

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]	0.681 ± 0.401	17329755	0.995	0.750	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.221 \pm 95.122) \times 10^{-2}$	17329755	0.278	0.455	1.134×10^{-2}	-79.5	595
sulfurdioxide total vertical column precision [DU]	0.505 ± 0.655	17329755	0.247	0.322	0.328	4.474×10^{-2}	91.0
sulfurdioxide slant column density corrected [DU]	$(1.976 \pm 38.841) \times 10^{-2}$	17329755	0.258	0.371	1.002×10^{-2}	-13.7	414
sulfurdioxide slant column density cobra [DU]	$(1.961 \pm 36.493) \times 10^{-2}$	17329755	0.258	0.371	1.002×10^{-2}	-13.7	32.6
sulfurdioxide slant column density cobra precision [DU]	0.299 ± 0.137	17329755	0.213	0.144	0.257	8.255×10^{-2}	18.6
sulfurdioxide slant column density window1 [DU]	0.126 ± 0.684	17329755	0.125	0.740	0.129	-59.3	77.1
sulfurdioxide slant column density window1 precision [DU]	0.299 ± 0.137	17329755	0.213	0.144	0.257	8.255×10^{-2}	18.6
sulfurdioxide slant column density corrected win1 [DU]	$(2.855 \pm 68.179) \times 10^{-2}$	17329755	-2.500×10^{-2}	0.733	8.826×10^{-3}	-59.3	77.0
background so2 slant column offset window1 [DU]	$(-9.707 \pm 13.609) \times 10^{-2}$	17329755	-0.180	0.128	-0.118	-1.27	3.84
sulfurdioxide slant column density window2 [DU]	1.03 ± 9.31	17329755	0.750	11.7	0.817	-1.961×10^3	1.023×10^3
sulfurdioxide slant column density window2 precision [DU]	8.42 ± 2.40	17329755	7.43	2.77	8.06	2.03	651
sulfurdioxide slant column density corrected win2 [DU]	0.431 ± 9.137	17329755	0.250	11.5	0.419	-1.960×10^3	1.024×10^3
background so2 slant column offset window2 [DU]	-0.596 ± 2.307	17329755	0.750	2.55	-6.560×10^{-2}	-16.2	12.0
sulfurdioxide slant column density window3 [DU]	-5.23 ± 25.01	17329755	-5.04	31.2	-4.98	-1.864×10^3	3.319×10^3
sulfurdioxide slant column density window3 precision [DU]	29.9 ± 14.2	17329755	23.7	11.1	26.0	9.72	1.286×10^3
sulfurdioxide slant column density corrected win3 [DU]	-1.33 ± 24.49	17329755	-2.80	30.7	-1.15	-1.868×10^3	3.314×10^3
background so2 slant column offset window3 [DU]	3.90 ± 5.44	17329755	-0.560	8.47	3.93	-20.3	25.4
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17329755	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.157 \pm 6.231) \times 10^{-2}$	17329755	1.423×10^{-2}	1.973×10^{-2}	1.540×10^{-2}	1.988×10^{-4}	2.17
fitted radiance shift [nm]	$(-2.748 \pm 27.696) \times 10^{-4}$	17329755	-5.000×10^{-4}	1.921×10^{-3}	-2.749×10^{-4}	-4.702×10^{-2}	5.006×10^{-2}
fitted radiance squeeze [1]	$(-2.734 \pm 18.307) \times 10^{-5}$	17329755	-1.000×10^{-5}	2.107×10^{-4}	-2.322×10^{-5}	-2.272×10^{-2}	1.465×10^{-2}
fitted root mean square [1]	$(1.305 \pm 0.554) \times 10^{-3}$	17329755	9.750×10^{-4}	5.707×10^{-4}	1.145×10^{-3}	3.200×10^{-4}	7.565×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.873 ± 0.433	17329755	0.780	0.512	0.808	5.000×10^{-2}	3.13
sulfurdioxide total air mass factor polluted precision [1]	0.113 ± 0.117	17329755	3.500×10^{-2}	0.106	7.266×10^{-2}	2.921×10^{-3}	2.19
sulfurdioxide clear air mass factor polluted [1]	0.735 ± 0.302	17329755	0.620	0.347	0.700	4.614×10^{-2}	3.15
number of spectral points in retrieval [1]	73.4 ± 0.5	17329755	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	6.000×10^{-2}	0.130	0.250	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.18	-0.847	-0.527	-0.359	-0.212	0.242	0.400	0.588	0.956	2.55
sulfurdioxide total vertical column precision [DU]	9.259×10^{-2}	0.132	0.163	0.189	0.224	0.546	0.715	0.923	1.37	3.29
sulfurdioxide slant column density corrected [DU]	-0.871	-0.502	-0.363	-0.270	-0.174	0.198	0.300	0.402	0.563	1.05
sulfurdioxide slant column density cobra [DU]	-0.871	-0.502	-0.363	-0.270	-0.174	0.198	0.300	0.402	0.563	1.05
sulfurdioxide slant column density cobra precision [DU]	0.137	0.168	0.183	0.195	0.210	0.354	0.406	0.457	0.549	0.794
sulfurdioxide slant column density window1 [DU]	-1.71	-0.928	-0.635	-0.443	-0.243	0.497	0.692	0.880	1.17	1.95
sulfurdioxide slant column density window1 precision [DU]	0.137	0.168	0.183	0.195	0.210	0.354	0.406	0.457	0.549	0.794
sulfurdioxide slant column density corrected win1 [DU]	-1.67	-0.980	-0.717	-0.540	-0.352	0.381	0.586	0.787	1.10	1.98
background so2 slant column offset window1 [DU]	-0.396	-0.255	-0.213	-0.193	-0.173	-4.516×10^{-2}	2.630×10^{-3}	5.424×10^{-2}	0.134	0.318
sulfurdioxide slant column density window2 [DU]	-20.6	-13.7	-10.3	-7.76	-4.93	6.74	9.79	12.6	16.4	24.7
sulfurdioxide slant column density window2 precision [DU]	4.33	5.29	5.87	6.32	6.85	9.62	10.6	11.4	12.7	15.4
sulfurdioxide slant column density corrected win2 [DU]	-21.6	-14.3	-10.8	-8.20	-5.32	6.16	9.05	11.6	15.2	22.7
background so2 slant column offset window2 [DU]	-7.44	-5.18	-3.75	-2.67	-1.67	0.877	1.13	1.35	1.87	4.56
sulfurdioxide slant column density window3 [DU]	-68.7	-46.7	-36.2	-28.7	-20.6	10.6	18.6	25.7	35.3	54.3
sulfurdioxide slant column density window3 precision [DU]	13.9	16.7	18.6	20.1	21.8	32.9	37.8	44.4	57.0	89.6
sulfurdioxide slant column density corrected win3 [DU]	-63.0	-41.8	-31.7	-24.4	-16.5	14.2	22.0	29.0	38.4	57.2
background so2 slant column offset window3 [DU]	-7.33	-4.30	-2.97	-1.87	-0.407	8.06	9.56	10.8	12.5	15.8
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]	7.116×10^{-4}	1.722×10^{-3}	3.594×10^{-3}	5.938×10^{-3}	8.639×10^{-3}	2.837×10^{-2}	4.366×10^{-2}	6.557×10^{-2}	0.116	0.287
fitted radiance shift [nm]	-8.541×10^{-3}	-4.404×10^{-3}	-2.923×10^{-3}	-2.044×10^{-3}	-1.272×10^{-3}	6.490×10^{-4}	1.423×10^{-3}	2.367×10^{-3}	3.981×10^{-3}	8.391×10^{-3}
fitted radiance squeeze [1]	-5.129×10^{-4}	-3.233×10^{-4}	-2.432×10^{-4}	-1.883×10^{-4}	-1.307×10^{-4}	8.003×10^{-5}	1.329×10^{-4}	1.823×10^{-4}	2.539×10^{-4}	4.298×10^{-4}
fitted root mean square [1]	5.821×10^{-4}	7.326×10^{-4}	8.160×10^{-4}	8.766×10^{-4}	9.486×10^{-4}	1.519×10^{-3}	1.763×10^{-3}	1.996×10^{-3}	2.363×10^{-3}	3.307×10^{-3}
sulfurdioxide total air mass factor polluted [1]	9.129×10^{-2}	0.274	0.389	0.481	0.582	1.09	1.27	1.44	1.68	2.21
sulfurdioxide total air mass factor polluted precision [1]	1.110×10^{-2}	2.066×10^{-2}	2.690×10^{-2}	3.200×10^{-2}	3.984×10^{-2}	0.146	0.191	0.238	0.319	0.596
sulfurdioxide clear air mass factor polluted [1]	0.251	0.344	0.404	0.463	0.536	0.883	0.980	1.07	1.20	1.72
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]	0.657 ± 0.411	10736434	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(2.108 \pm 80.717) \times 10^{-2}$	10736434	0.414	9.181×10^{-3}	-79.5	60.4	-0.196	0.218
sulfurdioxide total vertical column precision [DU]	0.453 ± 0.587	10736434	0.280	0.296	4.474×10^{-2}	27.9	0.207	0.487
sulfurdioxide slant column density corrected [DU]	$(1.421 \pm 31.718) \times 10^{-2}$	10736434	0.345	8.247×10^{-3}	-7.13	46.3	-0.163	0.182
sulfurdioxide slant column density cobra [DU]	$(1.418 \pm 31.495) \times 10^{-2}$	10736434	0.345	8.247×10^{-3}	-7.13	13.0	-0.163	0.182
sulfurdioxide slant column density cobra precision [DU]	0.272 ± 0.108	10736434	0.116	0.240	8.255×10^{-2}	10.6	0.201	0.317
sulfurdioxide slant column density window1 [DU]	0.128 ± 0.606	10736434	0.692	0.130	-17.4	42.2	-0.218	0.474
sulfurdioxide slant column density window1 precision [DU]	0.272 ± 0.108	10736434	0.116	0.240	8.255×10^{-2}	10.6	0.201	0.317
sulfurdioxide slant column density corrected win1 [DU]	$(1.275 \pm 59.998) \times 10^{-2}$	10736434	0.685	7.210×10^{-4}	-17.3	42.2	-0.338	0.347
background so2 slant column offset window1 [DU]	-0.116 ± 0.106	10736434	0.120	-0.130	-0.733	2.04	-0.177	-5.700×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.514 ± 8.743	10736434	11.1	0.426	-480	1.014×10^3	-5.10	6.03
sulfurdioxide slant column density window2 precision [DU]	8.12 ± 2.27	10736434	2.63	7.77	2.03	516	6.61	9.25
sulfurdioxide slant column density corrected win2 [DU]	0.447 ± 8.699	10736434	11.1	0.448	-479	1.012×10^3	-5.08	5.97
background so2 slant column offset window2 [DU]	$(-6.719 \pm 173.327) \times 10^{-2}$	10736434	2.10	0.227	-12.8	12.0	-1.13	0.974
sulfurdioxide slant column density window3 [DU]	-4.42 ± 24.47	10736434	30.3	-4.32	-1.864×10^3	3.319×10^3	-19.4	10.9
sulfurdioxide slant column density window3 precision [DU]	29.2 ± 14.7	10736434	11.2	25.0	9.72	1.286×10^3	21.1	32.3
sulfurdioxide slant column density corrected win3 [DU]	-1.51 ± 23.88	10736434	29.8	-1.35	-1.868×10^3	3.314×10^3	-16.2	13.6
background so2 slant column offset window3 [DU]	2.91 ± 5.35	10736434	8.98	2.93	-20.3	22.8	-1.57	7.41
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	10736434	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.461 \pm 6.877) \times 10^{-2}$	10736434	2.658×10^{-2}	1.563×10^{-2}	1.988×10^{-4}	2.17	6.828×10^{-3}	3.341×10^{-2}
fitted radiance shift [nm]	$(-4.668 \pm 287.343) \times 10^{-5}$	10736434	1.822×10^{-3}	-9.683×10^{-5}	-4.109×10^{-2}	4.022×10^{-2}	-9.737×10^{-4}	8.482×10^{-4}
fitted radiance squeeze [1]	$(-4.841 \pm 16.724) \times 10^{-5}$	10736434	2.011×10^{-4}	-3.969×10^{-5}	-8.567×10^{-3}	1.158×10^{-2}	-1.443×10^{-4}	5.687×10^{-5}
fitted root mean square [1]	$(1.207 \pm 0.450) \times 10^{-3}$	10736434	4.812×10^{-4}	1.085×10^{-3}	3.200×10^{-4}	2.678×10^{-2}	9.136×10^{-4}	1.395×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.900 ± 0.466	10736434	0.542	0.835	5.000×10^{-2}	3.13	0.585	1.13
sulfurdioxide total air mass factor polluted precision [1]	0.125 ± 0.134	10736434	0.119	7.780×10^{-2}	3.707×10^{-3}	2.19	4.163×10^{-2}	0.161
sulfurdioxide clear air mass factor polluted [1]	0.763 ± 0.345	10736434	0.412	0.728	9.871×10^{-2}	3.15	0.524	0.936
number of spectral points in retrieval [1]	73.5 ± 0.5	10736434	1.000	73.0	71.0	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]	0.721 ± 0.379	6593321	0.650	1.000	0.0	1.000	0.350	1.000
sulfurdioxide total vertical column [DU]	$(5.032 \pm 114.749) \times 10^{-2}$	6593321	0.534	1.583×10^{-2}	-70.4	595	-0.245	0.289
sulfurdioxide total vertical column precision [DU]	0.589 ± 0.746	6593321	0.373	0.390	4.722×10^{-2}	91.0	0.262	0.635
sulfurdioxide slant column density corrected [DU]	$(2.879 \pm 48.226) \times 10^{-2}$	6593321	0.422	1.362×10^{-2}	-13.7	414	-0.194	0.227
sulfurdioxide slant column density cobra [DU]	$(2.845 \pm 43.402) \times 10^{-2}$	6593321	0.422	1.362×10^{-2}	-13.7	32.6	-0.194	0.227
sulfurdioxide slant column density cobra precision [DU]	0.343 ± 0.164	6593321	0.178	0.302	8.887×10^{-2}	18.6	0.230	0.408
sulfurdioxide slant column density window1 [DU]	0.121 ± 0.795	6593321	0.830	0.127	-59.3	77.1	-0.290	0.539
sulfurdioxide slant column density window1 precision [DU]	0.343 ± 0.164	6593321	0.178	0.302	8.887×10^{-2}	18.6	0.230	0.408
sulfurdioxide slant column density corrected win1 [DU]	$(5.427 \pm 79.656) \times 10^{-2}$	6593321	0.824	2.466×10^{-2}	-59.3	77.0	-0.379	0.446
background so2 slant column offset window1 [DU]	$(-6.670 \pm 17.041) \times 10^{-2}$	6593321	0.143	-0.101	-1.27	3.84	-0.161	-1.876×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.86 ± 10.11	6593321	12.6	1.54	-1.961×10^3	1.023×10^3	-4.62	7.99
sulfurdioxide slant column density window2 precision [DU]	8.91 ± 2.51	6593321	2.86	8.55	2.39	651	7.29	10.1
sulfurdioxide slant column density corrected win2 [DU]	0.405 ± 9.807	6593321	12.2	0.365	-1.960×10^3	1.024×10^3	-5.74	6.50
background so2 slant column offset window2 [DU]	-1.46 ± 2.81	6593321	4.14	-0.651	-16.2	11.3	-3.49	0.651
sulfurdioxide slant column density window3 [DU]	-6.54 ± 25.81	6593321	32.7	-6.14	-1.119×10^3	624	-22.6	10.1
sulfurdioxide slant column density window3 precision [DU]	30.9 ± 13.3	6593321	10.5	27.4	10.2	329	23.3	33.8
sulfurdioxide slant column density corrected win3 [DU]	-1.02 ± 25.44	6593321	32.3	-0.786	-1.114×10^3	625	-17.0	15.3
background so2 slant column offset window3 [DU]	5.51 ± 5.17	6593321	7.69	5.08	-18.1	25.4	1.58	9.28
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	6593321	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.662 \pm 4.963) \times 10^{-2}$	6593321	1.351×10^{-2}	1.521×10^{-2}	8.991×10^{-4}	1.74	1.019×10^{-2}	2.369×10^{-2}
fitted radiance shift [nm]	$(-6.463 \pm 25.482) \times 10^{-4}$	6593321	1.968×10^{-3}	-5.974×10^{-4}	-4.702×10^{-2}	5.006×10^{-2}	-1.681×10^{-3}	2.865×10^{-4}
fitted radiance squeeze [1]	$(6.961 \pm 201.595) \times 10^{-6}$	6593321	2.247×10^{-4}	6.877×10^{-6}	-2.272×10^{-2}	1.465×10^{-2}	-1.050×10^{-4}	1.197×10^{-4}
fitted root mean square [1]	$(1.466 \pm 0.661) \times 10^{-3}$	6593321	7.145×10^{-4}	1.265×10^{-3}	3.520×10^{-4}	7.565×10^{-2}	1.022×10^{-3}	1.736×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.829 ± 0.370	6593321	0.457	0.773	5.000×10^{-2}	2.77	0.577	1.03
sulfurdioxide total air mass factor polluted precision [1]	$(9.239 \pm 7.632) \times 10^{-2}$	6593321	8.868×10^{-2}	6.574×10^{-2}	2.921×10^{-3}	1.50	3.766×10^{-2}	0.126
sulfurdioxide clear air mass factor polluted [1]	0.688 ± 0.205	6593321	0.262	0.672	4.614×10^{-2}	1.92	0.549	0.811
number of spectral points in retrieval [1]	73.4 ± 0.5	6593321	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]	0.690 ± 0.394	11471770	0.720	1.000	0.0	1.000	0.280	1.000
sulfurdioxide total vertical column [DU]	$(3.580 \pm 99.616) \times 10^{-2}$	11471770	0.455	1.196×10^{-2}	-70.4	595	-0.212	0.242
sulfurdioxide total vertical column precision [DU]	0.509 ± 0.686	11471770	0.317	0.320	4.826×10^{-2}	91.0	0.224	0.542
sulfurdioxide slant column density corrected [DU]	$(2.138 \pm 40.509) \times 10^{-2}$	11471770	0.373	1.041×10^{-2}	-10.2	414	-0.174	0.199
sulfurdioxide slant column density cobra [DU]	$(2.121 \pm 37.847) \times 10^{-2}$	11471770	0.373	1.041×10^{-2}	-10.2	32.6	-0.174	0.199
sulfurdioxide slant column density cobra precision [DU]	0.304 ± 0.146	11471770	0.161	0.253	8.255×10^{-2}	14.4	0.207	0.368
sulfurdioxide slant column density window1 [DU]	0.128 ± 0.704	11471770	0.746	0.135	-45.9	70.5	-0.241	0.505
sulfurdioxide slant column density window1 precision [DU]	0.304 ± 0.146	11471770	0.161	0.253	8.255×10^{-2}	14.4	0.207	0.368
sulfurdioxide slant column density corrected win1 [DU]	$(3.790 \pm 70.214) \times 10^{-2}$	11471770	0.740	1.598×10^{-2}	-45.9	70.6	-0.348	0.392
background so2 slant column offset window1 [DU]	$(-9.015 \pm 14.949) \times 10^{-2}$	11471770	0.135	-0.118	-1.27	3.84	-0.173	-3.824×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.22 ± 9.31	11471770	11.7	0.940	-1.961×10^3	1.014×10^3	-4.78	6.89
sulfurdioxide slant column density window2 precision [DU]	8.33 ± 2.31	11471770	2.71	7.97	2.03	516	6.80	9.51
sulfurdioxide slant column density corrected win2 [DU]	0.444 ± 9.086	11471770	11.4	0.425	-1.960×10^3	1.012×10^3	-5.29	6.15
background so2 slant column offset window2 [DU]	-0.772 ± 2.524	11471770	3.00	-2.653×10^{-2}	-16.2	12.0	-2.10	0.895
sulfurdioxide slant column density window3 [DU]	-2.77 ± 24.75	11471770	31.2	-2.71	-534	339	-18.2	13.0
sulfurdioxide slant column density window3 precision [DU]	28.6 ± 12.3	11471770	10.1	25.2	9.82	329	21.6	31.6
sulfurdioxide slant column density corrected win3 [DU]	1.16 ± 23.95	11471770	30.4	1.11	-529	344	-14.0	16.4
background so2 slant column offset window3 [DU]	3.93 ± 5.63	11471770	8.79	3.70	-20.3	25.4	-0.510	8.28
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	11471770	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.124 \pm 3.779) \times 10^{-2}$	11471770	1.329×10^{-2}	1.456×10^{-2}	3.087×10^{-4}	2.17	9.187×10^{-3}	2.248×10^{-2}
fitted radiance shift [nm]	$(-3.237 \pm 24.597) \times 10^{-4}$	11471770	1.897×10^{-3}	-2.835×10^{-4}	-4.327×10^{-2}	5.006×10^{-2}	-1.306×10^{-3}	5.910×10^{-4}
fitted radiance squeeze [1]	$(-1.743 \pm 18.524) \times 10^{-5}$	11471770	2.091×10^{-4}	-1.376×10^{-5}	-2.272×10^{-2}	1.465×10^{-2}	-1.200×10^{-4}	8.908×10^{-5}
fitted root mean square [1]	$(1.325 \pm 0.591) \times 10^{-3}$	11471770	6.402×10^{-4}	1.131×10^{-3}	3.200×10^{-4}	5.226×10^{-2}	9.385×10^{-4}	1.579×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.859 ± 0.378	11471770	0.463	0.819	5.000×10^{-2}	2.61	0.608	1.07
sulfurdioxide total air mass factor polluted precision [1]	0.107 ± 0.114	11471770	9.277×10^{-2}	6.968×10^{-2}	3.171×10^{-3}	2.19	4.125×10^{-2}	0.134
sulfurdioxide clear air mass factor polluted [1]	0.726 ± 0.240	11471770	0.324	0.716	5.235×10^{-2}	2.63	0.556	0.880
number of spectral points in retrieval [1]	73.4 ± 0.5	11471770	1.000	73.0	52.0	74.0	73.0	74.0

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

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.681 ± 0.412	4098141	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(2.090 \pm 80.723) \times 10^{-2}$	4098141	0.434	9.157×10^{-3}	-45.5	427	-0.205	0.229
sulfurdioxide total vertical column precision [DU]	0.472 ± 0.549	4098141	0.312	0.332	4.474×10^{-2}	32.5	0.214	0.526
sulfurdioxide slant column density corrected [DU]	$(1.519 \pm 34.638) \times 10^{-2}$	4098141	0.355	8.429×10^{-3}	-13.1	211	-0.168	0.187
sulfurdioxide slant column density cobra [DU]	$(1.504 \pm 32.256) \times 10^{-2}$	4098141	0.355	8.429×10^{-3}	-13.1	28.7	-0.168	0.187
sulfurdioxide slant column density cobra precision [DU]	0.278 ± 0.109	4098141	0.101	0.251	8.371×10^{-2}	18.6	0.211	0.312
sulfurdioxide slant column density window1 [DU]	0.130 ± 0.617	4098141	0.701	0.125	-59.3	77.1	-0.225	0.476
sulfurdioxide slant column density window1 precision [DU]	0.278 ± 0.109	4098141	0.101	0.251	8.371×10^{-2}	18.6	0.211	0.312
sulfurdioxide slant column density corrected win1 [DU]	$(4.244 \pm 612.436) \times 10^{-3}$	4098141	0.694	-9.136×10^{-3}	-59.3	77.0	-0.352	0.342
background so2 slant column offset window1 [DU]	-0.126 ± 0.099	4098141	0.105	-0.135	-0.705	1.81	-0.180	-7.470×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.371 ± 9.169	4098141	11.5	0.303	-510	1.023×10^3	-5.42	6.08
sulfurdioxide slant column density window2 precision [DU]	8.47 ± 2.59	4098141	2.80	8.11	2.14	651	6.85	9.66
sulfurdioxide slant column density corrected win2 [DU]	0.346 ± 9.128	4098141	11.4	0.341	-512	1.024×10^3	-5.37	6.05
background so2 slant column offset window2 [DU]	$(-2.537 \pm 172.244) \times 10^{-2}$	4098141	1.90	0.238	-15.4	12.0	-0.959	0.945
sulfurdioxide slant column density window3 [DU]	-9.89 ± 24.50	4098141	30.2	-9.18	-883	624	-24.7	5.58
sulfurdioxide slant column density window3 precision [DU]	32.1 ± 17.4	4098141	12.7	27.3	9.72	1.245×10^3	22.4	35.1
sulfurdioxide slant column density corrected win3 [DU]	-6.85 ± 24.50	4098141	30.5	-6.24	-888	625	-21.8	8.66
background so2 slant column offset window3 [DU]	3.04 ± 5.01	4098141	7.85	3.07	-20.3	25.4	-0.889	6.96
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.14	4098141	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.678 \pm 9.086) \times 10^{-2}$	4098141	5.631×10^{-2}	2.704×10^{-2}	1.988×10^{-4}	1.74	8.982×10^{-3}	6.529×10^{-2}
fitted radiance shift [nm]	$(-1.774 \pm 33.465) \times 10^{-4}$	4098141	1.863×10^{-3}	-2.681×10^{-4}	-4.702×10^{-2}	4.022×10^{-2}	-1.143×10^{-3}	7.199×10^{-4}
fitted radiance squeeze [1]	$(-3.654 \pm 17.069) \times 10^{-5}$	4098141	2.035×10^{-4}	-3.321×10^{-5}	-1.397×10^{-2}	1.344×10^{-2}	-1.367×10^{-4}	6.682×10^{-5}
fitted root mean square [1]	$(1.218 \pm 0.443) \times 10^{-3}$	4098141	4.198×10^{-4}	1.125×10^{-3}	3.266×10^{-4}	7.565×10^{-2}	9.484×10^{-4}	1.368×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.911 ± 0.544	4098141	0.603	0.767	5.000×10^{-2}	3.13	0.544	1.15
sulfurdioxide total air mass factor polluted precision [1]	0.123 ± 0.122	4098141	0.141	7.958×10^{-2}	3.086×10^{-3}	2.04	3.438×10^{-2}	0.175
sulfurdioxide clear air mass factor polluted [1]	0.772 ± 0.422	4098141	0.390	0.671	4.674×10^{-2}	3.15	0.517	0.907
number of spectral points in retrieval [1]	73.4 ± 0.5	4098141	1.000	73.0	70.0	74.0	73.0	74.0

3 Granule outlines

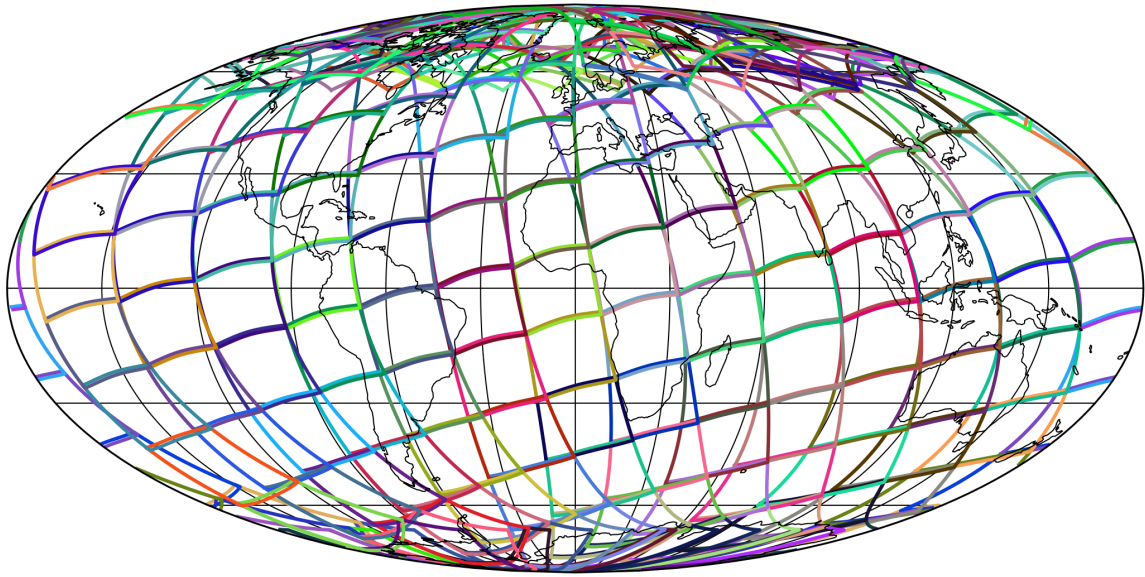


Figure 1: Outline of the granules.

