

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]	0.618 ± 0.416	17330827	0.995	0.810	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(6.094 \pm 188.372) \times 10^{-2}$	17330827	0.249	0.425	1.042×10^{-2}	-249	517
sulfurdioxide total vertical column precision [DU]	0.631 ± 1.288	17330827	0.197	0.354	0.300	3.866×10^{-2}	153
sulfurdioxide slant column density corrected [DU]	$(2.075 \pm 38.476) \times 10^{-2}$	17330827	0.227	0.344	9.309×10^{-3}	-24.3	480
sulfurdioxide slant column density cobra [DU]	$(2.053 \pm 35.638) \times 10^{-2}$	17330827	0.227	0.344	9.309×10^{-3}	-24.3	45.2
sulfurdioxide slant column density cobra precision [DU]	0.280 ± 0.137	17330827	0.188	0.133	0.237	7.577×10^{-2}	19.0
sulfurdioxide slant column density window1 [DU]	0.199 ± 0.668	17330827	0.225	0.712	0.213	-23.7	64.7
sulfurdioxide slant column density window1 precision [DU]	0.280 ± 0.137	17330827	0.188	0.133	0.237	7.577×10^{-2}	19.0
sulfurdioxide slant column density corrected win1 [DU]	$(9.506 \pm 65.289) \times 10^{-2}$	17330827	7.500×10^{-2}	0.688	7.789×10^{-2}	-23.7	65.0
background so2 slant column offset window1 [DU]	-0.104 ± 0.186	17330827	-0.220	0.202	-0.149	-1.13	5.31
sulfurdioxide slant column density window2 [DU]	3.75 ± 8.78	17330827	2.75	11.1	3.57	-900	944
sulfurdioxide slant column density window2 precision [DU]	7.85 ± 2.15	17330827	6.97	2.49	7.52	2.08	561
sulfurdioxide slant column density corrected win2 [DU]	2.68 ± 8.48	17330827	3.25	10.7	2.73	-898	945
background so2 slant column offset window2 [DU]	-1.07 ± 2.73	17330827	0.750	3.05	-0.117	-15.2	5.63
sulfurdioxide slant column density window3 [DU]	-21.4 ± 23.5	17330827	-23.0	29.7	-21.7	-941	1.820×10^3
sulfurdioxide slant column density window3 precision [DU]	27.8 ± 12.7	17330827	22.5	9.30	24.6	10.4	2.423×10^3
sulfurdioxide slant column density corrected win3 [DU]	-14.6 ± 22.5	17330827	-15.1	28.5	-14.8	-941	1.819×10^3
background so2 slant column offset window3 [DU]	6.80 ± 7.34	17330827	1.68	11.3	6.55	-22.1	33.3
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	17330827	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.458 \pm 9.846) \times 10^{-2}$	17330827	1.316×10^{-2}	1.746×10^{-2}	1.627×10^{-2}	4.191×10^{-4}	2.44
fitted radiance shift [nm]	$(-4.006 \pm 25.457) \times 10^{-4}$	17330827	-5.000×10^{-4}	1.798×10^{-3}	-4.185×10^{-4}	-4.464×10^{-2}	4.514×10^{-2}
fitted radiance squeeze [1]	$(-4.122 \pm 18.308) \times 10^{-5}$	17330827	-3.000×10^{-5}	2.028×10^{-4}	-3.483×10^{-5}	-1.346×10^{-2}	6.704×10^{-2}
fitted root mean square [1]	$(1.238 \pm 0.551) \times 10^{-3}$	17330827	9.250×10^{-4}	5.397×10^{-4}	1.075×10^{-3}	2.874×10^{-4}	4.706×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.872 ± 0.511	17330827	0.580	0.621	0.782	5.000×10^{-2}	2.95
sulfurdioxide total air mass factor polluted precision [1]	0.133 ± 0.144	17330827	2.500×10^{-2}	0.146	7.835×10^{-2}	2.500×10^{-3}	2.07
sulfurdioxide clear air mass factor polluted [1]	0.755 ± 0.450	17330827	0.580	0.406	0.674	2.264×10^{-2}	3.00
number of spectral points in retrieval [1]	73.4 ± 0.5	17330827	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	4.000×10^{-2}	9.000×10^{-2}	0.190	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-3.37	-0.961	-0.535	-0.346	-0.198	0.227	0.390	0.609	1.13	4.29
sulfurdioxide total vertical column precision [DU]	8.844×10^{-2}	0.117	0.140	0.163	0.197	0.551	0.813	1.20	2.11	6.21
sulfurdioxide slant column density corrected [DU]	-0.825	-0.468	-0.337	-0.250	-0.161	0.183	0.279	0.375	0.529	1.03
sulfurdioxide slant column density cobra [DU]	-0.825	-0.468	-0.337	-0.250	-0.161	0.183	0.279	0.375	0.529	1.03
sulfurdioxide slant column density cobra precision [DU]	0.128	0.155	0.170	0.180	0.194	0.328	0.384	0.440	0.529	0.781
sulfurdioxide slant column density window1 [DU]	-1.64	-0.837	-0.541	-0.348	-0.151	0.562	0.744	0.918	1.19	1.95
sulfurdioxide slant column density window1 precision [DU]	0.128	0.155	0.170	0.180	0.194	0.328	0.384	0.440	0.529	0.781
sulfurdioxide slant column density corrected win1 [DU]	-1.55	-0.859	-0.608	-0.440	-0.262	0.426	0.616	0.804	1.10	1.98
background so2 slant column offset window1 [DU]	-0.378	-0.306	-0.278	-0.256	-0.227	-2.593×10^{-2}	5.849×10^{-2}	0.140	0.245	0.470
sulfurdioxide slant column density window2 [DU]	-16.9	-10.2	-6.95	-4.56	-1.88	9.18	12.1	14.7	18.3	26.1
sulfurdioxide slant column density window2 precision [DU]	4.17	5.02	5.54	5.94	6.43	8.92	9.77	10.6	11.8	14.3
sulfurdioxide slant column density corrected win2 [DU]	-18.2	-11.2	-7.82	-5.37	-2.66	8.08	10.7	13.1	16.3	23.1
background so2 slant column offset window2 [DU]	-9.47	-7.08	-5.17	-3.69	-2.27	0.779	1.03	1.29	1.69	3.15
sulfurdioxide slant column density window3 [DU]	-79.2	-59.6	-50.4	-43.7	-36.3	-6.61	1.12	8.11	17.5	36.0
sulfurdioxide slant column density window3 precision [DU]	14.4	16.3	17.7	19.1	20.8	30.1	34.6	40.3	51.7	82.5
sulfurdioxide slant column density corrected win3 [DU]	-70.2	-51.2	-42.3	-35.9	-28.9	-0.409	6.90	13.5	22.4	40.4
background so2 slant column offset window3 [DU]	-7.04	-4.32	-2.70	-1.10	1.08	12.4	14.7	16.6	18.8	23.1
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]	2.245×10^{-3}	4.165×10^{-3}	6.001×10^{-3}	7.679×10^{-3}	9.903×10^{-3}	2.736×10^{-2}	3.555×10^{-2}	5.106×10^{-2}	0.102	0.389
fitted radiance shift [nm]	-8.038×10^{-3}	-4.149×10^{-3}	-2.785×10^{-3}	-2.006×10^{-3}	-1.345×10^{-3}	4.521×10^{-4}	1.172×10^{-3}	2.046×10^{-3}	3.543×10^{-3}	7.625×10^{-3}
fitted radiance squeeze [1]	-5.503×10^{-4}	-3.363×10^{-4}	-2.522×10^{-4}	-1.963×10^{-4}	-1.390×10^{-4}	6.385×10^{-5}	1.146×10^{-4}	1.624×10^{-4}	2.332×10^{-4}	4.121×10^{-4}
fitted root mean square [1]	5.593×10^{-4}	6.912×10^{-4}	7.673×10^{-4}	8.238×10^{-4}	8.916×10^{-4}	1.431×10^{-3}	1.673×10^{-3}	1.908×10^{-3}	2.281×10^{-3}	3.275×10^{-3}
sulfurdioxide total air mass factor polluted [1]	5.497×10^{-2}	0.191	0.297	0.393	0.511	1.13	1.36	1.59	1.89	2.44
sulfurdioxide total air mass factor polluted precision [1]	7.647×10^{-3}	1.564×10^{-2}	2.217×10^{-2}	2.783×10^{-2}	3.672×10^{-2}	0.183	0.246	0.315	0.417	0.671
sulfurdioxide clear air mass factor polluted [1]	0.146	0.248	0.328	0.405	0.491	0.898	1.02	1.14	1.56	2.68
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]	0.663 ± 0.410	7371634	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	0.121 ± 2.804	7371634	0.601	1.580×10^{-2}	-213	517	-0.274	0.327
sulfurdioxide total vertical column precision [DU]	1.00 ± 1.85	7371634	0.706	0.436	4.352×10^{-2}	65.9	0.247	0.953
sulfurdioxide slant column density corrected [DU]	$(2.961 \pm 44.097) \times 10^{-2}$	7371634	0.388	1.182×10^{-2}	-10.8	50.0	-0.179	0.209
sulfurdioxide slant column density cobra [DU]	$(2.923 \pm 42.471) \times 10^{-2}$	7371634	0.388	1.182×10^{-2}	-10.8	19.3	-0.179	0.209
sulfurdioxide slant column density cobra precision [DU]	0.322 ± 0.167	7371634	0.181	0.272	8.209×10^{-2}	9.79	0.209	0.390
sulfurdioxide slant column density window1 [DU]	0.250 ± 0.771	7371634	0.786	0.265	-14.3	49.2	-0.133	0.653
sulfurdioxide slant column density window1 precision [DU]	0.322 ± 0.167	7371634	0.181	0.272	8.209×10^{-2}	9.79	0.209	0.390
sulfurdioxide slant column density corrected win1 [DU]	0.122 ± 0.764	7371634	0.774	9.456×10^{-2}	-12.6	49.3	-0.285	0.490
background so2 slant column offset window1 [DU]	-0.127 ± 0.205	7371634	0.187	-0.171	-1.13	5.31	-0.251	-6.428×10^{-2}
sulfurdioxide slant column density window2 [DU]	4.58 ± 9.49	7371634	12.1	4.26	-96.4	205	-1.64	10.4
sulfurdioxide slant column density window2 precision [DU]	8.38 ± 2.18	7371634	2.68	8.06	2.09	118	6.88	9.56
sulfurdioxide slant column density corrected win2 [DU]	2.58 ± 9.00	7371634	11.5	2.63	-101	207	-3.15	8.35
background so2 slant column offset window2 [DU]	-2.00 ± 3.44	7371634	5.31	-0.562	-15.2	5.63	-4.62	0.684
sulfurdioxide slant column density window3 [DU]	-24.2 ± 24.4	7371634	31.2	-24.1	-191	142	-39.7	-8.54
sulfurdioxide slant column density window3 precision [DU]	29.2 ± 12.7	7371634	9.11	26.0	10.6	255	22.2	31.4
sulfurdioxide slant column density corrected win3 [DU]	-14.6 ± 23.7	7371634	30.0	-14.5	-179	156	-29.5	0.545
background so2 slant column offset window3 [DU]	9.67 ± 6.76	7371634	10.9	9.14	-18.7	33.3	4.03	14.9
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	7371634	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.567 \pm 14.574) \times 10^{-2}$	7371634	2.963×10^{-2}	1.939×10^{-2}	4.191×10^{-4}	2.44	1.067×10^{-2}	4.030×10^{-2}
fitted radiance shift [nm]	$(-2.523 \pm 25.580) \times 10^{-4}$	7371634	1.700×10^{-3}	-2.647×10^{-4}	-4.464×10^{-2}	4.101×10^{-2}	-1.122×10^{-3}	5.779×10^{-4}
fitted radiance squeeze [1]	$(-1.104 \pm 20.581) \times 10^{-5}$	7371634	2.180×10^{-4}	-5.783×10^{-6}	-1.284×10^{-2}	1.060×10^{-2}	-1.152×10^{-4}	1.028×10^{-4}
fitted root mean square [1]	$(1.401 \pm 0.669) \times 10^{-3}$	7371634	7.293×10^{-4}	1.181×10^{-3}	3.382×10^{-4}	3.537×10^{-2}	9.520×10^{-4}	1.681×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.694 ± 0.420	7371634	0.554	0.632	5.000×10^{-2}	2.81	0.378	0.932
sulfurdioxide total air mass factor polluted precision [1]	0.103 ± 0.143	7371634	9.883×10^{-2}	4.951×10^{-2}	2.500×10^{-3}	2.07	2.614×10^{-2}	0.125
sulfurdioxide clear air mass factor polluted [1]	0.591 ± 0.294	7371634	0.461	0.549	2.264×10^{-2}	2.20	0.353	0.813
number of spectral points in retrieval [1]	73.5 ± 0.5	7371634	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]	0.584 ± 0.418	9959193	0.840	0.490	0.0	1.000	0.160	1.000
sulfurdioxide total vertical column [DU]	$(1.653 \pm 59.287) \times 10^{-2}$	9959193	0.344	7.907×10^{-3}	-249	257	-0.162	0.182
sulfurdioxide total vertical column precision [DU]	0.355 ± 0.412	9959193	0.230	0.249	3.866×10^{-2}	153	0.172	0.402
sulfurdioxide slant column density corrected [DU]	$(1.419 \pm 33.702) \times 10^{-2}$	9959193	0.317	7.773×10^{-3}	-24.3	480	-0.149	0.168
sulfurdioxide slant column density cobra [DU]	$(1.409 \pm 29.565) \times 10^{-2}$	9959193	0.317	7.773×10^{-3}	-24.3	45.2	-0.149	0.168
sulfurdioxide slant column density cobra precision [DU]	0.249 ± 0.098	9959193	9.932×10^{-2}	0.222	7.577×10^{-2}	19.0	0.186	0.286
sulfurdioxide slant column density window1 [DU]	0.162 ± 0.577	9959193	0.663	0.180	-23.7	64.7	-0.161	0.501
sulfurdioxide slant column density window1 precision [DU]	0.249 ± 0.098	9959193	9.932×10^{-2}	0.222	7.577×10^{-2}	19.0	0.186	0.286
sulfurdioxide slant column density corrected win1 [DU]	$(7.479 \pm 55.566) \times 10^{-2}$	9959193	0.634	6.766×10^{-2}	-23.7	65.0	-0.249	0.385
background so2 slant column offset window1 [DU]	$(-8.688 \pm 16.877) \times 10^{-2}$	9959193	0.219	-0.135	-1.02	1.87	-0.210	8.402×10^{-3}
sulfurdioxide slant column density window2 [DU]	3.14 ± 8.17	9959193	10.4	3.12	-900	944	-2.04	8.33
sulfurdioxide slant column density window2 precision [DU]	7.46 ± 2.05	9959193	2.23	7.17	2.08	561	6.17	8.39
sulfurdioxide slant column density corrected win2 [DU]	2.75 ± 8.07	9959193	10.2	2.80	-898	945	-2.33	7.89
background so2 slant column offset window2 [DU]	-0.391 ± 1.766	9959193	2.29	0.109	-8.19	5.55	-1.46	0.829
sulfurdioxide slant column density window3 [DU]	-19.4 ± 22.6	9959193	28.6	-20.0	-941	1.820×10^3	-33.9	-5.31
sulfurdioxide slant column density window3 precision [DU]	26.8 ± 12.7	9959193	9.09	23.5	10.4	2.423×10^3	19.8	28.8
sulfurdioxide slant column density corrected win3 [DU]	-14.7 ± 21.6	9959193	27.3	-15.0	-941	1.819×10^3	-28.4	-1.09
background so2 slant column offset window3 [DU]	4.68 ± 7.04	9959193	11.7	4.17	-22.1	24.8	-1.25	10.4
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	9959193	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.897 \pm 2.401) \times 10^{-2}$	9959193	1.353×10^{-2}	1.472×10^{-2}	4.875×10^{-4}	1.05	9.476×10^{-3}	2.300×10^{-2}
fitted radiance shift [nm]	$(-5.103 \pm 25.310) \times 10^{-4}$	9959193	1.823×10^{-3}	-5.455×10^{-4}	-4.373×10^{-2}	4.514×10^{-2}	-1.478×10^{-3}	3.448×10^{-4}
fitted radiance squeeze [1]	$(-6.356 \pm 16.062) \times 10^{-5}$	9959193	1.904×10^{-4}	-5.370×10^{-5}	-1.346×10^{-2}	6.704×10^{-2}	-1.534×10^{-4}	3.700×10^{-5}
fitted root mean square [1]	$(1.118 \pm 0.404) \times 10^{-3}$	9959193	4.282×10^{-4}	1.017×10^{-3}	2.874×10^{-4}	4.706×10^{-2}	8.569×10^{-4}	1.285×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.00 ± 0.53	9959193	0.670	0.892	5.000×10^{-2}	2.95	0.616	1.29
sulfurdioxide total air mass factor polluted precision [1]	0.155 ± 0.142	9959193	0.170	0.112	4.689×10^{-3}	1.63	4.742×10^{-2}	0.217
sulfurdioxide clear air mass factor polluted [1]	0.876 ± 0.504	9959193	0.390	0.734	0.182	3.00	0.579	0.969
number of spectral points in retrieval [1]	73.4 ± 0.5	9959193	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]	0.658 ± 0.407	12509360	0.770	1.000	0.0	1.000	0.230	1.000
sulfurdioxide total vertical column [DU]	$(4.088 \pm 136.243) \times 10^{-2}$	12509360	0.405	8.918×10^{-3}	-133	297	-0.191	0.214
sulfurdioxide total vertical column precision [DU]	0.523 ± 0.967	12509360	0.287	0.284	4.769×10^{-2}	53.6	0.198	0.485
sulfurdioxide slant column density corrected [DU]	$(1.492 \pm 32.009) \times 10^{-2}$	12509360	0.329	7.776×10^{-3}	-8.06	78.4	-0.155	0.174
sulfurdioxide slant column density cobra [DU]	$(1.486 \pm 31.601) \times 10^{-2}$	12509360	0.329	7.776×10^{-3}	-8.06	28.1	-0.155	0.174
sulfurdioxide slant column density cobra precision [DU]	0.265 ± 0.121	12509360	0.112	0.226	7.577×10^{-2}	15.0	0.190	0.303
sulfurdioxide slant column density window1 [DU]	0.195 ± 0.616	12509360	0.678	0.209	-22.8	64.7	-0.136	0.541
sulfurdioxide slant column density window1 precision [DU]	0.265 ± 0.121	12509360	0.112	0.226	7.577×10^{-2}	15.0	0.190	0.303
sulfurdioxide slant column density corrected win1 [DU]	$(7.880 \pm 60.249) \times 10^{-2}$	12509360	0.658	6.828×10^{-2}	-23.0	65.0	-0.258	0.399
background so2 slant column offset window1 [DU]	-0.116 ± 0.164	12509360	0.187	-0.152	-0.999	3.40	-0.227	-3.993×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.32 ± 8.50	12509360	10.7	3.19	-799	705	-2.13	8.61
sulfurdioxide slant column density window2 precision [DU]	7.69 ± 2.05	12509360	2.36	7.38	2.08	561	6.34	8.70
sulfurdioxide slant column density corrected win2 [DU]	2.65 ± 8.29	12509360	10.6	2.70	-798	706	-2.60	7.96
background so2 slant column offset window2 [DU]	-0.667 ± 2.339	12509360	2.38	5.673×10^{-2}	-15.2	5.63	-1.57	0.812
sulfurdioxide slant column density window3 [DU]	-18.6 ± 23.2	12509360	29.5	-19.0	-472	355	-33.5	-3.94
sulfurdioxide slant column density window3 precision [DU]	27.5 ± 12.2	12509360	8.86	24.4	10.4	1.272×10^3	20.9	29.7
sulfurdioxide slant column density corrected win3 [DU]	-12.8 ± 22.2	12509360	28.3	-13.1	-477	353	-27.0	1.27
background so2 slant column offset window3 [DU]	5.89 ± 6.80	12509360	10.1	5.67	-22.1	33.3	0.707	10.8
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.15	12509360	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.341 \pm 4.797) \times 10^{-2}$	12509360	1.446×10^{-2}	1.594×10^{-2}	6.388×10^{-4}	2.44	1.047×10^{-2}	2.493×10^{-2}
fitted radiance shift [nm]	$(-3.956 \pm 24.292) \times 10^{-4}$	12509360	1.790×10^{-3}	-3.901×10^{-4}	-4.373×10^{-2}	4.514×10^{-2}	-1.327×10^{-3}	4.630×10^{-4}
fitted radiance squeeze [1]	$(-4.556 \pm 16.972) \times 10^{-5}$	12509360	1.926×10^{-4}	-3.740×10^{-5}	-1.214×10^{-2}	2.317×10^{-2}	-1.366×10^{-4}	5.604×10^{-5}
fitted root mean square [1]	$(1.174 \pm 0.496) \times 10^{-3}$	12509360	4.451×10^{-4}	1.029×10^{-3}	2.874×10^{-4}	3.537×10^{-2}	8.734×10^{-4}	1.319×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.851 ± 0.418	12509360	0.536	0.799	5.000×10^{-2}	2.68	0.555	1.09
sulfurdioxide total air mass factor polluted precision [1]	0.123 ± 0.121	12509360	0.131	7.635×10^{-2}	2.500×10^{-3}	1.68	3.985×10^{-2}	0.171
sulfurdioxide clear air mass factor polluted [1]	0.717 ± 0.277	12509360	0.347	0.690	2.702×10^{-2}	2.68	0.530	0.877
number of spectral points in retrieval [1]	73.5 ± 0.5	12509360	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]	0.528 ± 0.423	3938115	0.900	0.490	0.0	1.000	0.1000	1.000
sulfurdioxide total vertical column [DU]	$(9.081 \pm 242.768) \times 10^{-2}$	3938115	0.459	1.328×10^{-2}	-249	517	-0.206	0.253
sulfurdioxide total vertical column precision [DU]	0.781 ± 1.587	3938115	0.554	0.353	3.866×10^{-2}	153	0.175	0.730
sulfurdioxide slant column density corrected [DU]	$(3.354 \pm 50.950) \times 10^{-2}$	3938115	0.384	1.327×10^{-2}	-24.3	480	-0.175	0.209
sulfurdioxide slant column density cobra [DU]	$(3.293 \pm 42.600) \times 10^{-2}$	3938115	0.384	1.327×10^{-2}	-24.3	25.1	-0.175	0.209
sulfurdioxide slant column density cobra precision [DU]	0.310 ± 0.154	3938115	0.152	0.275	7.787×10^{-2}	19.0	0.213	0.365
sulfurdioxide slant column density window1 [DU]	0.204 ± 0.763	3938115	0.807	0.221	-23.7	50.1	-0.196	0.611
sulfurdioxide slant column density window1 precision [DU]	0.310 ± 0.154	3938115	0.152	0.275	7.787×10^{-2}	19.0	0.213	0.365
sulfurdioxide slant column density corrected win1 [DU]	0.131 ± 0.740	3938115	0.765	0.104	-23.7	50.2	-0.272	0.493
background so2 slant column offset window1 [DU]	$(-7.375 \pm 22.754) \times 10^{-2}$	3938115	0.260	-0.144	-1.13	5.31	-0.230	2.967×10^{-2}
sulfurdioxide slant column density window2 [DU]	4.66 ± 9.27	3938115	11.7	4.48	-900	944	-1.28	10.4
sulfurdioxide slant column density window2 precision [DU]	8.21 ± 2.35	3938115	2.68	7.86	2.09	418	6.68	9.36
sulfurdioxide slant column density corrected win2 [DU]	2.82 ± 8.87	3938115	11.2	2.87	-898	945	-2.73	8.42
background so2 slant column offset window2 [DU]	-1.85 ± 3.10	3938115	4.69	-0.951	-15.2	5.63	-3.99	0.694
sulfurdioxide slant column density window3 [DU]	-28.6 ± 22.6	3938115	28.2	-28.3	-941	1.820×10^3	-42.6	-14.3
sulfurdioxide slant column density window3 precision [DU]	28.4 ± 14.2	3938115	10.5	24.9	10.9	2.423×10^3	20.2	30.7
sulfurdioxide slant column density corrected win3 [DU]	-19.9 ± 22.7	3938115	28.3	-19.4	-941	1.819×10^3	-33.8	-5.49
background so2 slant column offset window3 [DU]	8.73 ± 7.99	3938115	13.4	9.85	-22.1	31.5	1.95	15.3
sulfurdioxide slant column cobra flag [1]	1.94 ± 0.33	3938115	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.737 \pm 15.025) \times 10^{-2}$	3938115	3.401×10^{-2}	1.712×10^{-2}	4.641×10^{-4}	2.26	7.537×10^{-3}	4.154×10^{-2}
fitted radiance shift [nm]	$(-4.304 \pm 28.453) \times 10^{-4}$	3938115	1.744×10^{-3}	-5.302×10^{-4}	-4.464×10^{-2}	4.101×10^{-2}	-1.383×10^{-3}	3.611×10^{-4}
fitted radiance squeeze [1]	$(-3.840 \pm 20.759) \times 10^{-5}$	3938115	2.310×10^{-4}	-3.350×10^{-5}	-1.346×10^{-2}	6.704×10^{-2}	-1.525×10^{-4}	7.849×10^{-5}
fitted root mean square [1]	$(1.371 \pm 0.605) \times 10^{-3}$	3938115	6.278×10^{-4}	1.240×10^{-3}	3.037×10^{-4}	4.706×10^{-2}	9.748×10^{-4}	1.603×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.984 ± 0.717	3938115	1.05	0.738	5.000×10^{-2}	2.95	0.418	1.47
sulfurdioxide total air mass factor polluted precision [1]	0.167 ± 0.195	3938115	0.202	9.690×10^{-2}	2.500×10^{-3}	2.07	2.743×10^{-2}	0.230
sulfurdioxide clear air mass factor polluted [1]	0.919 ± 0.759	3938115	0.750	0.630	2.266×10^{-2}	3.00	0.380	1.13
number of spectral points in retrieval [1]	73.4 ± 0.5	3938115	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

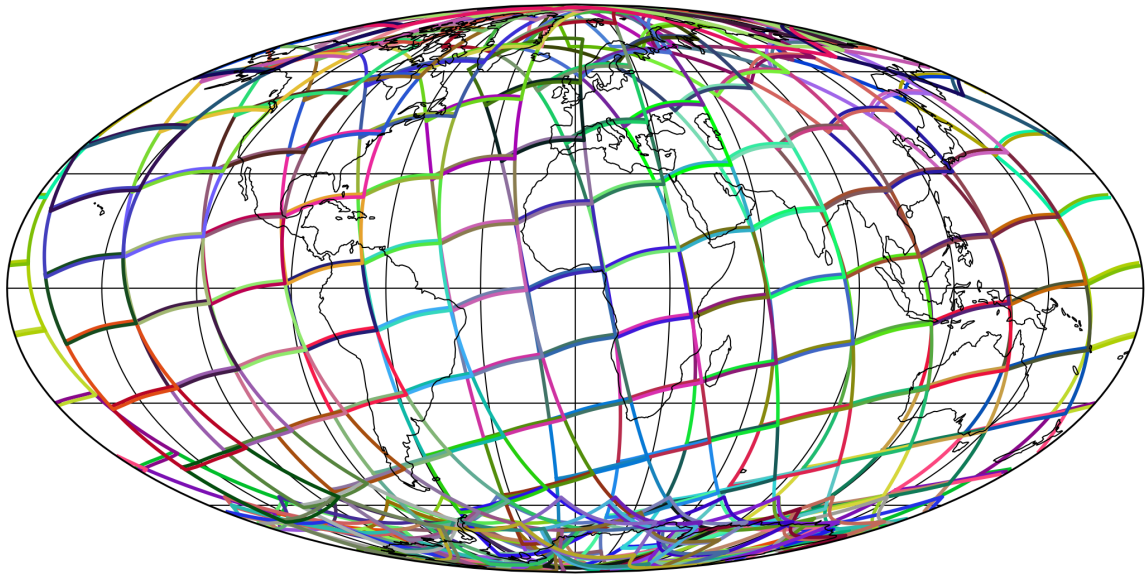


Figure 1: Outline of the granules.

