

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 ± 0.404	17325360	0.995	0.780	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(4.650 \pm 143.369) \times 10^{-2}$	17325360	0.263	0.485	1.173×10^{-2}	-124	432
sulfurdioxide total vertical column precision [DU]	0.637 ± 1.038	17325360	0.197	0.403	0.347	4.391×10^{-2}	42.0
sulfurdioxide slant column density corrected [DU]	$(2.179 \pm 40.414) \times 10^{-2}$	17325360	0.242	0.368	9.728×10^{-3}	-31.6	69.7
sulfurdioxide slant column density cobra [DU]	$(2.147 \pm 38.645) \times 10^{-2}$	17325360	0.242	0.368	9.728×10^{-3}	-31.6	33.5
sulfurdioxide slant column density cobra precision [DU]	0.301 ± 0.148	17325360	0.213	0.159	0.254	8.063×10^{-2}	15.5
sulfurdioxide slant column density window1 [DU]	0.182 ± 0.729	17325360	0.225	0.747	0.204	-193	54.9
sulfurdioxide slant column density window1 precision [DU]	0.301 ± 0.148	17325360	0.213	0.159	0.254	8.063×10^{-2}	15.5
sulfurdioxide slant column density corrected win1 [DU]	$(5.320 \pm 71.798) \times 10^{-2}$	17325360	2.500×10^{-2}	0.731	2.994×10^{-2}	-193	55.7
background so2 slant column offset window1 [DU]	-0.129 ± 0.203	17325360	-0.260	0.216	-0.181	-1.27	4.99
sulfurdioxide slant column density window2 [DU]	2.41 ± 9.24	17325360	1.75	11.6	2.12	-1.300×10^3	1.510×10^3
sulfurdioxide slant column density window2 precision [DU]	8.10 ± 2.24	17325360	7.43	2.52	7.78	2.03	600
sulfurdioxide slant column density corrected win2 [DU]	1.05 ± 8.91	17325360	1.25	11.2	1.01	-1.300×10^3	1.503×10^3
background so2 slant column offset window2 [DU]	-1.36 ± 3.15	17325360	0.750	3.80	-0.363	-18.2	14.8
sulfurdioxide slant column density window3 [DU]	-14.1 ± 23.9	17325360	-15.1	30.3	-14.4	-362	1.020×10^3
sulfurdioxide slant column density window3 precision [DU]	27.8 ± 13.0	17325360	22.5	9.50	24.3	9.17	291
sulfurdioxide slant column density corrected win3 [DU]	-7.69 ± 23.05	17325360	-8.40	29.1	-7.73	-365	1.019×10^3
background so2 slant column offset window3 [DU]	6.37 ± 7.53	17325360	0.560	12.4	5.79	-19.4	40.2
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	17325360	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.082 \pm 6.993) \times 10^{-2}$	17325360	1.539×10^{-2}	1.783×10^{-2}	1.496×10^{-2}	3.075×10^{-4}	2.00
fitted radiance shift [nm]	$(-4.851 \pm 25.805) \times 10^{-4}$	17325360	-5.000×10^{-4}	1.871×10^{-3}	-4.600×10^{-4}	-4.407×10^{-2}	0.110
fitted radiance squeeze [1]	$(-3.532 \pm 19.666) \times 10^{-5}$	17325360	-1.000×10^{-5}	2.070×10^{-4}	-1.869×10^{-5}	-1.786×10^{-2}	5.033×10^{-2}
fitted root mean square [1]	$(1.318 \pm 0.623) \times 10^{-3}$	17325360	9.250×10^{-4}	6.125×10^{-4}	1.124×10^{-3}	3.281×10^{-4}	7.861×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.811 ± 0.420	17325360	0.660	0.548	0.766	5.000×10^{-2}	2.78
sulfurdioxide total air mass factor polluted precision [1]	0.112 ± 0.123	17325360	3.500×10^{-2}	0.112	6.503×10^{-2}	2.500×10^{-3}	1.70
sulfurdioxide clear air mass factor polluted [1]	0.689 ± 0.283	17325360	0.620	0.382	0.664	4.385×10^{-2}	2.63
number of spectral points in retrieval [1]	73.4 ± 0.5	17325360	73.0	1.000	73.0	52.0	74.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	5.000×10^{-2}	0.110	0.220	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-3.17	-1.04	-0.601	-0.392	-0.226	0.259	0.442	0.679	1.20	3.79
sulfurdioxide total vertical column precision [DU]	0.100	0.138	0.166	0.190	0.224	0.626	0.887	1.25	1.99	5.15
sulfurdioxide slant column density corrected [DU]	-0.901	-0.507	-0.362	-0.268	-0.172	0.196	0.299	0.403	0.572	1.12
sulfurdioxide slant column density cobra [DU]	-0.901	-0.507	-0.362	-0.268	-0.172	0.196	0.299	0.403	0.572	1.12
sulfurdioxide slant column density cobra precision [DU]	0.138	0.164	0.177	0.189	0.204	0.362	0.422	0.474	0.559	0.869
sulfurdioxide slant column density window1 [DU]	-1.92	-0.947	-0.603	-0.390	-0.177	0.570	0.761	0.947	1.23	2.05
sulfurdioxide slant column density window1 precision [DU]	0.138	0.164	0.177	0.189	0.204	0.362	0.422	0.474	0.559	0.869
sulfurdioxide slant column density corrected win1 [DU]	-1.76	-0.976	-0.698	-0.517	-0.329	0.402	0.610	0.820	1.16	2.16
background so2 slant column offset window1 [DU]	-0.409	-0.329	-0.306	-0.288	-0.264	-4.798×10^{-2}	3.370×10^{-2}	0.116	0.247	0.581
sulfurdioxide slant column density window2 [DU]	-18.7	-12.0	-8.78	-6.34	-3.57	8.07	11.1	13.9	17.8	26.0
sulfurdioxide slant column density window2 precision [DU]	4.30	5.20	5.74	6.16	6.66	9.18	10.0	10.8	12.0	14.8
sulfurdioxide slant column density corrected win2 [DU]	-20.4	-13.2	-9.85	-7.35	-4.57	6.60	9.41	11.9	15.4	22.9
background so2 slant column offset window2 [DU]	-10.5	-7.69	-5.99	-4.66	-3.01	0.789	1.11	1.39	1.87	4.02
sulfurdioxide slant column density window3 [DU]	-72.1	-52.7	-43.4	-36.7	-29.3	1.01	8.93	16.1	25.6	44.4
sulfurdioxide slant column density window3 precision [DU]	13.4	16.1	17.9	19.2	20.8	30.3	34.9	40.9	52.5	83.3
sulfurdioxide slant column density corrected win3 [DU]	-64.9	-45.4	-36.2	-29.5	-22.2	6.93	14.4	21.1	30.1	48.2
background so2 slant column offset window3 [DU]	-7.93	-4.11	-2.69	-1.46	9.931×10^{-2}	12.5	14.8	16.7	18.8	22.1
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]	1.164×10^{-3}	2.229×10^{-3}	3.279×10^{-3}	5.395×10^{-3}	8.130×10^{-3}	2.596×10^{-2}	3.654×10^{-2}	5.529×10^{-2}	0.101	0.373
fitted radiance shift [nm]	-8.209×10^{-3}	-4.338×10^{-3}	-2.978×10^{-3}	-2.178×10^{-3}	-1.456×10^{-3}	4.149×10^{-4}	1.111×10^{-3}	1.970×10^{-3}	3.448×10^{-3}	7.541×10^{-3}
fitted radiance squeeze [1]	-6.679×10^{-4}	-3.667×10^{-4}	-2.560×10^{-4}	-1.899×10^{-4}	-1.268×10^{-4}	8.018×10^{-5}	1.293×10^{-4}	1.742×10^{-4}	2.372×10^{-4}	3.836×10^{-4}
fitted root mean square [1]	5.844×10^{-4}	7.190×10^{-4}	7.949×10^{-4}	8.523×10^{-4}	9.231×10^{-4}	1.536×10^{-3}	1.808×10^{-3}	2.079×10^{-3}	2.505×10^{-3}	3.605×10^{-3}
sulfurdioxide total air mass factor polluted [1]	5.912×10^{-2}	0.185	0.289	0.389	0.514	1.06	1.23	1.39	1.59	1.92
sulfurdioxide total air mass factor polluted precision [1]	8.240×10^{-3}	1.542×10^{-2}	2.220×10^{-2}	2.835×10^{-2}	3.581×10^{-2}	0.148	0.198	0.251	0.341	0.602
sulfurdioxide clear air mass factor polluted [1]	0.163	0.262	0.336	0.402	0.489	0.870	0.971	1.06	1.17	1.46
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]	0.621 ± 0.403	9531240	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(6.645 \pm 181.810) \times 10^{-2}$	9531240	0.560	1.274×10^{-2}	-124	432	-0.259	0.301
sulfurdioxide total vertical column precision [DU]	0.805 ± 1.311	9531240	0.558	0.408	4.719×10^{-2}	42.0	0.243	0.801
sulfurdioxide slant column density corrected [DU]	$(2.618 \pm 44.193) \times 10^{-2}$	9531240	0.385	9.887×10^{-3}	-31.6	69.7	-0.180	0.205
sulfurdioxide slant column density cobra [DU]	$(2.577 \pm 42.341) \times 10^{-2}$	9531240	0.385	9.887×10^{-3}	-31.6	26.0	-0.180	0.205
sulfurdioxide slant column density cobra precision [DU]	0.322 ± 0.168	9531240	0.193	0.268	8.362×10^{-2}	11.0	0.205	0.398
sulfurdioxide slant column density window1 [DU]	0.175 ± 0.796	9531240	0.783	0.203	-20.9	43.8	-0.198	0.586
sulfurdioxide slant column density window1 precision [DU]	0.322 ± 0.168	9531240	0.193	0.268	8.362×10^{-2}	11.0	0.205	0.398
sulfurdioxide slant column density corrected win1 [DU]	$(6.325 \pm 78.496) \times 10^{-2}$	9531240	0.769	3.228×10^{-2}	-20.2	43.5	-0.343	0.427
background so2 slant column offset window1 [DU]	-0.111 ± 0.235	9531240	0.241	-0.178	-1.27	4.99	-0.264	-2.286×10^{-2}
sulfurdioxide slant column density window2 [DU]	3.11 ± 9.29	9531240	11.8	2.77	-360	1.510×10^3	-2.99	8.85
sulfurdioxide slant column density window2 precision [DU]	8.00 ± 2.11	9531240	2.45	7.69	2.03	581	6.60	9.05
sulfurdioxide slant column density corrected win2 [DU]	0.949 ± 8.773	9531240	11.1	0.929	-369	1.503×10^3	-4.62	6.47
background so2 slant column offset window2 [DU]	-2.16 ± 3.64	9531240	5.65	-1.13	-18.2	14.8	-4.87	0.777
sulfurdioxide slant column density window3 [DU]	-16.1 ± 23.1	9531240	29.4	-16.5	-231	139	-30.9	-1.57
sulfurdioxide slant column density window3 precision [DU]	26.8 ± 12.2	9531240	8.48	23.5	9.17	218	20.3	28.8
sulfurdioxide slant column density corrected win3 [DU]	-7.25 ± 22.25	9531240	28.1	-7.19	-213	155	-21.2	6.87
background so2 slant column offset window3 [DU]	8.88 ± 7.39	9531240	12.8	9.58	-17.2	40.2	2.10	14.9
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	9531240	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(4.075 \pm 9.024) \times 10^{-2}$	9531240	2.812×10^{-2}	1.546×10^{-2}	3.075×10^{-4}	2.00	6.196×10^{-3}	3.432×10^{-2}
fitted radiance shift [nm]	$(-3.468 \pm 24.257) \times 10^{-4}$	9531240	1.696×10^{-3}	-3.362×10^{-4}	-4.259×10^{-2}	3.854×10^{-2}	-1.220×10^{-3}	4.762×10^{-4}
fitted radiance squeeze [1]	$(-5.806 \pm 21.707) \times 10^{-5}$	9531240	2.225×10^{-4}	-3.037×10^{-5}	-3.397×10^{-3}	1.060×10^{-2}	-1.505×10^{-4}	7.195×10^{-5}
fitted root mean square [1]	$(1.400 \pm 0.714) \times 10^{-3}$	9531240	7.296×10^{-4}	1.166×10^{-3}	3.420×10^{-4}	2.623×10^{-2}	9.288×10^{-4}	1.658×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.751 ± 0.426	9531240	0.582	0.697	5.000×10^{-2}	2.78	0.432	1.01
sulfurdioxide total air mass factor polluted precision [1]	0.109 ± 0.141	9531240	0.102	5.536×10^{-2}	2.500×10^{-3}	1.70	3.065×10^{-2}	0.133
sulfurdioxide clear air mass factor polluted [1]	0.635 ± 0.295	9531240	0.424	0.608	4.385×10^{-2}	2.63	0.403	0.827
number of spectral points in retrieval [1]	73.5 ± 0.5	9531240	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]	0.657 ± 0.404	7794120	0.770	1.000	0.0	1.000	0.230	1.000
sulfurdioxide total vertical column [DU]	$(2.210 \pm 72.512) \times 10^{-2}$	7794120	0.417	1.073×10^{-2}	-43.3	141	-0.196	0.221
sulfurdioxide total vertical column precision [DU]	0.432 ± 0.467	7794120	0.277	0.298	4.391×10^{-2}	25.9	0.209	0.486
sulfurdioxide slant column density corrected [DU]	$(1.642 \pm 35.239) \times 10^{-2}$	7794120	0.348	9.546×10^{-3}	-31.0	65.5	-0.163	0.185
sulfurdioxide slant column density cobra [DU]	$(1.622 \pm 33.569) \times 10^{-2}$	7794120	0.348	9.546×10^{-3}	-31.0	33.5	-0.163	0.185
sulfurdioxide slant column density cobra precision [DU]	0.277 ± 0.114	7794120	0.119	0.244	8.063×10^{-2}	15.5	0.202	0.321
sulfurdioxide slant column density window1 [DU]	0.192 ± 0.637	7794120	0.708	0.206	-193	54.9	-0.155	0.552
sulfurdioxide slant column density window1 precision [DU]	0.277 ± 0.114	7794120	0.119	0.244	8.063×10^{-2}	15.5	0.202	0.321
sulfurdioxide slant column density corrected win1 [DU]	$(4.092 \pm 62.620) \times 10^{-2}$	7794120	0.689	2.730×10^{-2}	-193	55.7	-0.314	0.375
background so2 slant column offset window1 [DU]	-0.151 ± 0.154	7794120	0.186	-0.184	-1.22	3.22	-0.263	-7.750×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.55 ± 9.11	7794120	11.3	1.36	-1.300×10^3	870	-4.23	7.10
sulfurdioxide slant column density window2 precision [DU]	8.21 ± 2.39	7794120	2.59	7.88	2.08	600	6.73	9.33
sulfurdioxide slant column density corrected win2 [DU]	1.17 ± 9.08	7794120	11.3	1.12	-1.300×10^3	871	-4.51	6.76
background so2 slant column offset window2 [DU]	-0.380 ± 2.027	7794120	2.16	-3.081×10^{-2}	-15.8	14.8	-1.36	0.798
sulfurdioxide slant column density window3 [DU]	-11.5 ± 24.5	7794120	31.0	-11.7	-362	1.020×10^3	-27.0	4.02
sulfurdioxide slant column density window3 precision [DU]	29.1 ± 13.8	7794120	10.4	25.4	9.55	291	21.4	31.9
sulfurdioxide slant column density corrected win3 [DU]	-8.24 ± 23.98	7794120	30.4	-8.44	-365	1.019×10^3	-23.4	7.00
background so2 slant column offset window3 [DU]	3.30 ± 6.48	7794120	10.3	2.00	-19.4	26.6	-1.76	8.53
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	7794120	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.869 \pm 2.535) \times 10^{-2}$	7794120	1.175×10^{-2}	1.469×10^{-2}	9.854×10^{-4}	1.69	9.681×10^{-3}	2.144×10^{-2}
fitted radiance shift [nm]	$(-6.542 \pm 27.487) \times 10^{-4}$	7794120	2.058×10^{-3}	-6.383×10^{-4}	-4.407×10^{-2}	0.110	-1.742×10^{-3}	3.167×10^{-4}
fitted radiance squeeze [1]	$(-7.497 \pm 164.125) \times 10^{-6}$	7794120	1.924×10^{-4}	-5.939×10^{-6}	-1.786×10^{-2}	5.033×10^{-2}	-1.028×10^{-4}	8.956×10^{-5}
fitted root mean square [1]	$(1.218 \pm 0.471) \times 10^{-3}$	7794120	4.836×10^{-4}	1.091×10^{-3}	3.281×10^{-4}	7.861×10^{-2}	9.168×10^{-4}	1.400×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.884 ± 0.400	7794120	0.506	0.841	5.000×10^{-2}	2.71	0.609	1.11
sulfurdioxide total air mass factor polluted precision [1]	0.116 ± 0.098	7794120	0.121	7.876×10^{-2}	3.851×10^{-3}	1.48	4.296×10^{-2}	0.164
sulfurdioxide clear air mass factor polluted [1]	0.754 ± 0.253	7794120	0.337	0.715	0.119	2.47	0.574	0.911
number of spectral points in retrieval [1]	73.4 ± 0.5	7794120	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]	0.678 ± 0.399	11818025	0.750	1.000	0.0	1.000	0.250	1.000
sulfurdioxide total vertical column [DU]	$(2.761 \pm 95.671) \times 10^{-2}$	11818025	0.439	9.990×10^{-3}	-71.4	141	-0.207	0.232
sulfurdioxide total vertical column precision [DU]	0.501 ± 0.690	11818025	0.315	0.309	4.428×10^{-2}	36.7	0.214	0.529
sulfurdioxide slant column density corrected [DU]	$(1.659 \pm 34.585) \times 10^{-2}$	11818025	0.352	8.568×10^{-3}	-17.2	69.7	-0.166	0.186
sulfurdioxide slant column density cobra [DU]	$(1.655 \pm 34.372) \times 10^{-2}$	11818025	0.352	8.568×10^{-3}	-17.2	33.5	-0.166	0.186
sulfurdioxide slant column density cobra precision [DU]	0.285 ± 0.130	11818025	0.135	0.242	8.063×10^{-2}	12.6	0.200	0.335
sulfurdioxide slant column density window1 [DU]	0.191 ± 0.665	11818025	0.717	0.207	-193	46.3	-0.158	0.559
sulfurdioxide slant column density window1 precision [DU]	0.285 ± 0.130	11818025	0.135	0.242	8.063×10^{-2}	12.6	0.200	0.335
sulfurdioxide slant column density corrected win1 [DU]	$(4.400 \pm 65.590) \times 10^{-2}$	11818025	0.703	2.643×10^{-2}	-193	46.1	-0.320	0.383
background so2 slant column offset window1 [DU]	-0.147 ± 0.173	11818025	0.199	-0.187	-1.22	3.29	-0.266	-6.732×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.90 ± 8.99	11818025	11.3	1.66	-1.048×10^3	1.510×10^3	-3.90	7.42
sulfurdioxide slant column density window2 precision [DU]	7.99 ± 2.16	11818025	2.46	7.66	2.08	581	6.59	9.05
sulfurdioxide slant column density corrected win2 [DU]	1.04 ± 8.81	11818025	11.1	1.00	-1.047×10^3	1.503×10^3	-4.53	6.54
background so2 slant column offset window2 [DU]	-0.868 ± 2.738	11818025	2.88	-0.143	-18.2	14.8	-2.03	0.848
sulfurdioxide slant column density window3 [DU]	-11.1 ± 24.0	11818025	30.6	-11.4	-362	1.020×10^3	-26.4	4.21
sulfurdioxide slant column density window3 precision [DU]	27.2 ± 12.0	11818025	9.08	24.0	9.50	291	20.6	29.7
sulfurdioxide slant column density corrected win3 [DU]	-5.68 ± 22.97	11818025	29.3	-5.89	-365	1.019×10^3	-20.4	8.95
background so2 slant column offset window3 [DU]	5.39 ± 7.11	11818025	11.2	4.41	-19.4	40.0	-0.288	10.9
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	11818025	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.184 \pm 3.570) \times 10^{-2}$	11818025	1.368×10^{-2}	1.495×10^{-2}	5.103×10^{-4}	1.76	9.175×10^{-3}	2.285×10^{-2}
fitted radiance shift [nm]	$(-4.943 \pm 23.836) \times 10^{-4}$	11818025	1.805×10^{-3}	-4.507×10^{-4}	-4.407×10^{-2}	4.071×10^{-2}	-1.426×10^{-3}	3.786×10^{-4}
fitted radiance squeeze [1]	$(-1.732 \pm 17.549) \times 10^{-5}$	11818025	1.945×10^{-4}	-8.889×10^{-6}	-1.786×10^{-2}	1.568×10^{-2}	-1.083×10^{-4}	8.623×10^{-5}
fitted root mean square [1]	$(1.248 \pm 0.540) \times 10^{-3}$	11818025	5.290×10^{-4}	1.081×10^{-3}	3.281×10^{-4}	7.861×10^{-2}	9.063×10^{-4}	1.435×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.845 ± 0.387	11818025	0.487	0.810	5.000×10^{-2}	2.54	0.583	1.07
sulfurdioxide total air mass factor polluted precision [1]	0.108 ± 0.100	11818025	0.105	6.898×10^{-2}	3.175×10^{-3}	1.64	4.013×10^{-2}	0.145
sulfurdioxide clear air mass factor polluted [1]	0.718 ± 0.249	11818025	0.335	0.697	6.807×10^{-2}	2.47	0.546	0.881
number of spectral points in retrieval [1]	73.4 ± 0.5	11818025	1.000	73.0	70.0	74.0	73.0	74.0

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

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.597 ± 0.407	3918778	0.820	0.490	0.0	1.000	0.180	1.000
sulfurdioxide total vertical column [DU]	$(7.013 \pm 188.758) \times 10^{-2}$	3918778	0.569	1.304×10^{-2}	-121	432	-0.263	0.306
sulfurdioxide total vertical column precision [DU]	0.821 ± 1.350	3918778	0.579	0.419	4.391×10^{-2}	42.0	0.253	0.832
sulfurdioxide slant column density corrected [DU]	$(2.603 \pm 45.353) \times 10^{-2}$	3918778	0.378	1.013×10^{-2}	-31.6	65.5	-0.177	0.202
sulfurdioxide slant column density cobra [DU]	$(2.539 \pm 41.752) \times 10^{-2}$	3918778	0.378	1.013×10^{-2}	-31.6	28.2	-0.177	0.202
sulfurdioxide slant column density cobra precision [DU]	0.311 ± 0.155	3918778	0.169	0.265	8.229×10^{-2}	15.5	0.208	0.377
sulfurdioxide slant column density window1 [DU]	0.192 ± 0.769	3918778	0.761	0.214	-29.9	54.9	-0.174	0.587
sulfurdioxide slant column density window1 precision [DU]	0.311 ± 0.155	3918778	0.169	0.265	8.229×10^{-2}	15.5	0.208	0.377
sulfurdioxide slant column density corrected win1 [DU]	$(6.175 \pm 75.689) \times 10^{-2}$	3918778	0.744	3.333×10^{-2}	-29.9	55.7	-0.331	0.414
background so2 slant column offset window1 [DU]	-0.130 ± 0.220	3918778	0.211	-0.193	-0.662	3.12	-0.269	-5.753×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.67 ± 9.49	3918778	11.9	2.40	-1.300×10^3	870	-3.43	8.50
sulfurdioxide slant column density window2 precision [DU]	8.28 ± 2.43	3918778	2.58	7.98	2.40	600	6.79	9.38
sulfurdioxide slant column density corrected win2 [DU]	1.01 ± 9.07	3918778	11.3	0.980	-1.300×10^3	871	-4.67	6.63
background so2 slant column offset window2 [DU]	-1.66 ± 3.39	3918778	4.69	-0.414	-18.2	14.8	-3.90	0.784
sulfurdioxide slant column density window3 [DU]	-20.1 ± 22.8	3918778	28.5	-19.8	-266	177	-34.2	-5.66
sulfurdioxide slant column density window3 precision [DU]	29.9 ± 15.7	3918778	11.1	25.5	9.17	247	21.2	32.3
sulfurdioxide slant column density corrected win3 [DU]	-13.0 ± 23.1	3918778	28.9	-12.5	-267	172	-27.2	1.73
background so2 slant column offset window3 [DU]	7.05 ± 7.79	3918778	13.3	6.77	-19.4	40.2	0.335	13.6
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	3918778	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.178 \pm 10.679) \times 10^{-2}$	3918778	4.159×10^{-2}	1.727×10^{-2}	3.075×10^{-4}	1.97	5.887×10^{-3}	4.748×10^{-2}
fitted radiance shift [nm]	$(-4.325 \pm 31.342) \times 10^{-4}$	3918778	2.065×10^{-3}	-4.527×10^{-4}	-3.847×10^{-2}	0.110	-1.506×10^{-3}	5.596×10^{-4}
fitted radiance squeeze [1]	$(-5.104 \pm 20.999) \times 10^{-5}$	3918778	2.199×10^{-4}	-2.981×10^{-5}	-1.278×10^{-2}	5.033×10^{-2}	-1.466×10^{-4}	7.336×10^{-5}
fitted root mean square [1]	$(1.358 \pm 0.666) \times 10^{-3}$	3918778	6.274×10^{-4}	1.168×10^{-3}	3.632×10^{-4}	5.359×10^{-2}	9.457×10^{-4}	1.573×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.752 ± 0.478	3918778	0.640	0.635	5.000×10^{-2}	2.78	0.402	1.04
sulfurdioxide total air mass factor polluted precision [1]	0.127 ± 0.165	3918778	0.137	5.787×10^{-2}	2.500×10^{-3}	1.70	2.764×10^{-2}	0.165
sulfurdioxide clear air mass factor polluted [1]	0.625 ± 0.324	3918778	0.433	0.569	4.420×10^{-2}	2.63	0.379	0.811
number of spectral points in retrieval [1]	73.4 ± 0.5	3918778	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

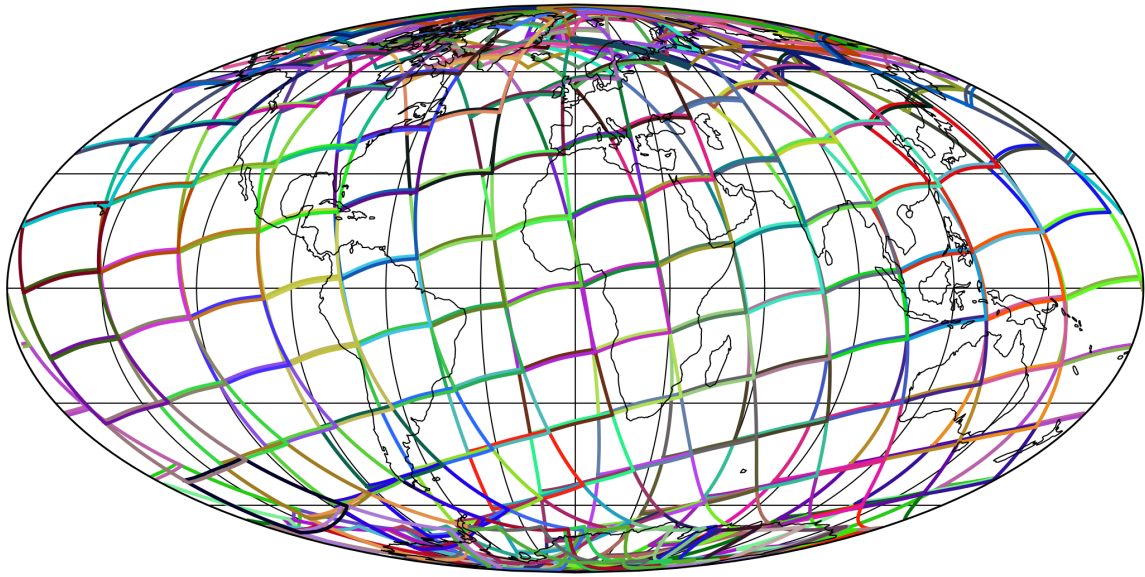


Figure 1: Outline of the granules.