4 Input data monitoring

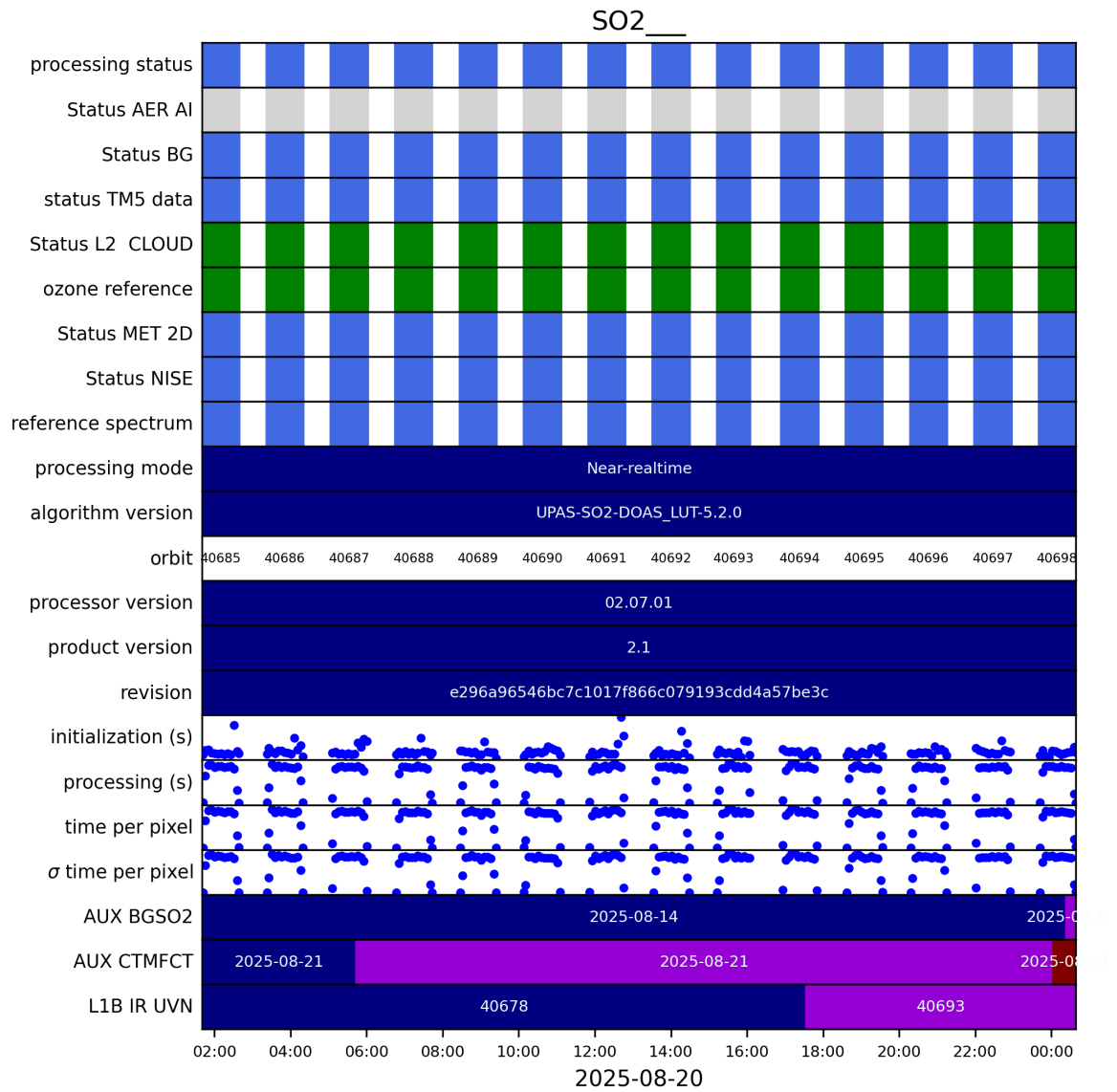


Figure 2: Input data per granule

5 Warnings and errors

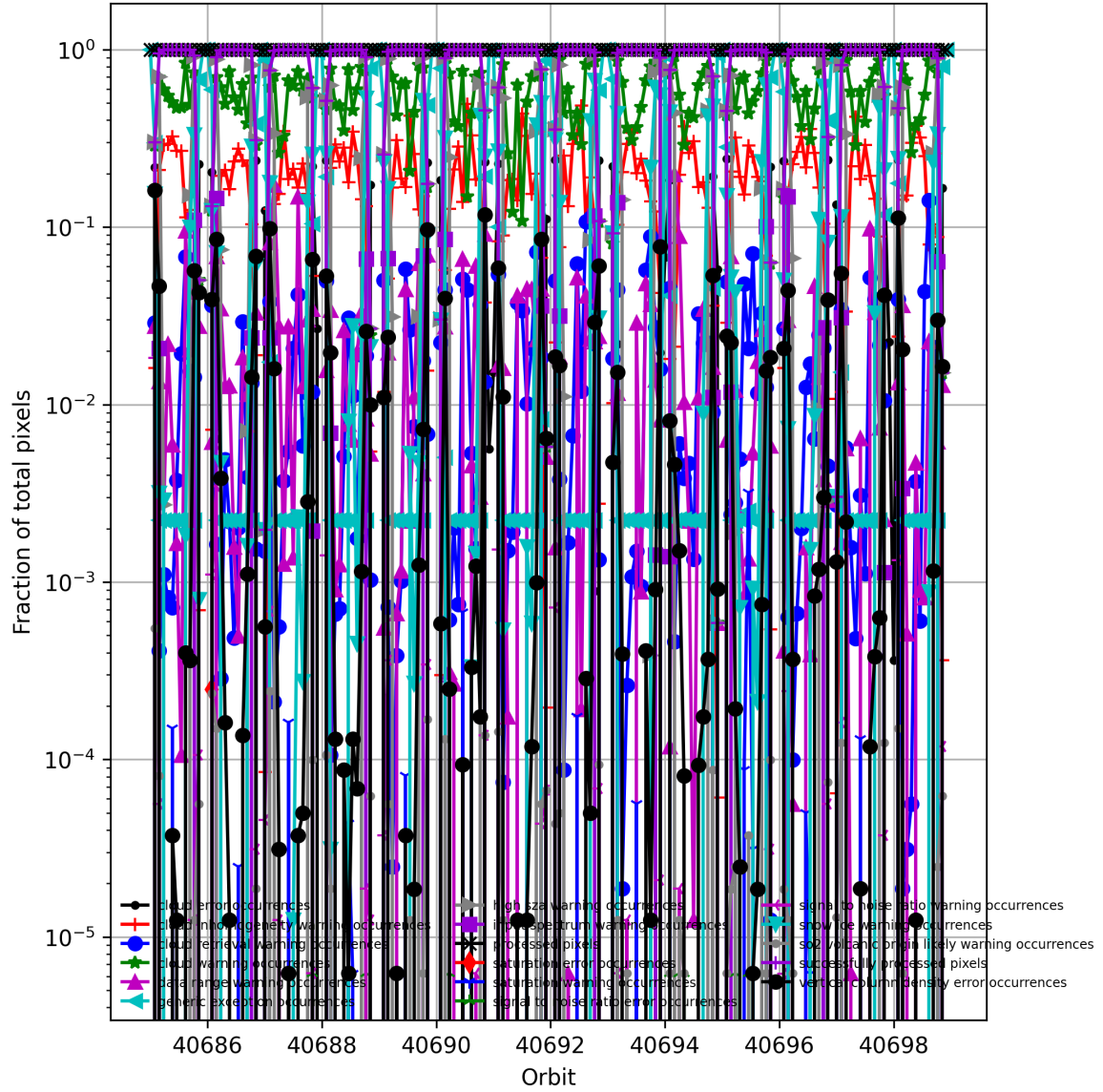


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

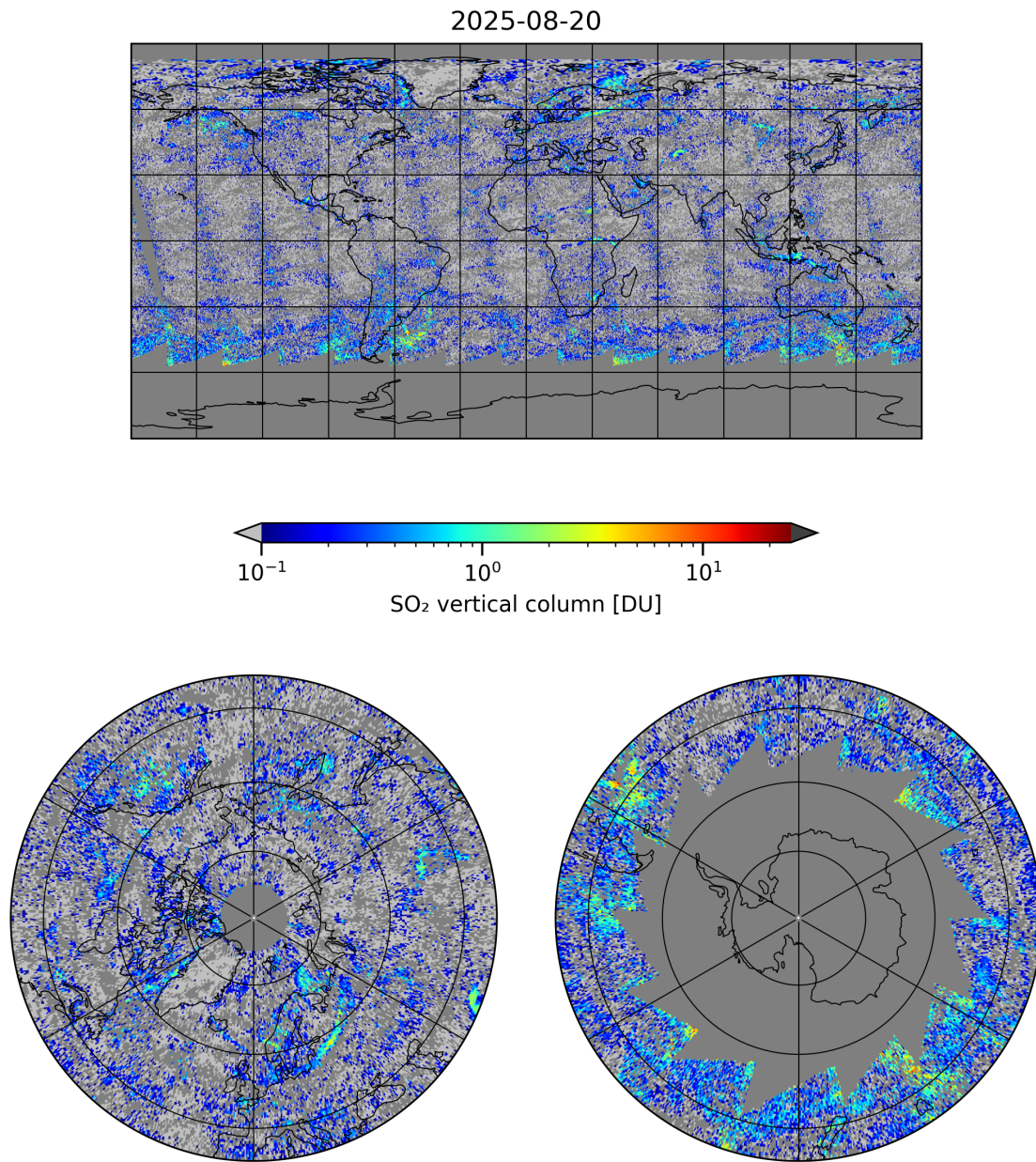


Figure 4: Map of “SO₂ vertical column” for 2025-08-20 to 2025-08-21

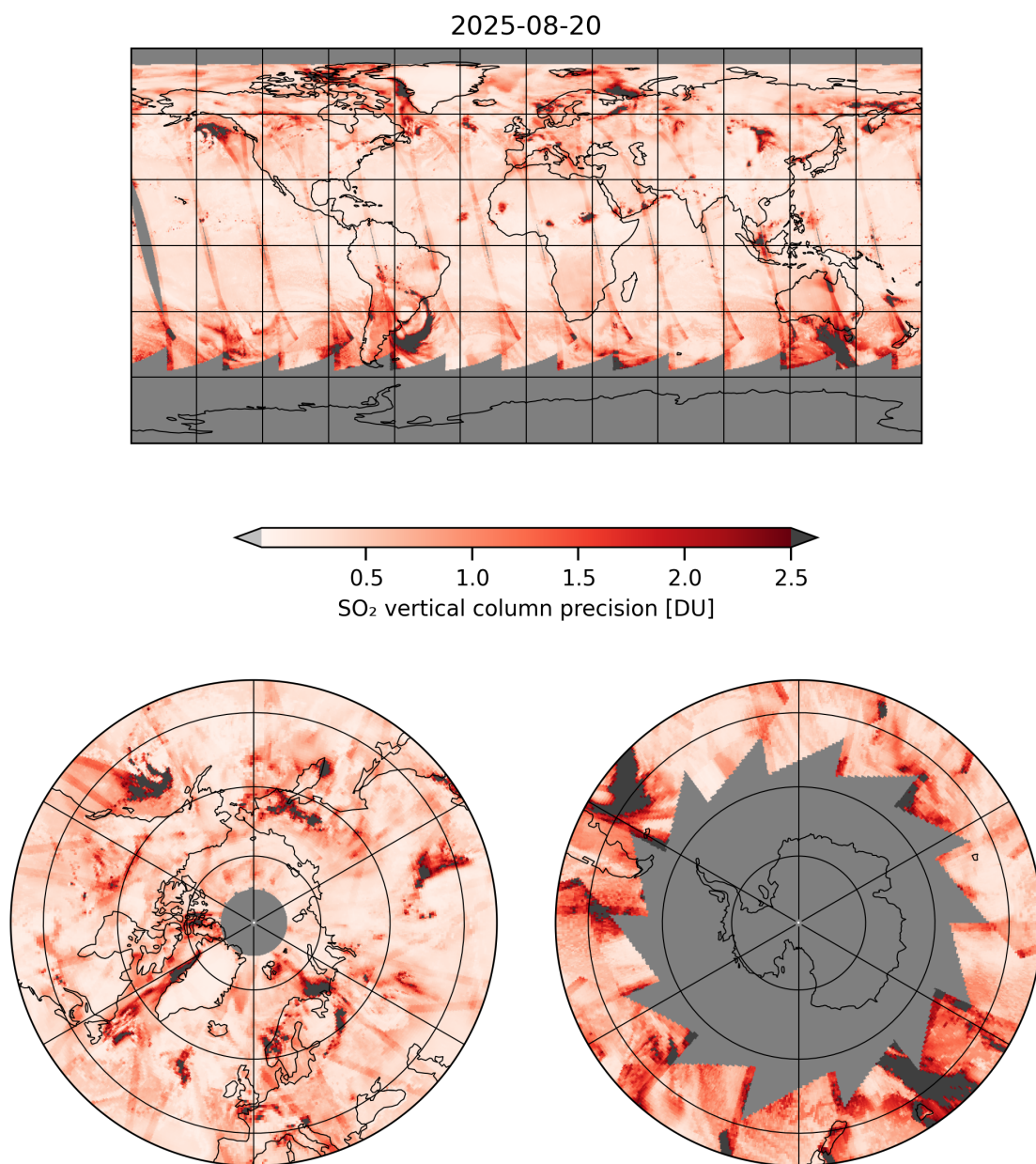


Figure 5: Map of “SO₂ vertical column precision” for 2025-08-20 to 2025-08-21

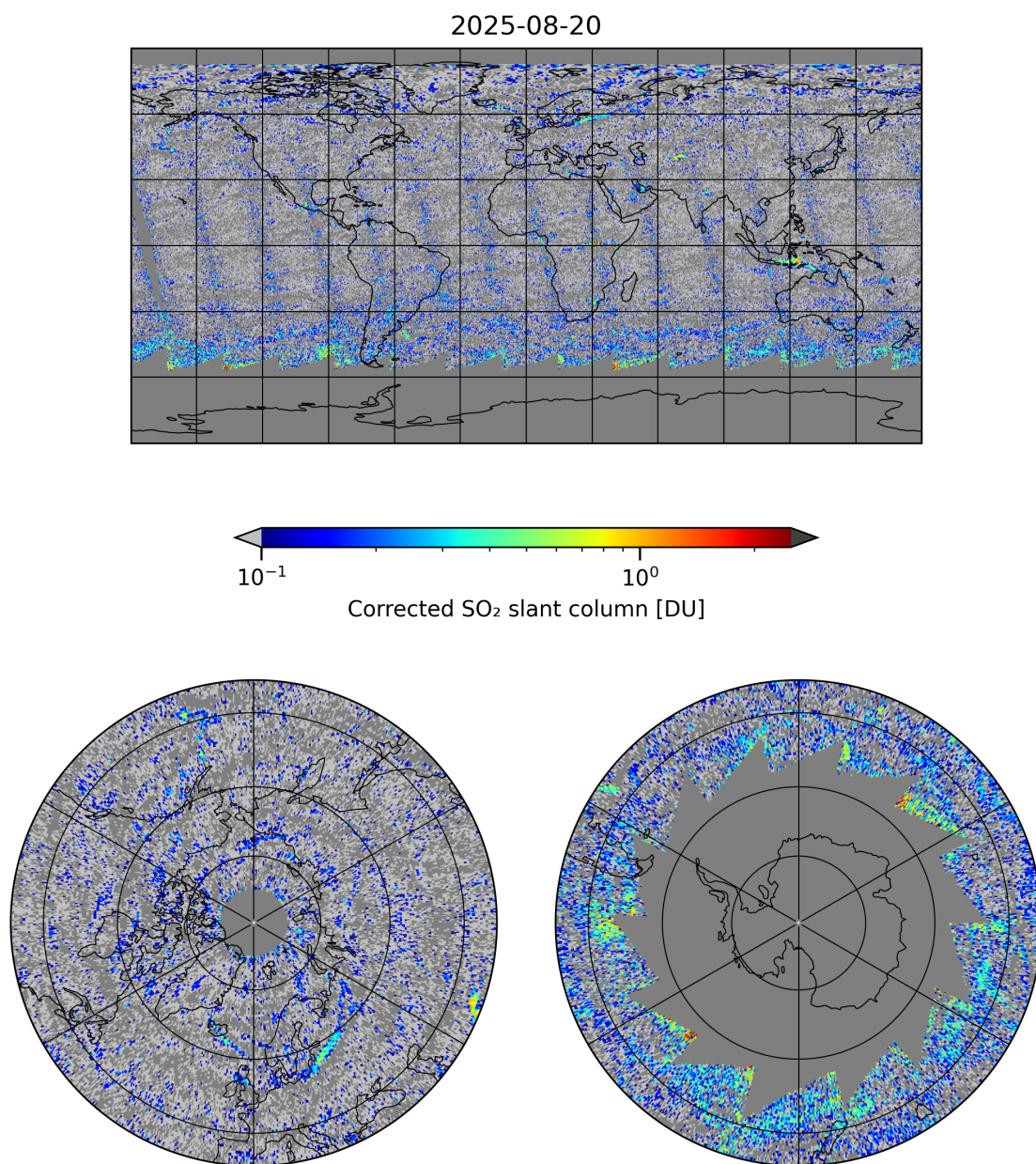


Figure 6: Map of “Corrected SO₂ slant column” for 2025-08-20 to 2025-08-21

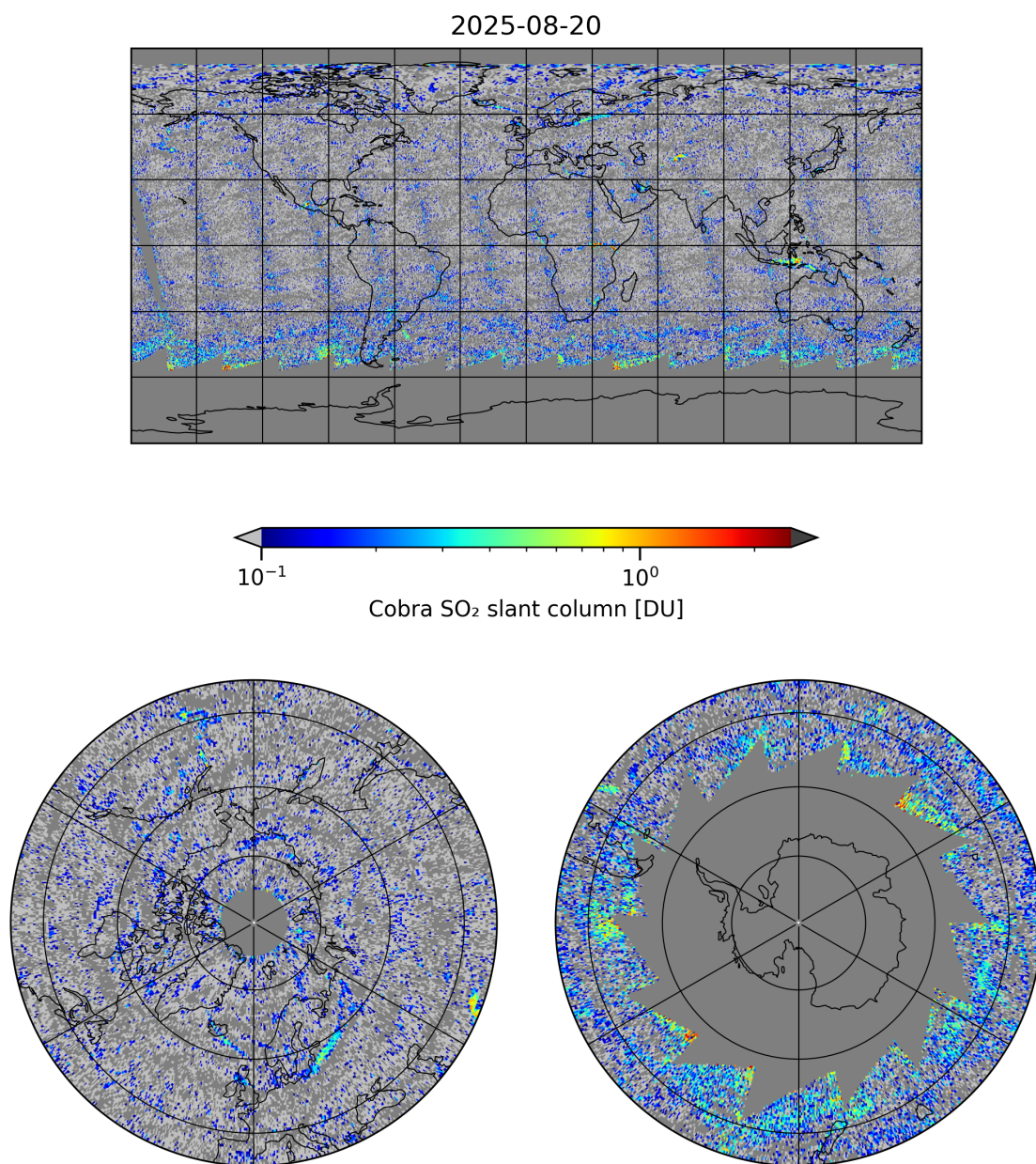


Figure 7: Map of “Cobra SO₂ slant column” for 2025-08-20 to 2025-08-21

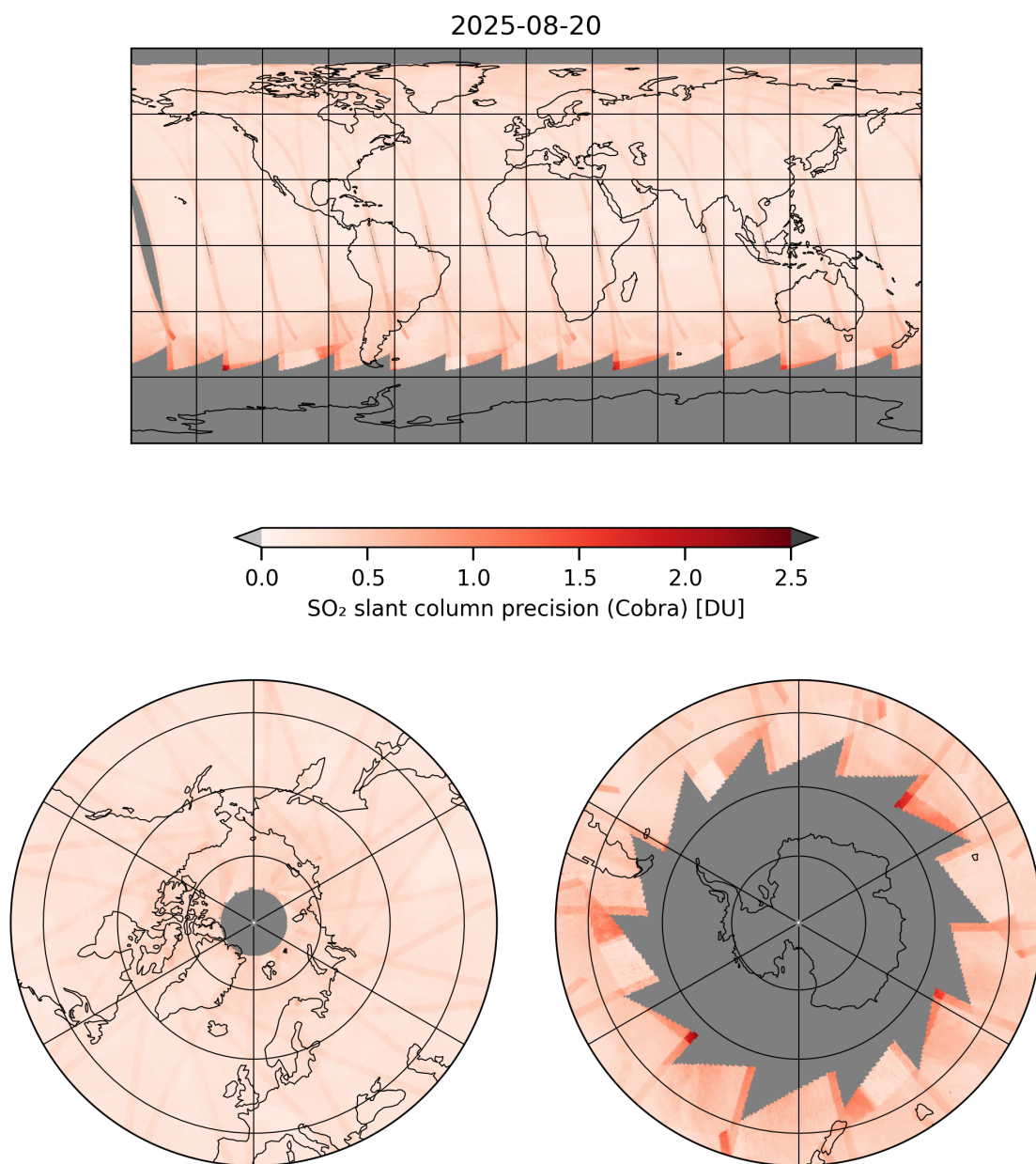


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-08-20 to 2025-08-21

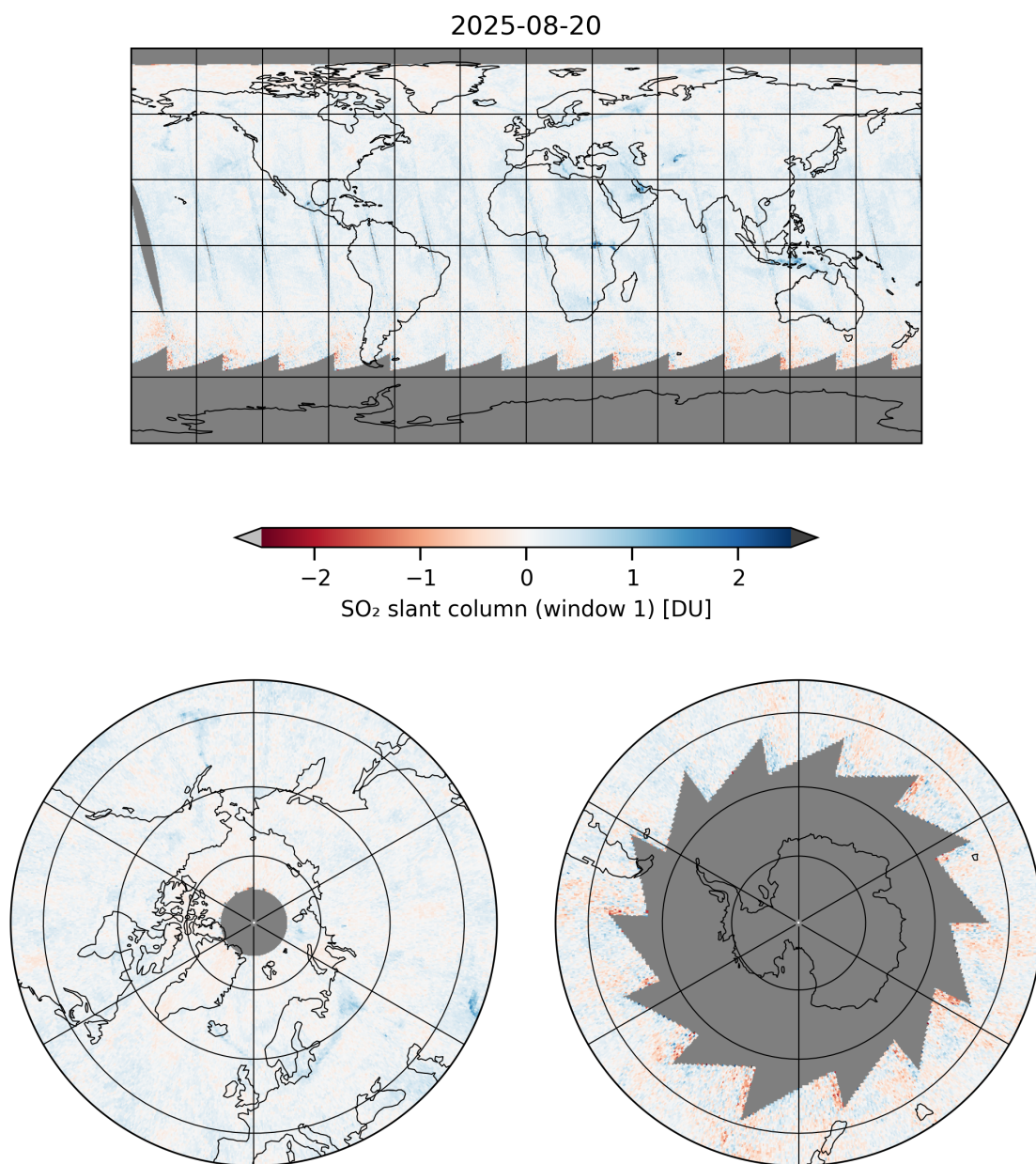


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-08-20 to 2025-08-21

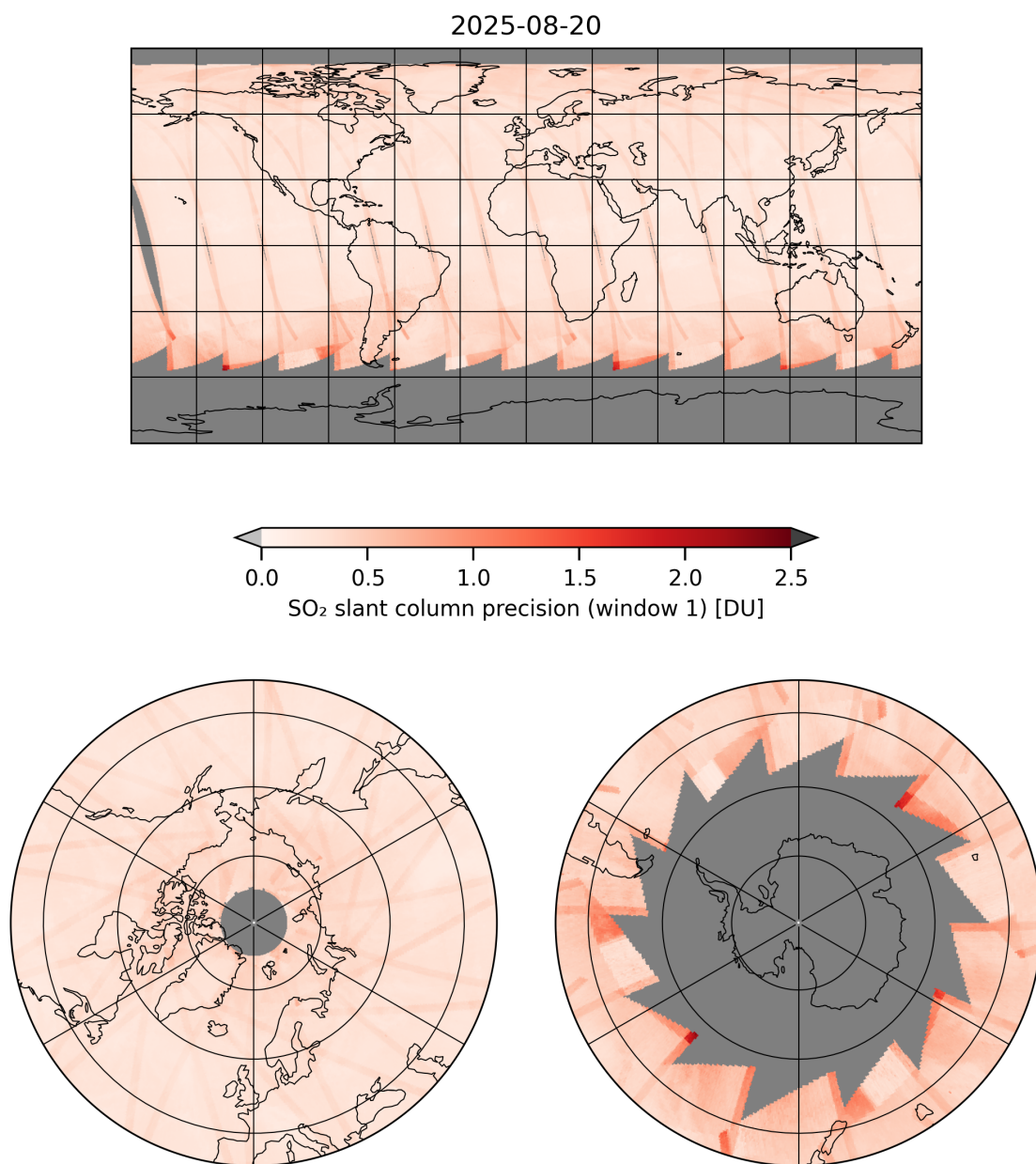


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-08-20 to 2025-08-21

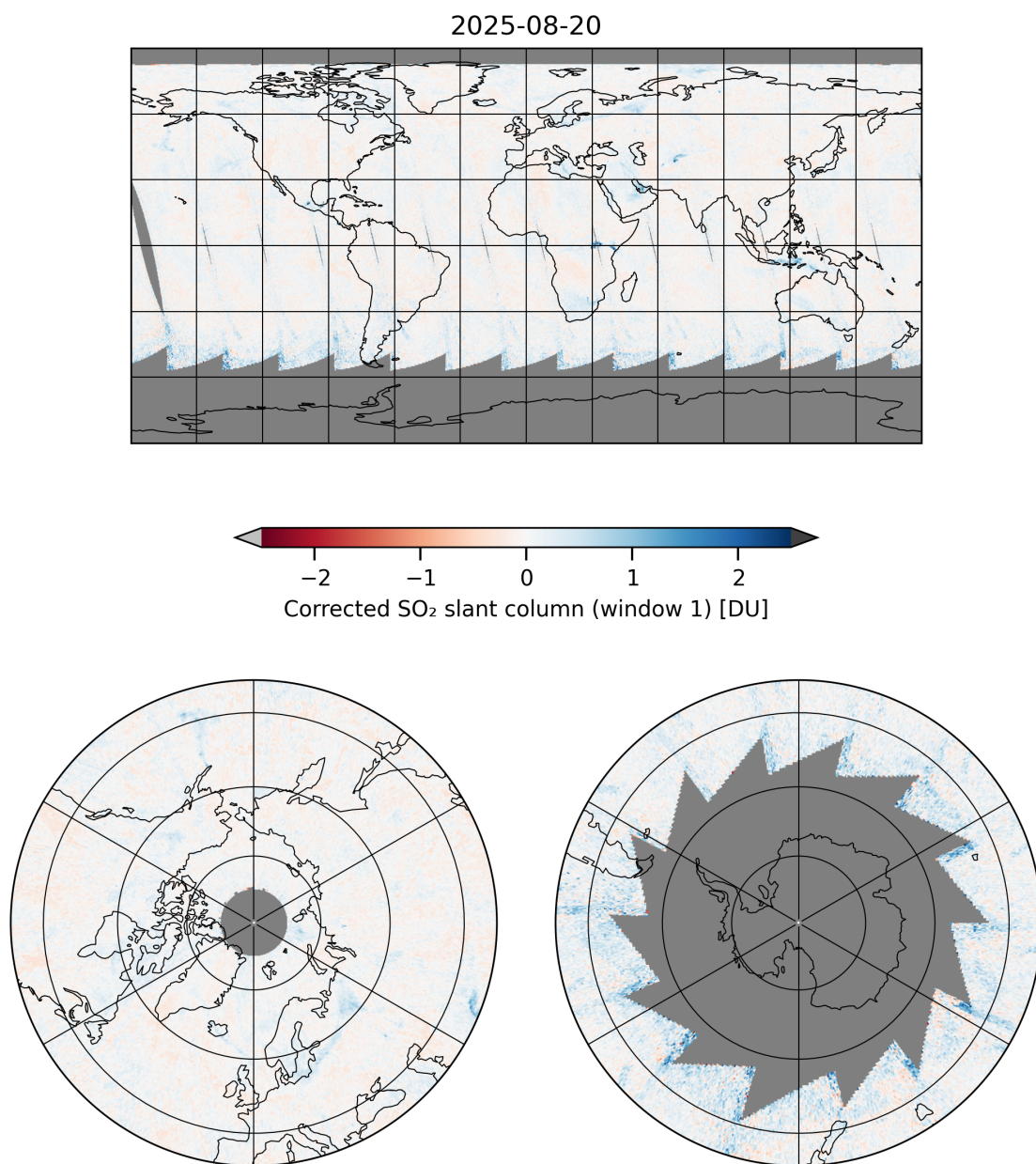


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-08-20 to 2025-08-21

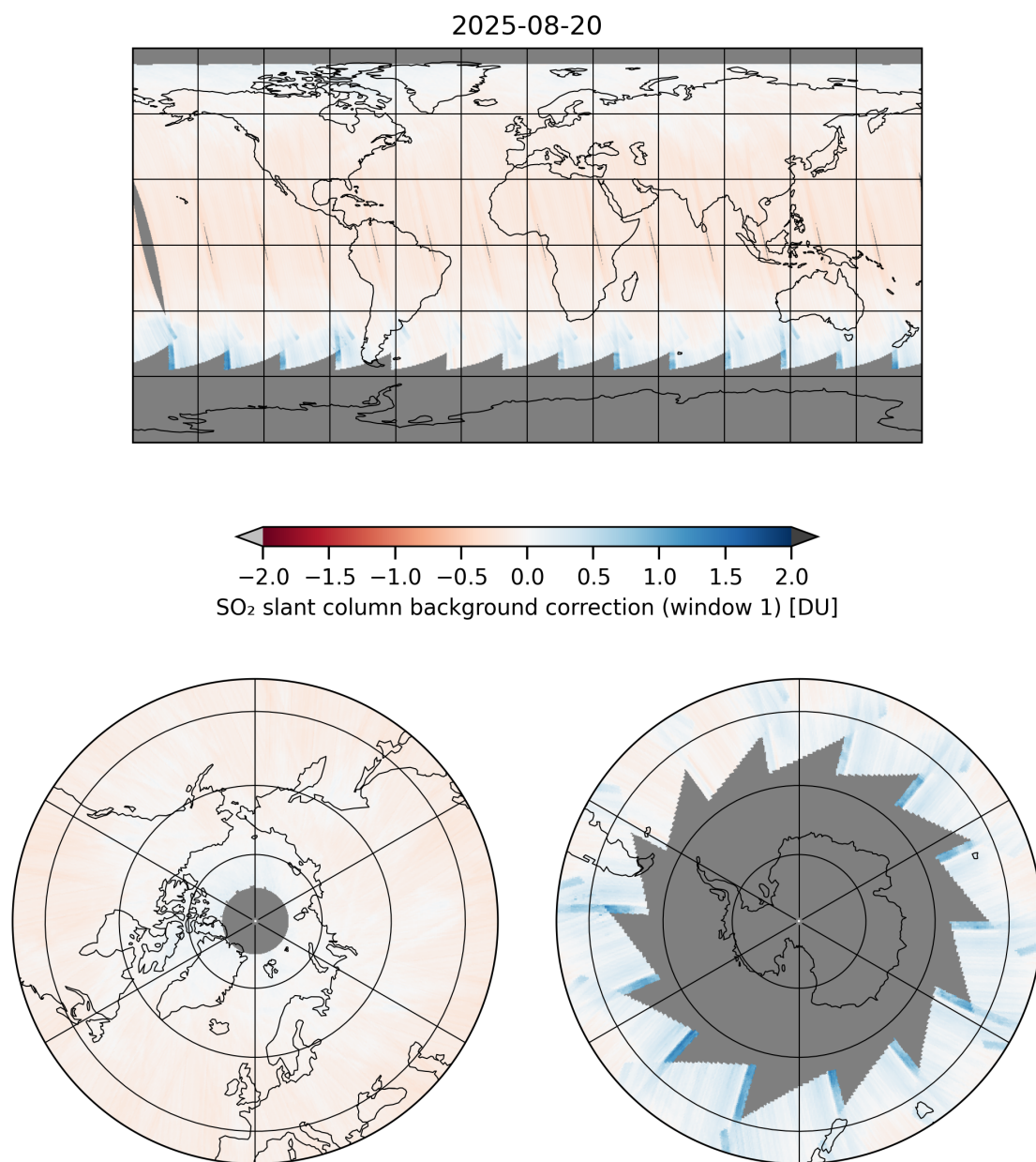


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-08-20 to 2025-08-21

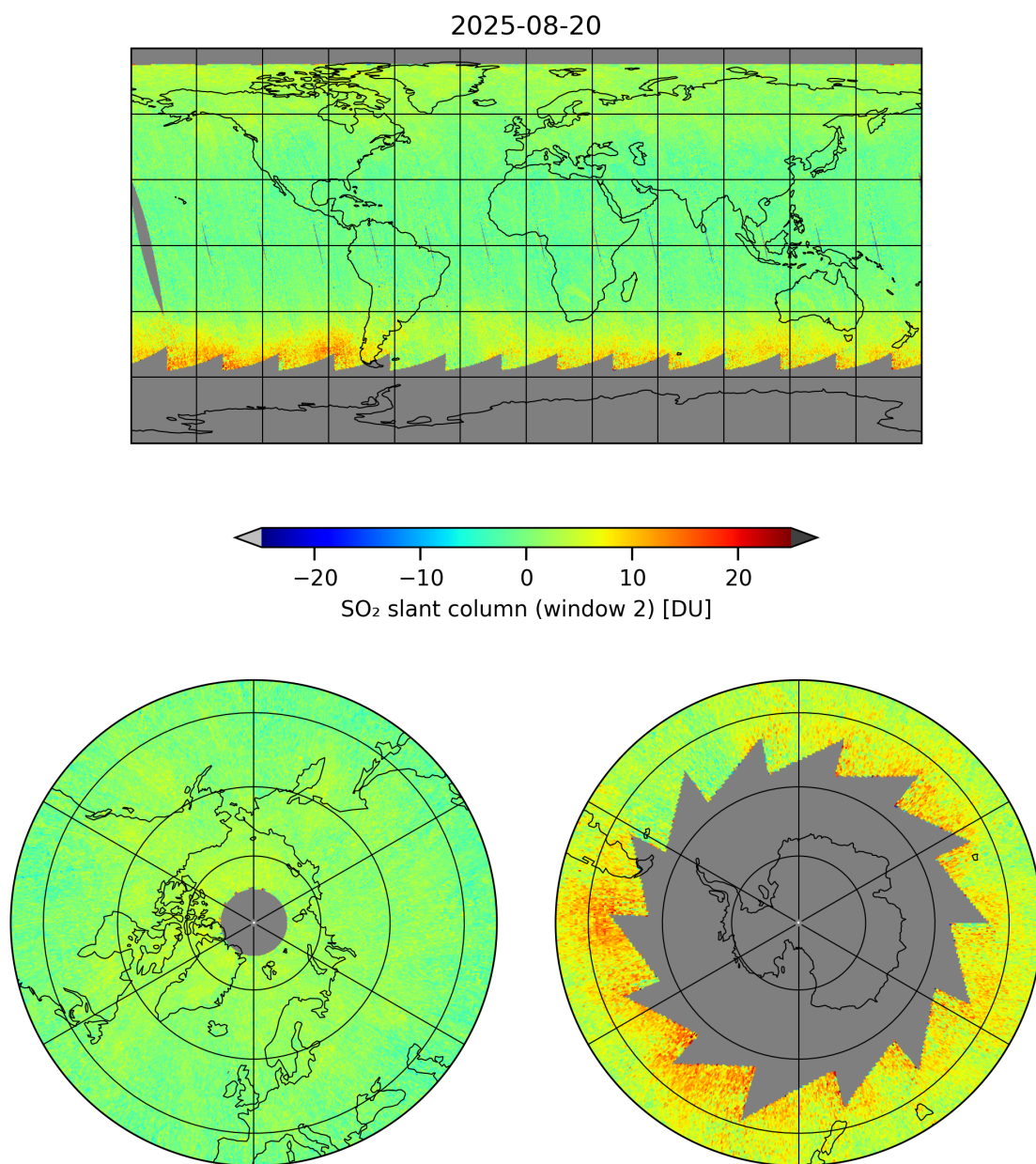


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-08-20 to 2025-08-21

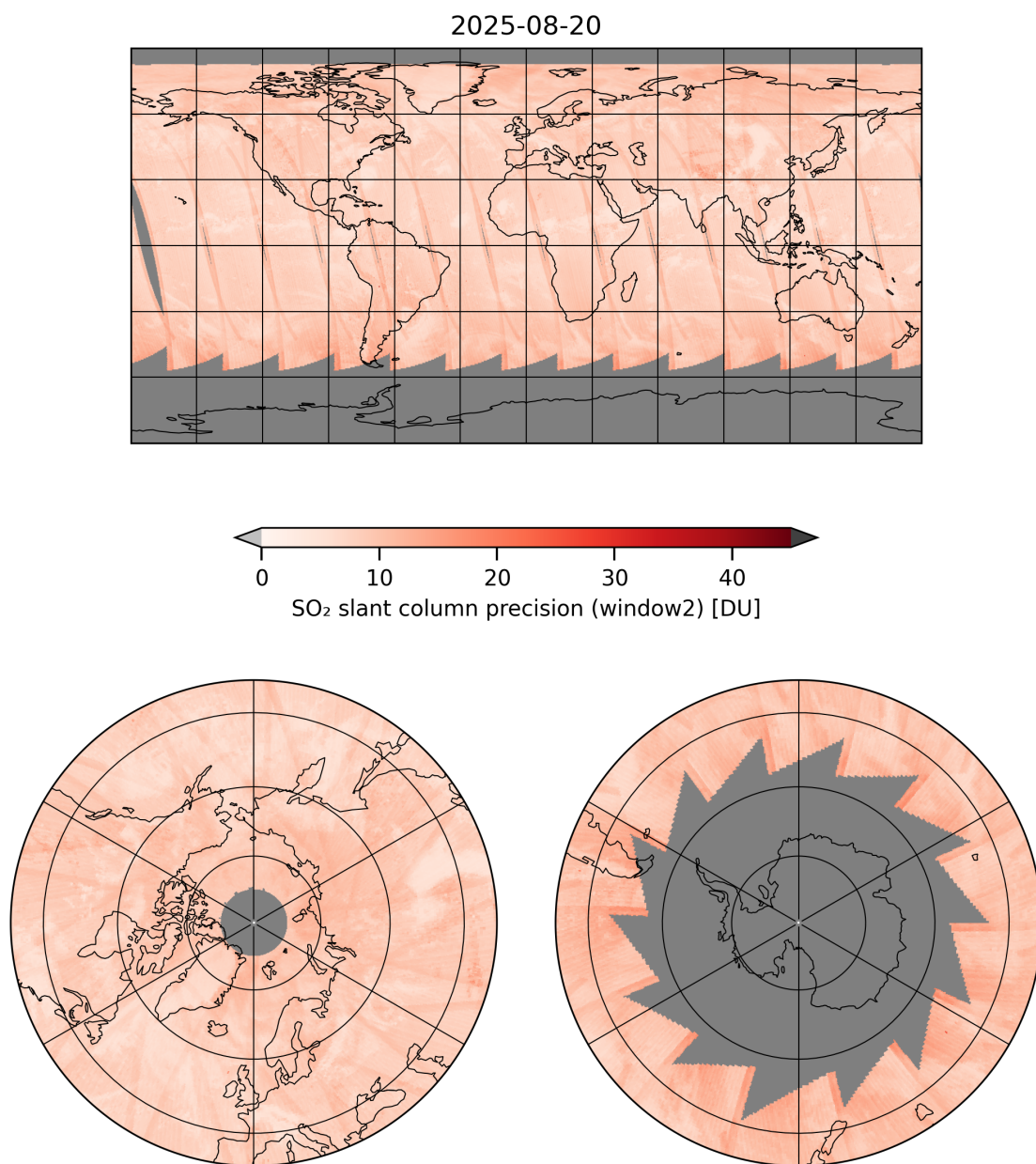


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-08-20 to 2025-08-21

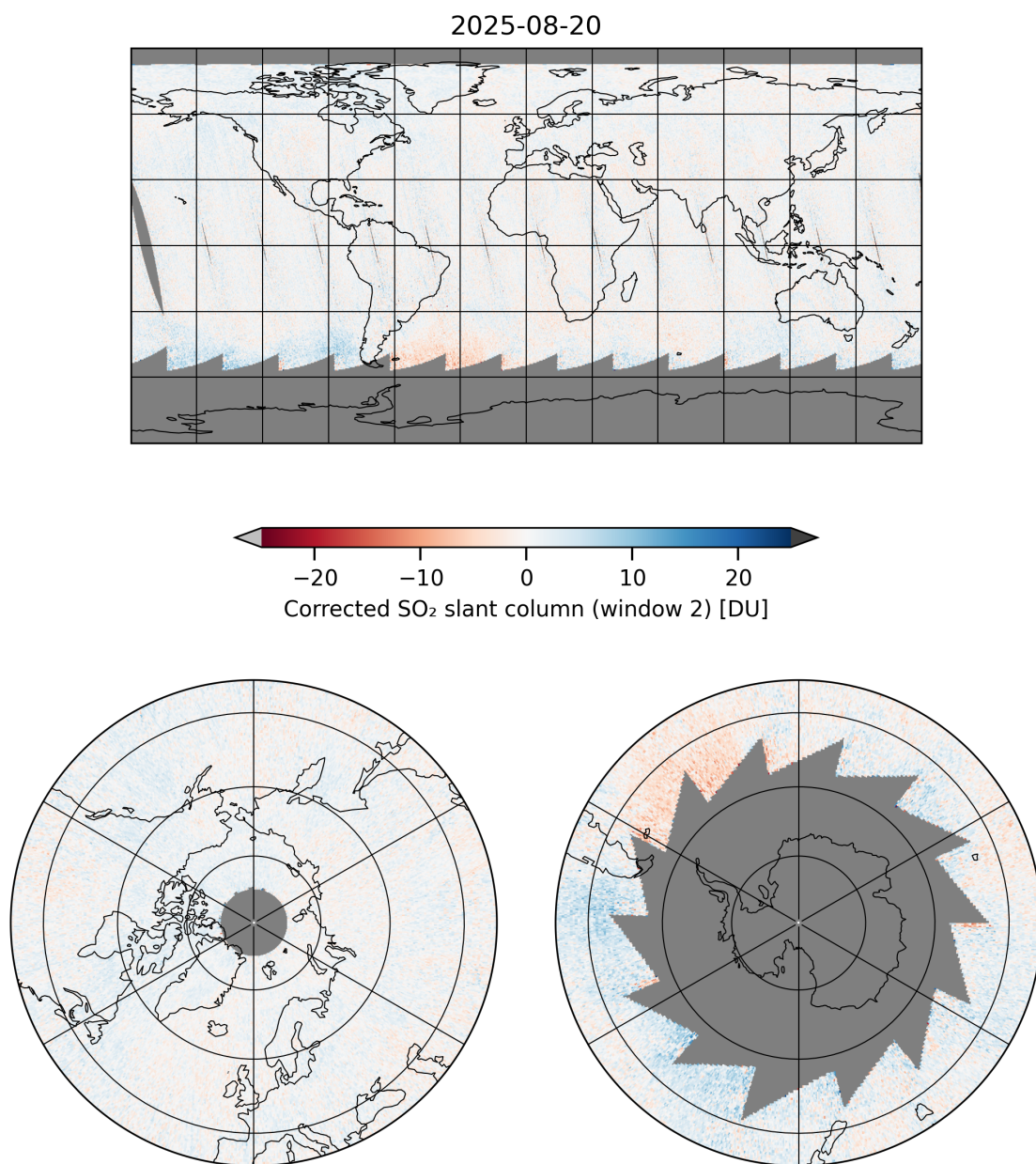


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-08-20 to 2025-08-21

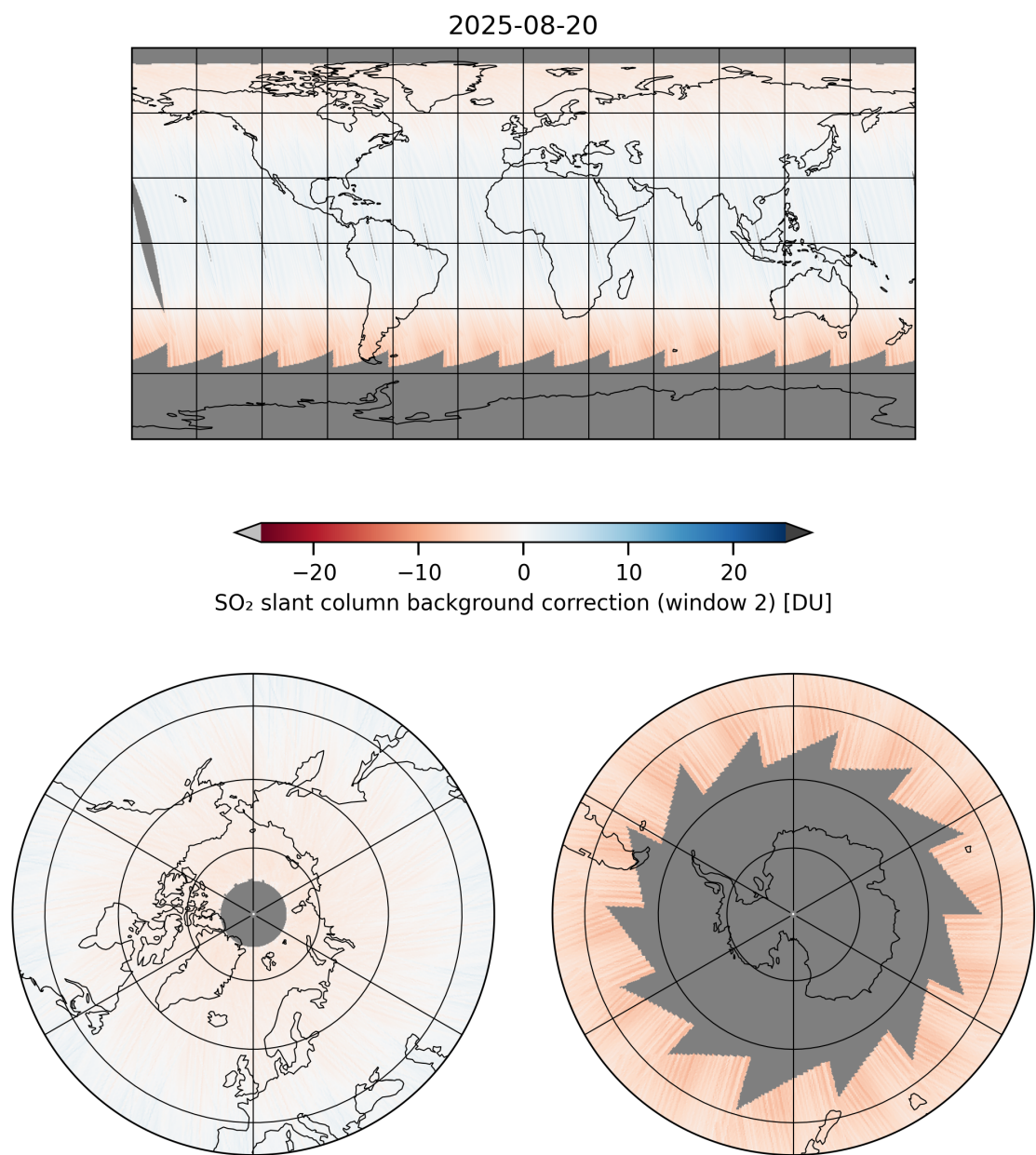


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-08-20 to 2025-08-21

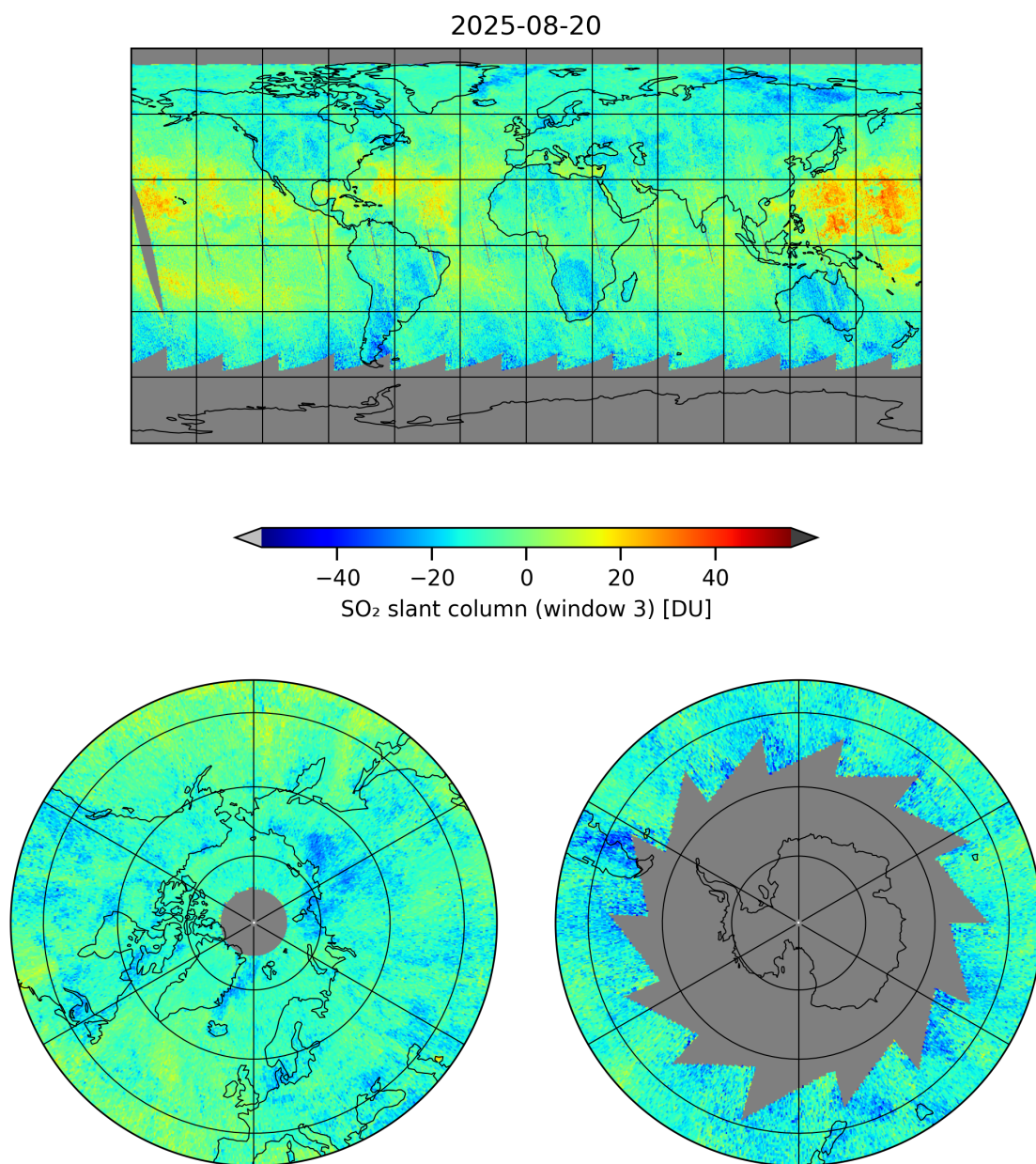


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-08-20 to 2025-08-21

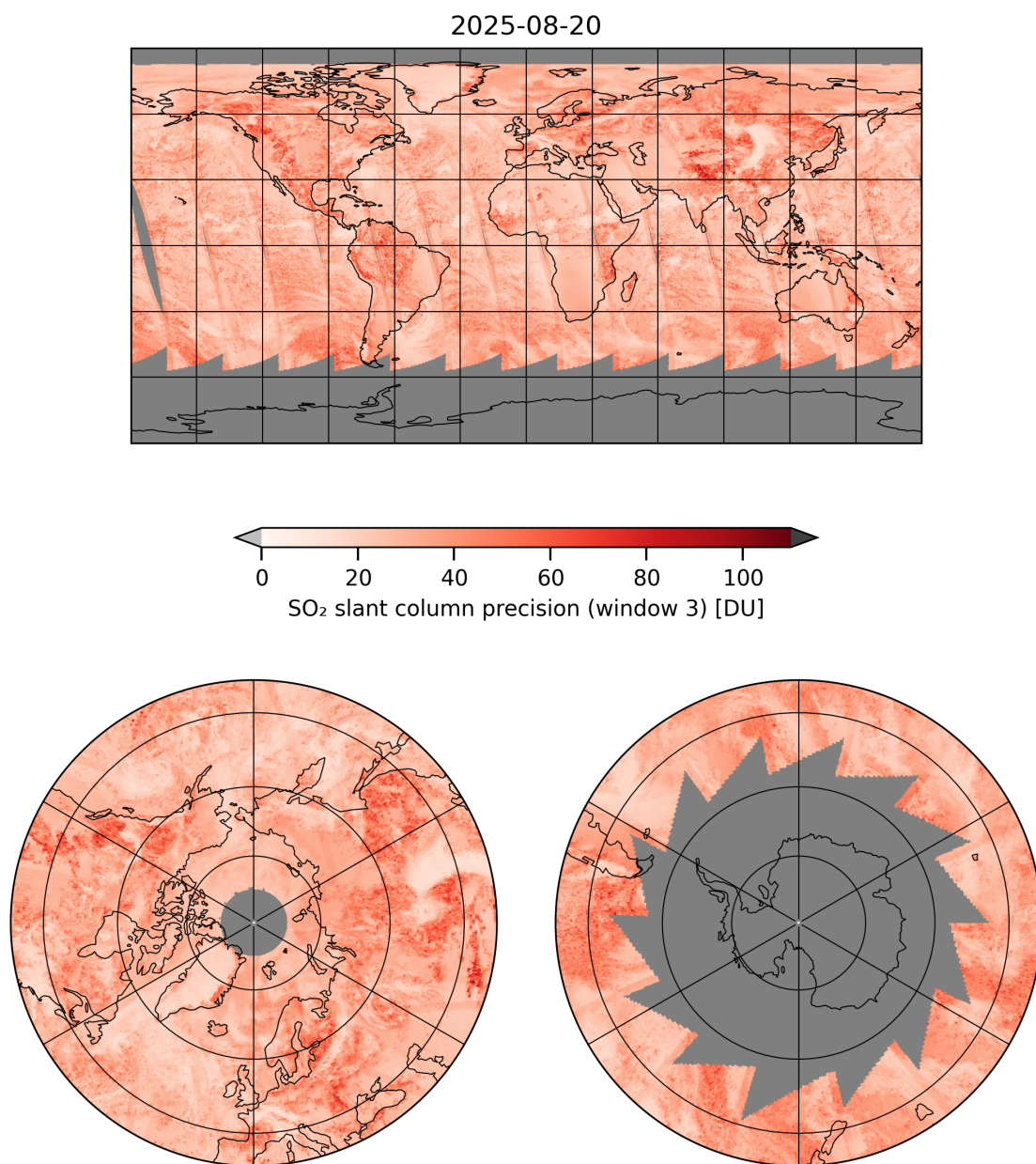


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-08-20 to 2025-08-21

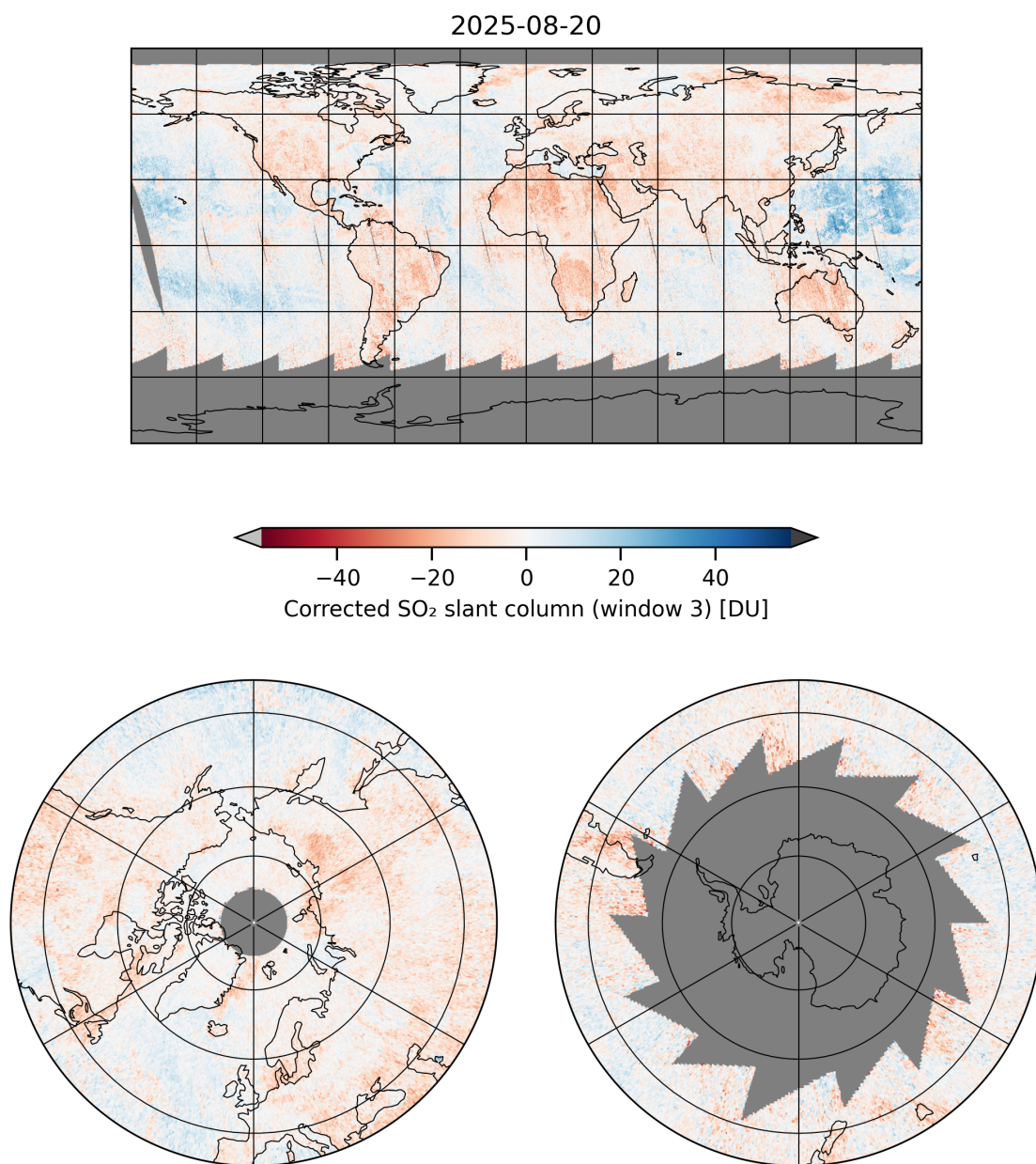


