

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]	0.640 ± 0.399	17357865	0.995	0.770	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.541 \pm 162.493) \times 10^{-2}$	17357865	0.278	0.469	1.203×10^{-2}	-160	5.316×10^3
sulfurdioxide total vertical column precision [DU]	0.512 ± 0.625	17357865	0.222	0.338	0.337	4.930×10^{-2}	58.0
sulfurdioxide slant column density corrected [DU]	$(2.372 \pm 48.445) \times 10^{-2}$	17357865	0.258	0.378	1.044×10^{-2}	-24.0	962
sulfurdioxide slant column density cobra [DU]	$(2.330 \pm 39.719) \times 10^{-2}$	17357865	0.258	0.378	1.044×10^{-2}	-24.0	90.0
sulfurdioxide slant column density cobra precision [DU]	0.302 ± 0.135	17357865	0.213	0.138	0.263	8.960×10^{-2}	22.6
sulfurdioxide slant column density window1 [DU]	0.187 ± 0.718	17357865	0.175	0.756	0.194	-70.3	105
sulfurdioxide slant column density window1 precision [DU]	0.302 ± 0.135	17357865	0.213	0.138	0.263	8.960×10^{-2}	22.6
sulfurdioxide slant column density corrected win1 [DU]	$(6.031 \pm 71.133) \times 10^{-2}$	17357865	2.500×10^{-2}	0.745	3.758×10^{-2}	-70.3	105
background so2 slant column offset window1 [DU]	-0.127 ± 0.156	17357865	-0.180	0.159	-0.157	-1.13	3.64
sulfurdioxide slant column density window2 [DU]	3.52 ± 9.23	17357865	3.25	11.6	3.41	-805	2.017×10^3
sulfurdioxide slant column density window2 precision [DU]	8.09 ± 2.24	17357865	7.43	2.53	7.74	2.20	616
sulfurdioxide slant column density corrected win2 [DU]	0.623 ± 8.869	17357865	0.750	11.1	0.669	-806	2.016×10^3
background so2 slant column offset window2 [DU]	-2.90 ± 3.07	17357865	-0.250	4.03	-1.86	-17.6	7.74
sulfurdioxide slant column density window3 [DU]	-16.7 ± 23.8	17357865	-18.5	29.9	-17.1	-451	741
sulfurdioxide slant column density window3 precision [DU]	28.2 ± 13.3	17357865	22.5	9.67	24.6	9.61	865
sulfurdioxide slant column density corrected win3 [DU]	-4.35 ± 23.04	17357865	-5.04	28.8	-4.26	-447	747
background so2 slant column offset window3 [DU]	12.4 ± 6.7	17357865	6.16	11.1	12.0	-14.3	31.7
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	17357865	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.086 \pm 8.128) \times 10^{-2}$	17357865	1.316×10^{-2}	1.694×10^{-2}	1.243×10^{-2}	1.864×10^{-4}	2.84
fitted radiance shift [nm]	$(-3.895 \pm 26.157) \times 10^{-4}$	17357865	-5.000×10^{-4}	1.776×10^{-3}	-3.727×10^{-4}	-6.115×10^{-2}	7.614×10^{-2}
fitted radiance squeeze [1]	$(-1.956 \pm 18.082) \times 10^{-5}$	17357865	-1.000×10^{-5}	2.052×10^{-4}	-1.373×10^{-5}	-1.608×10^{-2}	2.191×10^{-2}
fitted root mean square [1]	$(1.318 \pm 0.559) \times 10^{-3}$	17357865	9.750×10^{-4}	5.610×10^{-4}	1.157×10^{-3}	2.979×10^{-4}	8.614×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.864 ± 0.428	17357865	0.620	0.547	0.808	5.000×10^{-2}	2.93
sulfurdioxide total air mass factor polluted precision [1]	0.110 ± 0.118	17357865	3.500×10^{-2}	0.103	6.565×10^{-2}	3.519×10^{-3}	1.88
sulfurdioxide clear air mass factor polluted [1]	0.734 ± 0.297	17357865	0.620	0.389	0.703	6.714×10^{-2}	2.68
number of spectral points in retrieval [1]	73.4 ± 0.5	17357865	73.0	1.000	73.0	52.0	74.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	5.000×10^{-2}	0.120	0.230	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.16	-0.873	-0.542	-0.368	-0.219	0.250	0.413	0.609	0.995	2.57
sulfurdioxide total vertical column precision [DU]	0.104	0.142	0.170	0.195	0.228	0.566	0.748	0.962	1.38	3.15
sulfurdioxide slant column density corrected [DU]	-0.875	-0.505	-0.366	-0.274	-0.176	0.201	0.305	0.408	0.573	1.11
sulfurdioxide slant column density cobra [DU]	-0.875	-0.505	-0.366	-0.274	-0.176	0.201	0.305	0.408	0.573	1.11
sulfurdioxide slant column density cobra precision [DU]	0.149	0.175	0.188	0.199	0.214	0.351	0.405	0.459	0.555	0.806
sulfurdioxide slant column density window1 [DU]	-1.75	-0.906	-0.595	-0.394	-0.188	0.568	0.765	0.953	1.24	2.07
sulfurdioxide slant column density window1 precision [DU]	0.149	0.175	0.188	0.199	0.214	0.351	0.405	0.459	0.555	0.806
sulfurdioxide slant column density corrected win1 [DU]	-1.68	-0.967	-0.698	-0.519	-0.329	0.416	0.623	0.828	1.15	2.10
background so2 slant column offset window1 [DU]	-0.402	-0.297	-0.271	-0.253	-0.227	-6.745×10^{-2}	-7.020×10^{-3}	6.218×10^{-2}	0.170	0.420
sulfurdioxide slant column density window2 [DU]	-18.3	-11.1	-7.69	-5.18	-2.35	9.29	12.3	14.9	18.5	26.1
sulfurdioxide slant column density window2 precision [DU]	4.35	5.22	5.73	6.14	6.63	9.16	10.0	10.9	12.1	14.8
sulfurdioxide slant column density corrected win2 [DU]	-21.1	-13.6	-10.2	-7.67	-4.88	6.19	8.95	11.4	14.8	21.8
background so2 slant column offset window2 [DU]	-11.3	-9.31	-7.70	-6.23	-4.61	-0.577	-0.259	-2.252×10^{-2}	0.266	1.24
sulfurdioxide slant column density window3 [DU]	-74.7	-54.9	-45.6	-39.0	-31.8	-1.88	6.06	13.3	23.0	42.1
sulfurdioxide slant column density window3 precision [DU]	13.7	16.1	17.9	19.4	20.9	30.6	35.5	41.5	53.5	85.1
sulfurdioxide slant column density corrected win3 [DU]	-62.4	-42.2	-32.8	-26.0	-18.6	10.1	17.5	24.1	33.2	51.7
background so2 slant column offset window3 [DU]	-1.04	2.99	4.34	5.33	6.70	17.8	19.8	21.3	23.2	26.1
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	5.120×10^{-4}	8.772×10^{-4}	1.477×10^{-3}	3.047×10^{-3}	6.395×10^{-3}	2.333×10^{-2}	3.477×10^{-2}	5.823×10^{-2}	0.123	0.354
fitted radiance shift [nm]	-8.350×10^{-3}	-4.282×10^{-3}	-2.844×10^{-3}	-2.012×10^{-3}	-1.304×10^{-3}	4.719×10^{-4}	1.167×10^{-3}	2.045×10^{-3}	3.570×10^{-3}	7.793×10^{-3}
fitted radiance squeeze [1]	-5.261×10^{-4}	-3.117×10^{-4}	-2.290×10^{-4}	-1.745×10^{-4}	-1.182×10^{-4}	8.701×10^{-5}	1.384×10^{-4}	1.859×10^{-4}	2.538×10^{-4}	4.149×10^{-4}
fitted root mean square [1]	6.148×10^{-4}	7.538×10^{-4}	8.289×10^{-4}	8.869×10^{-4}	9.584×10^{-4}	1.519×10^{-3}	1.765×10^{-3}	2.010×10^{-3}	2.378×10^{-3}	3.381×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.104	0.261	0.360	0.446	0.558	1.10	1.30	1.48	1.70	2.03
sulfurdioxide total air mass factor polluted precision [1]	1.098×10^{-2}	1.898×10^{-2}	2.528×10^{-2}	3.064×10^{-2}	3.820×10^{-2}	0.141	0.190	0.243	0.334	0.591
sulfurdioxide clear air mass factor polluted [1]	0.225	0.318	0.379	0.438	0.521	0.910	1.00	1.10	1.25	1.68
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]	0.610 ± 0.400	10911598	0.790	0.490	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(3.760 \pm 109.339) \times 10^{-2}$	10911598	0.463	1.102×10^{-2}	-160	300	-0.216	0.247
sulfurdioxide total vertical column precision [DU]	0.517 ± 0.663	10911598	0.351	0.333	4.930×10^{-2}	58.0	0.221	0.572
sulfurdioxide slant column density corrected [DU]	$(2.575 \pm 44.417) \times 10^{-2}$	10911598	0.376	9.704×10^{-3}	-11.8	79.2	-0.176	0.200
sulfurdioxide slant column density cobra [DU]	$(2.525 \pm 41.523) \times 10^{-2}$	10911598	0.376	9.704×10^{-3}	-11.8	40.5	-0.176	0.200
sulfurdioxide slant column density cobra precision [DU]	0.304 ± 0.141	10911598	0.146	0.262	8.960×10^{-2}	18.6	0.210	0.355
sulfurdioxide slant column density window1 [DU]	0.182 ± 0.745	10911598	0.758	0.192	-12.3	74.2	-0.192	0.566
sulfurdioxide slant column density window1 precision [DU]	0.304 ± 0.141	10911598	0.146	0.262	8.960×10^{-2}	18.6	0.210	0.355
sulfurdioxide slant column density corrected win1 [DU]	$(6.425 \pm 73.734) \times 10^{-2}$	10911598	0.746	3.690×10^{-2}	-11.8	74.8	-0.329	0.417
background so2 slant column offset window1 [DU]	-0.118 ± 0.174	10911598	0.177	-0.160	-1.05	3.64	-0.231	-5.445×10^{-2}
sulfurdioxide slant column density window2 [DU]	4.02 ± 8.93	10911598	11.4	3.90	-77.0	123	-1.74	9.67
sulfurdioxide slant column density window2 precision [DU]	7.75 ± 2.04	10911598	2.31	7.44	2.20	137	6.40	8.71
sulfurdioxide slant column density corrected win2 [DU]	0.471 ± 8.420	10911598	10.7	0.549	-83.5	121	-4.80	5.85
background so2 slant column offset window2 [DU]	-3.55 ± 3.48	10911598	5.62	-2.68	-17.6	7.74	-6.14	-0.519
sulfurdioxide slant column density window3 [DU]	-17.8 ± 22.6	10911598	28.3	-18.4	-451	603	-32.2	-3.91
sulfurdioxide slant column density window3 precision [DU]	26.5 ± 12.7	10911598	7.96	23.1	9.61	865	20.1	28.1
sulfurdioxide slant column density corrected win3 [DU]	-4.07 ± 21.73	10911598	27.1	-3.97	-447	602	-17.5	9.58
background so2 slant column offset window3 [DU]	13.8 ± 7.1	10911598	12.2	15.0	-14.2	31.7	7.22	19.5
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	10911598	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.917 \pm 9.872) \times 10^{-2}$	10911598	2.703×10^{-2}	1.272×10^{-2}	1.864×10^{-4}	2.30	3.153×10^{-3}	3.019×10^{-2}
fitted radiance shift [nm]	$(-2.483 \pm 24.919) \times 10^{-4}$	10911598	1.575×10^{-3}	-2.661×10^{-4}	-4.180×10^{-2}	4.063×10^{-2}	-1.065×10^{-3}	5.106×10^{-4}
fitted radiance squeeze [1]	$(-3.905 \pm 18.110) \times 10^{-5}$	10911598	2.035×10^{-4}	-2.741×10^{-5}	-2.636×10^{-3}	2.129×10^{-2}	-1.331×10^{-4}	7.042×10^{-5}
fitted root mean square [1]	$(1.328 \pm 0.596) \times 10^{-3}$	10911598	5.846×10^{-4}	1.149×10^{-3}	2.979×10^{-4}	3.242×10^{-2}	9.452×10^{-4}	1.530×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.885 ± 0.463	10911598	0.630	0.811	5.000×10^{-2}	2.93	0.535	1.16
sulfurdioxide total air mass factor polluted precision [1]	0.116 ± 0.132	10911598	0.107	6.688×10^{-2}	3.519×10^{-3}	1.88	3.694×10^{-2}	0.144
sulfurdioxide clear air mass factor polluted [1]	0.734 ± 0.338	10911598	0.455	0.685	6.714×10^{-2}	2.68	0.473	0.928
number of spectral points in retrieval [1]	73.5 ± 0.5	10911598	1.000	73.0	52.0	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]	0.691 $\pm$ 0.392	6446267	0.710	1.000	0.0	1.000	0.290	1.000
sulfurdioxide total vertical column [DU]	$(3.169 \pm 225.525) \times 10^{-2}$	6446267	0.480	1.385×10^{-2}	-52.0	5.316×10^3	-0.223	0.257
sulfurdioxide total vertical column precision [DU]	0.502 $\pm$ 0.555	6446267	0.320	0.343	5.135×10^{-2}	32.0	0.237	0.557
sulfurdioxide slant column density corrected [DU]	$(2.028 \pm 54.588) \times 10^{-2}$	6446267	0.381	1.170×10^{-2}	-24.0	962	-0.177	0.204
sulfurdioxide slant column density cobra [DU]	$(2.000 \pm 36.460) \times 10^{-2}$	6446267	0.381	1.170×10^{-2}	-24.0	90.0	-0.177	0.204
sulfurdioxide slant column density cobra precision [DU]	0.300 $\pm$ 0.124	6446267	0.124	0.266	9.342×10^{-2}	22.6	0.221	0.345
sulfurdioxide slant column density window1 [DU]	0.195 $\pm$ 0.670	6446267	0.753	0.197	-70.3	105	-0.181	0.572
sulfurdioxide slant column density window1 precision [DU]	0.300 $\pm$ 0.124	6446267	0.124	0.266	9.342×10^{-2}	22.6	0.221	0.345
sulfurdioxide slant column density corrected win1 [DU]	$(5.365 \pm 66.495) \times 10^{-2}$	6446267	0.743	3.870×10^{-2}	-70.3	105	-0.328	0.415
background so2 slant column offset window1 [DU]	-0.142 $\pm$ 0.119	6446267	0.139	-0.154	-1.13	2.77	-0.219	-8.013×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.67 $\pm$ 9.66	6446267	12.0	2.55	-805	2.017×10^3	-3.37	8.59
sulfurdioxide slant column density window2 precision [DU]	8.65 $\pm$ 2.45	6446267	2.72	8.32	2.33	616	7.11	9.83
sulfurdioxide slant column density corrected win2 [DU]	0.881 $\pm$ 9.576	6446267	11.8	0.893	-806	2.016×10^3	-5.03	6.82
background so2 slant column offset window2 [DU]	-1.79 $\pm$ 1.71	6446267	2.10	-1.38	-10.6	7.27	-2.75	-0.645
sulfurdioxide slant column density window3 [DU]	-14.8 $\pm$ 25.5	6446267	32.4	-14.7	-428	741	-30.8	1.55
sulfurdioxide slant column density window3 precision [DU]	31.0 $\pm$ 13.8	6446267	10.7	27.4	10.5	259	23.2	33.9
sulfurdioxide slant column density corrected win3 [DU]	-4.83 $\pm$ 25.11	6446267	31.9	-4.85	-415	747	-20.7	11.2
background so2 slant column offset window3 [DU]	9.95 $\pm$ 5.26	6446267	7.48	9.04	-14.3	28.1	6.25	13.7
sulfurdioxide slant column cobra flag [1]	1.97 $\pm$ 0.26	6446267	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.680 \pm 3.124) \times 10^{-2}$	6446267	9.512×10^{-3}	1.221×10^{-2}	9.276×10^{-4}	2.84	8.435×10^{-3}	1.795×10^{-2}
fitted radiance shift [nm]	$(-6.284 \pm 27.967) \times 10^{-4}$	6446267	2.116×10^{-3}	-6.072×10^{-4}	-6.115×10^{-2}	7.614×10^{-2}	-1.735×10^{-3}	3.818×10^{-4}
fitted radiance squeeze [1]	$(1.342 \pm 17.547) \times 10^{-5}$	6446267	2.072×10^{-4}	1.012×10^{-5}	-1.608×10^{-2}	2.191×10^{-2}	-9.225×10^{-5}	1.150×10^{-4}
fitted root mean square [1]	$(1.301 \pm 0.491) \times 10^{-3}$	6446267	5.230×10^{-4}	1.168×10^{-3}	3.537×10^{-4}	8.614×10^{-2}	9.806×10^{-4}	1.504×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.829 $\pm$ 0.359	6446267	0.443	0.803	5.000×10^{-2}	2.56	0.589	1.03
sulfurdioxide total air mass factor polluted precision [1]	$(9.942 \pm 8.612) \times 10^{-2}$	6446267	9.644×10^{-2}	6.359×10^{-2}	3.837×10^{-3}	1.47	4.009×10^{-2}	0.137
sulfurdioxide clear air mass factor polluted [1]	0.736 $\pm$ 0.211	6446267	0.304	0.723	0.133	1.69	0.585	0.889
number of spectral points in retrieval [1]	73.4 $\pm$ 0.5	6446267	1.000	73.0	52.0	74.0	73.0	74.0

Table 5: Parameterlist and basic statistics for the analysis for observations over water

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.674 ± 0.390	11458054	0.730	1.000	0.0	1.000	0.270	1.000
sulfurdioxide total vertical column [DU]	$(2.966 \pm 87.900) \times 10^{-2}$	11458054	0.457	1.157×10^{-2}	-160	231	-0.214	0.243
sulfurdioxide total vertical column precision [DU]	0.486 ± 0.577	11458054	0.320	0.322	5.834×10^{-2}	41.1	0.225	0.546
sulfurdioxide slant column density corrected [DU]	$(2.072 \pm 38.879) \times 10^{-2}$	11458054	0.372	1.004×10^{-2}	-24.0	276	-0.174	0.198
sulfurdioxide slant column density cobra [DU]	$(2.062 \pm 37.223) \times 10^{-2}$	11458054	0.372	1.004×10^{-2}	-24.0	90.0	-0.174	0.198
sulfurdioxide slant column density cobra precision [DU]	0.300 ± 0.136	11458054	0.144	0.255	8.960×10^{-2}	22.6	0.210	0.354
sulfurdioxide slant column density window1 [DU]	0.187 ± 0.698	11458054	0.749	0.197	-70.3	105	-0.181	0.568
sulfurdioxide slant column density window1 precision [DU]	0.300 ± 0.136	11458054	0.144	0.255	8.960×10^{-2}	22.6	0.210	0.354
sulfurdioxide slant column density corrected win1 [DU]	$(5.507 \pm 69.110) \times 10^{-2}$	11458054	0.739	3.629×10^{-2}	-70.3	105	-0.328	0.411
background so2 slant column offset window1 [DU]	-0.132 ± 0.149	11458054	0.158	-0.160	-1.13	2.77	-0.229	-7.123×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.24 ± 9.20	11458054	11.6	3.08	-805	1.134×10^3	-2.64	8.96
sulfurdioxide slant column density window2 precision [DU]	8.10 ± 2.17	11458054	2.51	7.77	2.25	610	6.67	9.18
sulfurdioxide slant column density corrected win2 [DU]	0.645 ± 8.892	11458054	11.2	0.687	-806	1.139×10^3	-4.91	6.25
background so2 slant column offset window2 [DU]	-2.59 ± 2.97	11458054	3.39	-1.57	-17.6	7.74	-3.89	-0.503
sulfurdioxide slant column density window3 [DU]	-13.8 ± 24.0	11458054	30.6	-14.2	-451	575	-29.2	1.43
sulfurdioxide slant column density window3 precision [DU]	27.8 ± 11.9	11458054	9.00	24.6	9.79	285	21.3	30.3
sulfurdioxide slant column density corrected win3 [DU]	-2.12 ± 23.06	11458054	29.2	-2.26	-447	582	-16.7	12.5
background so2 slant column offset window3 [DU]	11.7 ± 6.6	11458054	10.5	10.7	-14.3	31.7	6.35	16.9
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	11458054	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.011 \pm 4.715) \times 10^{-2}$	11458054	1.226×10^{-2}	1.219×10^{-2}	2.523×10^{-4}	2.84	7.329×10^{-3}	1.959×10^{-2}
fitted radiance shift [nm]	$(-4.245 \pm 23.787) \times 10^{-4}$	11458054	1.762×10^{-3}	-3.903×10^{-4}	-6.115×10^{-2}	4.063×10^{-2}	-1.328×10^{-3}	4.338×10^{-4}
fitted radiance squeeze [1]	$(-1.201 \pm 18.000) \times 10^{-5}$	11458054	2.030×10^{-4}	-7.089×10^{-6}	-1.608×10^{-2}	2.191×10^{-2}	-1.100×10^{-4}	9.296×10^{-5}
fitted root mean square [1]	$(1.311 \pm 0.557) \times 10^{-3}$	11458054	5.964×10^{-4}	1.132×10^{-3}	3.363×10^{-4}	8.614×10^{-2}	9.445×10^{-4}	1.541×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.861 ± 0.388	11458054	0.493	0.834	5.000×10^{-2}	2.81	0.588	1.08
sulfurdioxide total air mass factor polluted precision [1]	0.101 ± 0.102	11458054	8.717×10^{-2}	6.357×10^{-2}	3.538×10^{-3}	1.70	4.083×10^{-2}	0.128
sulfurdioxide clear air mass factor polluted [1]	0.748 ± 0.275	11458054	0.363	0.734	8.410×10^{-2}	2.25	0.554	0.918
number of spectral points in retrieval [1]	73.4 ± 0.5	11458054	1.000	73.0	52.0	74.0	73.0	74.0

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

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.616 $\pm$ 0.417	4122764	0.830	1.000	0.0	1.000	0.170	1.000
sulfurdioxide total vertical column [DU]	$(3.953 \pm 287.173) \times 10^{-2}$	4122764	0.482	1.191×10^{-2}	-43.9	5.316×10^3	-0.224	0.257
sulfurdioxide total vertical column precision [DU]	0.532 $\pm$ 0.664	4122764	0.336	0.359	4.930×10^{-2}	58.0	0.235	0.571
sulfurdioxide slant column density corrected [DU]	$(2.467 \pm 65.472) \times 10^{-2}$	4122764	0.372	1.015×10^{-2}	-12.7	962	-0.174	0.198
sulfurdioxide slant column density cobra [DU]	$(2.383 \pm 40.920) \times 10^{-2}$	4122764	0.372	1.015×10^{-2}	-12.7	40.5	-0.174	0.198
sulfurdioxide slant column density cobra precision [DU]	0.293 $\pm$ 0.122	4122764	0.112	0.262	9.101×10^{-2}	19.0	0.217	0.329
sulfurdioxide slant column density window1 [DU]	0.206 $\pm$ 0.700	4122764	0.735	0.204	-26.0	49.2	-0.164	0.570
sulfurdioxide slant column density window1 precision [DU]	0.293 $\pm$ 0.122	4122764	0.112	0.262	9.101×10^{-2}	19.0	0.217	0.329
sulfurdioxide slant column density corrected win1 [DU]	$(6.266 \pm 69.437) \times 10^{-2}$	4122764	0.724	3.857×10^{-2}	-26.0	49.3	-0.317	0.407
background so2 slant column offset window1 [DU]	-0.144 $\pm$ 0.144	4122764	0.143	-0.169	-0.645	2.51	-0.233	-9.013×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.38 $\pm$ 9.27	4122764	11.6	3.37	-577	2.017×10^3	-2.41	9.19
sulfurdioxide slant column density window2 precision [DU]	8.13 $\pm$ 2.43	4122764	2.58	7.77	2.20	616	6.61	9.19
sulfurdioxide slant column density corrected win2 [DU]	0.576 $\pm$ 8.944	4122764	11.0	0.616	-577	2.016×10^3	-4.91	6.13
background so2 slant column offset window2 [DU]	-2.80 $\pm$ 2.96	4122764	3.99	-1.78	-17.1	7.74	-4.55	-0.568
sulfurdioxide slant column density window3 [DU]	-22.1 $\pm$ 22.7	4122764	28.1	-21.9	-348	169	-36.0	-7.91
sulfurdioxide slant column density window3 precision [DU]	29.9 $\pm$ 16.5	4122764	11.8	25.2	9.86	255	20.5	32.4
sulfurdioxide slant column density corrected win3 [DU]	-9.65 $\pm$ 23.00	4122764	28.5	-8.84	-339	171	-23.5	5.00
background so2 slant column offset window3 [DU]	12.5 $\pm$ 6.6	4122764	11.1	12.3	-14.3	31.3	6.84	18.0
sulfurdioxide slant column cobra flag [1]	1.99 $\pm$ 0.15	4122764	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.556 \pm 11.792) \times 10^{-2}$	4122764	4.537×10^{-2}	1.759×10^{-2}	1.864×10^{-4}	2.30	6.166×10^{-3}	5.154×10^{-2}
fitted radiance shift [nm]	$(-2.884 \pm 31.982) \times 10^{-4}$	4122764	1.857×10^{-3}	-3.053×10^{-4}	-5.259×10^{-2}	7.614×10^{-2}	-1.251×10^{-3}	6.059×10^{-4}
fitted radiance squeeze [1]	$(-2.383 \pm 17.237) \times 10^{-5}$	4122764	2.019×10^{-4}	-1.916×10^{-5}	-1.271×10^{-2}	1.265×10^{-2}	-1.216×10^{-4}	8.030×10^{-5}
fitted root mean square [1]	$(1.268 \pm 0.504) \times 10^{-3}$	4122764	4.526×10^{-4}	1.151×10^{-3}	2.979×10^{-4}	7.619×10^{-2}	9.654×10^{-4}	1.418×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.856 $\pm$ 0.489	4122764	0.619	0.716	5.000×10^{-2}	2.93	0.510	1.13
sulfurdioxide total air mass factor polluted precision [1]	0.128 $\pm$ 0.143	4122764	0.138	7.199×10^{-2}	3.529×10^{-3}	1.88	3.291×10^{-2}	0.171
sulfurdioxide clear air mass factor polluted [1]	0.701 $\pm$ 0.315	4122764	0.375	0.646	7.930×10^{-2}	2.61	0.478	0.853
number of spectral points in retrieval [1]	73.4 $\pm$ 0.5	4122764	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

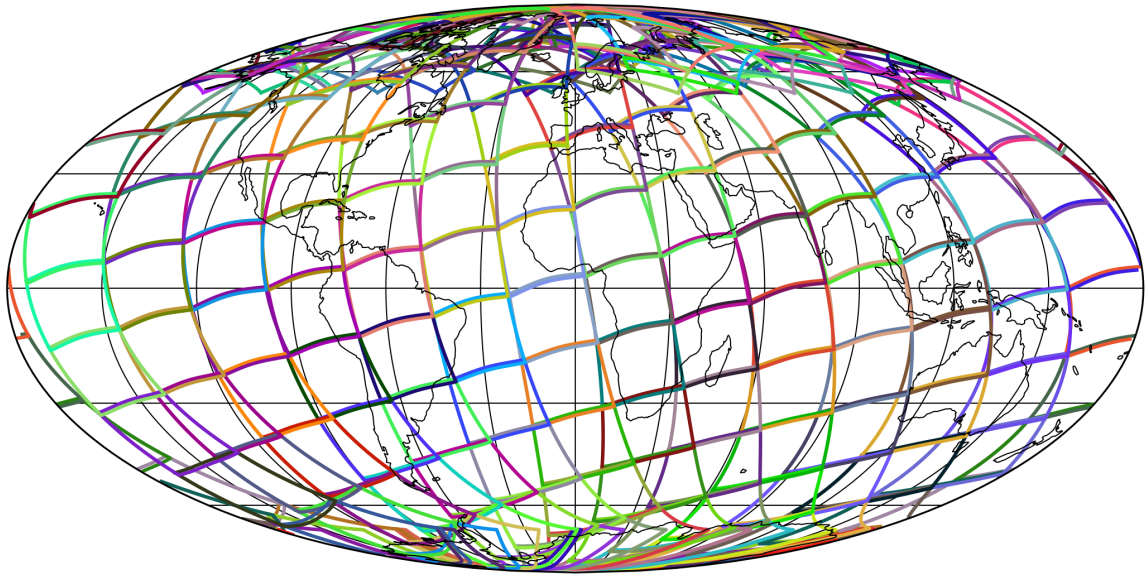


Figure 1: Outline of the granules.