4 Input data monitoring

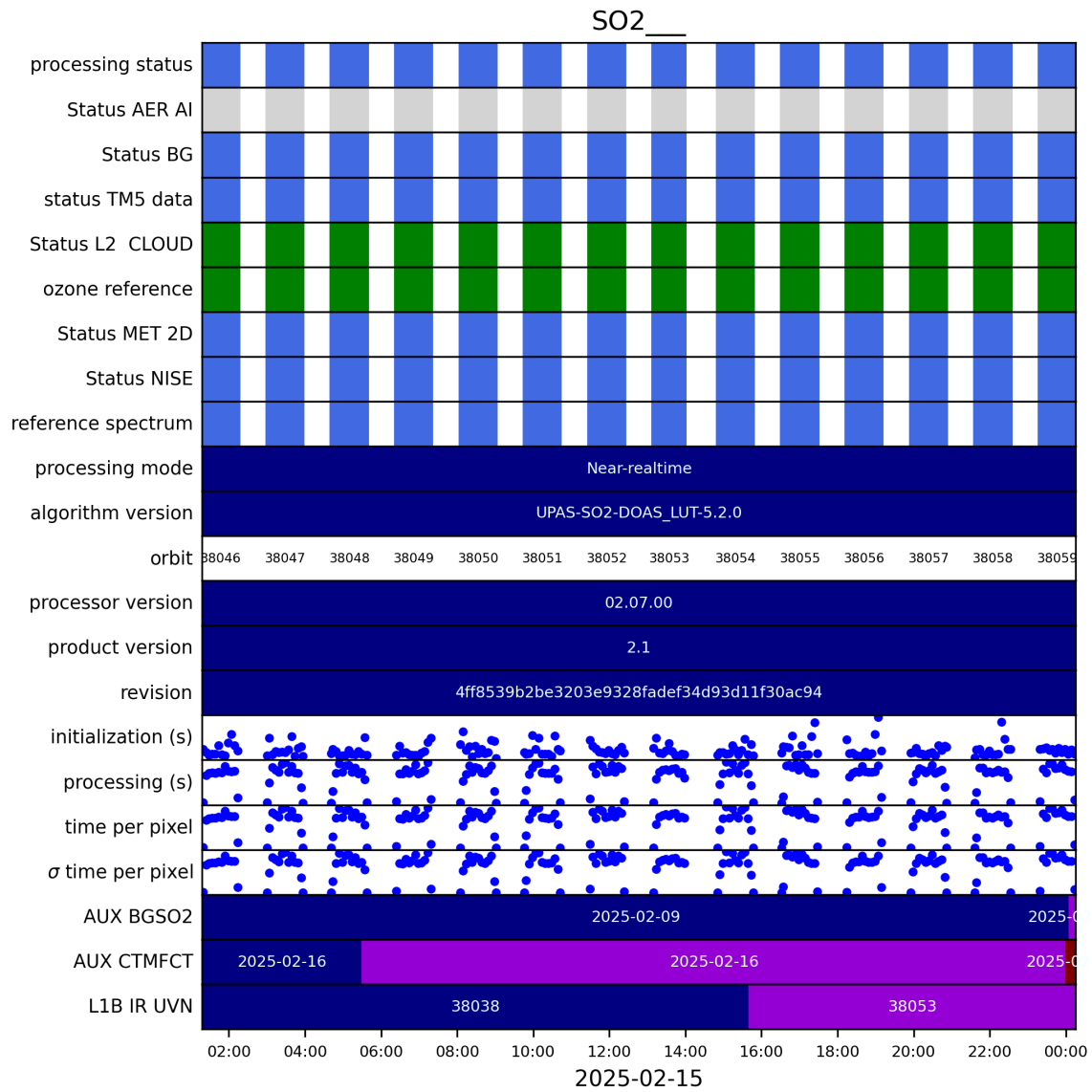


Figure 2: Input data per granule

5 Warnings and errors

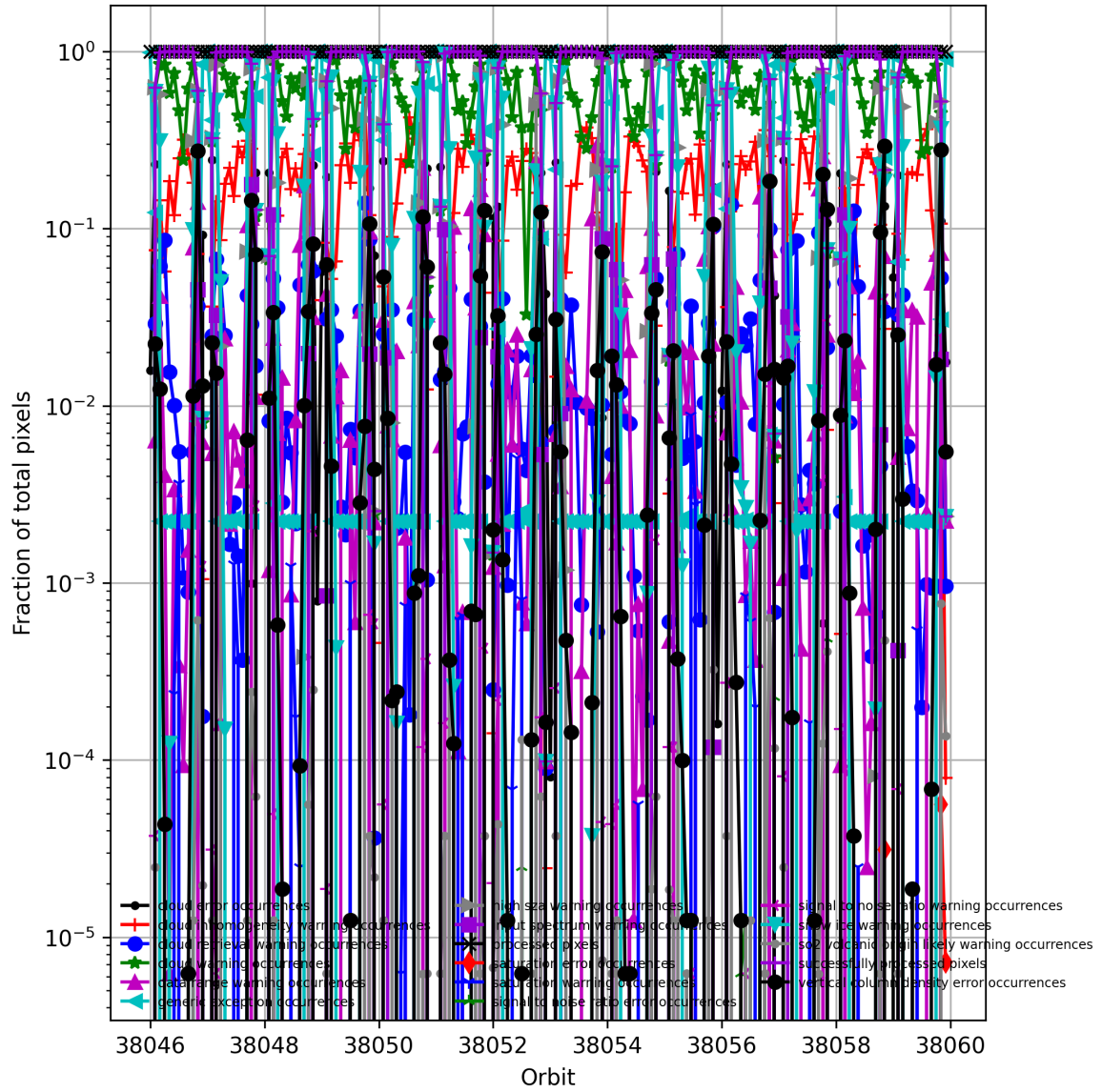


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

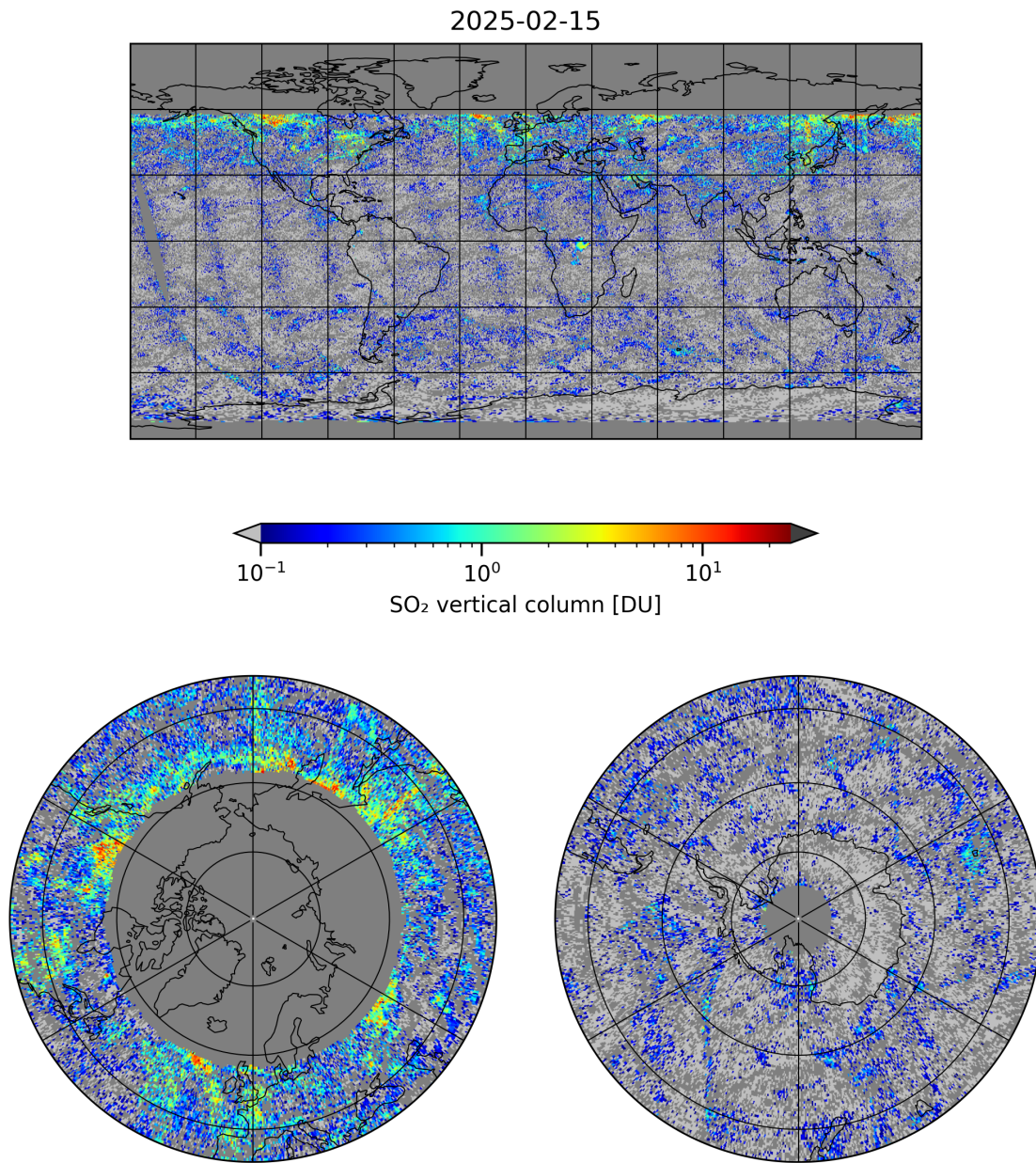


Figure 4: Map of “SO₂ vertical column” for 2025-02-15 to 2025-02-16

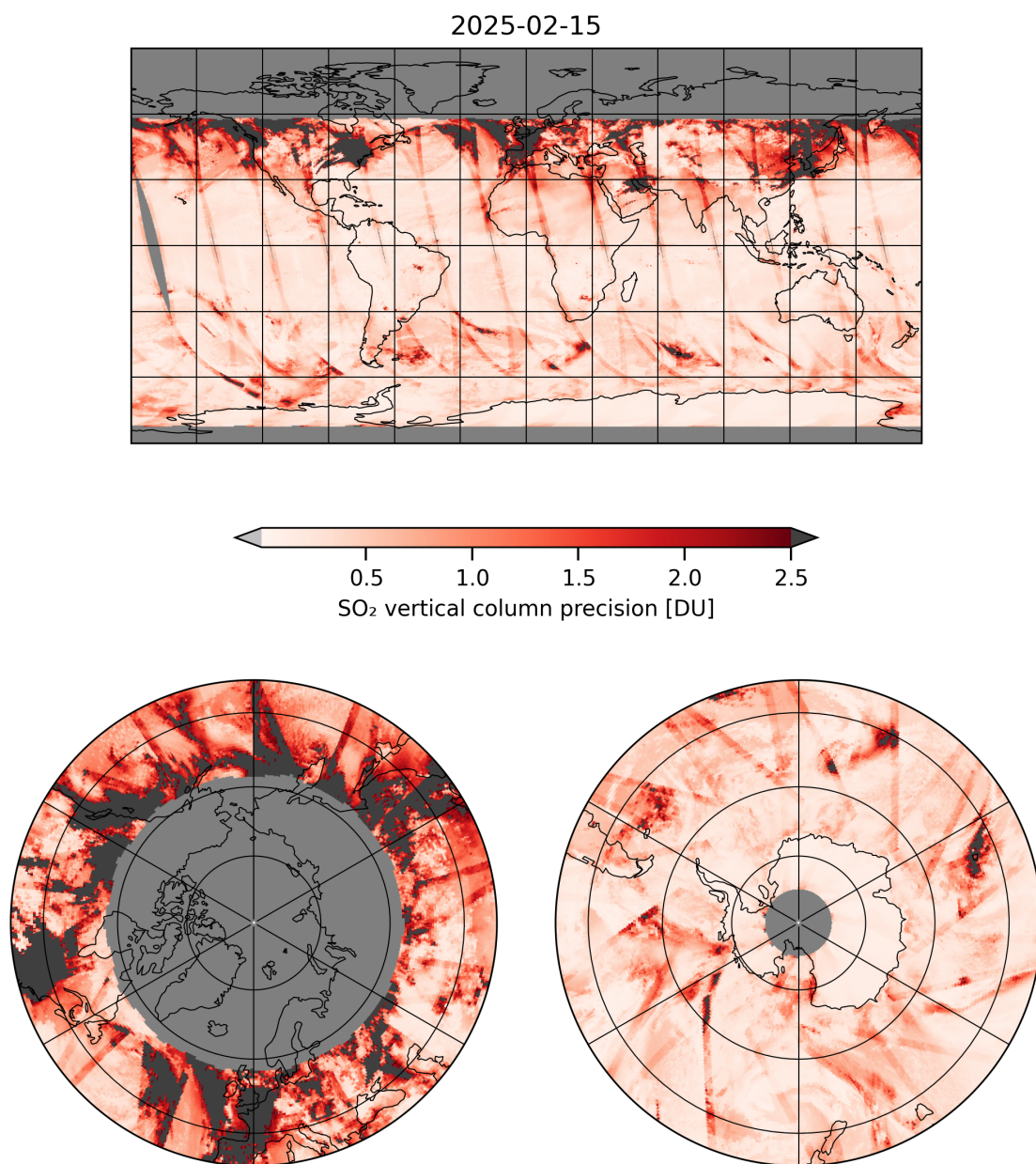


Figure 5: Map of “SO₂ vertical column precision” for 2025-02-15 to 2025-02-16

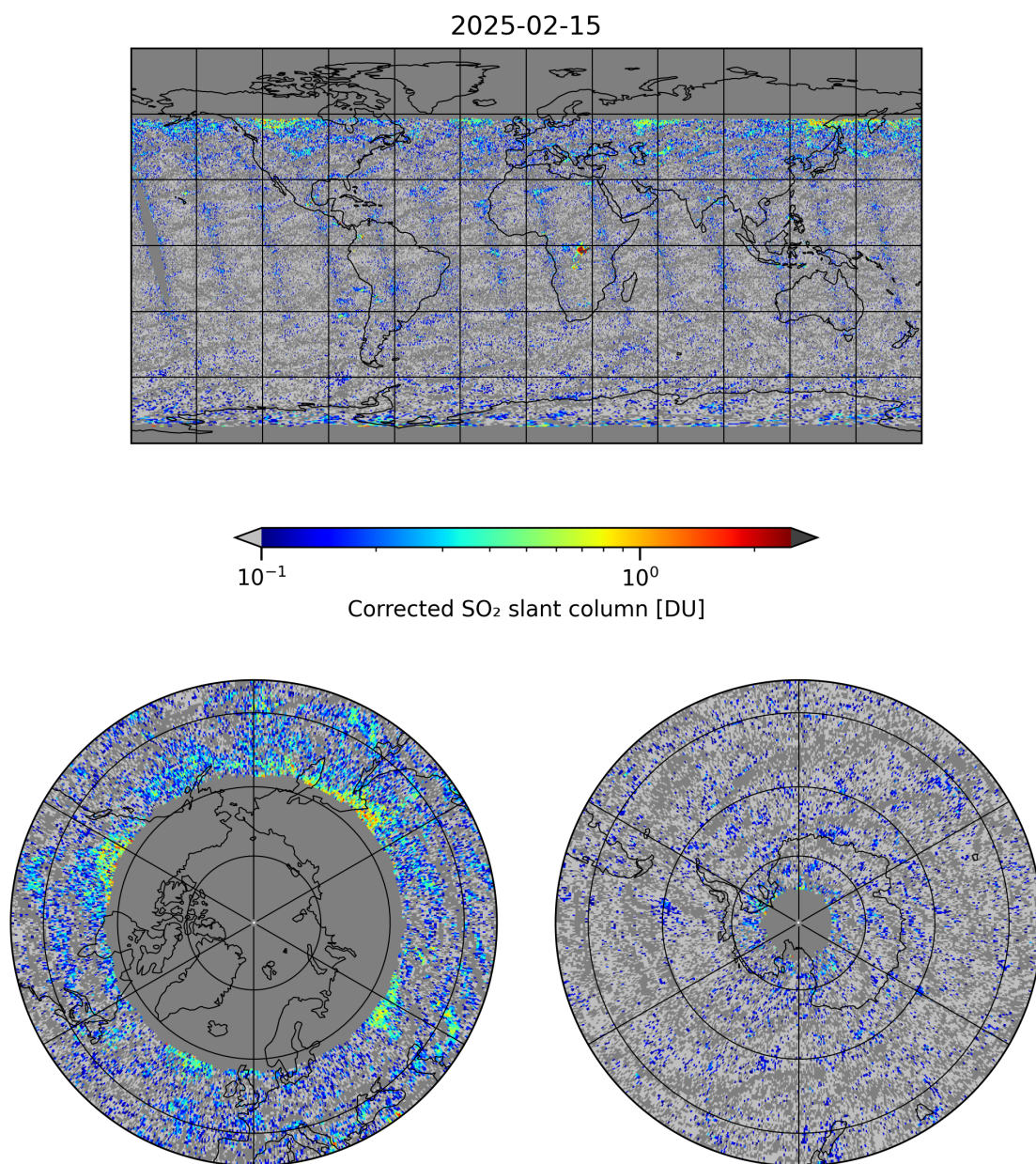


Figure 6: Map of “Corrected SO₂ slant column” for 2025-02-15 to 2025-02-16

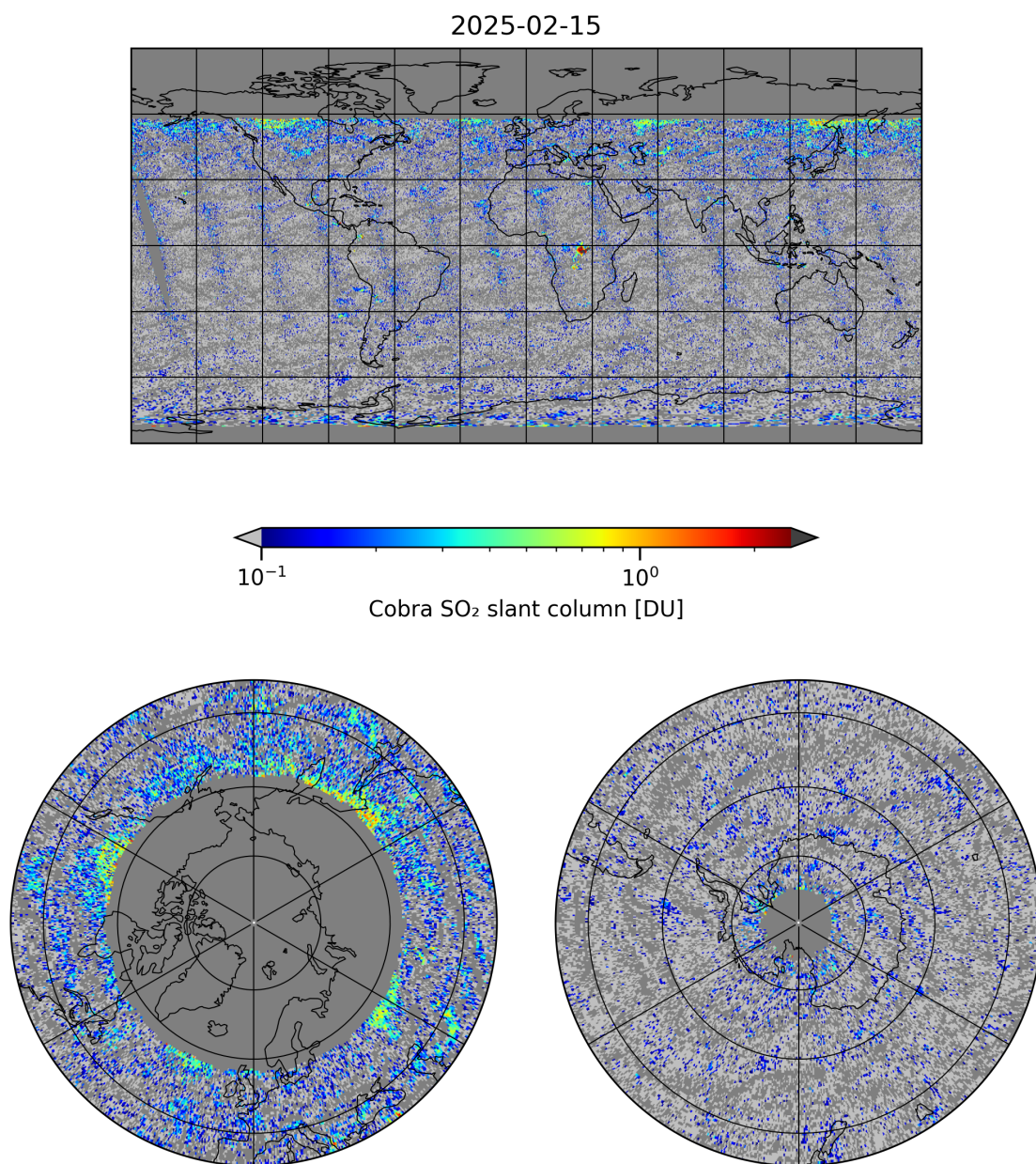


Figure 7: Map of “Cobra SO₂ slant column” for 2025-02-15 to 2025-02-16

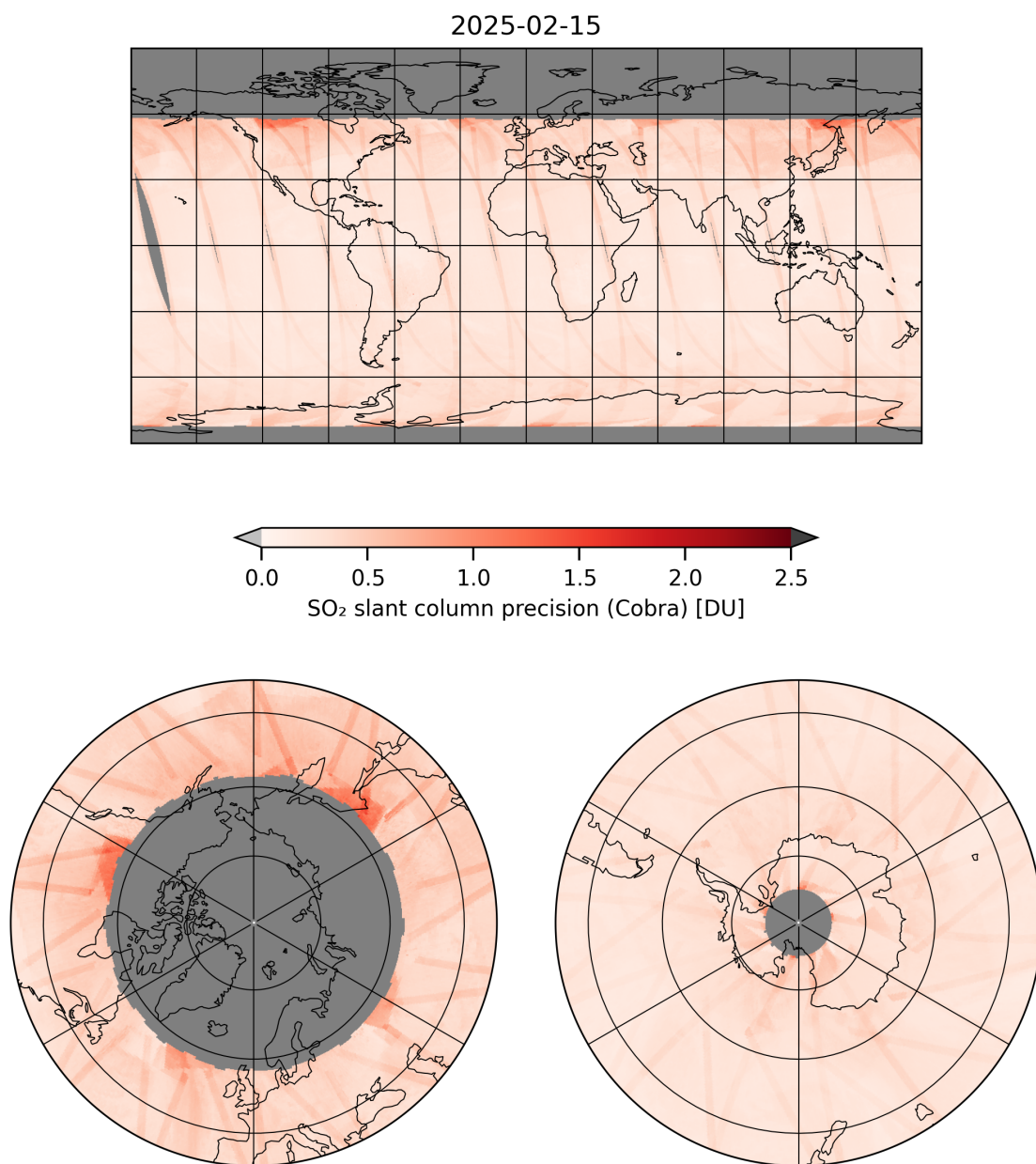


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-02-15 to 2025-02-16

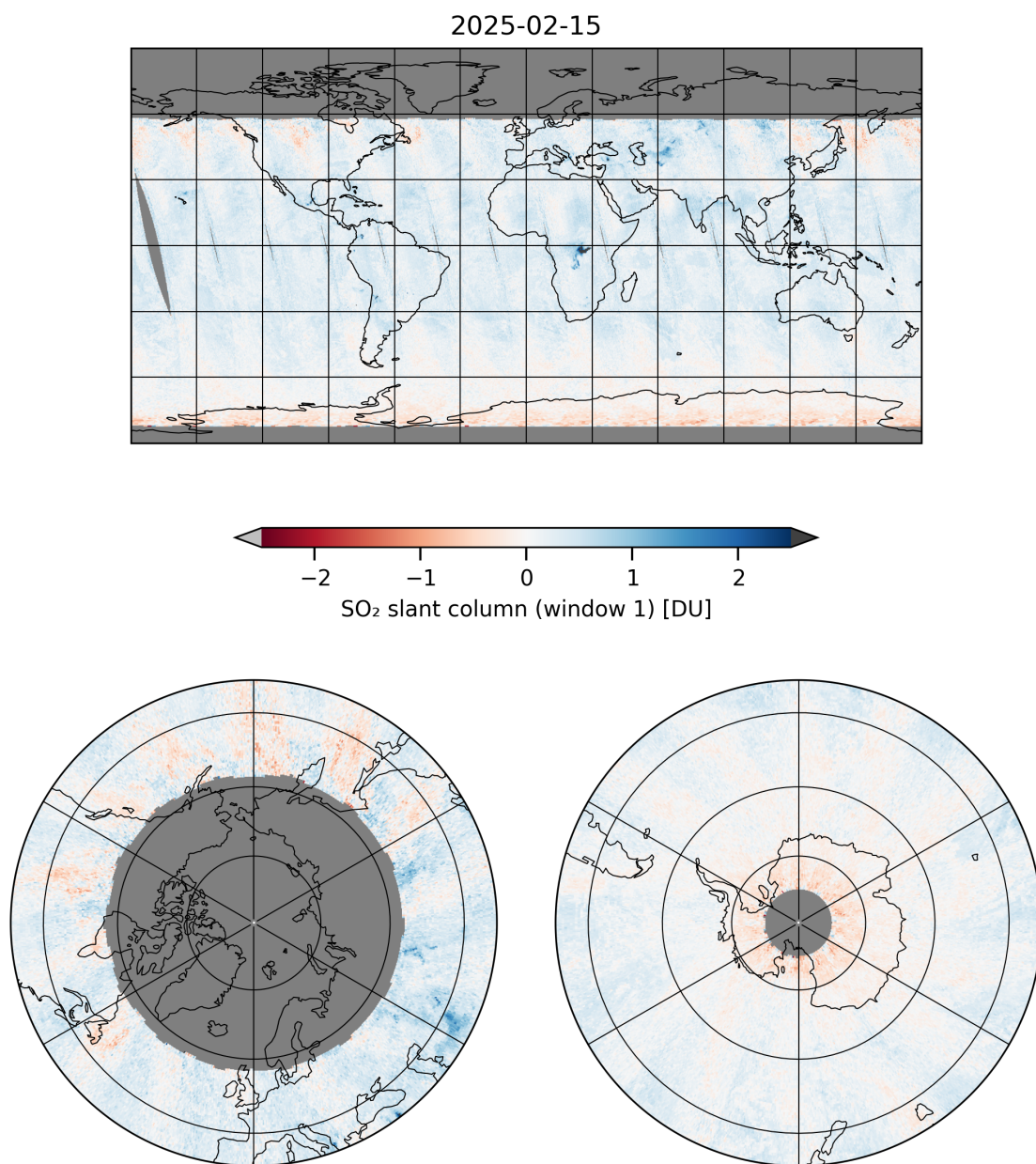


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-02-15 to 2025-02-16

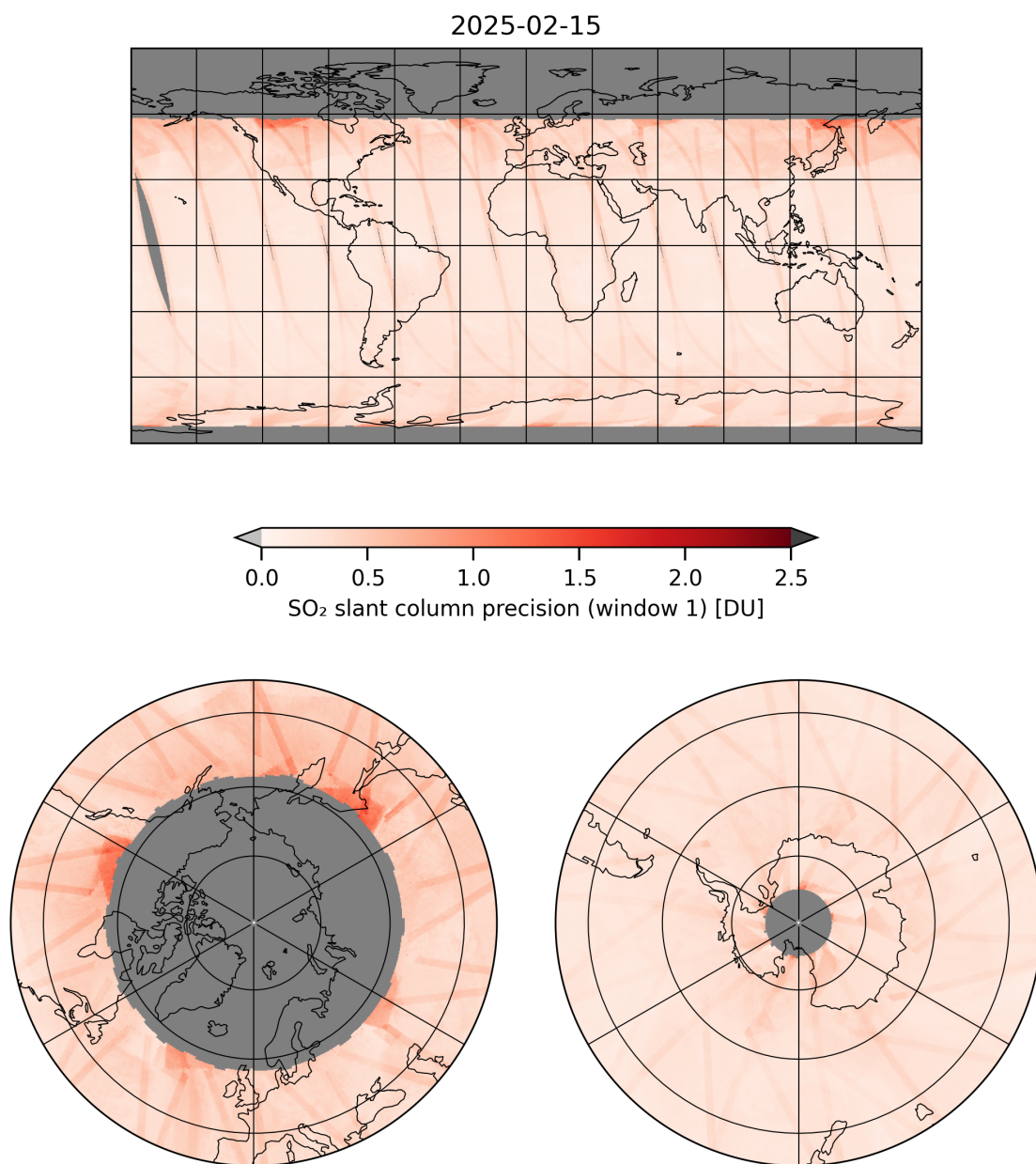


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-02-15 to 2025-02-16

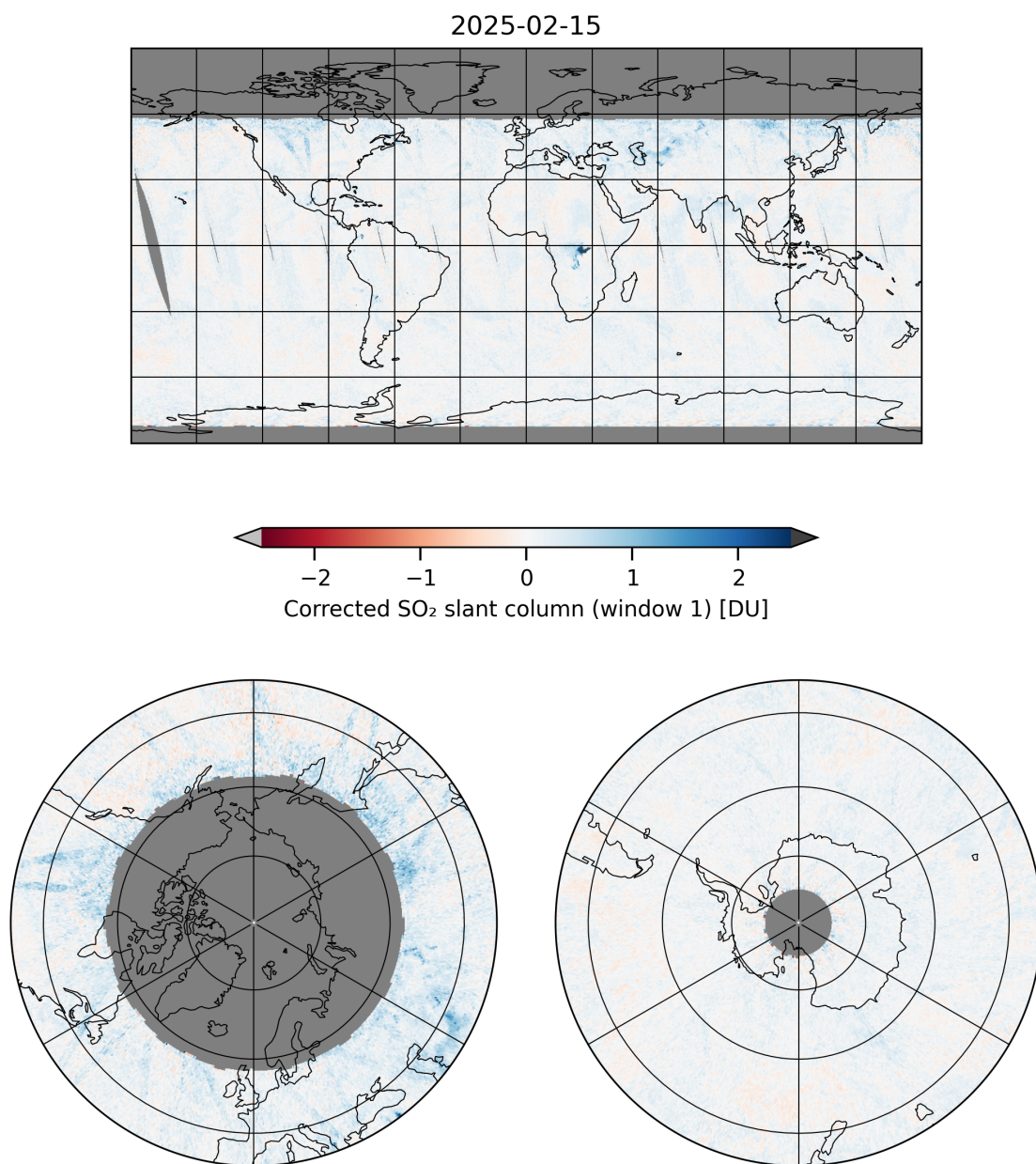


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-02-15 to 2025-02-16

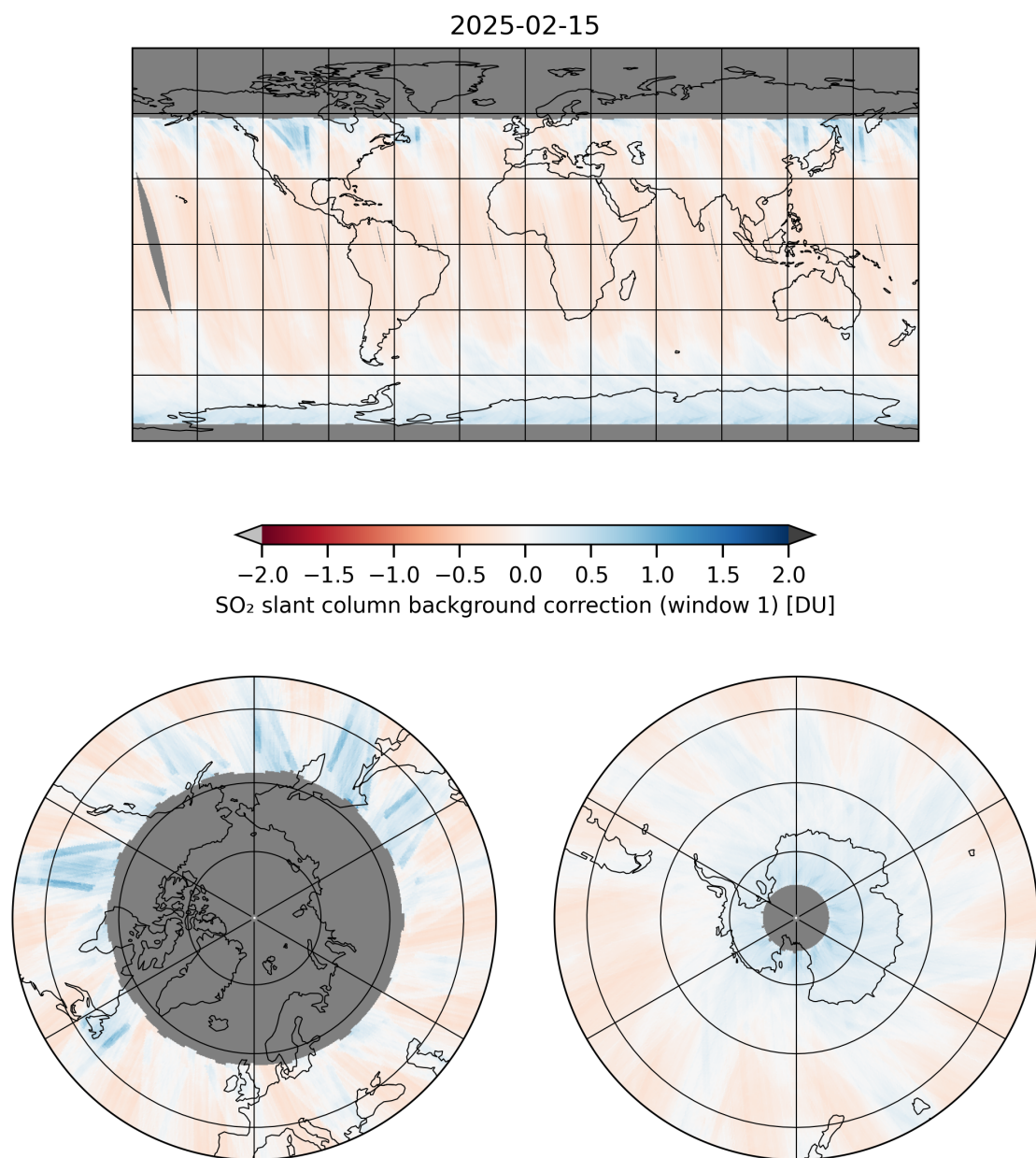


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-02-15 to 2025-02-16

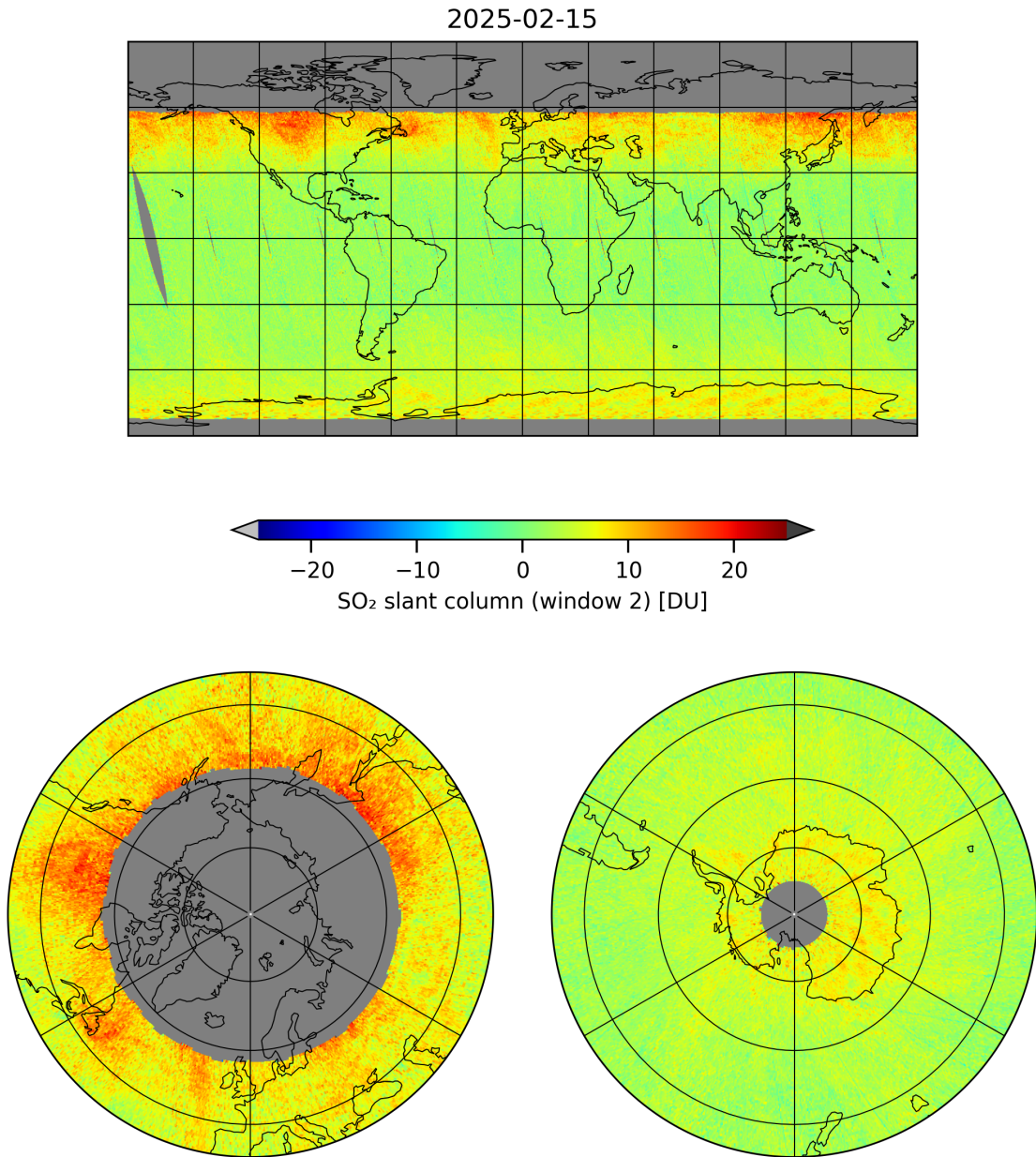


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-02-15 to 2025-02-16

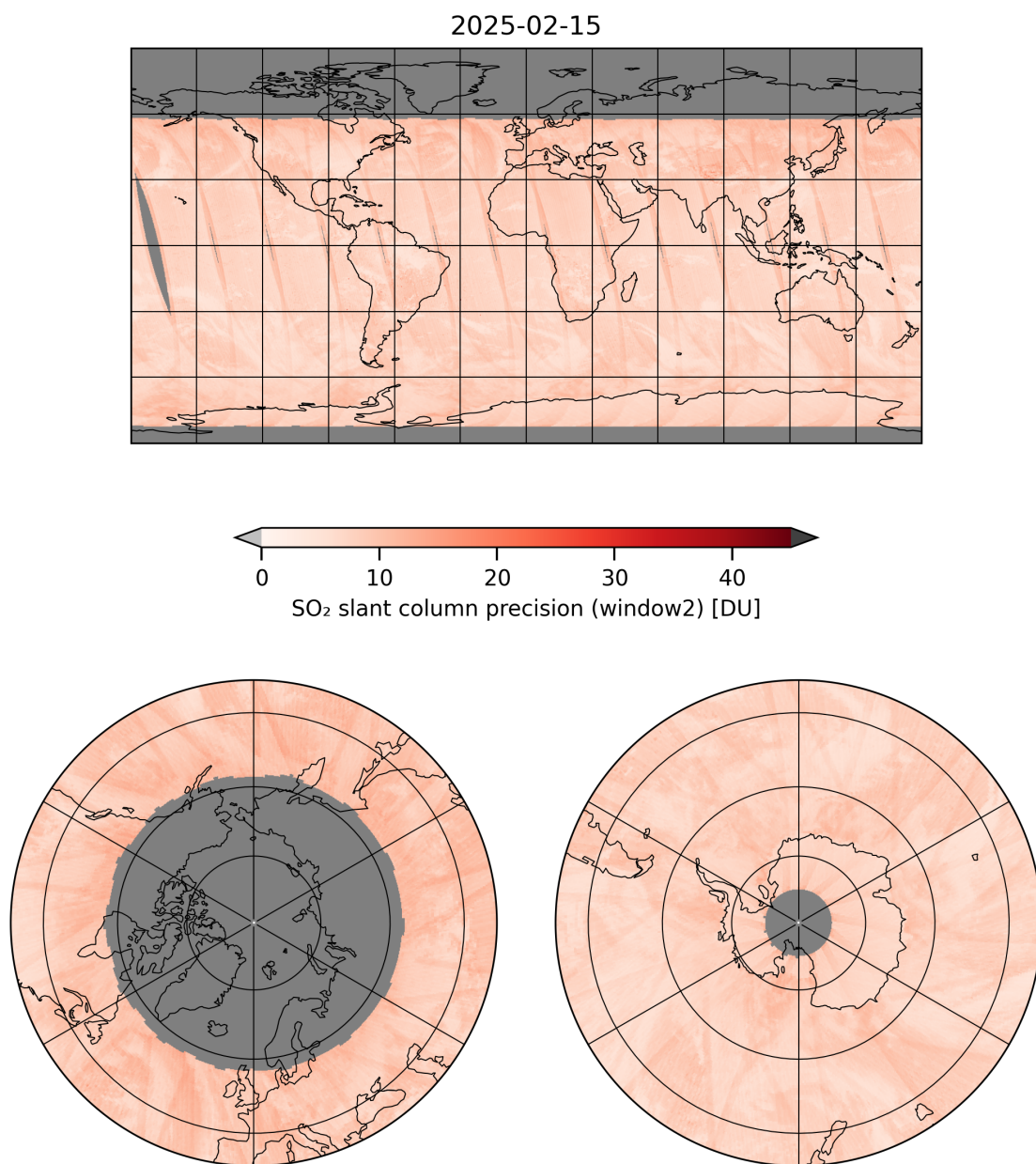


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-02-15 to 2025-02-16

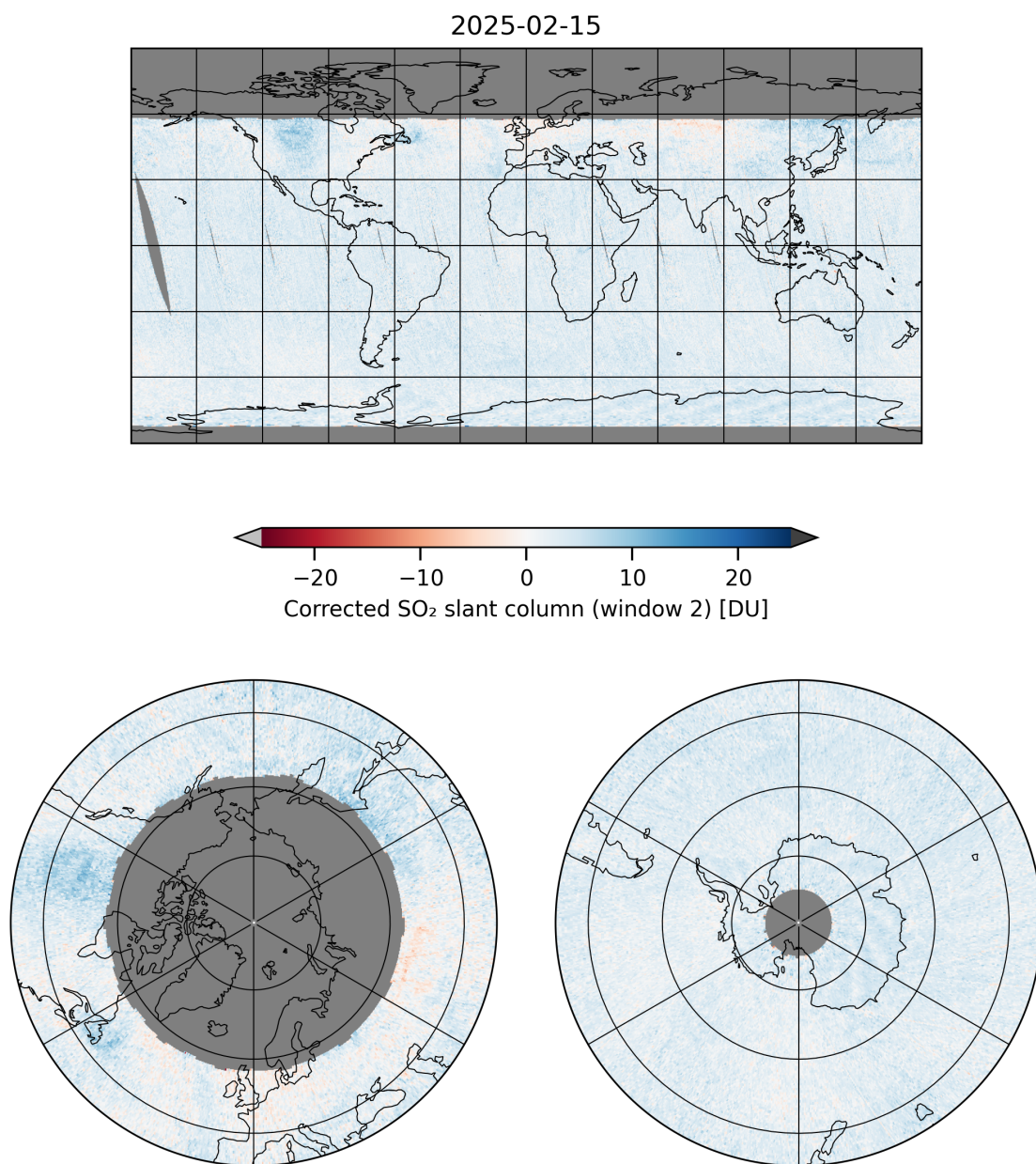


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-02-15 to 2025-02-16

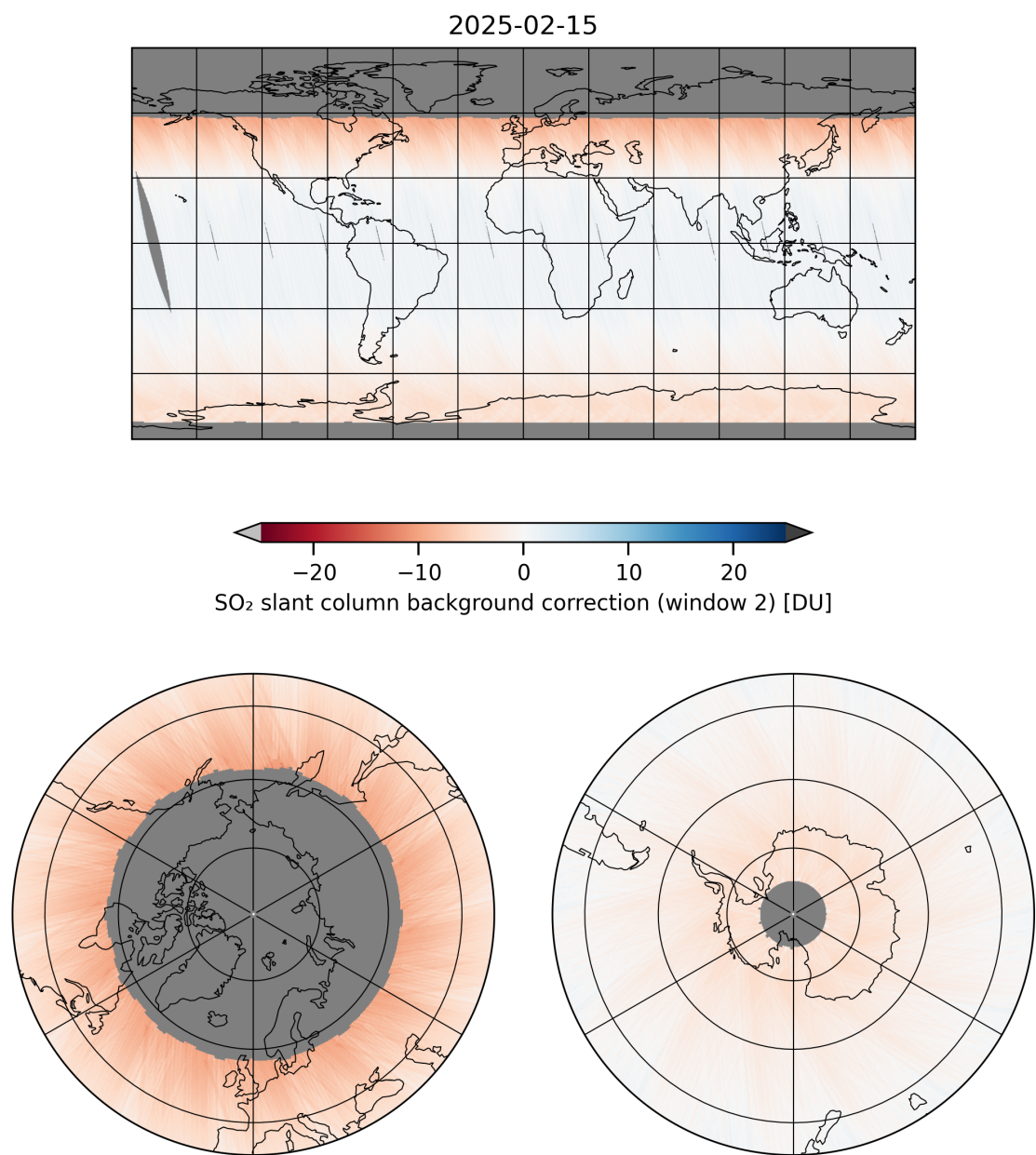


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-02-15 to 2025-02-16

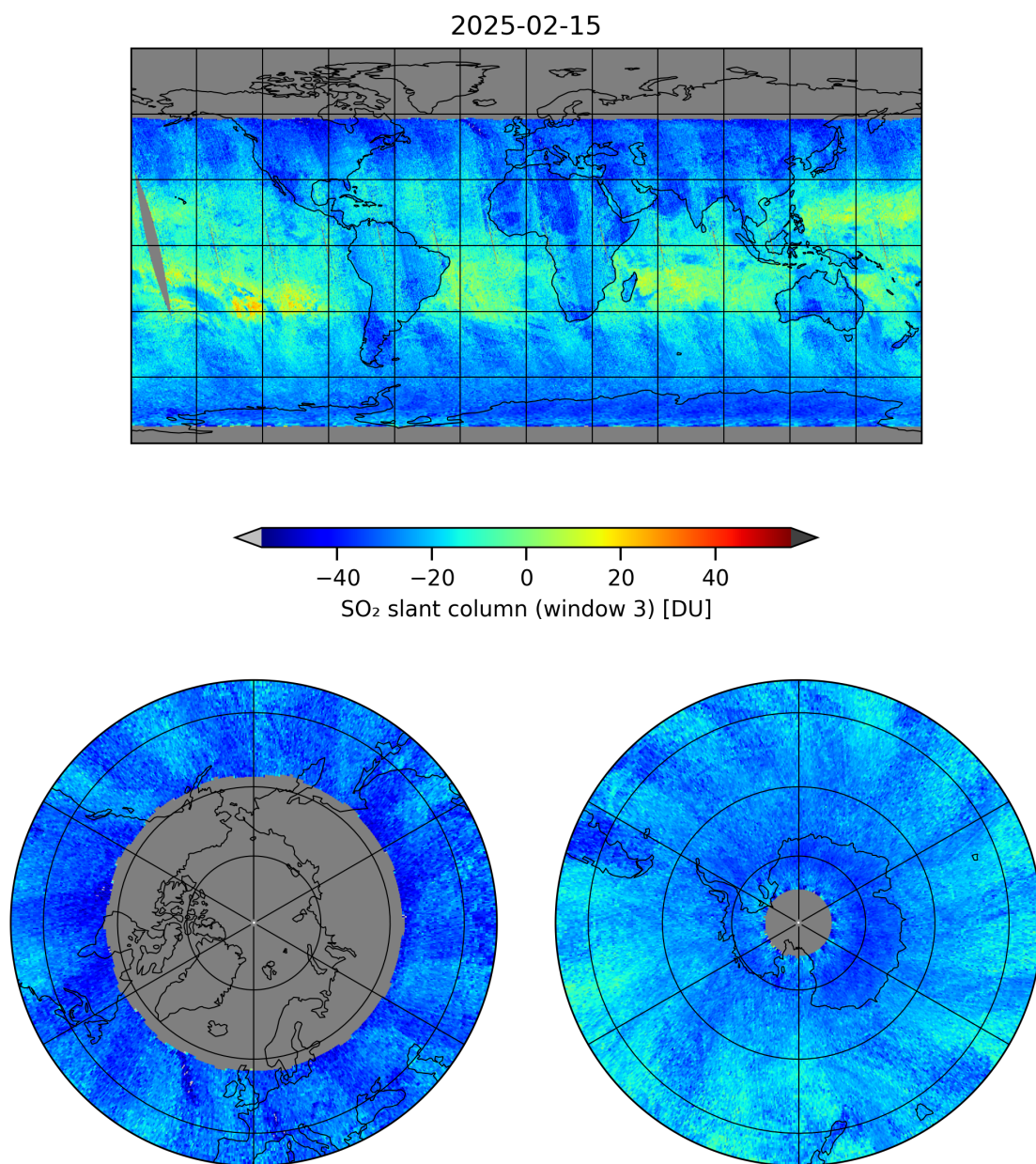


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-02-15 to 2025-02-16

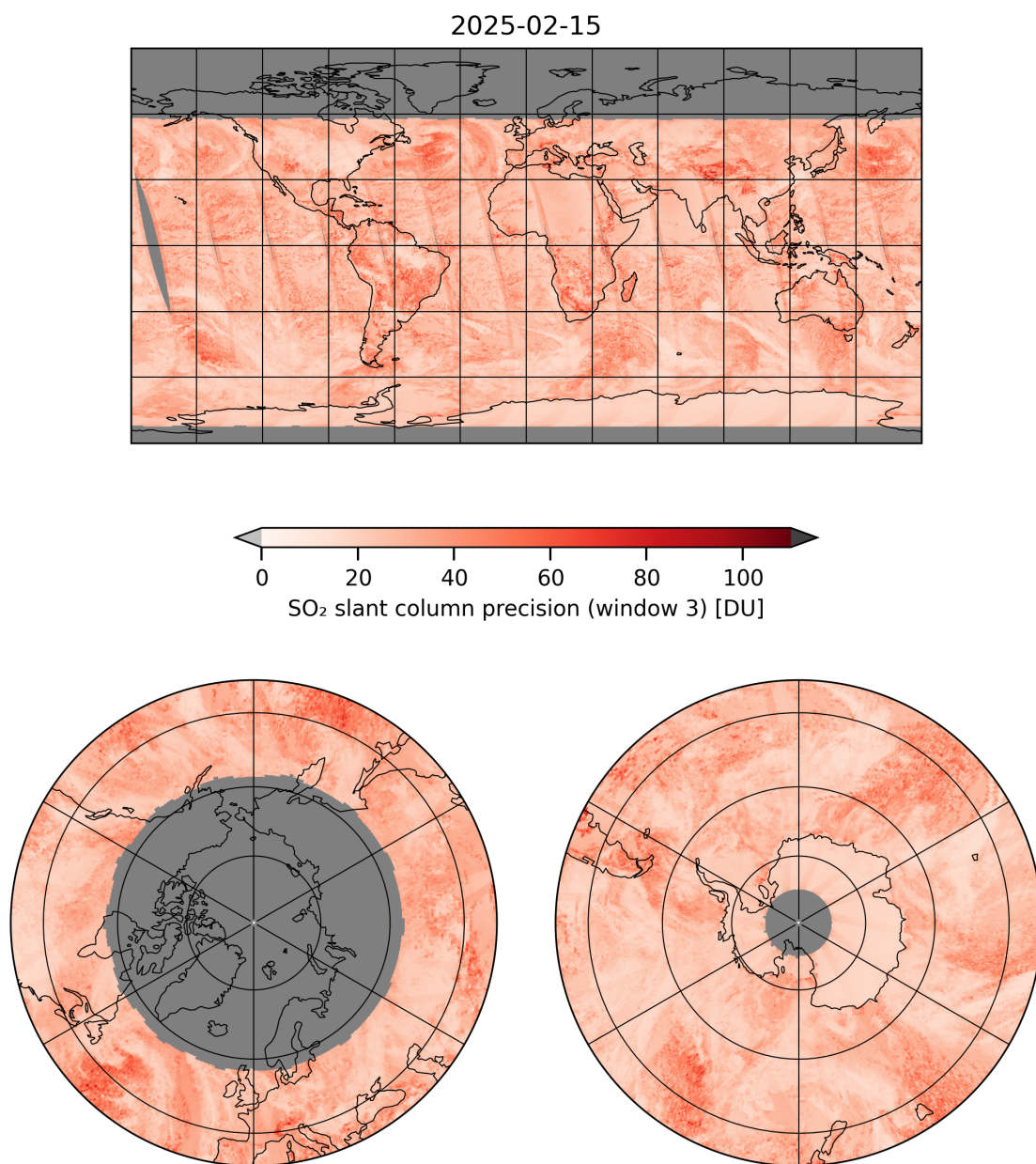


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-02-15 to 2025-02-16

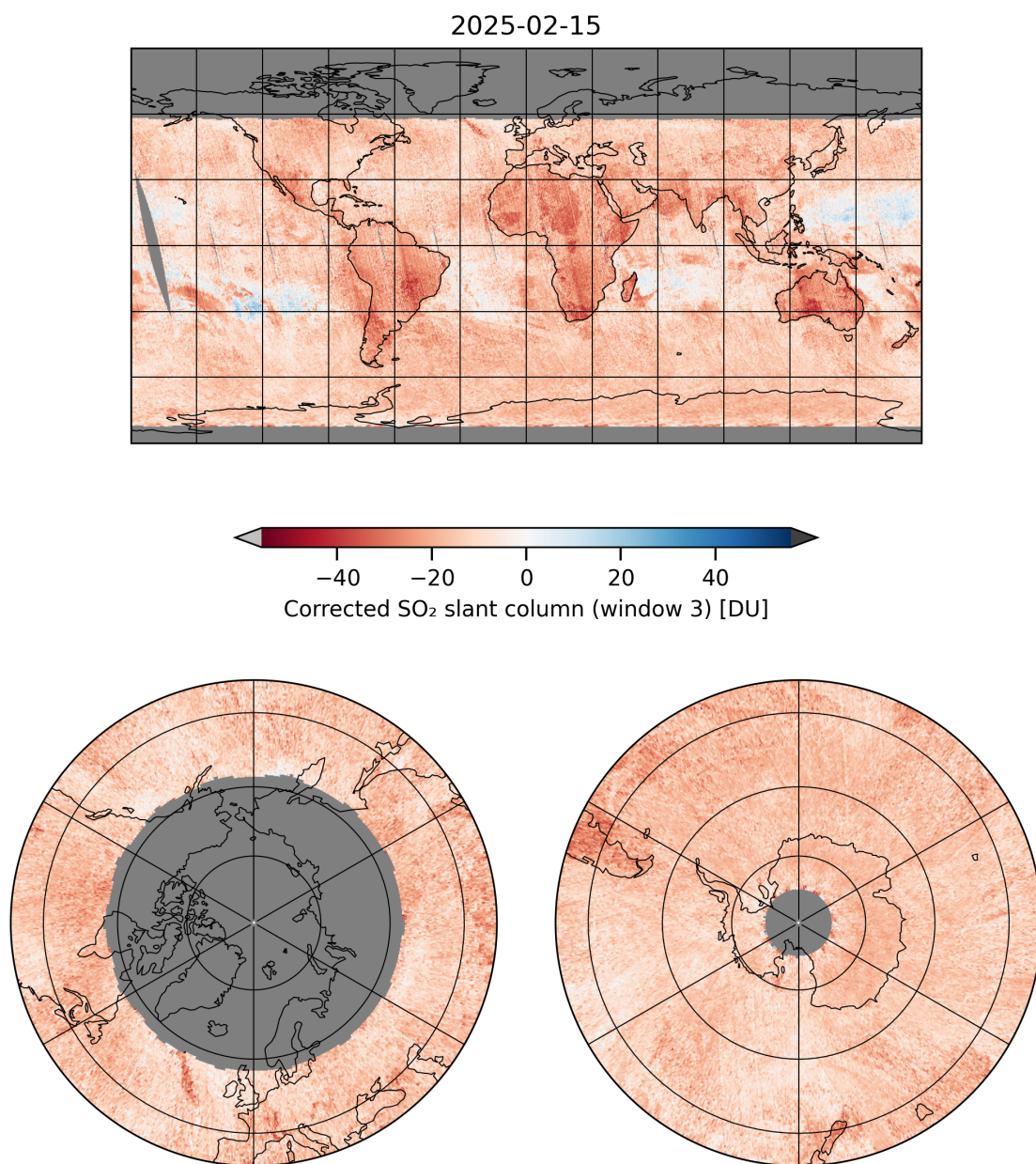