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-08-20 to 2025-08-21

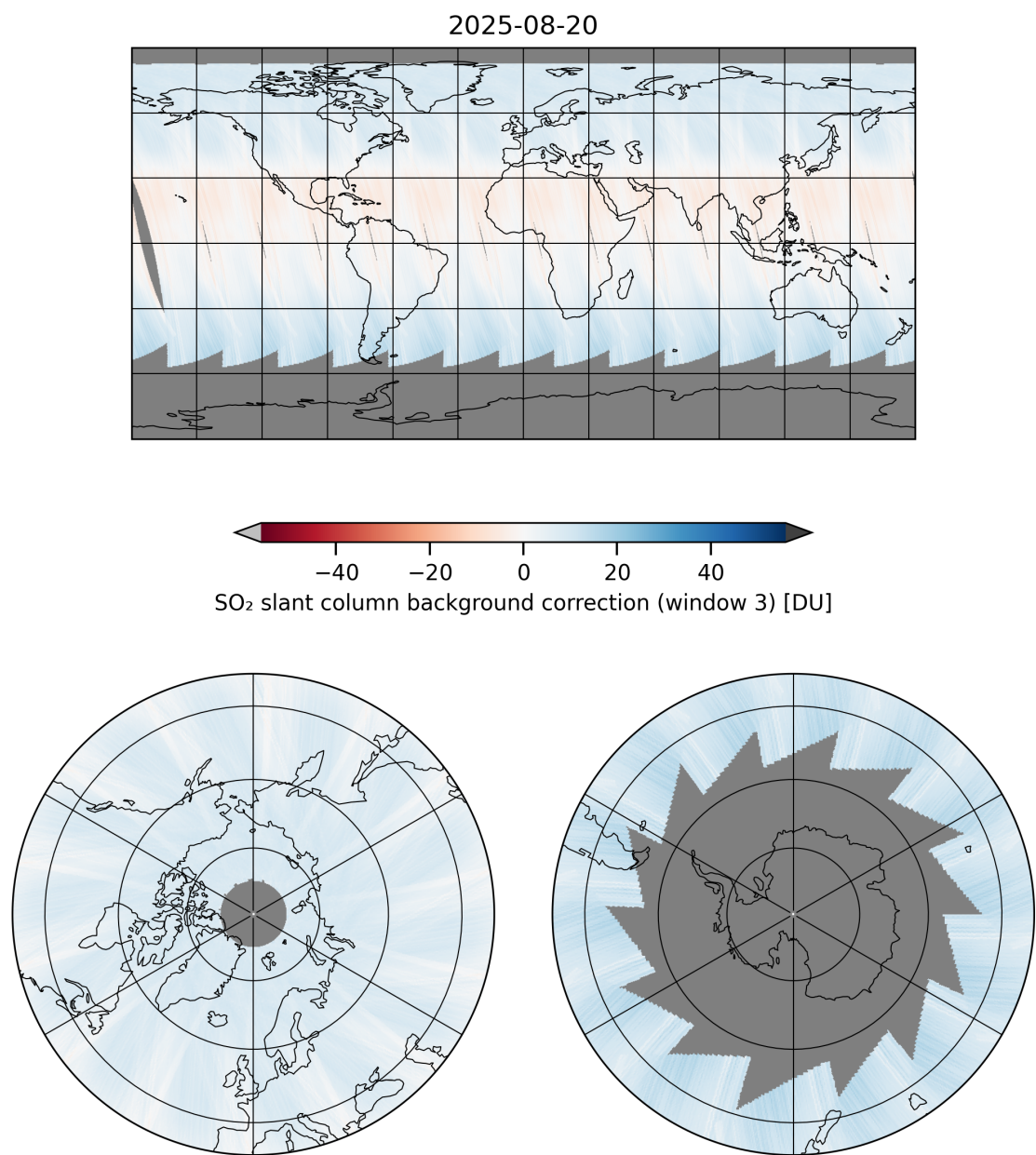


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-08-20 to 2025-08-21

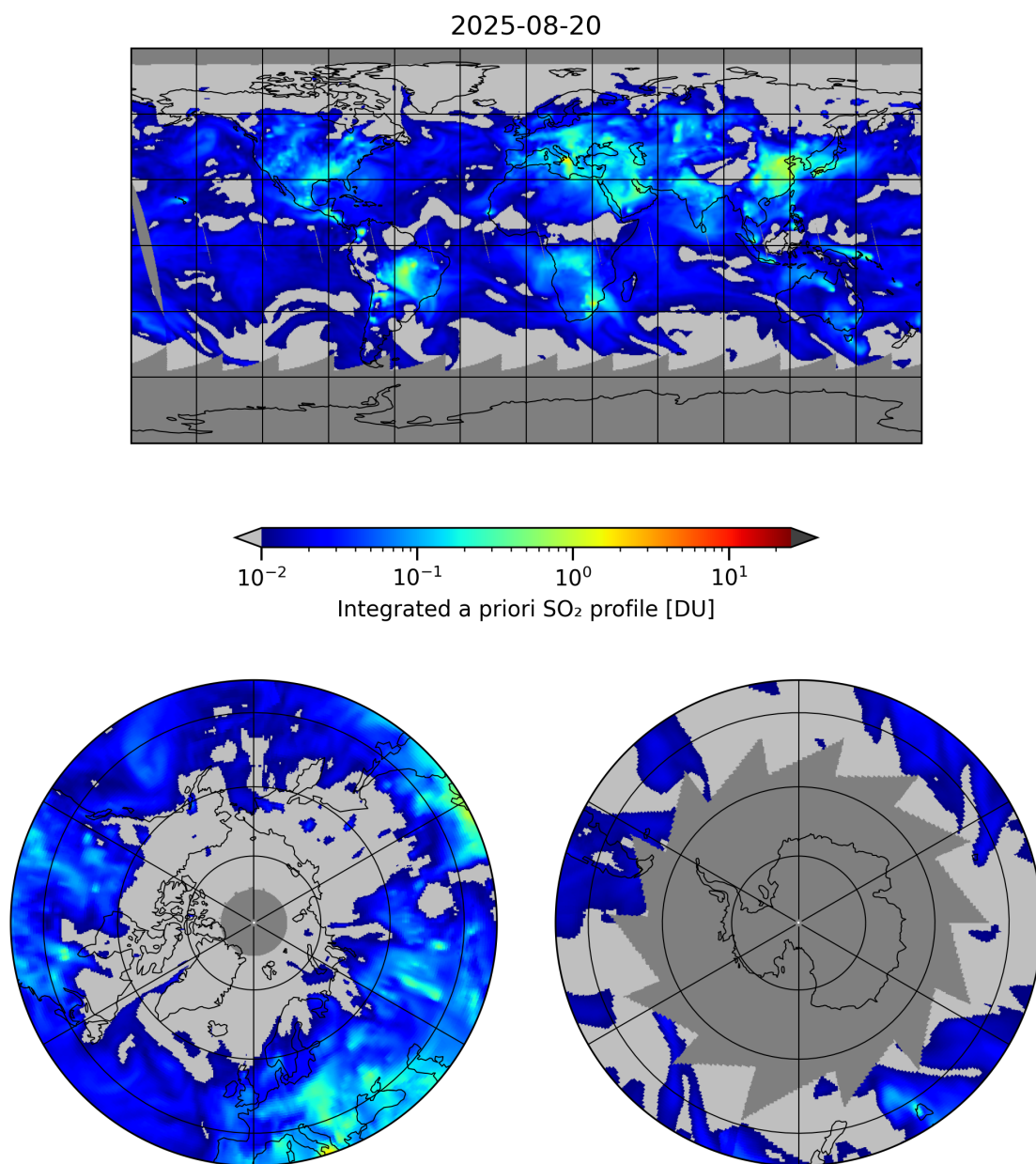


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-08-20 to 2025-08-21

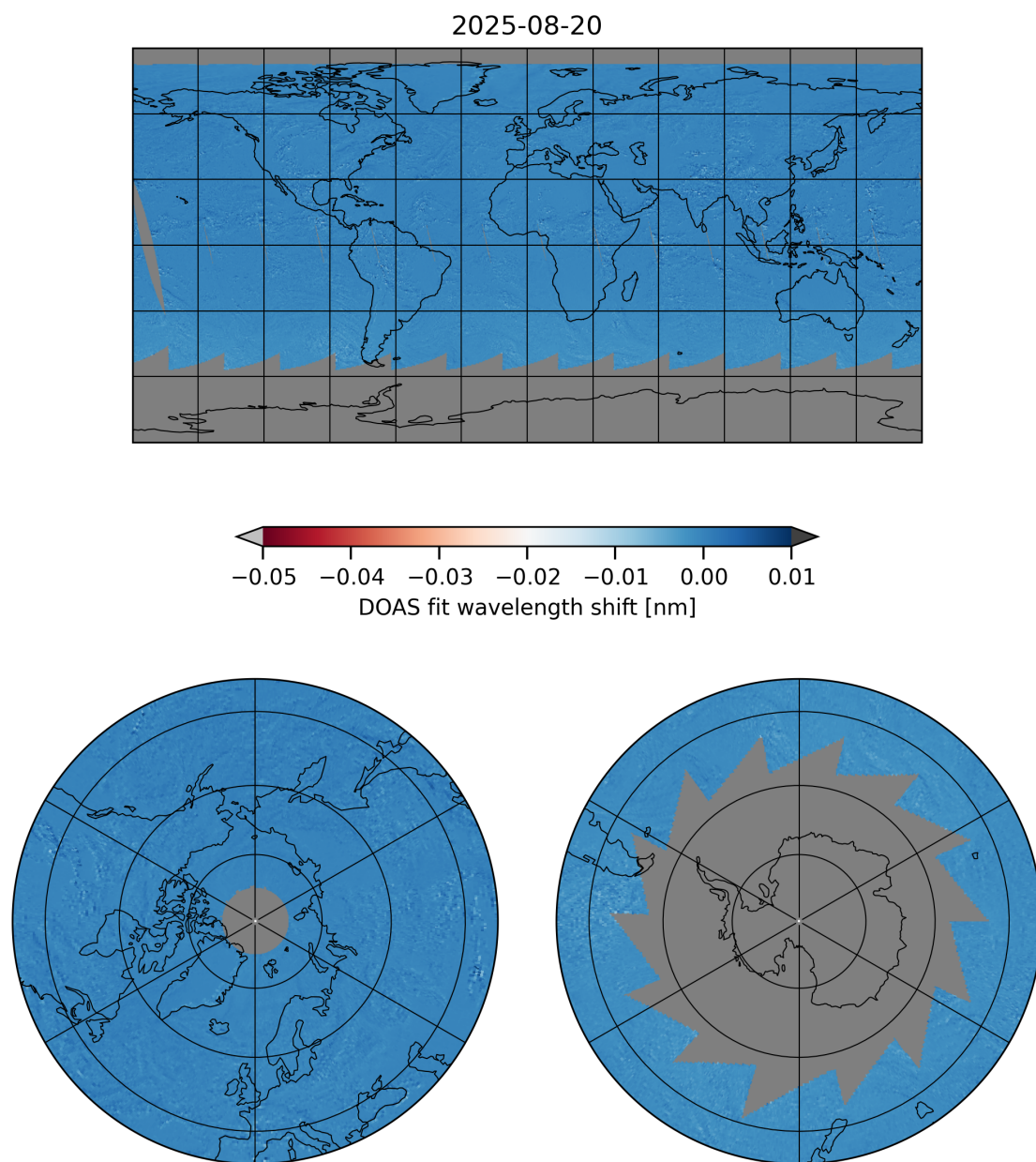


Figure 22: Map of “DOAS fit wavelength shift” for 2025-08-20 to 2025-08-21

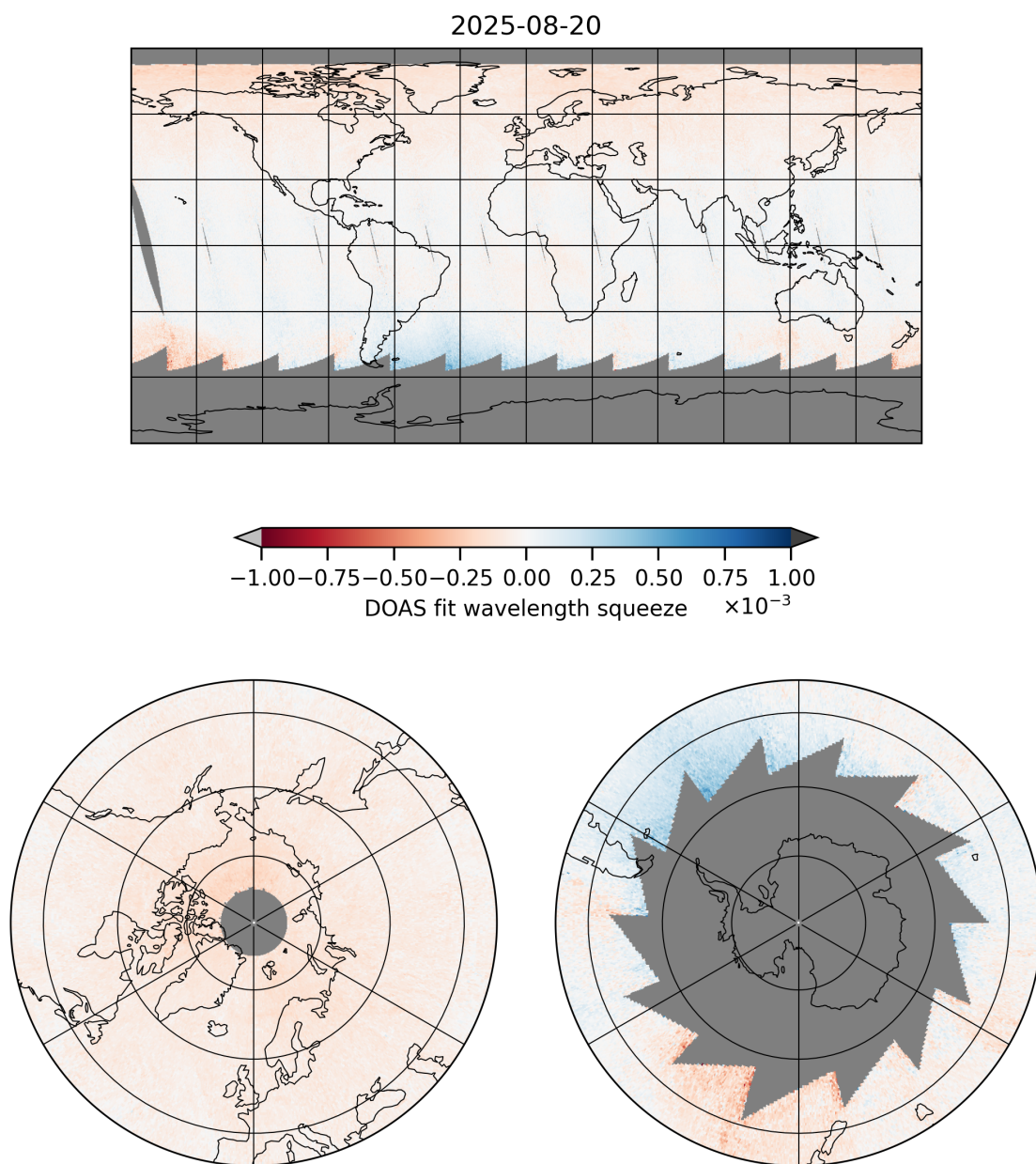


Figure 23: Map of "DOAS fit wavelength squeeze" for 2025-08-20 to 2025-08-21

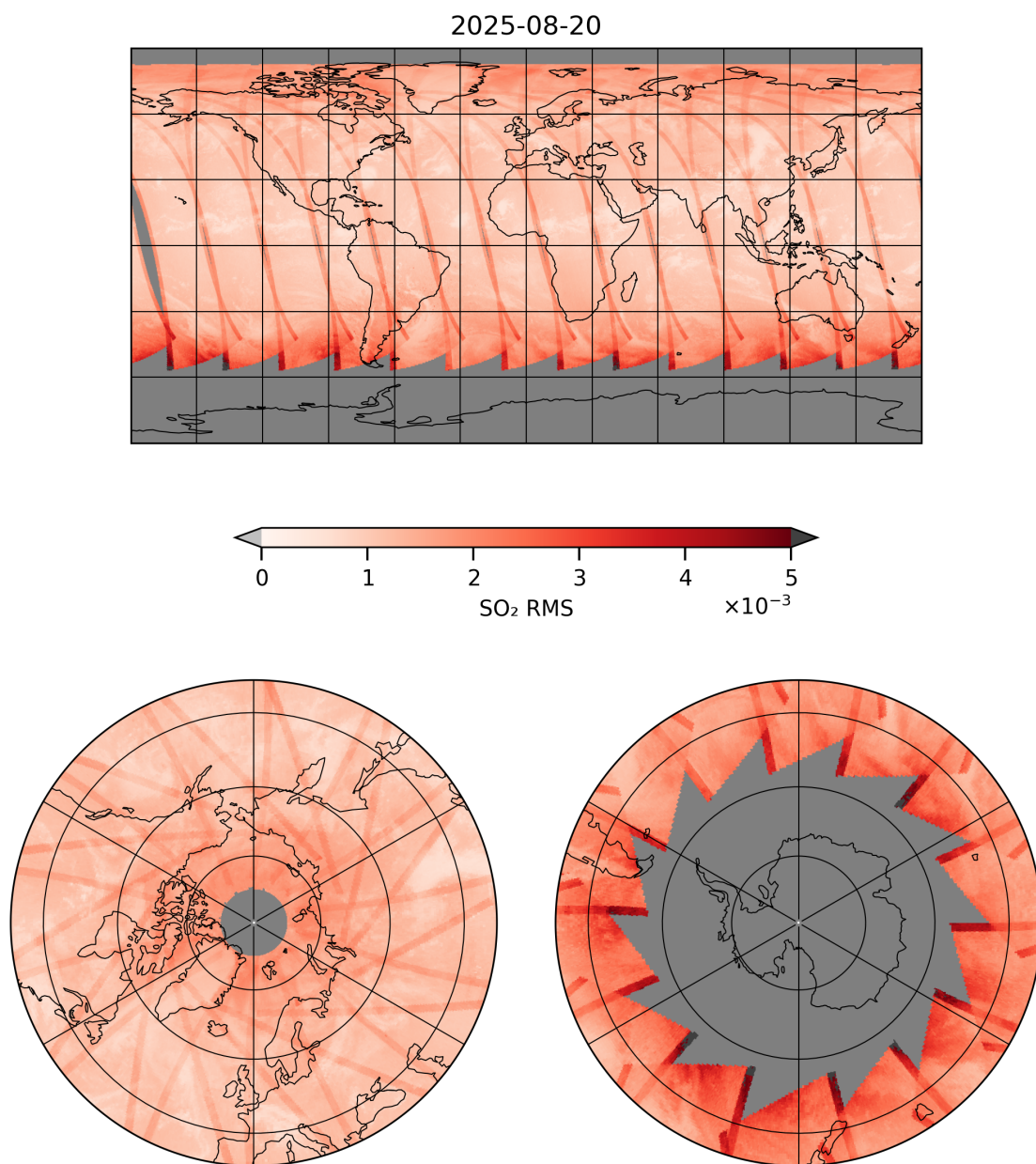


Figure 24: Map of “SO₂ RMS” for 2025-08-20 to 2025-08-21

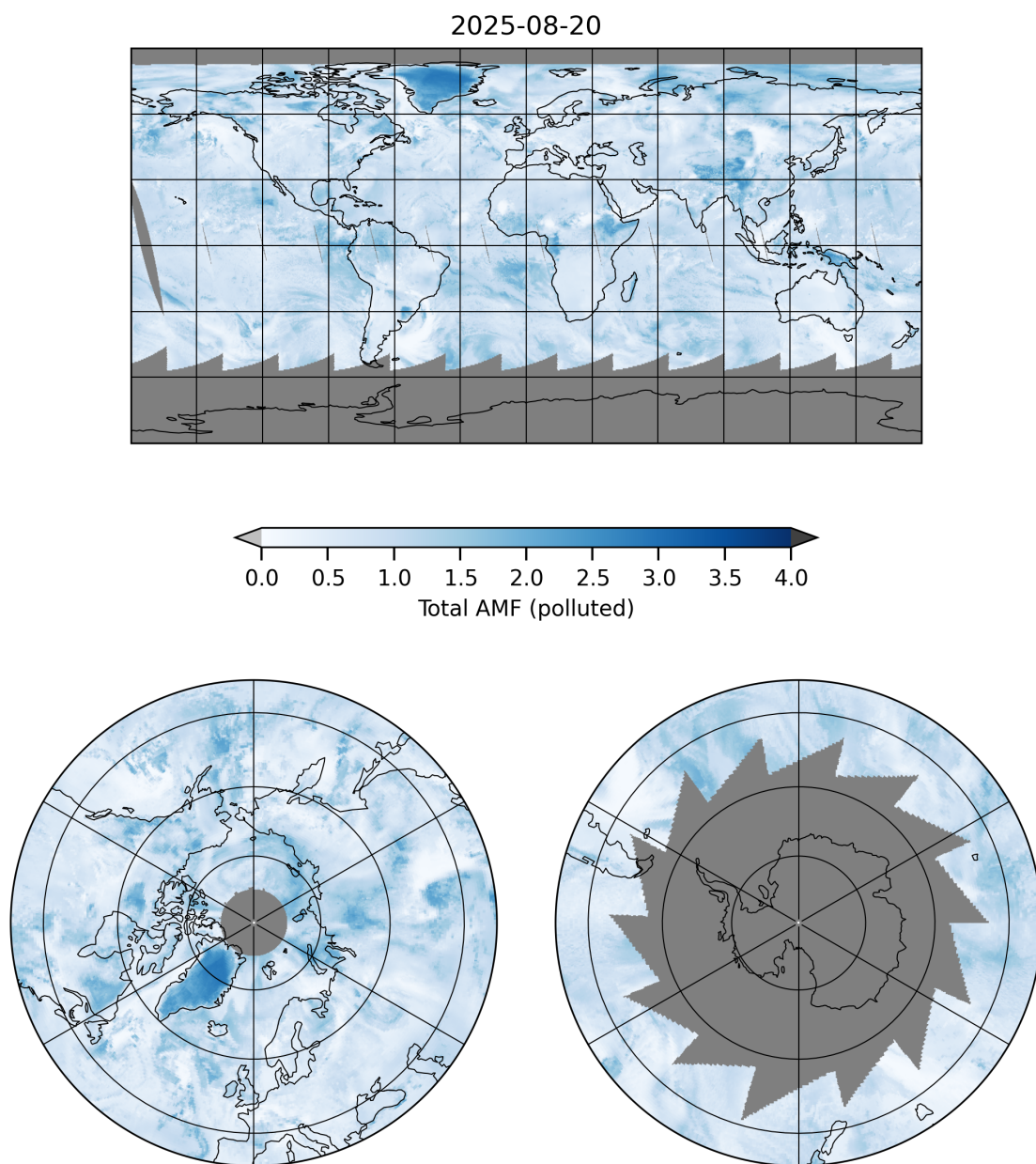


Figure 25: Map of “Total AMF (polluted)” for 2025-08-20 to 2025-08-21

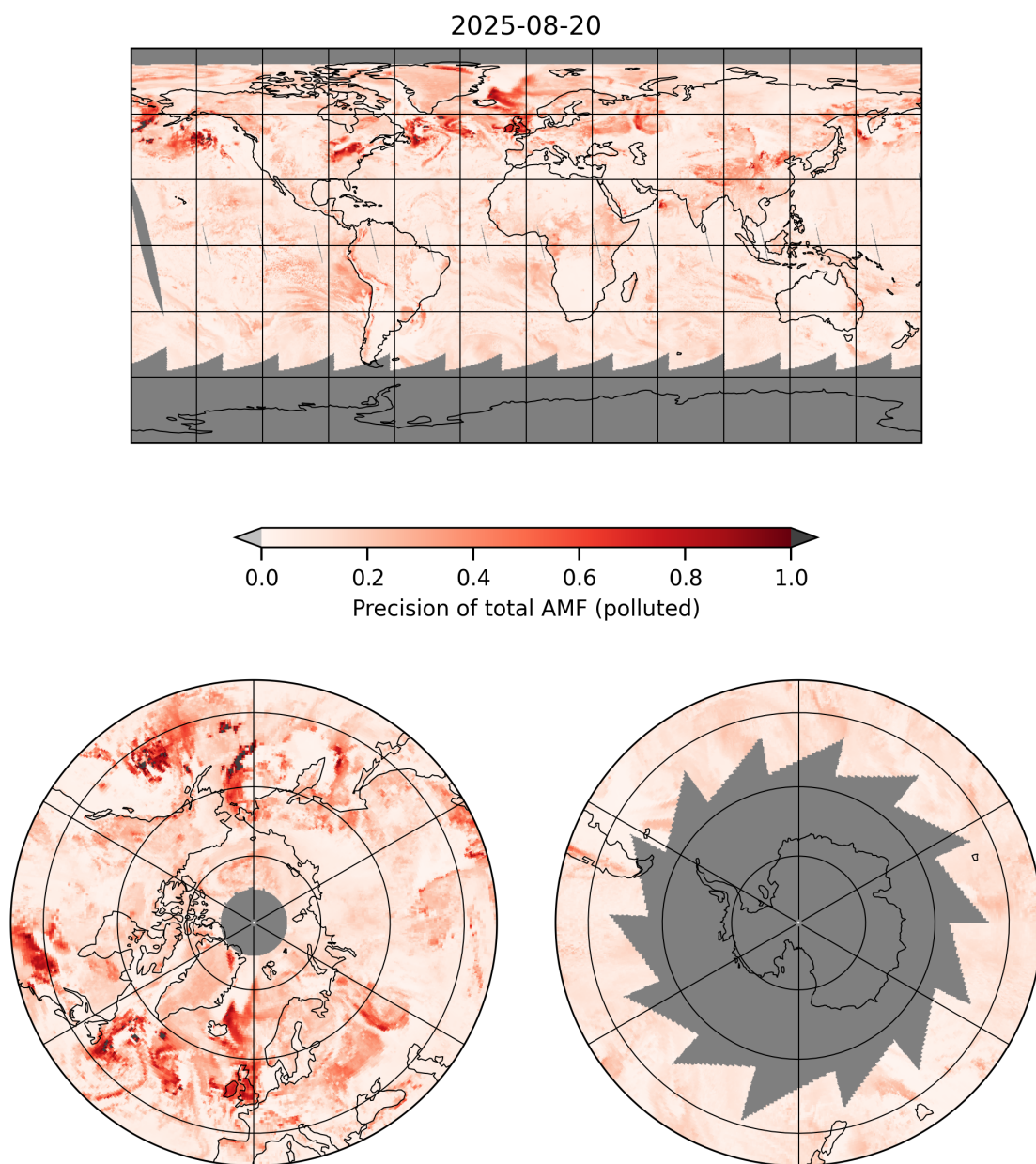


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-08-20 to 2025-08-21

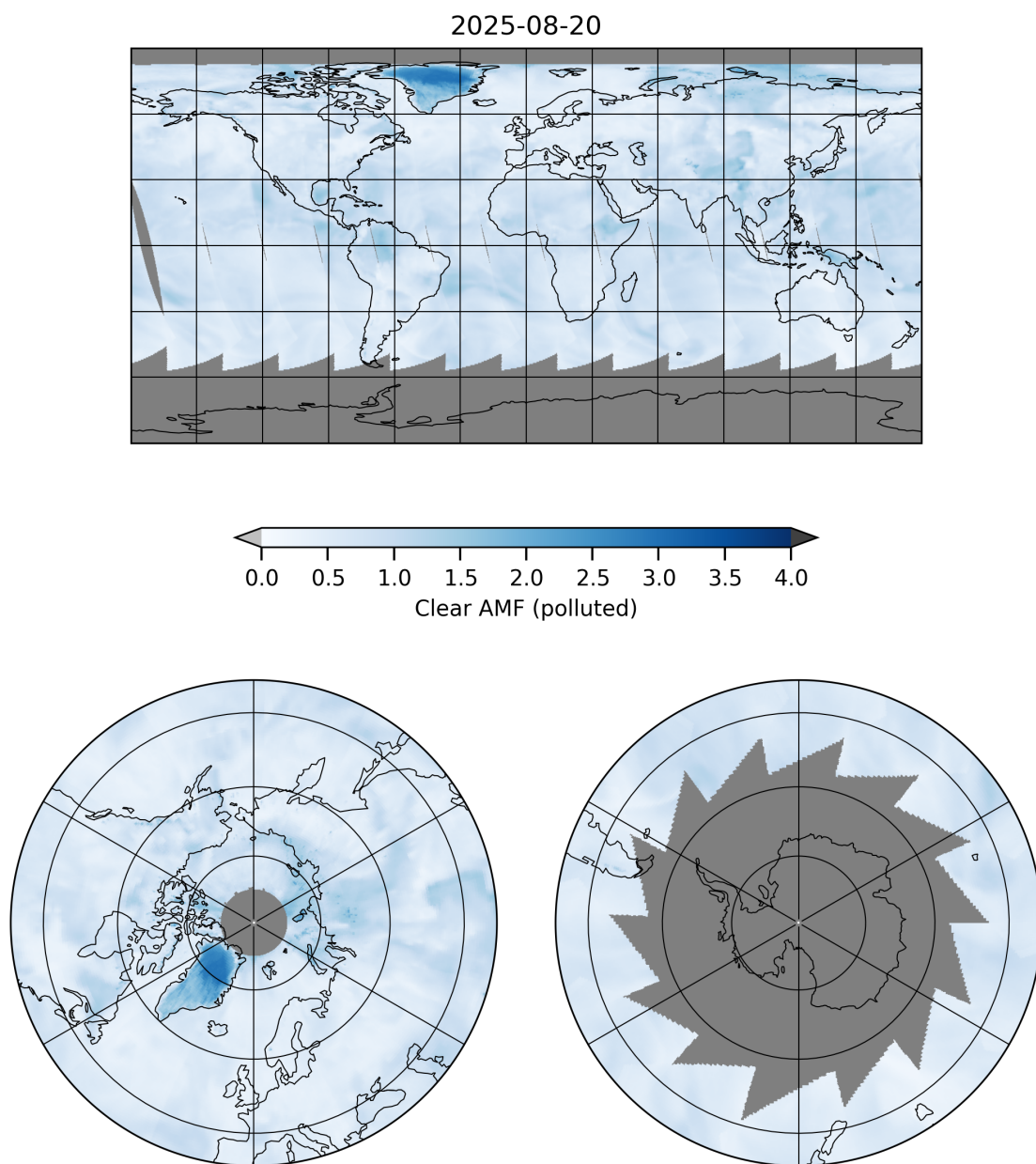


Figure 27: Map of “Clear AMF (polluted)” for 2025-08-20 to 2025-08-21

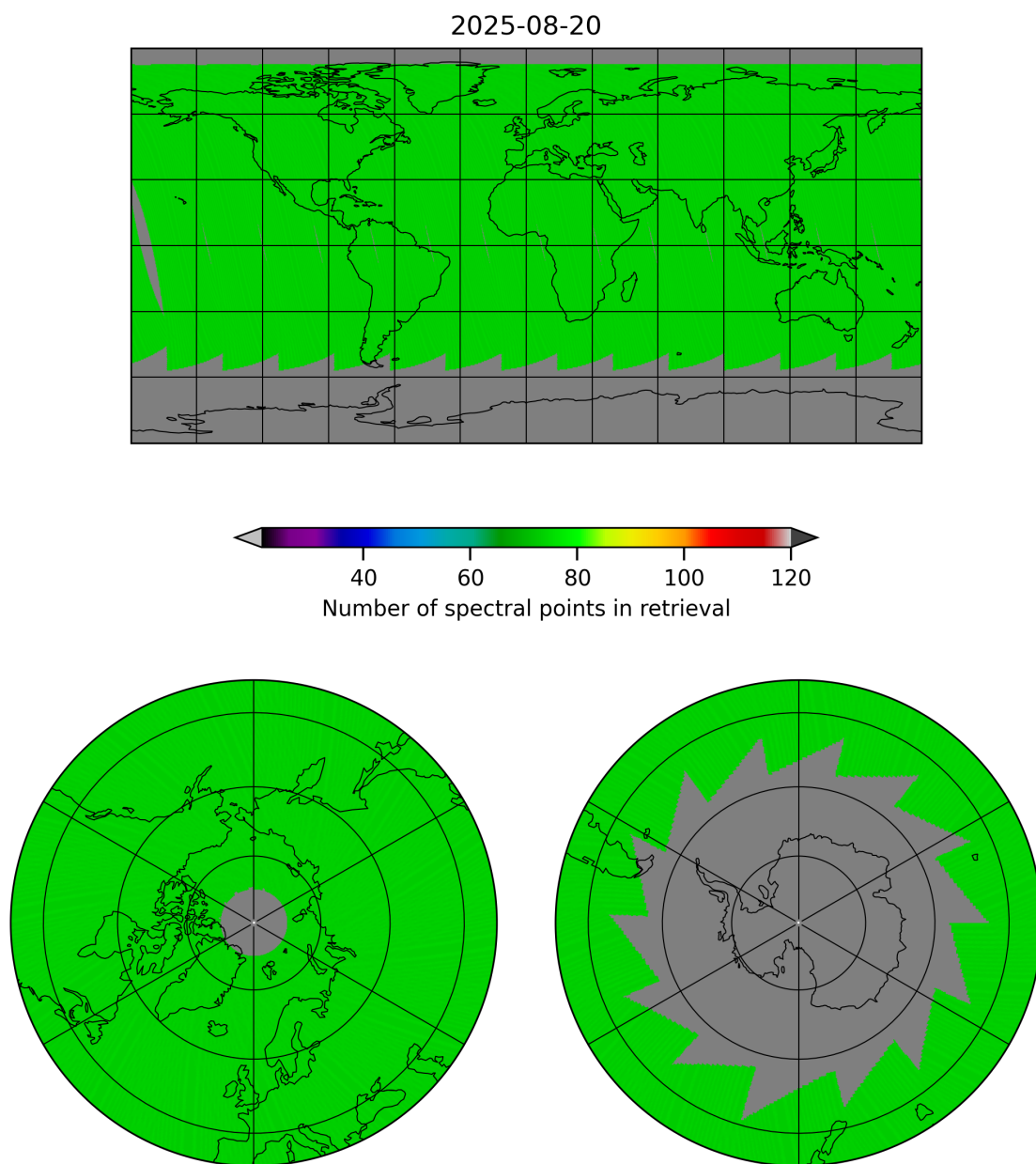


Figure 28: Map of “Number of spectral points in retrieval” for 2025-08-20 to 2025-08-21

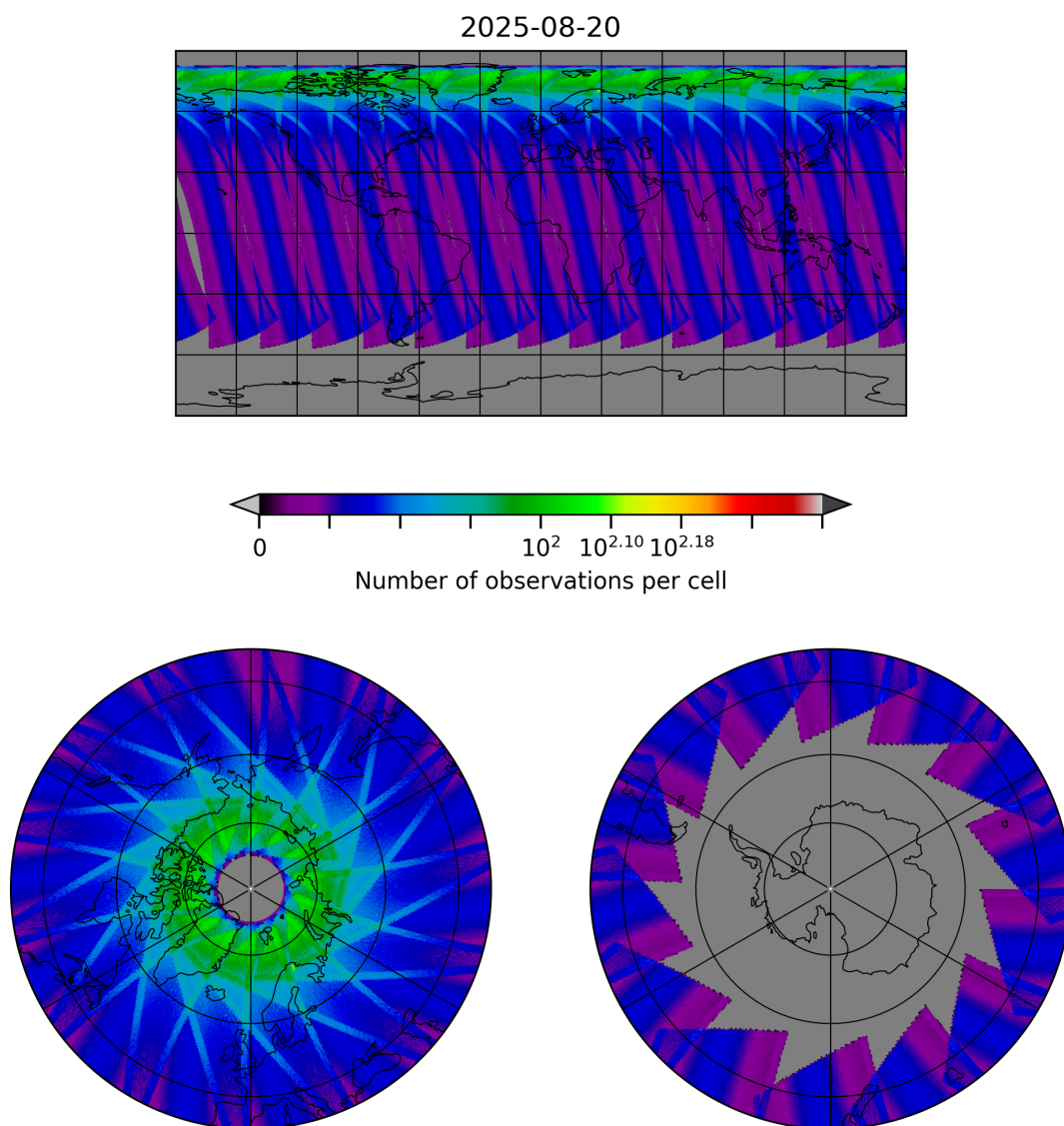


Figure 29: Map of the number of observations for 2025-08-20 to 2025-08-21

7 Zonal average

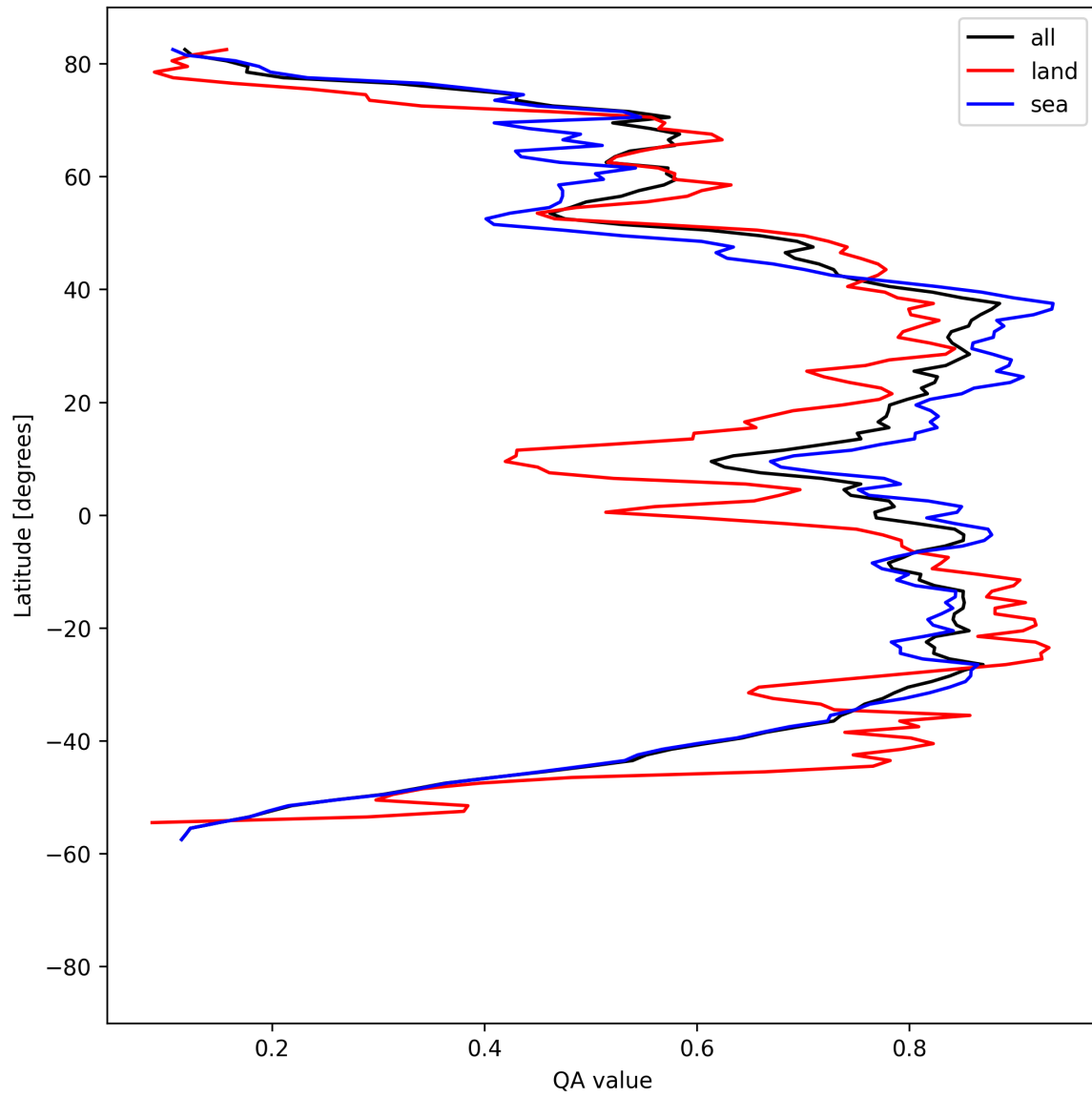


Figure 30: Zonal average of “QA value” for 2025-08-20 to 2025-08-21.

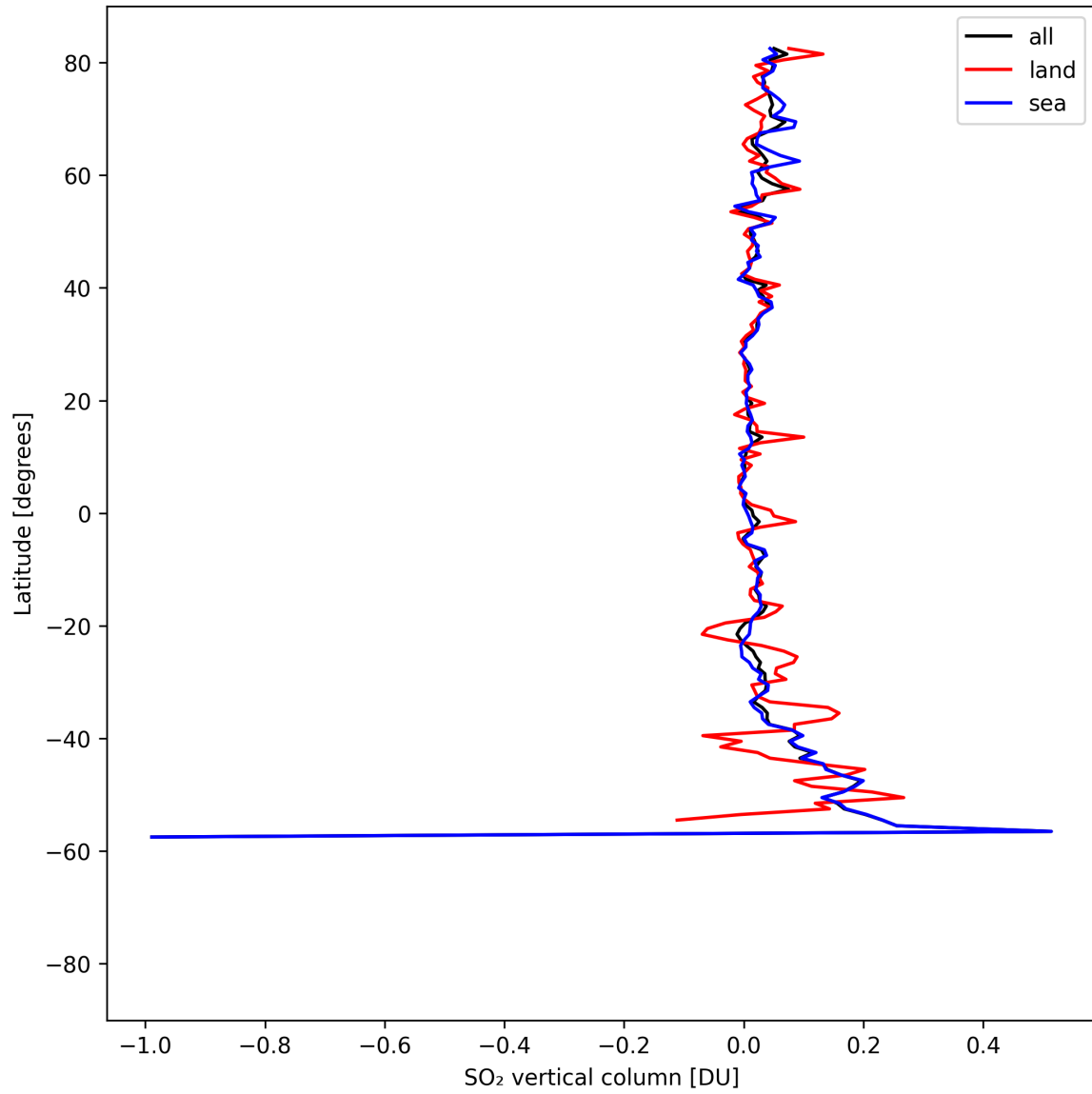


Figure 31: Zonal average of “SO₂ vertical column” for 2025-08-20 to 2025-08-21.

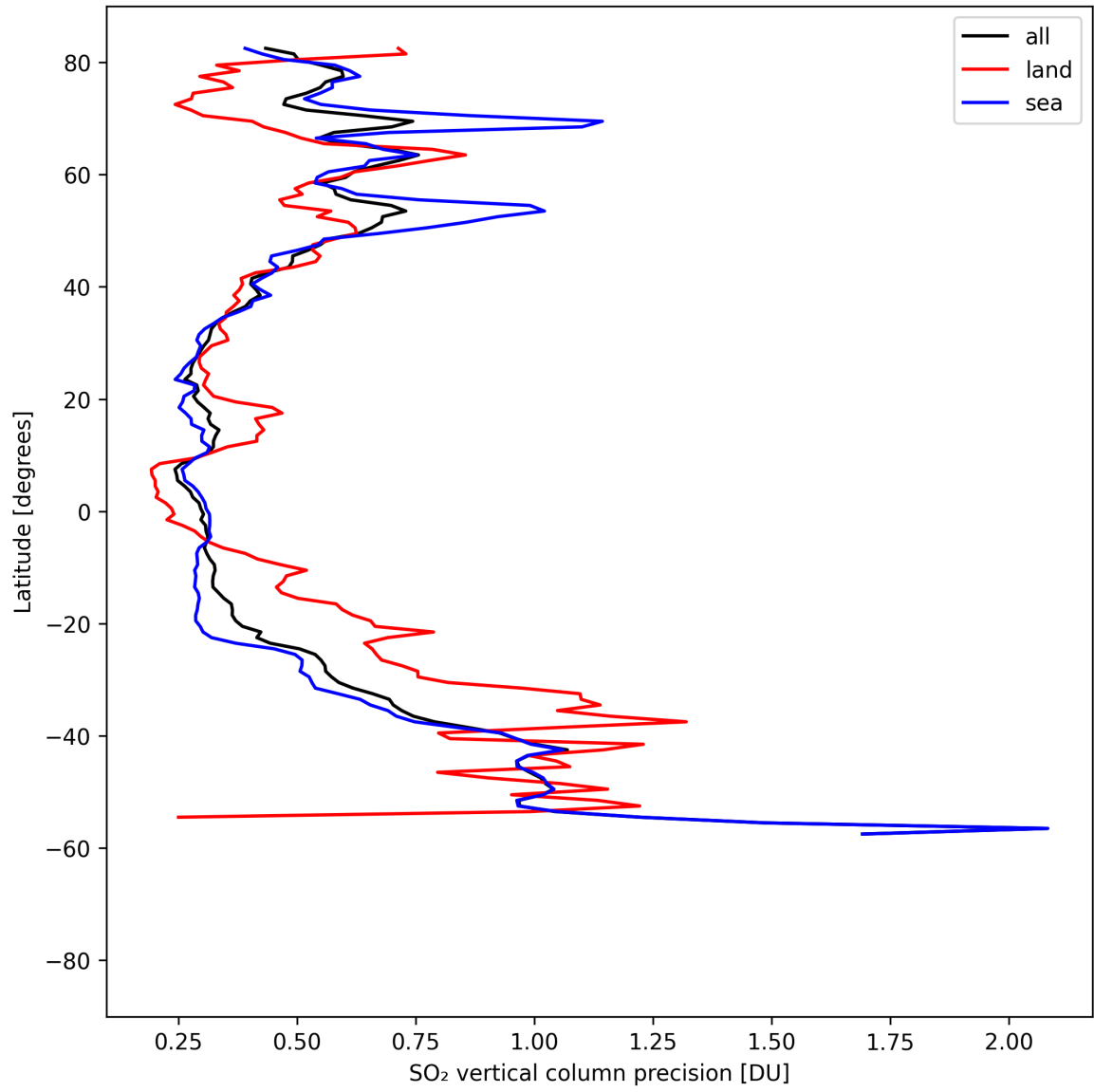


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-08-20 to 2025-08-21.

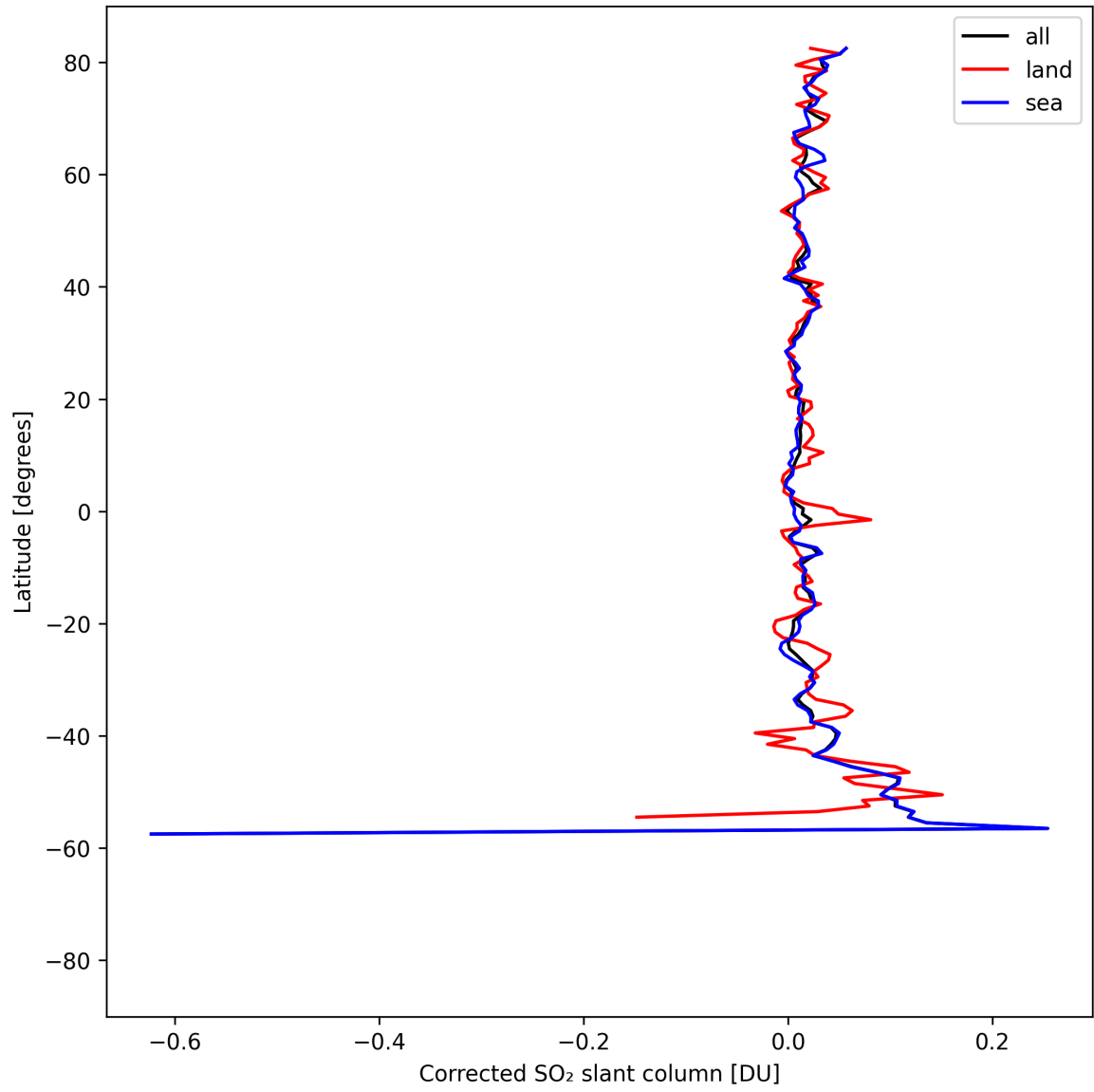


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-08-20 to 2025-08-21.

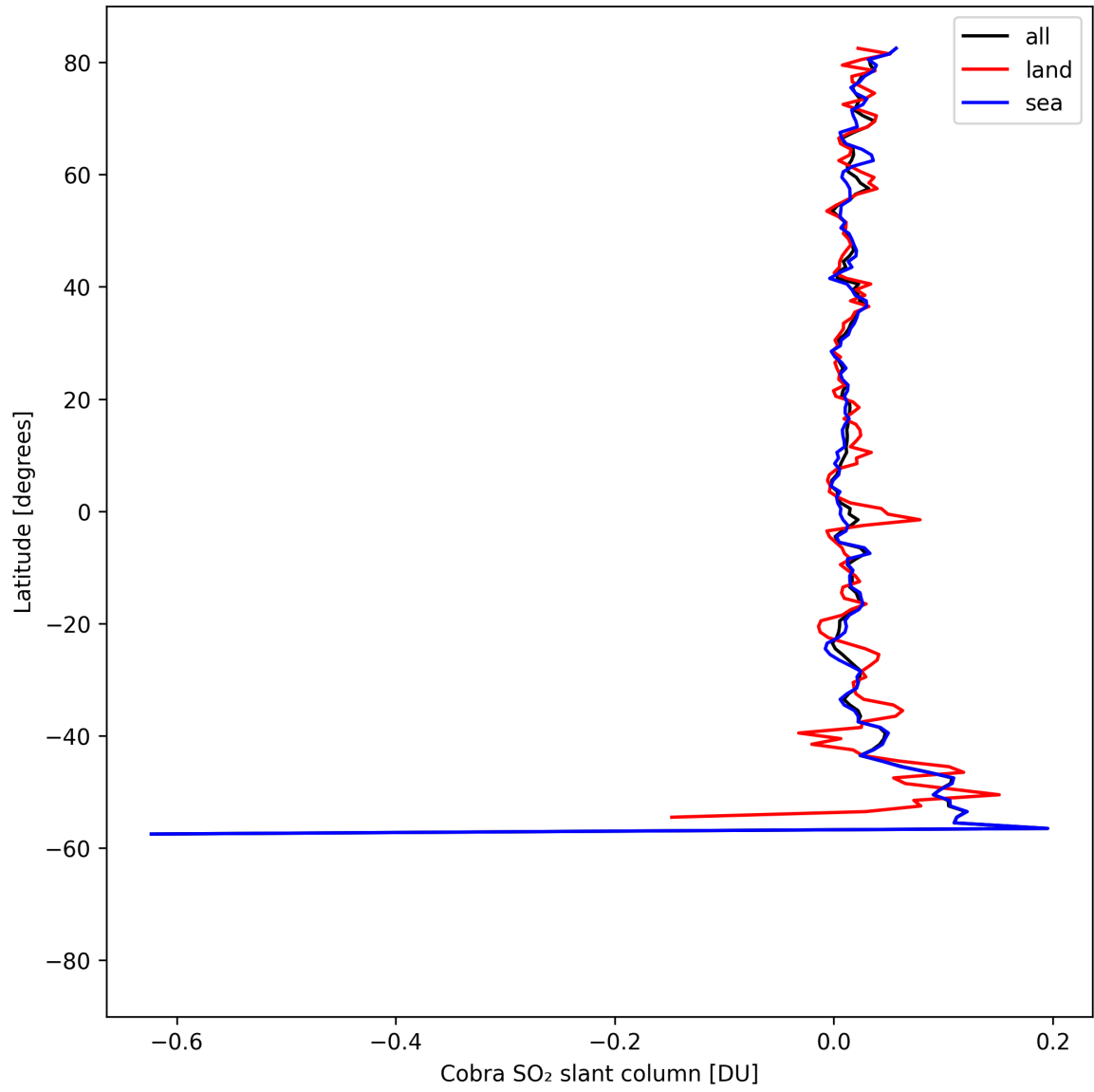


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-08-20 to 2025-08-21.

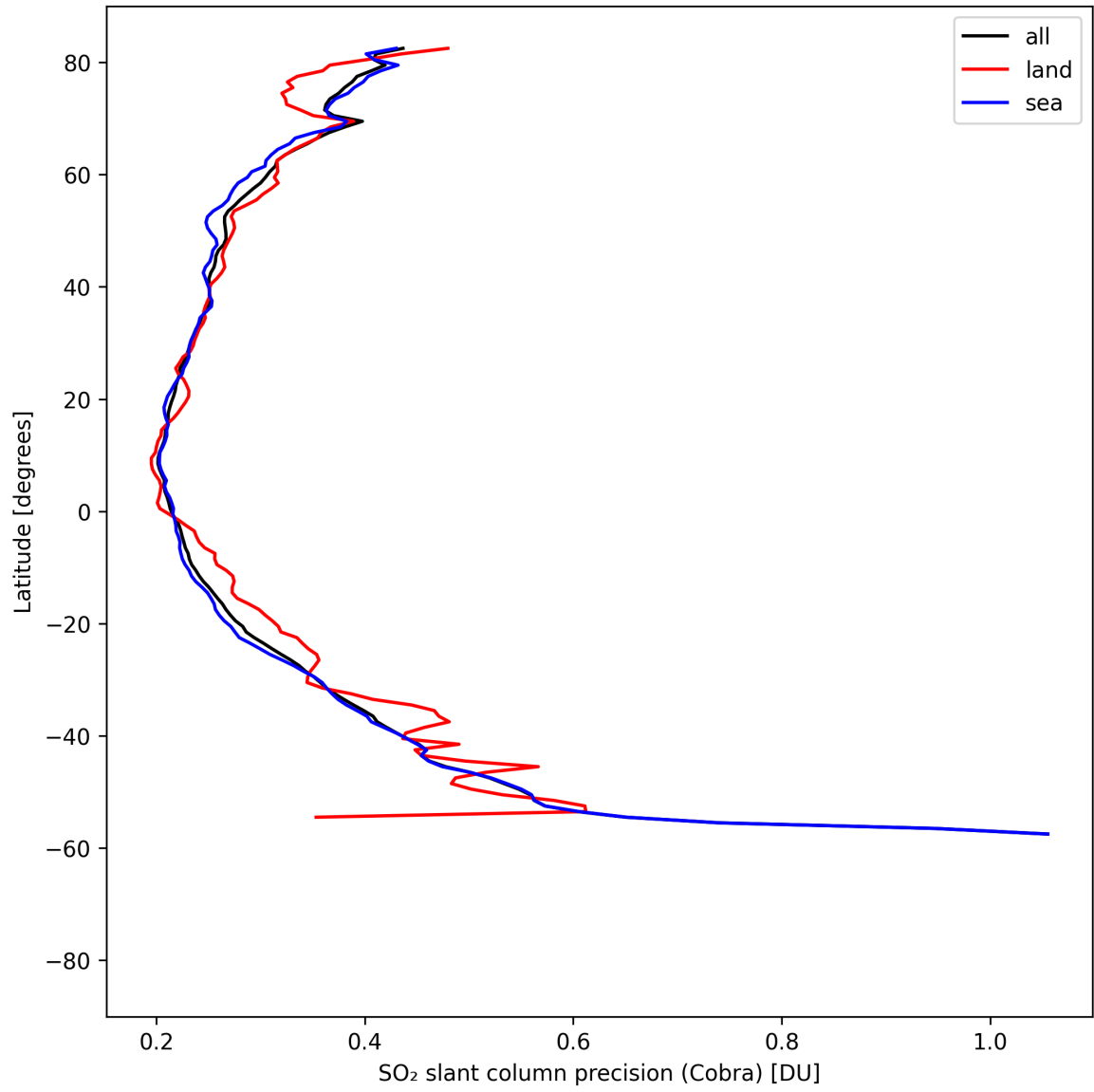


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-08-20 to 2025-08-21.

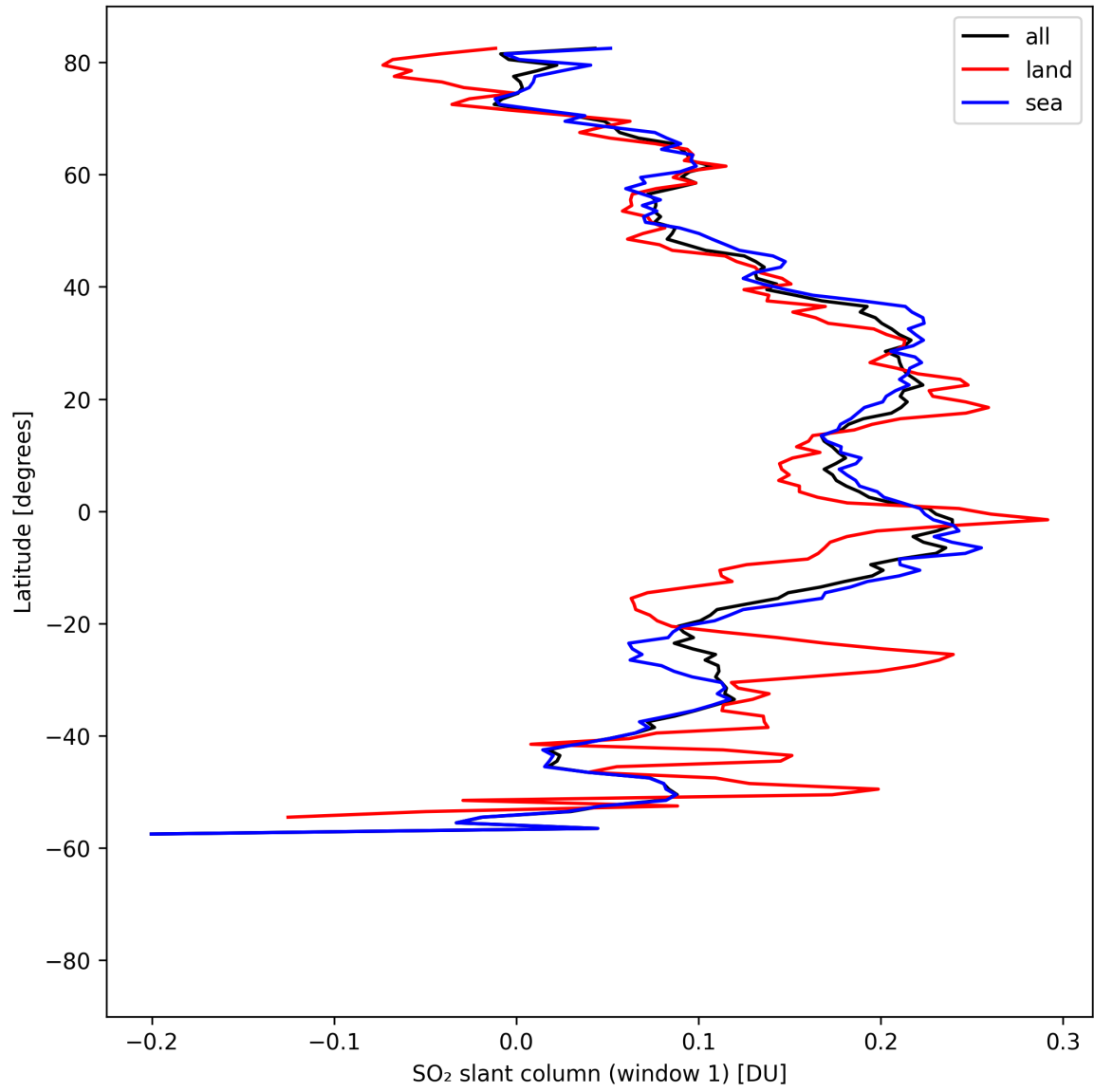


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-08-20 to 2025-08-21.

