

PyCAMA report generated by tropl2-proc

tropl2-proc

2025-06-23 (03:40)

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]	0.647 ± 0.402	17526212	0.995	0.780	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.154 \pm 110.917) \times 10^{-2}$	17526212	0.263	0.428	1.022×10^{-2}	-136	992
sulfurdioxide total vertical column precision [DU]	0.485 ± 0.714	17526212	0.222	0.303	0.309	3.999×10^{-2}	131
sulfurdioxide slant column density corrected [DU]	$(1.990 \pm 44.838) \times 10^{-2}$	17526212	0.250	0.370	9.566×10^{-3}	-39.9	599
sulfurdioxide slant column density cobra [DU]	$(1.951 \pm 37.404) \times 10^{-2}$	17526212	0.250	0.370	9.566×10^{-3}	-39.9	56.1
sulfurdioxide slant column density cobra precision [DU]	0.297 ± 0.134	17526212	0.213	0.132	0.256	8.053×10^{-2}	33.0
sulfurdioxide slant column density window1 [DU]	0.121 ± 0.691	17526212	0.125	0.747	0.123	-104	88.4
sulfurdioxide slant column density window1 precision [DU]	0.297 ± 0.134	17526212	0.213	0.132	0.256	8.053×10^{-2}	33.0
sulfurdioxide slant column density corrected win1 [DU]	$(2.359 \pm 68.057) \times 10^{-2}$	17526212	-2.500×10^{-2}	0.729	5.168×10^{-3}	-104	88.5
background so2 slant column offset window1 [DU]	$(-9.692 \pm 14.042) \times 10^{-2}$	17526212	-0.180	0.180	-0.127	-0.623	1.67
sulfurdioxide slant column density window2 [DU]	0.739 ± 9.062	17526212	0.750	11.3	0.646	-1.518×10^3	1.331×10^3
sulfurdioxide slant column density window2 precision [DU]	8.22 ± 2.42	17526212	7.43	2.68	7.85	2.30	556
sulfurdioxide slant column density corrected win2 [DU]	-0.403 ± 8.944	17526212	-0.250	11.1	-0.398	-1.520×10^3	1.330×10^3
background so2 slant column offset window2 [DU]	-1.14 ± 1.71	17526212	0.250	2.29	-0.853	-12.2	6.93
sulfurdioxide slant column density window3 [DU]	-2.53 ± 23.97	17526212	-2.80	29.4	-2.35	-400	329
sulfurdioxide slant column density window3 precision [DU]	28.4 ± 13.6	17526212	22.5	10.7	24.9	8.89	434
sulfurdioxide slant column density corrected win3 [DU]	5.63 ± 23.63	17526212	6.16	29.1	5.94	-393	335
background so2 slant column offset window3 [DU]	8.16 ± 4.33	17526212	10.6	6.16	8.49	-16.8	24.1
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17526212	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(2.901 \pm 5.310) \times 10^{-2}$	17526212	1.664×10^{-2}	2.257×10^{-2}	1.556×10^{-2}	1.923×10^{-4}	1.75
fitted radiance shift [nm]	$(-9.473 \pm 256.425) \times 10^{-5}$	17526212	1.000×10^{-4}	1.717×10^{-3}	-9.587×10^{-5}	-5.084×10^{-2}	8.192×10^{-2}
fitted radiance squeeze [1]	$(-5.128 \pm 19.277) \times 10^{-5}$	17526212	-3.000×10^{-5}	2.232×10^{-4}	-4.467×10^{-5}	-1.662×10^{-2}	2.208×10^{-2}
fitted root mean square [1]	$(1.295 \pm 0.535) \times 10^{-3}$	17526212	1.025×10^{-3}	5.266×10^{-4}	1.143×10^{-3}	3.132×10^{-4}	6.030×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.940 ± 0.499	17526212	0.700	0.616	0.847	5.000×10^{-2}	2.89
sulfurdioxide total air mass factor polluted precision [1]	0.120 ± 0.135	17526212	3.500×10^{-2}	0.113	7.698×10^{-2}	3.011×10^{-3}	2.16
sulfurdioxide clear air mass factor polluted [1]	0.787 ± 0.375	17526212	0.660	0.389	0.719	4.785×10^{-2}	2.89
number of spectral points in retrieval [1]	73.4 ± 0.5	17526212	73.0	1.000	73.0	52.0	156

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	5.000×10^{-2}	0.110	0.220	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.14	-0.807	-0.498	-0.338	-0.200	0.227	0.376	0.554	0.909	2.53
sulfurdioxide total vertical column precision [DU]	9.198×10^{-2}	0.127	0.152	0.177	0.210	0.513	0.681	0.881	1.33	3.19
sulfurdioxide slant column density corrected [DU]	-0.862	-0.497	-0.361	-0.269	-0.174	0.197	0.298	0.397	0.554	1.04
sulfurdioxide slant column density cobra [DU]	-0.862	-0.497	-0.361	-0.269	-0.174	0.197	0.298	0.397	0.554	1.04
sulfurdioxide slant column density cobra precision [DU]	0.142	0.170	0.186	0.197	0.212	0.344	0.400	0.454	0.545	0.786
sulfurdioxide slant column density window1 [DU]	-1.68	-0.936	-0.648	-0.455	-0.253	0.493	0.688	0.874	1.16	1.95
sulfurdioxide slant column density window1 precision [DU]	0.142	0.170	0.186	0.197	0.212	0.344	0.400	0.454	0.545	0.786
sulfurdioxide slant column density corrected win1 [DU]	-1.65	-0.975	-0.716	-0.540	-0.354	0.375	0.576	0.771	1.08	1.93
background so2 slant column offset window1 [DU]	-0.352	-0.275	-0.239	-0.219	-0.196	-1.597×10^{-2}	3.985×10^{-2}	9.141×10^{-2}	0.163	0.318
sulfurdioxide slant column density window2 [DU]	-20.6	-13.6	-10.3	-7.76	-4.97	6.32	9.20	11.8	15.4	23.3
sulfurdioxide slant column density window2 precision [DU]	4.27	5.13	5.69	6.14	6.67	9.35	10.3	11.2	12.5	15.3
sulfurdioxide slant column density corrected win2 [DU]	-22.0	-14.8	-11.3	-8.79	-5.98	5.17	7.96	10.5	13.9	21.3
background so2 slant column offset window2 [DU]	-5.75	-4.27	-3.49	-2.88	-2.20	9.583×10^{-2}	0.366	0.583	0.900	2.69
sulfurdioxide slant column density window3 [DU]	-64.2	-42.1	-31.9	-24.7	-17.1	12.4	20.0	27.0	36.4	55.5
sulfurdioxide slant column density window3 precision [DU]	13.2	15.5	17.6	19.2	20.8	31.6	36.3	42.0	53.8	85.7
sulfurdioxide slant column density corrected win3 [DU]	-55.2	-33.6	-23.5	-16.4	-8.71	20.4	27.8	34.5	43.7	62.7
background so2 slant column offset window3 [DU]	-1.74	0.833	2.45	3.71	5.15	11.3	12.4	13.3	14.6	17.5
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]	3.259×10^{-4}	4.929×10^{-4}	8.182×10^{-4}	1.499×10^{-3}	6.145×10^{-3}	2.872×10^{-2}	4.201×10^{-2}	6.600×10^{-2}	0.111	0.238
fitted radiance shift [nm]	-7.900×10^{-3}	-3.869×10^{-3}	-2.450×10^{-3}	-1.646×10^{-3}	-9.765×10^{-4}	7.401×10^{-4}	1.409×10^{-3}	2.262×10^{-3}	3.768×10^{-3}	7.958×10^{-3}
fitted radiance squeeze [1]	-5.650×10^{-4}	-3.665×10^{-4}	-2.809×10^{-4}	-2.218×10^{-4}	-1.596×10^{-4}	6.356×10^{-5}	1.180×10^{-4}	1.682×10^{-4}	2.404×10^{-4}	4.162×10^{-4}
fitted root mean square [1]	5.943×10^{-4}	7.360×10^{-4}	8.210×10^{-4}	8.843×10^{-4}	9.575×10^{-4}	1.484×10^{-3}	1.734×10^{-3}	1.973×10^{-3}	2.319×10^{-3}	3.221×10^{-3}
sulfurdioxide total air mass factor polluted [1]	8.476×10^{-2}	0.271	0.382	0.477	0.589	1.20	1.46	1.69	1.95	2.32
sulfurdioxide total air mass factor polluted precision [1]	1.044×10^{-2}	1.944×10^{-2}	2.570×10^{-2}	3.135×10^{-2}	3.930×10^{-2}	0.152	0.197	0.250	0.353	0.710
sulfurdioxide clear air mass factor polluted [1]	0.232	0.326	0.387	0.453	0.541	0.930	1.05	1.23	1.65	2.03
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]	0.601 $\pm$ 0.412	12327382	0.820	0.490	0.0	1.000	0.180	1.000
sulfurdioxide total vertical column [DU]	$(2.049 \pm 103.831) \times 10^{-2}$	12327382	0.386	7.950×10^{-3}	-136	346	-0.183	0.203
sulfurdioxide total vertical column precision [DU]	0.441 $\pm$ 0.714	12327382	0.257	0.273	3.999×10^{-2}	50.3	0.194	0.450
sulfurdioxide slant column density corrected [DU]	$(1.466 \pm 34.276) \times 10^{-2}$	12327382	0.347	7.659×10^{-3}	-7.23	59.7	-0.165	0.182
sulfurdioxide slant column density cobra [DU]	$(1.452 \pm 33.300) \times 10^{-2}$	12327382	0.347	7.659×10^{-3}	-7.23	36.5	-0.165	0.182
sulfurdioxide slant column density cobra precision [DU]	0.275 $\pm$ 0.116	12327382	0.108	0.240	8.053×10^{-2}	6.86	0.204	0.311
sulfurdioxide slant column density window1 [DU]	0.105 $\pm$ 0.635	12327382	0.707	0.113	-59.3	39.1	-0.246	0.461
sulfurdioxide slant column density window1 precision [DU]	0.275 $\pm$ 0.116	12327382	0.108	0.240	8.053×10^{-2}	6.86	0.204	0.311
sulfurdioxide slant column density corrected win1 [DU]	$(1.083 \pm 62.008) \times 10^{-2}$	12327382	0.686	-2.256×10^{-3}	-59.3	38.9	-0.341	0.344
background so2 slant column offset window1 [DU]	$(-9.414 \pm 14.659) \times 10^{-2}$	12327382	0.205	-0.122	-0.566	1.16	-0.205	-3.841×10^{-4}
sulfurdioxide slant column density window2 [DU]	0.527 $\pm$ 8.354	12327382	10.7	0.518	-806	460	-4.83	5.87
sulfurdioxide slant column density window2 precision [DU]	7.75 $\pm$ 2.10	12327382	2.33	7.46	2.30	323	6.39	8.72
sulfurdioxide slant column density corrected win2 [DU]	-0.484 $\pm$ 8.257	12327382	10.6	-0.451	-804	460	-5.75	4.81
background so2 slant column offset window2 [DU]	-1.01 $\pm$ 1.62	12327382	2.33	-0.794	-7.46	6.93	-2.12	0.211
sulfurdioxide slant column density window3 [DU]	-1.93 $\pm$ 22.37	12327382	27.6	-2.03	-244	242	-15.7	11.9
sulfurdioxide slant column density window3 precision [DU]	26.8 $\pm$ 13.5	12327382	8.78	23.2	8.89	434	19.9	28.6
sulfurdioxide slant column density corrected win3 [DU]	5.84 $\pm$ 21.98	12327382	27.3	6.05	-243	243	-7.63	19.6
background so2 slant column offset window3 [DU]	7.77 $\pm$ 4.35	12327382	6.75	8.59	-16.8	18.7	4.45	11.2
sulfurdioxide slant column cobra flag [1]	1.98 $\pm$ 0.18	12327382	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.991 \pm 5.898) \times 10^{-2}$	12327382	2.913×10^{-2}	1.217×10^{-2}	1.923×10^{-4}	1.75	1.860×10^{-3}	3.099×10^{-2}
fitted radiance shift [nm]	$(3.512 \pm 259.269) \times 10^{-5}$	12327382	1.609×10^{-3}	1.163×10^{-5}	-4.141×10^{-2}	4.039×10^{-2}	-7.855×10^{-4}	8.230×10^{-4}
fitted radiance squeeze [1]	$(-7.964 \pm 18.018) \times 10^{-5}$	12327382	2.164×10^{-4}	-6.620×10^{-5}	-1.296×10^{-2}	5.118×10^{-3}	-1.804×10^{-4}	3.600×10^{-5}
fitted root mean square [1]	$(1.218 \pm 0.483) \times 10^{-3}$	12327382	4.462×10^{-4}	1.088×10^{-3}	3.132×10^{-4}	4.201×10^{-2}	9.233×10^{-4}	1.370×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.993 $\pm$ 0.537	12327382	0.720	0.901	5.000×10^{-2}	2.89	0.597	1.32
sulfurdioxide total air mass factor polluted precision [1]	0.132 $\pm$ 0.151	12327382	0.121	8.786×10^{-2}	3.027×10^{-3}	2.16	4.297×10^{-2}	0.164
sulfurdioxide clear air mass factor polluted [1]	0.826 $\pm$ 0.422	12327382	0.466	0.753	5.333×10^{-2}	2.89	0.525	0.991
number of spectral points in retrieval [1]	73.4 $\pm$ 0.5	12327382	1.000	73.0	52.0	74.0	73.0	74.0

Table 4: Parameterlist and basic statistics for the analysis for observations in the southern hemisphere

