

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]	0.637 ± 0.412	17327738	0.995	0.790	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(4.430 \pm 159.501) \times 10^{-2}$	17327738	0.263	0.465	1.071×10^{-2}	-135	207
sulfurdioxide total vertical column precision [DU]	0.657 ± 1.188	17327738	0.222	0.374	0.328	4.311×10^{-2}	67.6
sulfurdioxide slant column density corrected [DU]	$(1.923 \pm 37.143) \times 10^{-2}$	17327738	0.250	0.356	8.996×10^{-3}	-36.3	50.3
sulfurdioxide slant column density cobra [DU]	$(1.909 \pm 36.397) \times 10^{-2}$	17327738	0.250	0.356	8.996×10^{-3}	-36.3	27.4
sulfurdioxide slant column density cobra precision [DU]	0.290 ± 0.139	17327738	0.213	0.142	0.244	7.935×10^{-2}	22.8
sulfurdioxide slant column density window1 [DU]	0.188 ± 0.696	17327738	0.225	0.731	0.203	-120	106
sulfurdioxide slant column density window1 precision [DU]	0.290 ± 0.139	17327738	0.213	0.142	0.244	7.935×10^{-2}	22.8
sulfurdioxide slant column density corrected win1 [DU]	$(3.395 \pm 68.180) \times 10^{-2}$	17327738	2.500×10^{-2}	0.711	1.395×10^{-2}	-120	106
background so2 slant column offset window1 [DU]	-0.154 ± 0.193	17327738	-0.300	0.210	-0.192	-1.43	4.67
sulfurdioxide slant column density window2 [DU]	1.90 ± 8.99	17327738	1.25	11.3	1.69	-1.257×10^3	1.000×10^3
sulfurdioxide slant column density window2 precision [DU]	8.02 ± 2.21	17327738	7.43	2.54	7.70	2.06	514
sulfurdioxide slant column density corrected win2 [DU]	0.160 ± 8.689	17327738	0.750	11.0	0.186	-1.257×10^3	1.001×10^3
background so2 slant column offset window2 [DU]	-1.74 ± 2.71	17327738	0.250	3.57	-0.813	-19.0	9.85
sulfurdioxide slant column density window3 [DU]	-9.14 ± 24.16	17327738	-10.6	30.5	-9.36	-1.341×10^3	253
sulfurdioxide slant column density window3 precision [DU]	27.6 ± 13.0	17327738	22.5	9.41	24.2	9.49	1.173×10^3
sulfurdioxide slant column density corrected win3 [DU]	2.34 ± 23.10	17327738	1.68	29.1	2.28	-1.336×10^3	268
background so2 slant column offset window3 [DU]	11.5 ± 7.3	17327738	7.28	11.8	11.1	-9.96	53.6
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.22	17327738	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.172 \pm 6.425) \times 10^{-2}$	17327738	1.664×10^{-2}	1.669×10^{-2}	1.637×10^{-2}	4.254×10^{-4}	2.56
fitted radiance shift [nm]	$(-4.373 \pm 25.426) \times 10^{-4}$	17327738	-5.000×10^{-4}	1.804×10^{-3}	-4.311×10^{-4}	-5.266×10^{-2}	7.106×10^{-2}
fitted radiance squeeze [1]	$(-2.422 \pm 18.996) \times 10^{-5}$	17327738	-1.000×10^{-5}	2.055×10^{-4}	-1.705×10^{-5}	-1.371×10^{-2}	2.104×10^{-2}
fitted root mean square [1]	$(1.273 \pm 0.576) \times 10^{-3}$	17327738	9.250×10^{-4}	5.784×10^{-4}	1.093×10^{-3}	3.224×10^{-4}	6.089×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.821 ± 0.449	17327738	0.780	0.552	0.768	5.000×10^{-2}	2.83
sulfurdioxide total air mass factor polluted precision [1]	0.116 ± 0.128	17327738	3.500×10^{-2}	0.118	6.589×10^{-2}	2.500×10^{-3}	1.81
sulfurdioxide clear air mass factor polluted [1]	0.706 ± 0.339	17327738	0.620	0.384	0.671	4.171×10^{-2}	2.94
number of spectral points in retrieval [1]	73.4 ± 0.5	17327738	73.0	1.000	73.0	53.0	74.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	4.000×10^{-2}	0.1000	0.210	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-3.56	-1.04	-0.580	-0.377	-0.218	0.247	0.421	0.651	1.18	4.16
sulfurdioxide total vertical column precision [DU]	9.870×10^{-2}	0.132	0.159	0.184	0.217	0.591	0.862	1.29	2.18	5.76
sulfurdioxide slant column density corrected [DU]	-0.864	-0.487	-0.349	-0.260	-0.167	0.189	0.287	0.386	0.545	1.05
sulfurdioxide slant column density cobra [DU]	-0.864	-0.487	-0.349	-0.260	-0.167	0.189	0.287	0.386	0.545	1.05
sulfurdioxide slant column density cobra precision [DU]	0.137	0.162	0.175	0.186	0.200	0.341	0.401	0.461	0.548	0.805
sulfurdioxide slant column density window1 [DU]	-1.76	-0.885	-0.571	-0.371	-0.169	0.562	0.750	0.931	1.21	1.98
sulfurdioxide slant column density window1 precision [DU]	0.137	0.162	0.175	0.186	0.200	0.341	0.401	0.461	0.548	0.805
sulfurdioxide slant column density corrected win1 [DU]	-1.68	-0.953	-0.692	-0.518	-0.336	0.375	0.574	0.772	1.09	2.00
background so2 slant column offset window1 [DU]	-0.489	-0.360	-0.326	-0.307	-0.282	-7.196×10^{-2}	4.837×10^{-3}	8.606×10^{-2}	0.198	0.454
sulfurdioxide slant column density window2 [DU]	-18.9	-12.3	-9.04	-6.62	-3.89	7.46	10.4	13.1	16.8	24.7
sulfurdioxide slant column density window2 precision [DU]	4.28	5.16	5.68	6.09	6.58	9.12	9.97	10.8	11.9	14.5
sulfurdioxide slant column density corrected win2 [DU]	-20.9	-13.9	-10.6	-8.09	-5.33	5.67	8.40	10.8	14.2	21.1
background so2 slant column offset window2 [DU]	-9.35	-7.07	-5.84	-4.73	-3.33	0.244	0.501	0.711	1.05	2.10
sulfurdioxide slant column density window3 [DU]	-68.2	-48.4	-38.9	-32.0	-24.4	6.08	14.0	21.2	30.9	50.0
sulfurdioxide slant column density window3 precision [DU]	13.4	15.7	17.5	18.9	20.5	29.9	34.6	40.4	52.2	83.2
sulfurdioxide slant column density corrected win3 [DU]	-54.9	-35.4	-26.1	-19.5	-12.2	16.9	24.4	31.1	40.2	58.7
background so2 slant column offset window3 [DU]	-1.59	0.747	2.10	3.52	5.51	17.3	19.5	21.2	23.3	26.7
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]	1.809×10^{-3}	3.623×10^{-3}	5.483×10^{-3}	7.491×10^{-3}	9.948×10^{-3}	2.664×10^{-2}	3.624×10^{-2}	5.312×10^{-2}	0.110	0.338
fitted radiance shift [nm]	-8.098×10^{-3}	-4.217×10^{-3}	-2.851×10^{-3}	-2.066×10^{-3}	-1.376×10^{-3}	4.280×10^{-4}	1.116×10^{-3}	1.972×10^{-3}	3.462×10^{-3}	7.555×10^{-3}
fitted radiance squeeze [1]	-5.745×10^{-4}	-3.311×10^{-4}	-2.390×10^{-4}	-1.806×10^{-4}	-1.222×10^{-4}	8.334×10^{-5}	1.354×10^{-4}	1.850×10^{-4}	2.598×10^{-4}	4.470×10^{-4}
fitted root mean square [1]	5.812×10^{-4}	7.144×10^{-4}	7.859×10^{-4}	8.406×10^{-4}	9.079×10^{-4}	1.486×10^{-3}	1.736×10^{-3}	1.976×10^{-3}	2.355×10^{-3}	3.353×10^{-3}
sulfurdioxide total air mass factor polluted [1]	5.000×10^{-2}	0.171	0.280	0.386	0.508	1.06	1.26	1.44	1.69	2.11
sulfurdioxide total air mass factor polluted precision [1]	7.640×10^{-3}	1.425×10^{-2}	2.132×10^{-2}	2.720×10^{-2}	3.553×10^{-2}	0.154	0.207	0.264	0.366	0.604
sulfurdioxide clear air mass factor polluted [1]	0.163	0.255	0.328	0.400	0.486	0.870	0.966	1.06	1.24	2.06
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]	0.631 ± 0.413	8223760	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(7.155 \pm 220.680) \times 10^{-2}$	8223760	0.596	1.413×10^{-2}	-135	207	-0.276	0.320
sulfurdioxide total vertical column precision [DU]	0.945 ± 1.603	8223760	0.661	0.425	4.311×10^{-2}	67.6	0.251	0.912
sulfurdioxide slant column density corrected [DU]	$(2.397 \pm 41.723) \times 10^{-2}$	8223760	0.384	1.044×10^{-2}	-9.37	48.4	-0.179	0.205
sulfurdioxide slant column density cobra [DU]	$(2.375 \pm 40.701) \times 10^{-2}$	8223760	0.384	1.044×10^{-2}	-9.37	27.4	-0.179	0.205
sulfurdioxide slant column density cobra precision [DU]	0.318 ± 0.163	8223760	0.170	0.267	7.944×10^{-2}	22.8	0.209	0.380
sulfurdioxide slant column density window1 [DU]	0.209 ± 0.773	8223760	0.782	0.226	-93.5	22.6	-0.169	0.613
sulfurdioxide slant column density window1 precision [DU]	0.318 ± 0.163	8223760	0.170	0.267	7.944×10^{-2}	22.8	0.209	0.380
sulfurdioxide slant column density corrected win1 [DU]	$(4.852 \pm 76.300) \times 10^{-2}$	8223760	0.769	2.102×10^{-2}	-93.5	22.4	-0.355	0.414
background so2 slant column offset window1 [DU]	-0.161 ± 0.216	8223760	0.212	-0.211	-1.43	4.67	-0.294	-8.286×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.59 ± 9.28	8223760	11.8	2.30	-161	127	-3.49	8.34
sulfurdioxide slant column density window2 precision [DU]	8.20 ± 2.16	8223760	2.63	7.89	2.18	285	6.72	9.35
sulfurdioxide slant column density corrected win2 [DU]	$(3.536 \pm 885.046) \times 10^{-2}$	8223760	11.3	7.022×10^{-2}	-164	121	-5.60	5.70
background so2 slant column offset window2 [DU]	-2.55 ± 3.16	8223760	5.26	-1.66	-19.0	9.85	-5.10	0.152
sulfurdioxide slant column density window3 [DU]	-11.8 ± 24.0	8223760	30.3	-11.9	-186	176	-27.0	3.37
sulfurdioxide slant column density window3 precision [DU]	27.6 ± 12.6	8223760	9.17	24.4	9.50	215	20.8	30.0
sulfurdioxide slant column density corrected win3 [DU]	2.58 ± 23.03	8223760	29.0	2.66	-170	193	-11.9	17.2
background so2 slant column offset window3 [DU]	14.4 ± 6.7	8223760	11.7	14.6	-5.23	53.6	8.25	19.9
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	8223760	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(4.420 \pm 8.456) \times 10^{-2}$	8223760	2.646×10^{-2}	1.724×10^{-2}	4.254×10^{-4}	1.66	9.567×10^{-3}	3.602×10^{-2}
fitted radiance shift [nm]	$(-2.702 \pm 24.776) \times 10^{-4}$	8223760	1.691×10^{-3}	-2.737×10^{-4}	-3.896×10^{-2}	3.986×10^{-2}	-1.129×10^{-3}	5.622×10^{-4}
fitted radiance squeeze [1]	$(-1.520 \pm 21.708) \times 10^{-5}$	8223760	2.249×10^{-4}	-6.493×10^{-6}	-1.043×10^{-2}	2.493×10^{-3}	-1.209×10^{-4}	1.040×10^{-4}
fitted root mean square [1]	$(1.387 \pm 0.677) \times 10^{-3}$	8223760	6.991×10^{-4}	1.169×10^{-3}	3.225×10^{-4}	3.564×10^{-2}	9.436×10^{-4}	1.643×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.701 ± 0.417	8223760	0.547	0.654	5.000×10^{-2}	2.80	0.393	0.940
sulfurdioxide total air mass factor polluted precision [1]	0.103 ± 0.140	8223760	9.599×10^{-2}	5.037×10^{-2}	2.500×10^{-3}	1.81	2.734×10^{-2}	0.123
sulfurdioxide clear air mass factor polluted [1]	0.599 ± 0.279	8223760	0.423	0.570	4.171×10^{-2}	2.82	0.374	0.797
number of spectral points in retrieval [1]	73.5 ± 0.5	8223760	1.000	73.0	53.0	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]	0.642 ± 0.411	9103978	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(1.968 \pm 66.463) \times 10^{-2}$	9103978	0.385	8.558×10^{-3}	-35.6	74.1	-0.182	0.203
sulfurdioxide total vertical column precision [DU]	0.397 ± 0.471	9103978	0.246	0.274	4.345×10^{-2}	27.0	0.197	0.443
sulfurdioxide slant column density corrected [DU]	$(1.494 \pm 32.449) \times 10^{-2}$	9103978	0.333	7.838×10^{-3}	-36.3	50.3	-0.157	0.176
sulfurdioxide slant column density cobra [DU]	$(1.488 \pm 32.009) \times 10^{-2}$	9103978	0.333	7.838×10^{-3}	-36.3	21.6	-0.157	0.176
sulfurdioxide slant column density cobra precision [DU]	0.264 ± 0.108	9103978	0.116	0.228	7.935×10^{-2}	21.4	0.194	0.310
sulfurdioxide slant column density window1 [DU]	0.169 ± 0.616	9103978	0.689	0.184	-120	106	-0.168	0.521
sulfurdioxide slant column density window1 precision [DU]	0.264 ± 0.108	9103978	0.116	0.228	7.935×10^{-2}	21.4	0.194	0.310
sulfurdioxide slant column density corrected win1 [DU]	$(2.079 \pm 59.876) \times 10^{-2}$	9103978	0.665	8.297×10^{-3}	-120	106	-0.321	0.344
background so2 slant column offset window1 [DU]	-0.148 ± 0.169	9103978	0.210	-0.179	-0.786	1.94	-0.272	-6.208×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.29 ± 8.68	9103978	10.9	1.18	-1.257×10^3	1.000×10^3	-4.22	6.68
sulfurdioxide slant column density window2 precision [DU]	7.86 ± 2.23	9103978	2.43	7.54	2.06	514	6.47	8.90
sulfurdioxide slant column density corrected win2 [DU]	0.274 ± 8.540	9103978	10.7	0.286	-1.257×10^3	1.001×10^3	-5.09	5.64
background so2 slant column offset window2 [DU]	-1.01 ± 1.96	9103978	2.37	-0.438	-15.3	9.66	-2.07	0.301
sulfurdioxide slant column density window3 [DU]	-6.70 ± 24.08	9103978	30.4	-7.11	-1.341×10^3	253	-22.0	8.41
sulfurdioxide slant column density window3 precision [DU]	27.6 ± 13.3	9103978	9.61	24.0	9.49	1.173×10^3	20.3	29.9
sulfurdioxide slant column density corrected win3 [DU]	2.13 ± 23.15	9103978	29.1	1.94	-1.336×10^3	268	-12.4	16.7
background so2 slant column offset window3 [DU]	8.83 ± 6.69	9103978	11.7	7.66	-9.96	30.9	3.05	14.7
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.20	9103978	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.045 \pm 3.362) \times 10^{-2}$	9103978	1.317×10^{-2}	1.584×10^{-2}	6.729×10^{-4}	2.56	1.017×10^{-2}	2.334×10^{-2}
fitted radiance shift [nm]	$(-5.882 \pm 25.906) \times 10^{-4}$	9103978	1.859×10^{-3}	-5.846×10^{-4}	-5.266×10^{-2}	7.106×10^{-2}	-1.576×10^{-3}	2.824×10^{-4}
fitted radiance squeeze [1]	$(-3.236 \pm 16.115) \times 10^{-5}$	9103978	1.902×10^{-4}	-2.526×10^{-5}	-1.371×10^{-2}	2.104×10^{-2}	-1.232×10^{-4}	6.697×10^{-5}
fitted root mean square [1]	$(1.170 \pm 0.442) \times 10^{-3}$	9103978	4.753×10^{-4}	1.041×10^{-3}	3.224×10^{-4}	6.089×10^{-2}	8.828×10^{-4}	1.358×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.930 ± 0.450	9103978	0.560	0.854	5.000×10^{-2}	2.83	0.616	1.18
sulfurdioxide total air mass factor polluted precision [1]	0.127 ± 0.115	9103978	0.132	8.702×10^{-2}	4.476×10^{-3}	1.57	4.289×10^{-2}	0.174
sulfurdioxide clear air mass factor polluted [1]	0.804 ± 0.359	9103978	0.345	0.740	0.134	2.94	0.580	0.925
number of spectral points in retrieval [1]	73.4 ± 0.5	9103978	1.000	73.0	53.0	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]	0.672 $\pm$ 0.405	12434205	0.770	1.000	0.0	1.000	0.230	1.000
sulfurdioxide total vertical column [DU]	$(2.737 \pm 119.824) \times 10^{-2}$	12434205	0.428	9.056×10^{-3}	-135	207	-0.203	0.225
sulfurdioxide total vertical column precision [DU]	0.523 $\pm$ 0.888	12434205	0.299	0.298	4.478×10^{-2}	67.6	0.212	0.511
sulfurdioxide slant column density corrected [DU]	$(1.463 \pm 33.501) \times 10^{-2}$	12434205	0.341	7.704×10^{-3}	-29.7	43.9	-0.162	0.180
sulfurdioxide slant column density cobra [DU]	$(1.456 \pm 33.093) \times 10^{-2}$	12434205	0.341	7.704×10^{-3}	-29.7	25.9	-0.162	0.180
sulfurdioxide slant column density cobra precision [DU]	0.276 $\pm$ 0.126	12434205	0.128	0.233	8.137×10^{-2}	14.0	0.195	0.323
sulfurdioxide slant column density window1 [DU]	0.180 $\pm$ 0.647	12434205	0.702	0.195	-77.2	39.7	-0.162	0.541
sulfurdioxide slant column density window1 precision [DU]	0.276 $\pm$ 0.126	12434205	0.128	0.233	8.137×10^{-2}	14.0	0.195	0.323
sulfurdioxide slant column density corrected win1 [DU]	$(2.213 \pm 63.408) \times 10^{-2}$	12434205	0.684	7.054×10^{-3}	-77.2	39.8	-0.331	0.353
background so2 slant column offset window1 [DU]	-0.158 $\pm$ 0.179	12434205	0.203	-0.189	-0.720	4.36	-0.279	-7.629×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.56 $\pm$ 8.75	12434205	11.1	1.38	-1.257×10^3	1.000×10^3	-4.08	6.98
sulfurdioxide slant column density window2 precision [DU]	7.88 $\pm$ 2.10	12434205	2.44	7.57	2.06	458	6.49	8.93
sulfurdioxide slant column density corrected win2 [DU]	0.182 $\pm$ 8.518	12434205	10.8	0.199	-1.257×10^3	1.001×10^3	-5.23	5.60
background so2 slant column offset window2 [DU]	-1.38 $\pm$ 2.39	12434205	2.88	-0.631	-19.0	9.85	-2.60	0.273
sulfurdioxide slant column density window3 [DU]	-6.24 $\pm$ 23.92	12434205	30.4	-6.61	-1.341×10^3	253	-21.5	8.89
sulfurdioxide slant column density window3 precision [DU]	27.1 $\pm$ 12.4	12434205	9.03	23.8	9.49	1.173×10^3	20.4	29.4
sulfurdioxide slant column density corrected win3 [DU]	4.42 $\pm$ 22.68	12434205	28.9	4.10	-1.336×10^3	268	-10.1	18.8
background so2 slant column offset window3 [DU]	10.7 $\pm$ 6.8	12434205	11.0	10.1	-9.96	51.5	5.19	16.1
sulfurdioxide slant column cobra flag [1]	1.98 $\pm$ 0.17	12434205	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.186 \pm 3.243) \times 10^{-2}$	12434205	1.286×10^{-2}	1.580×10^{-2}	5.622×10^{-4}	1.40	1.044×10^{-2}	2.331×10^{-2}
fitted radiance shift [nm]	$(-4.488 \pm 24.140) \times 10^{-4}$	12434205	1.784×10^{-3}	-4.264×10^{-4}	-5.266×10^{-2}	4.414×10^{-2}	-1.373×10^{-3}	4.108×10^{-4}
fitted radiance squeeze [1]	$(-2.590 \pm 17.591) \times 10^{-5}$	12434205	1.954×10^{-4}	-1.772×10^{-5}	-1.195×10^{-2}	2.104×10^{-2}	-1.180×10^{-4}	7.744×10^{-5}
fitted root mean square [1]	$(1.217 \pm 0.529) \times 10^{-3}$	12434205	5.092×10^{-4}	1.053×10^{-3}	3.224×10^{-4}	3.179×10^{-2}	8.895×10^{-4}	1.399×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.840 $\pm$ 0.399	12434205	0.486	0.806	5.000×10^{-2}	2.80	0.570	1.06
sulfurdioxide total air mass factor polluted precision [1]	0.112 $\pm$ 0.109	12434205	0.110	6.877×10^{-2}	2.500×10^{-3}	1.50	3.986×10^{-2}	0.150
sulfurdioxide clear air mass factor polluted [1]	0.723 $\pm$ 0.274	12434205	0.344	0.704	4.475×10^{-2}	2.82	0.536	0.880
number of spectral points in retrieval [1]	73.5 $\pm$ 0.5	12434205	1.000	73.0	71.0	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]	0.584 ± 0.419	3767068	0.850	0.490	0.0	1.000	0.150	1.000
sulfurdioxide total vertical column [DU]	$(7.199 \pm 203.101) \times 10^{-2}$	3767068	0.555	1.373×10^{-2}	-88.7	117	-0.254	0.301
sulfurdioxide total vertical column precision [DU]	0.877 ± 1.488	3767068	0.601	0.411	4.311×10^{-2}	37.8	0.235	0.835
sulfurdioxide slant column density corrected [DU]	$(2.718 \pm 42.262) \times 10^{-2}$	3767068	0.384	1.134×10^{-2}	-36.3	50.3	-0.178	0.206
sulfurdioxide slant column density cobra [DU]	$(2.699 \pm 41.217) \times 10^{-2}$	3767068	0.384	1.134×10^{-2}	-36.3	27.4	-0.178	0.206
sulfurdioxide slant column density cobra precision [DU]	0.312 ± 0.149	3767068	0.147	0.269	7.935×10^{-2}	22.8	0.214	0.361
sulfurdioxide slant column density window1 [DU]	0.216 ± 0.762	3767068	0.786	0.228	-120	106	-0.171	0.615
sulfurdioxide slant column density window1 precision [DU]	0.312 ± 0.149	3767068	0.147	0.269	7.935×10^{-2}	22.8	0.214	0.361
sulfurdioxide slant column density corrected win1 [DU]	$(5.709 \pm 74.715) \times 10^{-2}$	3767068	0.760	2.980×10^{-2}	-120	106	-0.342	0.418
background so2 slant column offset window1 [DU]	-0.158 ± 0.208	3767068	0.211	-0.213	-1.43	4.48	-0.292	-8.100×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.41 ± 9.40	3767068	11.9	2.23	-635	698	-3.62	8.26
sulfurdioxide slant column density window2 precision [DU]	8.34 ± 2.42	3767068	2.65	8.03	2.43	514	6.83	9.48
sulfurdioxide slant column density corrected win2 [DU]	0.153 ± 9.039	3767068	11.4	0.198	-634	698	-5.51	5.86
background so2 slant column offset window2 [DU]	-2.26 ± 3.05	3767068	4.87	-1.14	-19.0	9.85	-4.65	0.224
sulfurdioxide slant column density window3 [DU]	-16.5 ± 23.4	3767068	29.3	-16.1	-422	176	-30.9	-1.64
sulfurdioxide slant column density window3 precision [DU]	29.2 ± 14.5	3767068	10.3	25.4	9.50	248	21.1	31.4
sulfurdioxide slant column density corrected win3 [DU]	-3.77 ± 23.48	3767068	29.3	-3.17	-429	193	-18.1	11.2
background so2 slant column offset window3 [DU]	12.7 ± 7.8	3767068	13.4	13.1	-9.96	52.4	5.93	19.3
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.27	3767068	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.607 \pm 10.461) \times 10^{-2}$	3767068	4.020×10^{-2}	2.028×10^{-2}	4.254×10^{-4}	2.56	8.120×10^{-3}	4.832×10^{-2}
fitted radiance shift [nm]	$(-4.083 \pm 29.170) \times 10^{-4}$	3767068	1.828×10^{-3}	-4.518×10^{-4}	-3.954×10^{-2}	4.082×10^{-2}	-1.375×10^{-3}	4.524×10^{-4}
fitted radiance squeeze [1]	$(-1.560 \pm 20.476) \times 10^{-5}$	3767068	2.248×10^{-4}	-1.300×10^{-5}	-1.371×10^{-2}	1.291×10^{-2}	-1.264×10^{-4}	9.834×10^{-5}
fitted root mean square [1]	$(1.357 \pm 0.605) \times 10^{-3}$	3767068	6.278×10^{-4}	1.188×10^{-3}	3.248×10^{-4}	6.089×10^{-2}	9.664×10^{-4}	1.594×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.801 ± 0.565	3767068	0.715	0.639	5.000×10^{-2}	2.83	0.395	1.11
sulfurdioxide total air mass factor polluted precision [1]	0.129 ± 0.170	3767068	0.144	5.658×10^{-2}	2.637×10^{-3}	1.81	2.532×10^{-2}	0.169
sulfurdioxide clear air mass factor polluted [1]	0.690 ± 0.487	3767068	0.450	0.571	4.224×10^{-2}	2.94	0.375	0.824
number of spectral points in retrieval [1]	73.4 ± 0.5	3767068	1.000	73.0	53.0	74.0	73.0	74.0

3 Granule outlines

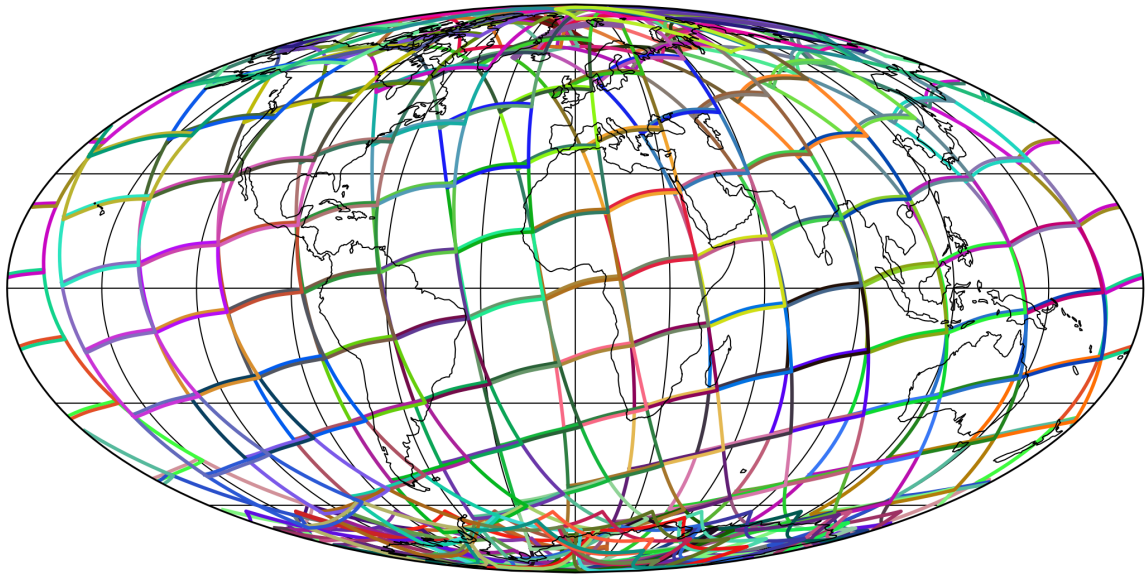


Figure 1: Outline of the granules.

