

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]	0.641 $\pm$ 0.412	17307141	0.995	0.790	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(4.417 \pm 150.585) \times 10^{-2}$	17307141	0.235	0.415	9.704×10^{-3}	-123	2.442×10^3
sulfurdioxide total vertical column precision [DU]	0.545 $\pm$ 0.926	17307141	0.197	0.331	0.302	3.576×10^{-2}	125
sulfurdioxide slant column density corrected [DU]	$(1.908 \pm 46.422) \times 10^{-2}$	17307141	0.235	0.344	8.928×10^{-3}	-11.3	278
sulfurdioxide slant column density cobra [DU]	$(1.833 \pm 34.569) \times 10^{-2}$	17307141	0.235	0.344	8.928×10^{-3}	-11.3	58.7
sulfurdioxide slant column density cobra precision [DU]	0.277 $\pm$ 0.128	17307141	0.213	0.123	0.239	7.364×10^{-2}	24.3
sulfurdioxide slant column density window1 [DU]	0.165 $\pm$ 0.657	17307141	0.175	0.712	0.175	-113	122
sulfurdioxide slant column density window1 precision [DU]	0.277 $\pm$ 0.128	17307141	0.213	0.123	0.239	7.364×10^{-2}	24.3
sulfurdioxide slant column density corrected win1 [DU]	$(6.444 \pm 64.237) \times 10^{-2}$	17307141	2.500×10^{-2}	0.687	4.806×10^{-2}	-113	122
background so2 slant column offset window1 [DU]	-0.101 $\pm$ 0.173	17307141	-0.180	0.197	-0.152	-1.47	7.14
sulfurdioxide slant column density window2 [DU]	2.80 $\pm$ 8.87	17307141	1.75	11.1	2.57	-675	833
sulfurdioxide slant column density window2 precision [DU]	7.85 $\pm$ 2.16	17307141	6.97	2.50	7.51	1.84	446
sulfurdioxide slant column density corrected win2 [DU]	$(7.824 \pm 855.113) \times 10^{-2}$	17307141	0.250	10.7	5.611×10^{-2}	-672	832
background so2 slant column offset window2 [DU]	-2.73 $\pm$ 2.53	17307141	-0.750	2.83	-1.91	-19.7	4.69
sulfurdioxide slant column density window3 [DU]	-16.8 $\pm$ 23.7	17307141	-18.5	29.7	-17.0	-684	656
sulfurdioxide slant column density window3 precision [DU]	26.9 $\pm$ 12.4	17307141	22.5	9.30	23.9	9.36	609
sulfurdioxide slant column density corrected win3 [DU]	-2.45 $\pm$ 22.75	17307141	-2.80	28.5	-2.56	-679	659
background so2 slant column offset window3 [DU]	14.3 $\pm$ 7.0	17307141	18.5	10.9	14.4	-8.07	36.8
sulfurdioxide slant column cobra flag [1]	1.98 $\pm$ 0.21	17307141	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(4.107 \pm 10.142) \times 10^{-2}$	17307141	1.423×10^{-2}	2.351×10^{-2}	1.994×10^{-2}	4.425×10^{-4}	3.32
fitted radiance shift [nm]	$(-4.325 \pm 24.073) \times 10^{-4}$	17307141	-5.000×10^{-4}	1.707×10^{-3}	-4.548×10^{-4}	-4.761×10^{-2}	0.110
fitted radiance squeeze [1]	$(-4.048 \pm 17.745) \times 10^{-5}$	17307141	-3.000×10^{-5}	2.057×10^{-4}	-3.513×10^{-5}	-1.600×10^{-2}	1.486×10^{-2}
fitted root mean square [1]	$(1.230 \pm 0.525) \times 10^{-3}$	17307141	9.250×10^{-4}	5.003×10^{-4}	1.083×10^{-3}	3.000×10^{-4}	6.319×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.903 $\pm$ 0.545	17307141	0.540	0.616	0.786	5.000×10^{-2}	3.08
sulfurdioxide total air mass factor polluted precision [1]	0.130 $\pm$ 0.134	17307141	3.500×10^{-2}	0.149	7.806×10^{-2}	2.500×10^{-3}	1.98
sulfurdioxide clear air mass factor polluted [1]	0.791 $\pm$ 0.518	17307141	0.700	0.387	0.683	2.288×10^{-2}	3.10
number of spectral points in retrieval [1]	73.4 $\pm$ 0.5	17307141	73.0	1.000	73.0	52.0	156

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	5.000×10^{-2}	0.1000	0.210	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.64	-0.875	-0.511	-0.336	-0.194	0.221	0.377	0.575	1.00	3.21
sulfurdioxide total vertical column precision [DU]	8.618×10^{-2}	0.111	0.135	0.160	0.195	0.526	0.745	1.04	1.69	4.44
sulfurdioxide slant column density corrected [DU]	-0.807	-0.463	-0.335	-0.250	-0.161	0.183	0.277	0.370	0.518	0.980
sulfurdioxide slant column density cobra [DU]	-0.807	-0.463	-0.335	-0.250	-0.161	0.183	0.277	0.370	0.518	0.980
sulfurdioxide slant column density cobra precision [DU]	0.133	0.157	0.171	0.182	0.197	0.320	0.378	0.433	0.513	0.747
sulfurdioxide slant column density window1 [DU]	-1.59	-0.849	-0.569	-0.382	-0.187	0.525	0.707	0.880	1.14	1.89
sulfurdioxide slant column density window1 precision [DU]	0.133	0.157	0.171	0.182	0.197	0.320	0.378	0.433	0.513	0.747
sulfurdioxide slant column density corrected win1 [DU]	-1.53	-0.876	-0.632	-0.467	-0.291	0.396	0.584	0.768	1.06	1.89
background so2 slant column offset window1 [DU]	-0.373	-0.296	-0.266	-0.244	-0.216	-1.823×10^{-2}	7.029×10^{-2}	0.146	0.241	0.412
sulfurdioxide slant column density window2 [DU]	-17.7	-11.1	-7.95	-5.57	-2.89	8.21	11.1	13.8	17.5	25.9
sulfurdioxide slant column density window2 precision [DU]	4.21	5.04	5.54	5.94	6.41	8.91	9.78	10.6	11.8	14.3
sulfurdioxide slant column density corrected win2 [DU]	-20.6	-13.7	-10.4	-8.01	-5.32	5.43	8.13	10.6	13.9	21.2
background so2 slant column offset window2 [DU]	-11.0	-8.27	-6.28	-4.99	-3.79	-0.956	-0.709	-0.530	-0.257	0.714
sulfurdioxide slant column density window3 [DU]	-75.4	-55.2	-45.8	-39.0	-31.6	-1.94	5.89	13.0	22.6	41.5
sulfurdioxide slant column density window3 precision [DU]	13.5	15.5	17.0	18.3	20.0	29.3	33.7	39.0	49.8	79.8
sulfurdioxide slant column density corrected win3 [DU]	-59.2	-39.5	-30.3	-23.8	-16.7	11.8	19.2	25.9	34.9	53.2
background so2 slant column offset window3 [DU]	0.448	3.03	4.69	6.58	8.93	19.8	21.8	23.5	25.3	28.3
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]	2.135×10^{-3}	4.929×10^{-3}	7.282×10^{-3}	9.242×10^{-3}	1.188×10^{-2}	3.539×10^{-2}	4.927×10^{-2}	7.165×10^{-2}	0.126	0.424
fitted radiance shift [nm]	-7.644×10^{-3}	-3.965×10^{-3}	-2.662×10^{-3}	-1.935×10^{-3}	-1.330×10^{-3}	3.774×10^{-4}	1.039×10^{-3}	1.868×10^{-3}	3.292×10^{-3}	7.153×10^{-3}
fitted radiance squeeze [1]	-5.138×10^{-4}	-3.300×10^{-4}	-2.519×10^{-4}	-1.978×10^{-4}	-1.409×10^{-4}	6.483×10^{-5}	1.153×10^{-4}	1.622×10^{-4}	2.304×10^{-4}	4.014×10^{-4}
fitted root mean square [1]	5.731×10^{-4}	6.996×10^{-4}	7.744×10^{-4}	8.319×10^{-4}	9.012×10^{-4}	1.402×10^{-3}	1.636×10^{-3}	1.874×10^{-3}	2.241×10^{-3}	3.164×10^{-3}
sulfurdioxide total air mass factor polluted [1]	9.463×10^{-2}	0.230	0.336	0.420	0.523	1.14	1.40	1.67	2.09	2.60
sulfurdioxide total air mass factor polluted precision [1]	9.507×10^{-3}	1.768×10^{-2}	2.337×10^{-2}	2.870×10^{-2}	3.676×10^{-2}	0.186	0.246	0.302	0.390	0.603
sulfurdioxide clear air mass factor polluted [1]	0.156	0.278	0.359	0.426	0.504	0.891	0.995	1.16	2.18	2.85
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]	0.708 ± 0.393	6868133	0.710	1.000	0.0	1.000	0.290	1.000
sulfurdioxide total vertical column [DU]	$(8.677 \pm 207.817) \times 10^{-2}$	6868133	0.617	1.567×10^{-2}	-123	410	-0.284	0.333
sulfurdioxide total vertical column precision [DU]	0.854 ± 1.335	6868133	0.607	0.446	4.200×10^{-2}	62.8	0.274	0.881
sulfurdioxide slant column density corrected [DU]	$(2.899 \pm 64.689) \times 10^{-2}$	6868133	0.395	1.147×10^{-2}	-11.3	278	-0.183	0.212
sulfurdioxide slant column density cobra [DU]	$(2.712 \pm 42.300) \times 10^{-2}$	6868133	0.395	1.147×10^{-2}	-11.3	38.5	-0.183	0.212
sulfurdioxide slant column density cobra precision [DU]	0.323 ± 0.155	6868133	0.173	0.282	8.634×10^{-2}	5.49	0.216	0.390
sulfurdioxide slant column density window1 [DU]	0.227 ± 0.767	6868133	0.795	0.234	-13.6	41.9	-0.166	0.628
sulfurdioxide slant column density window1 precision [DU]	0.323 ± 0.155	6868133	0.173	0.282	8.634×10^{-2}	5.49	0.216	0.390
sulfurdioxide slant column density corrected win1 [DU]	$(8.857 \pm 76.391) \times 10^{-2}$	6868133	0.785	5.985×10^{-2}	-12.3	41.6	-0.324	0.461
background so2 slant column offset window1 [DU]	-0.139 ± 0.166	6868133	0.159	-0.169	-1.47	7.14	-0.241	-8.264×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.60 ± 9.78	6868133	12.4	3.18	-582	279	-2.82	9.56
sulfurdioxide slant column density window2 precision [DU]	8.54 ± 2.21	6868133	2.75	8.23	2.19	428	7.01	9.77
sulfurdioxide slant column density corrected win2 [DU]	$(5.159 \pm 9263.346) \times 10^{-3}$	6868133	11.8	-3.602×10^{-2}	-584	278	-5.91	5.85
background so2 slant column offset window2 [DU]	-3.60 ± 3.21	6868133	4.63	-2.30	-19.7	4.49	-5.74	-1.11
sulfurdioxide slant column density window3 [DU]	-19.8 ± 25.0	6868133	31.9	-19.4	-204	555	-35.5	-3.61
sulfurdioxide slant column density window3 precision [DU]	28.9 ± 12.2	6868133	9.15	26.0	9.81	210	22.2	31.4
sulfurdioxide slant column density corrected win3 [DU]	-2.73 ± 24.44	6868133	31.0	-2.60	-176	565	-18.1	12.9
background so2 slant column offset window3 [DU]	17.0 ± 5.9	6868133	9.51	16.9	-3.01	35.8	12.2	21.7
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	6868133	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.590 \pm 15.359) \times 10^{-2}$	6868133	4.511×10^{-2}	2.323×10^{-2}	4.425×10^{-4}	3.32	1.244×10^{-2}	5.755×10^{-2}
fitted radiance shift [nm]	$(-2.719 \pm 23.760) \times 10^{-4}$	6868133	1.620×10^{-3}	-2.923×10^{-4}	-3.086×10^{-2}	3.103×10^{-2}	-1.103×10^{-3}	5.171×10^{-4}
fitted radiance squeeze [1]	$(7.104 \pm 1905.075) \times 10^{-7}$	6868133	2.145×10^{-4}	9.668×10^{-7}	-2.856×10^{-3}	2.133×10^{-3}	-1.061×10^{-4}	1.085×10^{-4}
fitted root mean square [1]	$(1.405 \pm 0.641) \times 10^{-3}$	6868133	6.891×10^{-4}	1.209×10^{-3}	3.000×10^{-4}	1.500×10^{-2}	9.773×10^{-4}	1.666×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.683 ± 0.381	6868133	0.486	0.626	5.000×10^{-2}	2.84	0.403	0.889
sulfurdioxide total air mass factor polluted precision [1]	$(9.861 \pm 13.295) \times 10^{-2}$	6868133	9.356×10^{-2}	4.636×10^{-2}	2.500×10^{-3}	1.98	2.701×10^{-2}	0.121
sulfurdioxide clear air mass factor polluted [1]	0.587 ± 0.264	6868133	0.405	0.564	2.288×10^{-2}	2.21	0.380	0.785
number of spectral points in retrieval [1]	73.5 ± 0.5	6868133	1.000	73.0	52.0	156	73.0	74.0

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

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.597 ± 0.419	10439008	0.830	1.000	0.0	1.000	0.170	1.000
sulfurdioxide total vertical column [DU]	$(1.614 \pm 95.709) \times 10^{-2}$	10439008	0.333	7.431×10^{-3}	-63.3	2.442×10^3	-0.157	0.176
sulfurdioxide total vertical column precision [DU]	0.341 ± 0.381	10439008	0.222	0.243	3.576×10^{-2}	125	0.168	0.389
sulfurdioxide slant column density corrected [DU]	$(1.256 \pm 28.610) \times 10^{-2}$	10439008	0.317	7.560×10^{-3}	-10.5	122	-0.150	0.167
sulfurdioxide slant column density cobra [DU]	$(1.254 \pm 28.340) \times 10^{-2}$	10439008	0.317	7.560×10^{-3}	-10.5	58.7	-0.150	0.167
sulfurdioxide slant column density cobra precision [DU]	0.247 ± 0.094	10439008	8.778×10^{-2}	0.222	7.364×10^{-2}	24.3	0.188	0.276
sulfurdioxide slant column density window1 [DU]	0.124 ± 0.570	10439008	0.664	0.142	-113	122	-0.199	0.465
sulfurdioxide slant column density window1 precision [DU]	0.247 ± 0.094	10439008	8.778×10^{-2}	0.222	7.364×10^{-2}	24.3	0.188	0.276
sulfurdioxide slant column density corrected win1 [DU]	$(4.857 \pm 54.731) \times 10^{-2}$	10439008	0.633	4.173×10^{-2}	-113	122	-0.273	0.360
background so2 slant column offset window1 [DU]	$(-7.584 \pm 17.305) \times 10^{-2}$	10439008	0.235	-0.137	-0.792	2.00	-0.201	3.379×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.28 ± 8.18	10439008	10.4	2.23	-675	833	-2.93	7.43
sulfurdioxide slant column density window2 precision [DU]	7.40 ± 2.00	10439008	2.14	7.11	1.84	446	6.14	8.28
sulfurdioxide slant column density corrected win2 [DU]	0.126 ± 8.048	10439008	10.2	0.109	-672	832	-4.97	5.18
background so2 slant column offset window2 [DU]	-2.15 ± 1.73	10439008	2.35	-1.69	-14.4	4.69	-3.24	-0.882
sulfurdioxide slant column density window3 [DU]	-14.8 ± 22.6	10439008	28.4	-15.6	-684	656	-29.4	-0.918
sulfurdioxide slant column density window3 precision [DU]	25.6 ± 12.4	10439008	8.55	22.5	9.36	609	18.9	27.5
sulfurdioxide slant column density corrected win3 [DU]	-2.27 ± 21.56	10439008	27.0	-2.54	-679	659	-15.9	11.2
background so2 slant column offset window3 [DU]	12.5 ± 7.1	10439008	11.8	12.3	-8.07	36.8	6.55	18.3
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.18	10439008	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.472 \pm 2.934) \times 10^{-2}$	10439008	1.801×10^{-2}	1.871×10^{-2}	5.309×10^{-4}	1.75	1.158×10^{-2}	2.959×10^{-2}
fitted radiance shift [nm]	$(-5.382 \pm 24.219) \times 10^{-4}$	10439008	1.724×10^{-3}	-5.719×10^{-4}	-4.761×10^{-2}	0.110	-1.452×10^{-3}	2.710×10^{-4}
fitted radiance squeeze [1]	$(-6.758 \pm 16.271) \times 10^{-5}$	10439008	1.973×10^{-4}	-5.679×10^{-5}	-1.600×10^{-2}	1.486×10^{-2}	-1.605×10^{-4}	3.688×10^{-5}
fitted root mean square [1]	$(1.115 \pm 0.393) \times 10^{-3}$	10439008	3.955×10^{-4}	1.021×10^{-3}	3.284×10^{-4}	6.319×10^{-2}	8.662×10^{-4}	1.262×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.05 ± 0.59	10439008	0.708	0.904	5.000×10^{-2}	3.08	0.624	1.33
sulfurdioxide total air mass factor polluted precision [1]	0.151 ± 0.131	10439008	0.173	0.112	5.563×10^{-3}	1.33	4.660×10^{-2}	0.220
sulfurdioxide clear air mass factor polluted [1]	0.925 ± 0.594	10439008	0.380	0.741	0.156	3.10	0.581	0.961
number of spectral points in retrieval [1]	73.4 ± 0.5	10439008	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]	0.679 ± 0.402	12412197	0.750	1.000	0.0	1.000	0.250	1.000
sulfurdioxide total vertical column [DU]	$(2.752 \pm 104.857) \times 10^{-2}$	12412197	0.404	8.438×10^{-3}	-78.4	300	-0.191	0.212
sulfurdioxide total vertical column precision [DU]	0.476 ± 0.723	12412197	0.270	0.289	4.304×10^{-2}	34.6	0.200	0.471
sulfurdioxide slant column density corrected [DU]	$(1.407 \pm 35.860) \times 10^{-2}$	12412197	0.328	7.353×10^{-3}	-9.64	187	-0.155	0.173
sulfurdioxide slant column density cobra [DU]	$(1.371 \pm 31.387) \times 10^{-2}$	12412197	0.328	7.353×10^{-3}	-9.64	58.7	-0.155	0.173
sulfurdioxide slant column density cobra precision [DU]	0.263 ± 0.118	12412197	0.102	0.226	7.364×10^{-2}	24.3	0.192	0.294
sulfurdioxide slant column density window1 [DU]	0.171 ± 0.605	12412197	0.673	0.179	-113	122	-0.162	0.511
sulfurdioxide slant column density window1 precision [DU]	0.263 ± 0.118	12412197	0.102	0.226	7.364×10^{-2}	24.3	0.192	0.294
sulfurdioxide slant column density corrected win1 [DU]	$(5.292 \pm 59.439) \times 10^{-2}$	12412197	0.654	4.162×10^{-2}	-113	122	-0.283	0.371
background so2 slant column offset window1 [DU]	-0.118 ± 0.148	12412197	0.176	-0.155	-1.38	4.33	-0.216	-4.039×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.36 ± 8.54	12412197	10.7	2.19	-675	833	-3.12	7.61
sulfurdioxide slant column density window2 precision [DU]	7.66 ± 2.05	12412197	2.35	7.35	1.84	446	6.31	8.65
sulfurdioxide slant column density corrected win2 [DU]	$(2.934 \pm 832.680) \times 10^{-2}$	12412197	10.5	1.155×10^{-2}	-672	832	-5.25	5.27
background so2 slant column offset window2 [DU]	-2.33 ± 2.16	12412197	2.27	-1.69	-19.7	4.69	-3.18	-0.913
sulfurdioxide slant column density window3 [DU]	-13.8 ± 23.3	12412197	29.5	-14.3	-684	656	-28.6	0.844
sulfurdioxide slant column density window3 precision [DU]	26.6 ± 11.9	12412197	8.83	23.6	9.36	488	20.1	28.9
sulfurdioxide slant column density corrected win3 [DU]	-0.413 ± 22.216	12412197	28.2	-0.824	-679	659	-14.6	13.6
background so2 slant column offset window3 [DU]	13.4 ± 6.5	12412197	9.79	13.4	-8.07	35.8	8.48	18.3
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.15	12412197	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.972 \pm 4.410) \times 10^{-2}$	12412197	1.917×10^{-2}	1.958×10^{-2}	8.870×10^{-4}	2.20	1.282×10^{-2}	3.198×10^{-2}
fitted radiance shift [nm]	$(-3.995 \pm 23.286) \times 10^{-4}$	12412197	1.730×10^{-3}	-3.910×10^{-4}	-4.665×10^{-2}	3.228×10^{-2}	-1.293×10^{-3}	4.374×10^{-4}
fitted radiance squeeze [1]	$(-3.951 \pm 16.403) \times 10^{-5}$	12412197	1.931×10^{-4}	-3.376×10^{-5}	-1.600×10^{-2}	1.486×10^{-2}	-1.328×10^{-4}	6.039×10^{-5}
fitted root mean square [1]	$(1.161 \pm 0.473) \times 10^{-3}$	12412197	4.096×10^{-4}	1.030×10^{-3}	3.154×10^{-4}	6.319×10^{-2}	8.767×10^{-4}	1.286×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.853 ± 0.415	12412197	0.513	0.799	5.000×10^{-2}	2.73	0.560	1.07
sulfurdioxide total air mass factor polluted precision [1]	0.121 ± 0.112	12412197	0.135	7.560×10^{-2}	2.500×10^{-3}	1.54	3.978×10^{-2}	0.175
sulfurdioxide clear air mass factor polluted [1]	0.709 ± 0.256	12412197	0.328	0.691	4.296×10^{-2}	2.73	0.533	0.861
number of spectral points in retrieval [1]	73.4 ± 0.5	12412197	1.000	73.0	52.0	156	73.0	74.0

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

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.545 $\pm$ 0.424	4141425	0.890	0.490	0.0	1.000	0.110	1.000
sulfurdioxide total vertical column [DU]	(7.258 $\pm$ 213.693) $\times 10^{-2}$	4141425	0.419	1.143 $\times 10^{-2}$	-123	2.442 $\times 10^3$	-0.188	0.230
sulfurdioxide total vertical column precision [DU]	0.652 $\pm$ 1.170	4141425	0.526	0.337	3.576 $\times 10^{-2}$	125	0.152	0.678
sulfurdioxide slant column density corrected [DU]	(2.818 $\pm$ 58.817) $\times 10^{-2}$	4141425	0.388	1.277 $\times 10^{-2}$	-11.3	278	-0.178	0.209
sulfurdioxide slant column density cobra [DU]	(2.706 $\pm$ 39.446) $\times 10^{-2}$	4141425	0.388	1.277 $\times 10^{-2}$	-11.3	38.5	-0.178	0.209
sulfurdioxide slant column density cobra precision [DU]	0.308 $\pm$ 0.132	4141425	0.139	0.276	8.297 $\times 10^{-2}$	9.48	0.221	0.360
sulfurdioxide slant column density window1 [DU]	0.143 $\pm$ 0.748	4141425	0.826	0.154	-45.5	41.9	-0.270	0.556
sulfurdioxide slant column density window1 precision [DU]	0.308 $\pm$ 0.132	4141425	0.139	0.276	8.297 $\times 10^{-2}$	9.48	0.221	0.360
sulfurdioxide slant column density corrected win1 [DU]	(8.875 $\pm$ 72.031) $\times 10^{-2}$	4141425	0.775	6.545 $\times 10^{-2}$	-45.5	41.6	-0.314	0.460
background so2 slant column offset window1 [DU]	(-5.405 $\pm$ 21.959) $\times 10^{-2}$	4141425	0.322	-0.139	-0.993	7.14	-0.213	0.109
sulfurdioxide slant column density window2 [DU]	3.76 $\pm$ 9.40	4141425	11.8	3.57	-469	807	-2.26	9.56
sulfurdioxide slant column density window2 precision [DU]	8.25 $\pm$ 2.30	4141425	2.72	7.90	1.96	262	6.70	9.42
sulfurdioxide slant column density corrected win2 [DU]	0.202 $\pm$ 9.002	4141425	11.3	0.186	-470	808	-5.45	5.82
background so2 slant column offset window2 [DU]	-3.56 $\pm$ 2.89	4141425	4.28	-3.03	-19.7	4.69	-5.38	-1.11
sulfurdioxide slant column density window3 [DU]	-24.4 $\pm$ 22.9	4141425	28.3	-24.0	-650	599	-38.3	-10.1
sulfurdioxide slant column density window3 precision [DU]	27.3 $\pm$ 13.4	4141425	10.3	24.3	9.85	609	19.5	29.8
sulfurdioxide slant column density corrected win3 [DU]	-7.79 $\pm$ 23.12	4141425	28.6	-7.18	-653	607	-21.8	6.84
background so2 slant column offset window3 [DU]	16.6 $\pm$ 7.6	4141425	12.3	18.4	-8.07	36.8	10.4	22.7
sulfurdioxide slant column cobra flag [1]	1.95 $\pm$ 0.32	4141425	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	(6.313 $\pm$ 15.688) $\times 10^{-2}$	4141425	4.366 $\times 10^{-2}$	2.052 $\times 10^{-2}$	4.425 $\times 10^{-4}$	3.32	7.312 $\times 10^{-3}$	5.097 $\times 10^{-2}$
fitted radiance shift [nm]	(-5.531 $\pm$ 25.652) $\times 10^{-4}$	4141425	1.538 $\times 10^{-3}$	-6.571 $\times 10^{-4}$	-4.761 $\times 10^{-2}$	6.540 $\times 10^{-2}$	-1.404 $\times 10^{-3}$	1.344 $\times 10^{-4}$
fitted radiance squeeze [1]	(-4.866 $\pm$ 20.499) $\times 10^{-5}$	4141425	2.445 $\times 10^{-4}$	-4.493 $\times 10^{-5}$	-1.262 $\times 10^{-2}$	1.160 $\times 10^{-2}$	-1.712 $\times 10^{-4}$	7.329 $\times 10^{-5}$
fitted root mean square [1]	(1.378 $\pm$ 0.562) $\times 10^{-3}$	4141425	5.779 $\times 10^{-4}$	1.258 $\times 10^{-3}$	3.000 $\times 10^{-4}$	4.098 $\times 10^{-2}$	1.017 $\times 10^{-3}$	1.595 $\times 10^{-3}$
sulfurdioxide total air mass factor polluted [1]	1.09 $\pm$ 0.80	4141425	1.29	0.759	5.000 $\times 10^{-2}$	3.08	0.445	1.73
sulfurdioxide total air mass factor polluted precision [1]	0.158 $\pm$ 0.178	4141425	0.197	9.944 $\times 10^{-2}$	2.500 $\times 10^{-3}$	1.98	2.883 $\times 10^{-2}$	0.225
sulfurdioxide clear air mass factor polluted [1]	1.08 $\pm$ 0.89	4141425	1.20	0.675	2.288 $\times 10^{-2}$	3.10	0.423	1.62
number of spectral points in retrieval [1]	73.4 $\pm$ 0.5	4141425	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

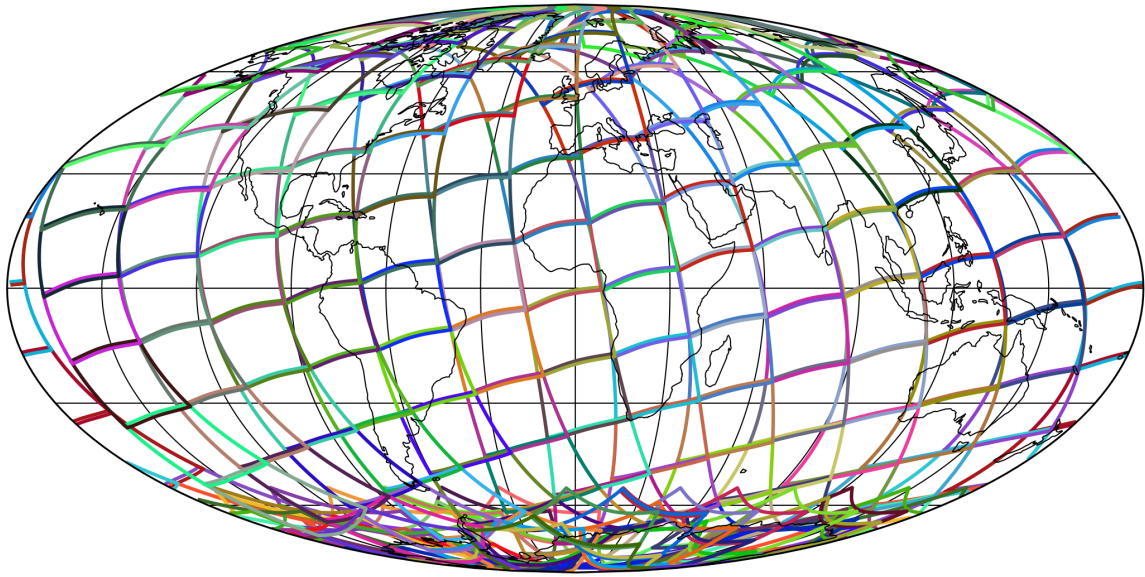


Figure 1: Outline of the granules.