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.755 ± 0.356	5198830	0.570	1.000	0.0	1.000	0.430	1.000
sulfurdioxide total vertical column [DU]	$(5.776 \pm 126.099) \times 10^{-2}$	5198830	0.557	1.781×10^{-2}	-129	992	-0.254	0.303
sulfurdioxide total vertical column precision [DU]	0.590 ± 0.703	5198830	0.378	0.405	5.134×10^{-2}	131	0.276	0.653
sulfurdioxide slant column density corrected [DU]	$(3.232 \pm 63.163) \times 10^{-2}$	5198830	0.437	1.517×10^{-2}	-39.9	599	-0.200	0.237
sulfurdioxide slant column density cobra [DU]	$(3.136 \pm 45.663) \times 10^{-2}$	5198830	0.437	1.517×10^{-2}	-39.9	56.1	-0.200	0.237
sulfurdioxide slant column density cobra precision [DU]	0.348 ± 0.157	5198830	0.165	0.309	9.359×10^{-2}	33.0	0.243	0.409
sulfurdioxide slant column density window1 [DU]	0.157 ± 0.807	5198830	0.856	0.152	-104	88.4	-0.275	0.581
sulfurdioxide slant column density window1 precision [DU]	0.348 ± 0.157	5198830	0.165	0.309	9.359×10^{-2}	33.0	0.243	0.409
sulfurdioxide slant column density corrected win1 [DU]	$(5.384 \pm 80.524) \times 10^{-2}$	5198830	0.852	2.684×10^{-2}	-104	88.5	-0.391	0.461
background so2 slant column offset window1 [DU]	-0.104 ± 0.124	5198830	0.118	-0.133	-0.623	1.67	-0.173	-5.540×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.24 ± 10.54	5198830	12.9	1.01	-1.518×10^3	1.331×10^3	-5.36	7.58
sulfurdioxide slant column density window2 precision [DU]	9.32 ± 2.74	5198830	2.98	8.96	2.54	556	7.65	10.6
sulfurdioxide slant column density corrected win2 [DU]	-0.210 ± 10.388	5198830	12.8	-0.247	-1.520×10^3	1.330×10^3	-6.62	6.15
background so2 slant column offset window2 [DU]	-1.45 ± 1.87	5198830	2.29	-0.942	-12.2	5.07	-2.48	-0.184
sulfurdioxide slant column density window3 [DU]	-3.95 ± 27.35	5198830	34.6	-3.28	-400	329	-20.8	13.7
sulfurdioxide slant column density window3 precision [DU]	32.3 ± 12.9	5198830	10.7	29.3	10.2	247	24.8	35.5
sulfurdioxide slant column density corrected win3 [DU]	5.12 ± 27.14	5198830	34.3	5.58	-393	335	-11.7	22.6
background so2 slant column offset window3 [DU]	9.07 ± 4.15	5198830	5.59	8.31	-14.5	24.1	6.22	11.8
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.28	5198830	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.687 \pm 3.539) \times 10^{-2}$	5198830	1.280×10^{-2}	1.897×10^{-2}	2.182×10^{-3}	1.06	1.377×10^{-2}	2.658×10^{-2}
fitted radiance shift [nm]	$(-4.026 \pm 24.684) \times 10^{-4}$	5198830	1.878×10^{-3}	-3.983×10^{-4}	-5.084×10^{-2}	8.192×10^{-2}	-1.385×10^{-3}	4.928×10^{-4}
fitted radiance squeeze [1]	$(1.595 \pm 20.462) \times 10^{-5}$	5198830	2.327×10^{-4}	1.141×10^{-5}	-1.662×10^{-2}	2.208×10^{-2}	-1.030×10^{-4}	1.297×10^{-4}
fitted root mean square [1]	$(1.475 \pm 0.605) \times 10^{-3}$	5198830	6.703×10^{-4}	1.309×10^{-3}	3.543×10^{-4}	6.030×10^{-2}	1.070×10^{-3}	1.740×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.815 ± 0.363	5198830	0.417	0.750	5.000×10^{-2}	2.63	0.577	0.994
sulfurdioxide total air mass factor polluted precision [1]	$(9.045 \pm 8.143) \times 10^{-2}$	5198830	8.810×10^{-2}	5.658×10^{-2}	3.011×10^{-3}	1.22	3.480×10^{-2}	0.123
sulfurdioxide clear air mass factor polluted [1]	0.693 ± 0.202	5198830	0.248	0.684	4.785×10^{-2}	1.60	0.565	0.813
number of spectral points in retrieval [1]	73.4 ± 0.5	5198830	1.000	73.0	52.0	156	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]	0.647 ± 0.393	11370005	0.760	1.000	0.0	1.000	0.240	1.000
sulfurdioxide total vertical column [DU]	$(3.130 \pm 105.479) \times 10^{-2}$	11370005	0.426	1.085×10^{-2}	-136	373	-0.200	0.227
sulfurdioxide total vertical column precision [DU]	0.474 ± 0.690	11370005	0.288	0.303	5.730×10^{-2}	47.0	0.210	0.499
sulfurdioxide slant column density corrected [DU]	$(2.033 \pm 41.995) \times 10^{-2}$	11370005	0.373	1.008×10^{-2}	-39.9	438	-0.174	0.199
sulfurdioxide slant column density cobra [DU]	$(2.008 \pm 37.465) \times 10^{-2}$	11370005	0.373	1.008×10^{-2}	-39.9	36.5	-0.174	0.199
sulfurdioxide slant column density cobra precision [DU]	0.300 ± 0.136	11370005	0.143	0.258	8.545×10^{-2}	19.4	0.210	0.354
sulfurdioxide slant column density window1 [DU]	0.118 ± 0.697	11370005	0.755	0.126	-104	59.6	-0.257	0.499
sulfurdioxide slant column density window1 precision [DU]	0.300 ± 0.136	11370005	0.143	0.258	8.545×10^{-2}	19.4	0.210	0.354
sulfurdioxide slant column density corrected win1 [DU]	$(2.796 \pm 68.549) \times 10^{-2}$	11370005	0.737	1.061×10^{-2}	-104	59.7	-0.353	0.384
background so2 slant column offset window1 [DU]	$(-8.992 \pm 14.818) \times 10^{-2}$	11370005	0.189	-0.127	-0.623	1.67	-0.194	-4.947×10^{-3}
sulfurdioxide slant column density window2 [DU]	0.841 ± 9.009	11370005	11.3	0.704	-1.518×10^3	983	-4.87	6.38
sulfurdioxide slant column density window2 precision [DU]	8.13 ± 2.28	11370005	2.59	7.76	2.30	556	6.64	9.23
sulfurdioxide slant column density corrected win2 [DU]	-0.357 ± 8.873	11370005	11.1	-0.360	-1.520×10^3	981	-5.92	5.19
background so2 slant column offset window2 [DU]	-1.20 ± 1.81	11370005	2.49	-0.784	-12.2	6.93	-2.37	0.122
sulfurdioxide slant column density window3 [DU]	$(1.657 \pm 2357.414) \times 10^{-2}$	11370005	29.3	-0.131	-400	329	-14.6	14.7
sulfurdioxide slant column density window3 precision [DU]	27.1 ± 11.4	11370005	9.46	24.1	8.89	247	20.6	30.0
sulfurdioxide slant column density corrected win3 [DU]	7.97 ± 23.03	11370005	28.7	7.92	-393	335	-6.34	22.4
background so2 slant column offset window3 [DU]	7.95 ± 4.39	11370005	6.12	8.05	-16.8	24.1	4.94	11.1
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	11370005	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.069 \pm 3.435) \times 10^{-2}$	11370005	1.626×10^{-2}	1.450×10^{-2}	2.272×10^{-4}	1.75	6.996×10^{-3}	2.325×10^{-2}
fitted radiance shift [nm]	$(-1.047 \pm 22.015) \times 10^{-4}$	11370005	1.643×10^{-3}	-8.648×10^{-5}	-4.871×10^{-2}	4.573×10^{-2}	-9.442×10^{-4}	6.994×10^{-4}
fitted radiance squeeze [1]	$(-4.445 \pm 19.570) \times 10^{-5}$	11370005	2.248×10^{-4}	-3.660×10^{-5}	-1.662×10^{-2}	1.472×10^{-2}	-1.531×10^{-4}	7.174×10^{-5}
fitted root mean square [1]	$(1.308 \pm 0.546) \times 10^{-3}$	11370005	5.798×10^{-4}	1.145×10^{-3}	3.467×10^{-4}	4.929×10^{-2}	9.515×10^{-4}	1.531×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.940 ± 0.465	11370005	0.572	0.863	5.000×10^{-2}	2.76	0.623	1.20
sulfurdioxide total air mass factor polluted precision [1]	0.116 ± 0.138	11370005	9.669×10^{-2}	7.446×10^{-2}	3.119×10^{-3}	2.16	4.178×10^{-2}	0.138
sulfurdioxide clear air mass factor polluted [1]	0.807 ± 0.375	11370005	0.362	0.741	5.333×10^{-2}	2.48	0.575	0.936
number of spectral points in retrieval [1]	73.4 ± 0.5	11370005	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]	0.678 ± 0.415	4263070	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(3.088 \pm 112.782) \times 10^{-2}$	4263070	0.415	8.637×10^{-3}	-129	992	-0.195	0.220
sulfurdioxide total vertical column precision [DU]	0.476 ± 0.670	4263070	0.315	0.311	3.999×10^{-2}	131	0.202	0.518
sulfurdioxide slant column density corrected [DU]	$(1.939 \pm 53.248) \times 10^{-2}$	4263070	0.358	8.282×10^{-3}	-23.7	599	-0.169	0.189
sulfurdioxide slant column density cobra [DU]	$(1.862 \pm 36.943) \times 10^{-2}$	4263070	0.358	8.282×10^{-3}	-23.7	56.1	-0.169	0.189
sulfurdioxide slant column density cobra precision [DU]	0.283 ± 0.125	4263070	0.103	0.246	8.053×10^{-2}	33.0	0.211	0.315
sulfurdioxide slant column density window1 [DU]	0.145 ± 0.667	4263070	0.718	0.135	-54.9	88.4	-0.223	0.495
sulfurdioxide slant column density window1 precision [DU]	0.283 ± 0.125	4263070	0.103	0.246	8.053×10^{-2}	33.0	0.211	0.315
sulfurdioxide slant column density corrected win1 [DU]	$(1.314 \pm 65.816) \times 10^{-2}$	4263070	0.701	-5.989×10^{-3}	-54.9	88.5	-0.351	0.350
background so2 slant column offset window1 [DU]	-0.131 ± 0.119	4263070	0.146	-0.154	-0.559	1.27	-0.211	-6.430×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.362 ± 9.242	4263070	11.4	0.353	-932	1.331×10^3	-5.37	6.05
sulfurdioxide slant column density window2 precision [DU]	8.42 ± 2.73	4263070	2.86	8.03	2.35	521	6.76	9.62
sulfurdioxide slant column density corrected win2 [DU]	-0.473 ± 9.152	4263070	11.3	-0.455	-932	1.330×10^3	-6.11	5.16
background so2 slant column offset window2 [DU]	-0.835 ± 1.471	4263070	1.90	-0.612	-12.1	5.68	-1.73	0.171
sulfurdioxide slant column density window3 [DU]	-7.43 ± 24.36	4263070	29.7	-6.58	-400	253	-21.9	7.84
sulfurdioxide slant column density window3 precision [DU]	31.2 ± 17.1	4263070	13.0	26.6	9.28	434	21.7	34.6
sulfurdioxide slant column density corrected win3 [DU]	0.482 ± 24.467	4263070	30.0	1.41	-386	260	-14.1	15.9
background so2 slant column offset window3 [DU]	7.91 ± 4.27	4263070	6.32	8.39	-16.8	24.0	4.90	11.2
sulfurdioxide slant column cobra flag [1]	2.00 ± 0.09	4263070	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(4.967 \pm 7.631) \times 10^{-2}$	4263070	5.038×10^{-2}	2.538×10^{-2}	1.923×10^{-4}	1.51	9.018×10^{-3}	5.940×10^{-2}
fitted radiance shift [nm]	$(-7.394 \pm 320.142) \times 10^{-5}$	4263070	1.727×10^{-3}	-1.196×10^{-4}	-5.084×10^{-2}	8.192×10^{-2}	-9.758×10^{-4}	7.509×10^{-4}
fitted radiance squeeze [1]	$(-4.838 \pm 18.174) \times 10^{-5}$	4263070	2.131×10^{-4}	-4.583×10^{-5}	-1.517×10^{-2}	2.208×10^{-2}	-1.537×10^{-4}	5.942×10^{-5}
fitted root mean square [1]	$(1.239 \pm 0.484) \times 10^{-3}$	4263070	4.189×10^{-4}	1.118×10^{-3}	3.132×10^{-4}	6.030×10^{-2}	9.566×10^{-4}	1.375×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.951 ± 0.568	4263070	0.664	0.800	5.000×10^{-2}	2.89	0.544	1.21
sulfurdioxide total air mass factor polluted precision [1]	0.123 ± 0.126	4263070	0.146	7.781×10^{-2}	3.011×10^{-3}	1.81	3.276×10^{-2}	0.178
sulfurdioxide clear air mass factor polluted [1]	0.768 ± 0.382	4263070	0.403	0.680	4.785×10^{-2}	2.89	0.514	0.917
number of spectral points in retrieval [1]	73.4 ± 0.5	4263070	1.000	73.0	52.0	156	73.0	74.0

3 Granule outlines

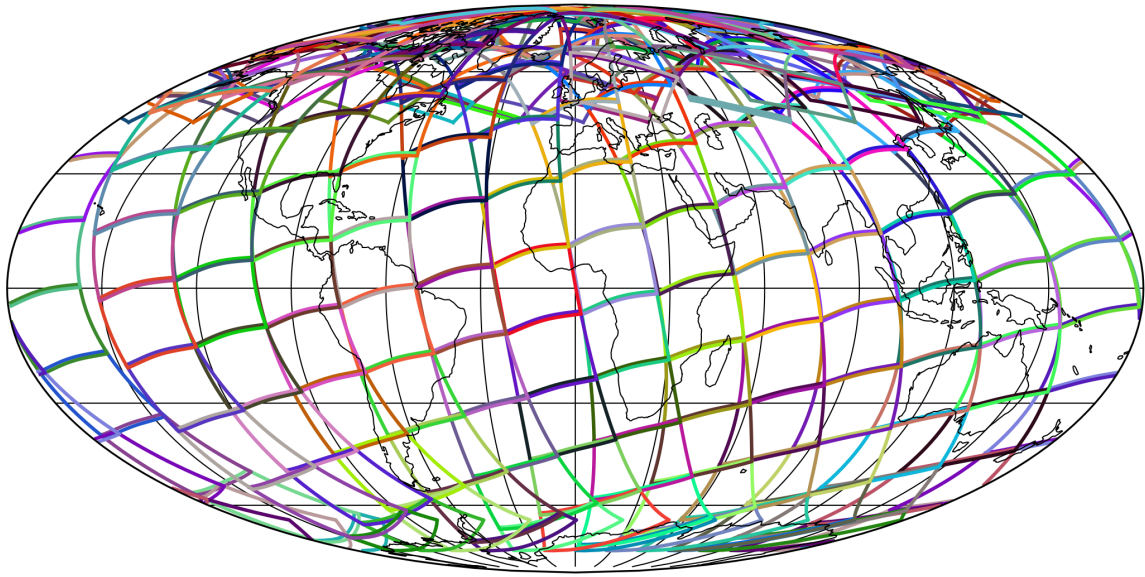


Figure 1: Outline of the granules.