4 Input data monitoring

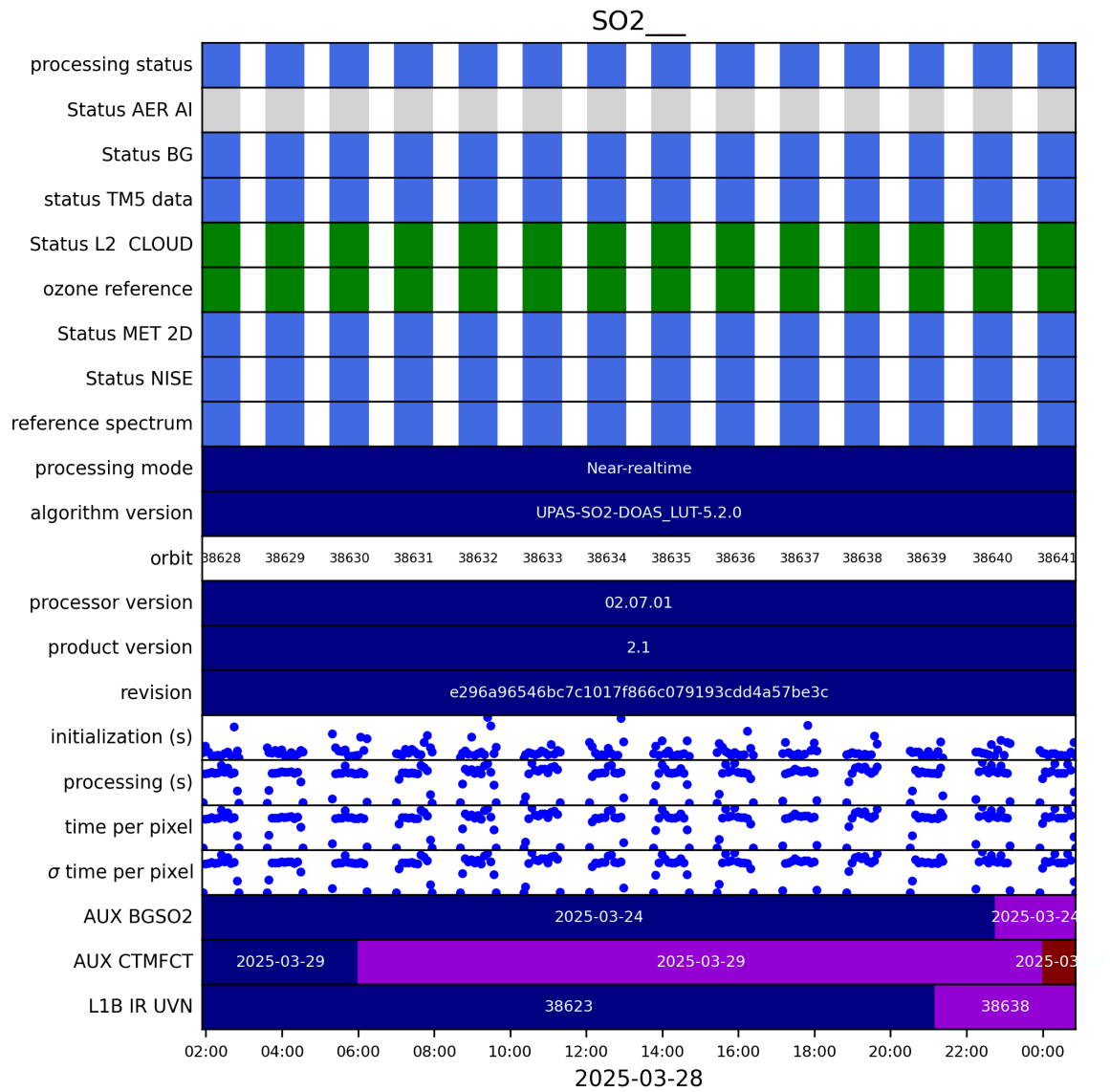


Figure 2: Input data per granule

5 Warnings and errors

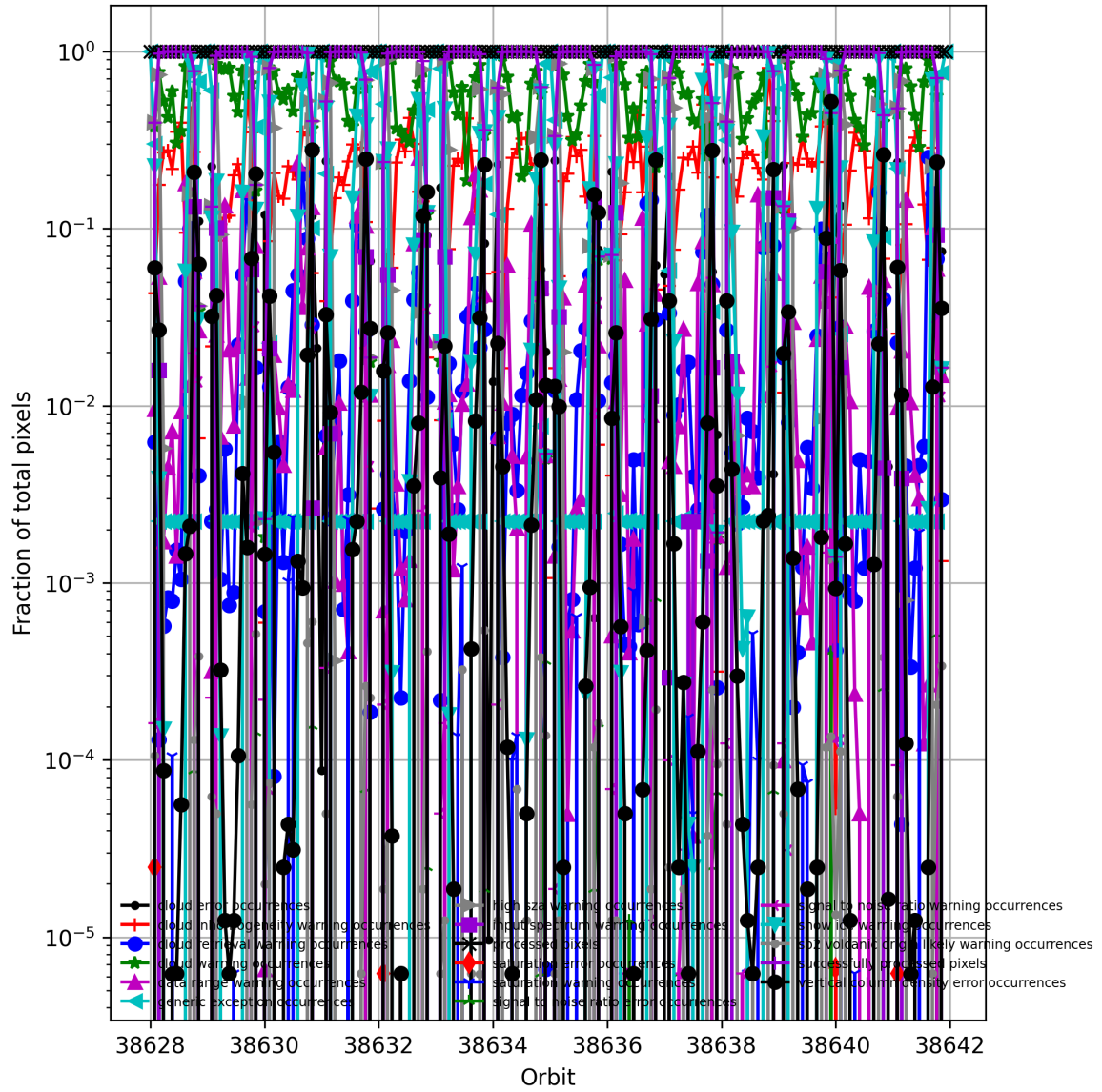


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

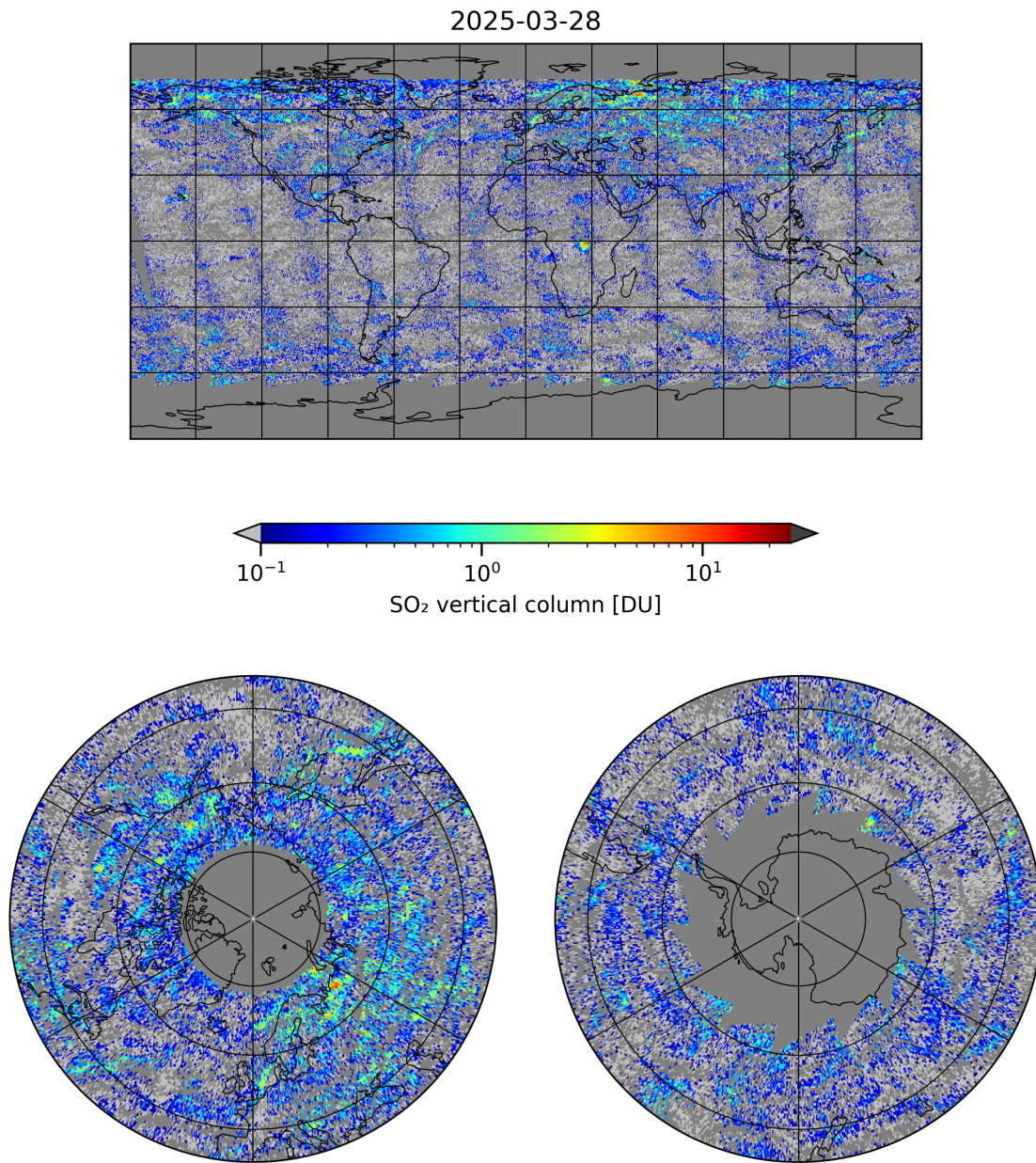


Figure 4: Map of “SO₂ vertical column” for 2025-03-28 to 2025-03-29

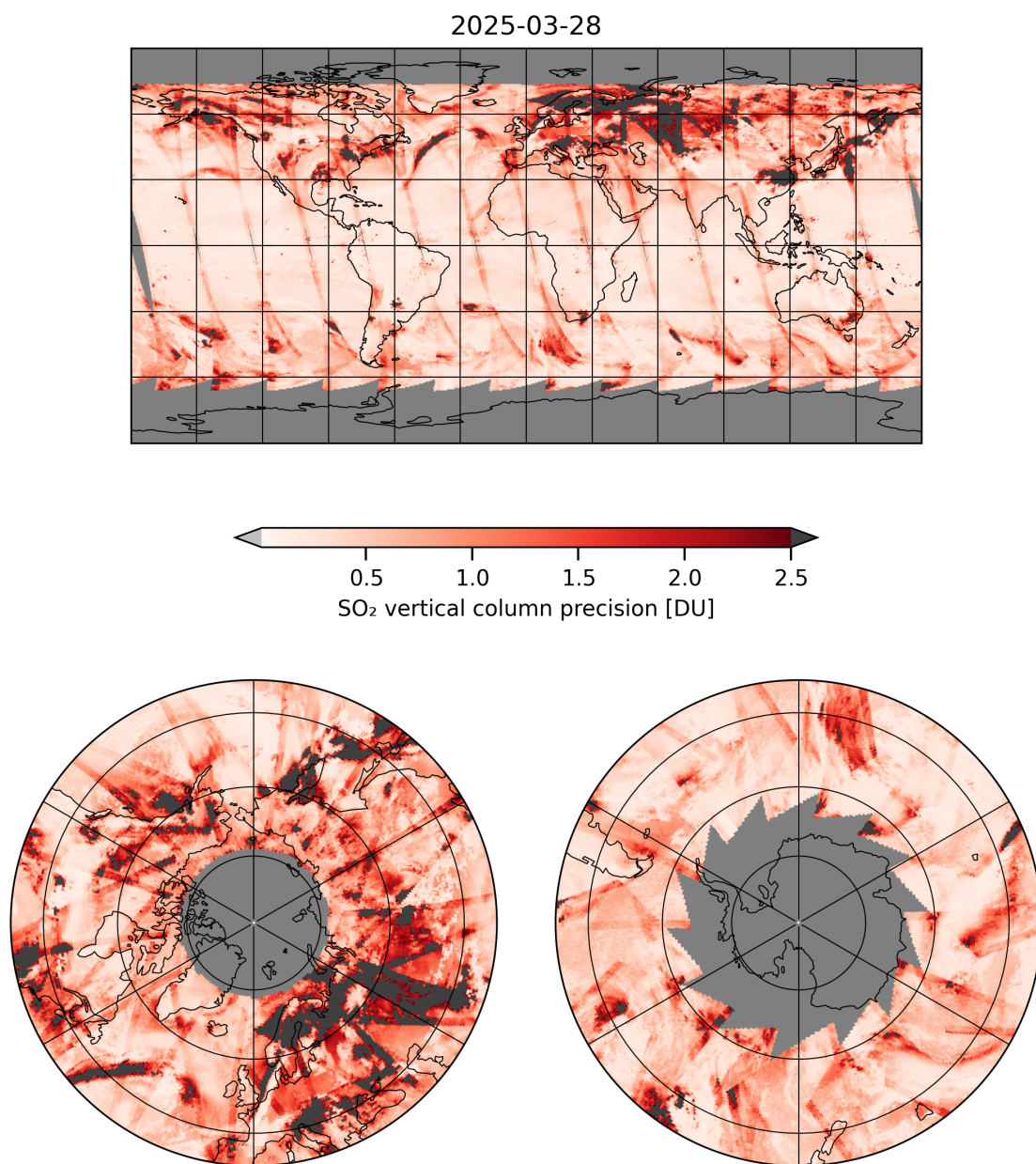


Figure 5: Map of “SO₂ vertical column precision” for 2025-03-28 to 2025-03-29

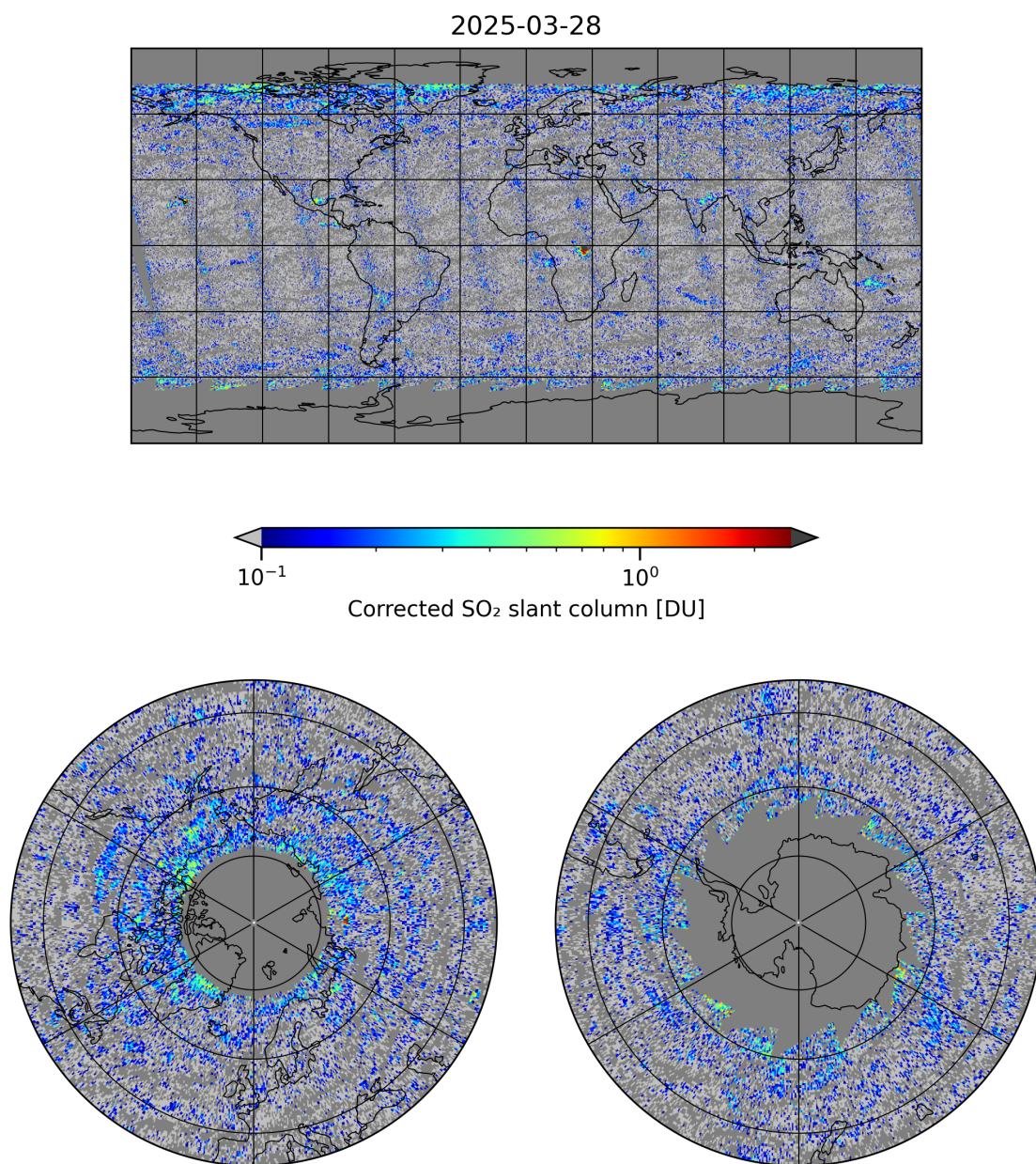


Figure 6: Map of “Corrected SO₂ slant column” for 2025-03-28 to 2025-03-29

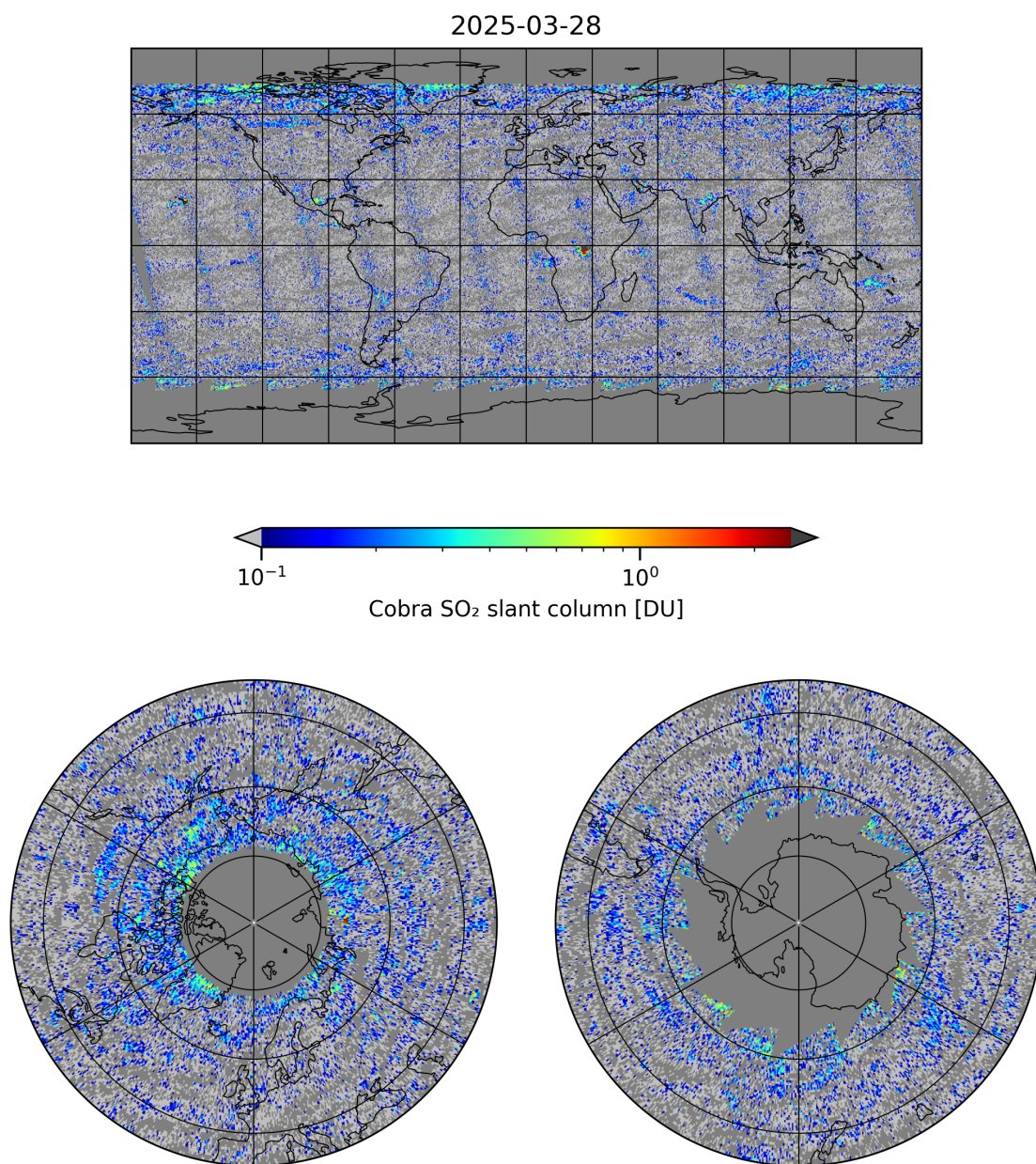


Figure 7: Map of “Cobra SO₂ slant column” for 2025-03-28 to 2025-03-29

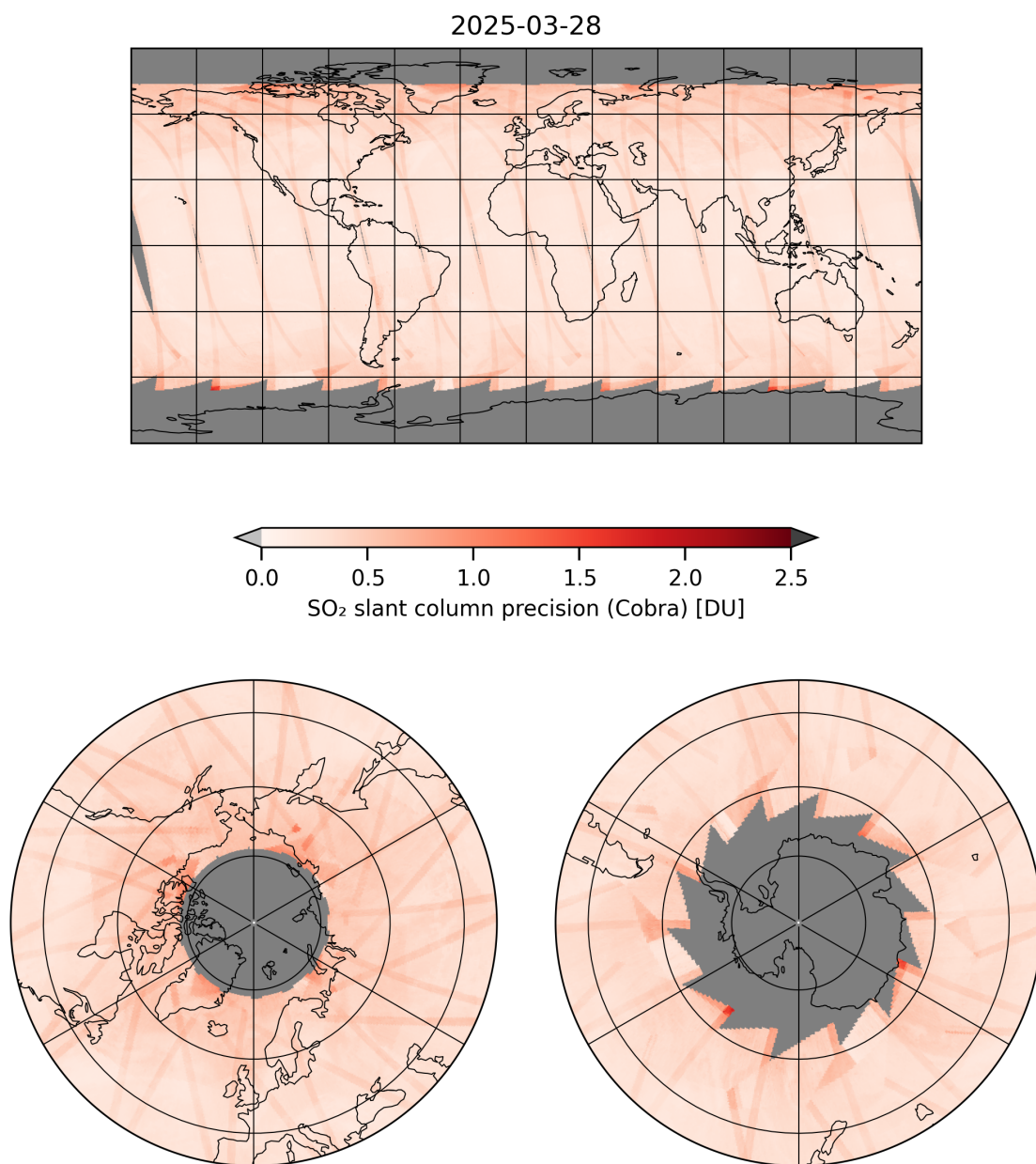


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-03-28 to 2025-03-29

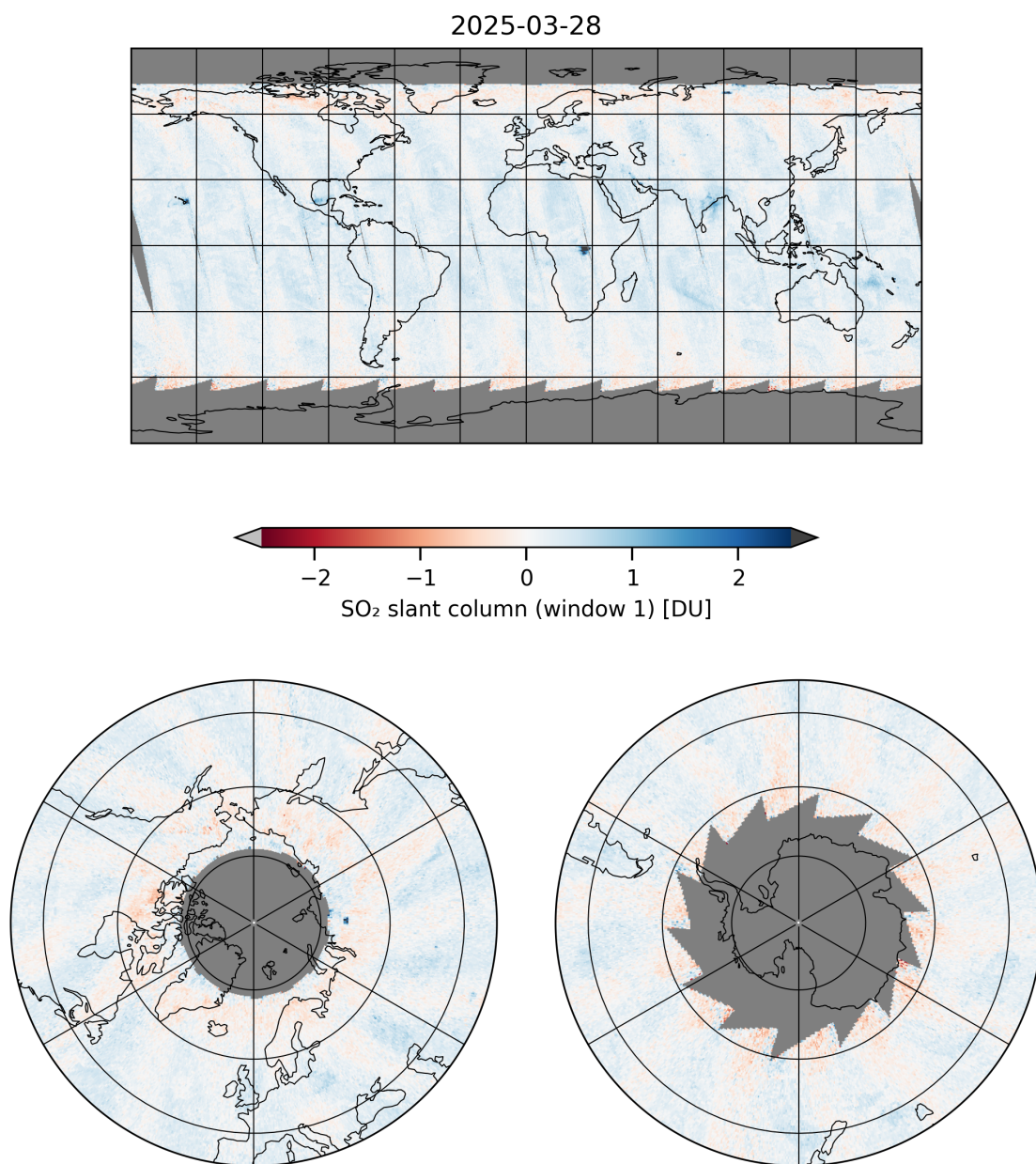


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-03-28 to 2025-03-29

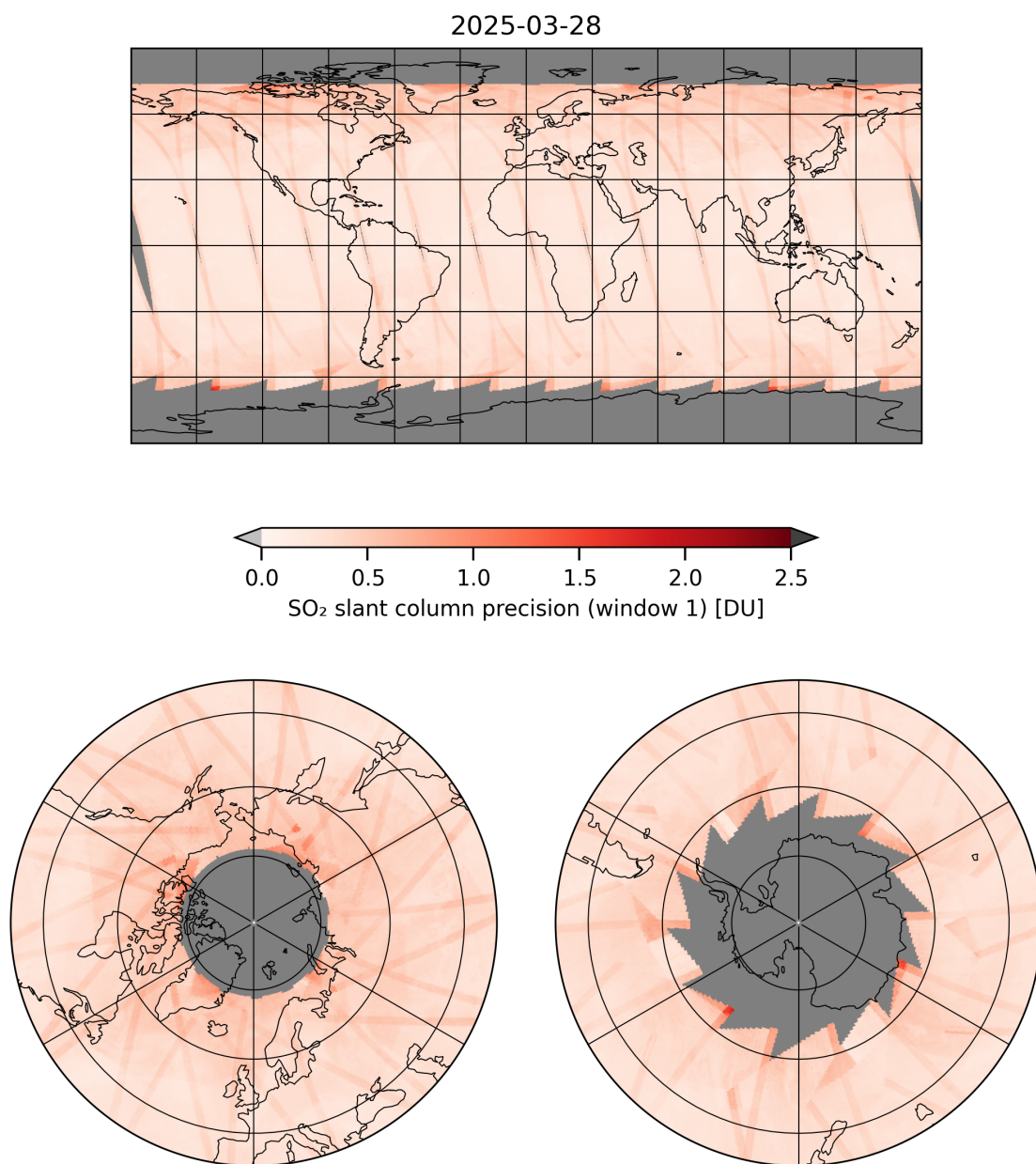


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-03-28 to 2025-03-29

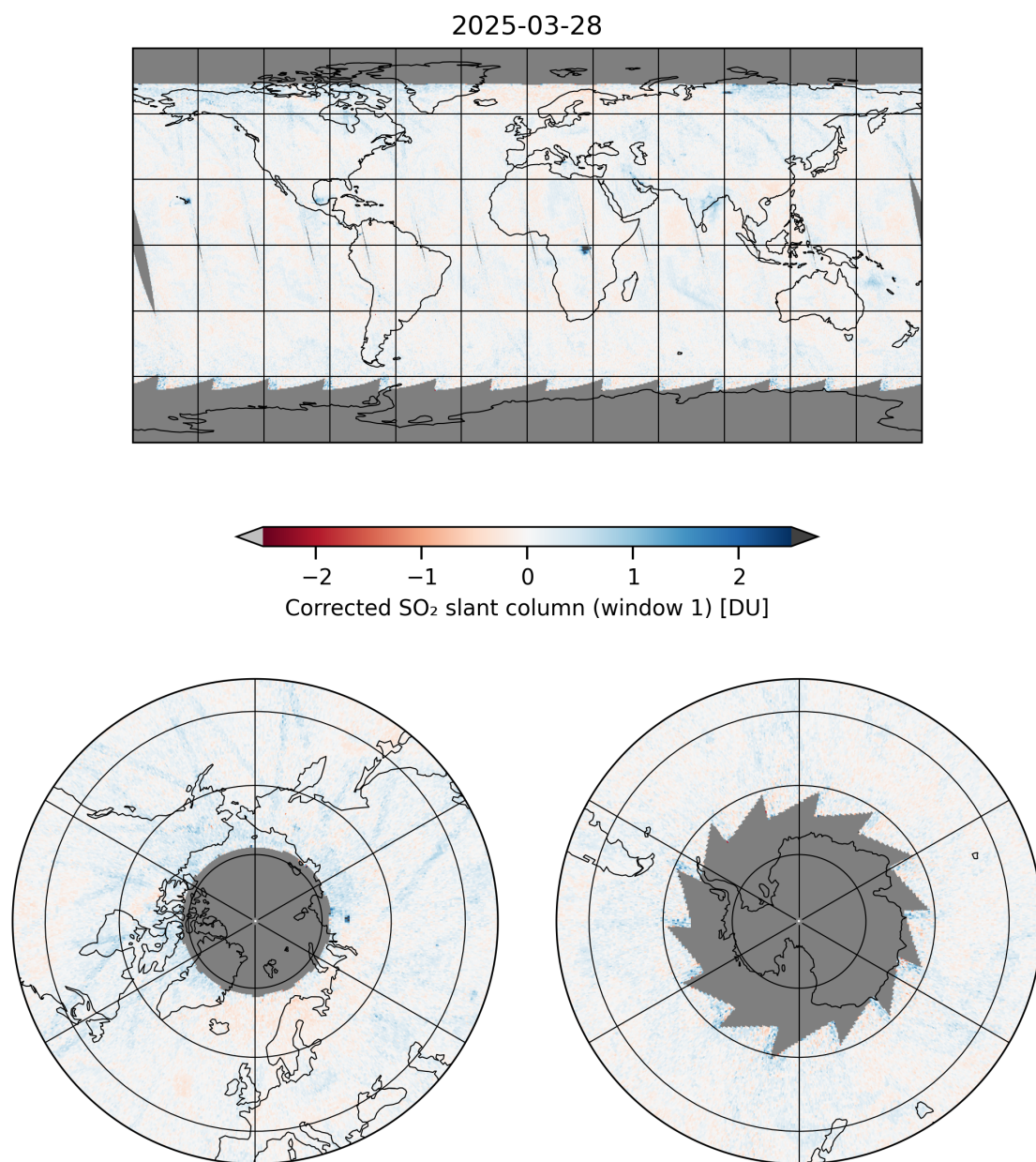


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-03-28 to 2025-03-29

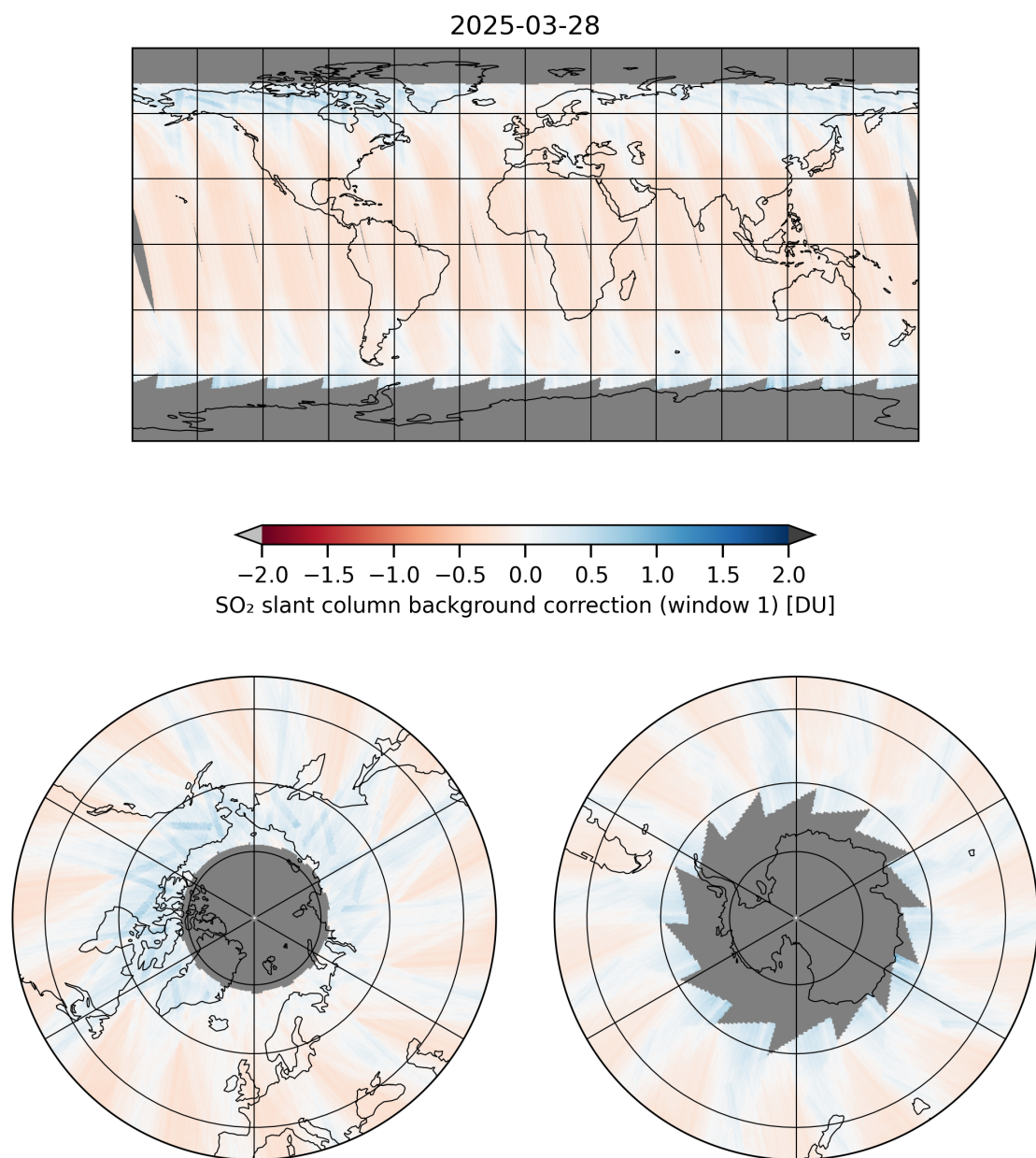


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-03-28 to 2025-03-29

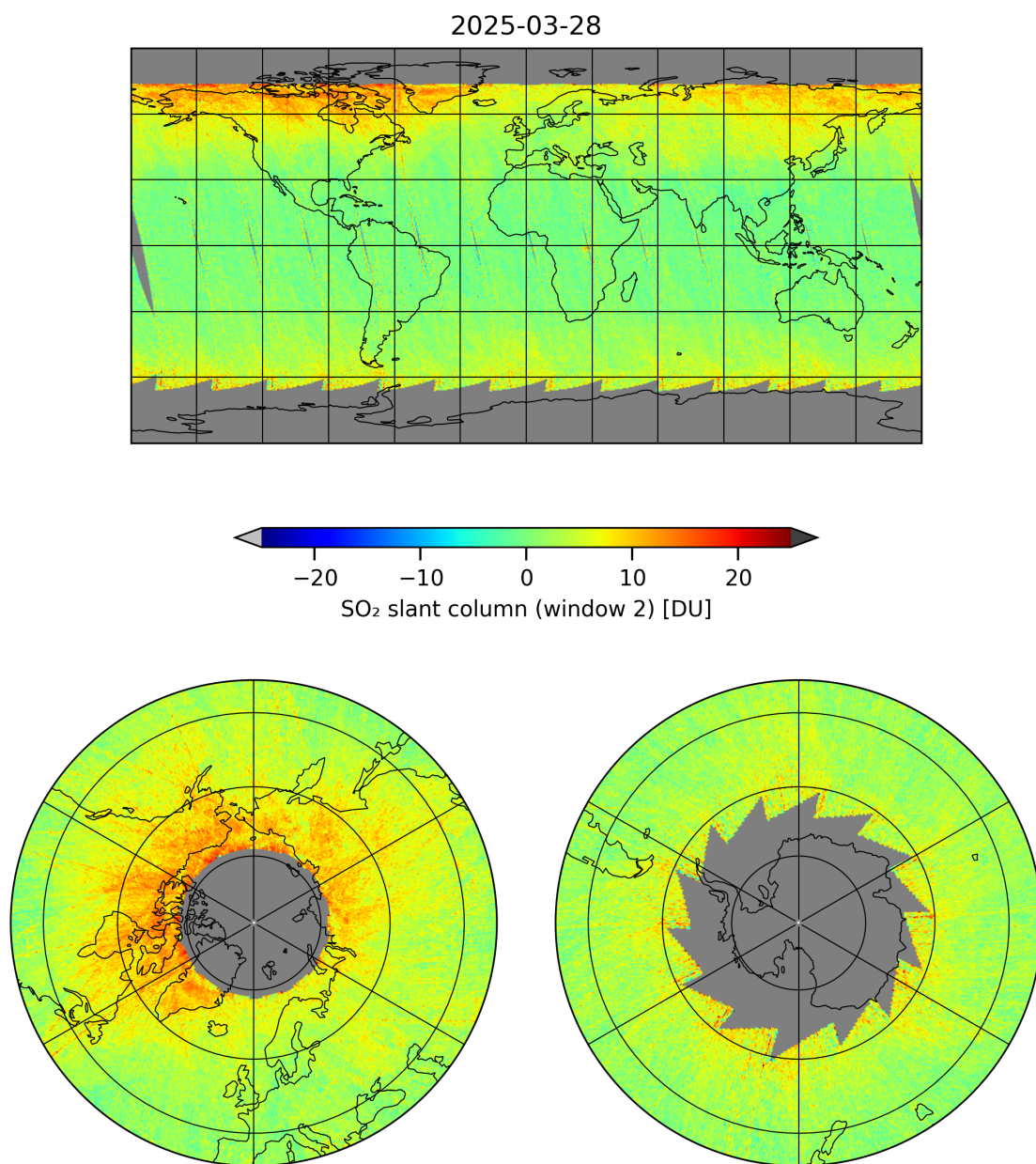


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-03-28 to 2025-03-29

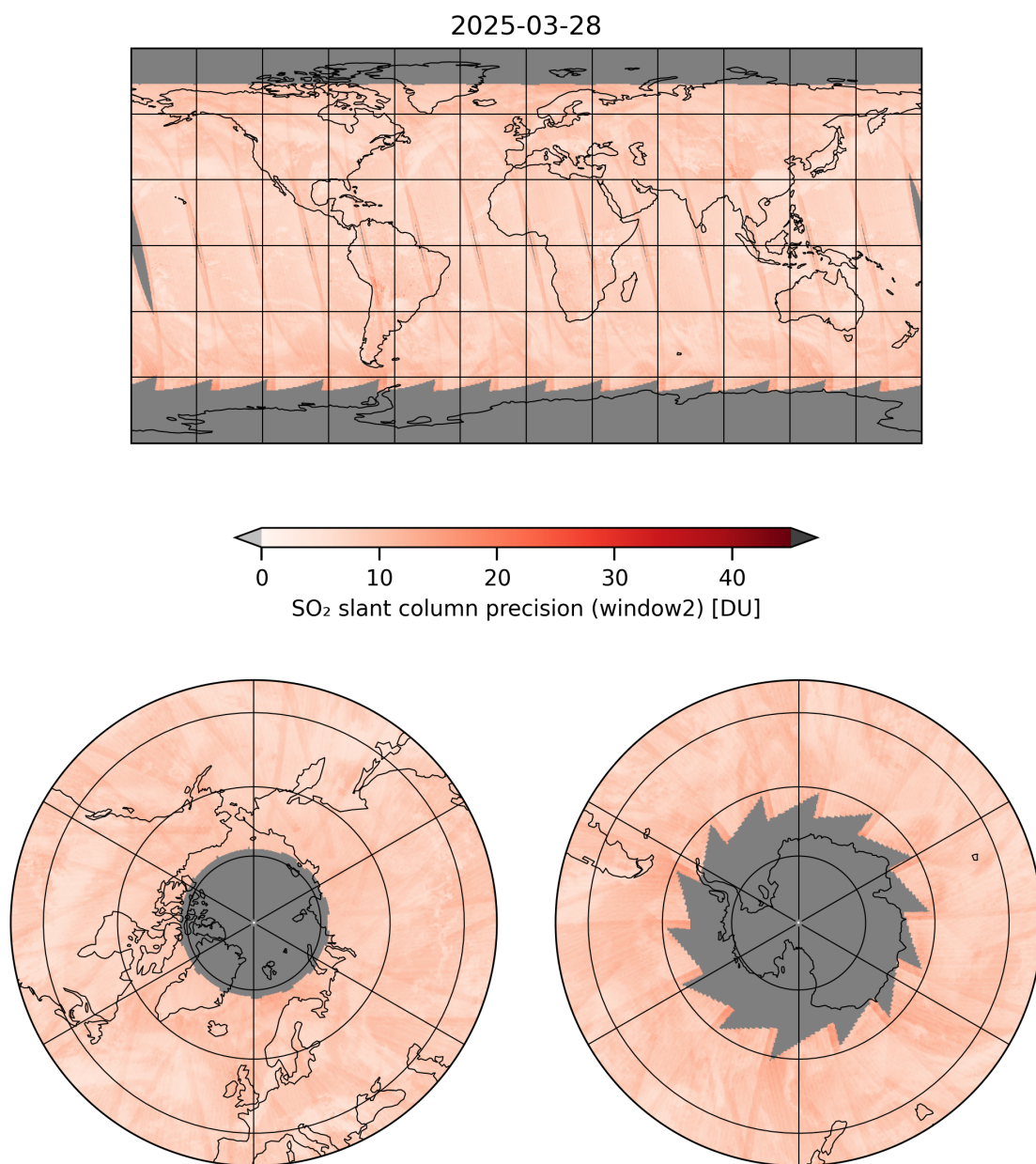


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-03-28 to 2025-03-29

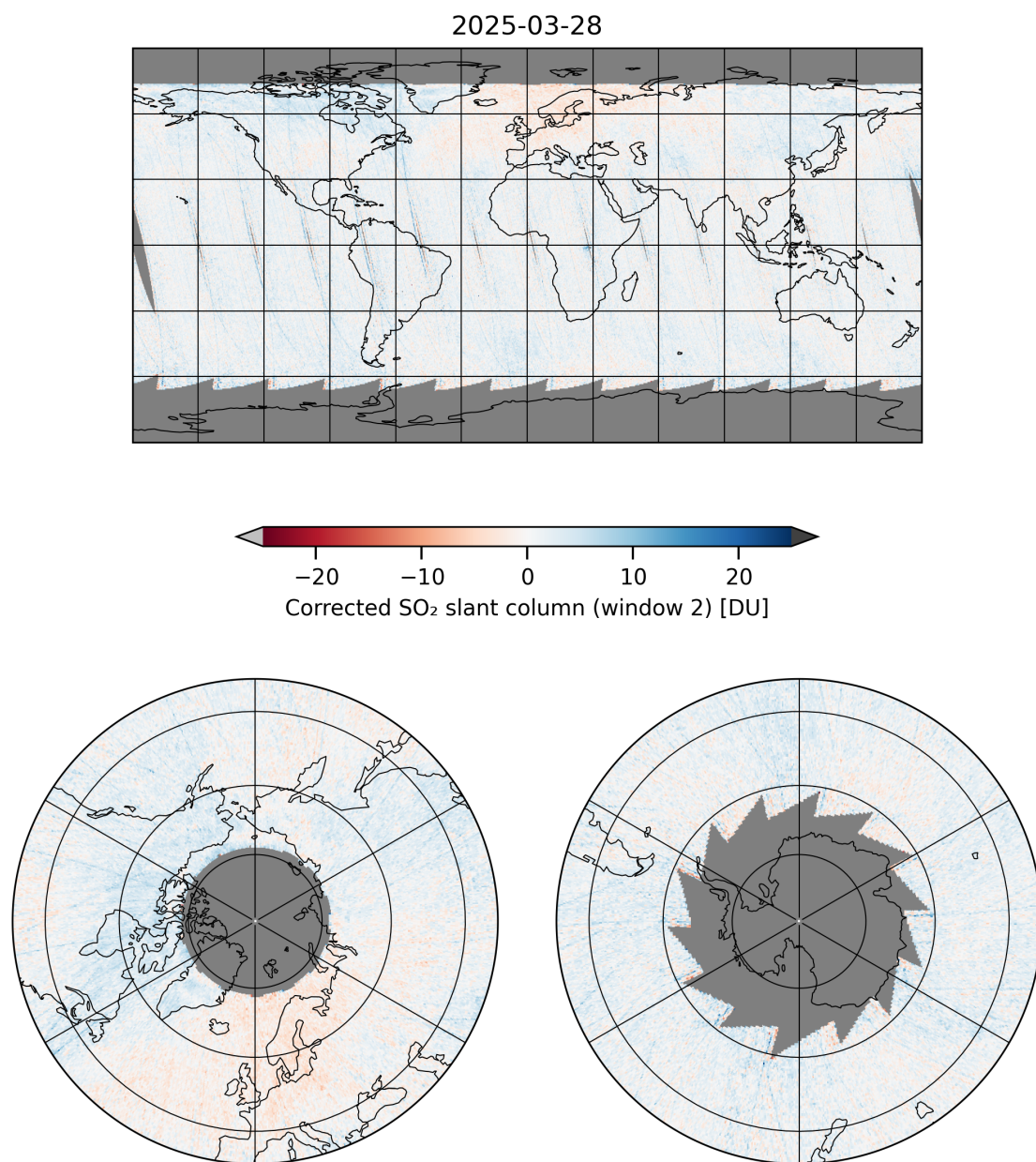


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-03-28 to 2025-03-29

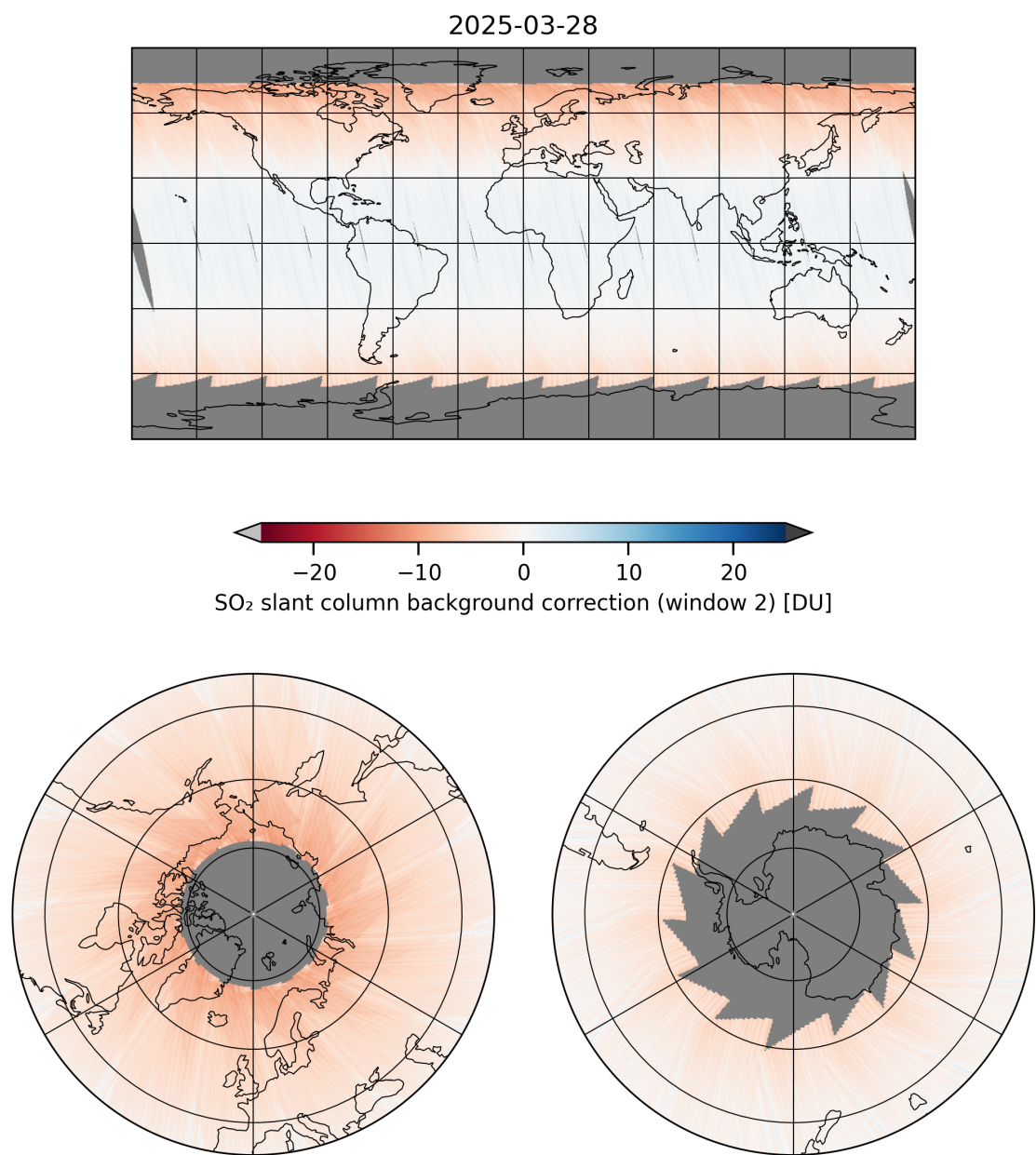


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-03-28 to 2025-03-29

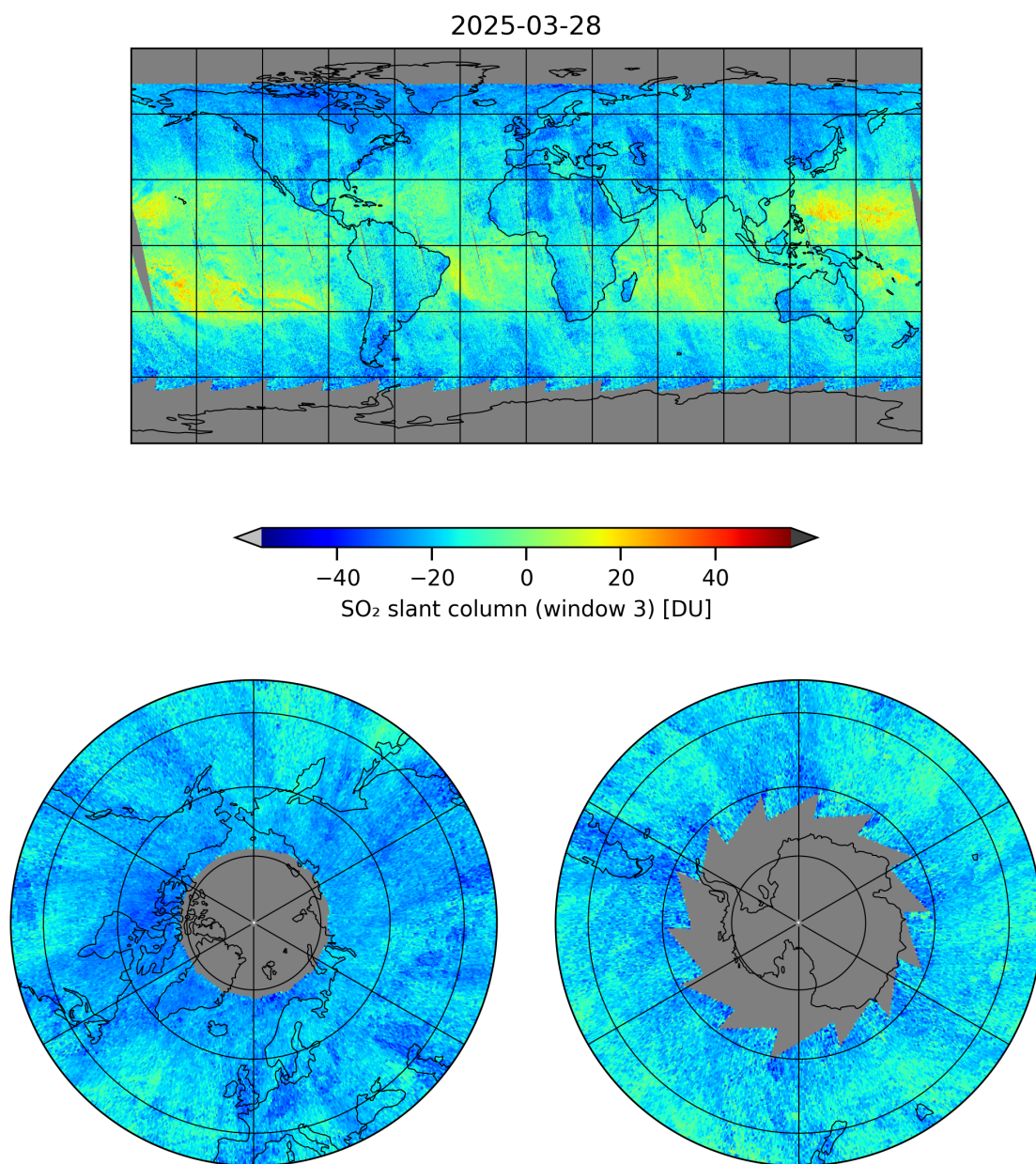


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-03-28 to 2025-03-29

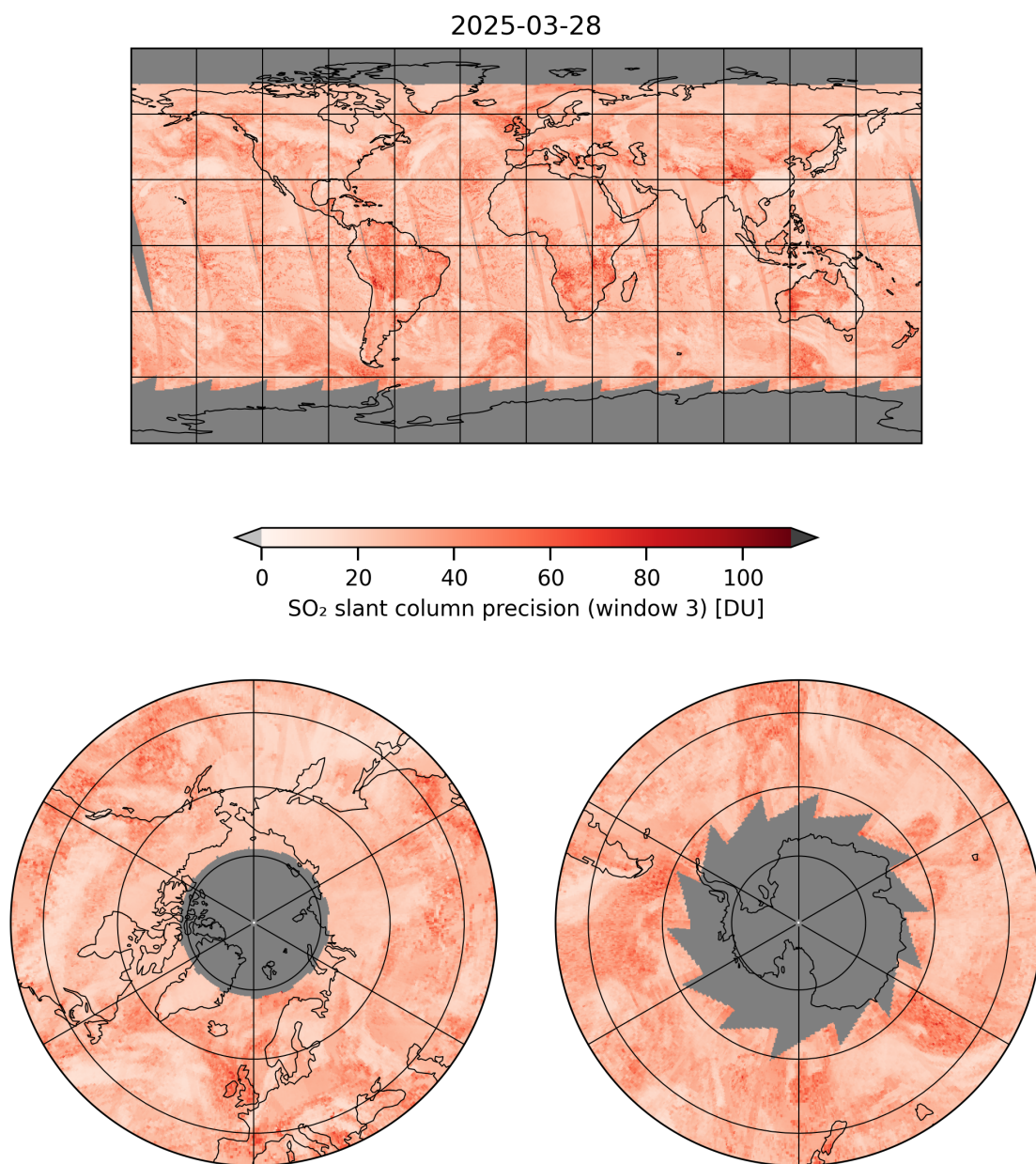


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-03-28 to 2025-03-29

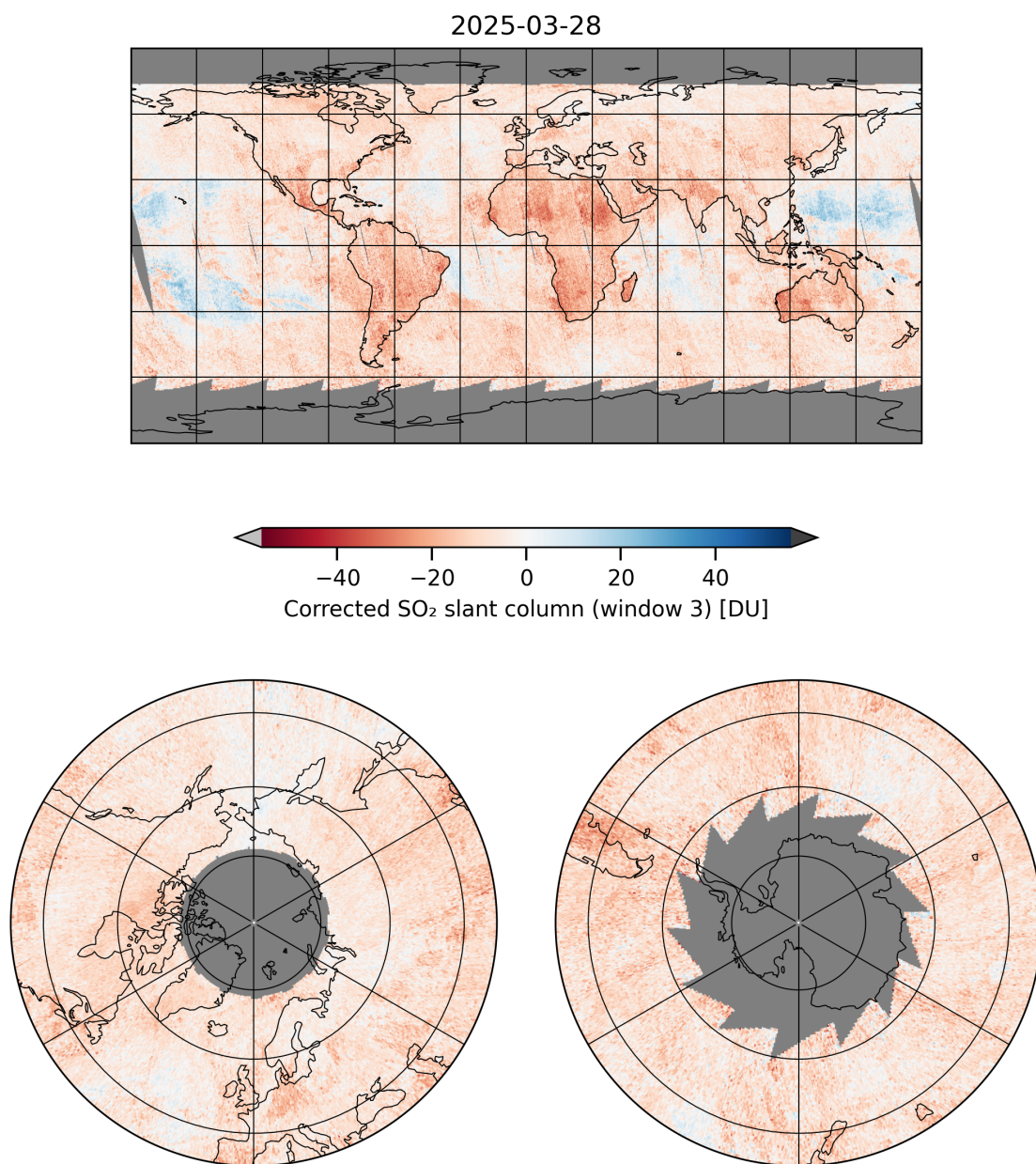


