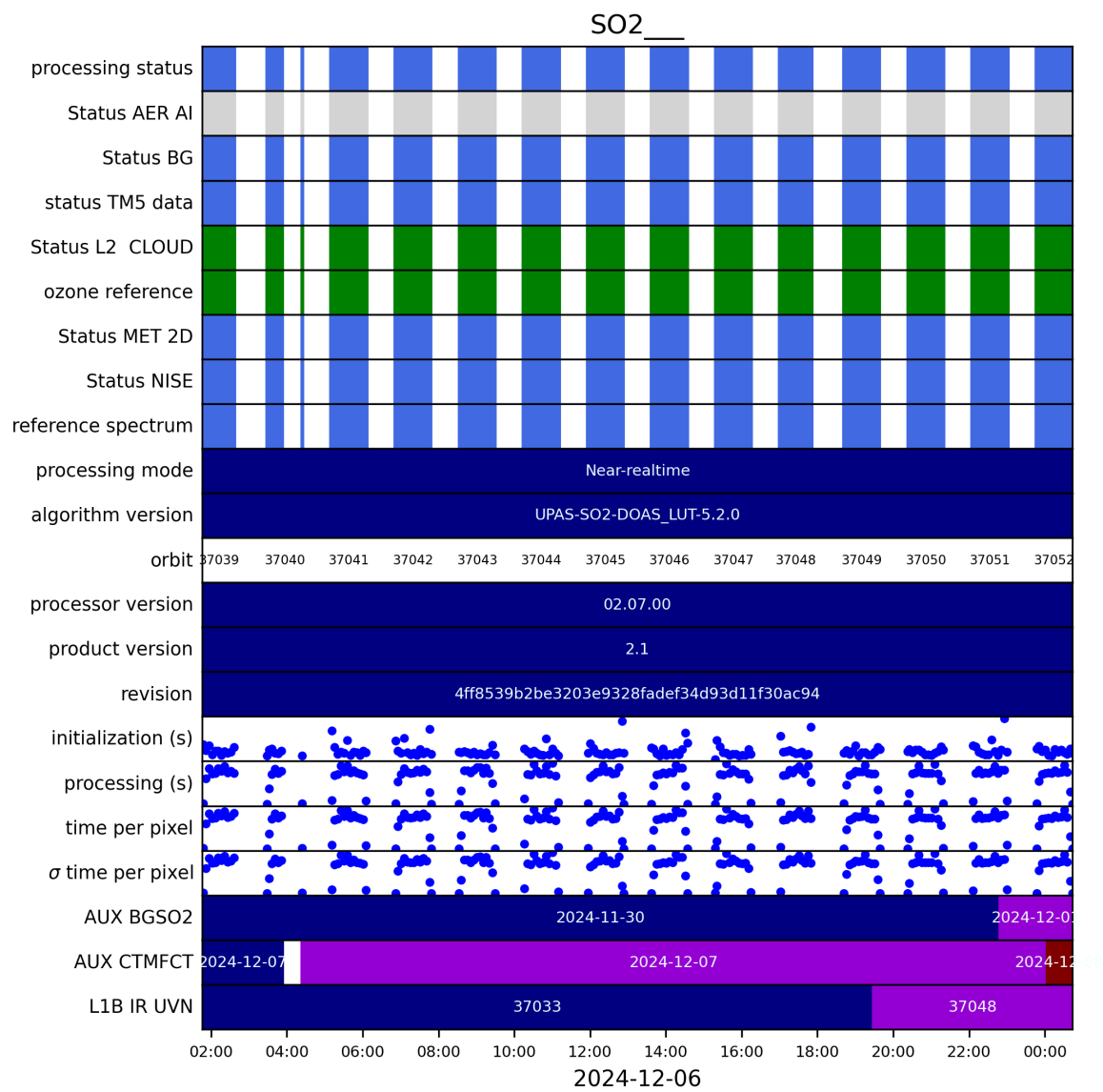


Figure 2: Input data per granule

5 Warnings and errors

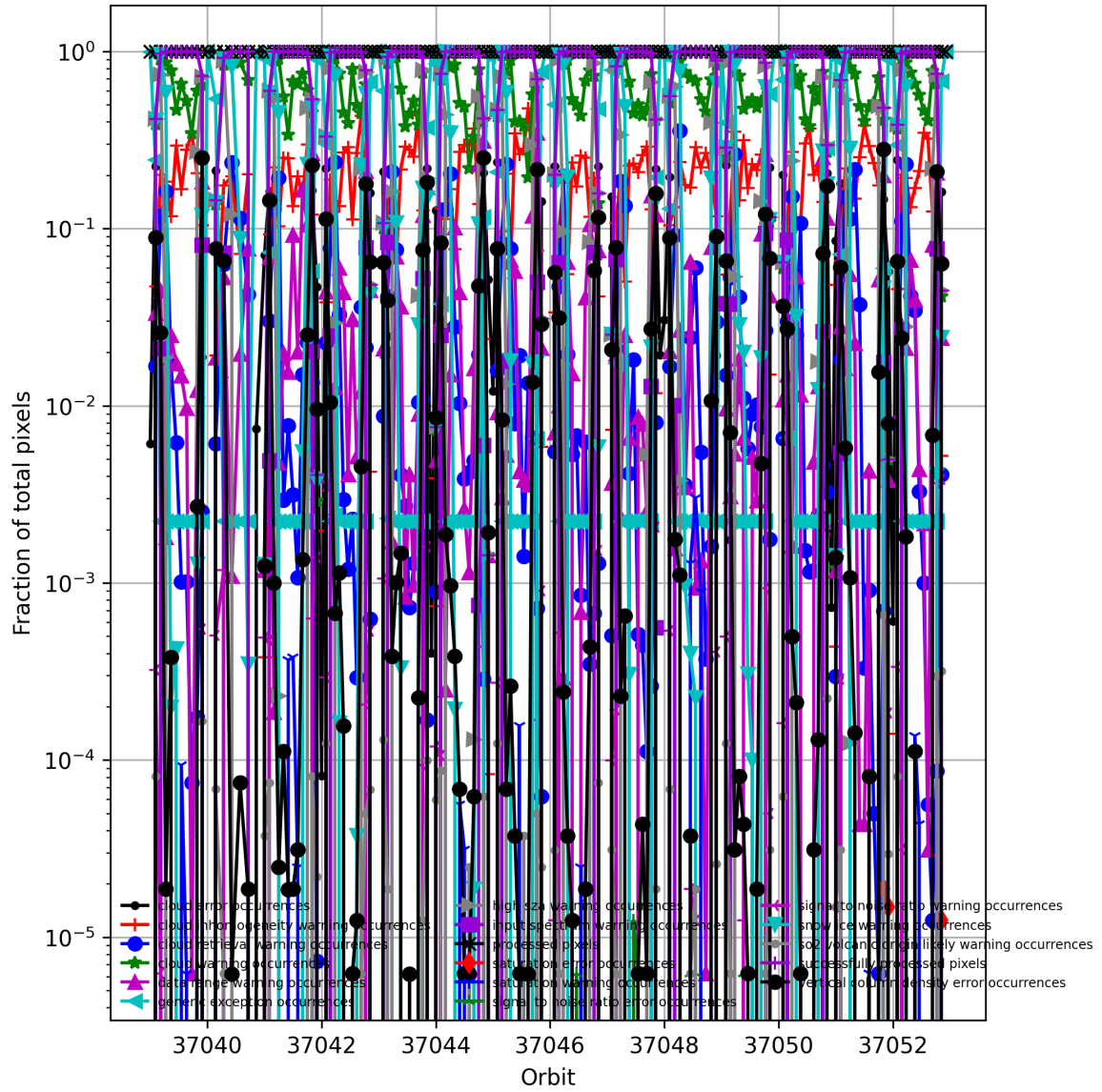


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

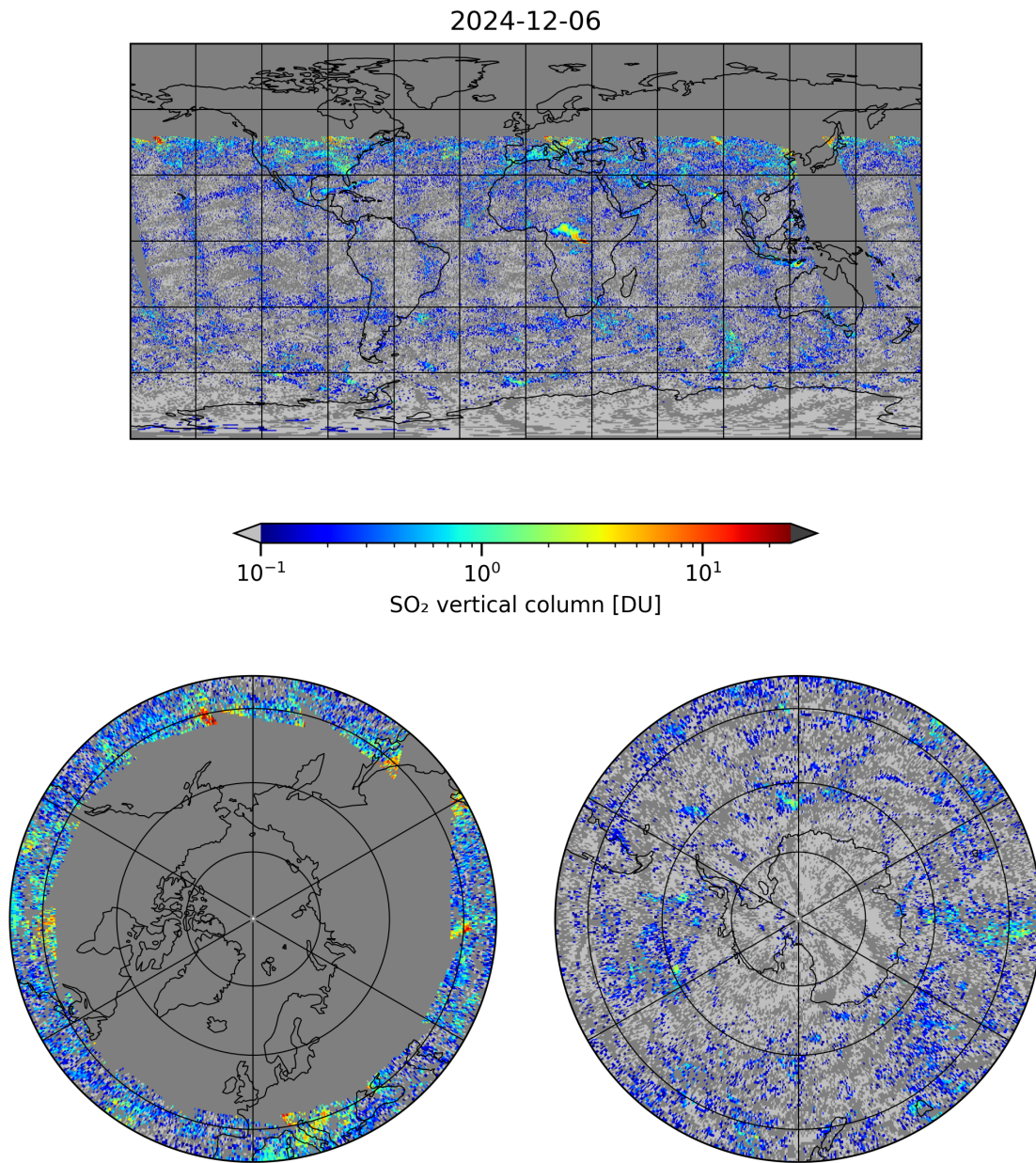


Figure 4: Map of “SO₂ vertical column” for 2024-12-06 to 2024-12-07

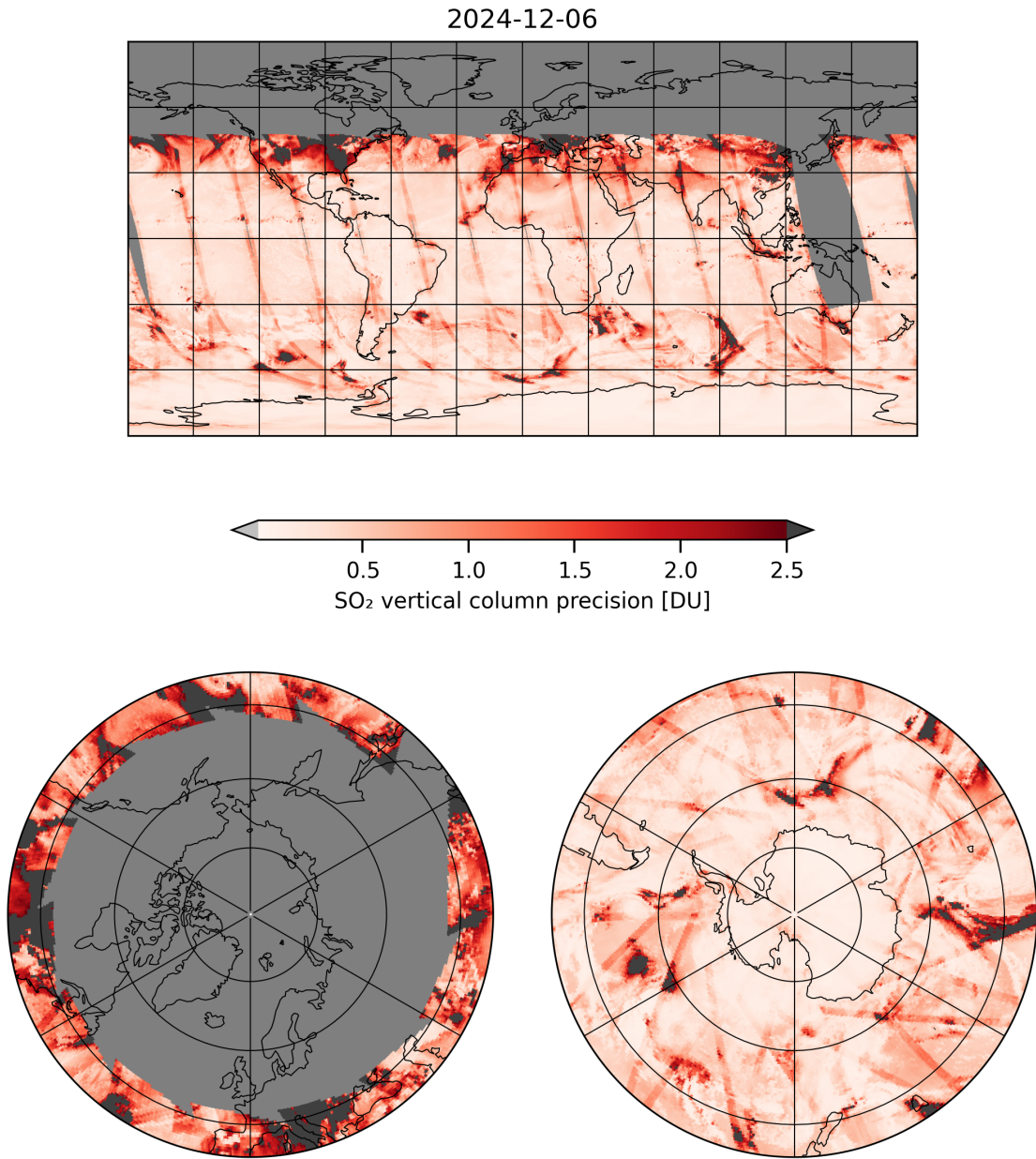


Figure 5: Map of “SO₂ vertical column precision” for 2024-12-06 to 2024-12-07

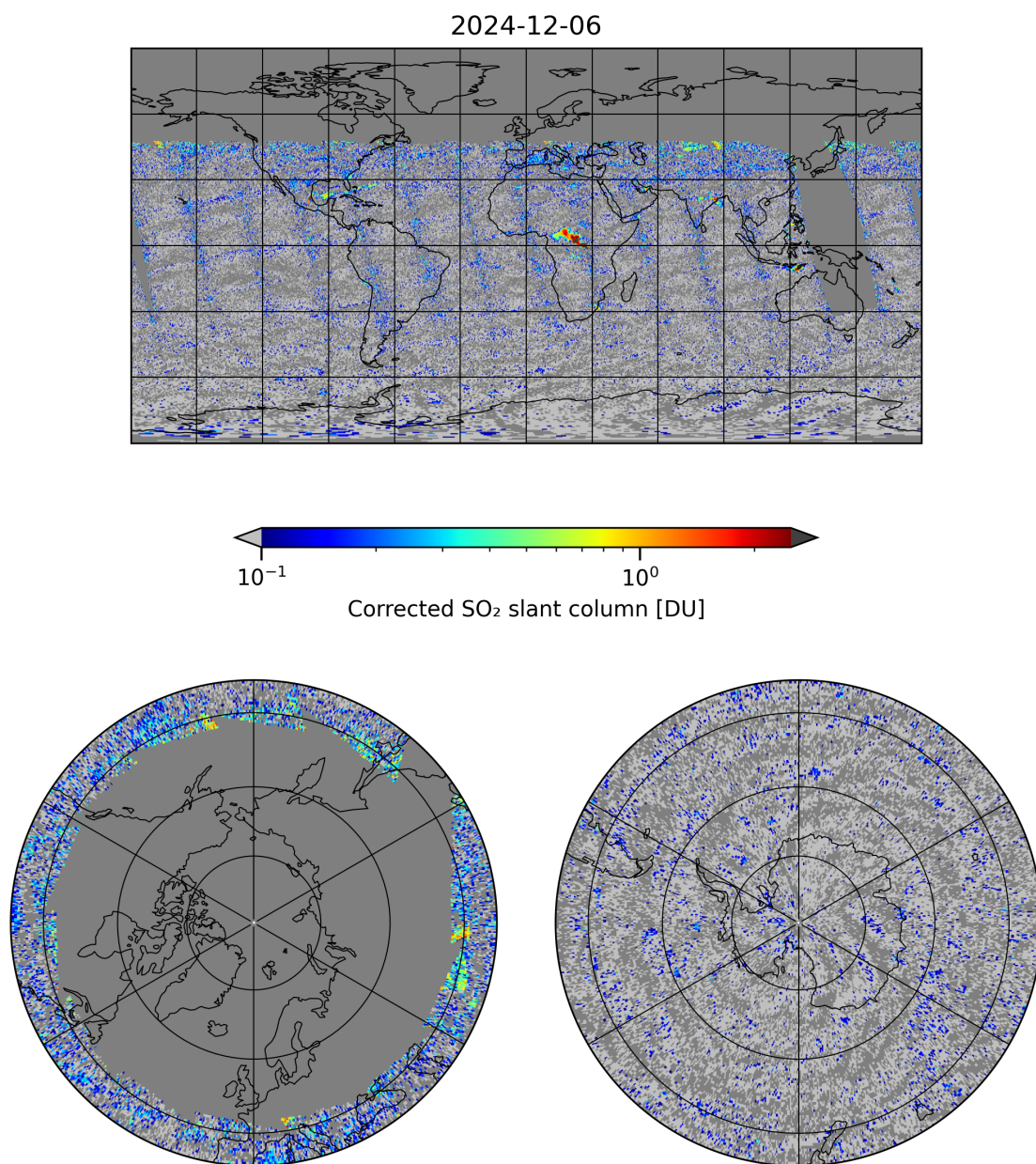


Figure 6: Map of “Corrected SO₂ slant column” for 2024-12-06 to 2024-12-07

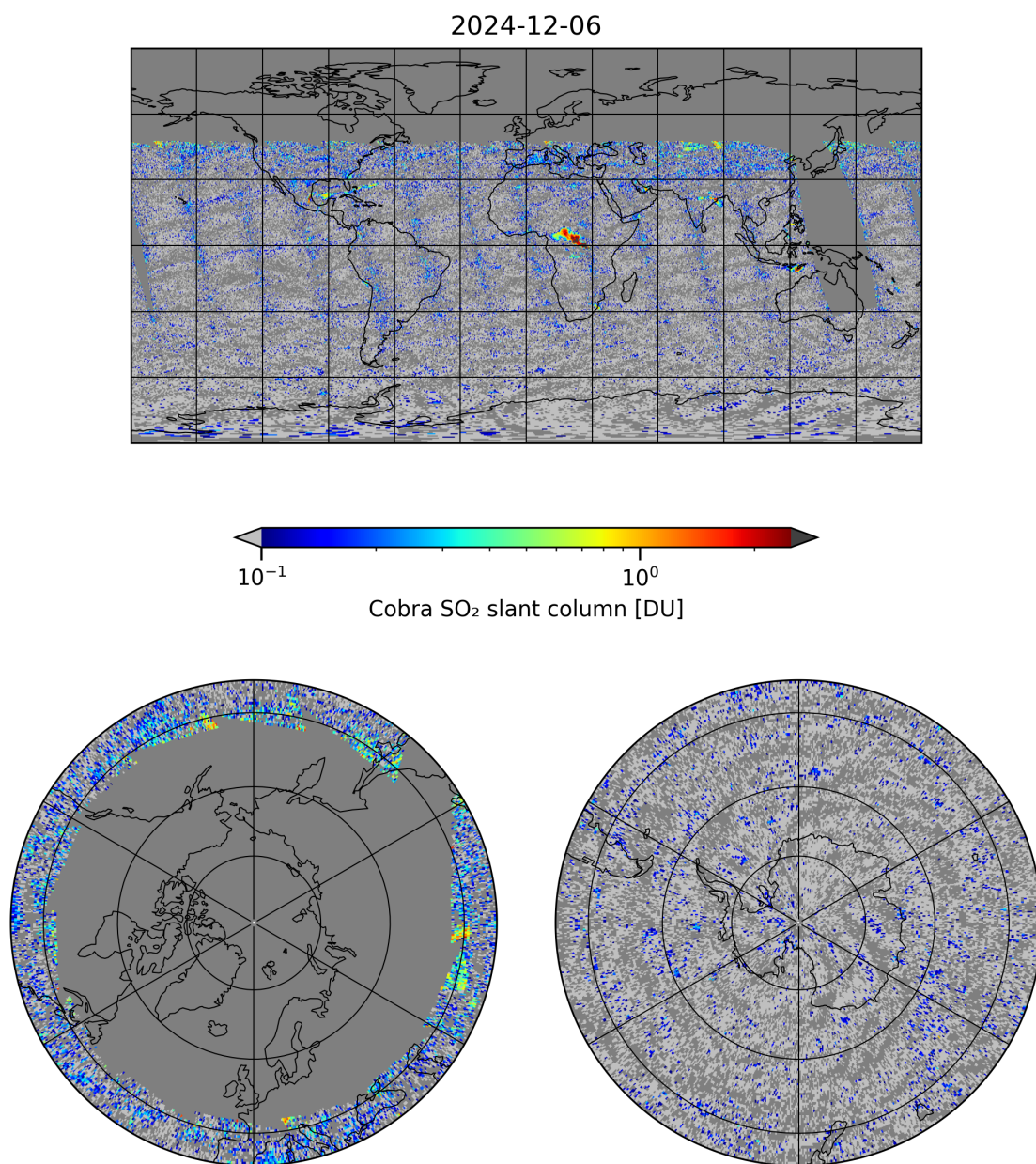


Figure 7: Map of “Cobra SO₂ slant column” for 2024-12-06 to 2024-12-07

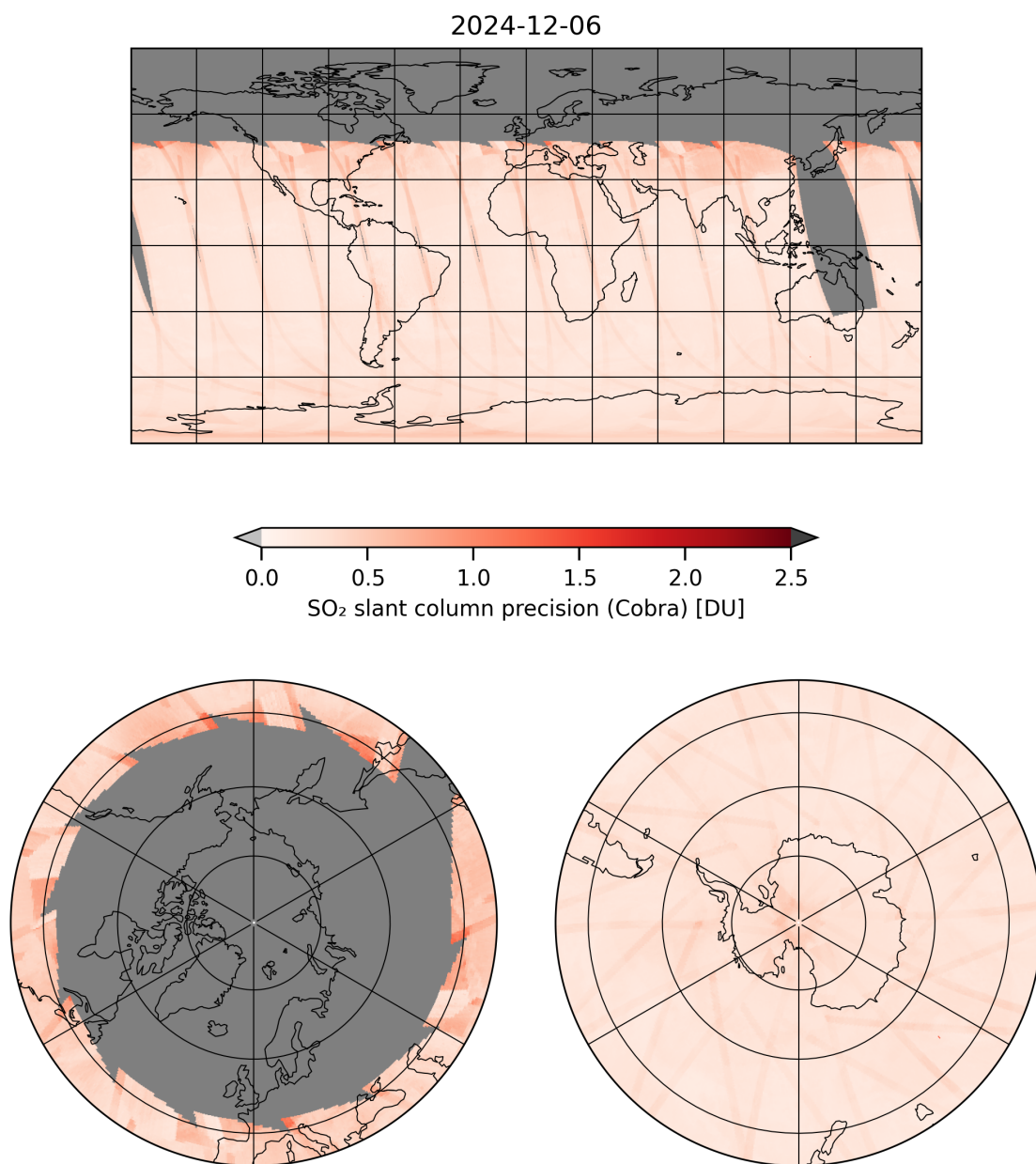


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2024-12-06 to 2024-12-07

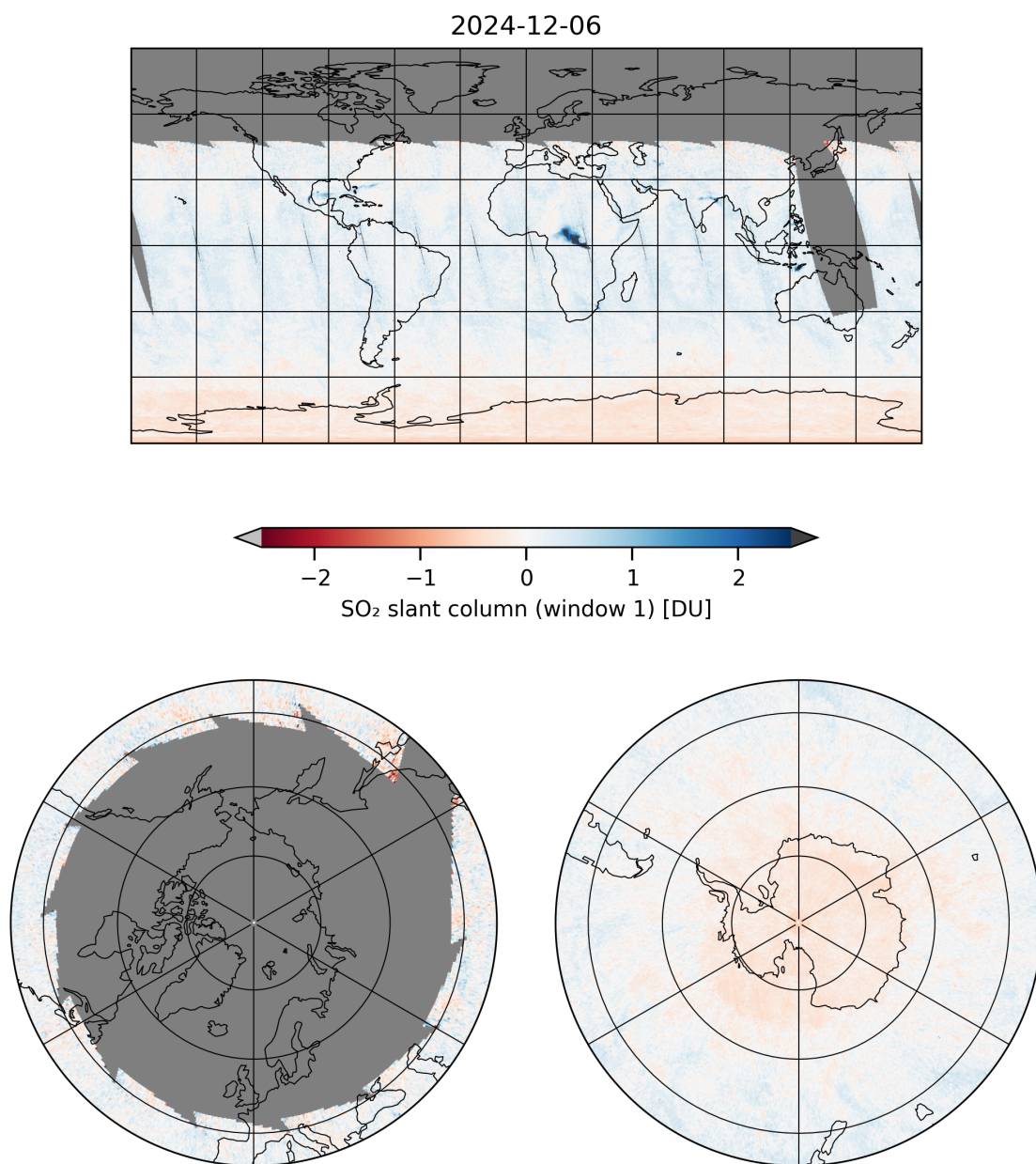


Figure 9: Map of “SO₂ slant column (window 1)” for 2024-12-06 to 2024-12-07

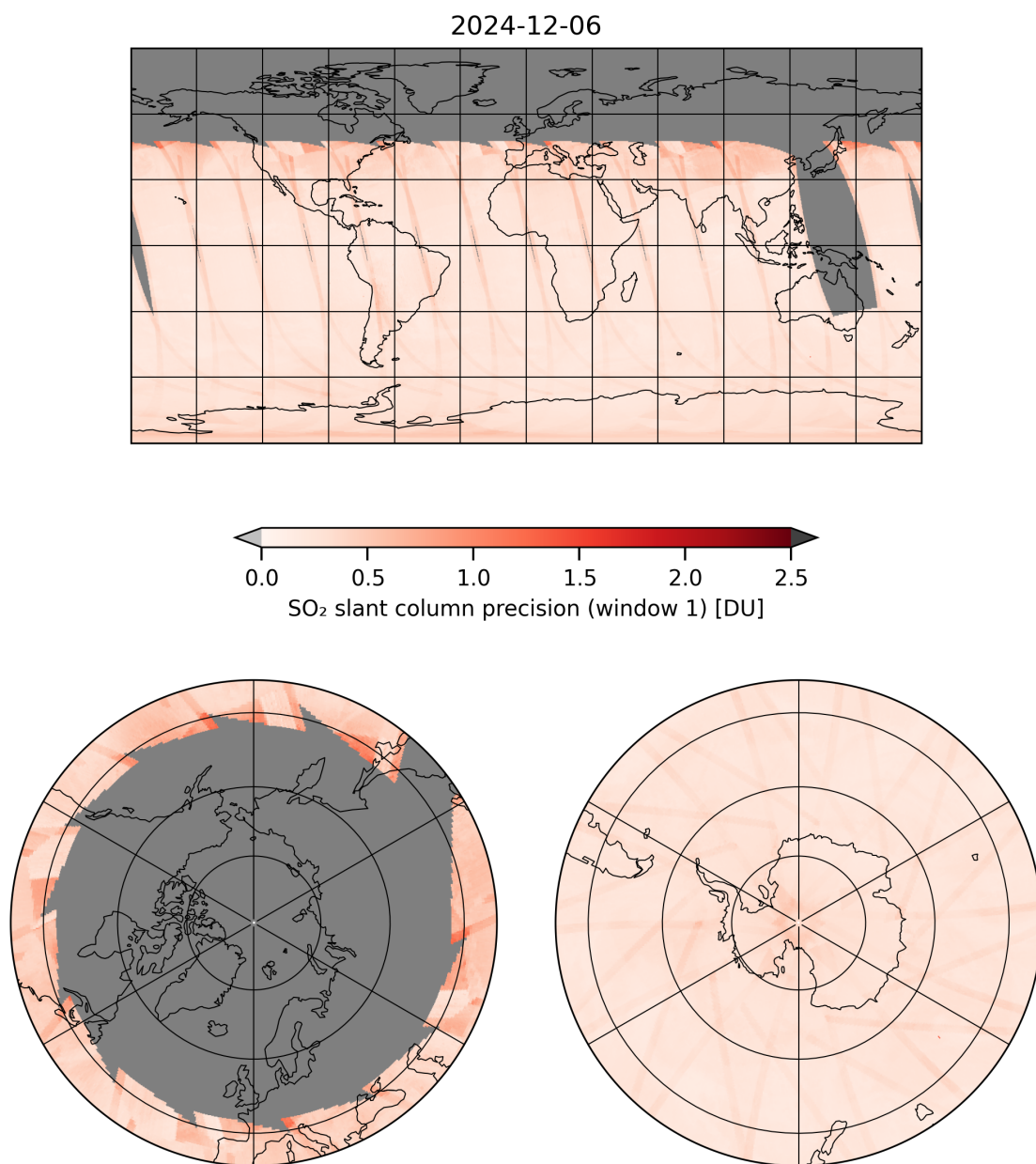


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2024-12-06 to 2024-12-07

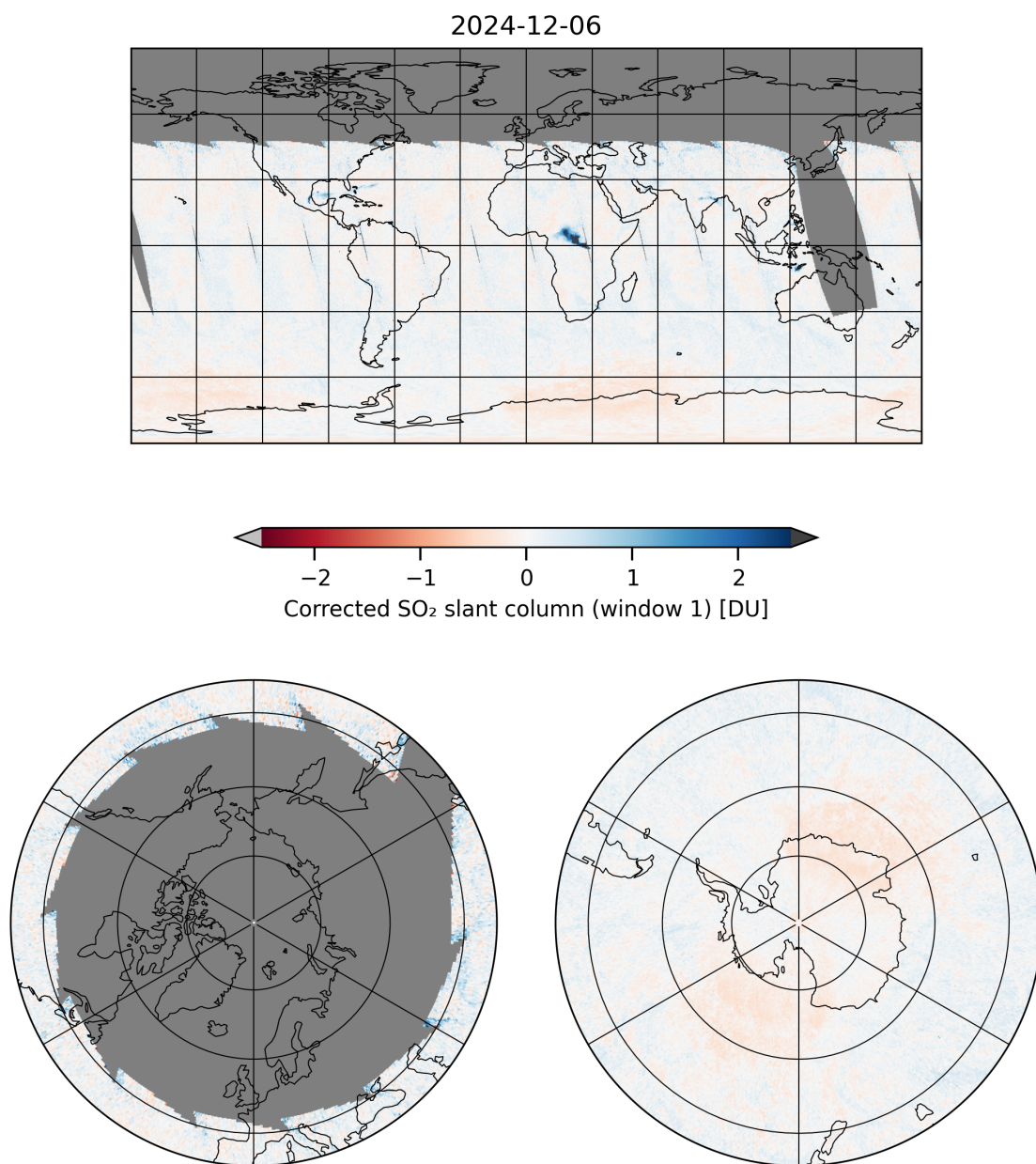


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2024-12-06 to 2024-12-07

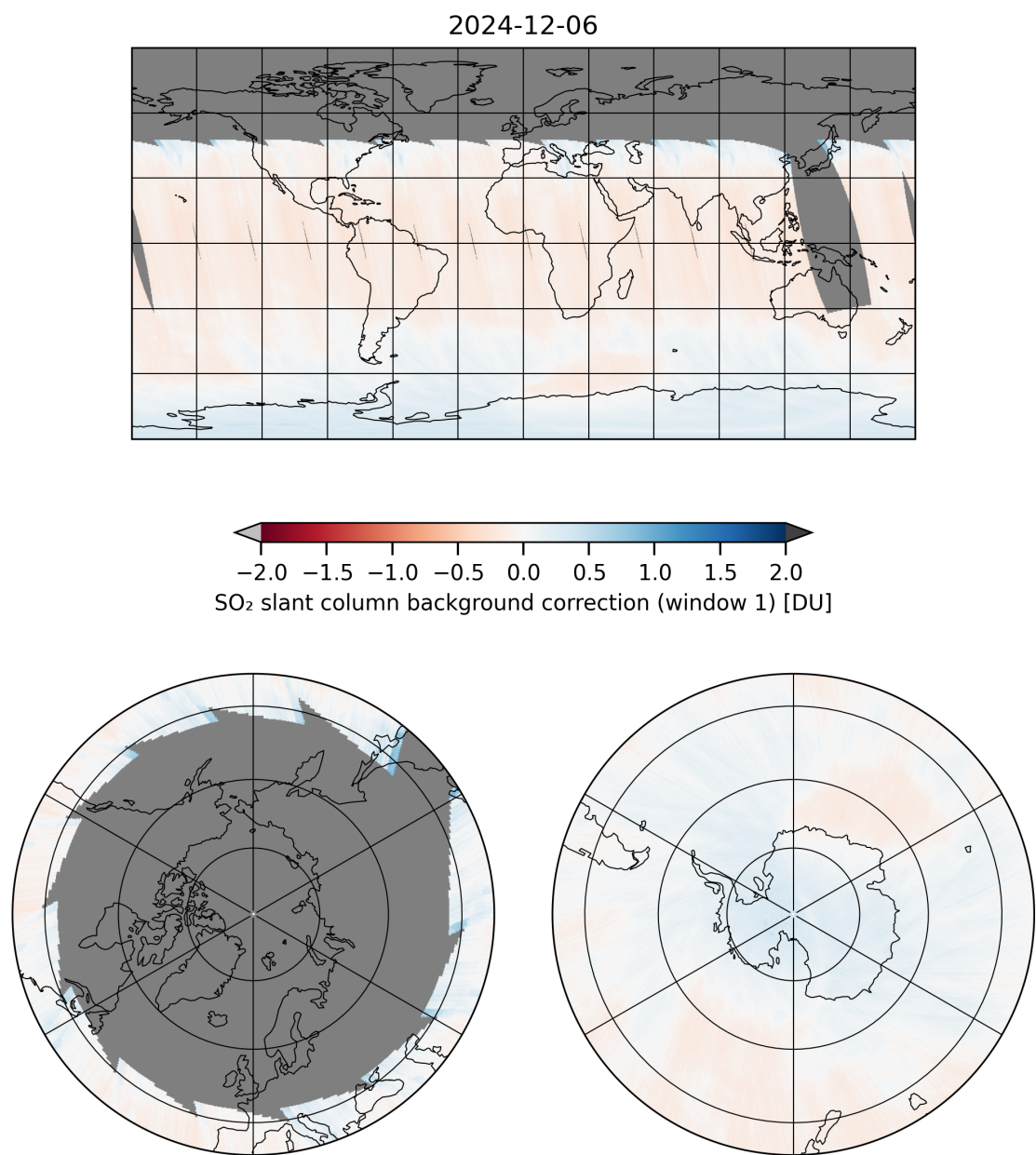


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2024-12-06 to 2024-12-07

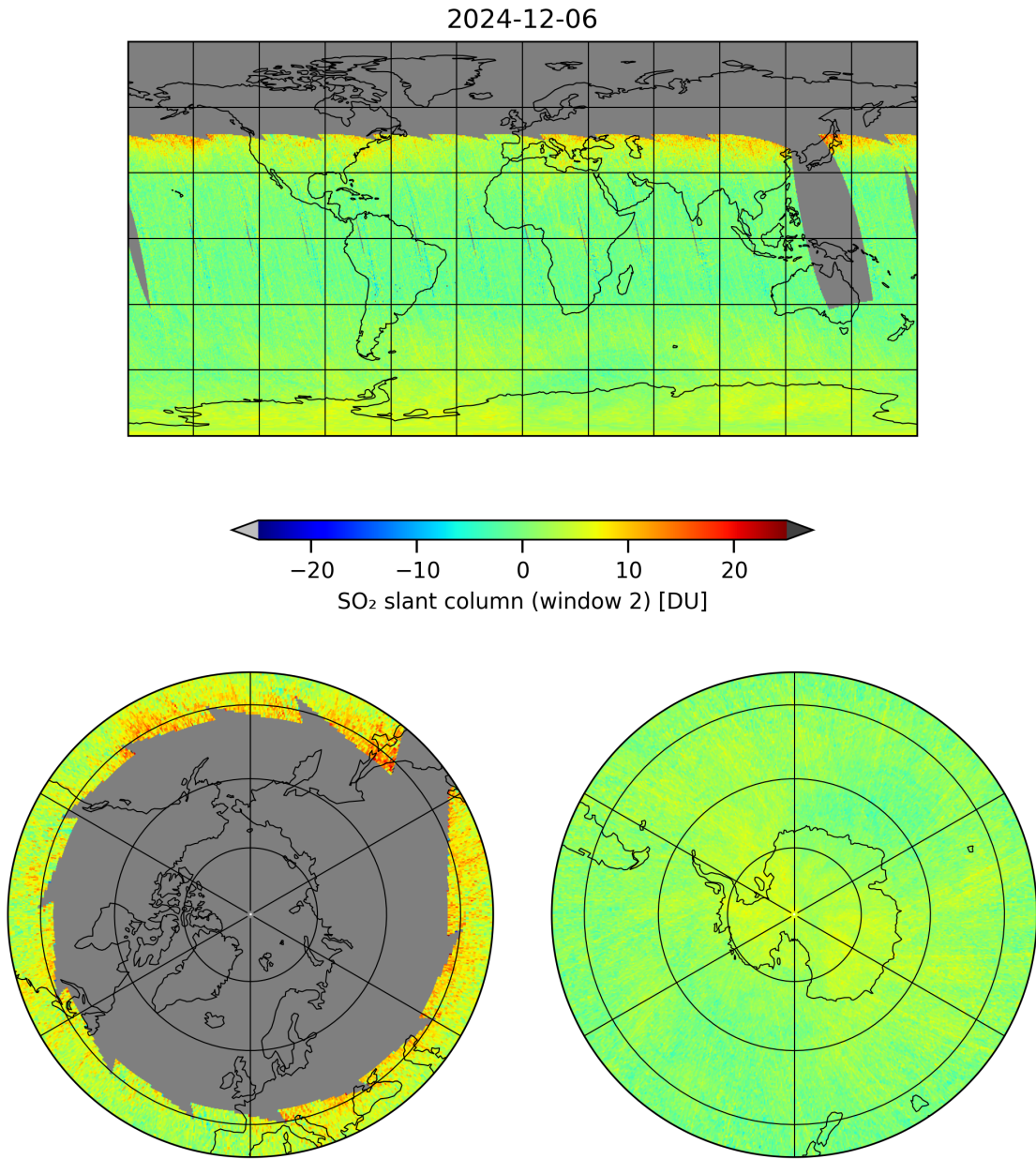


Figure 13: Map of “SO₂ slant column (window 2)” for 2024-12-06 to 2024-12-07

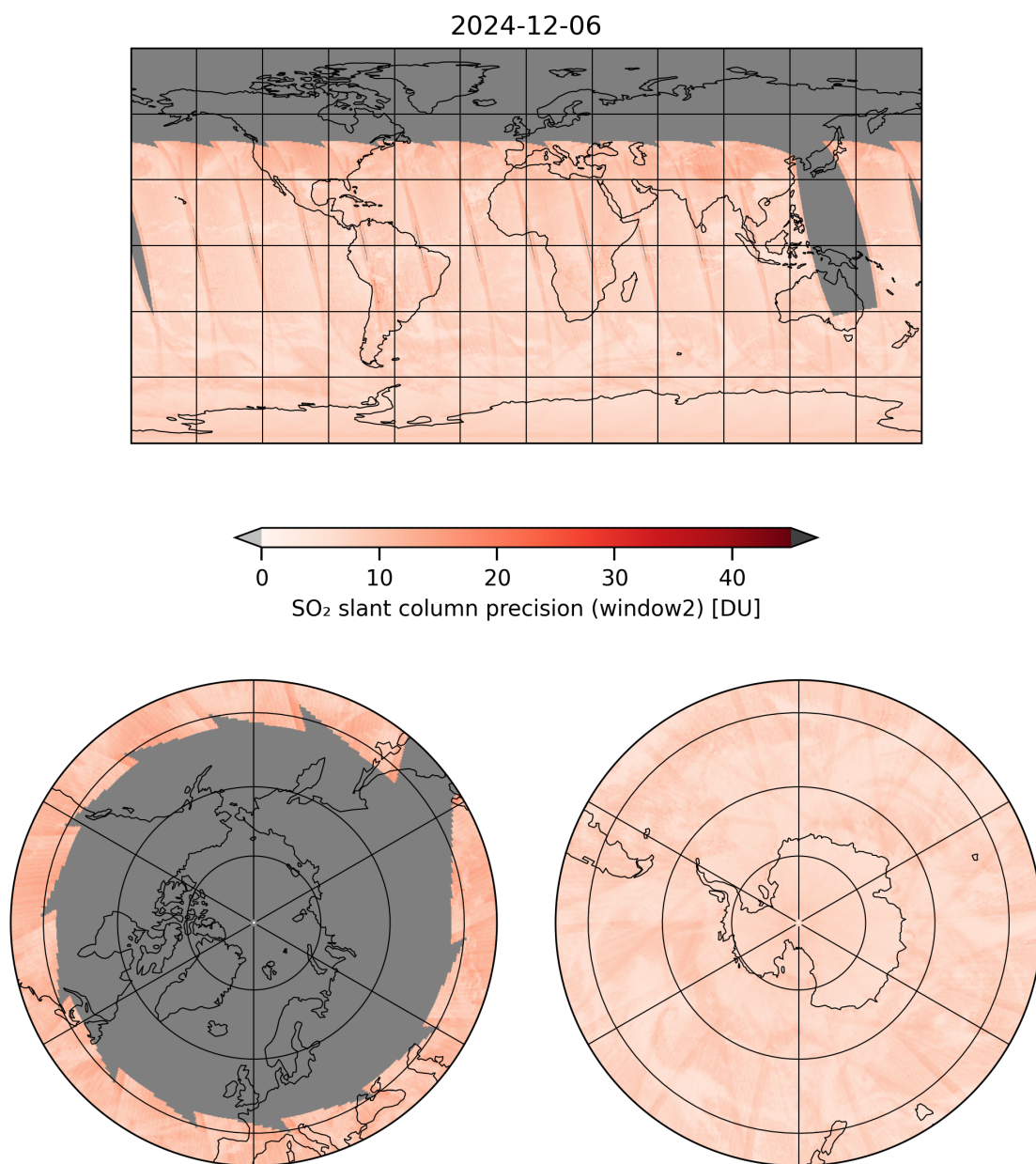


Figure 14: Map of “SO₂ slant column precision (window2)” for 2024-12-06 to 2024-12-07