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-02-15 to 2025-02-16

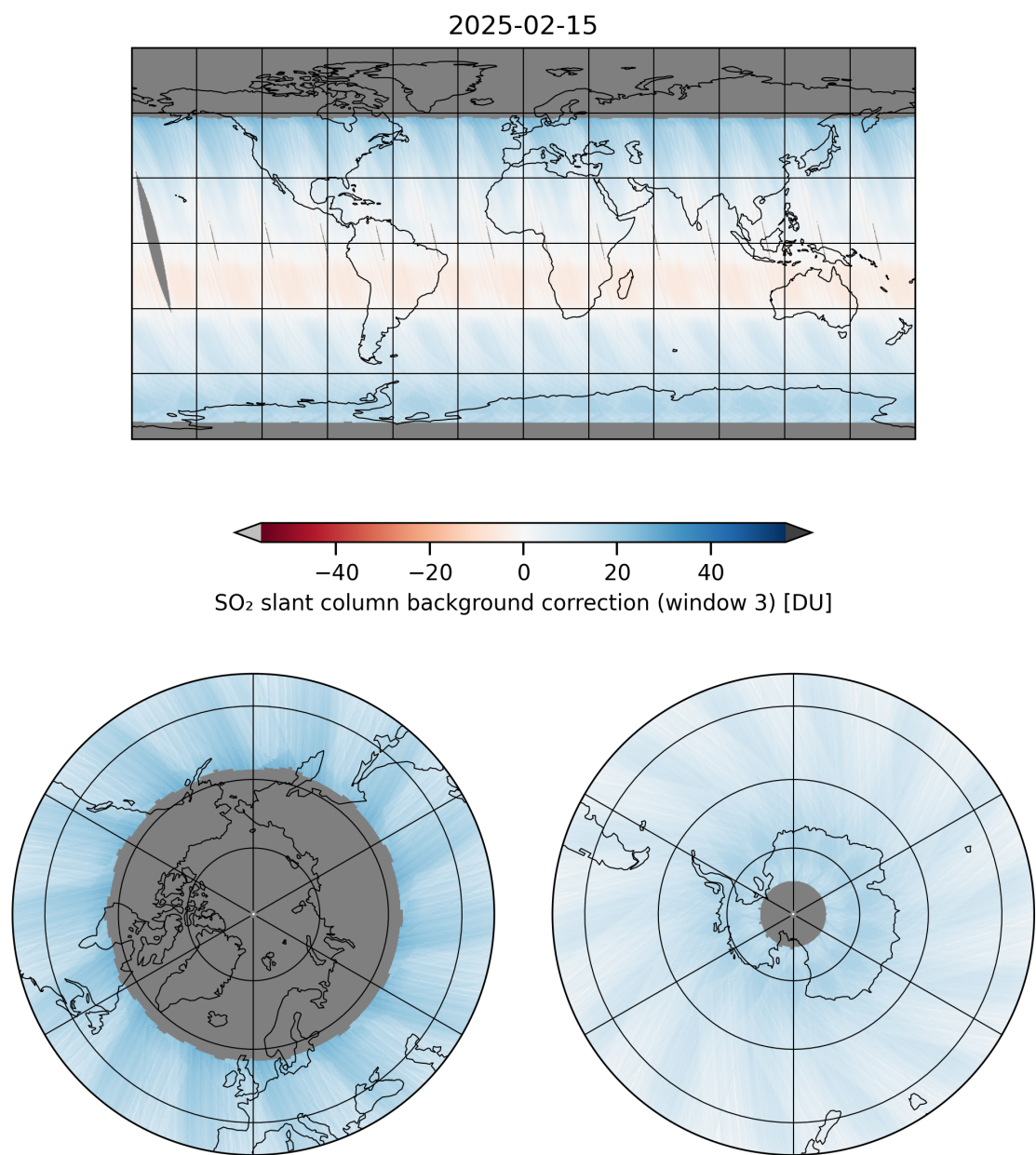


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-02-15 to 2025-02-16

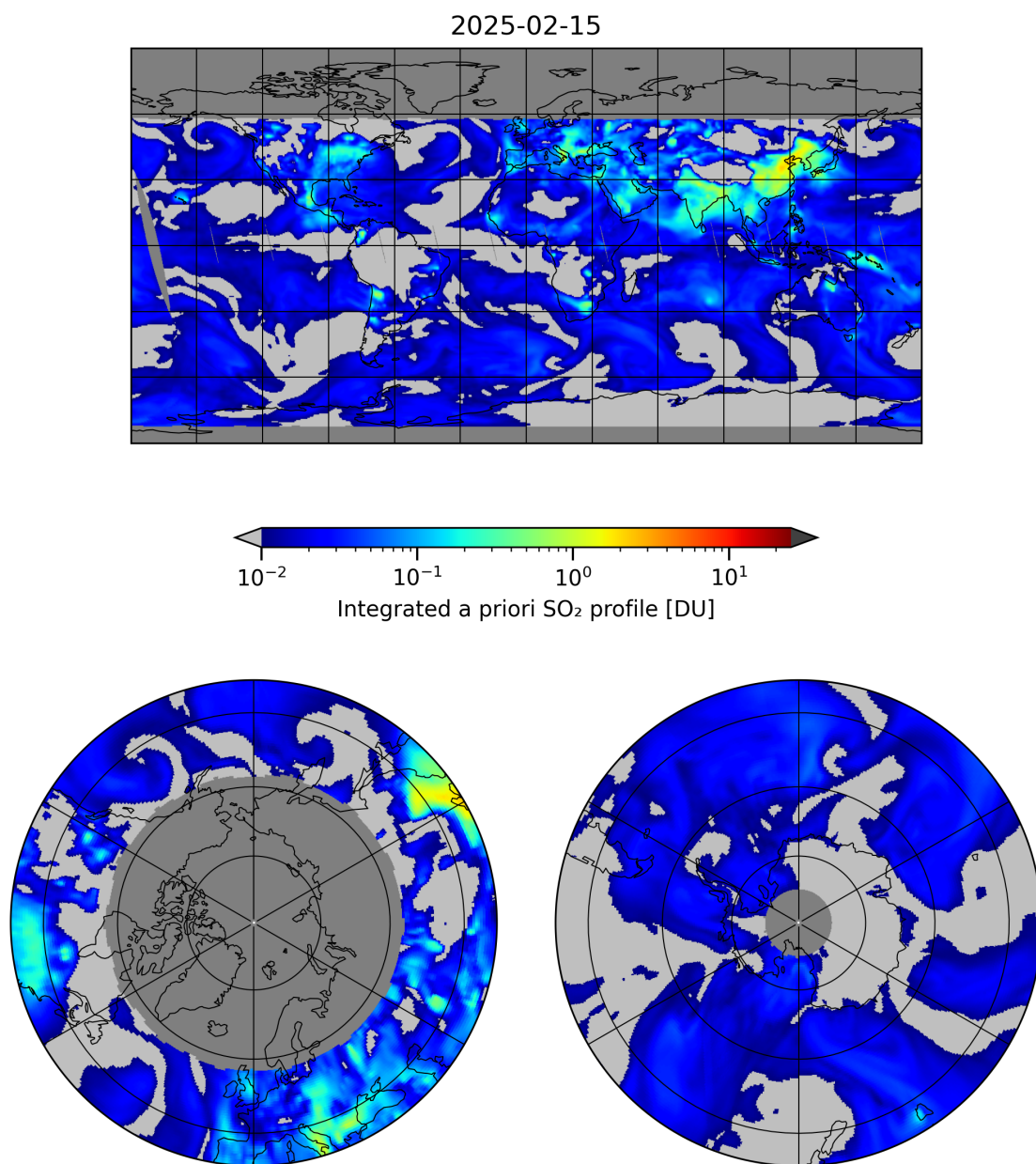


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-02-15 to 2025-02-16

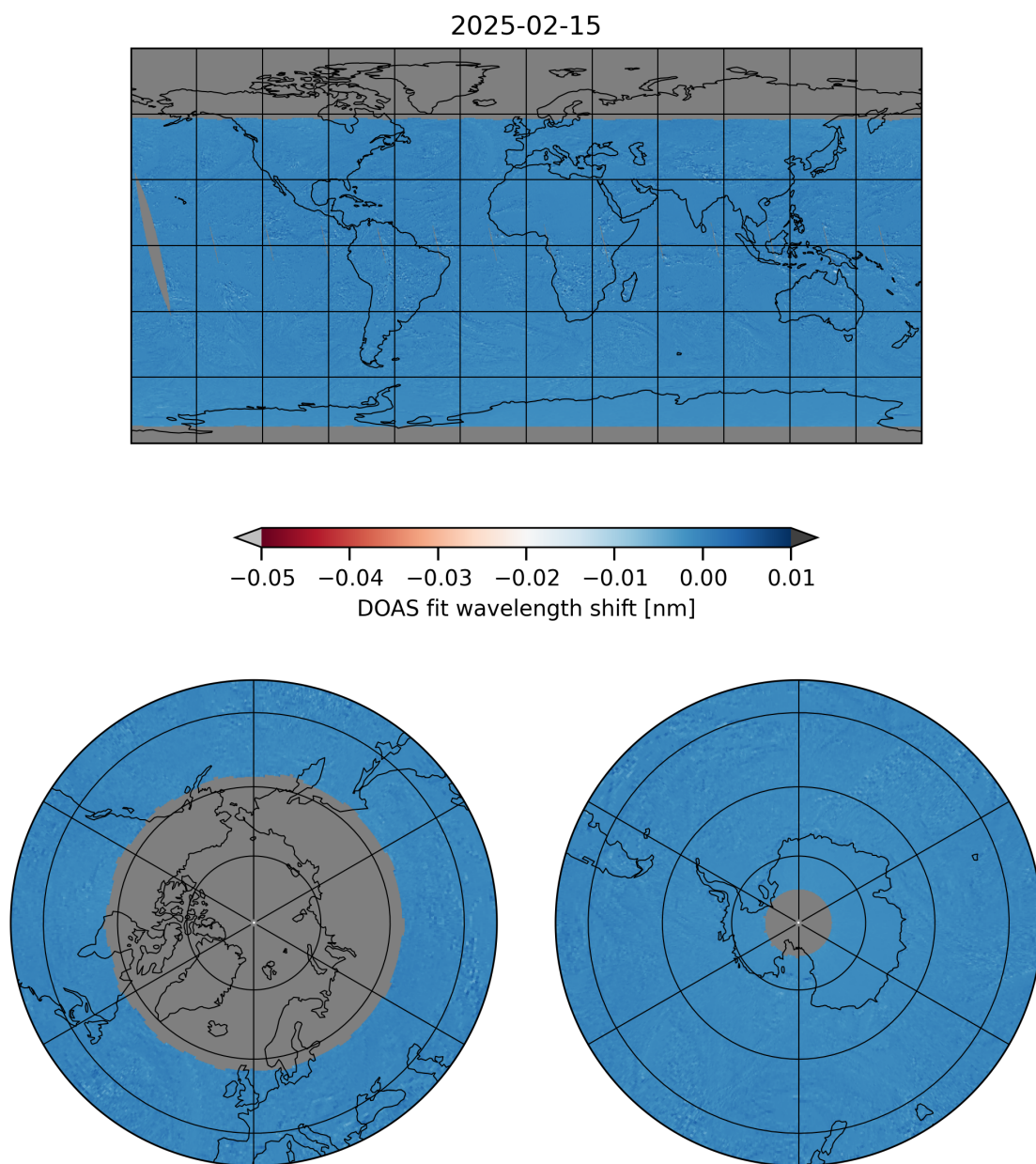


Figure 22: Map of “DOAS fit wavelength shift” for 2025-02-15 to 2025-02-16

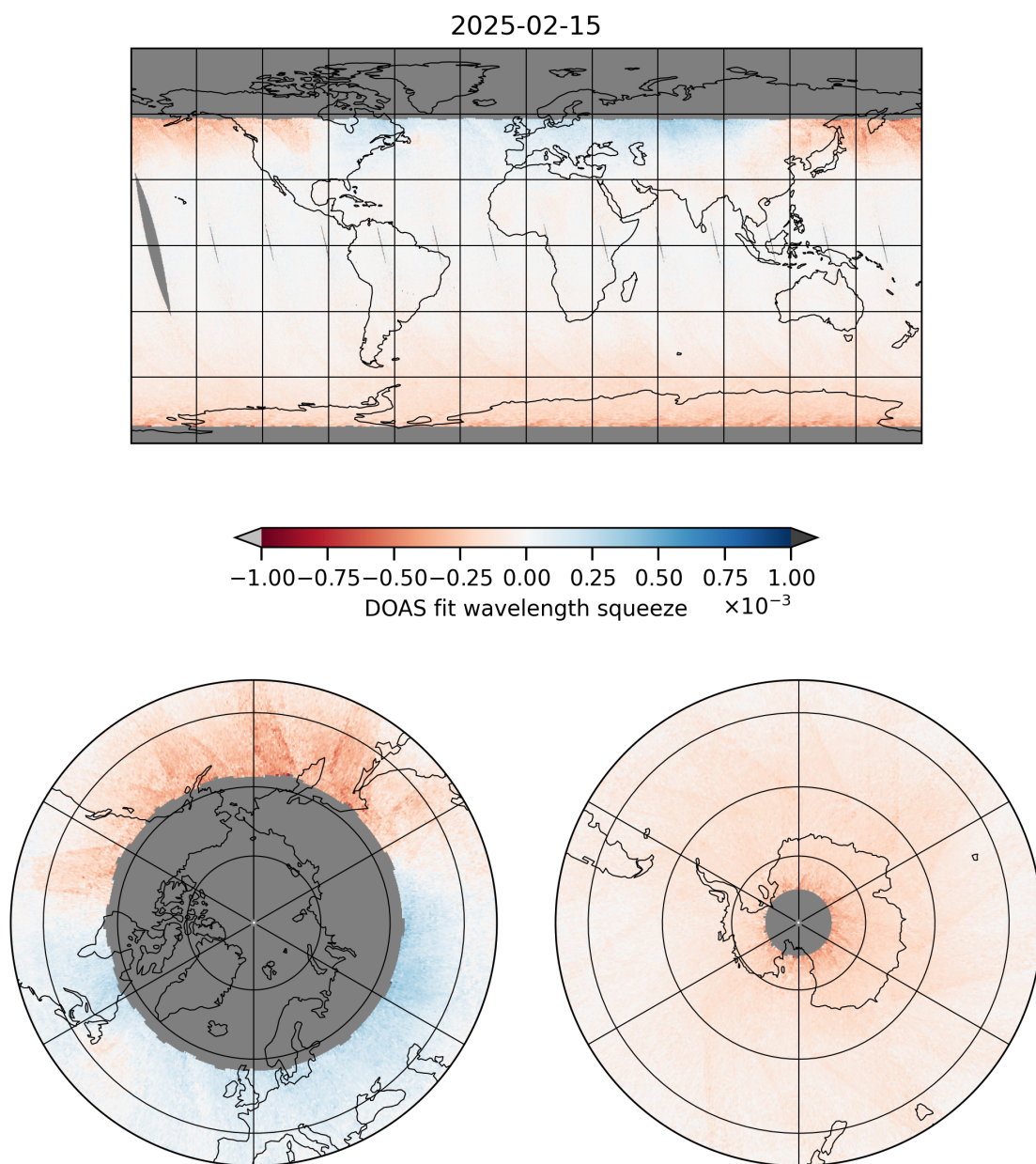


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-02-15 to 2025-02-16

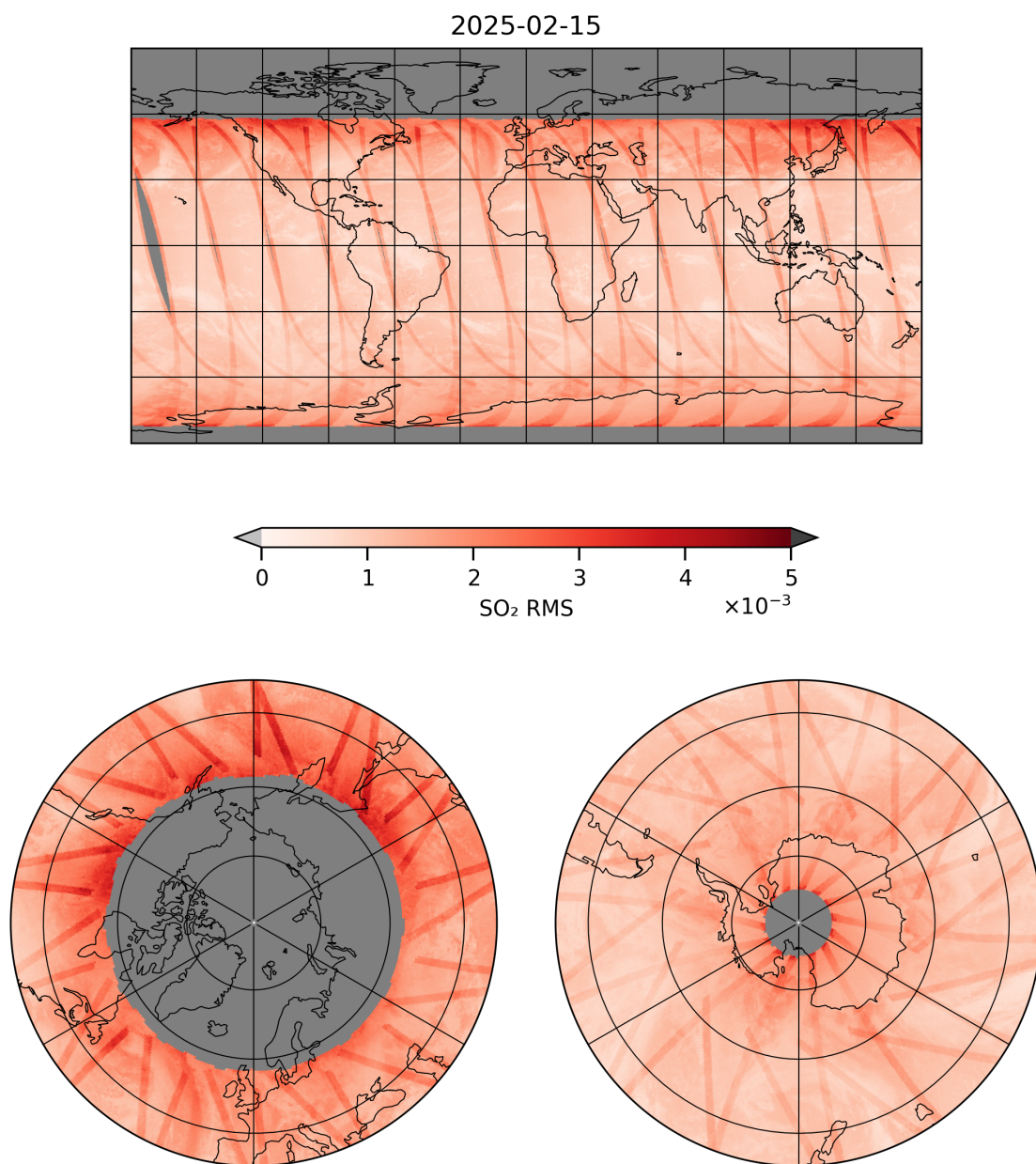


Figure 24: Map of “SO₂ RMS” for 2025-02-15 to 2025-02-16

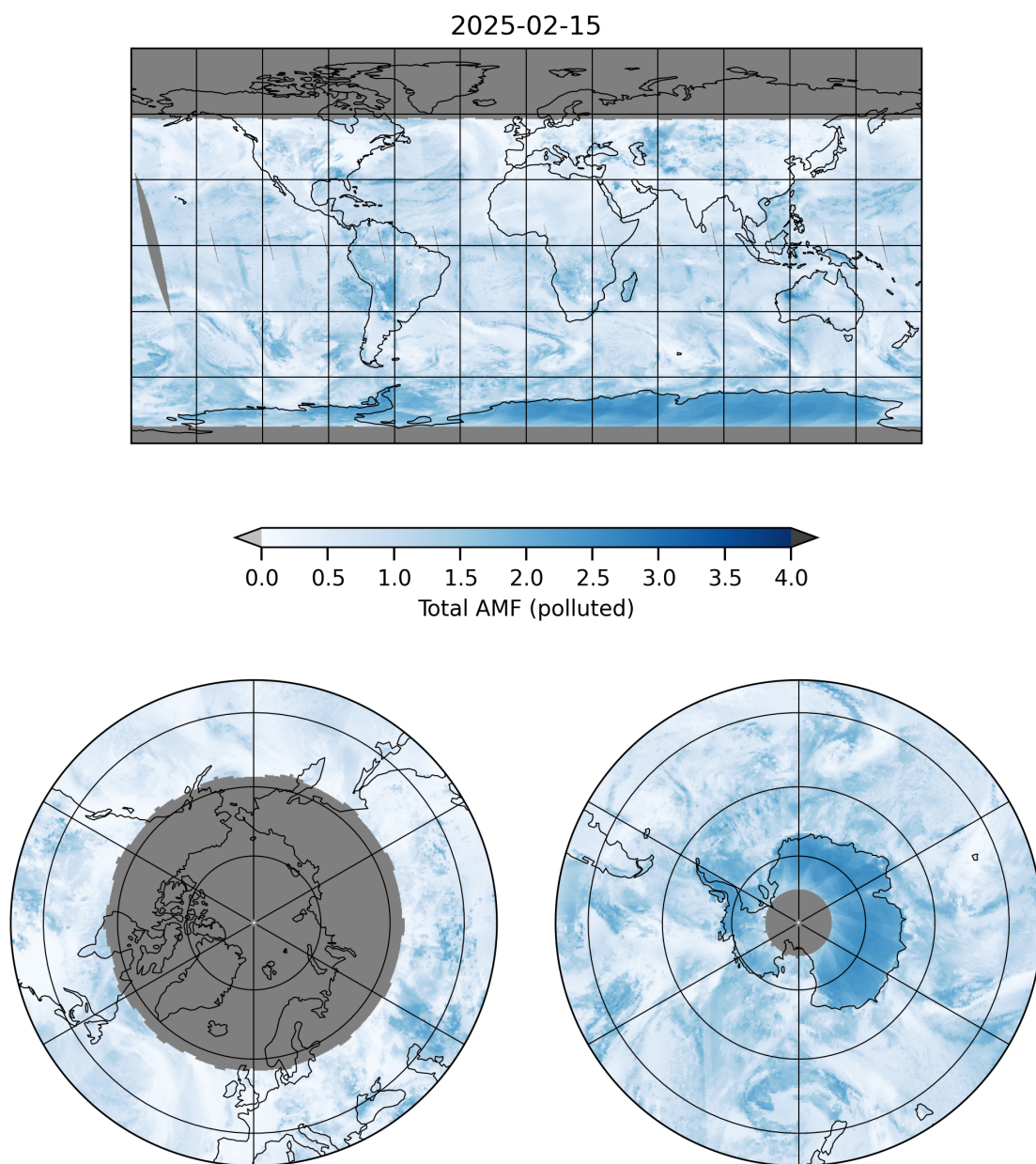


Figure 25: Map of “Total AMF (polluted)” for 2025-02-15 to 2025-02-16

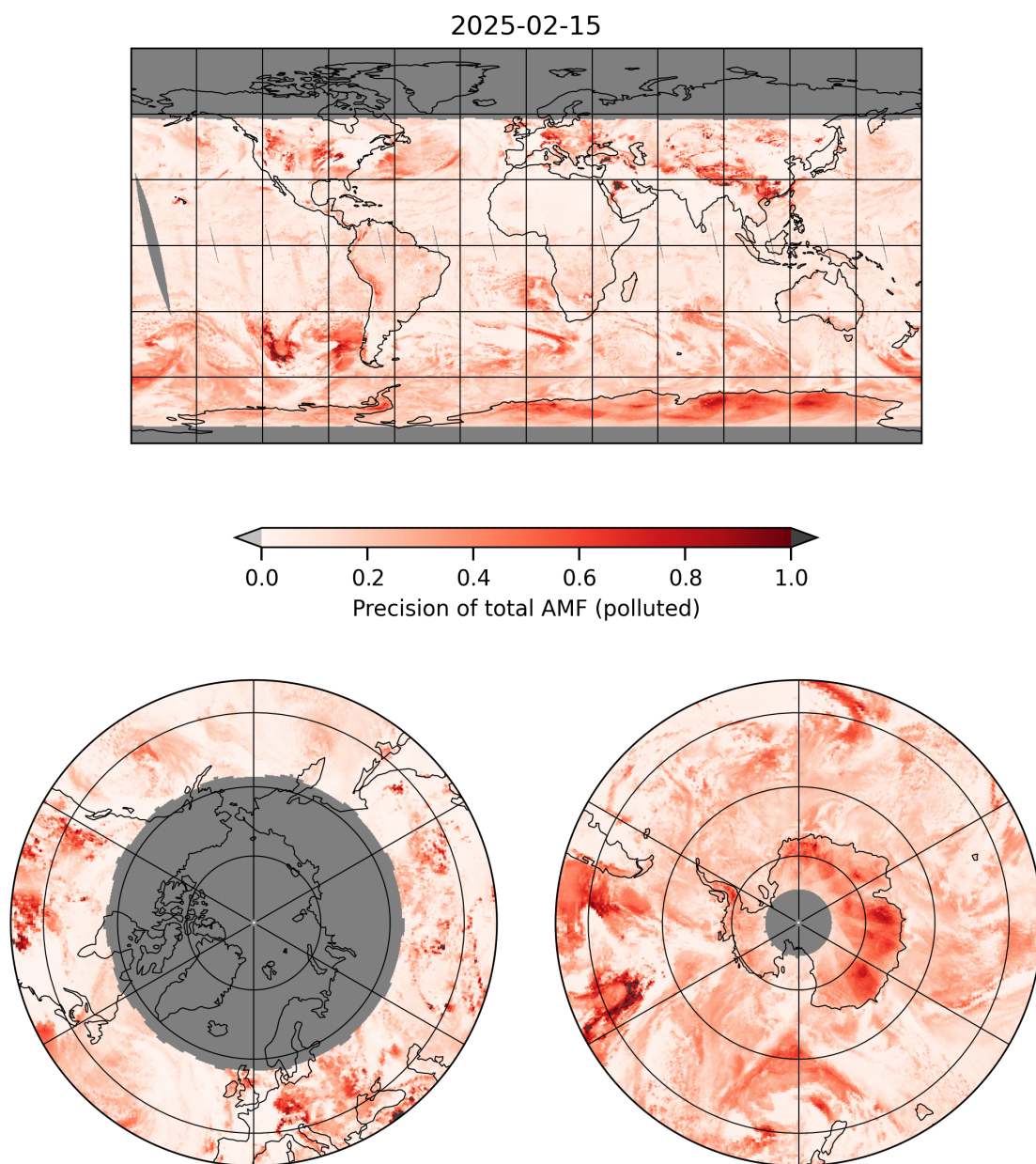


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-02-15 to 2025-02-16

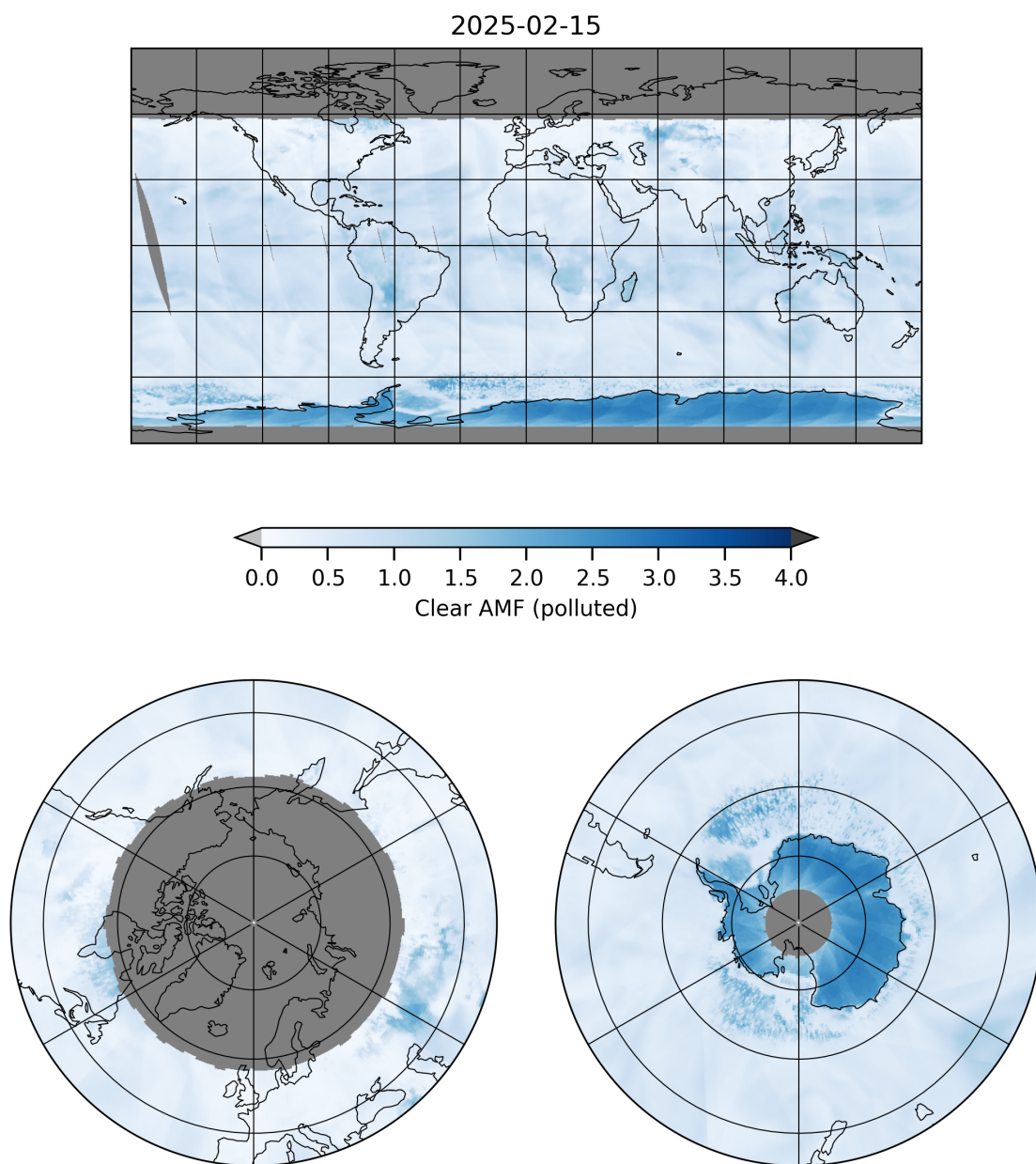


Figure 27: Map of “Clear AMF (polluted)” for 2025-02-15 to 2025-02-16

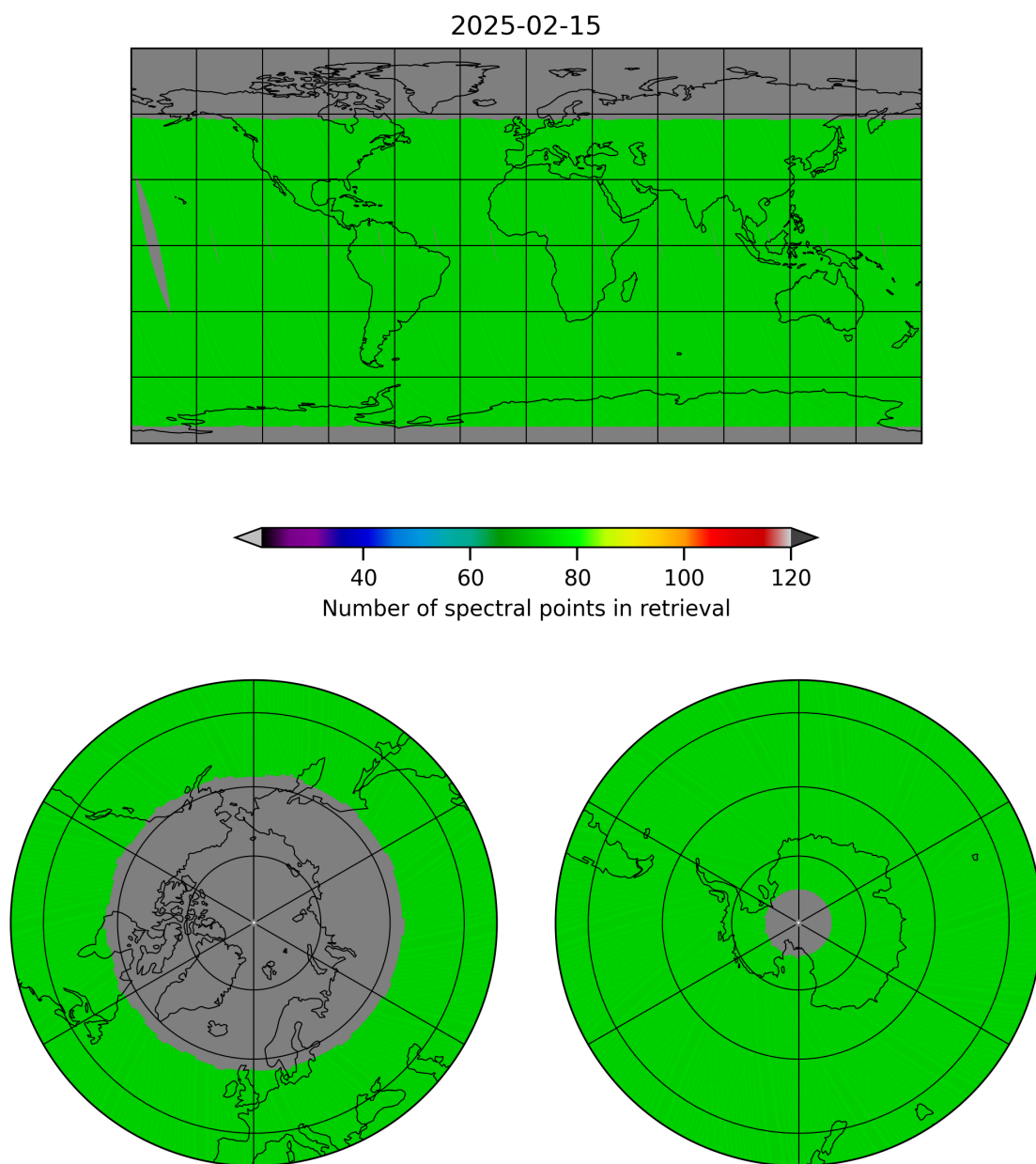


Figure 28: Map of “Number of spectral points in retrieval” for 2025-02-15 to 2025-02-16

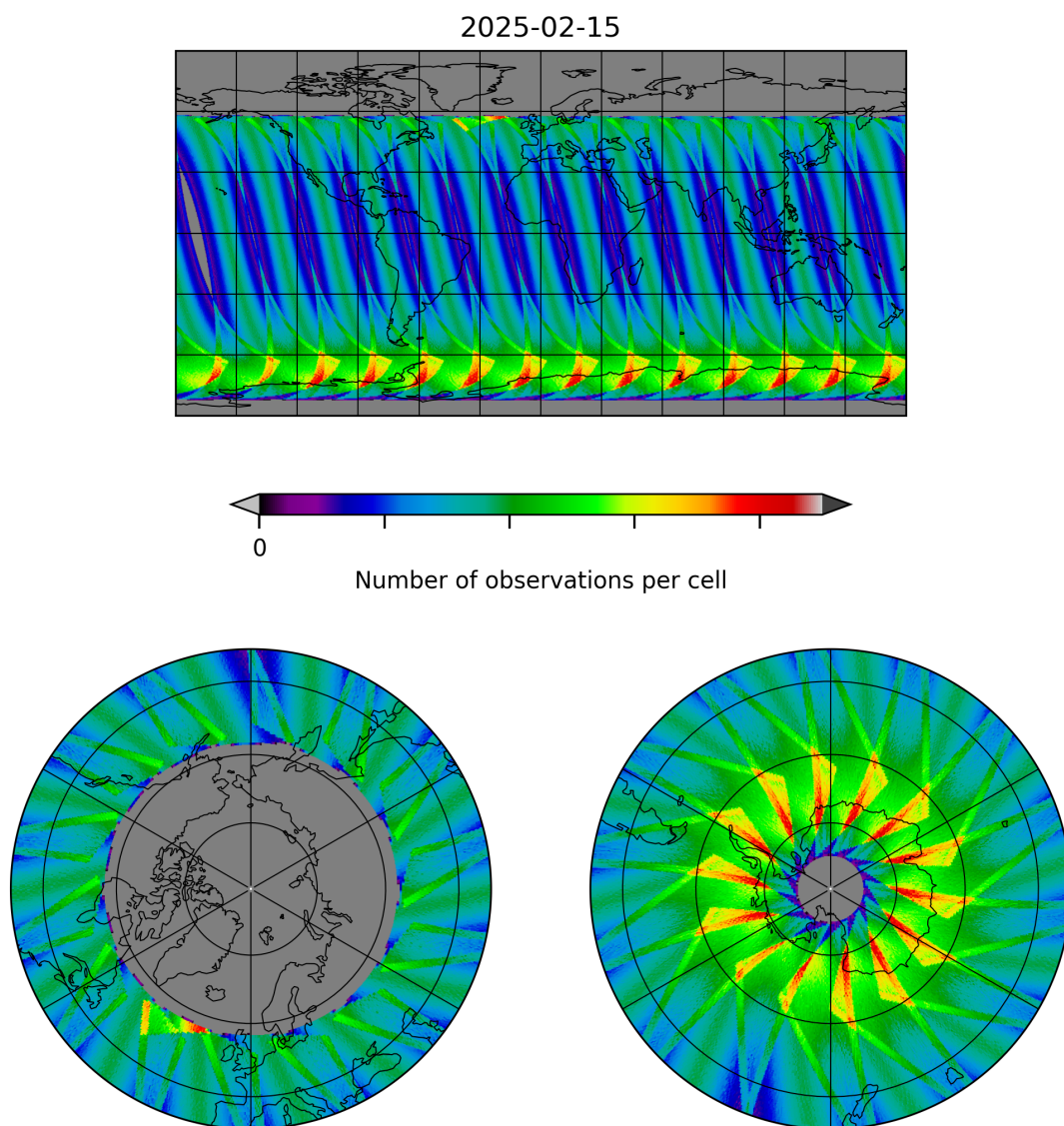


Figure 29: Map of the number of observations for 2025-02-15 to 2025-02-16

7 Zonal average

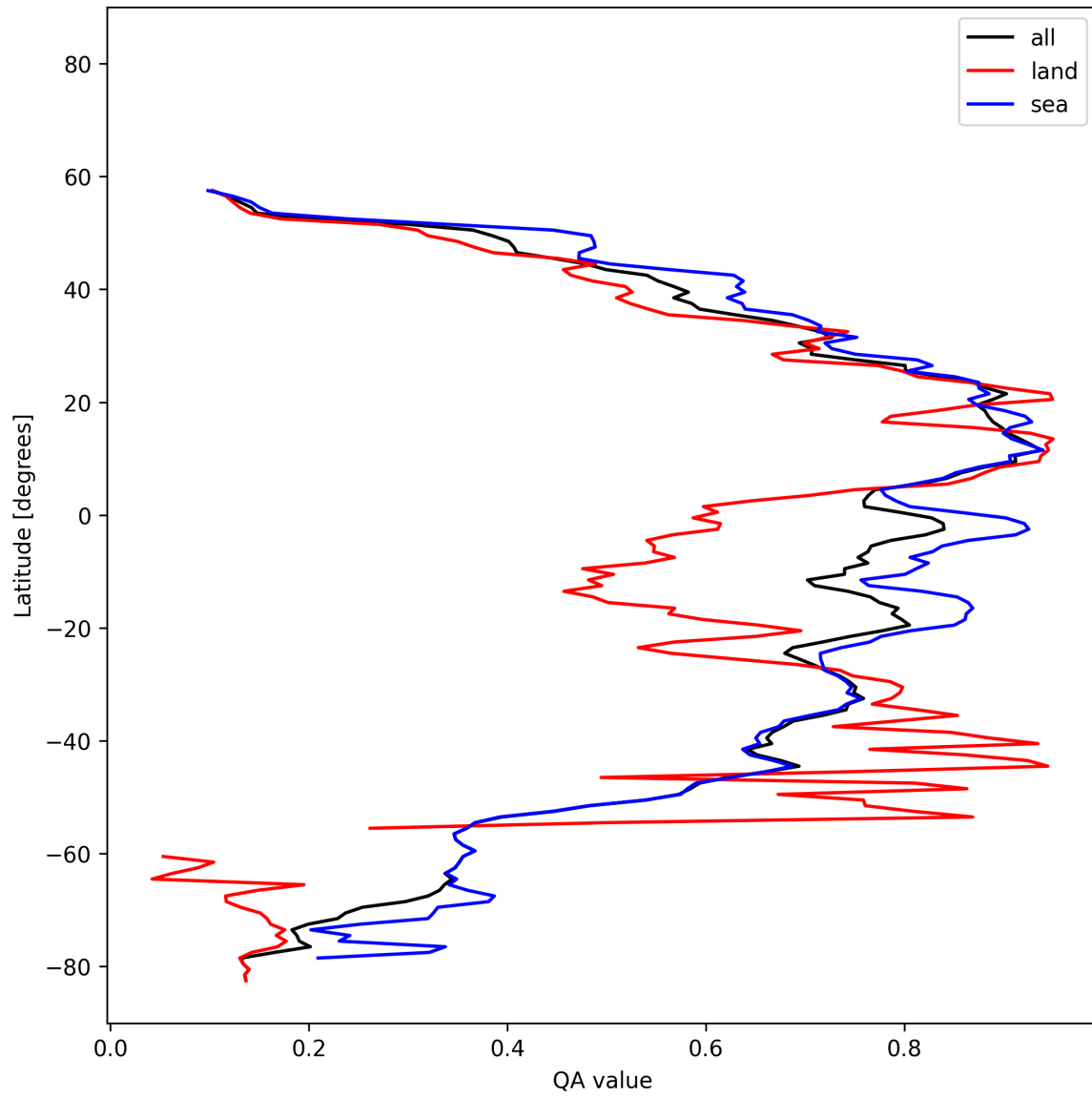


Figure 30: Zonal average of "QA value" for 2025-02-15 to 2025-02-16.

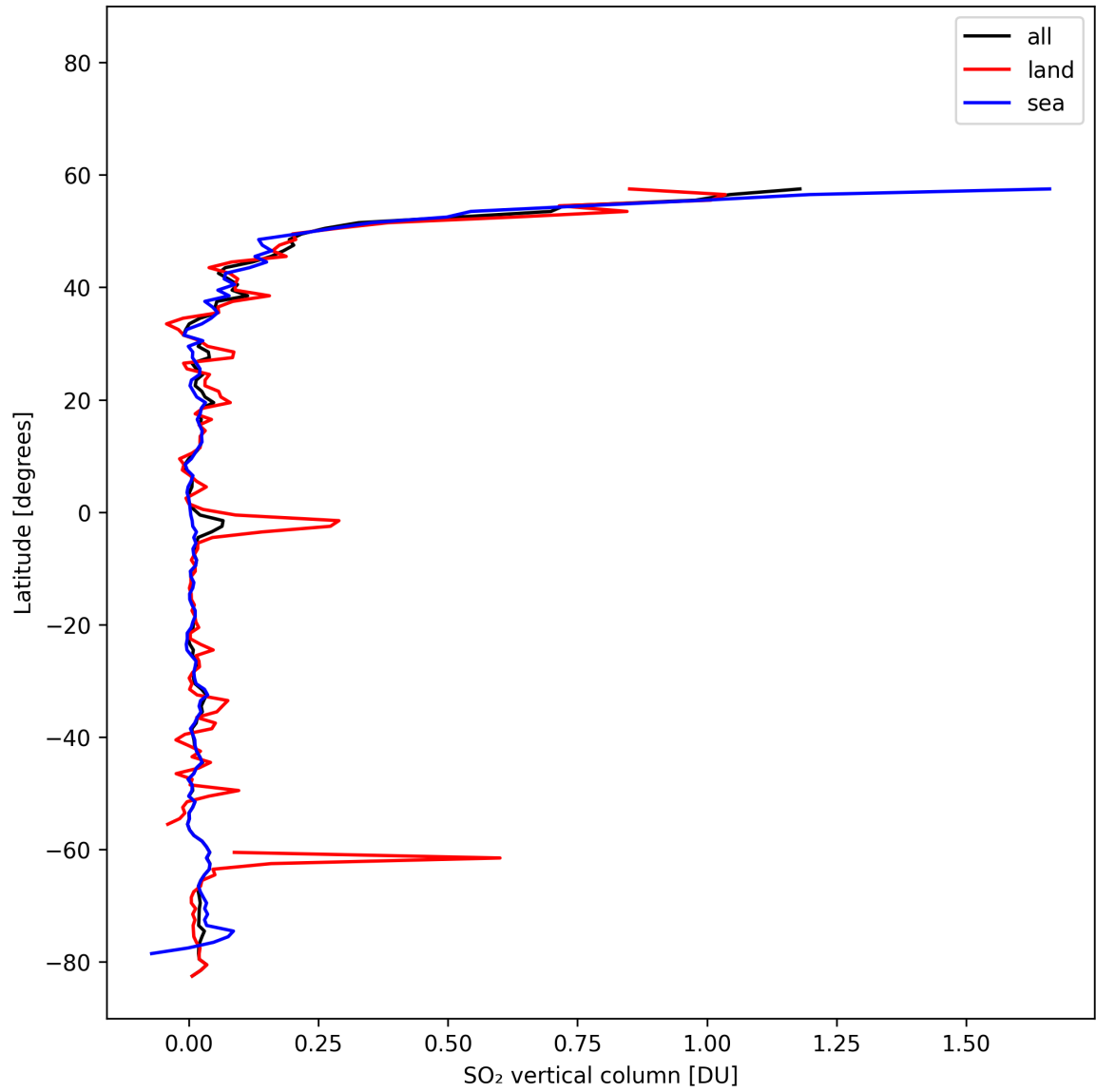


Figure 31: Zonal average of “SO₂ vertical column” for 2025-02-15 to 2025-02-16.

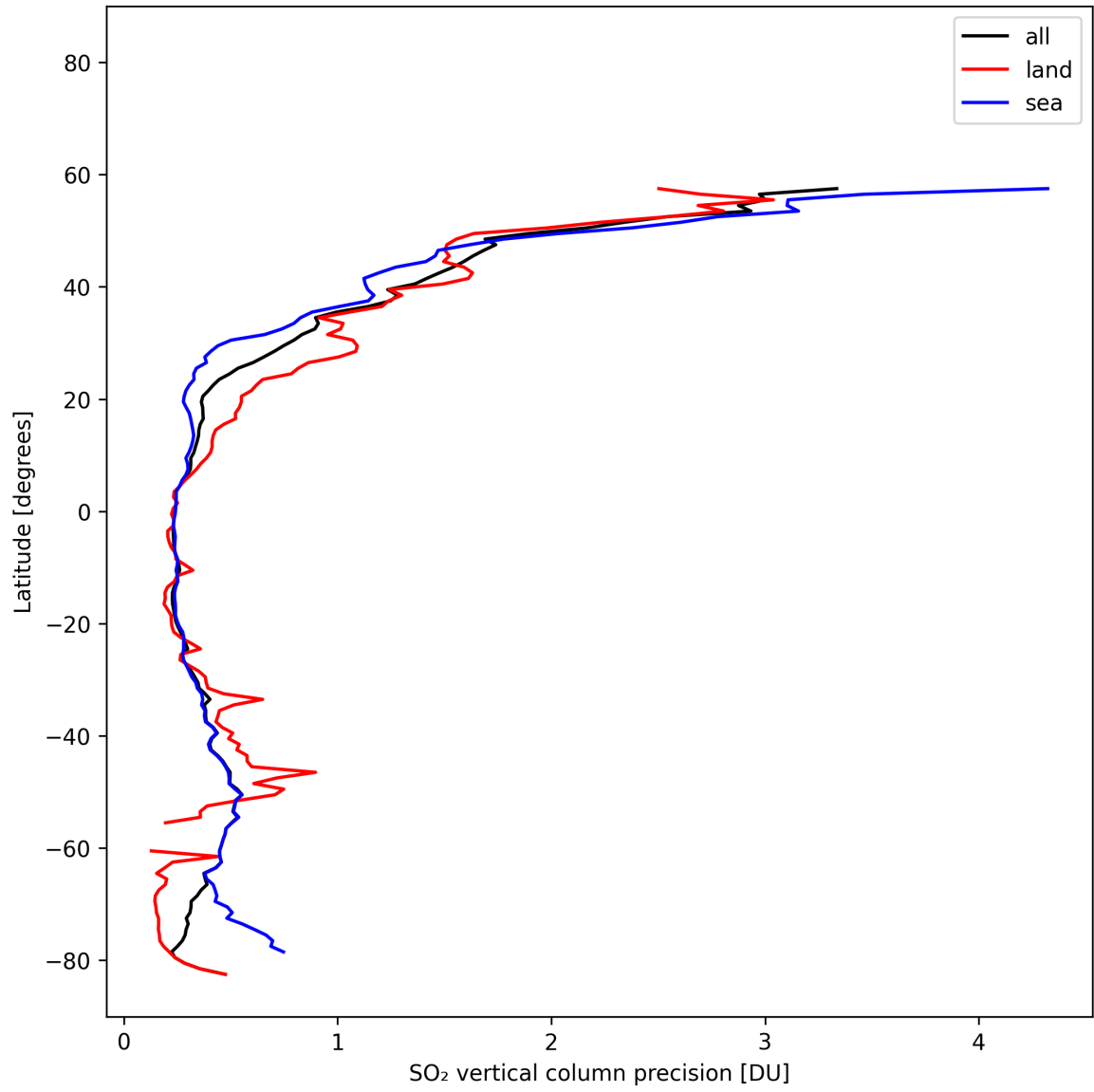


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-02-15 to 2025-02-16.

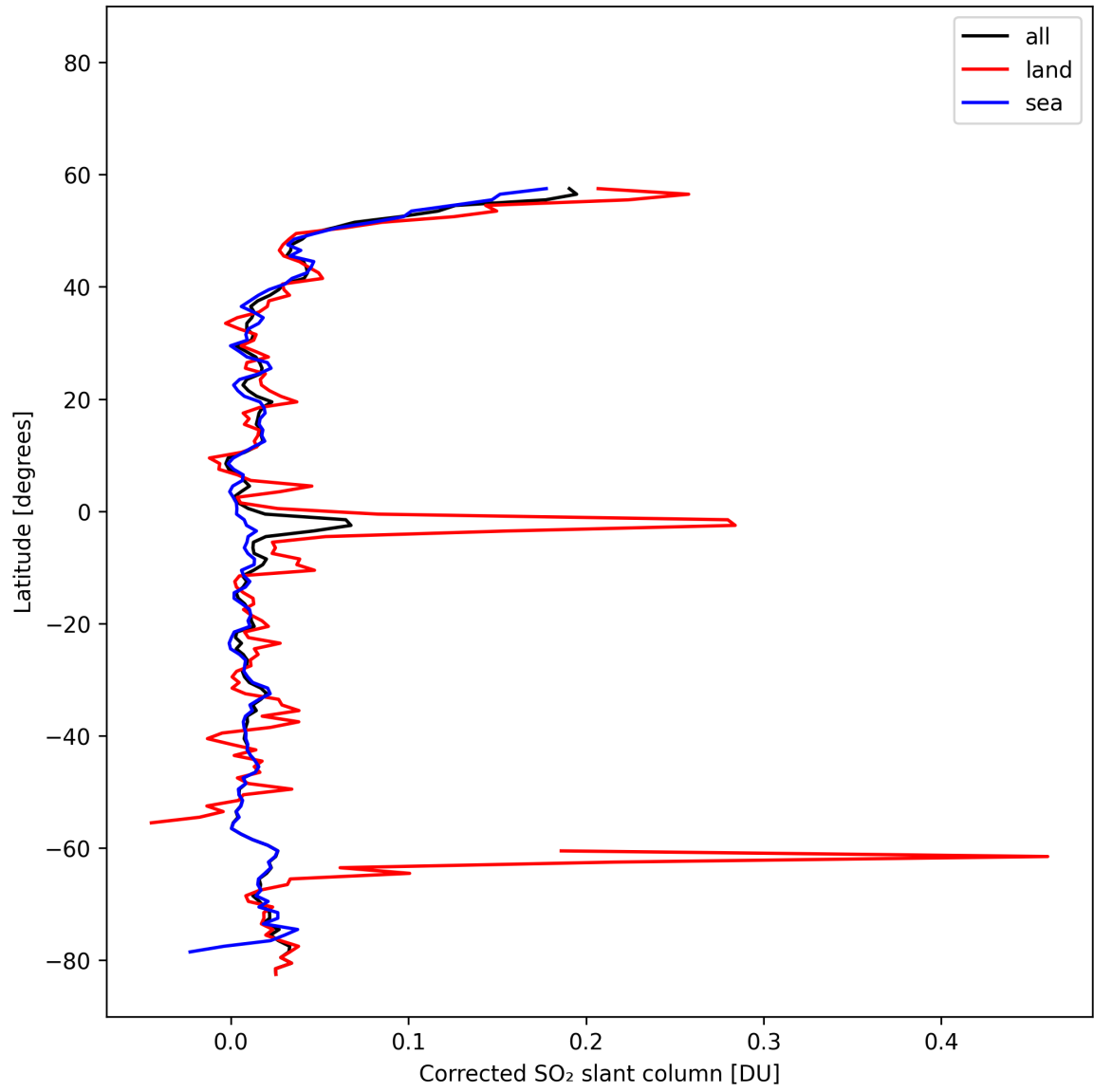


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-02-15 to 2025-02-16.

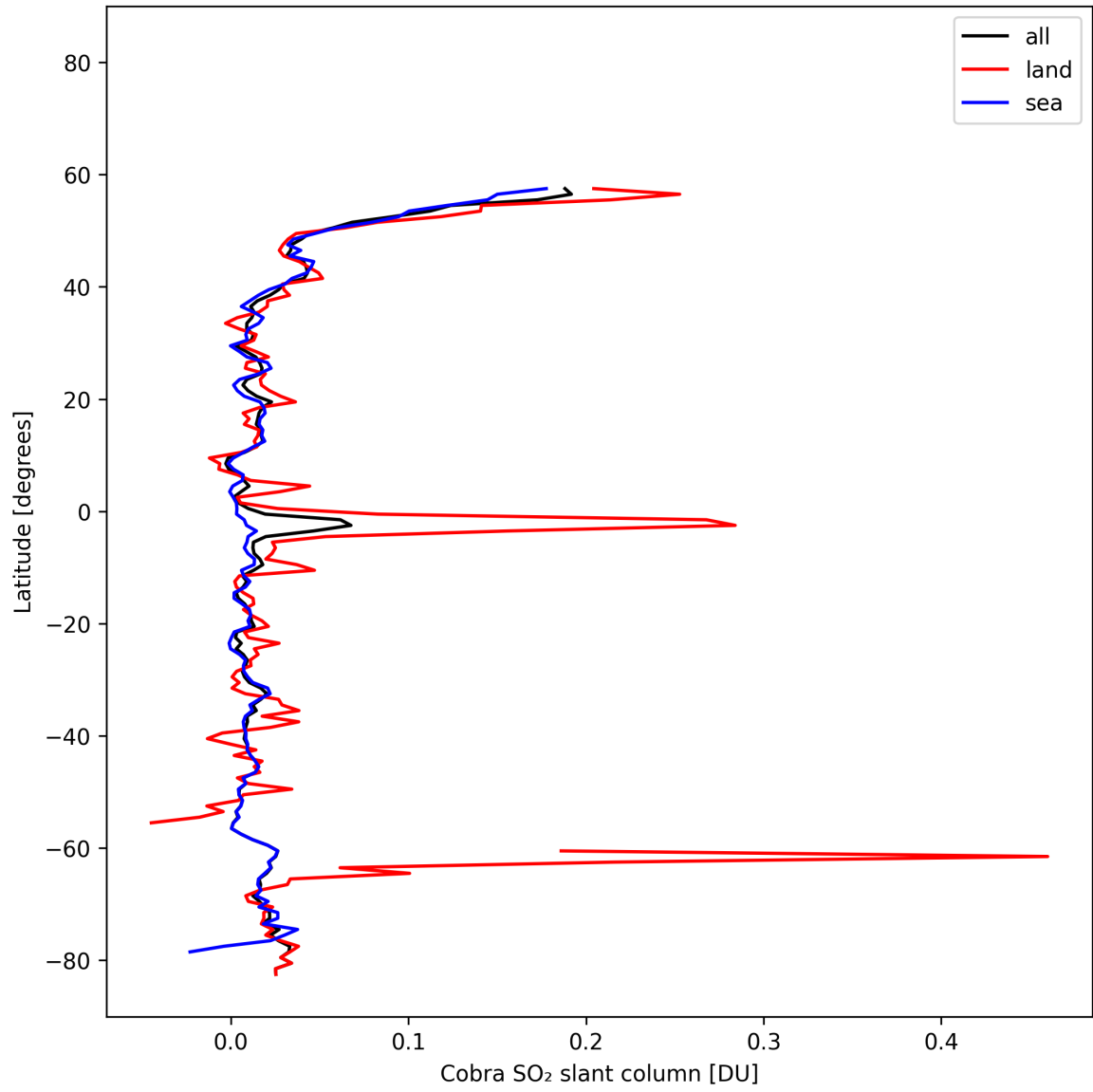


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-02-15 to 2025-02-16.

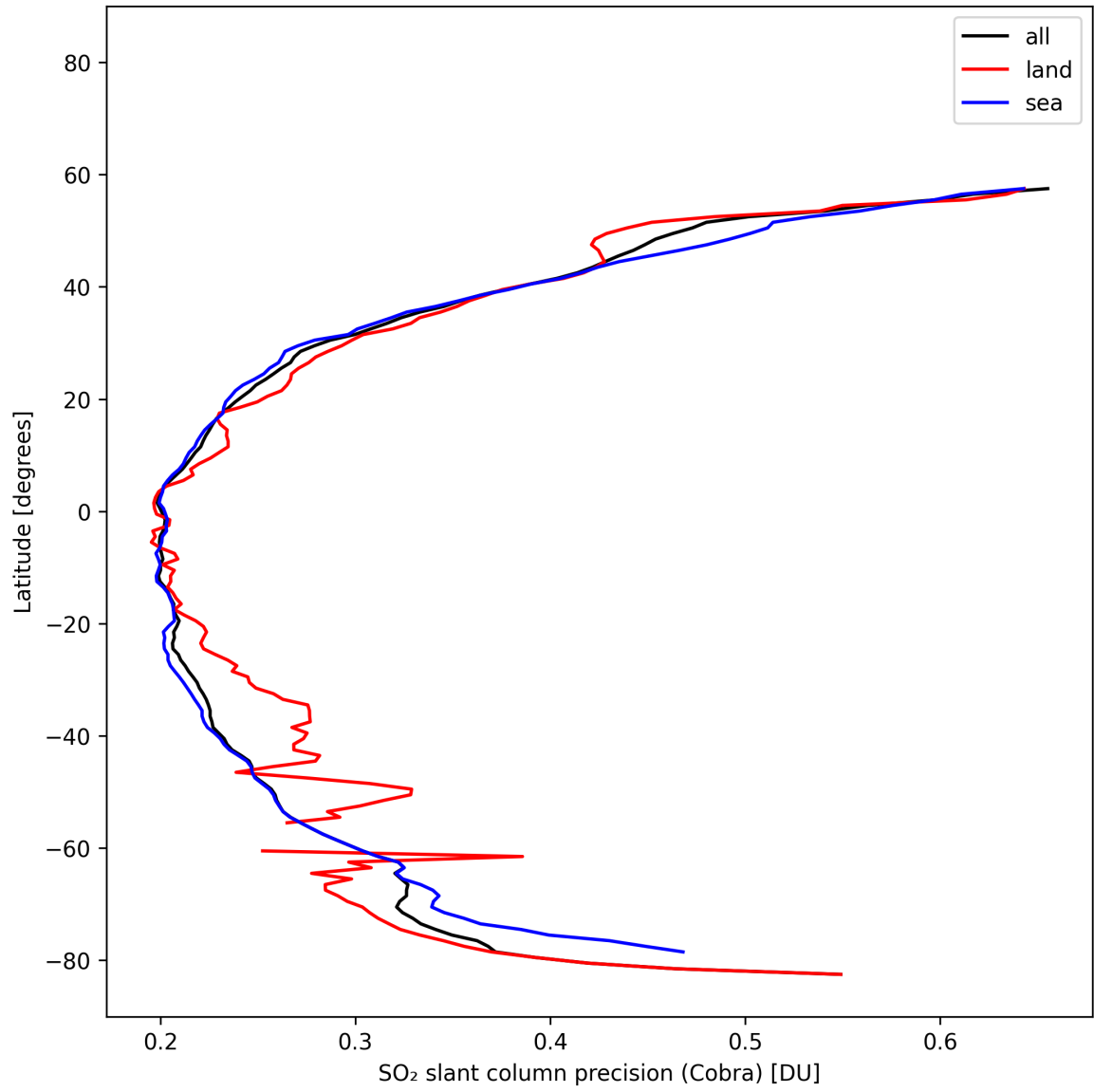


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-02-15 to 2025-02-16.

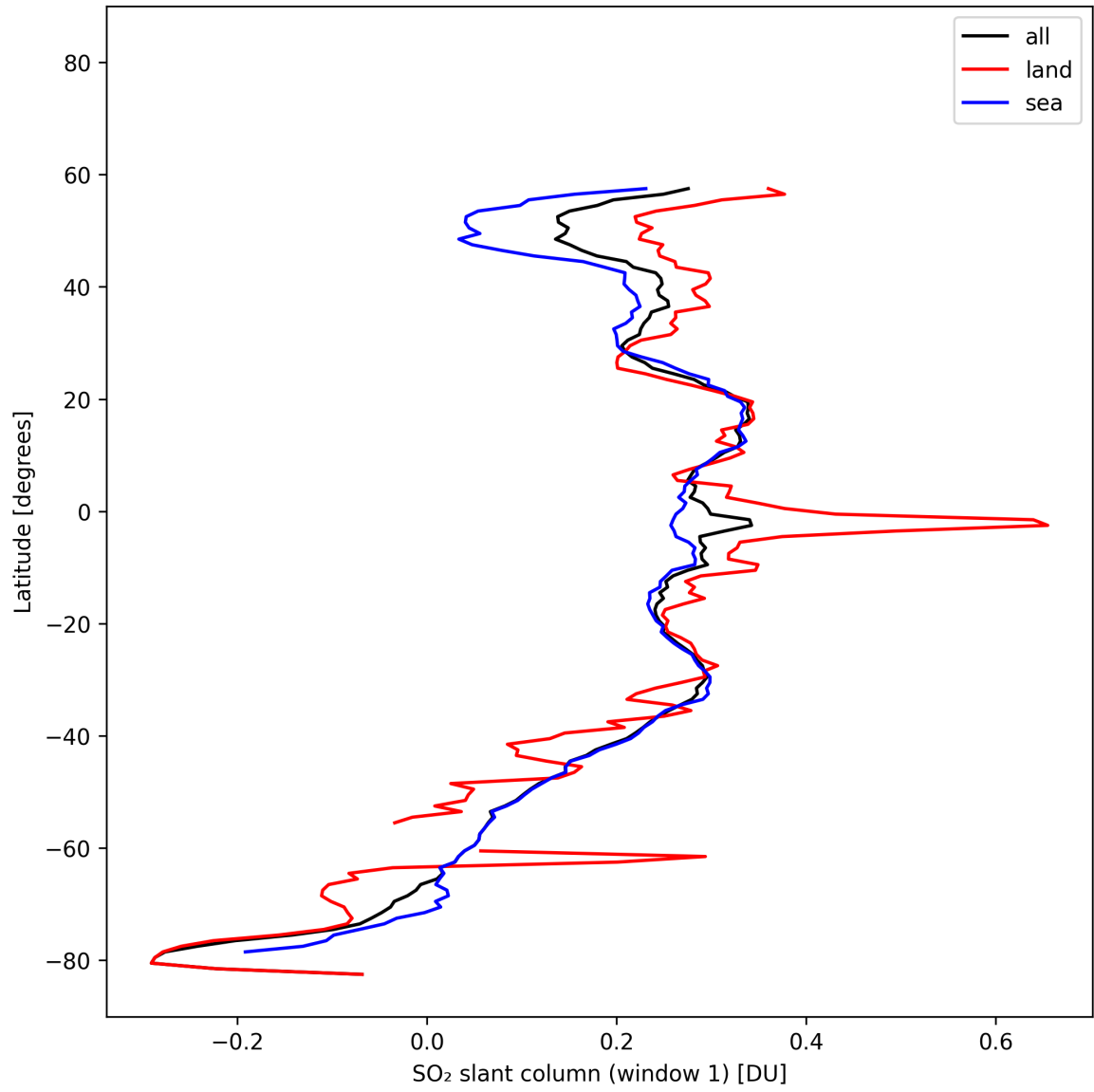


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-02-15 to 2025-02-16.