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-03-28 to 2025-03-29

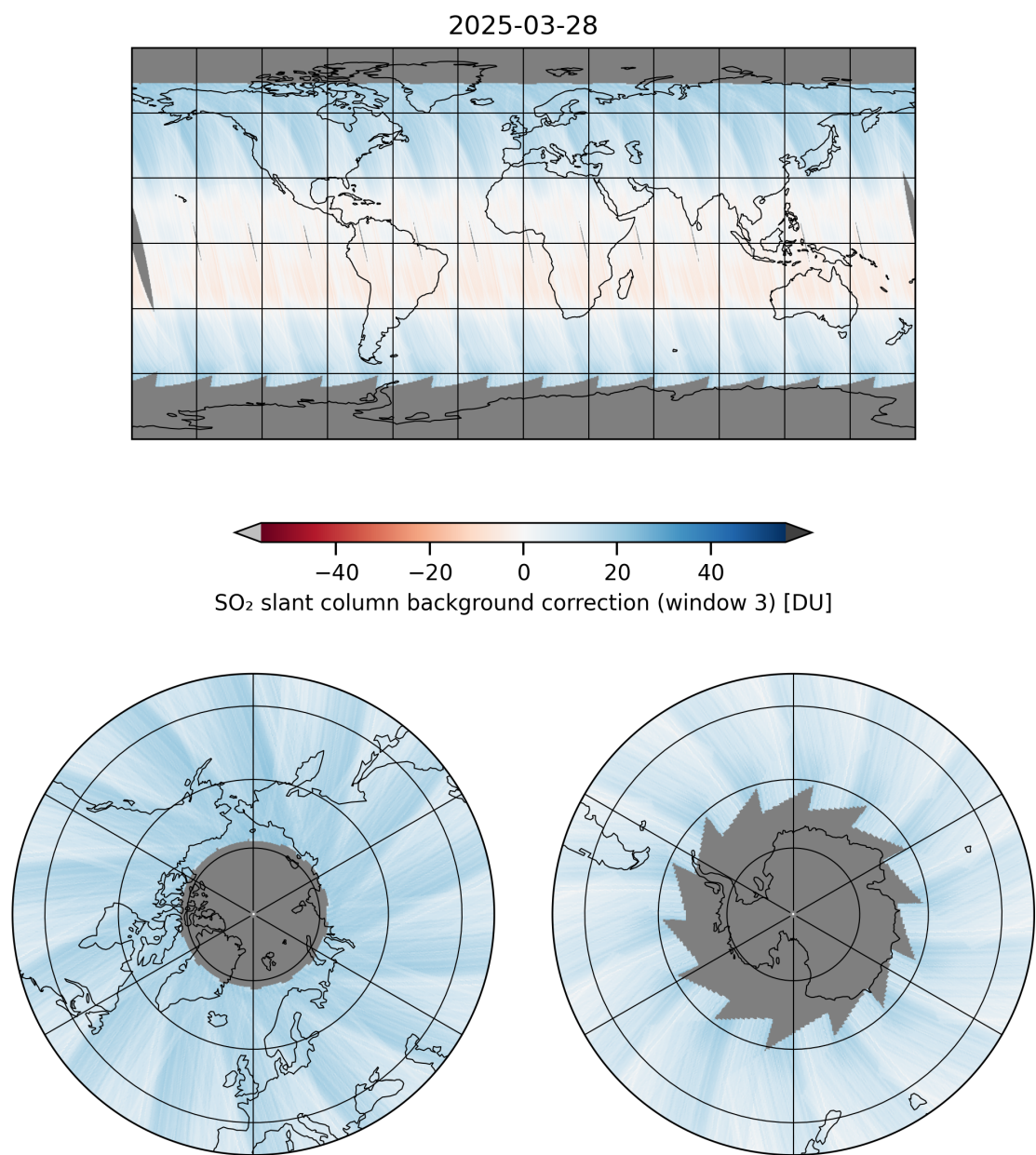


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-03-28 to 2025-03-29

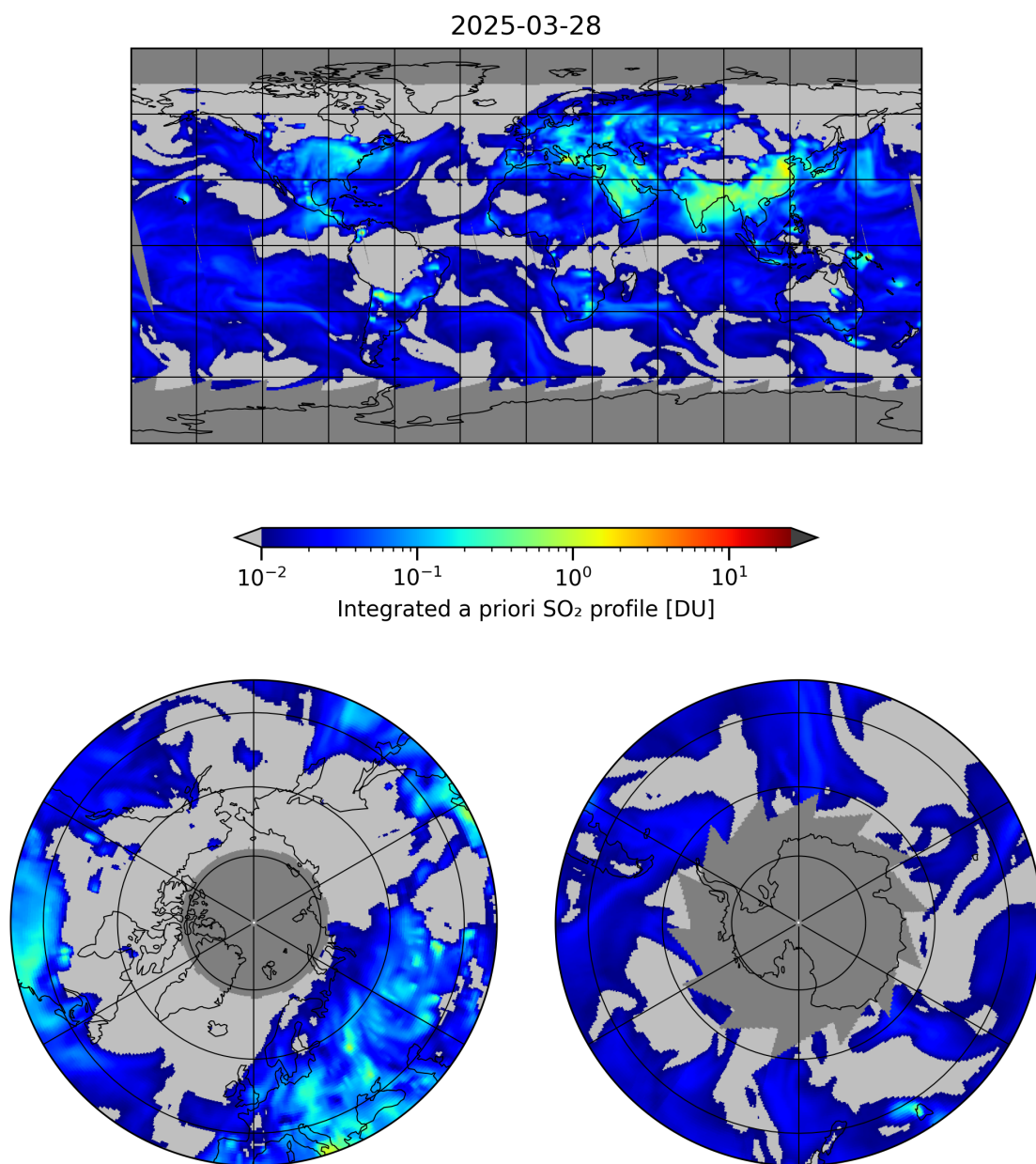


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-03-28 to 2025-03-29

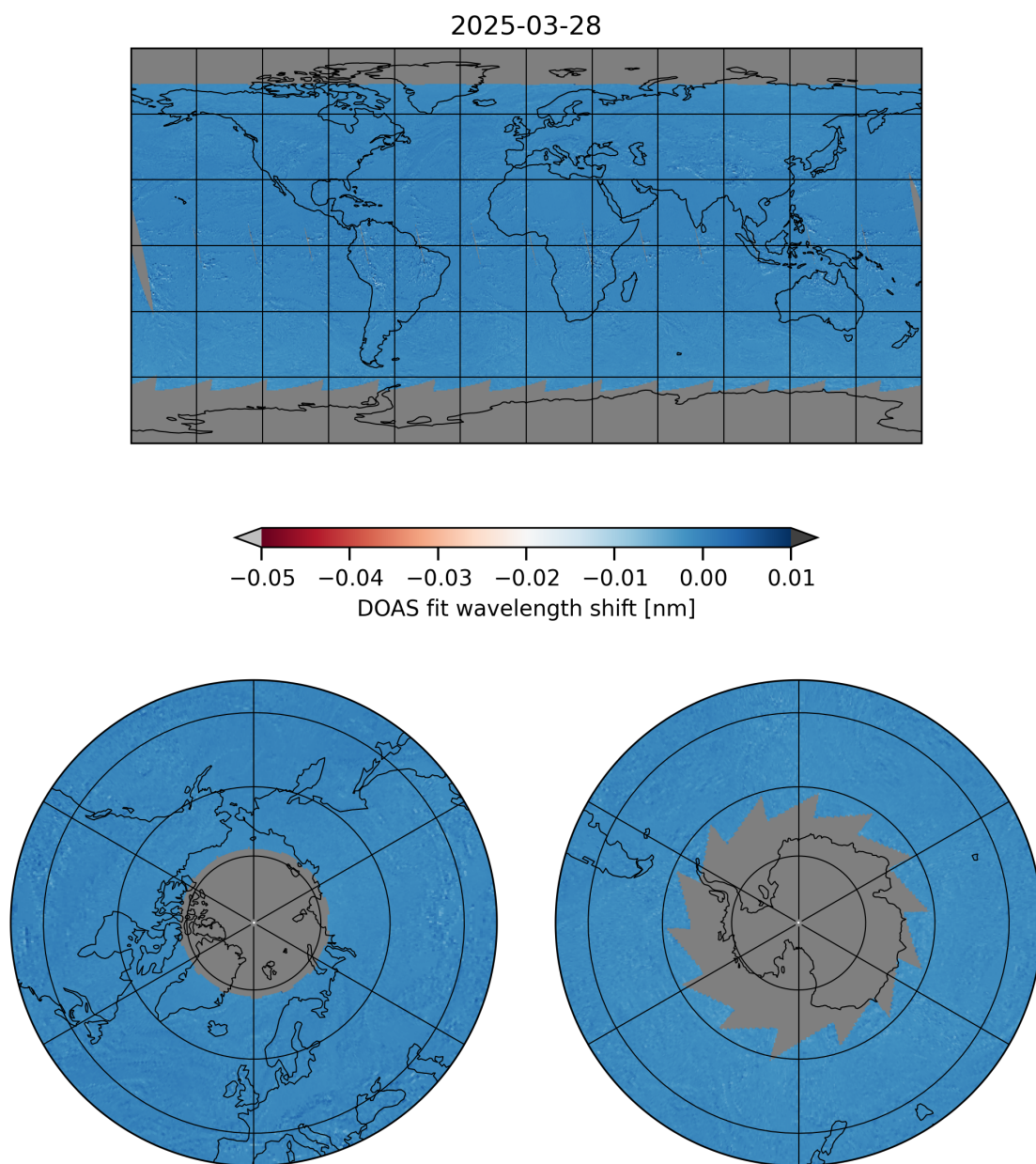


Figure 22: Map of “DOAS fit wavelength shift” for 2025-03-28 to 2025-03-29

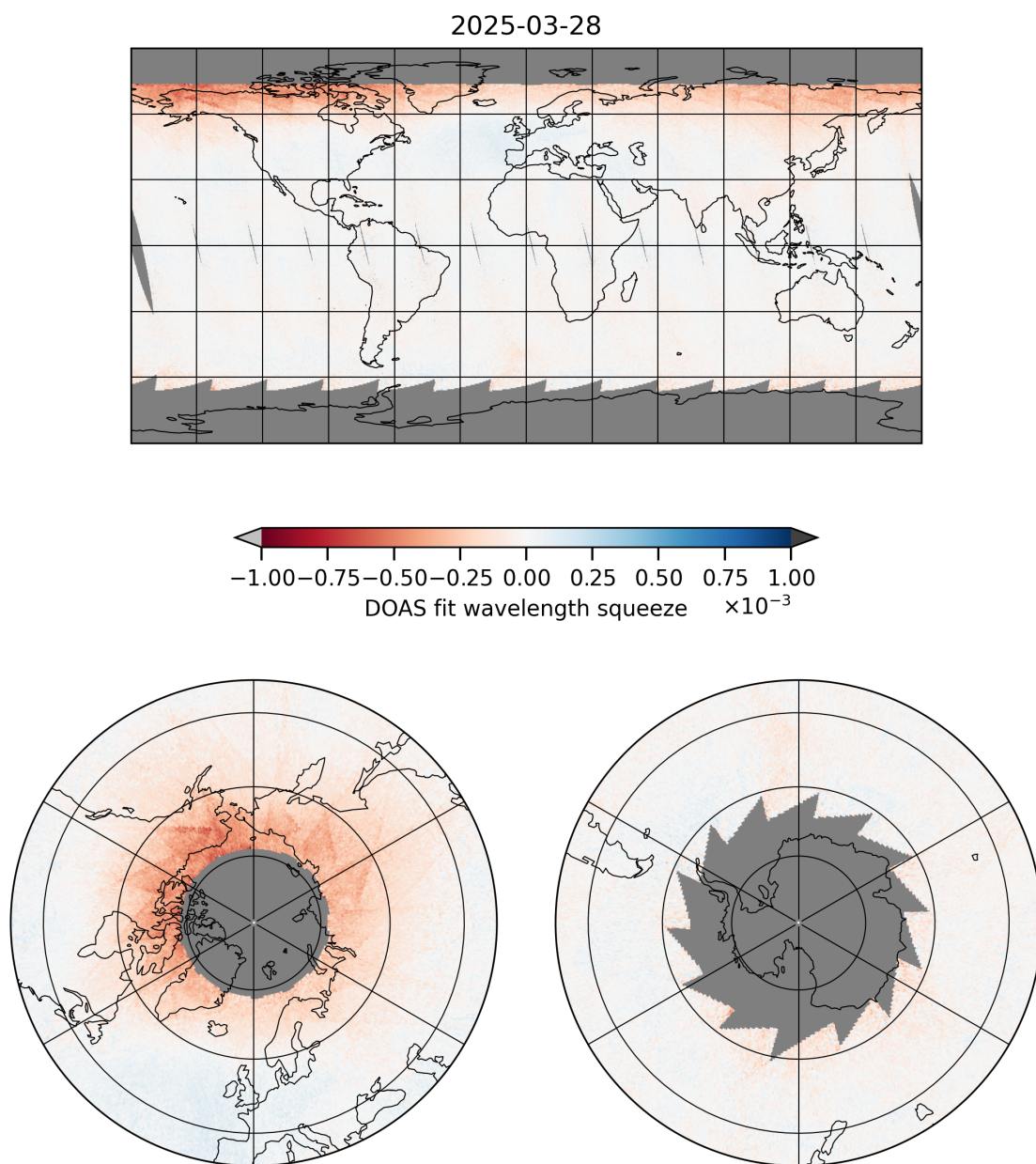


Figure 23: Map of "DOAS fit wavelength squeeze" for 2025-03-28 to 2025-03-29

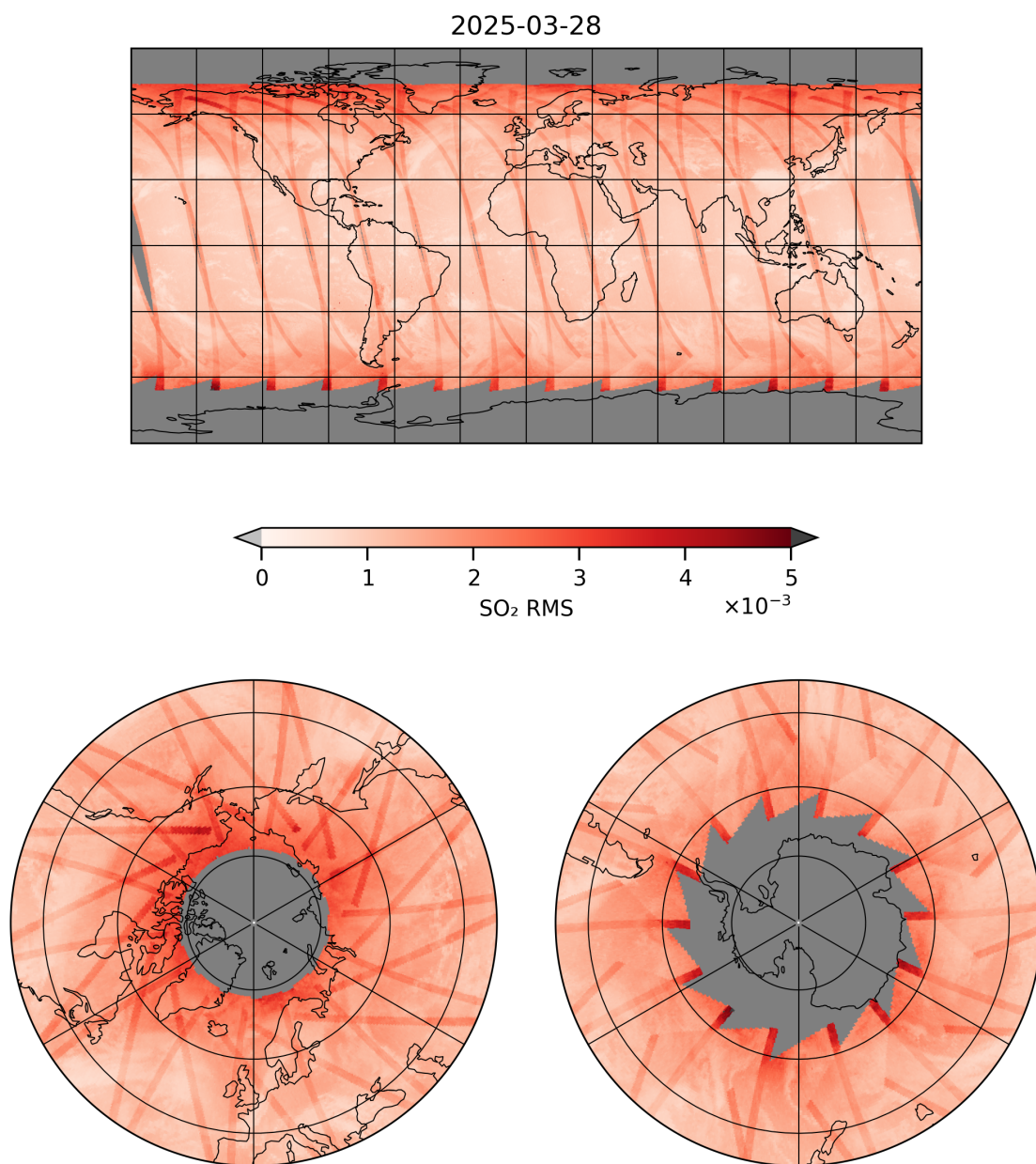


Figure 24: Map of “SO₂ RMS” for 2025-03-28 to 2025-03-29

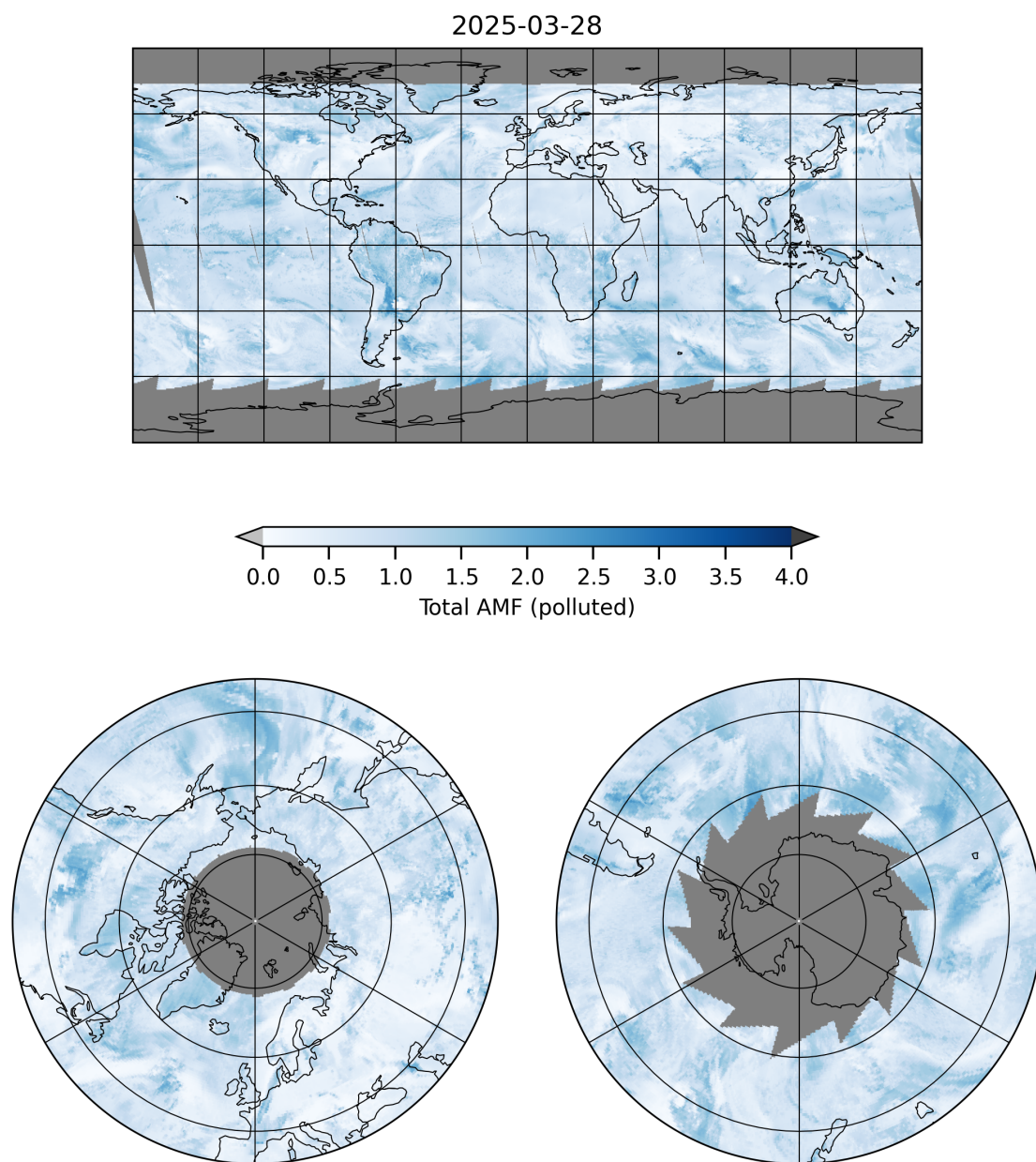


Figure 25: Map of “Total AMF (polluted)” for 2025-03-28 to 2025-03-29

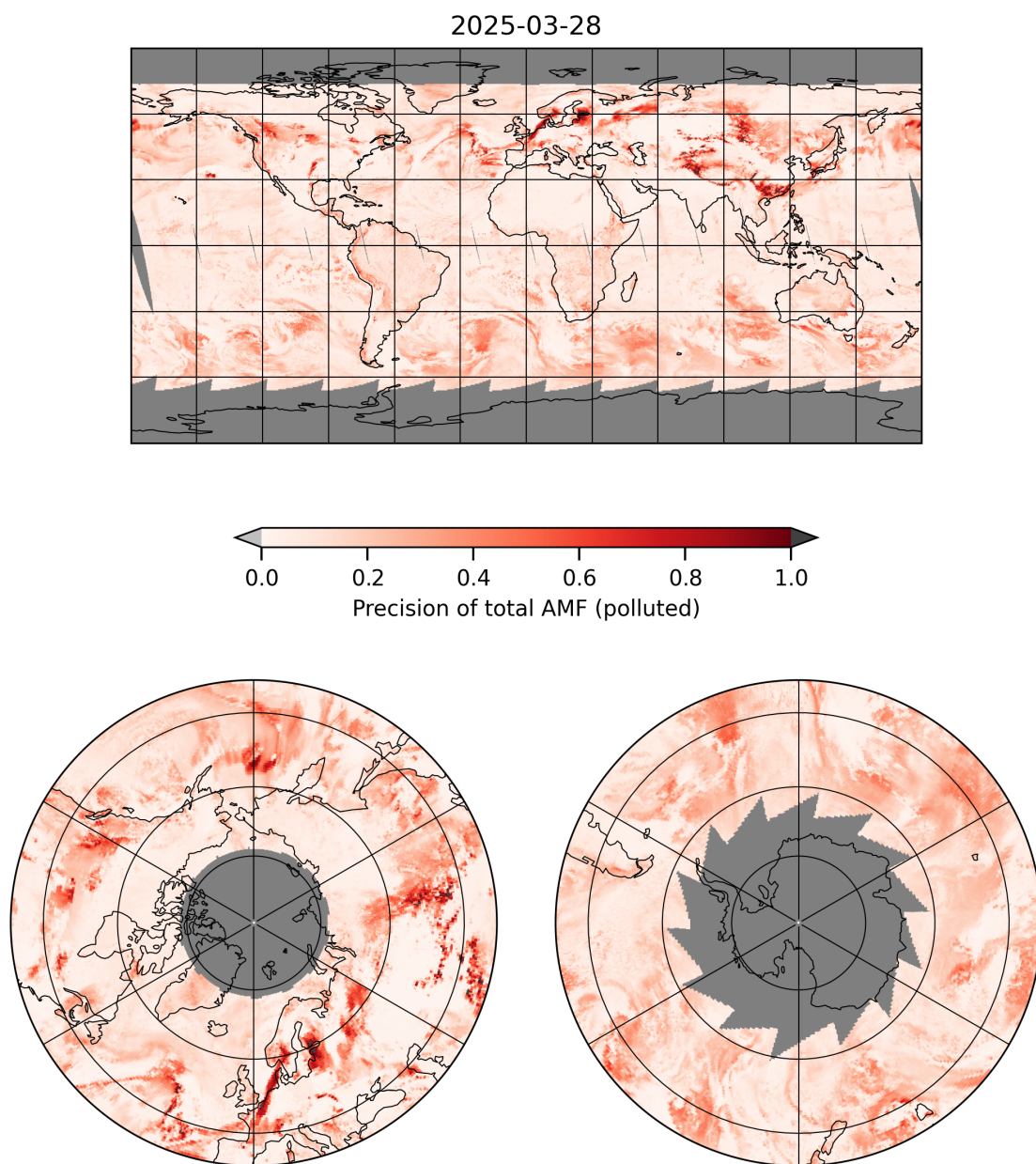


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-03-28 to 2025-03-29

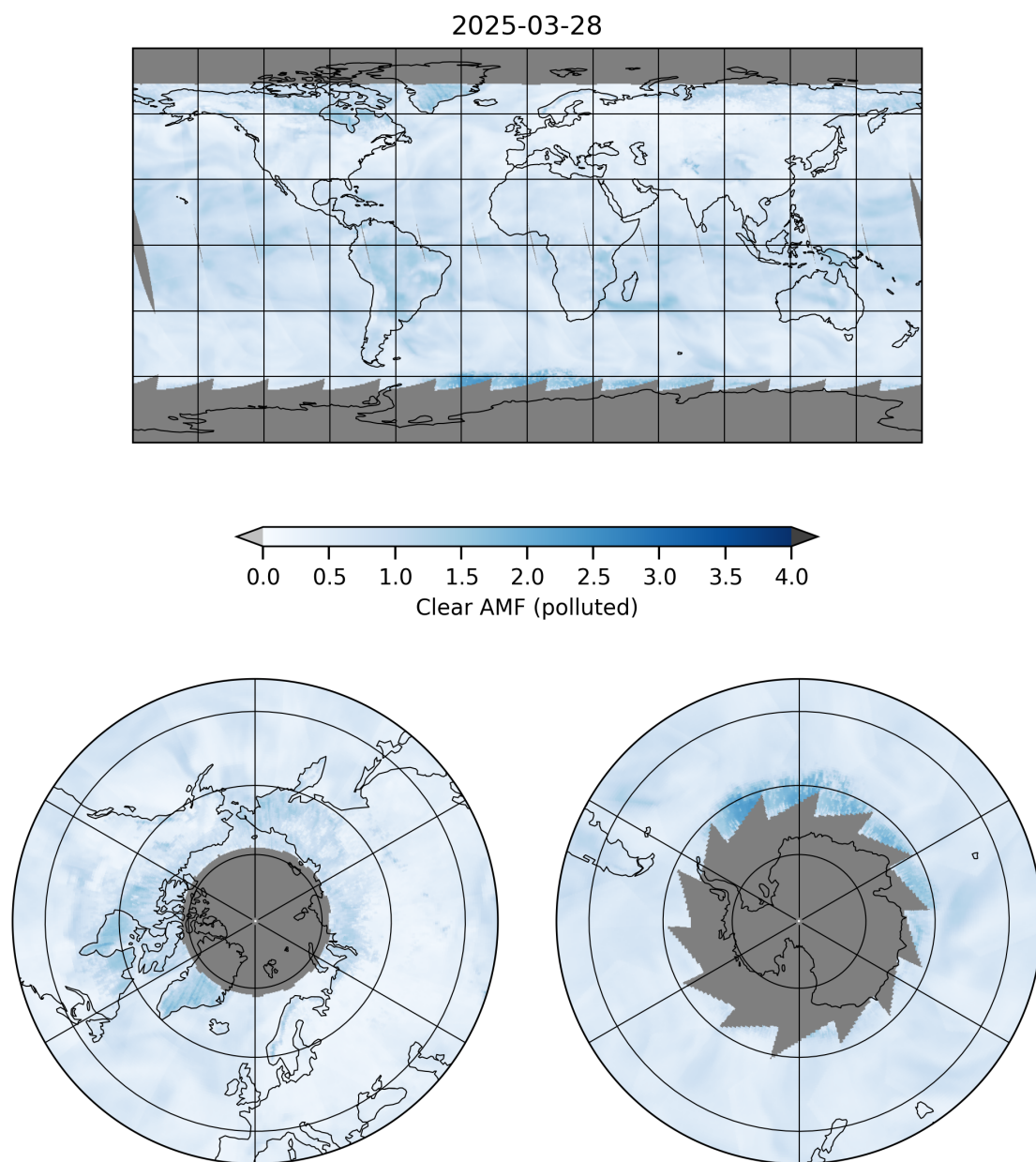


Figure 27: Map of “Clear AMF (polluted)” for 2025-03-28 to 2025-03-29

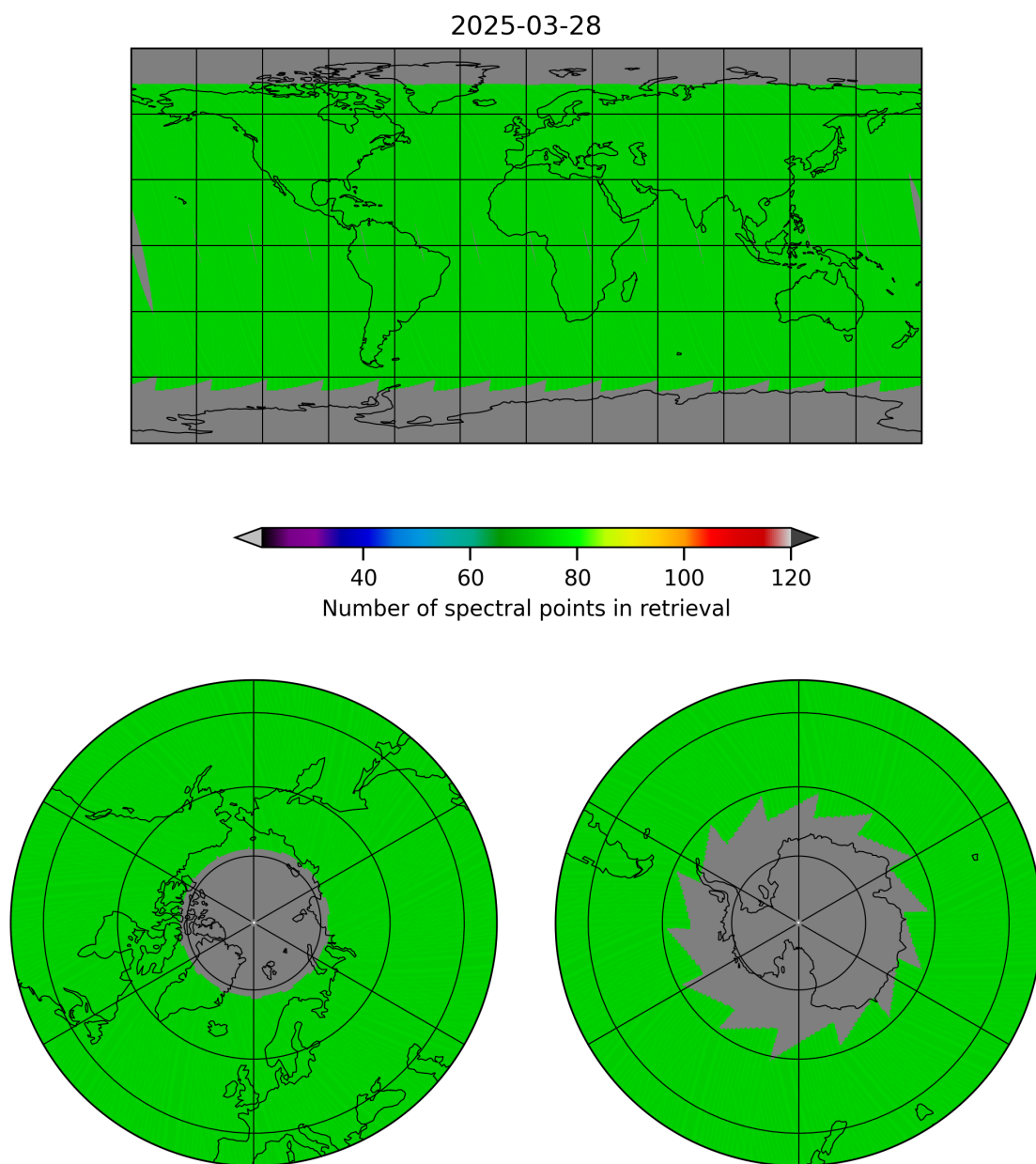


Figure 28: Map of “Number of spectral points in retrieval” for 2025-03-28 to 2025-03-29

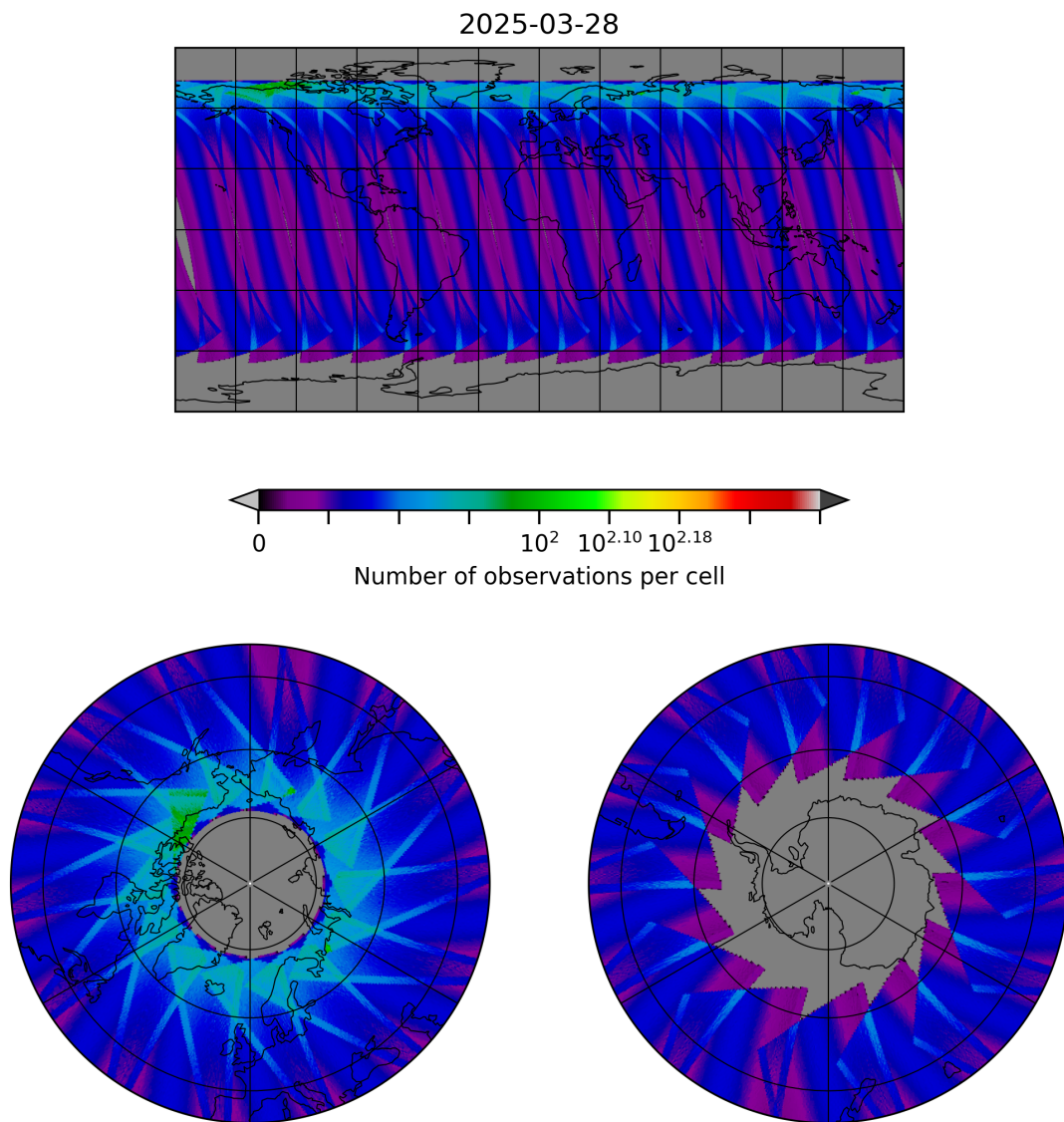


Figure 29: Map of the number of observations for 2025-03-28 to 2025-03-29

7 Zonal average

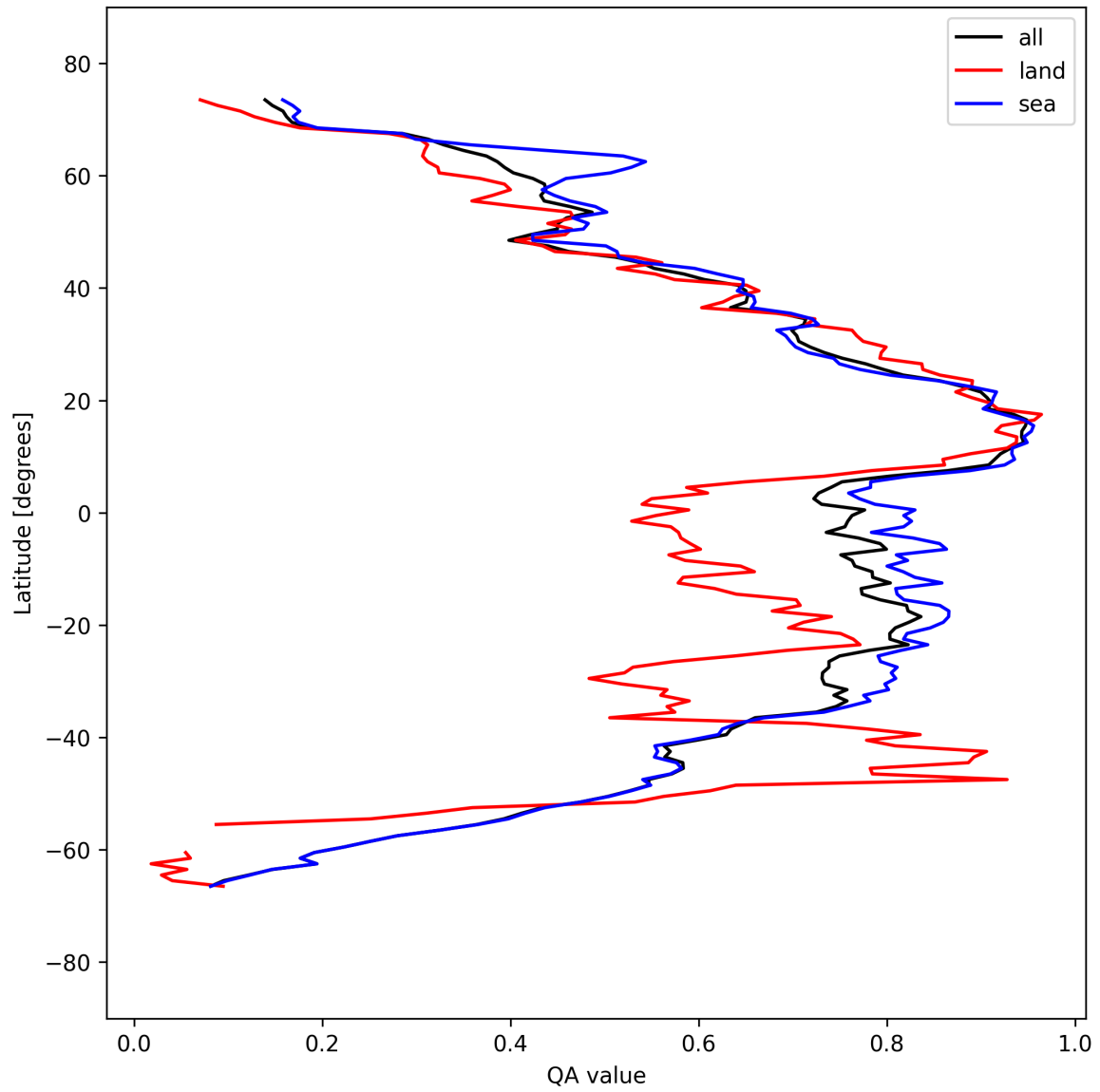


Figure 30: Zonal average of “QA value” for 2025-03-28 to 2025-03-29.

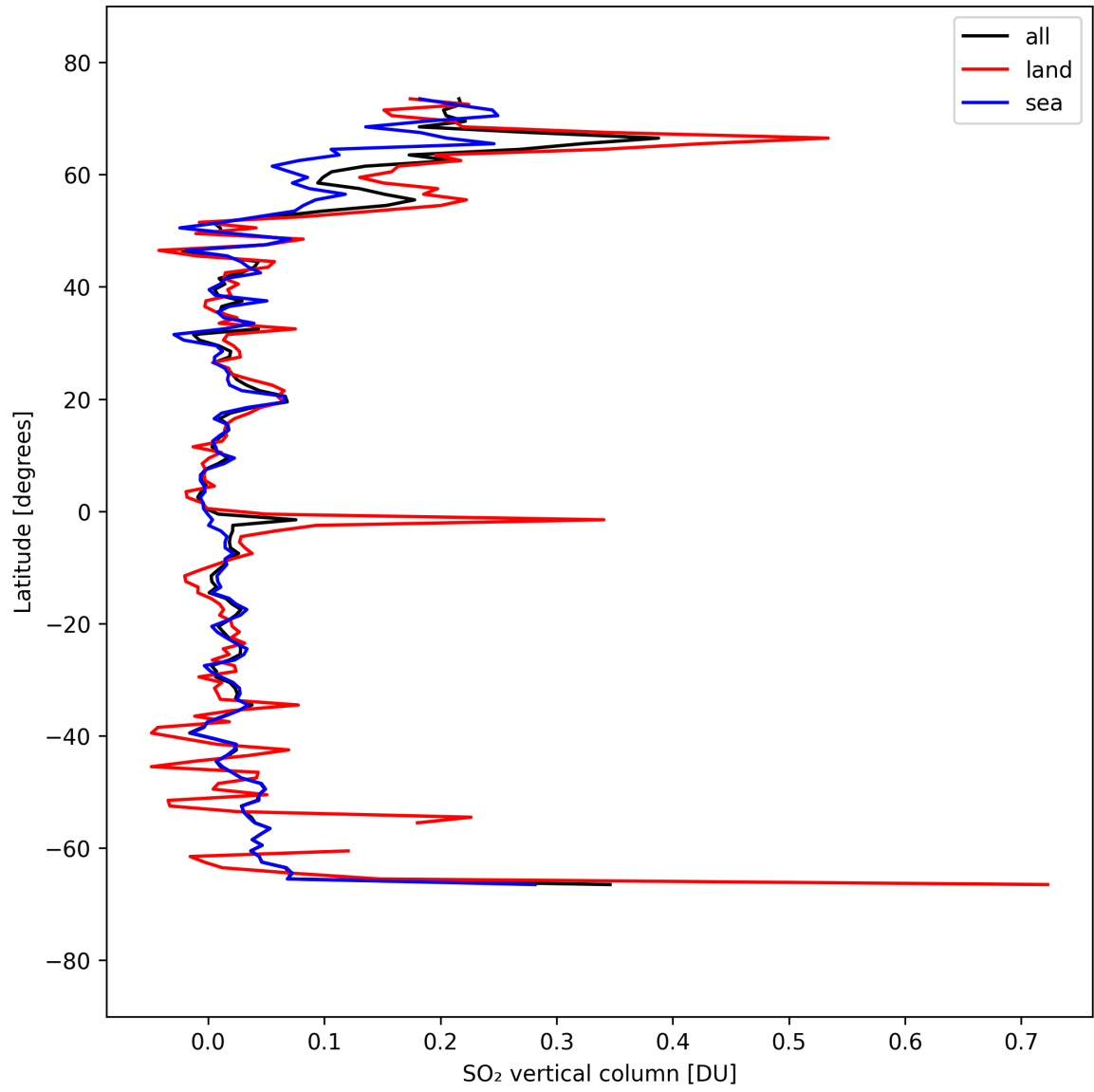


Figure 31: Zonal average of “SO₂ vertical column” for 2025-03-28 to 2025-03-29.

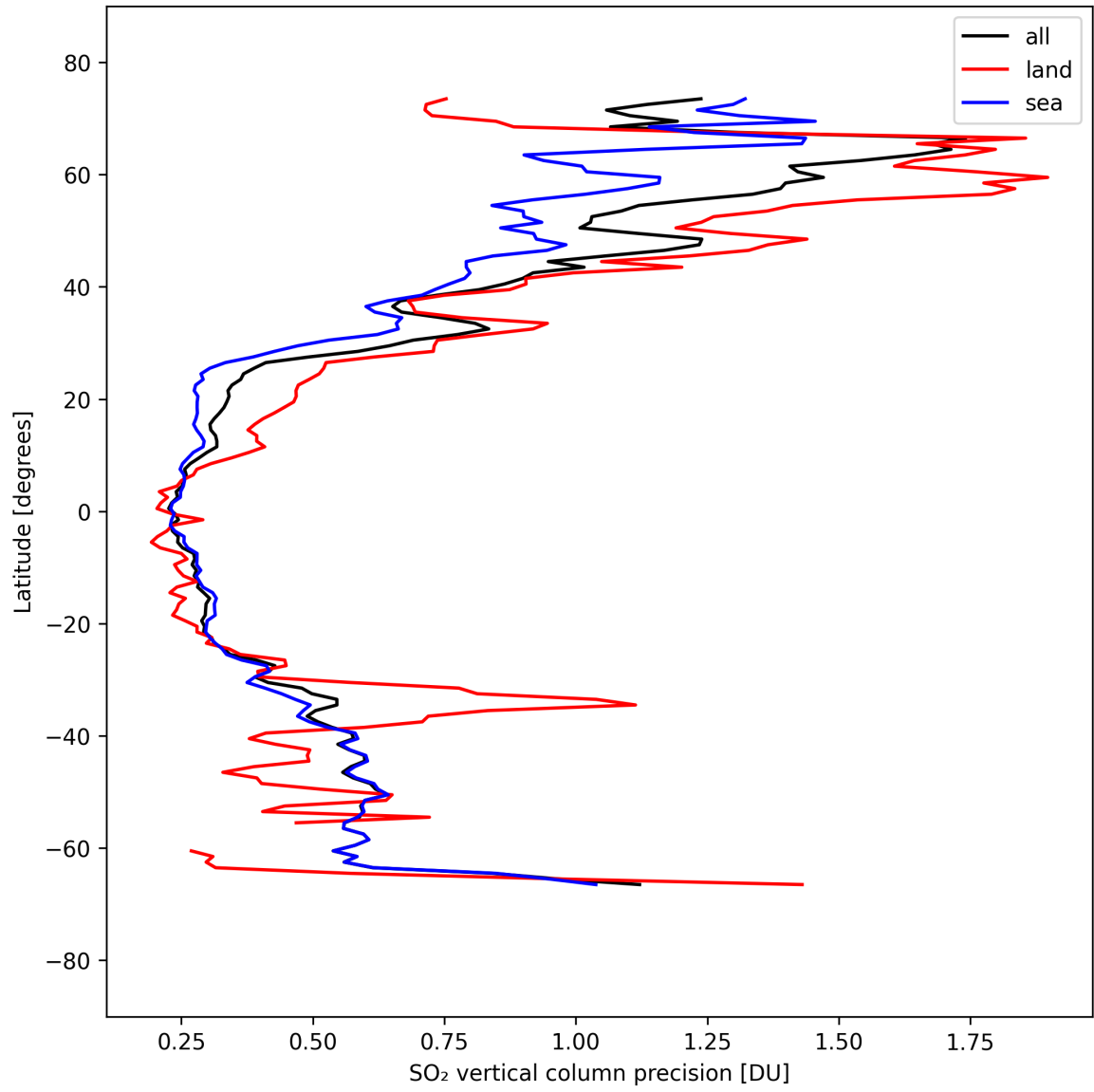


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-03-28 to 2025-03-29.

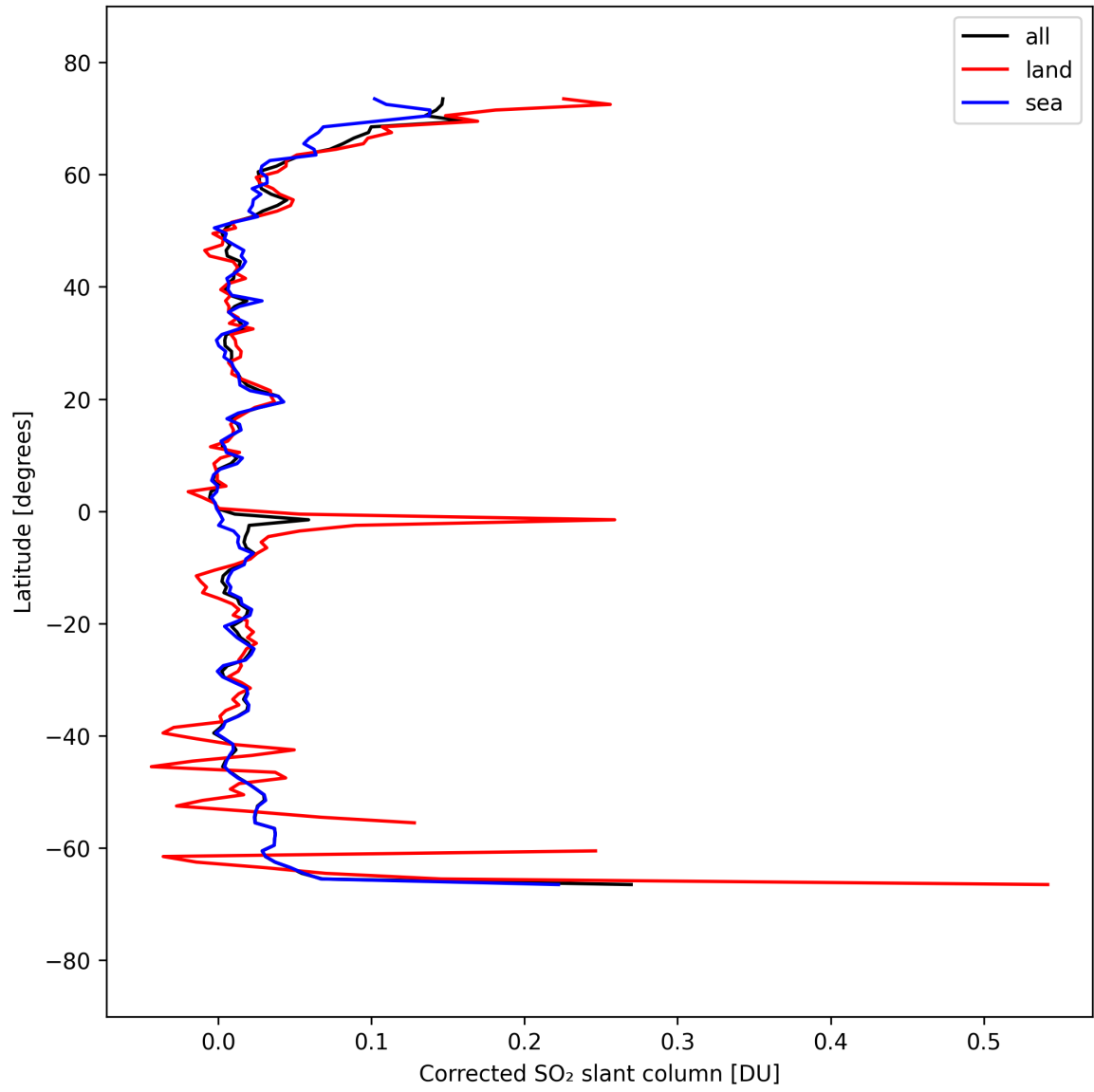


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-03-28 to 2025-03-29.

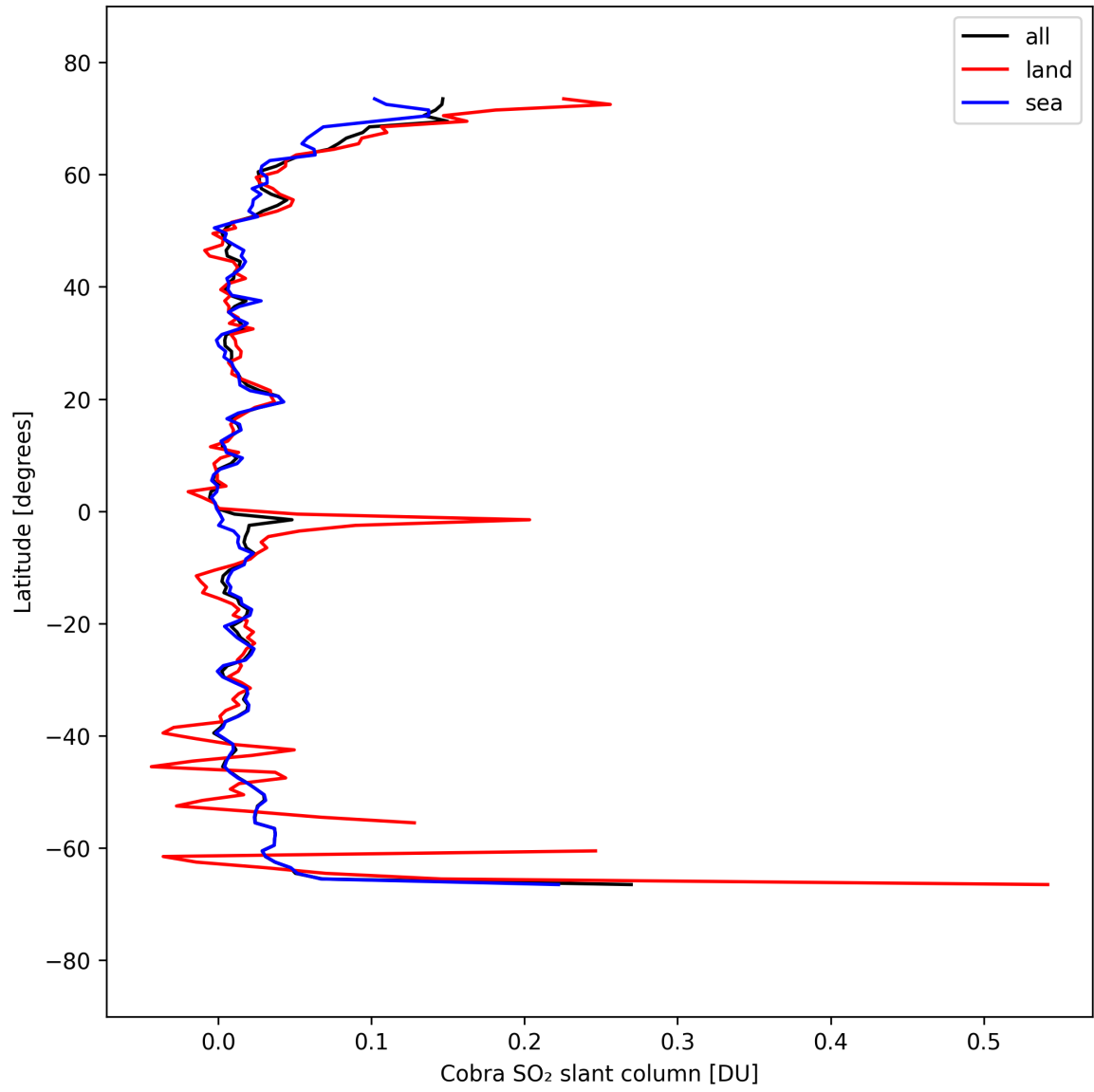


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-03-28 to 2025-03-29.

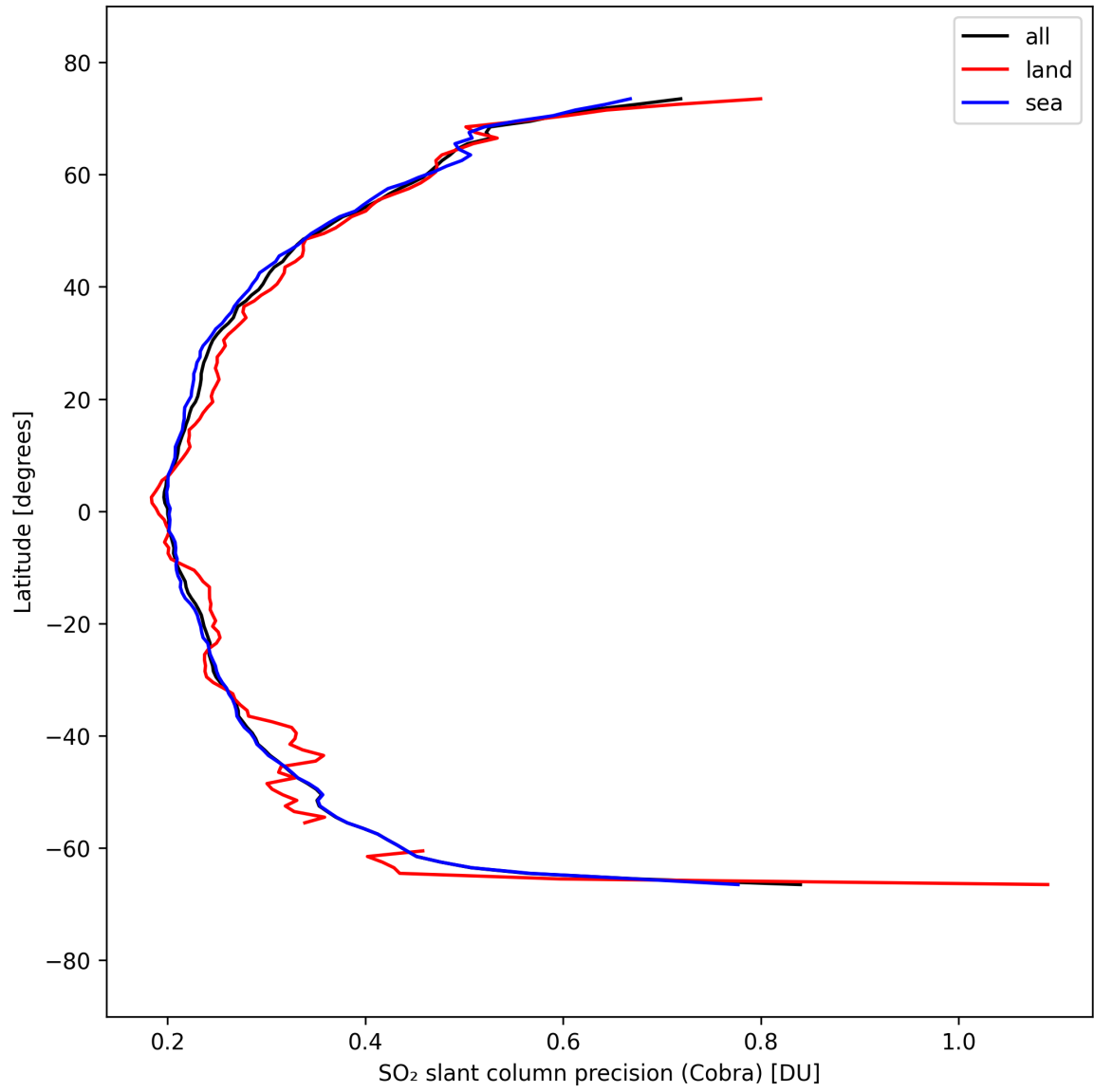


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-03-28 to 2025-03-29.

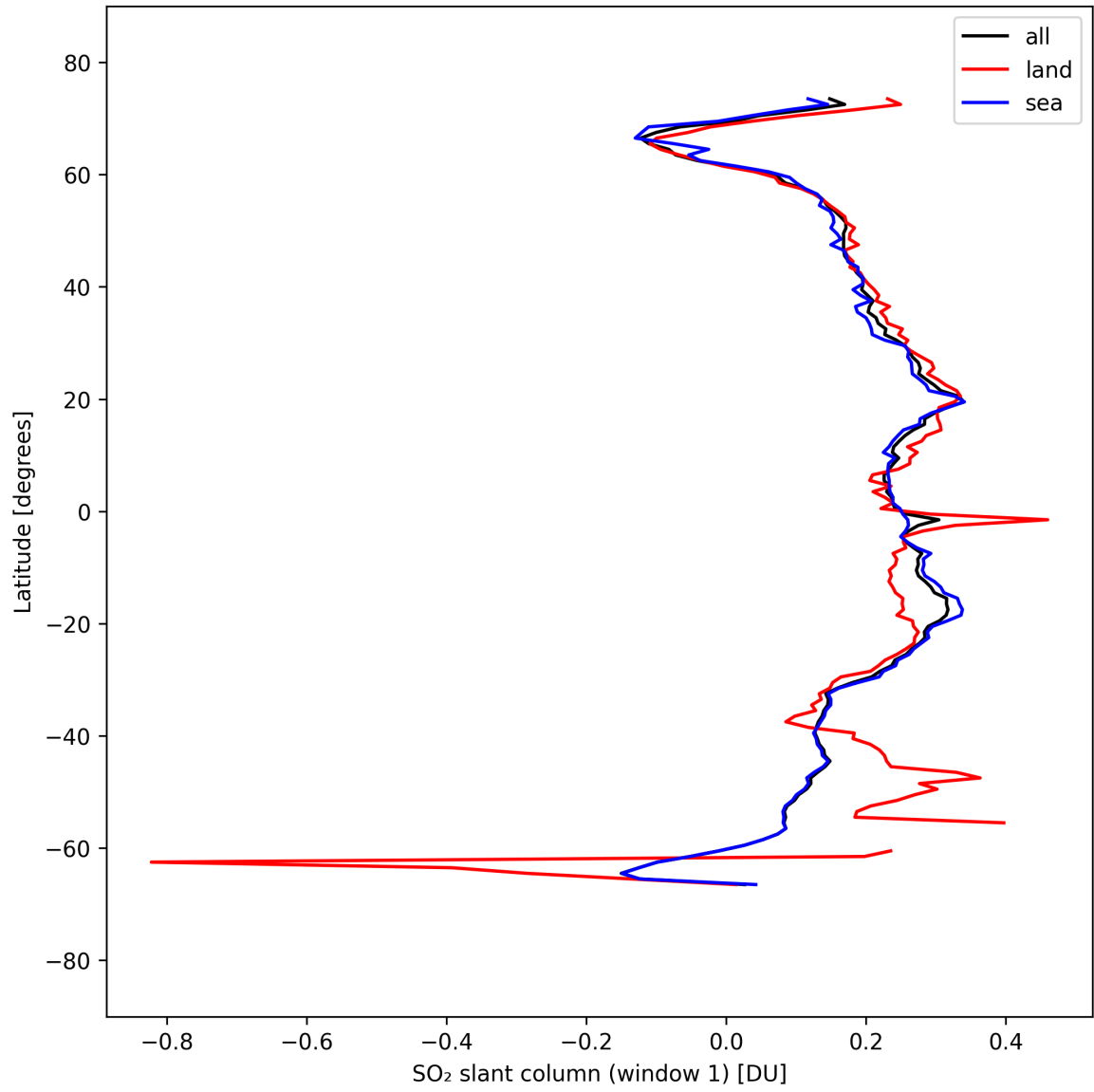


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-03-28 to 2025-03-29.