4 Input data monitoring

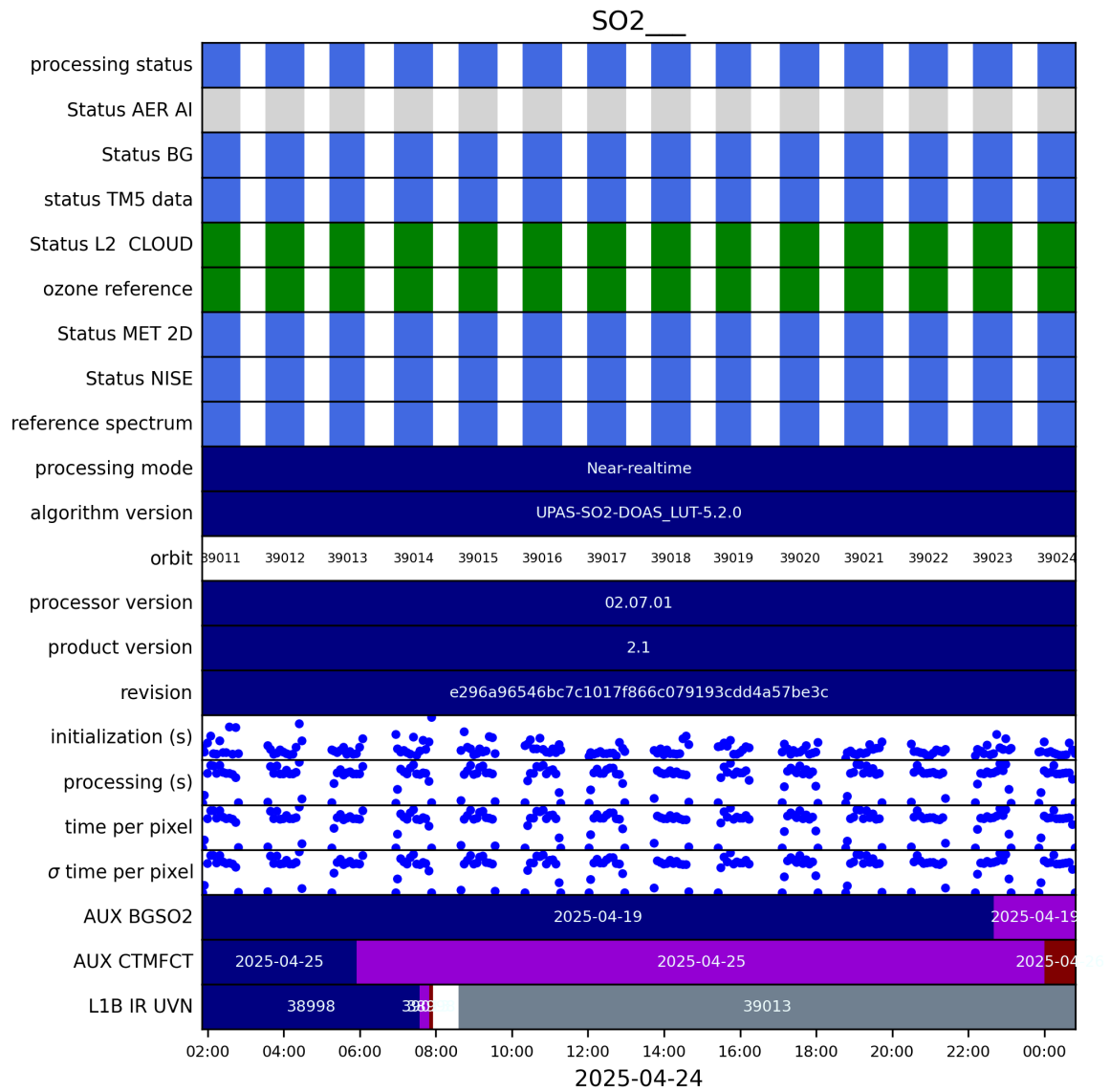


Figure 2: Input data per granule

5 Warnings and errors

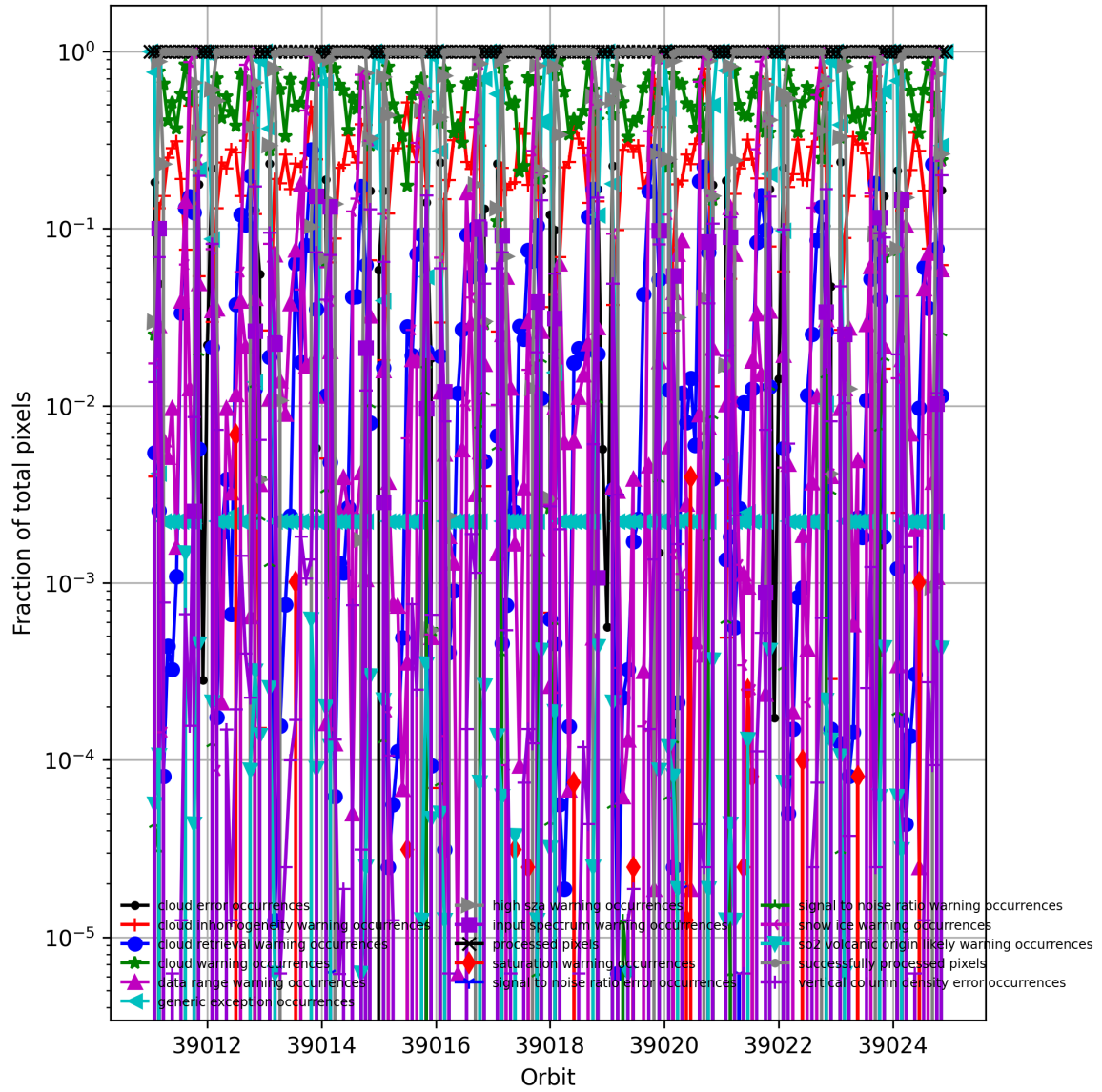


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

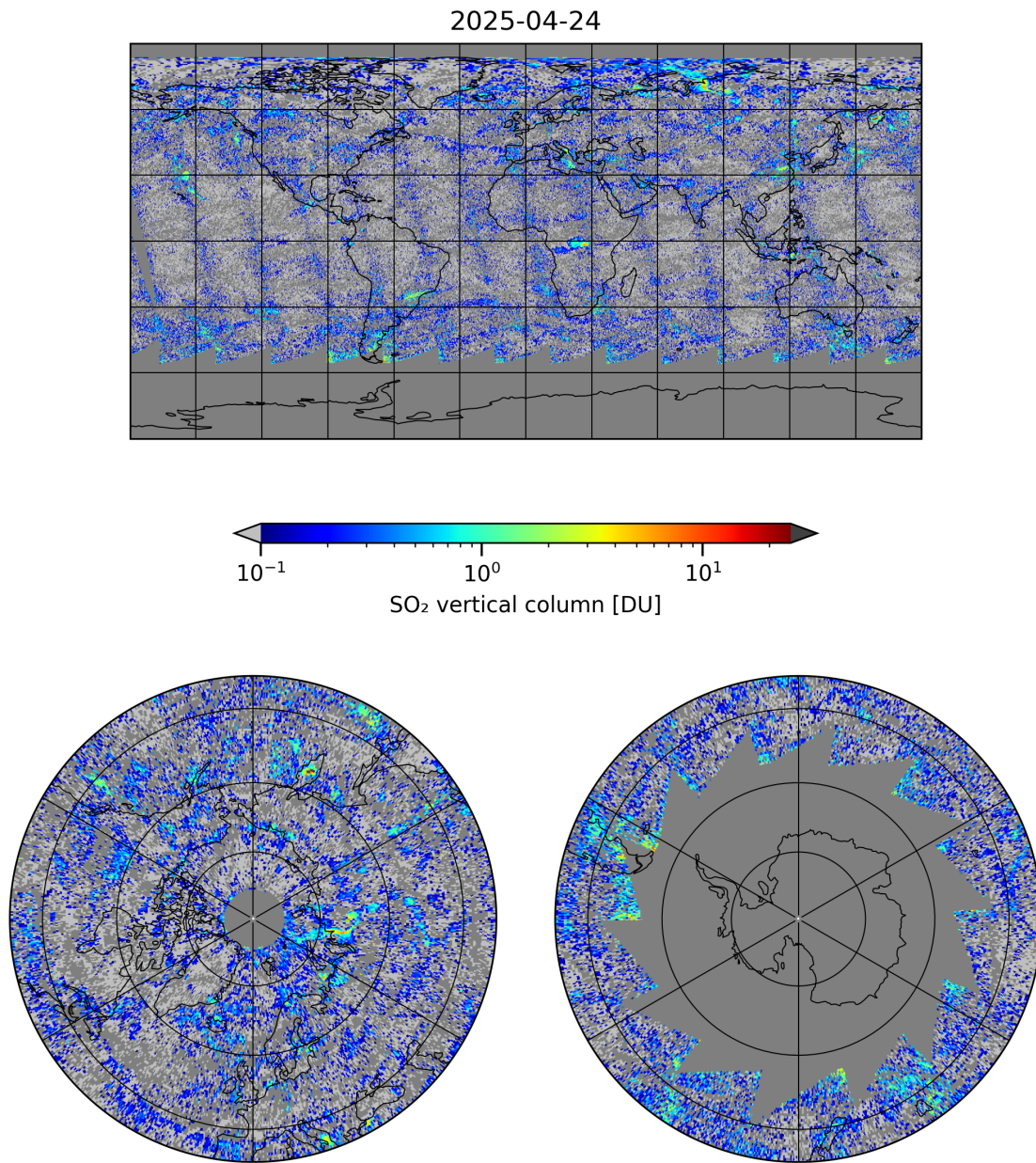


Figure 4: Map of “SO₂ vertical column” for 2025-04-24 to 2025-04-25

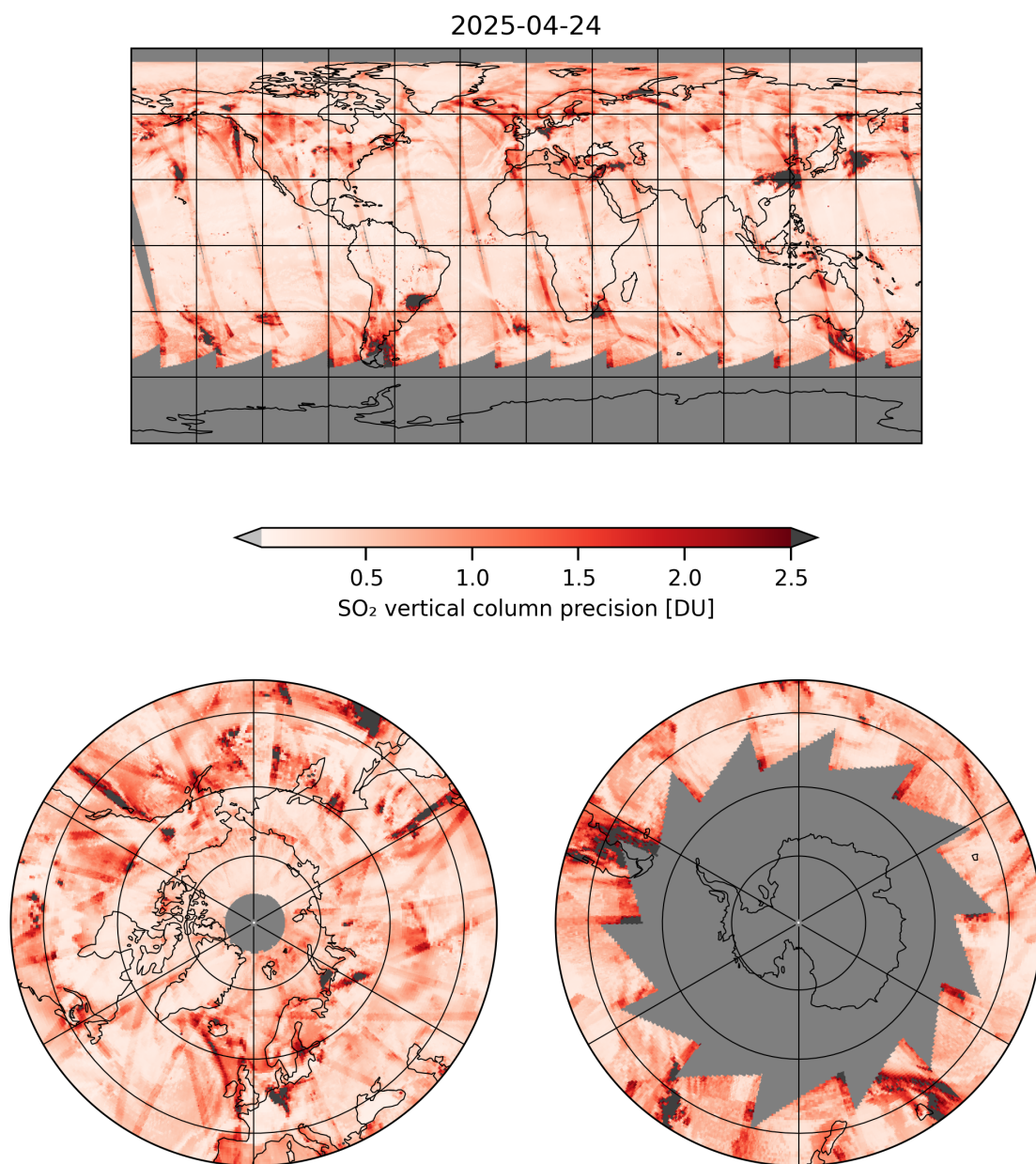


Figure 5: Map of “SO₂ vertical column precision” for 2025-04-24 to 2025-04-25

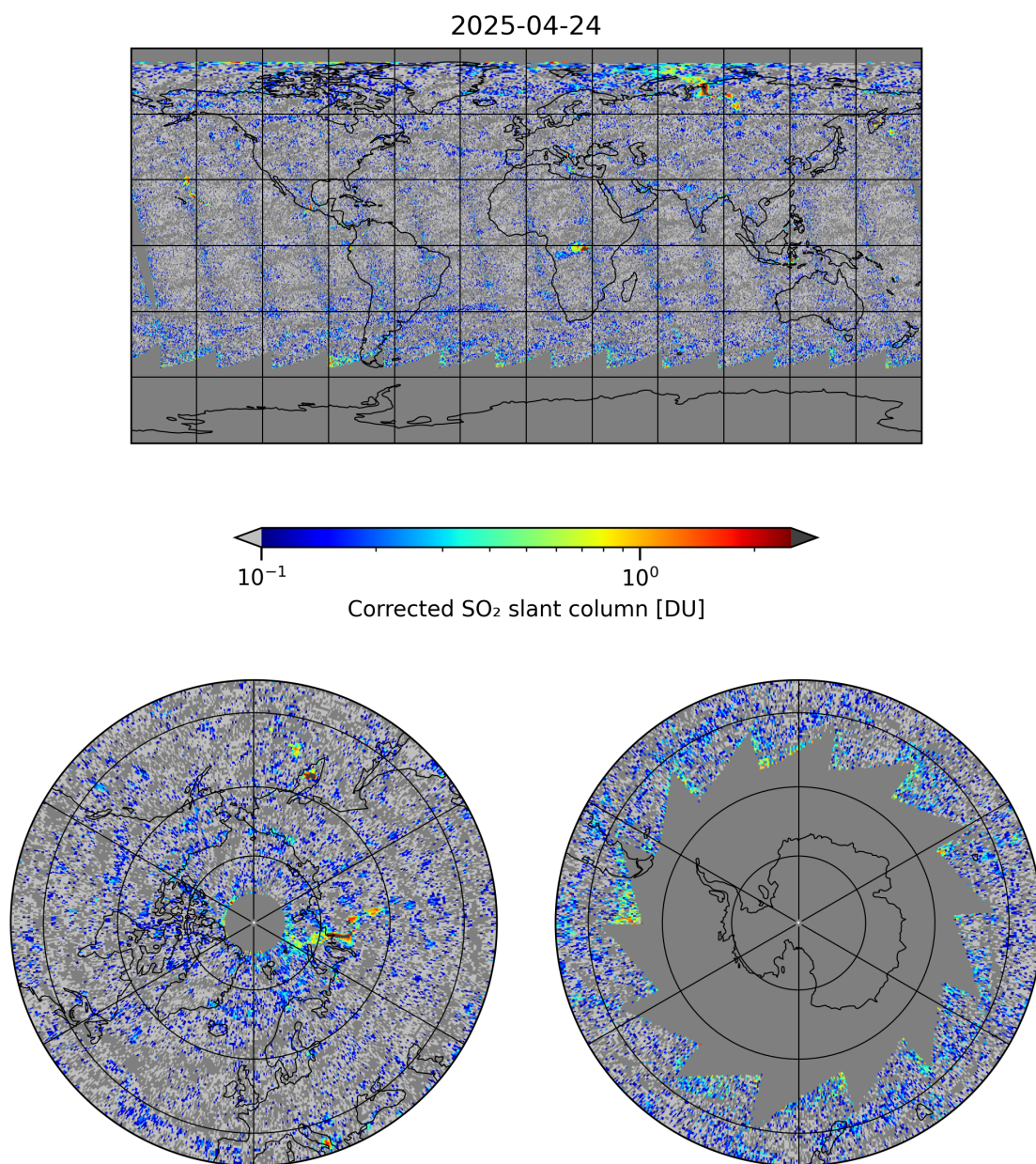


Figure 6: Map of “Corrected SO₂ slant column” for 2025-04-24 to 2025-04-25

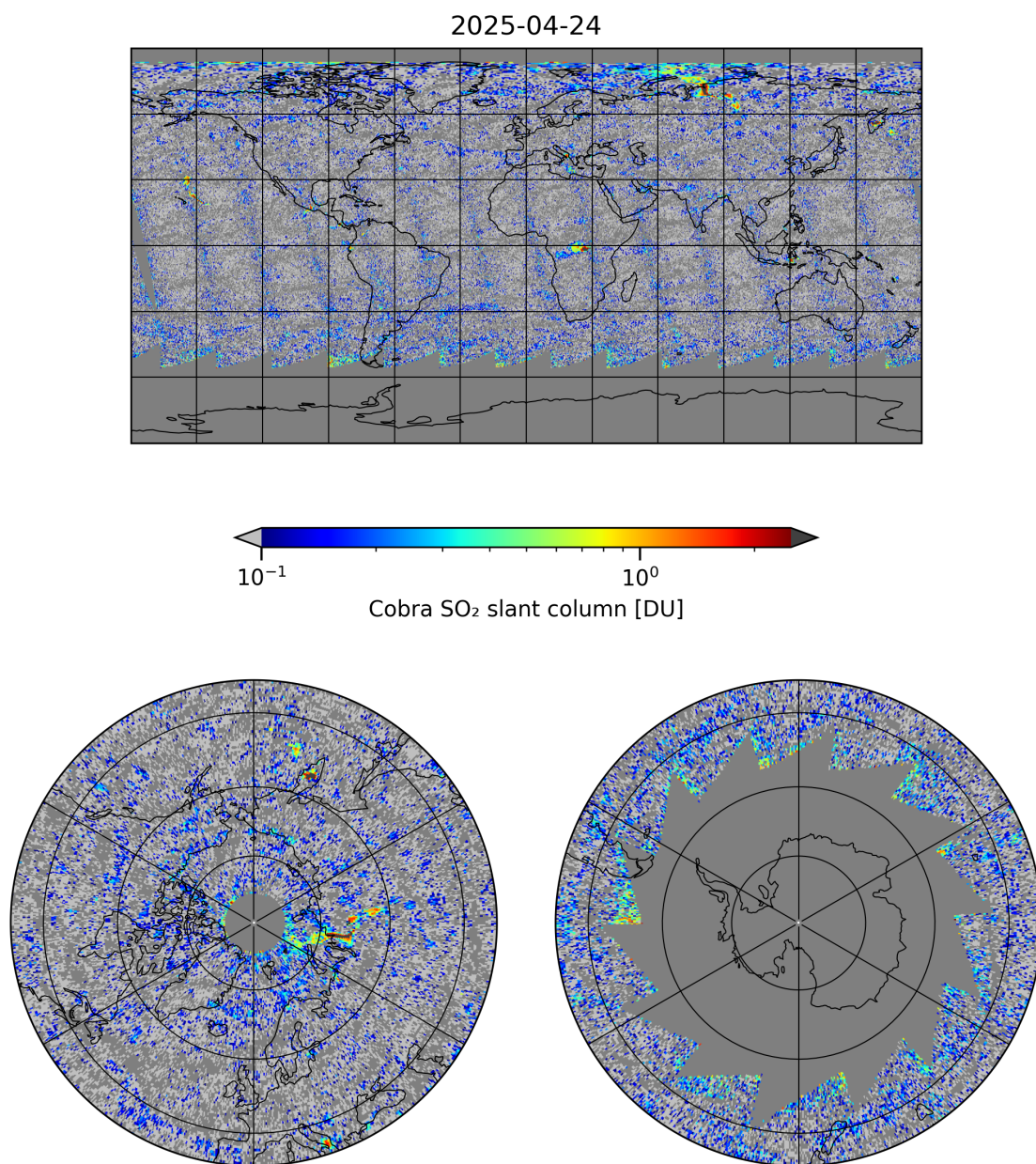


Figure 7: Map of “Cobra SO₂ slant column” for 2025-04-24 to 2025-04-25

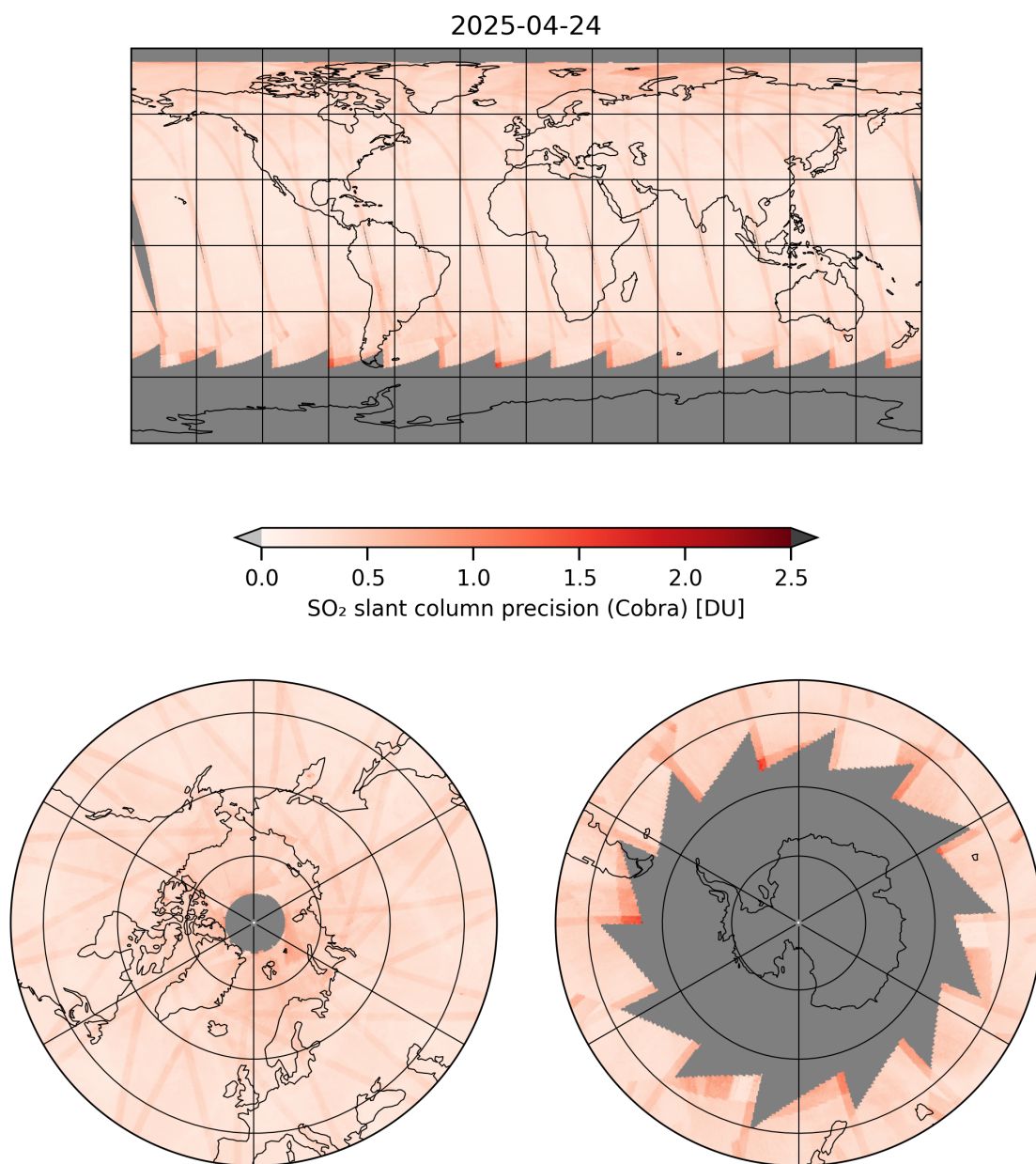


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-04-24 to 2025-04-25

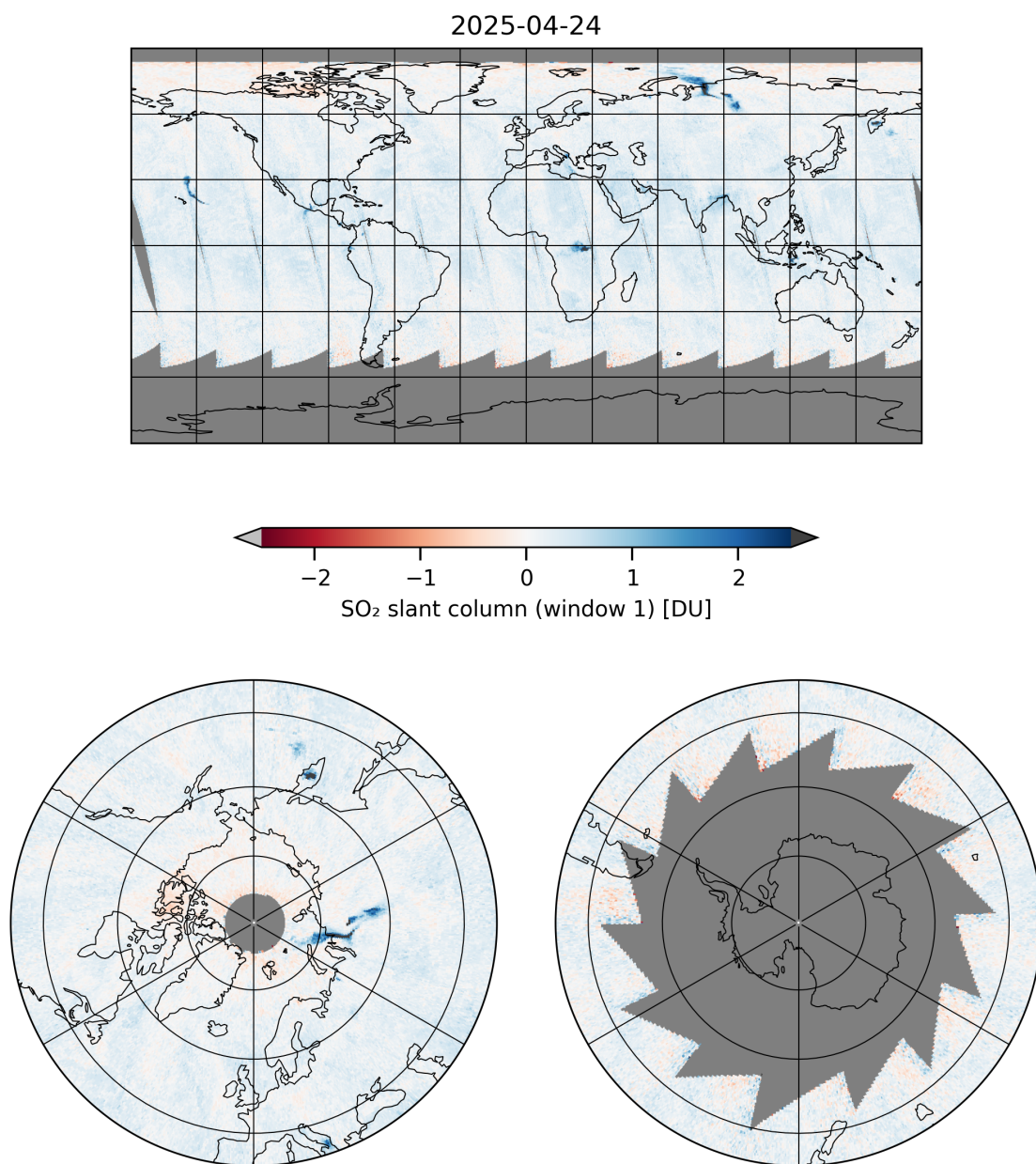


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-04-24 to 2025-04-25

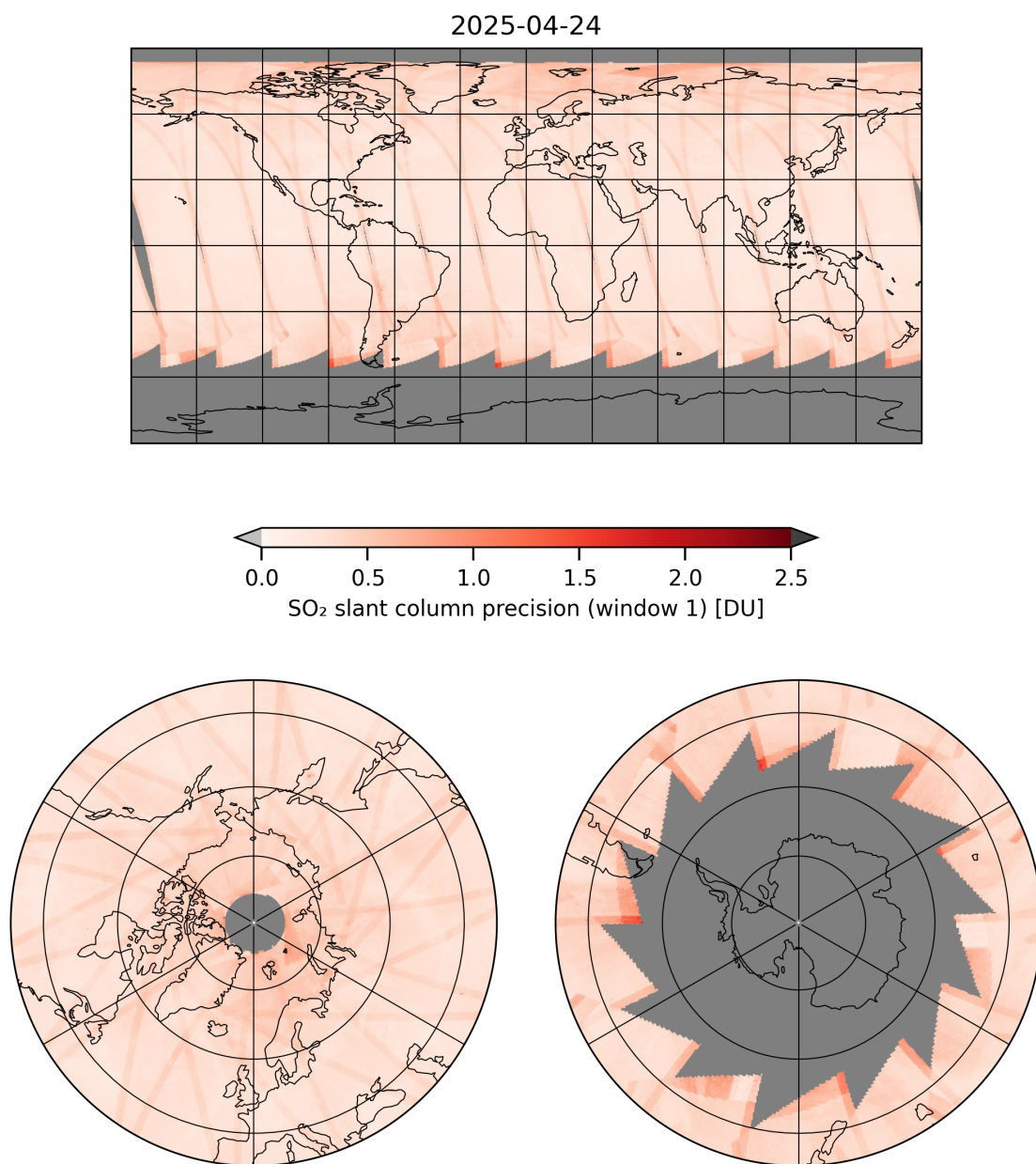


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-04-24 to 2025-04-25

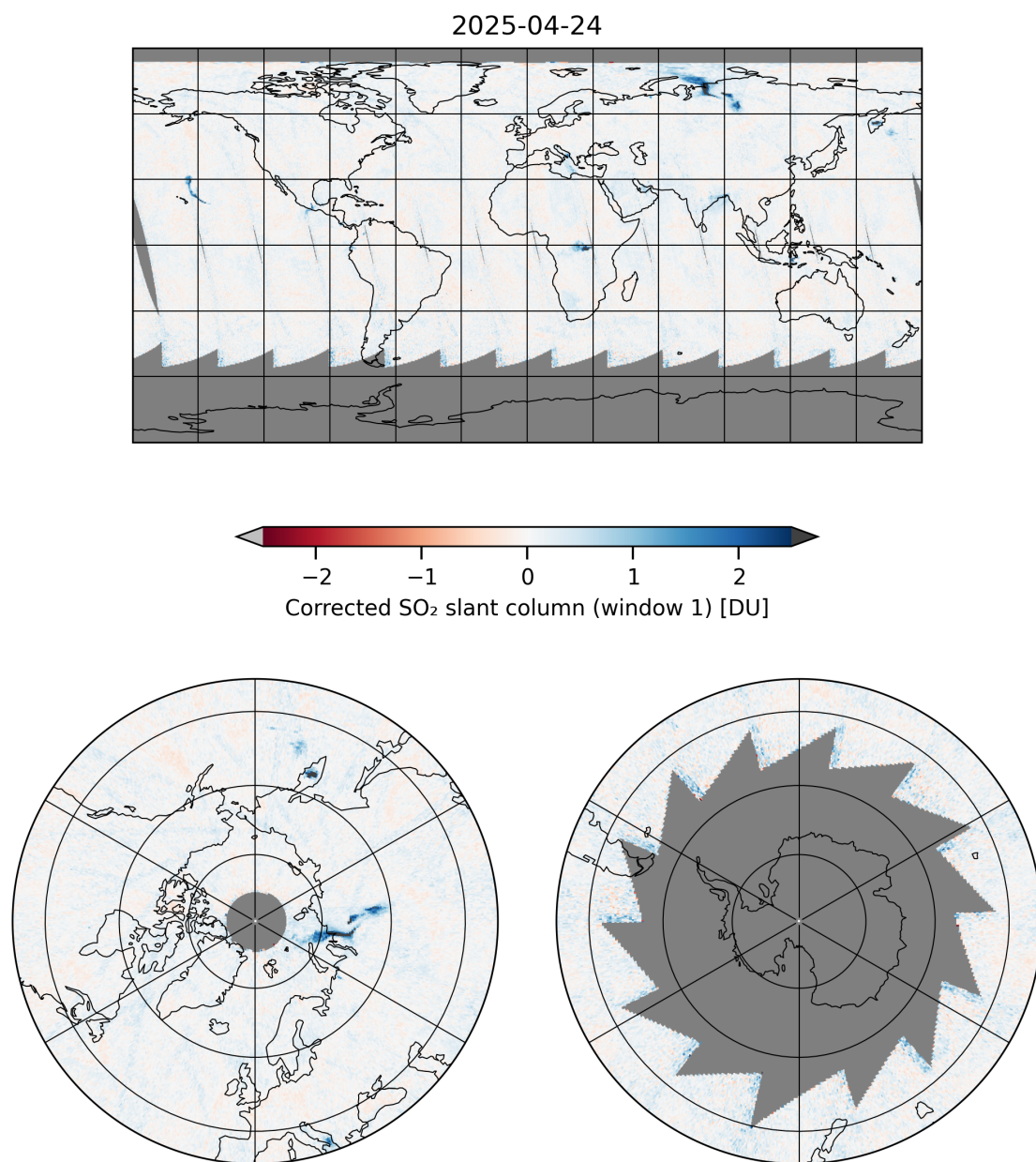


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-04-24 to 2025-04-25

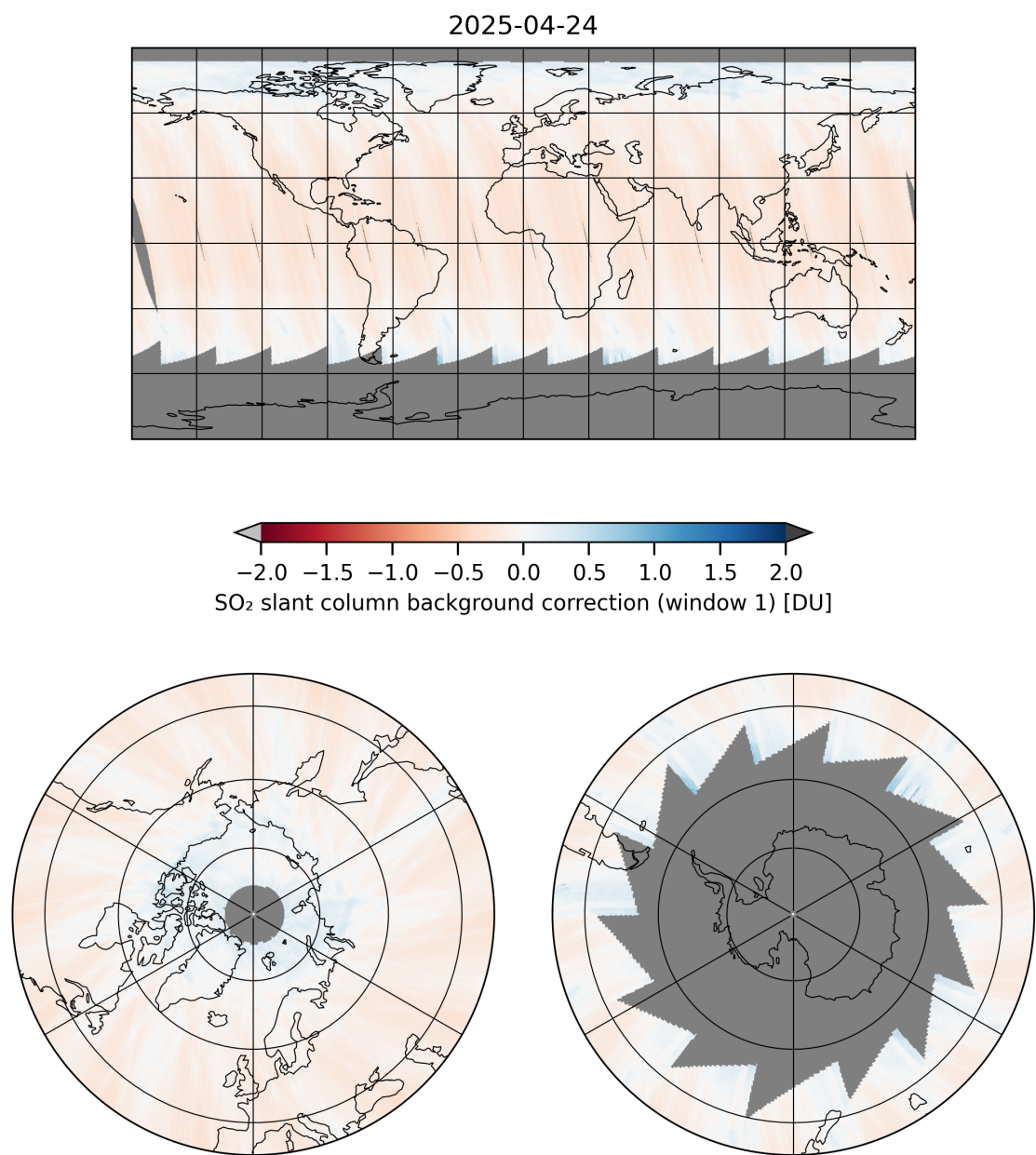


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-04-24 to 2025-04-25

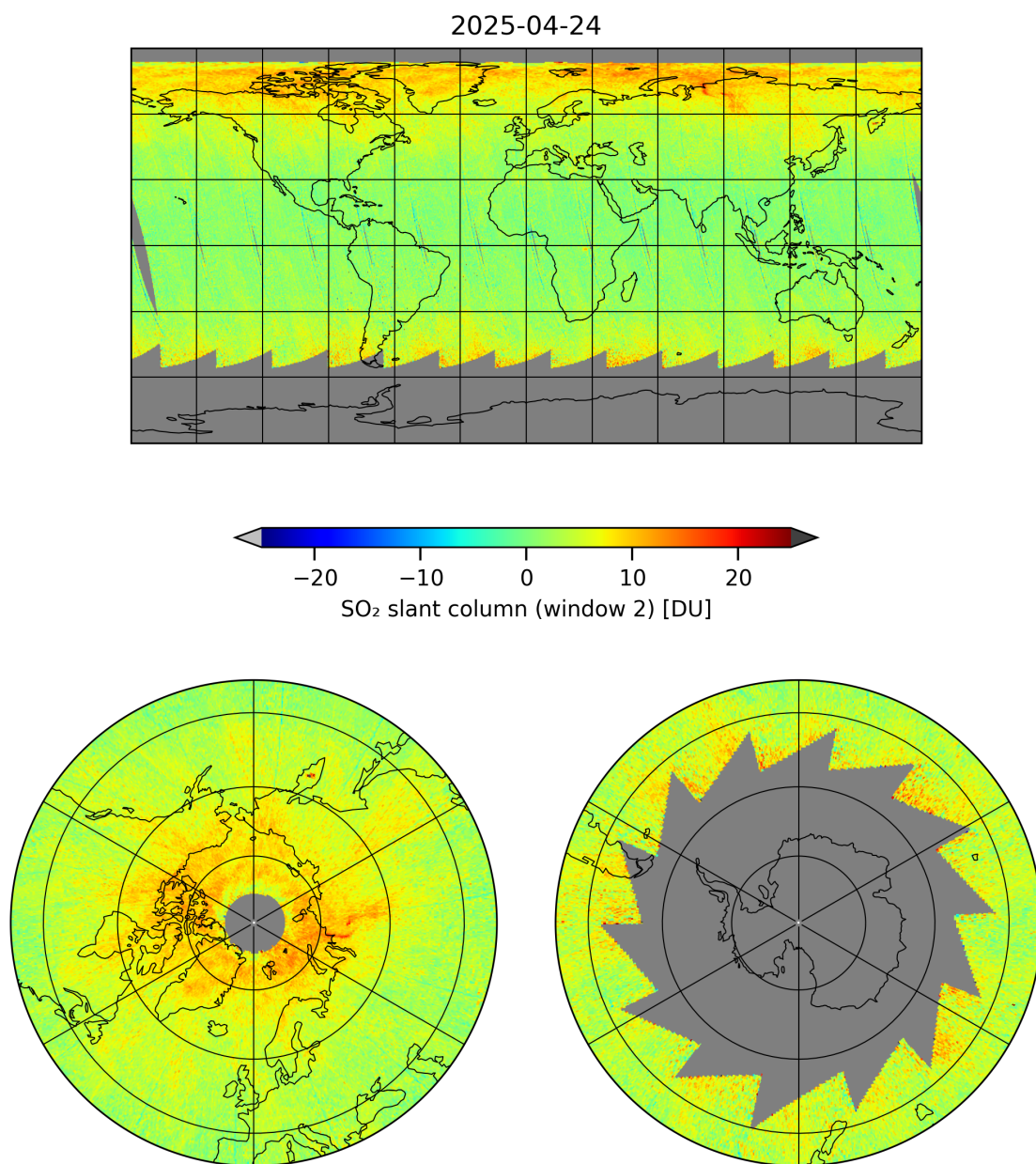


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-04-24 to 2025-04-25

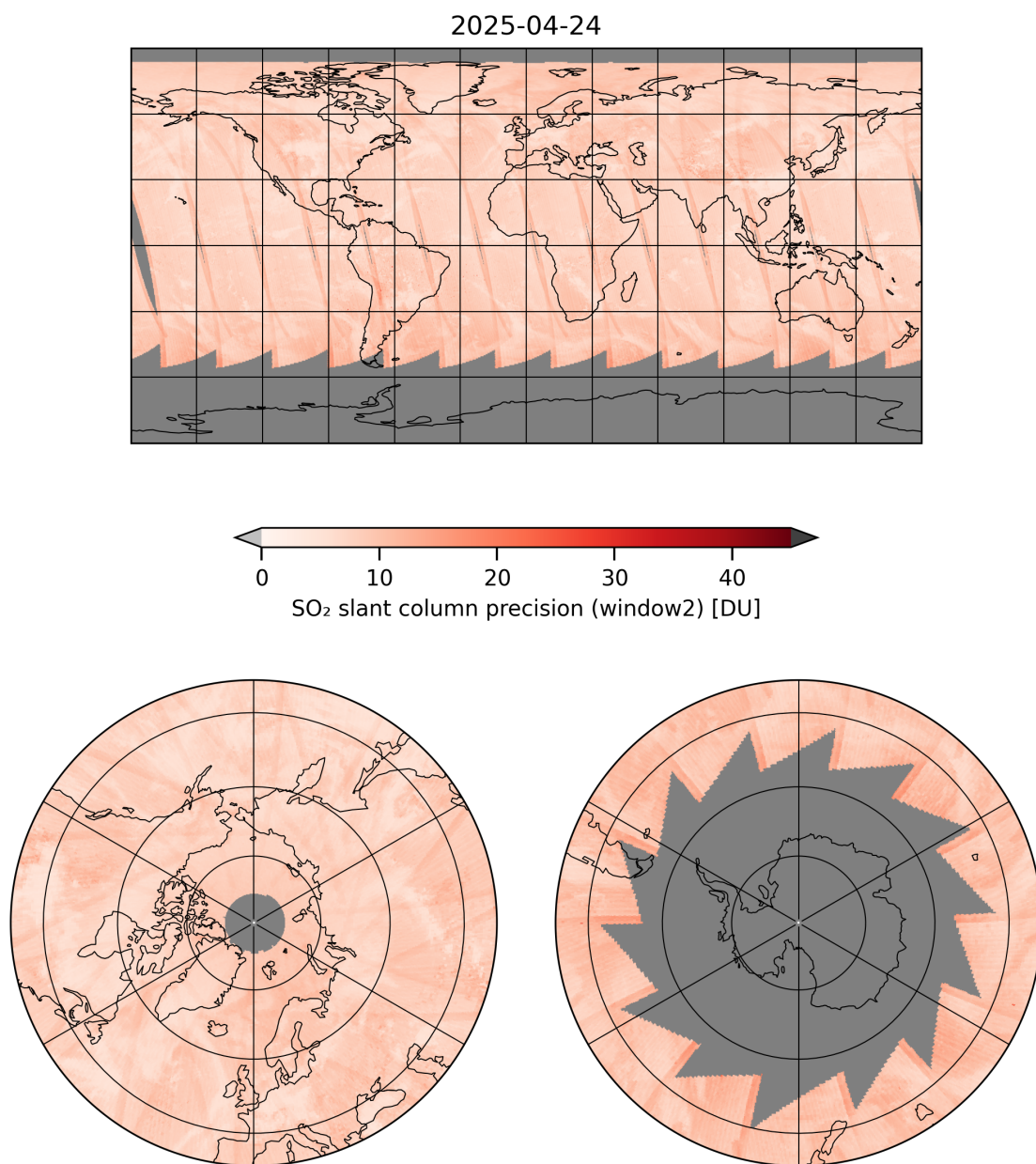


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-04-24 to 2025-04-25

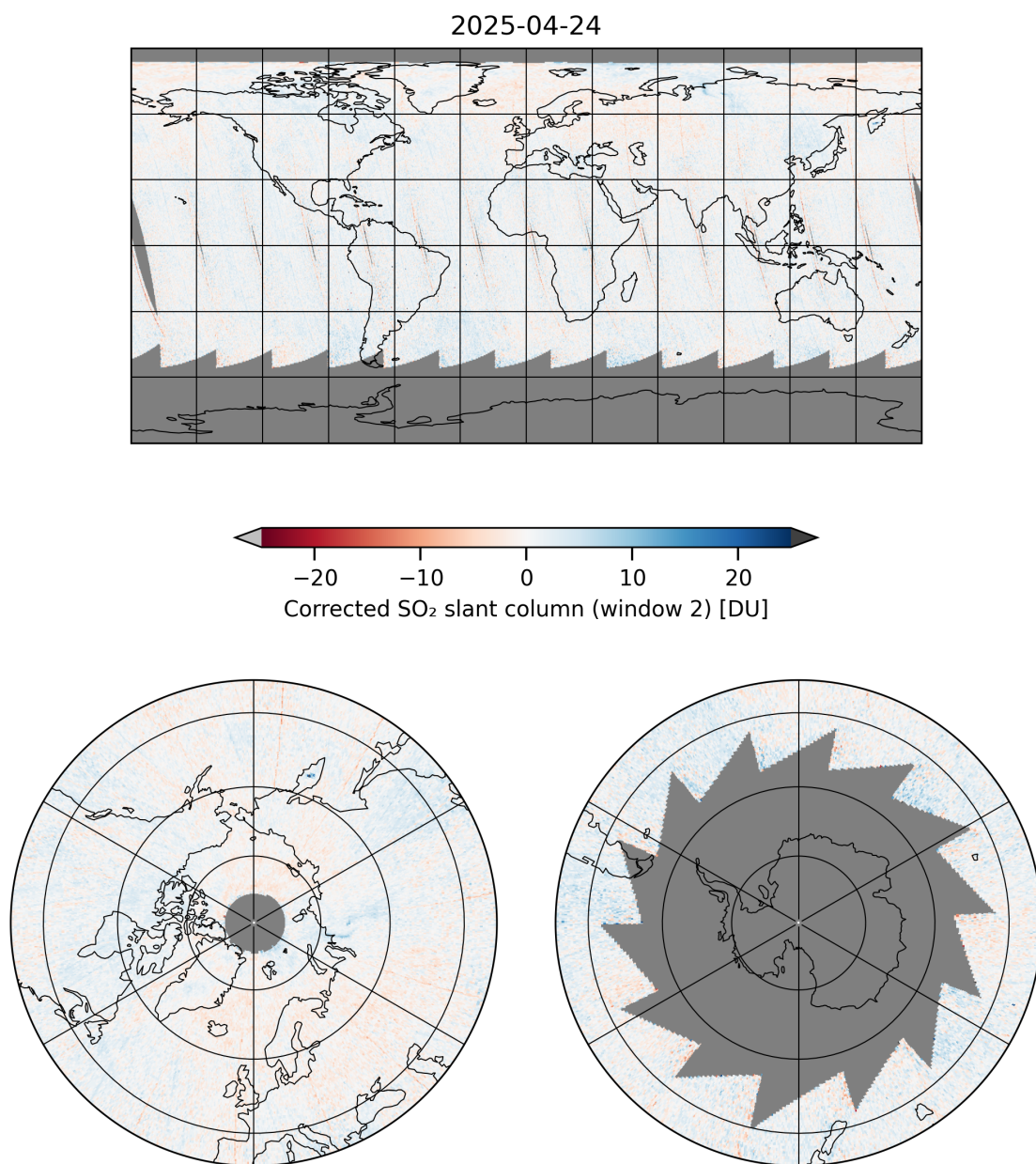


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-04-24 to 2025-04-25

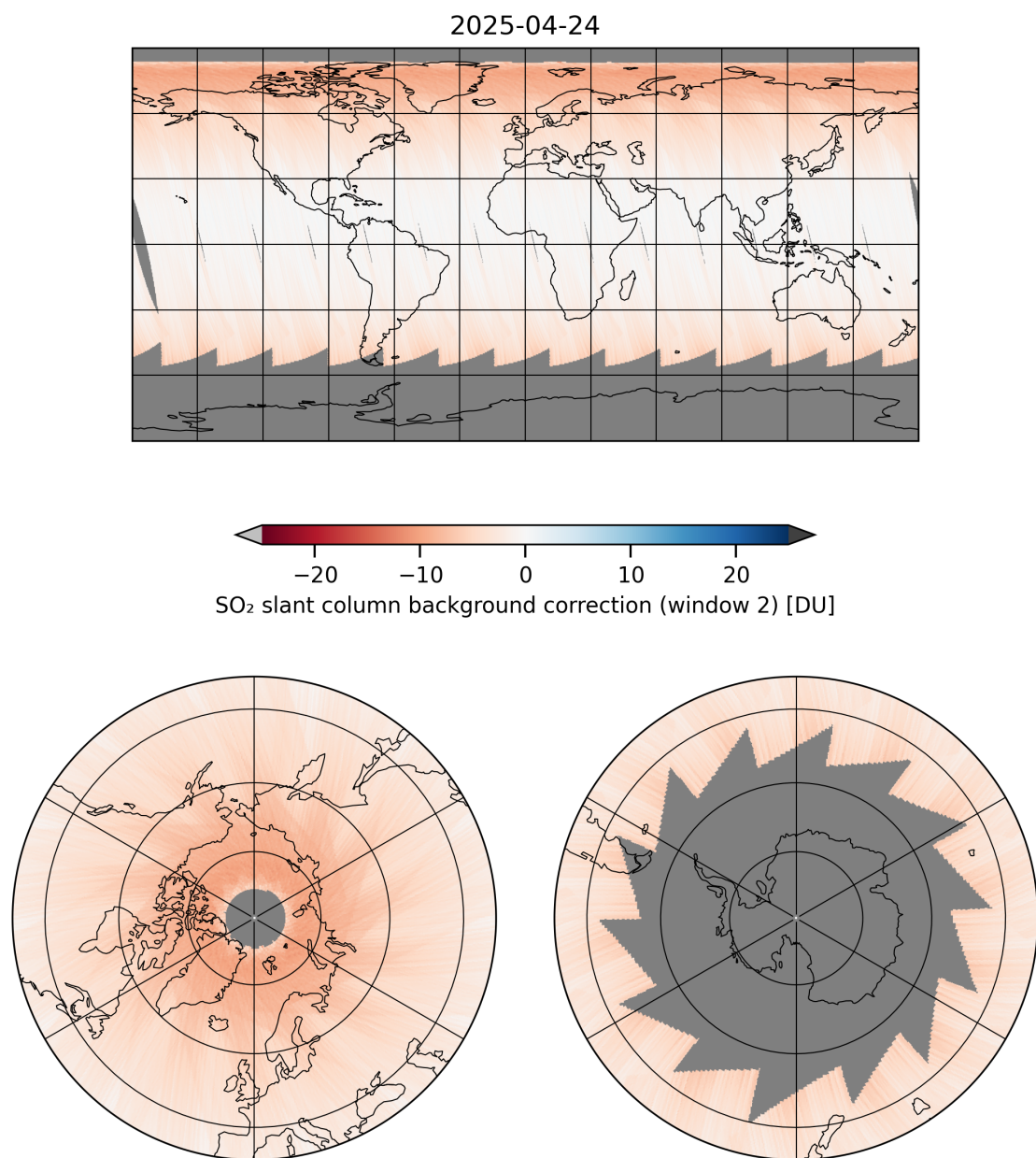


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-04-24 to 2025-04-25

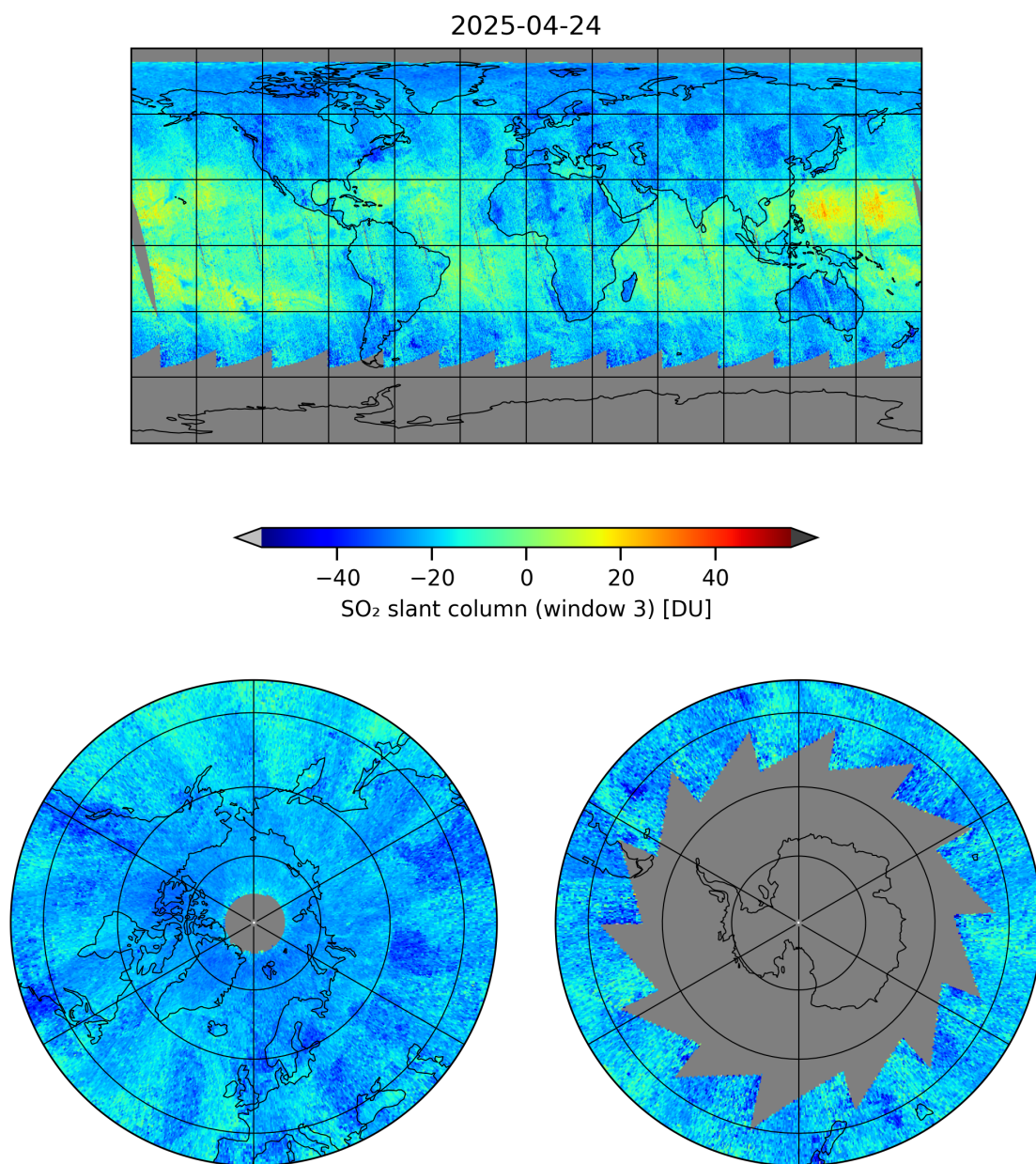


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-04-24 to 2025-04-25

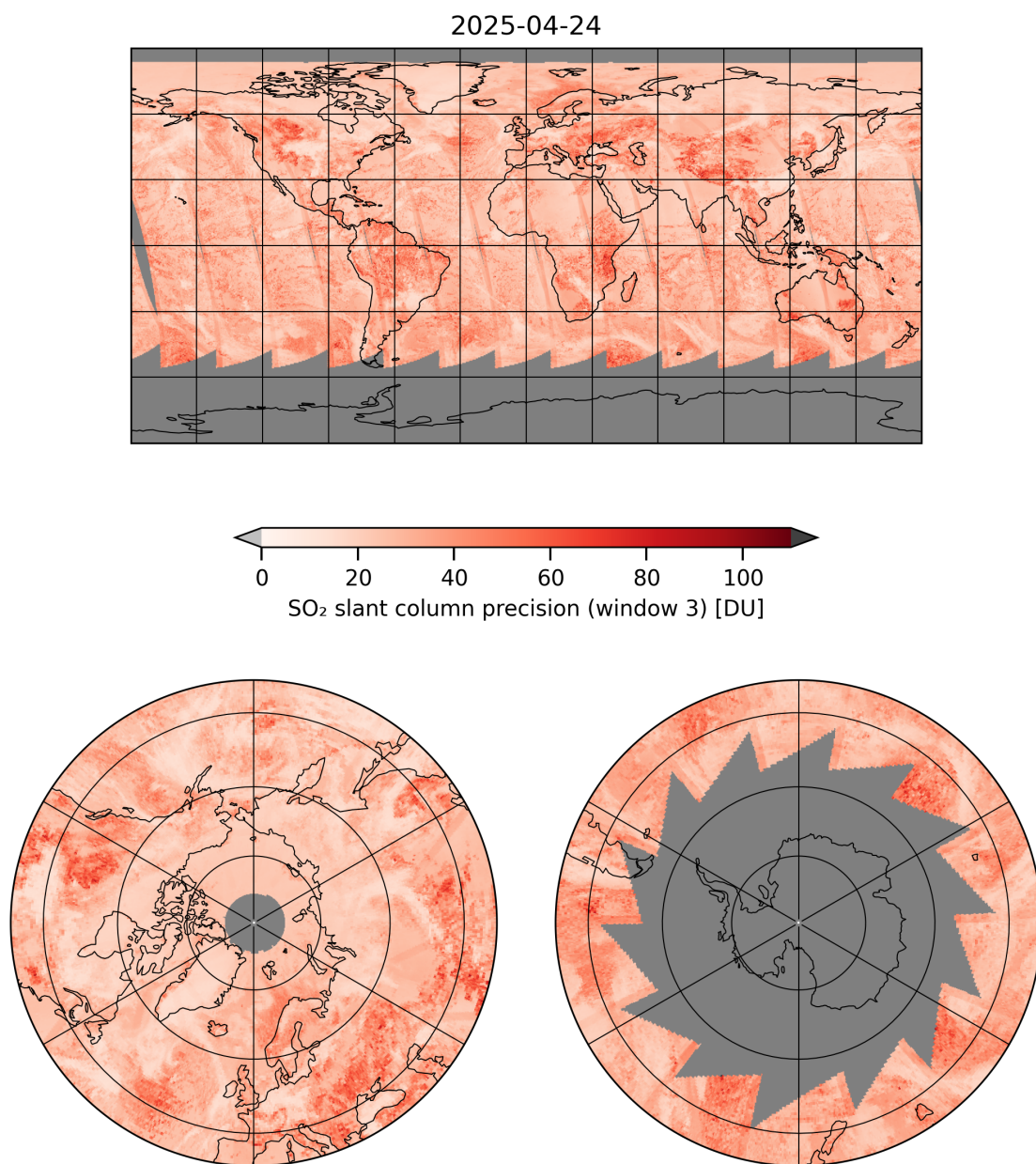


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-04-24 to 2025-04-25

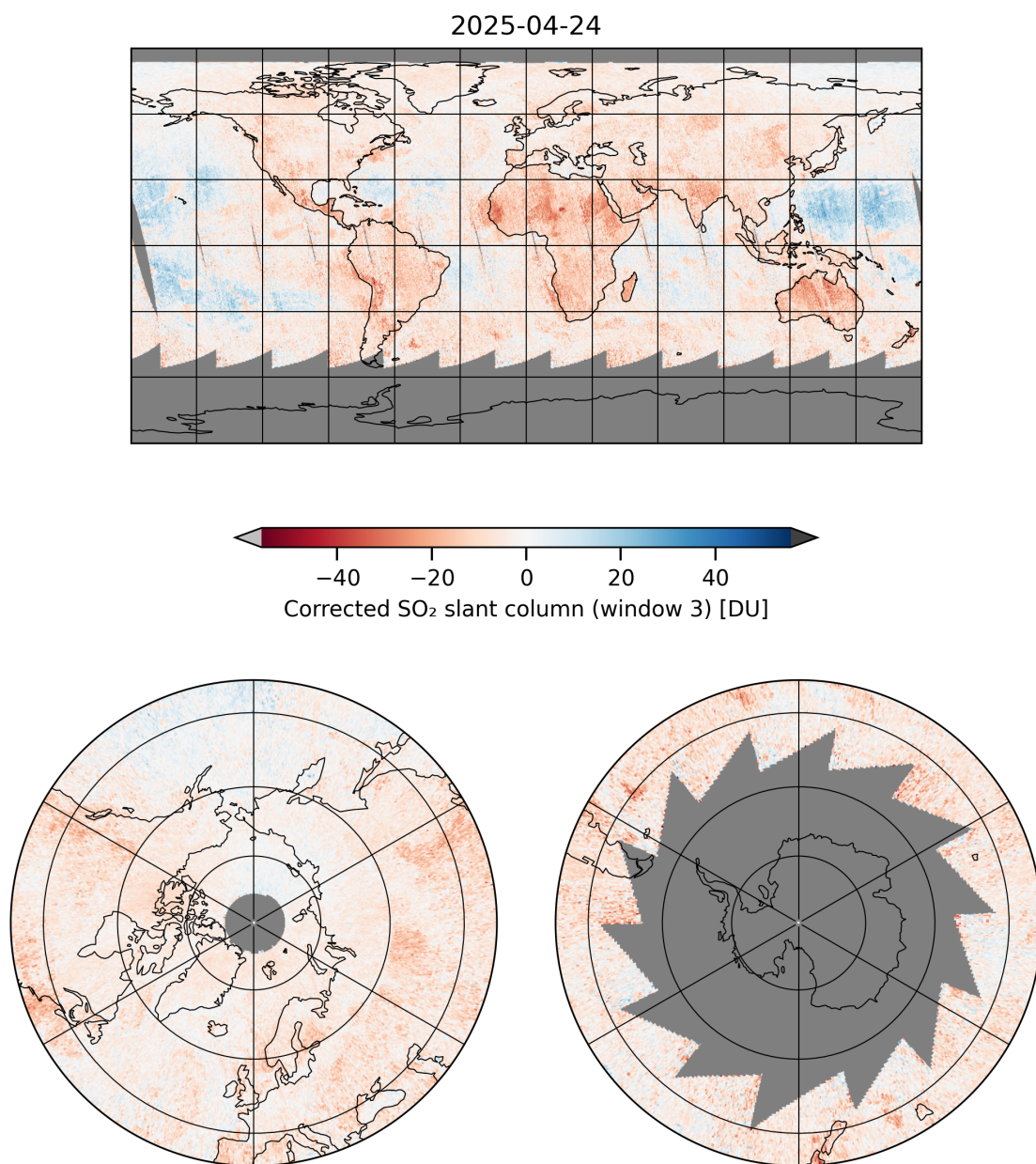


Figure 19: Map of "Corrected SO₂ slant column (window 3)" for 2025-04-24 to 2025-04-25