4 Input data monitoring

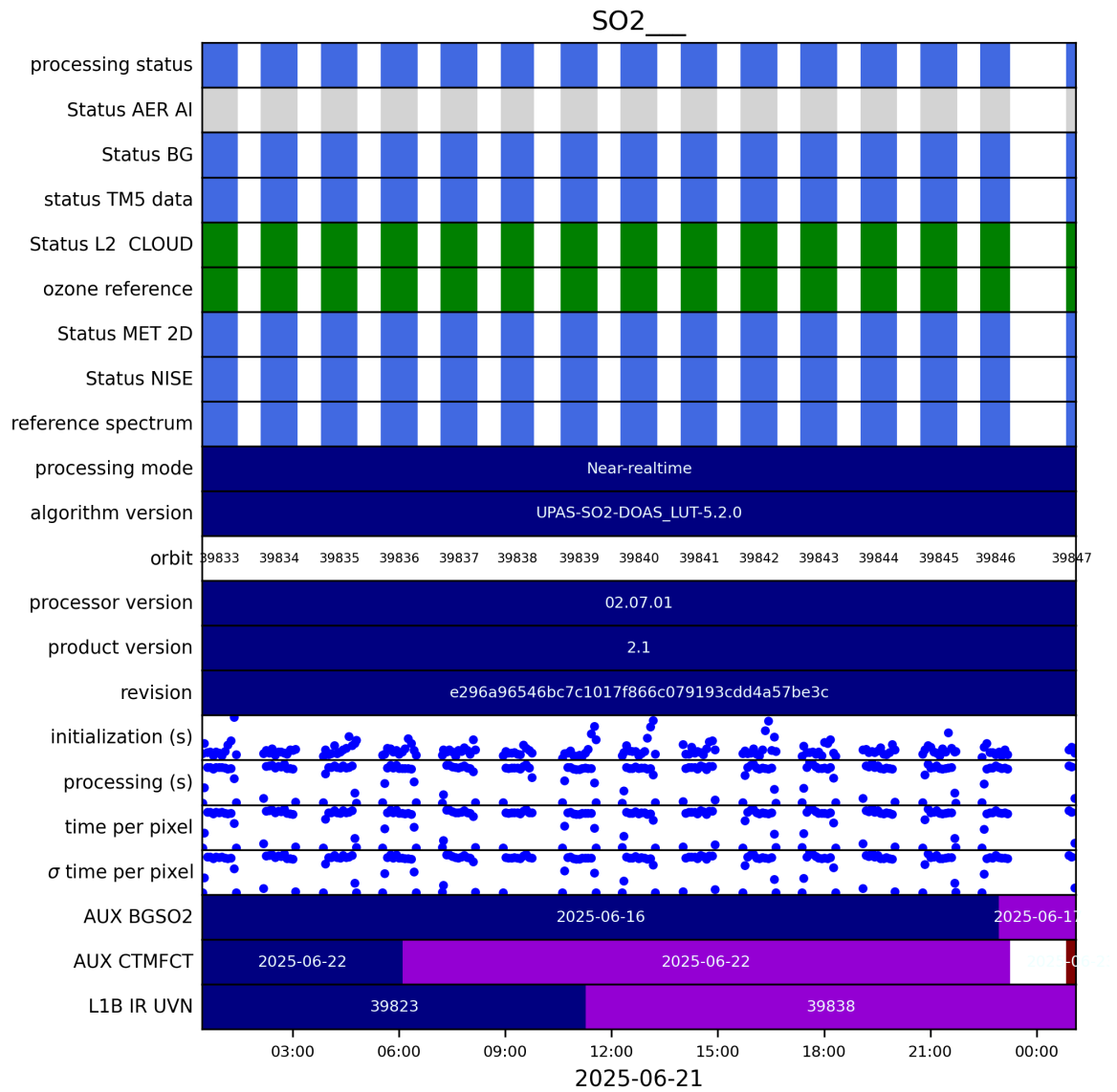


Figure 2: Input data per granule

5 Warnings and errors

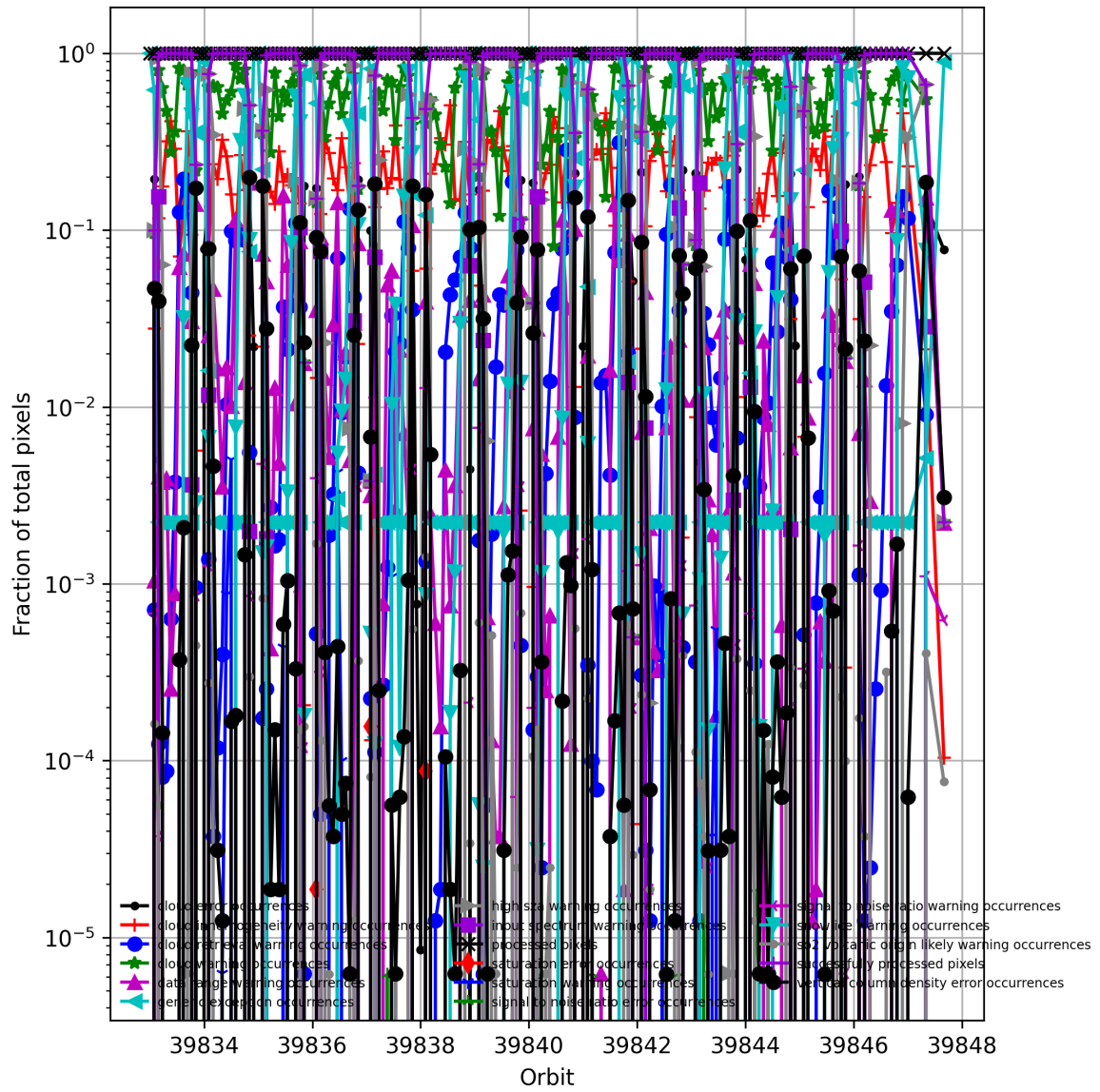


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

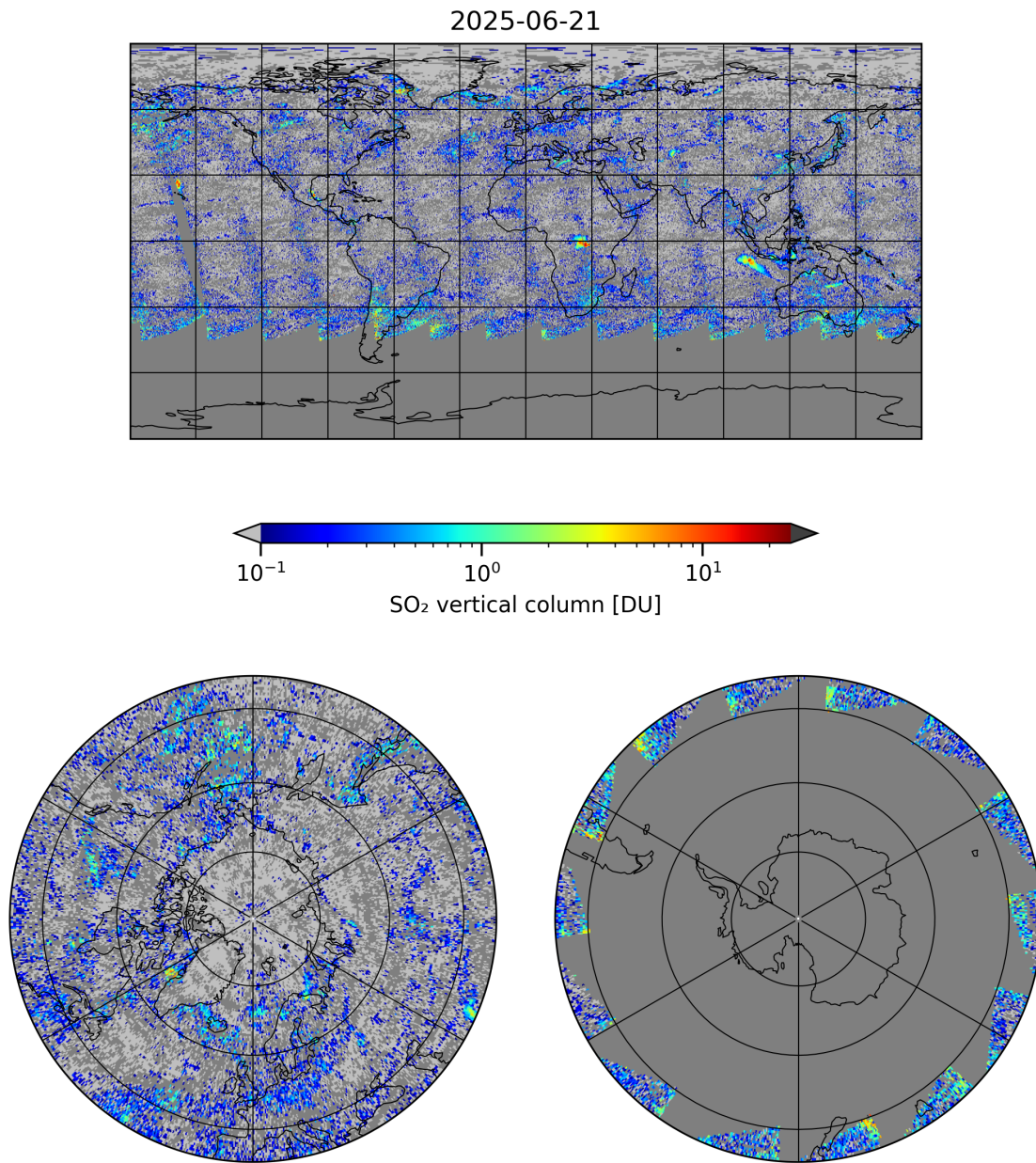


Figure 4: Map of “SO₂ vertical column” for 2025-06-21 to 2025-06-22

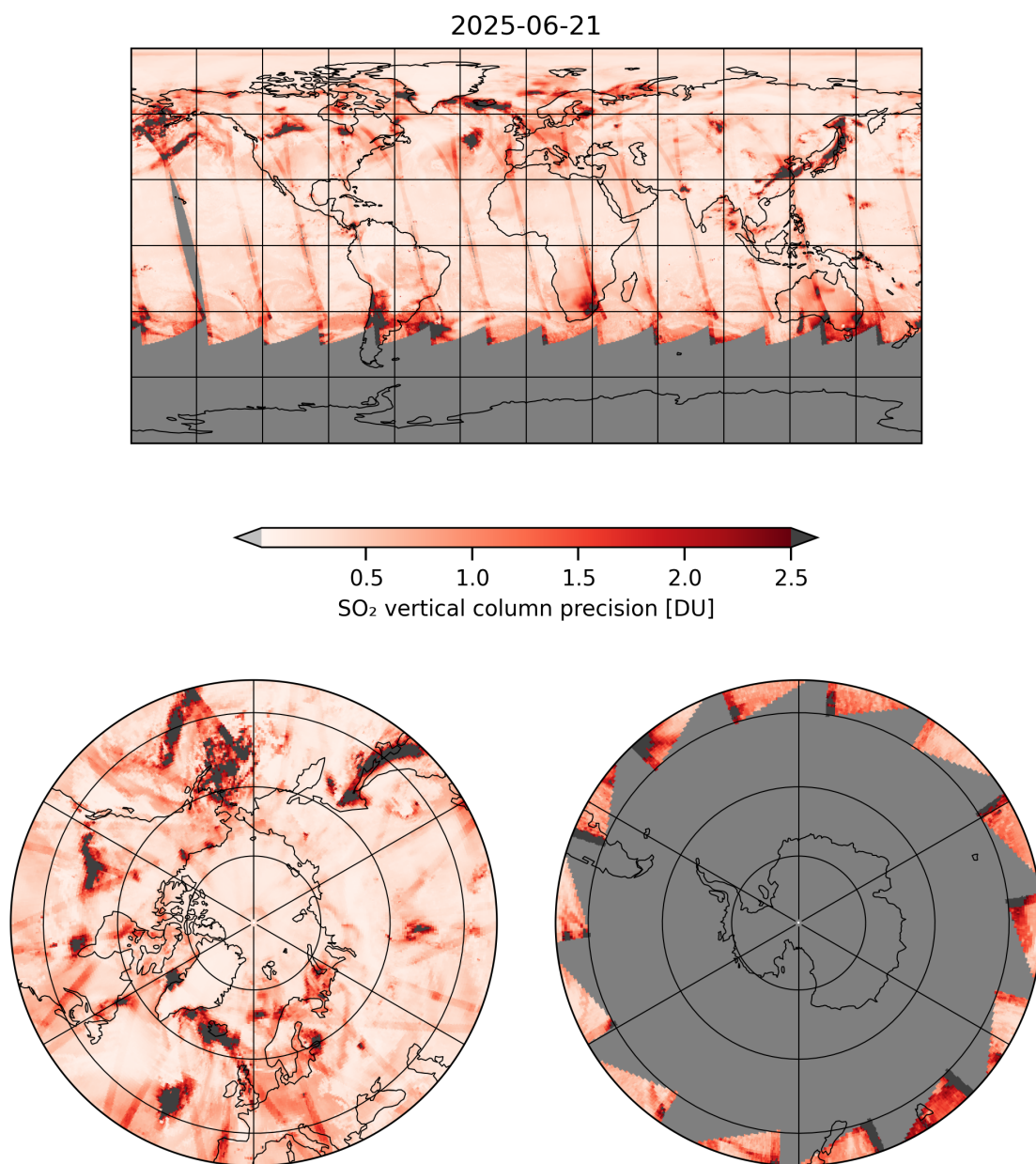


Figure 5: Map of “SO₂ vertical column precision” for 2025-06-21 to 2025-06-22