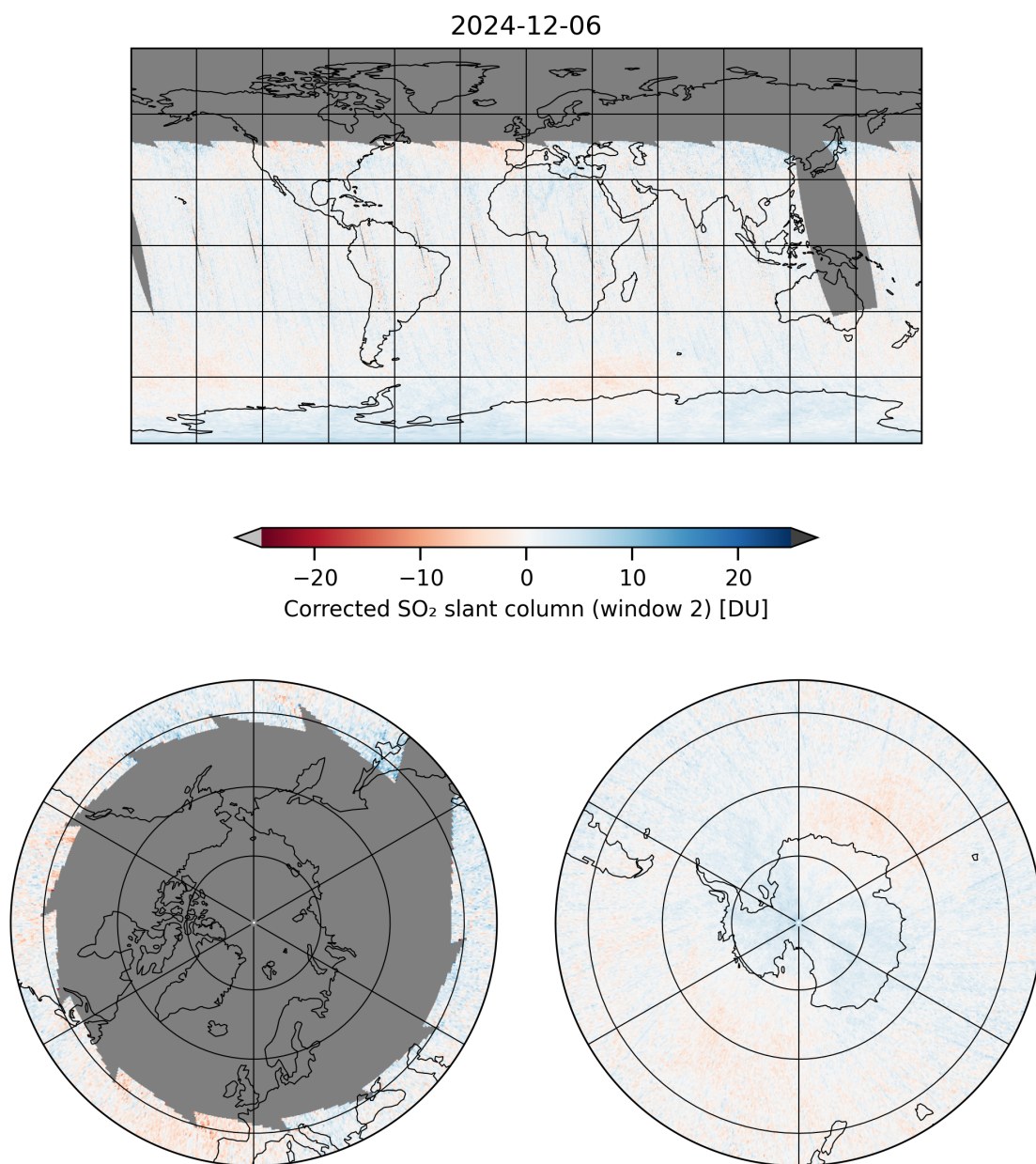


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2024-12-06 to 2024-12-07

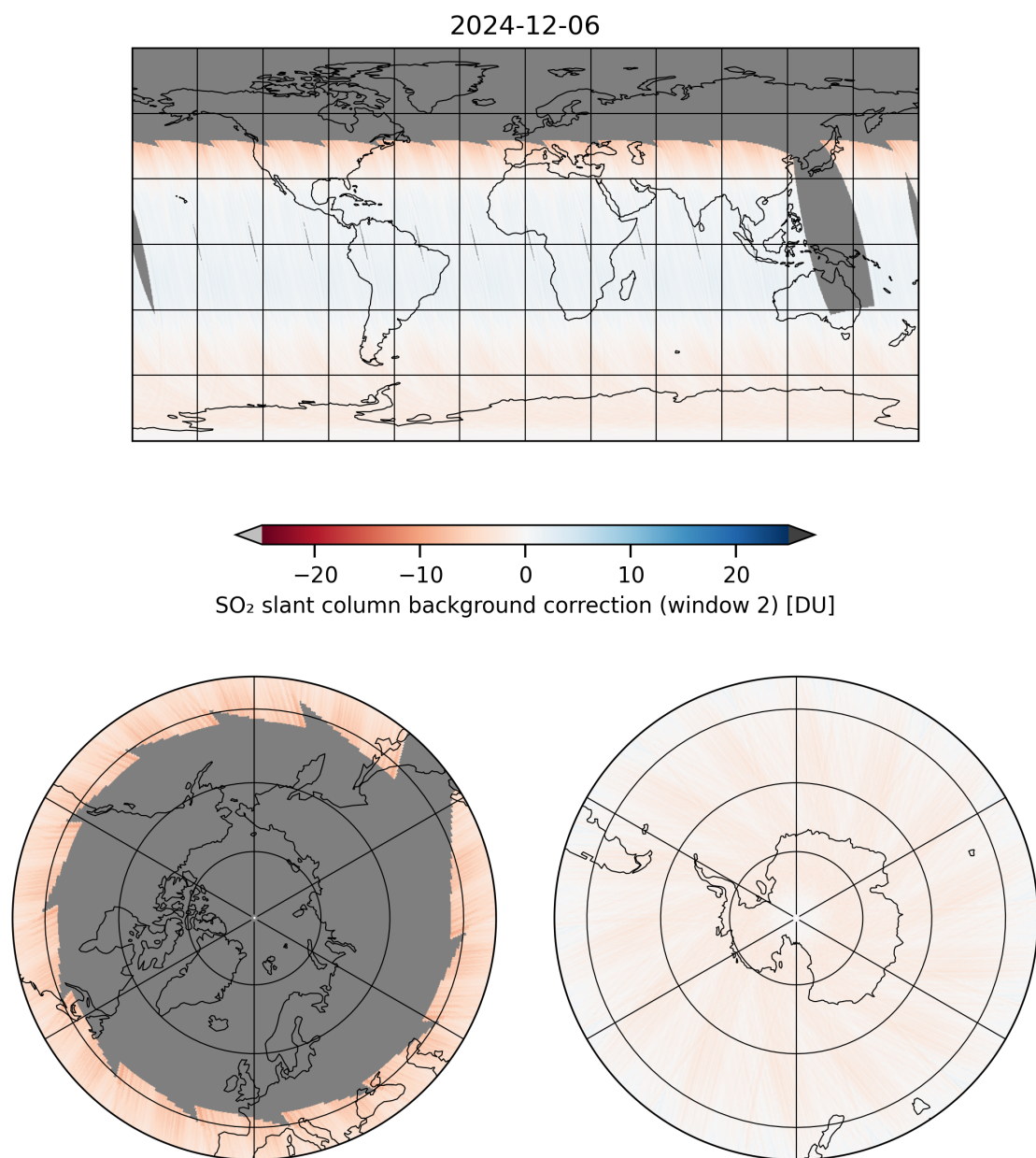


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2024-12-06 to 2024-12-07

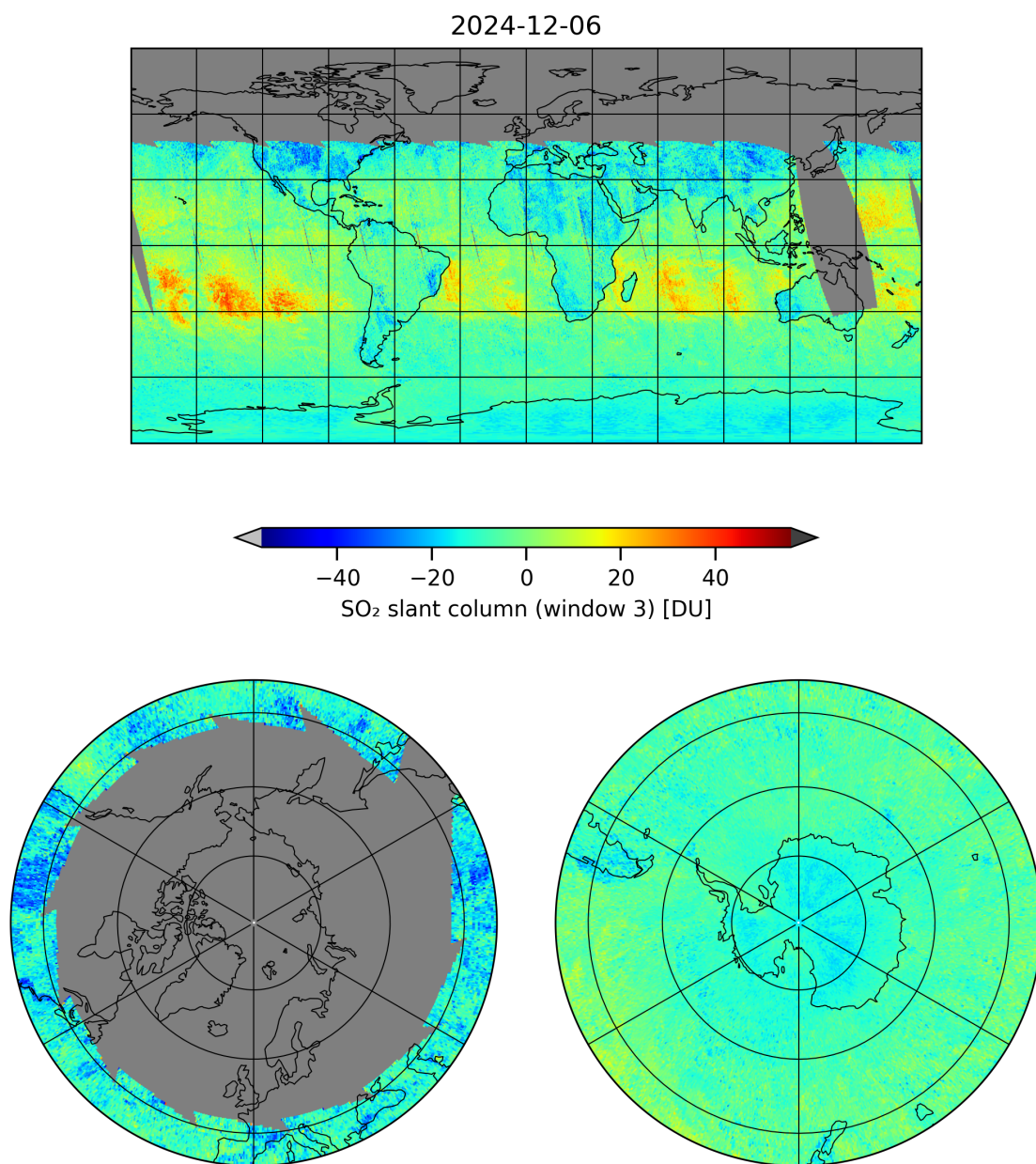


Figure 17: Map of “SO₂ slant column (window 3)” for 2024-12-06 to 2024-12-07

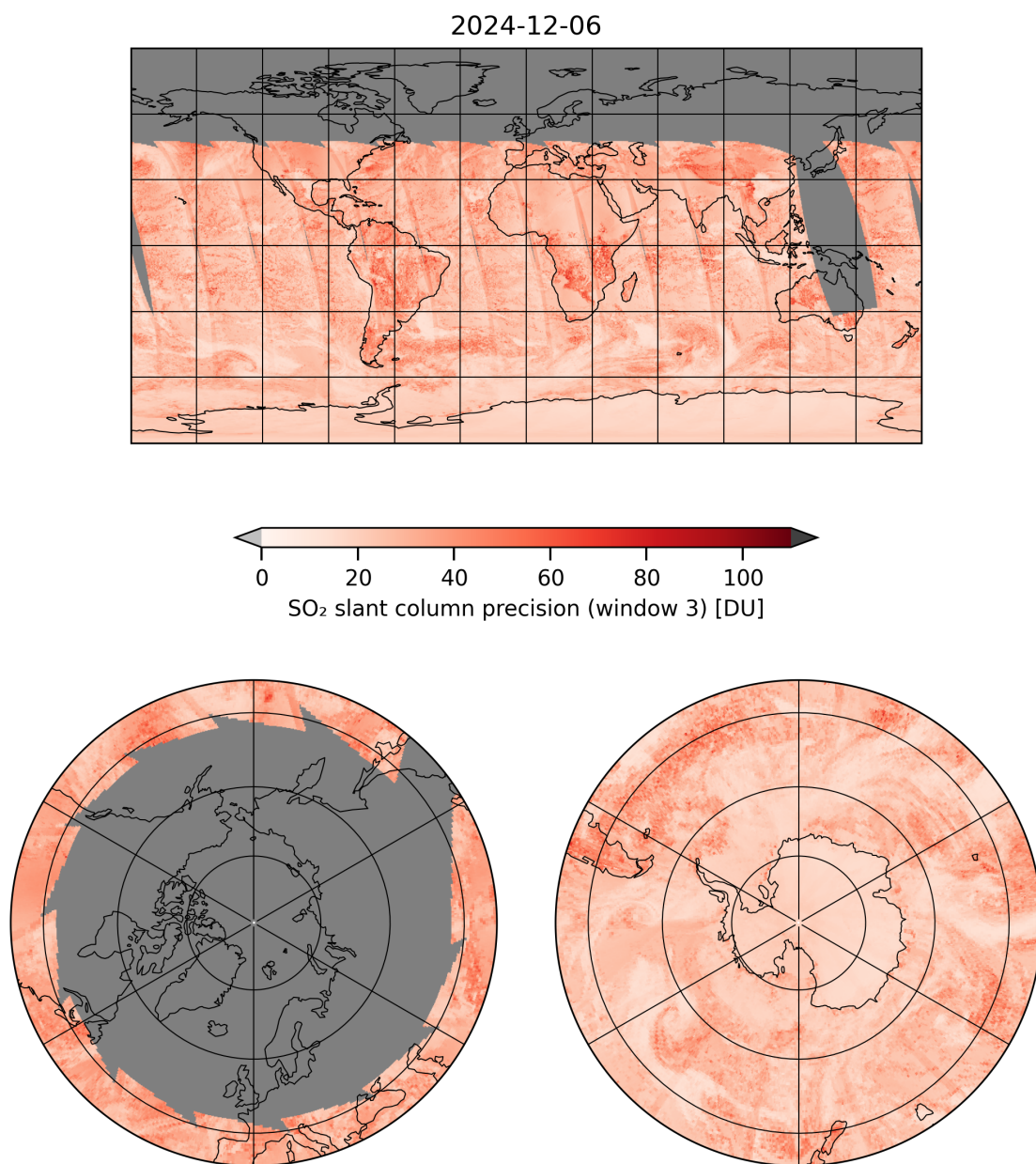


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2024-12-06 to 2024-12-07

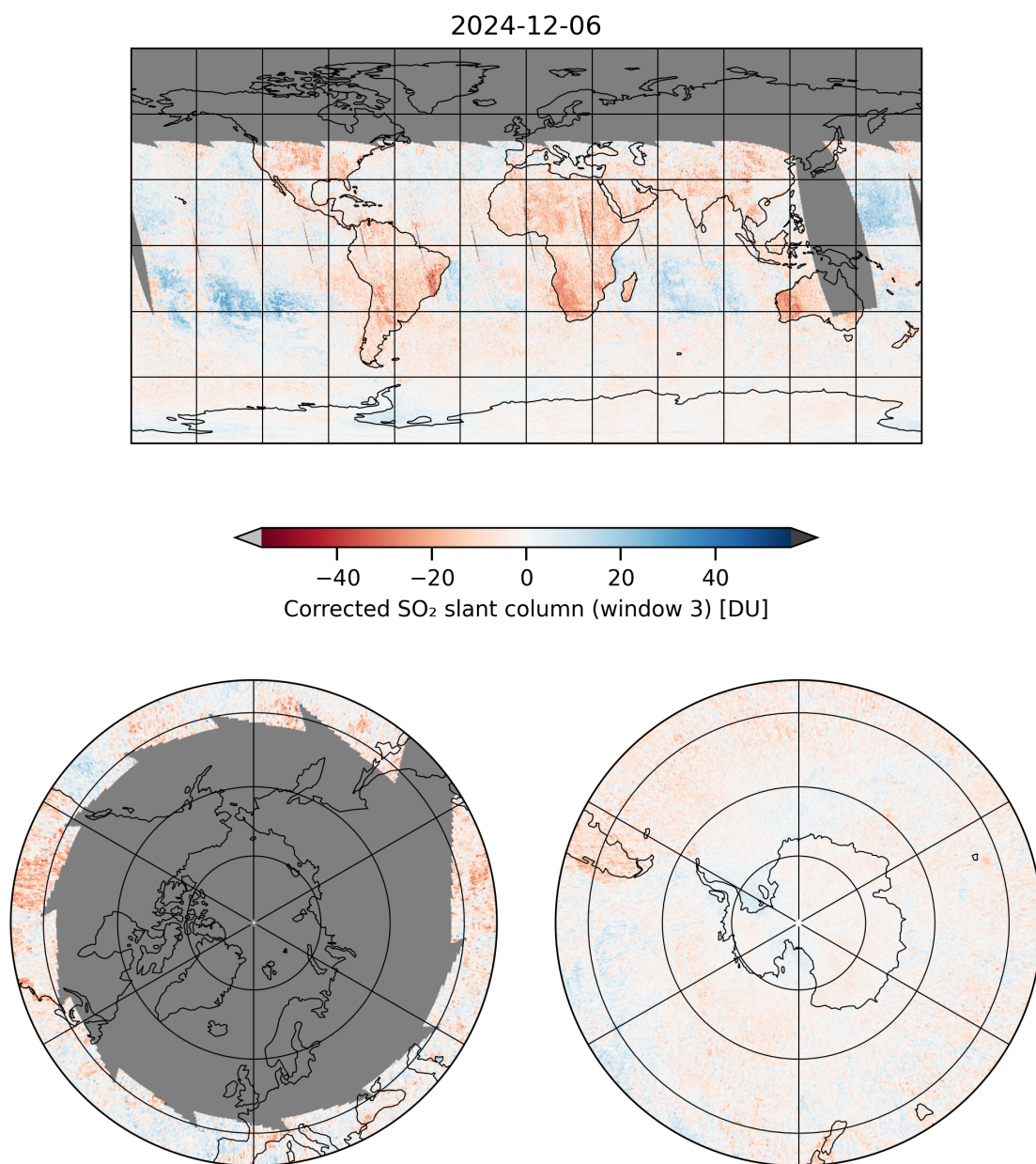


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2024-12-06 to 2024-12-07

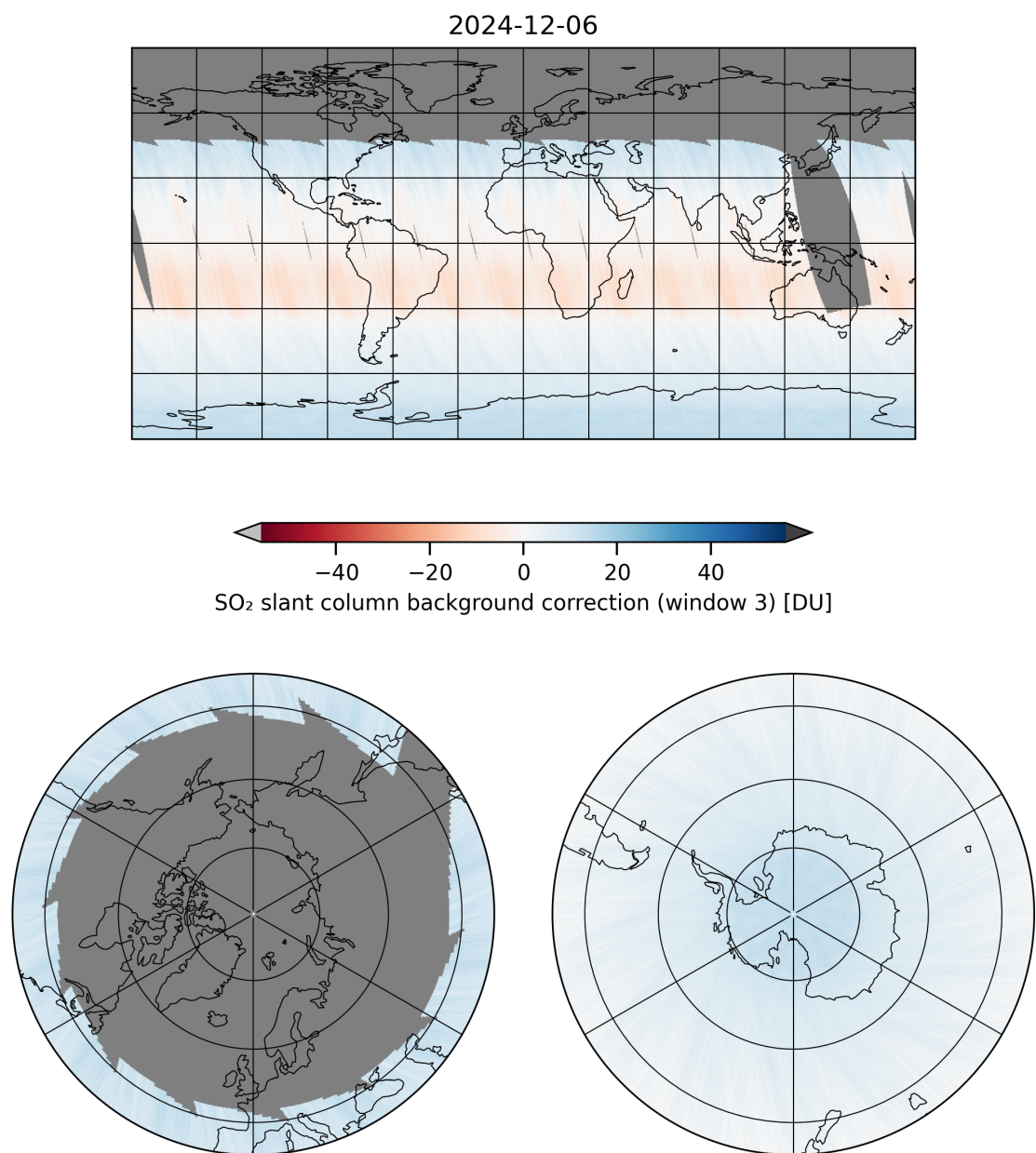


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2024-12-06 to 2024-12-07

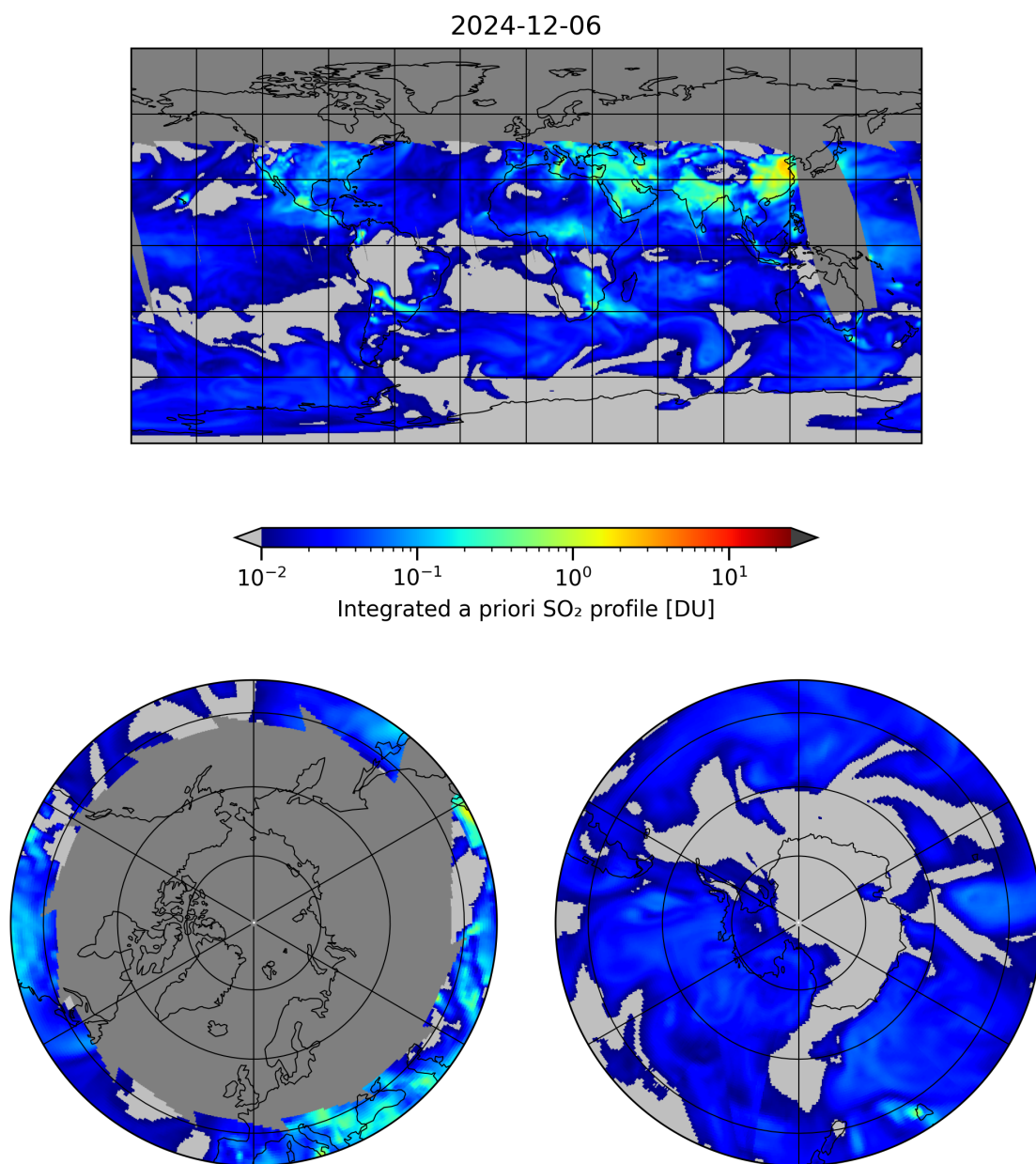


Figure 21: Map of “Integrated a priori SO₂ profile” for 2024-12-06 to 2024-12-07

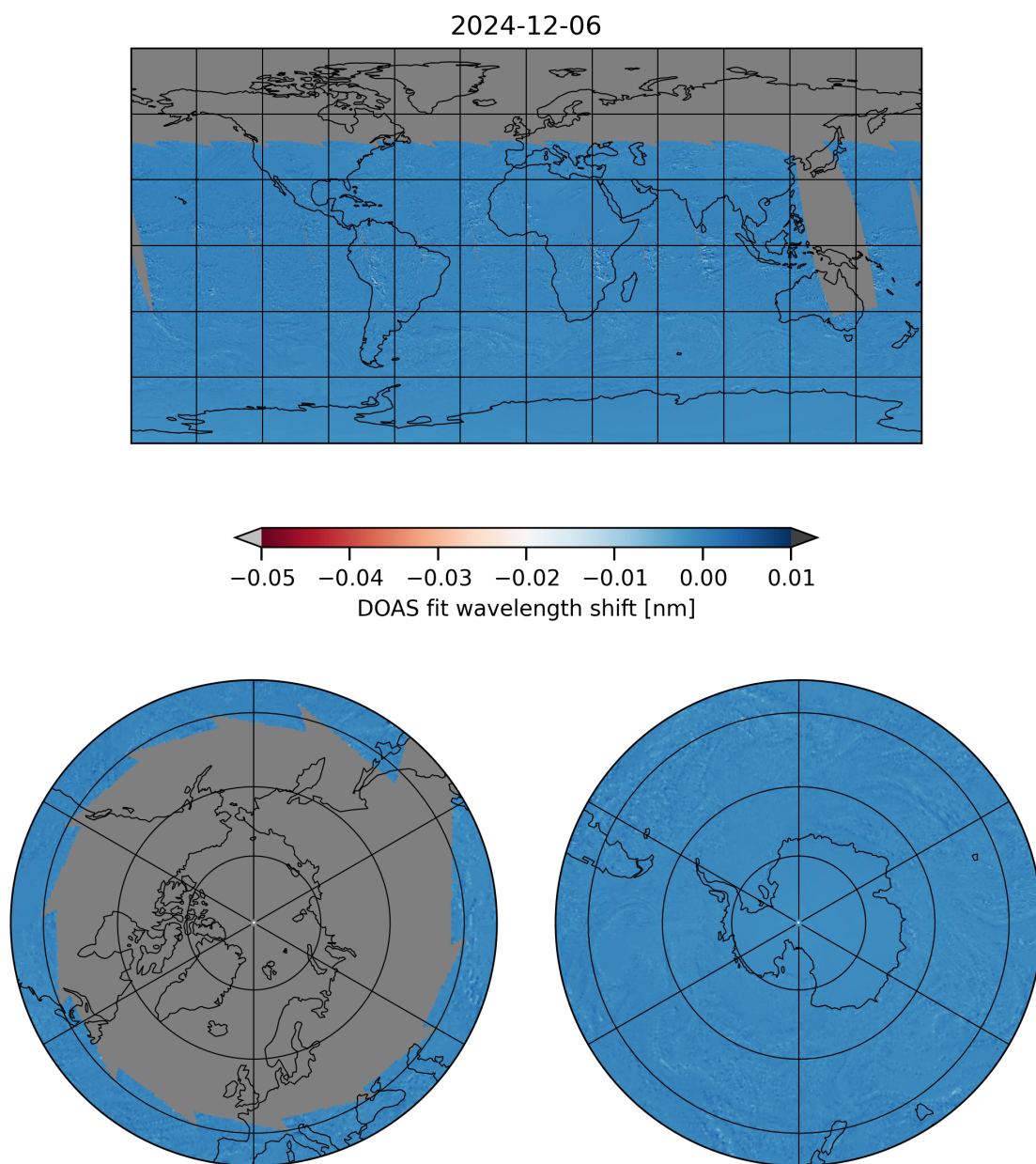


Figure 22: Map of “DOAS fit wavelength shift” for 2024-12-06 to 2024-12-07

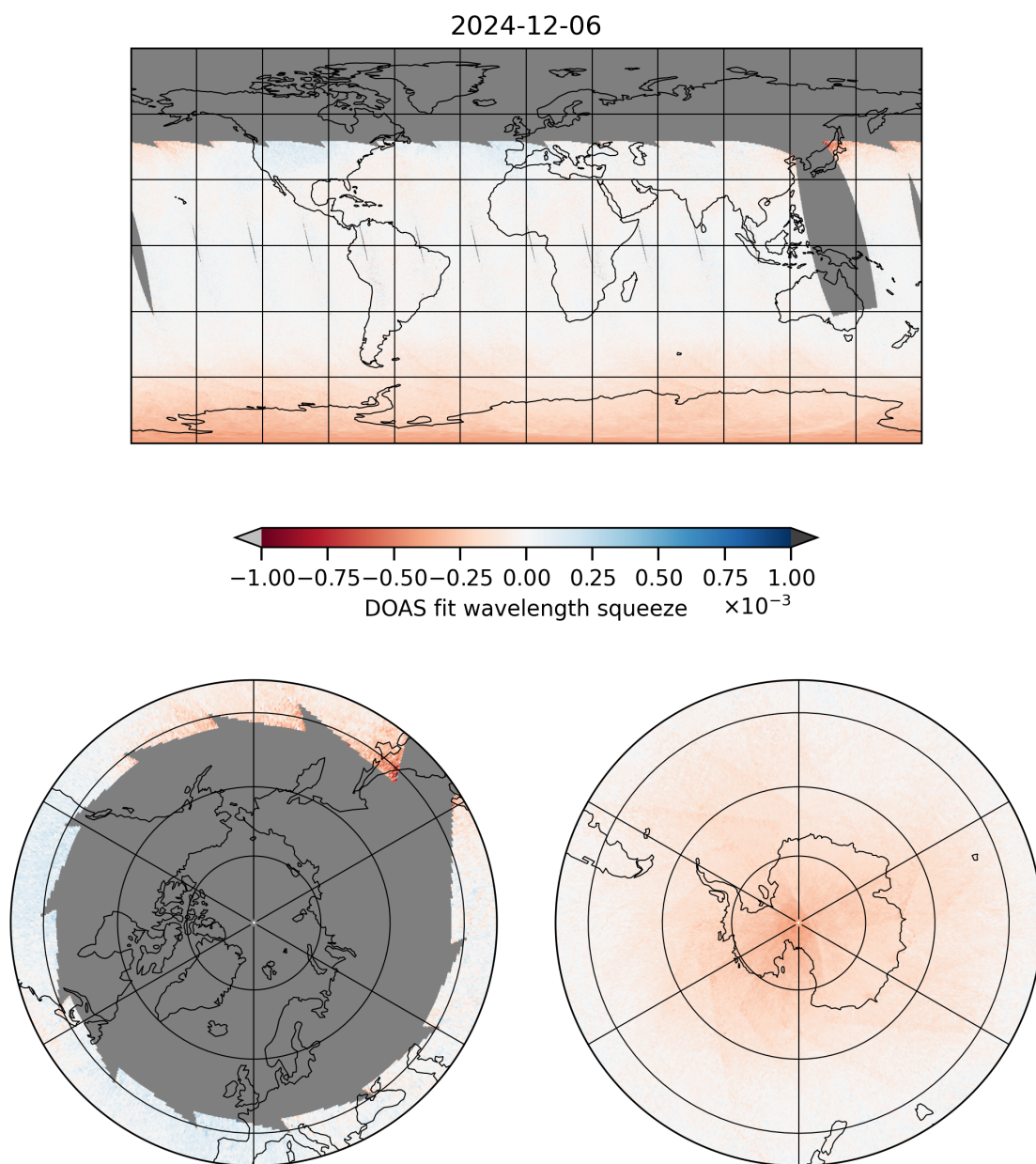


Figure 23: Map of “DOAS fit wavelength squeeze” for 2024-12-06 to 2024-12-07

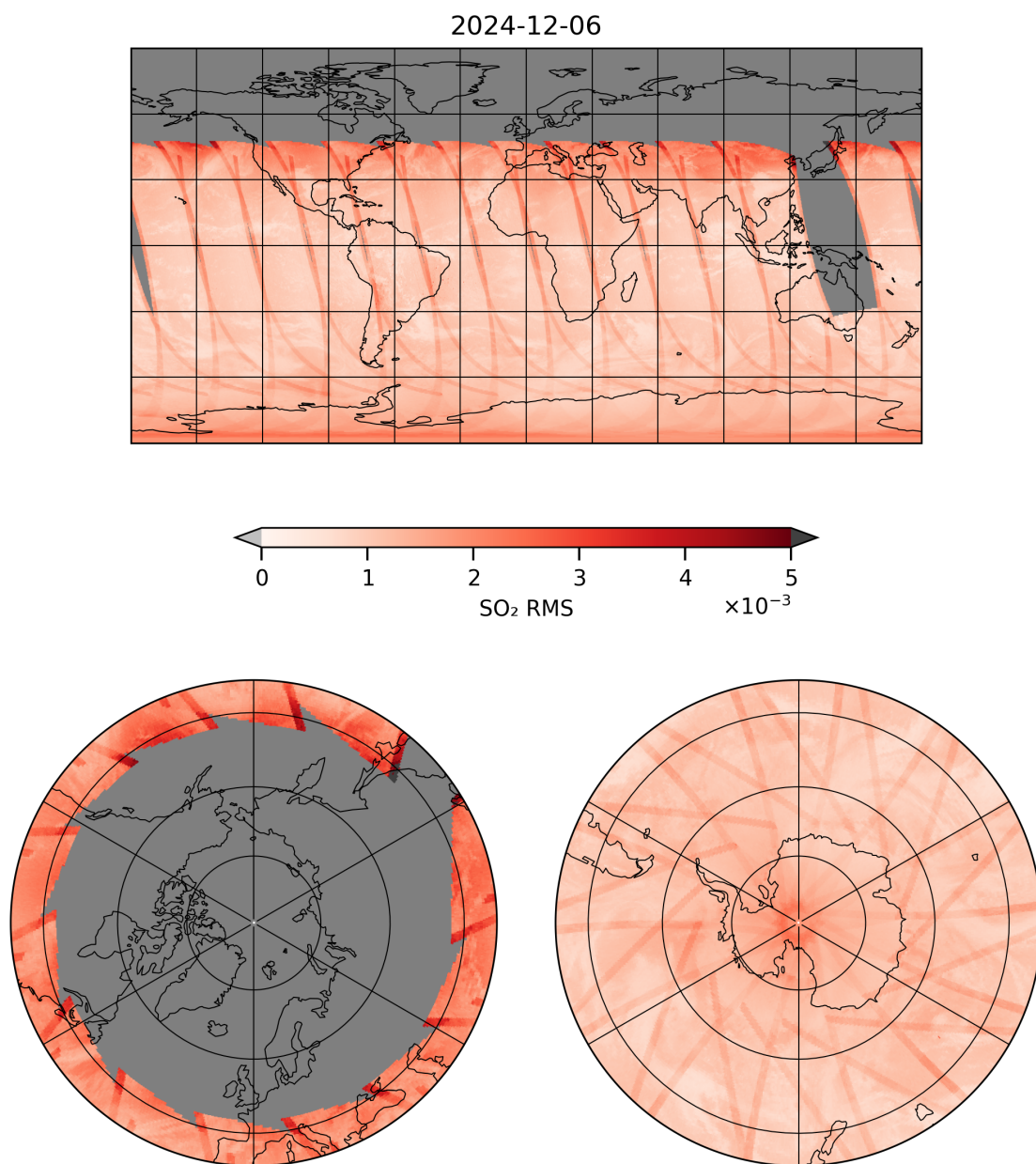


Figure 24: Map of “SO₂ RMS” for 2024-12-06 to 2024-12-07

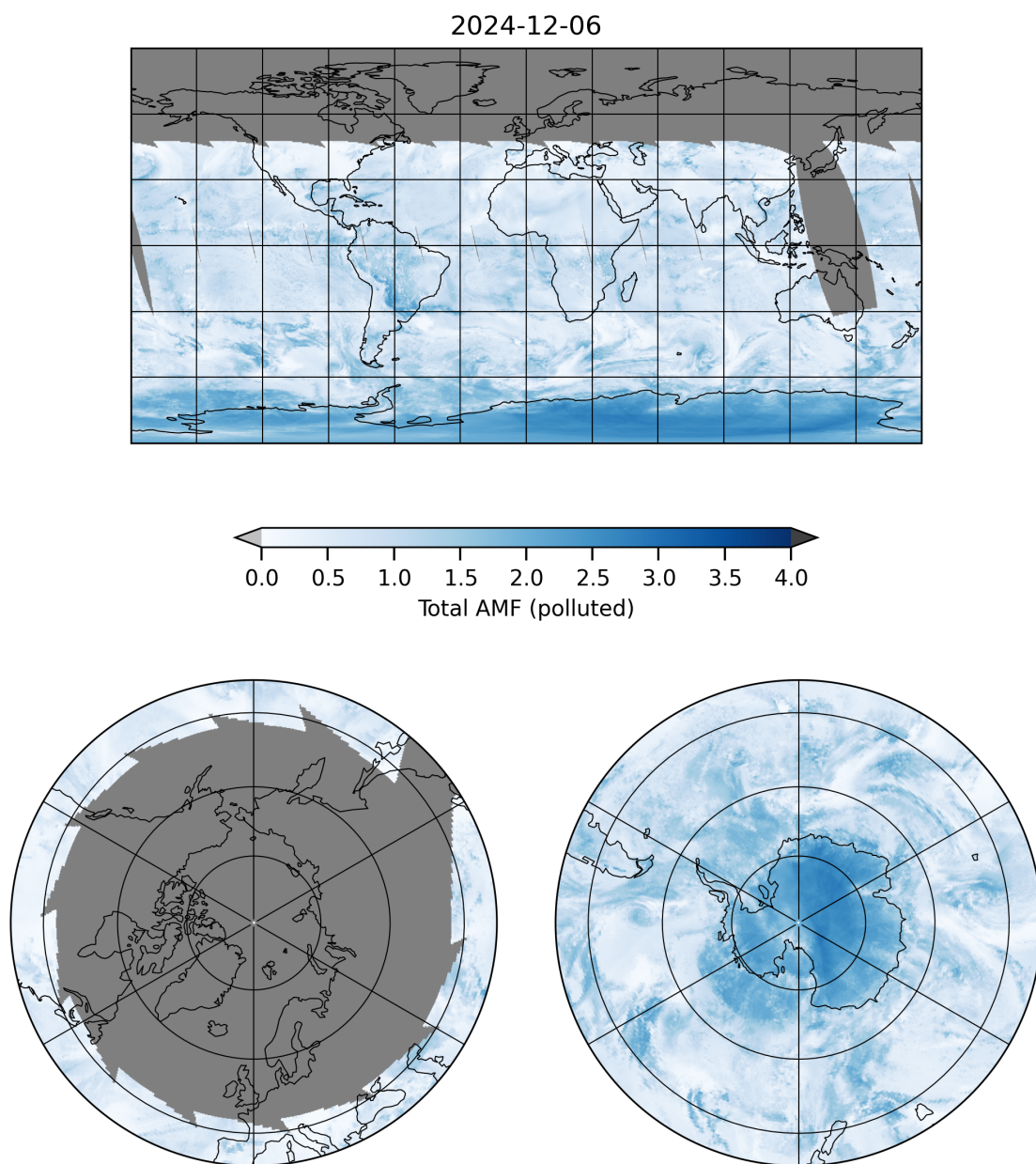


Figure 25: Map of “Total AMF (polluted)” for 2024-12-06 to 2024-12-07

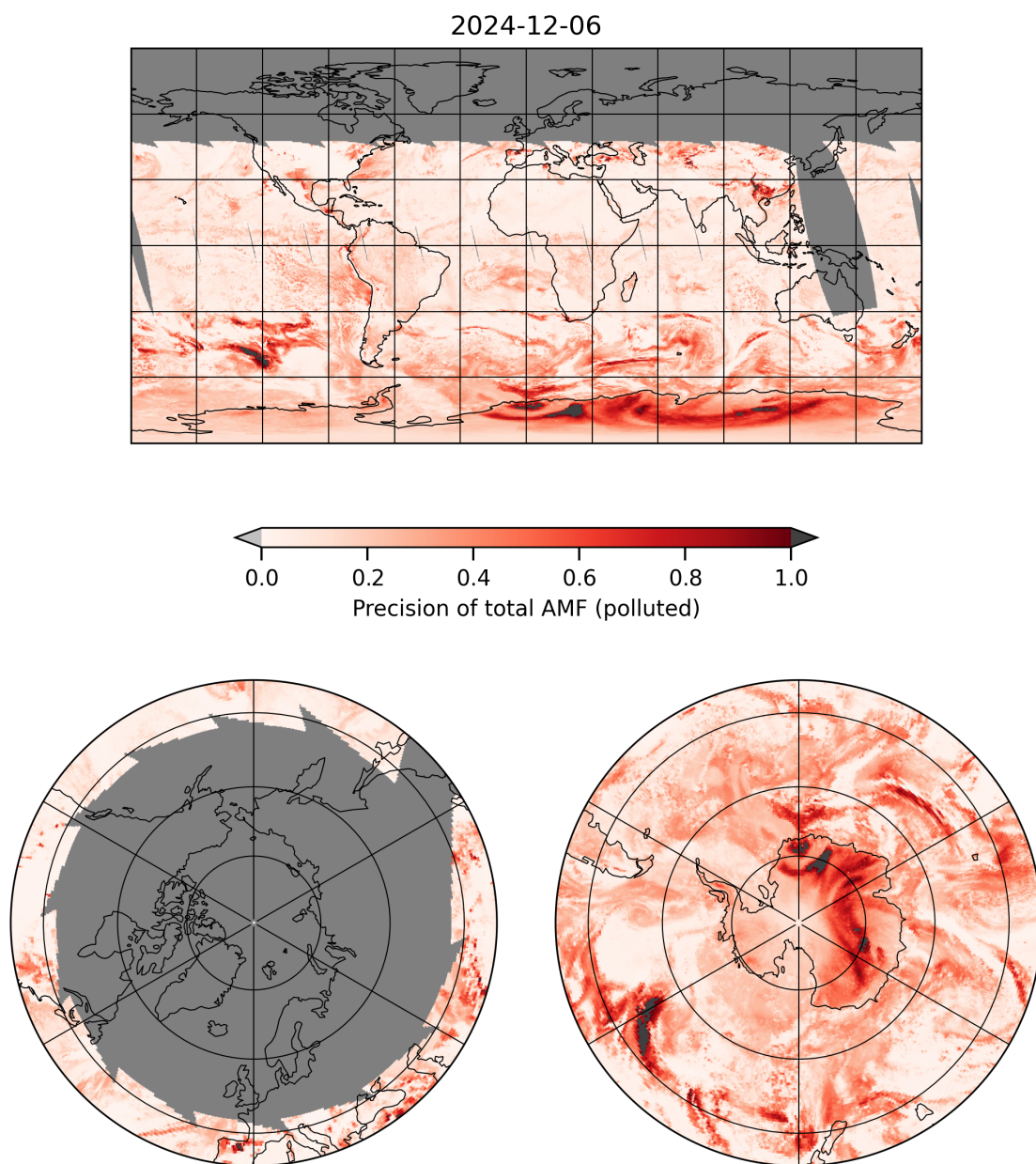


Figure 26: Map of “Precision of total AMF (polluted)” for 2024-12-06 to 2024-12-07

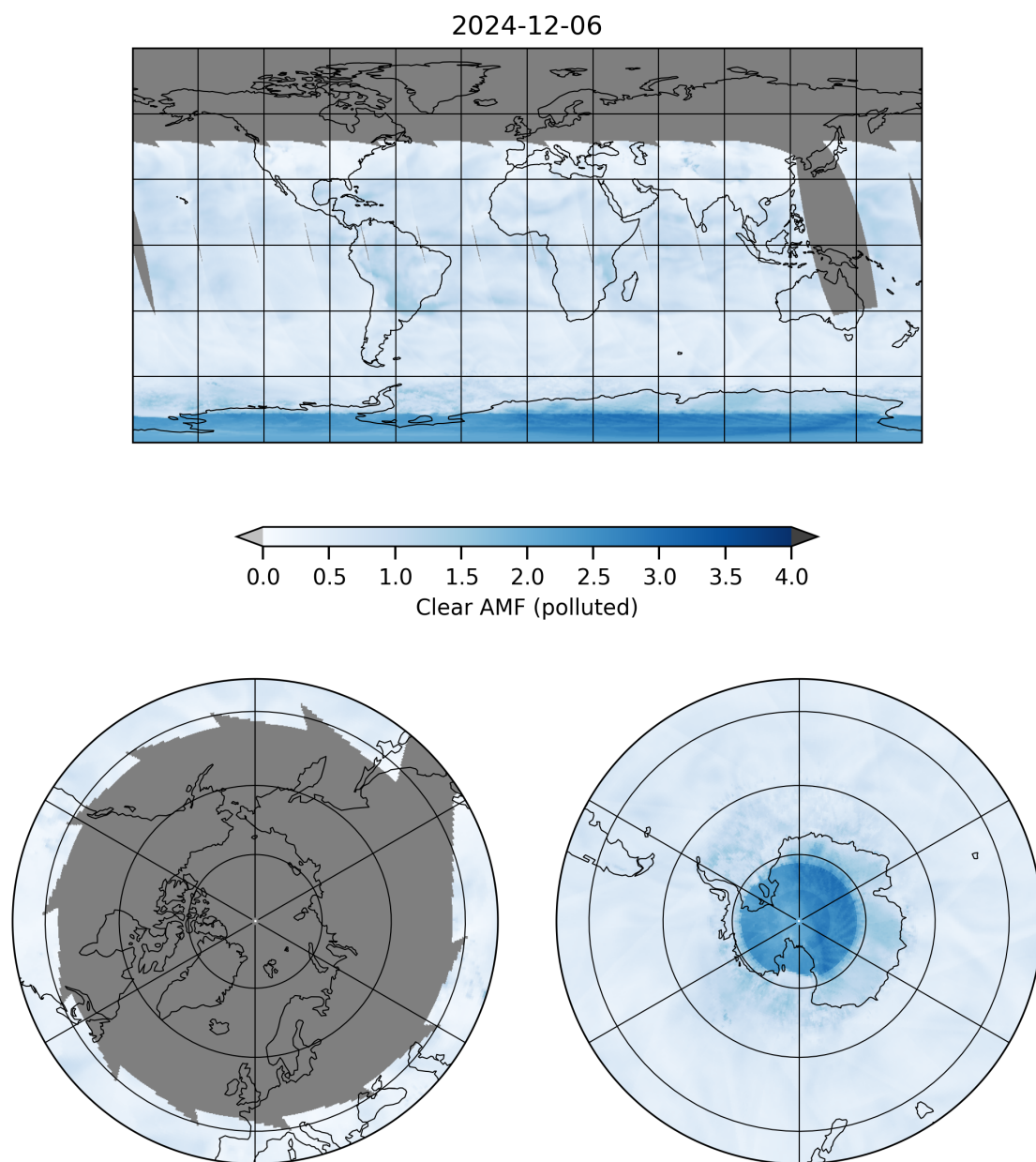


Figure 27: Map of “Clear AMF (polluted)” for 2024-12-06 to 2024-12-07

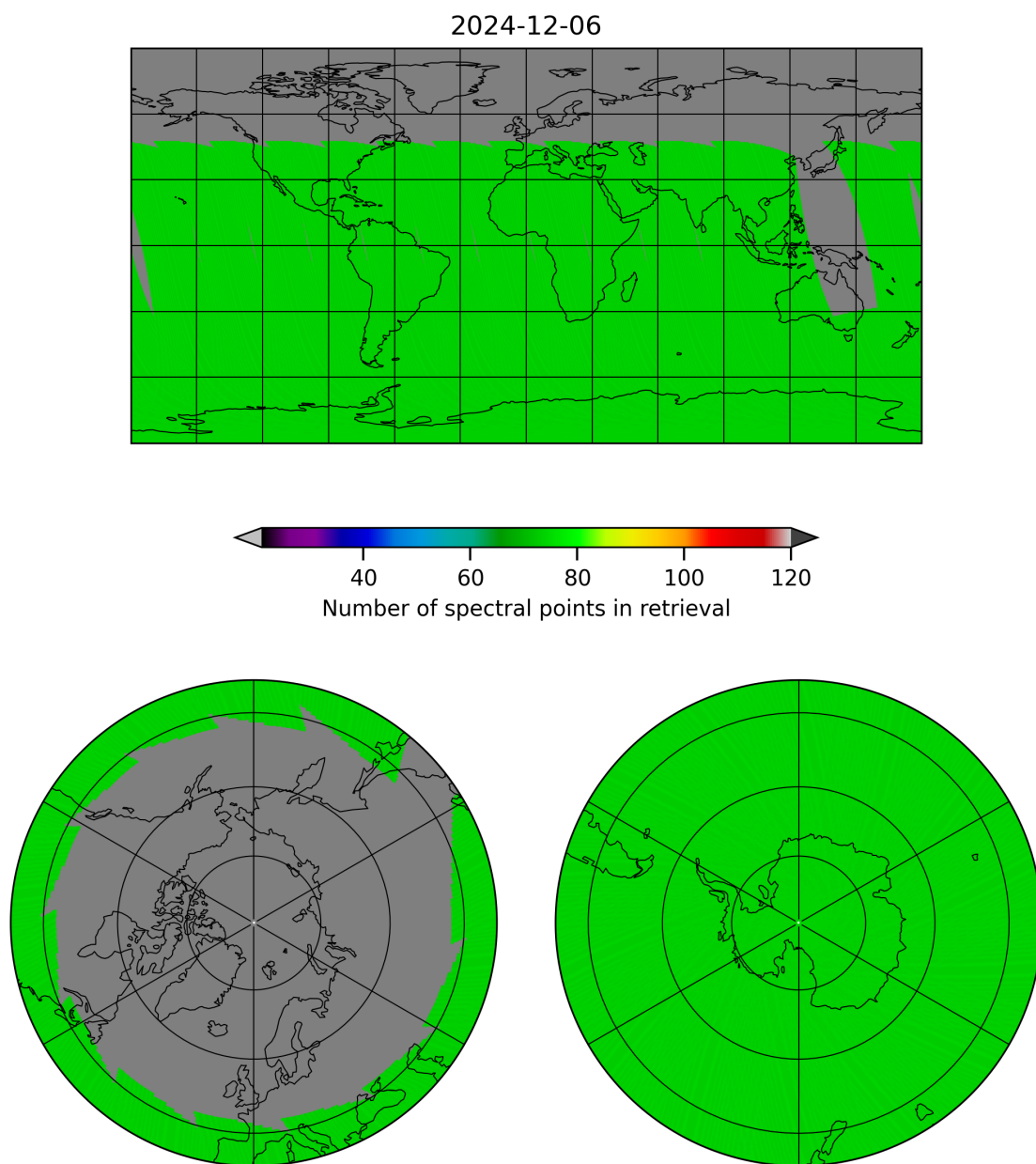


Figure 28: Map of “Number of spectral points in retrieval” for 2024-12-06 to 2024-12-07

