

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]	0.621 ± 0.407	17365548	0.995	0.790	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.523 \pm 80.243) \times 10^{-2}$	17365548	0.249	0.426	1.005×10^{-2}	-103	664
sulfurdioxide total vertical column precision [DU]	0.459 ± 0.551	17365548	0.222	0.311	0.305	4.710×10^{-2}	78.1
sulfurdioxide slant column density corrected [DU]	$(1.812 \pm 38.217) \times 10^{-2}$	17365548	0.242	0.372	9.443×10^{-3}	-46.3	378
sulfurdioxide slant column density cobra [DU]	$(1.802 \pm 35.765) \times 10^{-2}$	17365548	0.242	0.372	9.443×10^{-3}	-46.3	52.1
sulfurdioxide slant column density cobra precision [DU]	0.296 ± 0.128	17365548	0.213	0.125	0.258	8.571×10^{-2}	26.3
sulfurdioxide slant column density window1 [DU]	0.139 ± 0.672	17365548	0.175	0.744	0.143	-59.7	85.8
sulfurdioxide slant column density window1 precision [DU]	0.296 ± 0.128	17365548	0.213	0.125	0.258	8.571×10^{-2}	26.3
sulfurdioxide slant column density corrected win1 [DU]	$(4.365 \pm 66.255) \times 10^{-2}$	17365548	2.500×10^{-2}	0.730	2.704×10^{-2}	-59.7	85.7
background so2 slant column offset window1 [DU]	$(-9.527 \pm 13.931) \times 10^{-2}$	17365548	-0.180	0.160	-0.123	-0.674	2.32
sulfurdioxide slant column density window2 [DU]	2.42 ± 8.93	17365548	2.25	11.2	2.38	-1.131×10^3	966
sulfurdioxide slant column density window2 precision [DU]	8.04 ± 2.37	17365548	7.43	2.64	7.69	2.27	640
sulfurdioxide slant column density corrected win2 [DU]	0.459 ± 8.745	17365548	0.250	11.0	0.465	-1.136×10^3	965
background so2 slant column offset window2 [DU]	-1.96 ± 2.25	17365548	-0.250	3.22	-1.52	-11.1	9.72
sulfurdioxide slant column density window3 [DU]	-12.5 ± 23.5	17365548	-12.9	29.0	-12.8	-741	591
sulfurdioxide slant column density window3 precision [DU]	28.1 ± 13.8	17365548	22.5	10.4	24.4	9.21	584
sulfurdioxide slant column density corrected win3 [DU]	-2.76 ± 23.16	17365548	-2.80	28.5	-2.52	-736	597
background so2 slant column offset window3 [DU]	9.78 ± 5.47	17365548	14.0	8.58	10.2	-19.1	30.7
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.20	17365548	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(2.982 \pm 6.899) \times 10^{-2}$	17365548	1.800×10^{-2}	2.034×10^{-2}	1.468×10^{-2}	2.765×10^{-4}	1.87
fitted radiance shift [nm]	$(-2.149 \pm 26.111) \times 10^{-4}$	17365548	1.000×10^{-4}	1.715×10^{-3}	-2.024×10^{-4}	-8.876×10^{-2}	4.189×10^{-2}
fitted radiance squeeze [1]	$(-3.480 \pm 18.191) \times 10^{-5}$	17365548	-3.000×10^{-5}	2.091×10^{-4}	-3.030×10^{-5}	-2.448×10^{-2}	2.632×10^{-2}
fitted root mean square [1]	$(1.285 \pm 0.509) \times 10^{-3}$	17365548	1.025×10^{-3}	5.005×10^{-4}	1.144×10^{-3}	3.322×10^{-4}	6.695×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.947 ± 0.495	17365548	0.740	0.639	0.856	5.000×10^{-2}	2.81
sulfurdioxide total air mass factor polluted precision [1]	0.124 ± 0.133	17365548	3.500×10^{-2}	0.120	7.826×10^{-2}	2.871×10^{-3}	2.00
sulfurdioxide clear air mass factor polluted [1]	0.770 ± 0.349	17365548	0.620	0.425	0.717	6.375×10^{-2}	2.70
number of spectral points in retrieval [1]	73.4 ± 0.5	17365548	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	3.000×10^{-2}	9.000×10^{-2}	0.210	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-1.89	-0.789	-0.493	-0.336	-0.200	0.226	0.372	0.544	0.876	2.16
sulfurdioxide total vertical column precision [DU]	9.697×10^{-2}	0.127	0.152	0.177	0.209	0.520	0.679	0.856	1.20	2.67
sulfurdioxide slant column density corrected [DU]	-0.850	-0.495	-0.360	-0.270	-0.175	0.197	0.298	0.396	0.549	1.00
sulfurdioxide slant column density cobra [DU]	-0.850	-0.495	-0.360	-0.270	-0.175	0.197	0.298	0.396	0.549	1.00
sulfurdioxide slant column density cobra precision [DU]	0.146	0.174	0.189	0.200	0.215	0.340	0.396	0.449	0.537	0.761
sulfurdioxide slant column density window1 [DU]	-1.65	-0.904	-0.620	-0.430	-0.232	0.512	0.705	0.889	1.16	1.91
sulfurdioxide slant column density window1 precision [DU]	0.146	0.174	0.189	0.200	0.215	0.340	0.396	0.449	0.537	0.761
sulfurdioxide slant column density corrected win1 [DU]	-1.61	-0.945	-0.691	-0.518	-0.333	0.397	0.597	0.789	1.08	1.90
background so2 slant column offset window1 [DU]	-0.350	-0.258	-0.227	-0.210	-0.189	-2.908×10^{-2}	2.743×10^{-2}	8.112×10^{-2}	0.163	0.369
sulfurdioxide slant column density window2 [DU]	-18.8	-11.9	-8.52	-6.02	-3.23	8.01	10.8	13.4	16.8	24.3
sulfurdioxide slant column density window2 precision [DU]	4.26	5.06	5.57	5.99	6.51	9.15	10.0	10.9	12.2	14.9
sulfurdioxide slant column density corrected win2 [DU]	-20.7	-13.6	-10.2	-7.77	-5.02	5.93	8.67	11.1	14.5	21.7
background so2 slant column offset window2 [DU]	-7.48	-6.06	-5.17	-4.40	-3.49	-0.268	4.739×10^{-2}	0.301	0.646	3.08
sulfurdioxide slant column density window3 [DU]	-71.8	-50.7	-41.1	-34.4	-27.0	1.96	9.67	16.8	26.4	45.7
sulfurdioxide slant column density window3 precision [DU]	13.3	15.6	17.4	18.8	20.5	30.9	35.8	41.9	54.2	86.8
sulfurdioxide slant column density corrected win3 [DU]	-62.1	-41.1	-31.3	-24.3	-16.8	11.7	18.9	25.6	34.7	53.6
background so2 slant column offset window3 [DU]	-3.28	1.04	2.91	4.18	5.58	14.2	15.4	16.4	17.7	20.2
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]	6.389×10^{-4}	1.058×10^{-3}	1.478×10^{-3}	2.359×10^{-3}	6.516×10^{-3}	2.685×10^{-2}	3.994×10^{-2}	5.870×10^{-2}	0.100	0.306
fitted radiance shift [nm]	-8.258×10^{-3}	-4.087×10^{-3}	-2.608×10^{-3}	-1.777×10^{-3}	-1.095×10^{-3}	6.196×10^{-4}	1.294×10^{-3}	2.164×10^{-3}	3.711×10^{-3}	8.024×10^{-3}
fitted radiance squeeze [1]	-5.231×10^{-4}	-3.281×10^{-4}	-2.481×10^{-4}	-1.938×10^{-4}	-1.367×10^{-4}	7.230×10^{-5}	1.246×10^{-4}	1.732×10^{-4}	2.433×10^{-4}	4.119×10^{-4}
fitted root mean square [1]	6.072×10^{-4}	7.515×10^{-4}	8.322×10^{-4}	8.923×10^{-4}	9.633×10^{-4}	1.464×10^{-3}	1.704×10^{-3}	1.939×10^{-3}	2.264×10^{-3}	3.107×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.118	0.290	0.384	0.468	0.585	1.22	1.48	1.71	1.94	2.23
sulfurdioxide total air mass factor polluted precision [1]	1.248×10^{-2}	2.003×10^{-2}	2.602×10^{-2}	3.200×10^{-2}	4.082×10^{-2}	0.161	0.212	0.271	0.378	0.666
sulfurdioxide clear air mass factor polluted [1]	0.236	0.325	0.381	0.434	0.517	0.942	1.06	1.20	1.47	1.92
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]	0.565 ± 0.414	11845184	0.850	0.490	0.0	1.000	0.150	1.000
sulfurdioxide total vertical column [DU]	$(1.996 \pm 73.369) \times 10^{-2}$	11845184	0.396	8.053×10^{-3}	-62.8	60.9	-0.187	0.208
sulfurdioxide total vertical column precision [DU]	0.433 ± 0.532	11845184	0.289	0.283	4.710×10^{-2}	27.7	0.194	0.483
sulfurdioxide slant column density corrected [DU]	$(1.565 \pm 33.562) \times 10^{-2}$	11845184	0.354	7.726×10^{-3}	-9.35	38.2	-0.168	0.186
sulfurdioxide slant column density cobra [DU]	$(1.563 \pm 33.457) \times 10^{-2}$	11845184	0.354	7.726×10^{-3}	-9.35	12.3	-0.168	0.186
sulfurdioxide slant column density cobra precision [DU]	0.280 ± 0.118	11845184	0.109	0.244	8.571×10^{-2}	6.17	0.207	0.317
sulfurdioxide slant column density window1 [DU]	0.125 ± 0.643	11845184	0.715	0.134	-9.82	13.7	-0.228	0.487
sulfurdioxide slant column density window1 precision [DU]	0.280 ± 0.118	11845184	0.109	0.244	8.571×10^{-2}	6.17	0.207	0.317
sulfurdioxide slant column density corrected win1 [DU]	$(3.851 \pm 62.926) \times 10^{-2}$	11845184	0.698	2.341×10^{-2}	-9.35	13.5	-0.321	0.377
background so2 slant column offset window1 [DU]	$(-8.681 \pm 15.030) \times 10^{-2}$	11845184	0.190	-0.119	-0.618	1.93	-0.195	-4.922×10^{-3}
sulfurdioxide slant column density window2 [DU]	2.52 ± 8.29	11845184	10.7	2.52	-167	475	-2.82	7.84
sulfurdioxide slant column density window2 precision [DU]	7.53 ± 2.02	11845184	2.30	7.25	2.27	286	6.19	8.49
sulfurdioxide slant column density corrected win2 [DU]	0.355 ± 8.058	11845184	10.3	0.392	-166	469	-4.79	5.53
background so2 slant column offset window2 [DU]	-2.16 ± 2.42	11845184	3.78	-1.89	-10.5	9.72	-3.95	-0.171
sulfurdioxide slant column density window3 [DU]	-12.8 ± 21.8	11845184	26.9	-13.2	-382	477	-26.5	0.472
sulfurdioxide slant column density window3 precision [DU]	26.2 ± 13.4	11845184	8.30	22.6	9.21	240	19.4	27.7
sulfurdioxide slant column density corrected win3 [DU]	-2.65 ± 21.31	11845184	26.4	-2.46	-371	490	-15.7	10.7
background so2 slant column offset window3 [DU]	10.2 ± 5.7	11845184	9.11	11.7	-19.1	24.5	5.49	14.6
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.17	11845184	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.264 \pm 8.000) \times 10^{-2}$	11845184	2.549×10^{-2}	1.217×10^{-2}	2.765×10^{-4}	1.87	2.759×10^{-3}	2.825×10^{-2}
fitted radiance shift [nm]	$(-8.101 \pm 256.231) \times 10^{-5}$	11845184	1.577×10^{-3}	-9.417×10^{-5}	-4.555×10^{-2}	4.189×10^{-2}	-8.903×10^{-4}	6.868×10^{-4}
fitted radiance squeeze [1]	$(-5.760 \pm 17.196) \times 10^{-5}$	11845184	2.012×10^{-4}	-4.688×10^{-5}	-5.856×10^{-3}	7.040×10^{-3}	-1.517×10^{-4}	4.948×10^{-5}
fitted root mean square [1]	$(1.230 \pm 0.487) \times 10^{-3}$	11845184	4.429×10^{-4}	1.096×10^{-3}	3.322×10^{-4}	3.505×10^{-2}	9.316×10^{-4}	1.375×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.987 ± 0.540	11845184	0.770	0.879	5.000×10^{-2}	2.81	0.570	1.34
sulfurdioxide total air mass factor polluted precision [1]	0.138 ± 0.148	11845184	0.136	8.823×10^{-2}	2.871×10^{-3}	2.00	4.231×10^{-2}	0.178
sulfurdioxide clear air mass factor polluted [1]	0.781 ± 0.392	11845184	0.501	0.714	6.375×10^{-2}	2.70	0.476	0.977
number of spectral points in retrieval [1]	73.5 ± 0.5	11845184	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]	0.740 ± 0.365	5520364	0.590	1.000	0.0	1.000	0.410	1.000
sulfurdioxide total vertical column [DU]	$(3.653 \pm 93.289) \times 10^{-2}$	5520364	0.499	1.546×10^{-2}	-103	664	-0.230	0.269
sulfurdioxide total vertical column precision [DU]	0.515 ± 0.585	5520364	0.344	0.353	4.908×10^{-2}	78.1	0.248	0.592
sulfurdioxide slant column density corrected [DU]	$(2.343 \pm 46.660) \times 10^{-2}$	5520364	0.415	1.373×10^{-2}	-46.3	378	-0.192	0.223
sulfurdioxide slant column density cobra [DU]	$(2.315 \pm 40.267) \times 10^{-2}$	5520364	0.415	1.373×10^{-2}	-46.3	52.1	-0.192	0.223
sulfurdioxide slant column density cobra precision [DU]	0.329 ± 0.141	5520364	0.146	0.289	9.429×10^{-2}	26.3	0.238	0.384
sulfurdioxide slant column density window1 [DU]	0.168 ± 0.730	5520364	0.811	0.166	-59.7	85.8	-0.240	0.572
sulfurdioxide slant column density window1 precision [DU]	0.329 ± 0.141	5520364	0.146	0.289	9.429×10^{-2}	26.3	0.238	0.384
sulfurdioxide slant column density corrected win1 [DU]	$(5.466 \pm 72.873) \times 10^{-2}$	5520364	0.807	3.619×10^{-2}	-59.7	85.7	-0.362	0.445
background so2 slant column offset window1 [DU]	-0.113 ± 0.110	5520364	0.103	-0.127	-0.674	2.32	-0.175	-7.230×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.21 ± 10.16	5520364	12.6	2.04	-1.131×10^3	966	-4.20	8.42
sulfurdioxide slant column density window2 precision [DU]	9.12 ± 2.67	5520364	2.81	8.78	2.36	640	7.53	10.3
sulfurdioxide slant column density corrected win2 [DU]	0.683 ± 10.057	5520364	12.5	0.653	-1.136×10^3	965	-5.59	6.92
background so2 slant column offset window2 [DU]	-1.53 ± 1.78	5520364	2.04	-1.18	-11.1	9.60	-2.48	-0.434
sulfurdioxide slant column density window3 [DU]	-11.9 ± 26.9	5520364	34.1	-11.4	-741	591	-28.6	5.47
sulfurdioxide slant column density window3 precision [DU]	32.2 ± 13.6	5520364	10.6	28.8	10.3	584	24.5	35.1
sulfurdioxide slant column density corrected win3 [DU]	-3.00 ± 26.70	5520364	33.9	-2.70	-736	597	-19.7	14.2
background so2 slant column offset window3 [DU]	8.90 ± 4.85	5520364	6.35	8.03	-13.0	30.7	5.69	12.0
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	5520364	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.376 \pm 3.442) \times 10^{-2}$	5520364	1.375×10^{-2}	1.778×10^{-2}	9.833×10^{-4}	1.43	1.201×10^{-2}	2.576×10^{-2}
fitted radiance shift [nm]	$(-5.023 \pm 26.904) \times 10^{-4}$	5520364	1.943×10^{-3}	-4.877×10^{-4}	-8.876×10^{-2}	4.174×10^{-2}	-1.514×10^{-3}	4.285×10^{-4}
fitted radiance squeeze [1]	$(1.414 \pm 19.270) \times 10^{-5}$	5520364	2.236×10^{-4}	9.786×10^{-6}	-2.448×10^{-2}	2.632×10^{-2}	-1.004×10^{-4}	1.232×10^{-4}
fitted root mean square [1]	$(1.403 \pm 0.535) \times 10^{-3}$	5520364	5.748×10^{-4}	1.265×10^{-3}	3.322×10^{-4}	6.695×10^{-2}	1.051×10^{-3}	1.626×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.862 ± 0.367	5520364	0.465	0.822	5.000×10^{-2}	2.62	0.606	1.07
sulfurdioxide total air mass factor polluted precision [1]	$(9.560 \pm 8.519) \times 10^{-2}$	5520364	8.779×10^{-2}	6.237×10^{-2}	4.450×10^{-3}	1.49	3.850×10^{-2}	0.126
sulfurdioxide clear air mass factor polluted [1]	0.745 ± 0.230	5520364	0.301	0.720	8.607×10^{-2}	1.70	0.591	0.892
number of spectral points in retrieval [1]	73.4 ± 0.5	5520364	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]	0.638 ± 0.397	11330892	0.770	1.000	0.0	1.000	0.230	1.000
sulfurdioxide total vertical column [DU]	$(2.234 \pm 75.912) \times 10^{-2}$	11330892	0.415	9.523×10^{-3}	-48.7	270	-0.196	0.220
sulfurdioxide total vertical column precision [DU]	0.441 ± 0.537	11330892	0.278	0.290	5.098×10^{-2}	37.5	0.209	0.487
sulfurdioxide slant column density corrected [DU]	$(1.678 \pm 37.663) \times 10^{-2}$	11330892	0.372	8.991×10^{-3}	-21.1	326	-0.175	0.197
sulfurdioxide slant column density cobra [DU]	$(1.671 \pm 35.901) \times 10^{-2}$	11330892	0.372	8.991×10^{-3}	-21.1	43.5	-0.175	0.197
sulfurdioxide slant column density cobra precision [DU]	0.298 ± 0.132	11330892	0.139	0.258	8.571×10^{-2}	22.0	0.212	0.352
sulfurdioxide slant column density window1 [DU]	0.133 ± 0.681	11330892	0.750	0.144	-58.9	85.8	-0.236	0.514
sulfurdioxide slant column density window1 precision [DU]	0.298 ± 0.132	11330892	0.139	0.258	8.571×10^{-2}	22.0	0.212	0.352
sulfurdioxide slant column density corrected win1 [DU]	$(4.230 \pm 66.970) \times 10^{-2}$	11330892	0.736	2.717×10^{-2}	-58.9	85.7	-0.336	0.400
background so2 slant column offset window1 [DU]	$(-9.114 \pm 14.757) \times 10^{-2}$	11330892	0.165	-0.124	-0.674	2.04	-0.189	-2.475×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.39 ± 8.93	11330892	11.3	2.29	-1.131×10^3	871	-3.30	7.96
sulfurdioxide slant column density window2 precision [DU]	8.01 ± 2.27	11330892	2.57	7.67	2.27	640	6.54	9.11
sulfurdioxide slant column density corrected win2 [DU]	0.491 ± 8.736	11330892	11.0	0.490	-1.136×10^3	871	-5.01	5.97
background so2 slant column offset window2 [DU]	-1.90 ± 2.31	11330892	3.21	-1.30	-11.1	9.72	-3.42	-0.209
sulfurdioxide slant column density window3 [DU]	-9.91 ± 23.49	11330892	29.4	-10.4	-643	518	-24.7	4.67
sulfurdioxide slant column density window3 precision [DU]	27.2 ± 11.8	11330892	9.34	24.1	9.29	584	20.6	29.9
sulfurdioxide slant column density corrected win3 [DU]	-0.432 ± 22.788	11330892	28.4	-0.570	-630	534	-14.6	13.8
background so2 slant column offset window3 [DU]	9.48 ± 5.60	11330892	8.77	9.28	-19.1	30.7	5.27	14.0
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	11330892	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.003 \pm 3.396) \times 10^{-2}$	11330892	1.509×10^{-2}	1.419×10^{-2}	3.462×10^{-4}	1.49	7.587×10^{-3}	2.268×10^{-2}
fitted radiance shift [nm]	$(-2.493 \pm 23.140) \times 10^{-4}$	11330892	1.679×10^{-3}	-2.261×10^{-4}	-8.876×10^{-2}	4.174×10^{-2}	-1.104×10^{-3}	5.745×10^{-4}
fitted radiance squeeze [1]	$(-2.863 \pm 18.445) \times 10^{-5}$	11330892	2.095×10^{-4}	-2.328×10^{-5}	-2.448×10^{-2}	2.632×10^{-2}	-1.304×10^{-4}	7.916×10^{-5}
fitted root mean square [1]	$(1.299 \pm 0.526) \times 10^{-3}$	11330892	5.655×10^{-4}	1.146×10^{-3}	3.338×10^{-4}	6.695×10^{-2}	9.541×10^{-4}	1.520×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.959 ± 0.458	11330892	0.585	0.894	5.000×10^{-2}	2.59	0.638	1.22
sulfurdioxide total air mass factor polluted precision [1]	0.114 ± 0.123	11330892	9.647×10^{-2}	7.402×10^{-2}	4.615×10^{-3}	2.00	4.394×10^{-2}	0.140
sulfurdioxide clear air mass factor polluted [1]	0.809 ± 0.343	11330892	0.390	0.770	0.112	2.69	0.580	0.970
number of spectral points in retrieval [1]	73.4 ± 0.5	11330892	1.000	73.0	53.0	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]	0.651 ± 0.416	4193526	0.810	1.000	0.0	1.000	0.190	1.000
sulfurdioxide total vertical column [DU]	$(2.534 \pm 77.299) \times 10^{-2}$	4193526	0.453	9.572×10^{-3}	-103	135	-0.213	0.240
sulfurdioxide total vertical column precision [DU]	0.480 ± 0.512	4193526	0.345	0.349	4.710×10^{-2}	78.1	0.216	0.561
sulfurdioxide slant column density corrected [DU]	$(1.701 \pm 34.912) \times 10^{-2}$	4193526	0.364	8.614×10^{-3}	-46.3	57.0	-0.172	0.192
sulfurdioxide slant column density cobra [DU]	$(1.691 \pm 34.270) \times 10^{-2}$	4193526	0.364	8.613×10^{-3}	-46.3	52.1	-0.172	0.192
sulfurdioxide slant column density cobra precision [DU]	0.285 ± 0.116	4193526	9.847×10^{-2}	0.253	8.986×10^{-2}	26.3	0.216	0.315
sulfurdioxide slant column density window1 [DU]	0.168 ± 0.637	4193526	0.723	0.162	-59.7	64.7	-0.198	0.524
sulfurdioxide slant column density window1 precision [DU]	0.285 ± 0.116	4193526	9.847×10^{-2}	0.253	8.986×10^{-2}	26.3	0.216	0.315
sulfurdioxide slant column density corrected win1 [DU]	$(4.338 \pm 63.049) \times 10^{-2}$	4193526	0.711	2.765×10^{-2}	-59.7	64.7	-0.323	0.388
background so2 slant column offset window1 [DU]	-0.125 ± 0.114	4193526	0.132	-0.142	-0.596	2.32	-0.200	-6.828×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.12 ± 9.08	4193526	11.4	2.16	-982	966	-3.58	7.82
sulfurdioxide slant column density window2 precision [DU]	8.27 ± 2.57	4193526	2.73	7.90	2.43	463	6.67	9.40
sulfurdioxide slant column density corrected win2 [DU]	0.414 ± 8.945	4193526	11.1	0.425	-983	965	-5.16	5.99
background so2 slant column offset window2 [DU]	-1.70 ± 2.06	4193526	2.79	-1.31	-10.5	9.72	-3.02	-0.230
sulfurdioxide slant column density window3 [DU]	-17.8 ± 23.6	4193526	28.9	-17.3	-741	591	-32.0	-3.11
sulfurdioxide slant column density window3 precision [DU]	30.9 ± 17.1	4193526	12.7	25.9	9.50	240	21.2	33.8
sulfurdioxide slant column density corrected win3 [DU]	-8.34 ± 23.93	4193526	29.6	-7.43	-736	597	-22.7	6.85
background so2 slant column offset window3 [DU]	9.48 ± 5.21	4193526	8.18	9.93	-19.1	30.0	5.53	13.7
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.11	4193526	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.386 \pm 11.105) \times 10^{-2}$	4193526	4.923×10^{-2}	2.090×10^{-2}	2.765×10^{-4}	1.87	7.016×10^{-3}	5.624×10^{-2}
fitted radiance shift [nm]	$(-1.348 \pm 32.082) \times 10^{-4}$	4193526	1.756×10^{-3}	-1.478×10^{-4}	-4.942×10^{-2}	4.189×10^{-2}	-1.051×10^{-3}	7.052×10^{-4}
fitted radiance squeeze [1]	$(-3.568 \pm 17.437) \times 10^{-5}$	4193526	2.050×10^{-4}	-3.366×10^{-5}	-1.596×10^{-2}	1.587×10^{-2}	-1.369×10^{-4}	6.809×10^{-5}
fitted root mean square [1]	$(1.239 \pm 0.451) \times 10^{-3}$	4193526	3.929×10^{-4}	1.131×10^{-3}	3.322×10^{-4}	5.357×10^{-2}	9.732×10^{-4}	1.366×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.895 ± 0.538	4193526	0.629	0.724	5.000×10^{-2}	2.81	0.512	1.14
sulfurdioxide total air mass factor polluted precision [1]	0.134 ± 0.143	4193526	0.160	8.265×10^{-2}	2.871×10^{-3}	1.49	3.168×10^{-2}	0.192
sulfurdioxide clear air mass factor polluted [1]	0.695 ± 0.339	4193526	0.365	0.615	6.375×10^{-2}	2.70	0.465	0.830
number of spectral points in retrieval [1]	73.4 ± 0.5	4193526	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

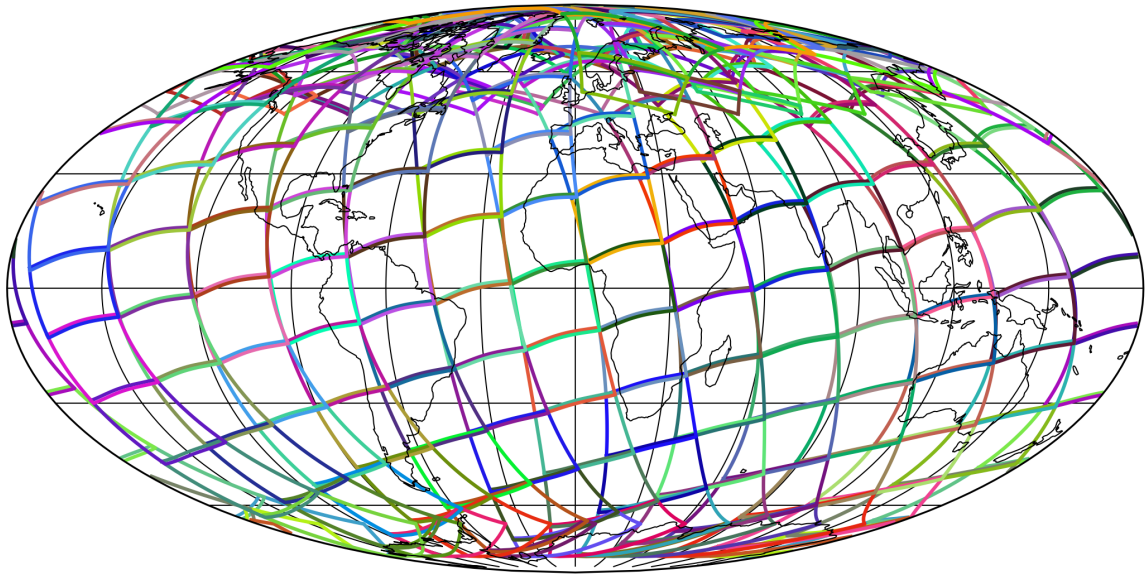


Figure 1: Outline of the granules.