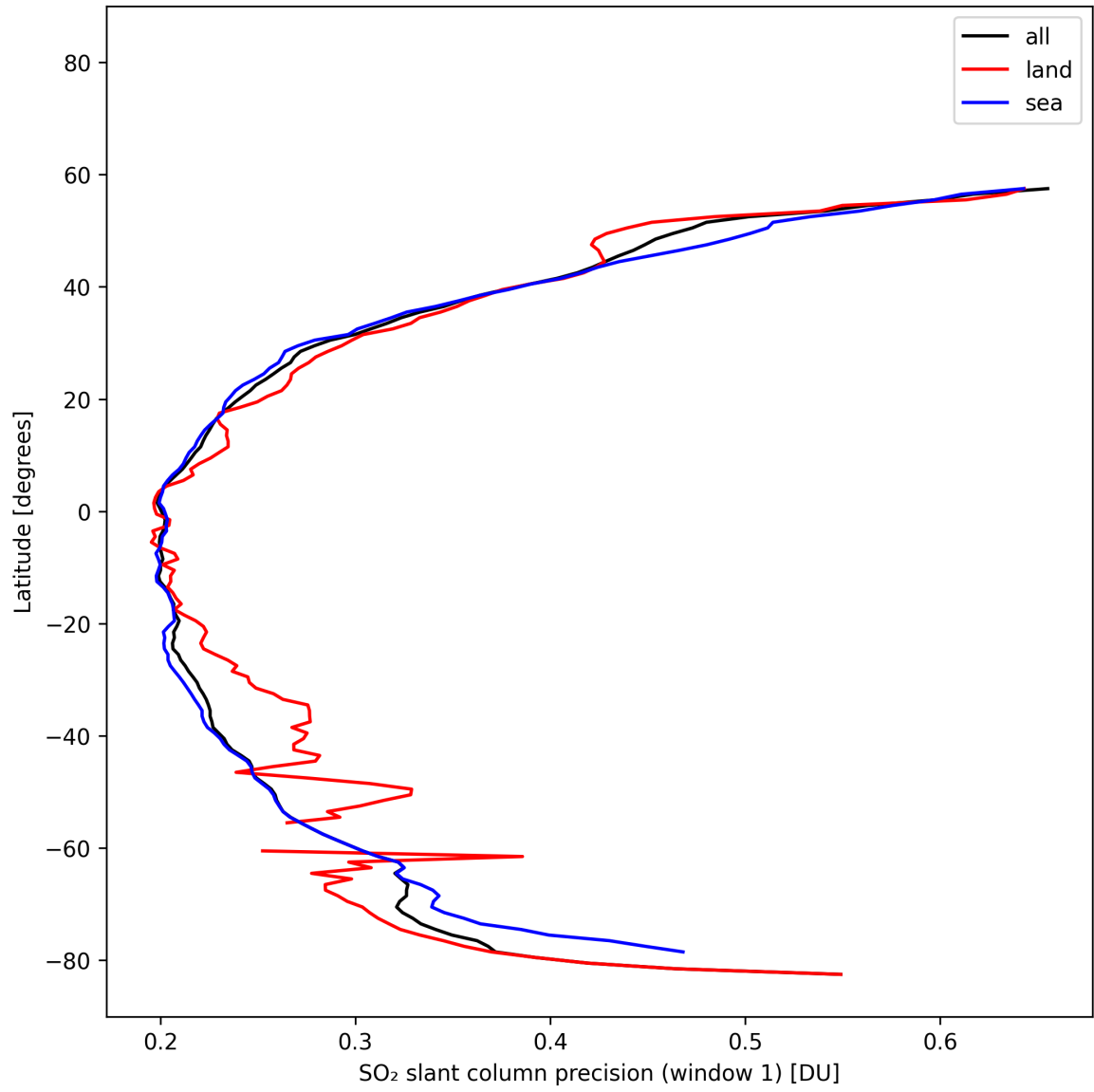


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-02-15 to 2025-02-16.

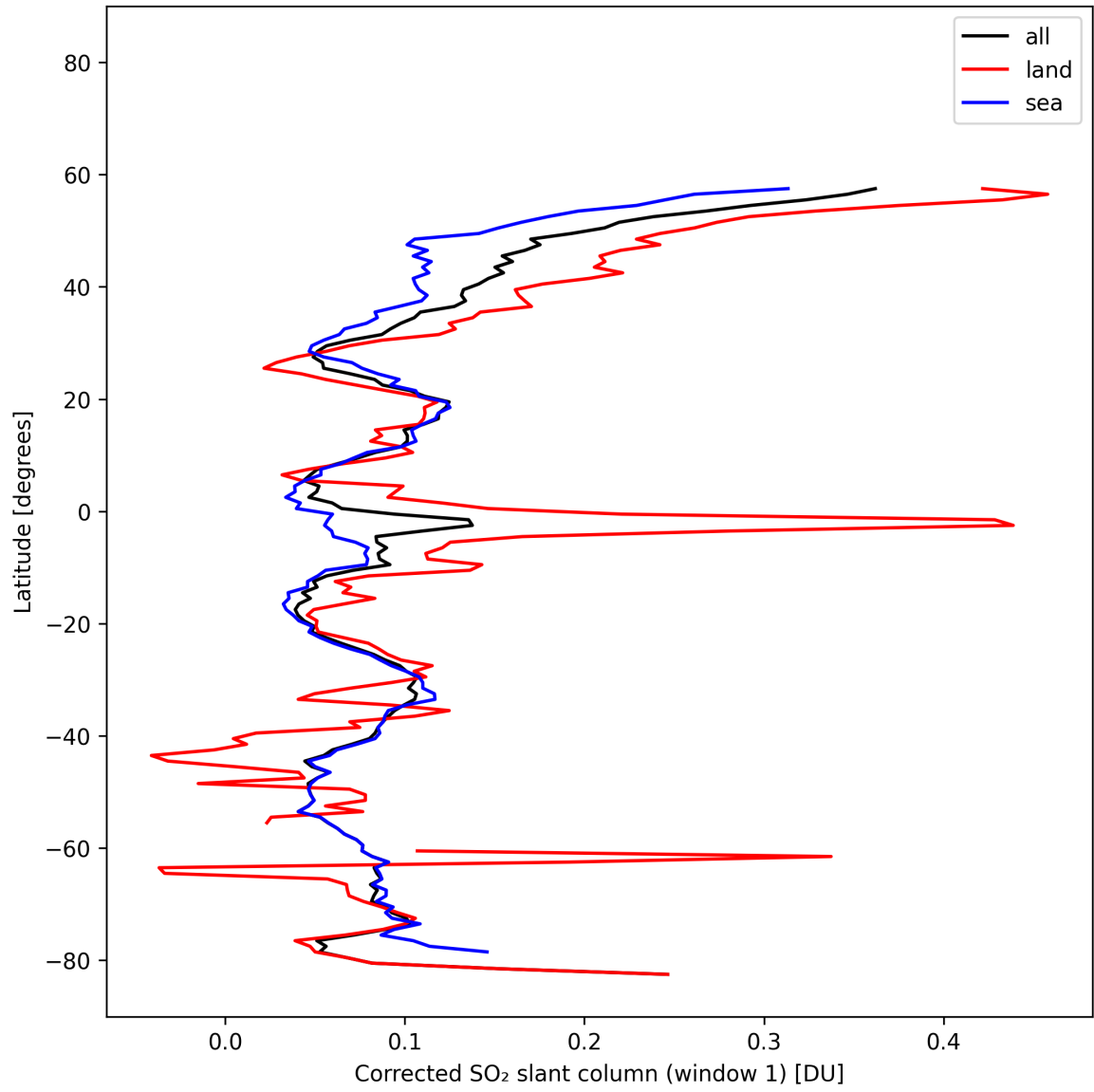


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-02-15 to 2025-02-16.

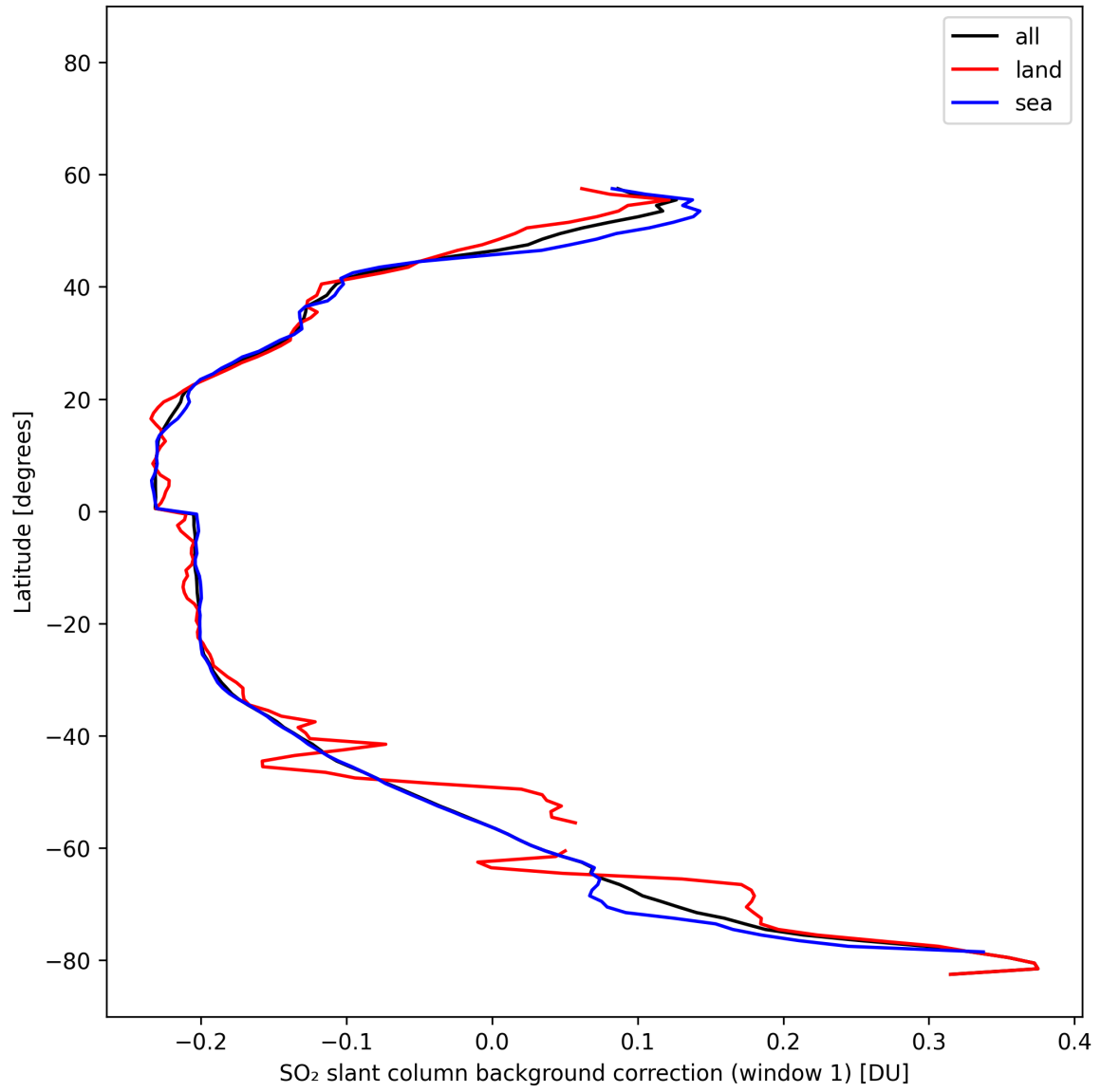


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-02-15 to 2025-02-16.

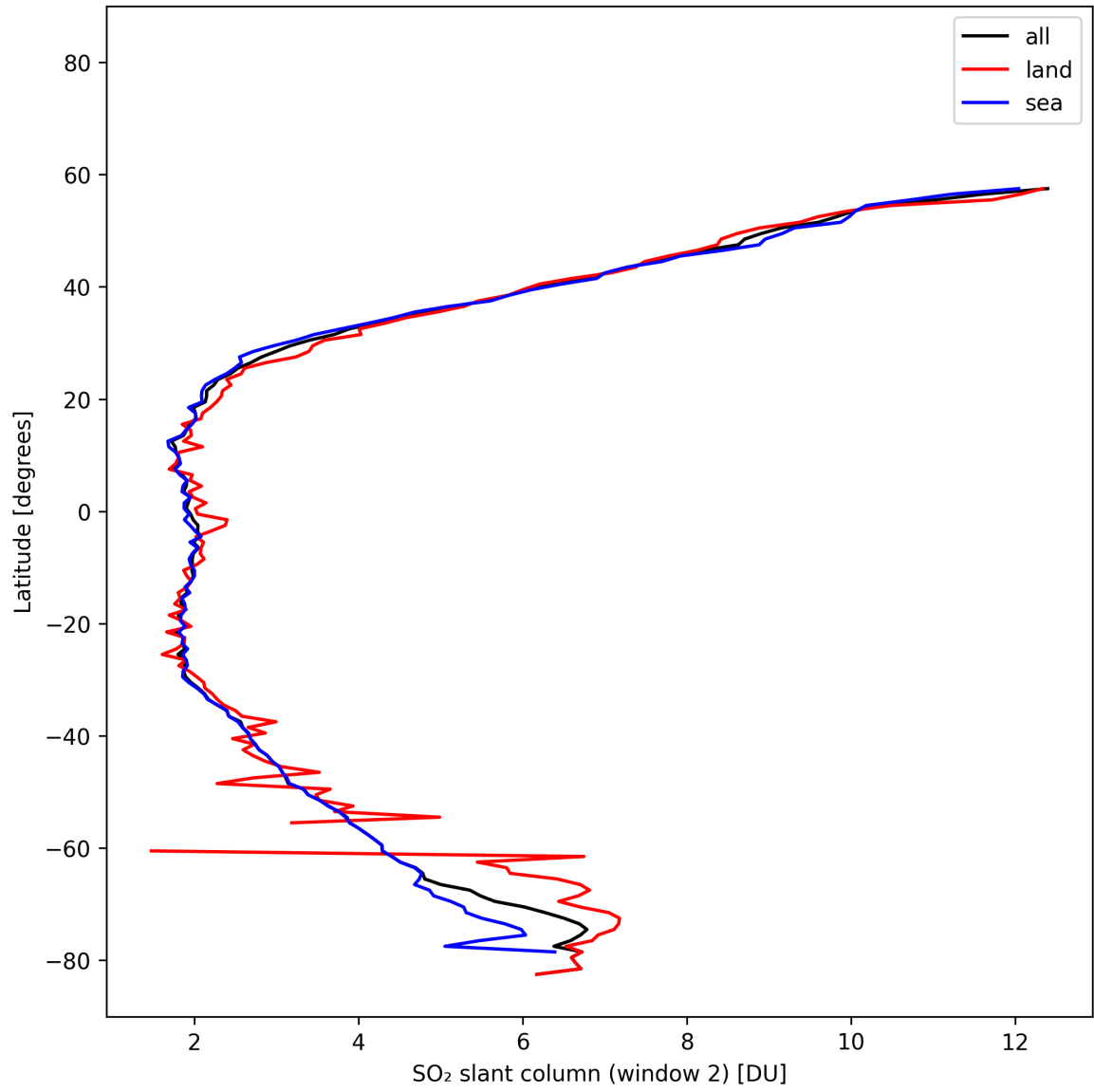


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-02-15 to 2025-02-16.

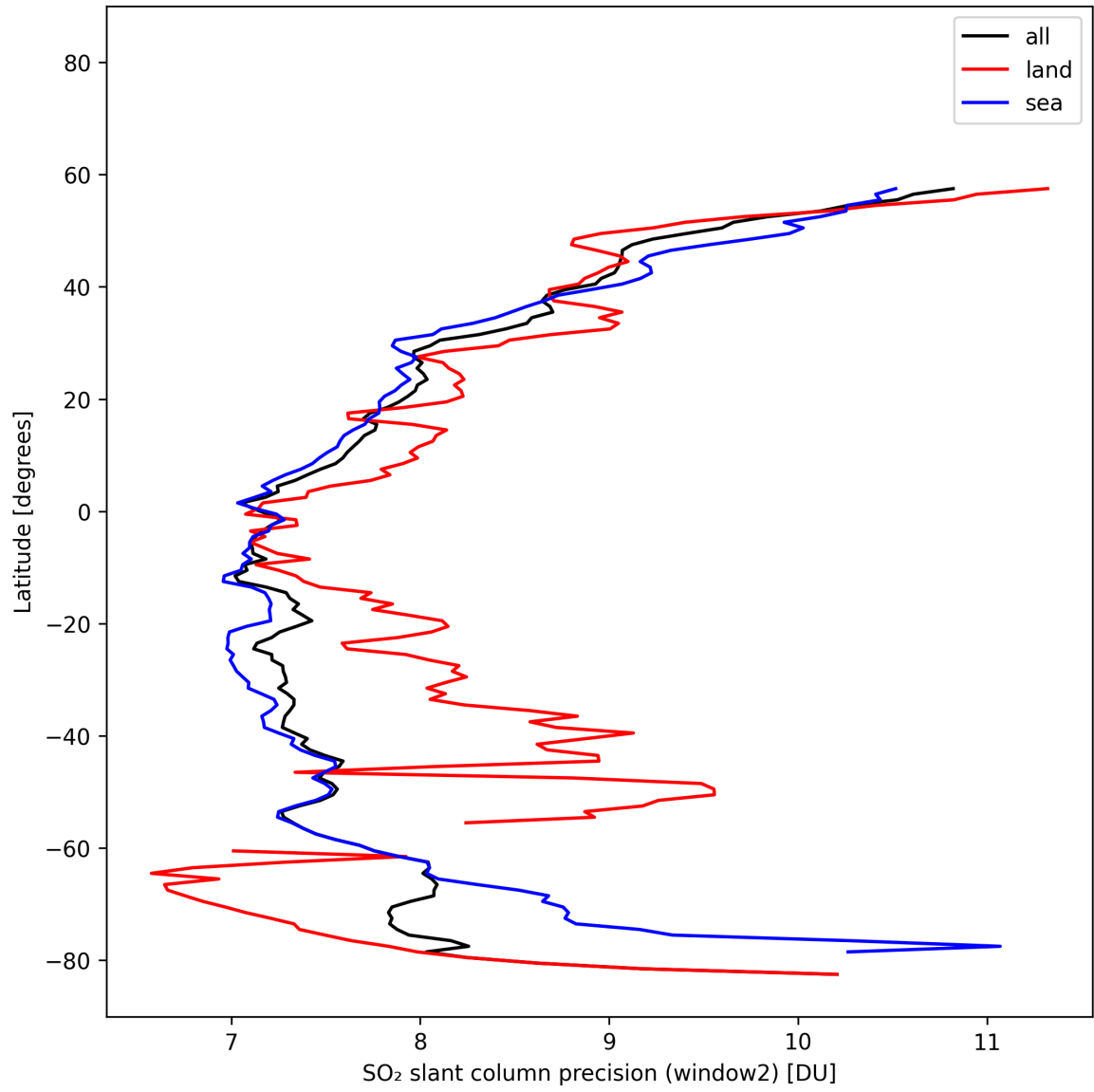


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-02-15 to 2025-02-16.

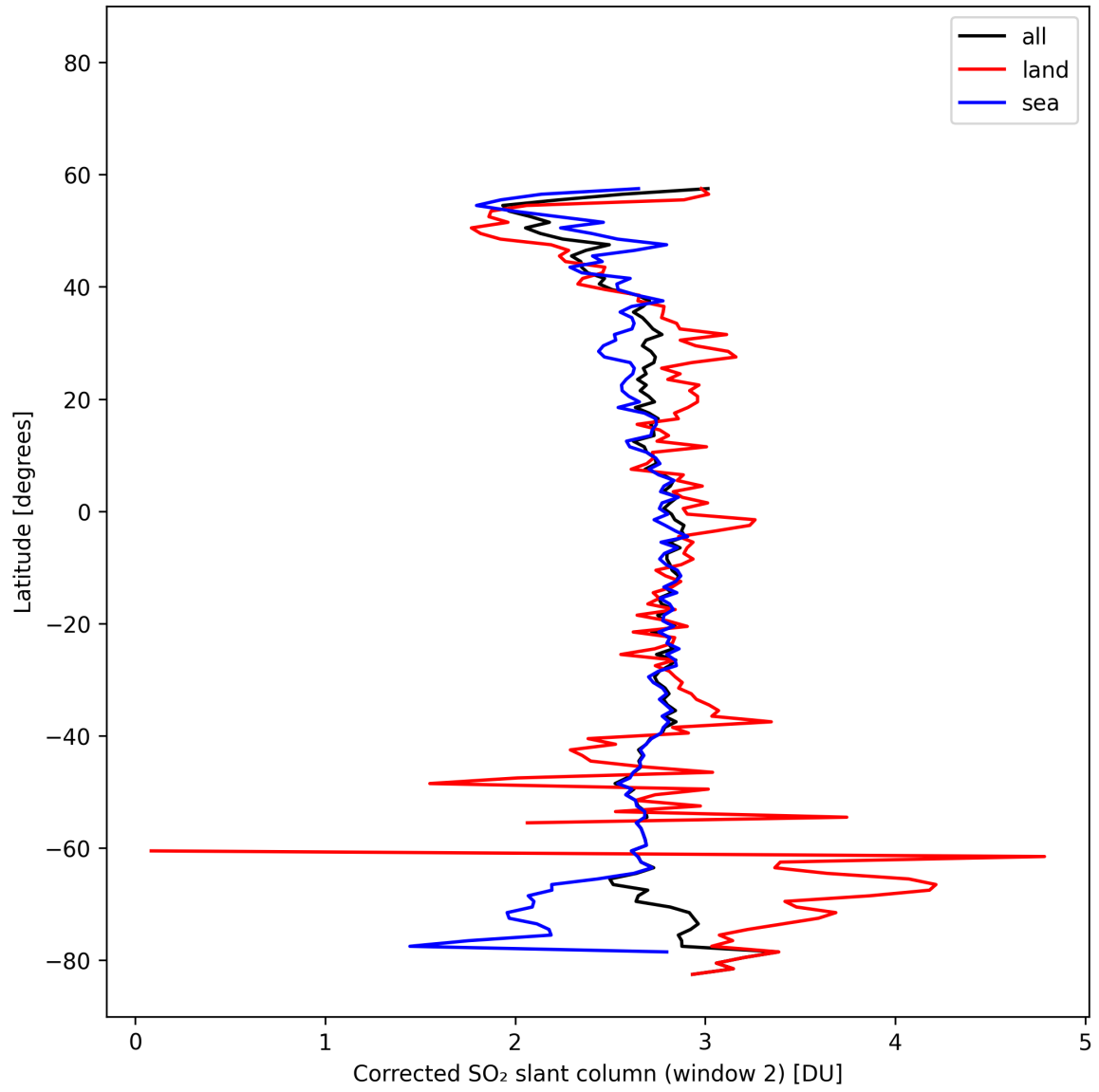


Figure 42: Zonal average of "Corrected SO₂ slant column (window 2)" for 2025-02-15 to 2025-02-16.

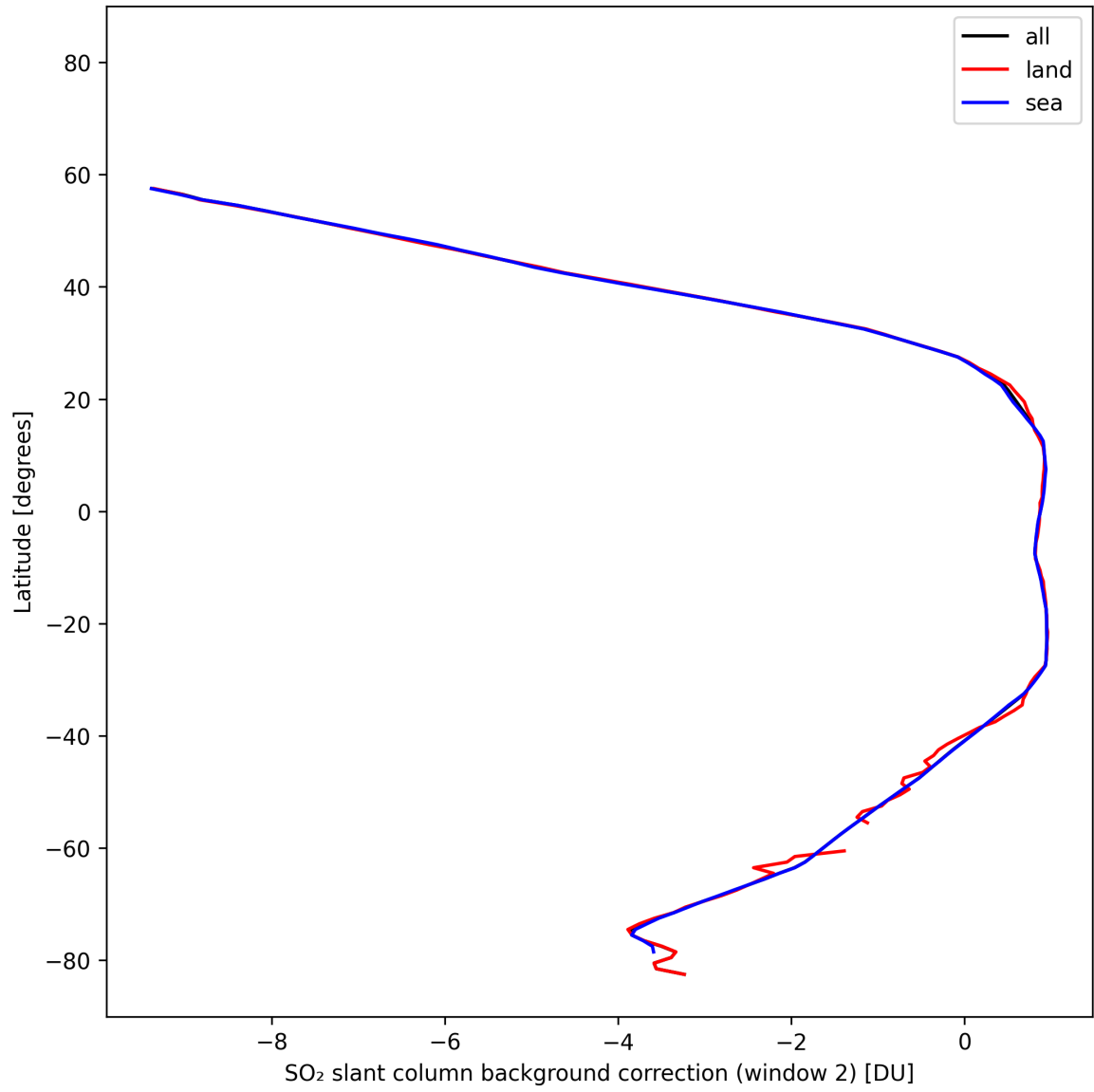


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-02-15 to 2025-02-16.

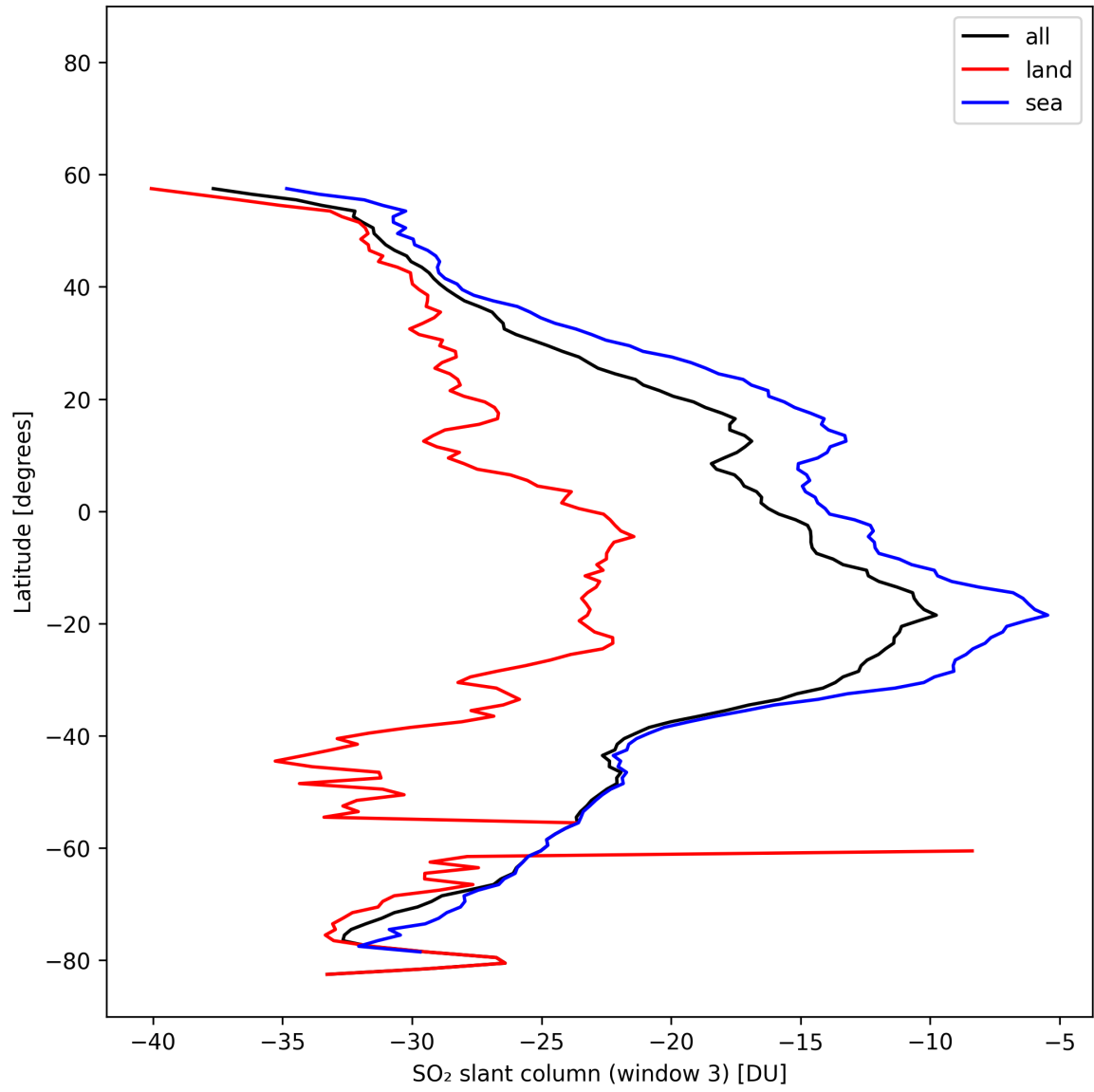


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-02-15 to 2025-02-16.

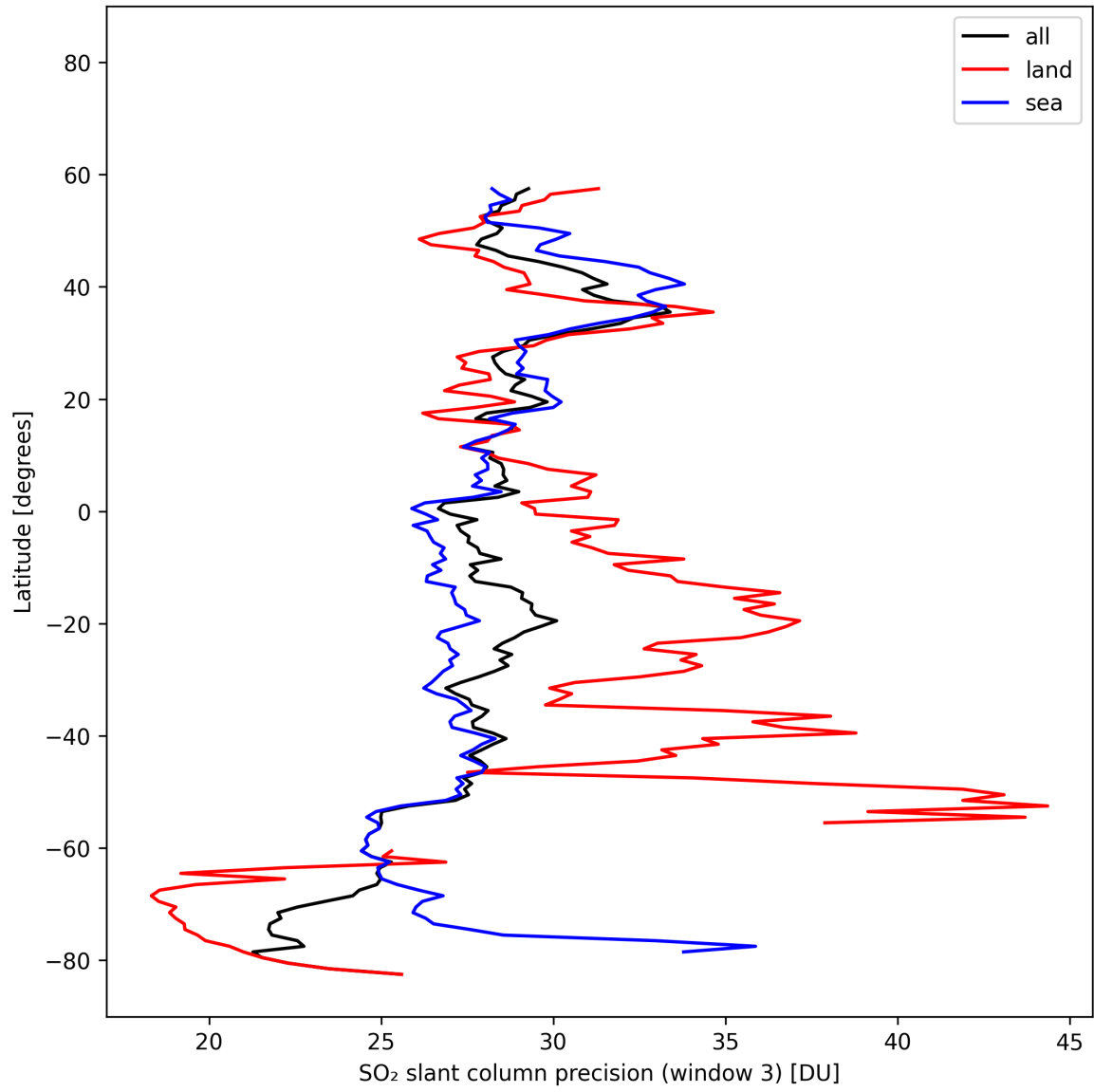


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-02-15 to 2025-02-16.

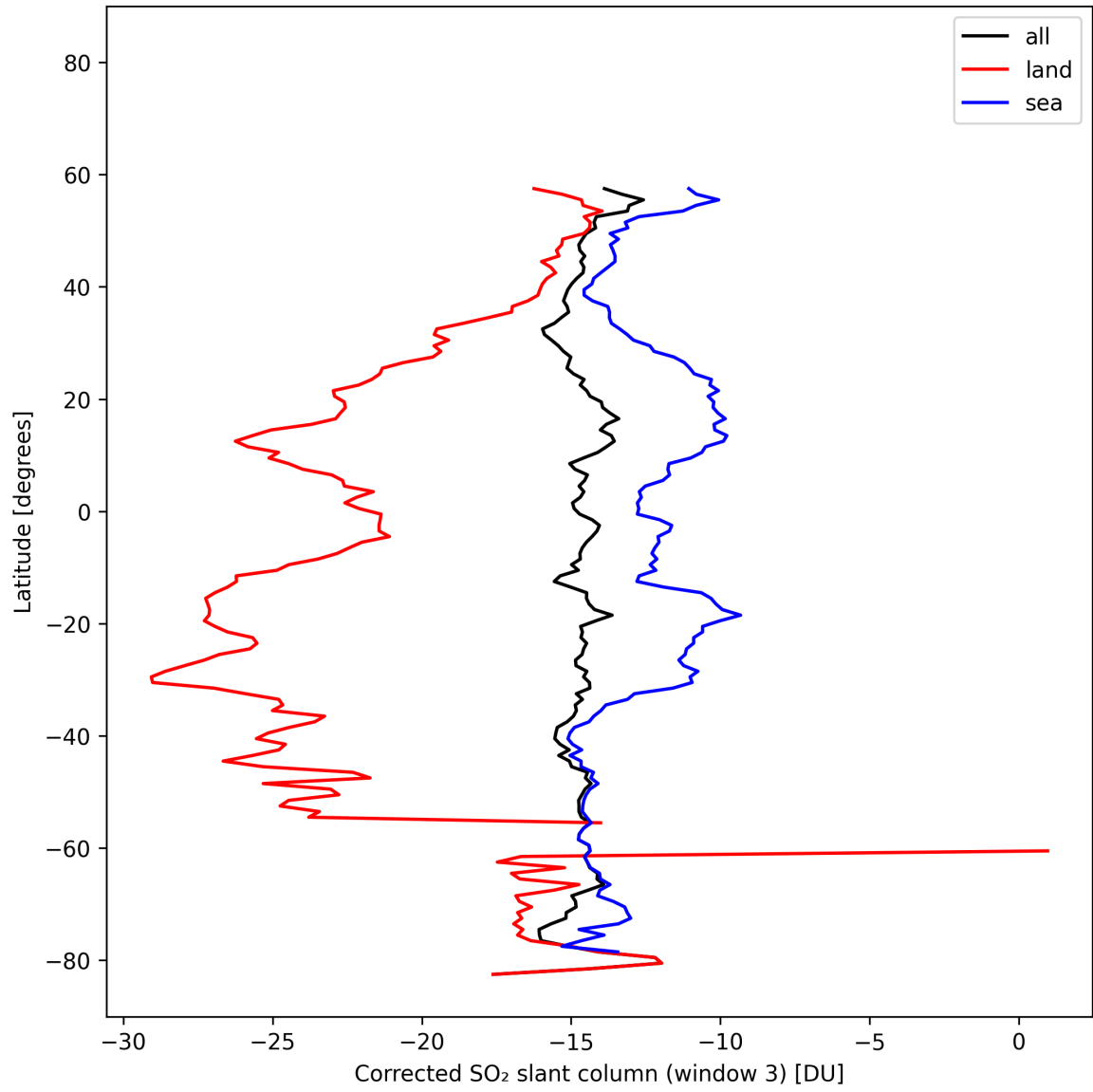


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-02-15 to 2025-02-16.

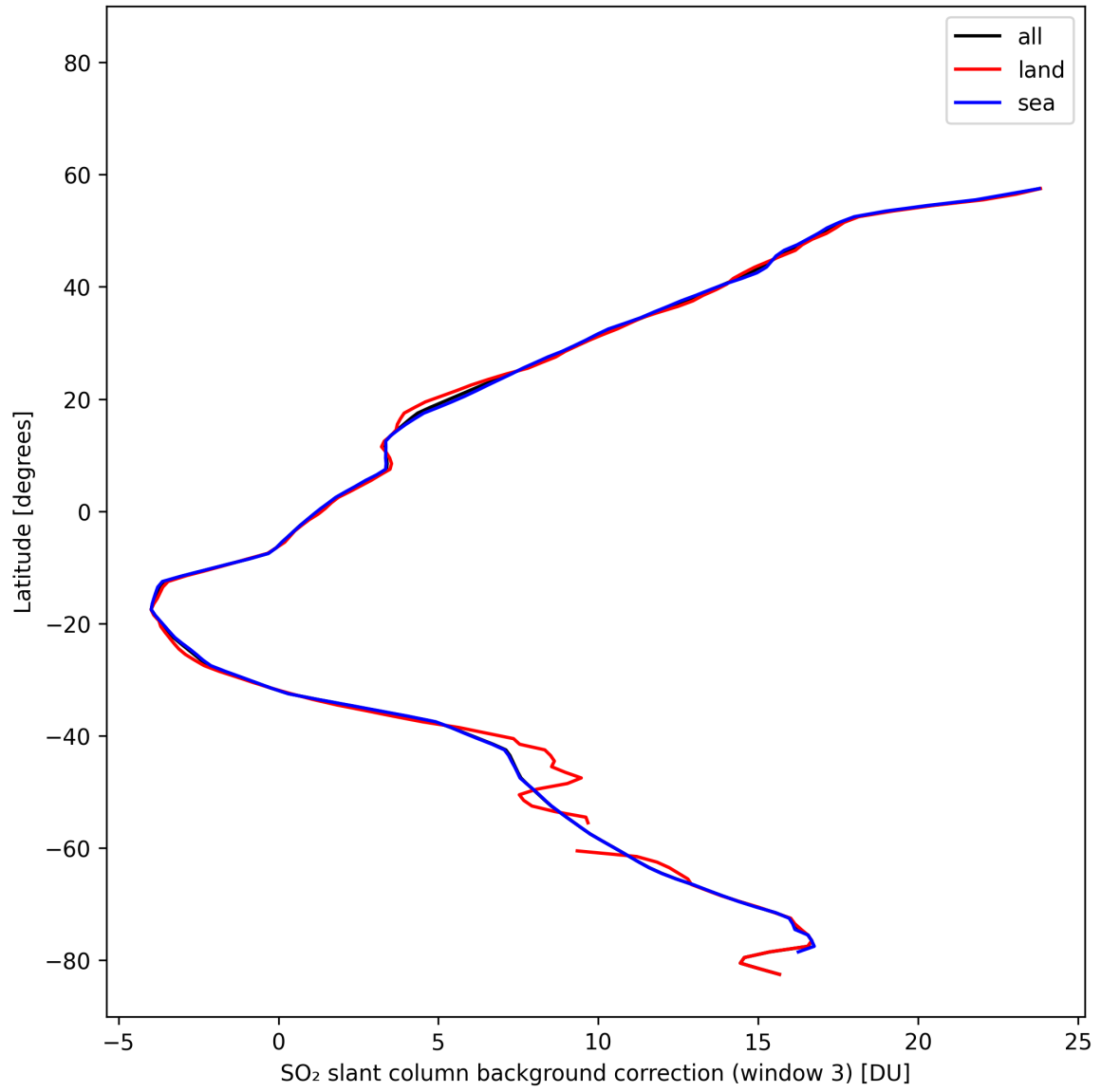


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-02-15 to 2025-02-16.

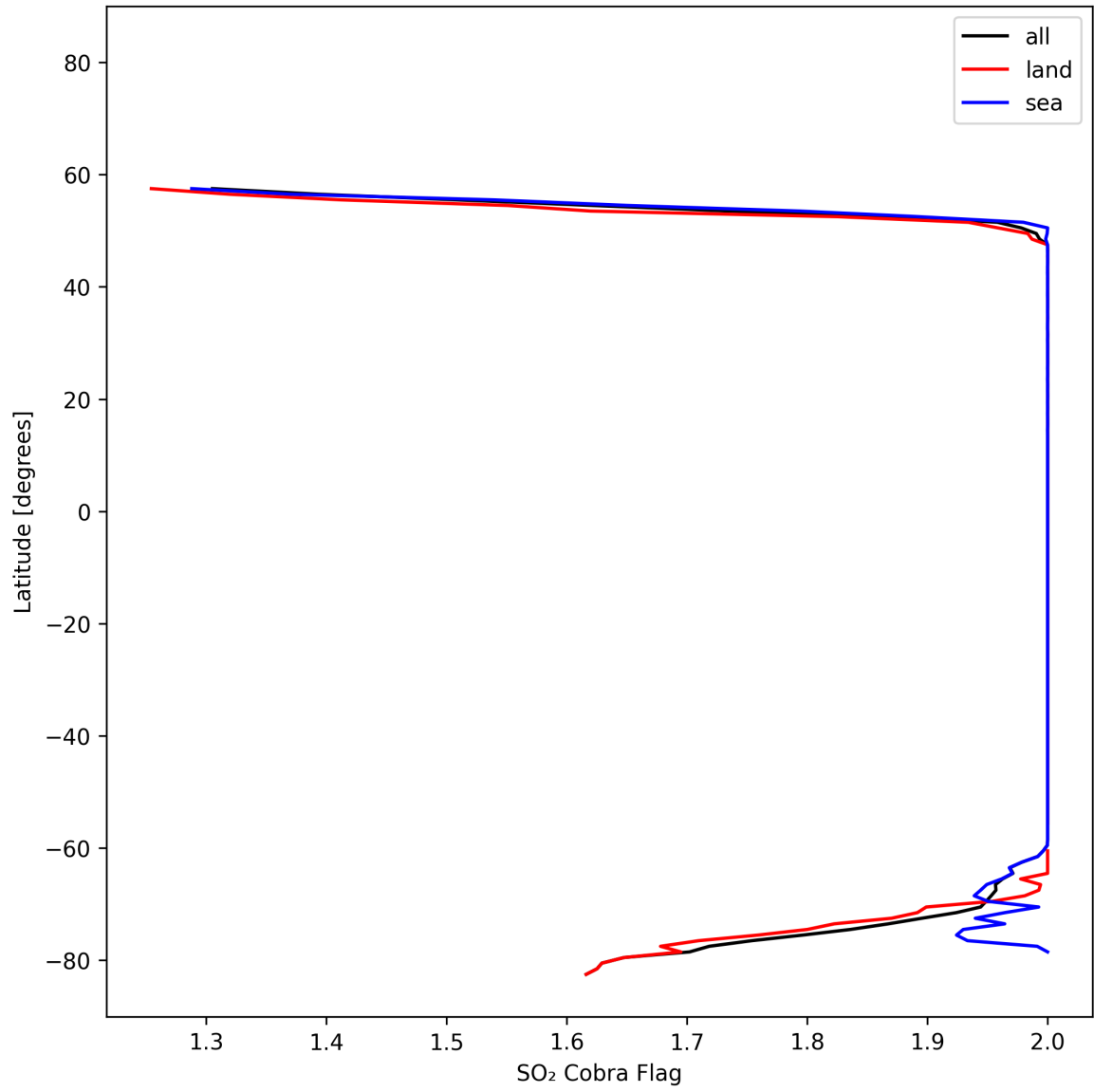


Figure 48: Zonal average of “SO₂ Cobra Flag” for 2025-02-15 to 2025-02-16.

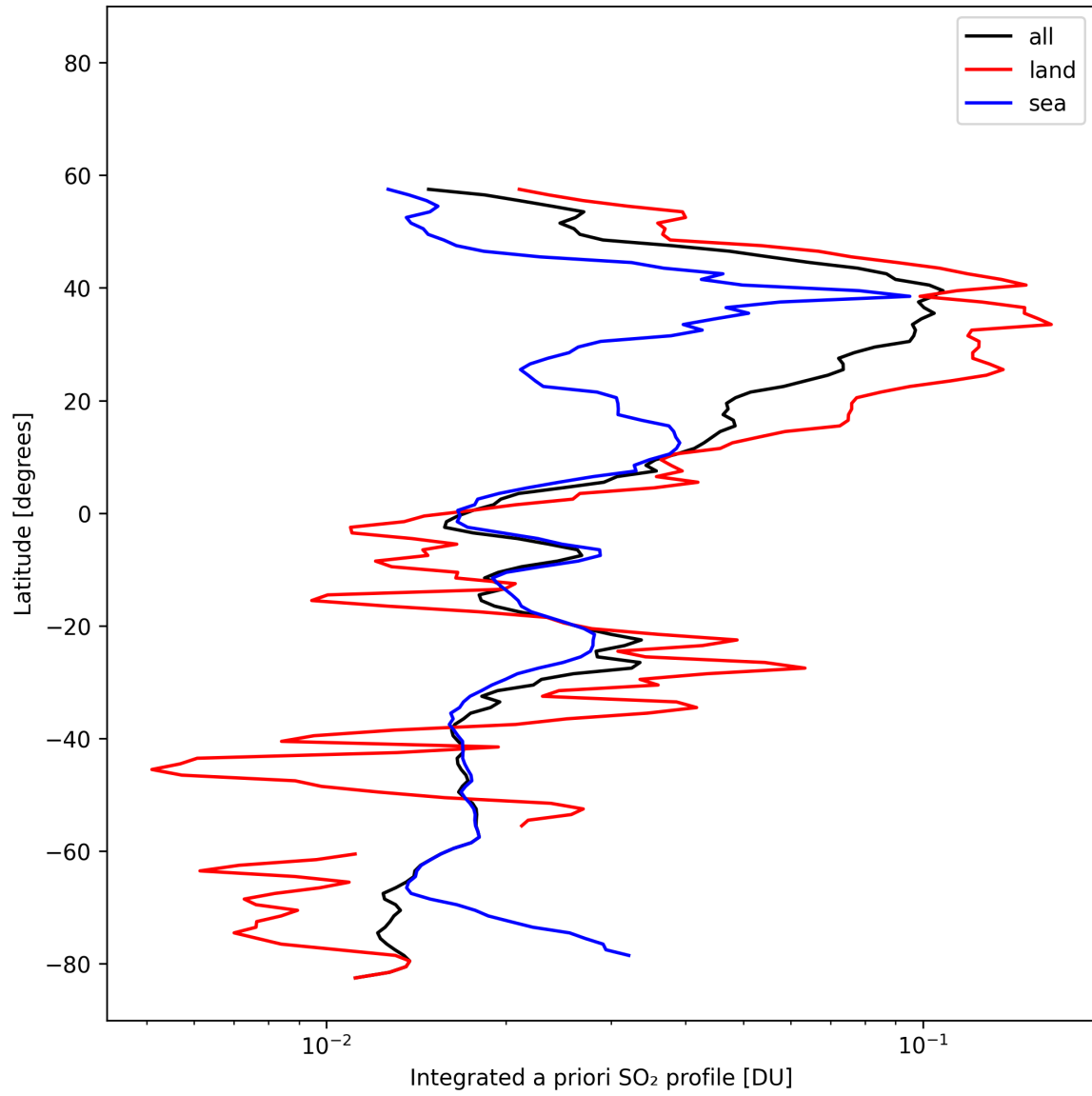


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-02-15 to 2025-02-16.

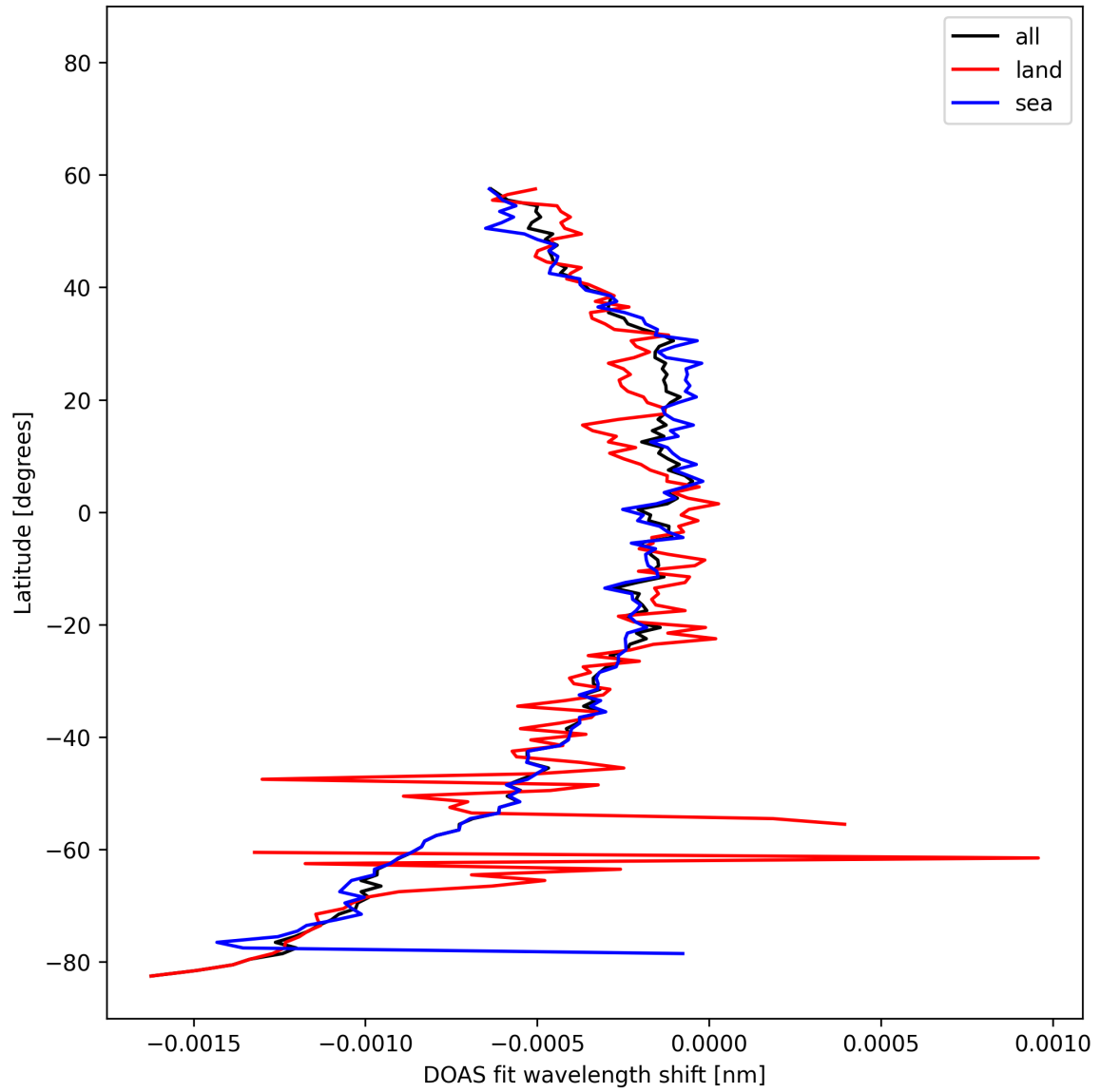


Figure 50: Zonal average of "DOAS fit wavelength shift" for 2025-02-15 to 2025-02-16.

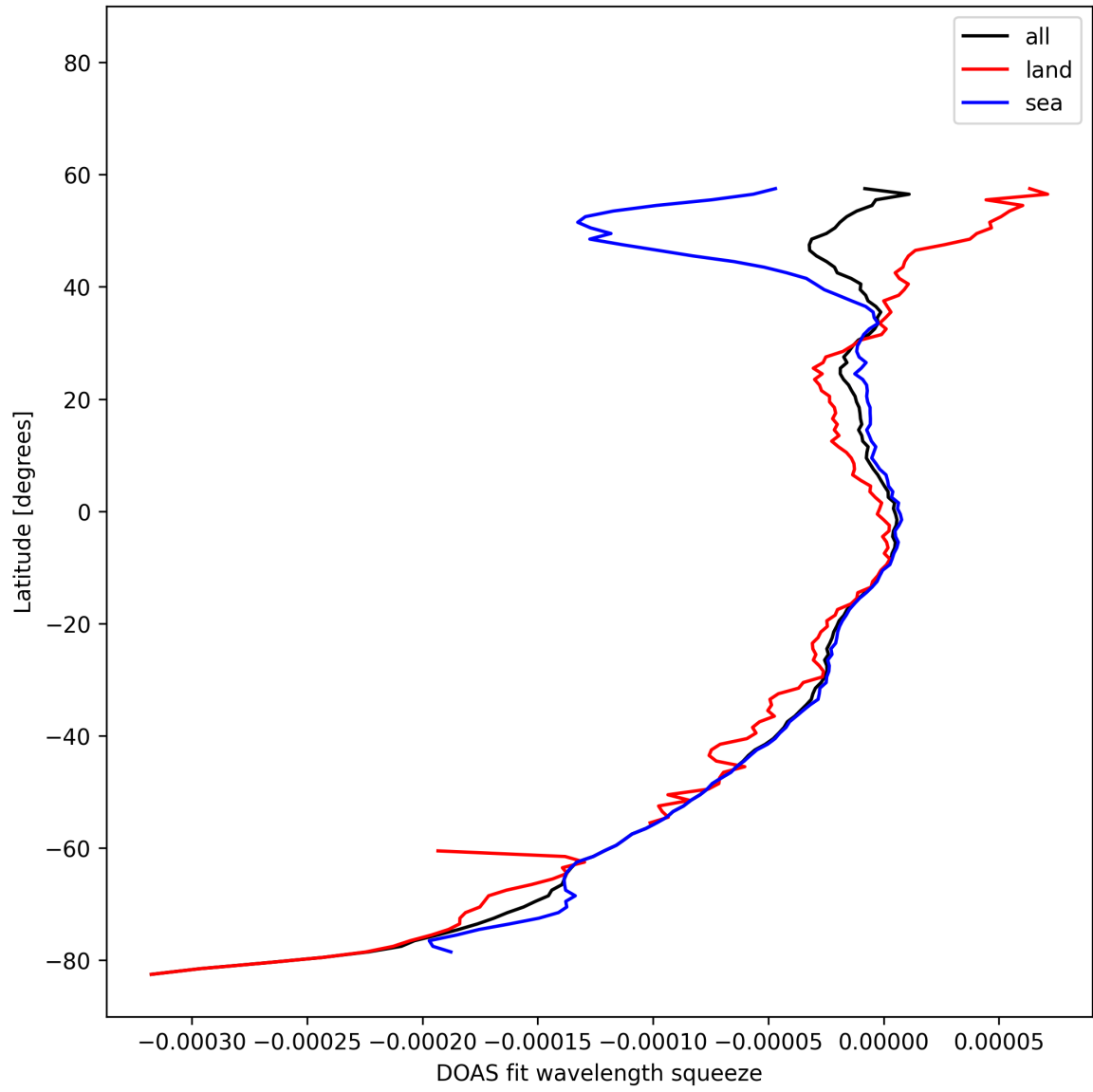


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-02-15 to 2025-02-16.