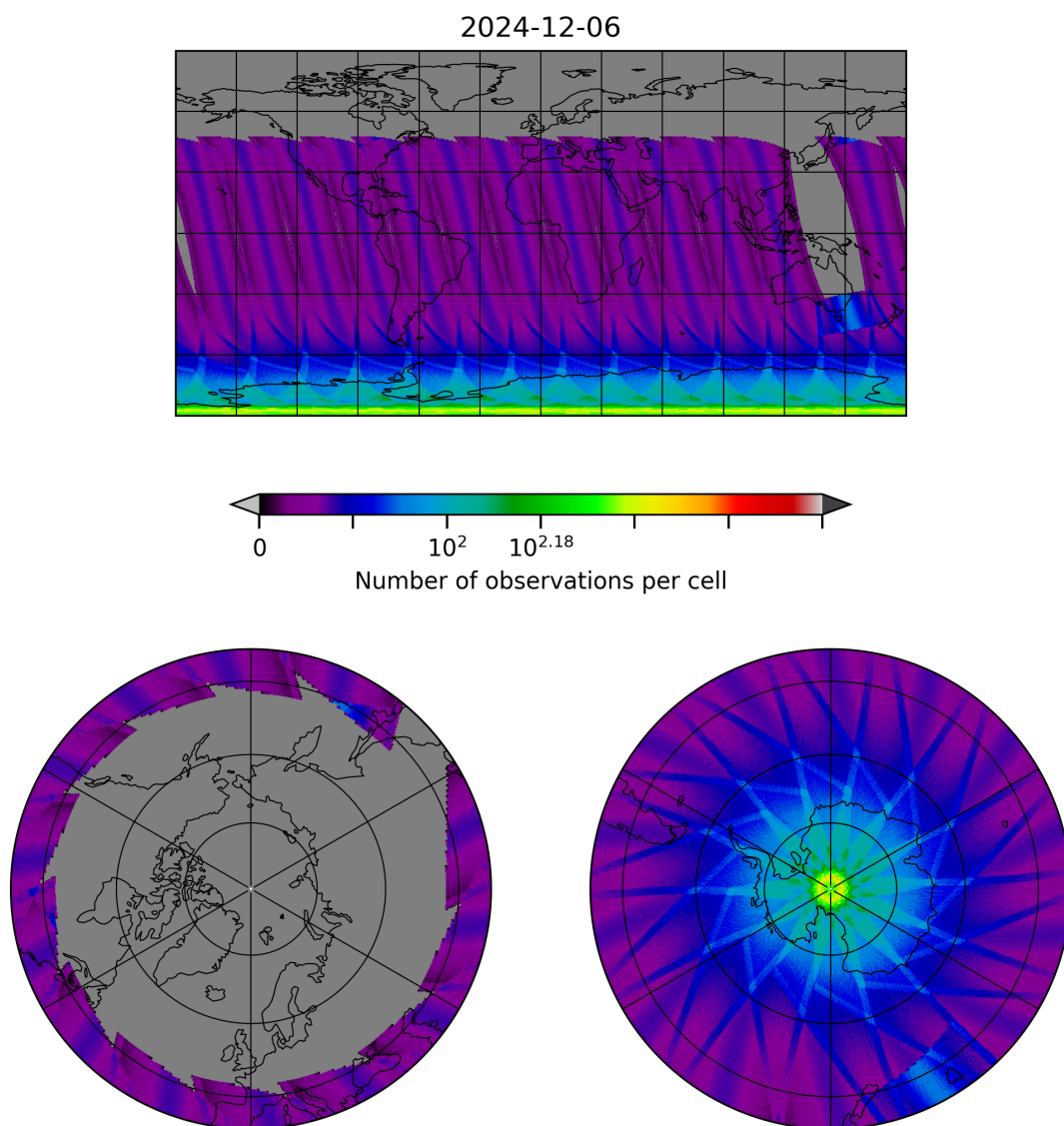


Figure 29: Map of the number of observations for 2024-12-06 to 2024-12-07

7 Zonal average

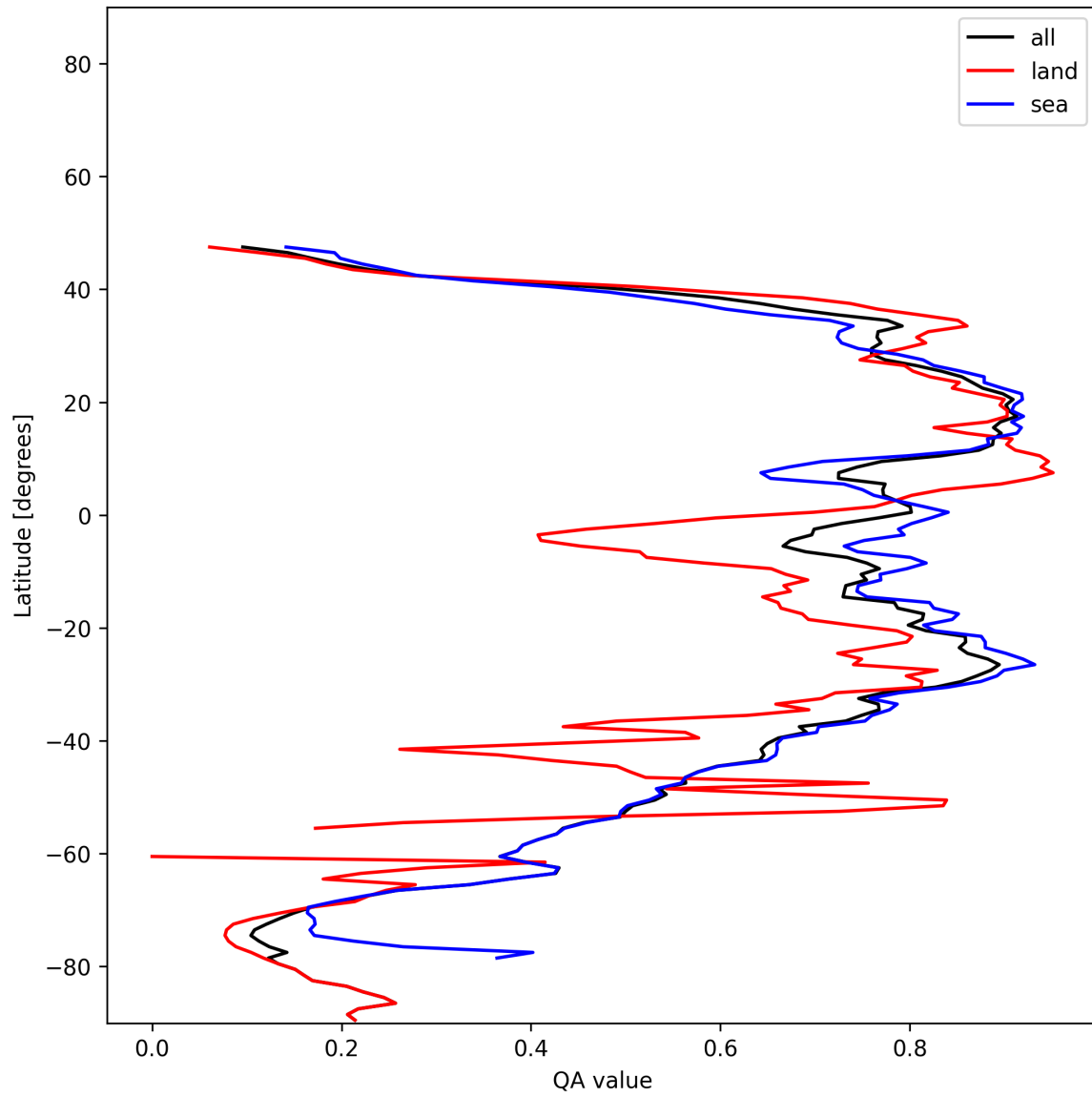


Figure 30: Zonal average of “QA value” for 2024-12-06 to 2024-12-07.

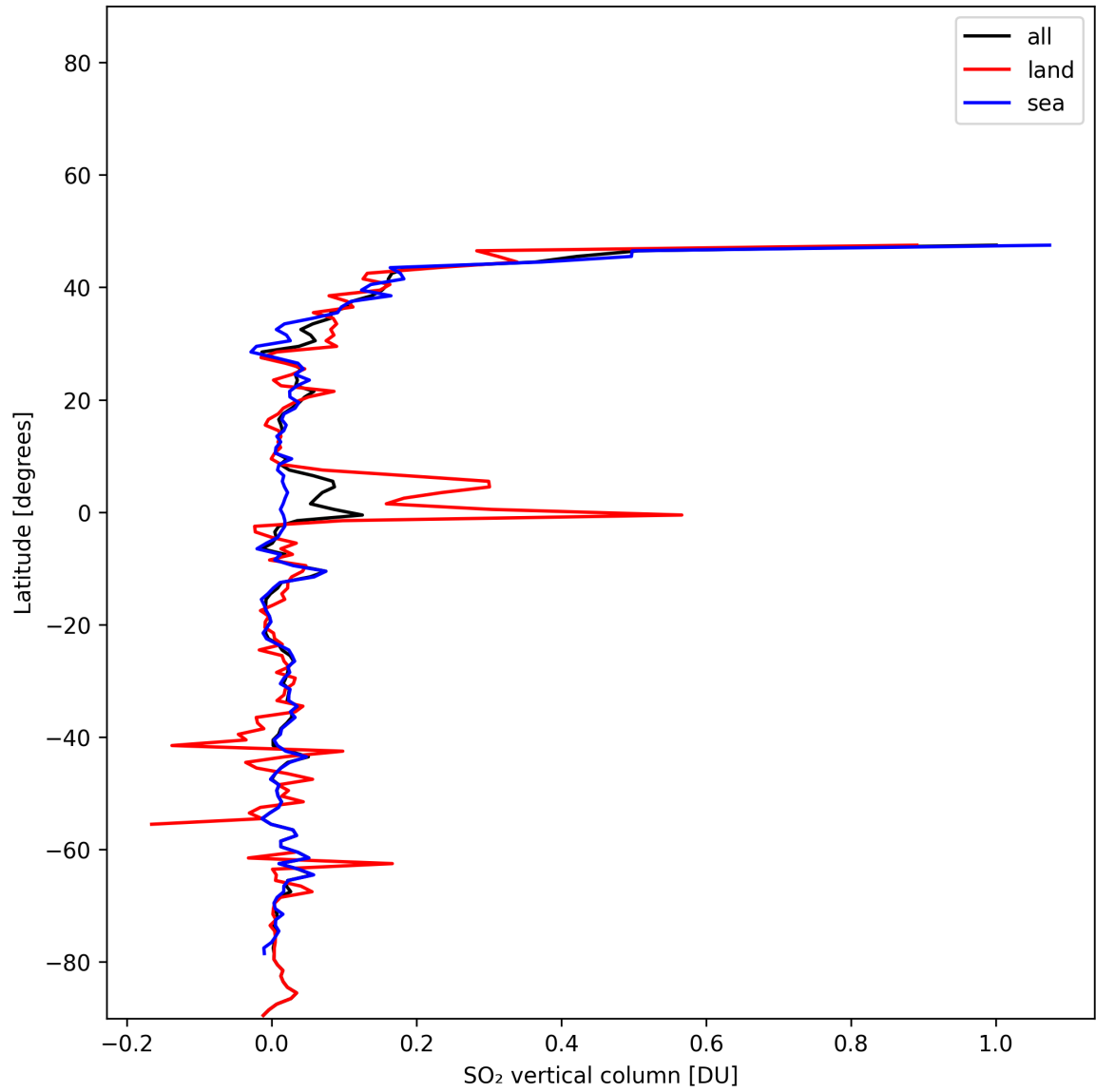


Figure 31: Zonal average of “SO₂ vertical column” for 2024-12-06 to 2024-12-07.

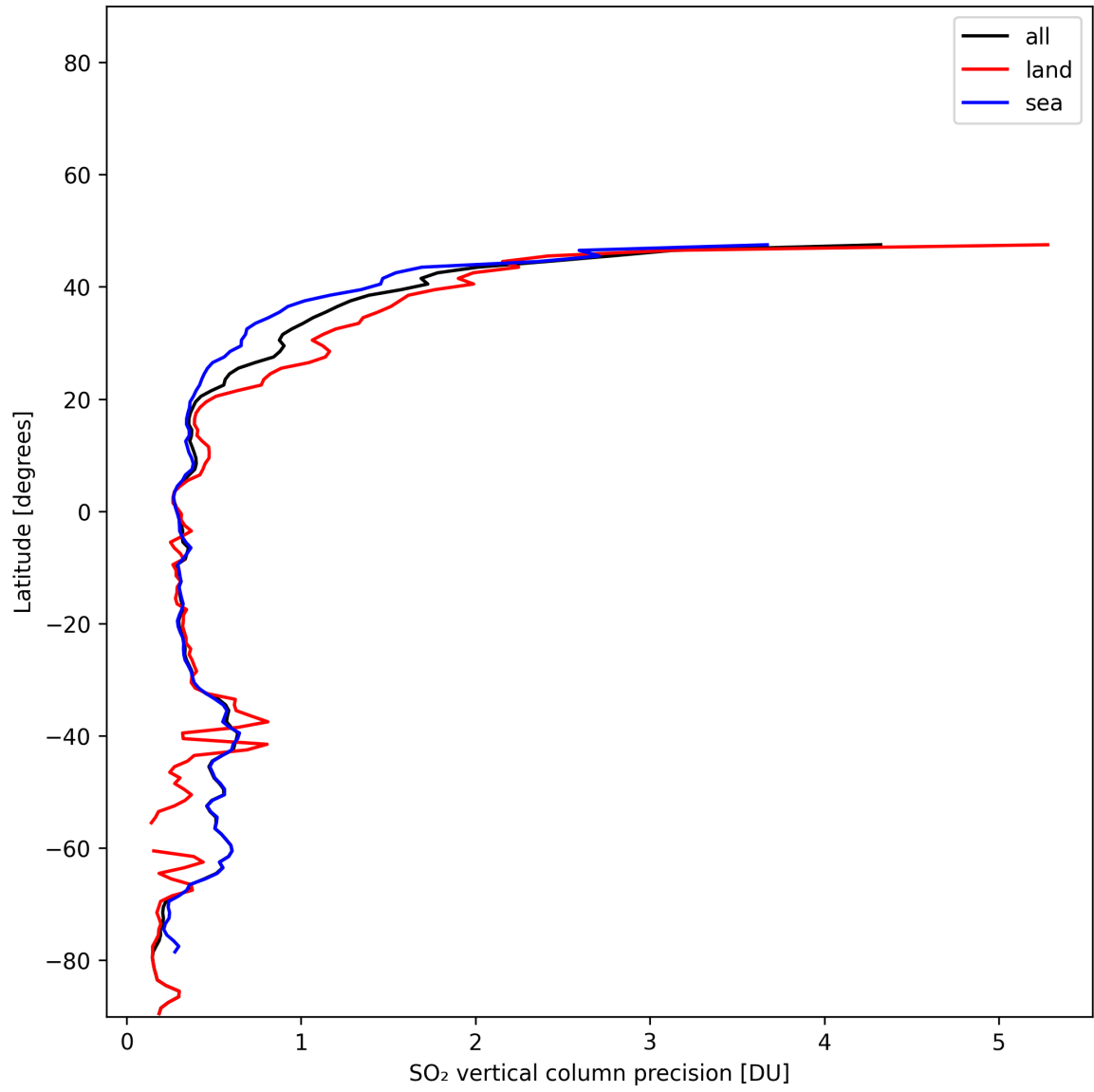


Figure 32: Zonal average of “SO₂ vertical column precision” for 2024-12-06 to 2024-12-07.

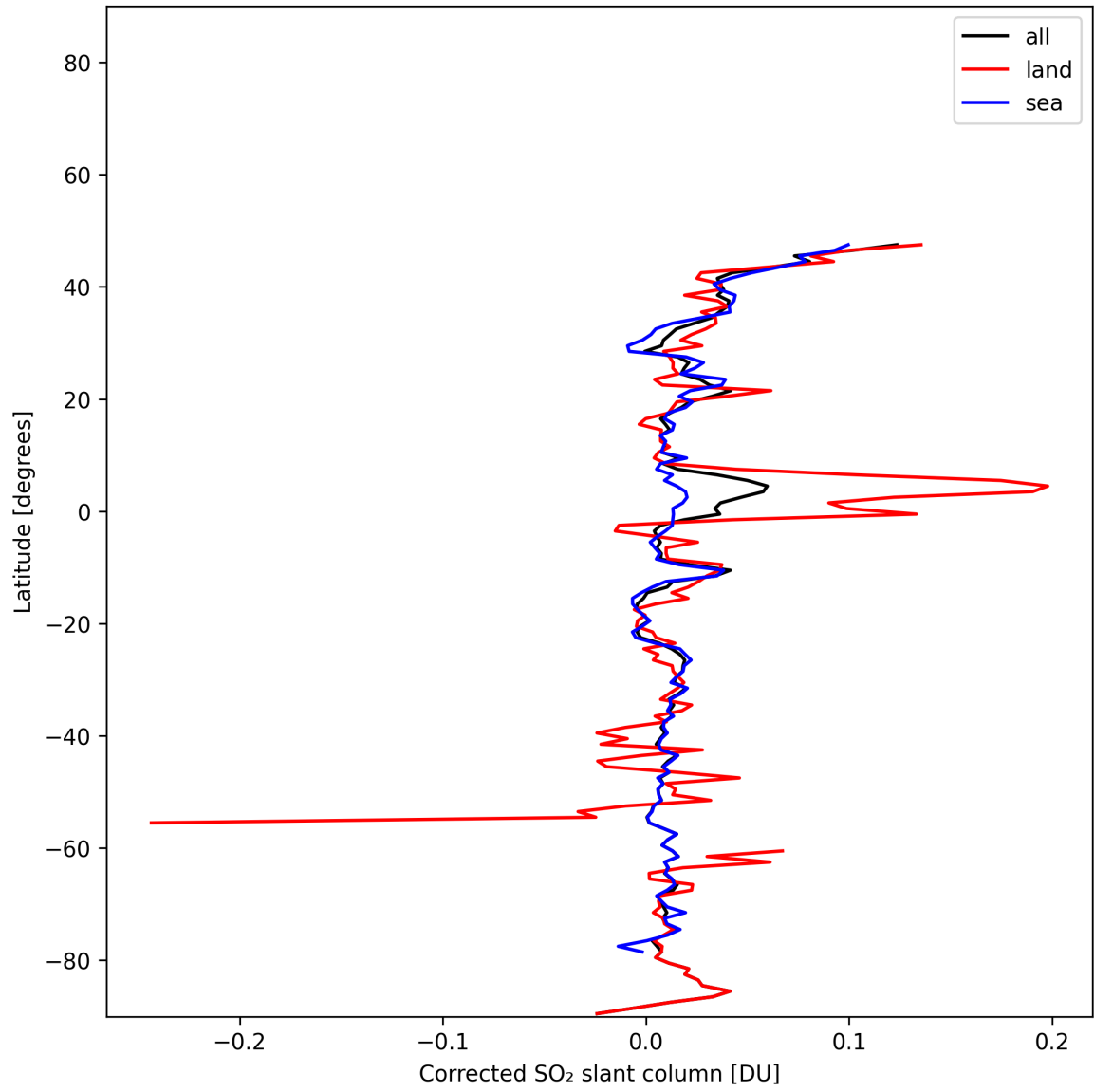


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2024-12-06 to 2024-12-07.

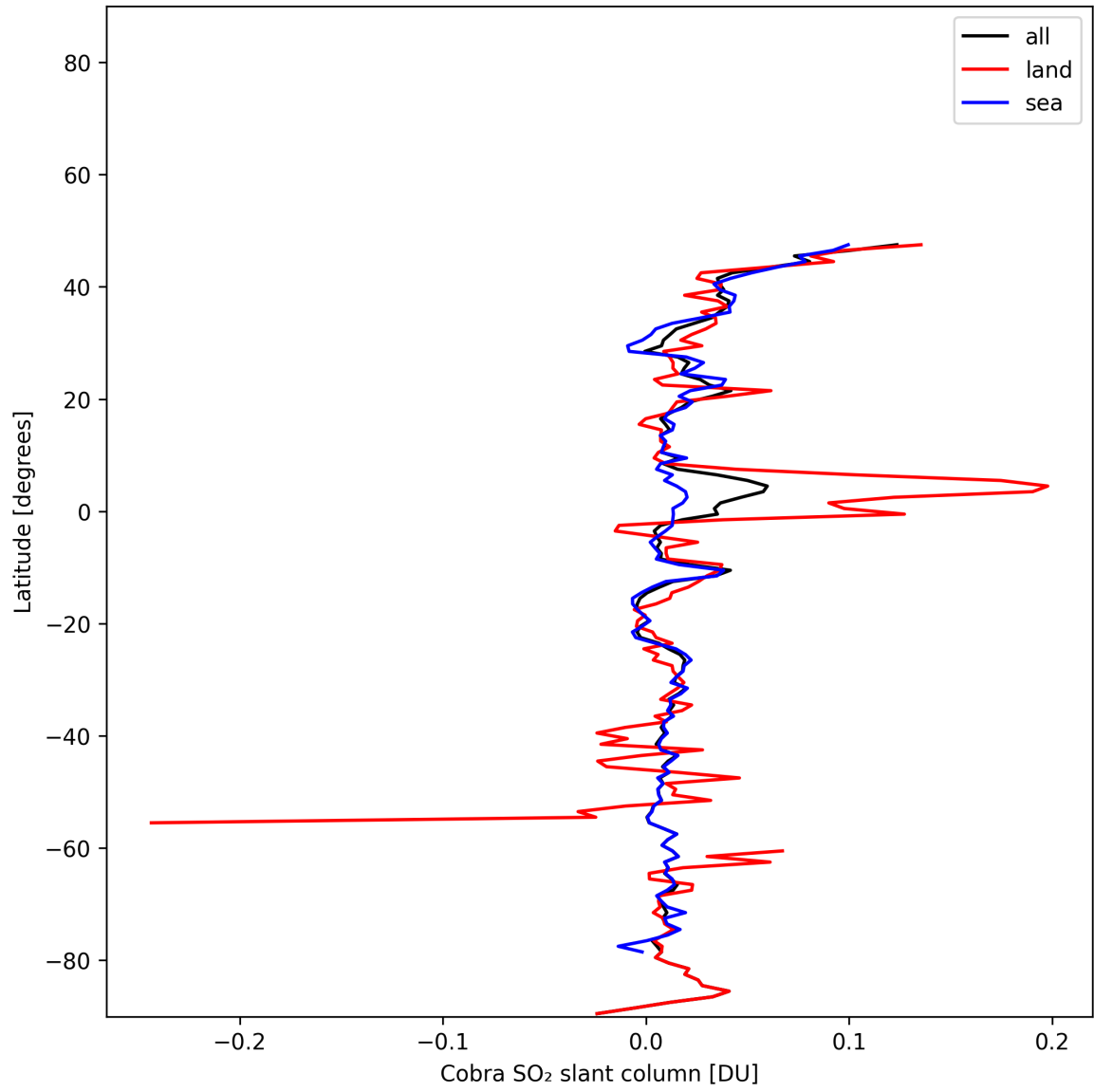


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2024-12-06 to 2024-12-07.

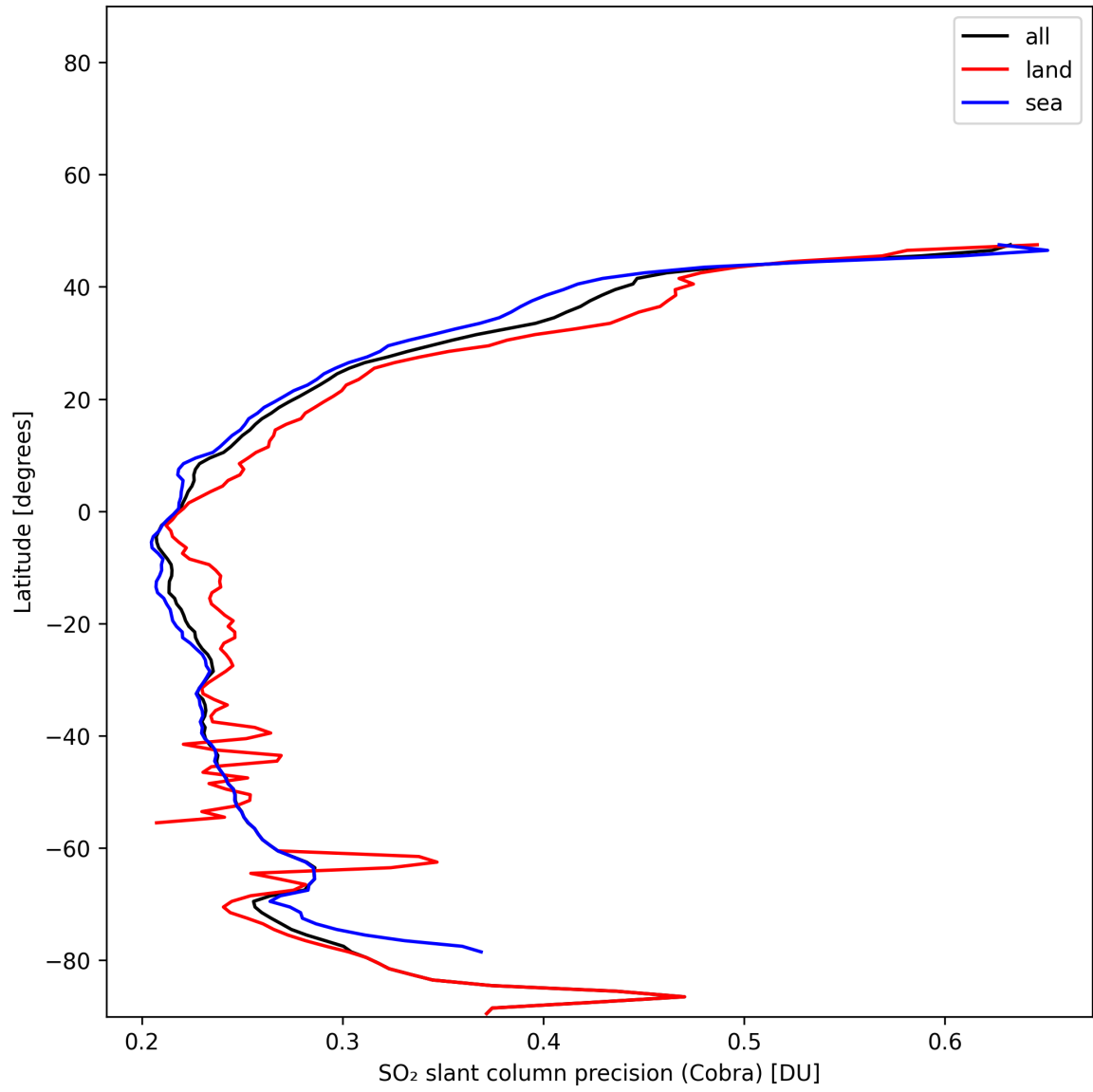


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2024-12-06 to 2024-12-07.

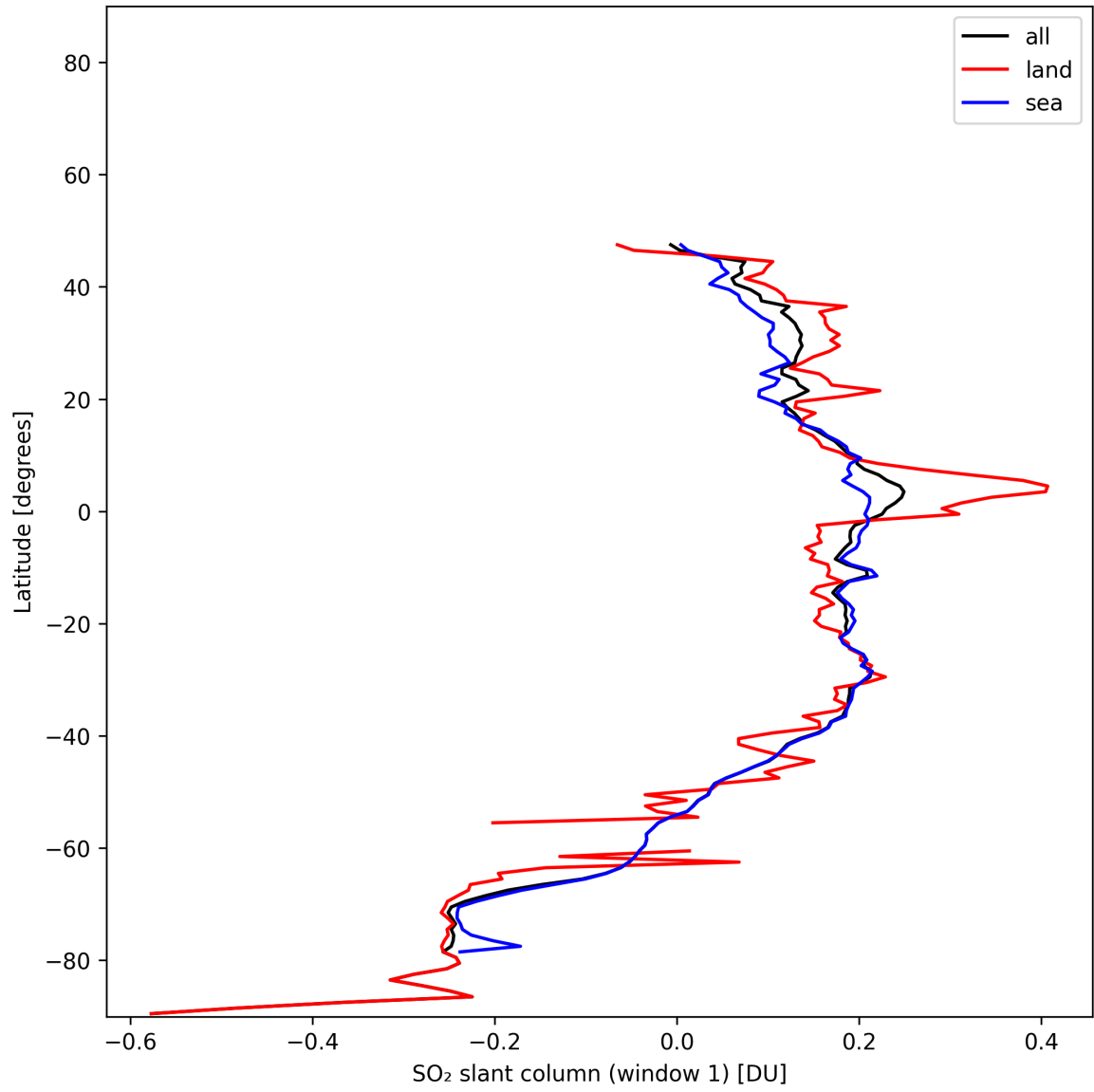


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2024-12-06 to 2024-12-07.

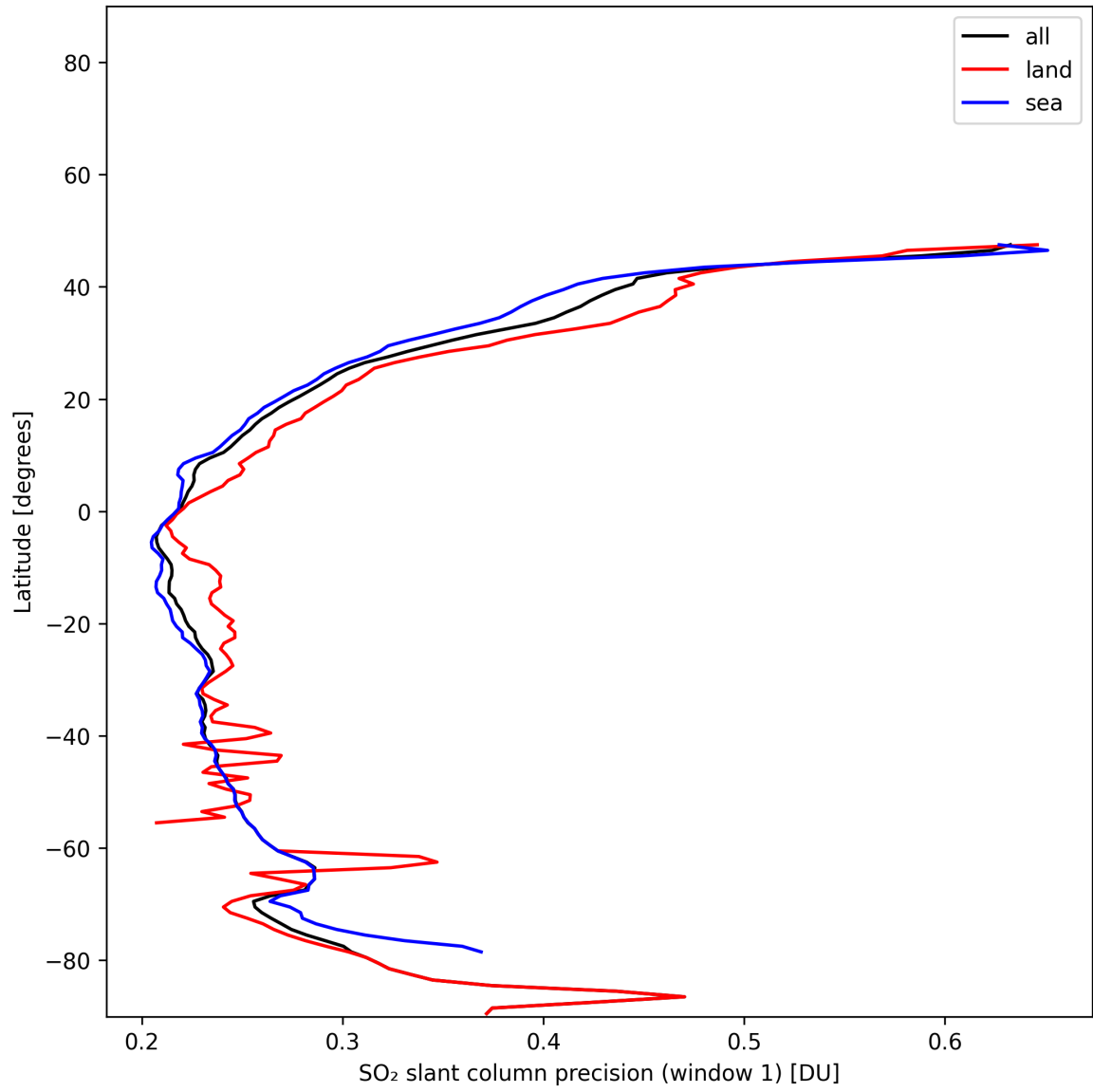


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2024-12-06 to 2024-12-07.

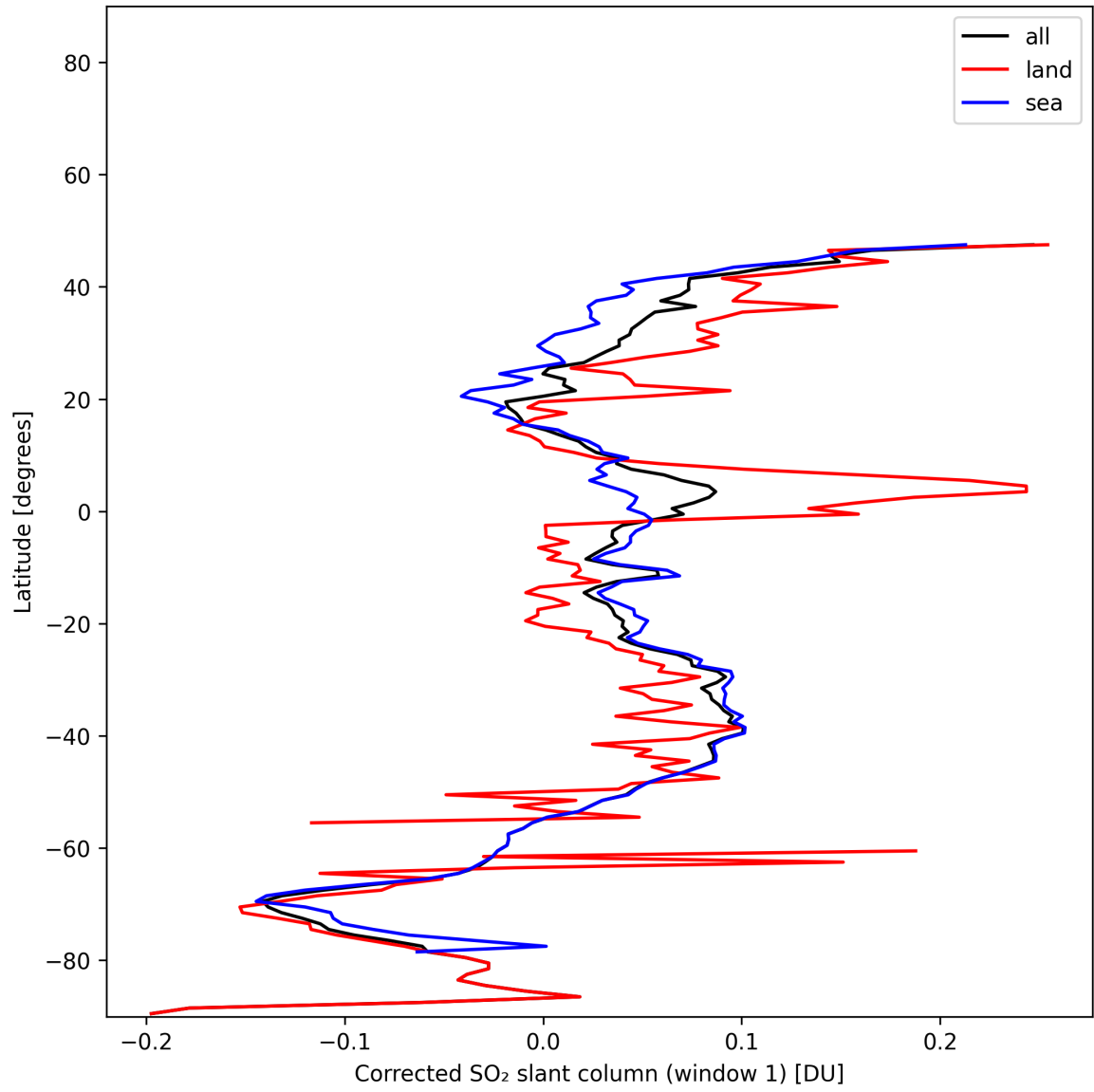


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2024-12-06 to 2024-12-07.

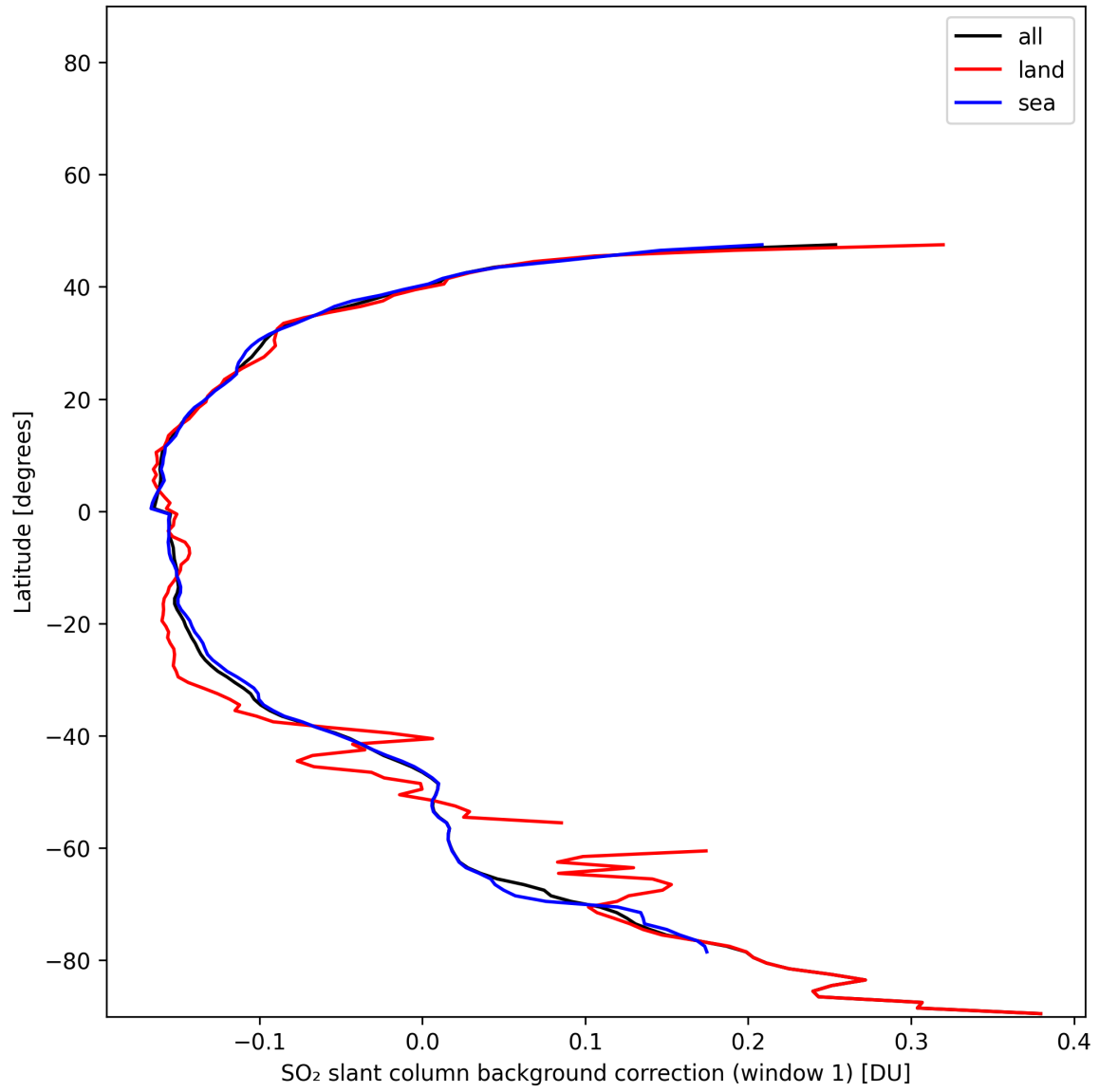


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2024-12-06 to 2024-12-07.

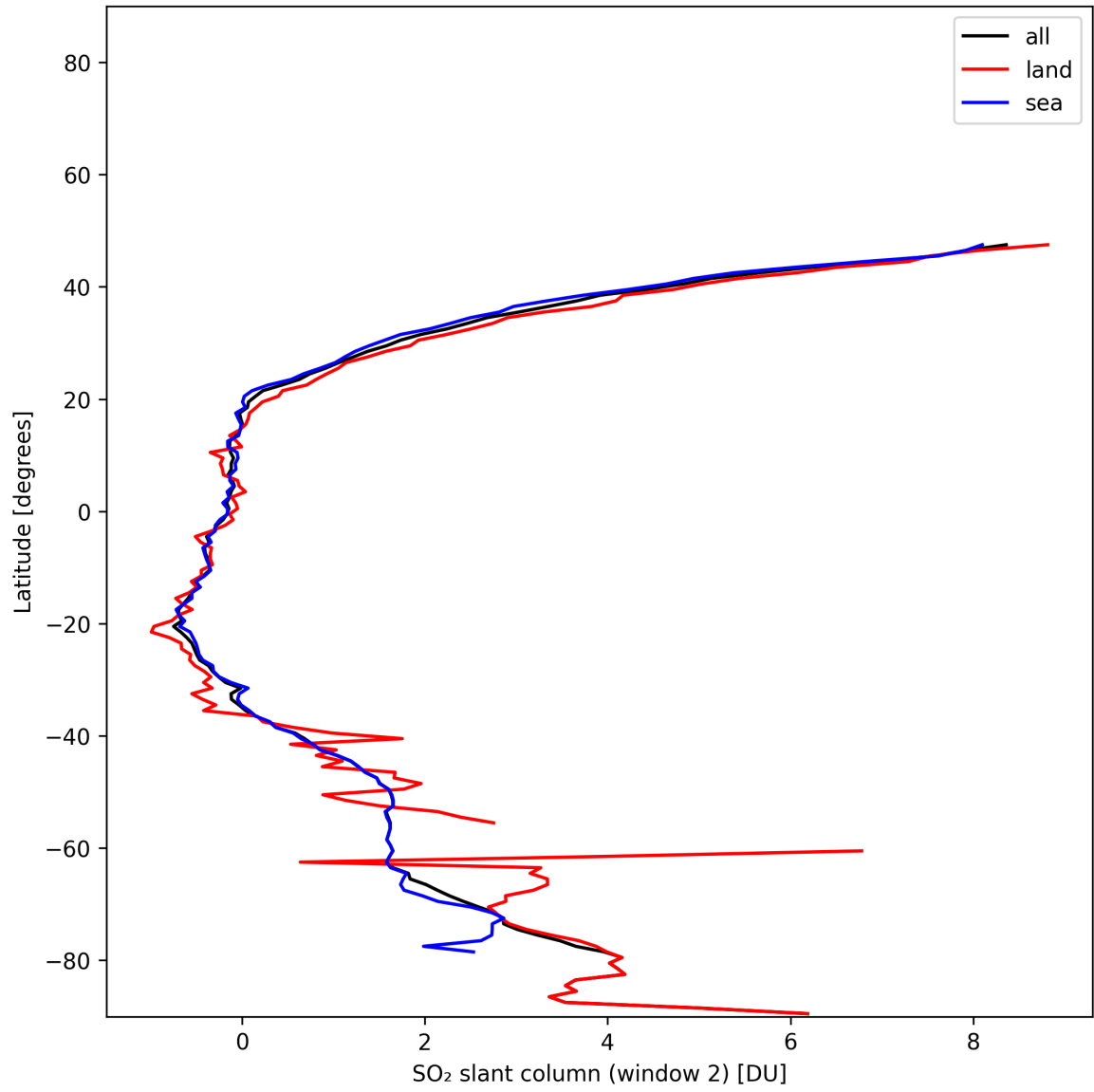


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2024-12-06 to 2024-12-07.

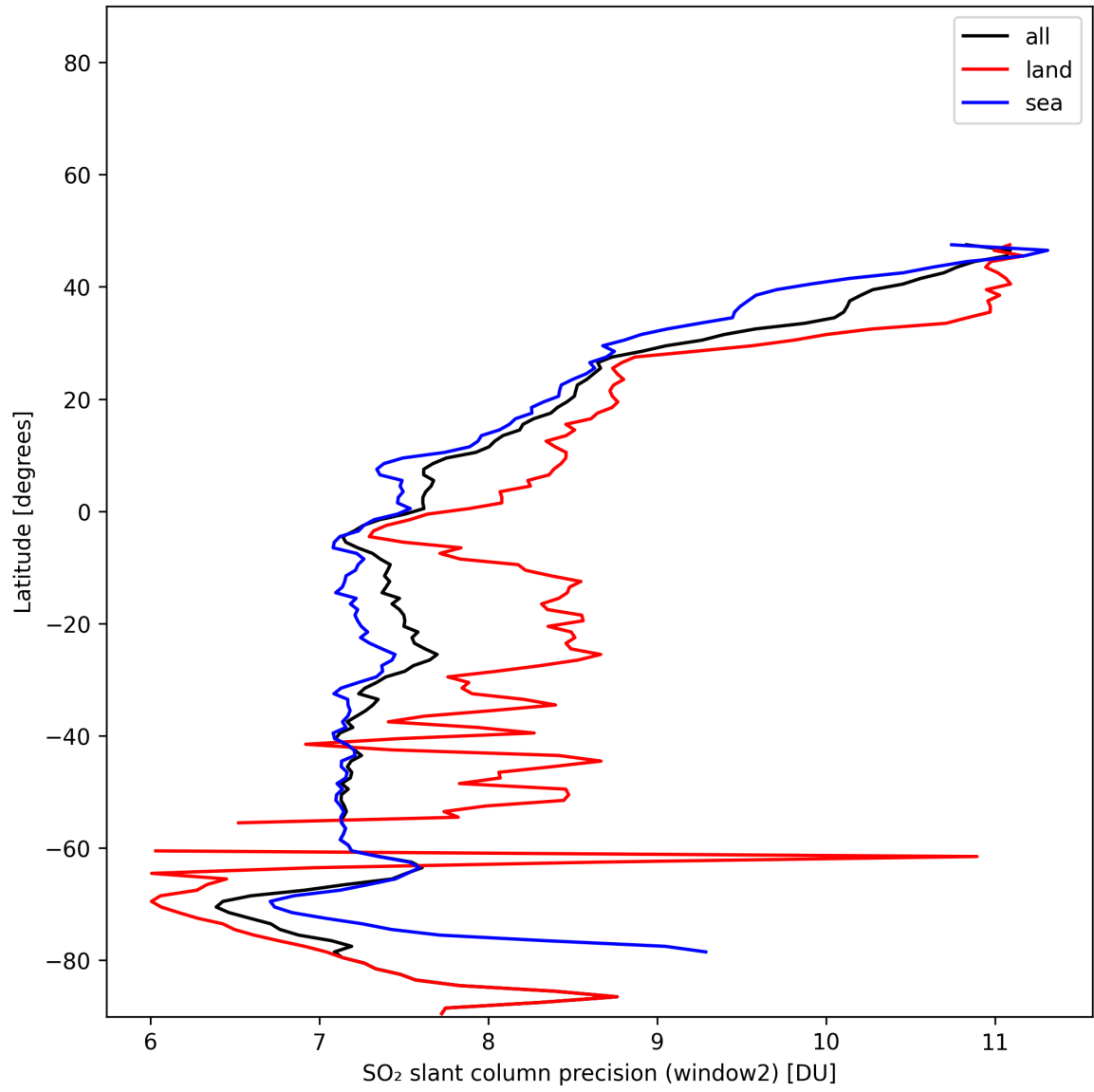


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2024-12-06 to 2024-12-07.