4 Input data monitoring

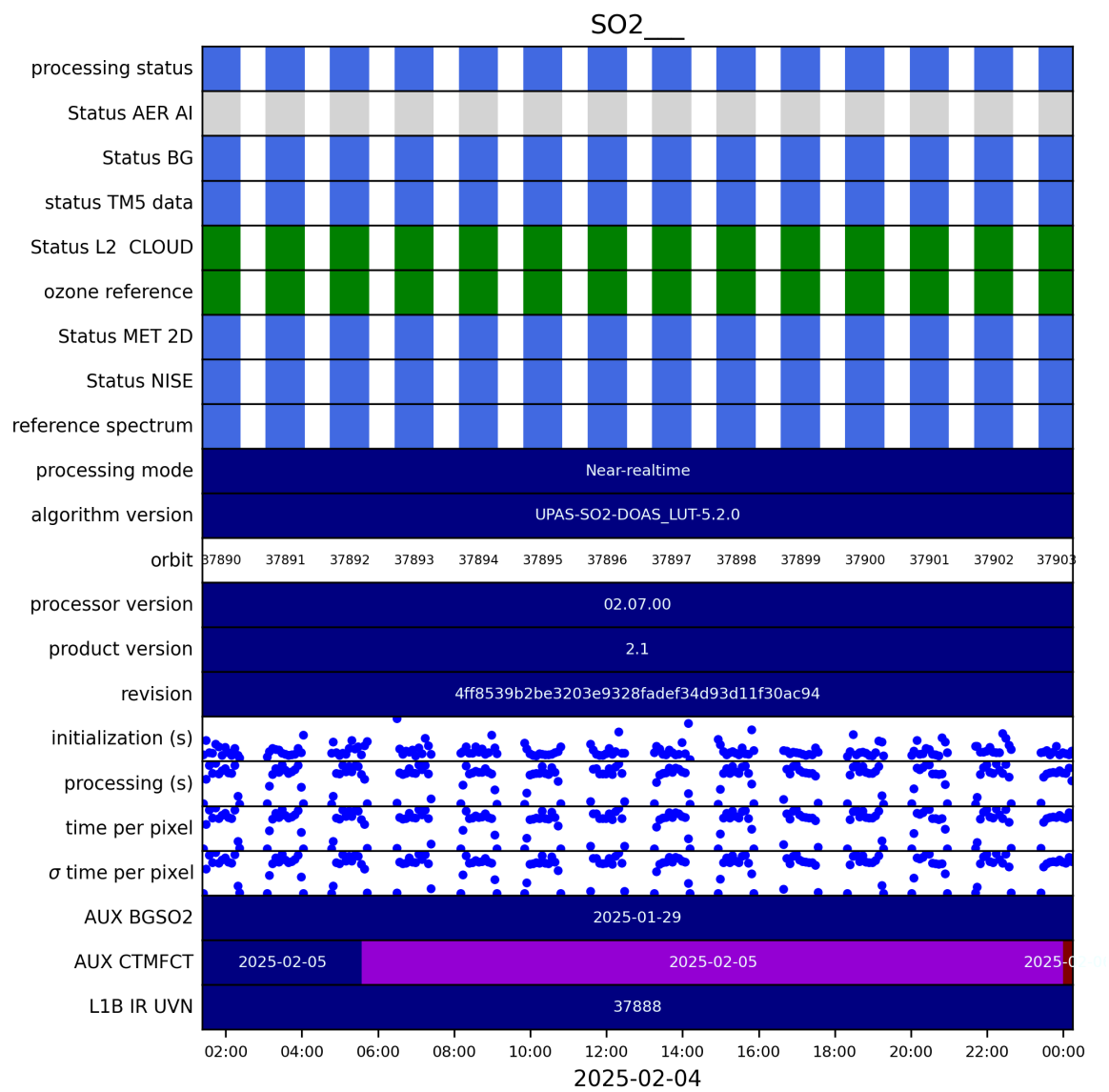


Figure 2: Input data per granule

5 Warnings and errors

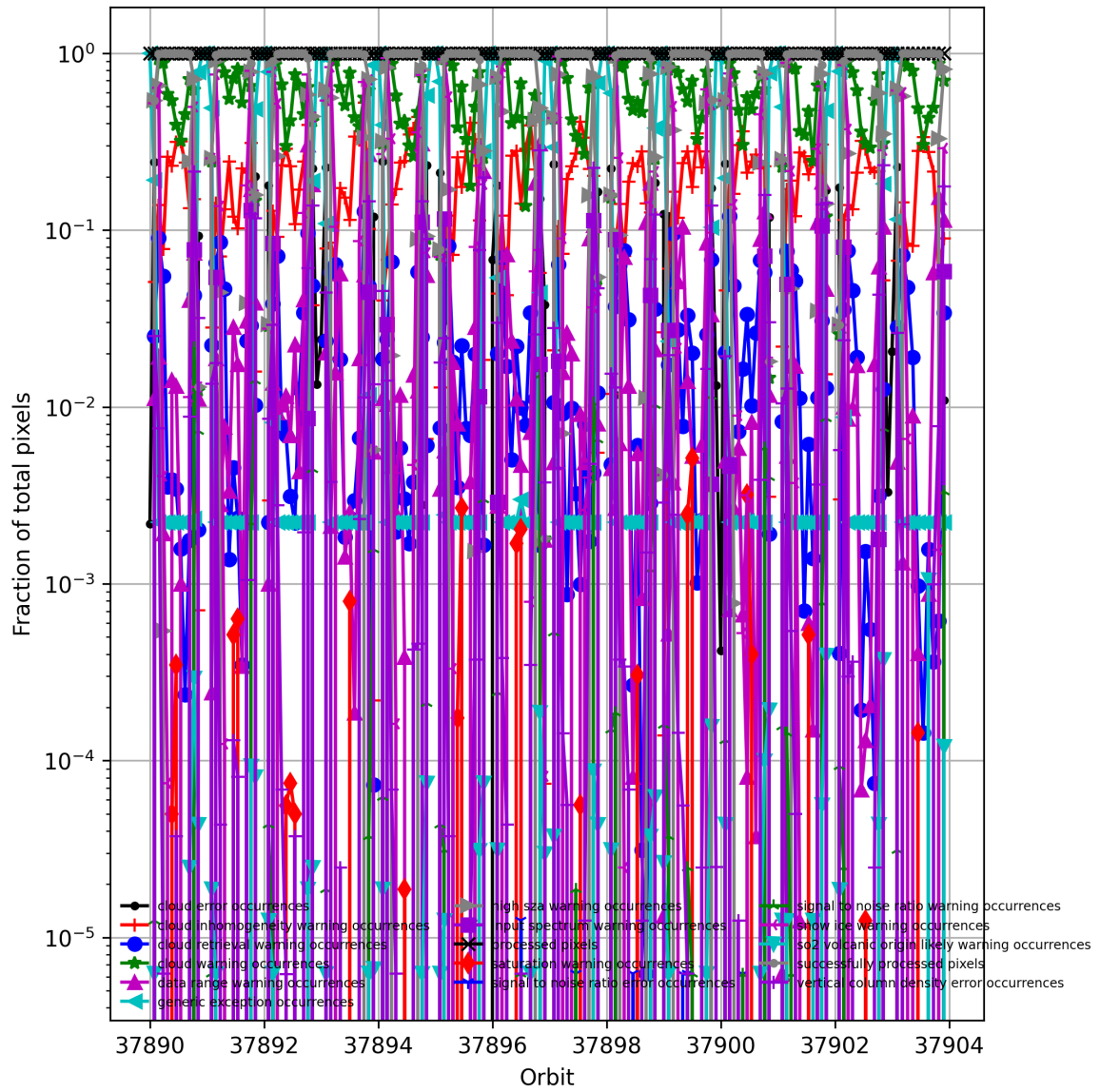


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

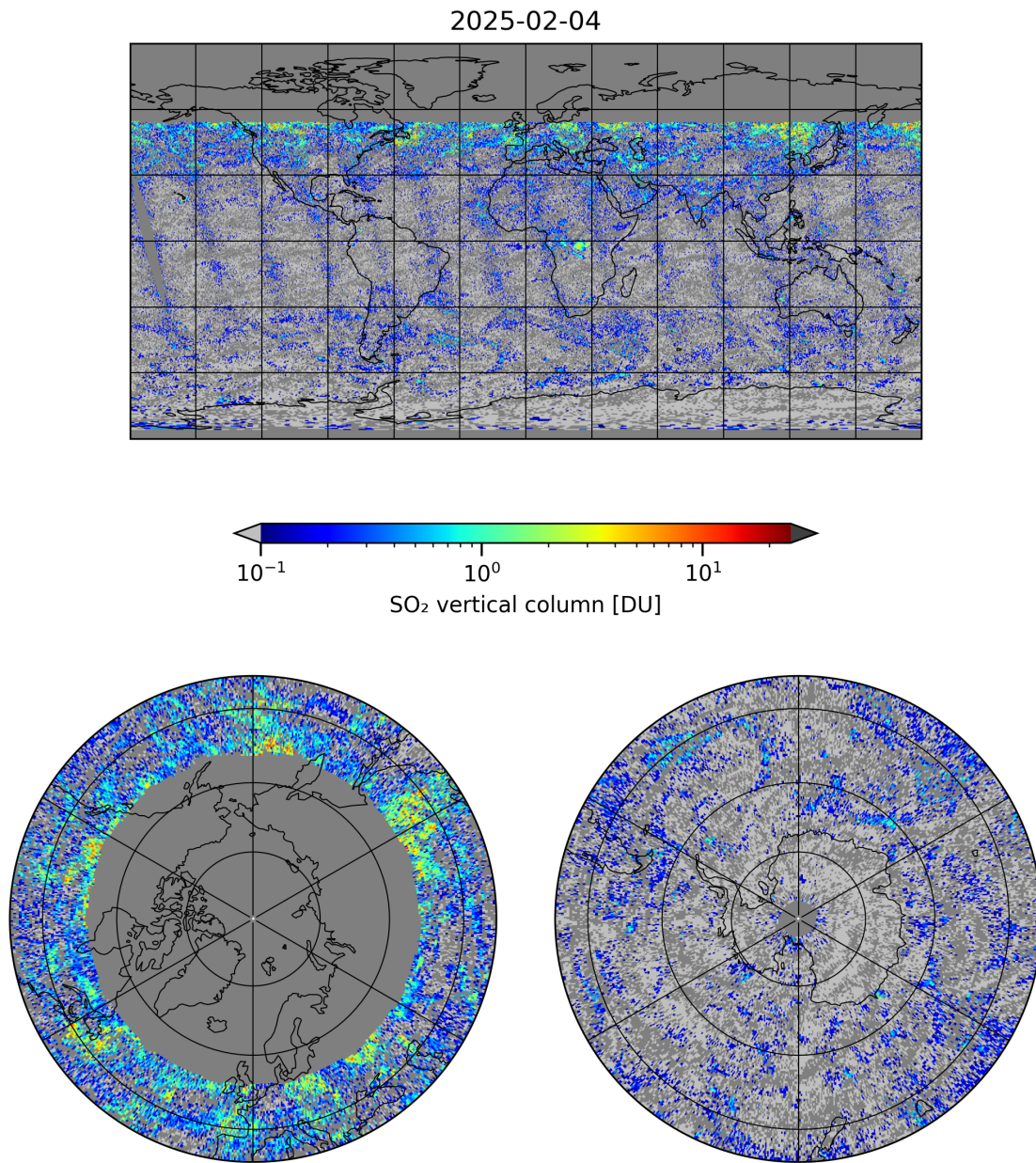


Figure 4: Map of “SO₂ vertical column” for 2025-02-04 to 2025-02-05

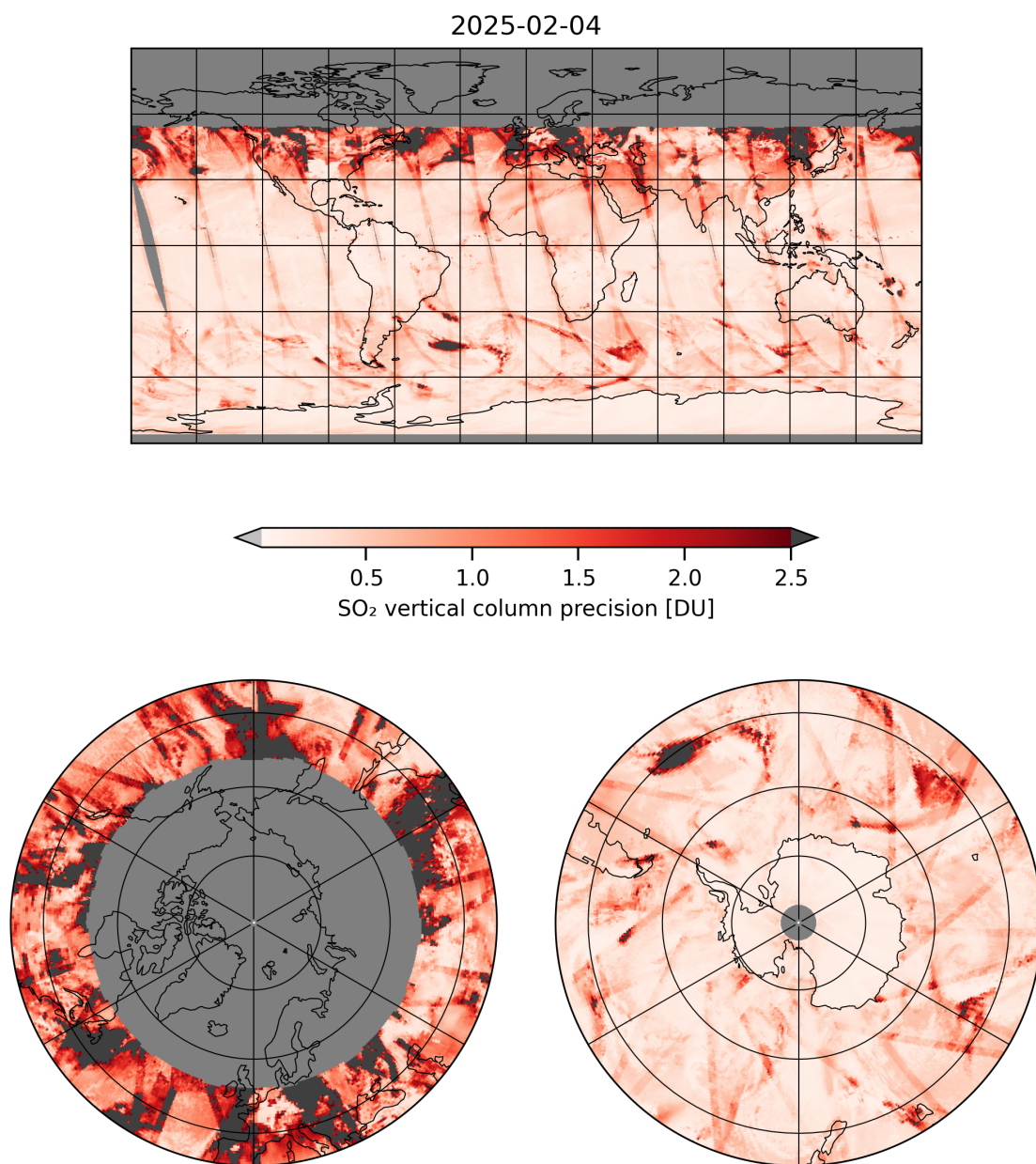


Figure 5: Map of “SO₂ vertical column precision” for 2025-02-04 to 2025-02-05

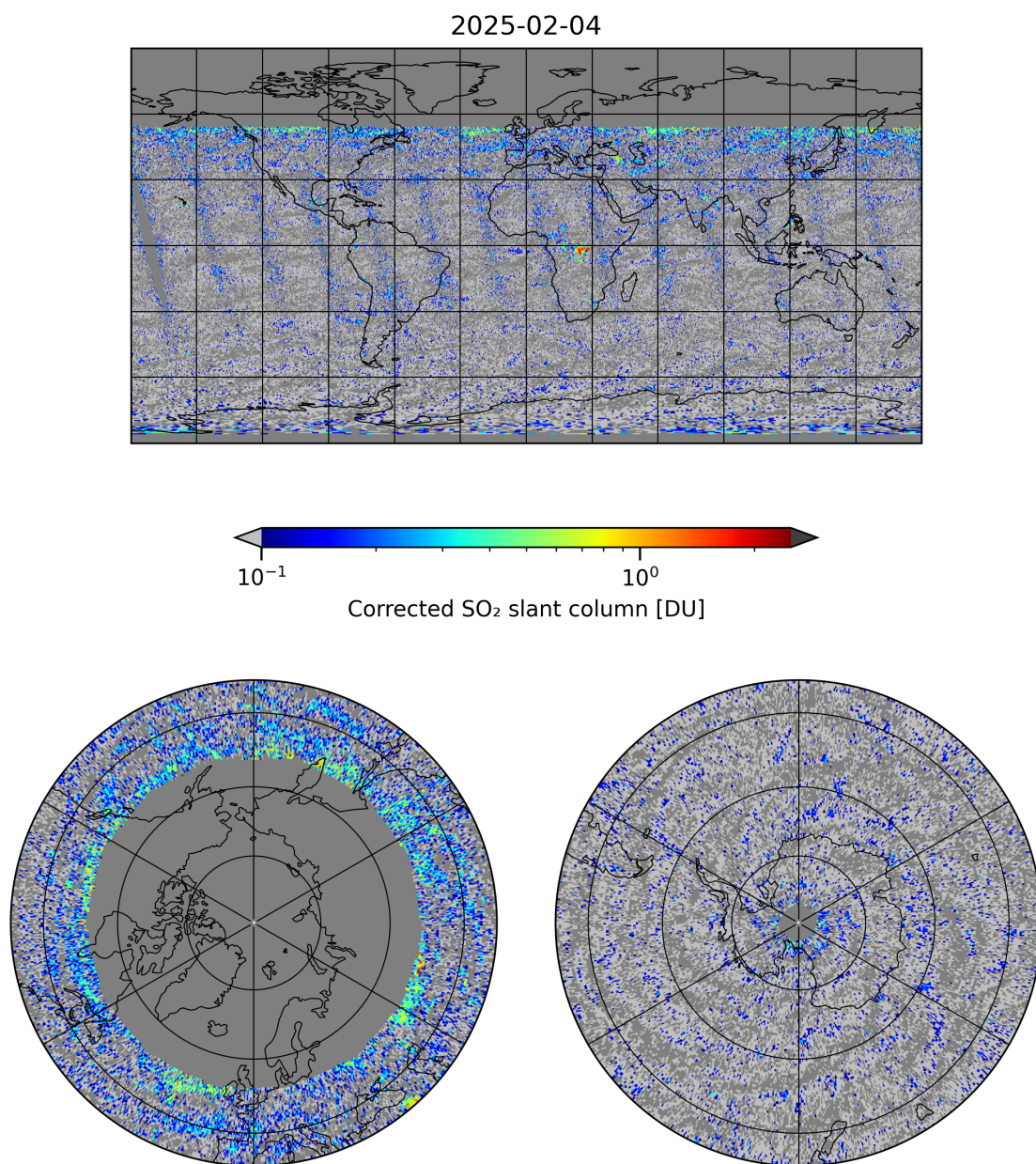


Figure 6: Map of “Corrected SO₂ slant column” for 2025-02-04 to 2025-02-05

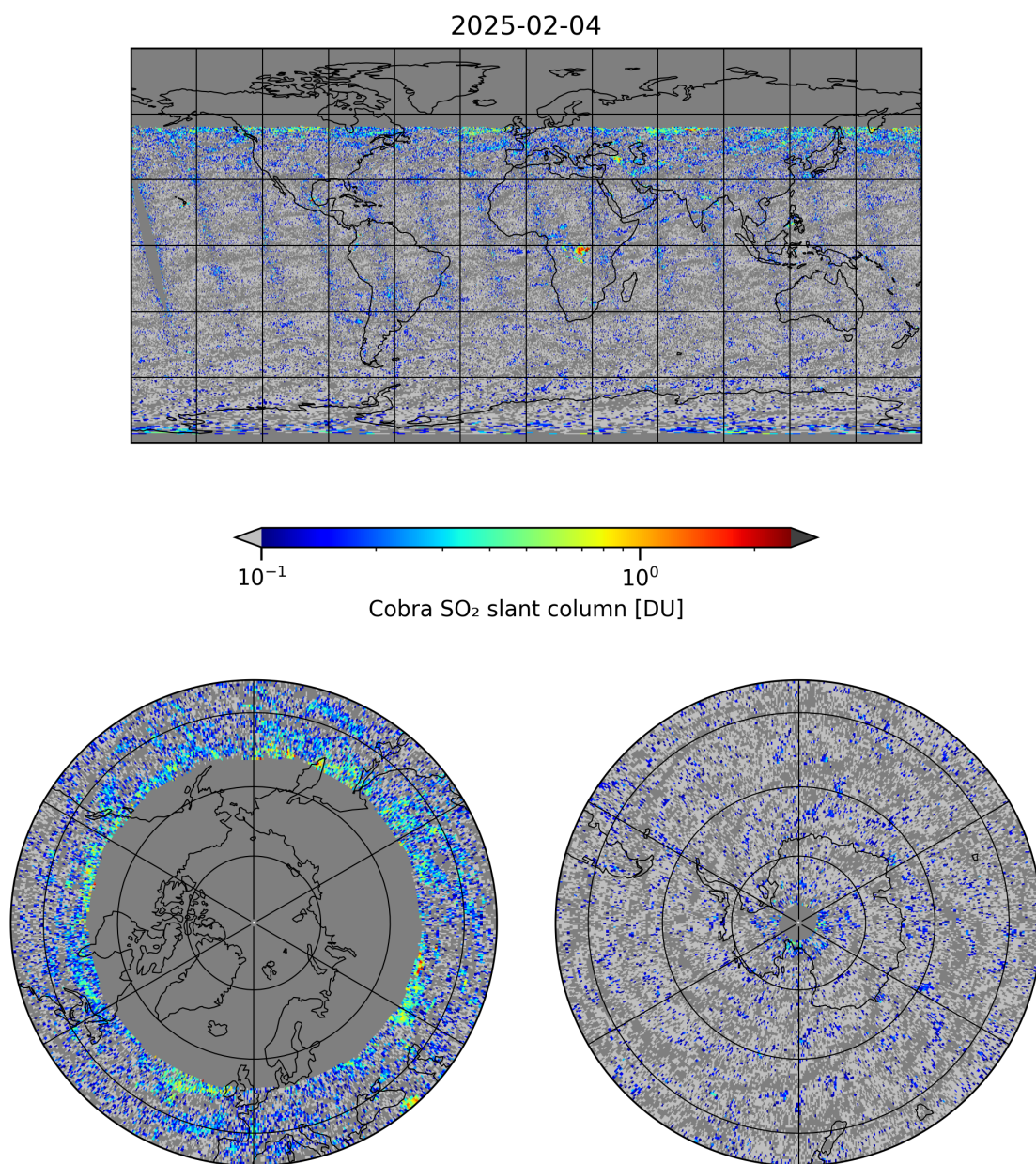


Figure 7: Map of “Cobra SO₂ slant column” for 2025-02-04 to 2025-02-05

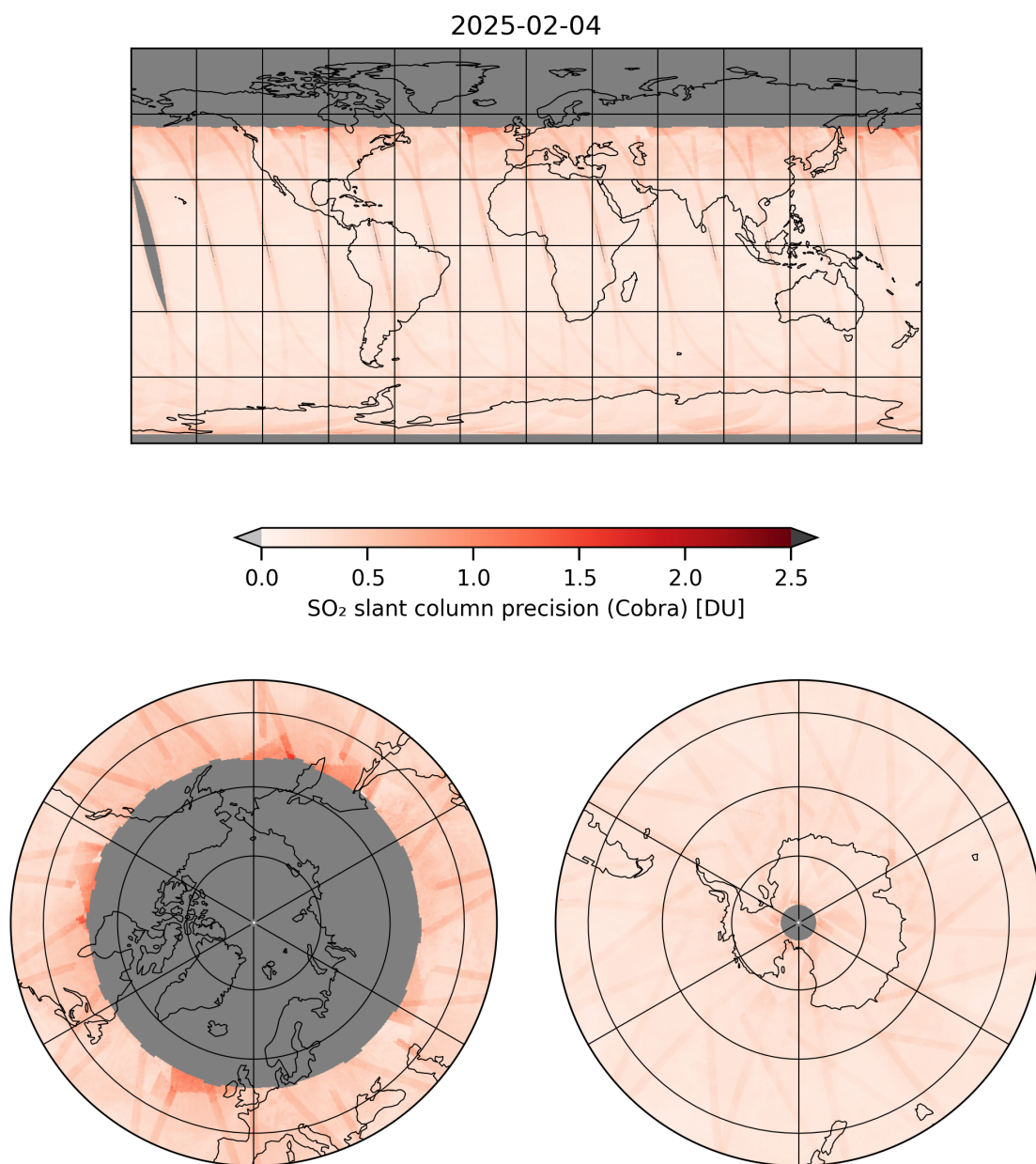


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-02-04 to 2025-02-05

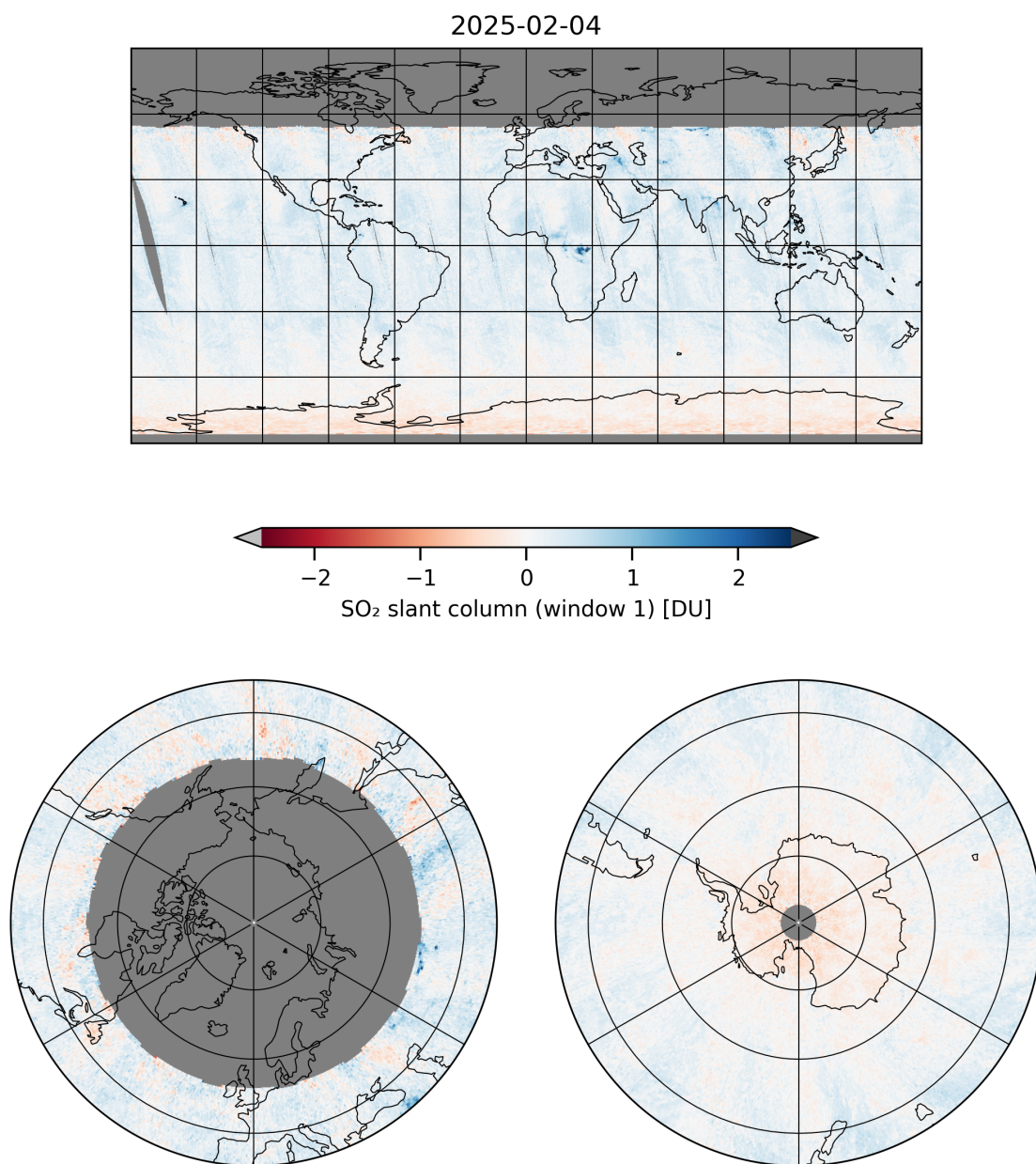


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-02-04 to 2025-02-05

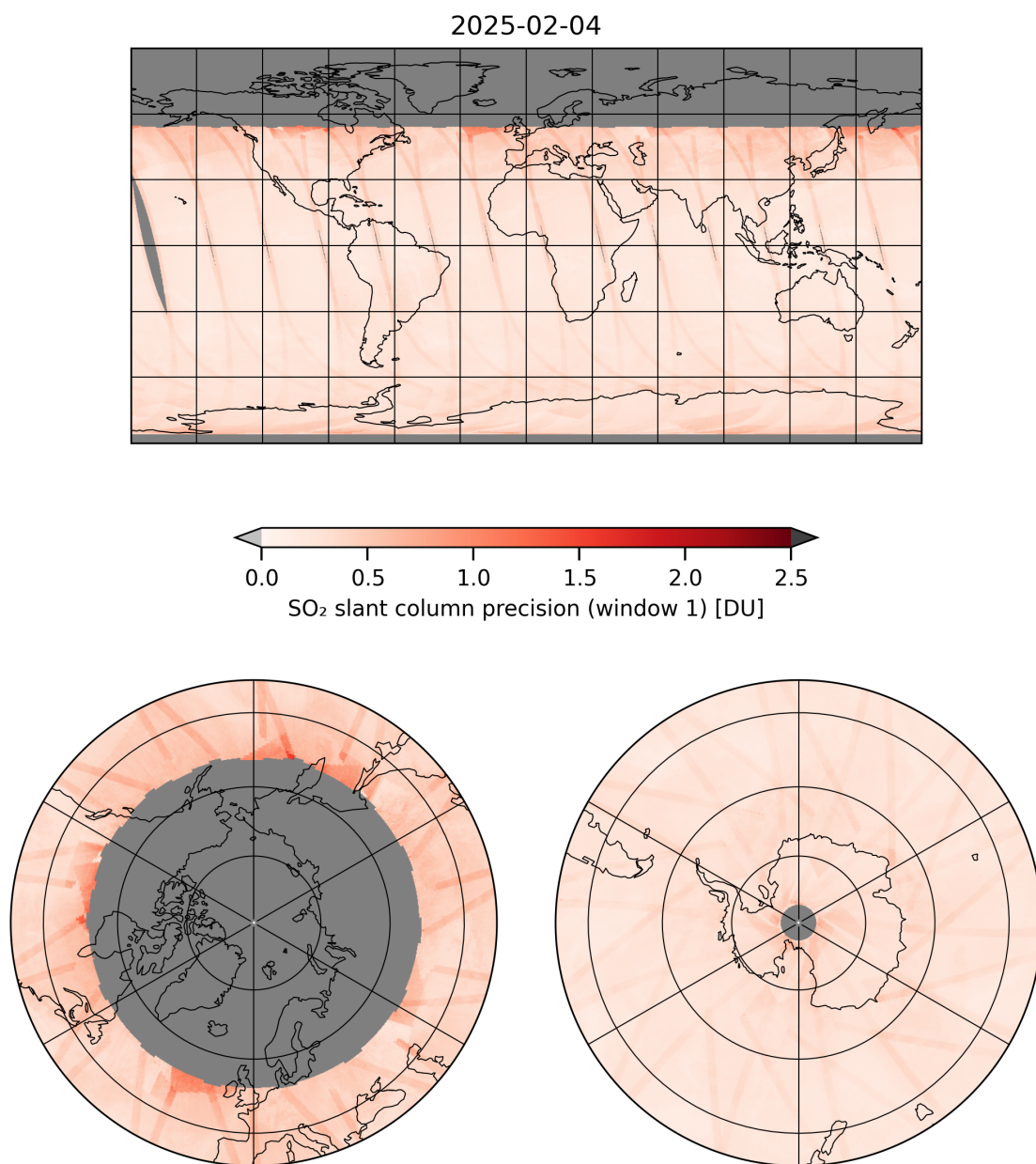


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-02-04 to 2025-02-05

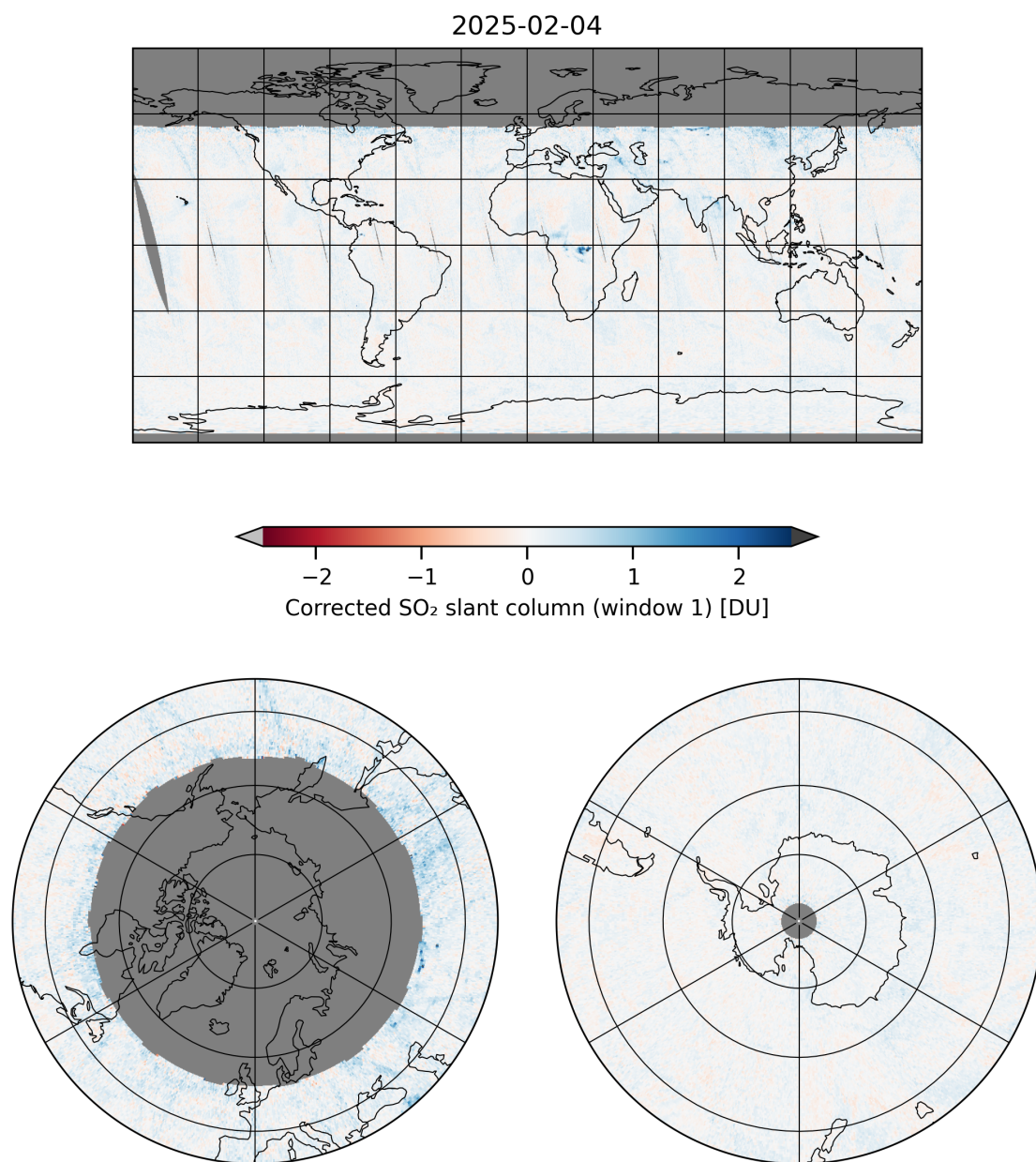


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-02-04 to 2025-02-05

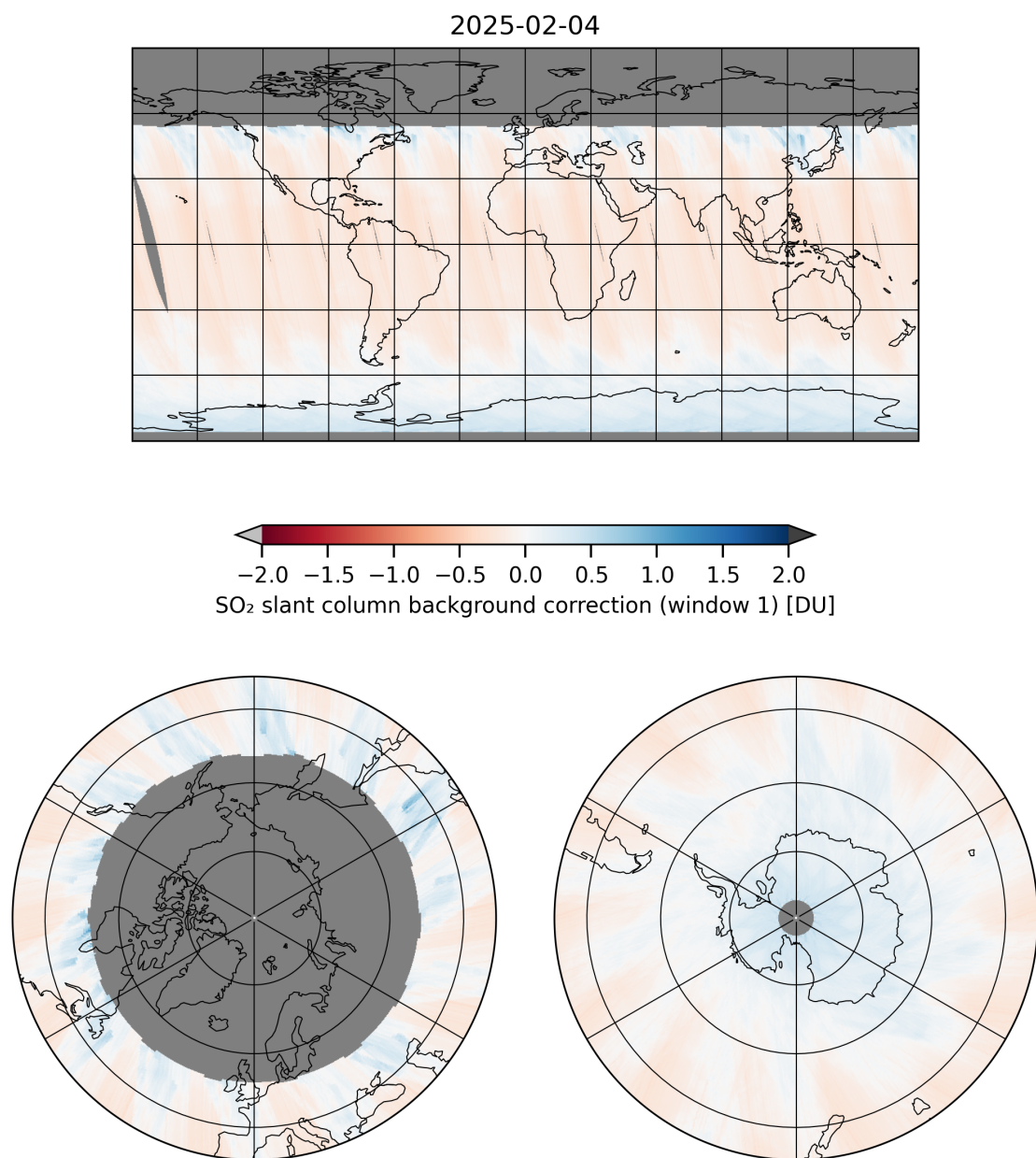


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-02-04 to 2025-02-05

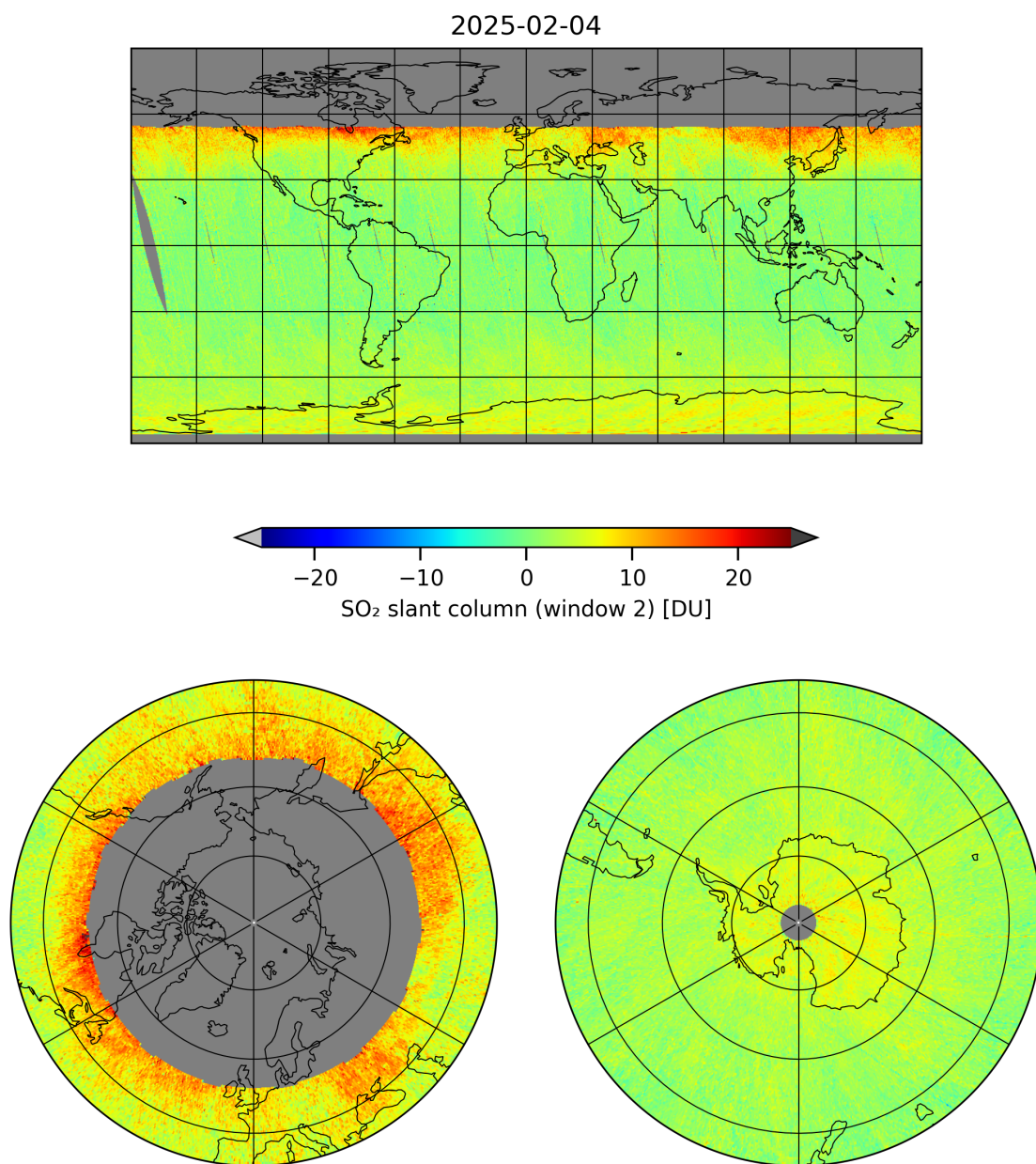


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-02-04 to 2025-02-05

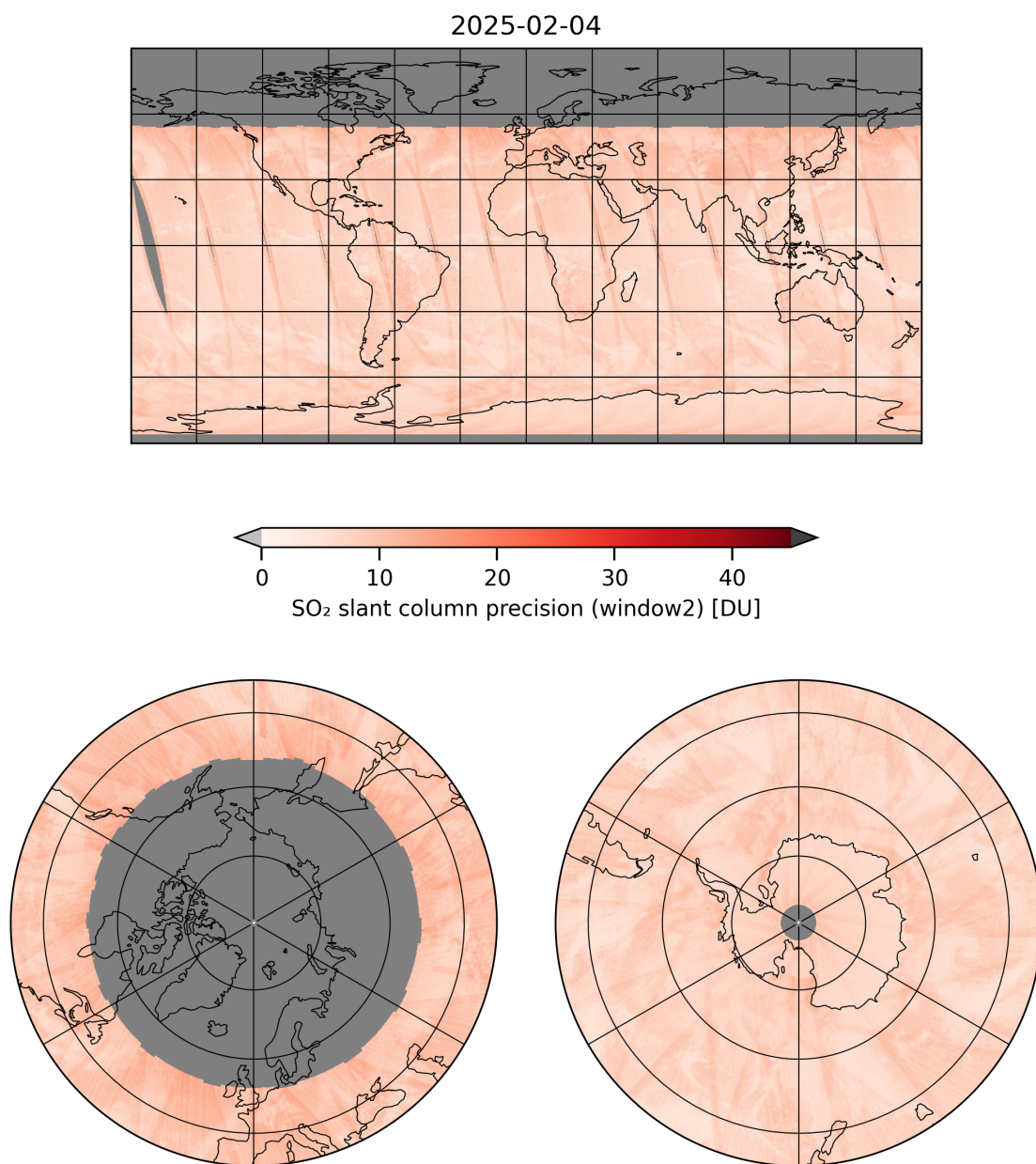


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-02-04 to 2025-02-05

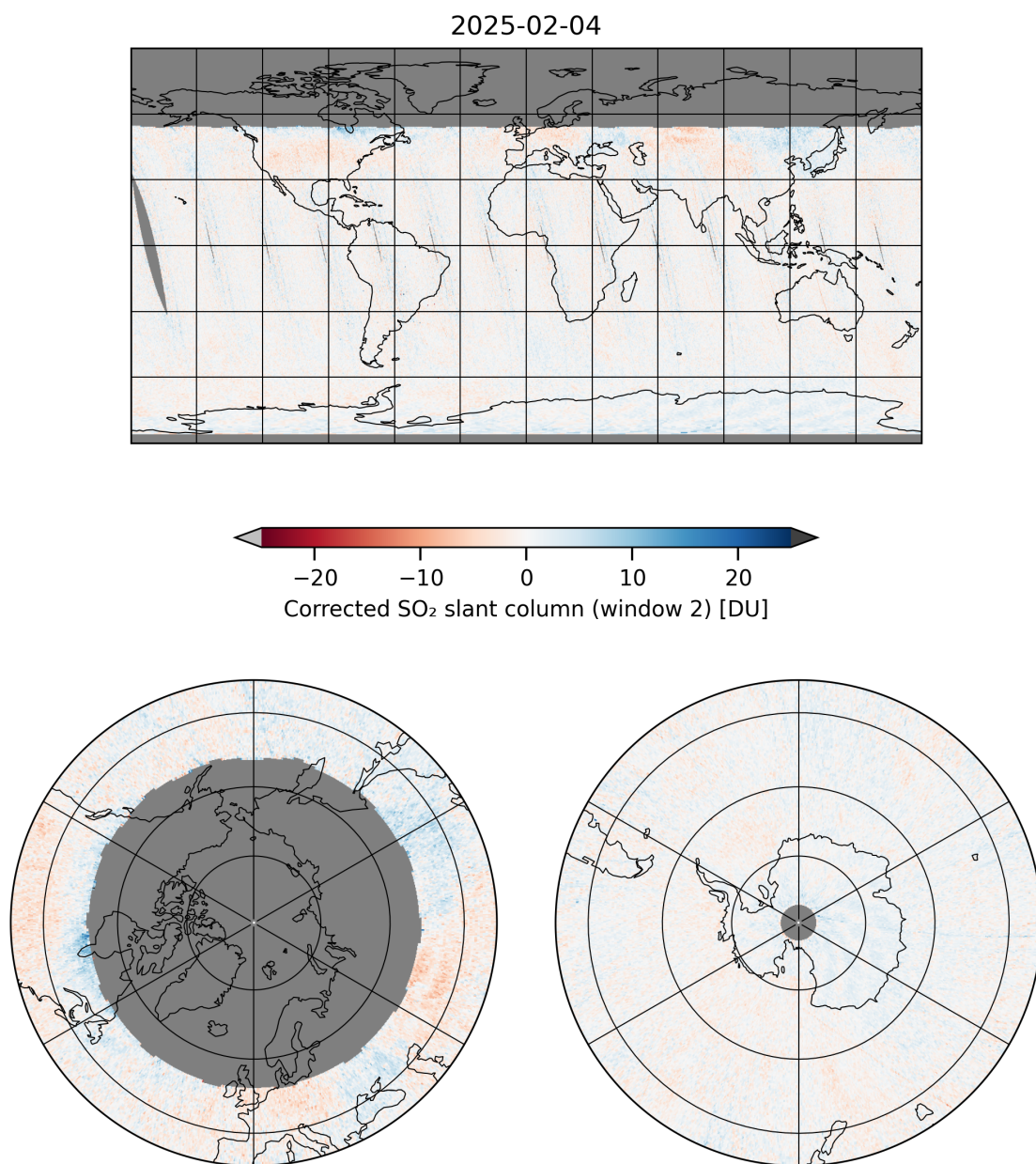


Figure 15: Map of "Corrected SO₂ slant column (window 2)" for 2025-02-04 to 2025-02-05