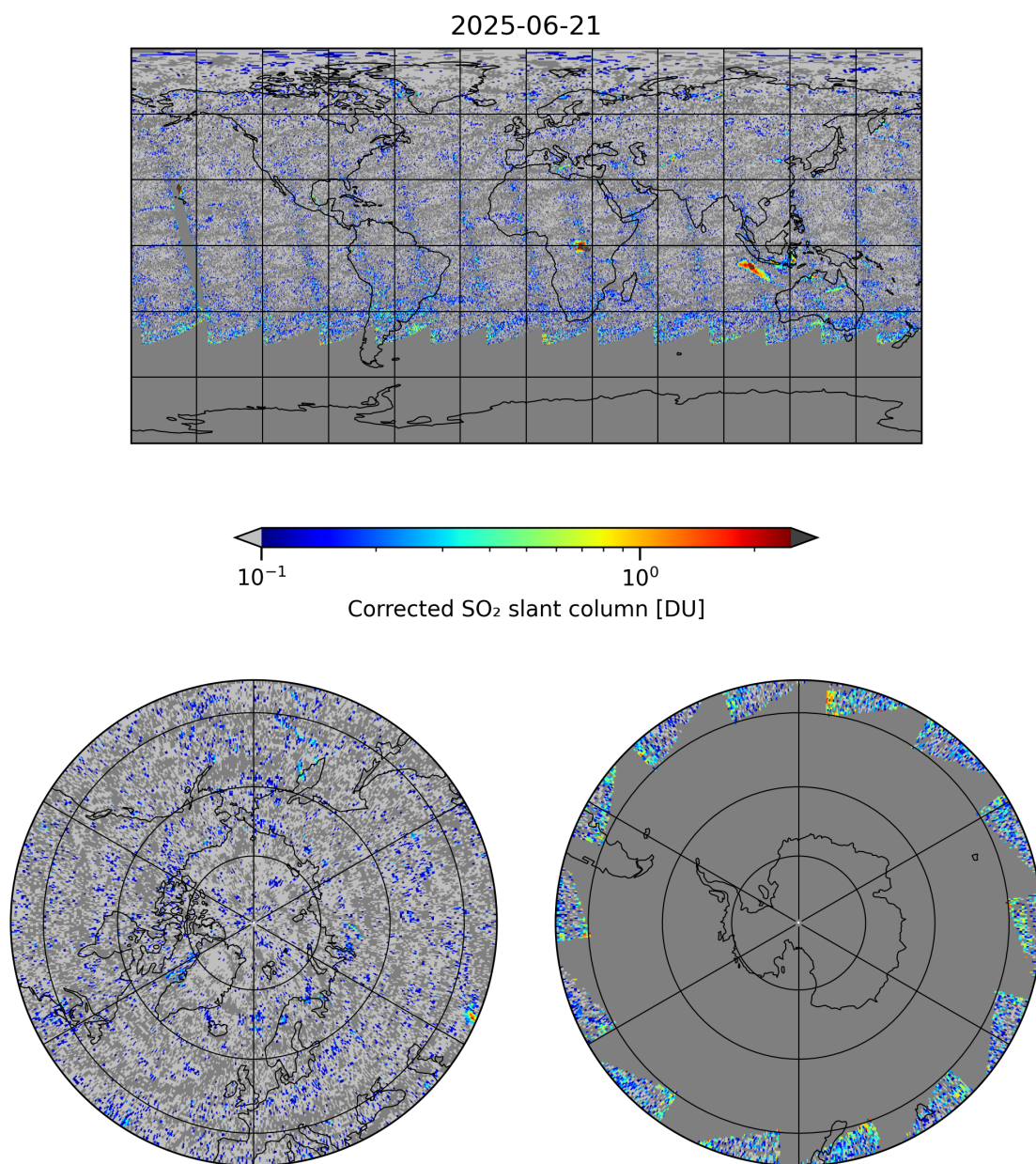


Figure 6: Map of “Corrected SO₂ slant column” for 2025-06-21 to 2025-06-22

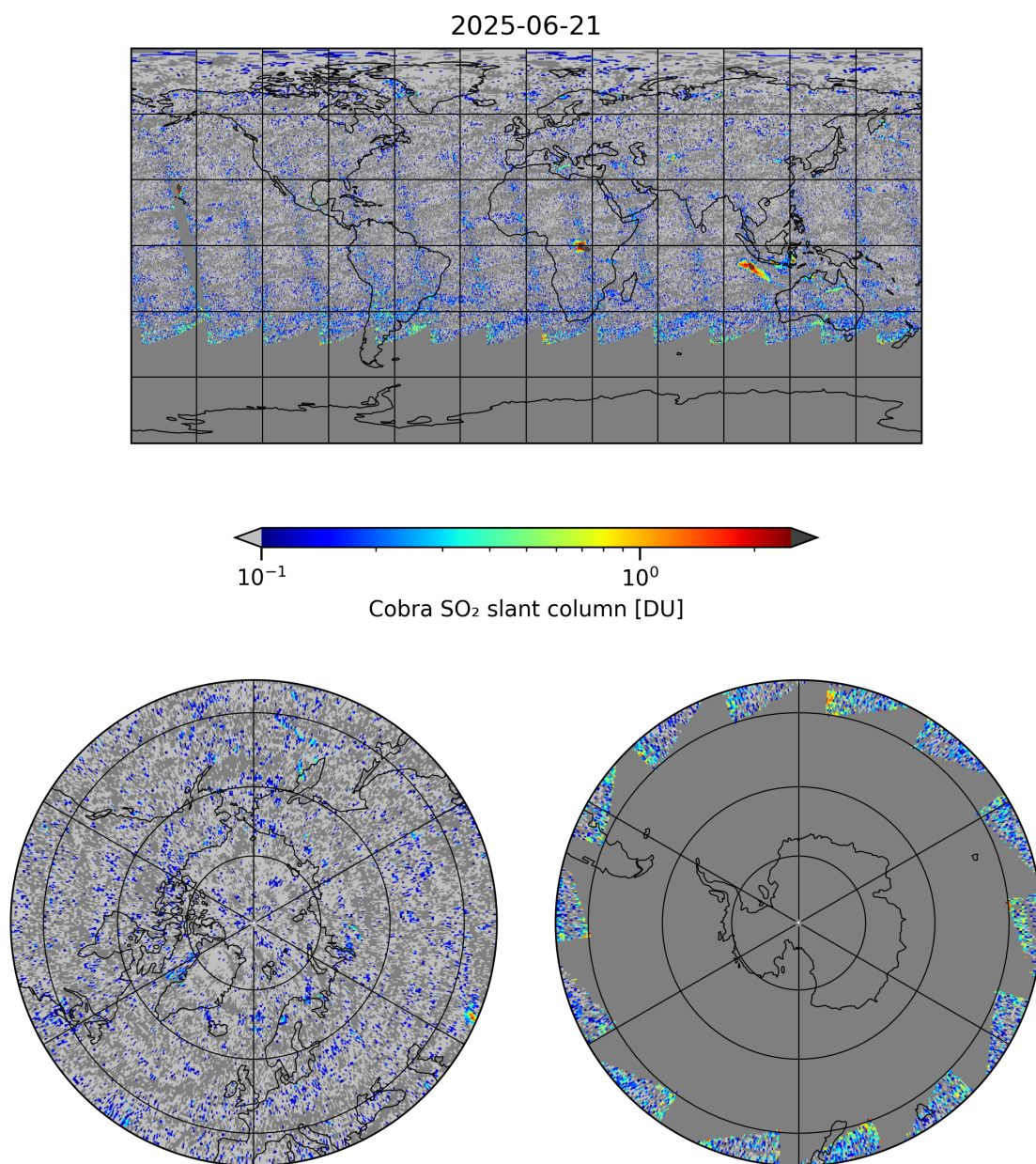


Figure 7: Map of “Cobra SO₂ slant column” for 2025-06-21 to 2025-06-22

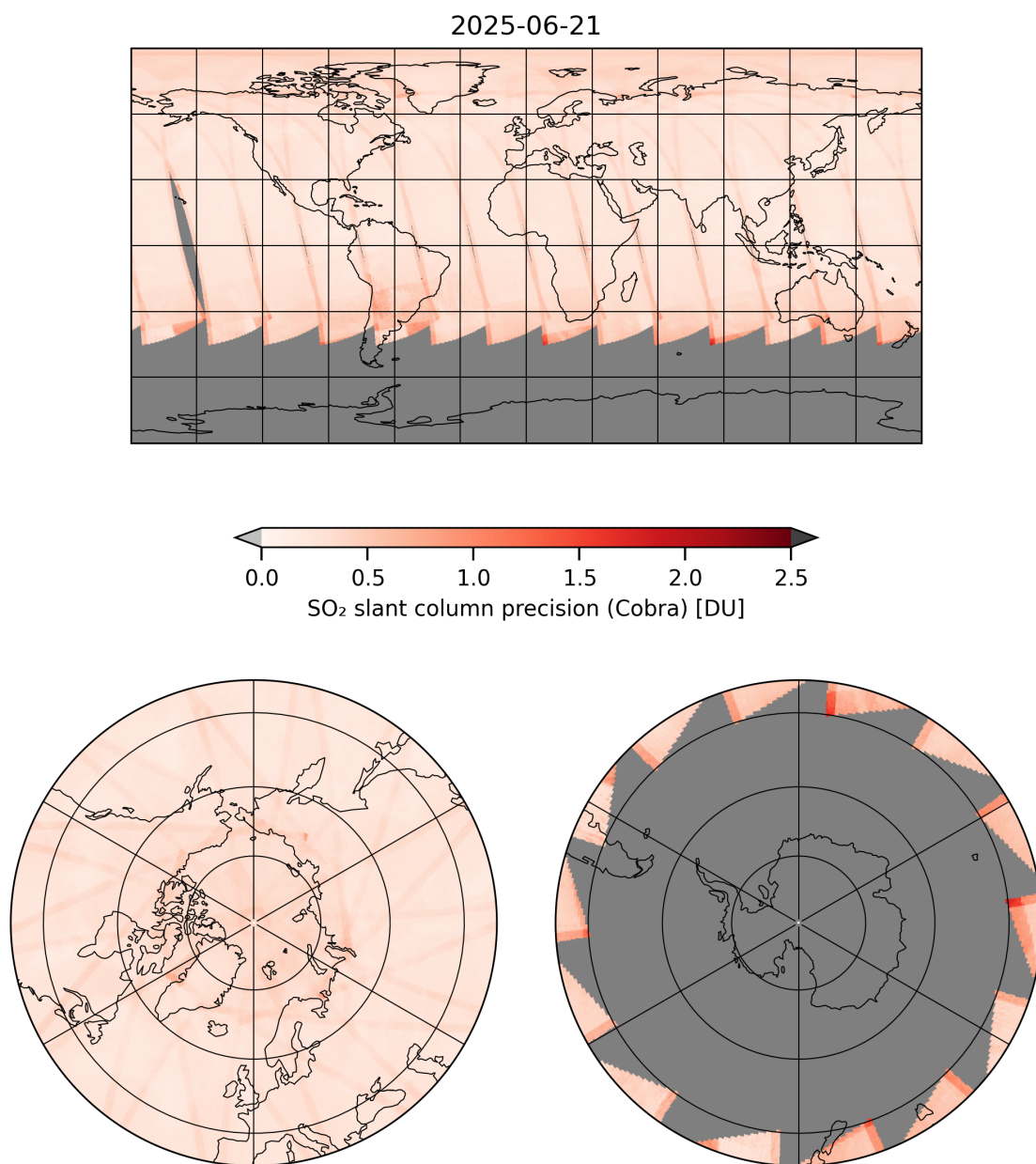


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-06-21 to 2025-06-22

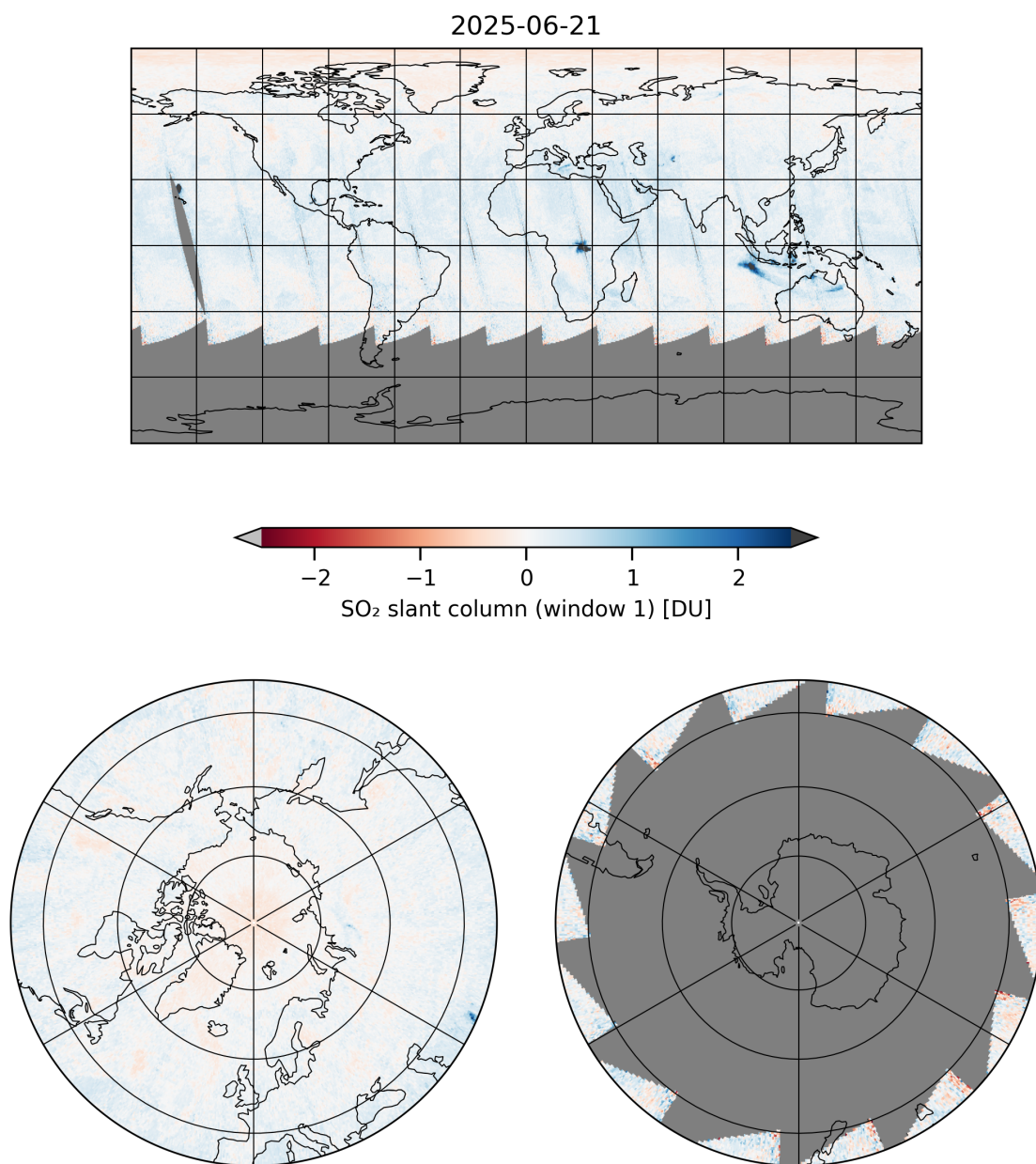


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-06-21 to 2025-06-22