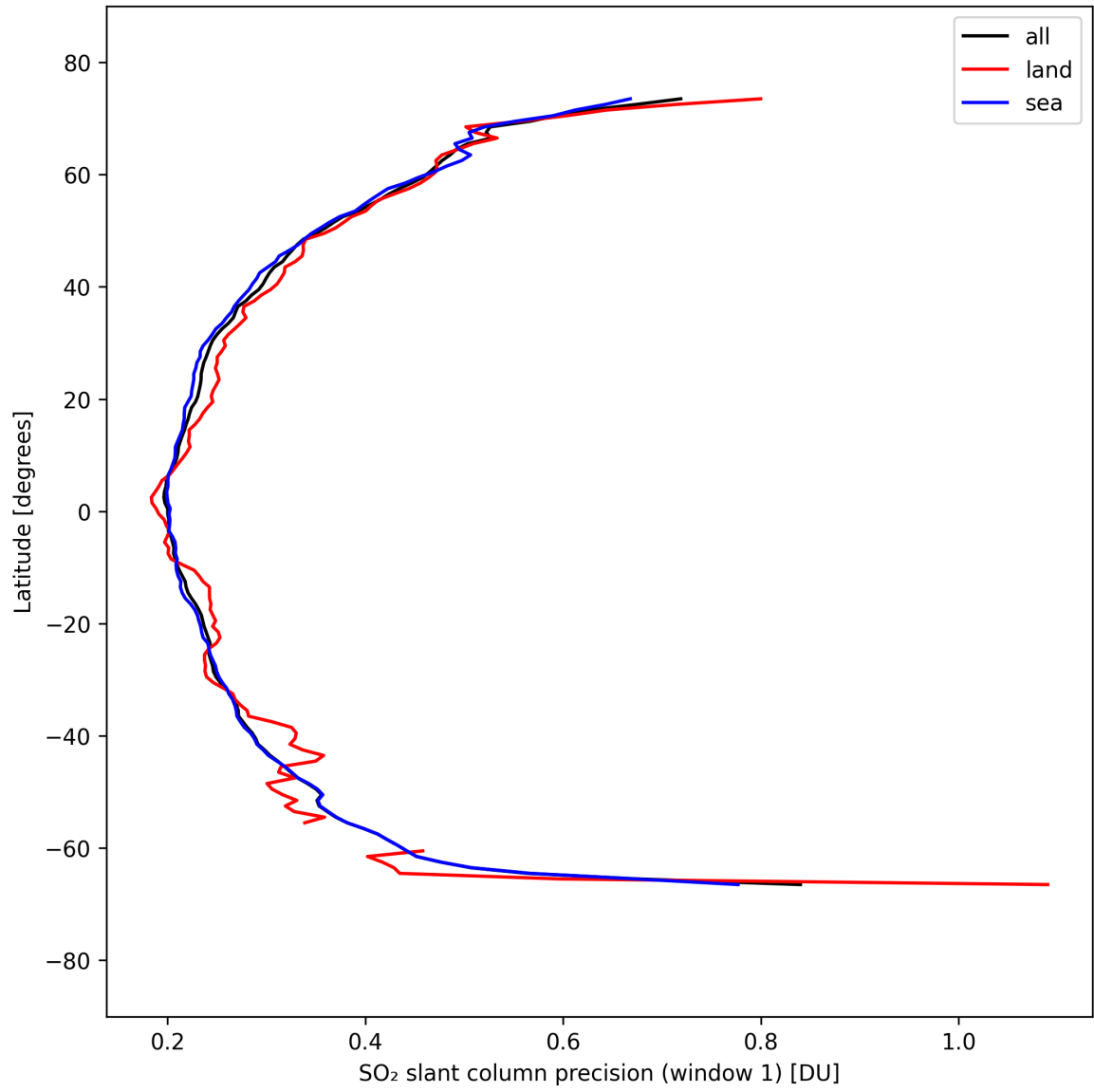


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-03-28 to 2025-03-29.

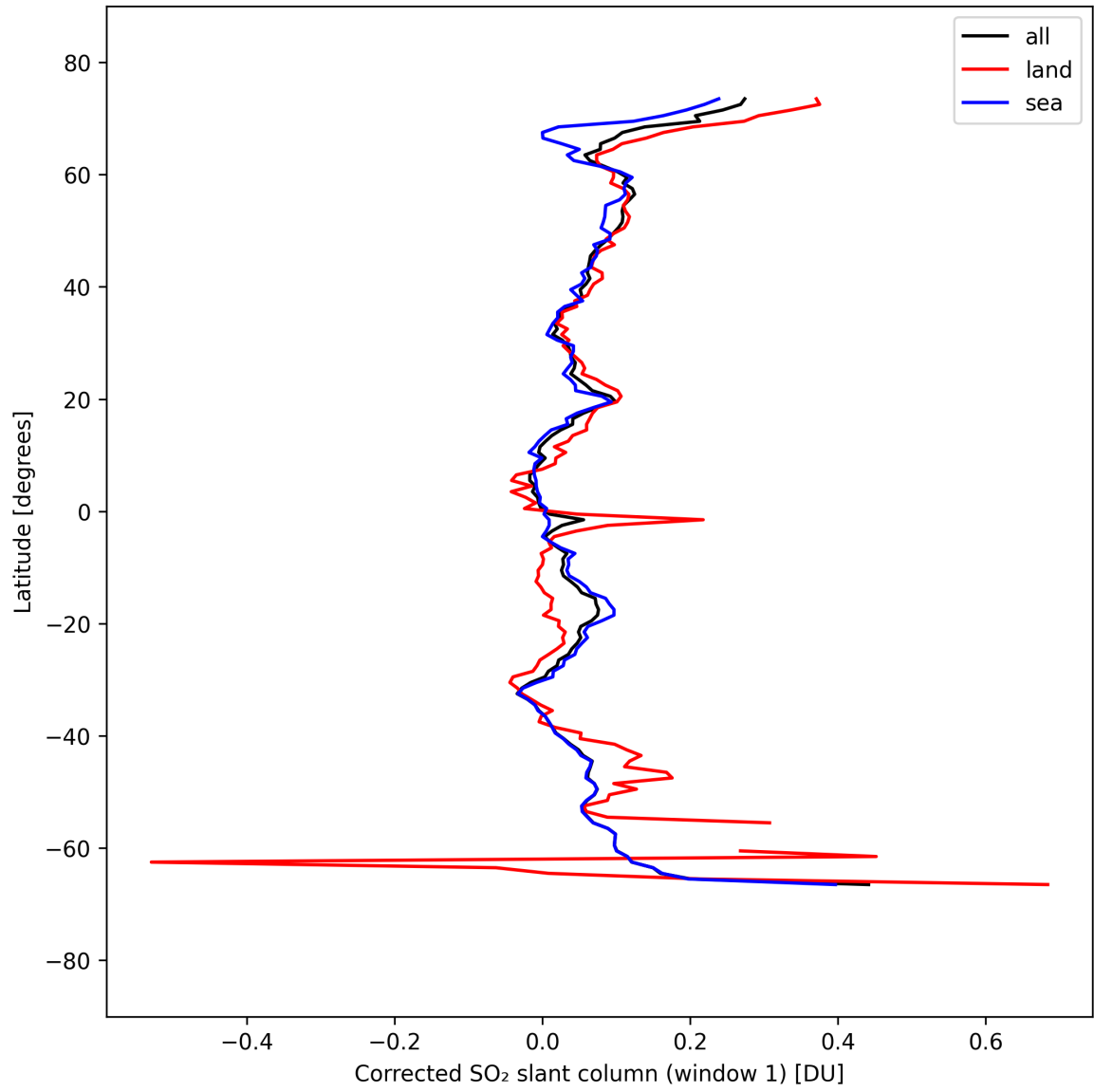


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-03-28 to 2025-03-29.

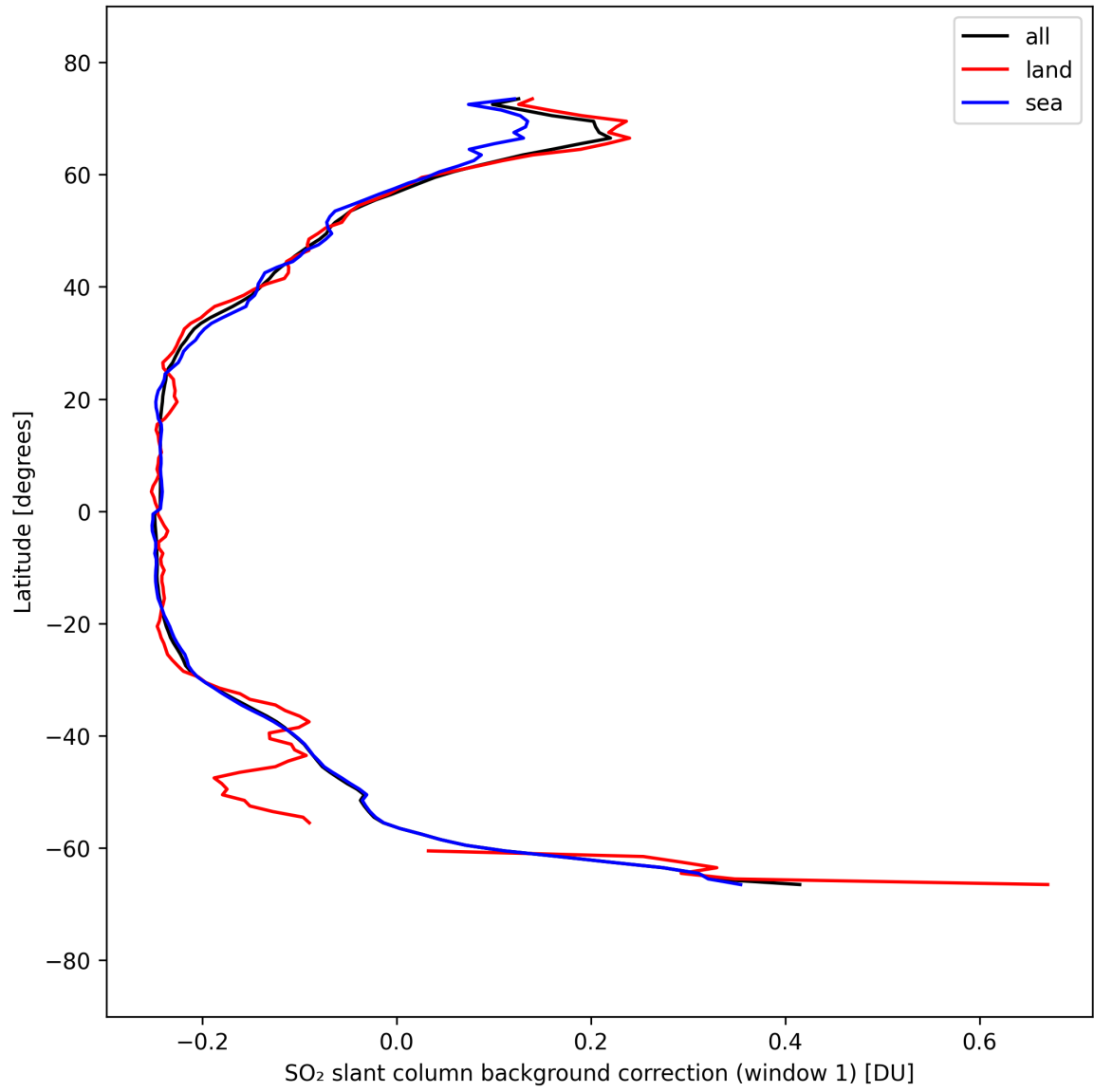


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-03-28 to 2025-03-29.

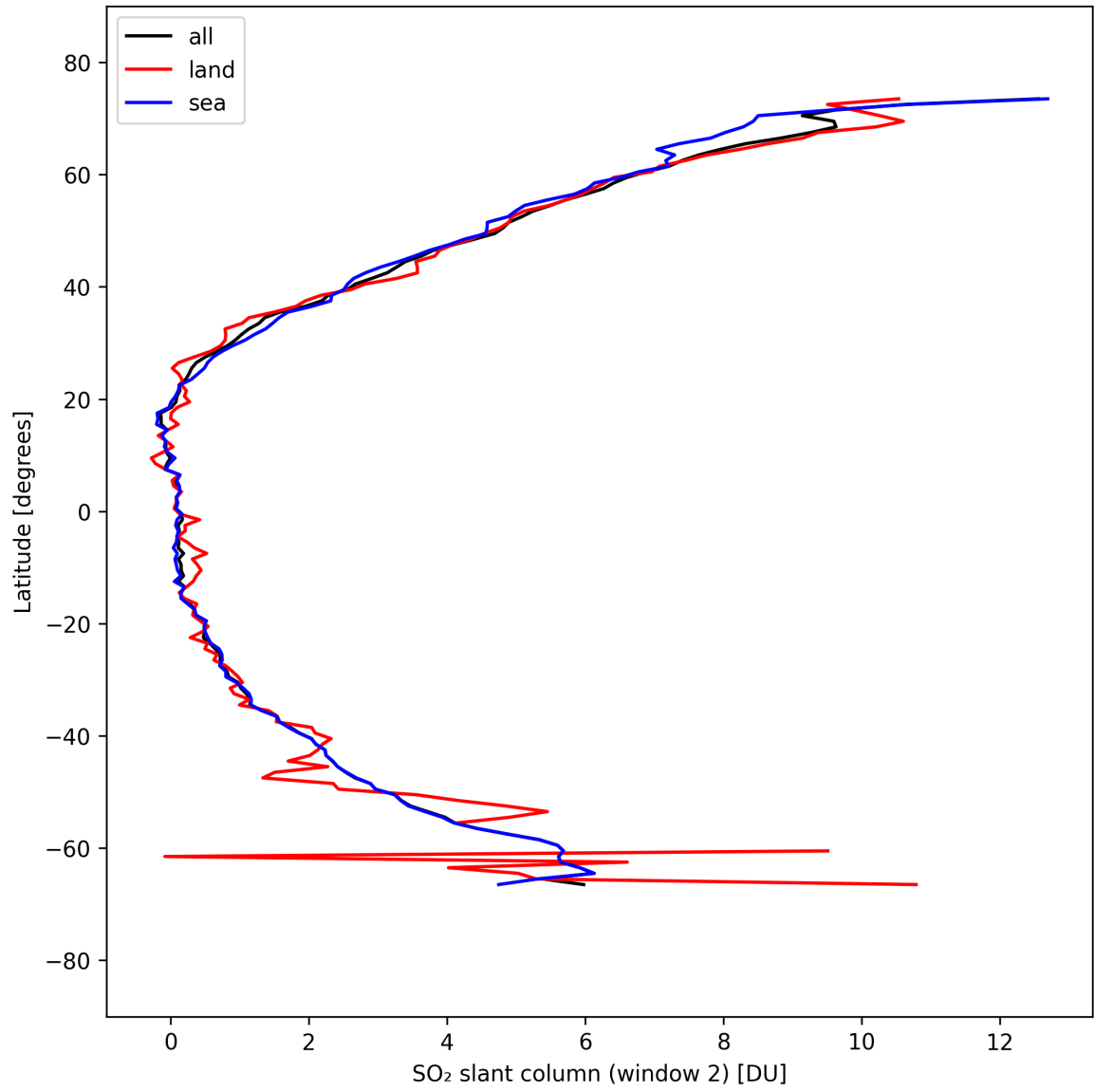


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-03-28 to 2025-03-29.

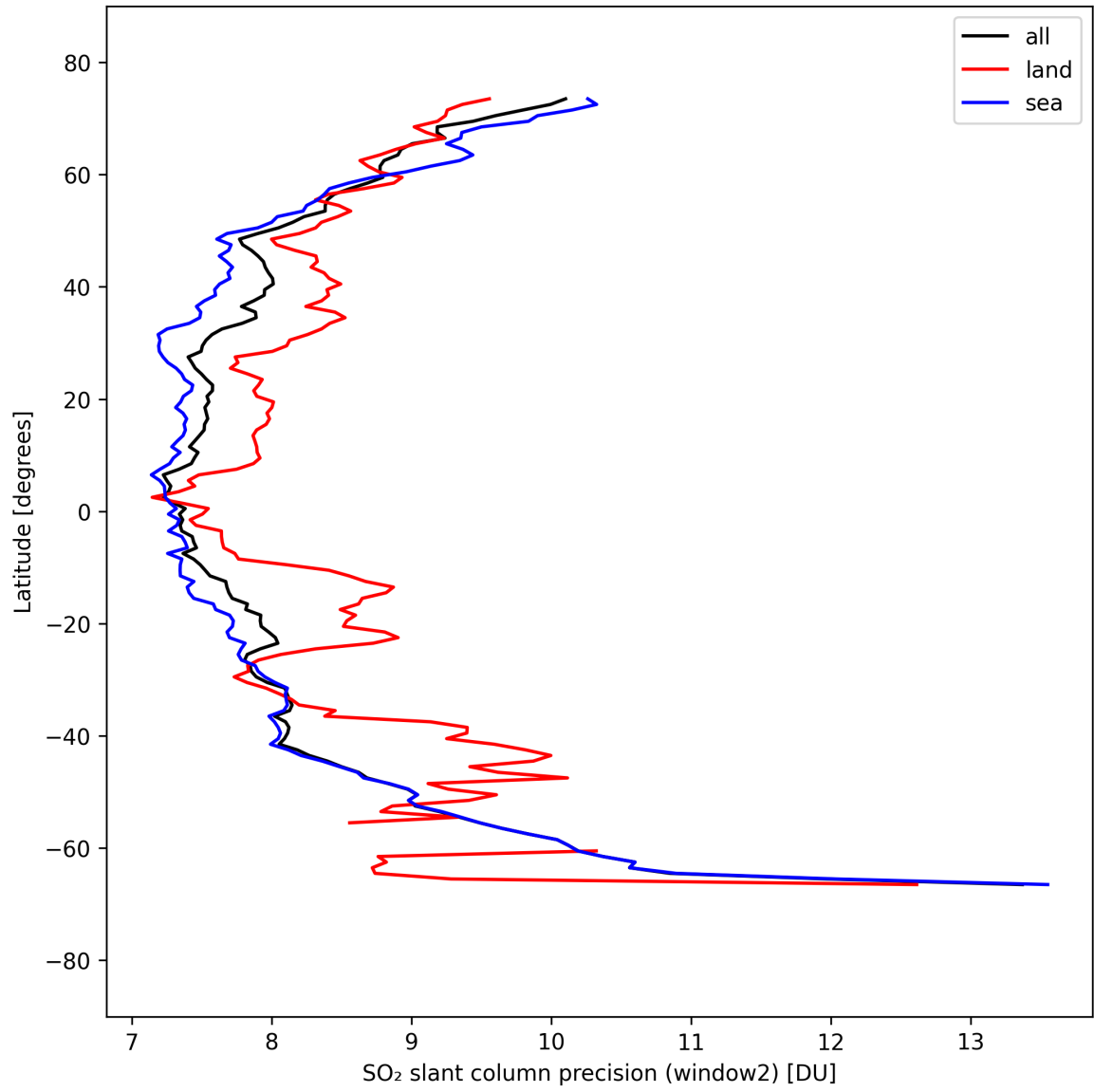


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-03-28 to 2025-03-29.

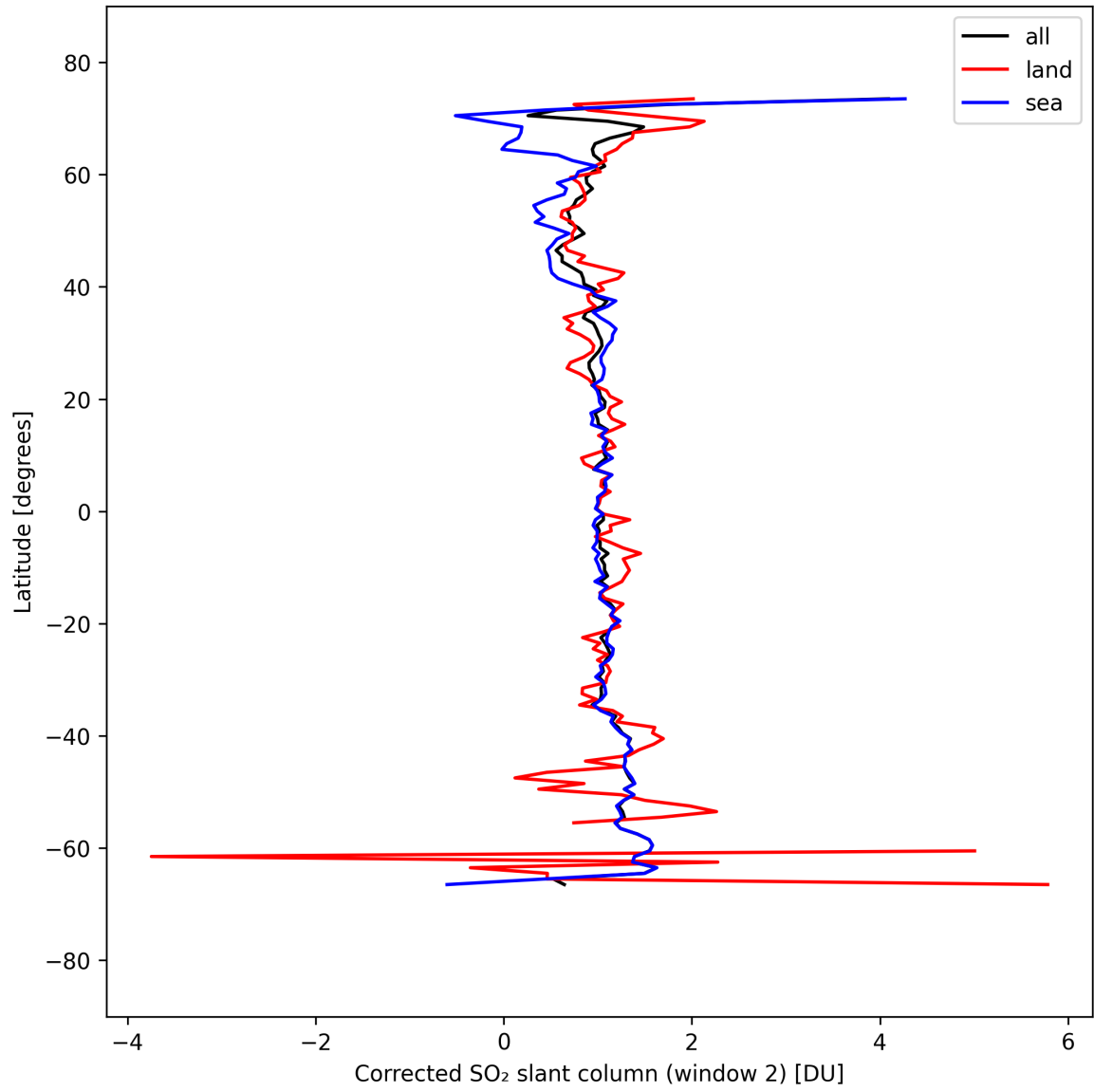


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-03-28 to 2025-03-29.

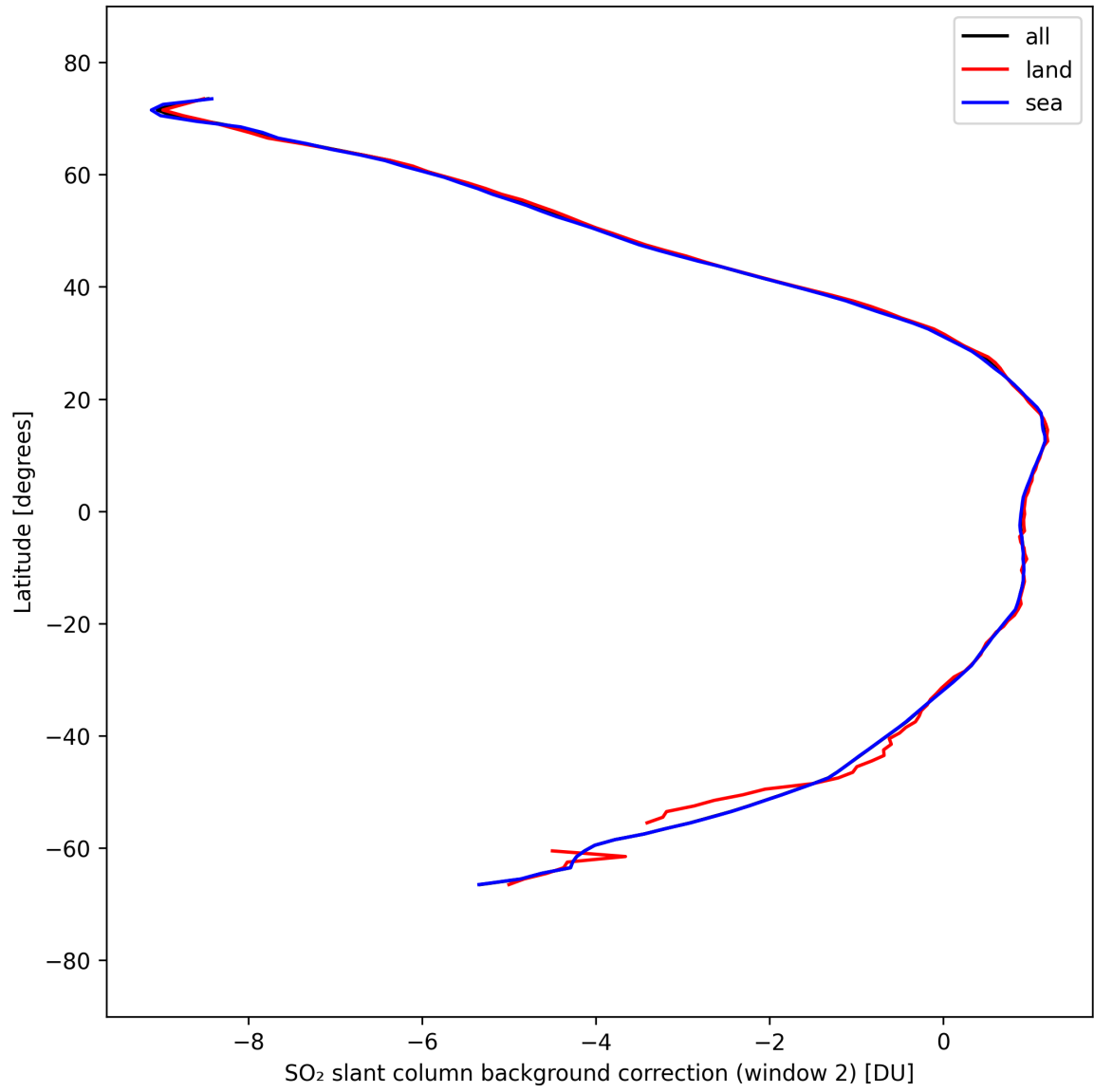


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-03-28 to 2025-03-29.

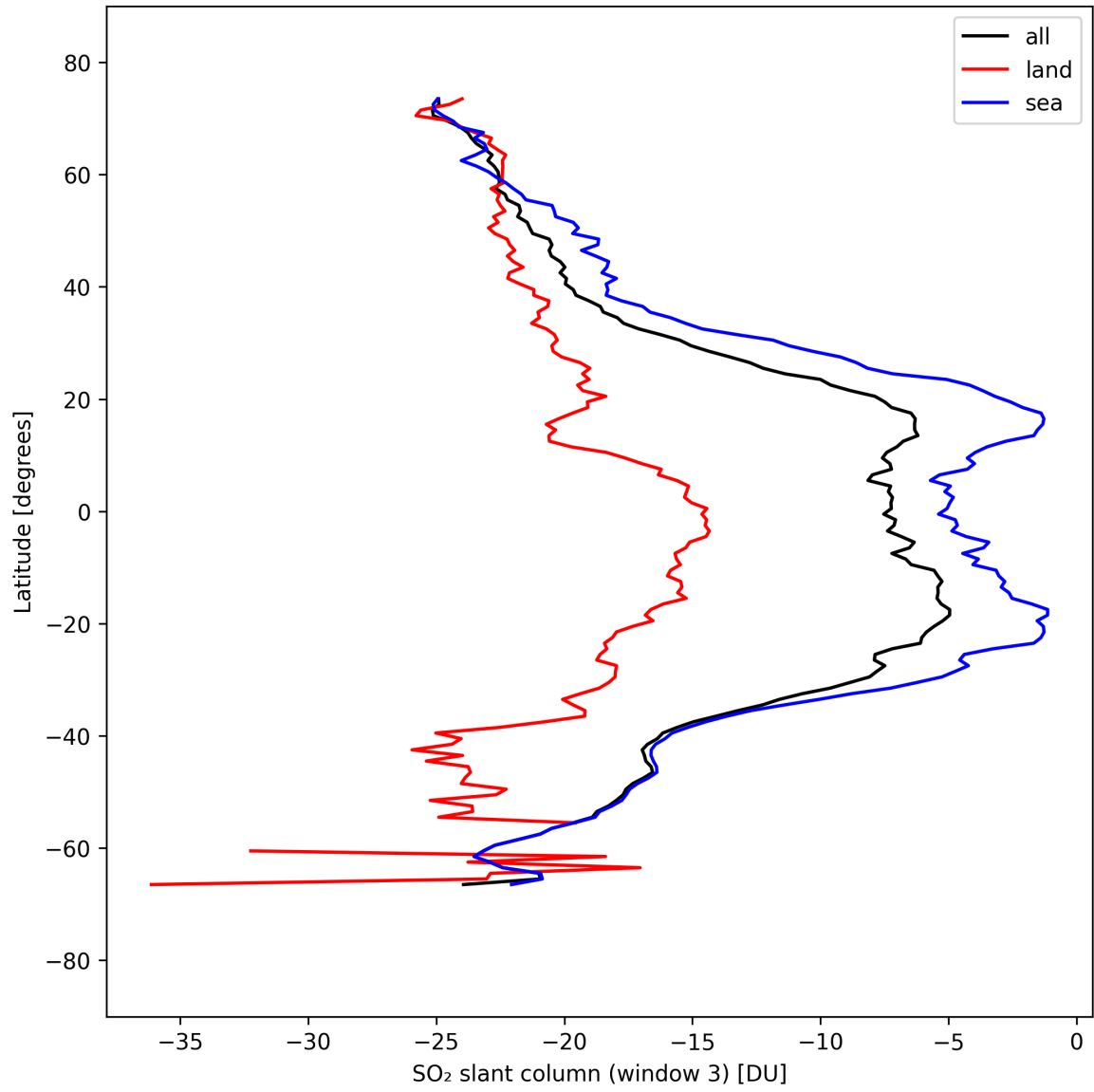


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-03-28 to 2025-03-29.

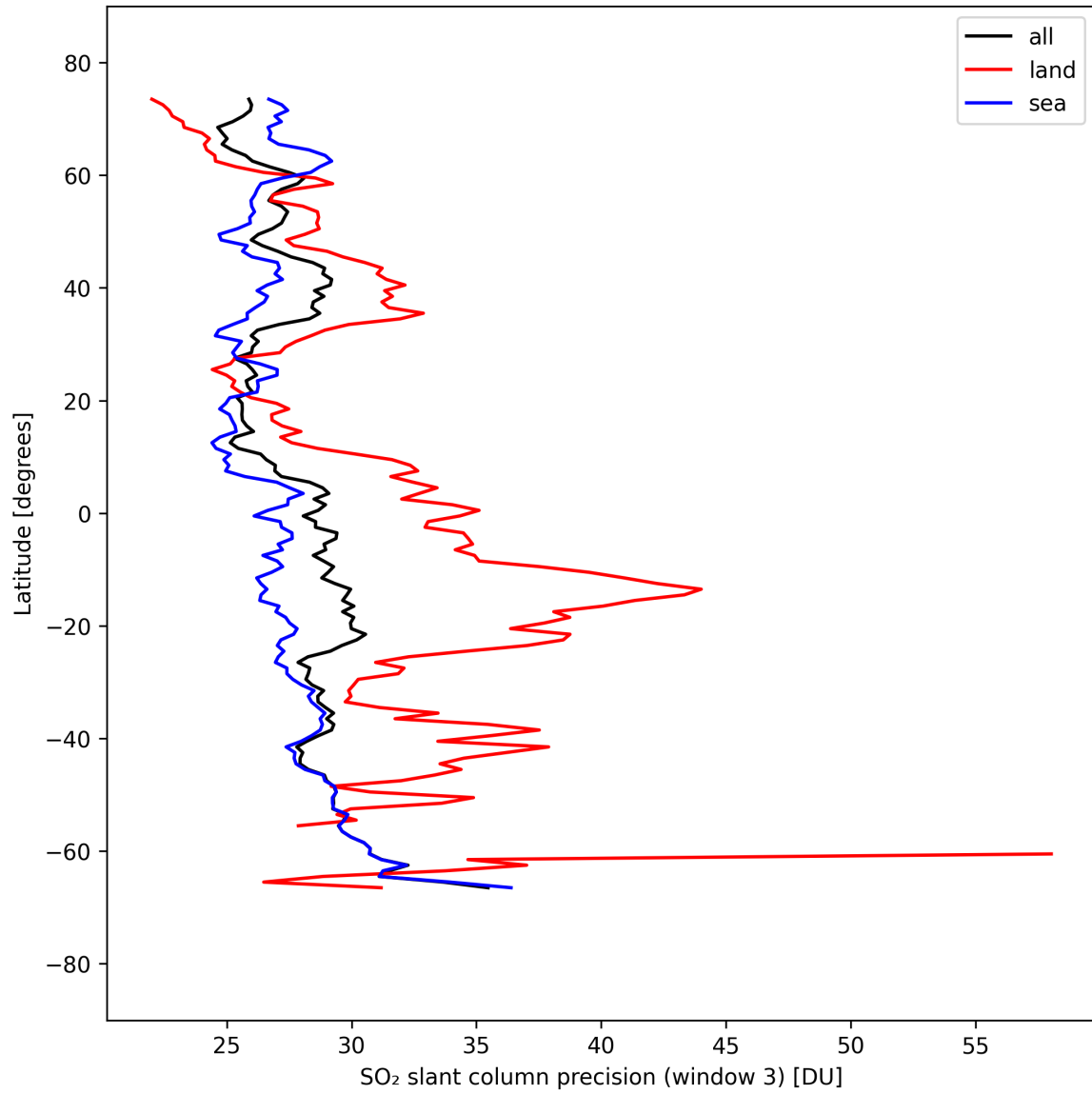


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-03-28 to 2025-03-29.

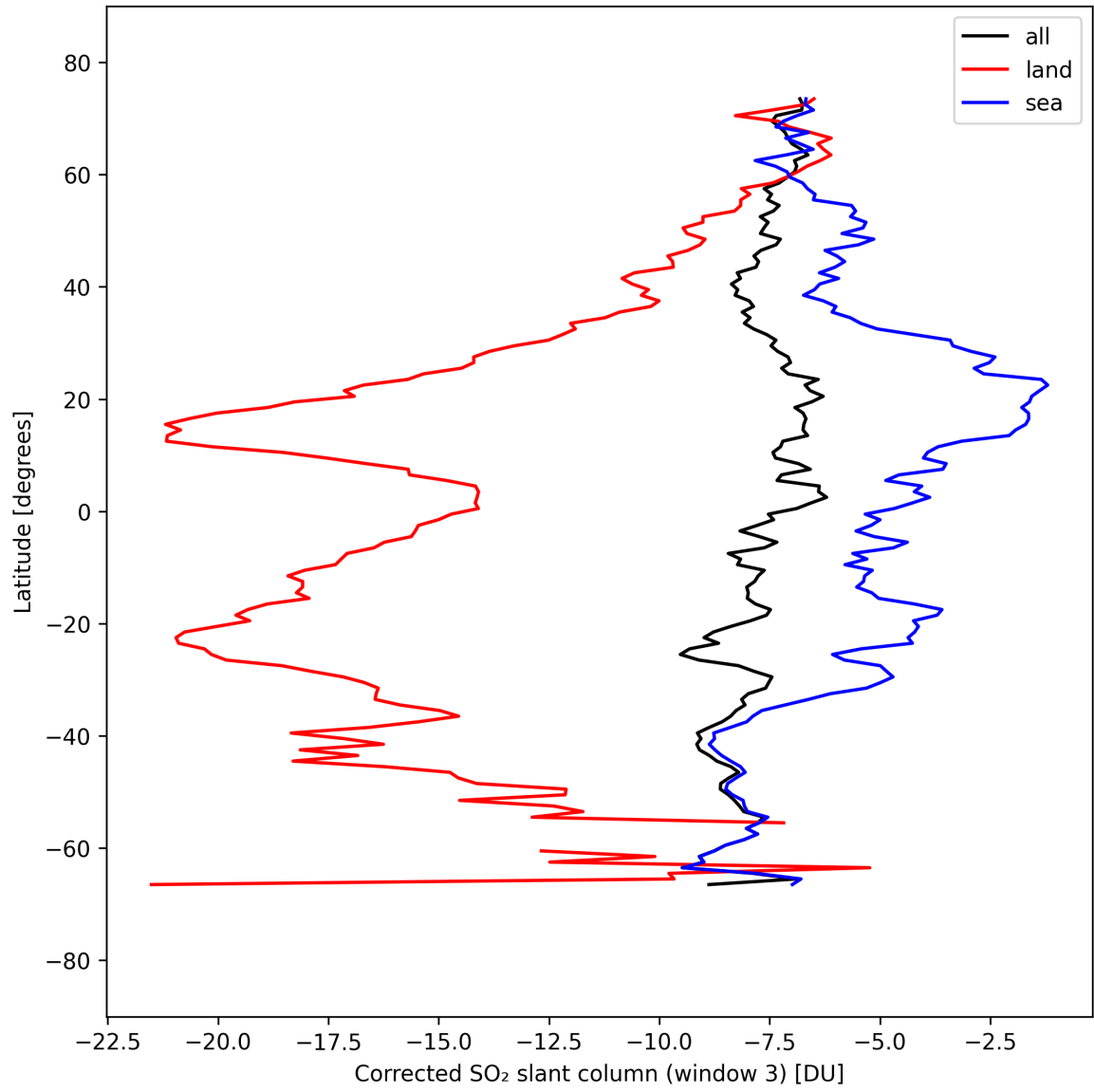


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-03-28 to 2025-03-29.

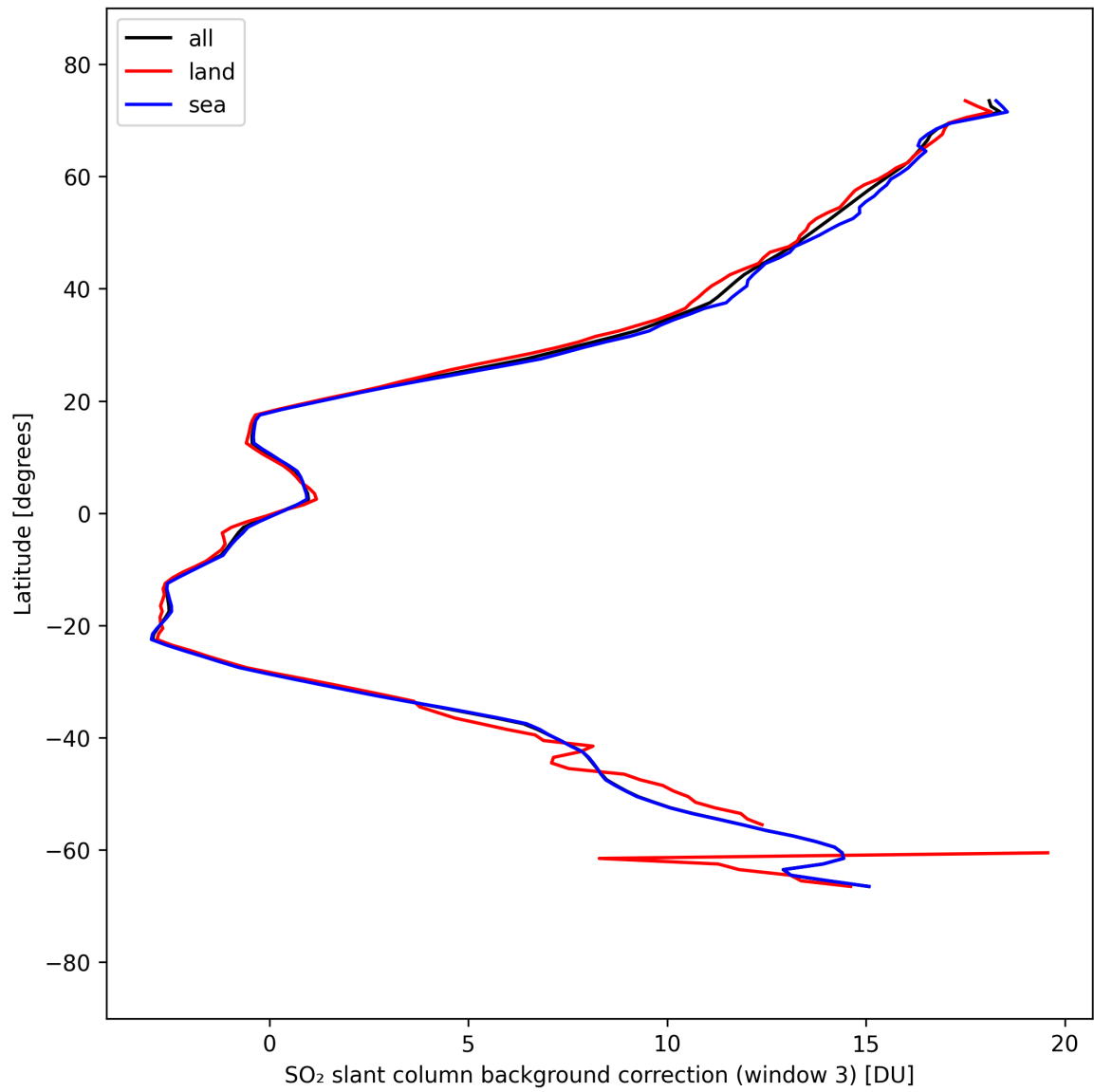


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-03-28 to 2025-03-29.

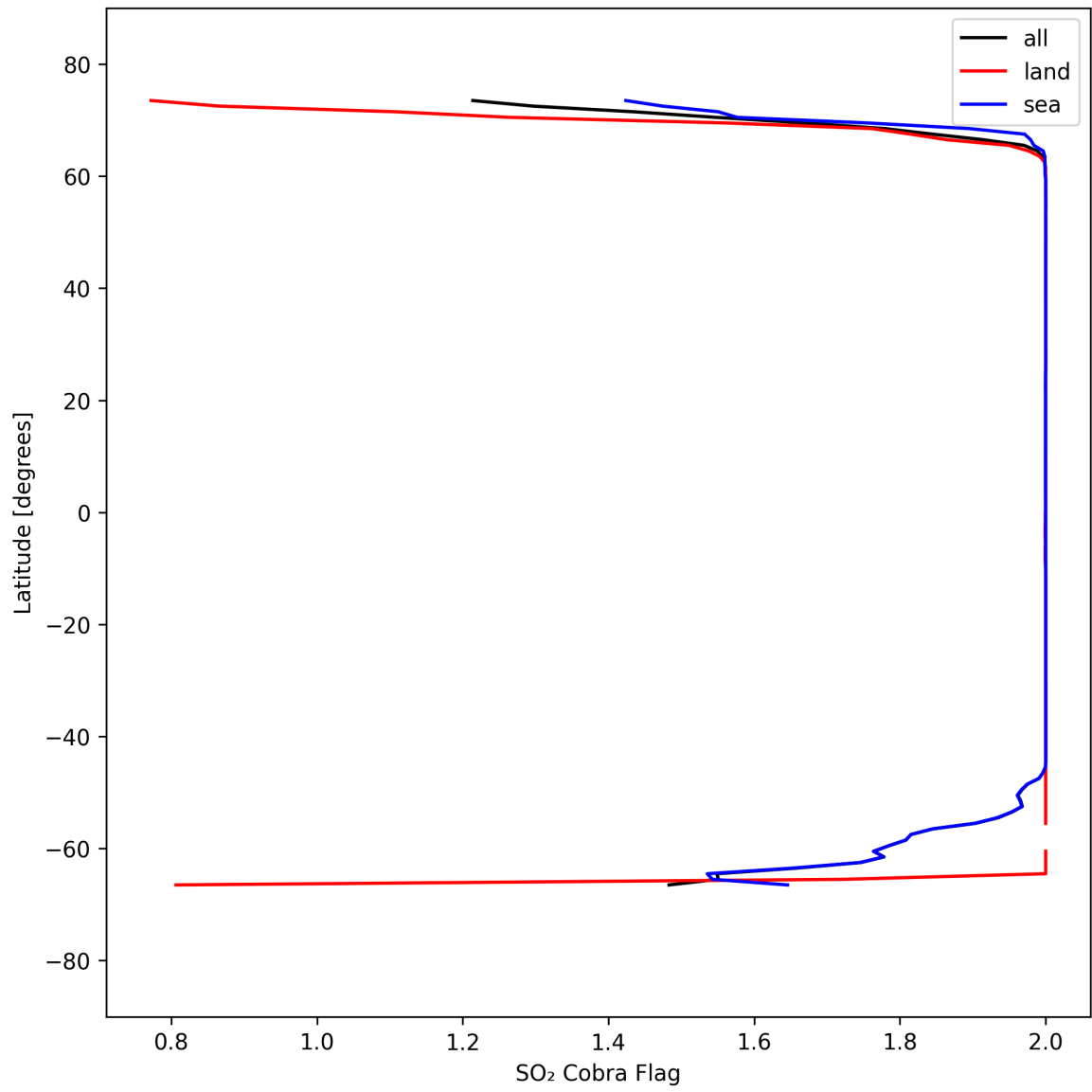


Figure 48: Zonal average of "SO₂ Cobra Flag" for 2025-03-28 to 2025-03-29.

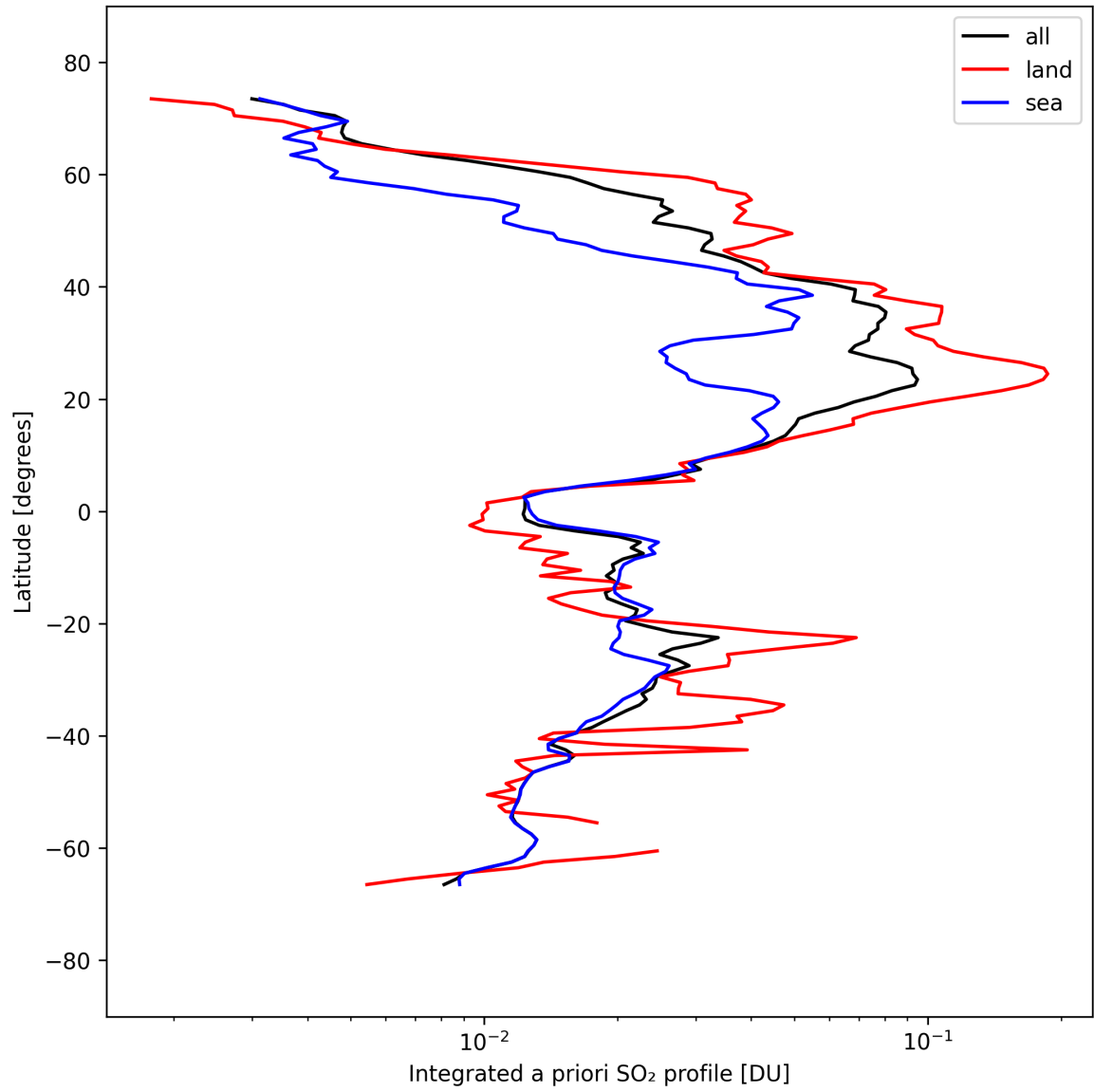


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-03-28 to 2025-03-29.

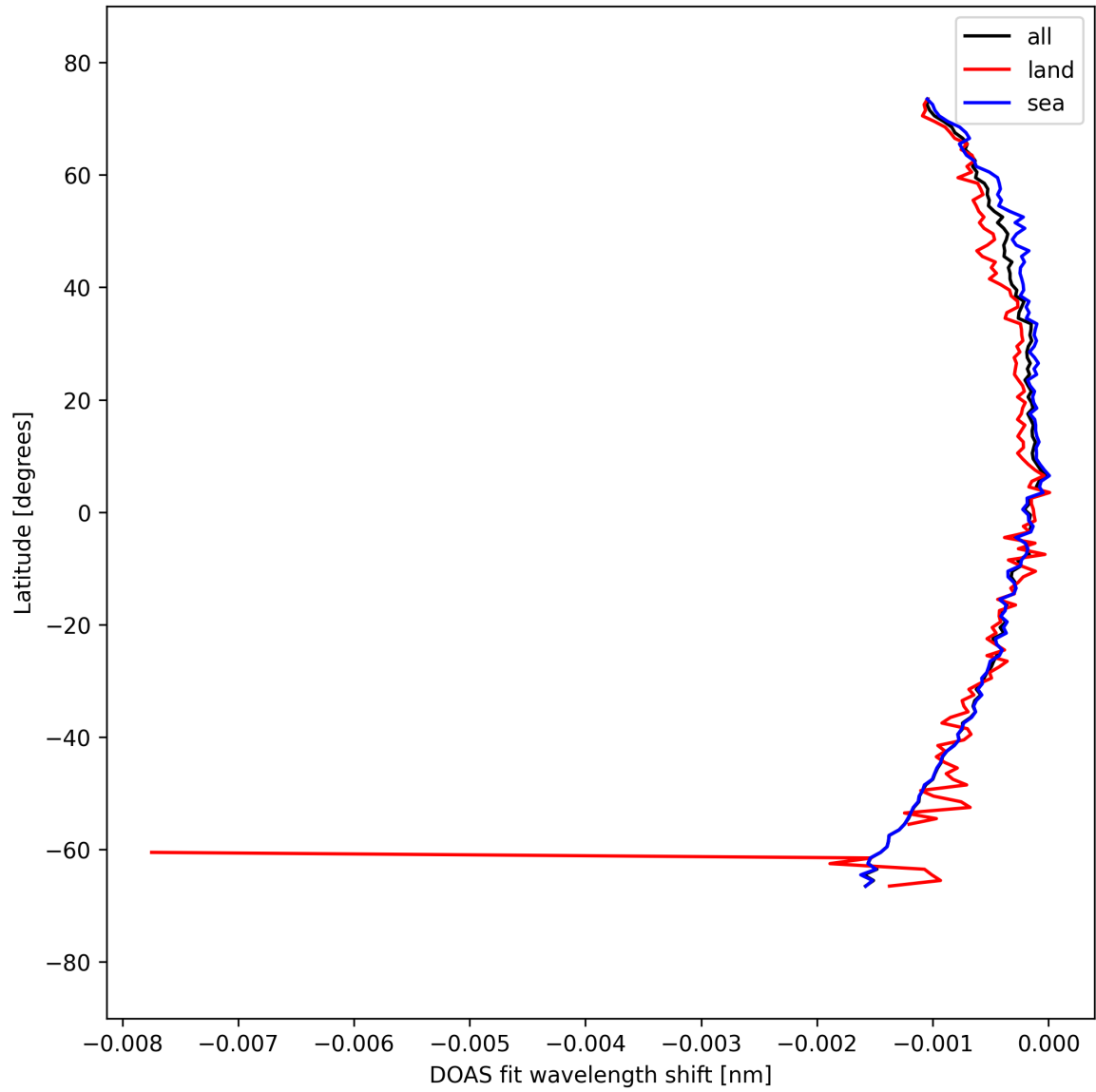


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-03-28 to 2025-03-29.

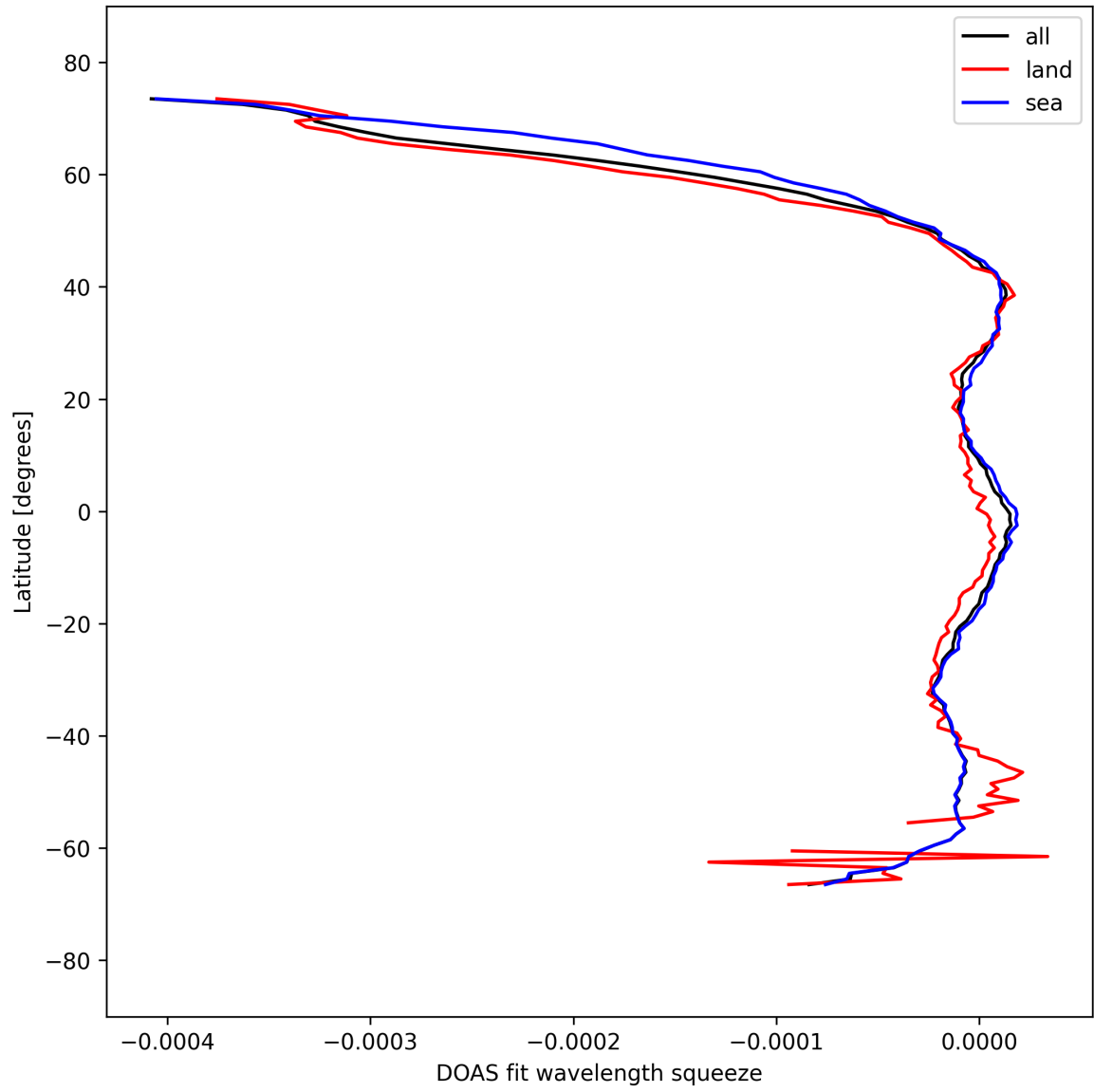


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-03-28 to 2025-03-29.