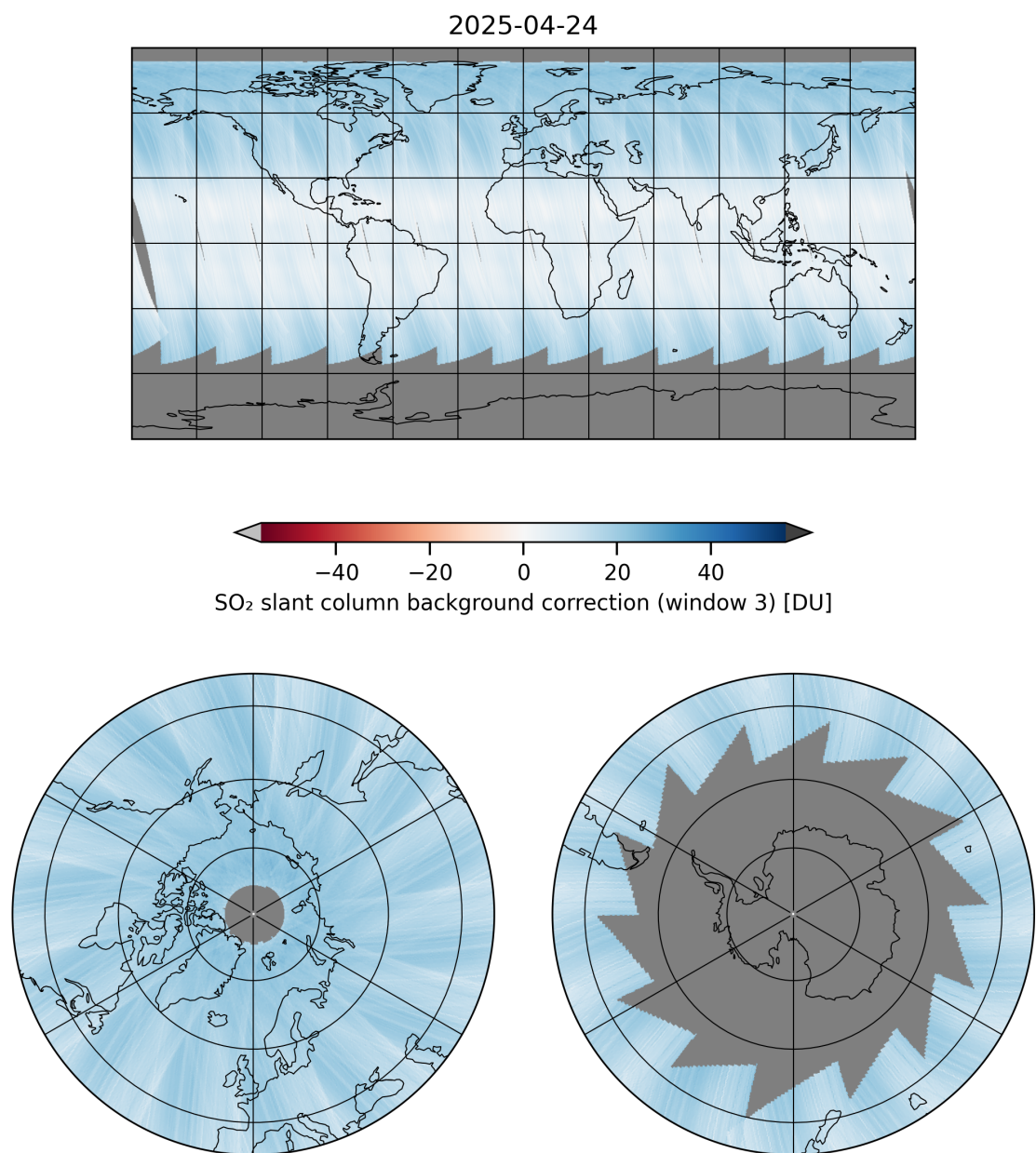


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-04-24 to 2025-04-25

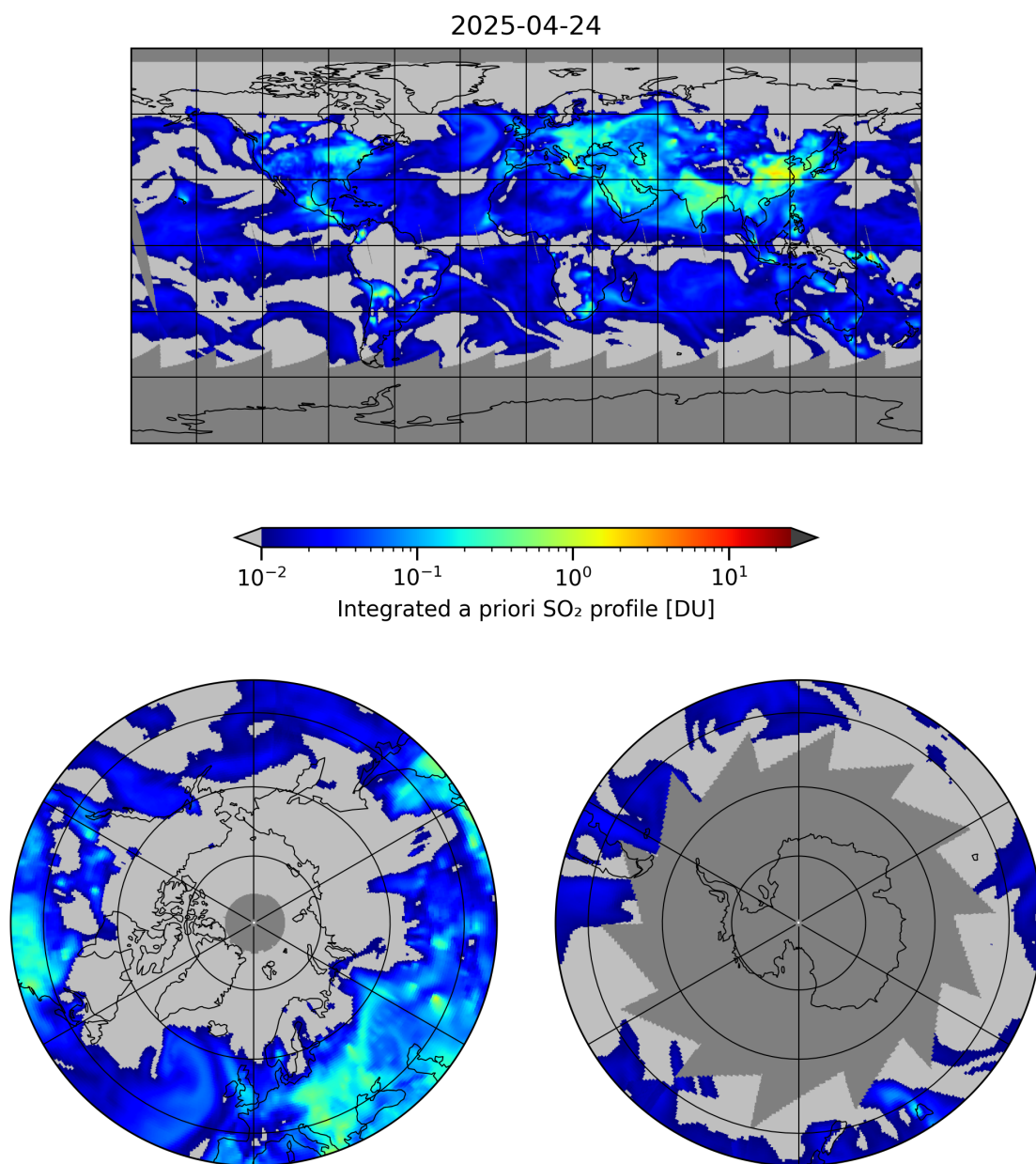


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-04-24 to 2025-04-25

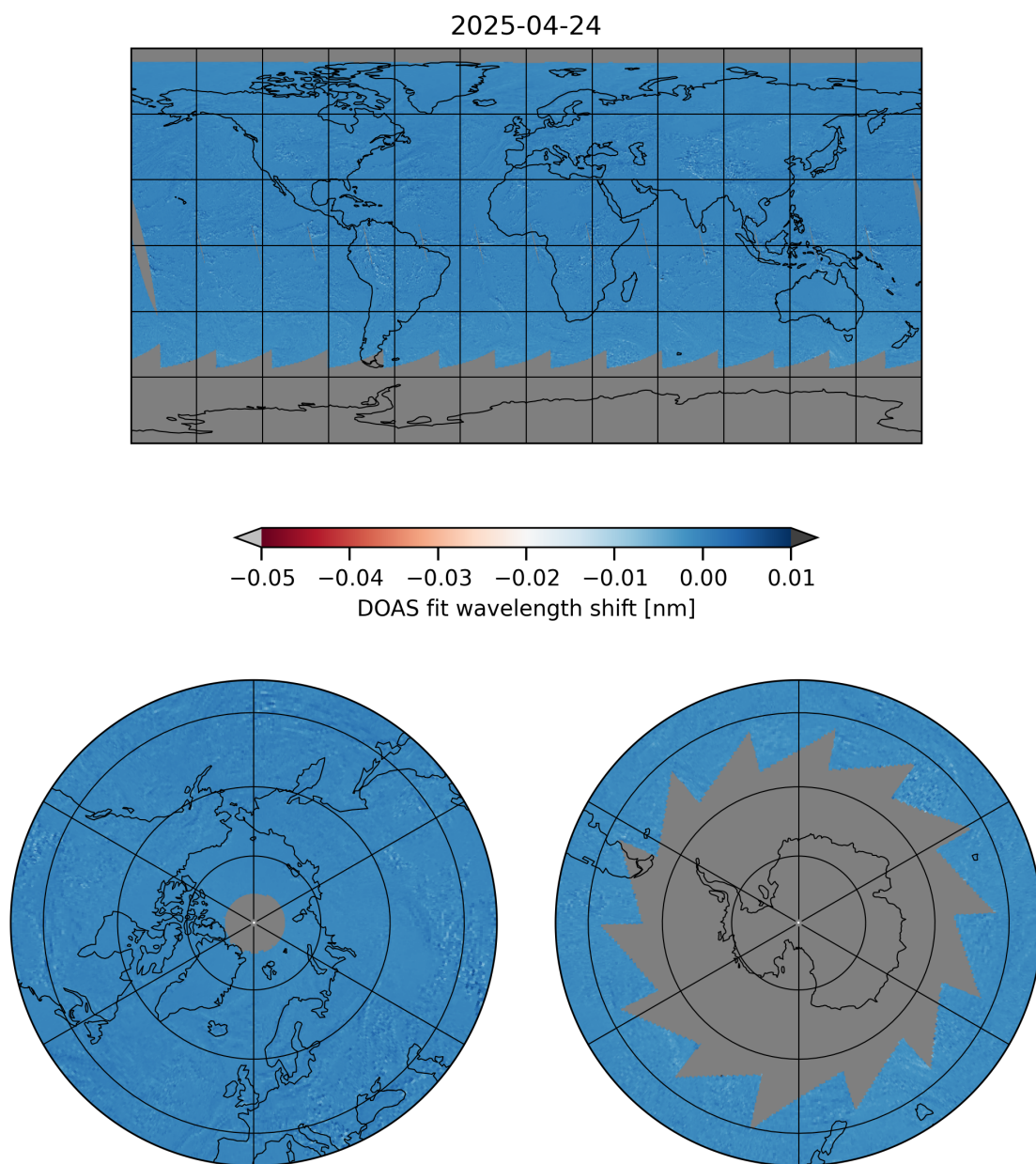


Figure 22: Map of “DOAS fit wavelength shift” for 2025-04-24 to 2025-04-25

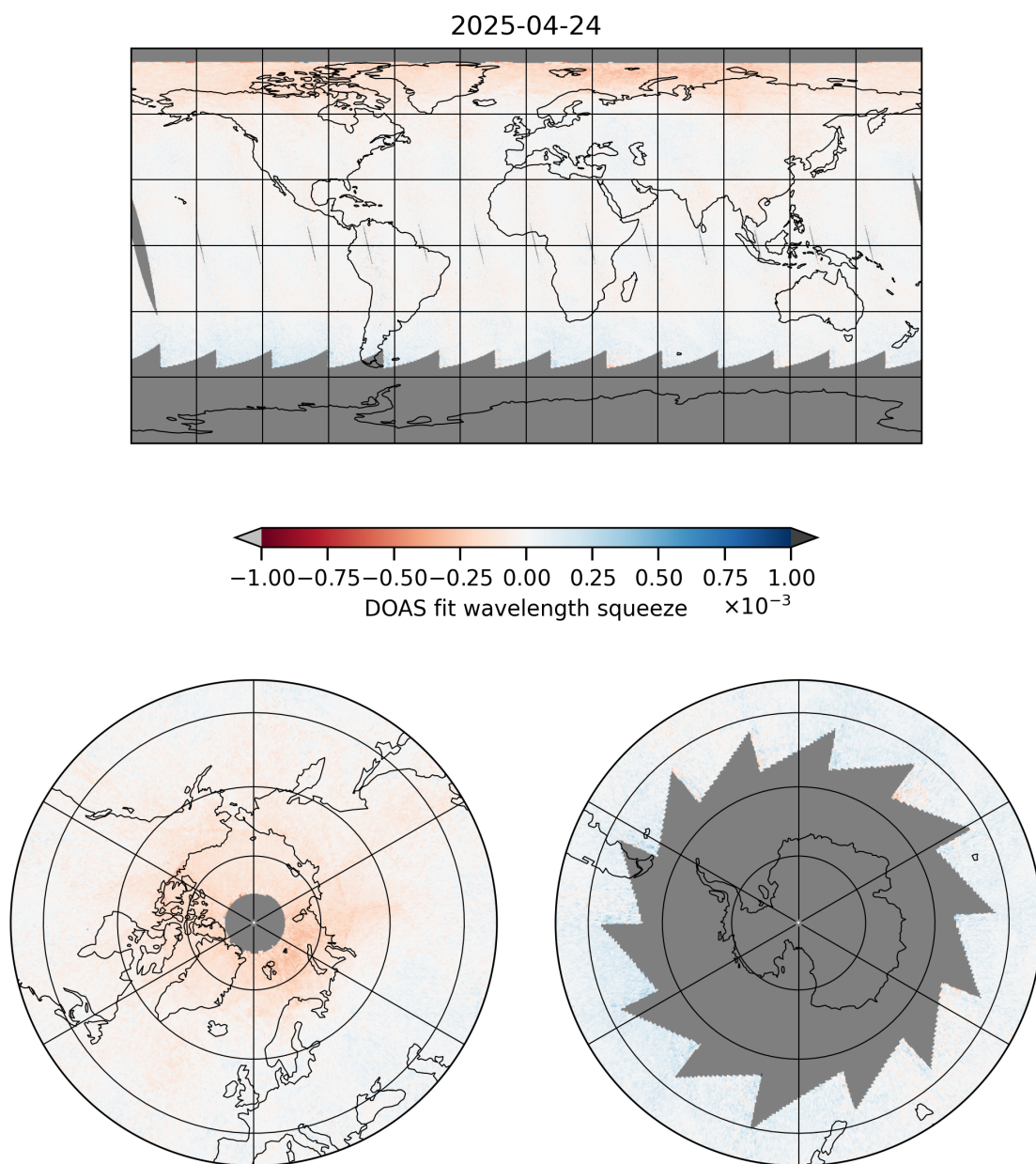


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-04-24 to 2025-04-25

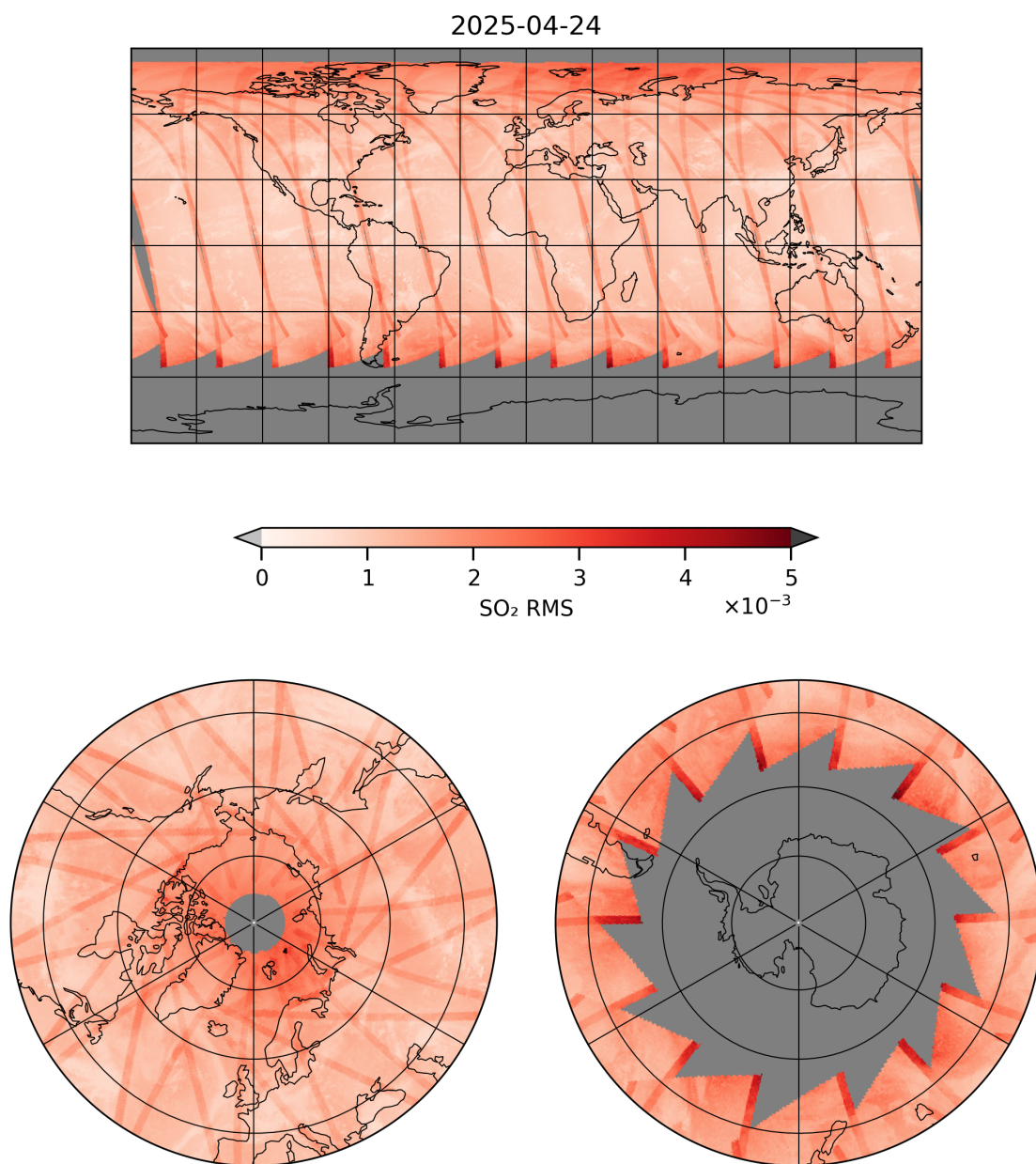


Figure 24: Map of “SO₂ RMS” for 2025-04-24 to 2025-04-25

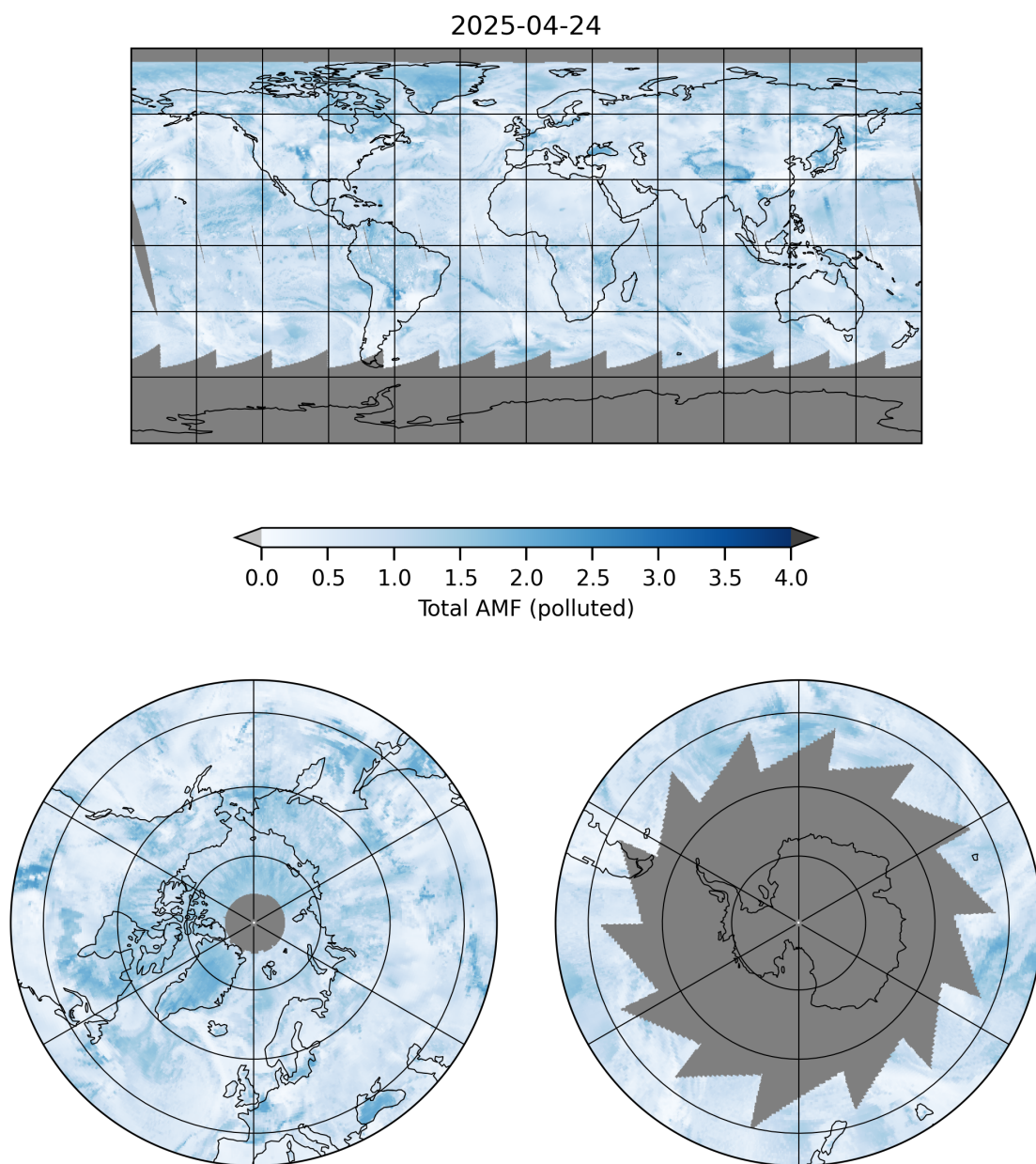


Figure 25: Map of “Total AMF (polluted)” for 2025-04-24 to 2025-04-25

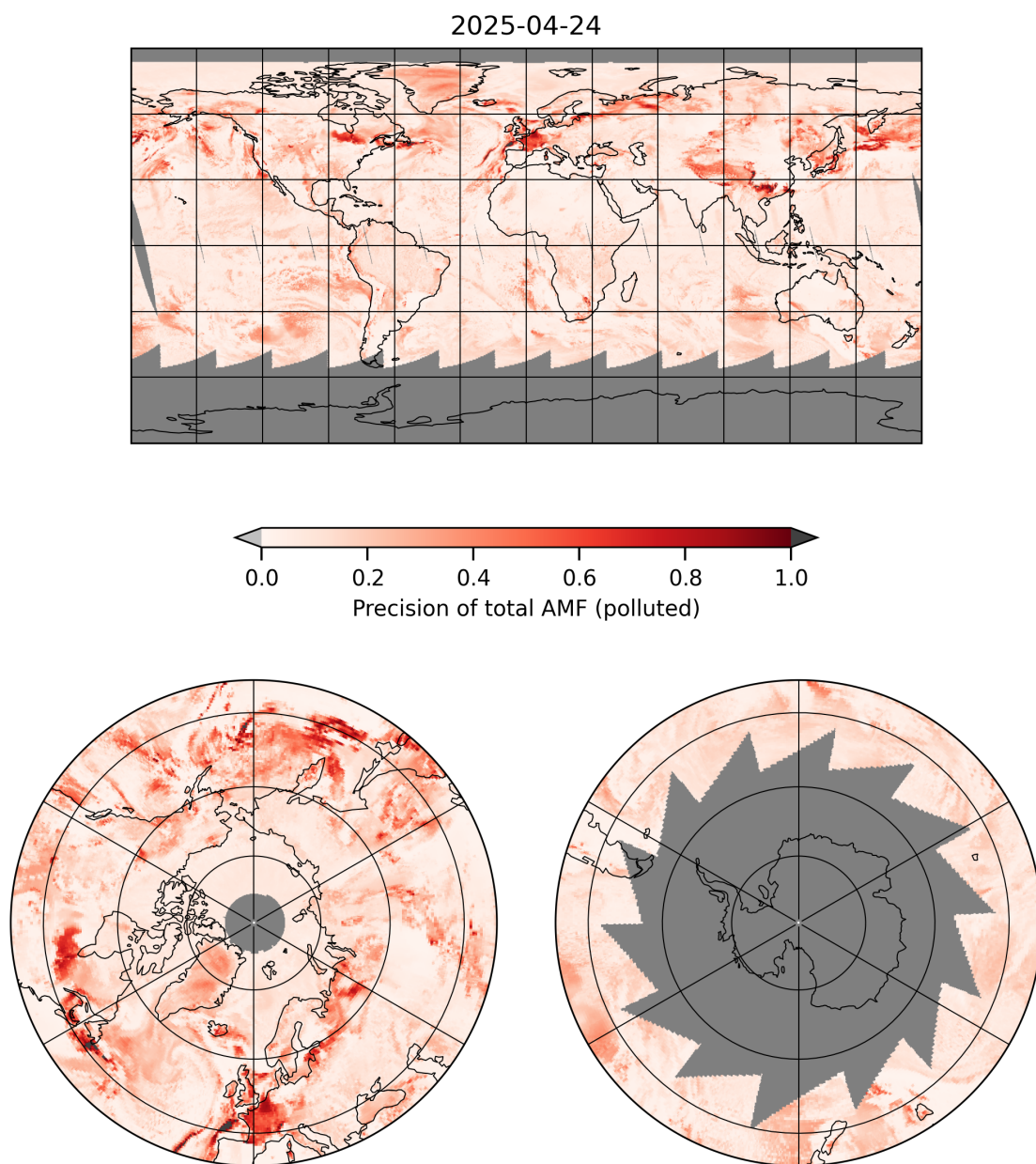


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-04-24 to 2025-04-25

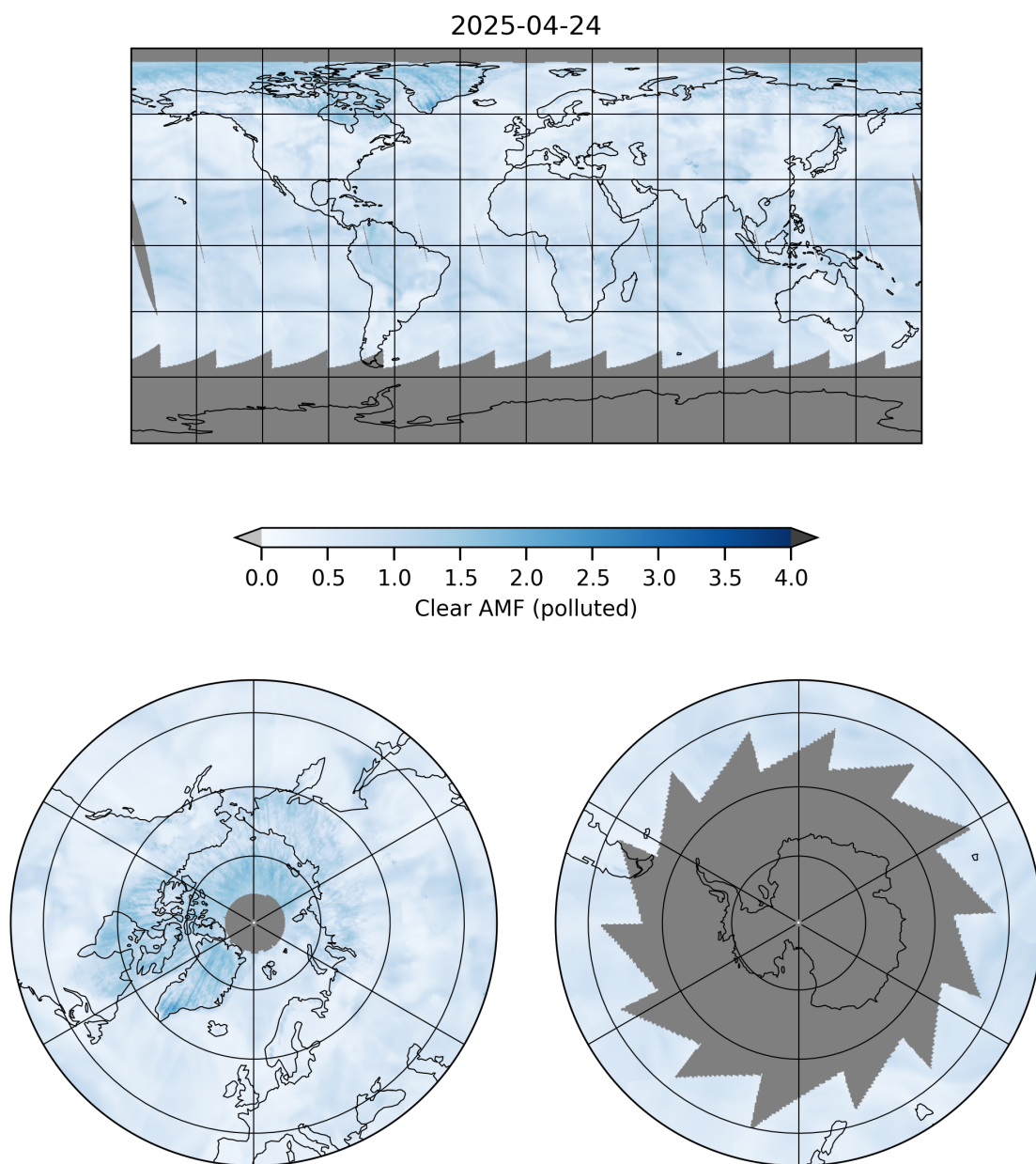


Figure 27: Map of “Clear AMF (polluted)” for 2025-04-24 to 2025-04-25

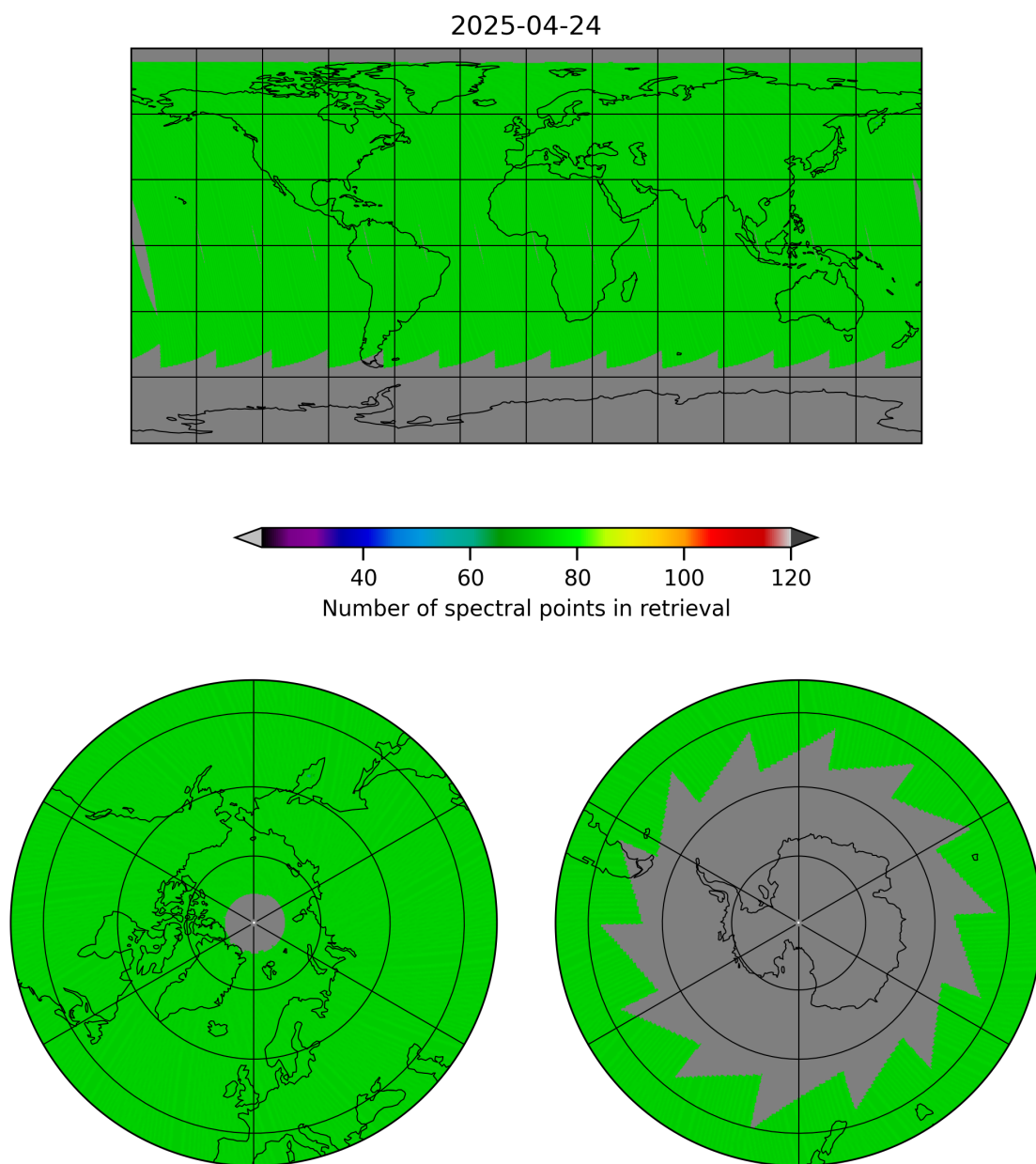


Figure 28: Map of “Number of spectral points in retrieval” for 2025-04-24 to 2025-04-25

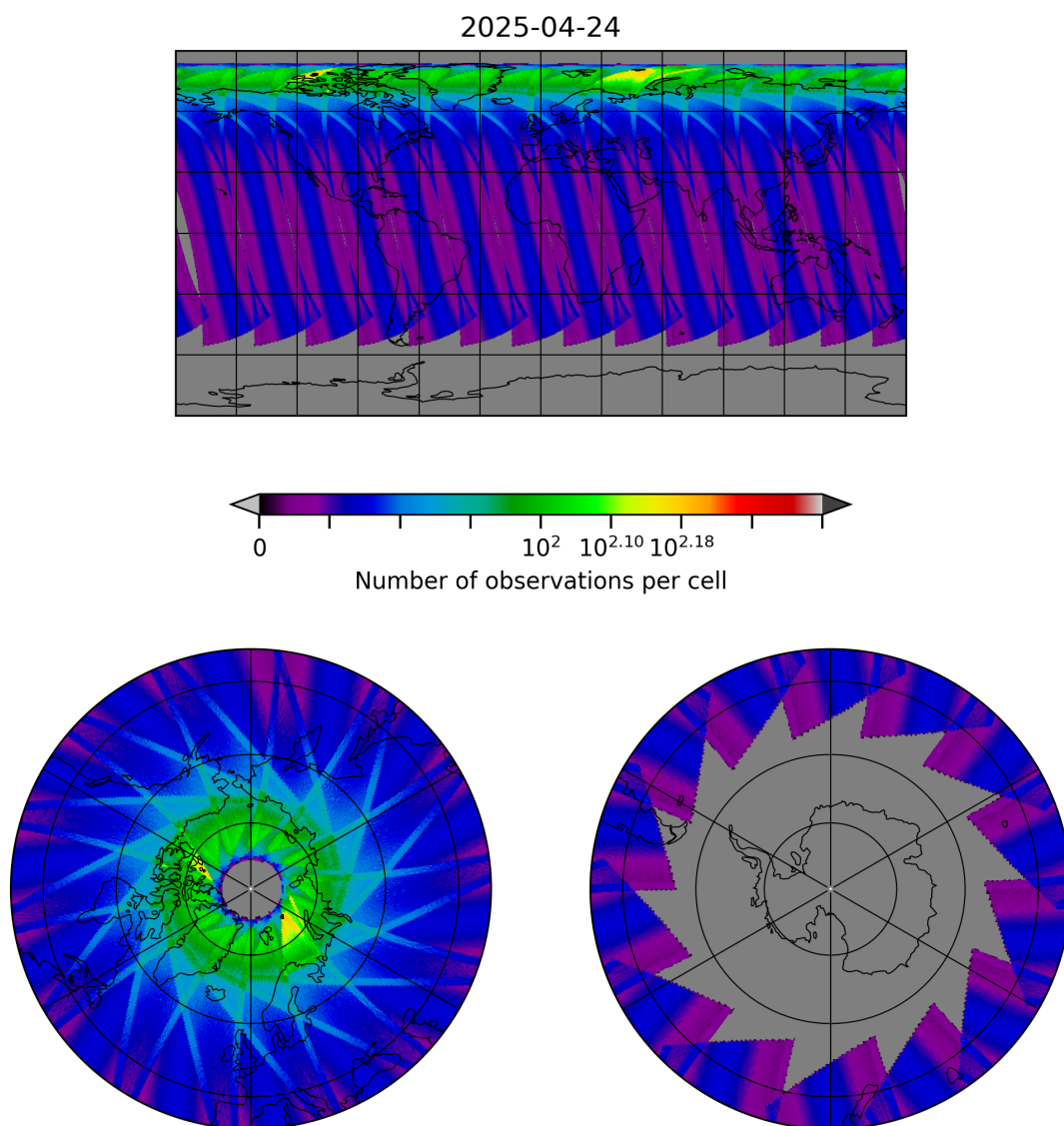


Figure 29: Map of the number of observations for 2025-04-24 to 2025-04-25

7 Zonal average

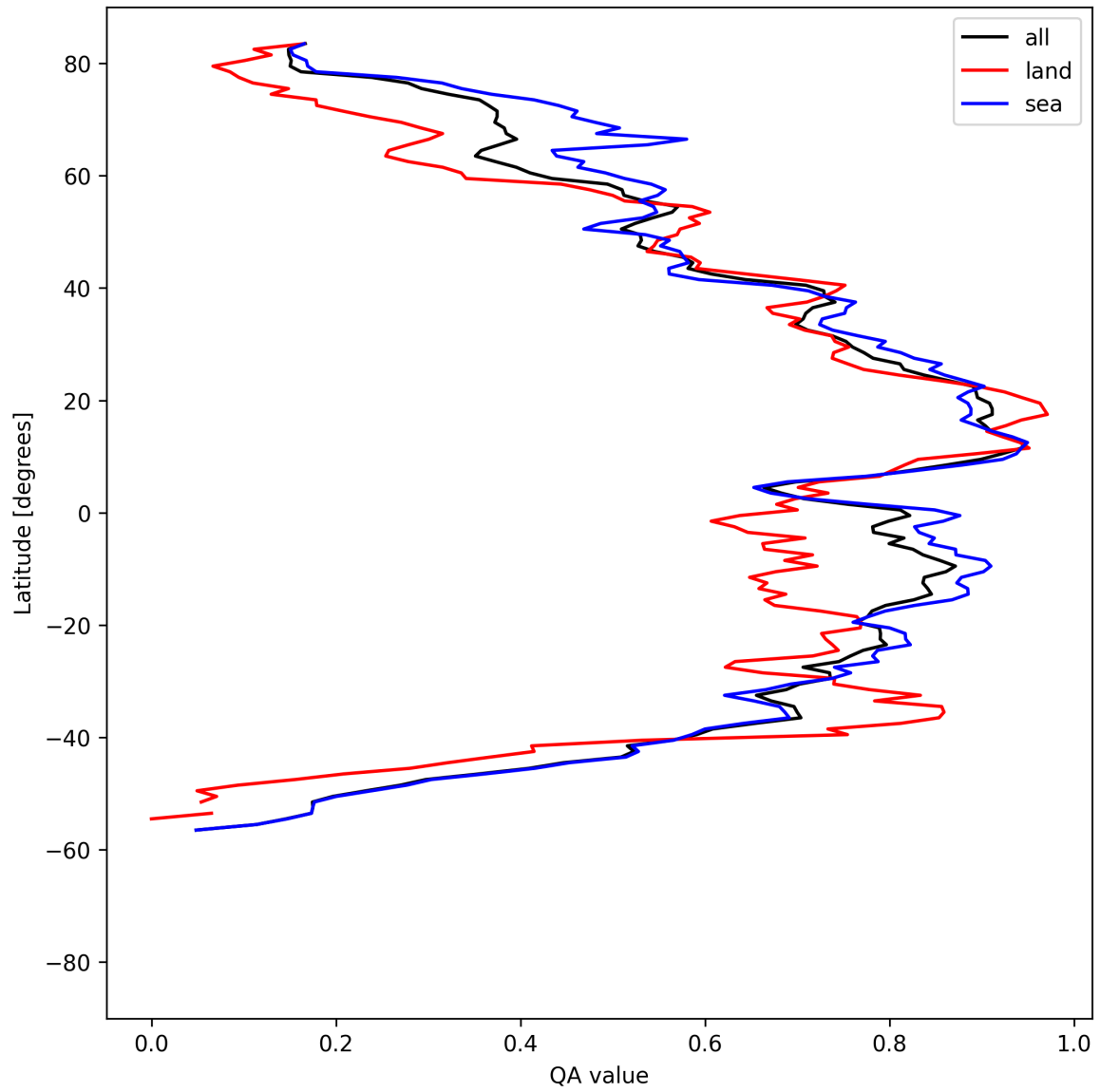


Figure 30: Zonal average of “QA value” for 2025-04-24 to 2025-04-25.

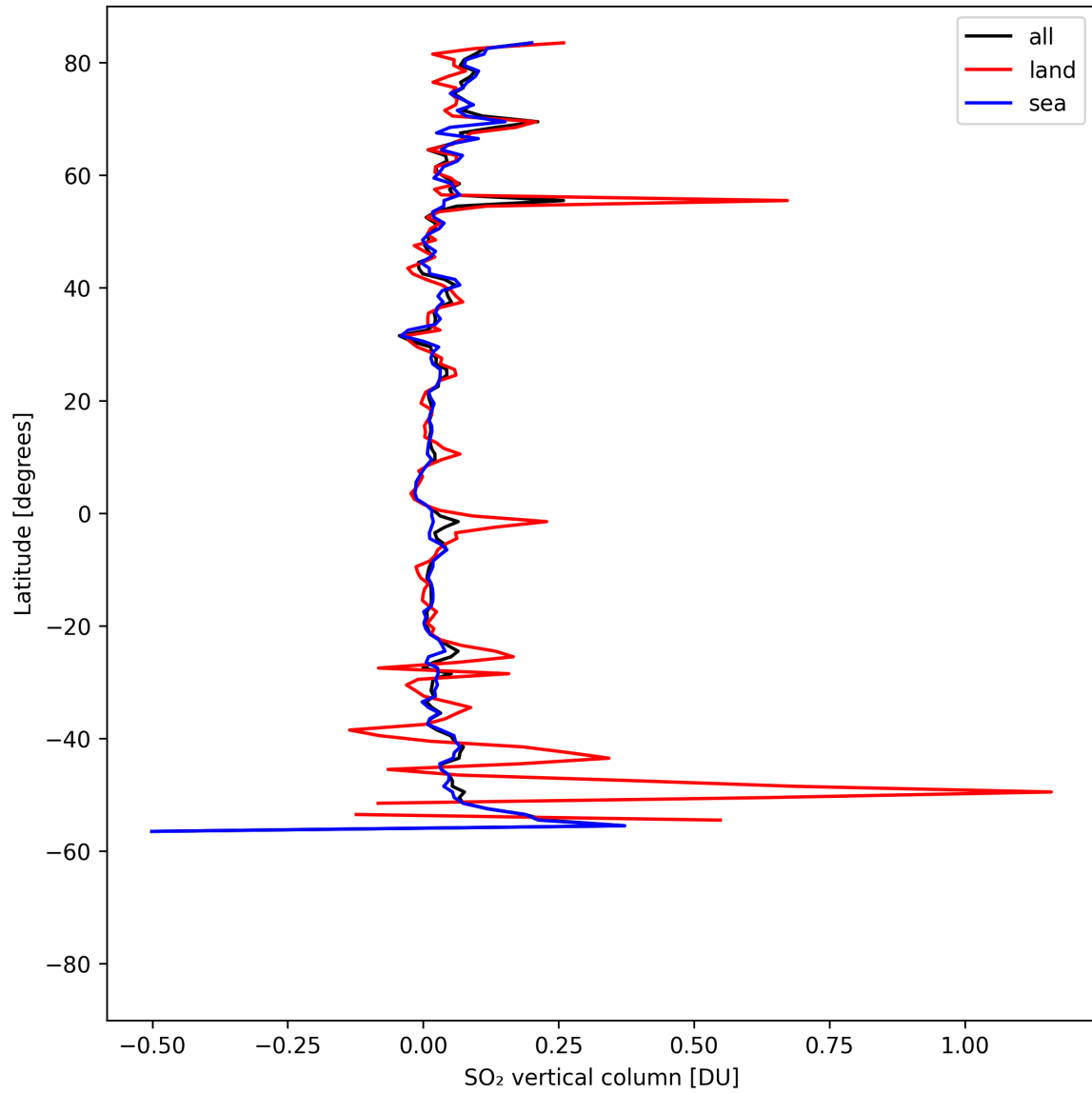


Figure 31: Zonal average of “SO₂ vertical column” for 2025-04-24 to 2025-04-25.

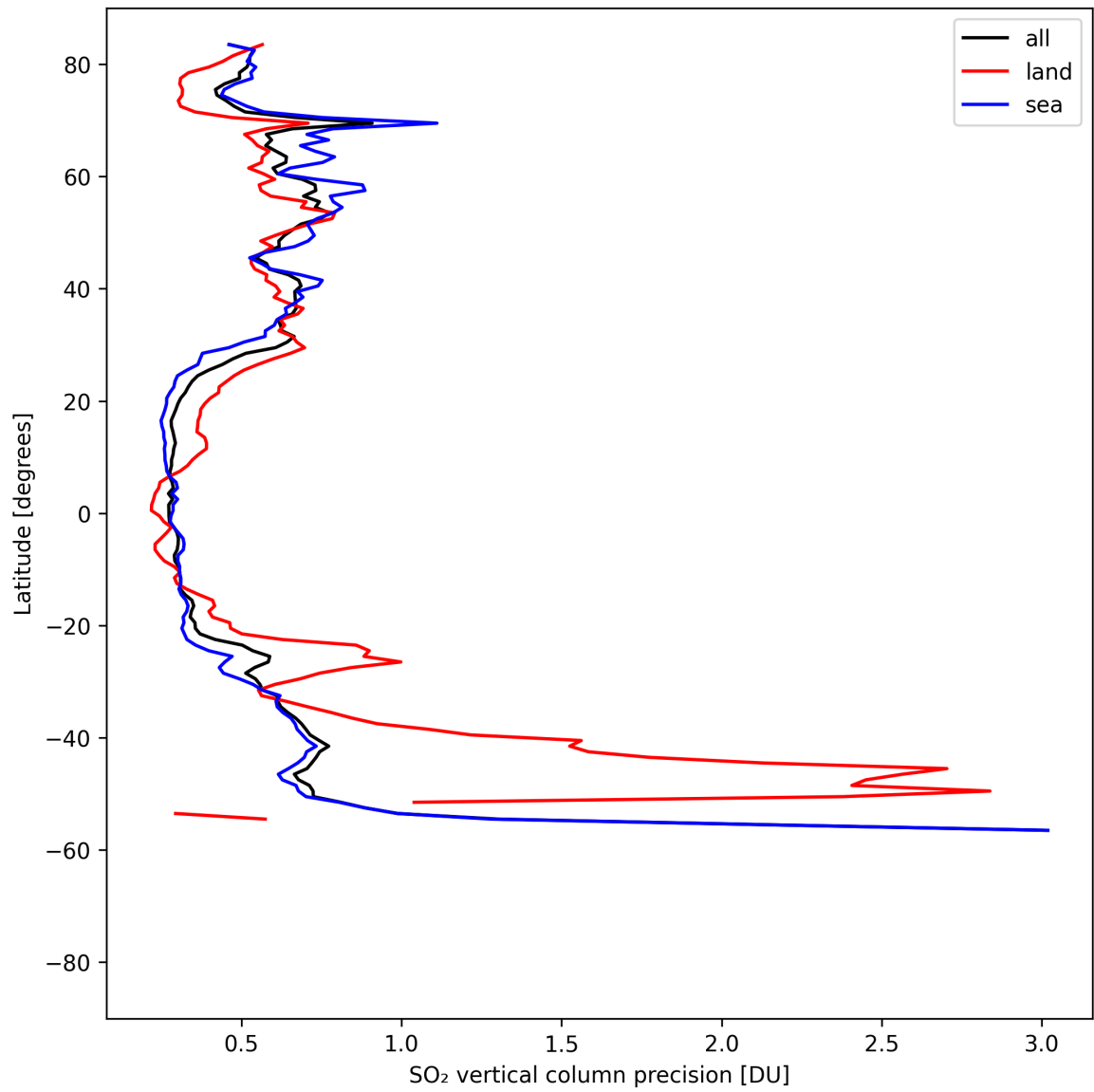


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-04-24 to 2025-04-25.

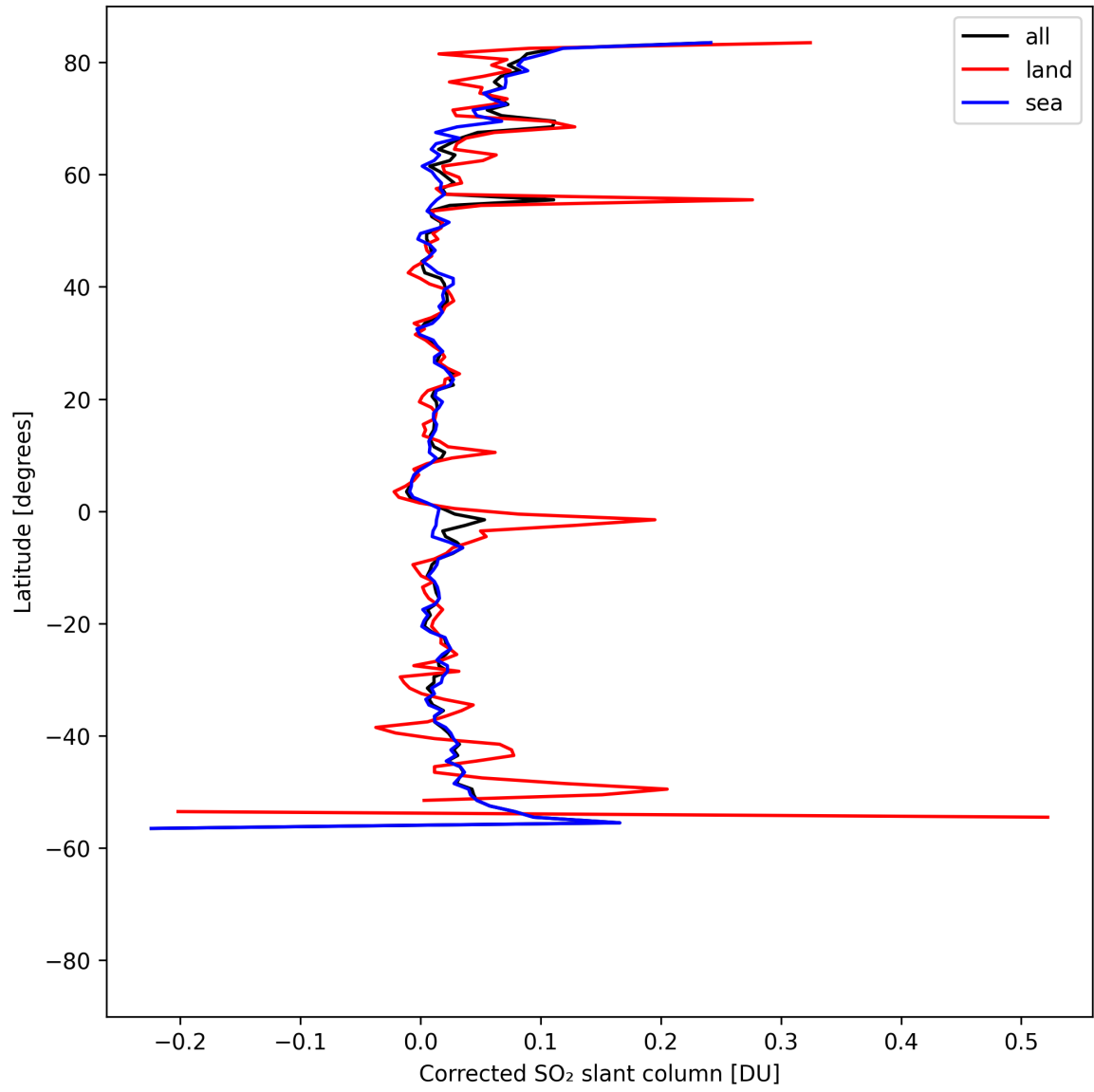


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-04-24 to 2025-04-25.

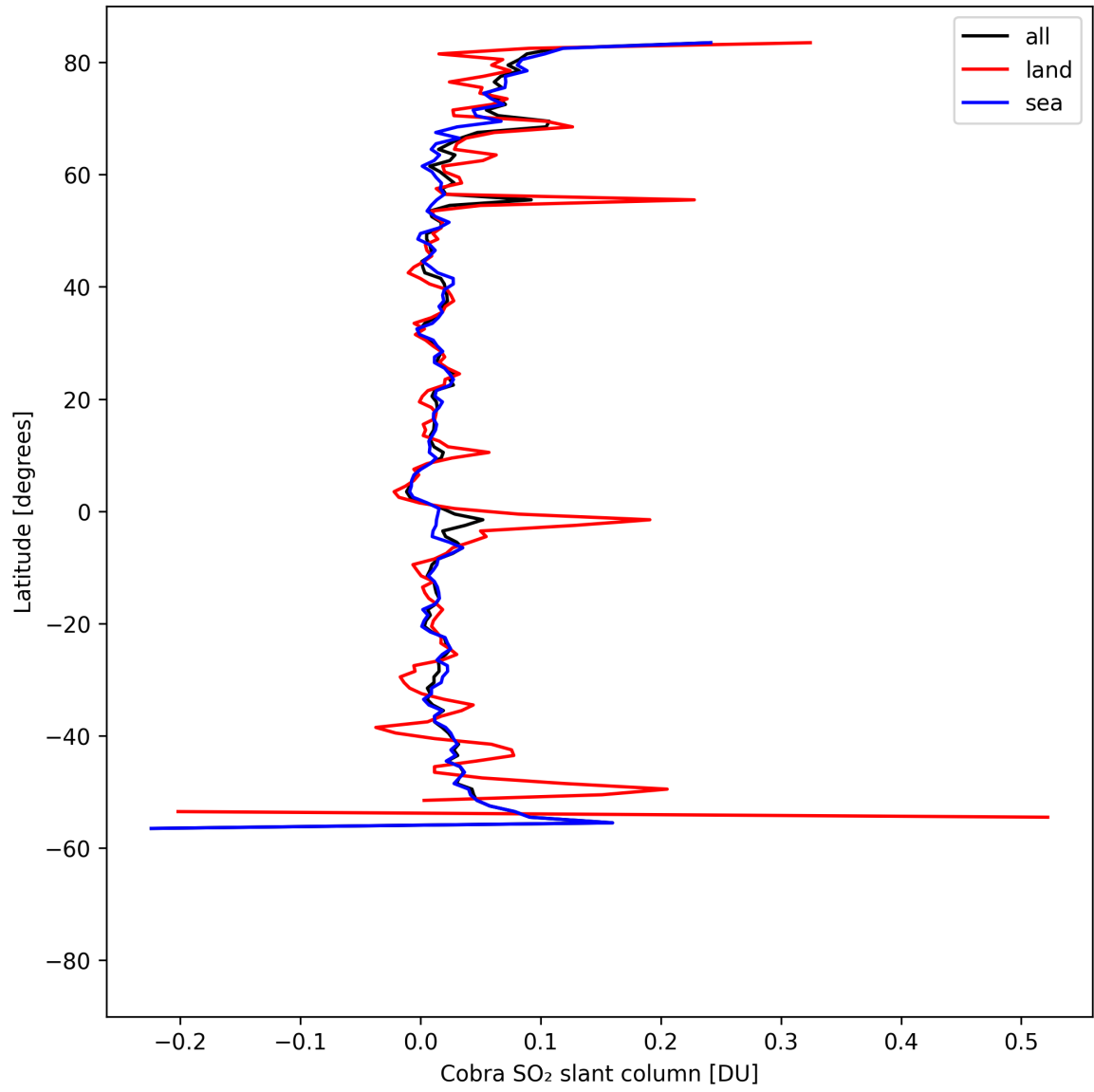


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-04-24 to 2025-04-25.

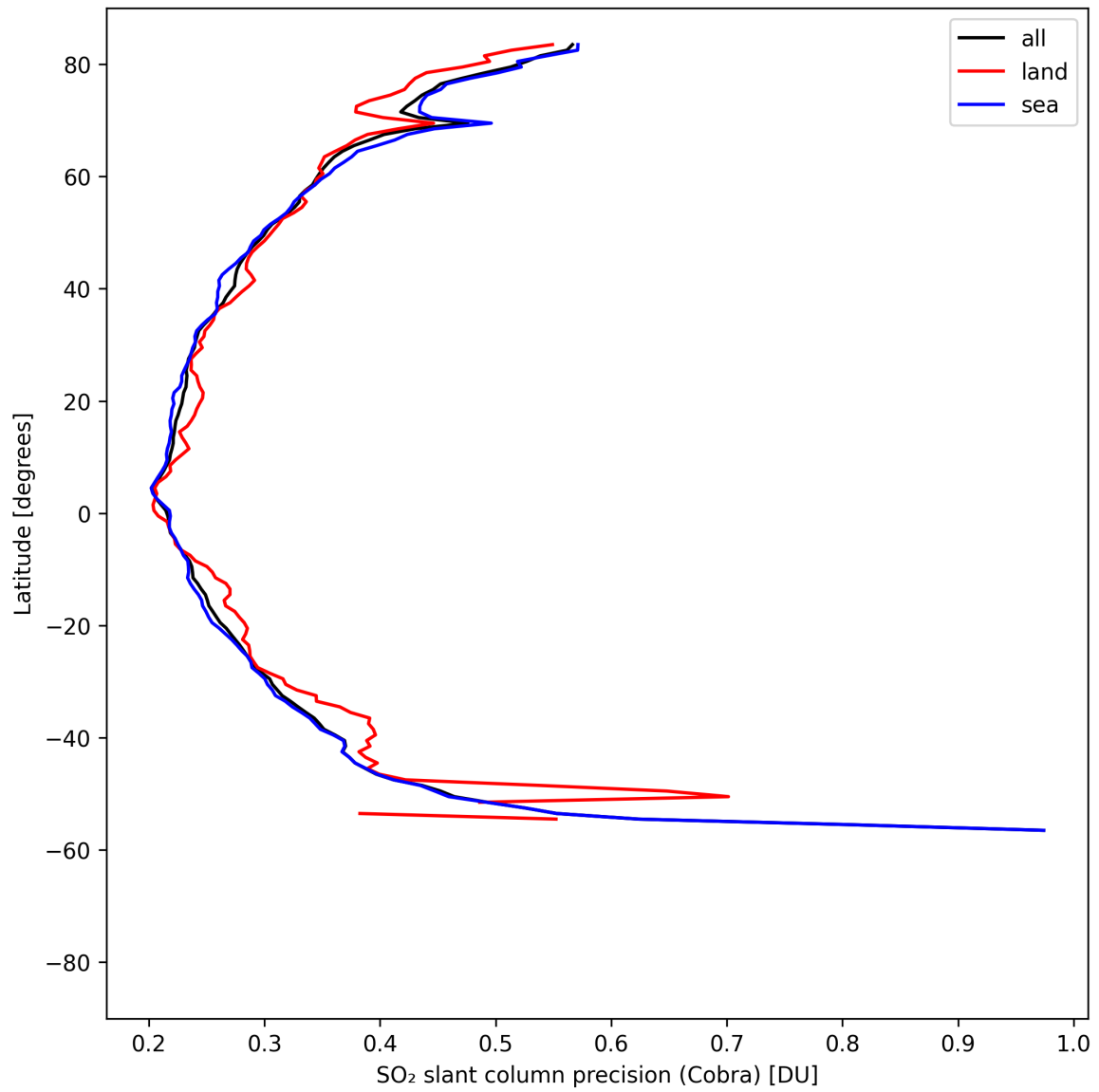


Figure 35: Zonal average of "SO₂ slant column precision (Cobra)" for 2025-04-24 to 2025-04-25.

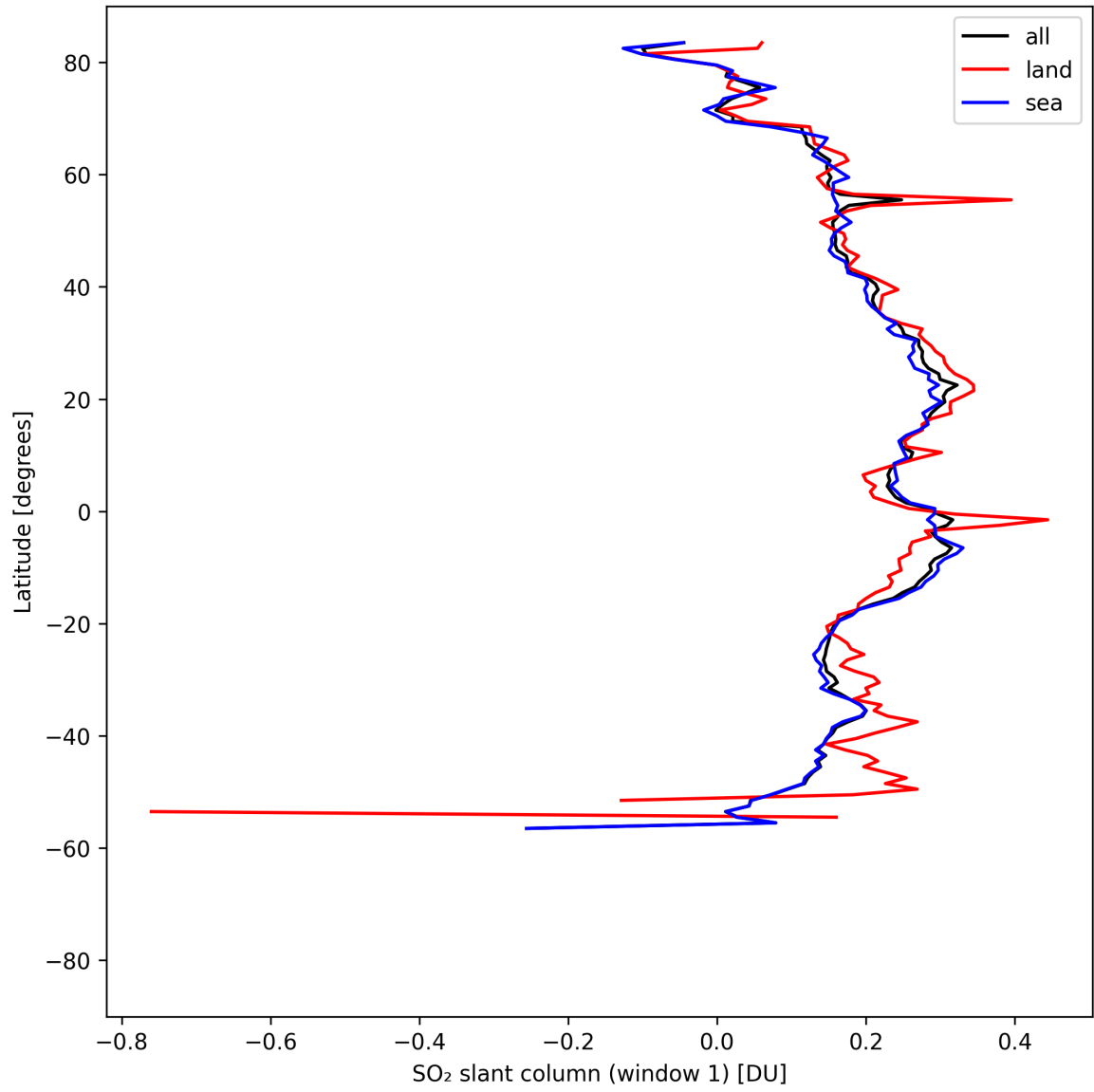


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-04-24 to 2025-04-25.