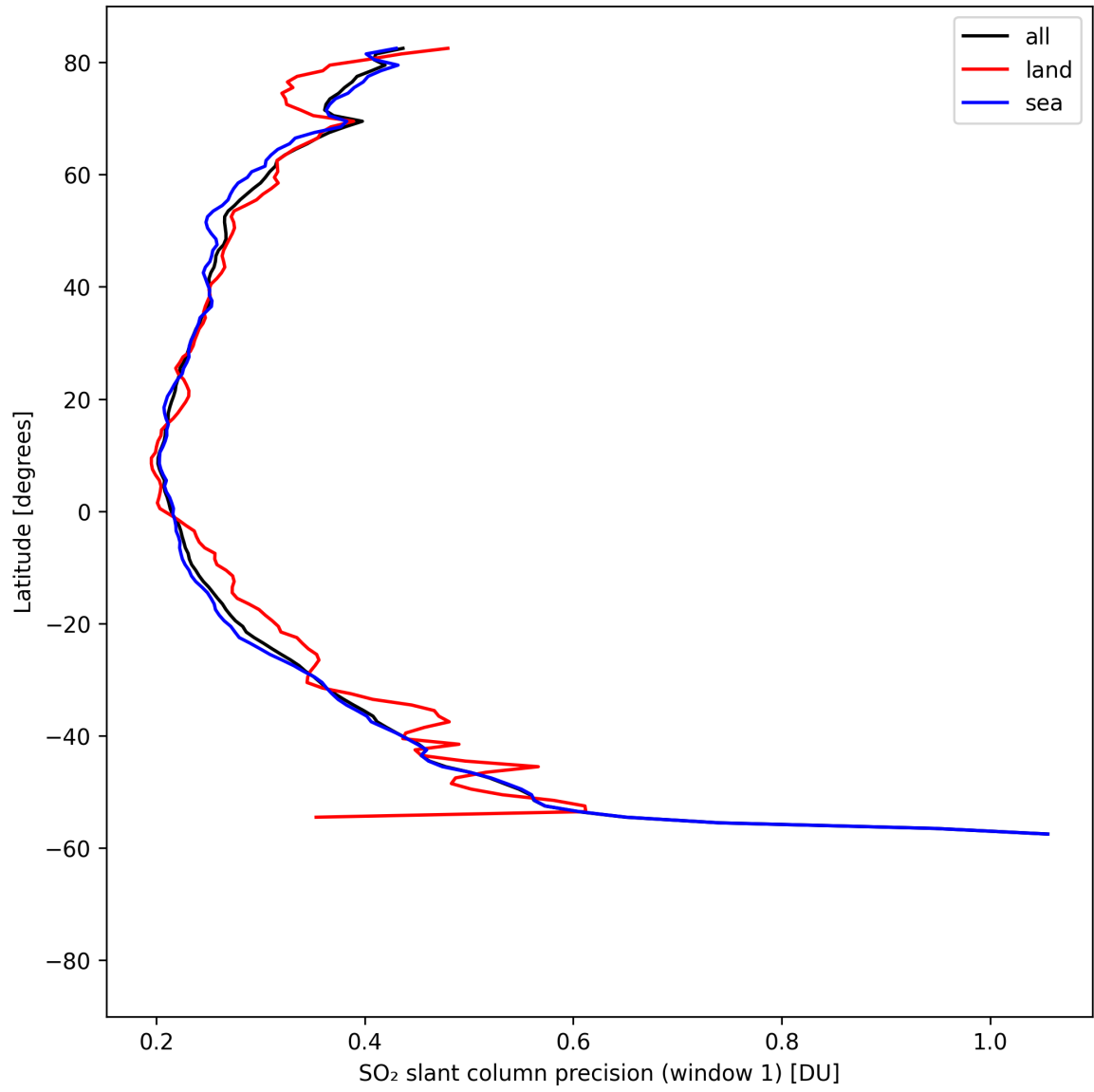


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-08-20 to 2025-08-21.

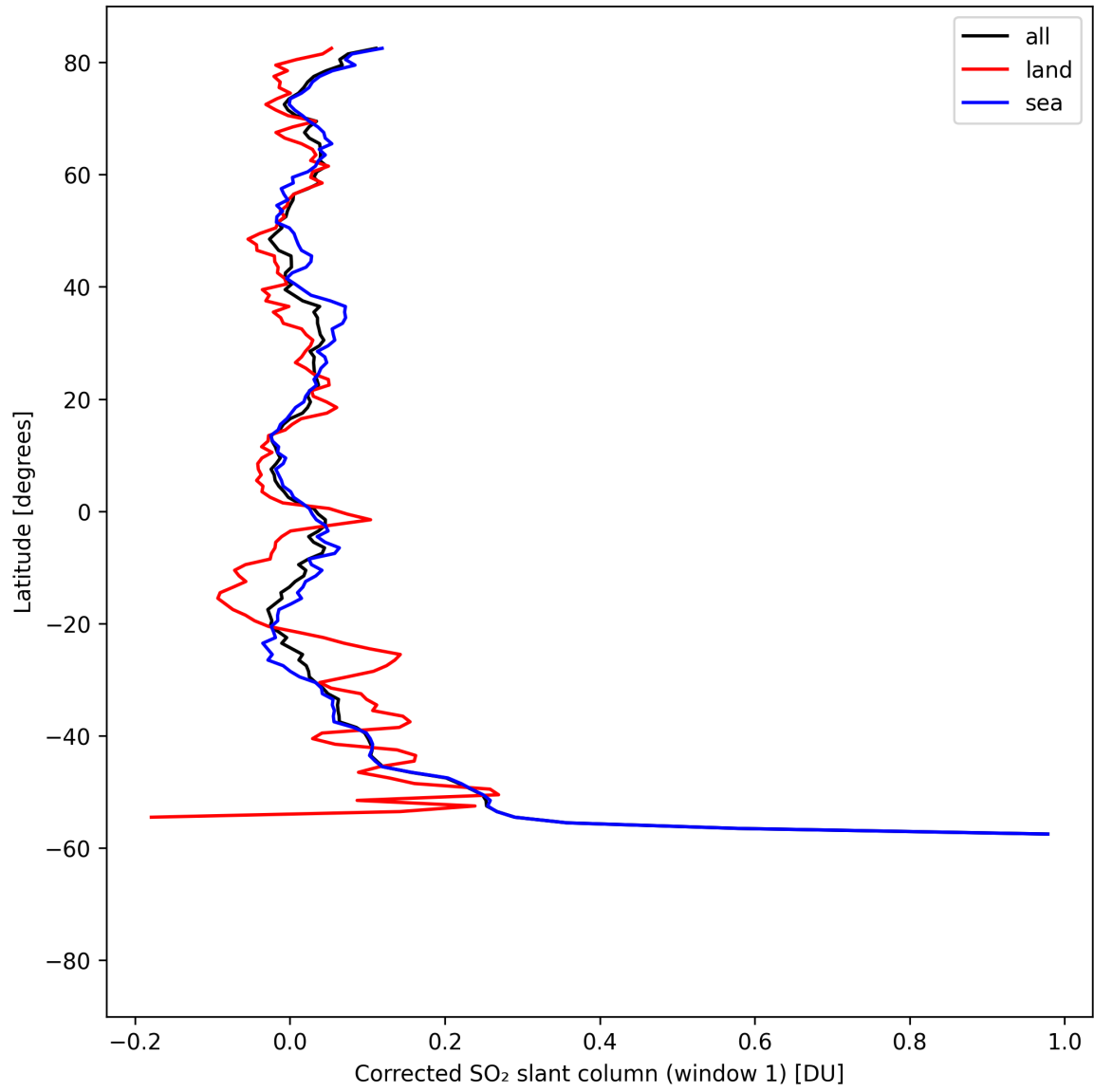


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-08-20 to 2025-08-21.

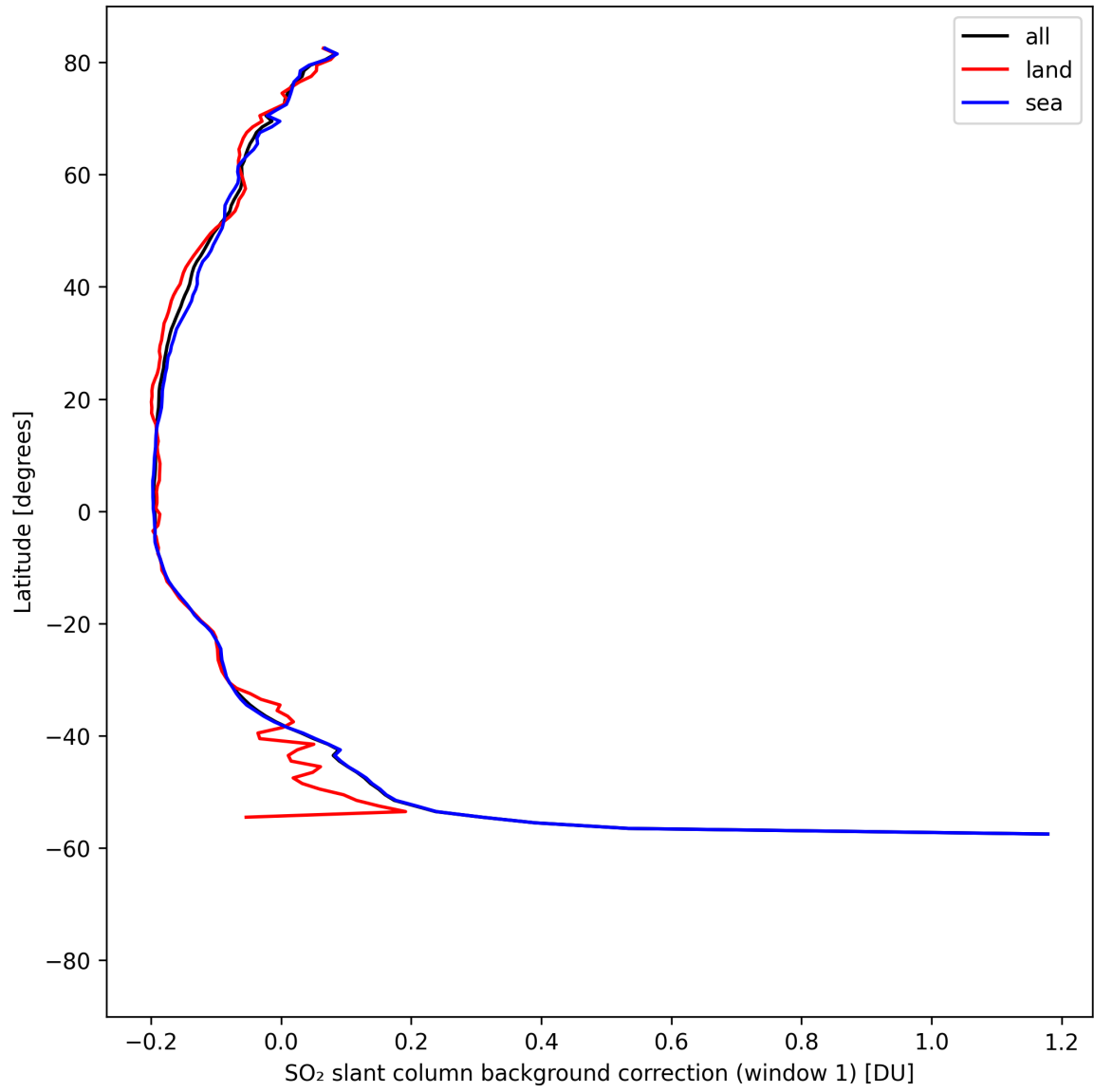


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-08-20 to 2025-08-21.

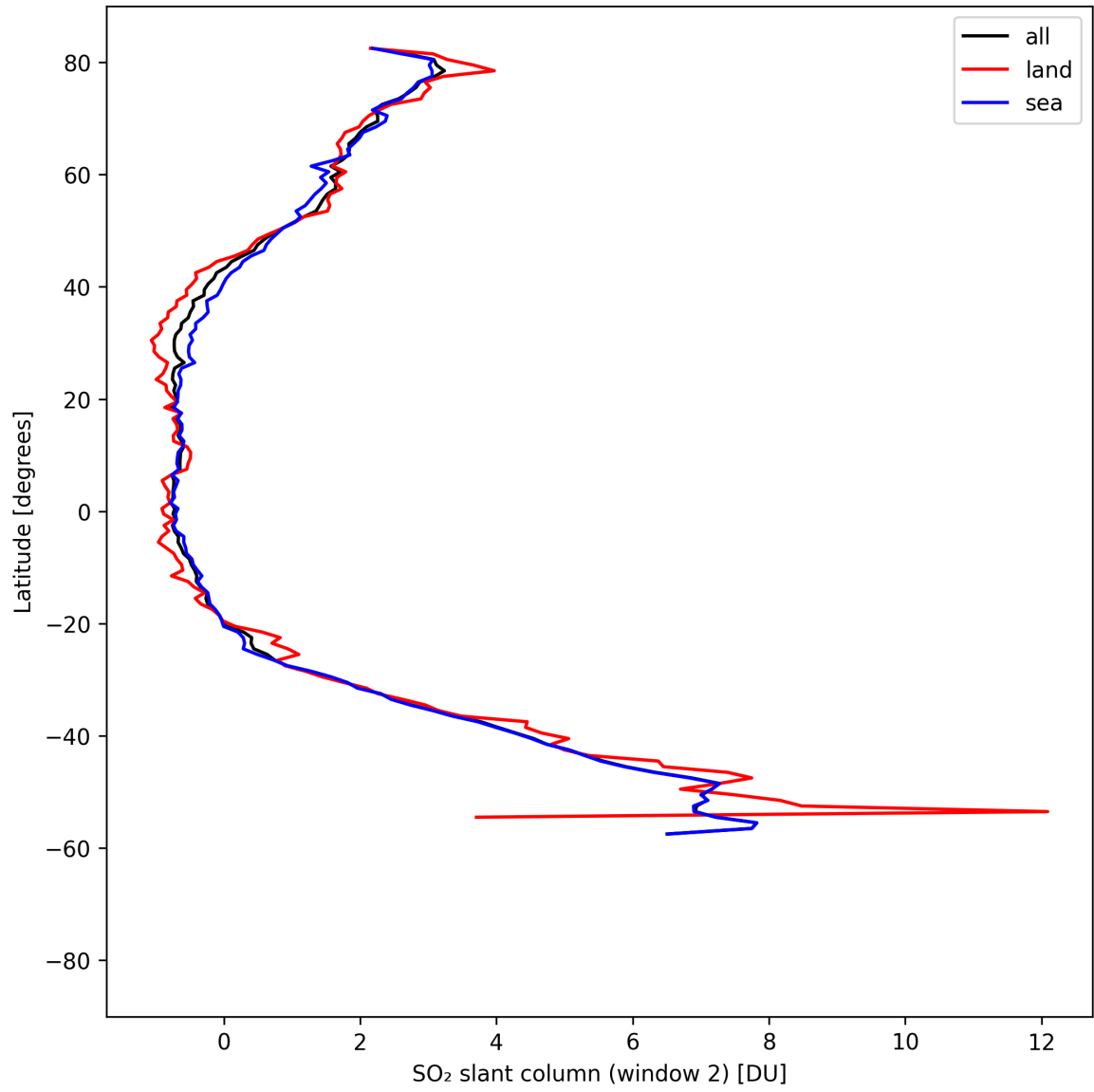


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-08-20 to 2025-08-21.

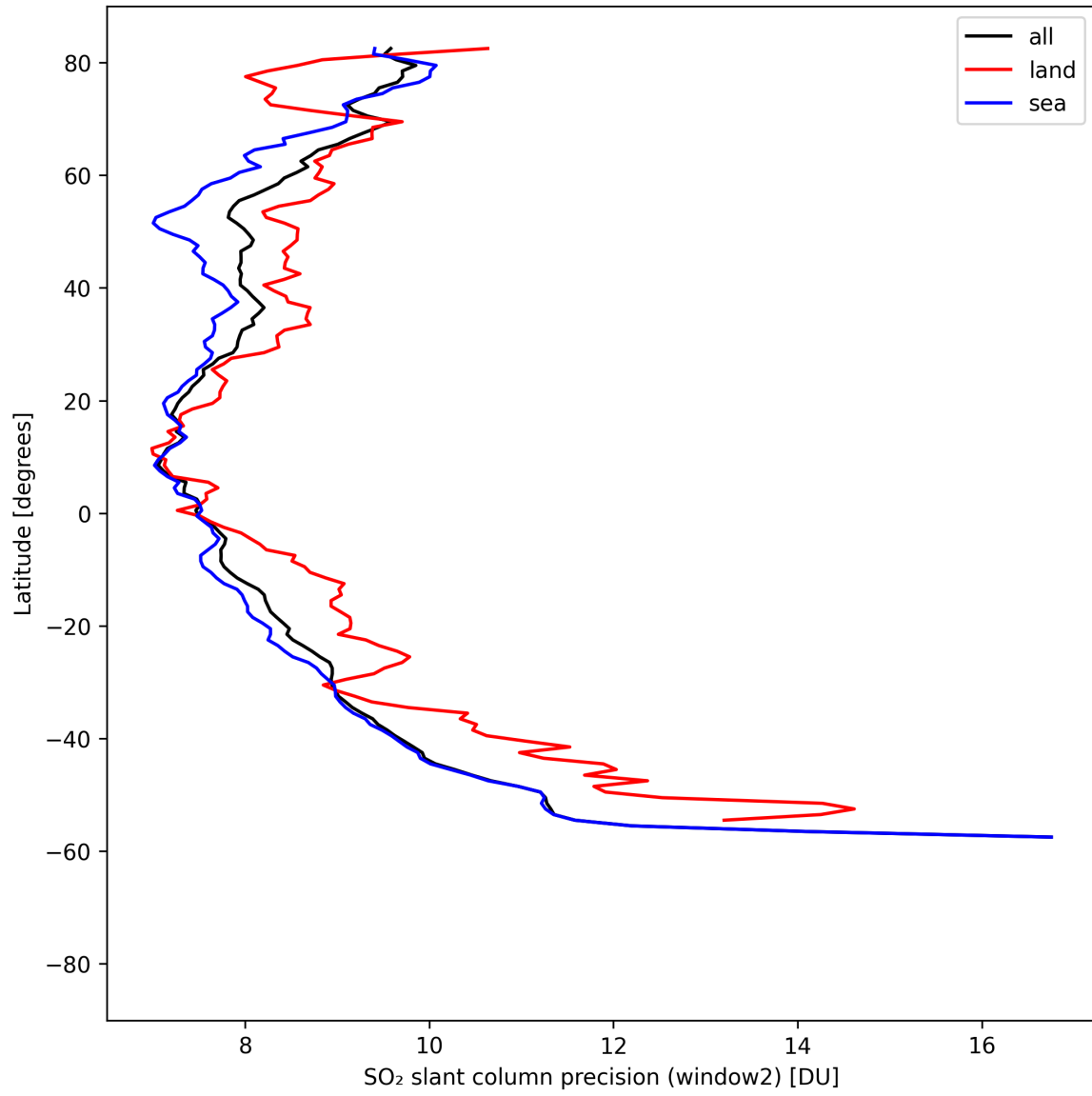


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-08-20 to 2025-08-21.

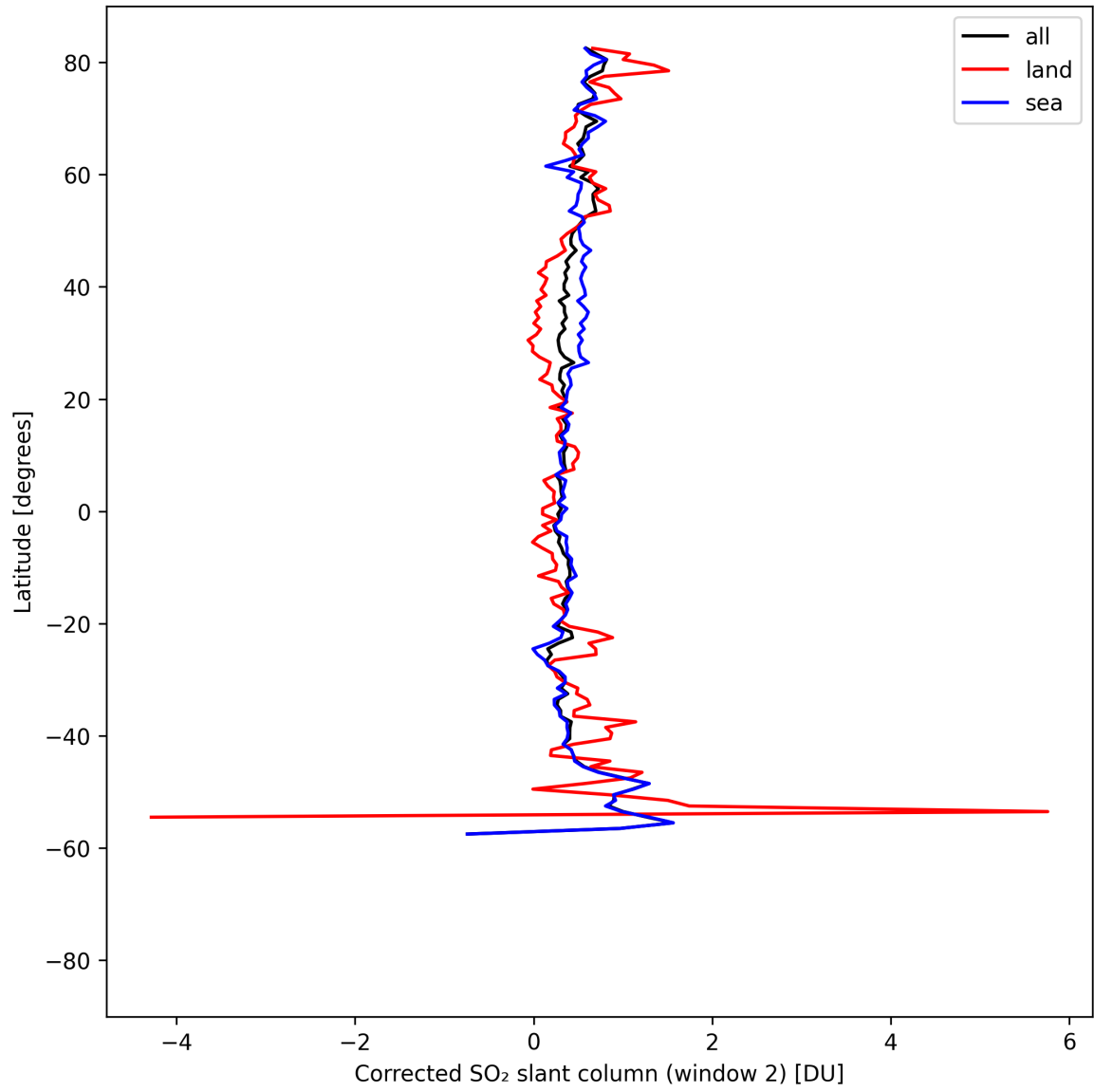


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-08-20 to 2025-08-21.

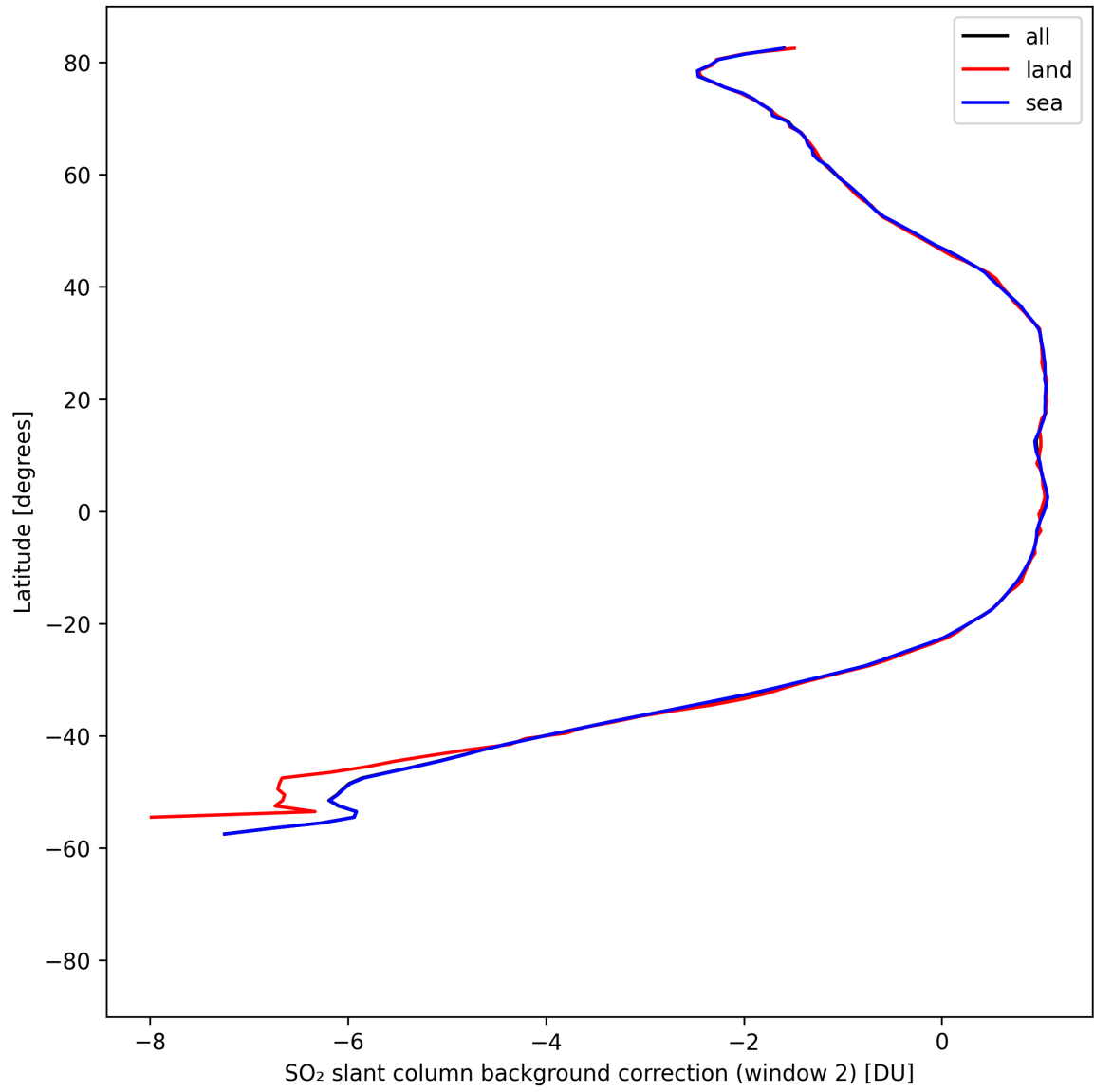


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-08-20 to 2025-08-21.

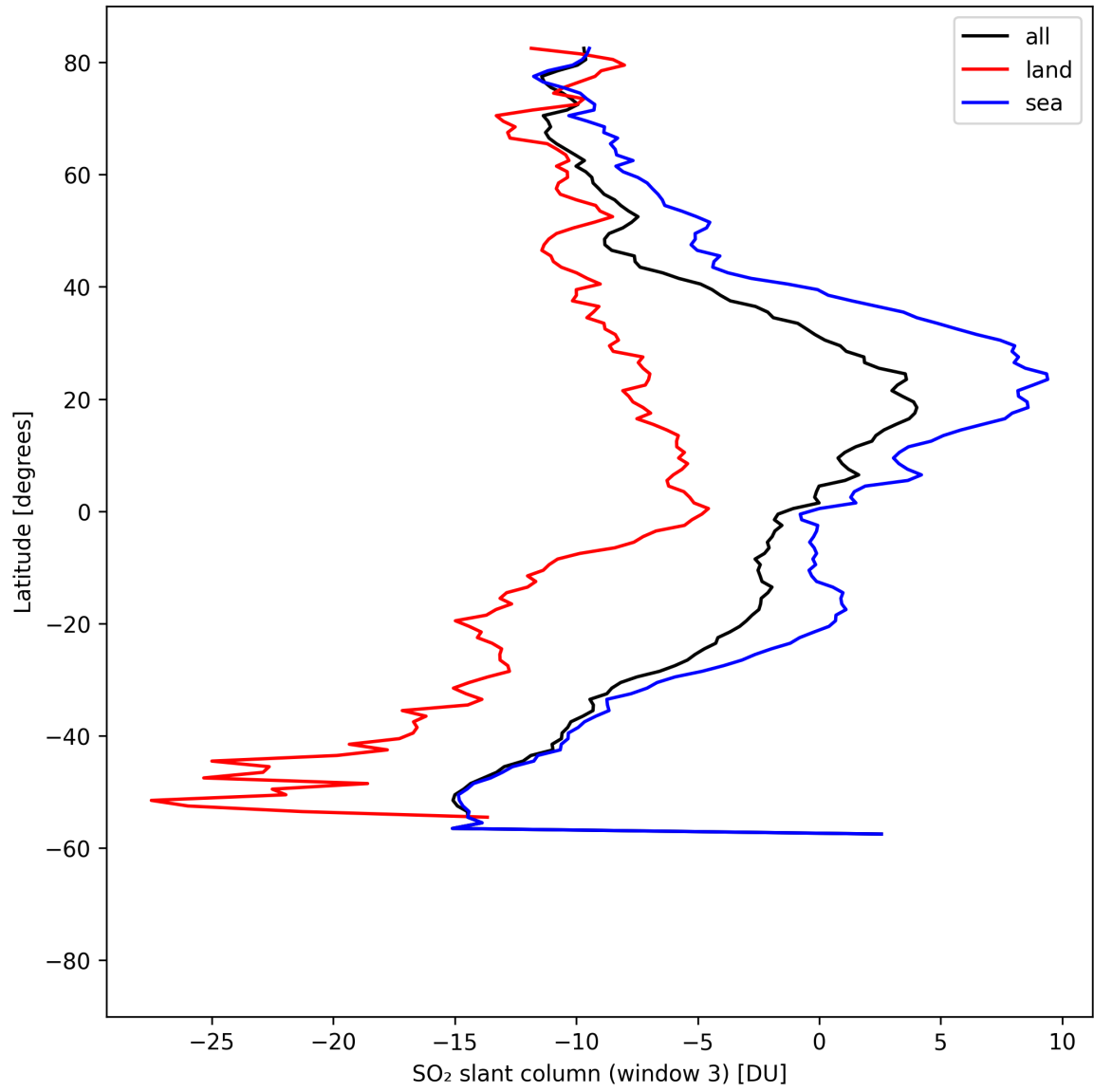


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-08-20 to 2025-08-21.

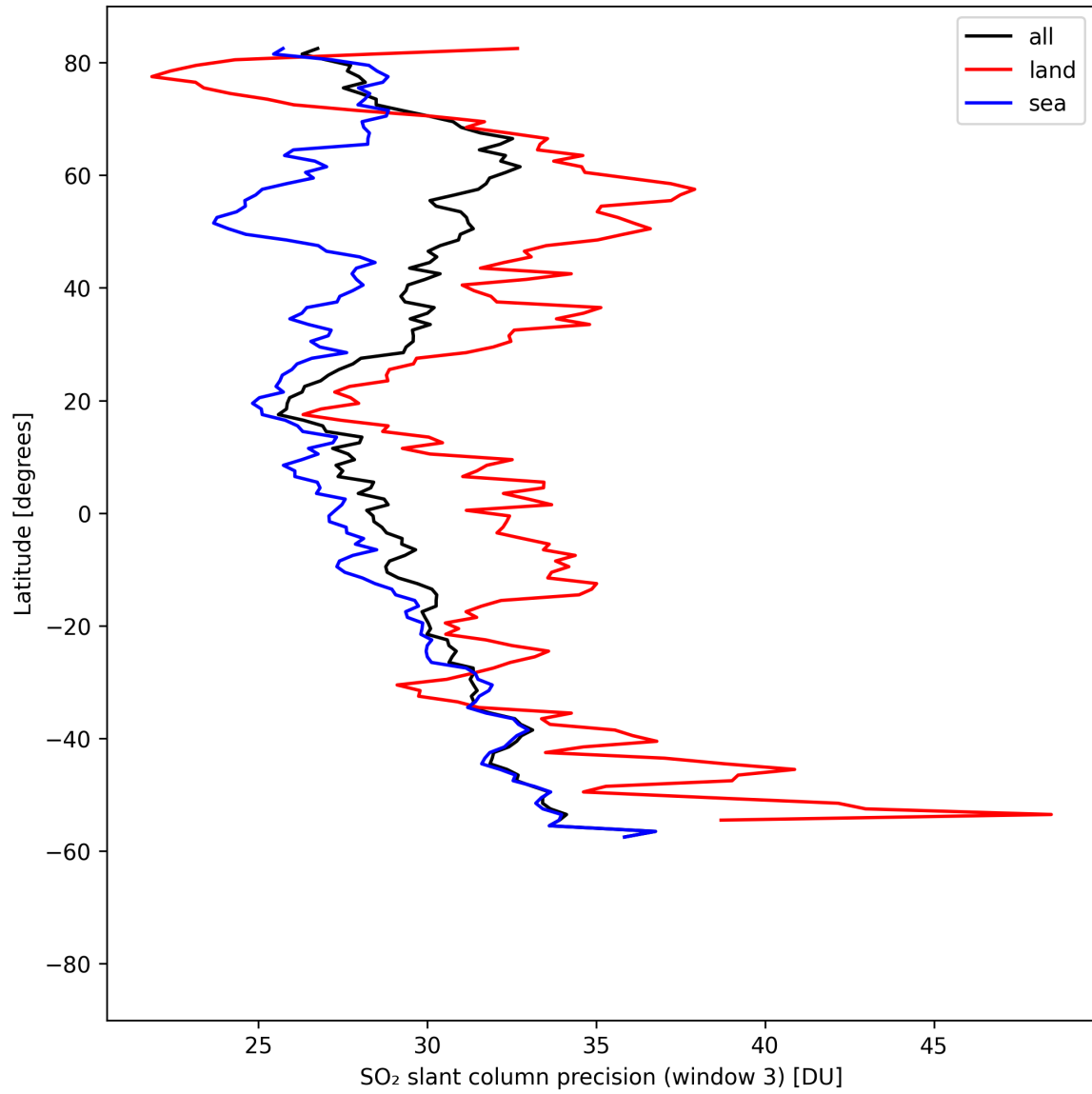


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-08-20 to 2025-08-21.

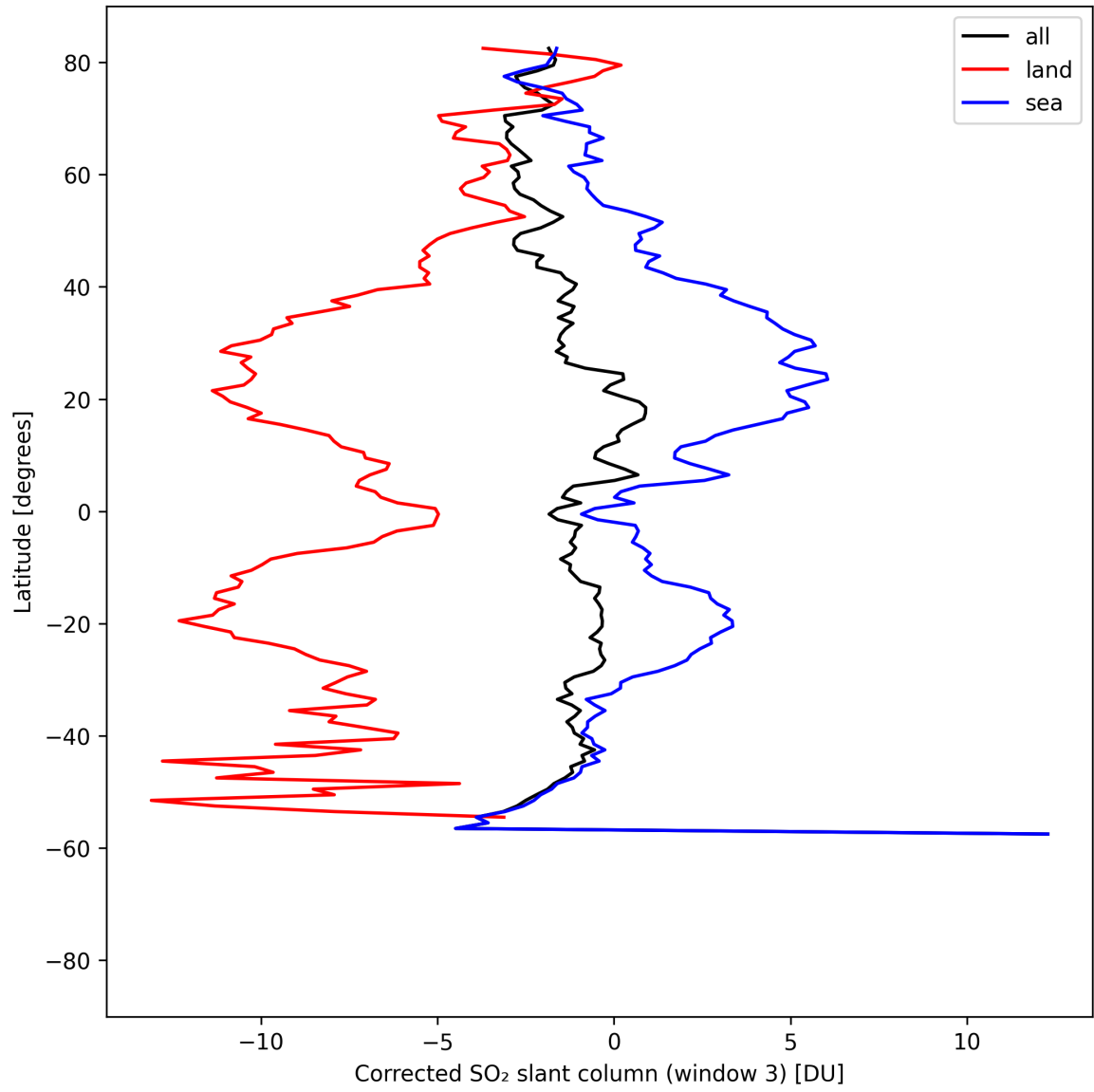


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-08-20 to 2025-08-21.

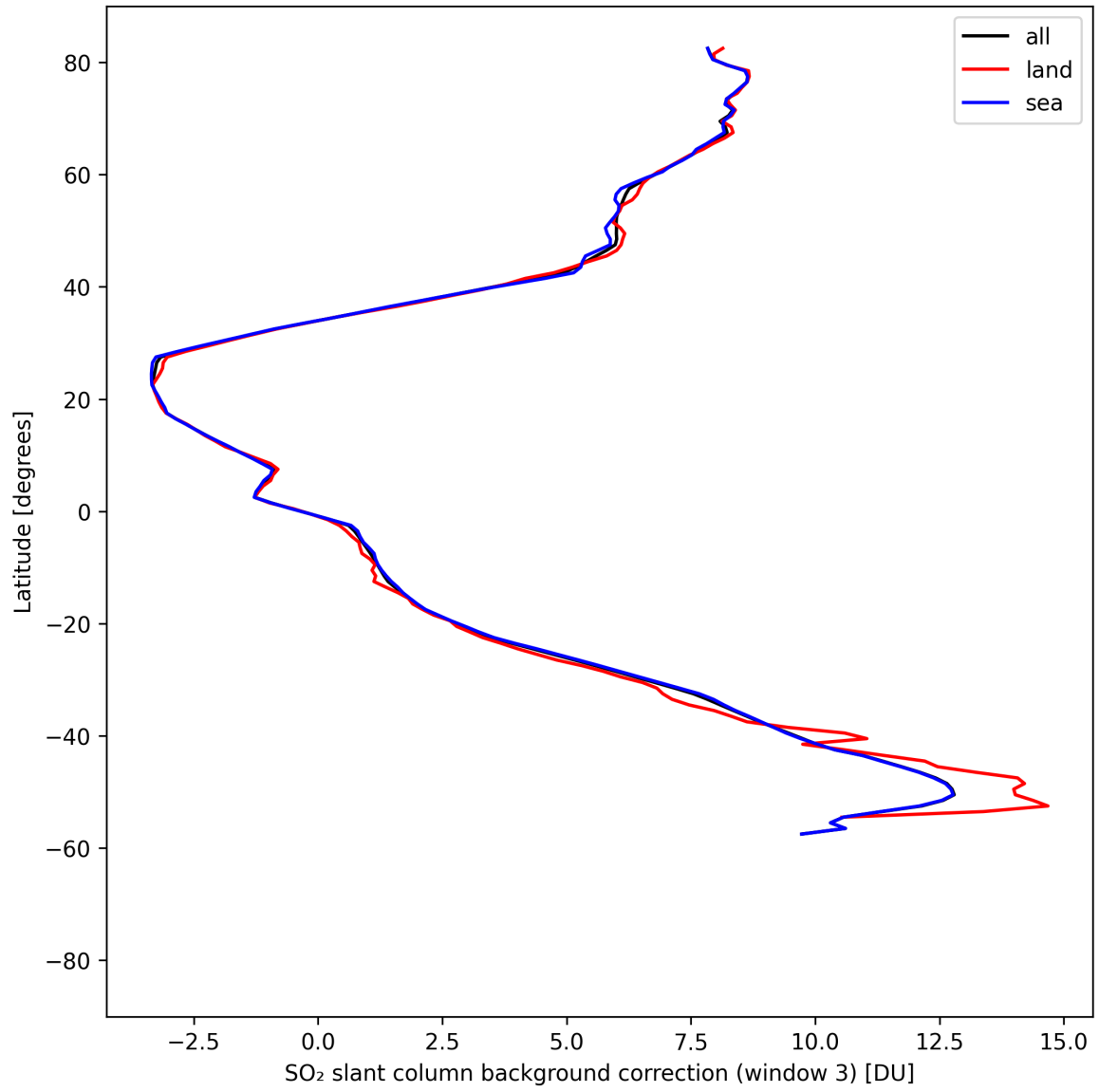


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-08-20 to 2025-08-21.

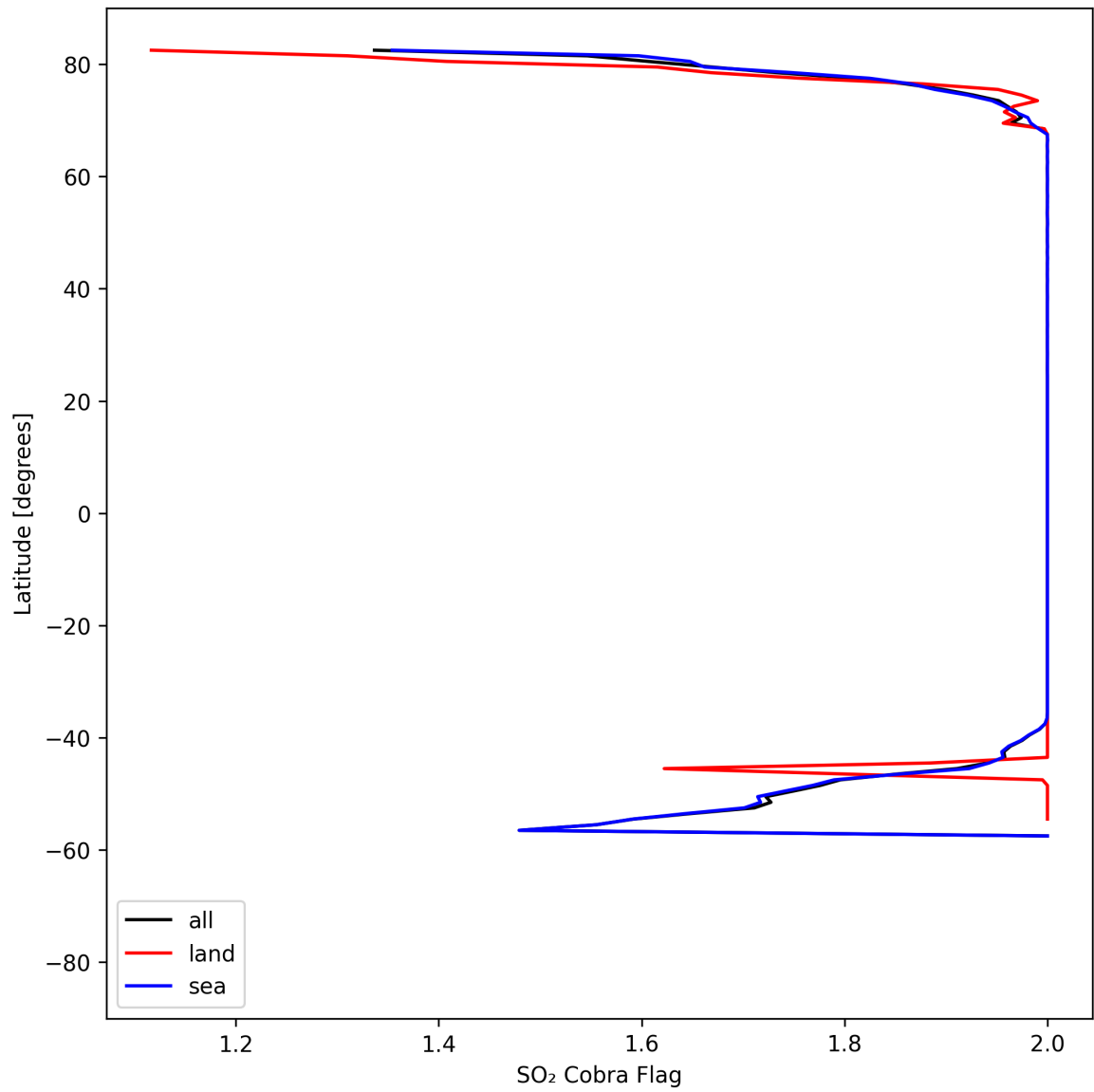


Figure 48: Zonal average of “SO₂ Cobra Flag” for 2025-08-20 to 2025-08-21.

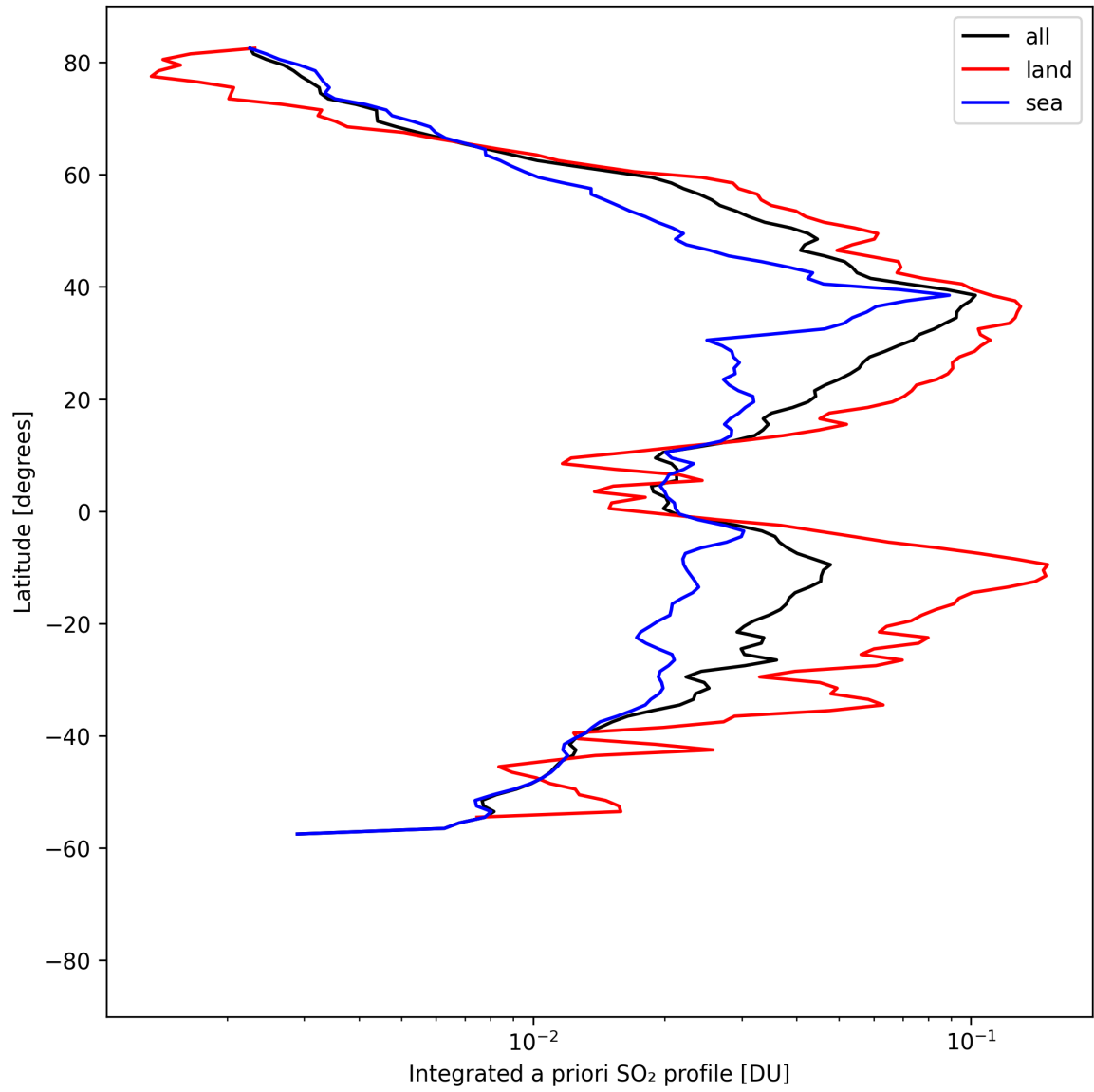


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-08-20 to 2025-08-21.

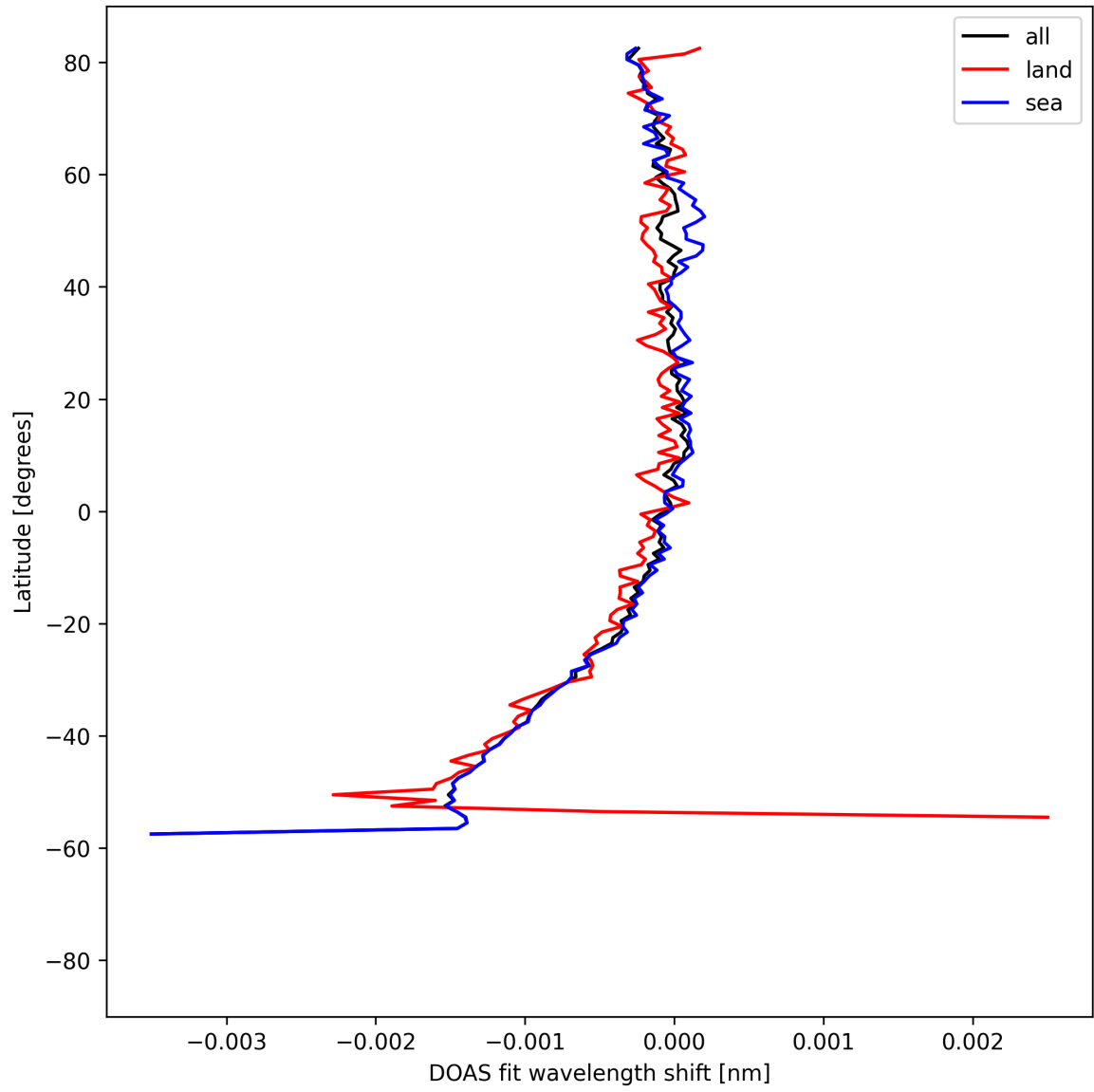


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-08-20 to 2025-08-21.

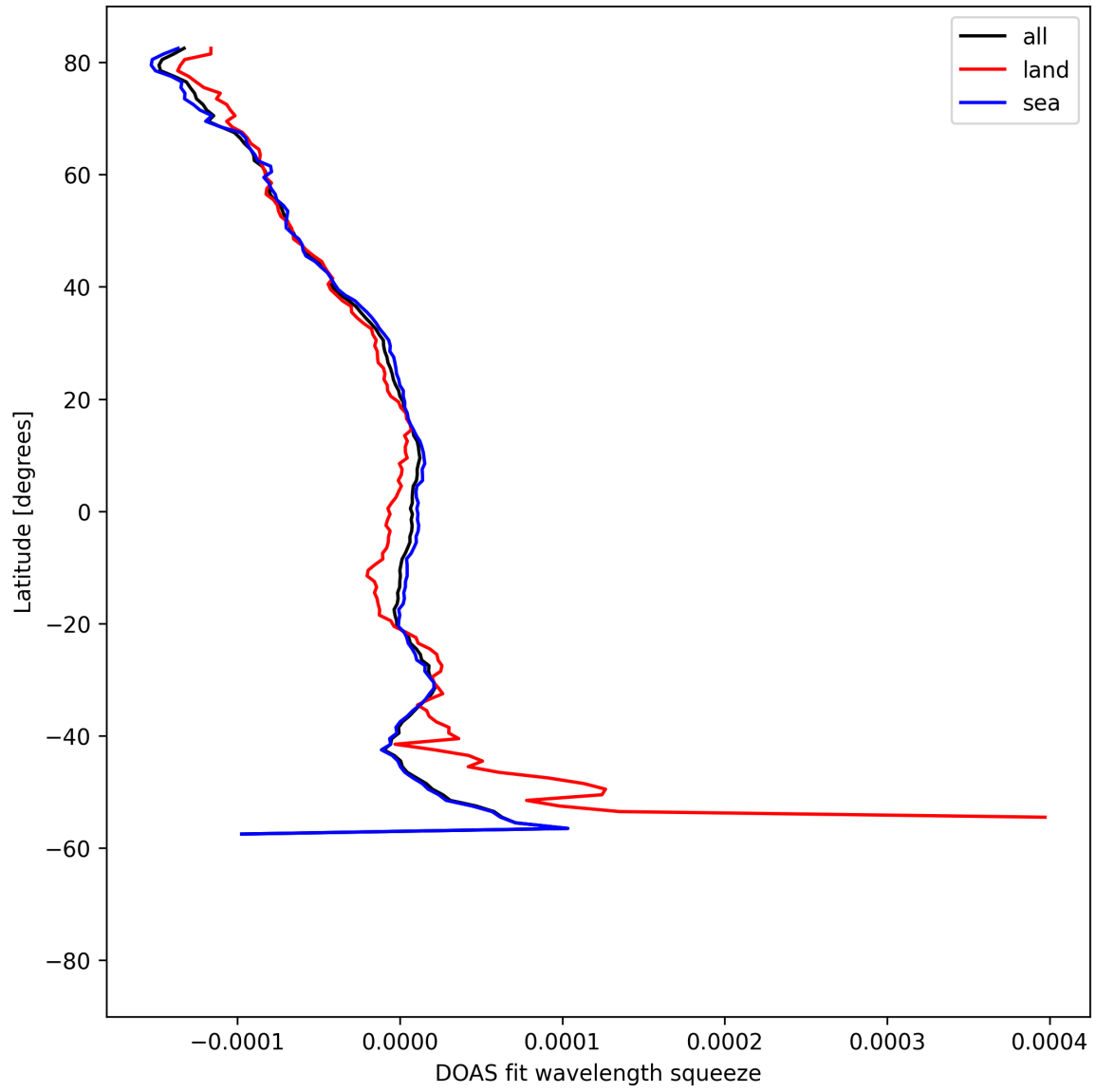


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-08-20 to 2025-08-21.