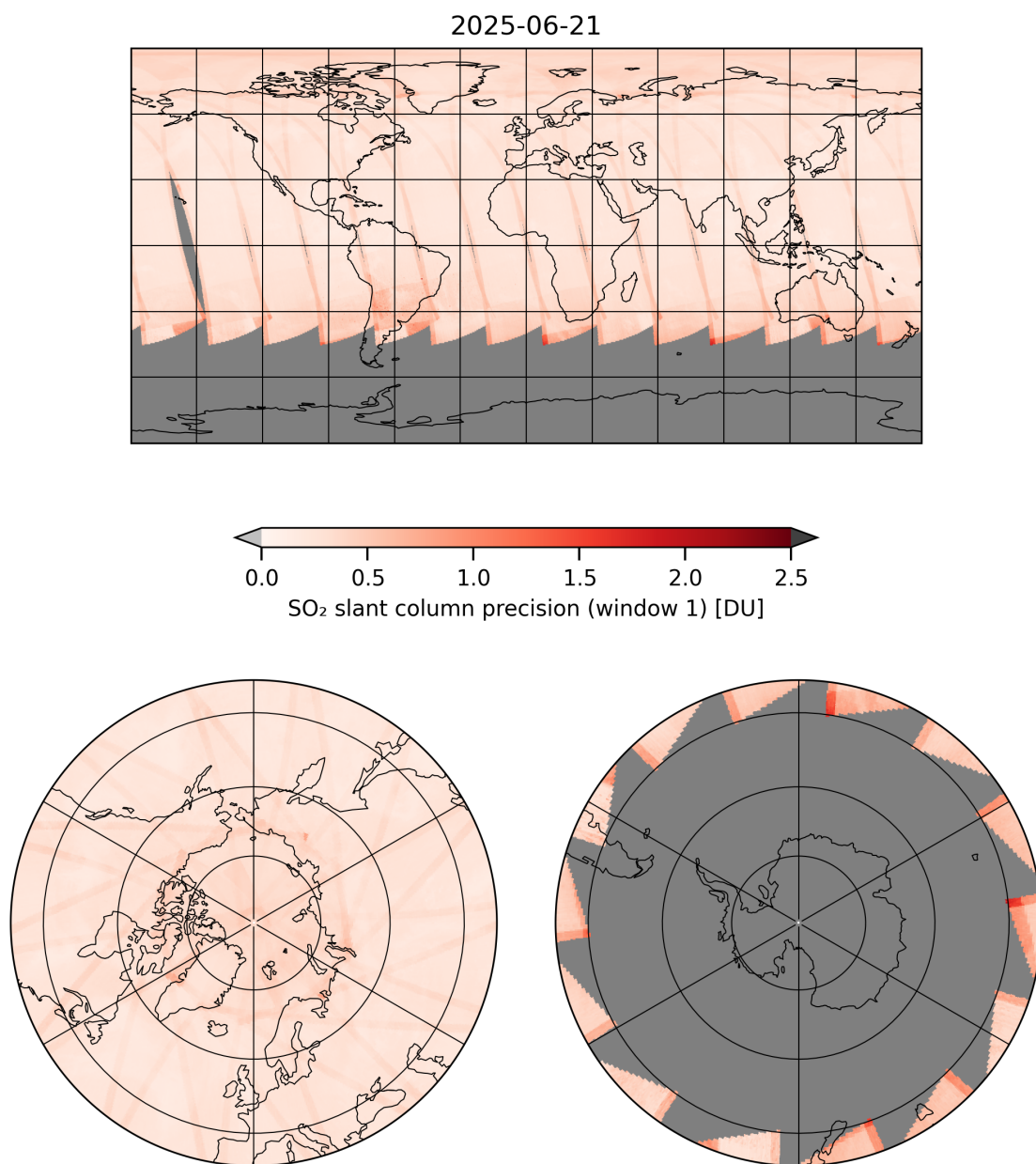


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-06-21 to 2025-06-22

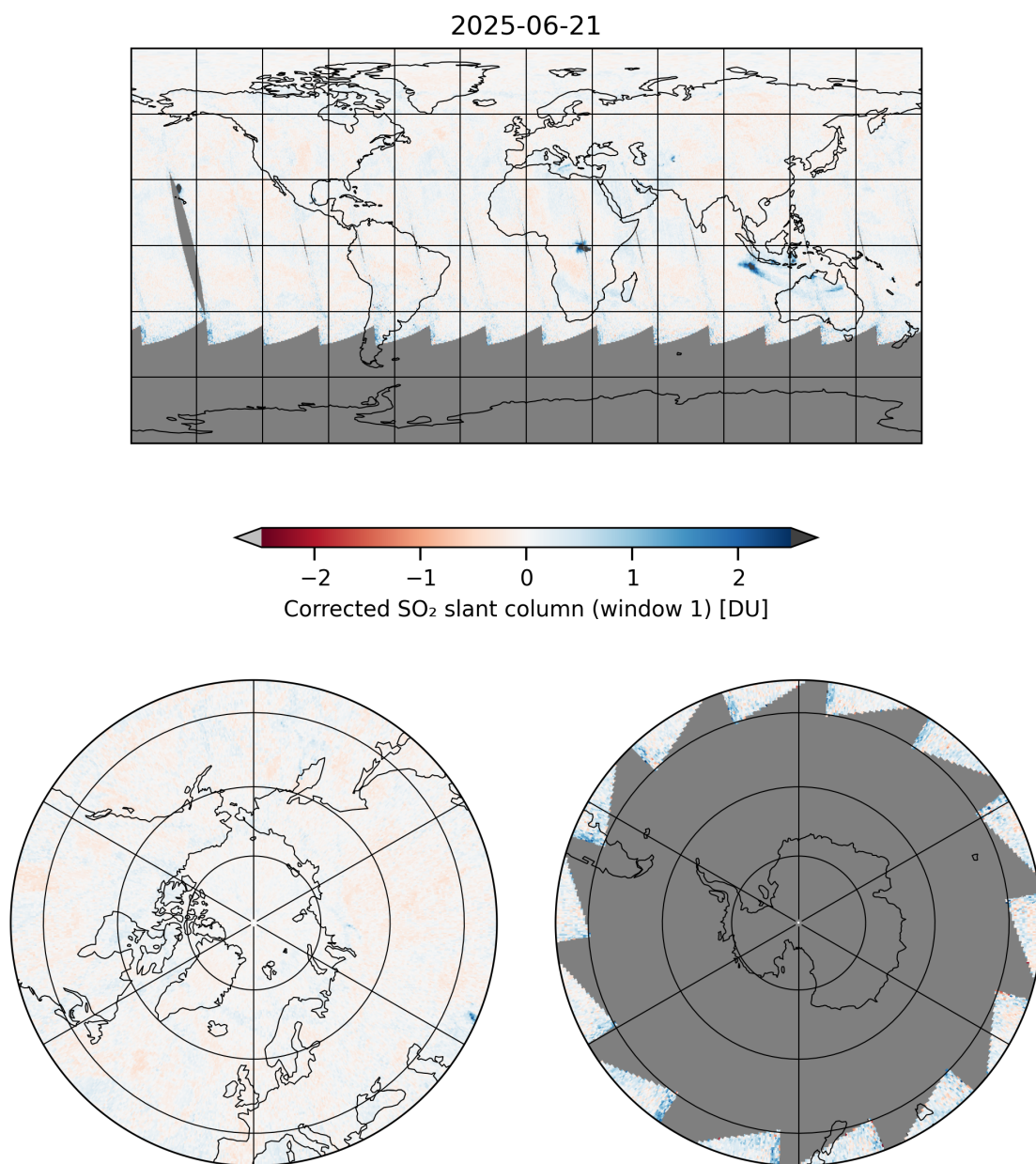


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-06-21 to 2025-06-22

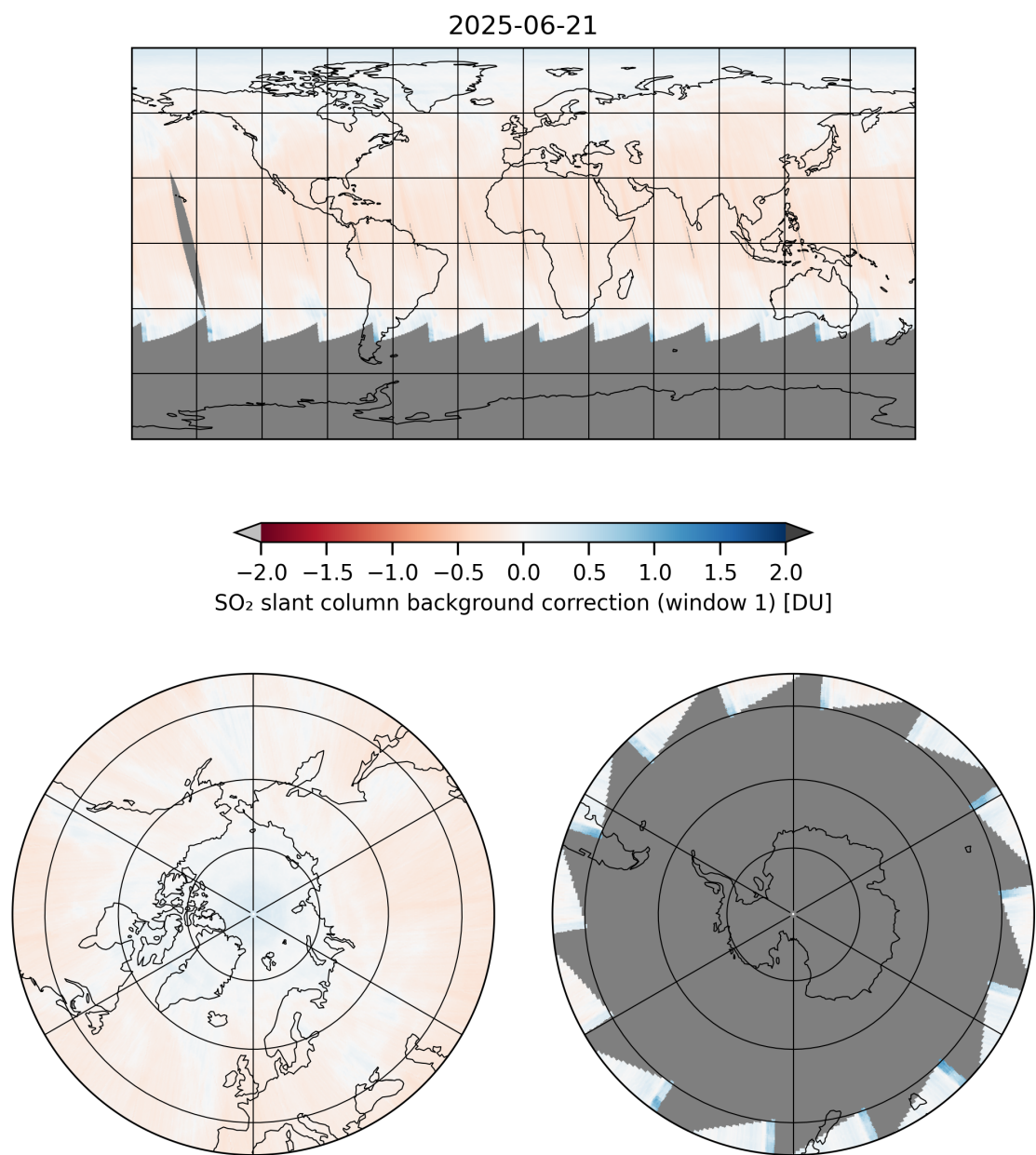


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-06-21 to 2025-06-22

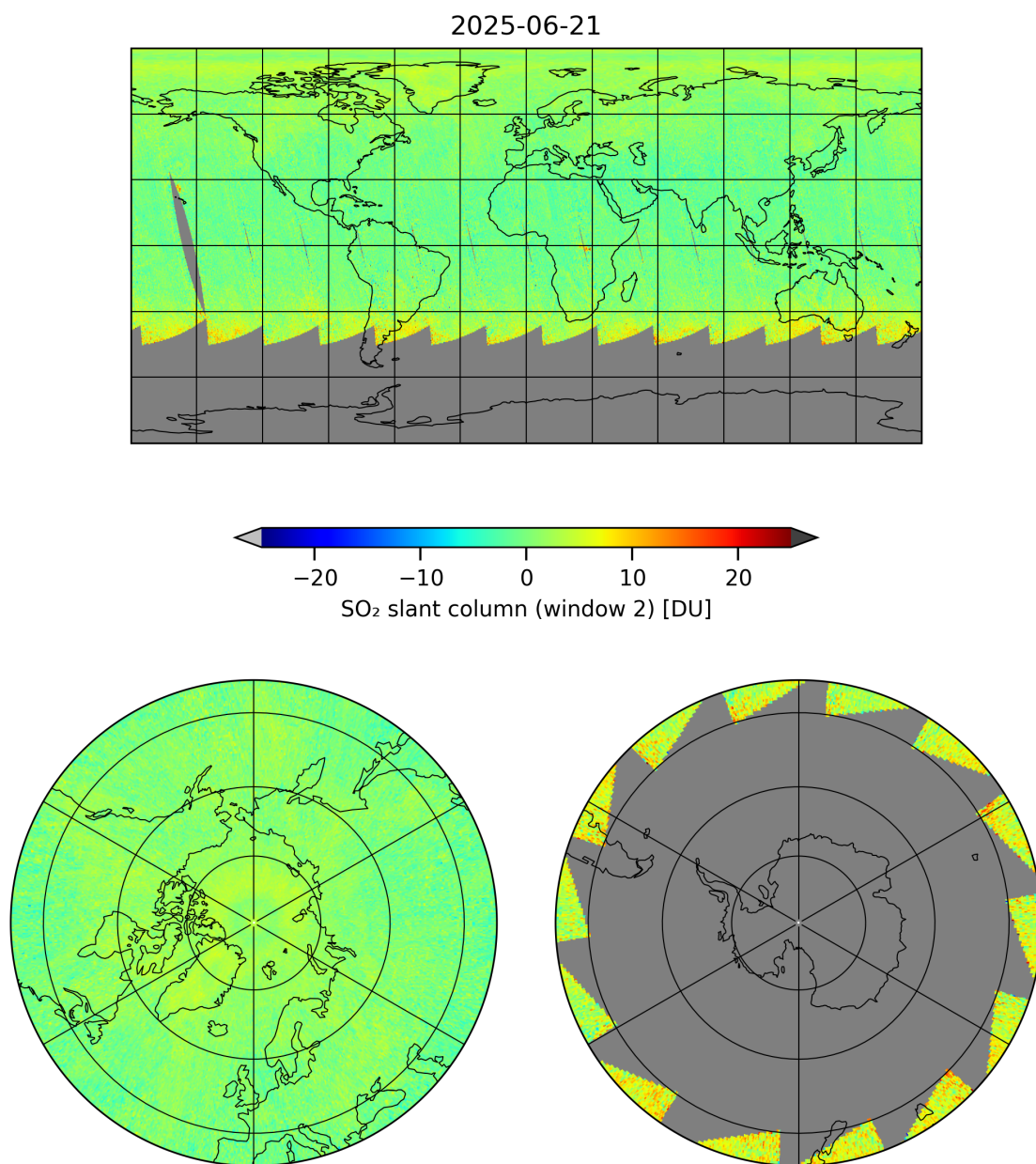


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-06-21 to 2025-06-22