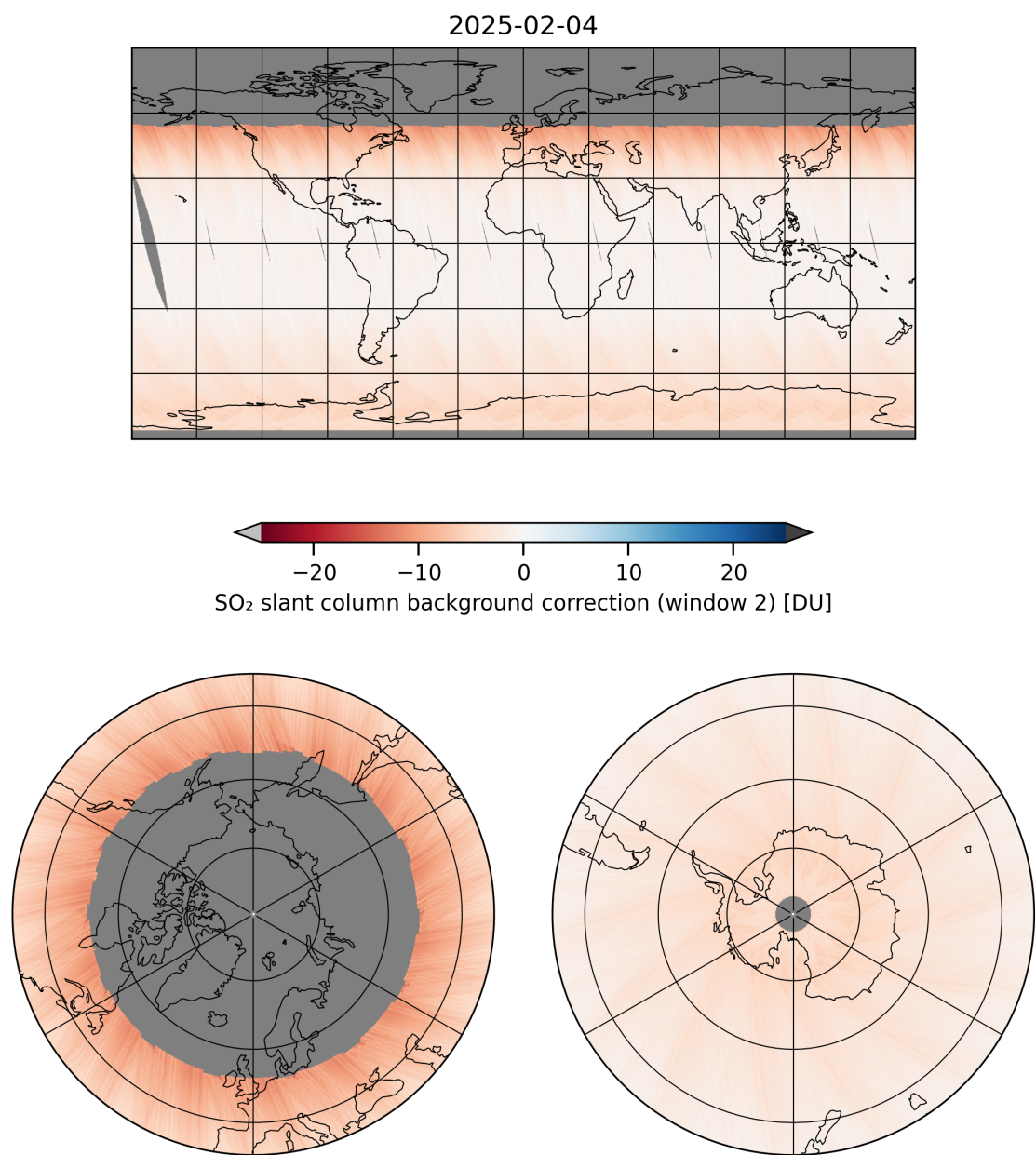


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-02-04 to 2025-02-05

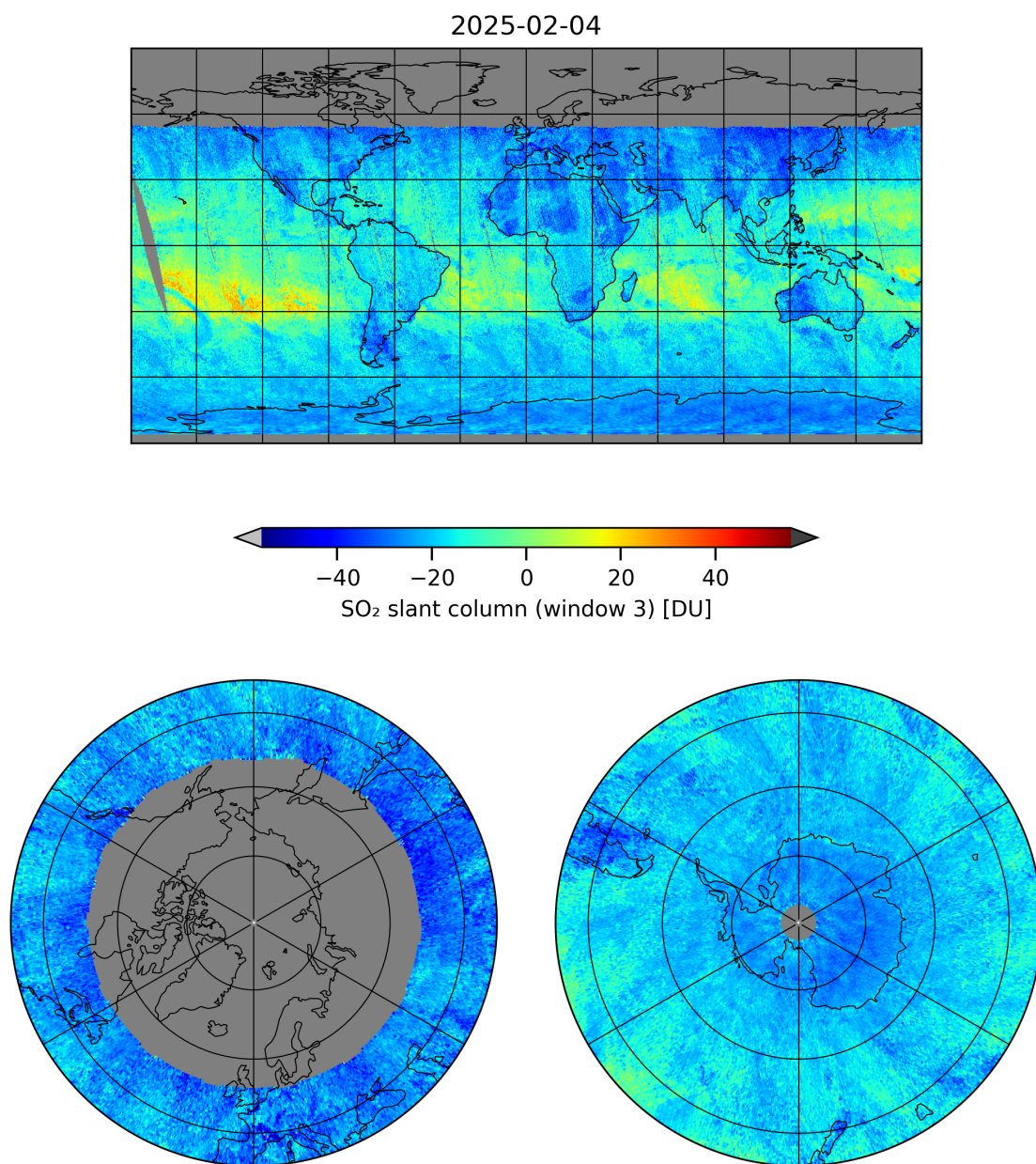


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-02-04 to 2025-02-05

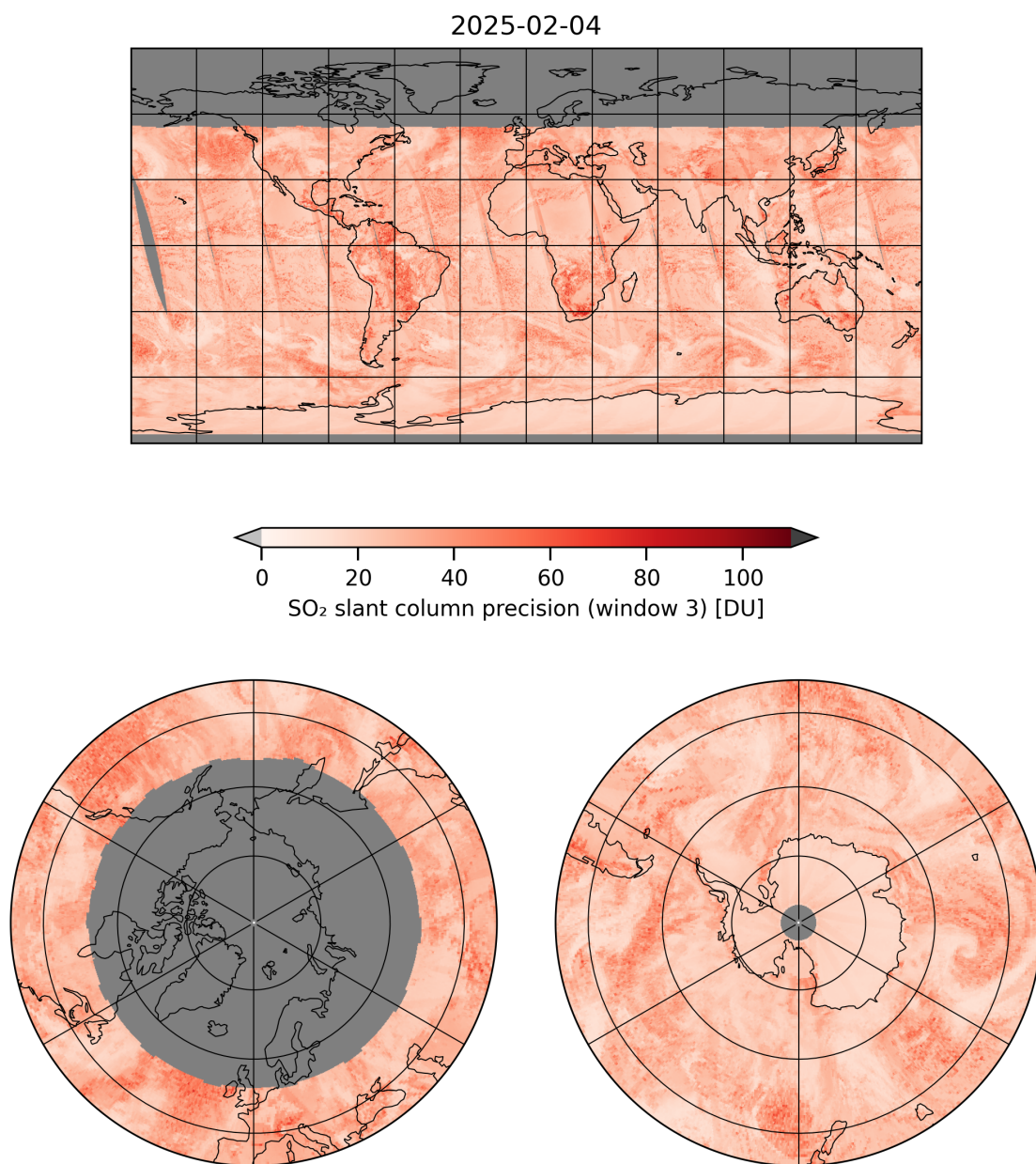


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-02-04 to 2025-02-05

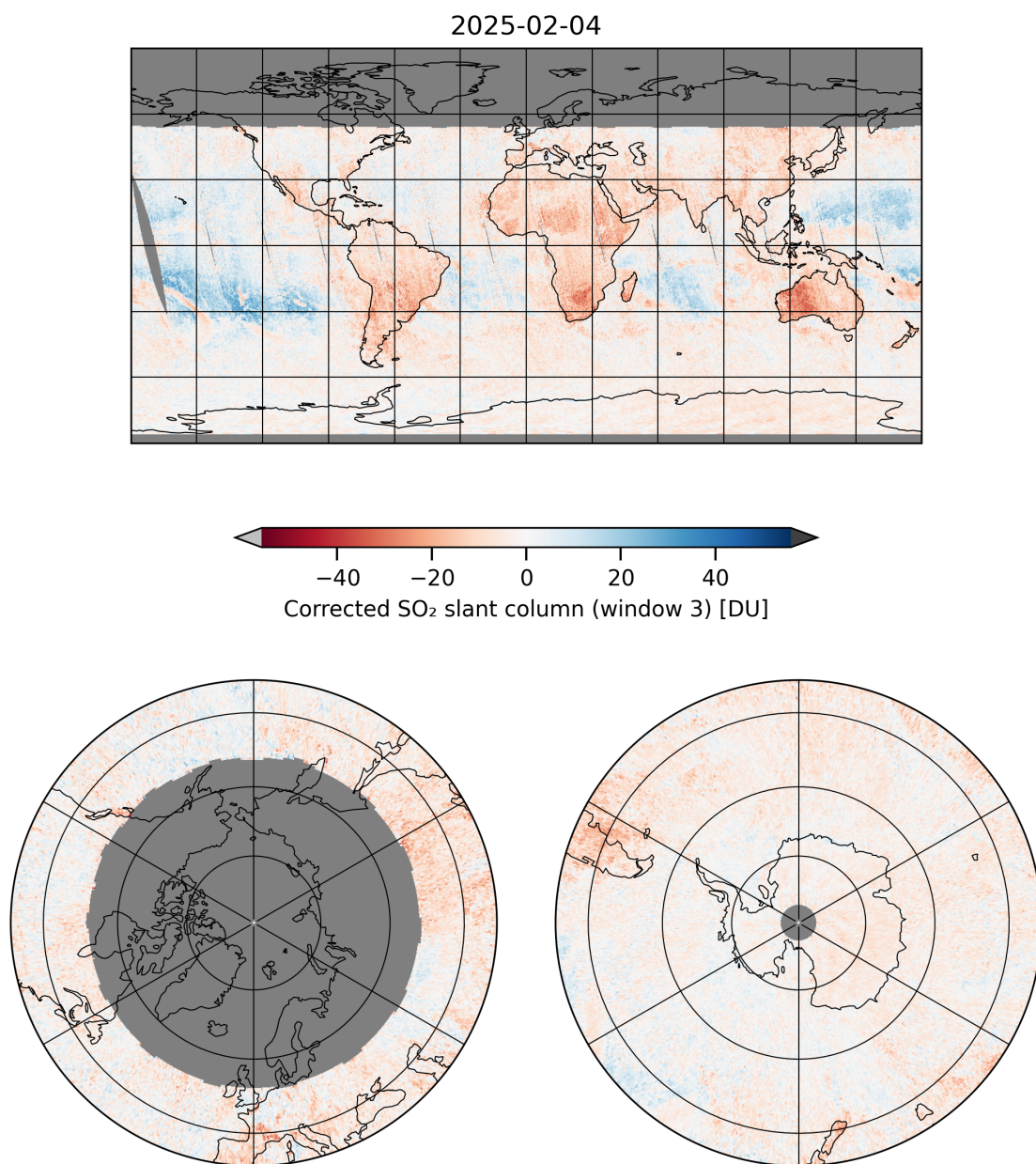


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-02-04 to 2025-02-05

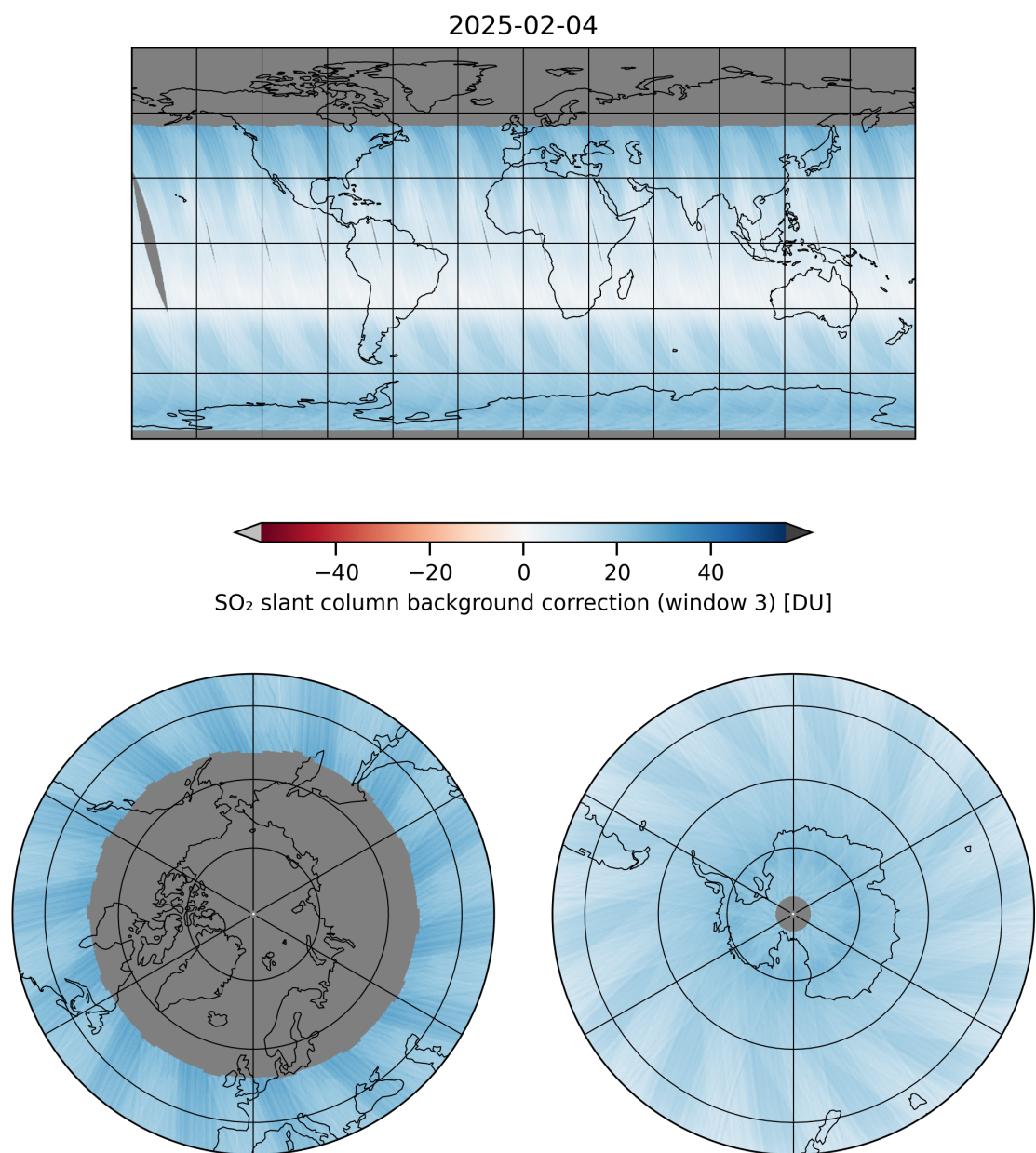


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-02-04 to 2025-02-05

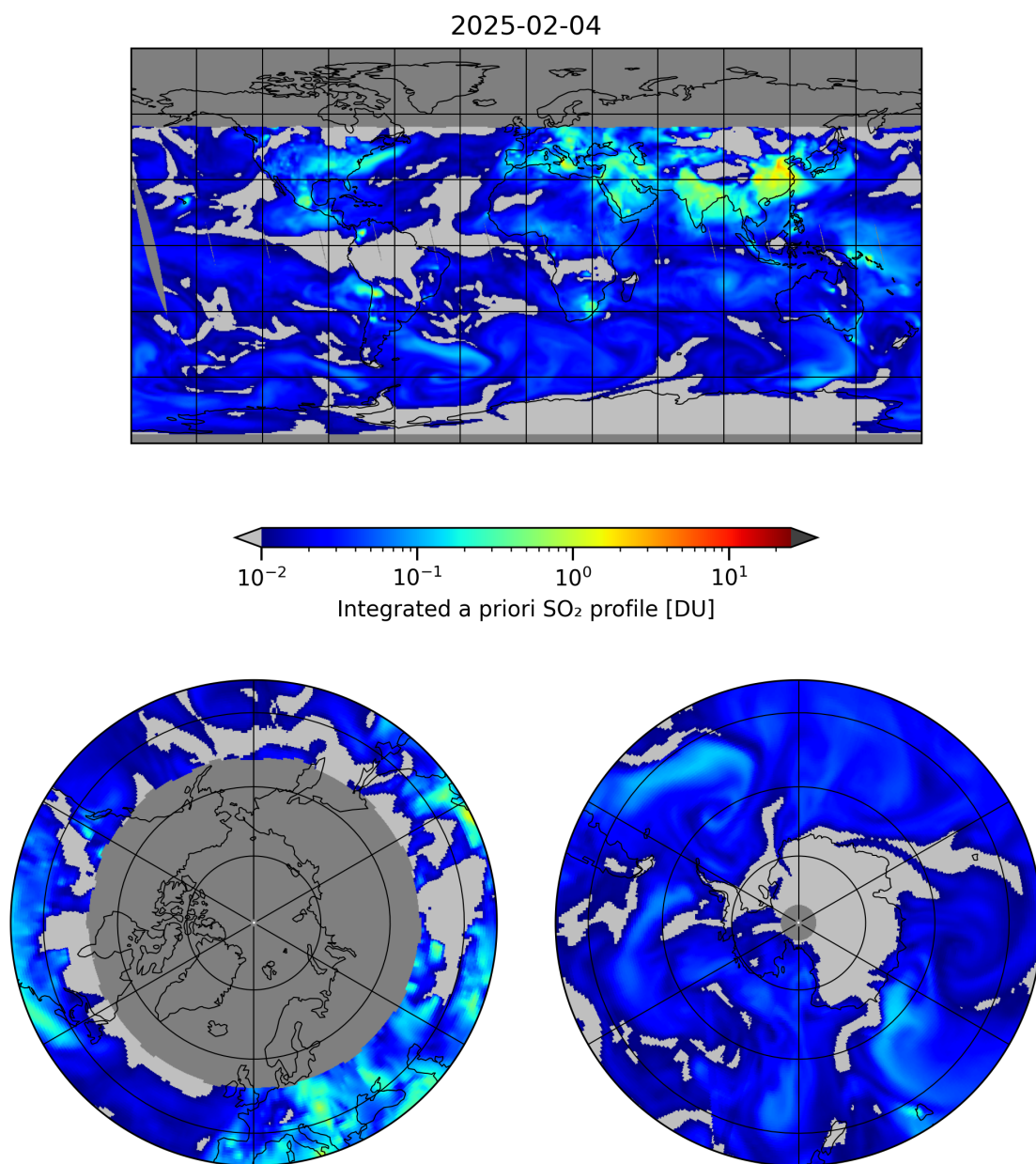


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-02-04 to 2025-02-05

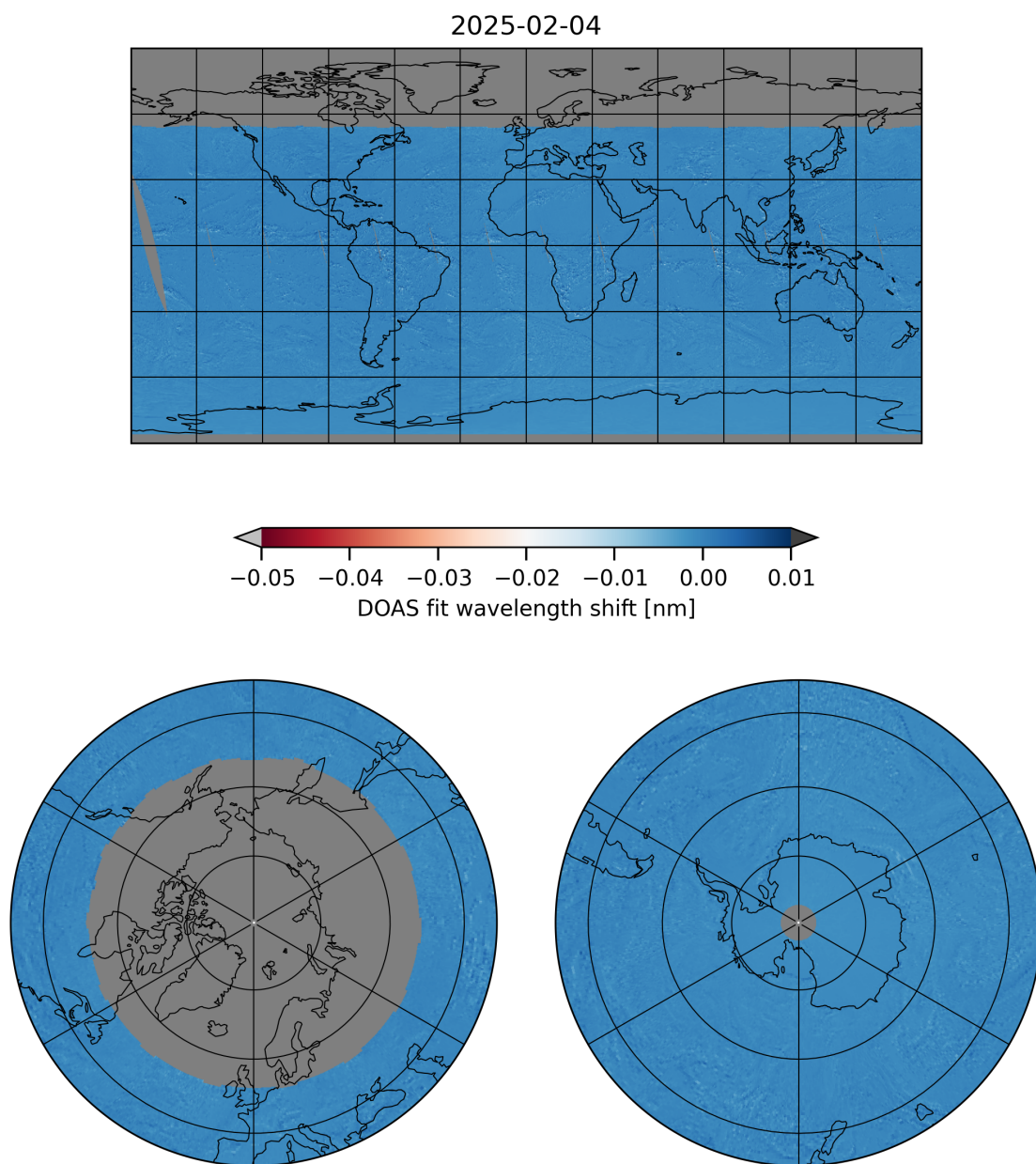


Figure 22: Map of “DOAS fit wavelength shift” for 2025-02-04 to 2025-02-05

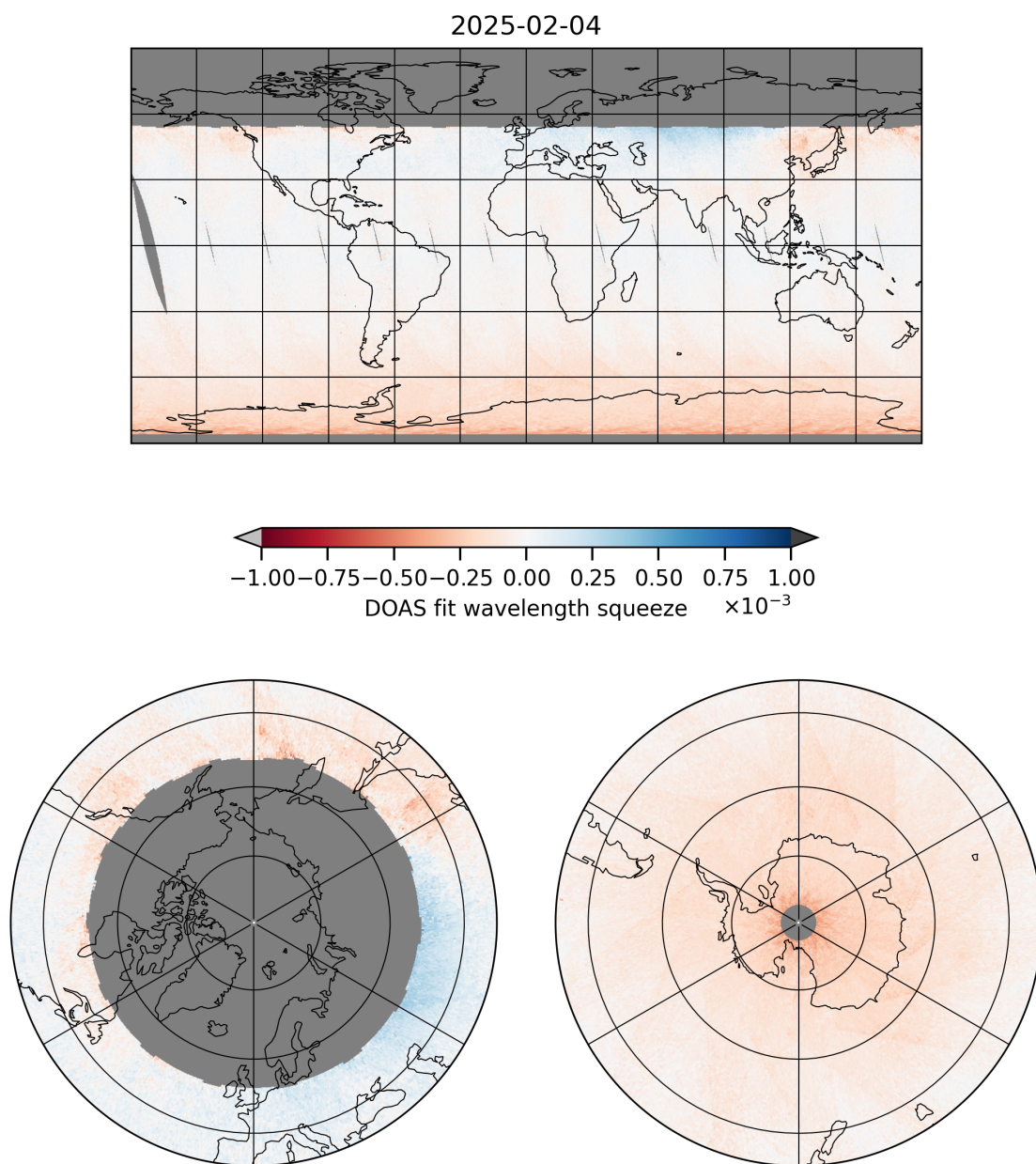


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-02-04 to 2025-02-05

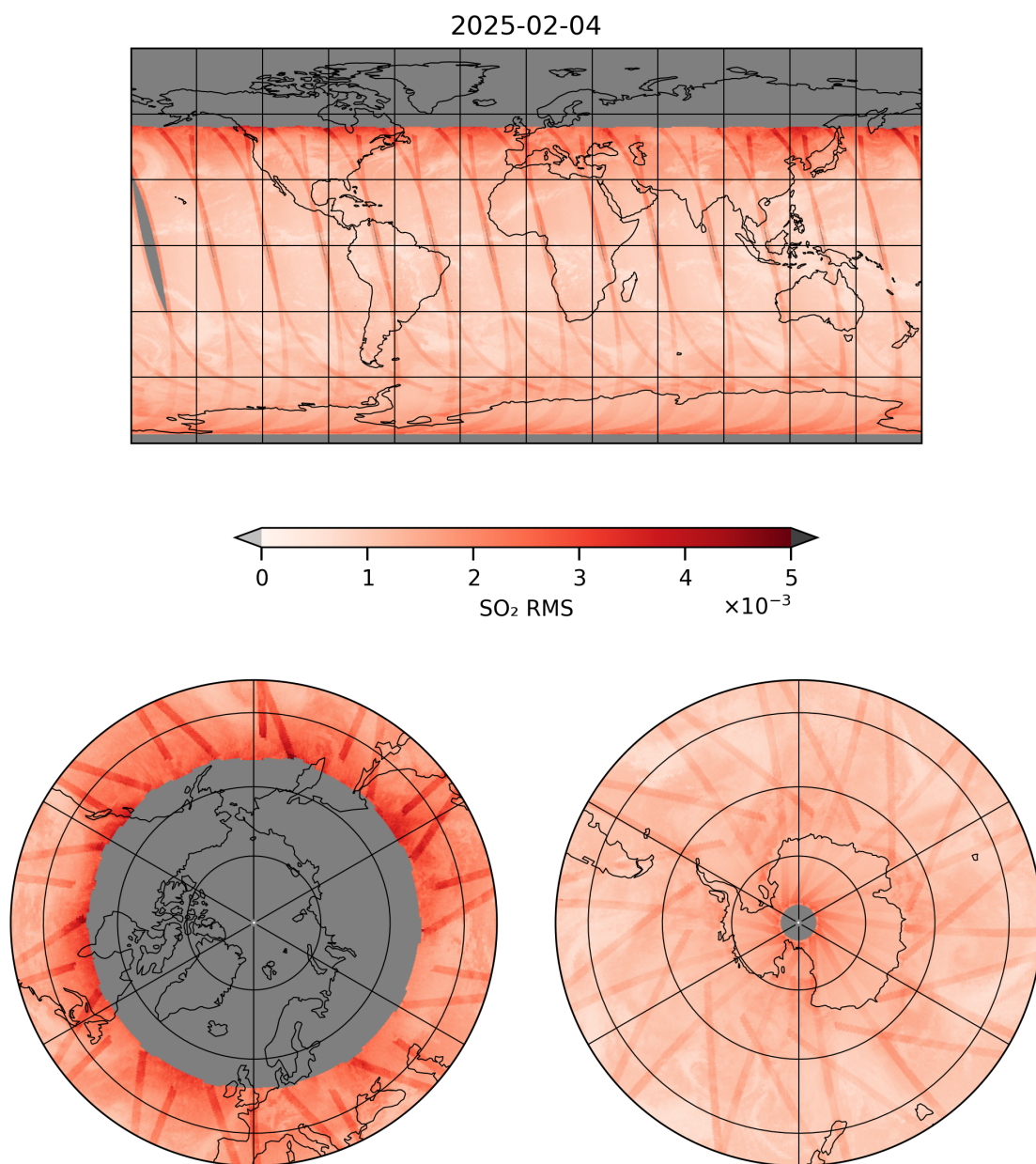


Figure 24: Map of “SO₂ RMS” for 2025-02-04 to 2025-02-05

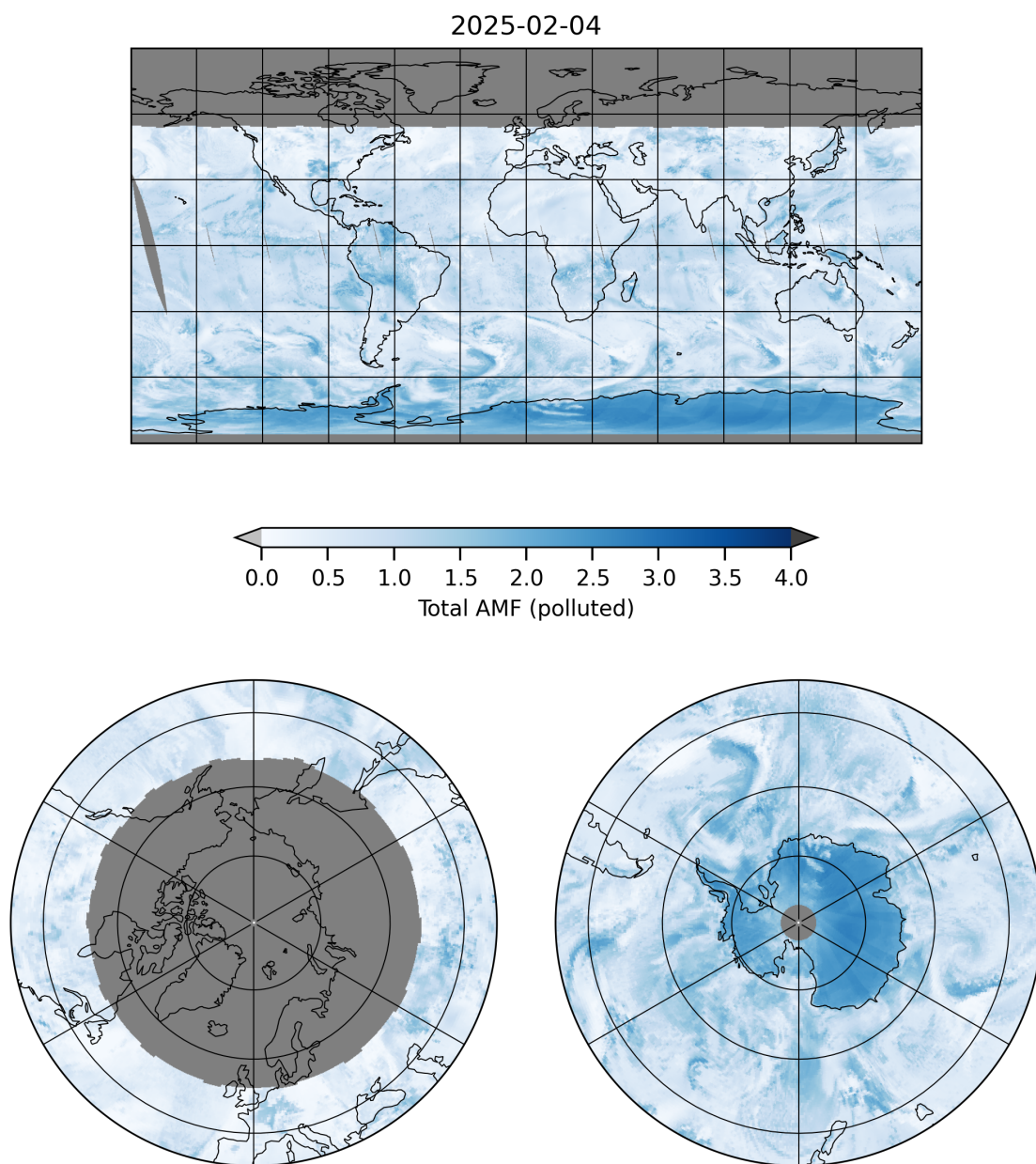


Figure 25: Map of “Total AMF (polluted)” for 2025-02-04 to 2025-02-05

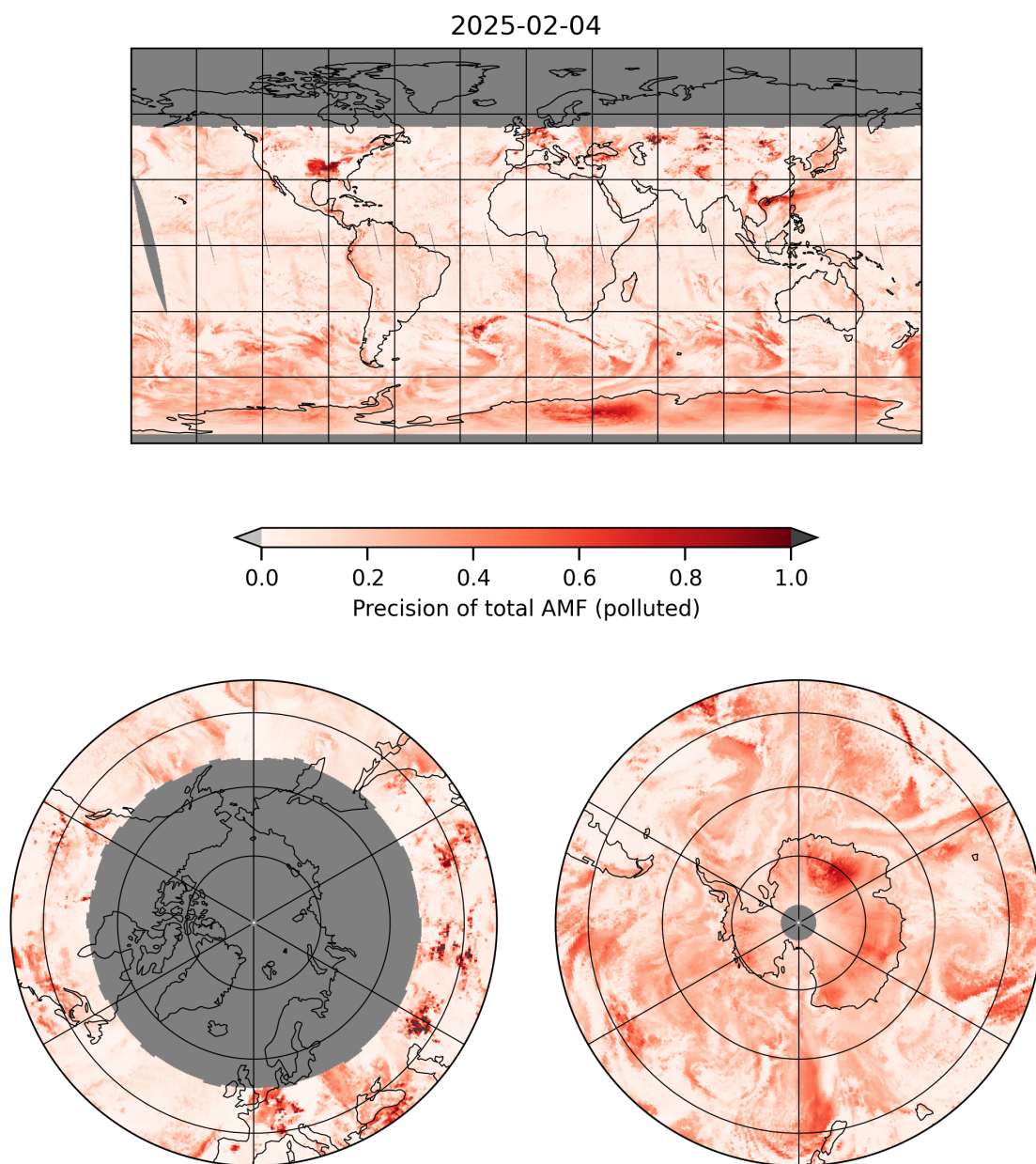


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-02-04 to 2025-02-05

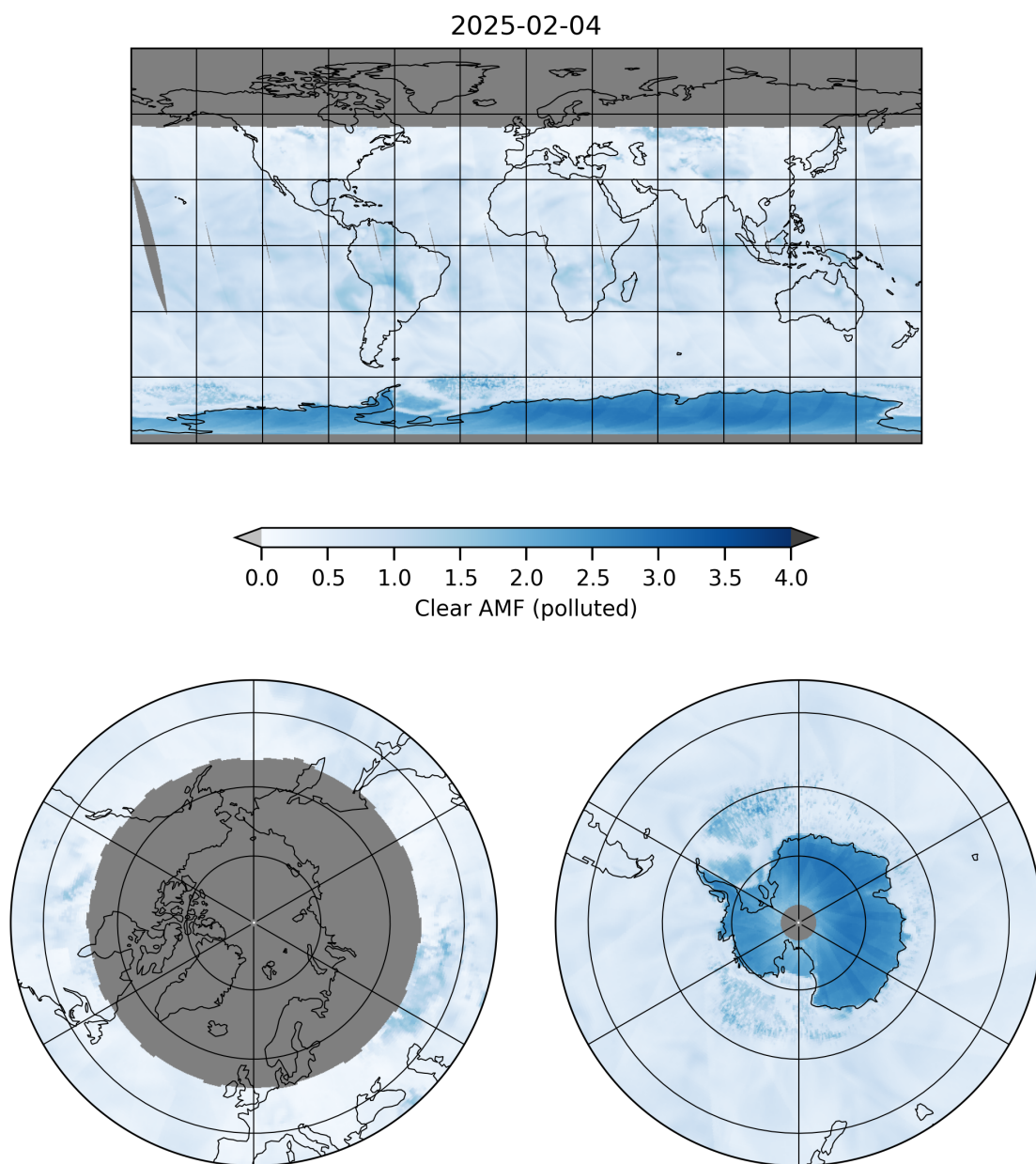


Figure 27: Map of “Clear AMF (polluted)” for 2025-02-04 to 2025-02-05

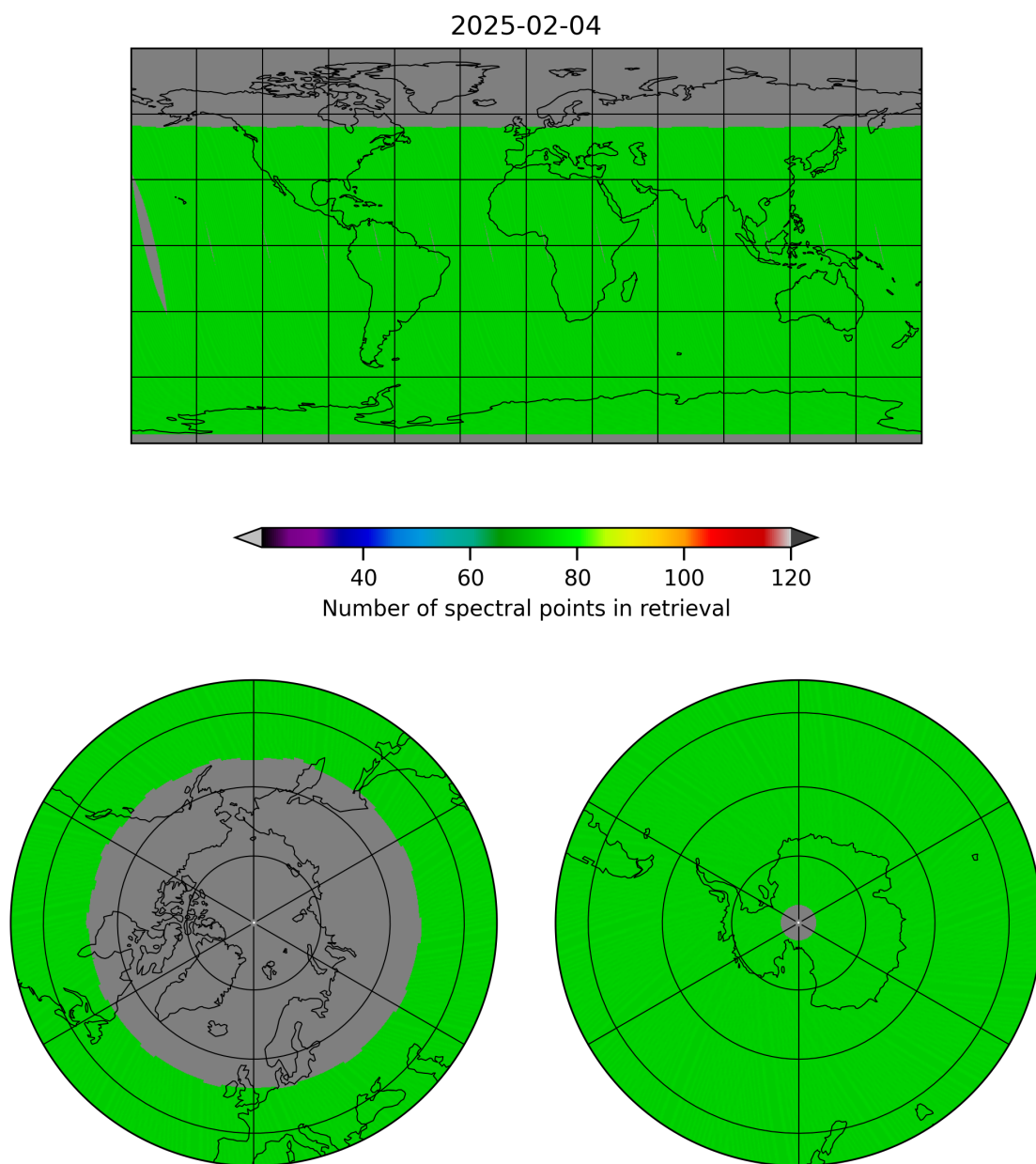


Figure 28: Map of “Number of spectral points in retrieval” for 2025-02-04 to 2025-02-05

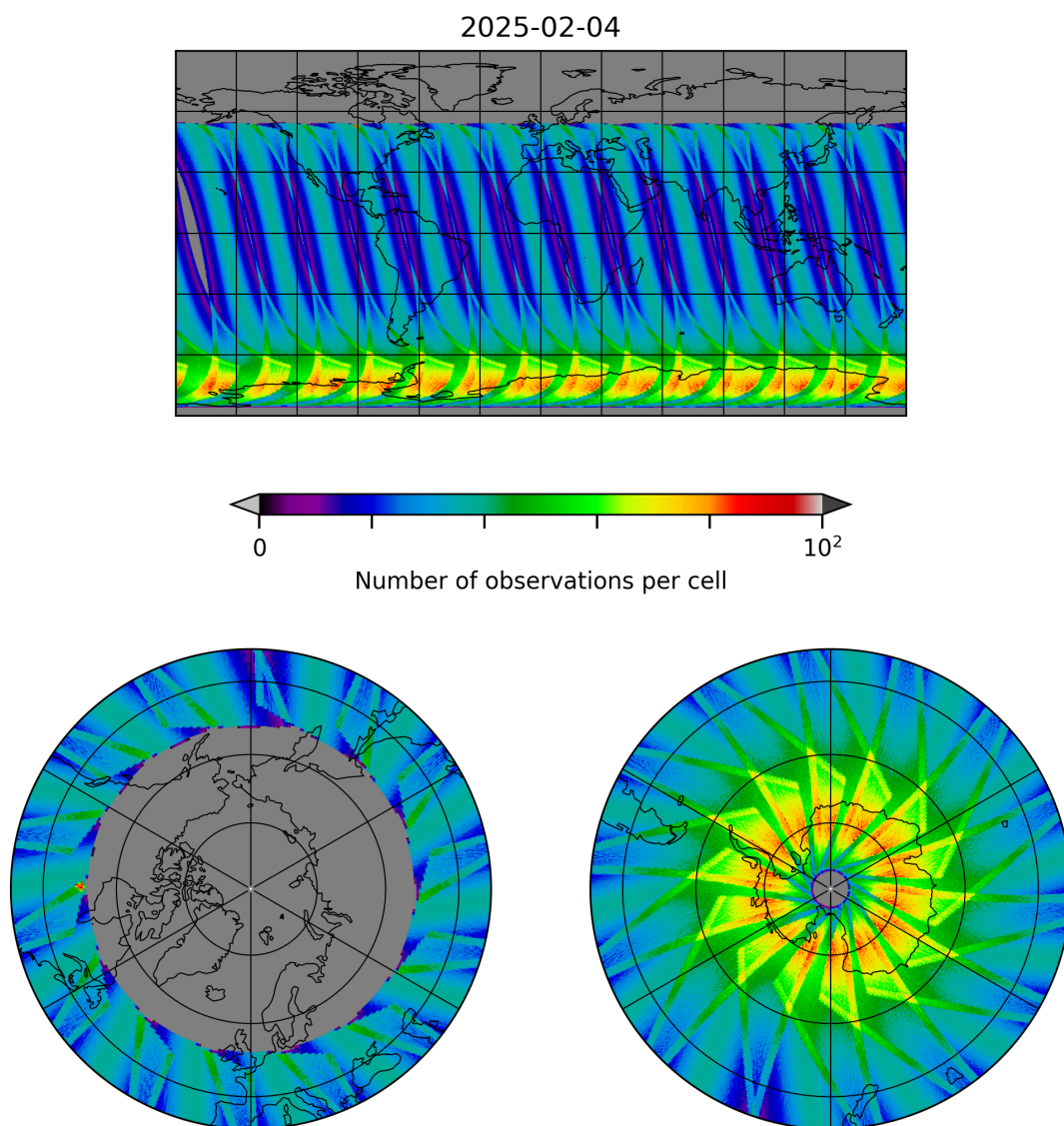


Figure 29: Map of the number of observations for 2025-02-04 to 2025-02-05

7 Zonal average

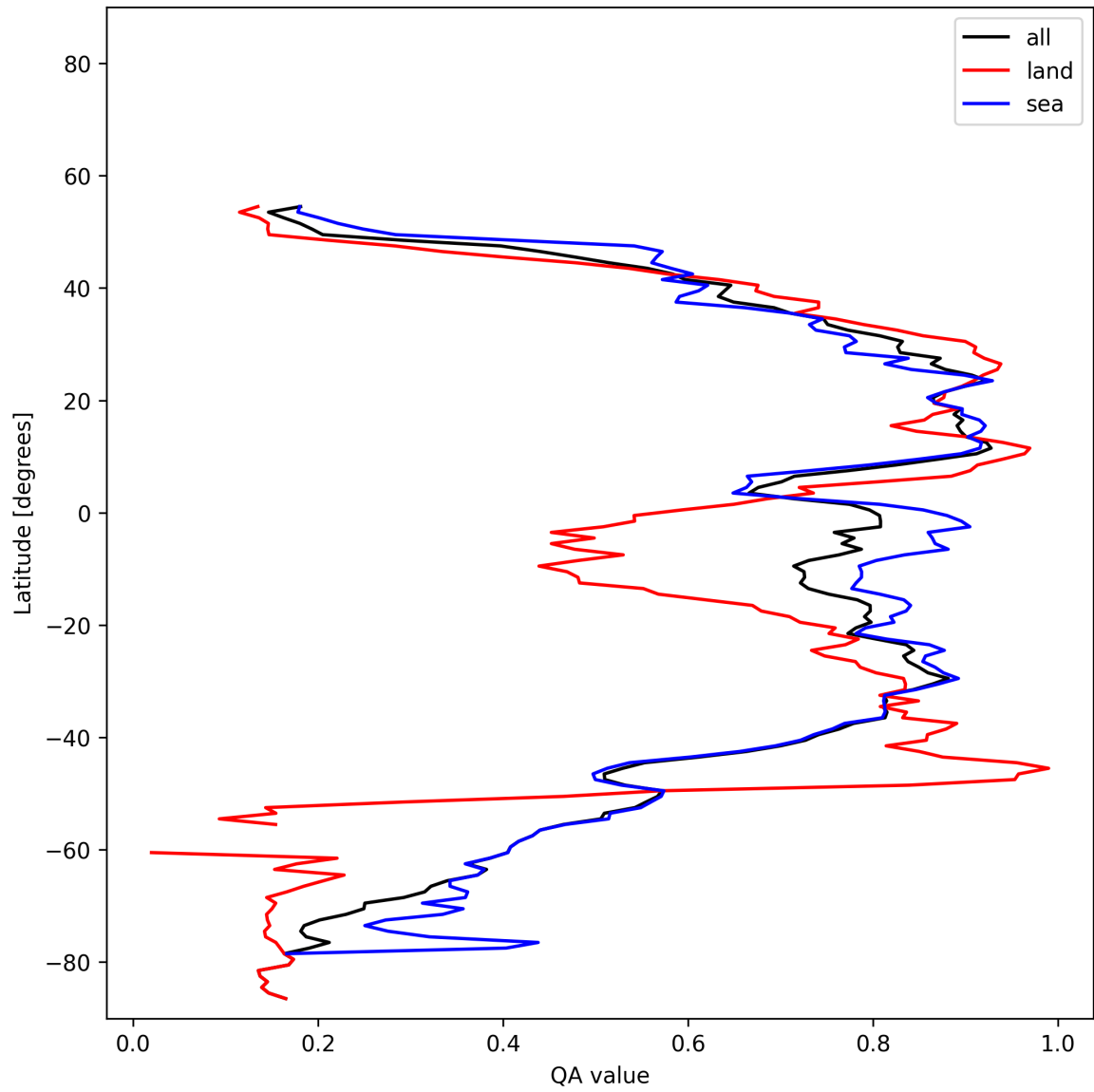


Figure 30: Zonal average of “QA value” for 2025-02-04 to 2025-02-05.

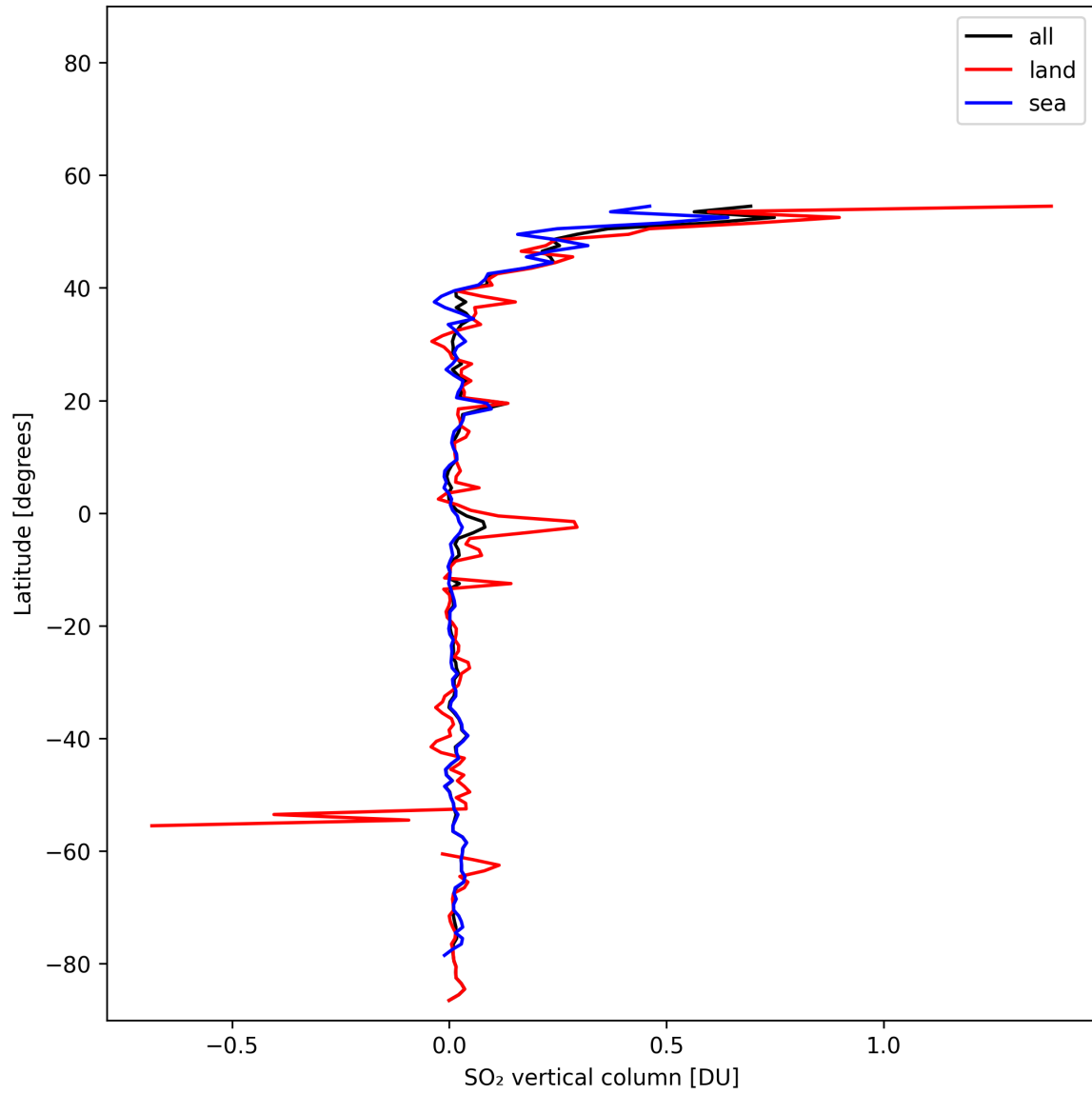


Figure 31: Zonal average of “SO₂ vertical column” for 2025-02-04 to 2025-02-05.

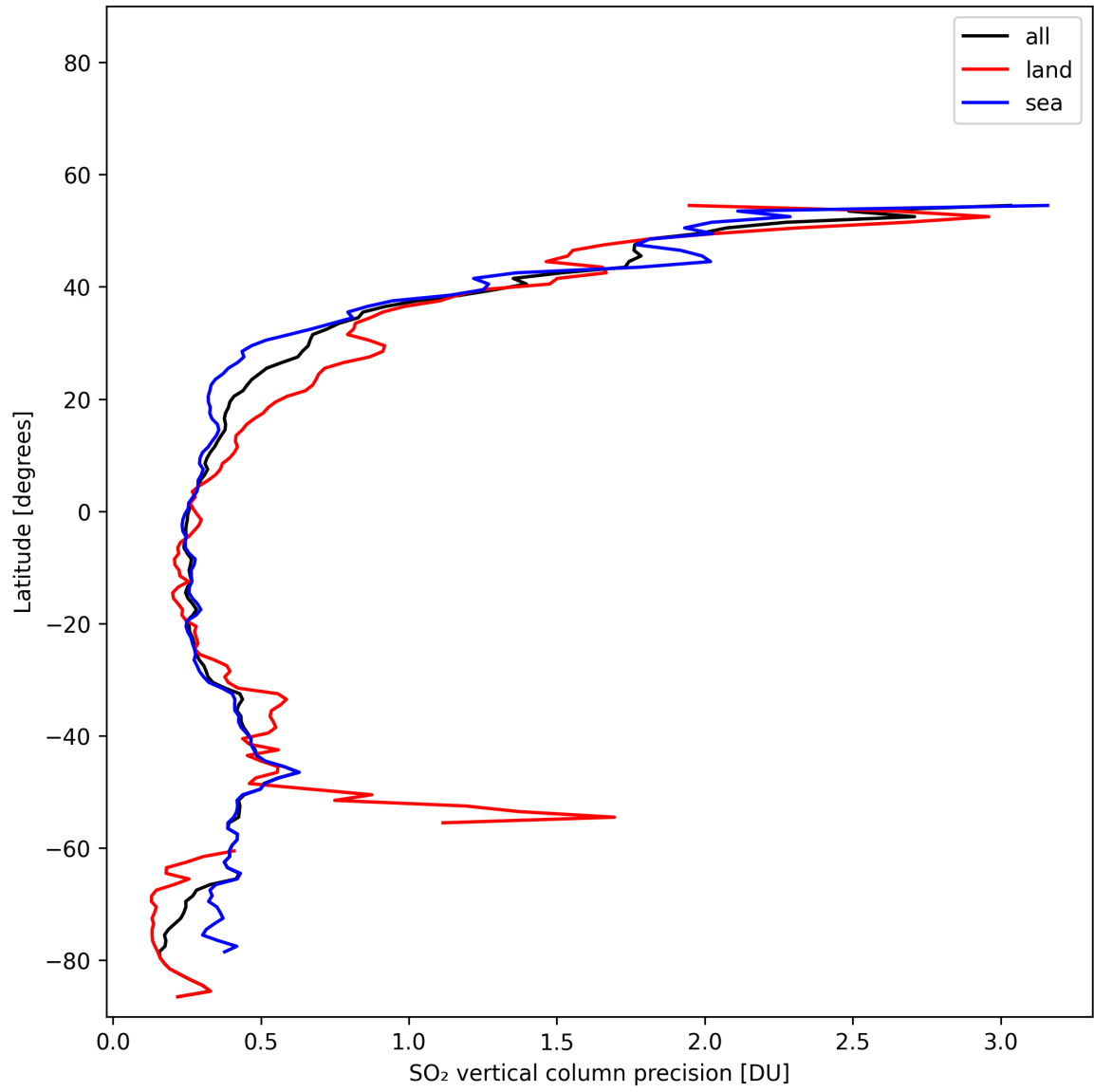


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-02-04 to 2025-02-05.

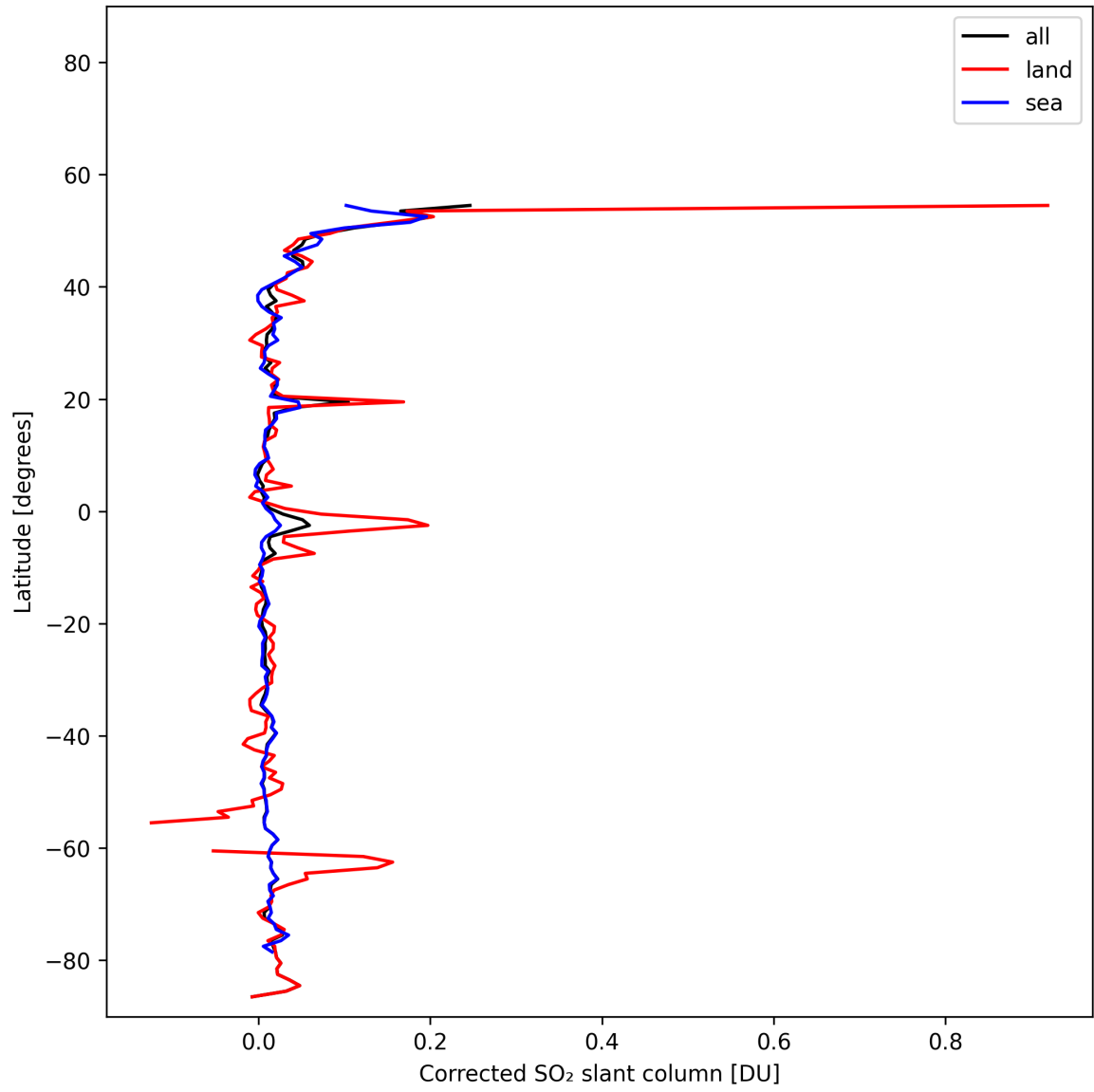


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-02-04 to 2025-02-05.

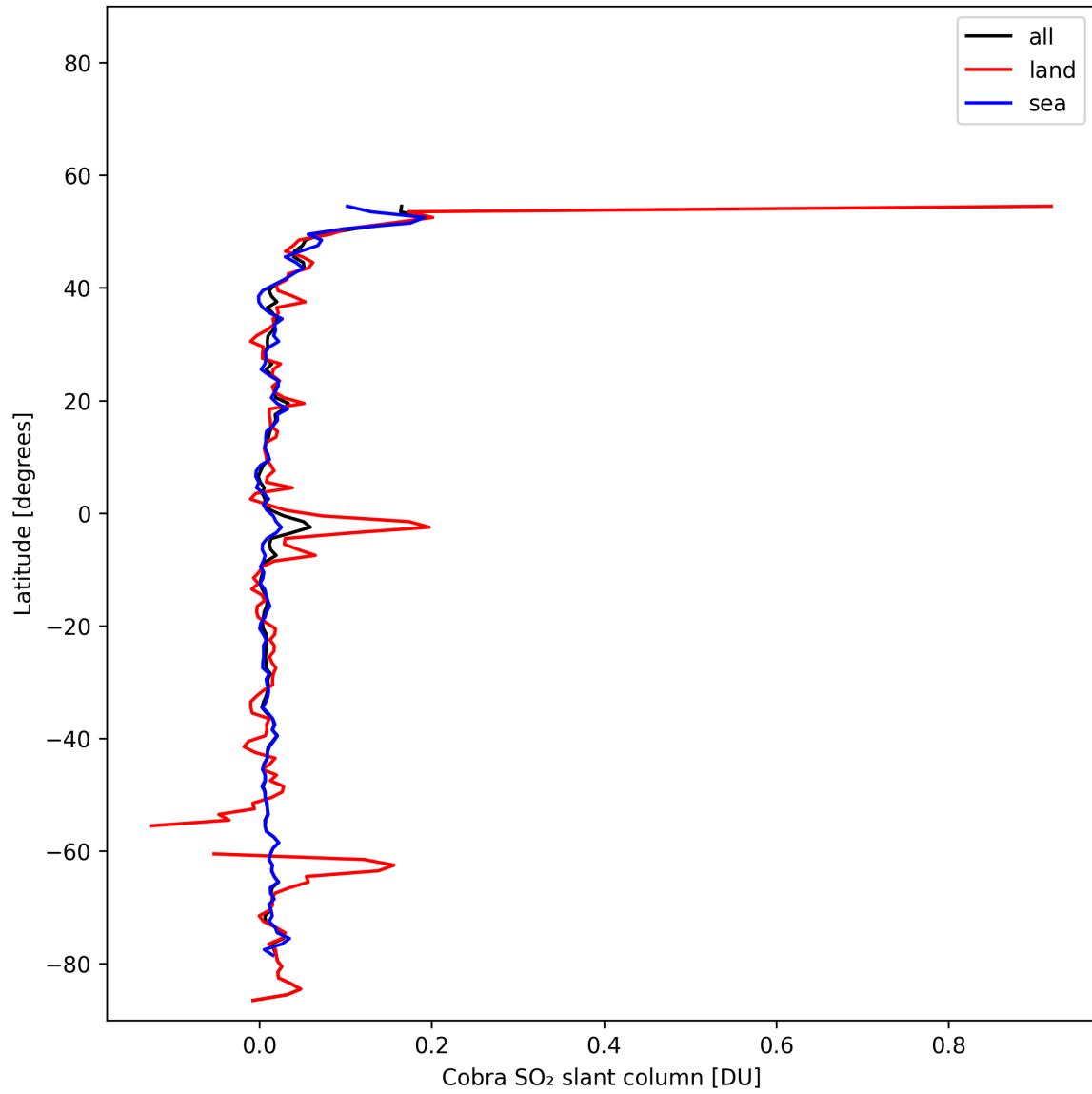


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-02-04 to 2025-02-05.

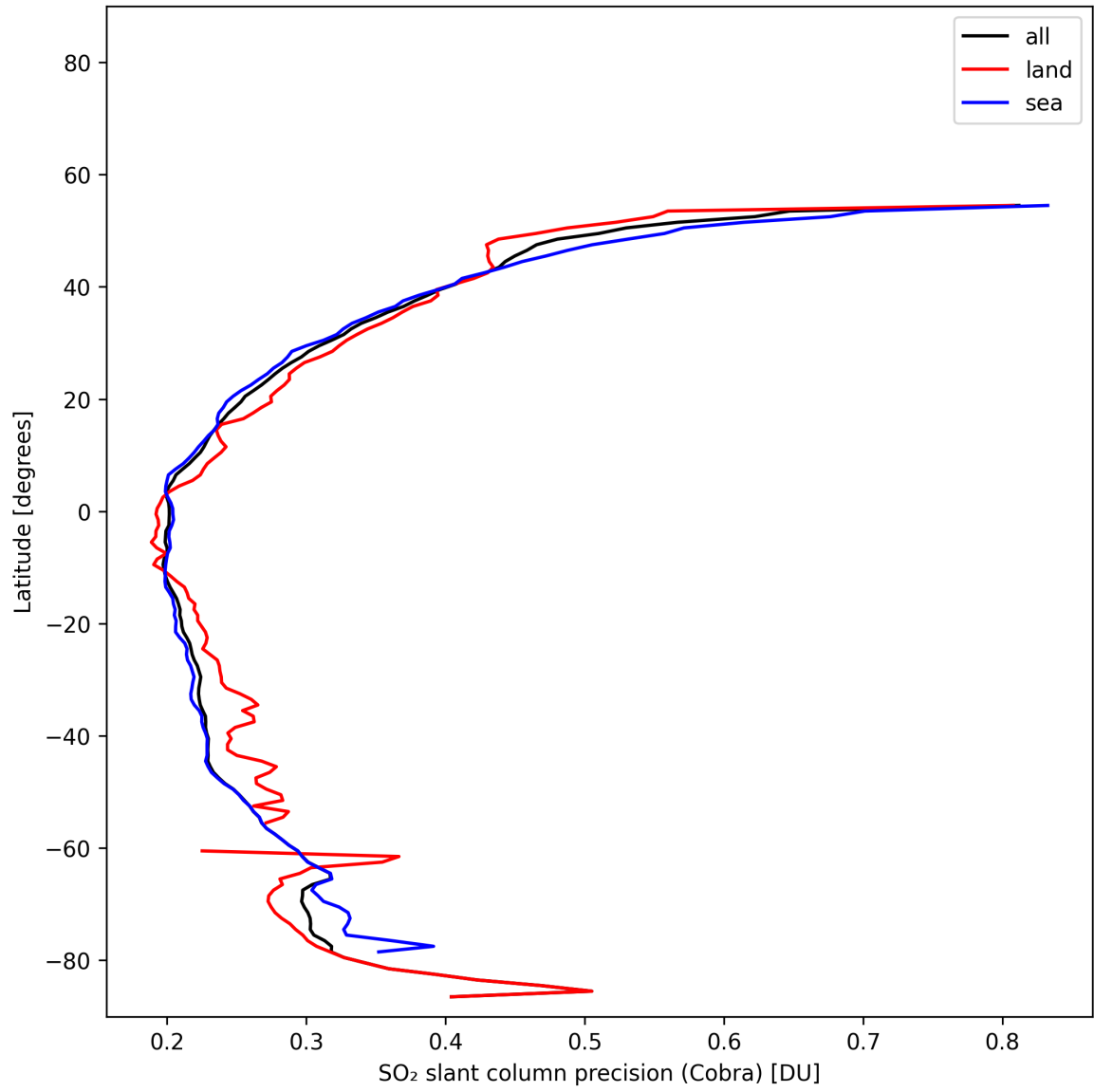


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-02-04 to 2025-02-05.

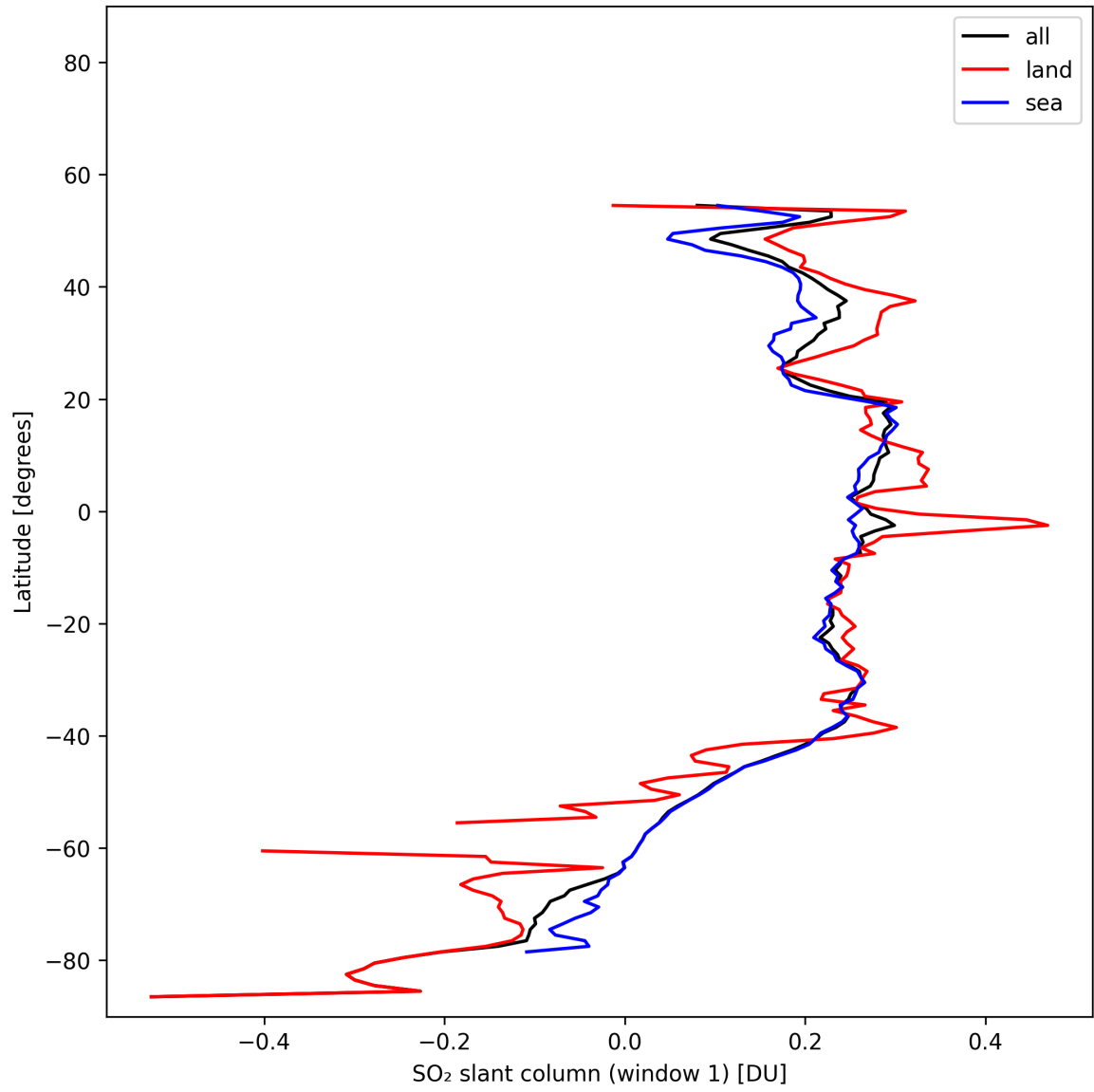


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-02-04 to 2025-02-05.