4 Input data monitoring

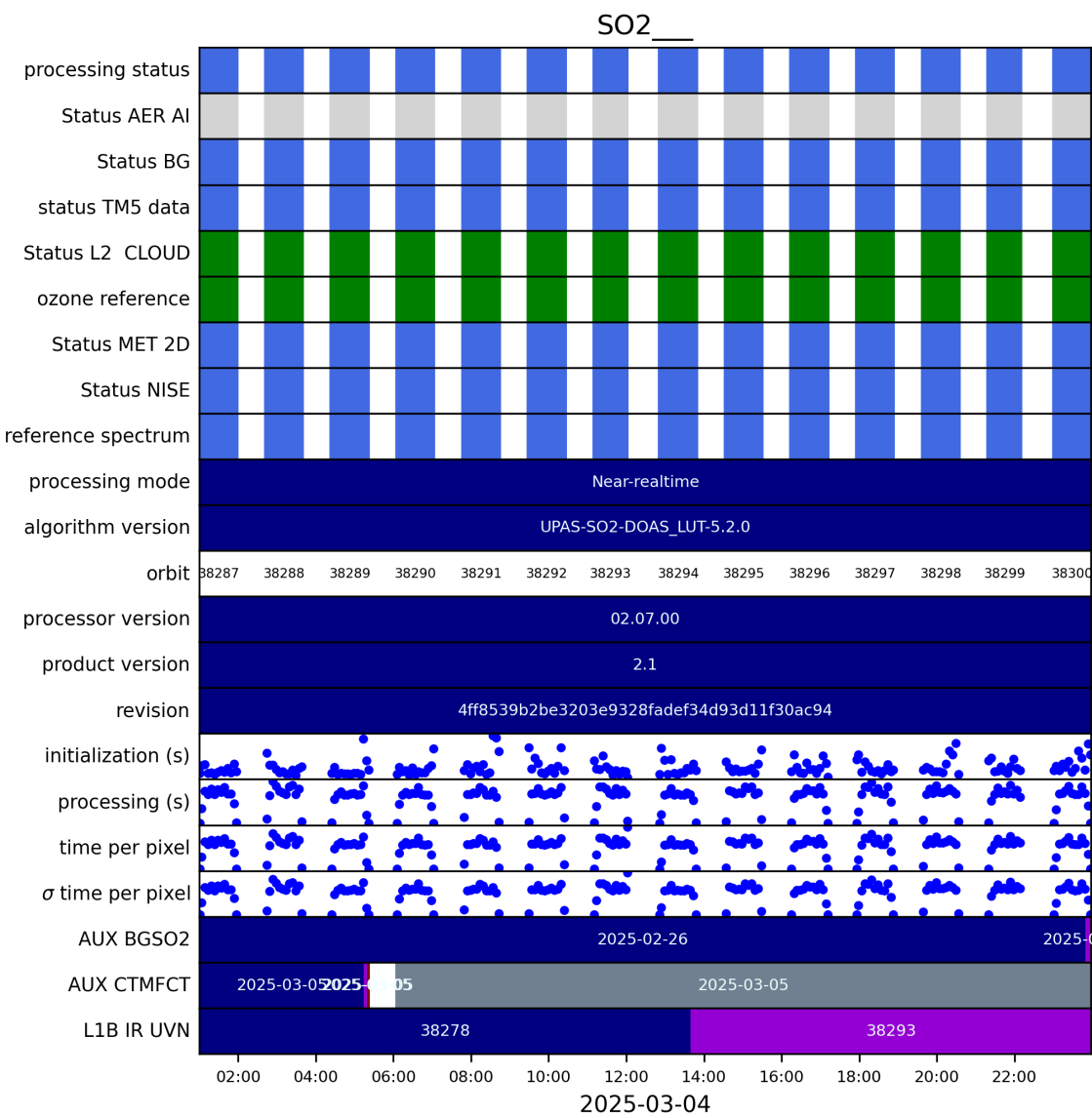


Figure 2: Input data per granule

5 Warnings and errors

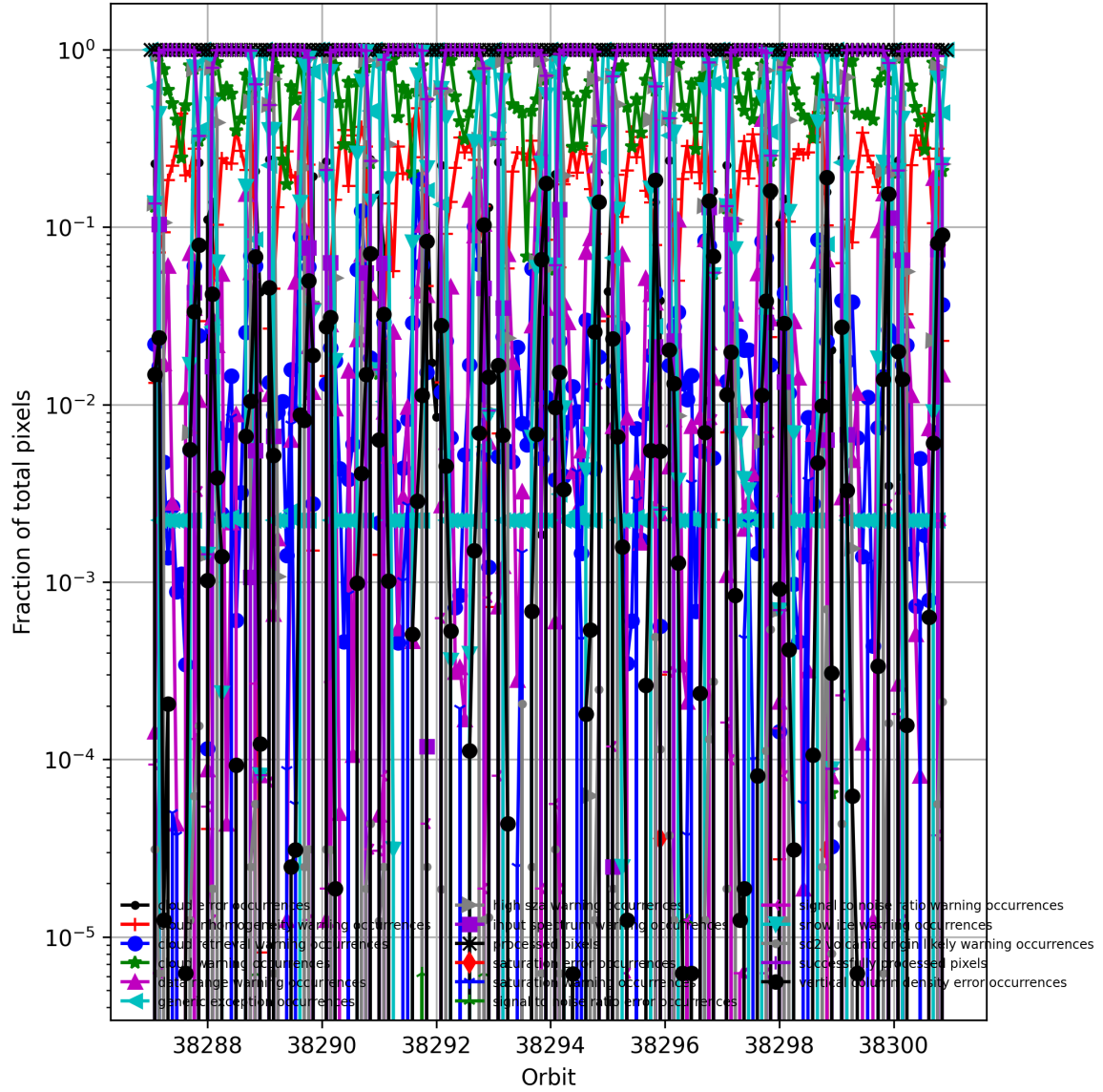


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

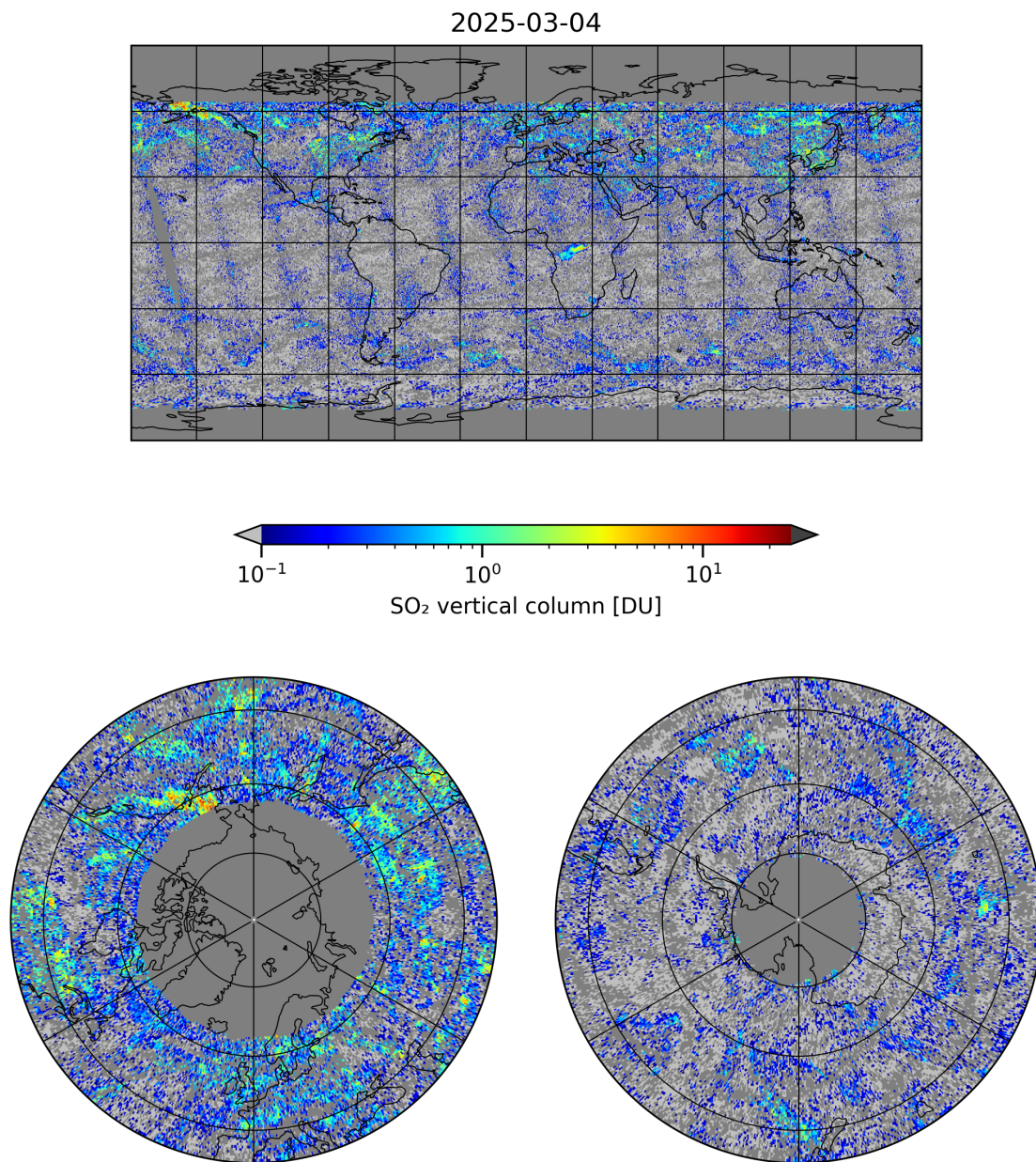


Figure 4: Map of “SO₂ vertical column” for 2025-03-04 to 2025-03-04

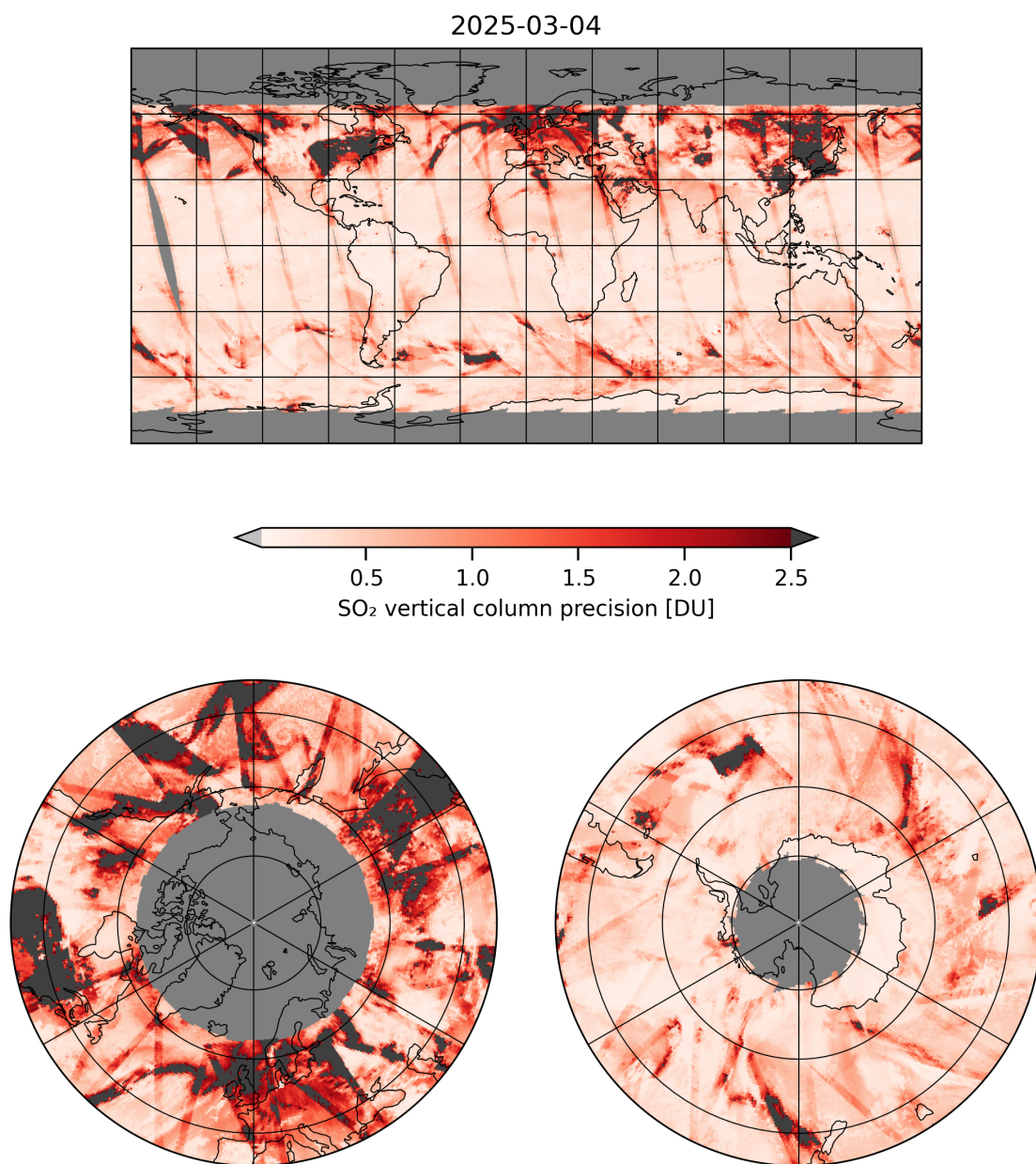


Figure 5: Map of “SO₂ vertical column precision” for 2025-03-04 to 2025-03-04

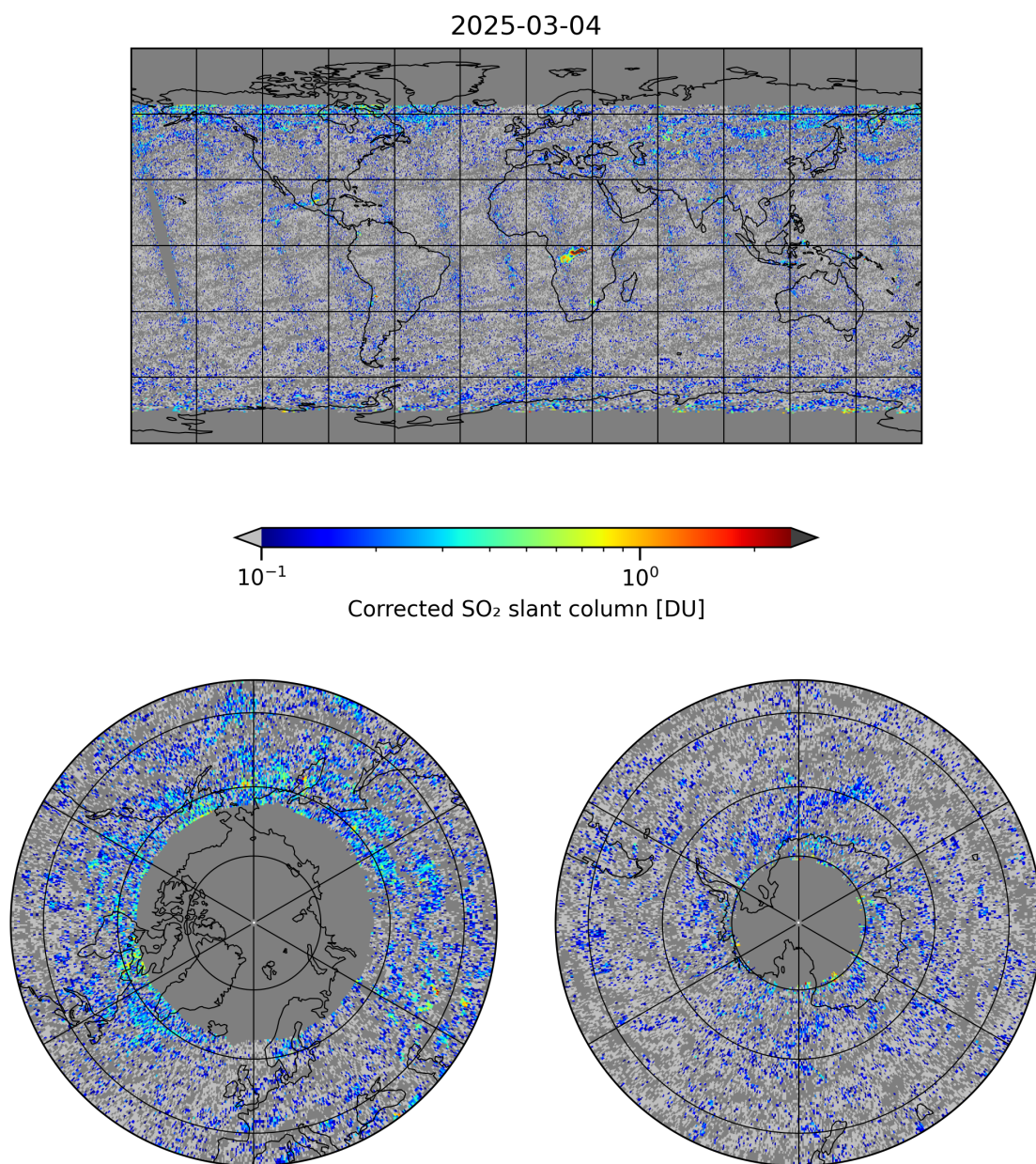


Figure 6: Map of “Corrected SO₂ slant column” for 2025-03-04 to 2025-03-04

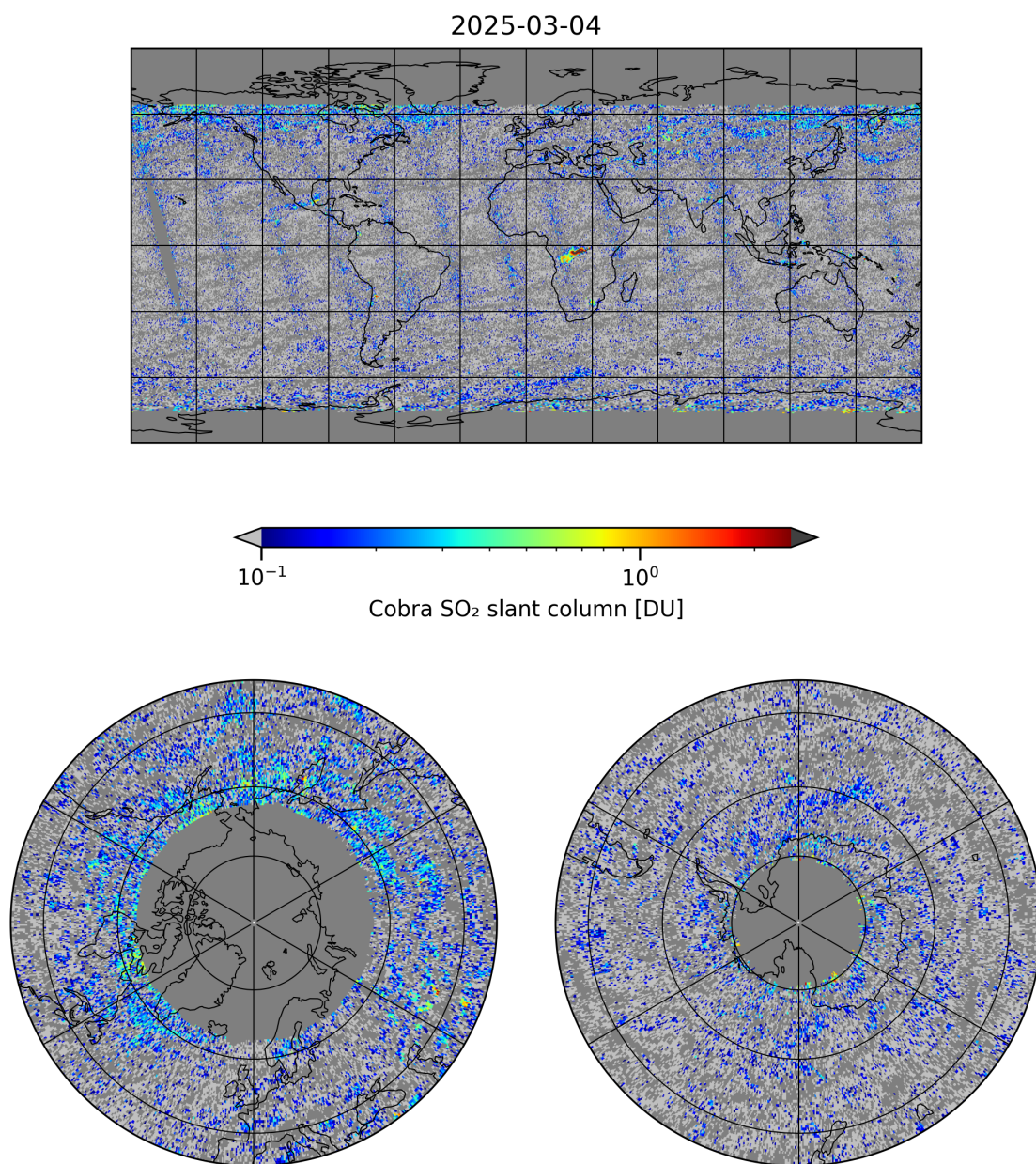


Figure 7: Map of “Cobra SO₂ slant column” for 2025-03-04 to 2025-03-04

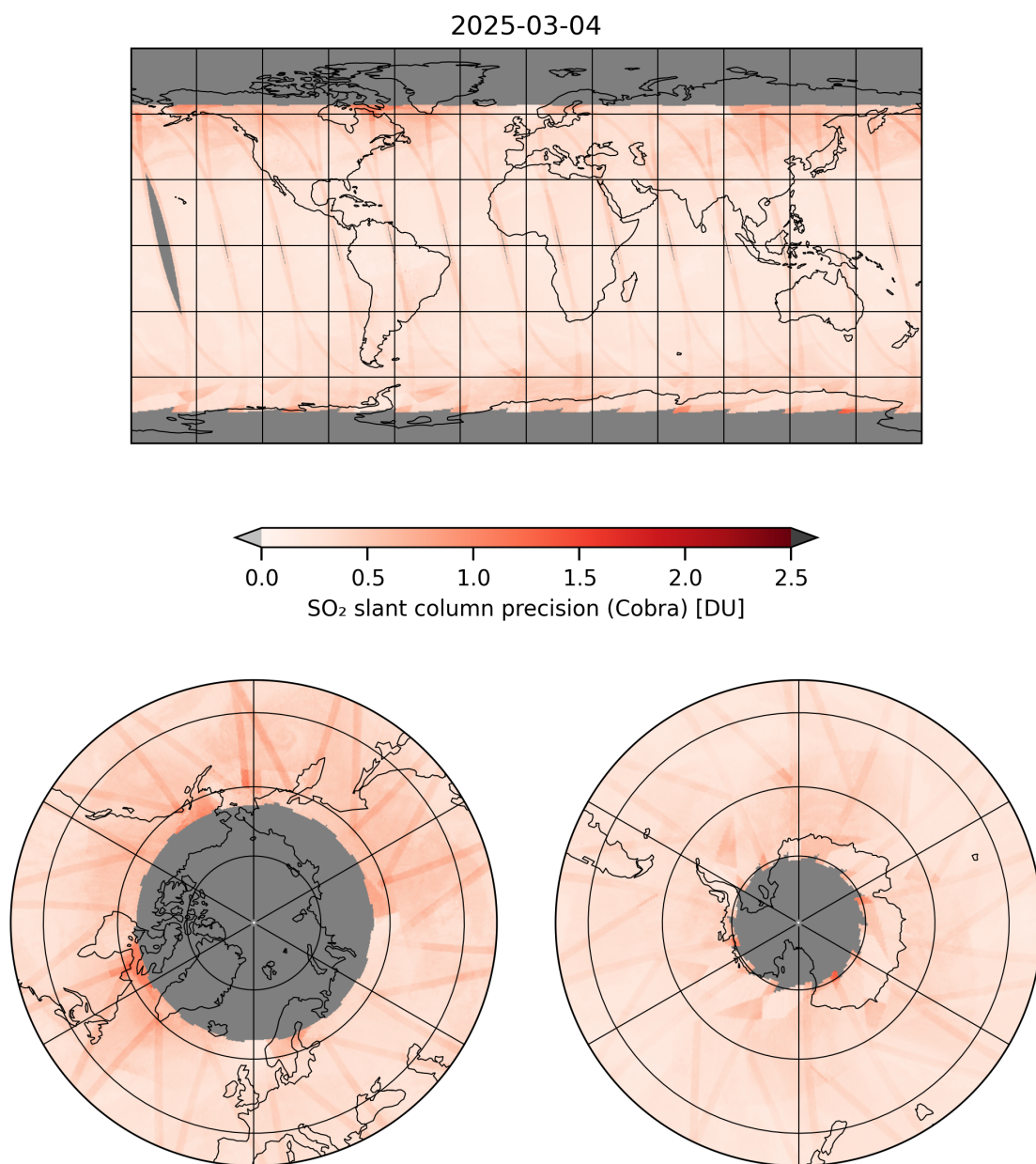


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-03-04 to 2025-03-04

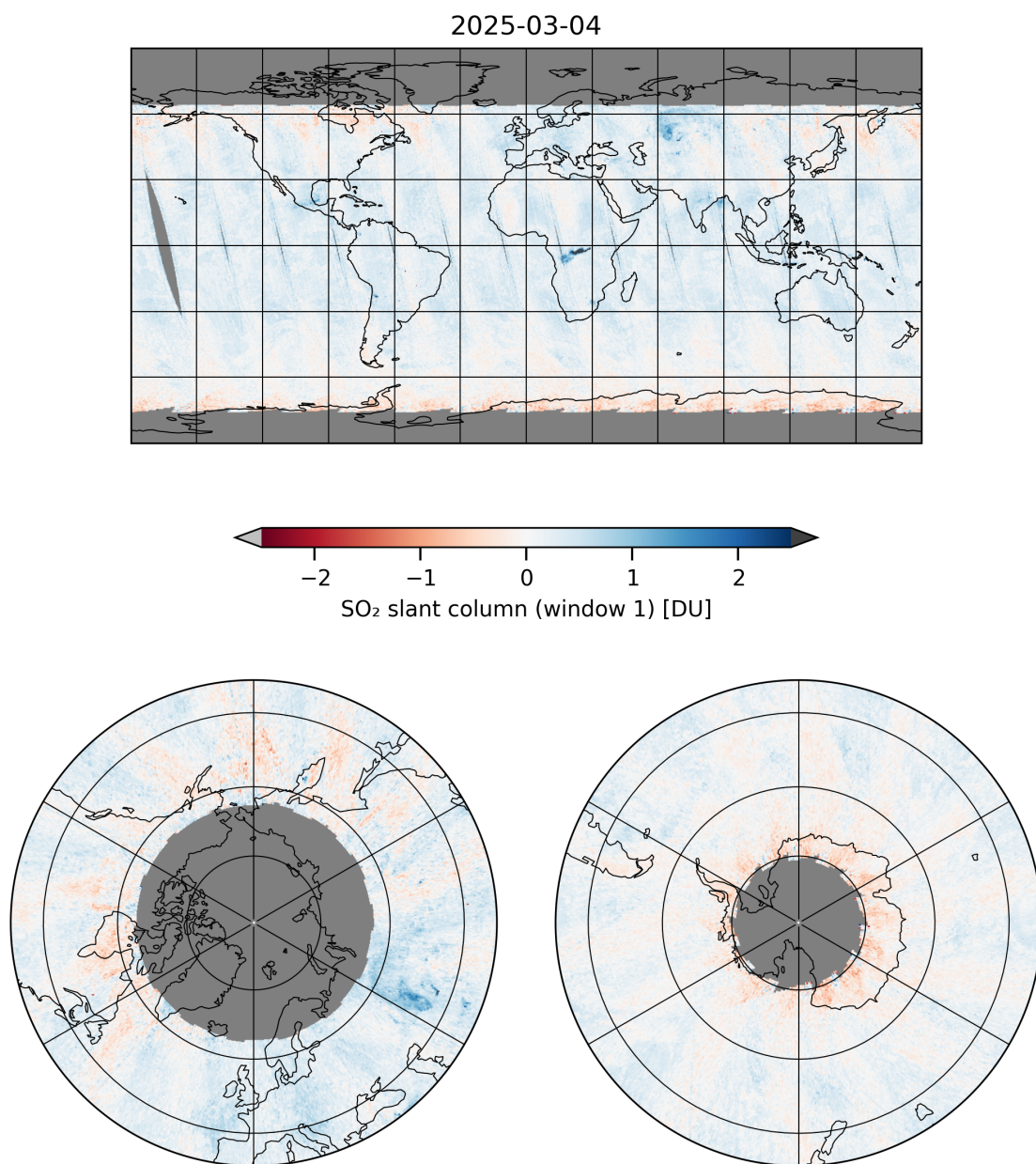


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-03-04 to 2025-03-04

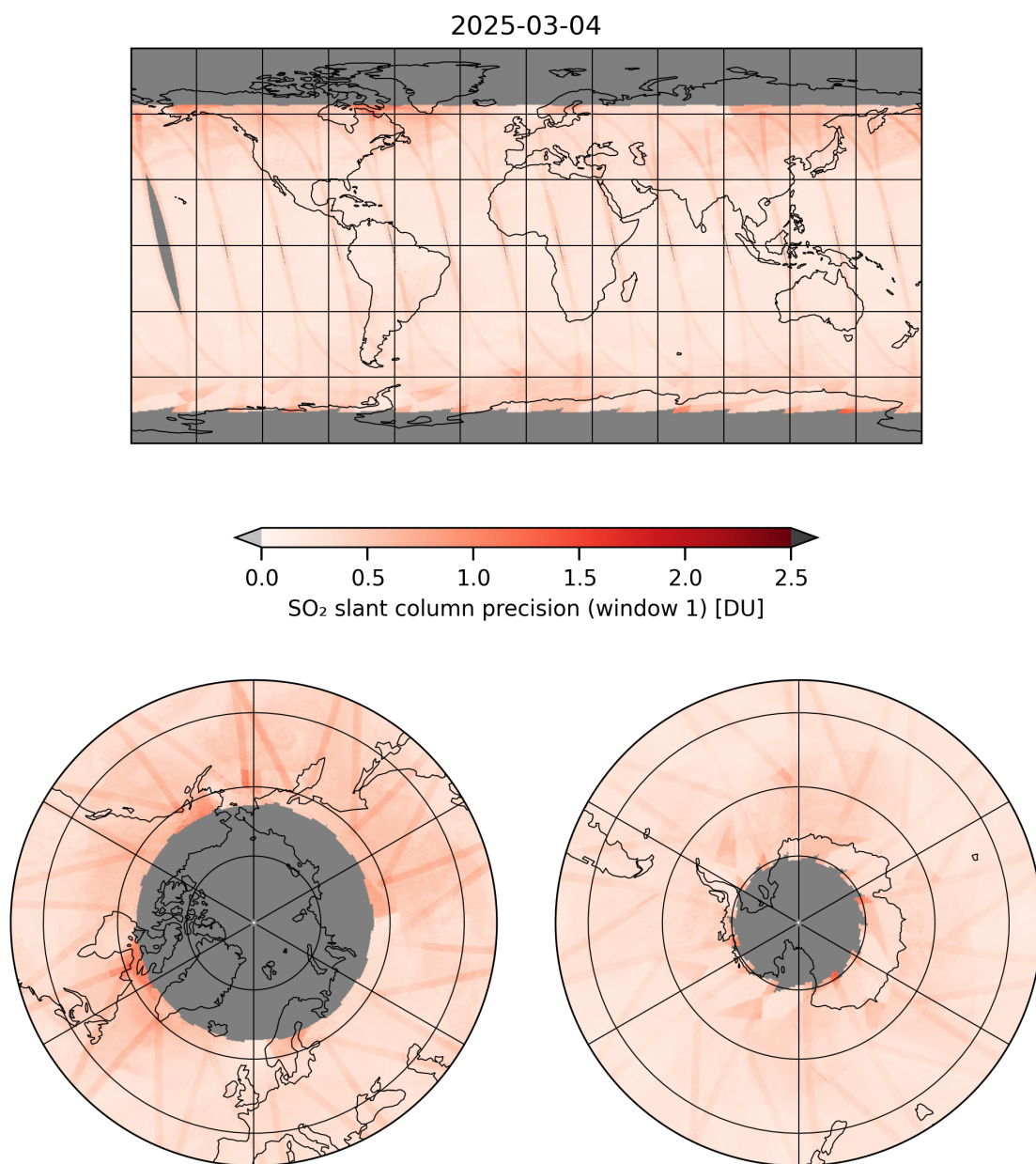


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-03-04 to 2025-03-04

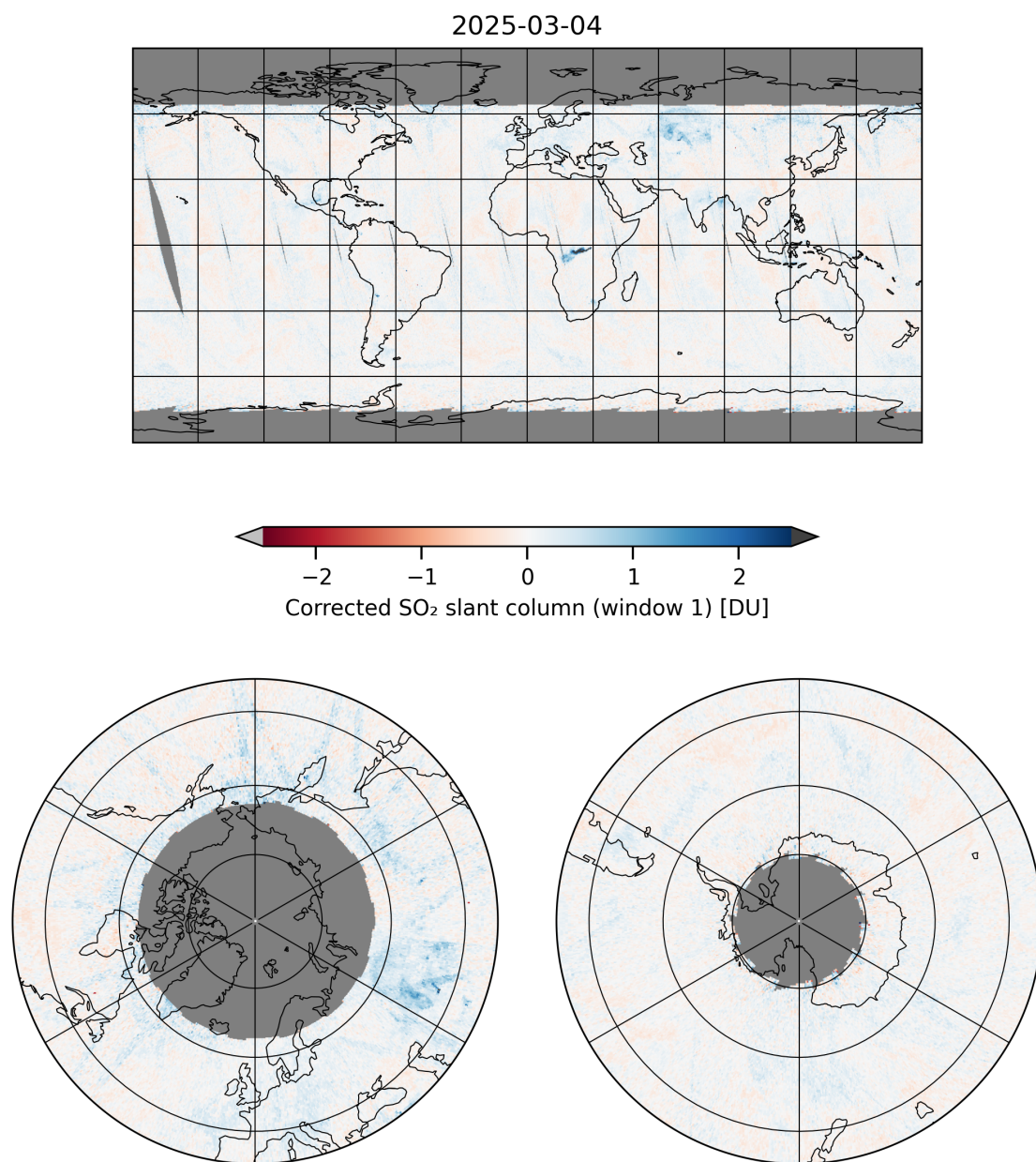


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-03-04 to 2025-03-04

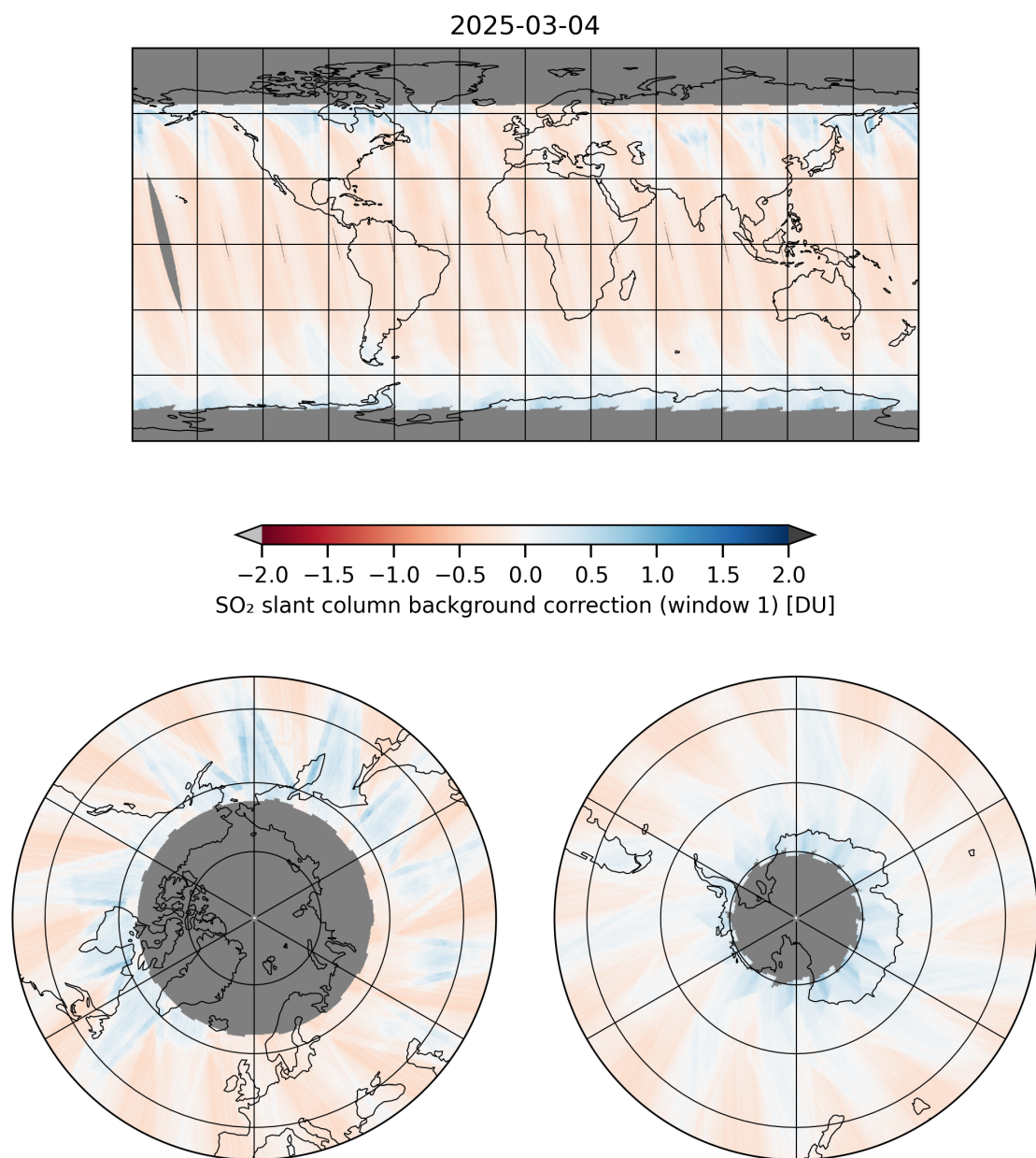


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-03-04 to 2025-03-04

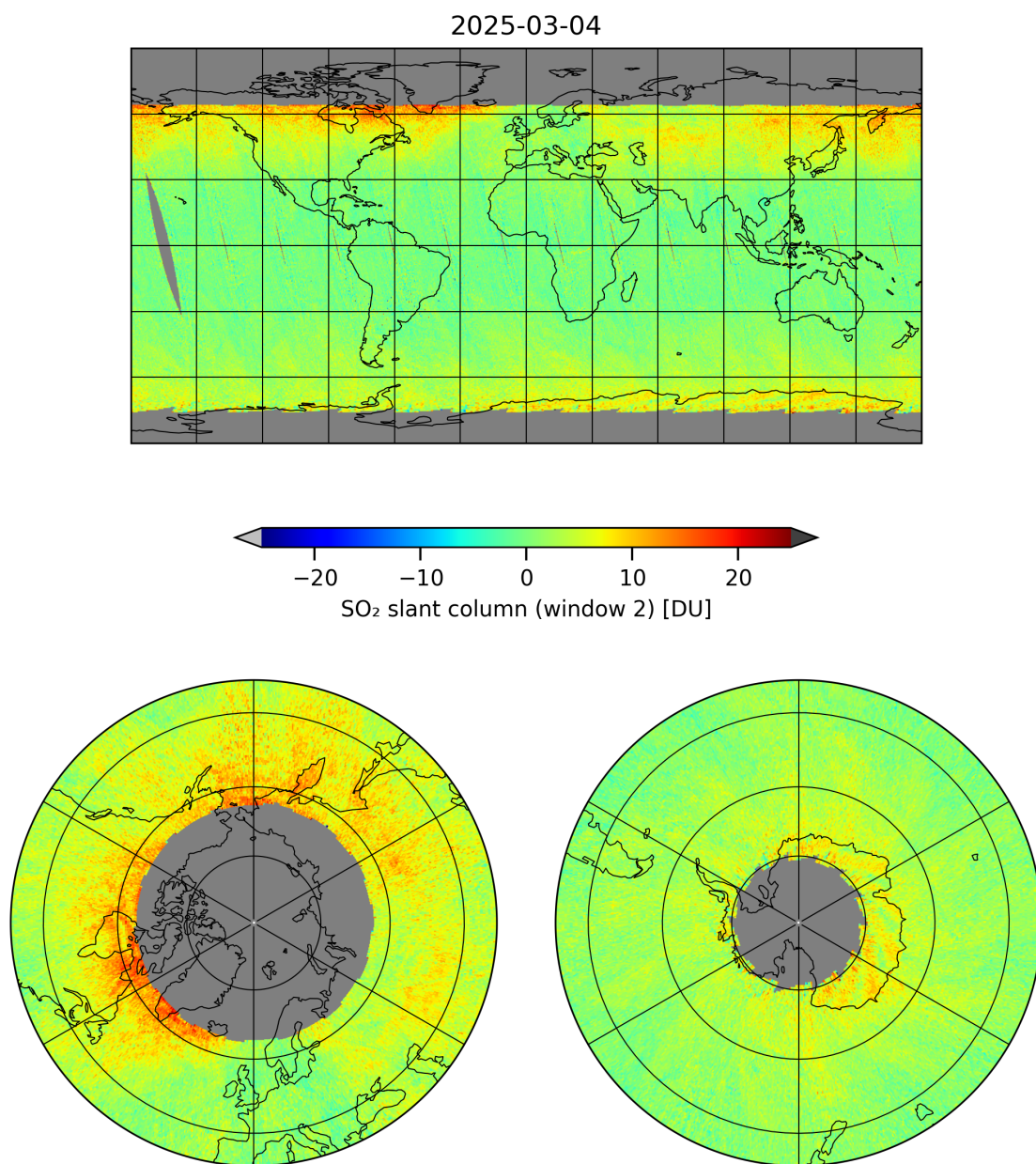


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-03-04 to 2025-03-04

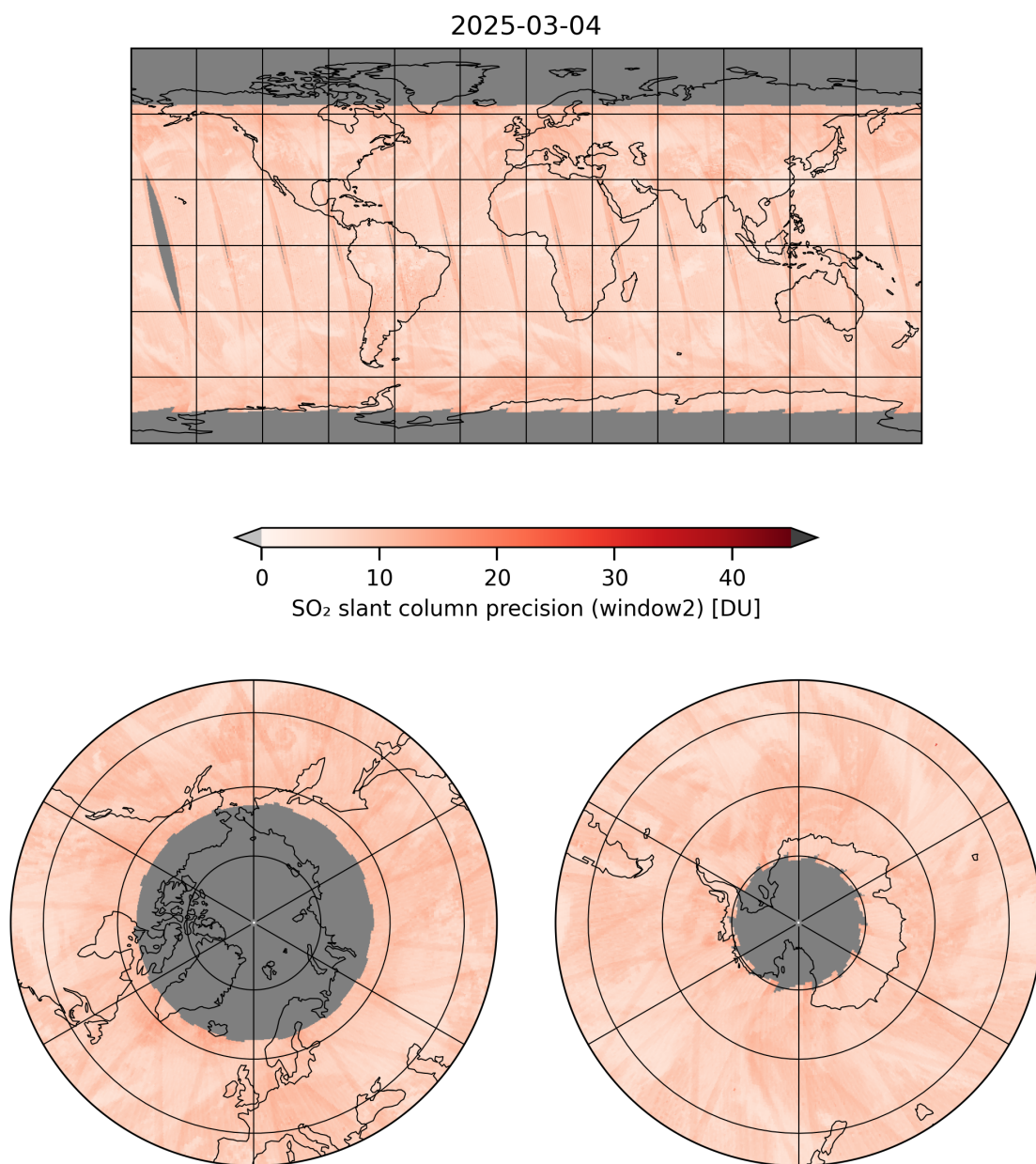


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-03-04 to 2025-03-04

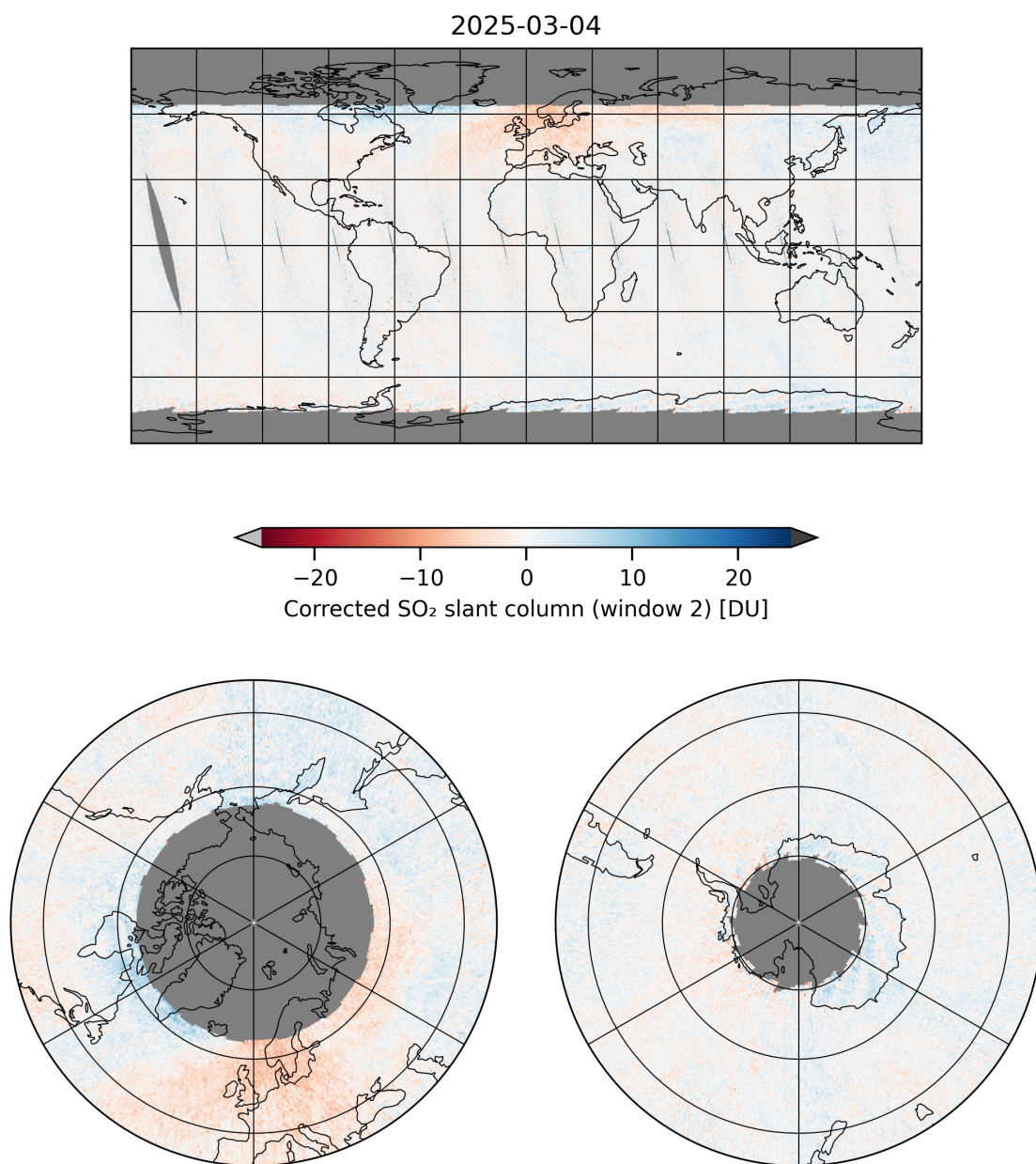


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-03-04 to 2025-03-04

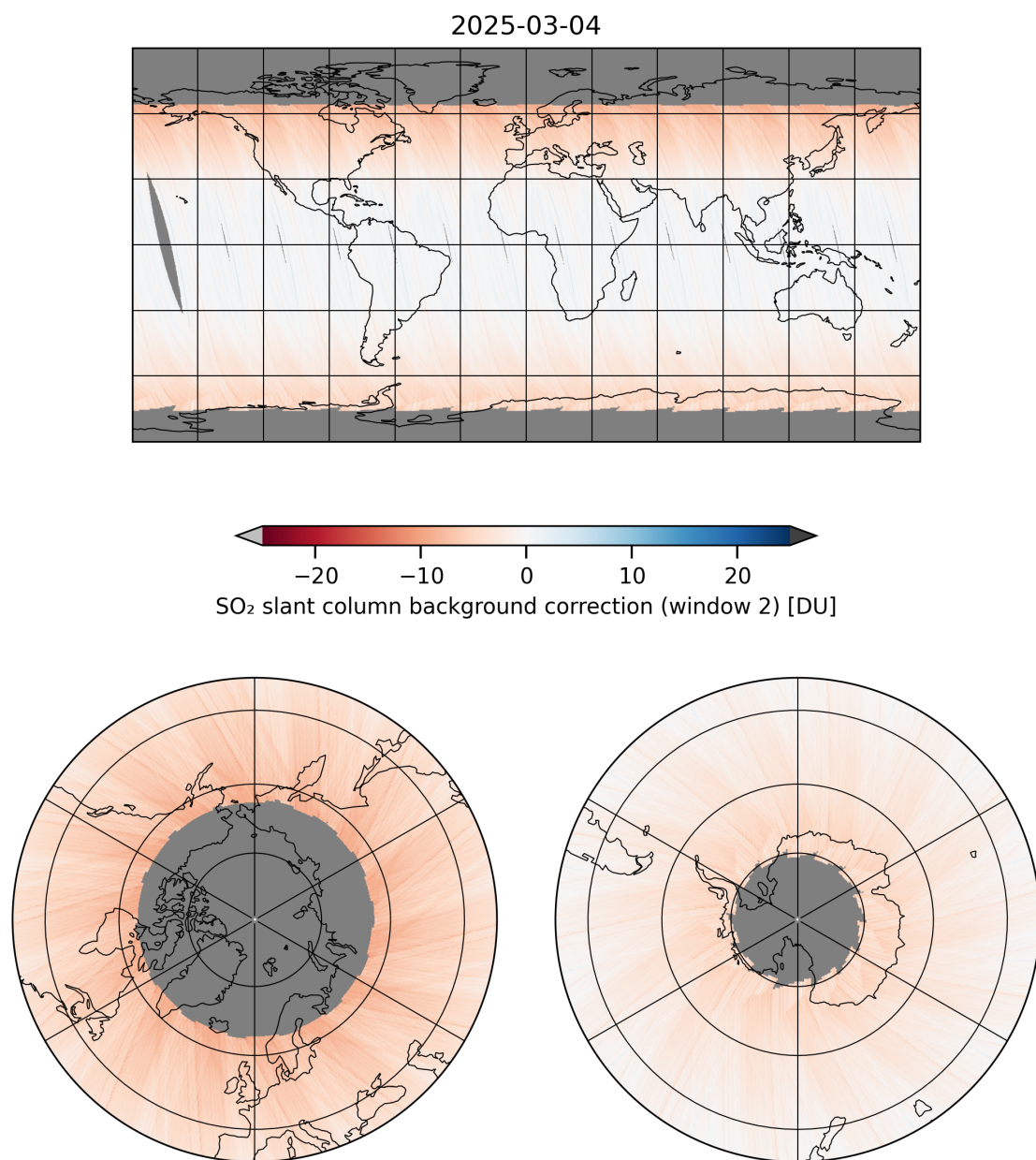


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-03-04 to 2025-03-04

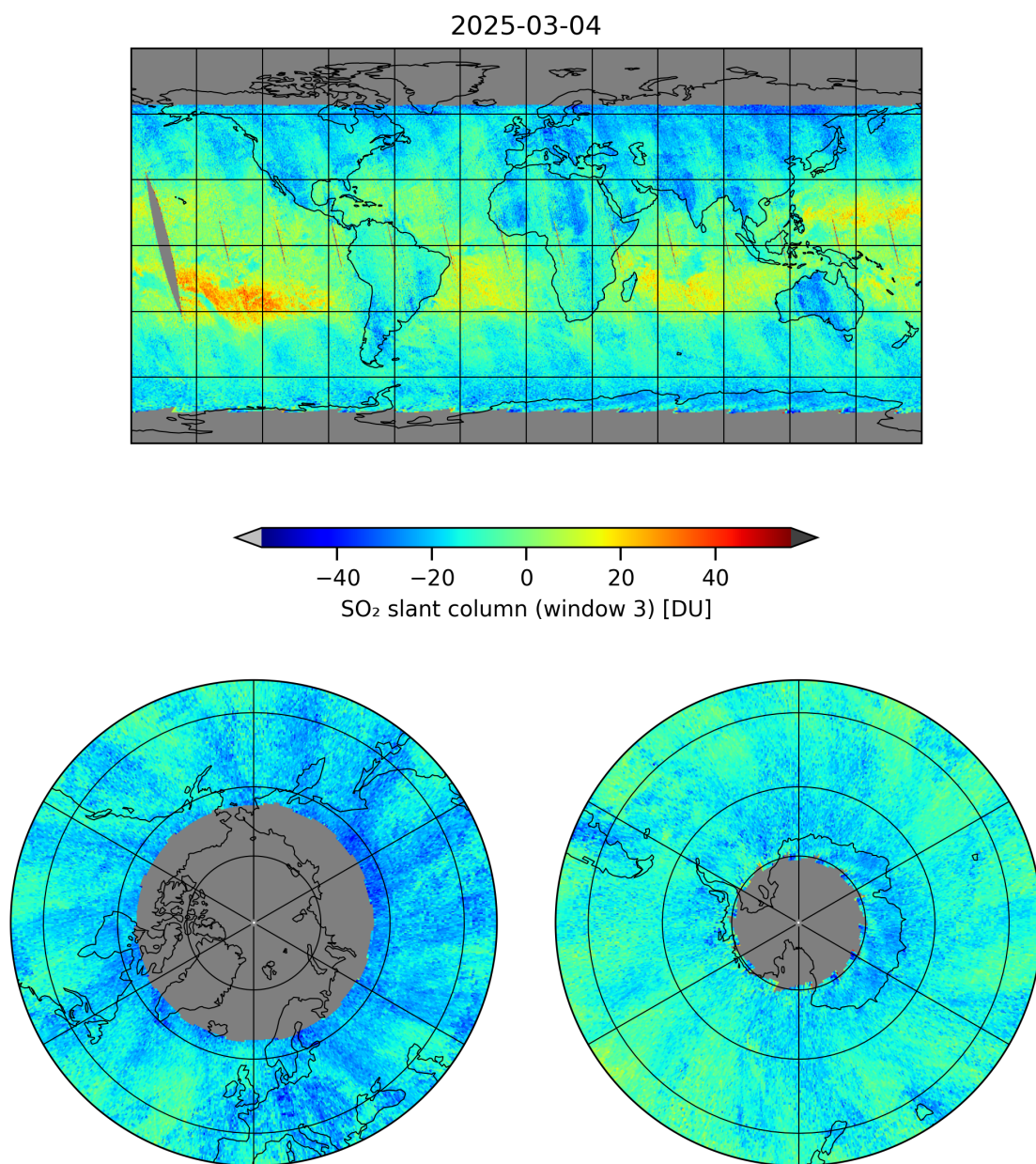


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-03-04 to 2025-03-04

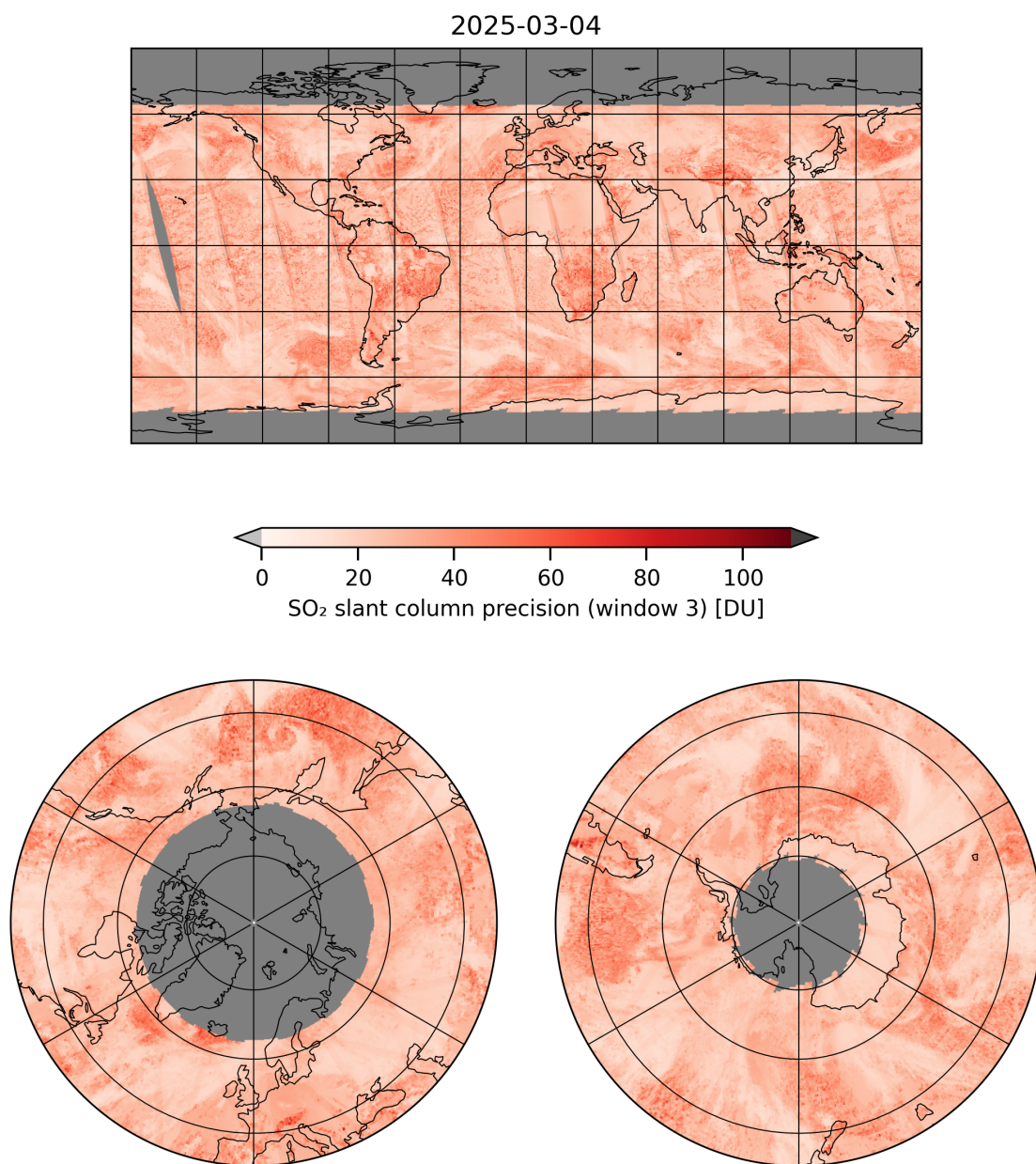


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-03-04 to 2025-03-04

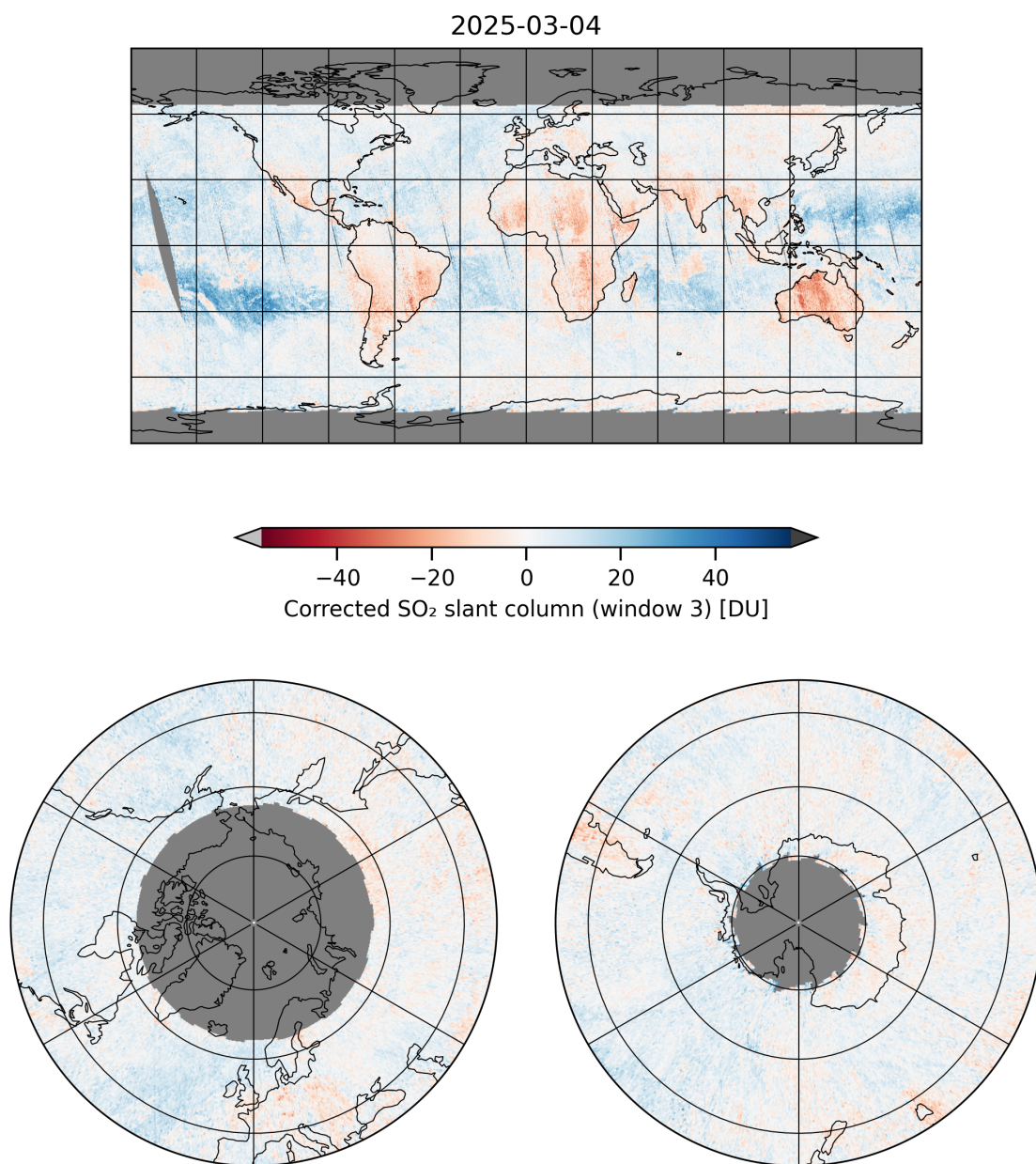