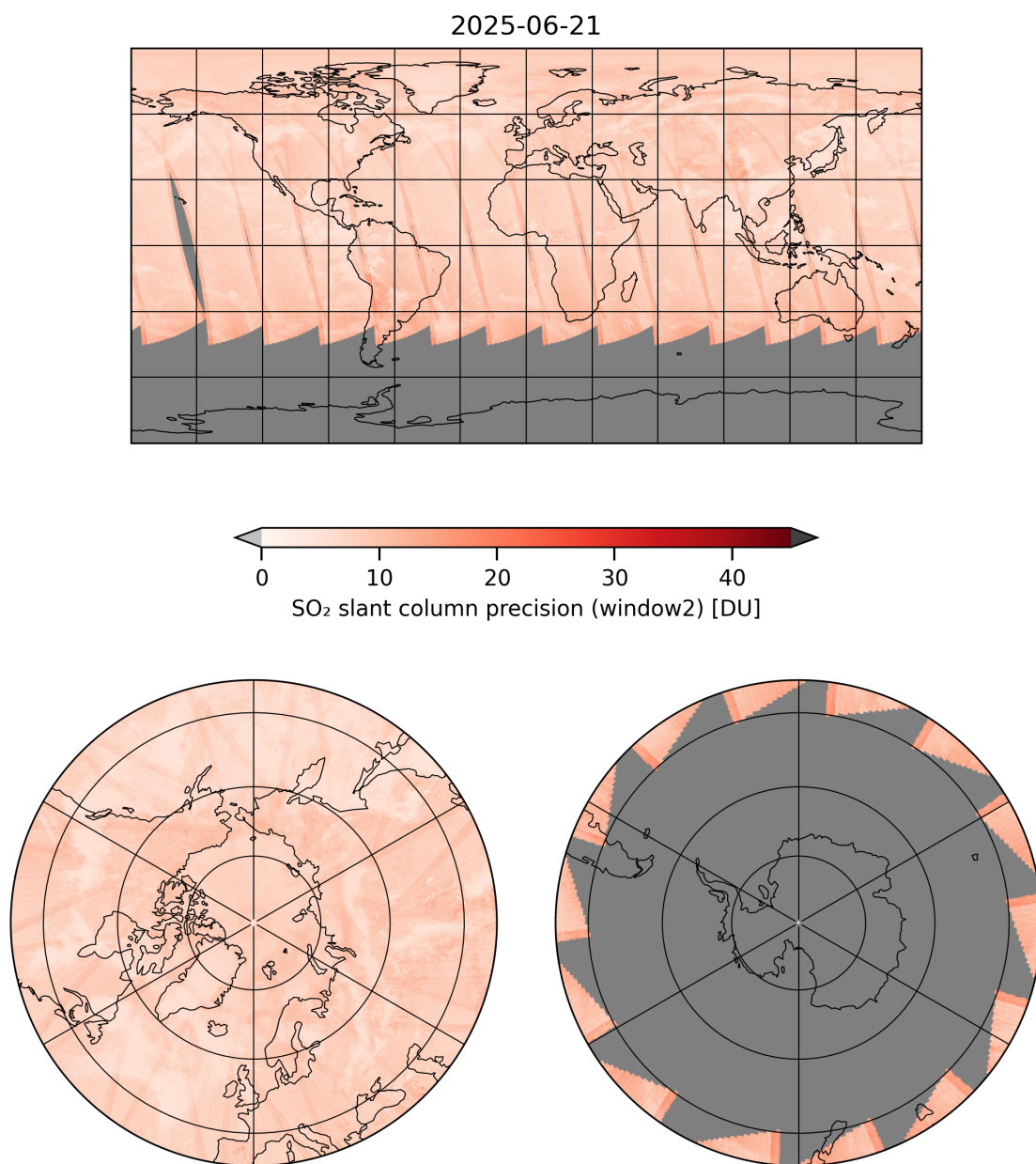


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-06-21 to 2025-06-22

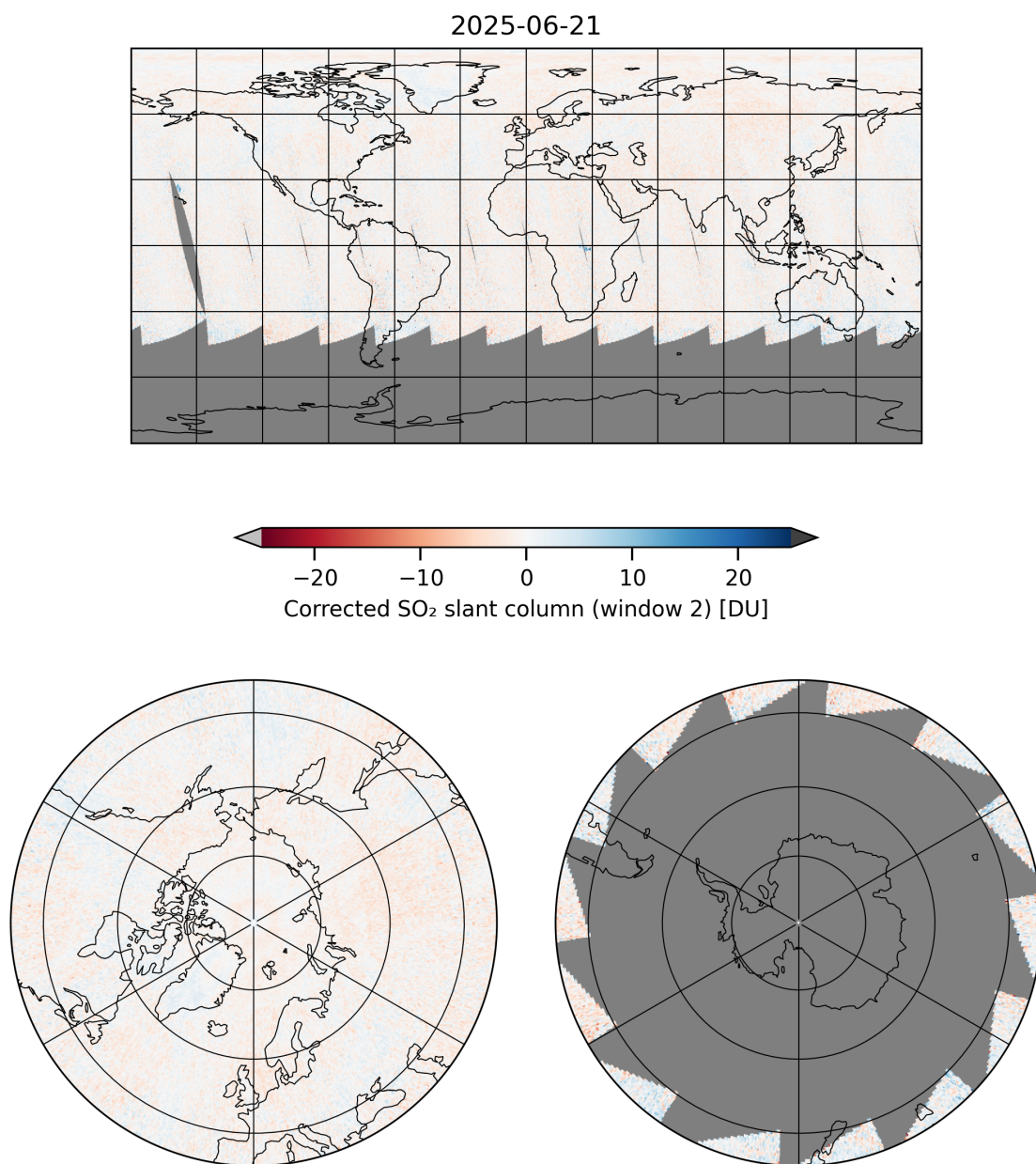


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-06-21 to 2025-06-22

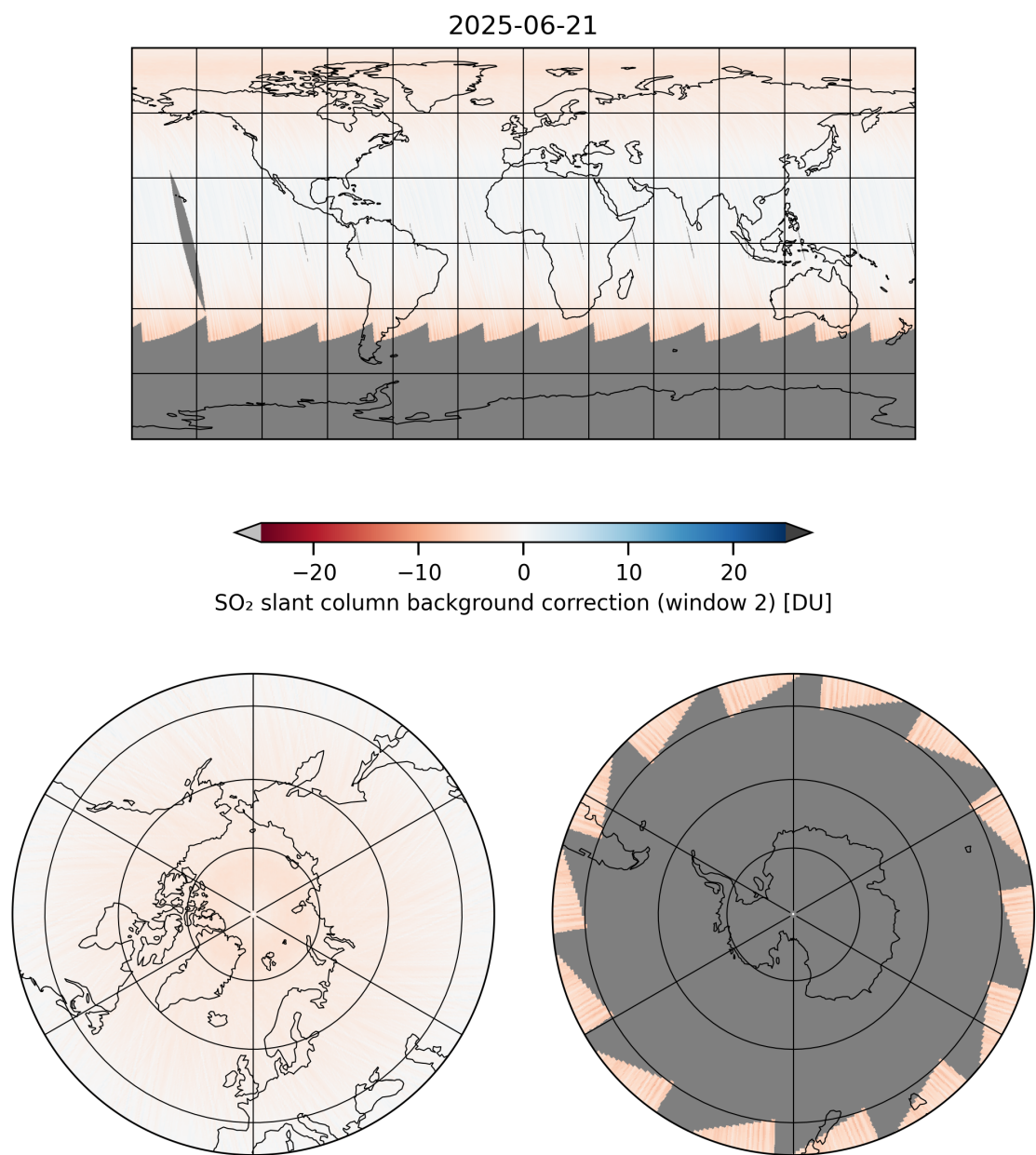


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-06-21 to 2025-06-22

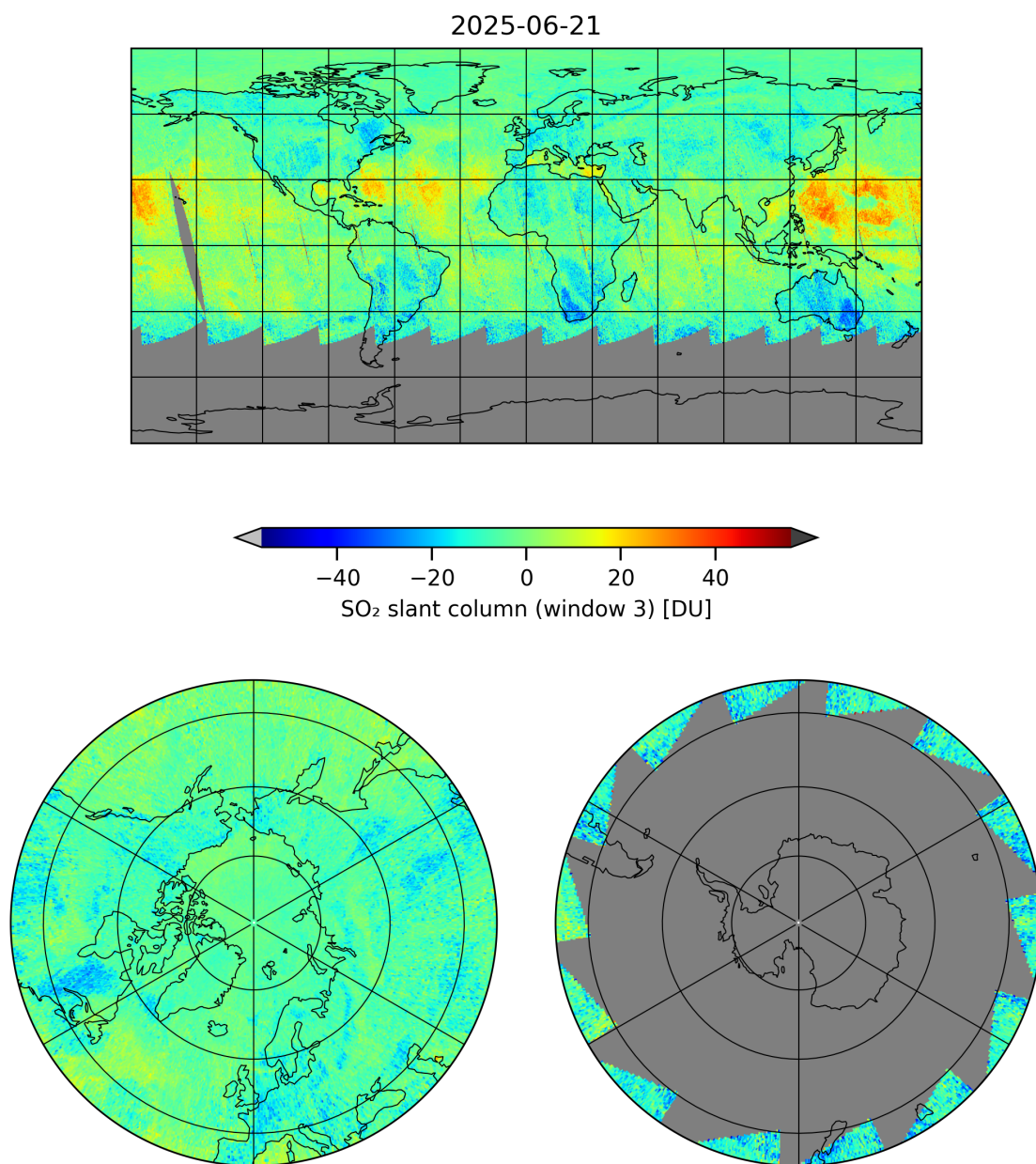


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-06-21 to 2025-06-22