4 Input data monitoring

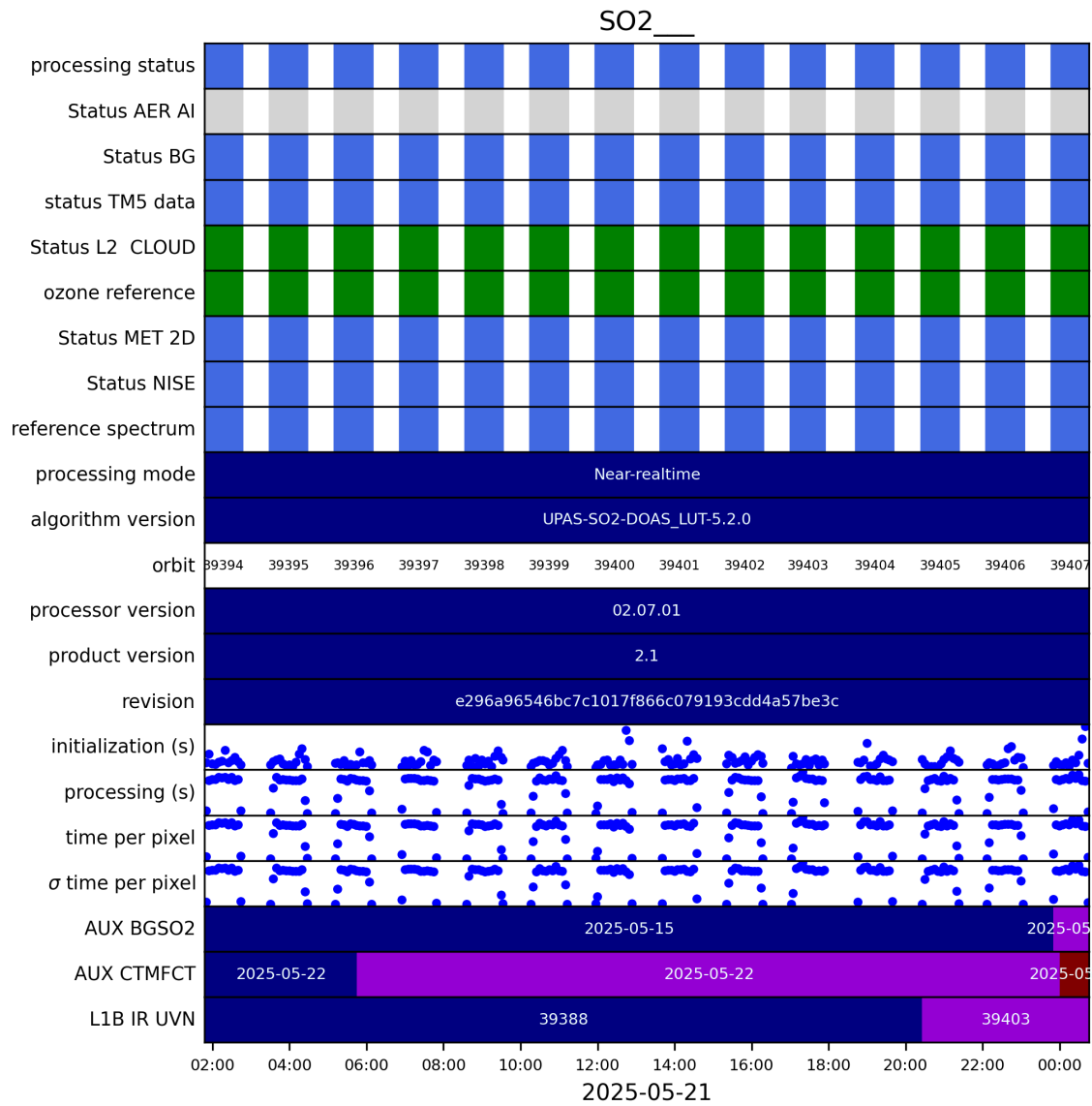


Figure 2: Input data per granule

5 Warnings and errors

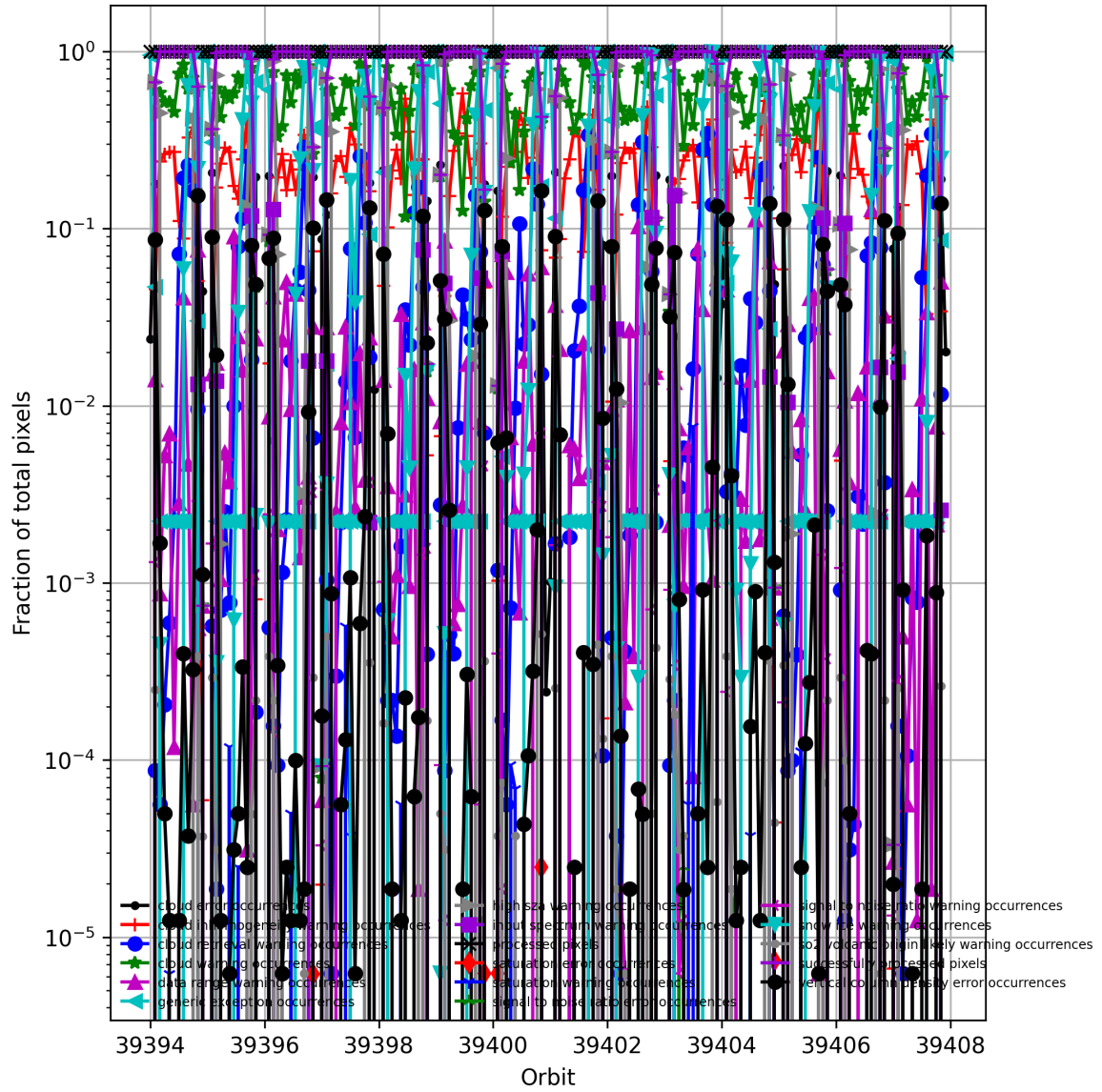


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

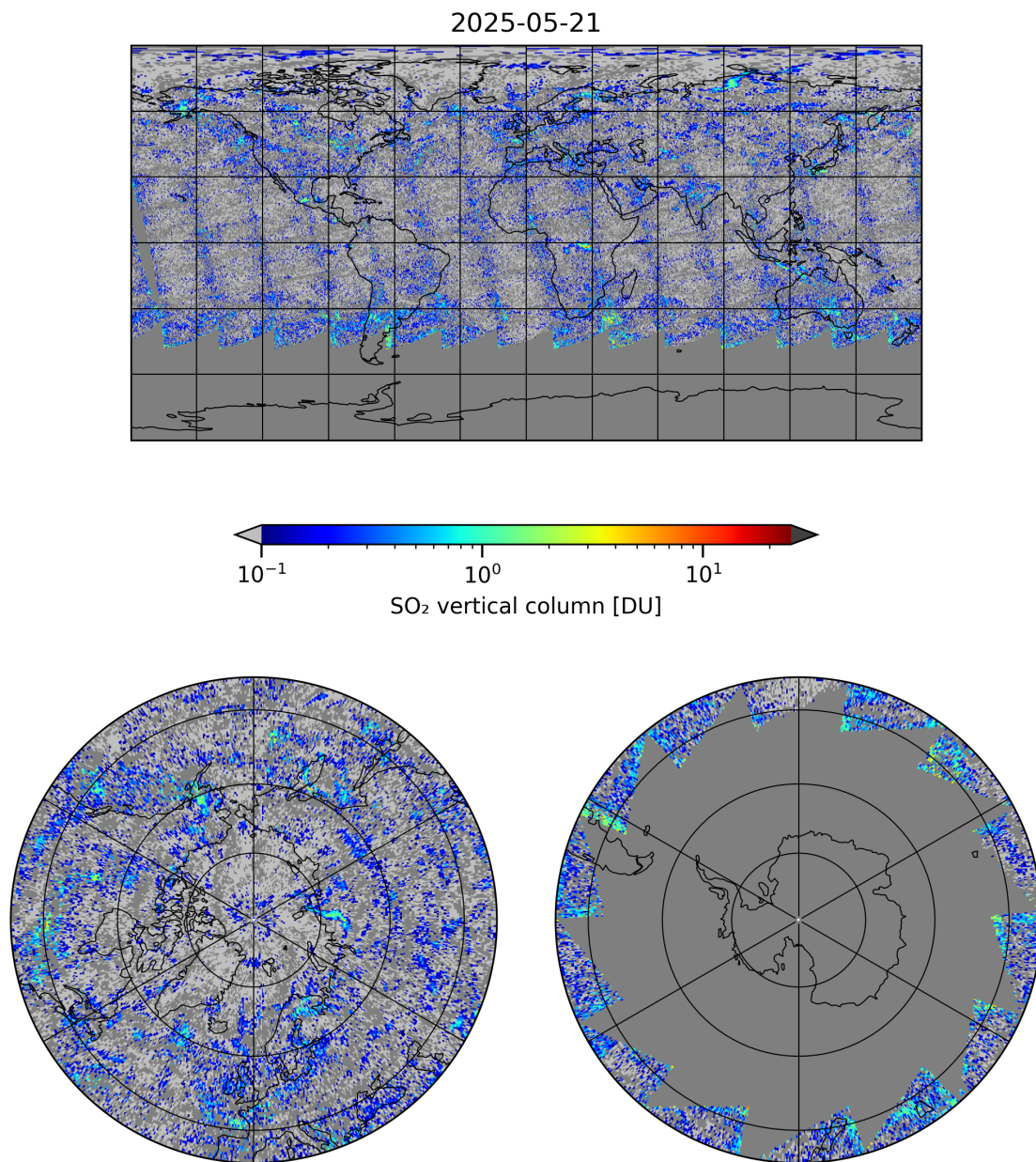


Figure 4: Map of “SO₂ vertical column” for 2025-05-21 to 2025-05-22

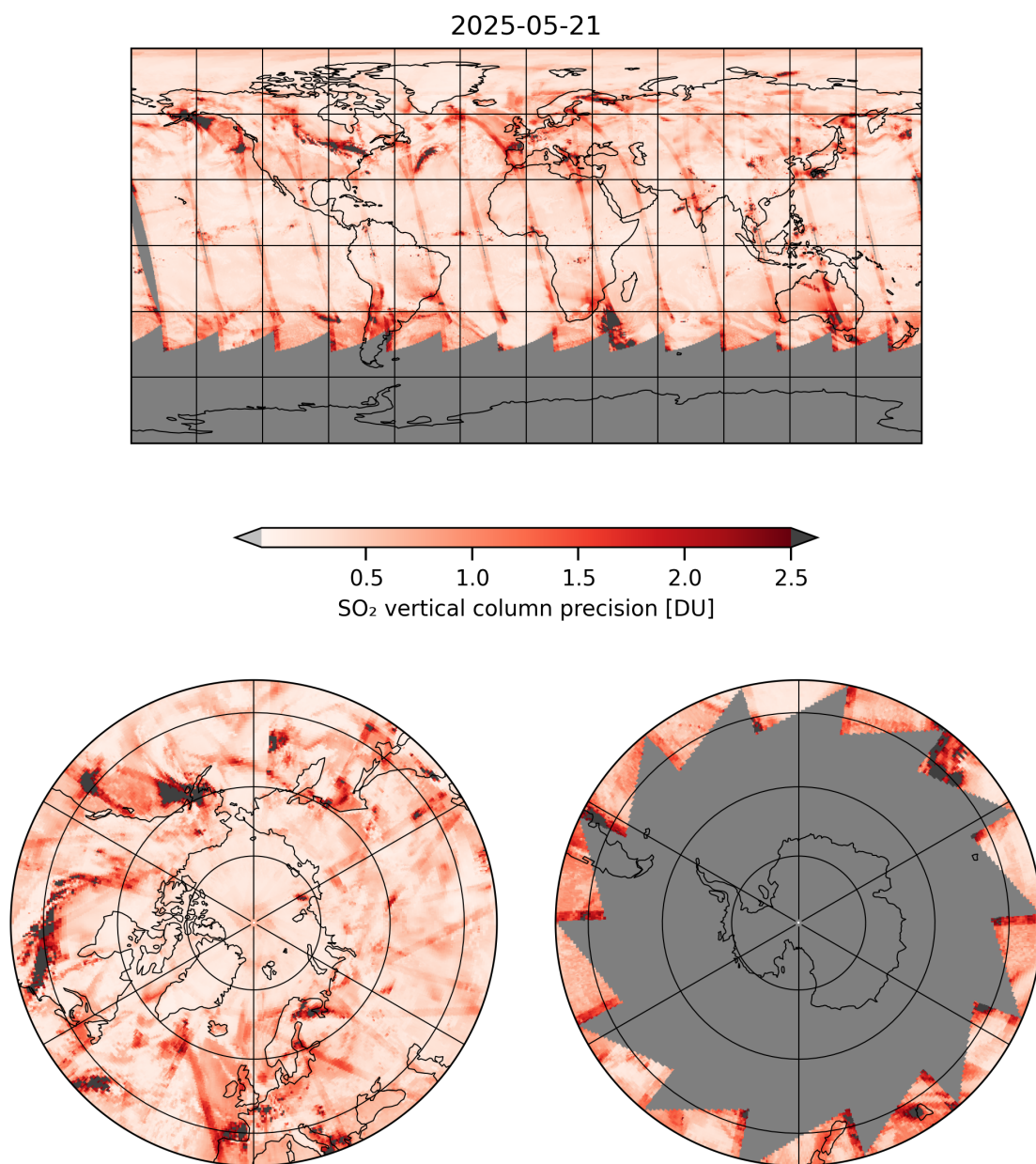


Figure 5: Map of “SO₂ vertical column precision” for 2025-05-21 to 2025-05-22

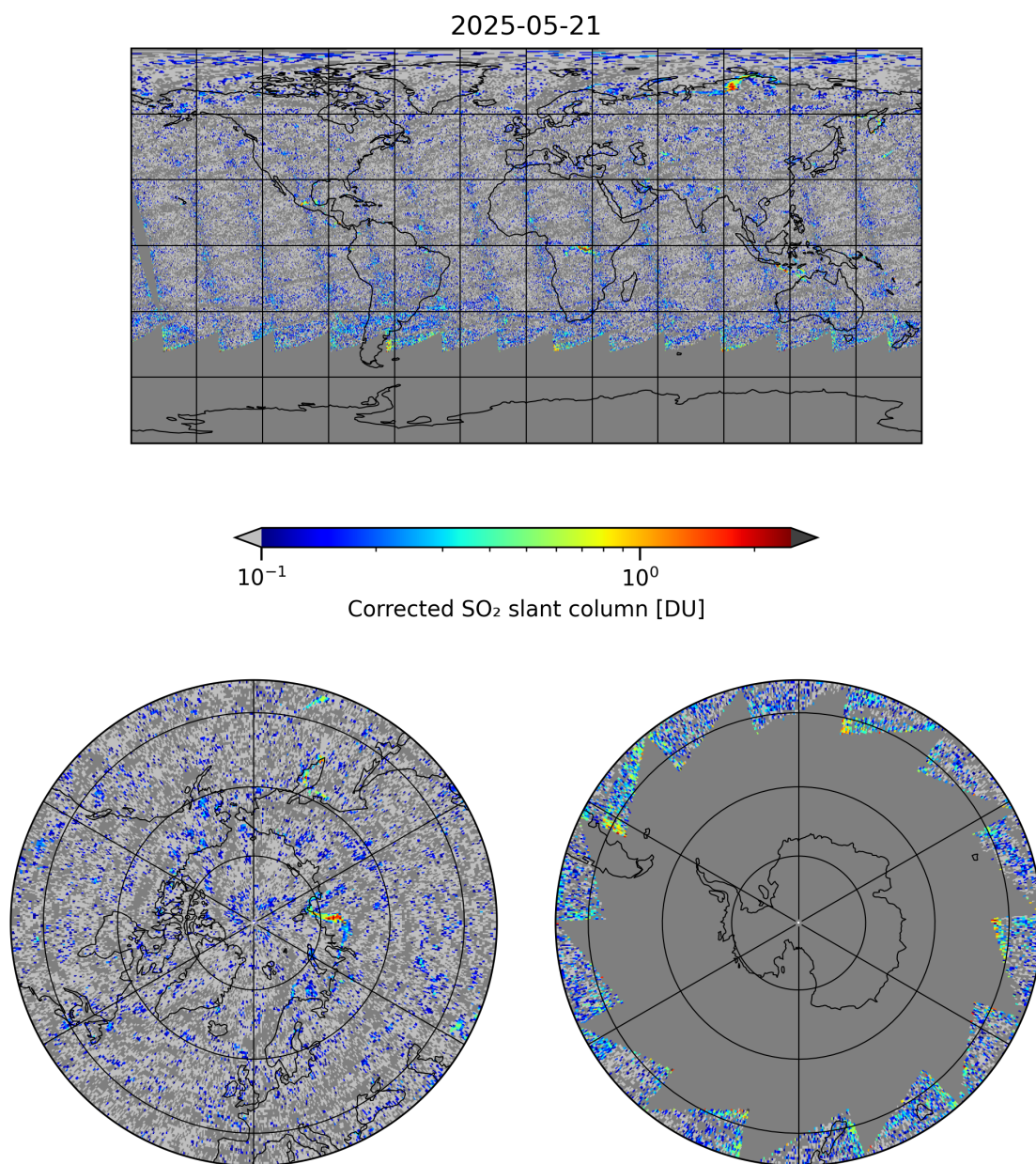


Figure 6: Map of “Corrected SO₂ slant column” for 2025-05-21 to 2025-05-22

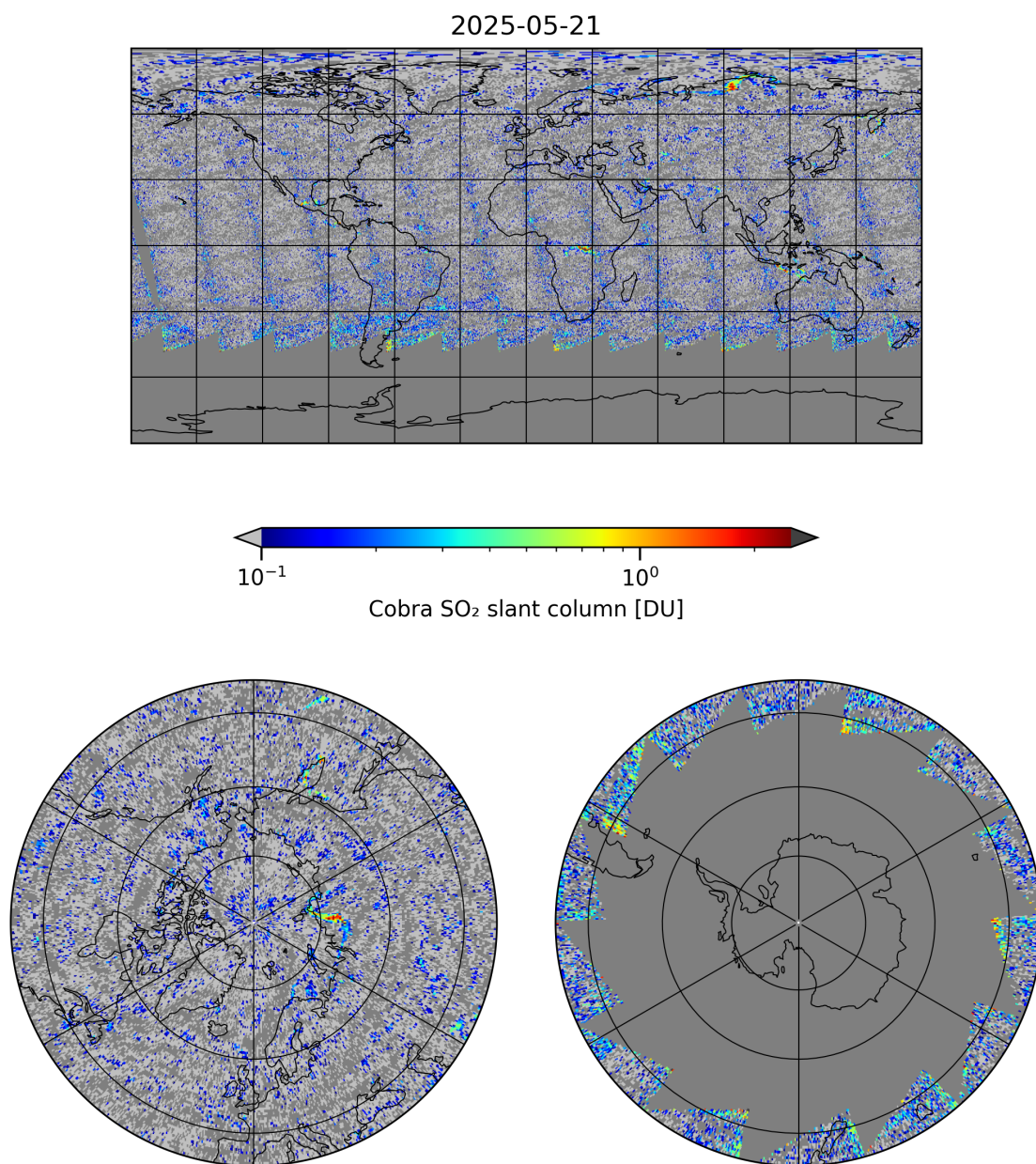


Figure 7: Map of “Cobra SO₂ slant column” for 2025-05-21 to 2025-05-22

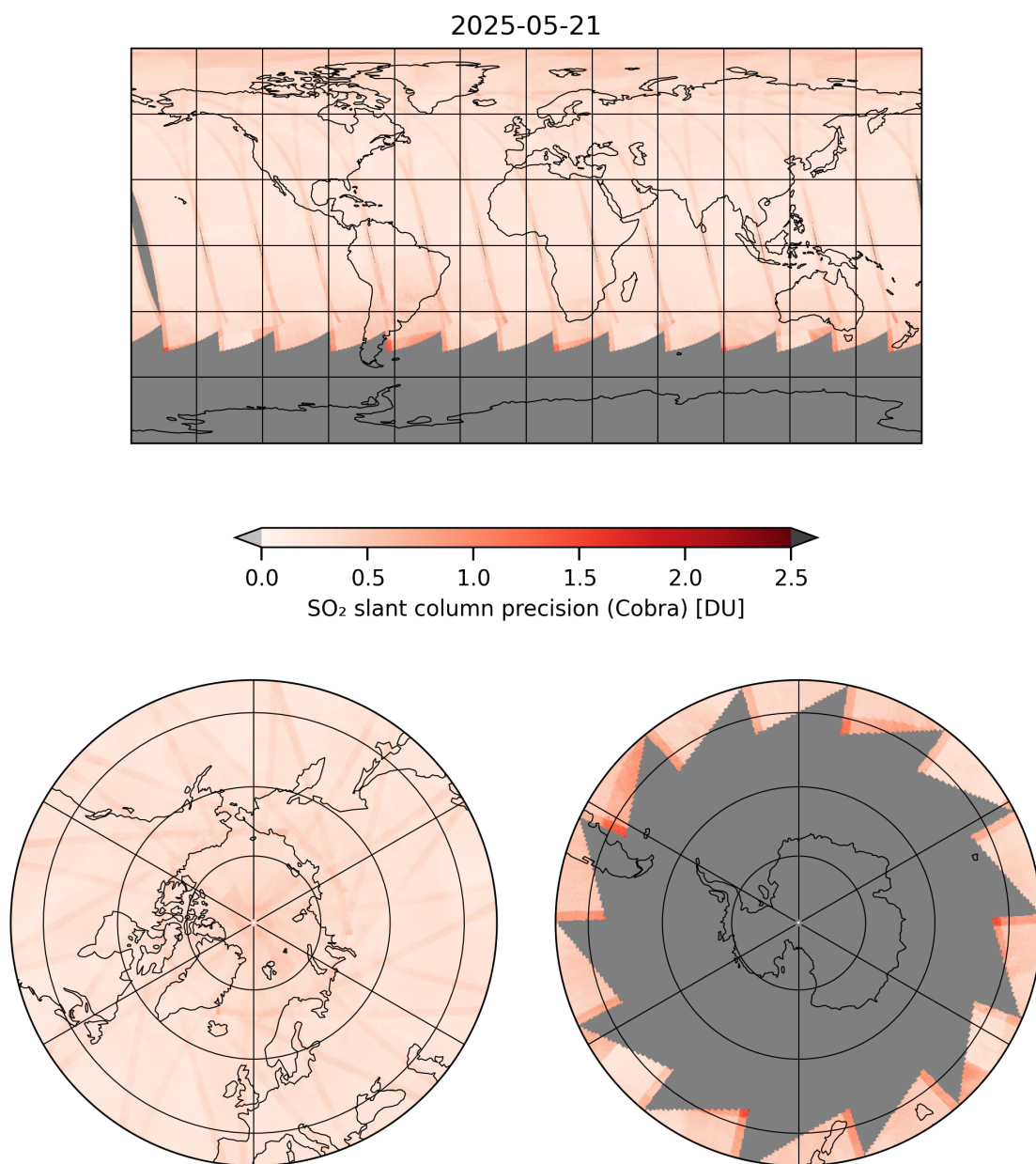


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-05-21 to 2025-05-22

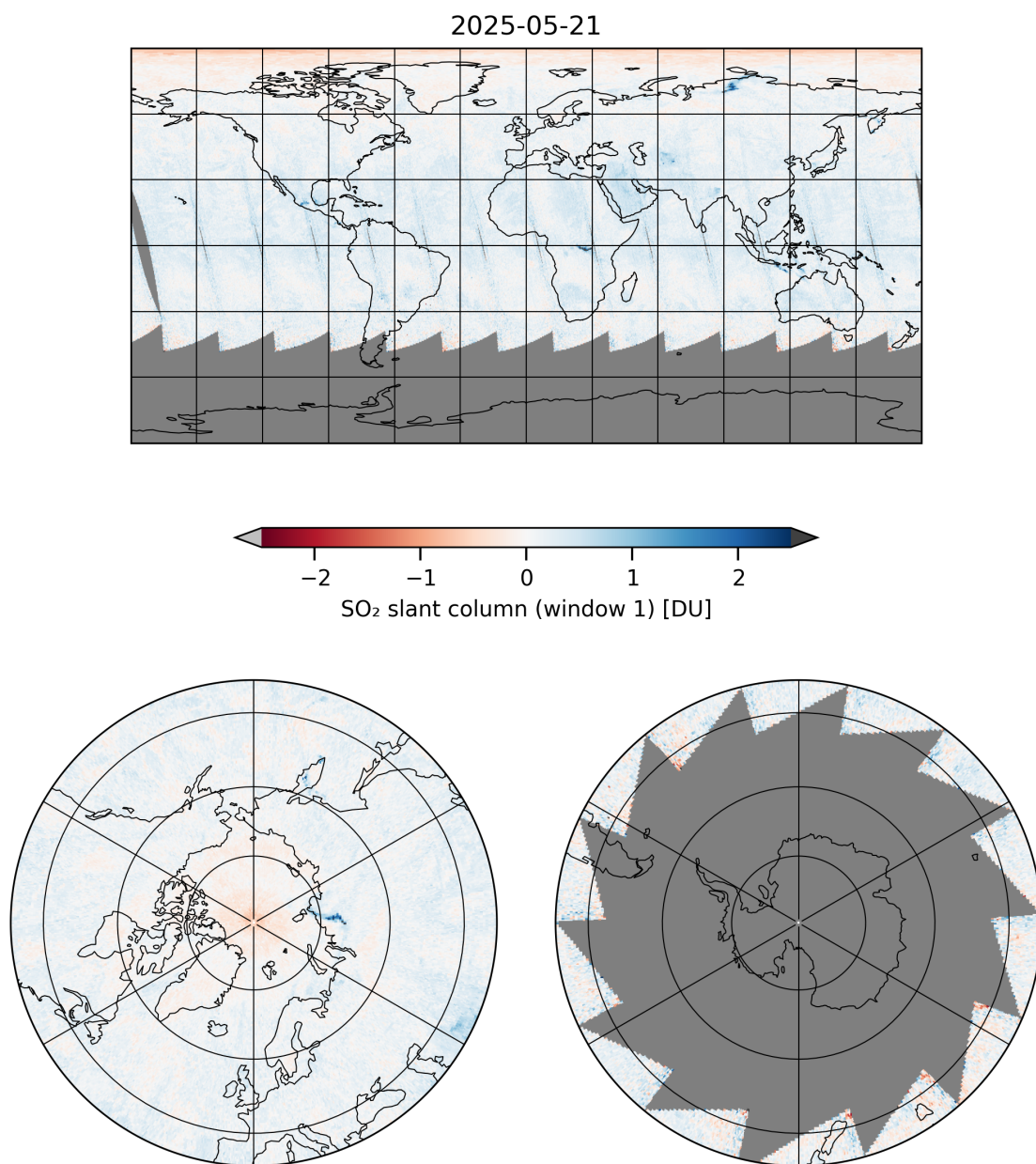


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-05-21 to 2025-05-22

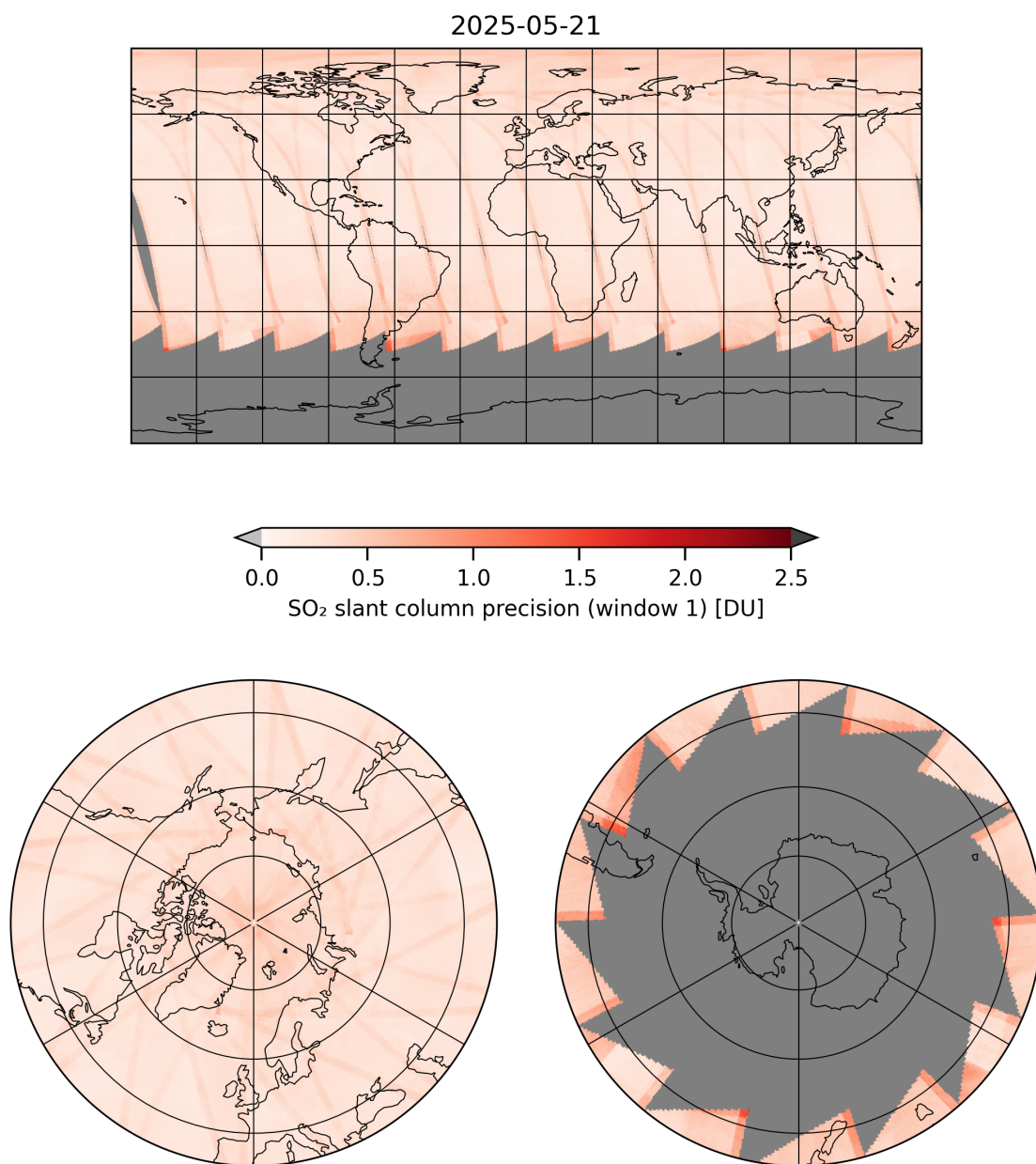


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-05-21 to 2025-05-22

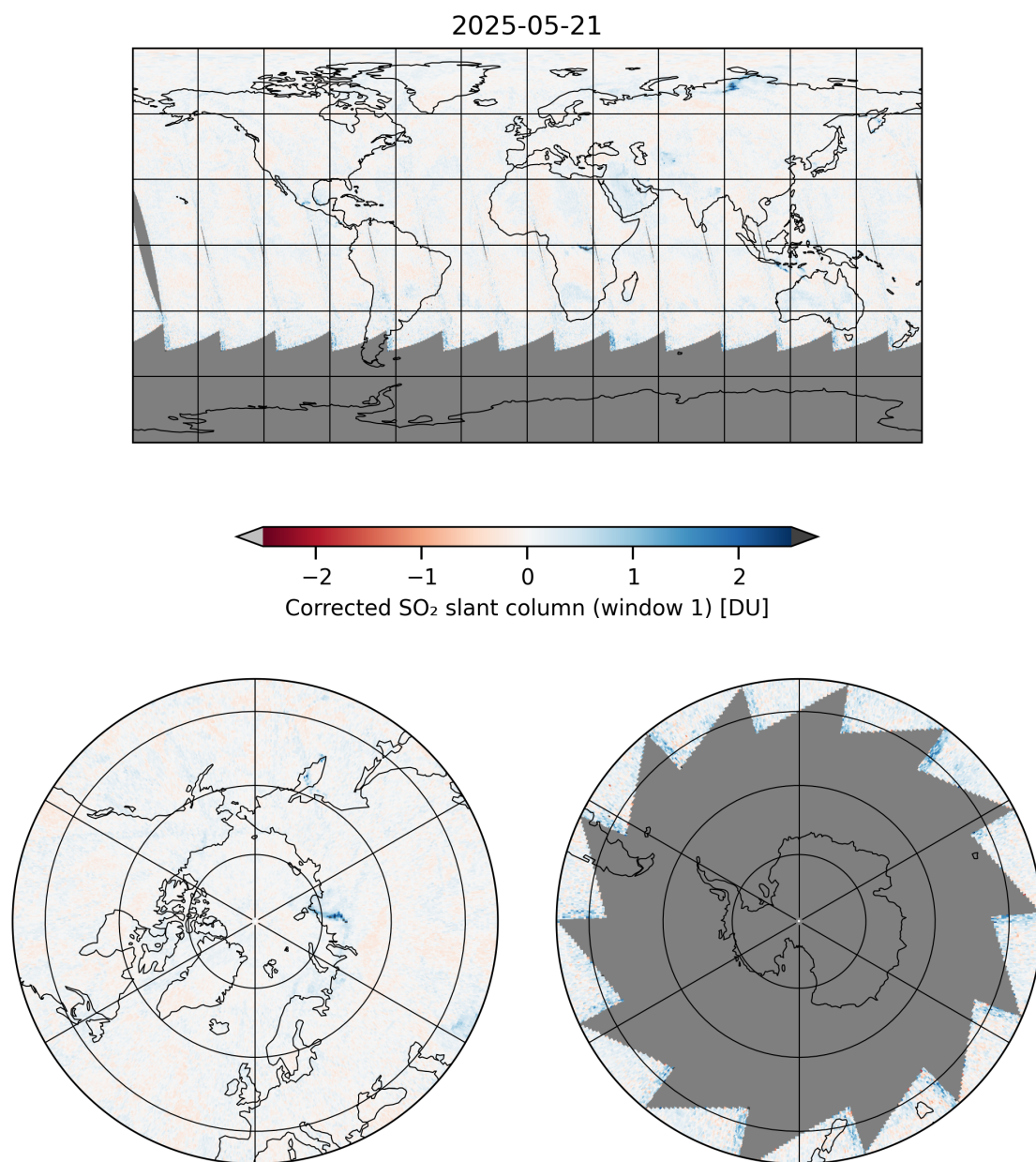


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-05-21 to 2025-05-22

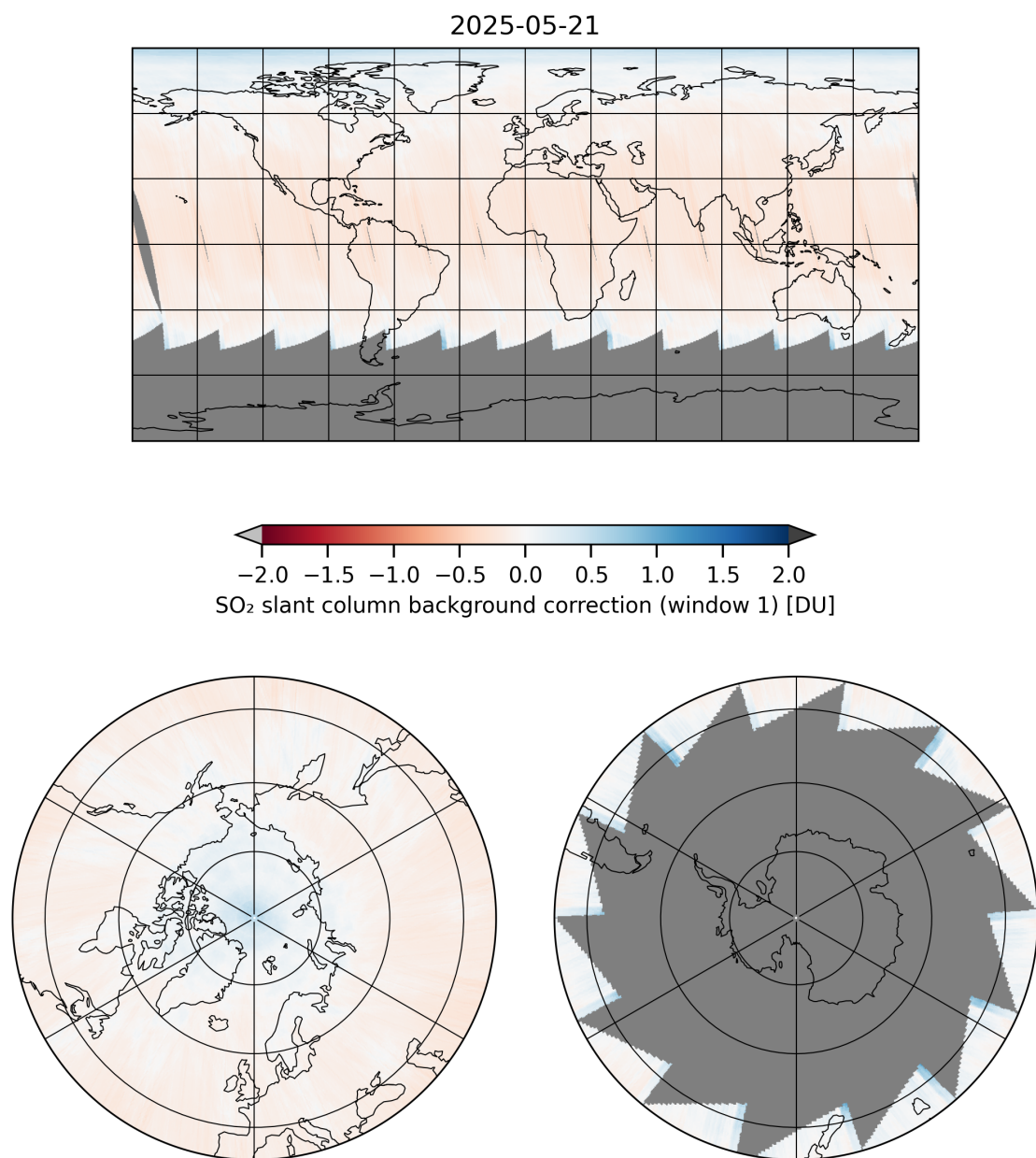


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-05-21 to 2025-05-22

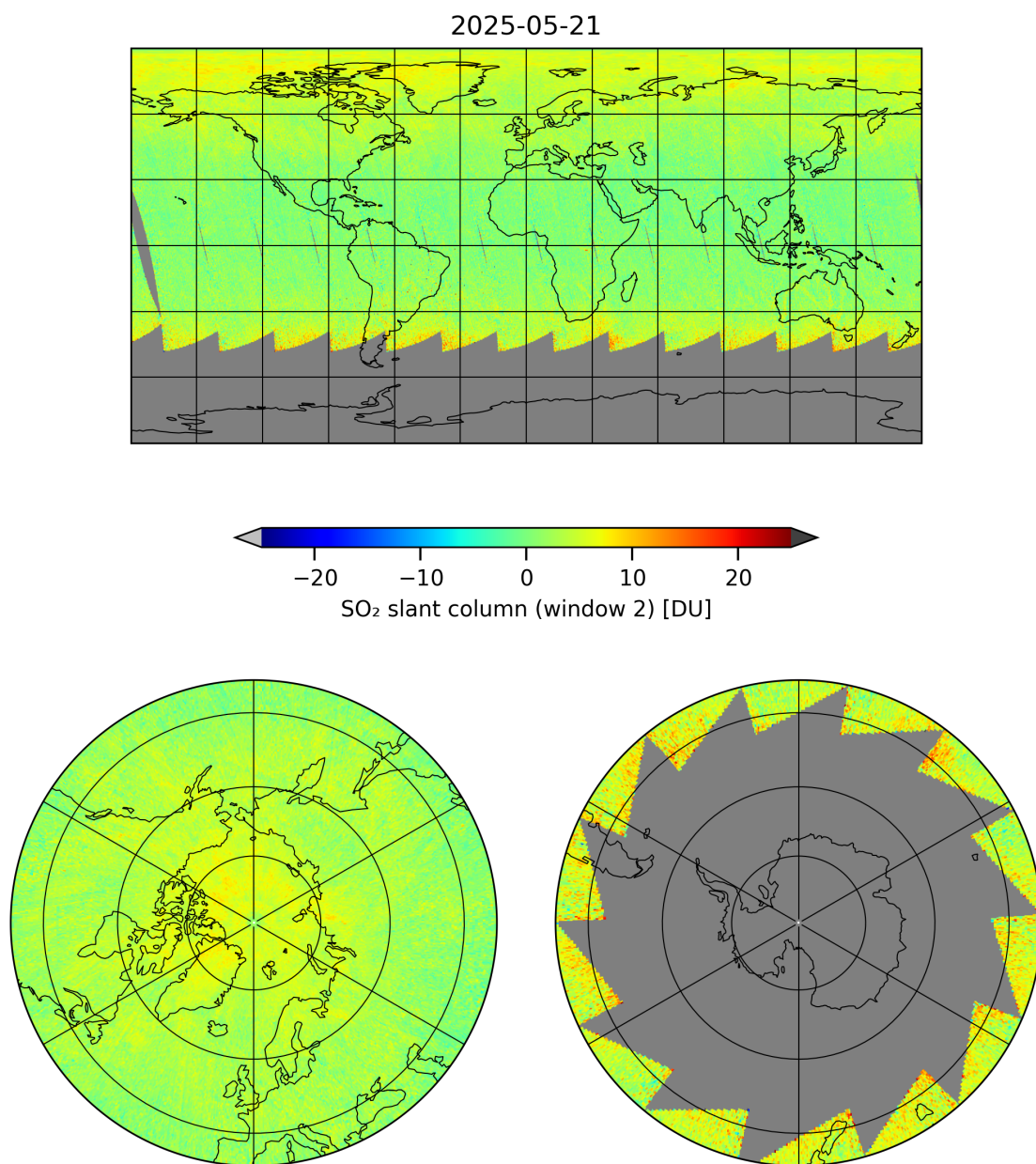


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-05-21 to 2025-05-22

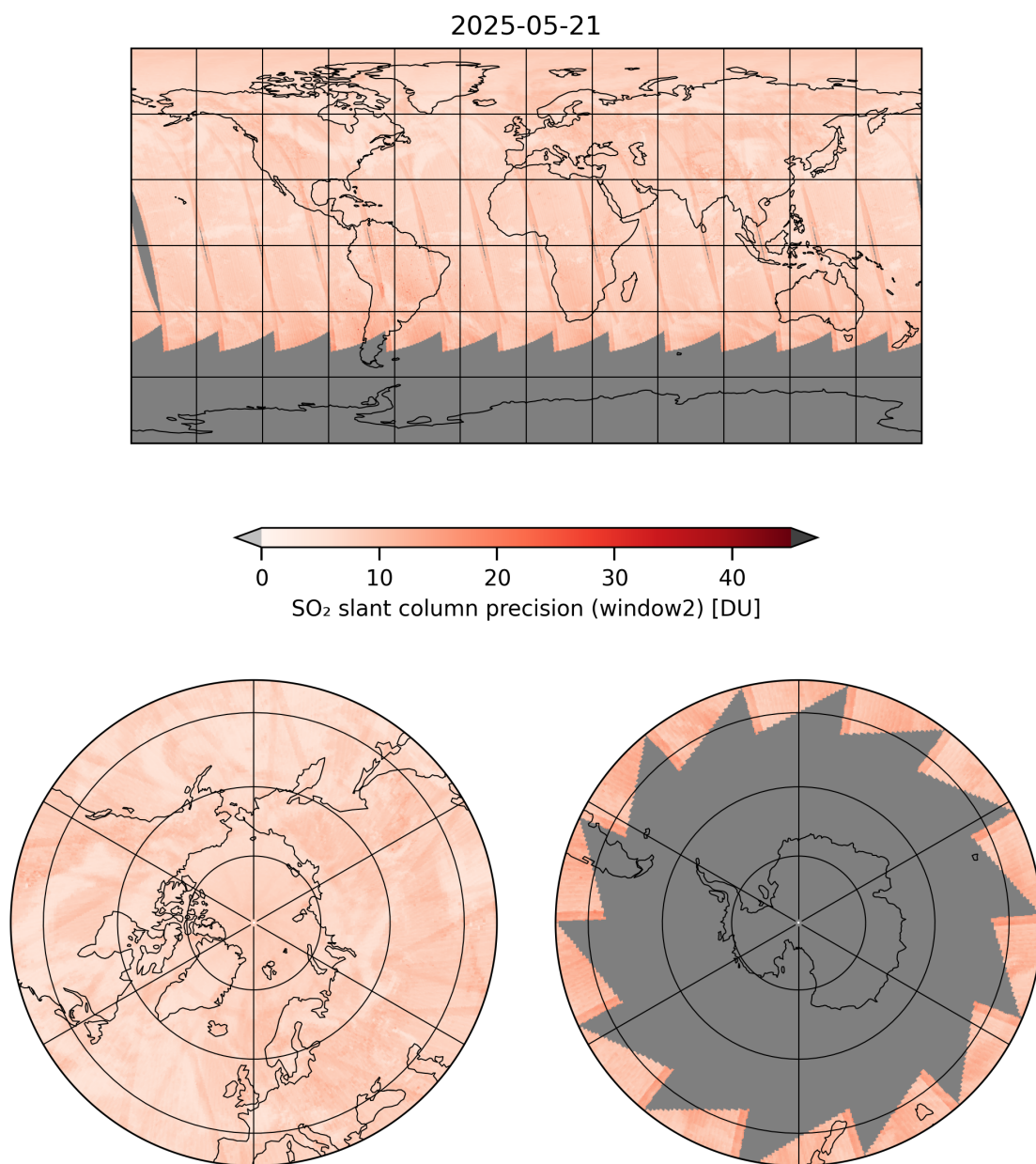


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-05-21 to 2025-05-22

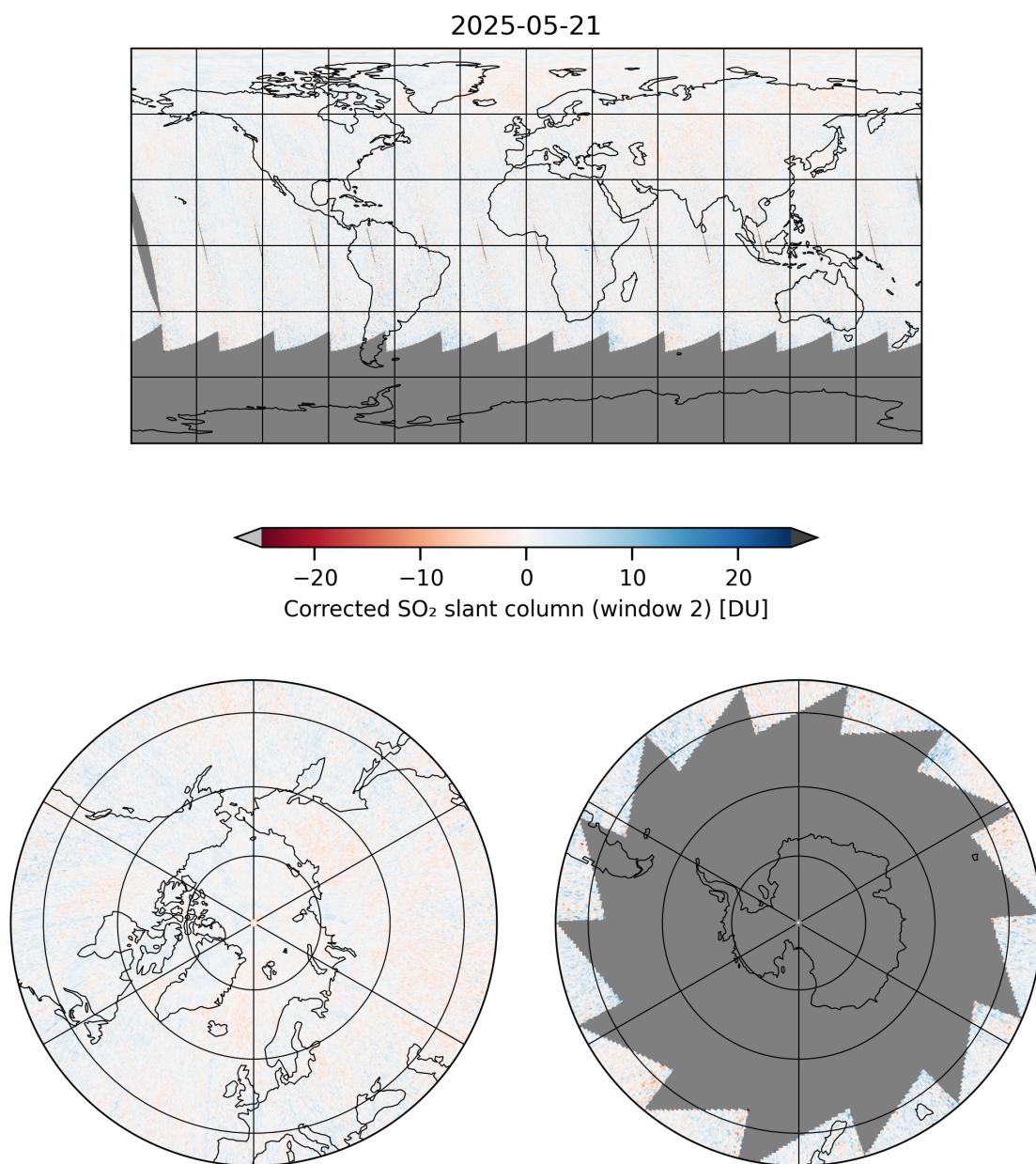


Figure 15: Map of "Corrected SO₂ slant column (window 2)" for 2025-05-21 to 2025-05-22