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-03-04 to 2025-03-04

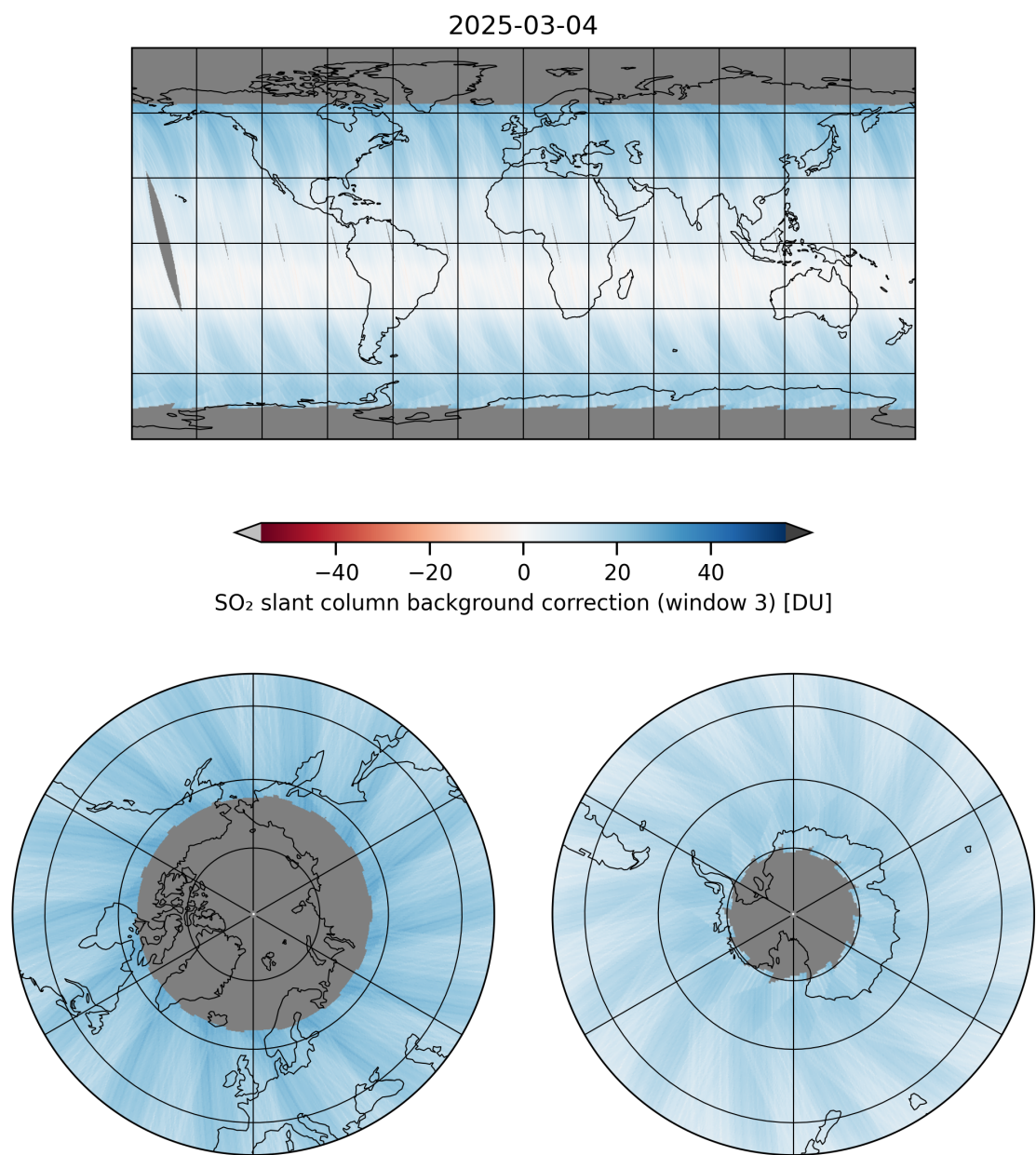


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-03-04 to 2025-03-04

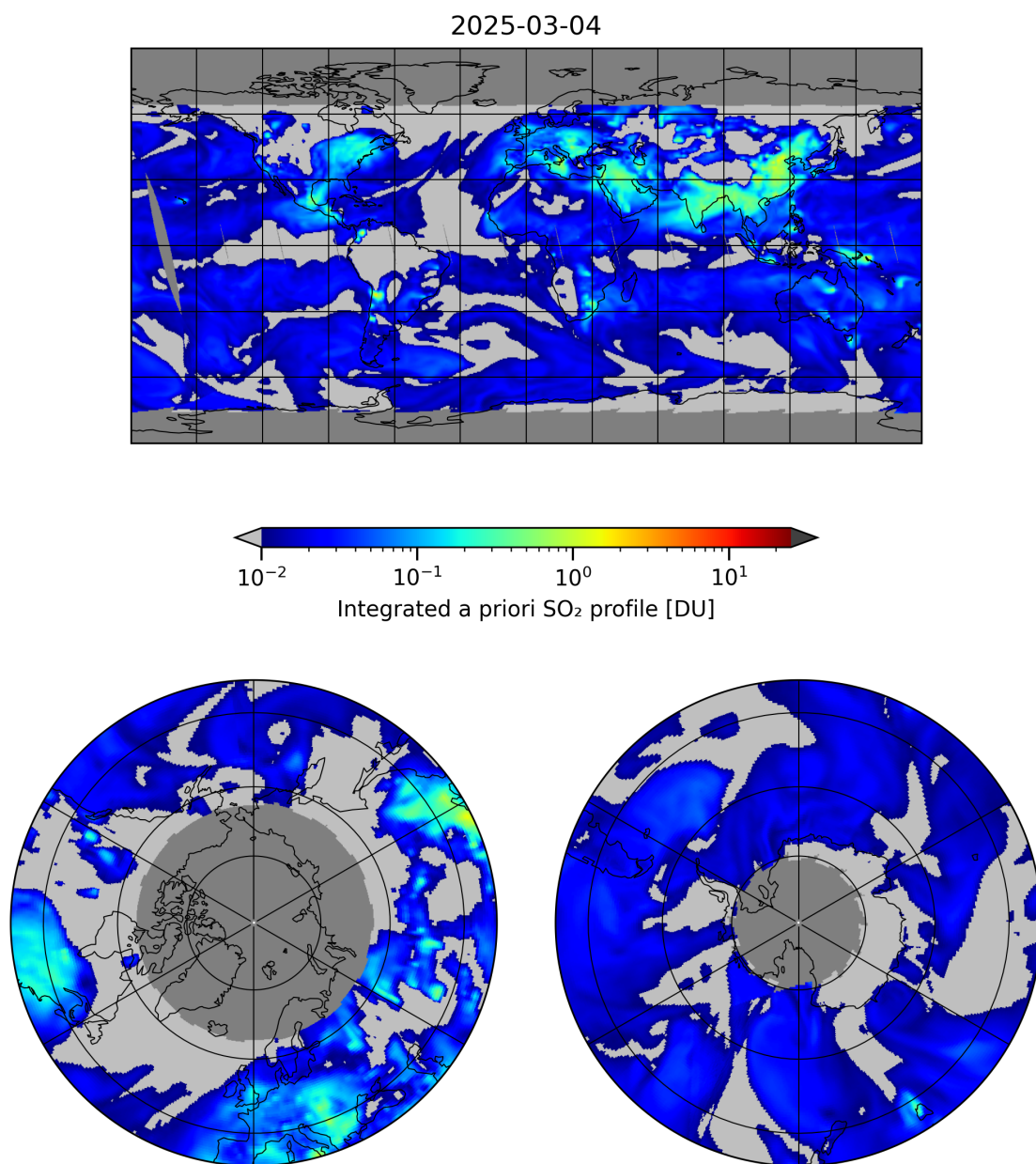


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-03-04 to 2025-03-04

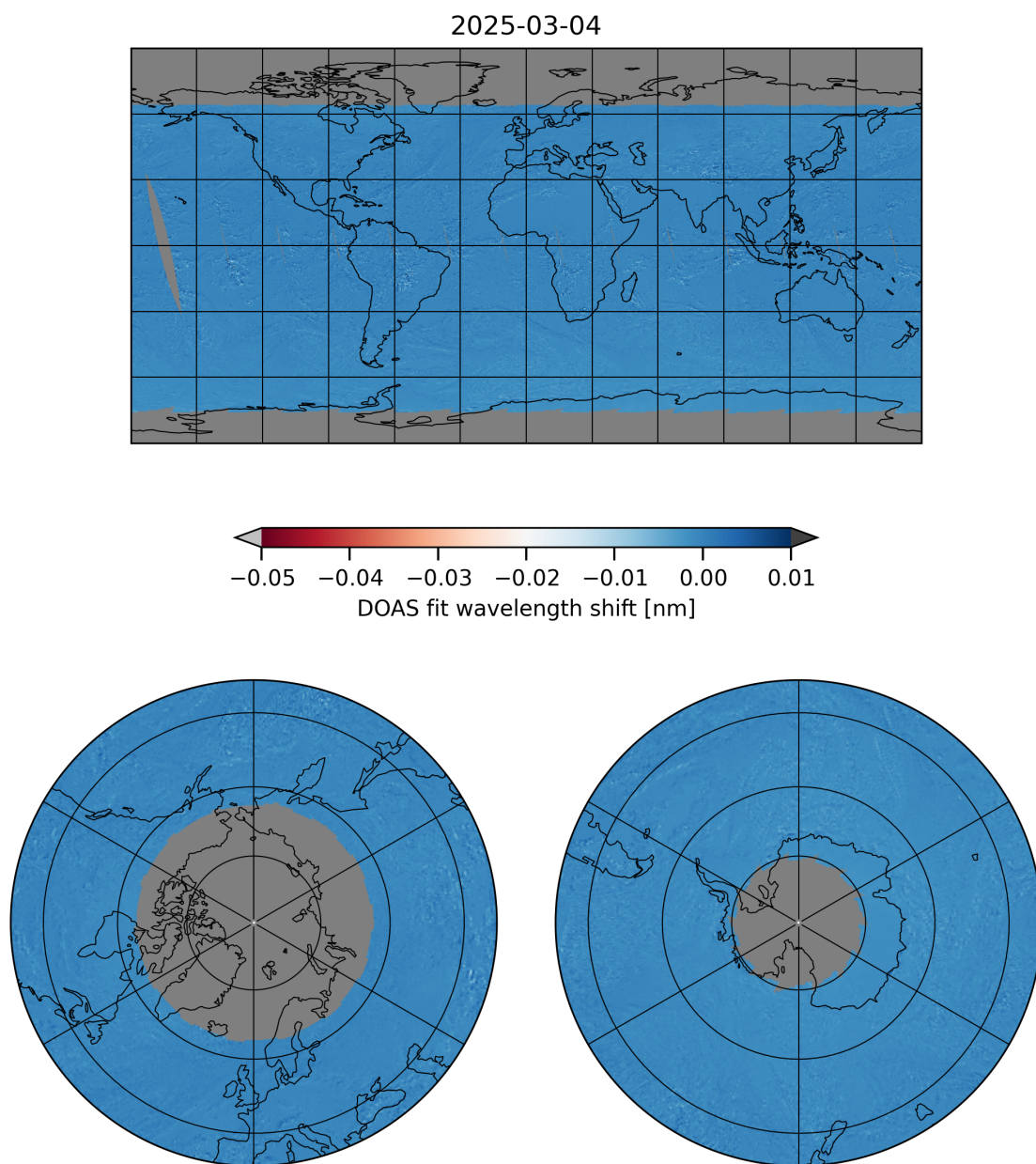


Figure 22: Map of “DOAS fit wavelength shift” for 2025-03-04 to 2025-03-04

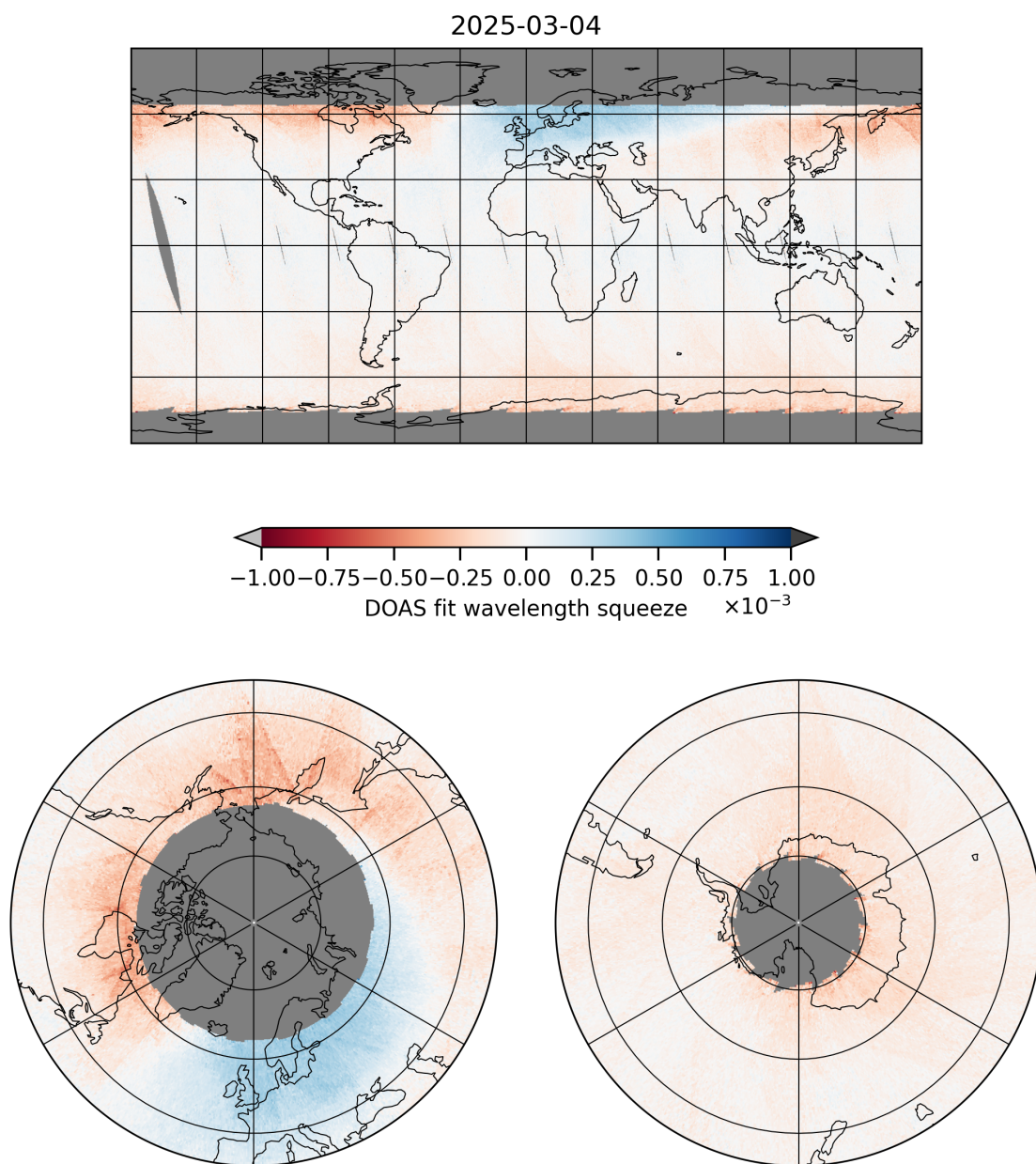


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-03-04 to 2025-03-04

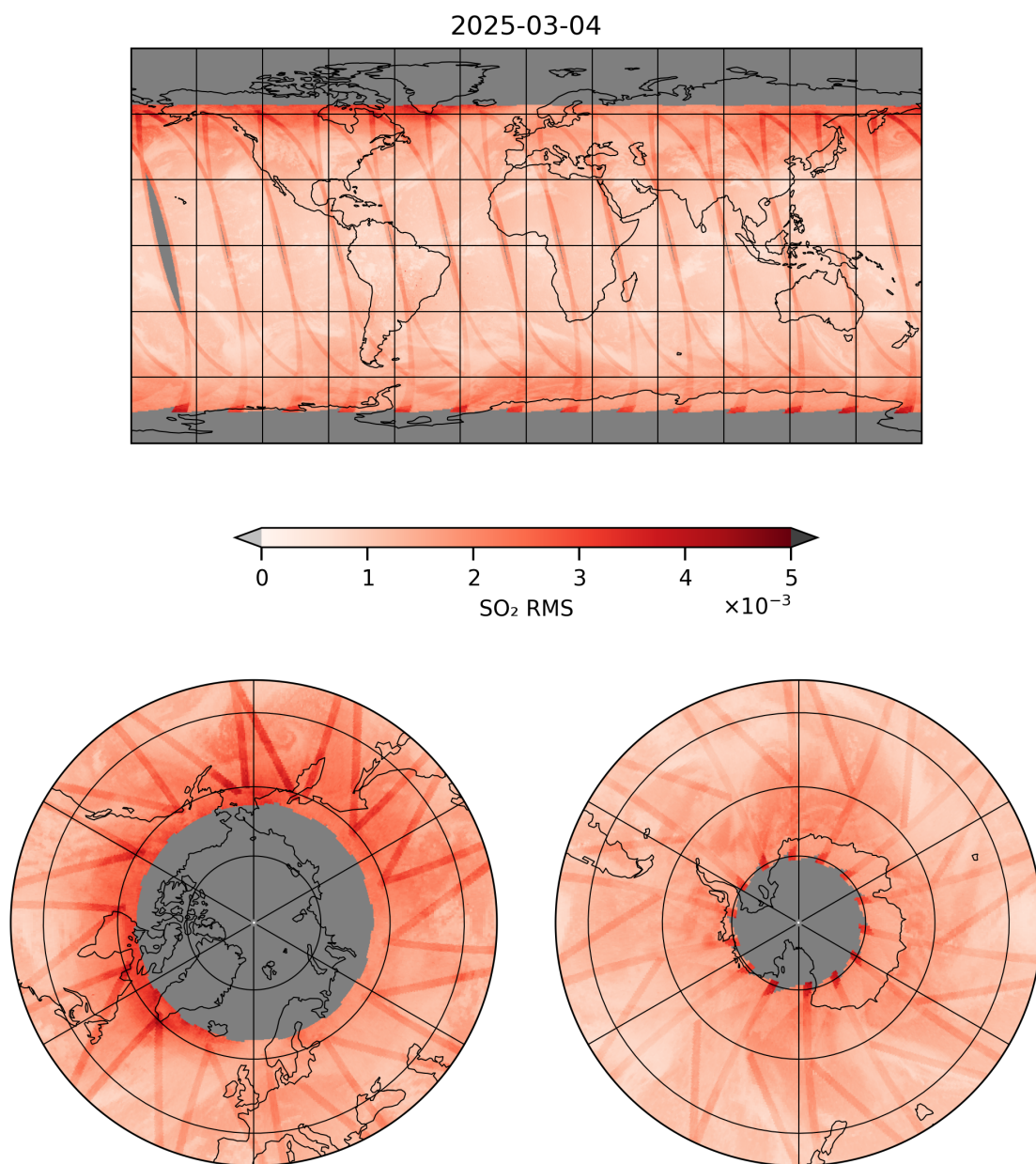


Figure 24: Map of “SO₂ RMS” for 2025-03-04 to 2025-03-04

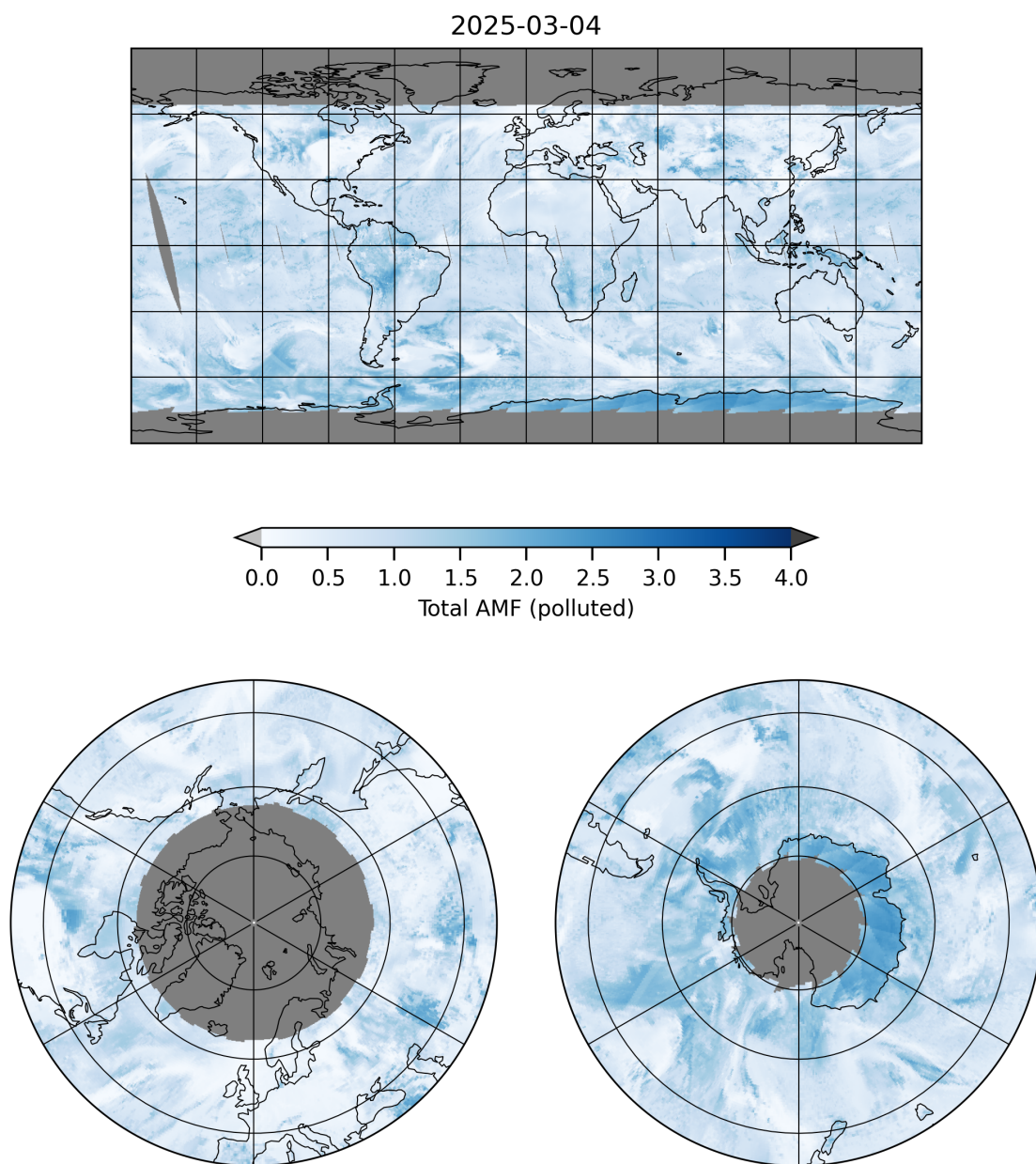


Figure 25: Map of “Total AMF (polluted)” for 2025-03-04 to 2025-03-04

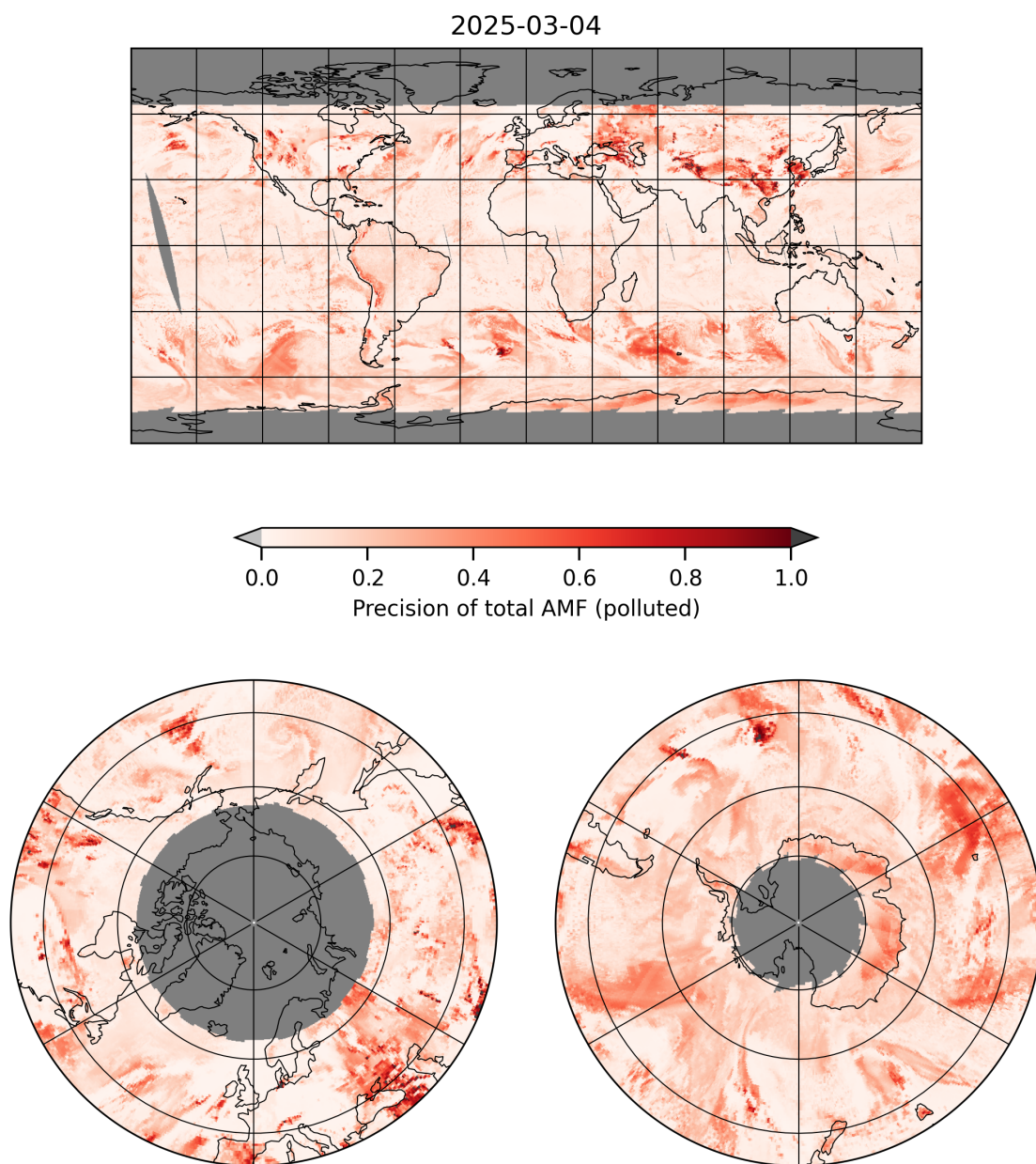


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-03-04 to 2025-03-04

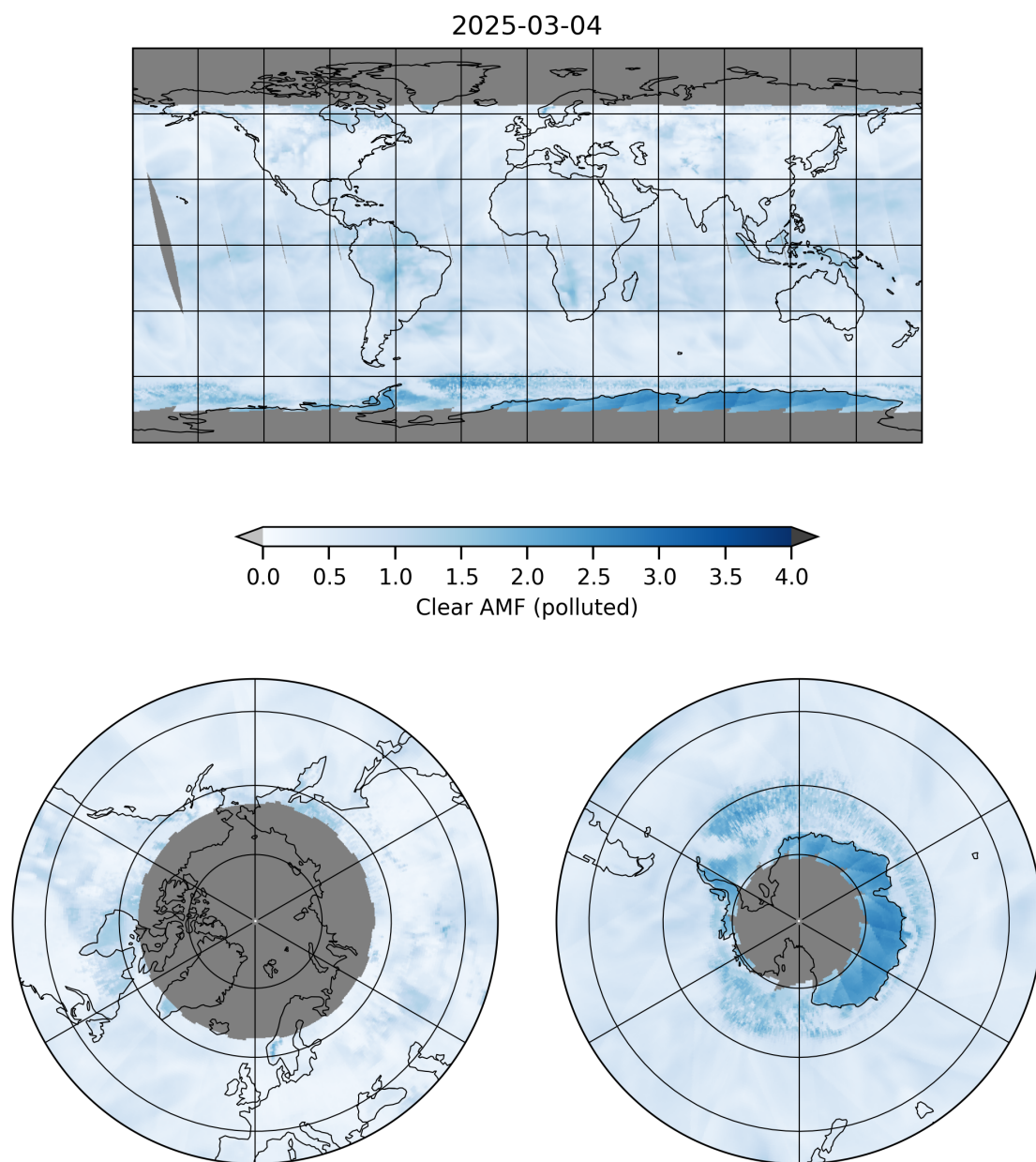


Figure 27: Map of “Clear AMF (polluted)” for 2025-03-04 to 2025-03-04

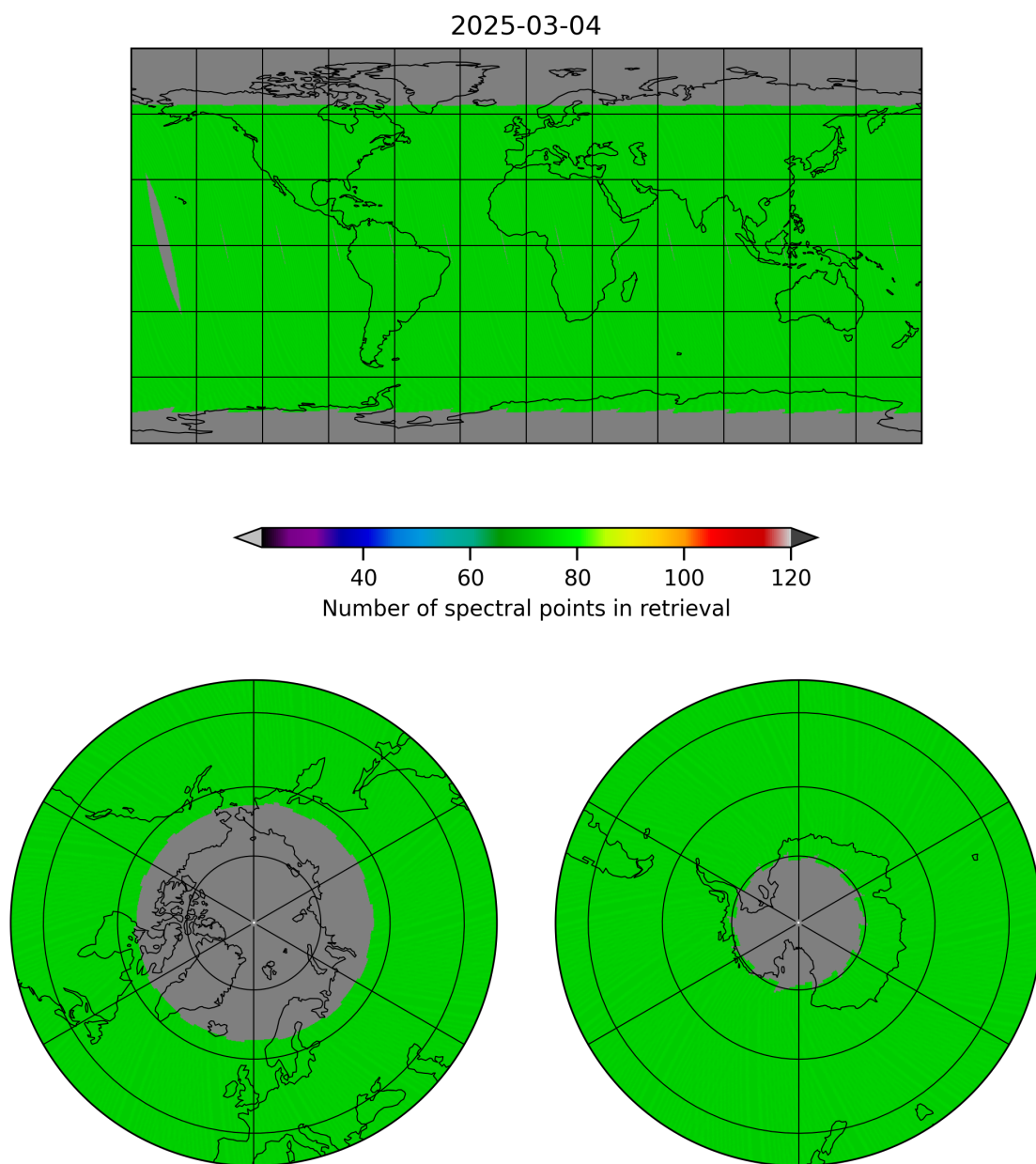


Figure 28: Map of “Number of spectral points in retrieval” for 2025-03-04 to 2025-03-04

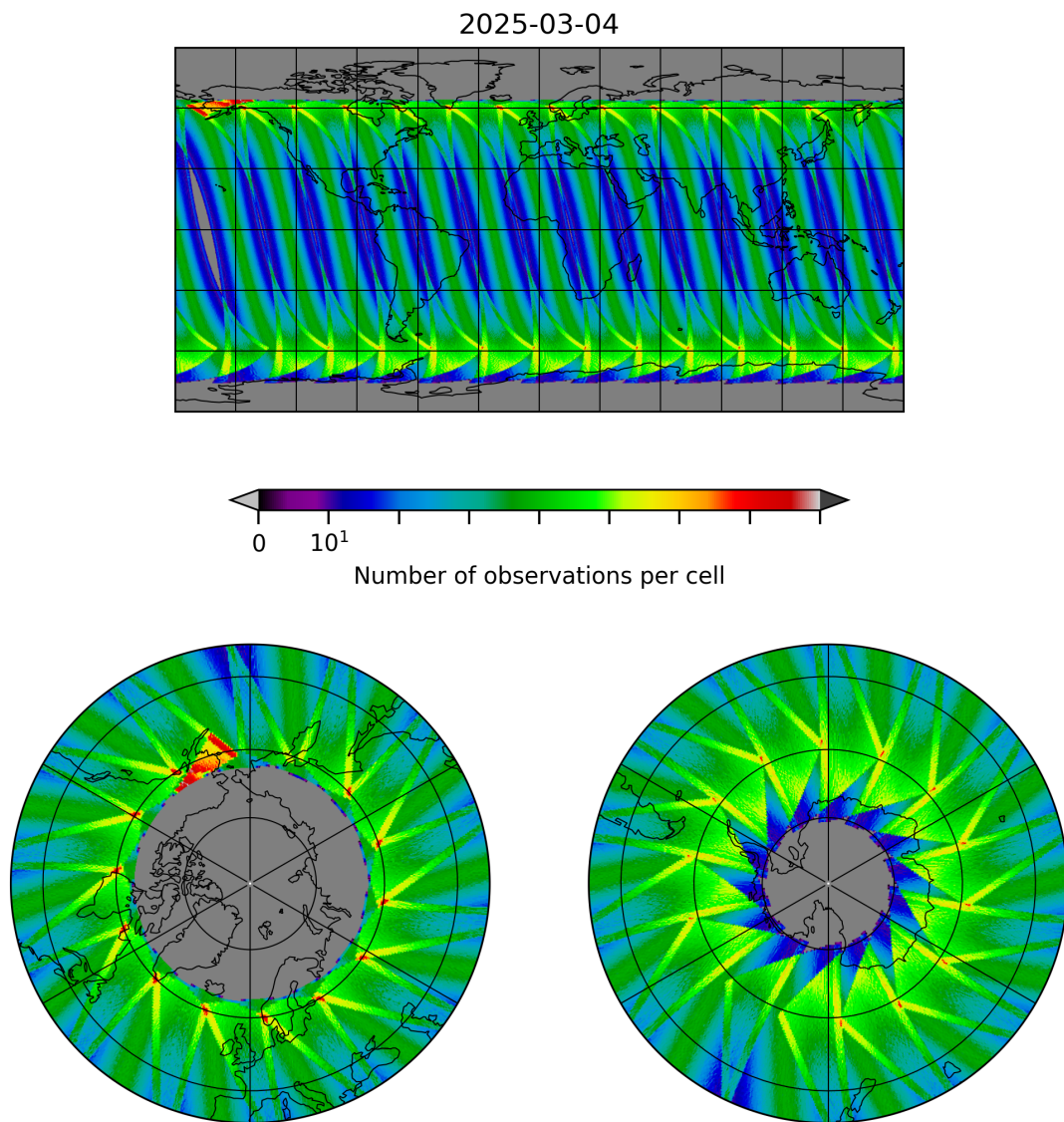


Figure 29: Map of the number of observations for 2025-03-04 to 2025-03-04

7 Zonal average

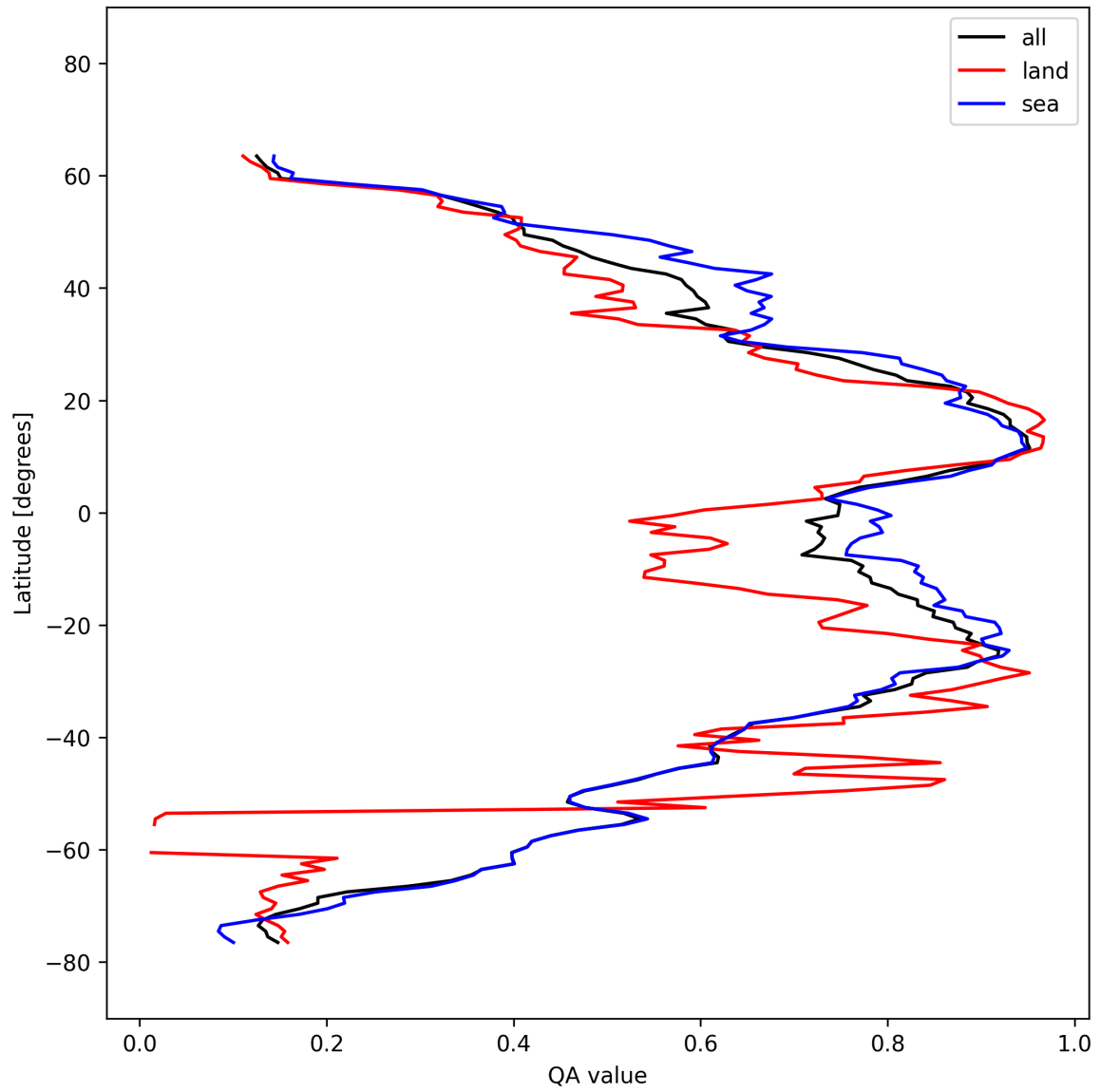


Figure 30: Zonal average of “QA value” for 2025-03-04 to 2025-03-04.

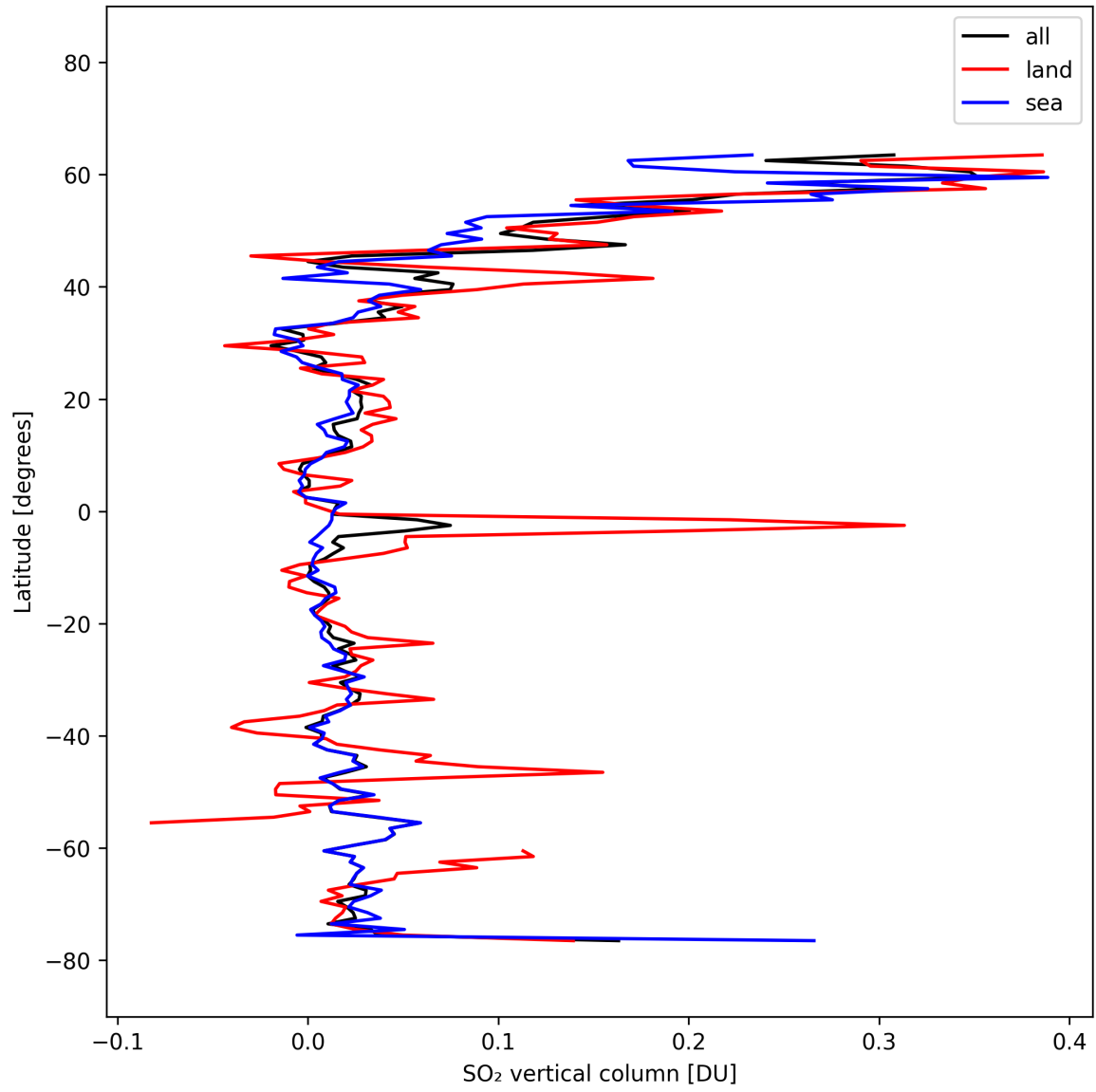


Figure 31: Zonal average of “SO₂ vertical column” for 2025-03-04 to 2025-03-04.

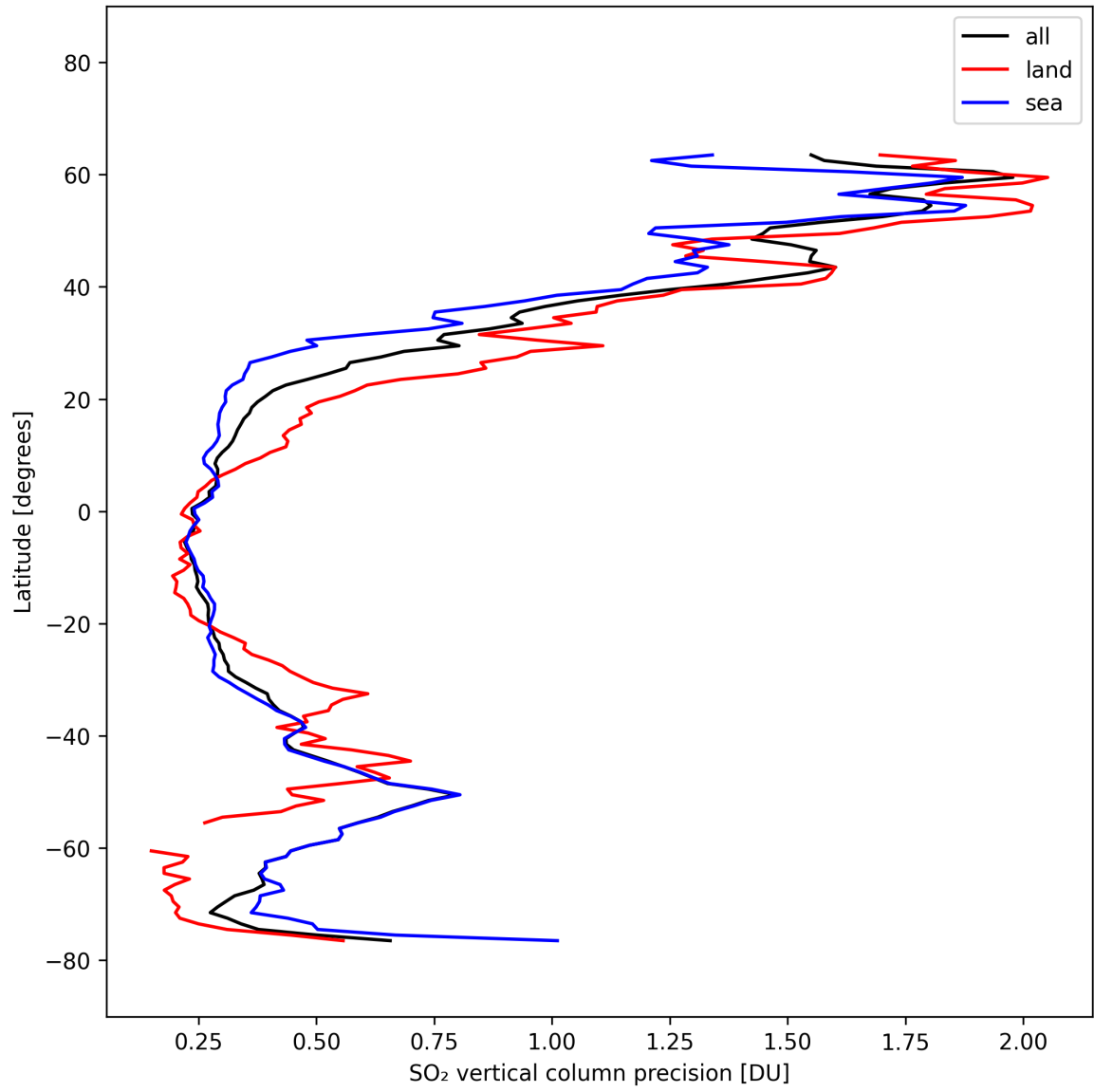


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-03-04 to 2025-03-04.

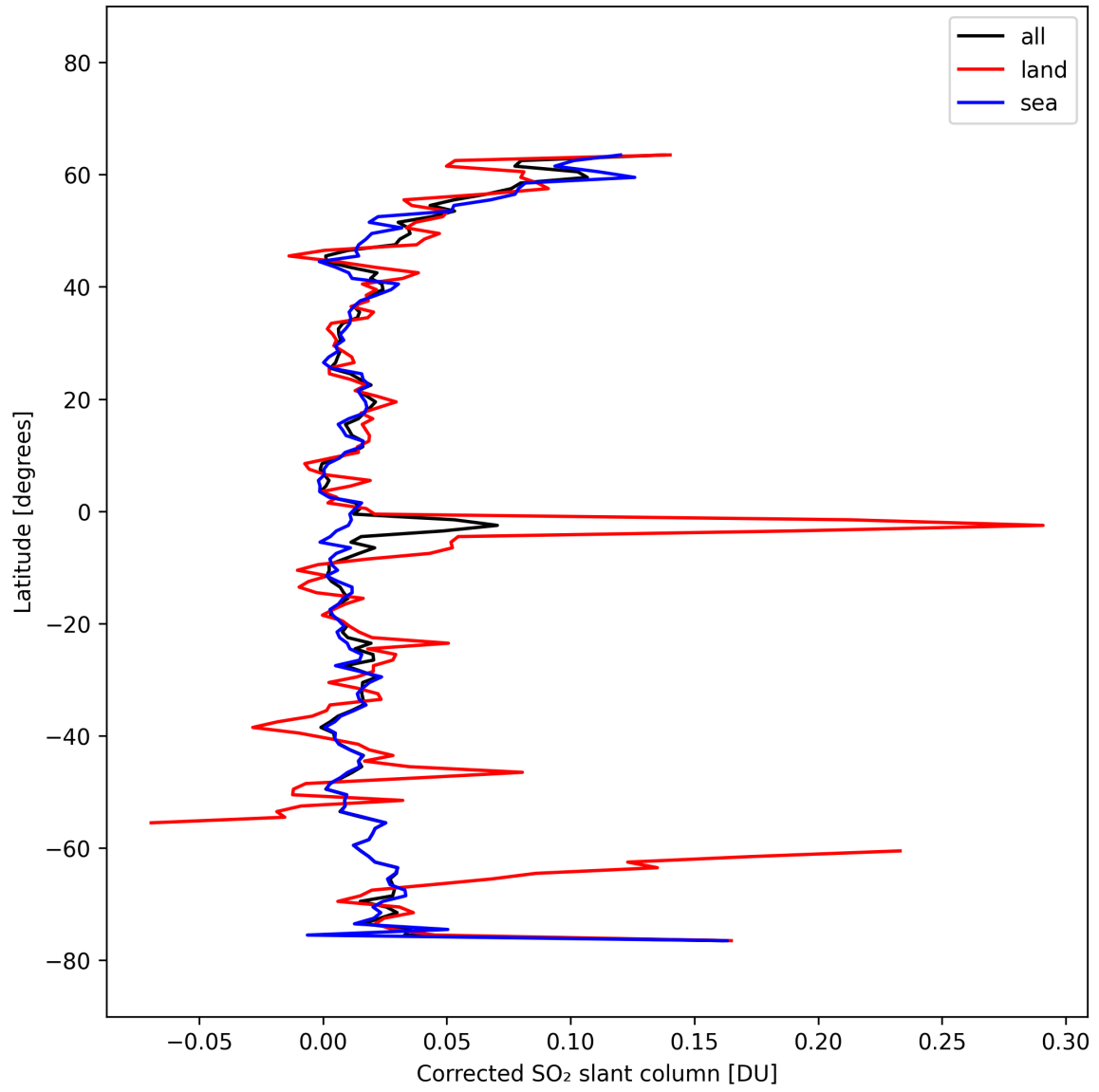


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-03-04 to 2025-03-04.

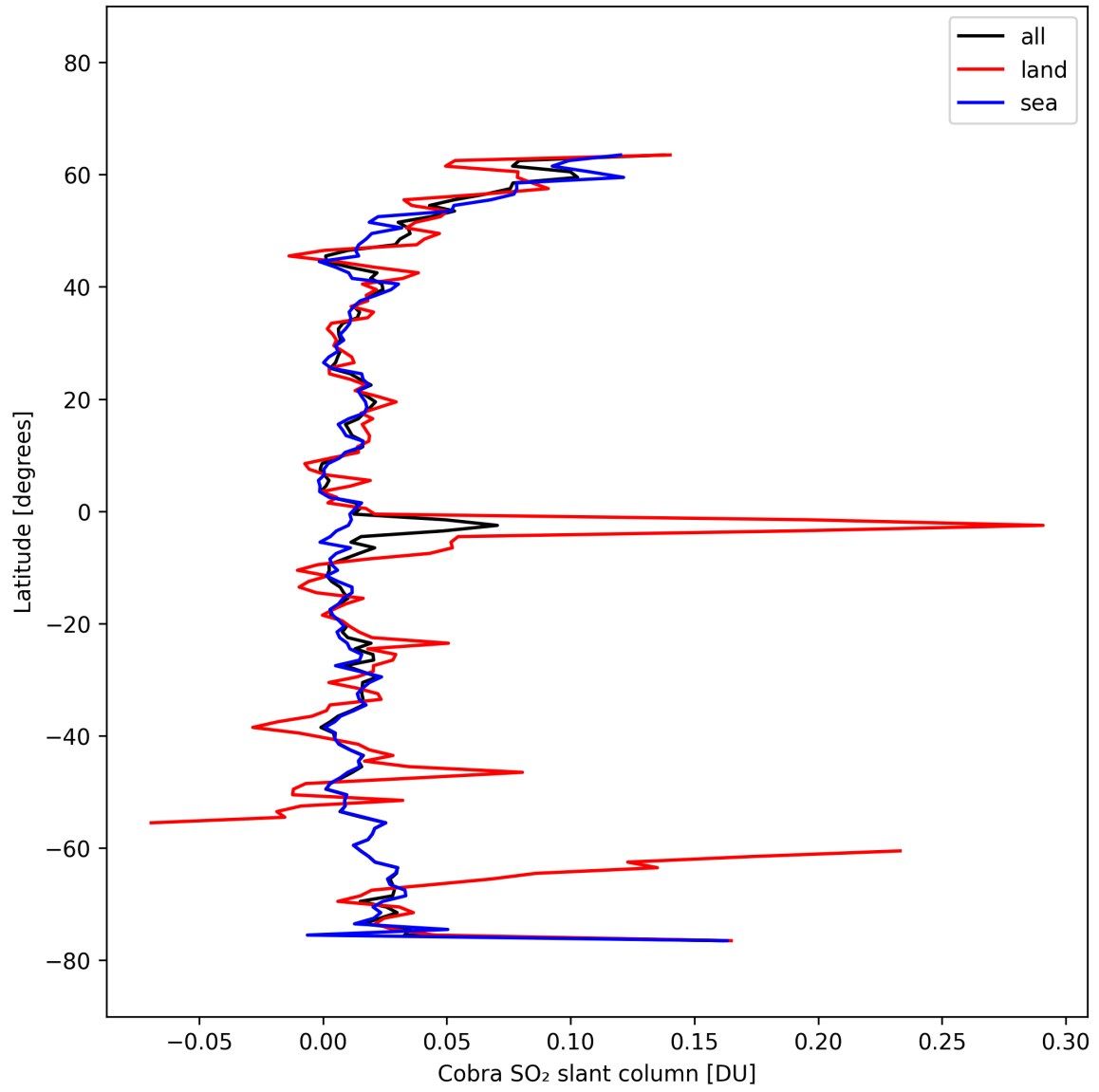


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-03-04 to 2025-03-04.

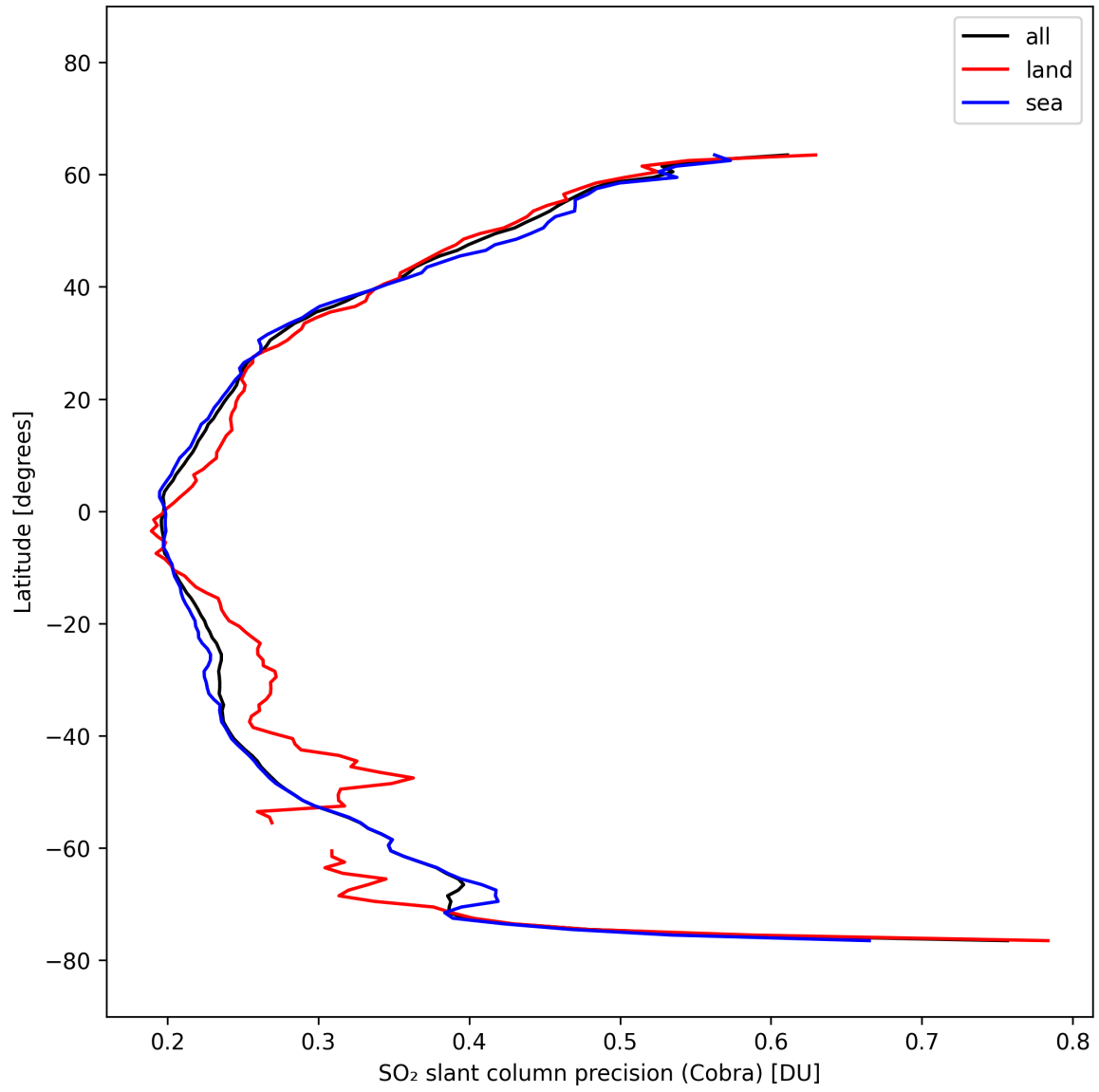


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-03-04 to 2025-03-04.

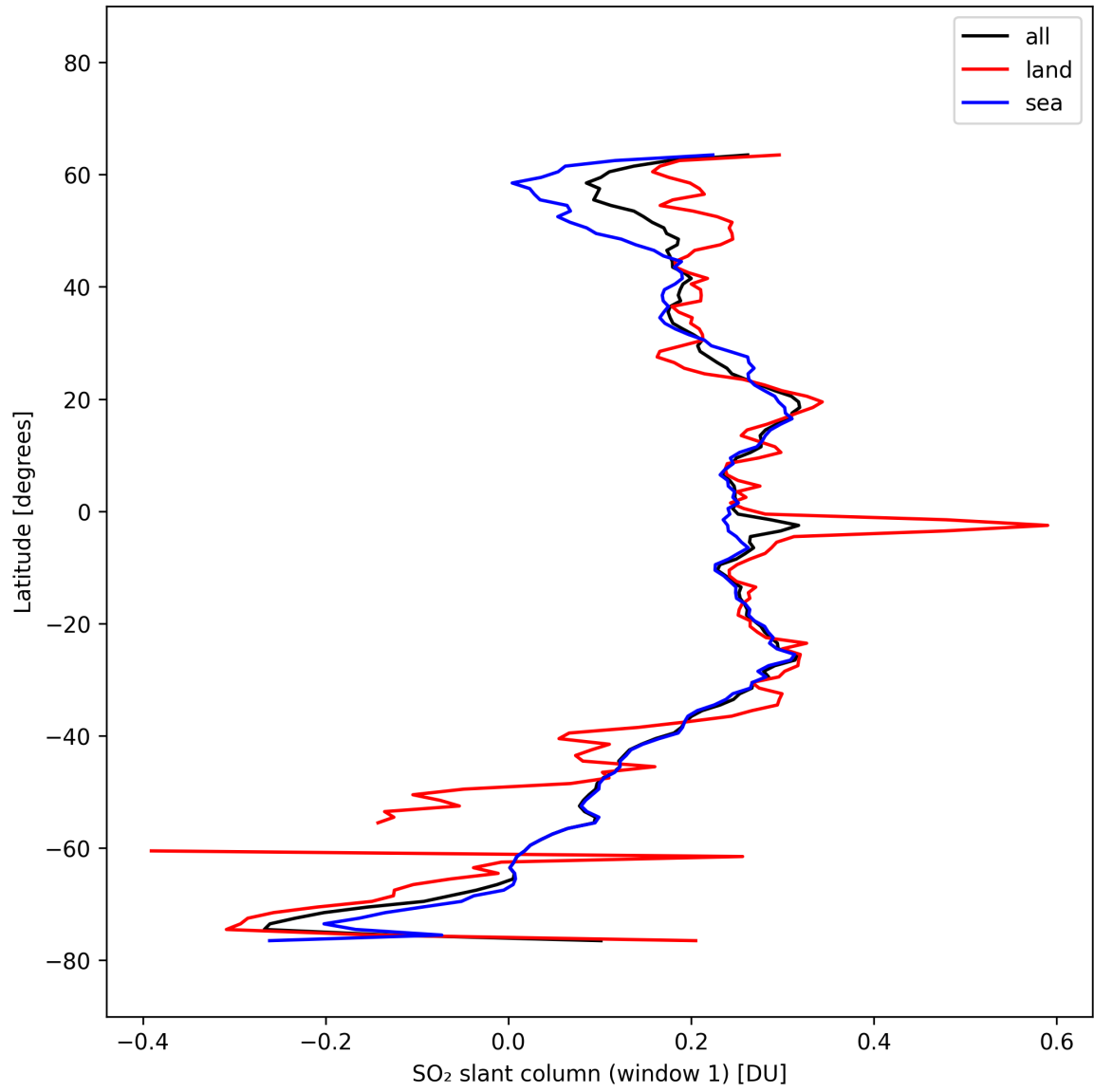


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-03-04 to 2025-03-04.