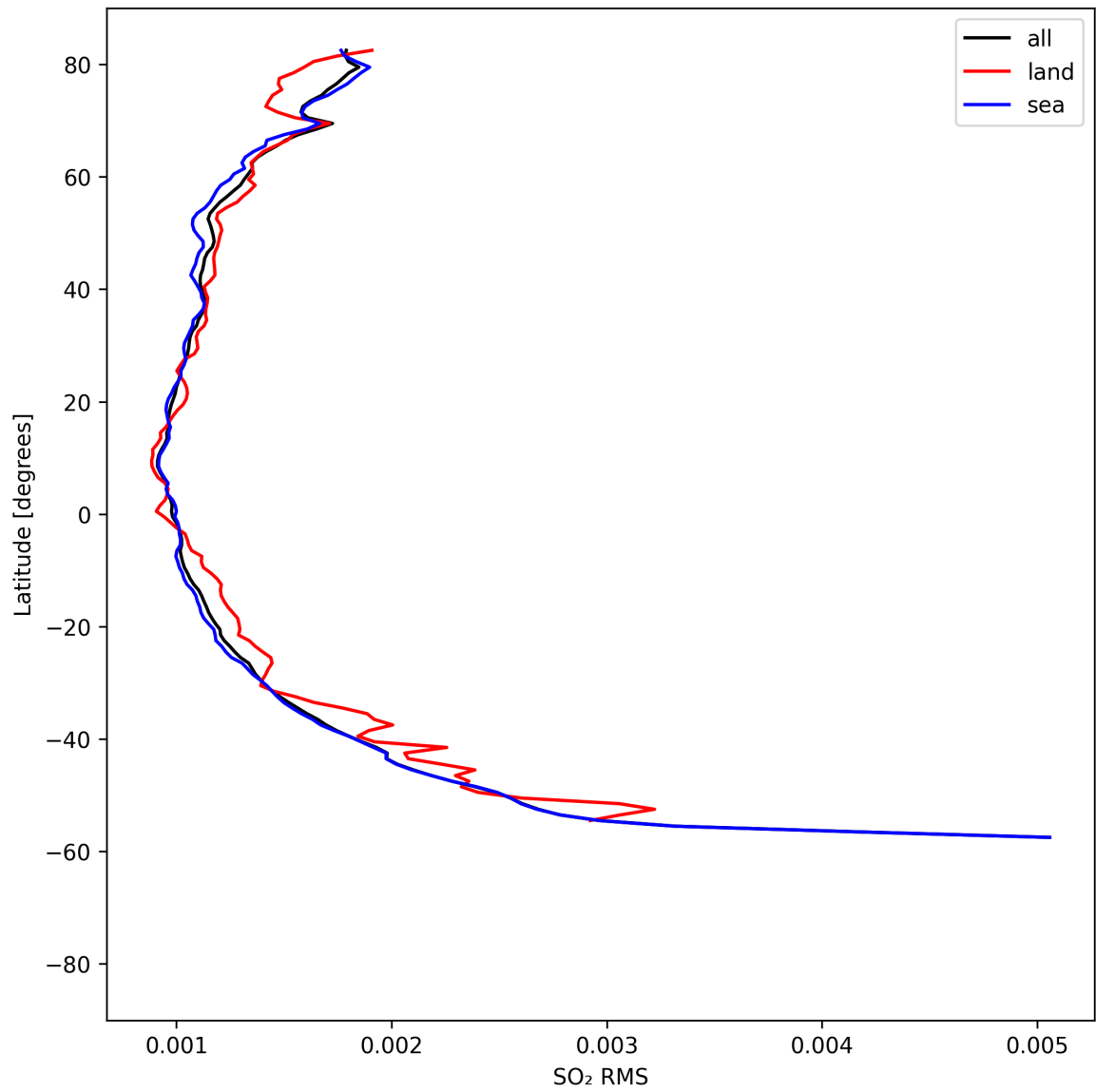


Figure 52: Zonal average of “SO₂ RMS” for 2025-08-20 to 2025-08-21.

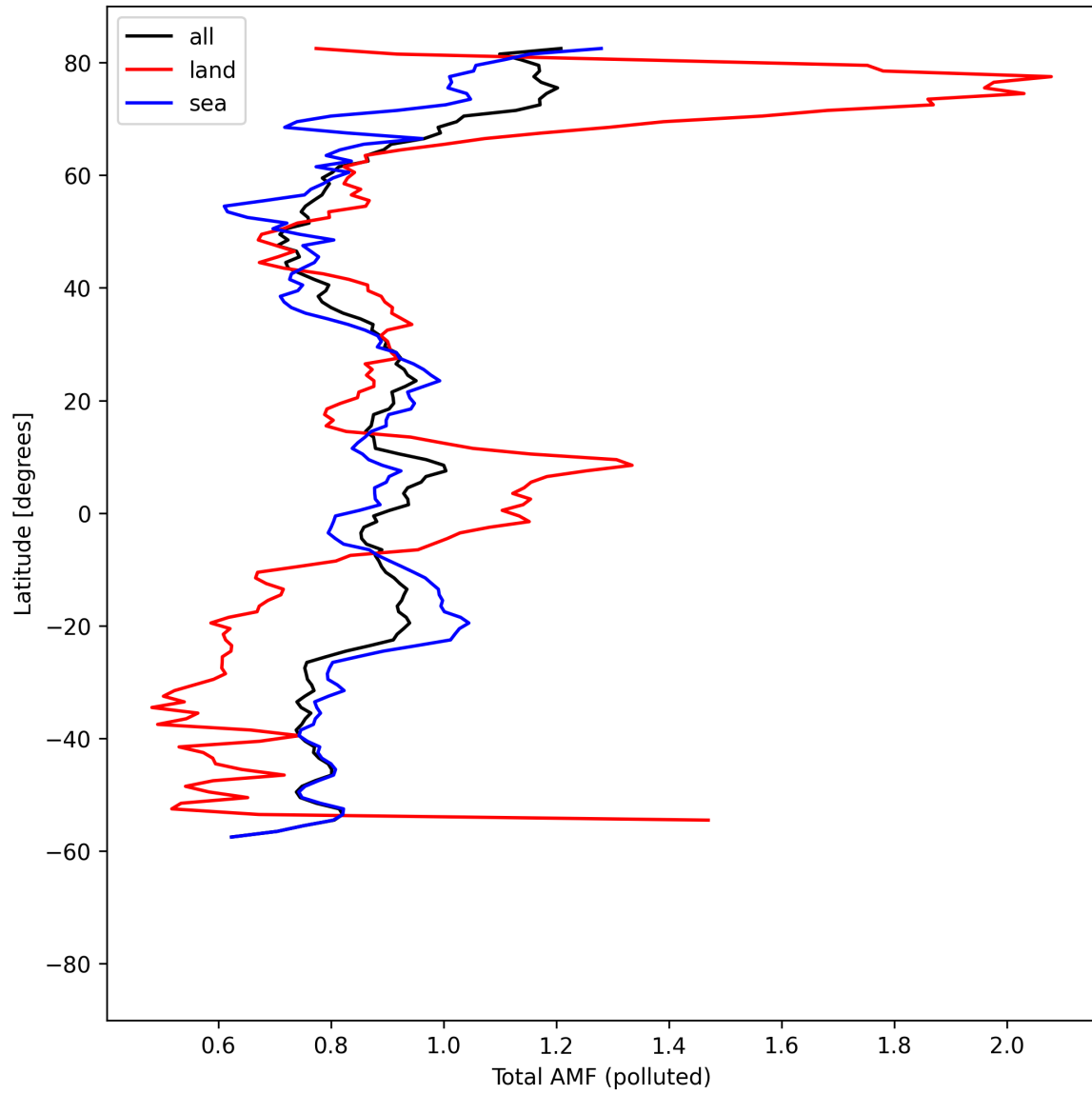


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-08-20 to 2025-08-21.

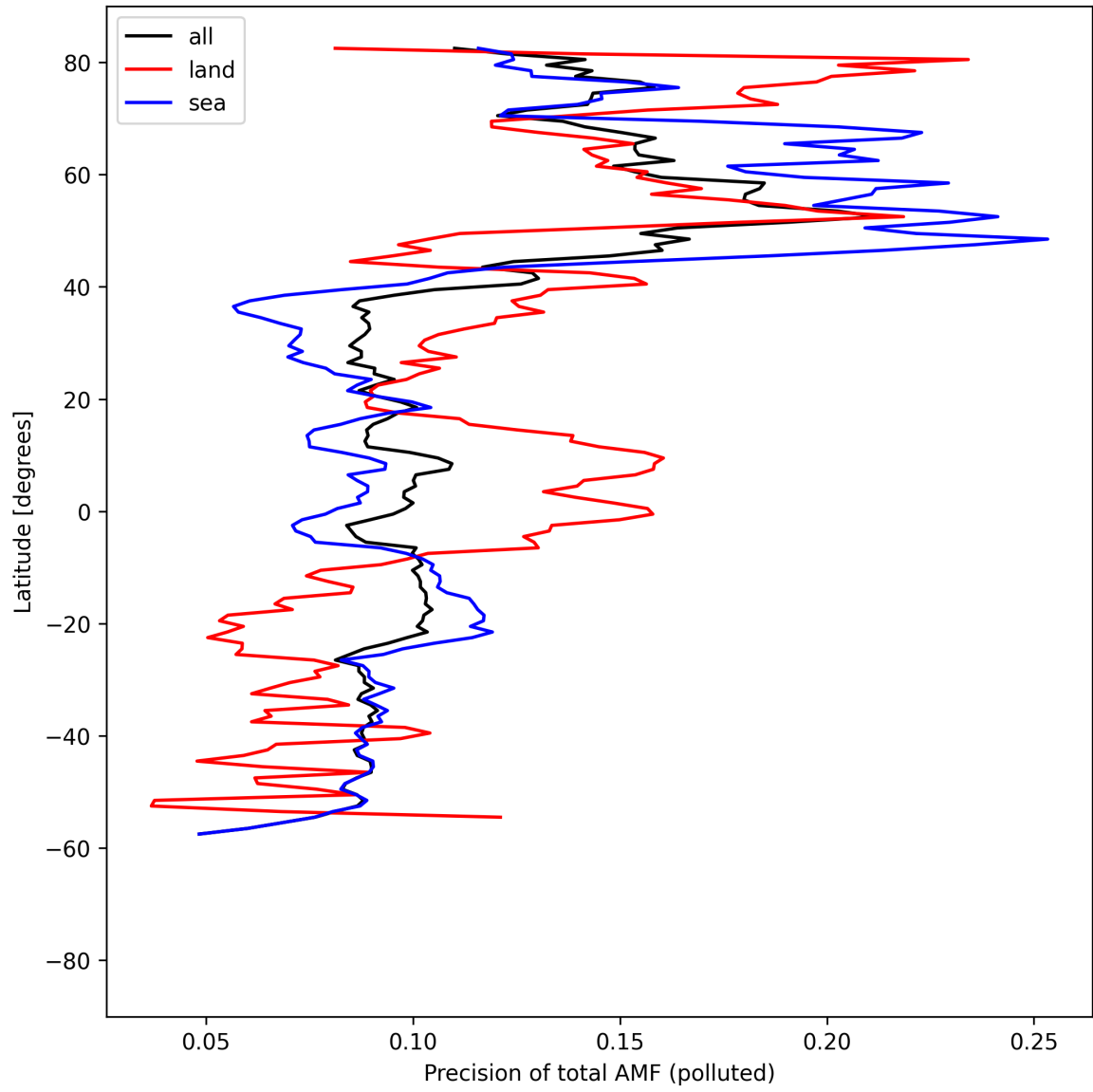


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-08-20 to 2025-08-21.

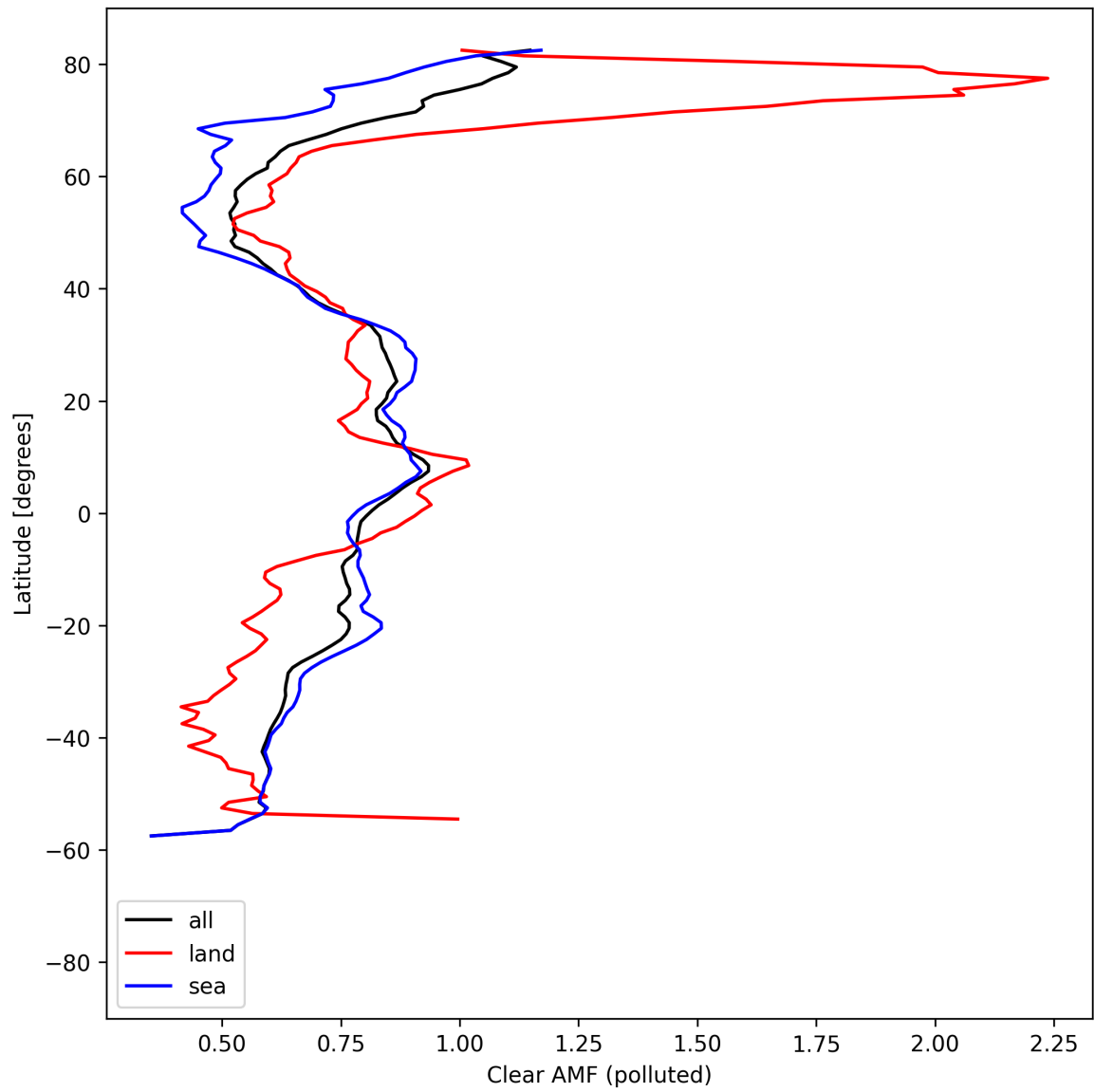


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-08-20 to 2025-08-21.

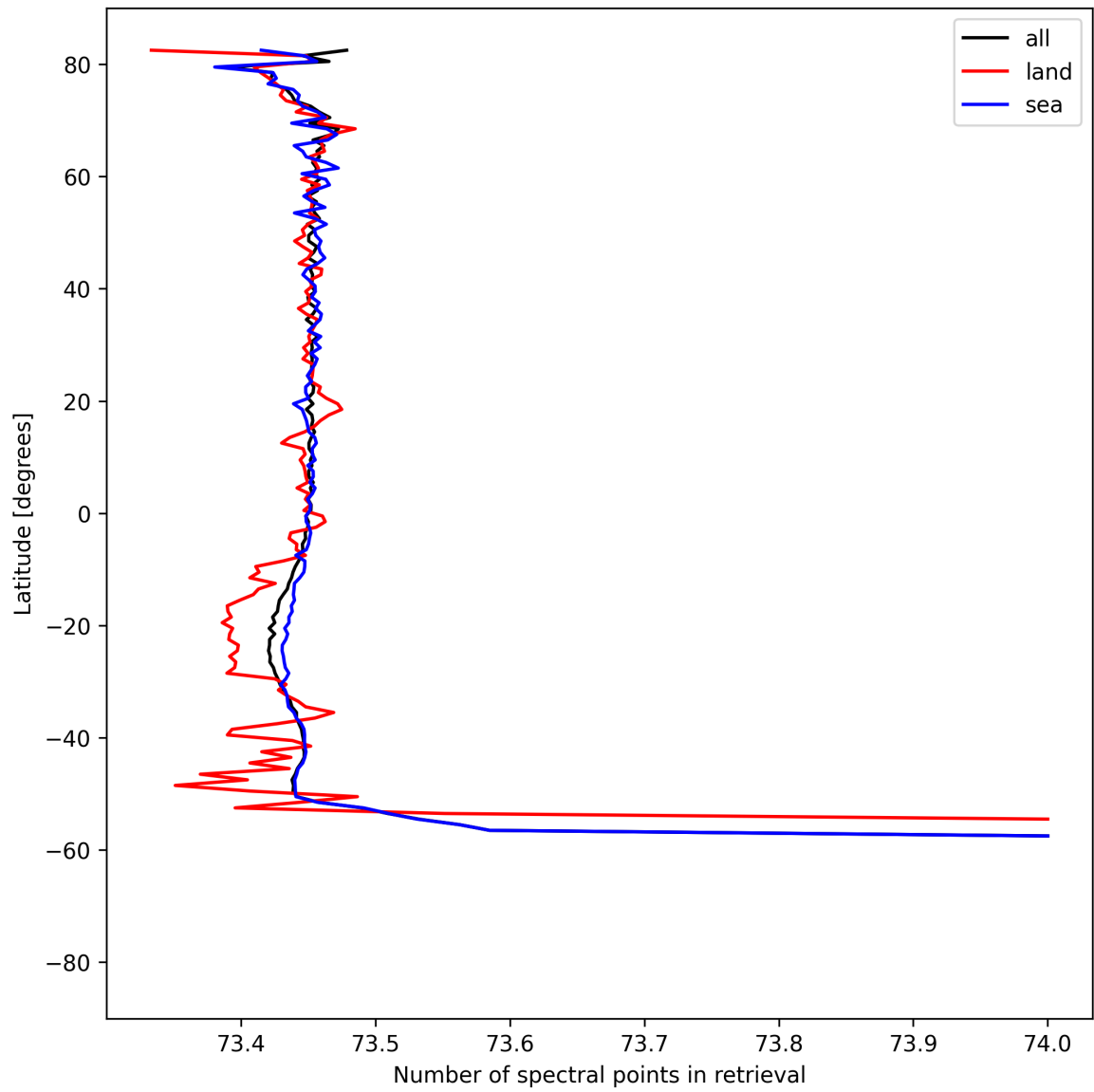


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-08-20 to 2025-08-21.