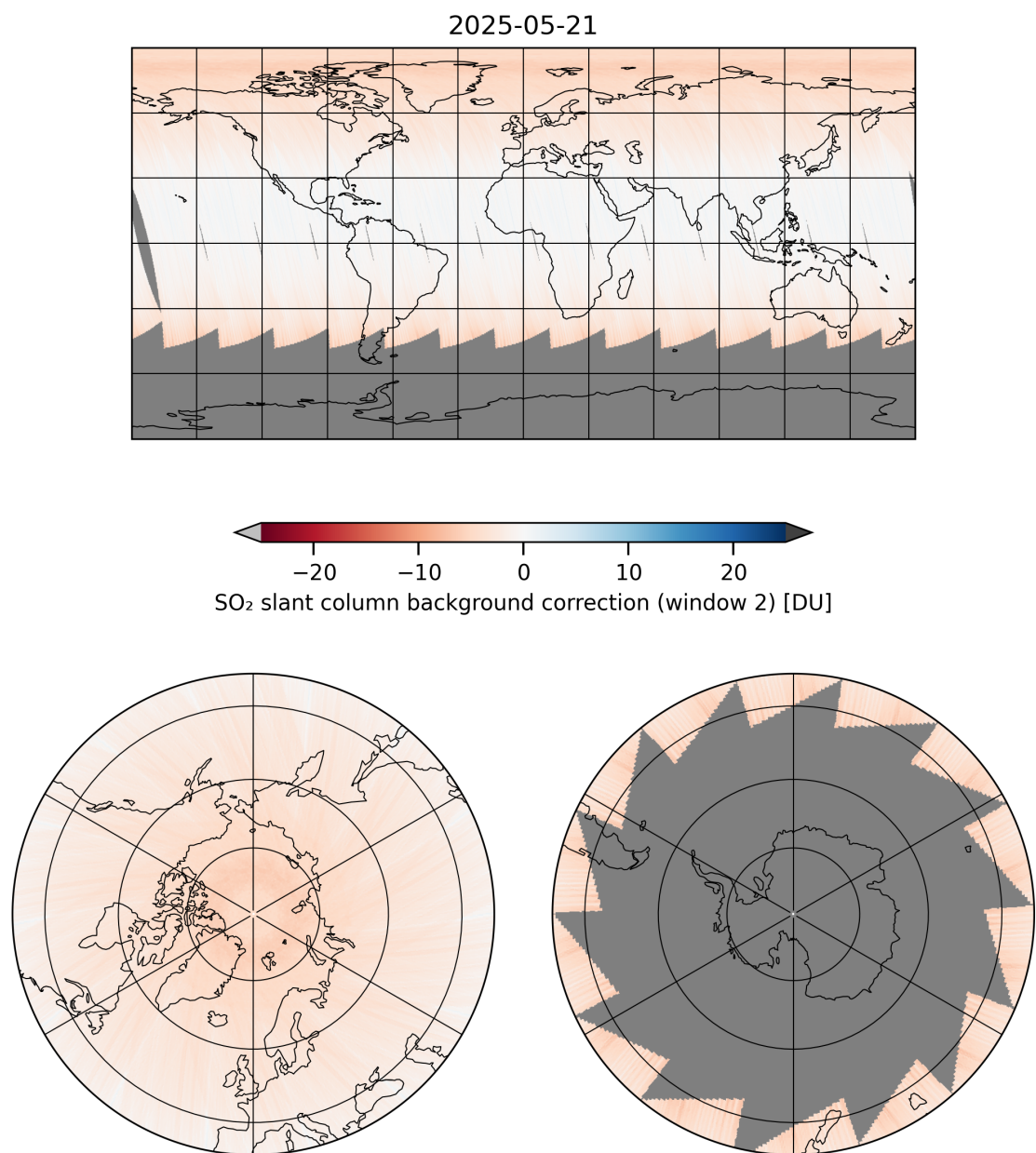


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-05-21 to 2025-05-22

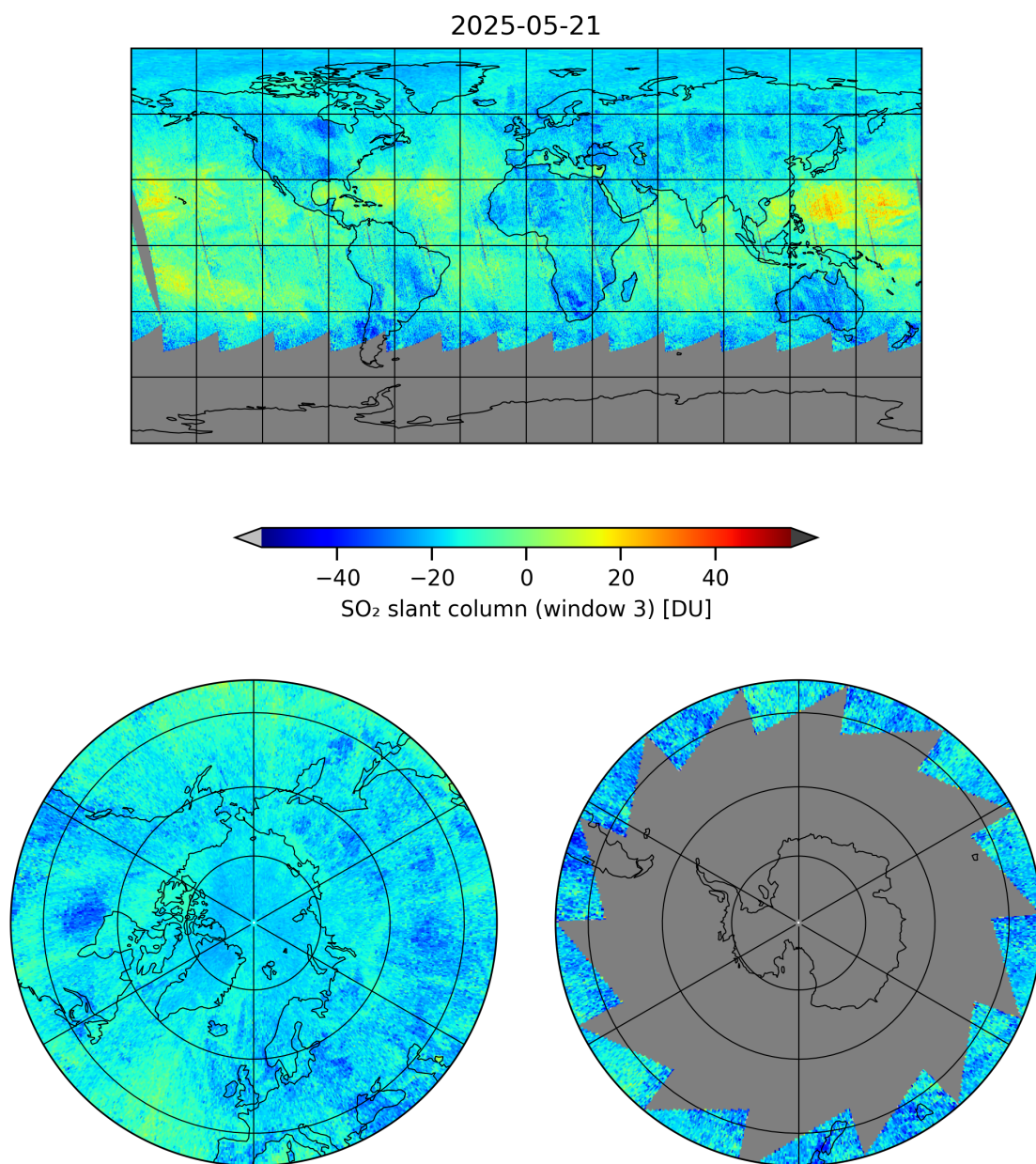


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-05-21 to 2025-05-22

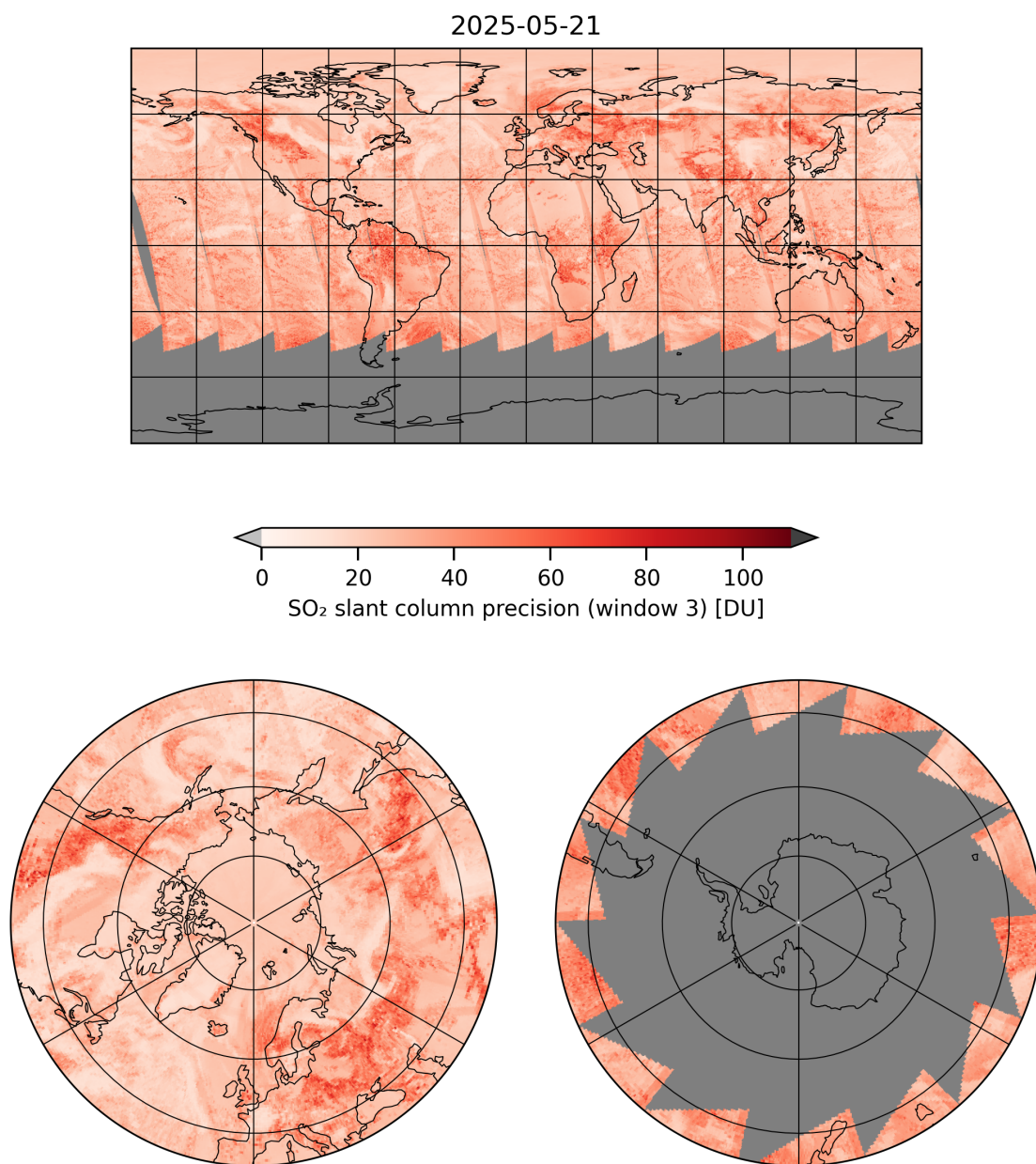


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-05-21 to 2025-05-22

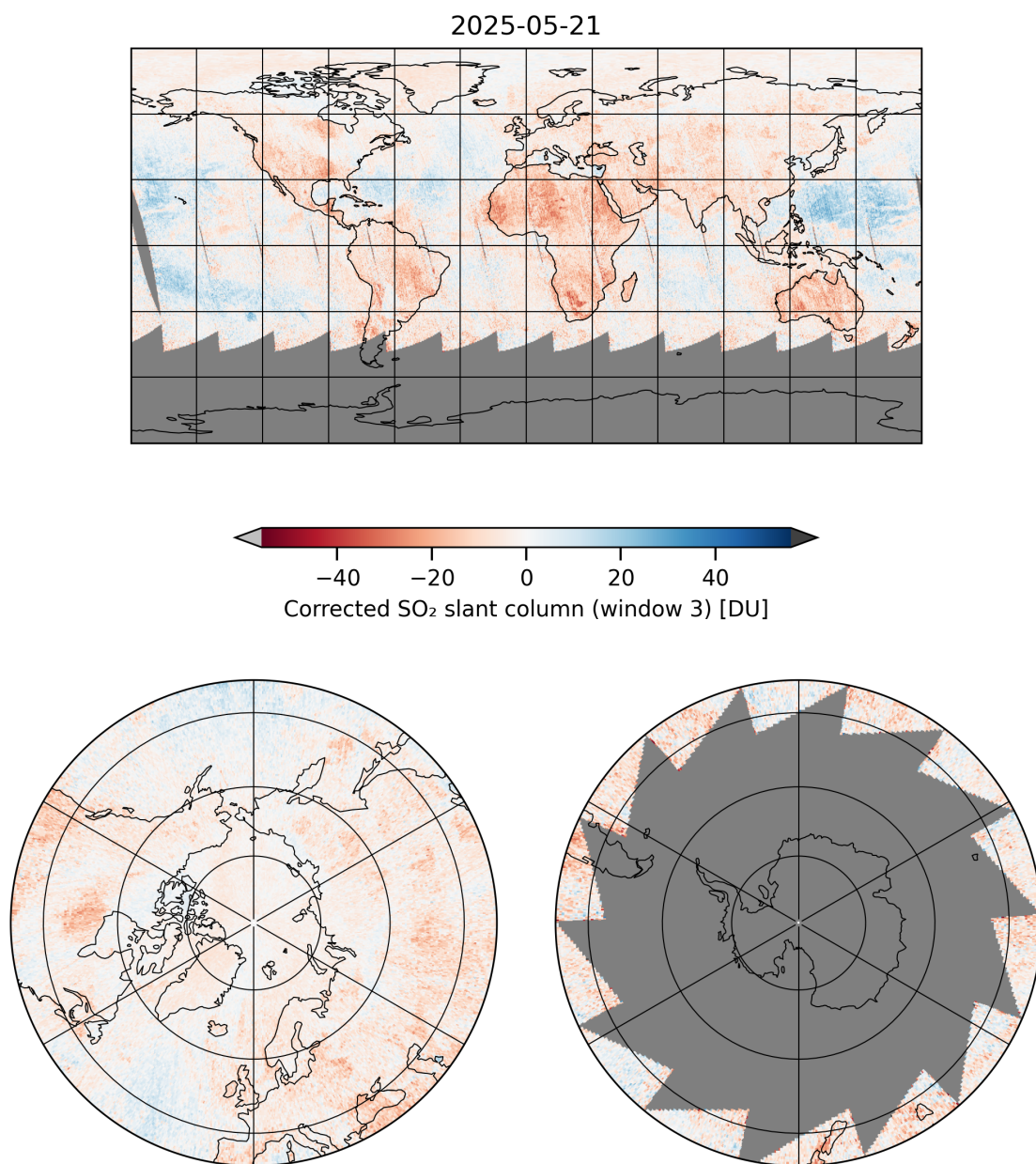


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-05-21 to 2025-05-22

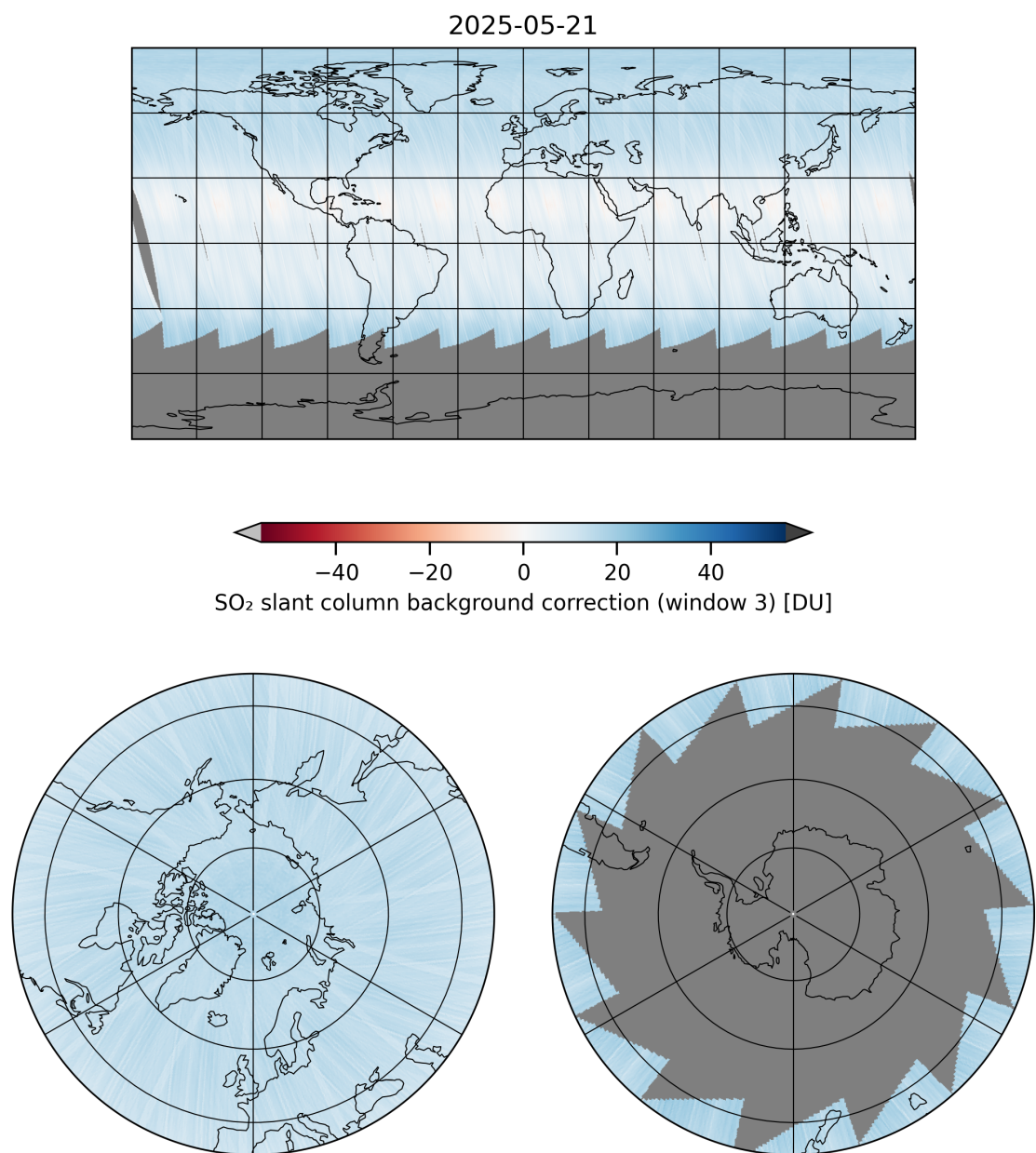


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-05-21 to 2025-05-22

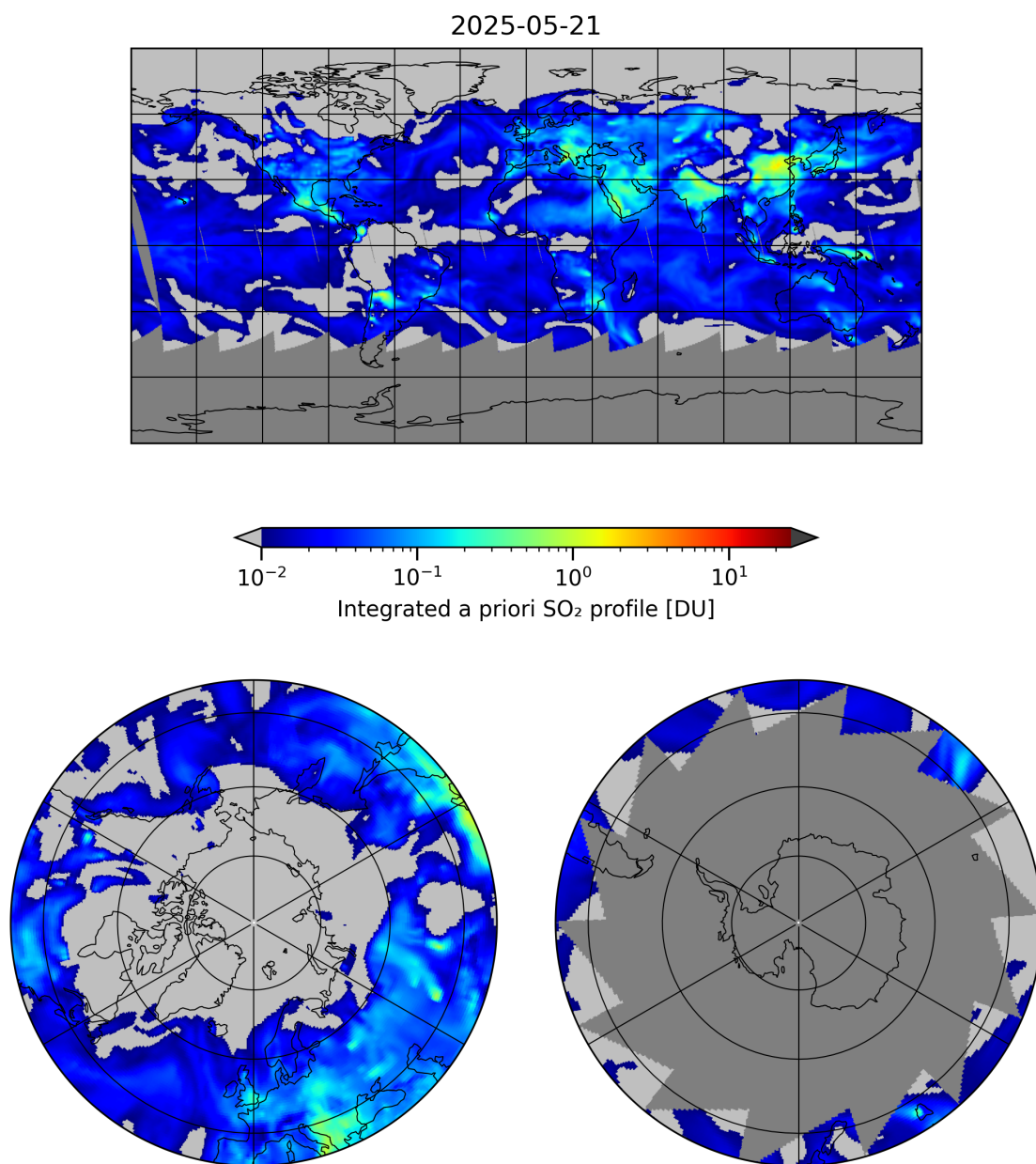


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-05-21 to 2025-05-22

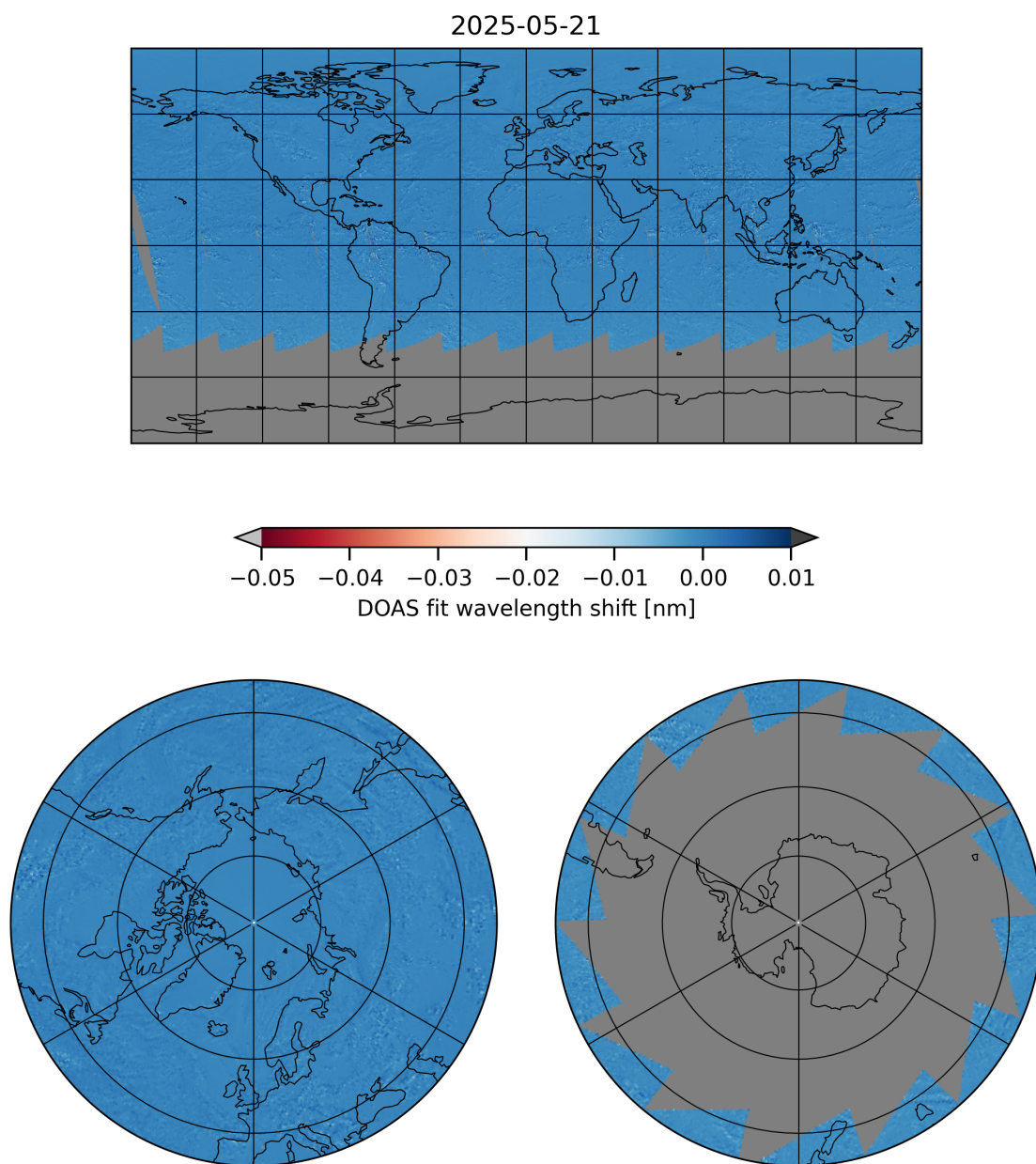


Figure 22: Map of “DOAS fit wavelength shift” for 2025-05-21 to 2025-05-22

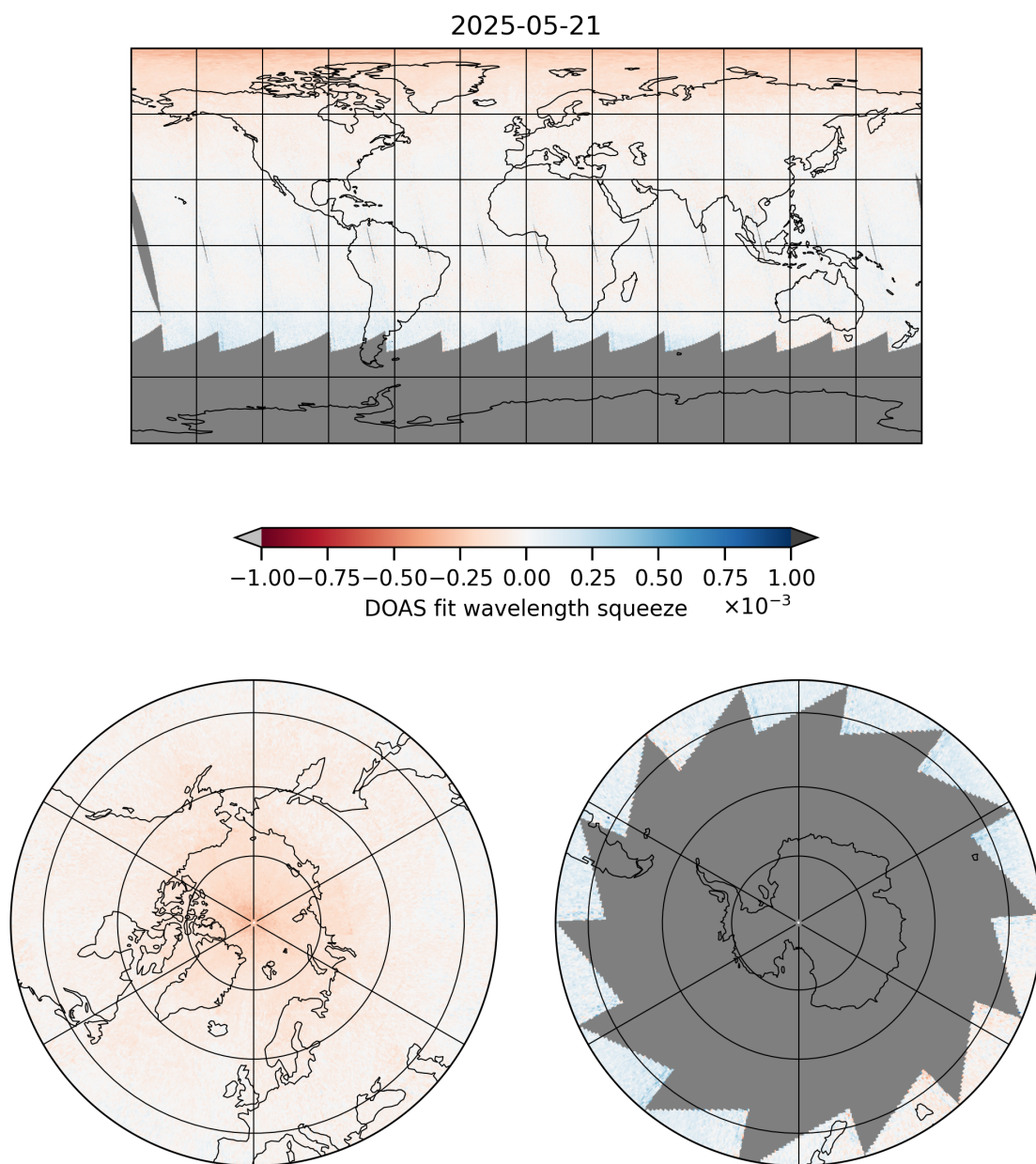


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-05-21 to 2025-05-22

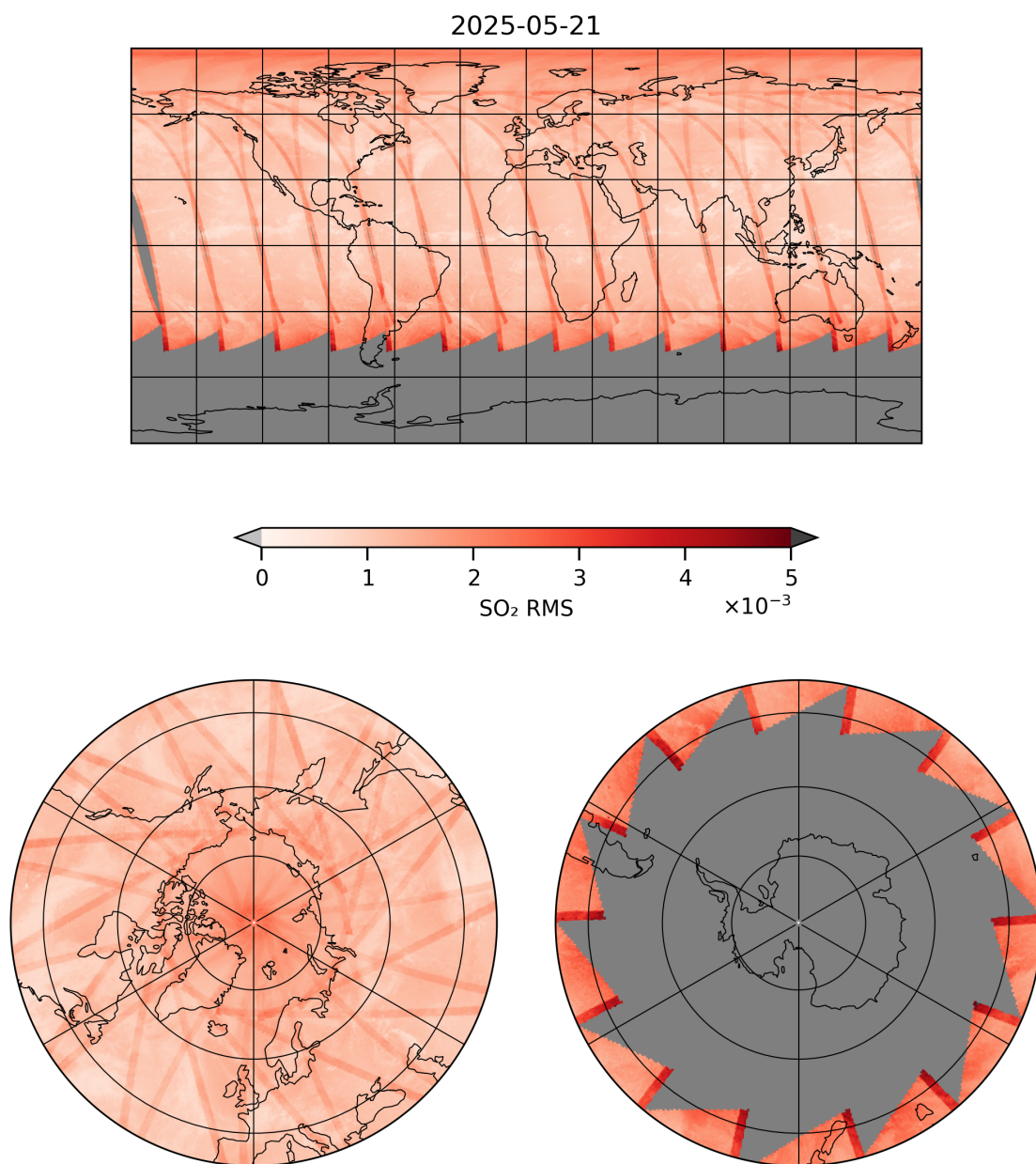


Figure 24: Map of “SO₂ RMS” for 2025-05-21 to 2025-05-22

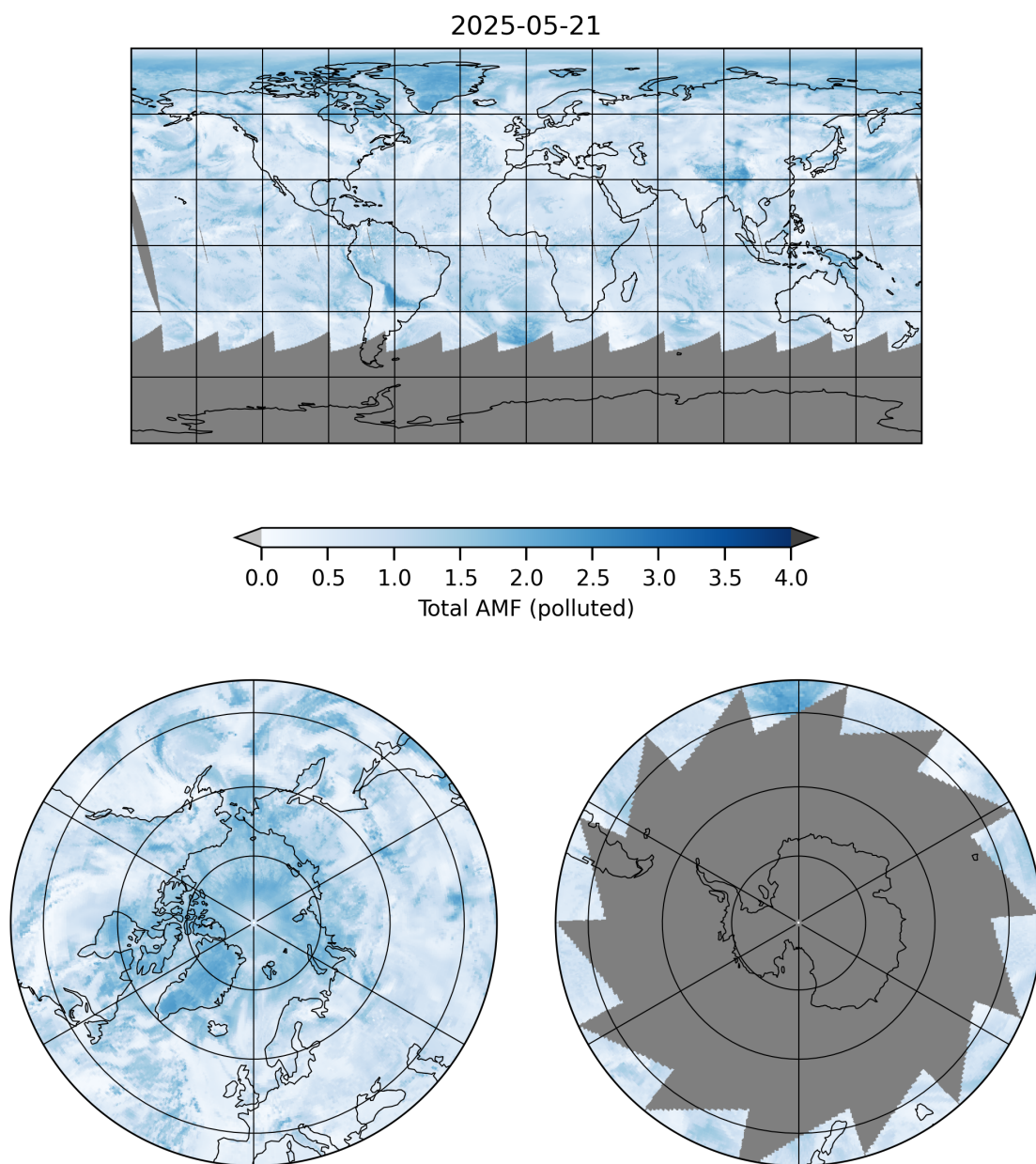


Figure 25: Map of “Total AMF (polluted)” for 2025-05-21 to 2025-05-22

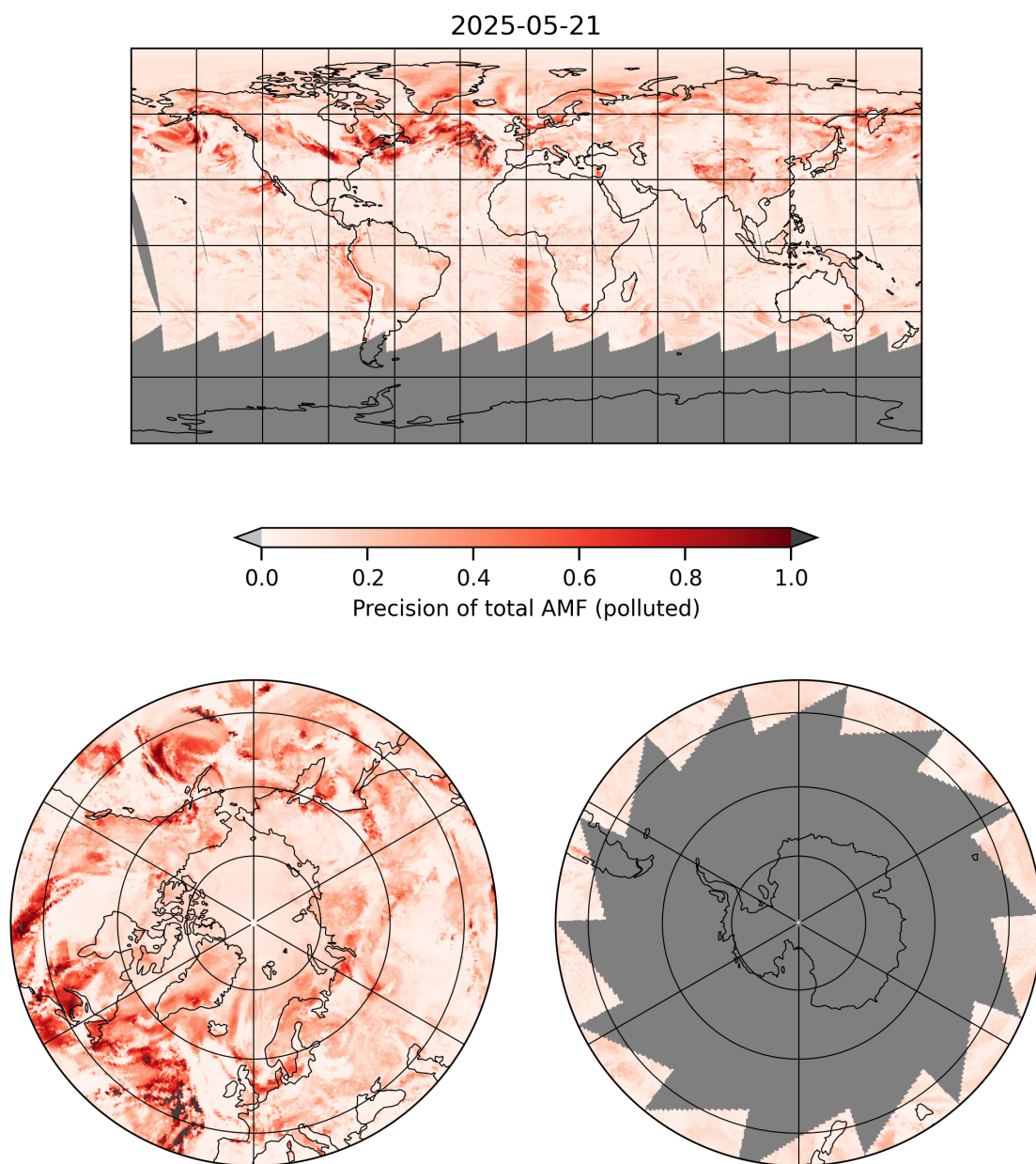


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-05-21 to 2025-05-22

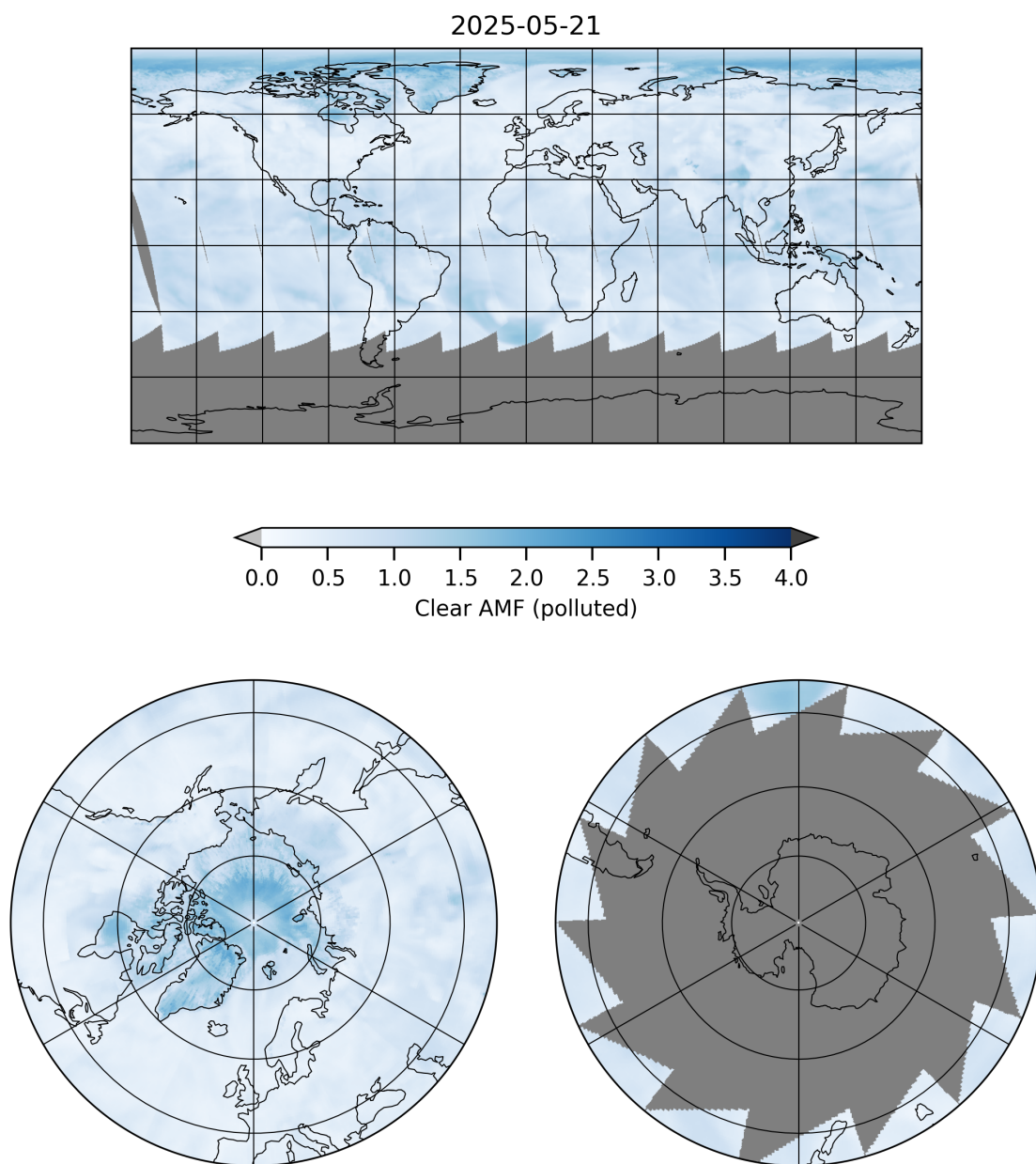


Figure 27: Map of “Clear AMF (polluted)” for 2025-05-21 to 2025-05-22

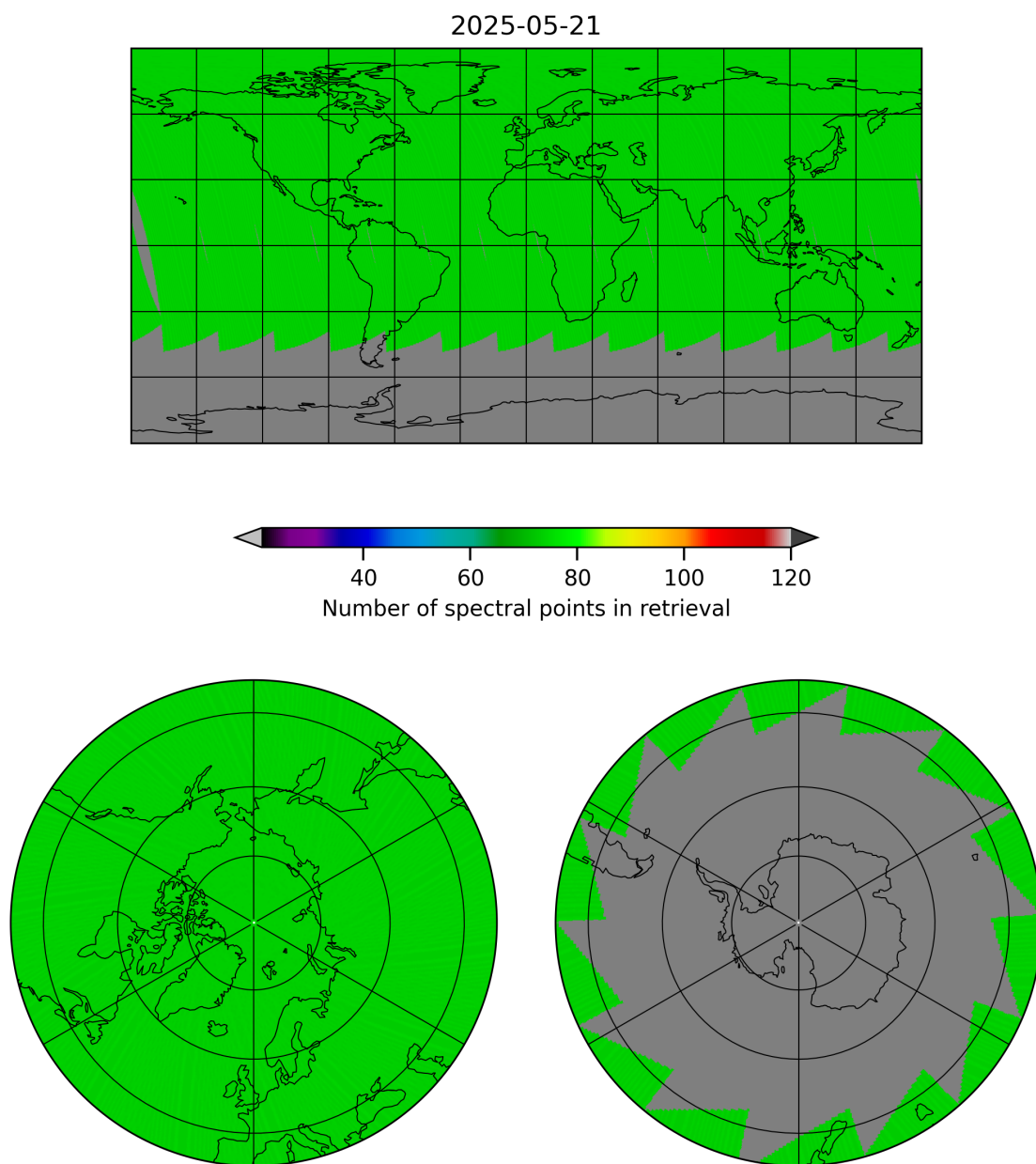


Figure 28: Map of “Number of spectral points in retrieval” for 2025-05-21 to 2025-05-22

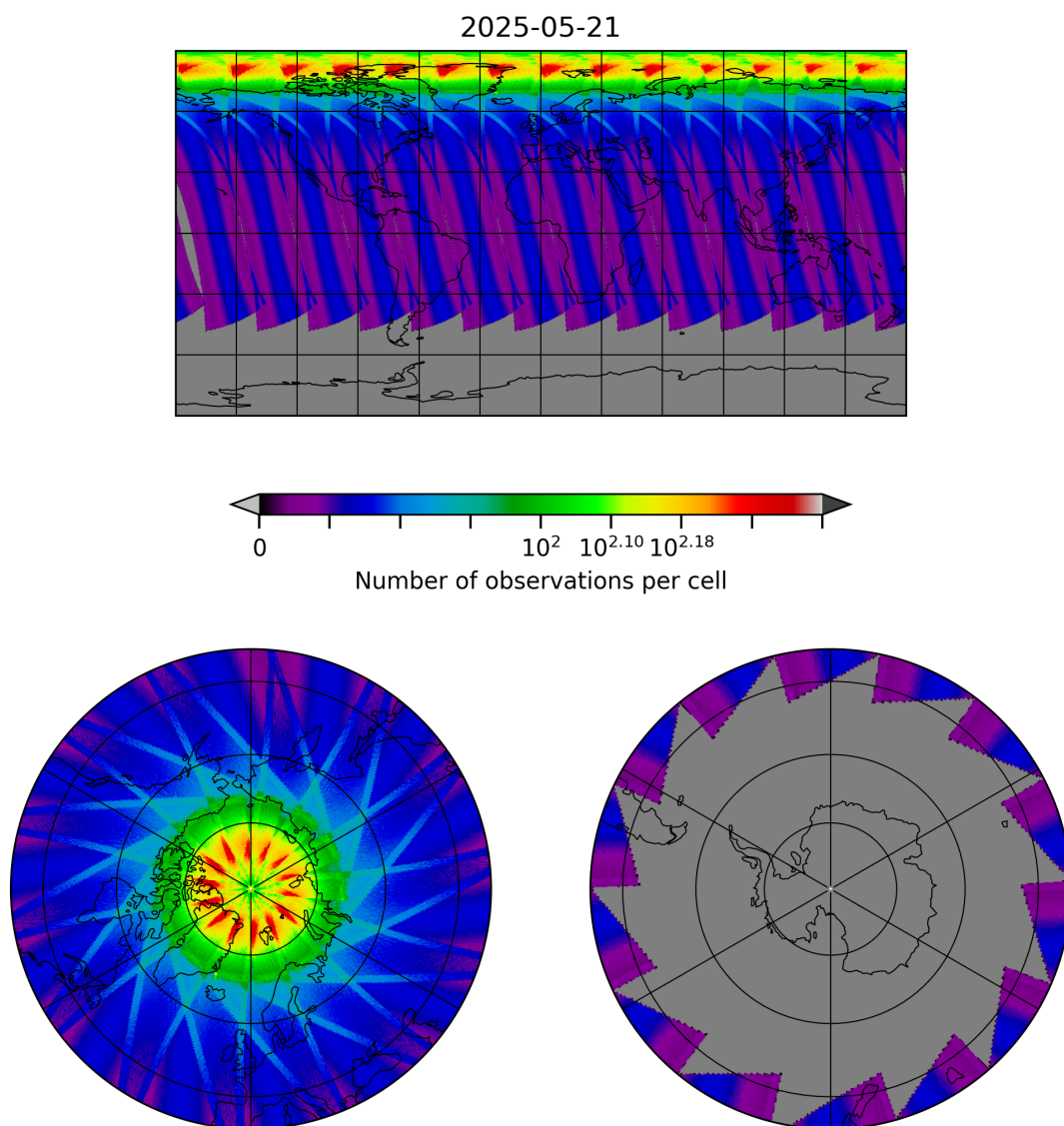


Figure 29: Map of the number of observations for 2025-05-21 to 2025-05-22

7 Zonal average

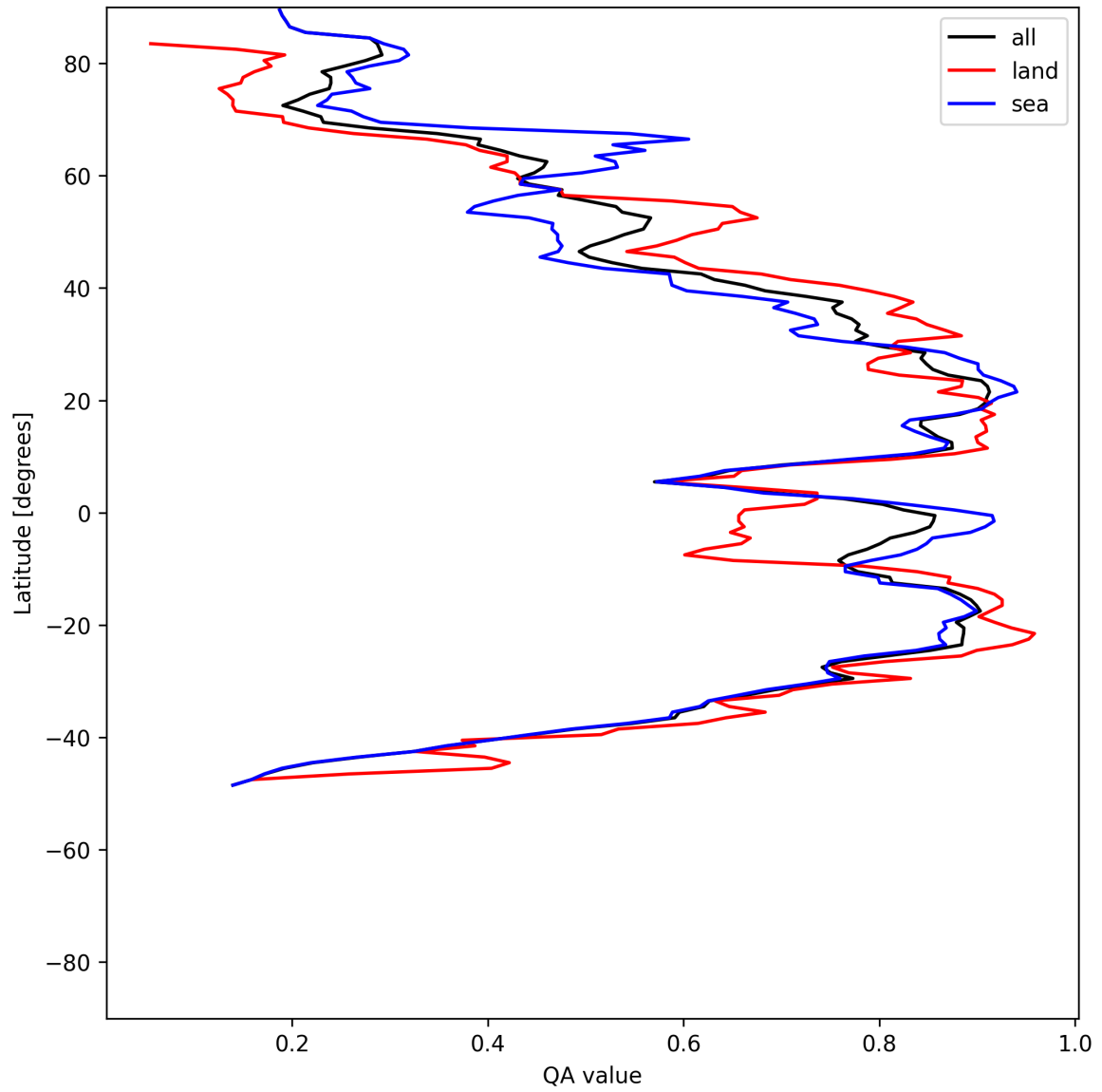


Figure 30: Zonal average of “QA value” for 2025-05-21 to 2025-05-22.

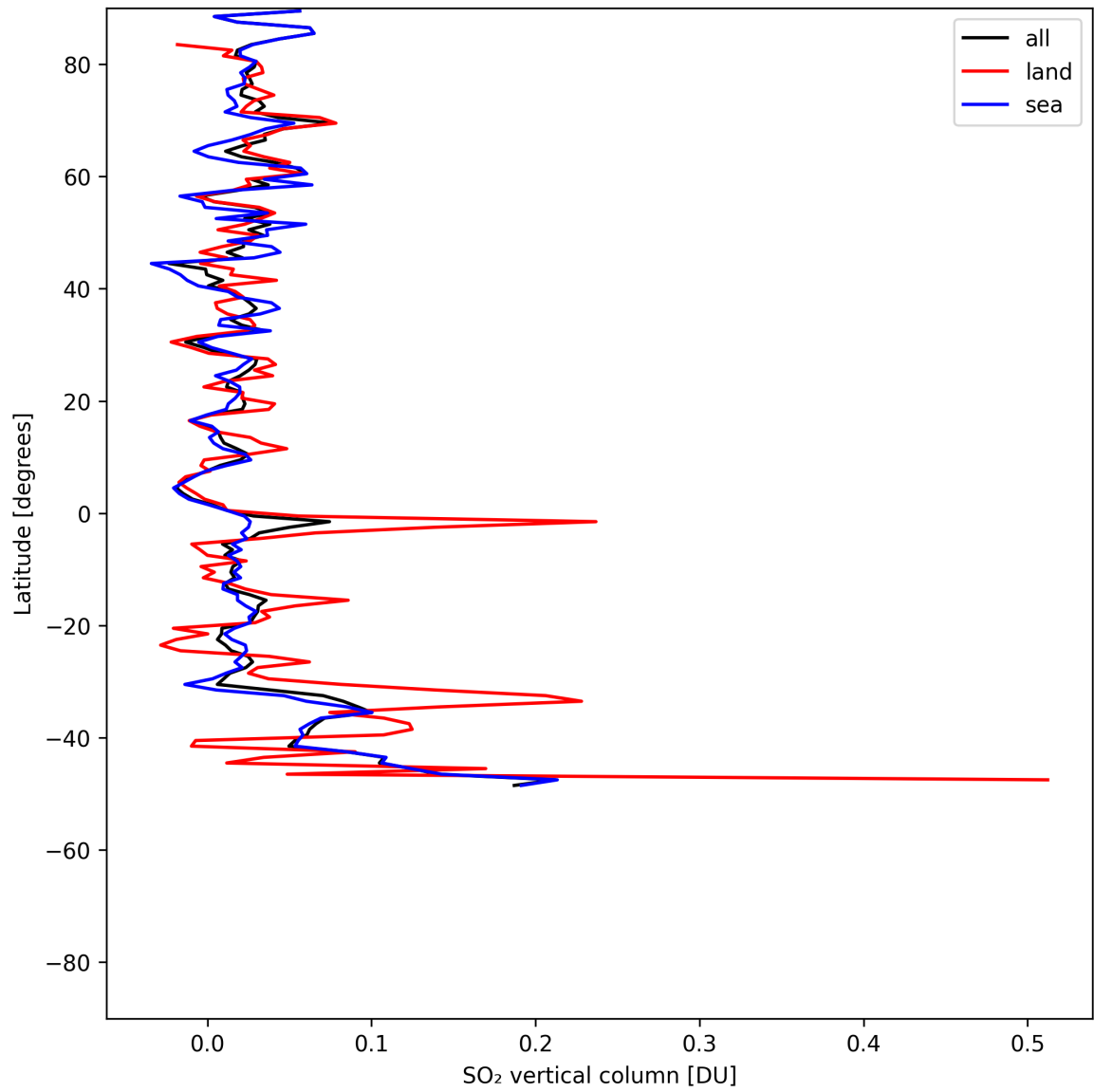


Figure 31: Zonal average of “SO₂ vertical column” for 2025-05-21 to 2025-05-22.

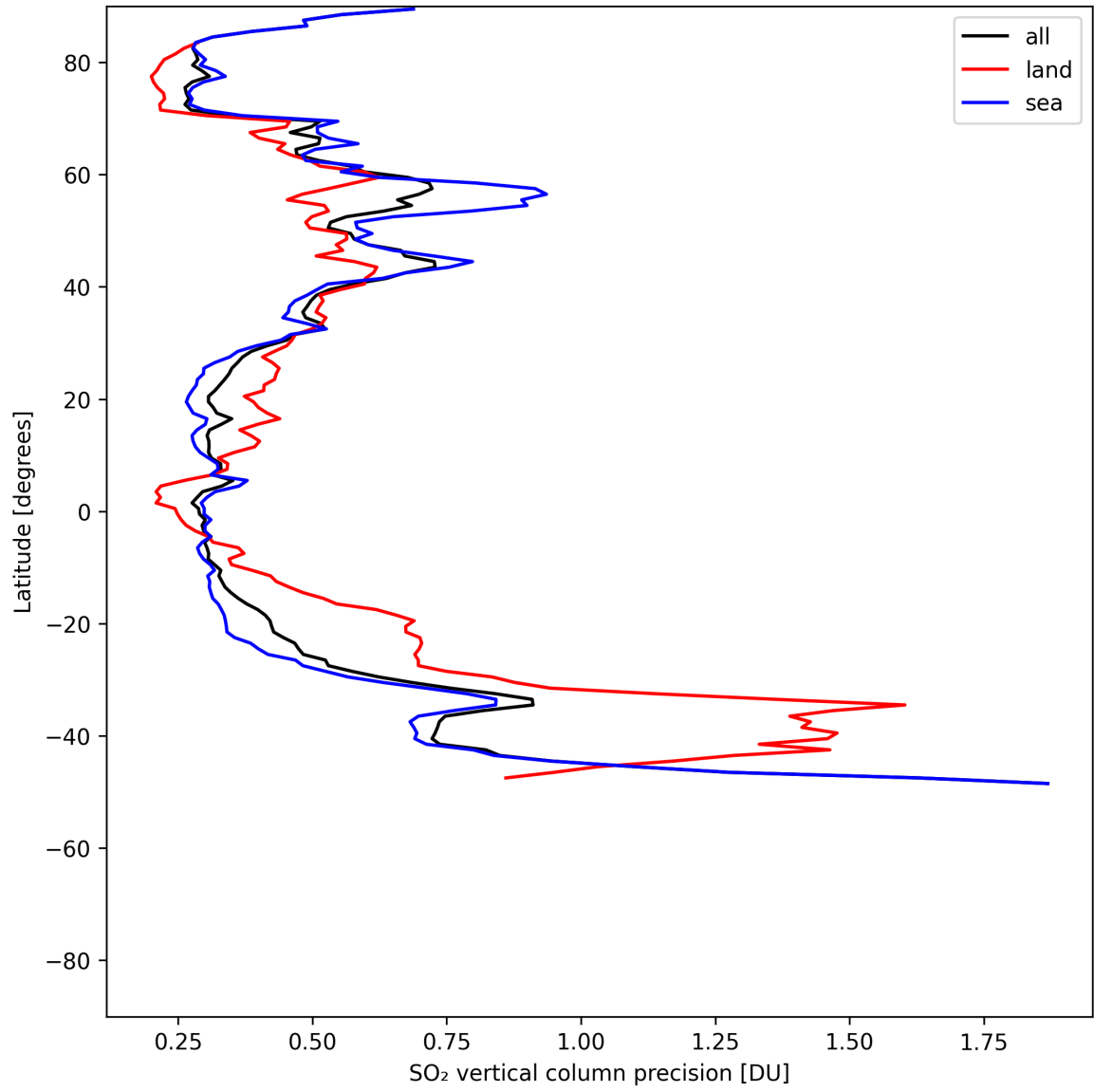


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-05-21 to 2025-05-22.

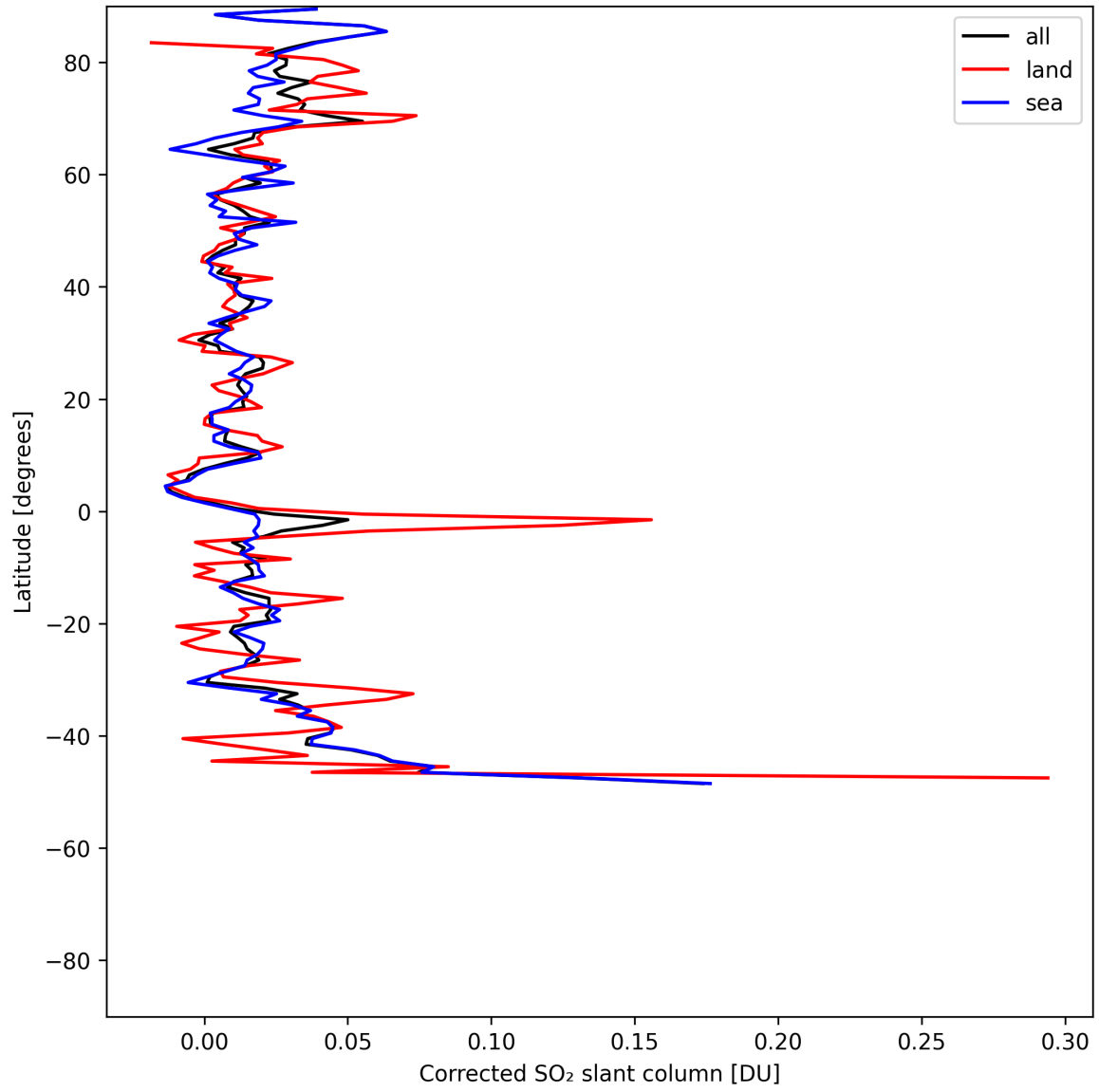


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-05-21 to 2025-05-22.

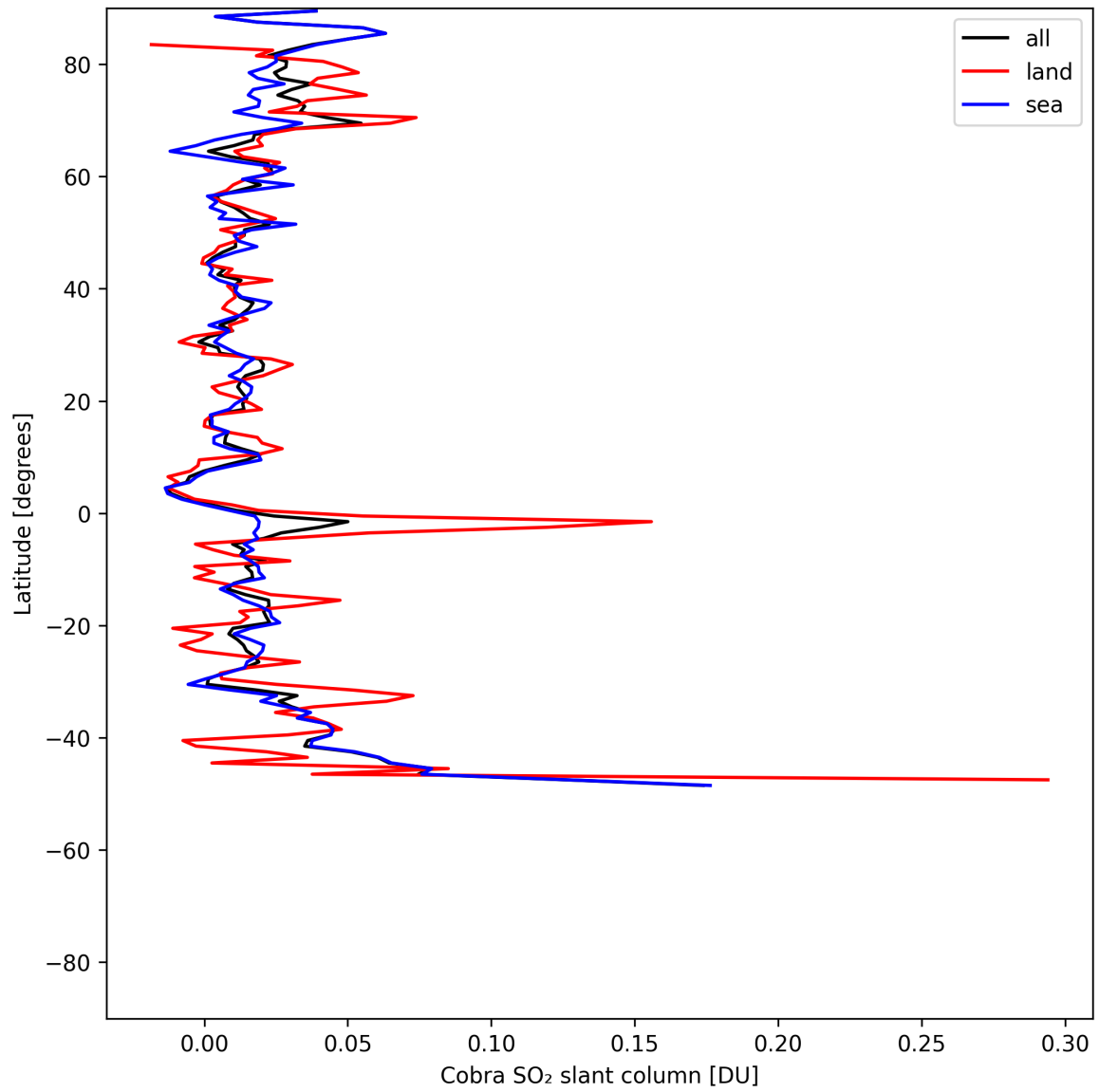


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-05-21 to 2025-05-22.

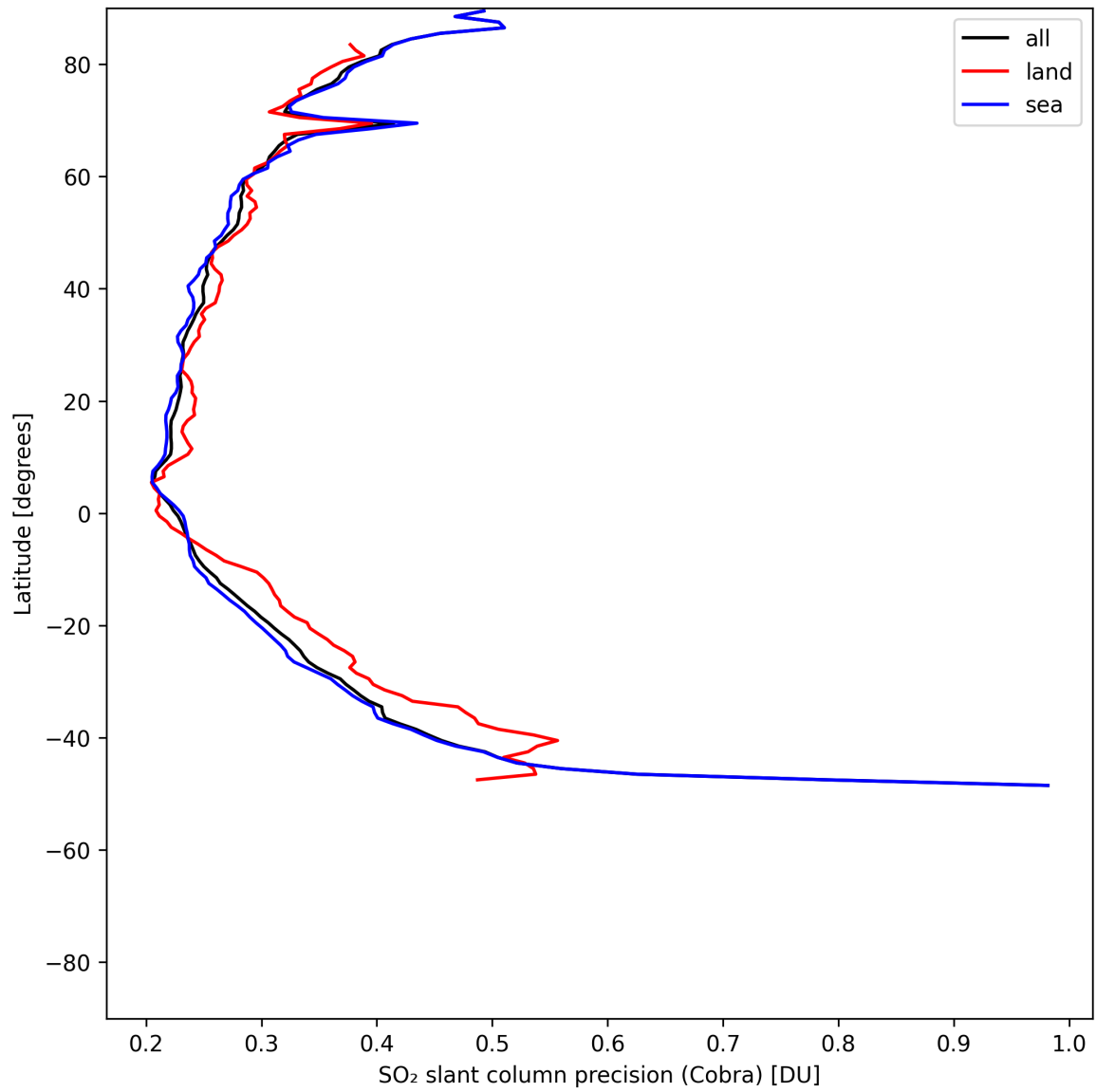


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-05-21 to 2025-05-22.

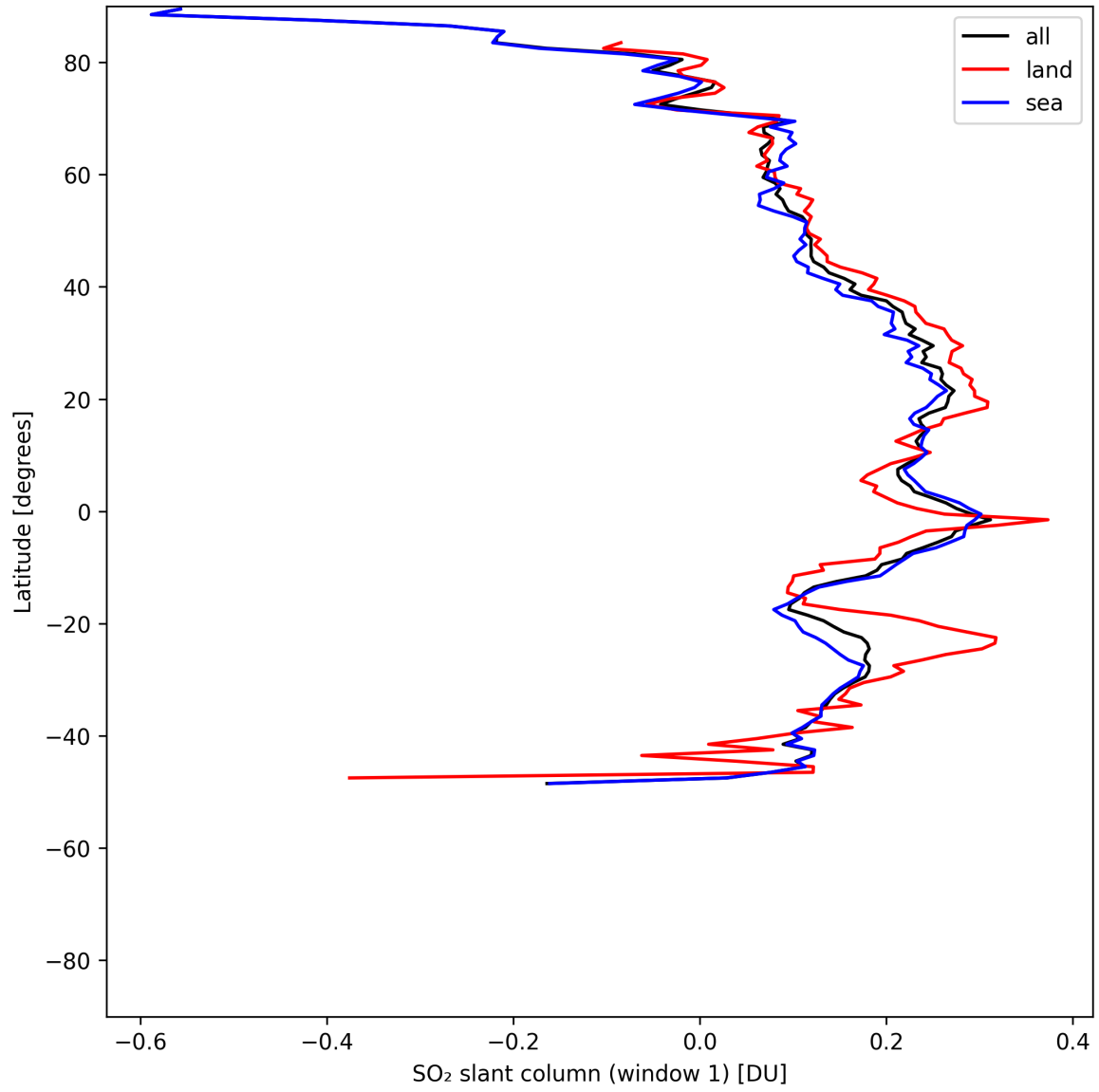


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-05-21 to 2025-05-22.