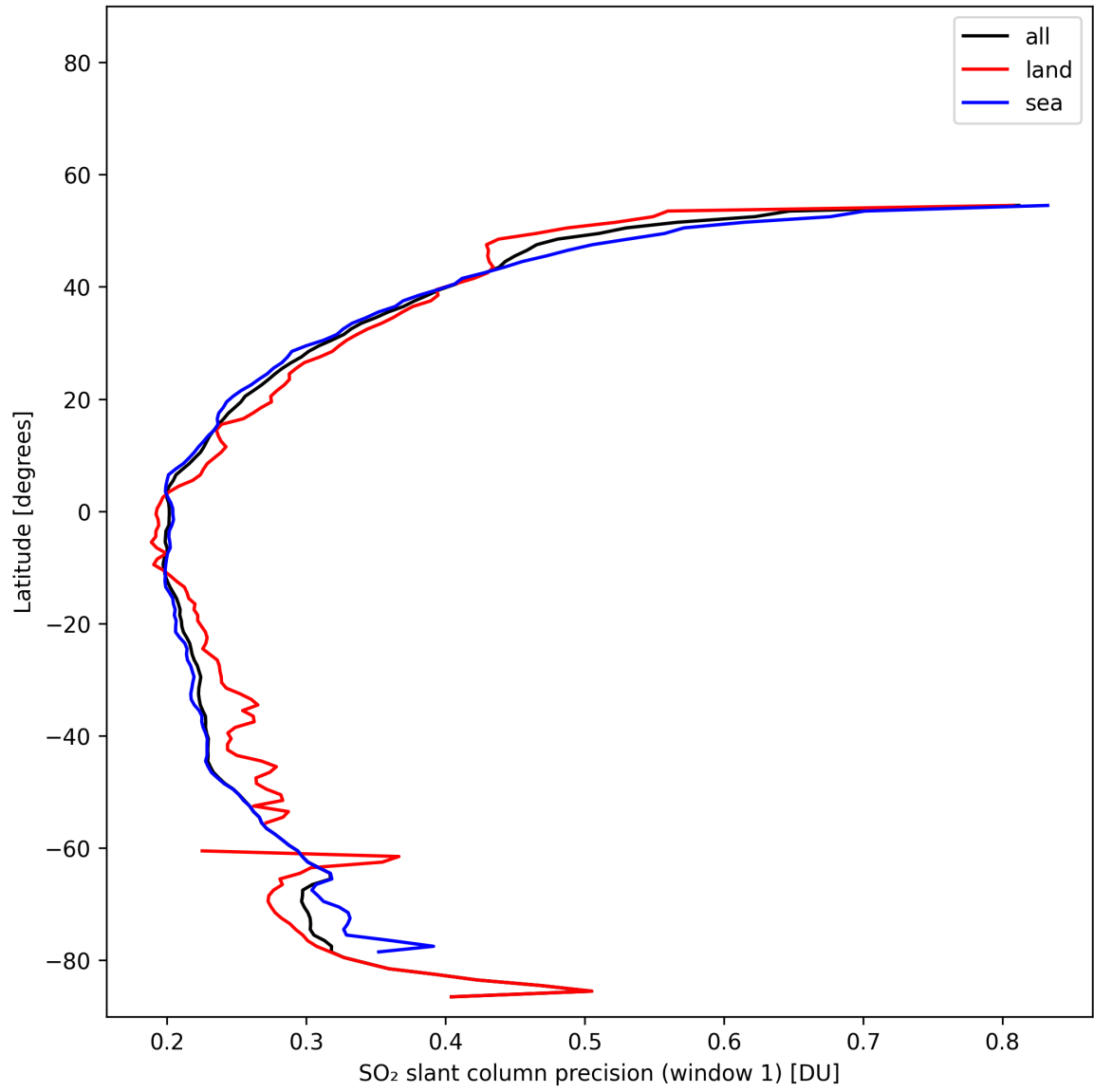


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-02-04 to 2025-02-05.

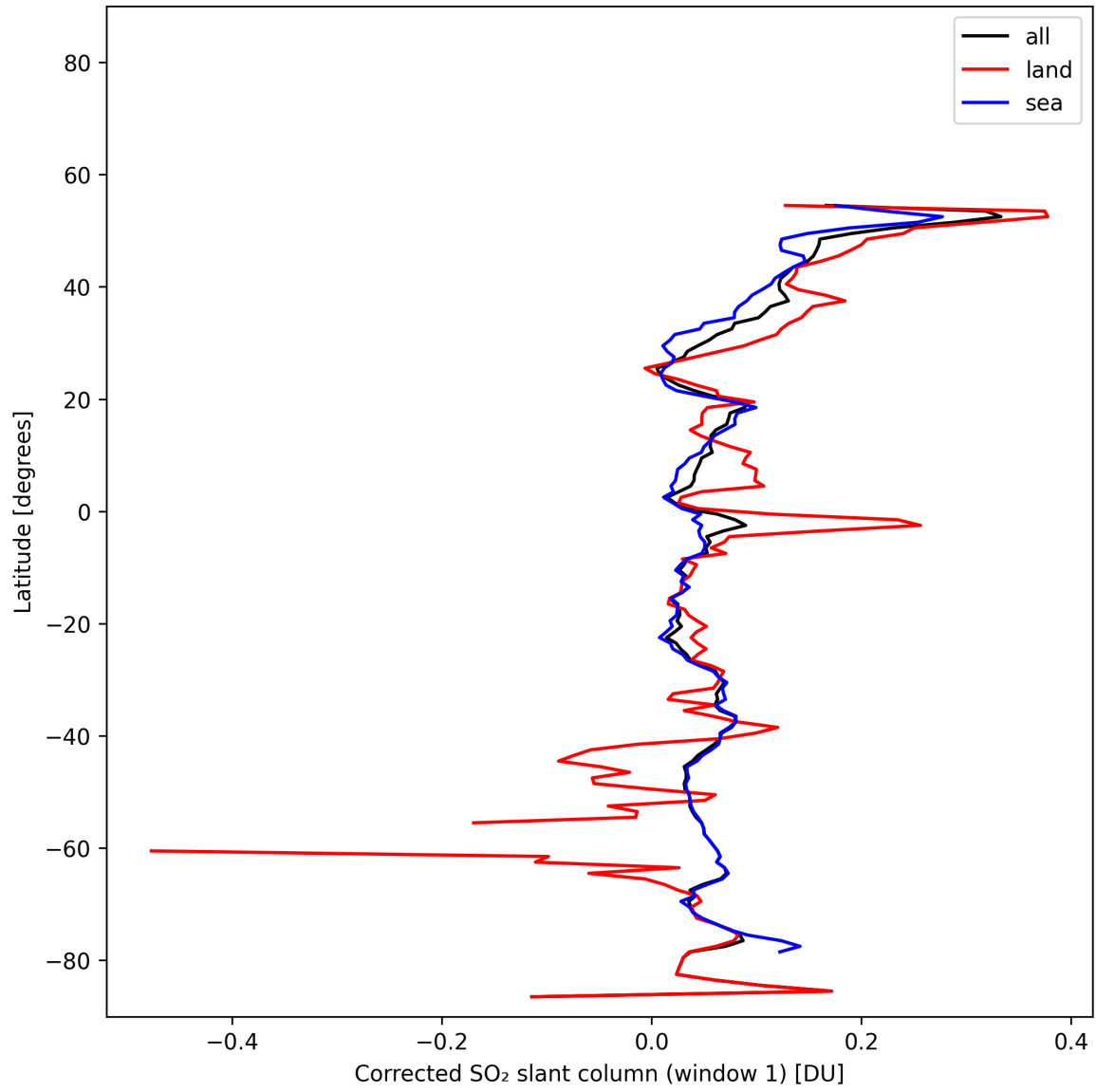


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-02-04 to 2025-02-05.

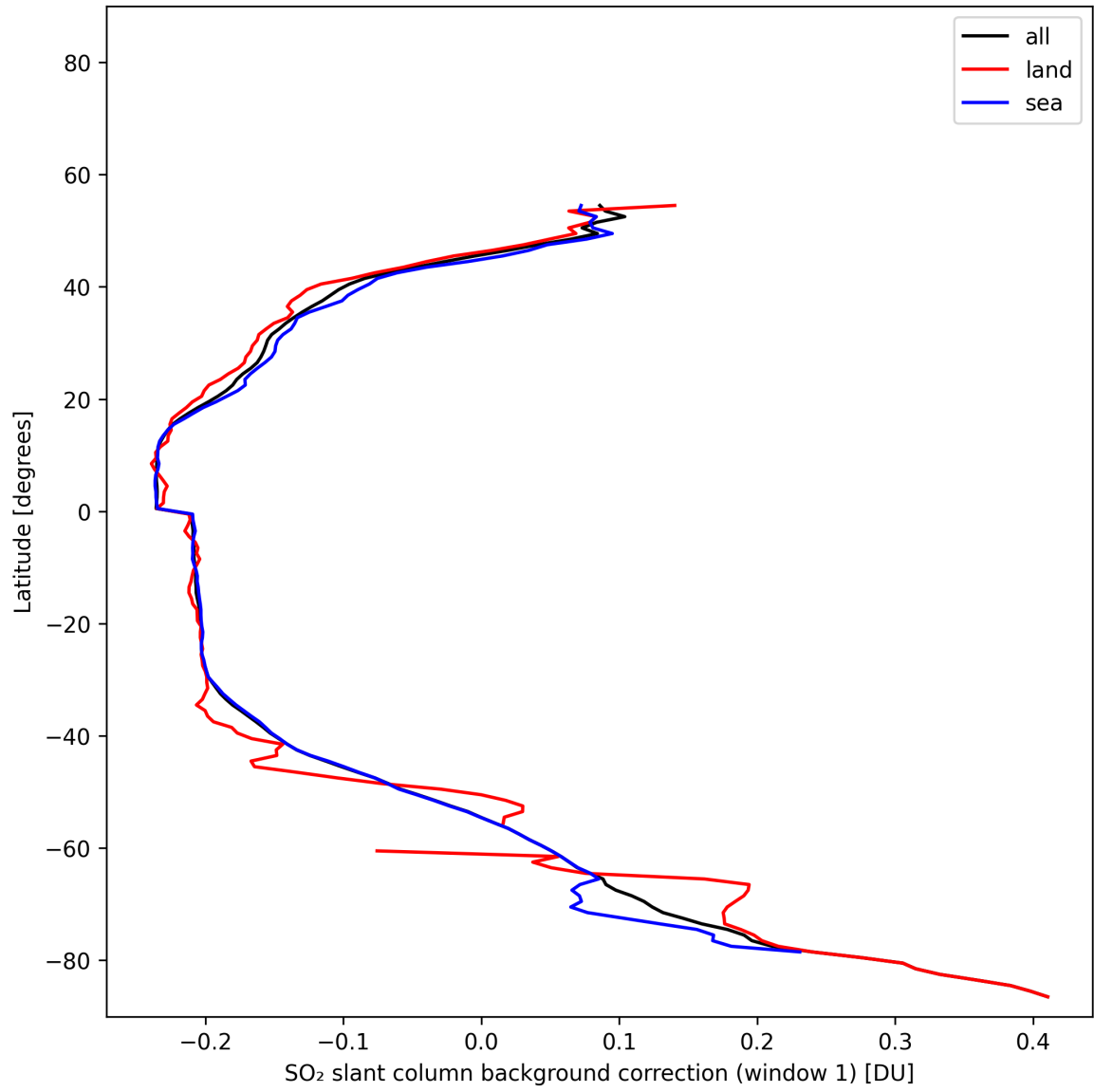


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-02-04 to 2025-02-05.

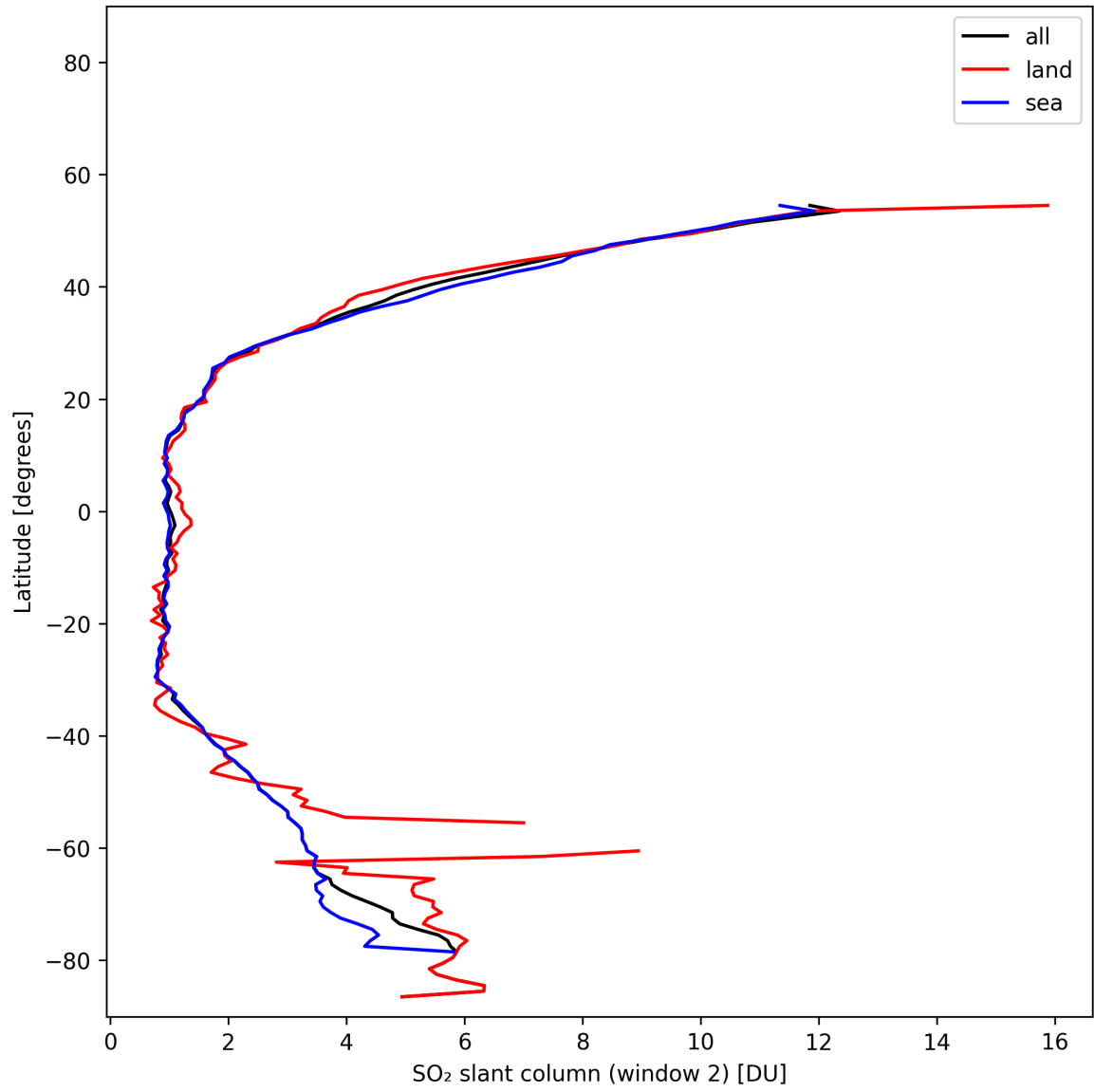


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-02-04 to 2025-02-05.

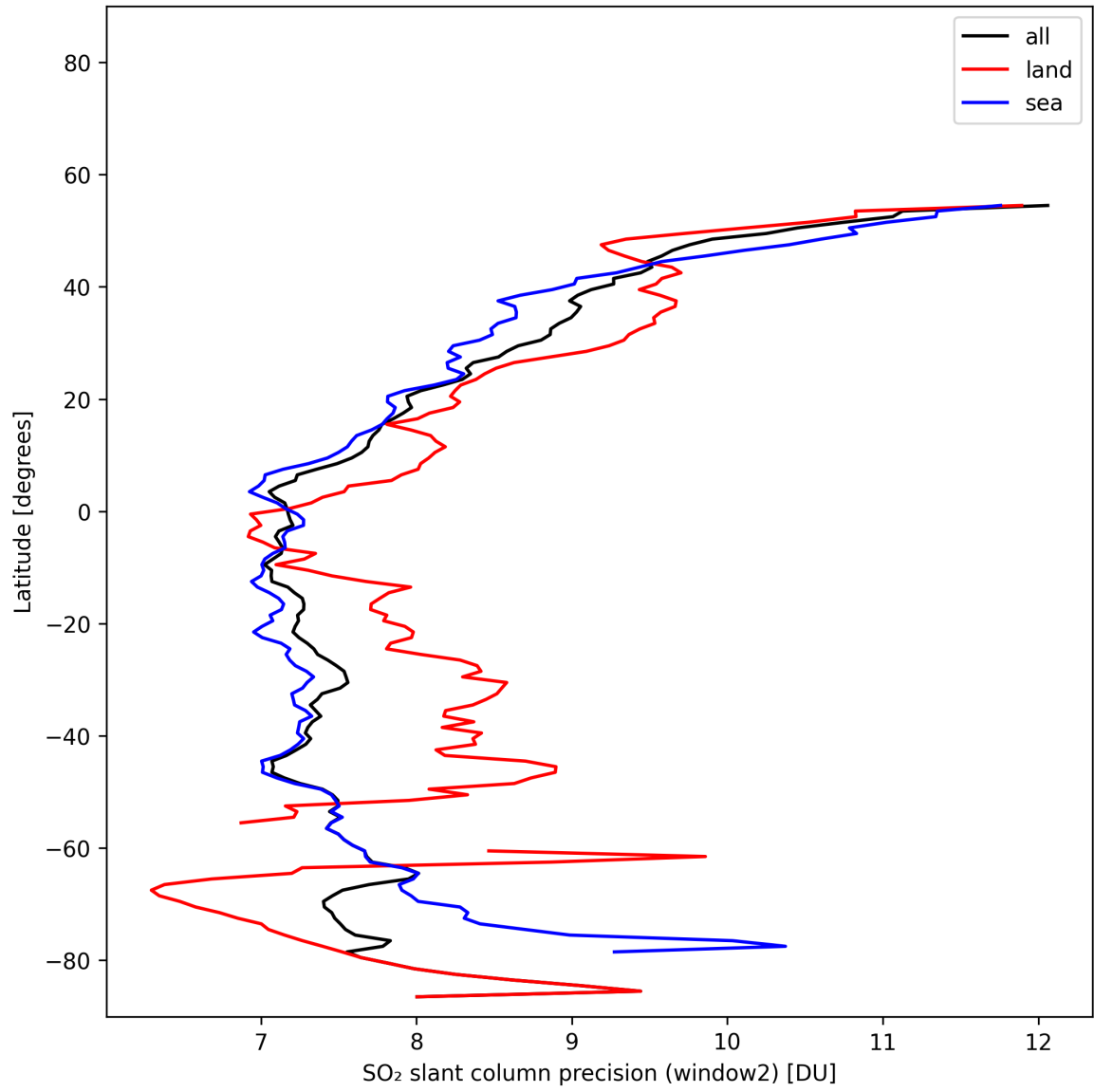


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-02-04 to 2025-02-05.

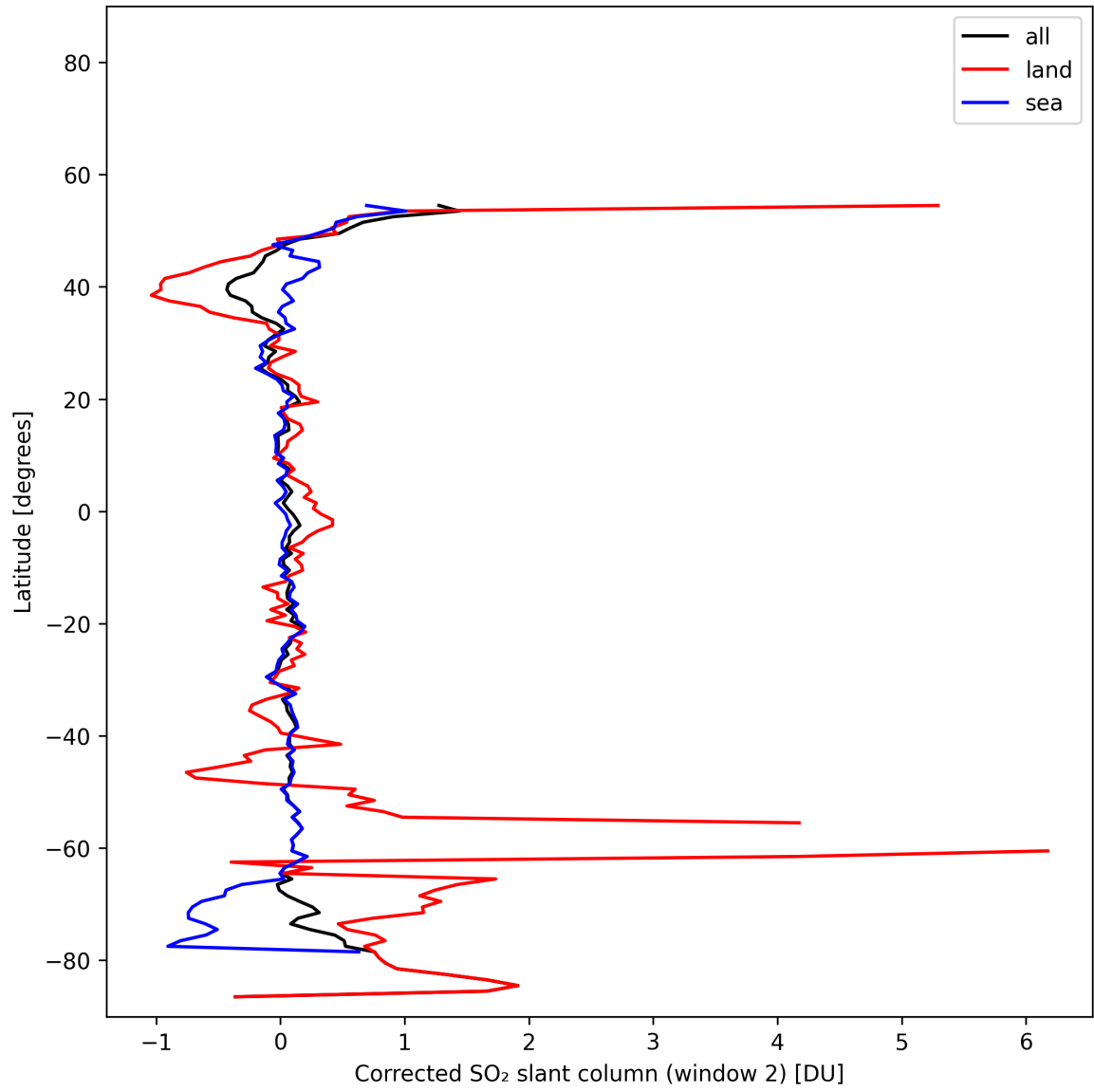


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-02-04 to 2025-02-05.

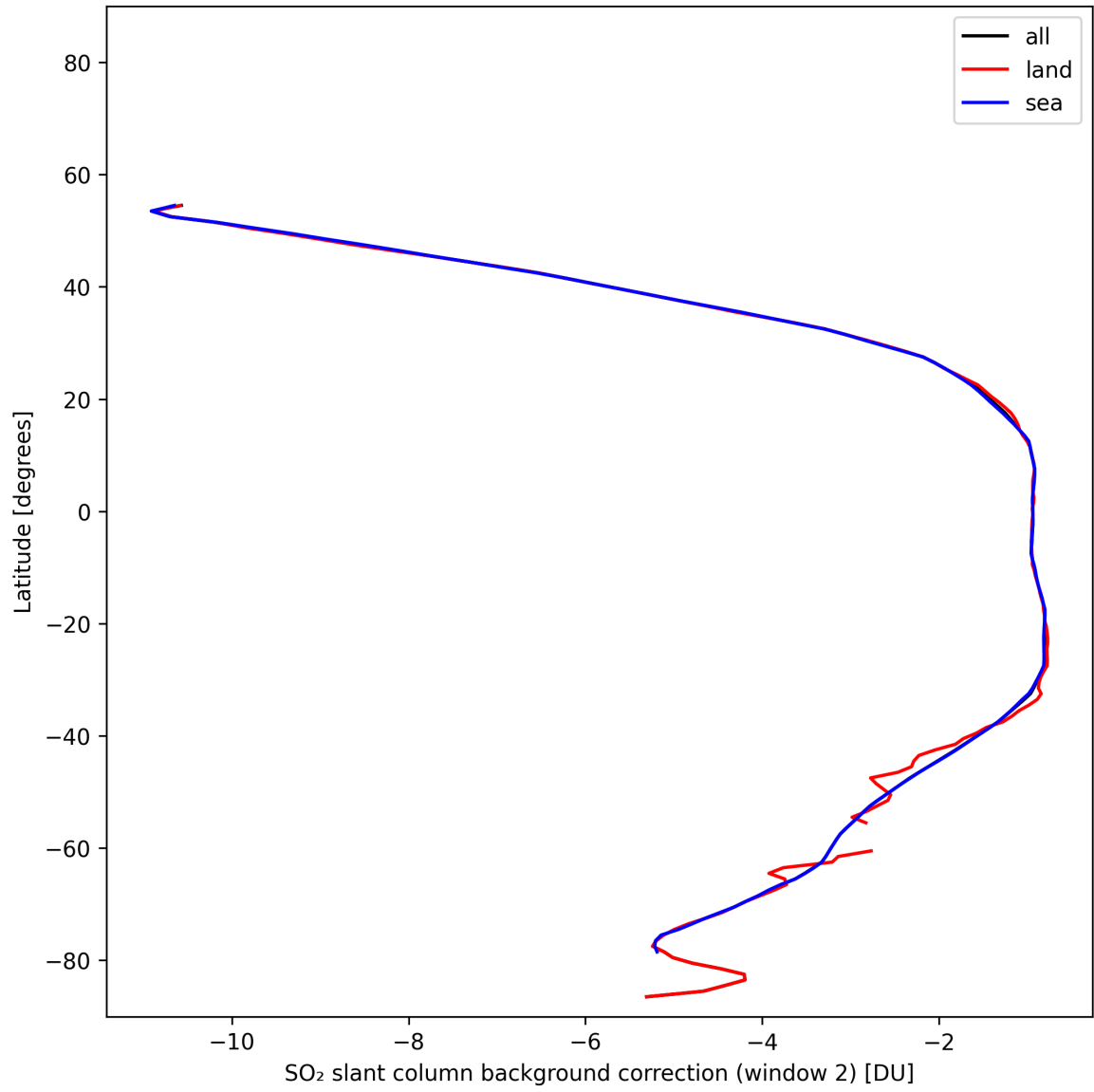


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-02-04 to 2025-02-05.

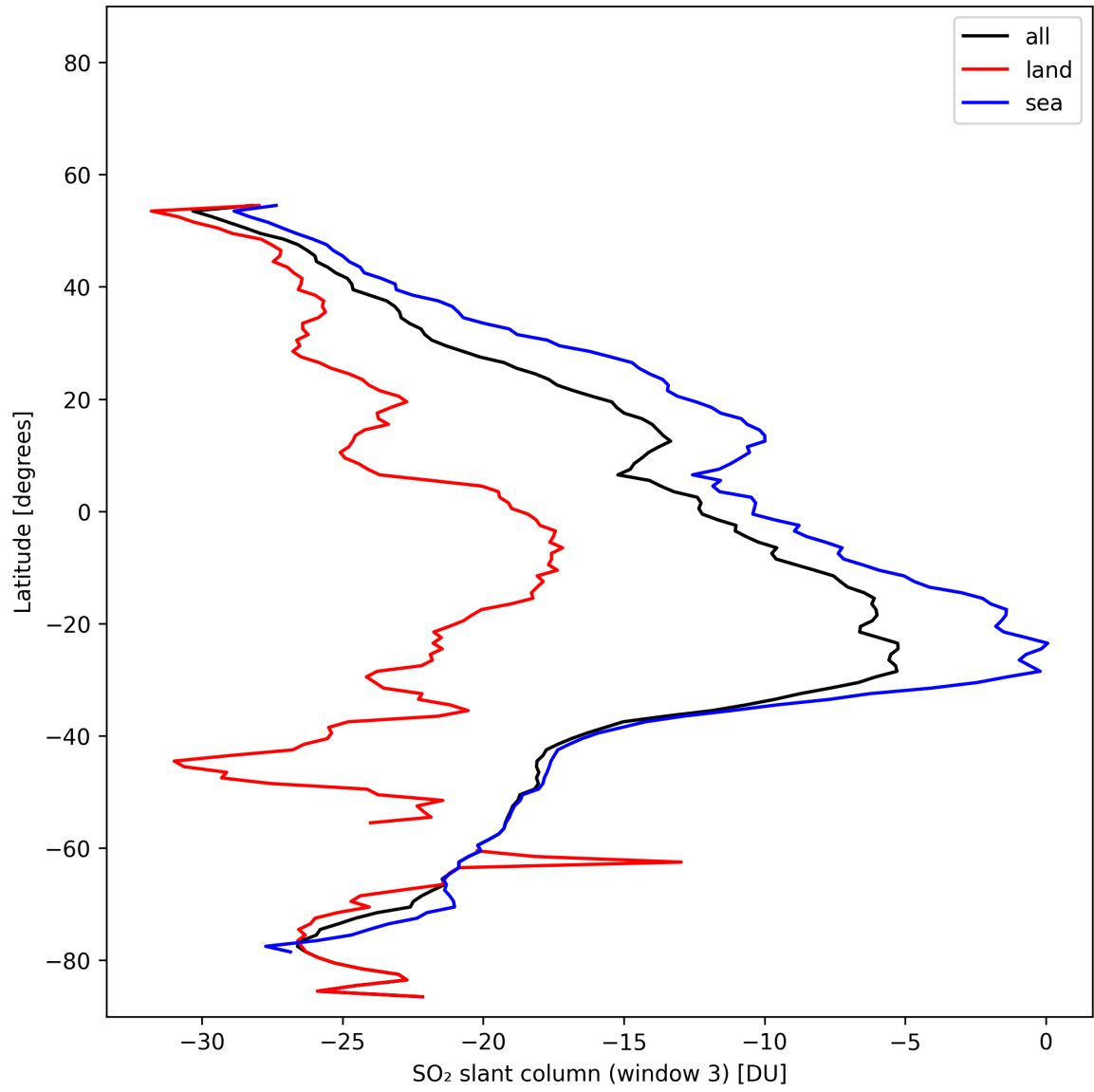


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-02-04 to 2025-02-05.

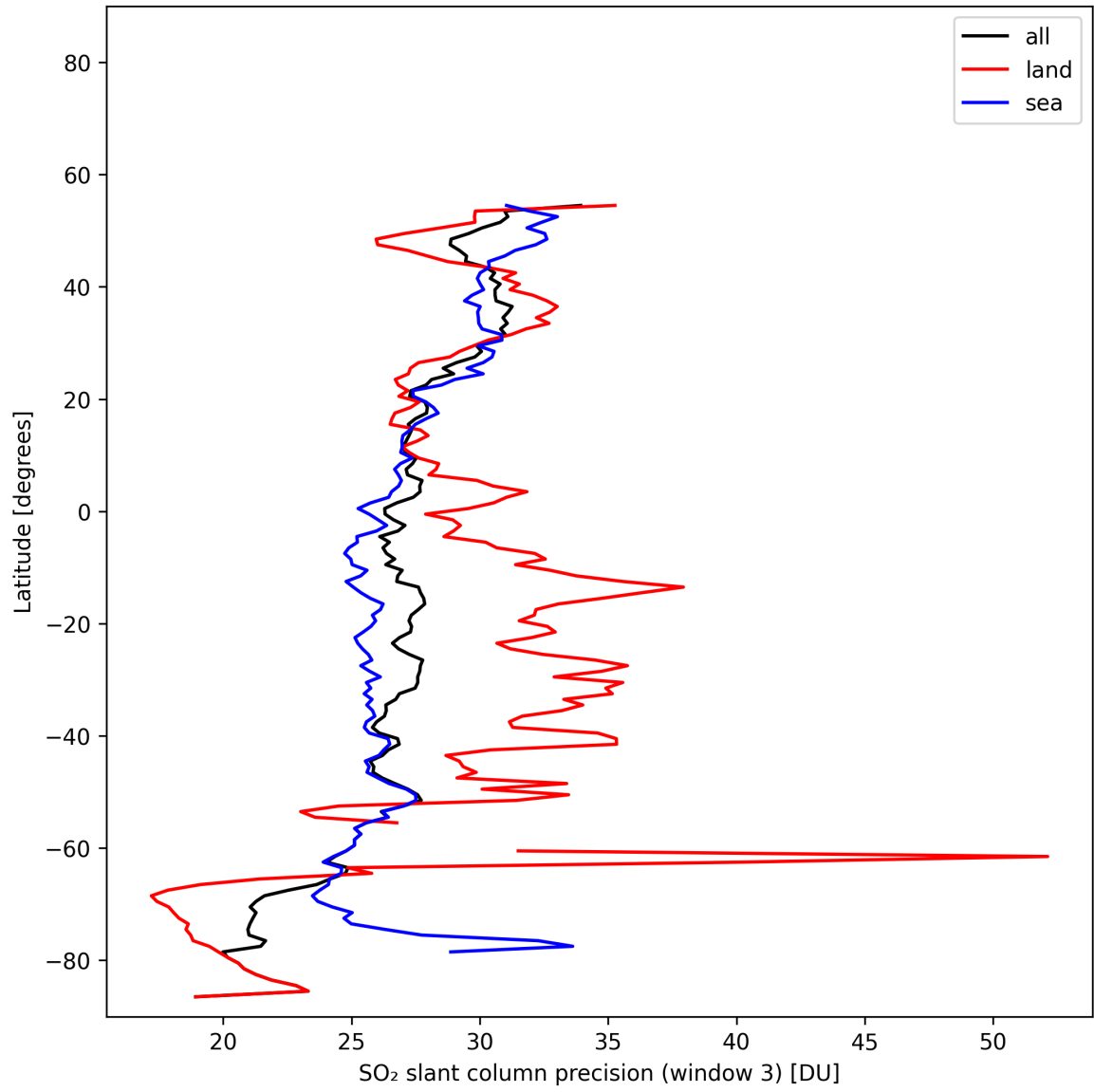


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-02-04 to 2025-02-05.

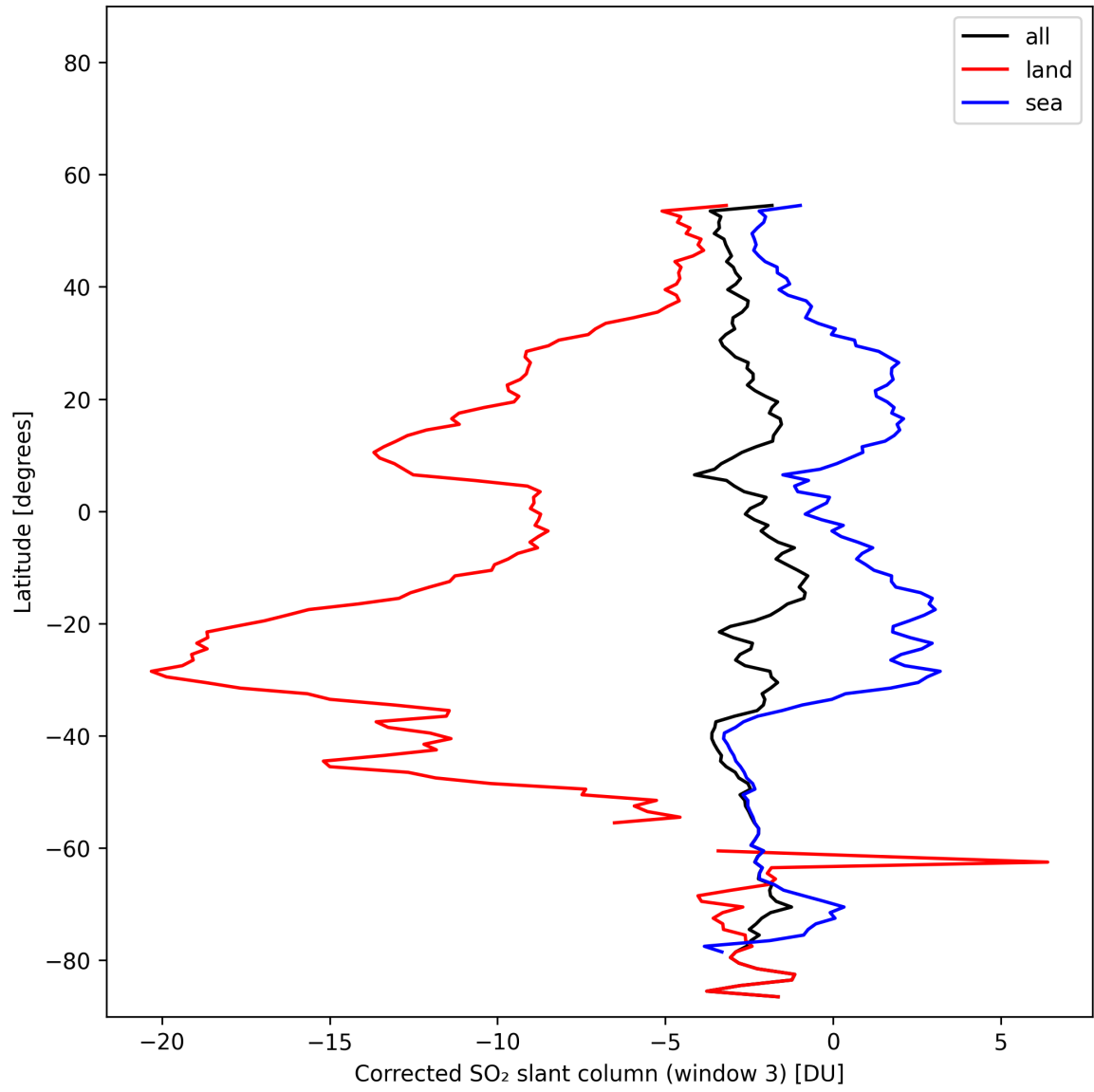


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-02-04 to 2025-02-05.

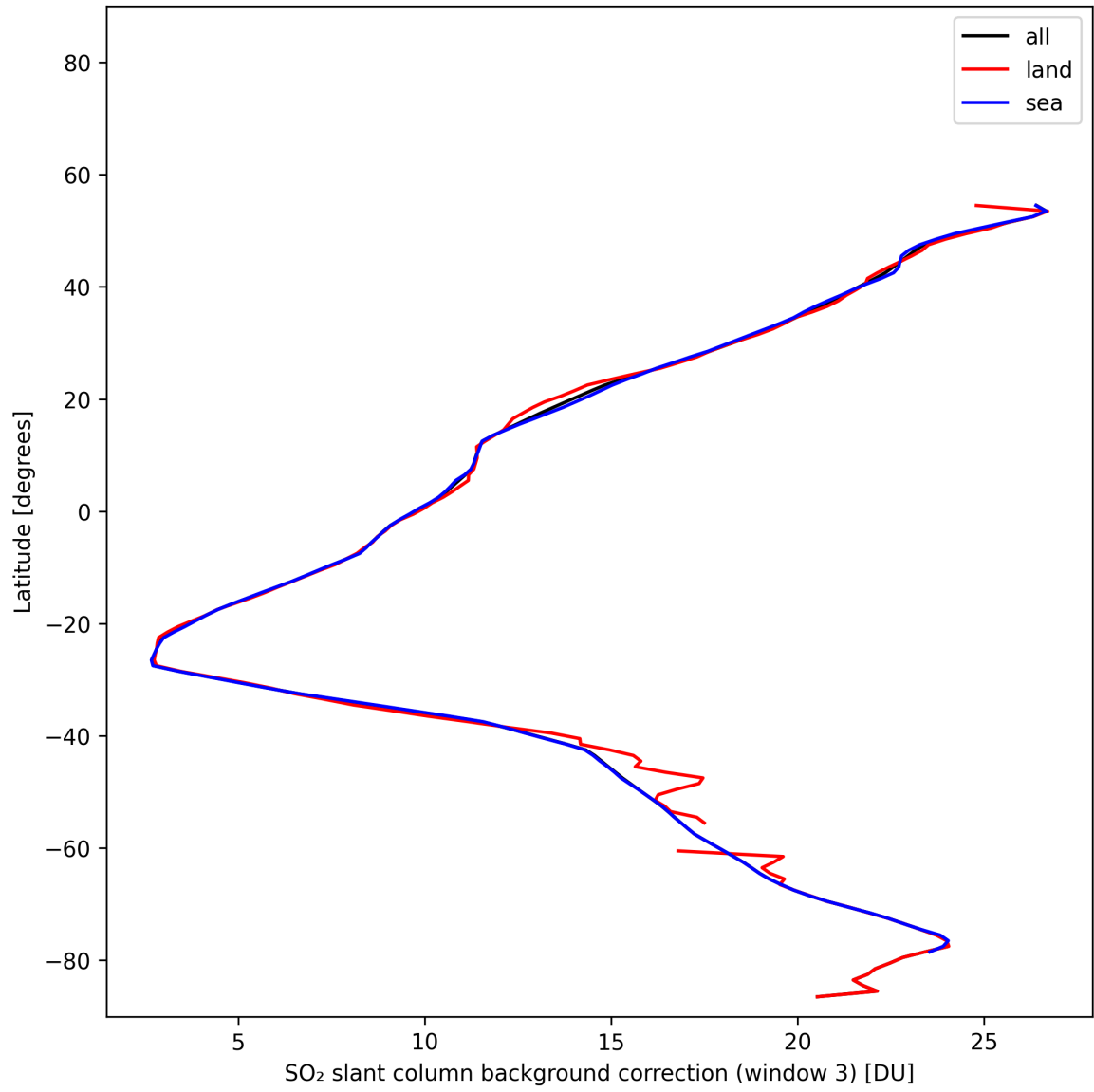


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-02-04 to 2025-02-05.

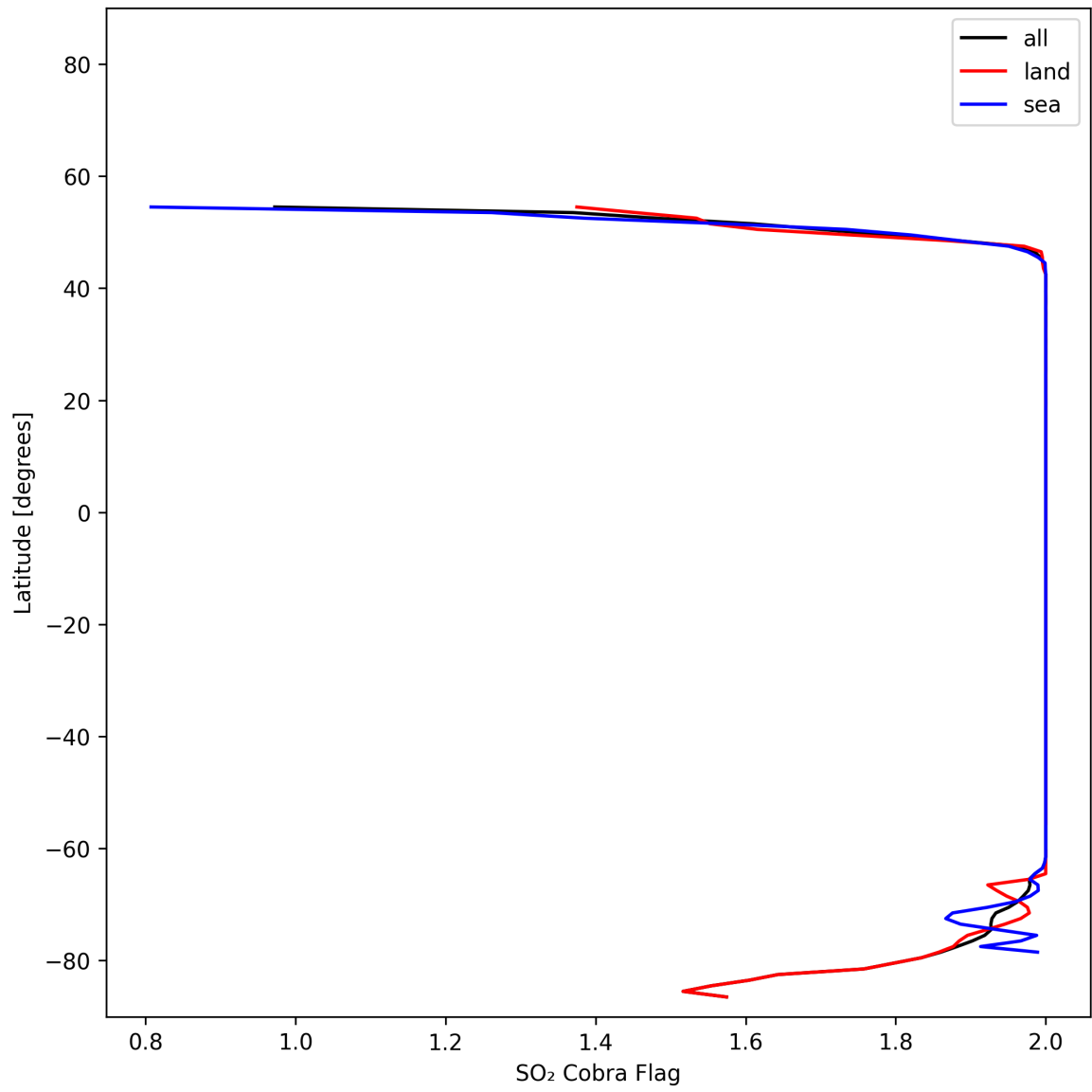


Figure 48: Zonal average of “SO₂ Cobra Flag” for 2025-02-04 to 2025-02-05.

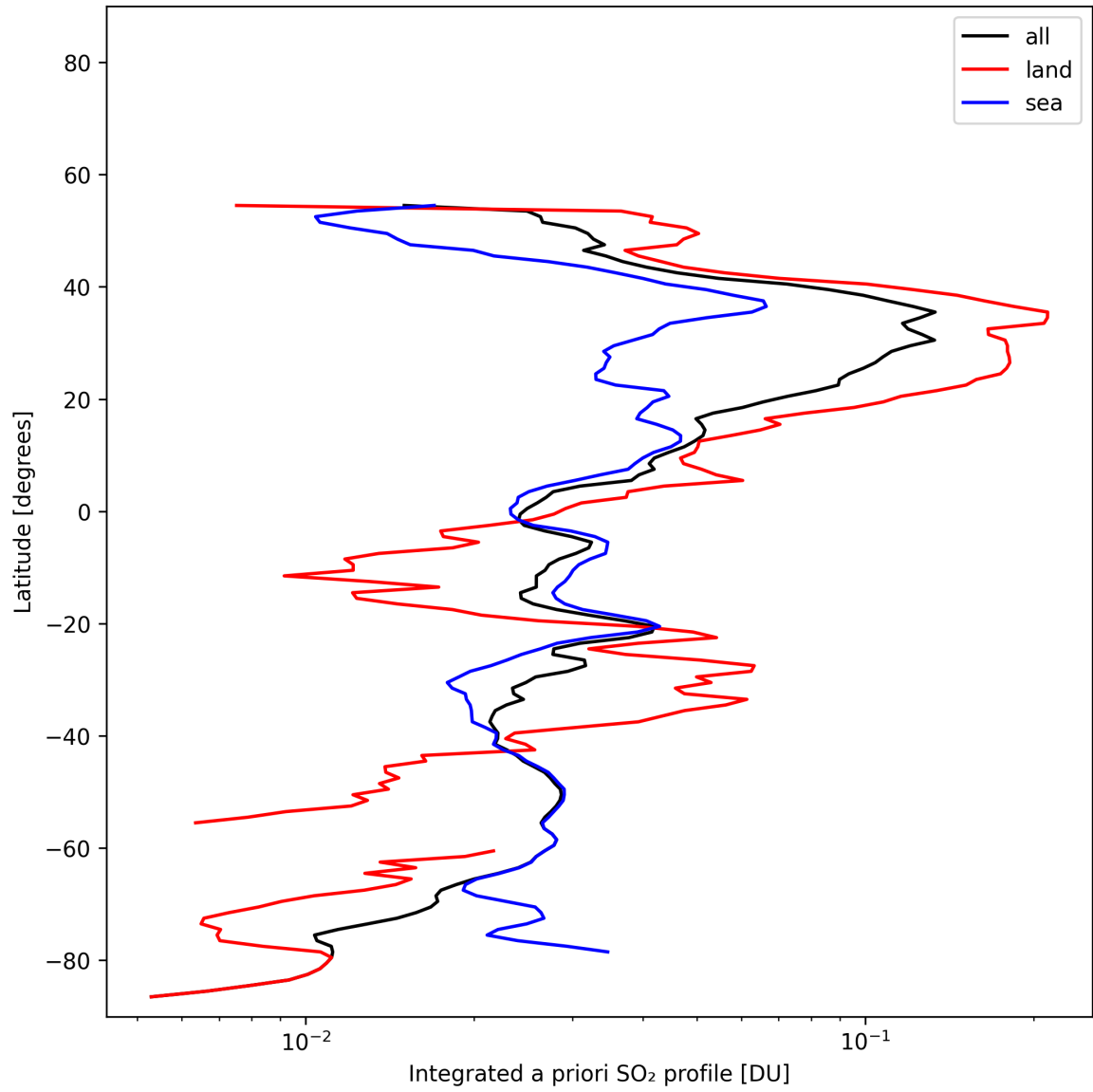


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-02-04 to 2025-02-05.

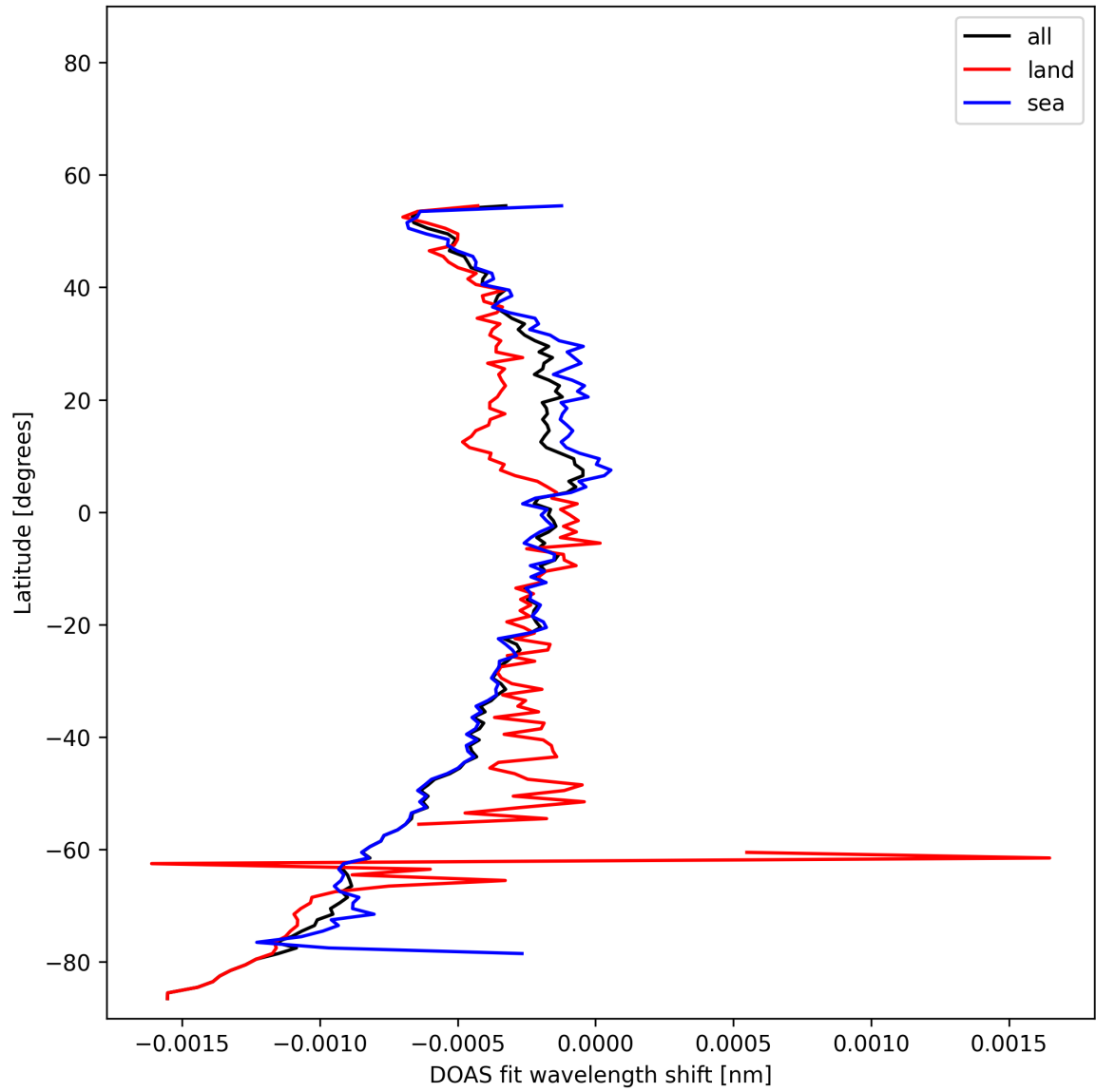


Figure 50: Zonal average of "DOAS fit wavelength shift" for 2025-02-04 to 2025-02-05.

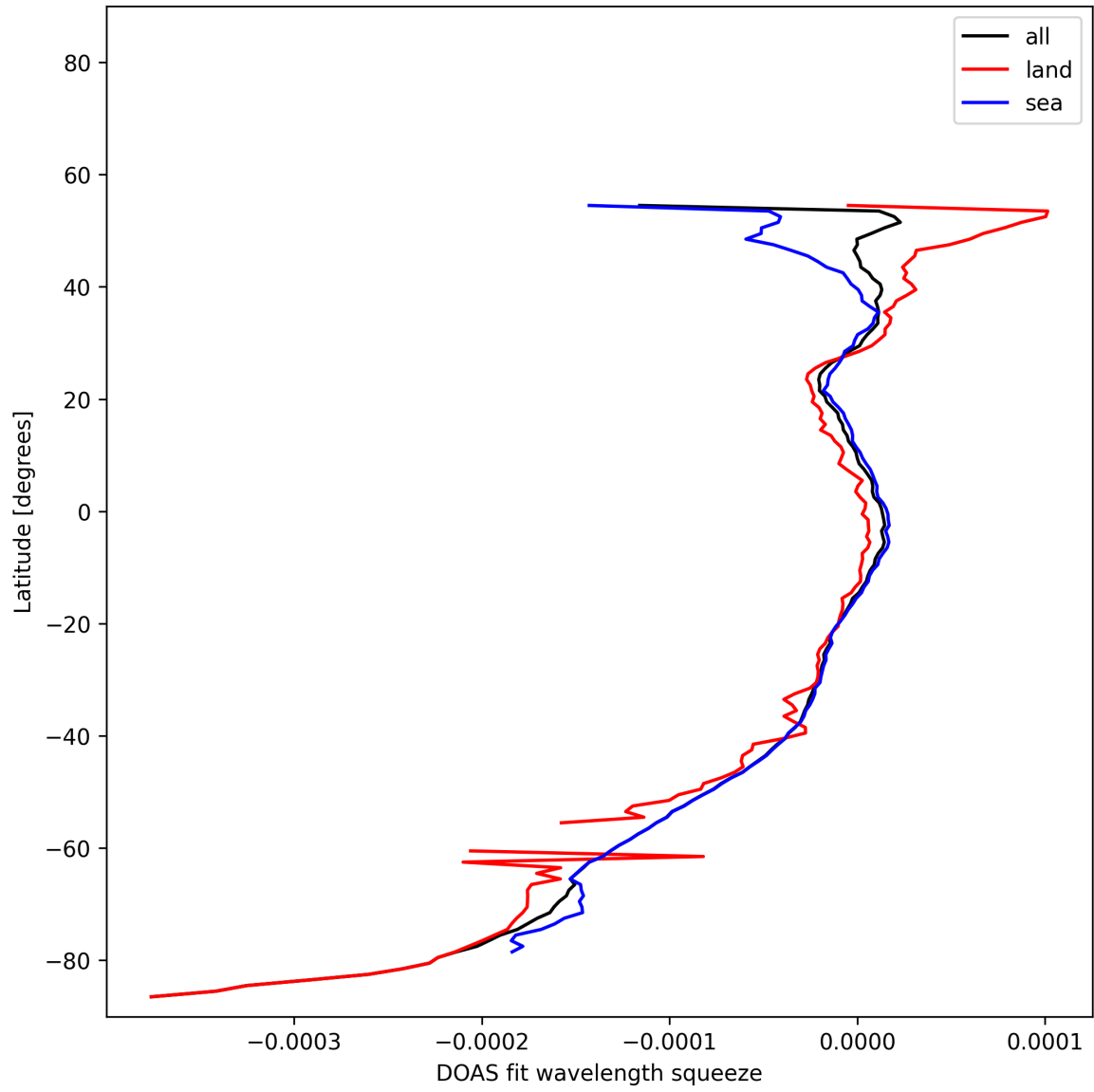


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-02-04 to 2025-02-05.