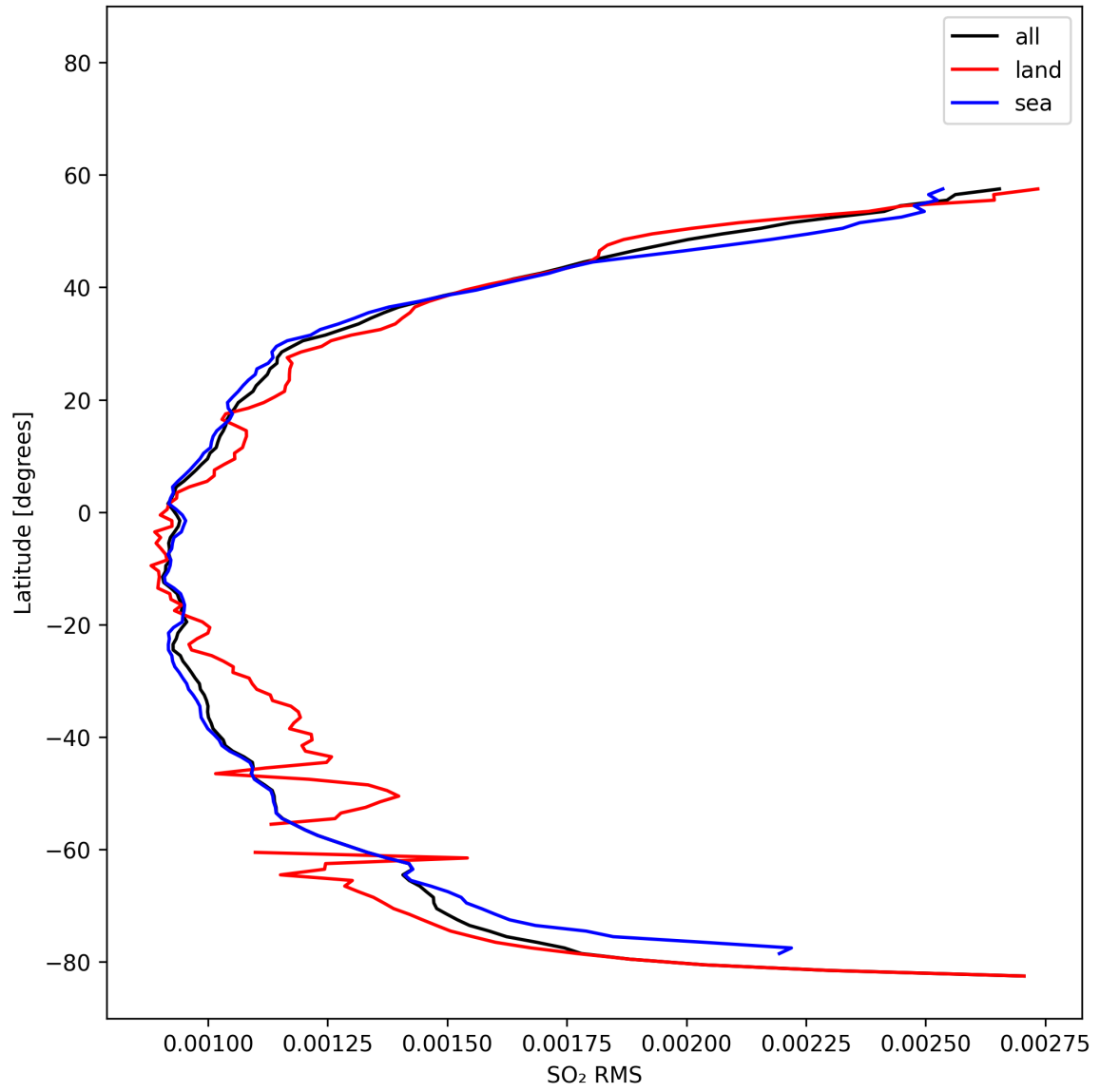


Figure 52: Zonal average of “SO₂ RMS” for 2025-02-15 to 2025-02-16.

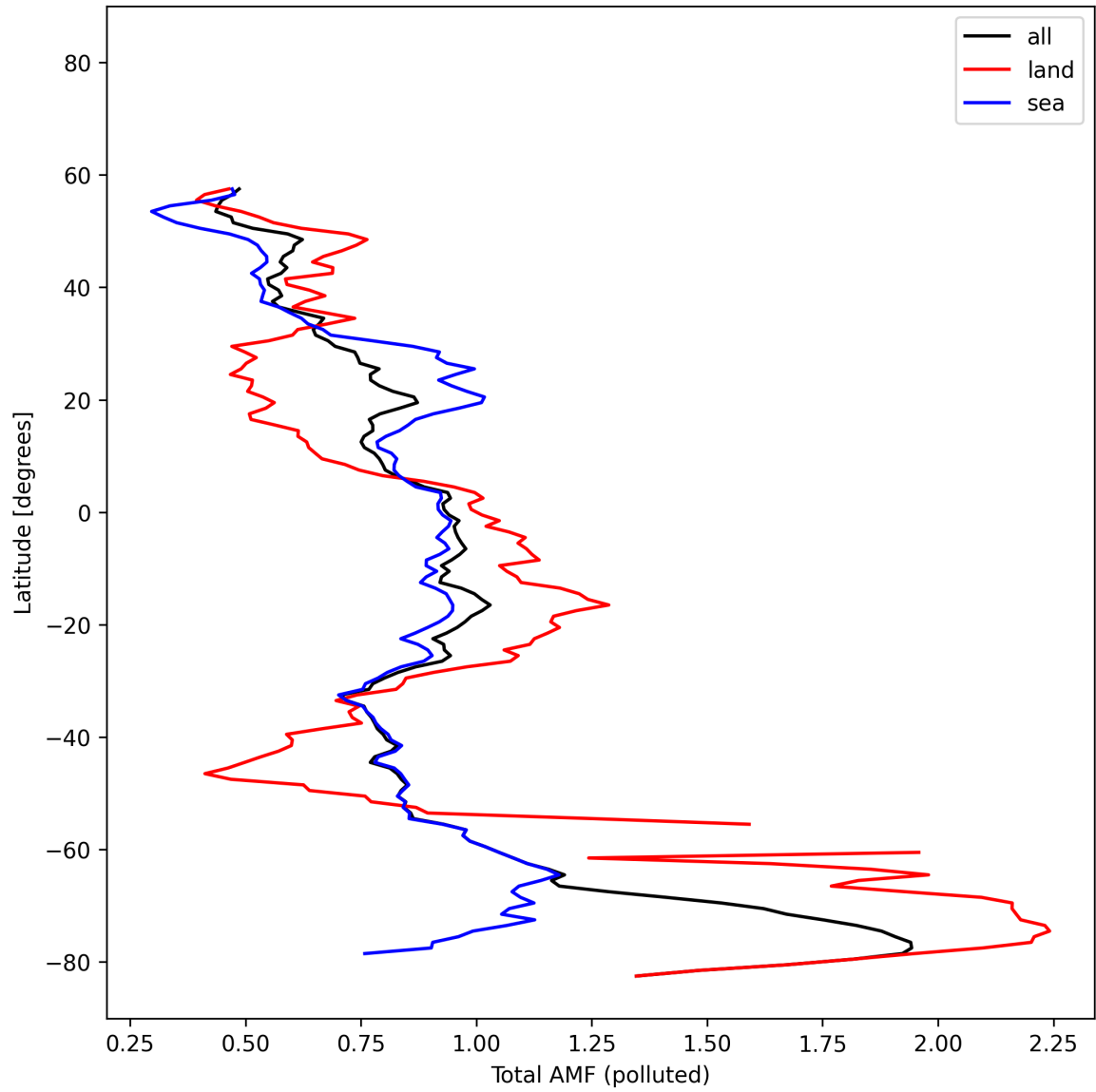


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-02-15 to 2025-02-16.

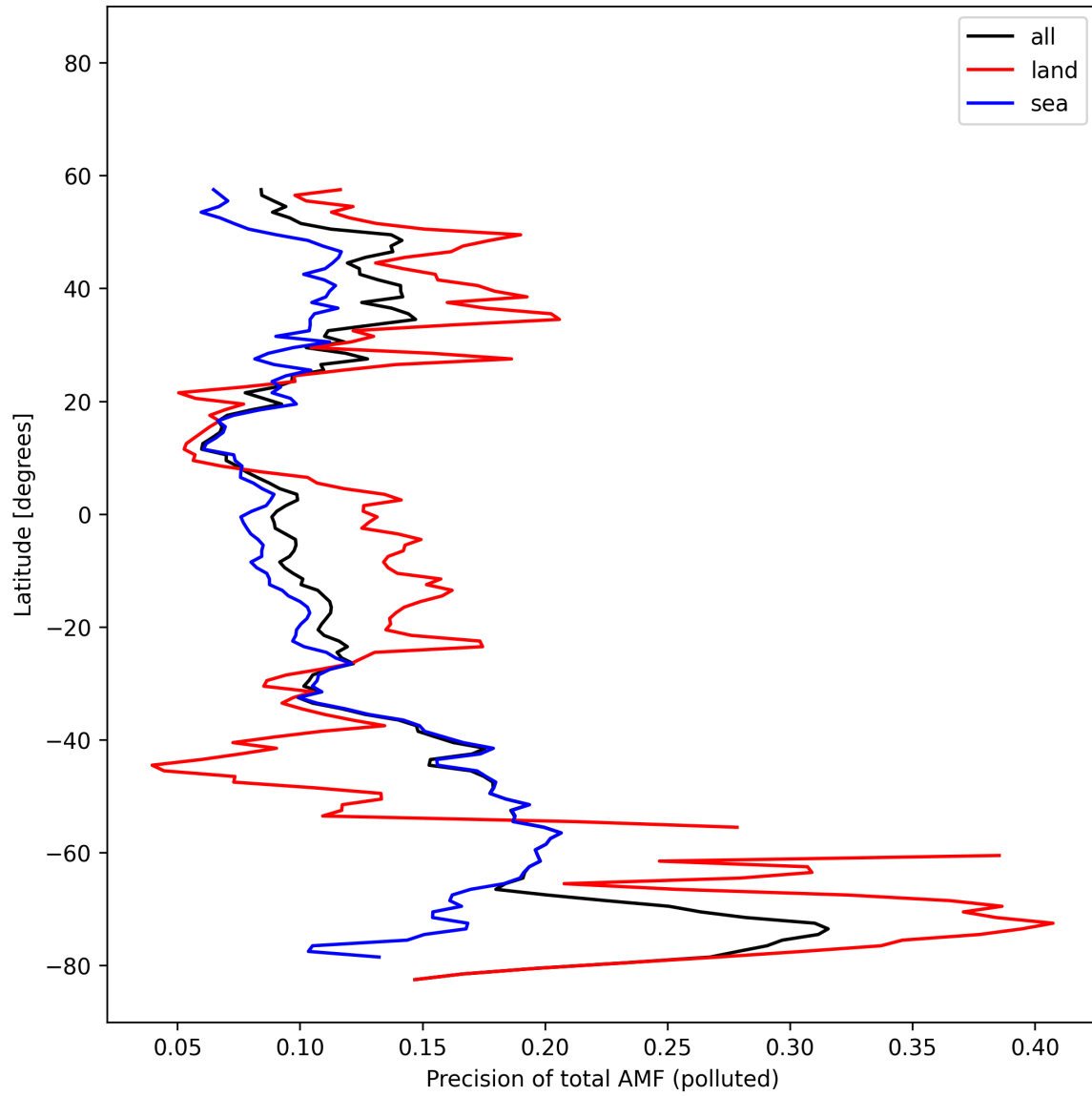


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-02-15 to 2025-02-16.

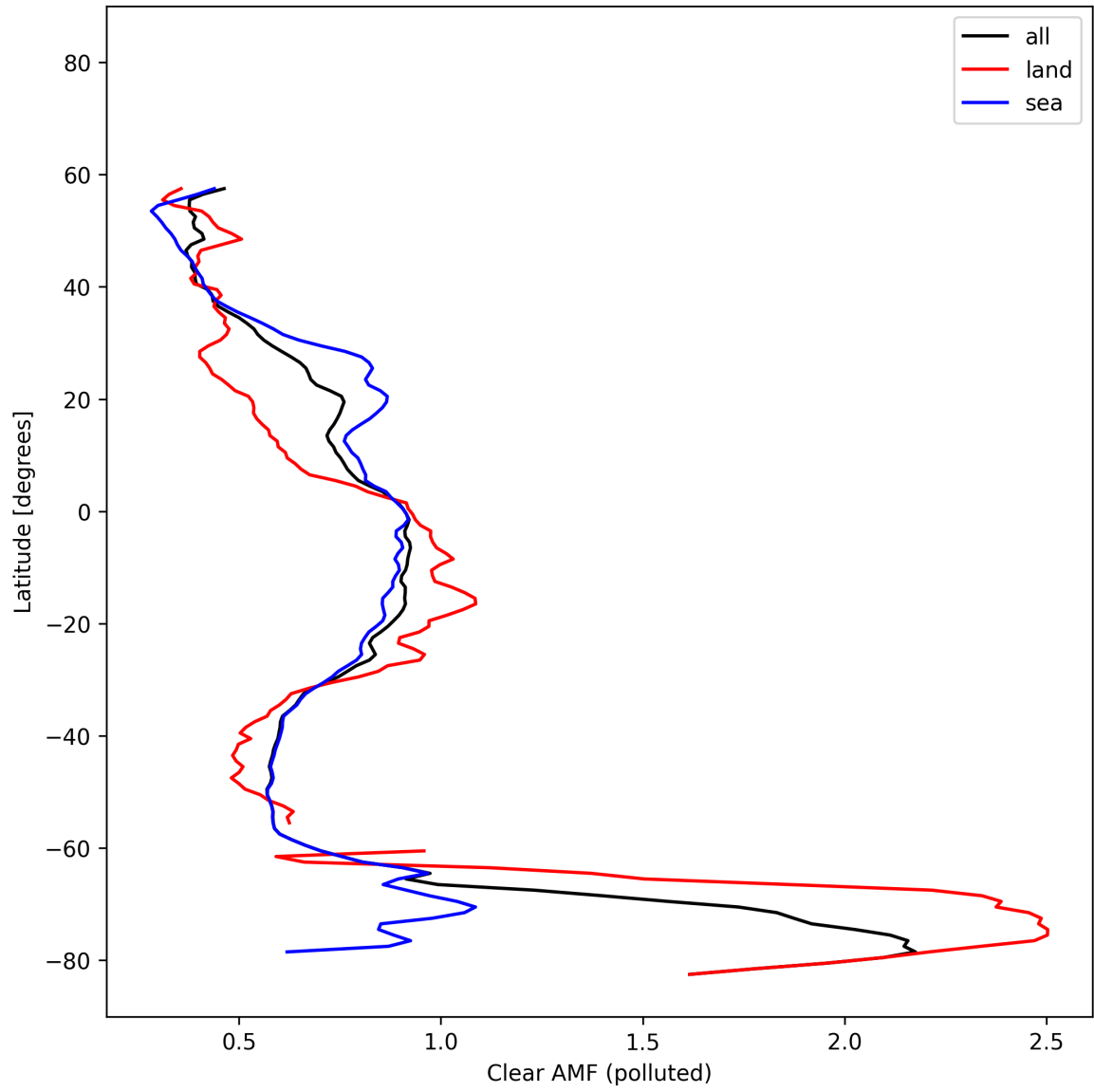


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-02-15 to 2025-02-16.

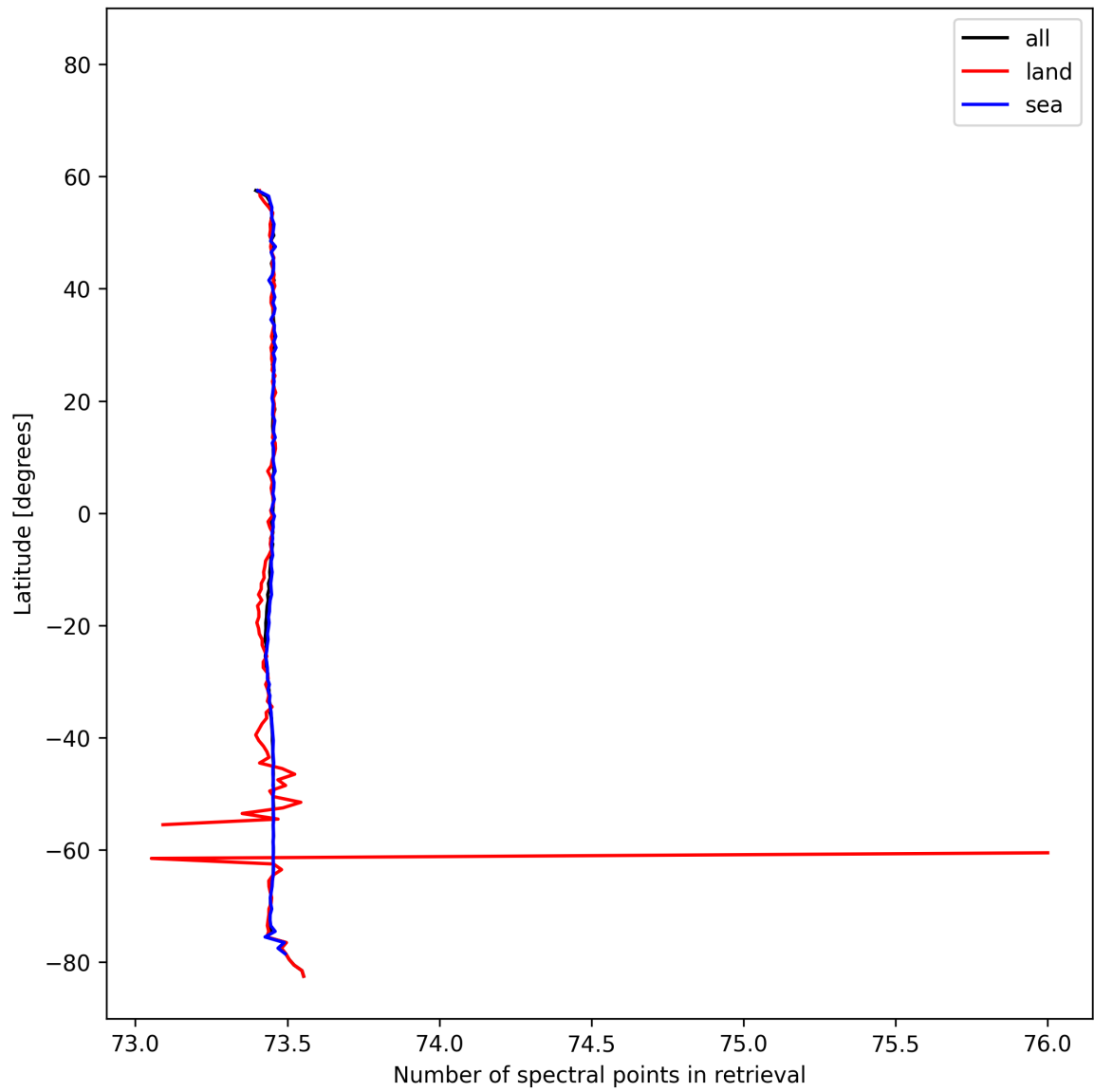


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-02-15 to 2025-02-16.