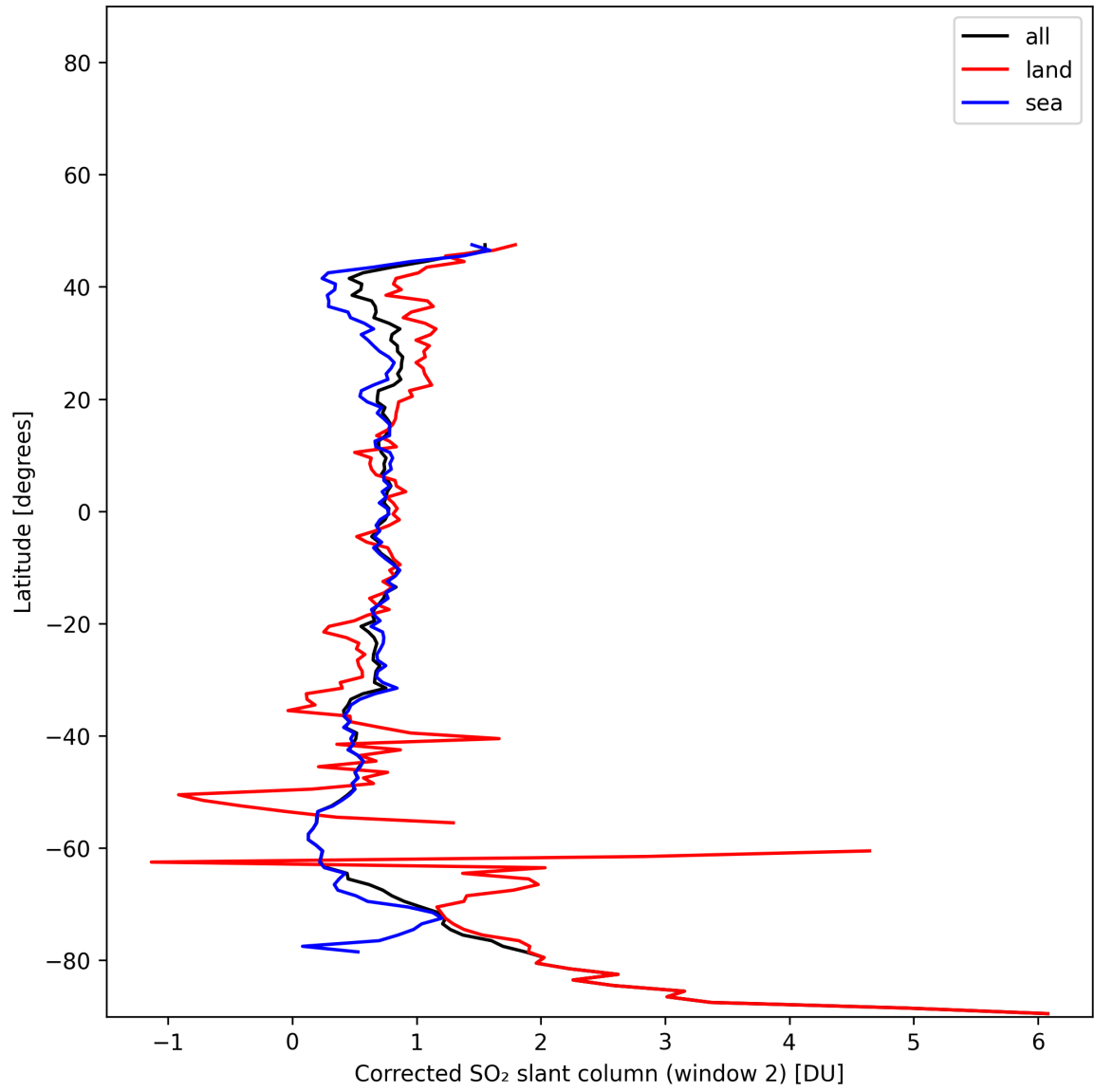


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2024-12-06 to 2024-12-07.

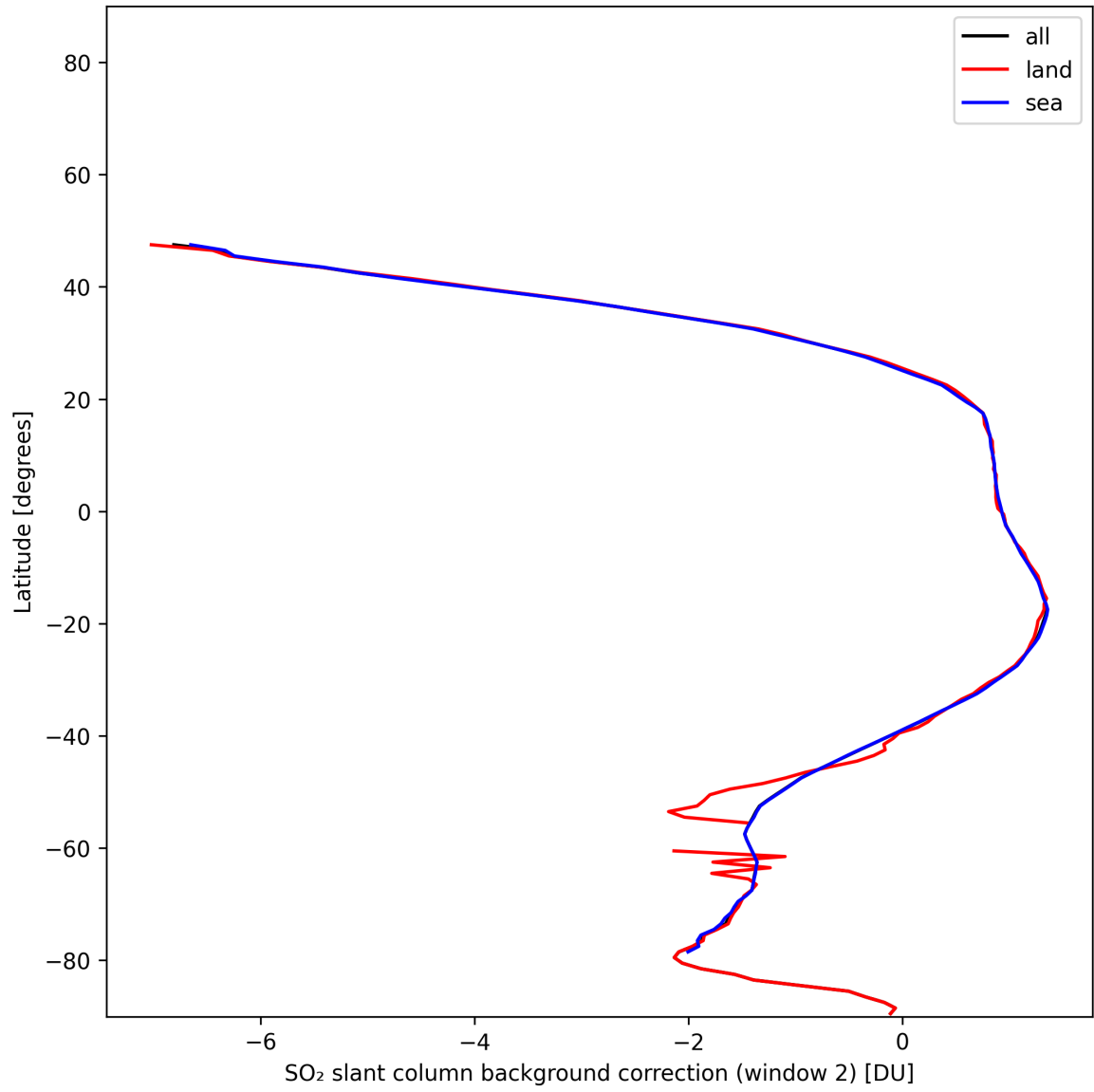


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2024-12-06 to 2024-12-07.

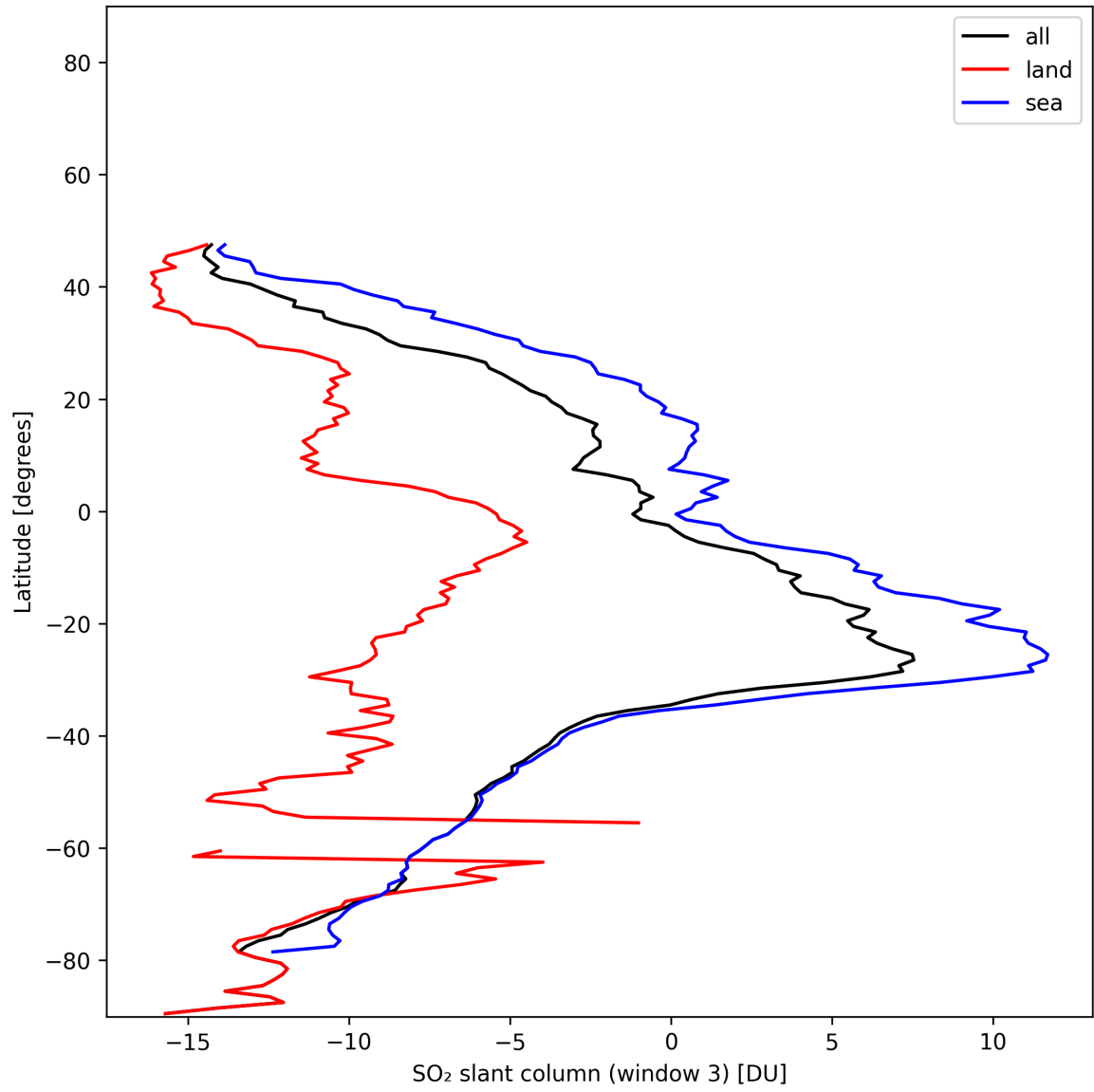


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2024-12-06 to 2024-12-07.

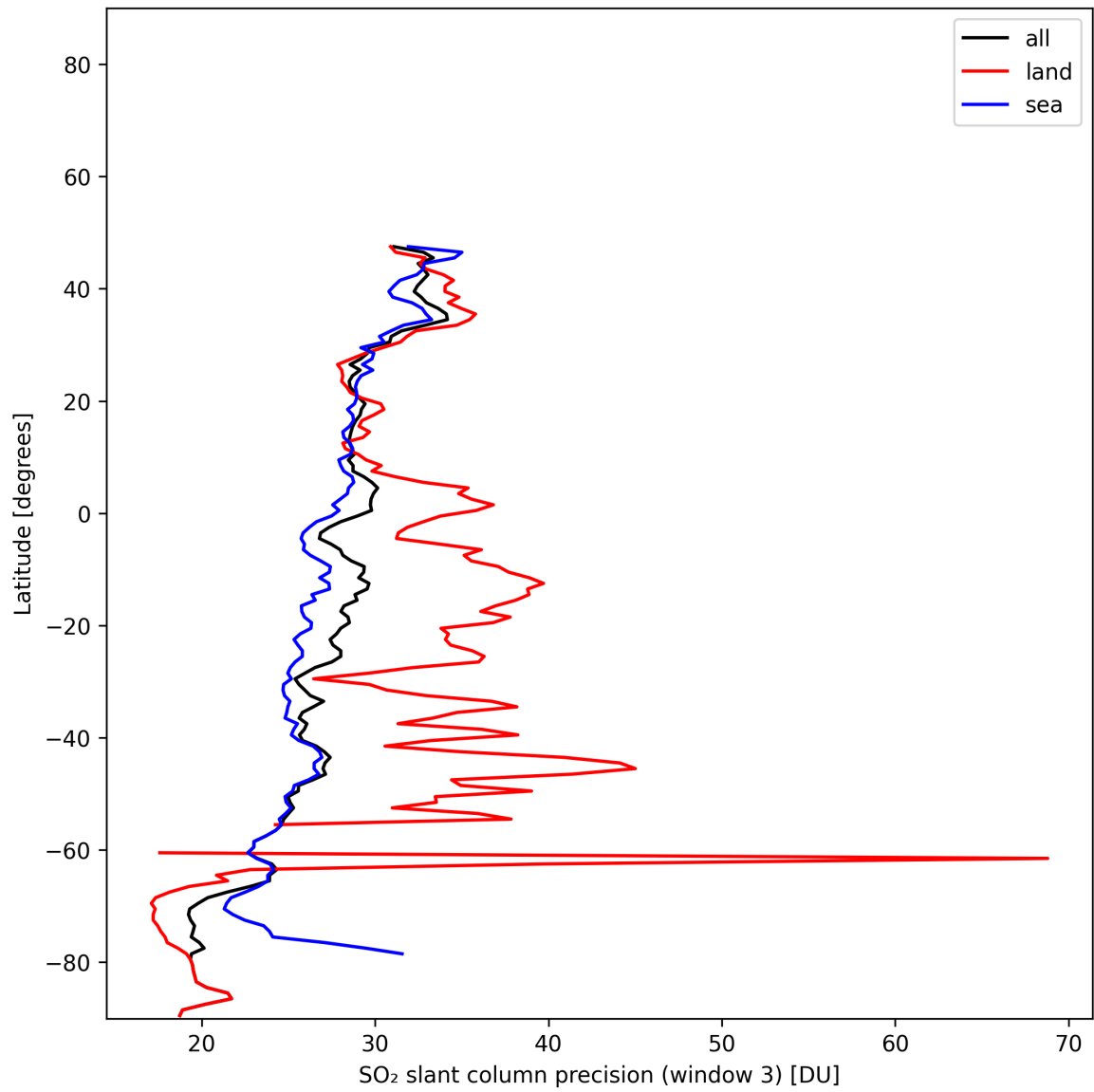


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2024-12-06 to 2024-12-07.

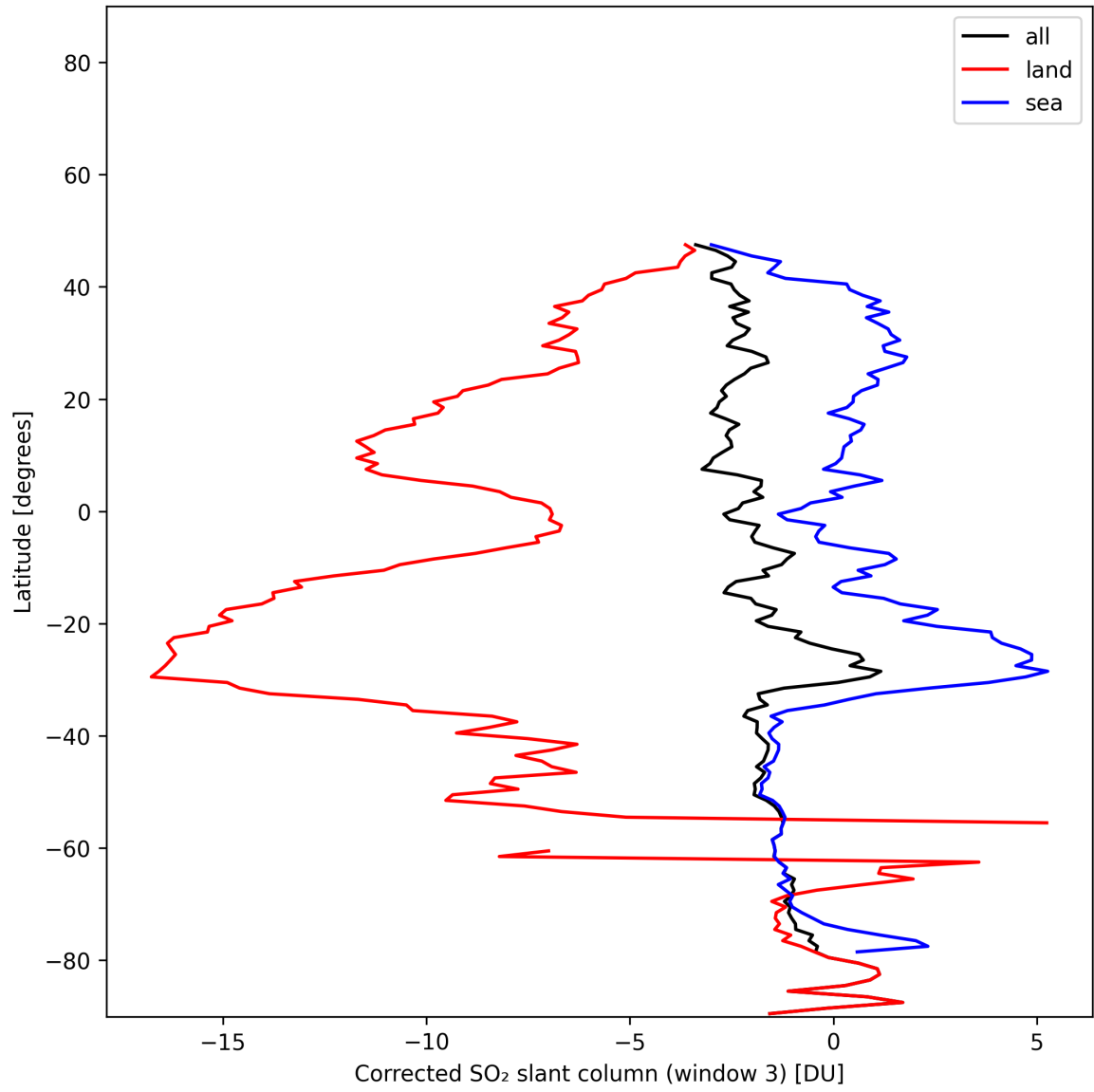


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2024-12-06 to 2024-12-07.

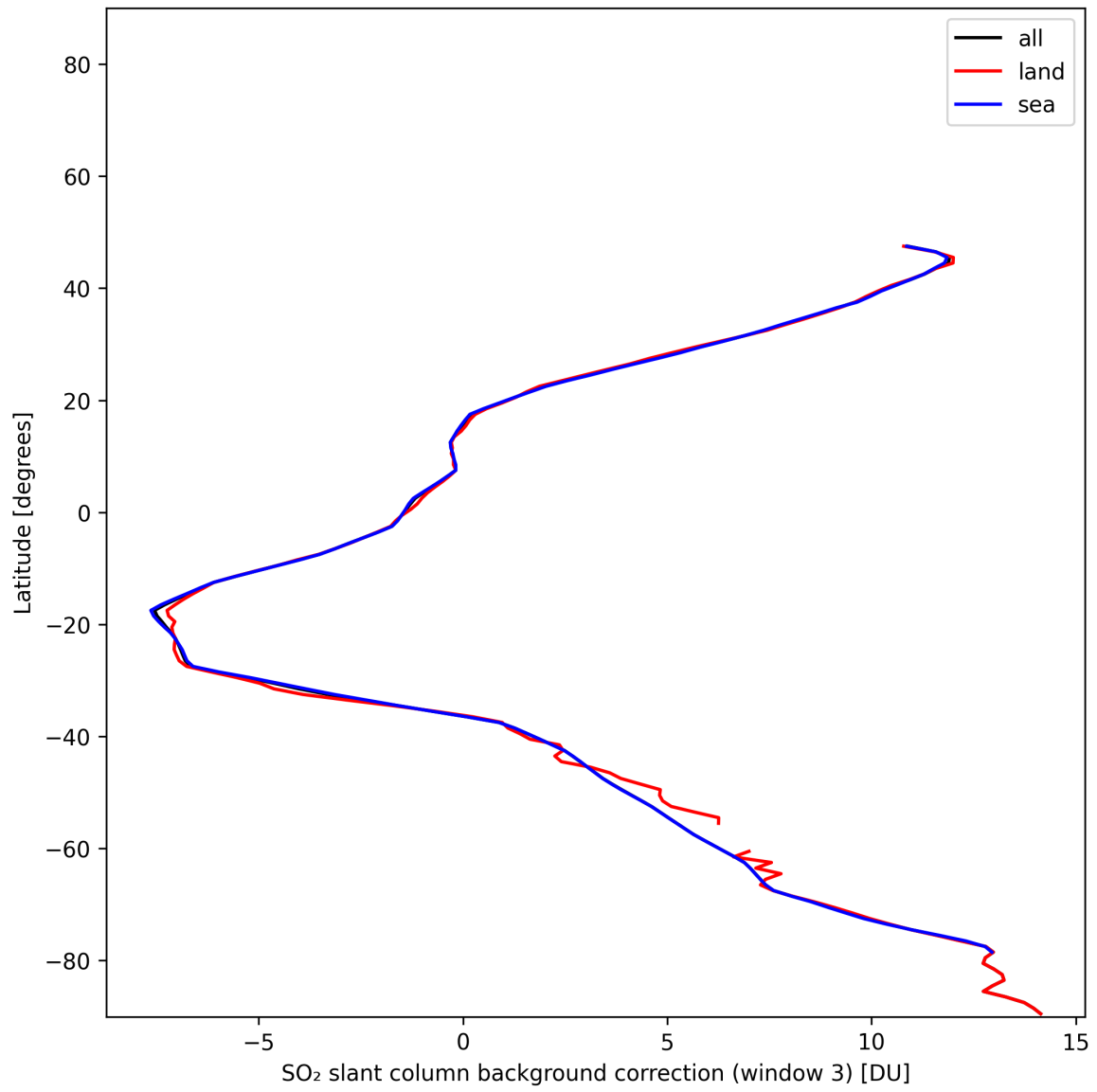


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2024-12-06 to 2024-12-07.

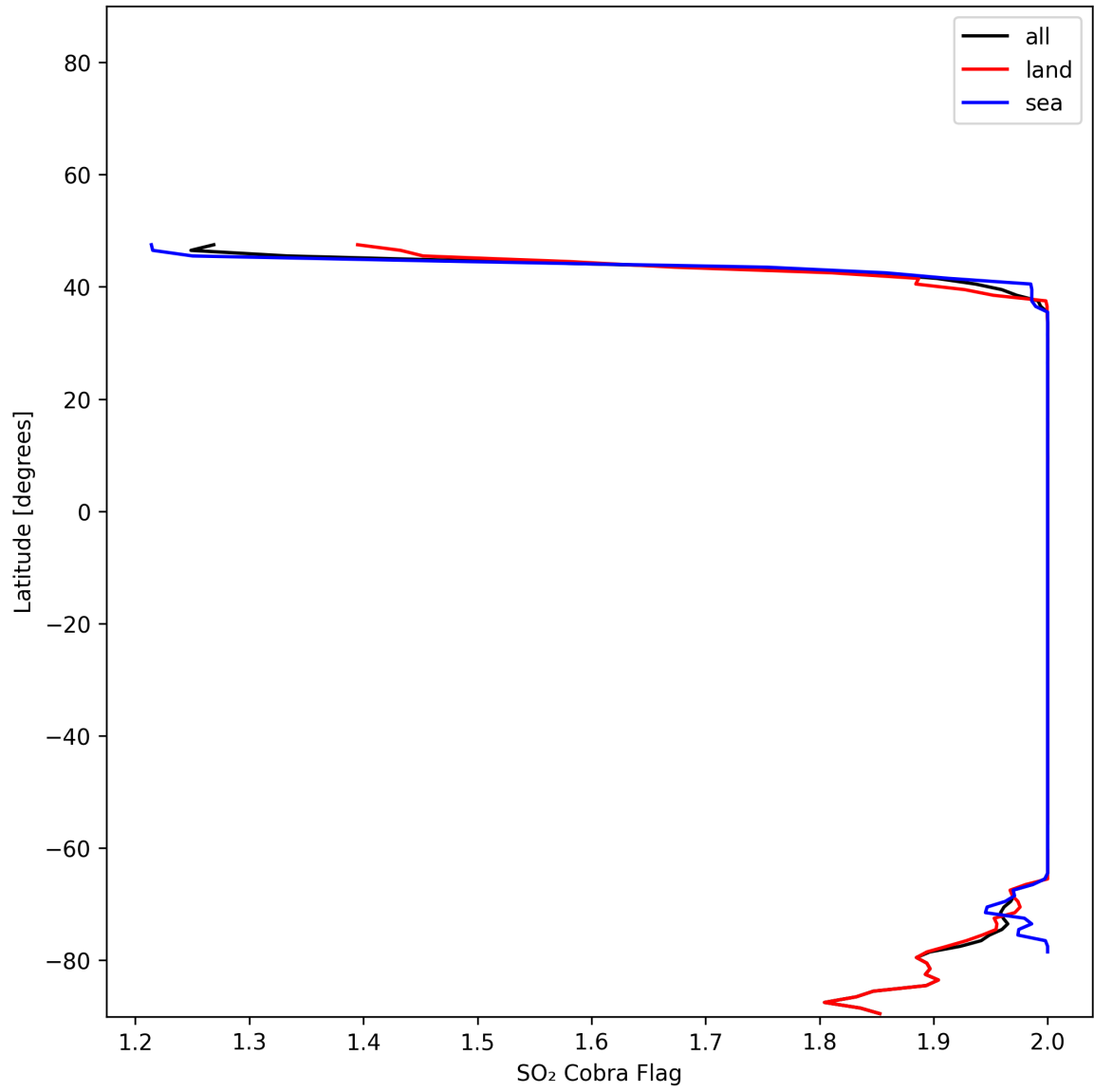


Figure 48: Zonal average of "SO₂ Cobra Flag" for 2024-12-06 to 2024-12-07.

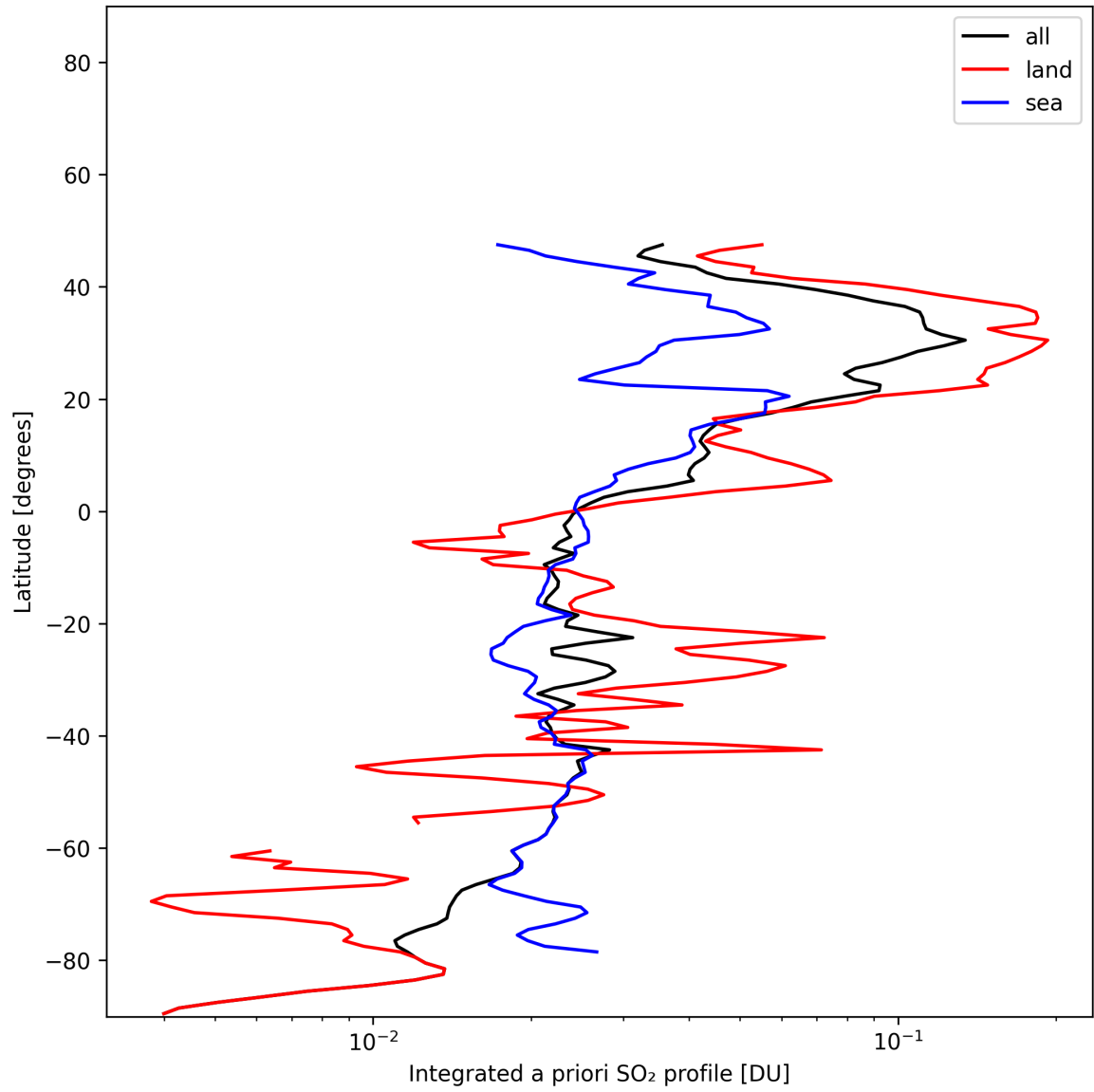


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2024-12-06 to 2024-12-07.

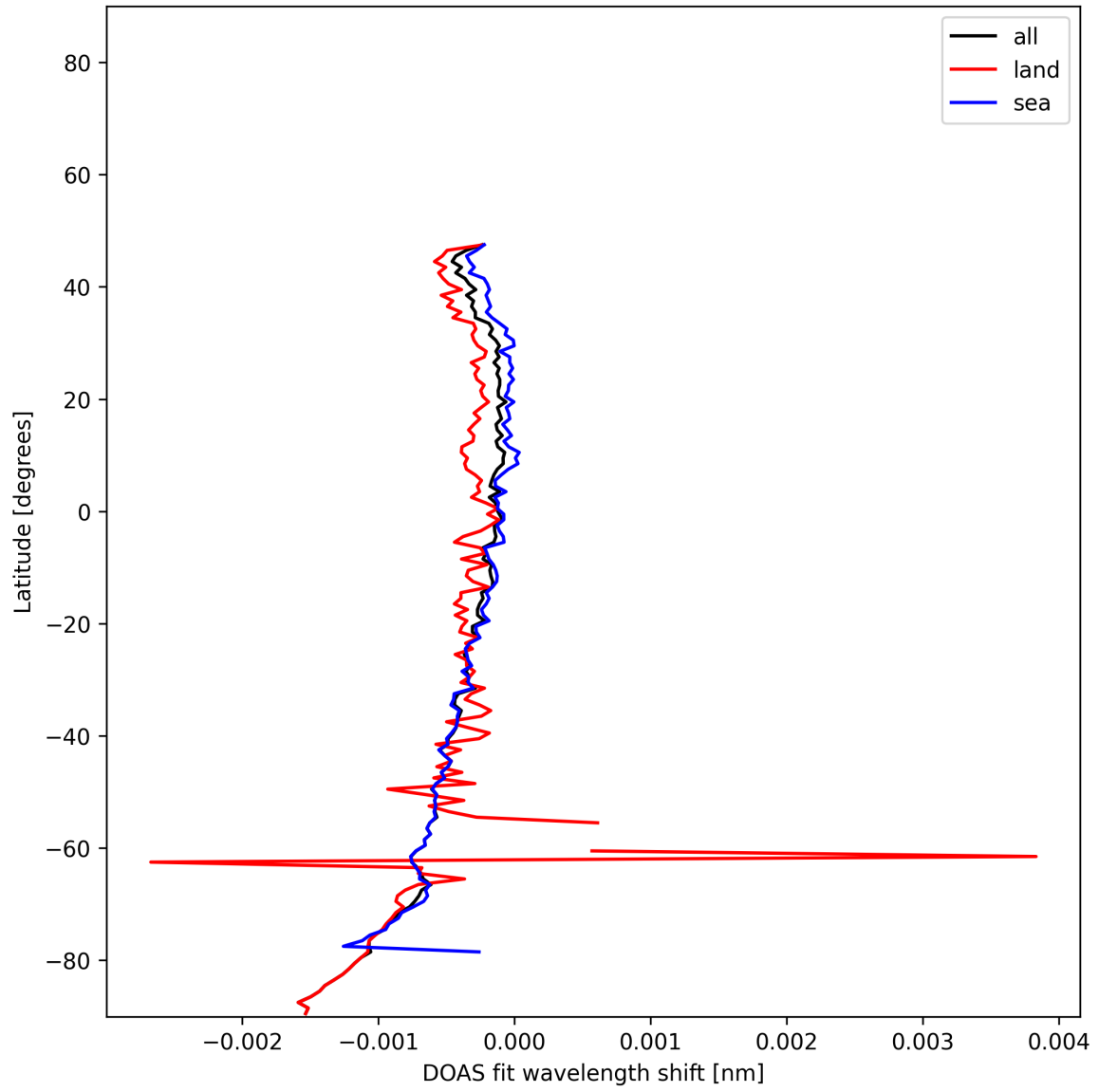


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2024-12-06 to 2024-12-07.

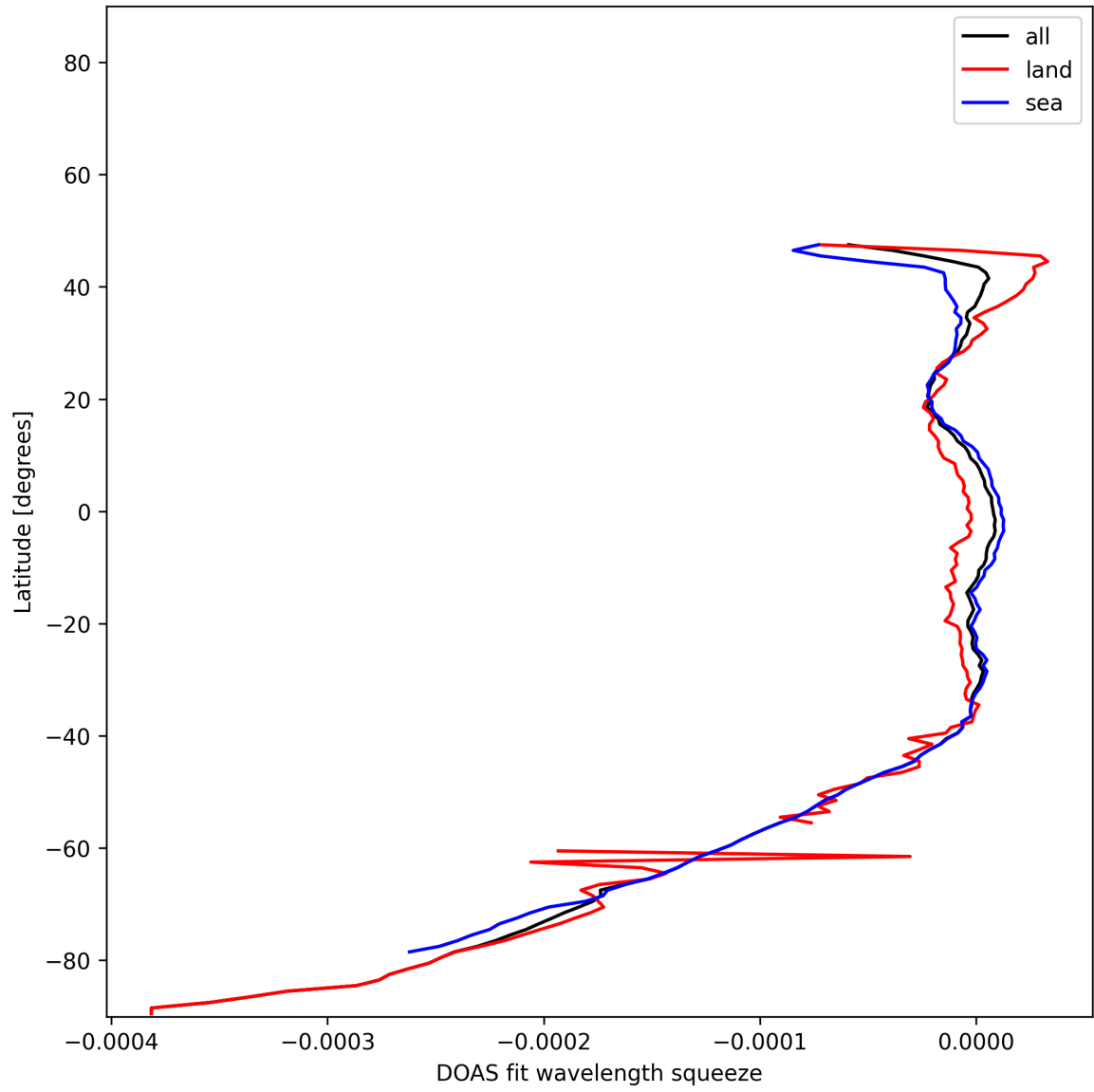


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2024-12-06 to 2024-12-07.

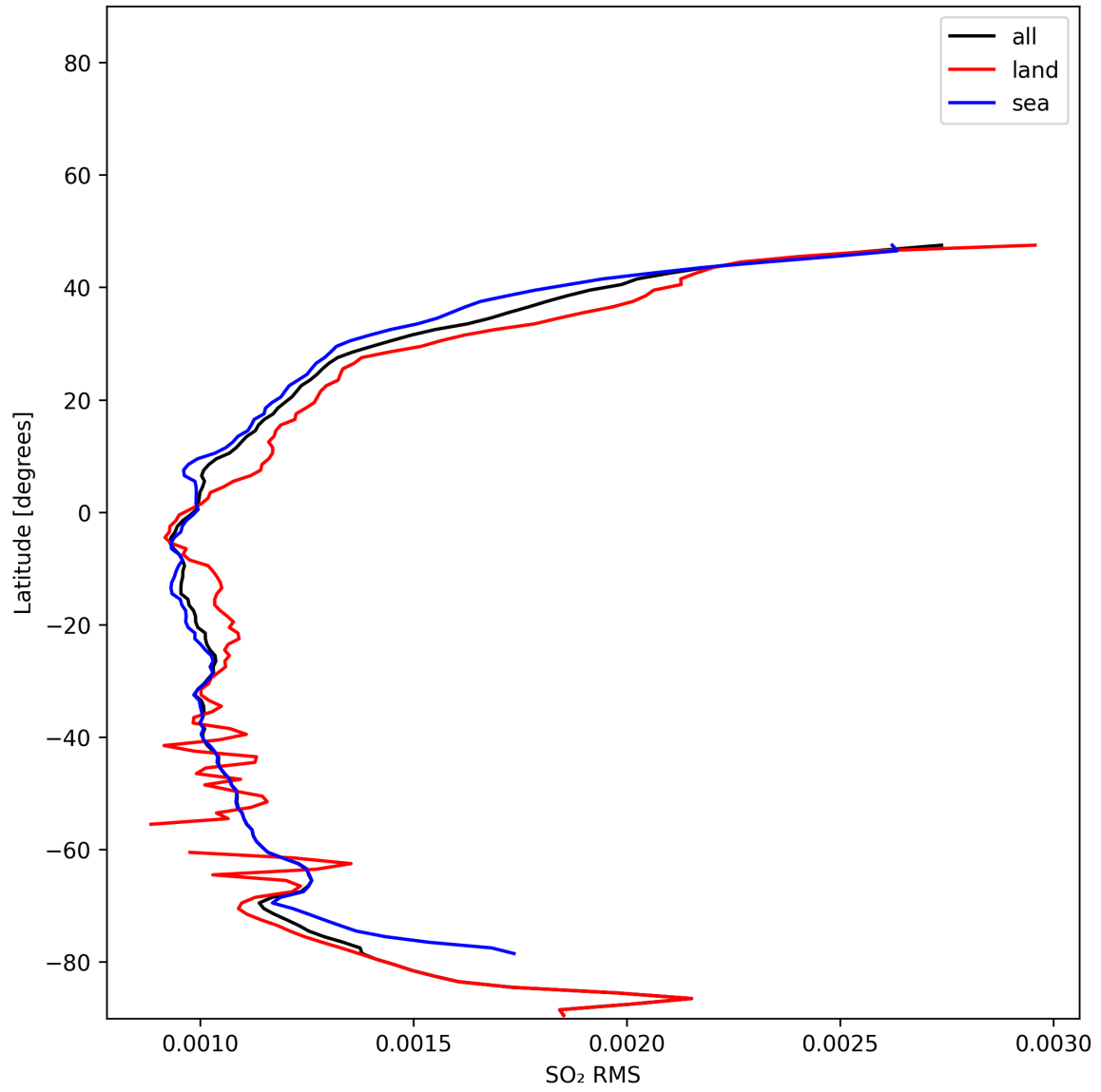


Figure 52: Zonal average of “SO₂ RMS” for 2024-12-06 to 2024-12-07.

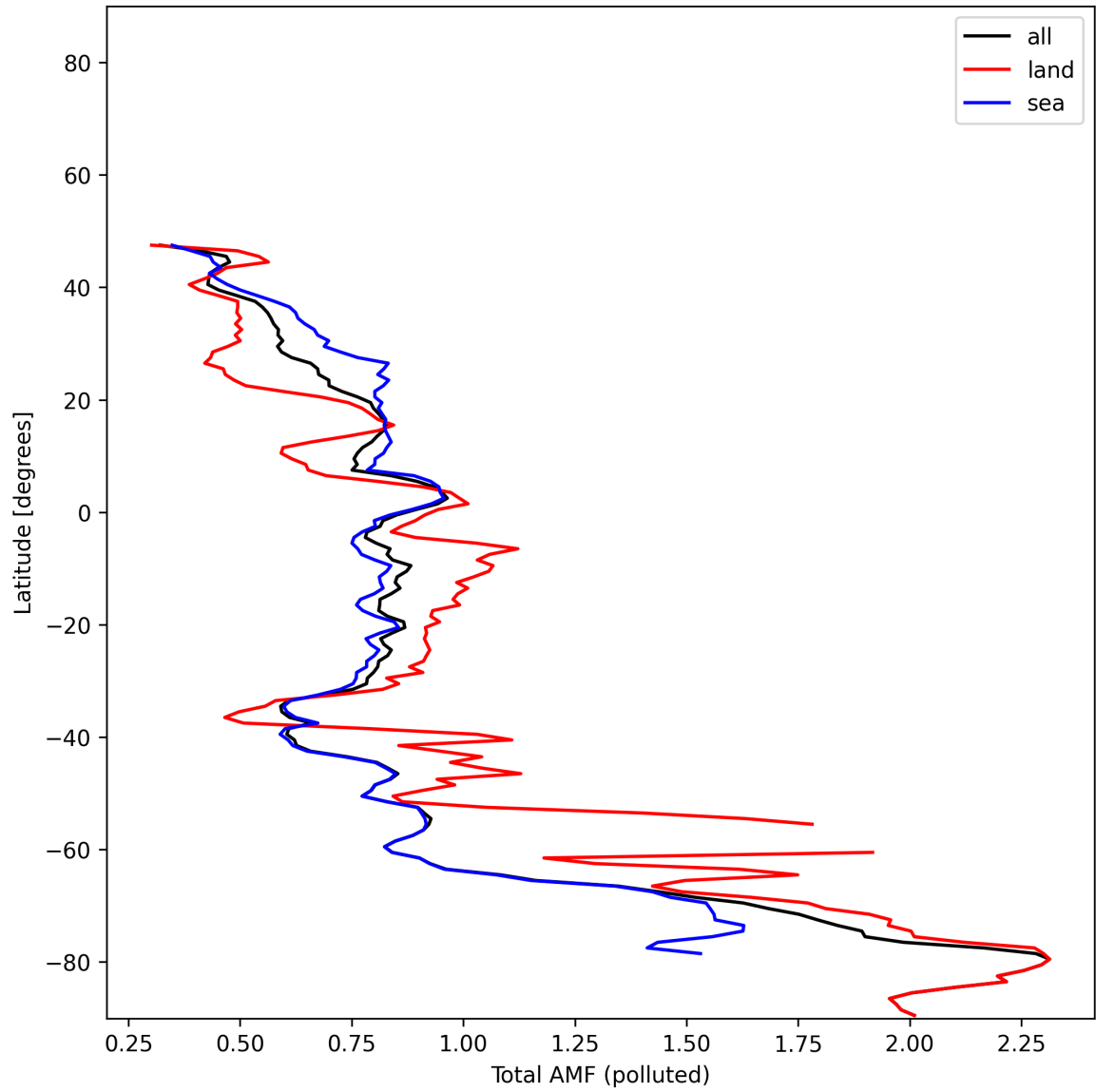


Figure 53: Zonal average of “Total AMF (polluted)” for 2024-12-06 to 2024-12-07.

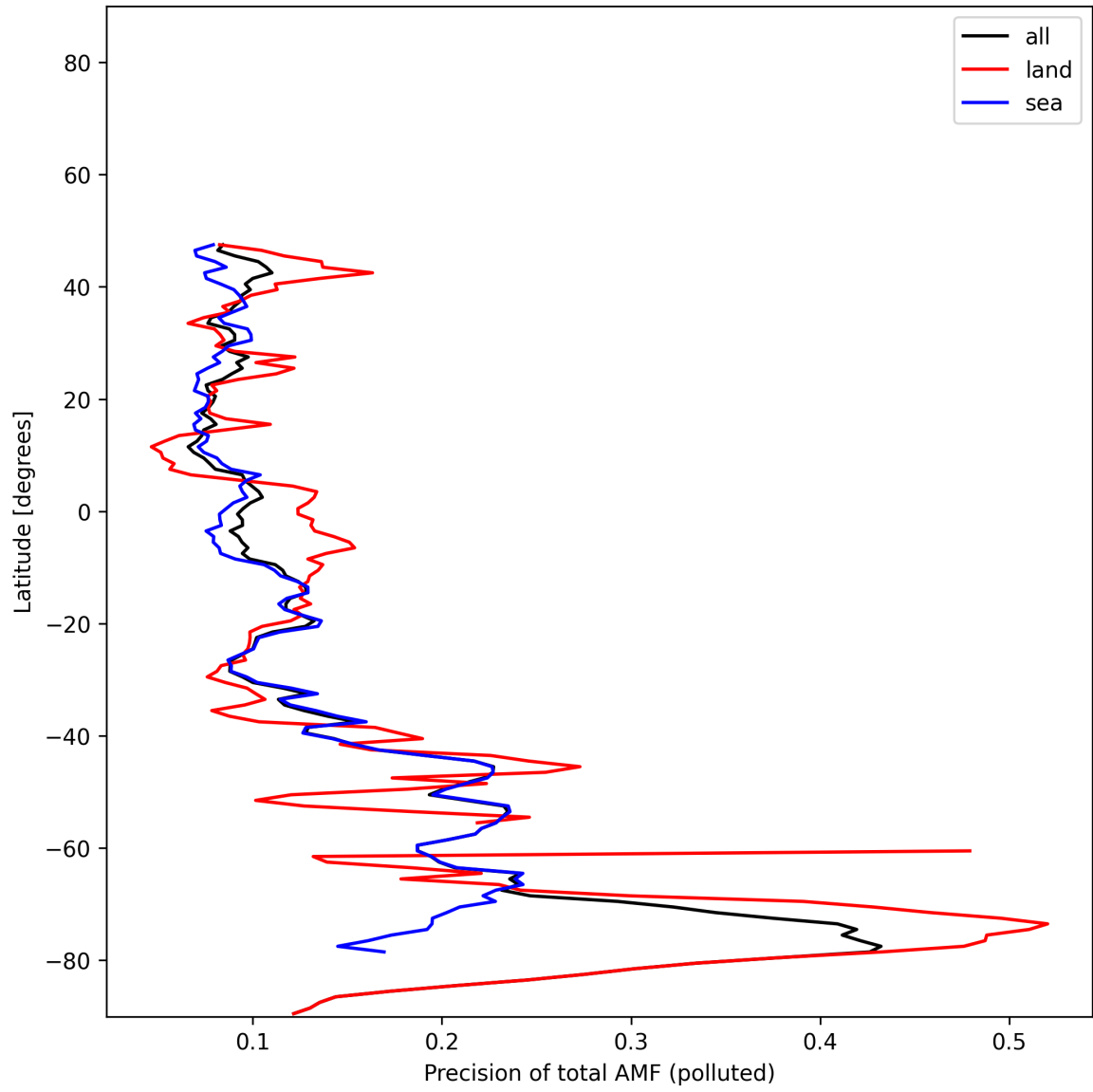


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2024-12-06 to 2024-12-07.