8 Histograms

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

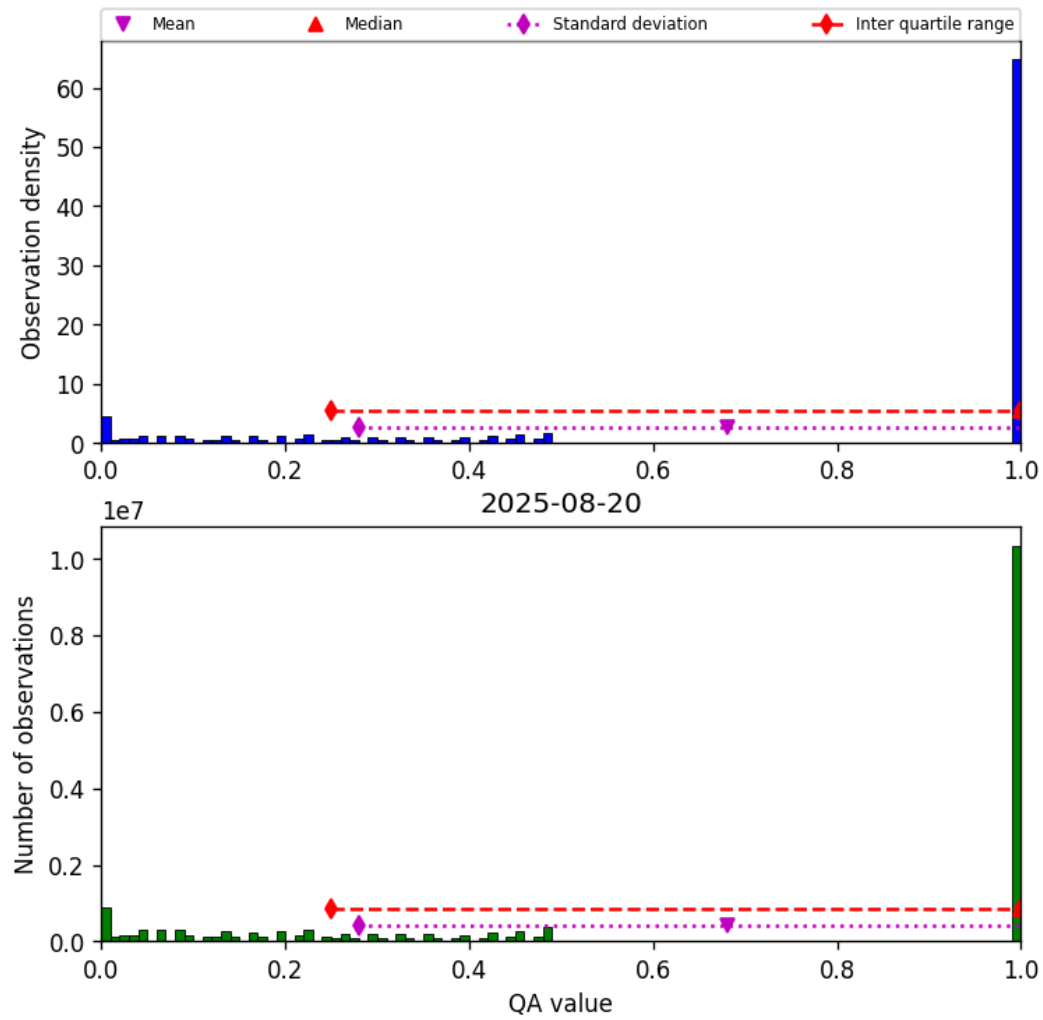


Figure 57: Histogram of “QA value” for 2025-08-20 to 2025-08-21

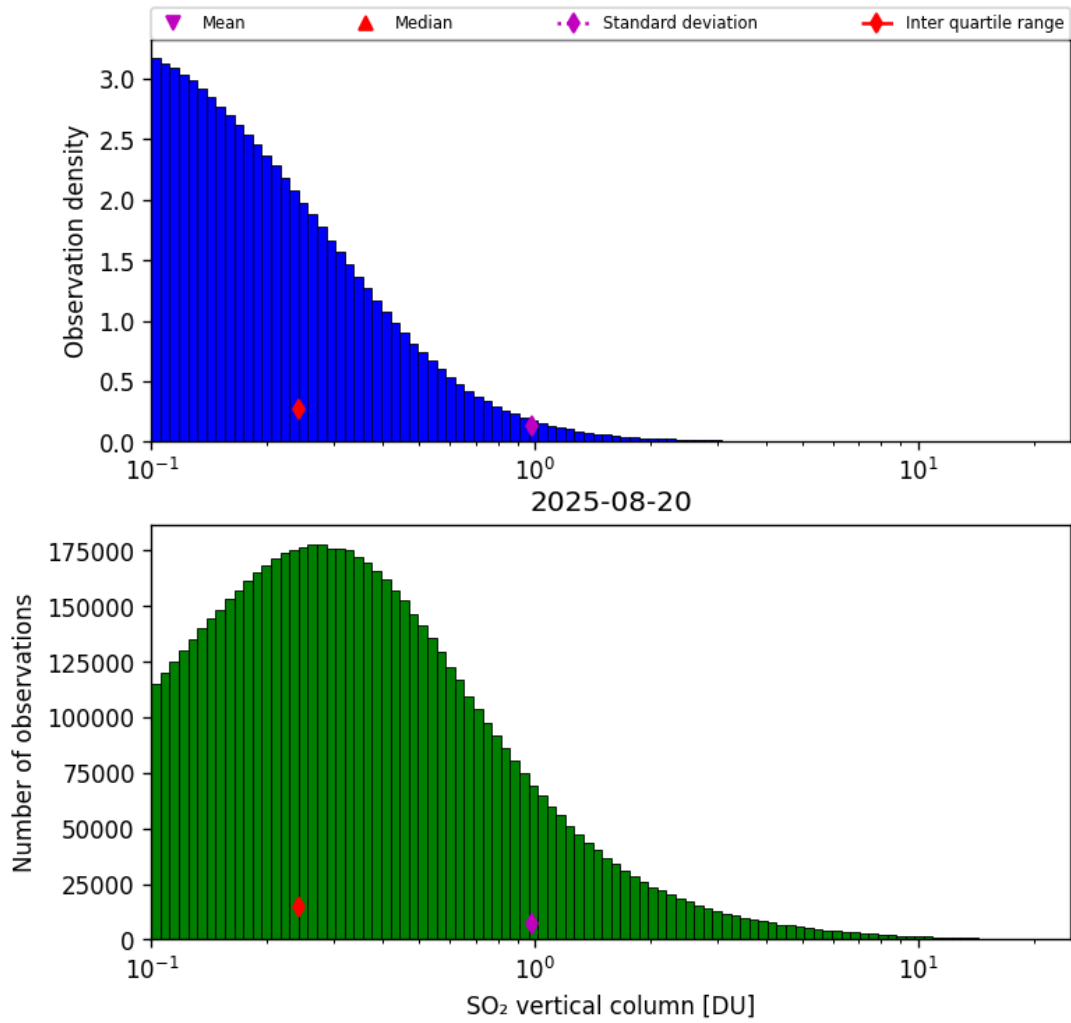


Figure 58: Histogram of “SO₂ vertical column” for 2025-08-20 to 2025-08-21

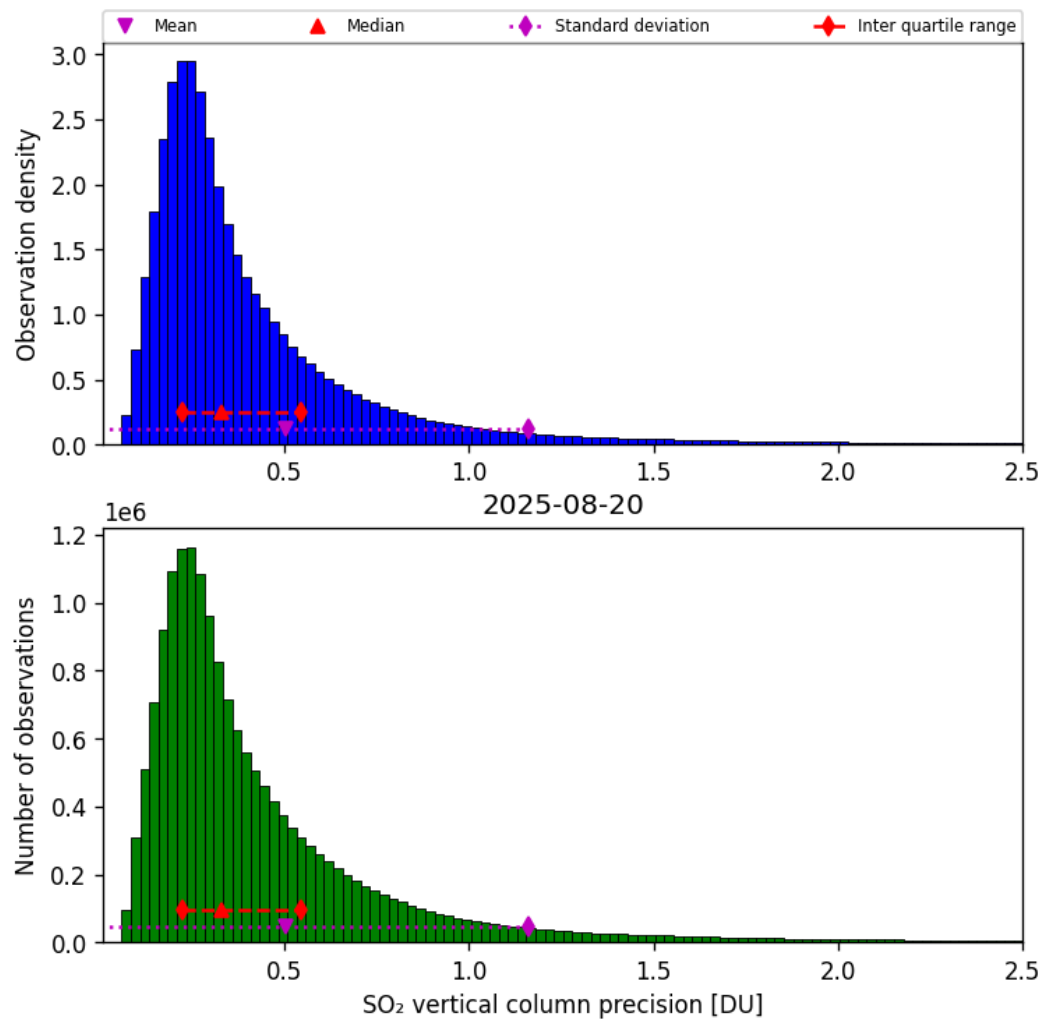


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-08-20 to 2025-08-21

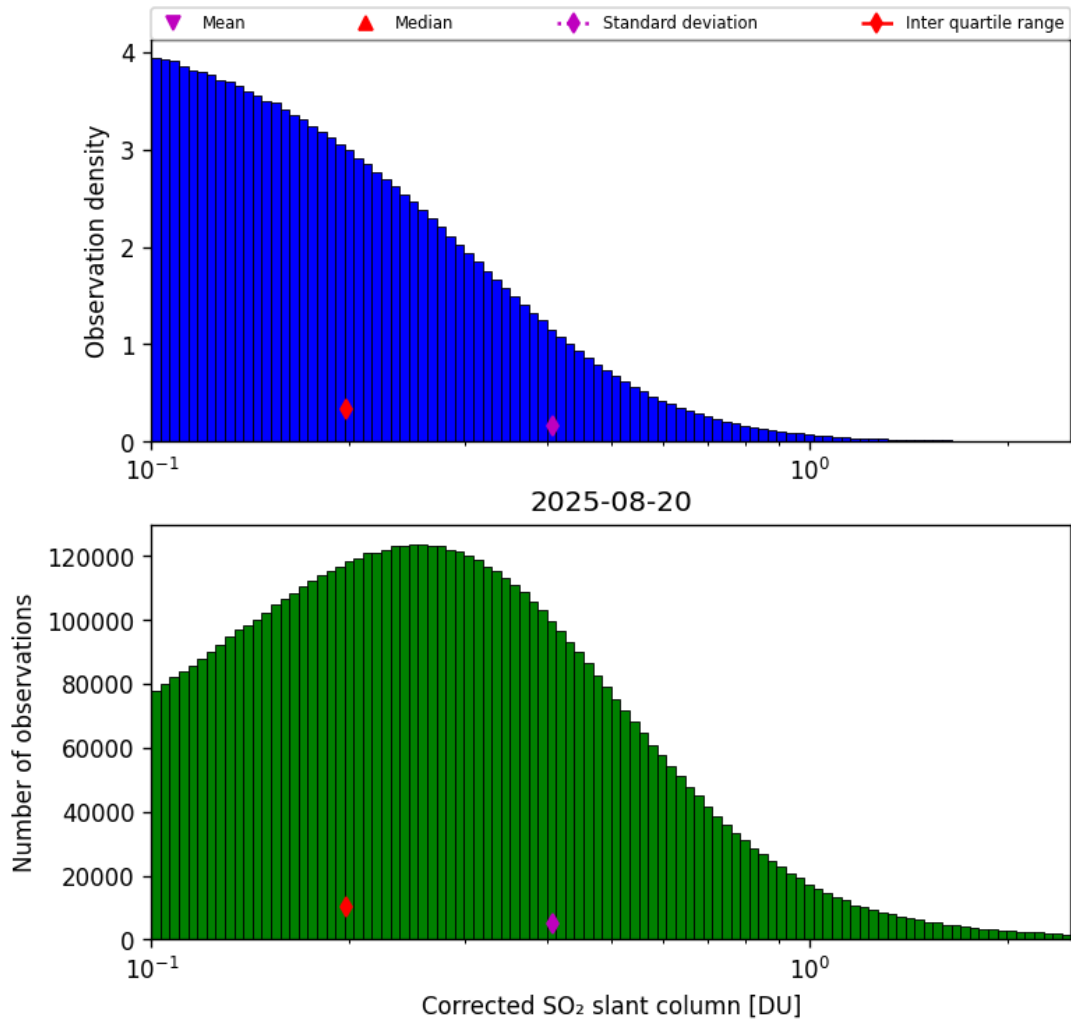


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-08-20 to 2025-08-21

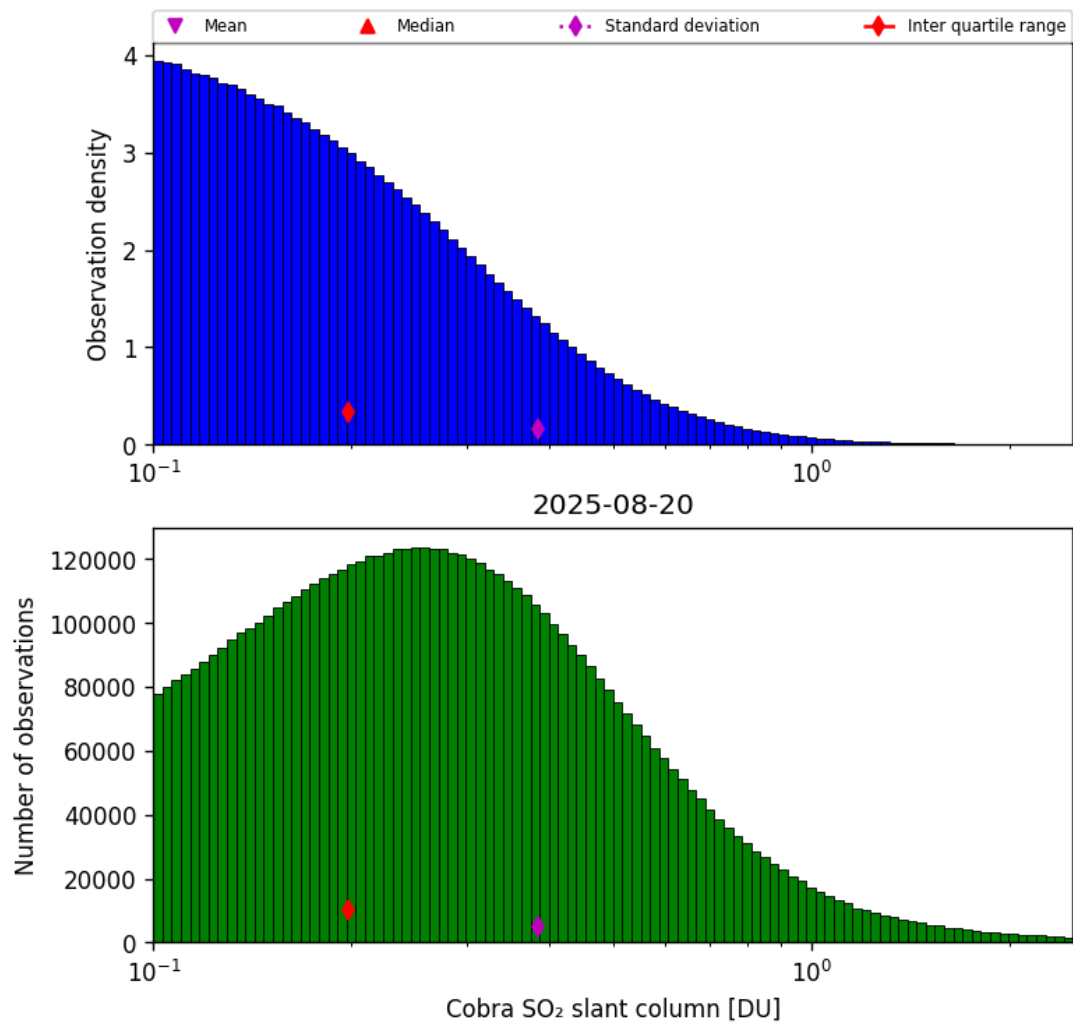


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-08-20 to 2025-08-21

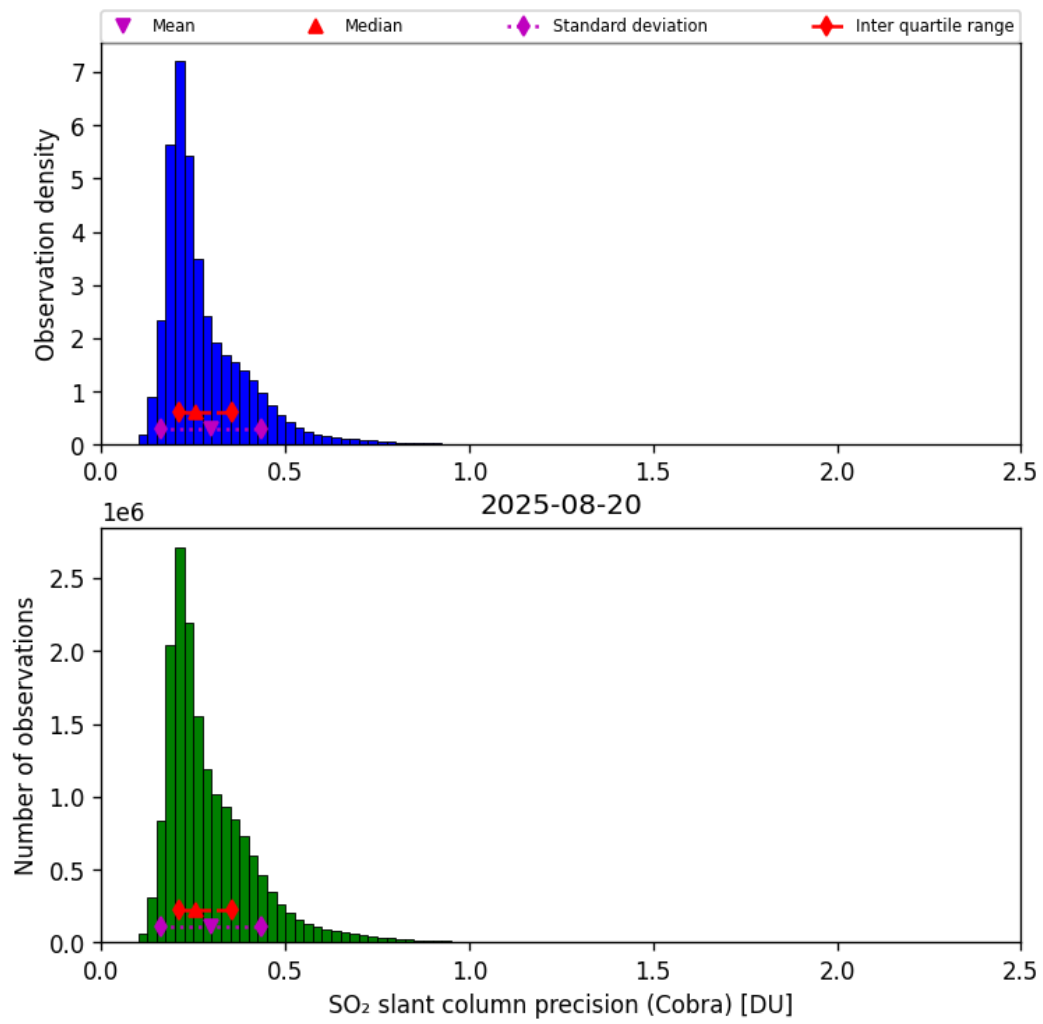


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-08-20 to 2025-08-21

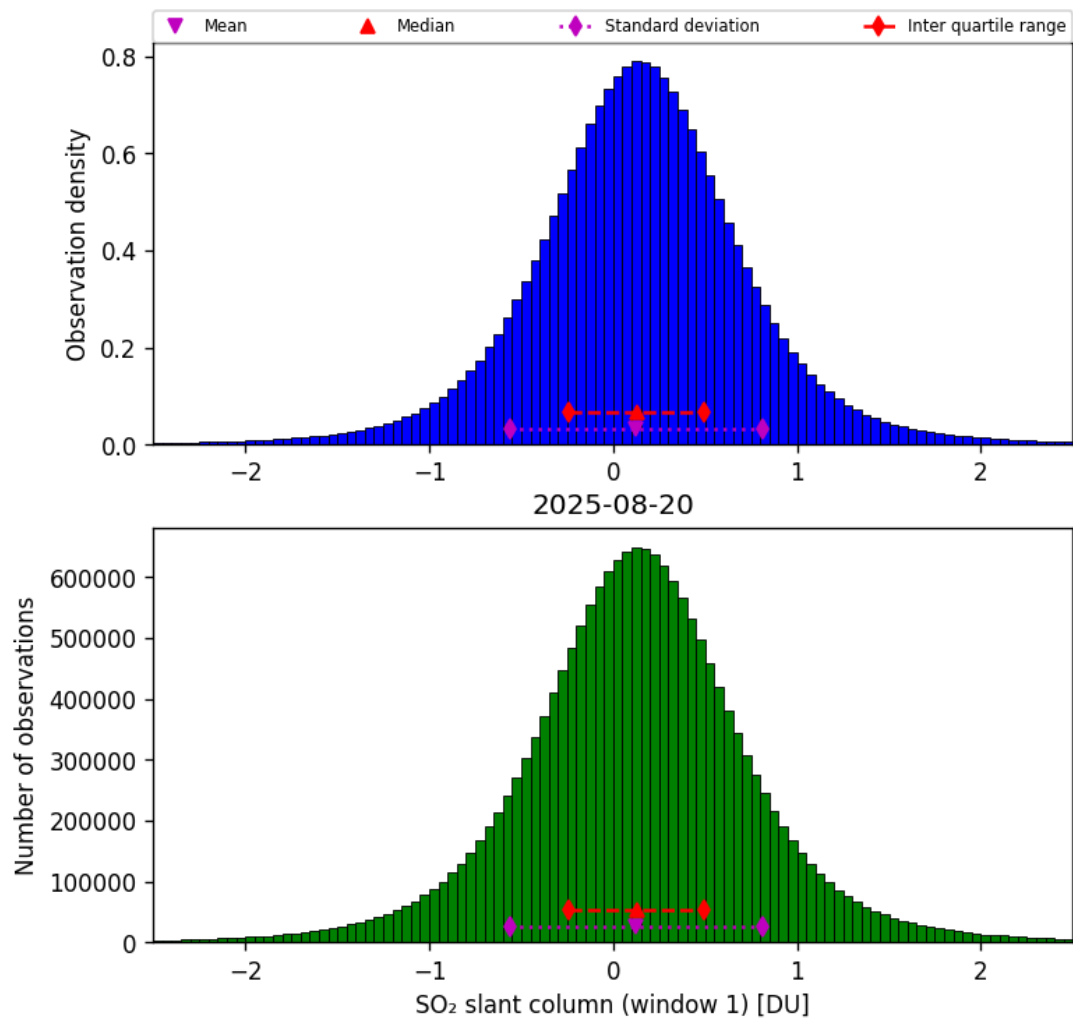


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-08-20 to 2025-08-21

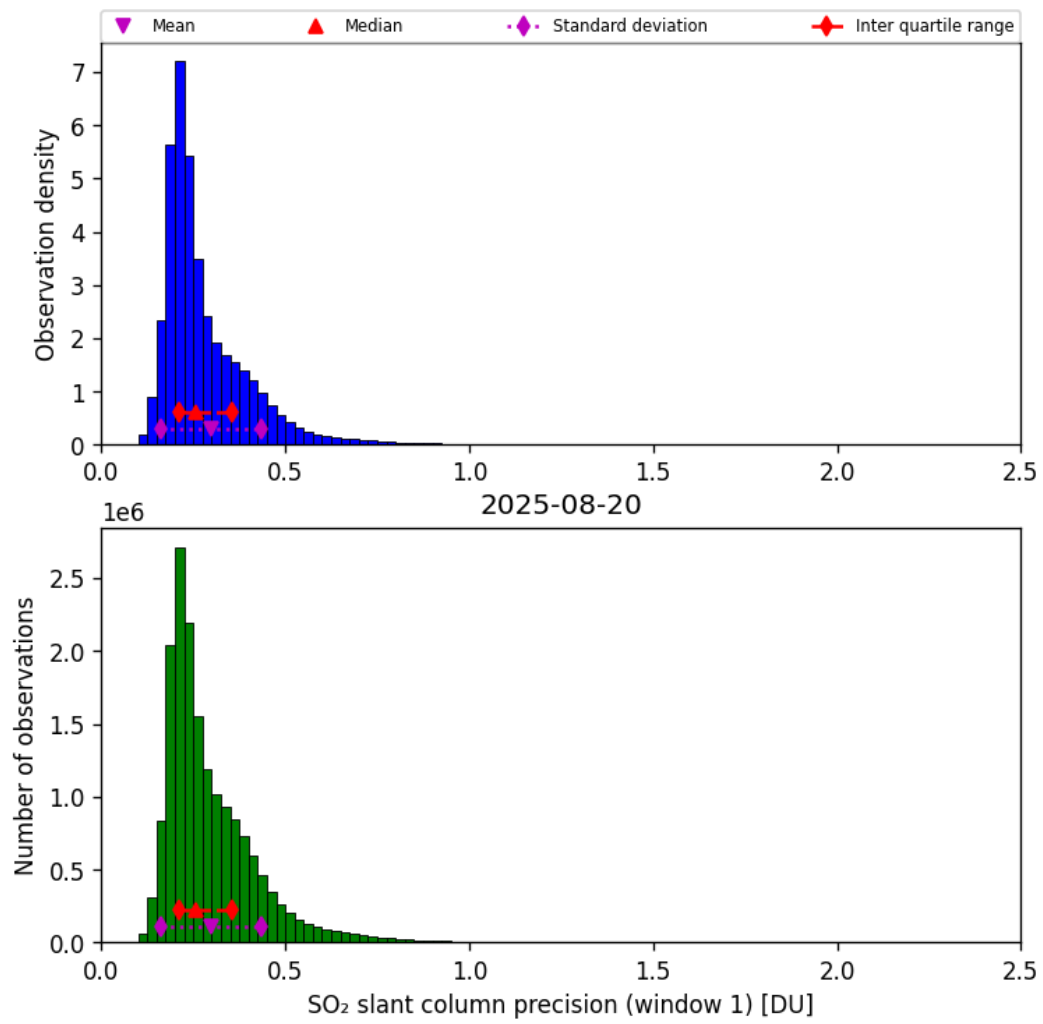


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-08-20 to 2025-08-21

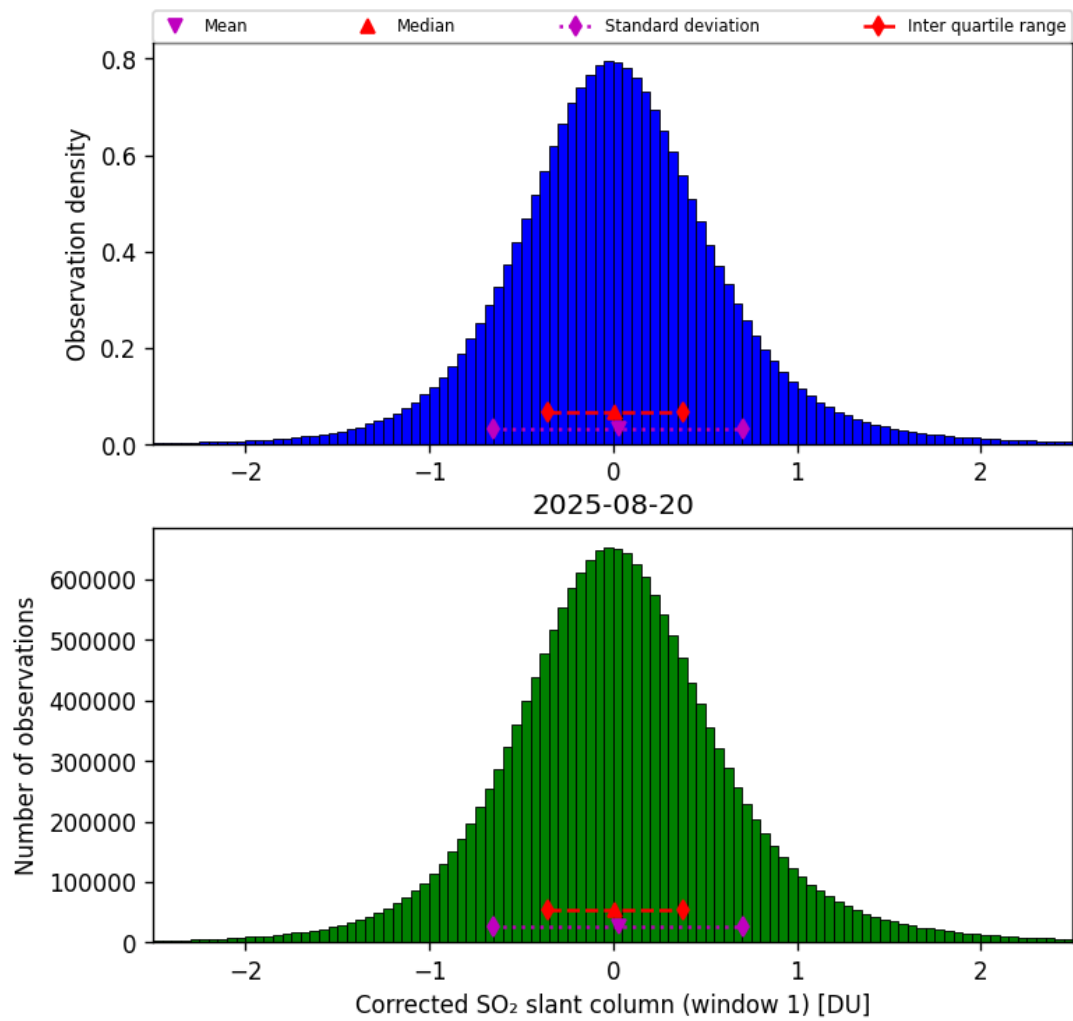


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-08-20 to 2025-08-21

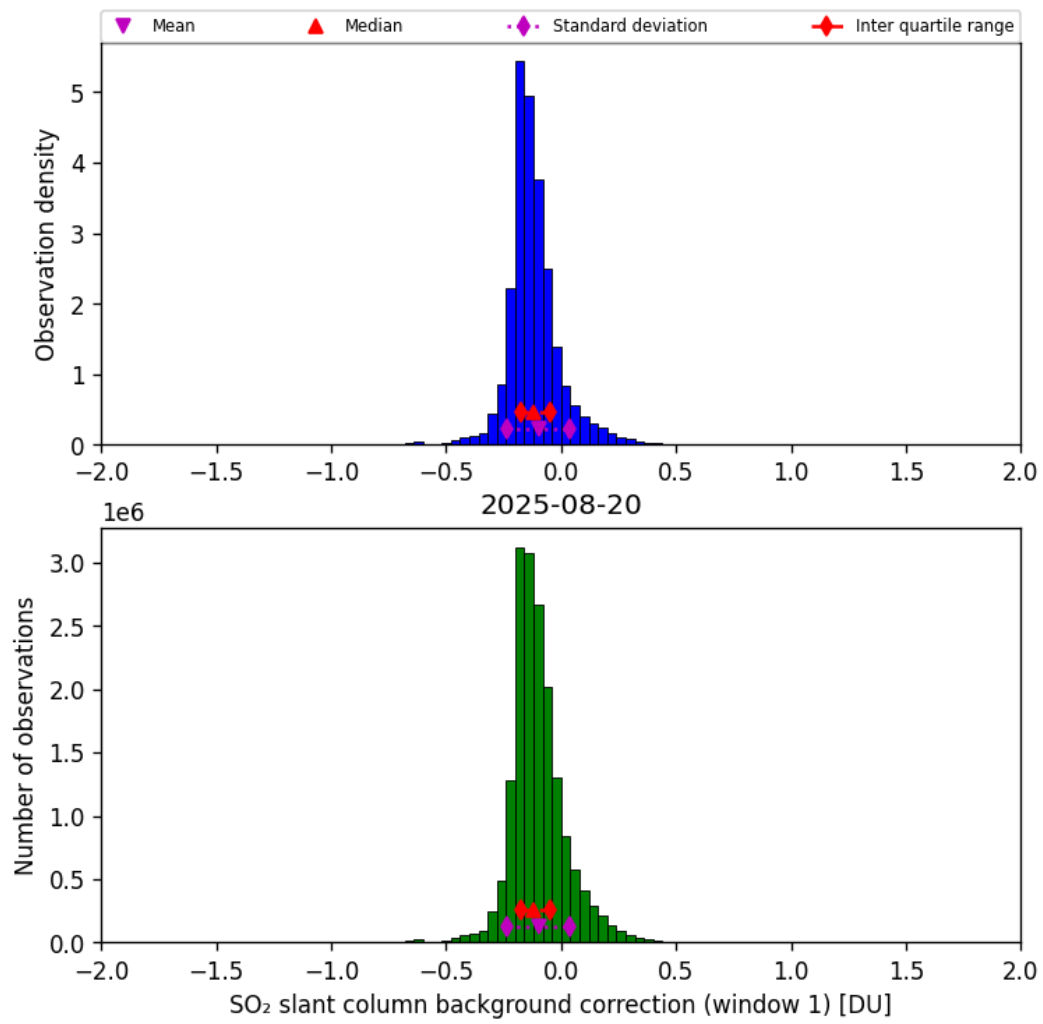


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-08-20 to 2025-08-21

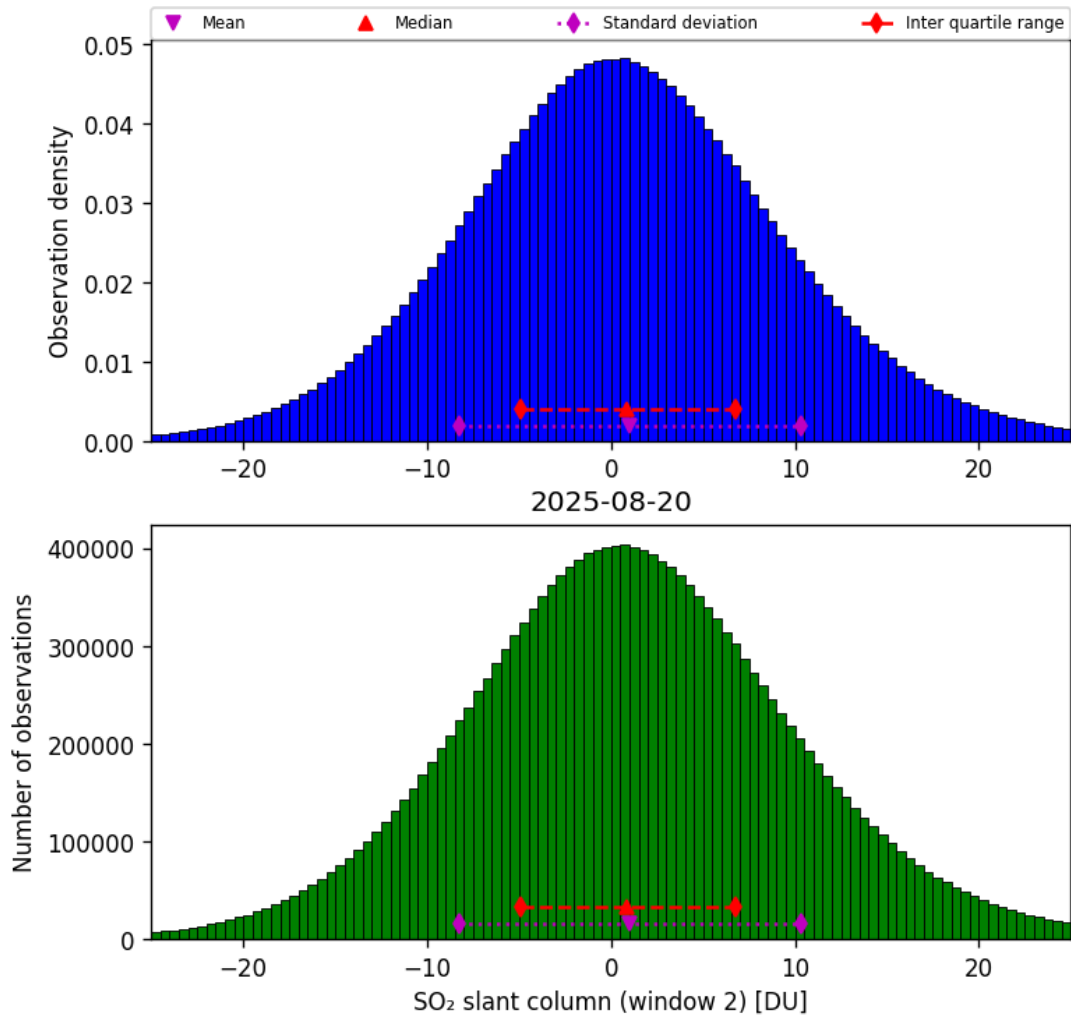


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-08-20 to 2025-08-21

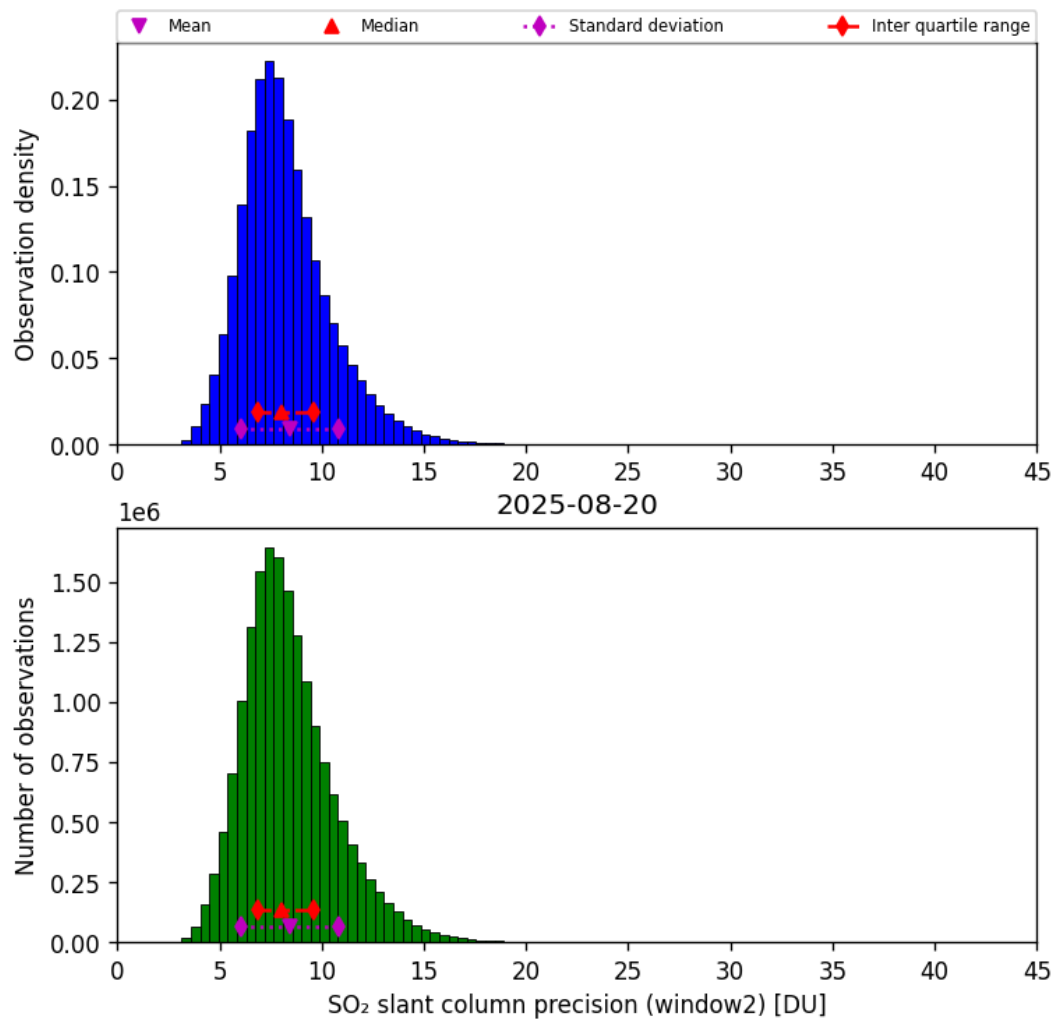


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-08-20 to 2025-08-21

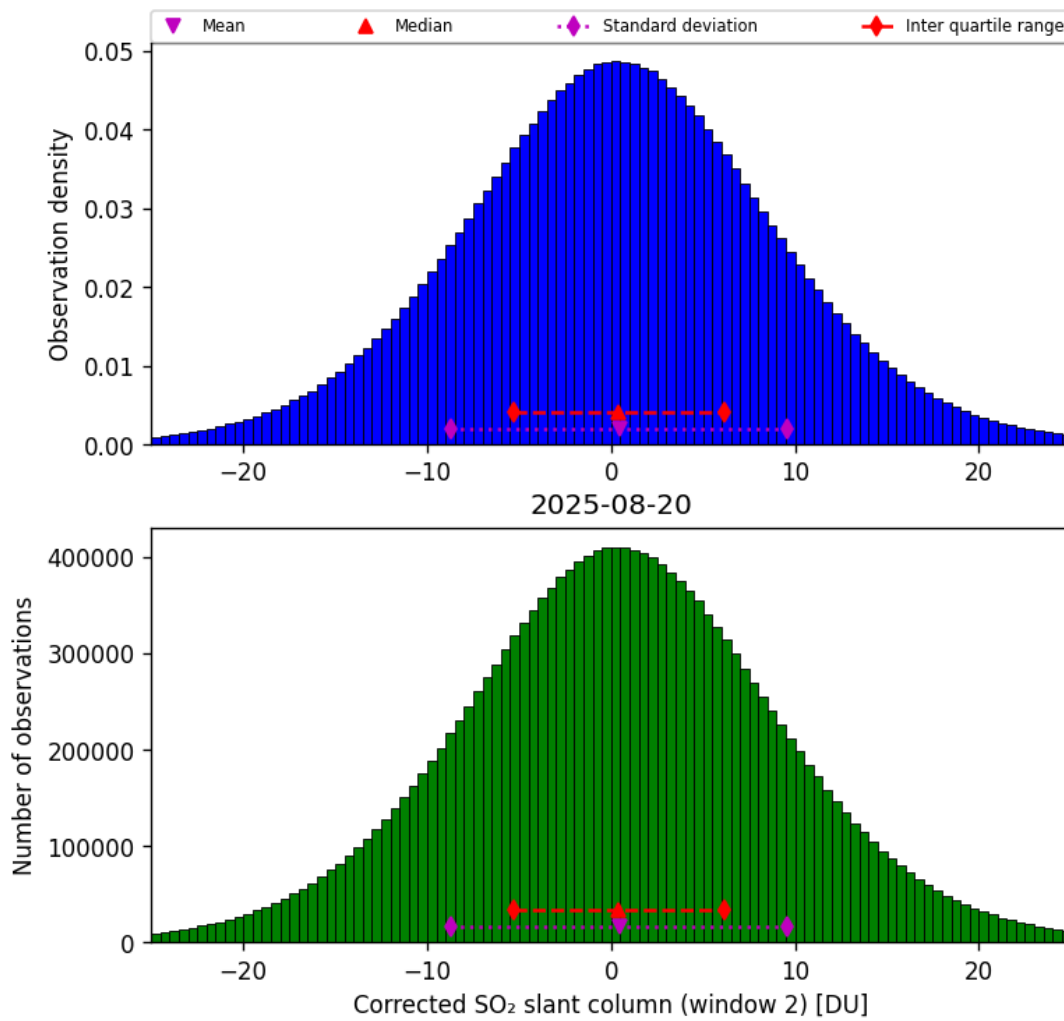


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-08-20 to 2025-08-21

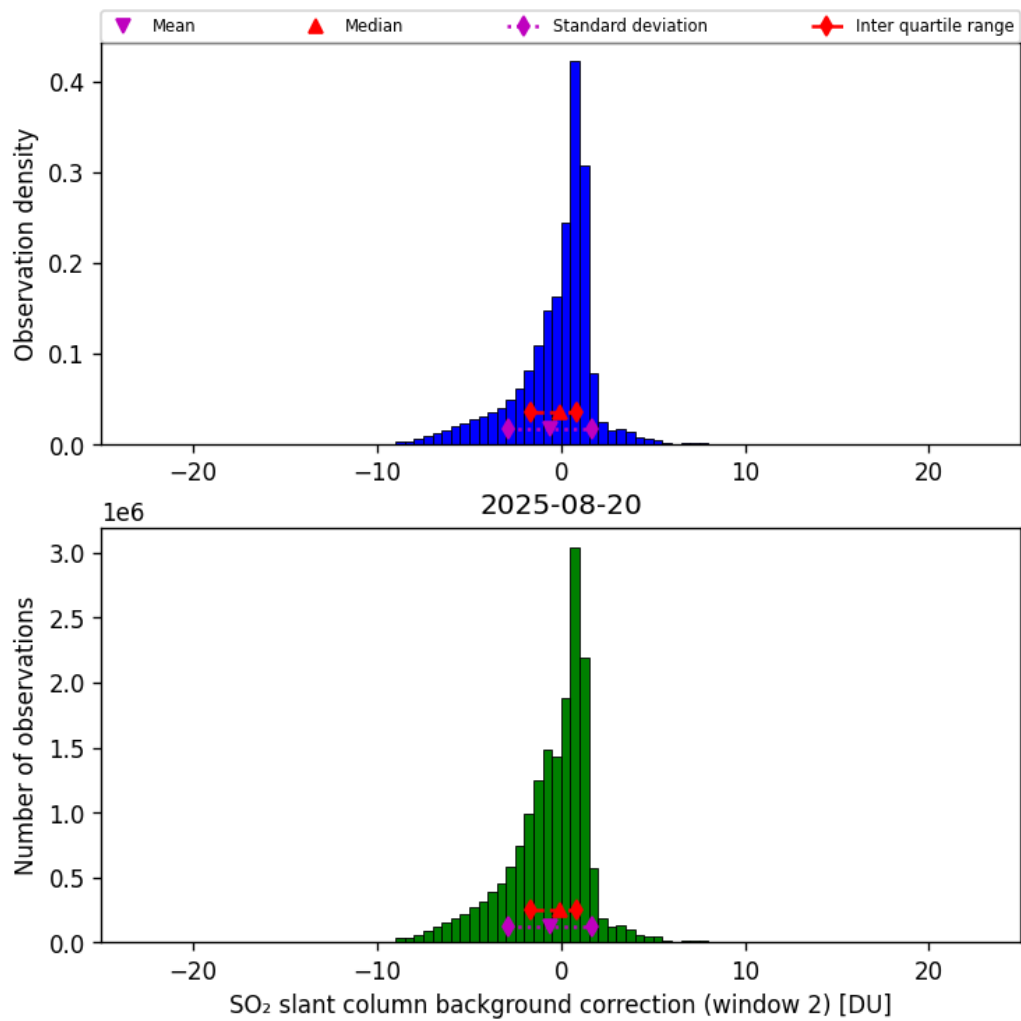


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-08-20 to 2025-08-21

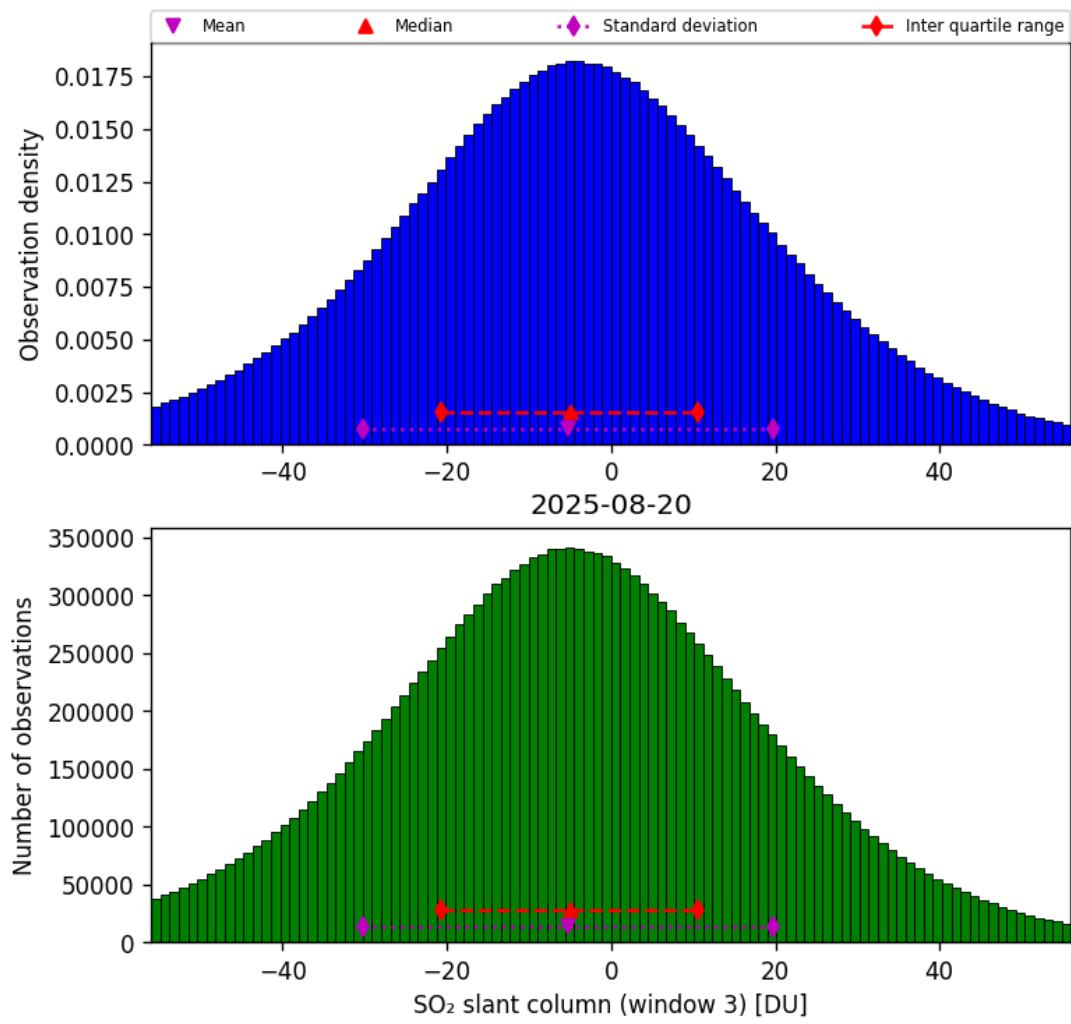


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-08-20 to 2025-08-21

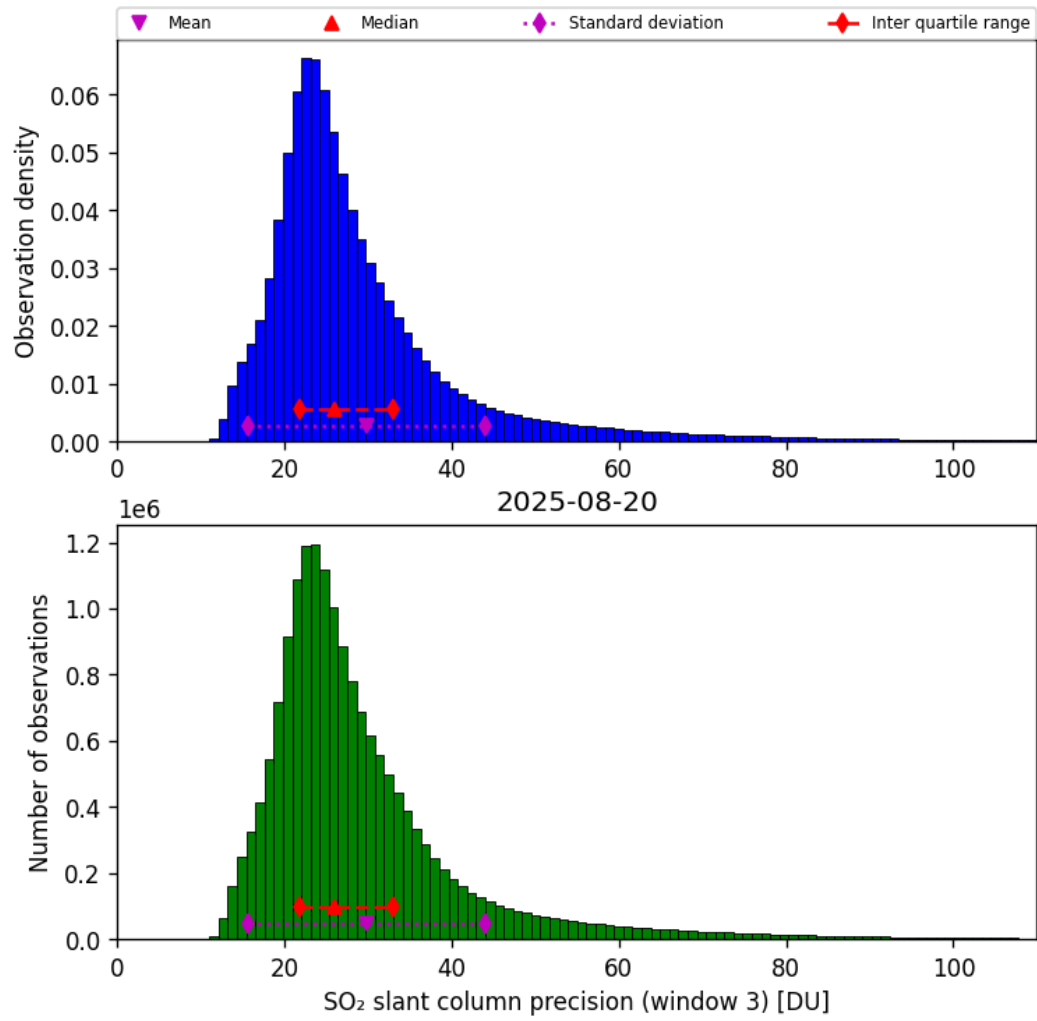


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-08-20 to 2025-08-21

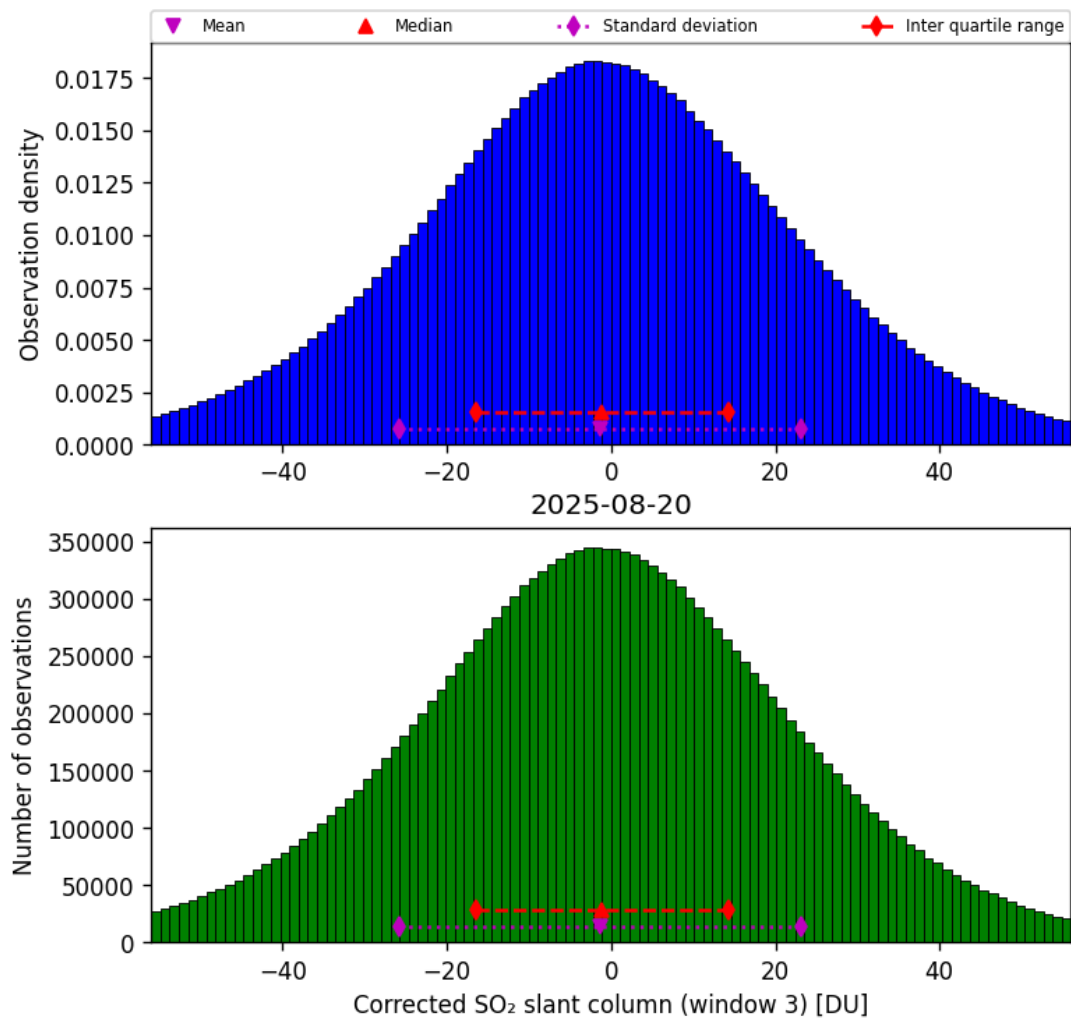


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-08-20 to 2025-08-21

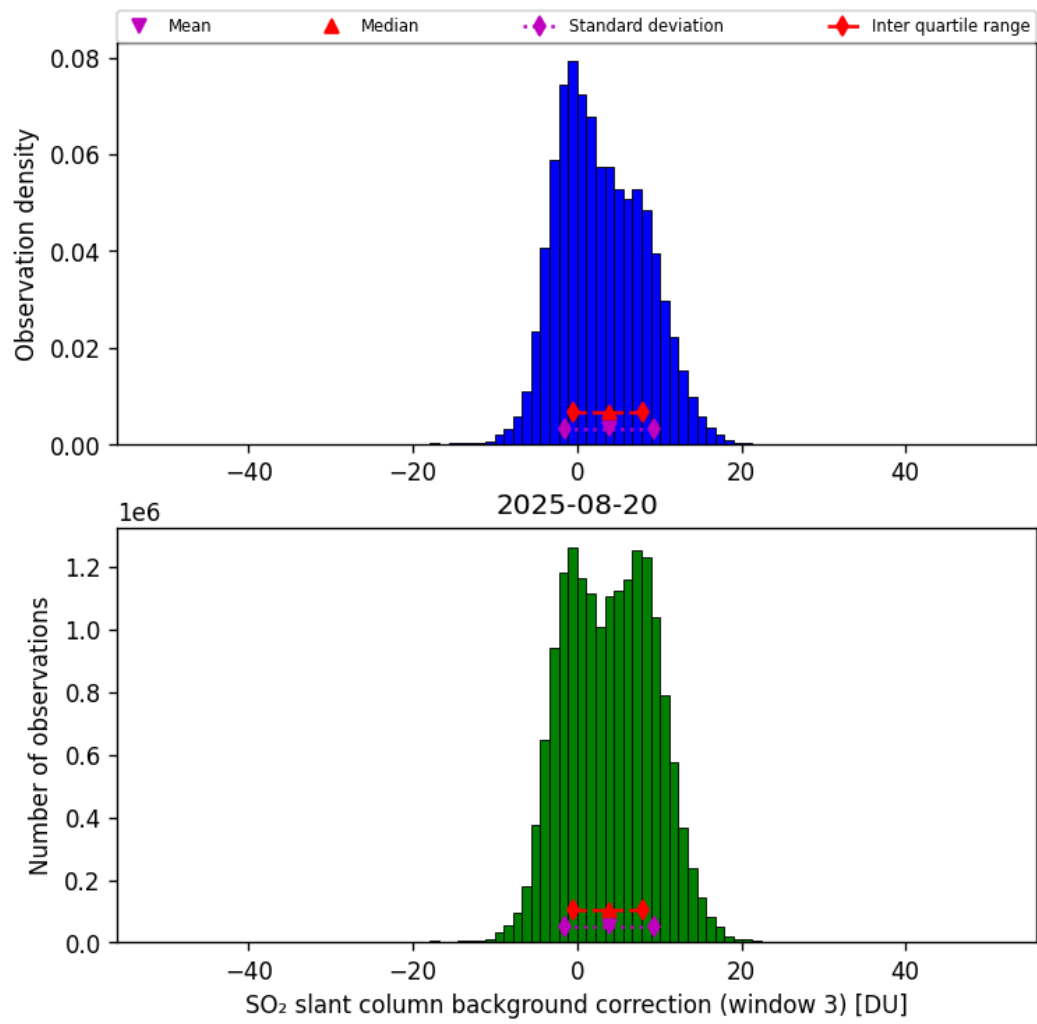


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-08-20 to 2025-08-21

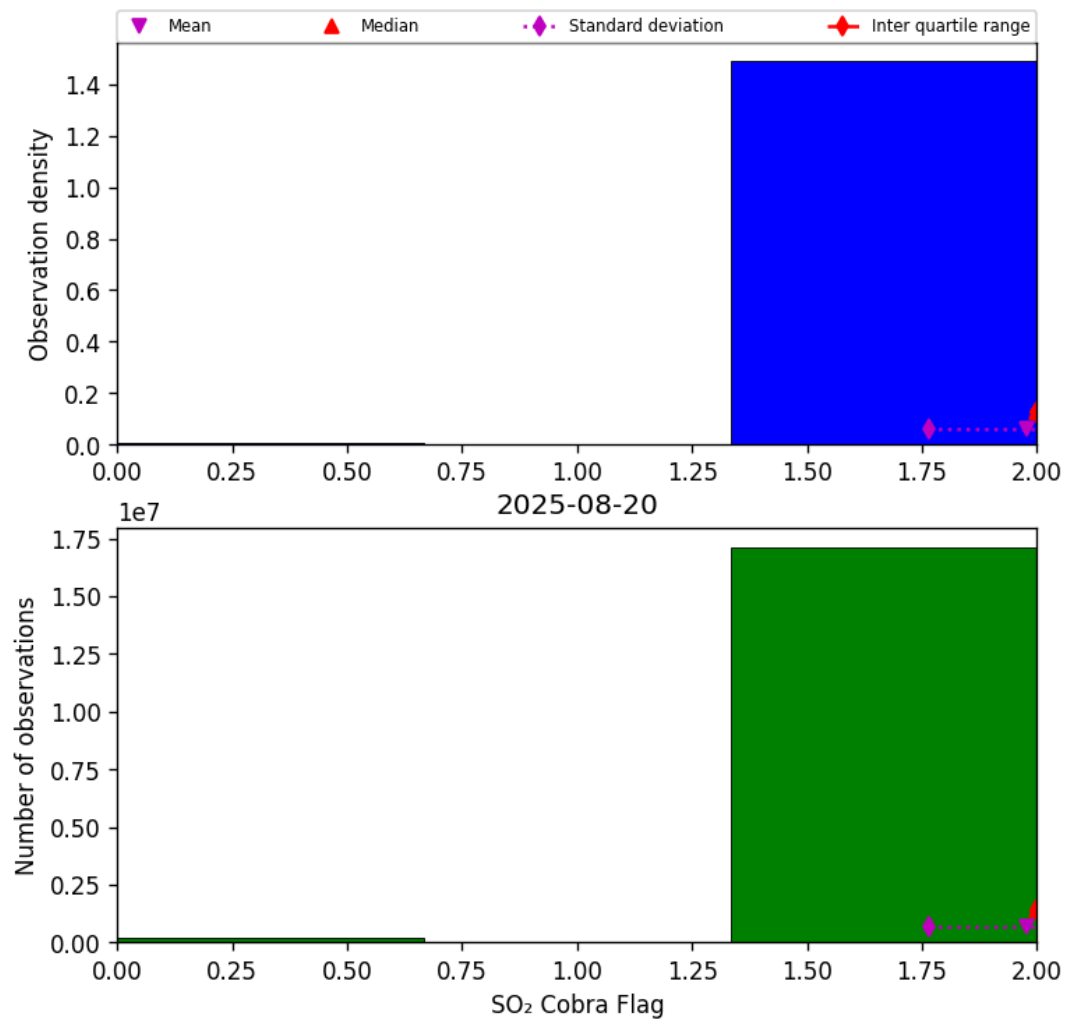


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-08-20 to 2025-08-21

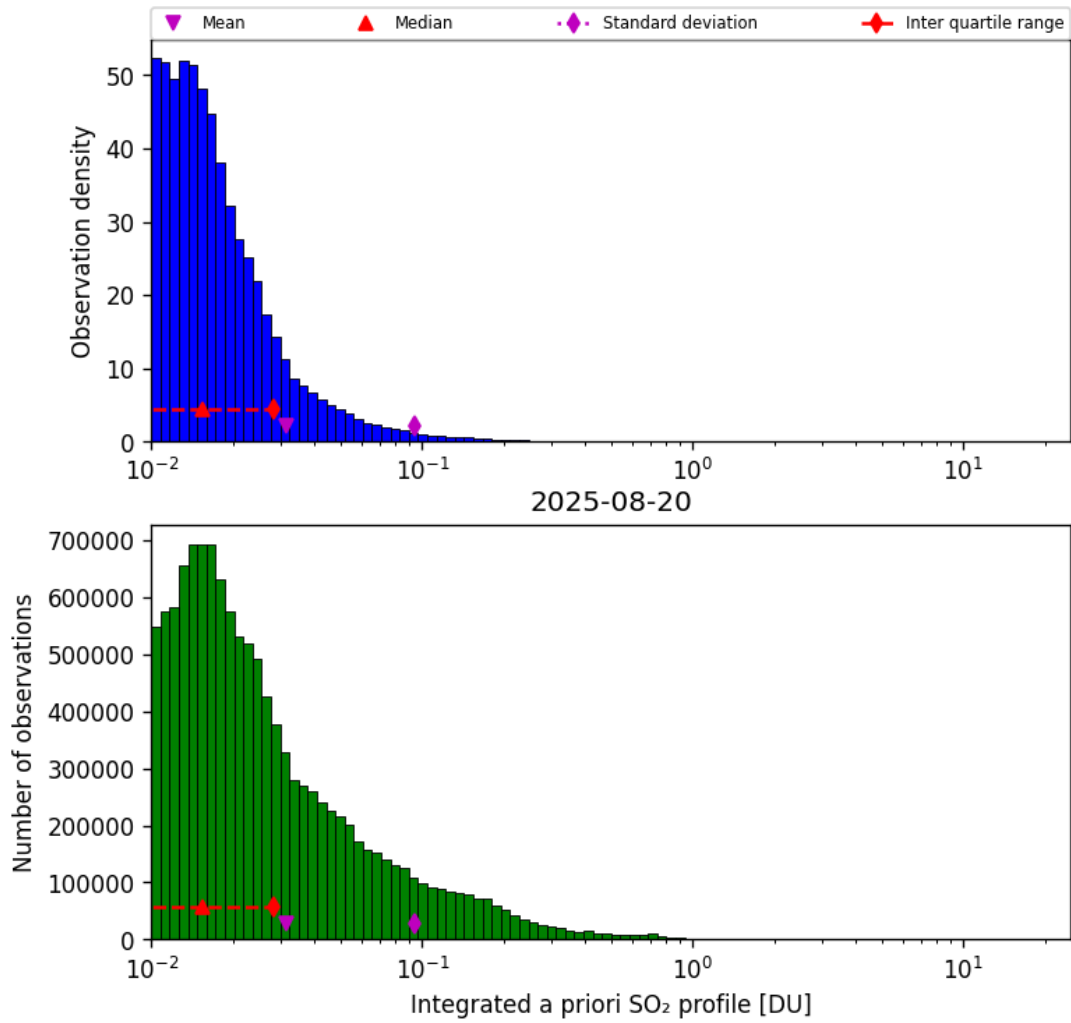


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-08-20 to 2025-08-21

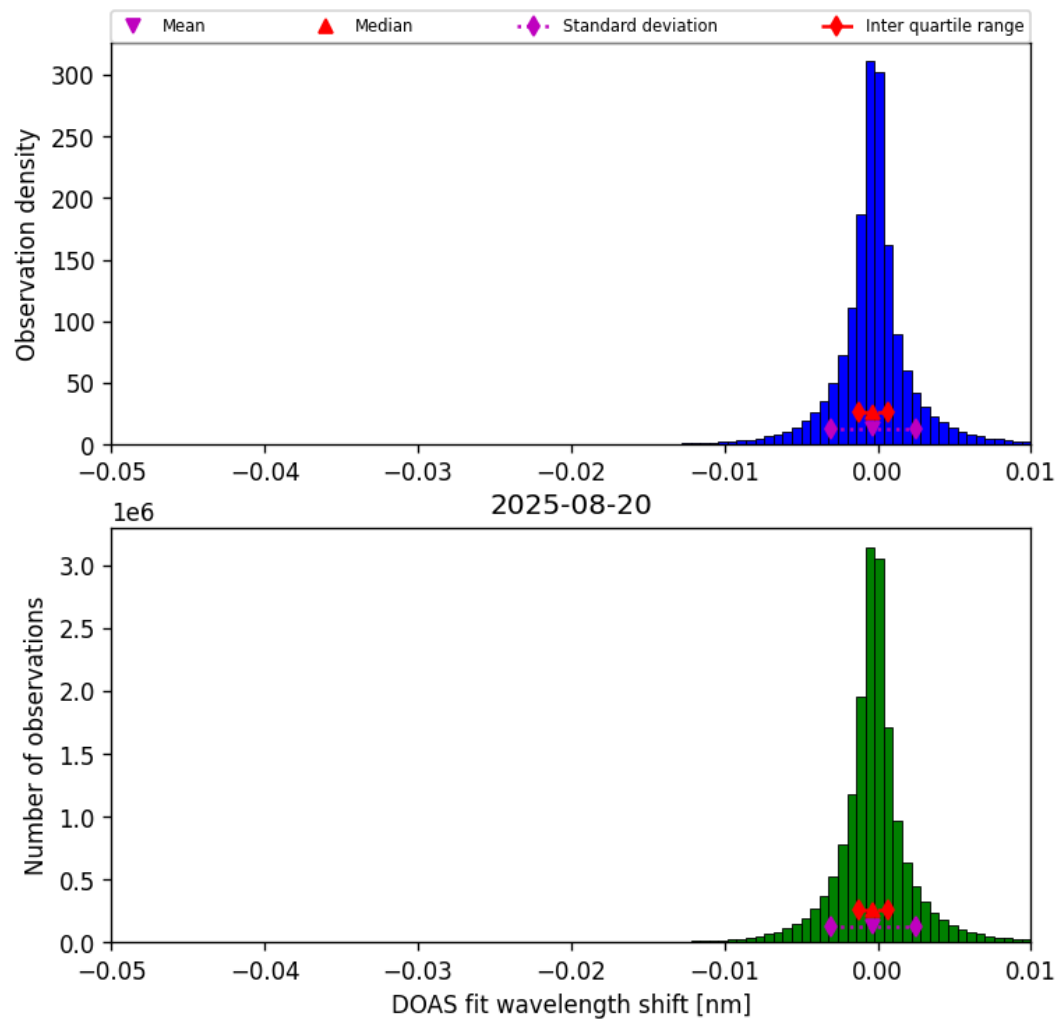


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-08-20 to 2025-08-21

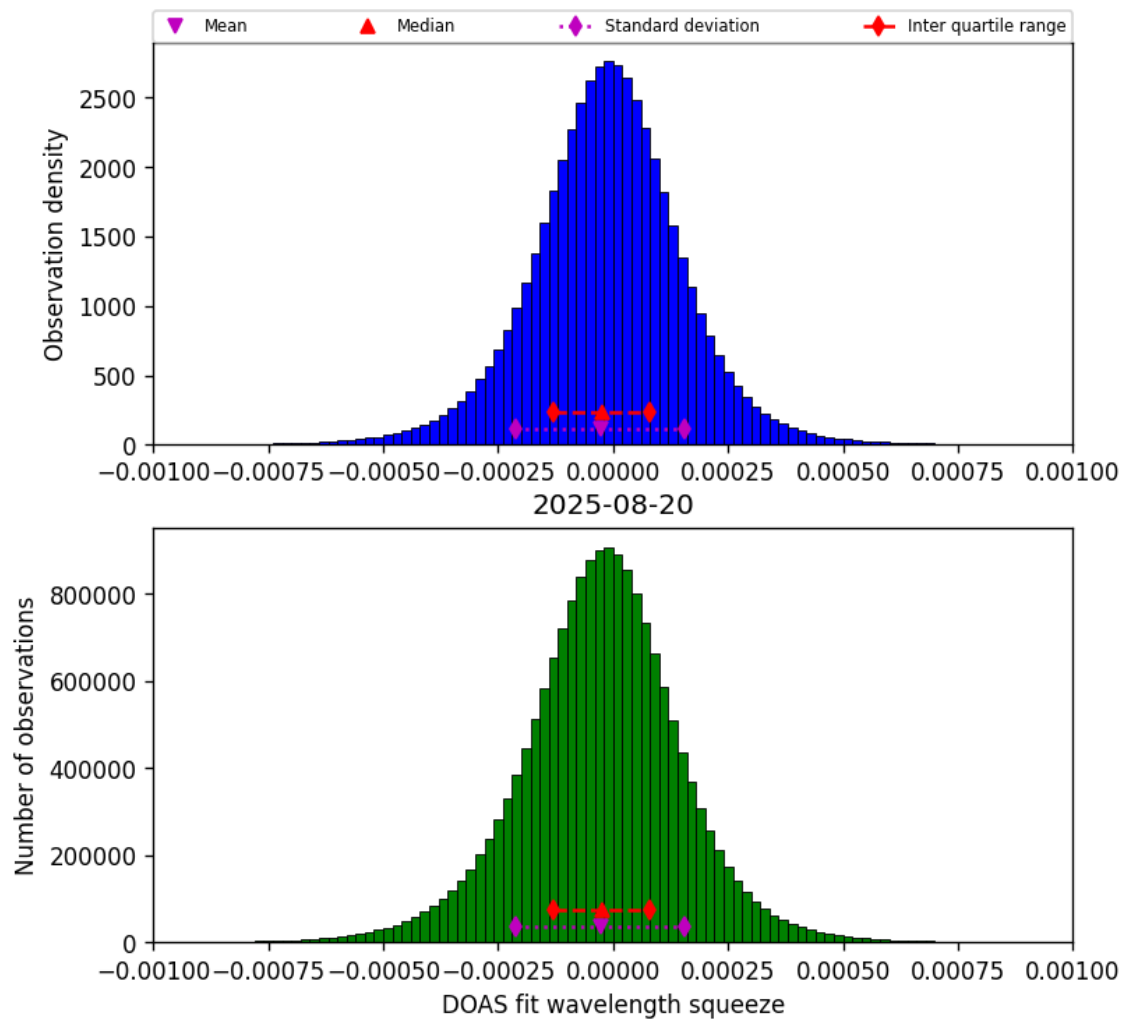


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-08-20 to 2025-08-21

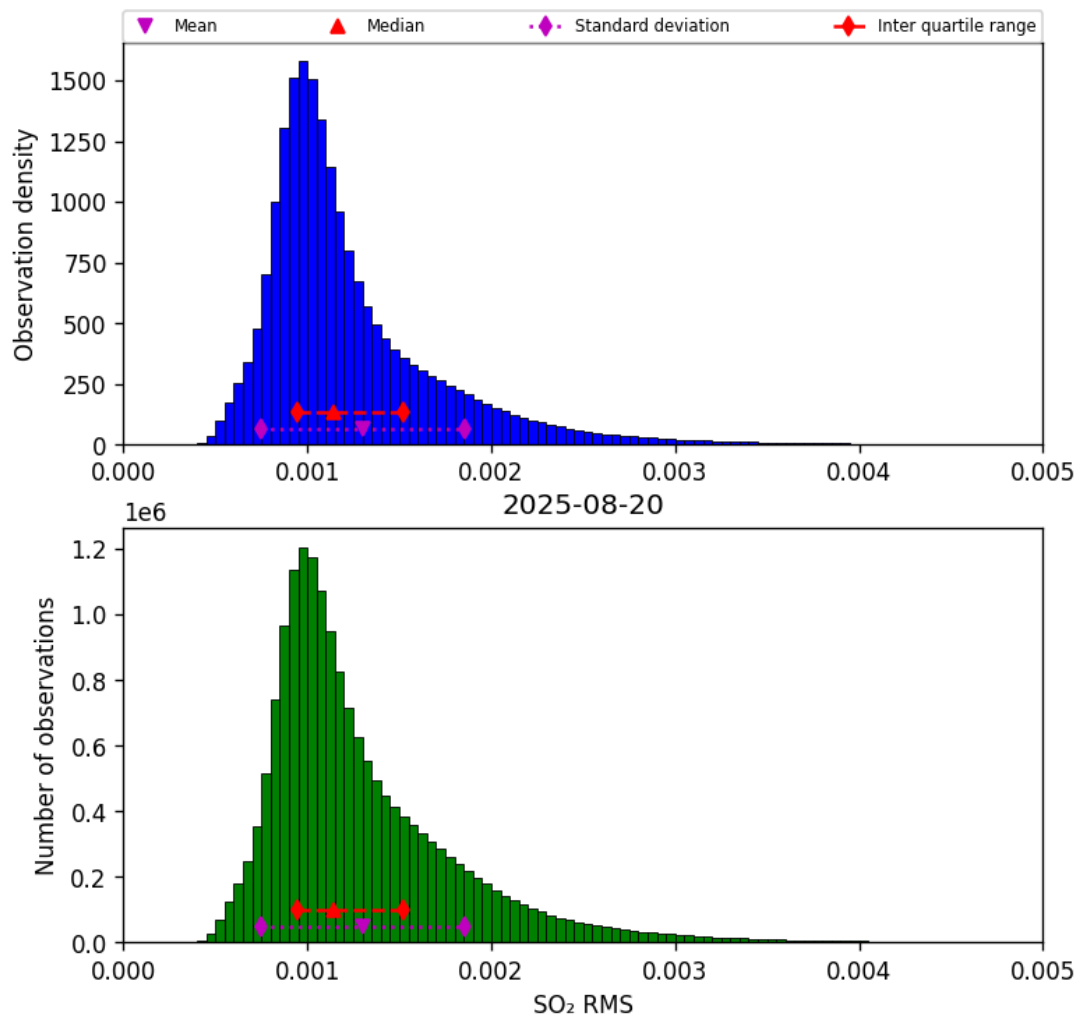


Figure 79: Histogram of “SO₂ RMS” for 2025-08-20 to 2025-08-21

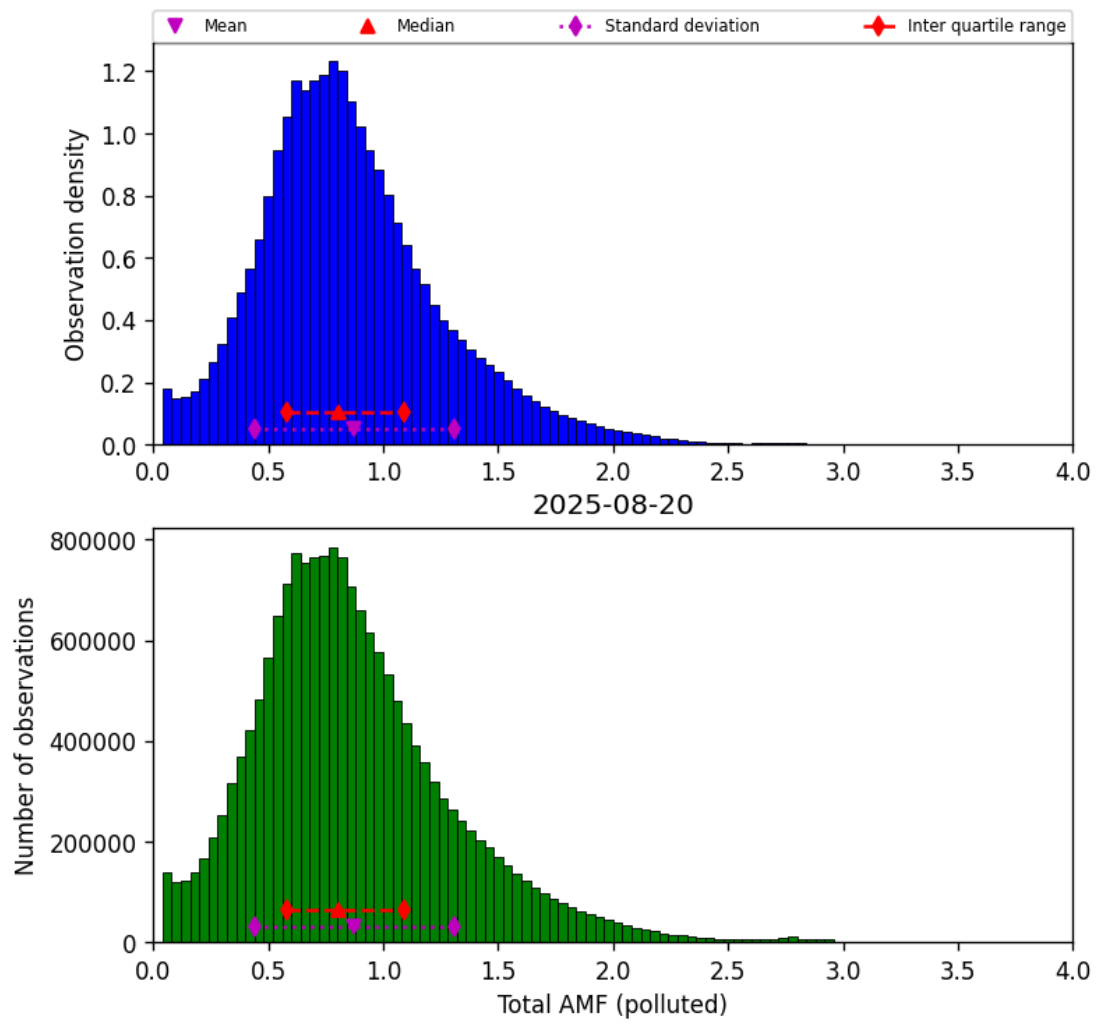


Figure 80: Histogram of “Total AMF (polluted)” for 2025-08-20 to 2025-08-21

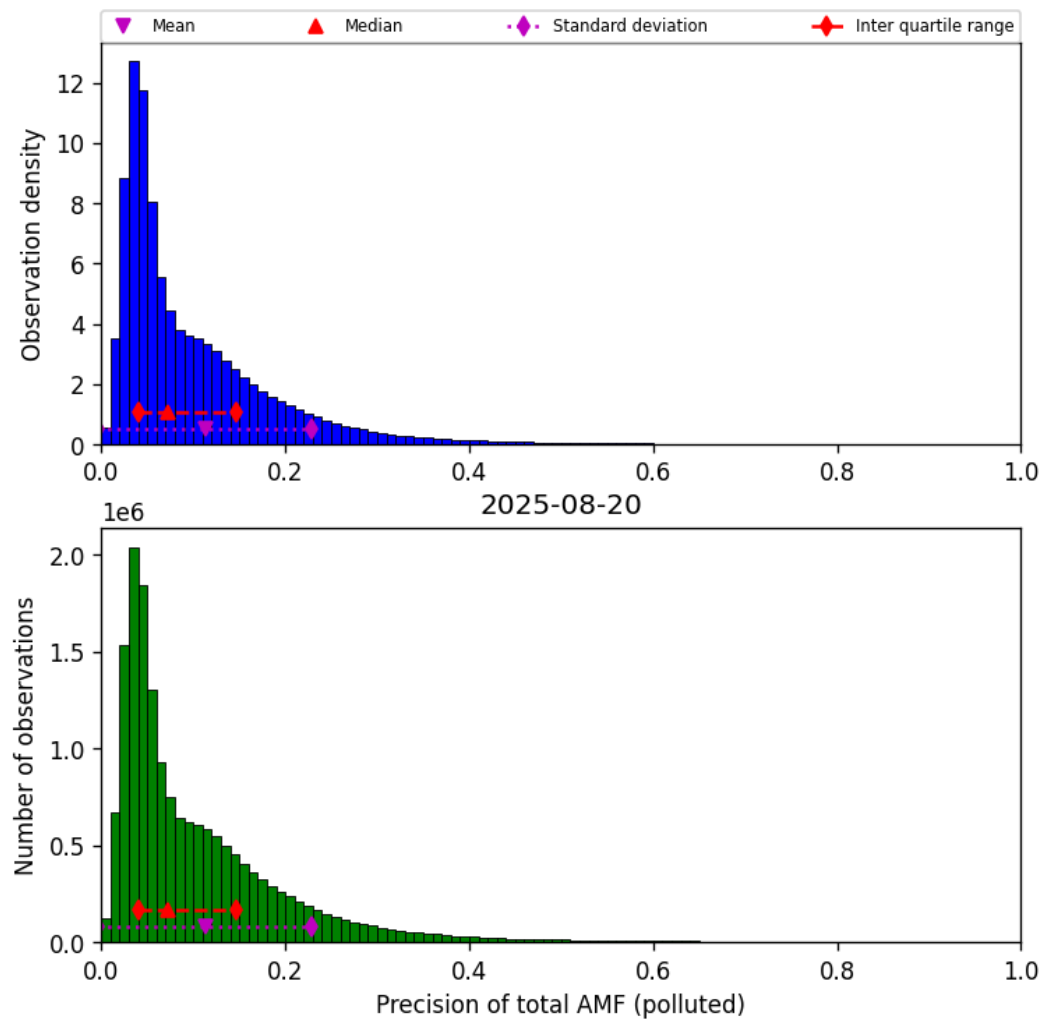


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-08-20 to 2025-08-21

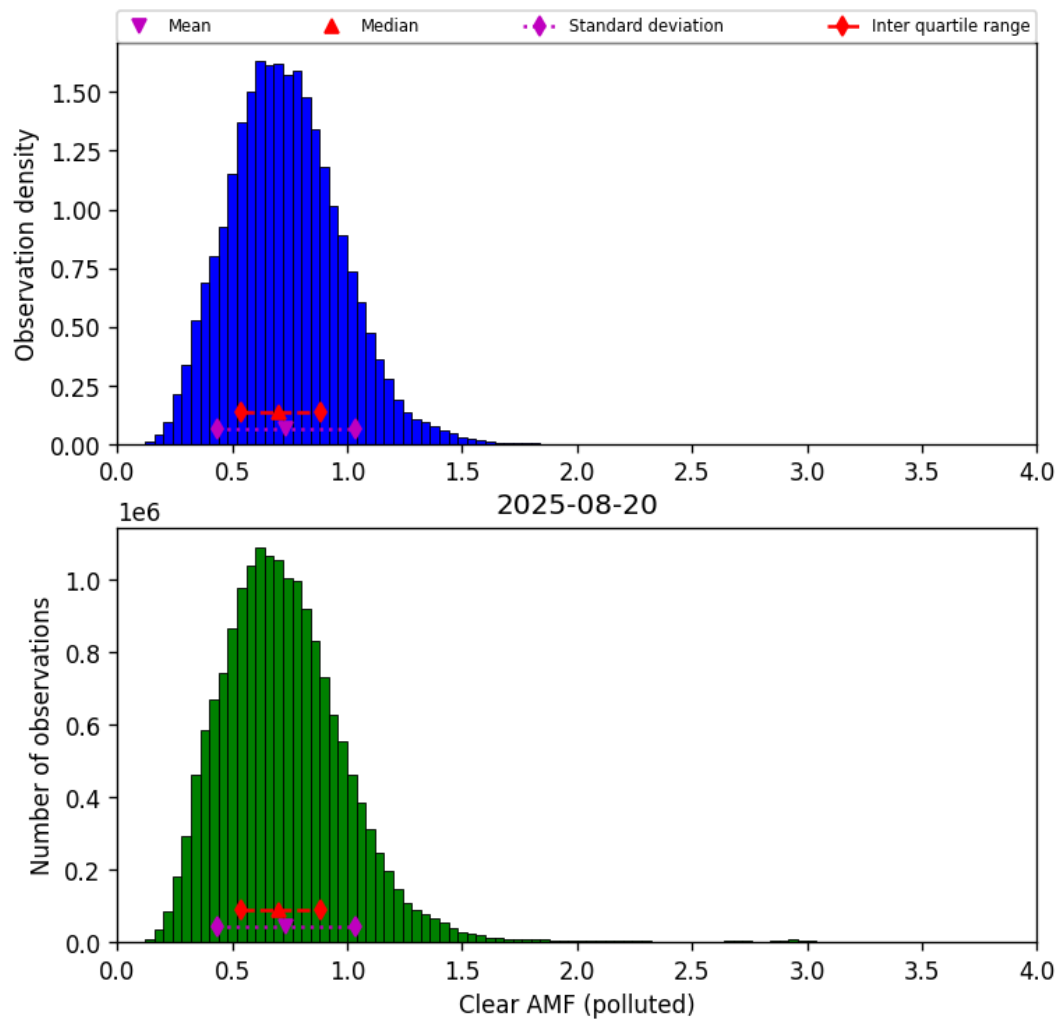


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-08-20 to 2025-08-21

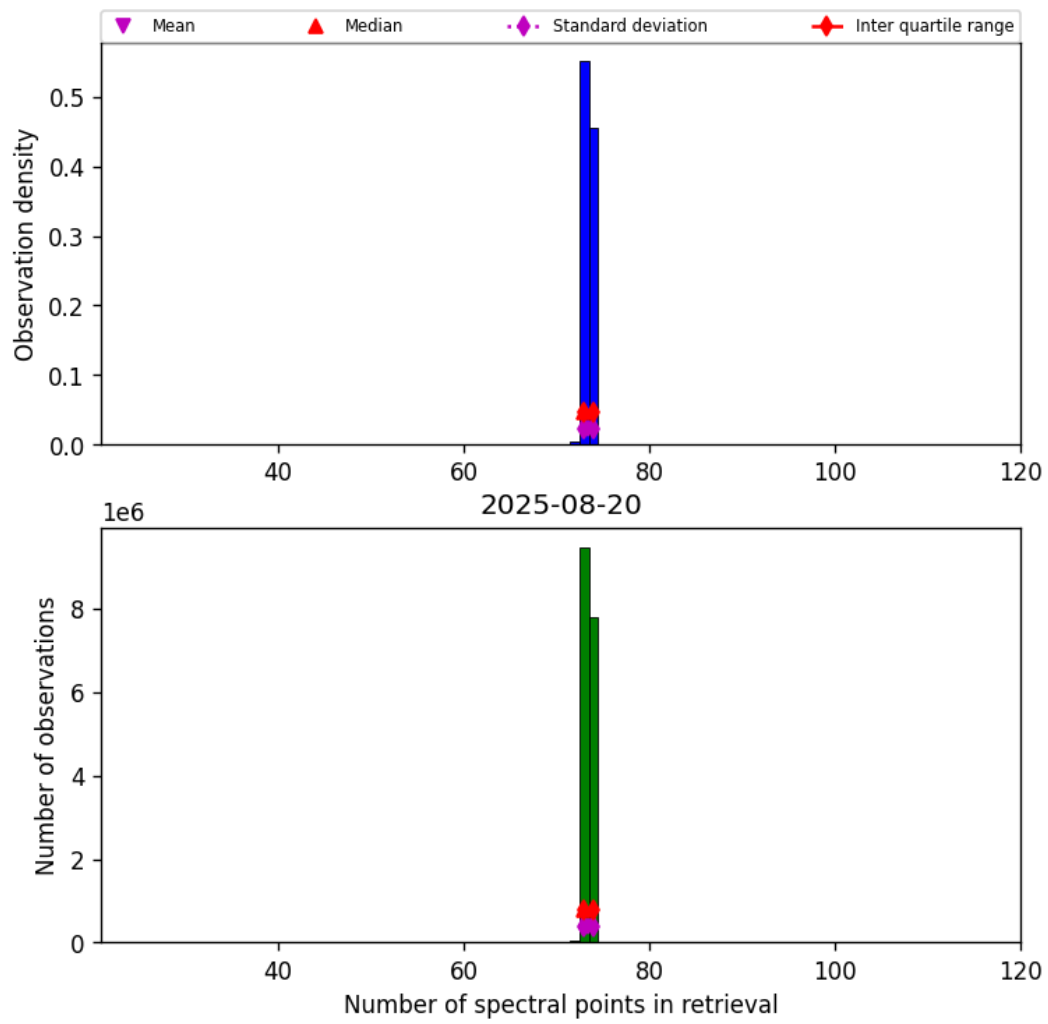


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-08-20 to 2025-08-21

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.