8 Histograms

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

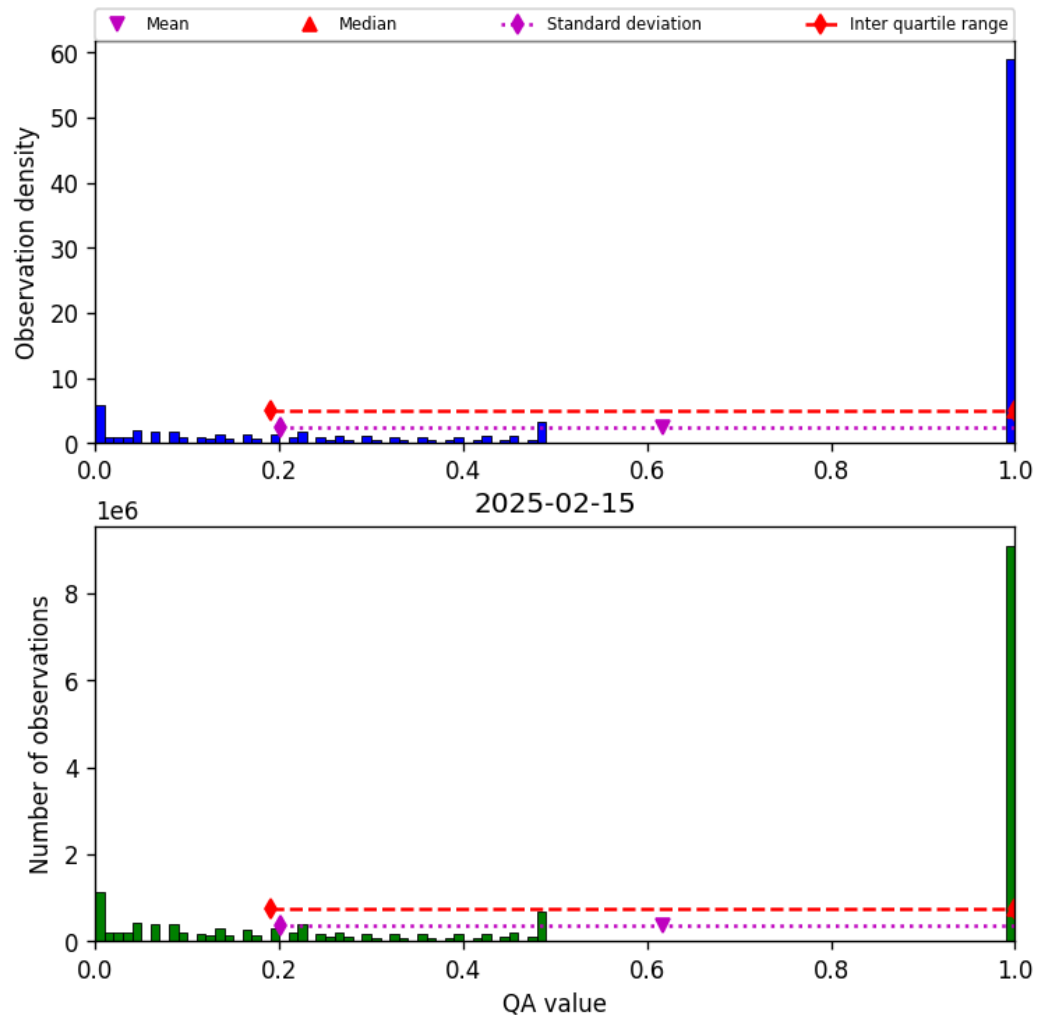


Figure 57: Histogram of “QA value” for 2025-02-15 to 2025-02-16

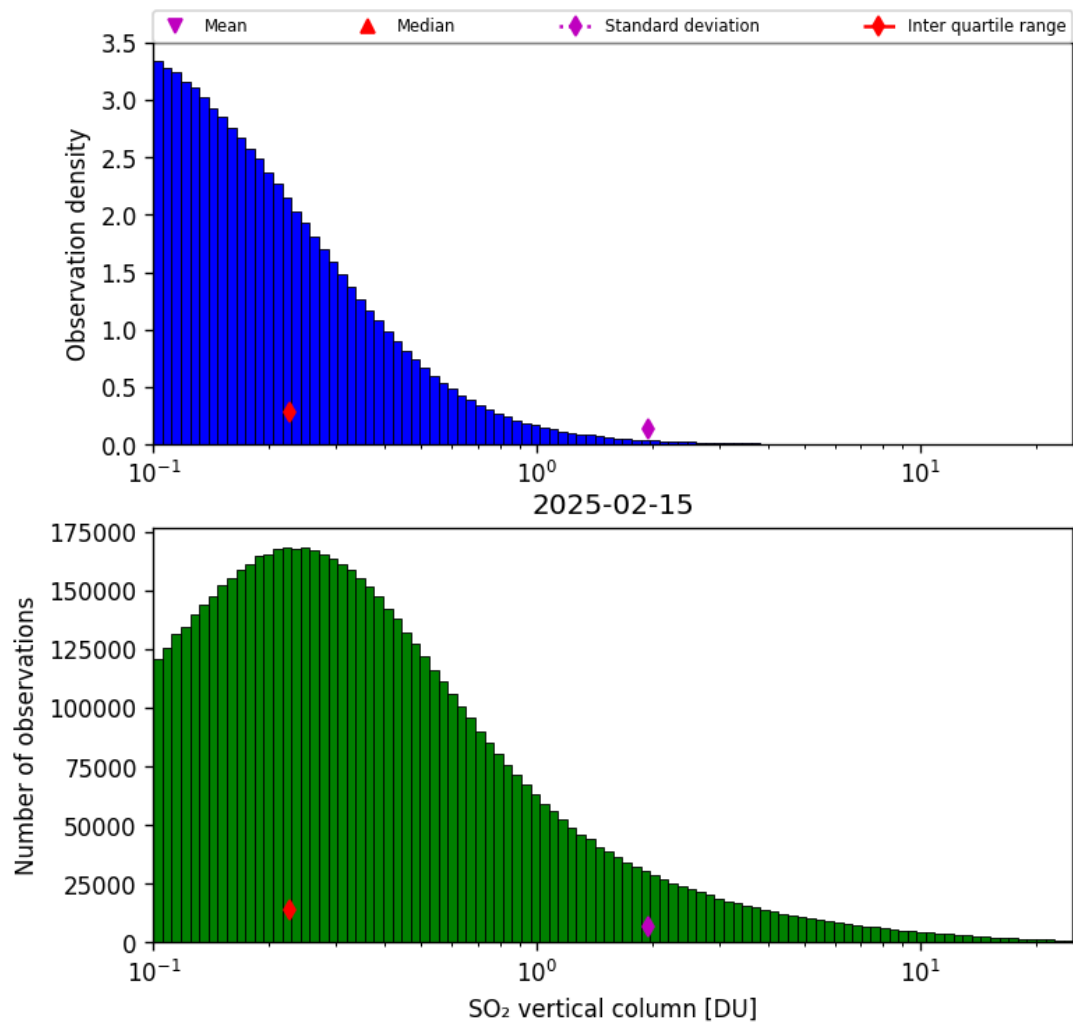


Figure 58: Histogram of “SO₂ vertical column” for 2025-02-15 to 2025-02-16

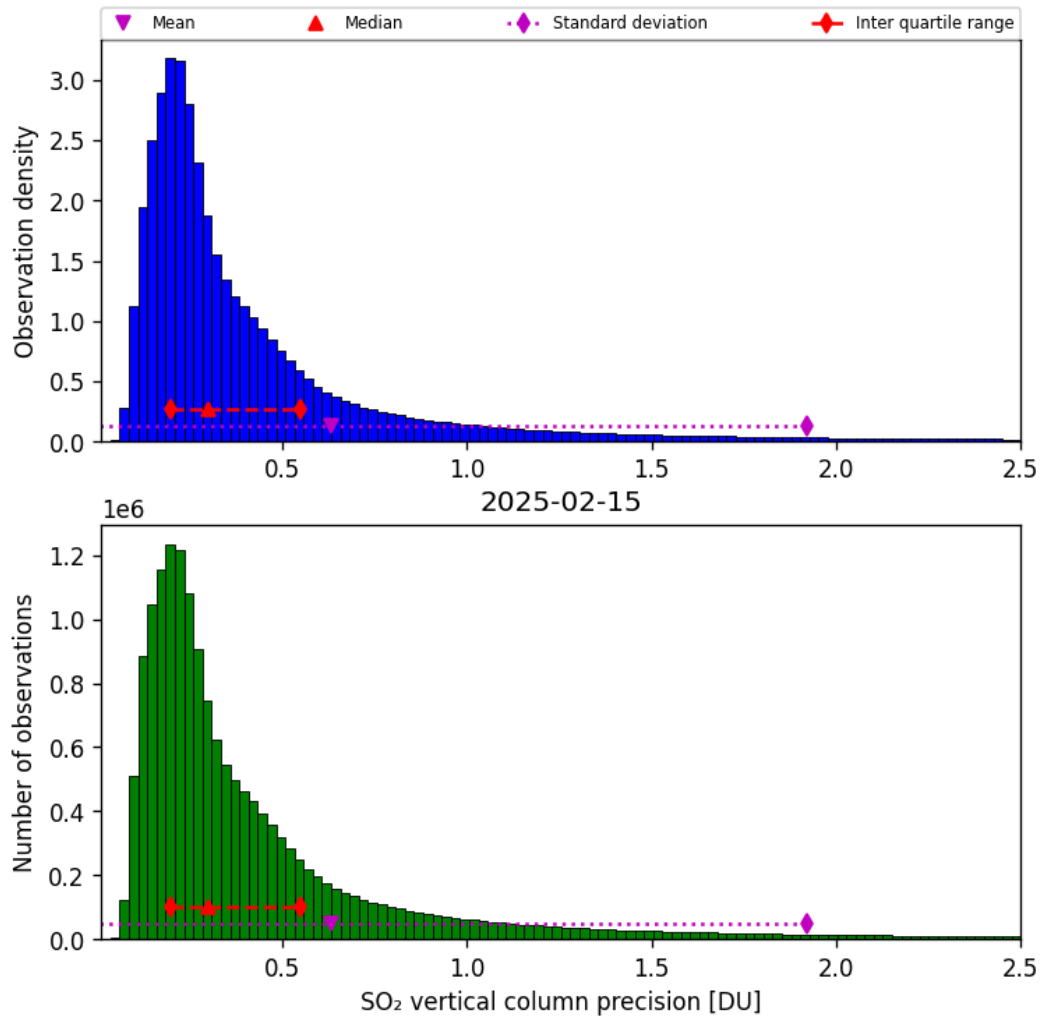


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-02-15 to 2025-02-16

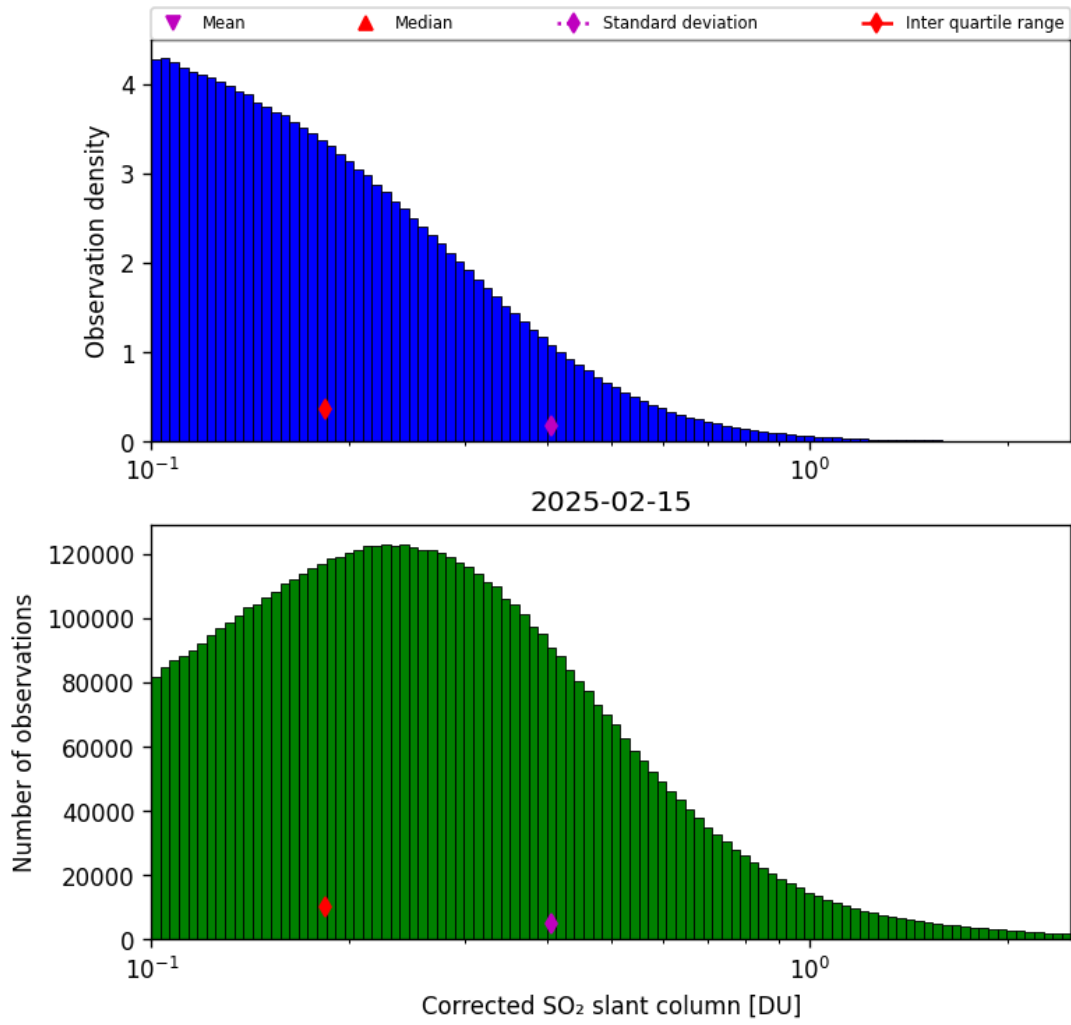


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-02-15 to 2025-02-16

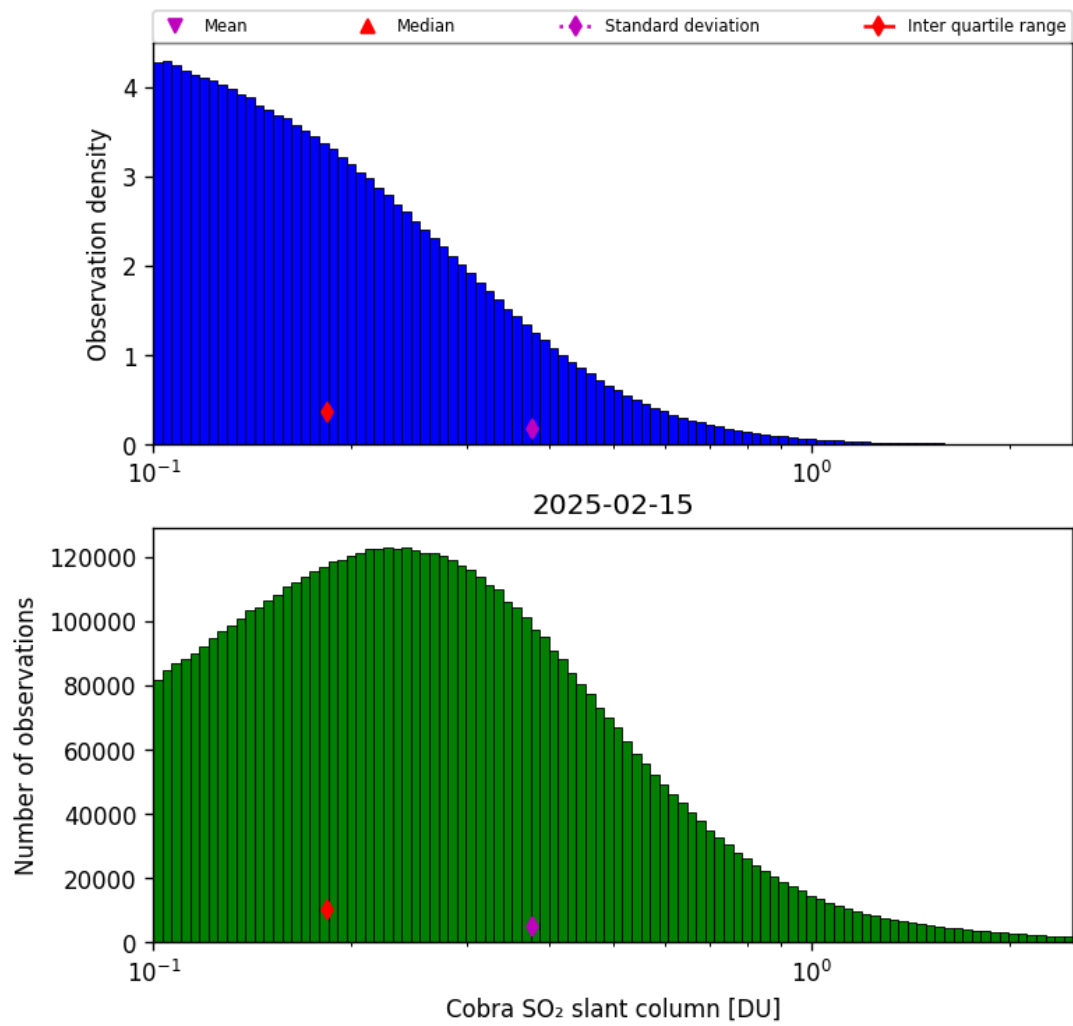


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-02-15 to 2025-02-16

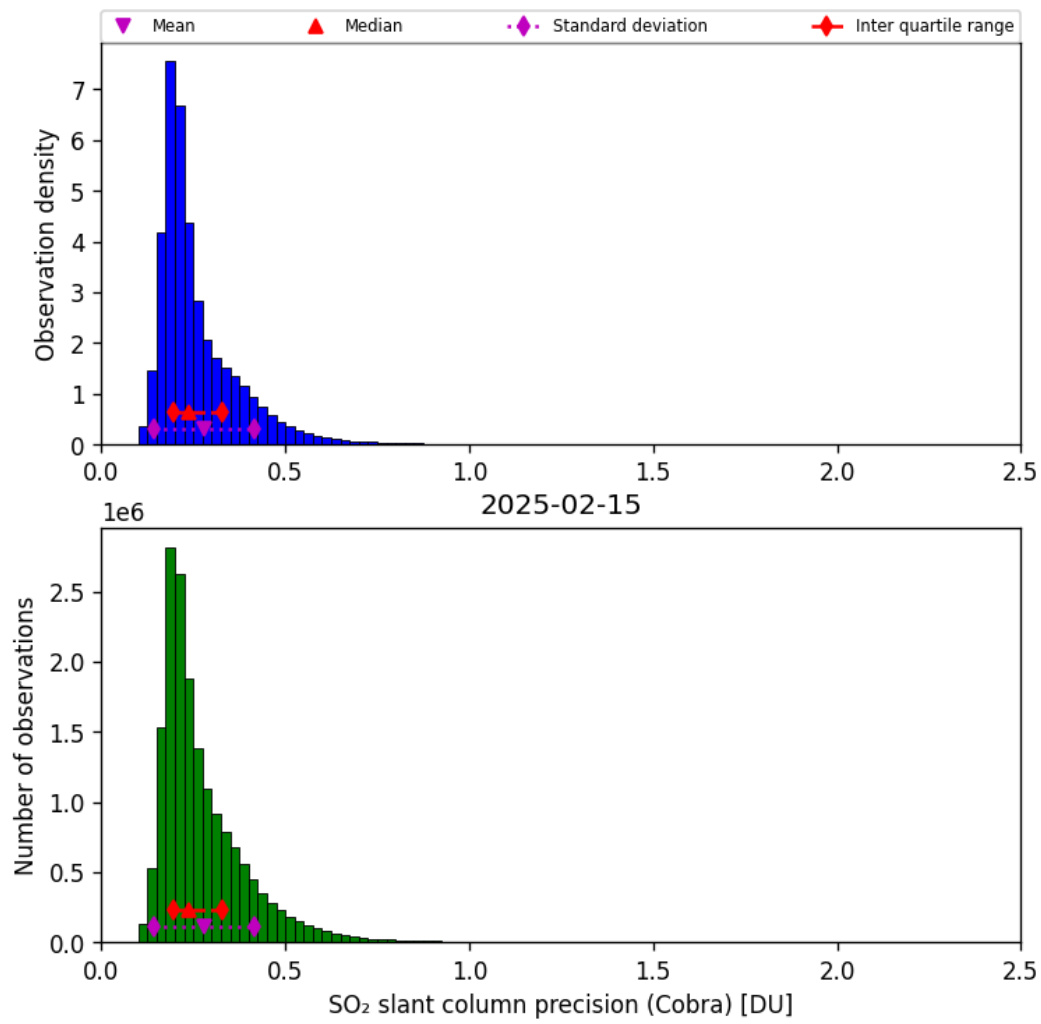


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-02-15 to 2025-02-16

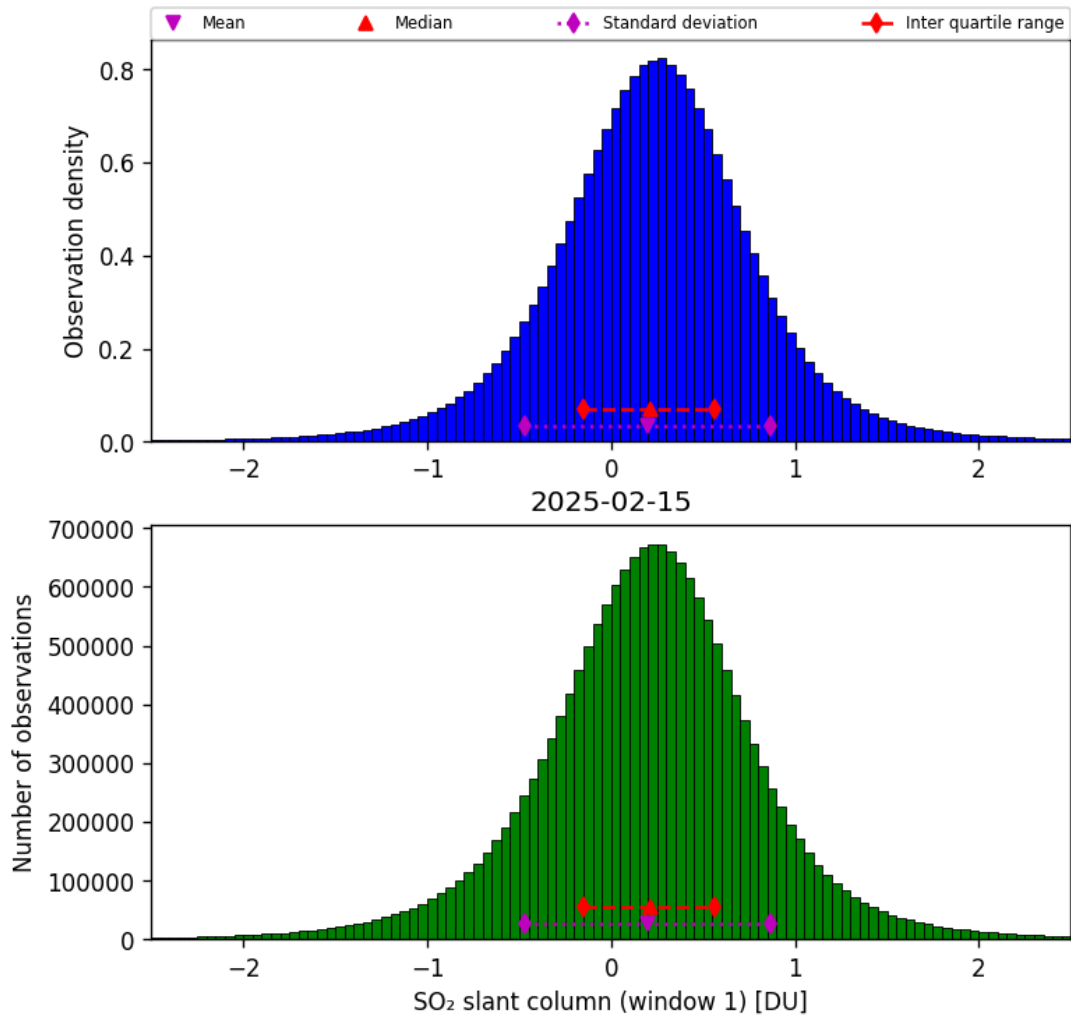


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-02-15 to 2025-02-16

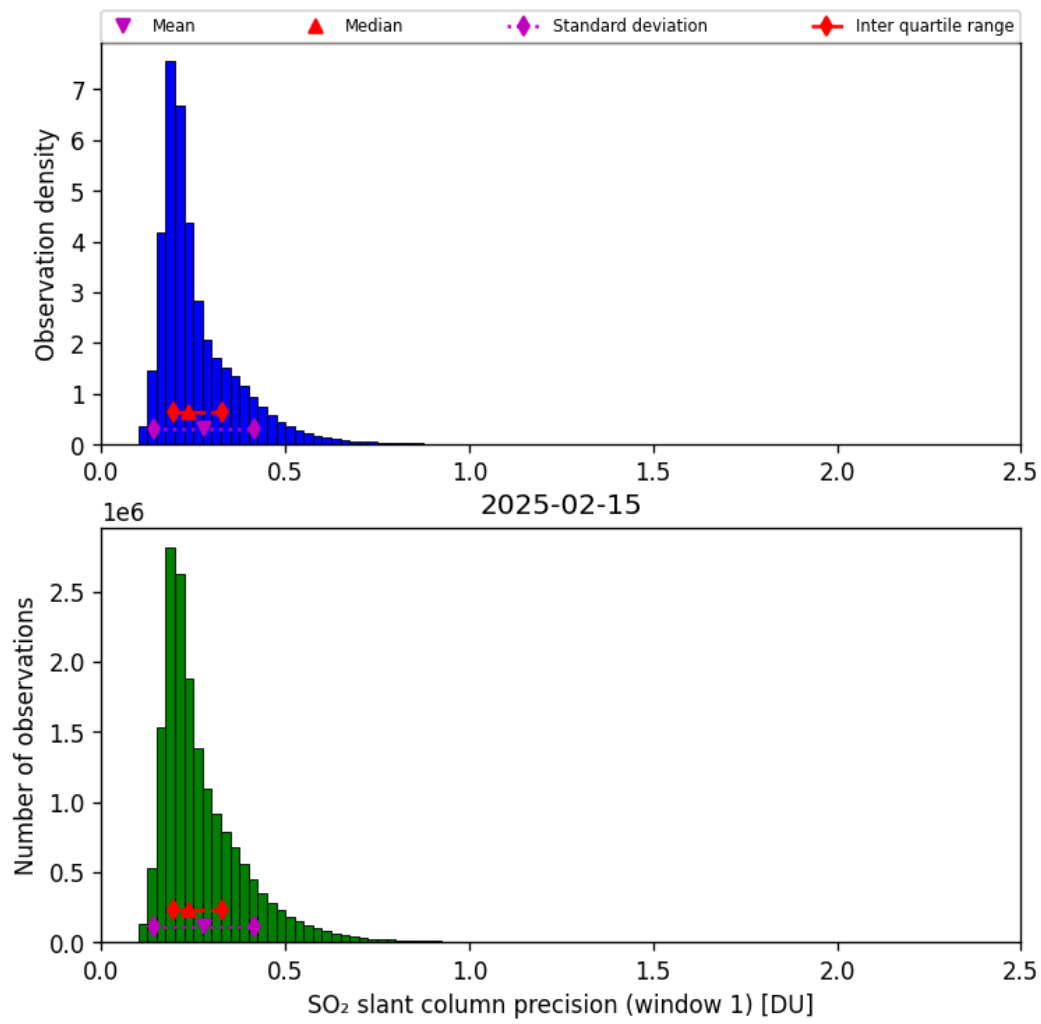


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-02-15 to 2025-02-16

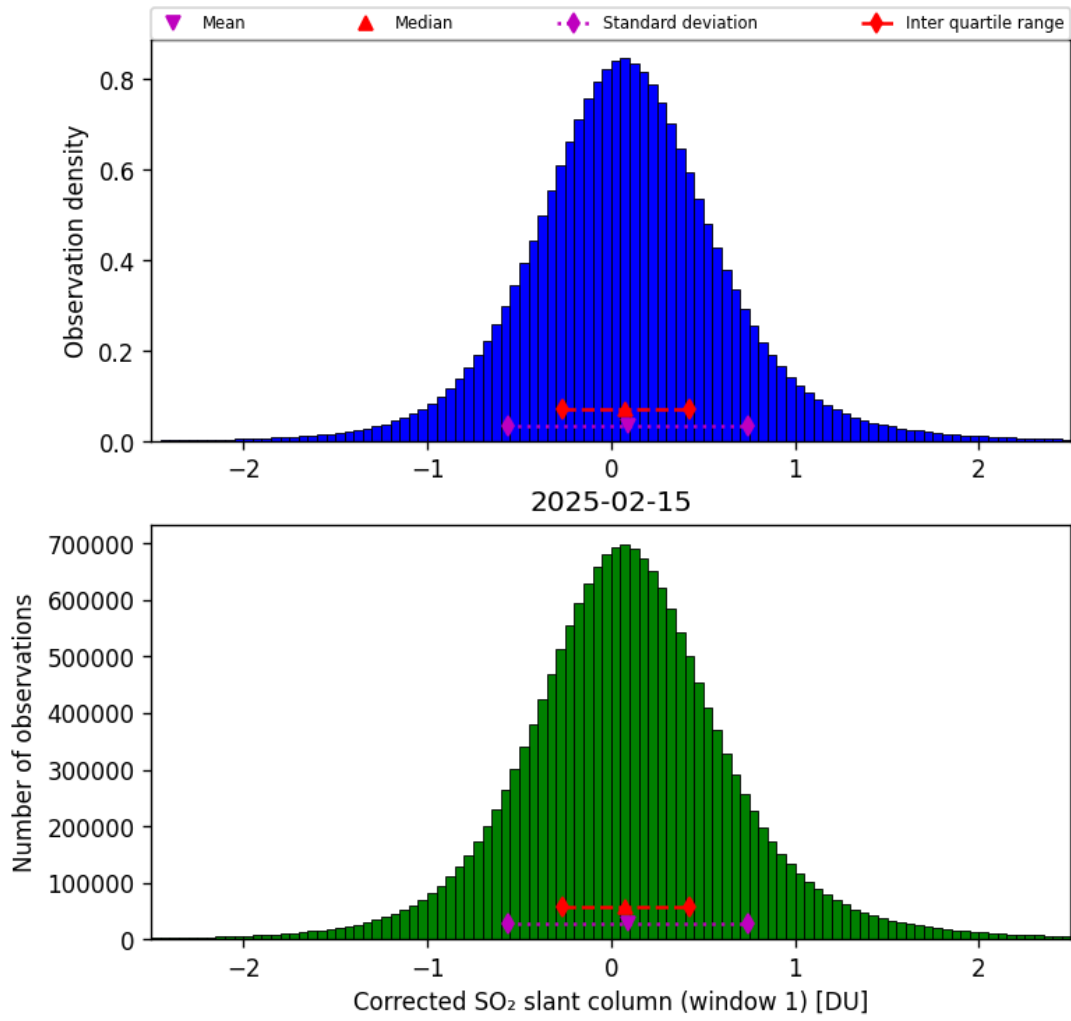


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-02-15 to 2025-02-16

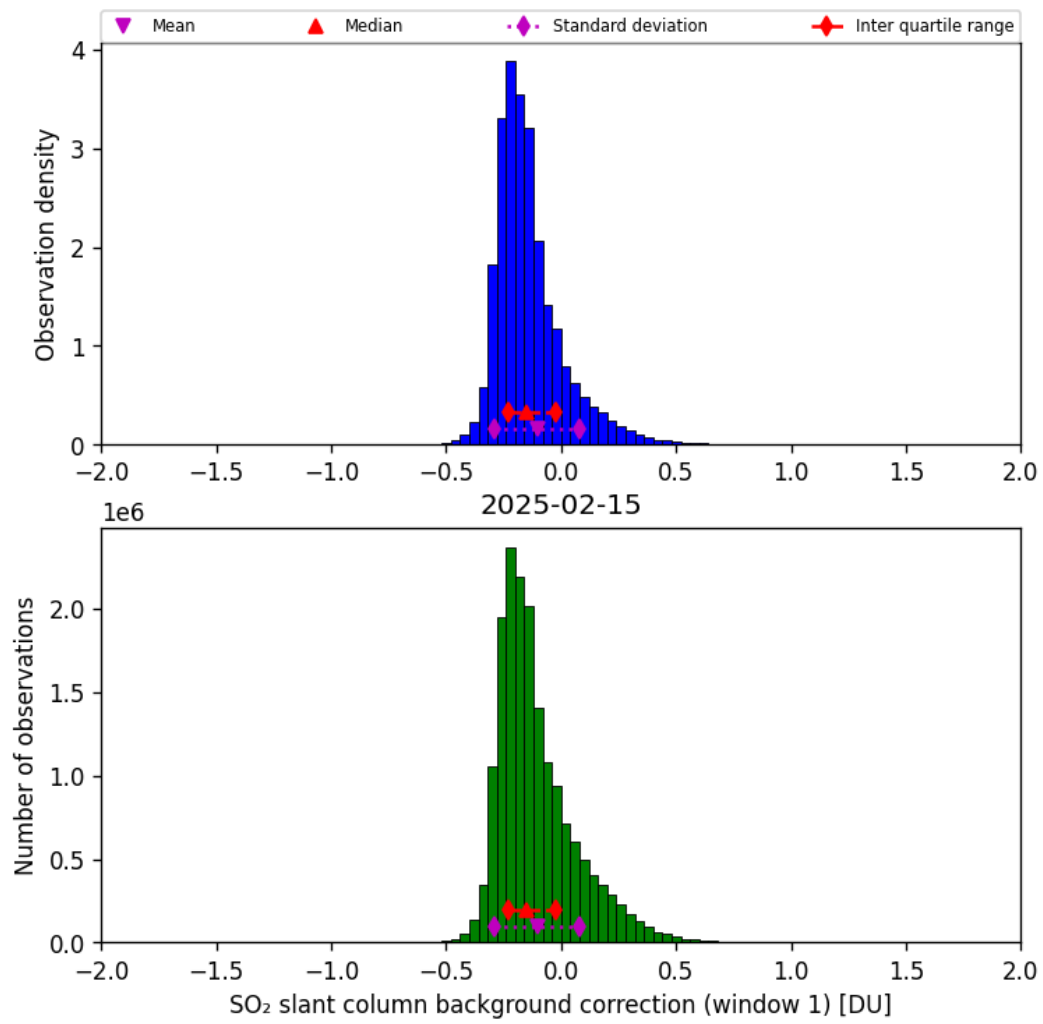


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-02-15 to 2025-02-16

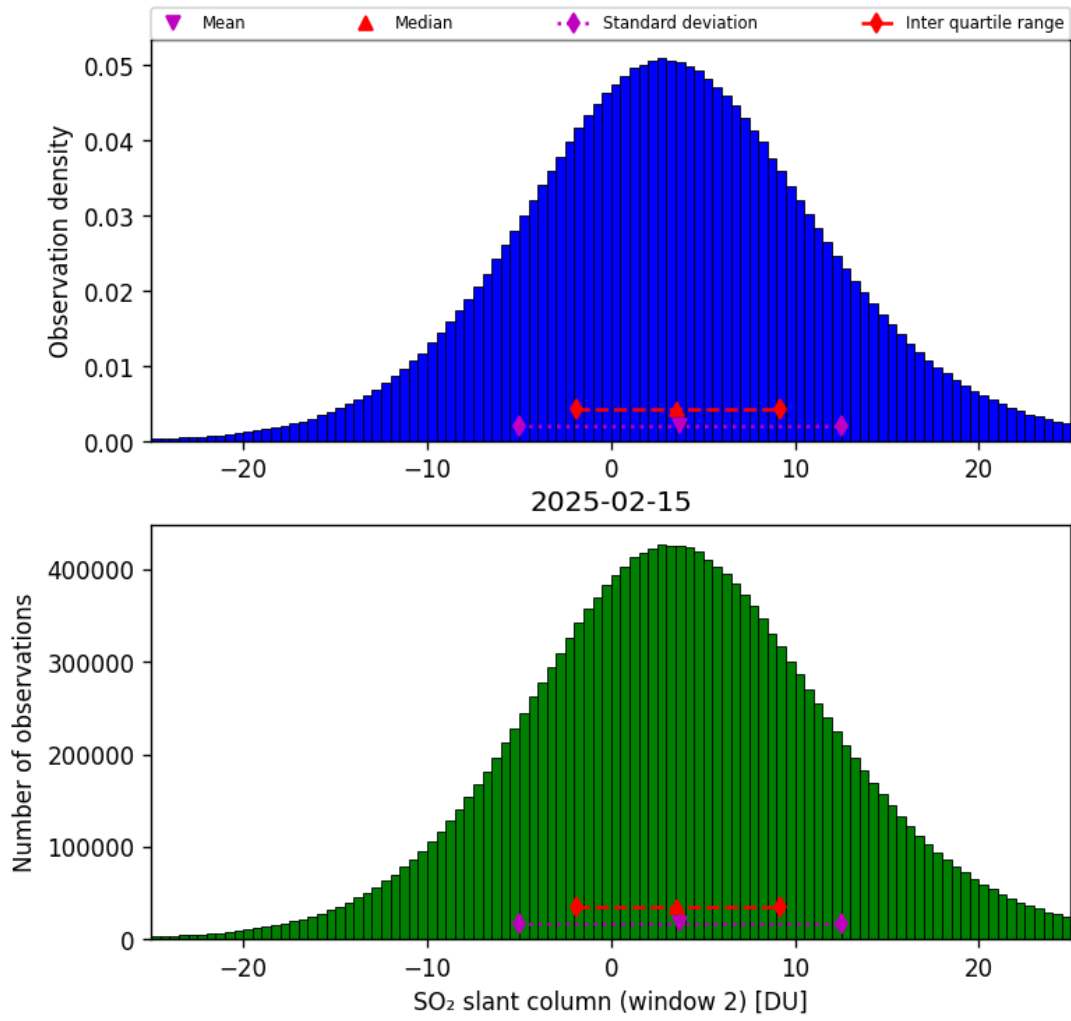


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-02-15 to 2025-02-16

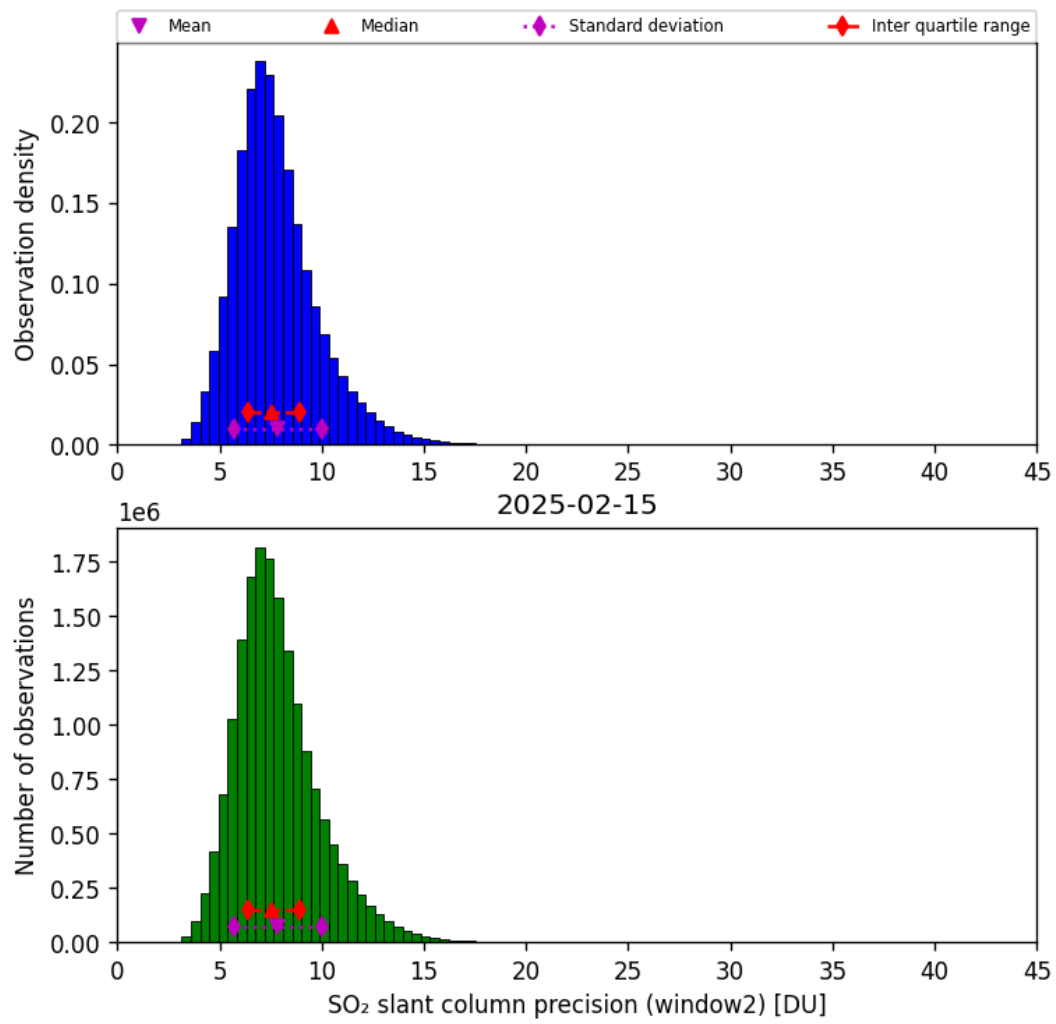


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-02-15 to 2025-02-16

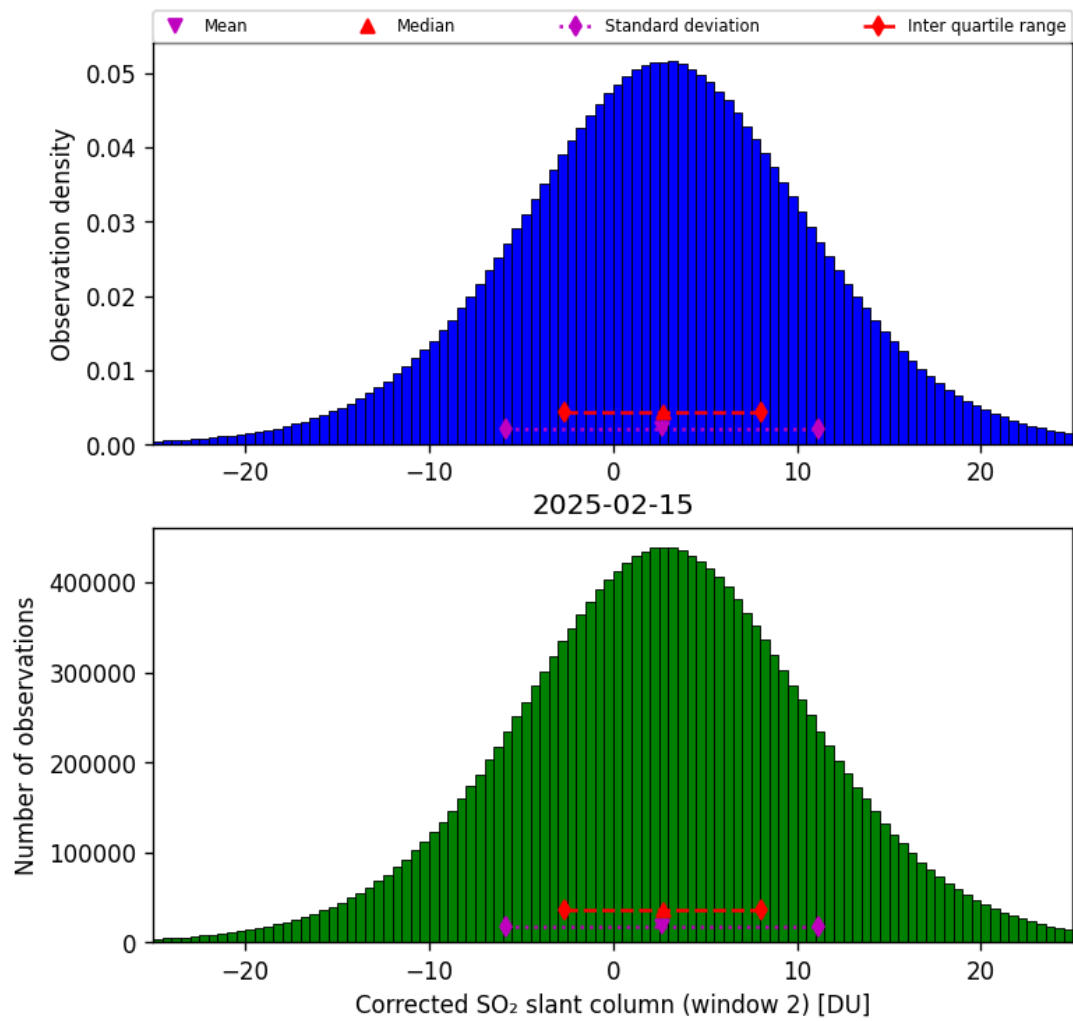


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-02-15 to 2025-02-16

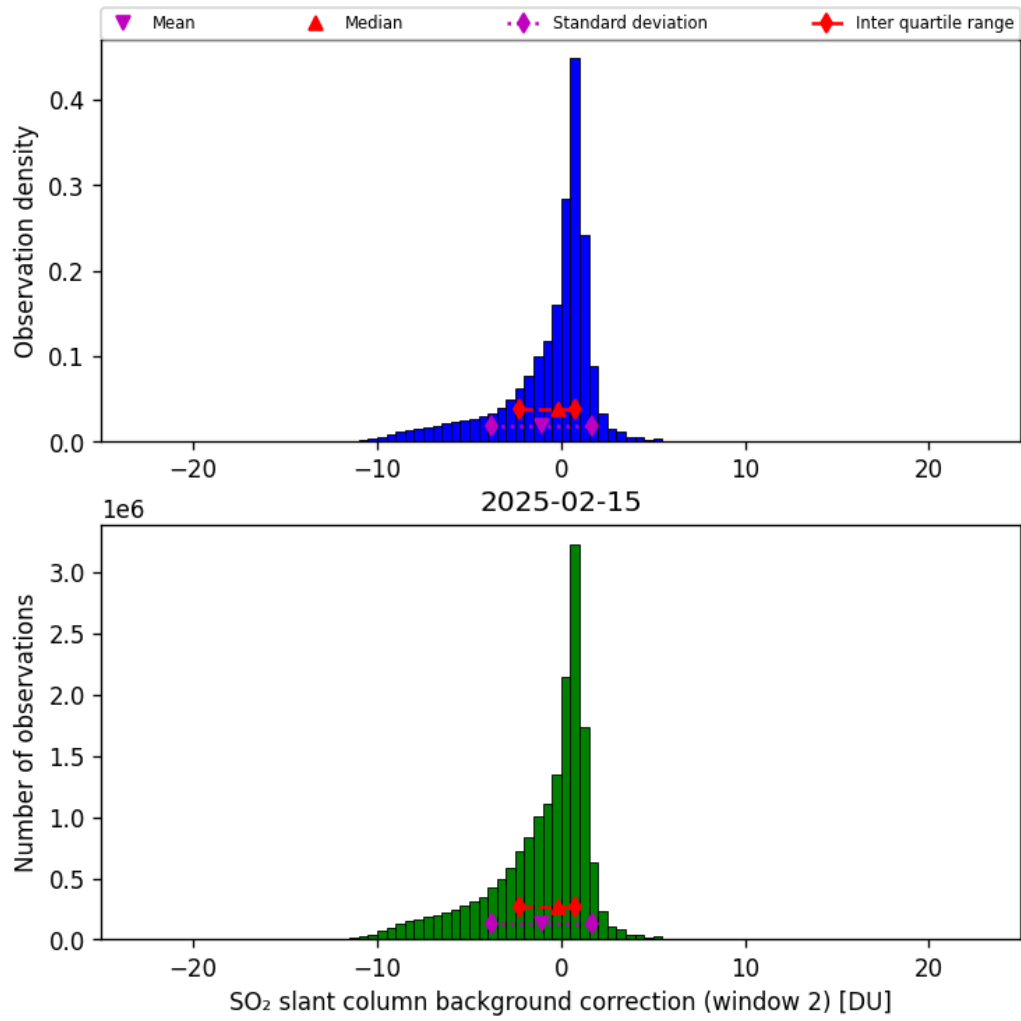


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-02-15 to 2025-02-16

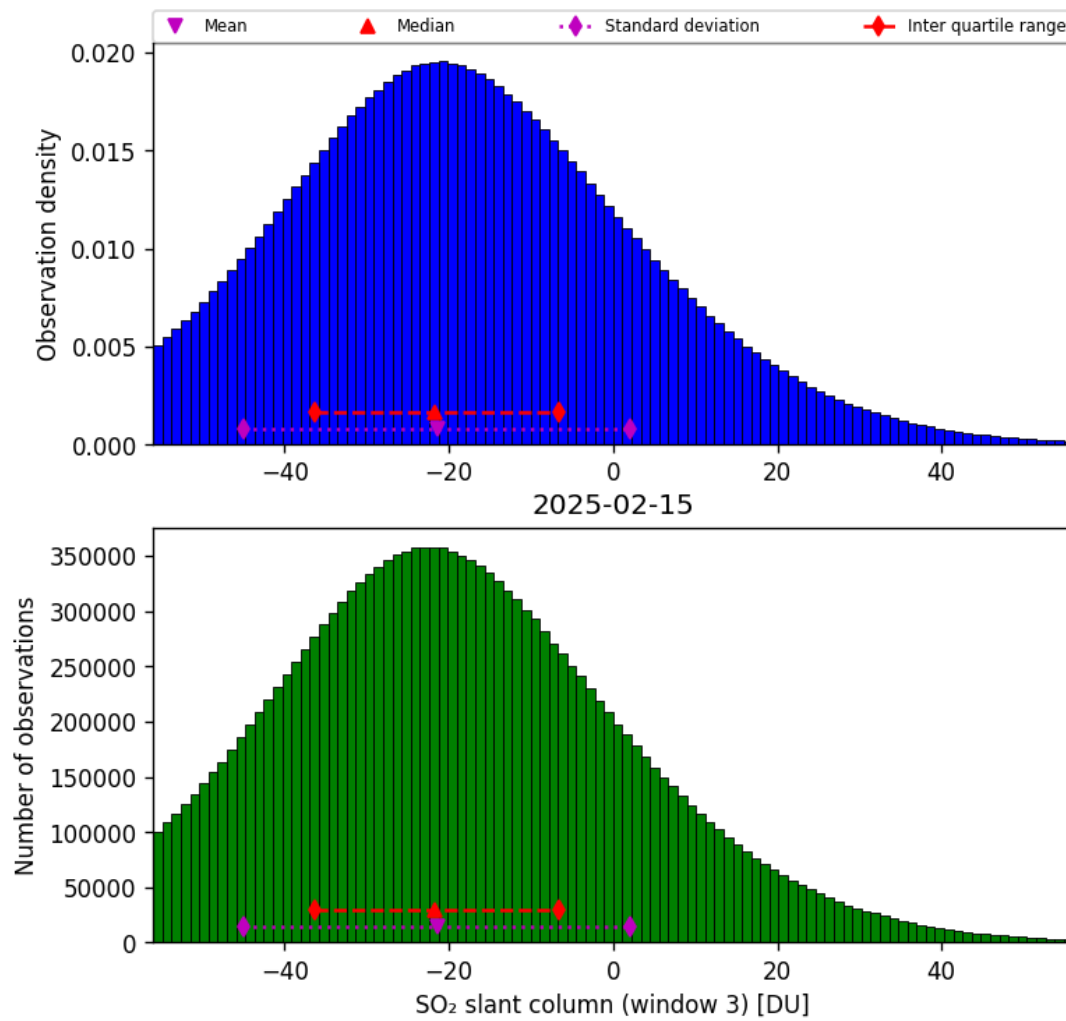


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-02-15 to 2025-02-16

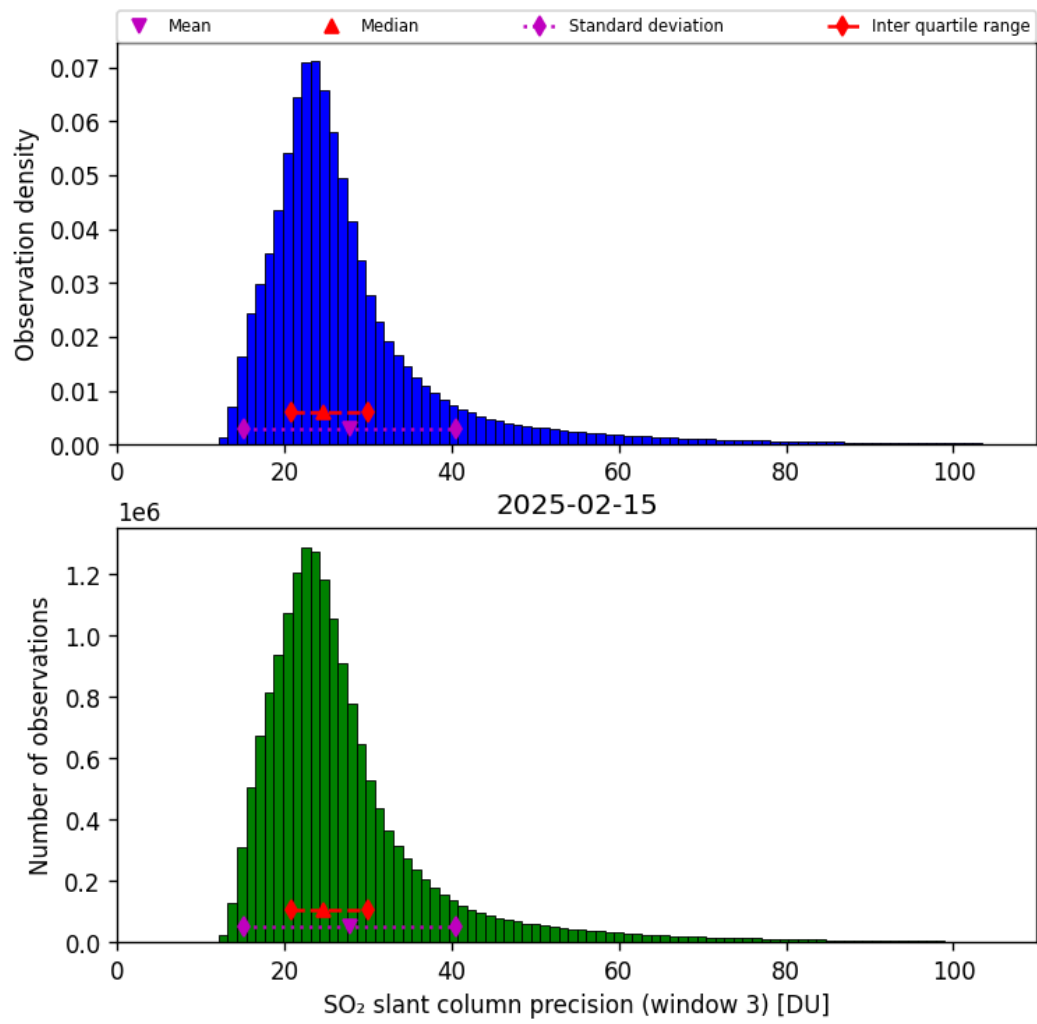


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-02-15 to 2025-02-16

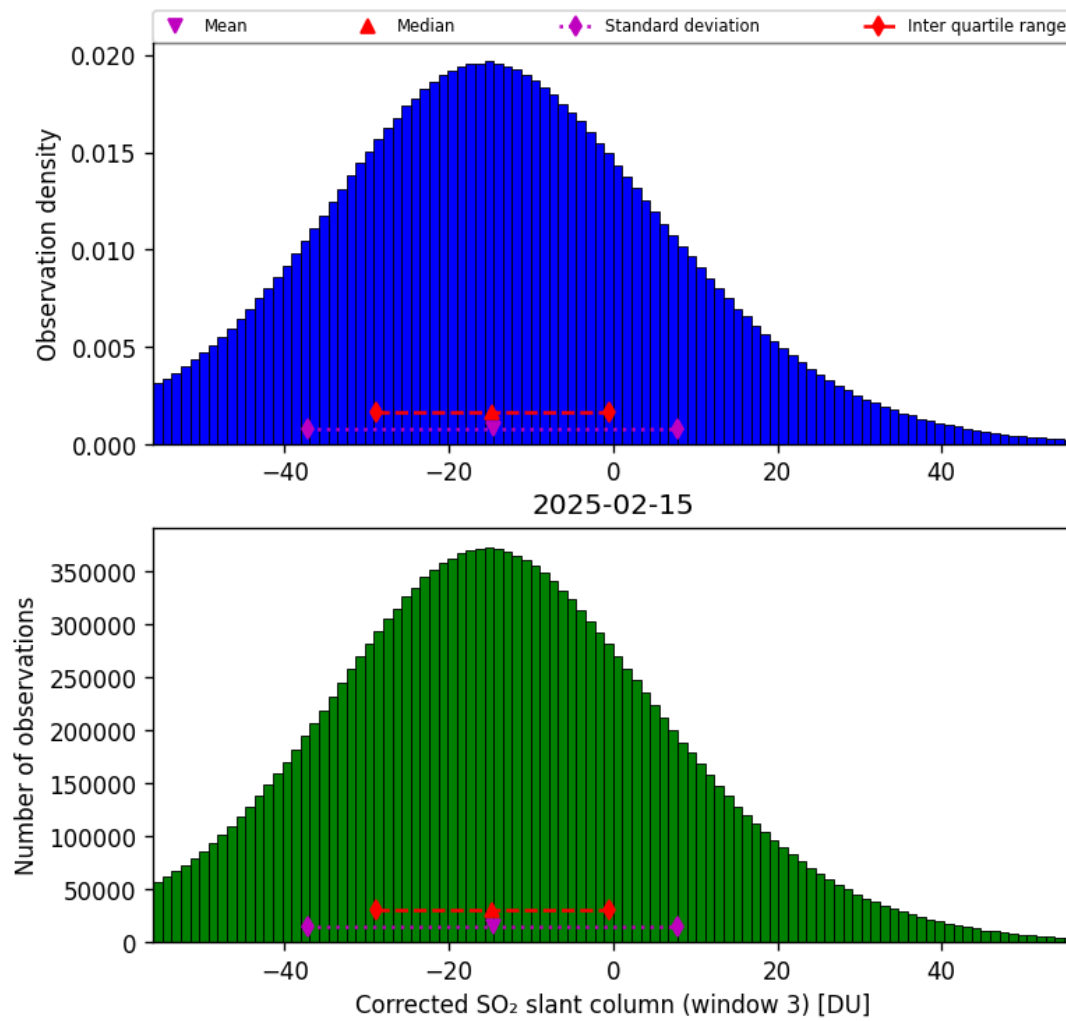


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-02-15 to 2025-02-16

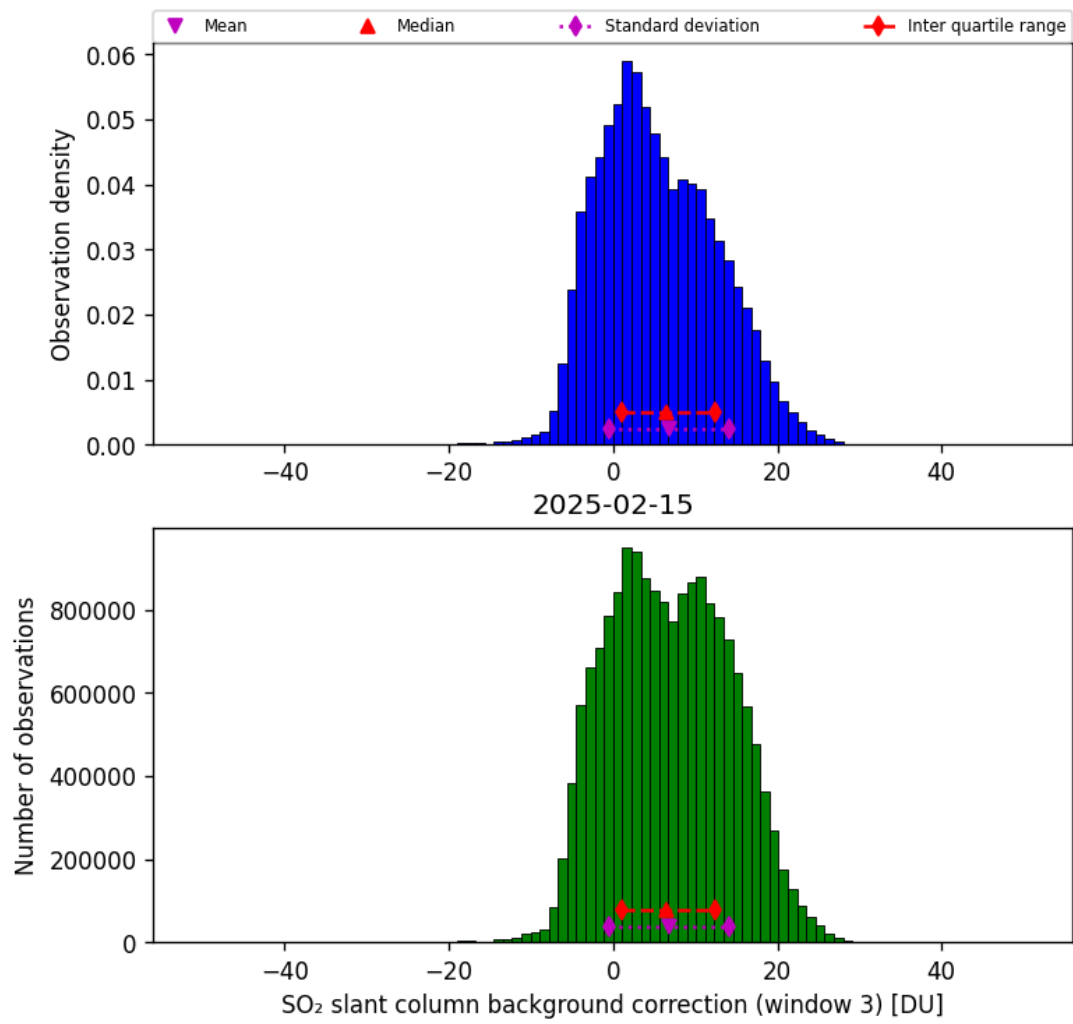


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-02-15 to 2025-02-16

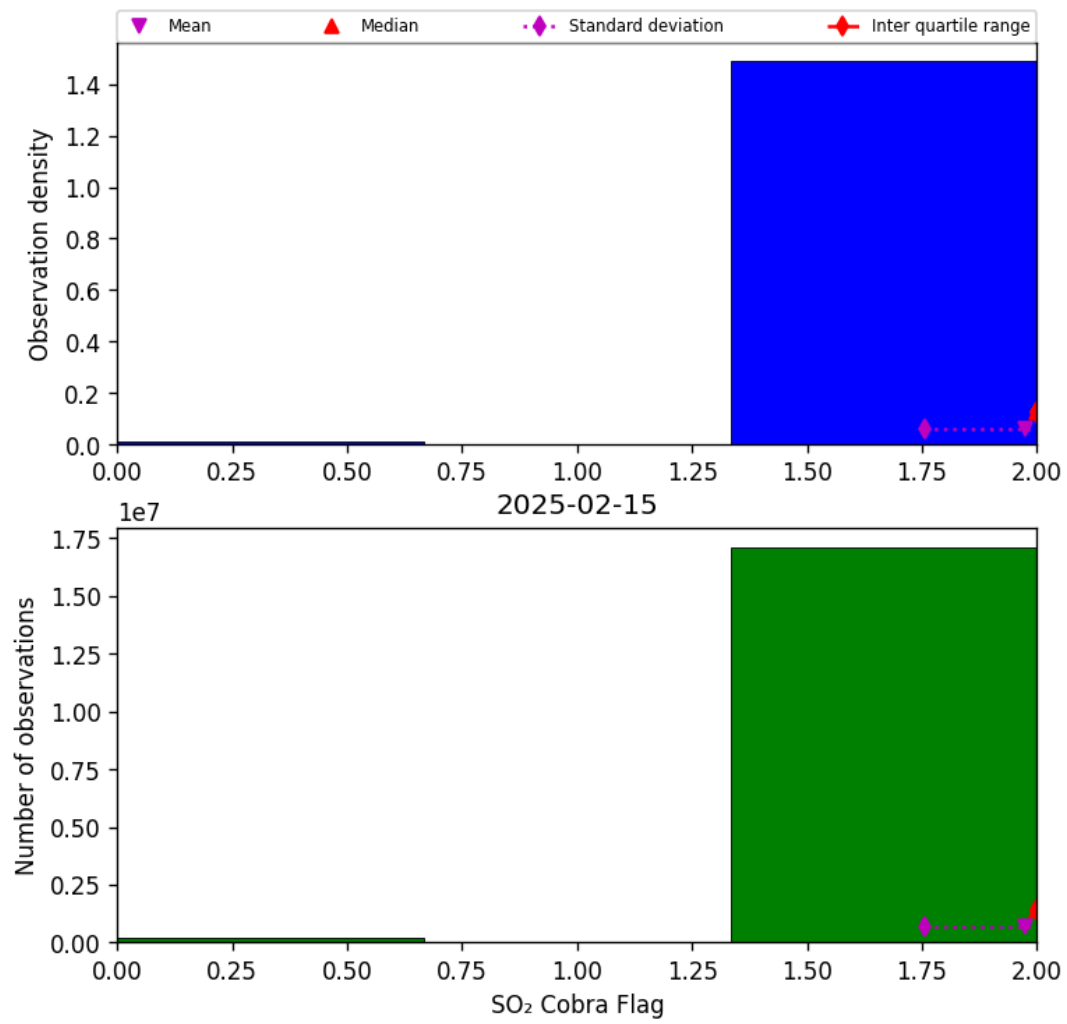