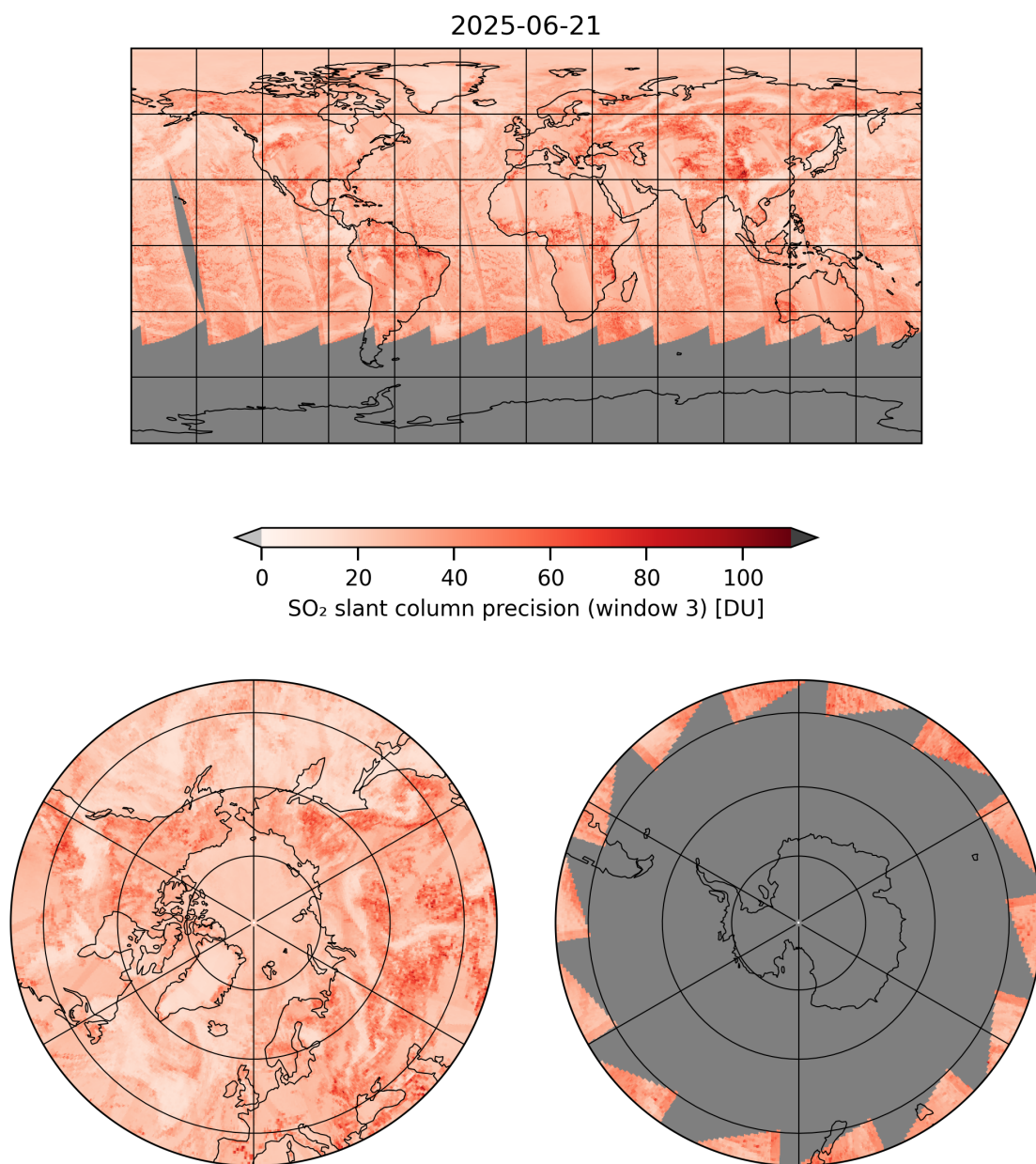


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-06-21 to 2025-06-22

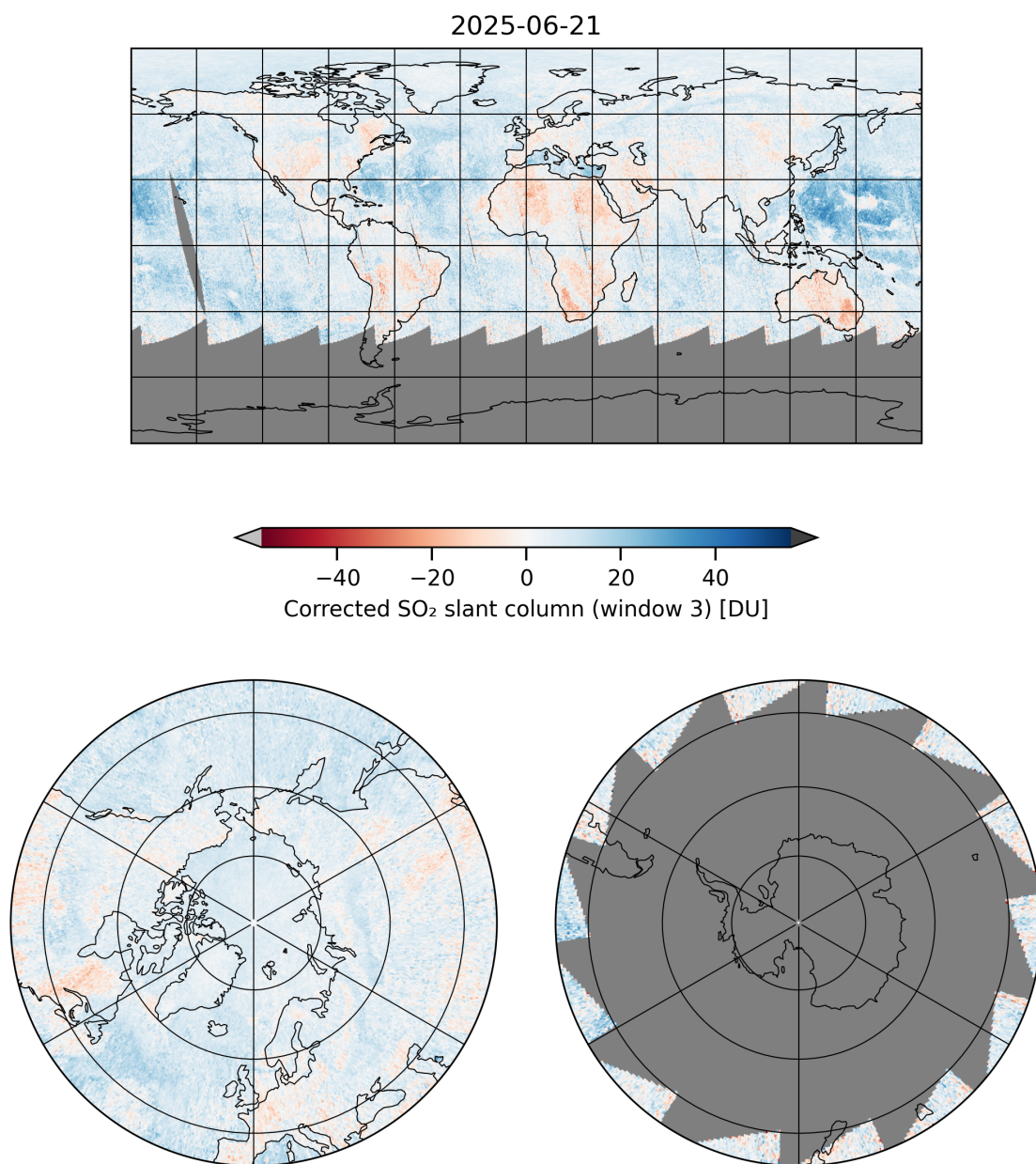


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-06-21 to 2025-06-22

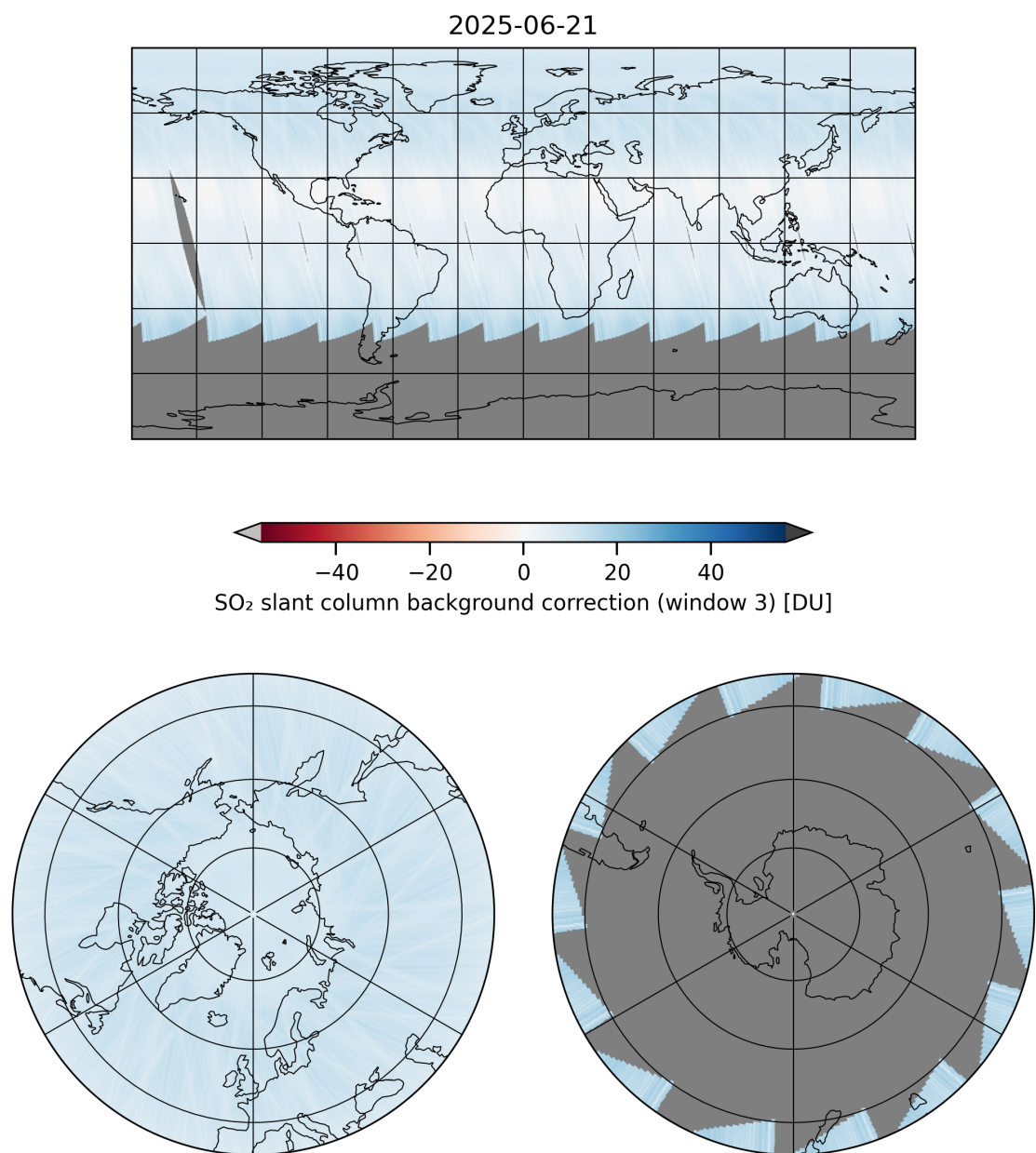


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-06-21 to 2025-06-22

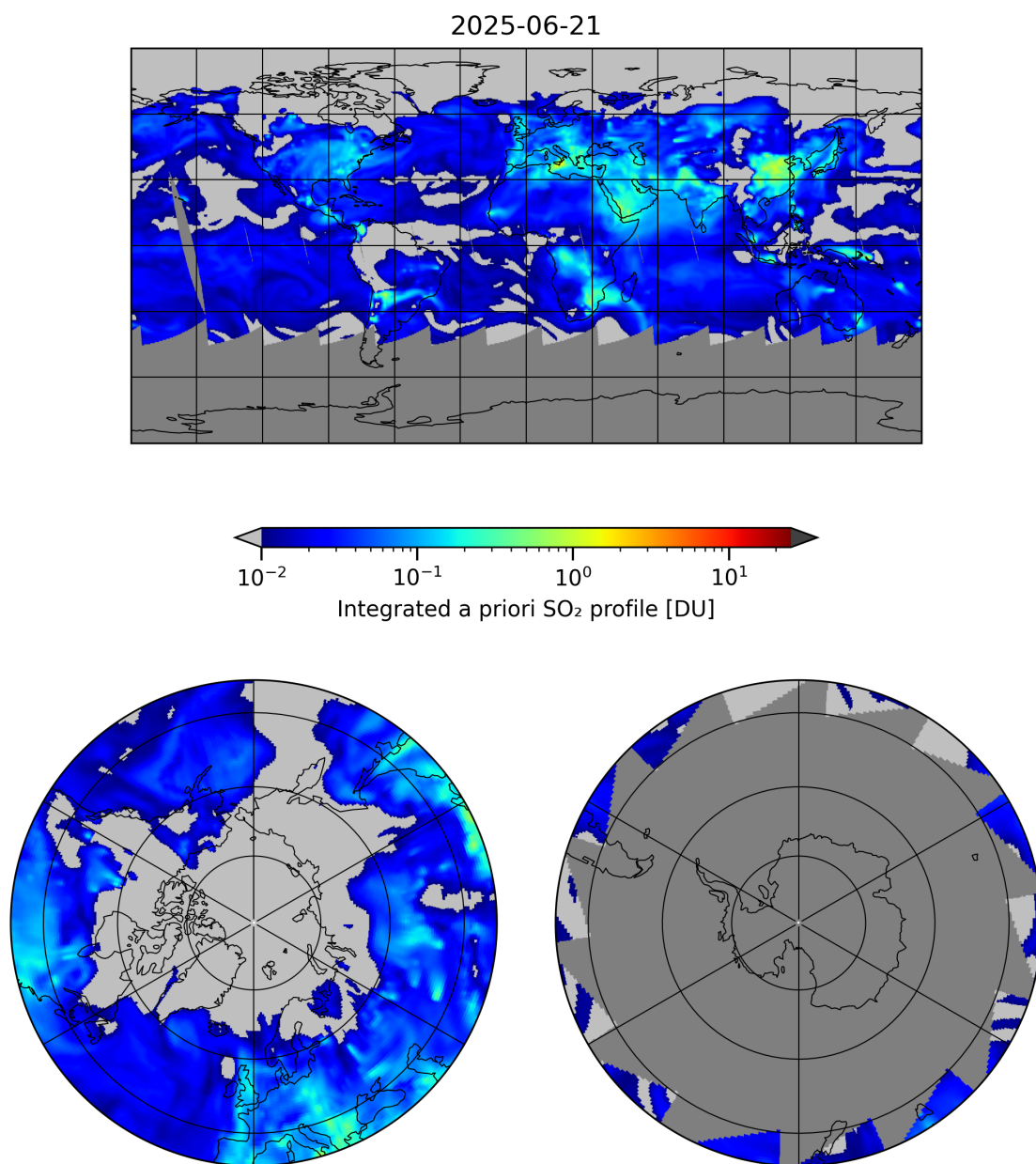


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-06-21 to 2025-06-22