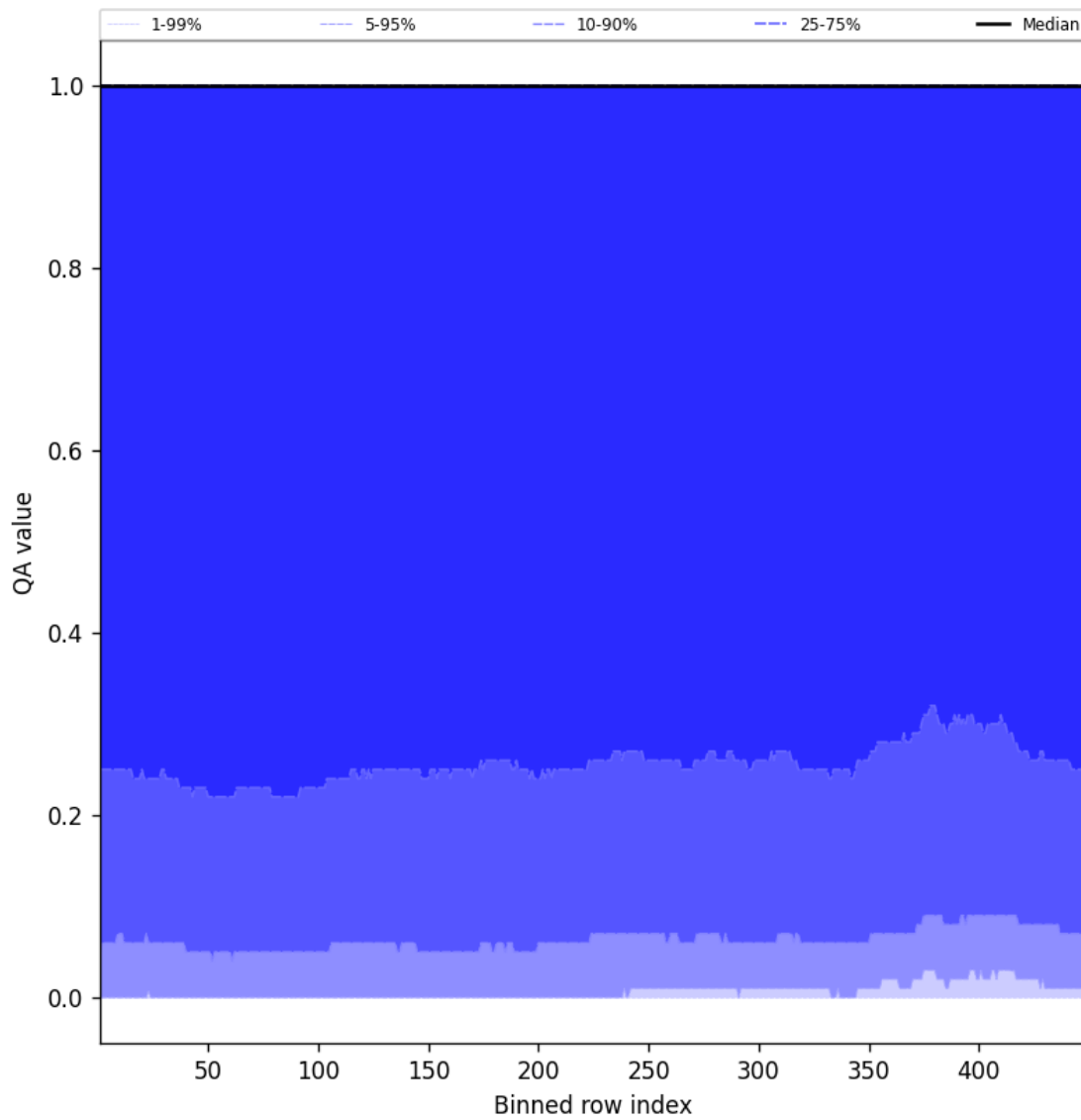


Figure 84: Along track statistics of “QA value” for 2025-08-20 to 2025-08-21

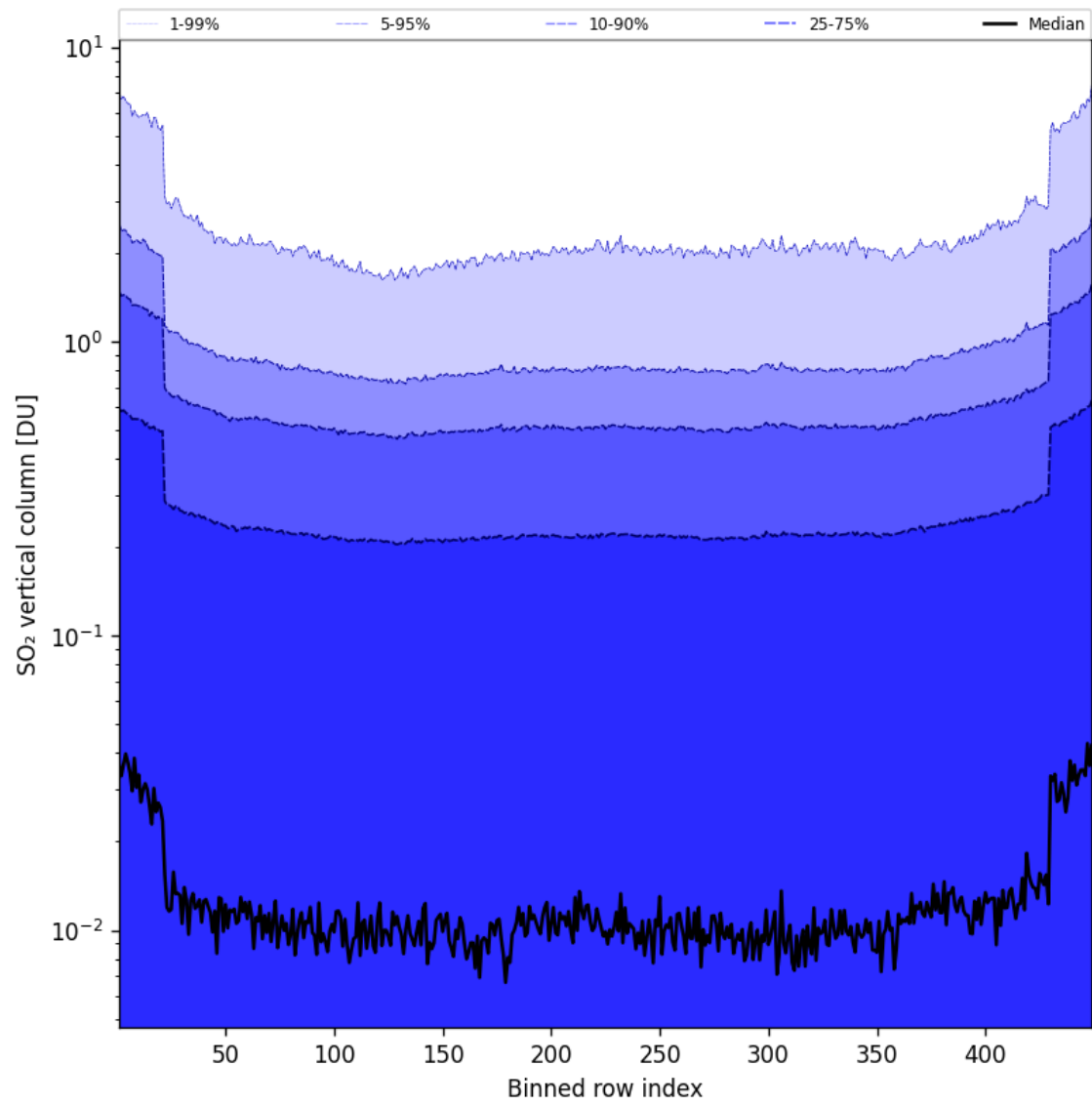


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-08-20 to 2025-08-21

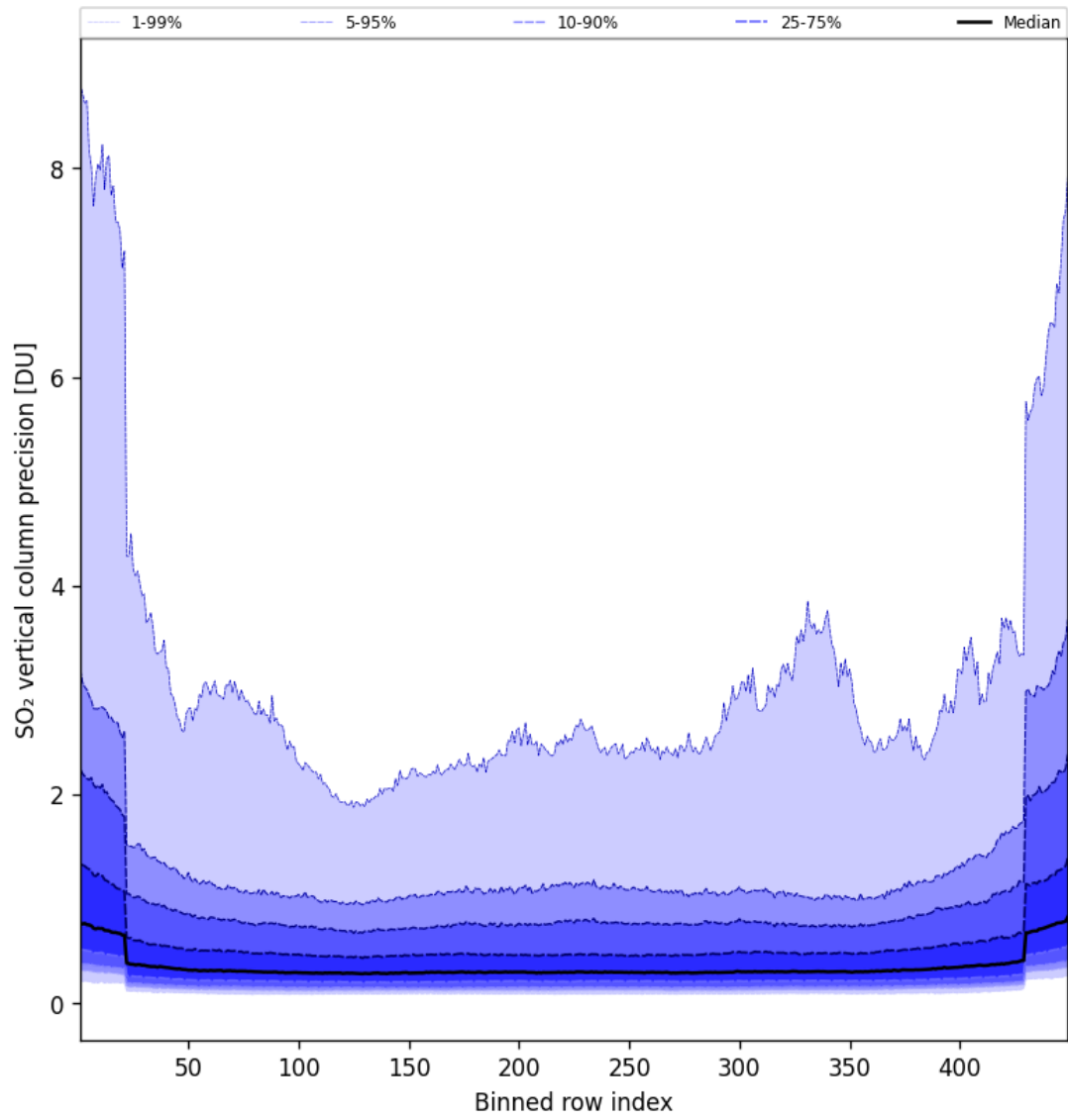


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-08-20 to 2025-08-21

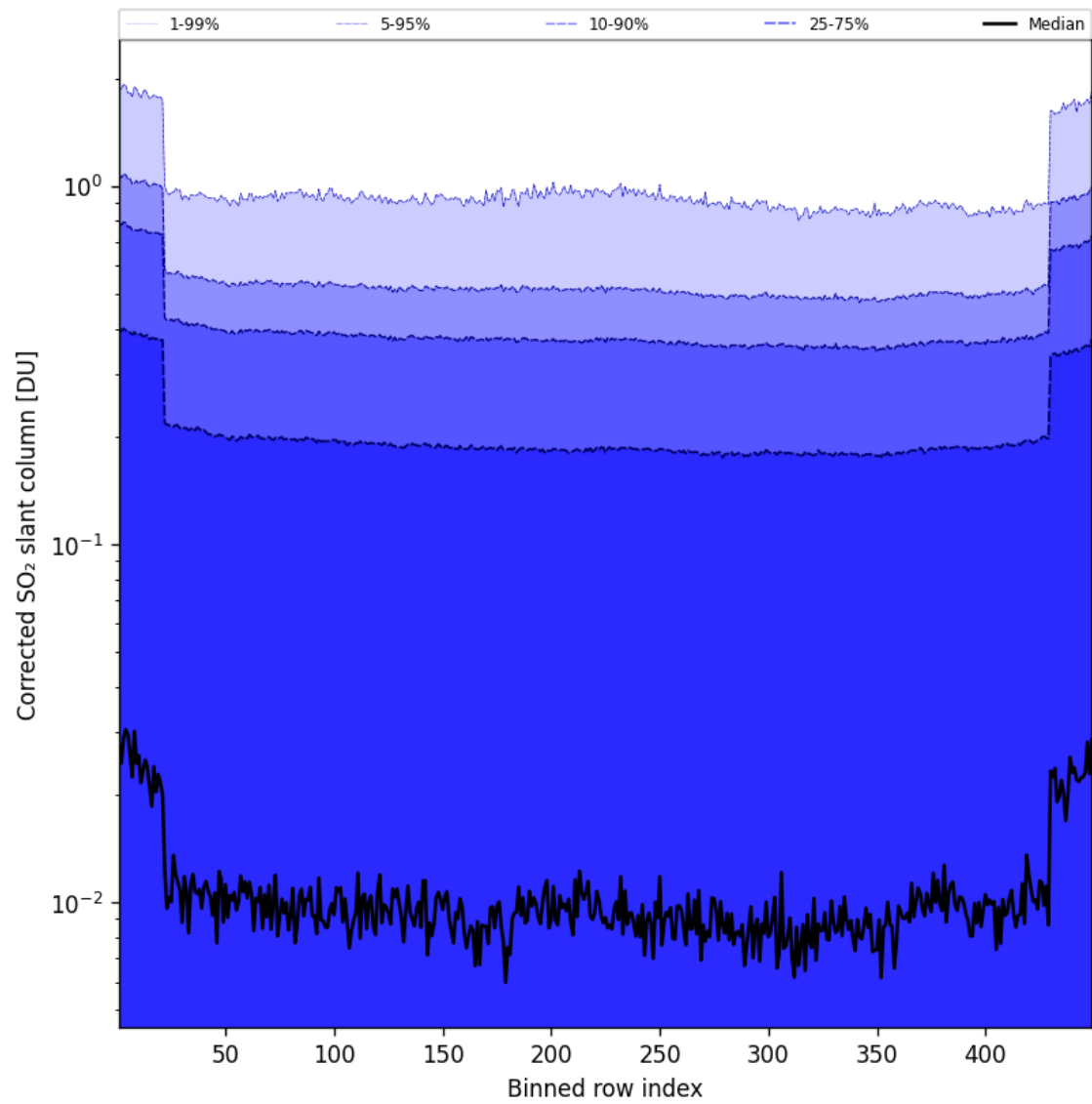


Figure 87: Along track statistics of "Corrected SO₂ slant column" for 2025-08-20 to 2025-08-21