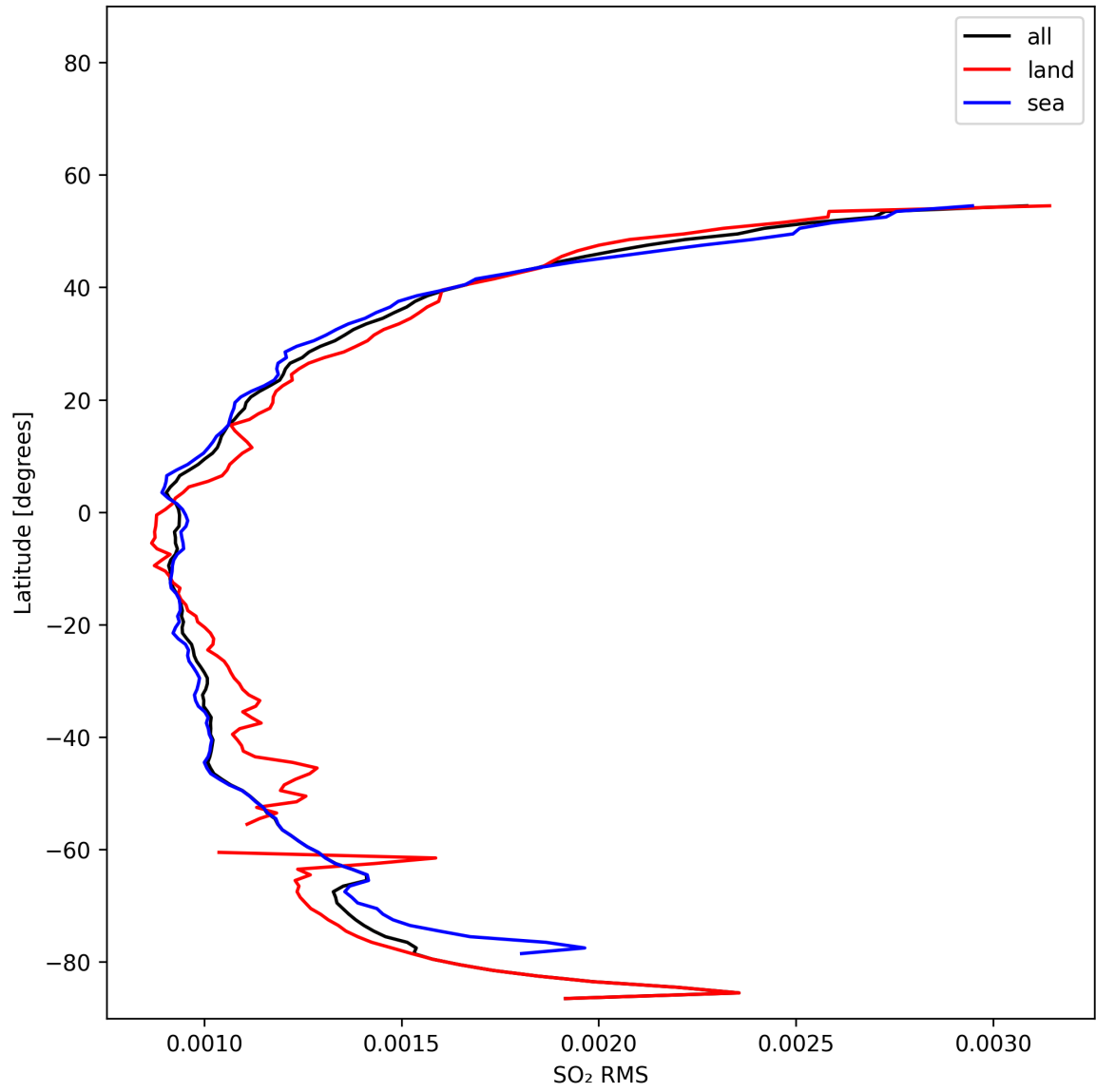


Figure 52: Zonal average of “SO₂ RMS” for 2025-02-04 to 2025-02-05.

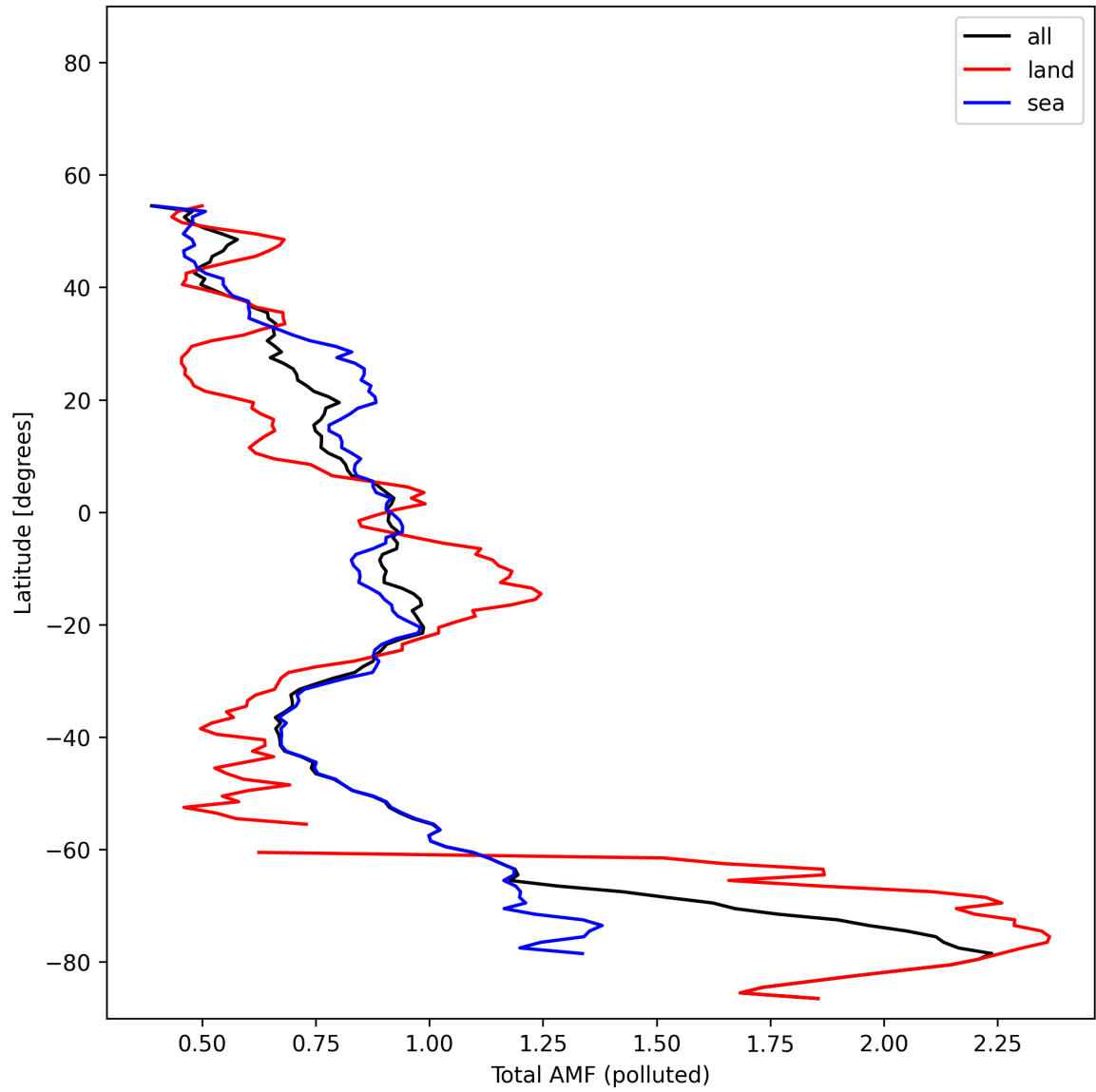


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-02-04 to 2025-02-05.

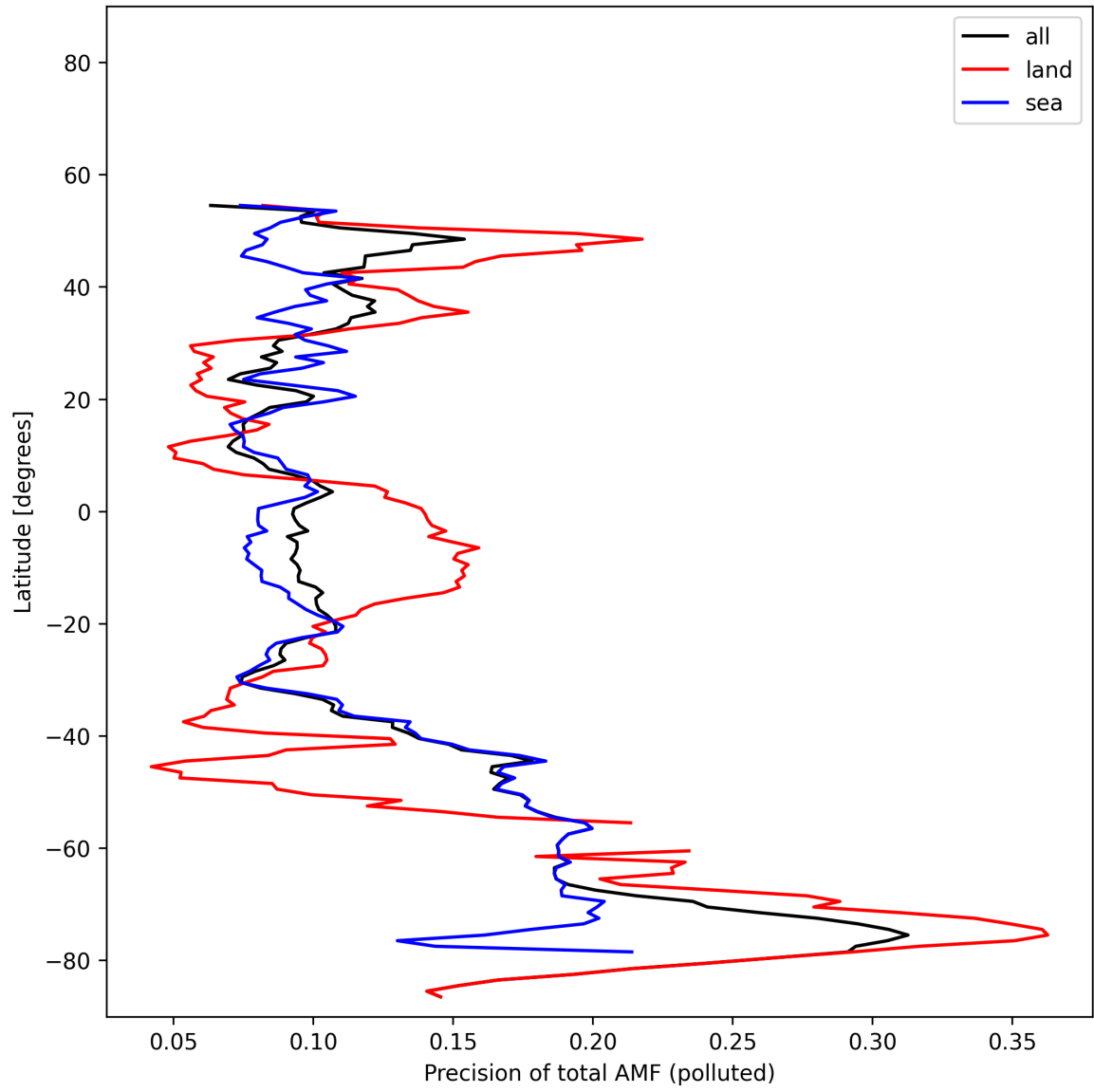


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-02-04 to 2025-02-05.

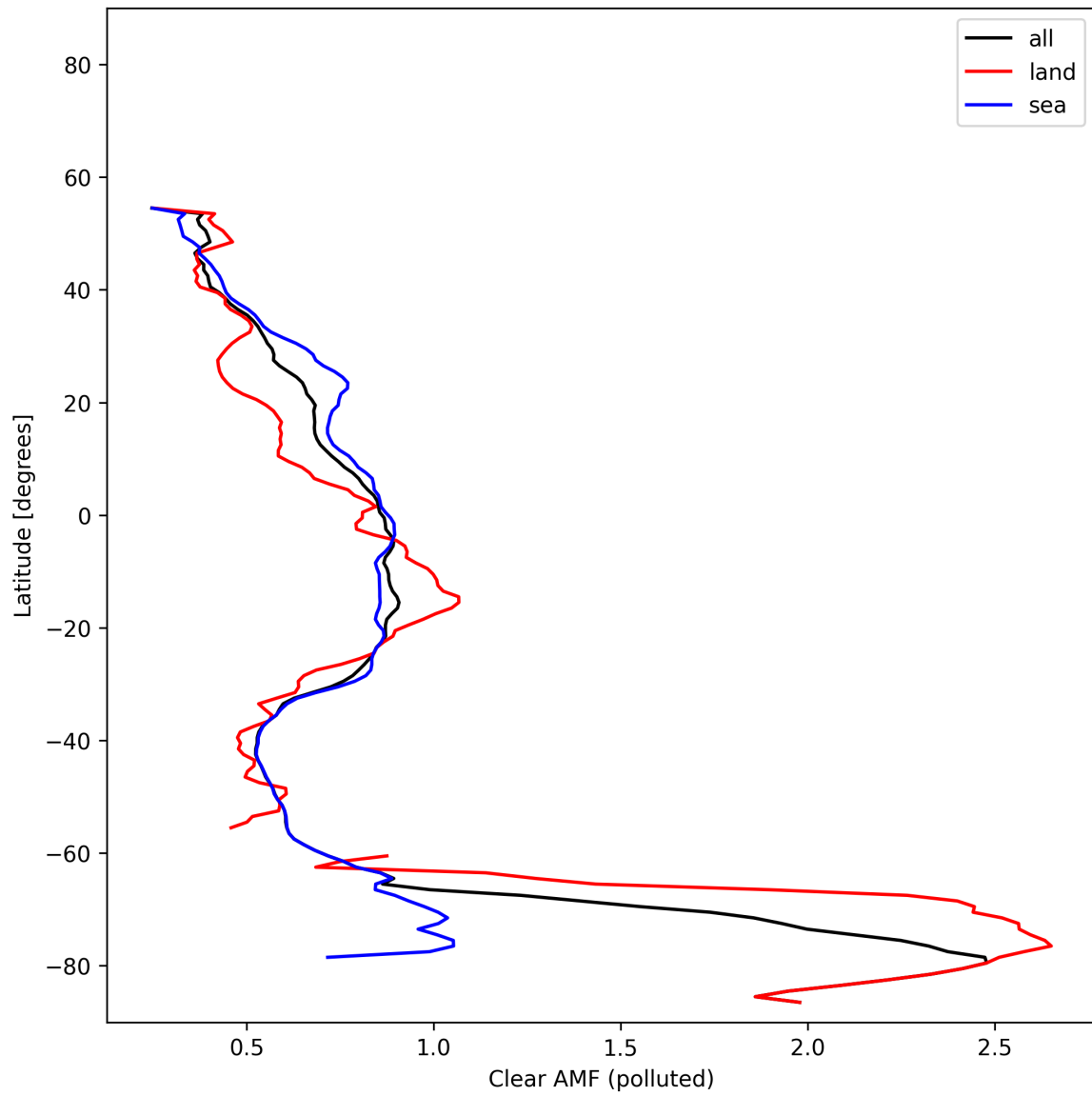


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-02-04 to 2025-02-05.

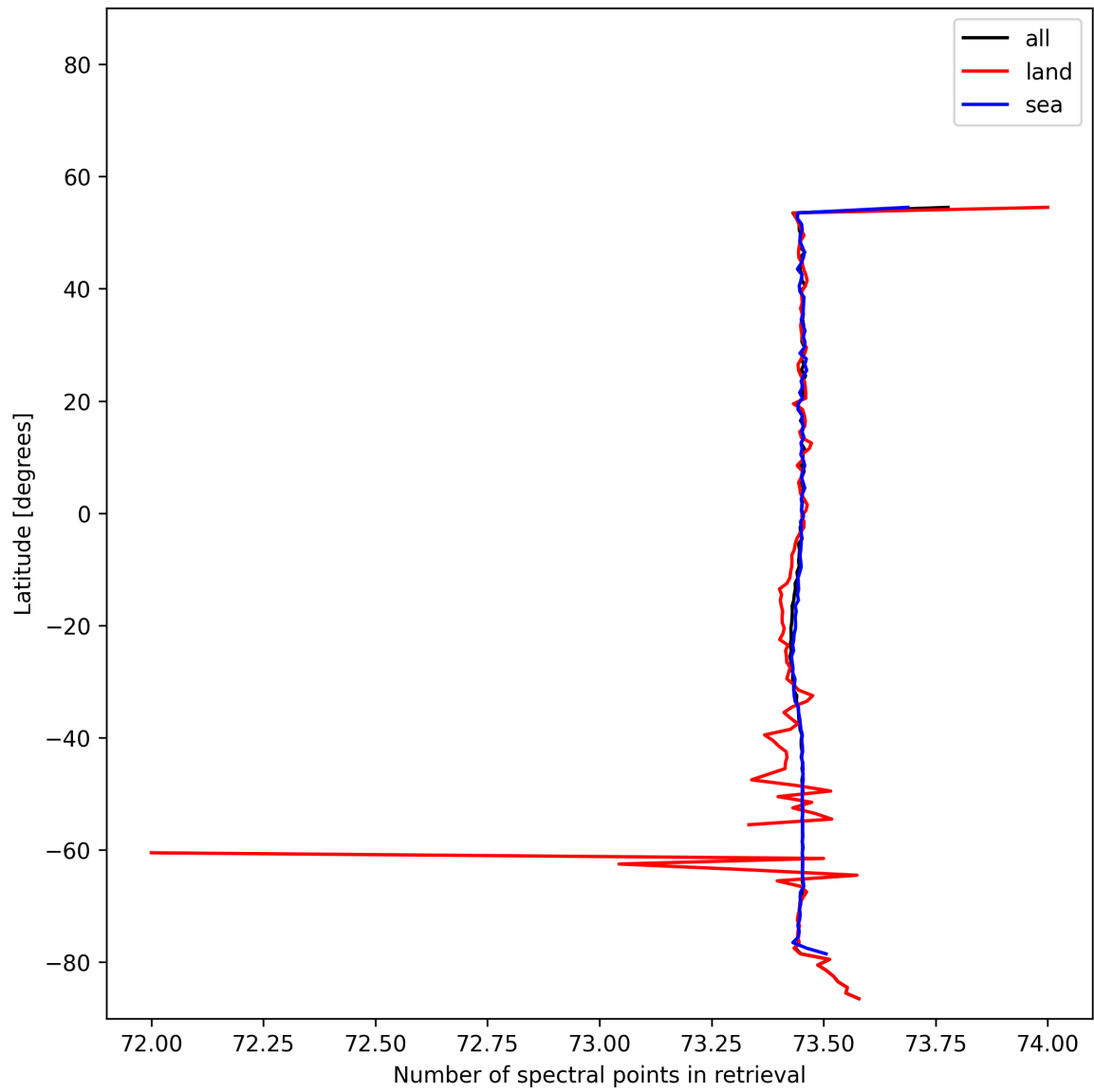


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-02-04 to 2025-02-05.