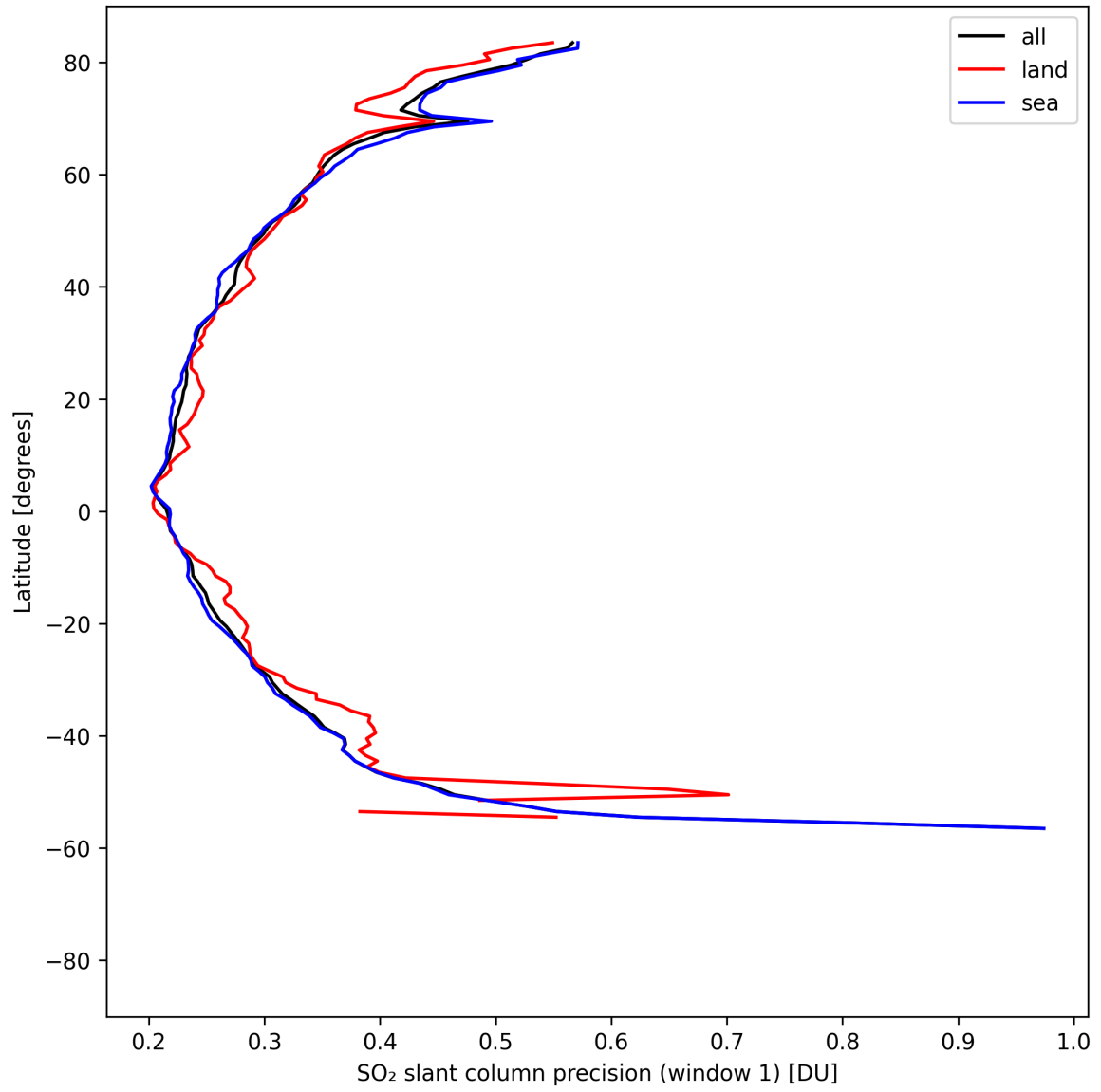


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-04-24 to 2025-04-25.

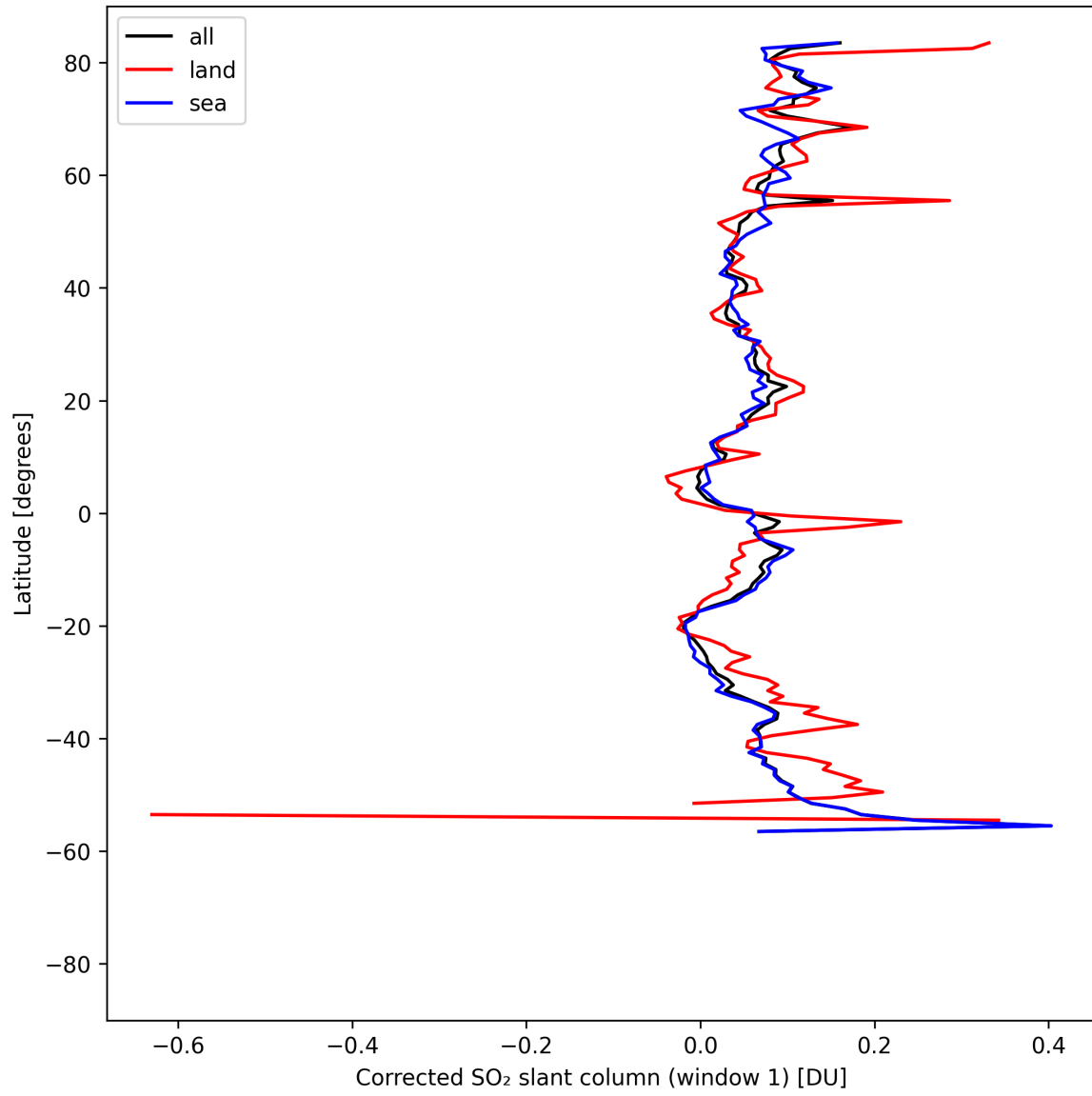


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-04-24 to 2025-04-25.

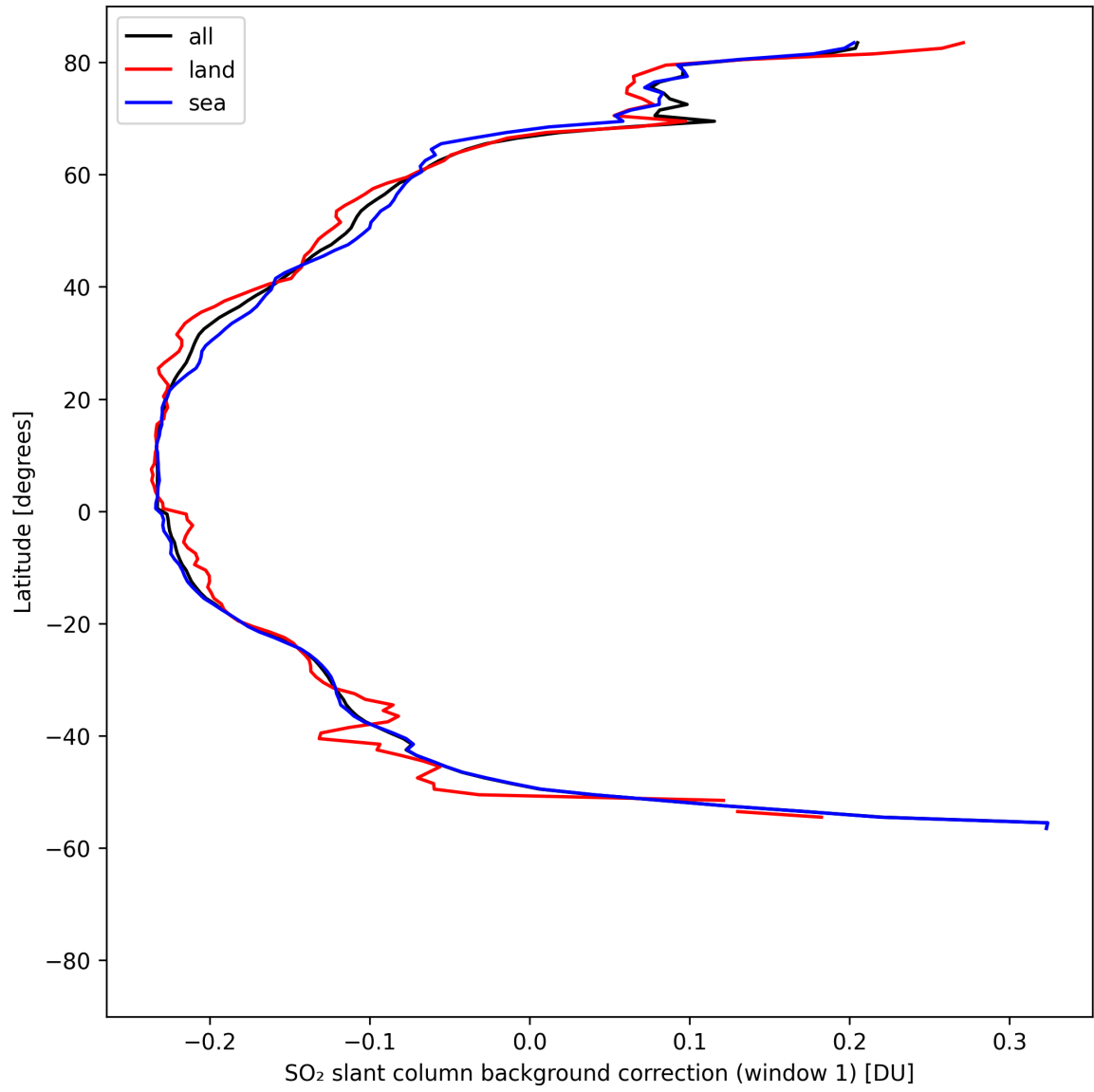


Figure 39: Zonal average of "SO₂ slant column background correction (window 1)" for 2025-04-24 to 2025-04-25.

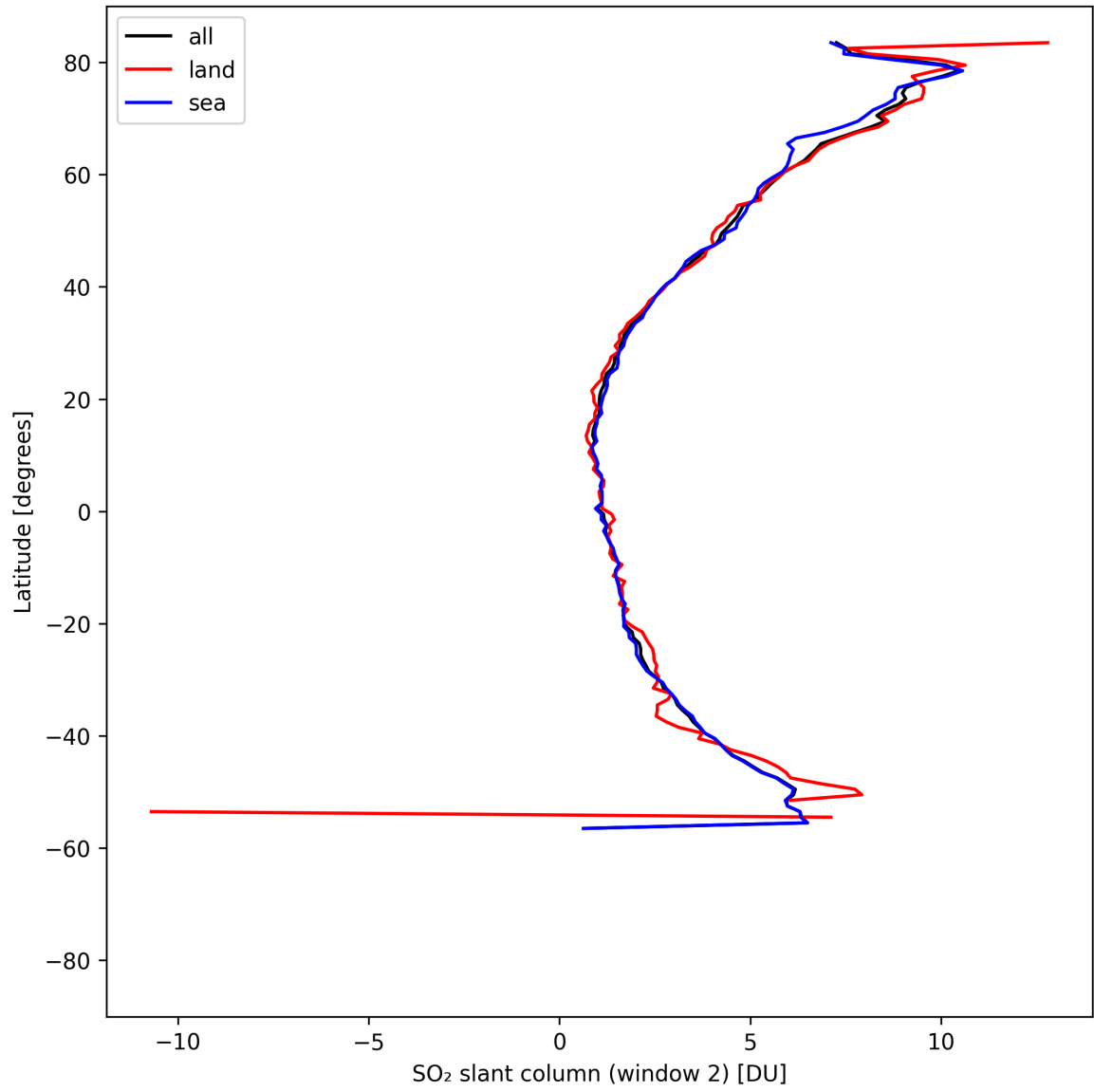


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-04-24 to 2025-04-25.

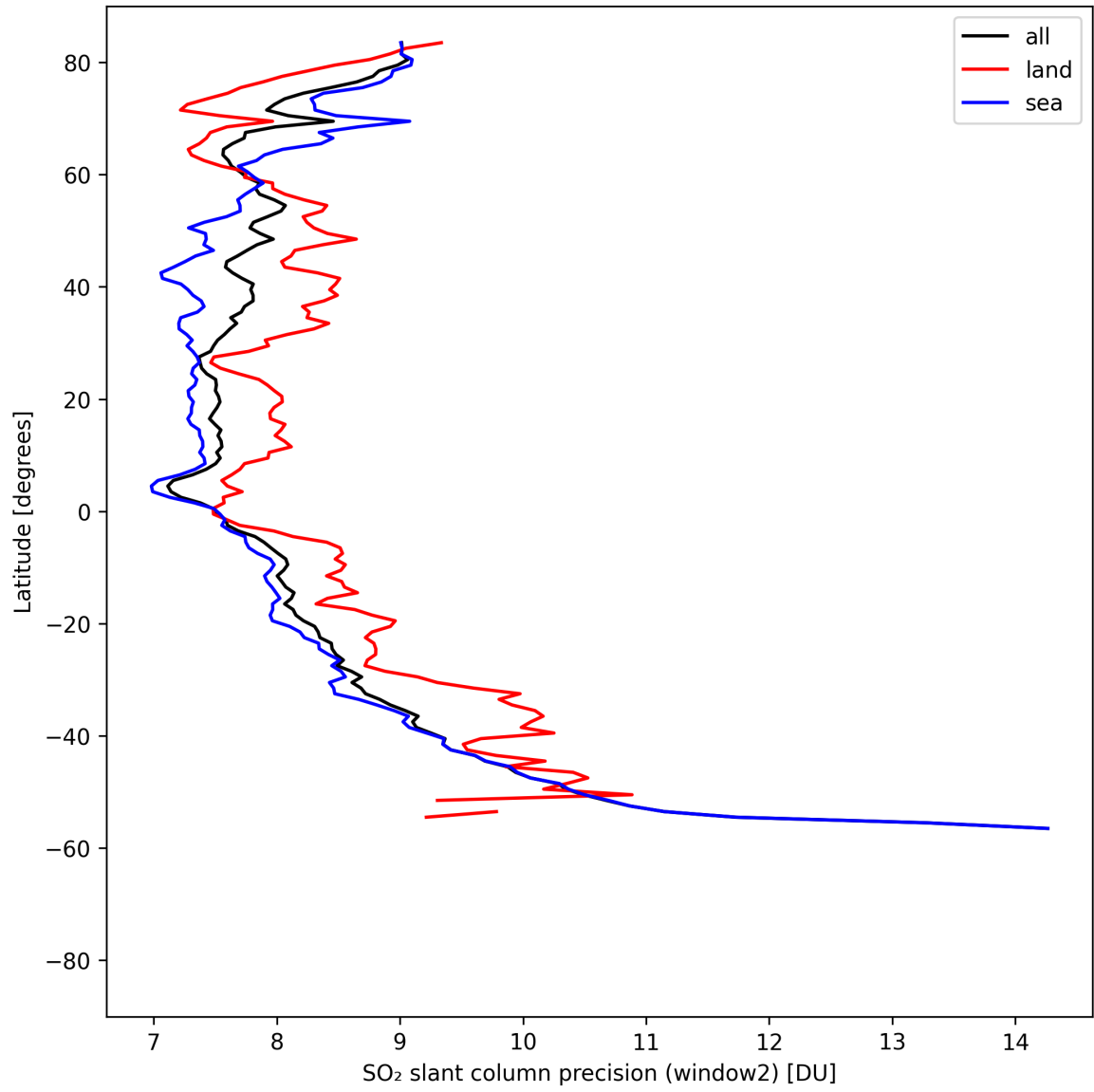


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-04-24 to 2025-04-25.

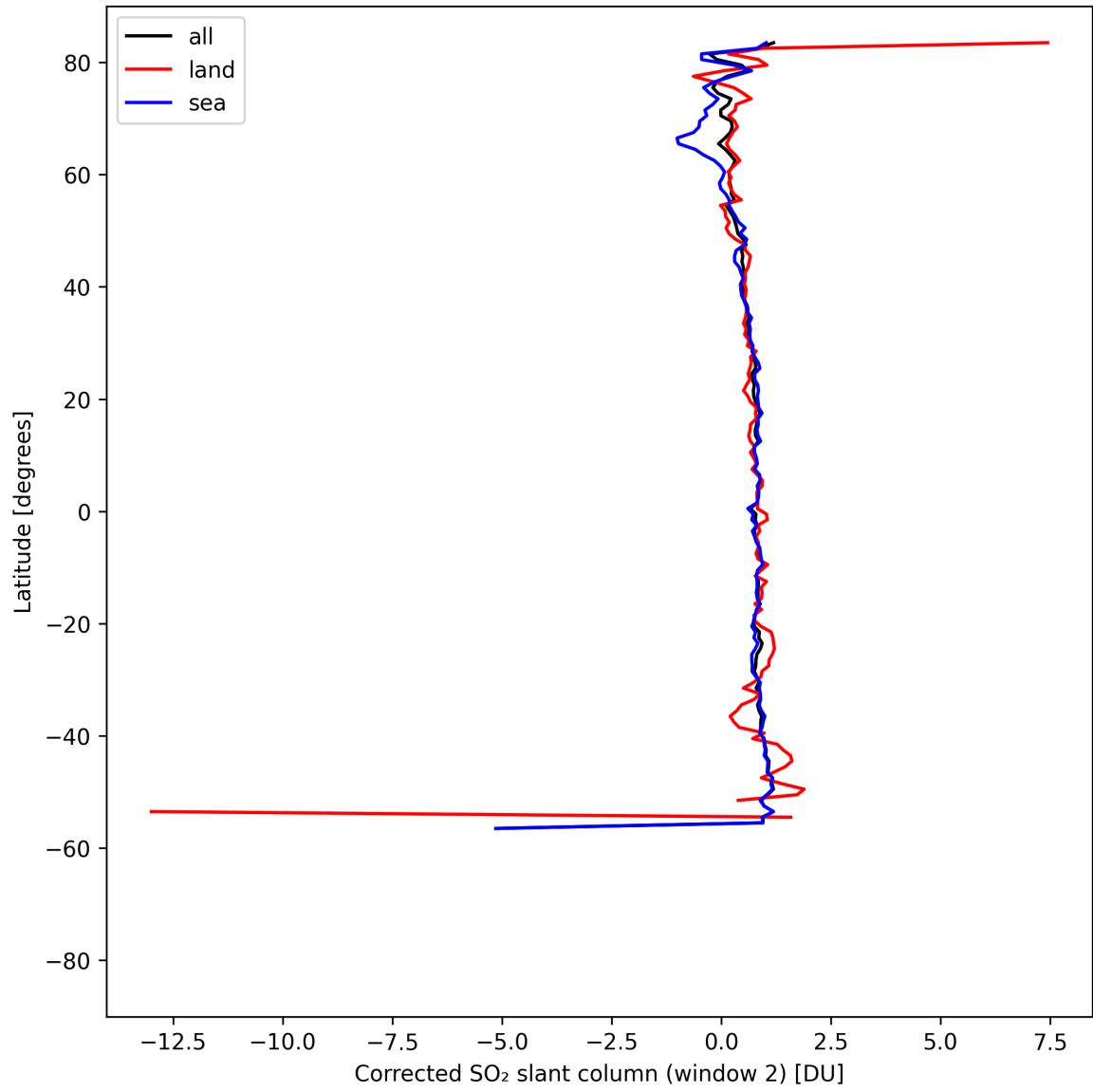


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-04-24 to 2025-04-25.

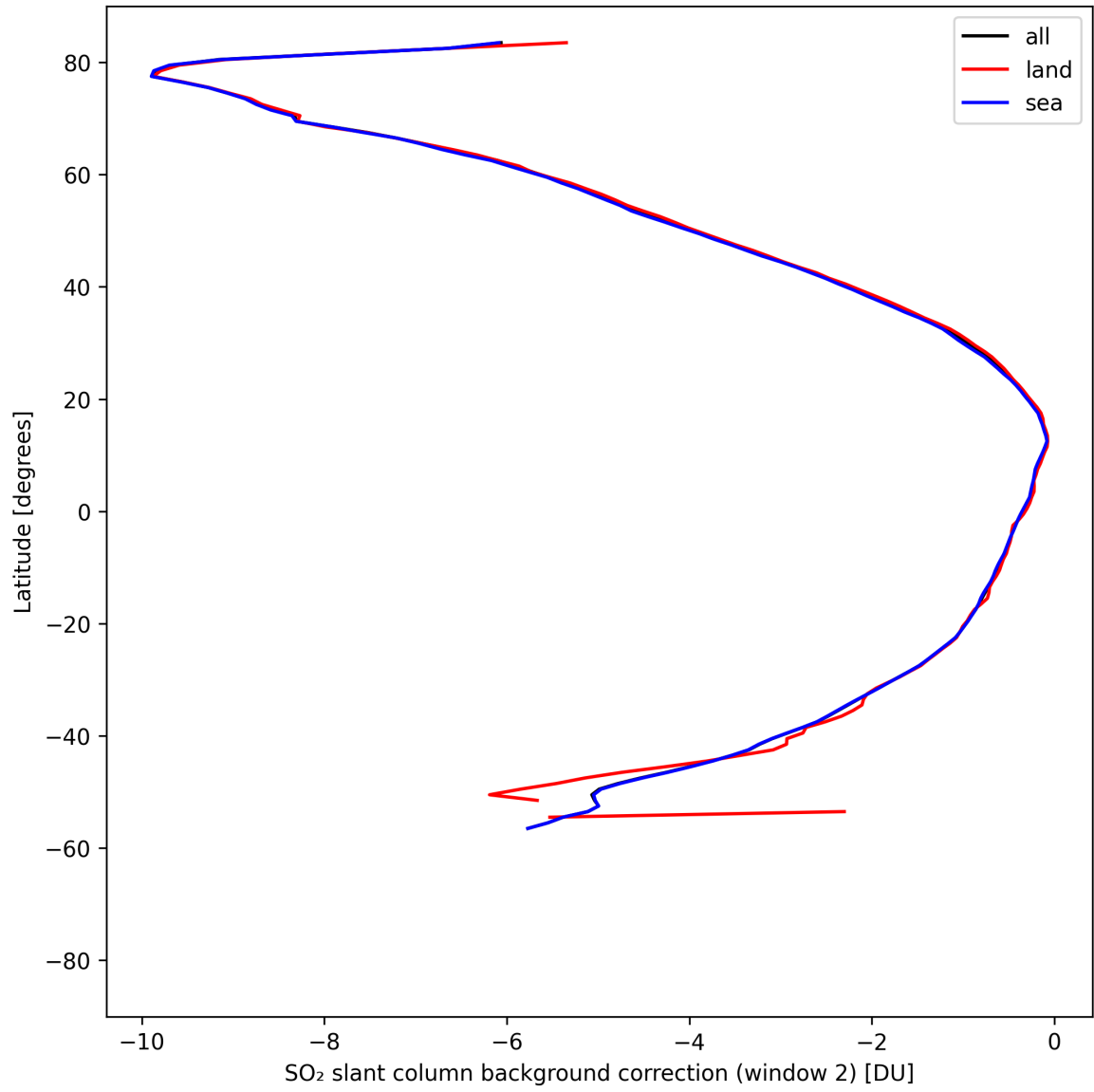


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-04-24 to 2025-04-25.

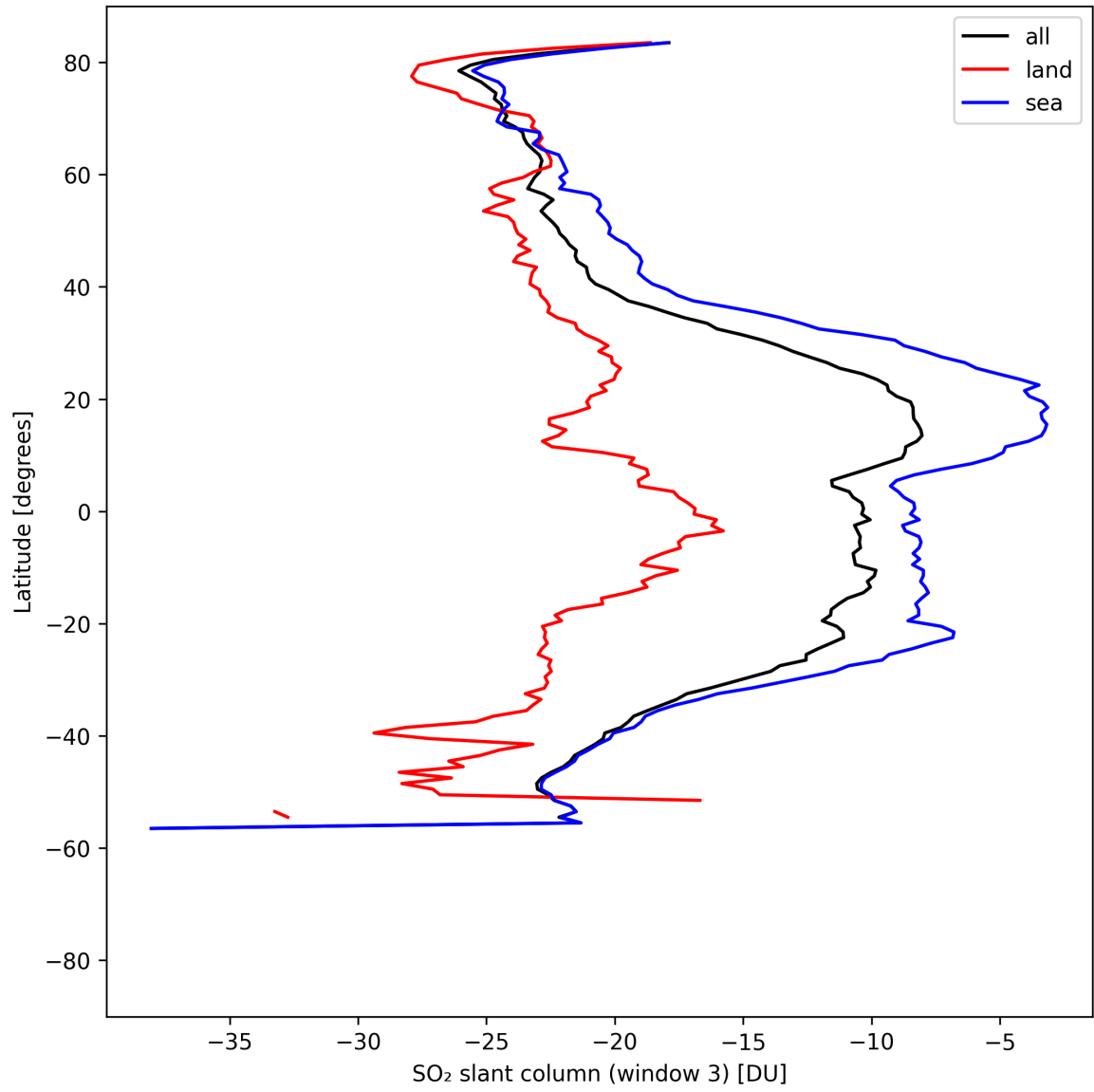


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-04-24 to 2025-04-25.

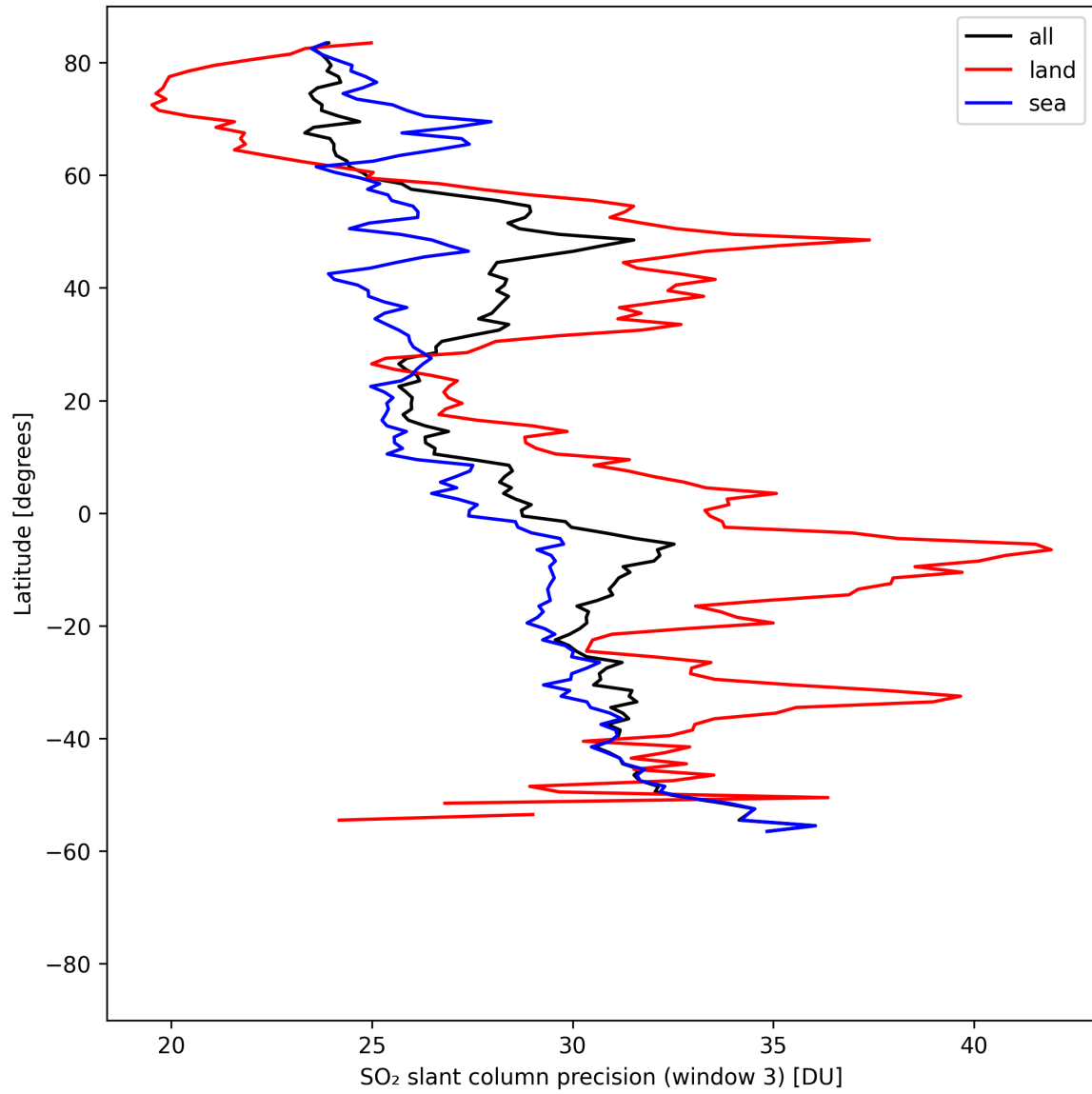


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-04-24 to 2025-04-25.

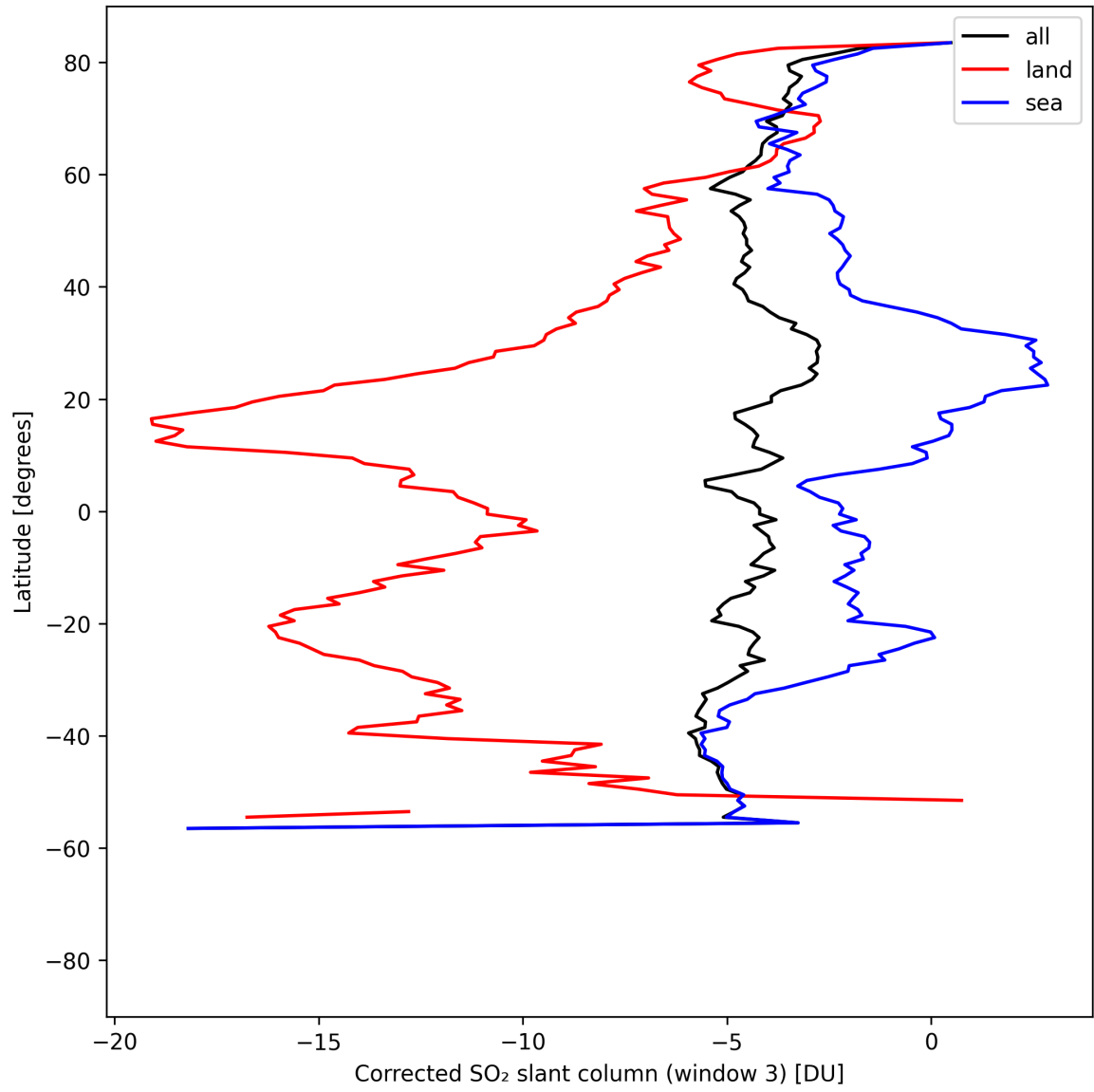


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-04-24 to 2025-04-25.

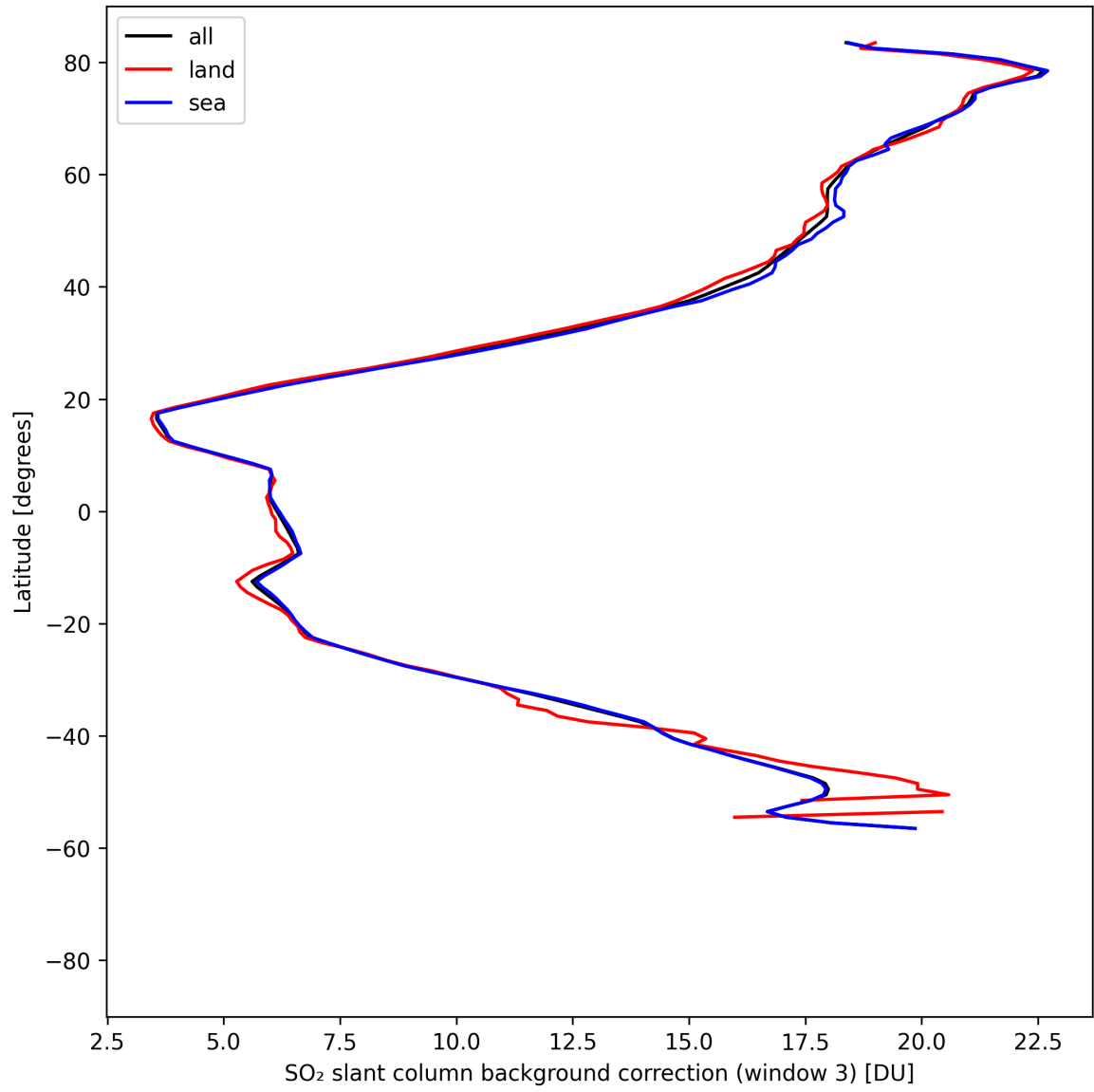


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-04-24 to 2025-04-25.

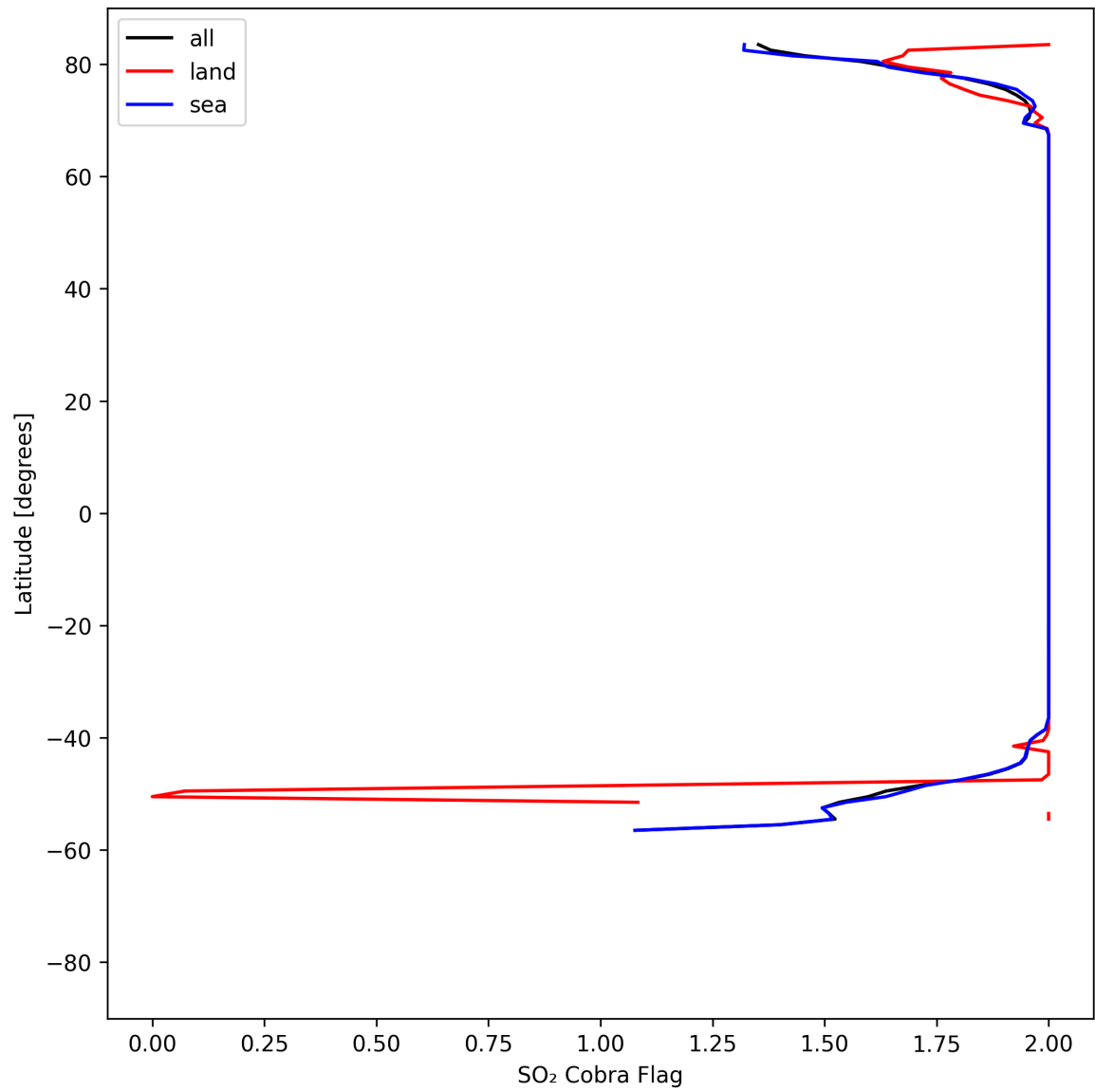


Figure 48: Zonal average of “SO₂ Cobra Flag” for 2025-04-24 to 2025-04-25.

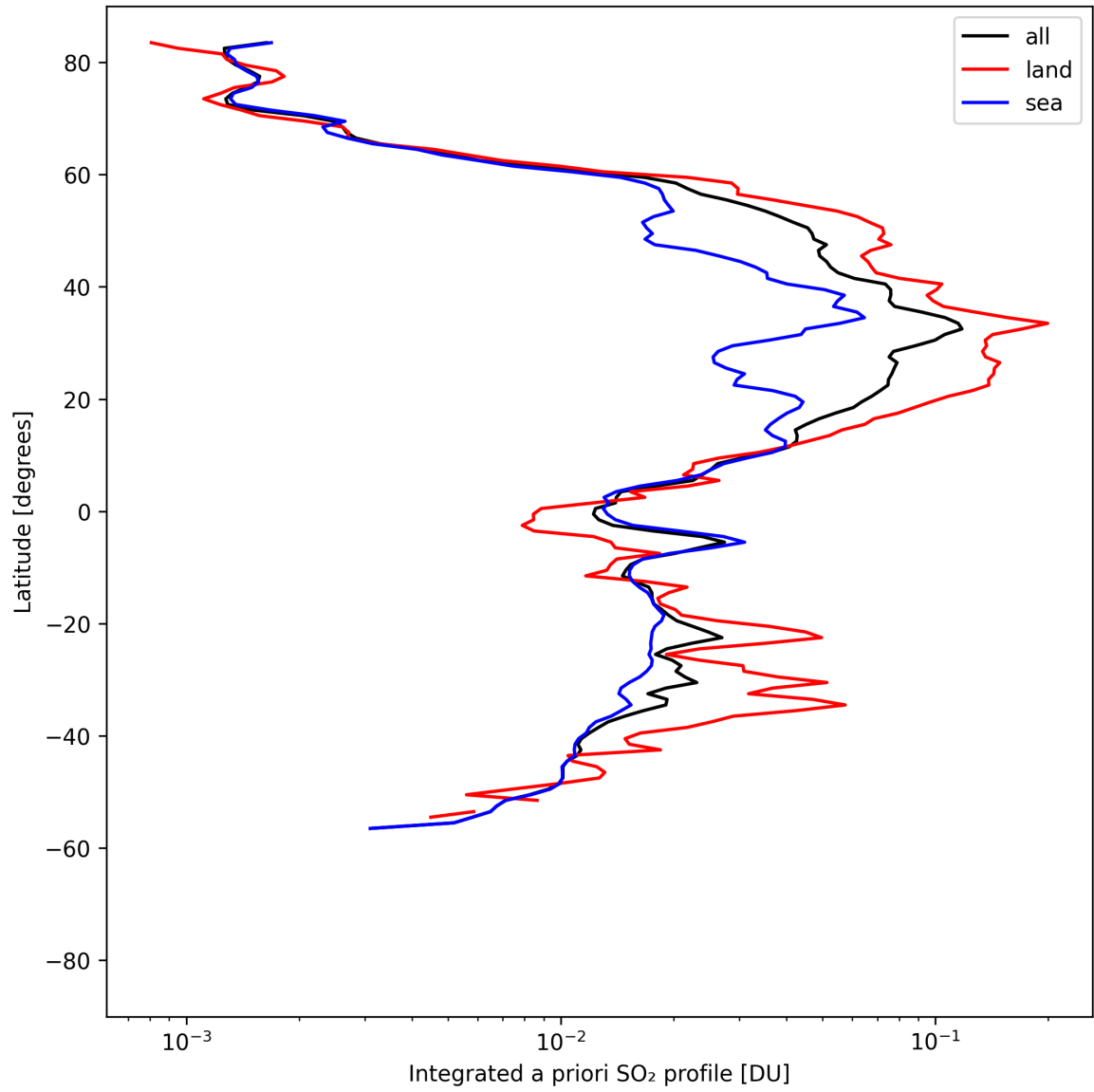


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-04-24 to 2025-04-25.

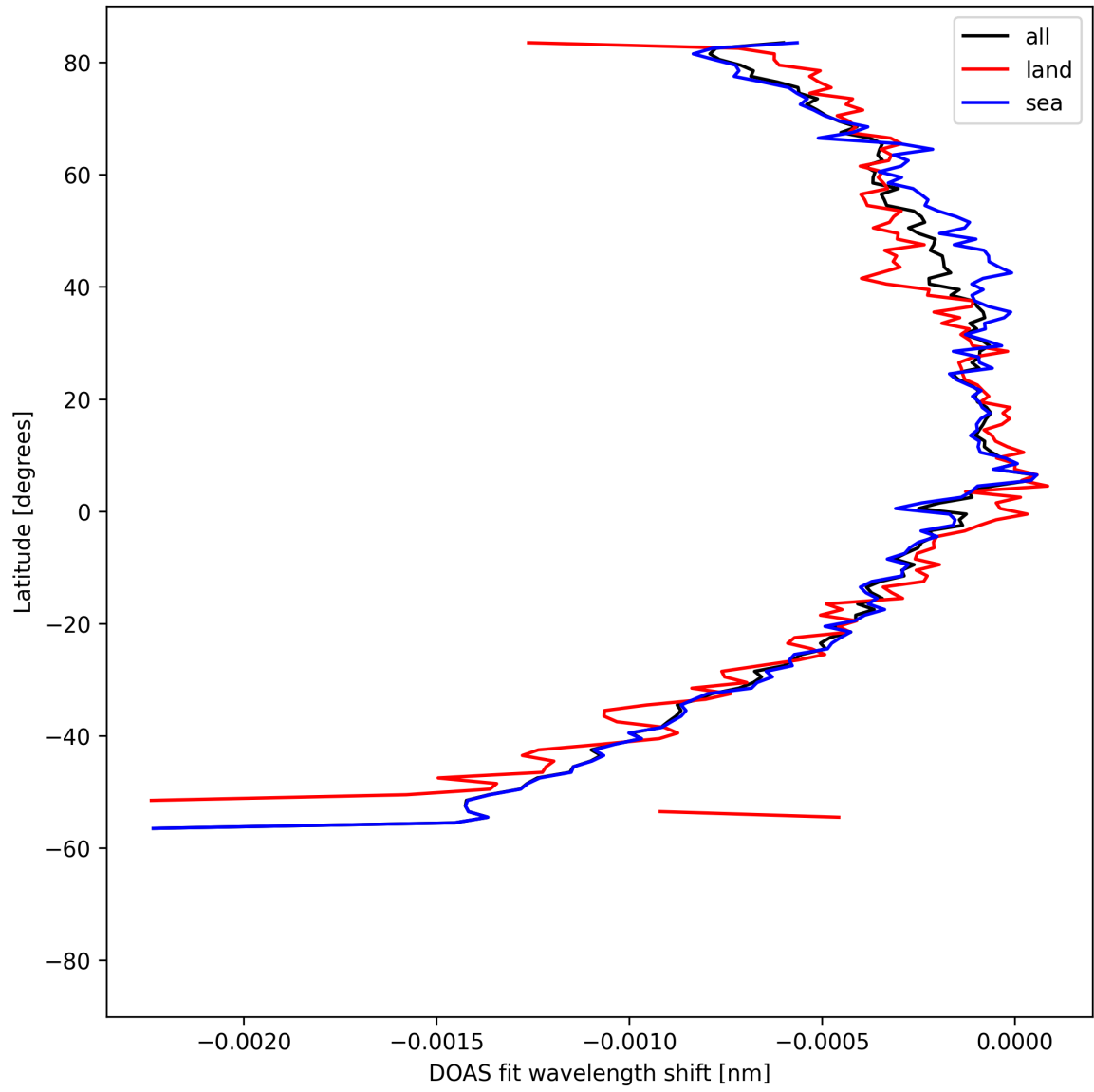


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-04-24 to 2025-04-25.

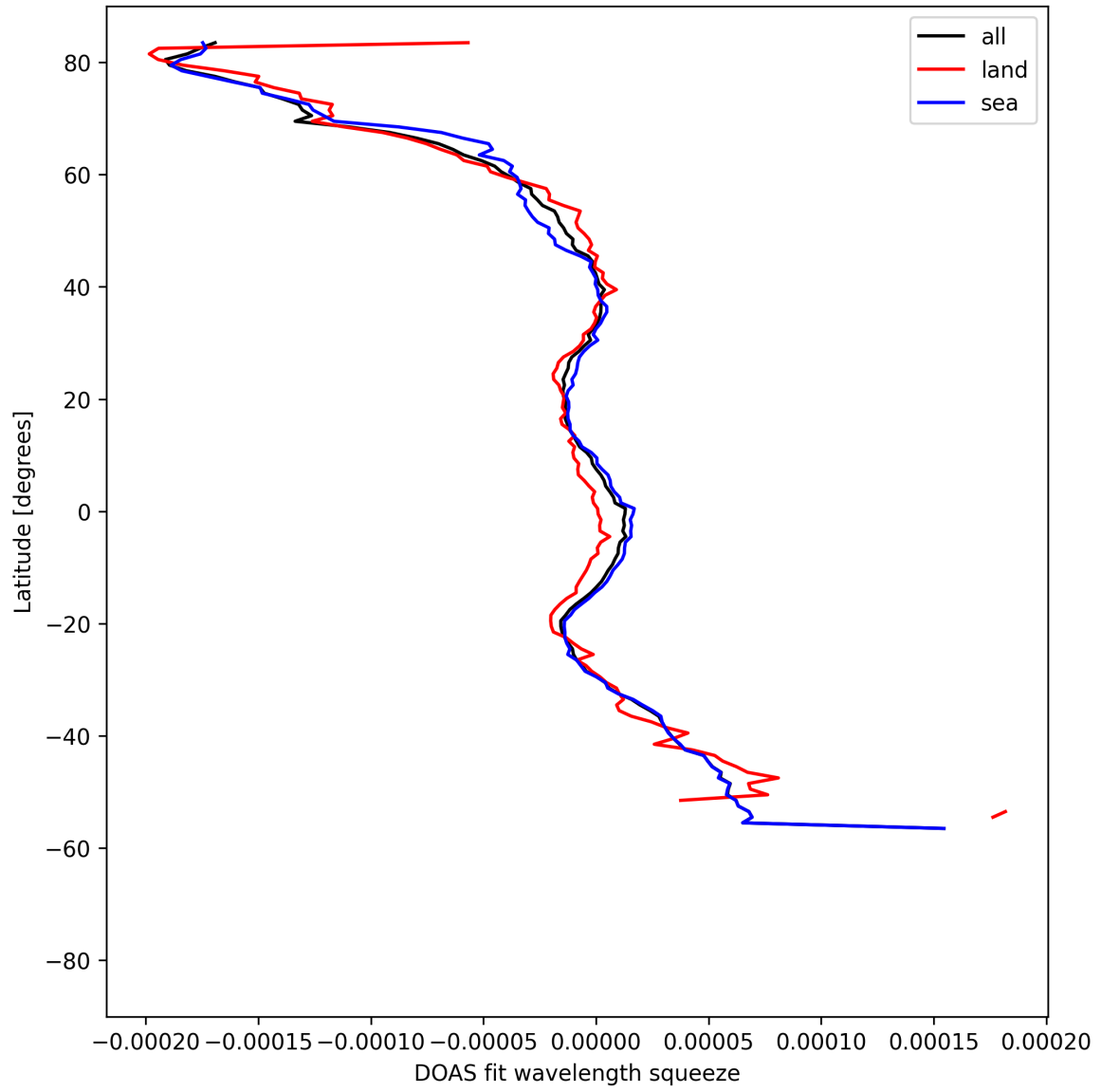


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-04-24 to 2025-04-25.