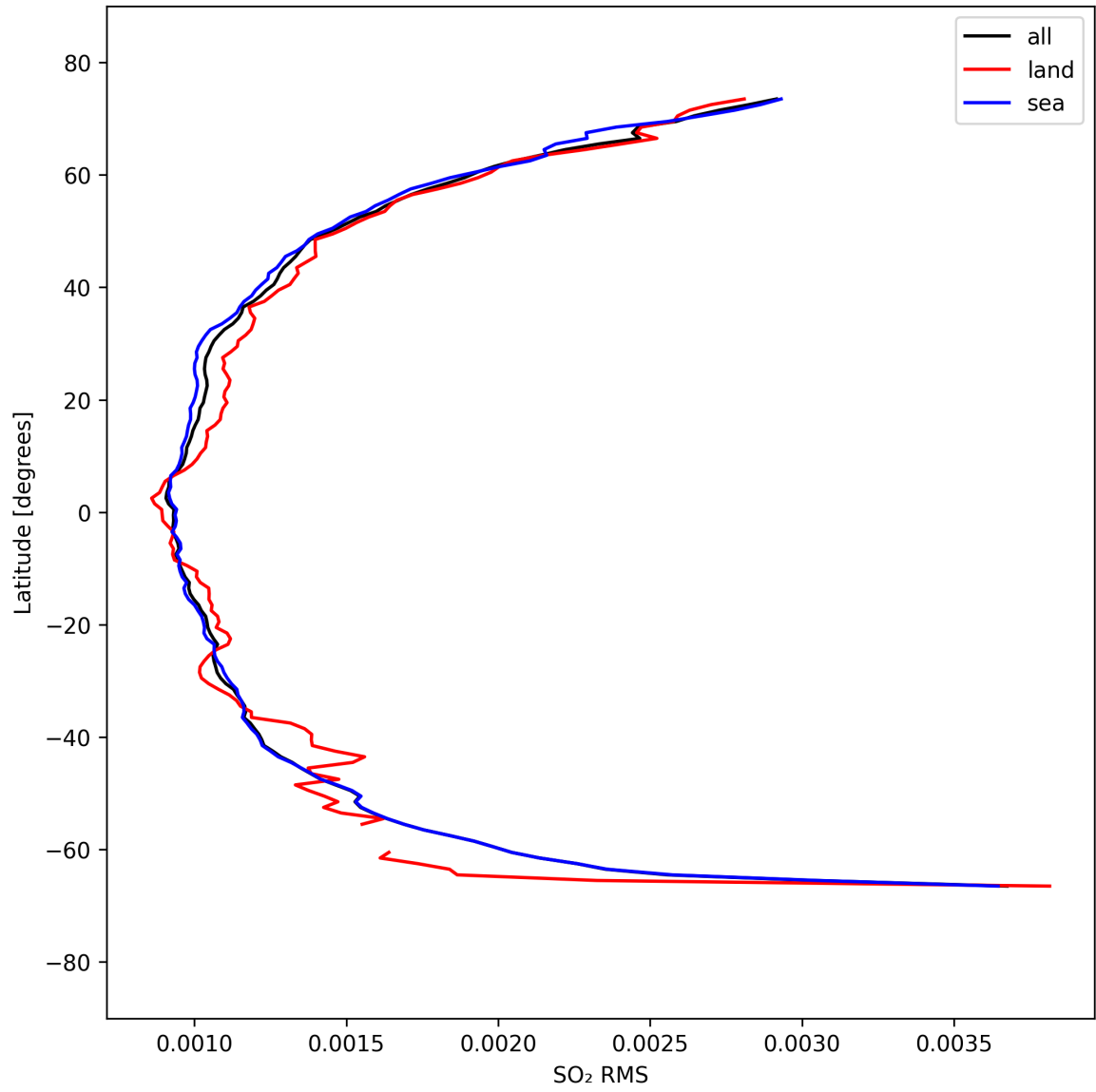


Figure 52: Zonal average of “SO₂ RMS” for 2025-03-28 to 2025-03-29.

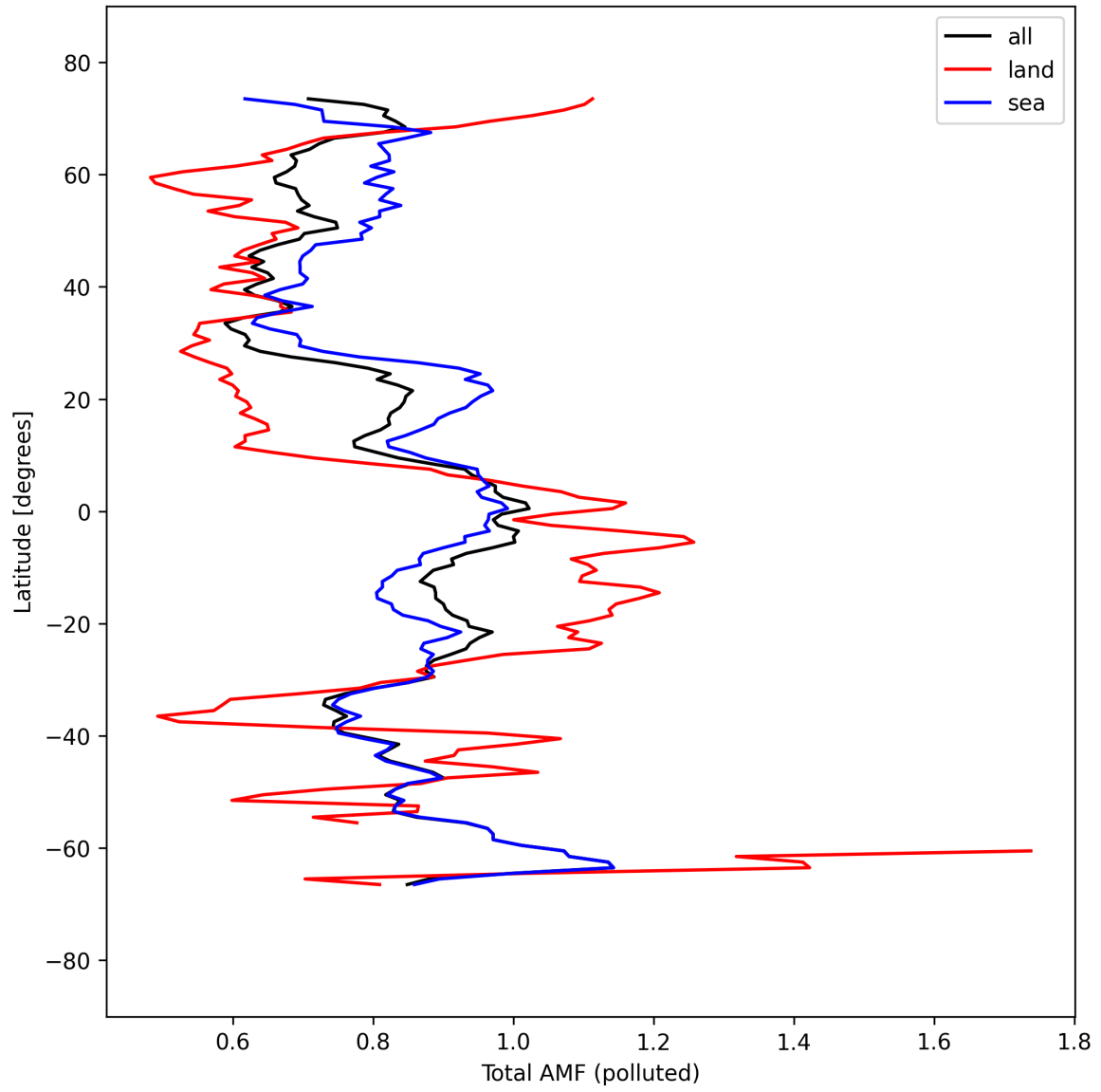


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-03-28 to 2025-03-29.

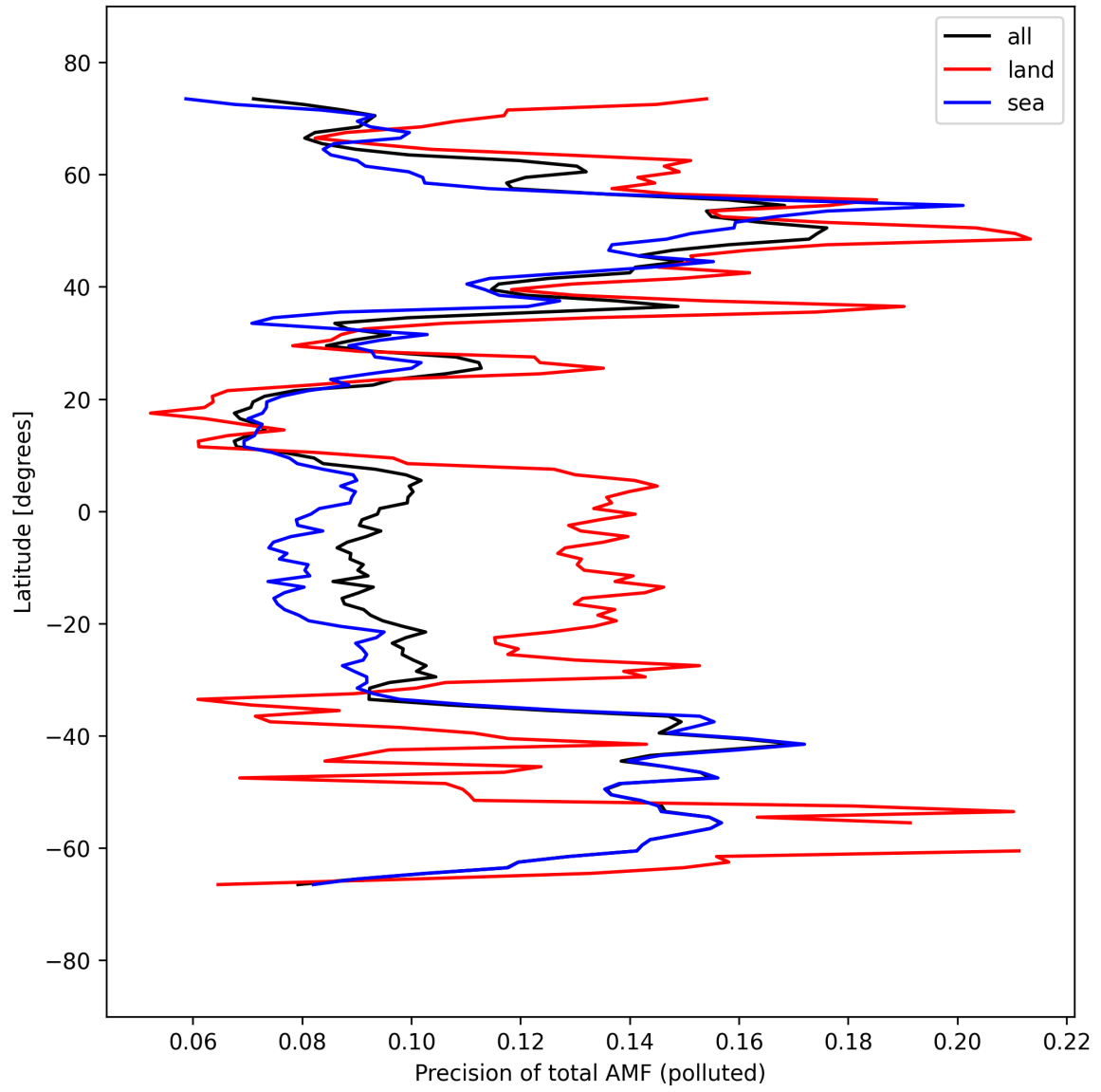


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-03-28 to 2025-03-29.

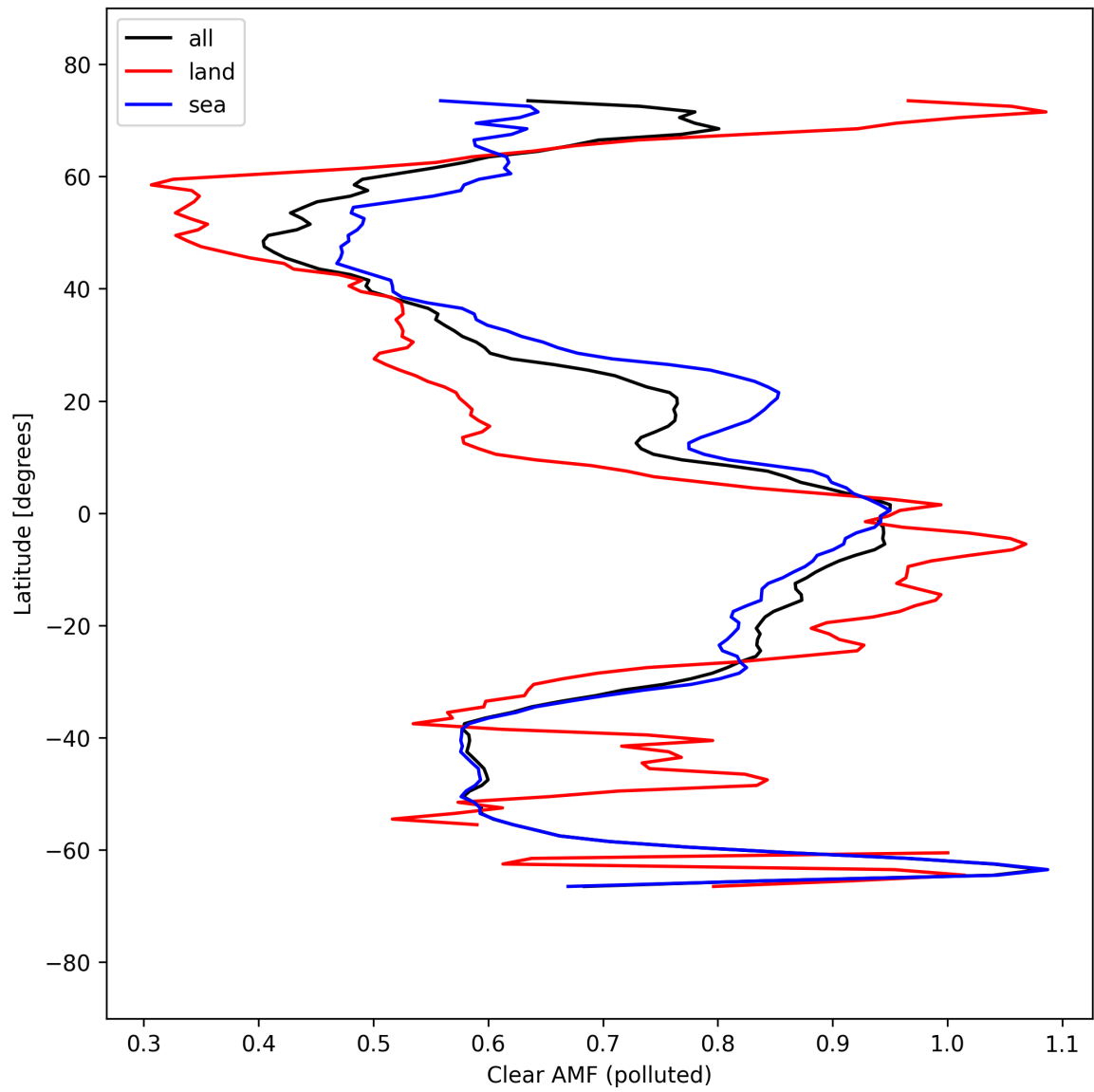


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-03-28 to 2025-03-29.

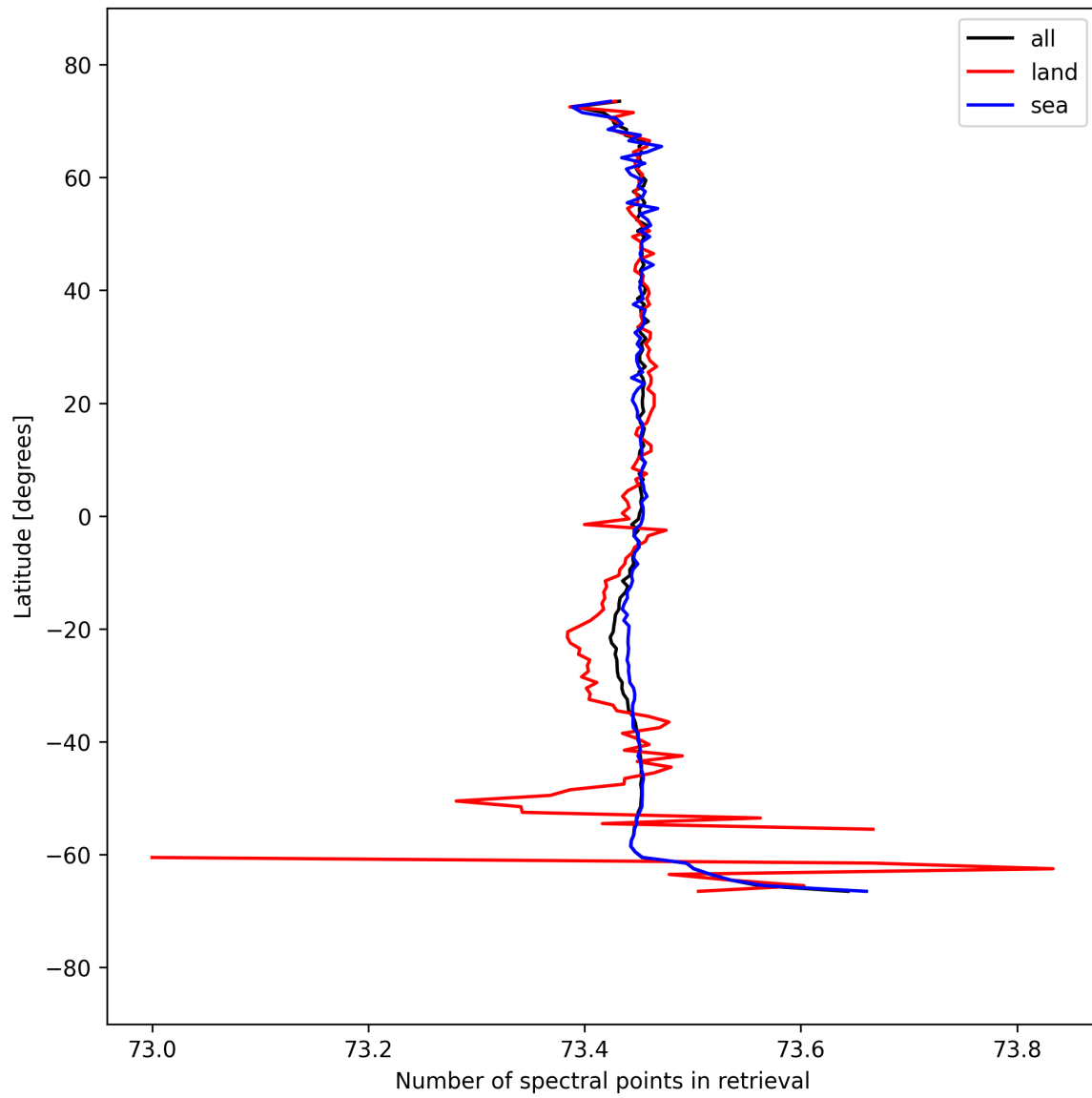


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-03-28 to 2025-03-29.