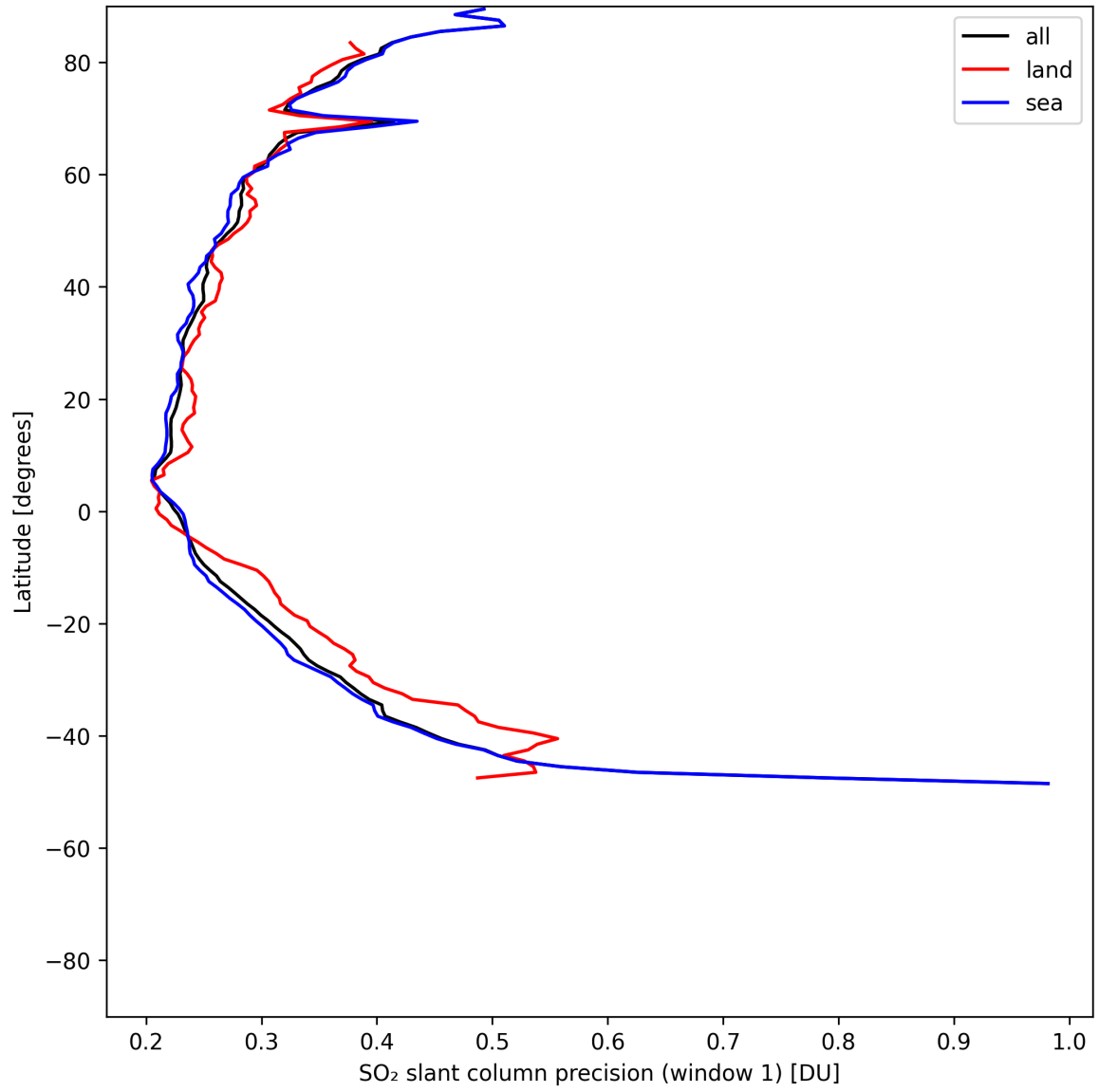


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-05-21 to 2025-05-22.

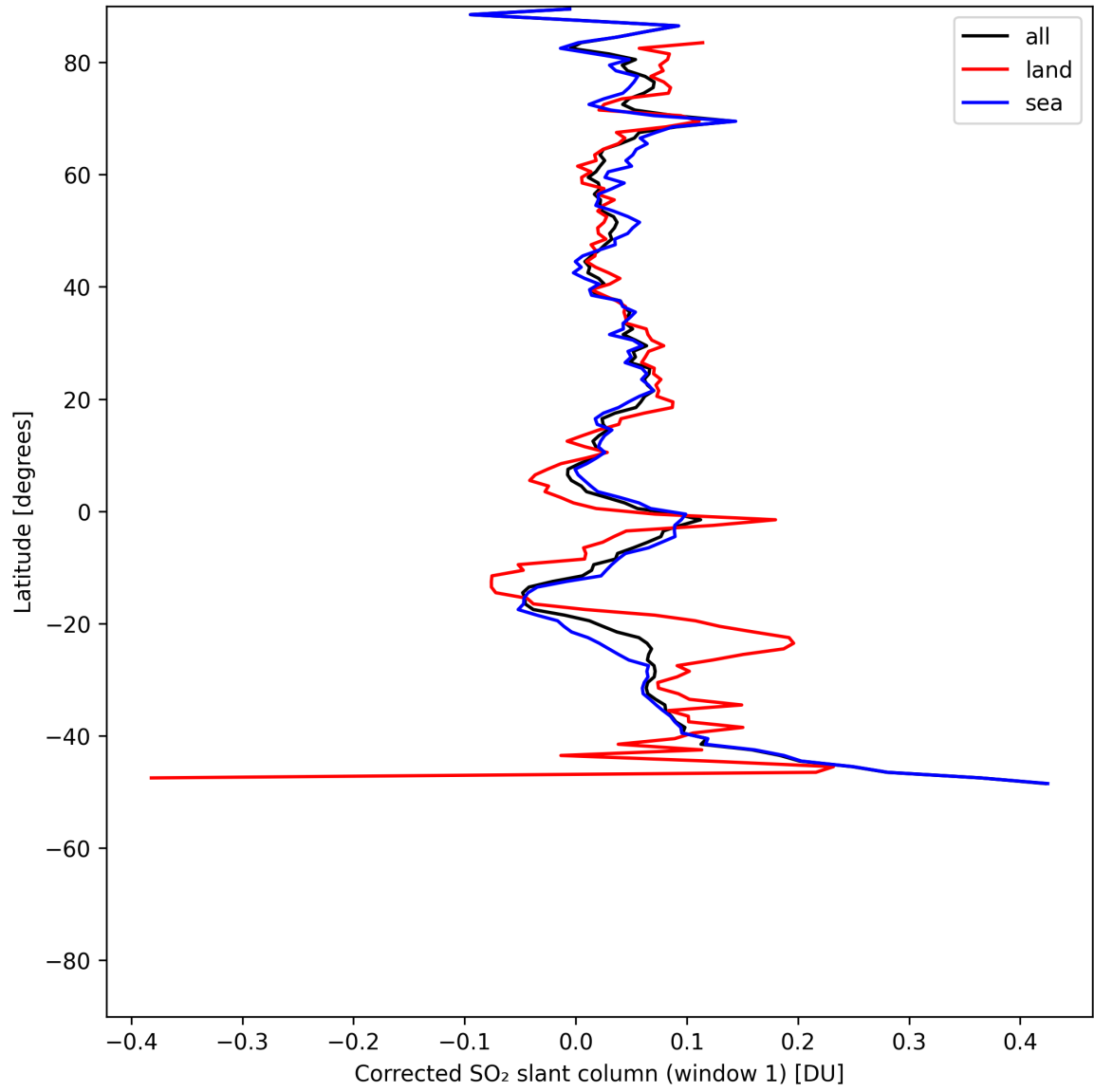


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-05-21 to 2025-05-22.

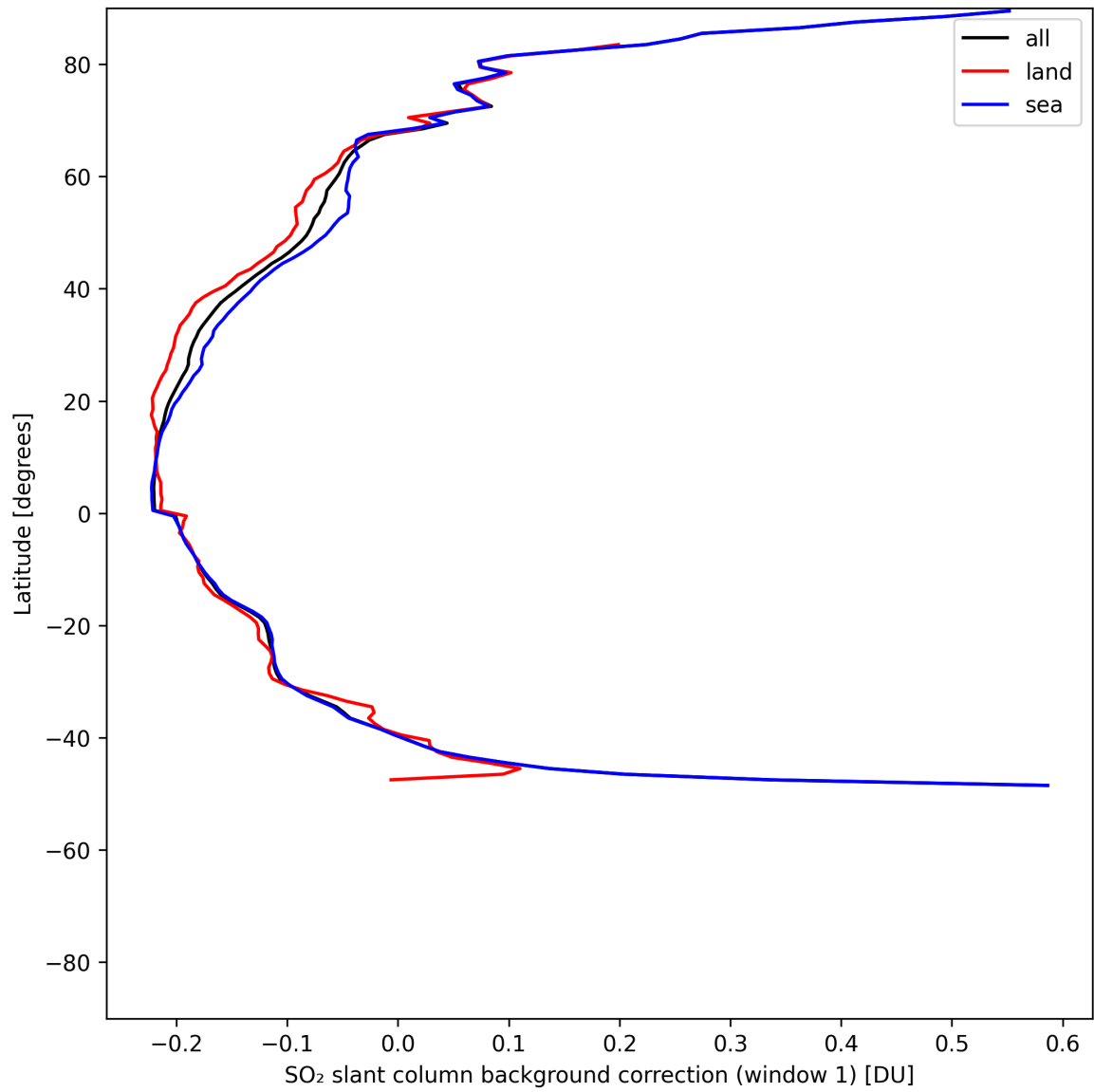


Figure 39: Zonal average of "SO₂ slant column background correction (window 1)" for 2025-05-21 to 2025-05-22.

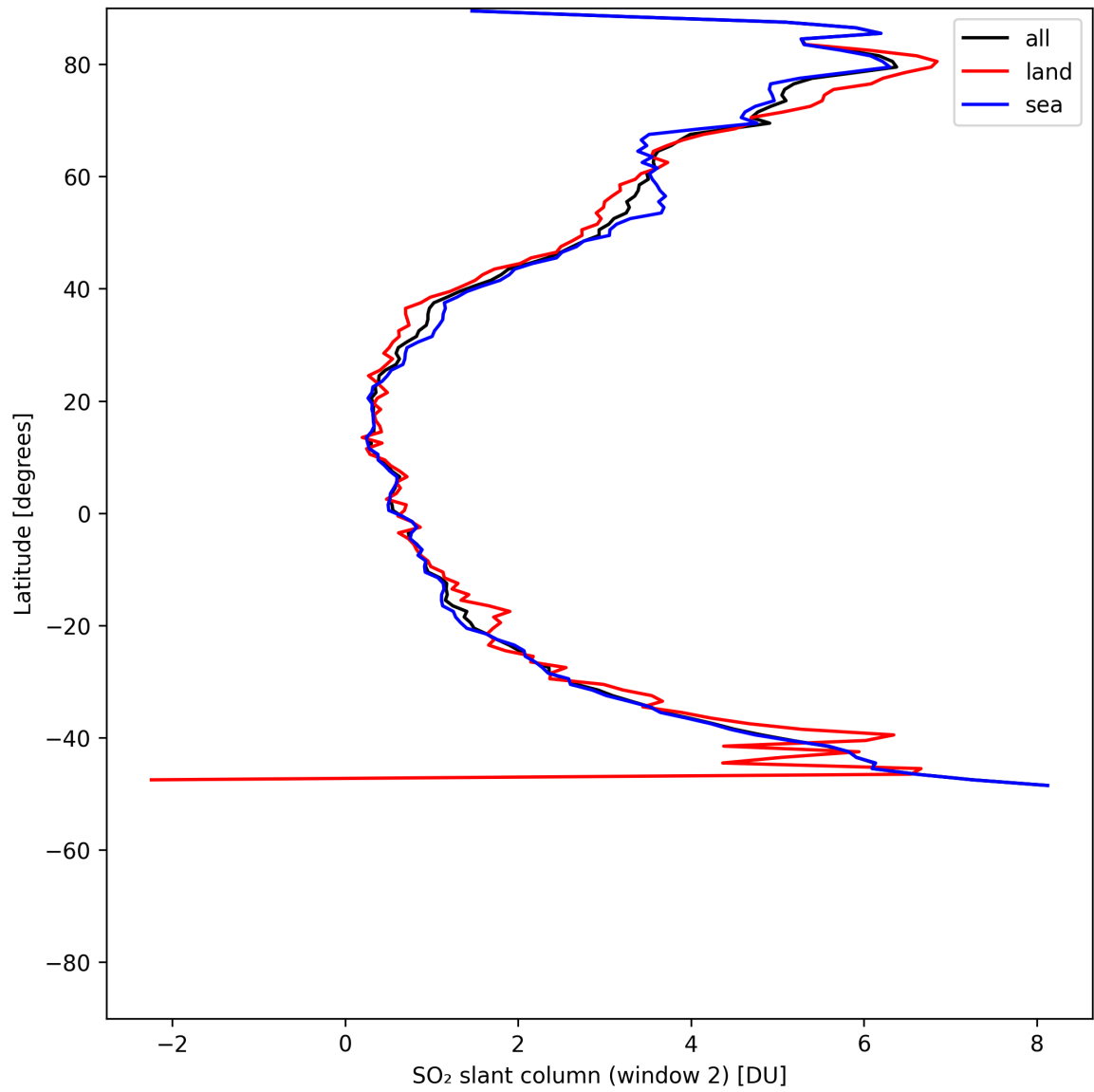


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-05-21 to 2025-05-22.

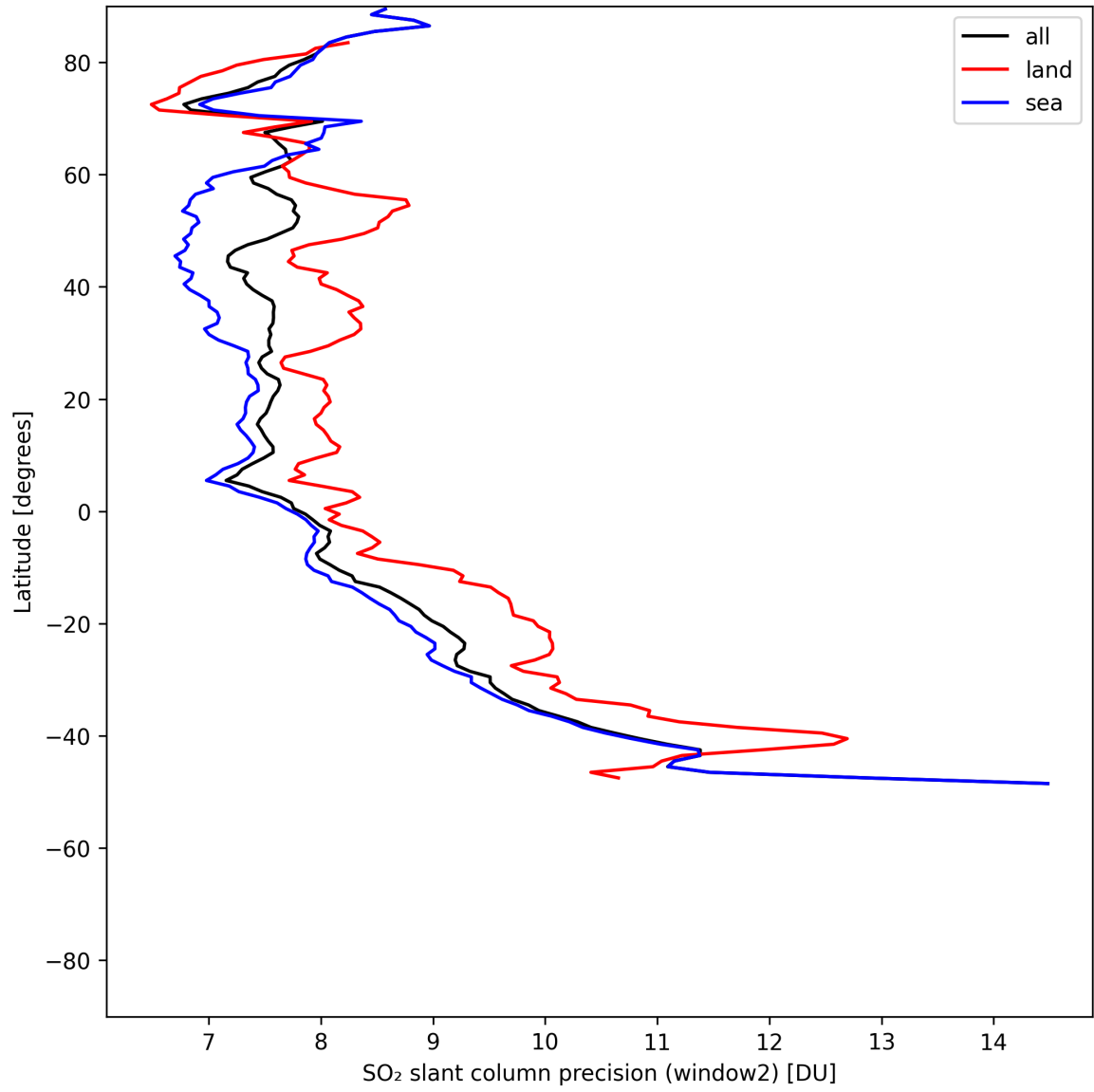


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-05-21 to 2025-05-22.

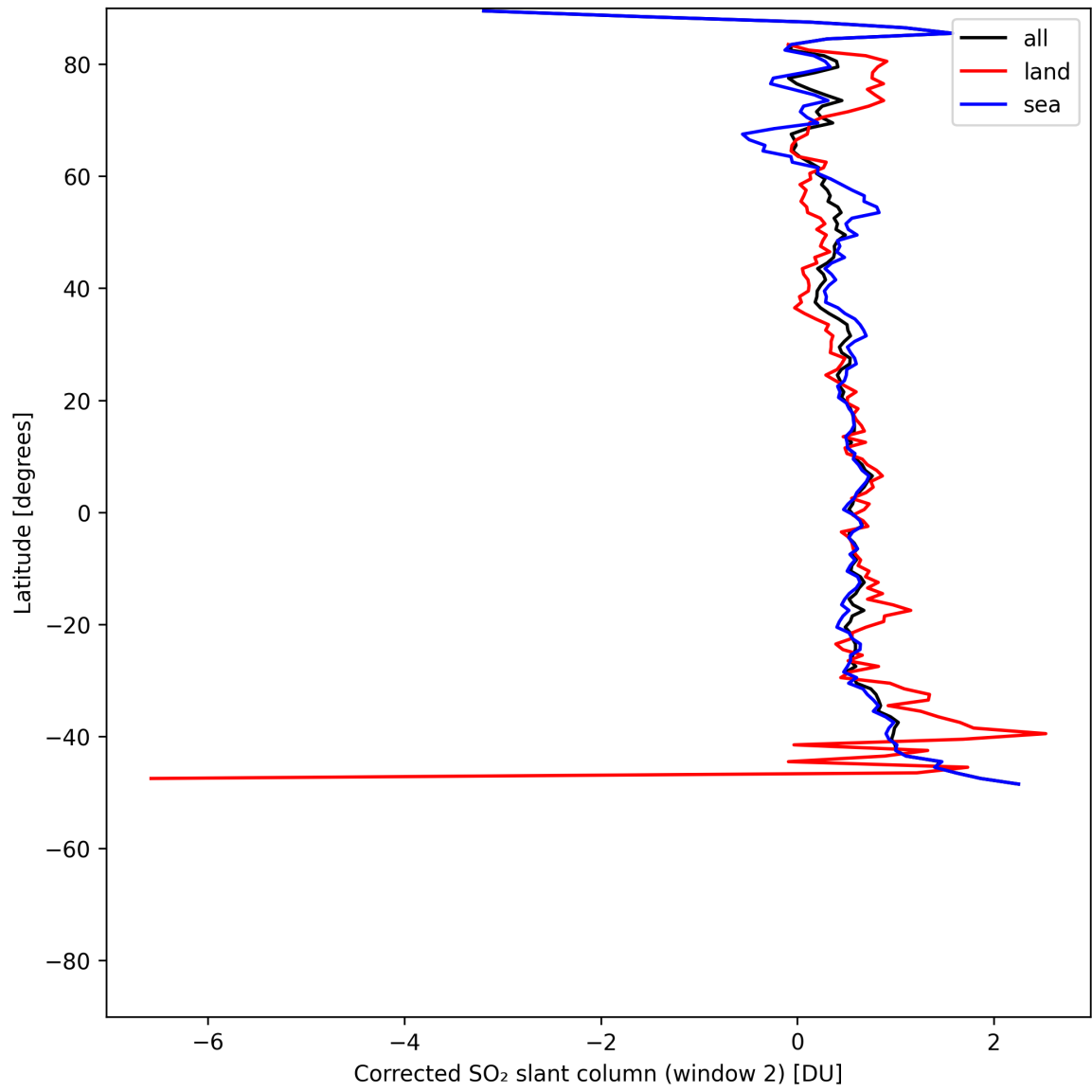


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-05-21 to 2025-05-22.

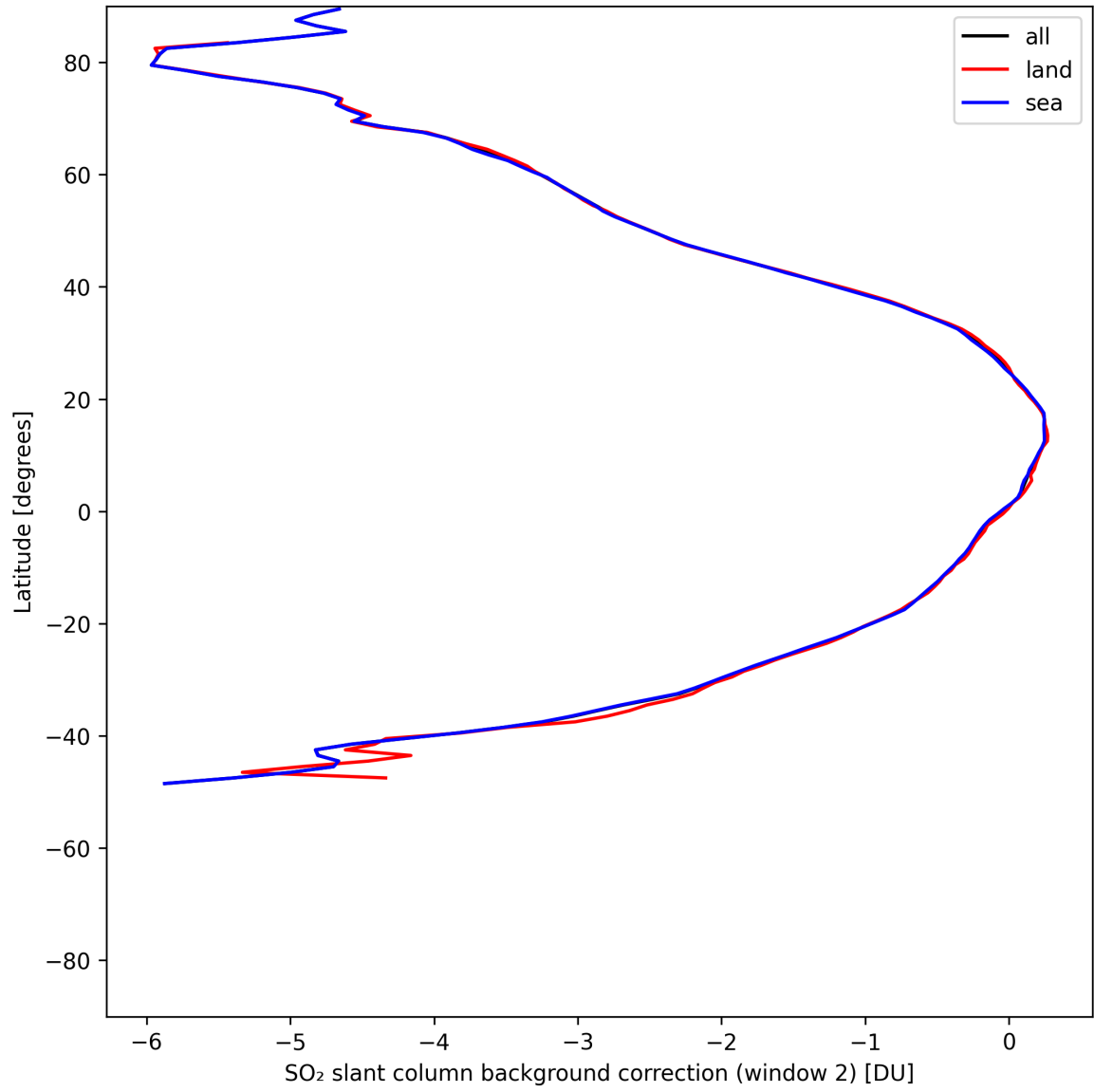


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-05-21 to 2025-05-22.

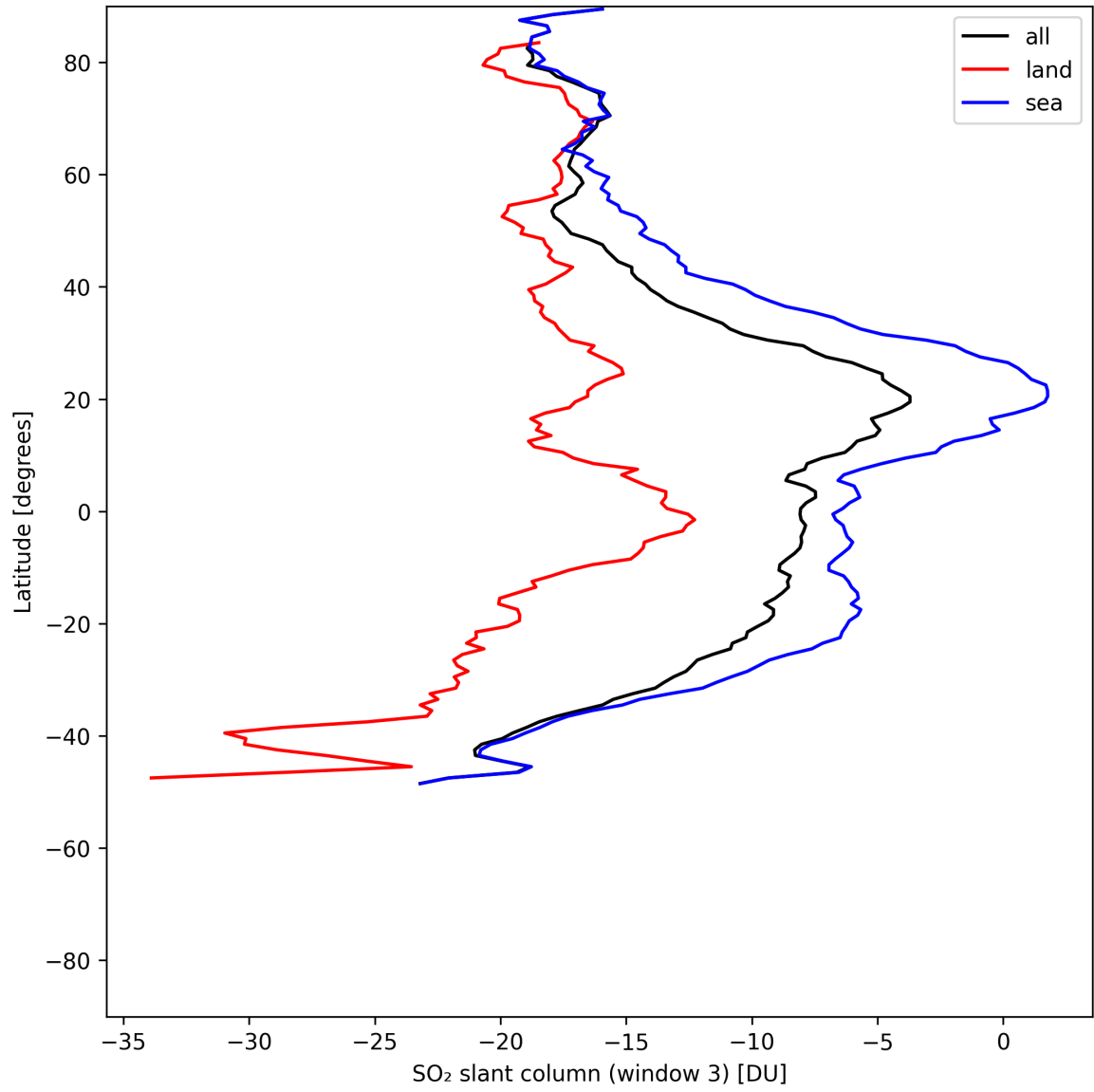


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-05-21 to 2025-05-22.

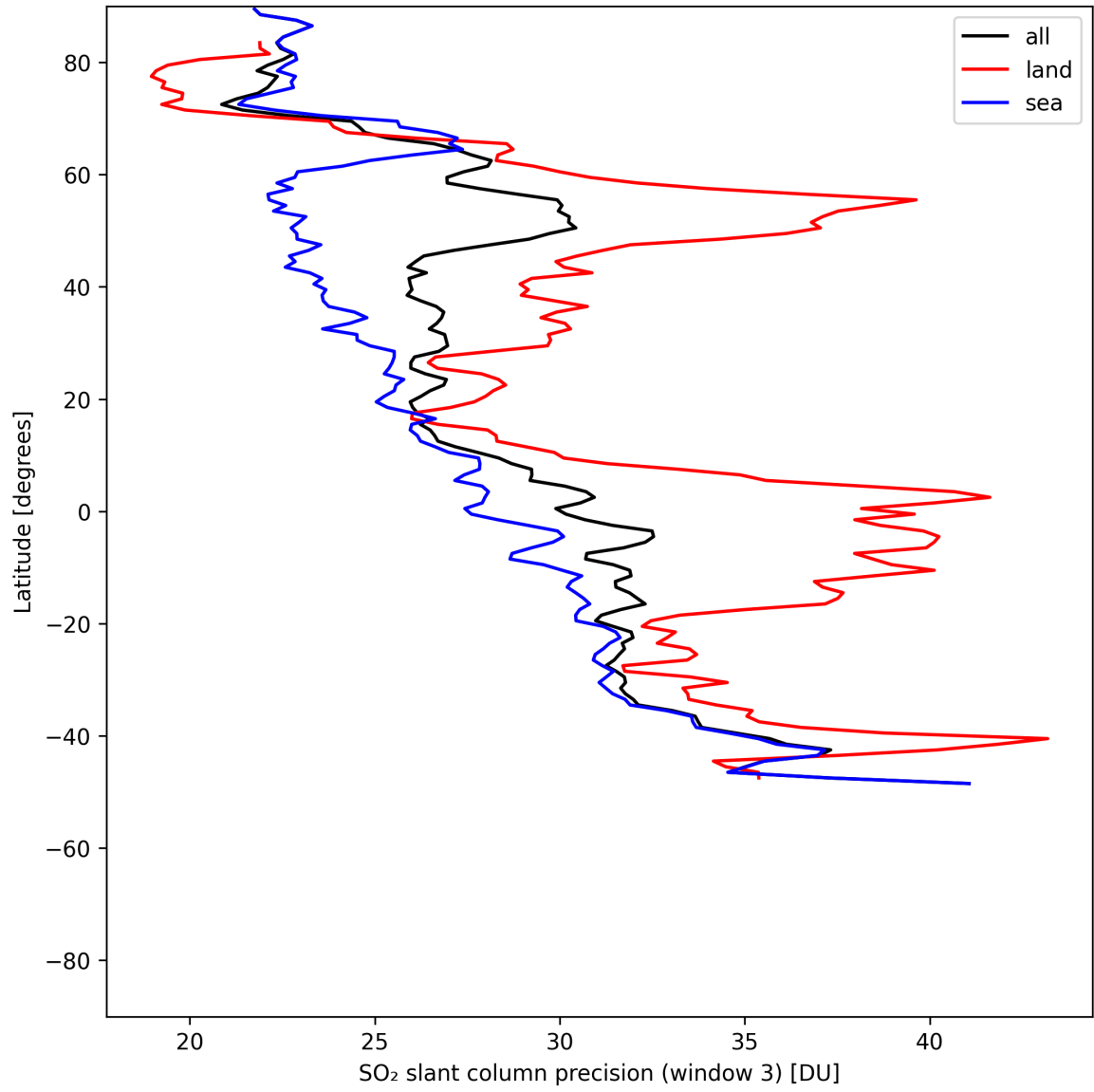


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-05-21 to 2025-05-22.

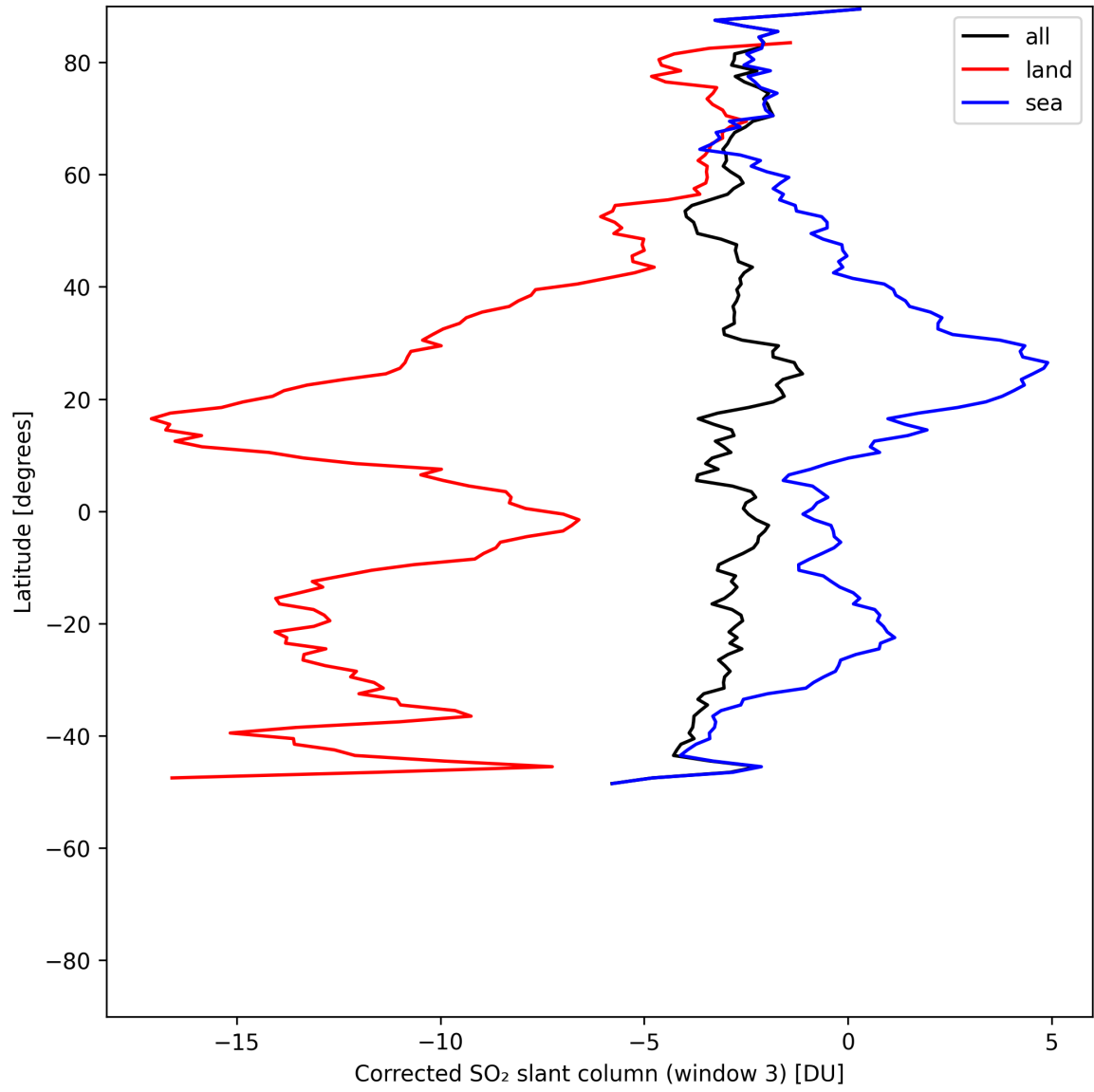


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-05-21 to 2025-05-22.

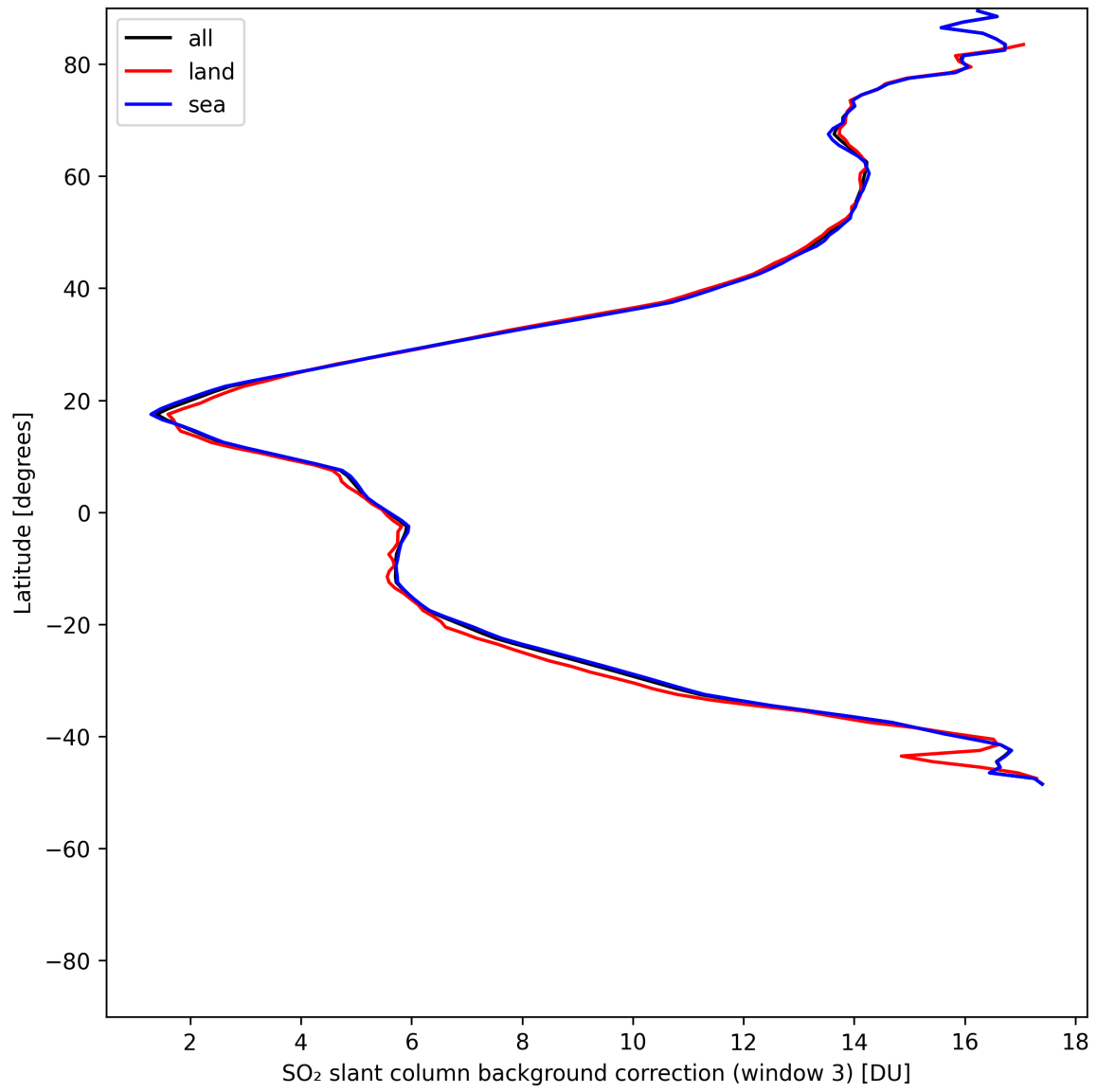


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-05-21 to 2025-05-22.

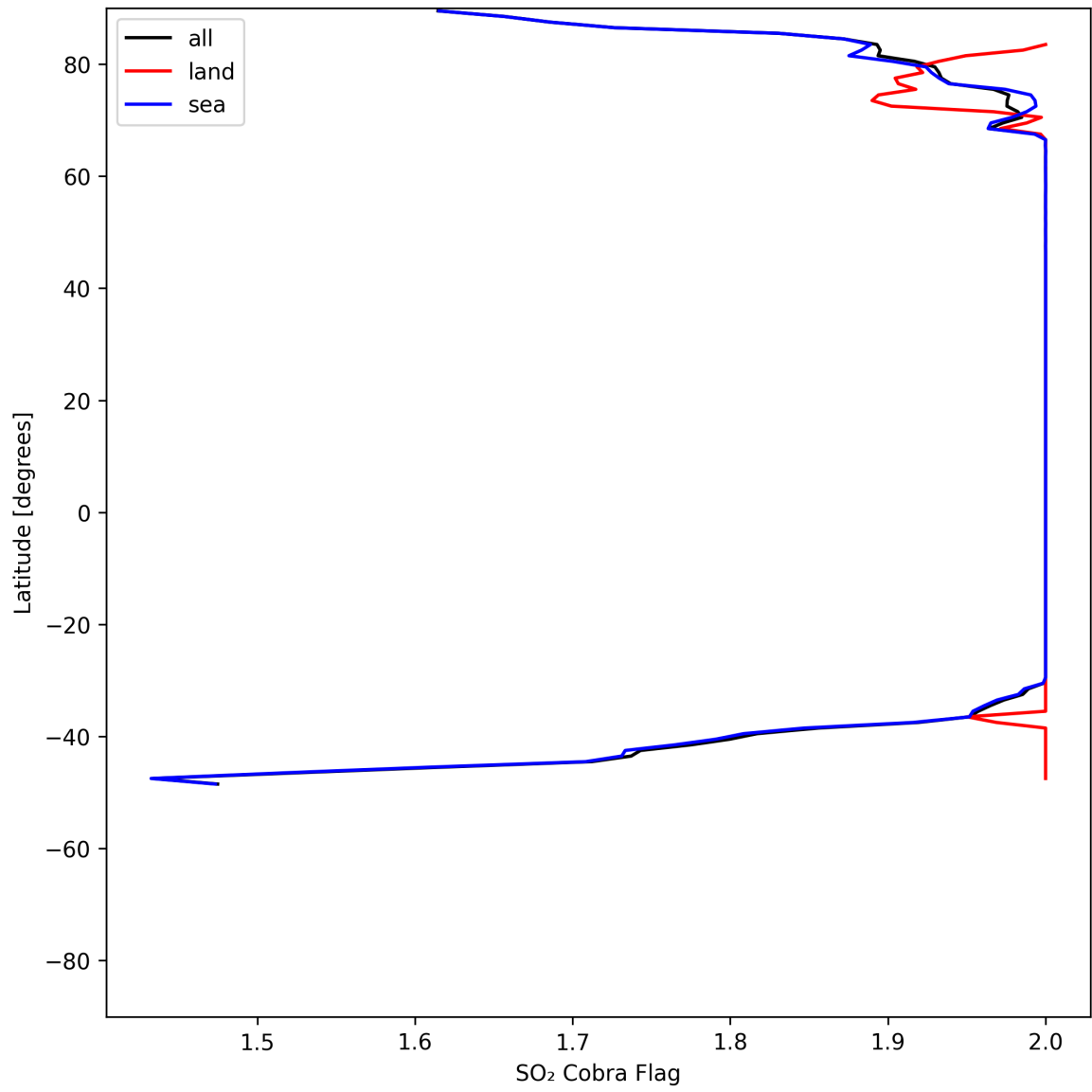


Figure 48: Zonal average of "SO₂ Cobra Flag" for 2025-05-21 to 2025-05-22.

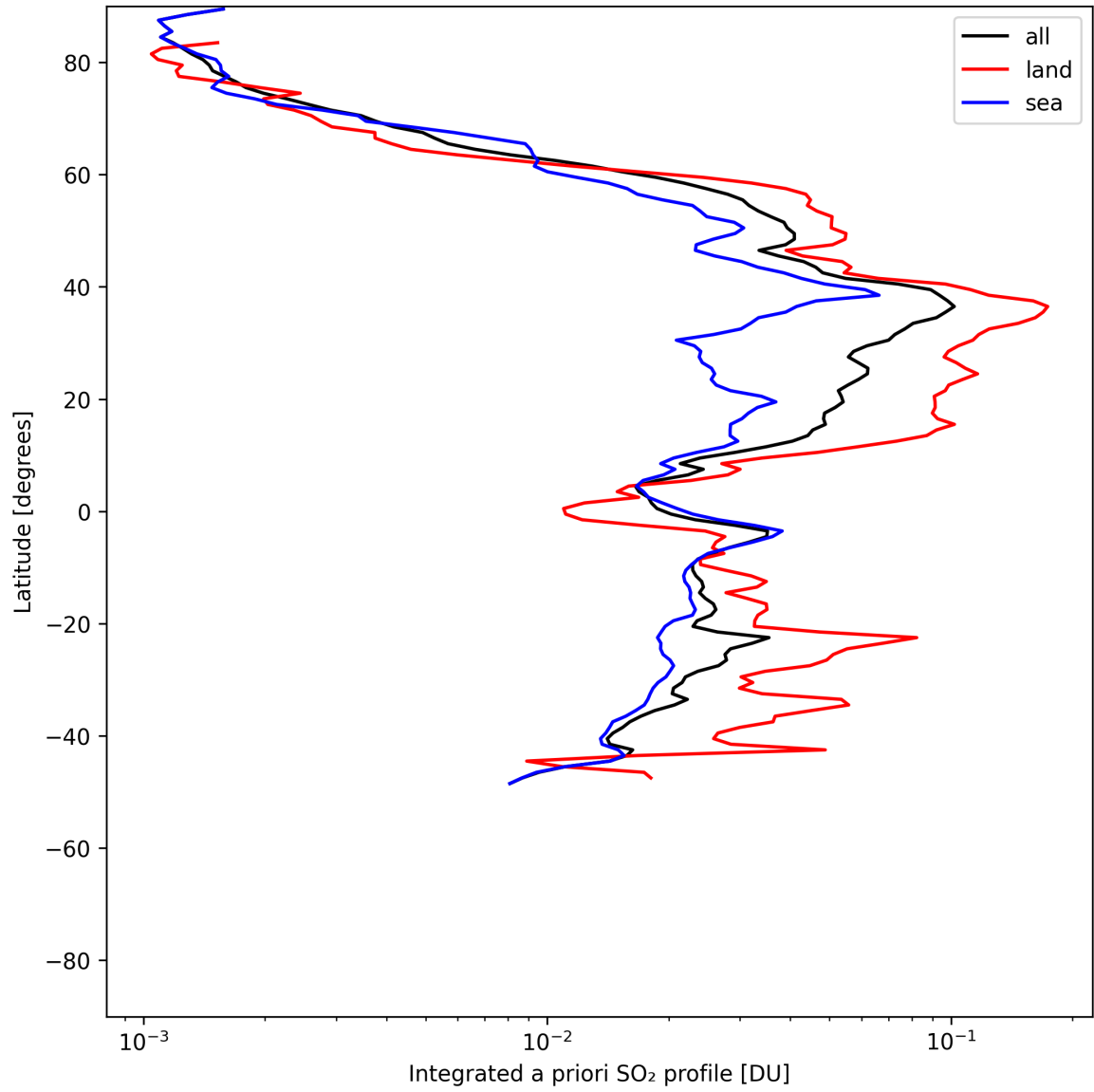


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-05-21 to 2025-05-22.

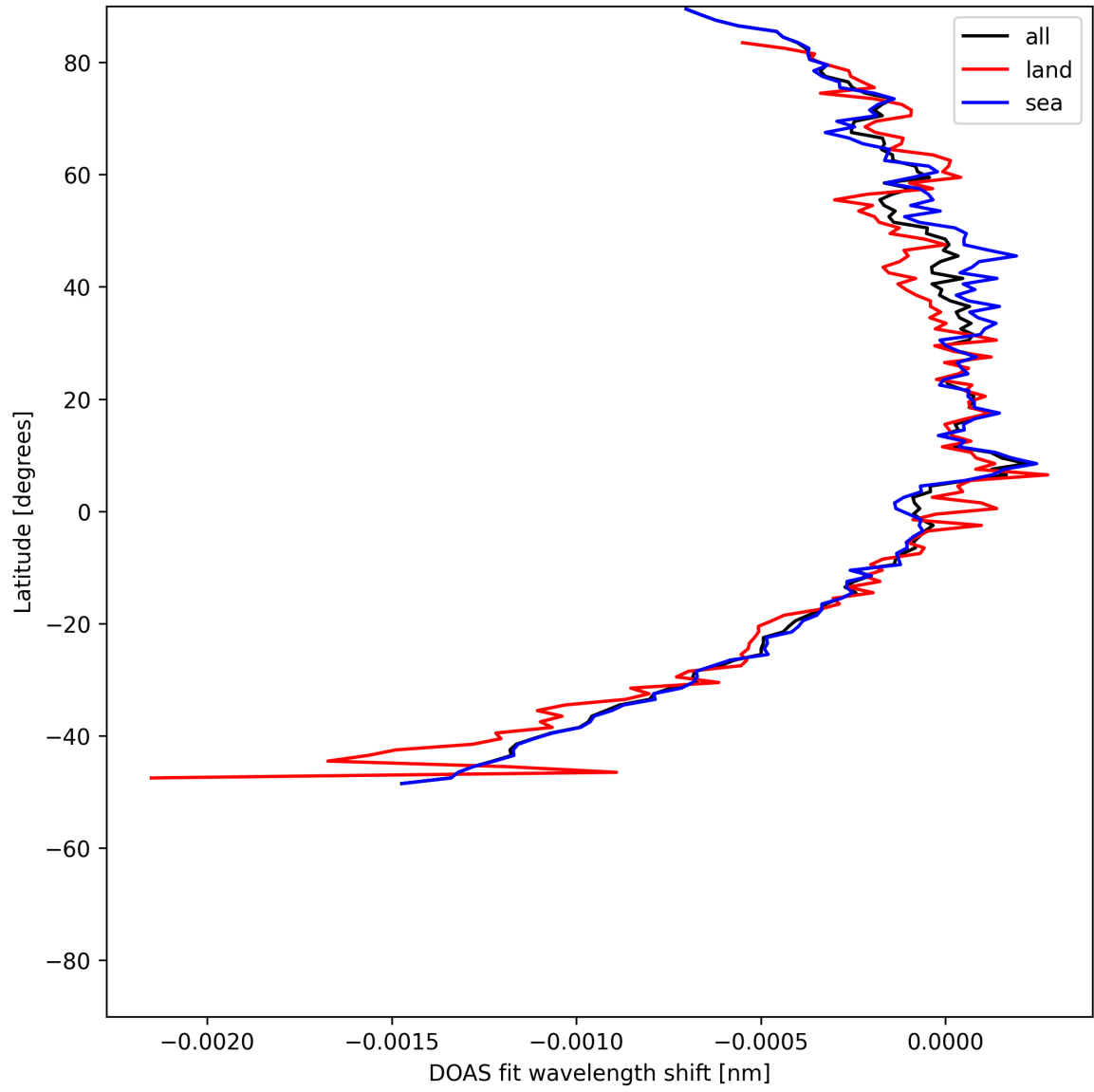


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-05-21 to 2025-05-22.

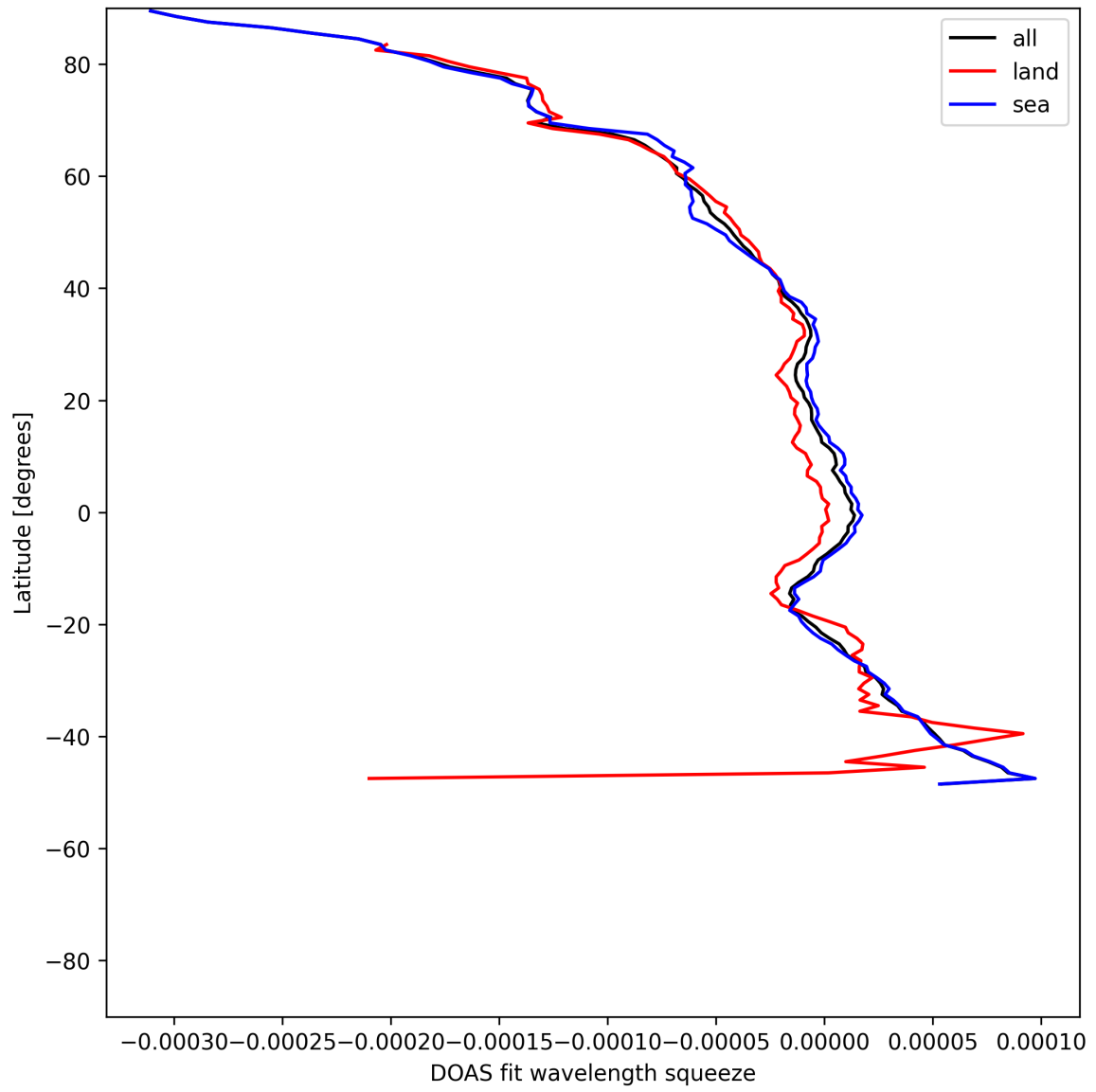


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-05-21 to 2025-05-22.