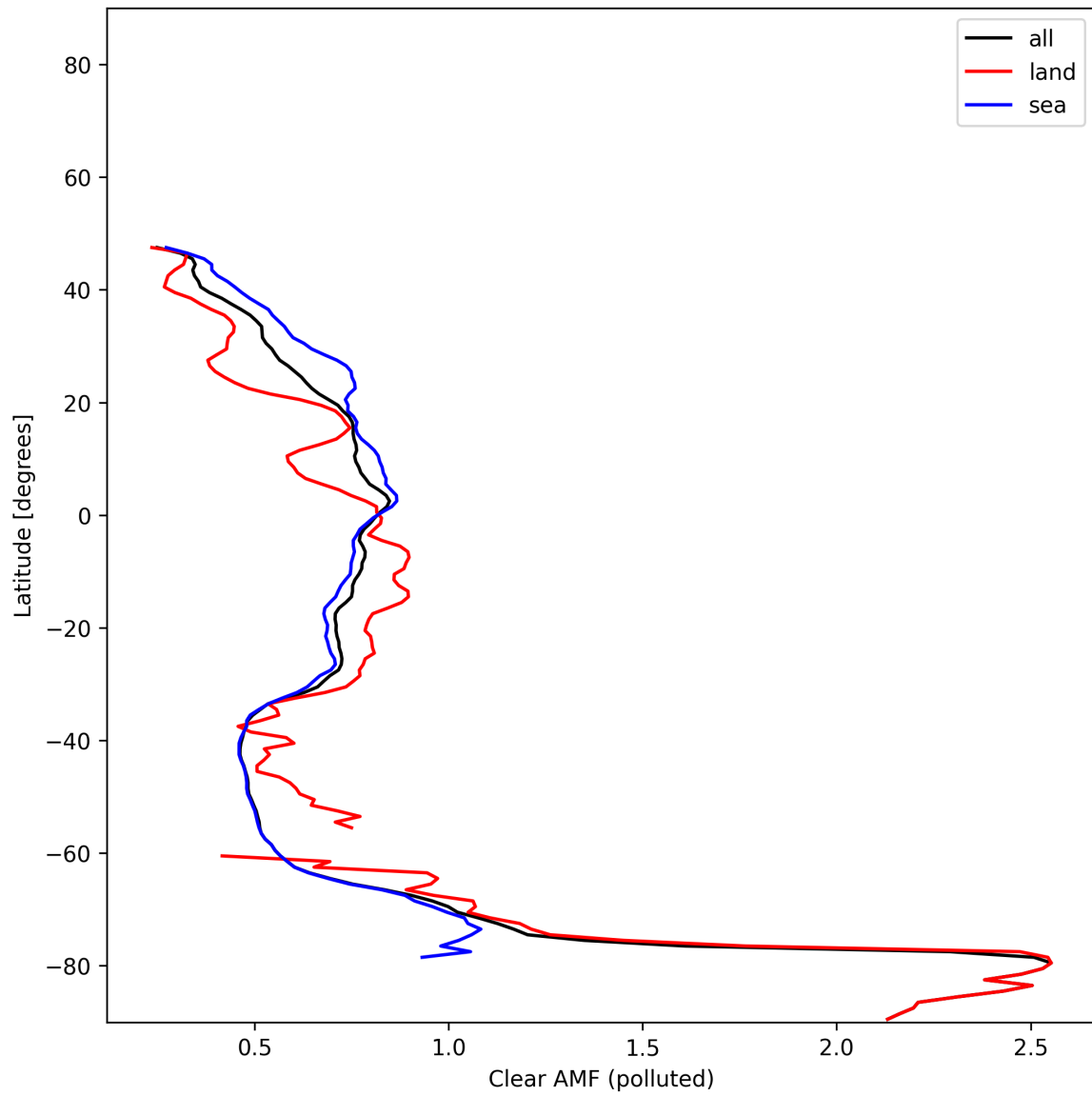


Figure 55: Zonal average of “Clear AMF (polluted)” for 2024-12-06 to 2024-12-07.

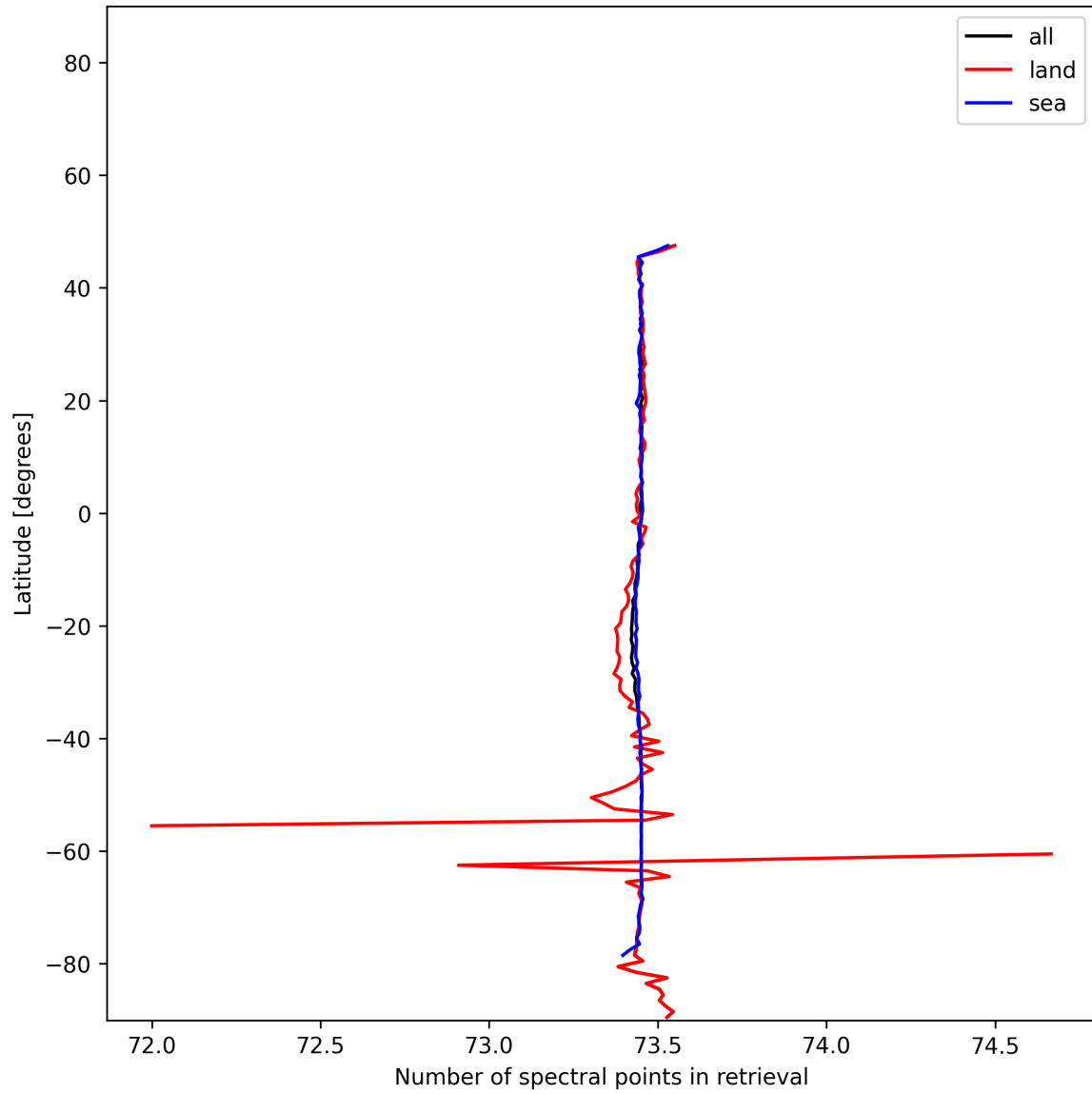


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2024-12-06 to 2024-12-07.

8 Histograms

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

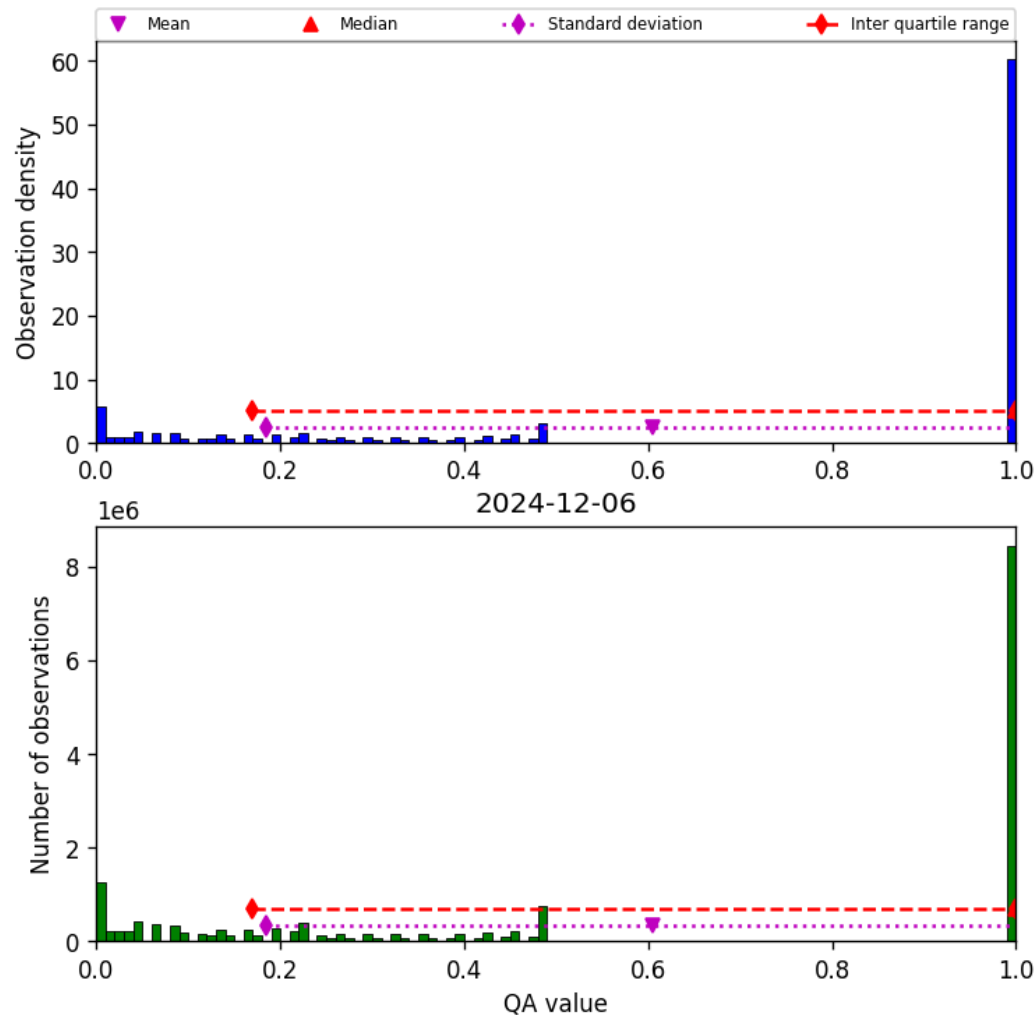


Figure 57: Histogram of “QA value” for 2024-12-06 to 2024-12-07

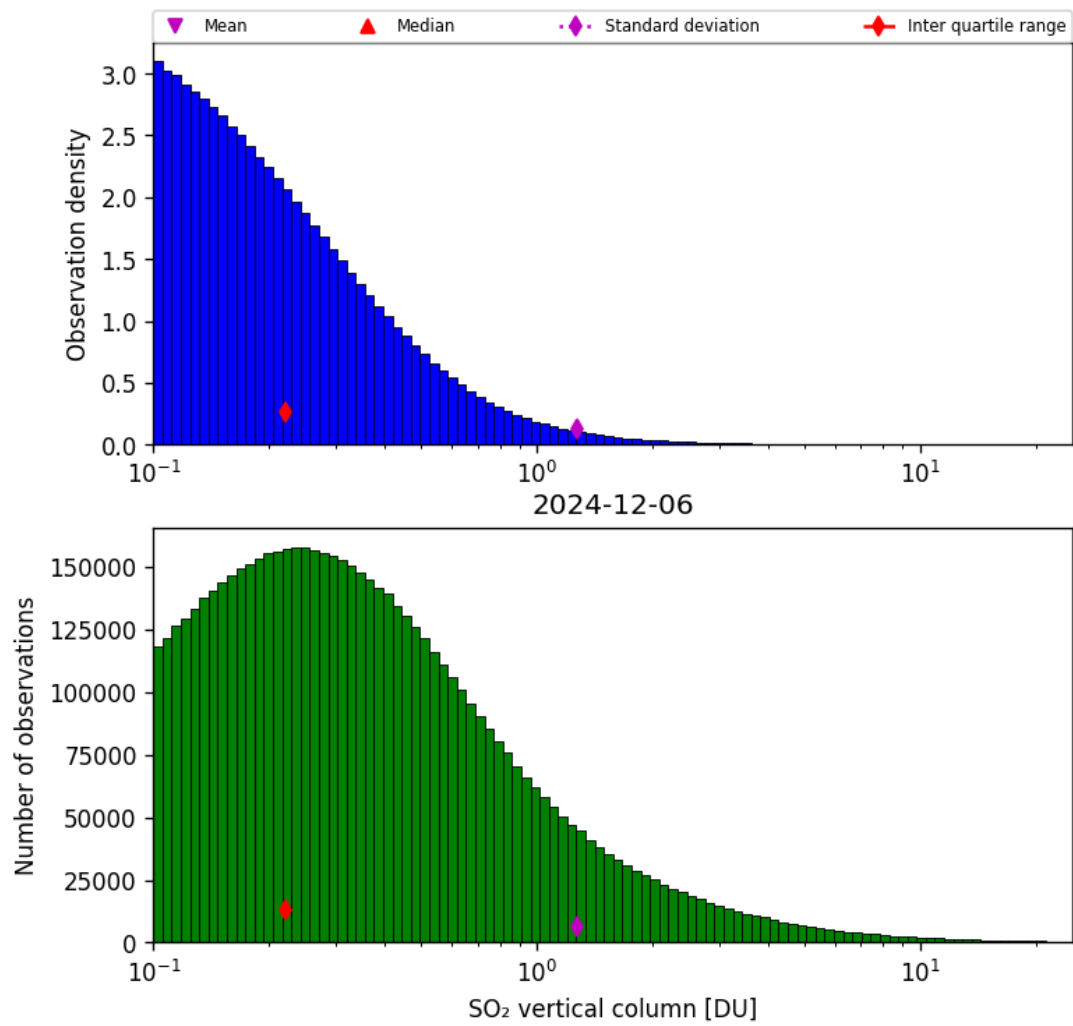


Figure 58: Histogram of “SO₂ vertical column” for 2024-12-06 to 2024-12-07

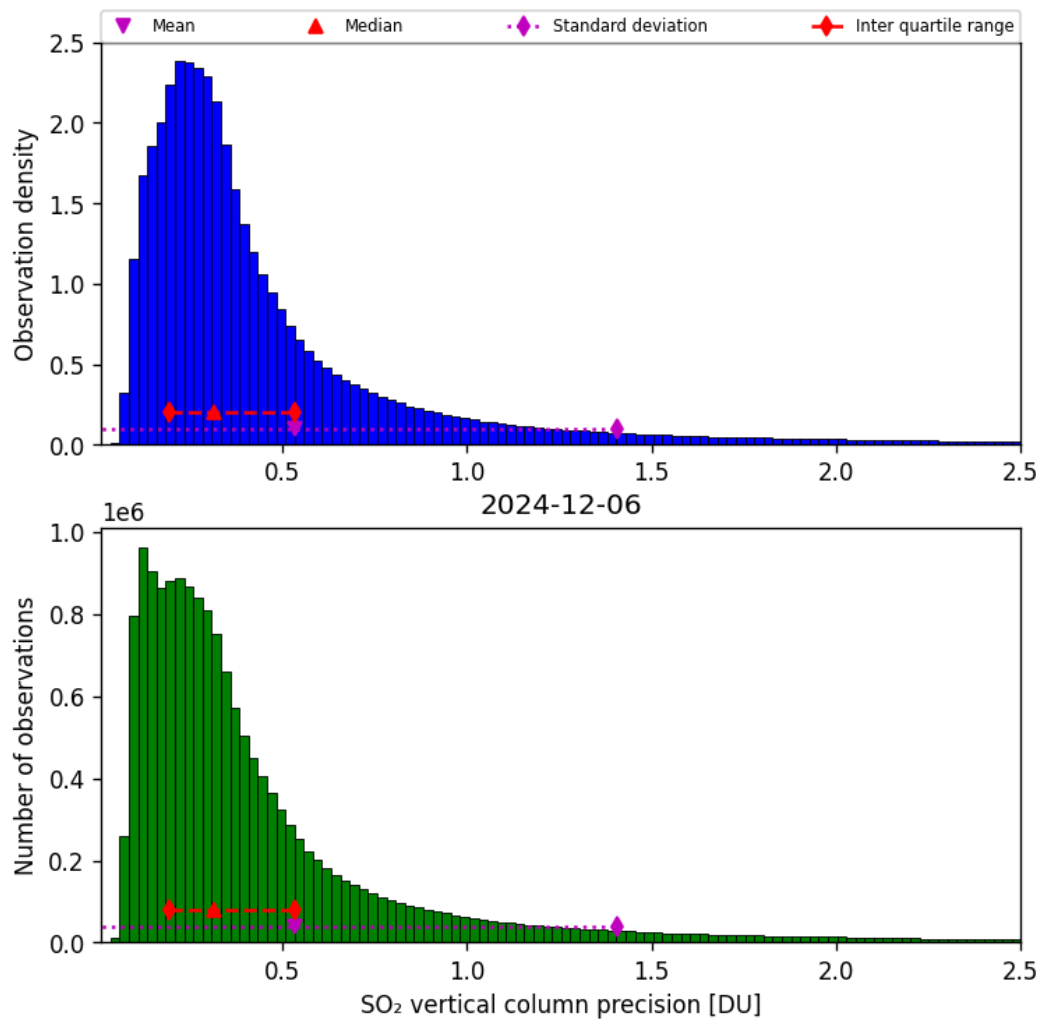


Figure 59: Histogram of “SO₂ vertical column precision” for 2024-12-06 to 2024-12-07

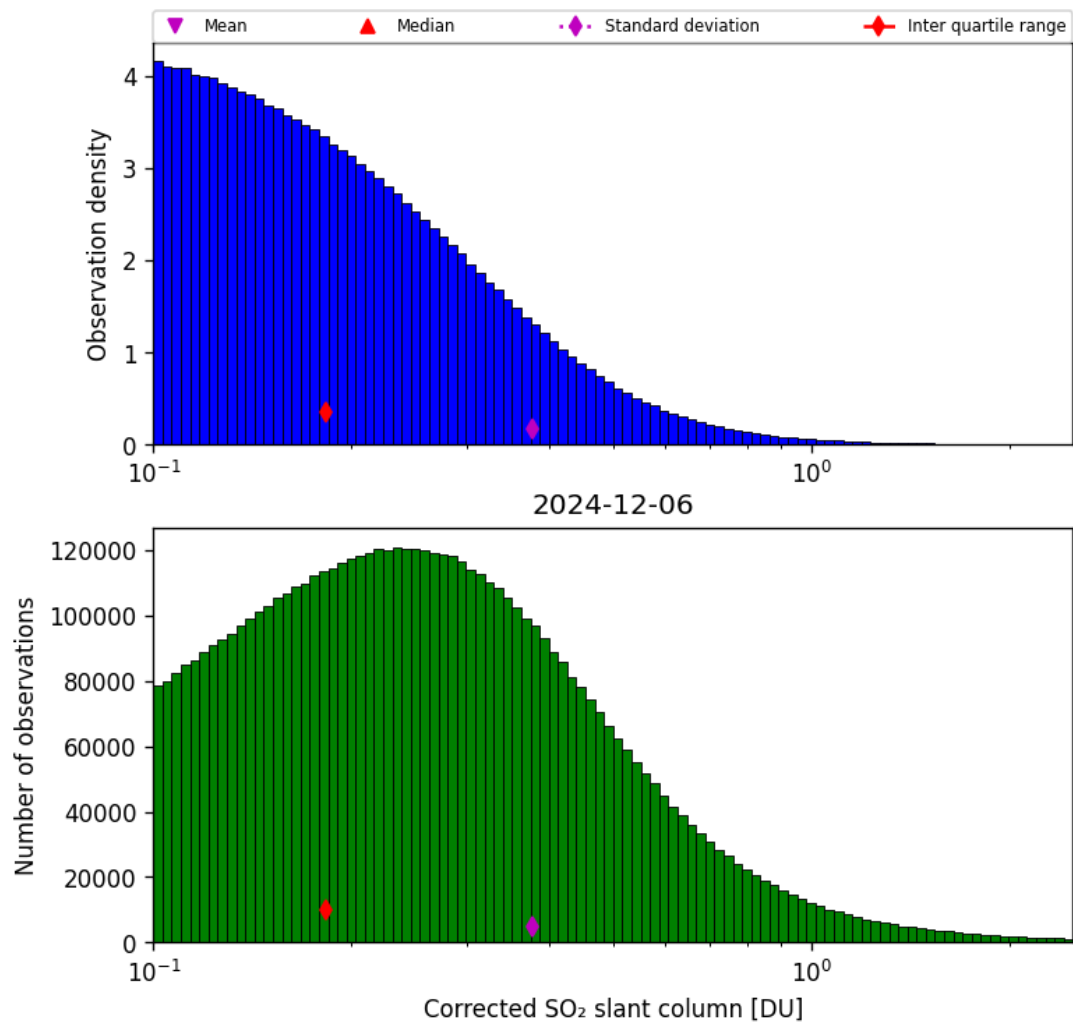


Figure 60: Histogram of “Corrected SO₂ slant column” for 2024-12-06 to 2024-12-07