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-02-15 to 2025-02-16

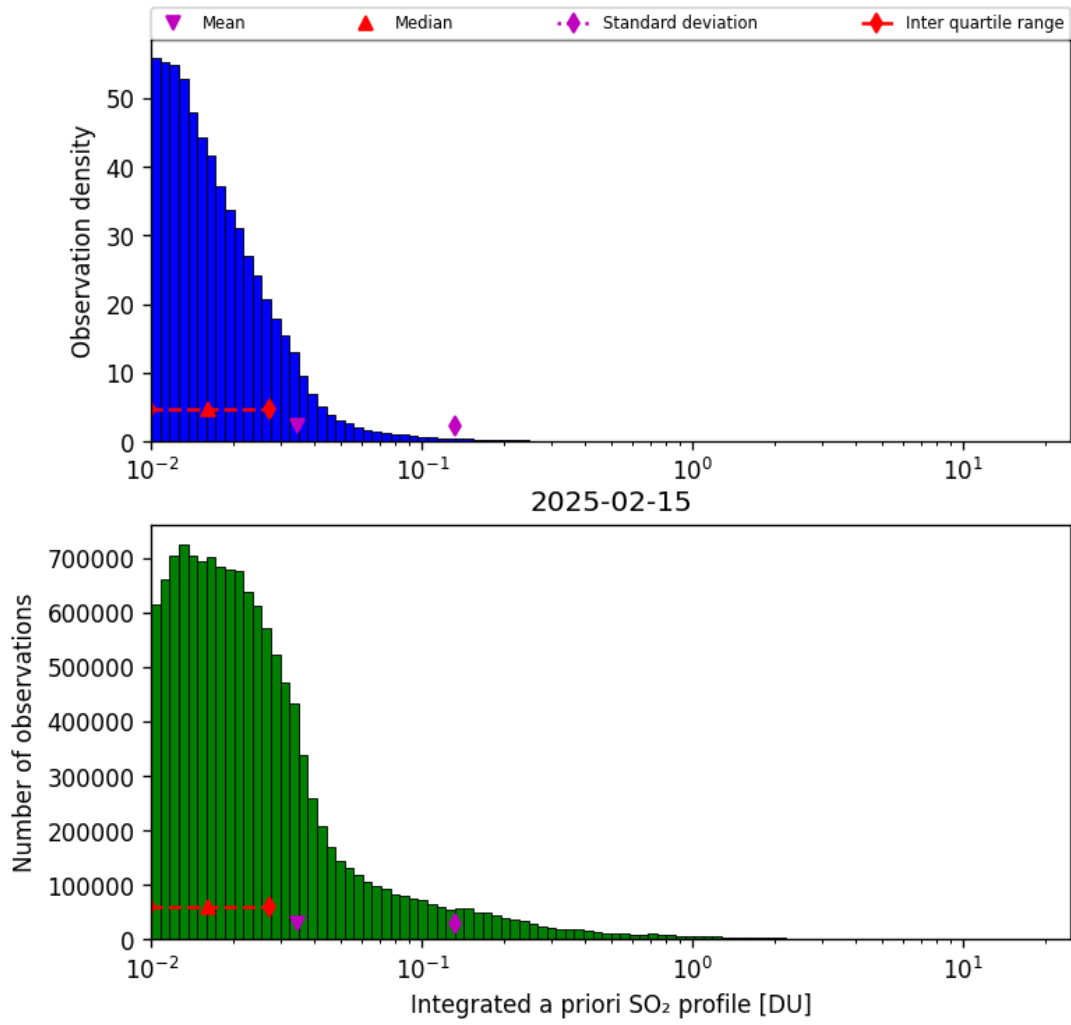


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-02-15 to 2025-02-16

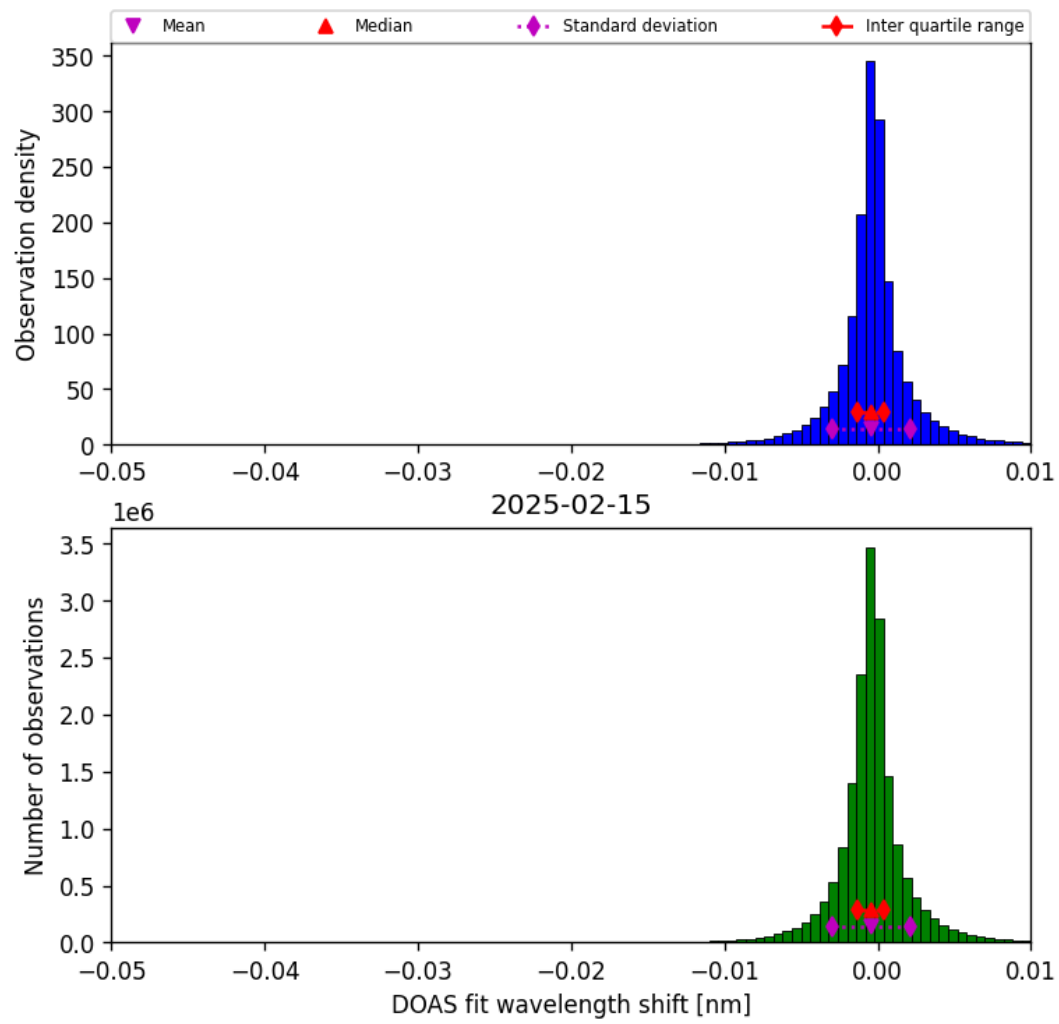


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-02-15 to 2025-02-16

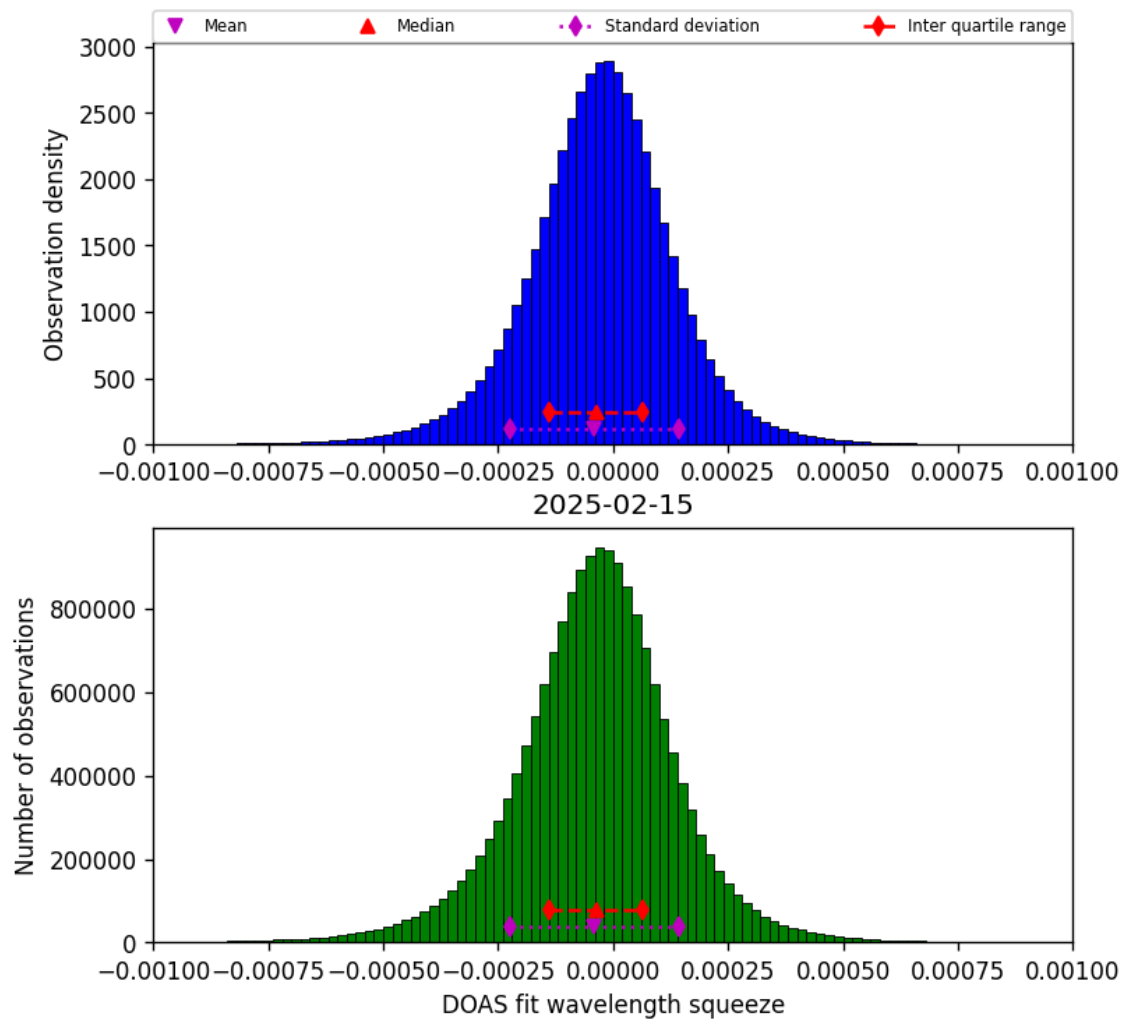


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-02-15 to 2025-02-16

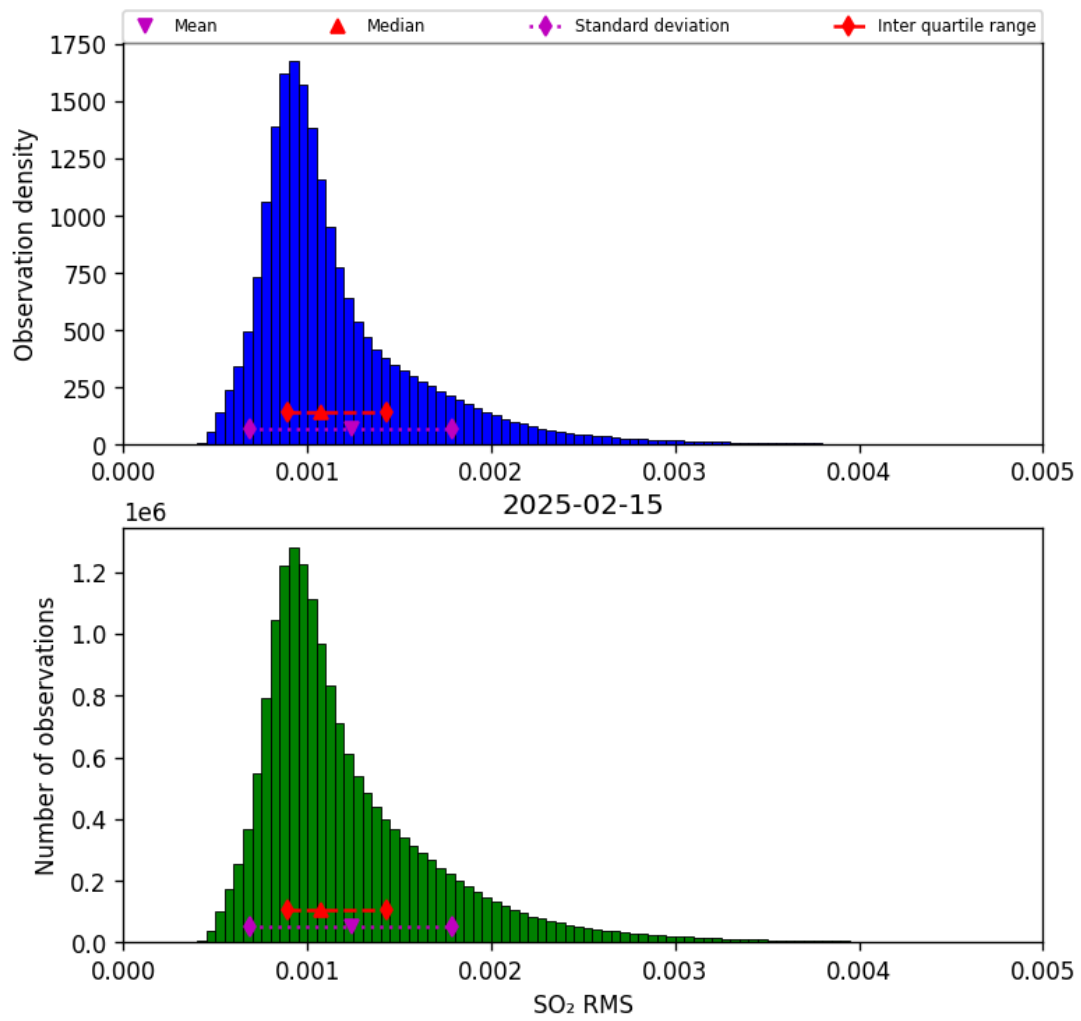


Figure 79: Histogram of “SO₂ RMS” for 2025-02-15 to 2025-02-16

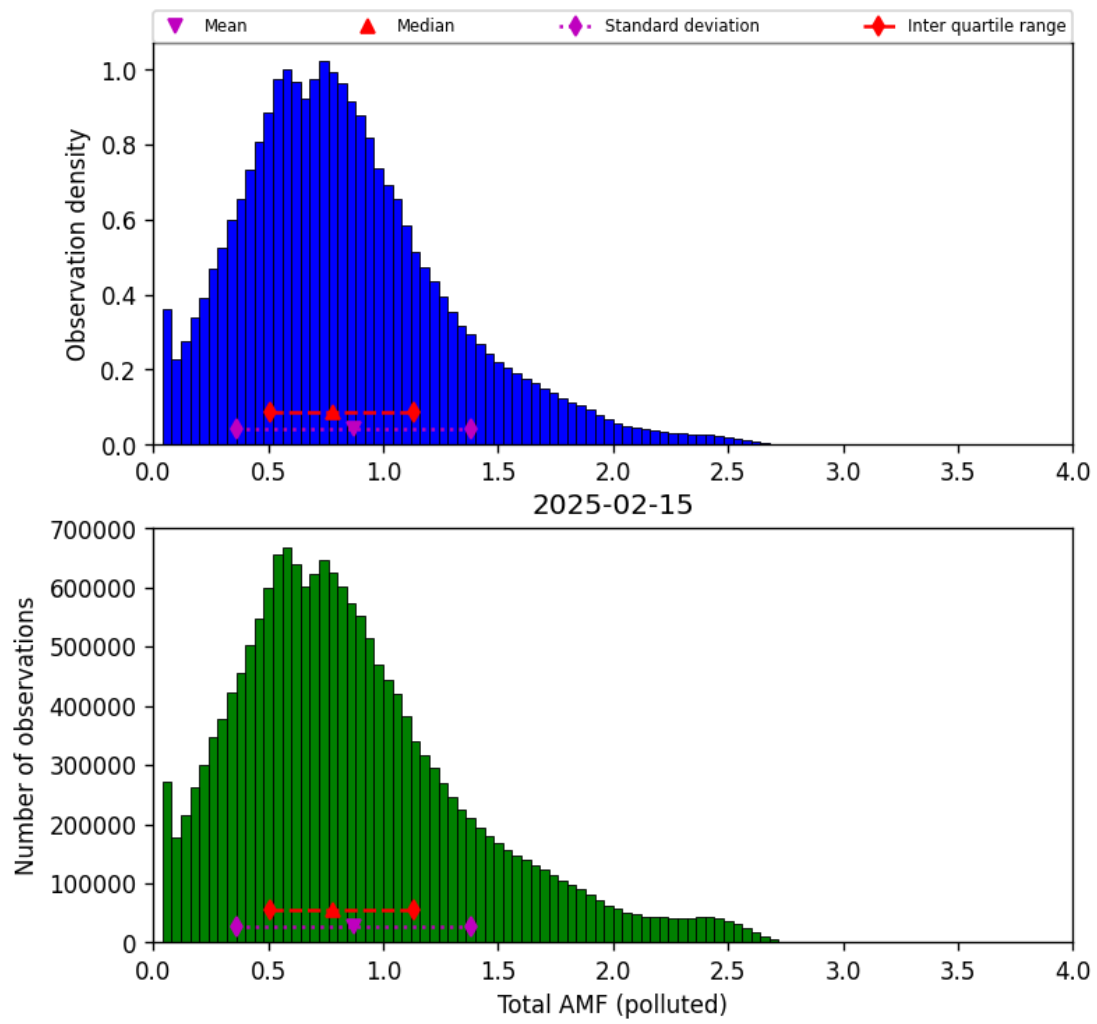


Figure 80: Histogram of “Total AMF (polluted)” for 2025-02-15 to 2025-02-16

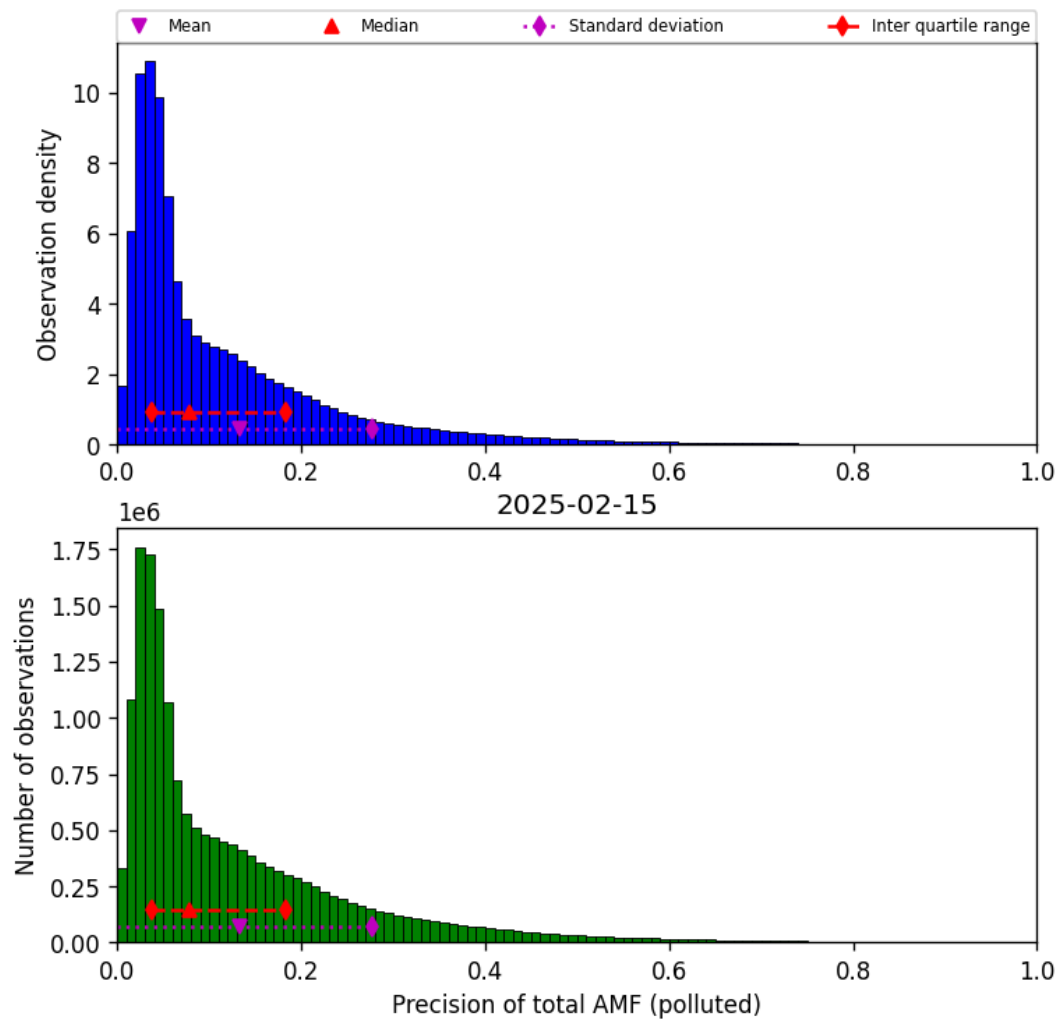


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-02-15 to 2025-02-16

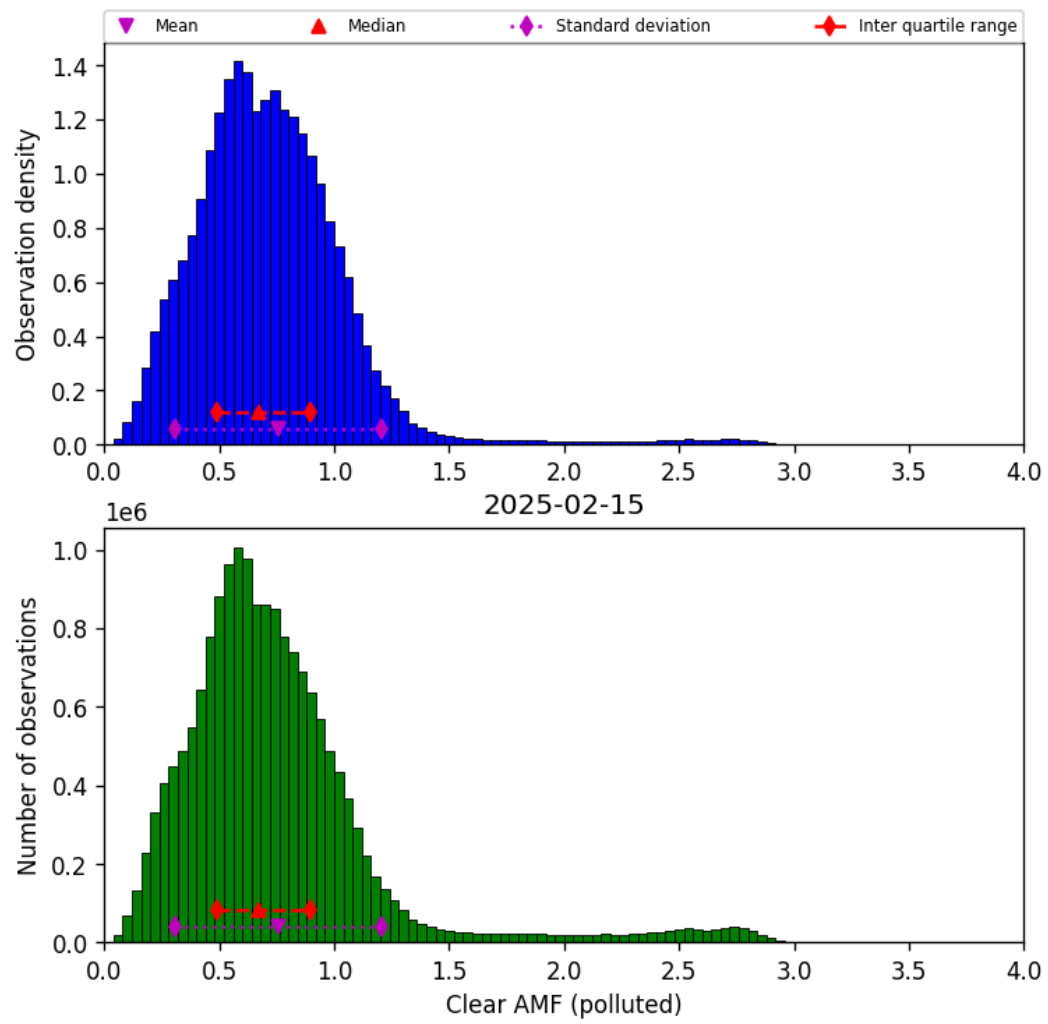


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-02-15 to 2025-02-16

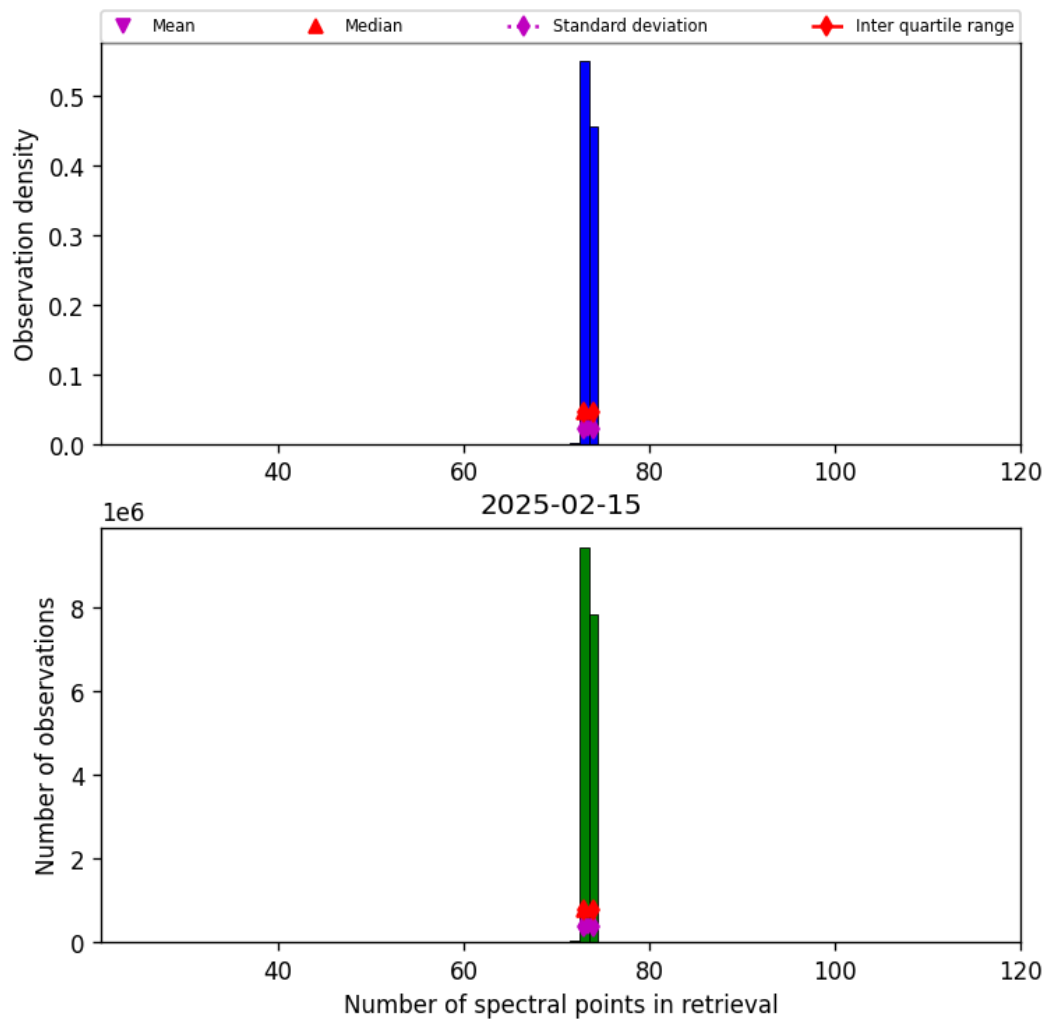


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-02-15 to 2025-02-16

9 Along track statistics

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

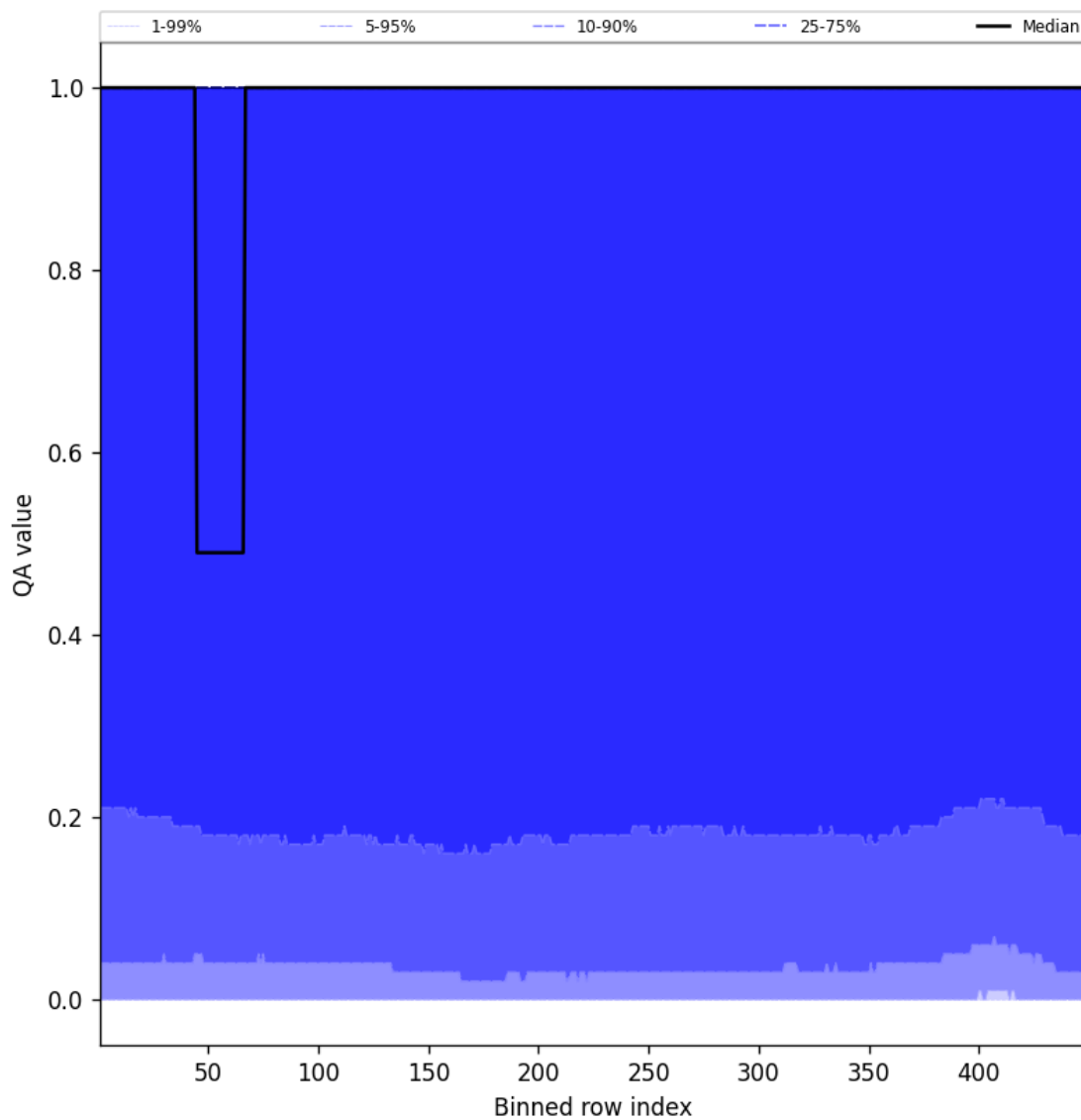


Figure 84: Along track statistics of “QA value” for 2025-02-15 to 2025-02-16

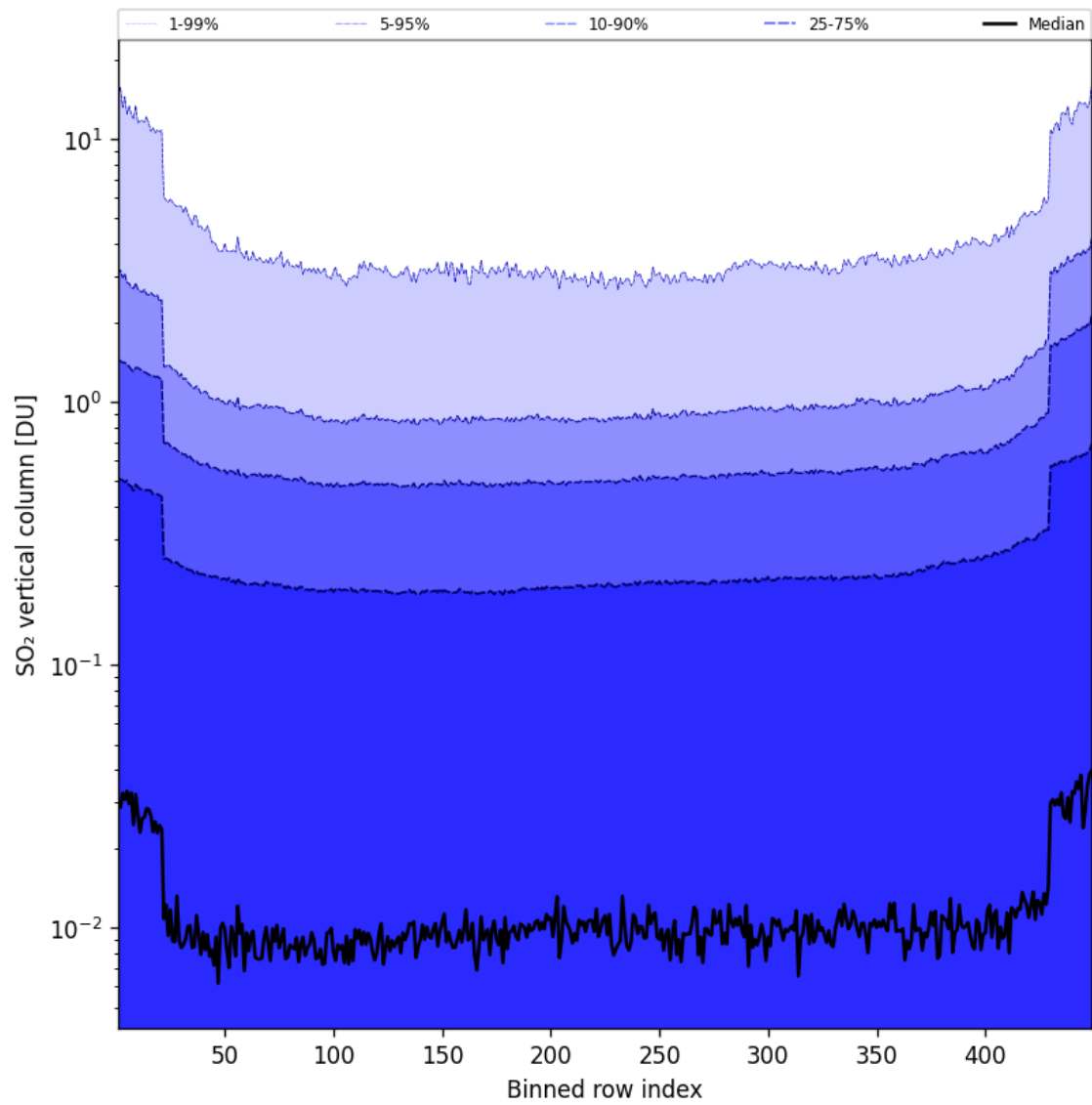


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-02-15 to 2025-02-16

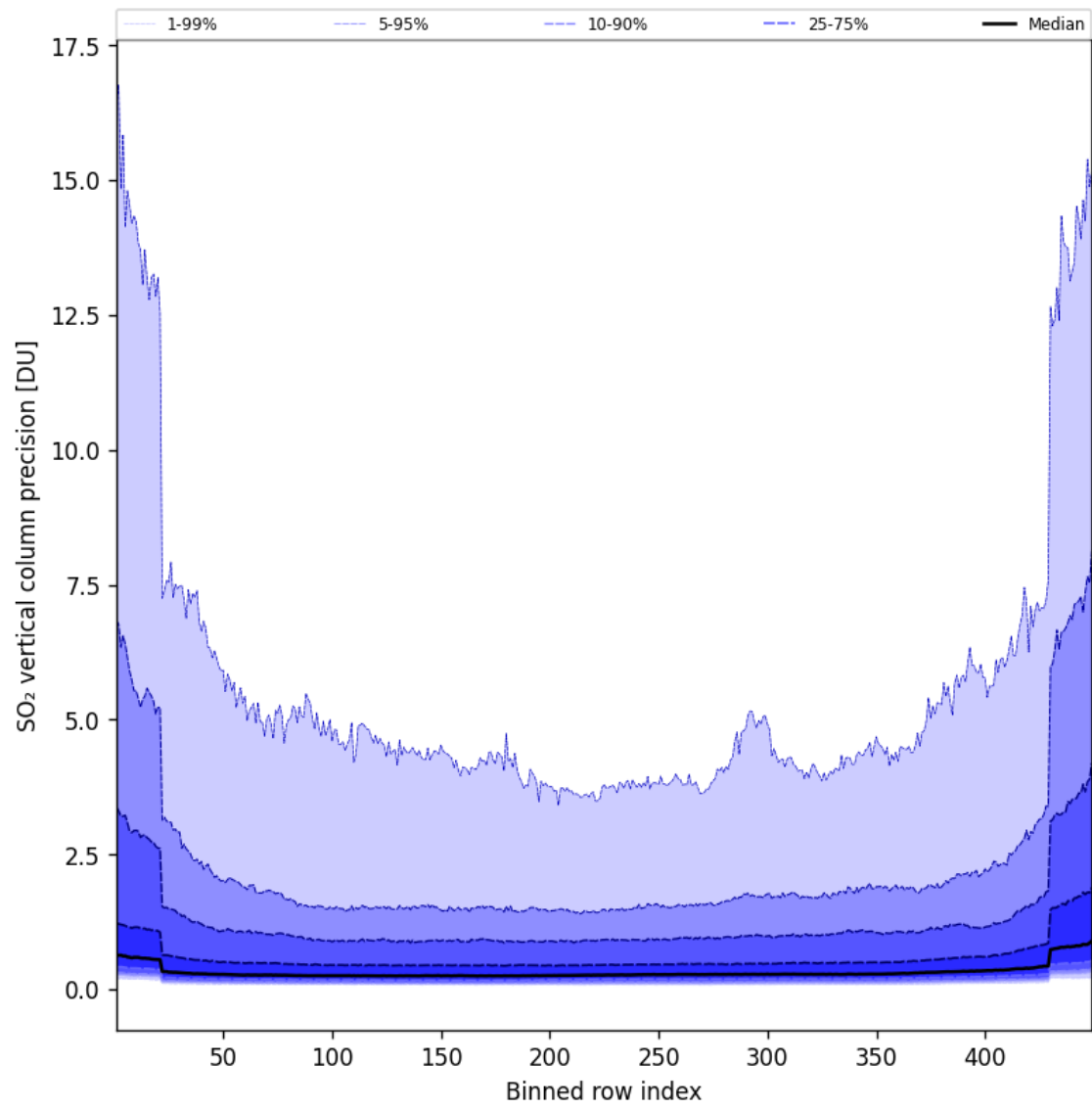


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-02-15 to 2025-02-16

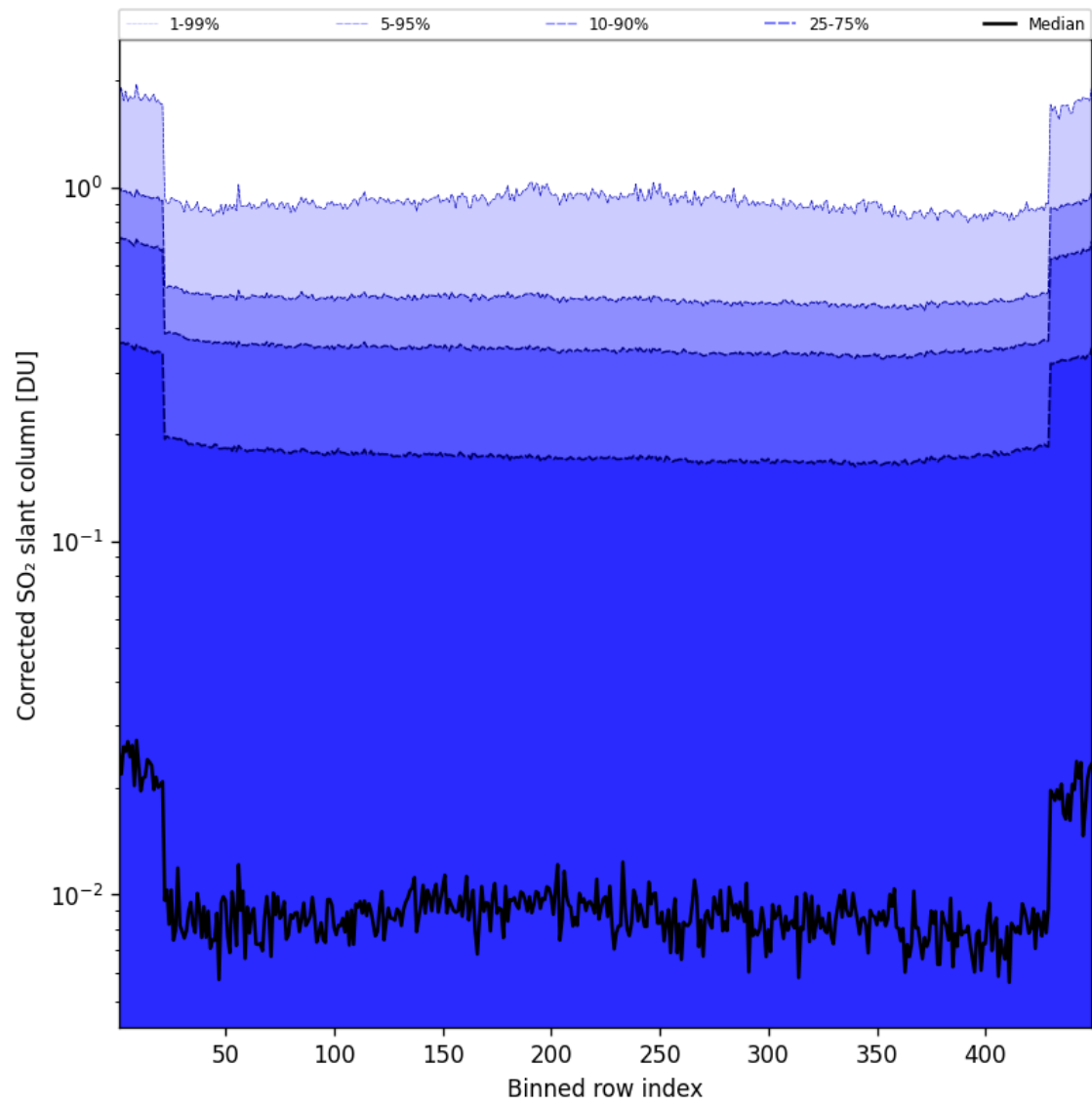


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-02-15 to 2025-02-16

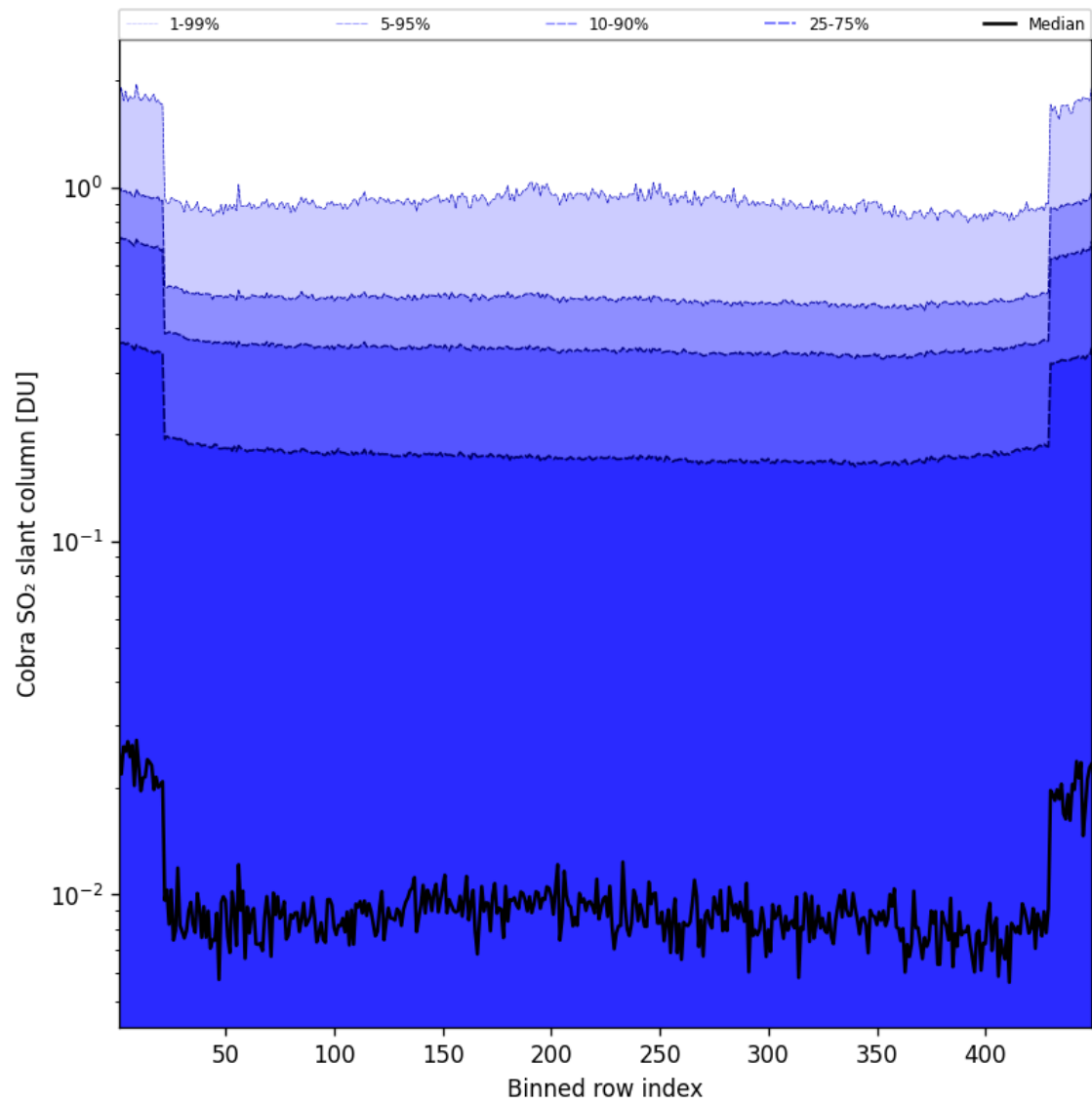


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-02-15 to 2025-02-16

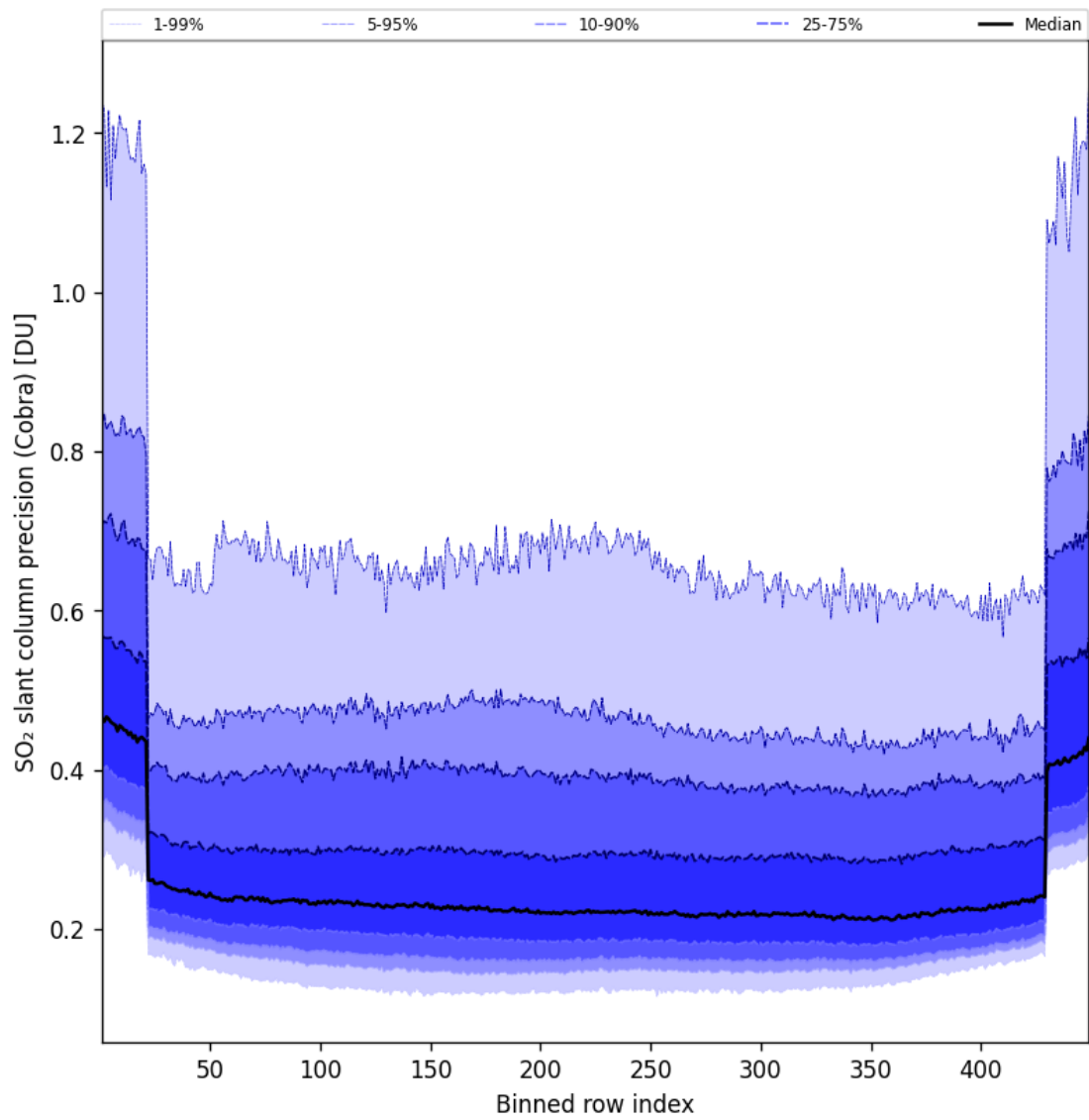


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-02-15 to 2025-02-16

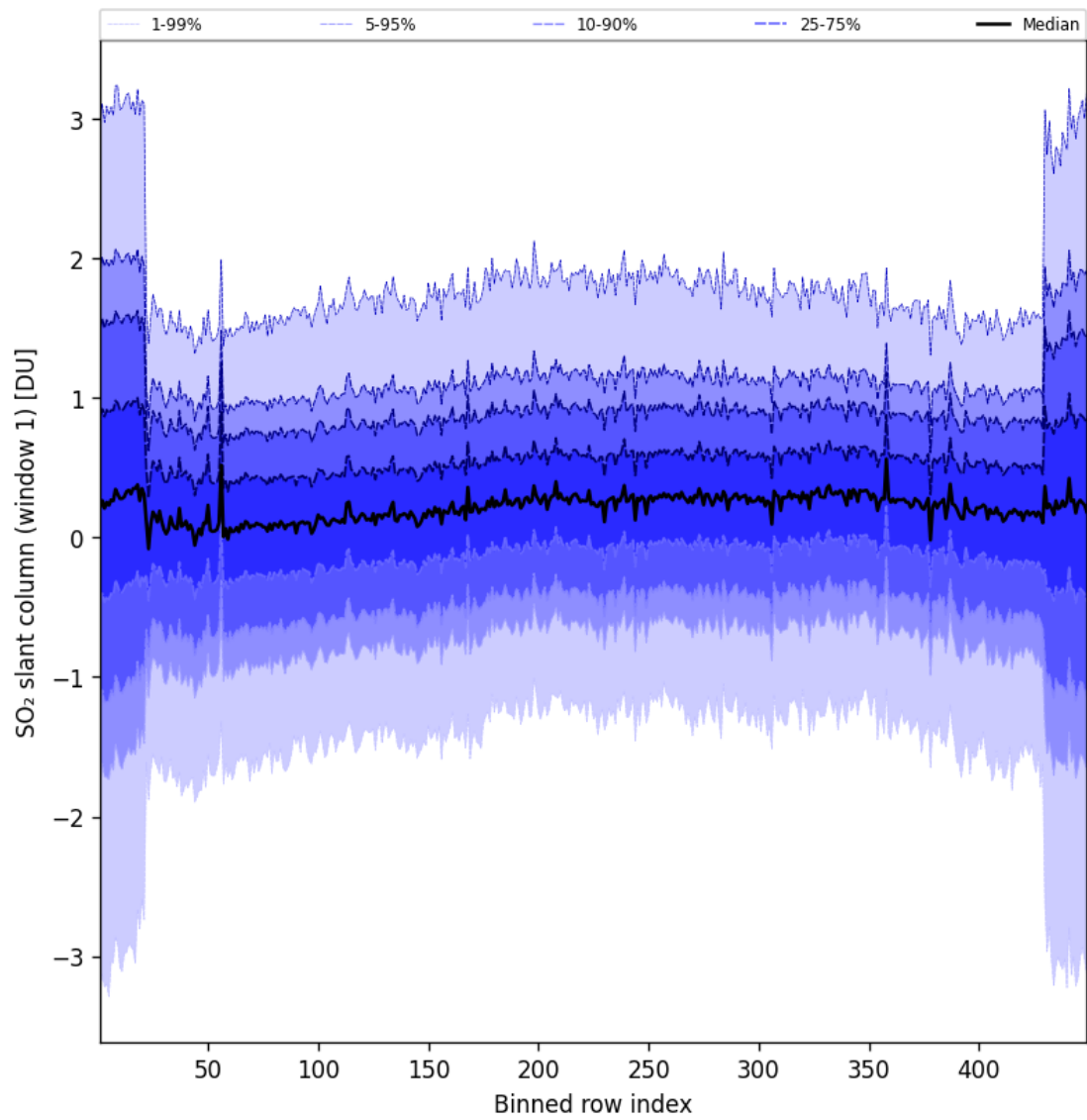


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-02-15 to 2025-02-16

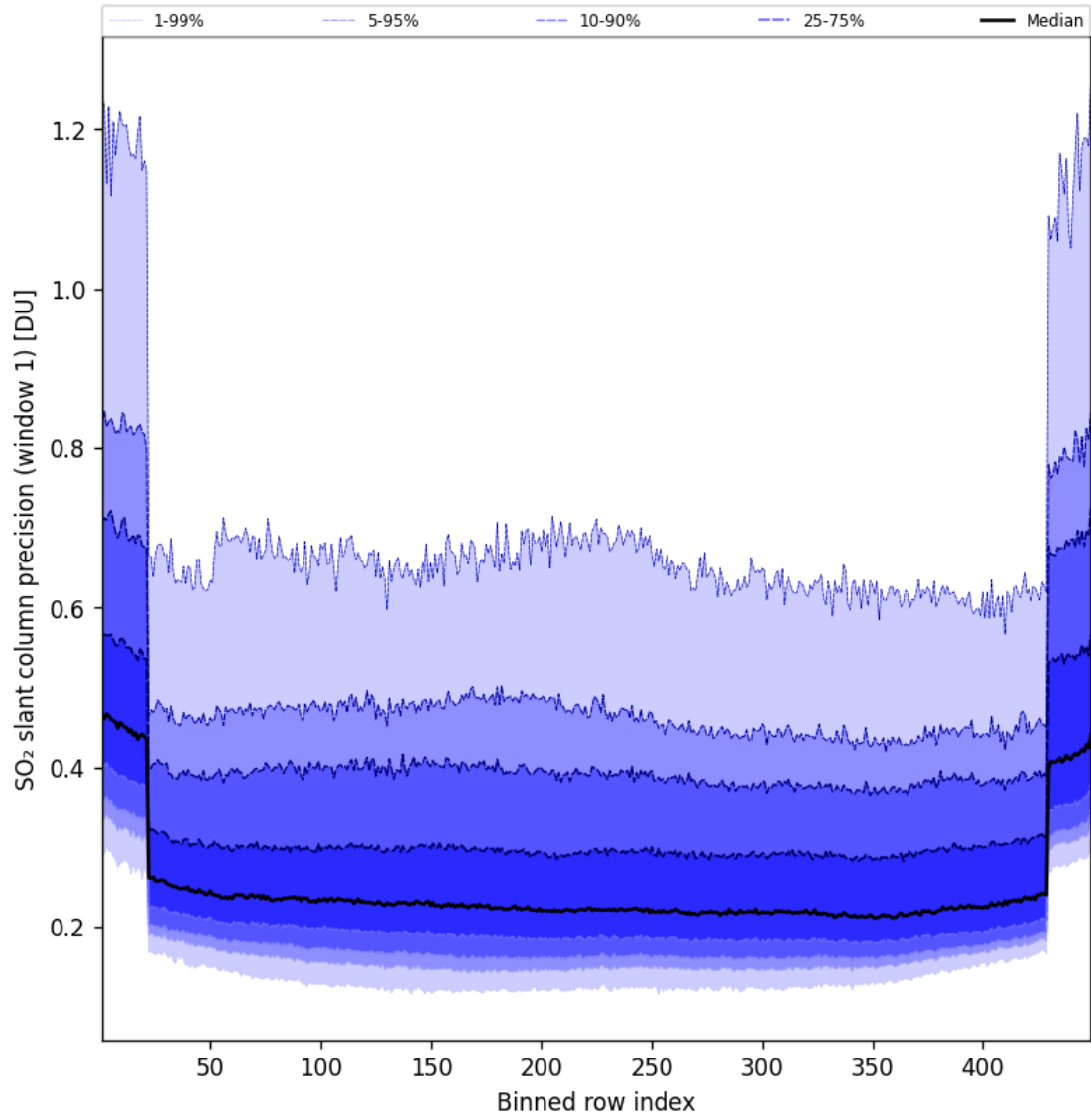


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-02-15 to 2025-02-16

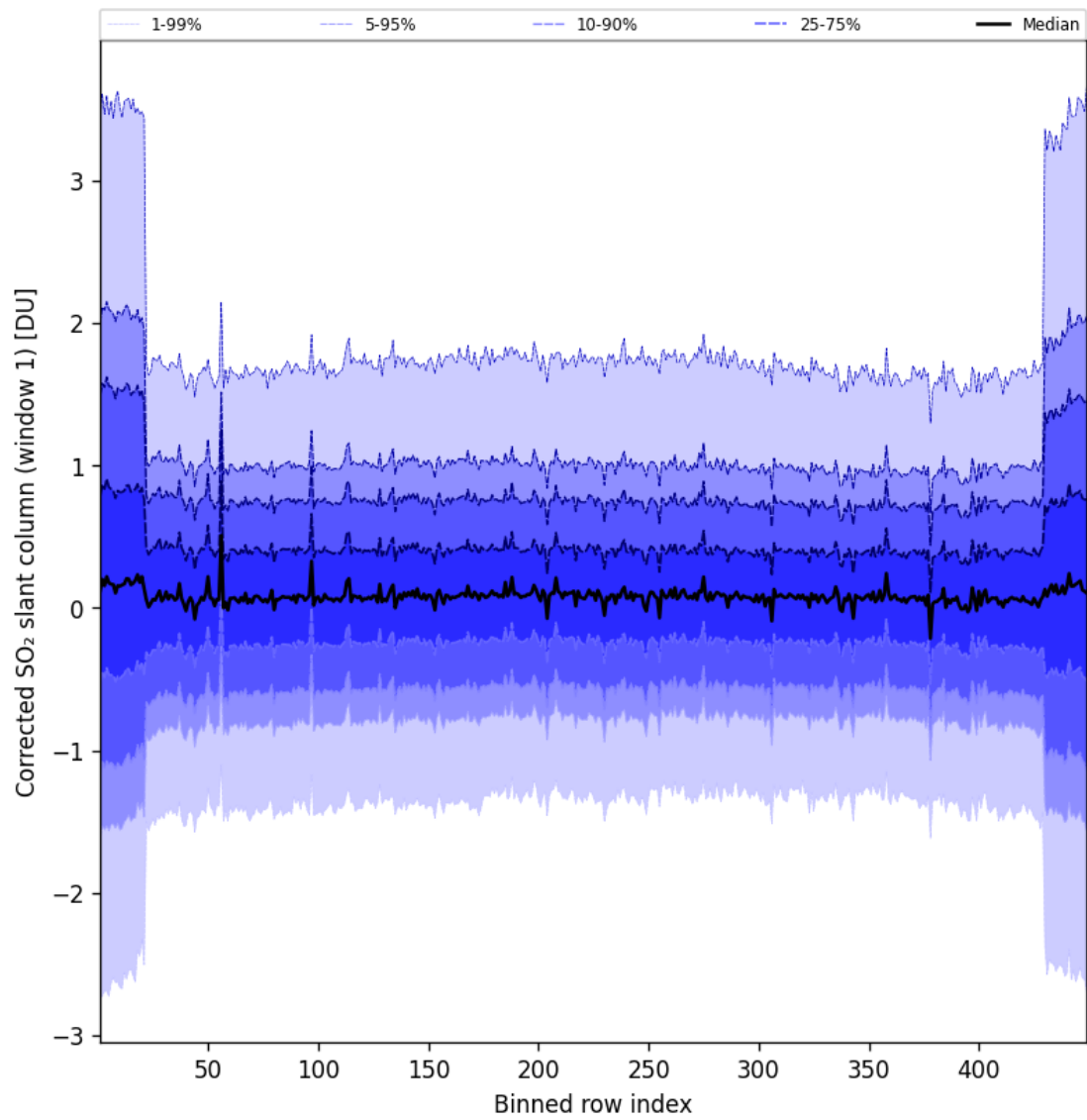


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-02-15 to 2025-02-16

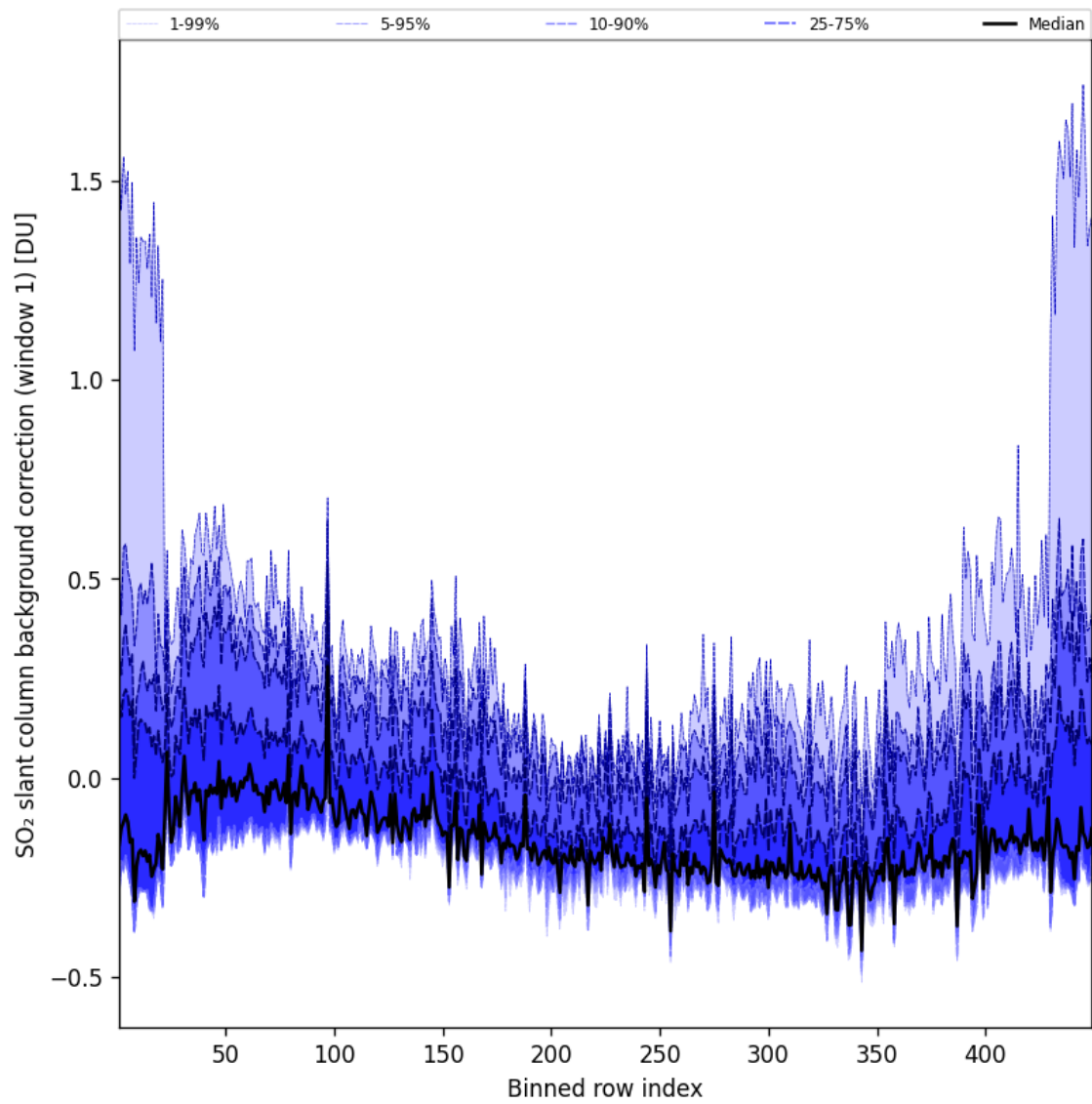