8 Histograms

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

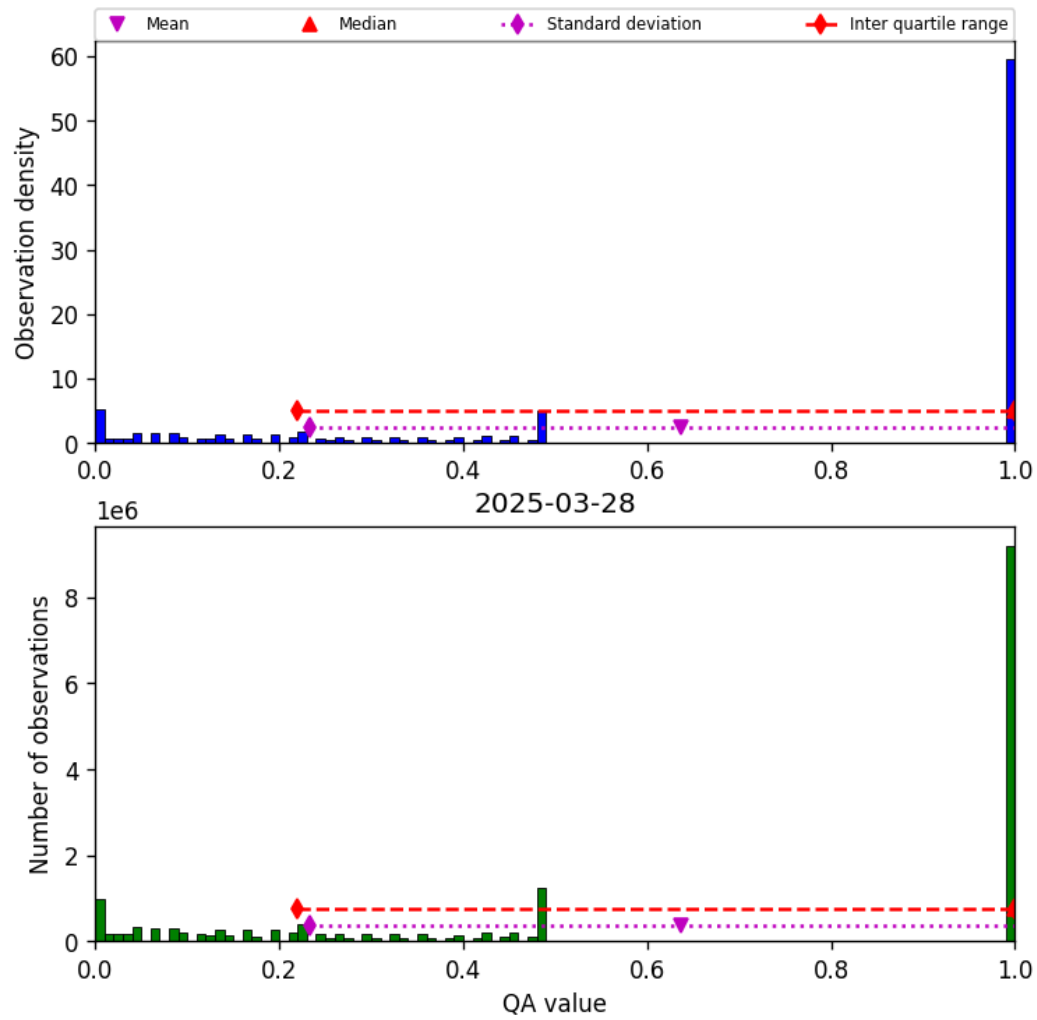


Figure 57: Histogram of “QA value” for 2025-03-28 to 2025-03-29

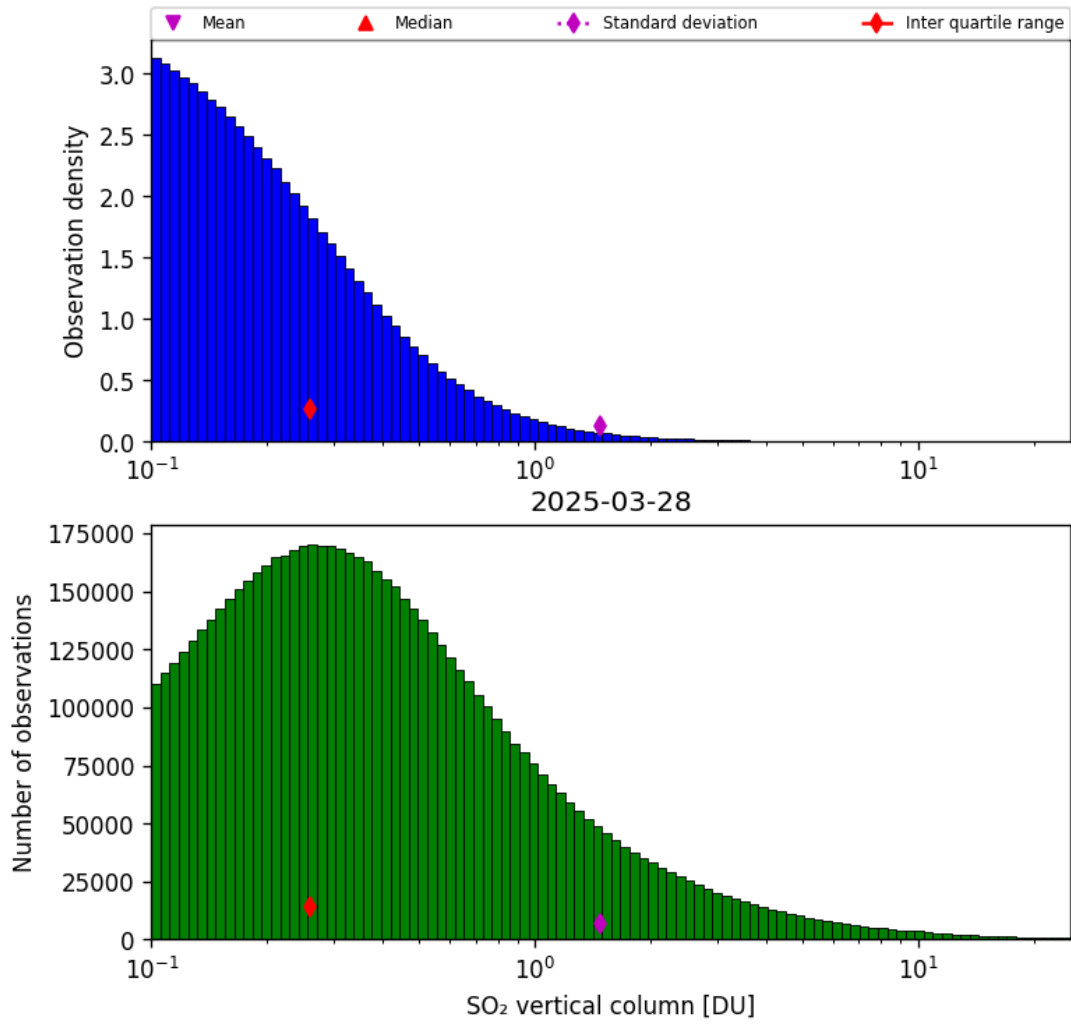


Figure 58: Histogram of “SO₂ vertical column” for 2025-03-28 to 2025-03-29

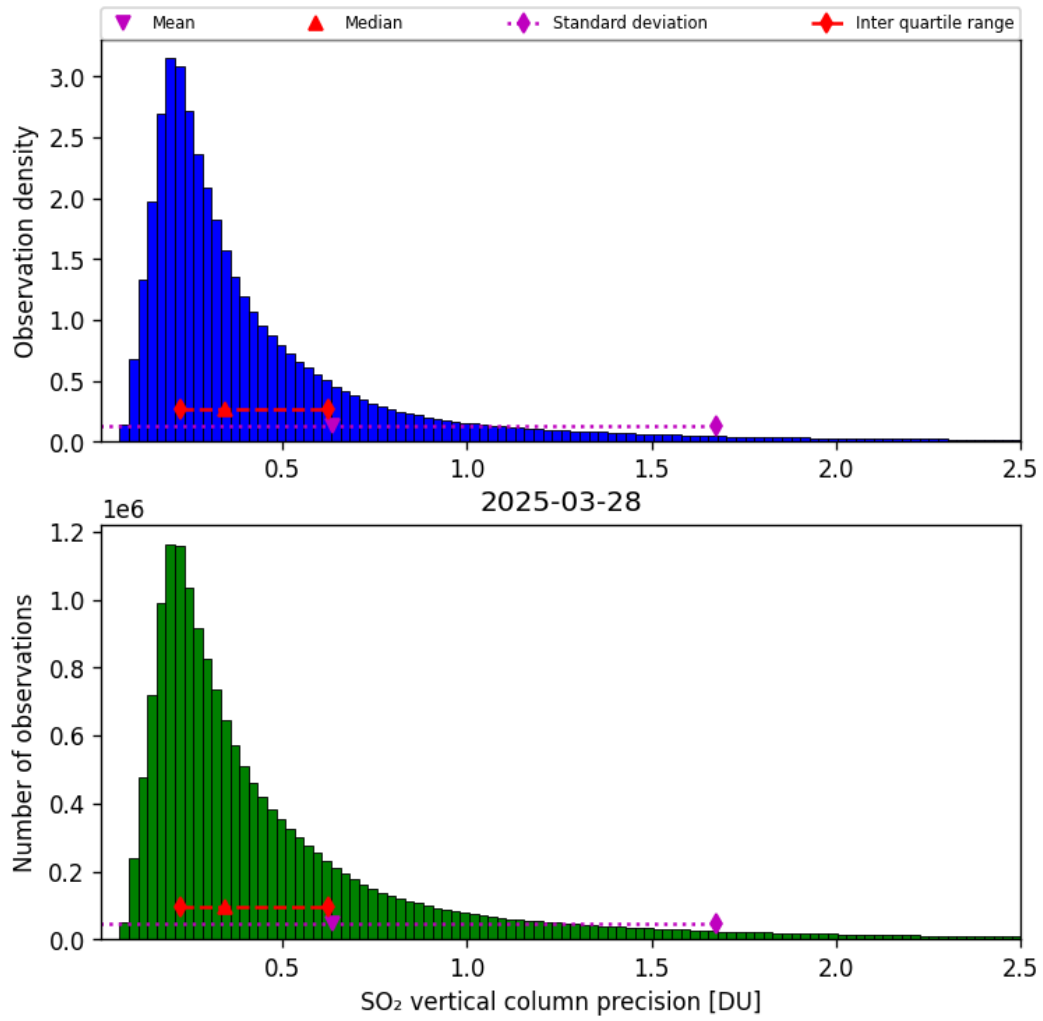


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-03-28 to 2025-03-29

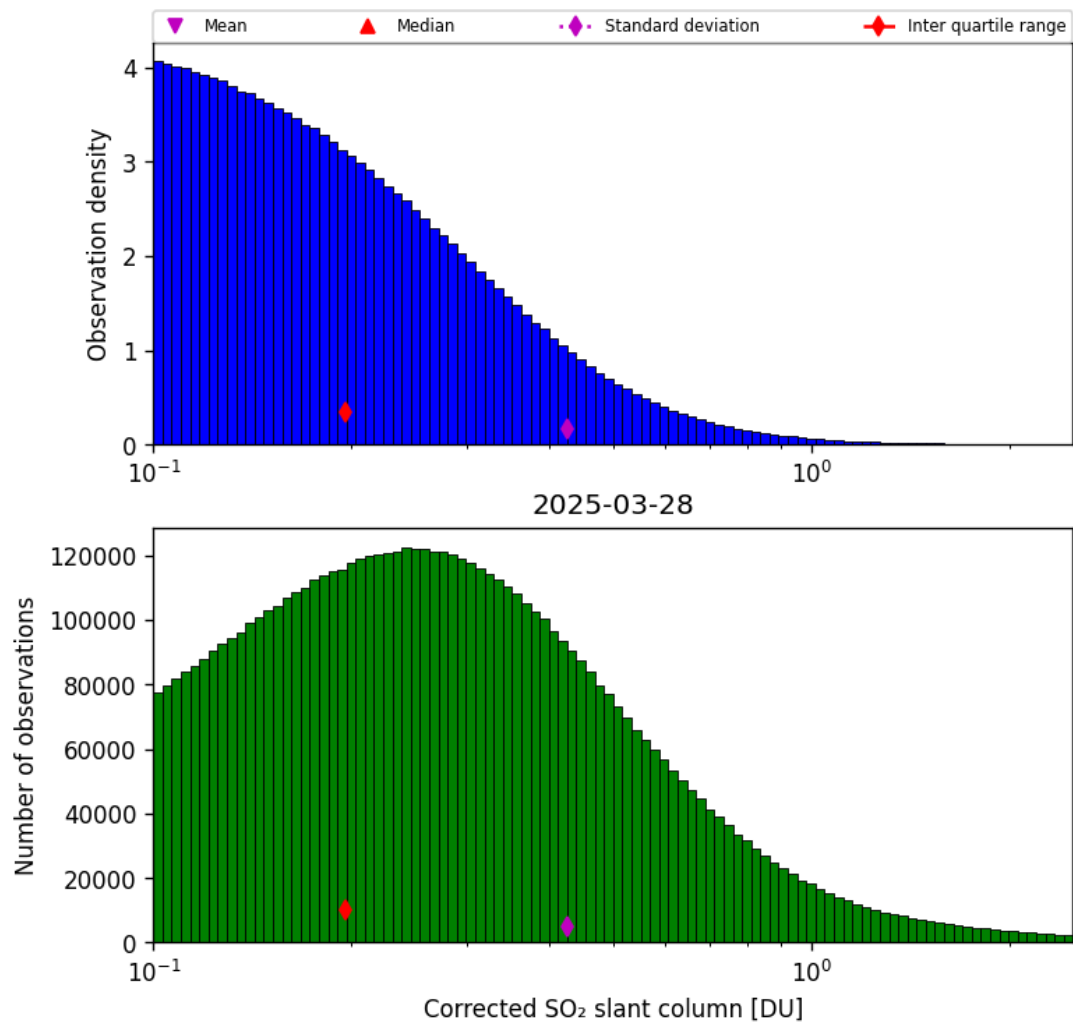


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-03-28 to 2025-03-29

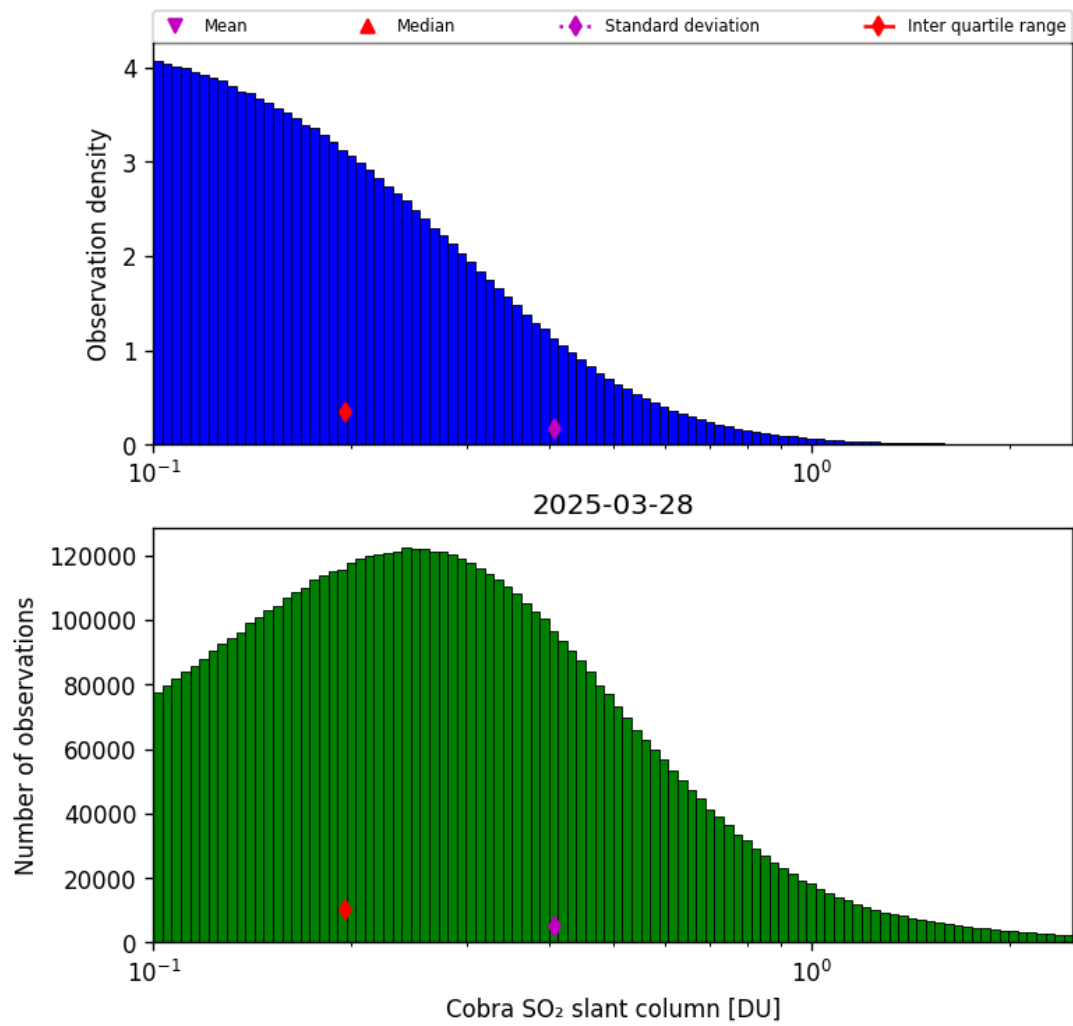


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-03-28 to 2025-03-29

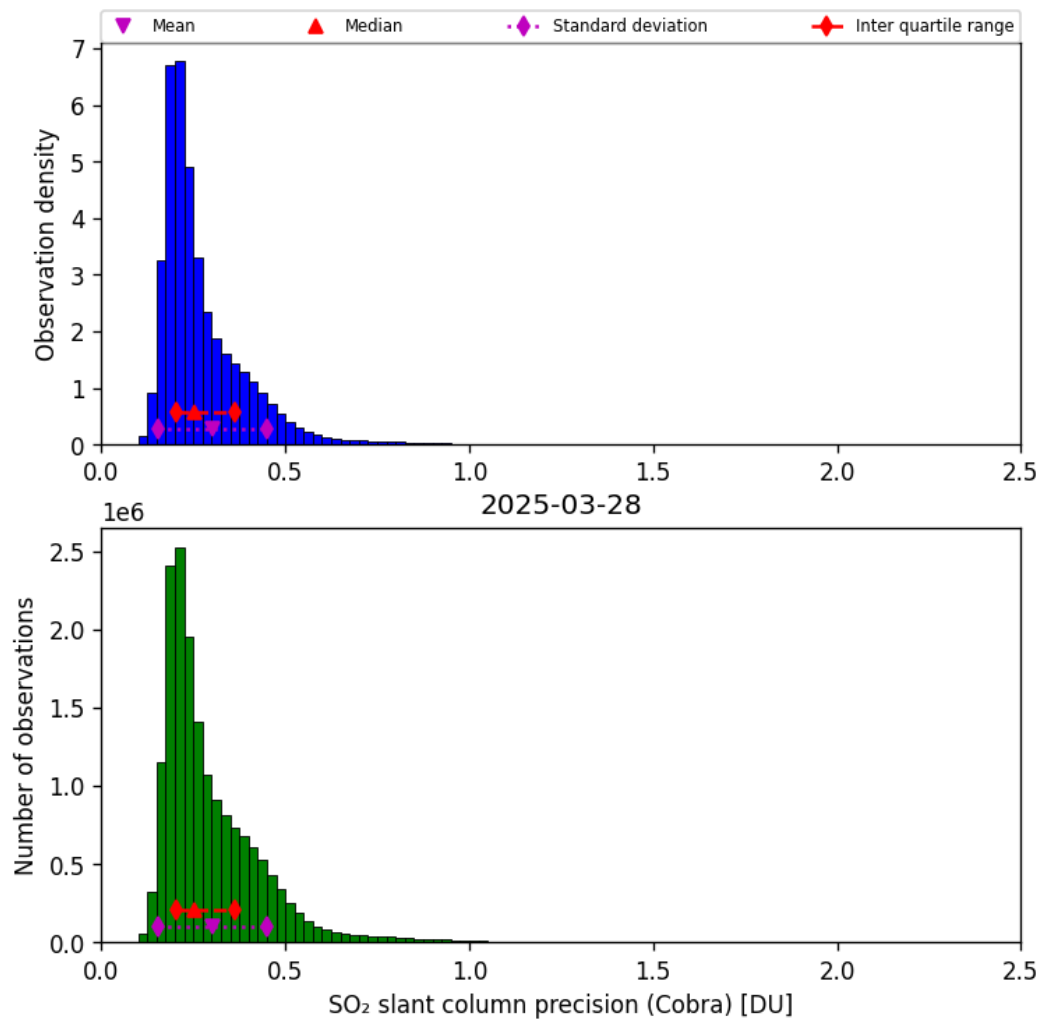


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-03-28 to 2025-03-29

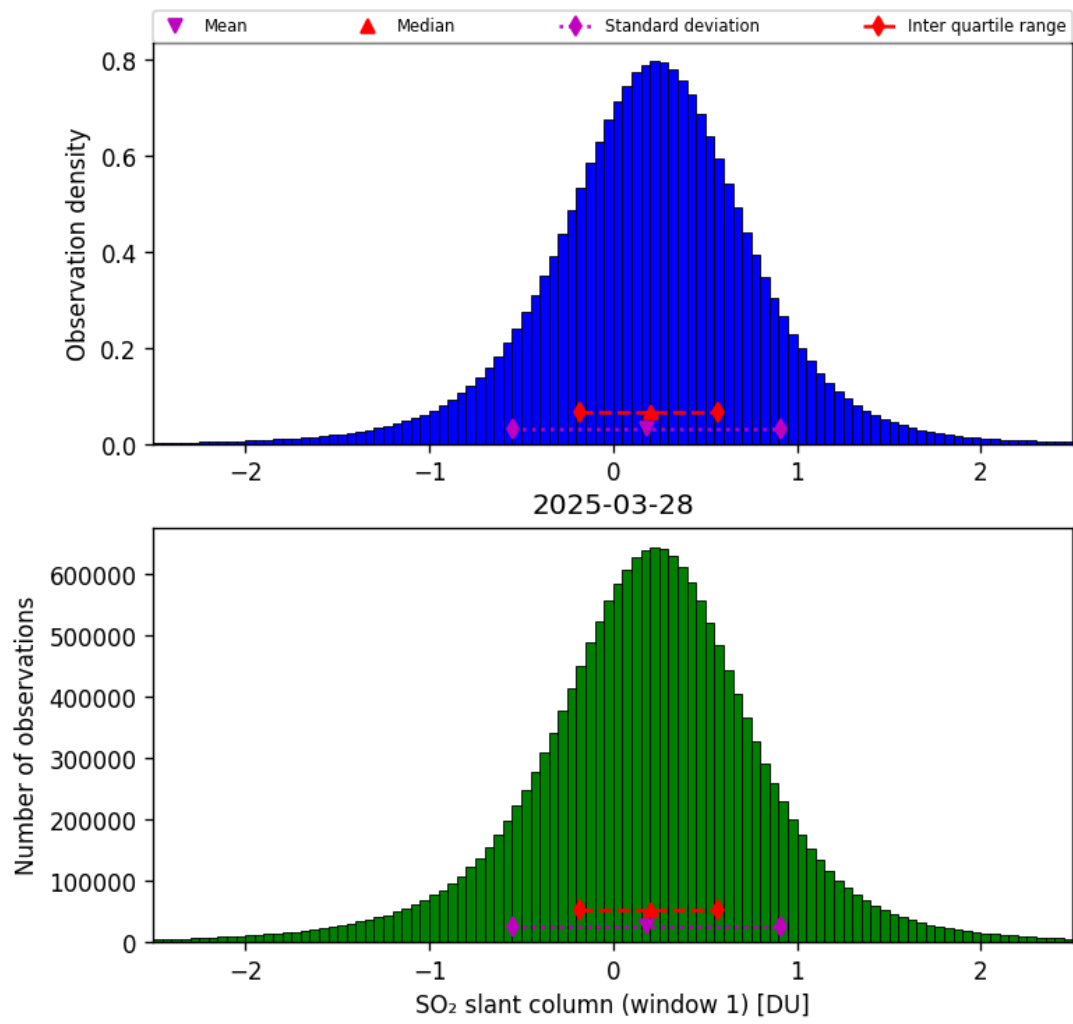


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-03-28 to 2025-03-29

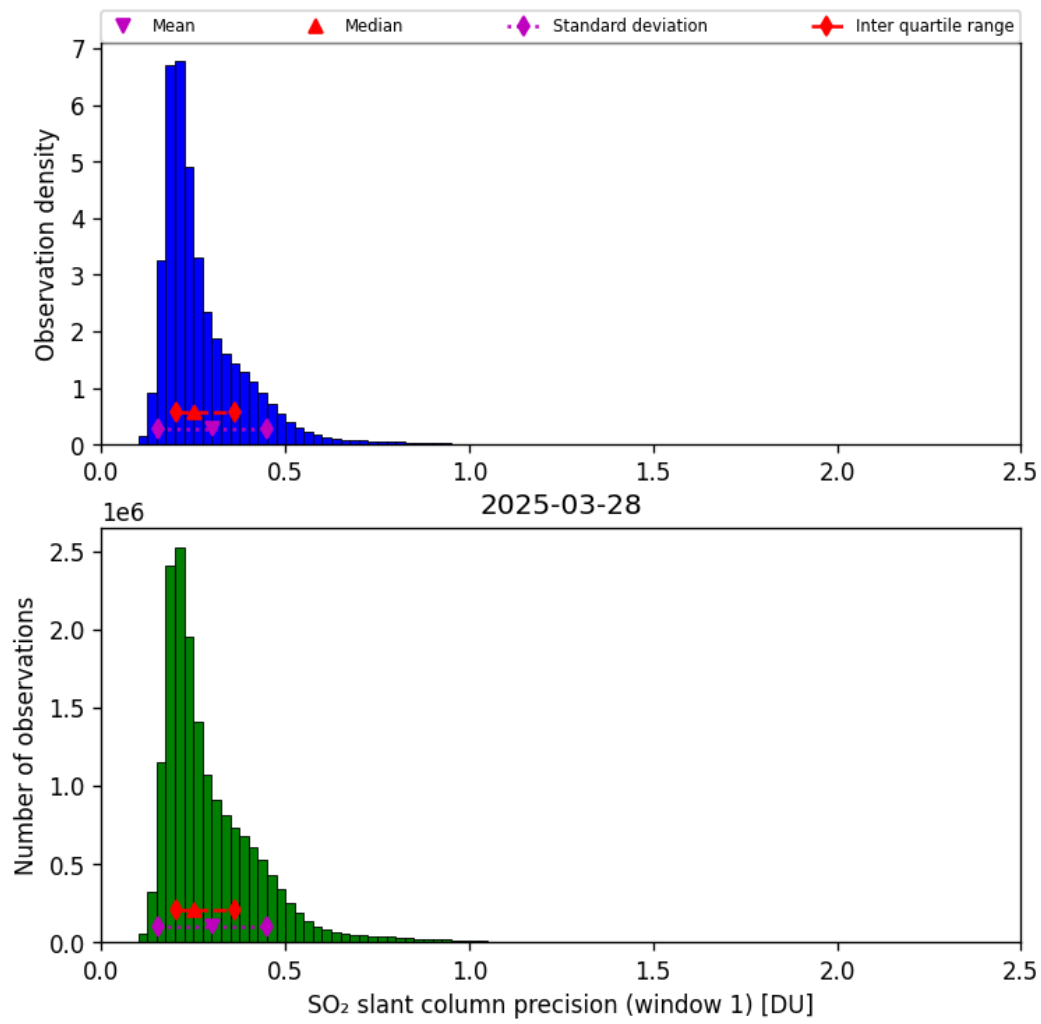


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-03-28 to 2025-03-29

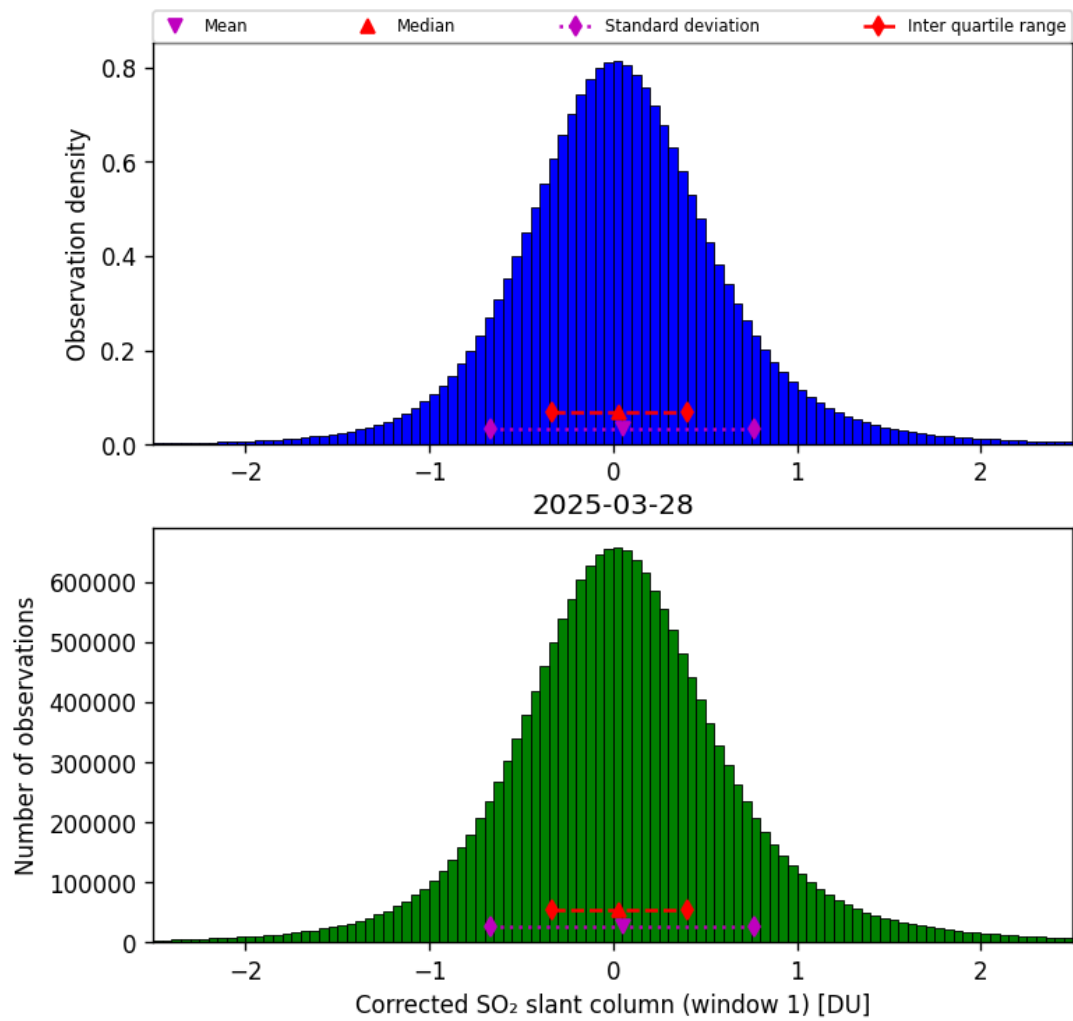


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-03-28 to 2025-03-29

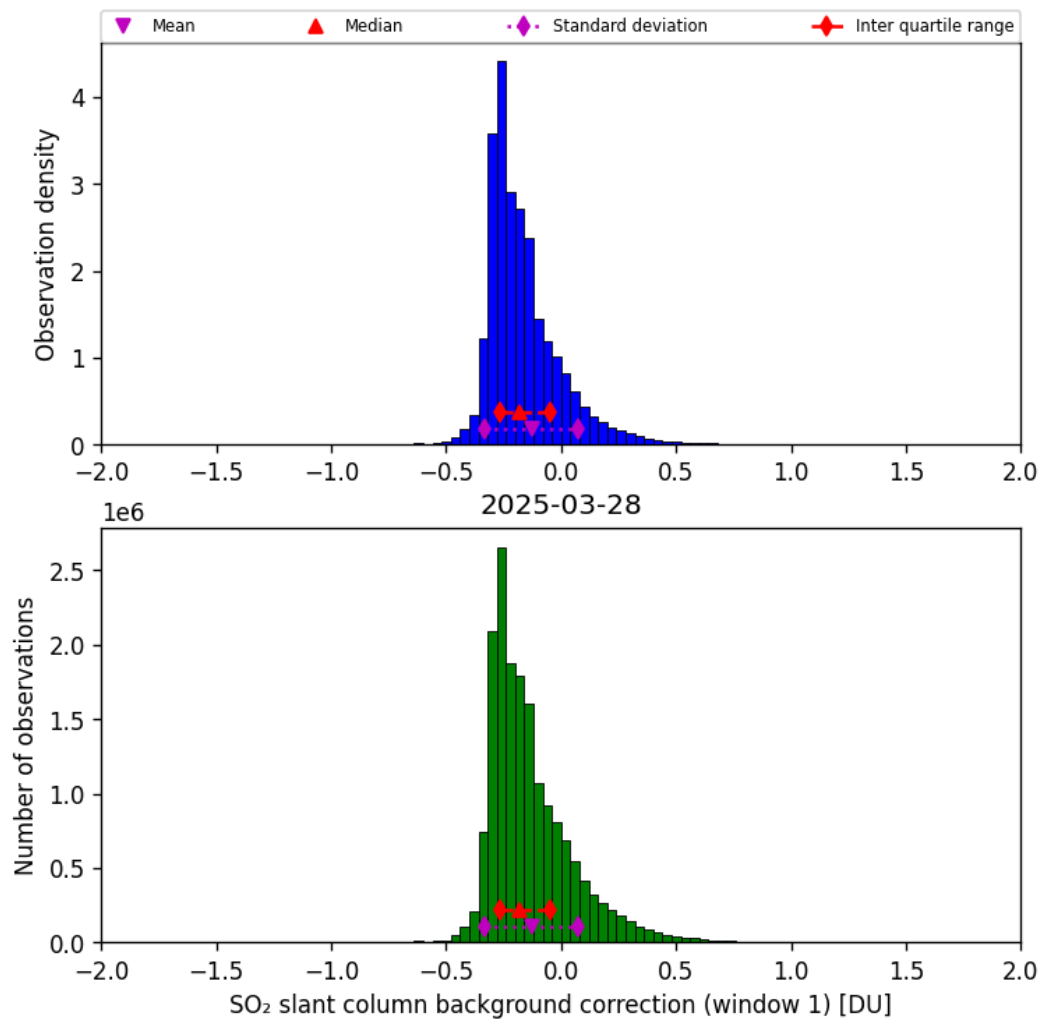


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-03-28 to 2025-03-29

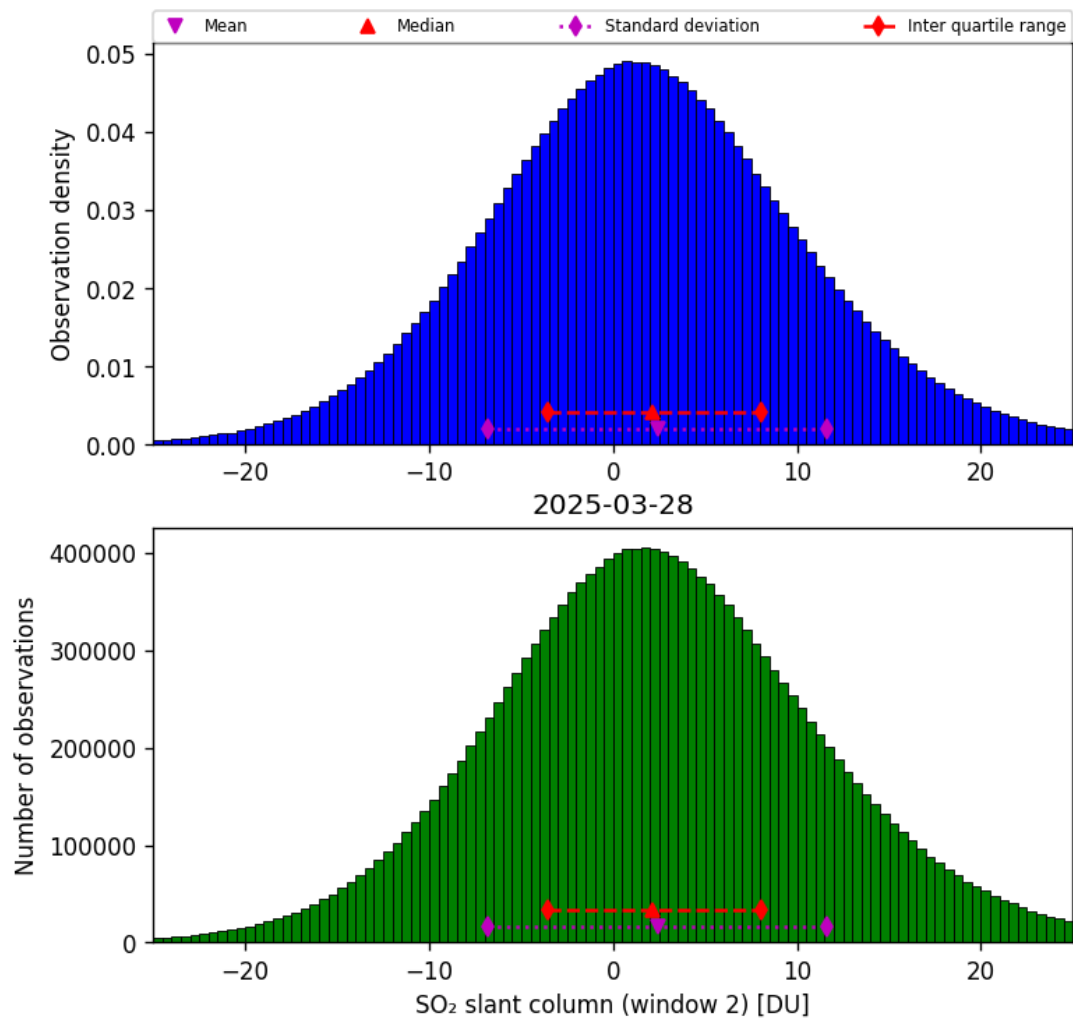


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-03-28 to 2025-03-29

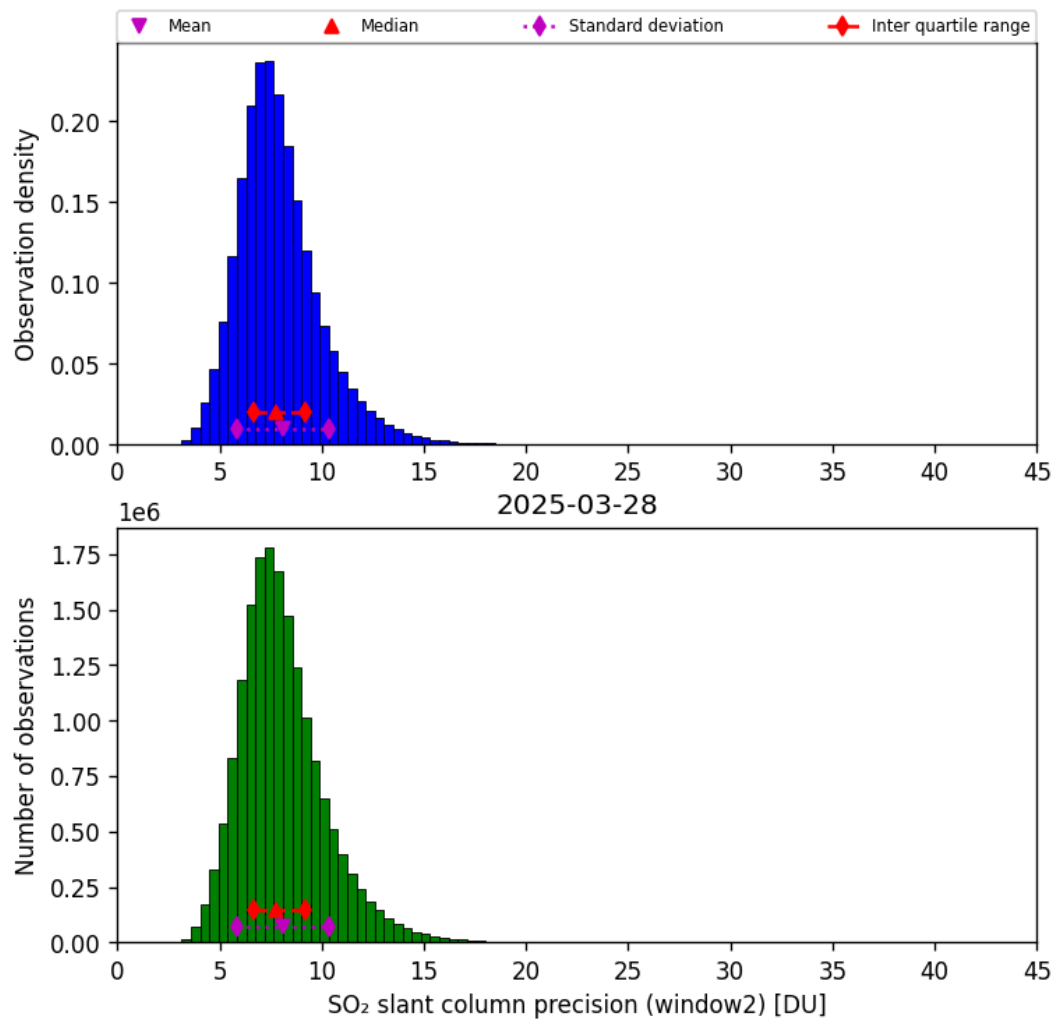


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-03-28 to 2025-03-29

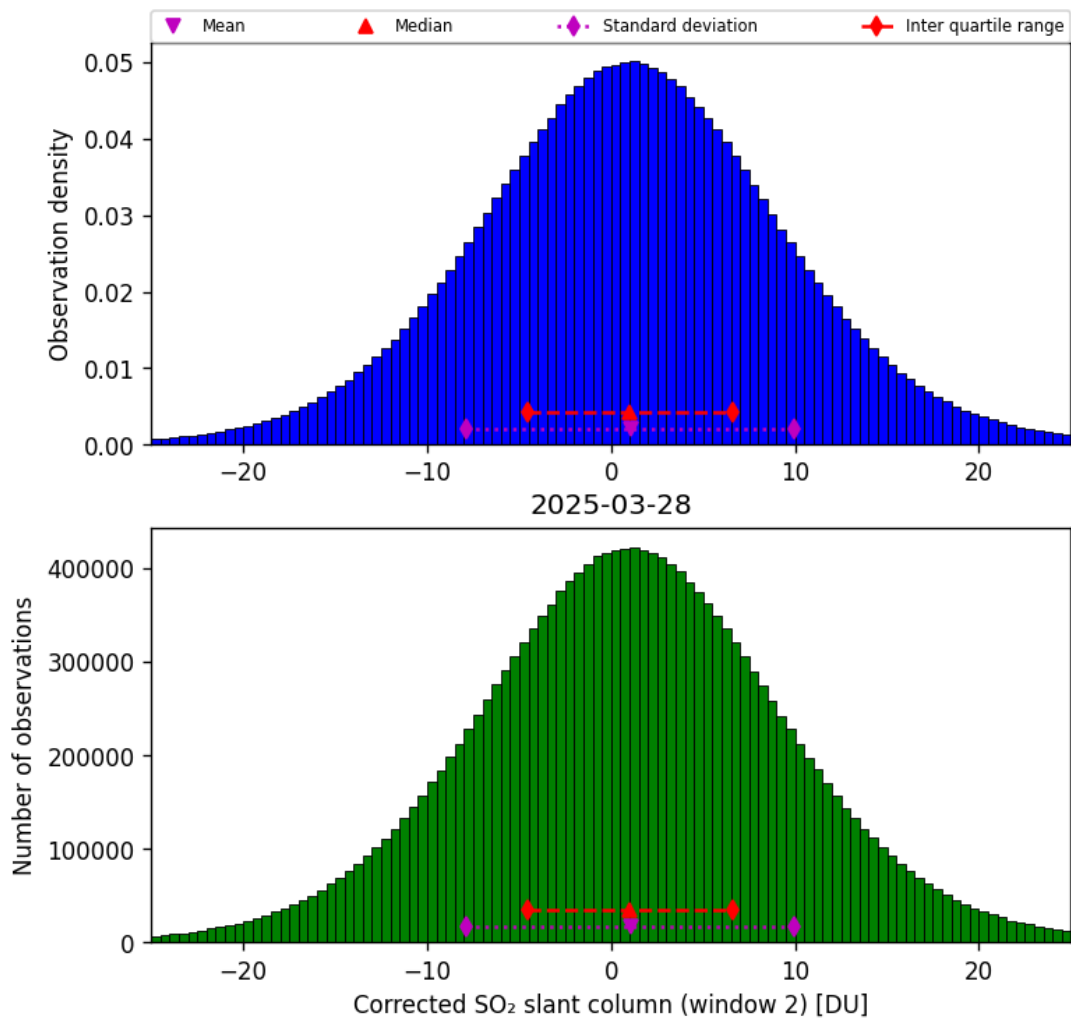


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-03-28 to 2025-03-29

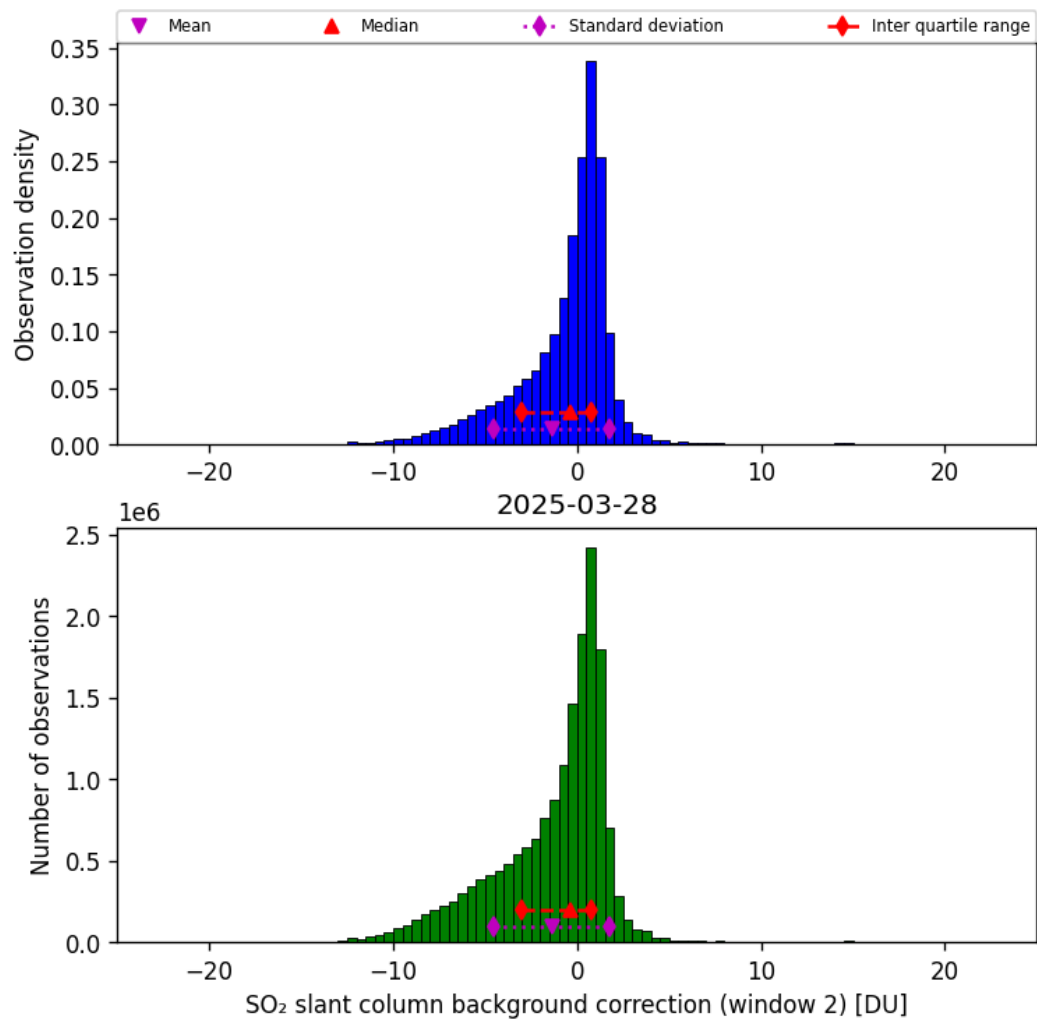


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-03-28 to 2025-03-29

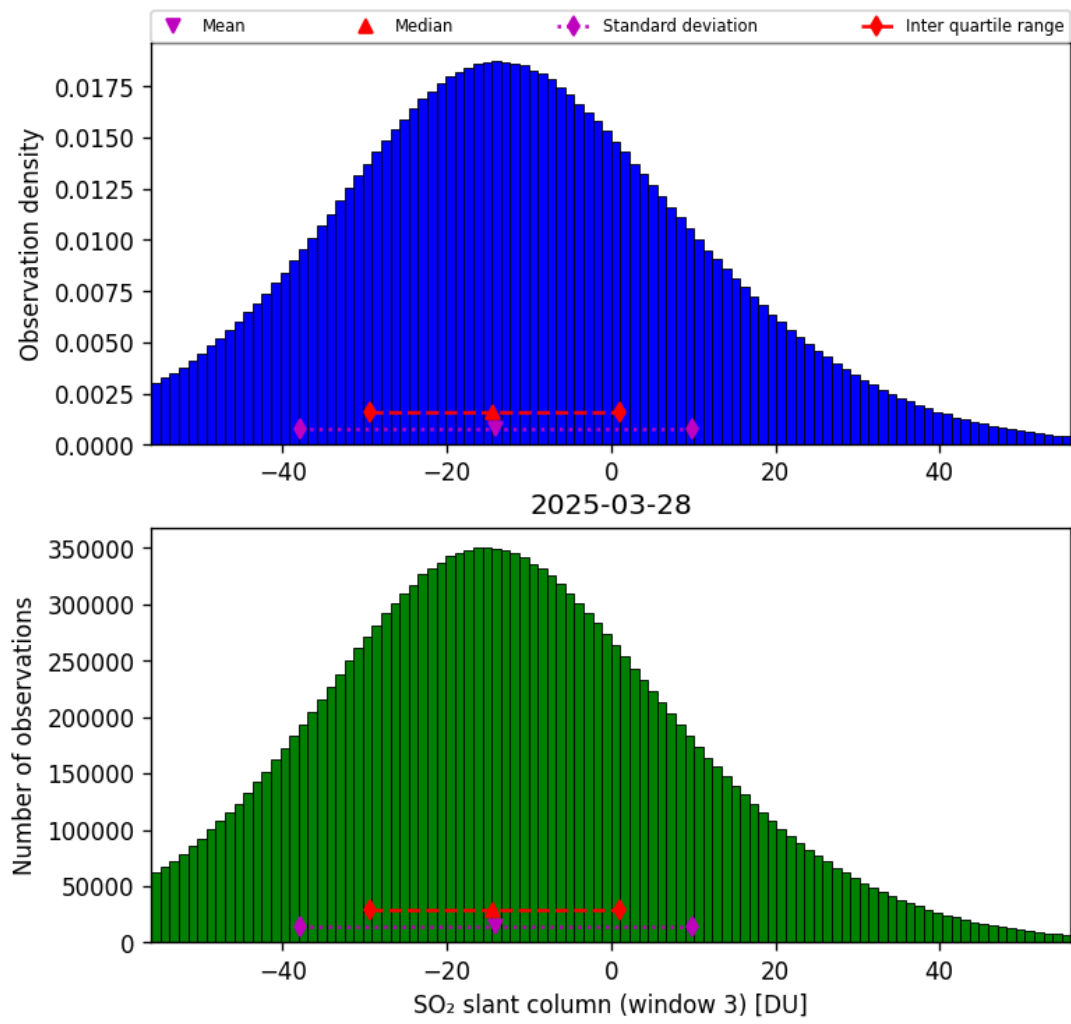


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-03-28 to 2025-03-29

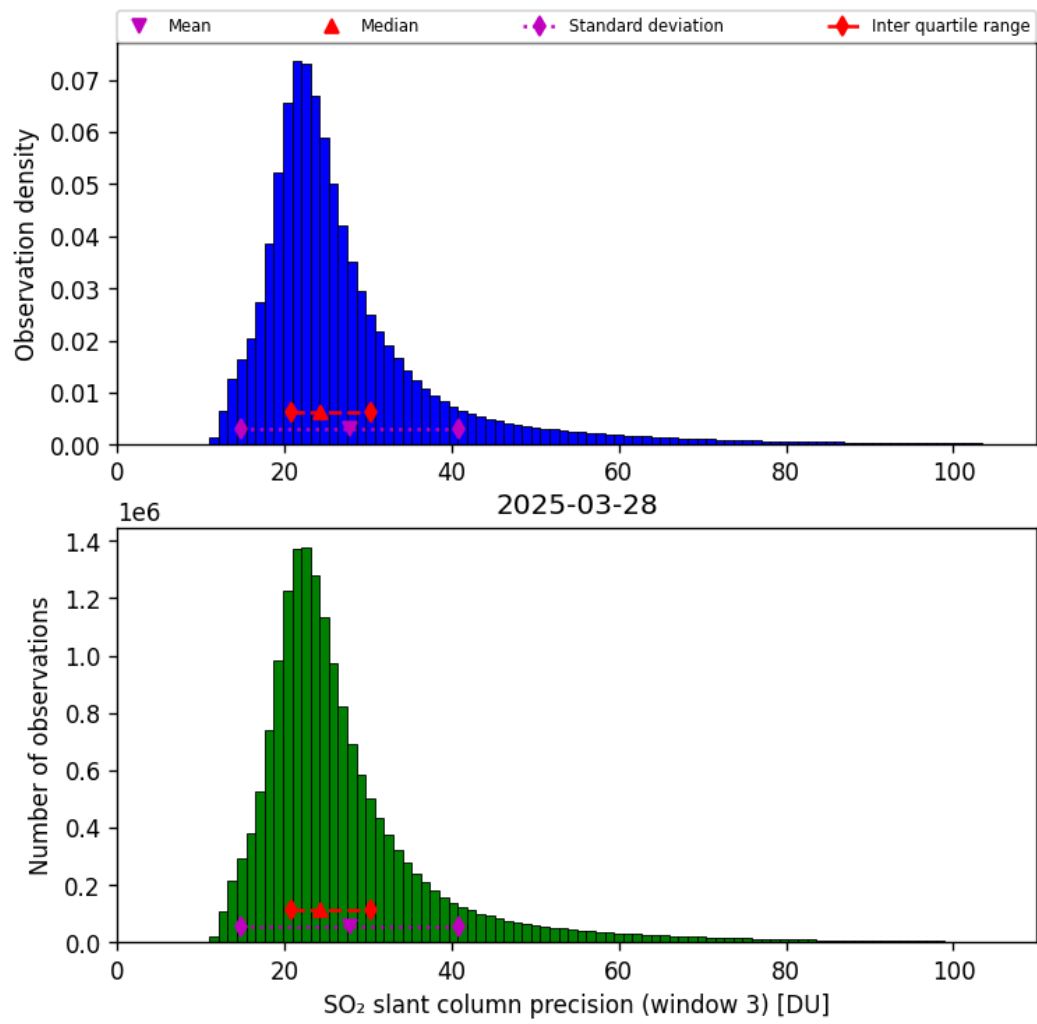


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-03-28 to 2025-03-29

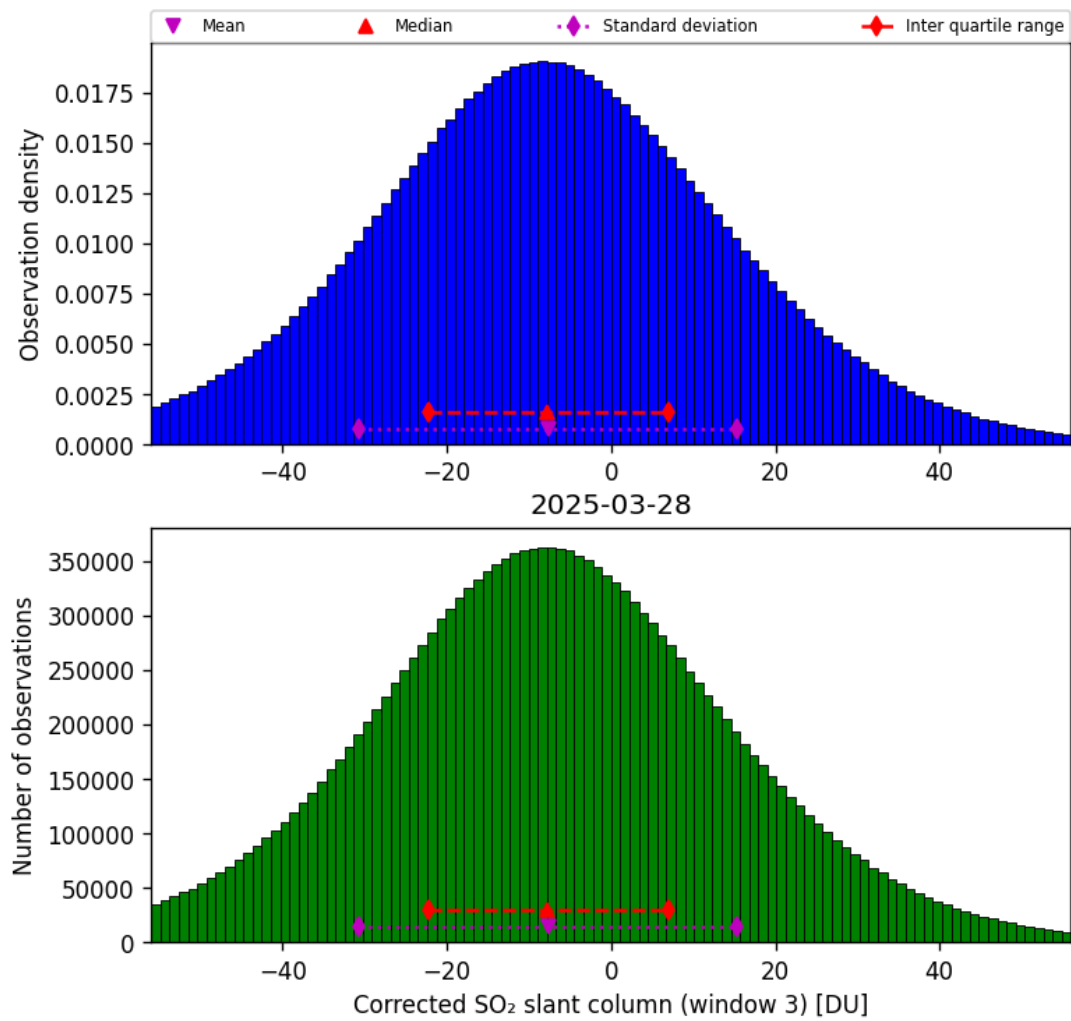


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-03-28 to 2025-03-29

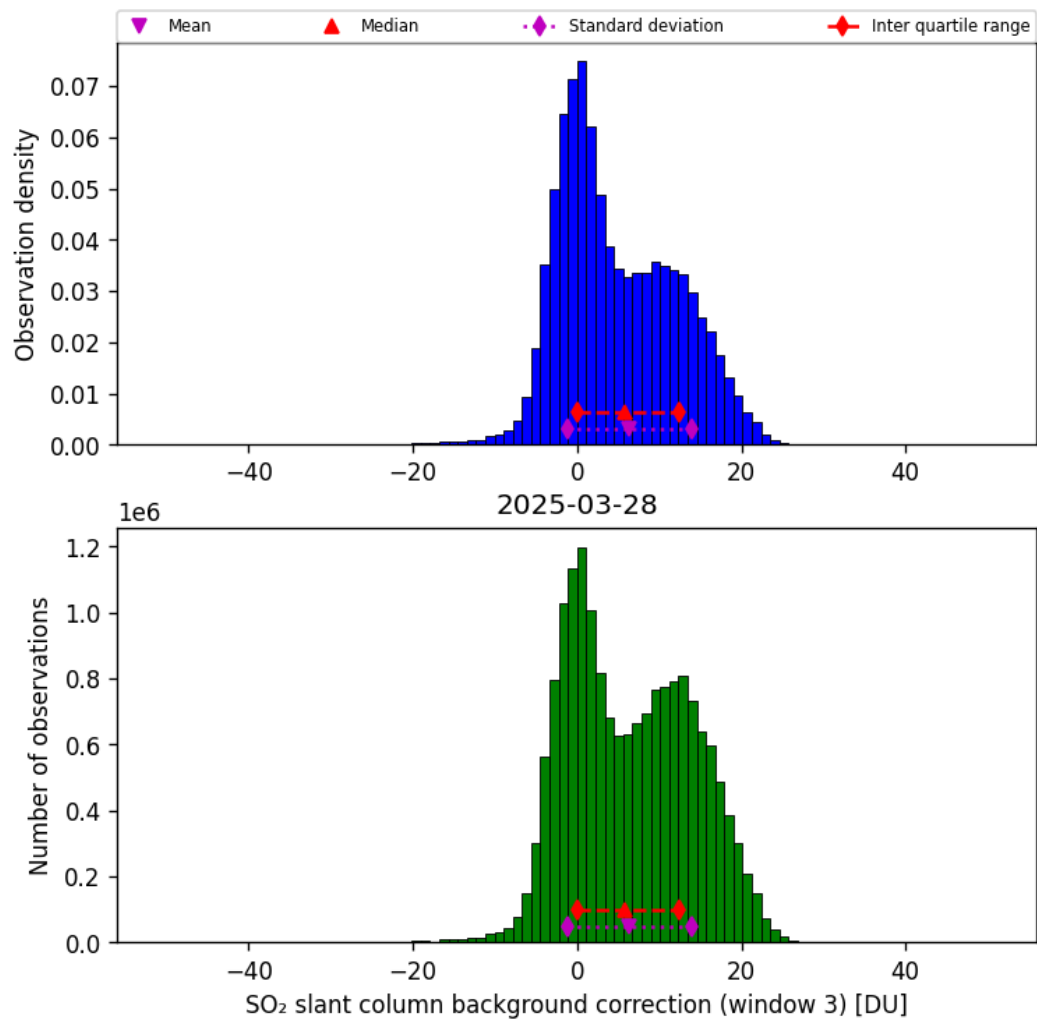


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-03-28 to 2025-03-29

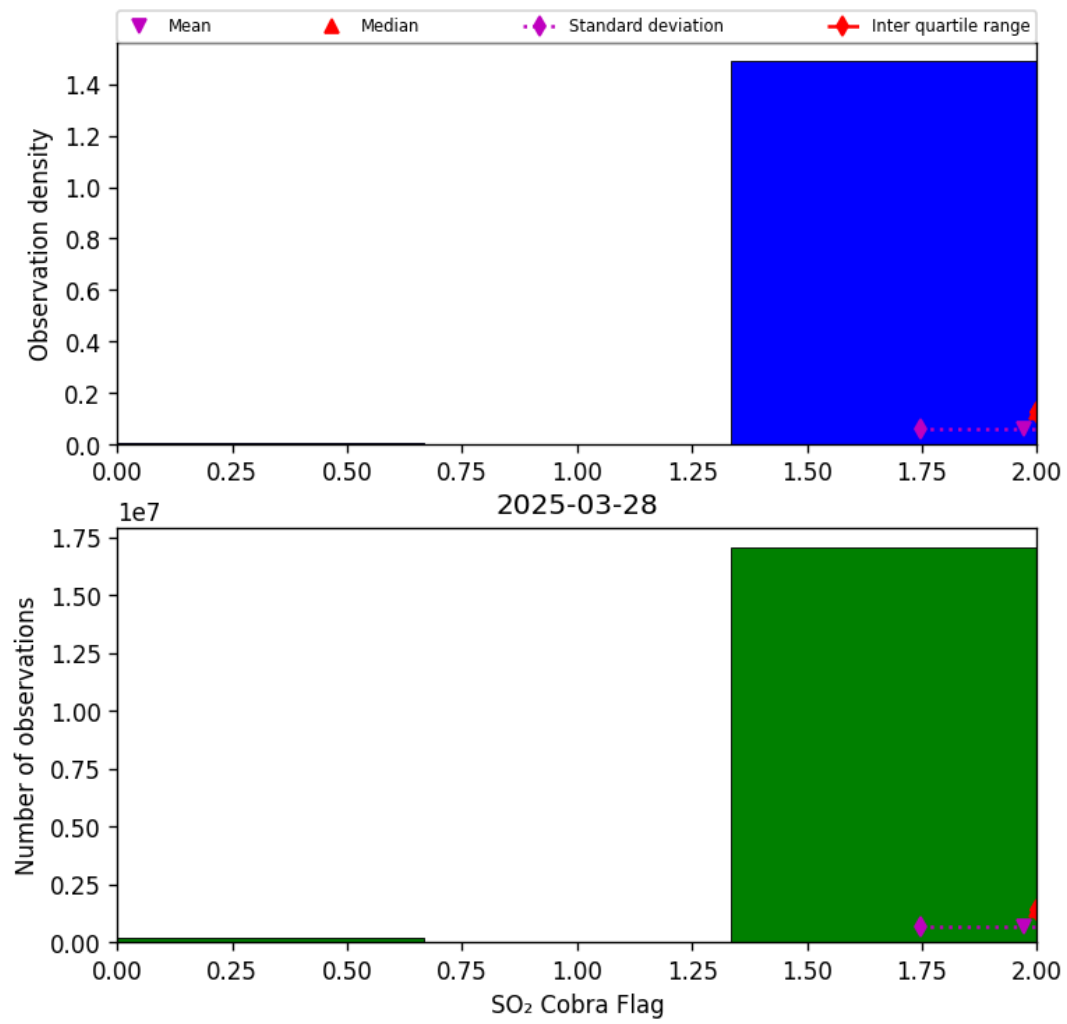


Figure 75: Histogram of "SO₂ Cobra Flag" for 2025-03-28 to 2025-03-29

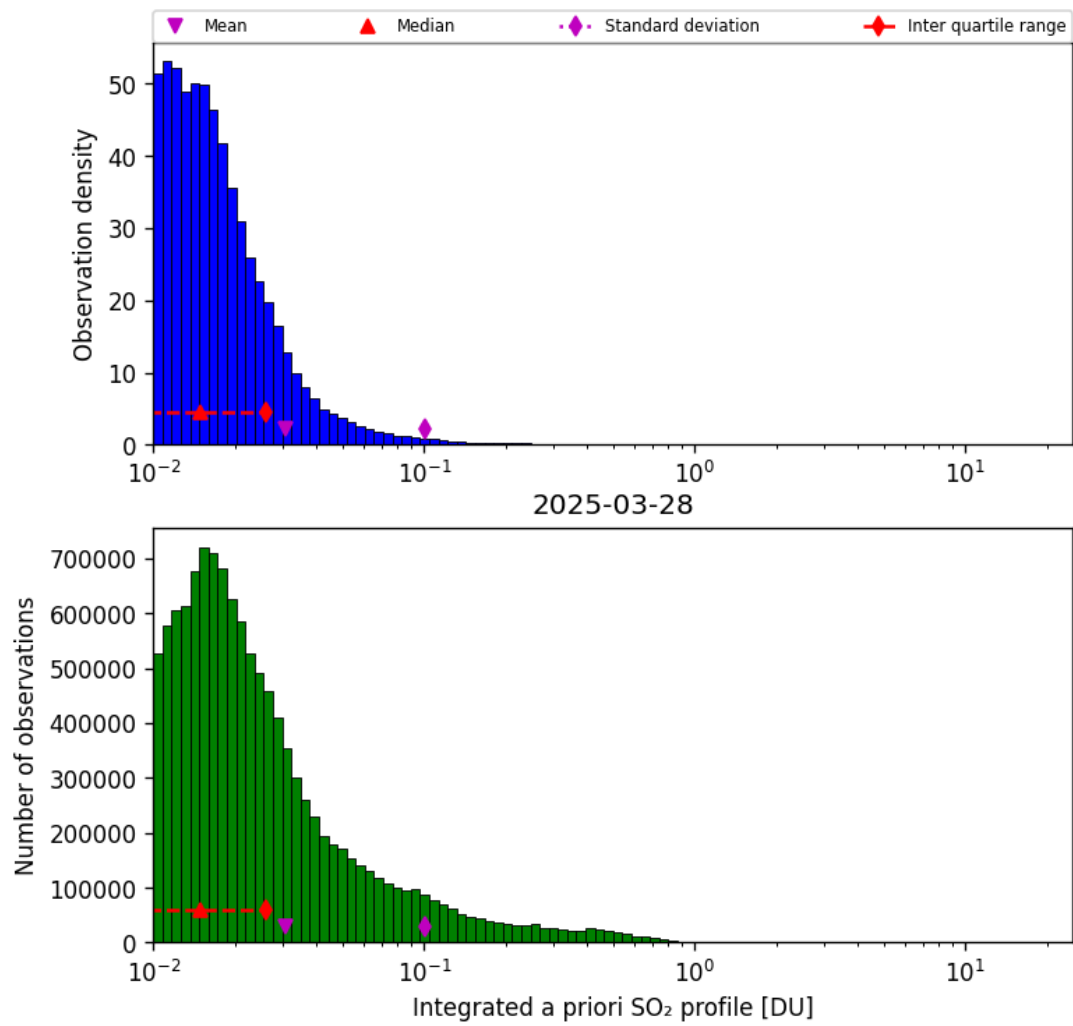


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-03-28 to 2025-03-29

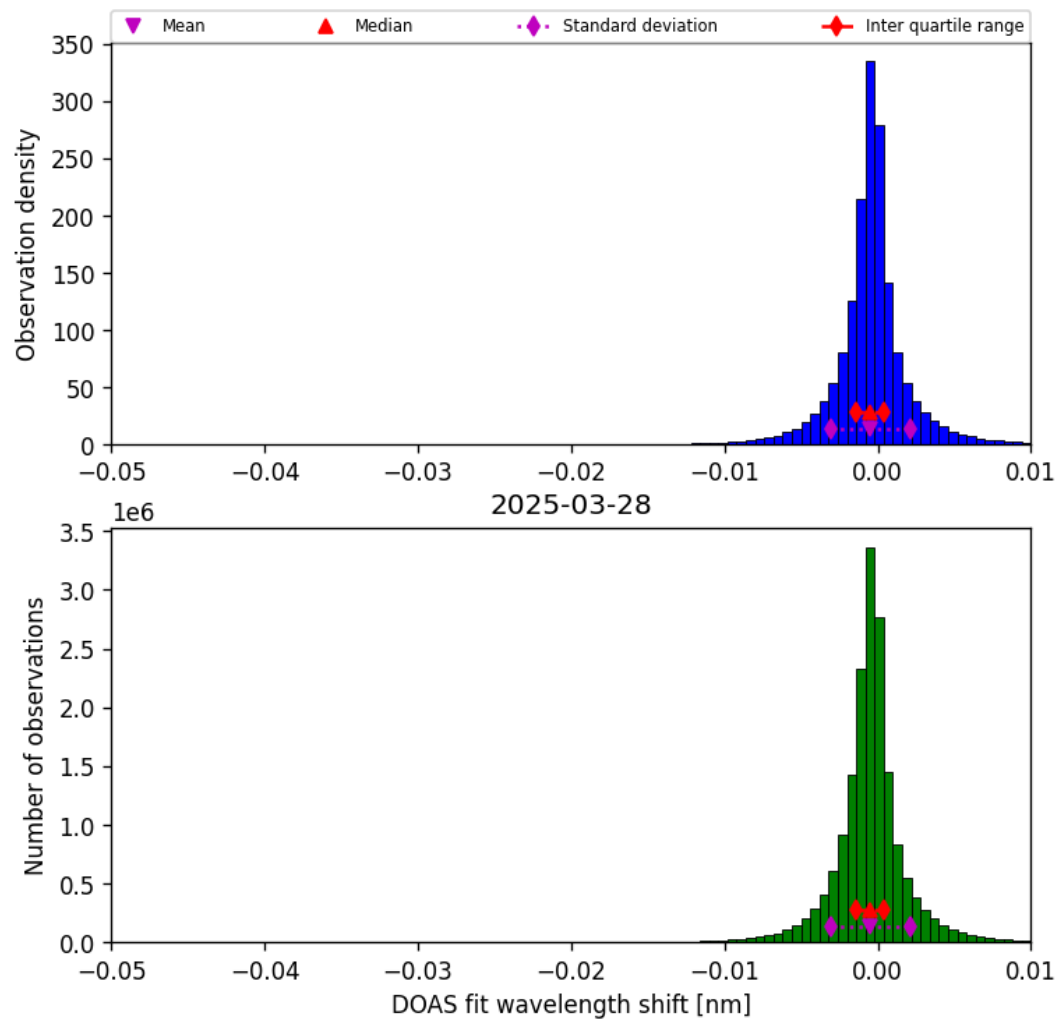


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-03-28 to 2025-03-29

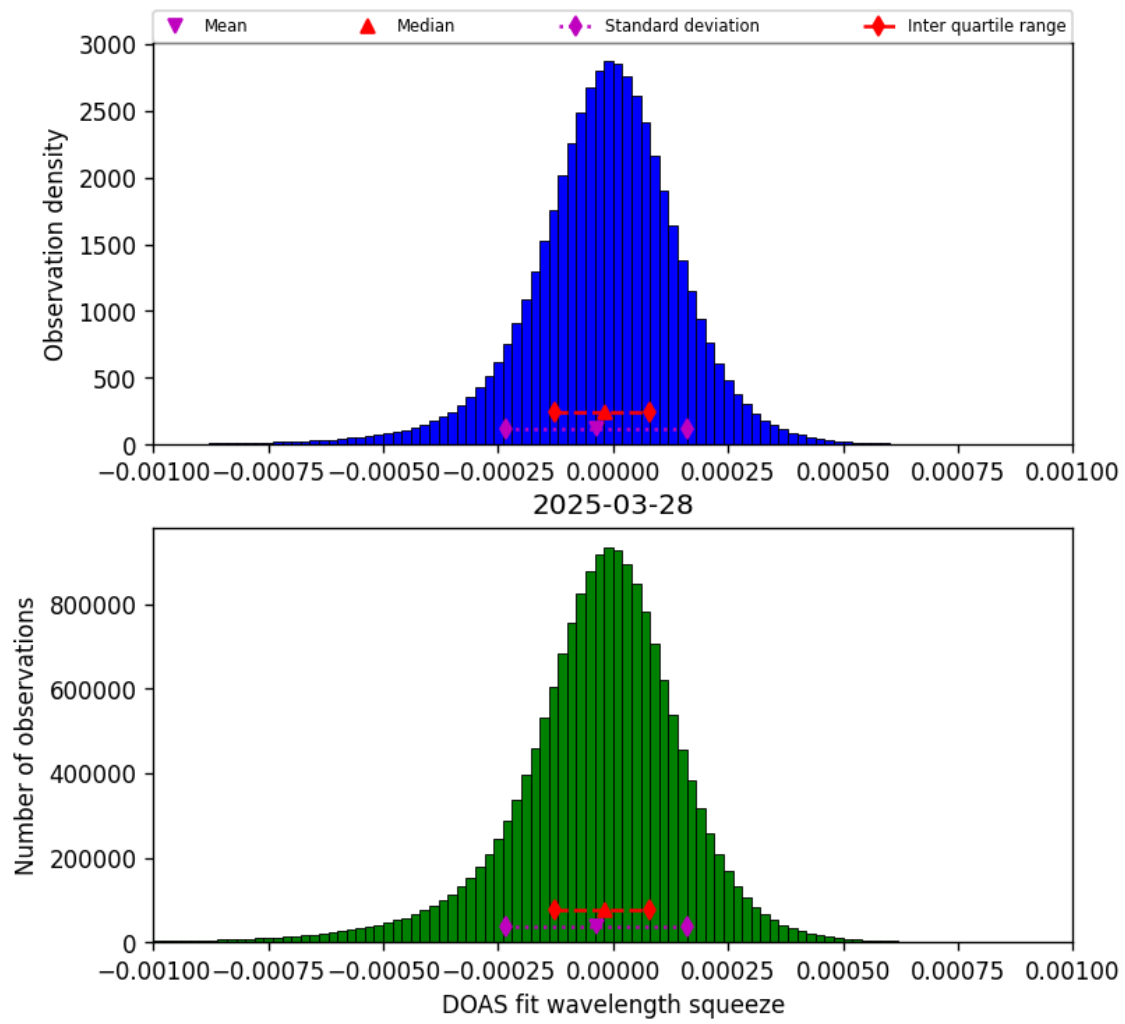


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-03-28 to 2025-03-29

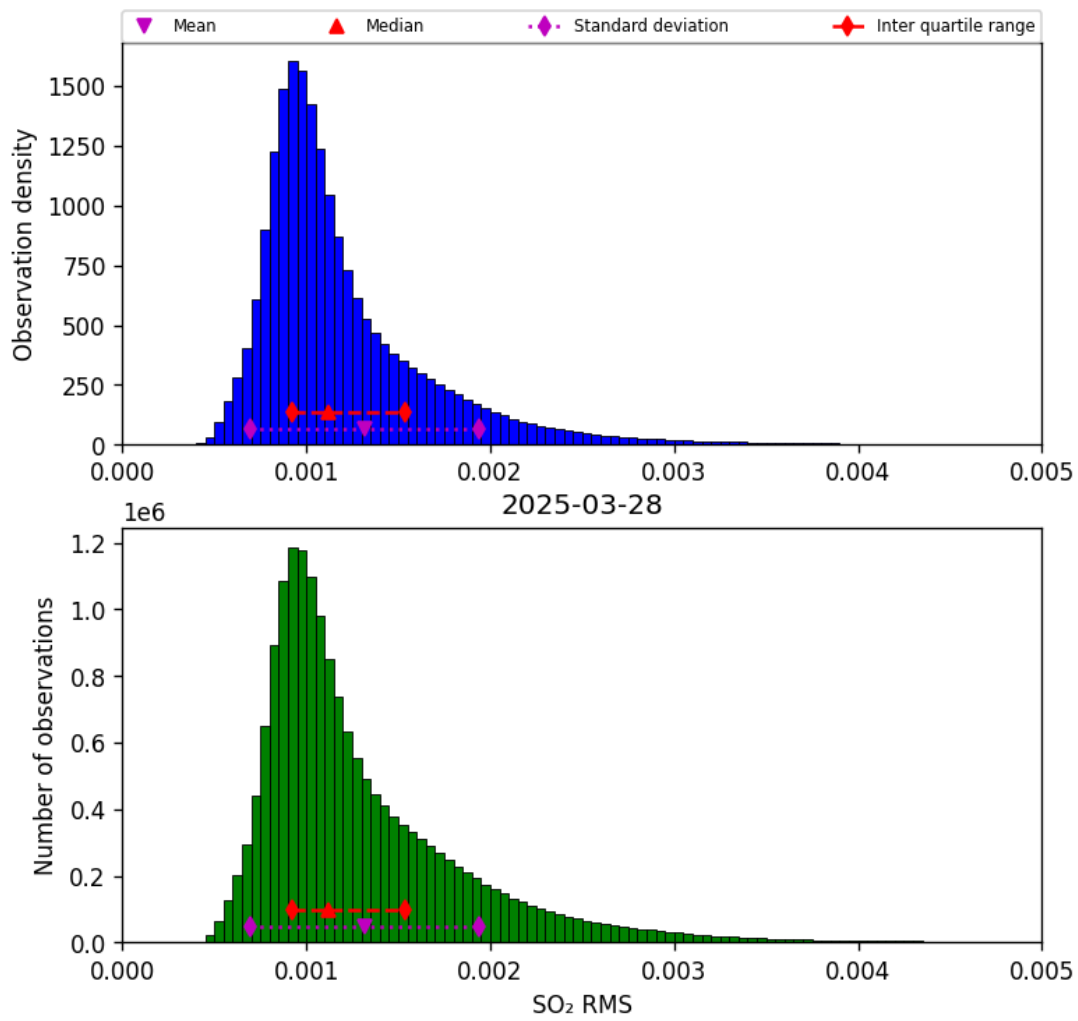


Figure 79: Histogram of “SO₂ RMS” for 2025-03-28 to 2025-03-29

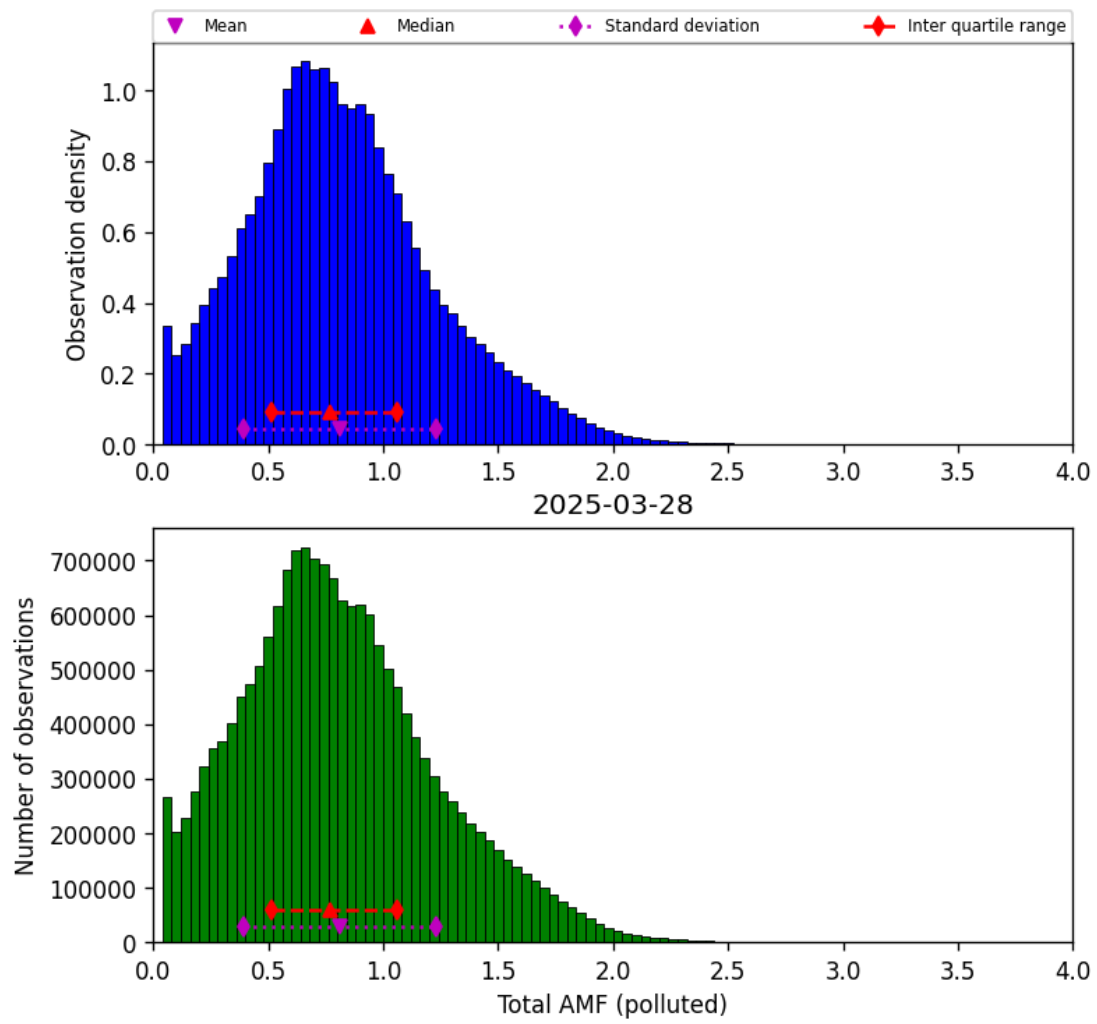


Figure 80: Histogram of “Total AMF (polluted)” for 2025-03-28 to 2025-03-29

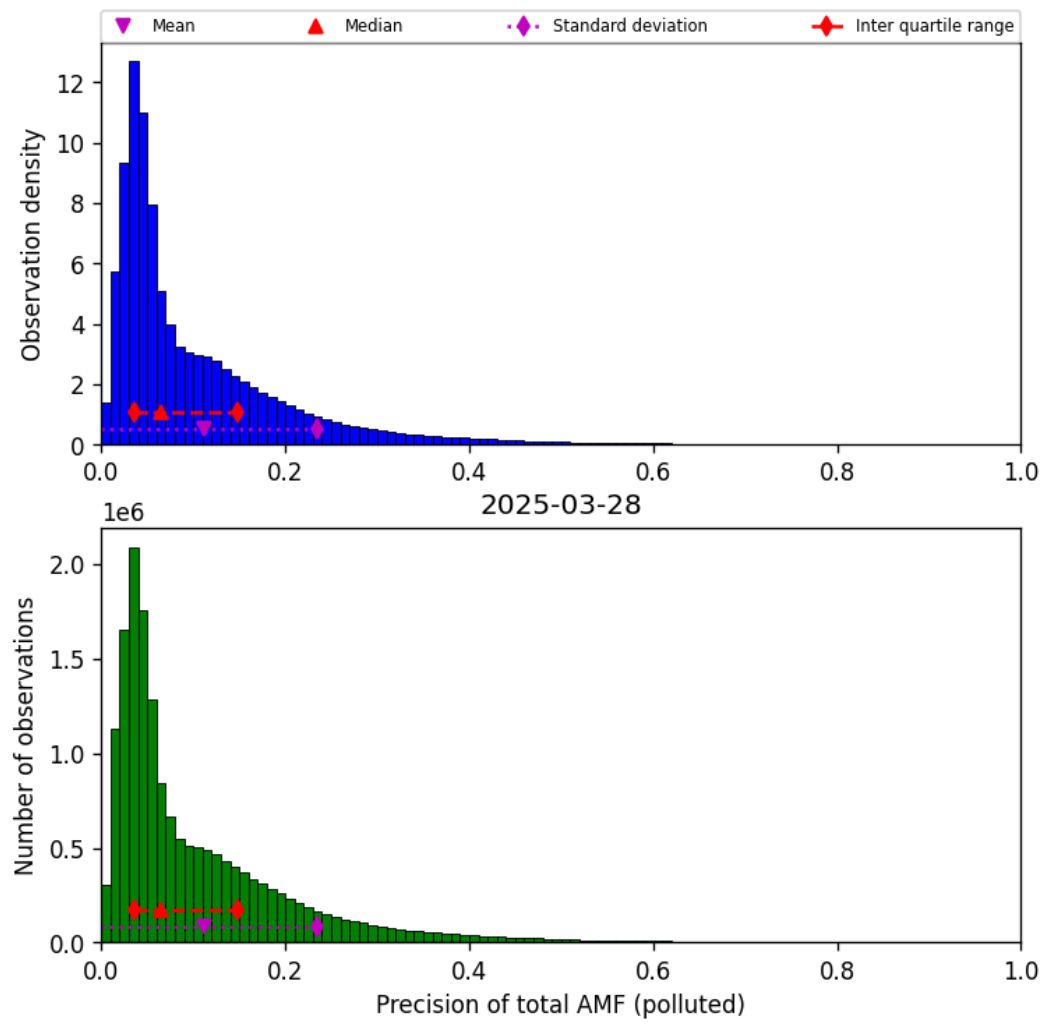


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-03-28 to 2025-03-29

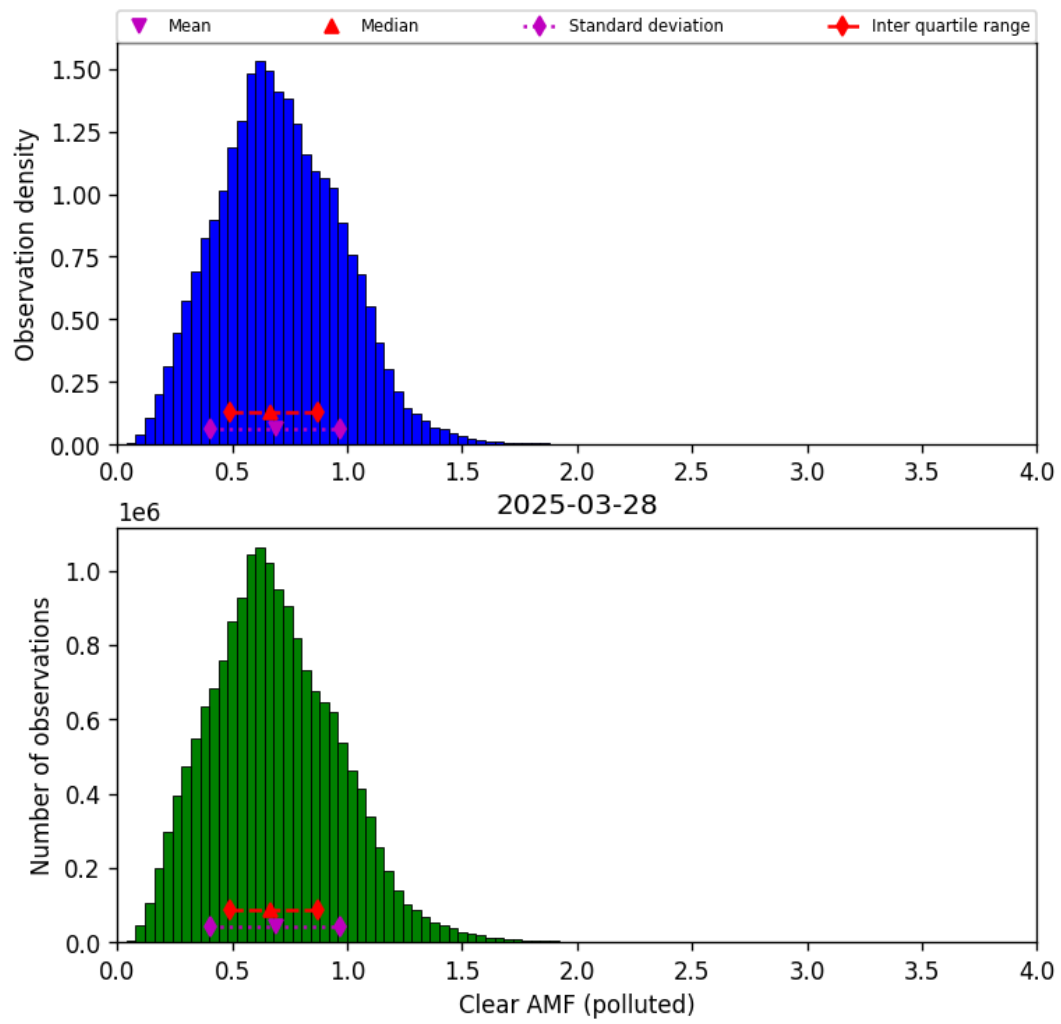


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-03-28 to 2025-03-29

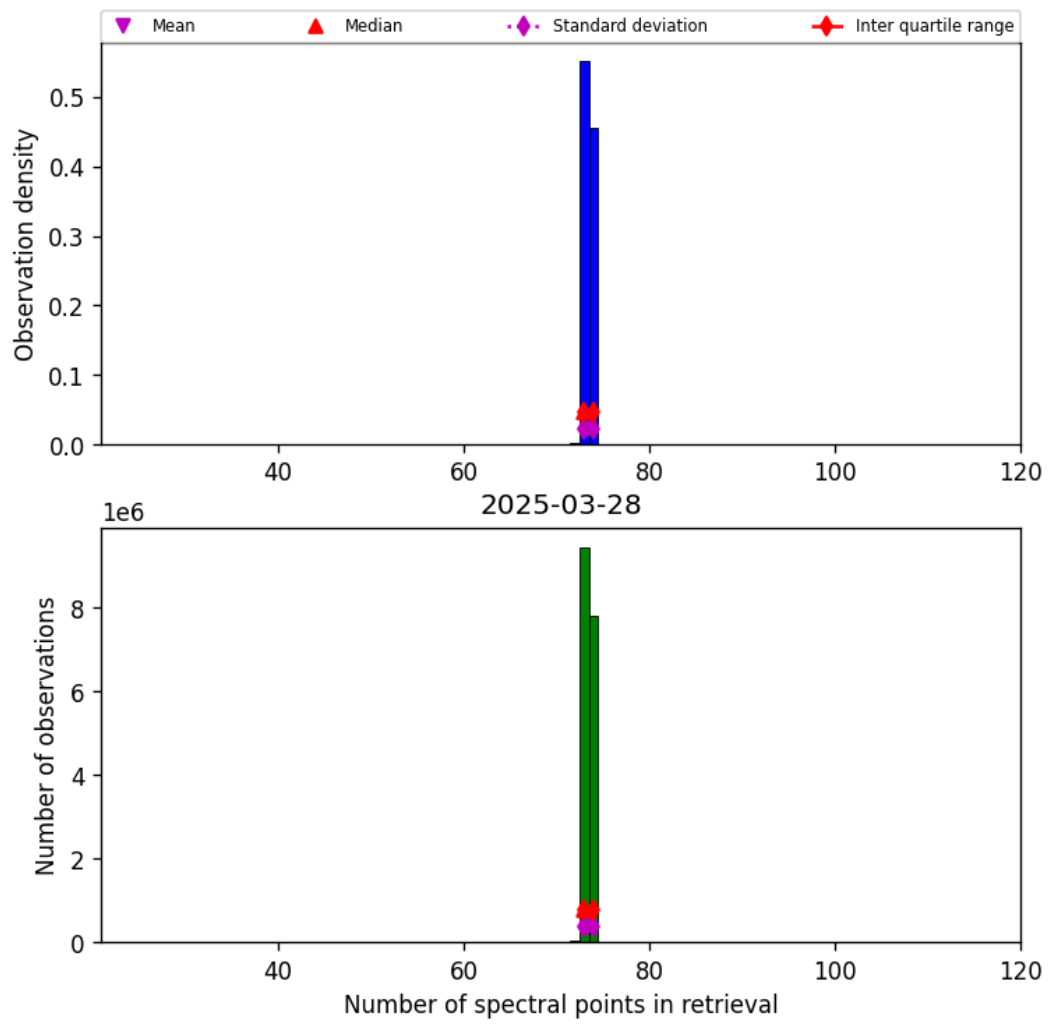


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-03-28 to 2025-03-29

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.