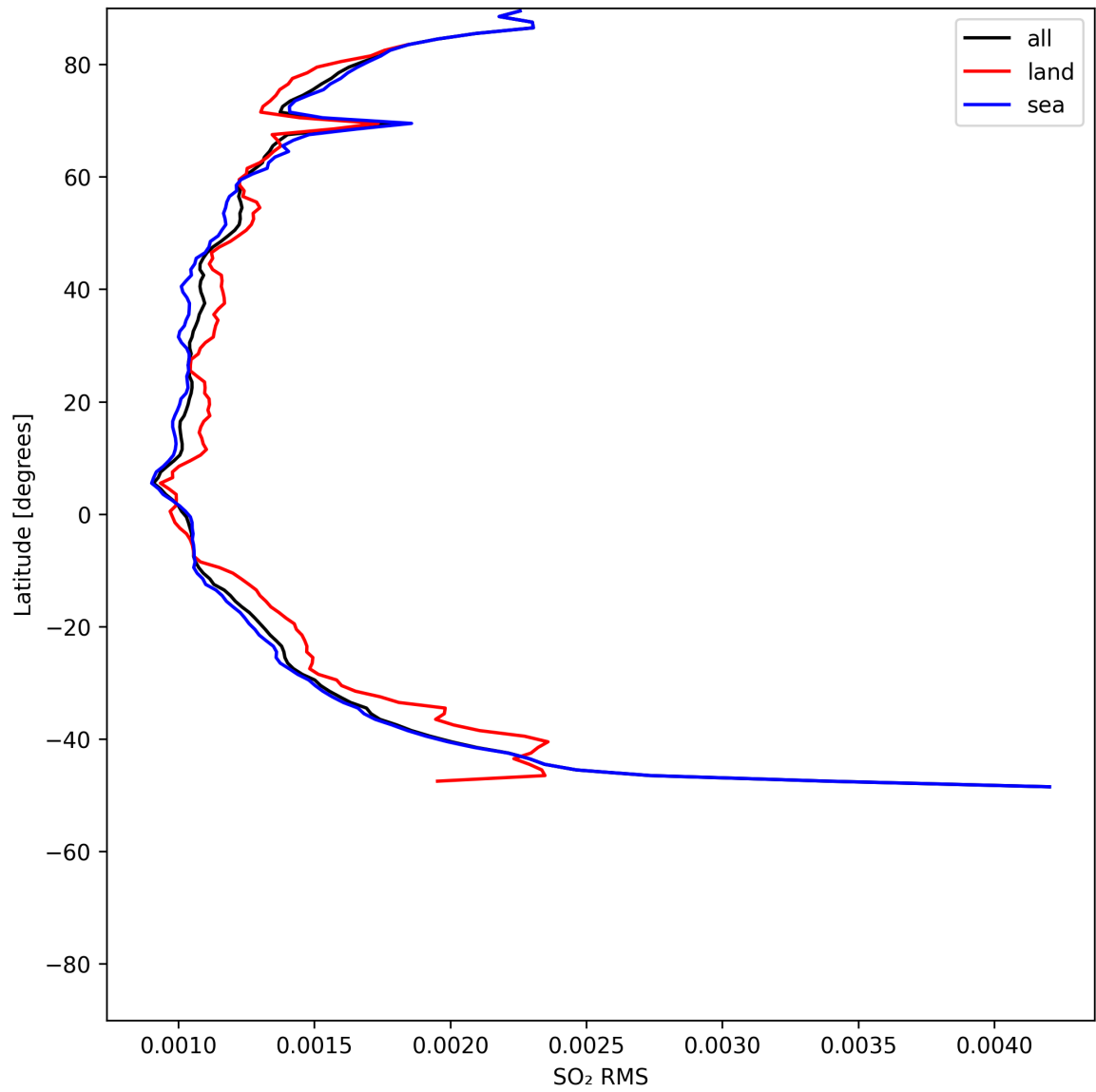


Figure 52: Zonal average of “SO₂ RMS” for 2025-05-21 to 2025-05-22.

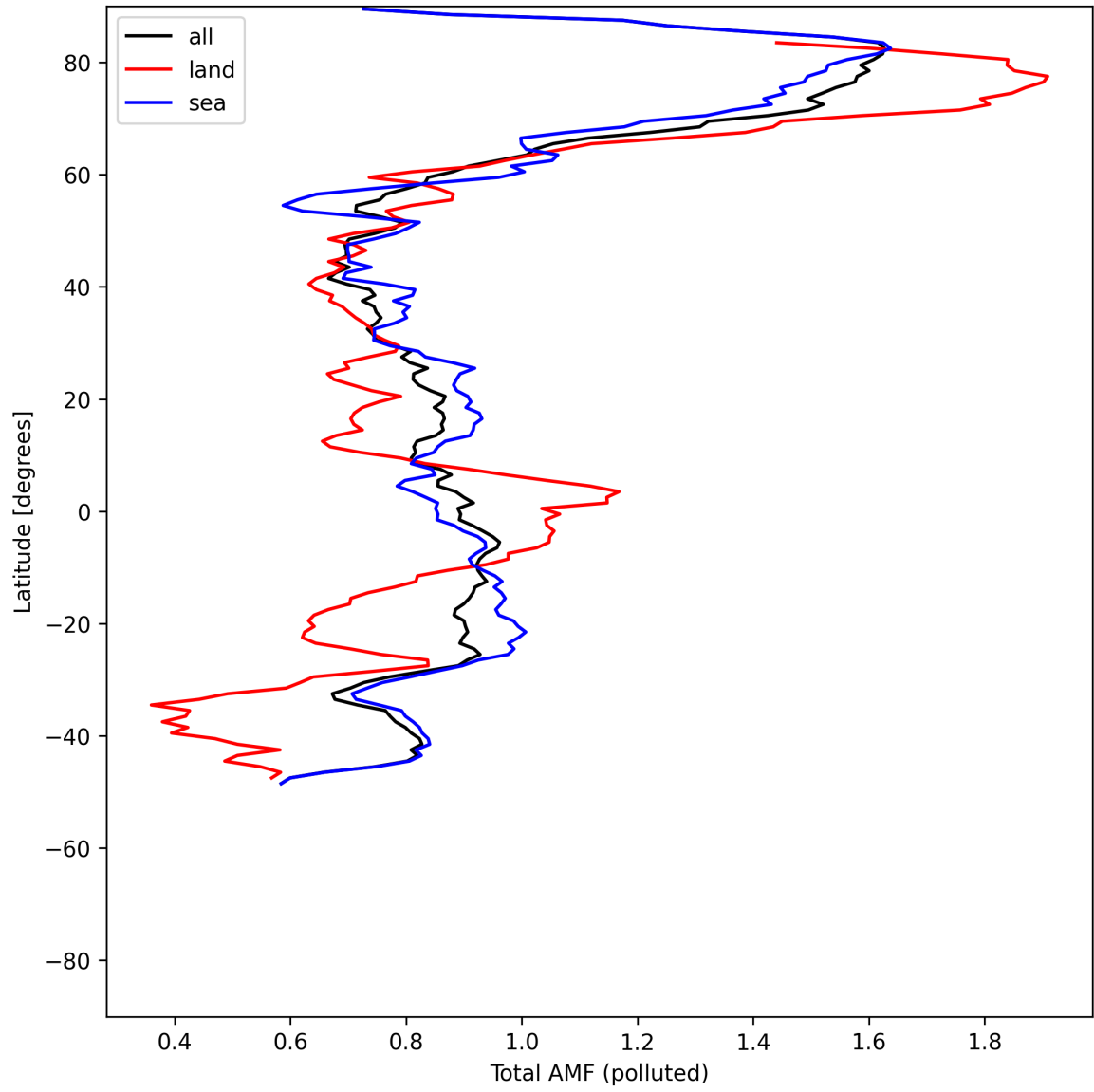


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-05-21 to 2025-05-22.

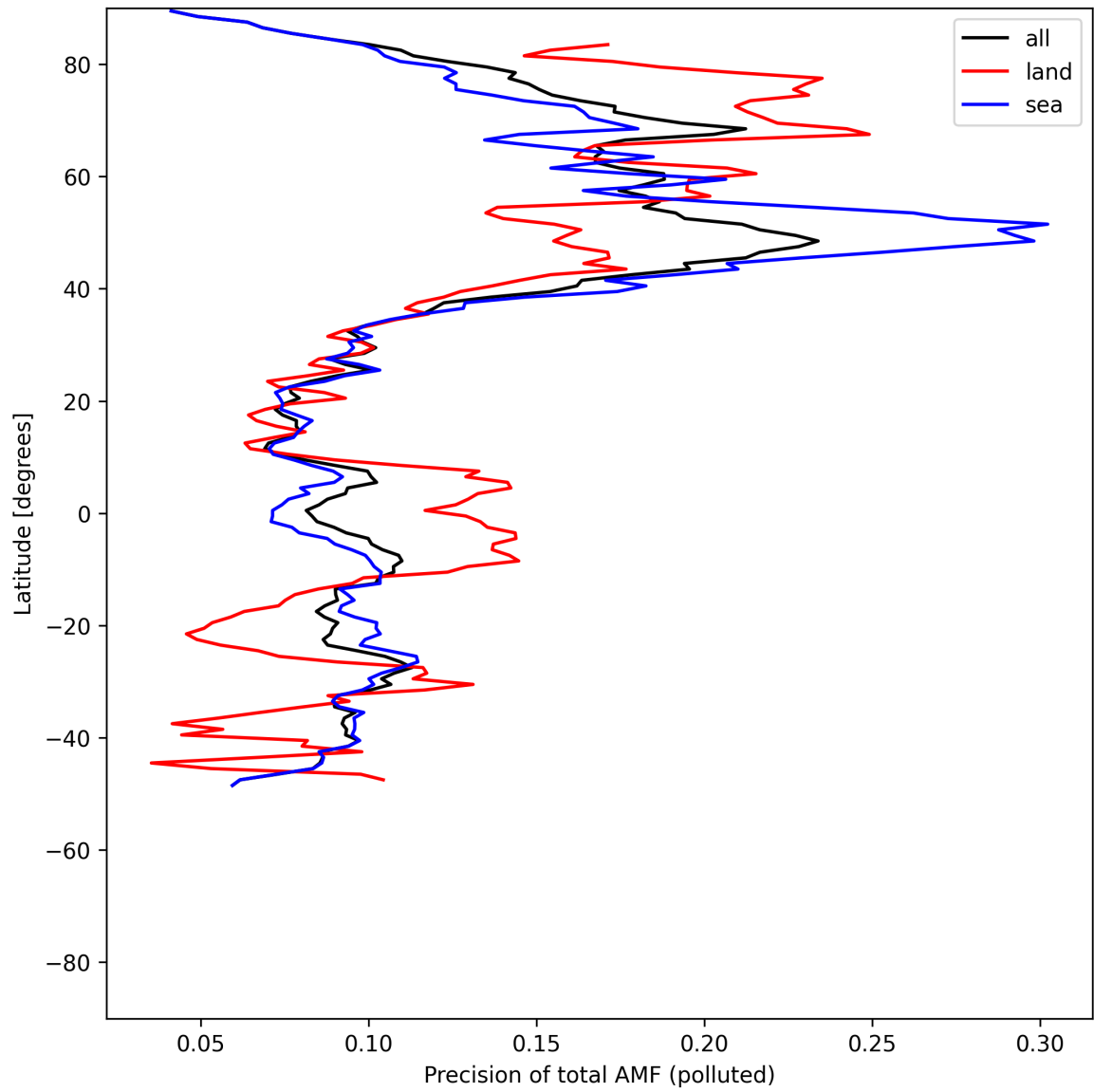


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-05-21 to 2025-05-22.

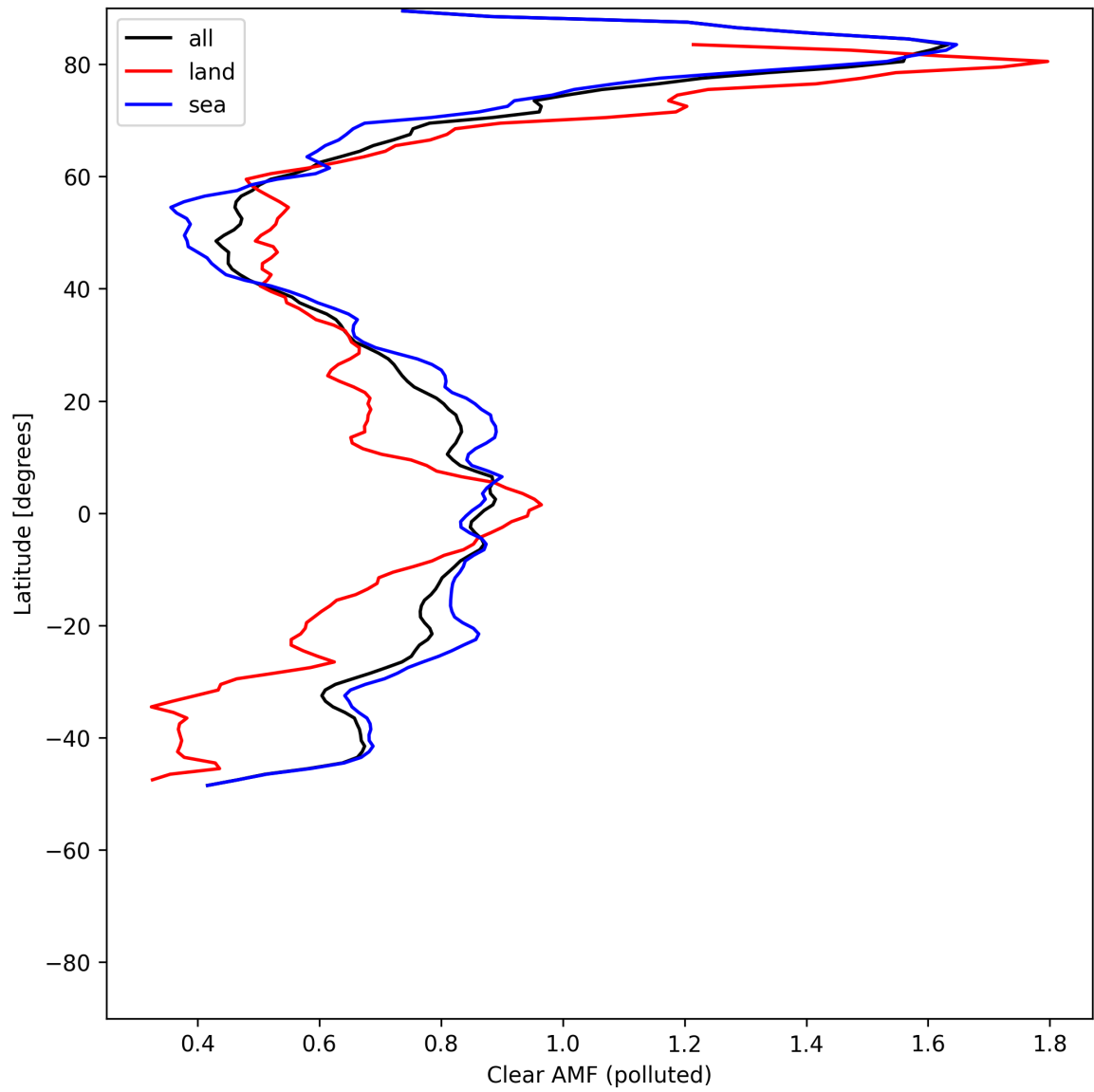


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-05-21 to 2025-05-22.

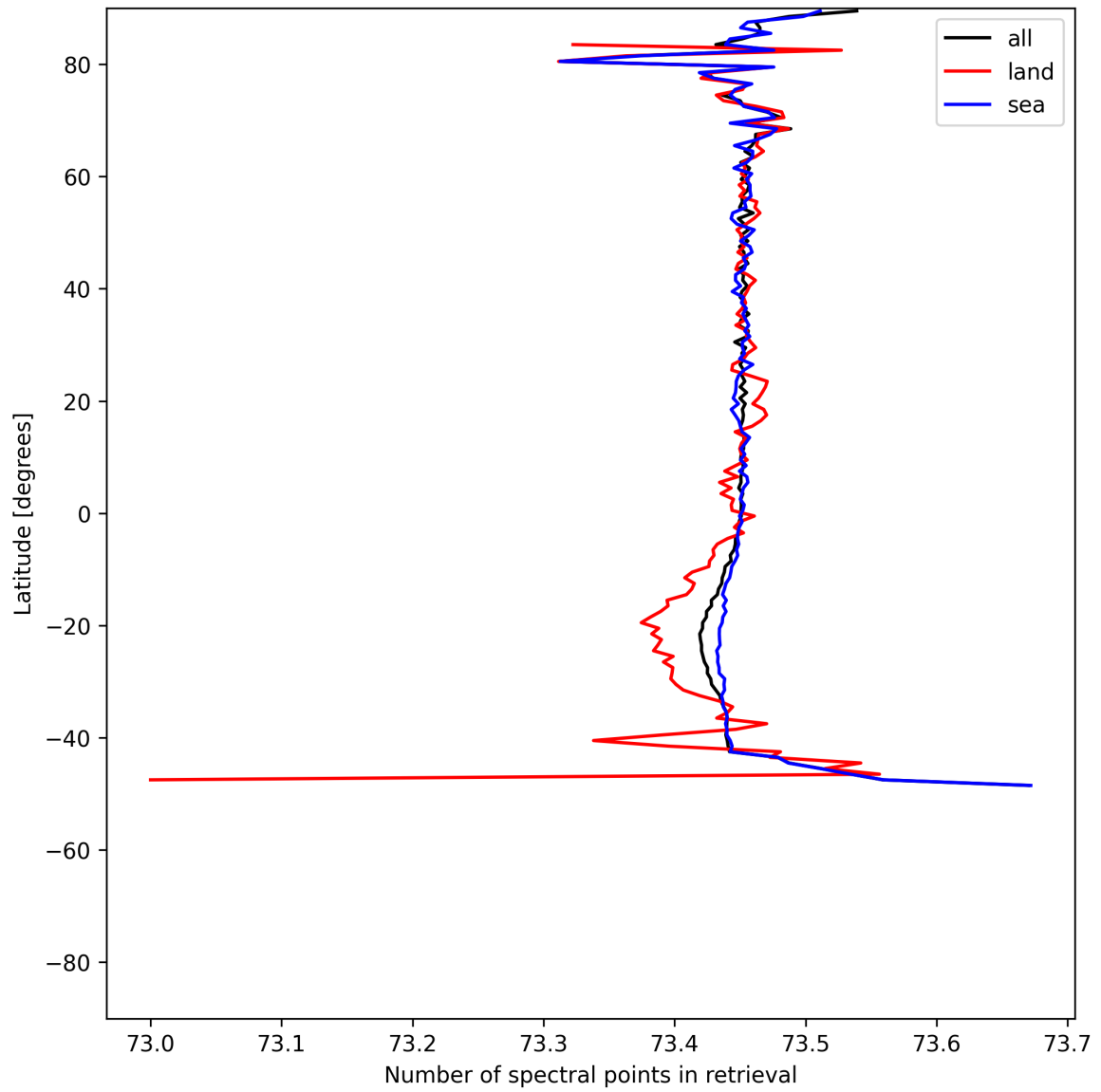


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-05-21 to 2025-05-22.