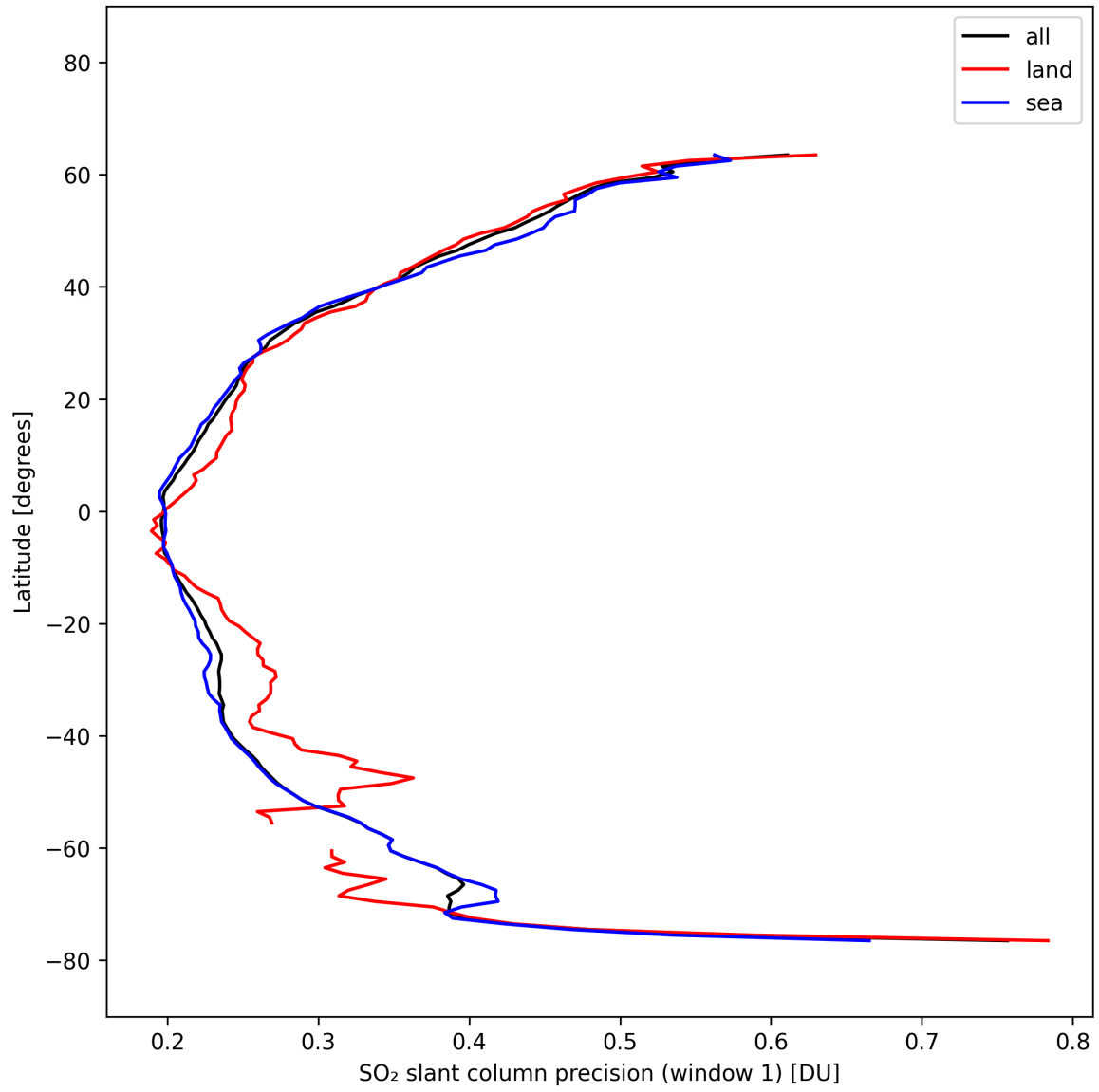


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-03-04 to 2025-03-04.

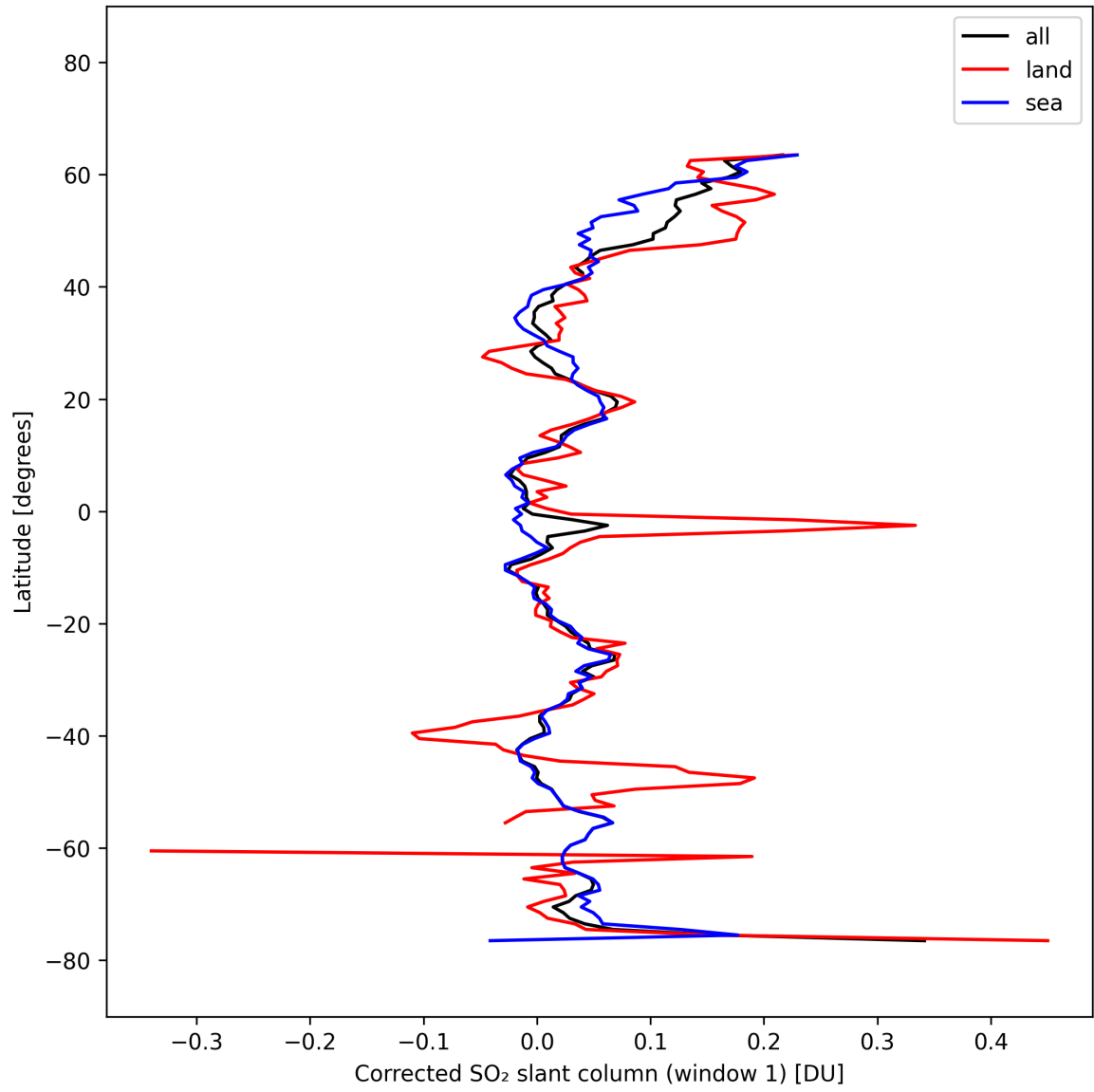


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-03-04 to 2025-03-04.

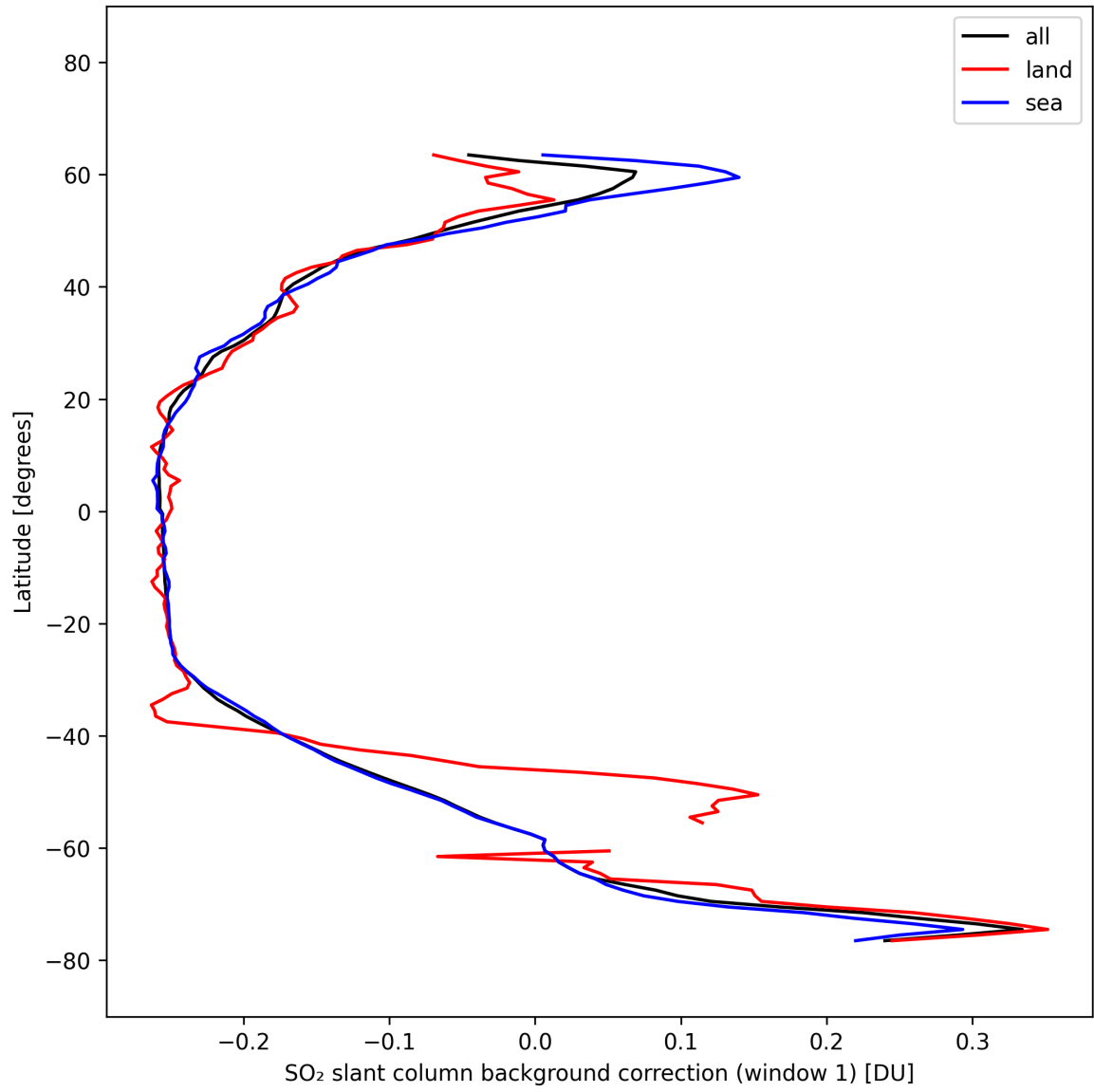


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-03-04 to 2025-03-04.

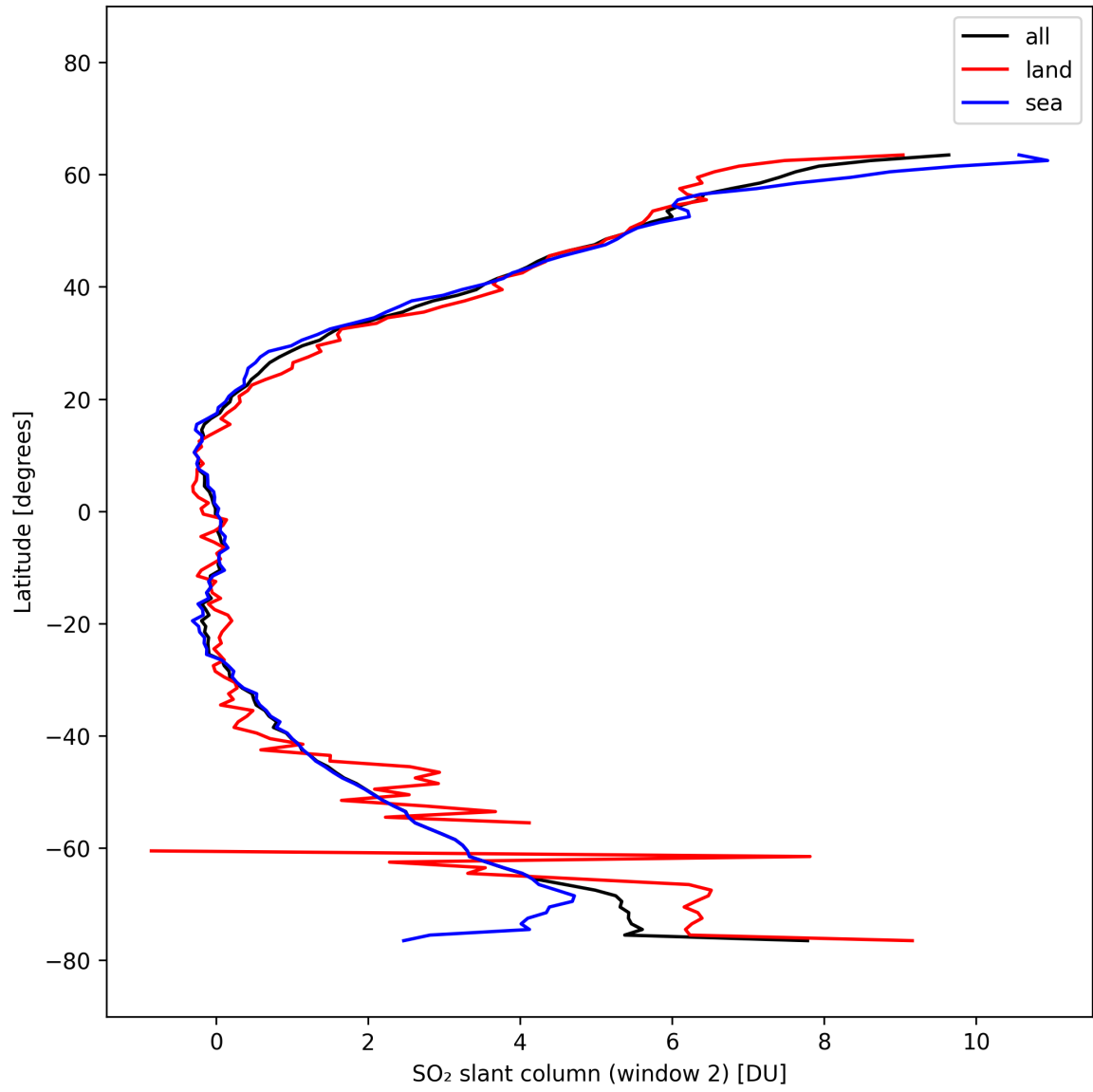


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-03-04 to 2025-03-04.

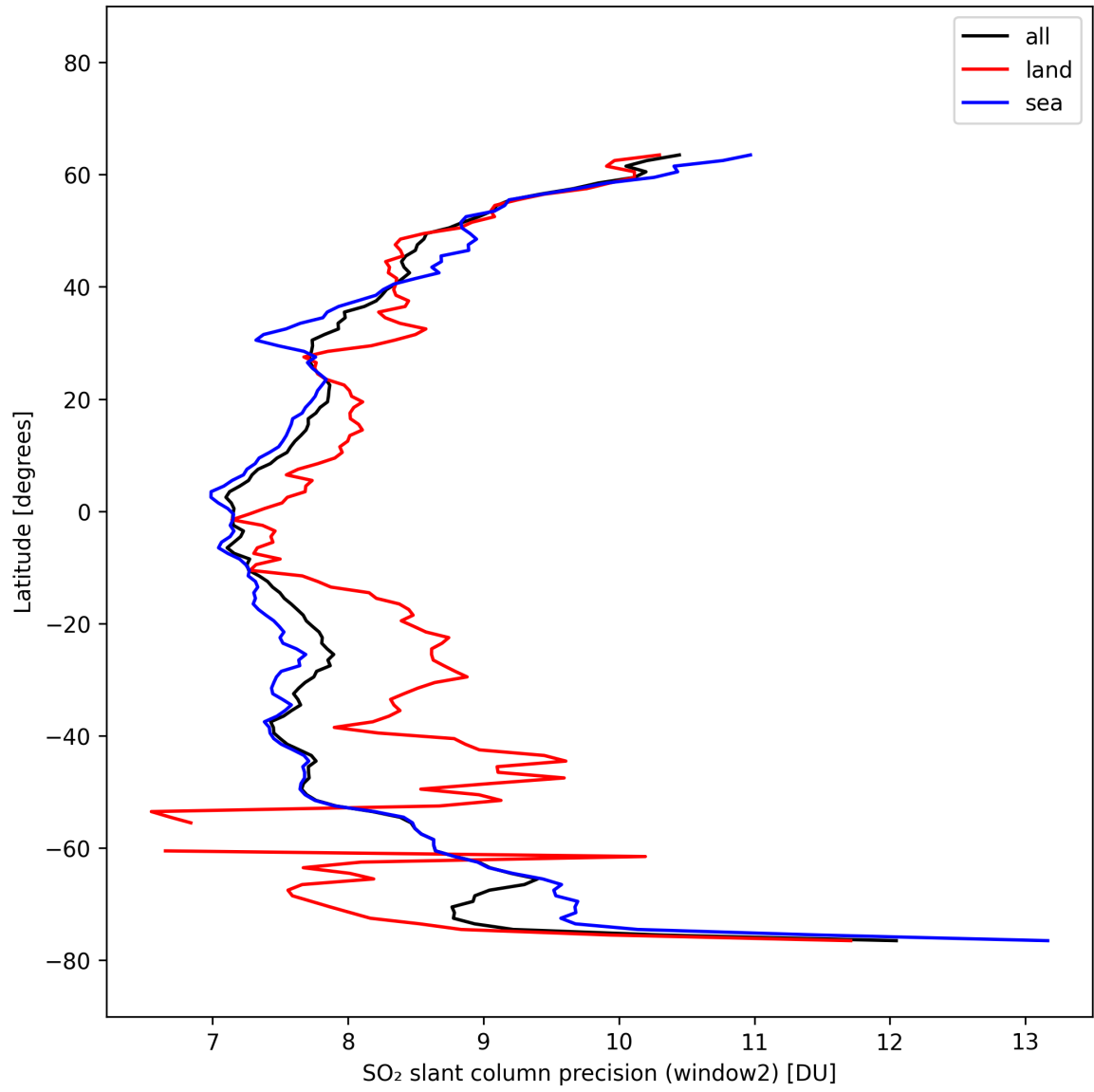


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-03-04 to 2025-03-04.

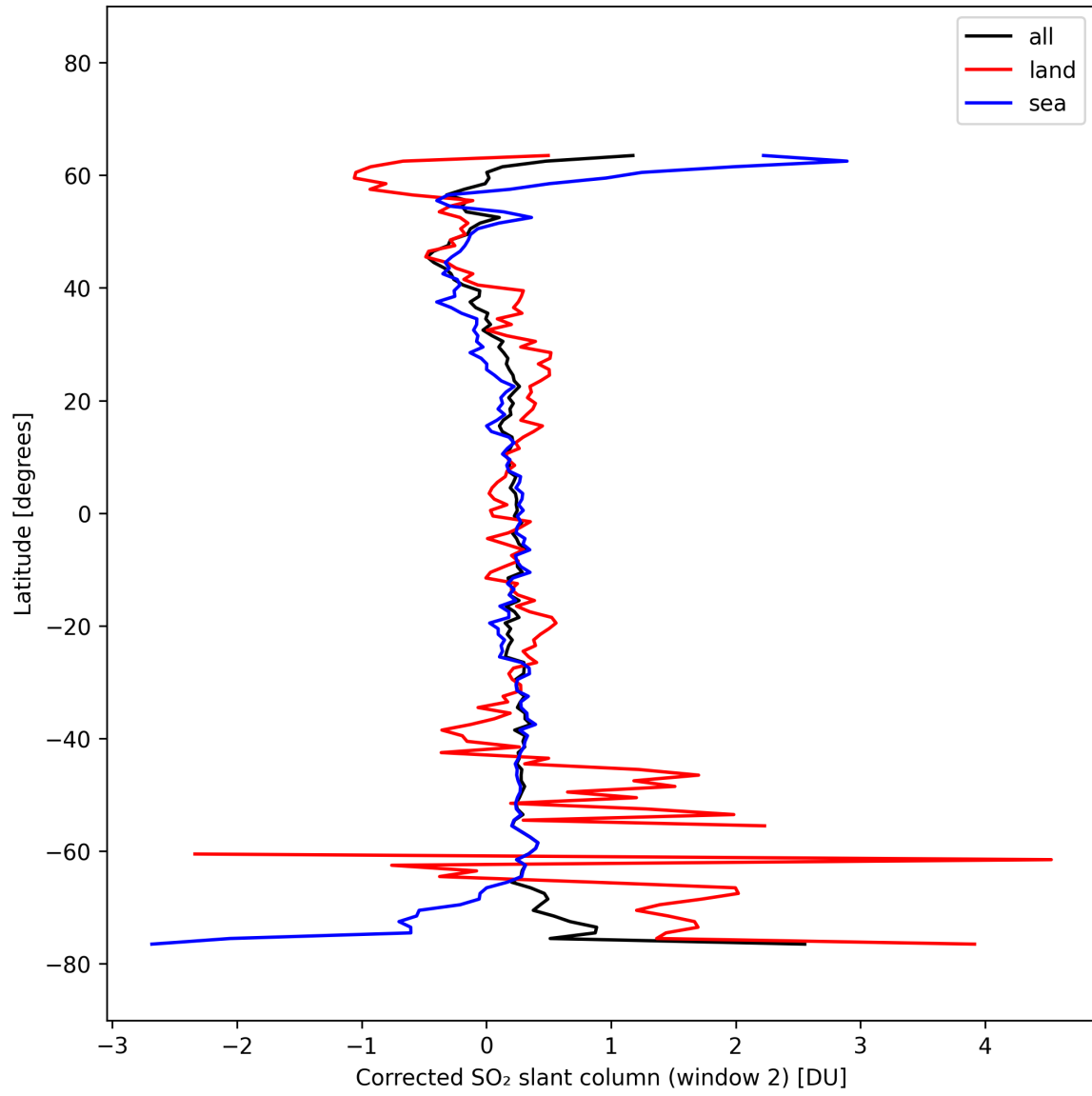


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-03-04 to 2025-03-04.

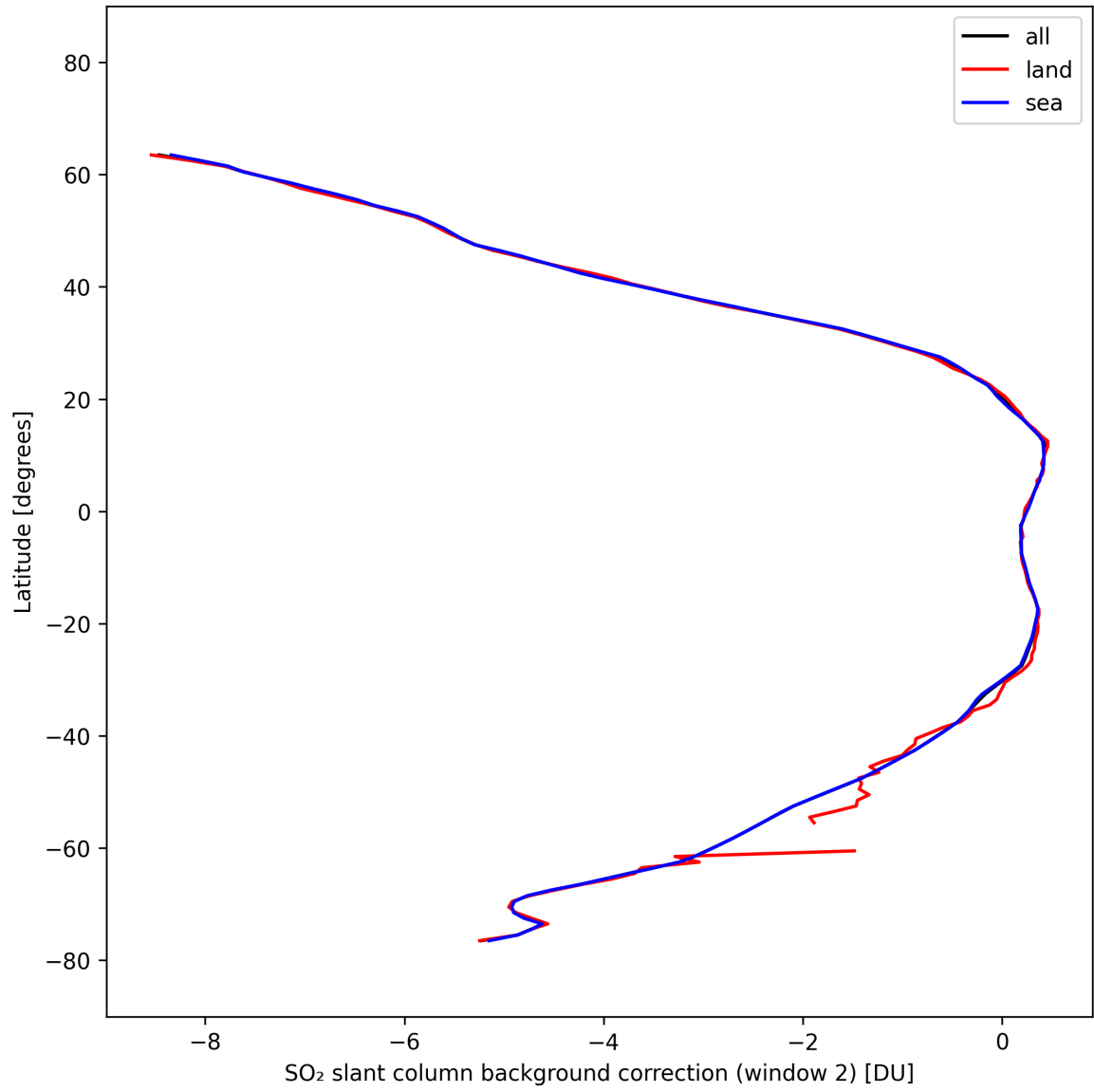


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-03-04 to 2025-03-04.

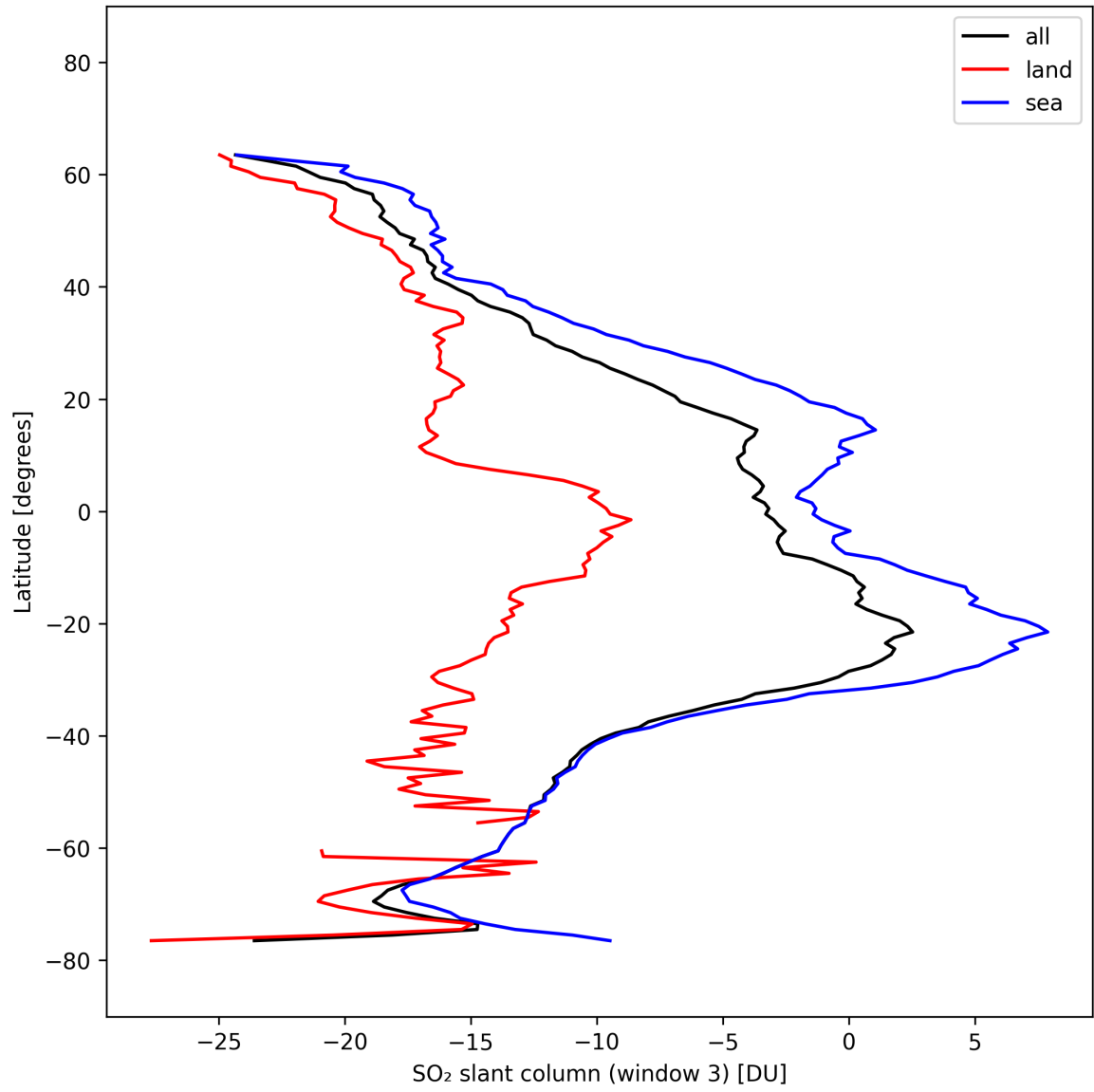


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-03-04 to 2025-03-04.

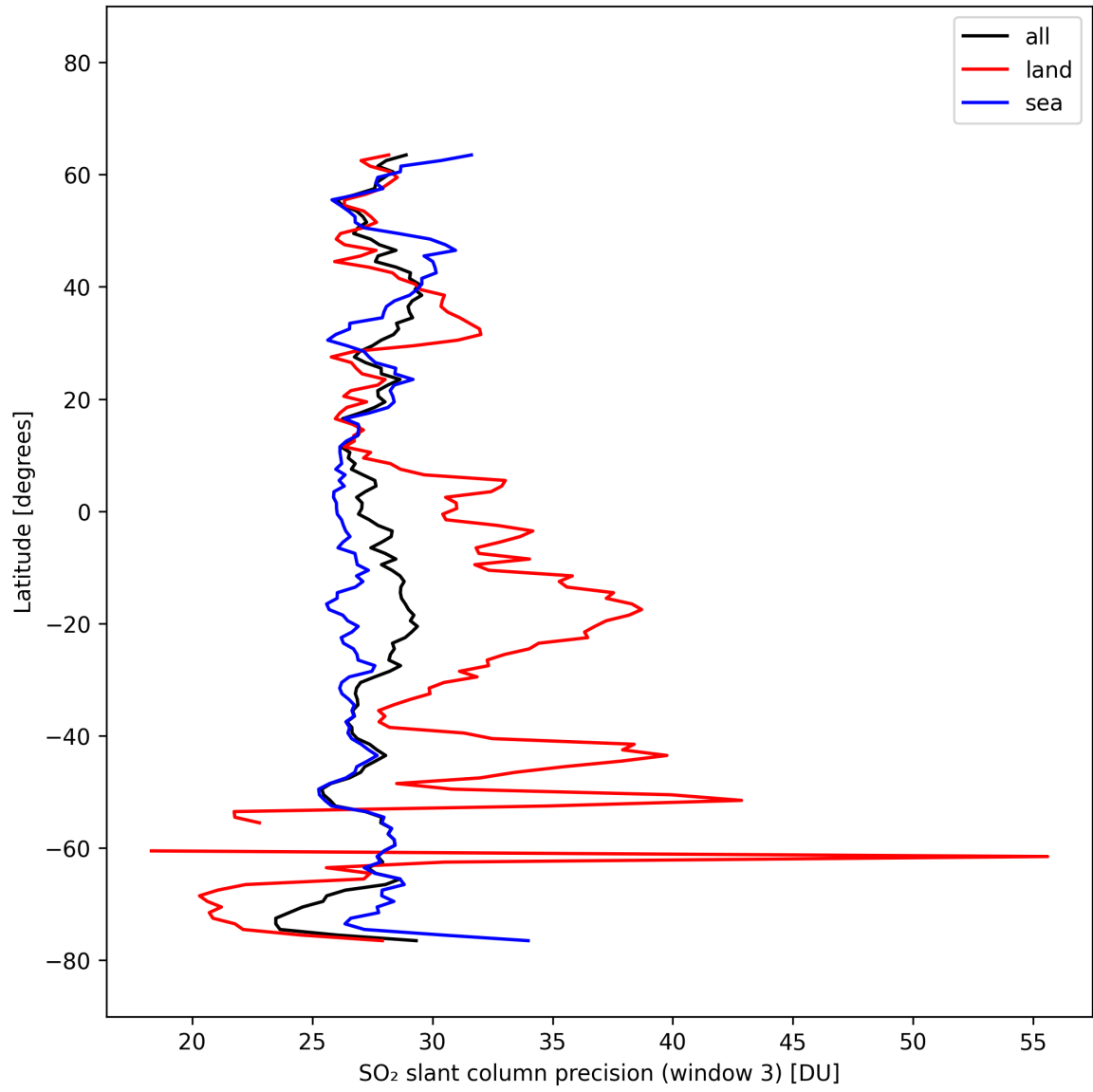


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-03-04 to 2025-03-04.

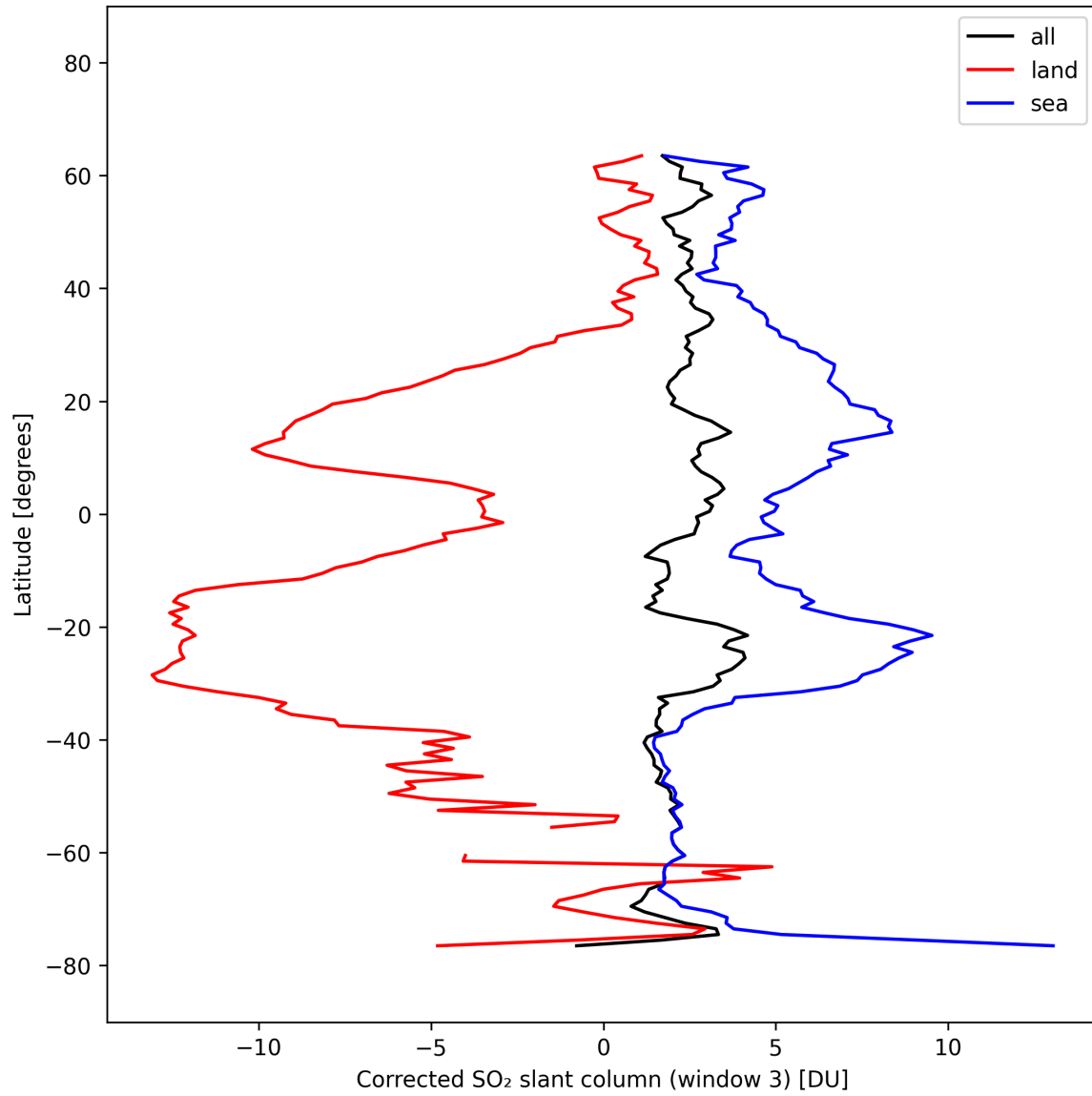


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-03-04 to 2025-03-04.

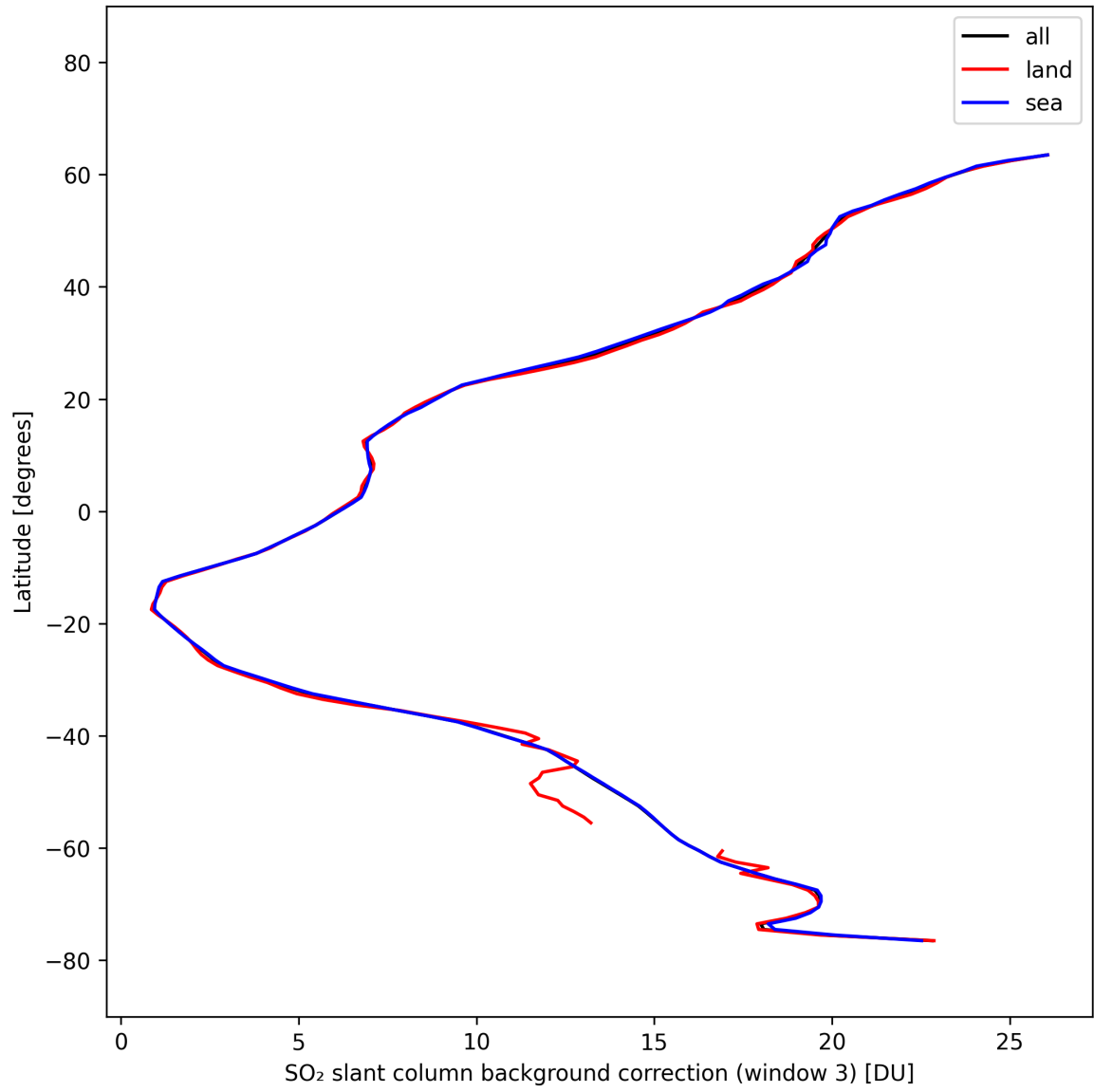


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-03-04 to 2025-03-04.

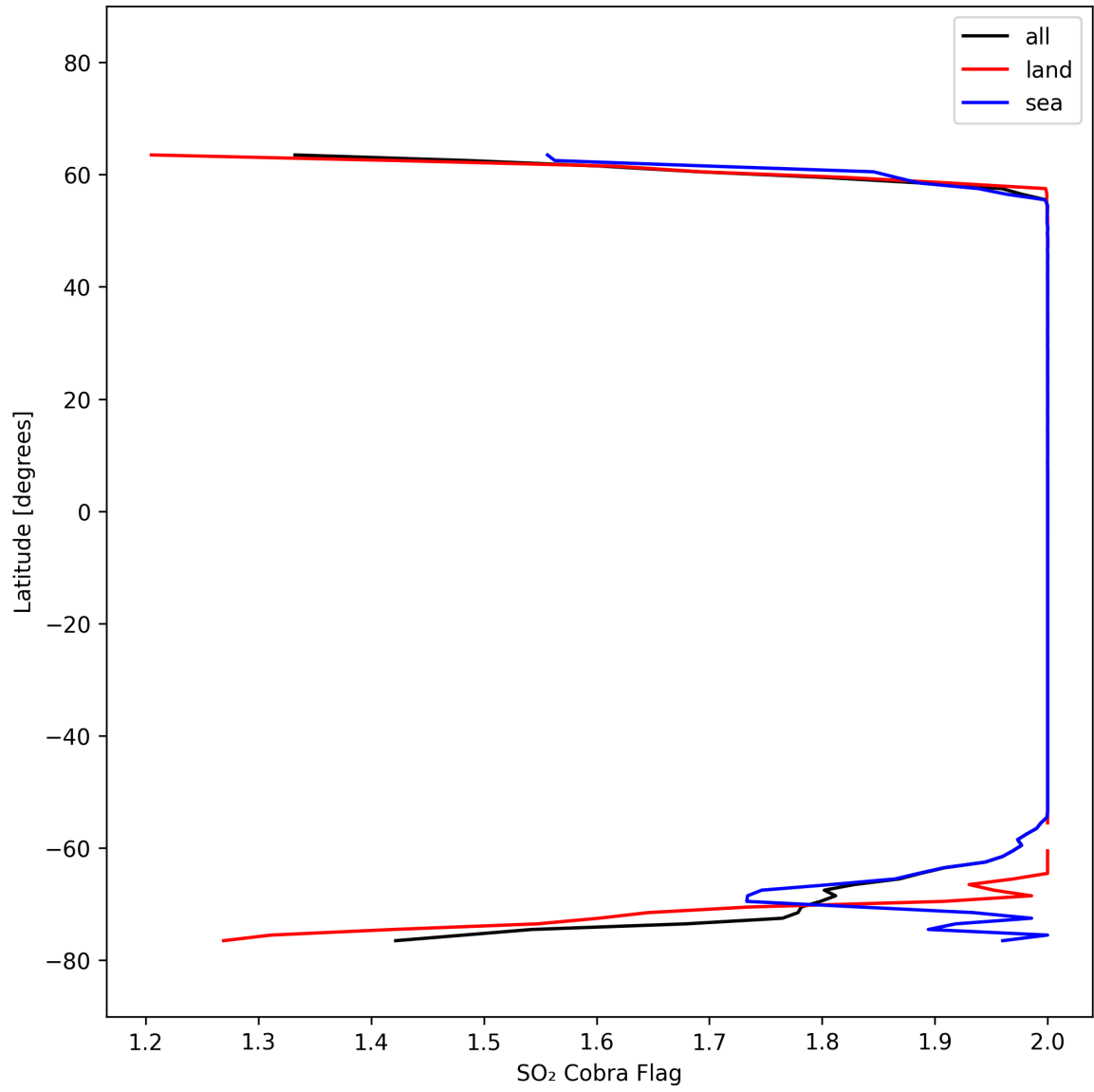


Figure 48: Zonal average of “SO₂ Cobra Flag” for 2025-03-04 to 2025-03-04.

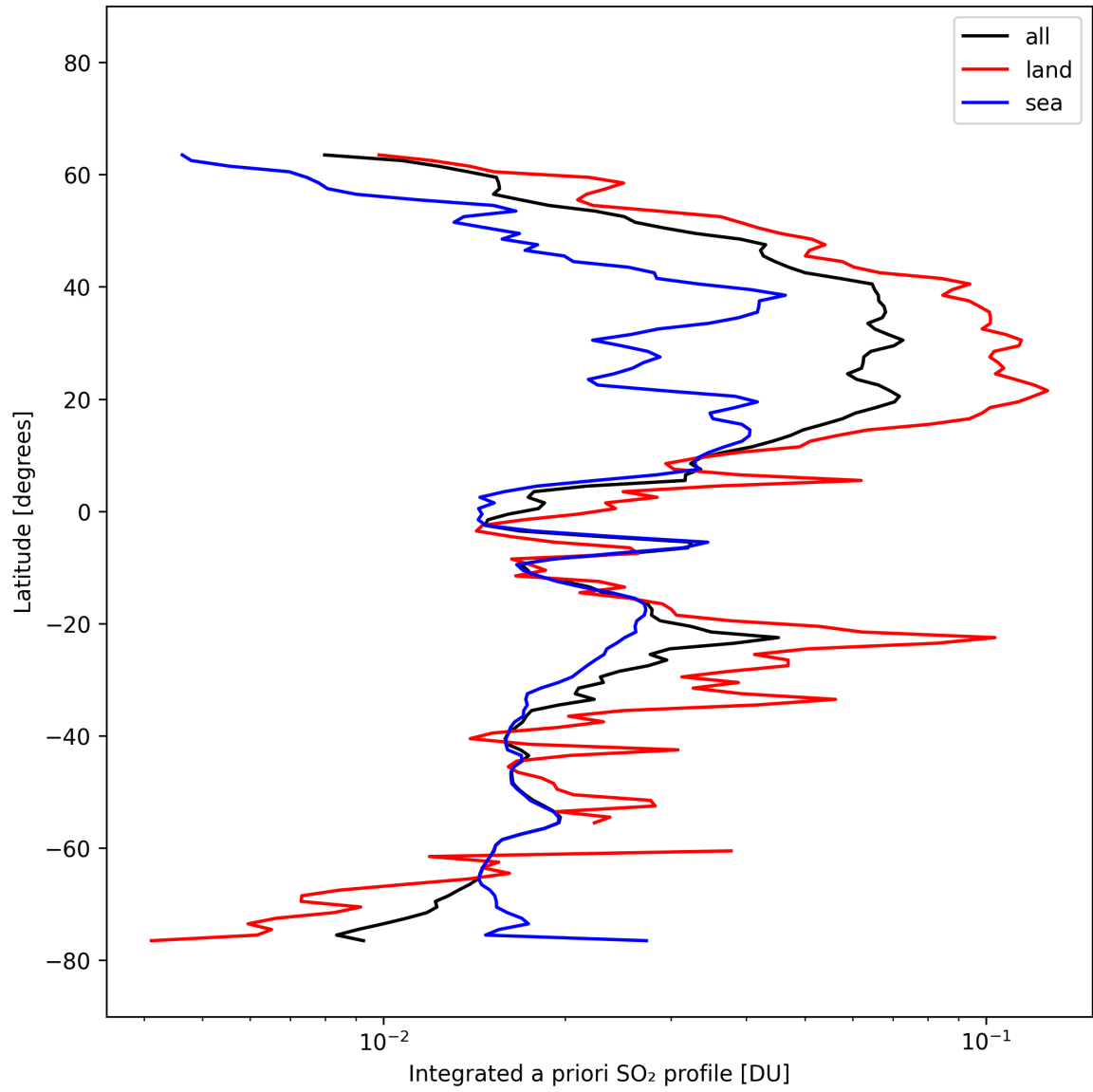


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-03-04 to 2025-03-04.

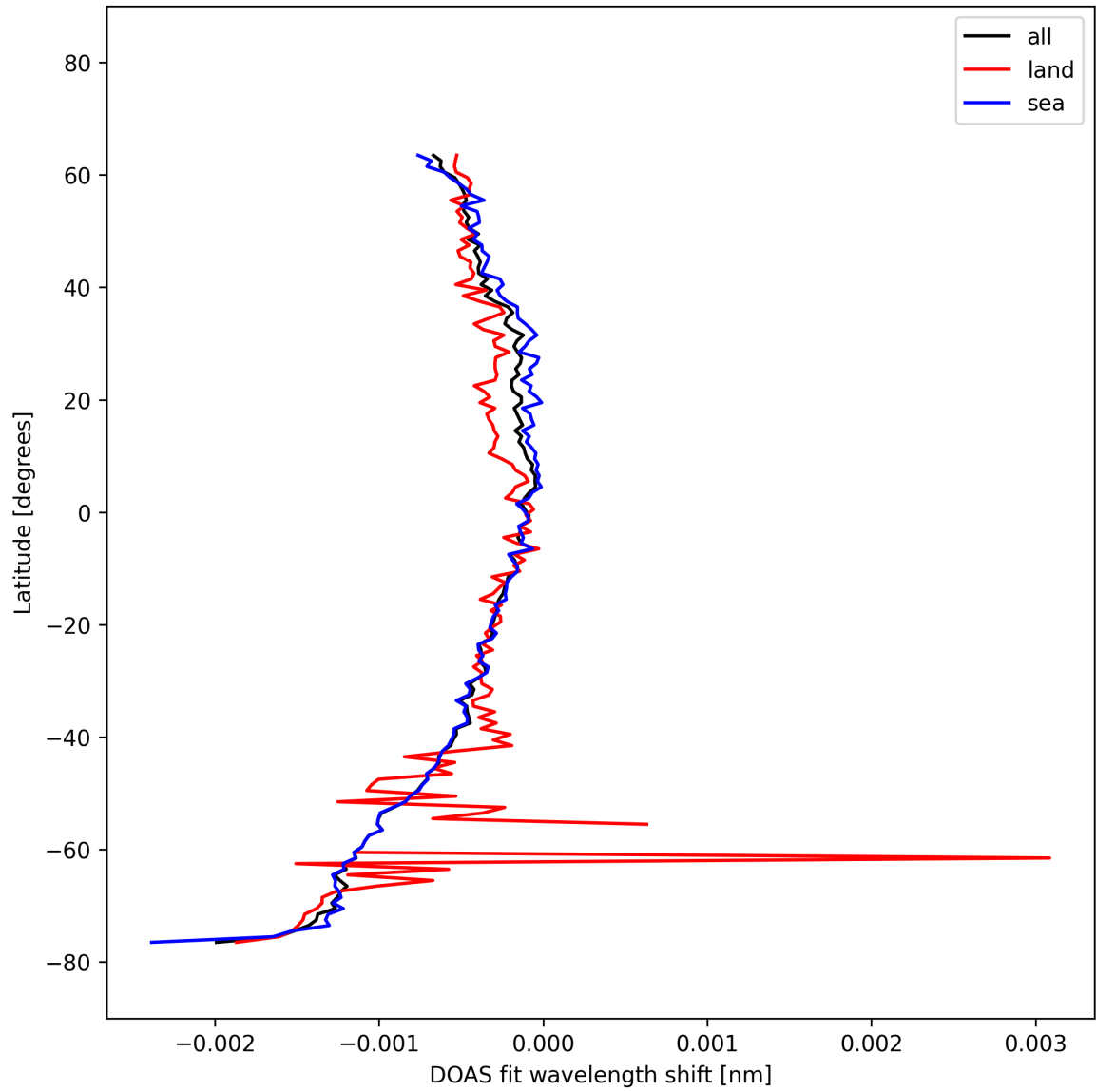


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-03-04 to 2025-03-04.

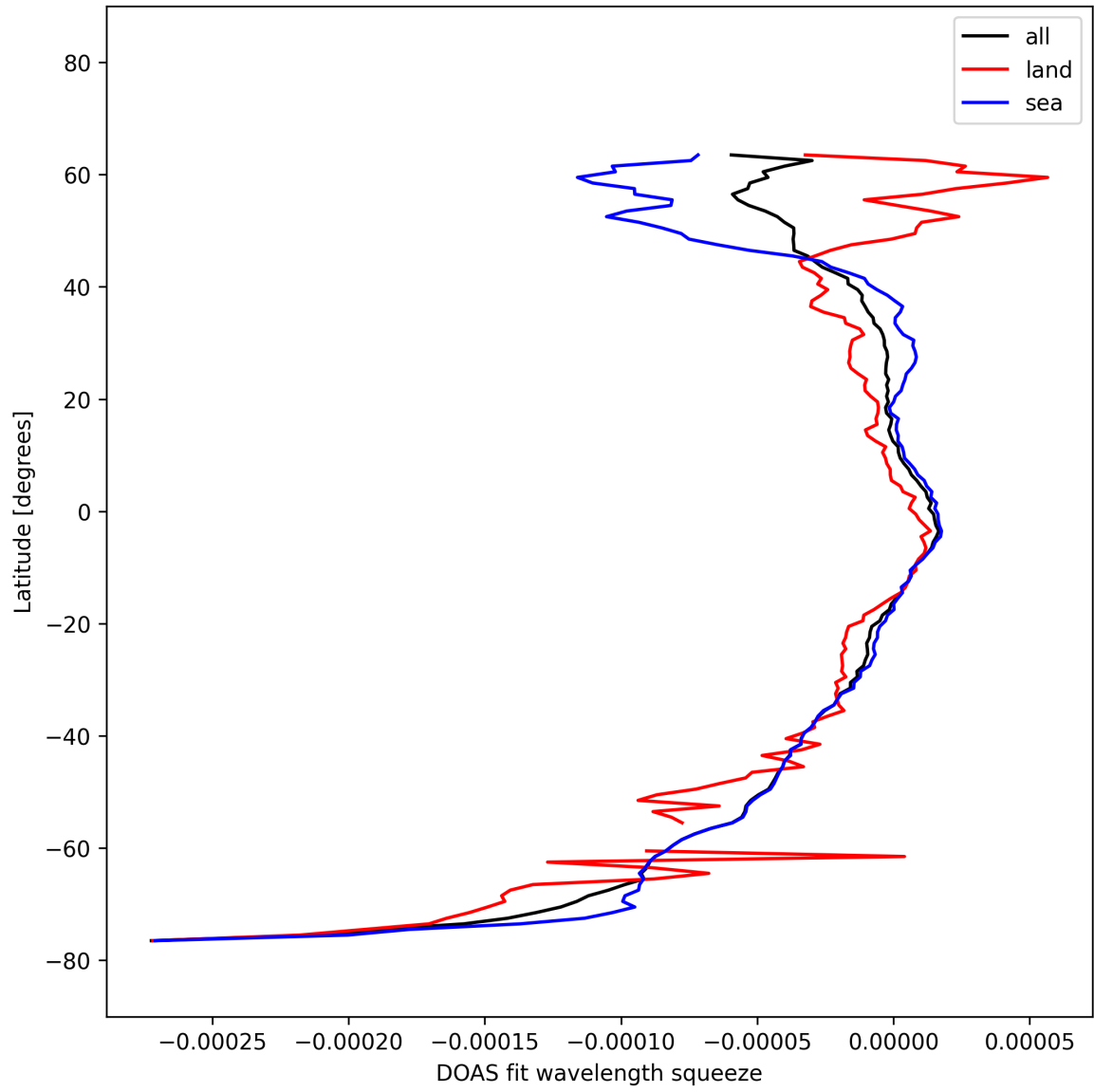


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-03-04 to 2025-03-04.