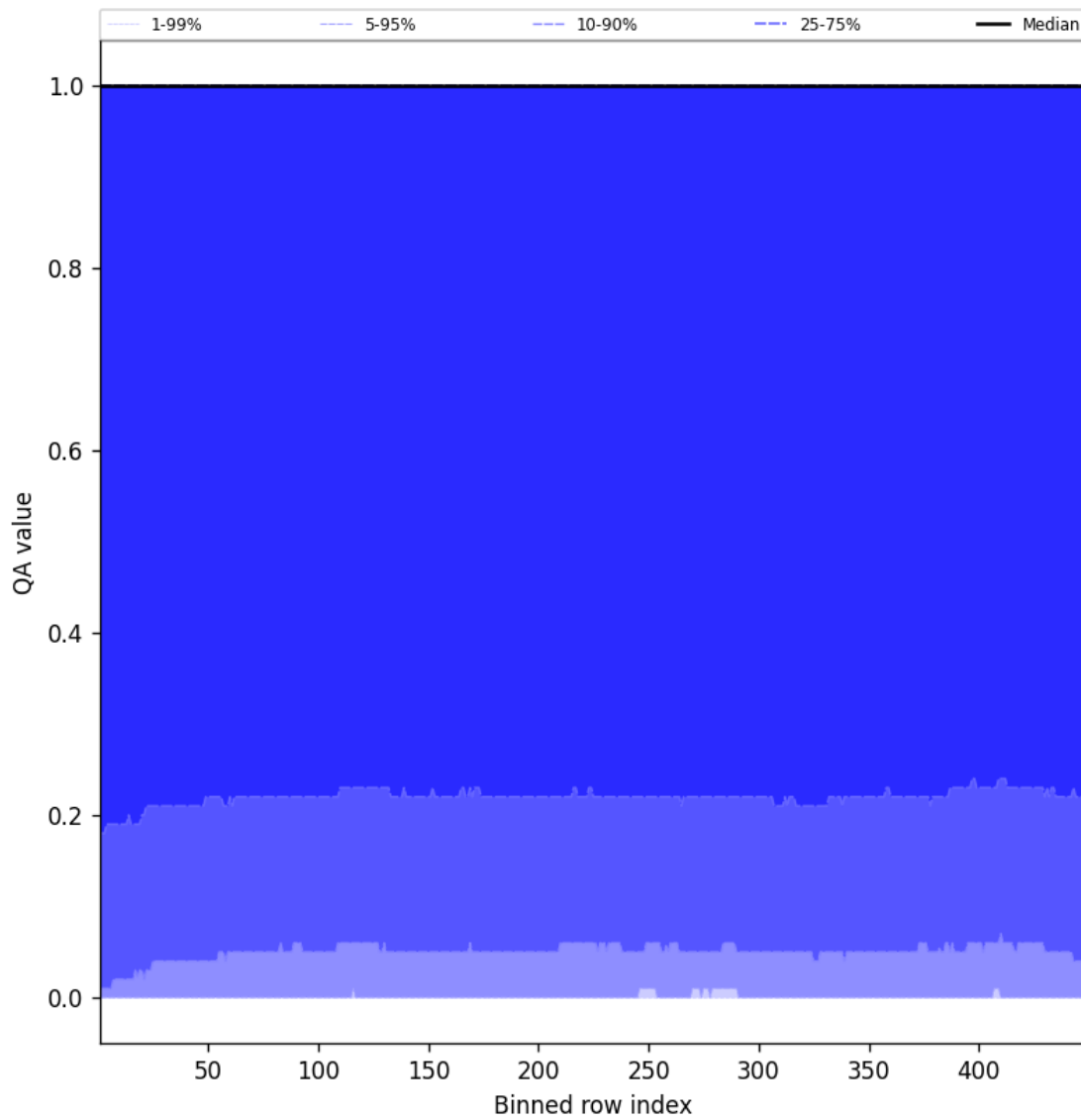


Figure 84: Along track statistics of “QA value” for 2025-03-28 to 2025-03-29

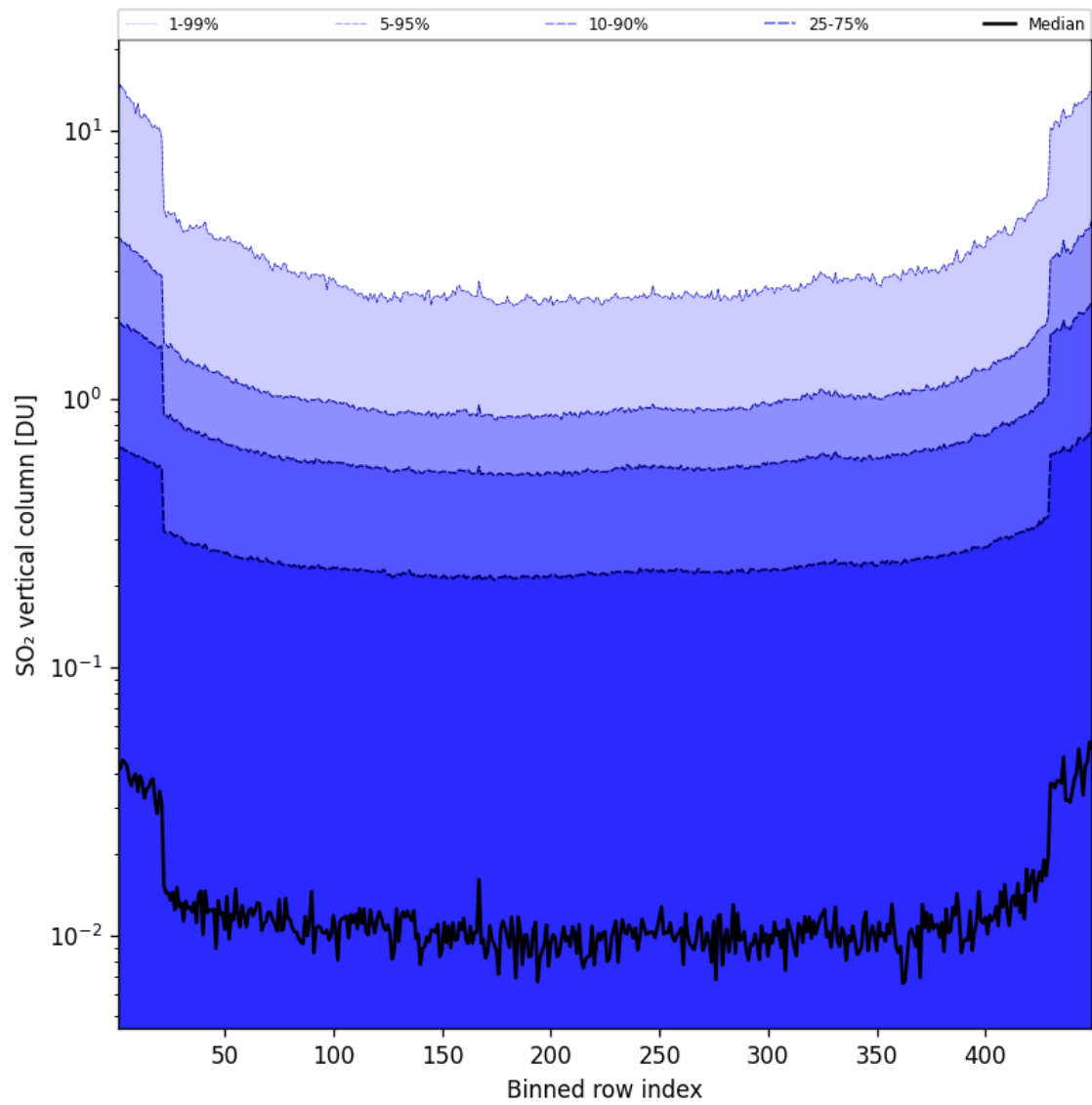


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-03-28 to 2025-03-29

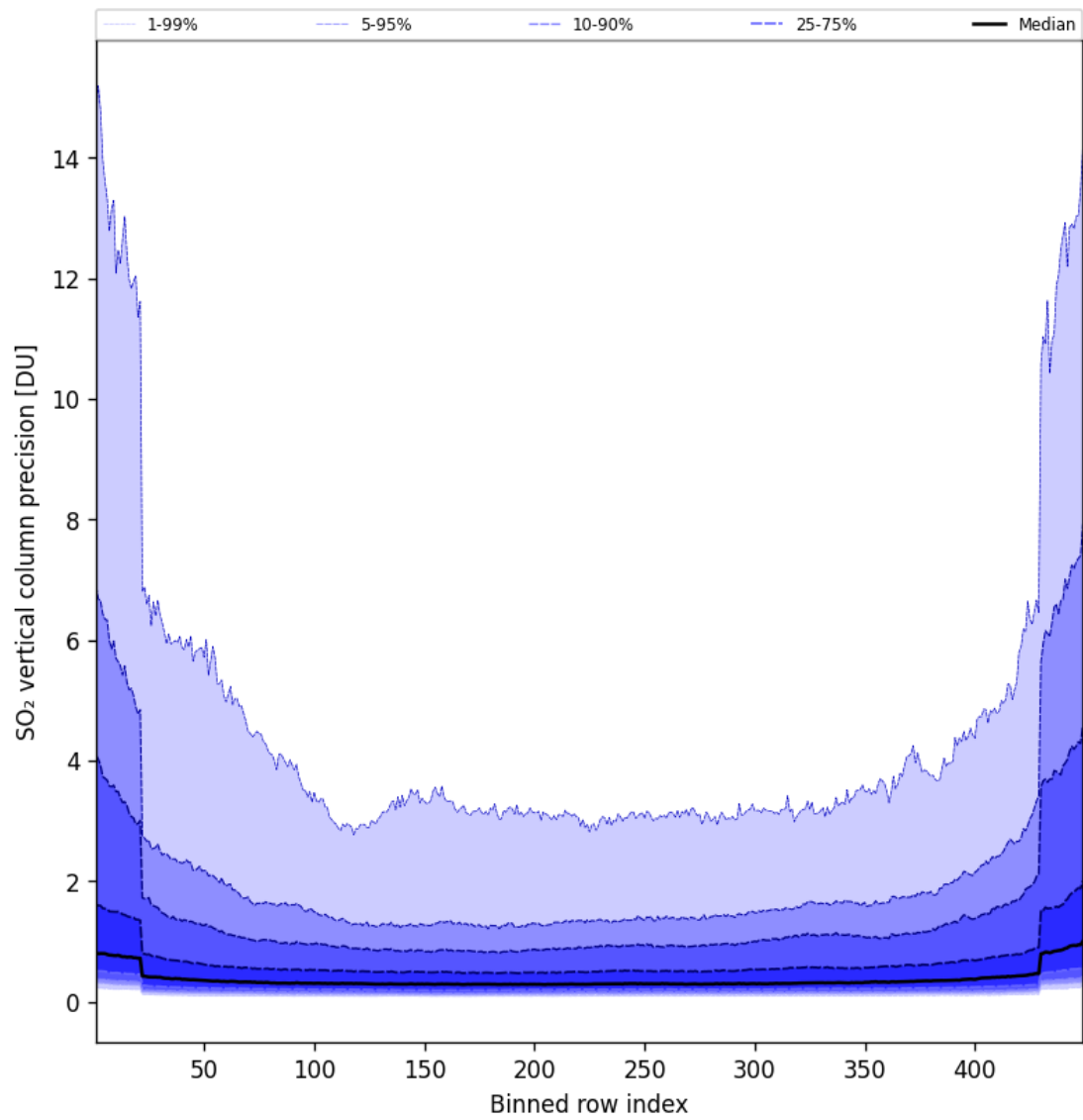


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-03-28 to 2025-03-29

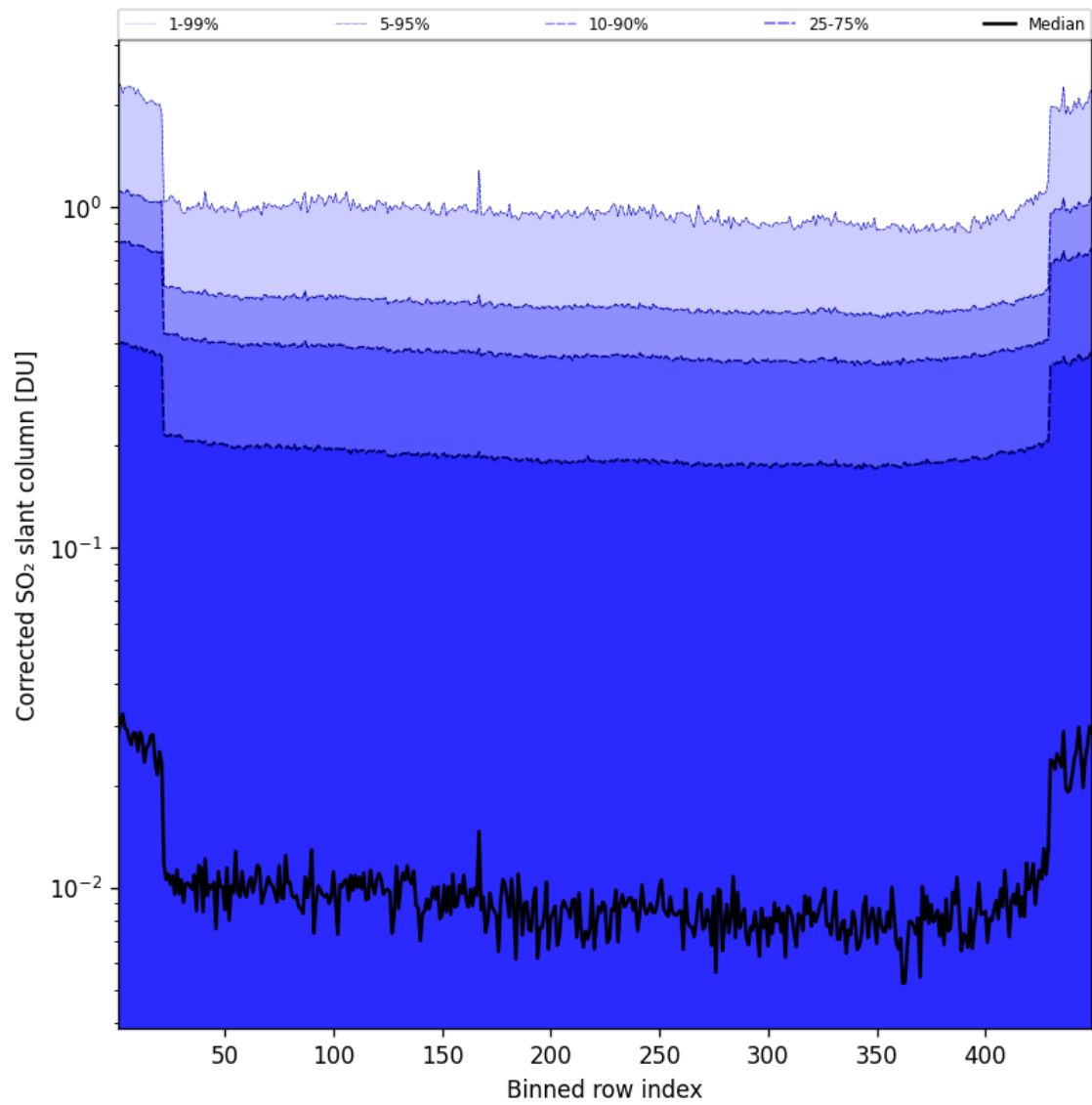


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-03-28 to 2025-03-29

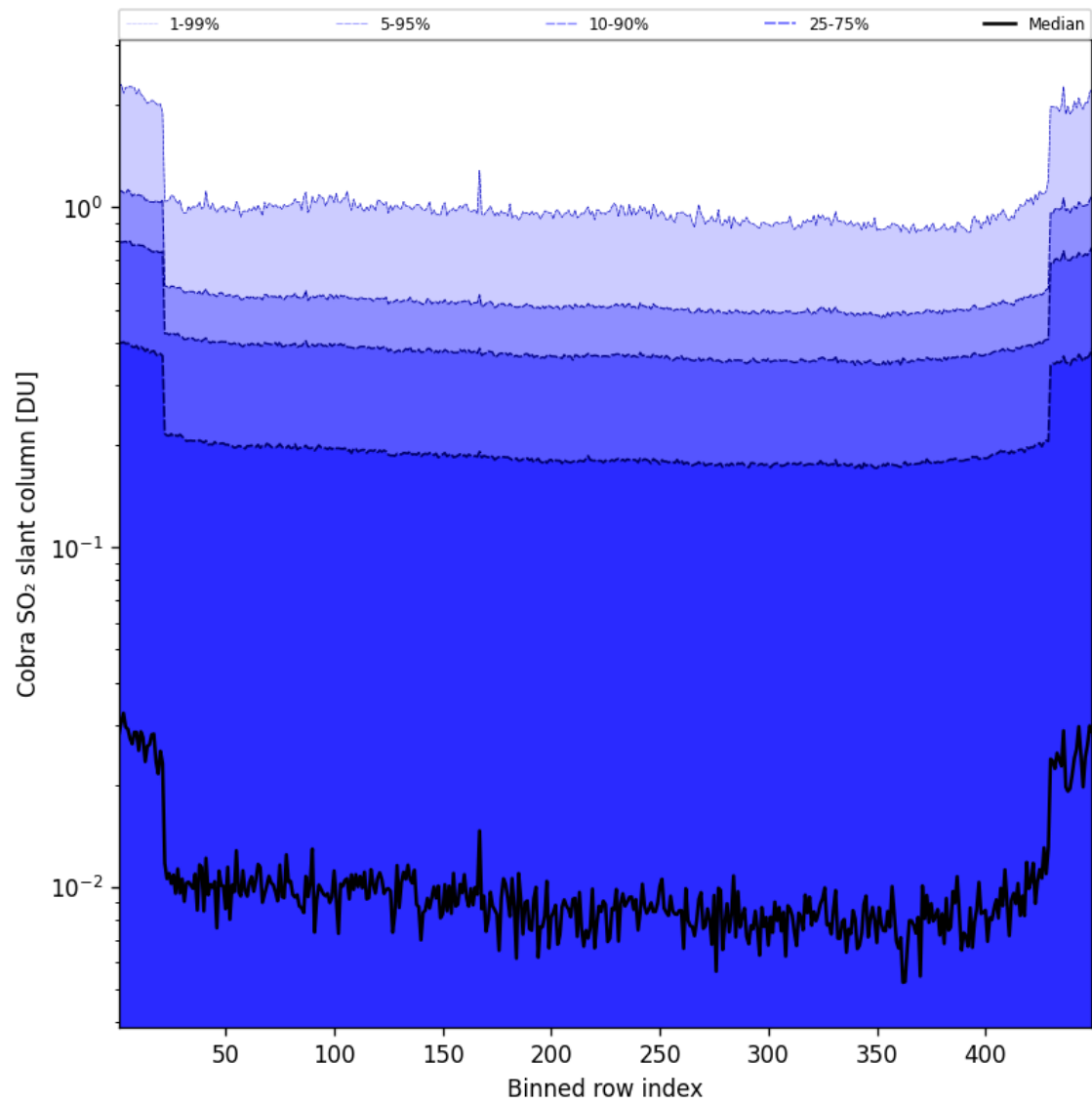


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-03-28 to 2025-03-29

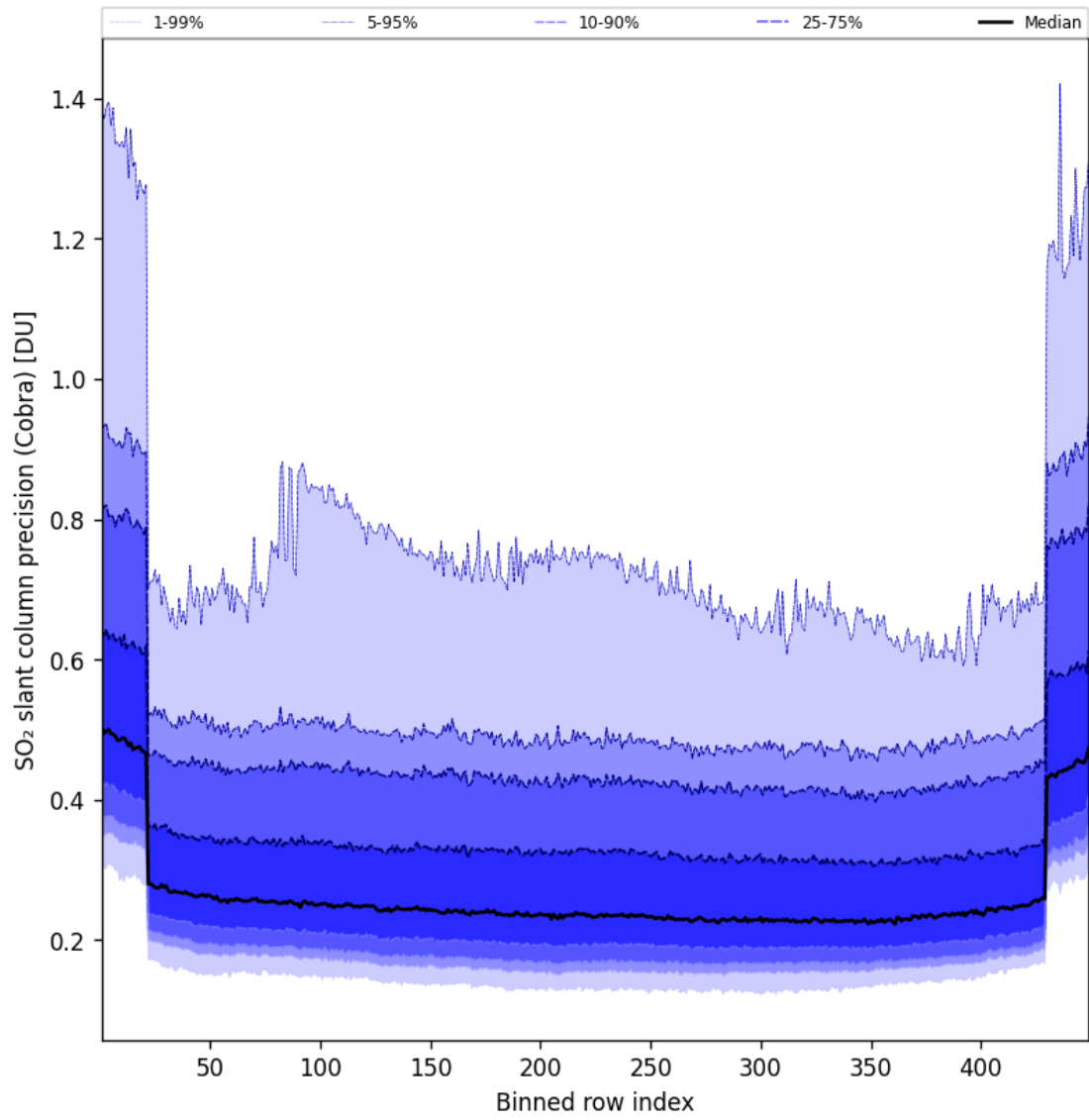


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-03-28 to 2025-03-29

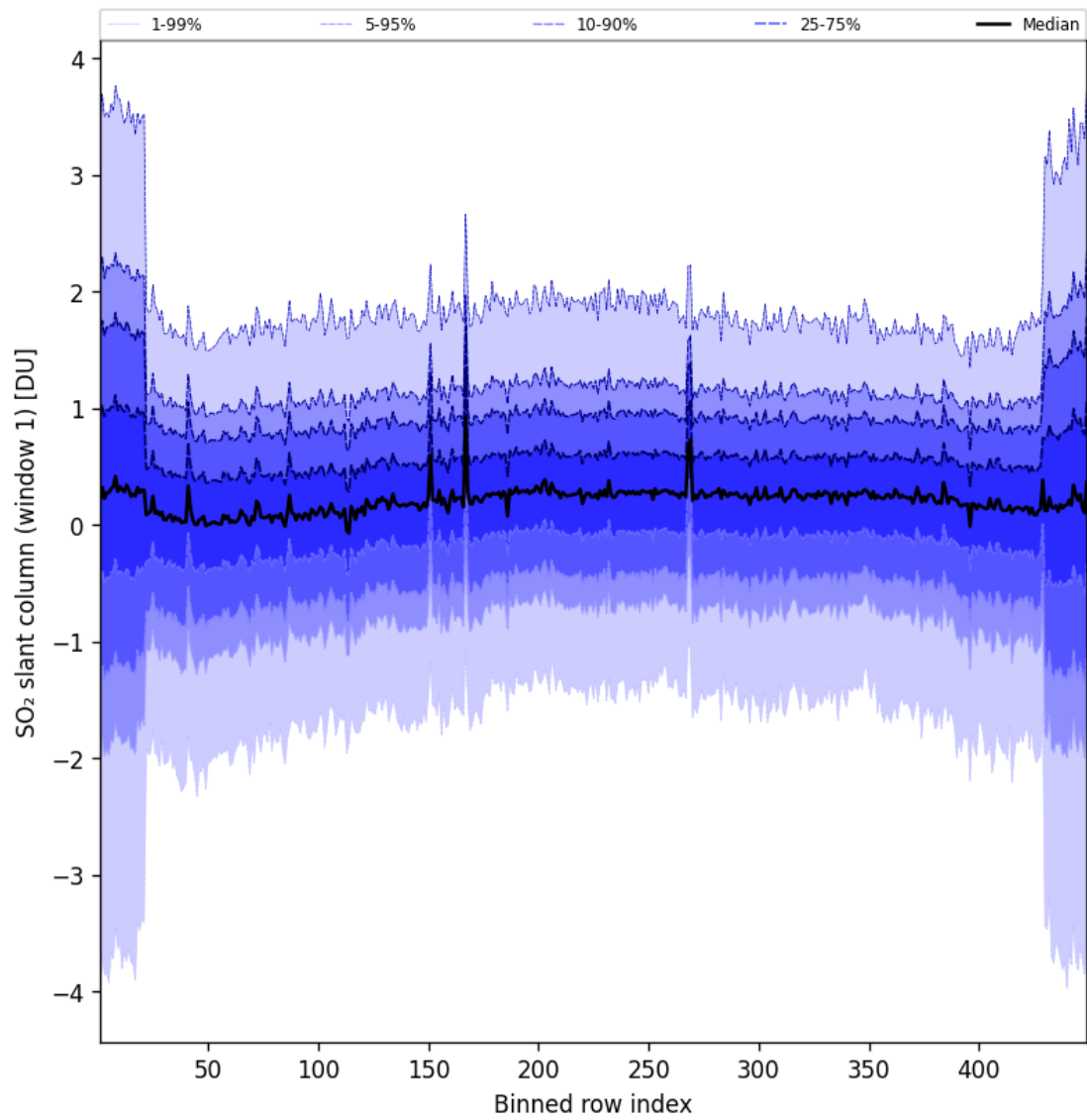


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-03-28 to 2025-03-29

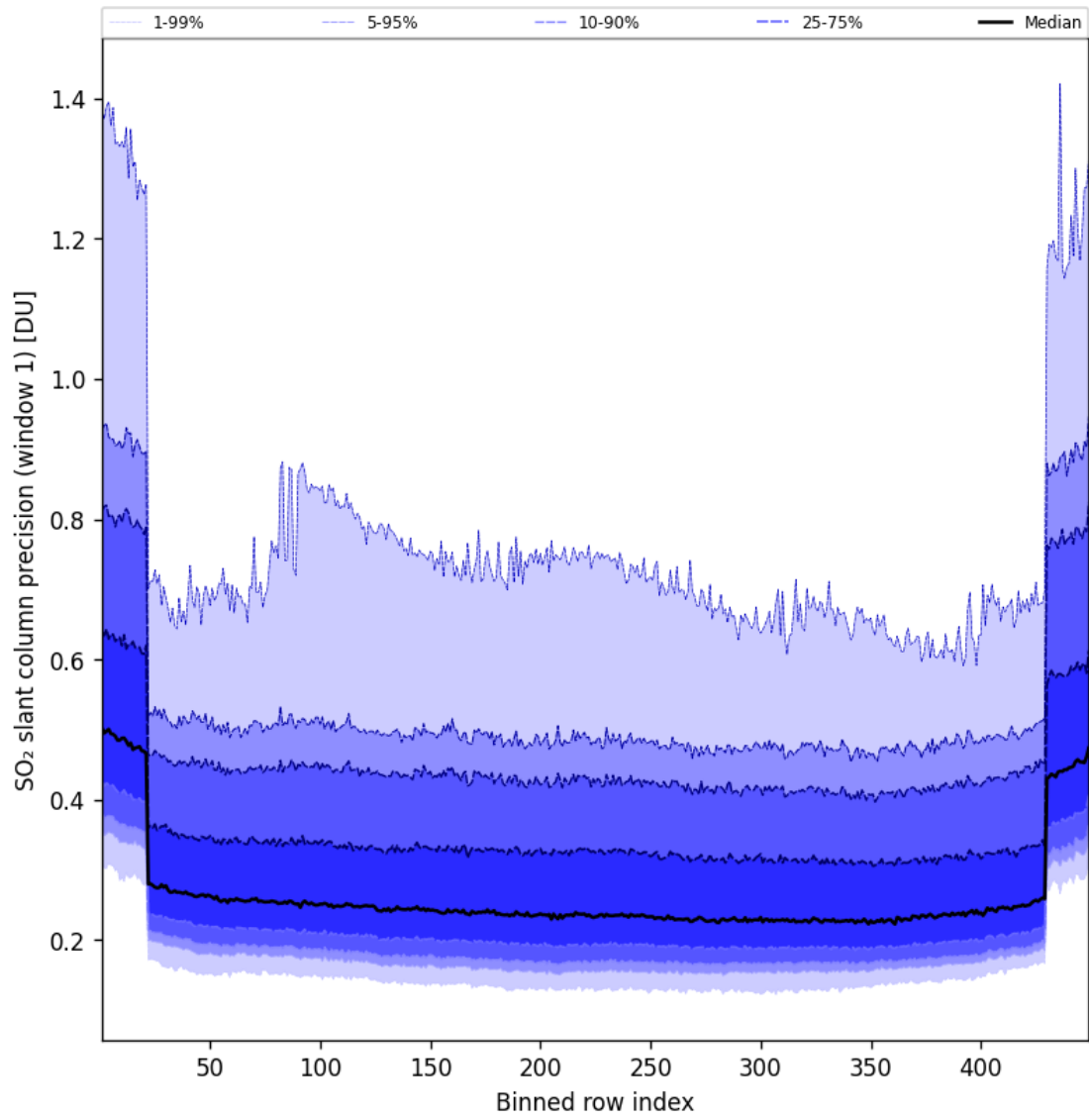


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-03-28 to 2025-03-29

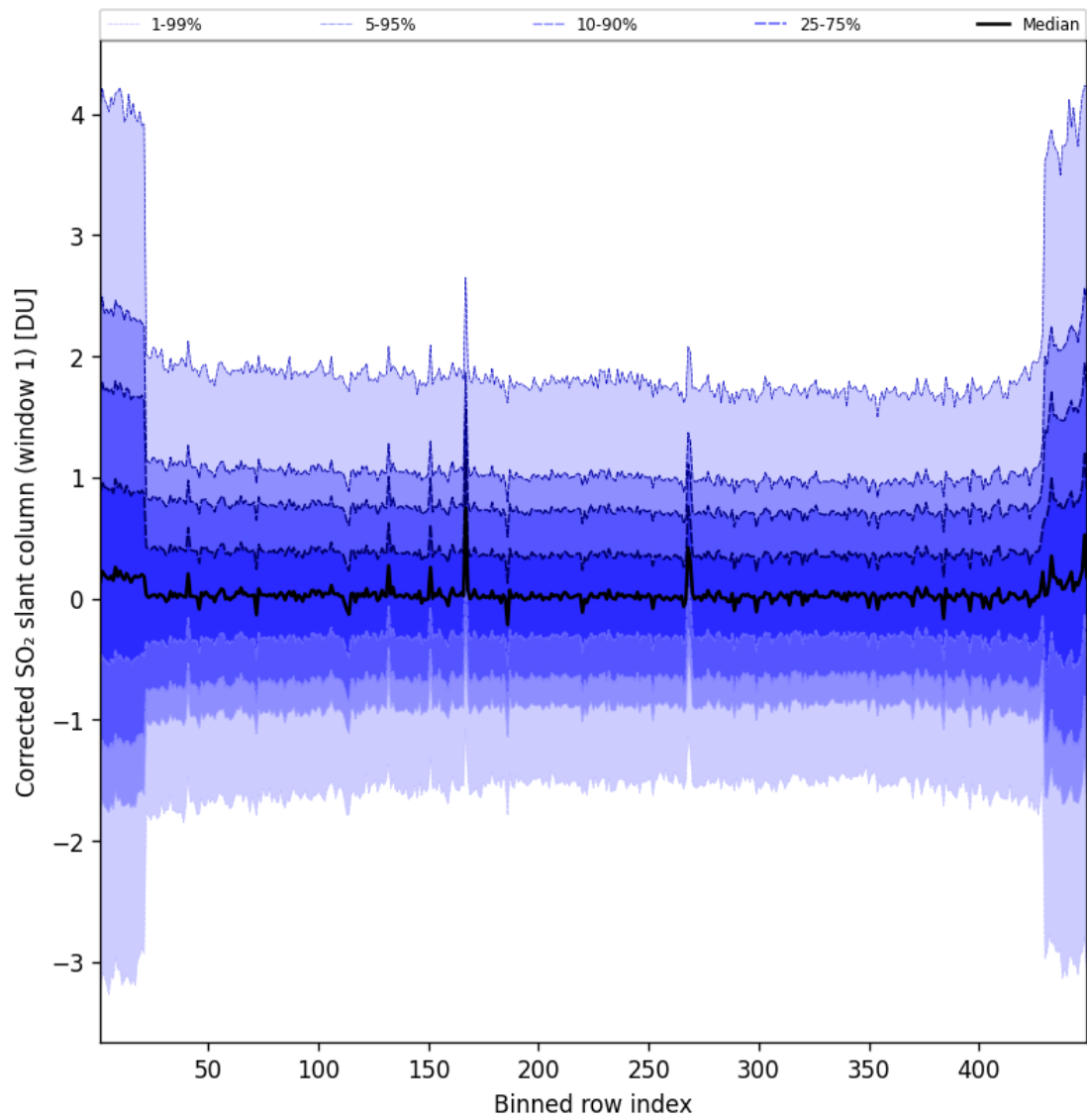


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-03-28 to 2025-03-29

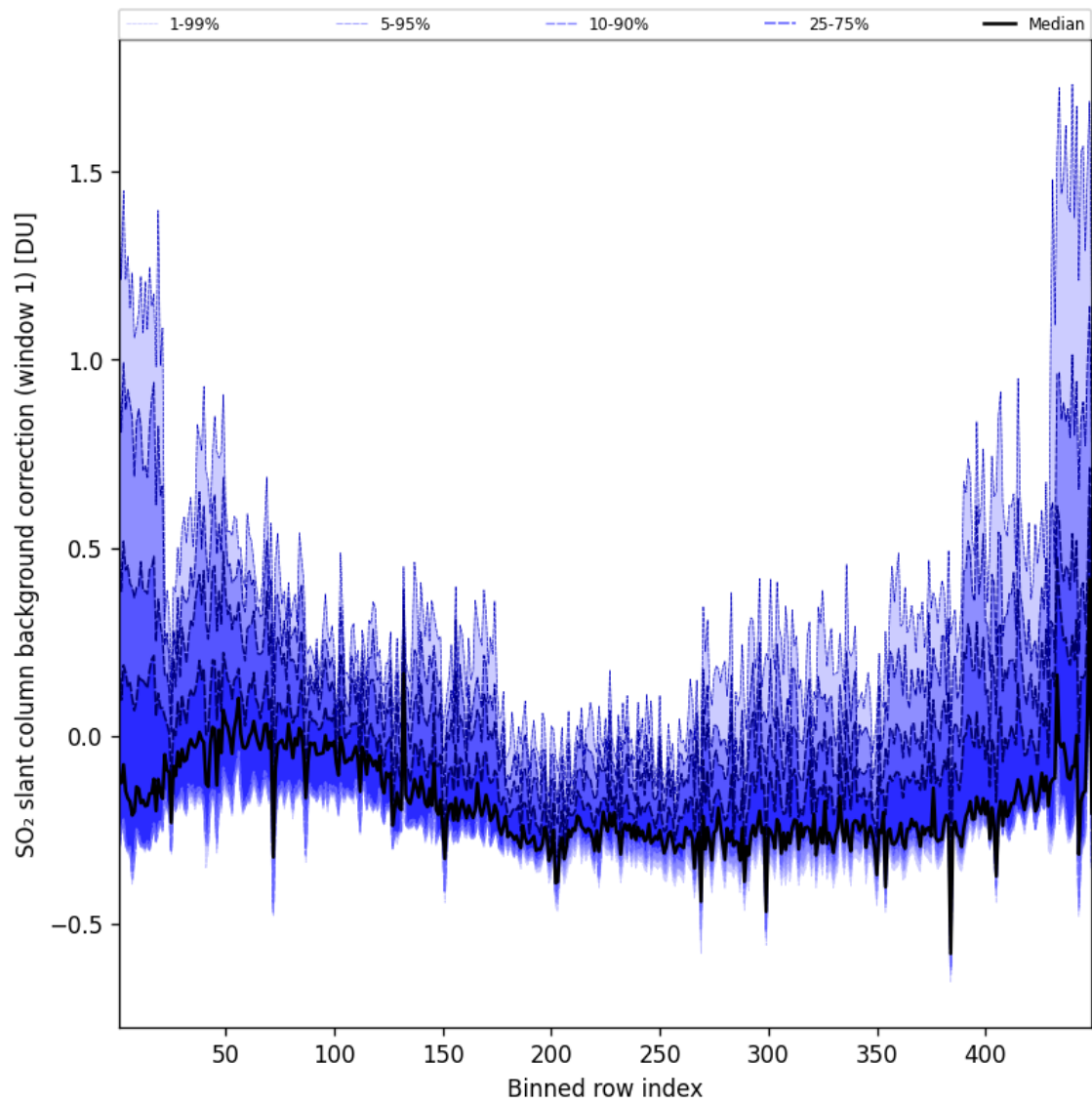


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-03-28 to 2025-03-29

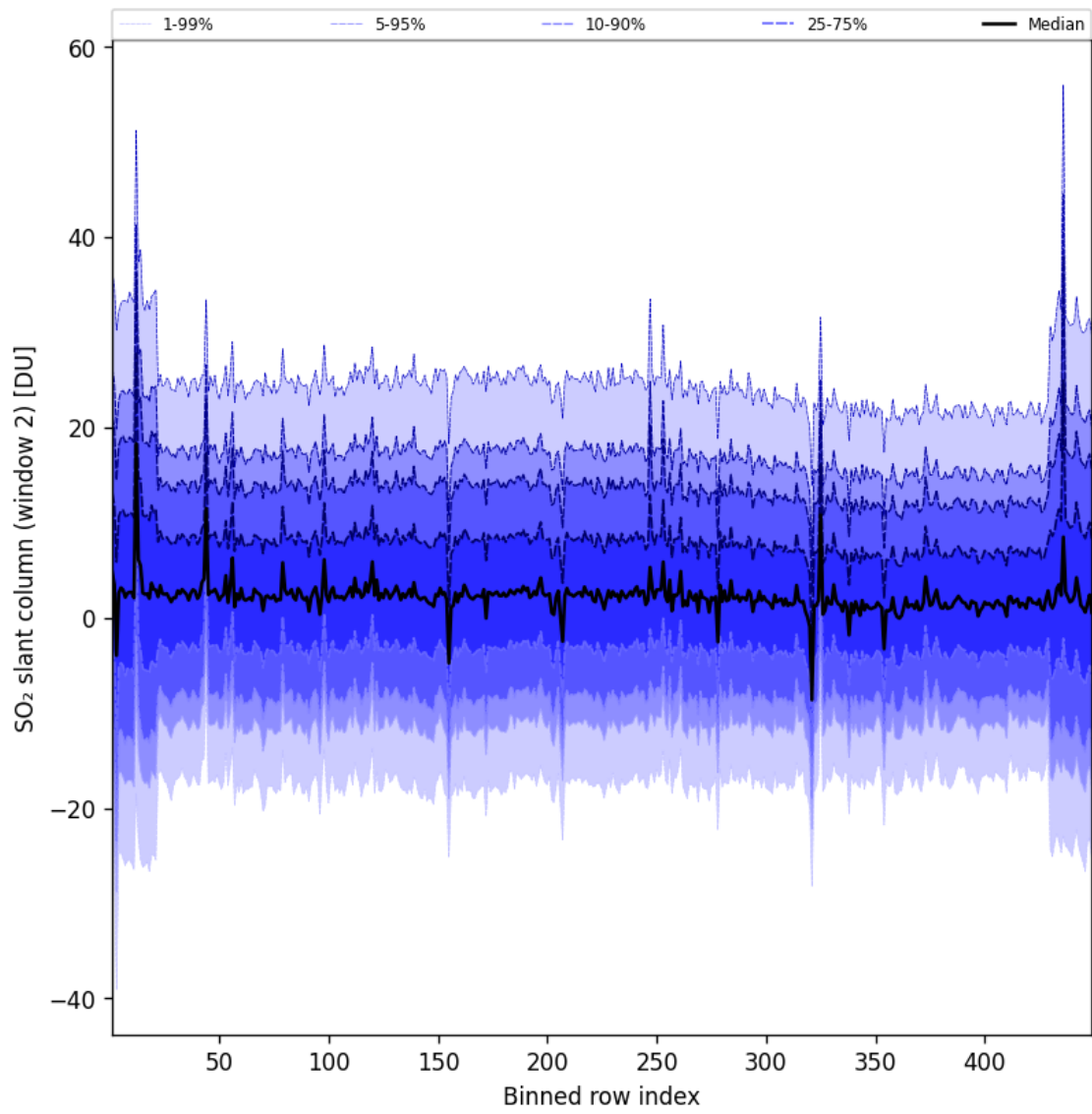


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-03-28 to 2025-03-29

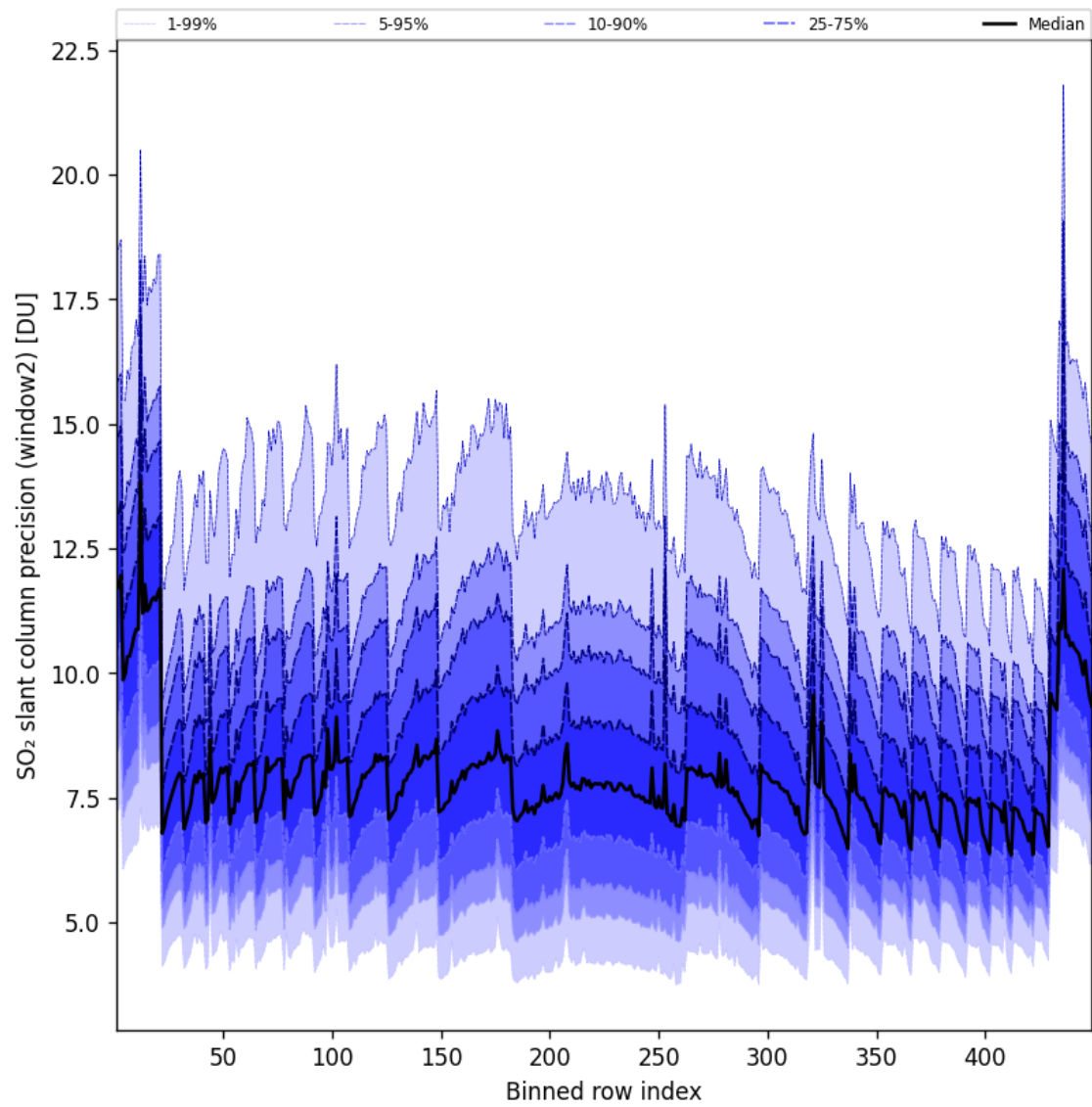


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-03-28 to 2025-03-29

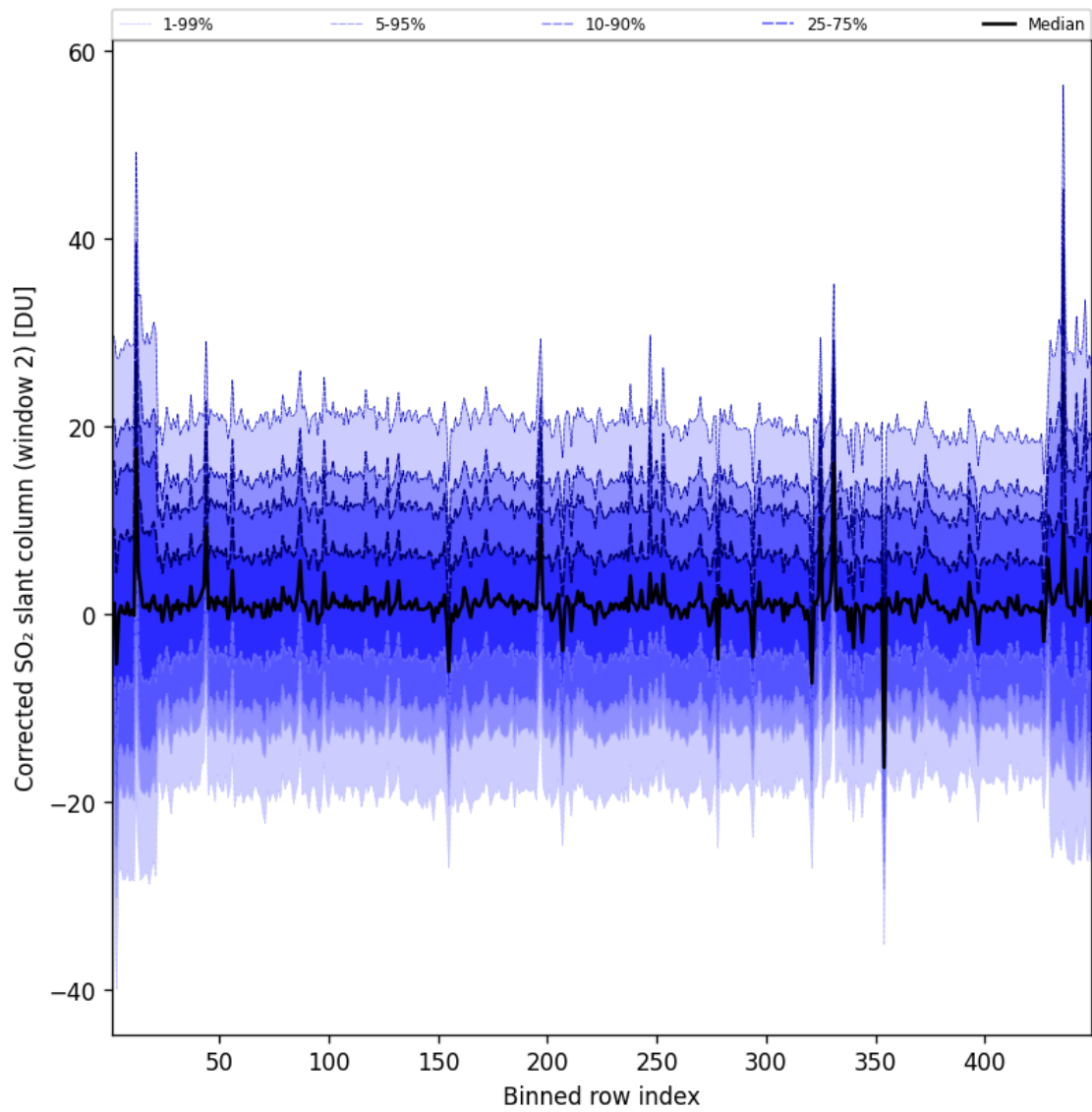


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-03-28 to 2025-03-29

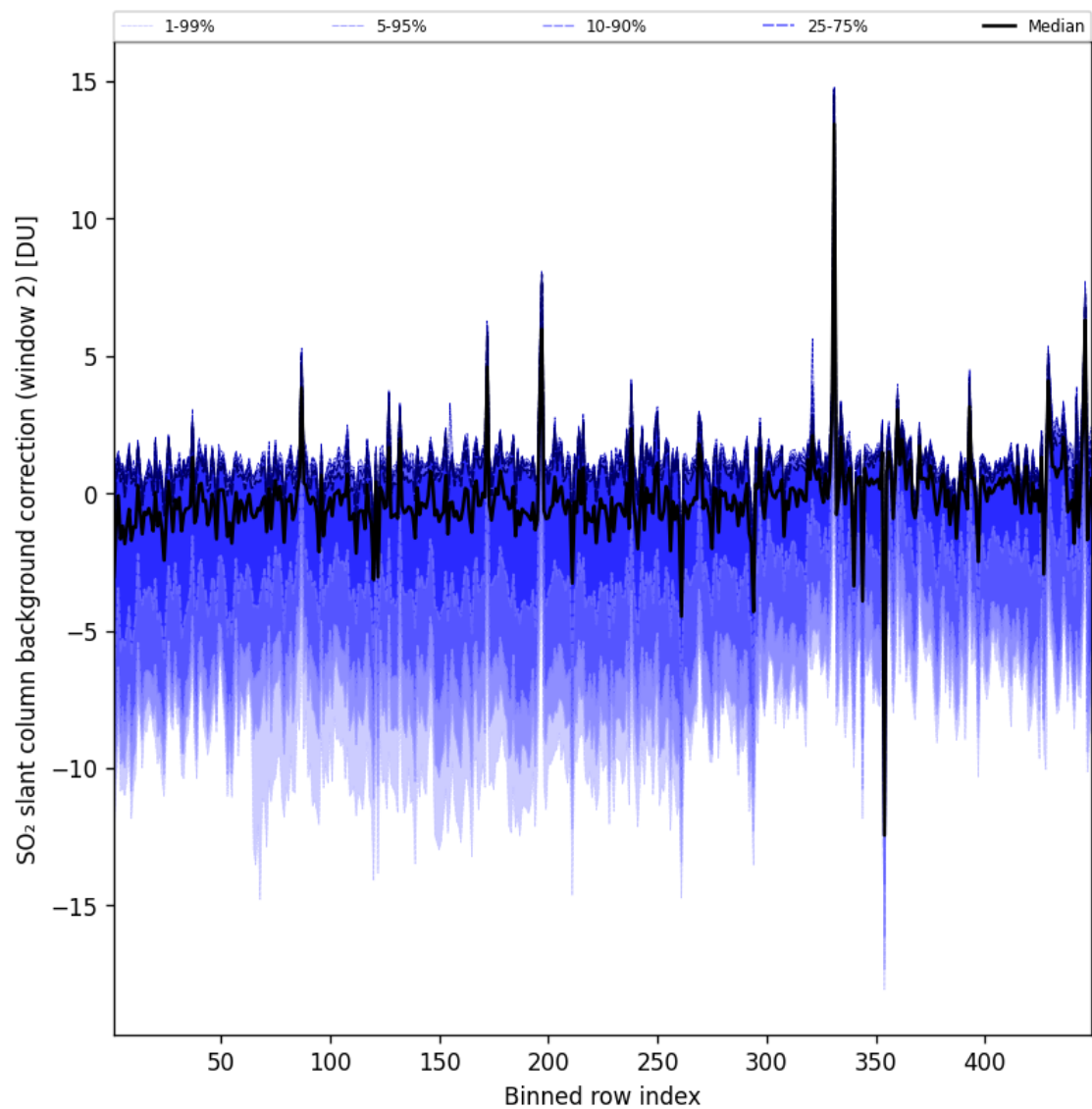


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-03-28 to 2025-03-29