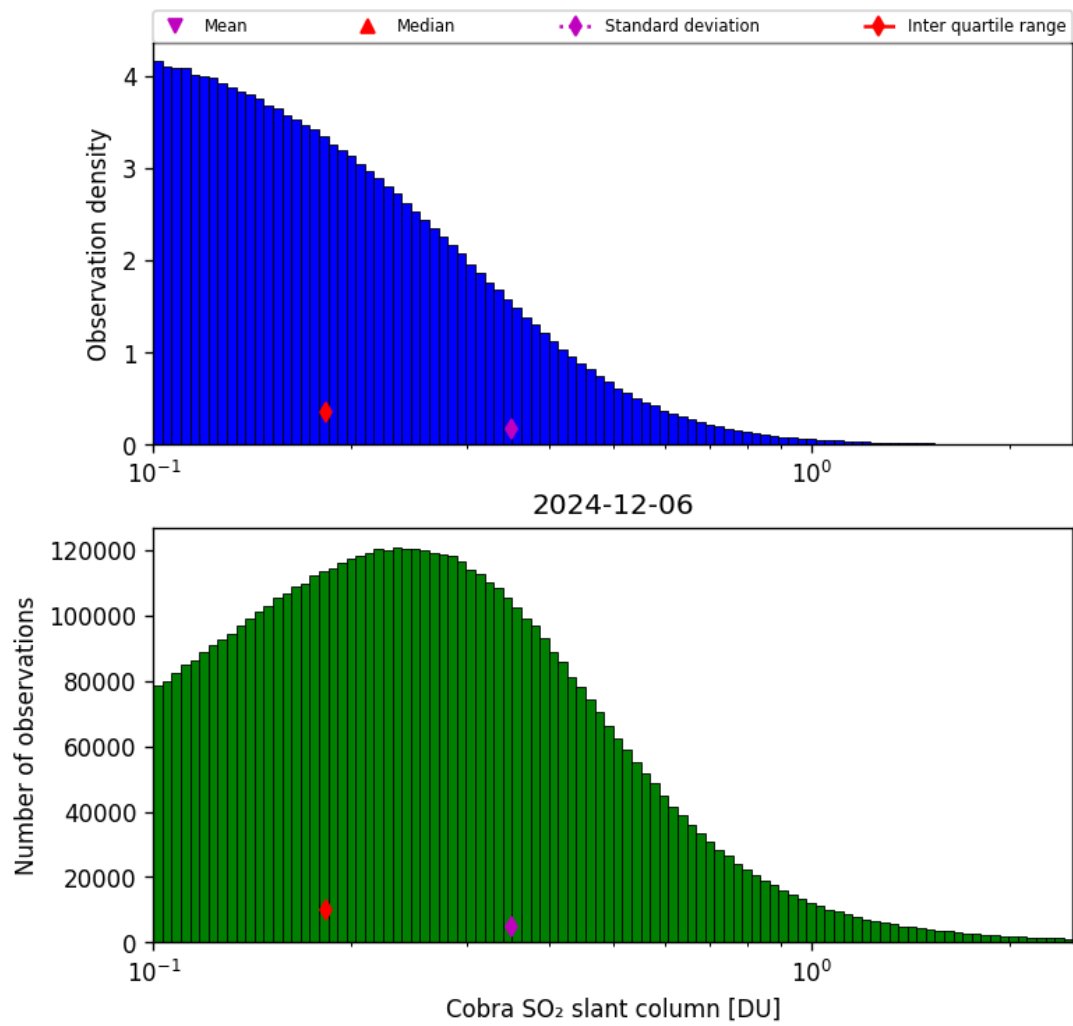


Figure 61: Histogram of “Cobra SO₂ slant column” for 2024-12-06 to 2024-12-07

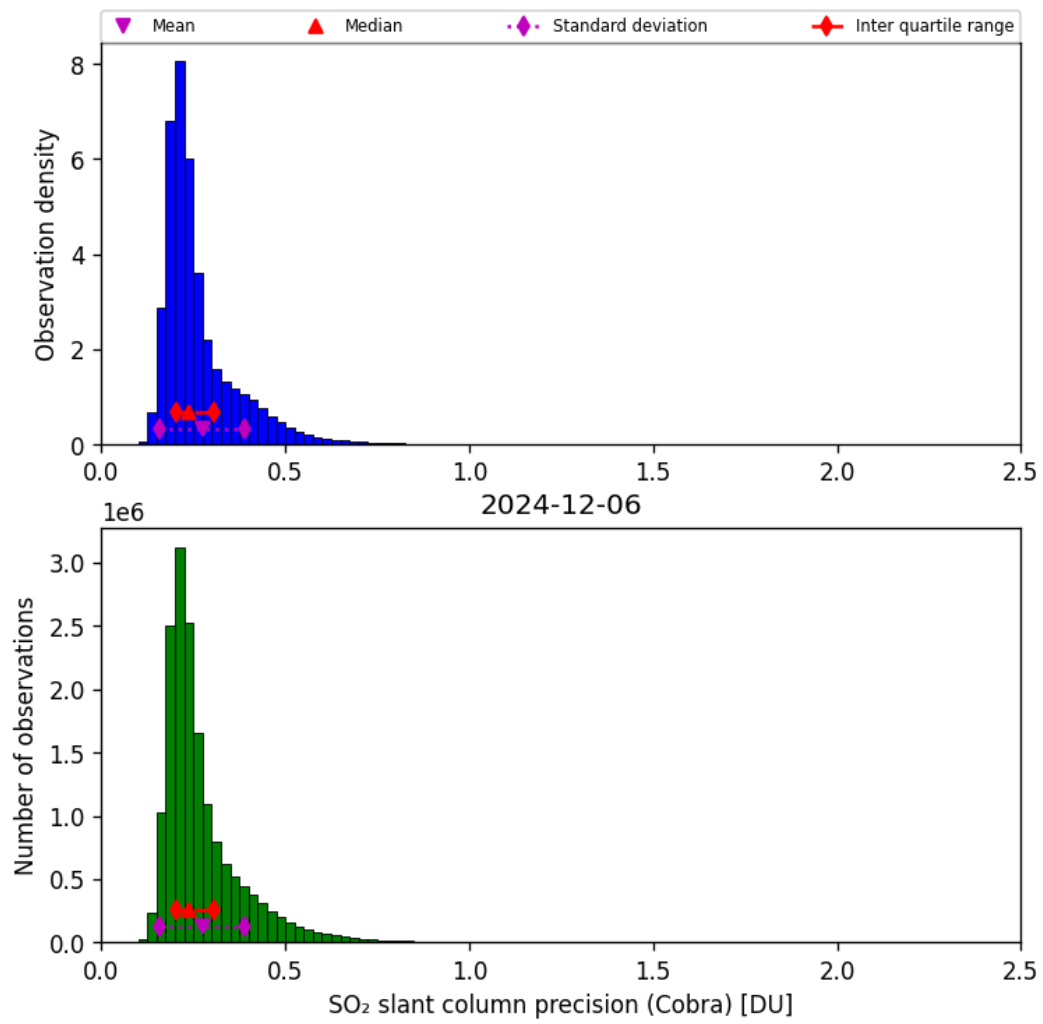


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2024-12-06 to 2024-12-07

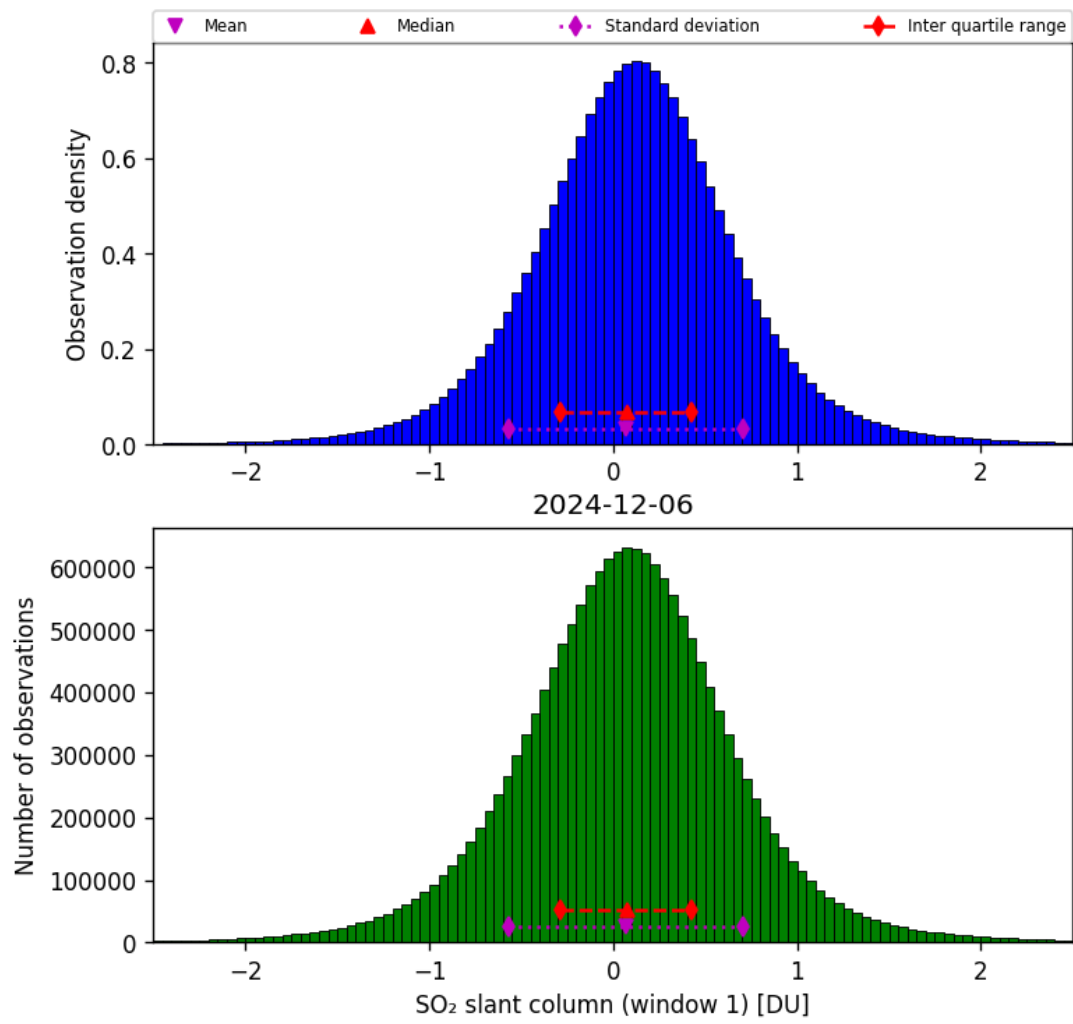


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2024-12-06 to 2024-12-07

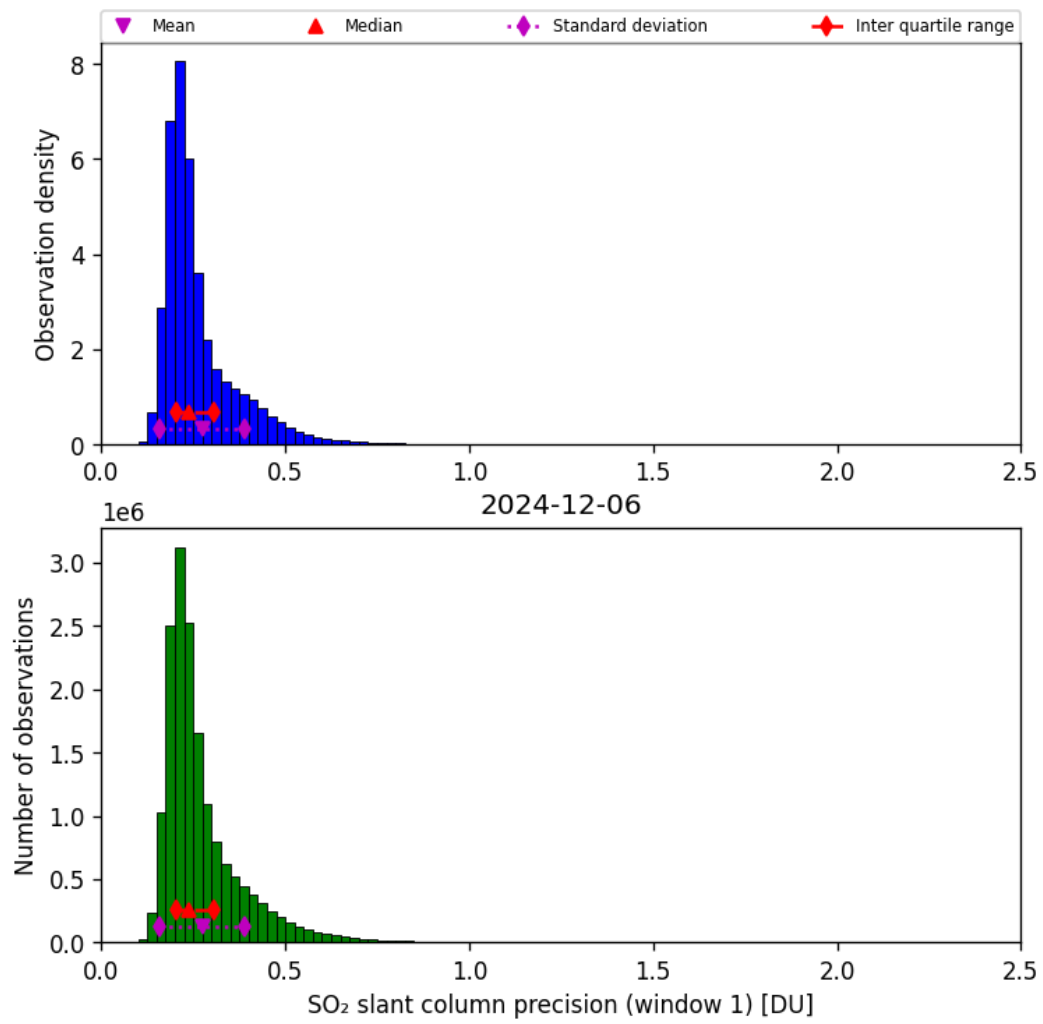


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2024-12-06 to 2024-12-07

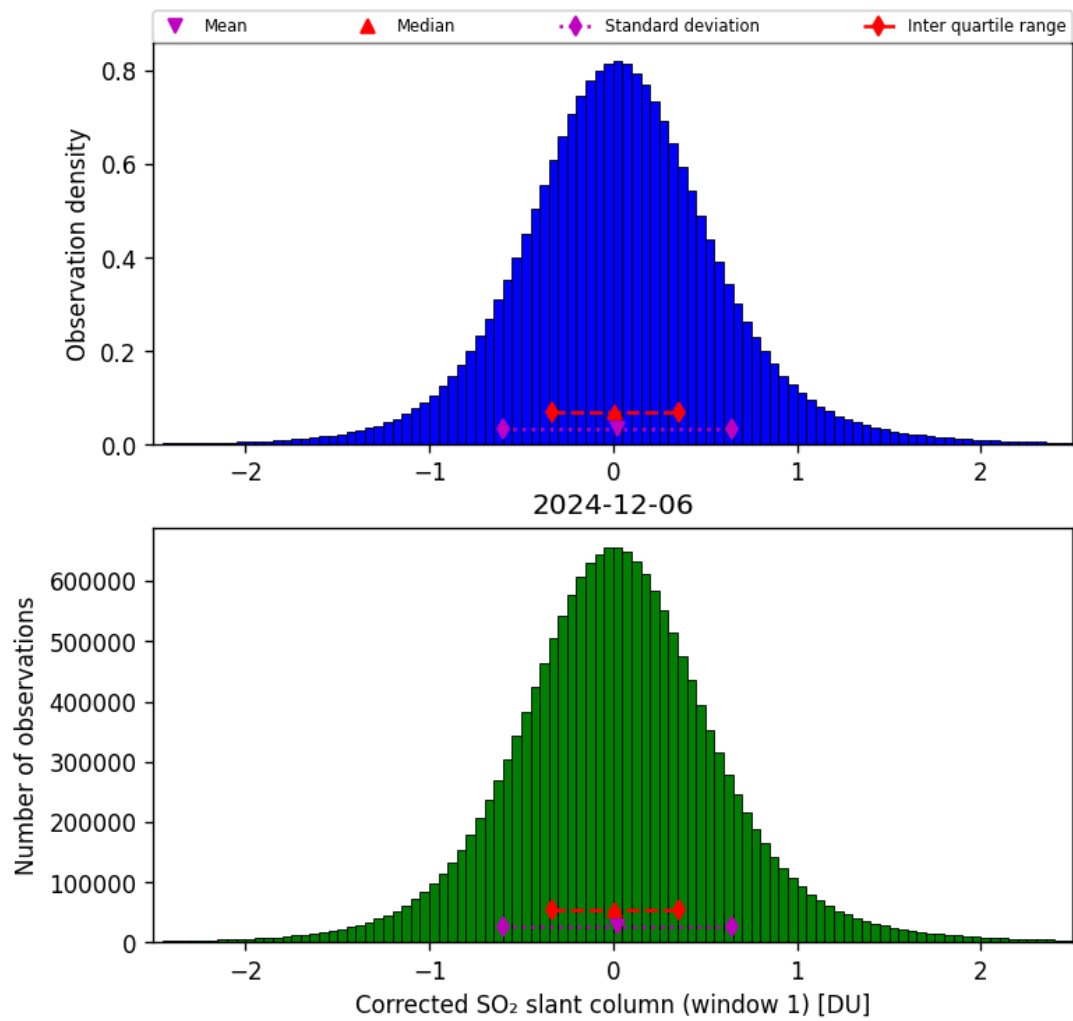


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2024-12-06 to 2024-12-07

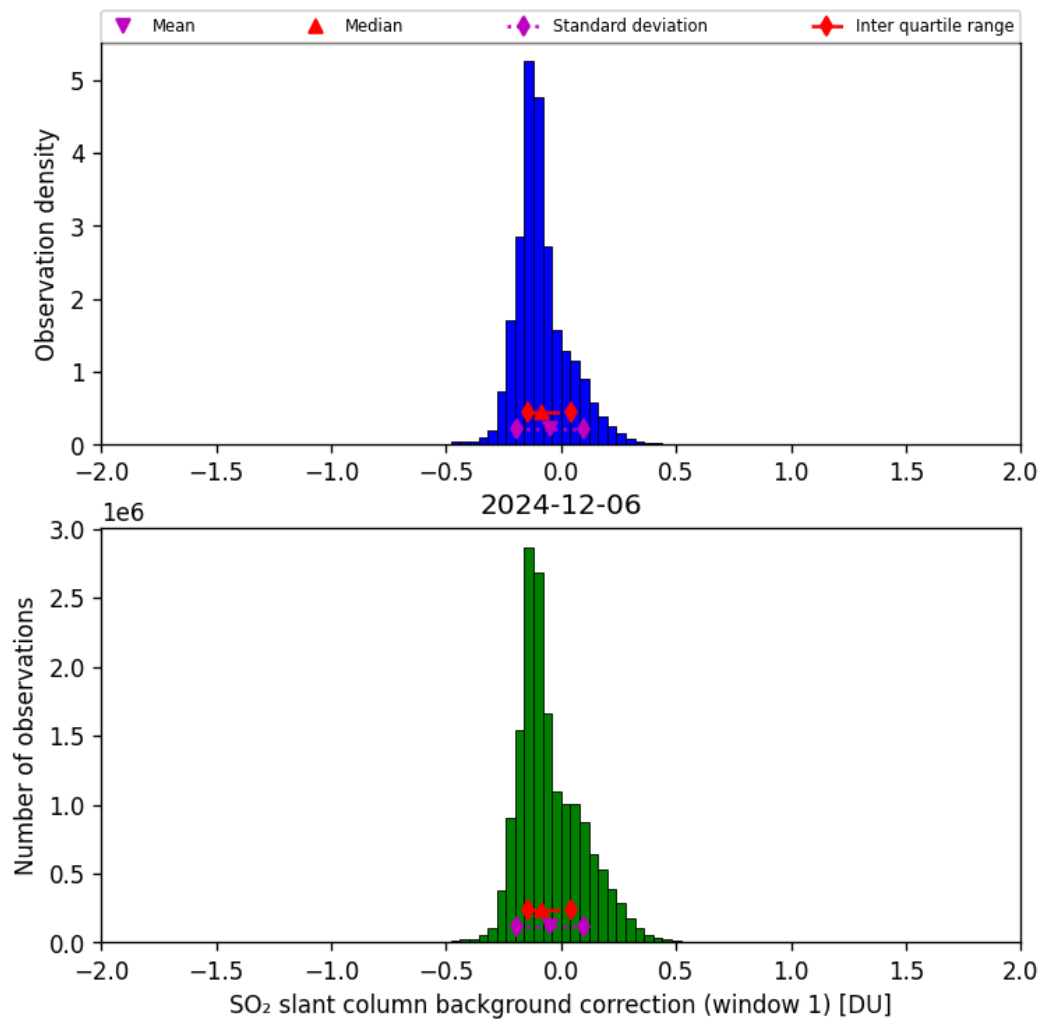


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2024-12-06 to 2024-12-07

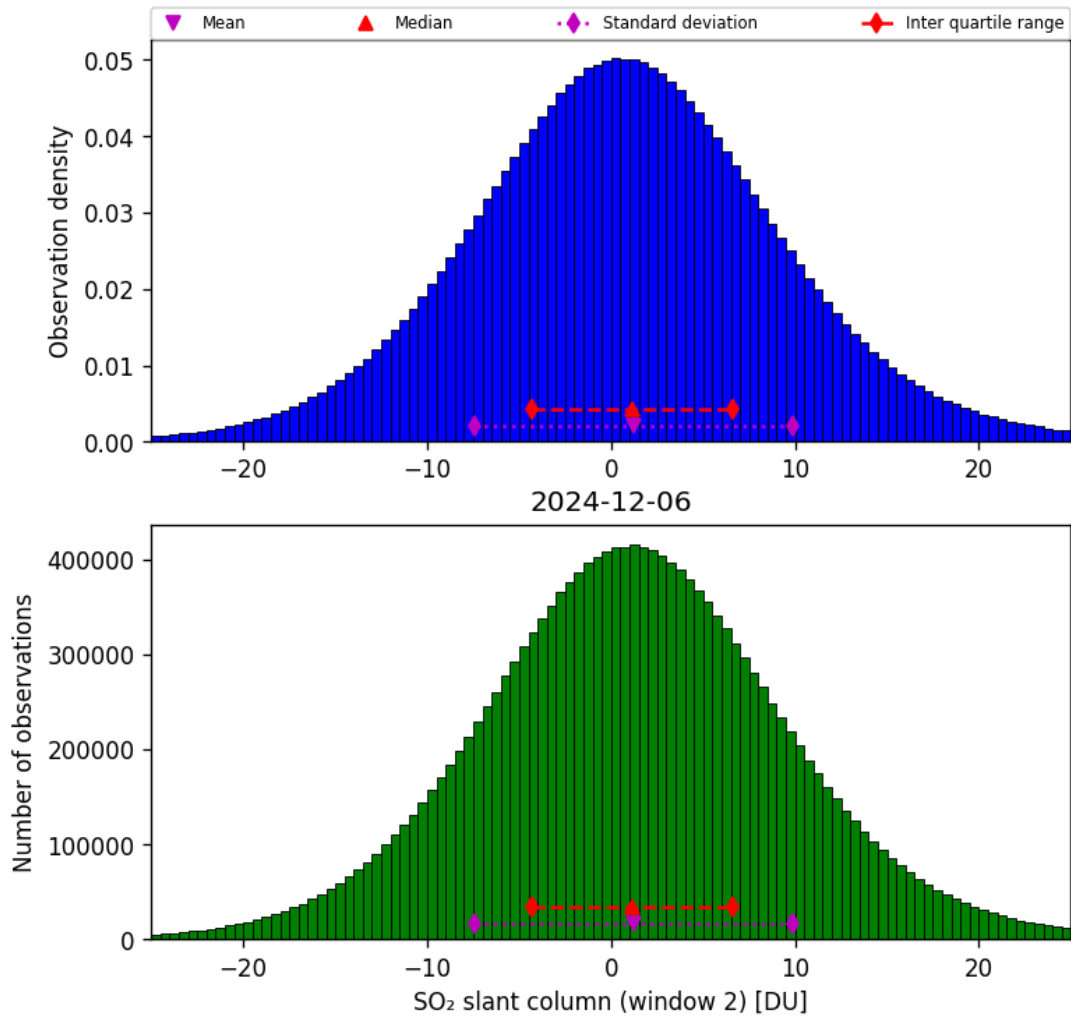


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2024-12-06 to 2024-12-07

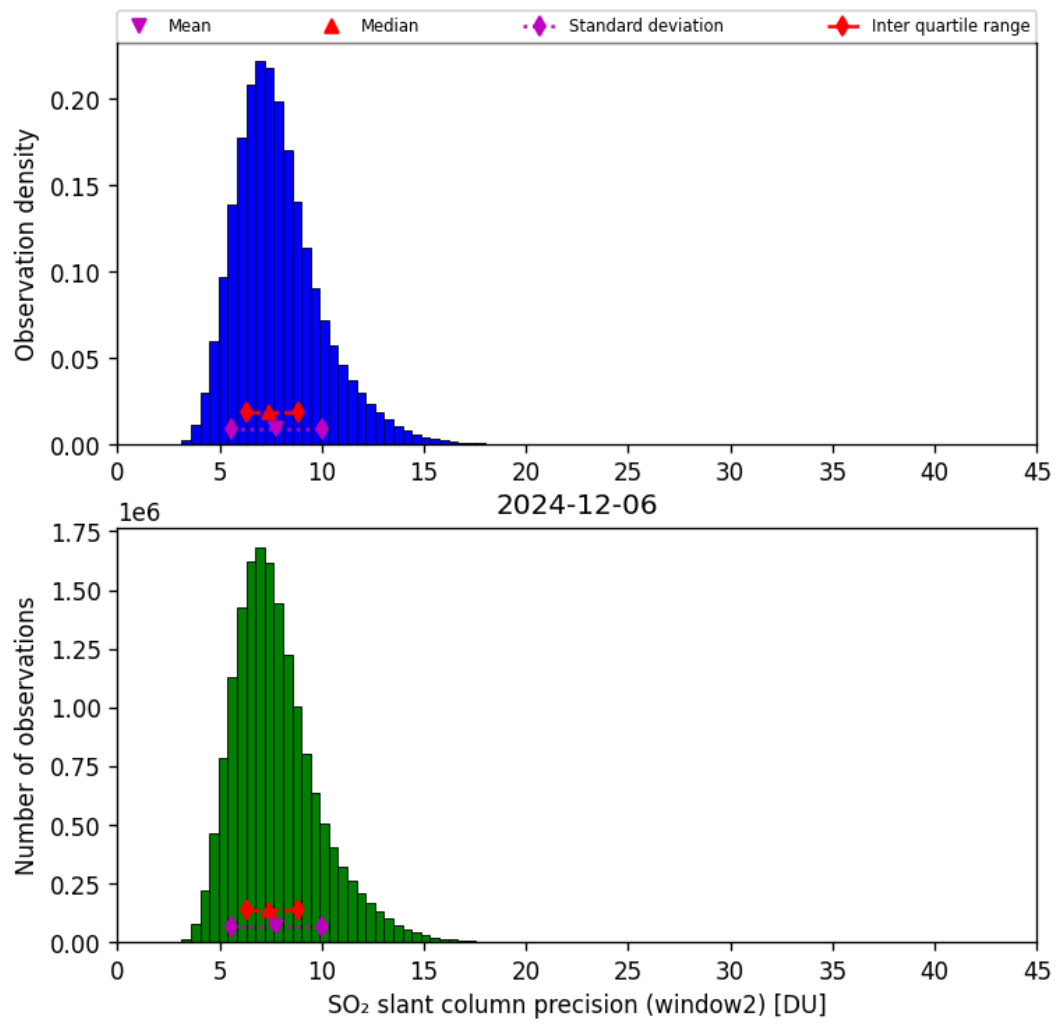


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2024-12-06 to 2024-12-07

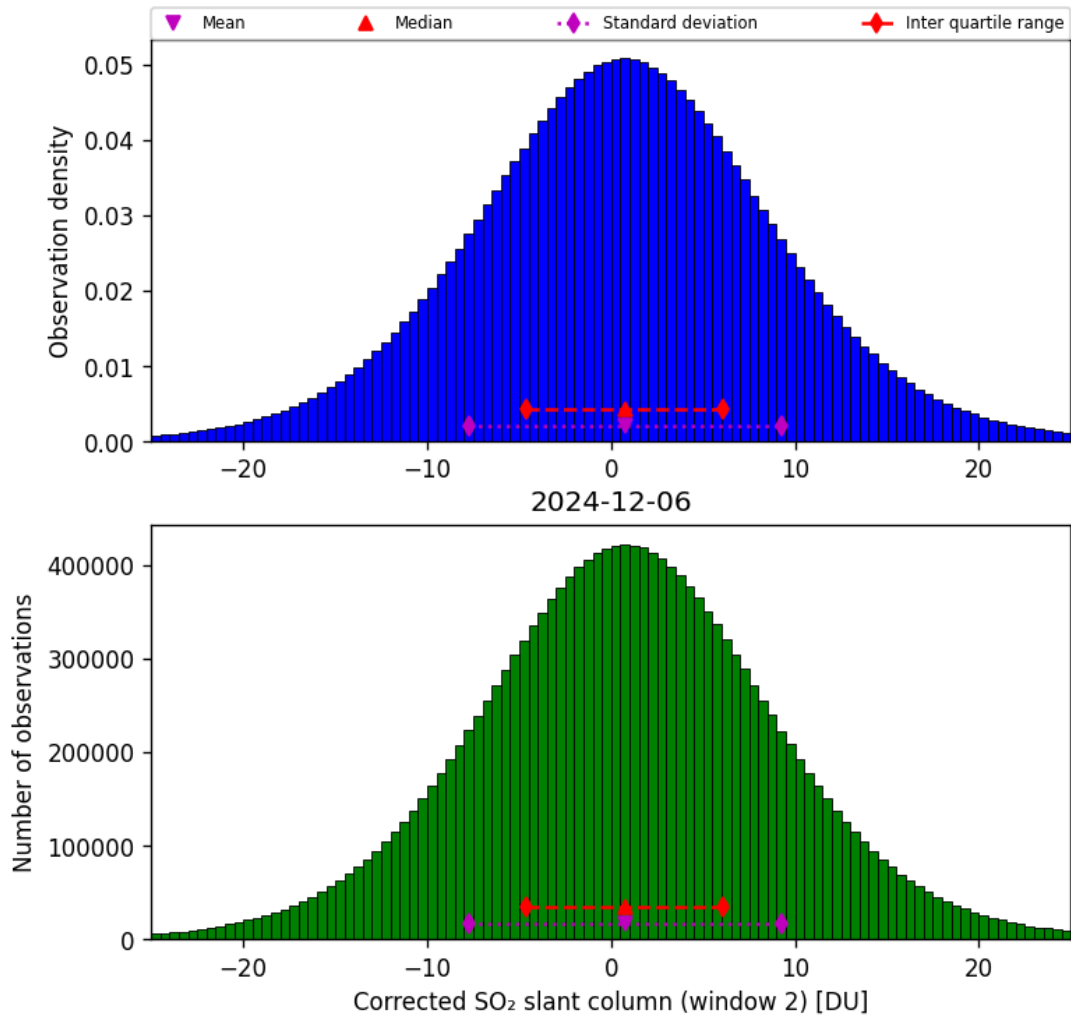


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2024-12-06 to 2024-12-07

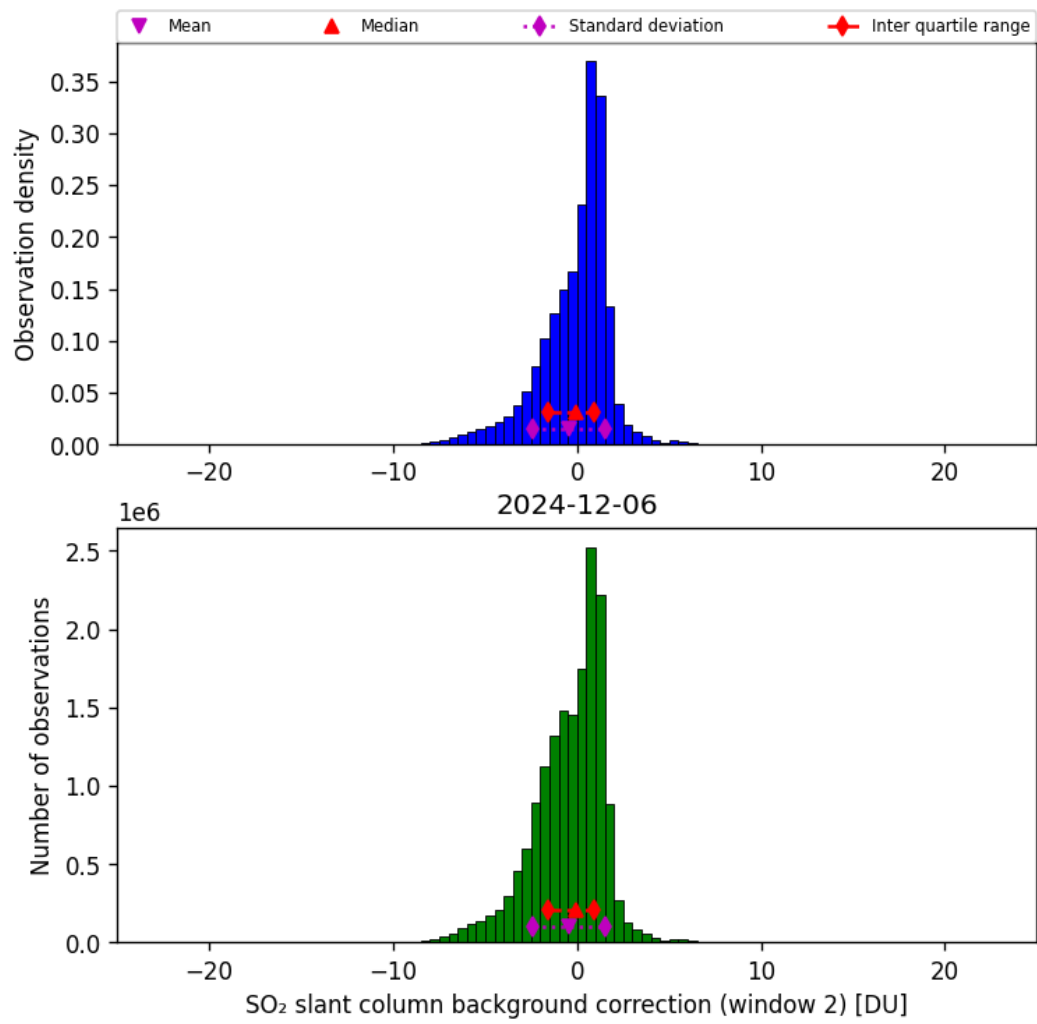


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2024-12-06 to 2024-12-07

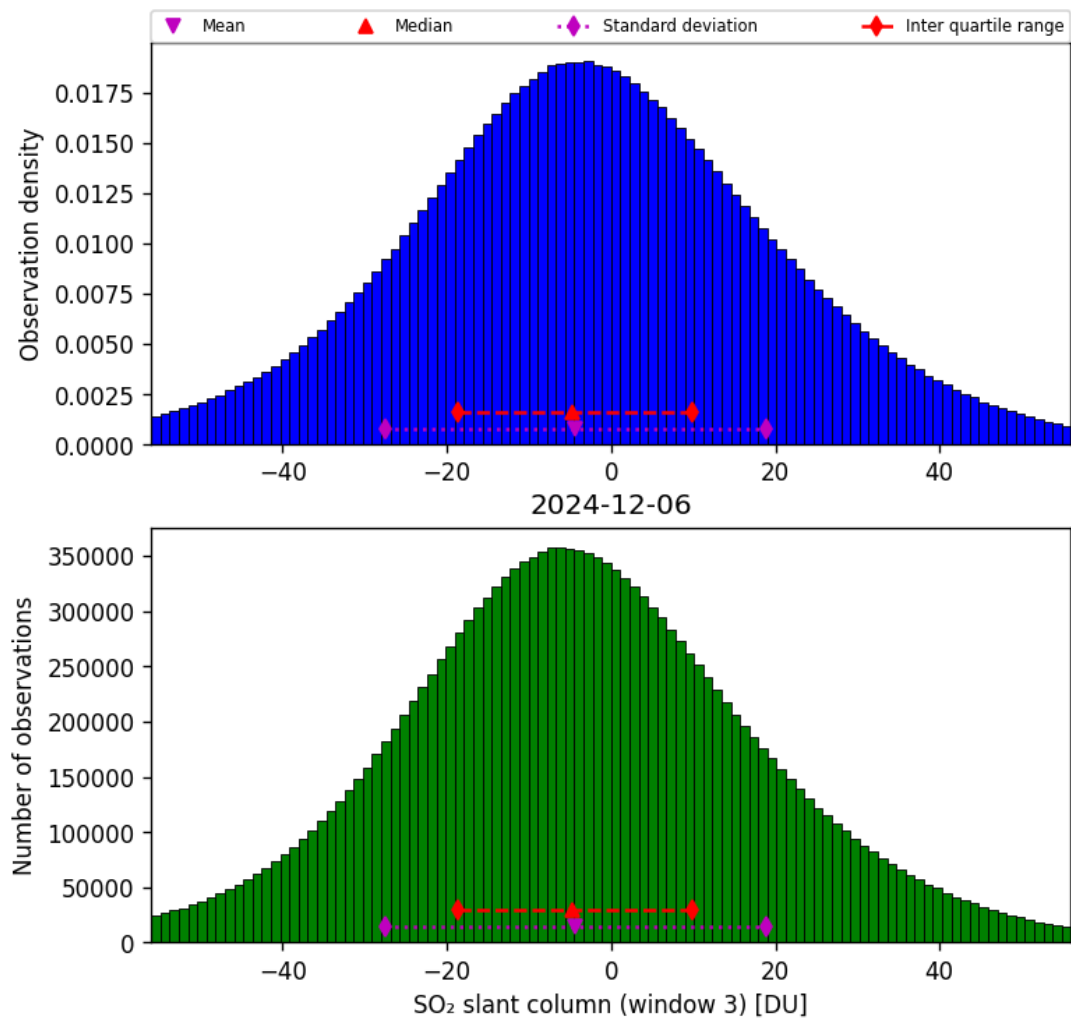


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2024-12-06 to 2024-12-07

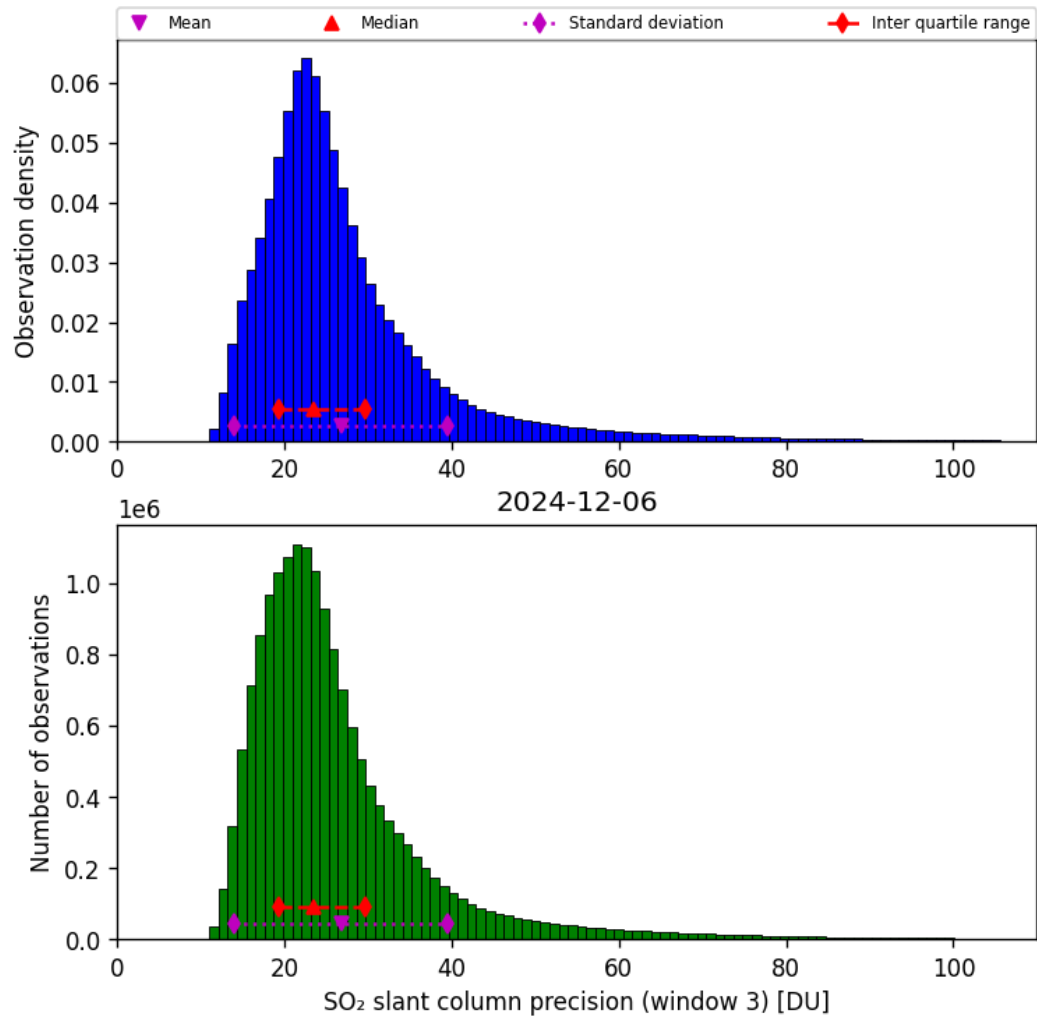


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2024-12-06 to 2024-12-07

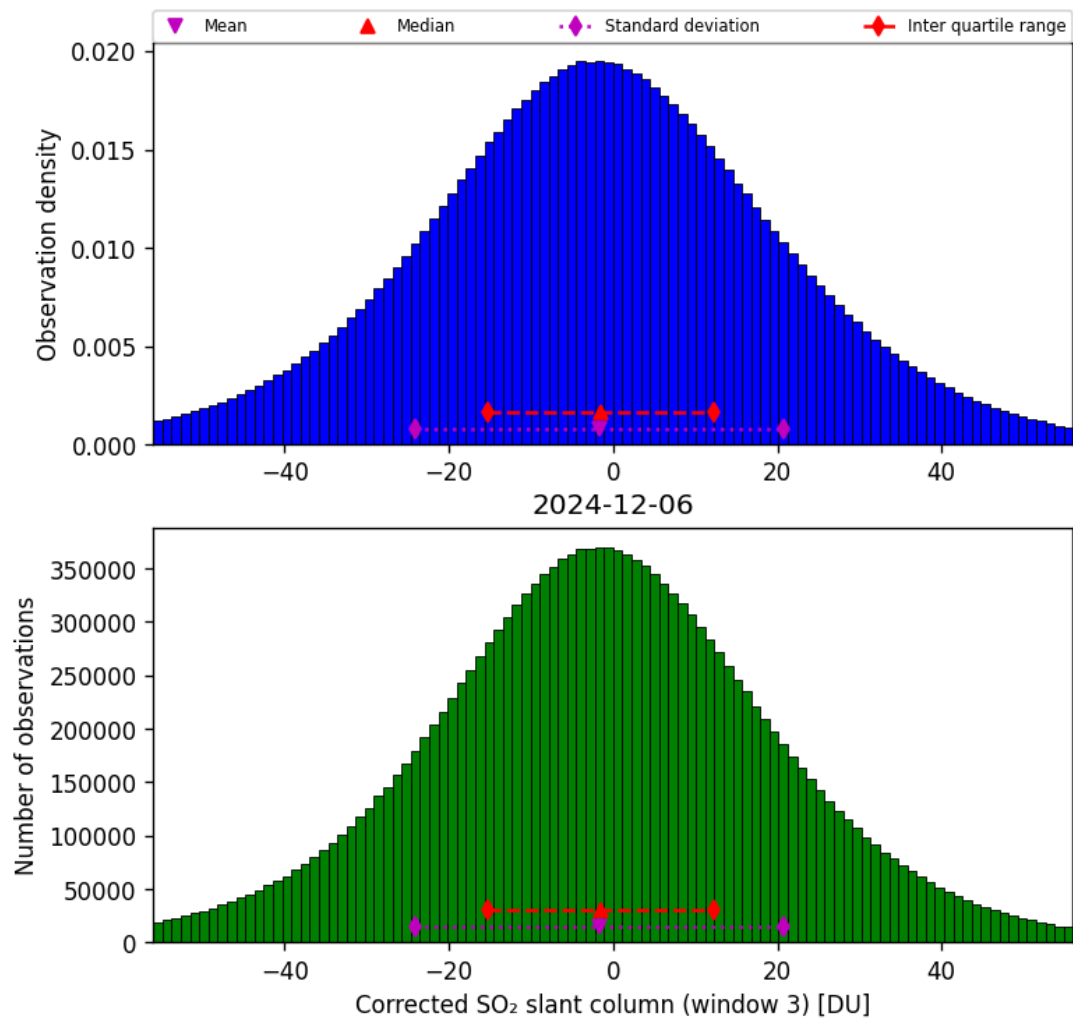


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2024-12-06 to 2024-12-07

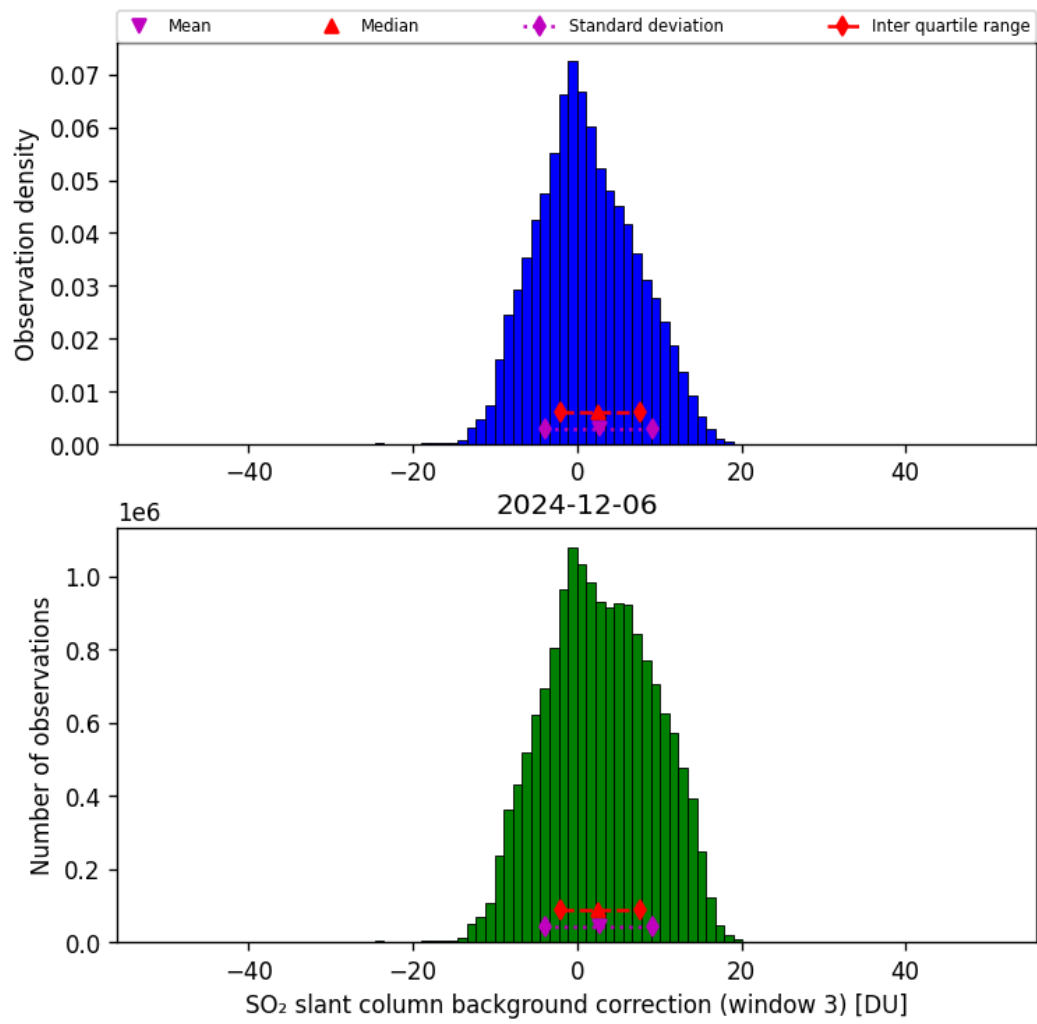


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2024-12-06 to 2024-12-07

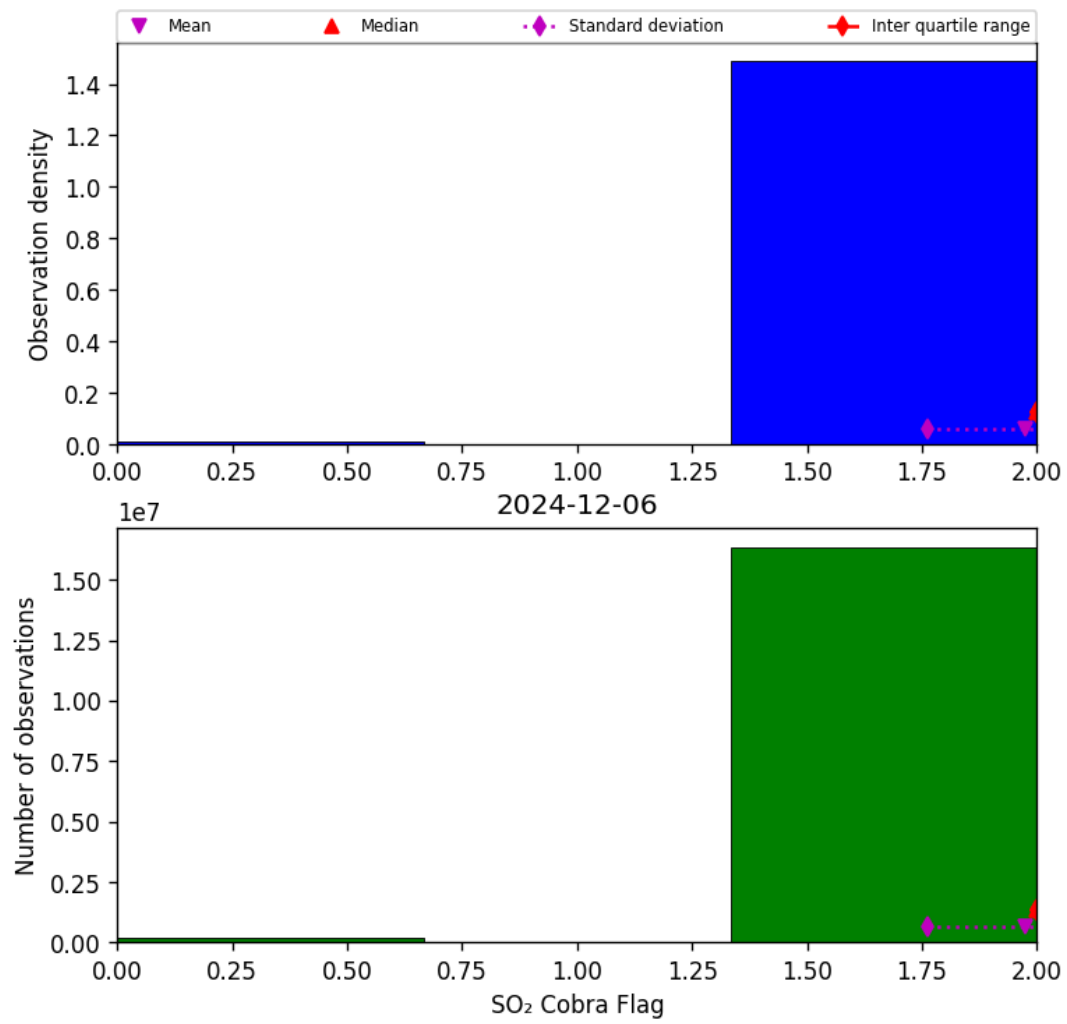


Figure 75: Histogram of “SO₂ Cobra Flag” for 2024-12-06 to 2024-12-07

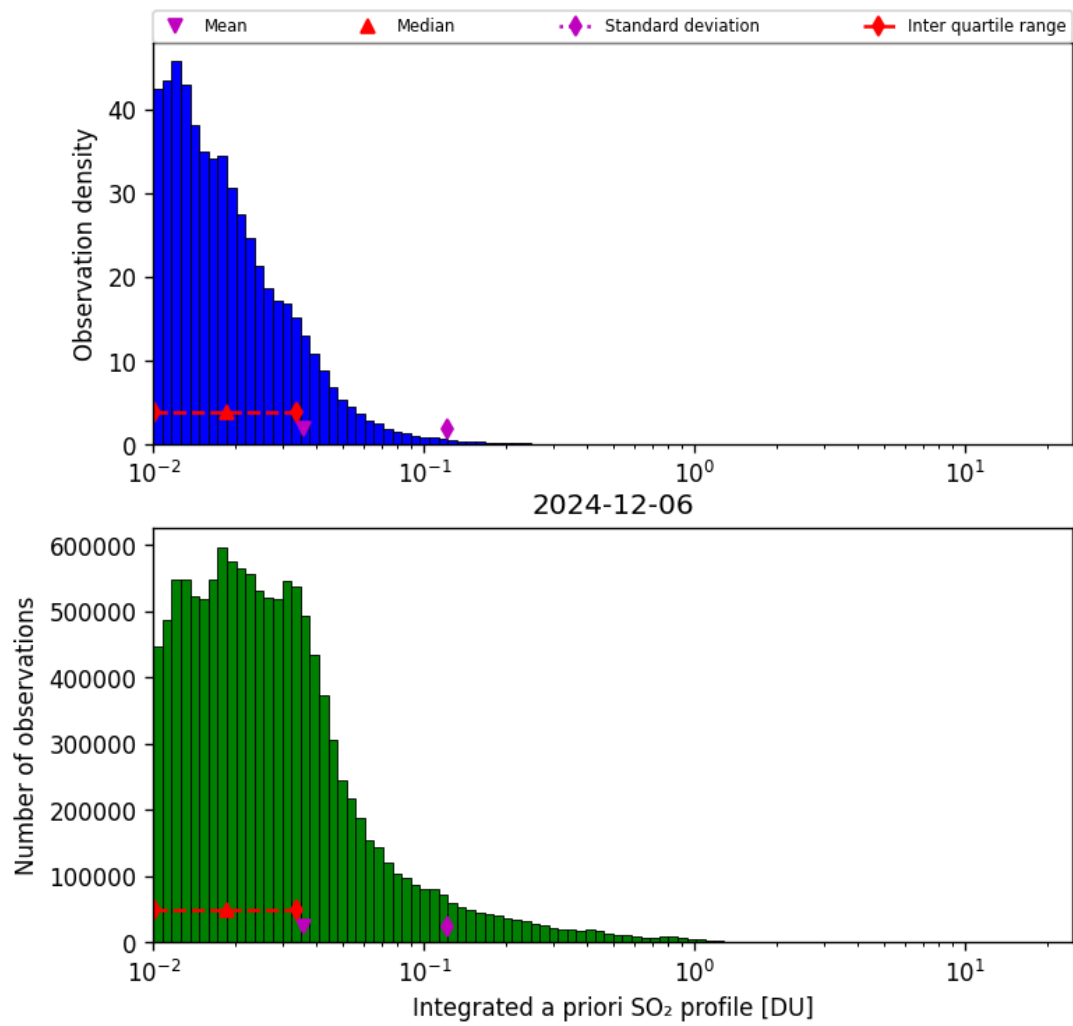


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2024-12-06 to 2024-12-07

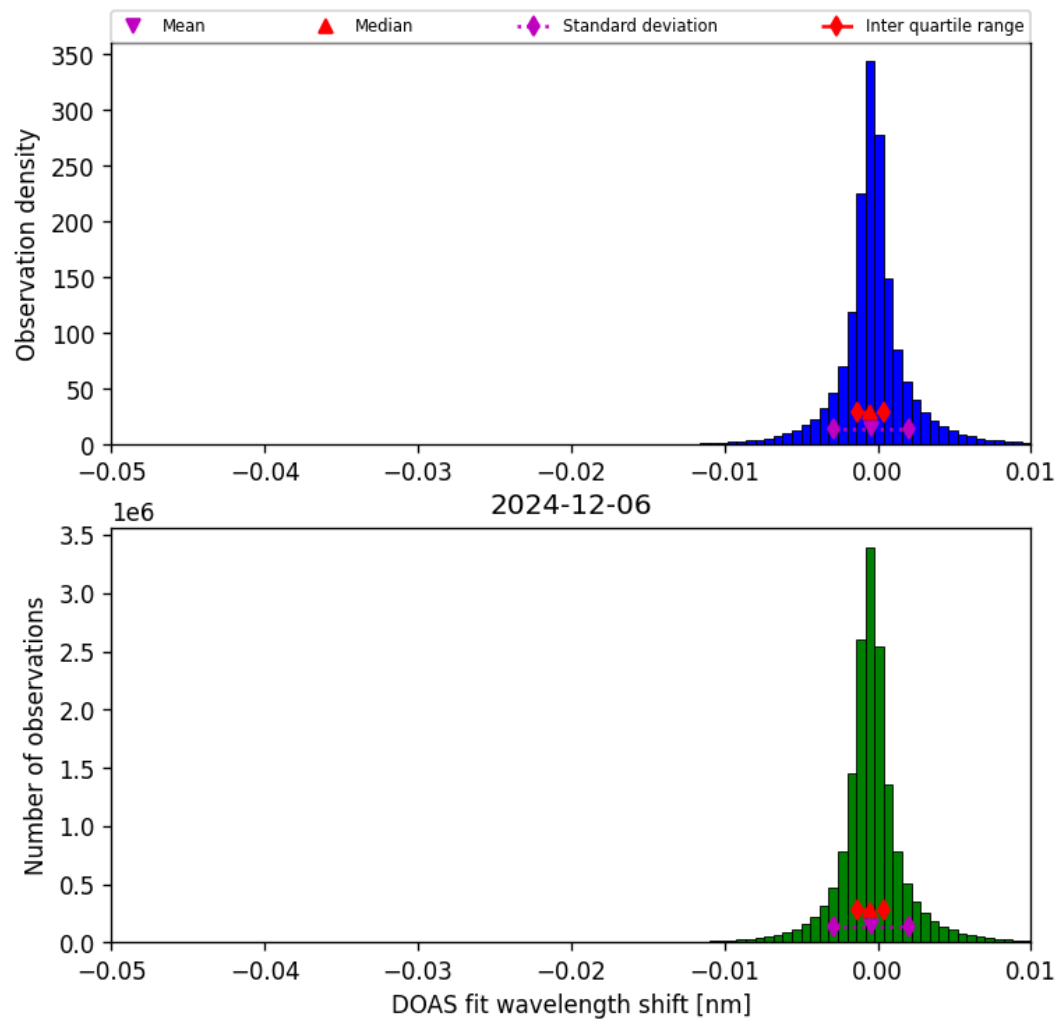


Figure 77: Histogram of “DOAS fit wavelength shift” for 2024-12-06 to 2024-12-07

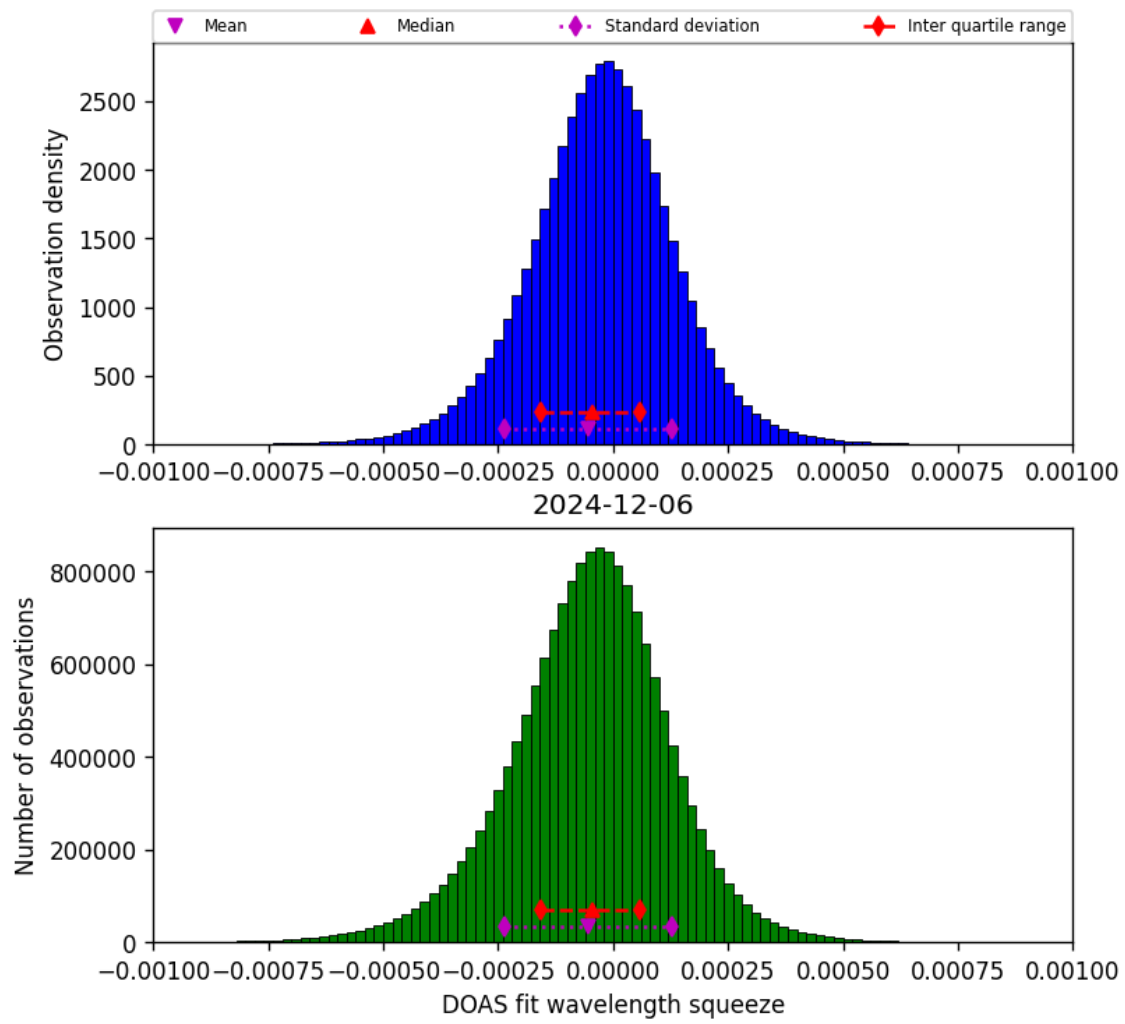


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2024-12-06 to 2024-12-07

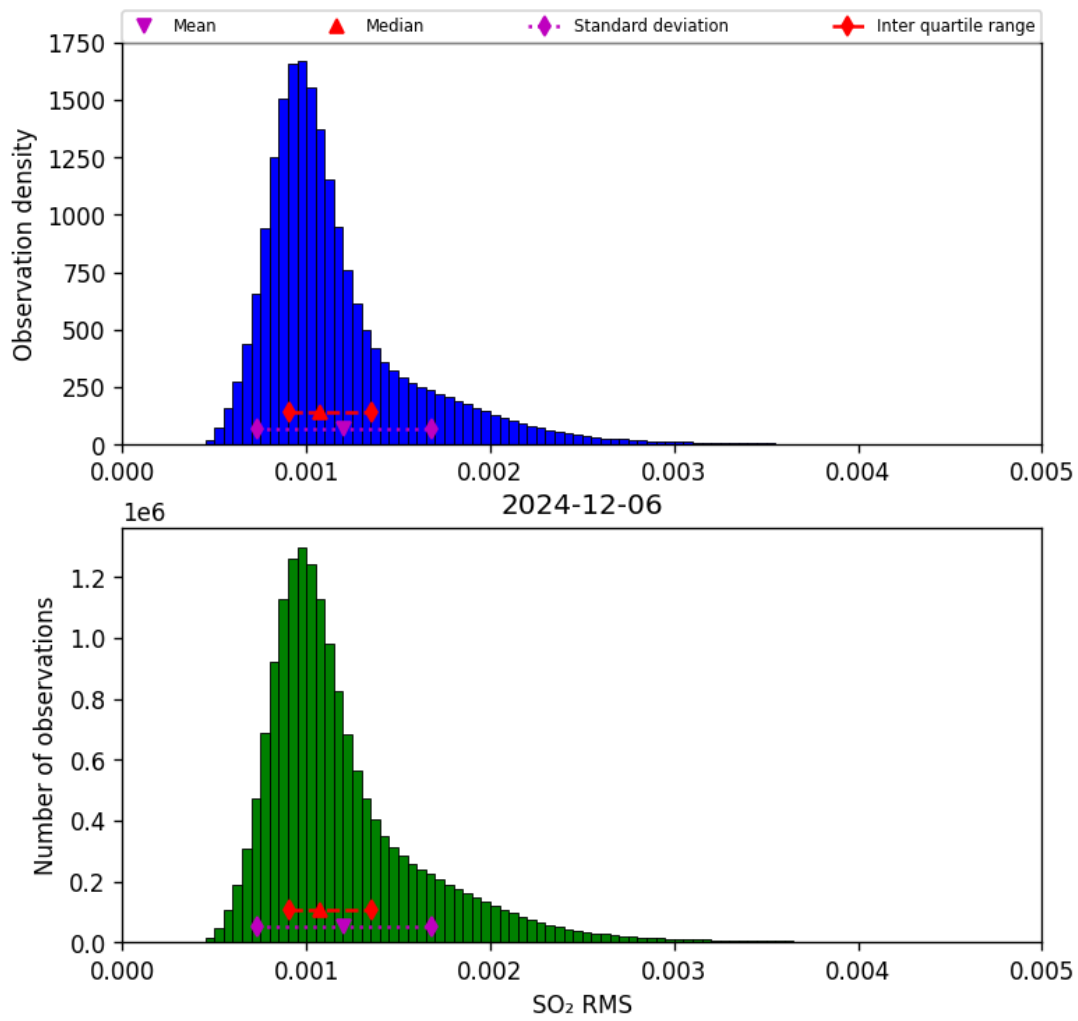


Figure 79: Histogram of “SO₂ RMS” for 2024-12-06 to 2024-12-07

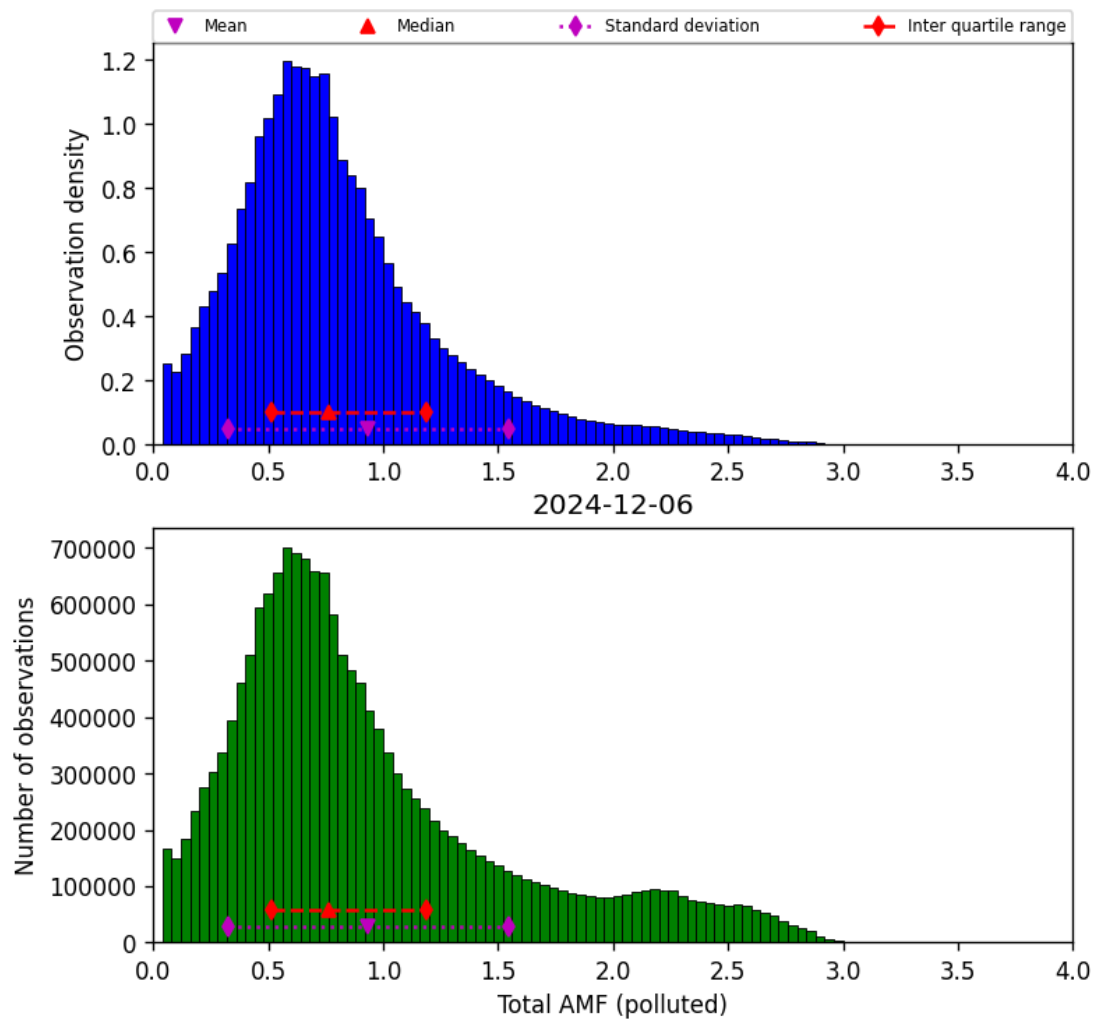


Figure 80: Histogram of “Total AMF (polluted)” for 2024-12-06 to 2024-12-07

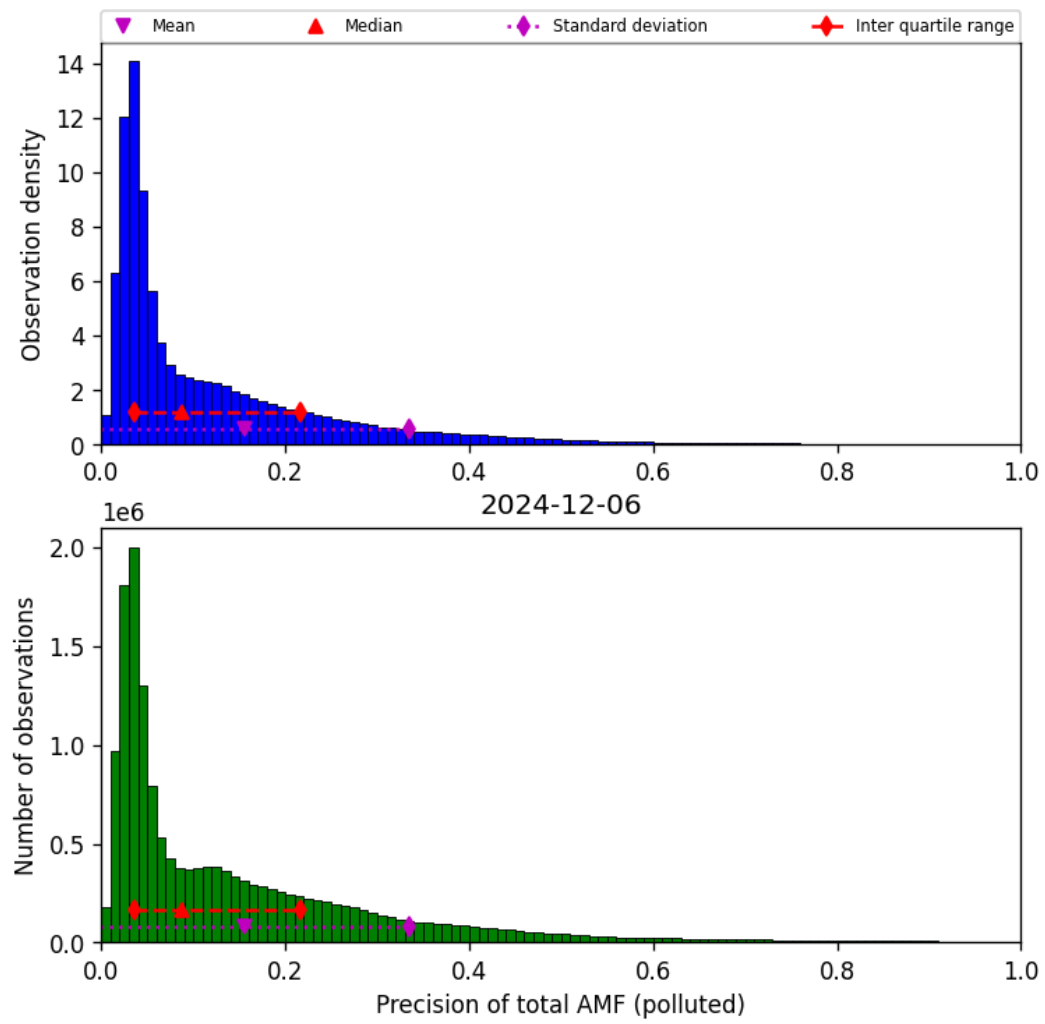


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2024-12-06 to 2024-12-07

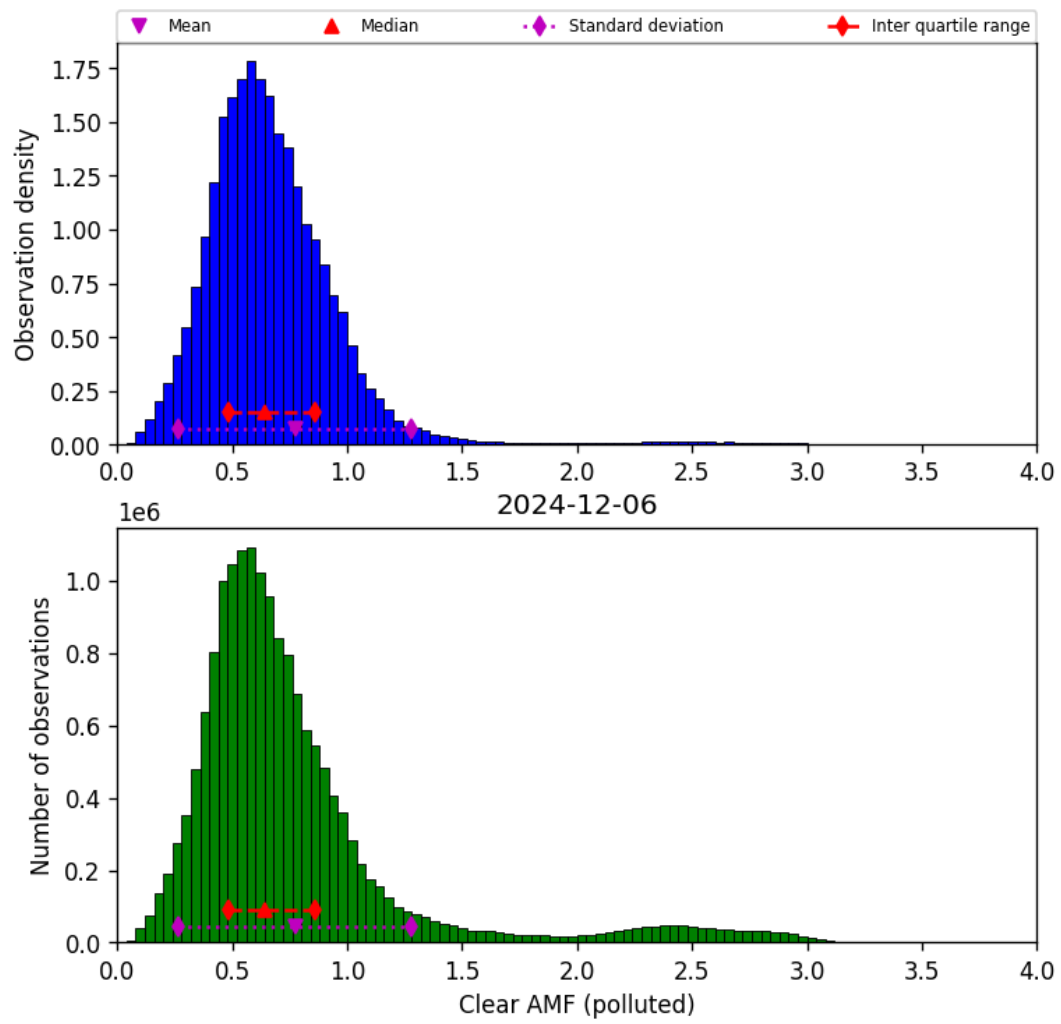


Figure 82: Histogram of "Clear AMF (polluted)" for 2024-12-06 to 2024-12-07

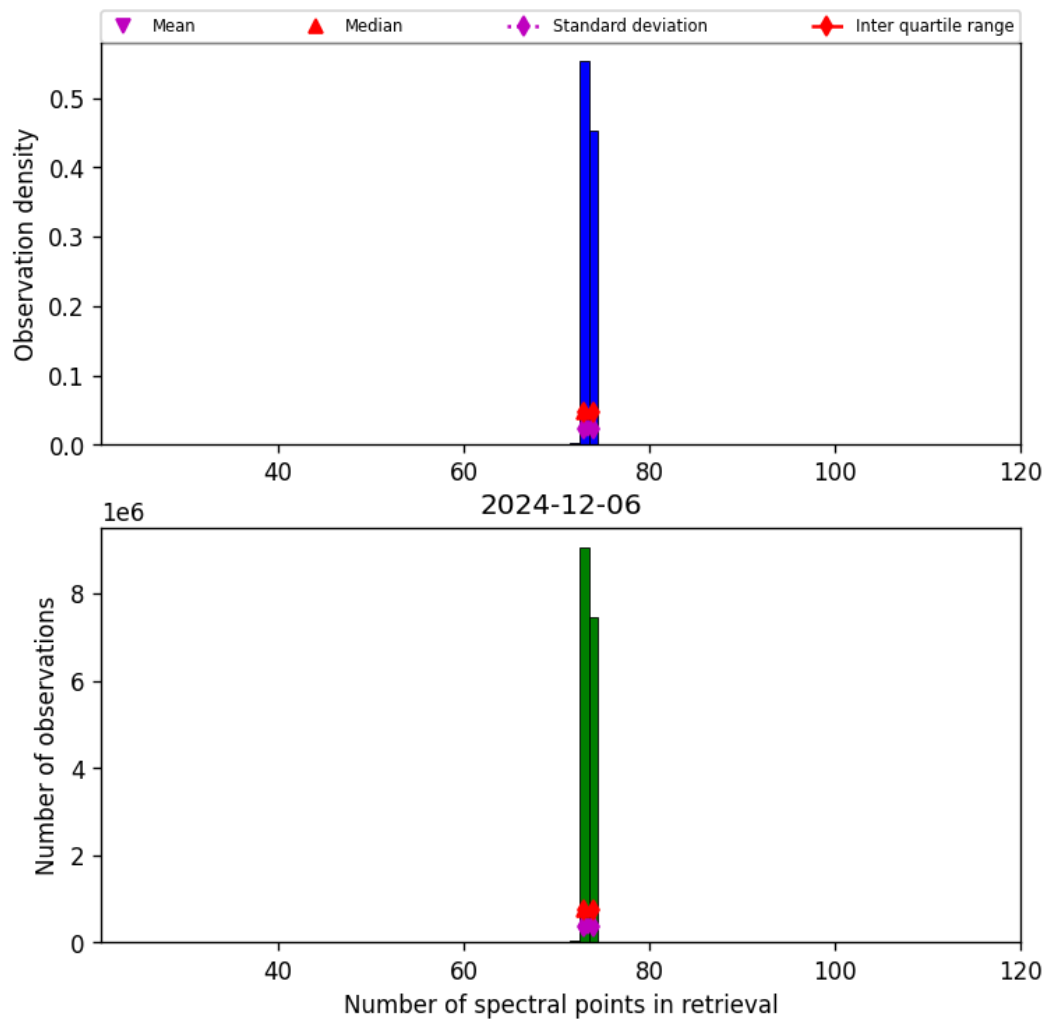


Figure 83: Histogram of “Number of spectral points in retrieval” for 2024-12-06 to 2024-12-07

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.