8 Histograms

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

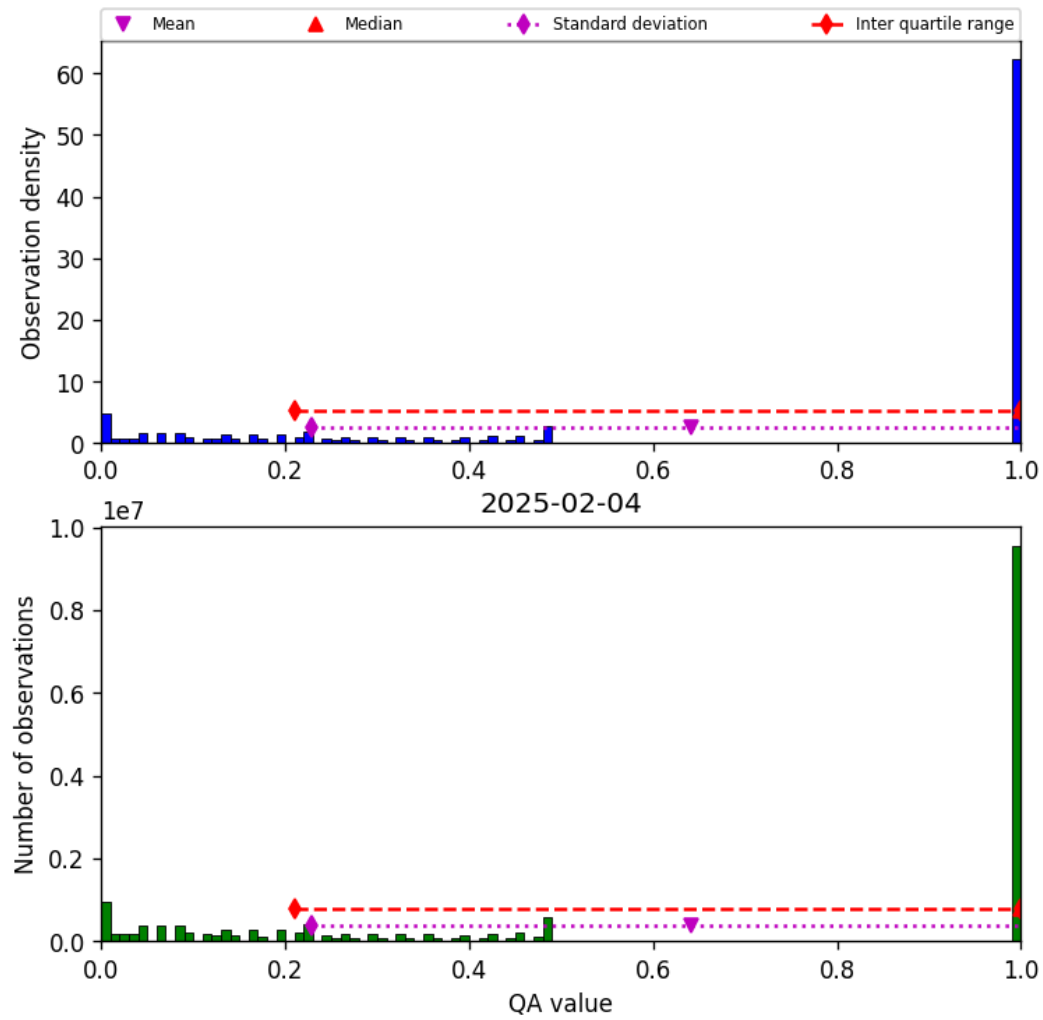


Figure 57: Histogram of “QA value” for 2025-02-04 to 2025-02-05

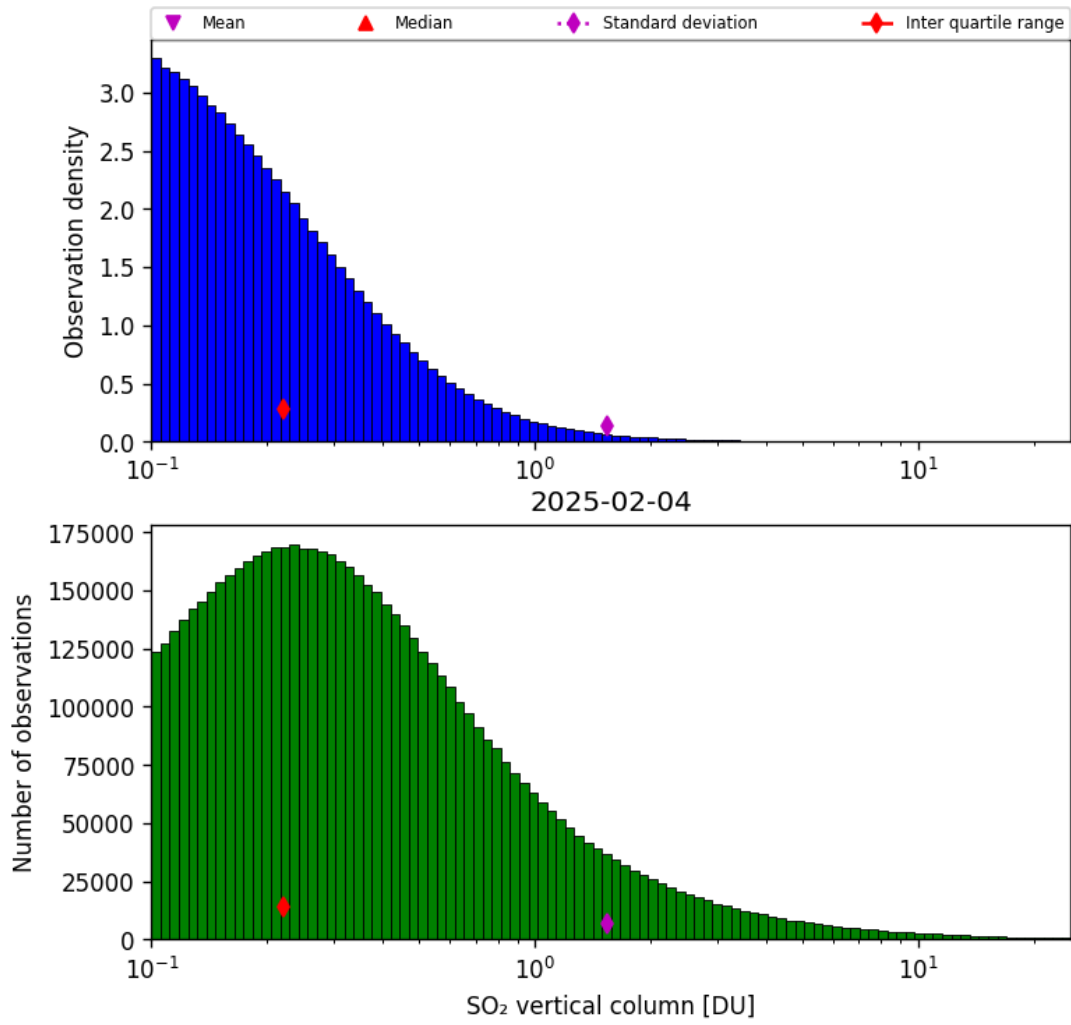


Figure 58: Histogram of “SO₂ vertical column” for 2025-02-04 to 2025-02-05

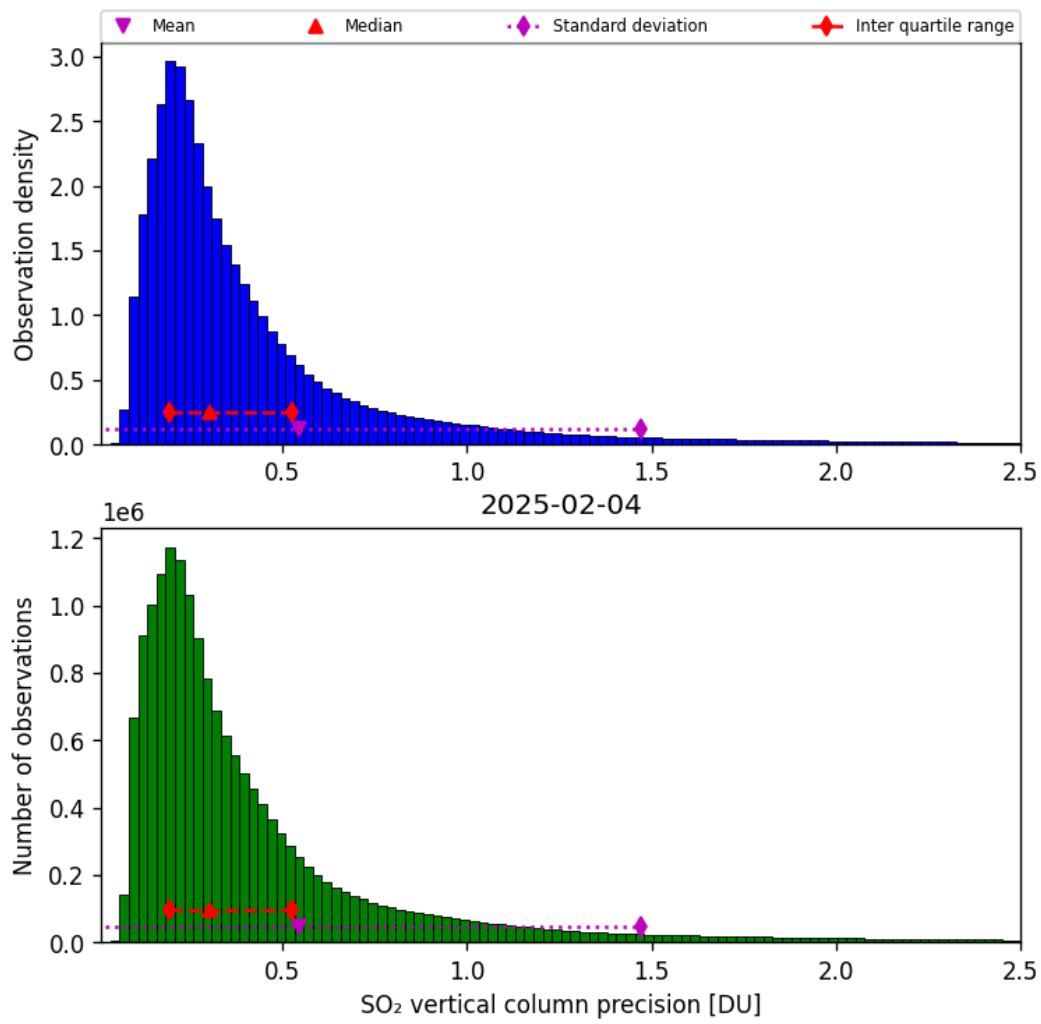


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-02-04 to 2025-02-05

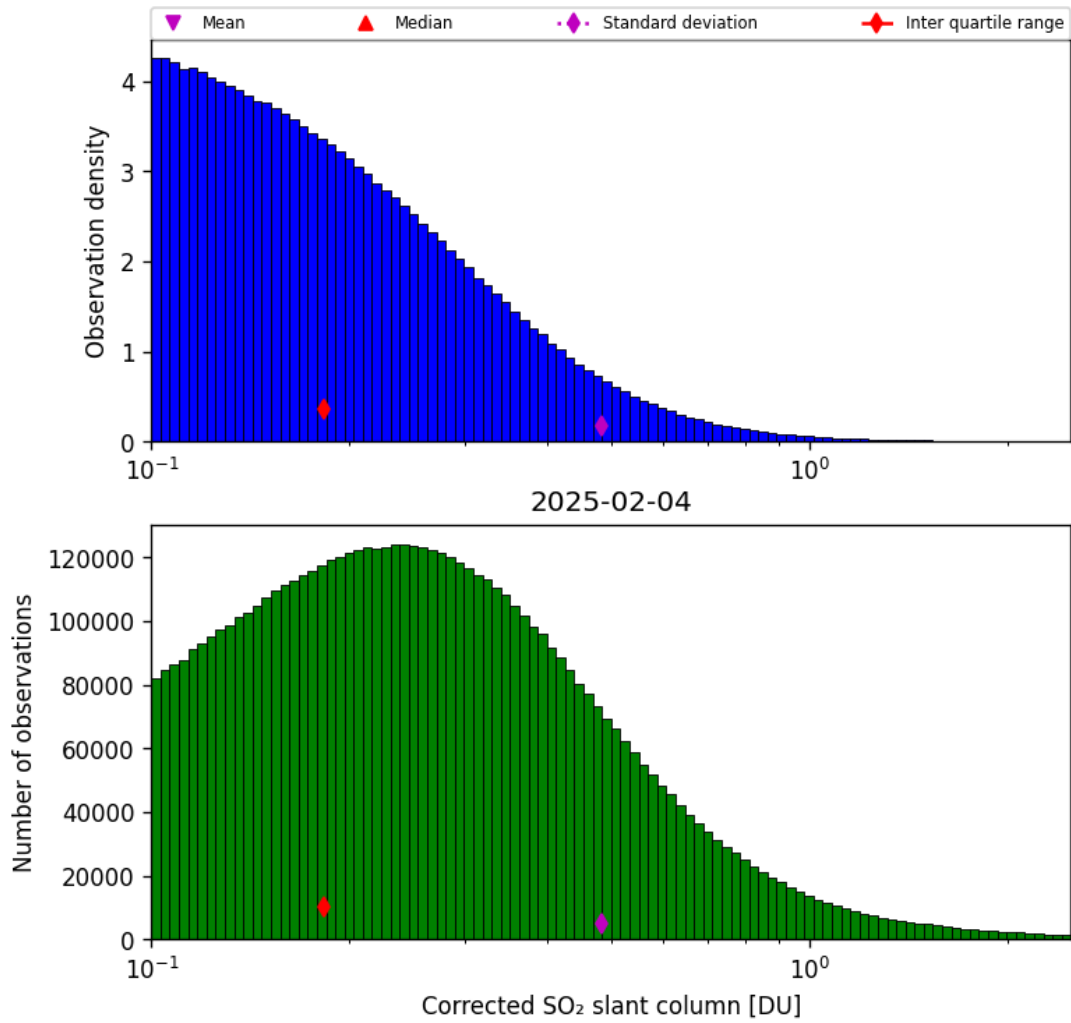


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-02-04 to 2025-02-05

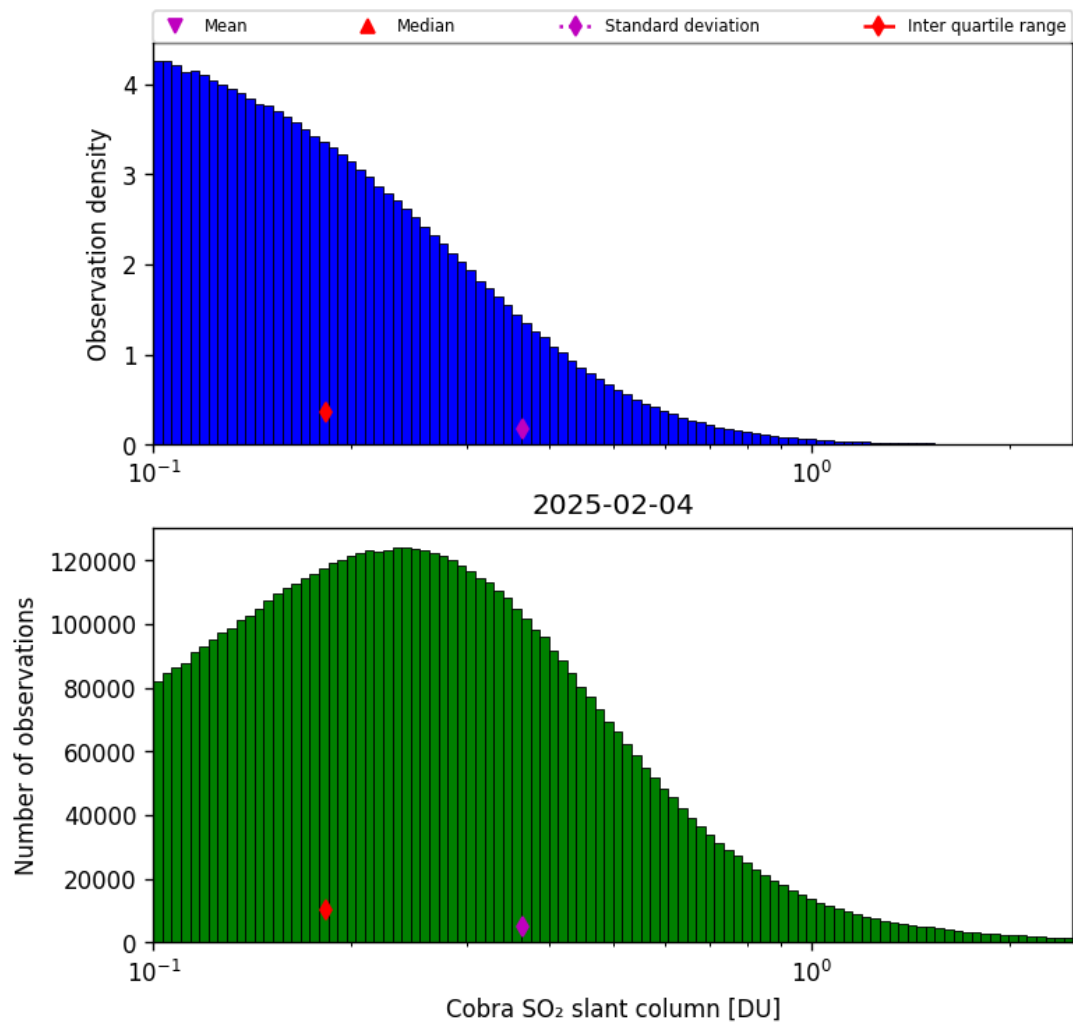


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-02-04 to 2025-02-05

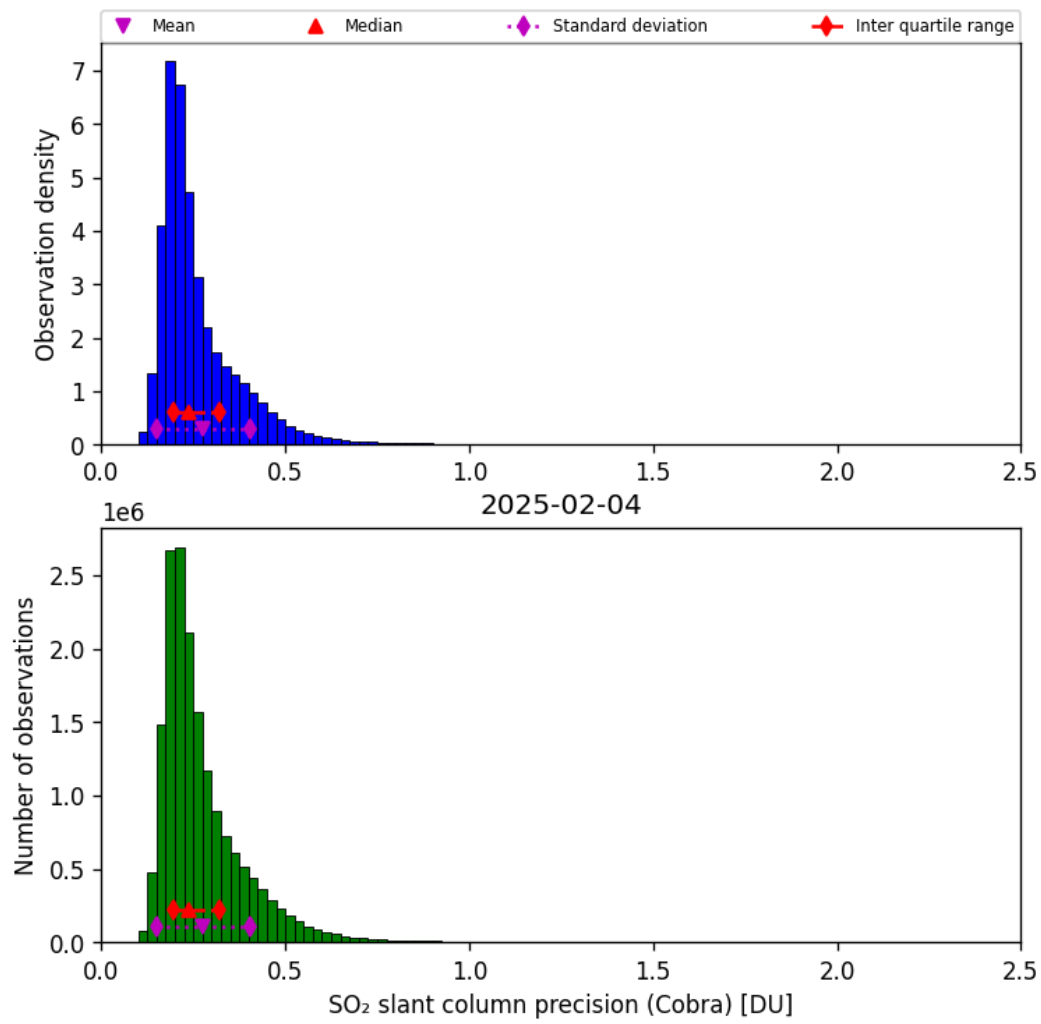


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-02-04 to 2025-02-05

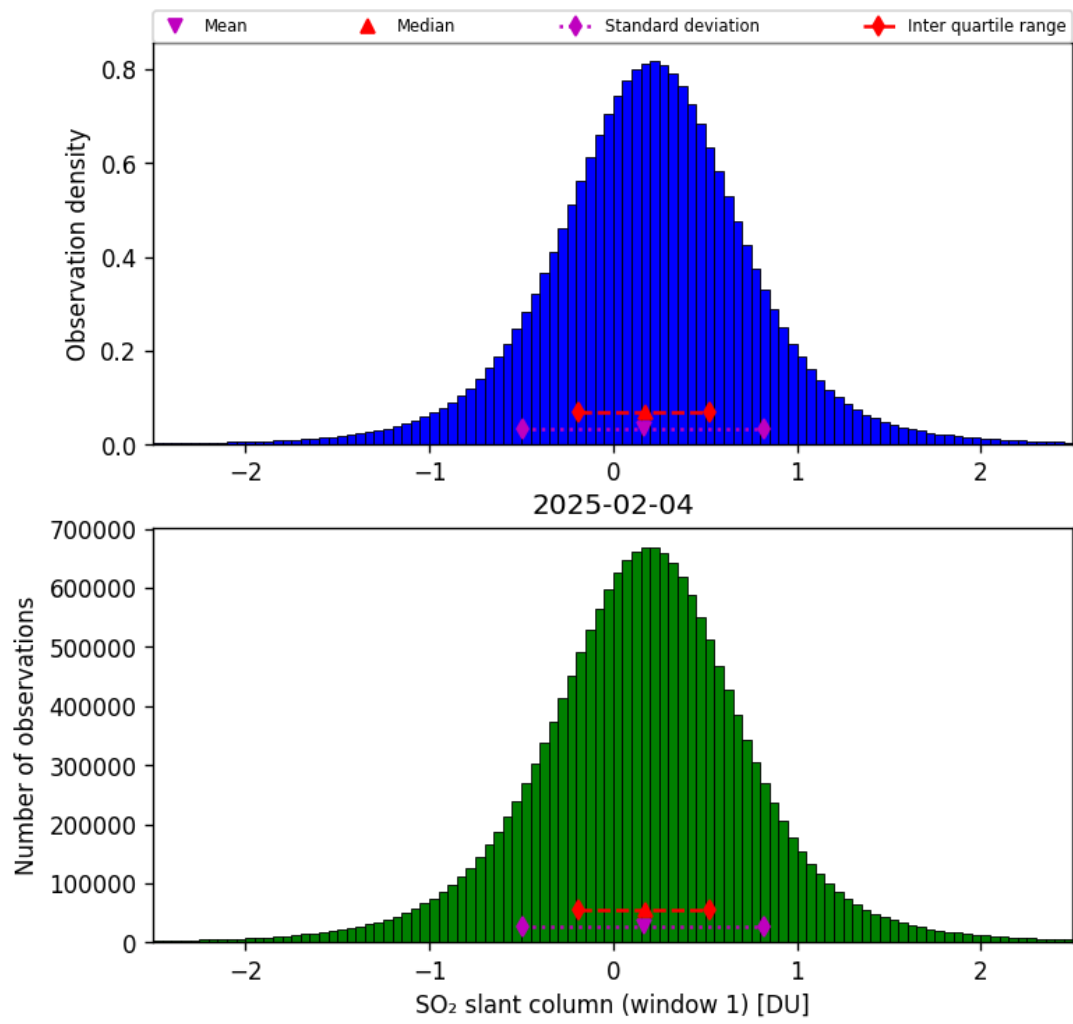


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-02-04 to 2025-02-05

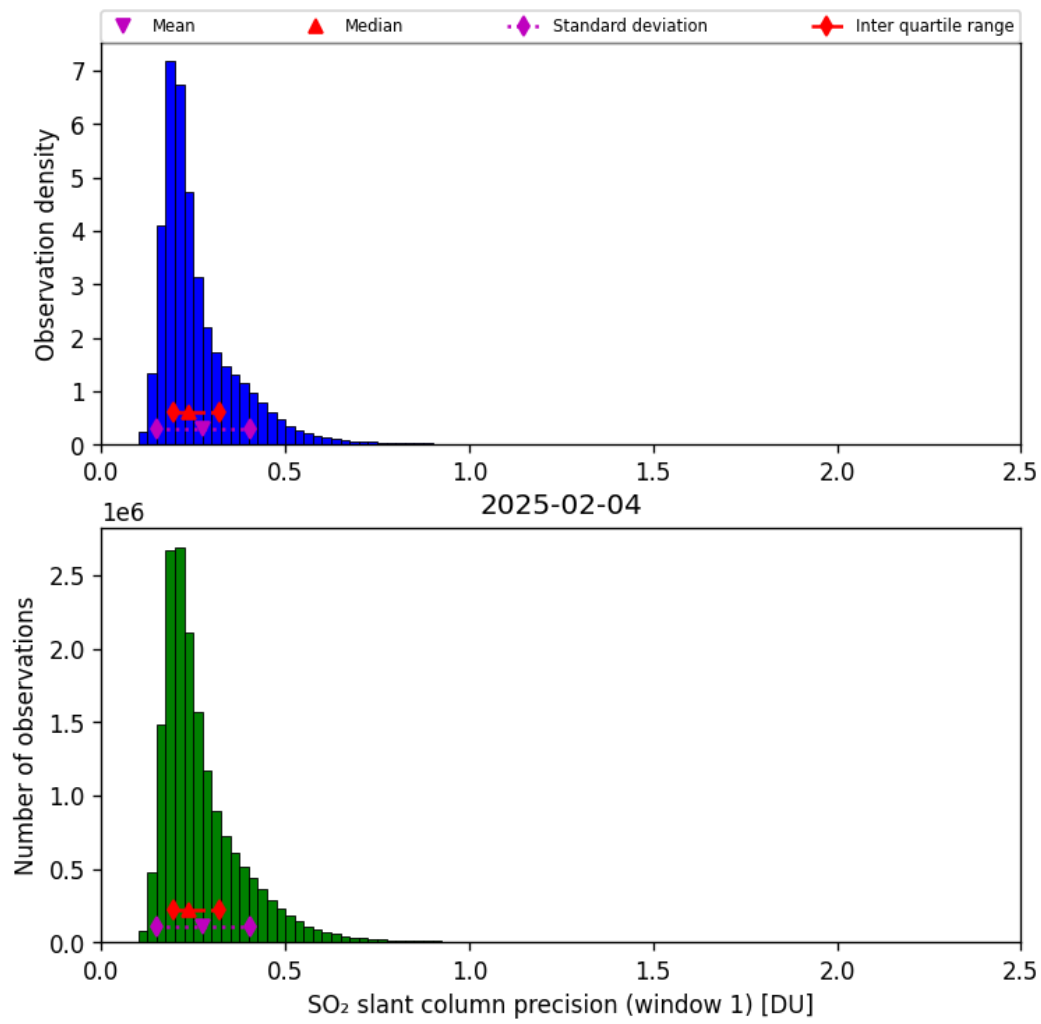


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-02-04 to 2025-02-05

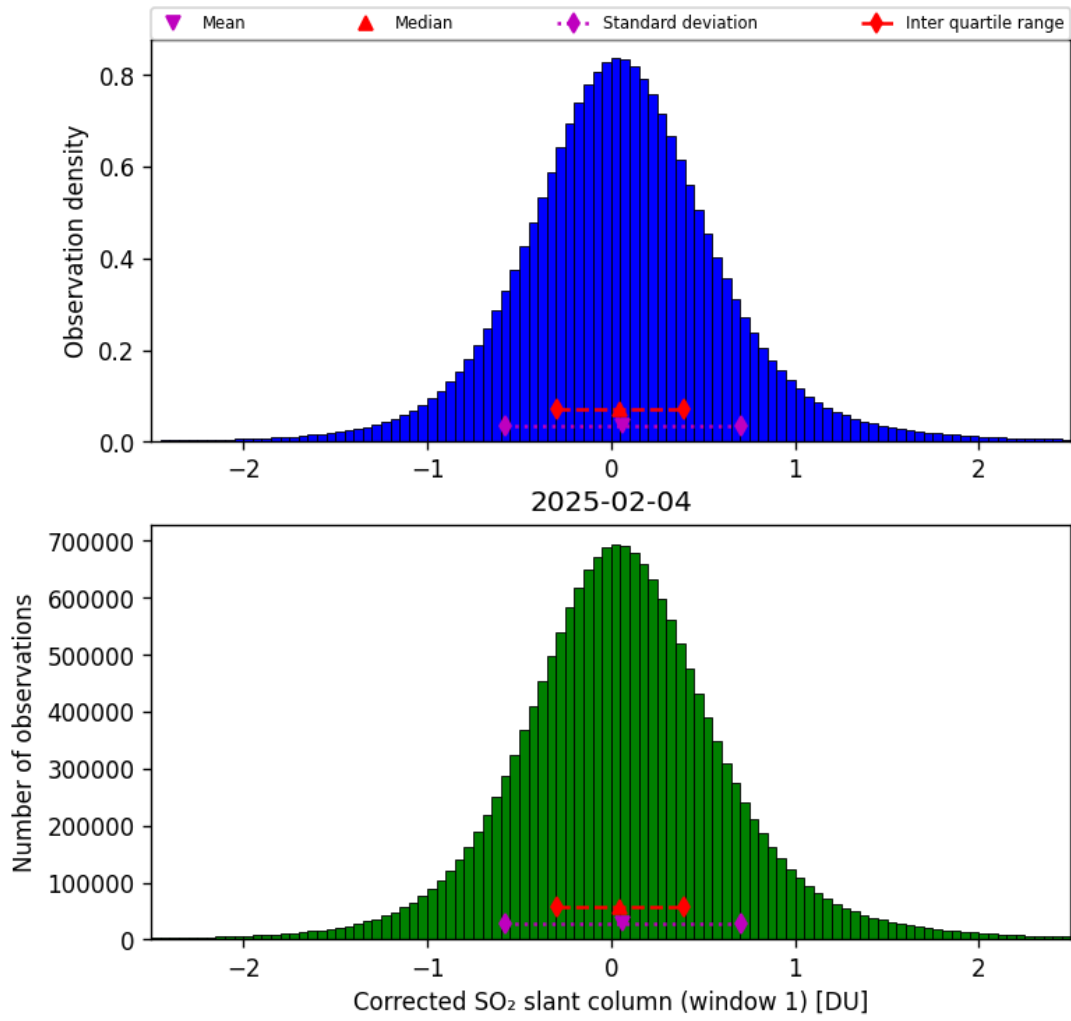


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-02-04 to 2025-02-05

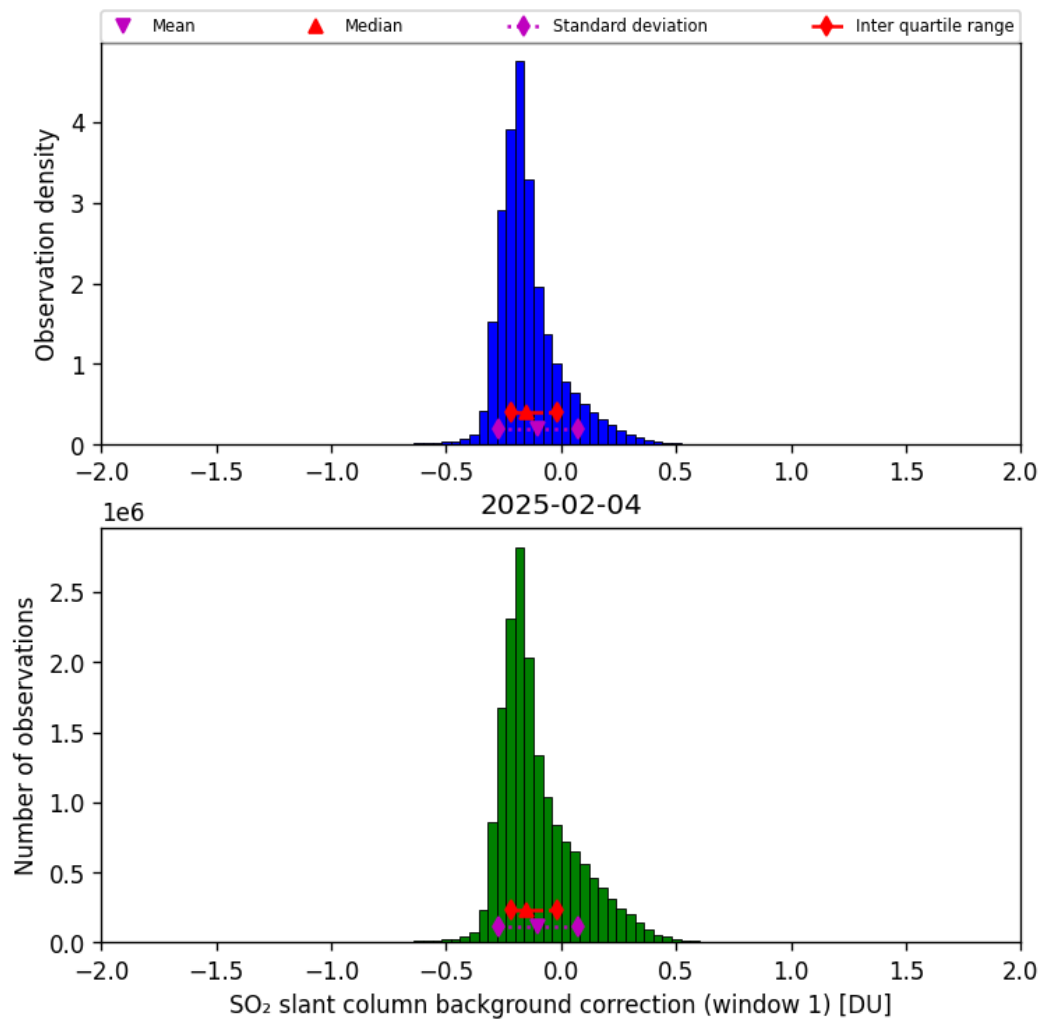


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-02-04 to 2025-02-05

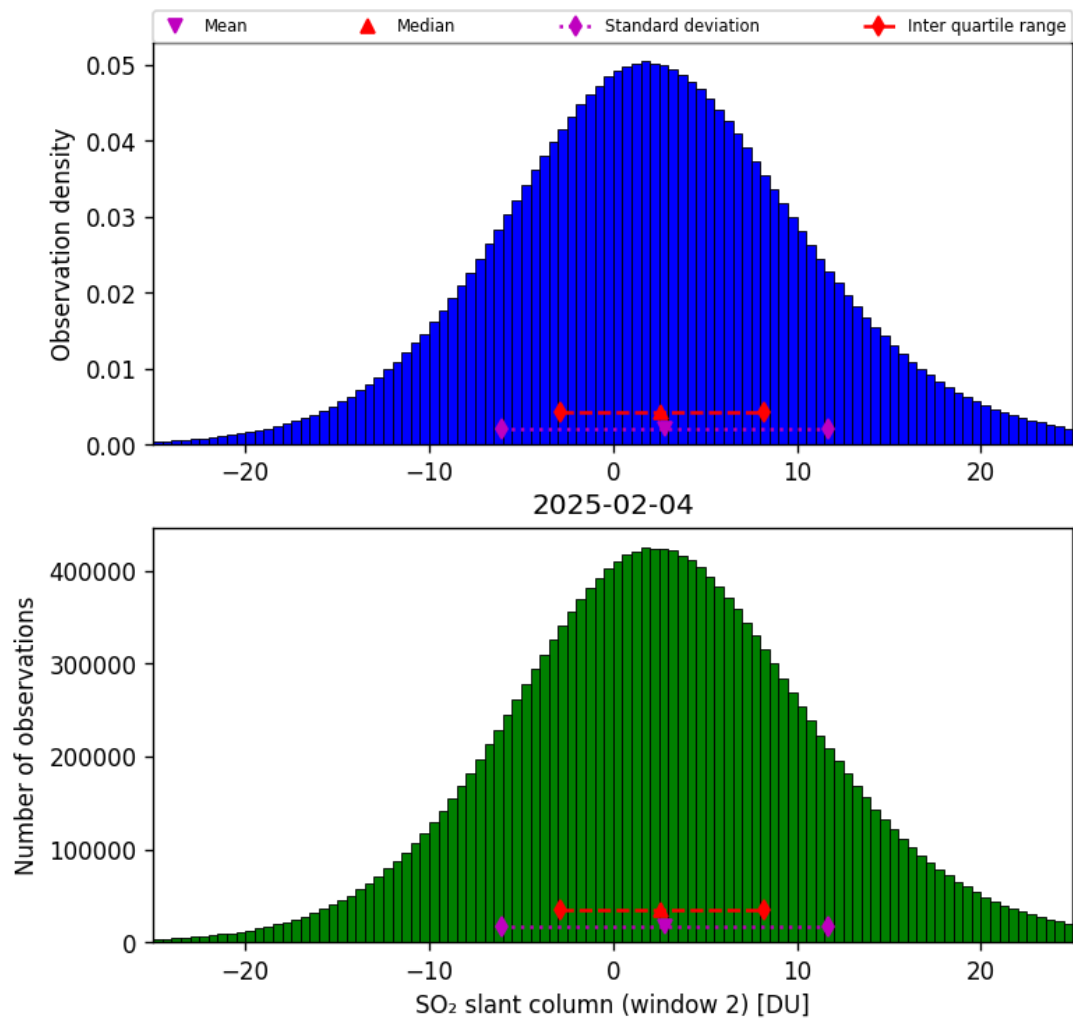


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-02-04 to 2025-02-05

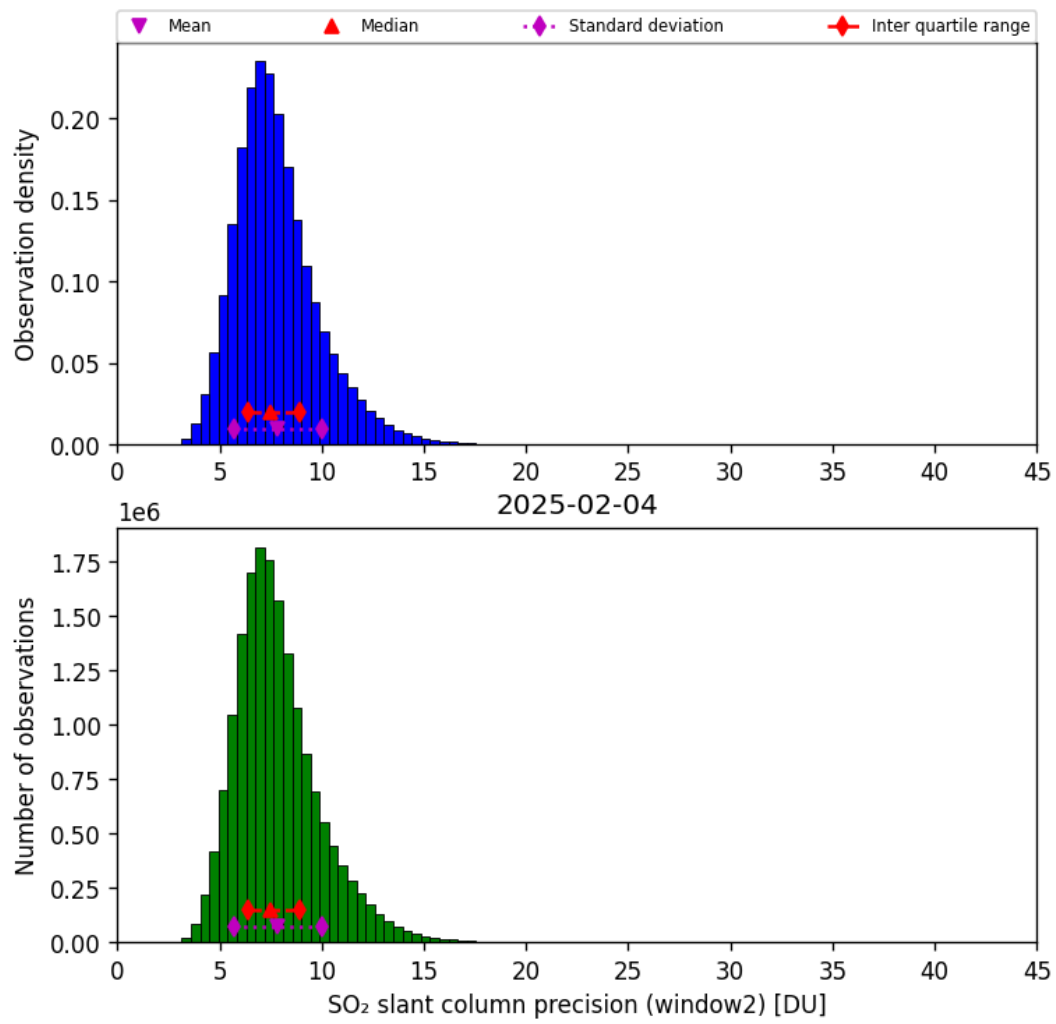


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-02-04 to 2025-02-05

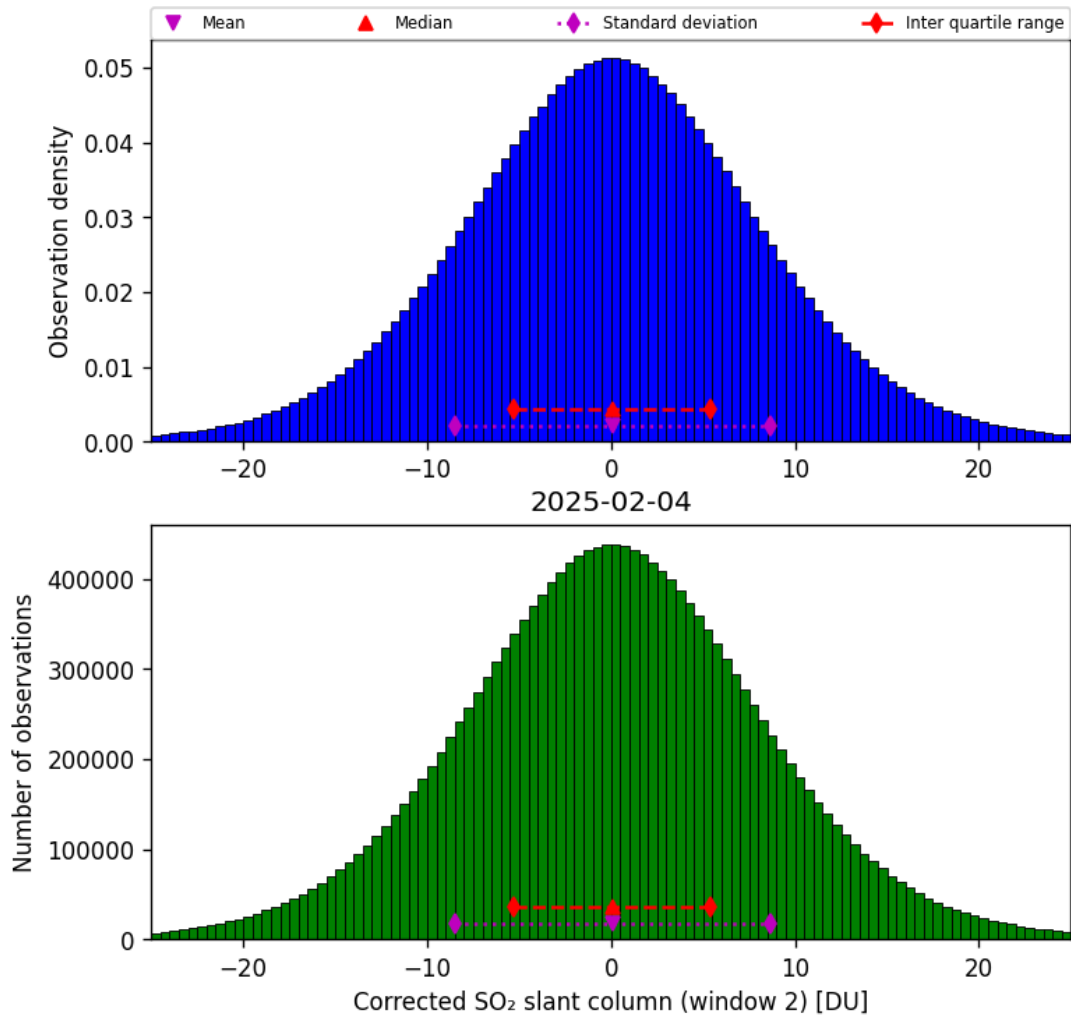


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-02-04 to 2025-02-05

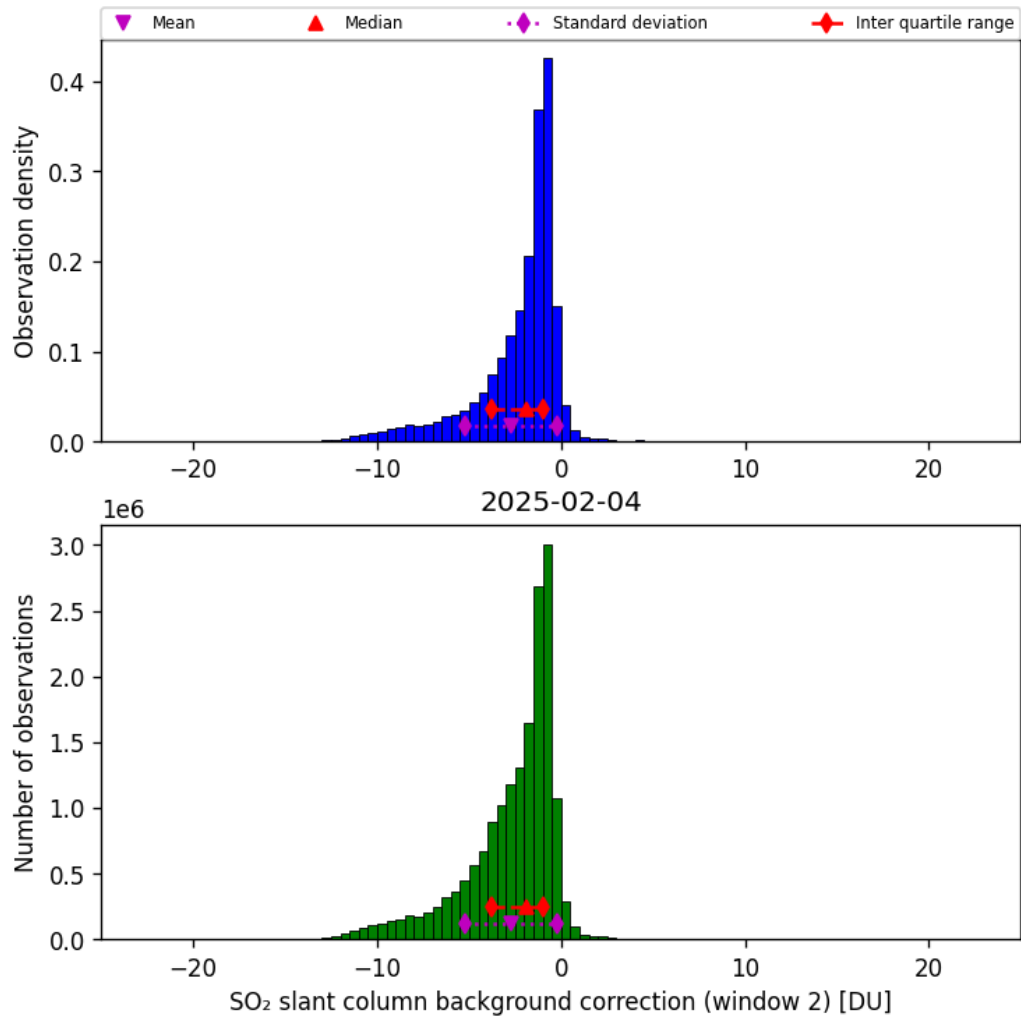


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-02-04 to 2025-02-05

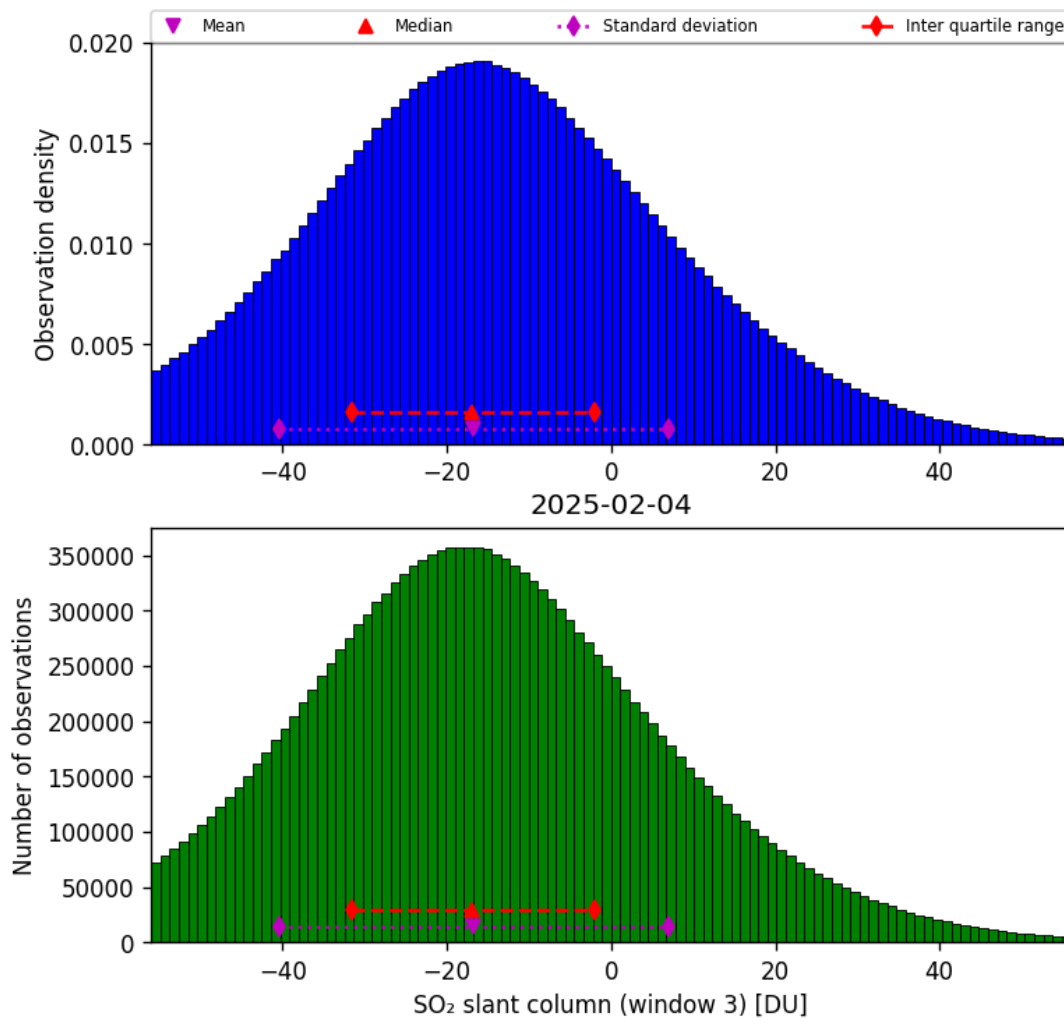


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-02-04 to 2025-02-05

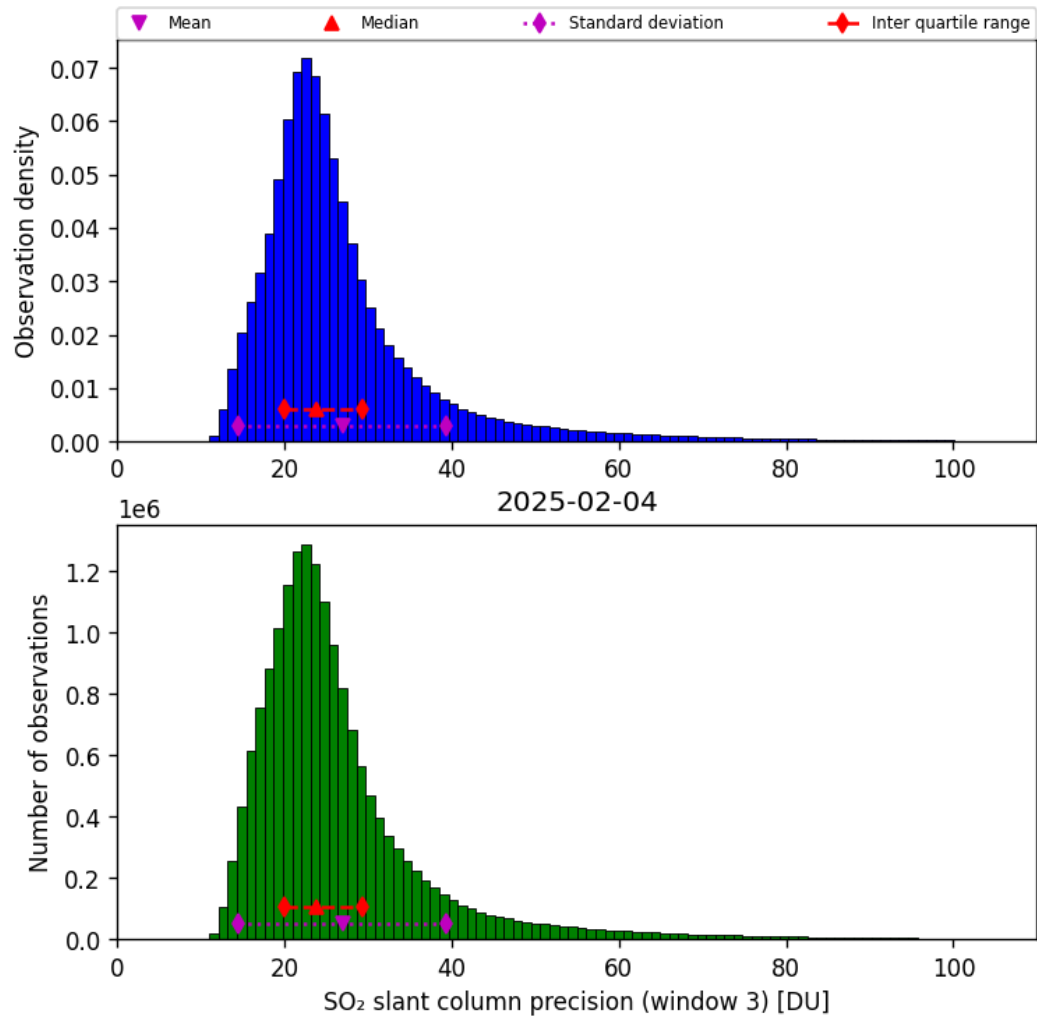


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-02-04 to 2025-02-05

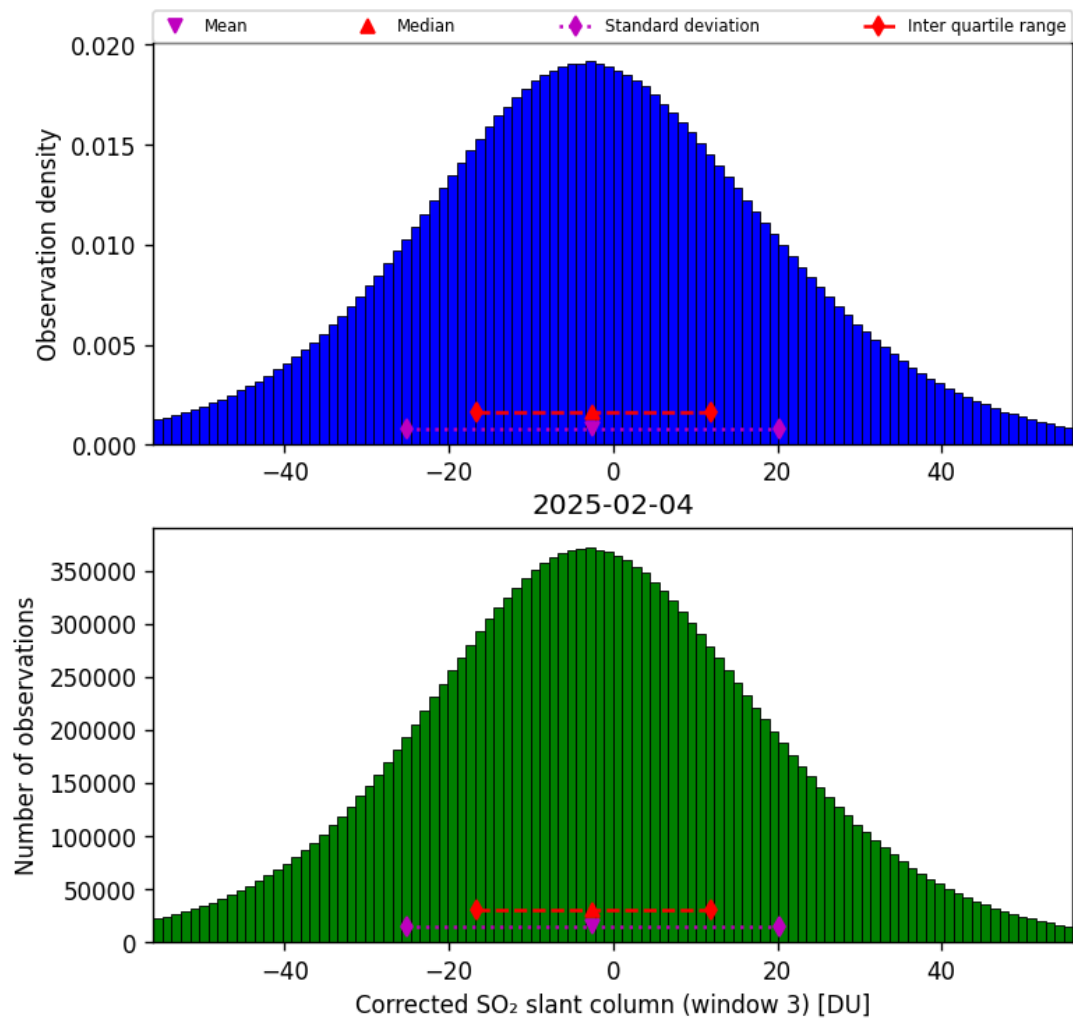


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-02-04 to 2025-02-05

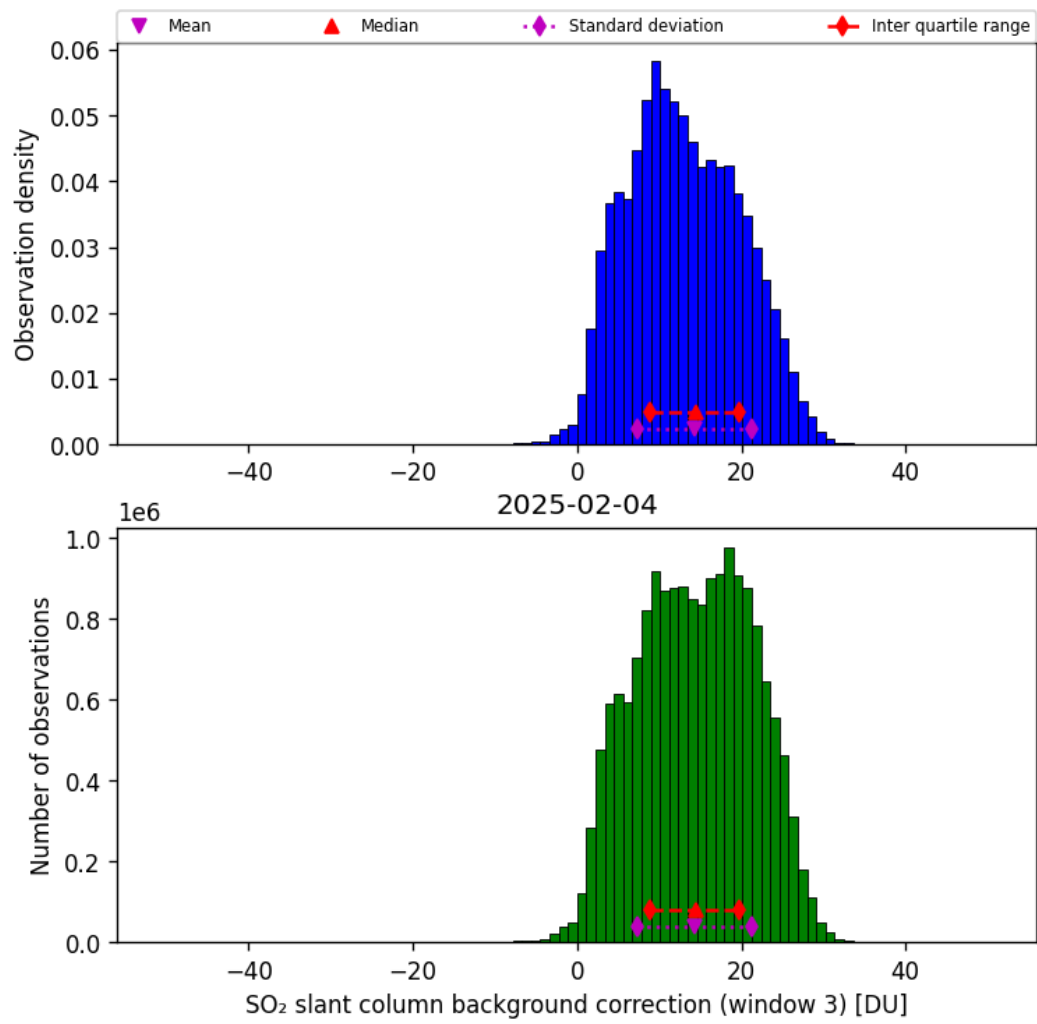


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-02-04 to 2025-02-05

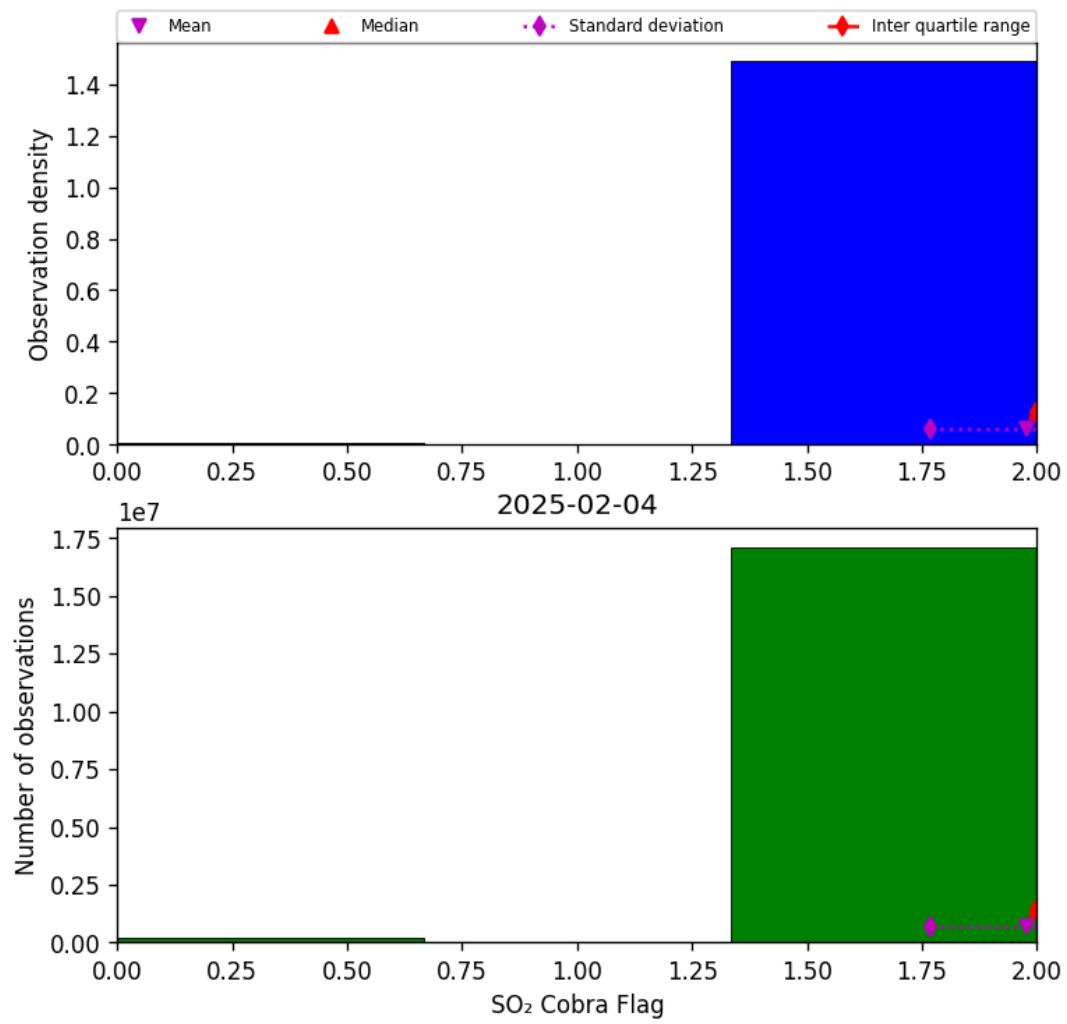


Figure 75: Histogram of "SO₂ Cobra Flag" for 2025-02-04 to 2025-02-05

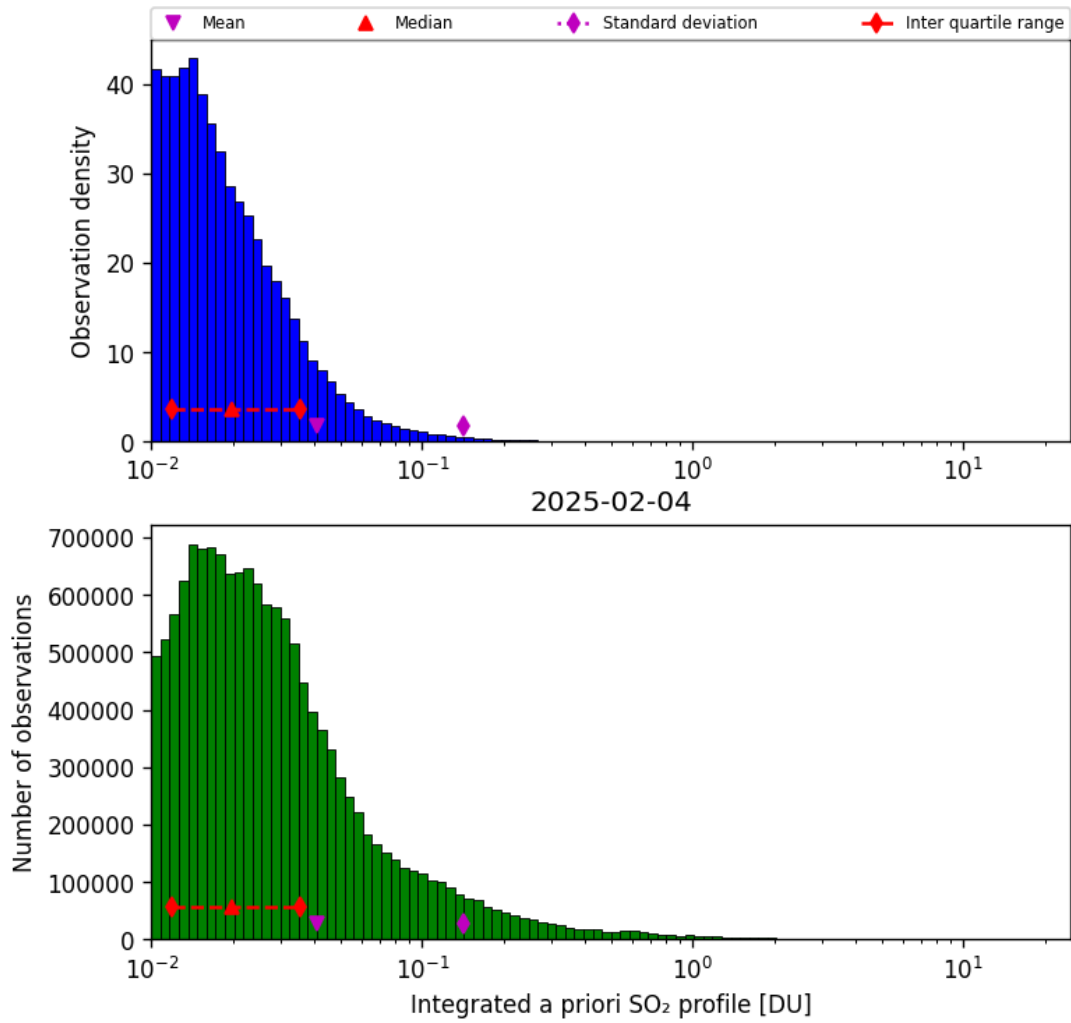


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-02-04 to 2025-02-05

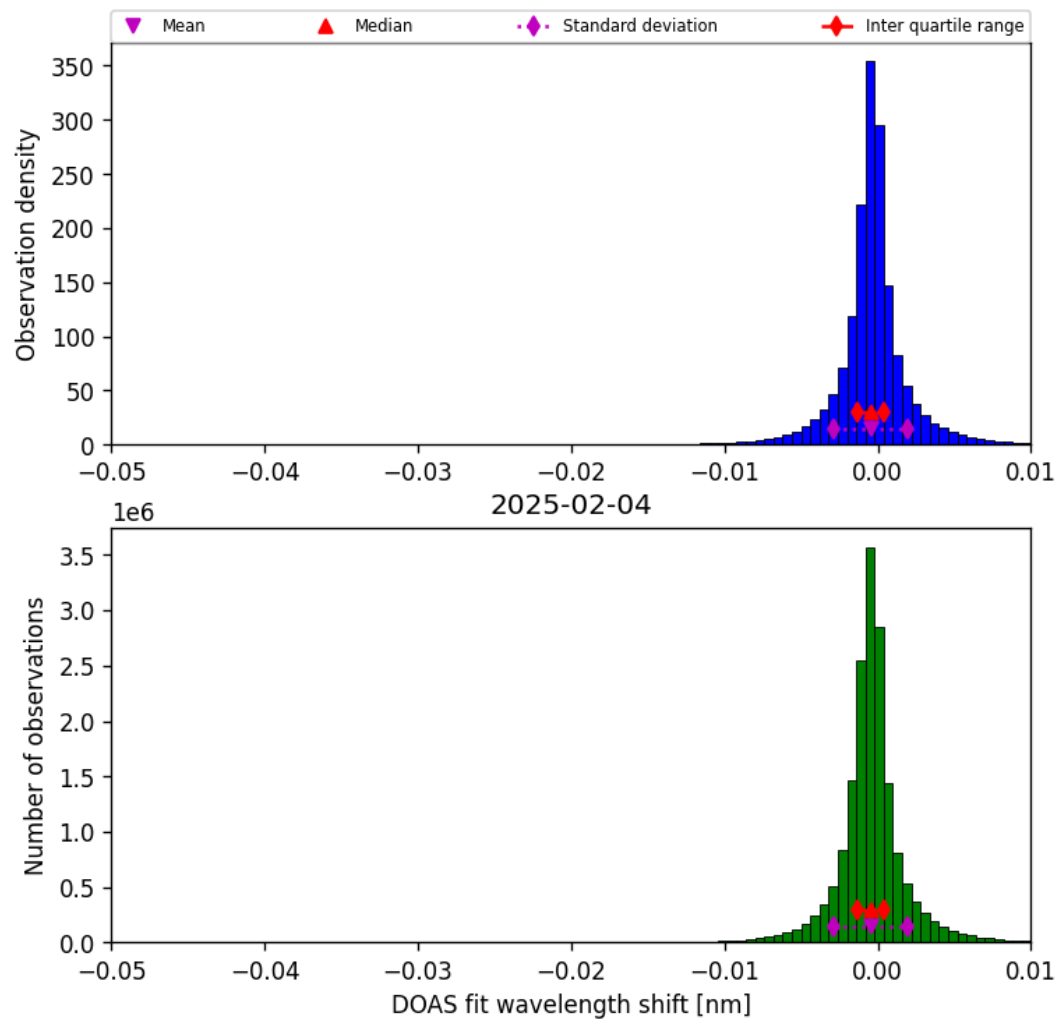


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-02-04 to 2025-02-05

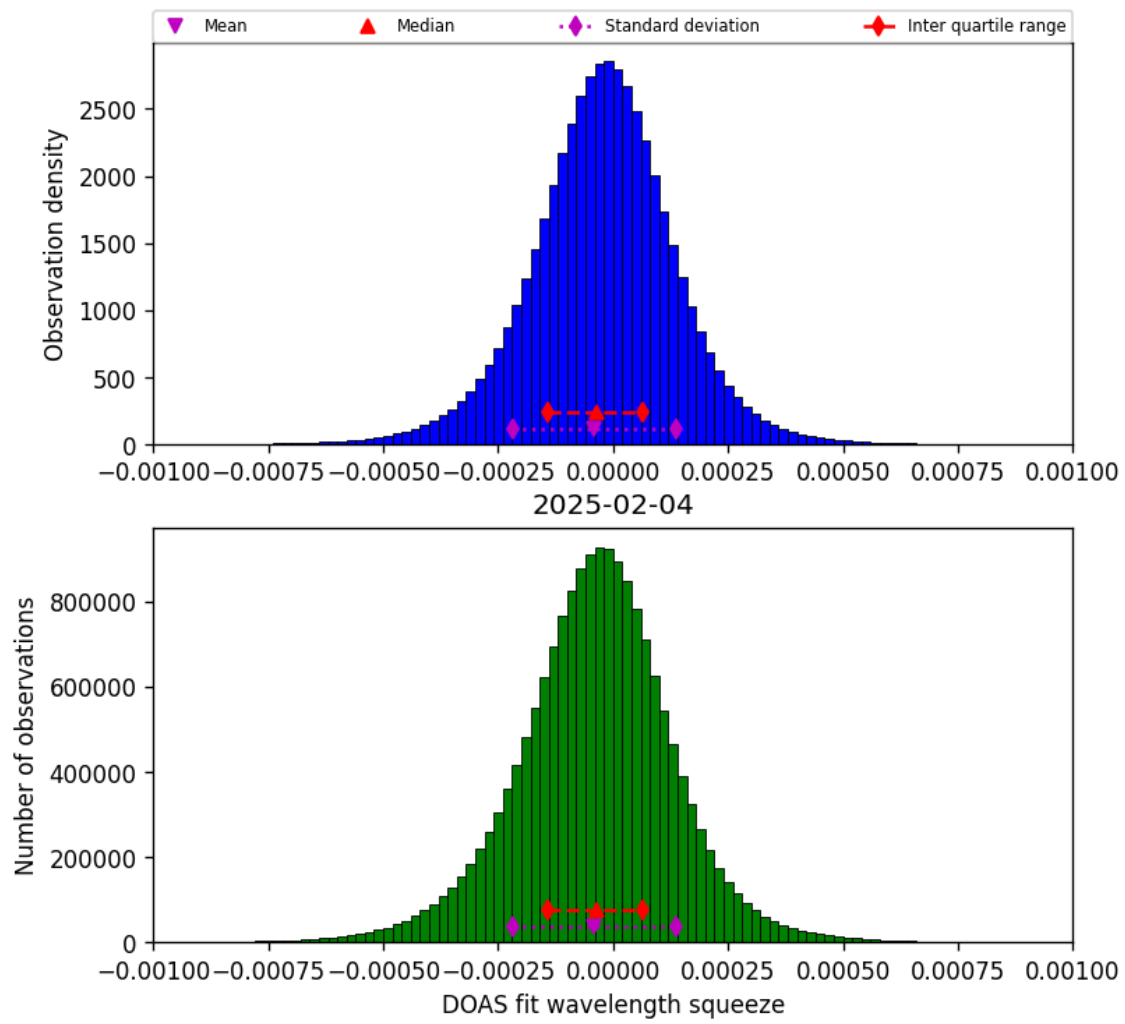


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-02-04 to 2025-02-05

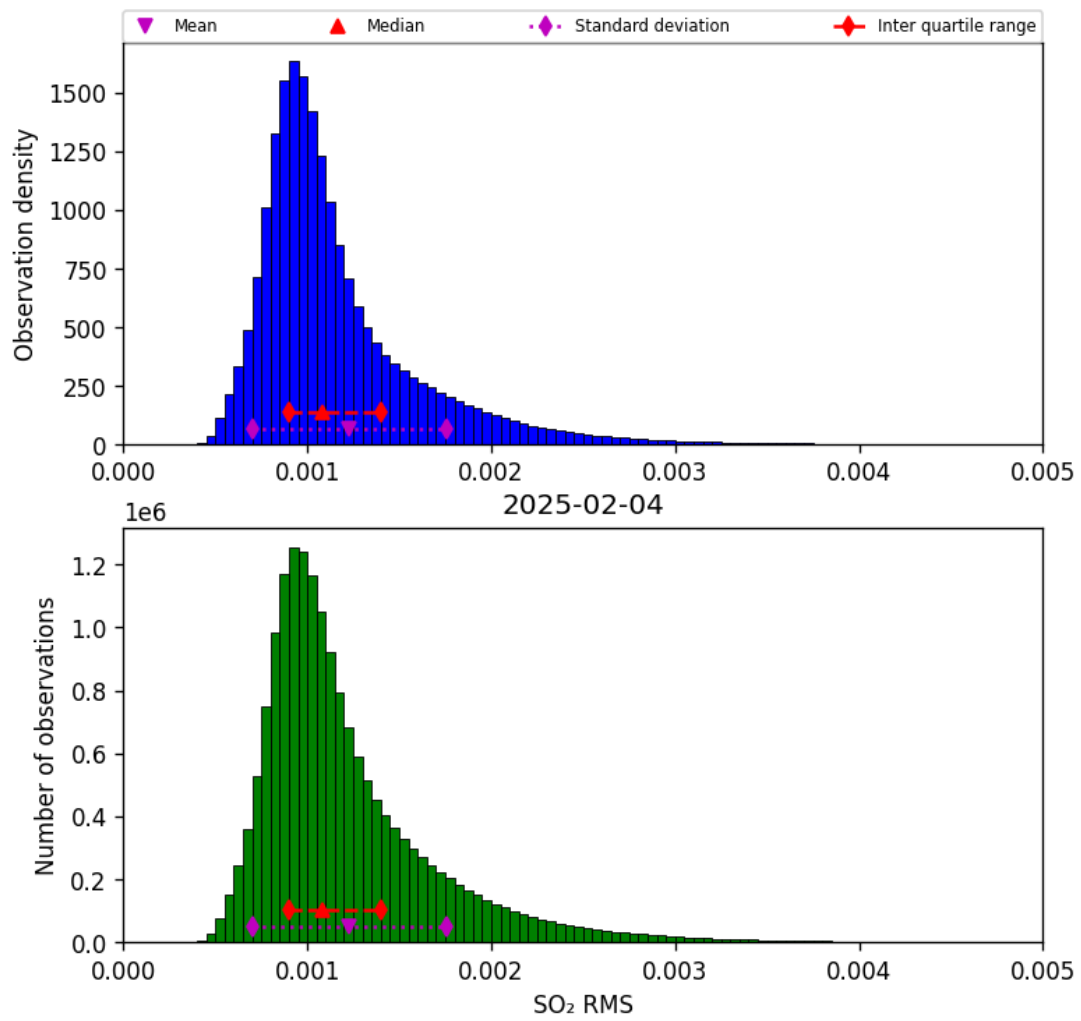


Figure 79: Histogram of “SO₂ RMS” for 2025-02-04 to 2025-02-05

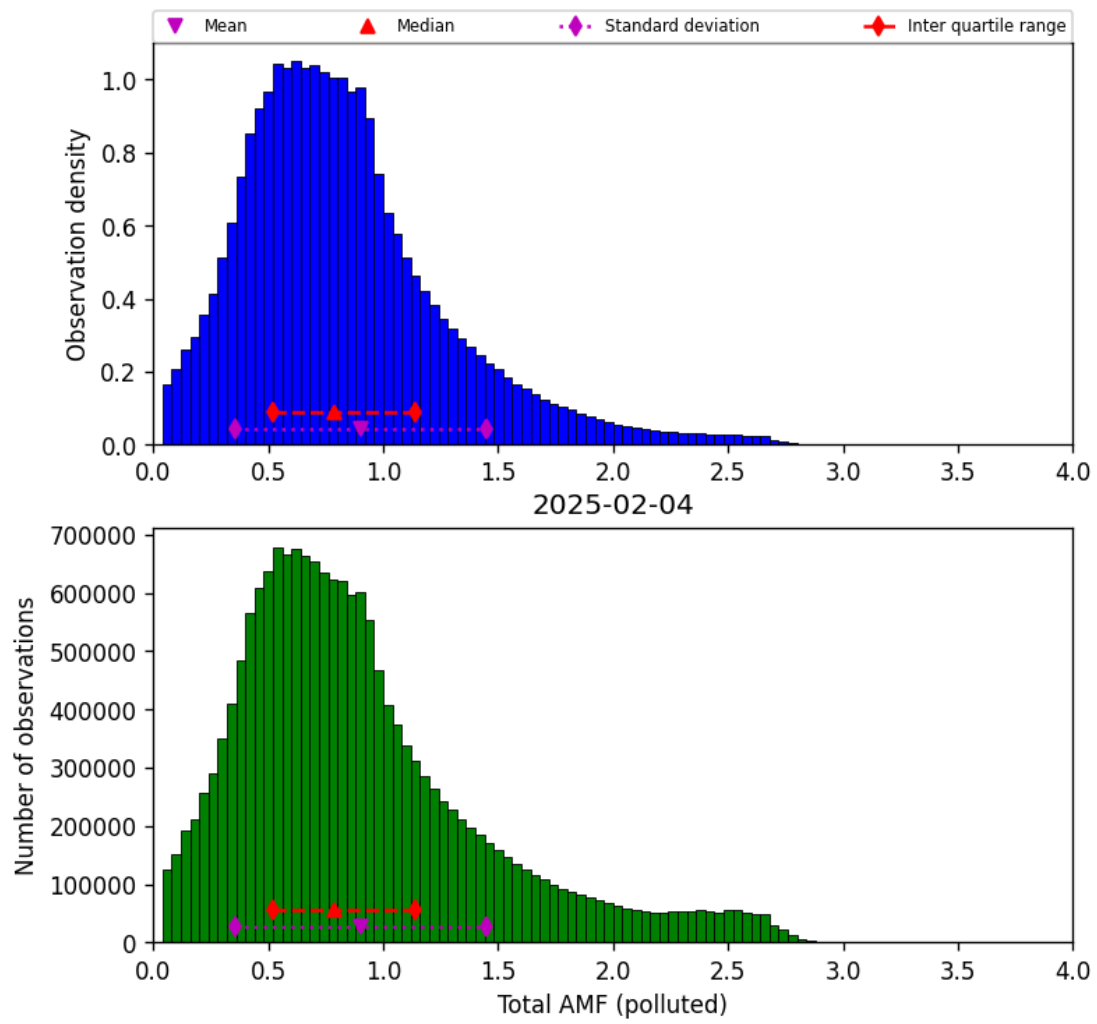


Figure 80: Histogram of “Total AMF (polluted)” for 2025-02-04 to 2025-02-05

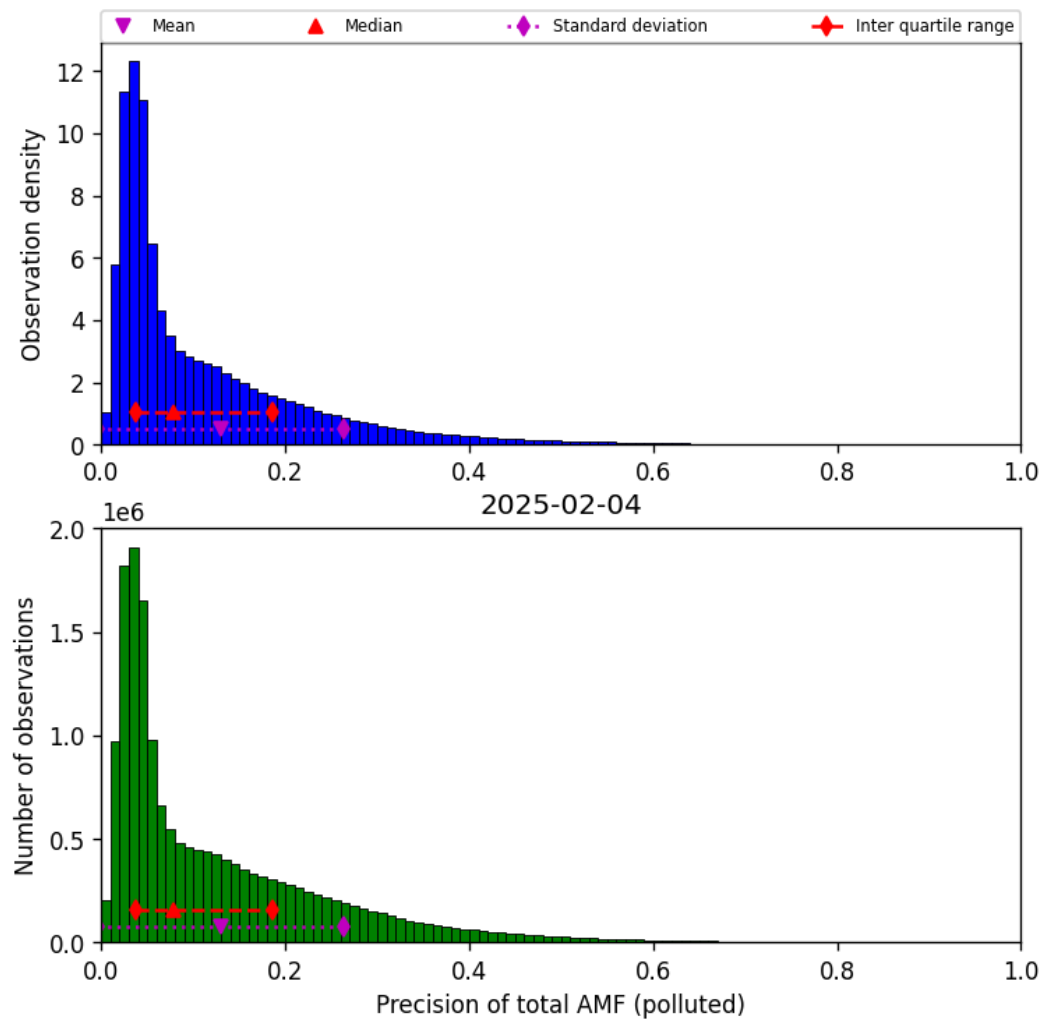


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-02-04 to 2025-02-05

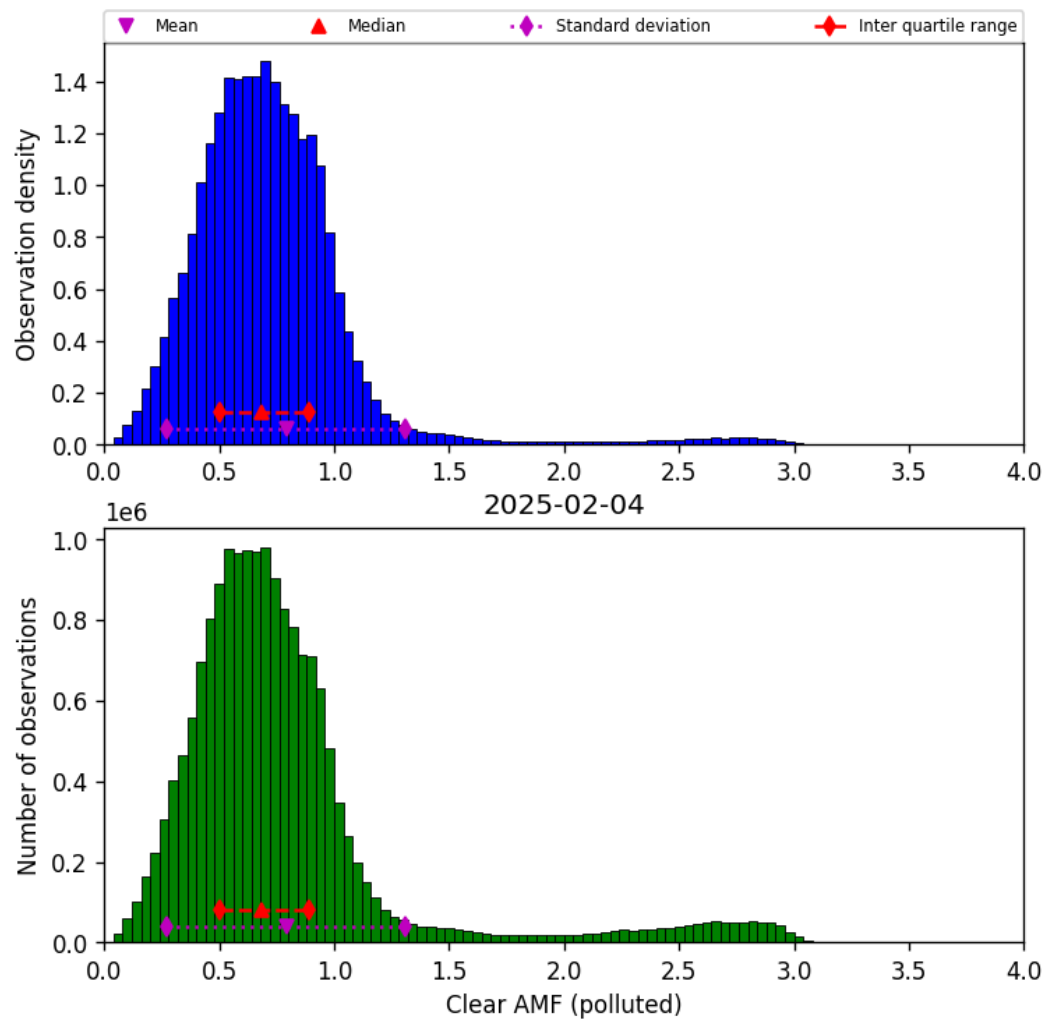


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-02-04 to 2025-02-05

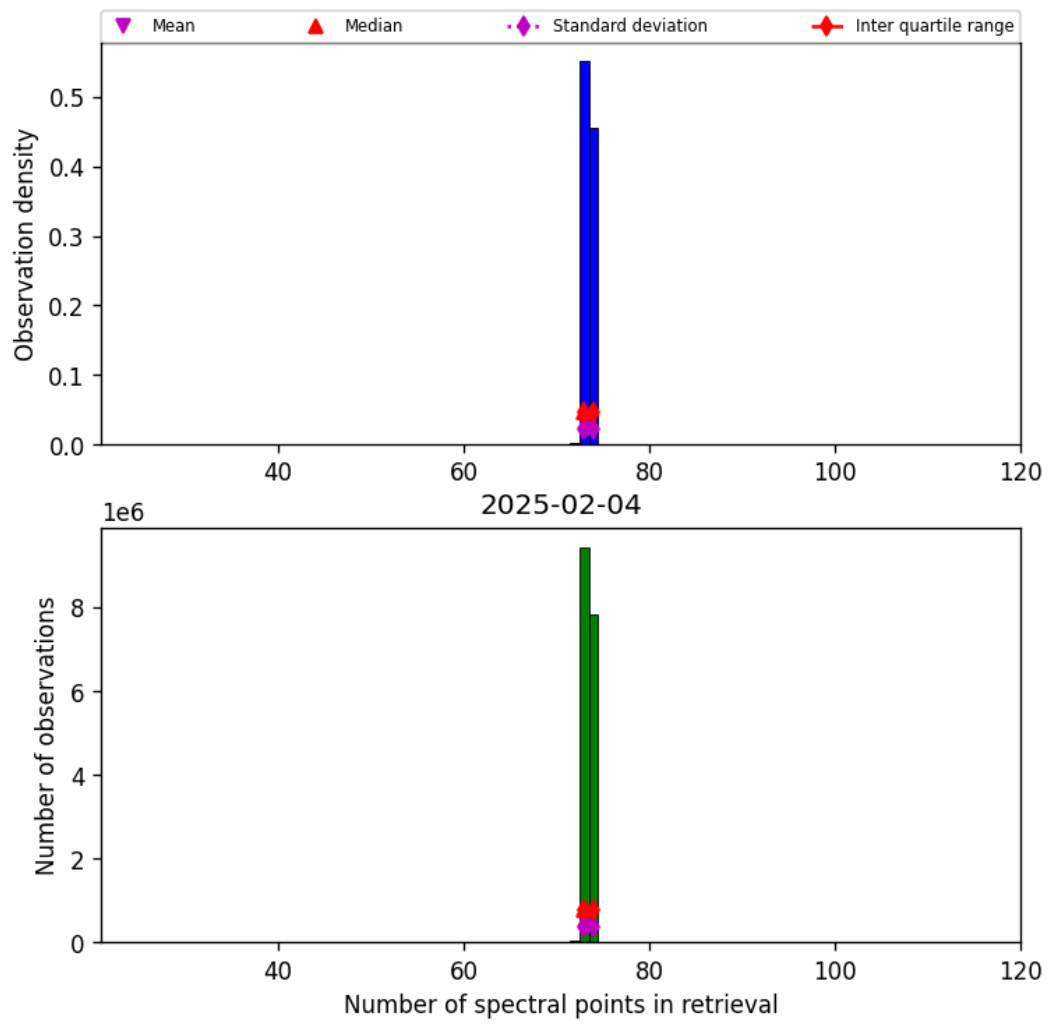


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-02-04 to 2025-02-05

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.