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-02-15 to 2025-02-16

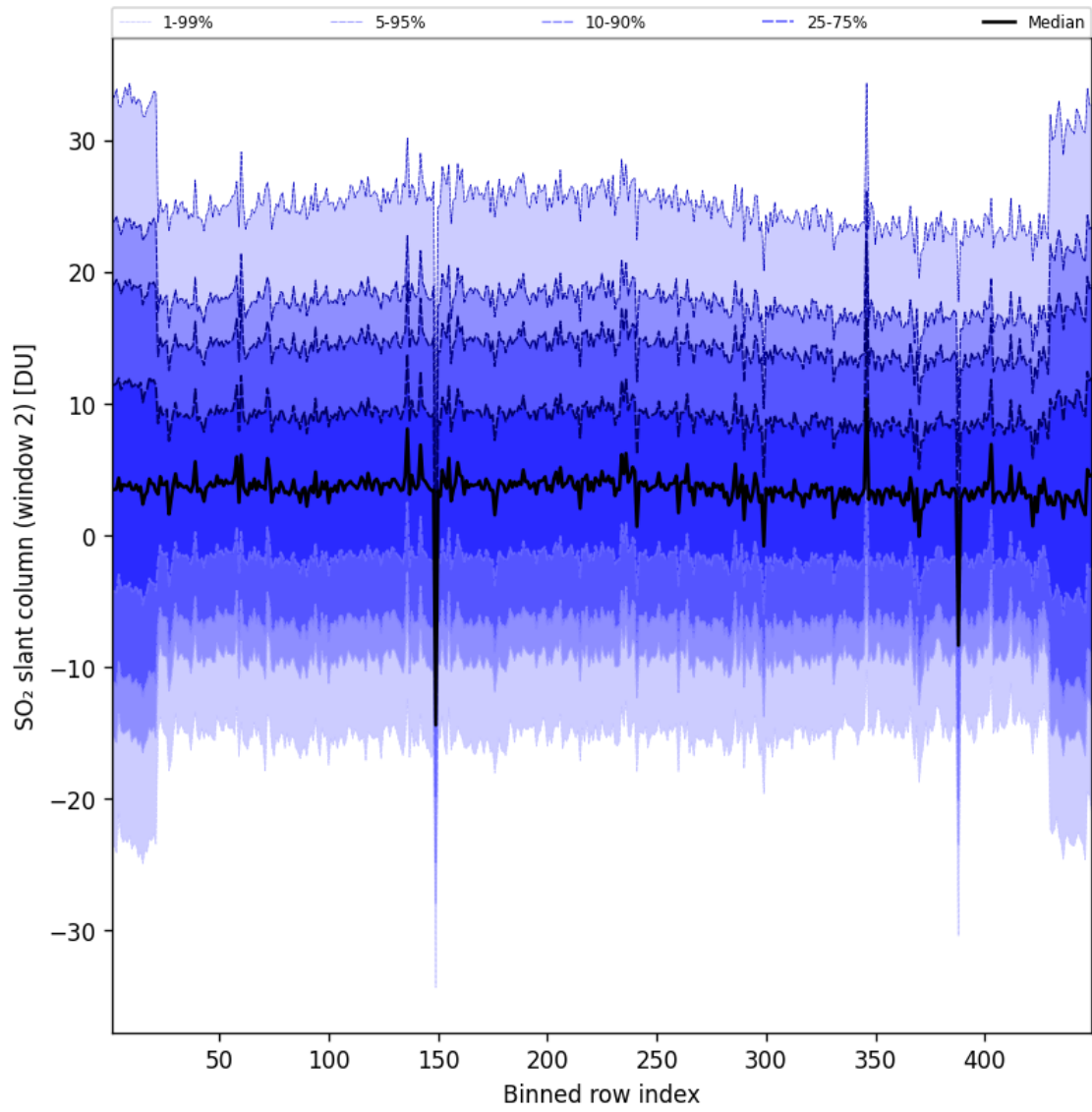


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-02-15 to 2025-02-16

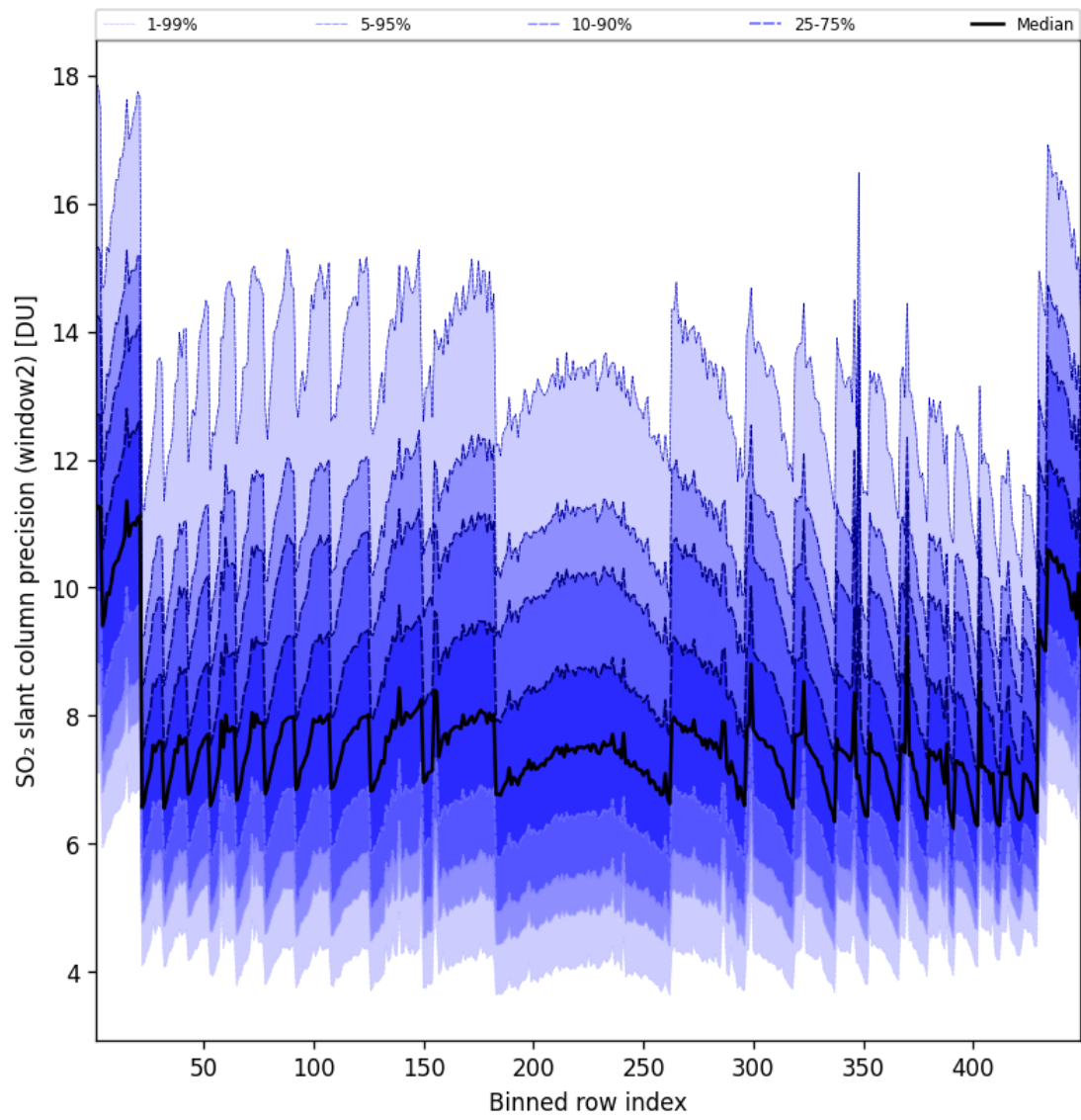


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-02-15 to 2025-02-16

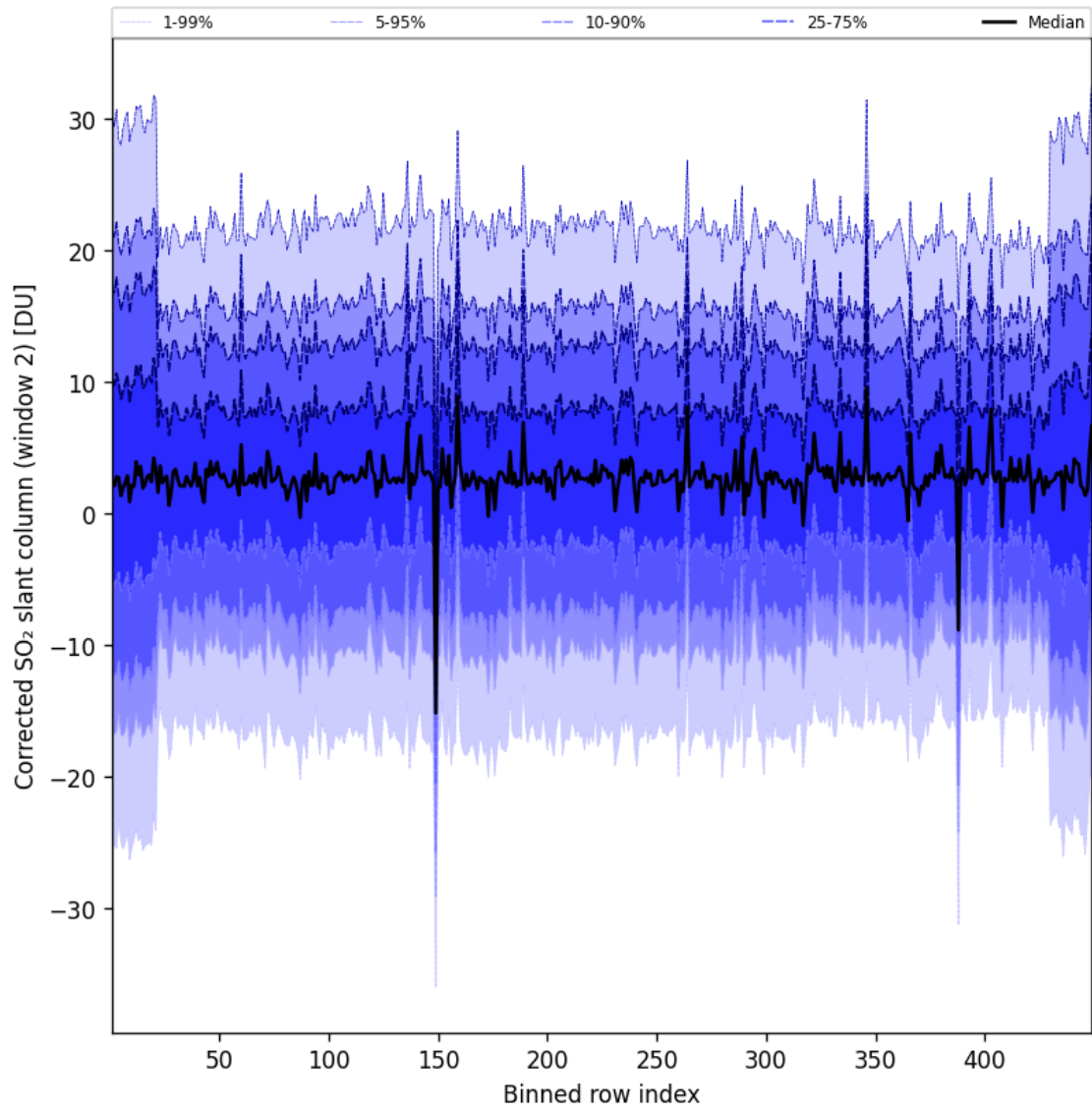


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-02-15 to 2025-02-16

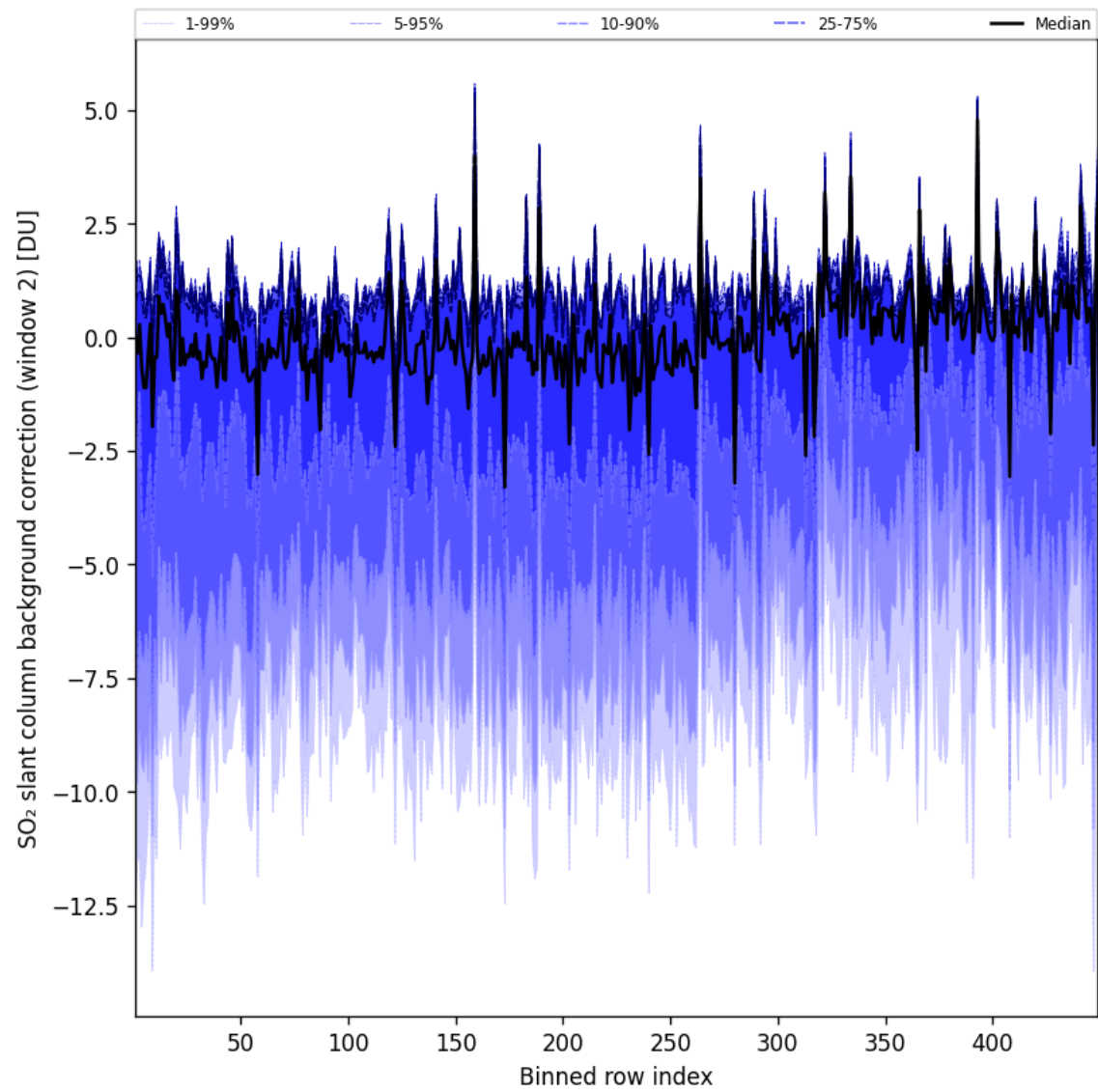


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-02-15 to 2025-02-16

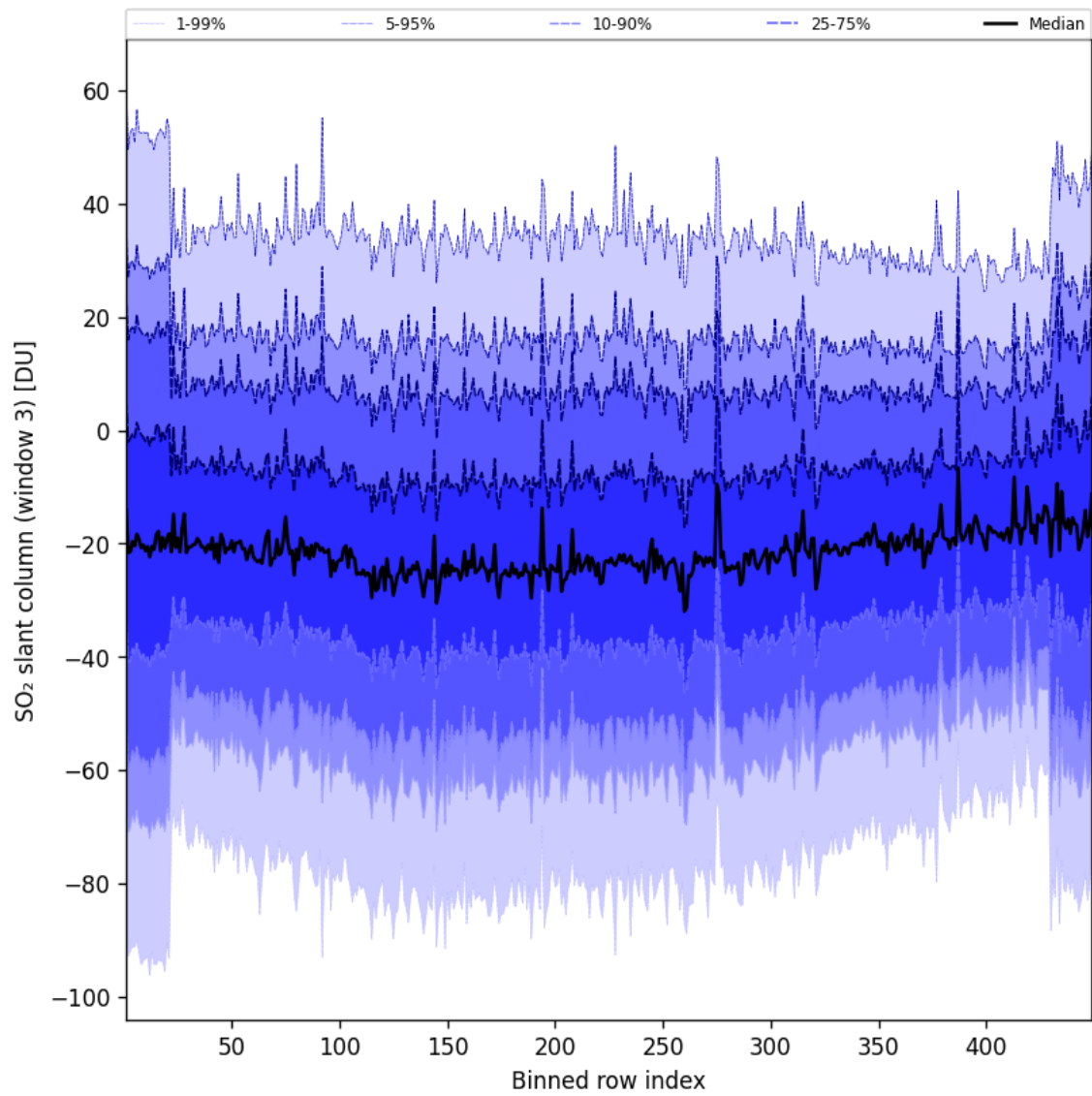


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-02-15 to 2025-02-16

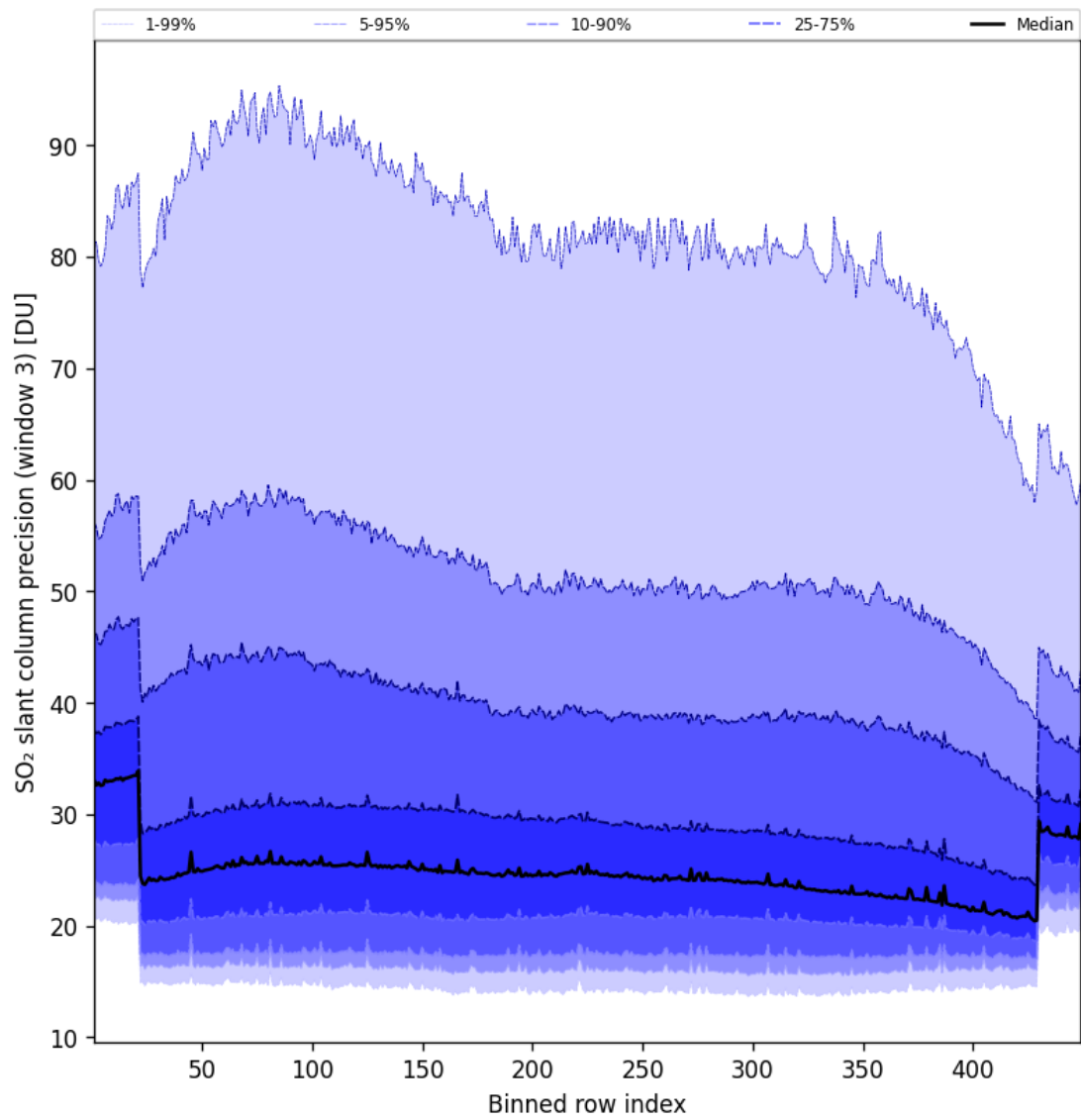


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-02-15 to 2025-02-16

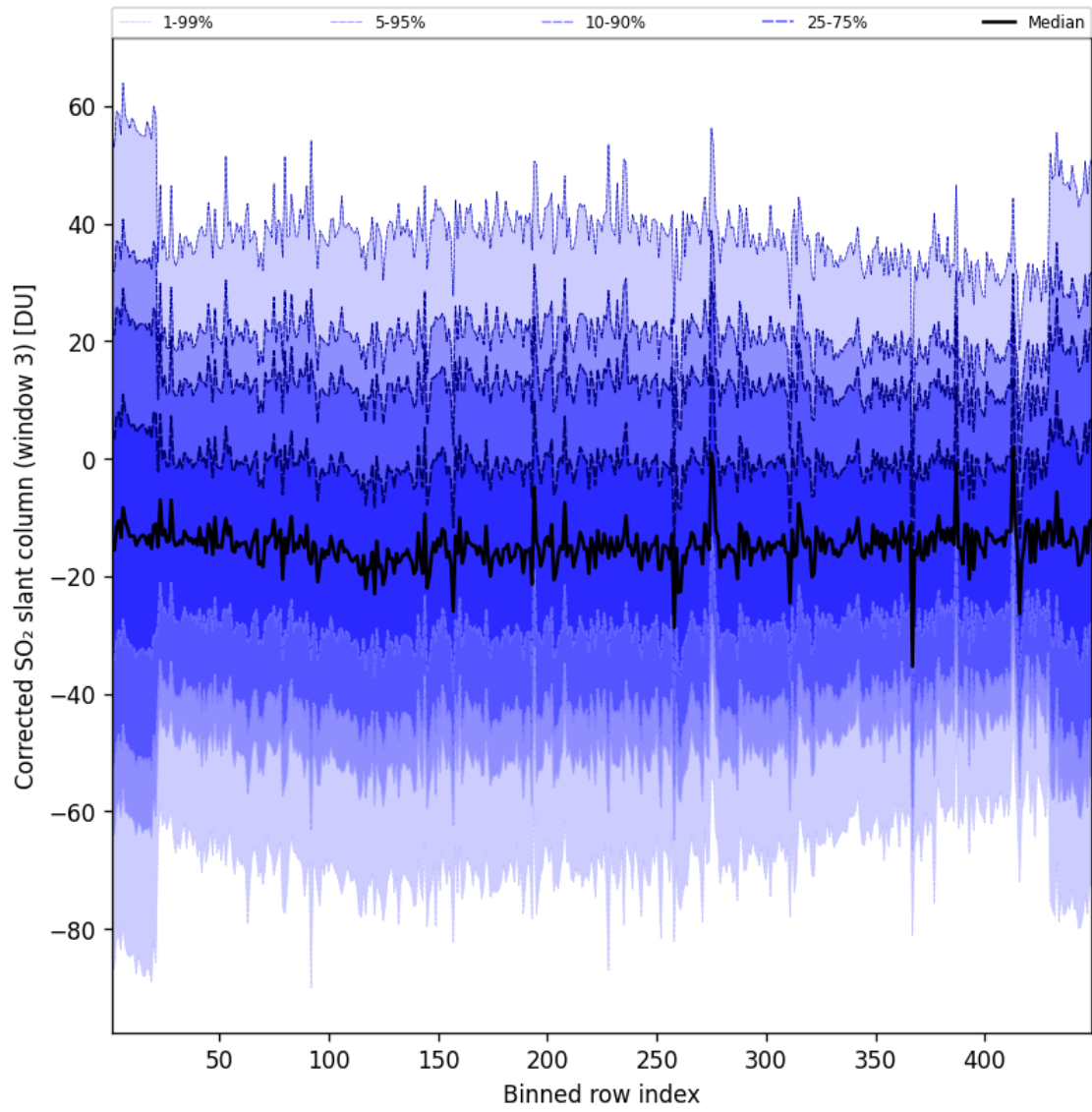


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-02-15 to 2025-02-16

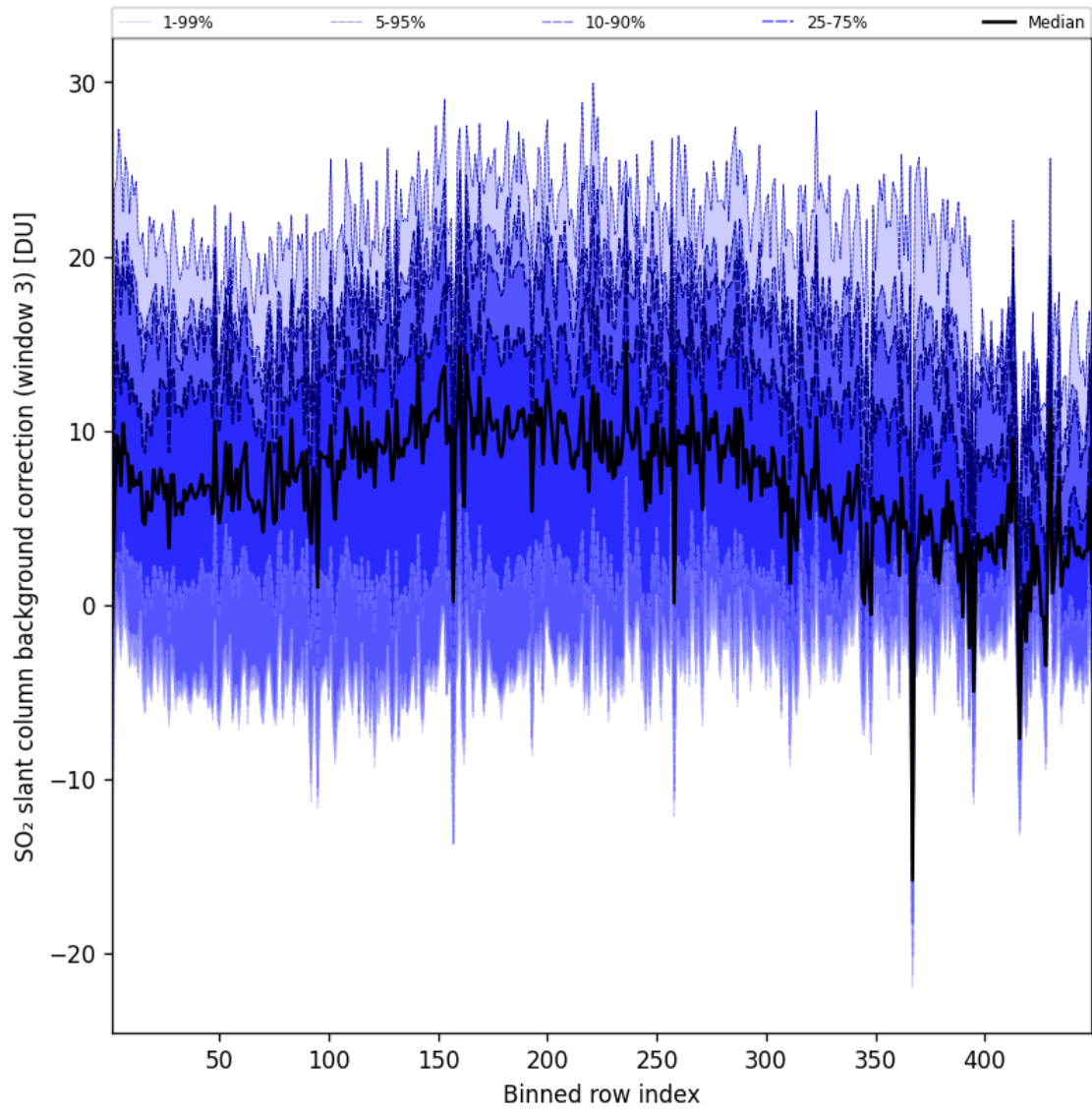


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-02-15 to 2025-02-16

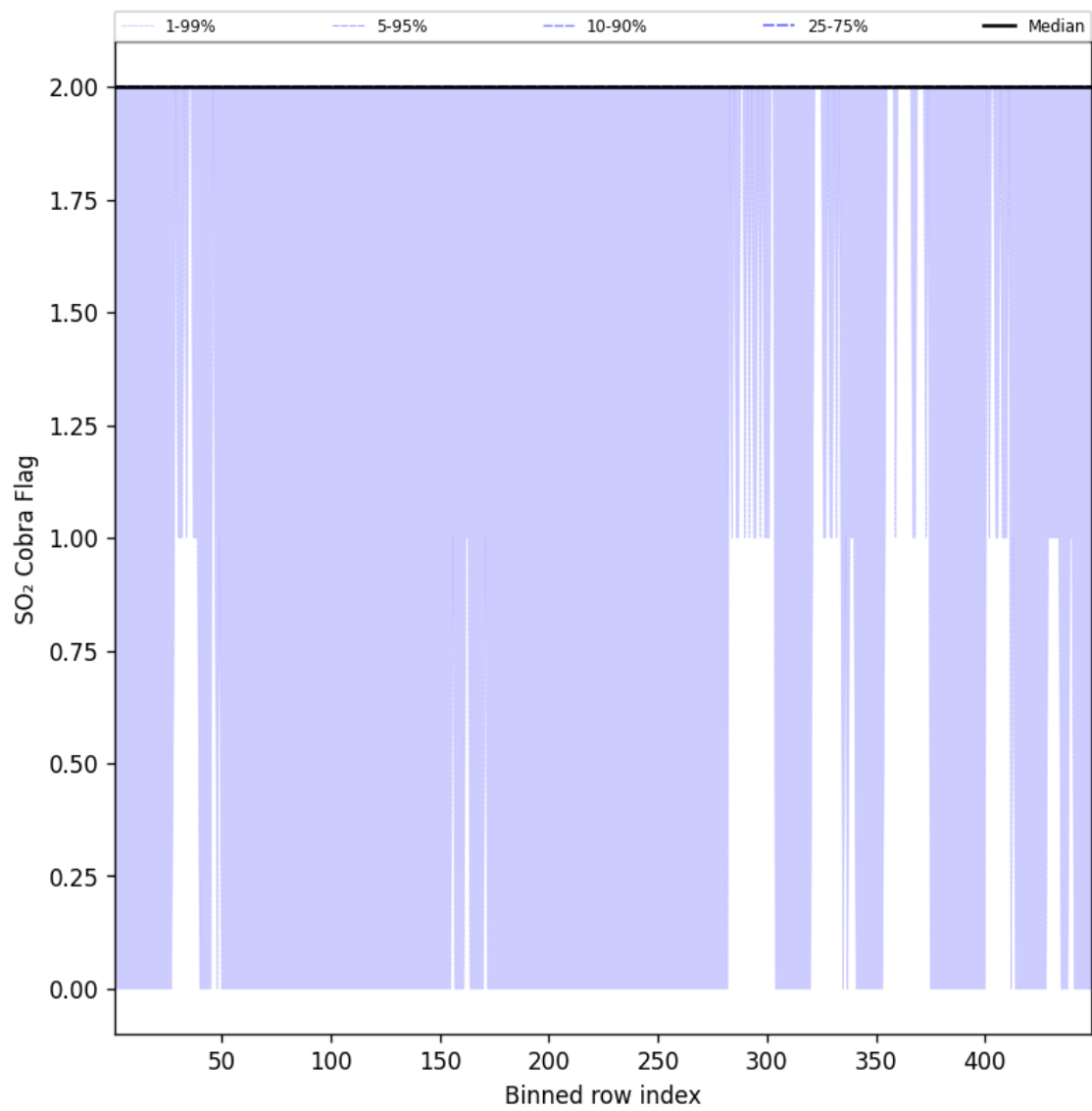


Figure 102: Along track statistics of "SO₂ Cobra Flag" for 2025-02-15 to 2025-02-16

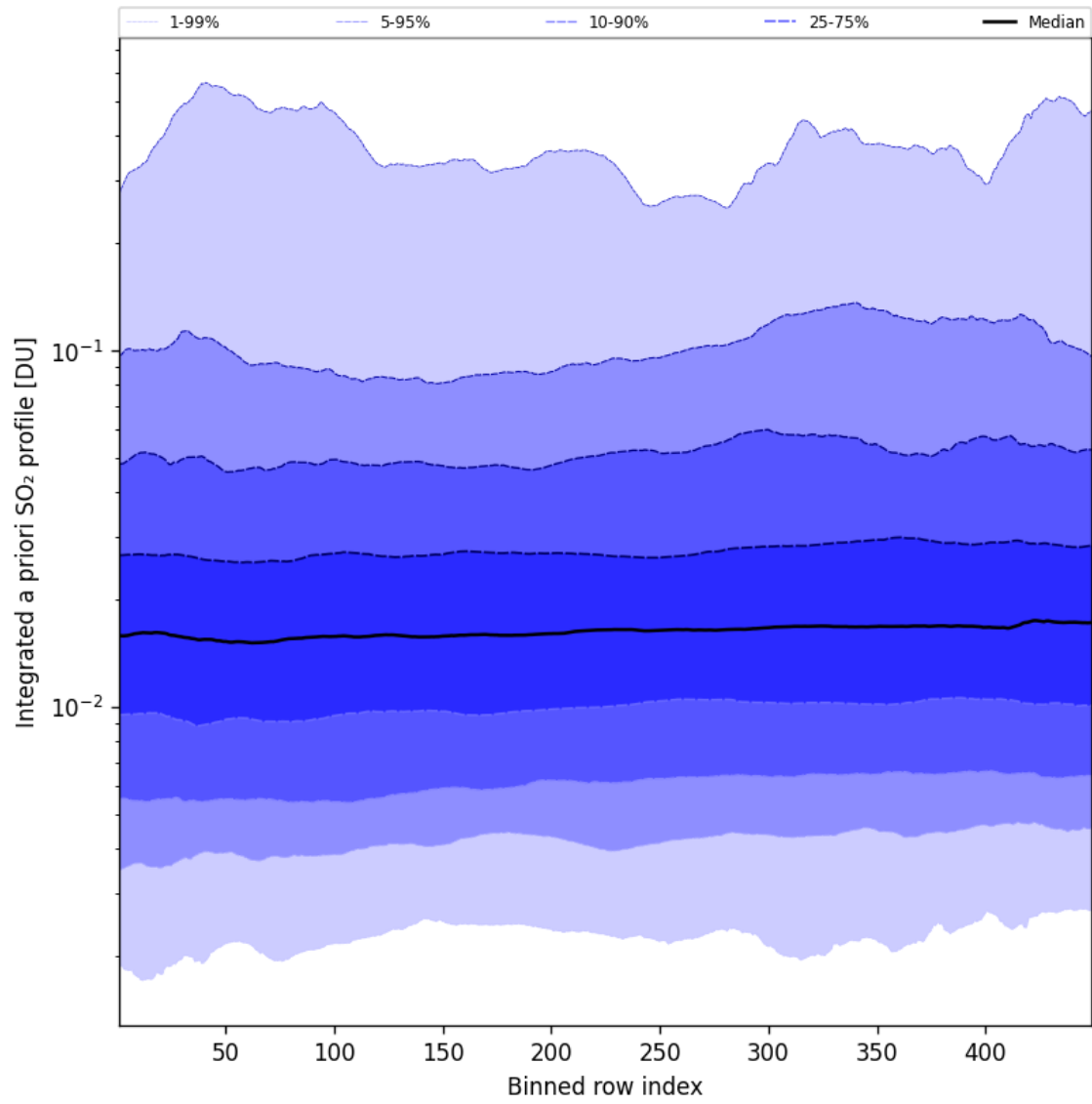


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-02-15 to 2025-02-16

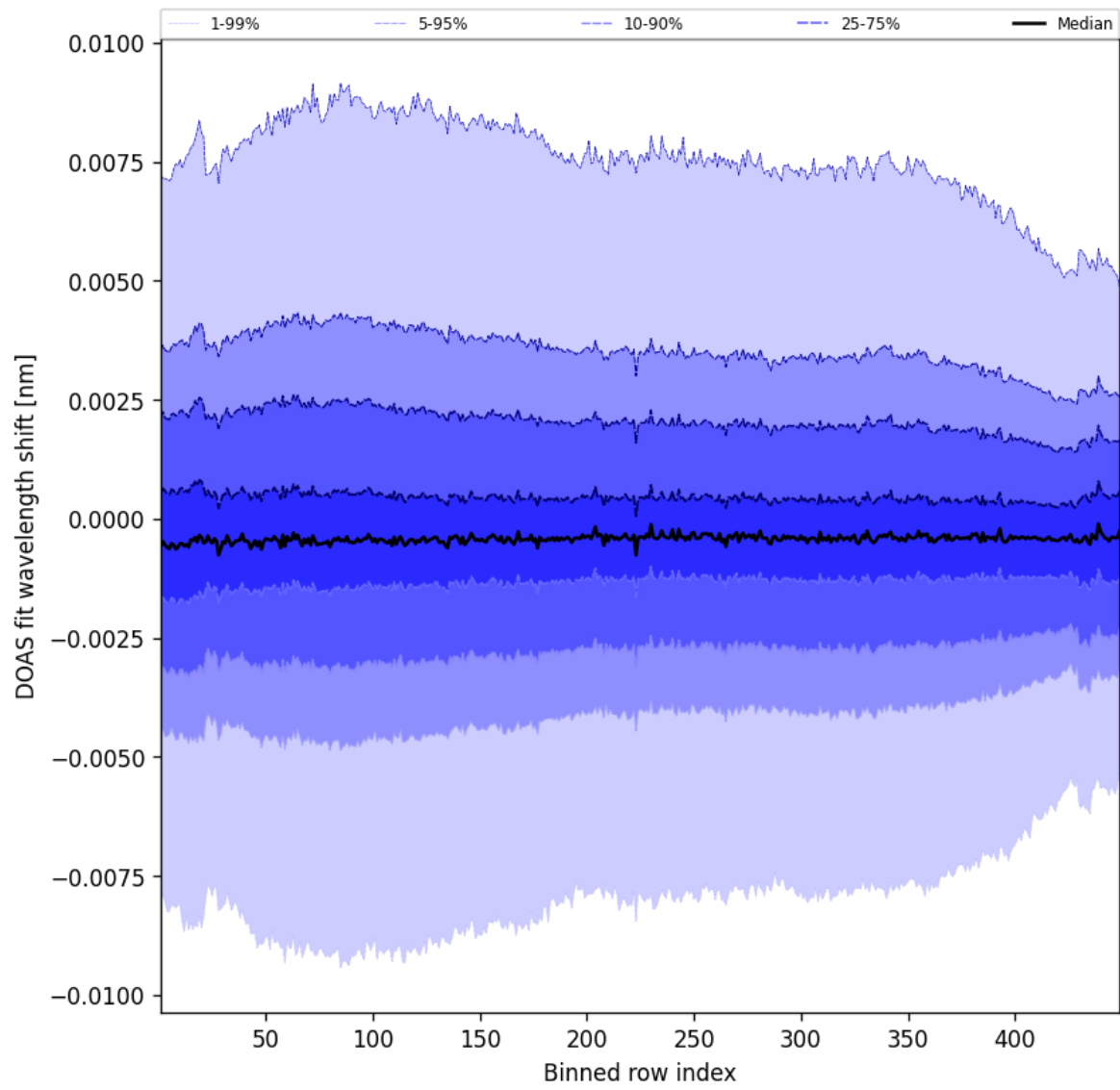


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-02-15 to 2025-02-16

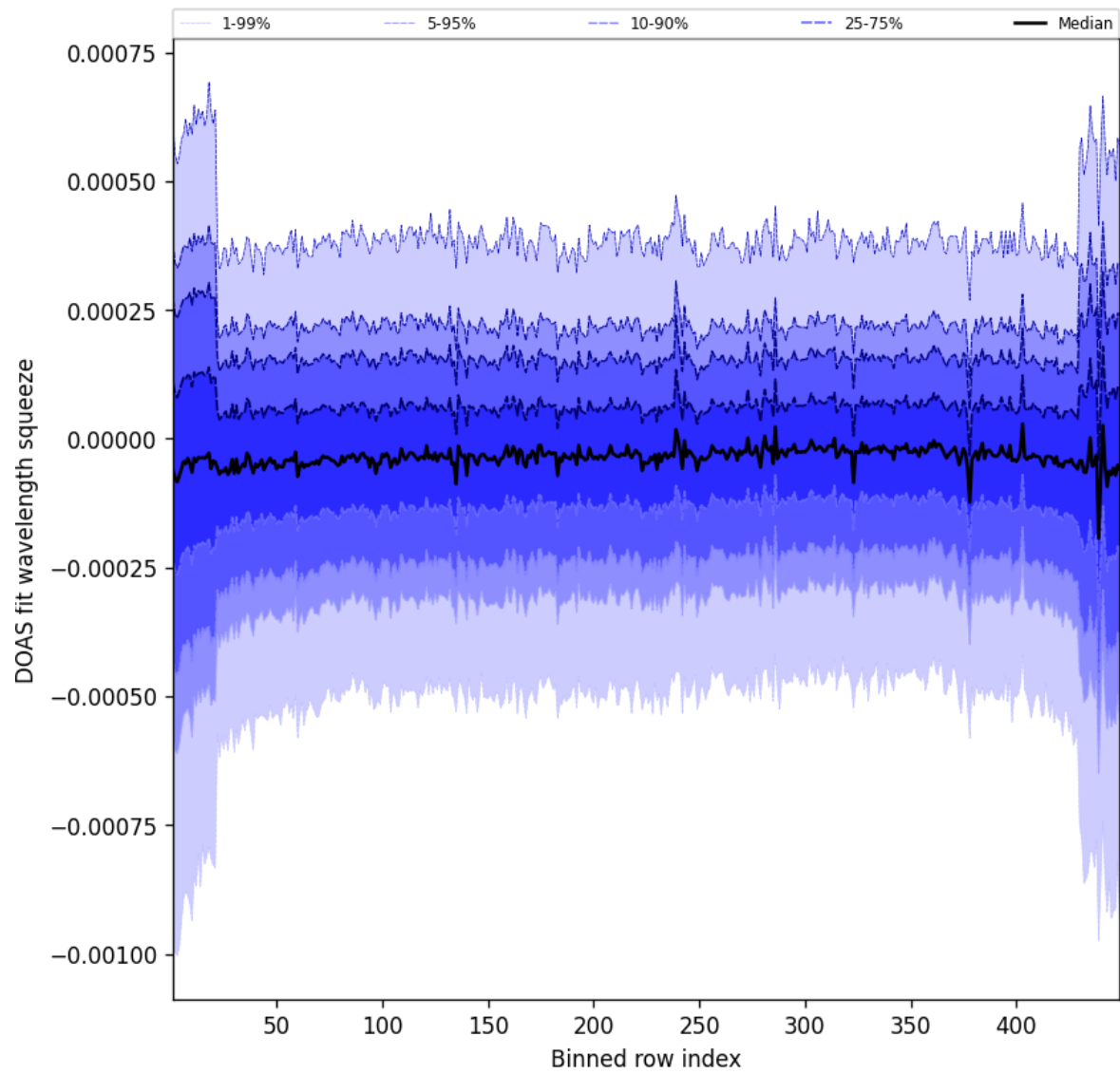


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-02-15 to 2025-02-16

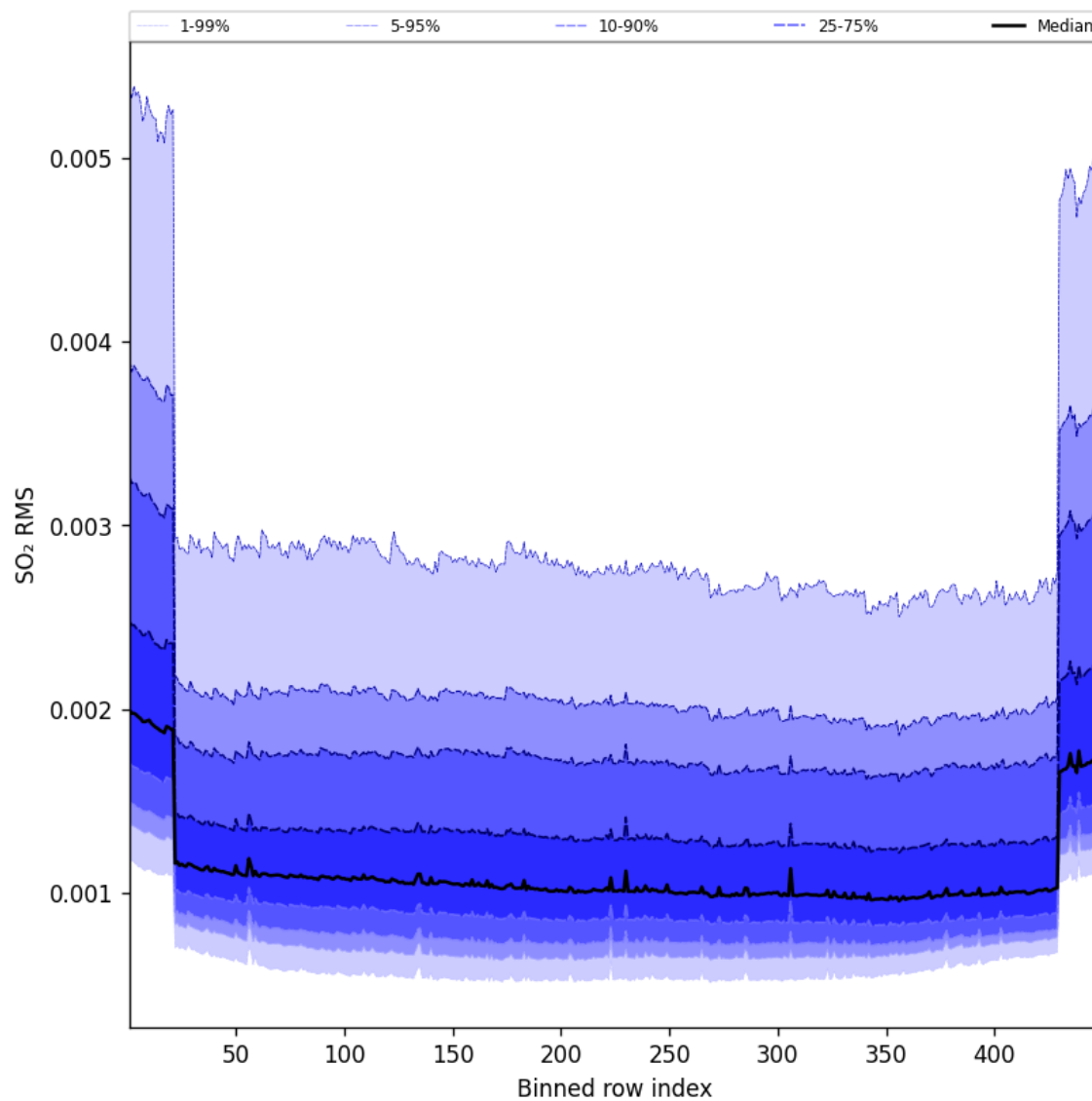


Figure 106: Along track statistics of “SO₂ RMS” for 2025-02-15 to 2025-02-16

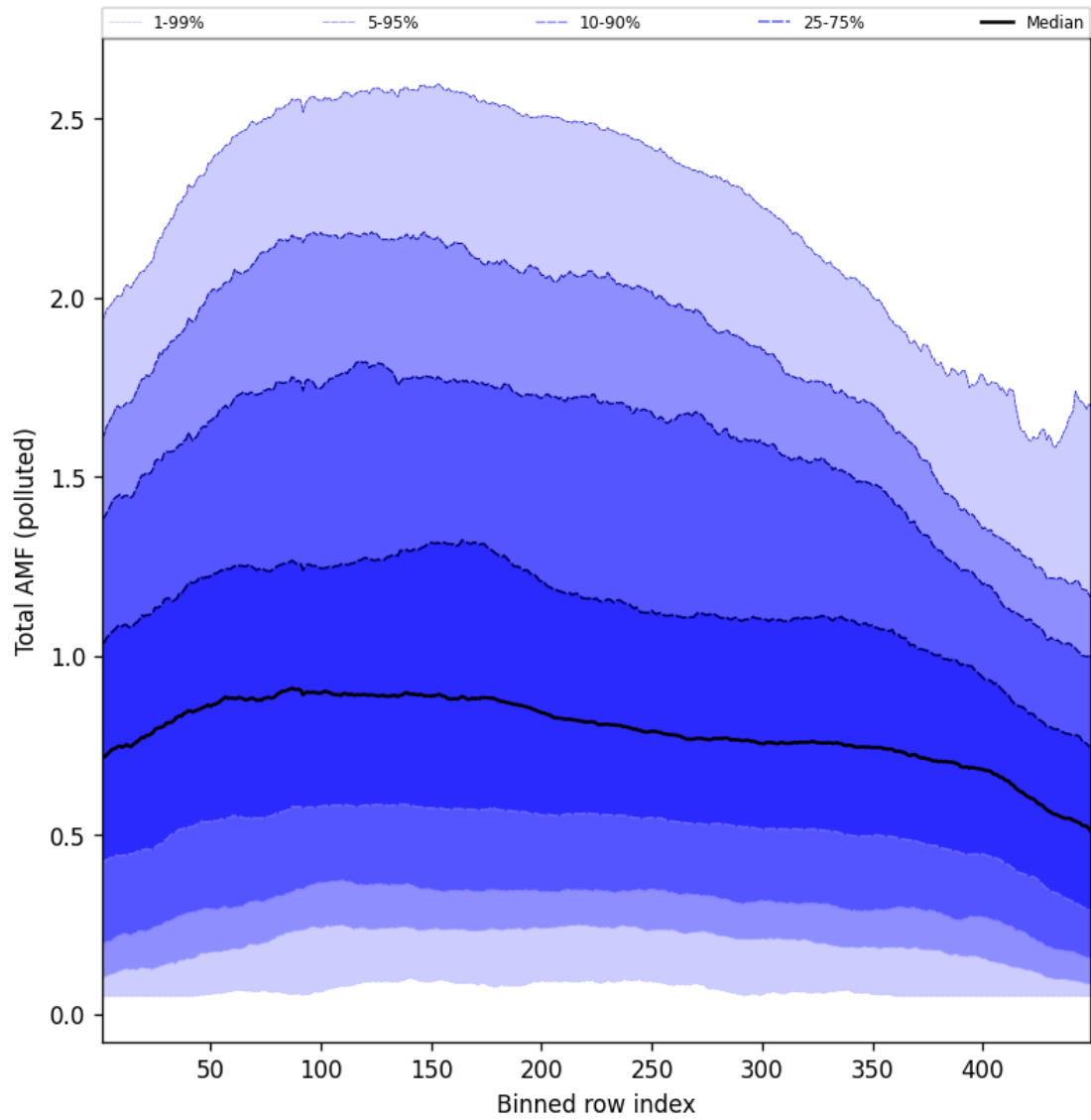


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-02-15 to 2025-02-16

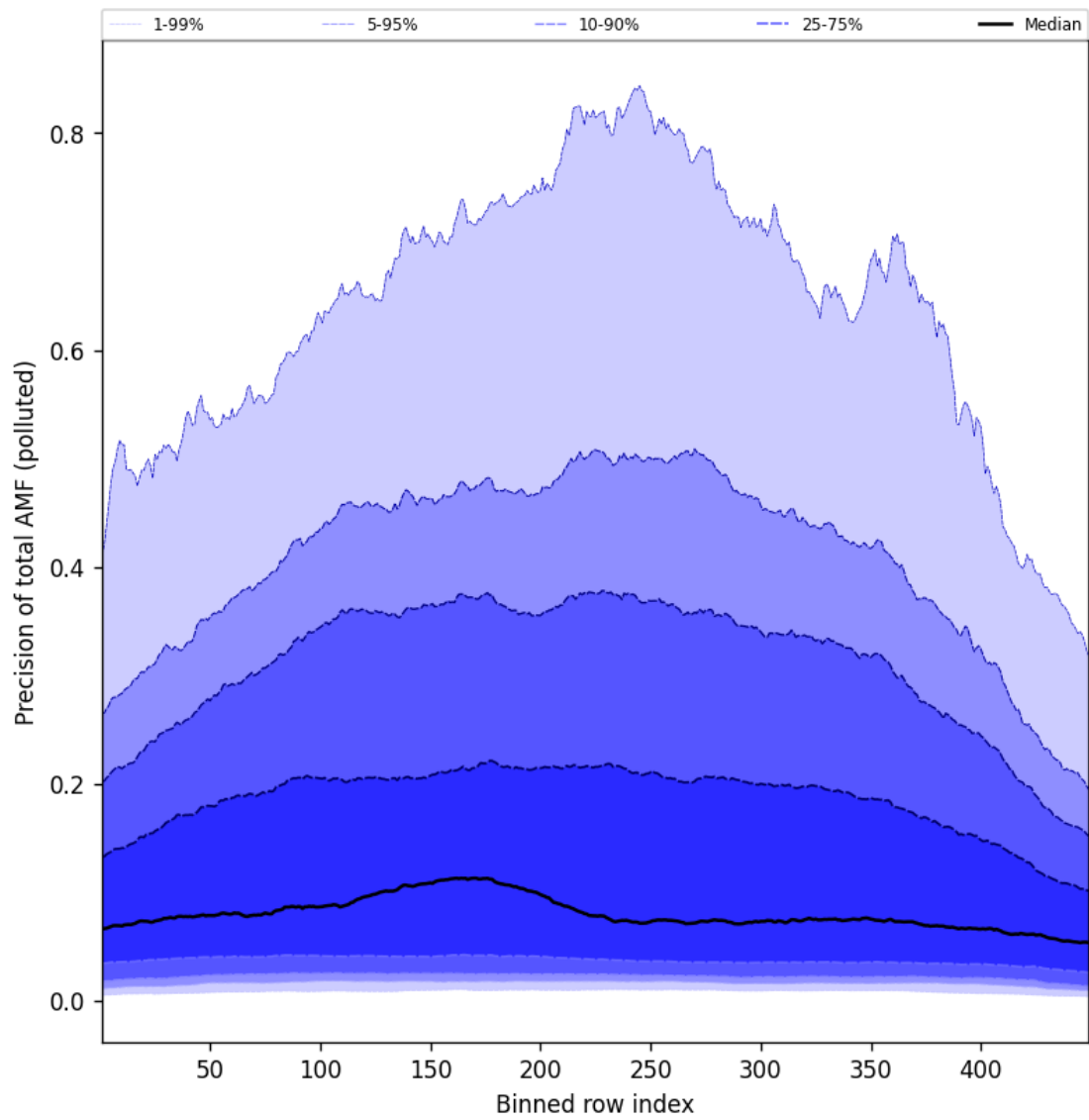


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-02-15 to 2025-02-16

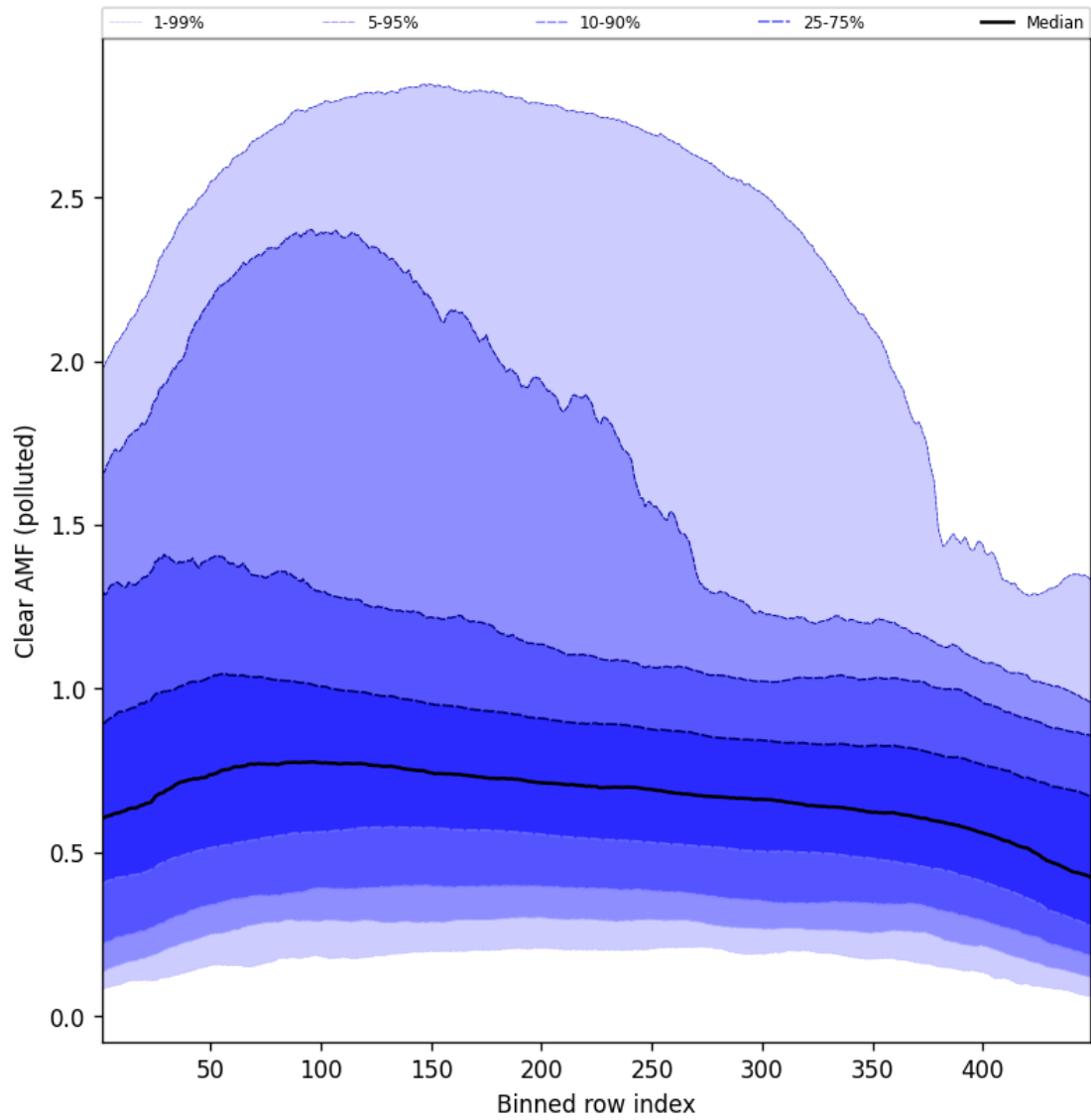


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-02-15 to 2025-02-16

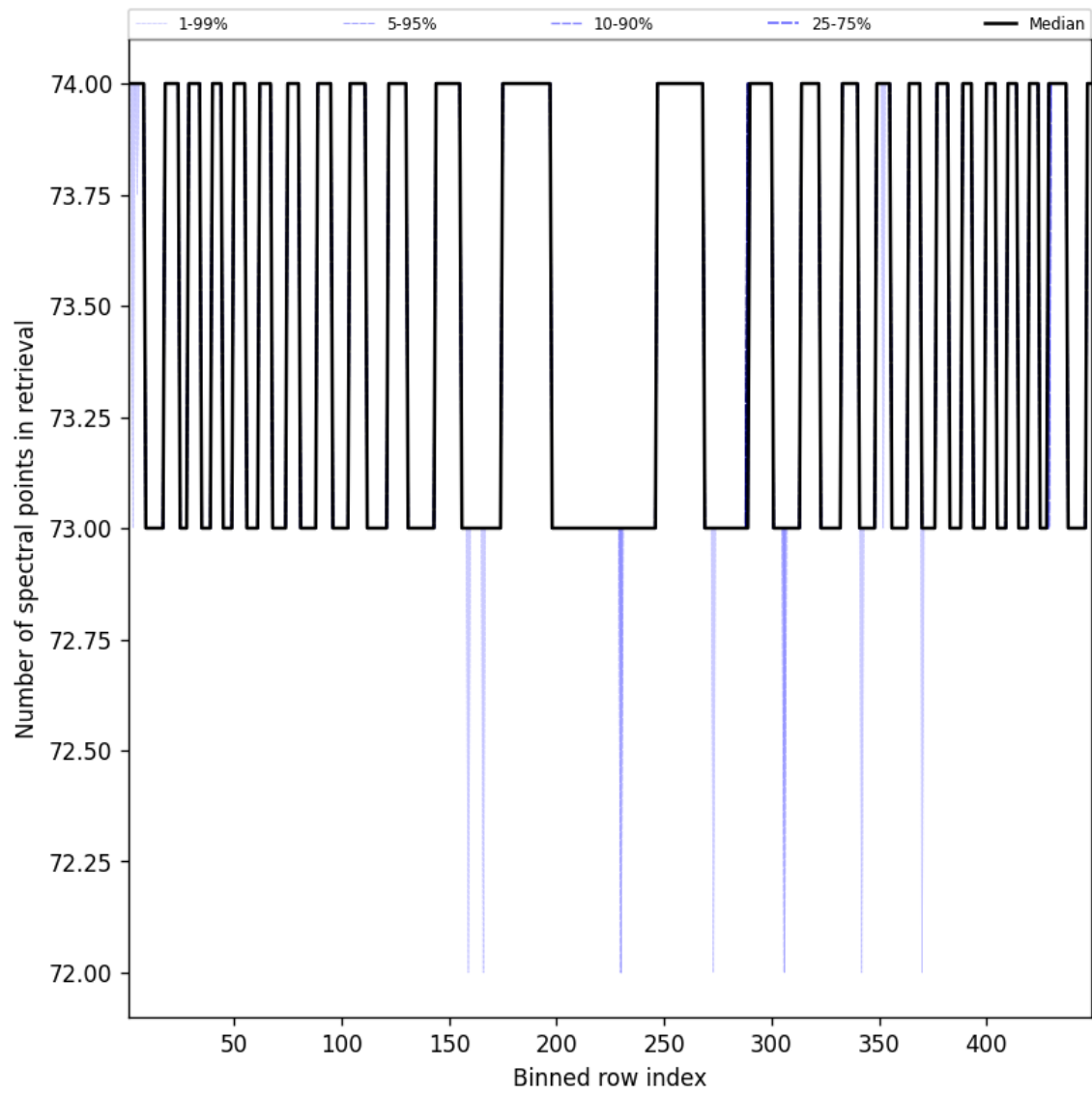


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-02-15 to 2025-02-16

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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