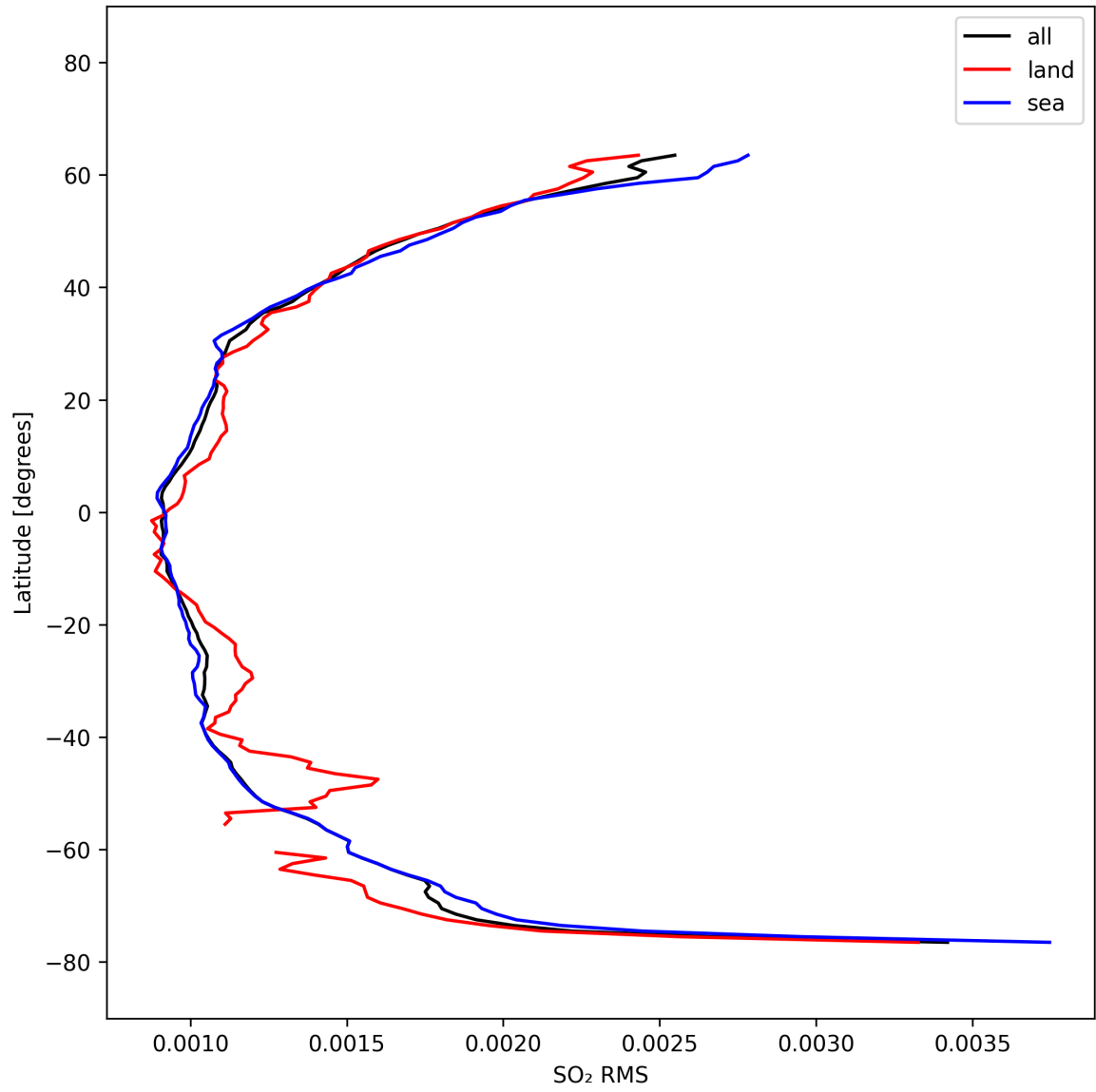


Figure 52: Zonal average of “SO₂ RMS” for 2025-03-04 to 2025-03-04.

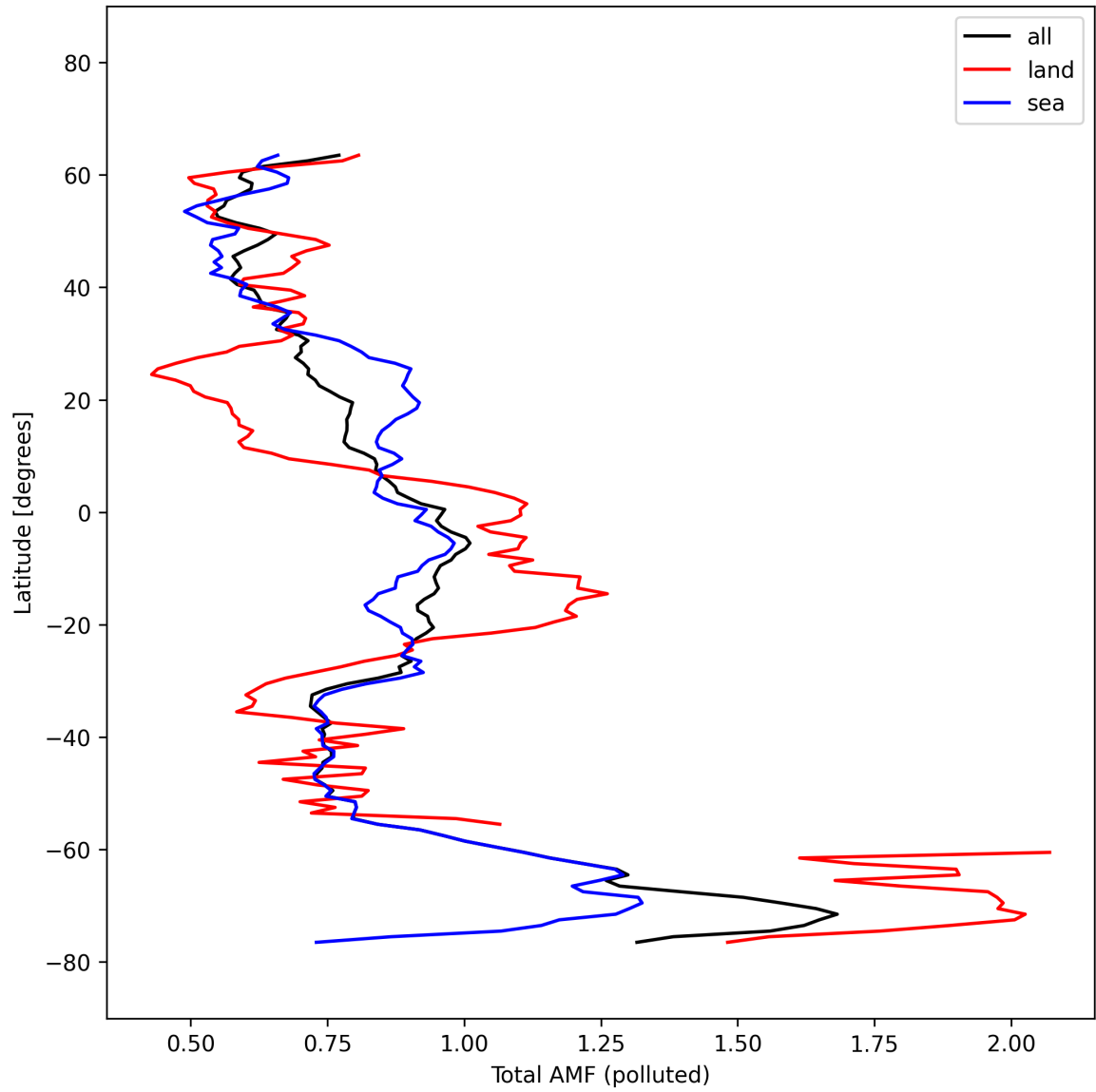


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-03-04 to 2025-03-04.

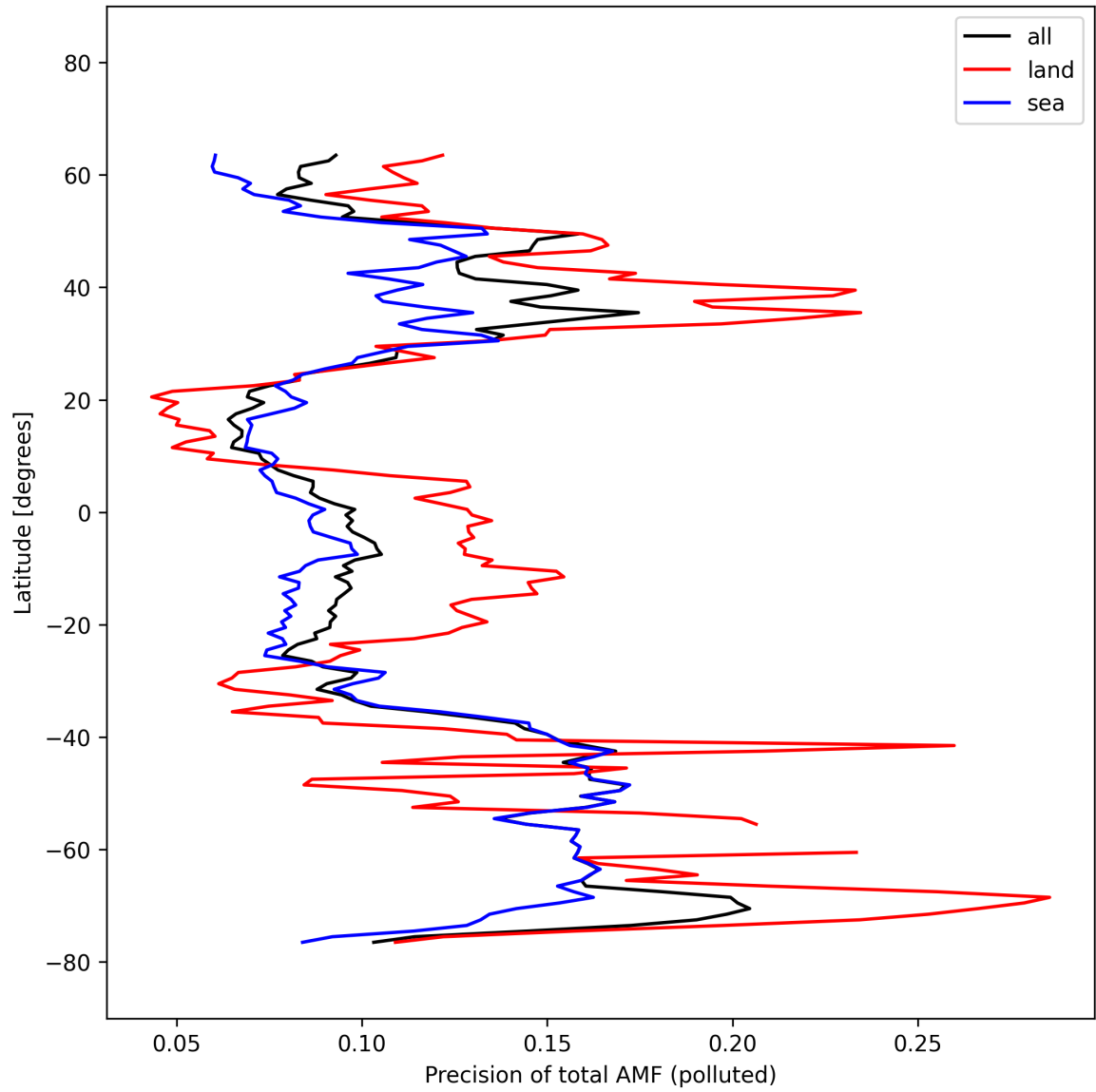


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-03-04 to 2025-03-04.

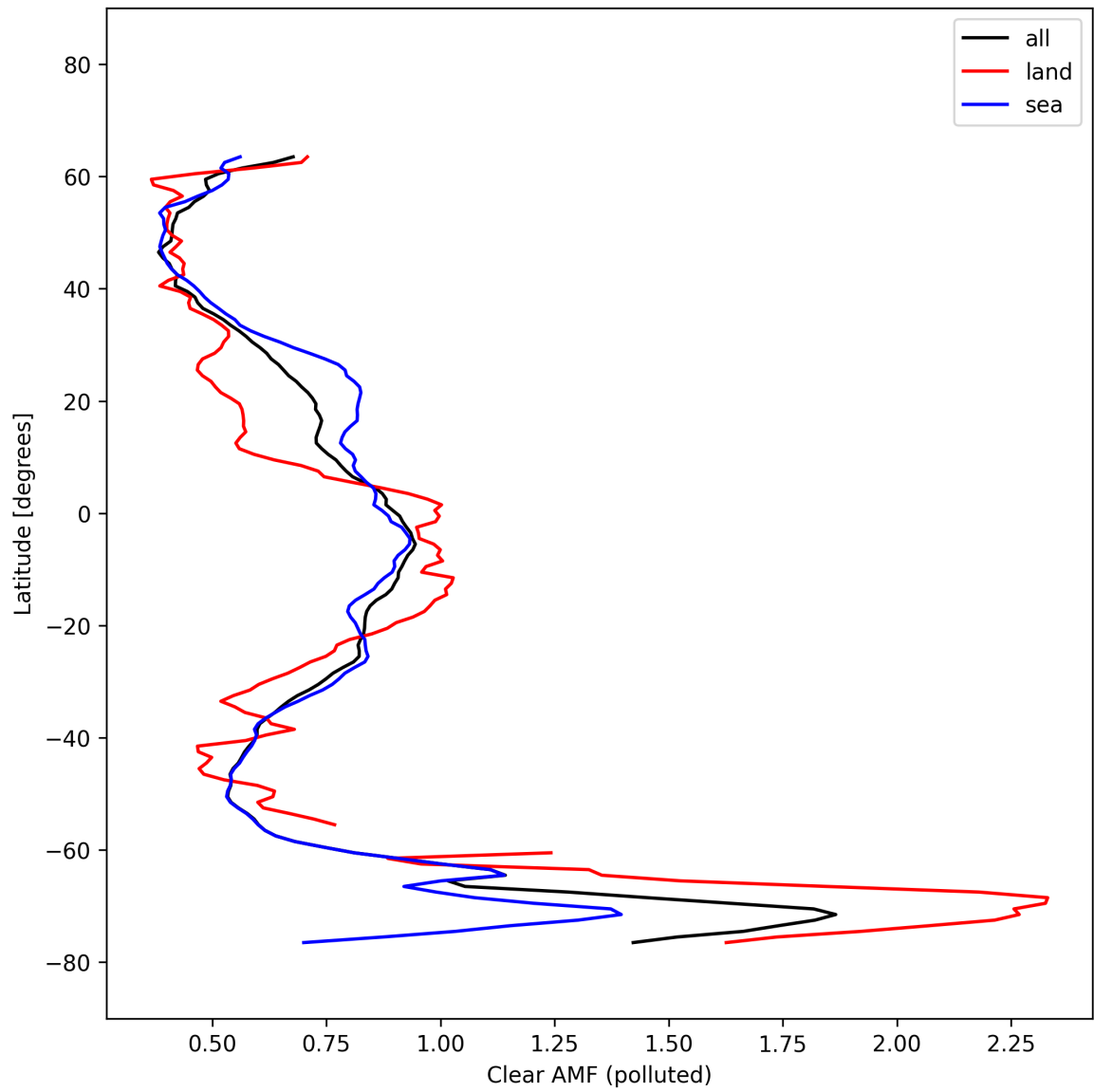


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-03-04 to 2025-03-04.

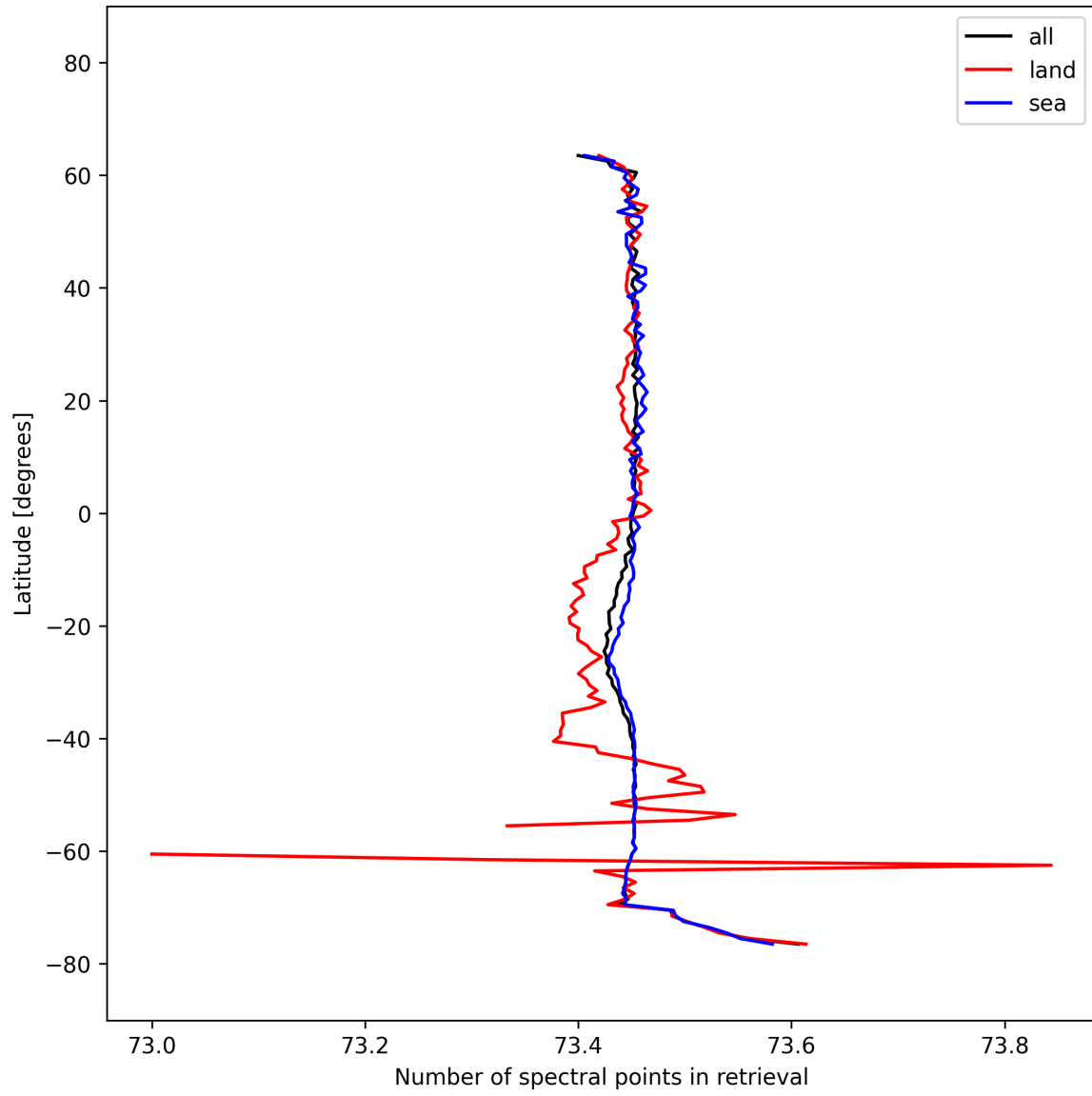


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-03-04 to 2025-03-04.