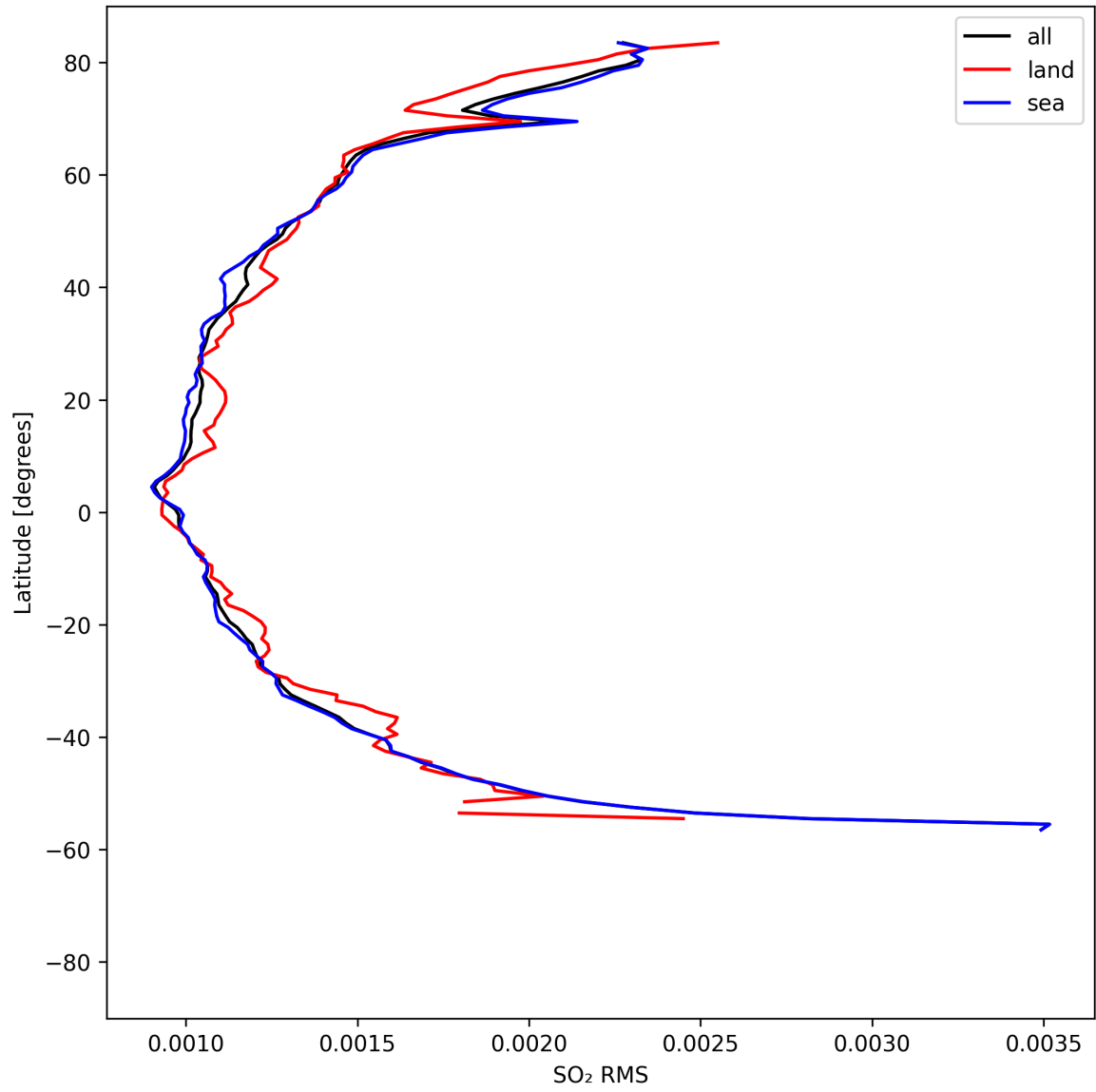


Figure 52: Zonal average of “SO₂ RMS” for 2025-04-24 to 2025-04-25.

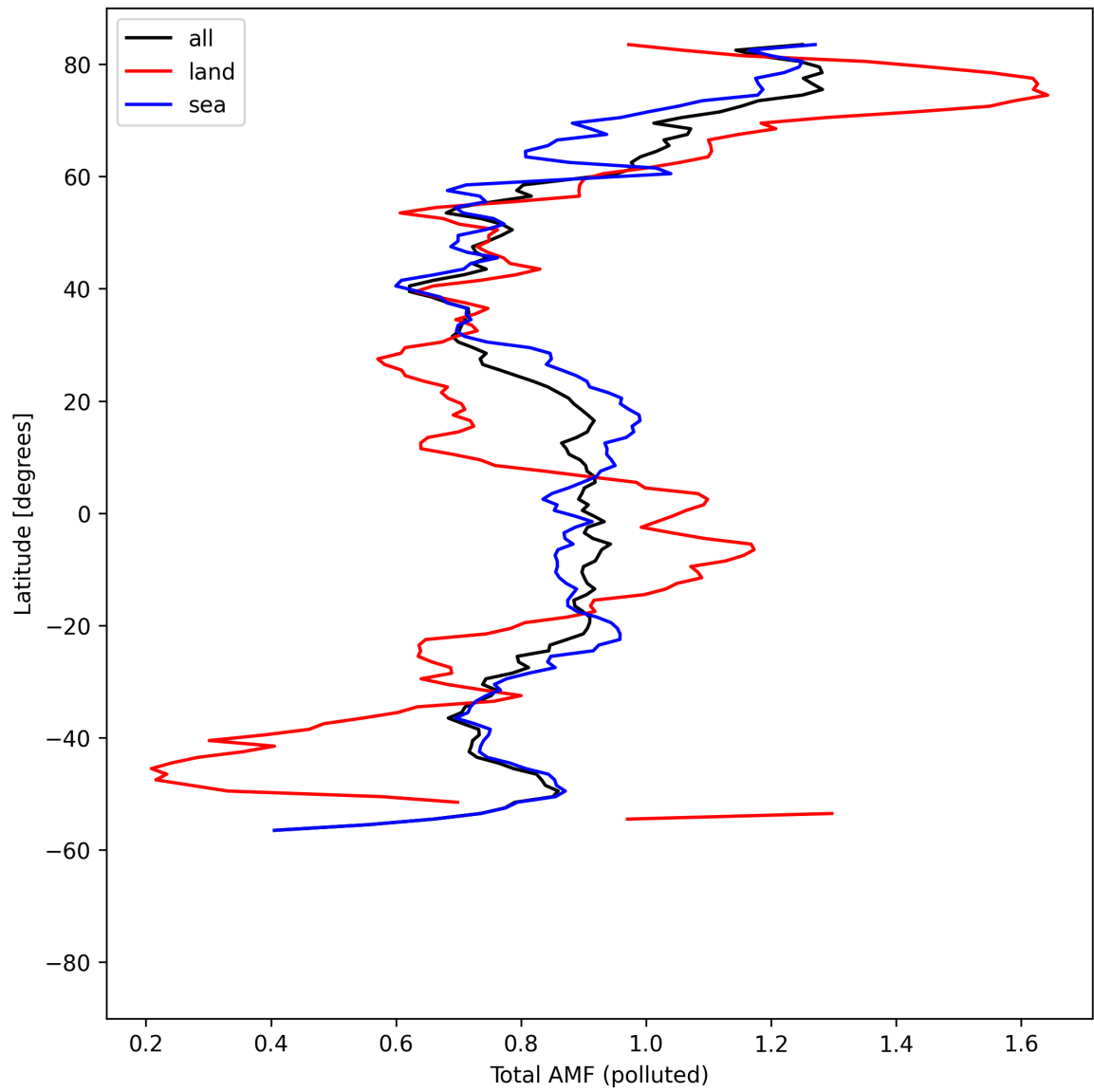


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-04-24 to 2025-04-25.

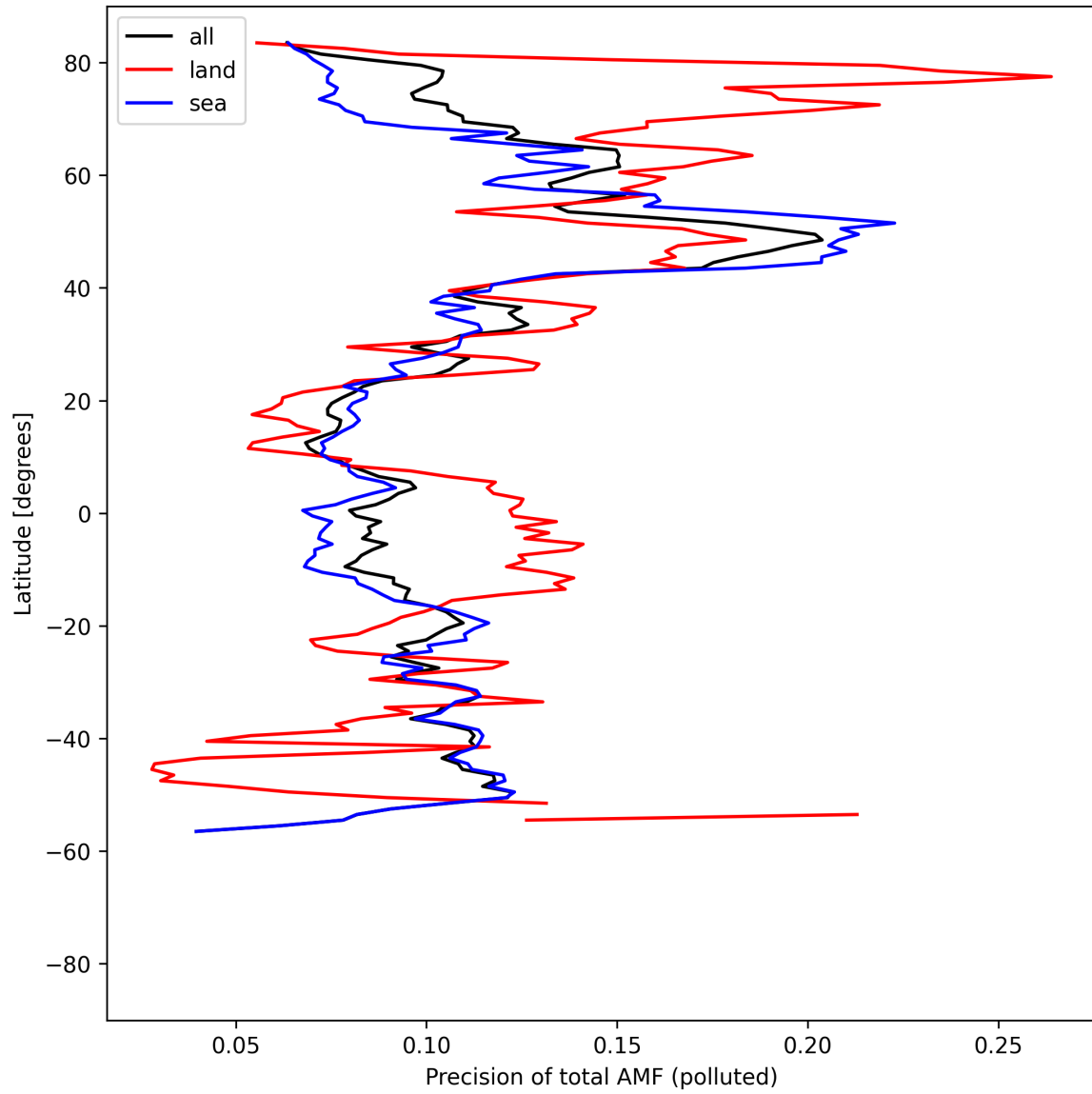


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-04-24 to 2025-04-25.

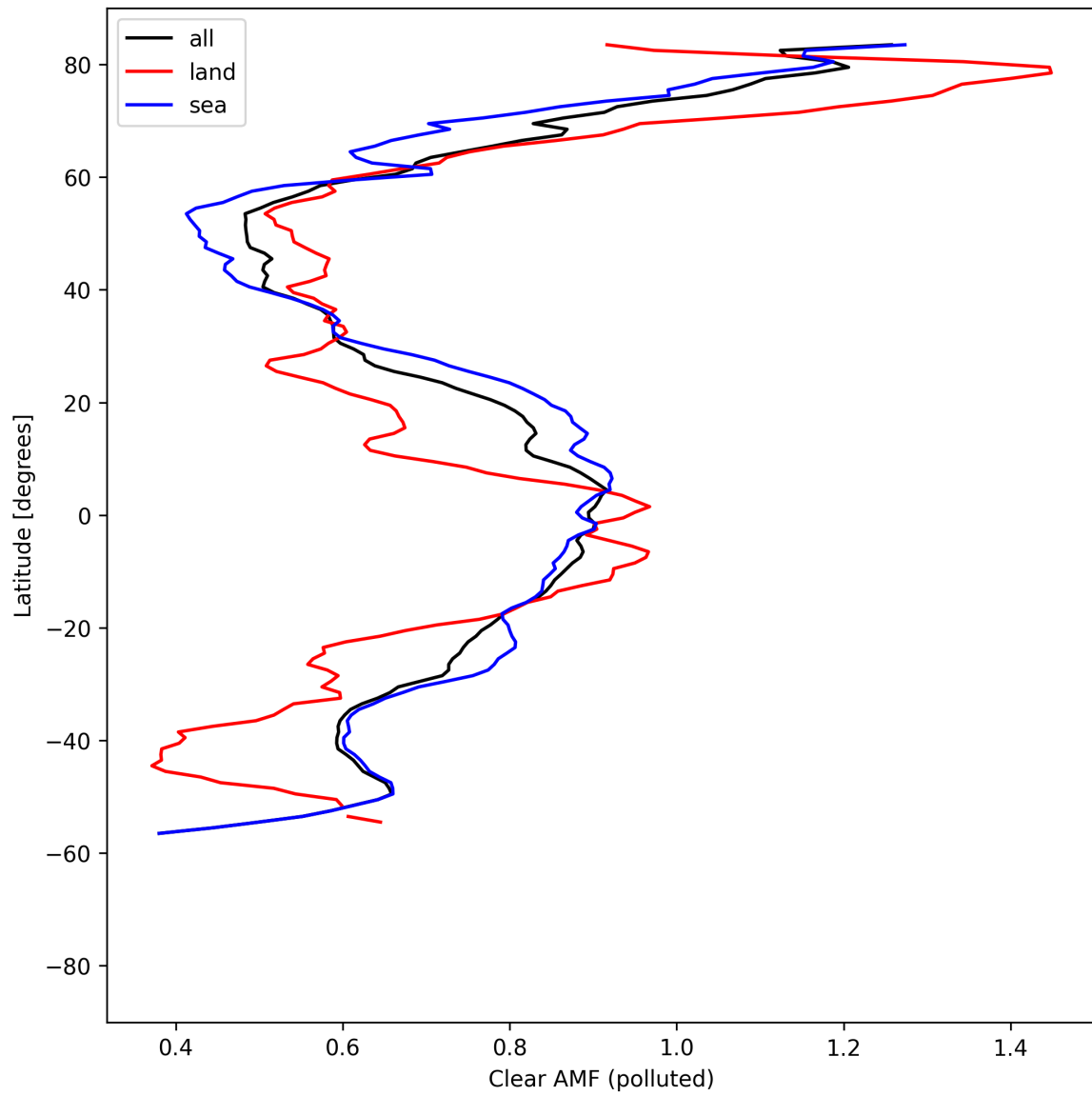


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-04-24 to 2025-04-25.

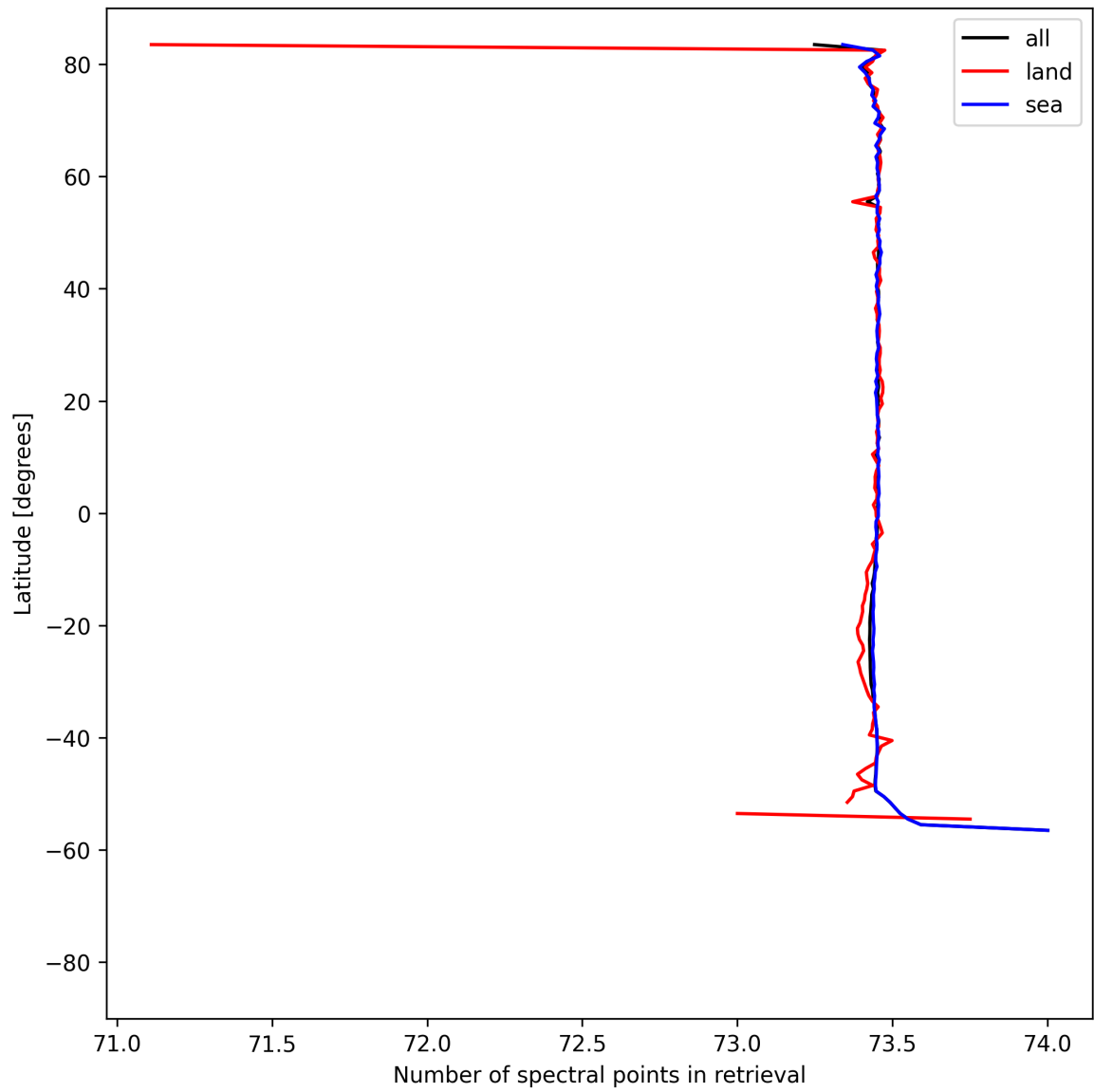


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-04-24 to 2025-04-25.