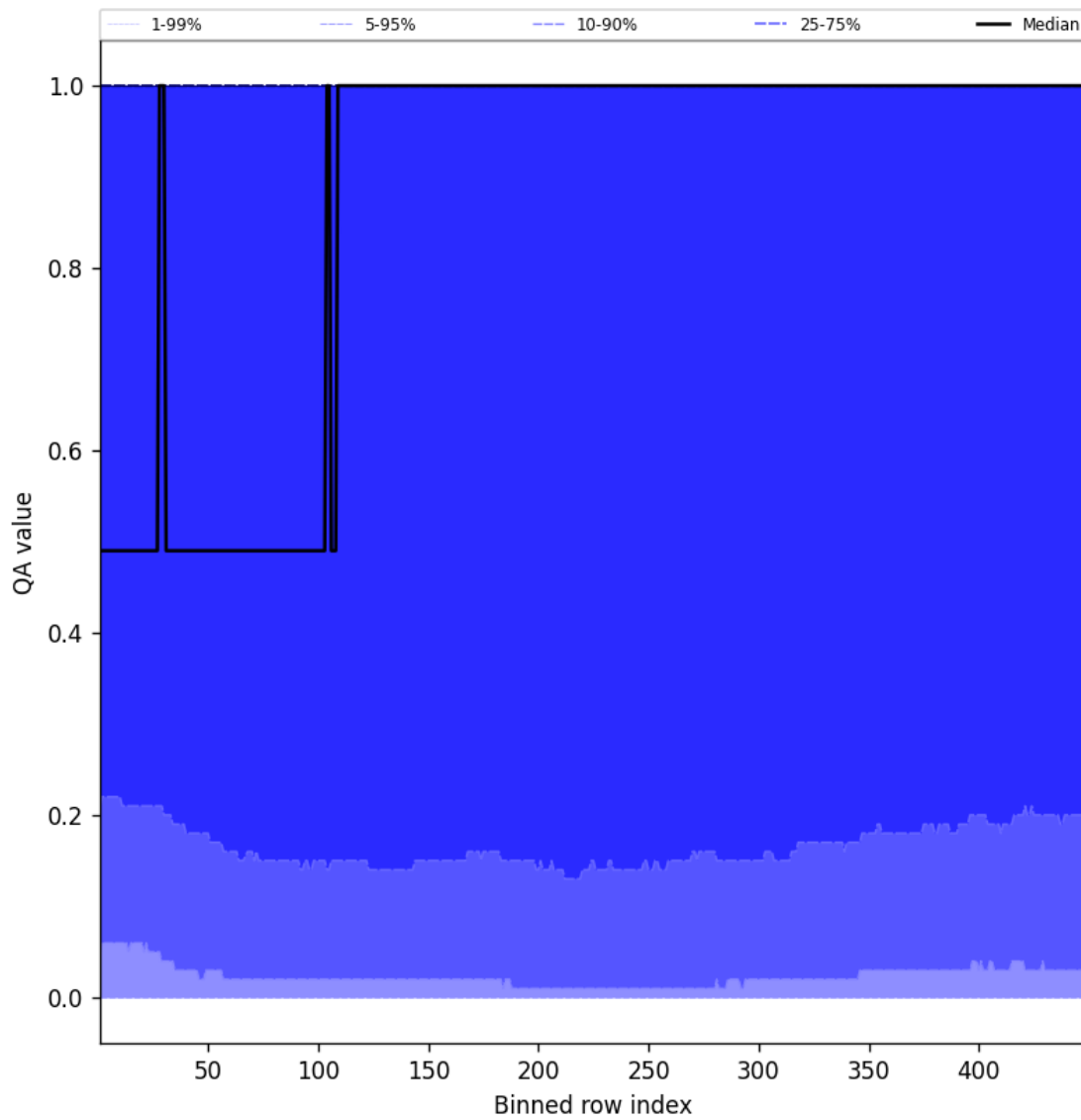


Figure 84: Along track statistics of “QA value” for 2024-12-06 to 2024-12-07

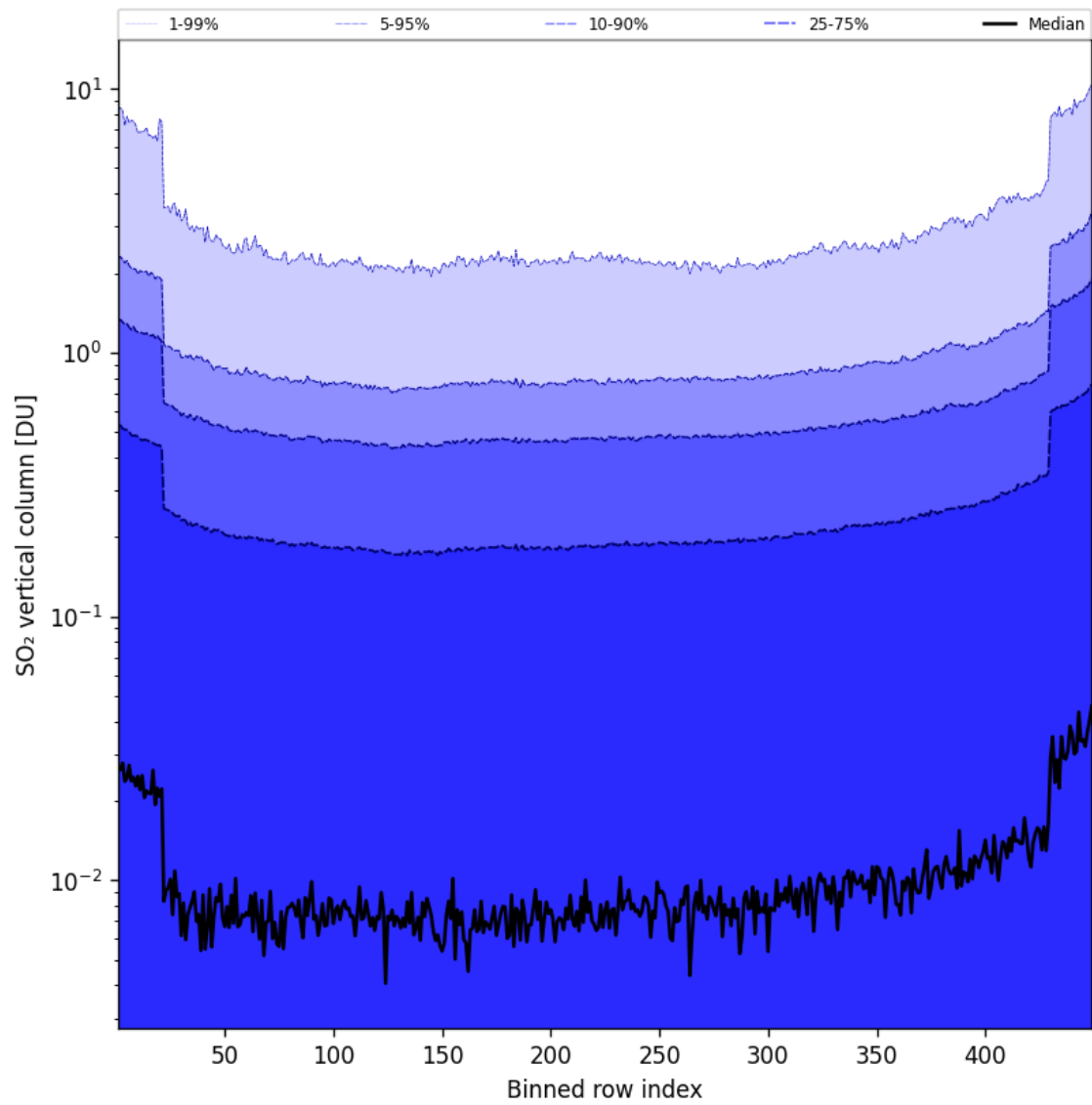


Figure 85: Along track statistics of “SO₂ vertical column” for 2024-12-06 to 2024-12-07