8 Histograms

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

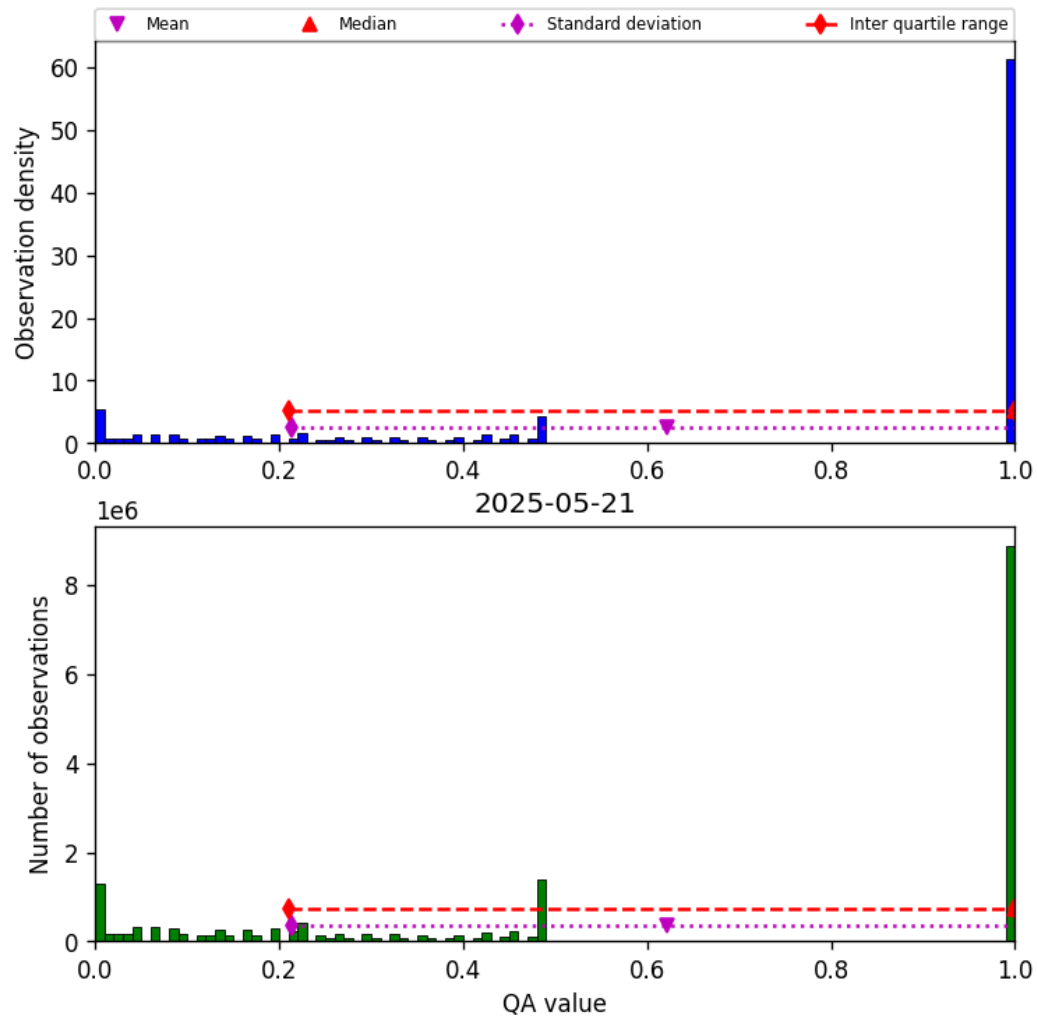


Figure 57: Histogram of “QA value” for 2025-05-21 to 2025-05-22

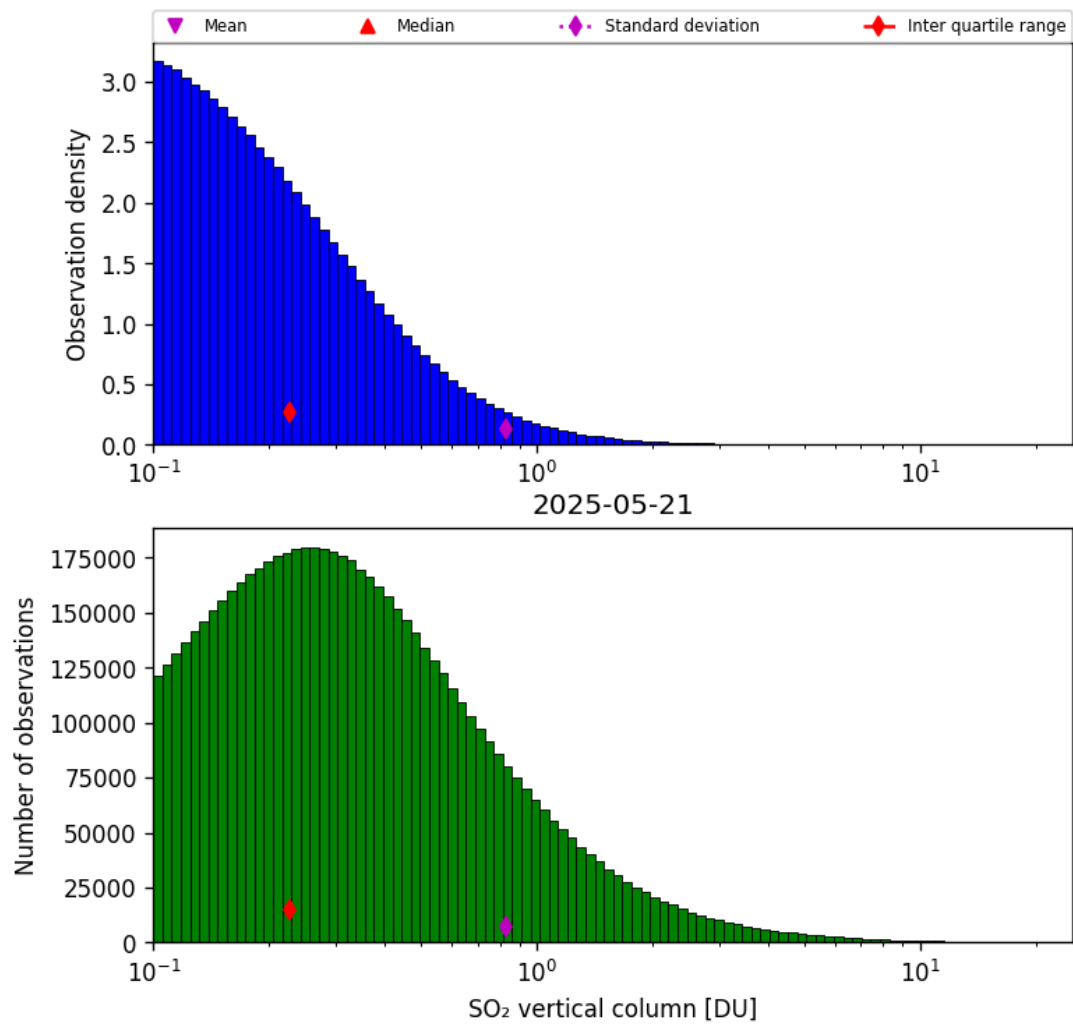


Figure 58: Histogram of “SO₂ vertical column” for 2025-05-21 to 2025-05-22

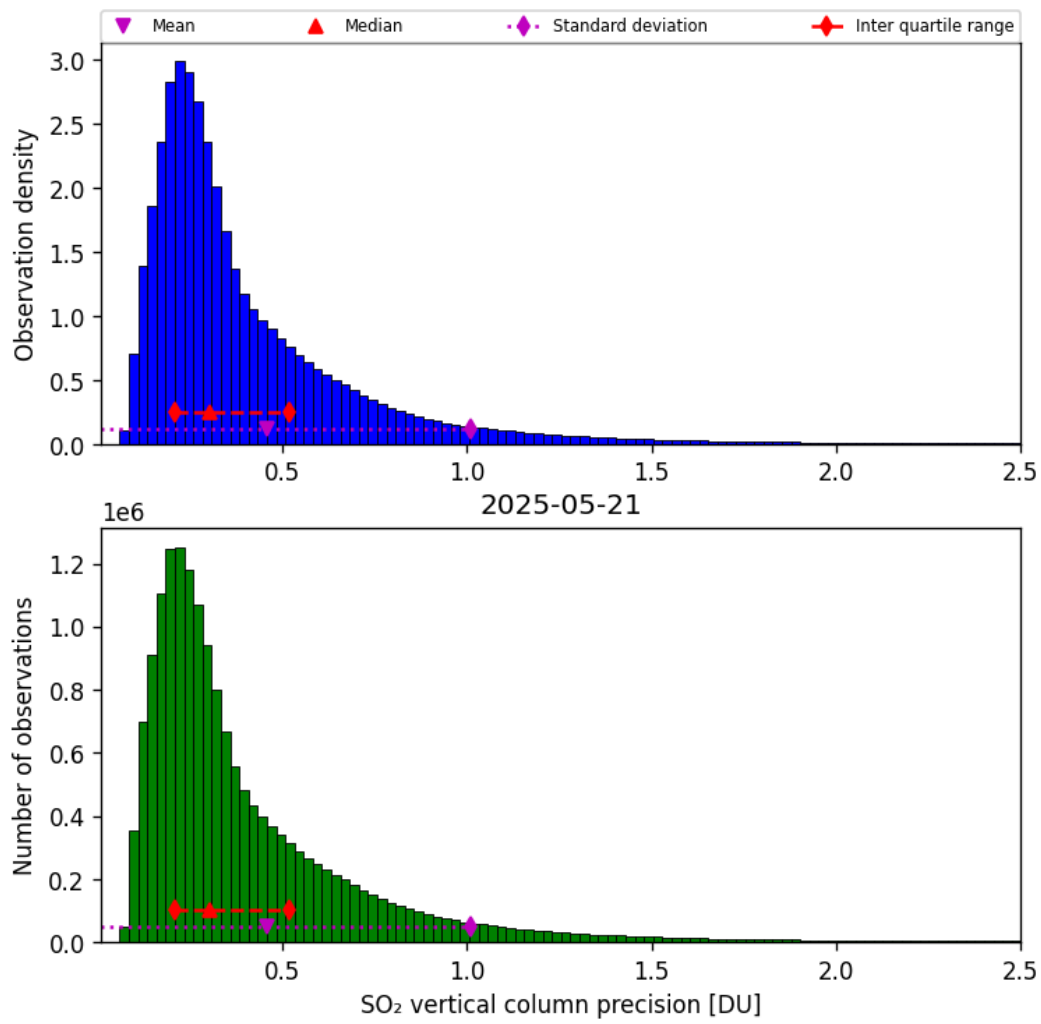


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-05-21 to 2025-05-22

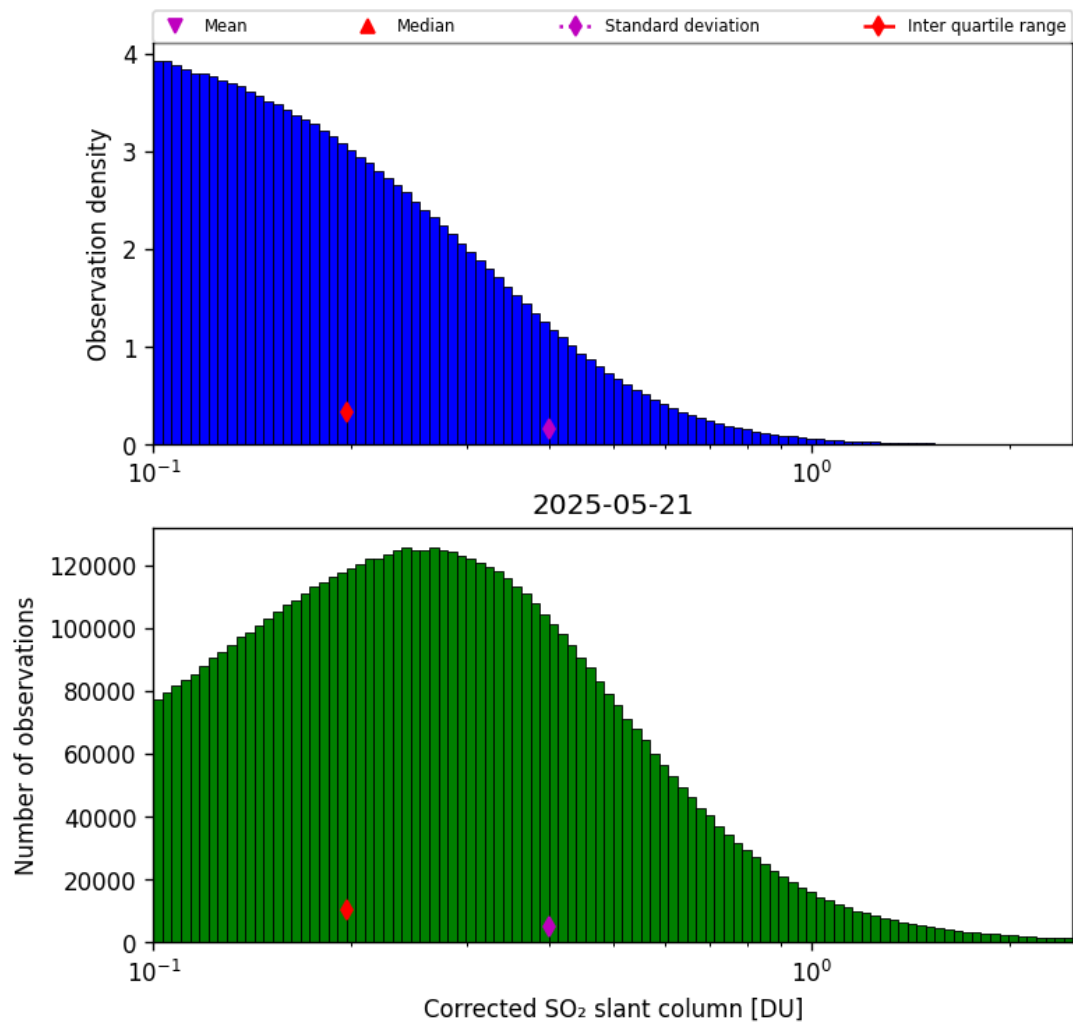


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-05-21 to 2025-05-22

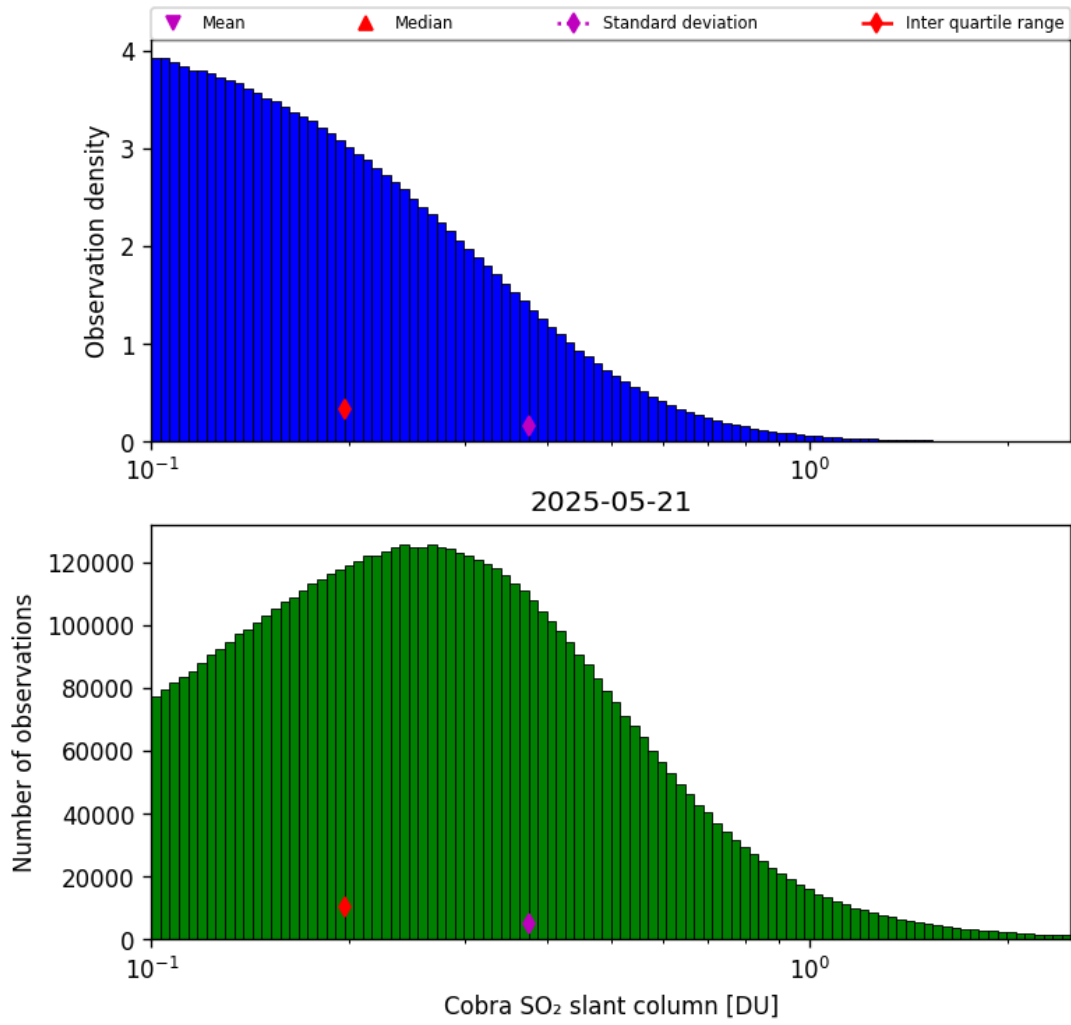


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-05-21 to 2025-05-22

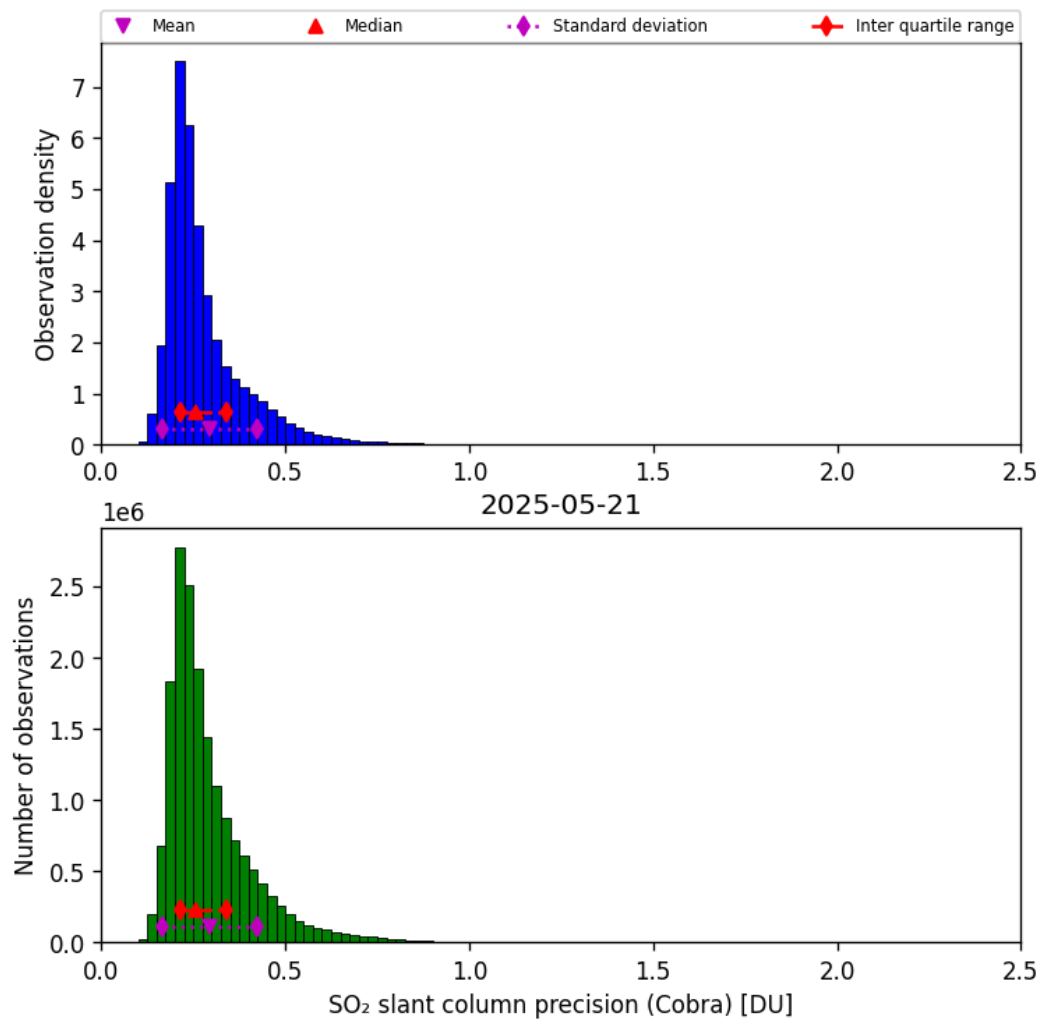


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-05-21 to 2025-05-22

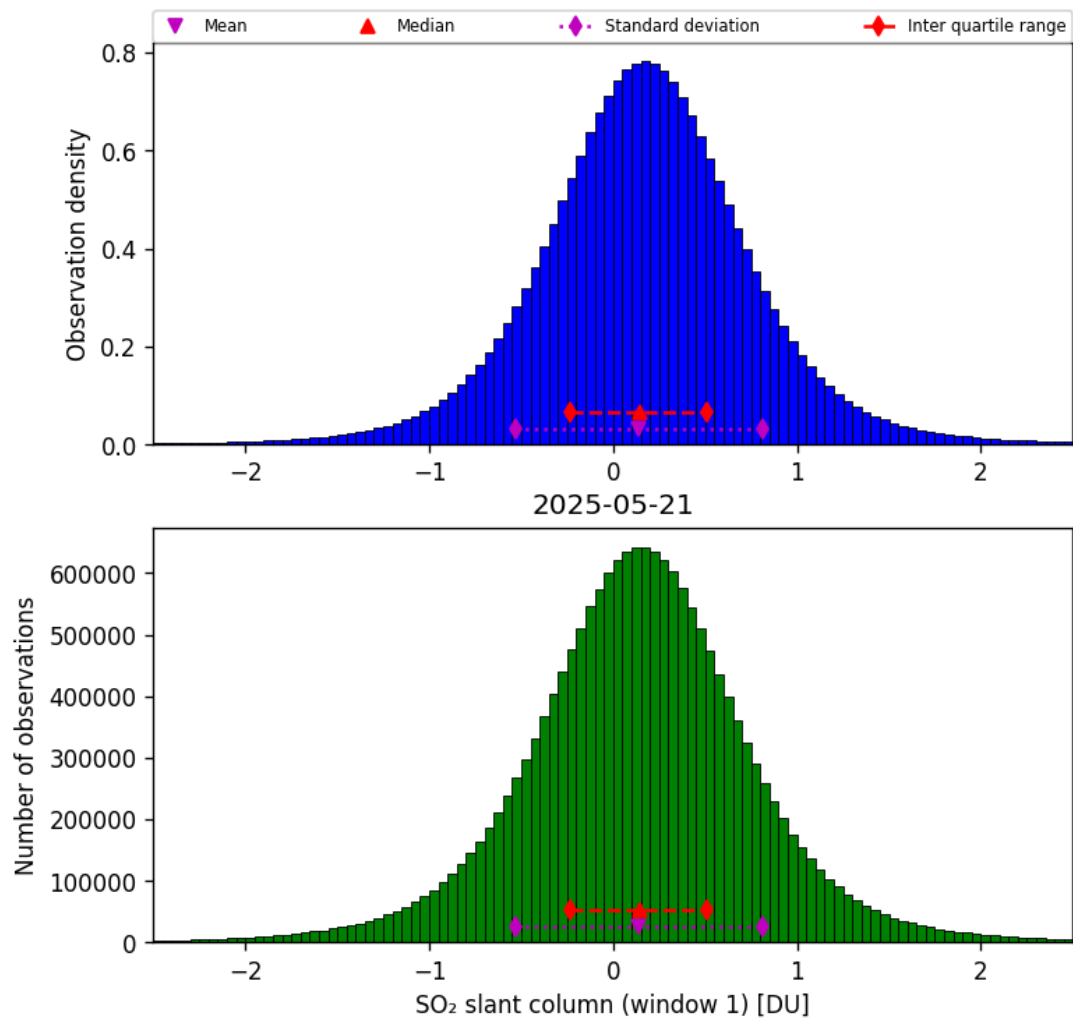


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-05-21 to 2025-05-22

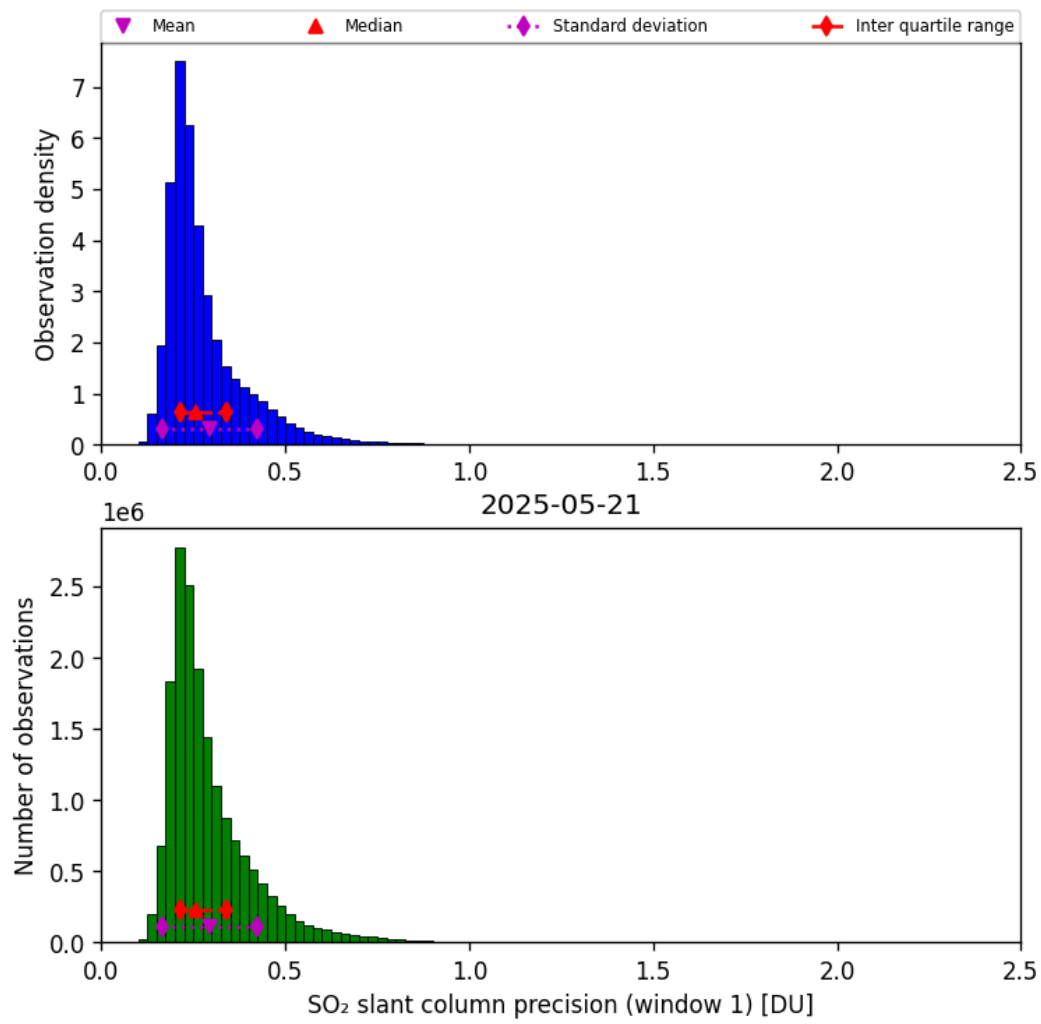


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-05-21 to 2025-05-22

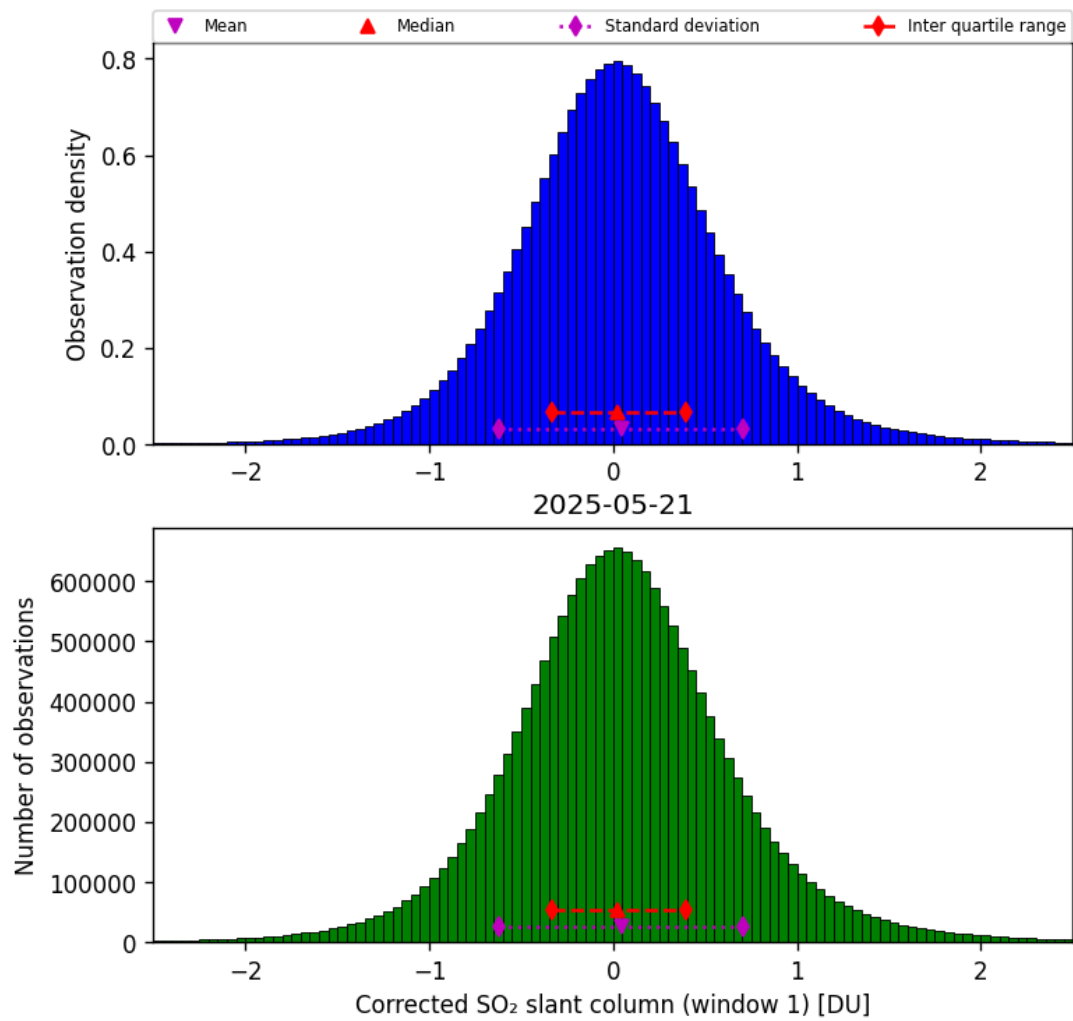


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-05-21 to 2025-05-22

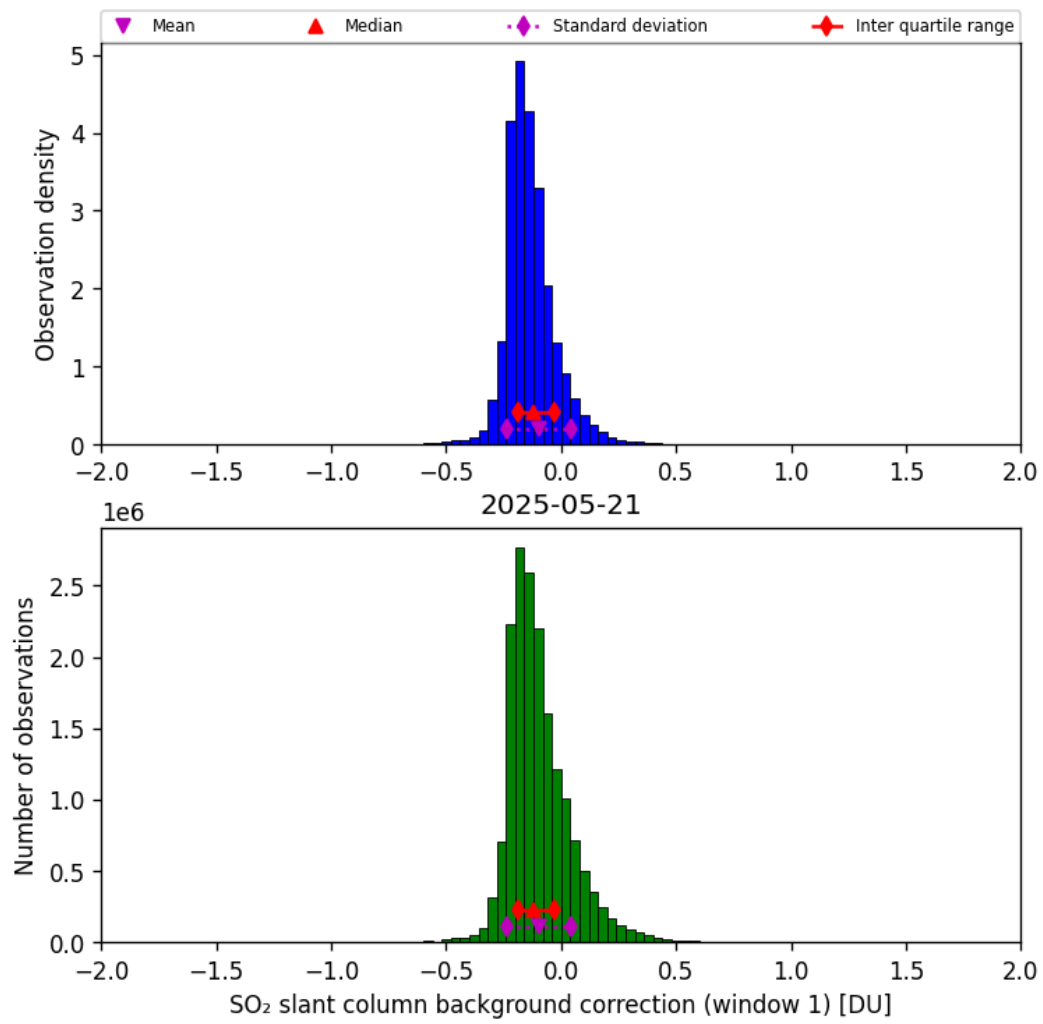


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-05-21 to 2025-05-22

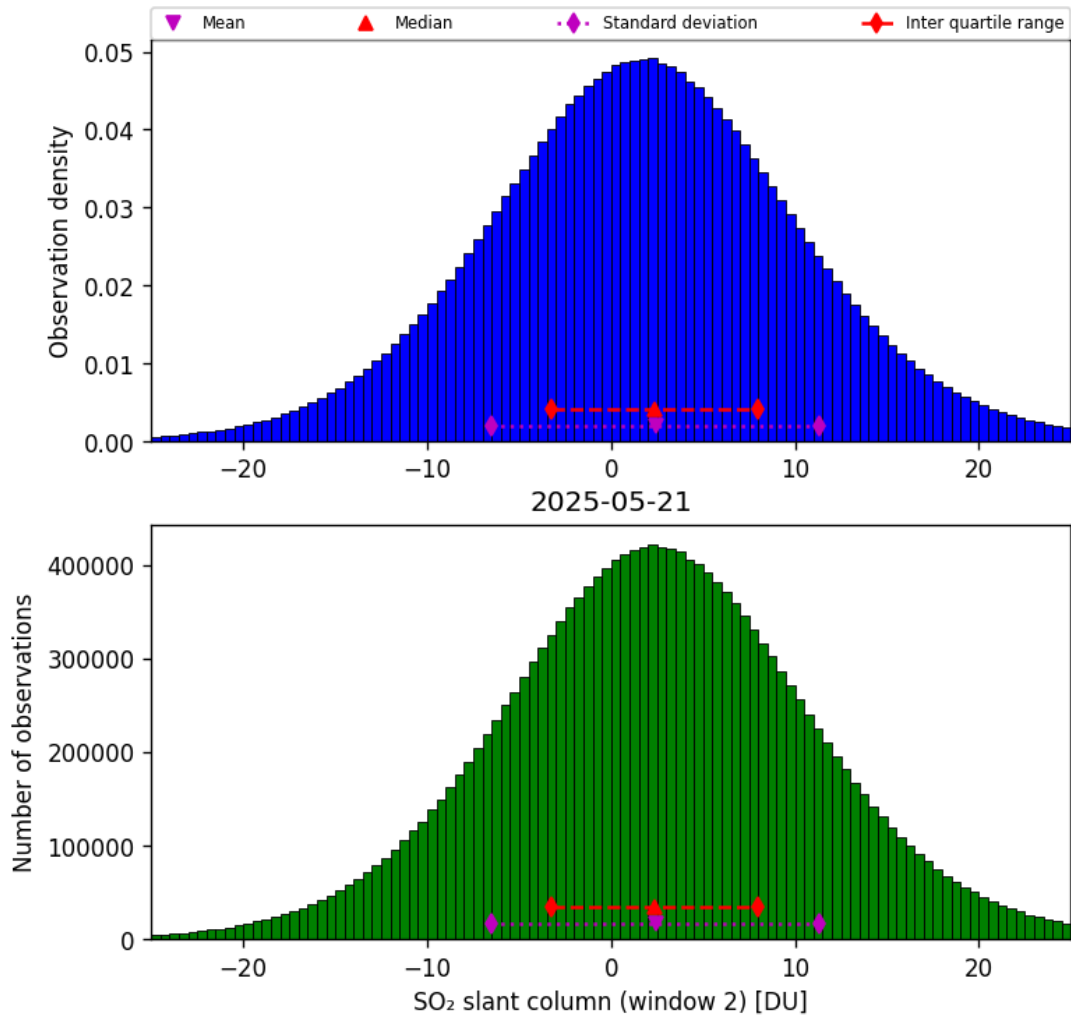


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-05-21 to 2025-05-22

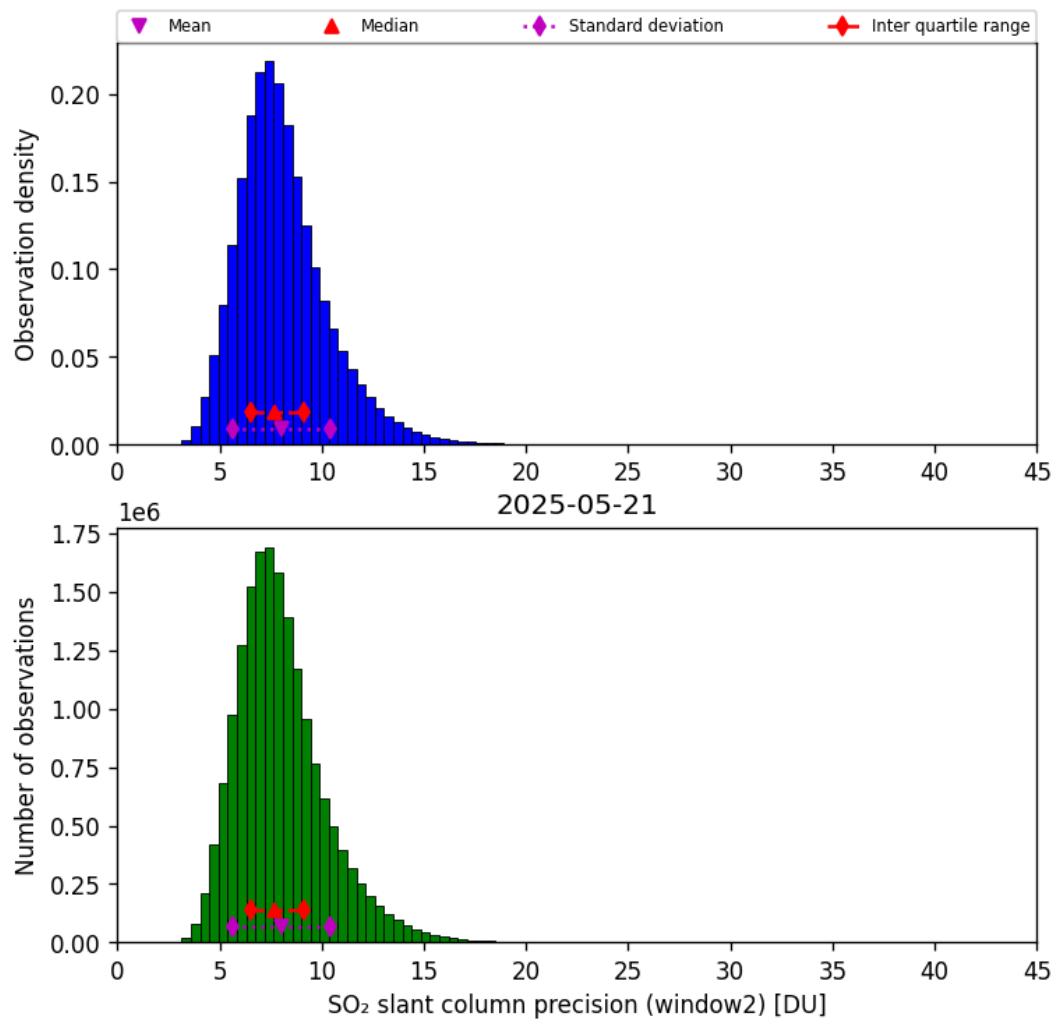


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-05-21 to 2025-05-22

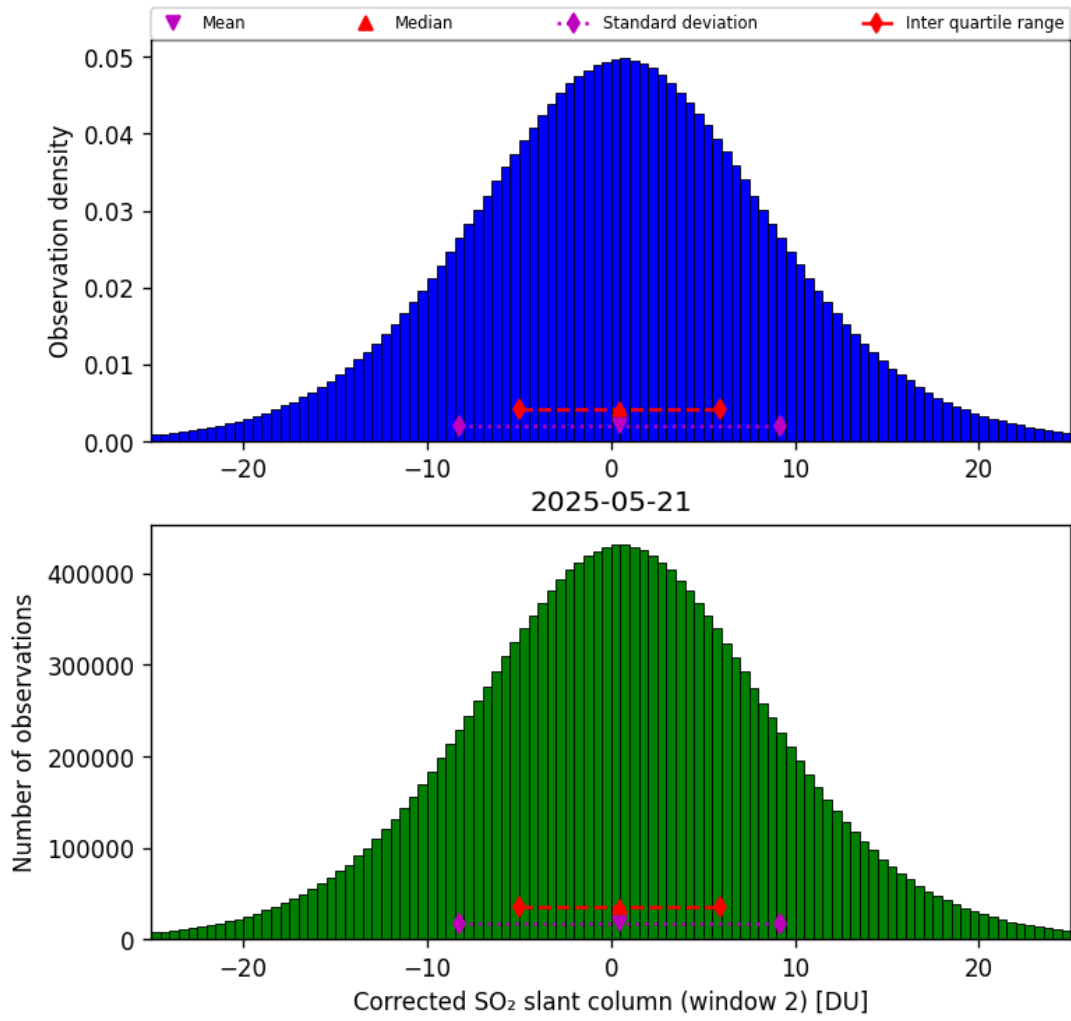


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-05-21 to 2025-05-22

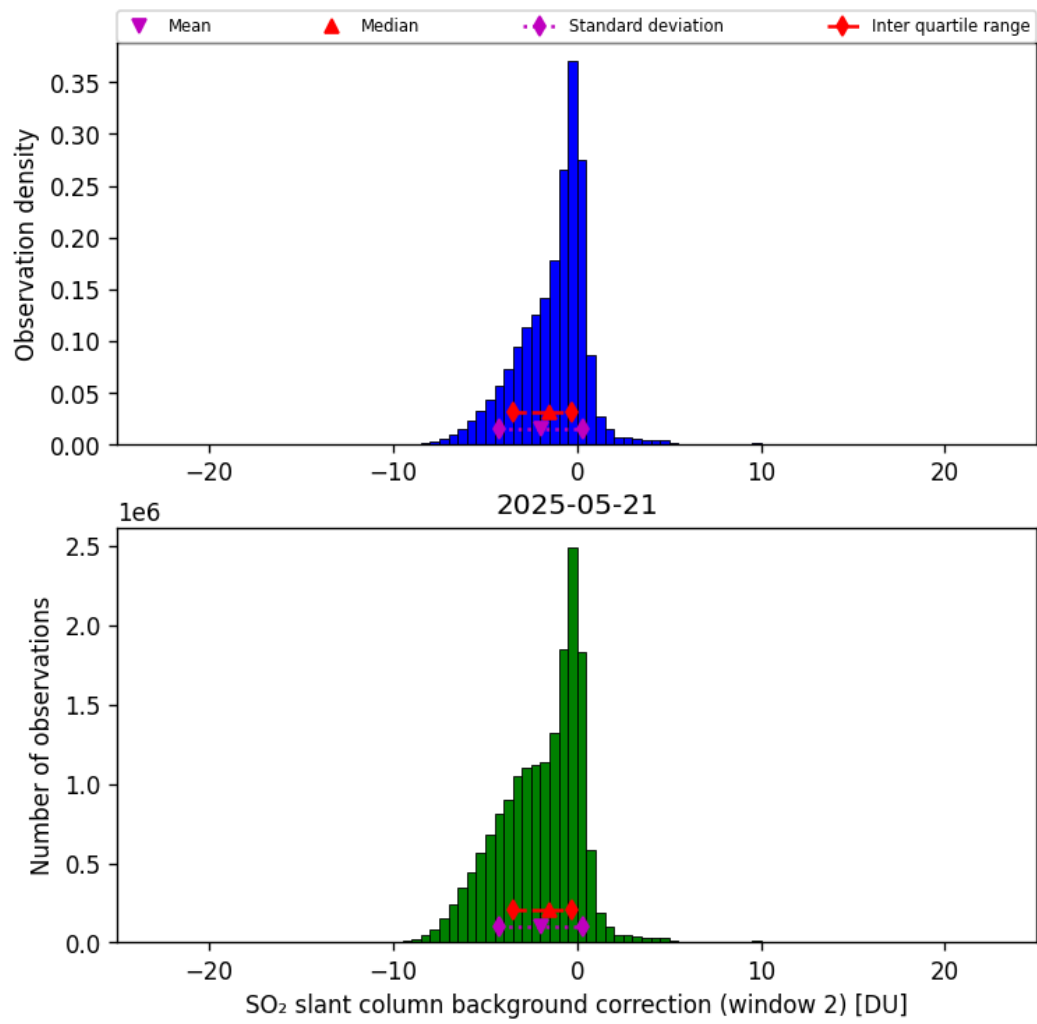


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-05-21 to 2025-05-22

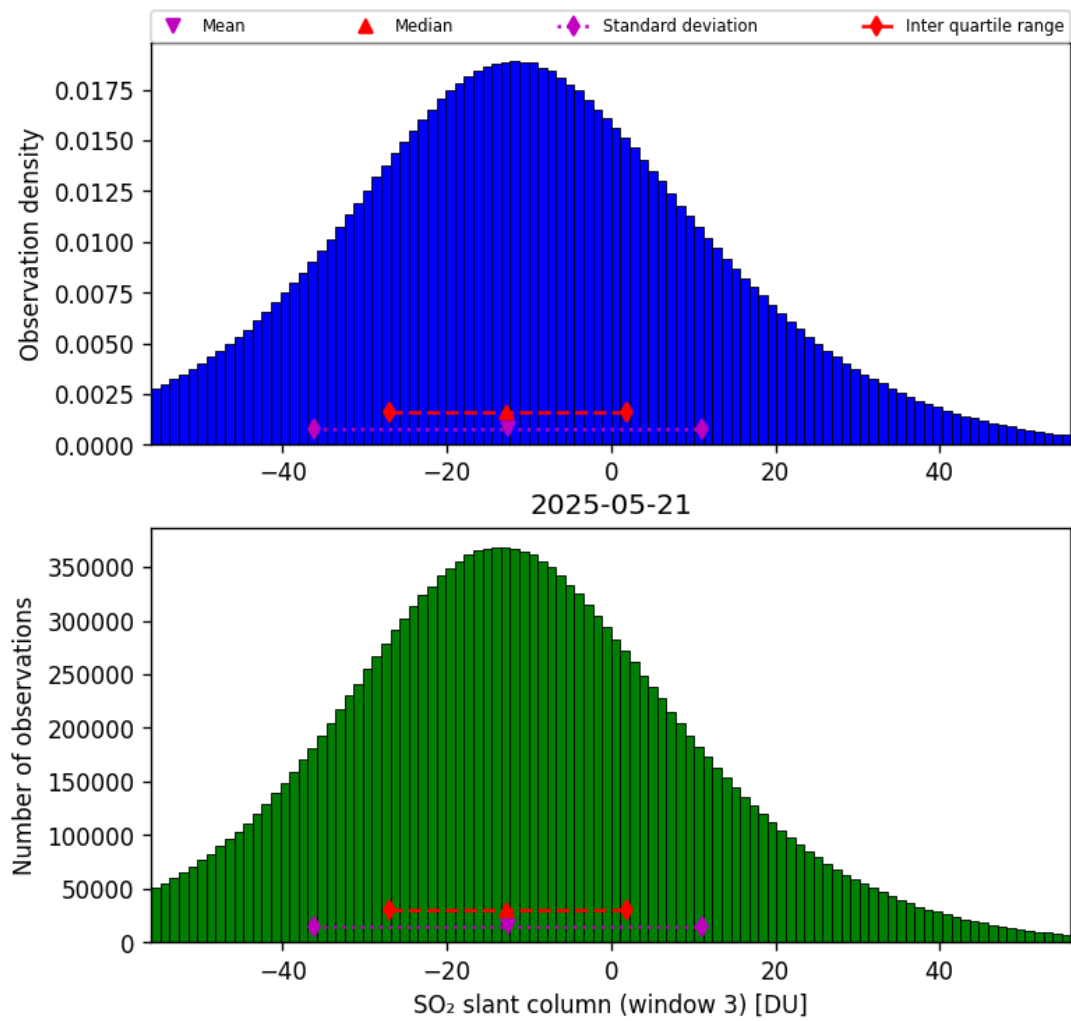


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-05-21 to 2025-05-22

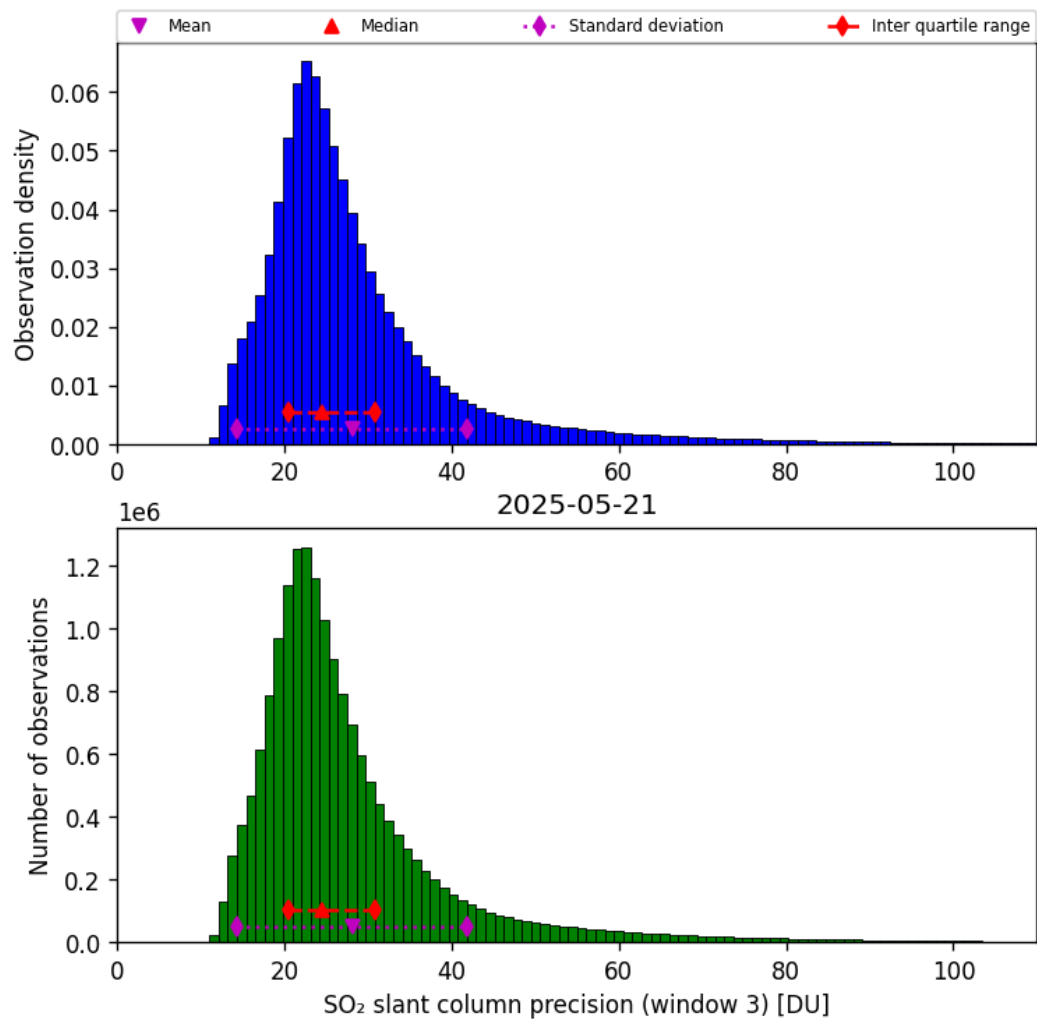


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-05-21 to 2025-05-22

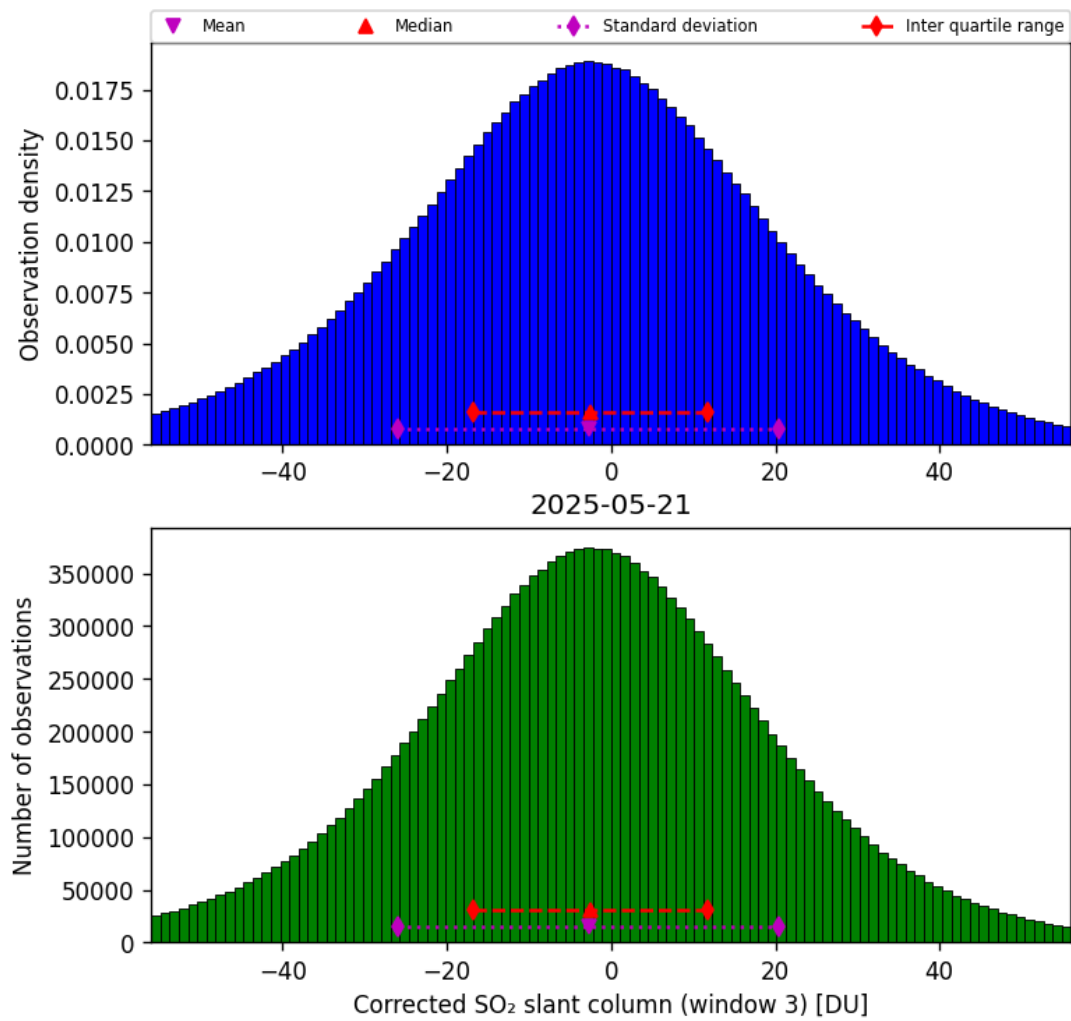


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-05-21 to 2025-05-22

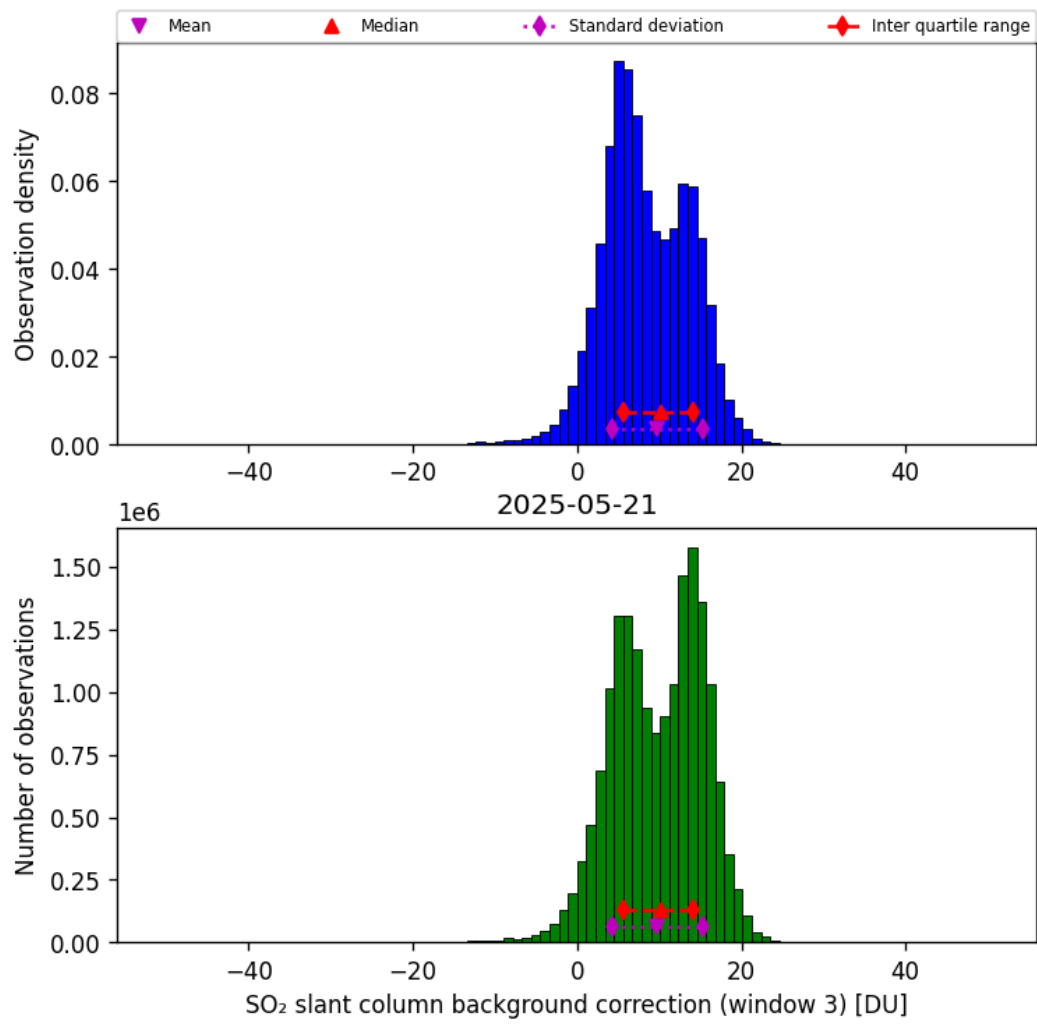


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-05-21 to 2025-05-22

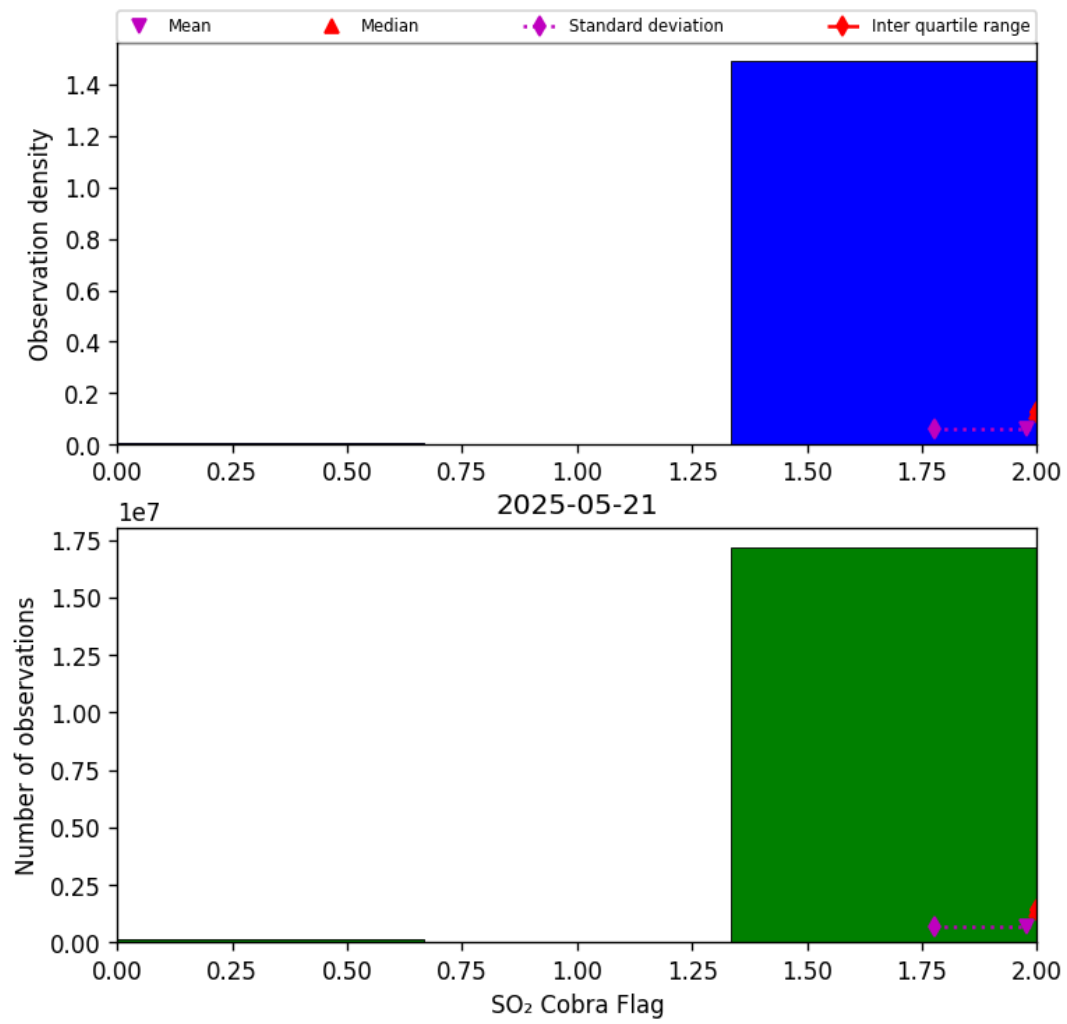


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-05-21 to 2025-05-22

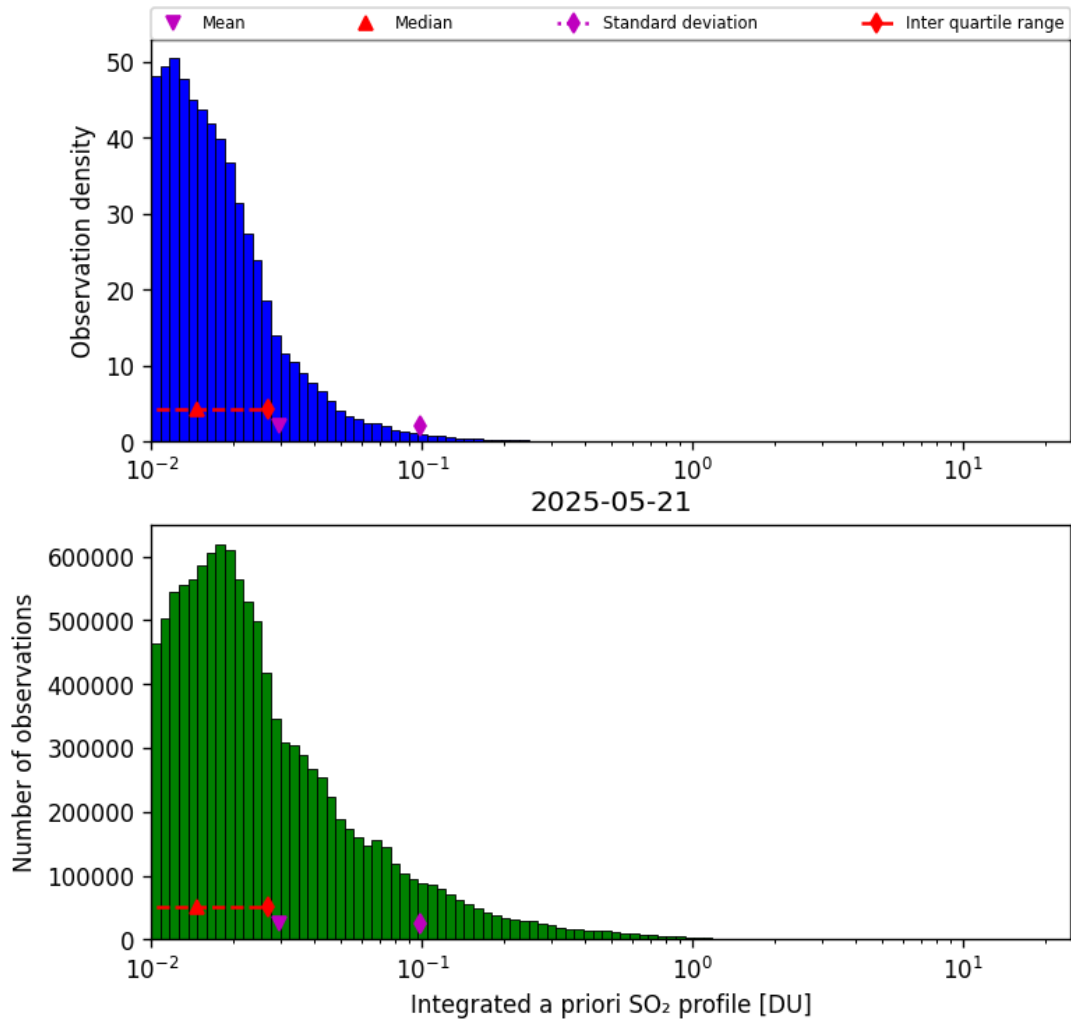


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-05-21 to 2025-05-22

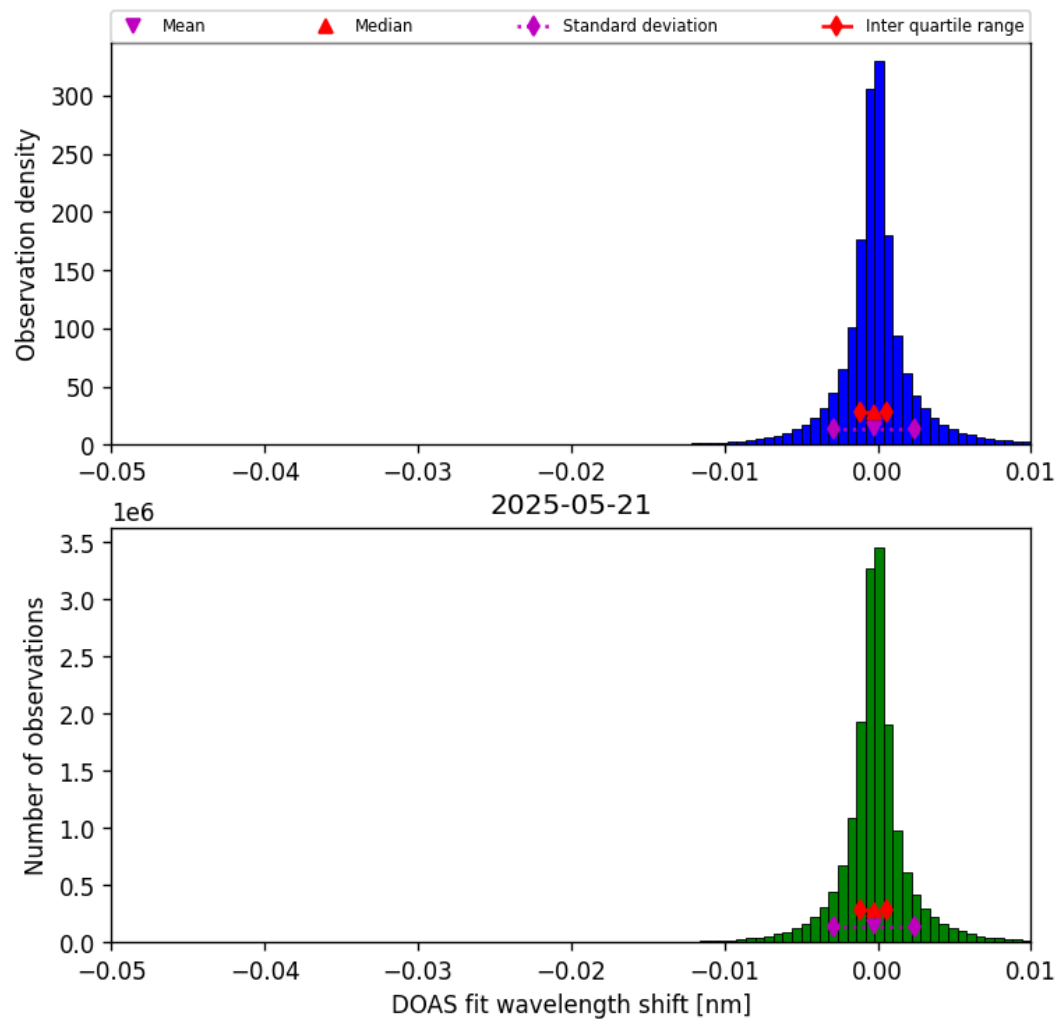


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-05-21 to 2025-05-22

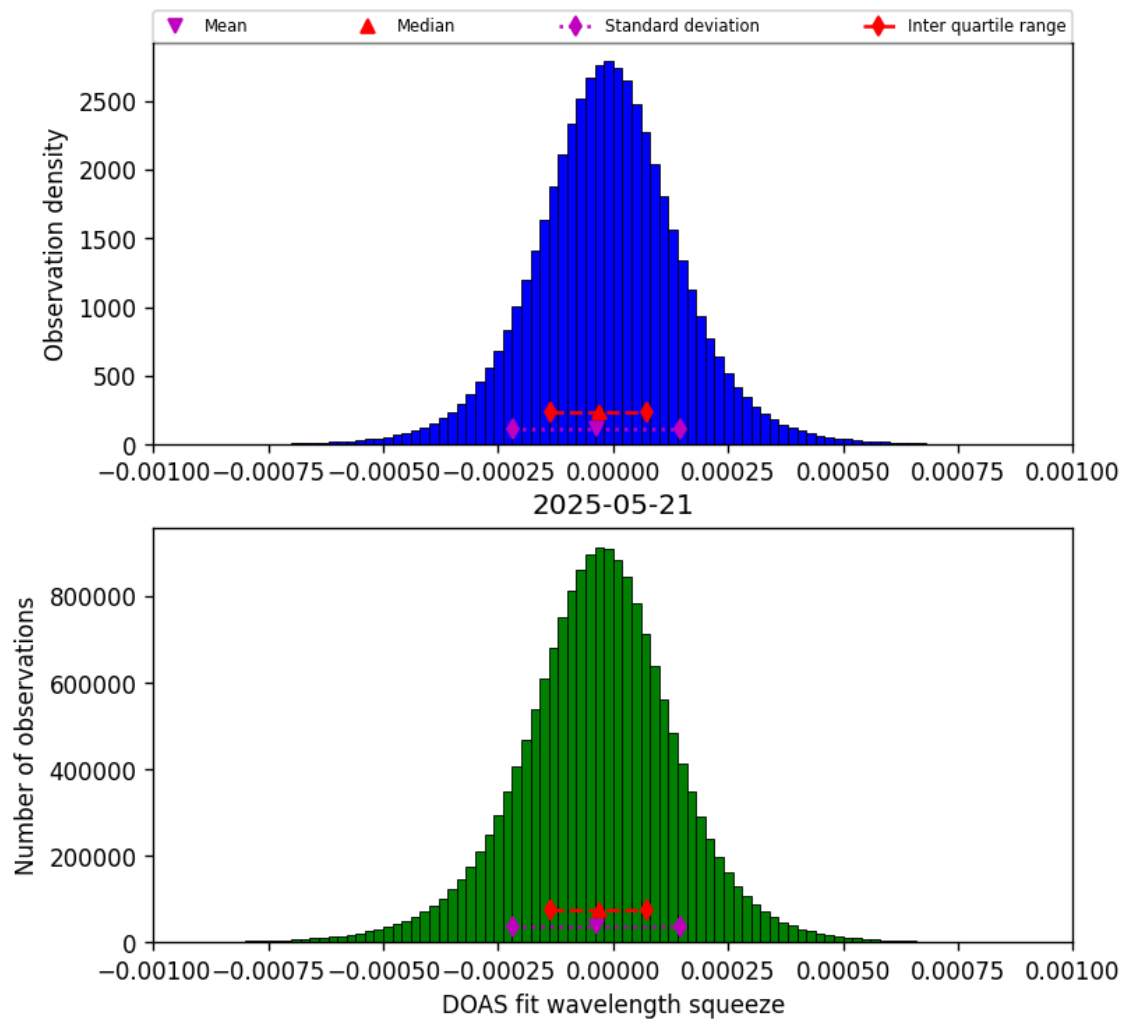


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-05-21 to 2025-05-22

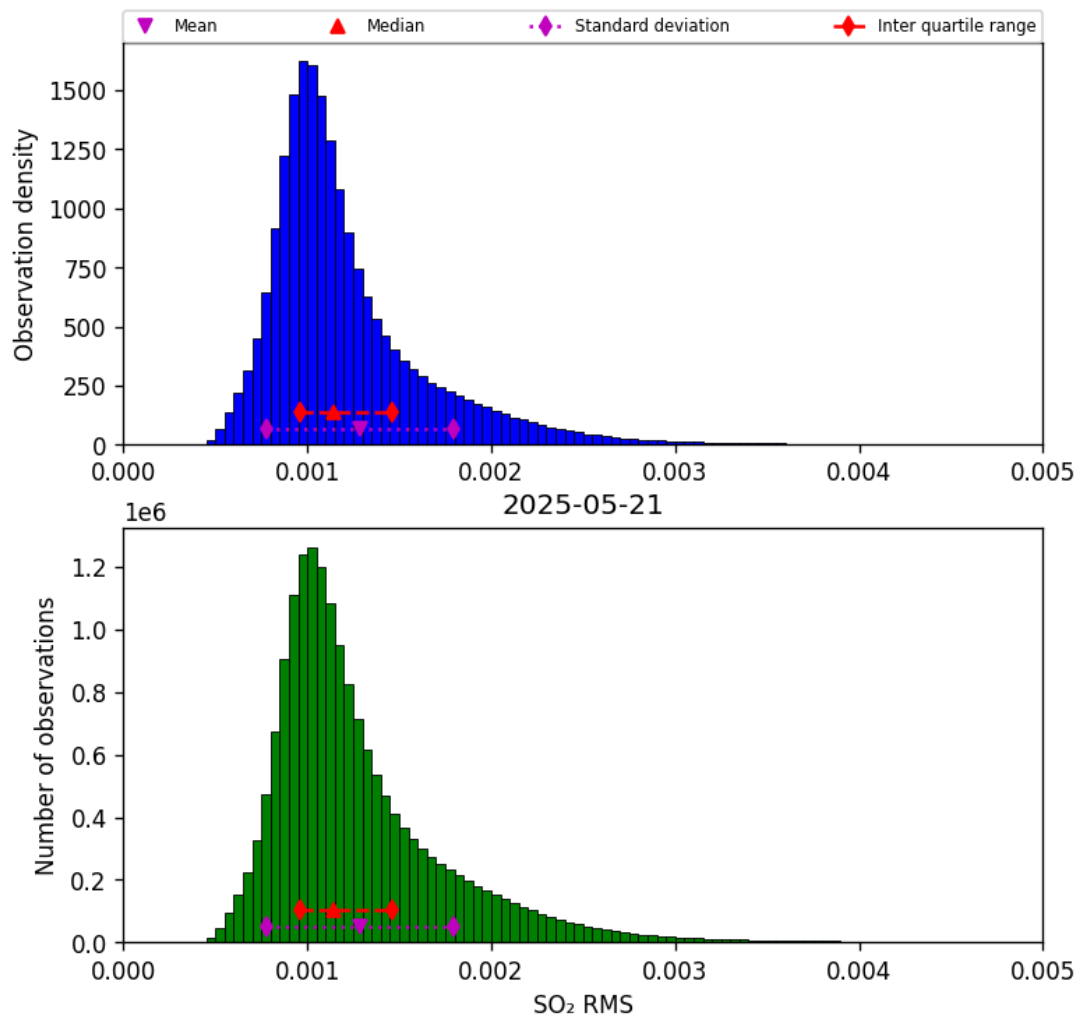


Figure 79: Histogram of “SO₂ RMS” for 2025-05-21 to 2025-05-22

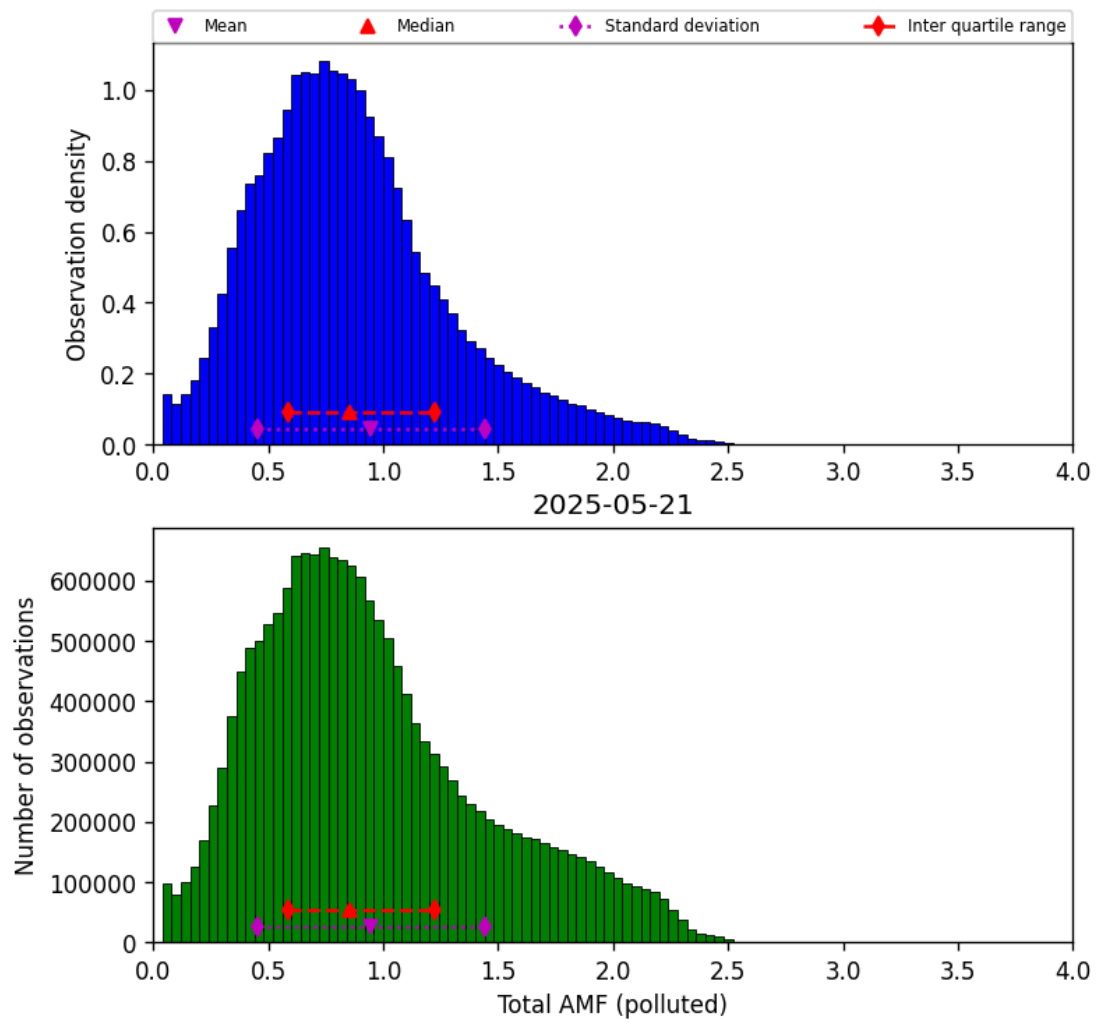


Figure 80: Histogram of “Total AMF (polluted)” for 2025-05-21 to 2025-05-22

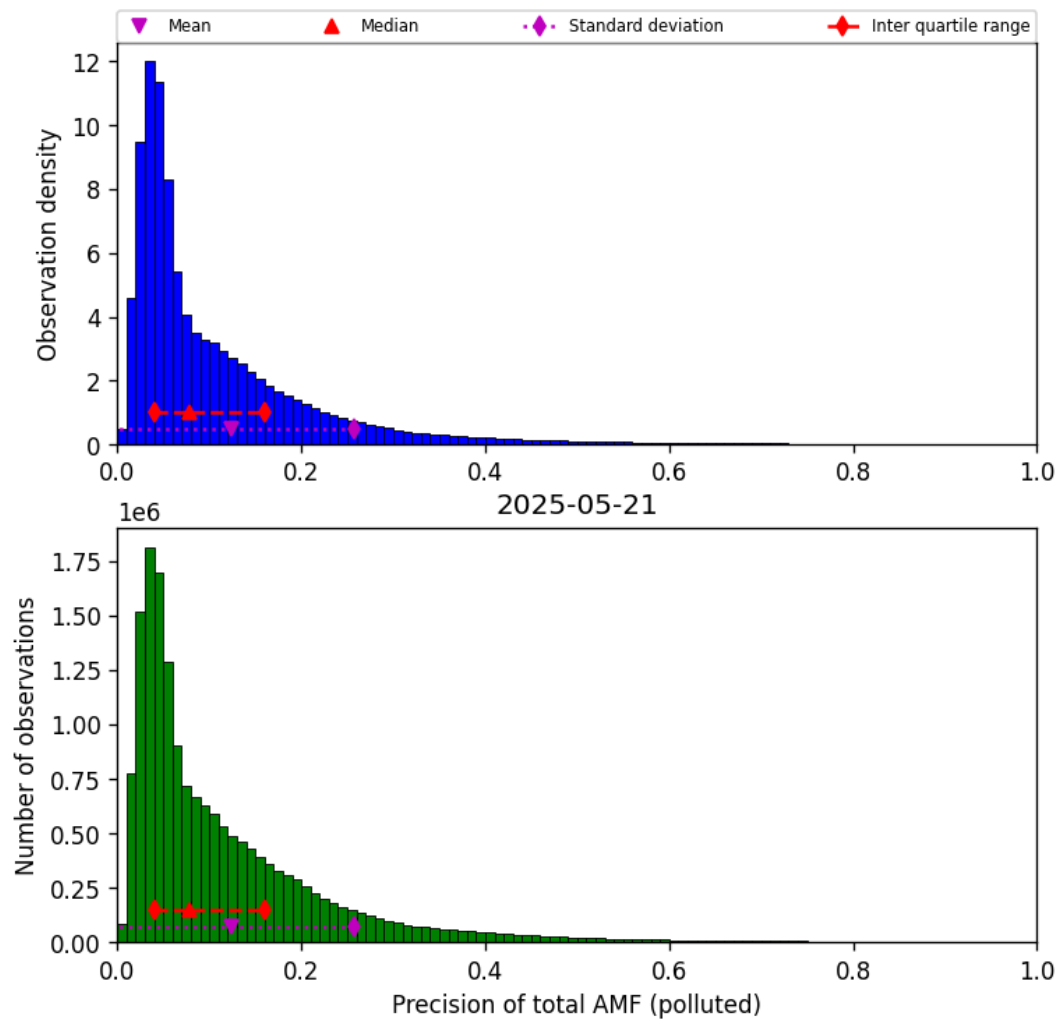


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-05-21 to 2025-05-22

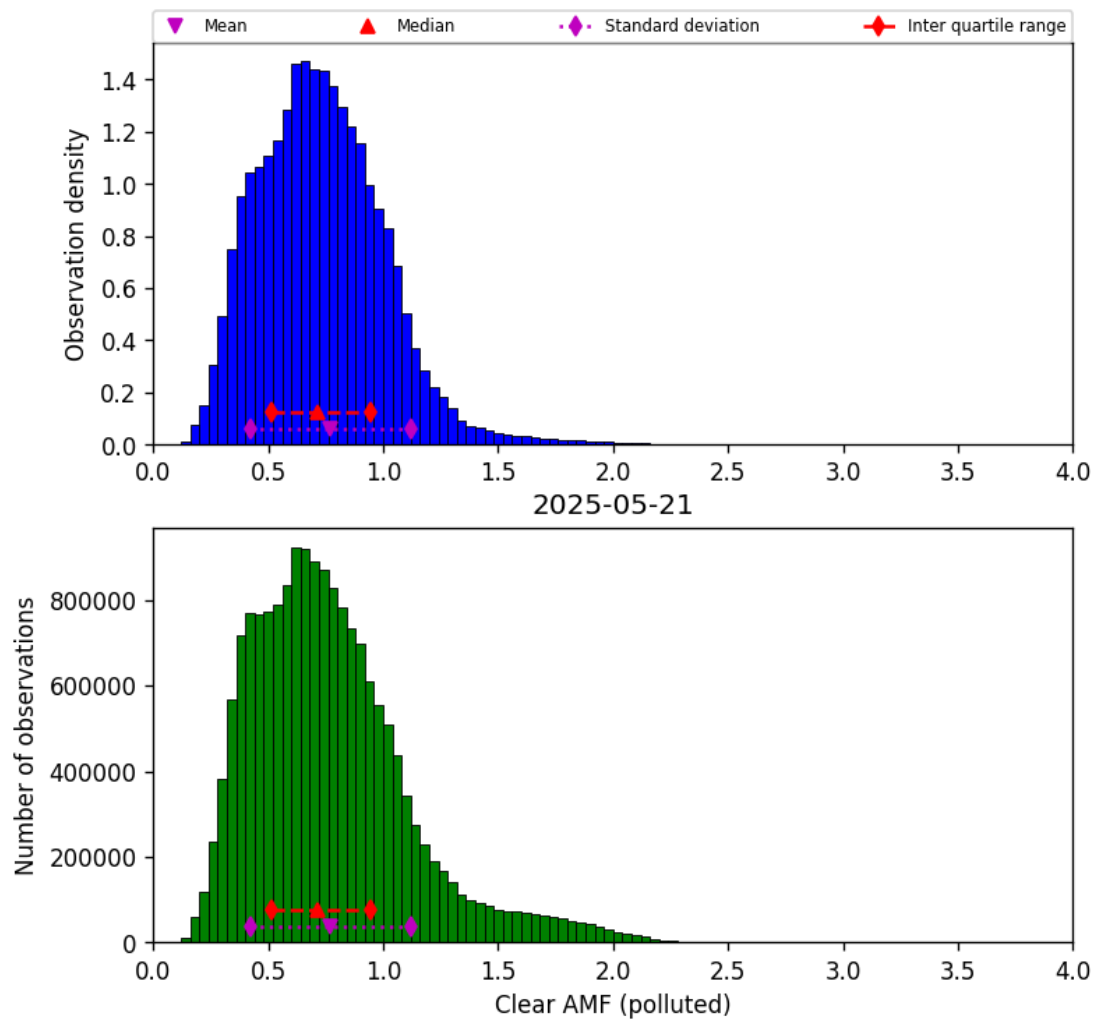


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-05-21 to 2025-05-22

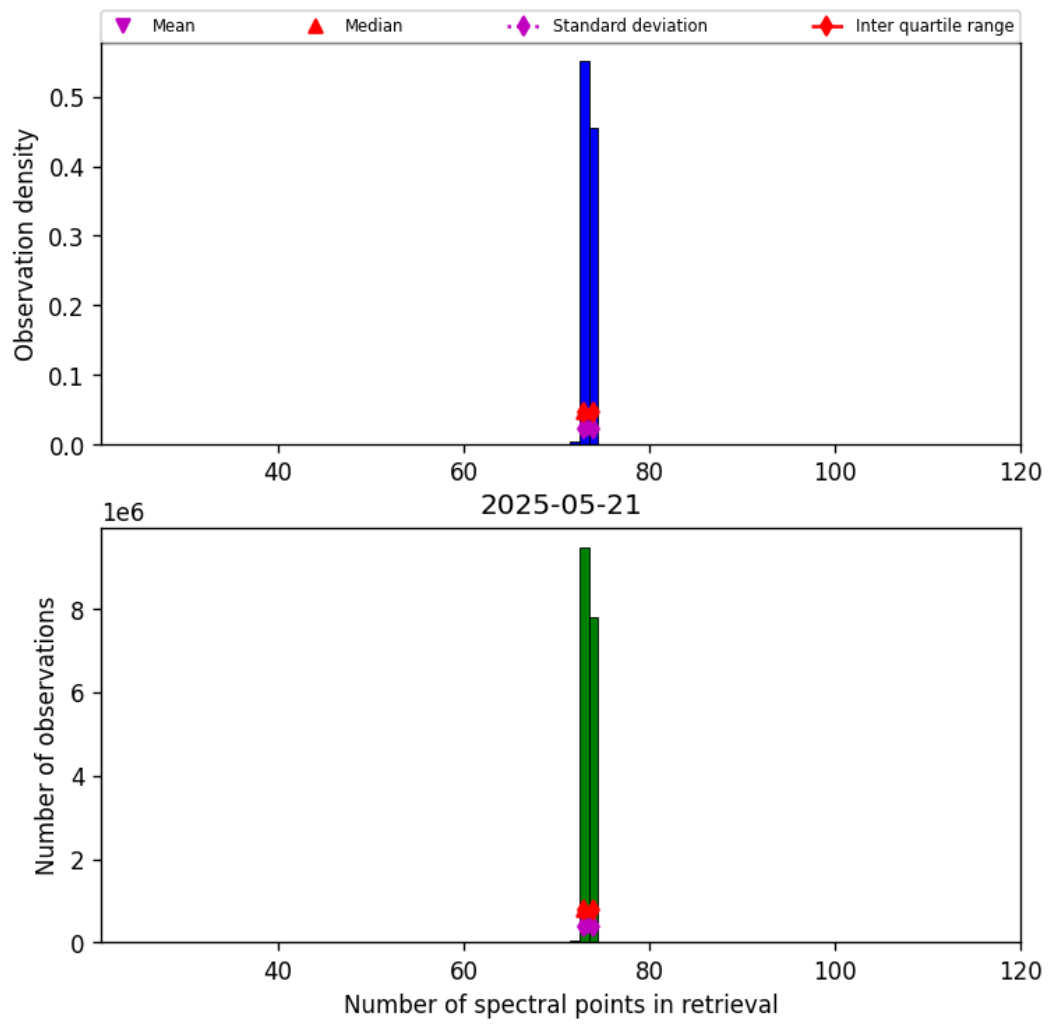


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-05-21 to 2025-05-22

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.