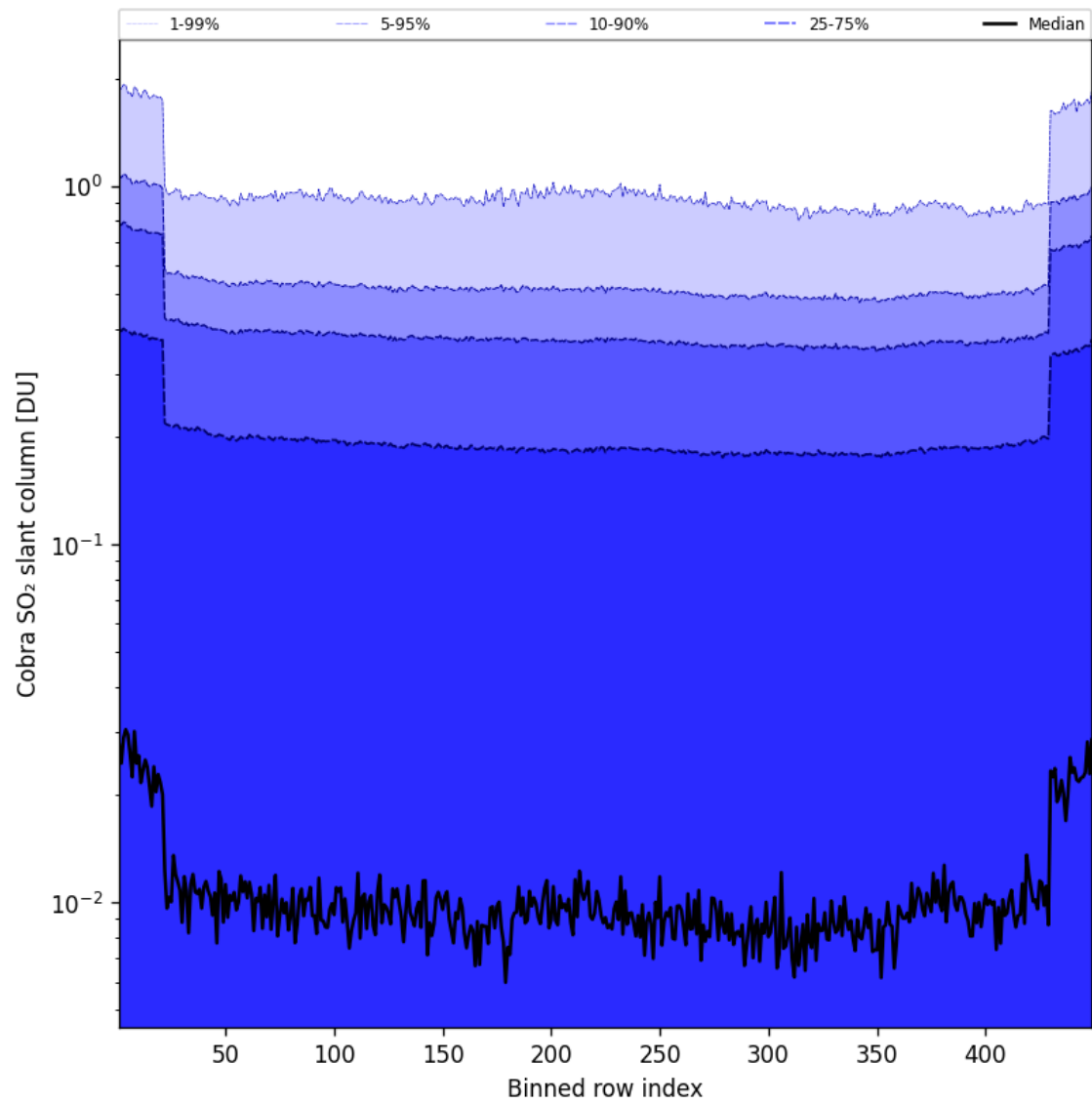


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-08-20 to 2025-08-21

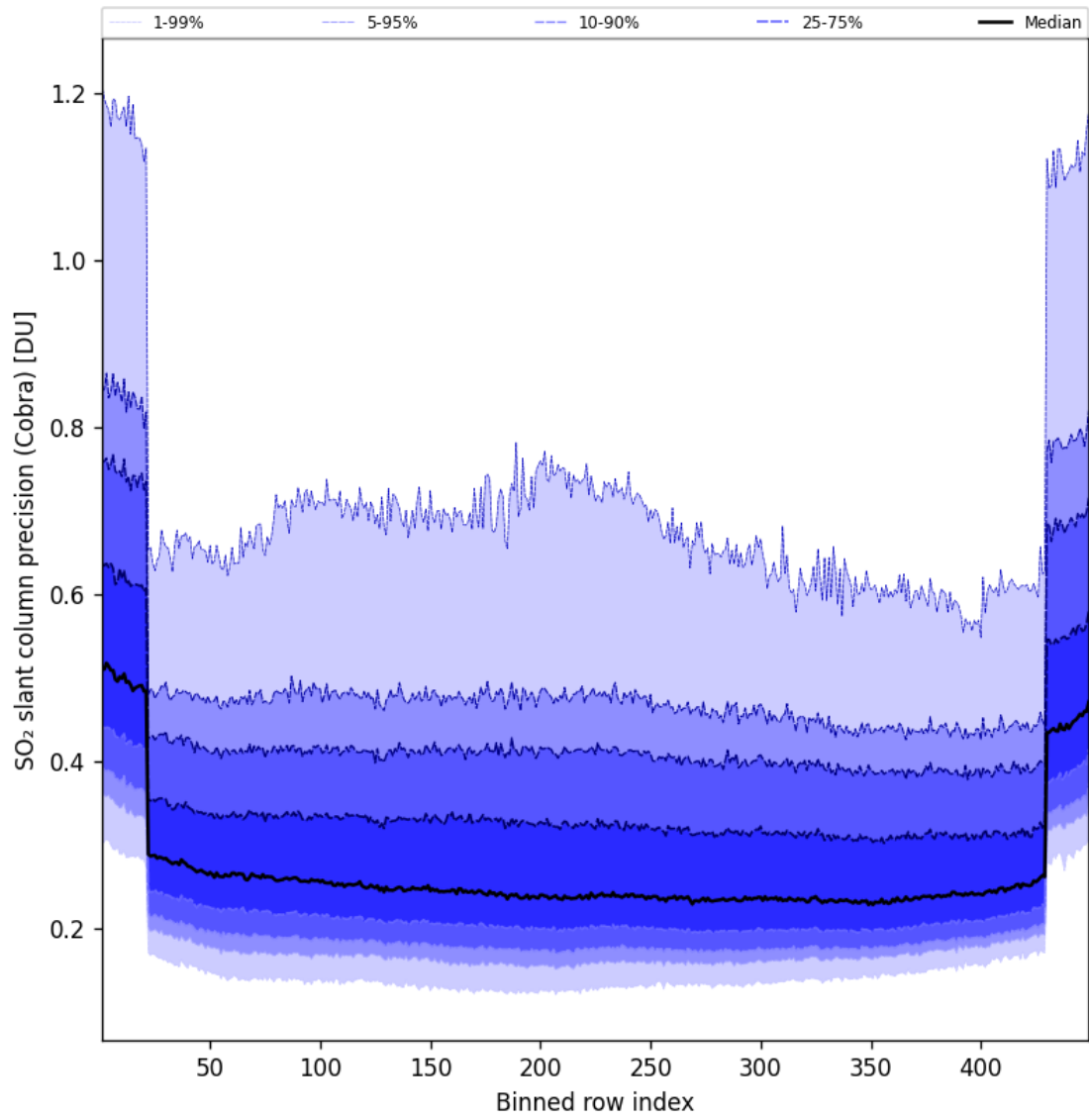


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-08-20 to 2025-08-21

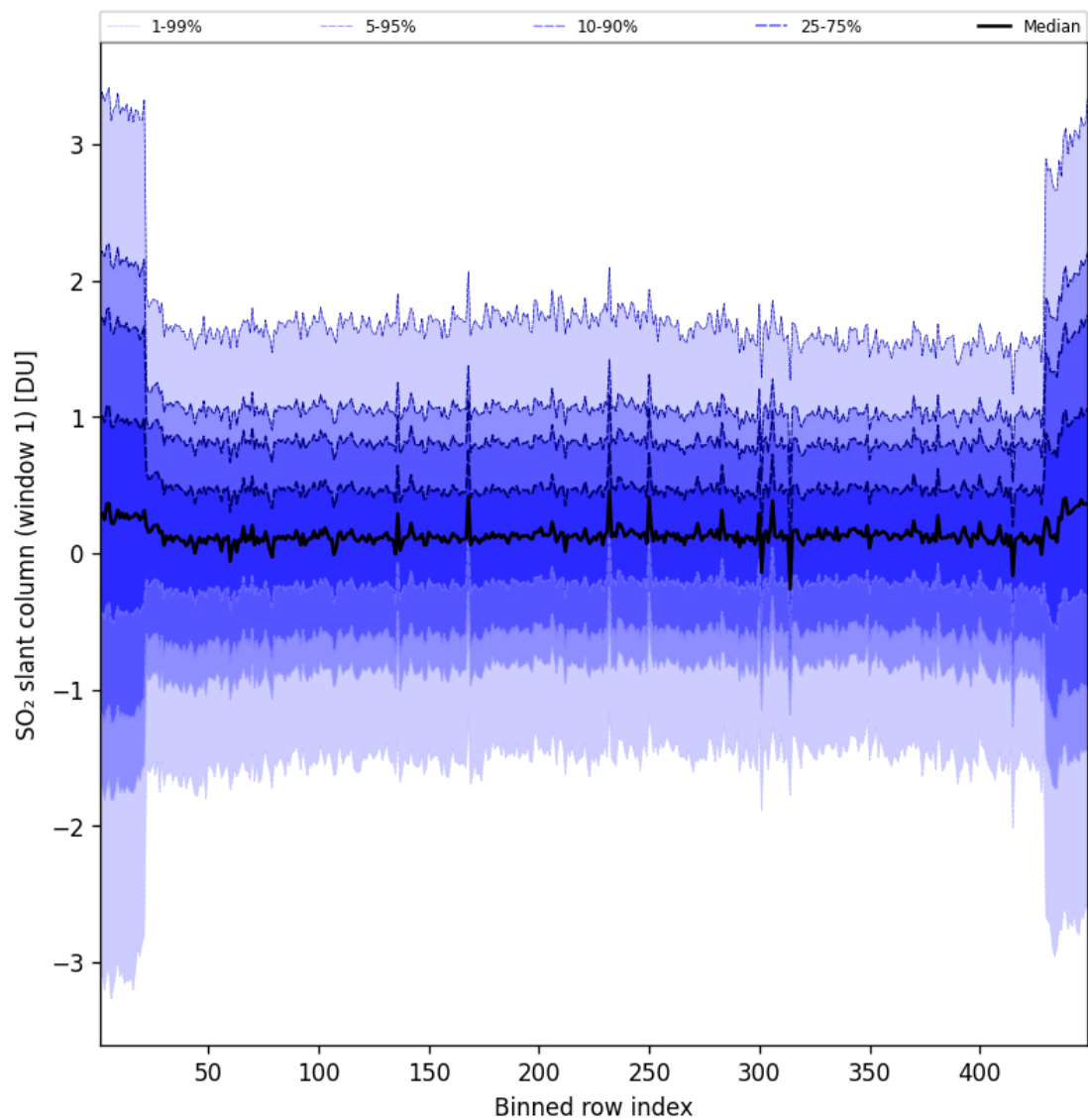


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-08-20 to 2025-08-21

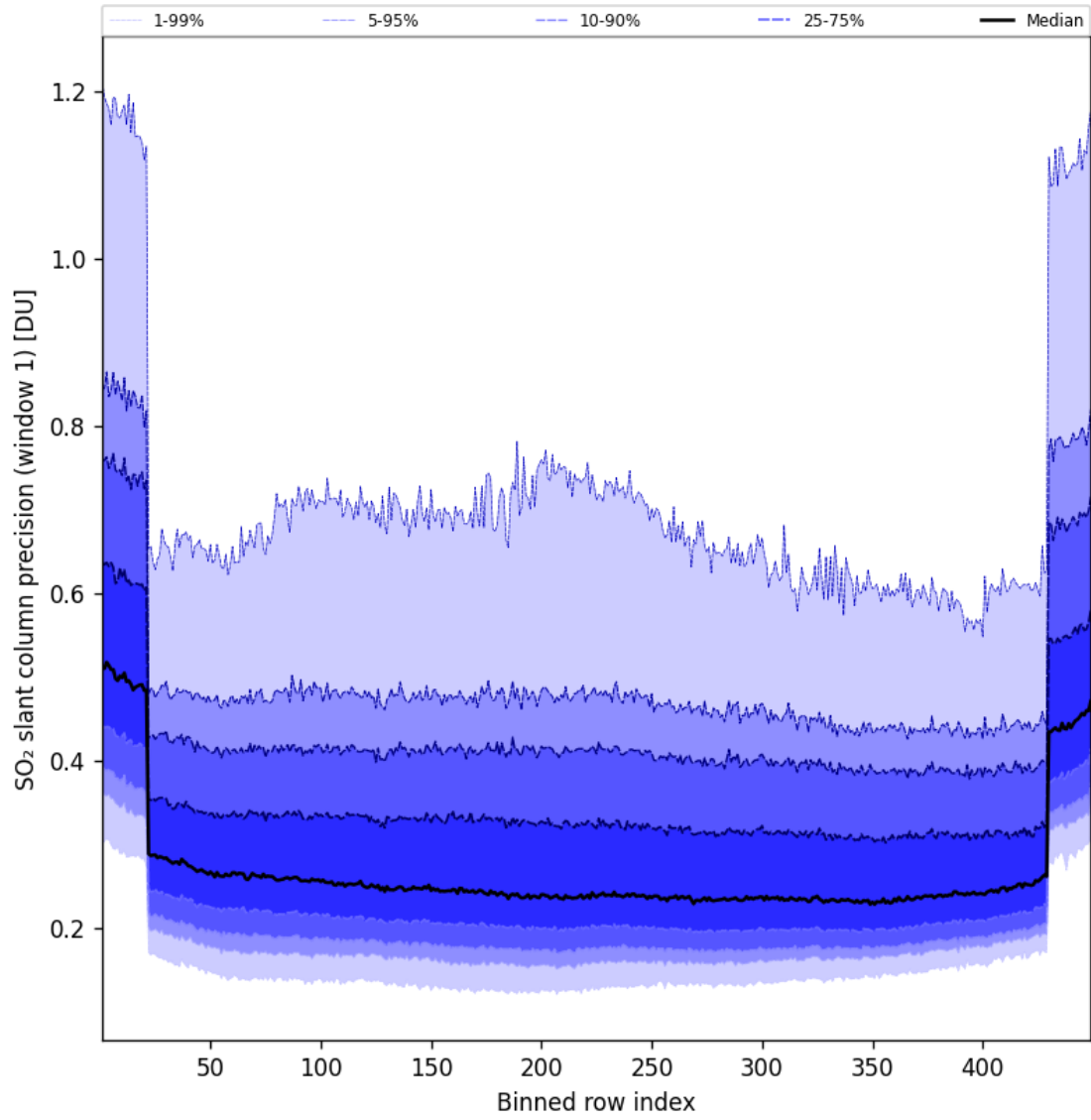


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-08-20 to 2025-08-21

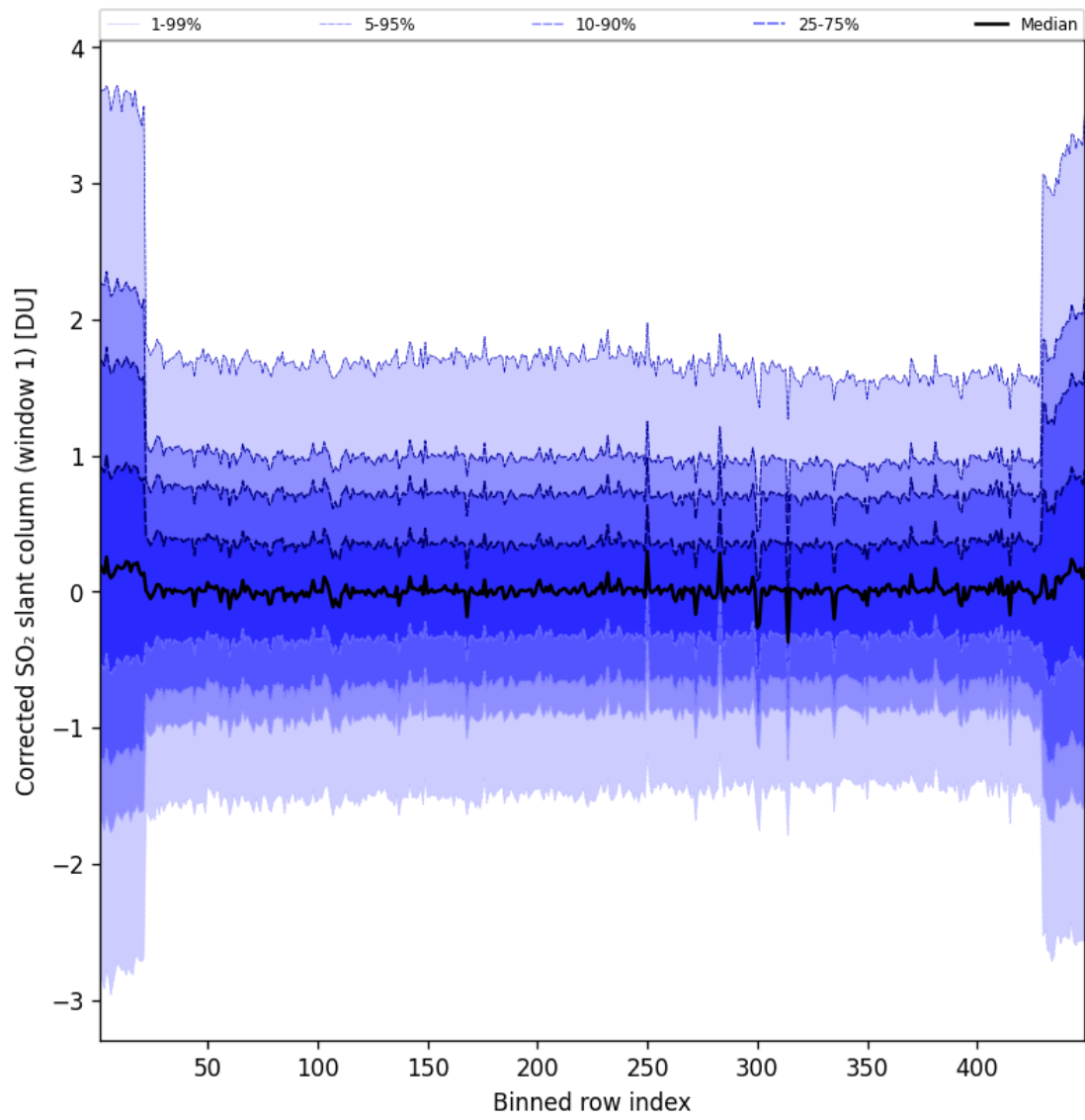


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-08-20 to 2025-08-21

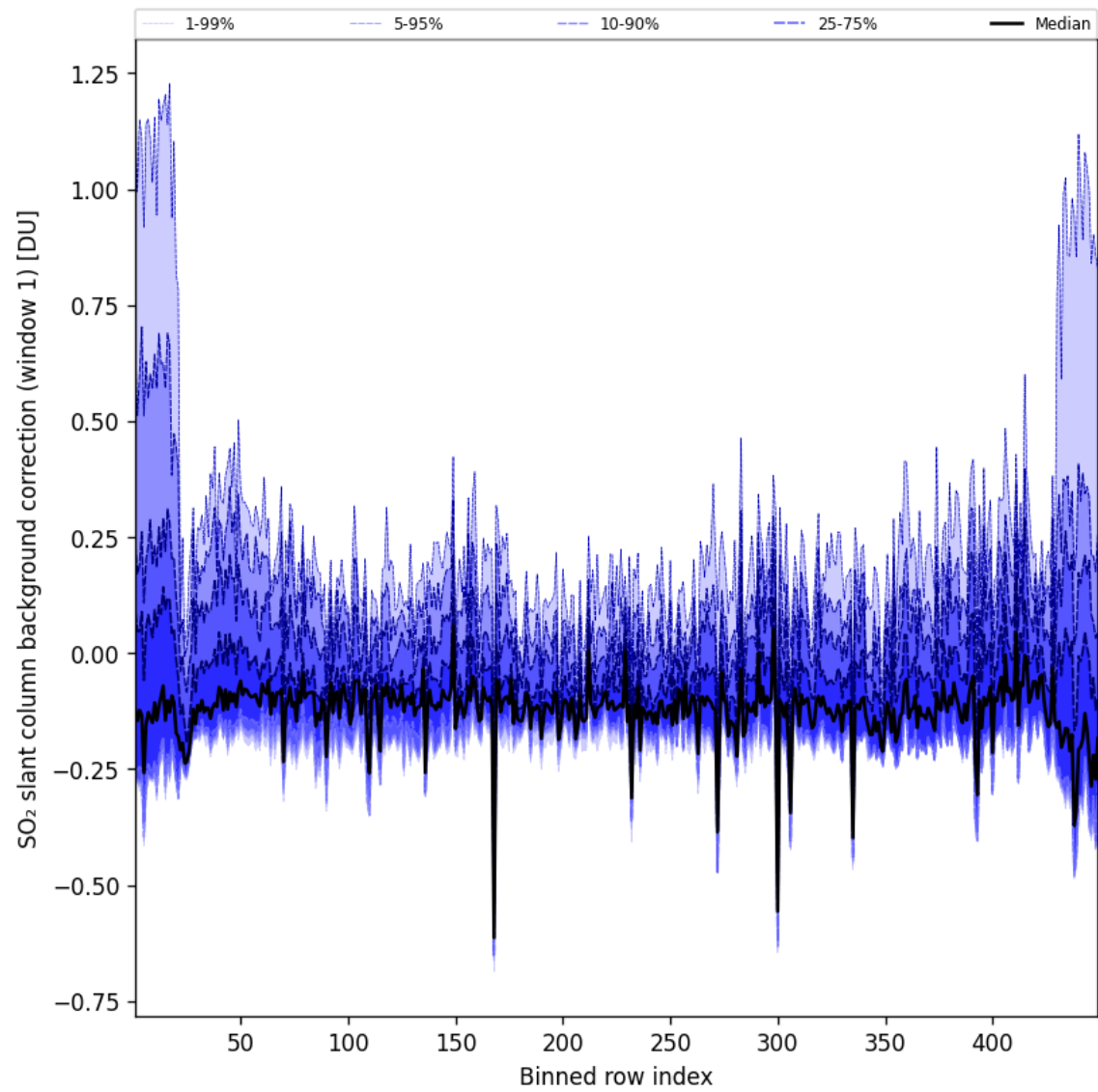


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-08-20 to 2025-08-21

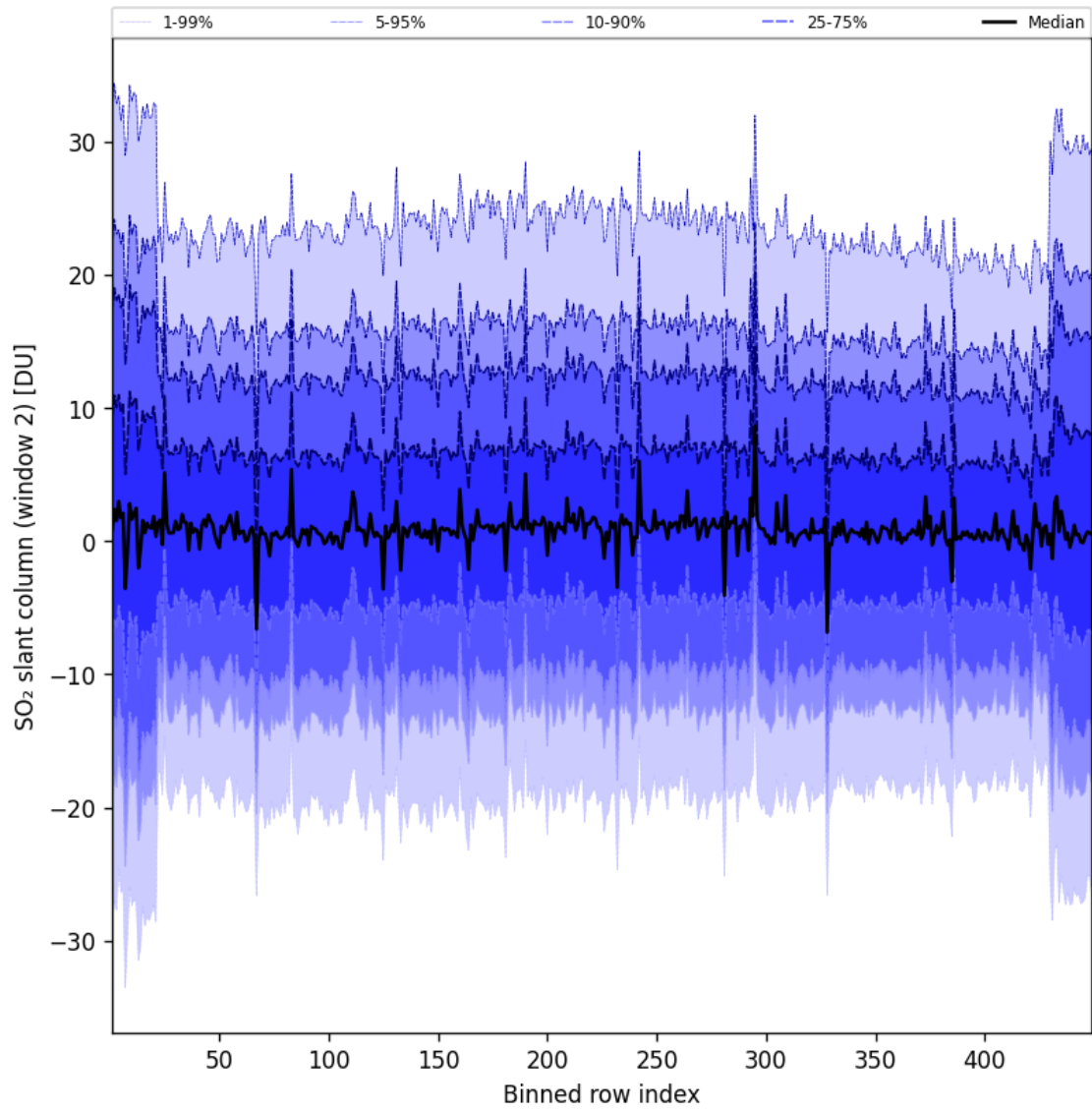


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-08-20 to 2025-08-21

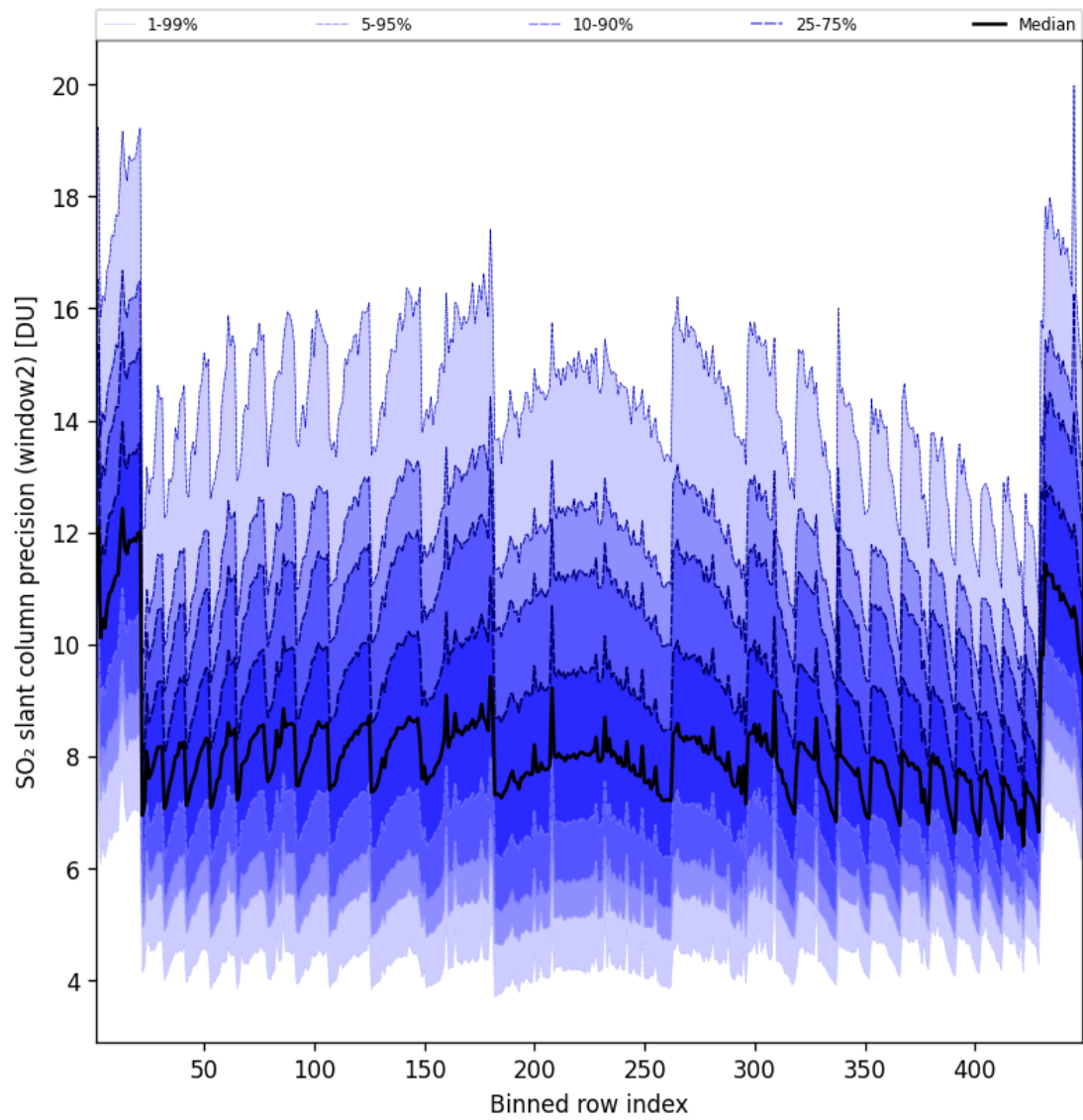


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-08-20 to 2025-08-21

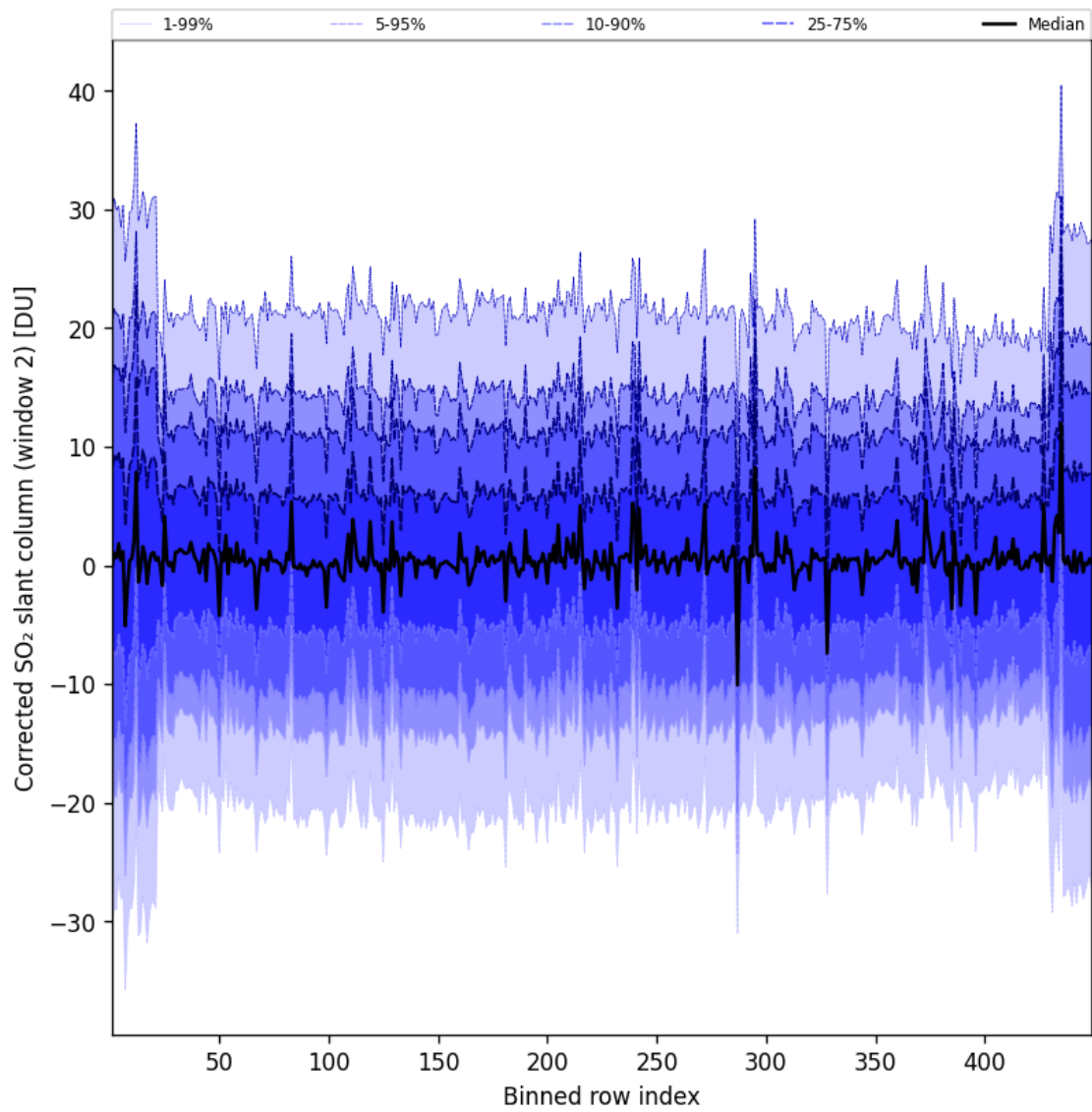


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-08-20 to 2025-08-21

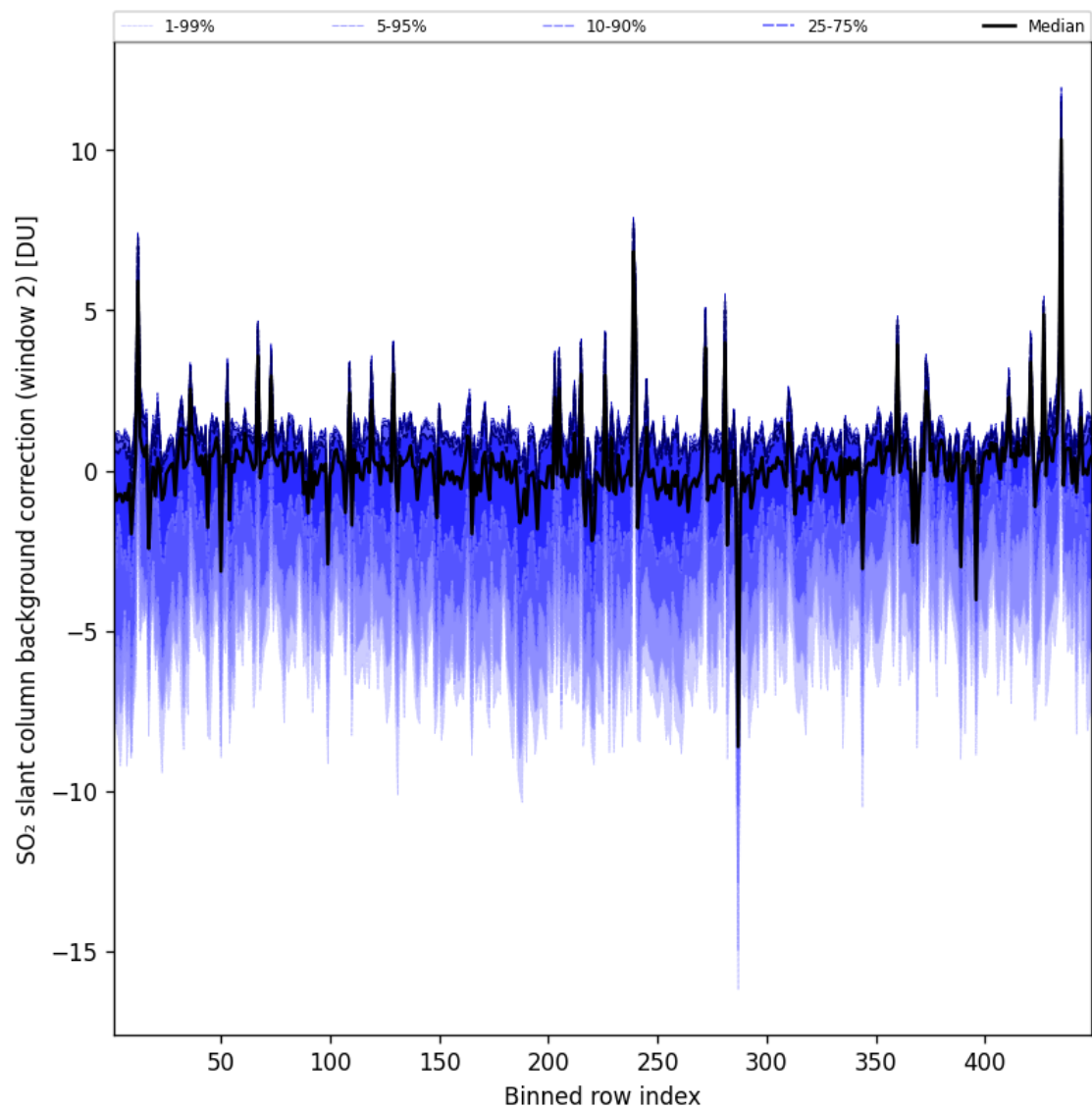


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-08-20 to 2025-08-21

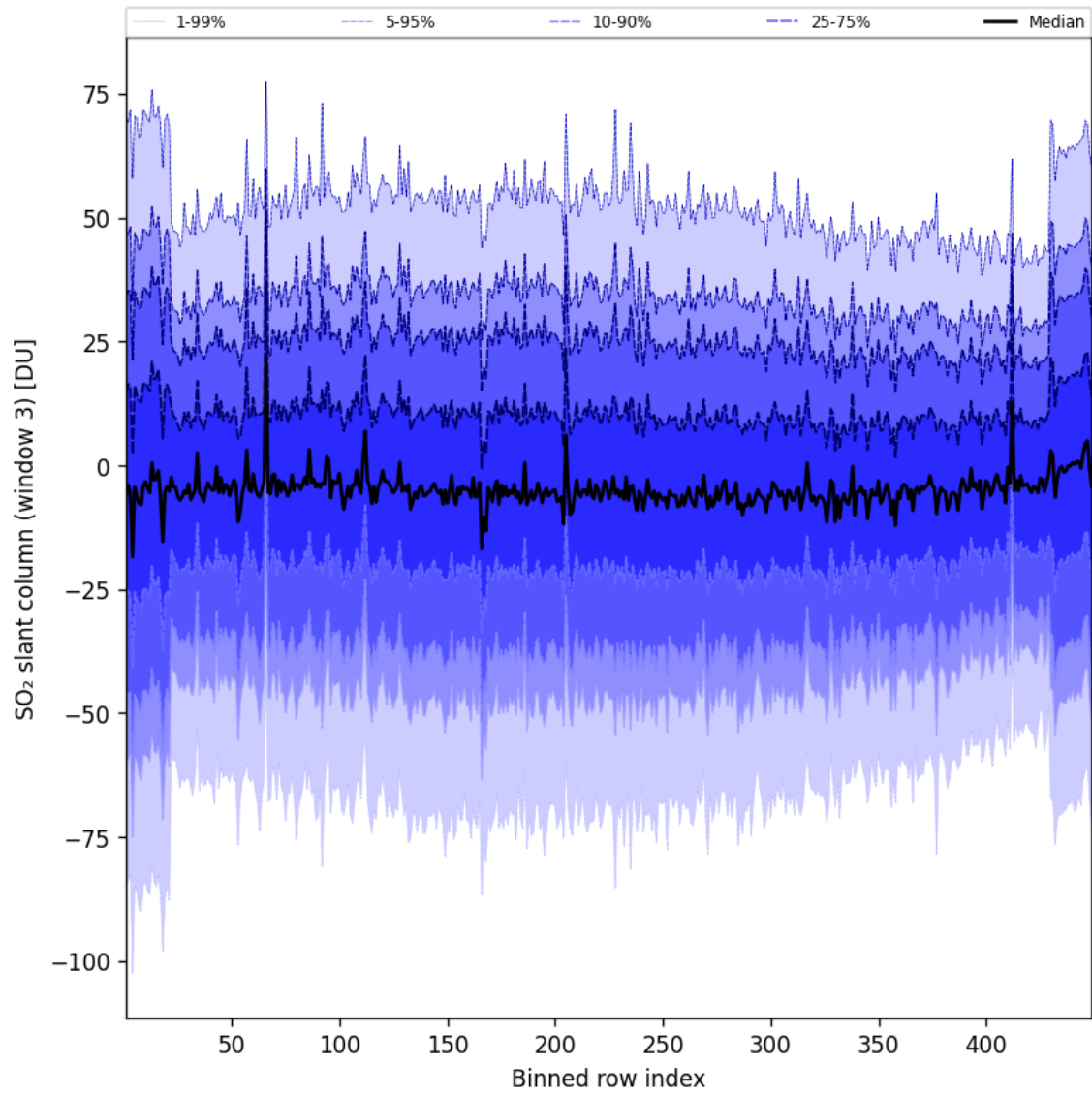


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-08-20 to 2025-08-21

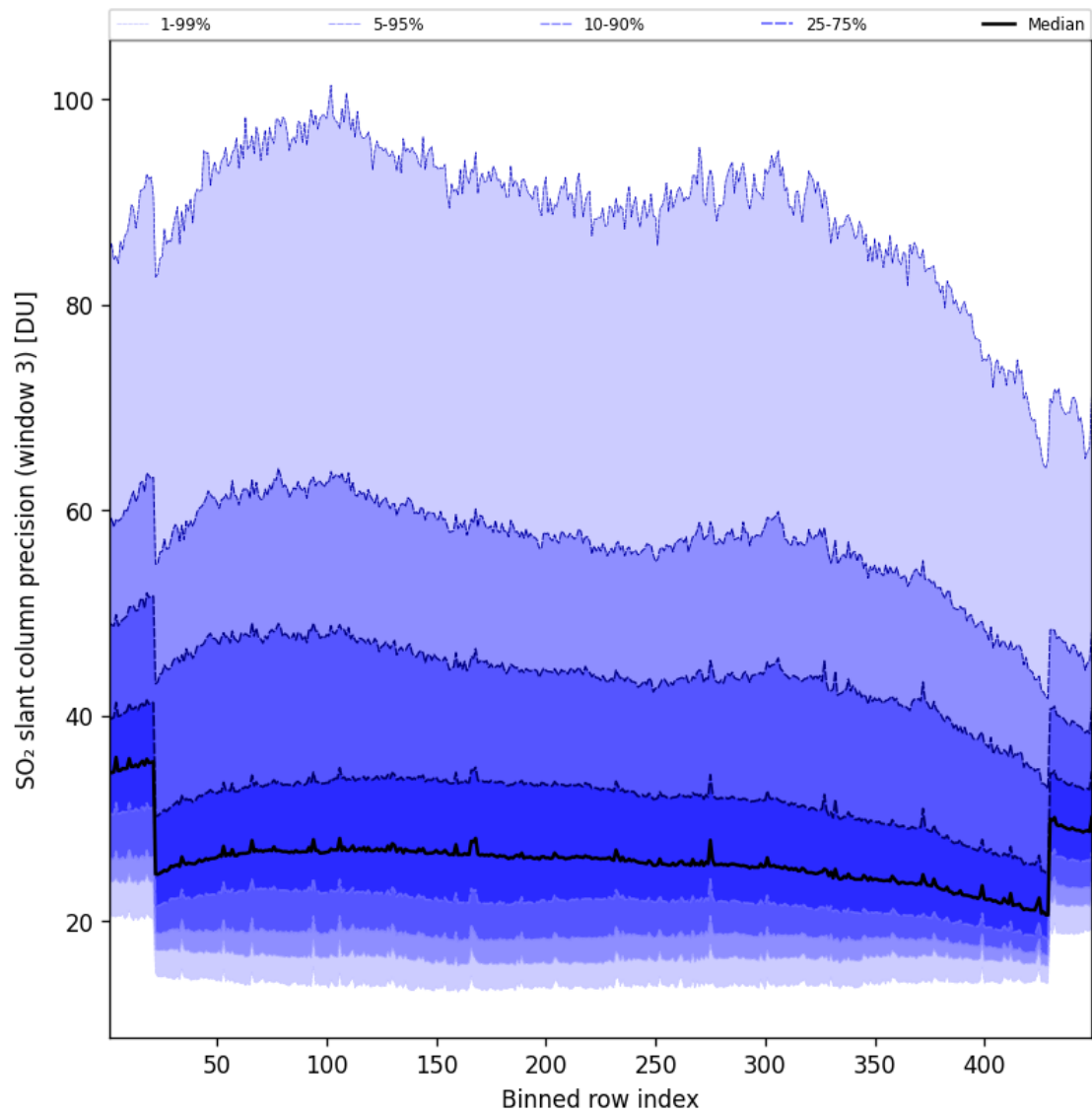


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-08-20 to 2025-08-21

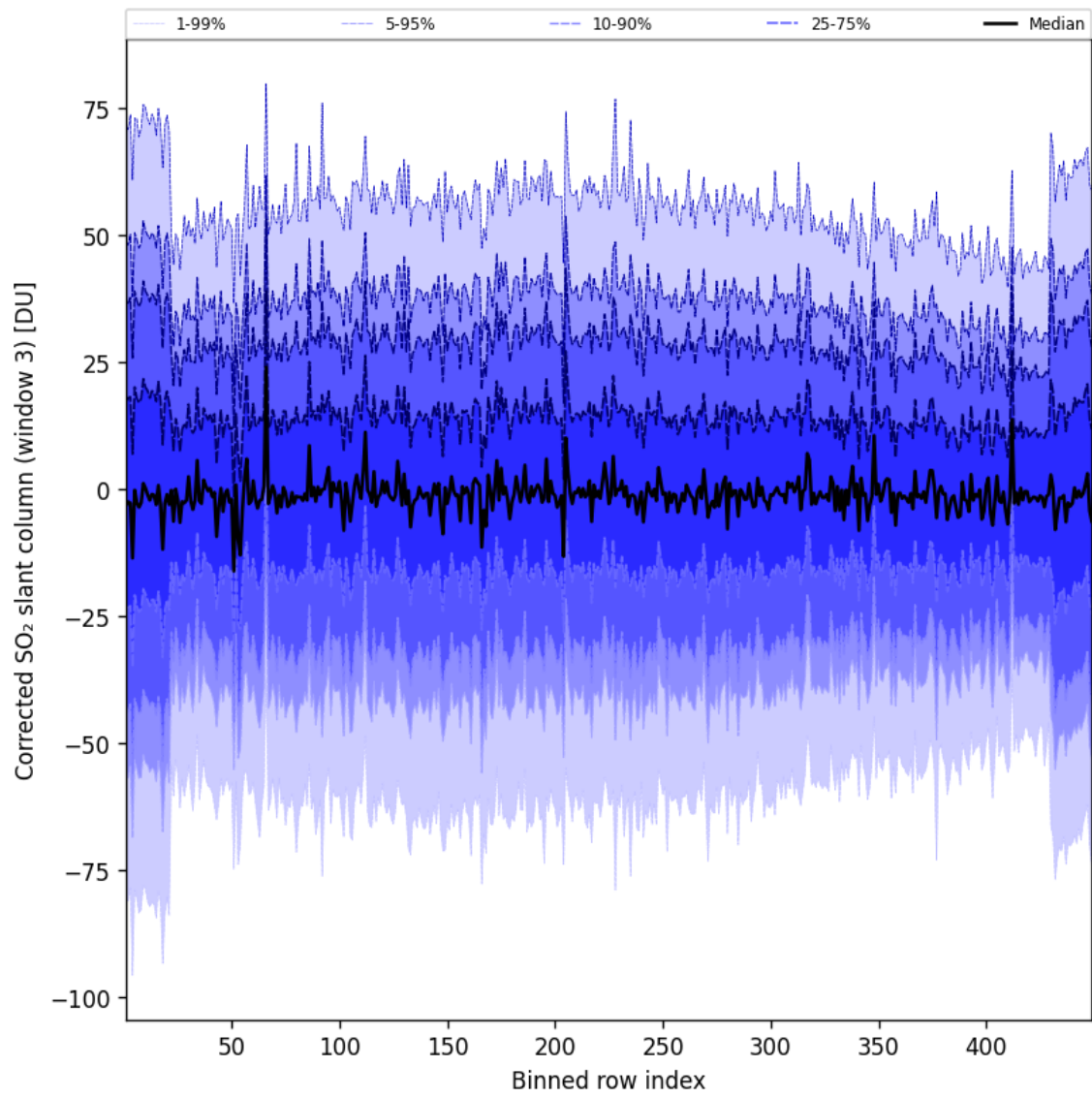


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-08-20 to 2025-08-21

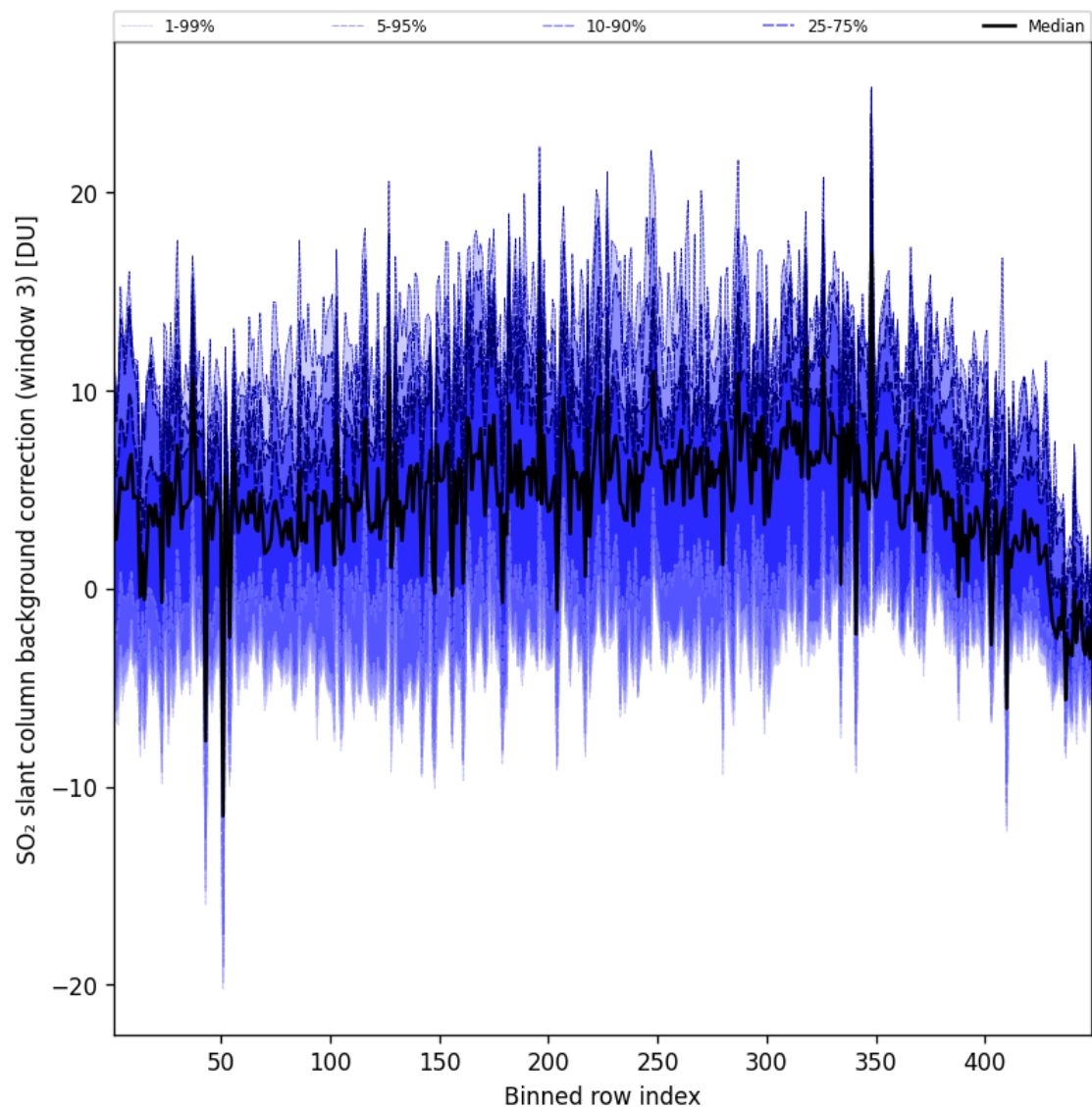


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-08-20 to 2025-08-21

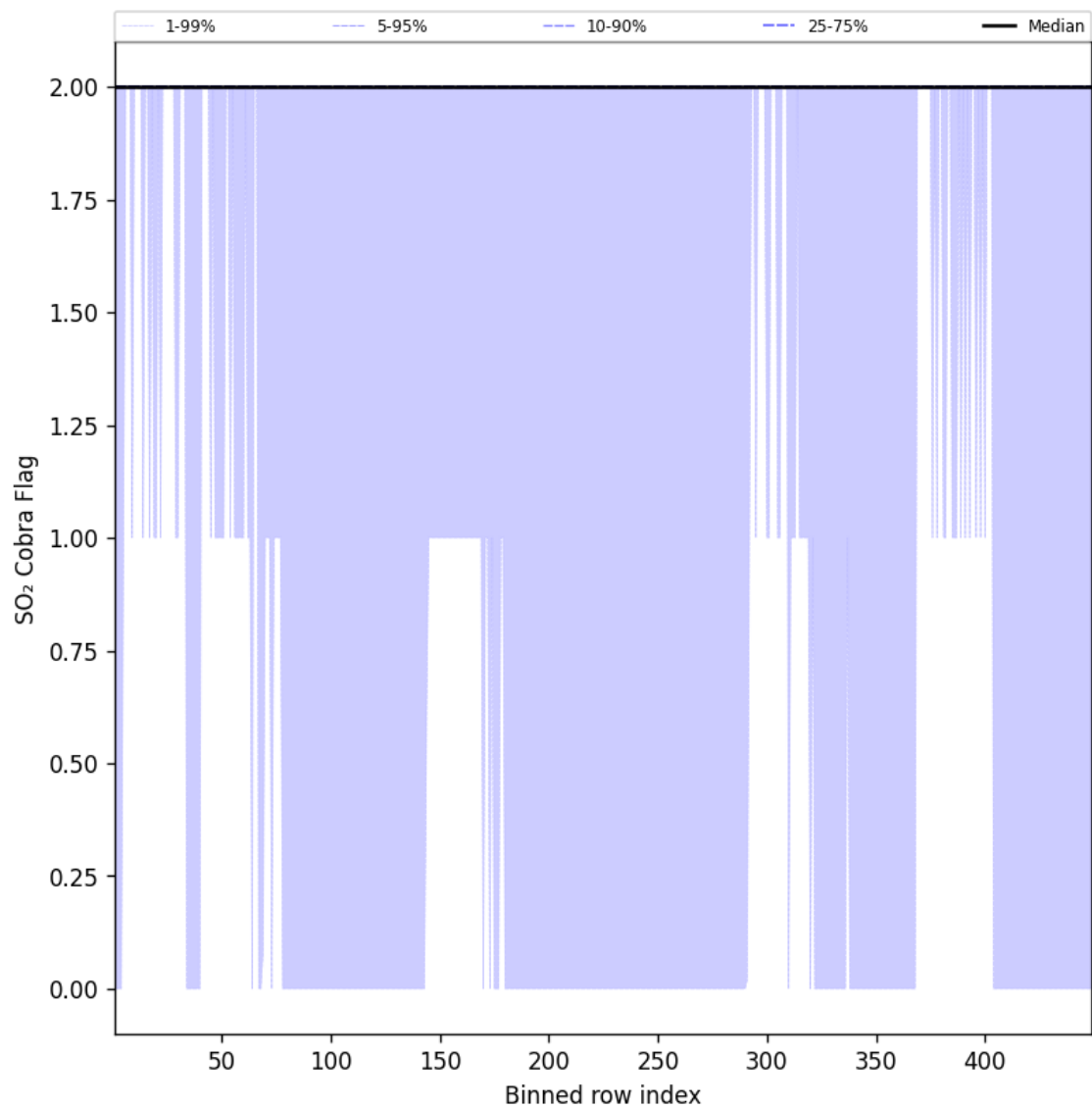


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-08-20 to 2025-08-21

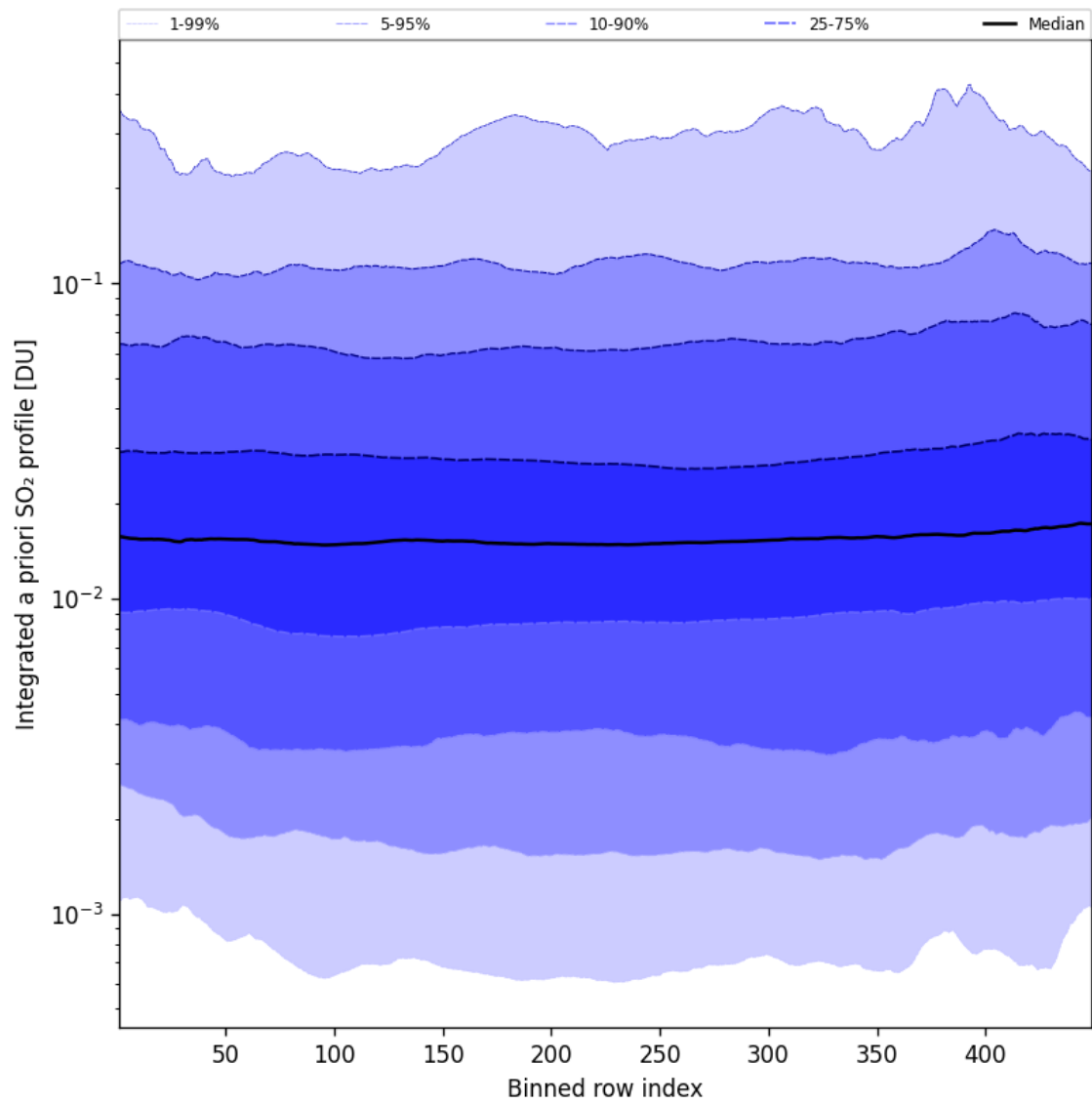


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-08-20 to 2025-08-21

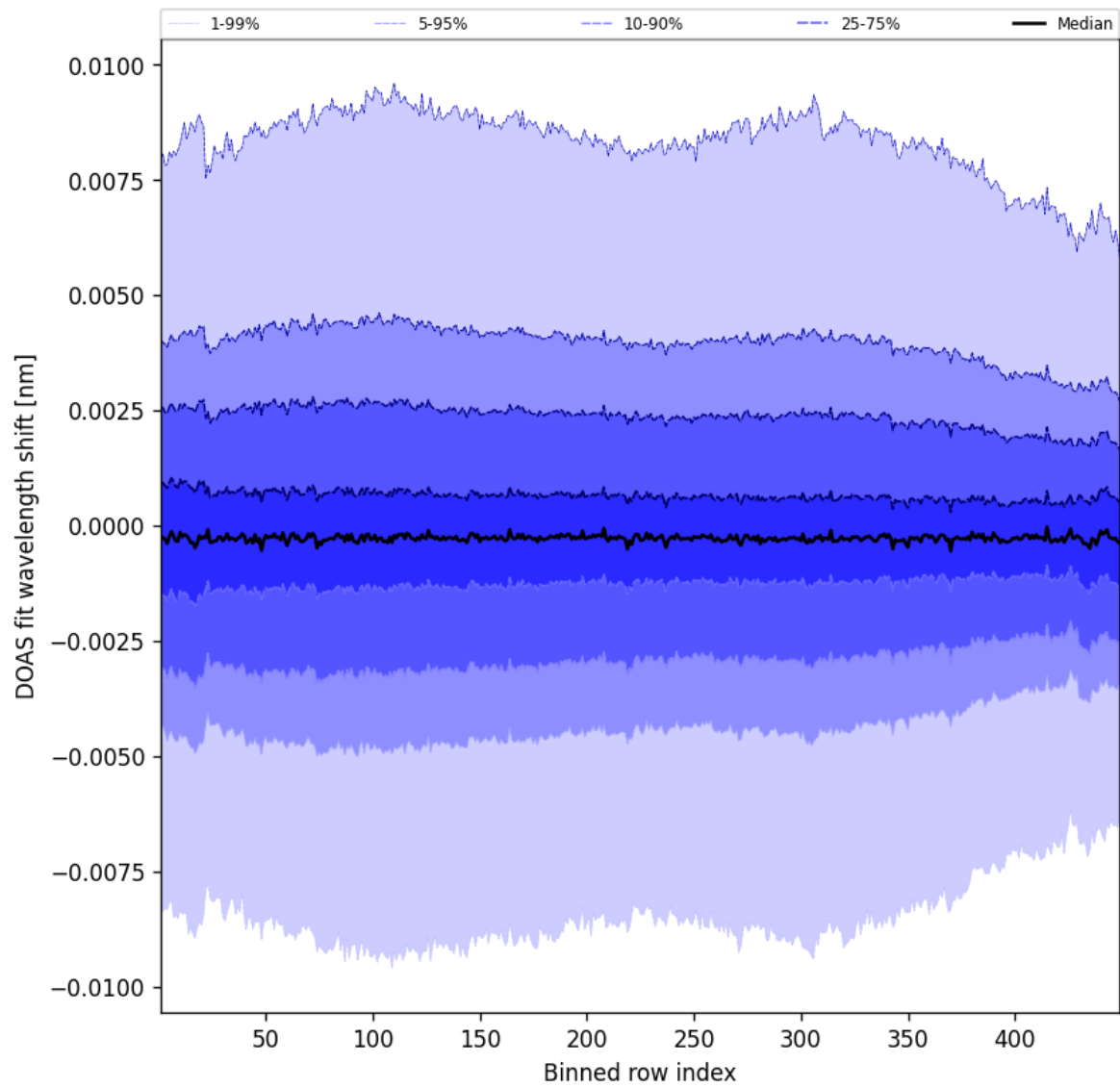


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-08-20 to 2025-08-21

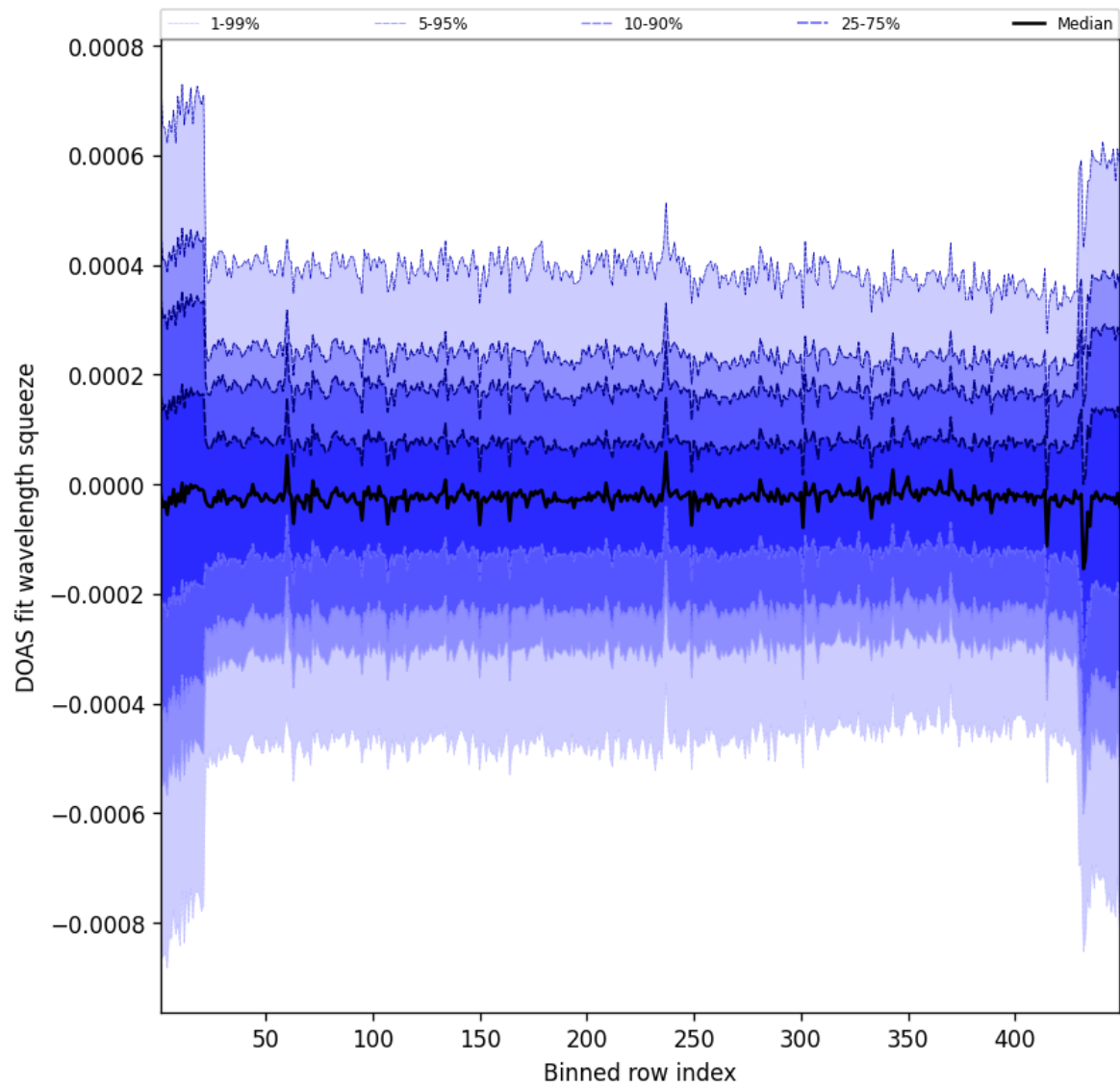


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-08-20 to 2025-08-21

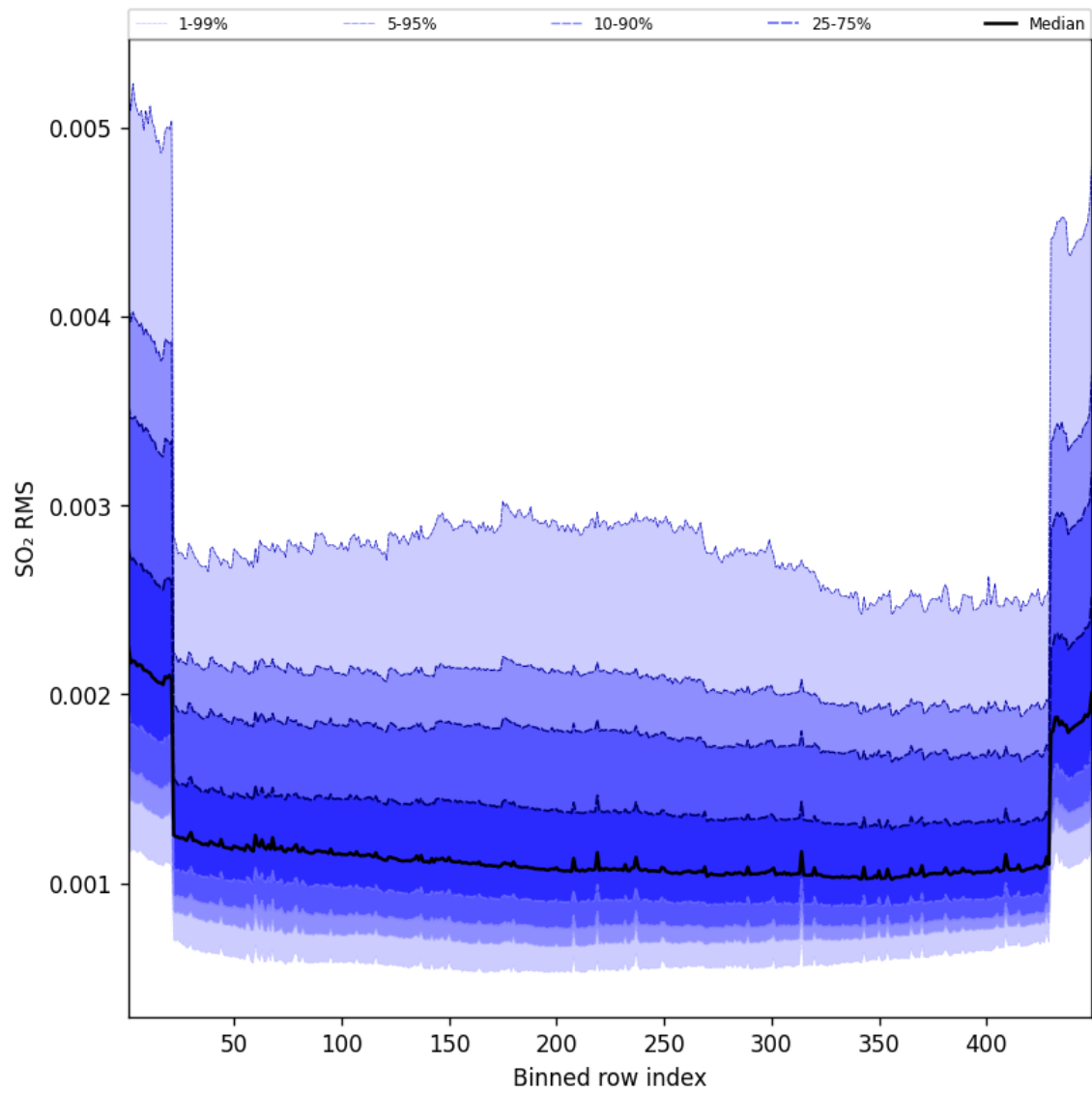


Figure 106: Along track statistics of “SO₂ RMS” for 2025-08-20 to 2025-08-21

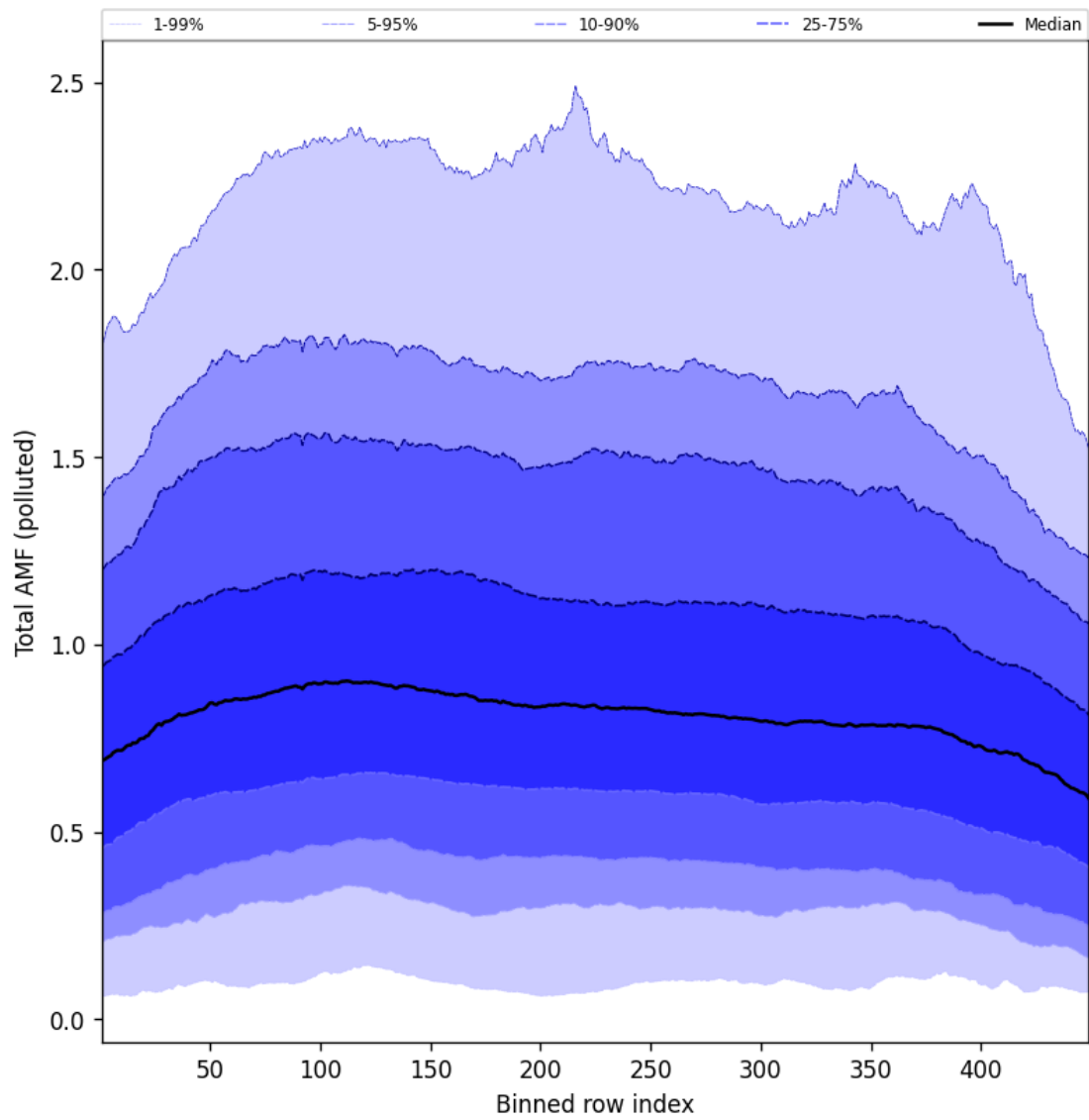


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-08-20 to 2025-08-21

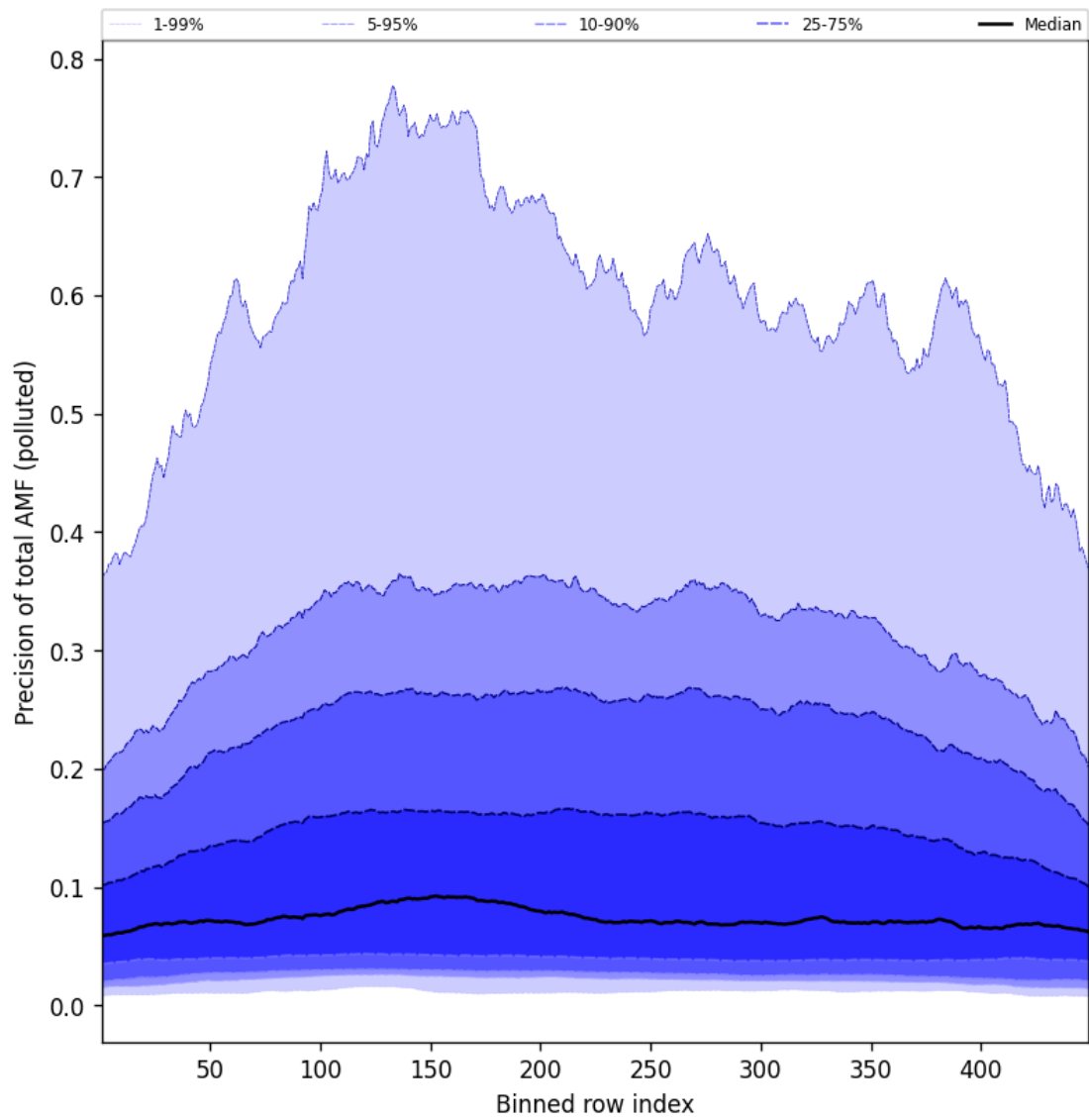


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-08-20 to 2025-08-21

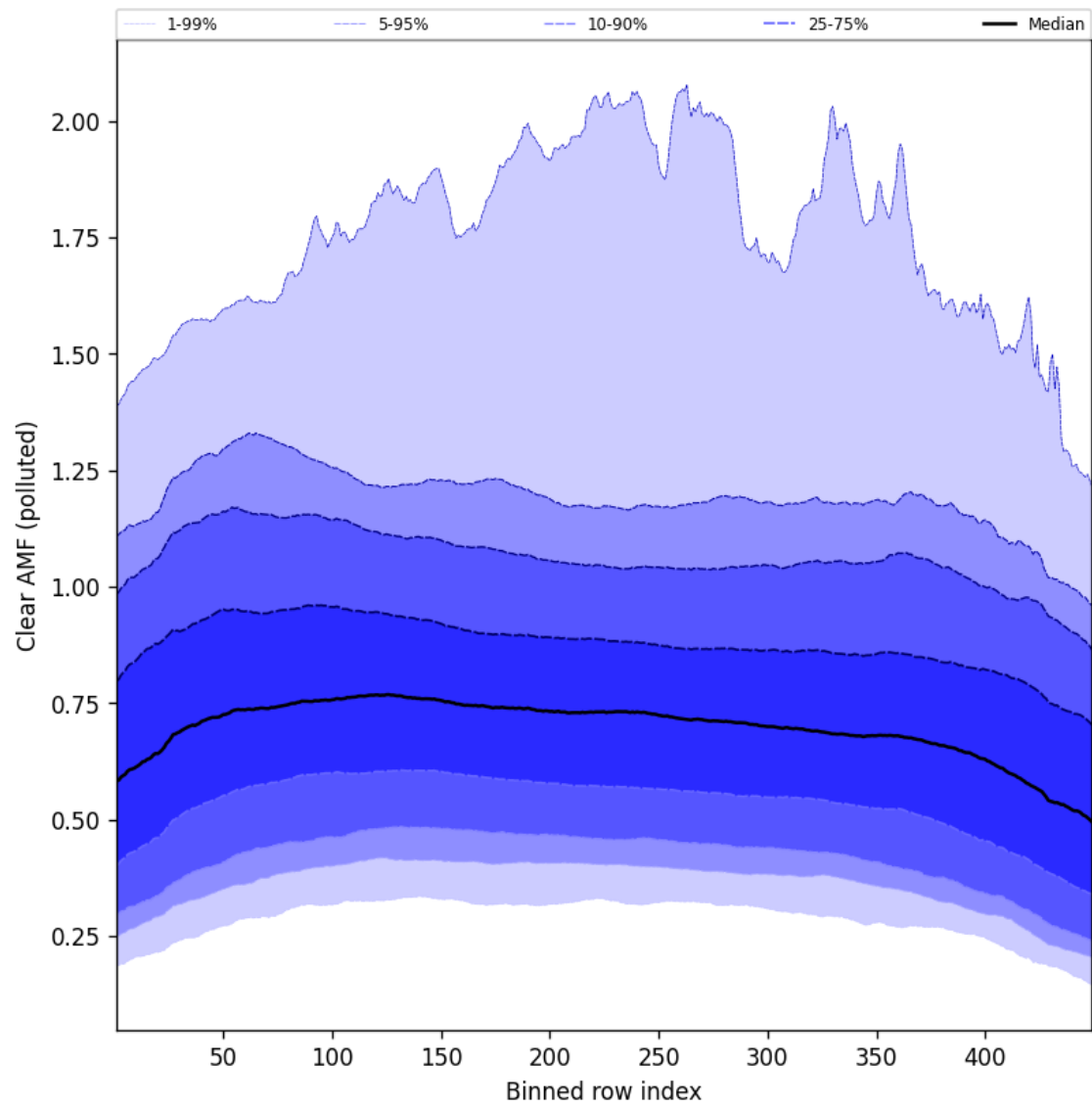


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-08-20 to 2025-08-21

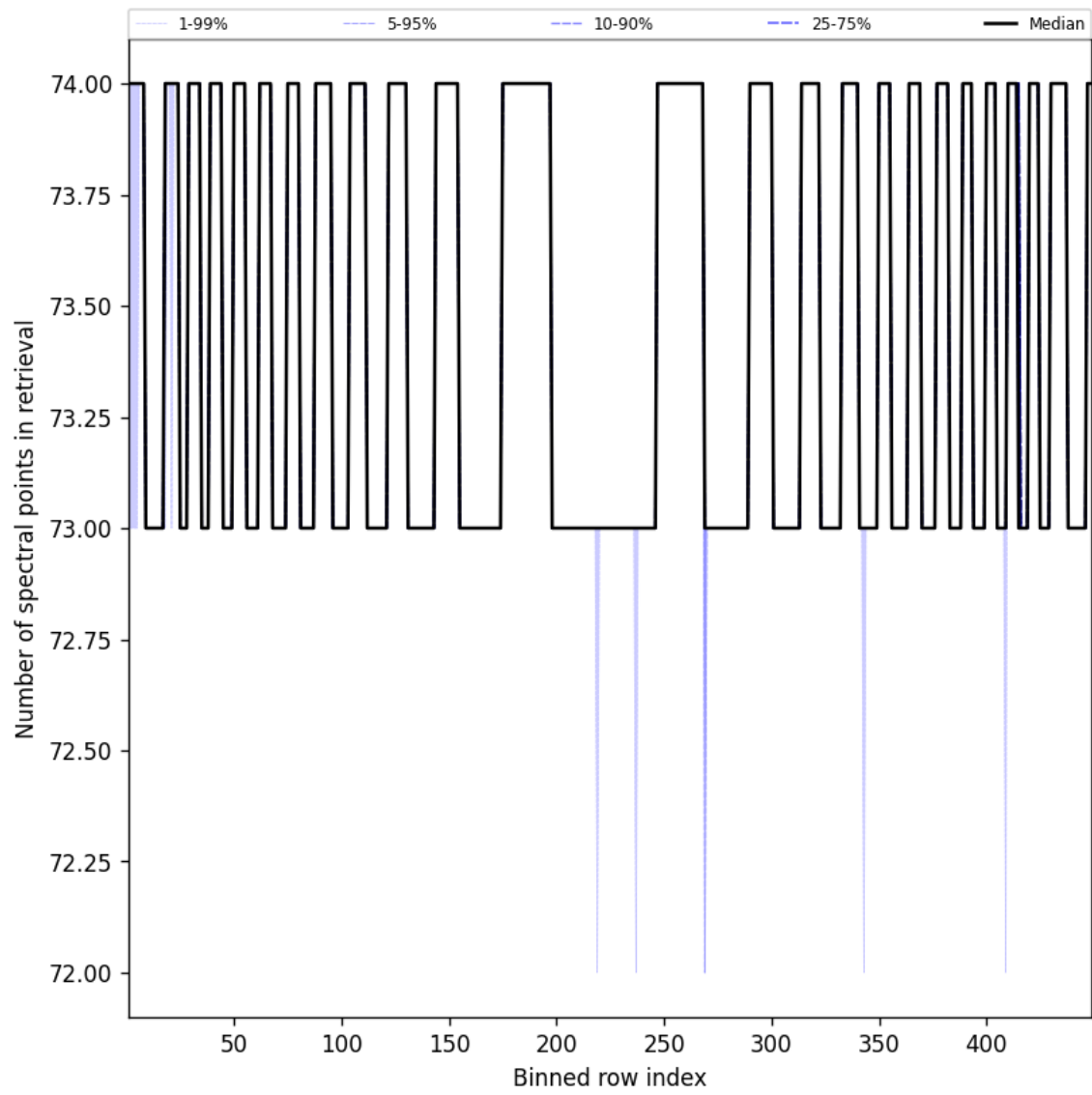


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-08-20 to 2025-08-21

10 Coincidence density

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

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