8 Histograms

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

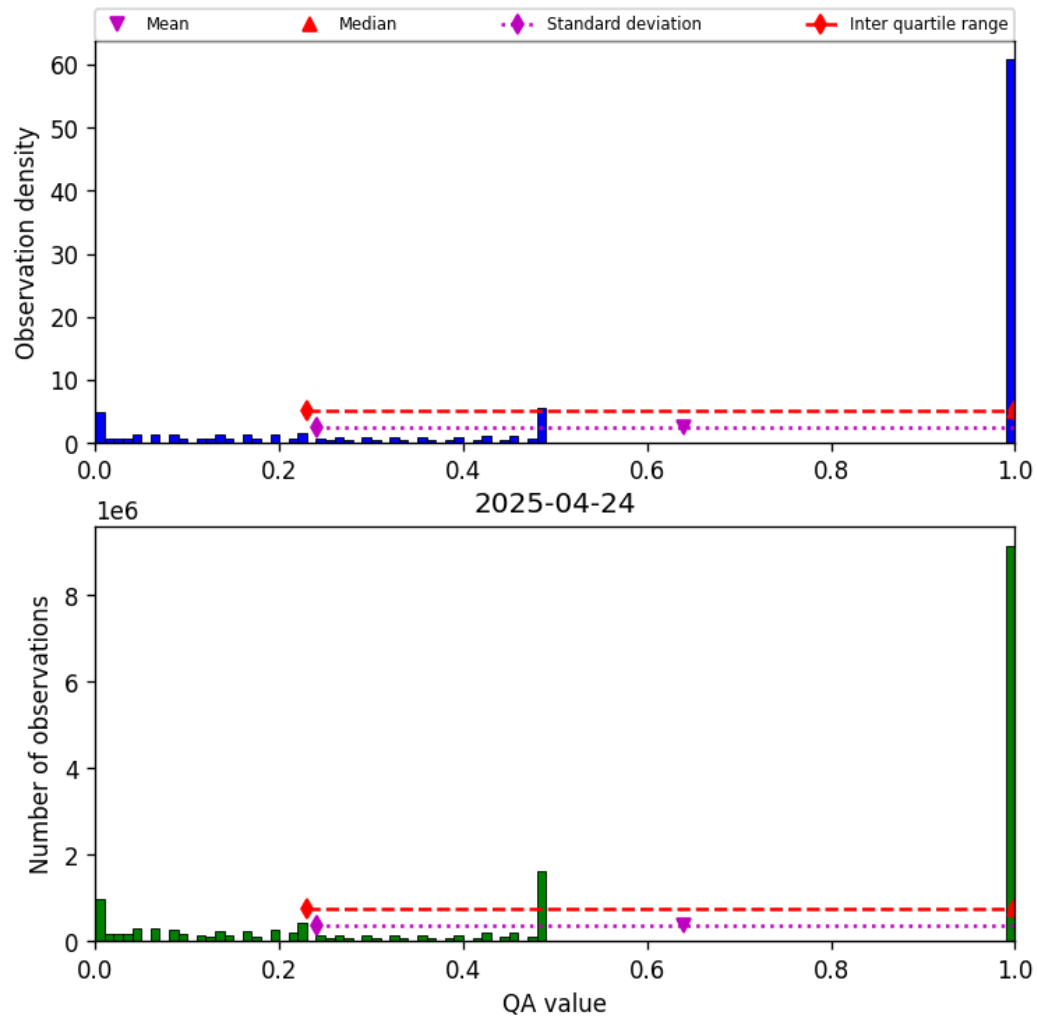


Figure 57: Histogram of “QA value” for 2025-04-24 to 2025-04-25

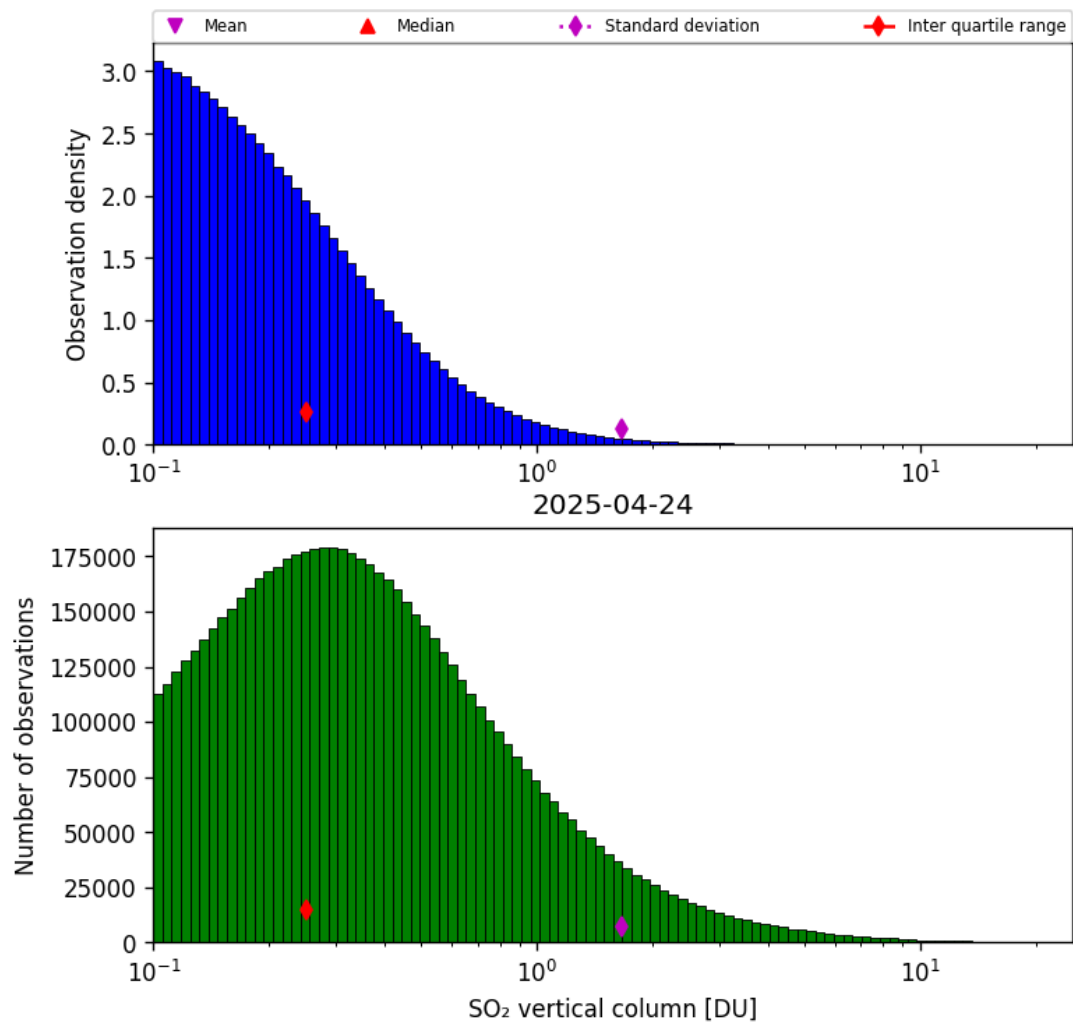


Figure 58: Histogram of “SO₂ vertical column” for 2025-04-24 to 2025-04-25

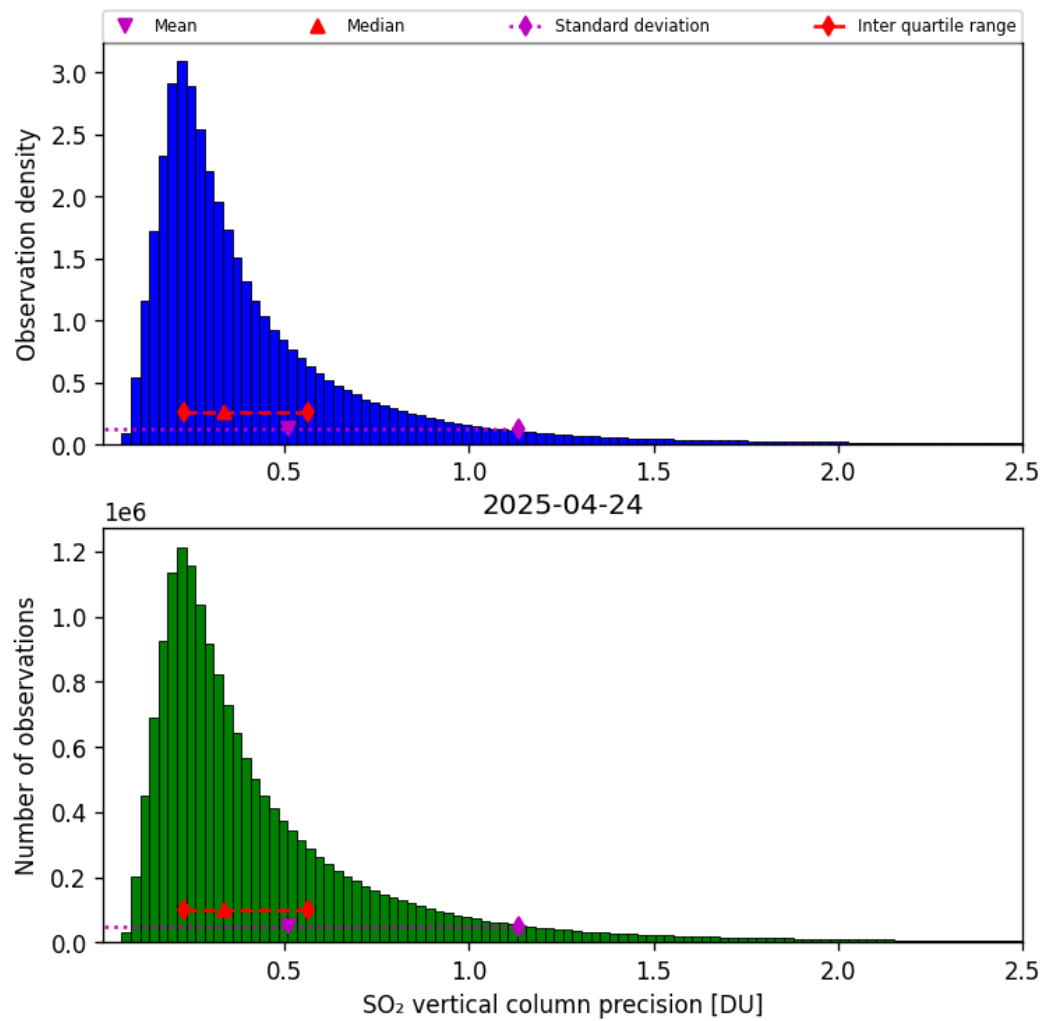


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-04-24 to 2025-04-25

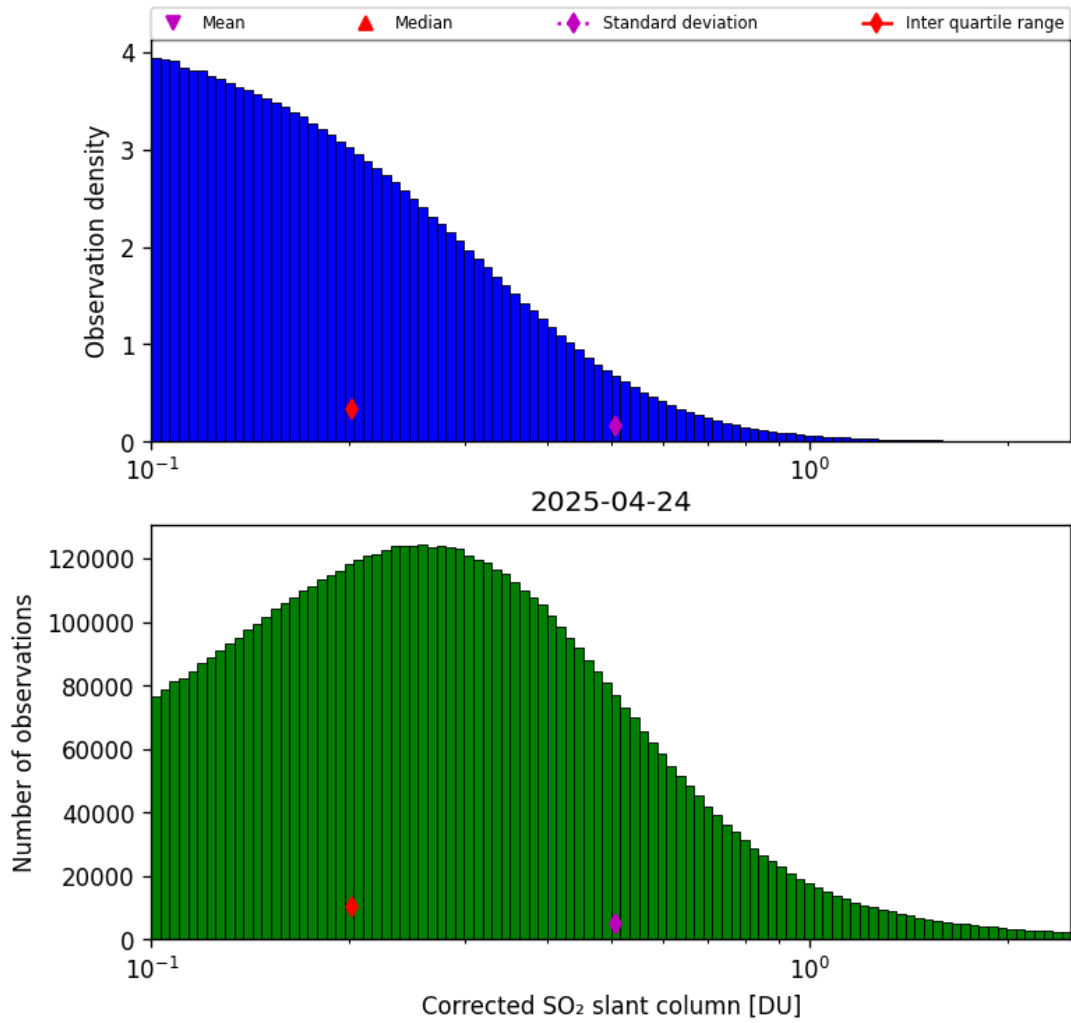


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-04-24 to 2025-04-25

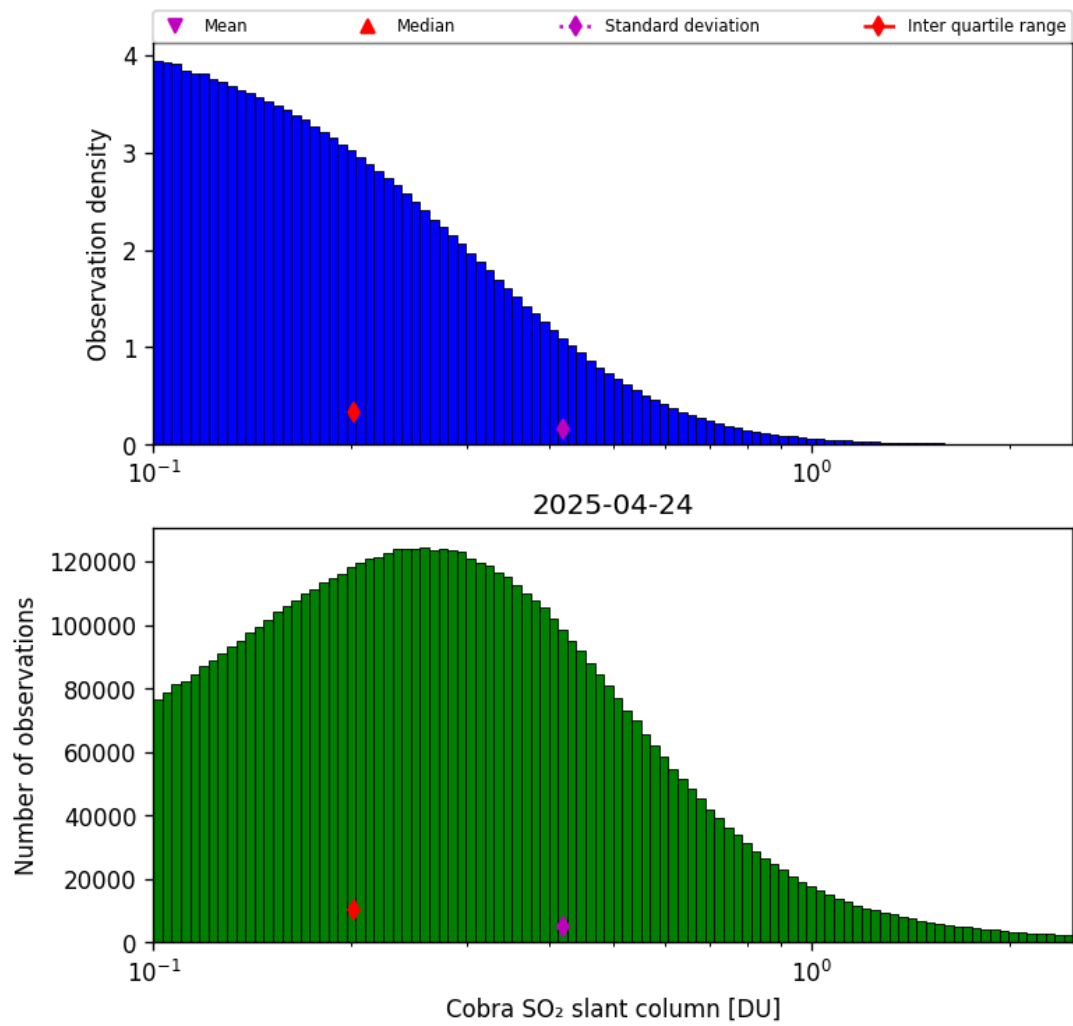


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-04-24 to 2025-04-25

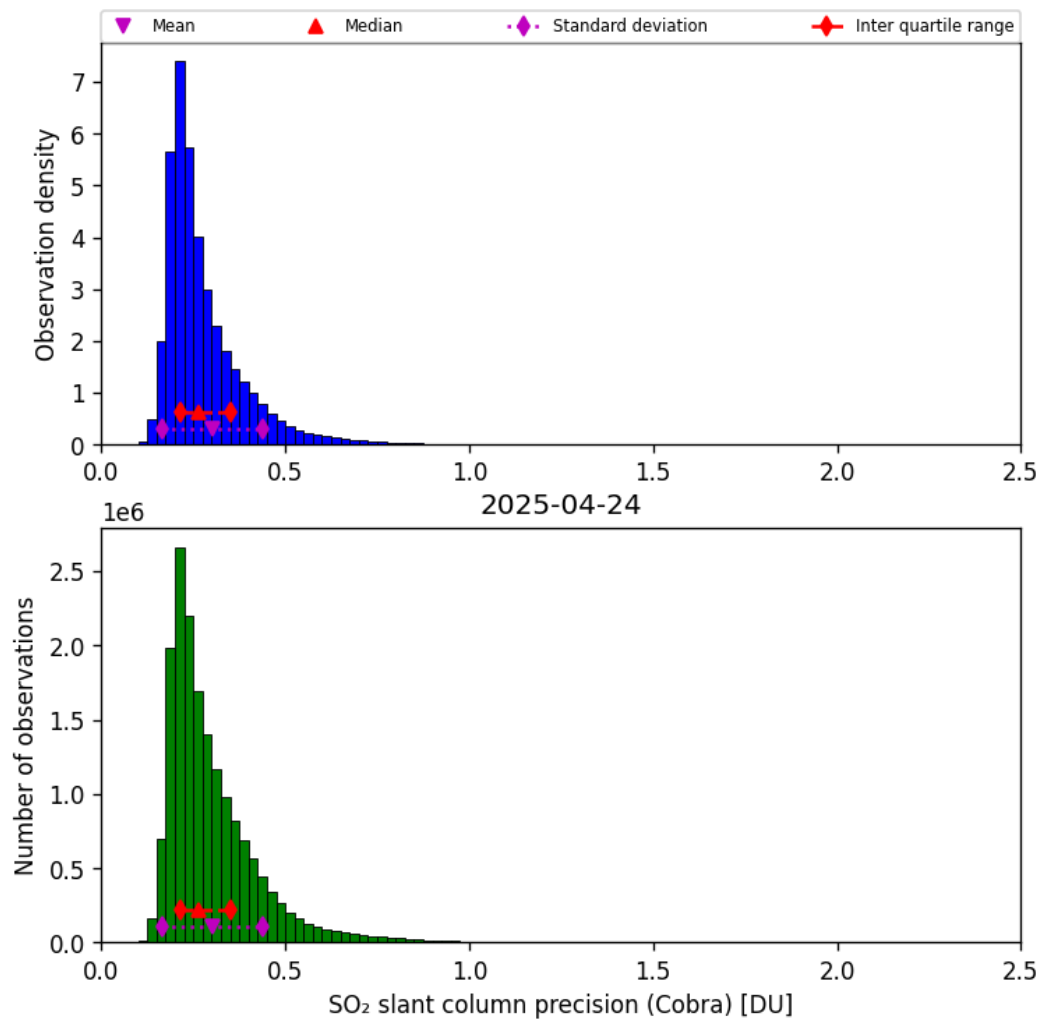


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-04-24 to 2025-04-25

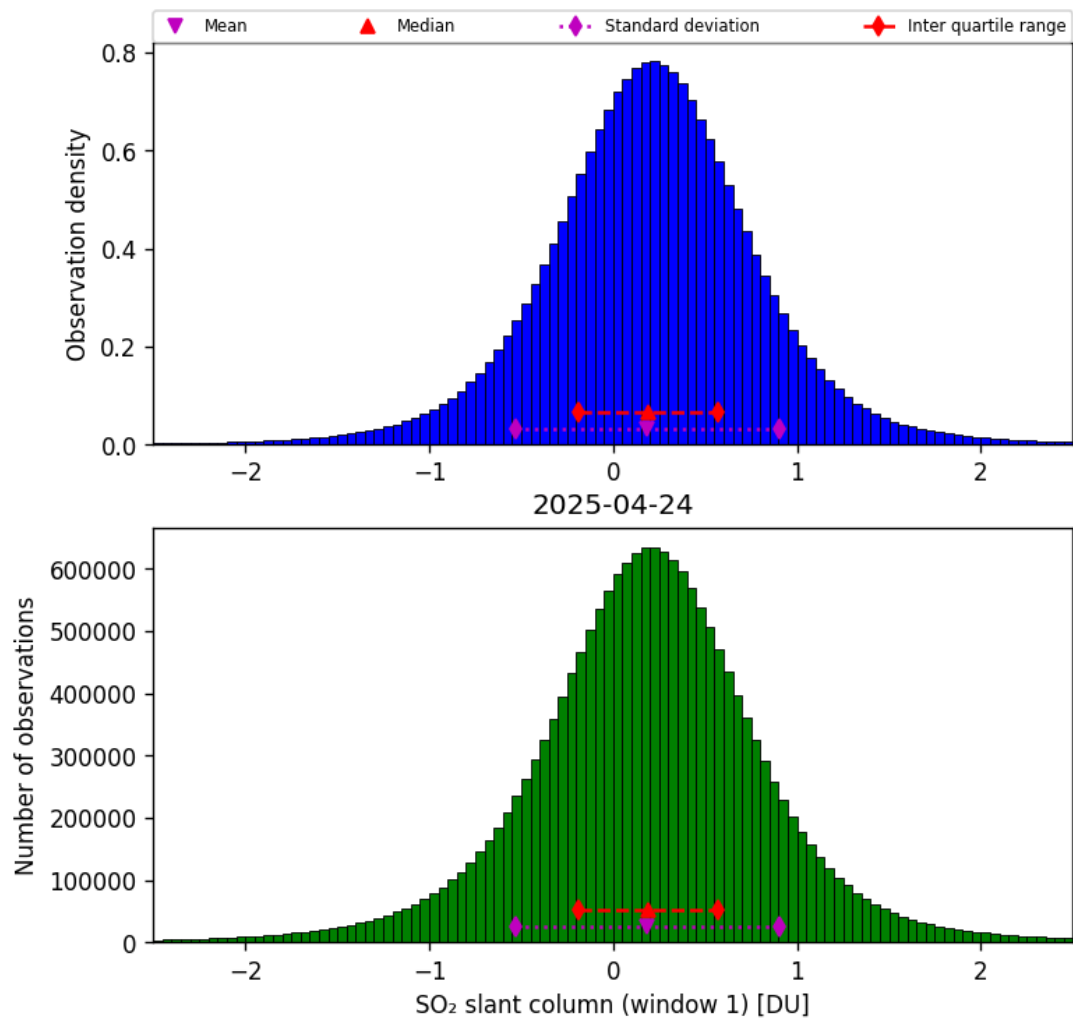


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-04-24 to 2025-04-25

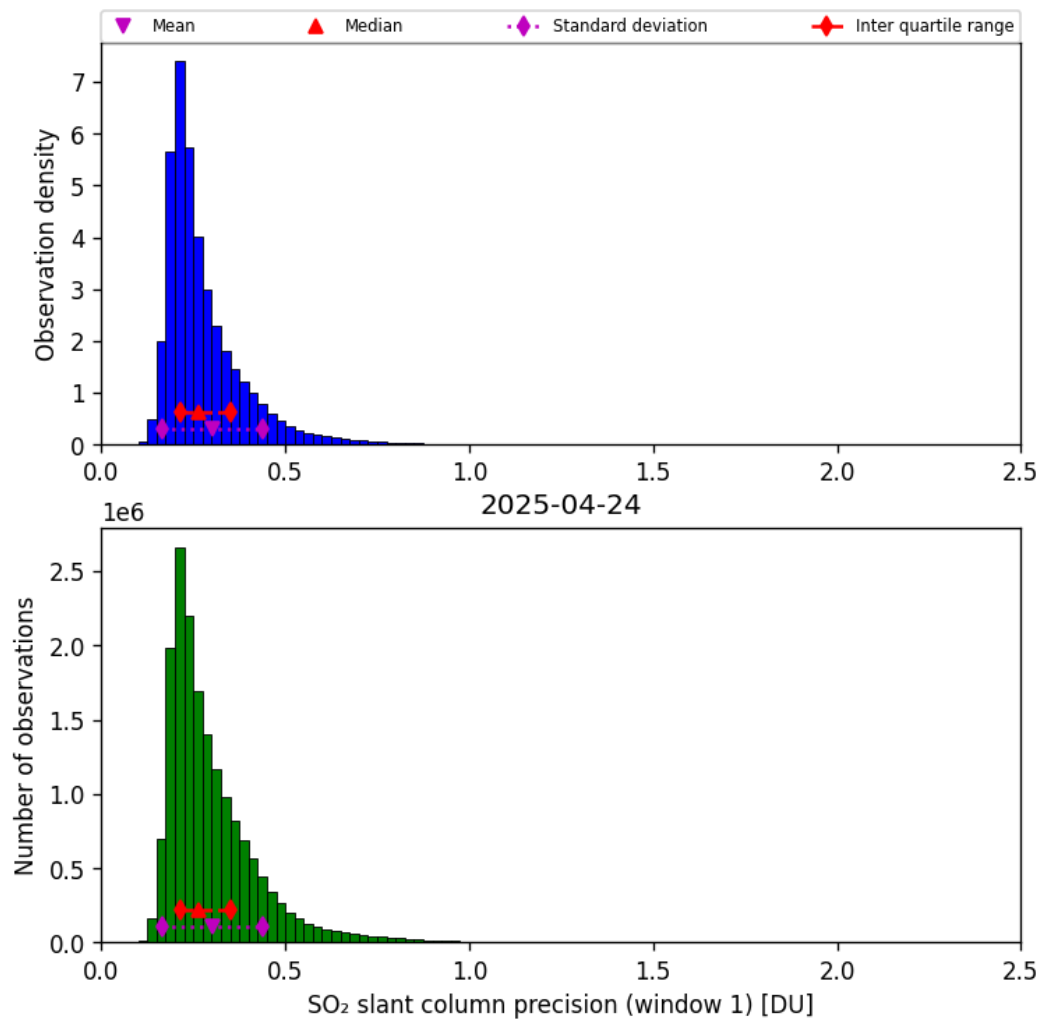


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-04-24 to 2025-04-25

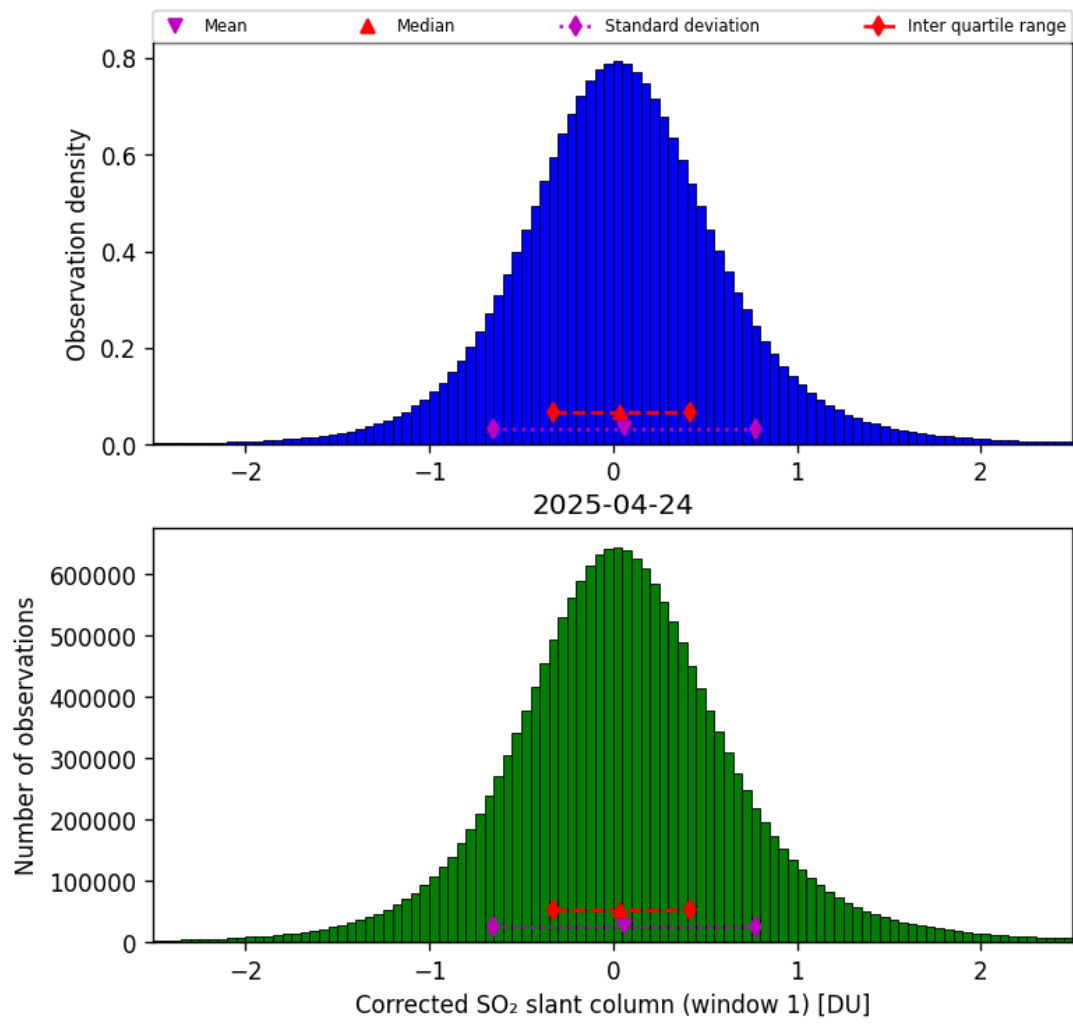


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-04-24 to 2025-04-25

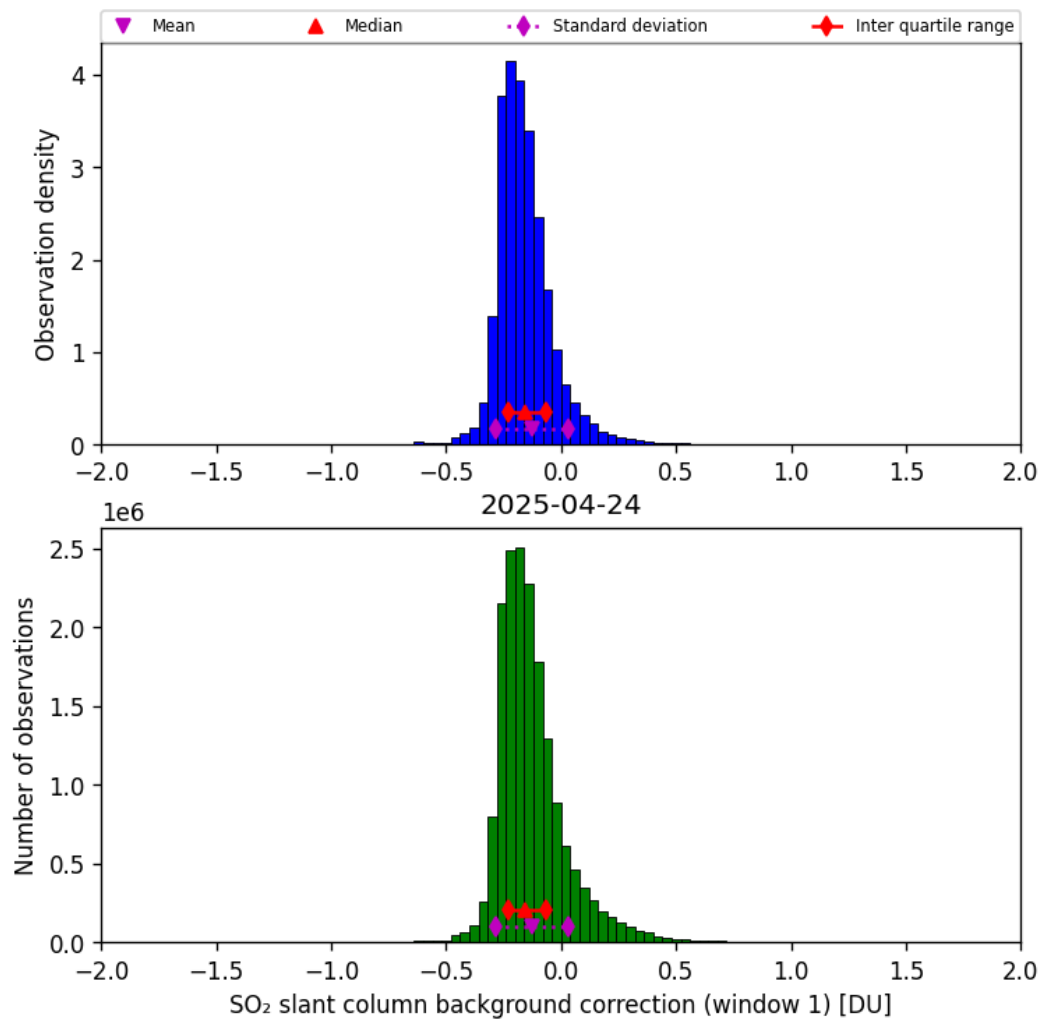


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-04-24 to 2025-04-25

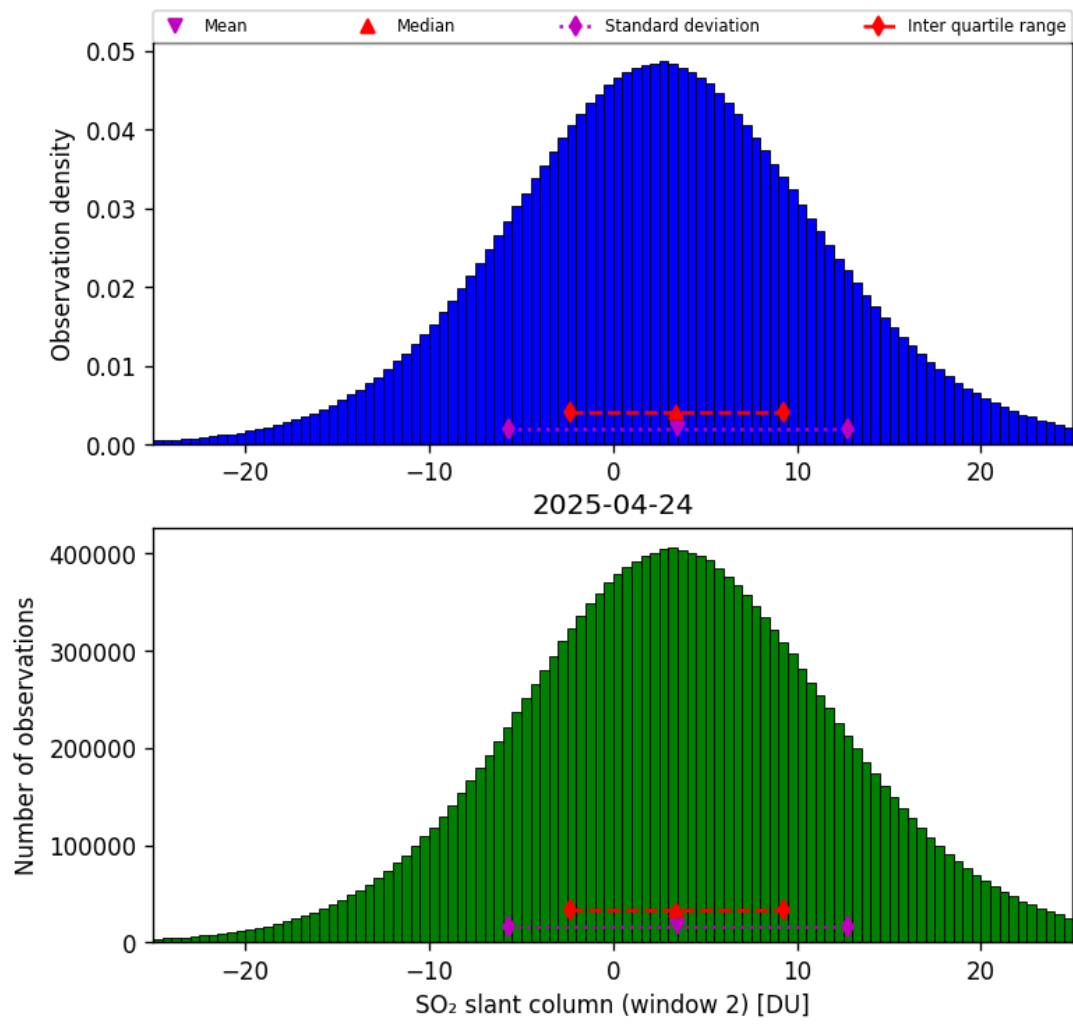


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-04-24 to 2025-04-25

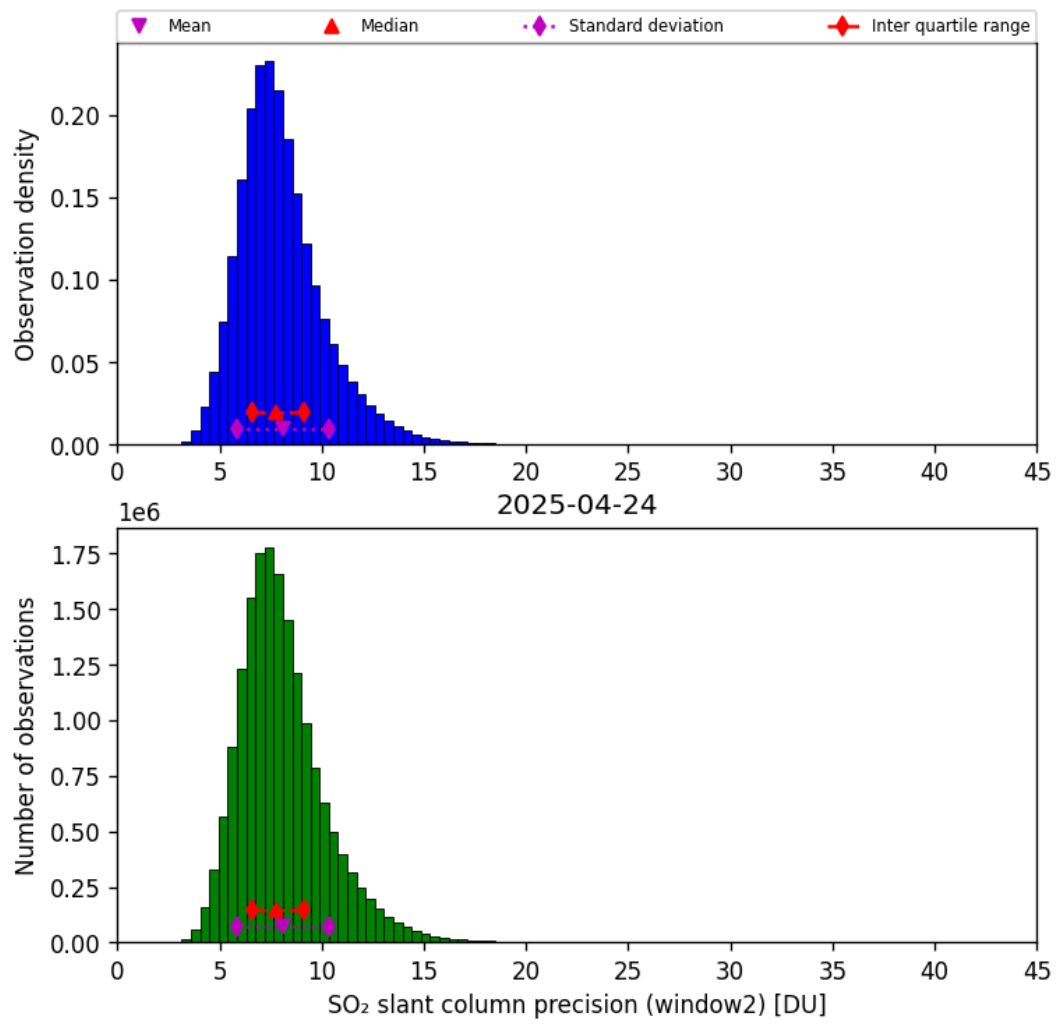


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-04-24 to 2025-04-25

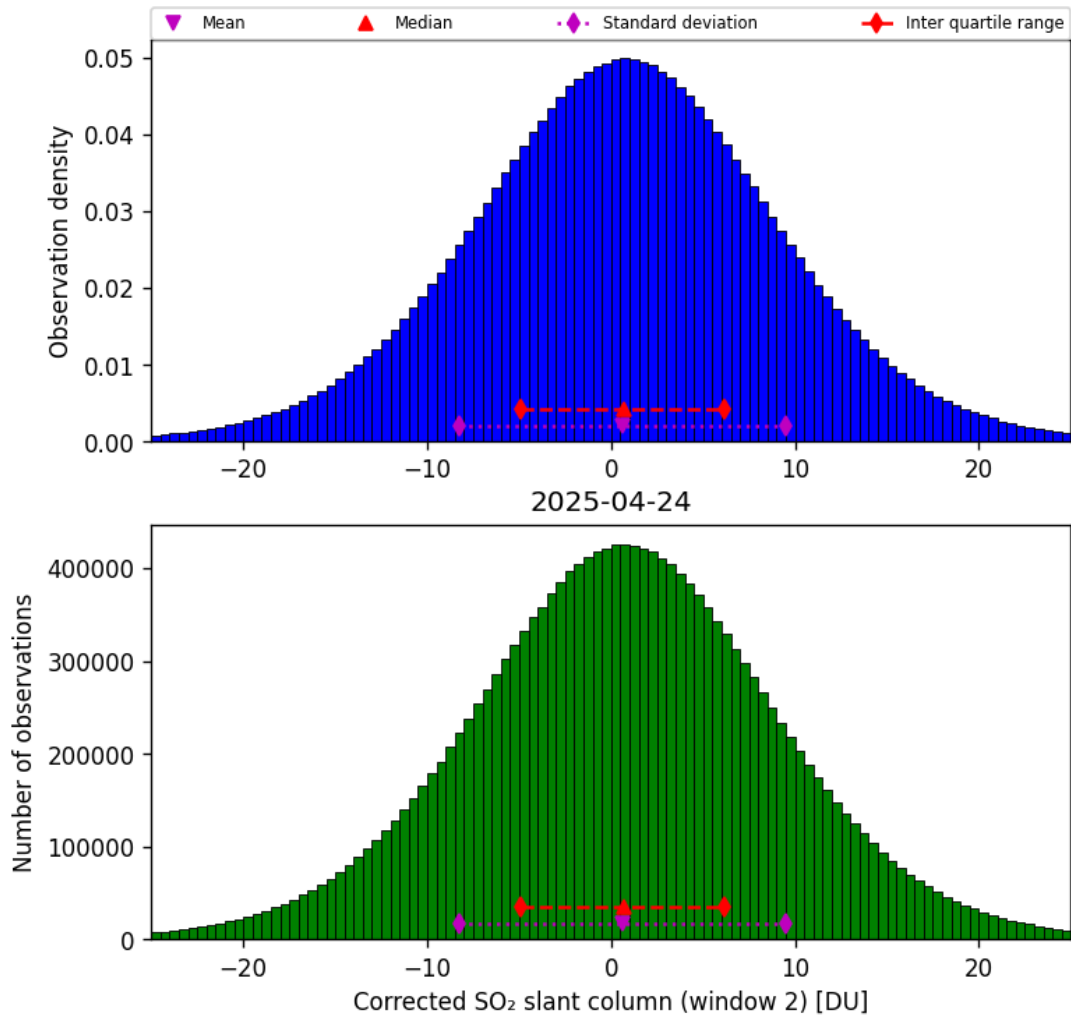


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-04-24 to 2025-04-25

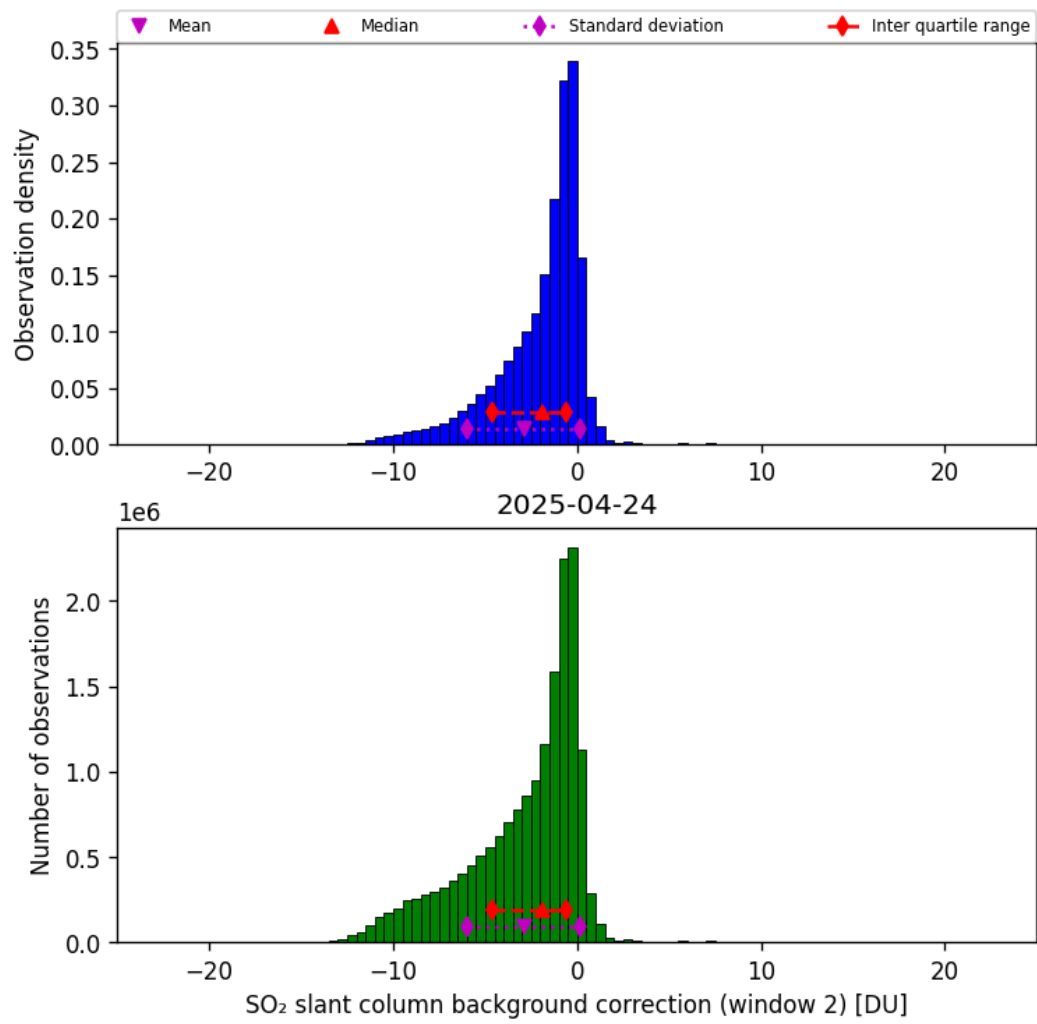


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-04-24 to 2025-04-25

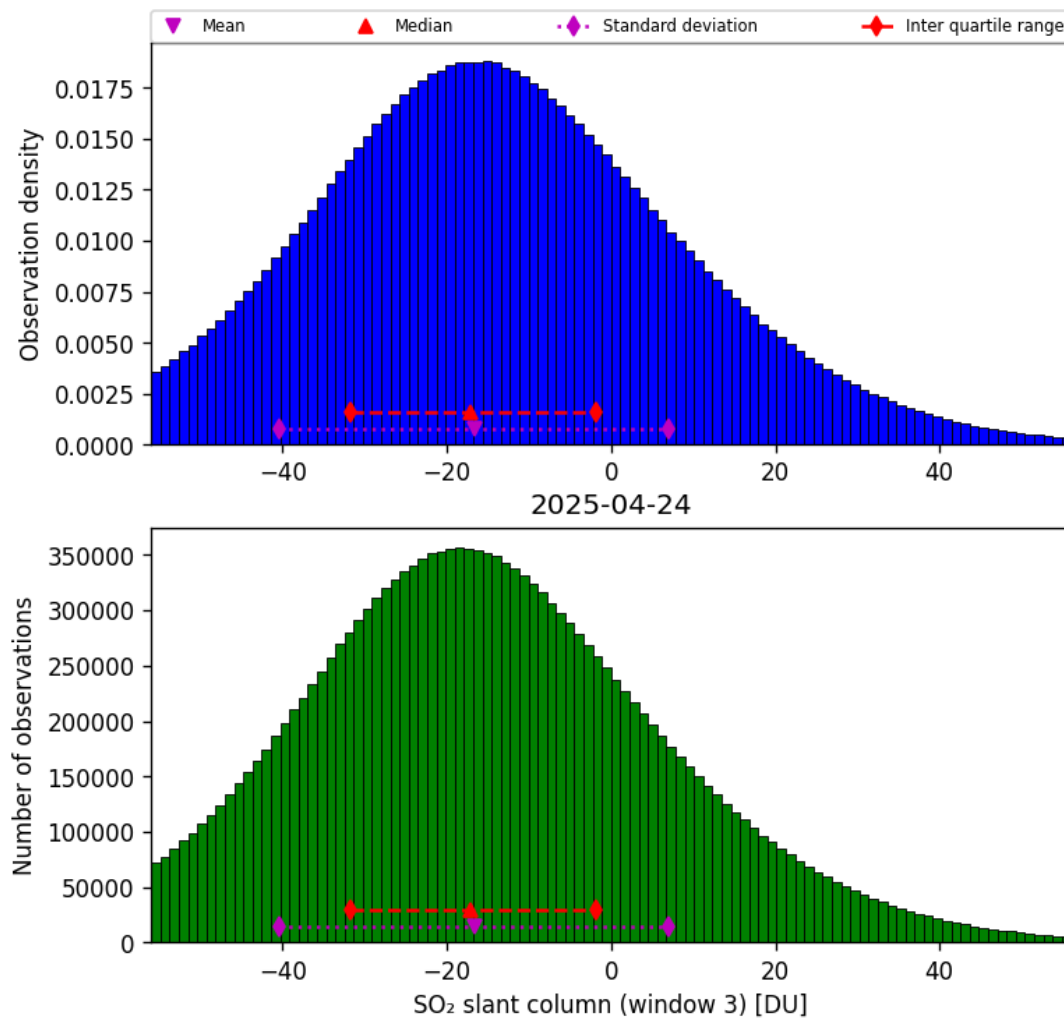


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-04-24 to 2025-04-25

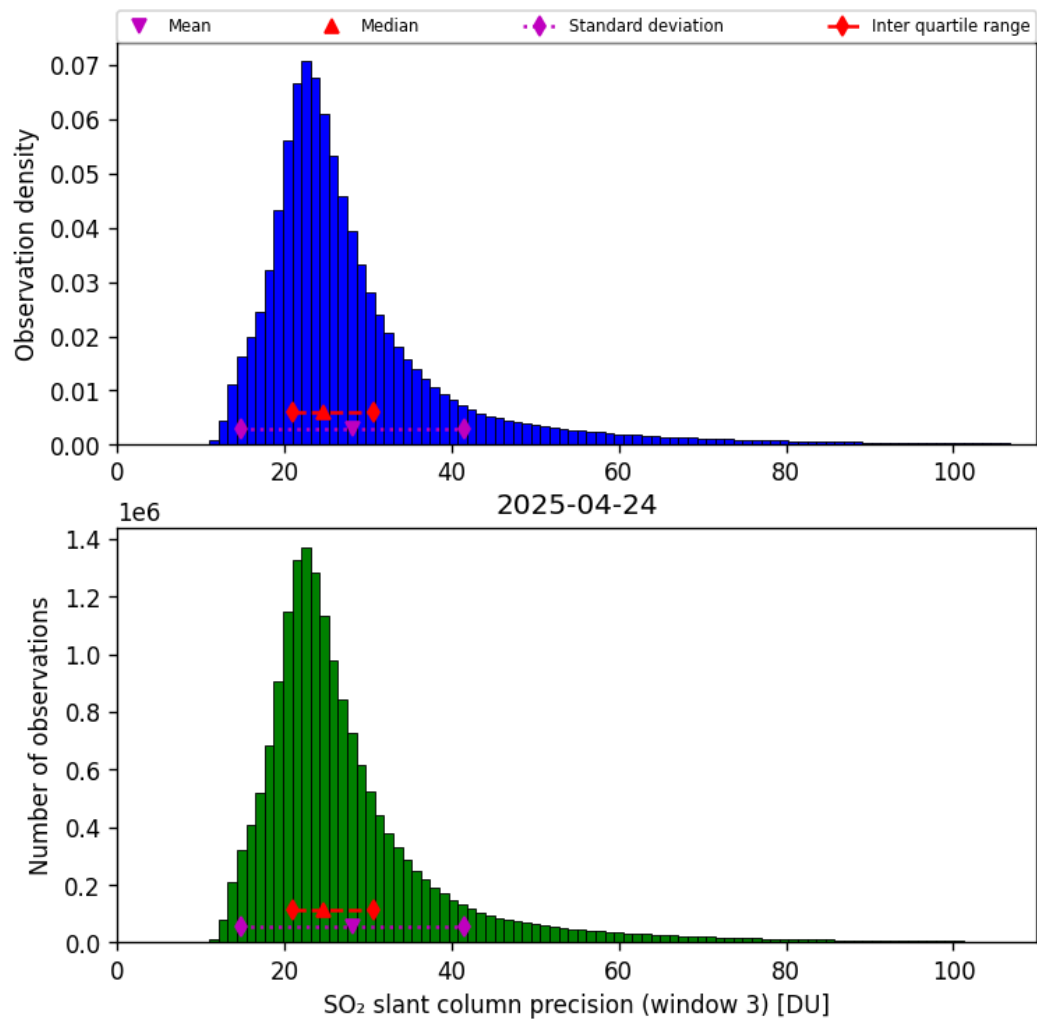


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-04-24 to 2025-04-25

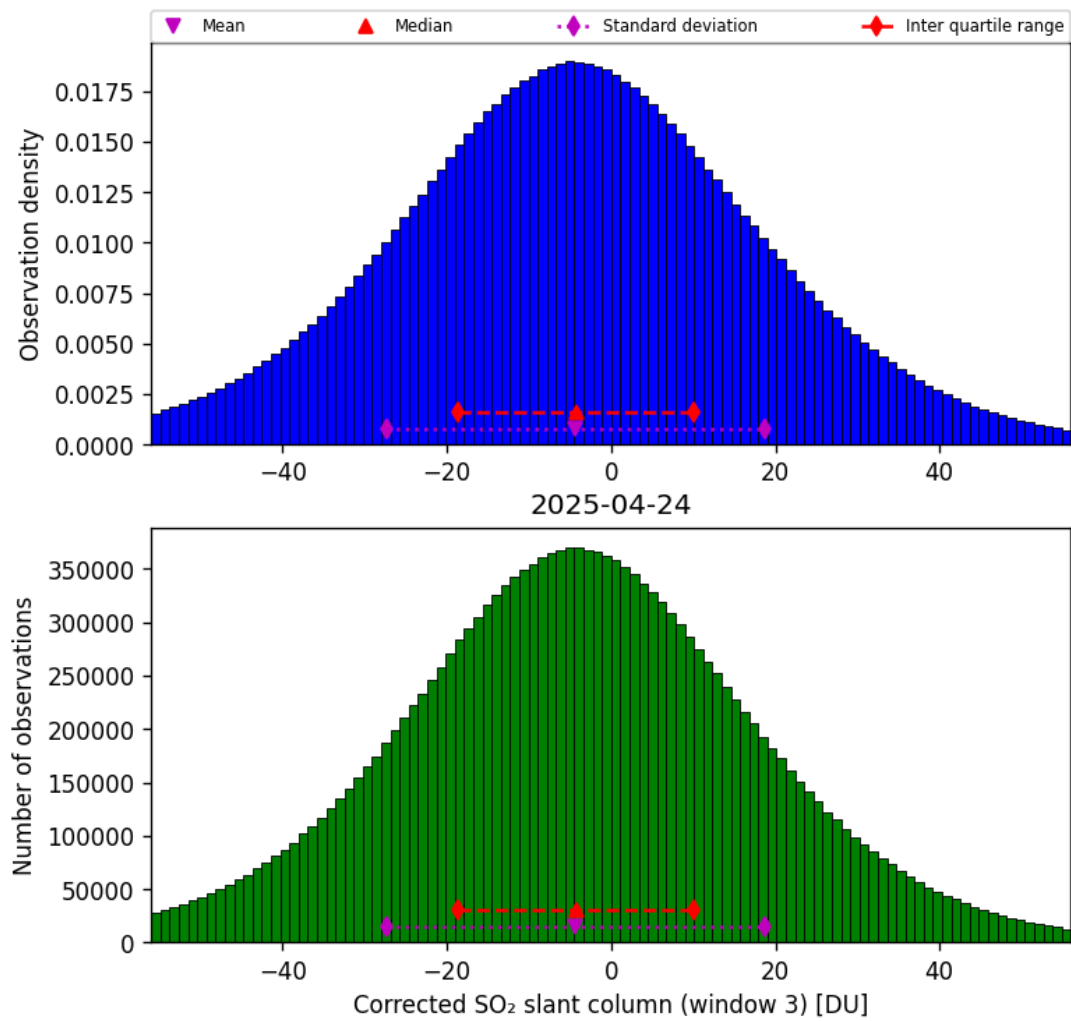


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-04-24 to 2025-04-25

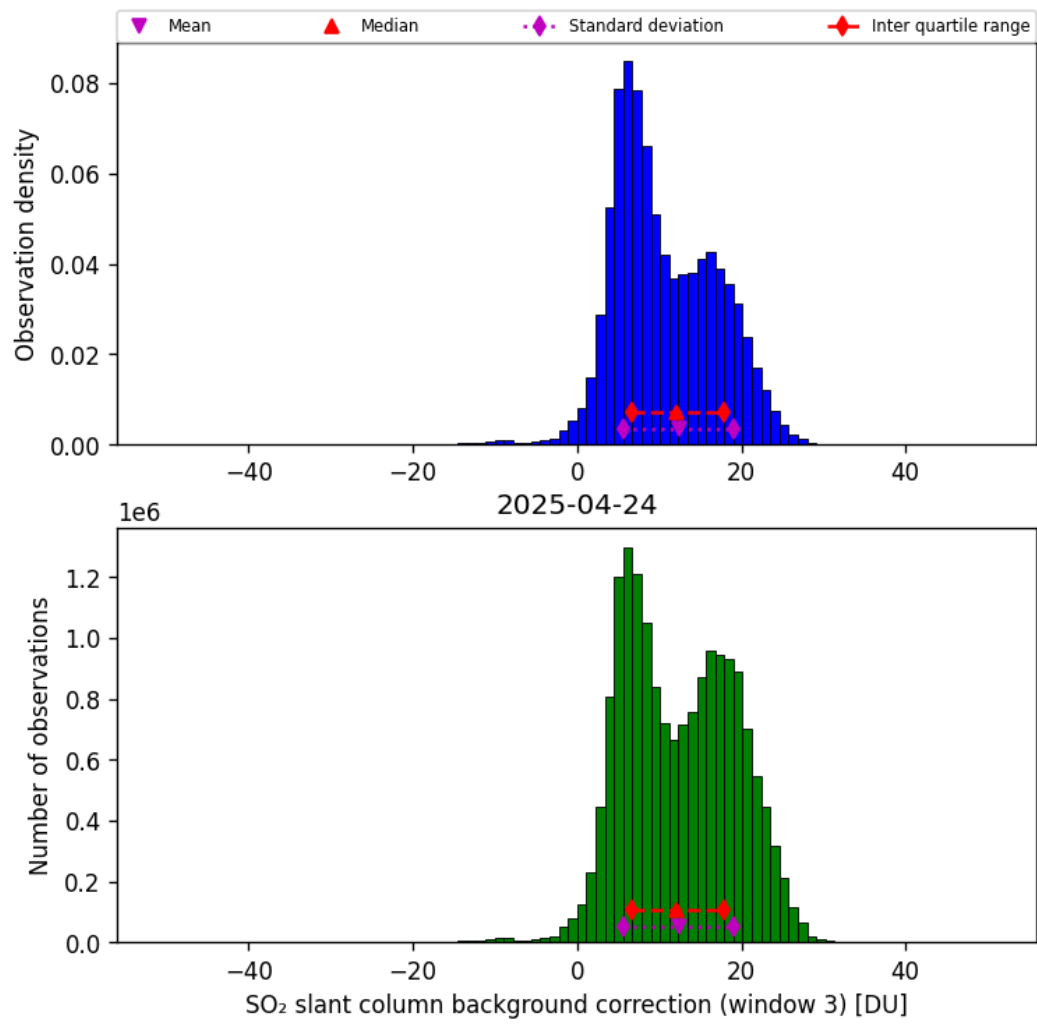


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-04-24 to 2025-04-25

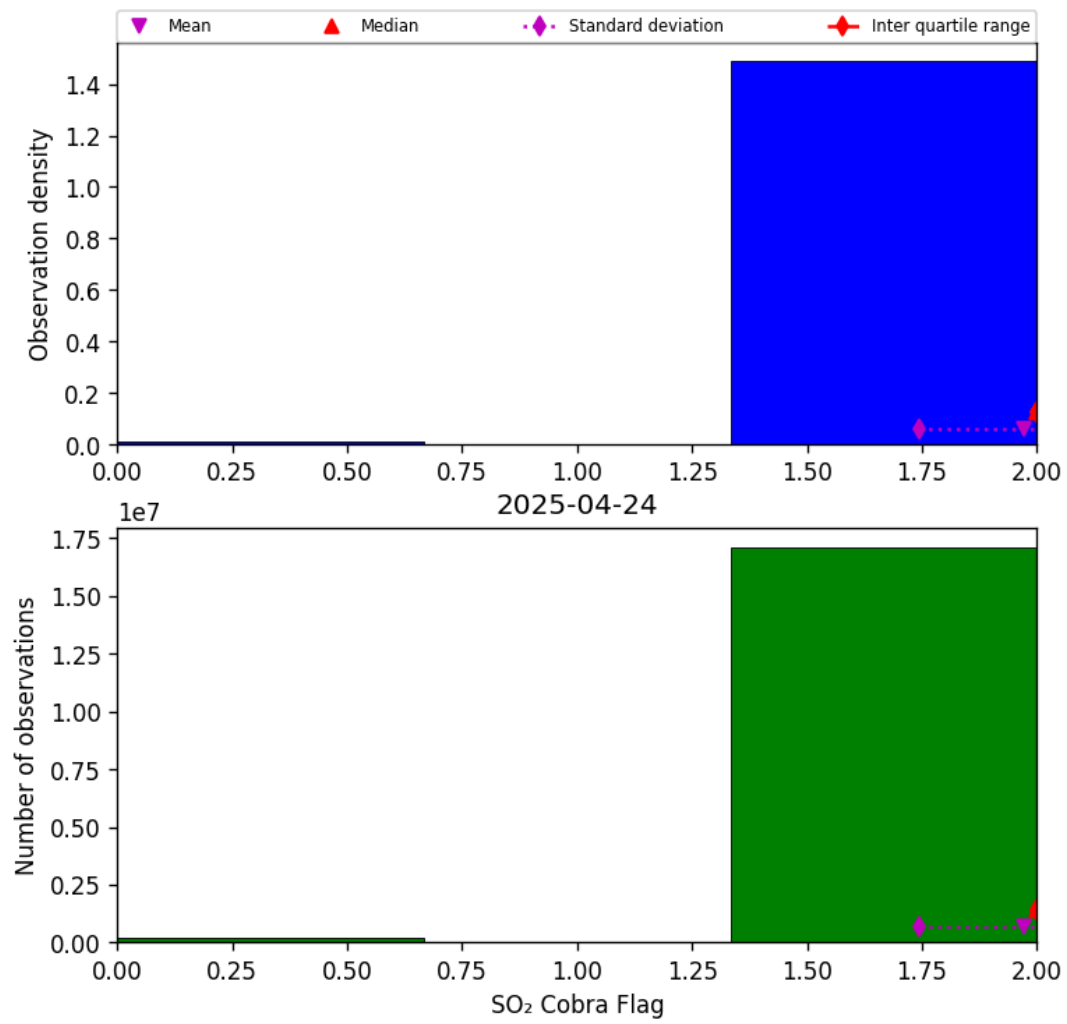


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-04-24 to 2025-04-25

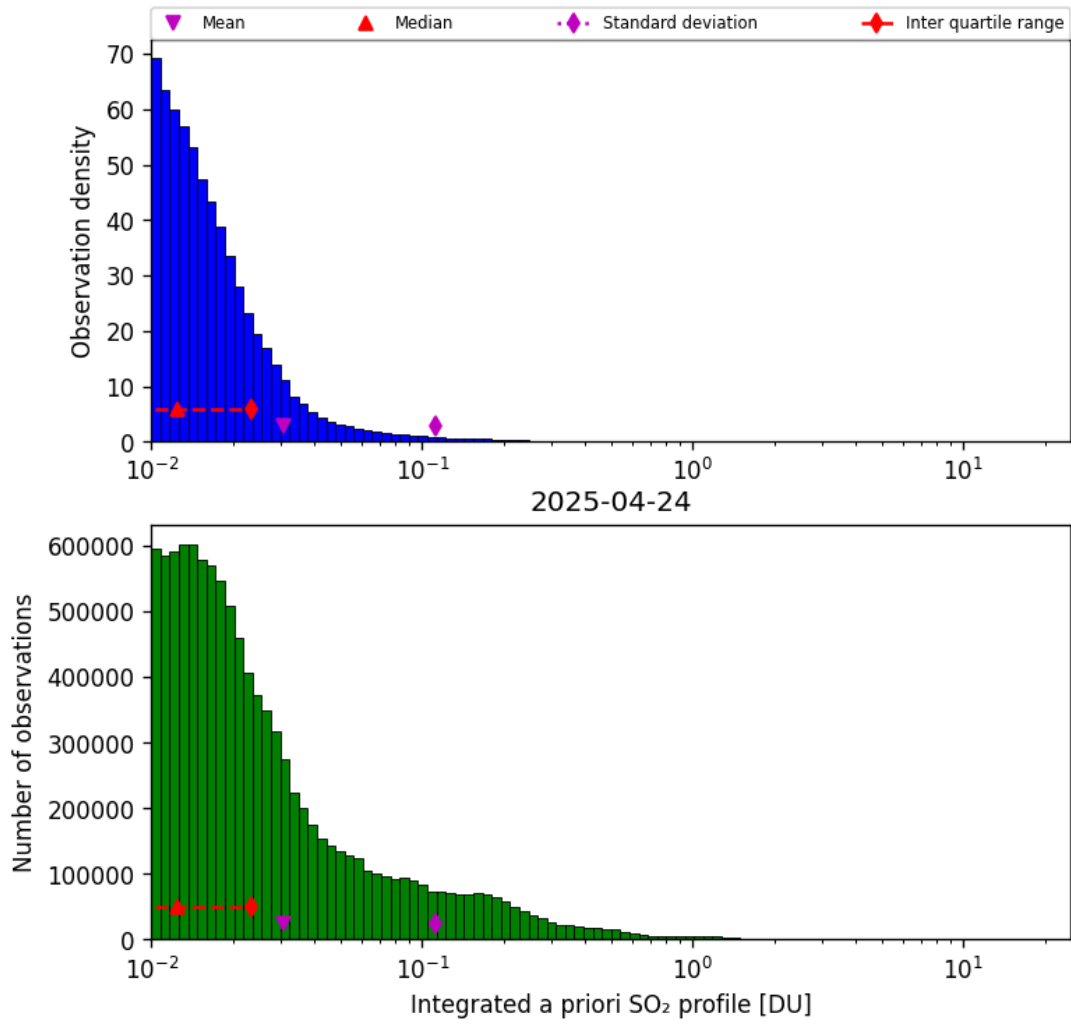


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-04-24 to 2025-04-25

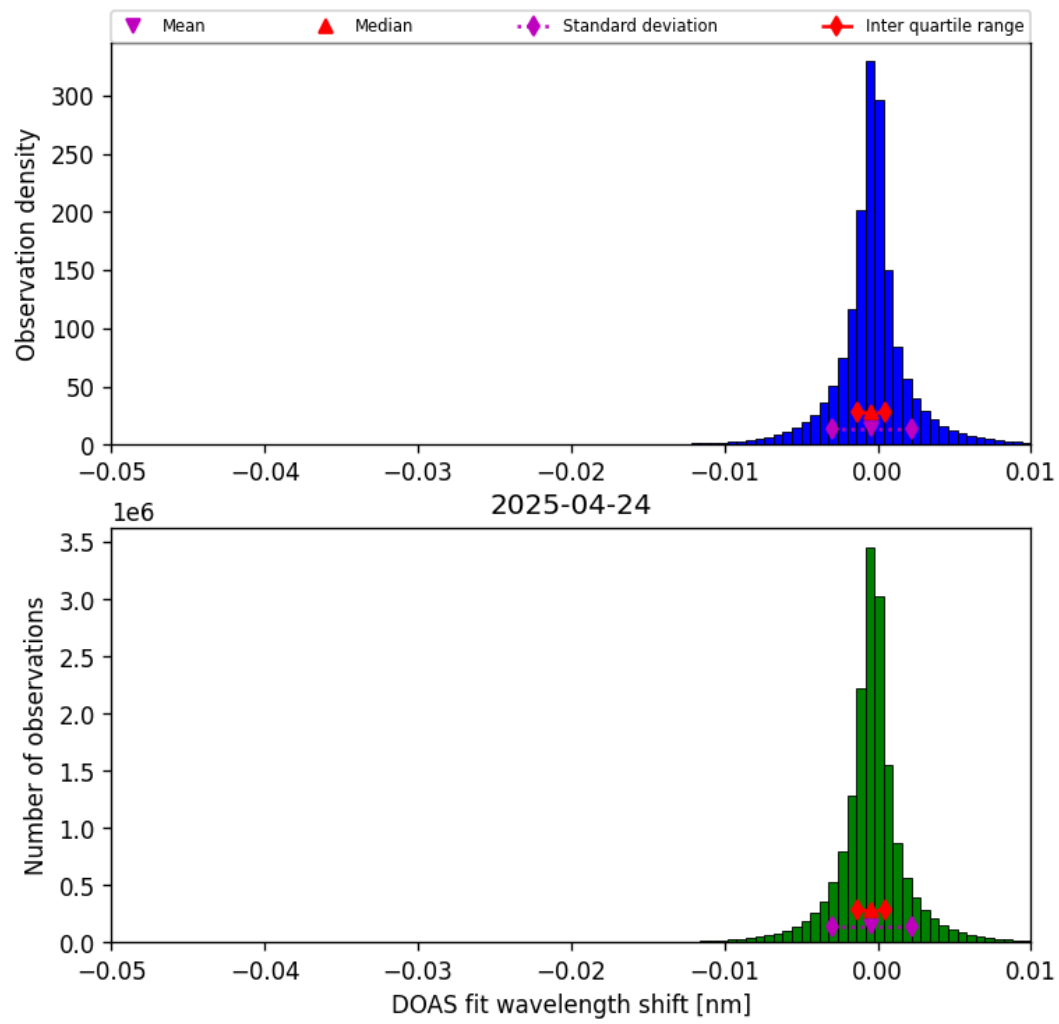


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-04-24 to 2025-04-25

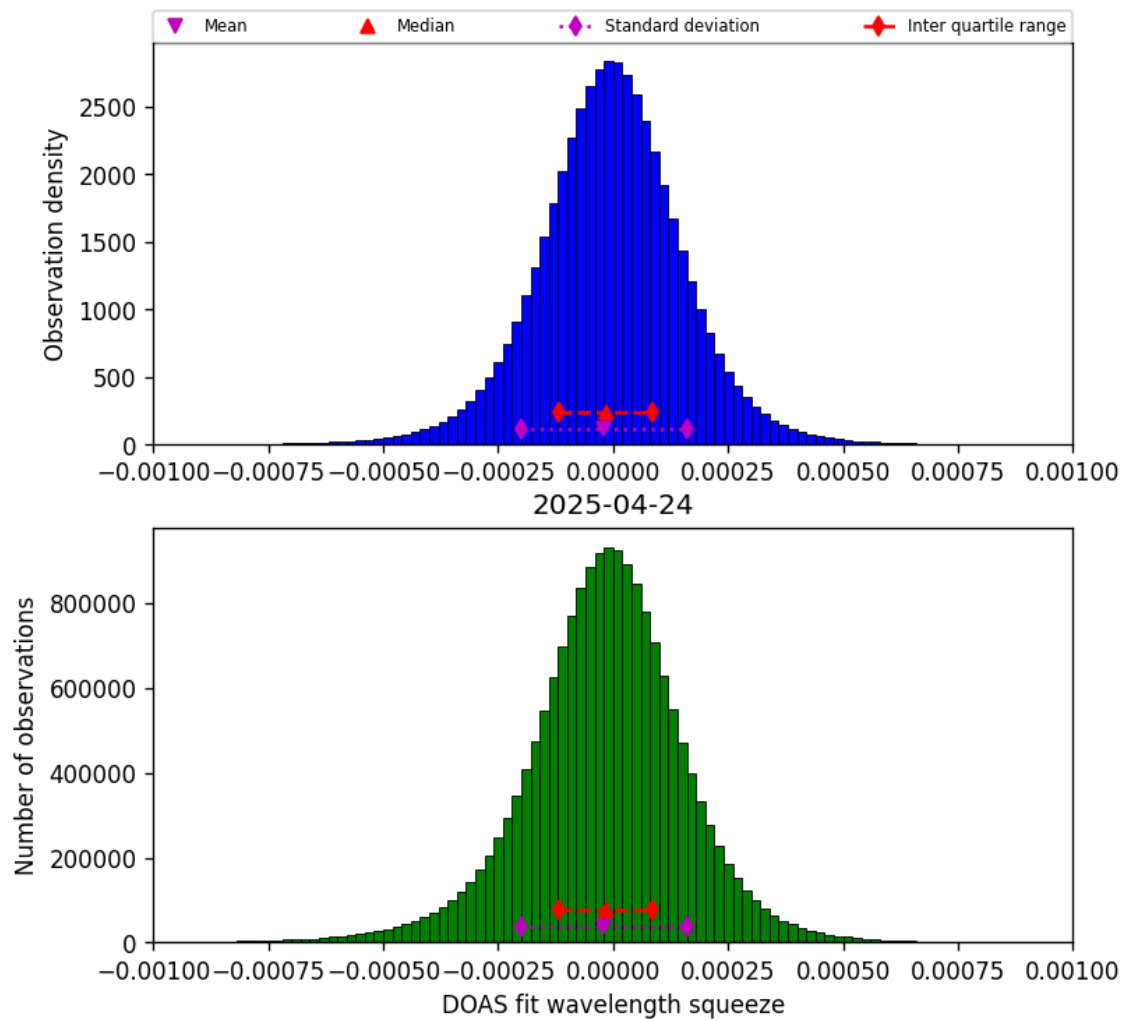


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-04-24 to 2025-04-25

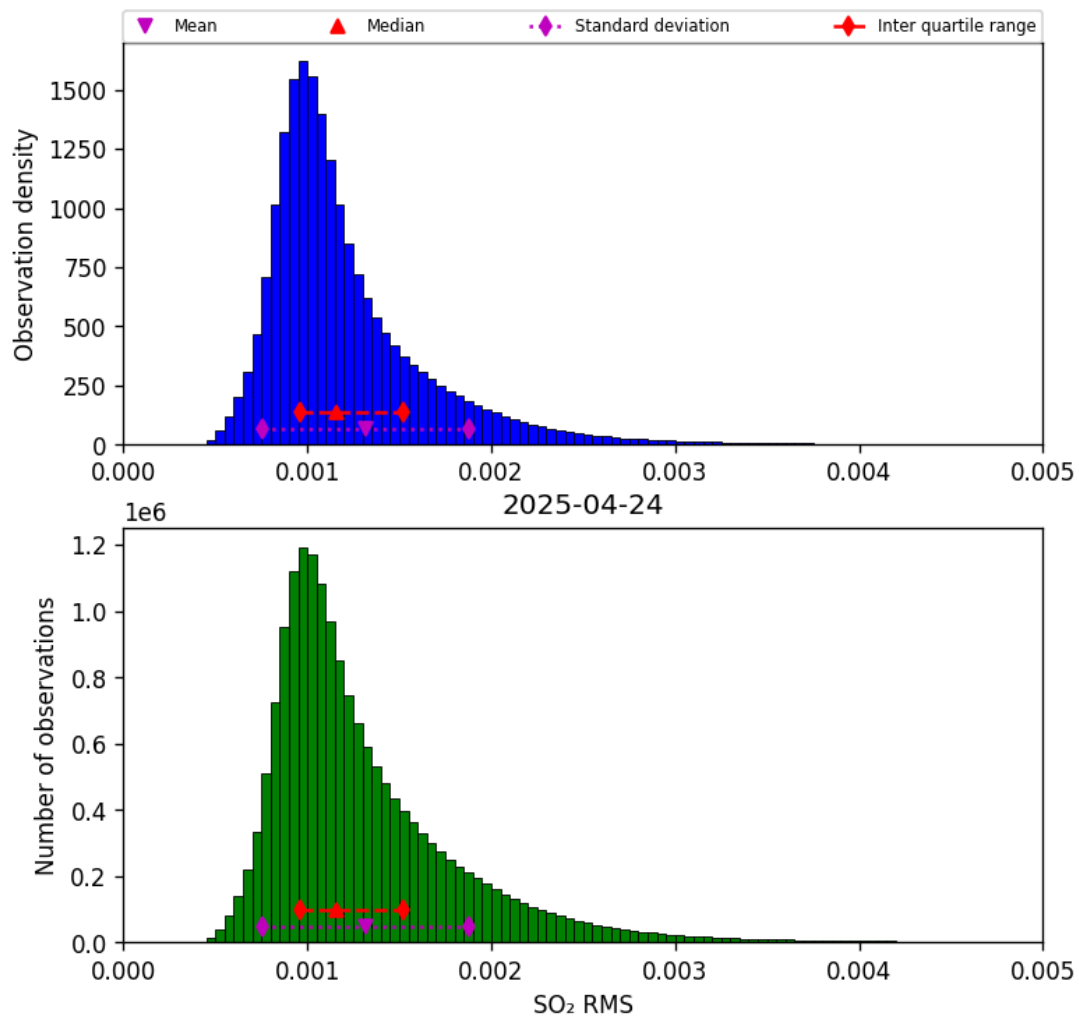


Figure 79: Histogram of “SO₂ RMS” for 2025-04-24 to 2025-04-25

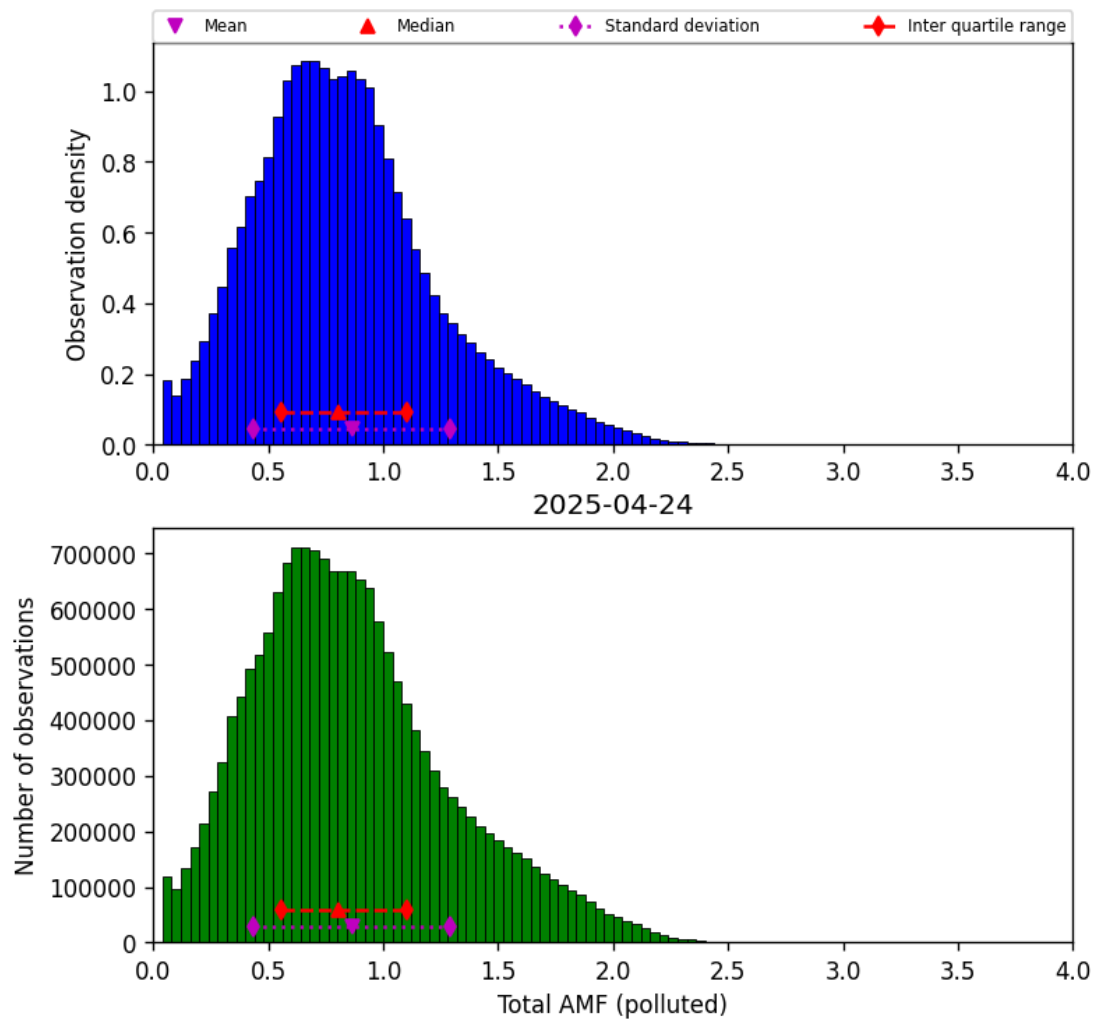


Figure 80: Histogram of “Total AMF (polluted)” for 2025-04-24 to 2025-04-25

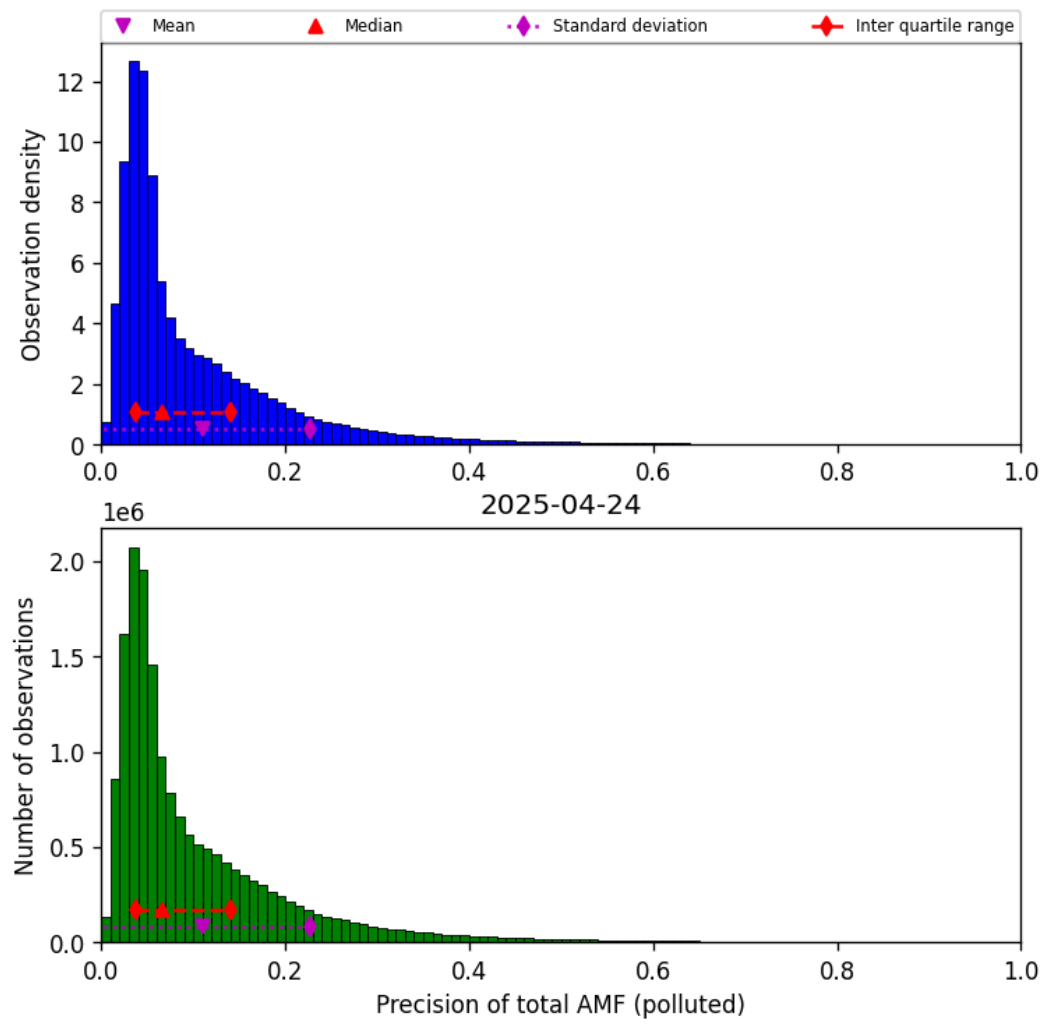


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-04-24 to 2025-04-25

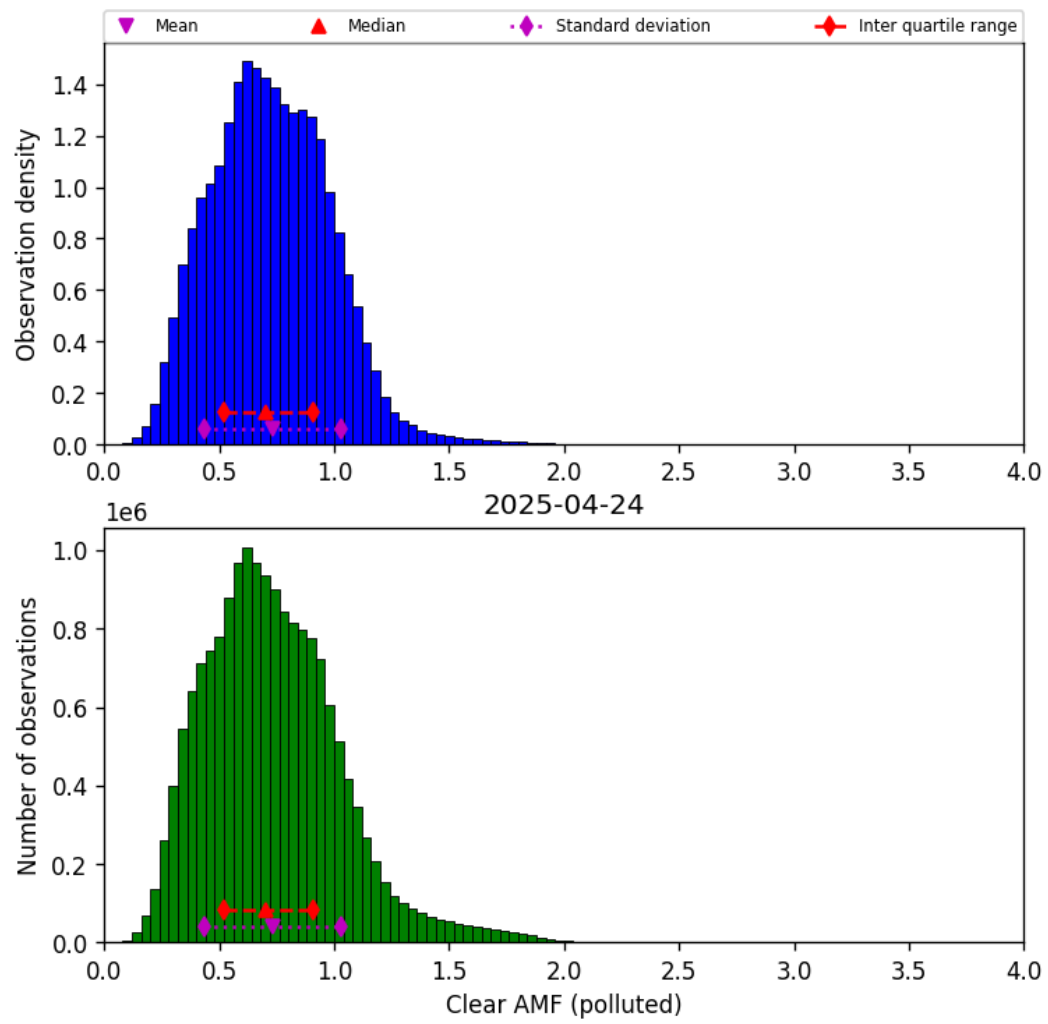


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-04-24 to 2025-04-25

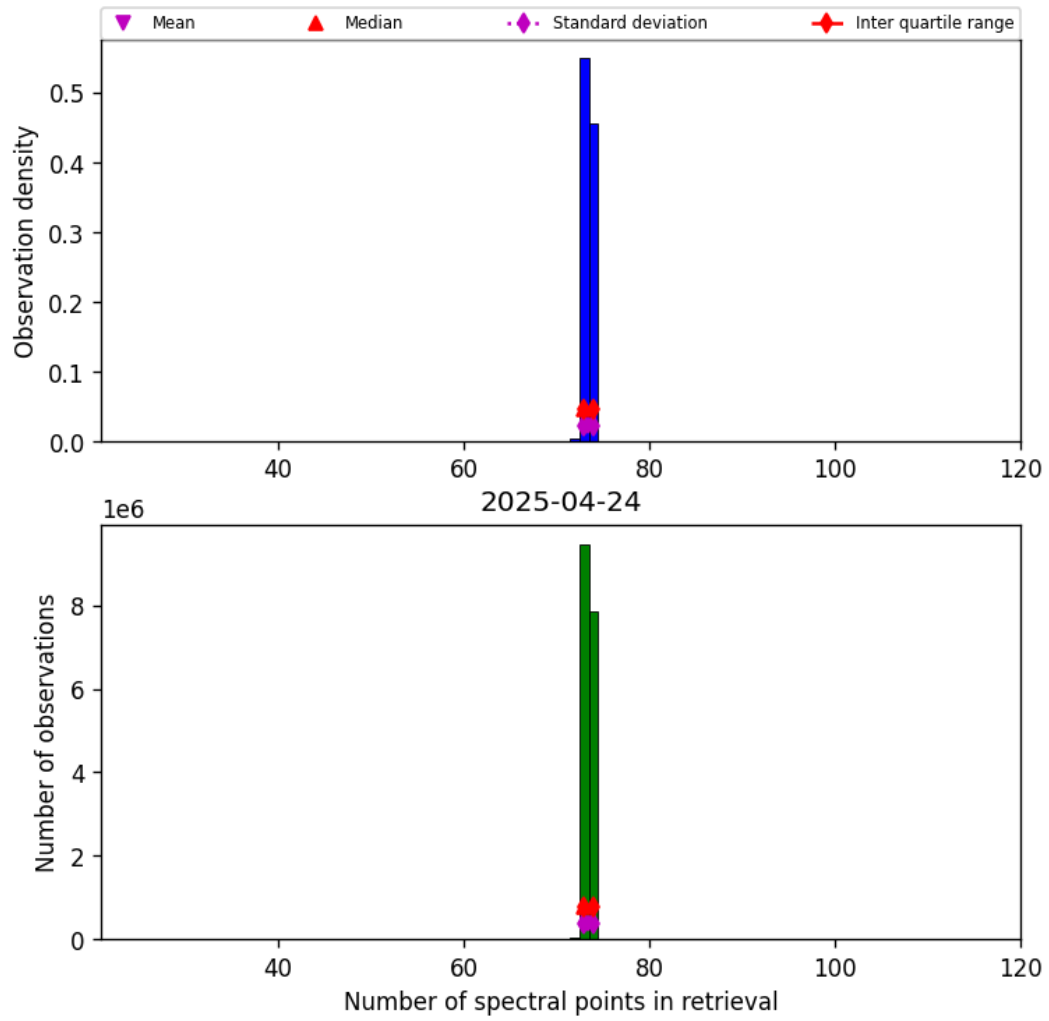


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-04-24 to 2025-04-25

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.