8 Histograms

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

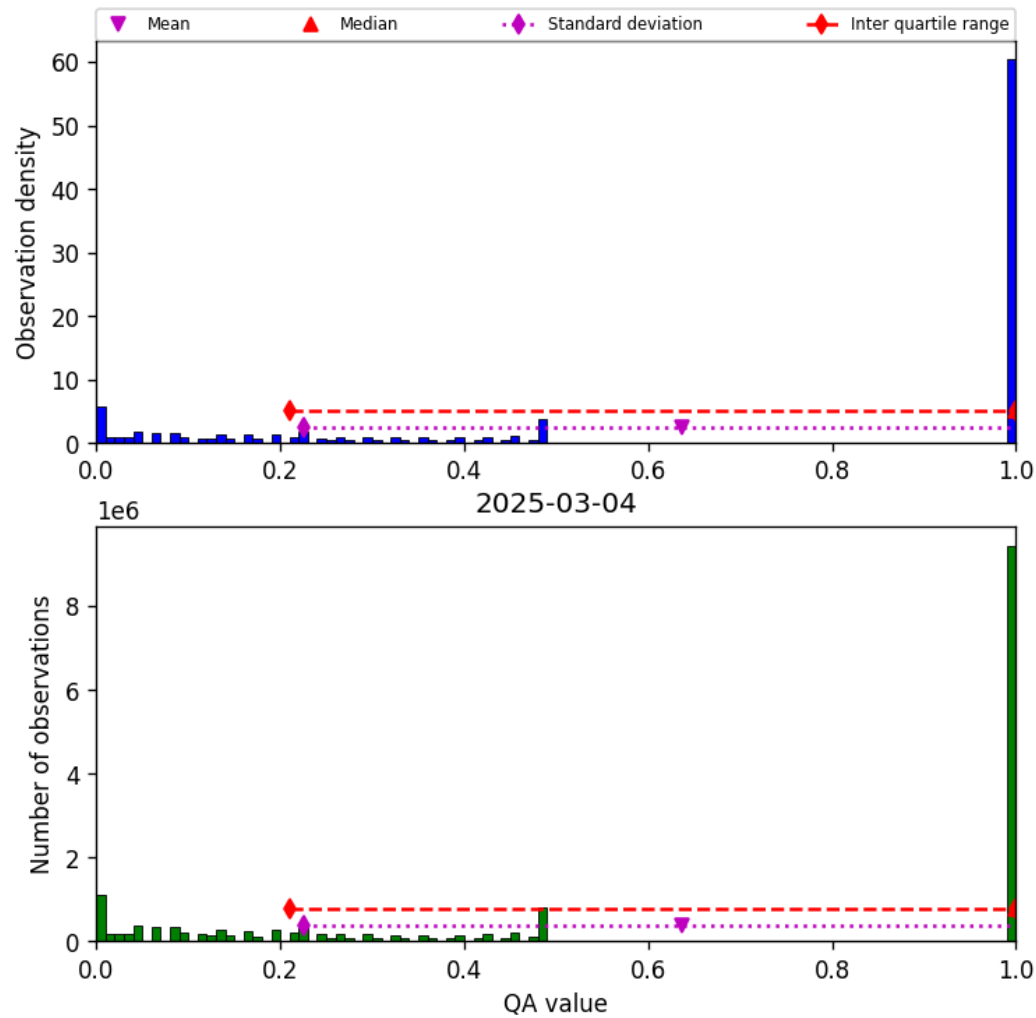


Figure 57: Histogram of “QA value” for 2025-03-04 to 2025-03-04

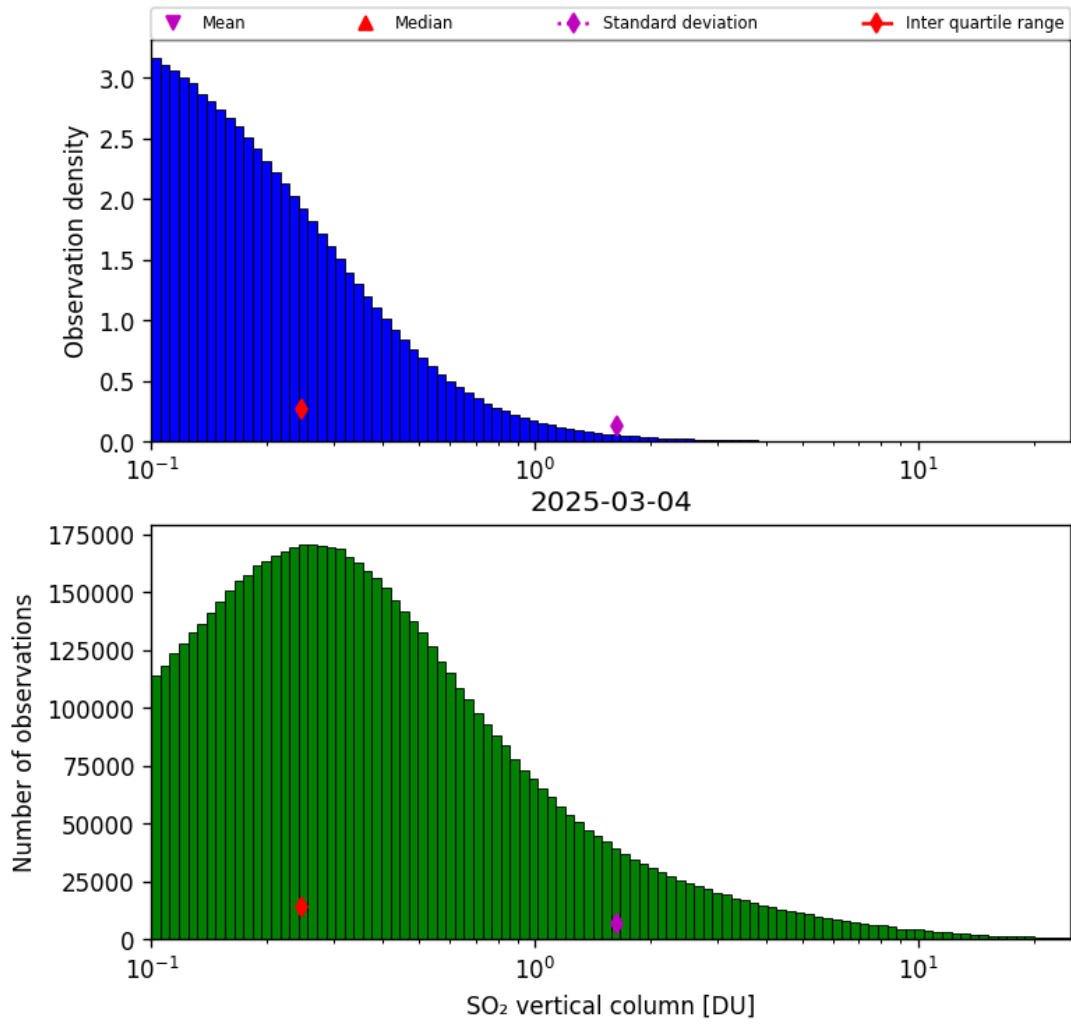


Figure 58: Histogram of “SO₂ vertical column” for 2025-03-04 to 2025-03-04

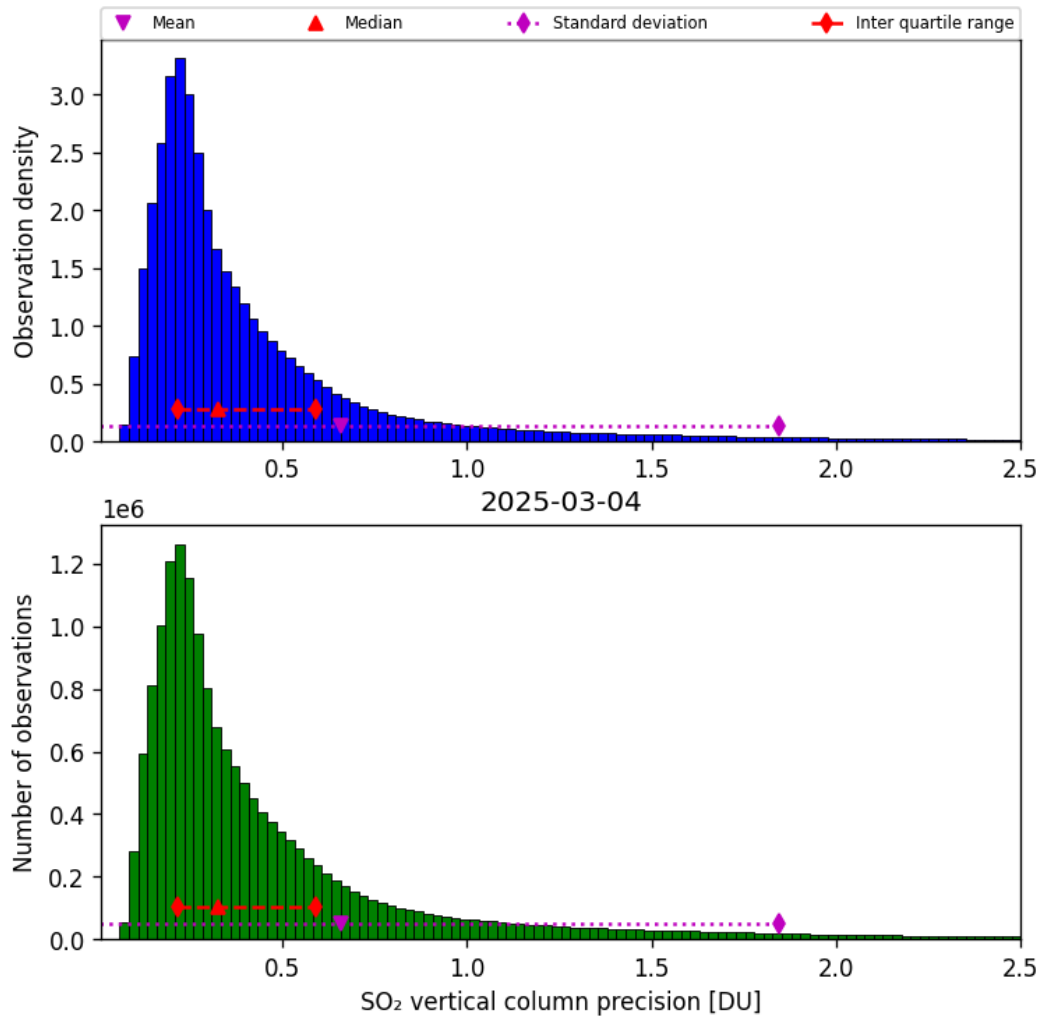


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-03-04 to 2025-03-04

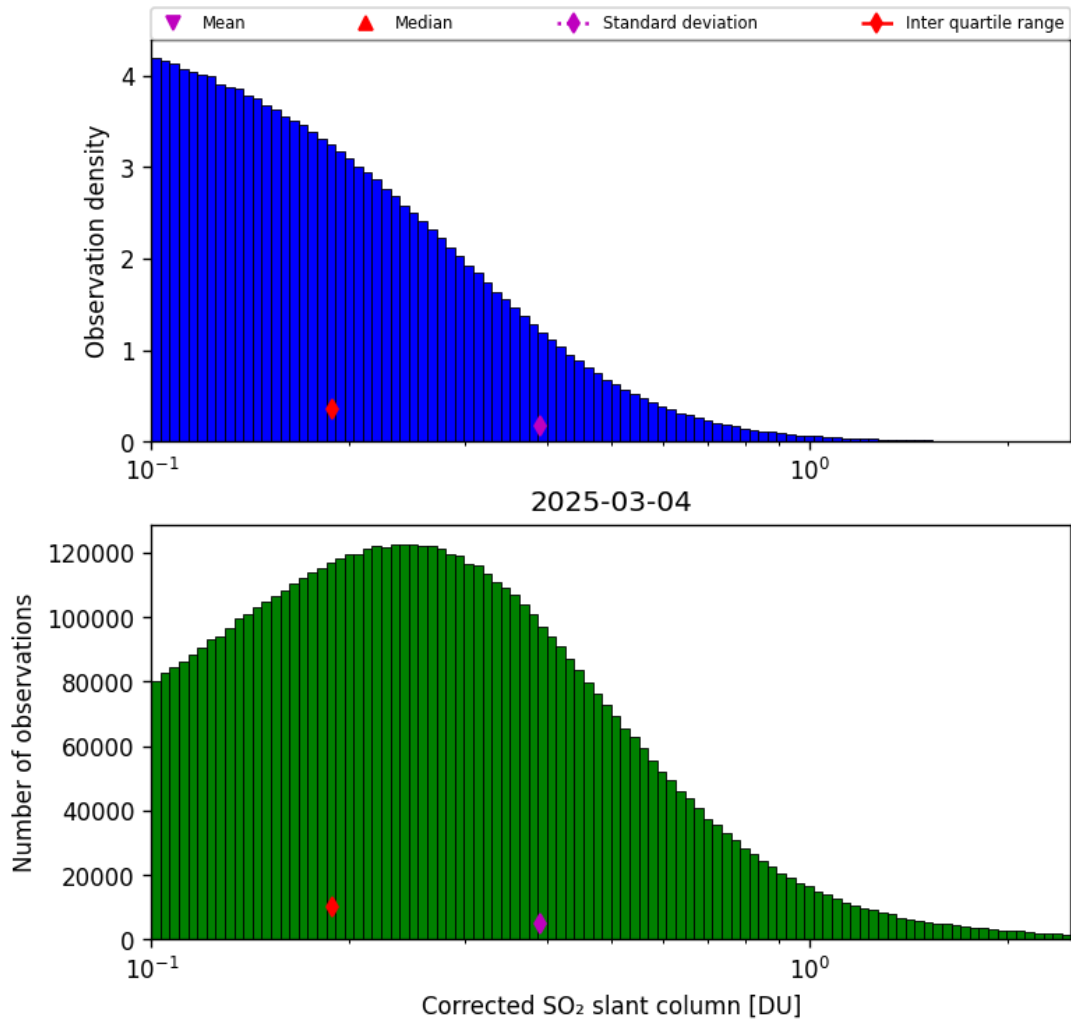


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-03-04 to 2025-03-04

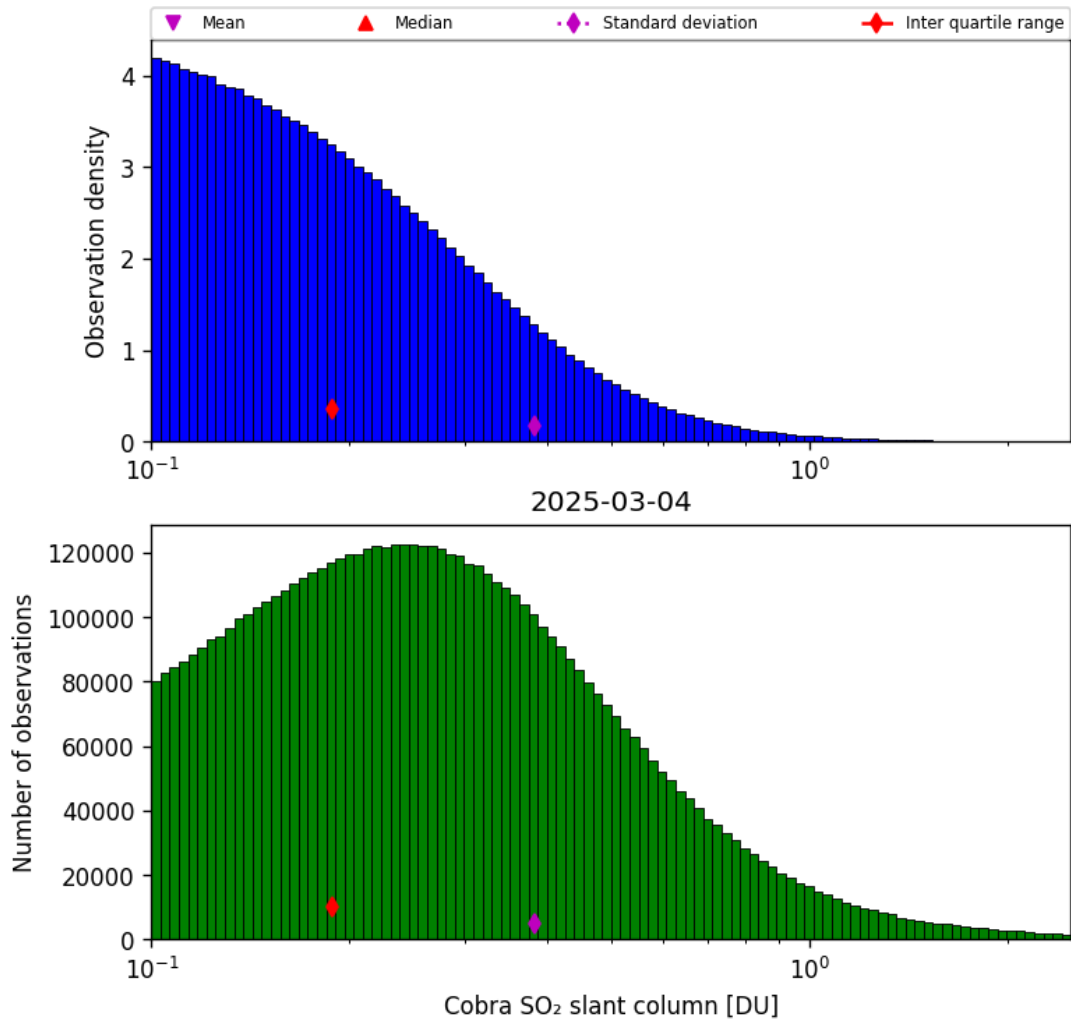


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-03-04 to 2025-03-04

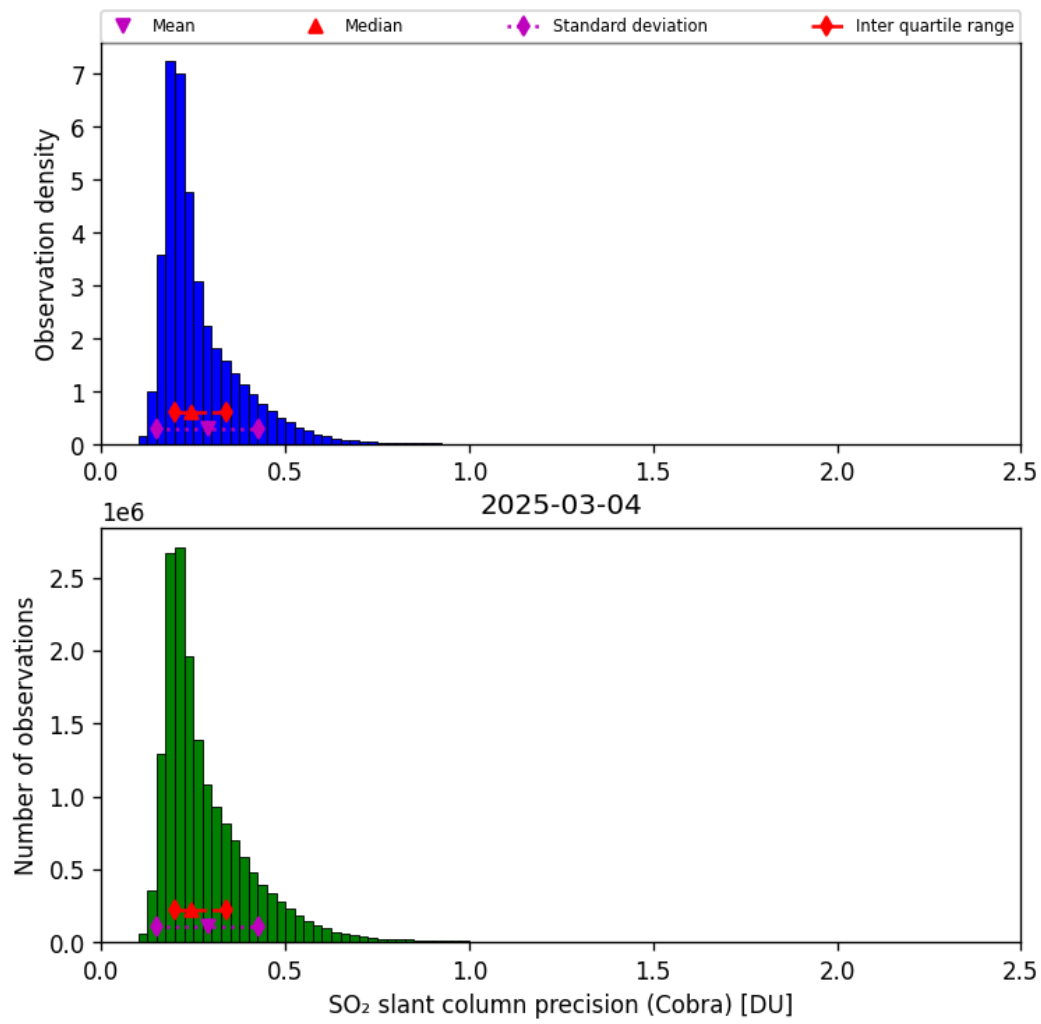


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-03-04 to 2025-03-04

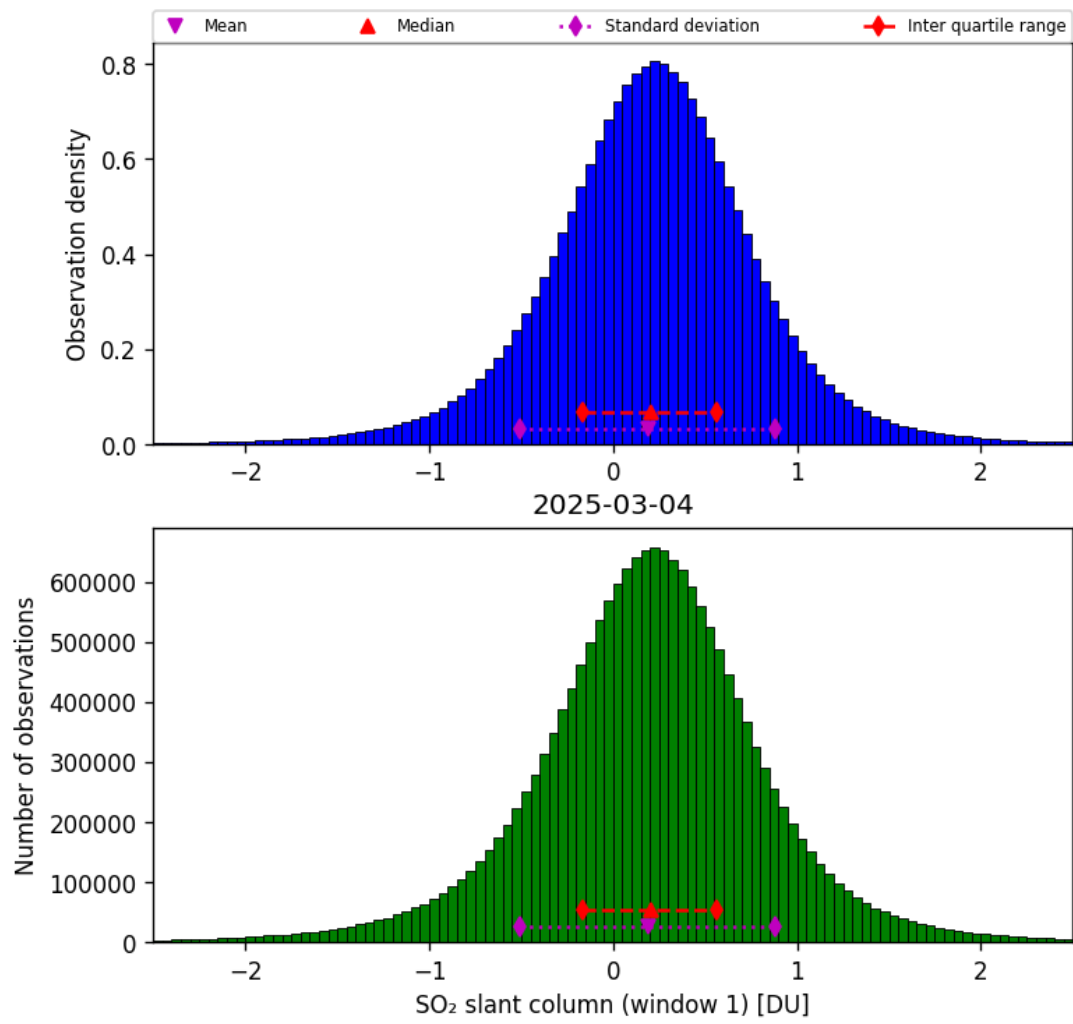


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-03-04 to 2025-03-04

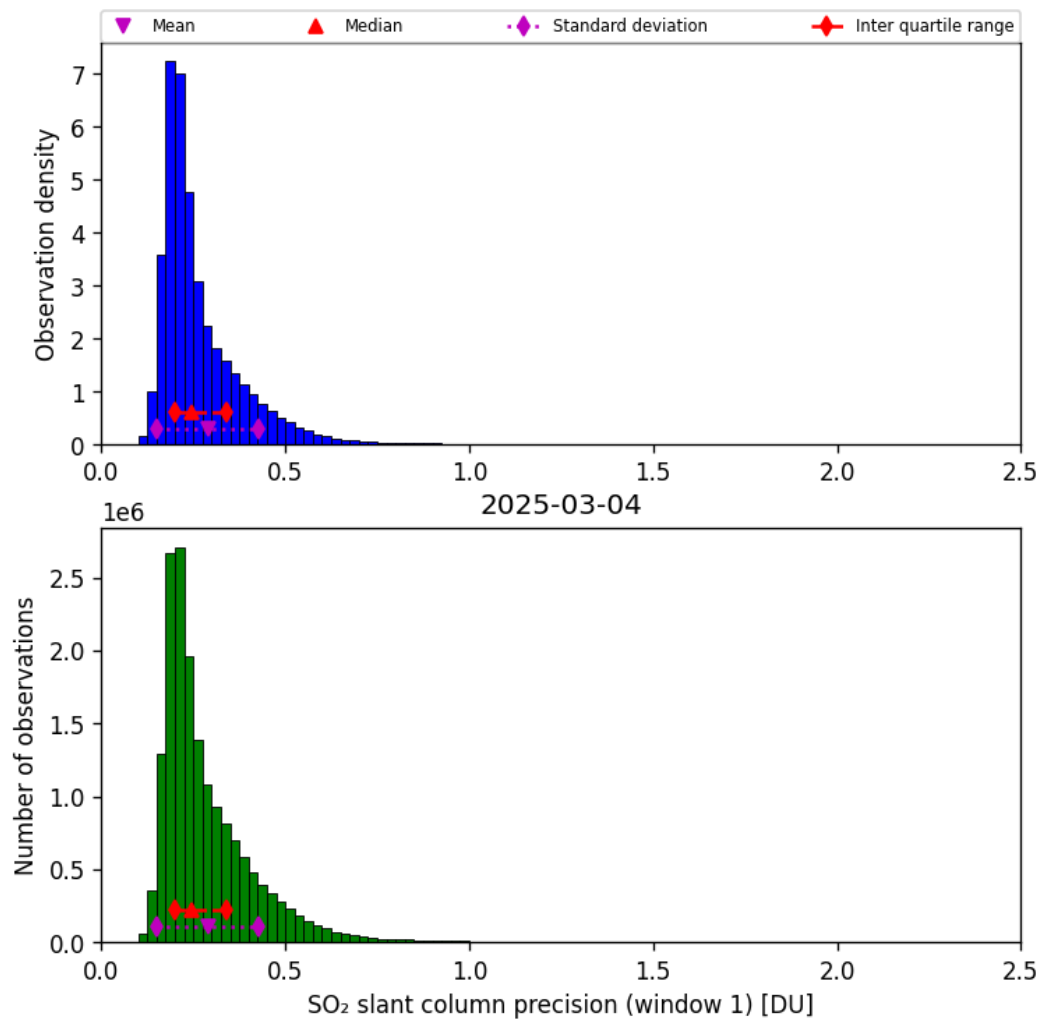


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-03-04 to 2025-03-04

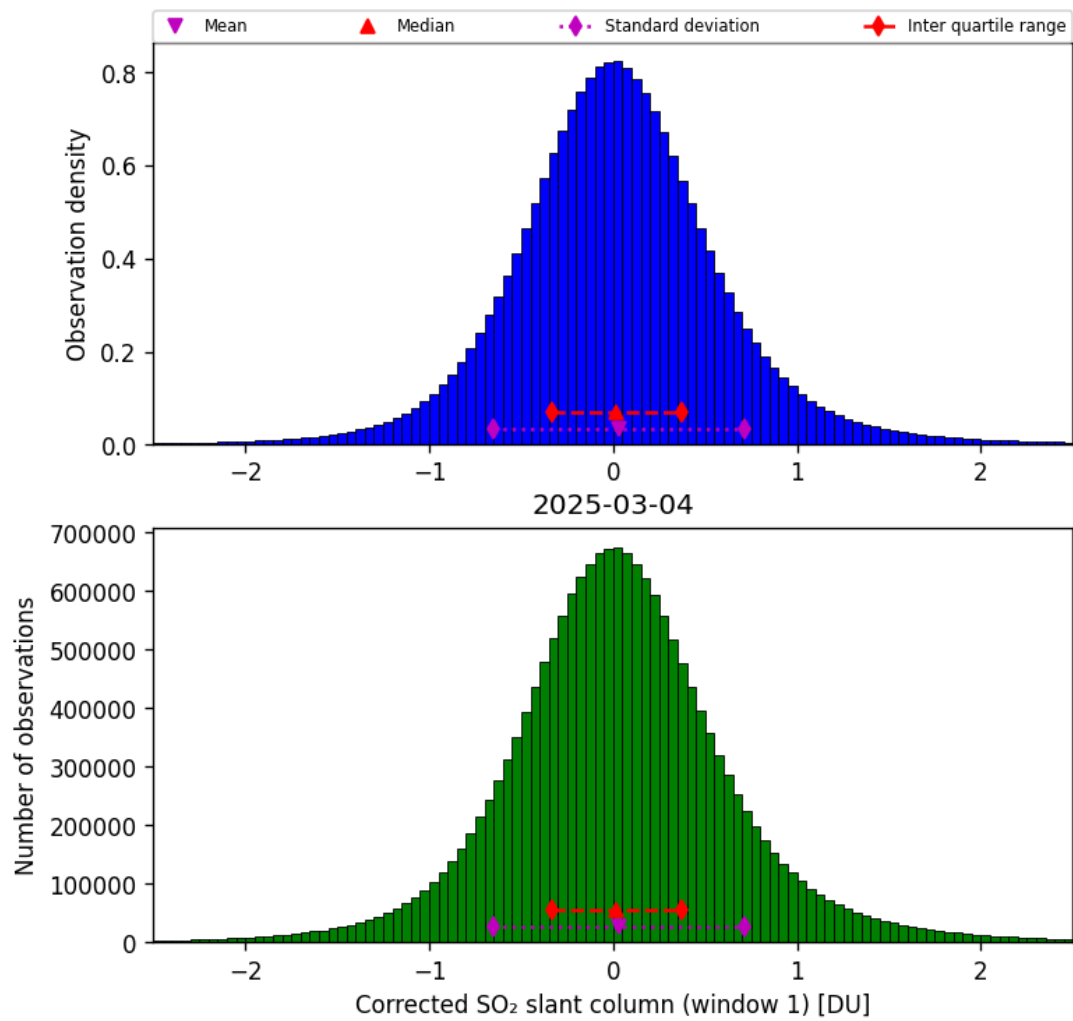


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-03-04 to 2025-03-04

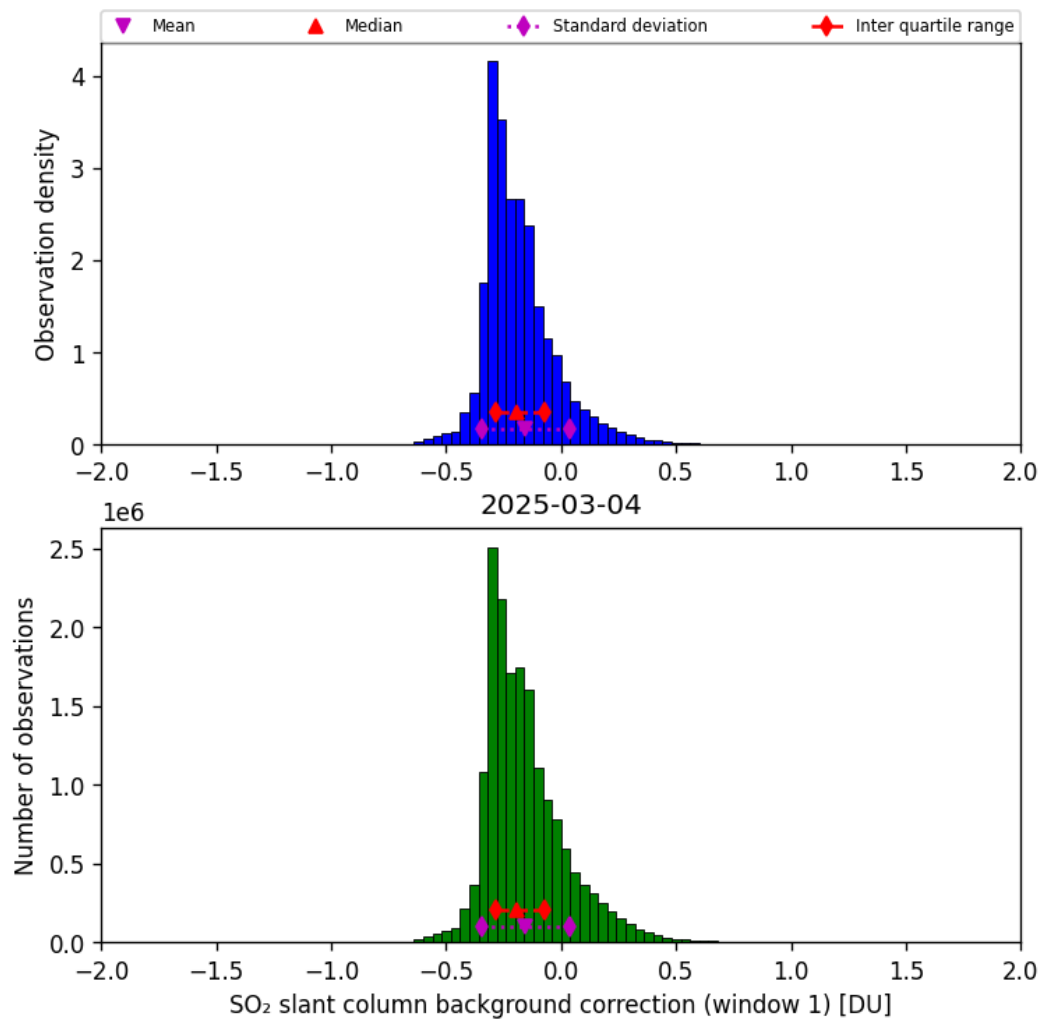


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-03-04 to 2025-03-04

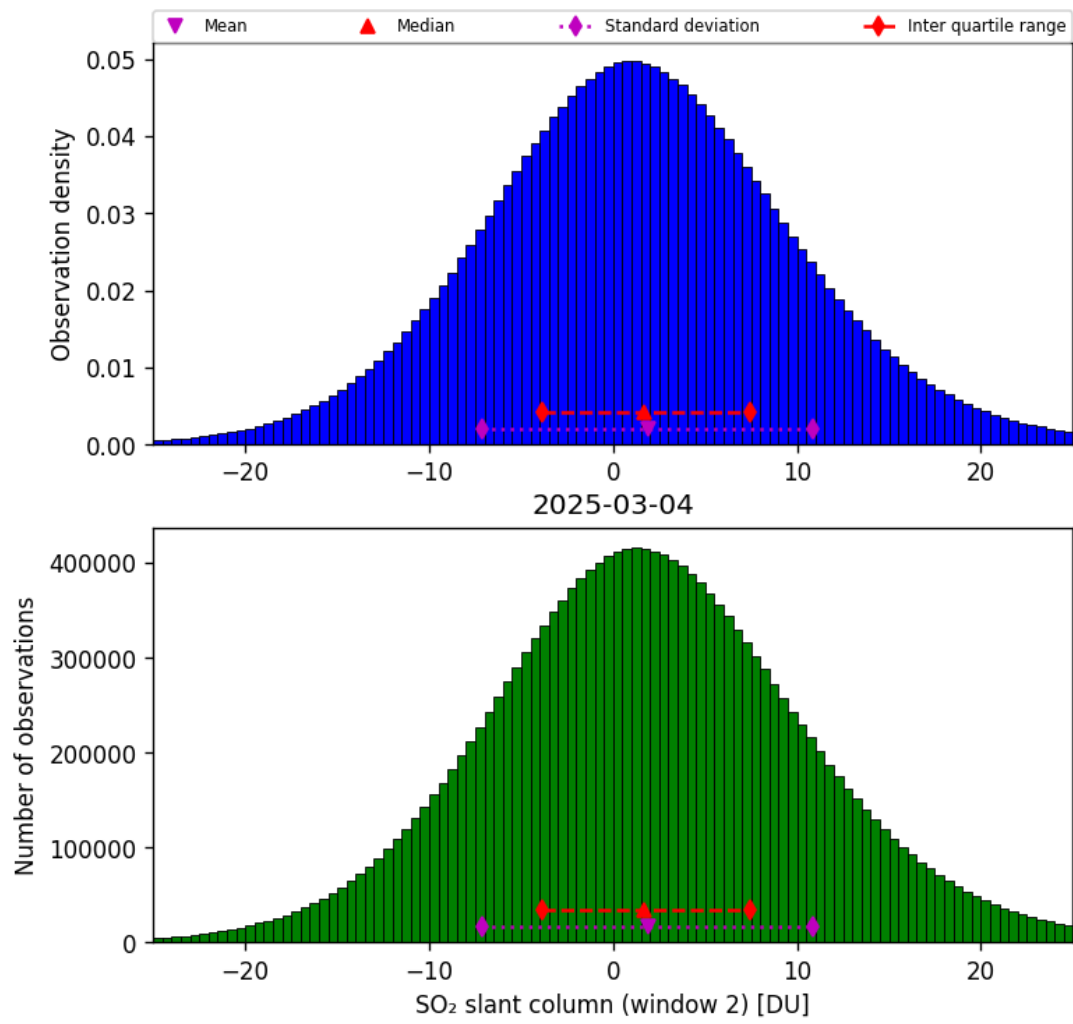


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-03-04 to 2025-03-04

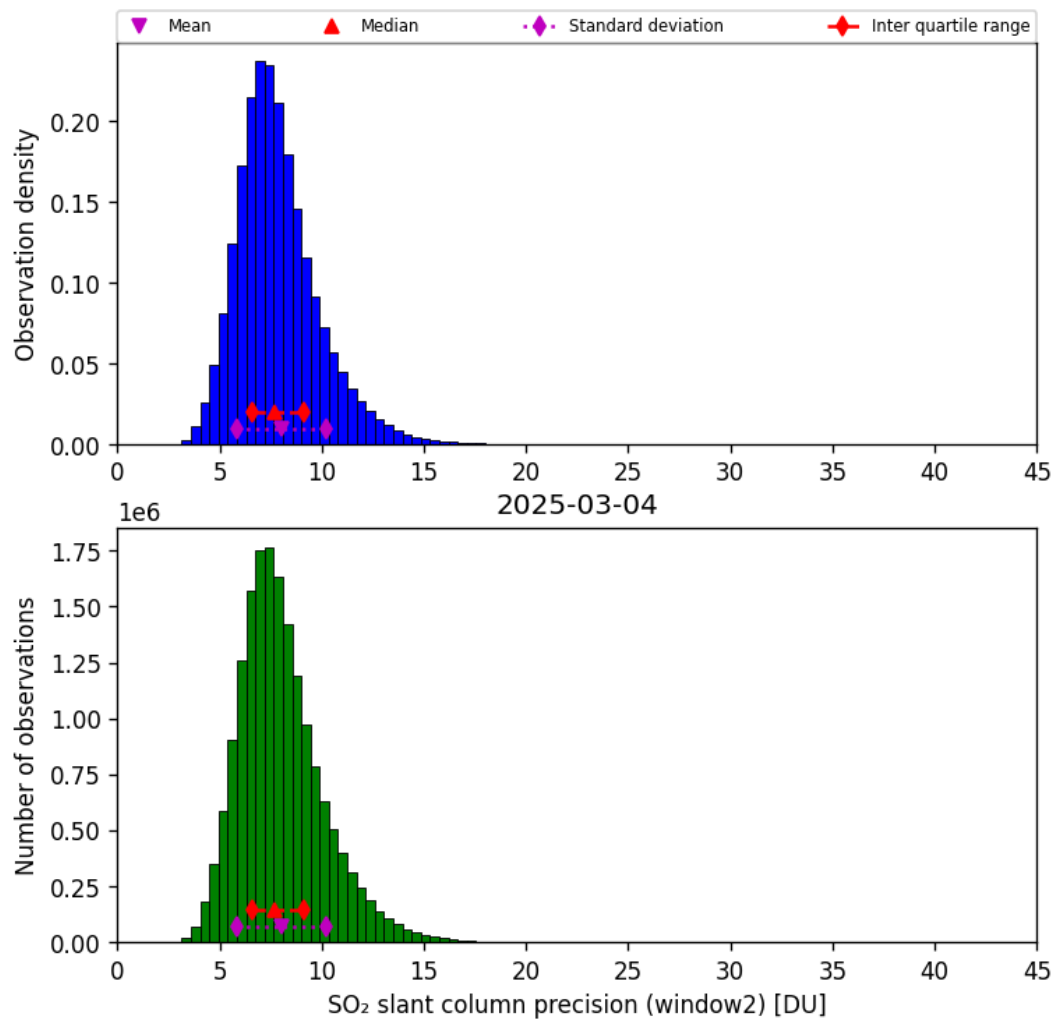


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-03-04 to 2025-03-04

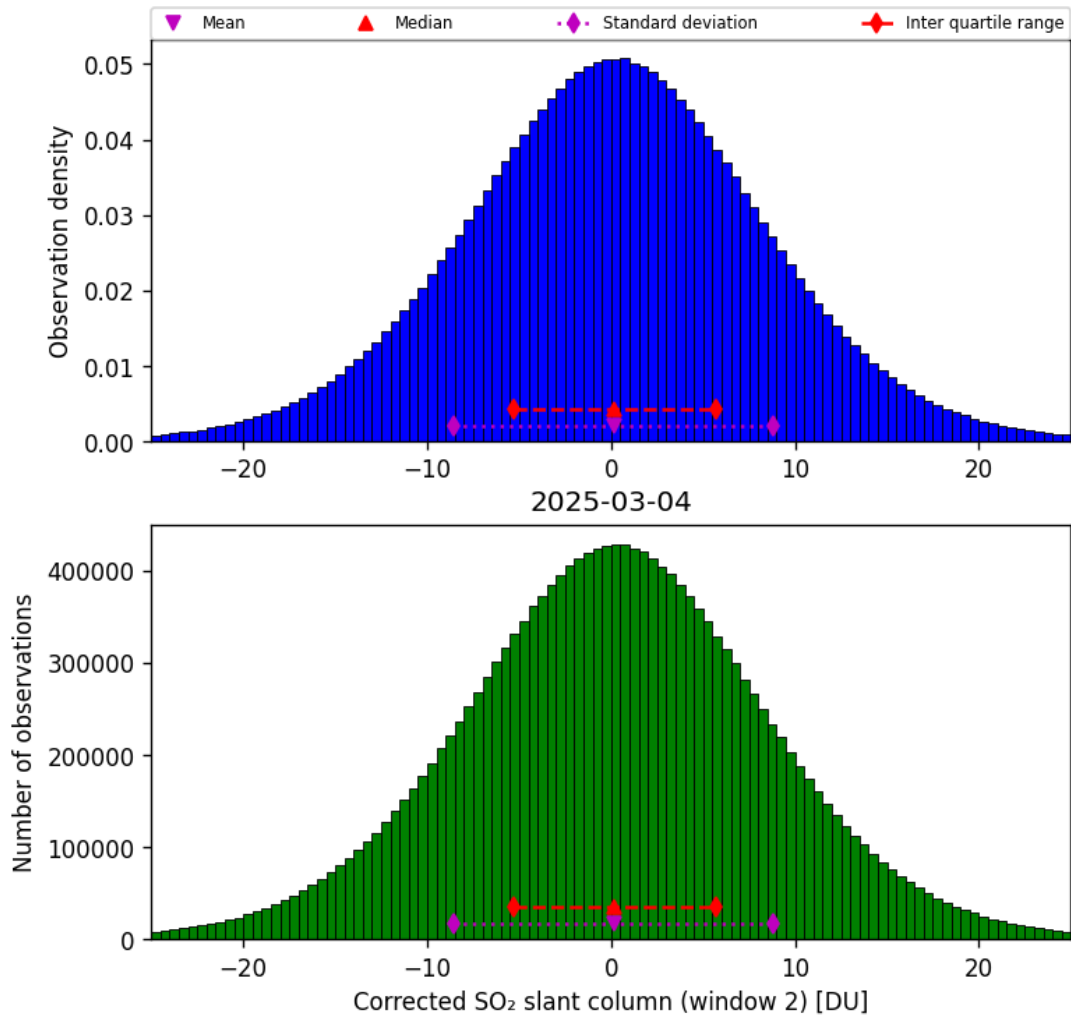


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-03-04 to 2025-03-04

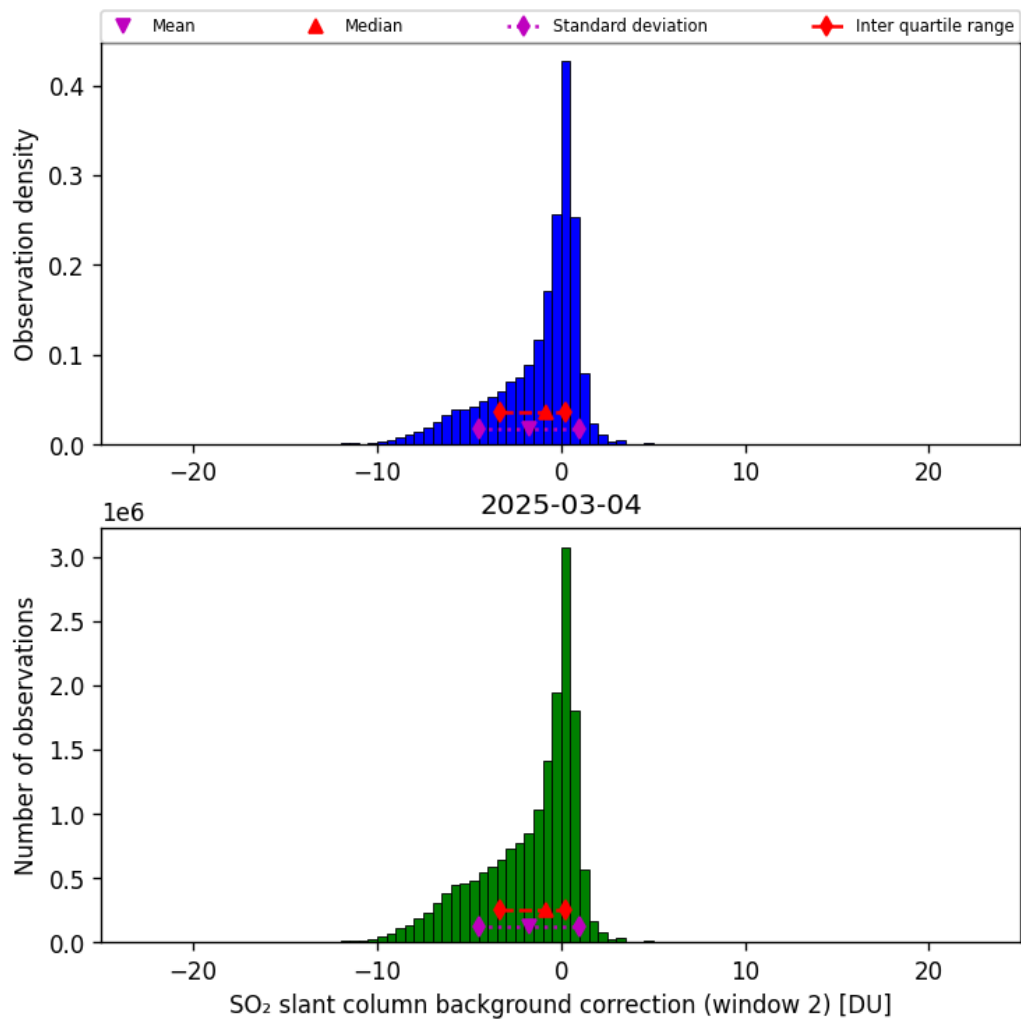


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-03-04 to 2025-03-04

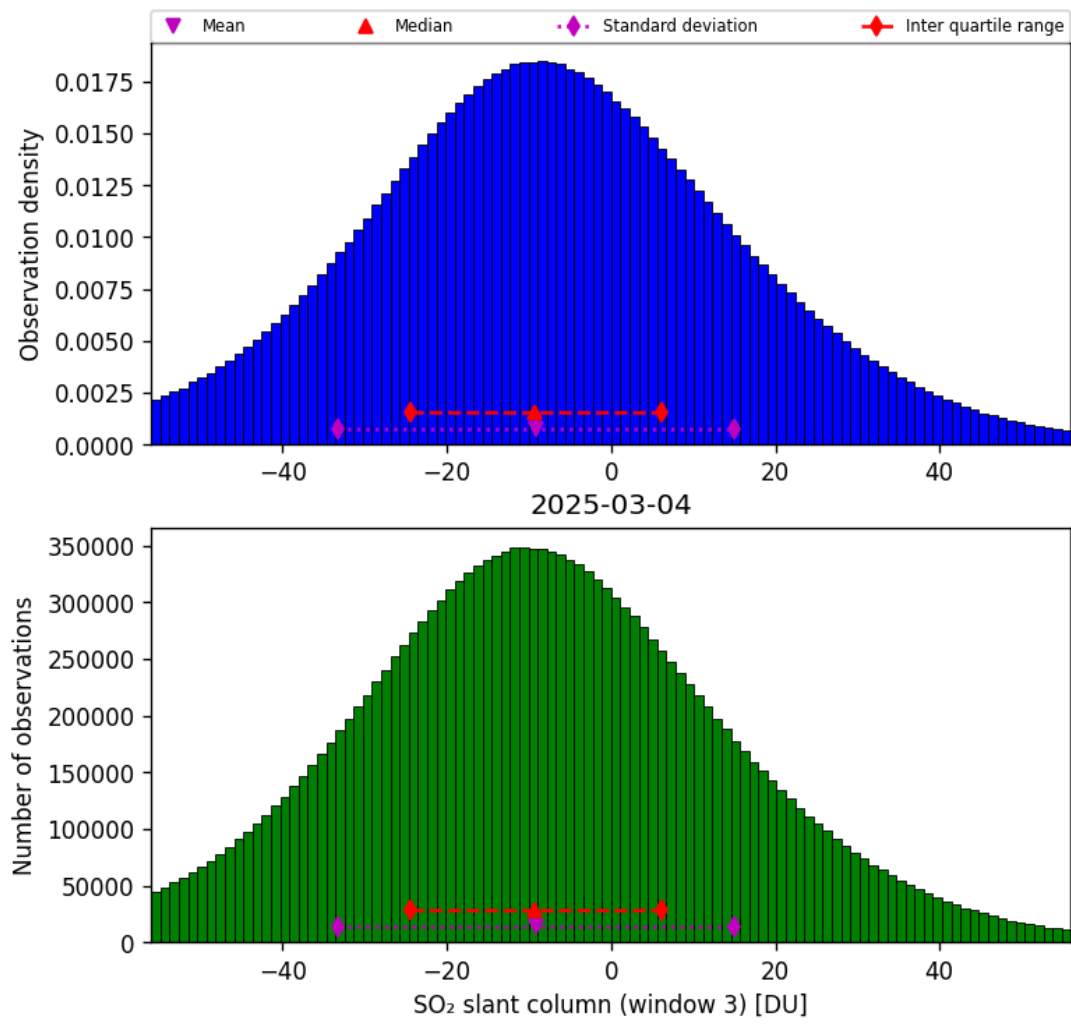


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-03-04 to 2025-03-04

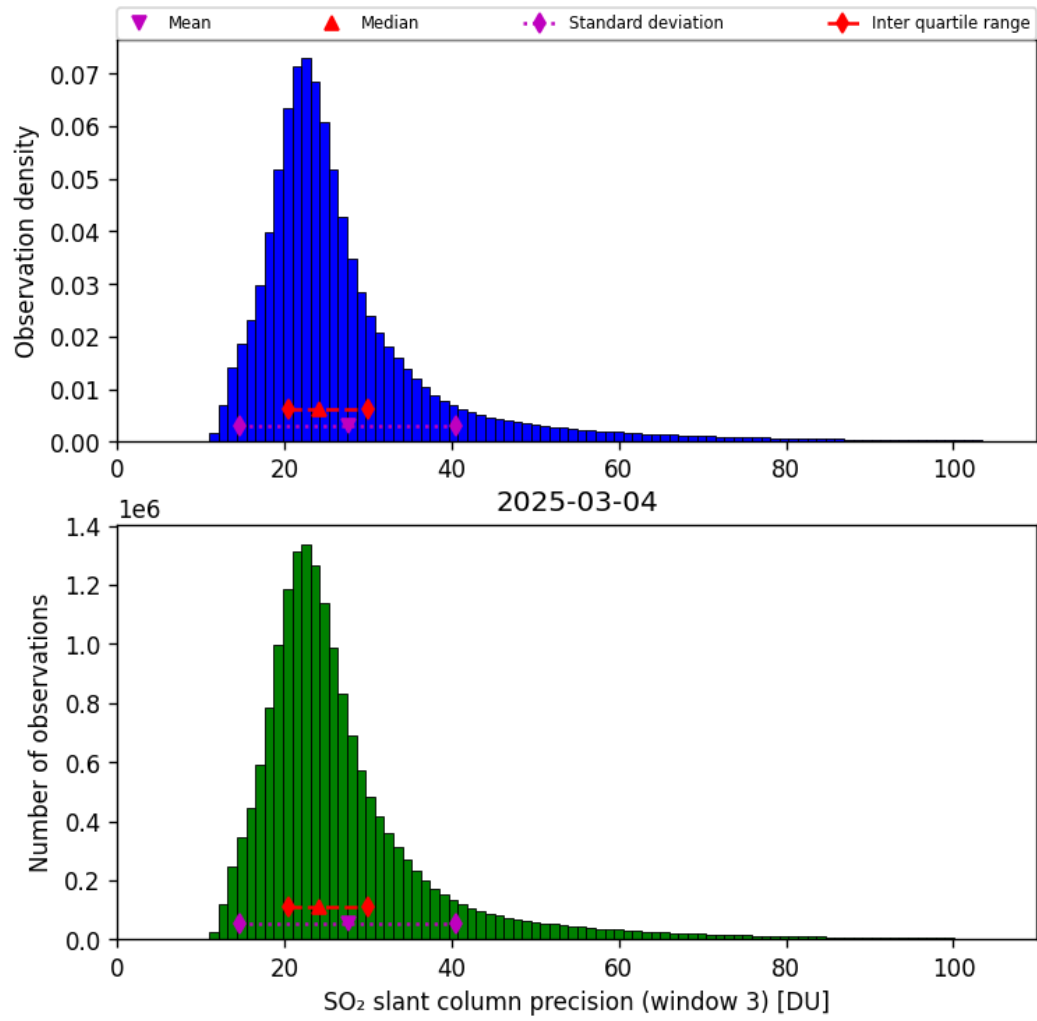


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-03-04 to 2025-03-04

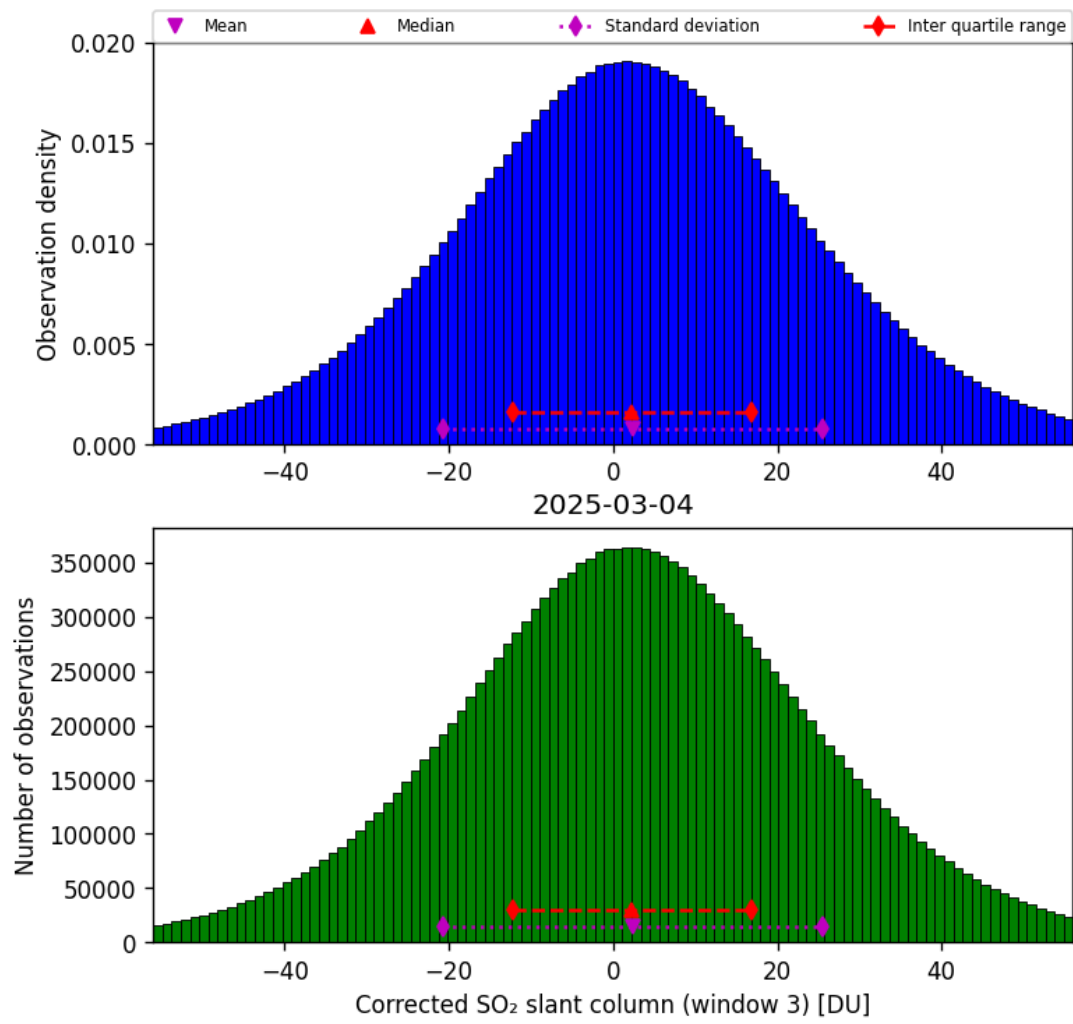


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-03-04 to 2025-03-04

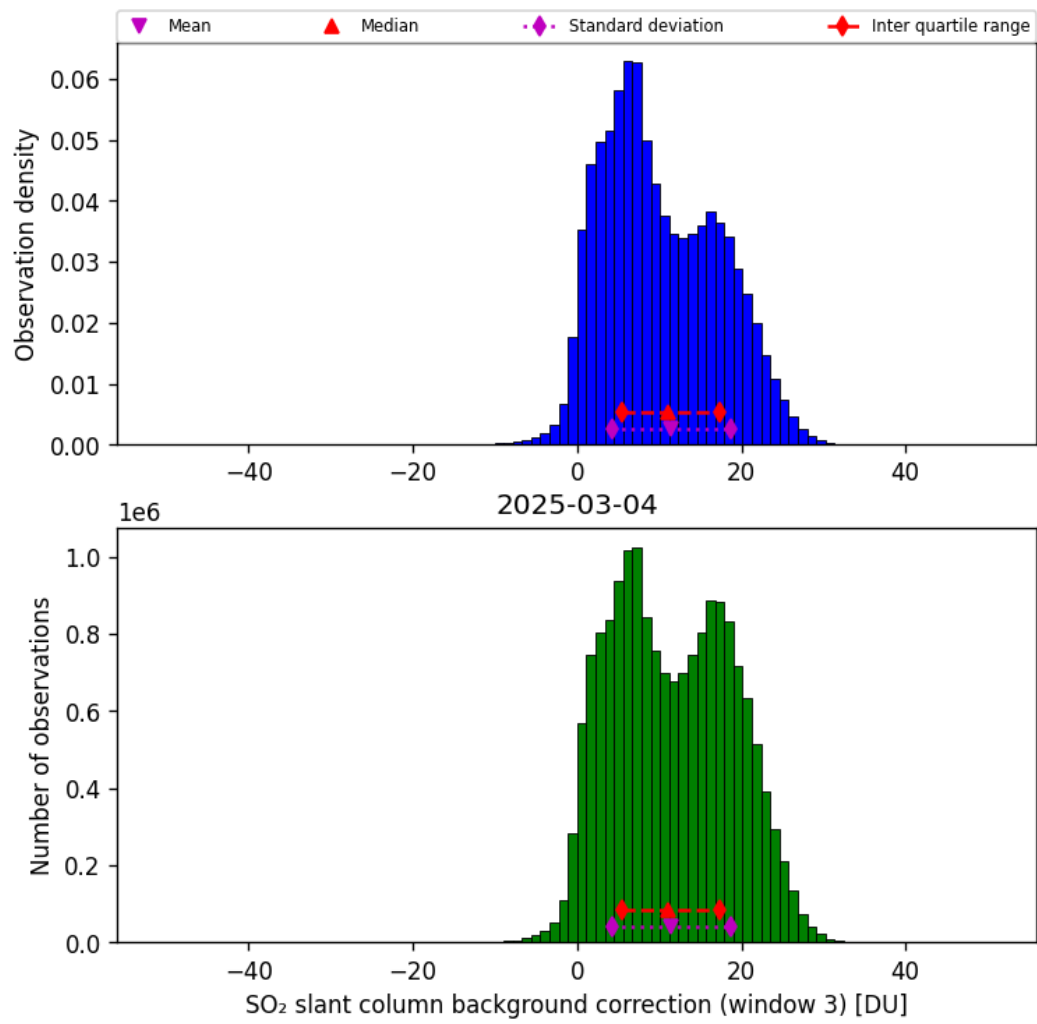


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-03-04 to 2025-03-04

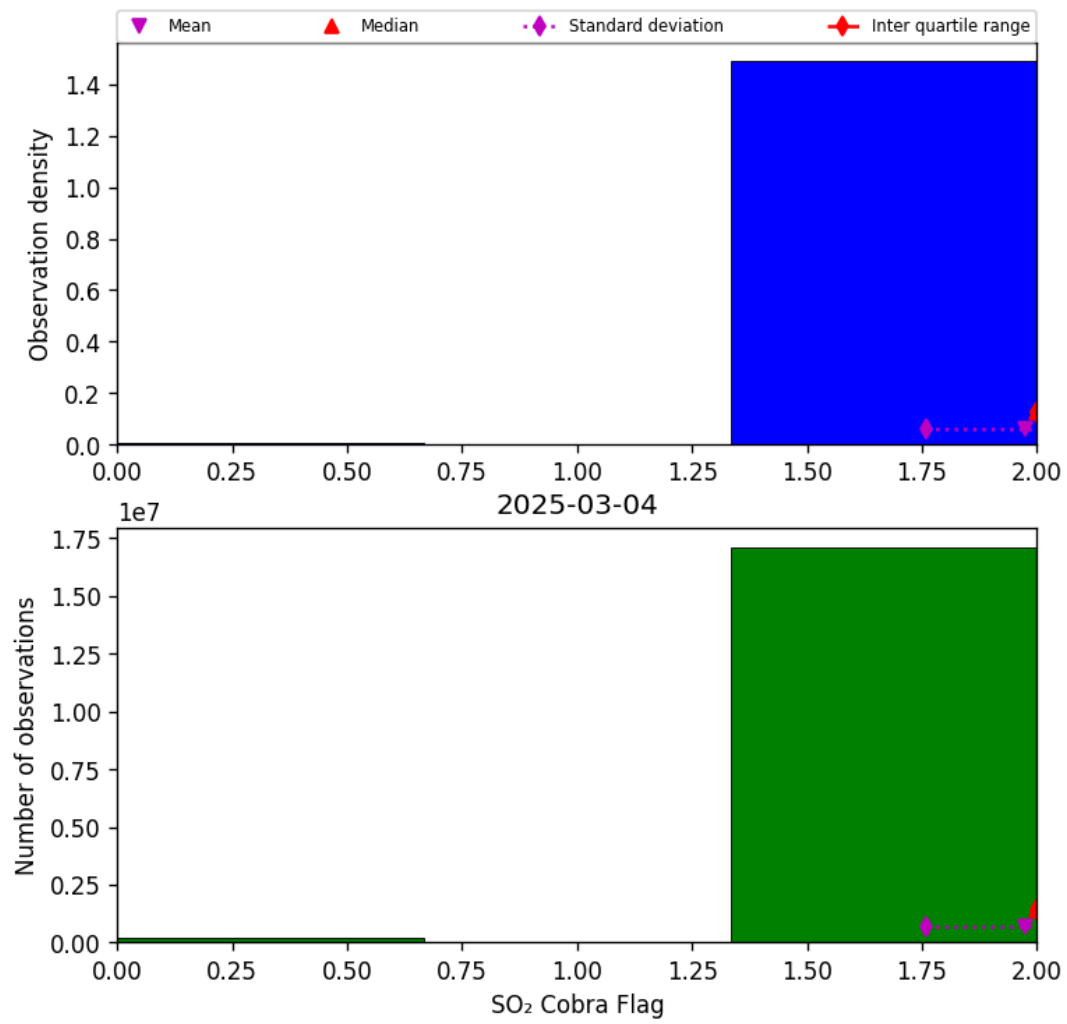