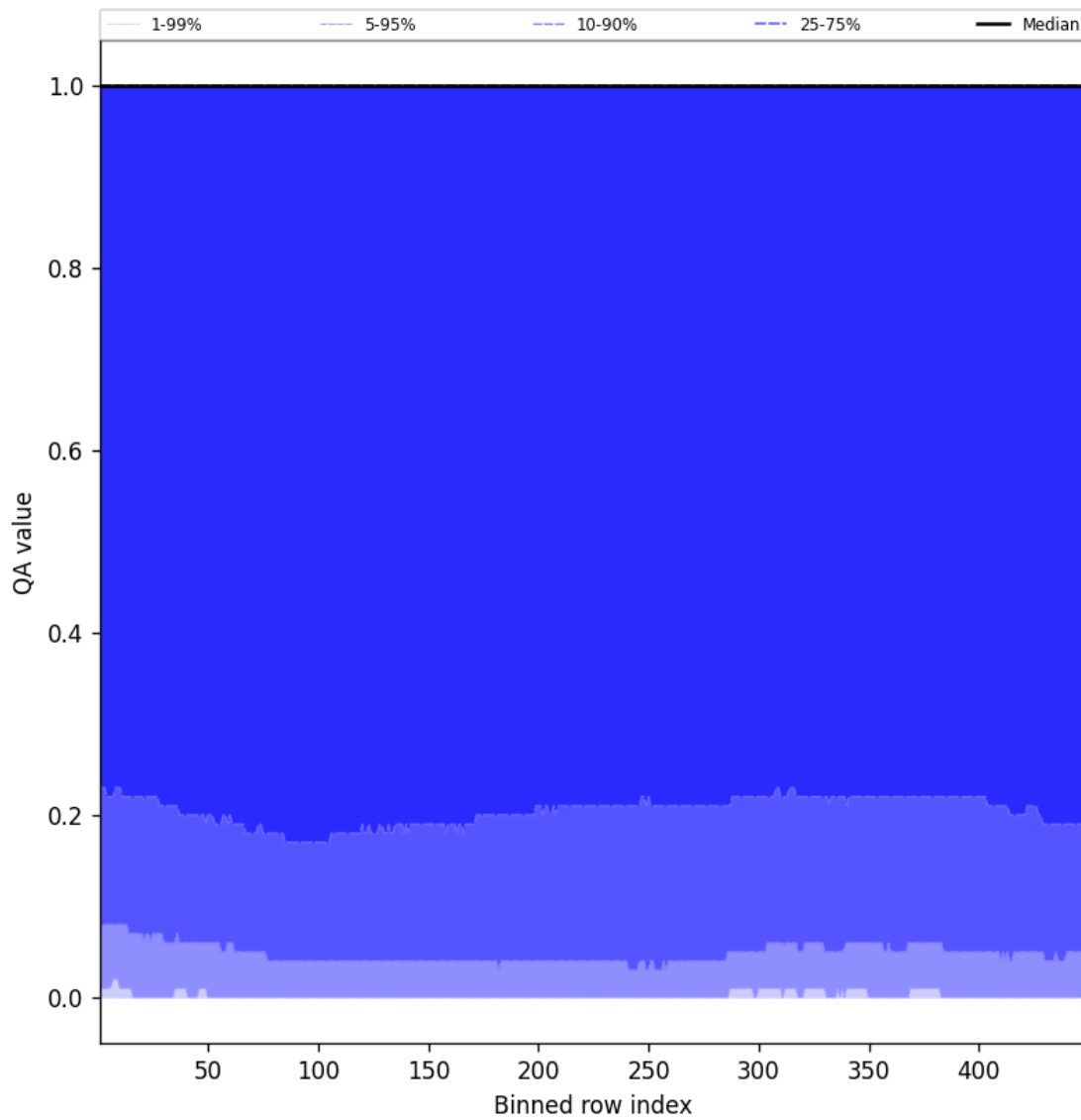


Figure 84: Along track statistics of “QA value” for 2025-02-04 to 2025-02-05

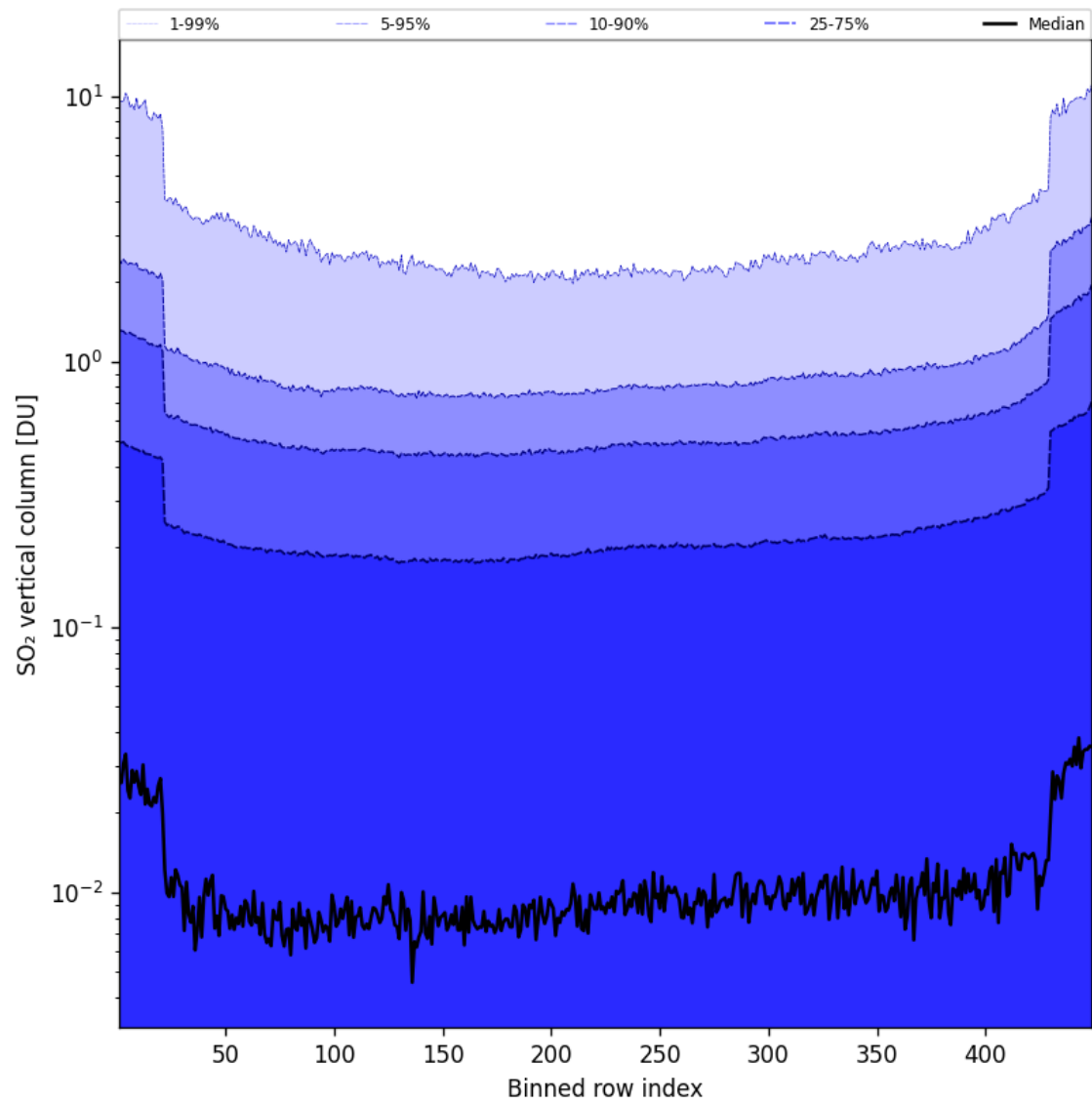


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-02-04 to 2025-02-05

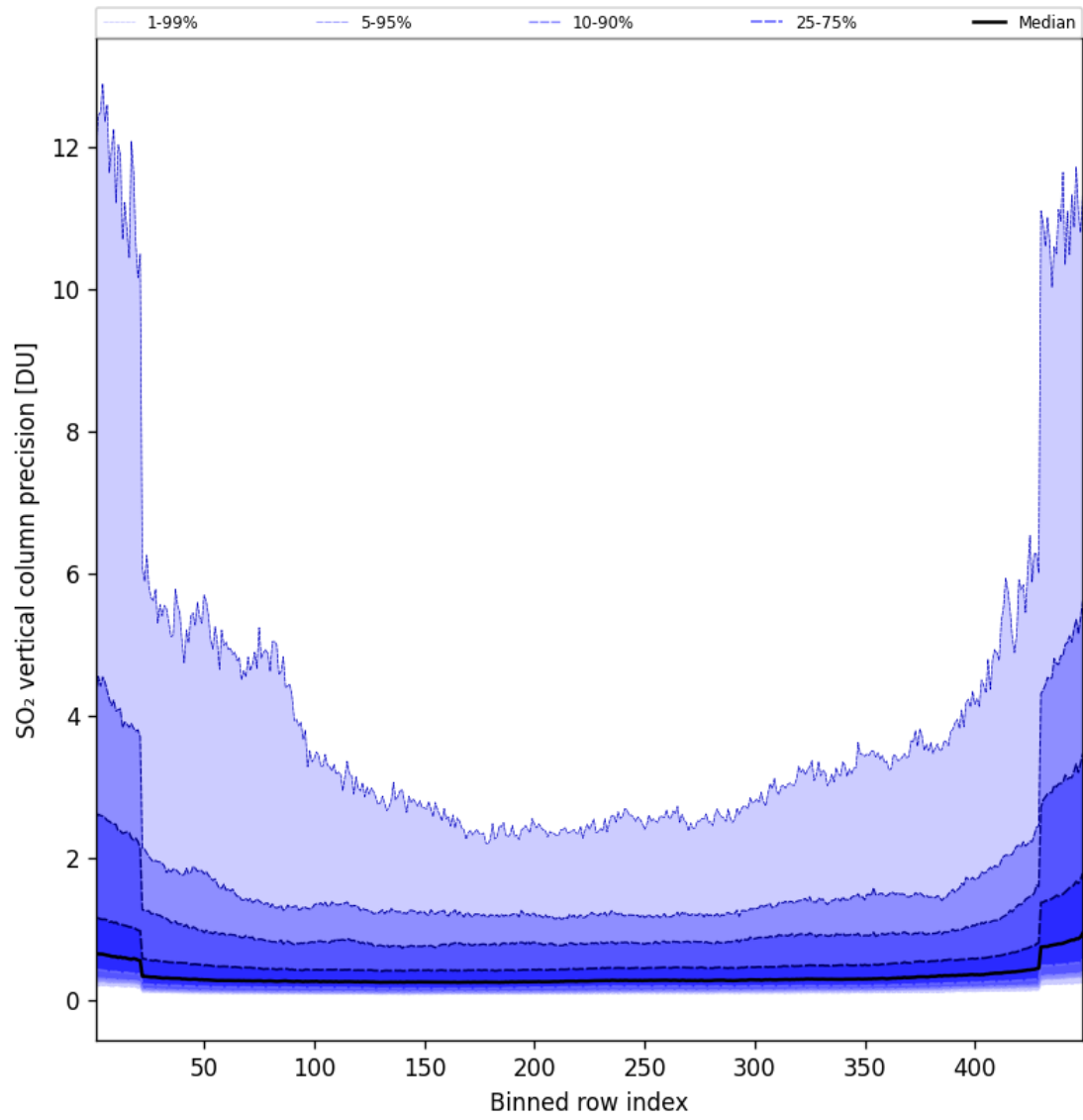


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-02-04 to 2025-02-05

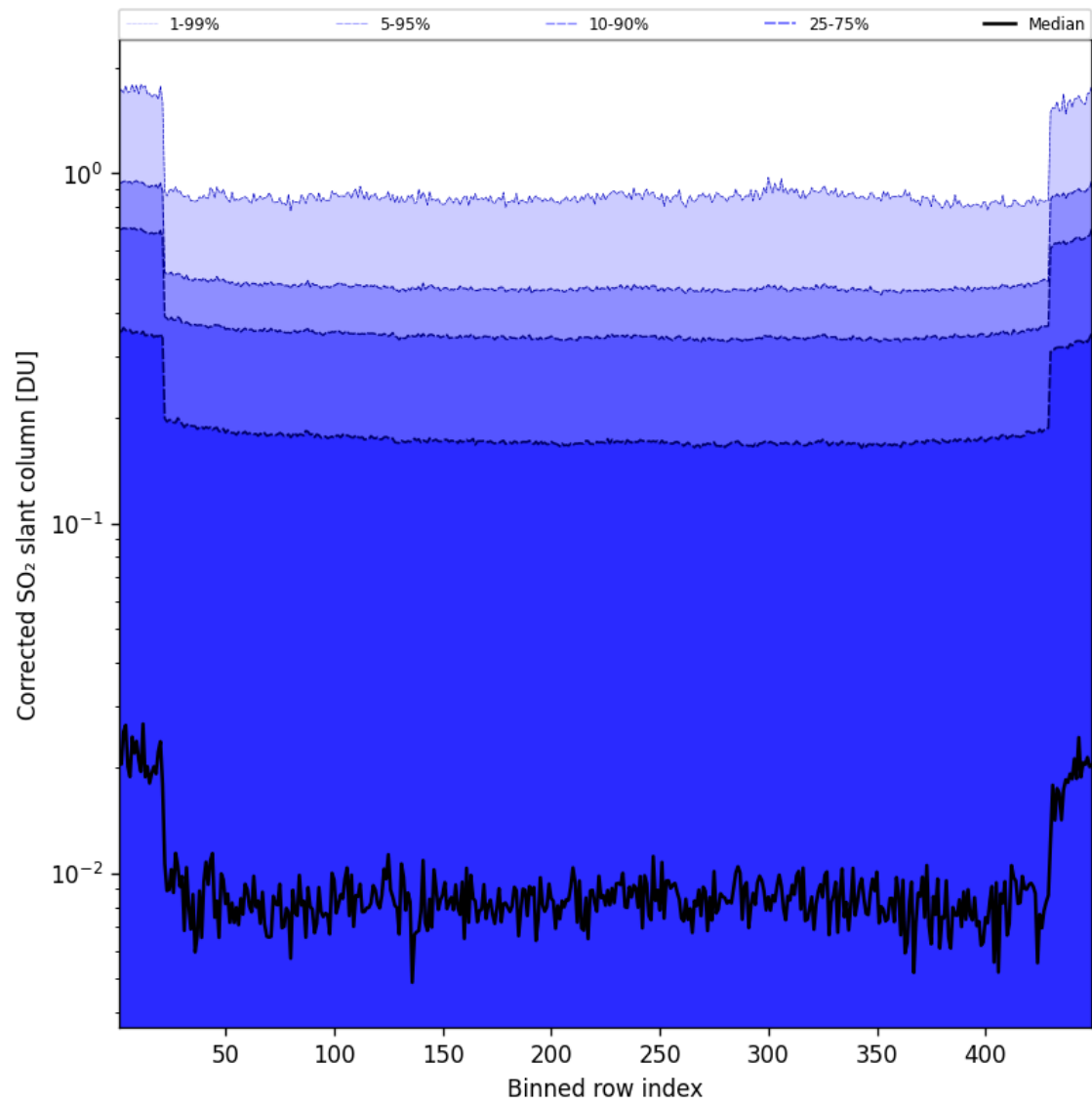


Figure 87: Along track statistics of "Corrected SO₂ slant column" for 2025-02-04 to 2025-02-05

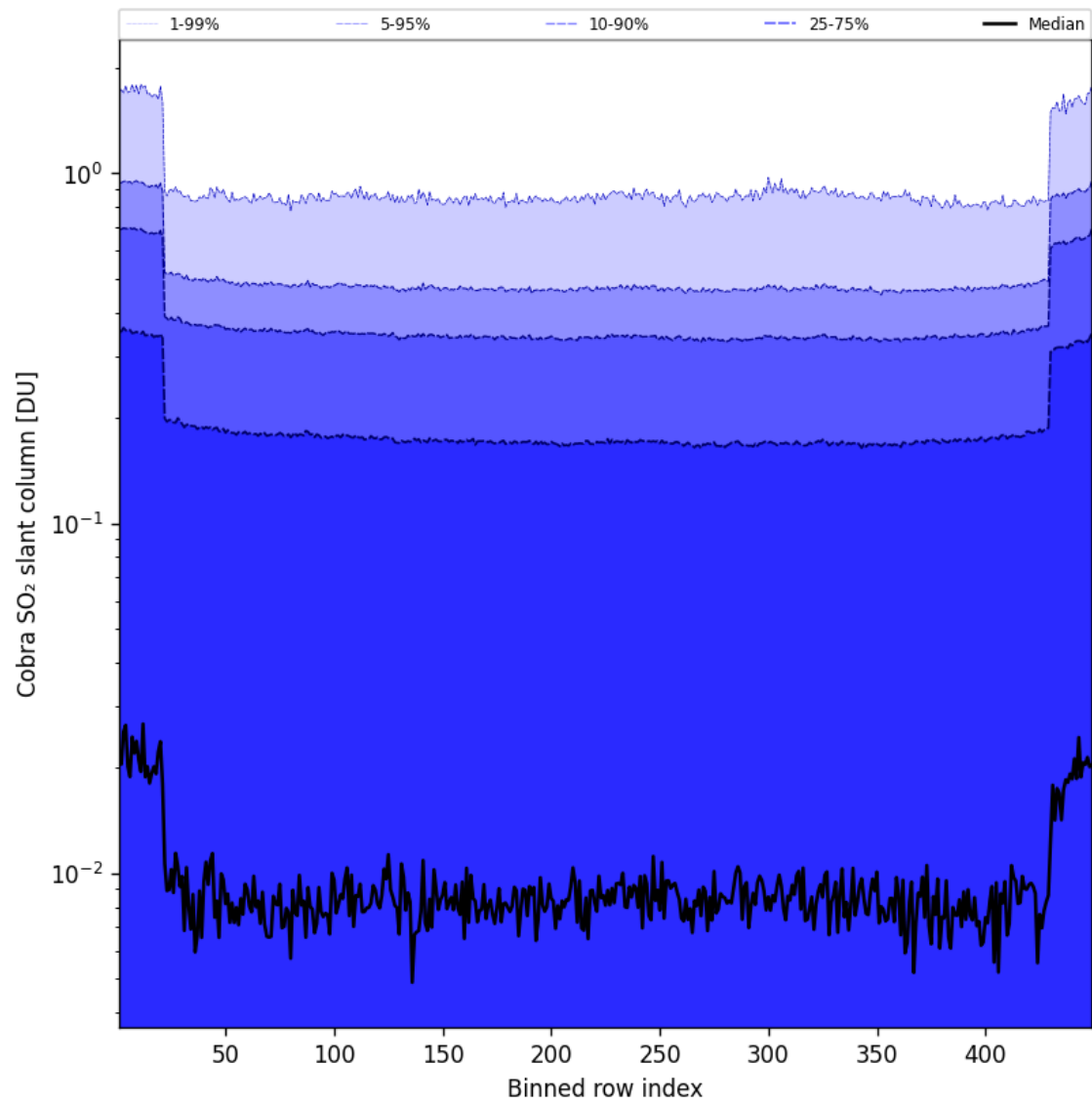


Figure 88: Along track statistics of "Cobra SO₂ slant column" for 2025-02-04 to 2025-02-05