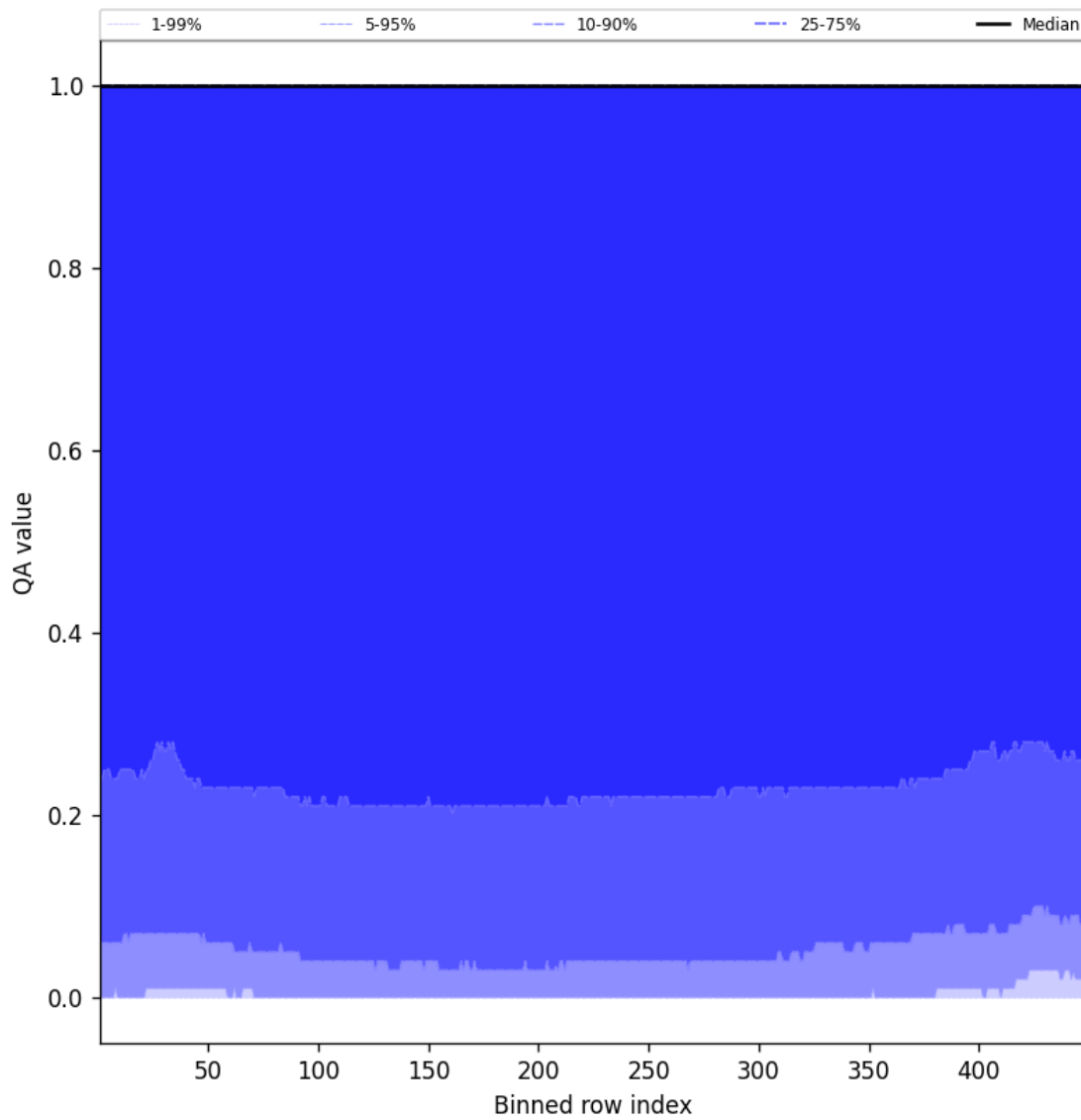


Figure 84: Along track statistics of “QA value” for 2025-04-24 to 2025-04-25

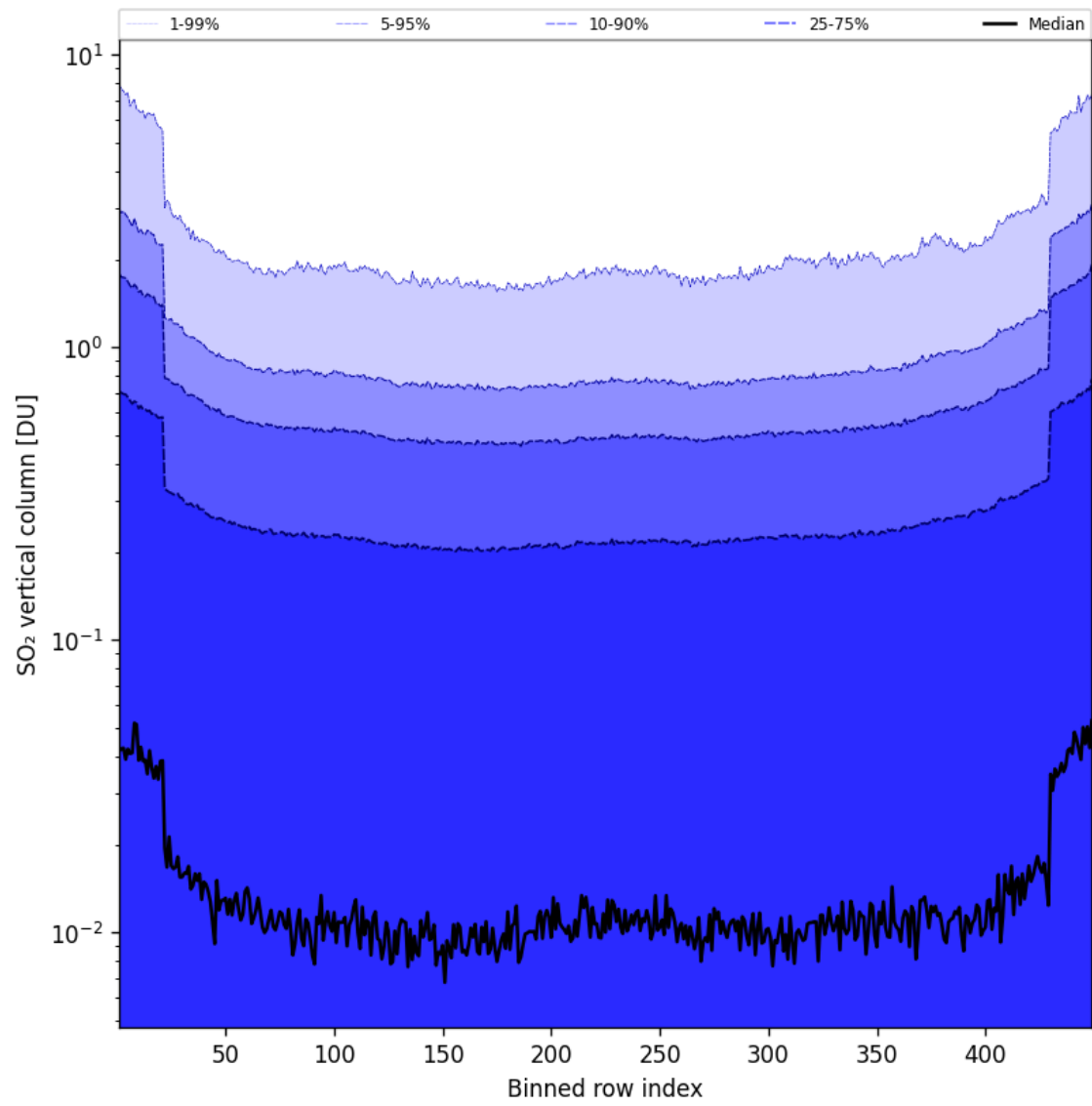


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-04-24 to 2025-04-25

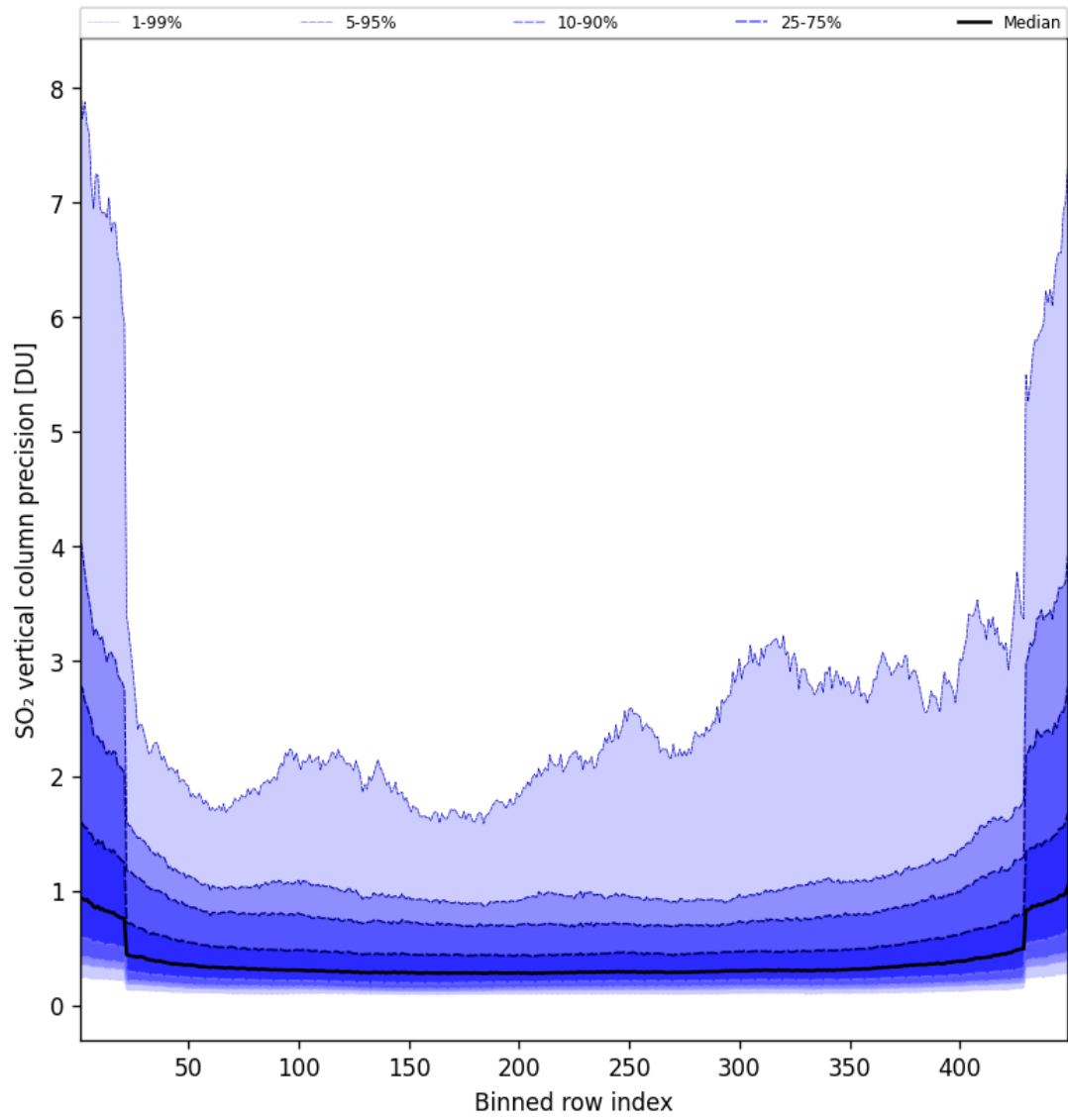


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-04-24 to 2025-04-25

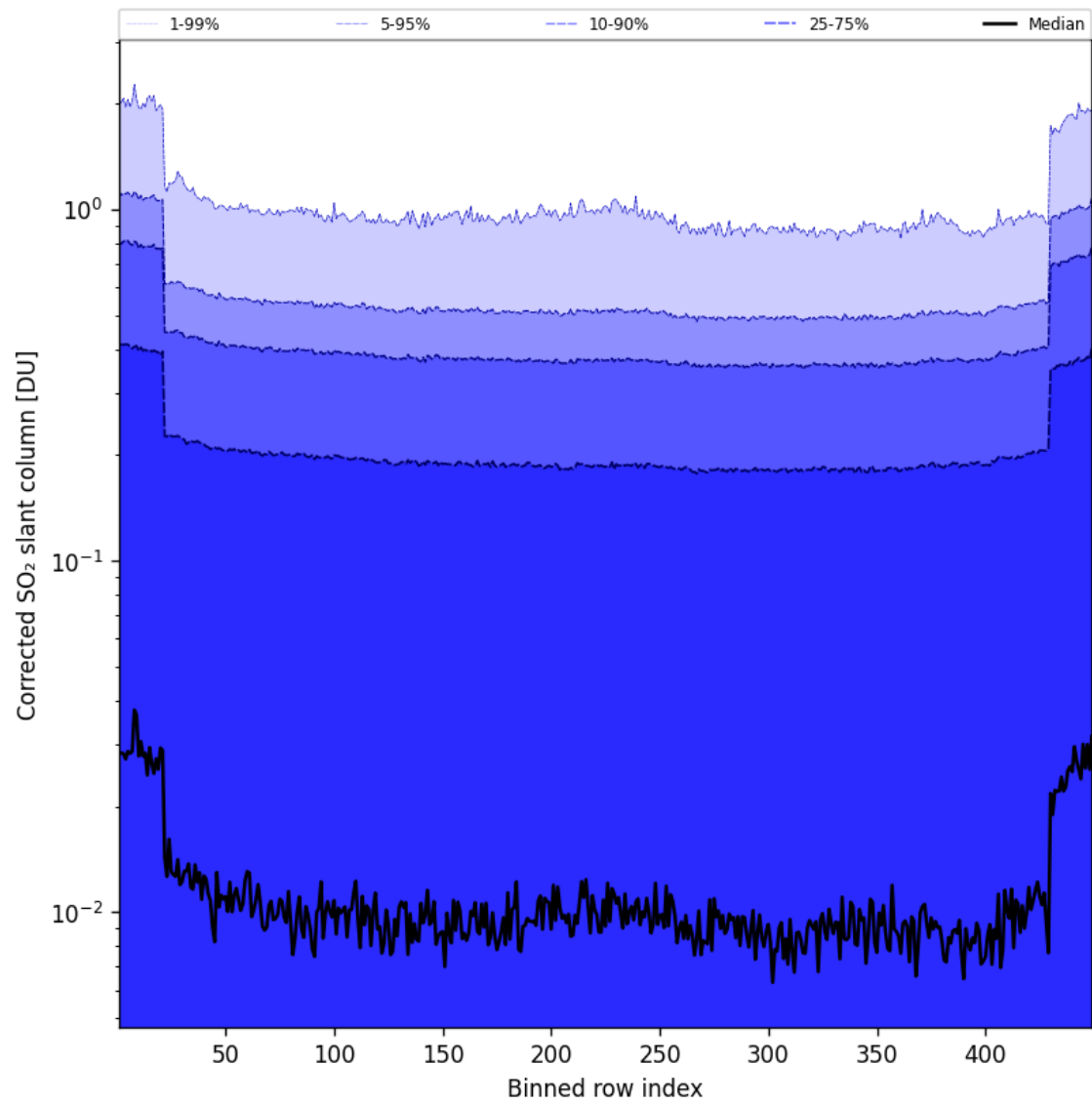


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-04-24 to 2025-04-25

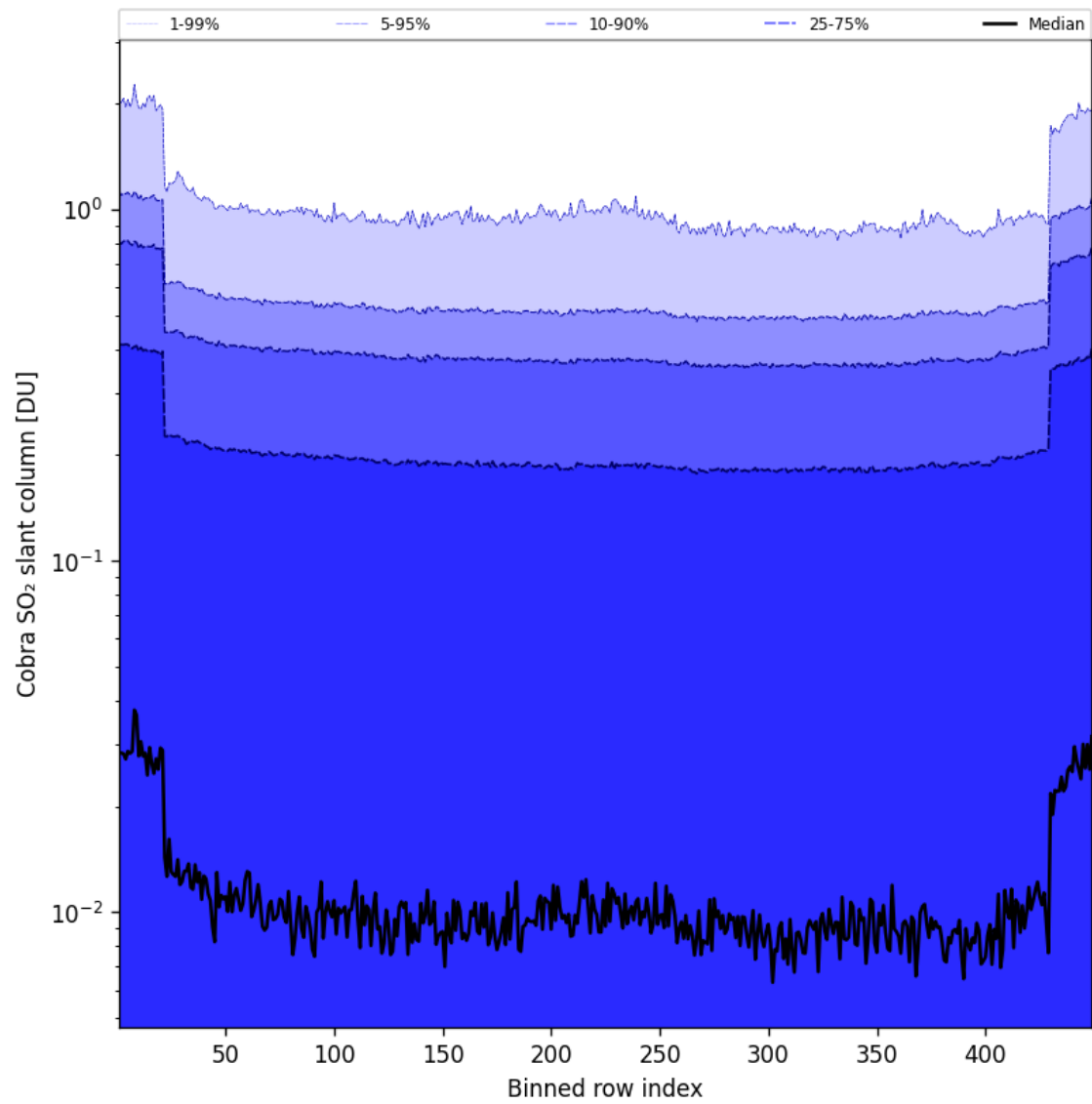


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-04-24 to 2025-04-25

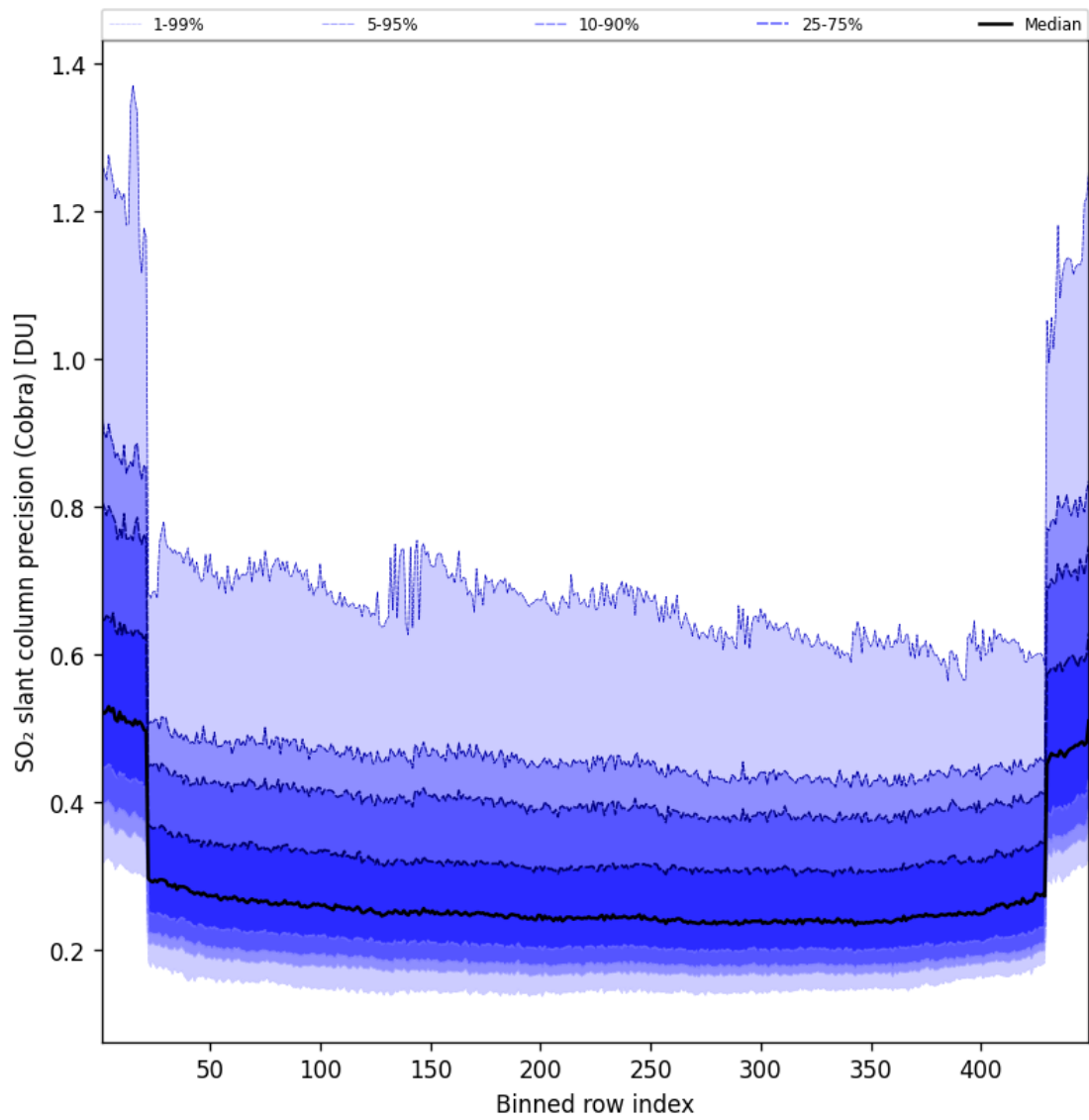


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-04-24 to 2025-04-25

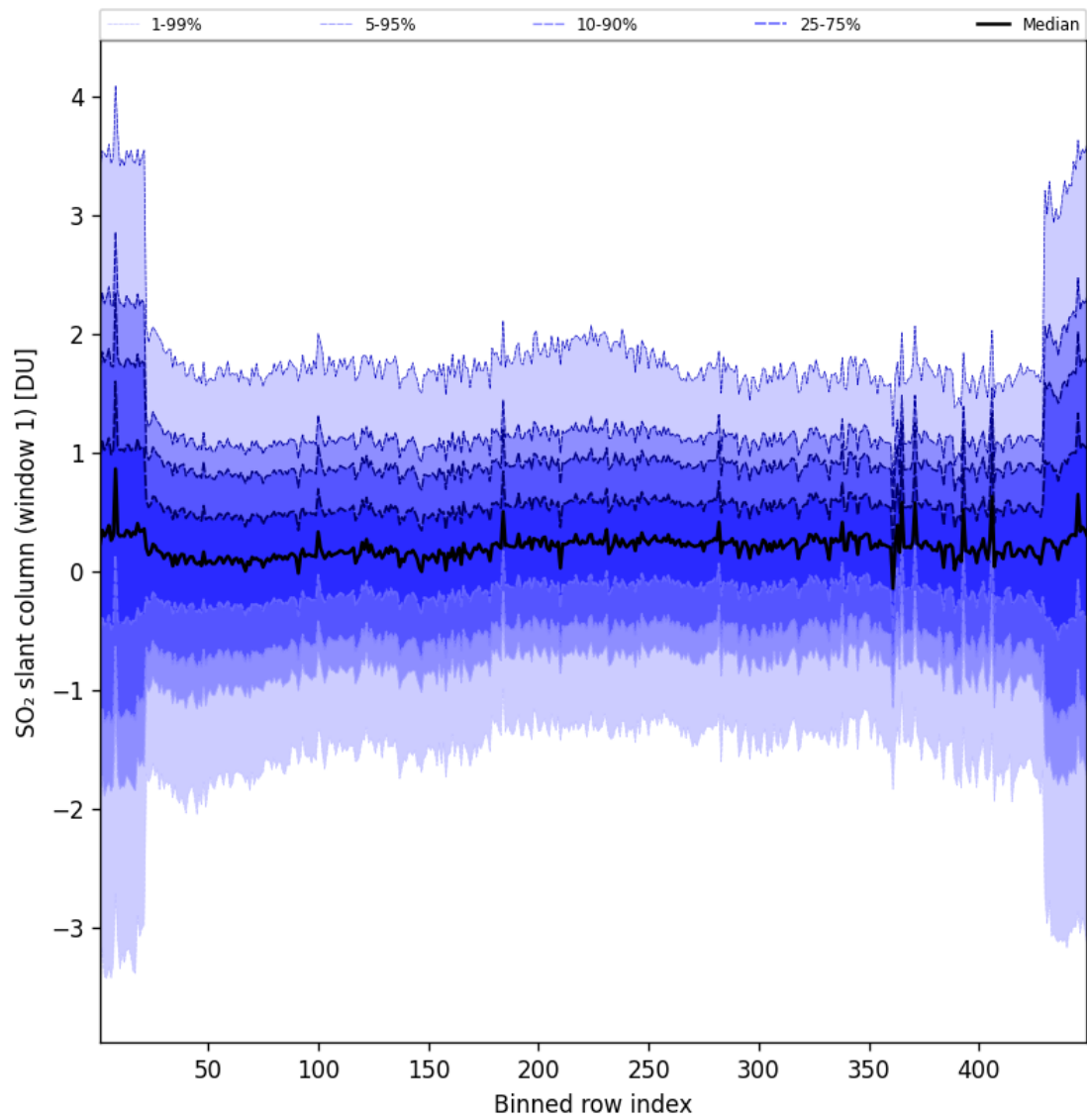


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-04-24 to 2025-04-25

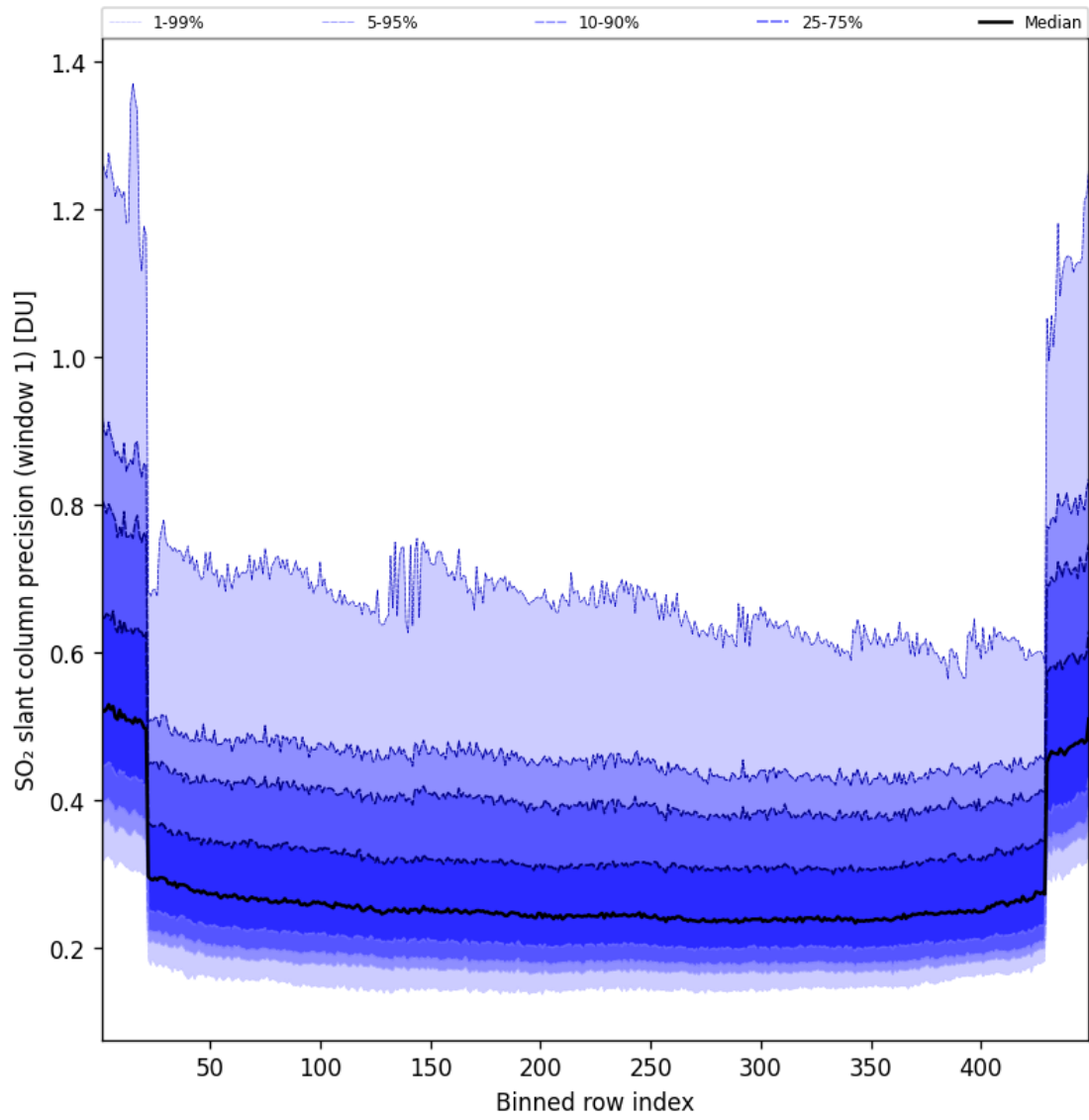


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-04-24 to 2025-04-25

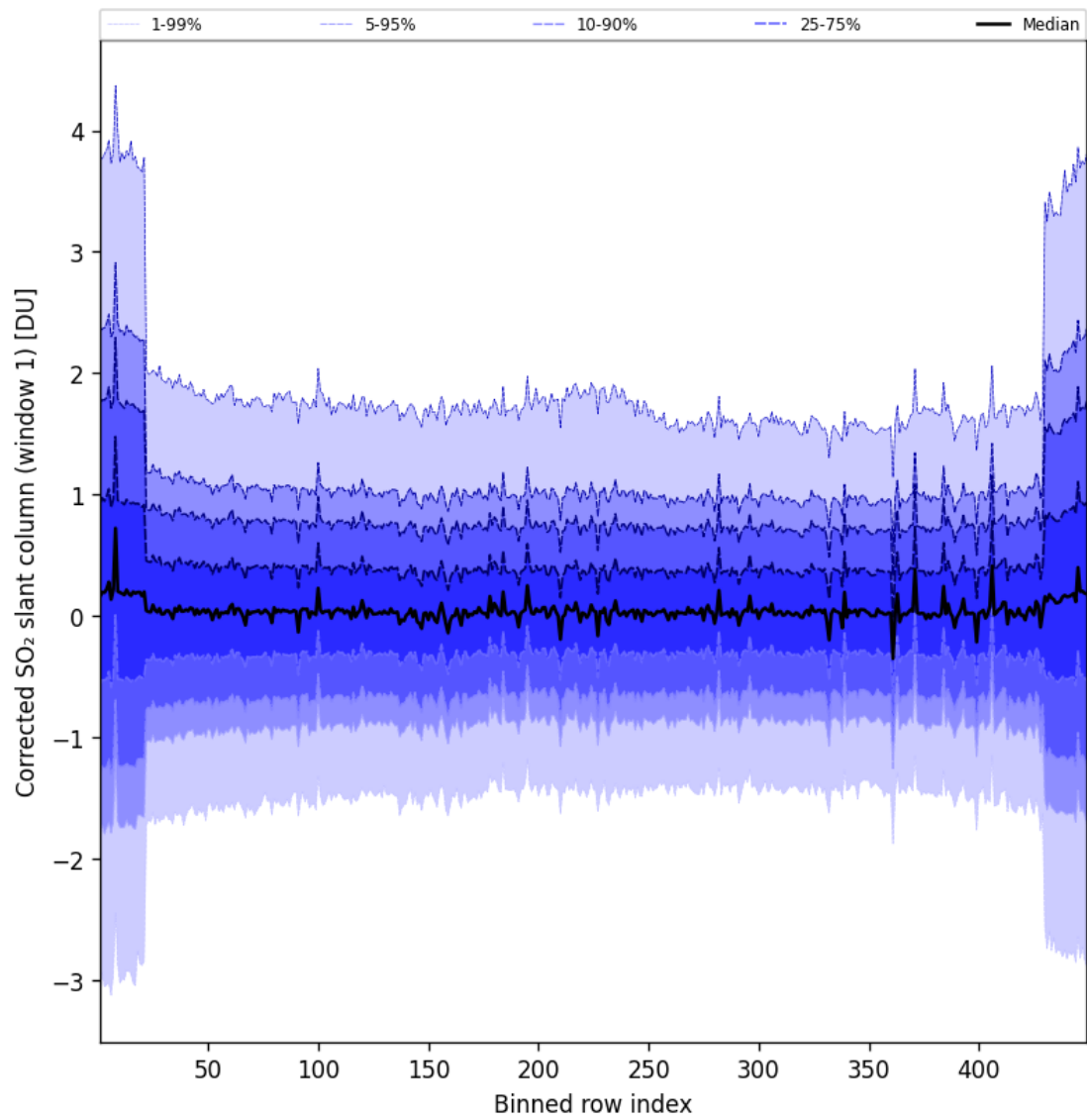


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-04-24 to 2025-04-25

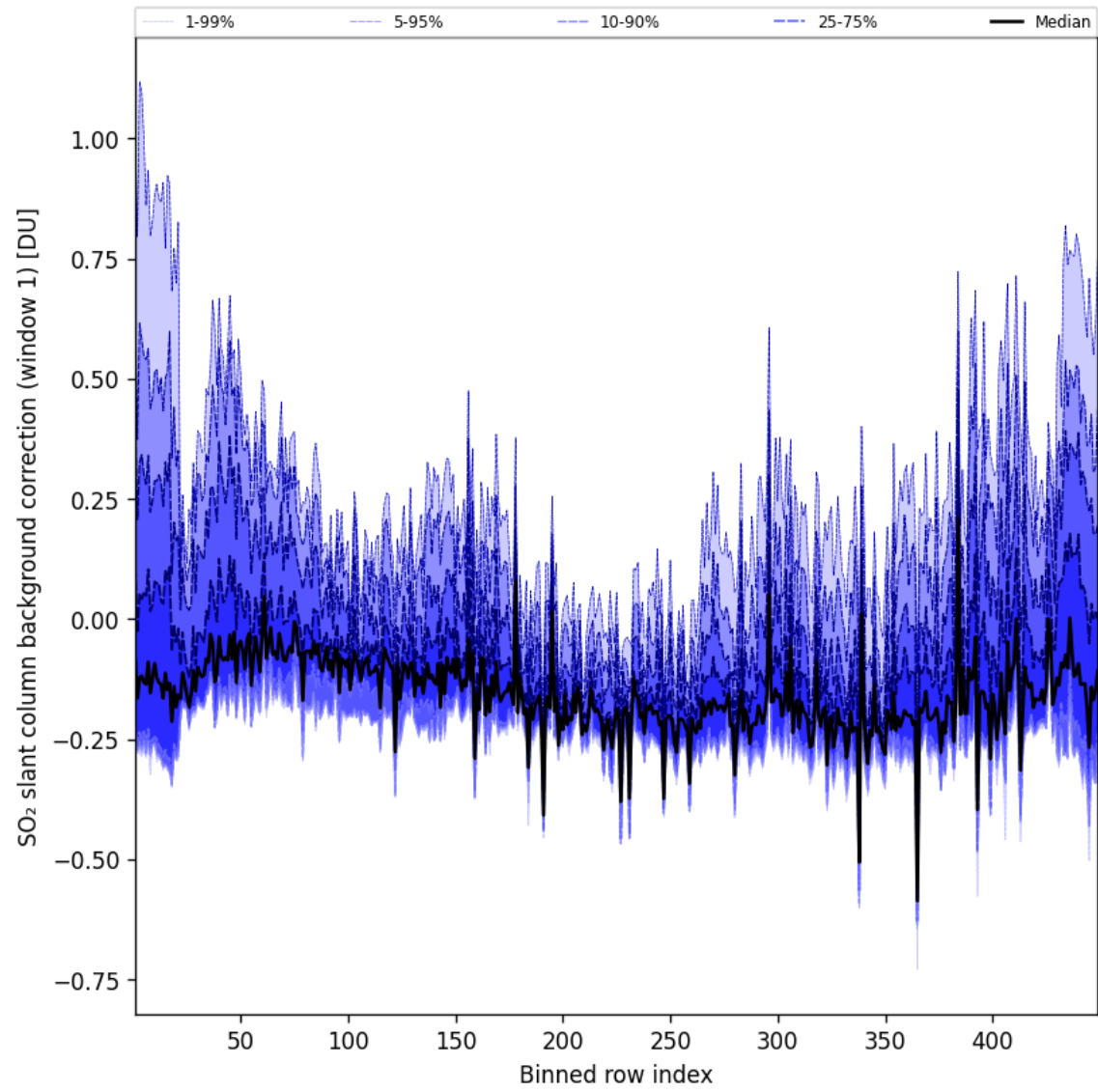


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-04-24 to 2025-04-25

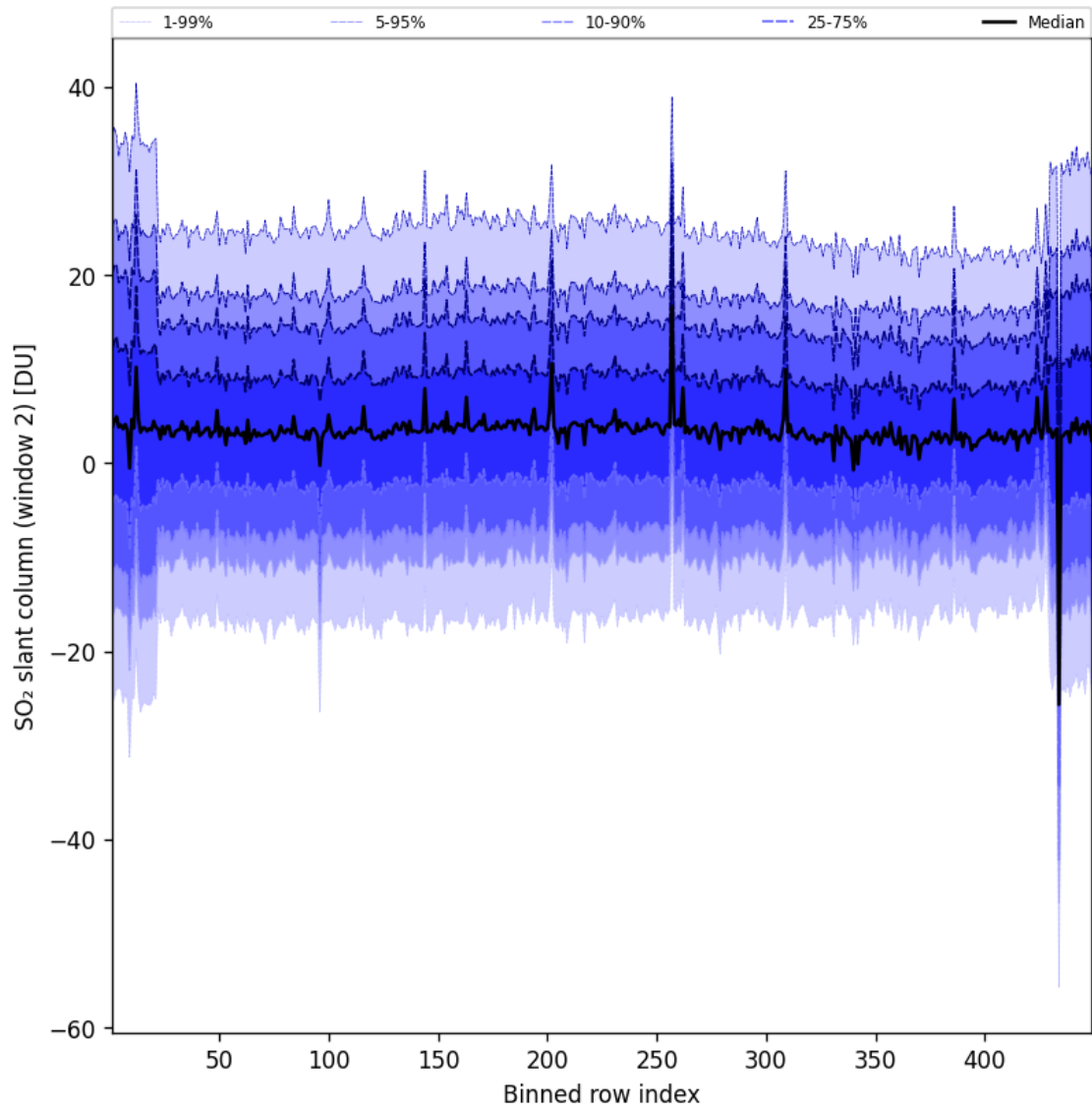


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-04-24 to 2025-04-25

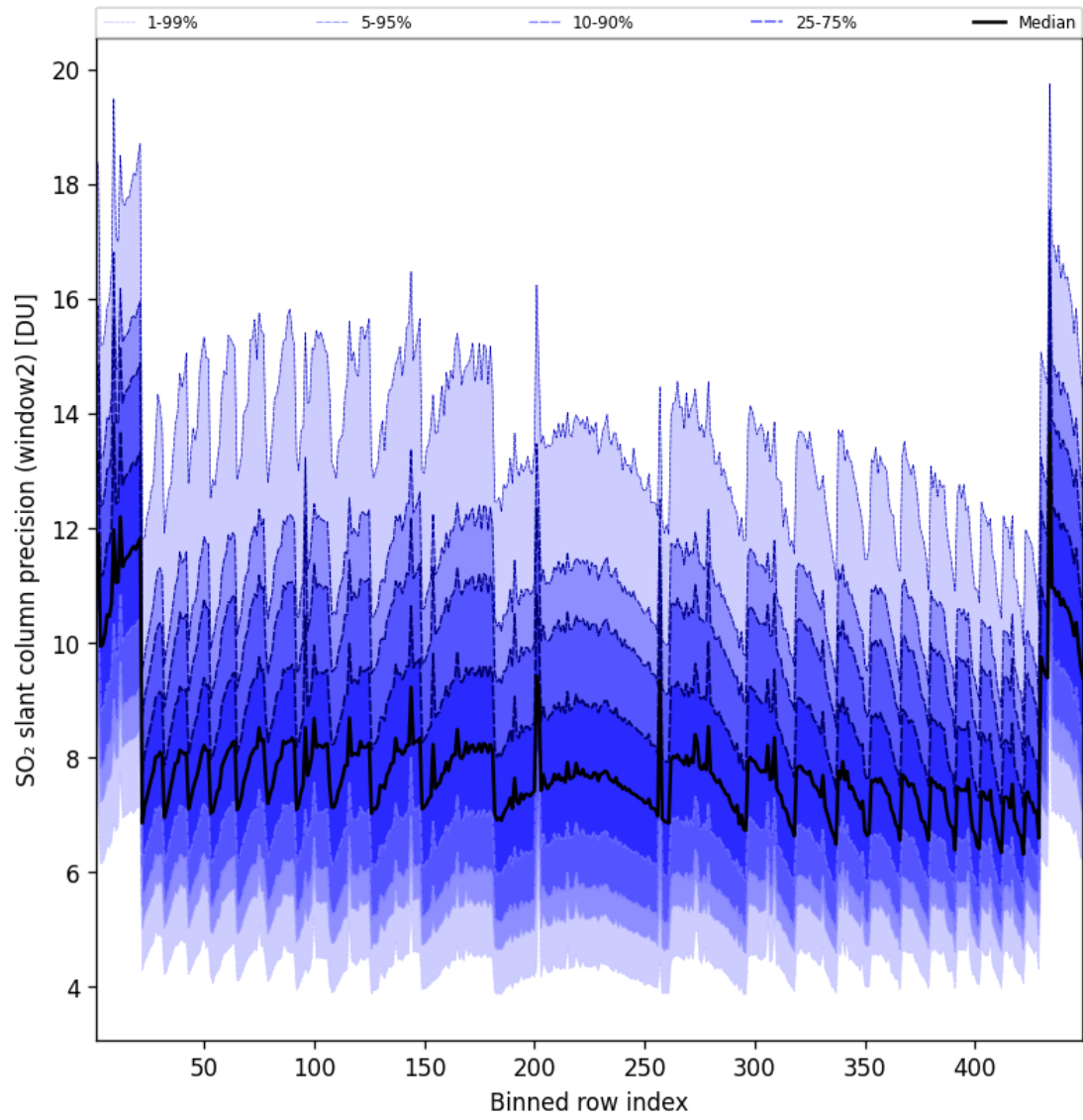


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-04-24 to 2025-04-25

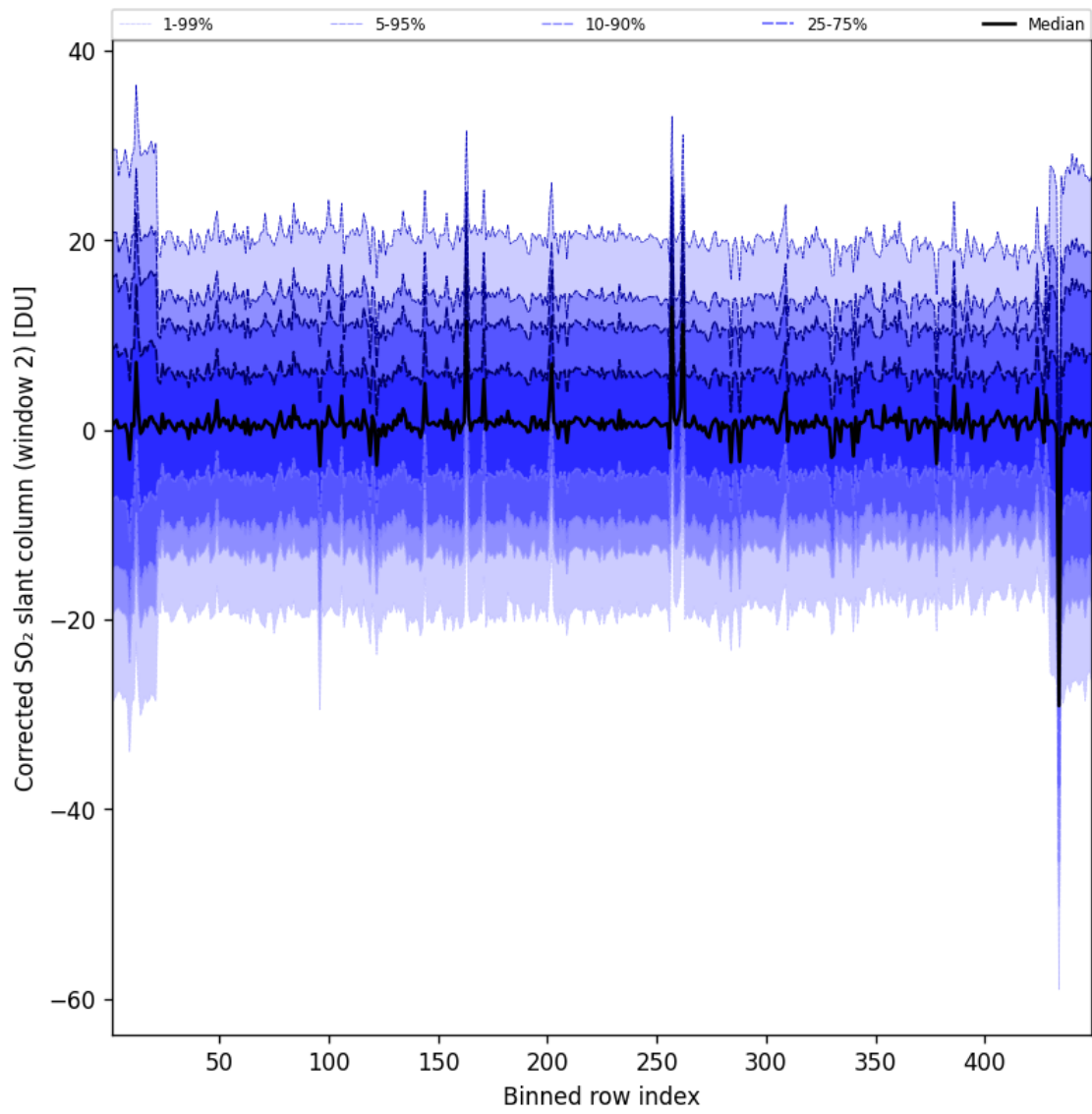


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-04-24 to 2025-04-25

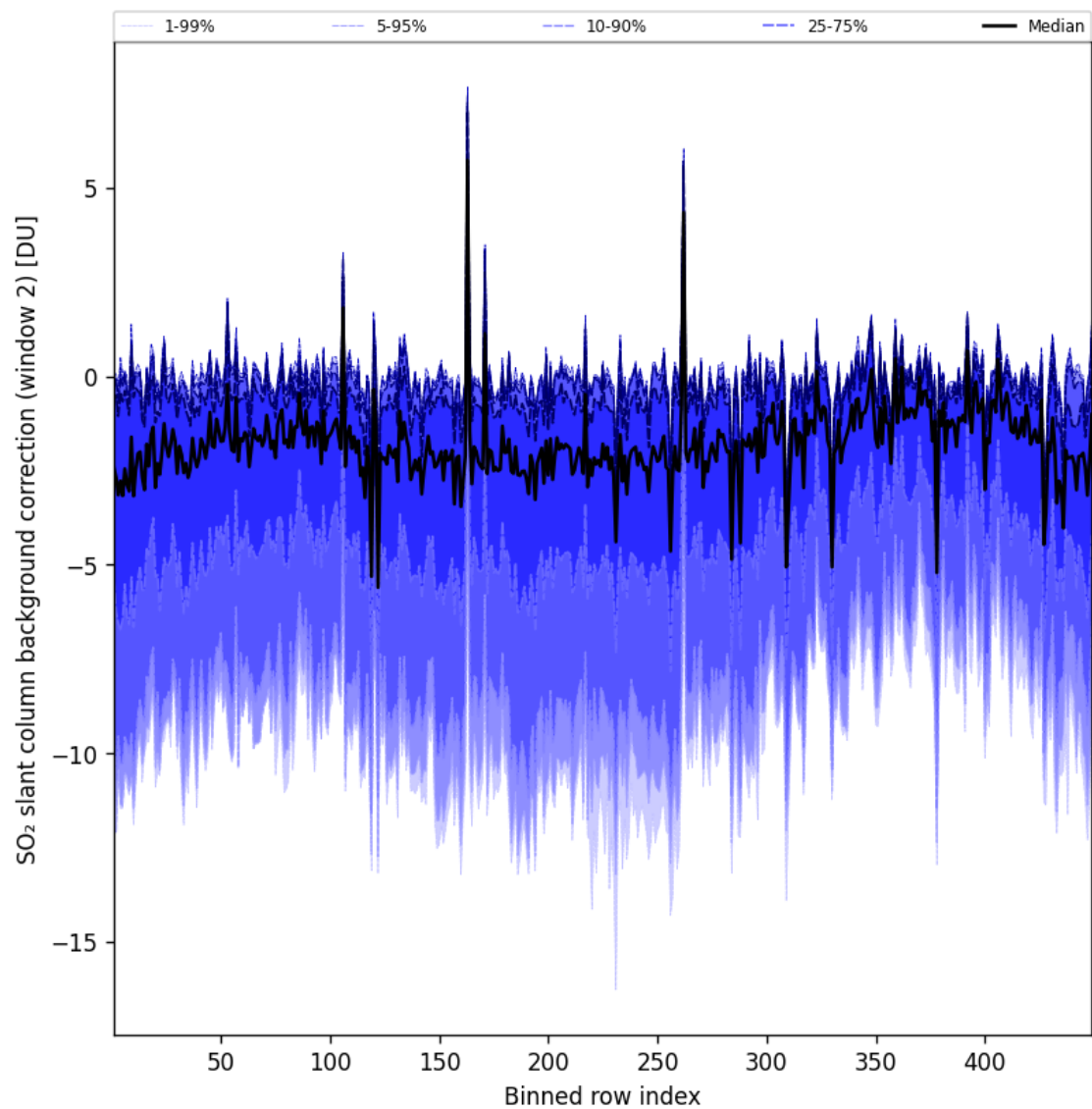


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-04-24 to 2025-04-25