Figure 75: Histogram of "SO₂ Cobra Flag" for 2025-03-04 to 2025-03-04

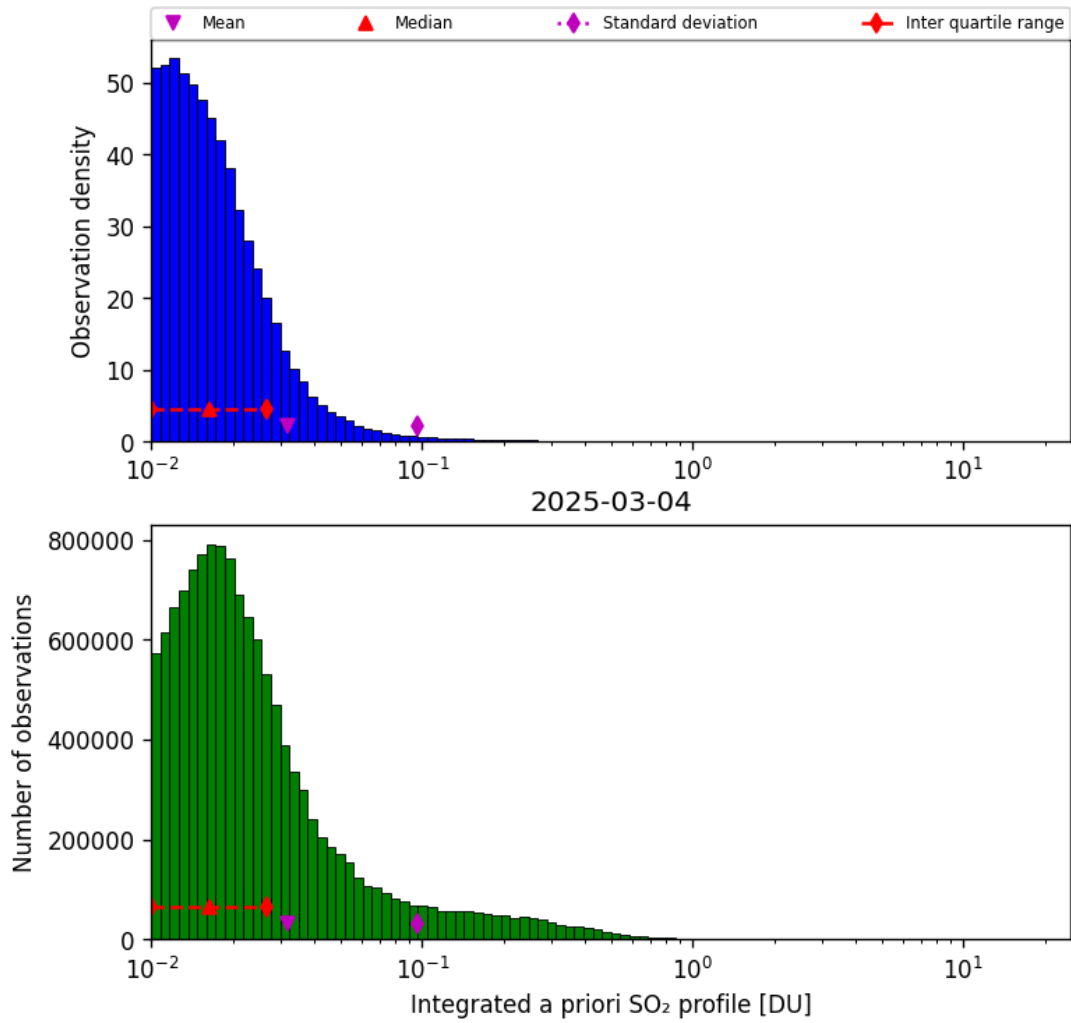


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-03-04 to 2025-03-04

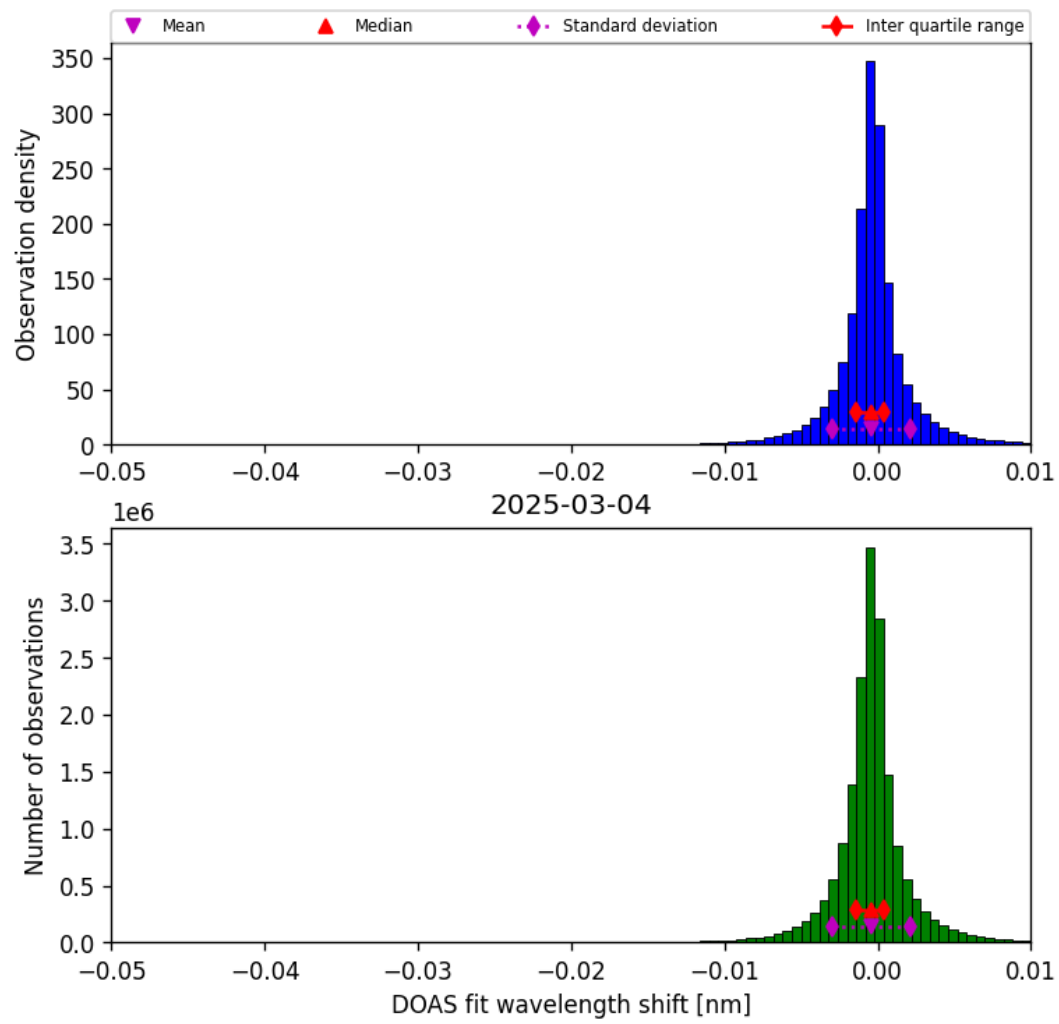


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-03-04 to 2025-03-04

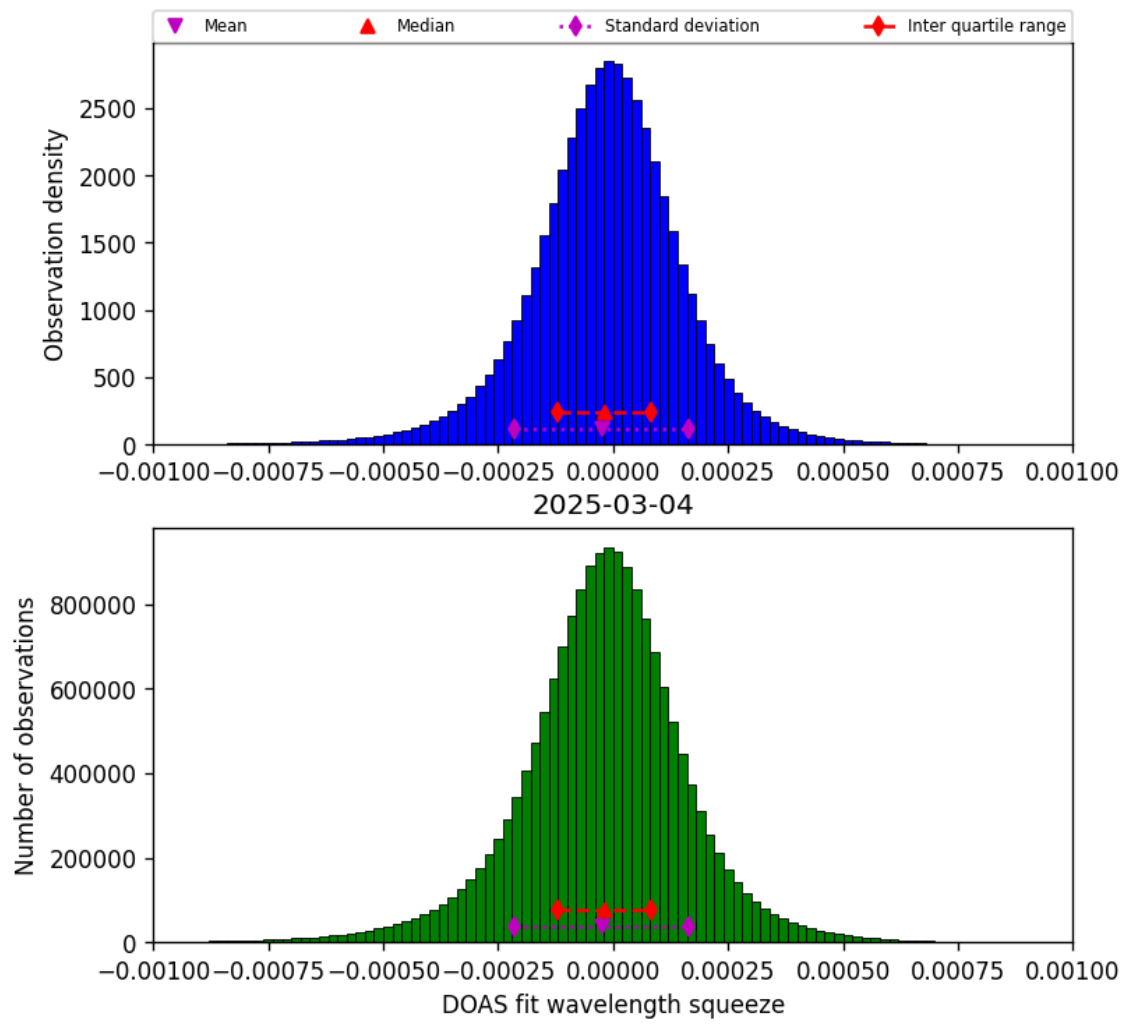


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-03-04 to 2025-03-04

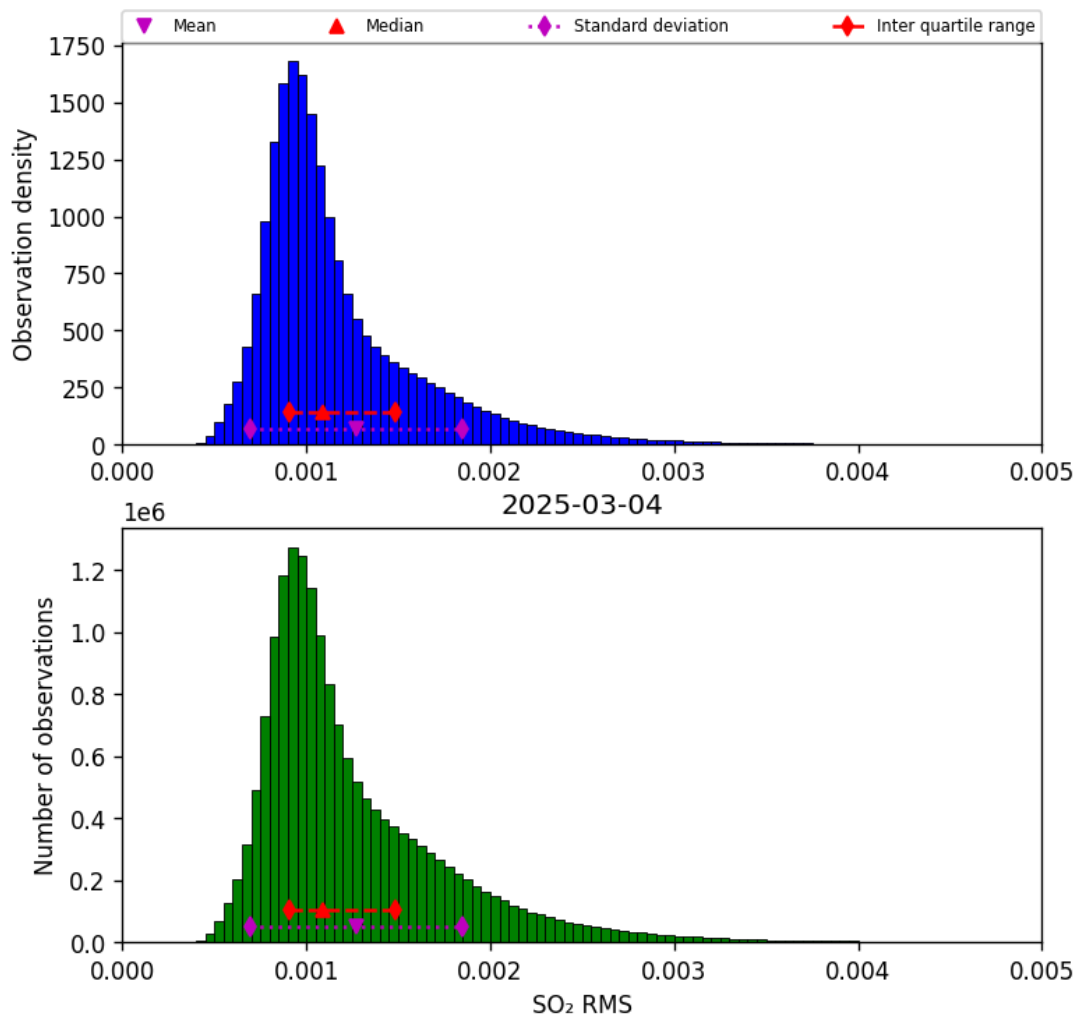


Figure 79: Histogram of “SO₂ RMS” for 2025-03-04 to 2025-03-04

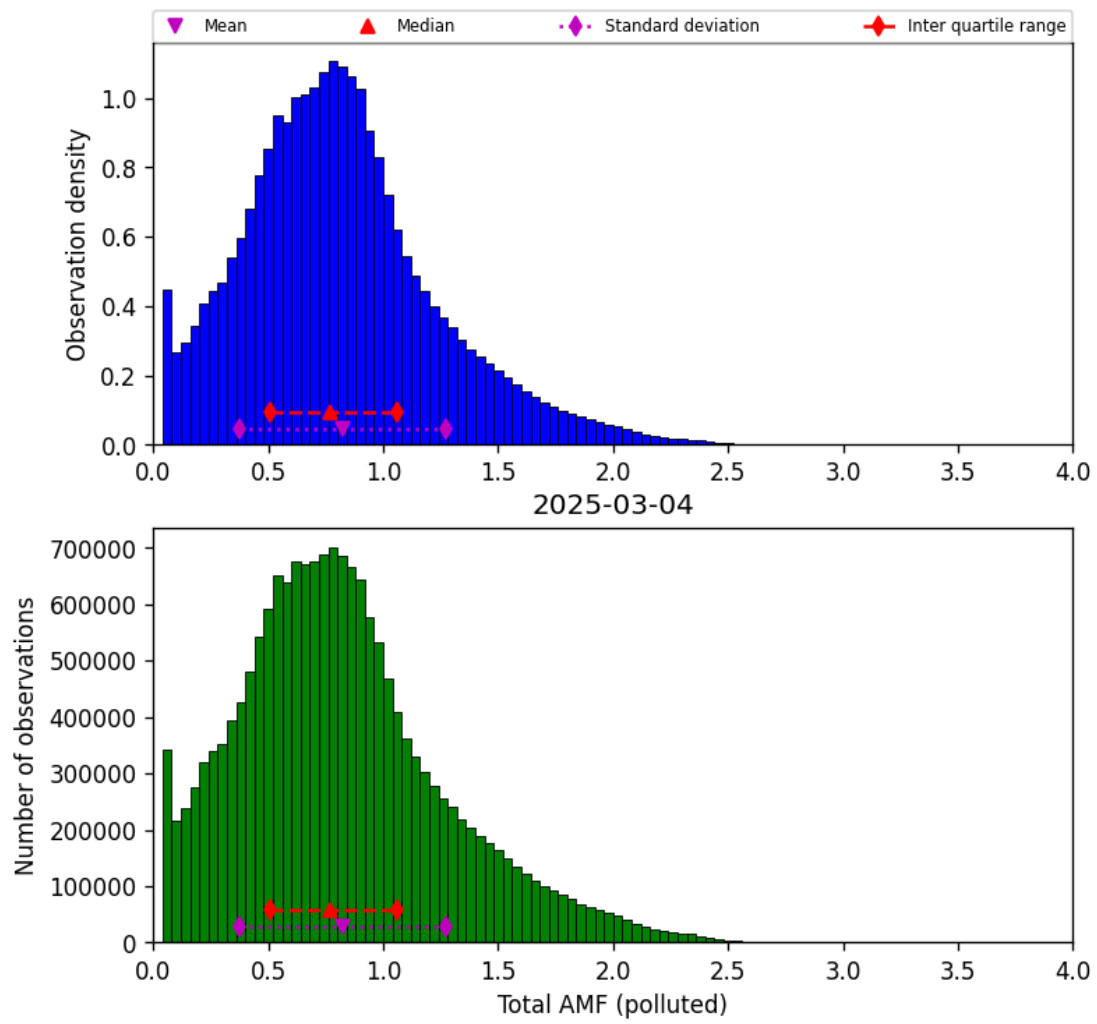


Figure 80: Histogram of “Total AMF (polluted)” for 2025-03-04 to 2025-03-04

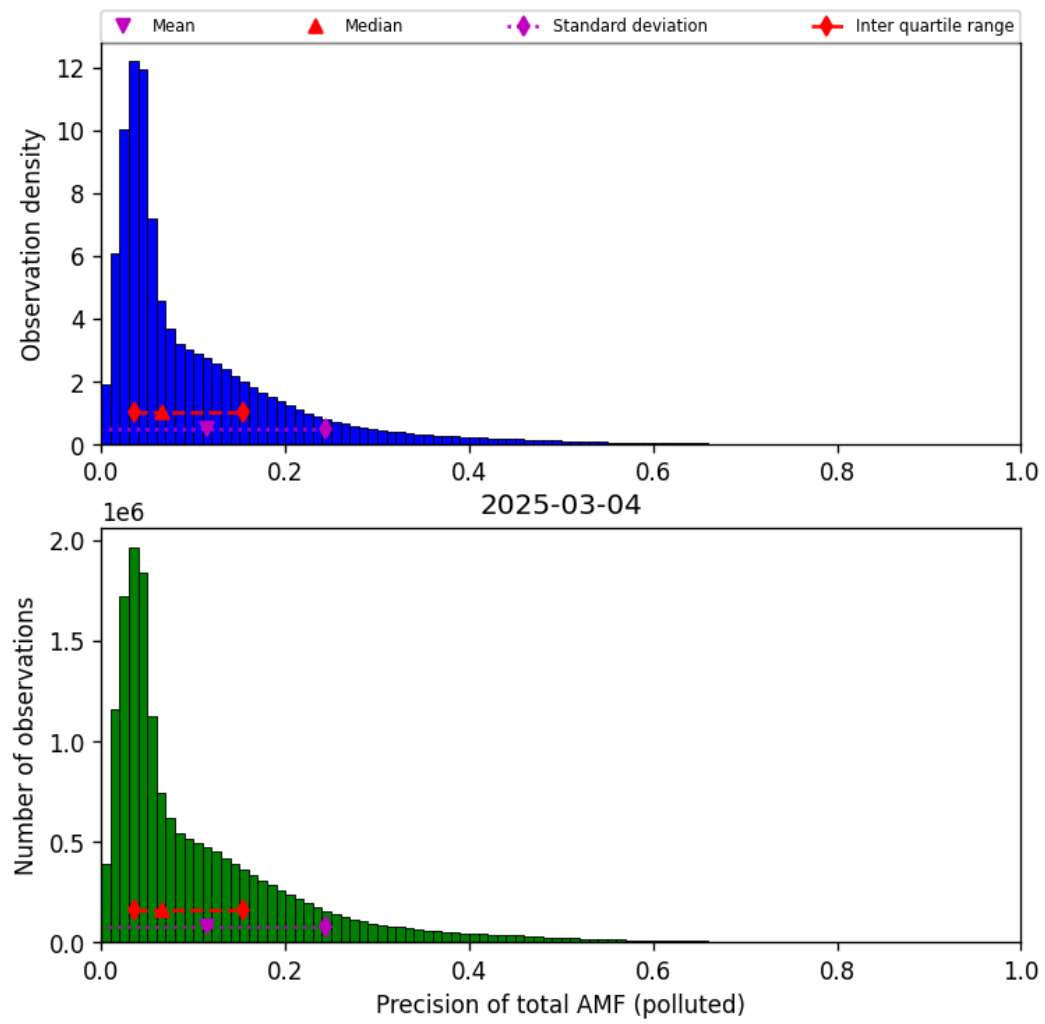


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-03-04 to 2025-03-04

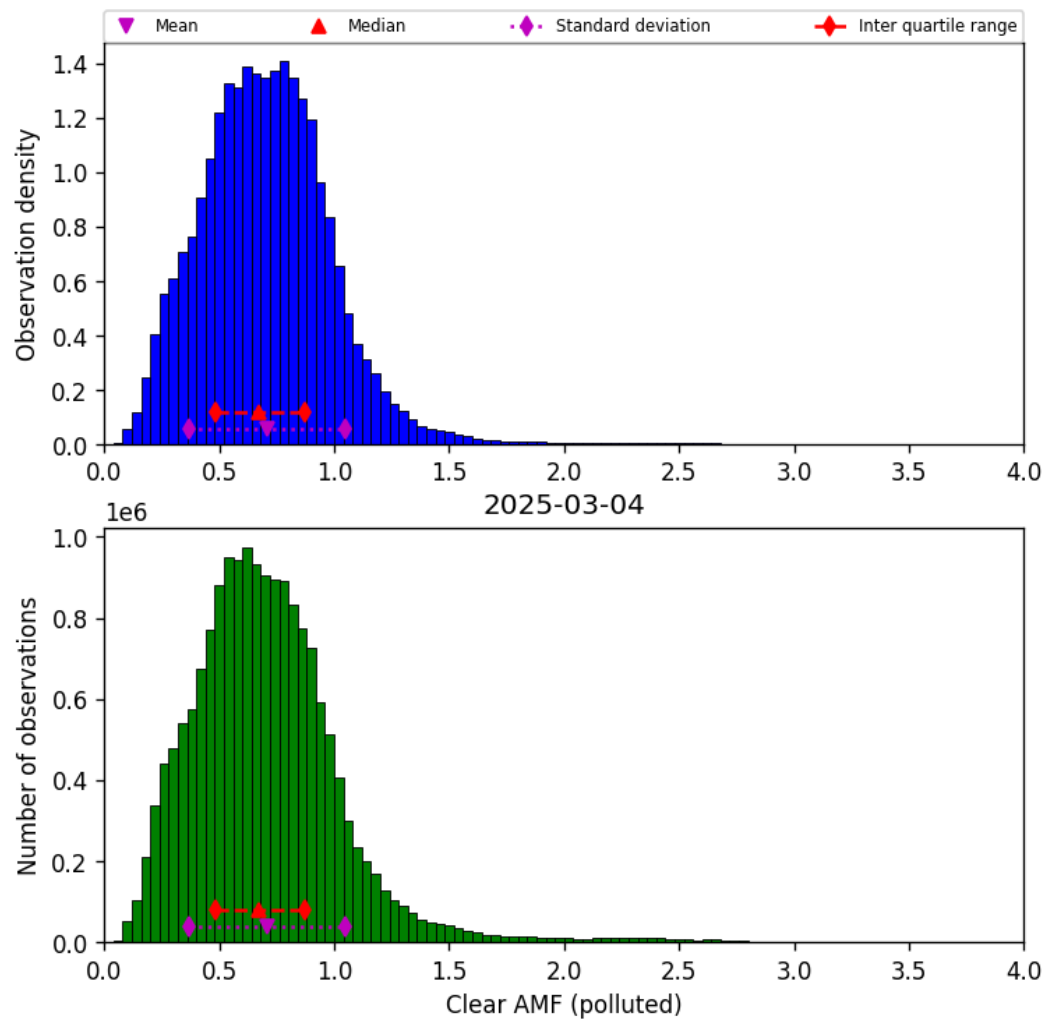


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-03-04 to 2025-03-04

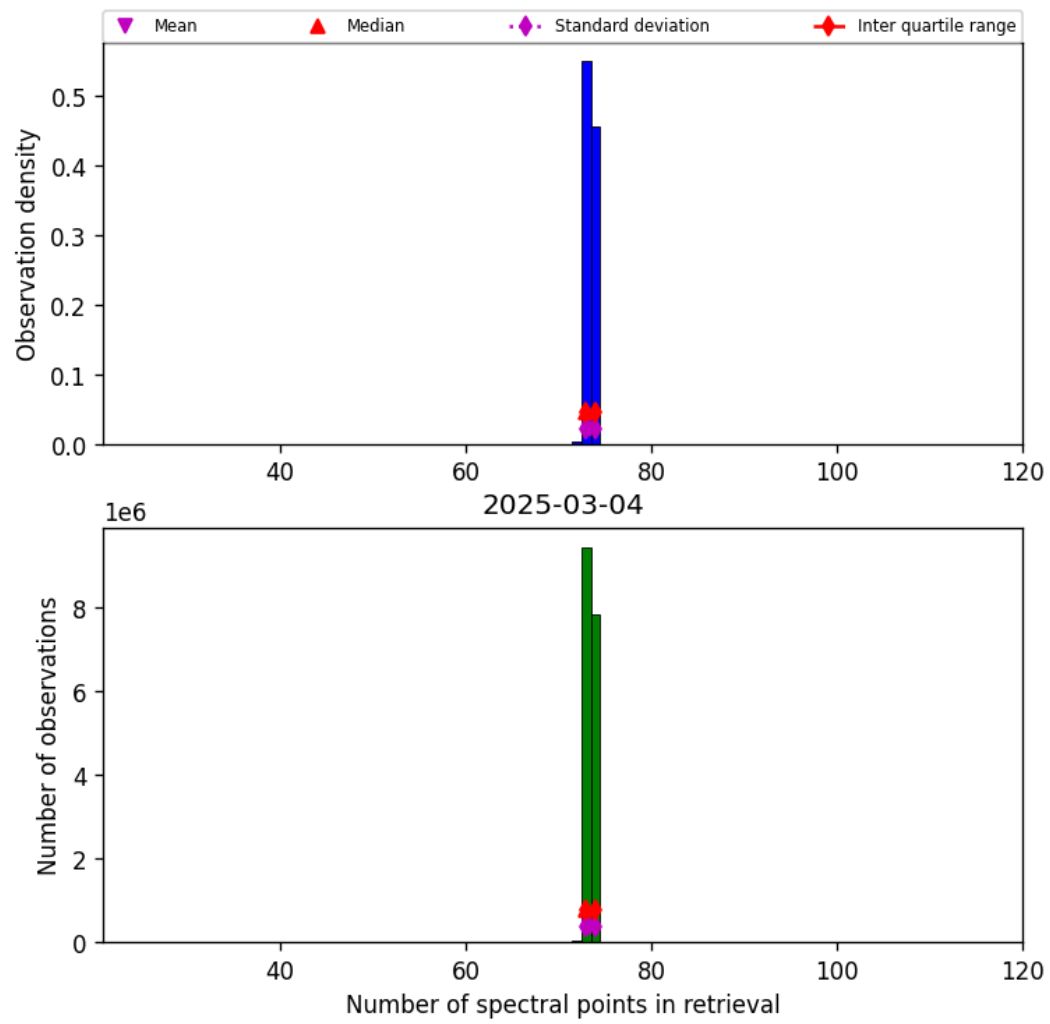


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-03-04 to 2025-03-04

9 Along track statistics

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

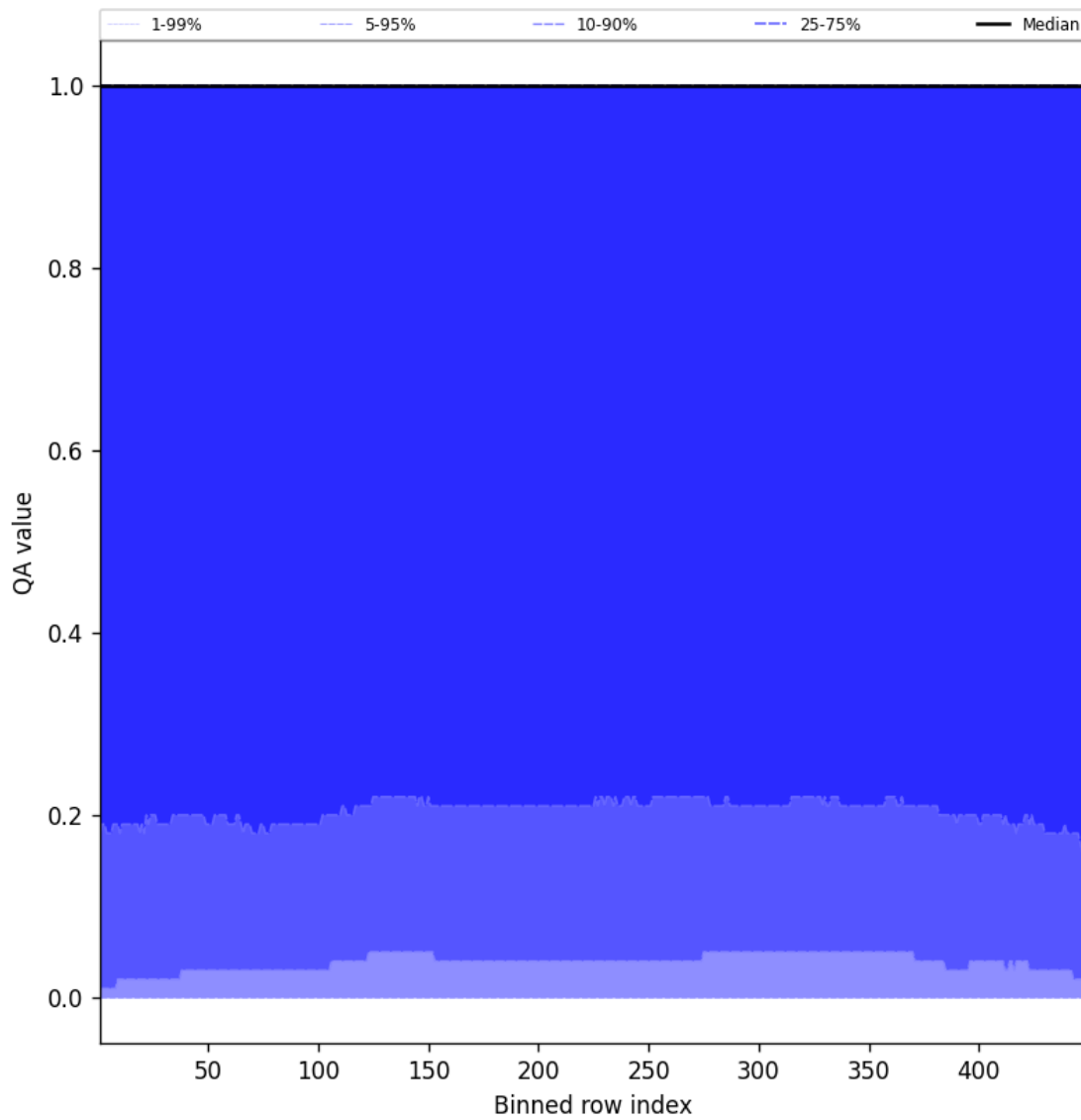


Figure 84: Along track statistics of “QA value” for 2025-03-04 to 2025-03-04

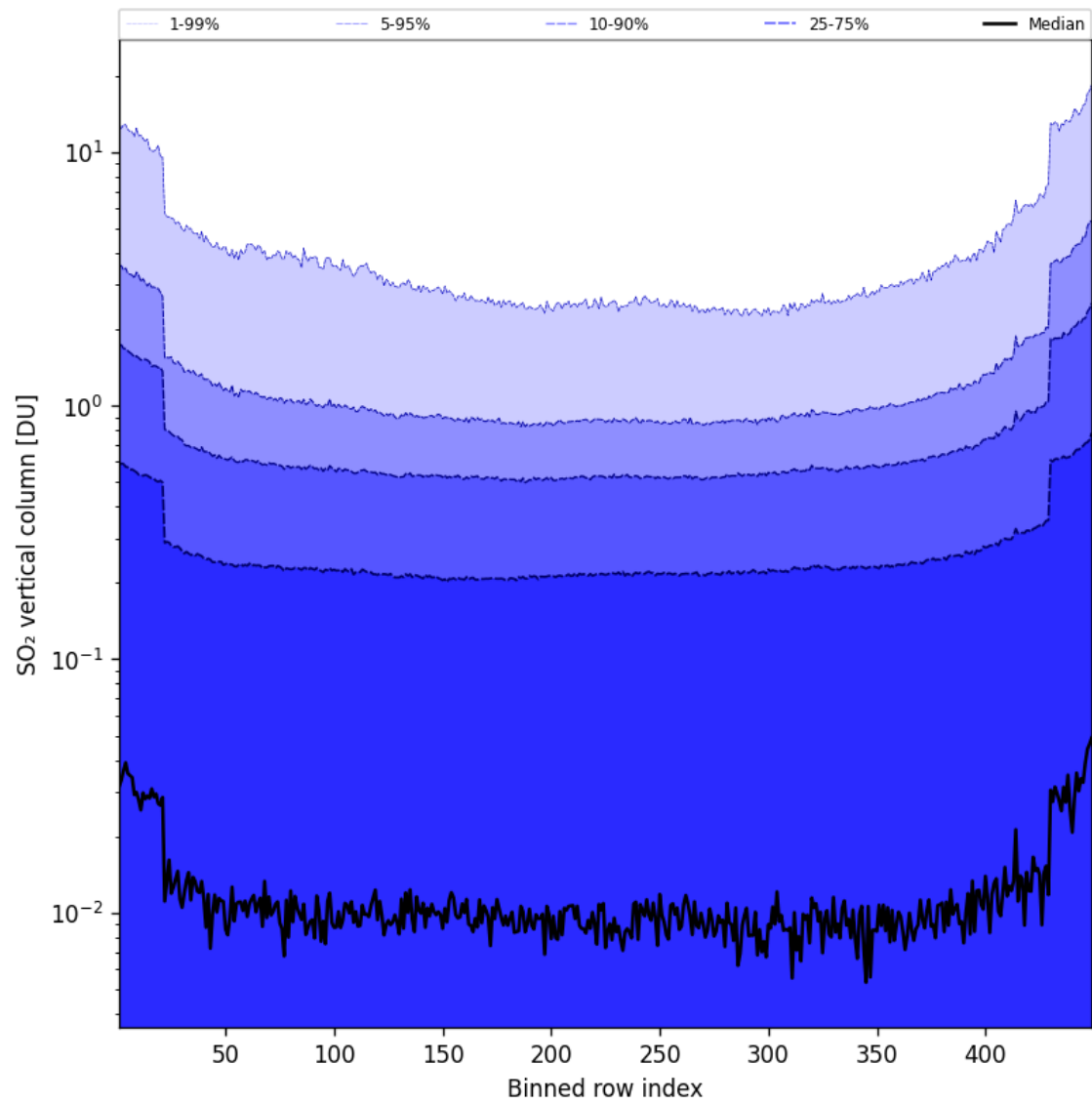


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-03-04 to 2025-03-04

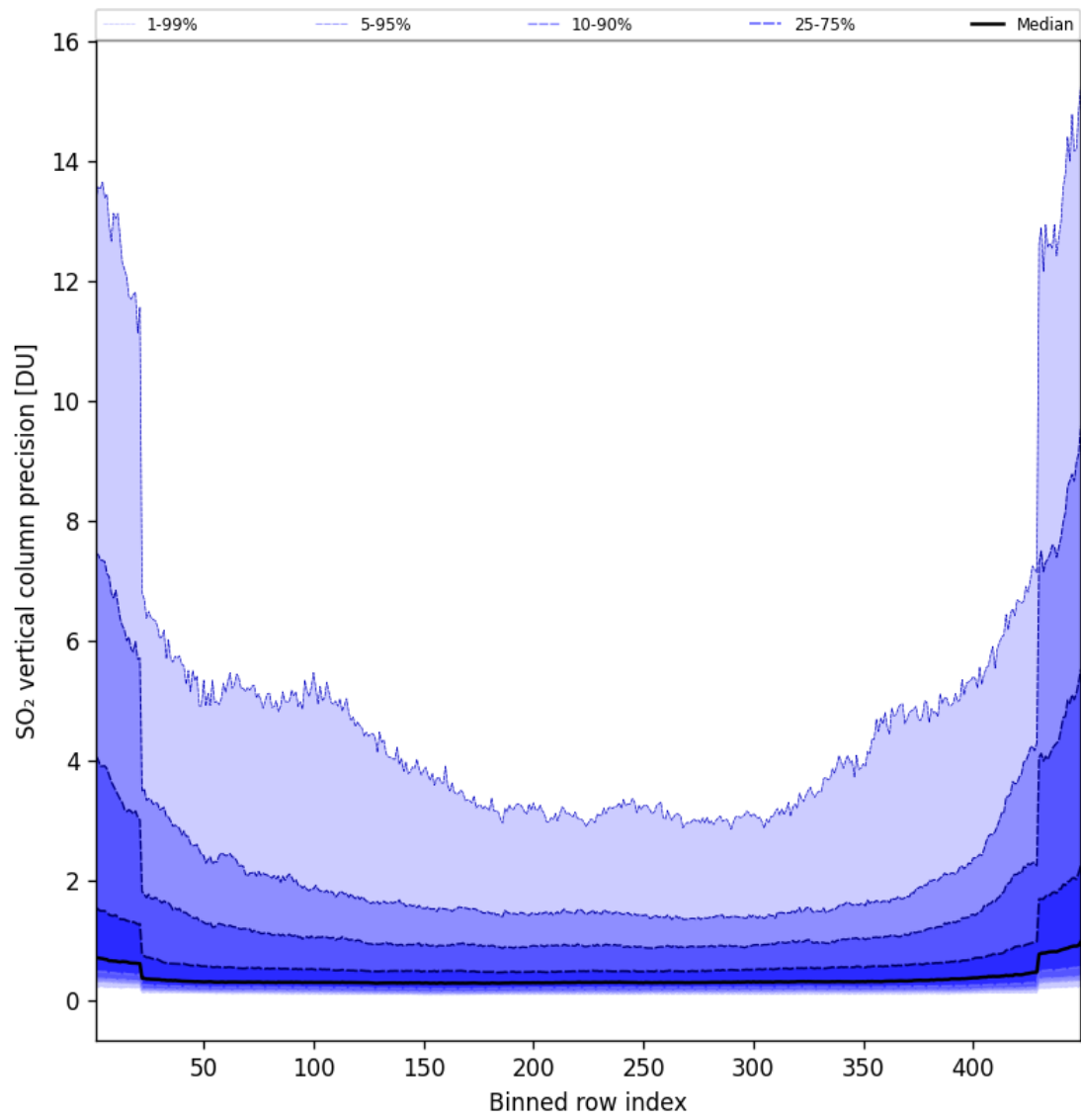


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-03-04 to 2025-03-04

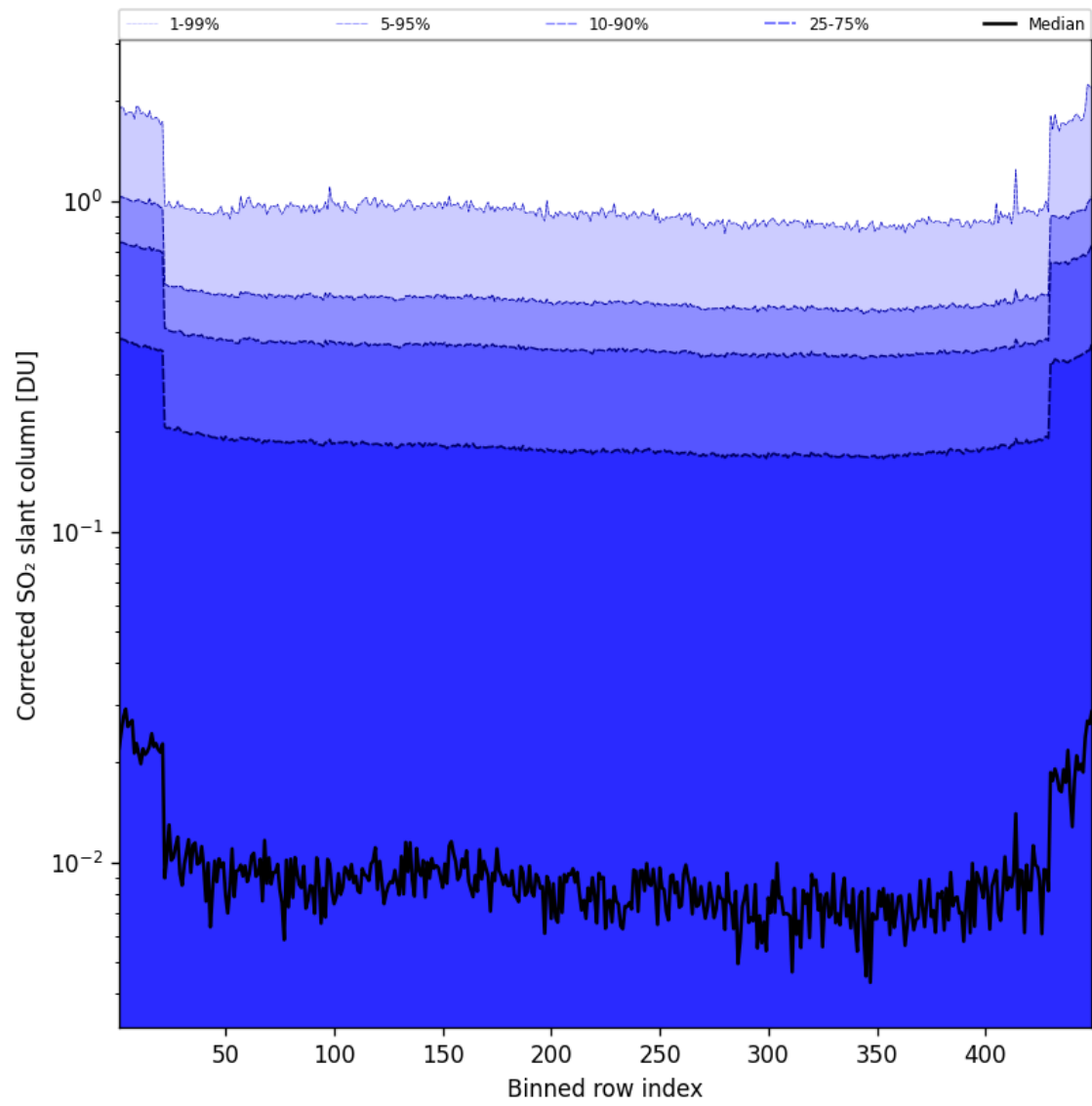


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-03-04 to 2025-03-04

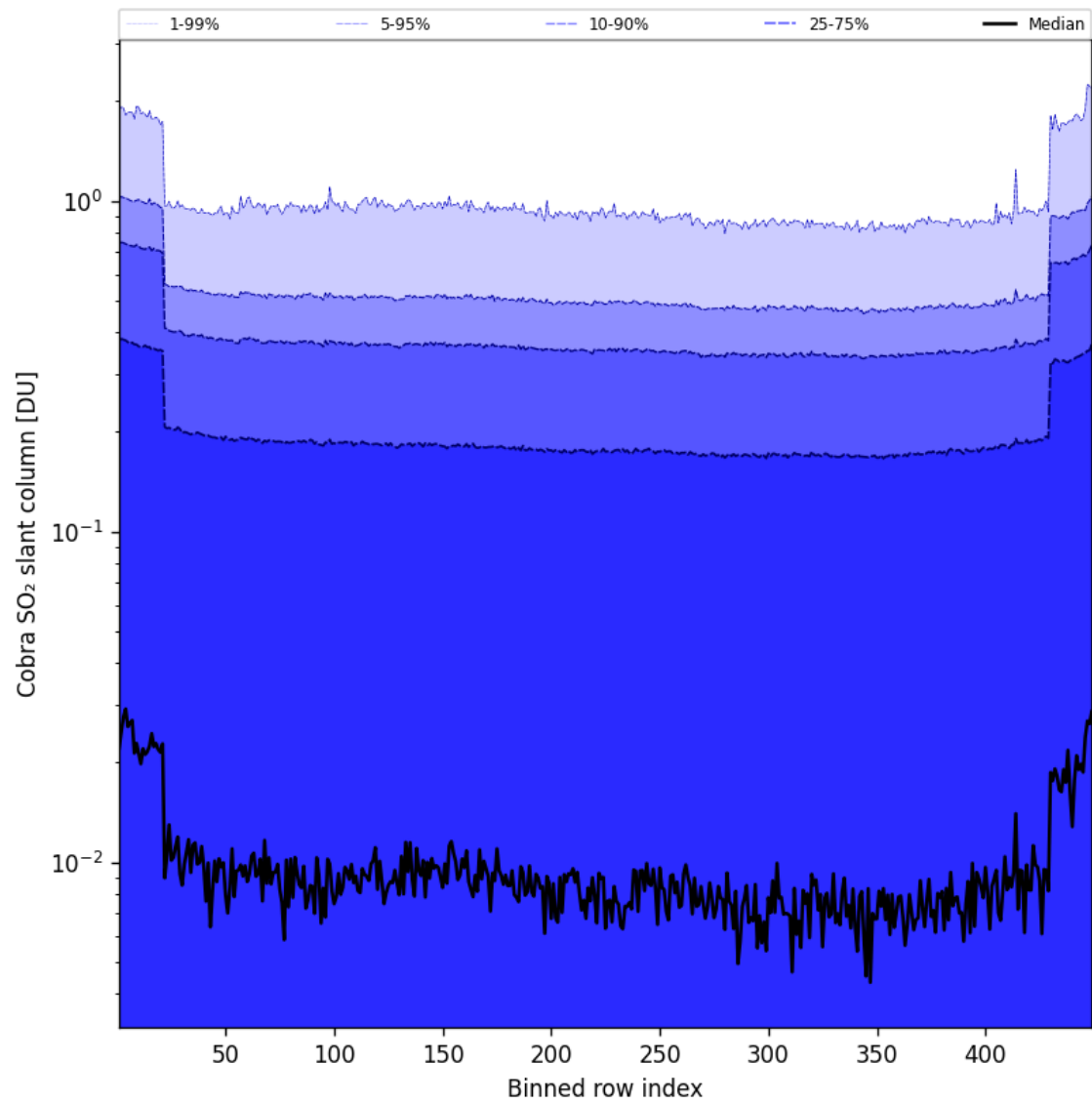


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-03-04 to 2025-03-04

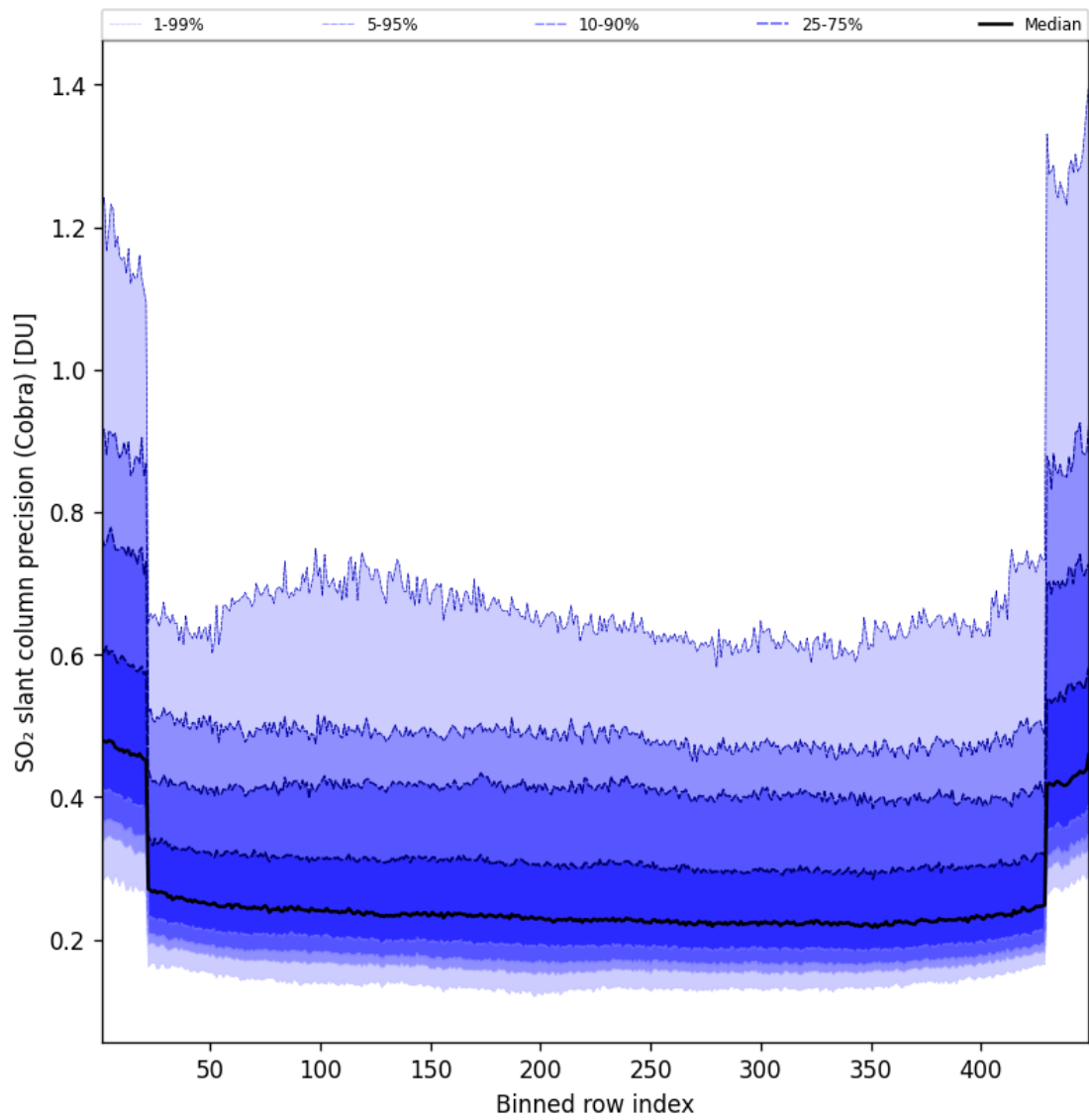


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-03-04 to 2025-03-04

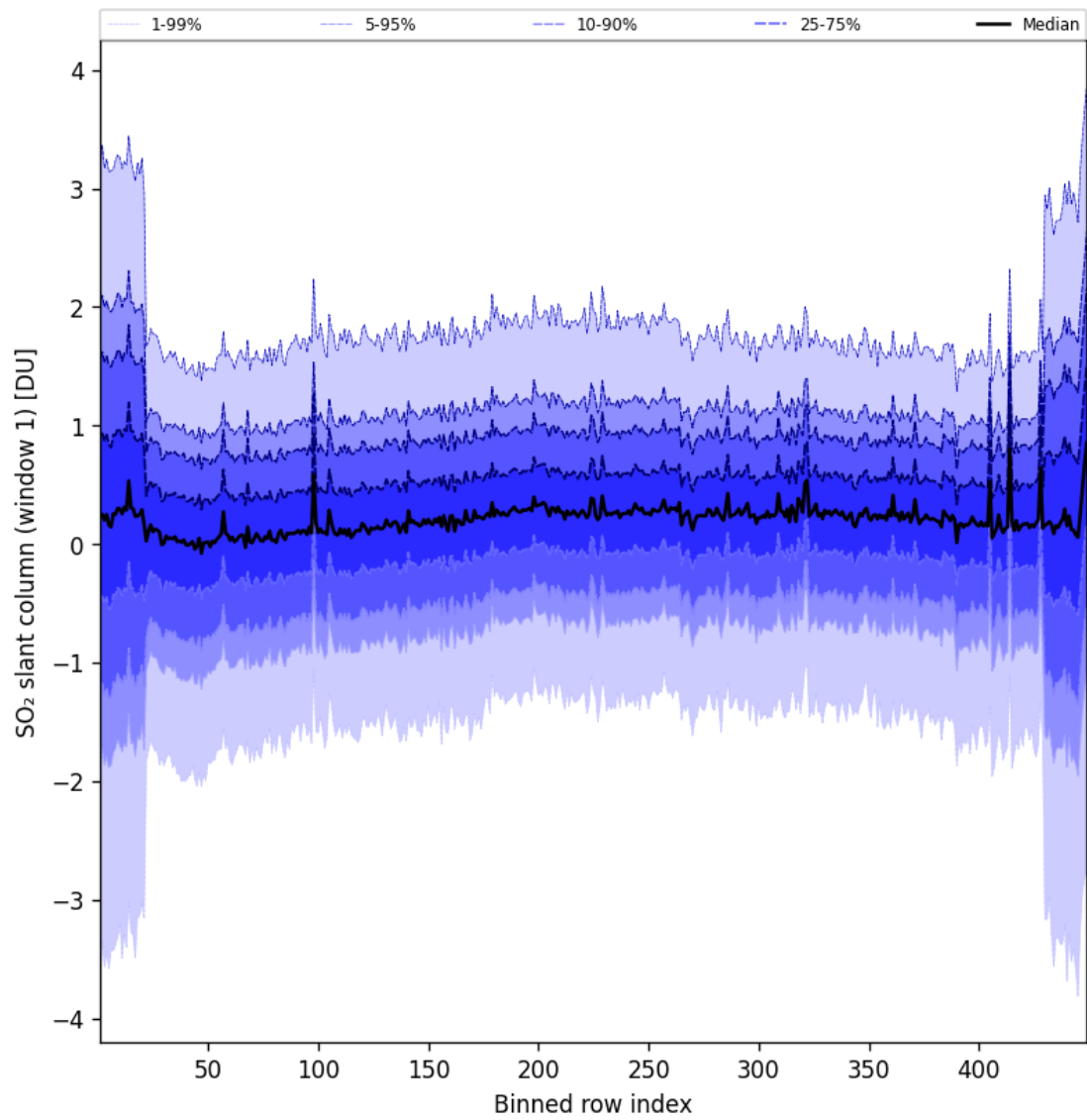


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-03-04 to 2025-03-04

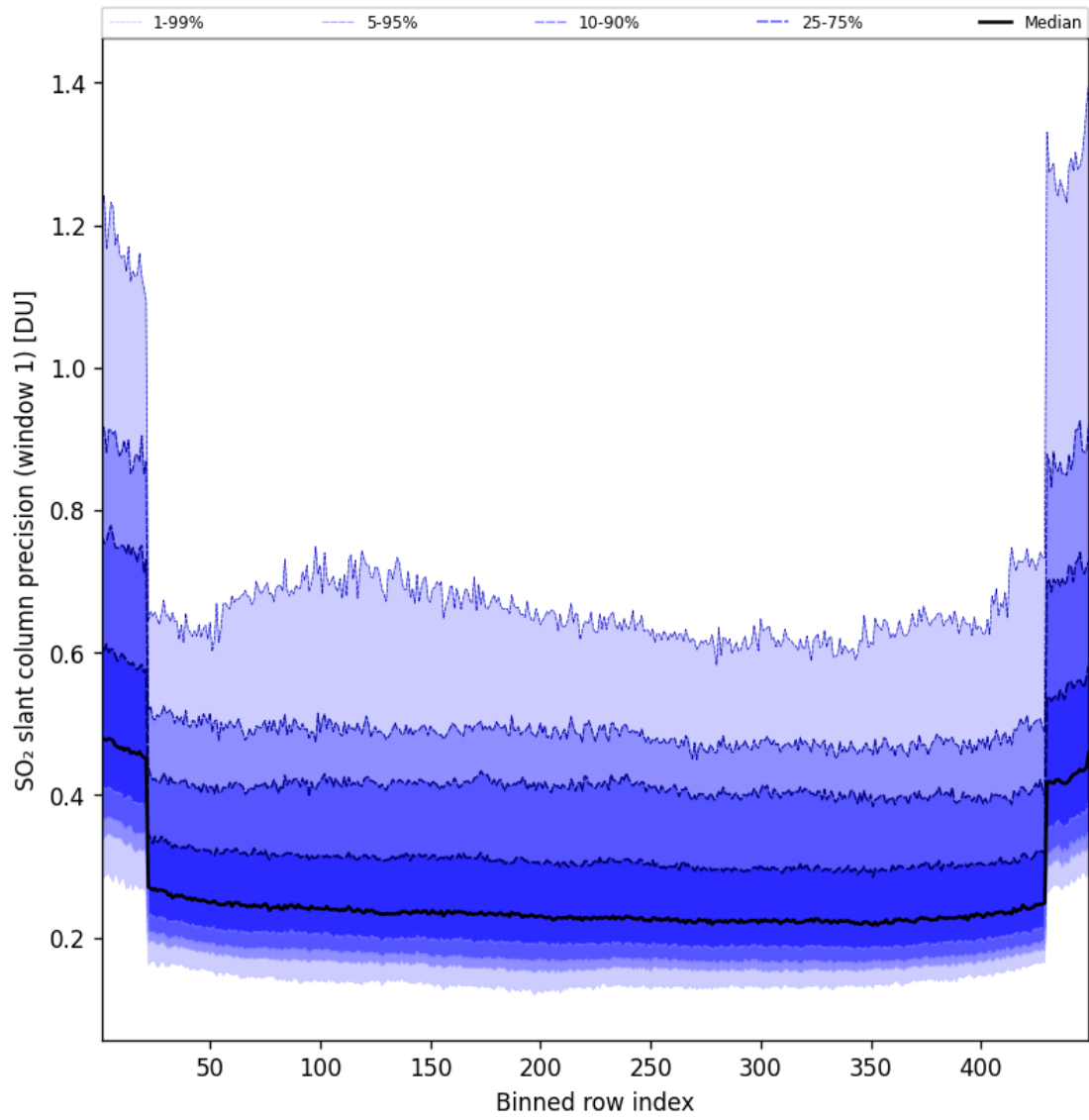


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-03-04 to 2025-03-04

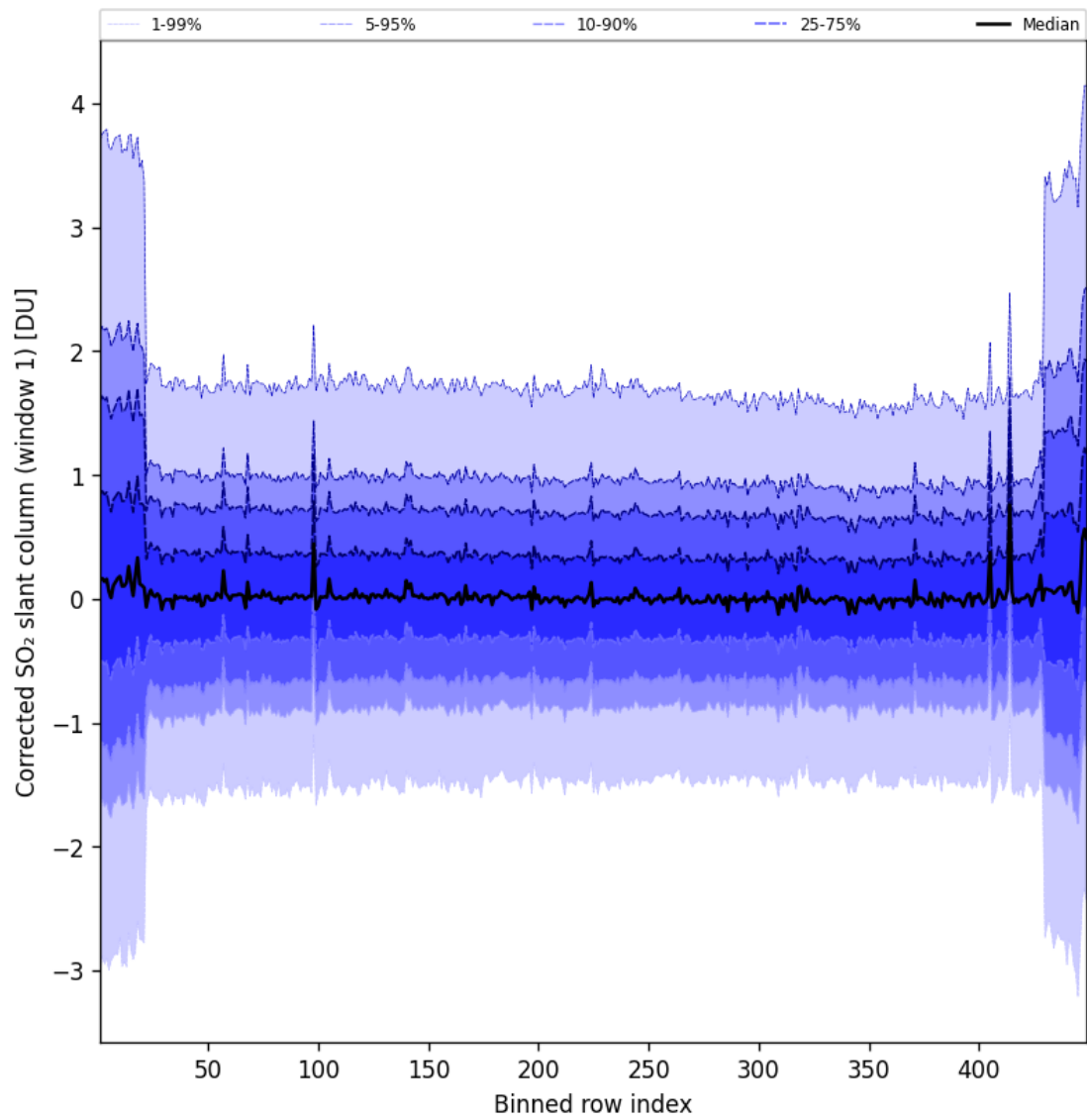


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-03-04 to 2025-03-04

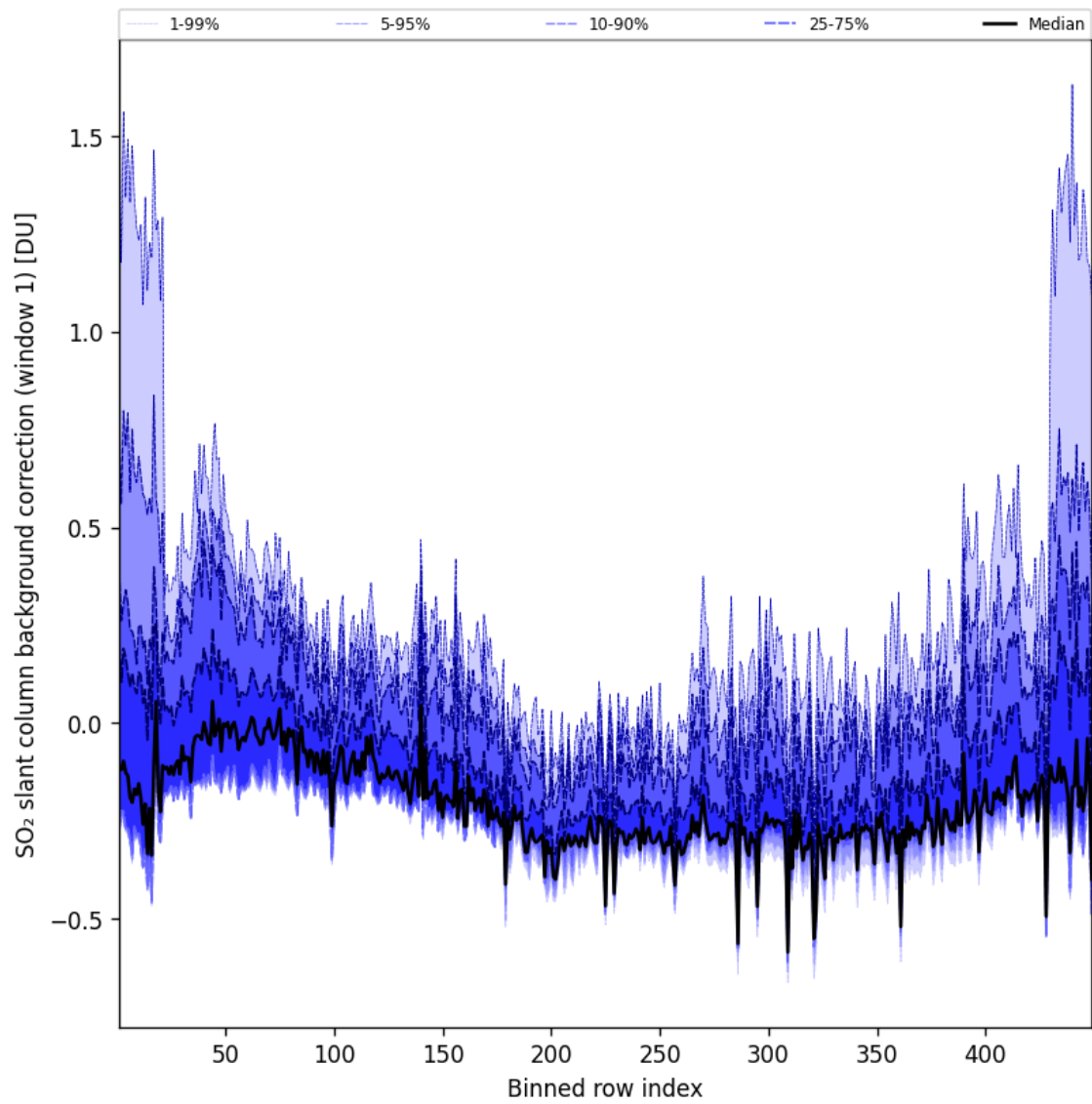