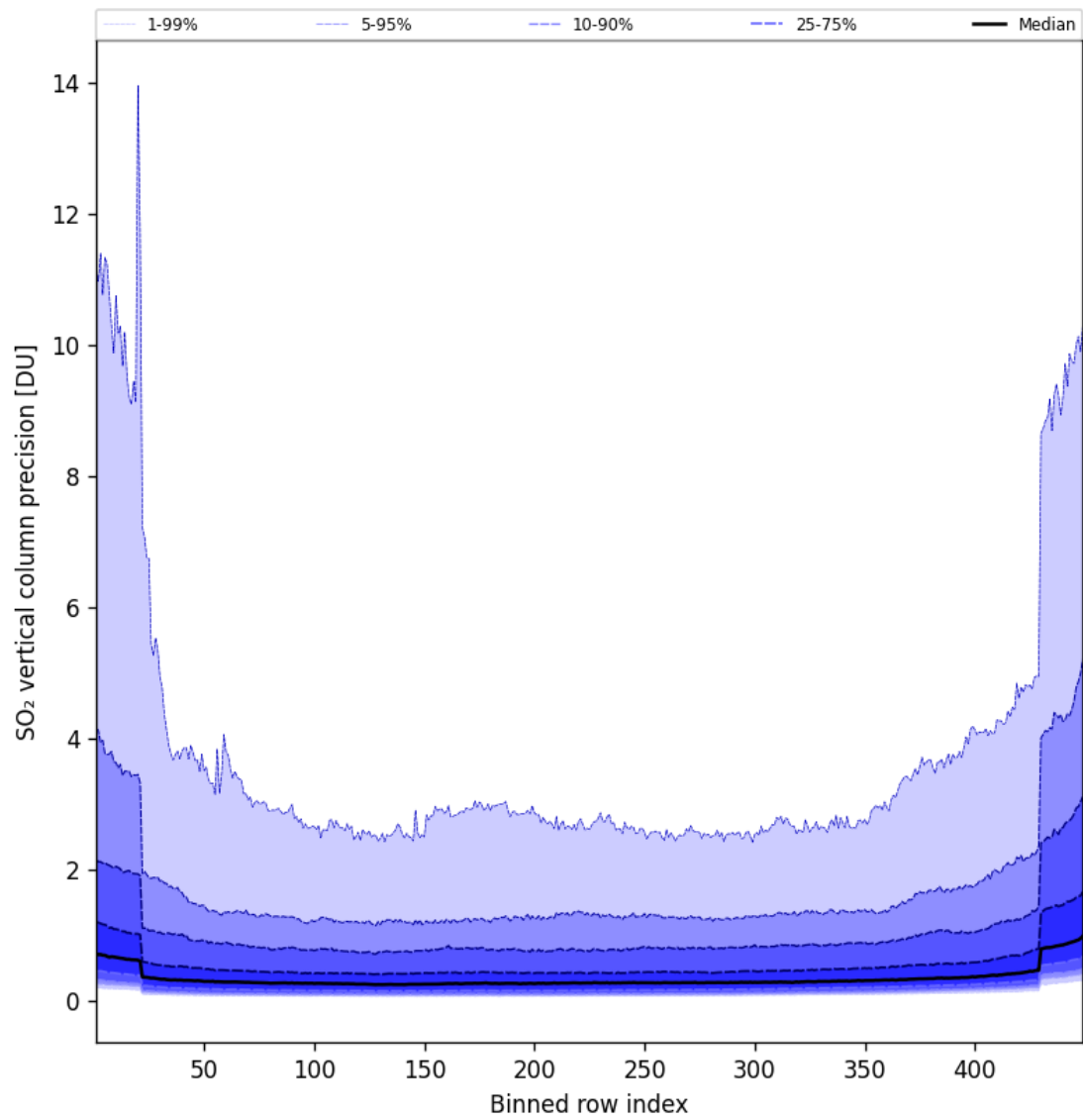


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2024-12-06 to 2024-12-07

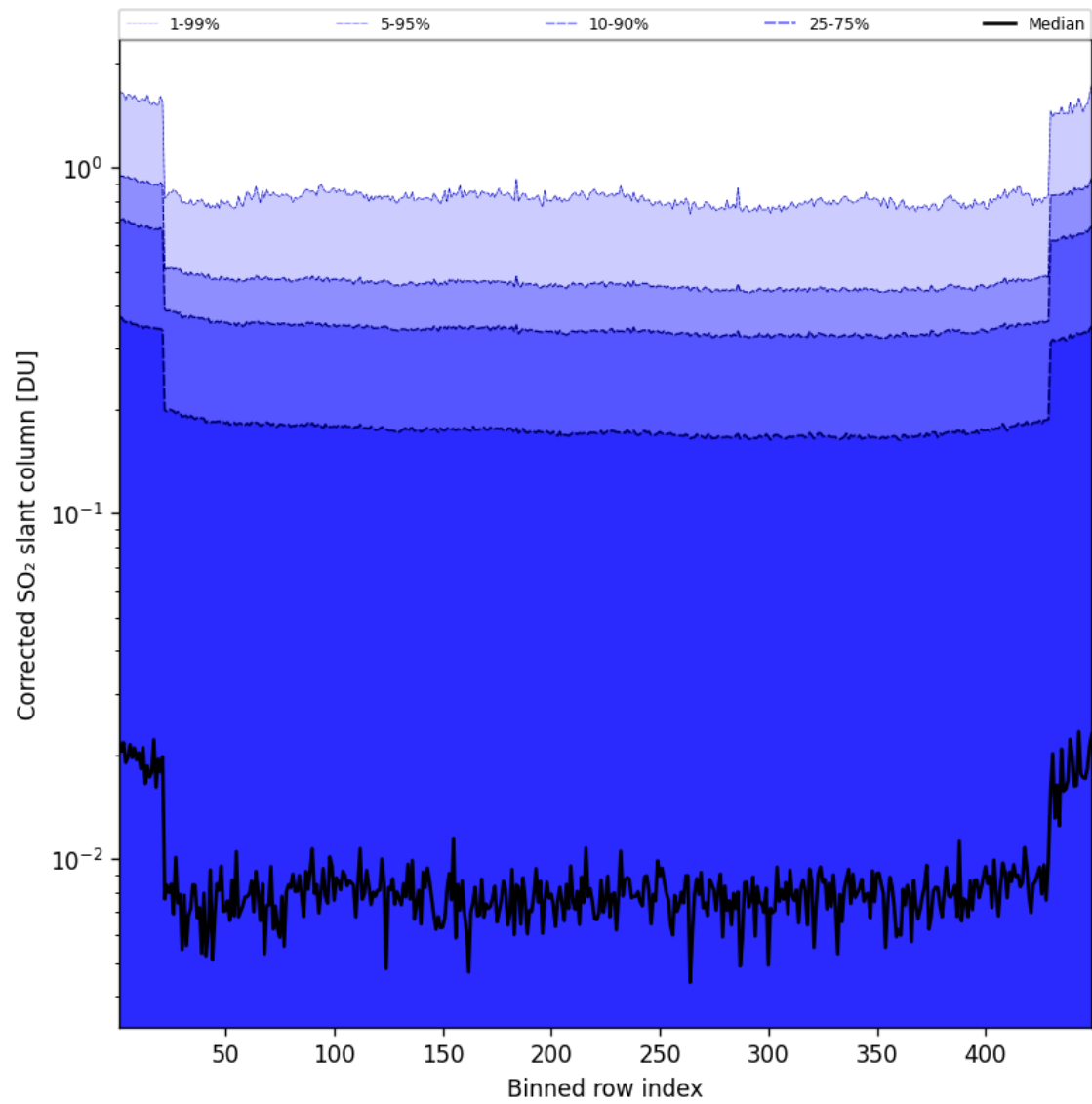


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2024-12-06 to 2024-12-07

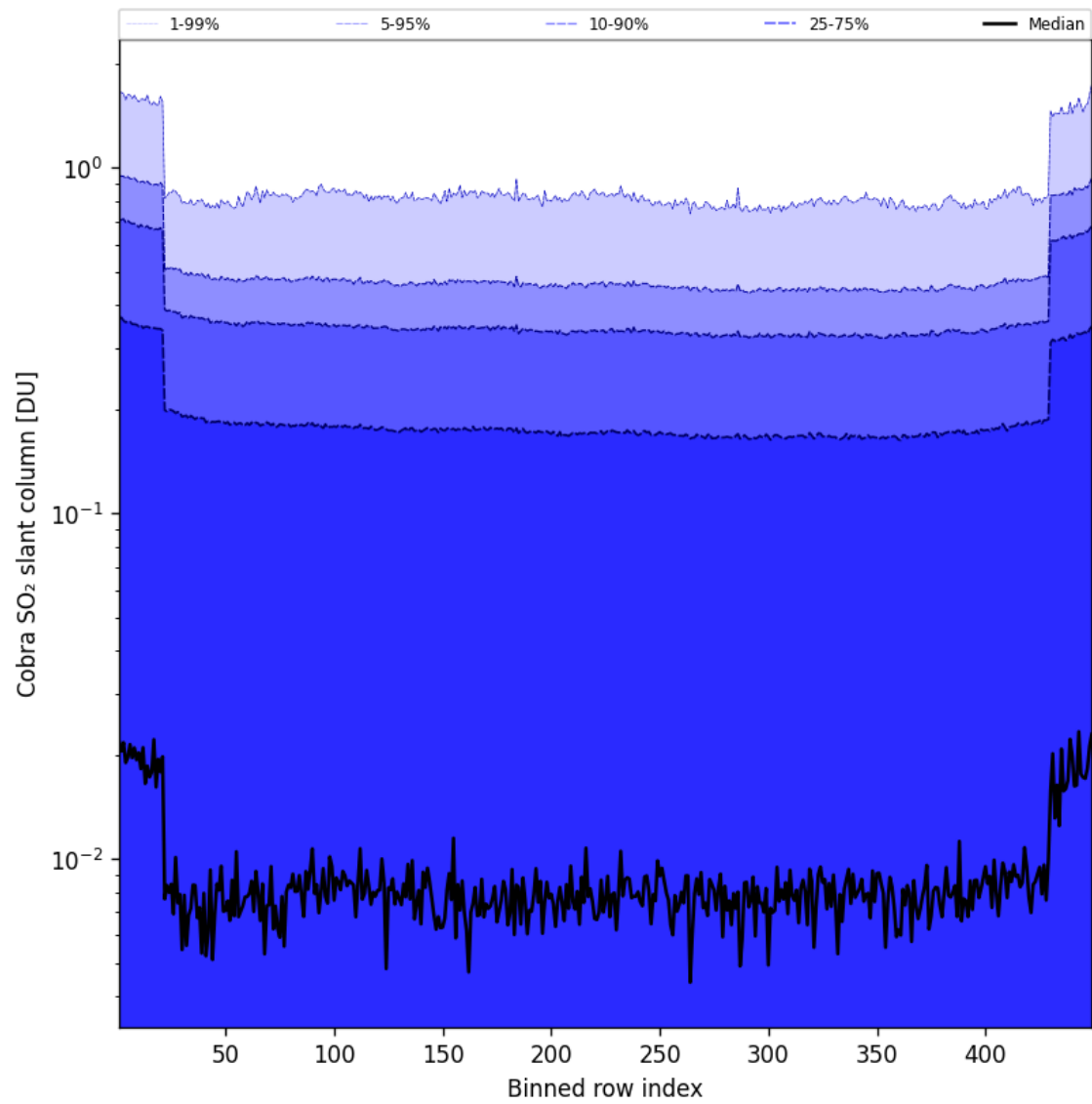


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2024-12-06 to 2024-12-07

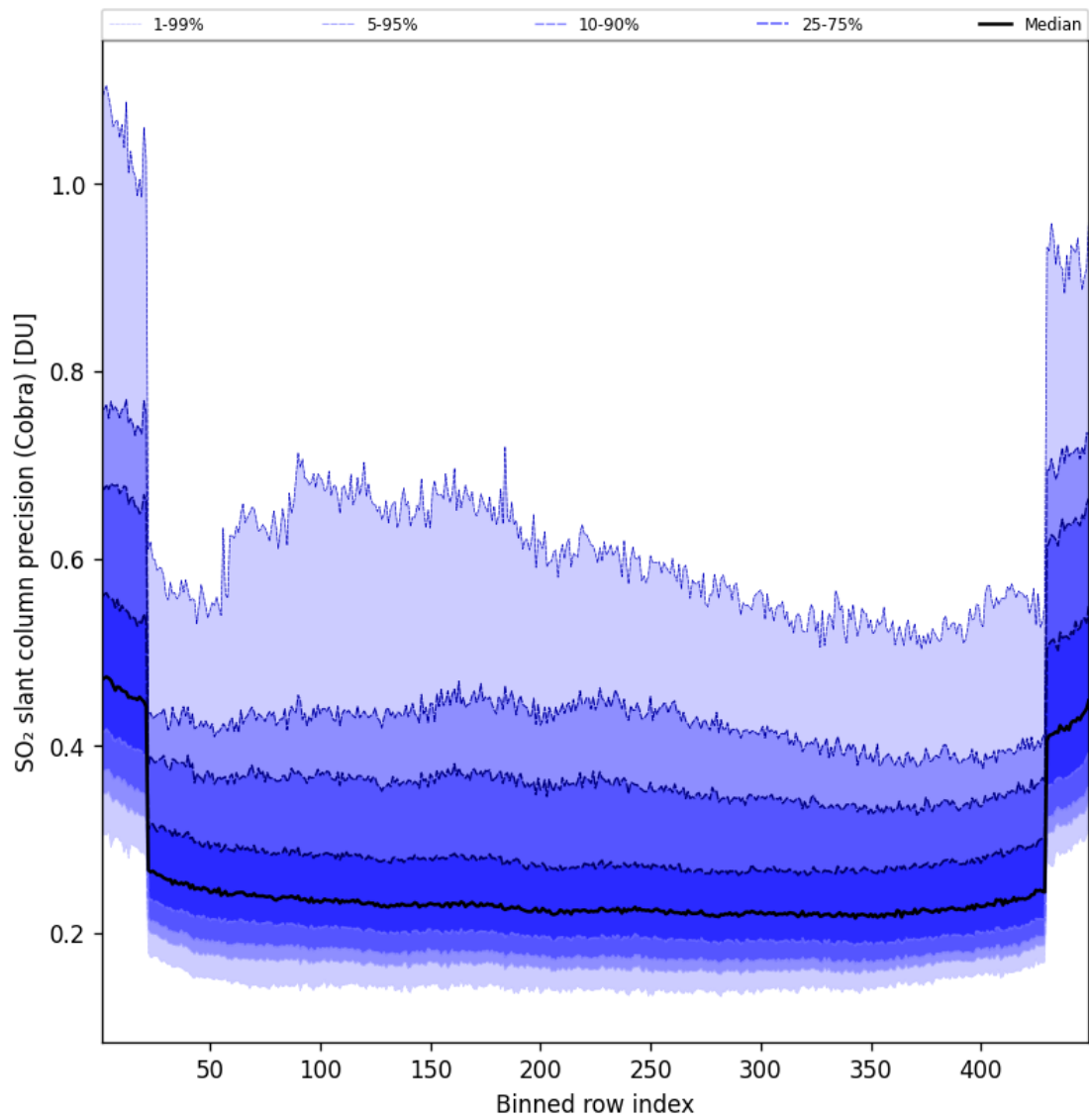


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2024-12-06 to 2024-12-07

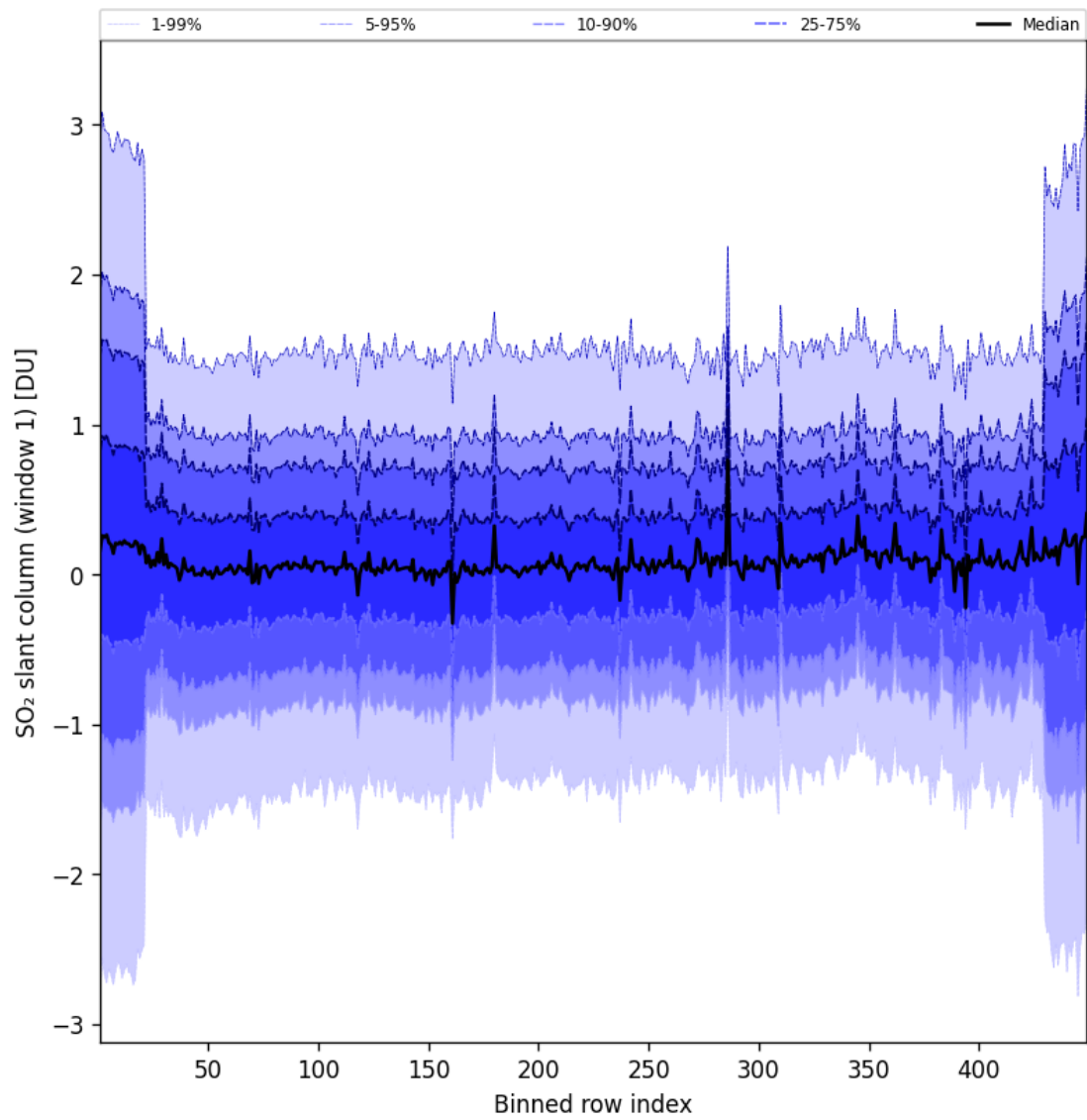


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2024-12-06 to 2024-12-07

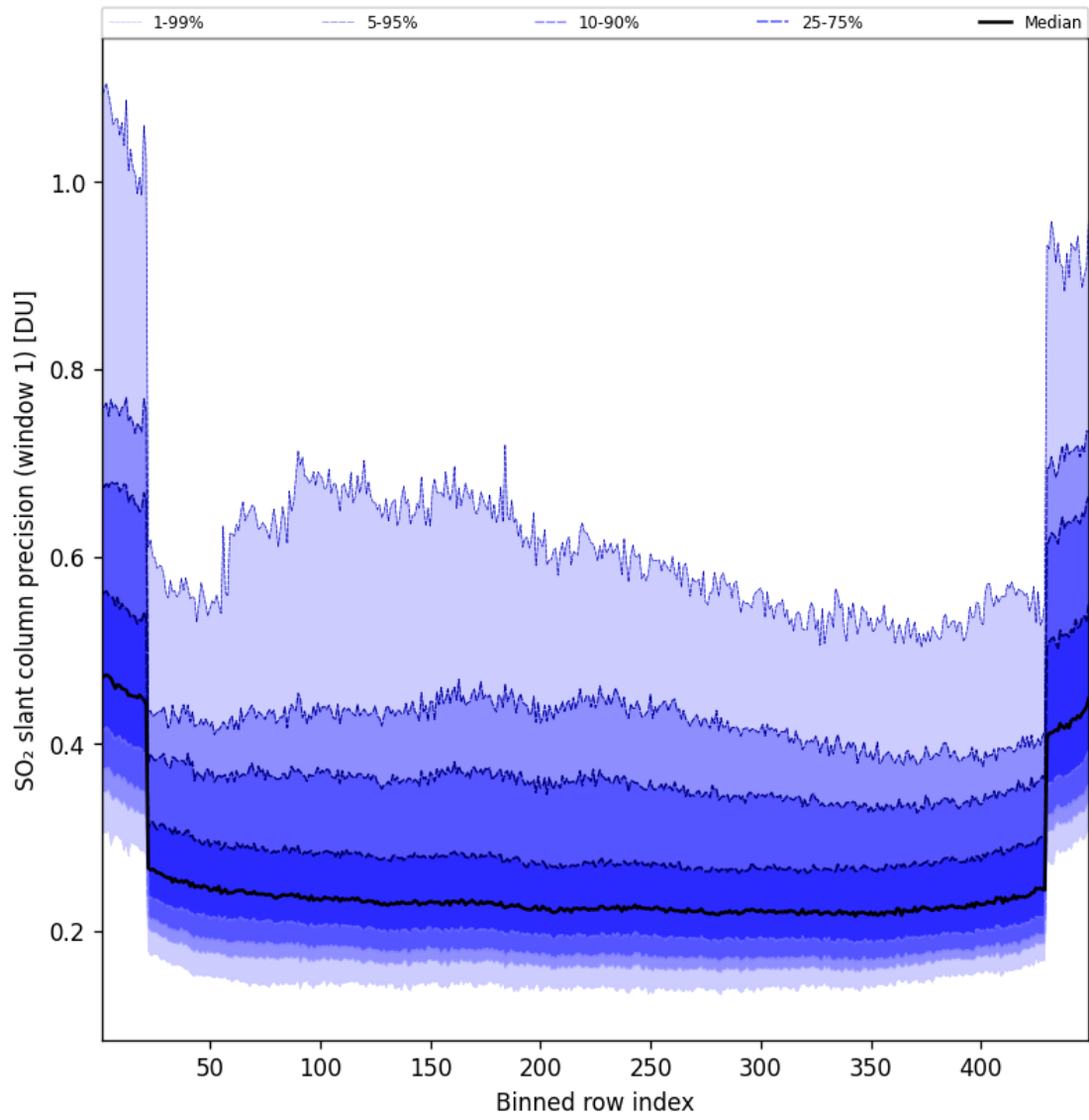


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2024-12-06 to 2024-12-07

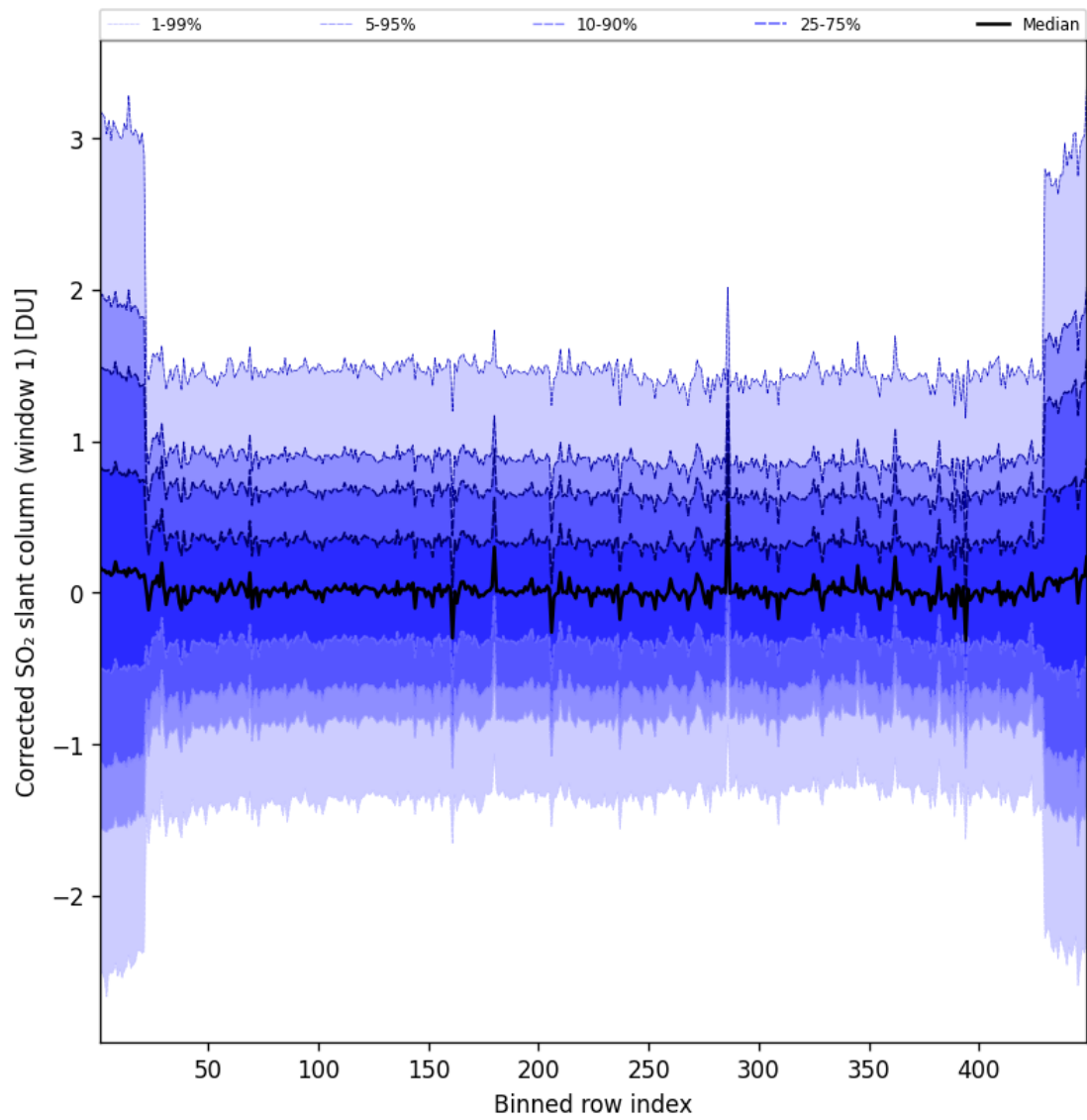


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2024-12-06 to 2024-12-07

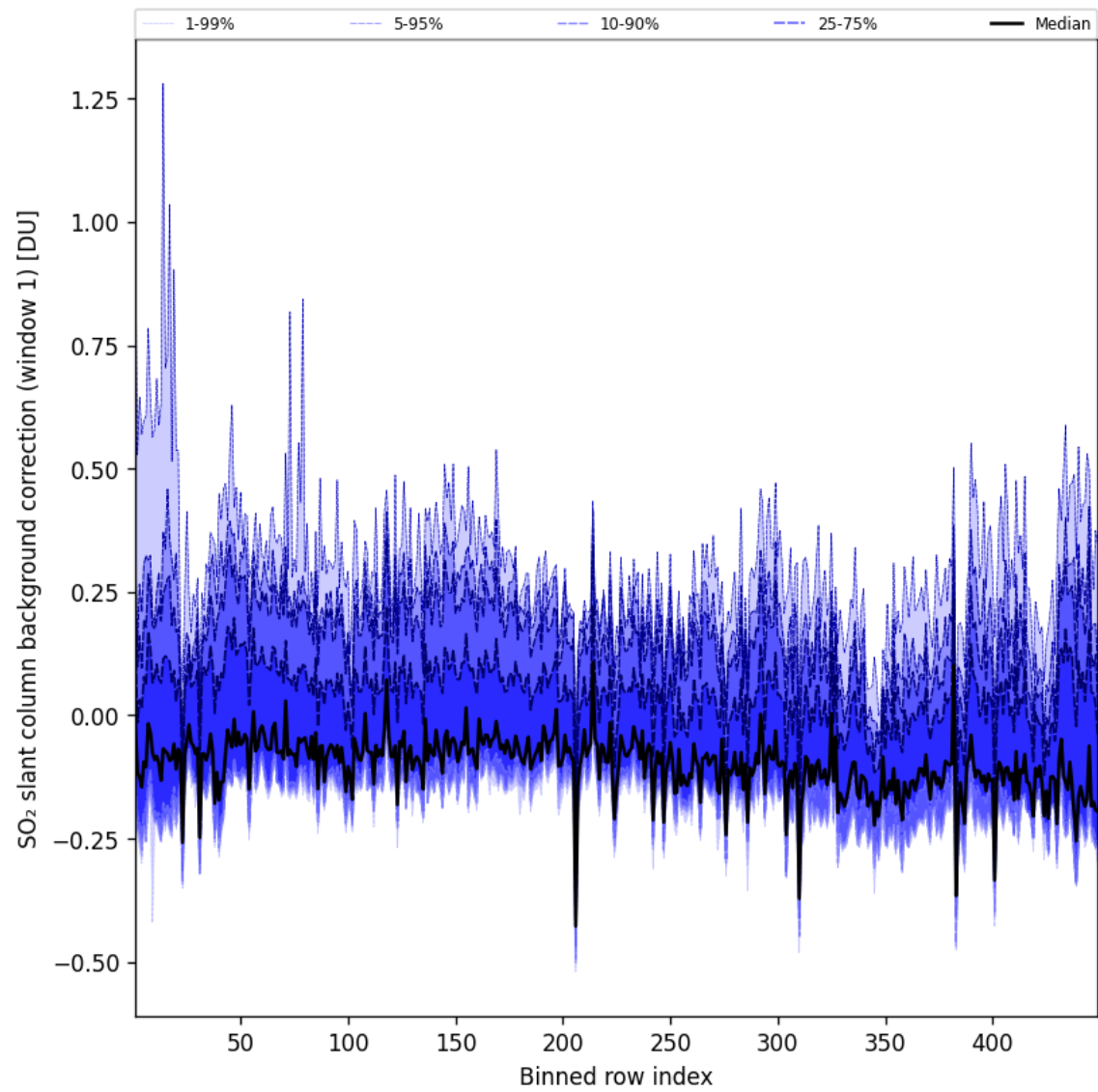


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2024-12-06 to 2024-12-07

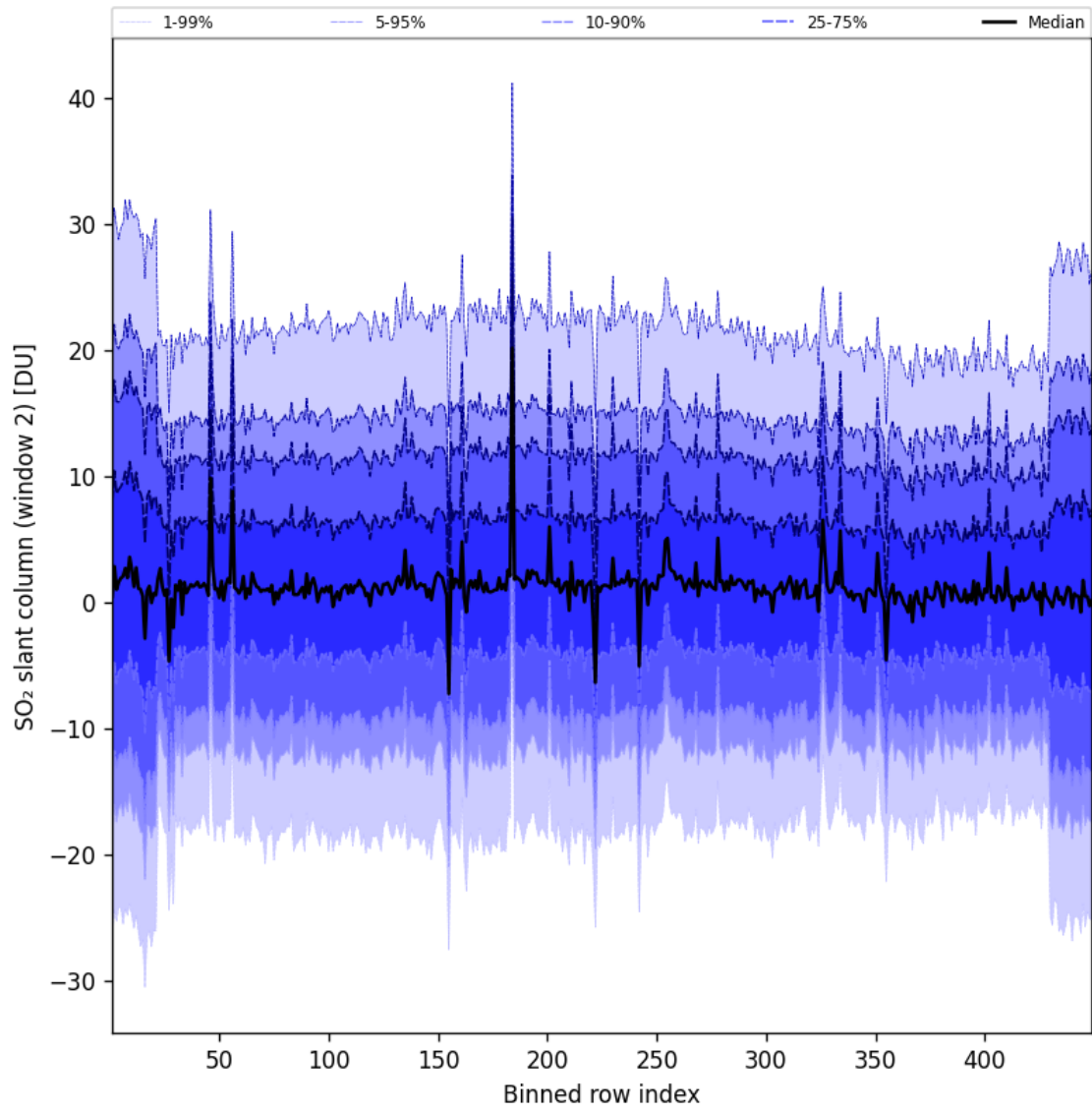


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2024-12-06 to 2024-12-07

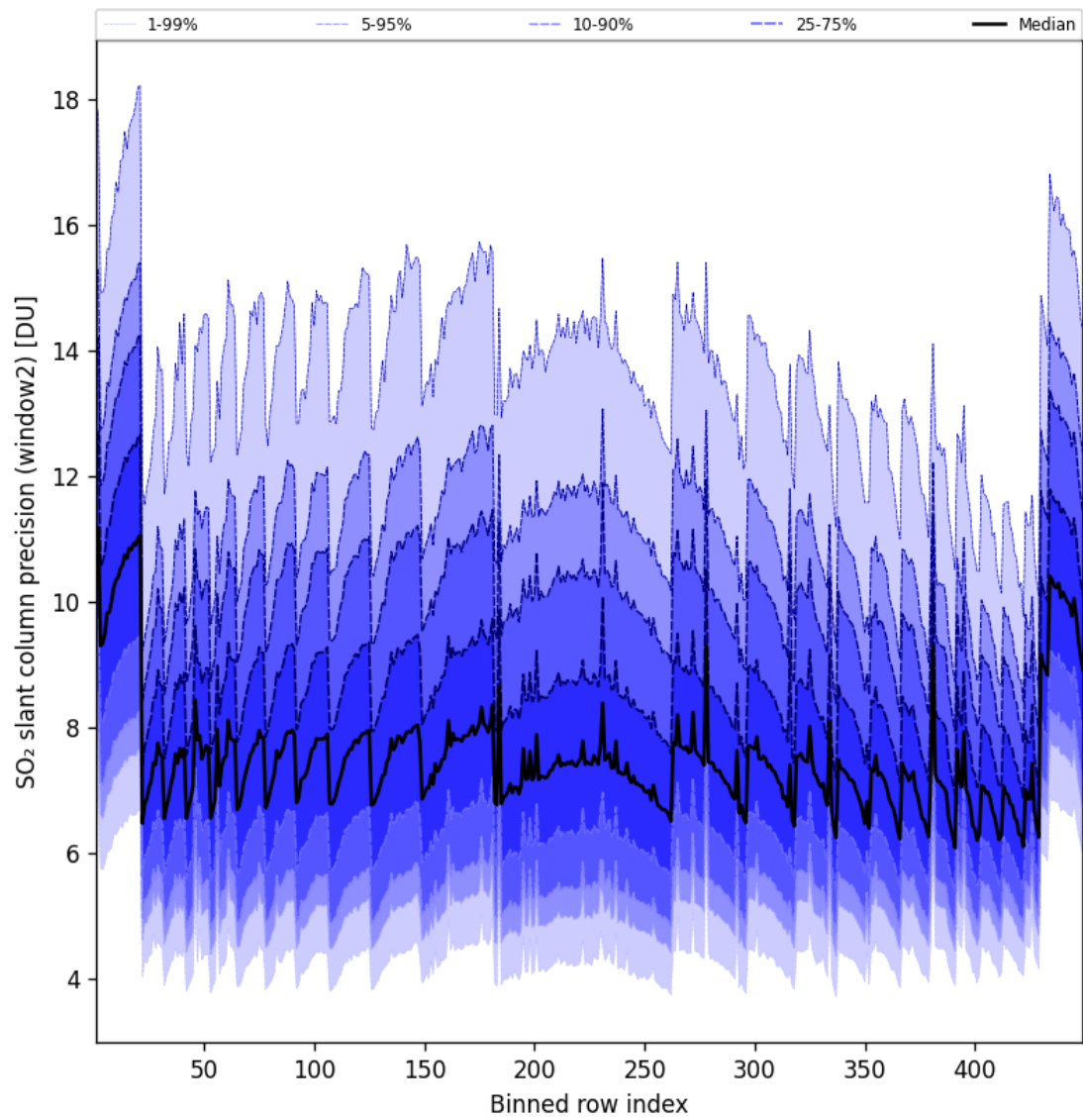


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2024-12-06 to 2024-12-07

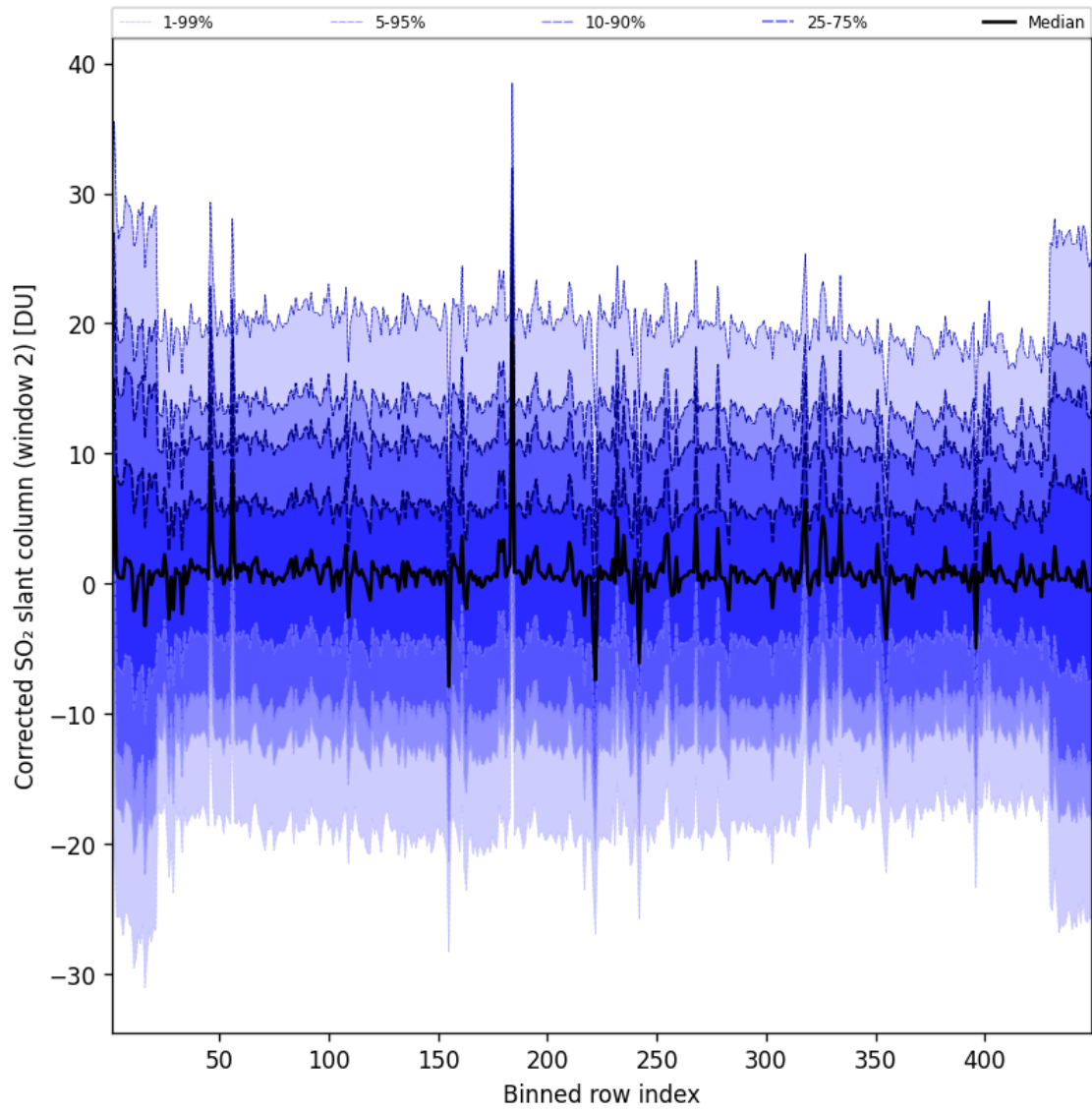


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2024-12-06 to 2024-12-07

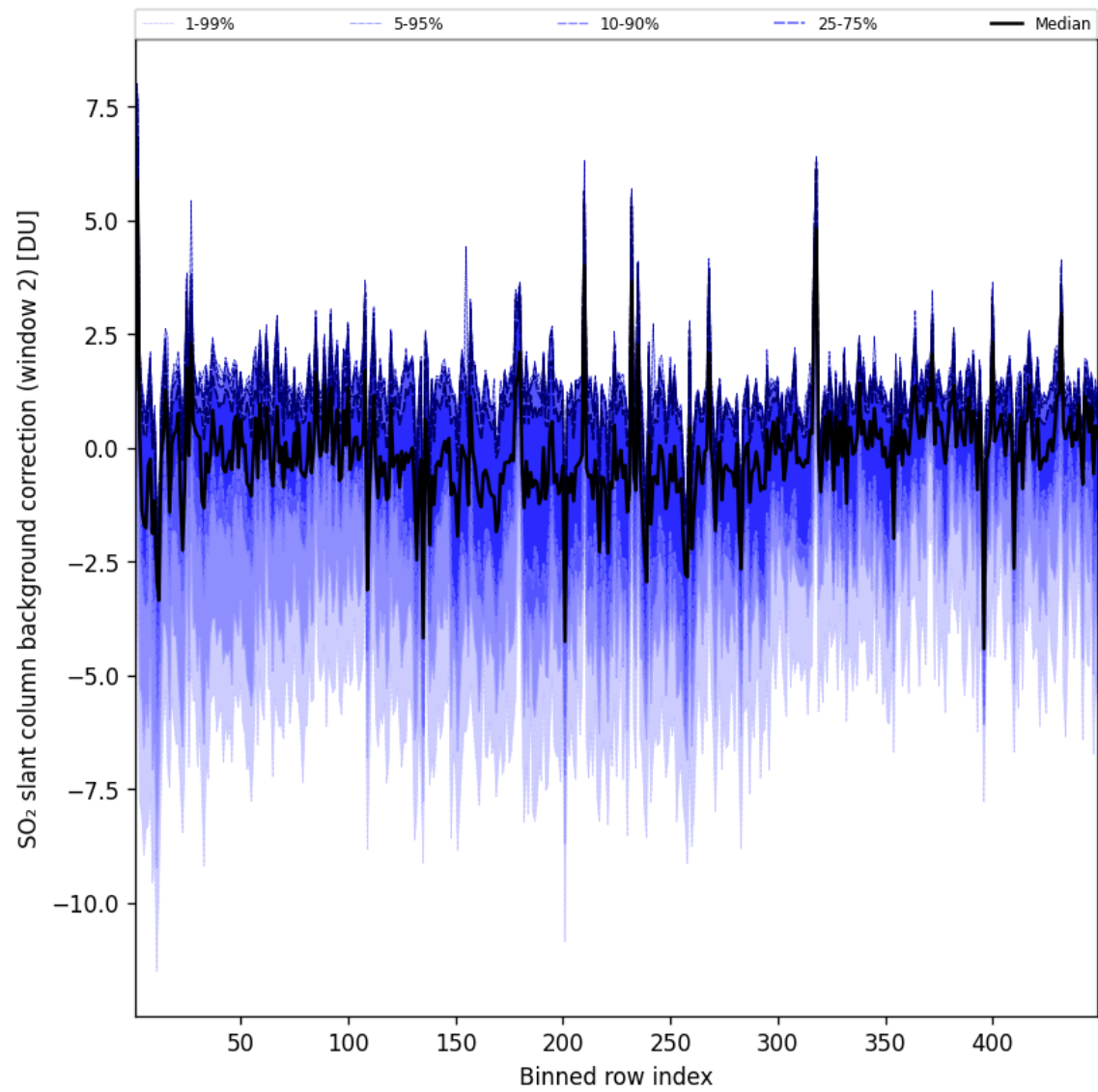


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2024-12-06 to 2024-12-07

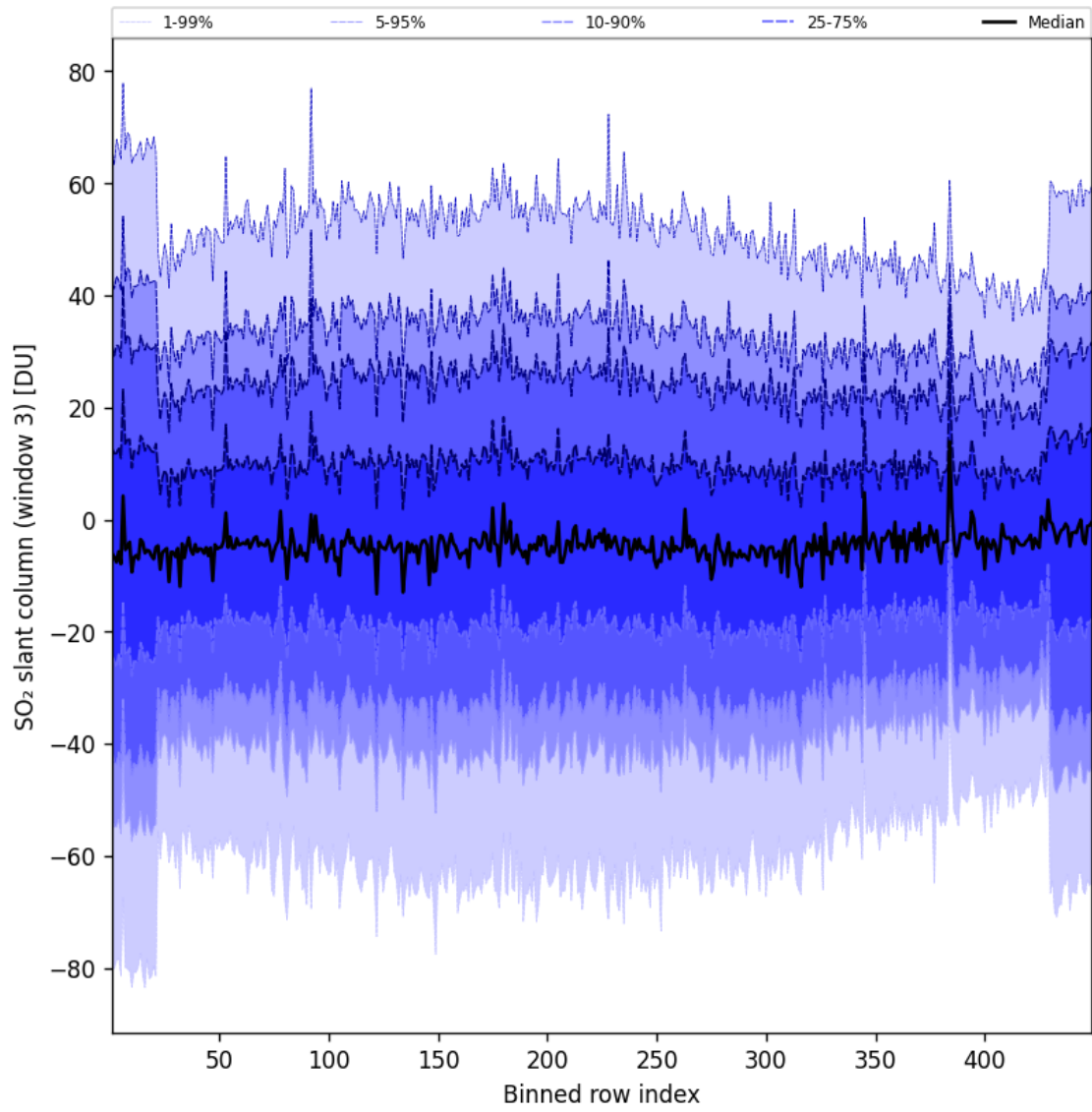


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2024-12-06 to 2024-12-07

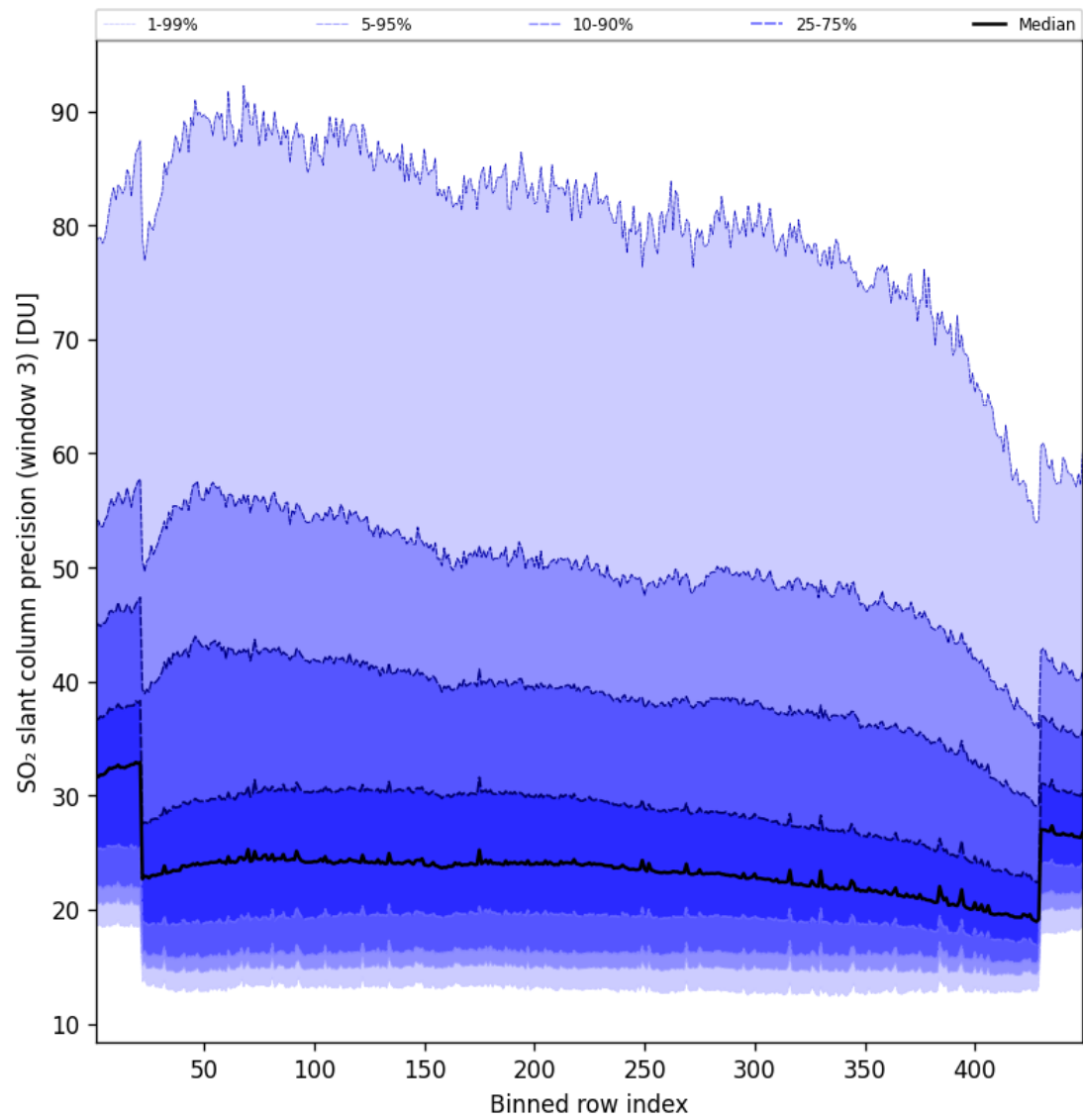


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2024-12-06 to 2024-12-07

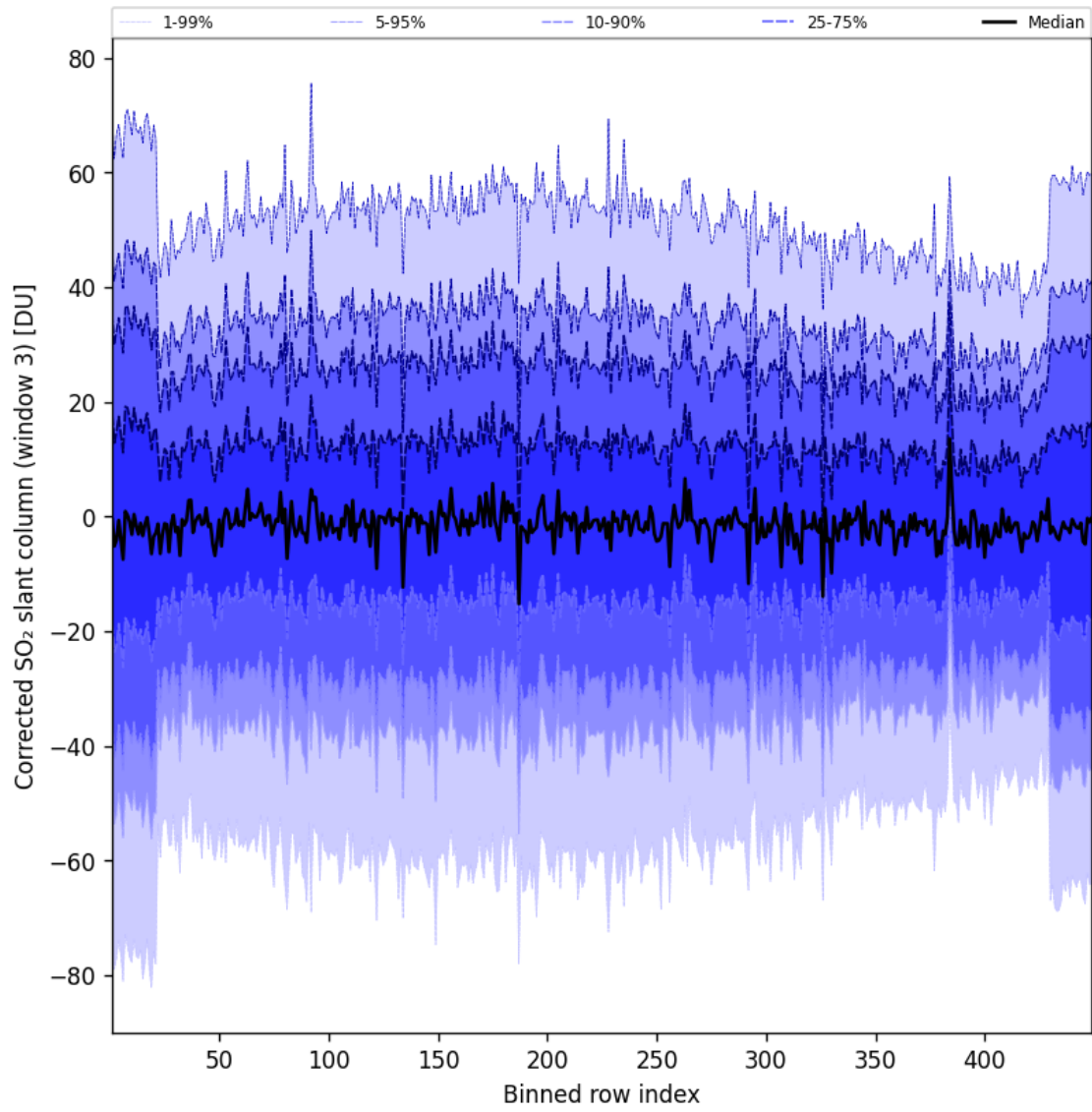


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2024-12-06 to 2024-12-07

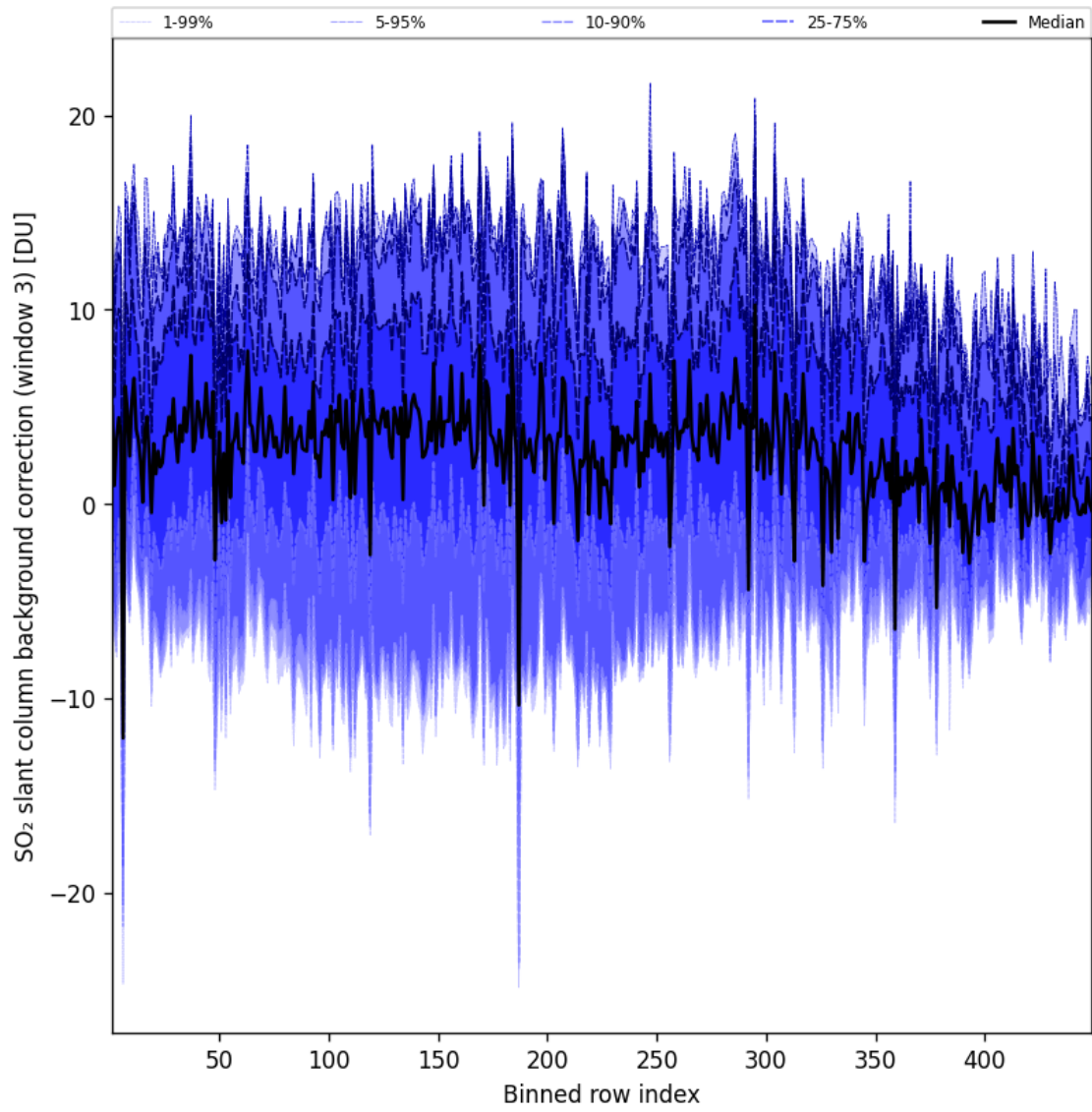


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2024-12-06 to 2024-12-07

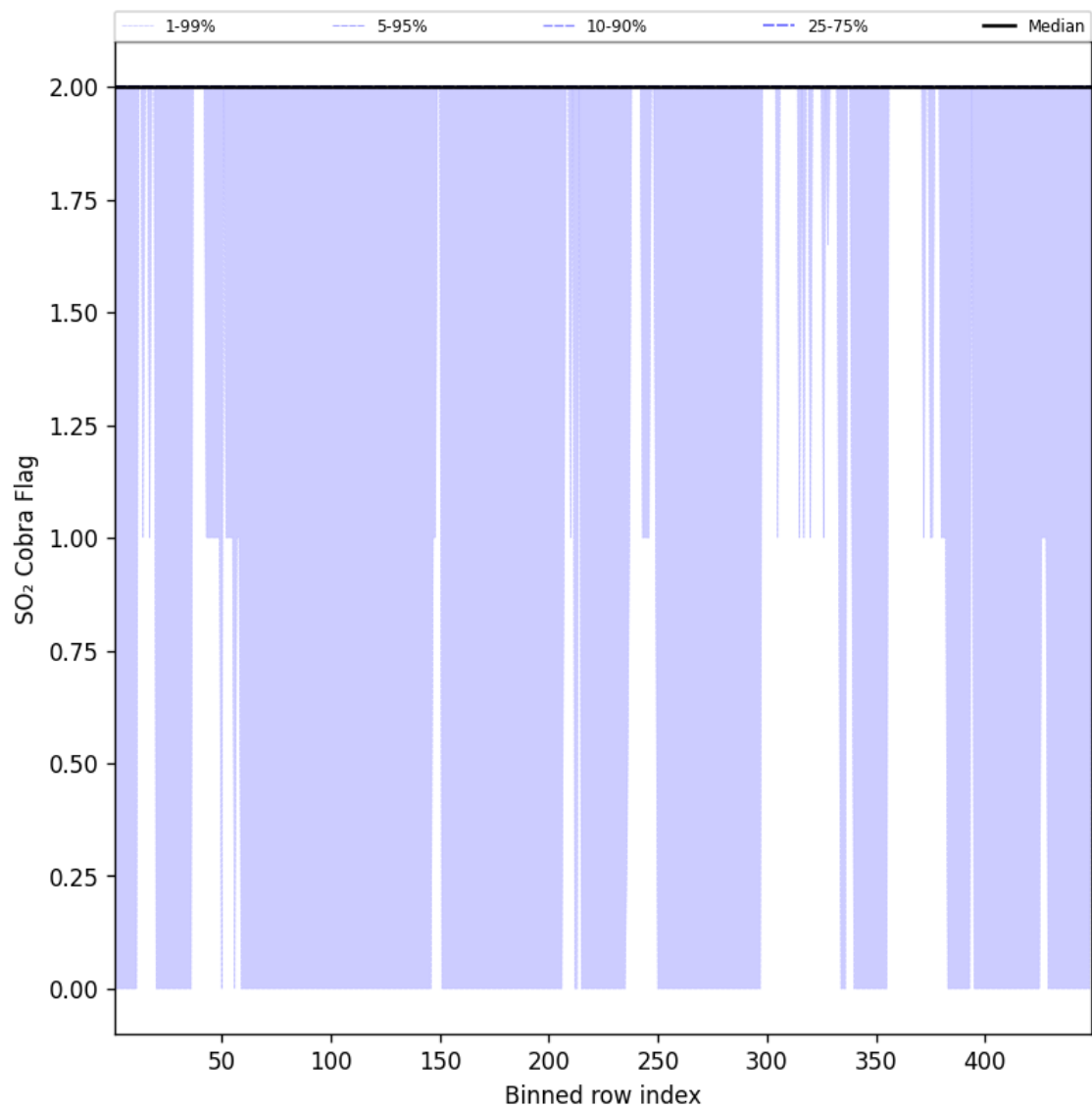


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2024-12-06 to 2024-12-07

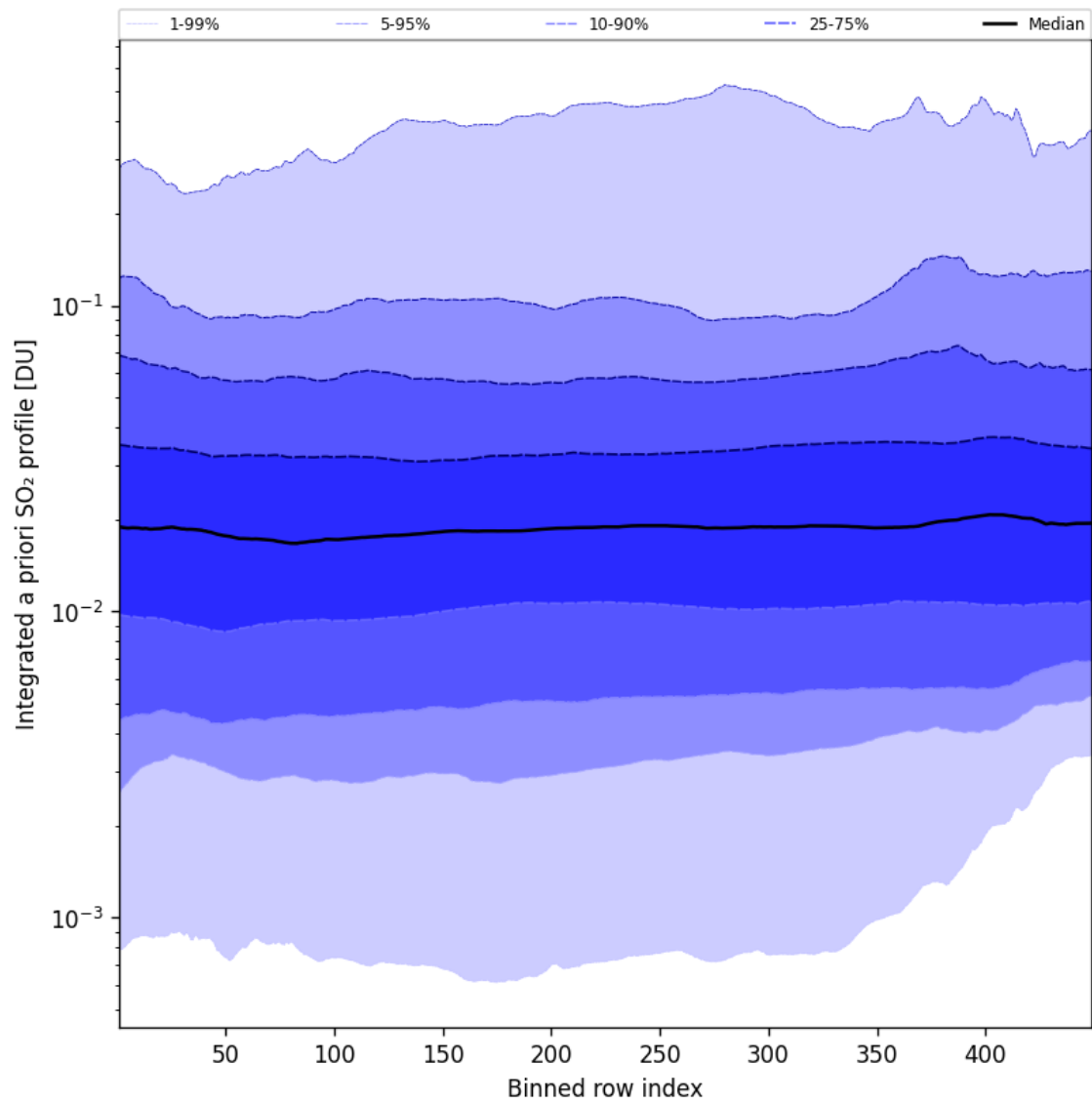


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2024-12-06 to 2024-12-07

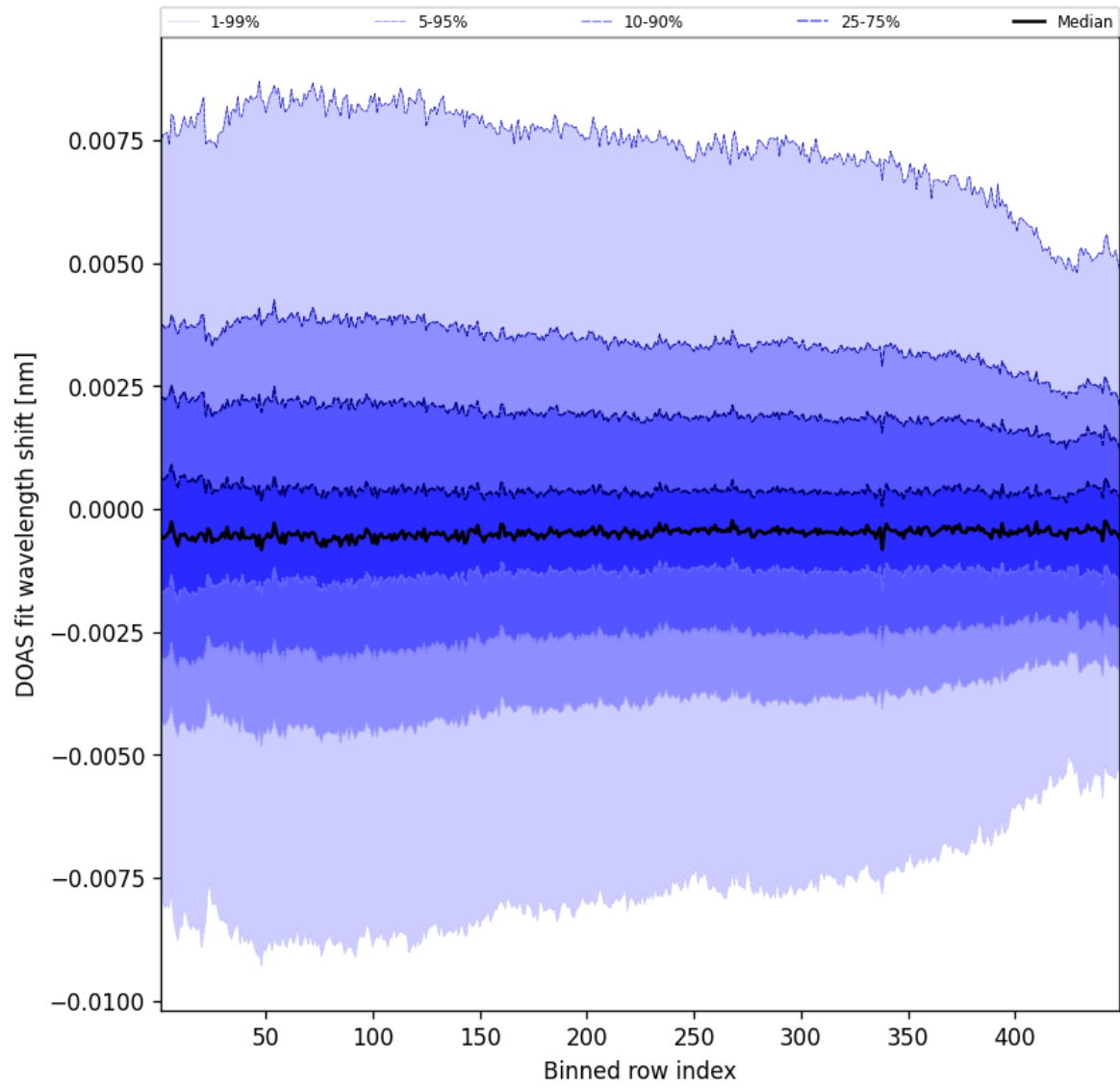


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2024-12-06 to 2024-12-07

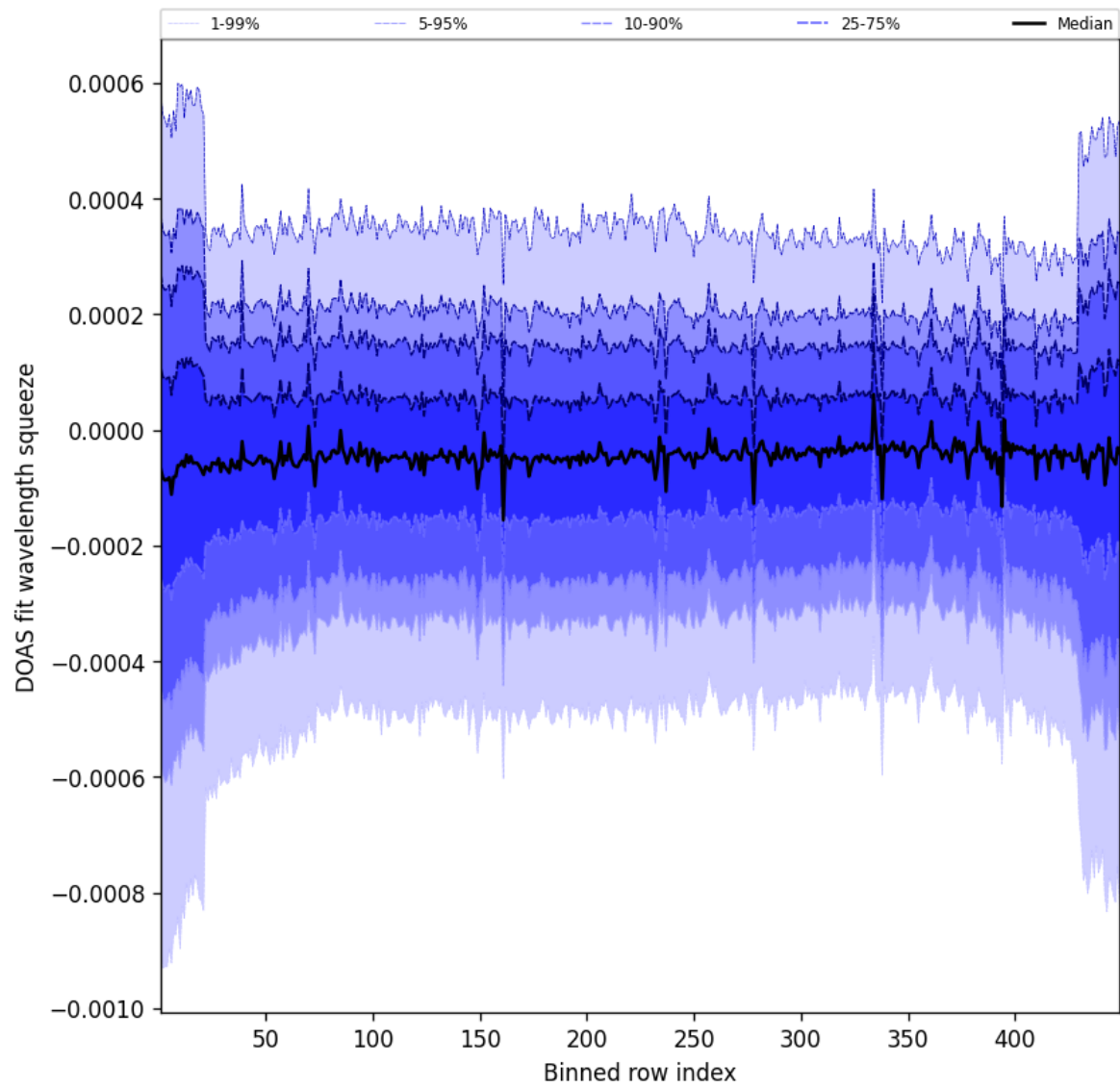


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2024-12-06 to 2024-12-07

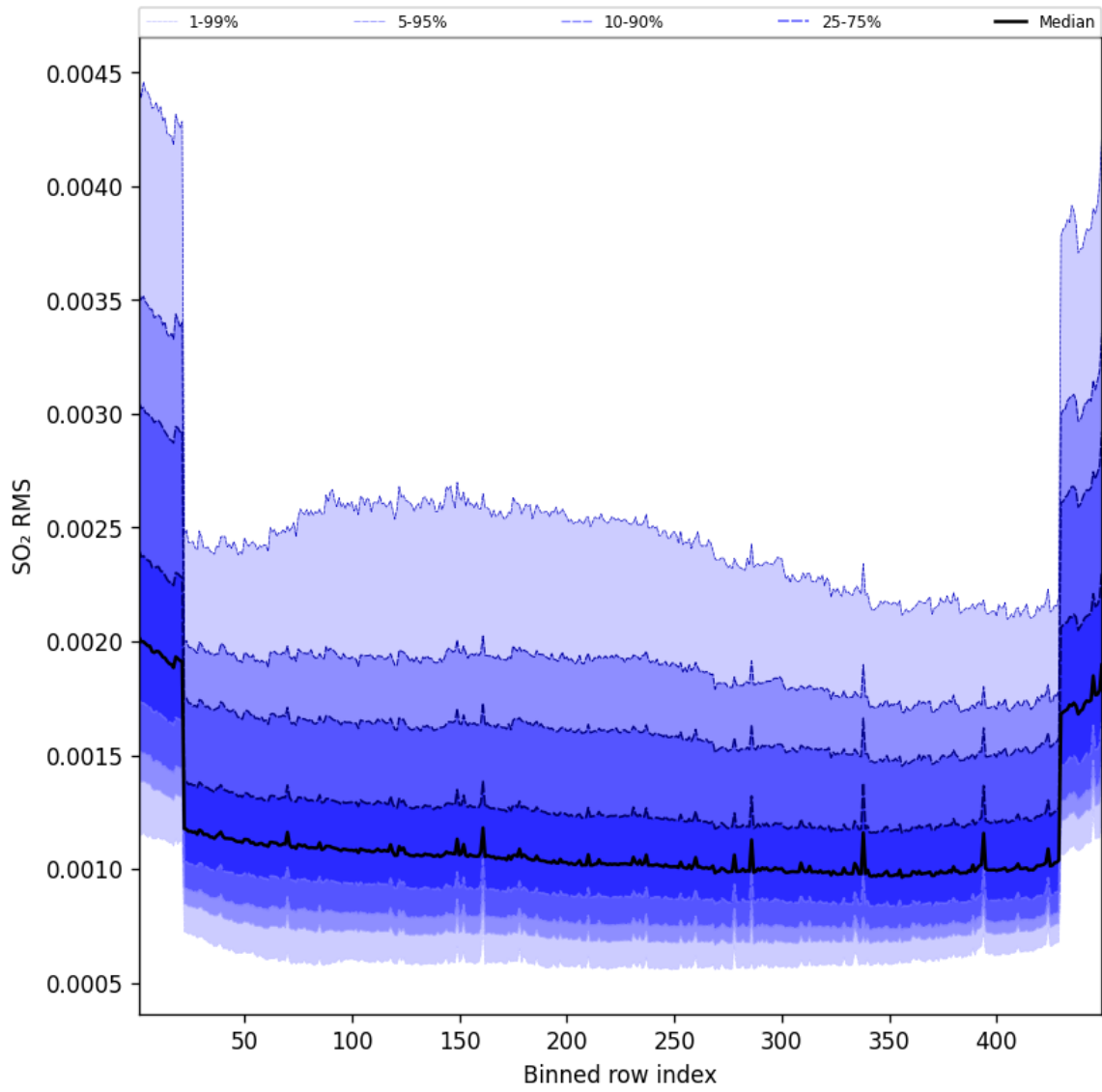


Figure 106: Along track statistics of “SO₂ RMS” for 2024-12-06 to 2024-12-07

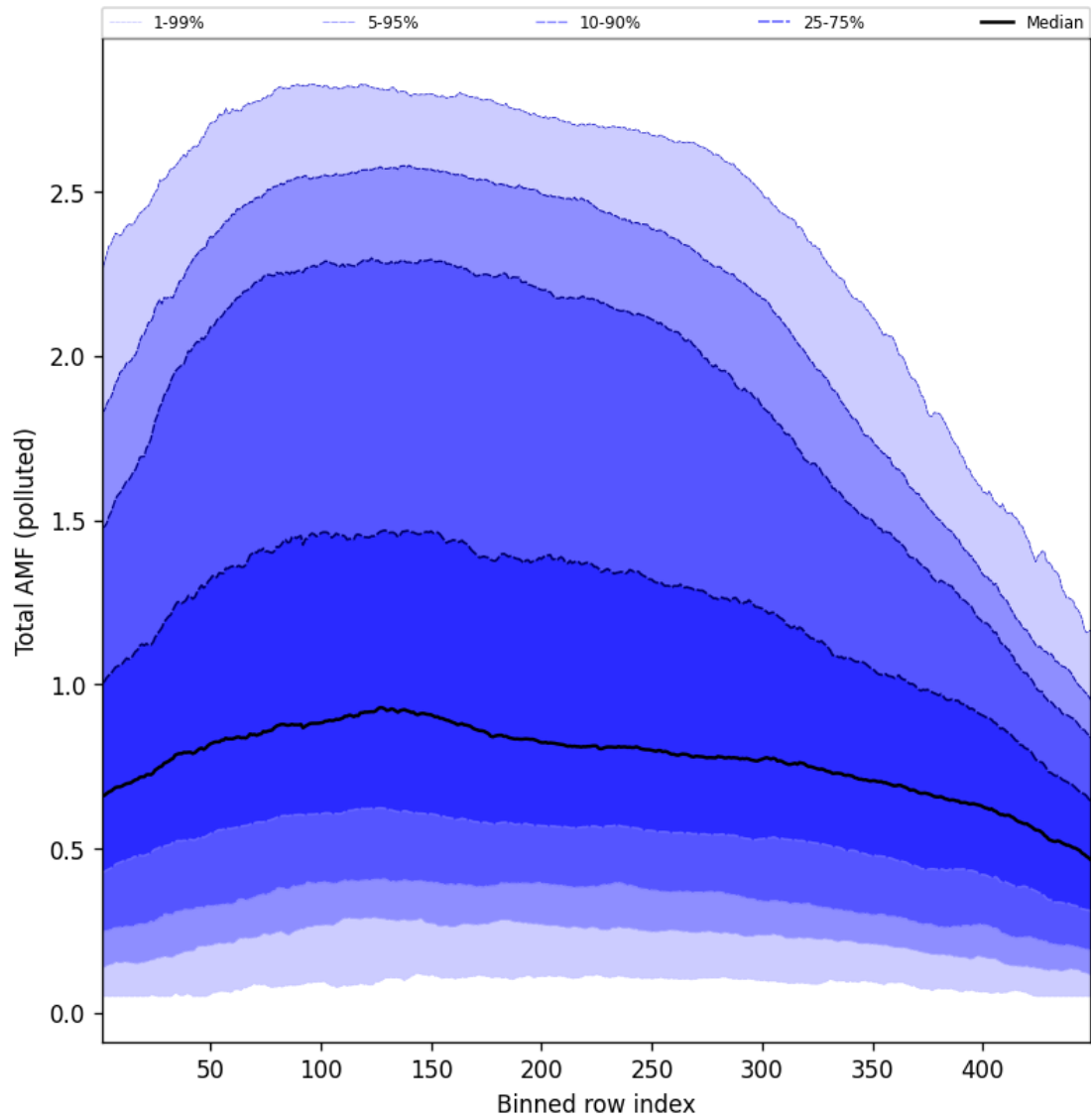


Figure 107: Along track statistics of “Total AMF (polluted)” for 2024-12-06 to 2024-12-07

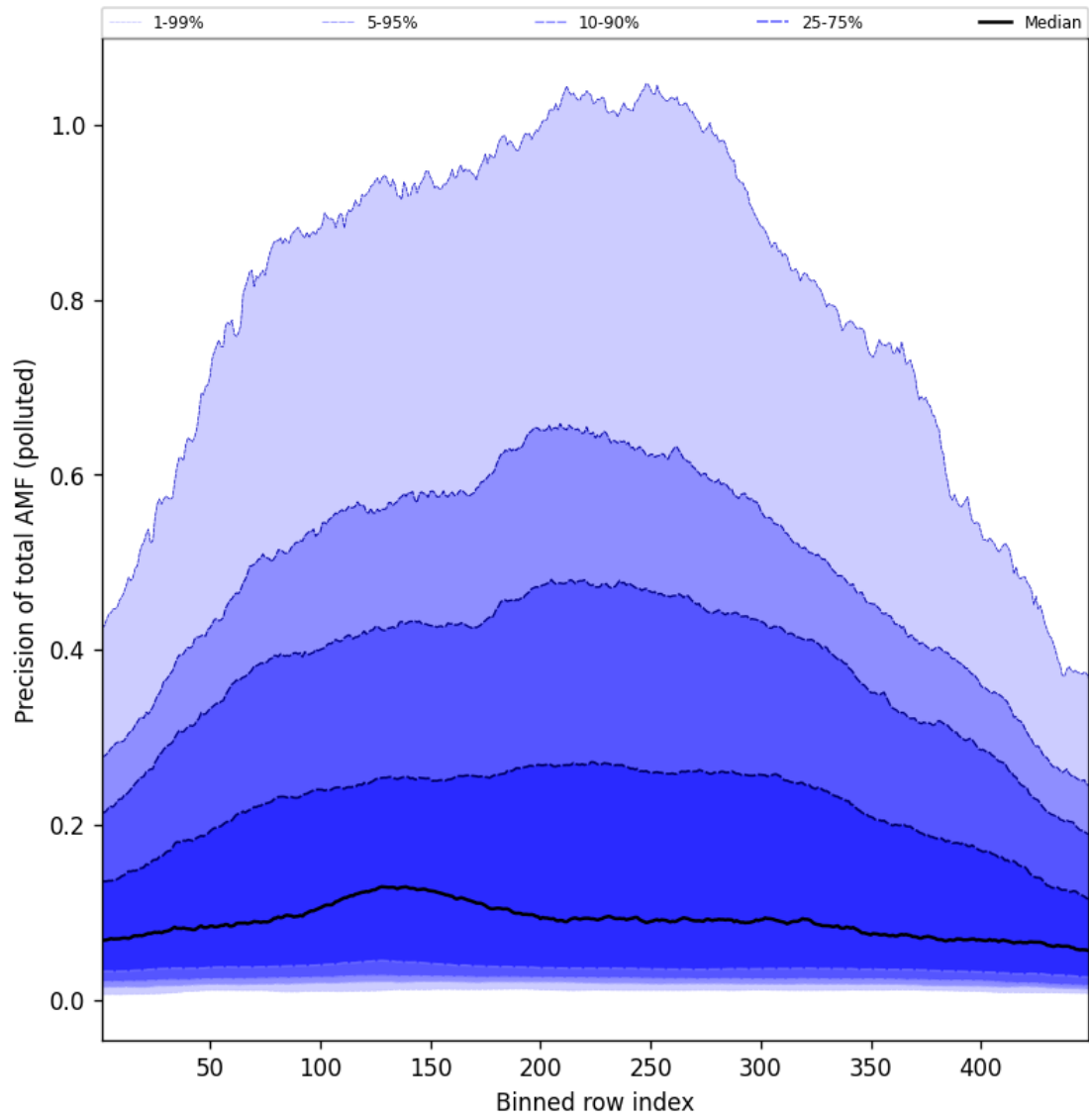


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2024-12-06 to 2024-12-07

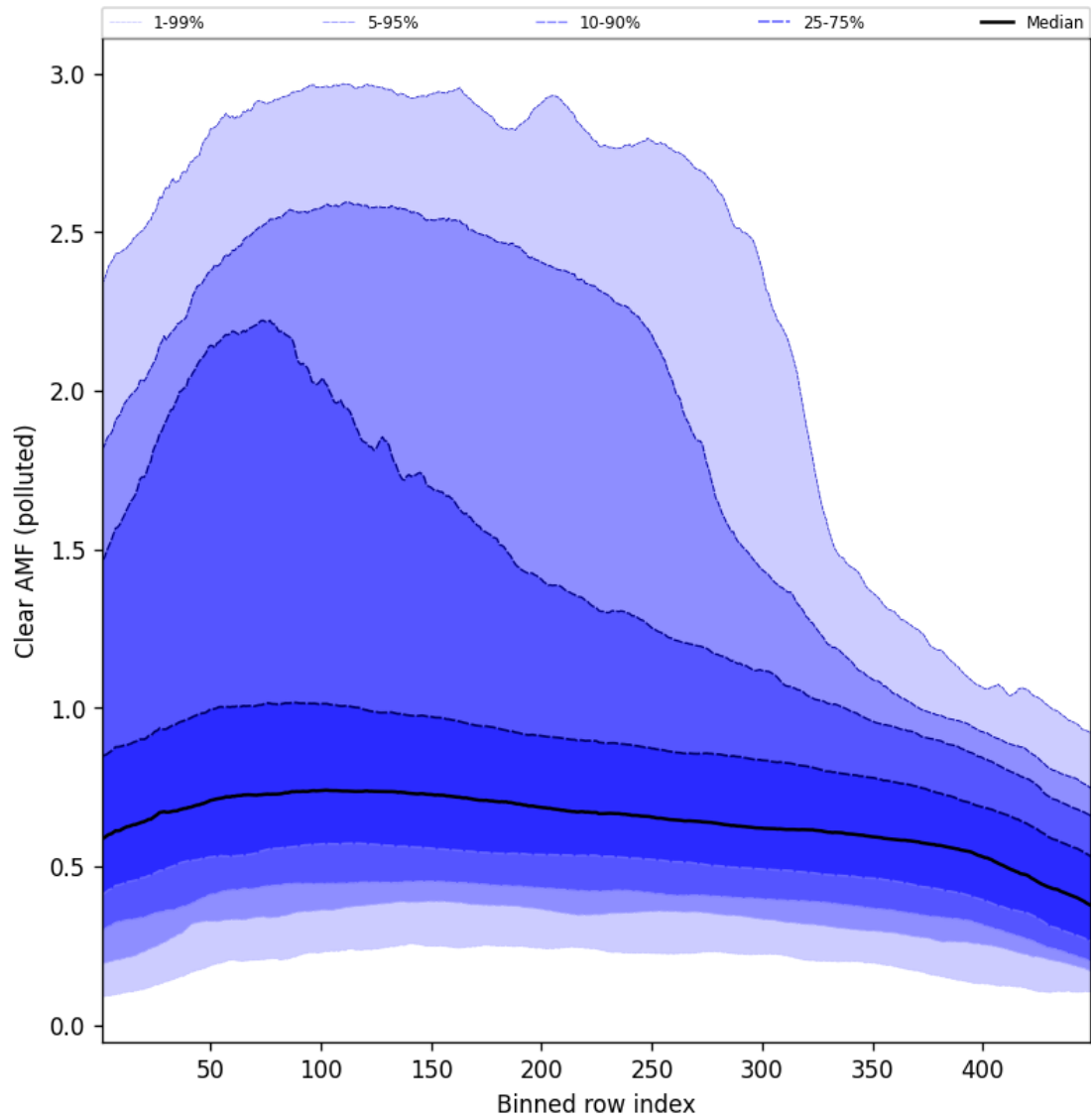


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2024-12-06 to 2024-12-07

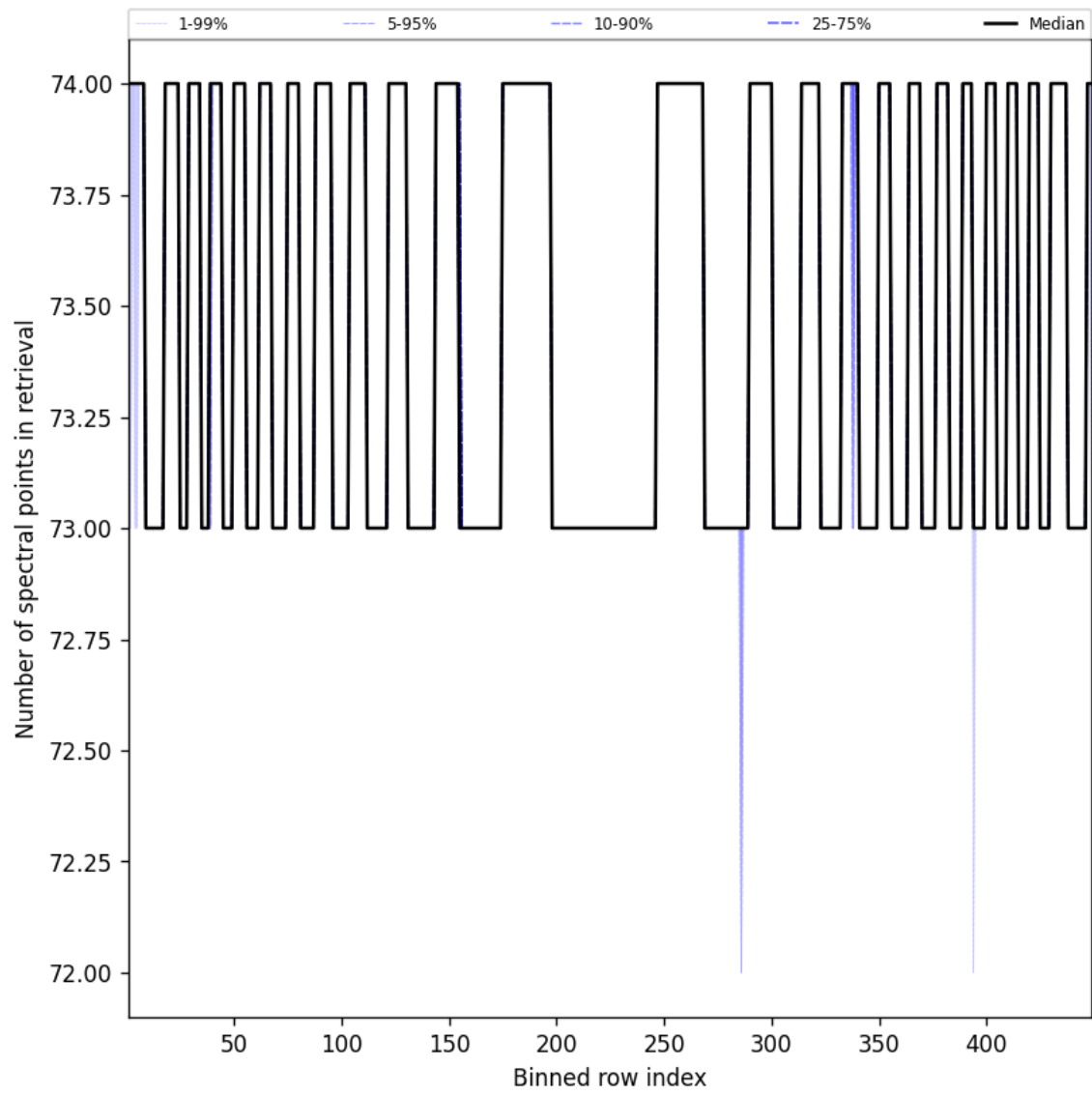


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2024-12-06 to 2024-12-07

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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