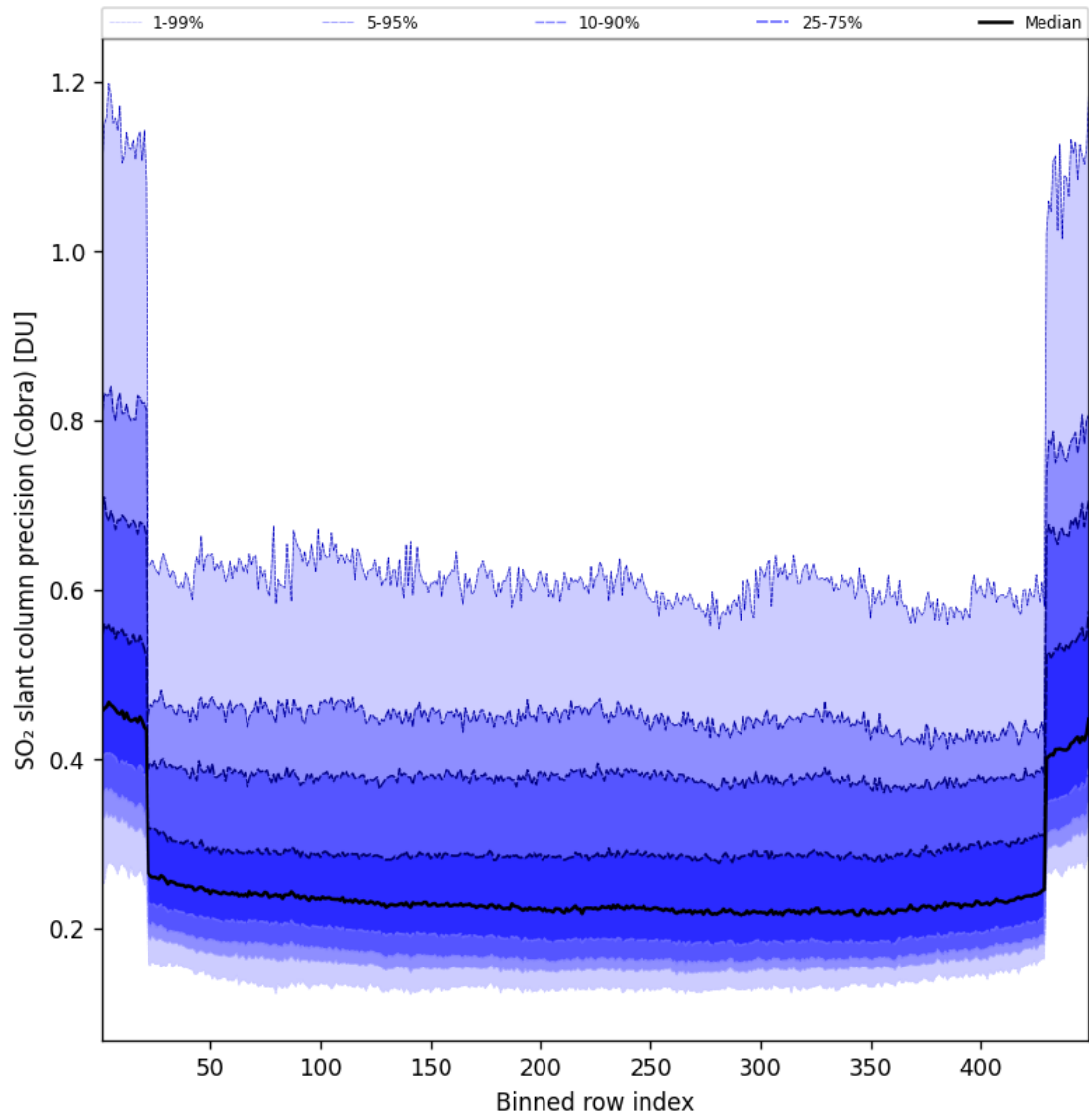


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-02-04 to 2025-02-05

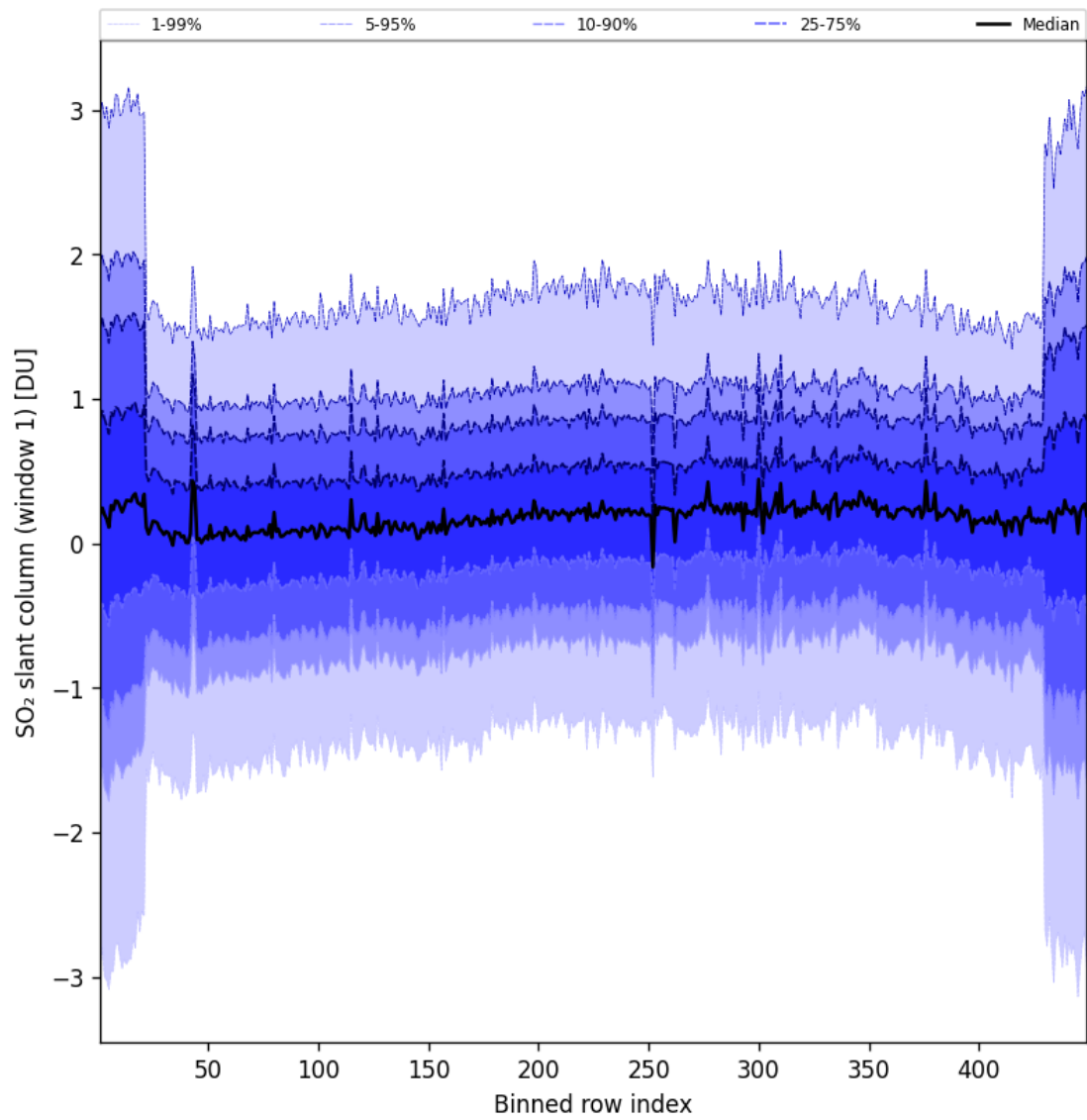


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-02-04 to 2025-02-05

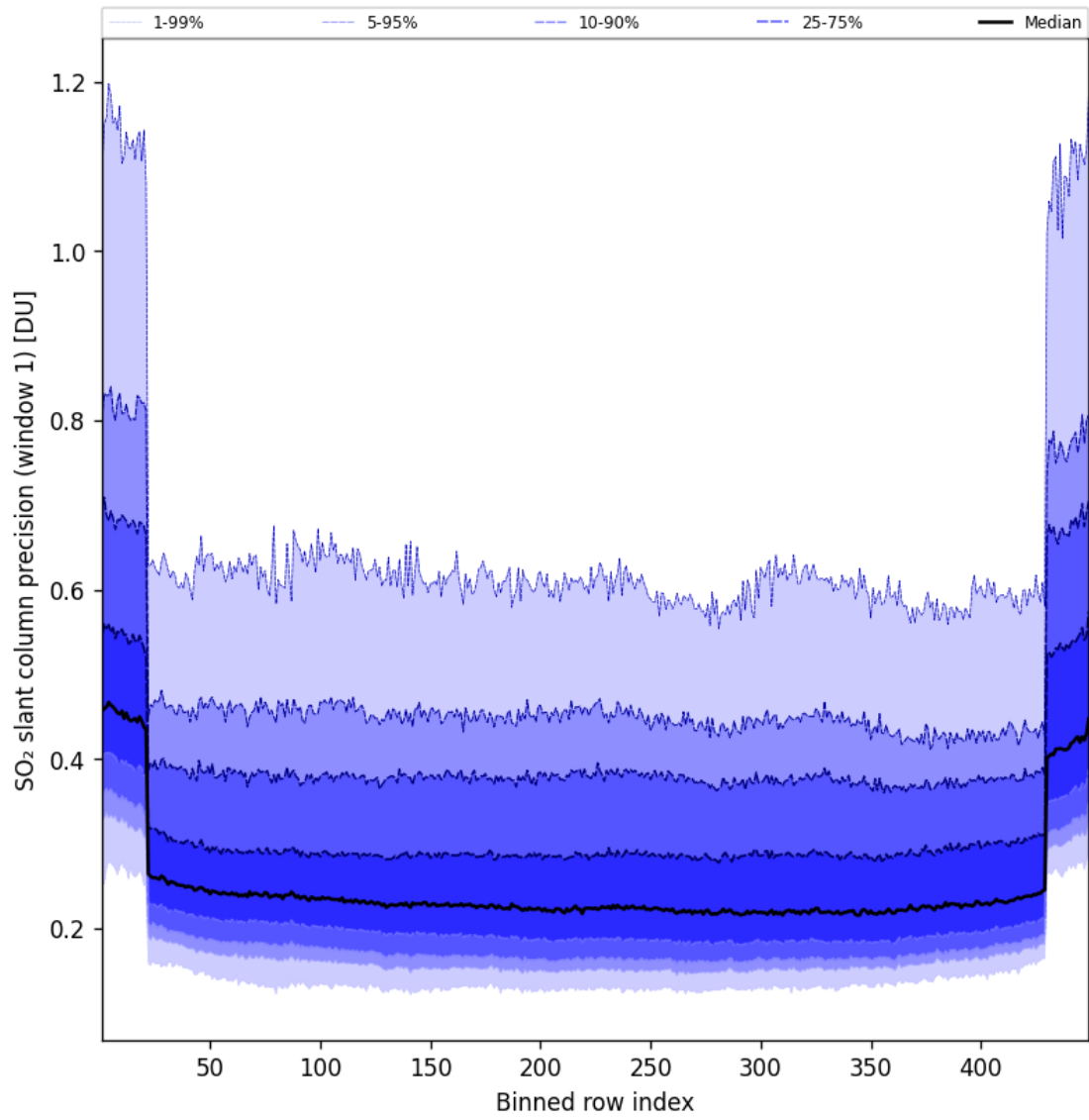


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-02-04 to 2025-02-05

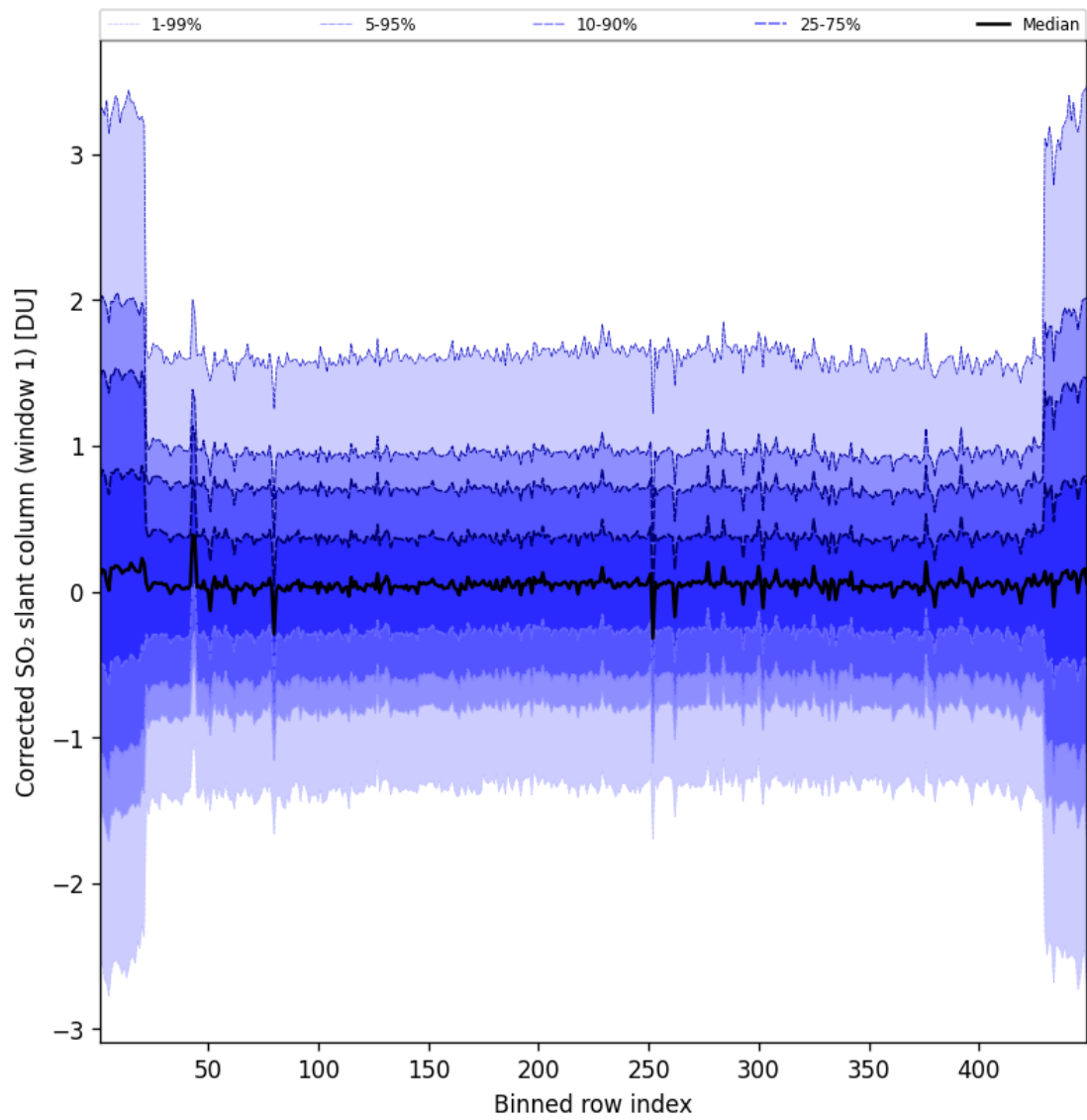


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-02-04 to 2025-02-05

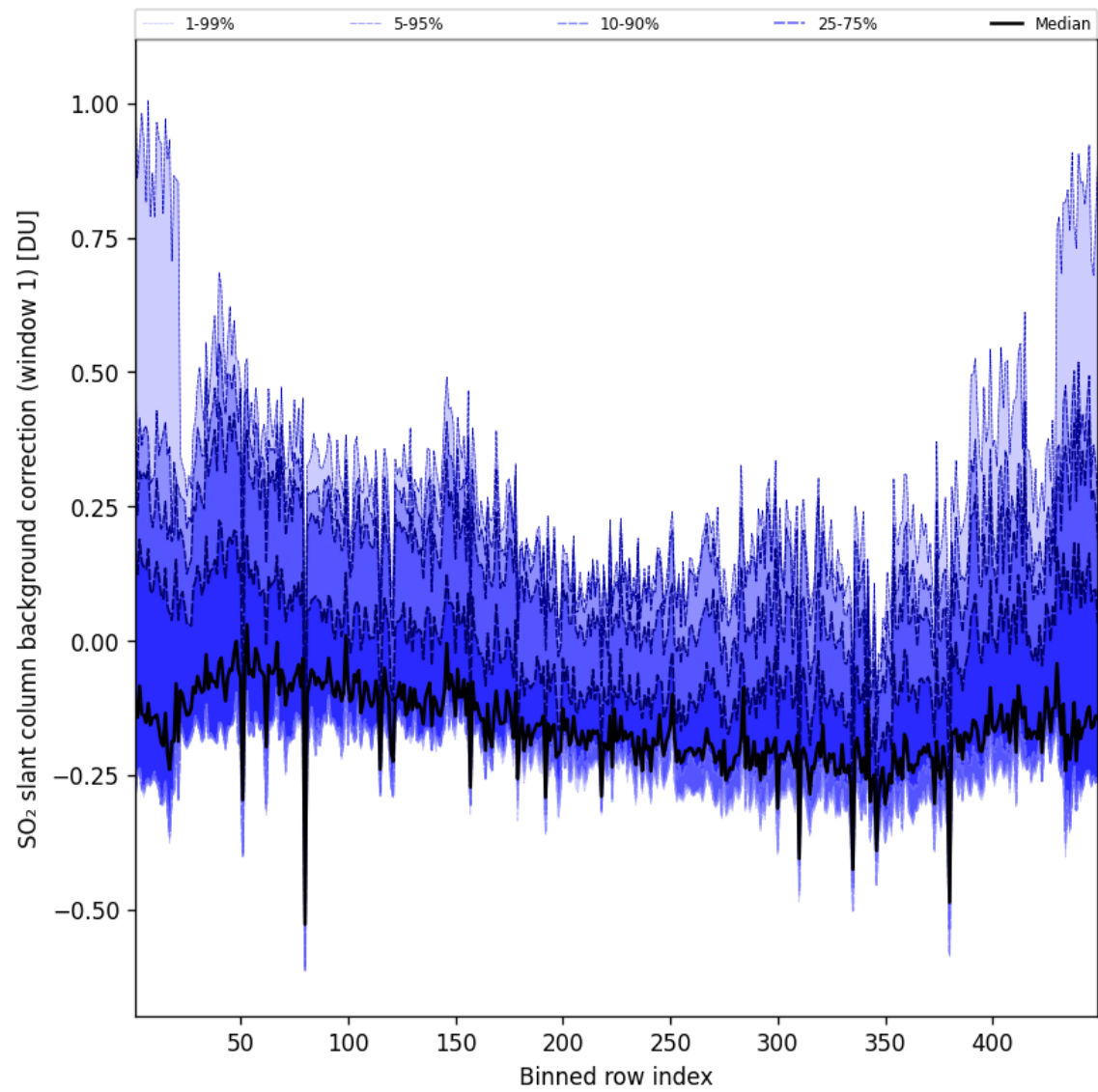


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-02-04 to 2025-02-05

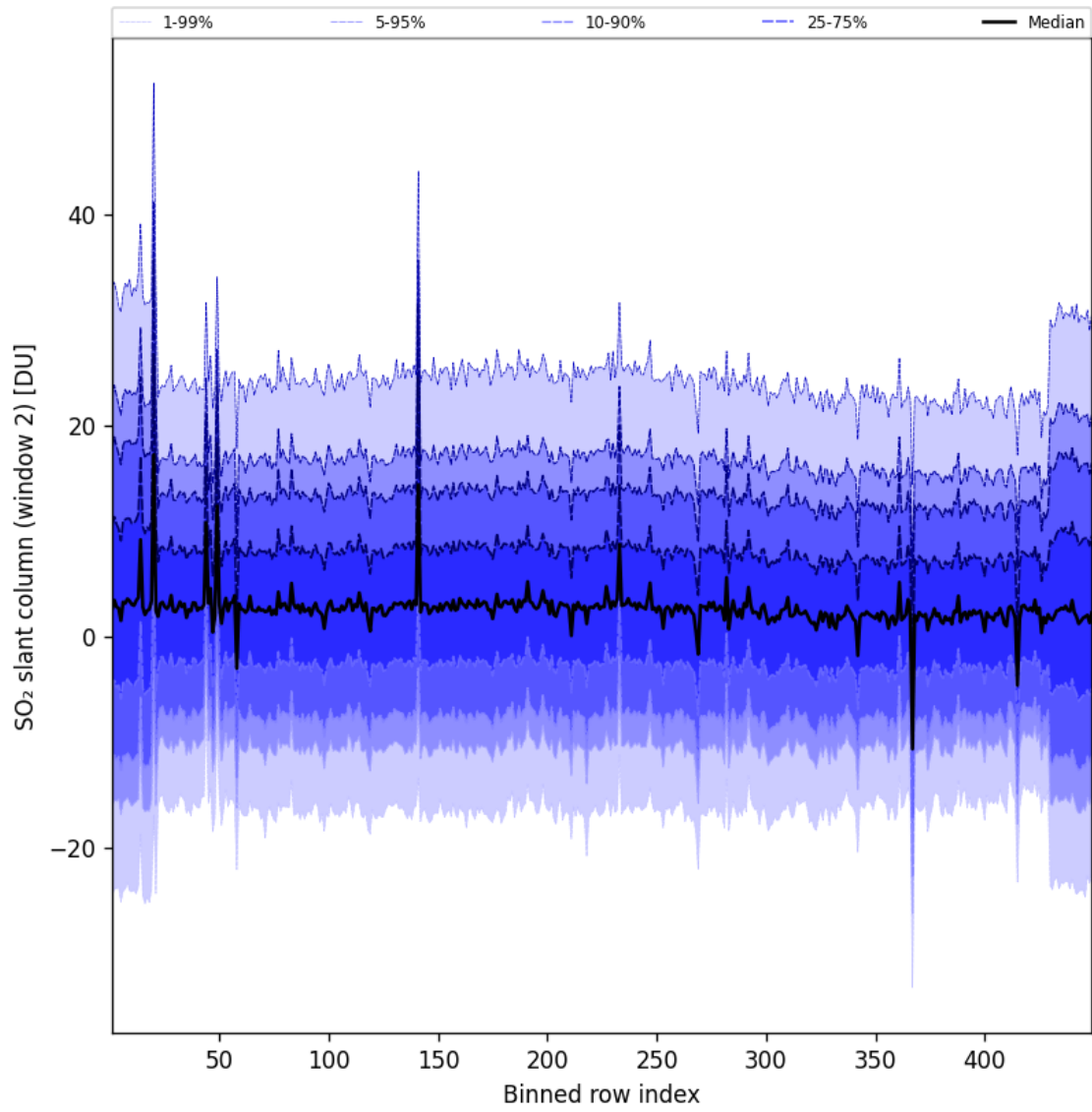


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-02-04 to 2025-02-05

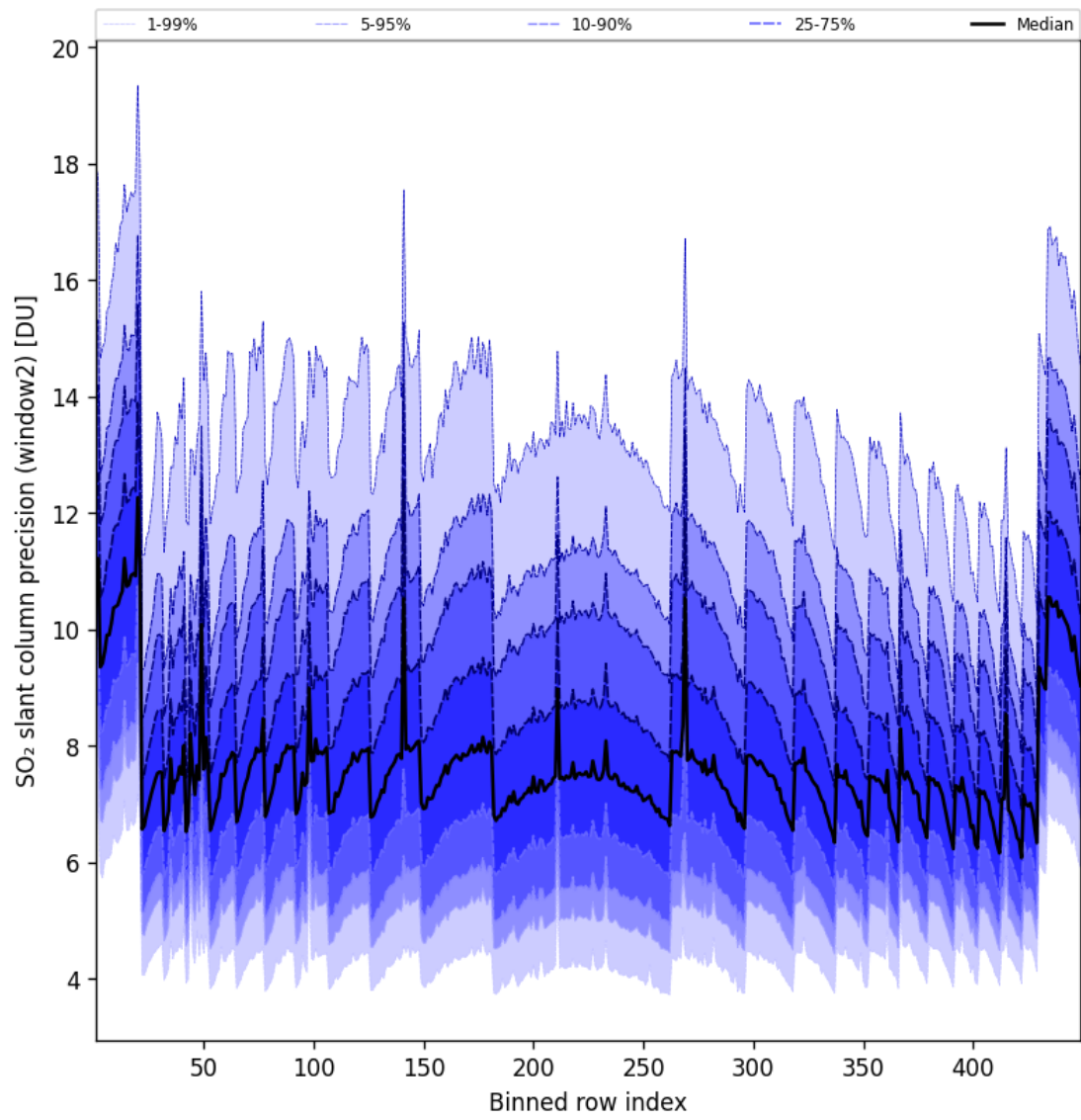


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-02-04 to 2025-02-05

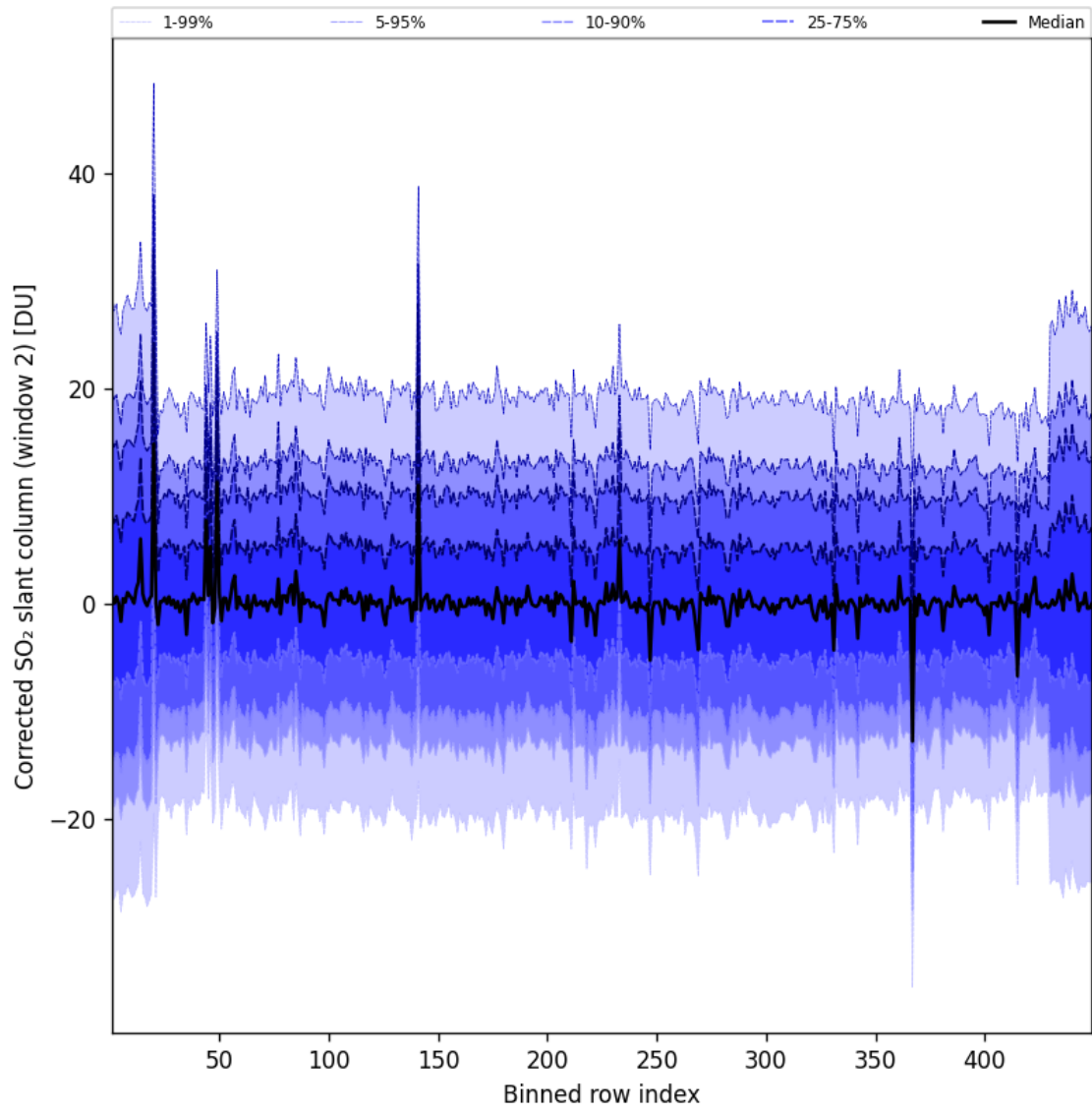


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-02-04 to 2025-02-05

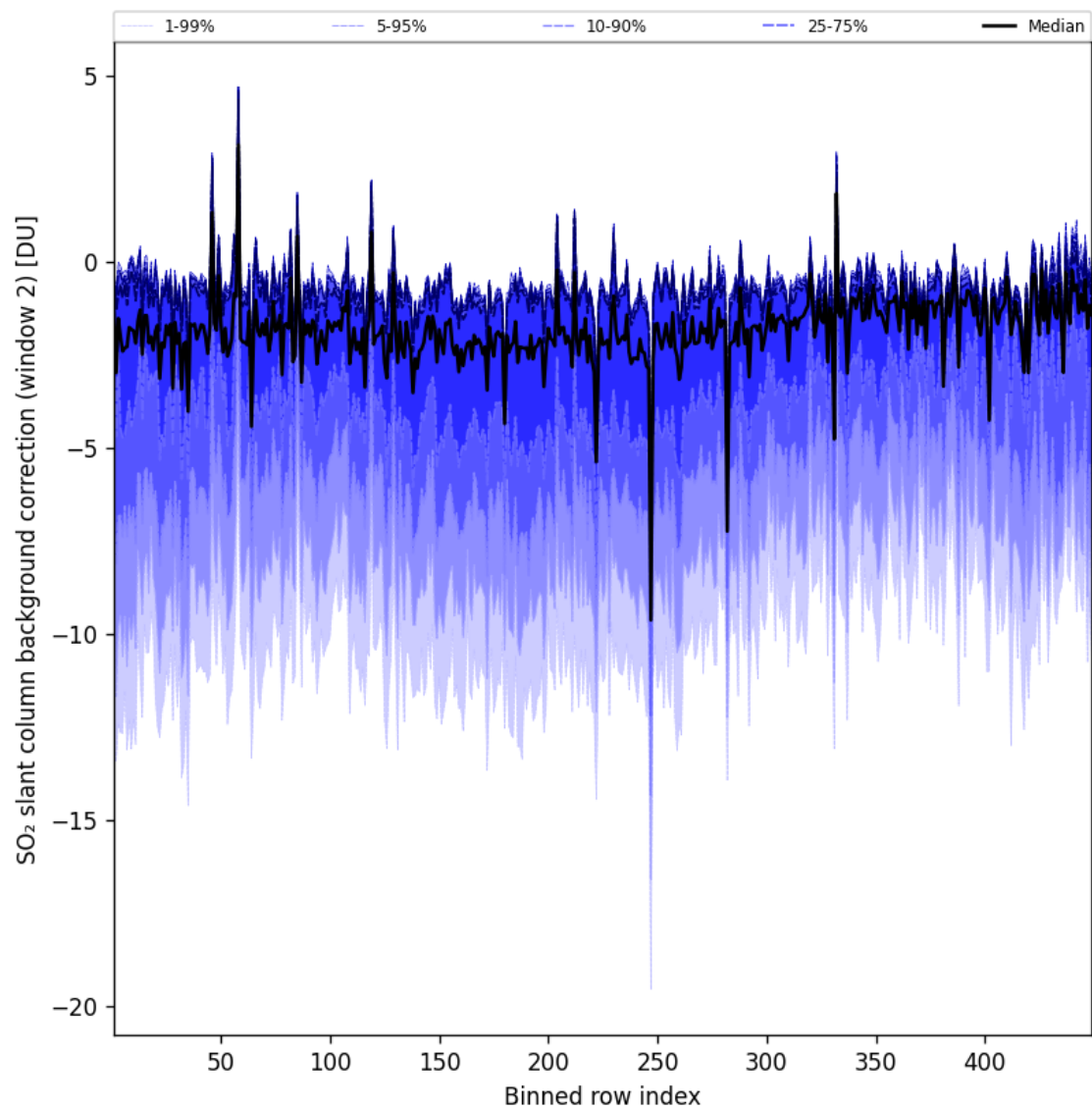


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-02-04 to 2025-02-05

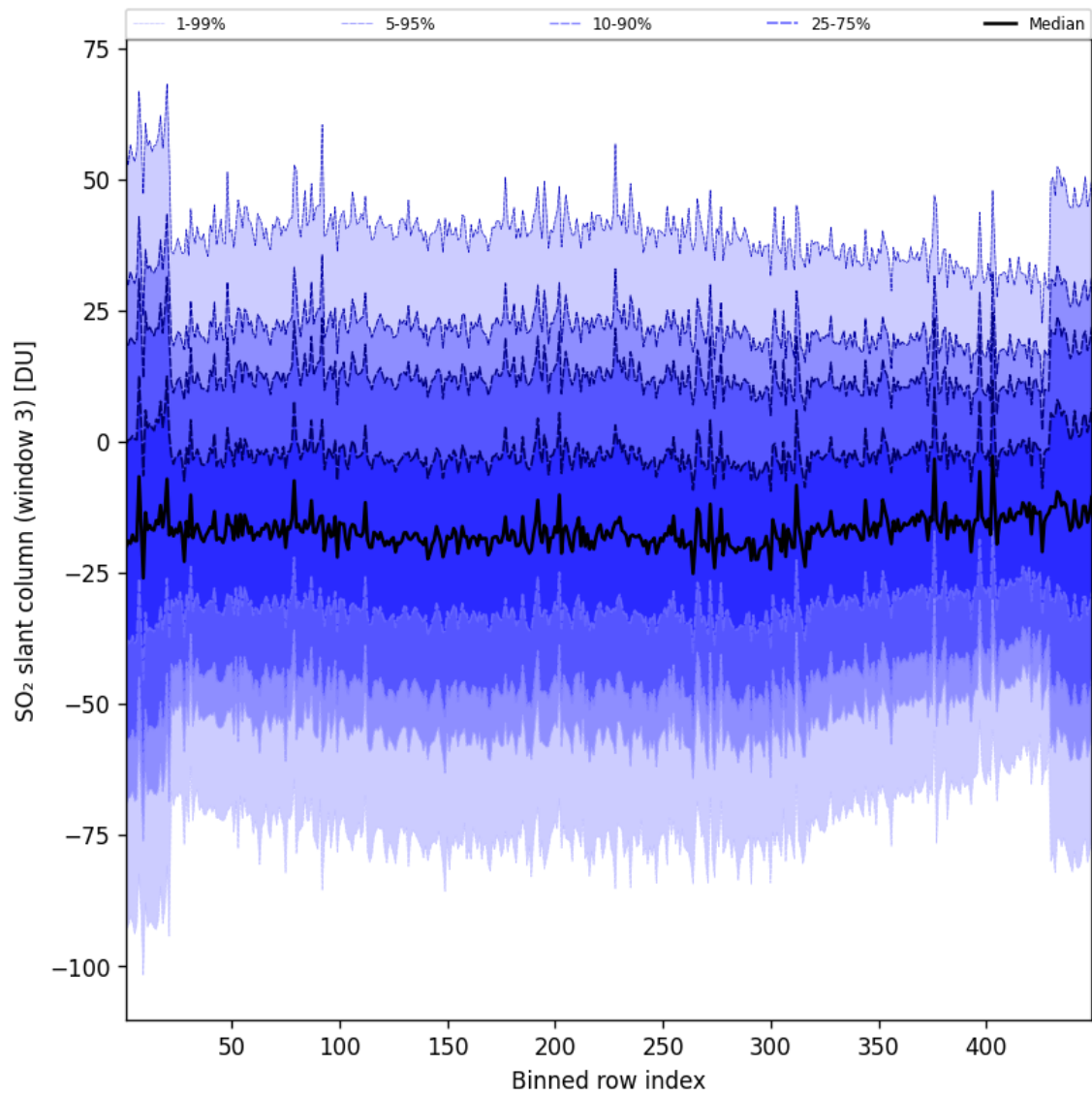


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-02-04 to 2025-02-05

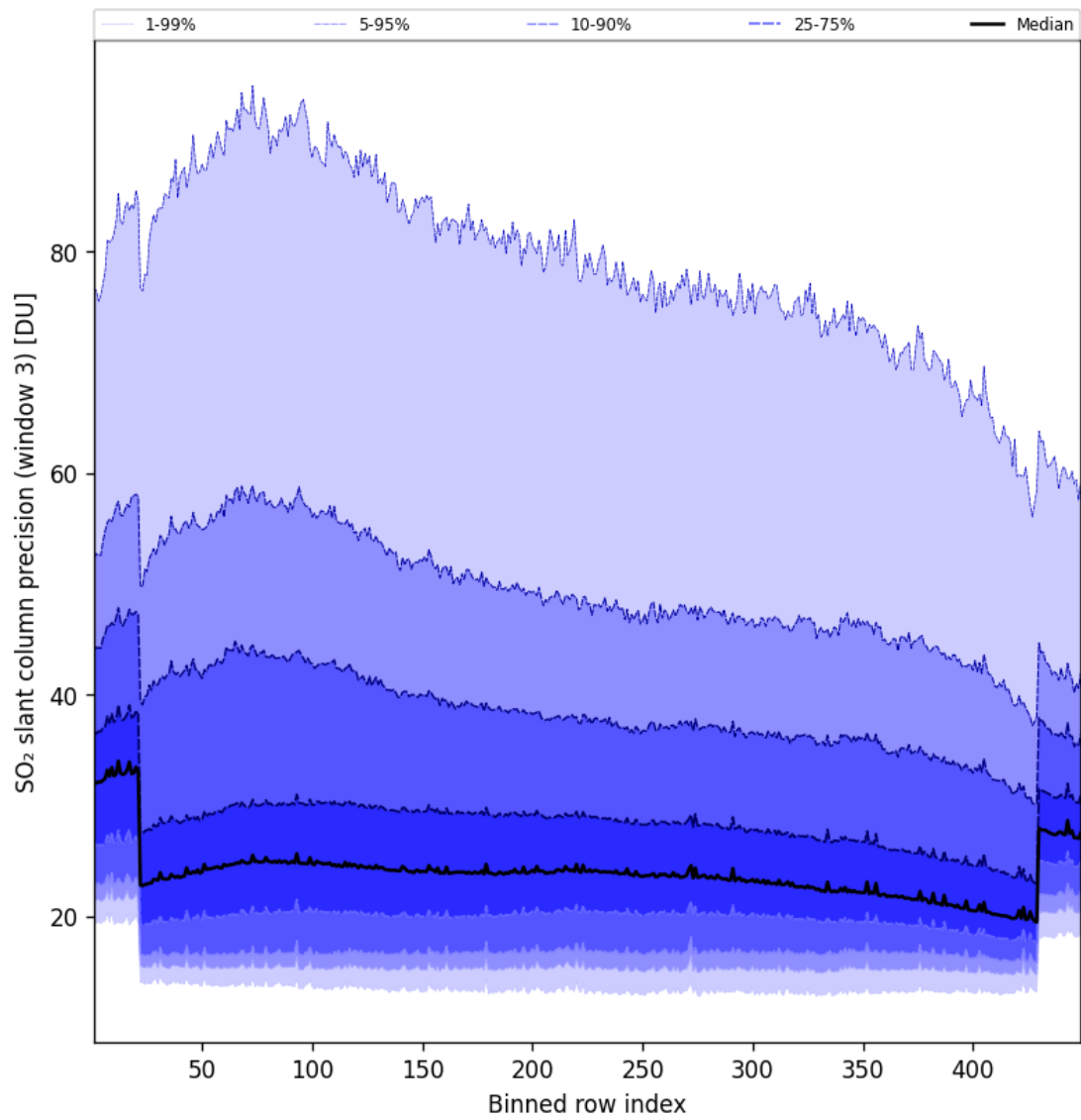


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-02-04 to 2025-02-05

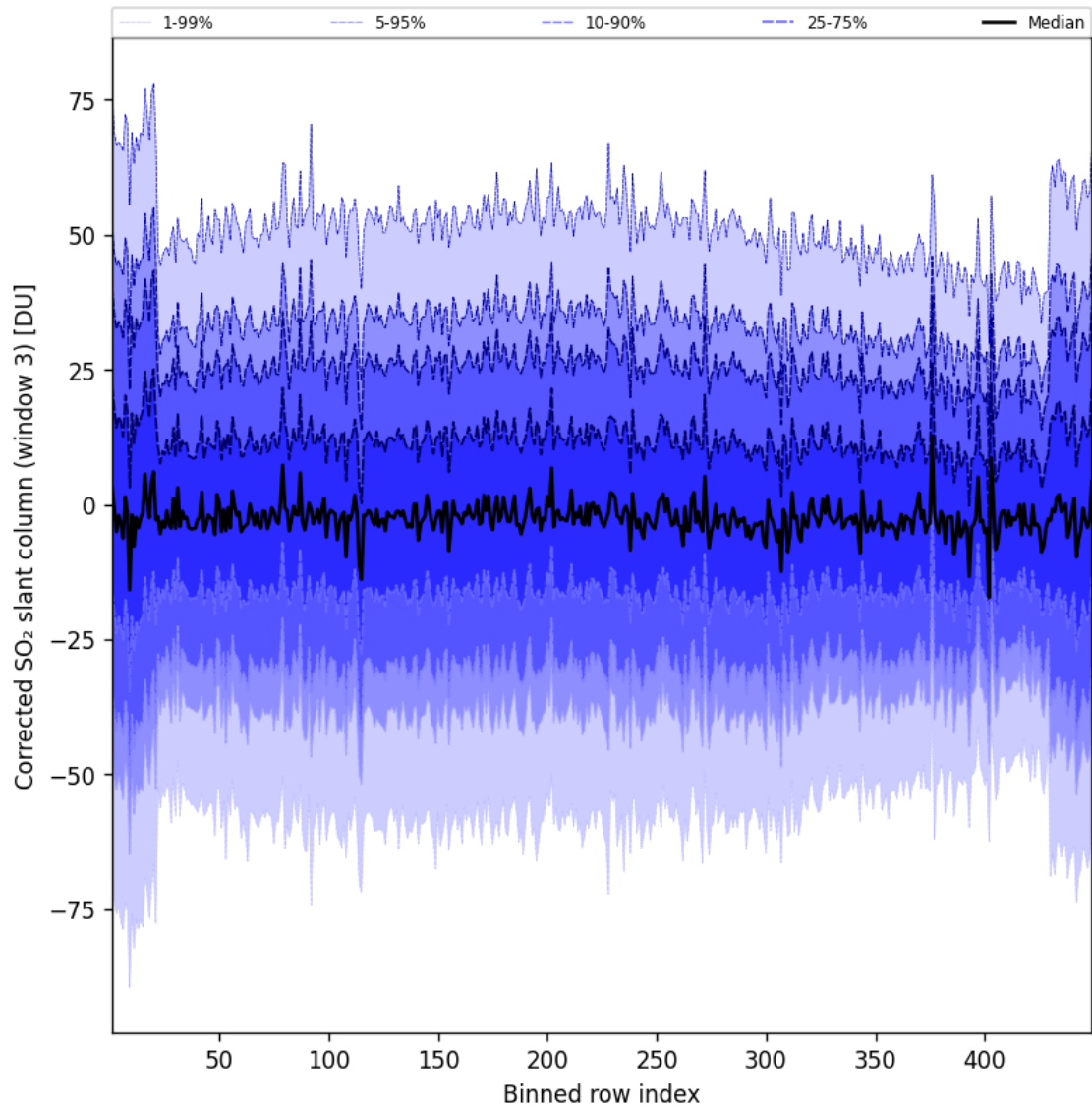


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-02-04 to 2025-02-05

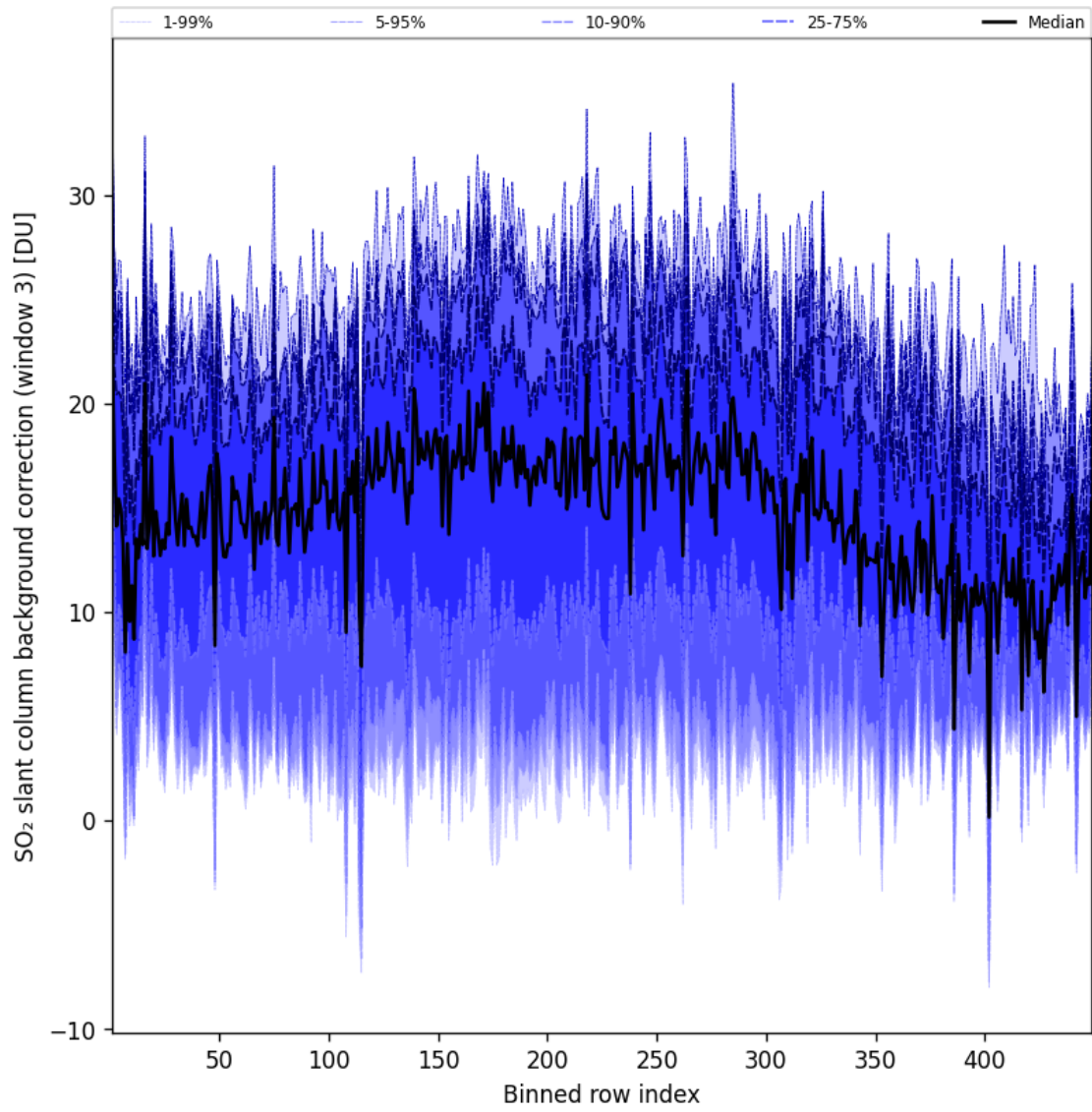


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-02-04 to 2025-02-05

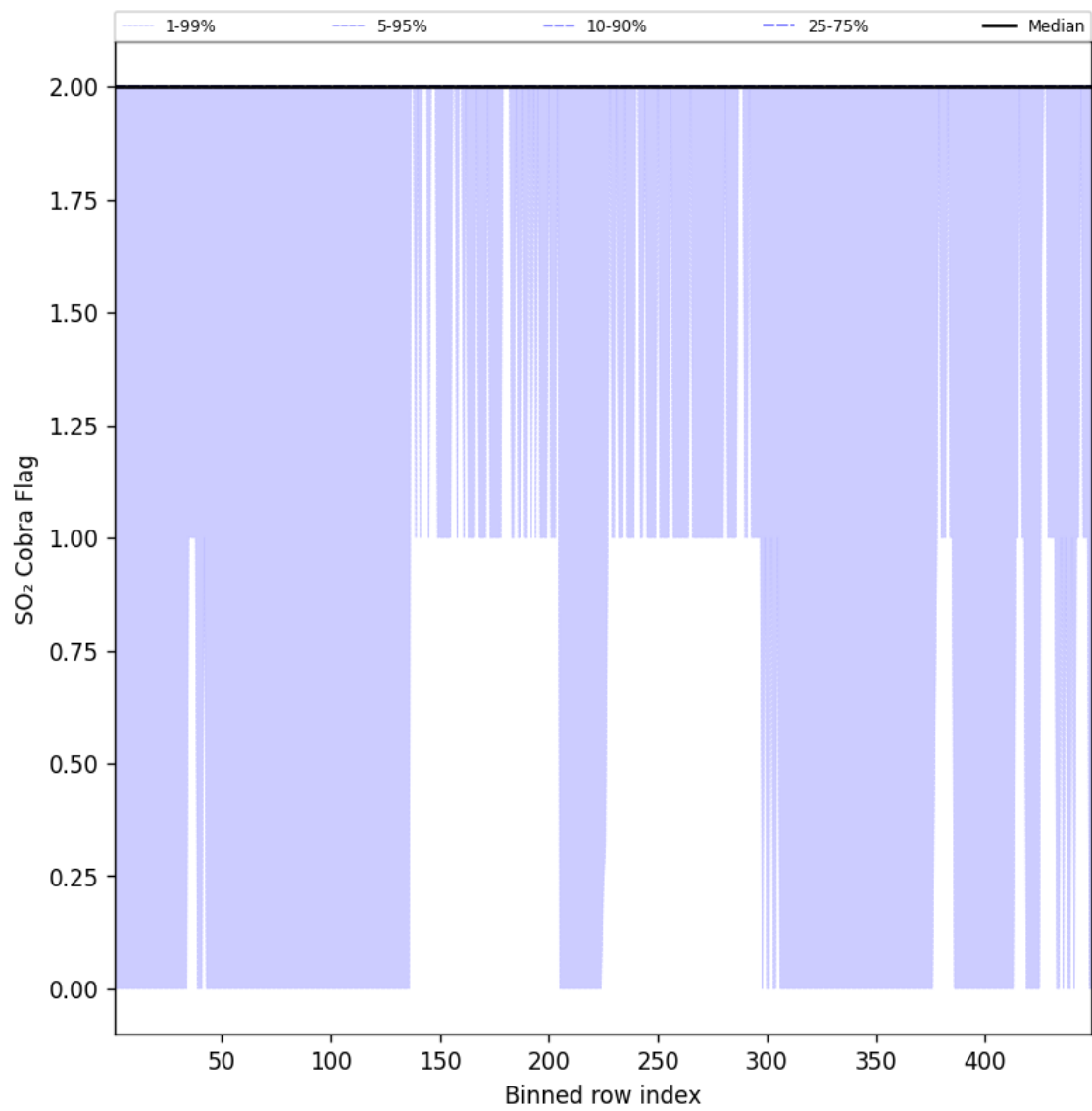


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-02-04 to 2025-02-05

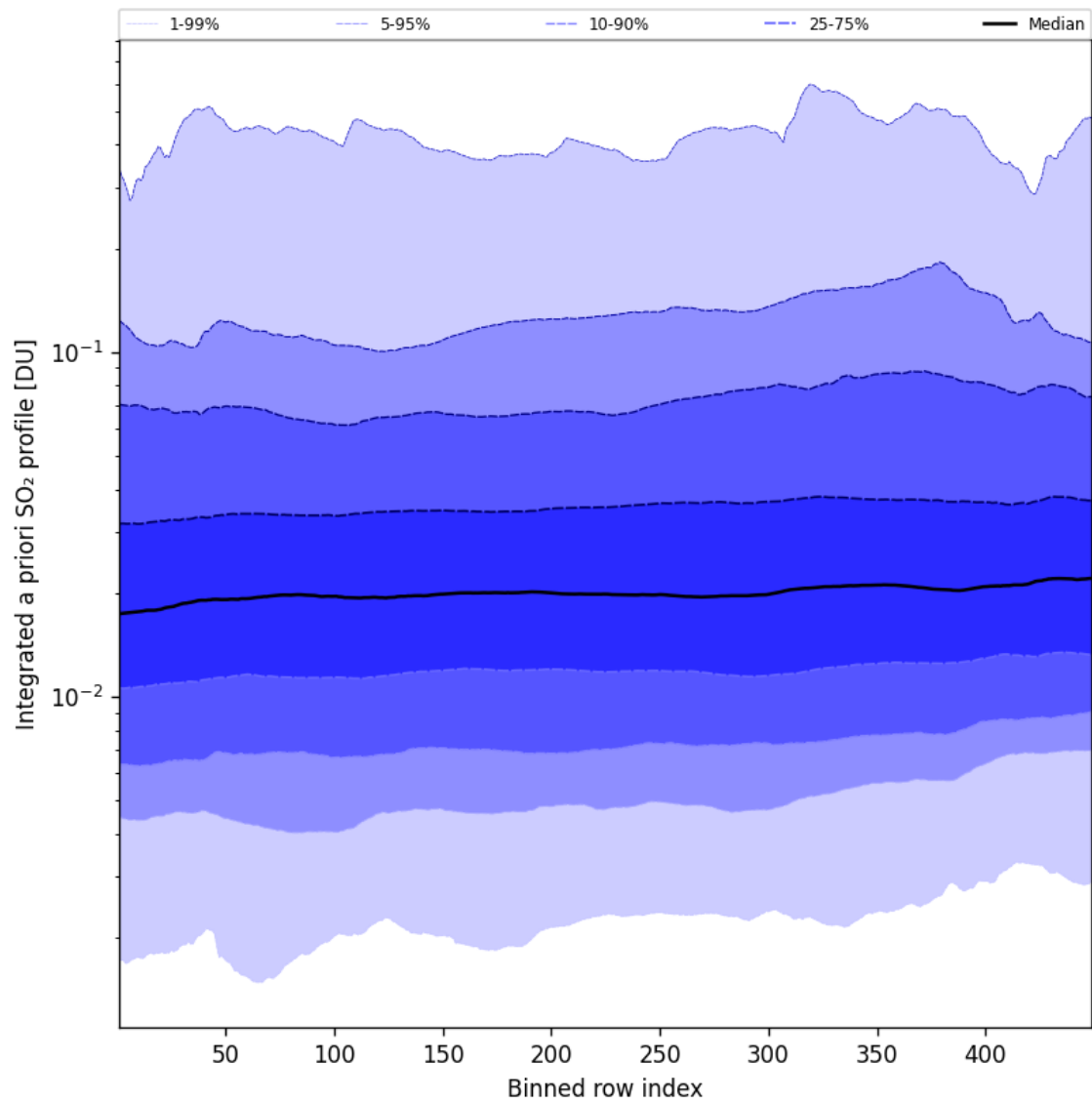


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-02-04 to 2025-02-05

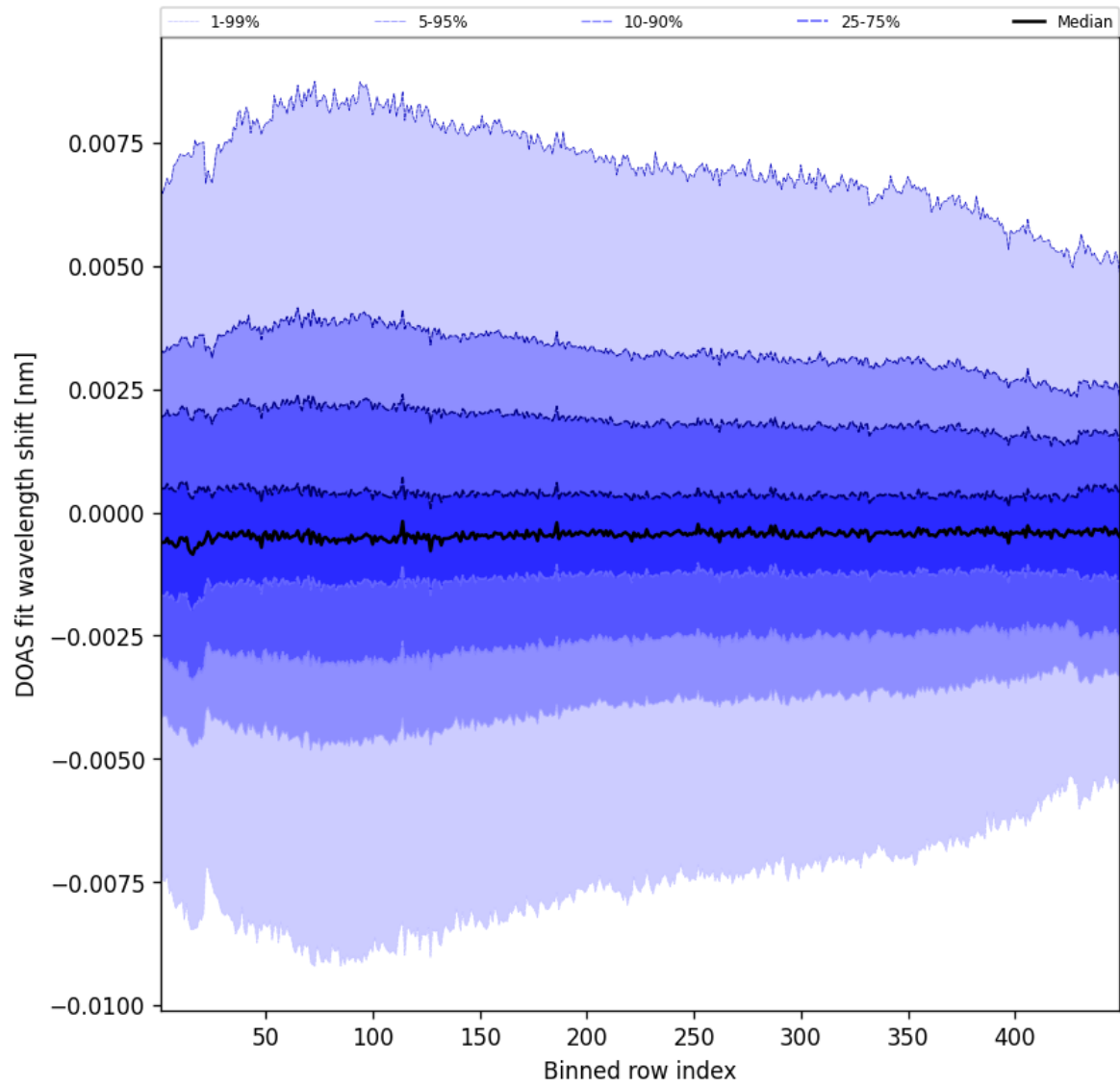


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-02-04 to 2025-02-05

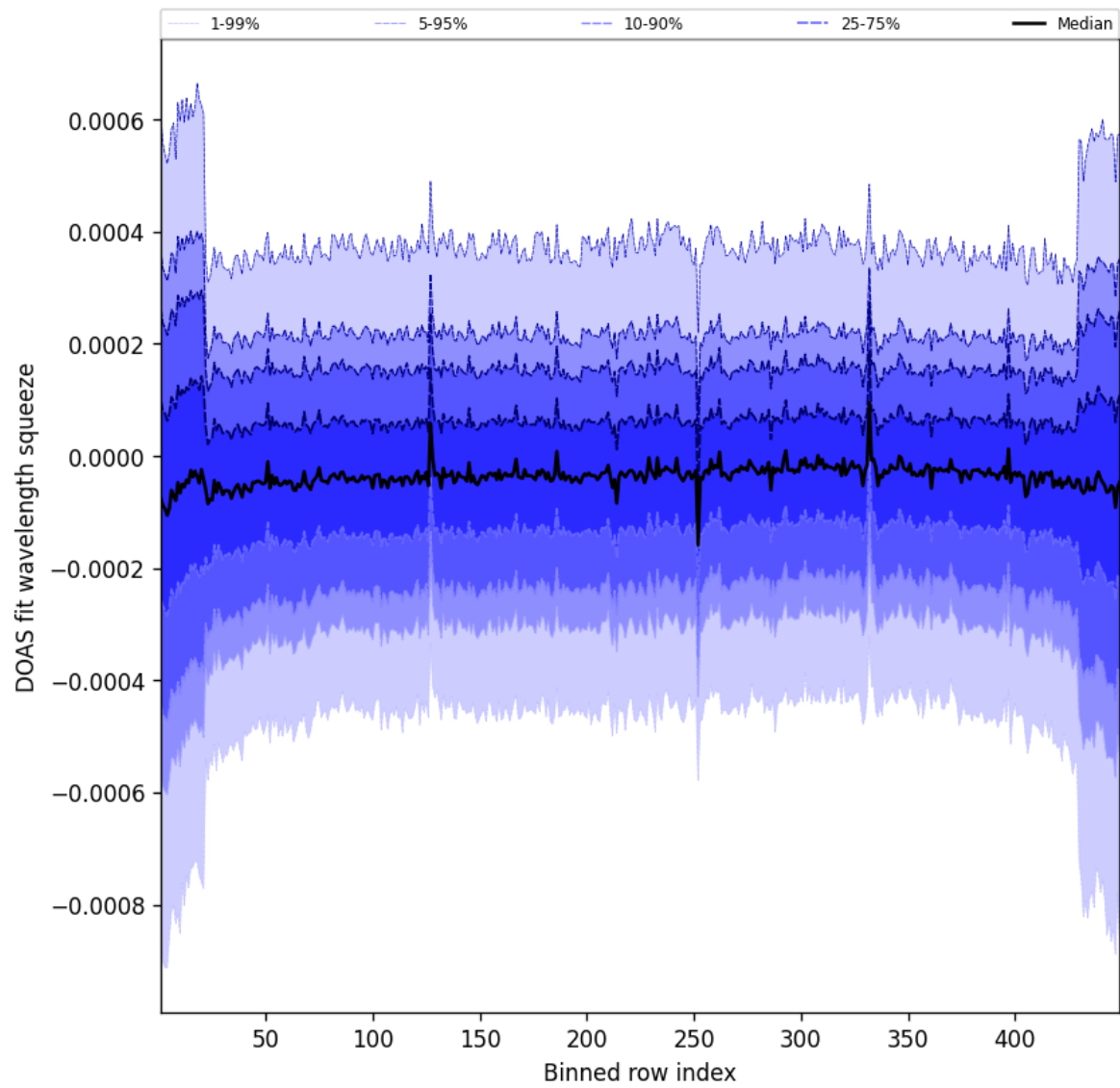


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-02-04 to 2025-02-05

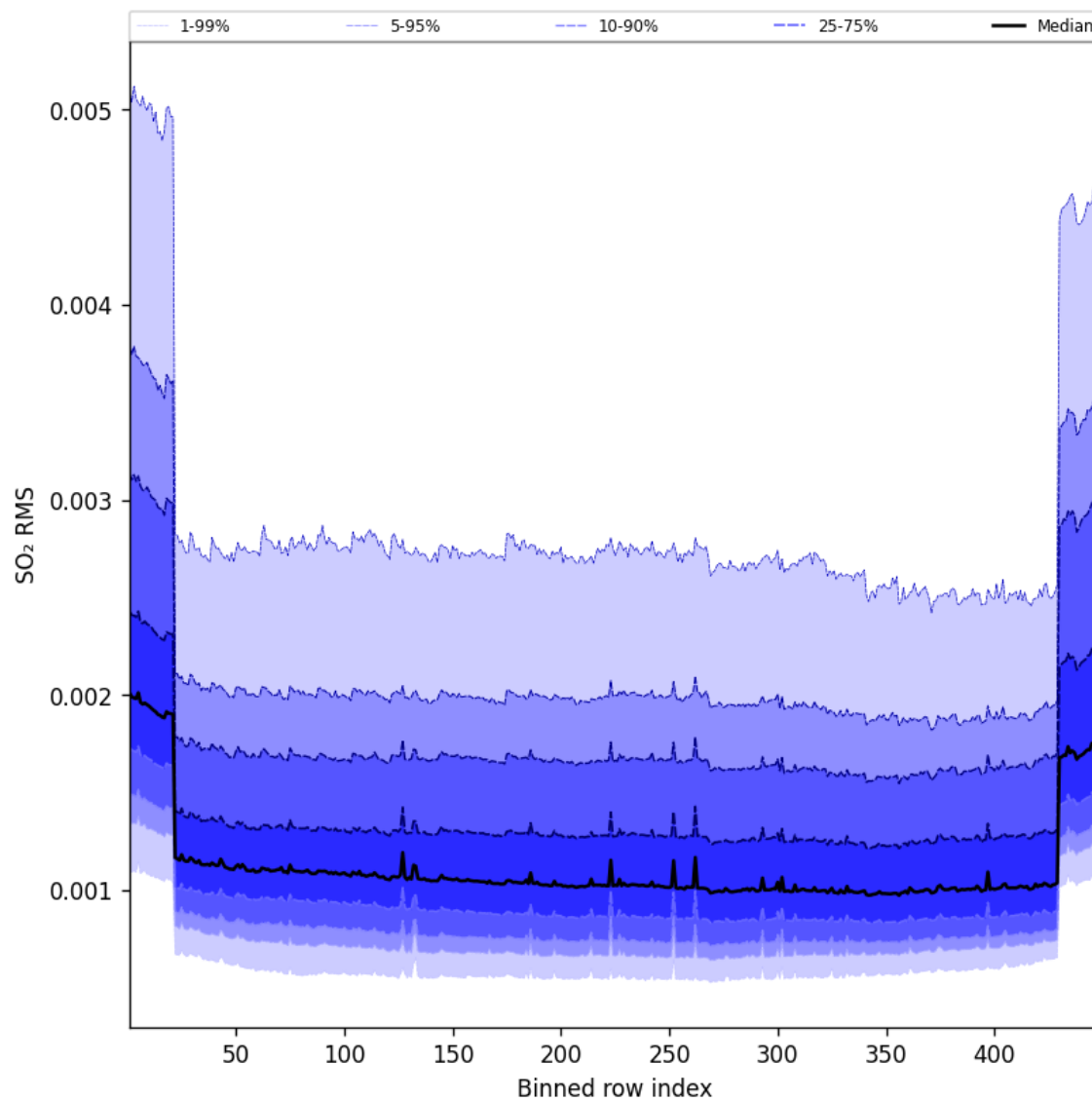


Figure 106: Along track statistics of “SO₂ RMS” for 2025-02-04 to 2025-02-05

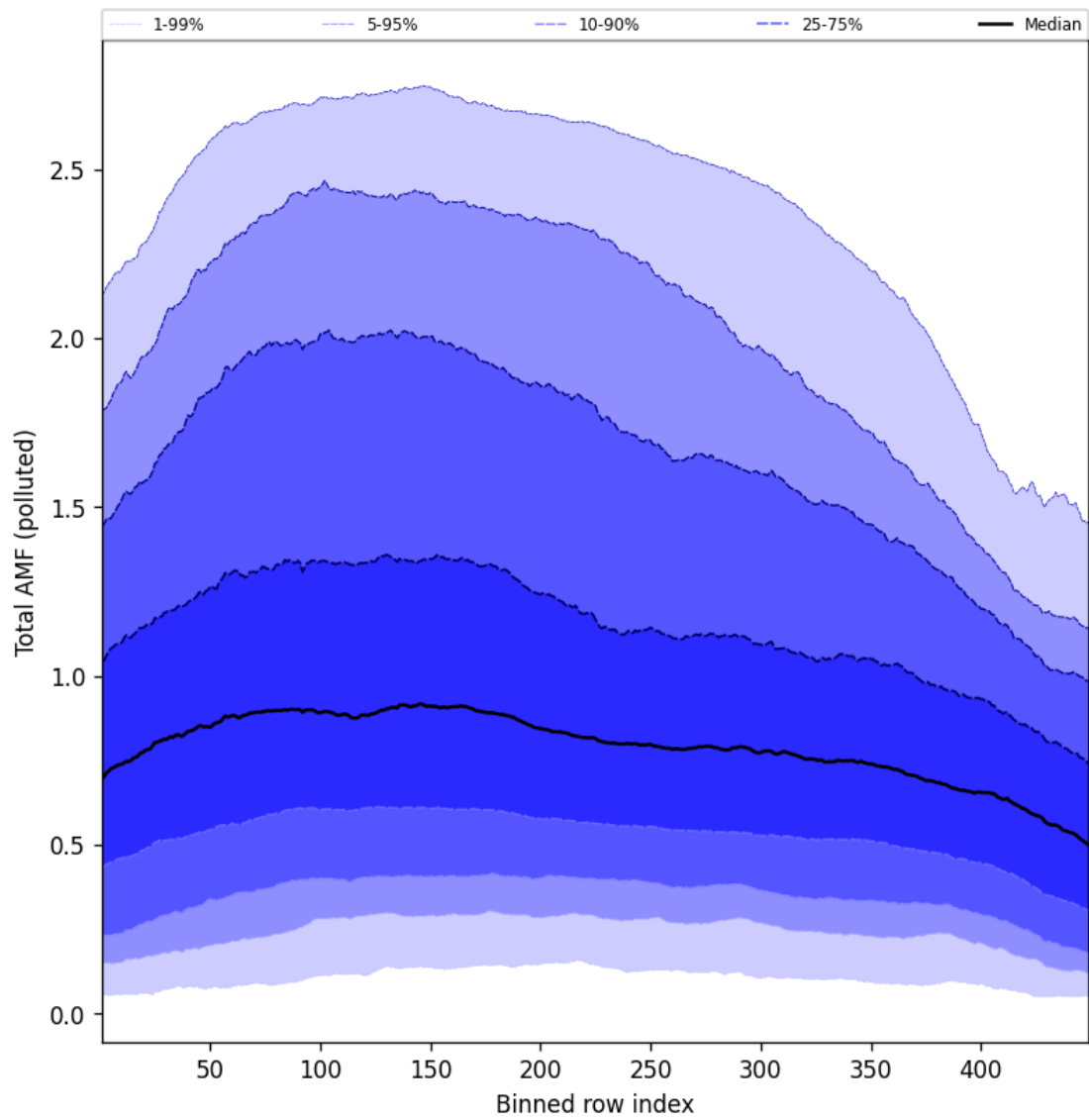


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-02-04 to 2025-02-05

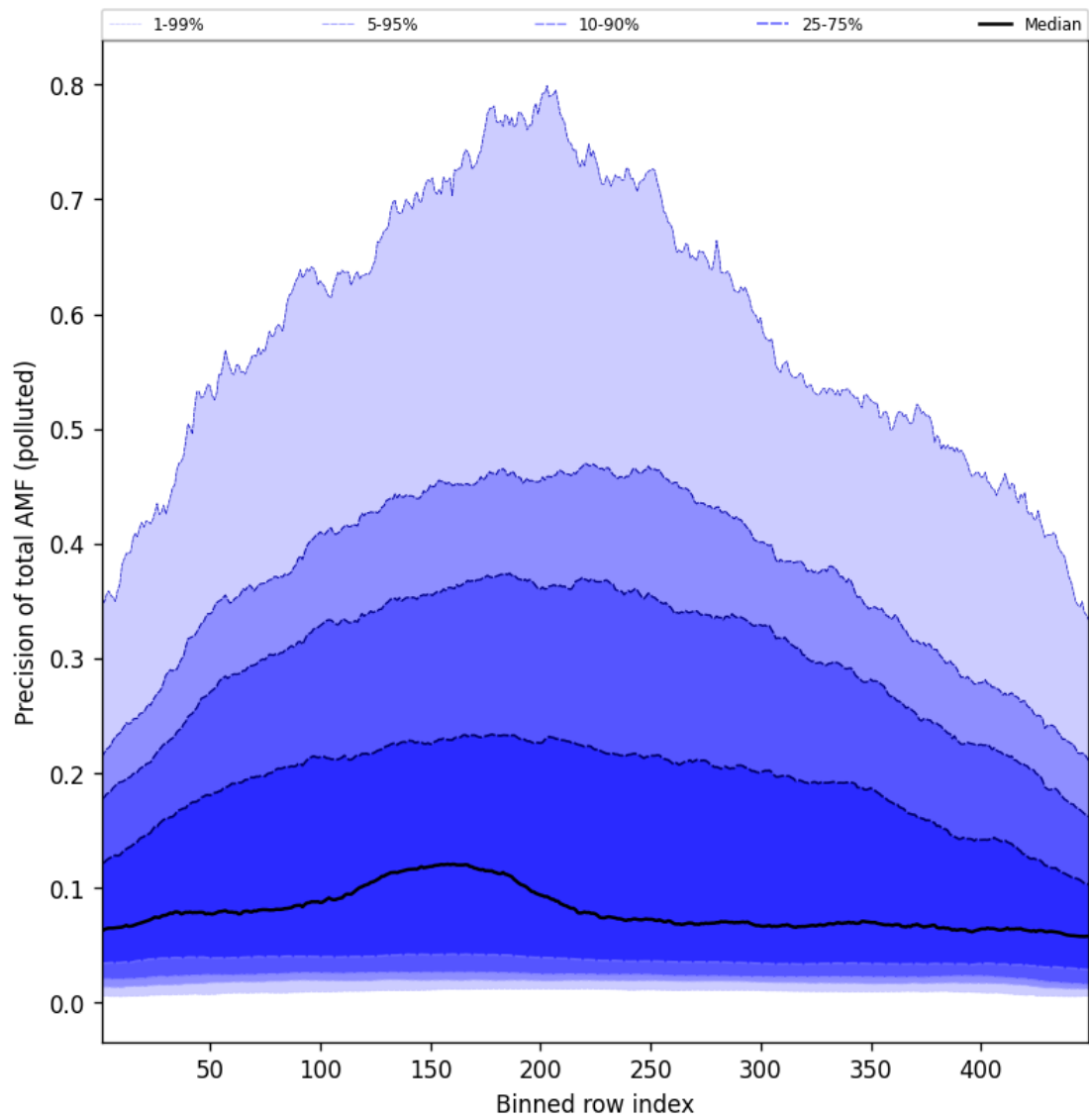


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-02-04 to 2025-02-05

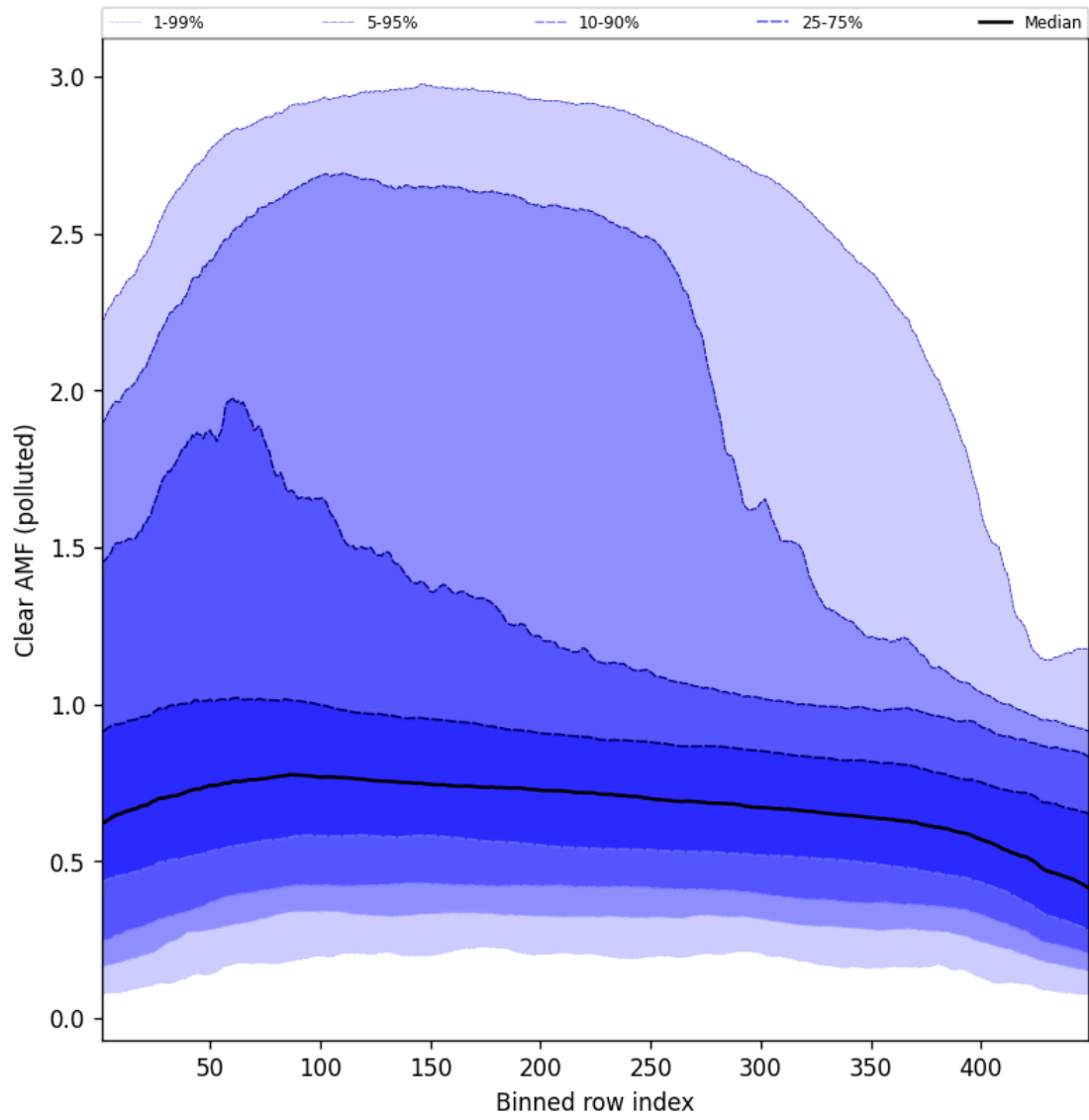


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-02-04 to 2025-02-05

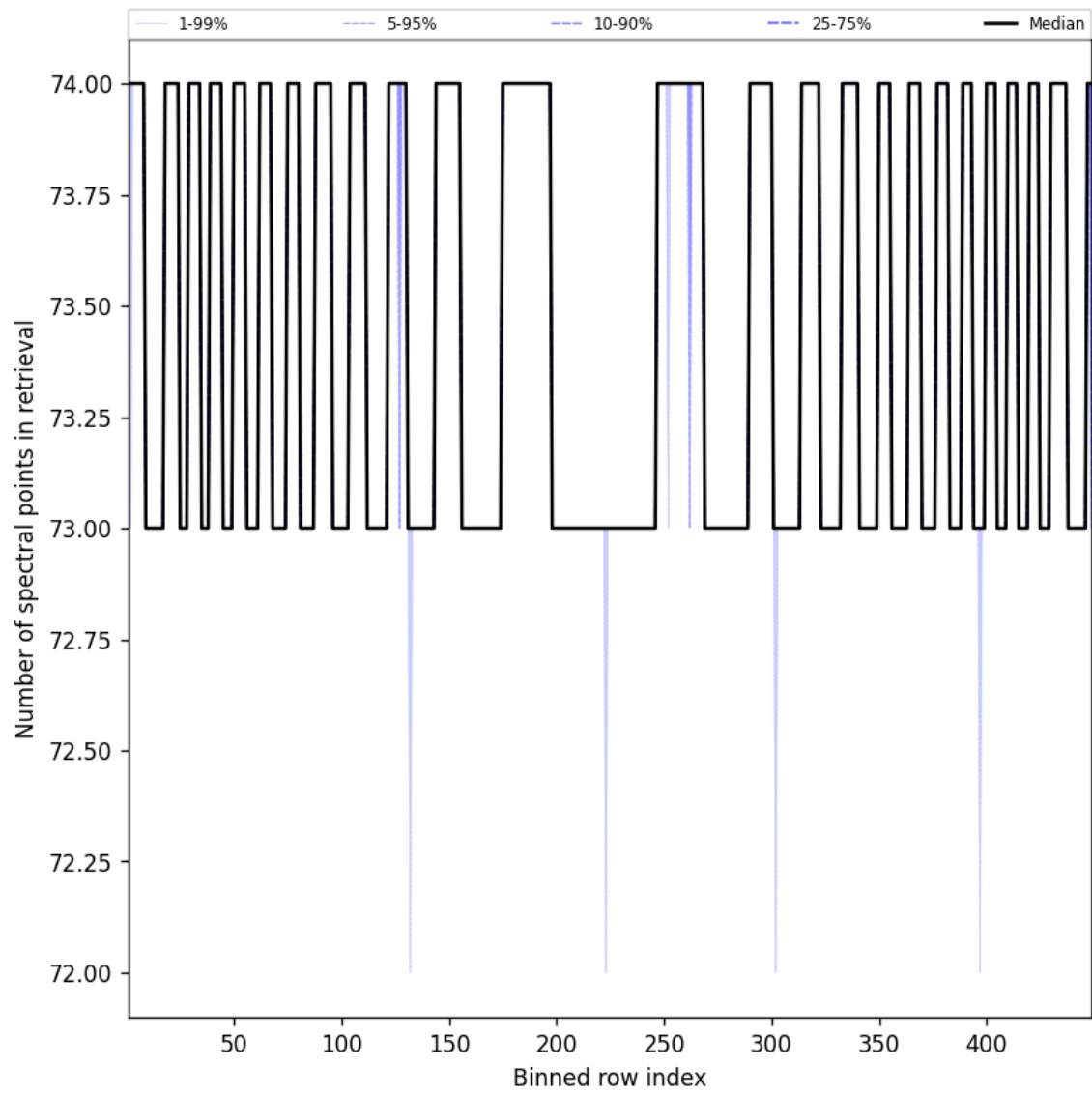


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-02-04 to 2025-02-05

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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