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-03-04 to 2025-03-04

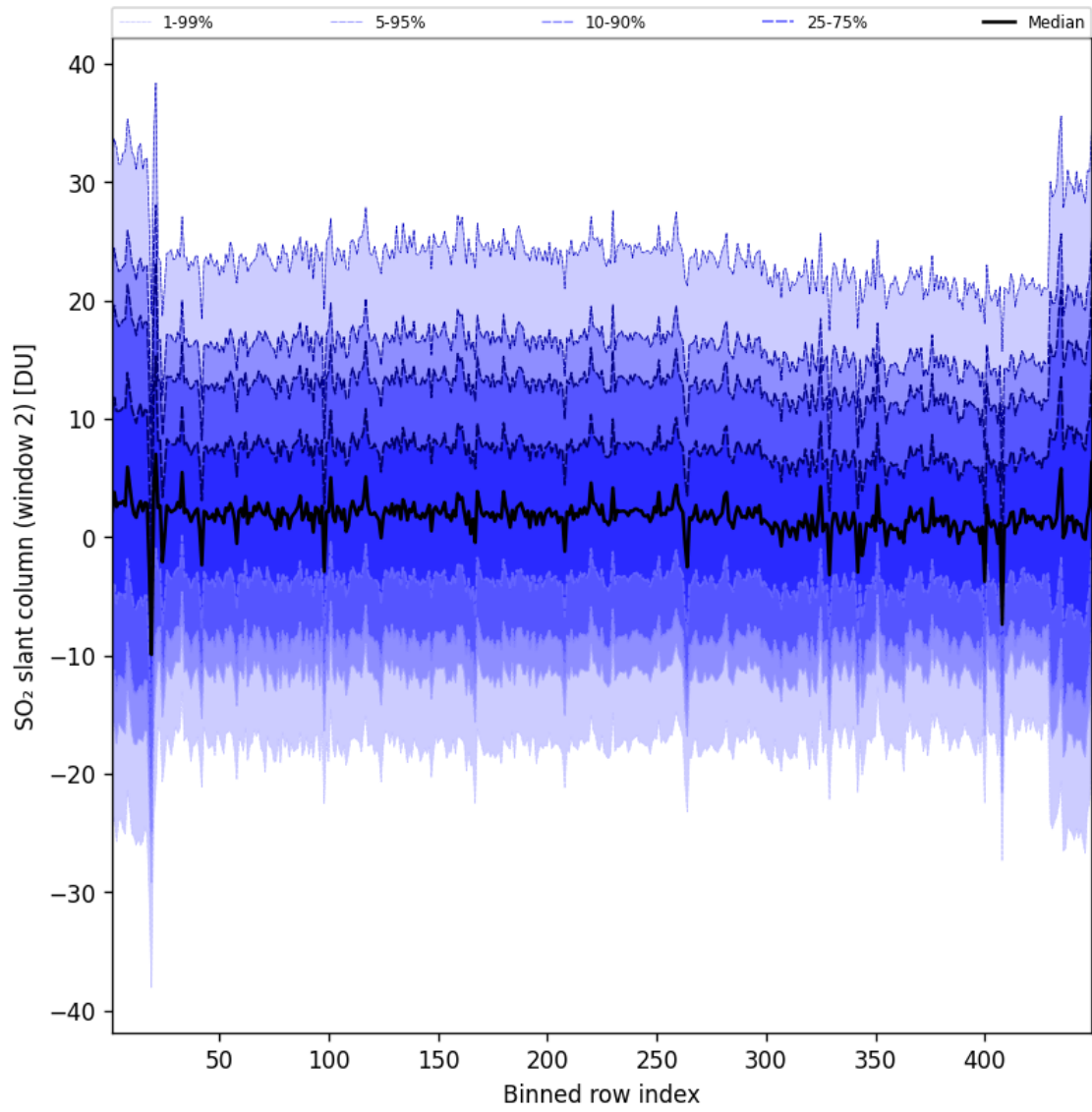


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-03-04 to 2025-03-04

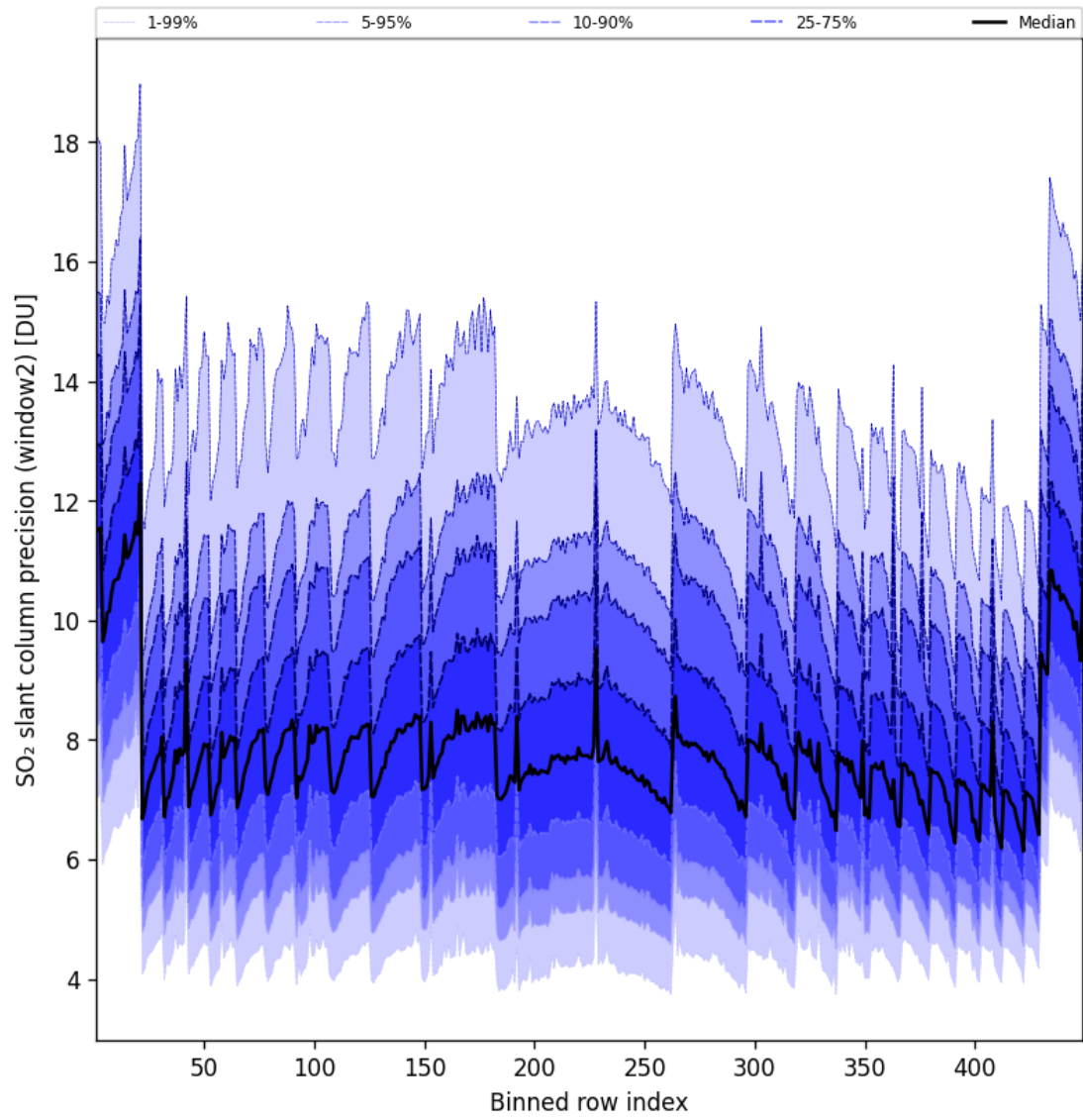


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-03-04 to 2025-03-04

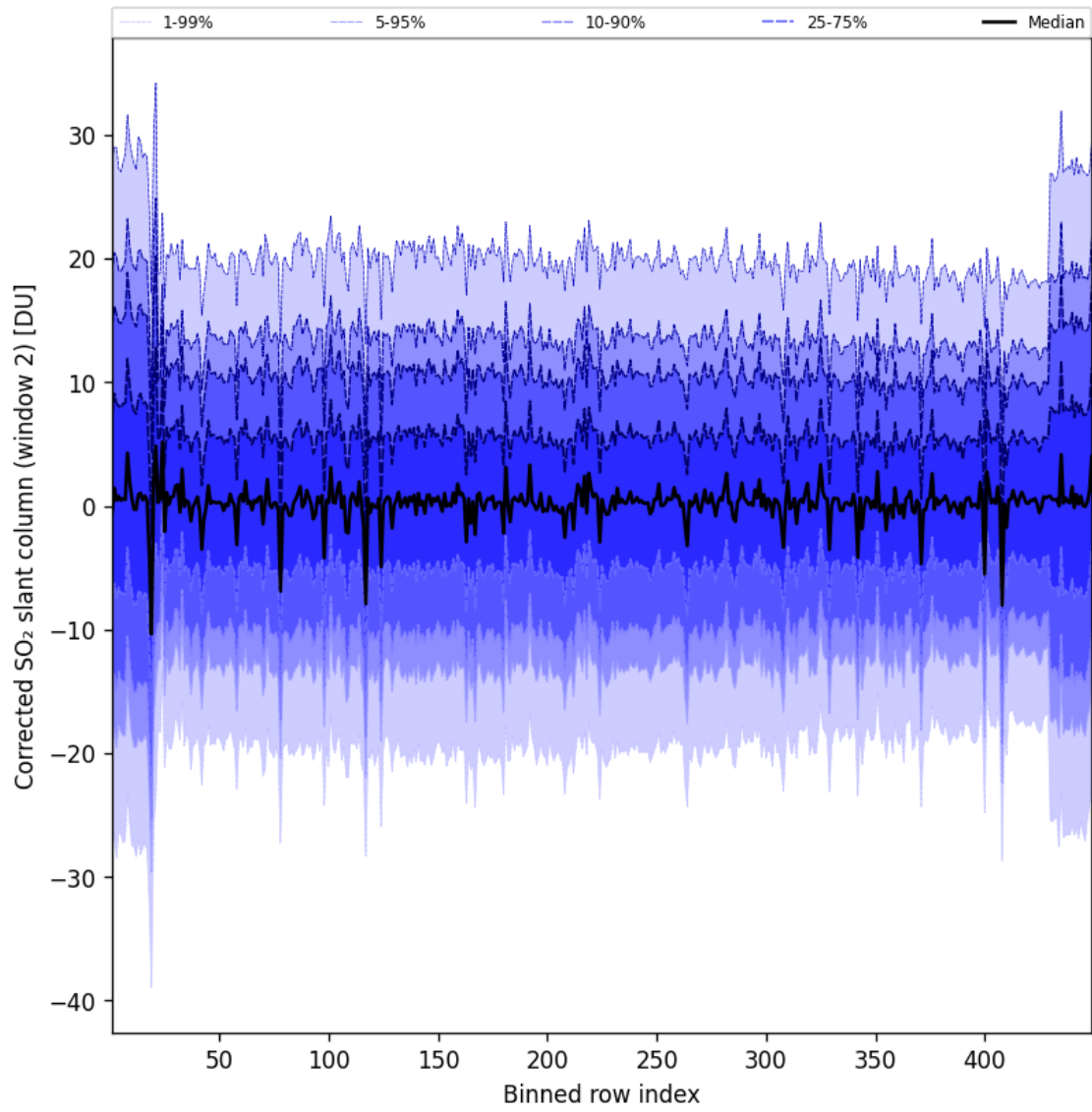


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-03-04 to 2025-03-04

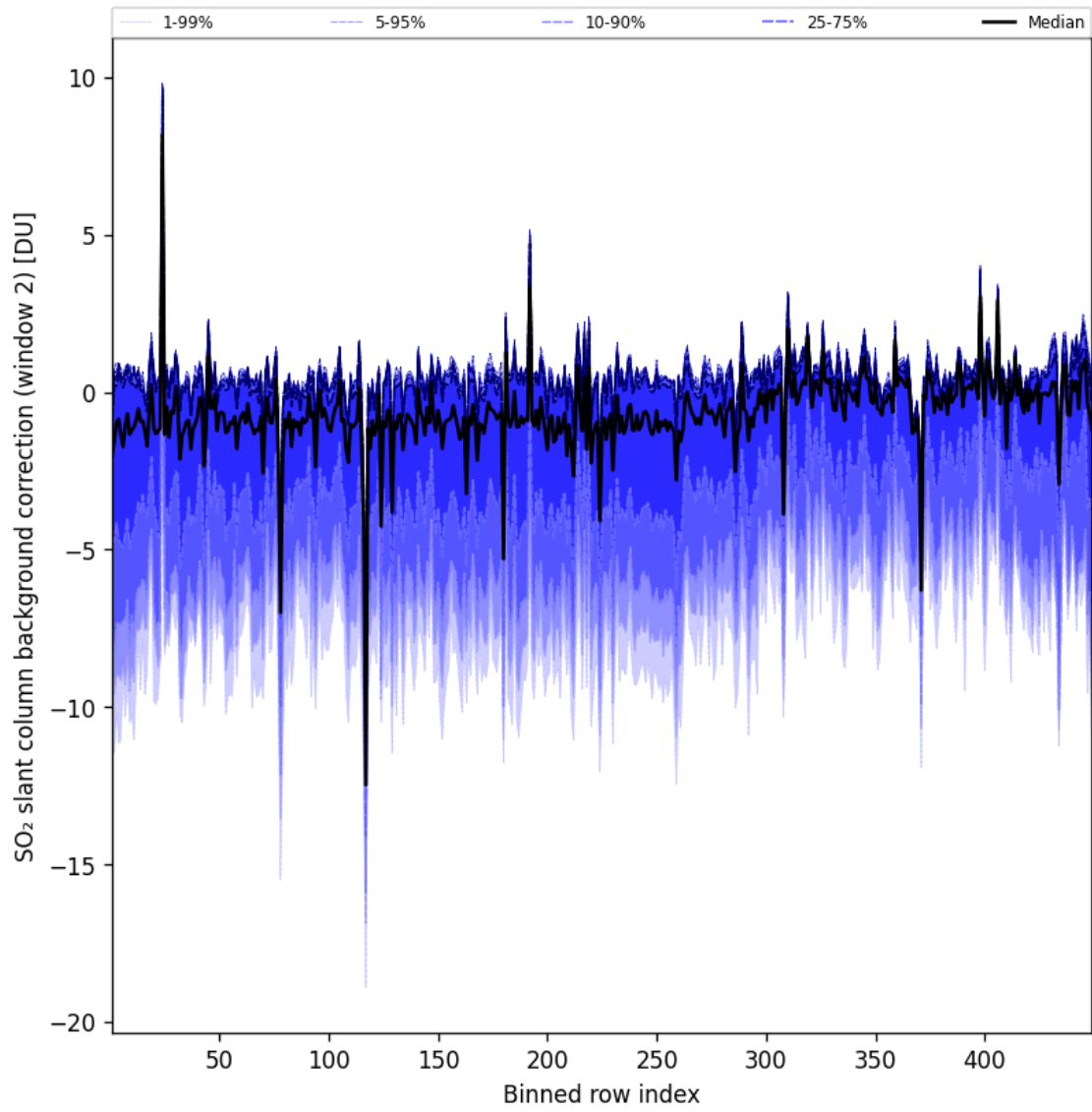


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-03-04 to 2025-03-04

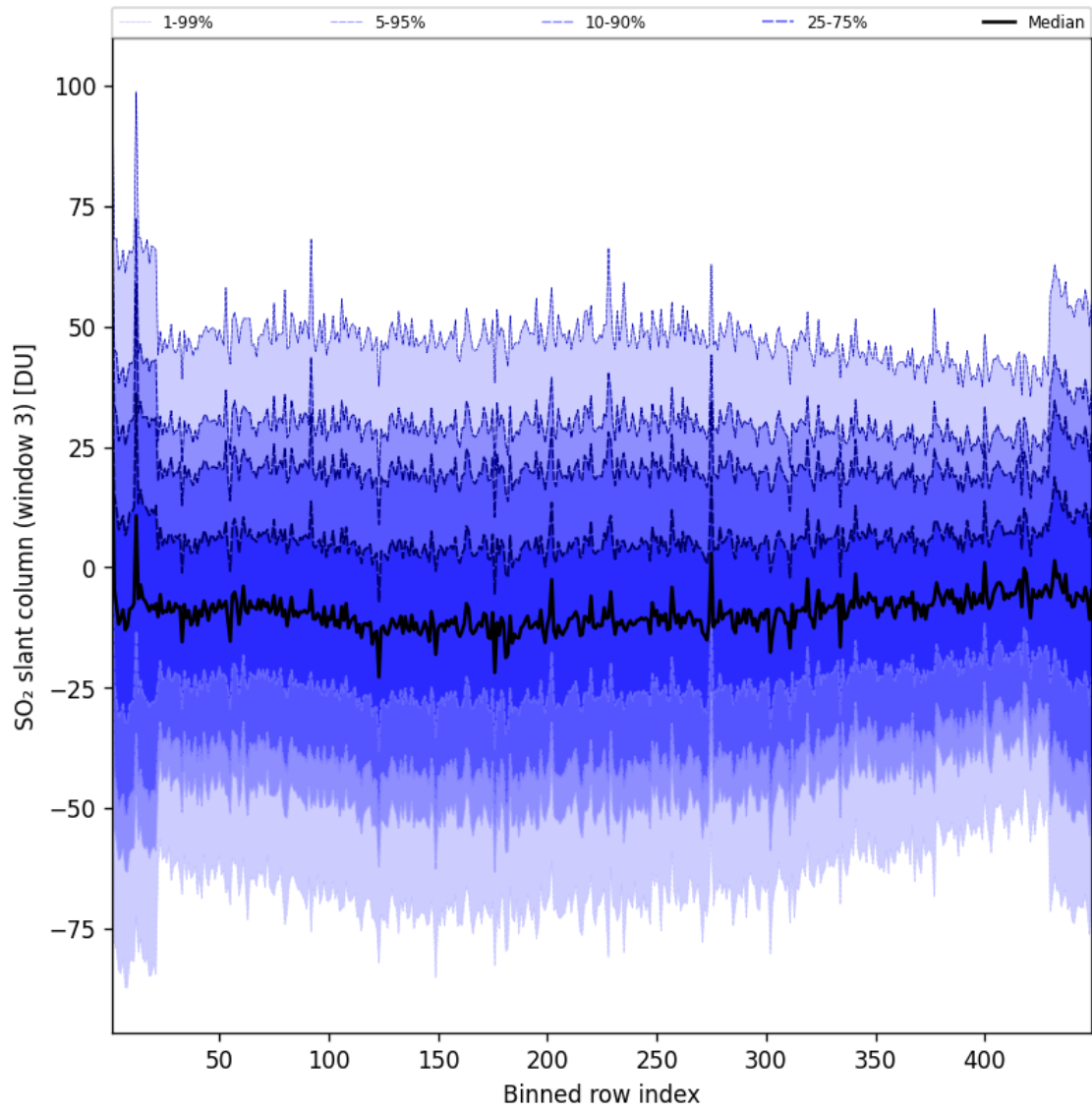


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-03-04 to 2025-03-04

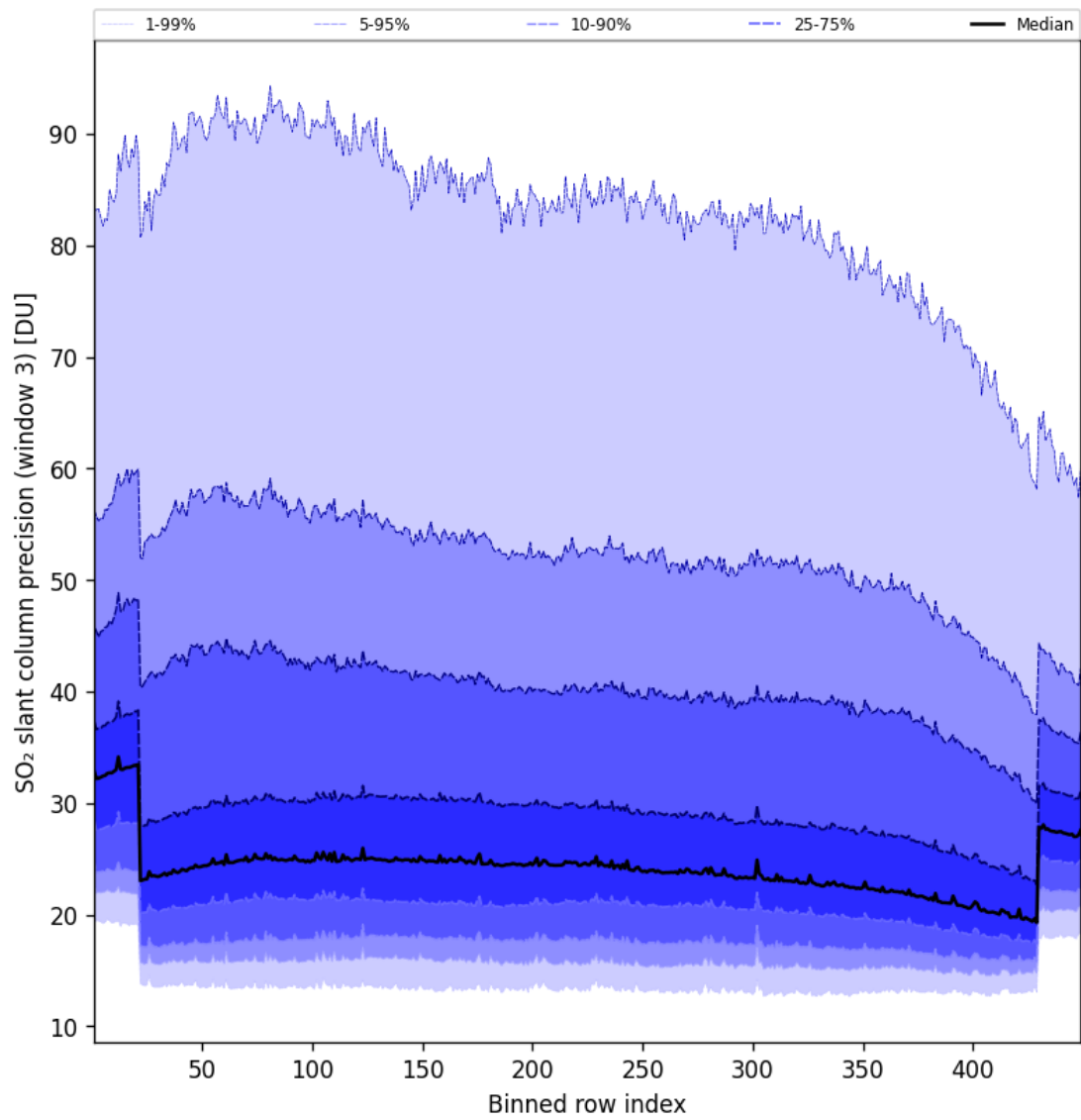


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-03-04 to 2025-03-04

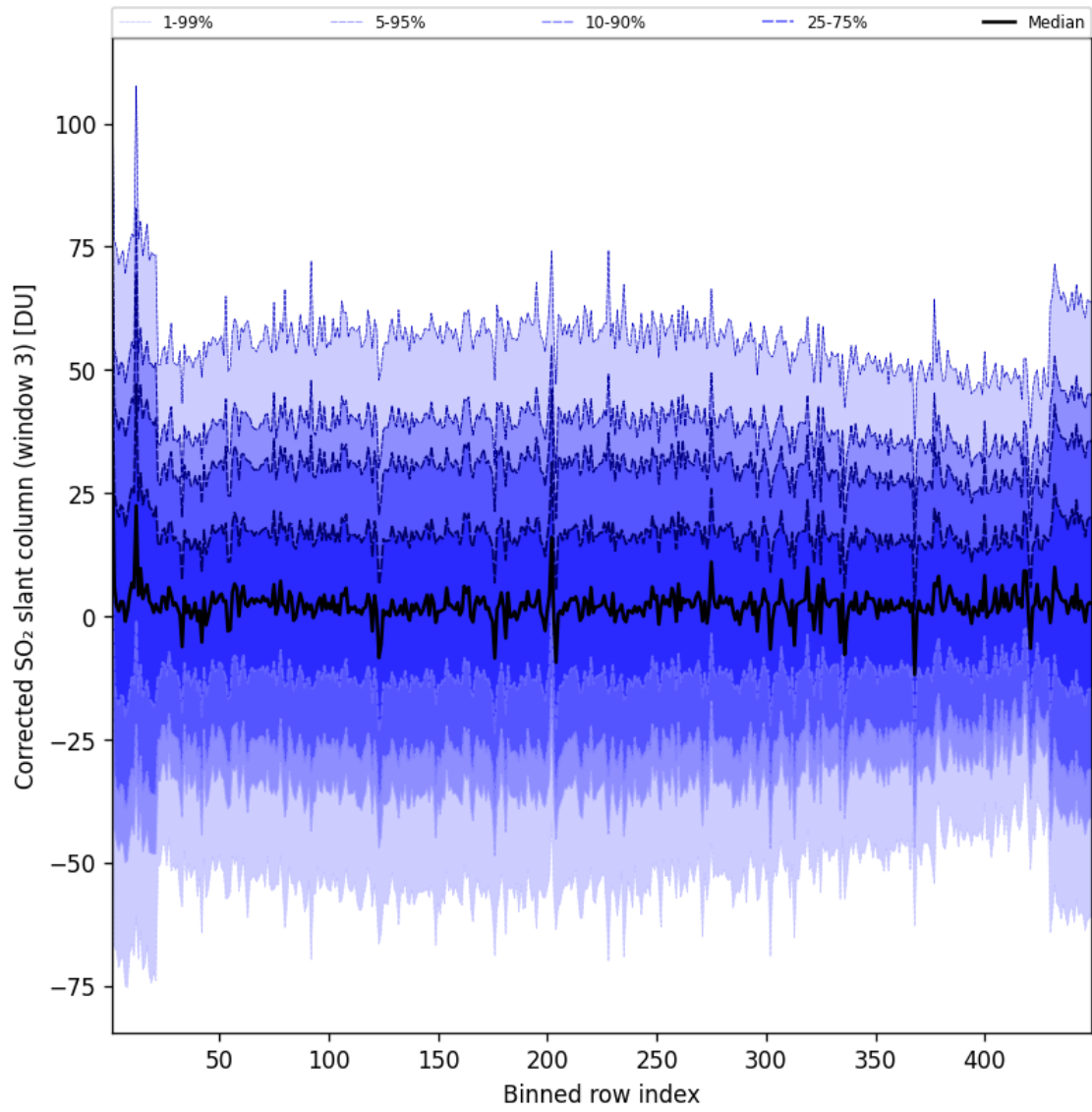


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-03-04 to 2025-03-04

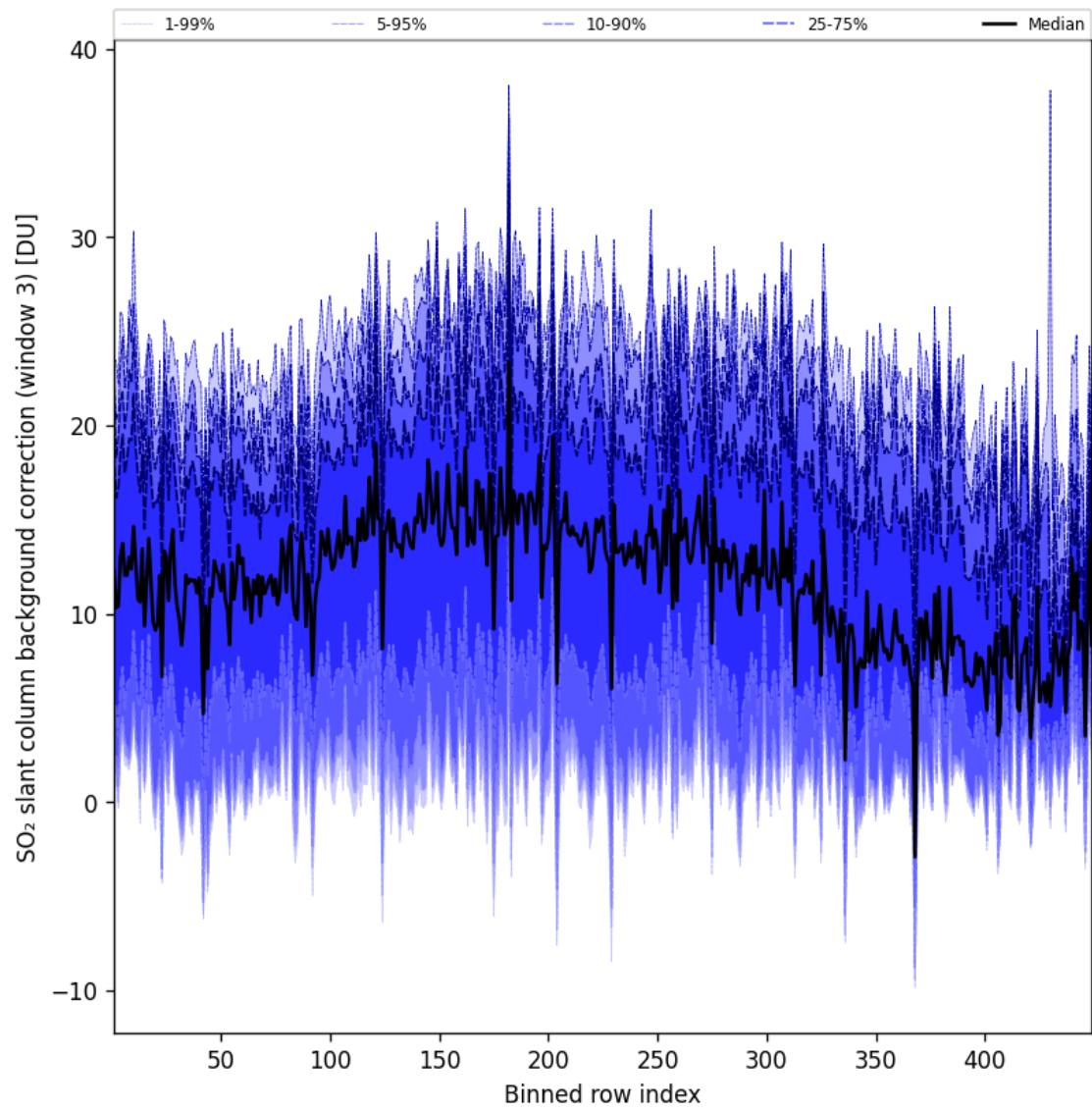


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-03-04 to 2025-03-04

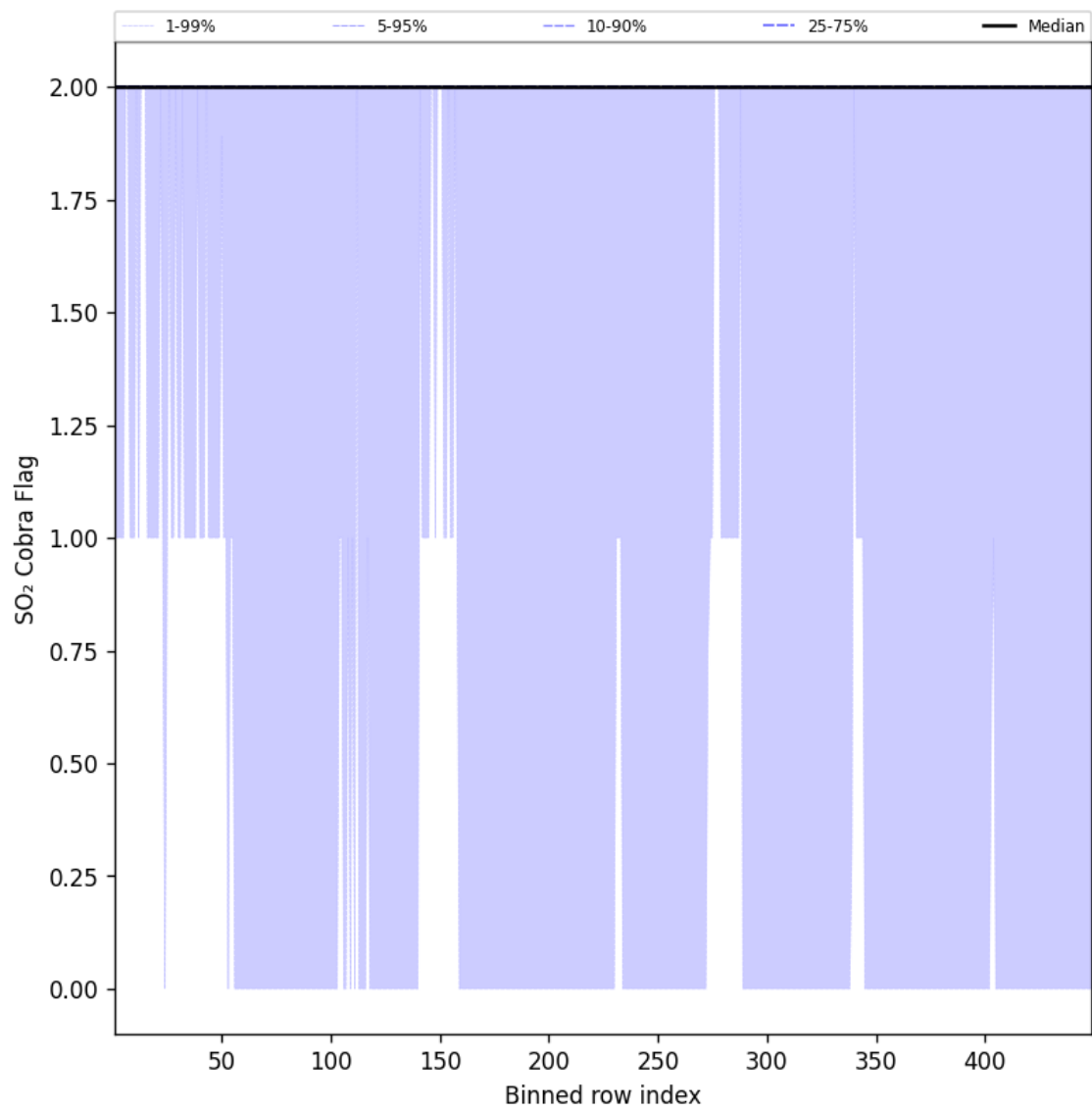


Figure 102: Along track statistics of "SO₂ Cobra Flag" for 2025-03-04 to 2025-03-04

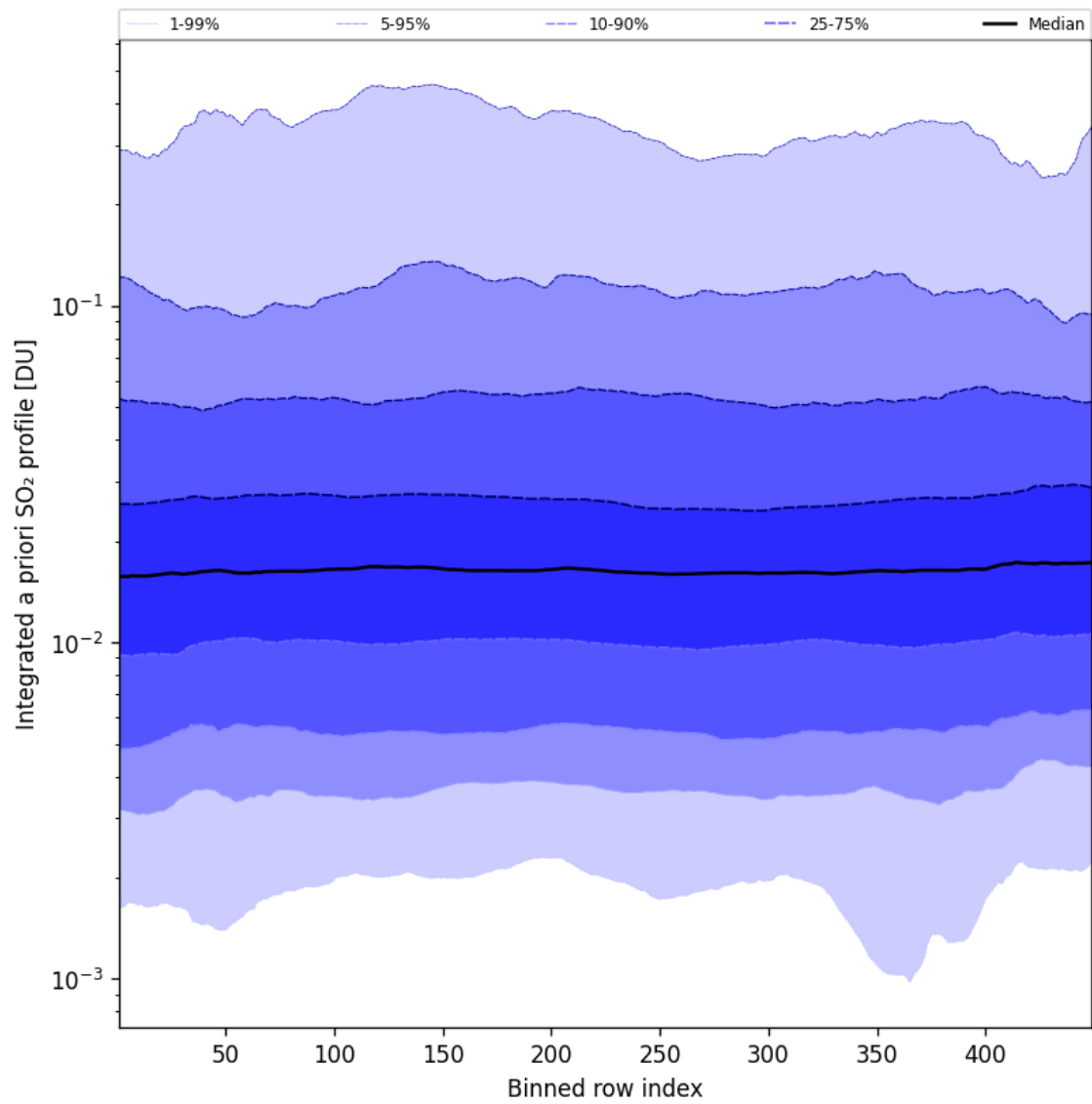


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-03-04 to 2025-03-04

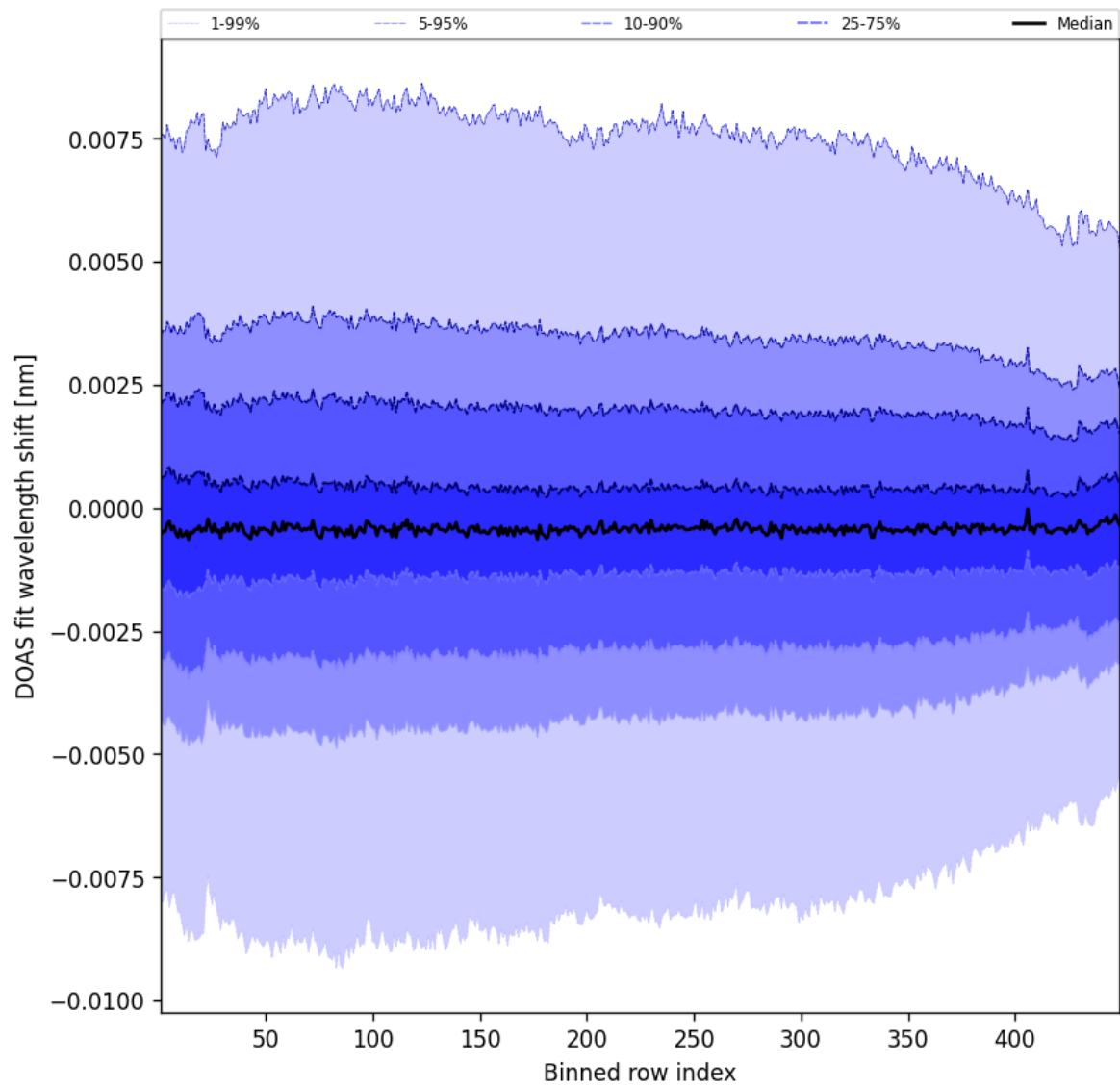


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-03-04 to 2025-03-04

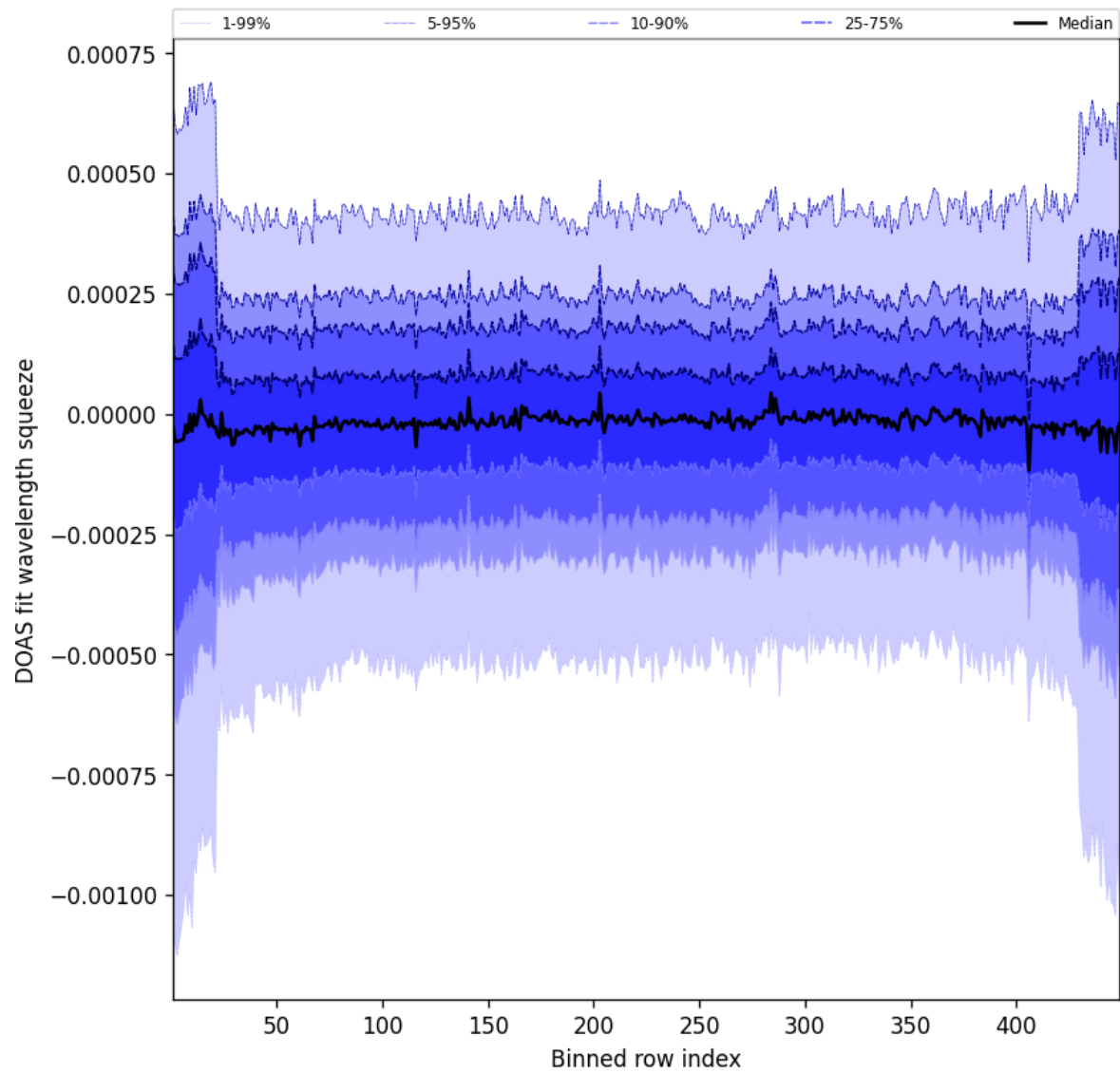


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-03-04 to 2025-03-04

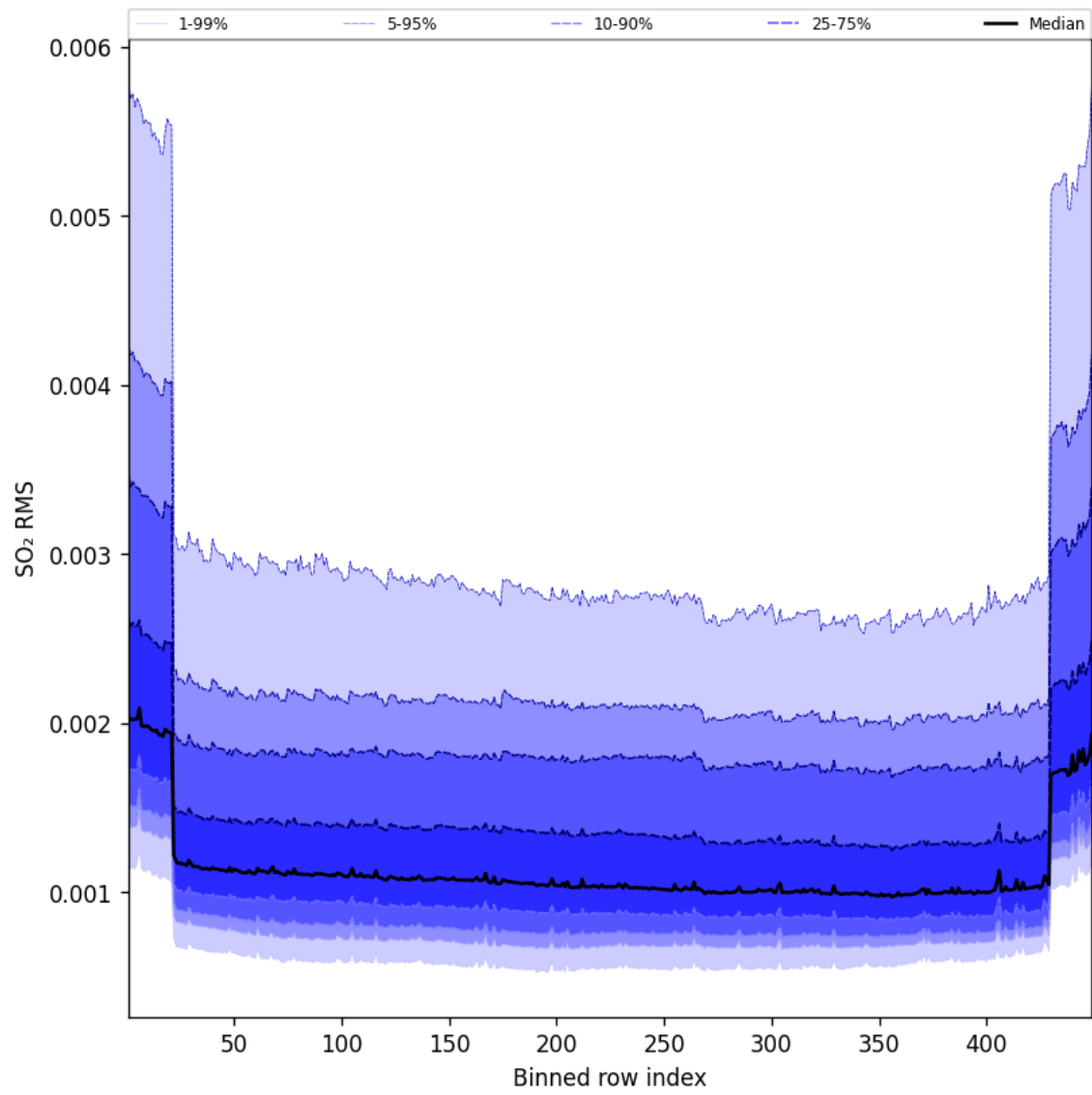


Figure 106: Along track statistics of “SO₂ RMS” for 2025-03-04 to 2025-03-04

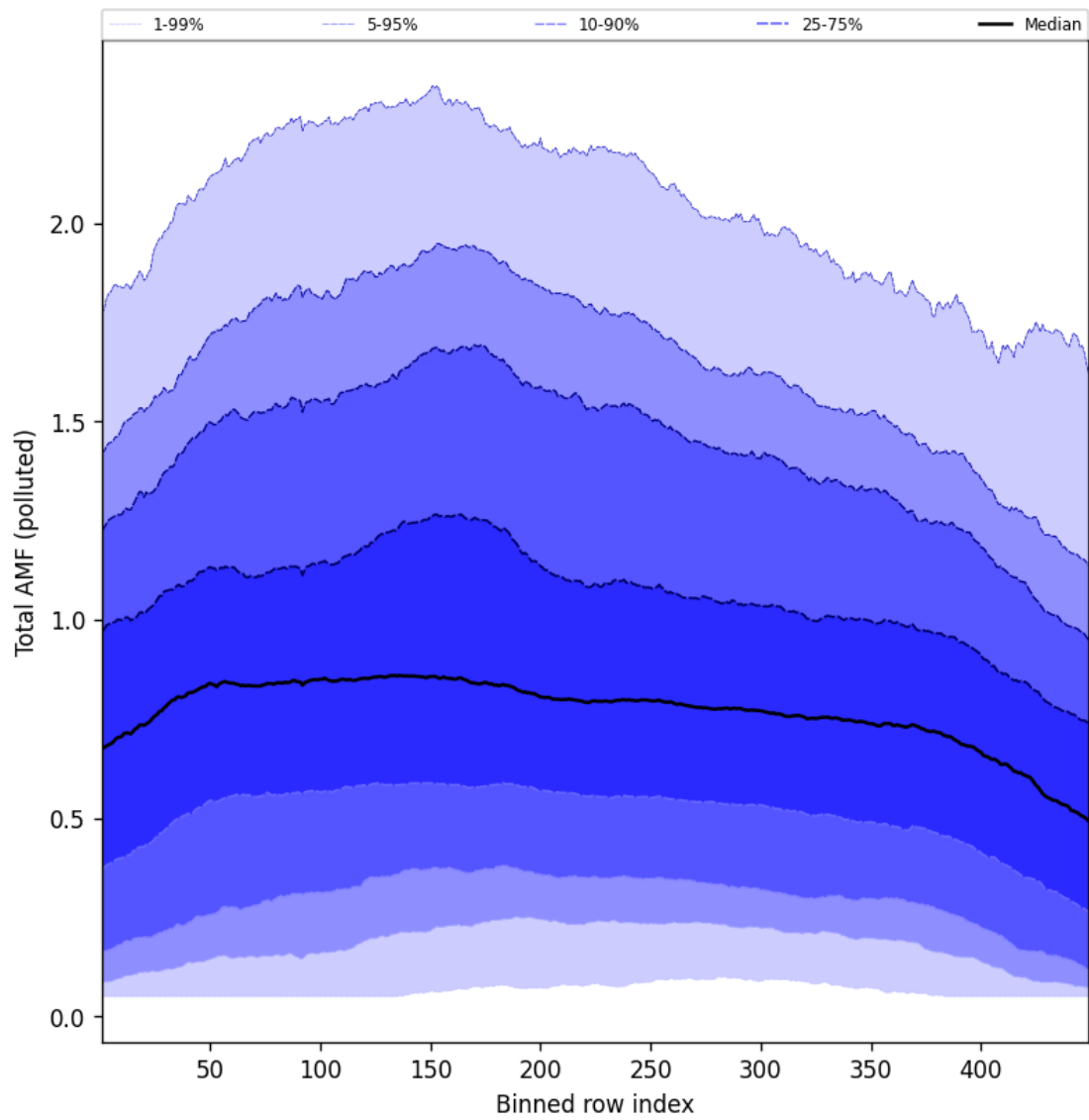


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-03-04 to 2025-03-04

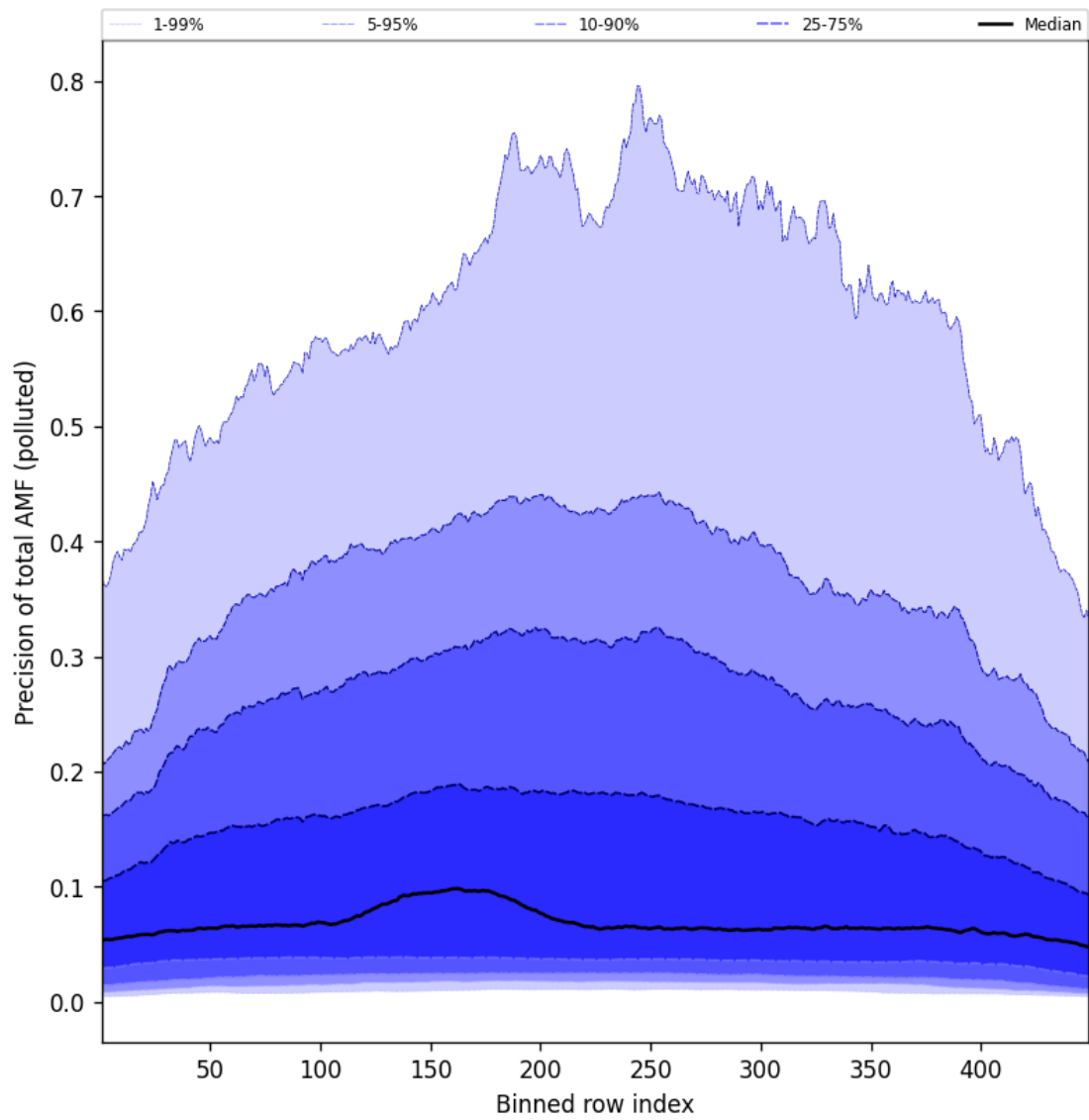


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-03-04 to 2025-03-04

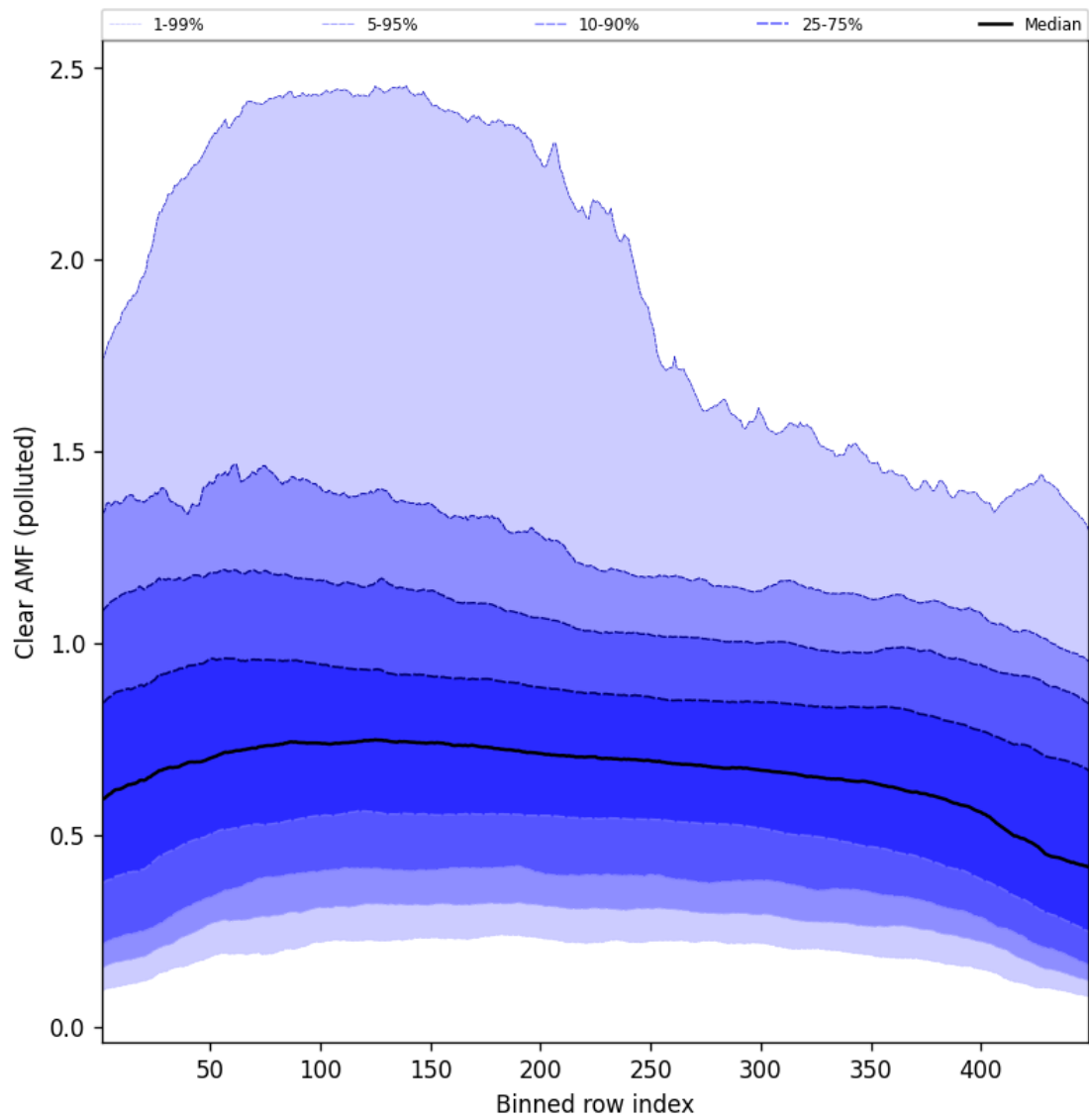


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-03-04 to 2025-03-04

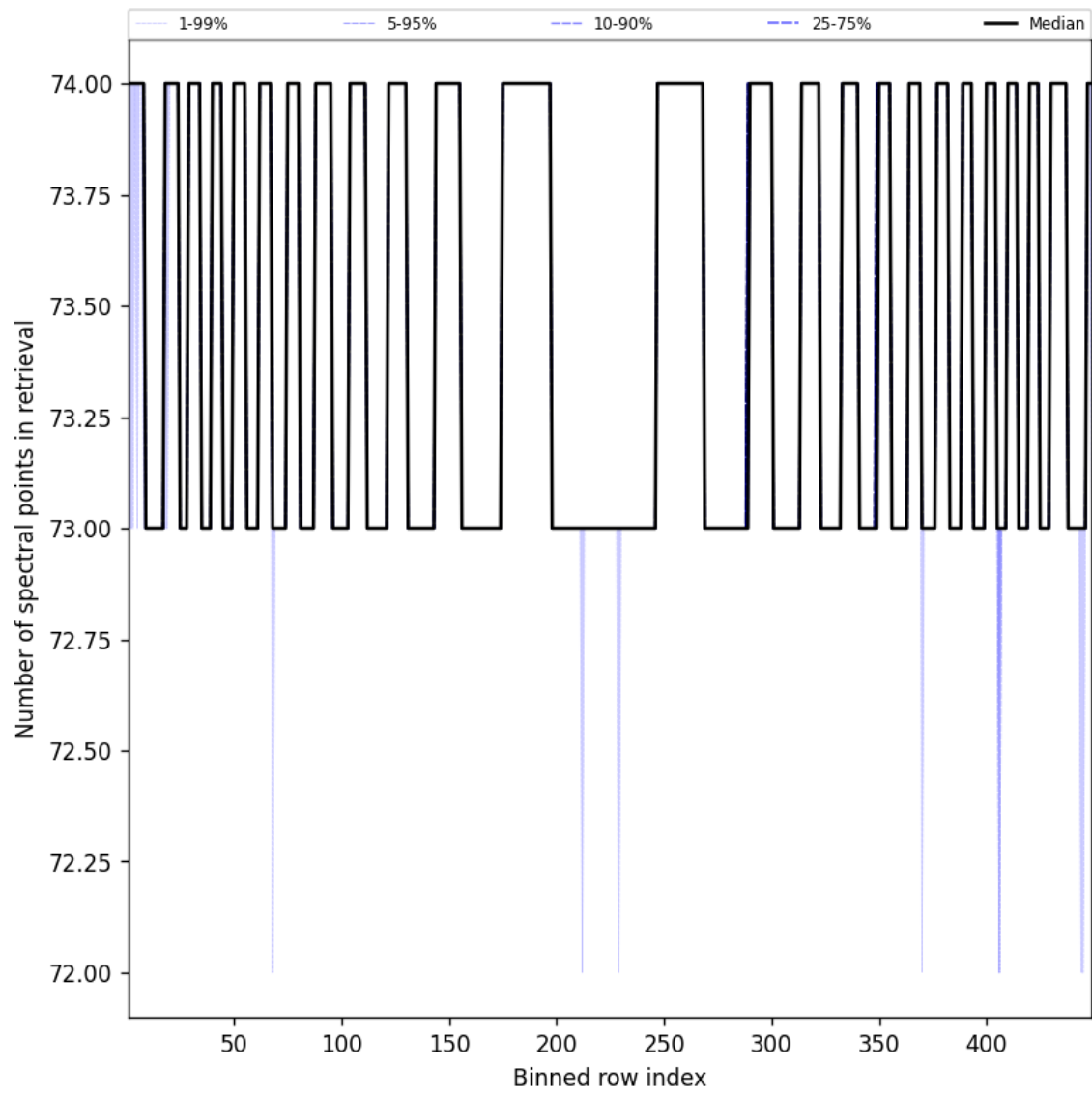


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-03-04 to 2025-03-04

10 Coincidence density

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

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