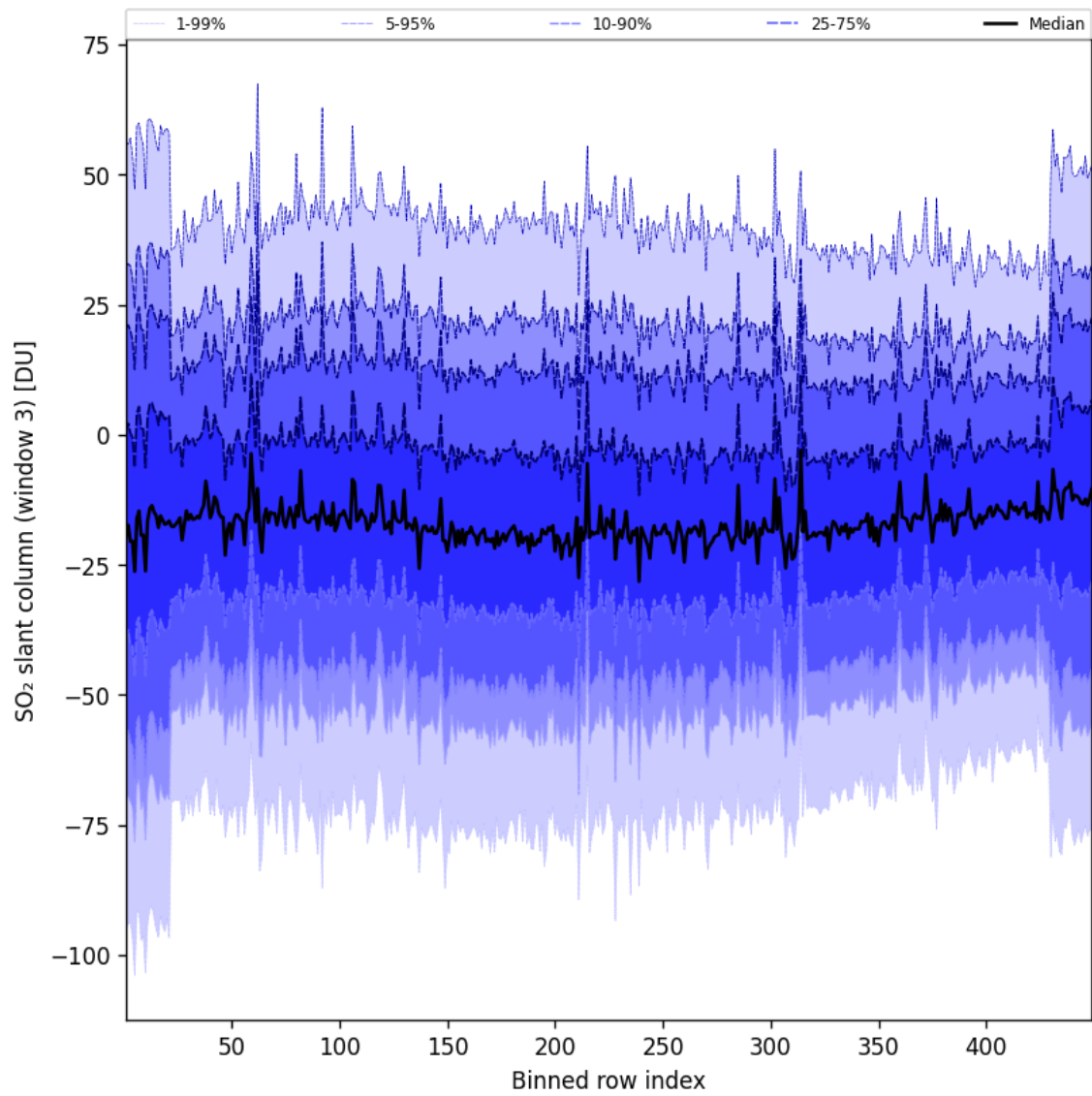


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-04-24 to 2025-04-25

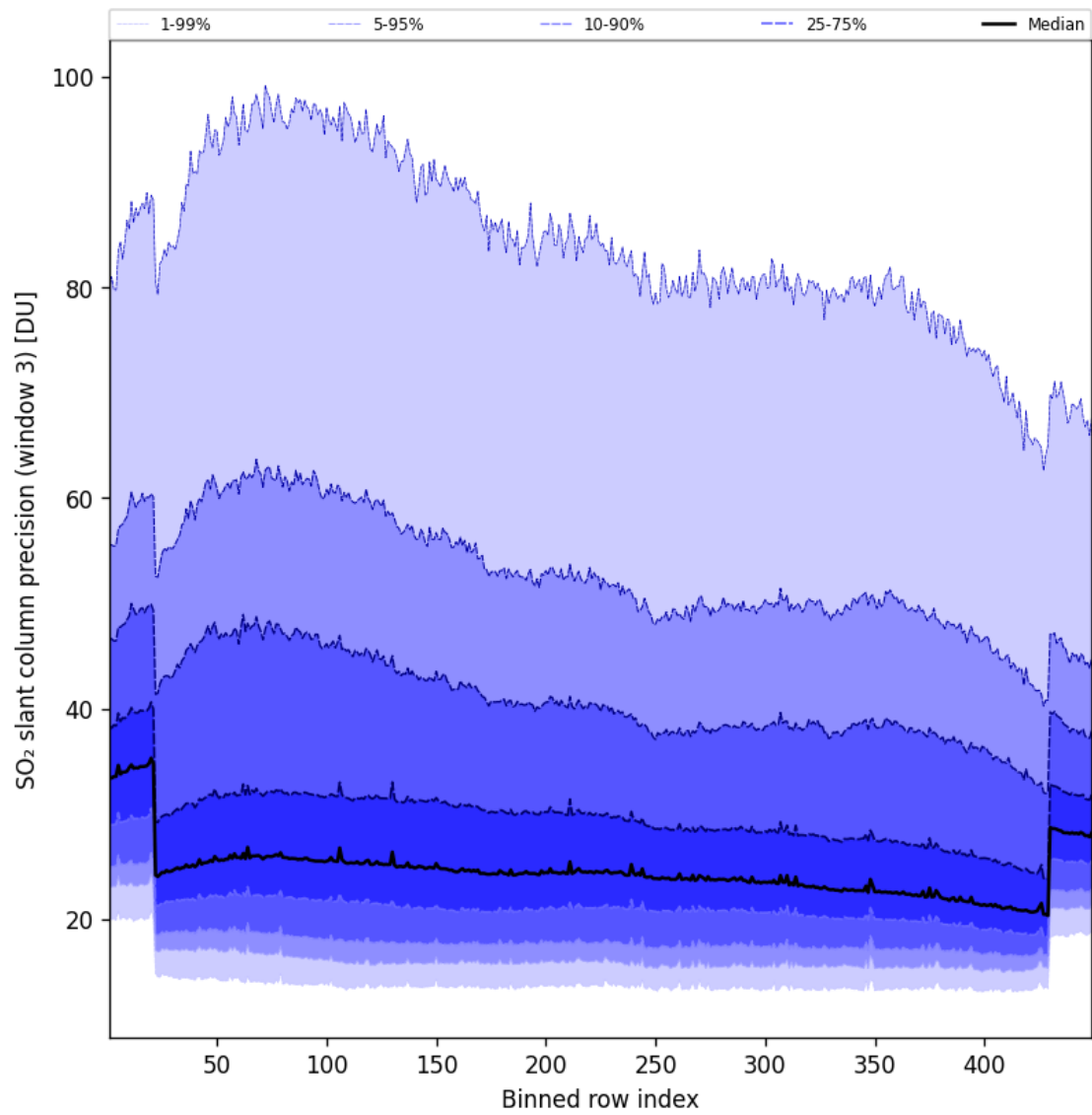


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-04-24 to 2025-04-25

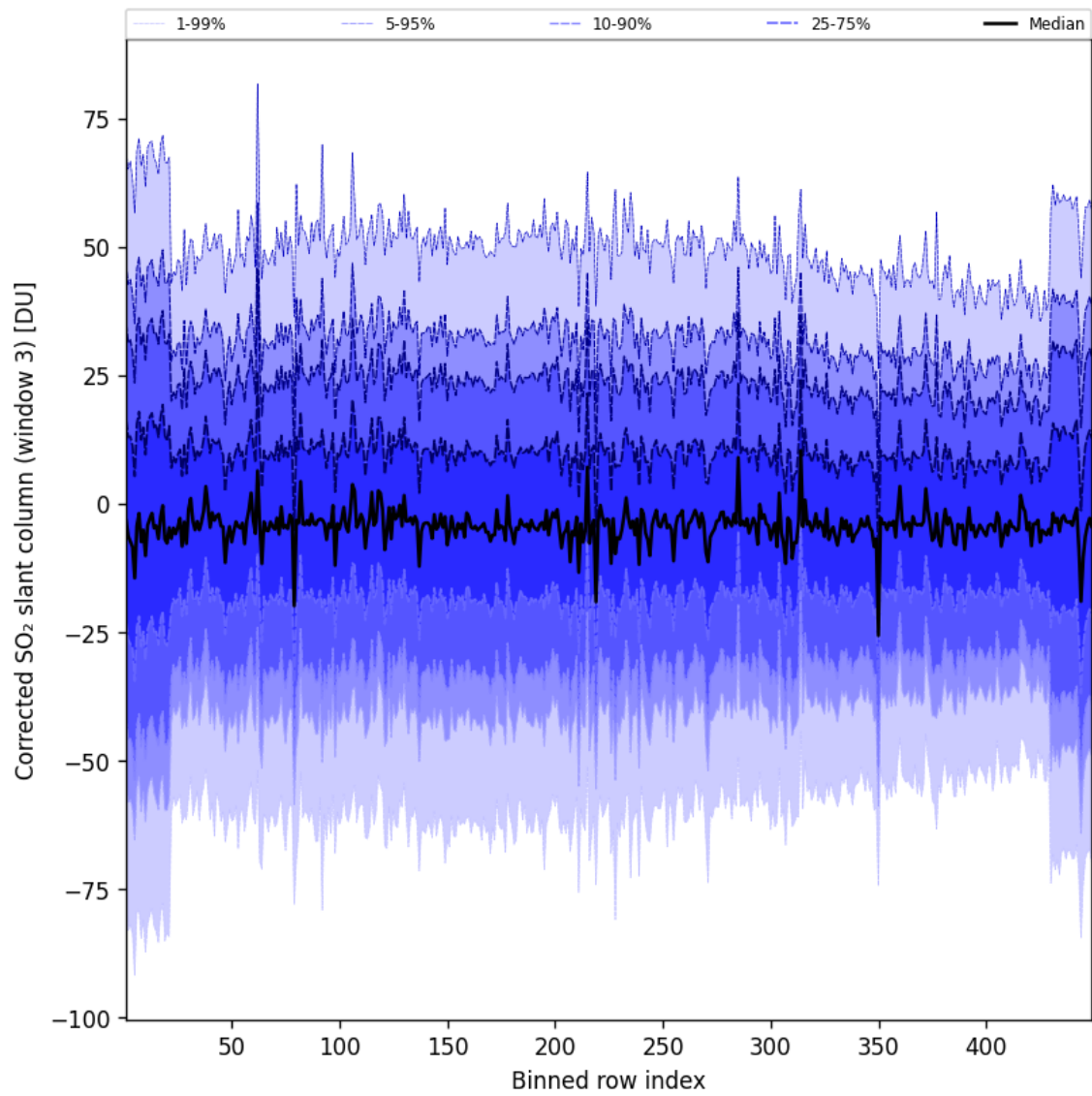


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-04-24 to 2025-04-25

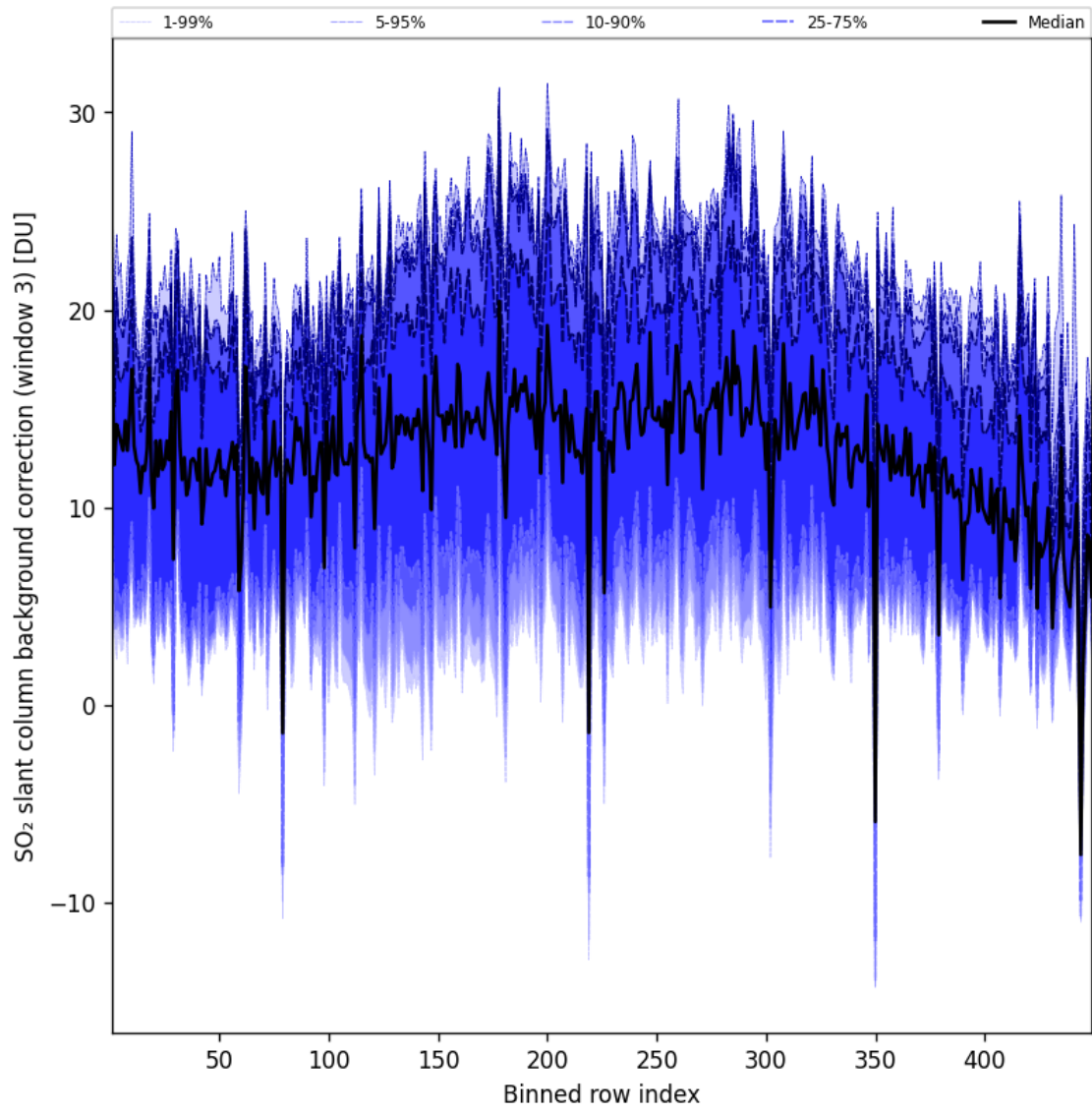


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-04-24 to 2025-04-25

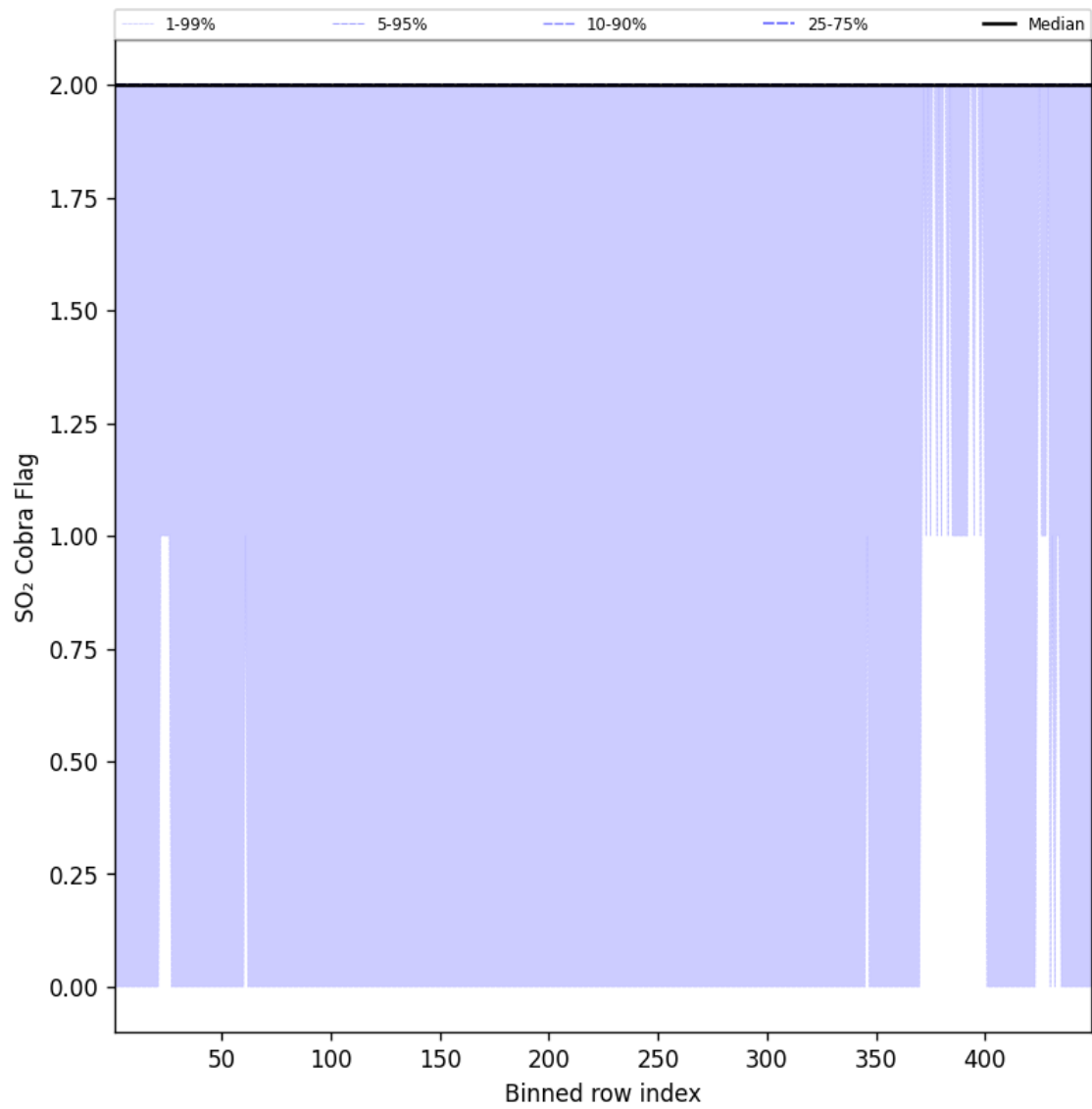


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-04-24 to 2025-04-25

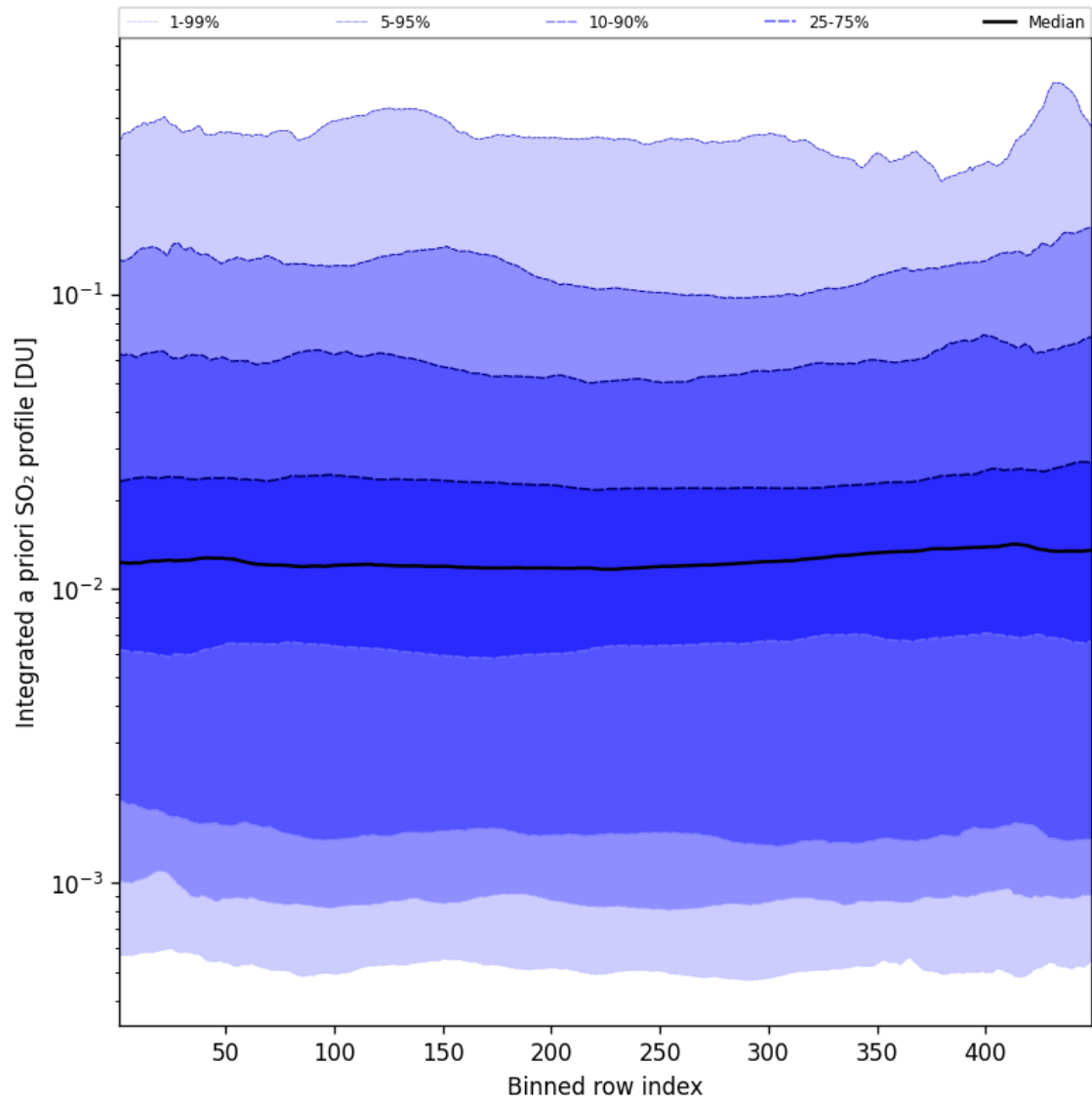


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-04-24 to 2025-04-25

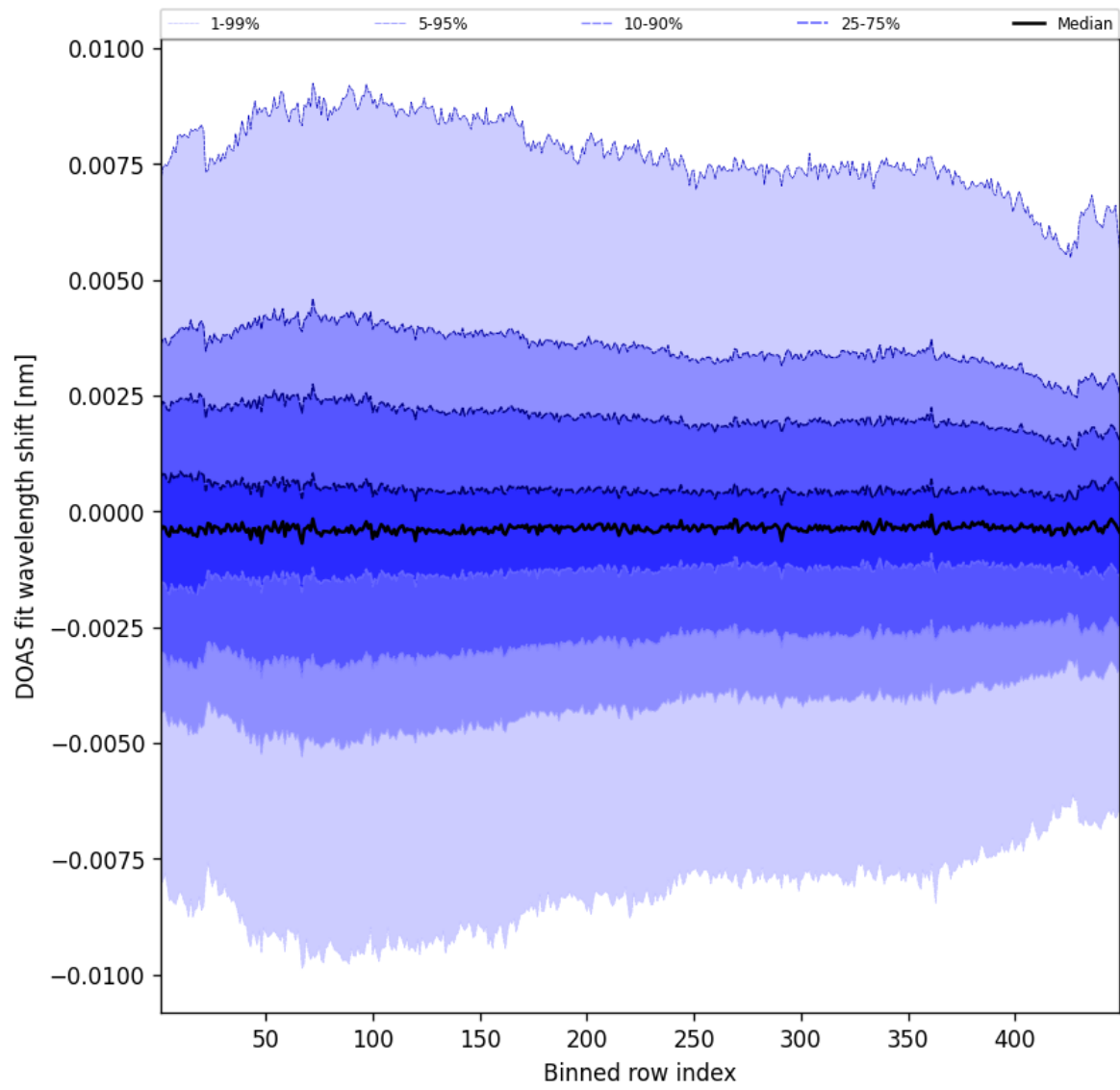


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-04-24 to 2025-04-25

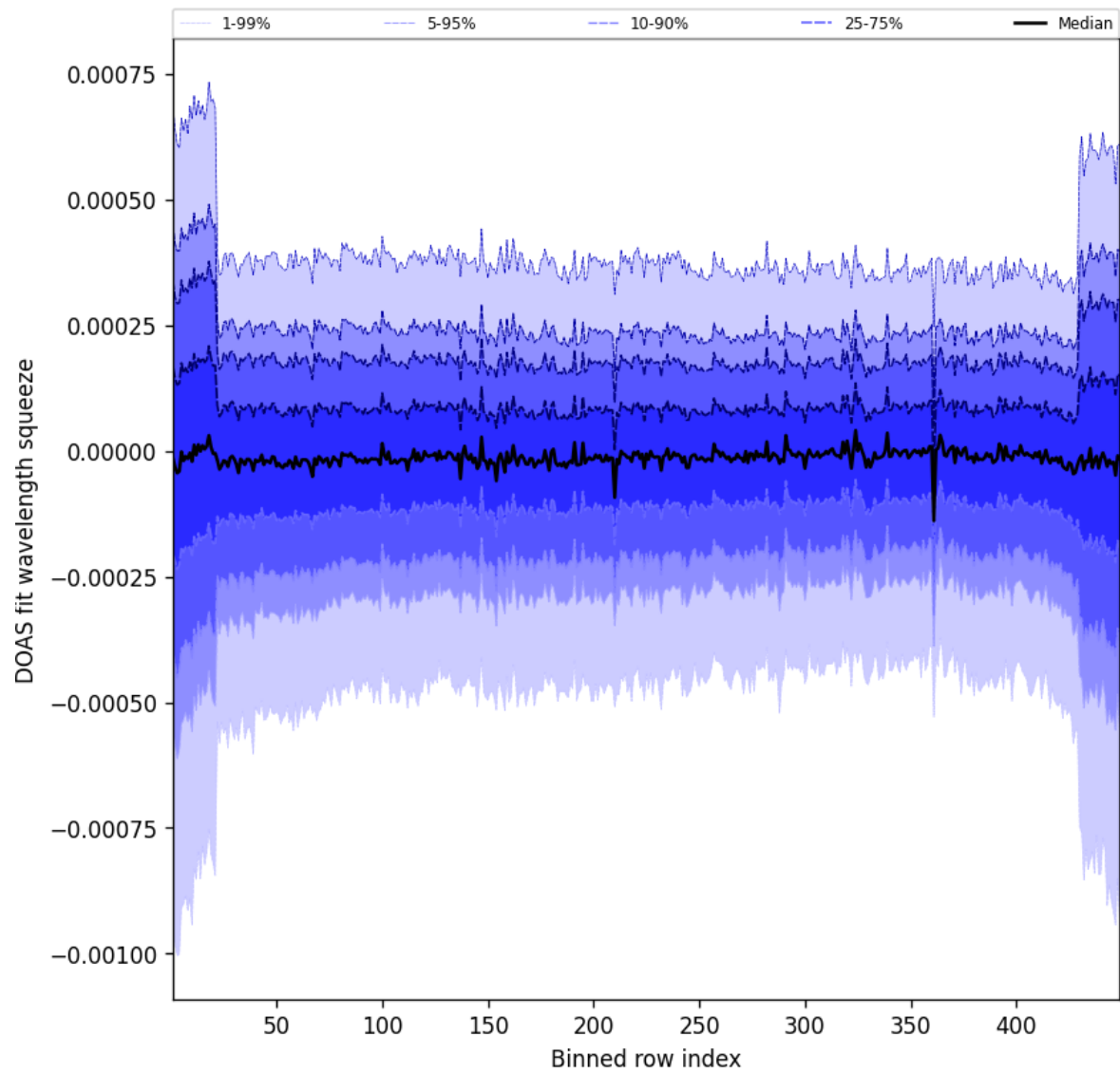


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-04-24 to 2025-04-25

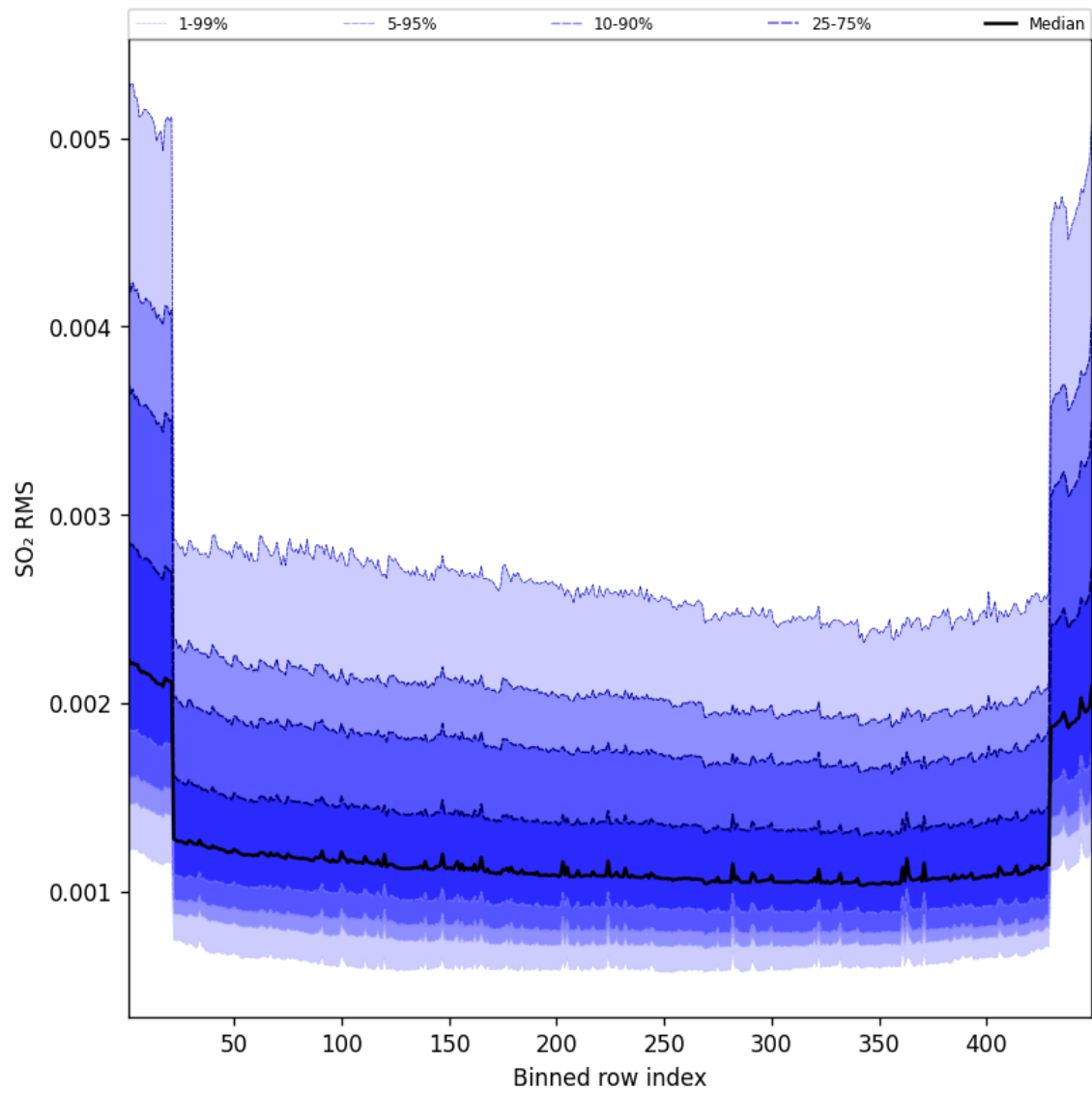


Figure 106: Along track statistics of “SO₂ RMS” for 2025-04-24 to 2025-04-25

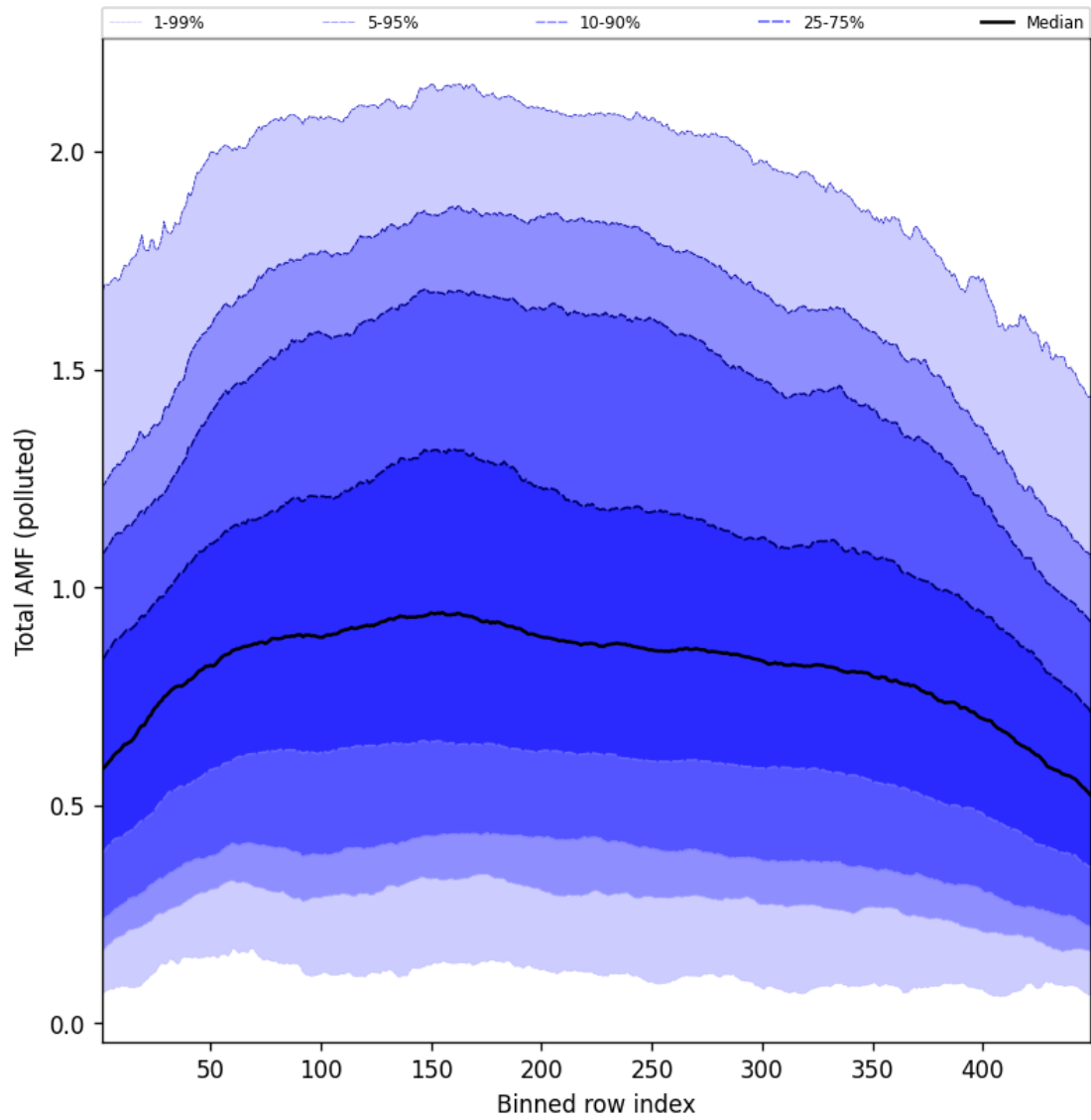


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-04-24 to 2025-04-25

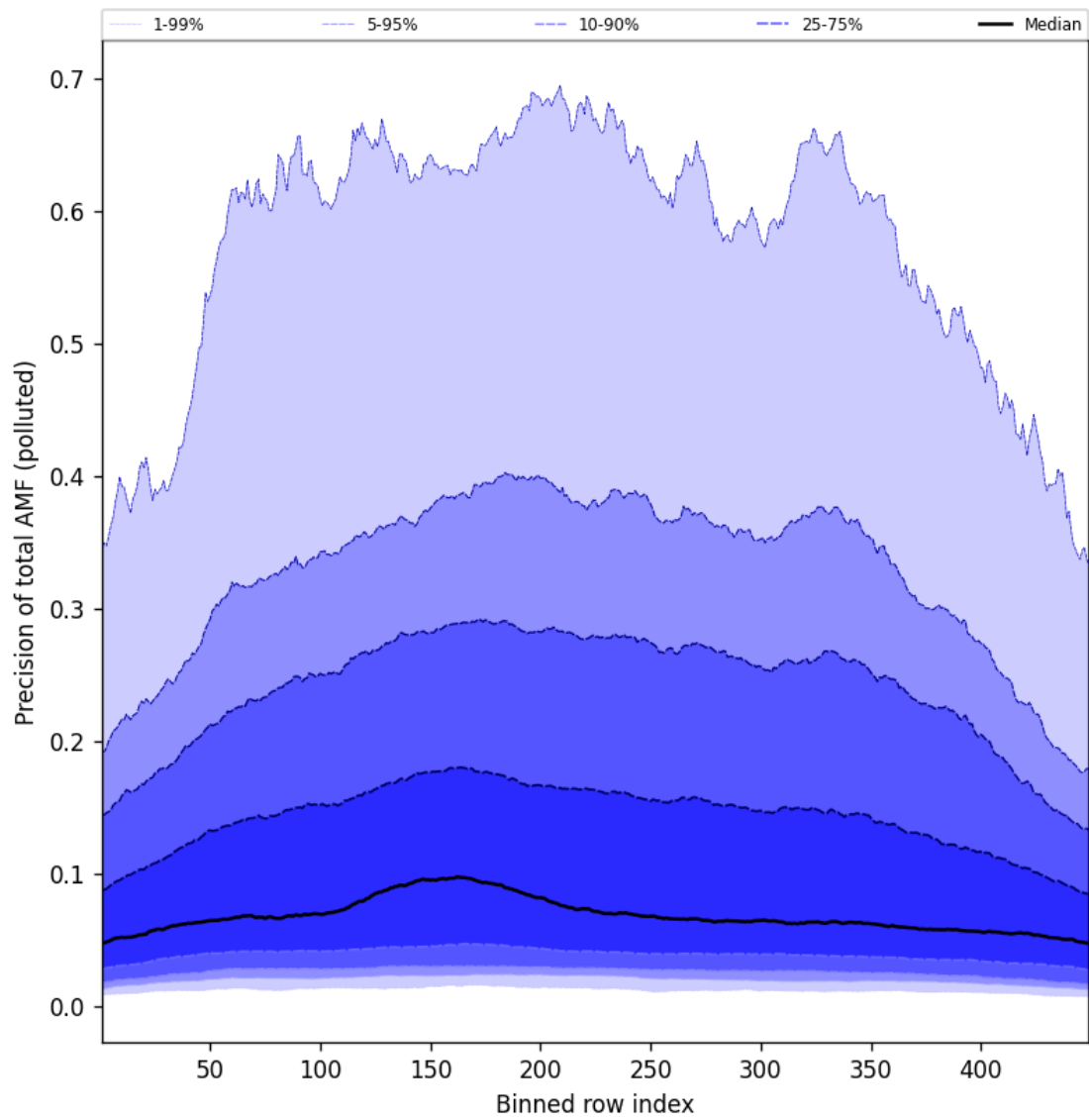


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-04-24 to 2025-04-25

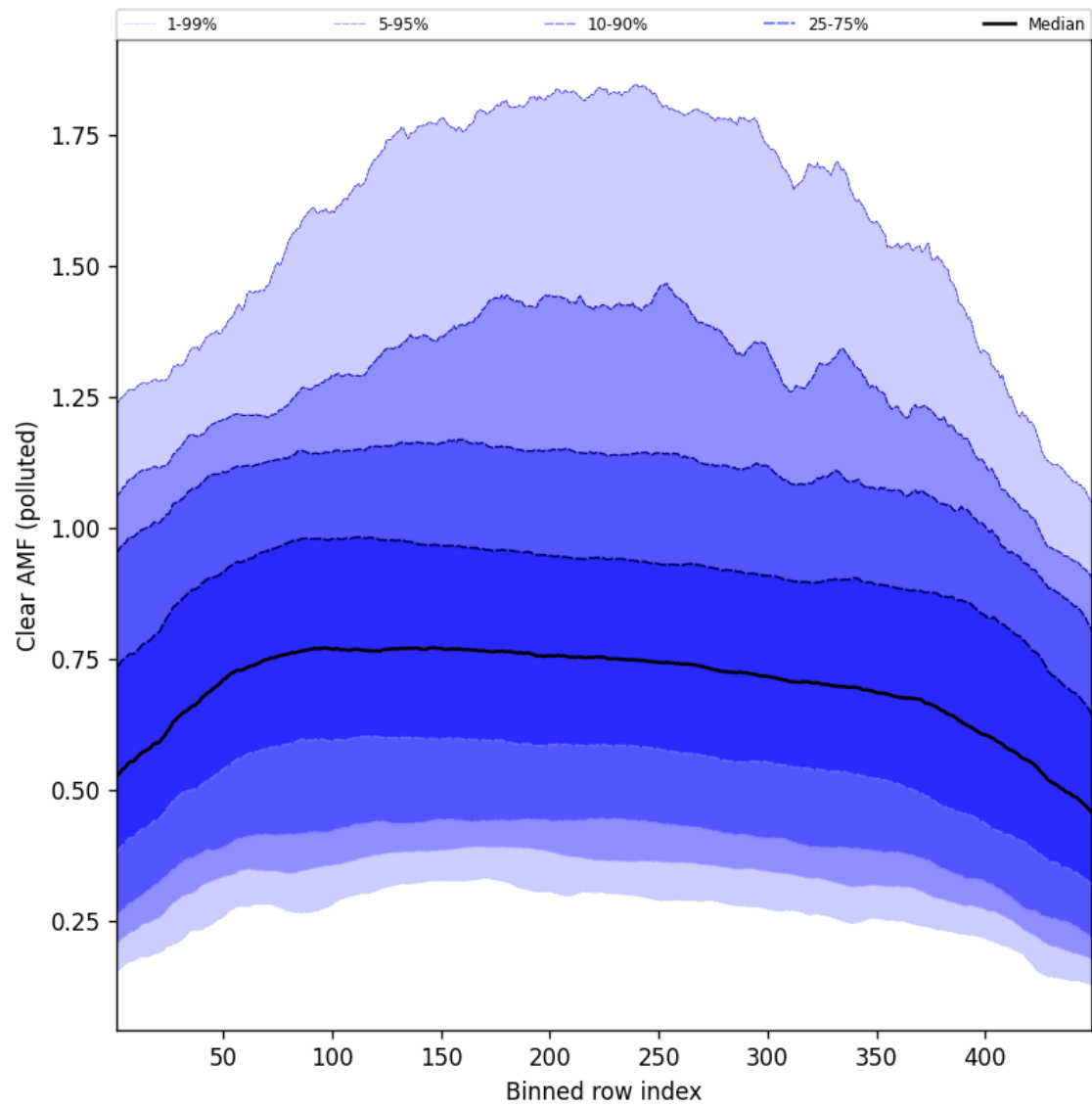


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-04-24 to 2025-04-25

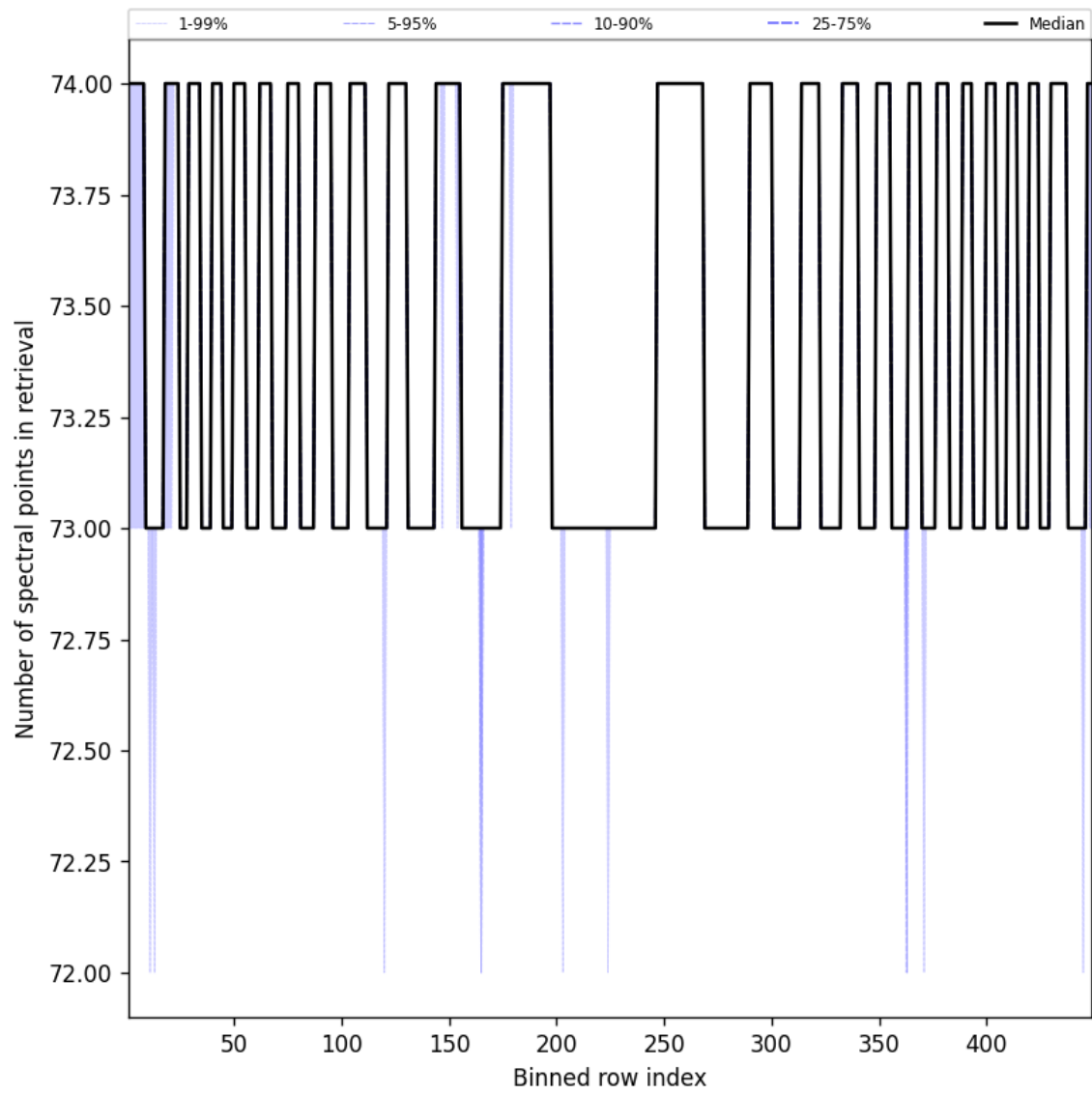


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-04-24 to 2025-04-25

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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Maarten Sneep (maarten.sneep@knmi.nl).