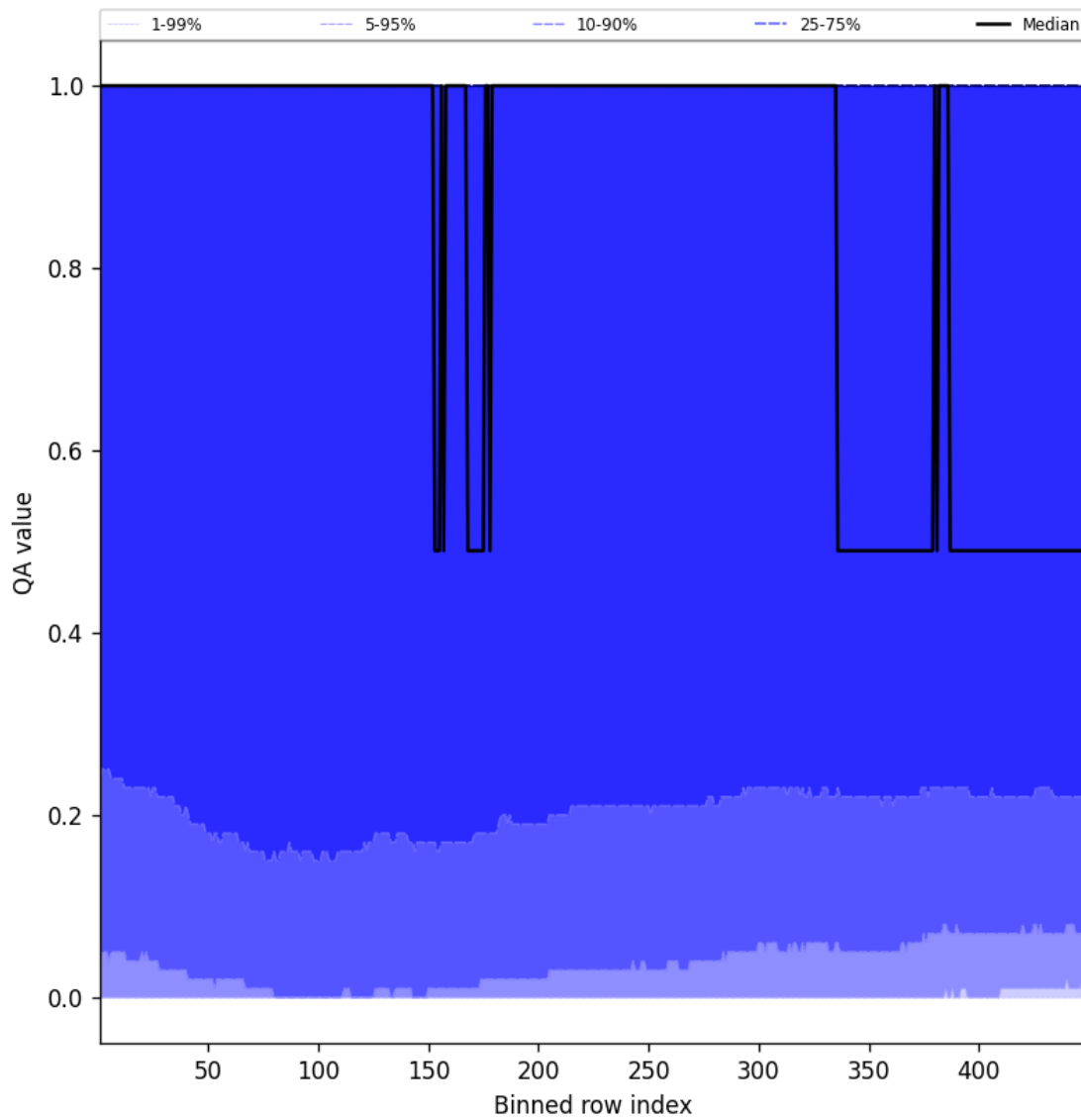


Figure 84: Along track statistics of “QA value” for 2025-05-21 to 2025-05-22

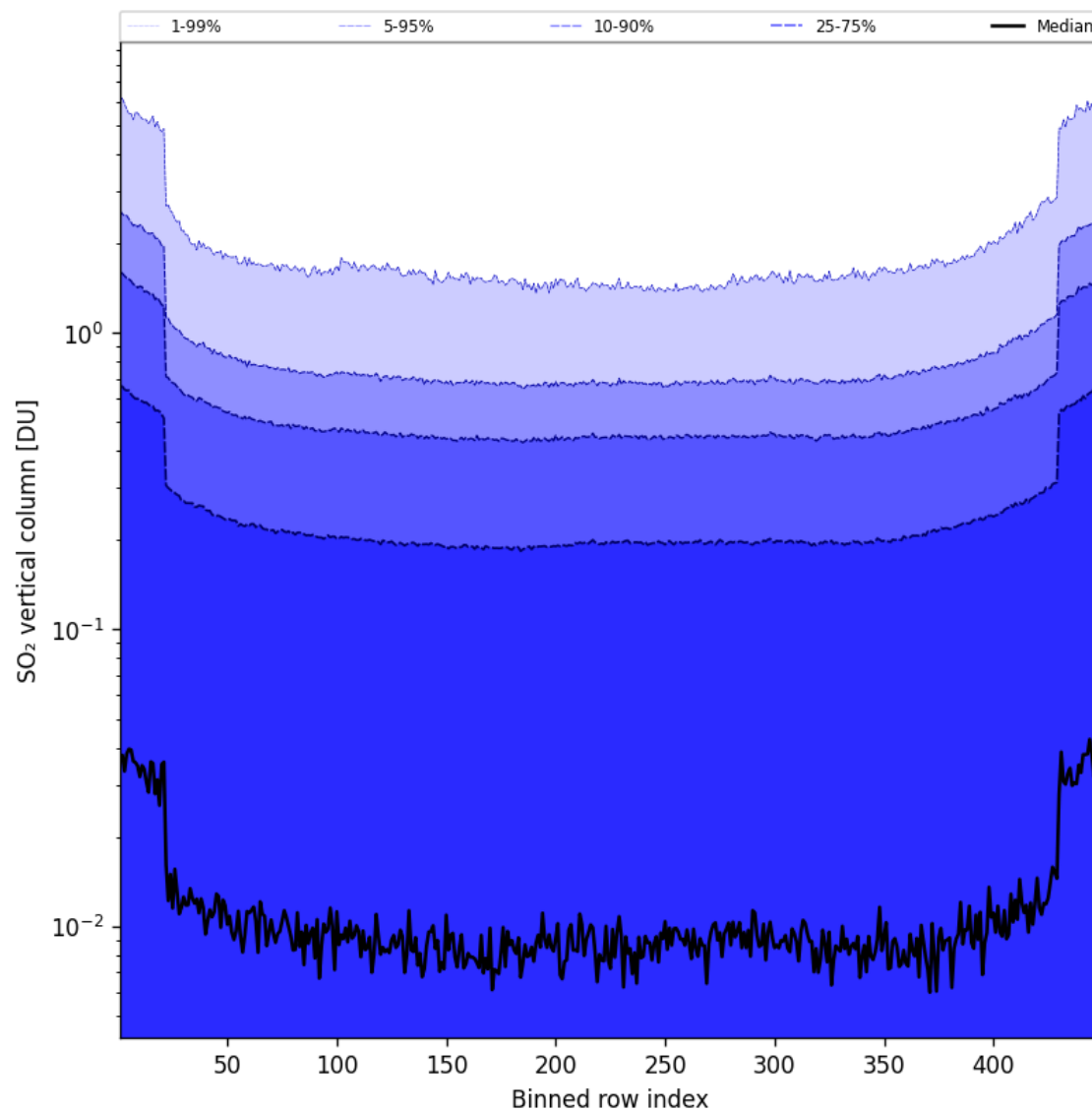


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-05-21 to 2025-05-22

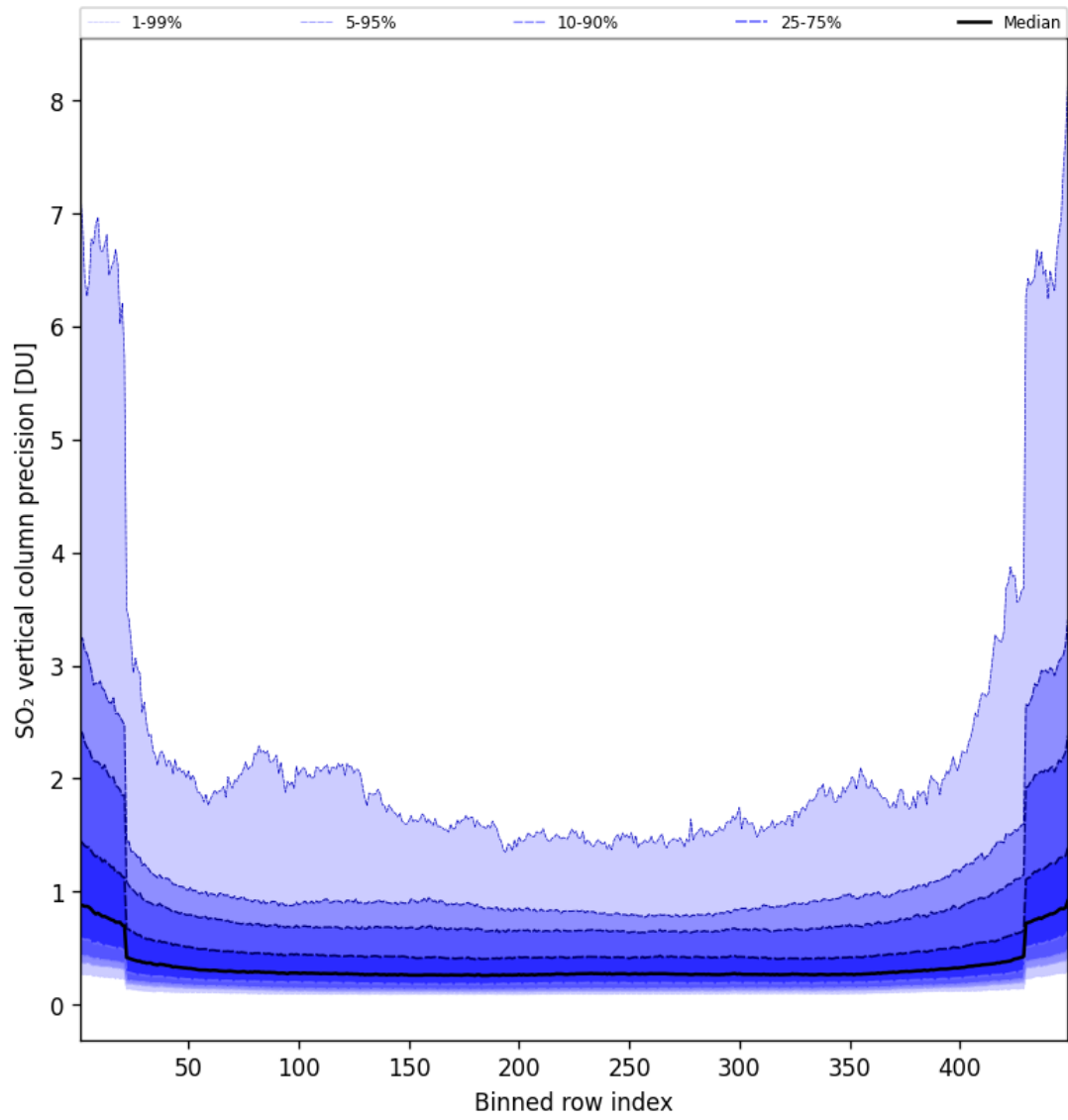


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-05-21 to 2025-05-22

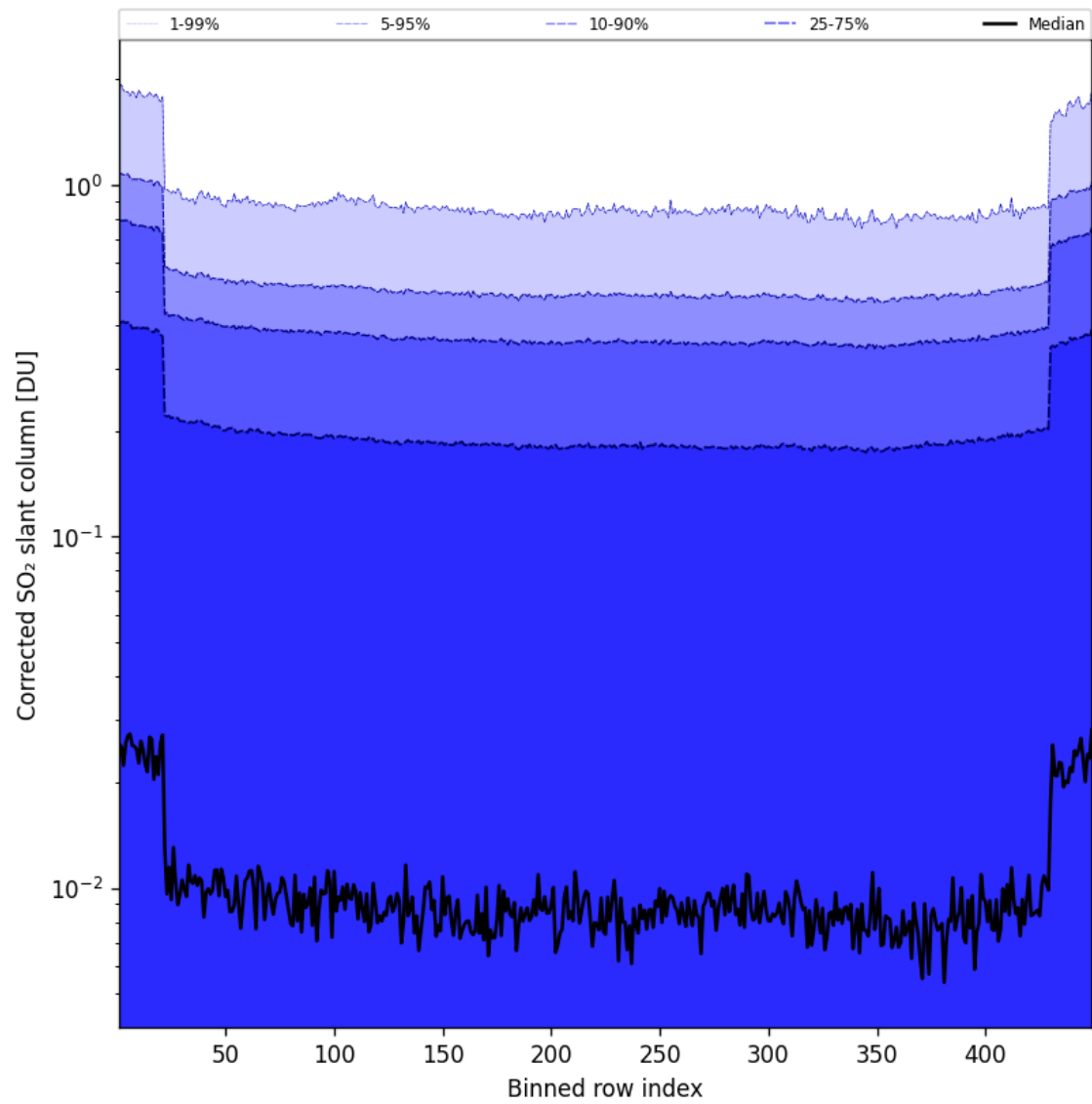


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-05-21 to 2025-05-22

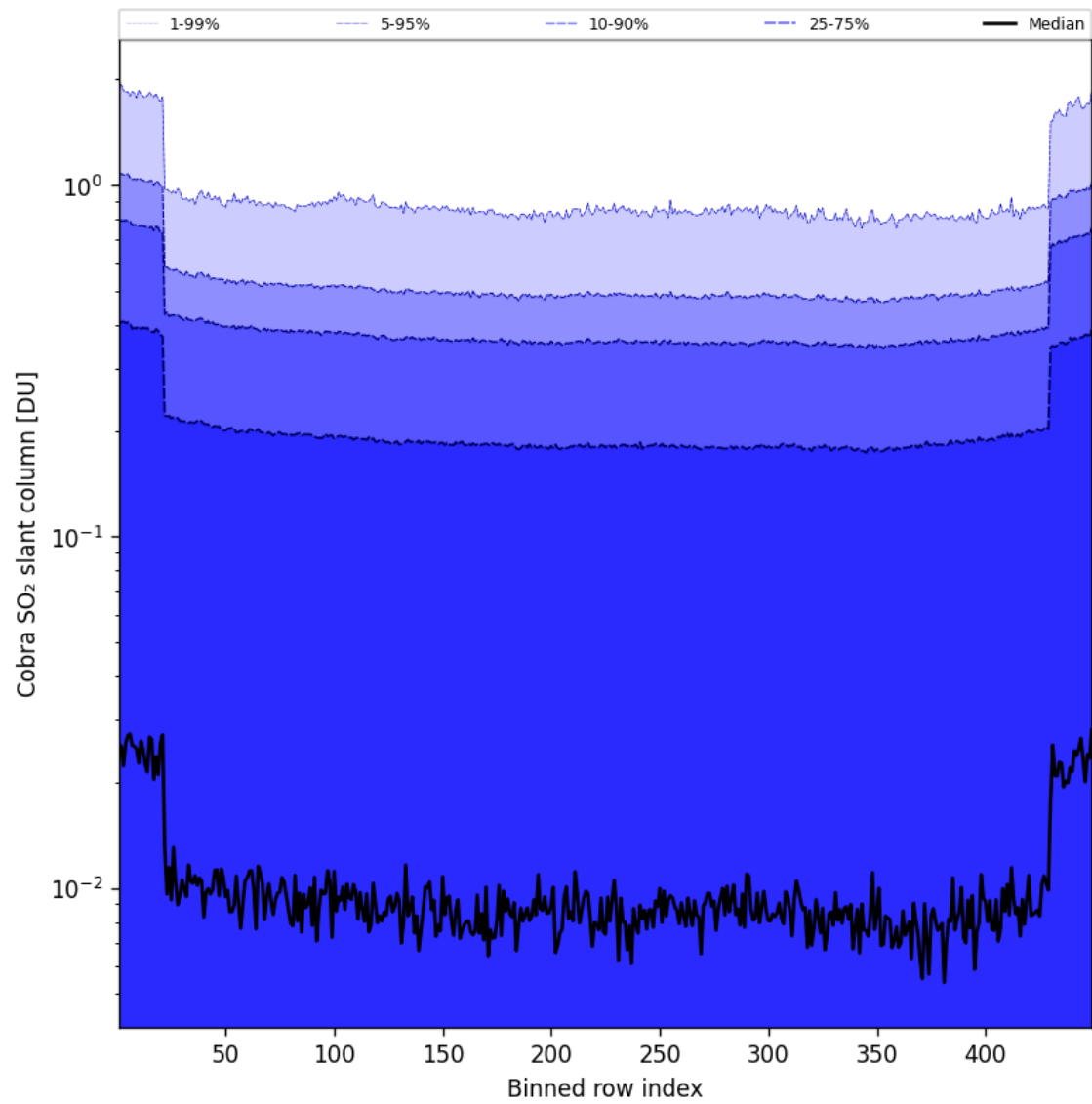


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-05-21 to 2025-05-22

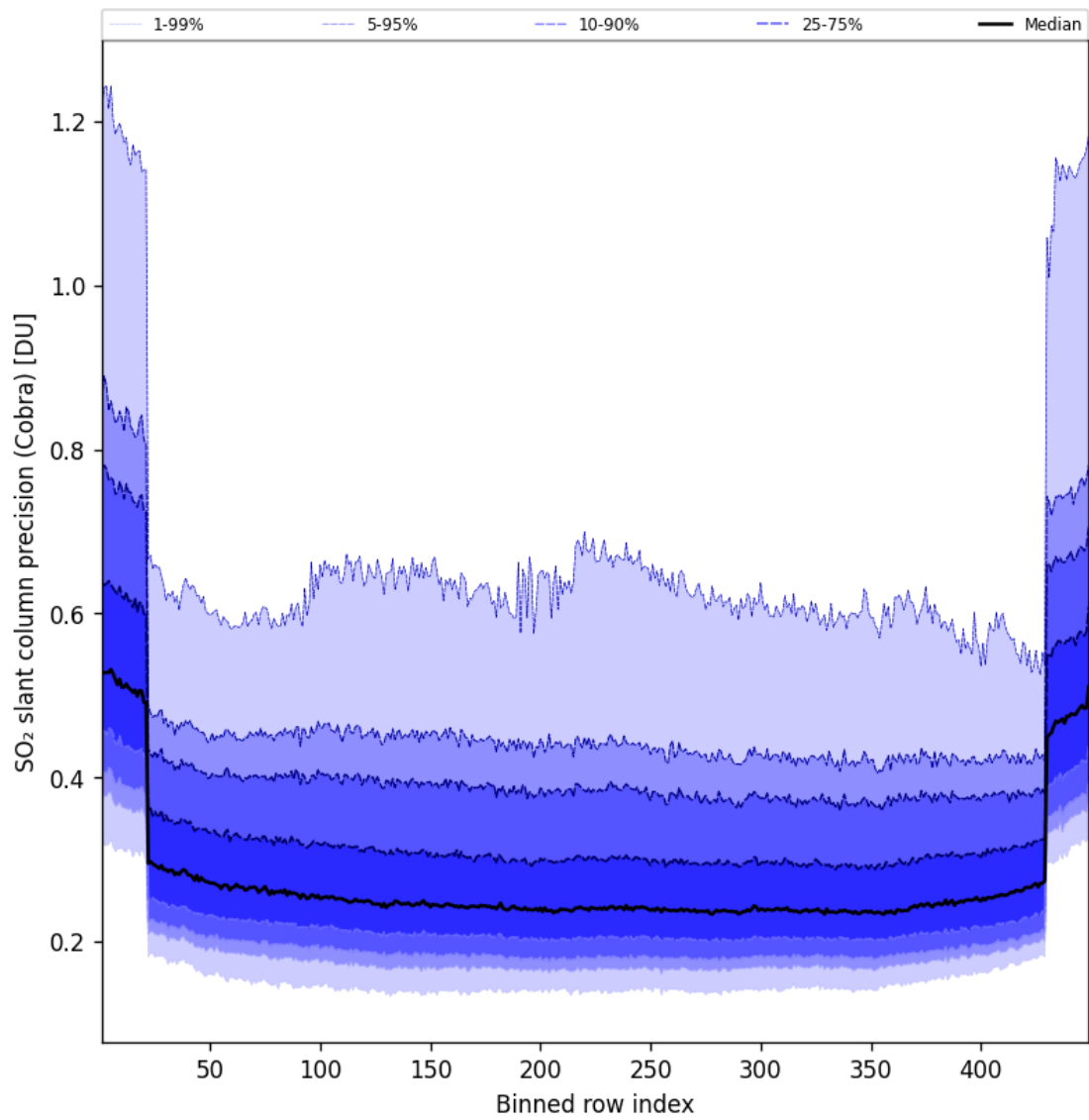


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-05-21 to 2025-05-22

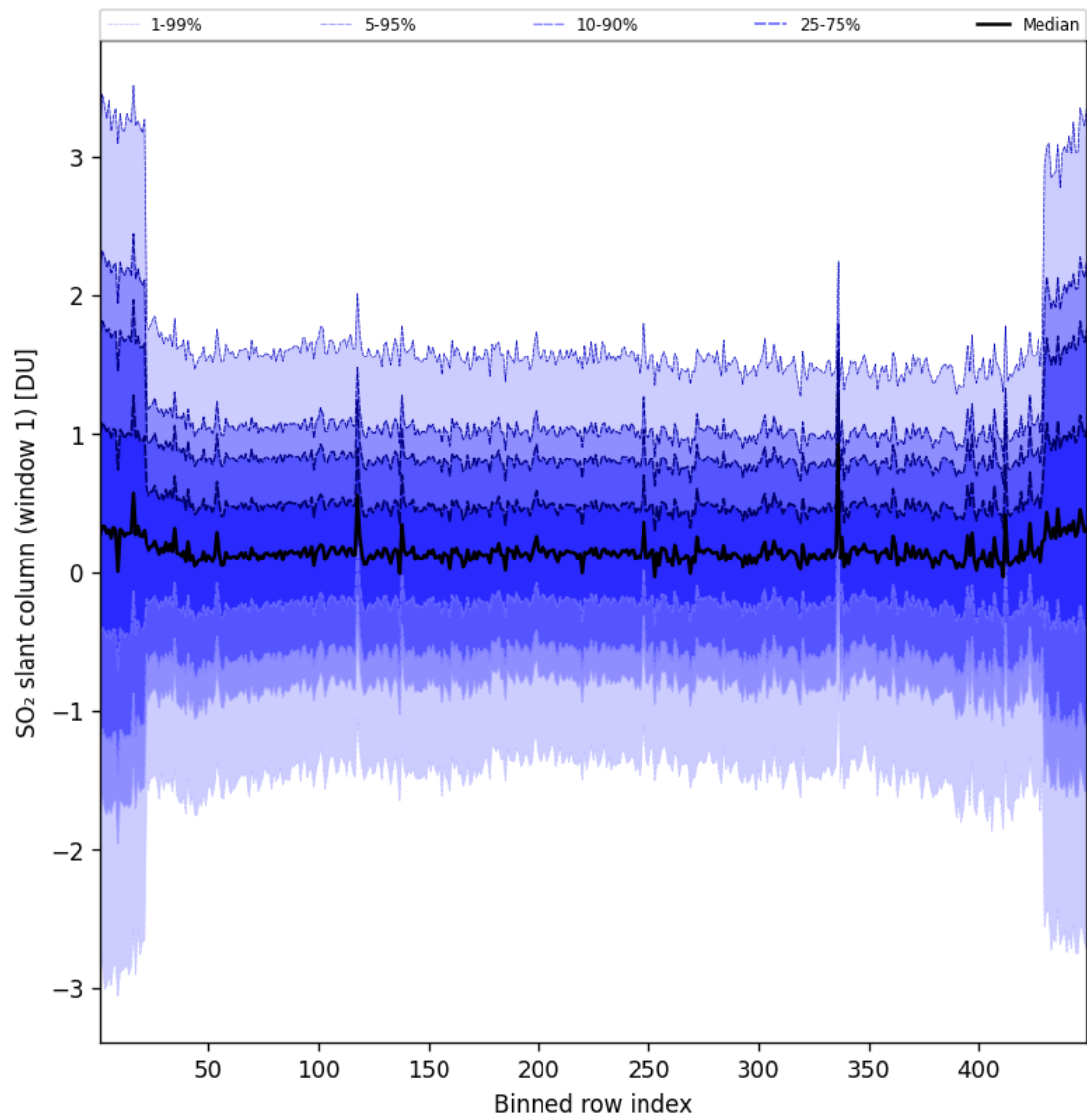


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-05-21 to 2025-05-22

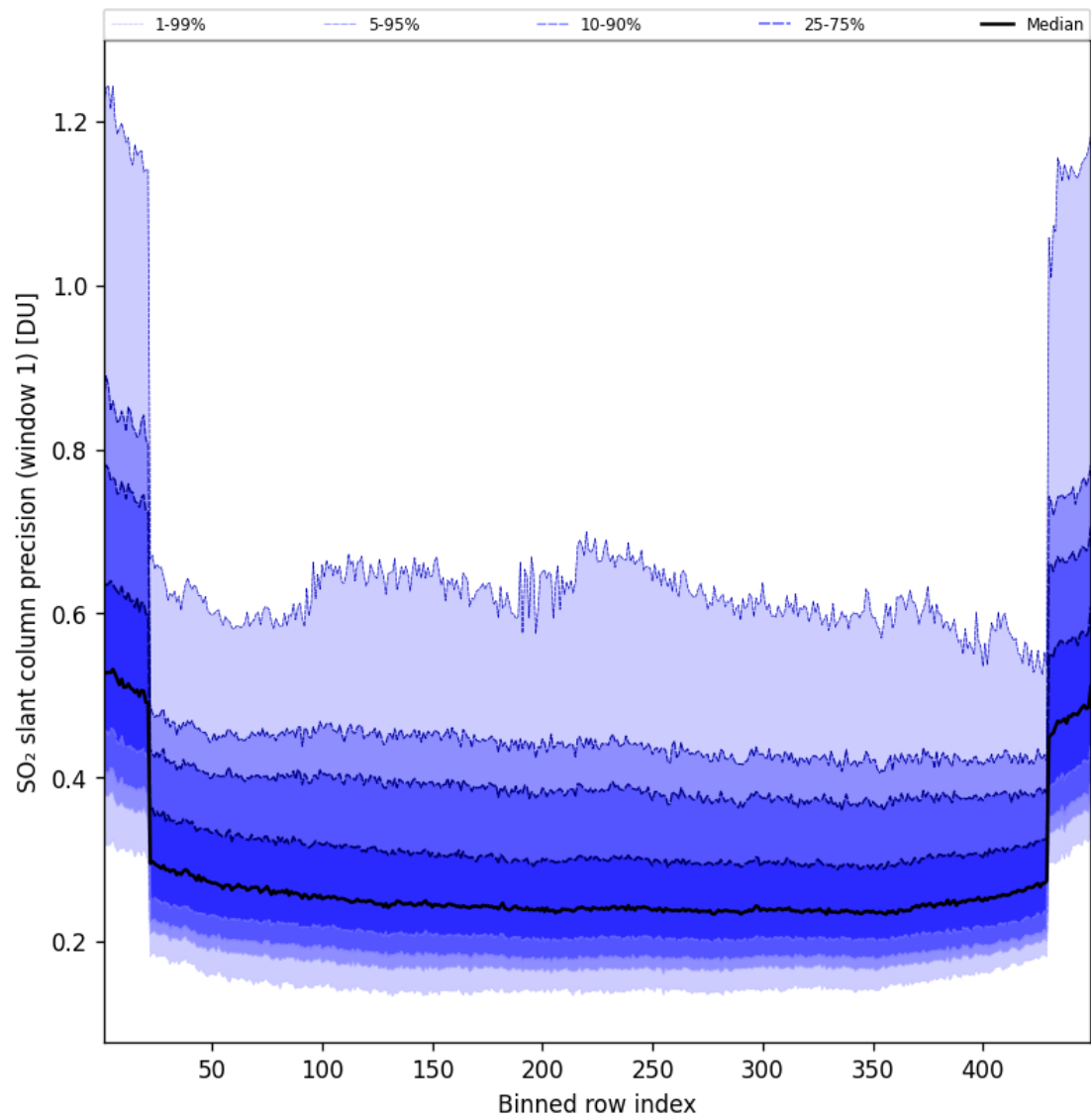


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-05-21 to 2025-05-22

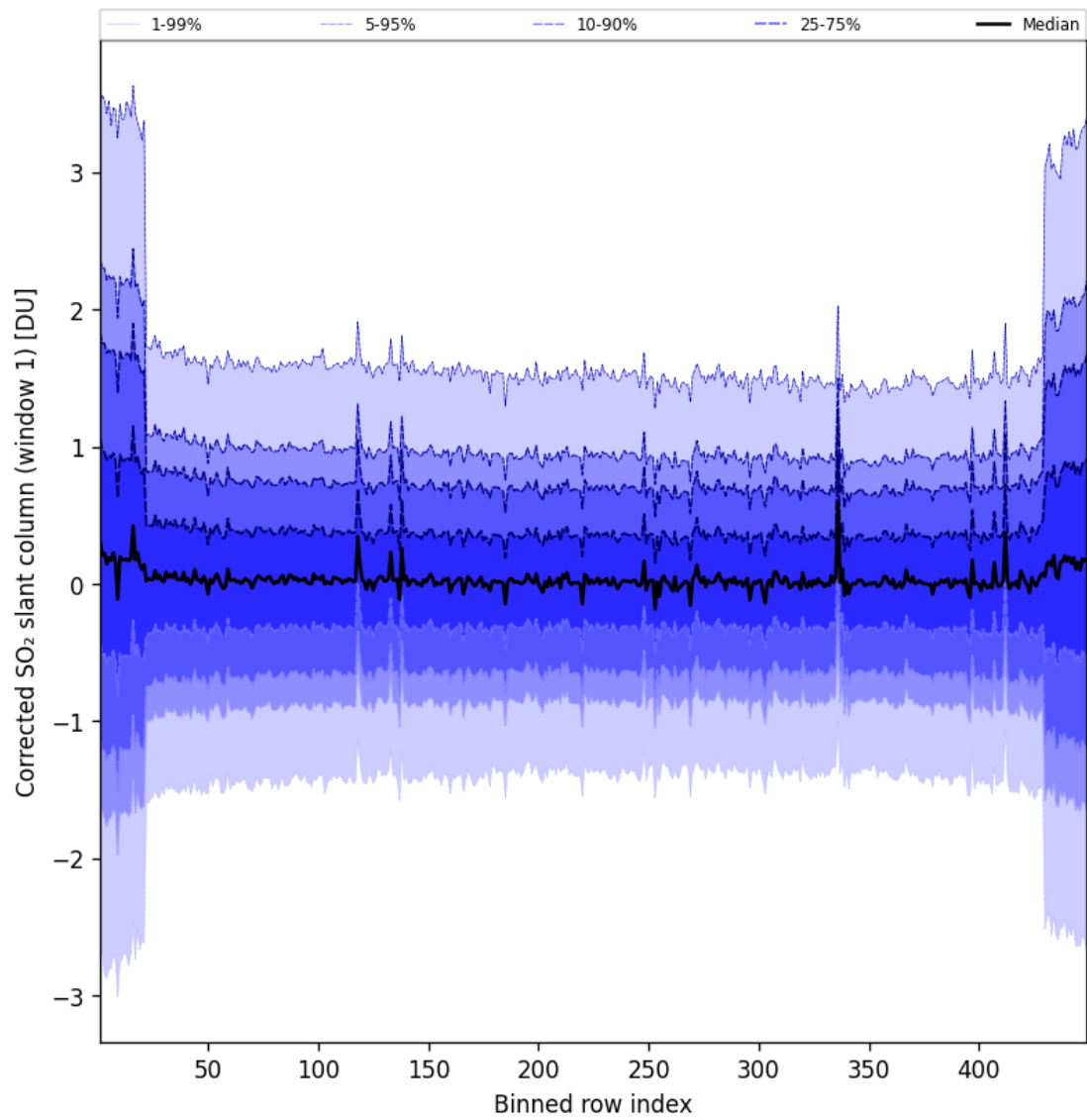


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-05-21 to 2025-05-22

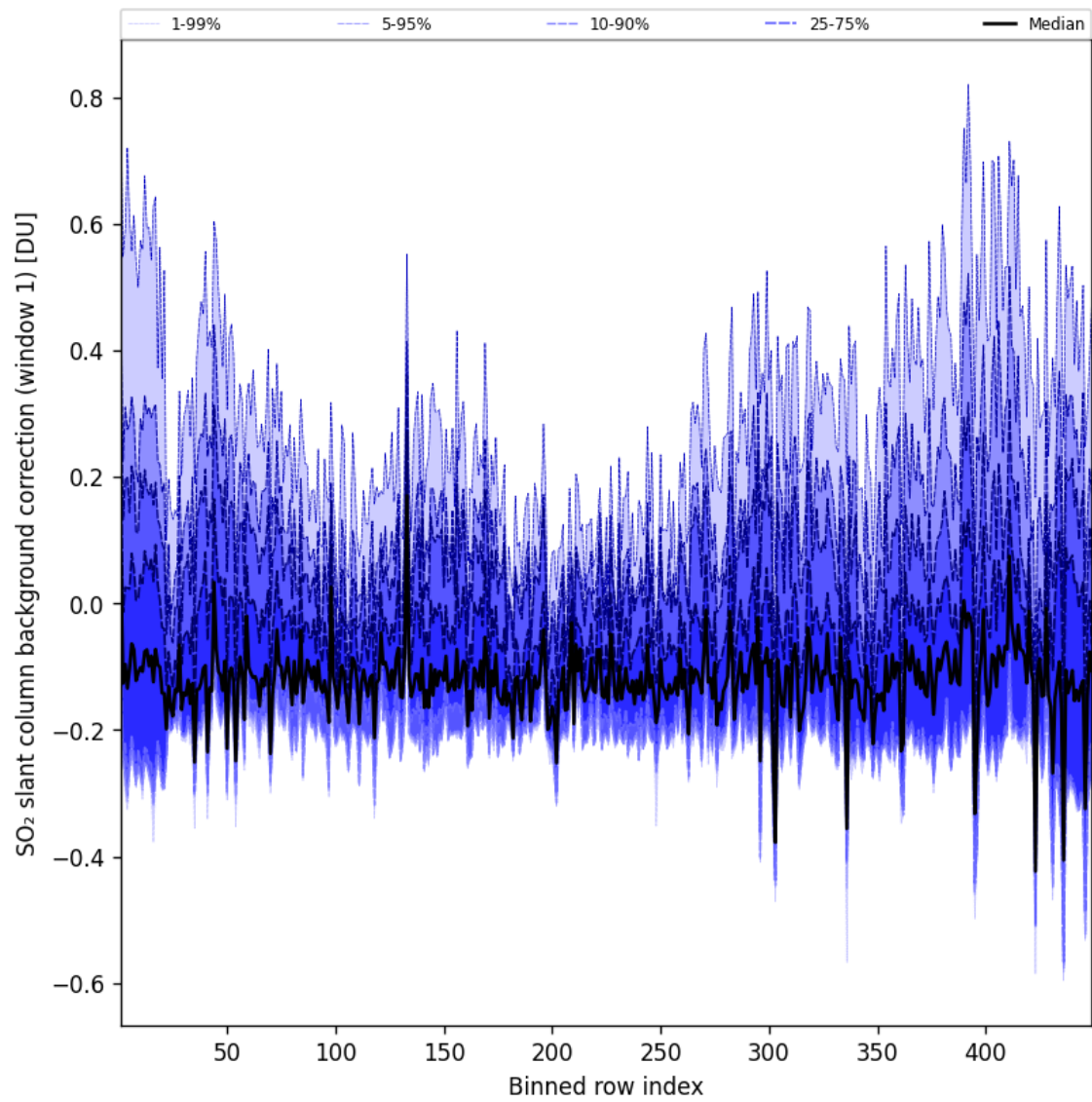


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-05-21 to 2025-05-22

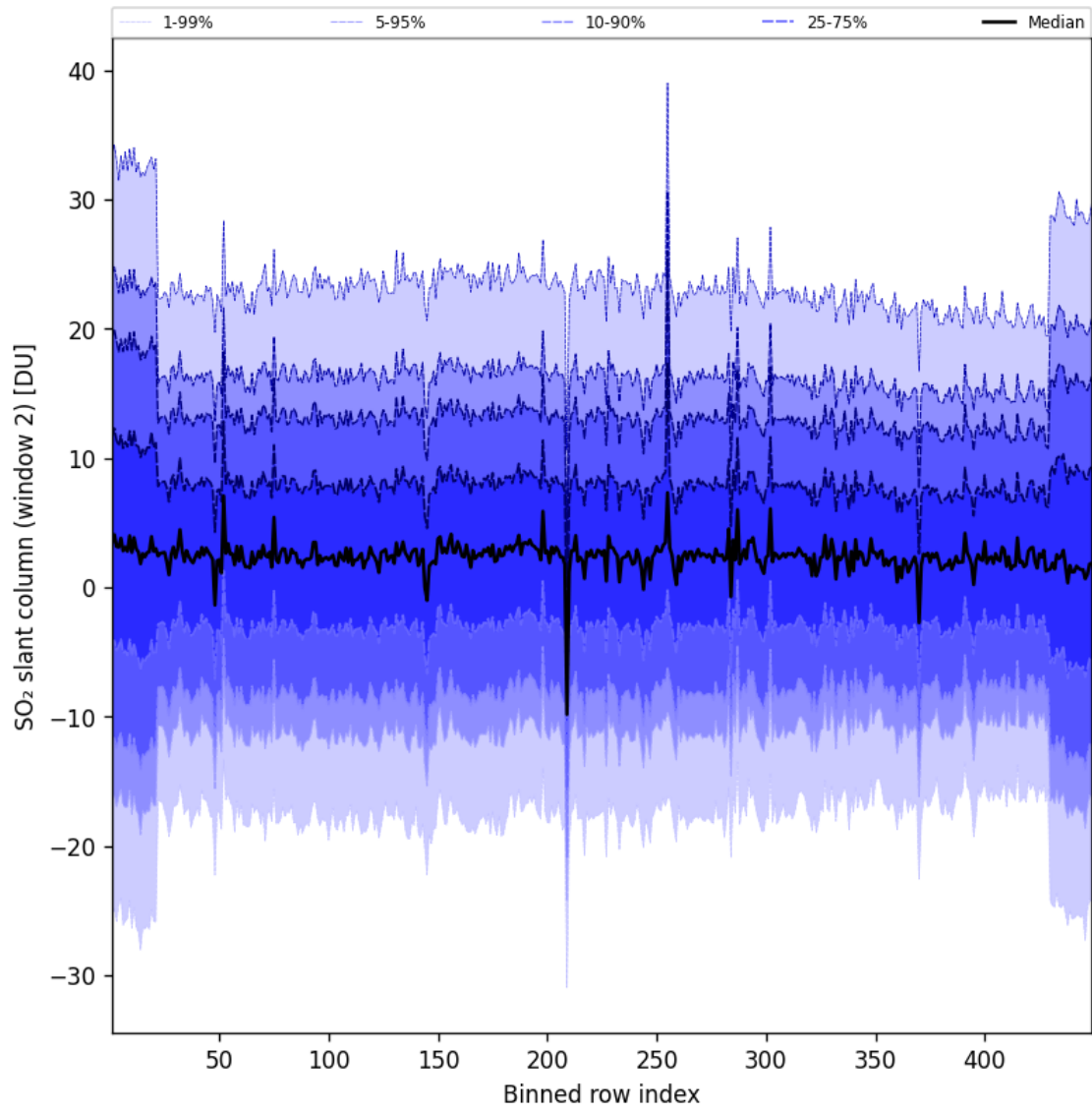


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-05-21 to 2025-05-22

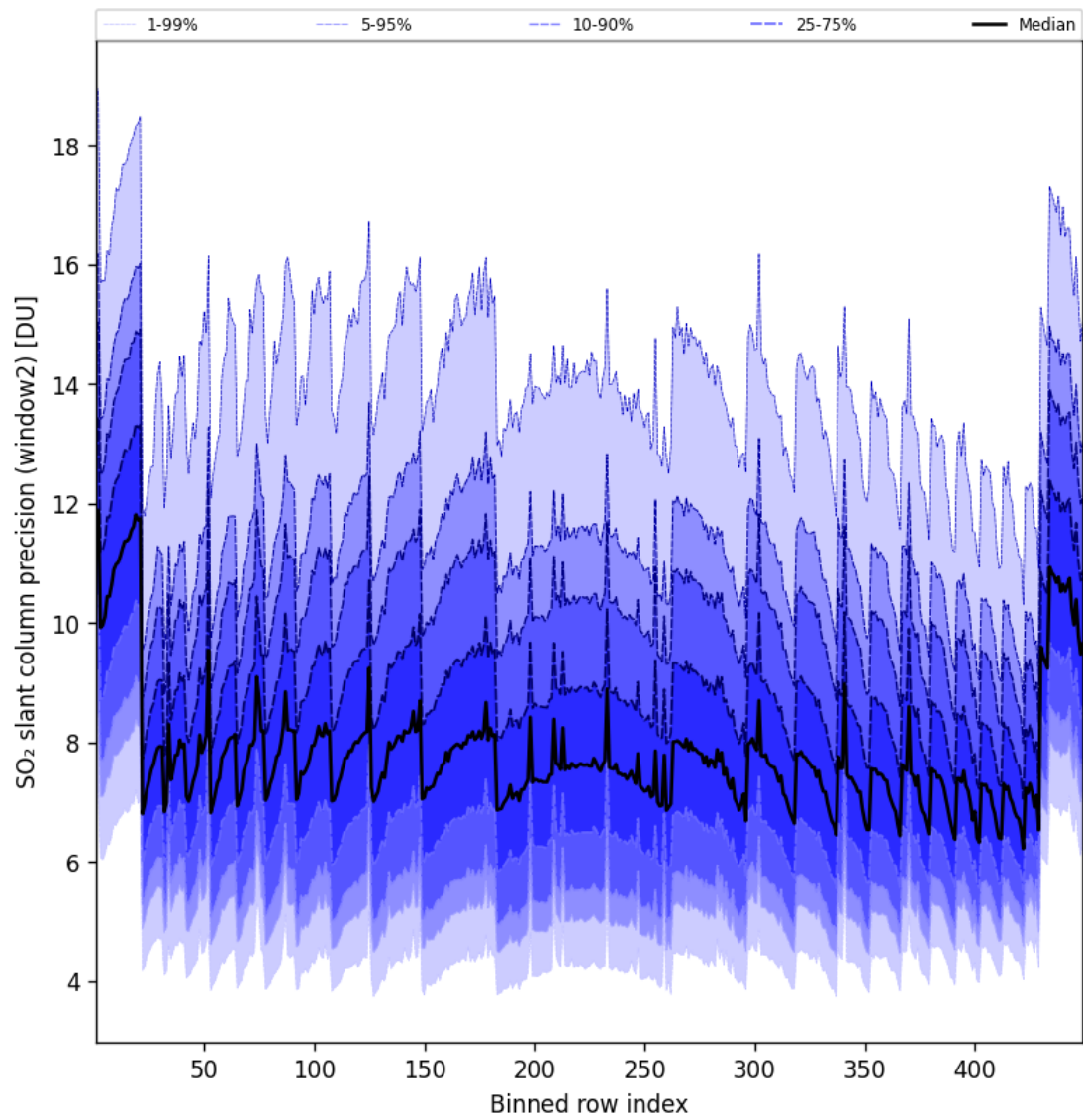


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-05-21 to 2025-05-22

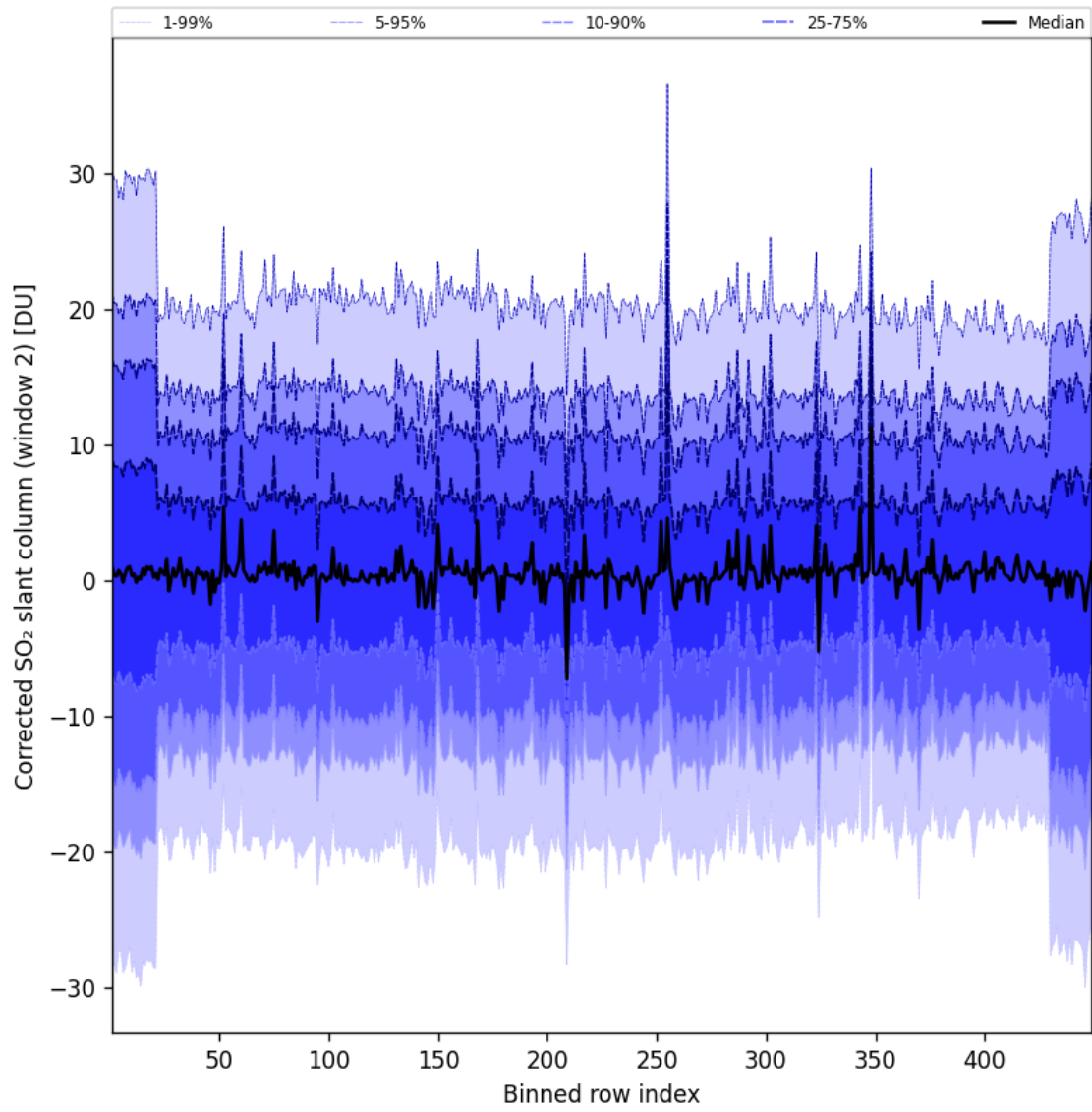


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-05-21 to 2025-05-22

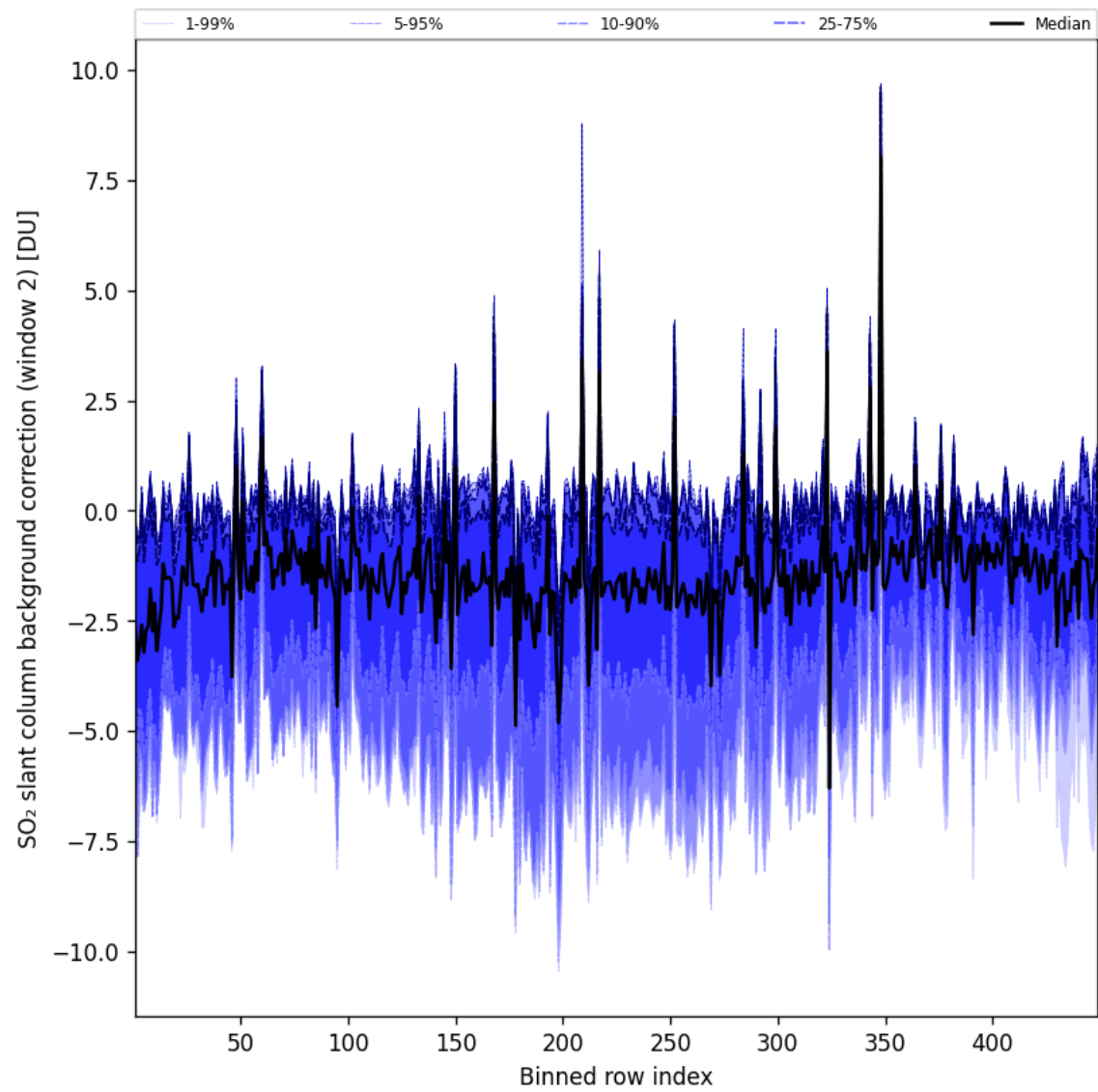


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-05-21 to 2025-05-22