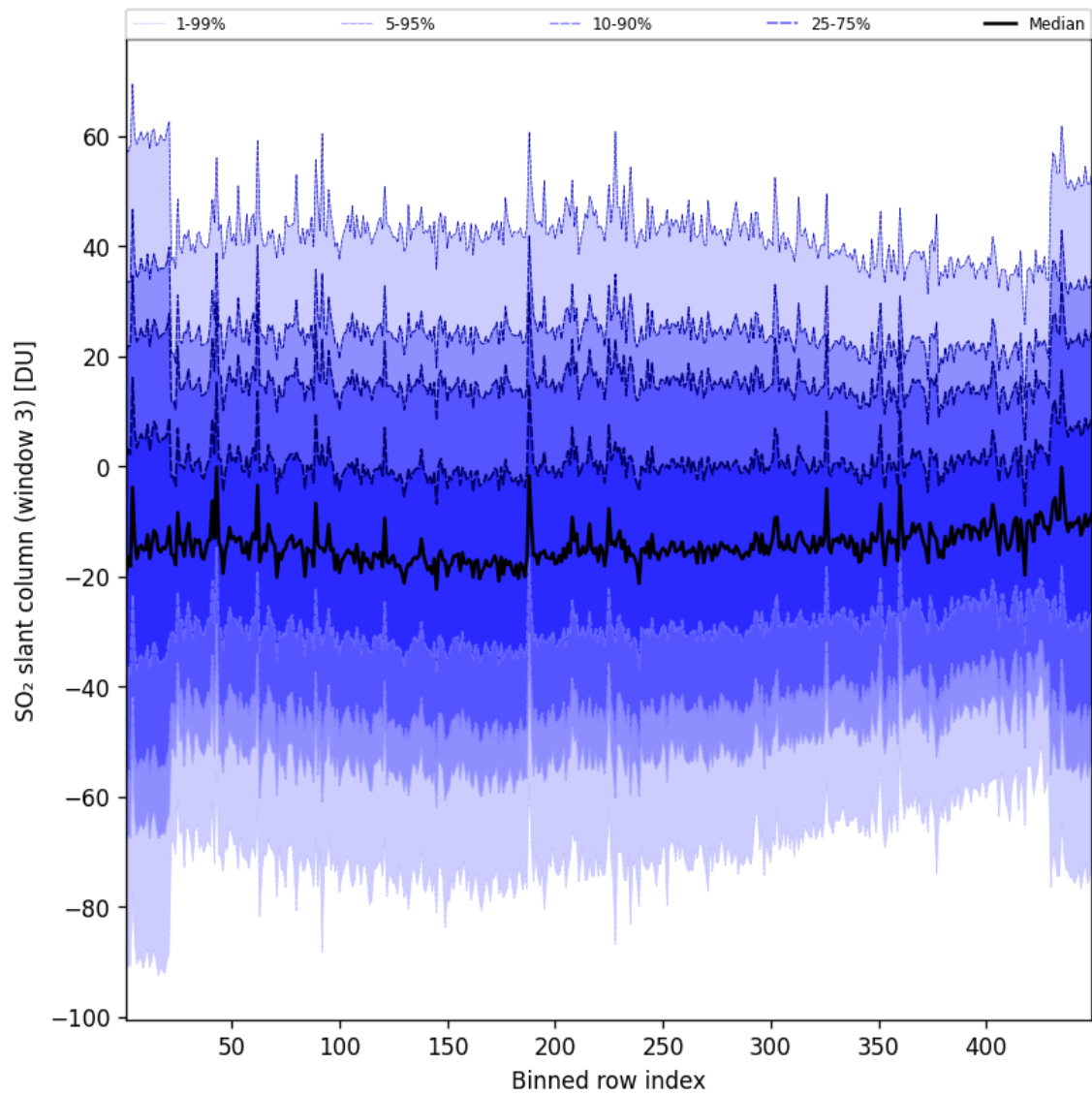


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-03-28 to 2025-03-29

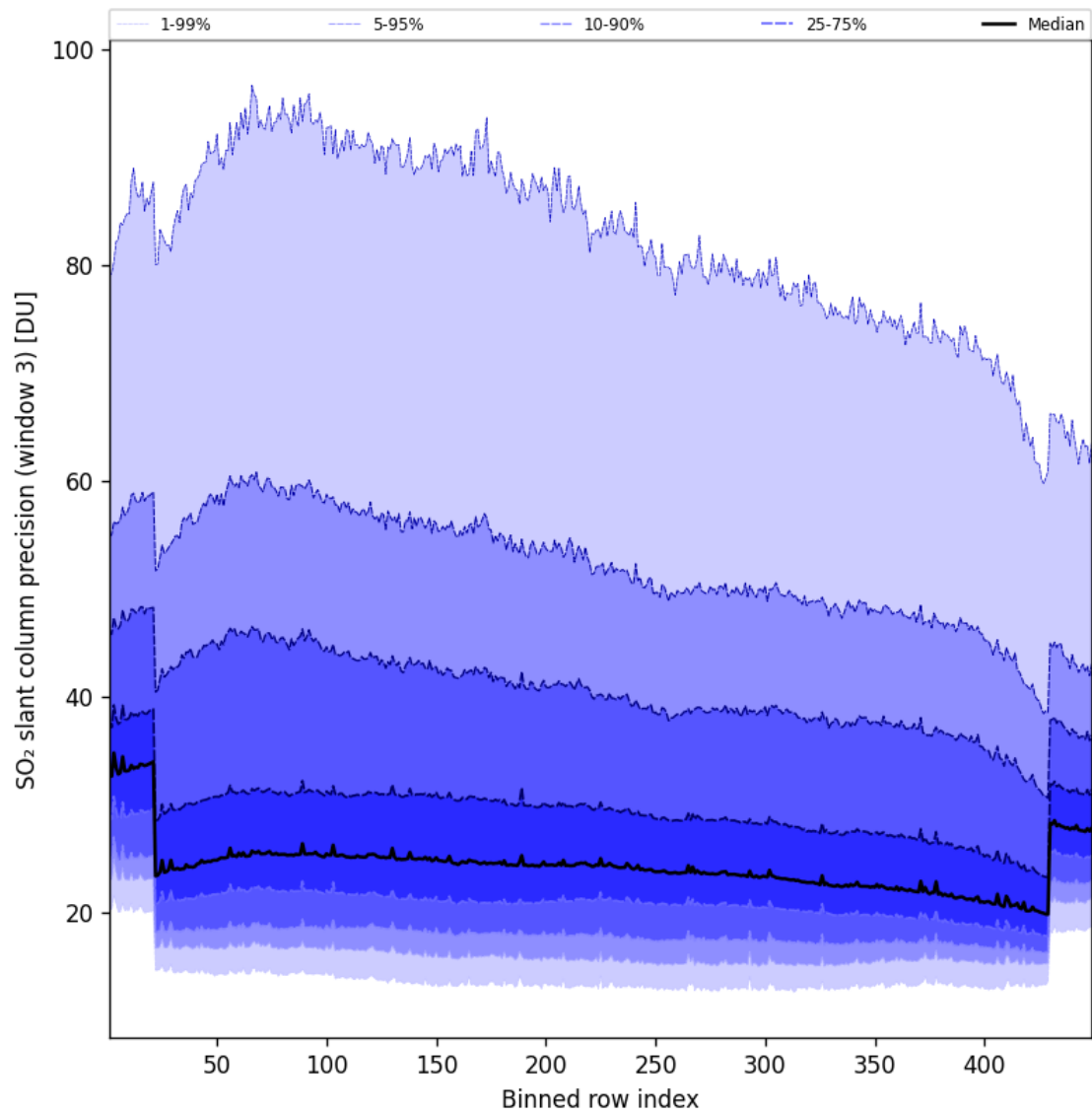


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-03-28 to 2025-03-29

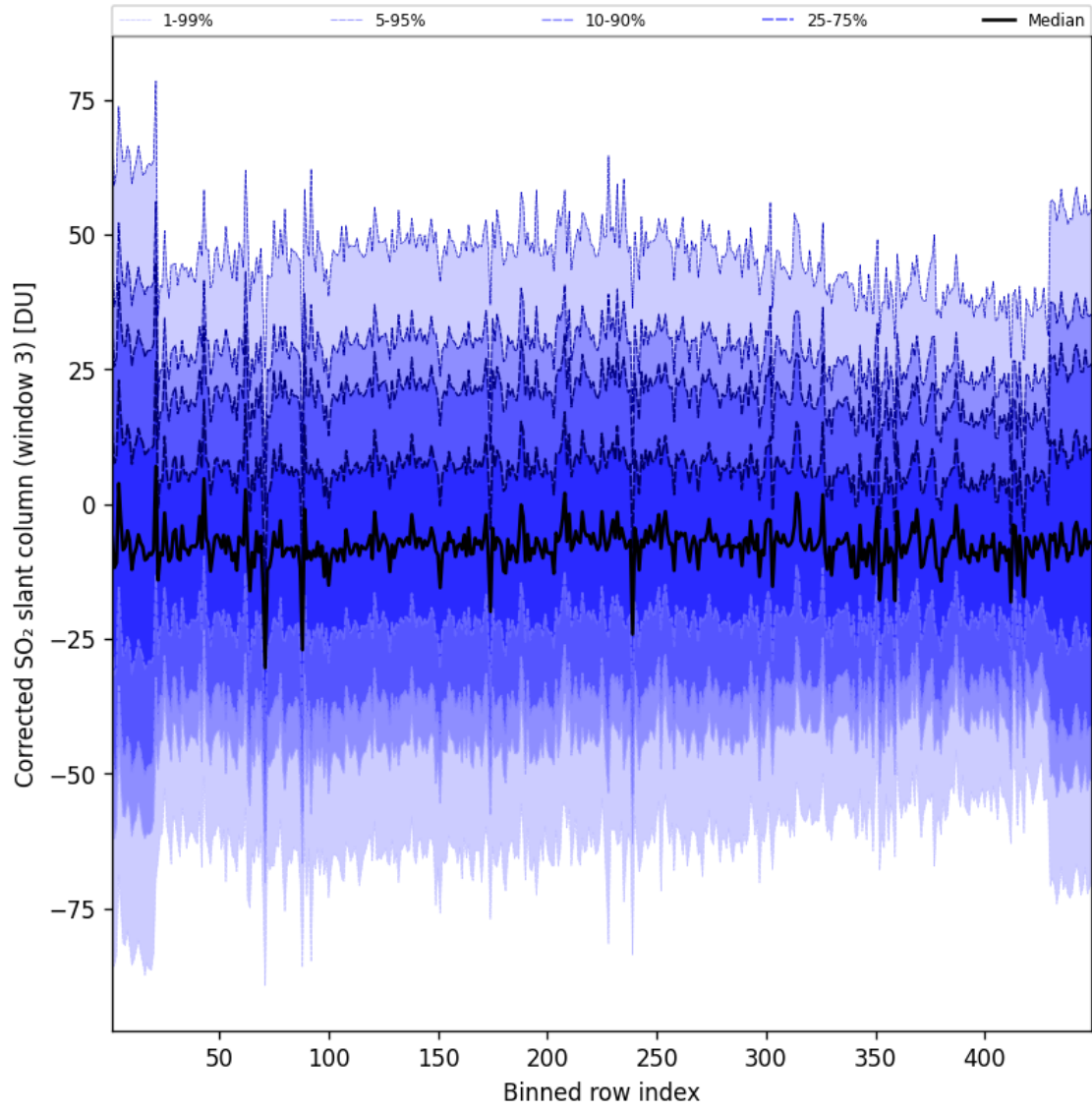


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-03-28 to 2025-03-29

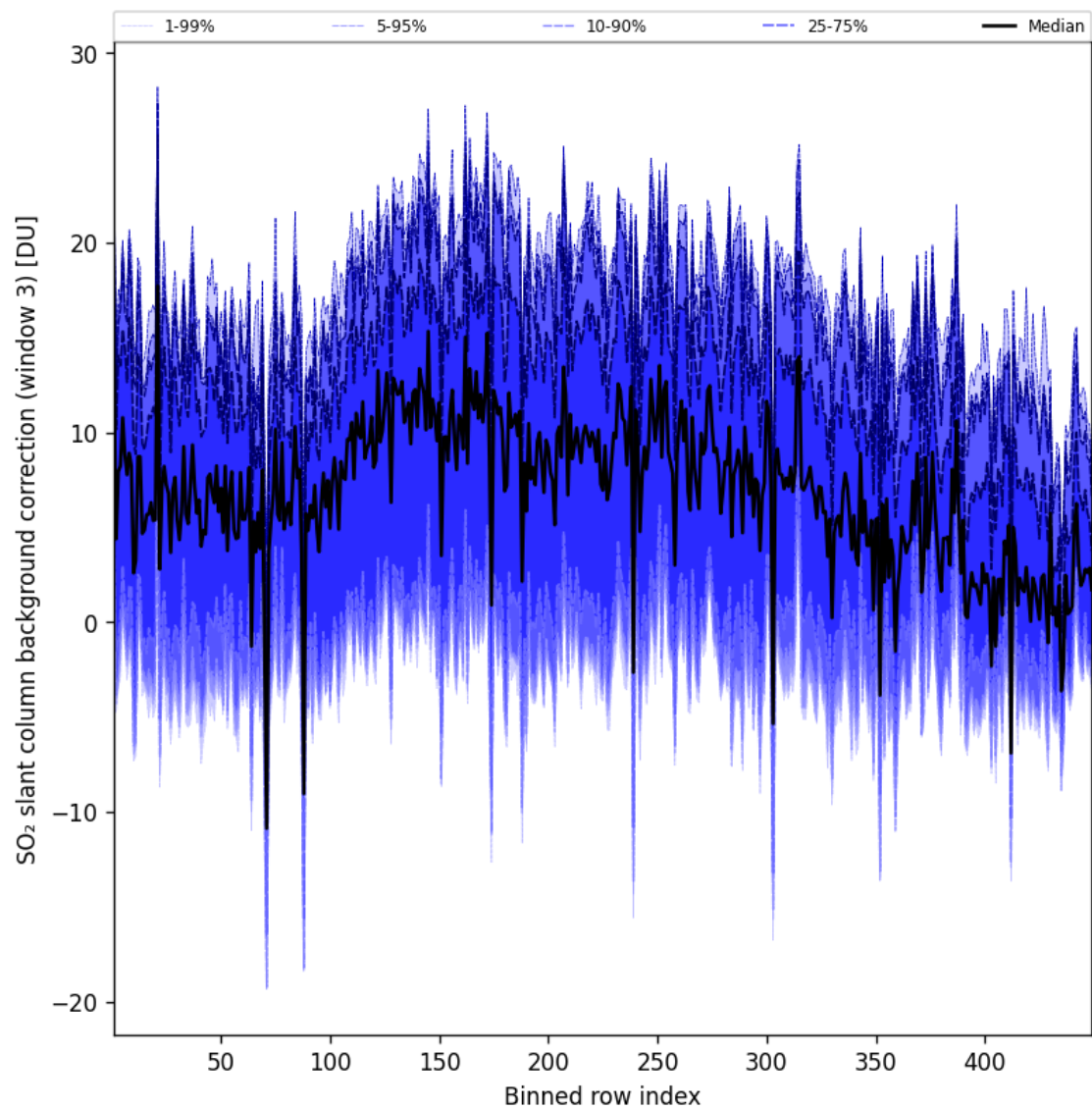


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-03-28 to 2025-03-29

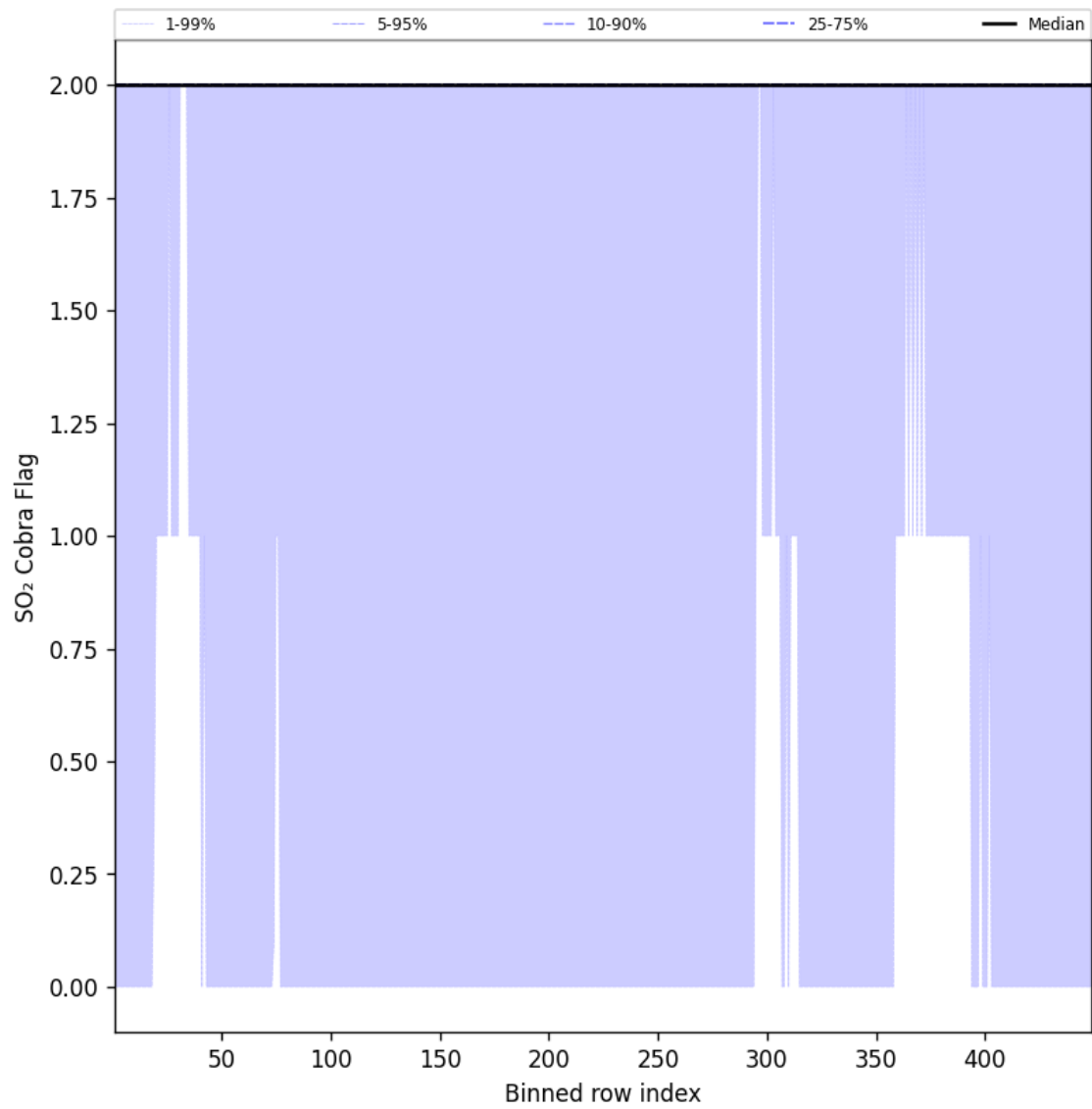


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-03-28 to 2025-03-29

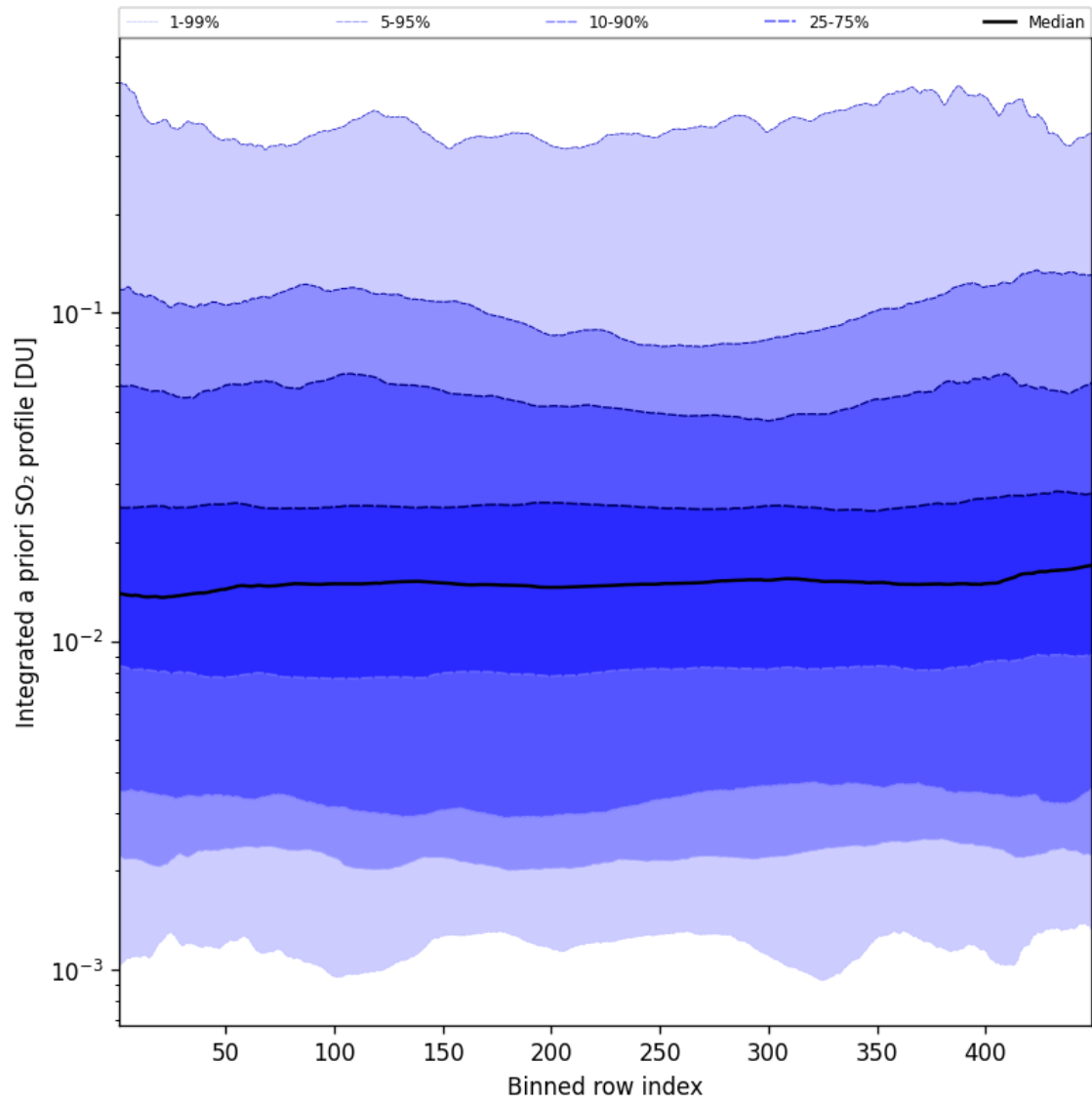


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-03-28 to 2025-03-29

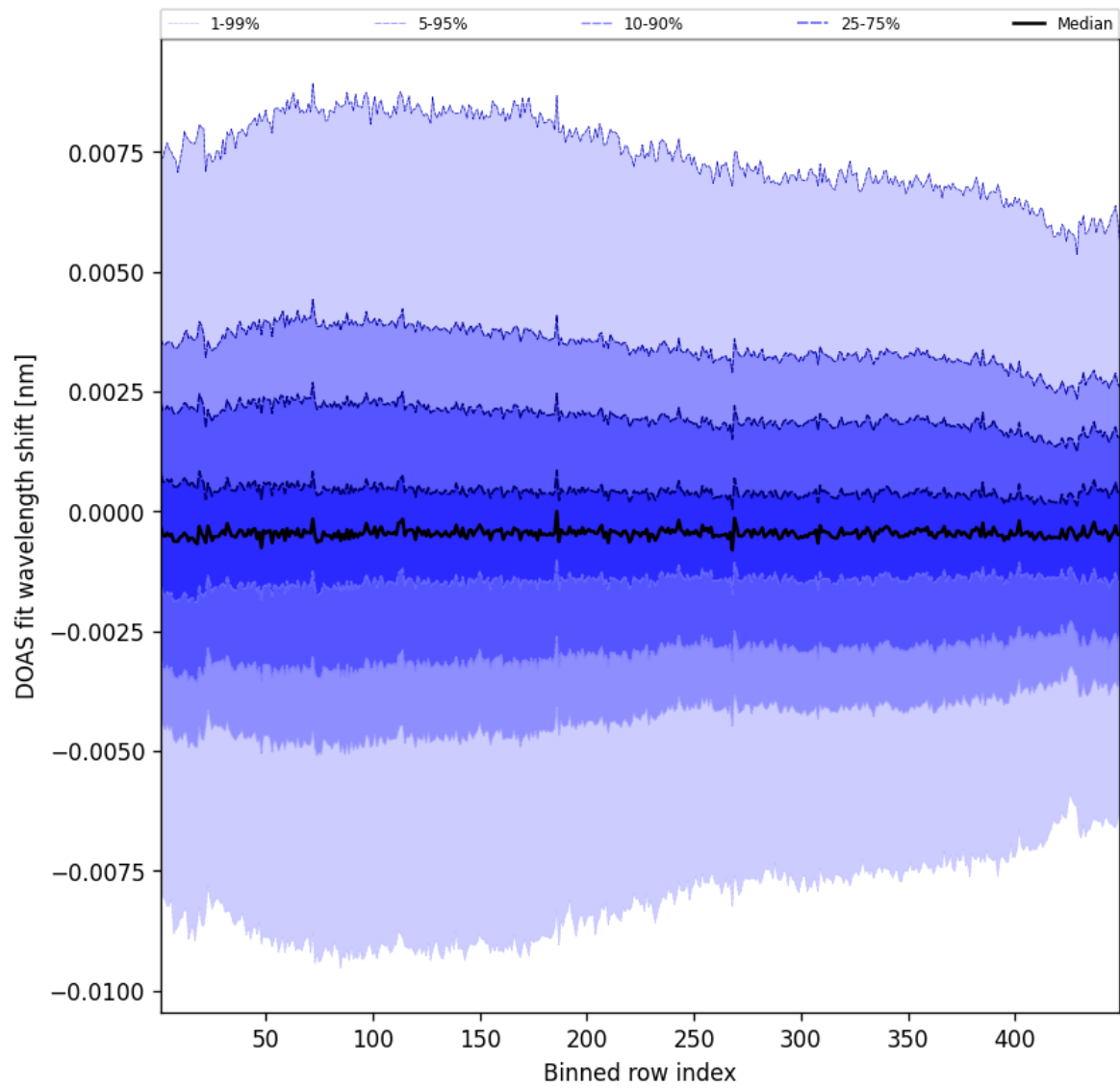


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-03-28 to 2025-03-29

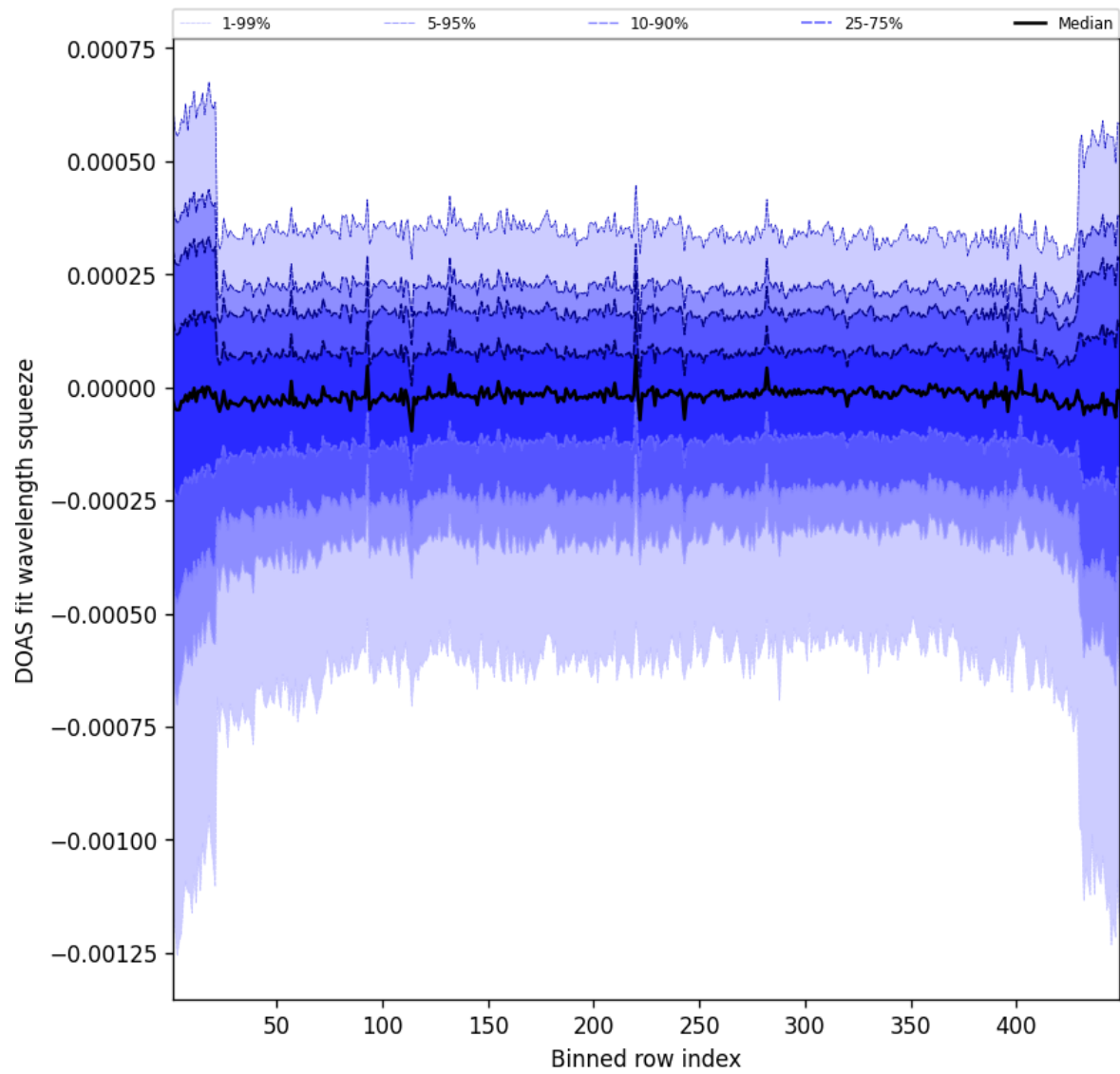


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-03-28 to 2025-03-29

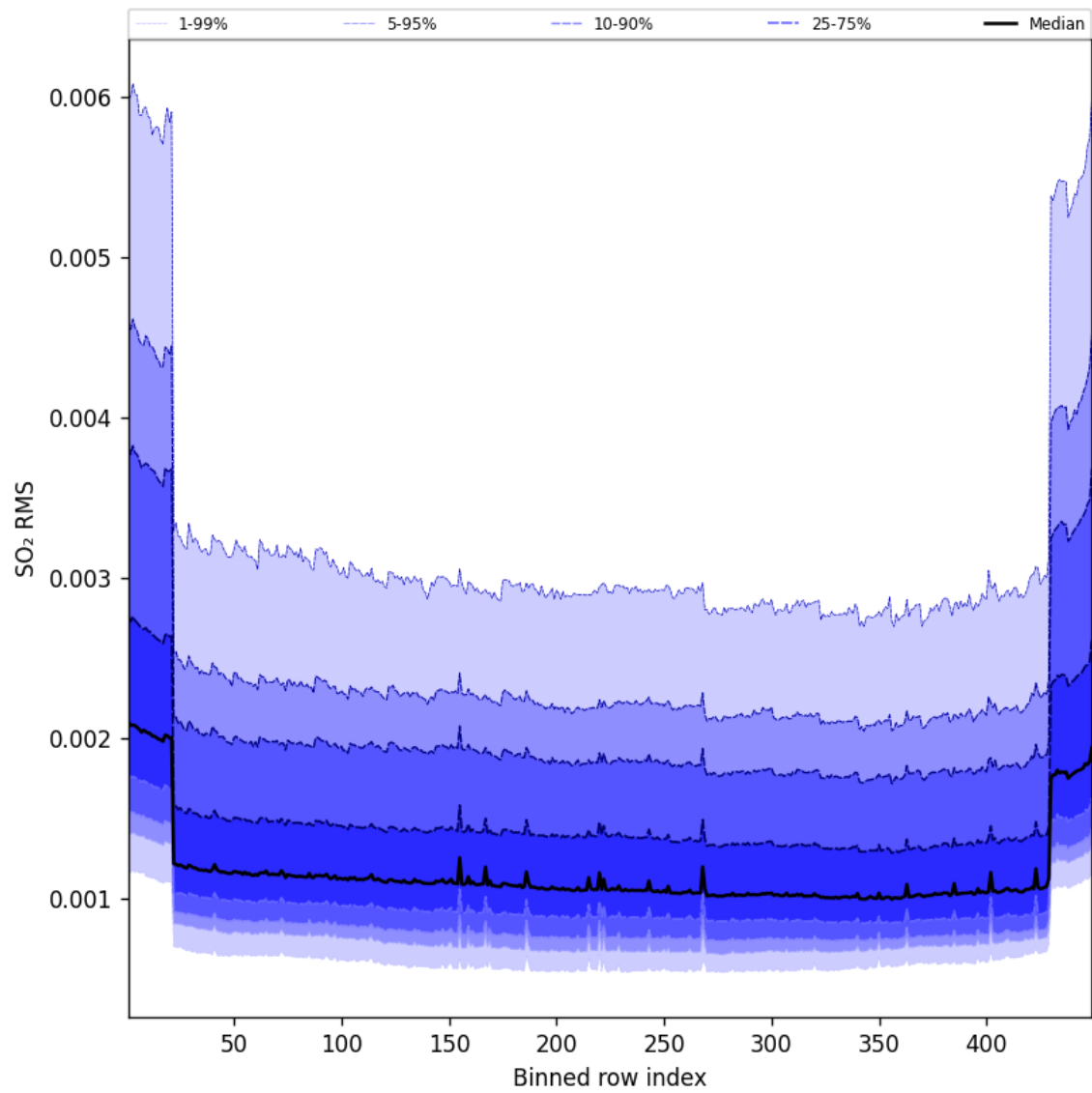


Figure 106: Along track statistics of “SO₂ RMS” for 2025-03-28 to 2025-03-29

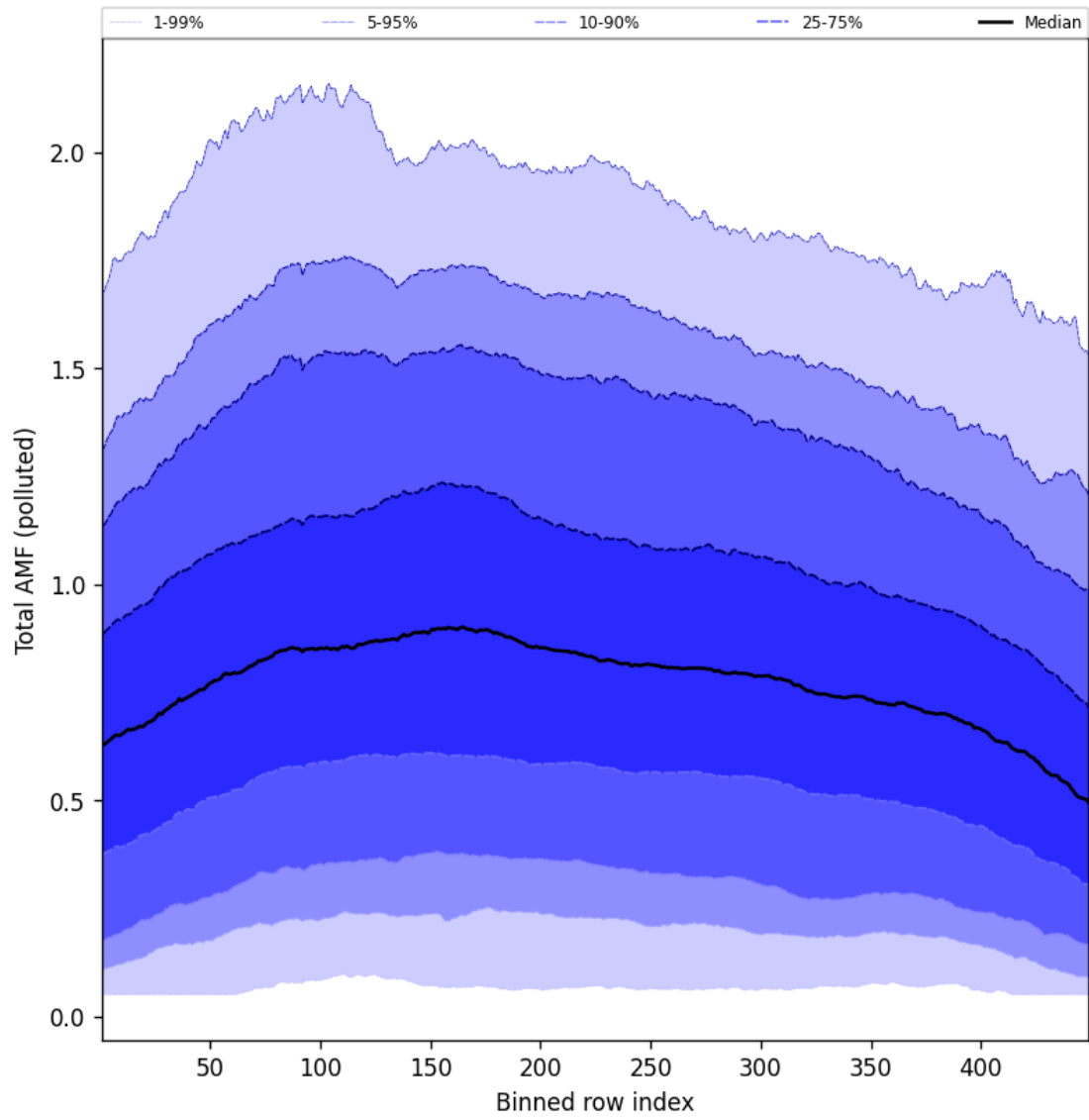


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-03-28 to 2025-03-29

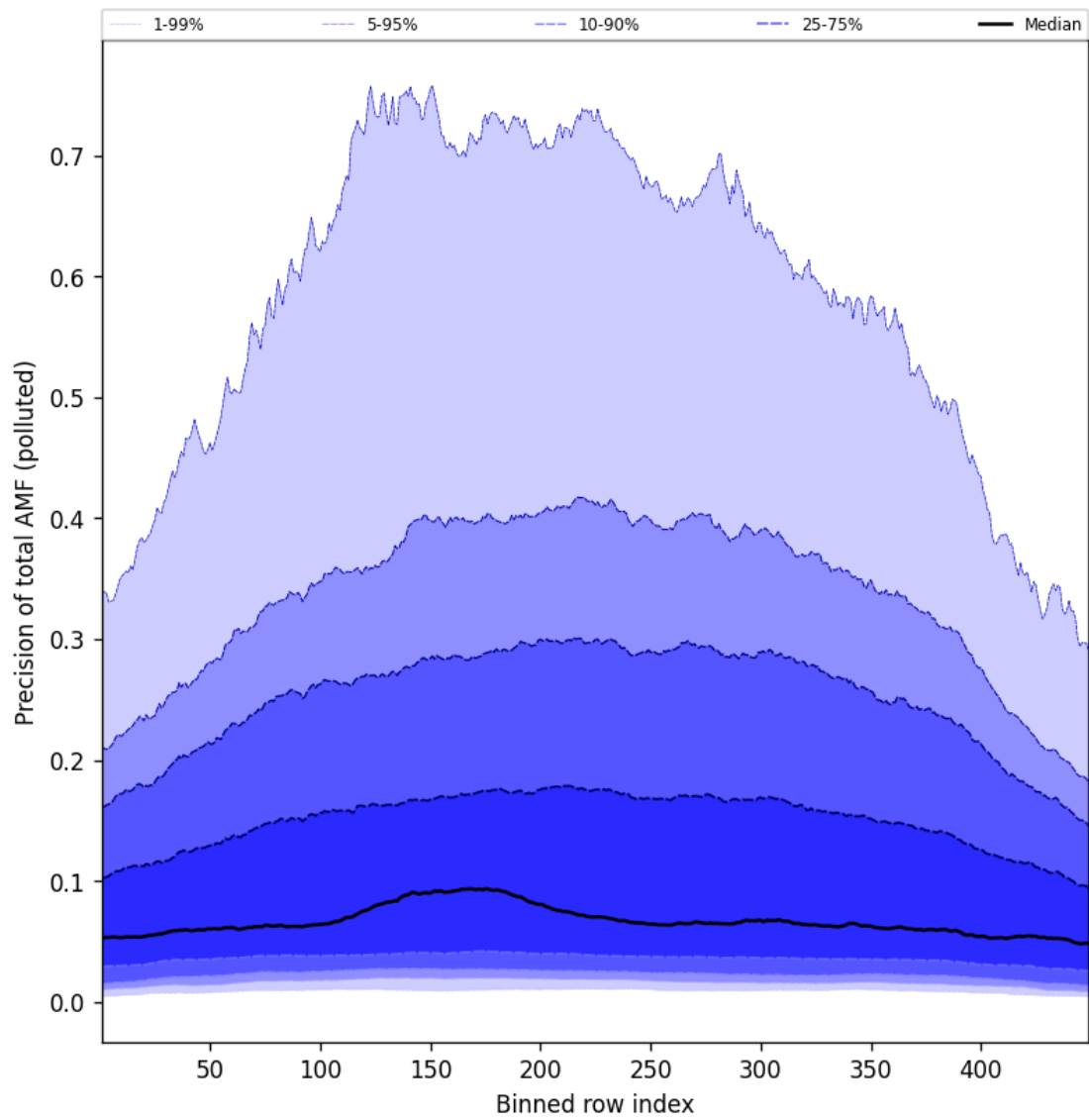


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-03-28 to 2025-03-29

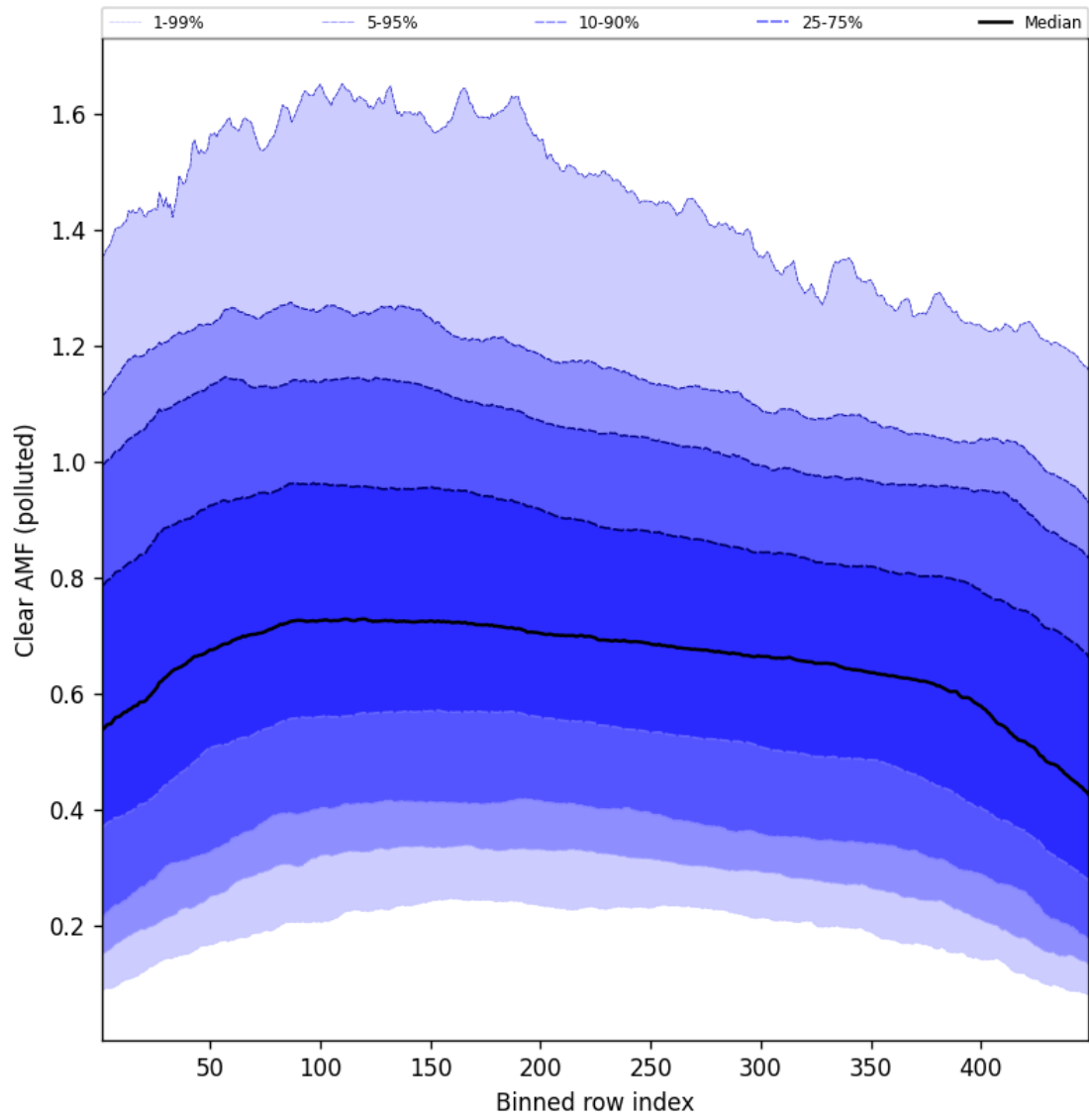


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-03-28 to 2025-03-29

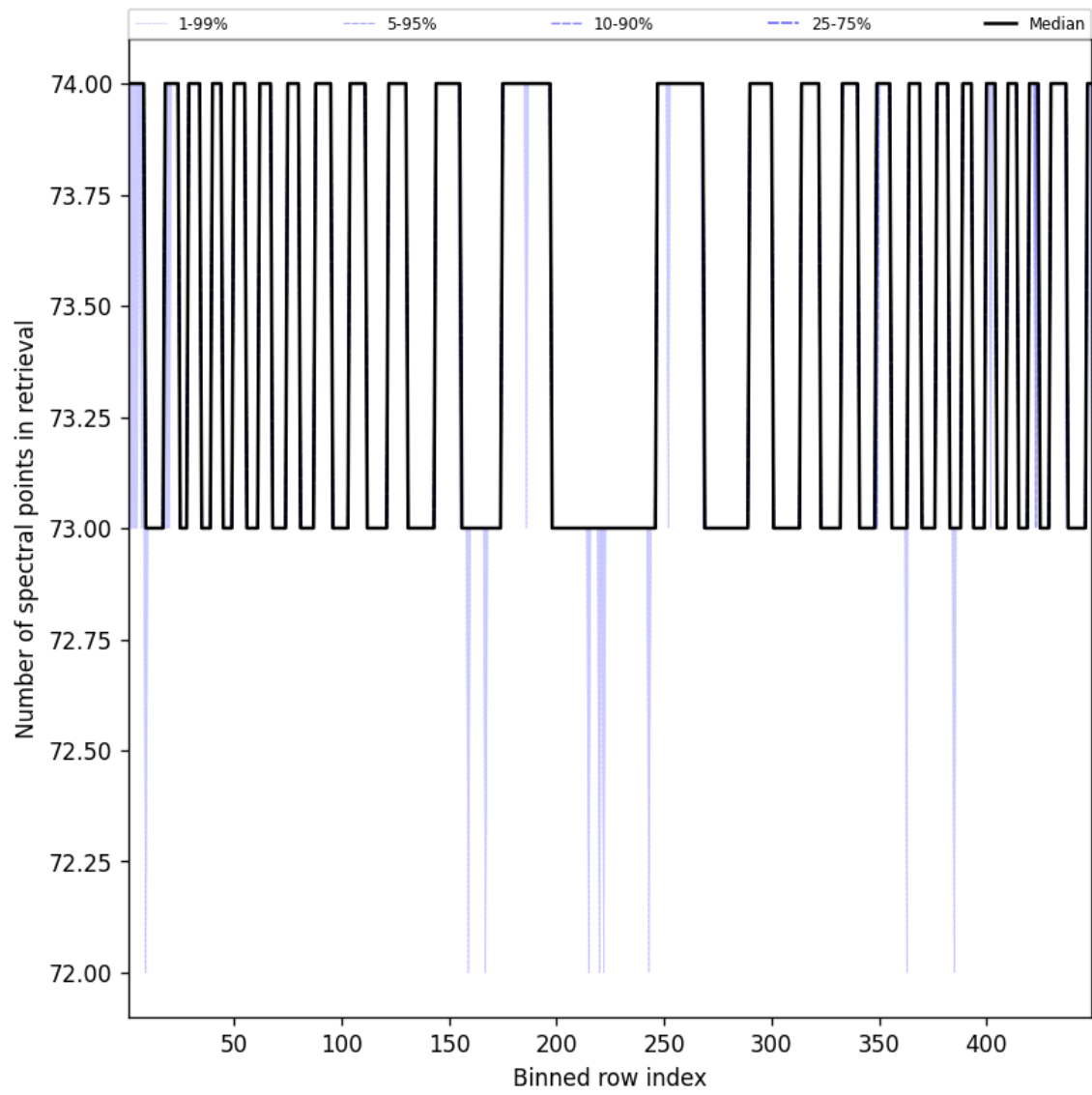


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-03-28 to 2025-03-29

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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