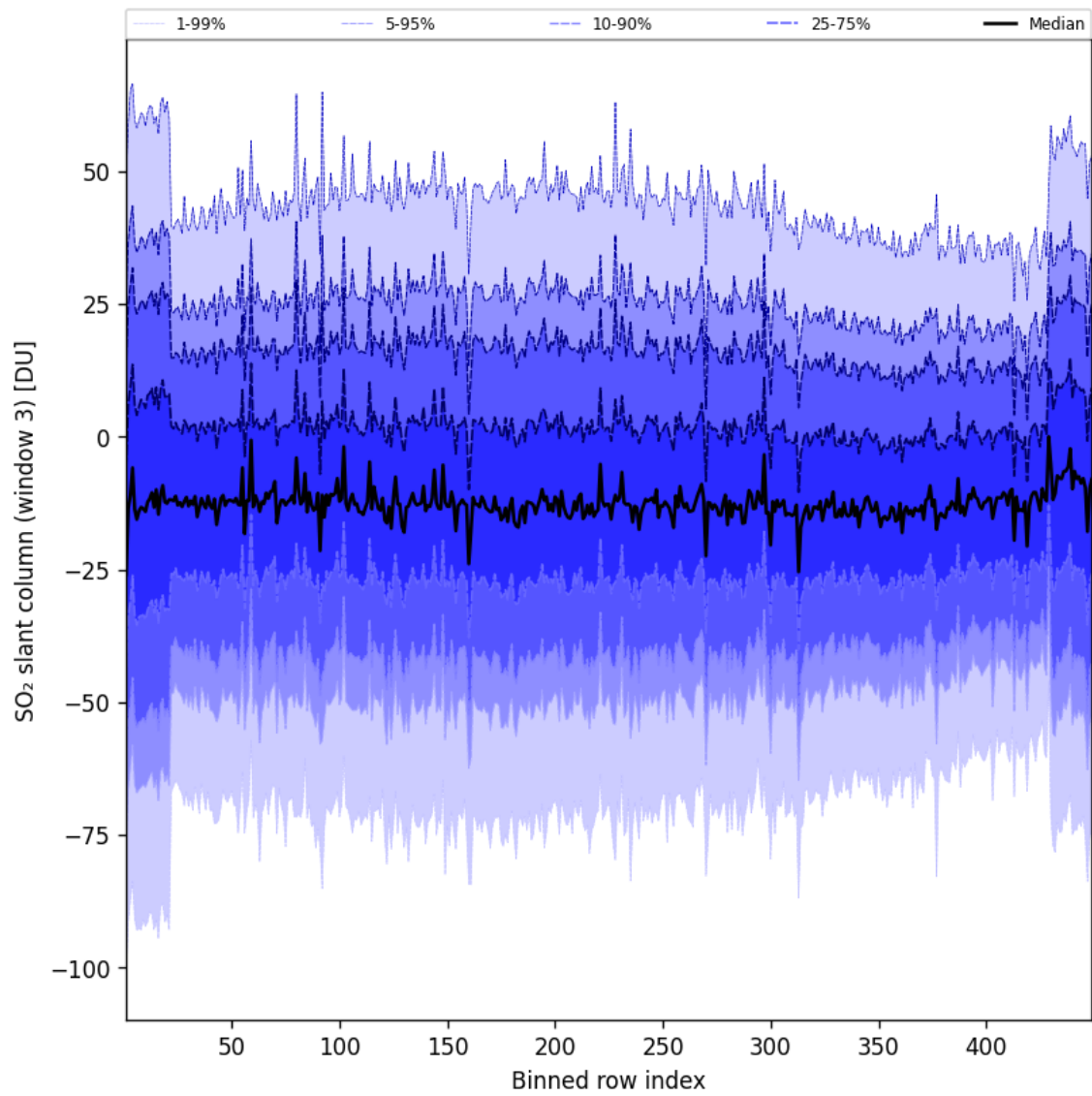


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-05-21 to 2025-05-22

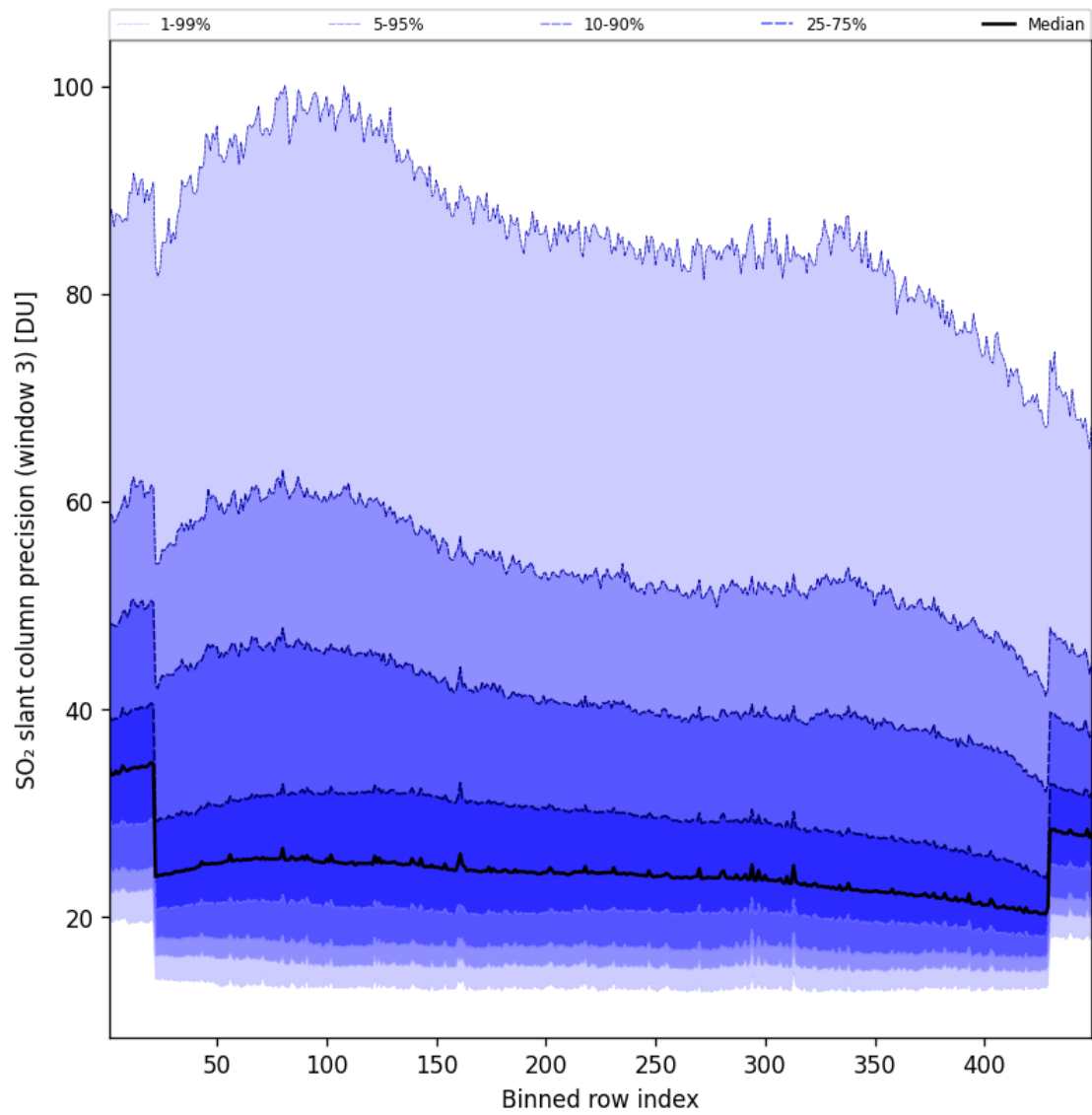


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-05-21 to 2025-05-22

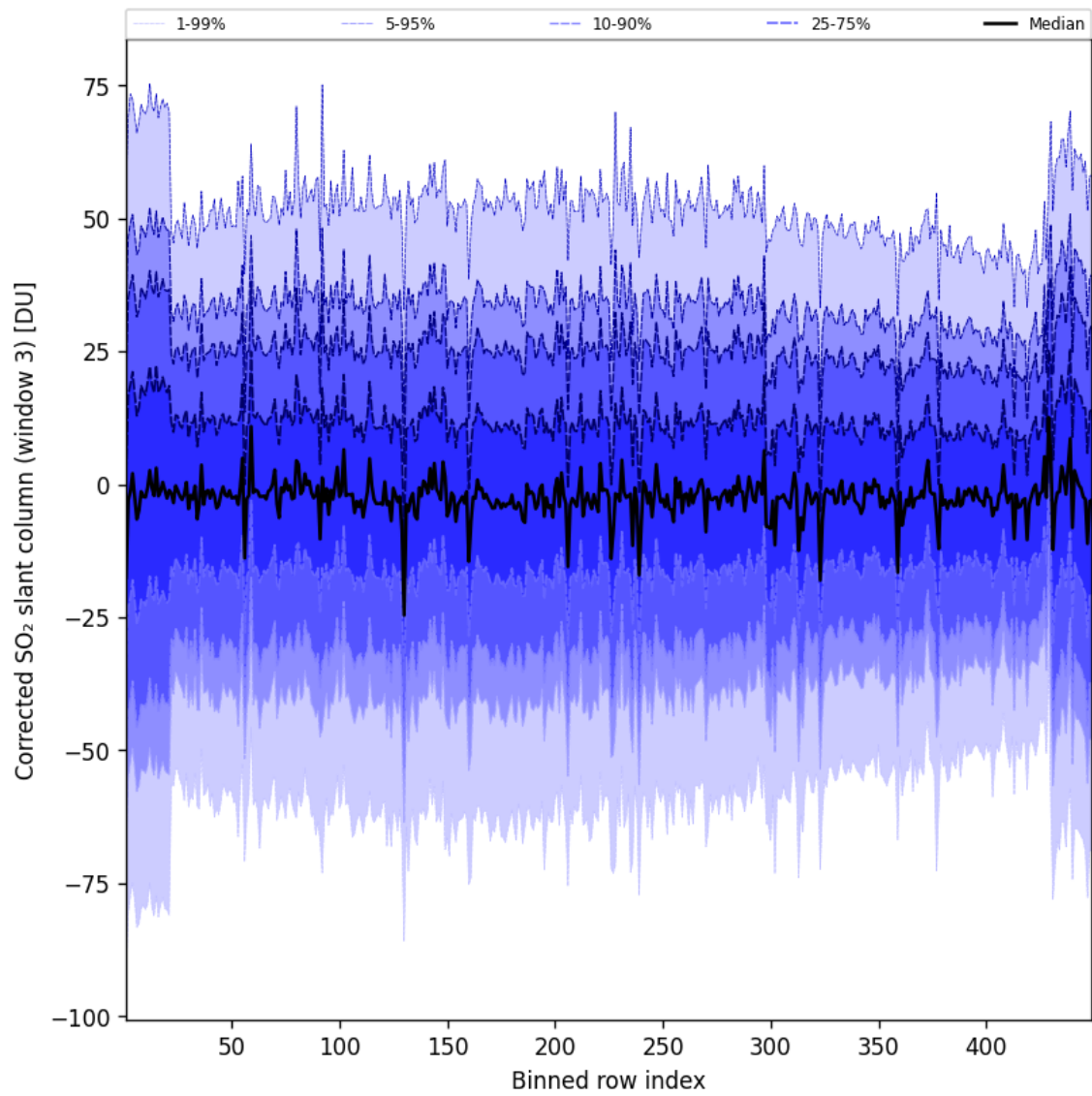


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-05-21 to 2025-05-22

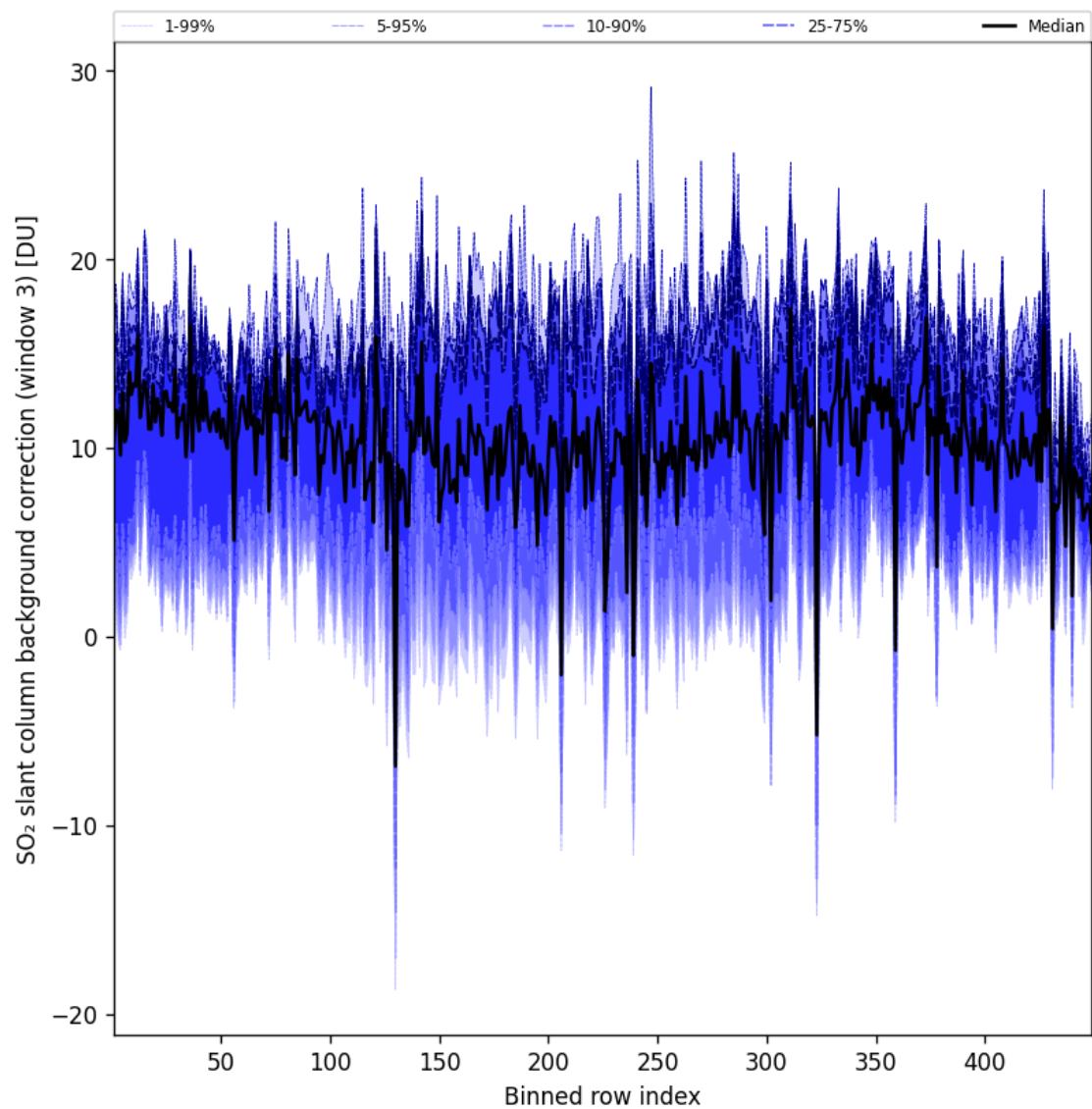


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-05-21 to 2025-05-22

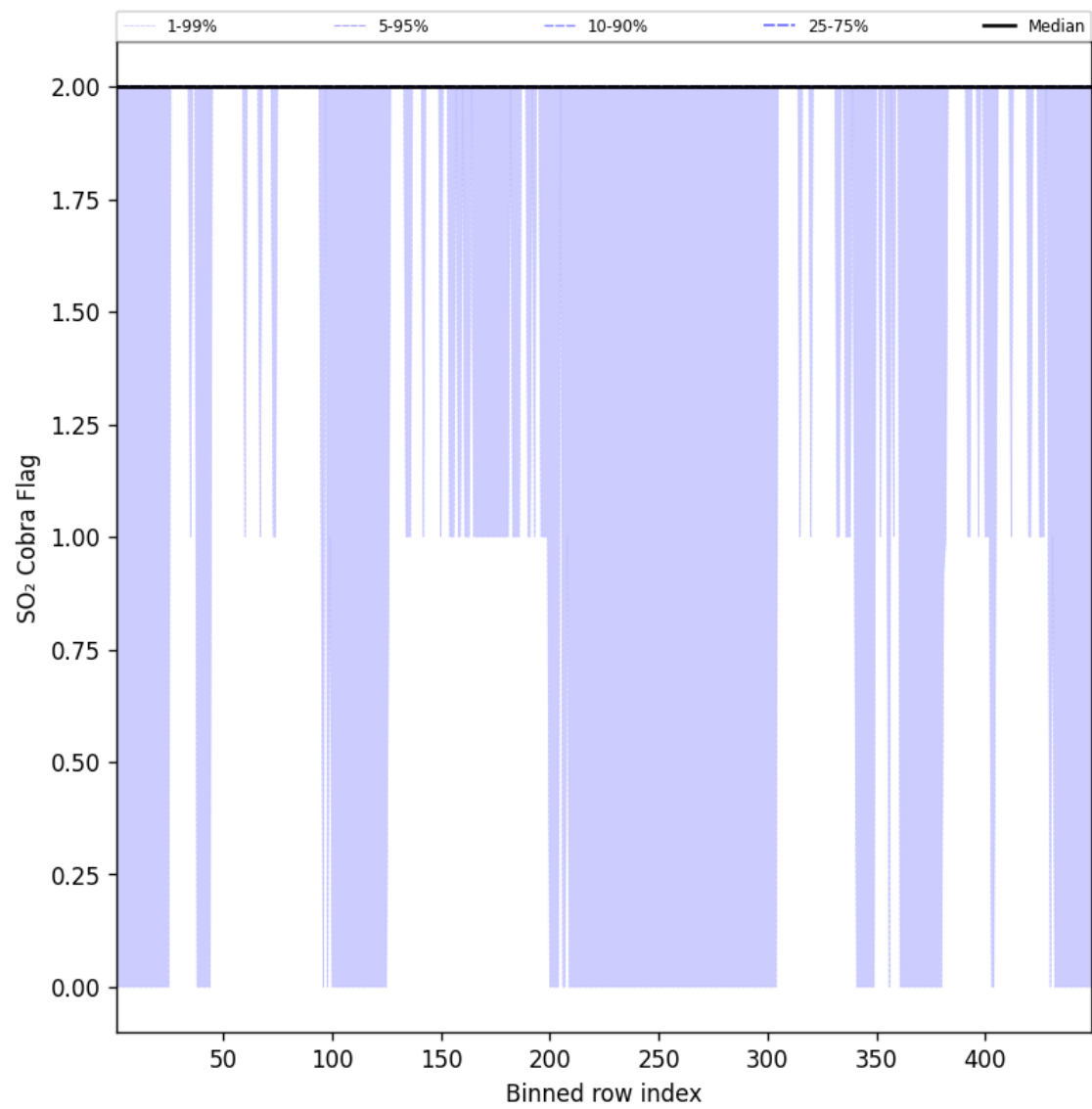


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-05-21 to 2025-05-22

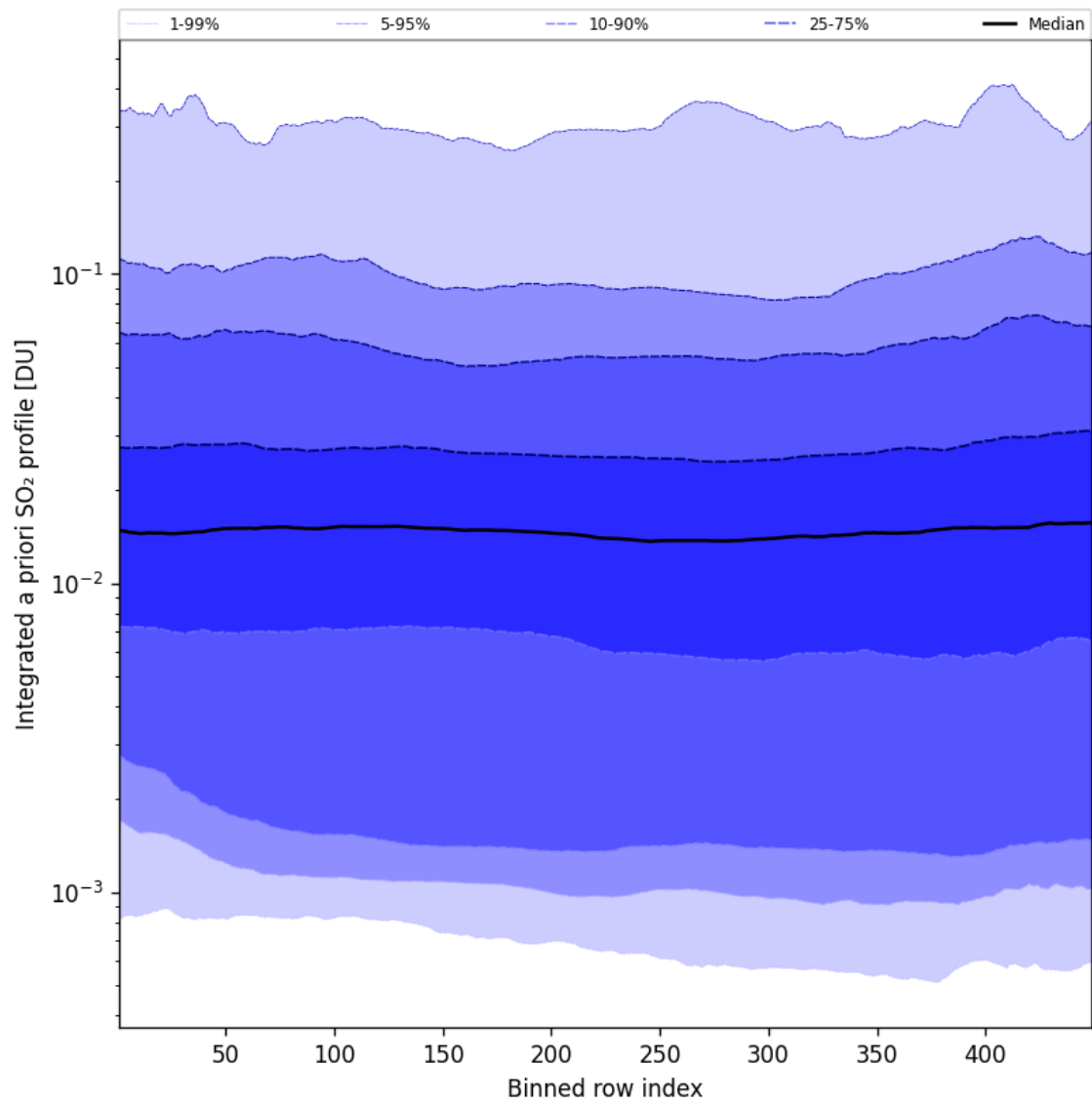


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-05-21 to 2025-05-22

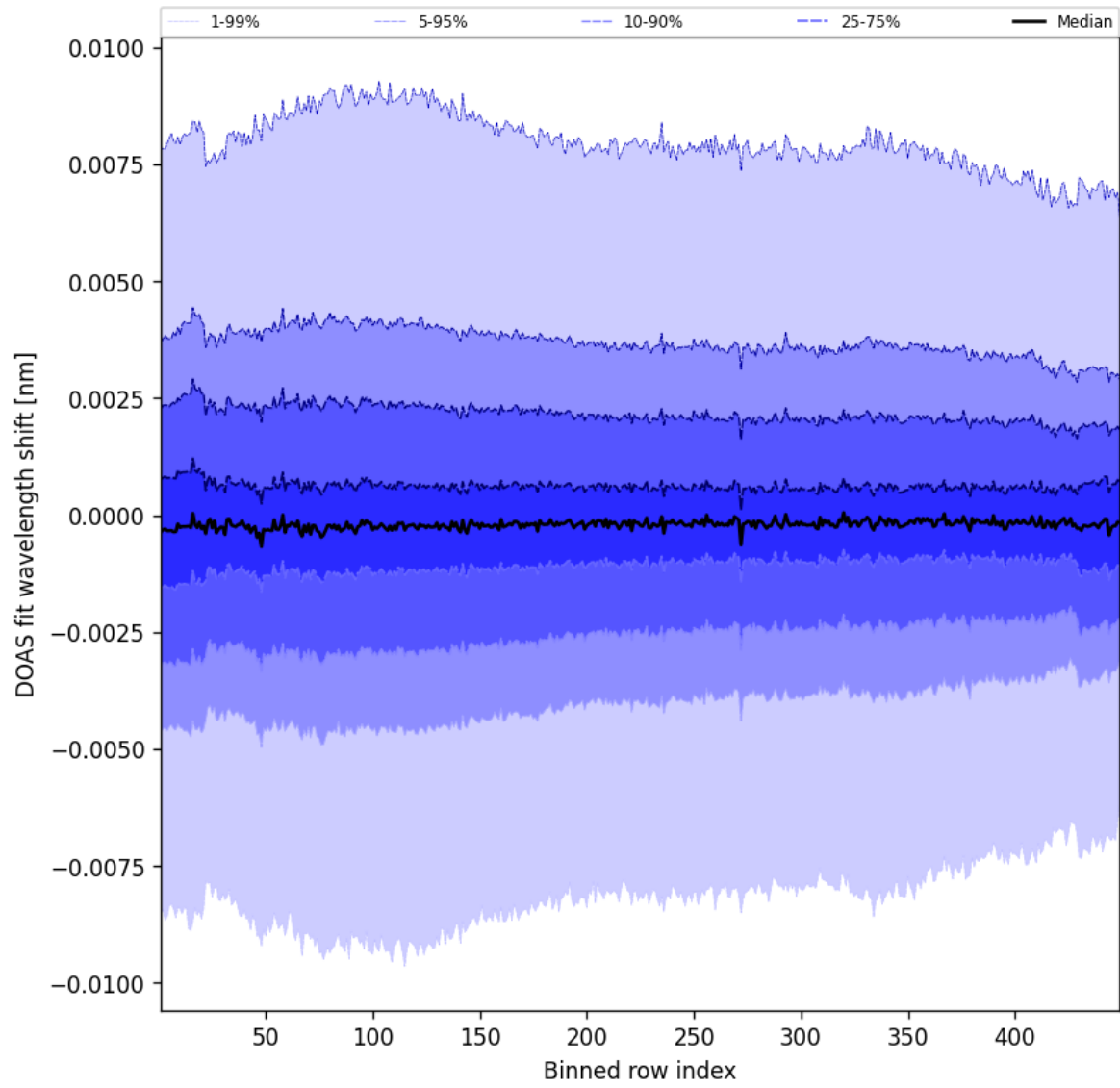


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-05-21 to 2025-05-22

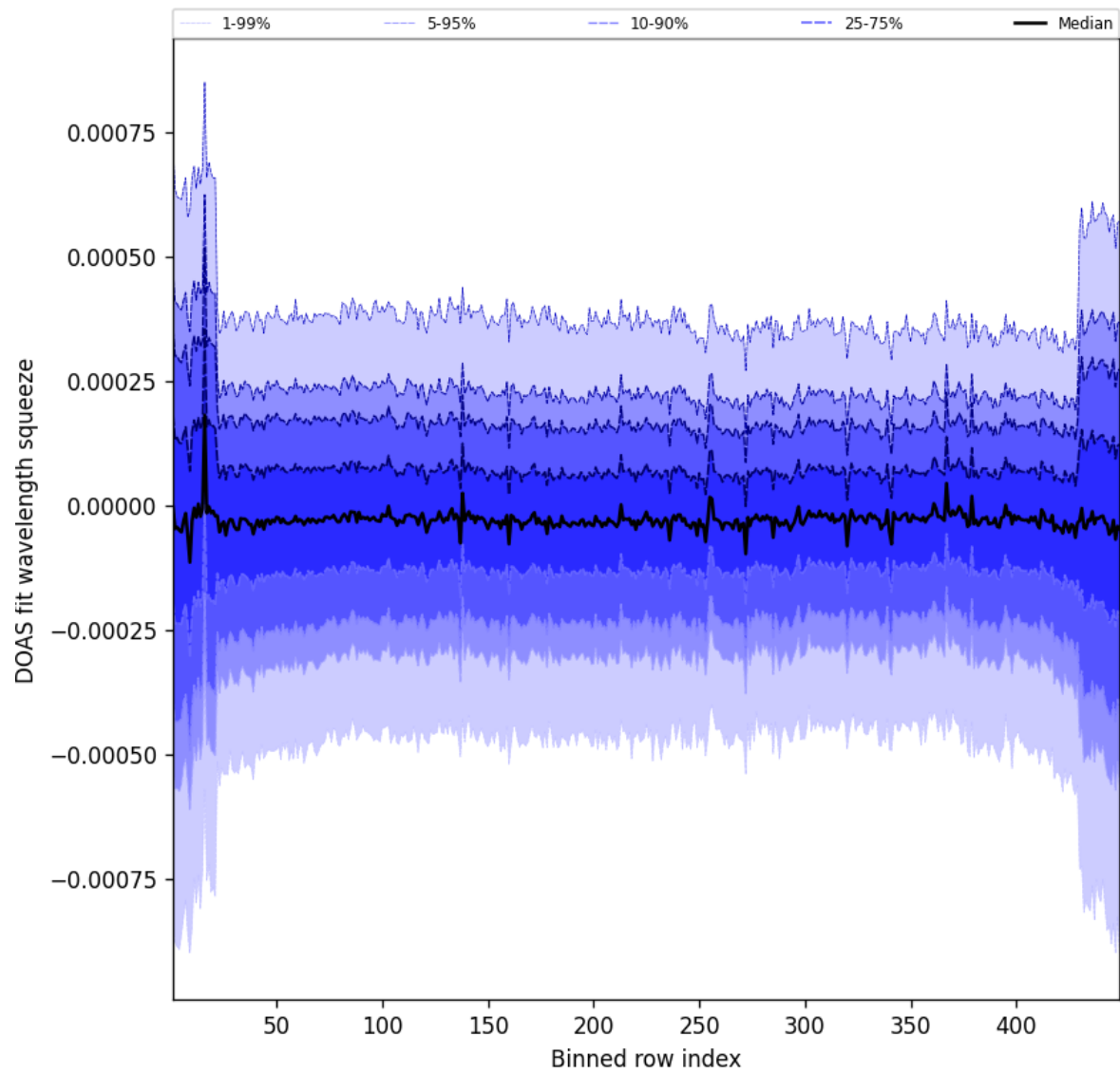


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-05-21 to 2025-05-22

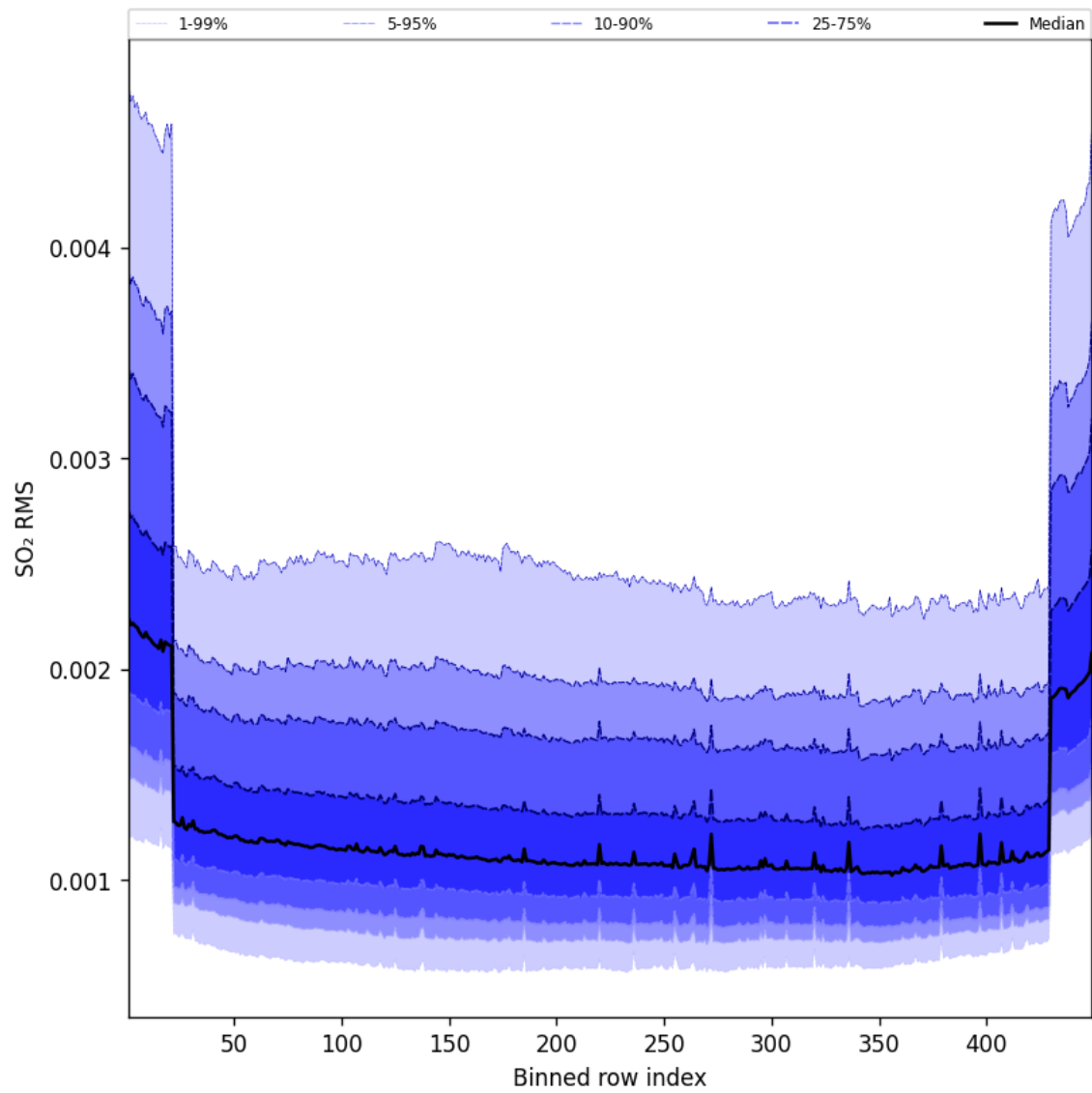


Figure 106: Along track statistics of “SO₂ RMS” for 2025-05-21 to 2025-05-22

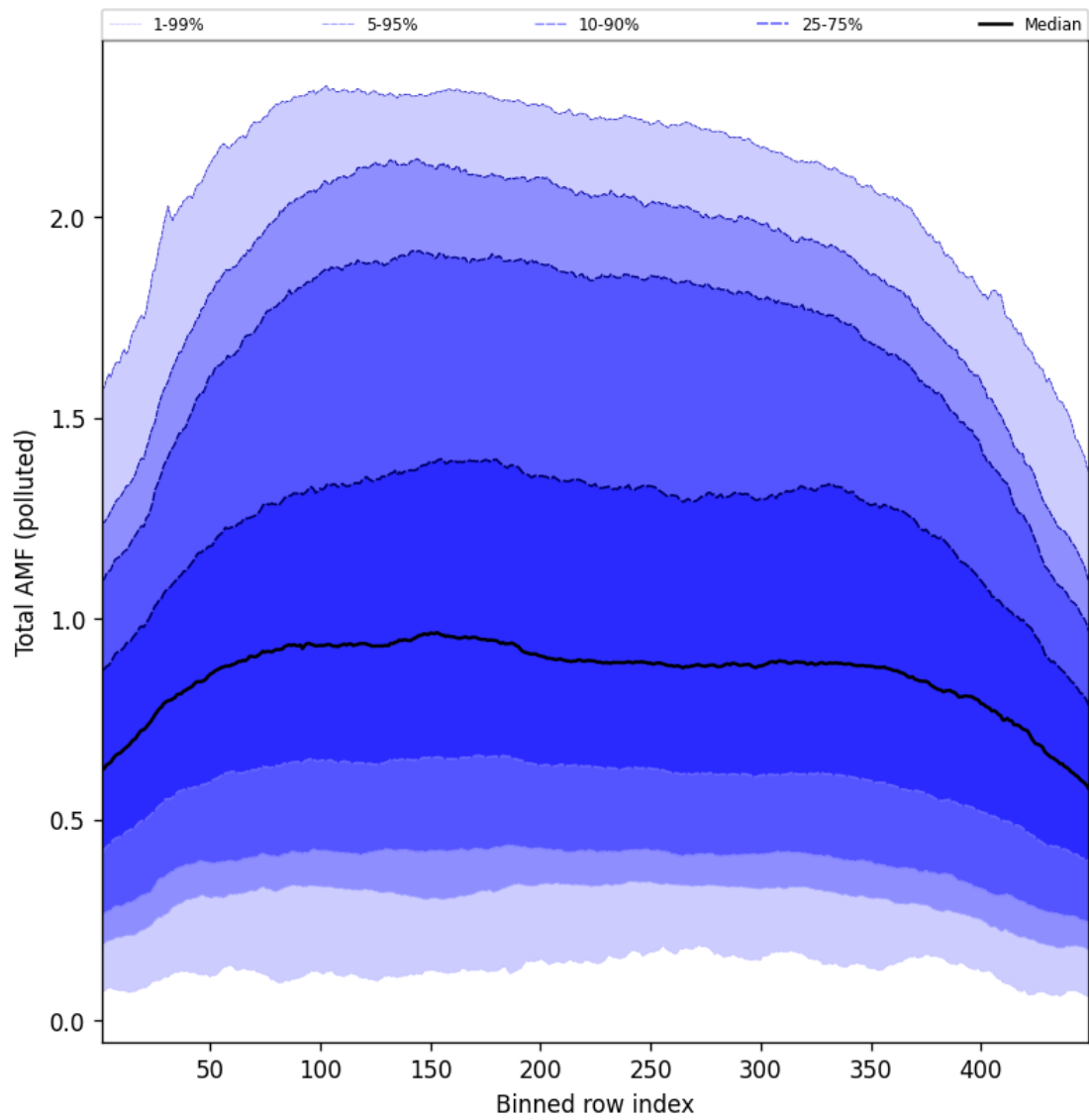


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-05-21 to 2025-05-22

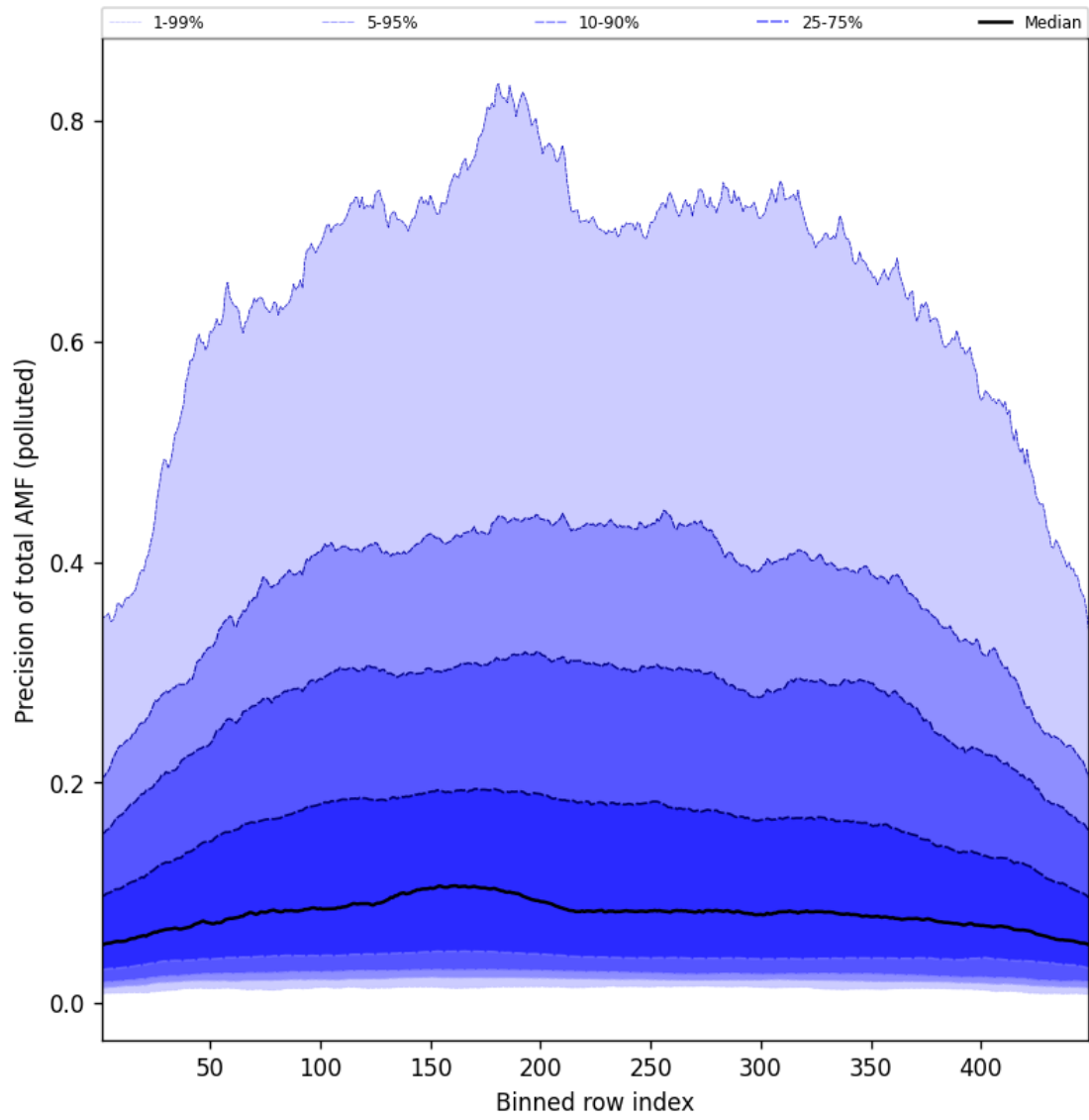


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-05-21 to 2025-05-22

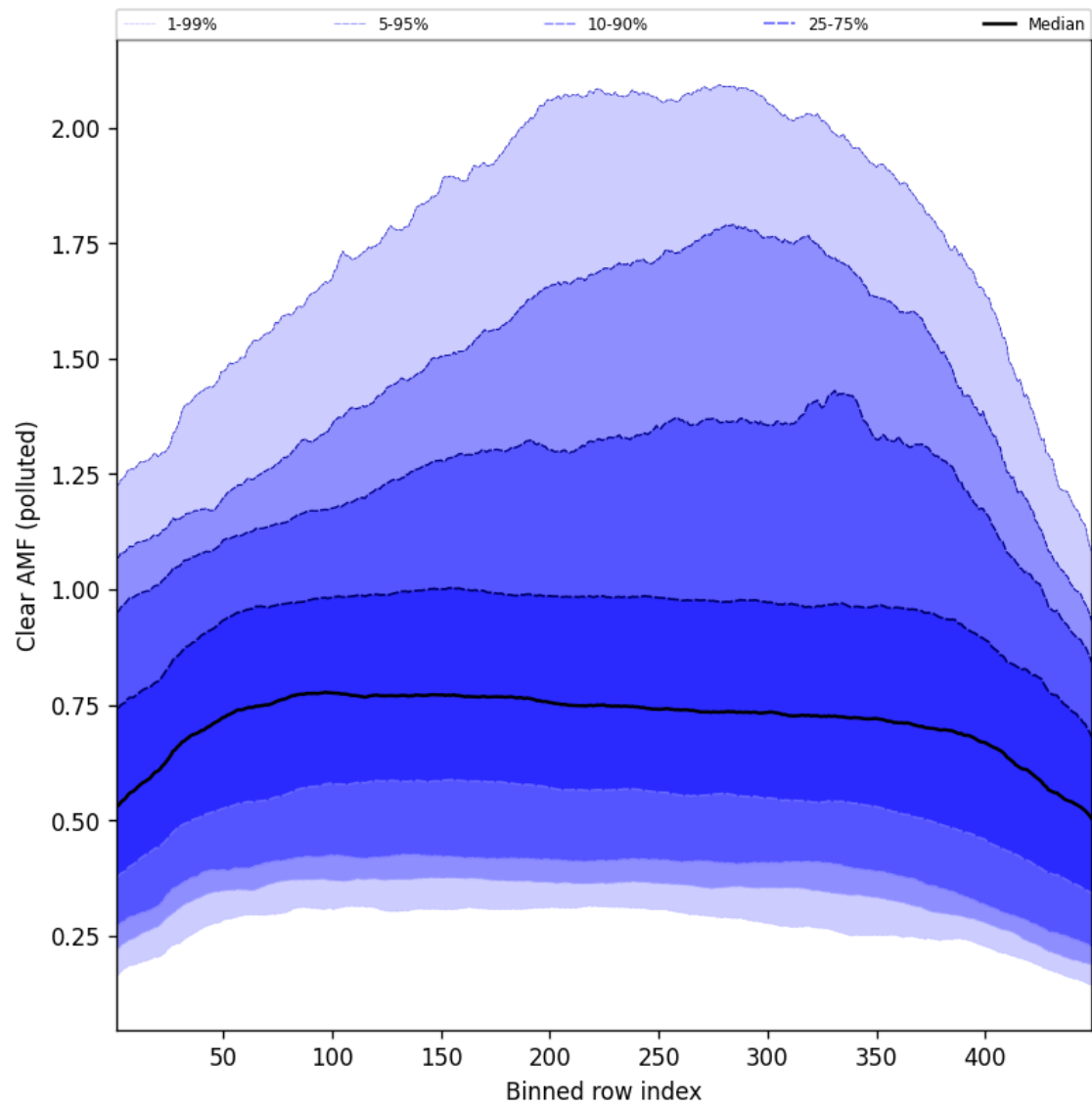


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-05-21 to 2025-05-22

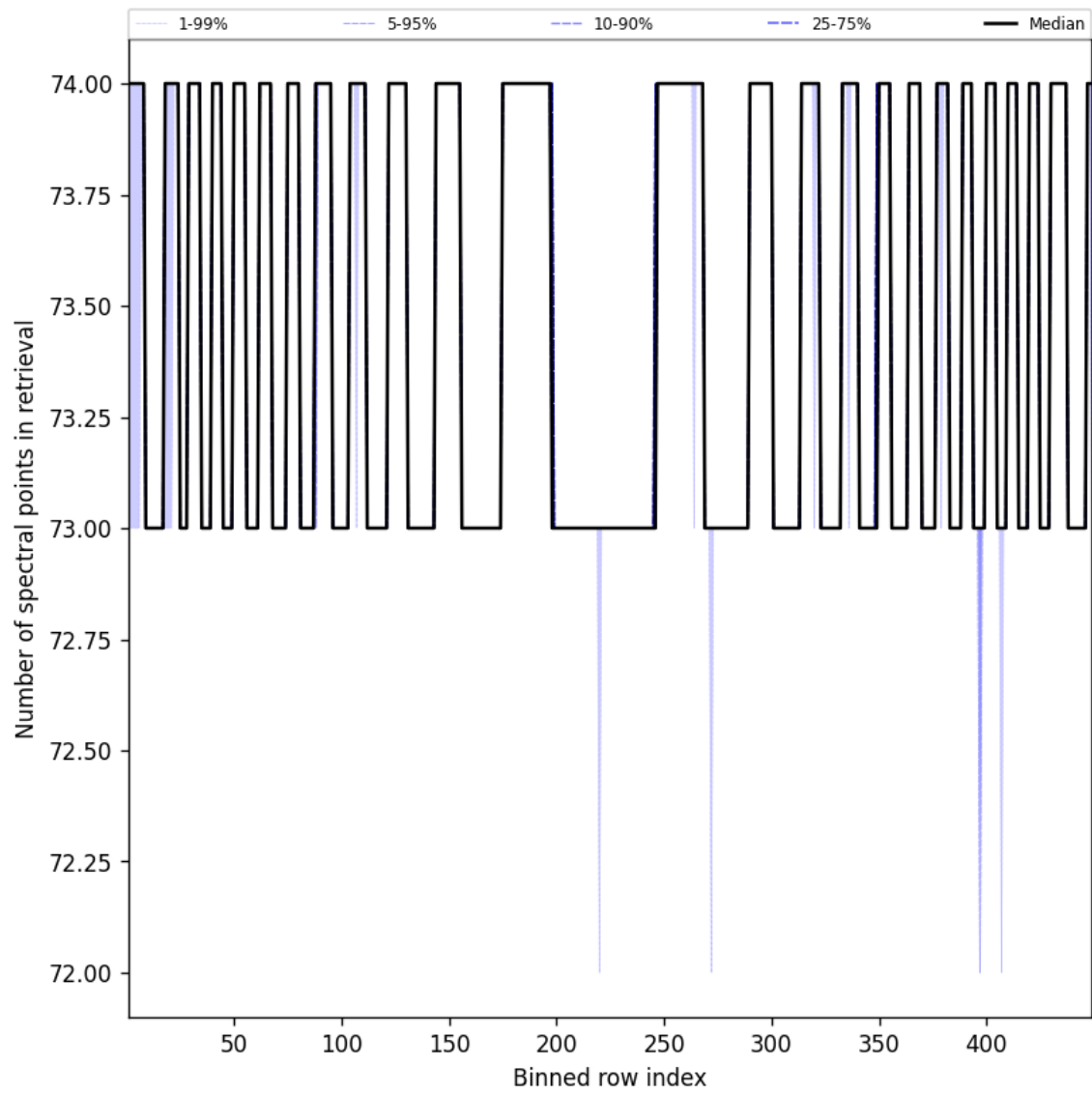


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-05-21 to 2025-05-22

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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