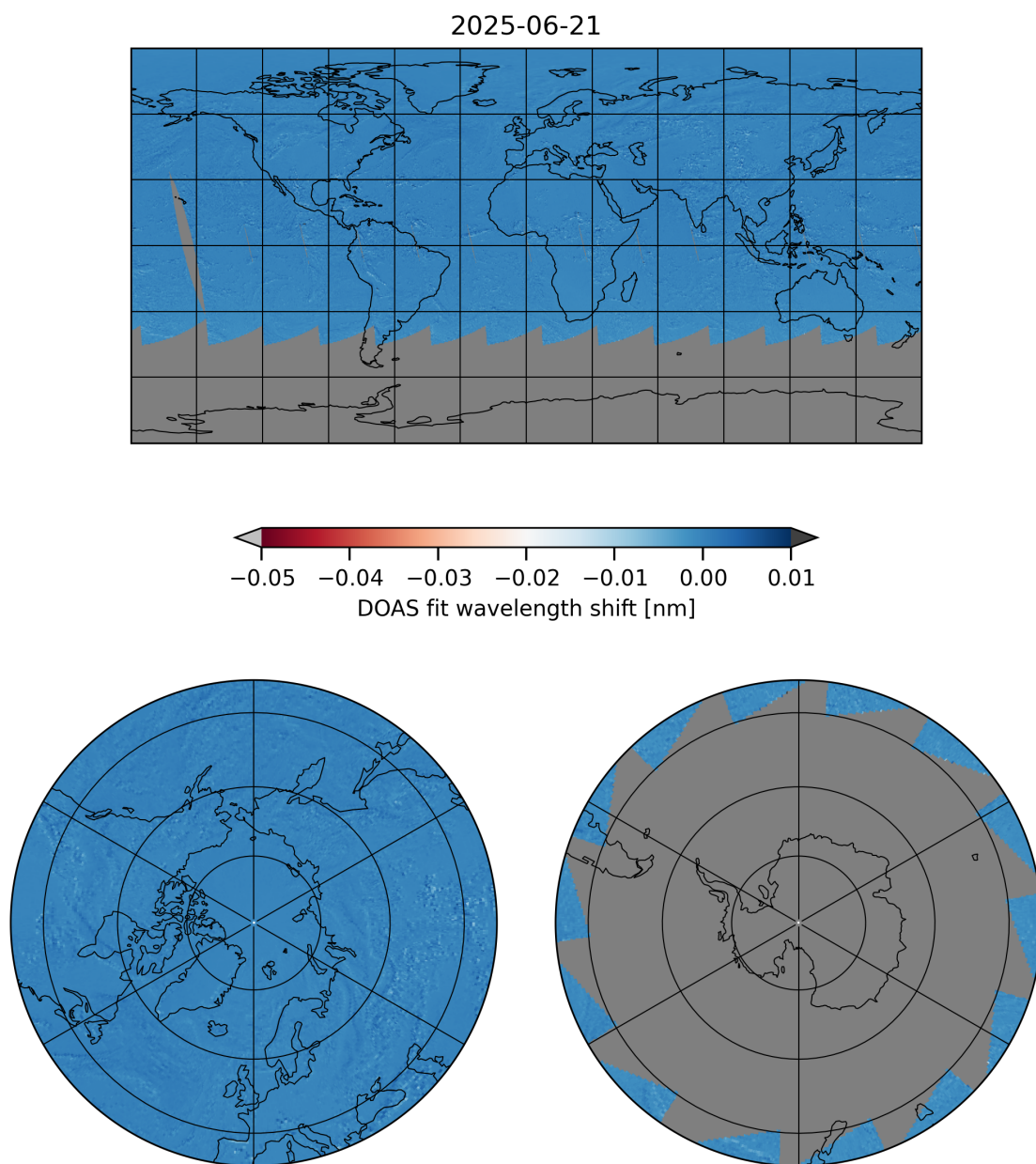


Figure 22: Map of “DOAS fit wavelength shift” for 2025-06-21 to 2025-06-22

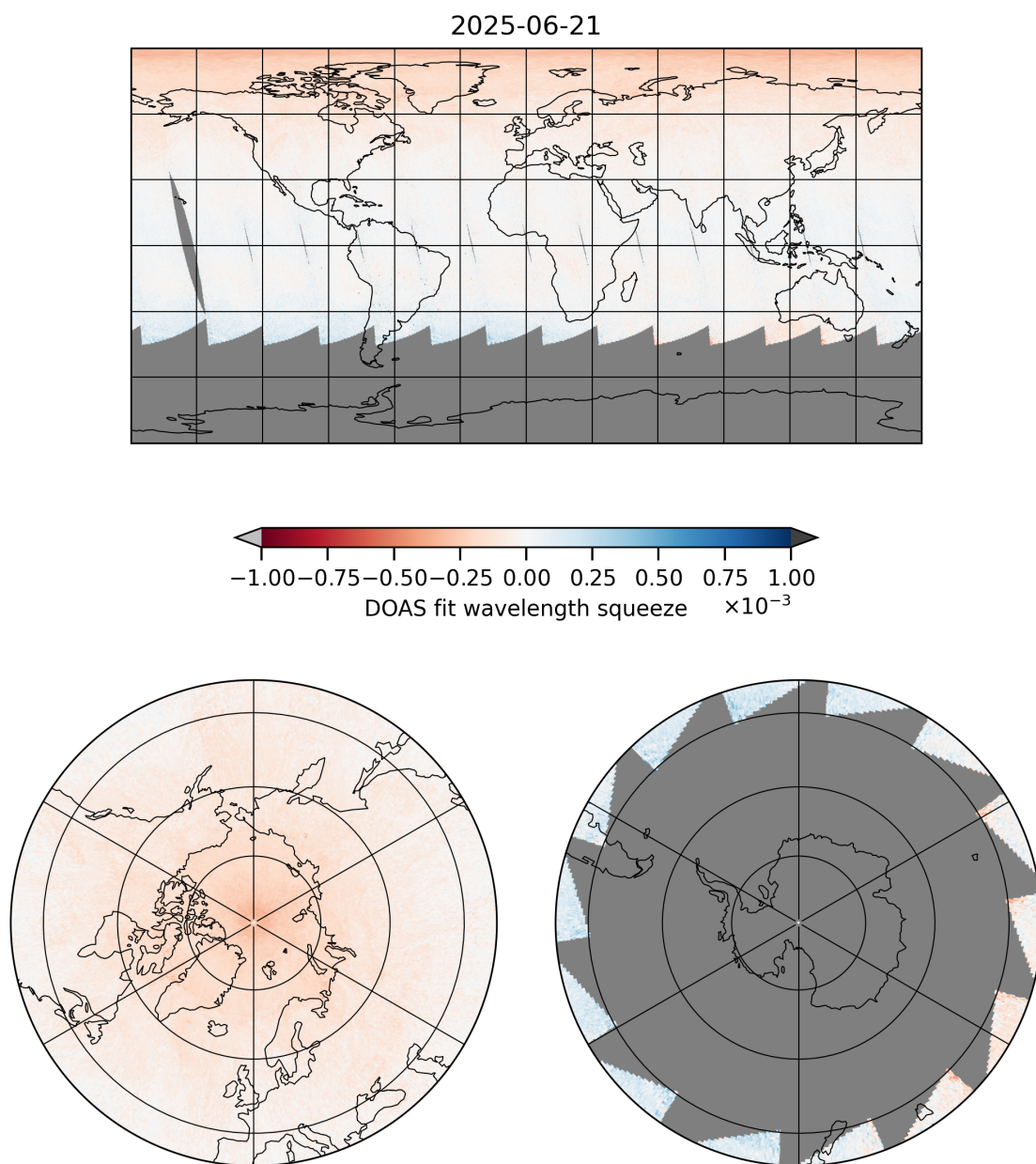


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-06-21 to 2025-06-22

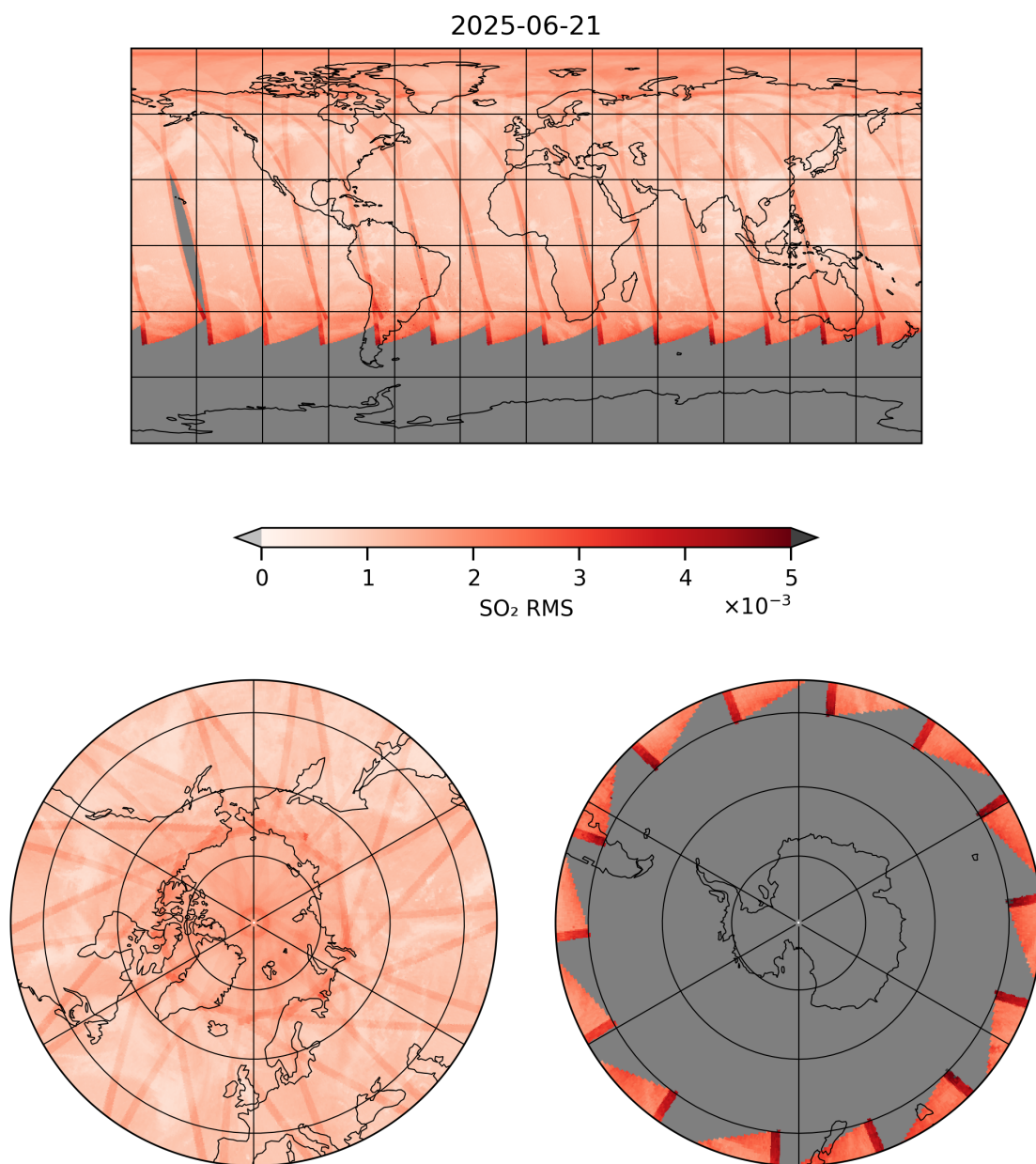


Figure 24: Map of “SO₂ RMS” for 2025-06-21 to 2025-06-22

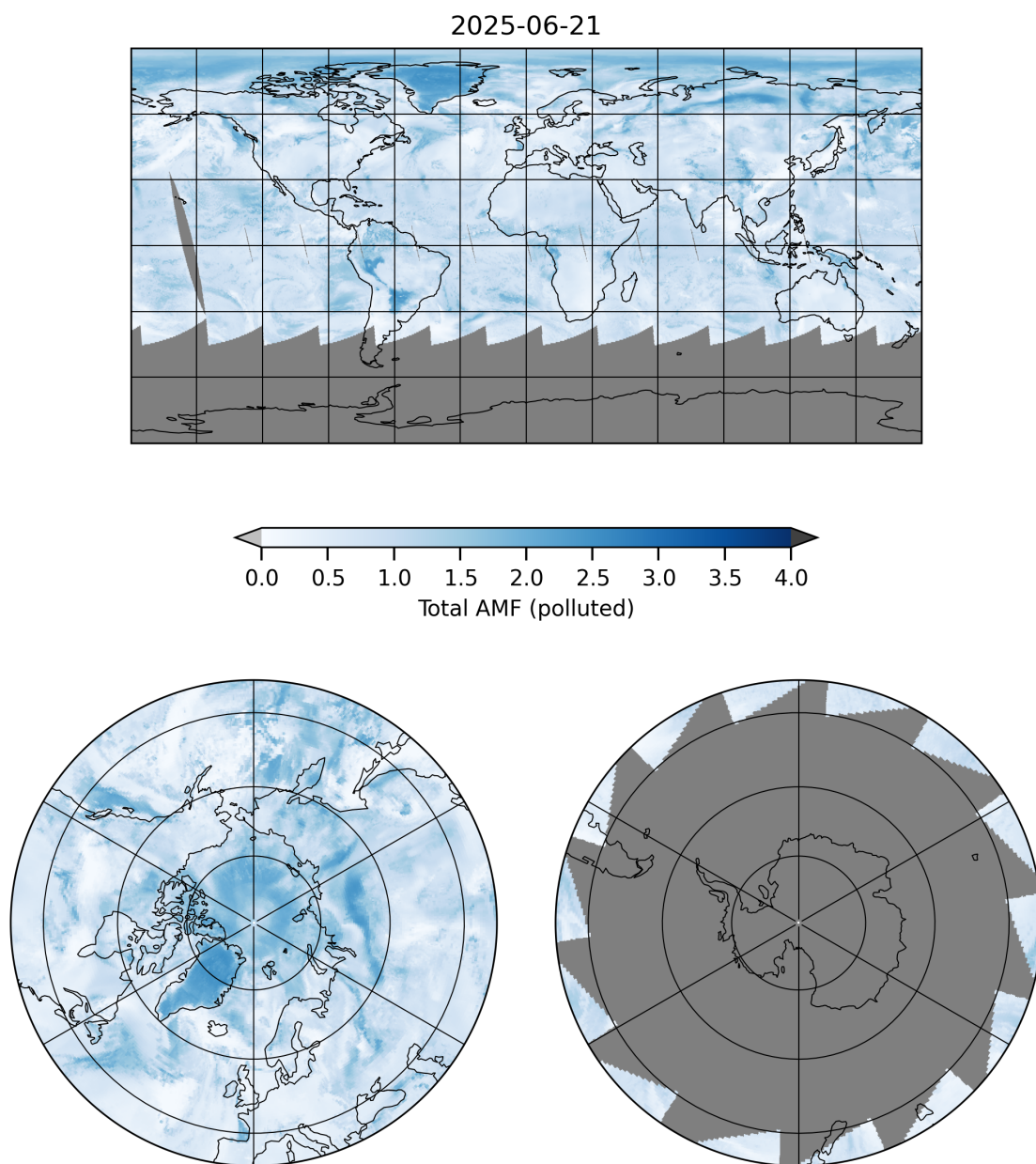


Figure 25: Map of “Total AMF (polluted)” for 2025-06-21 to 2025-06-22

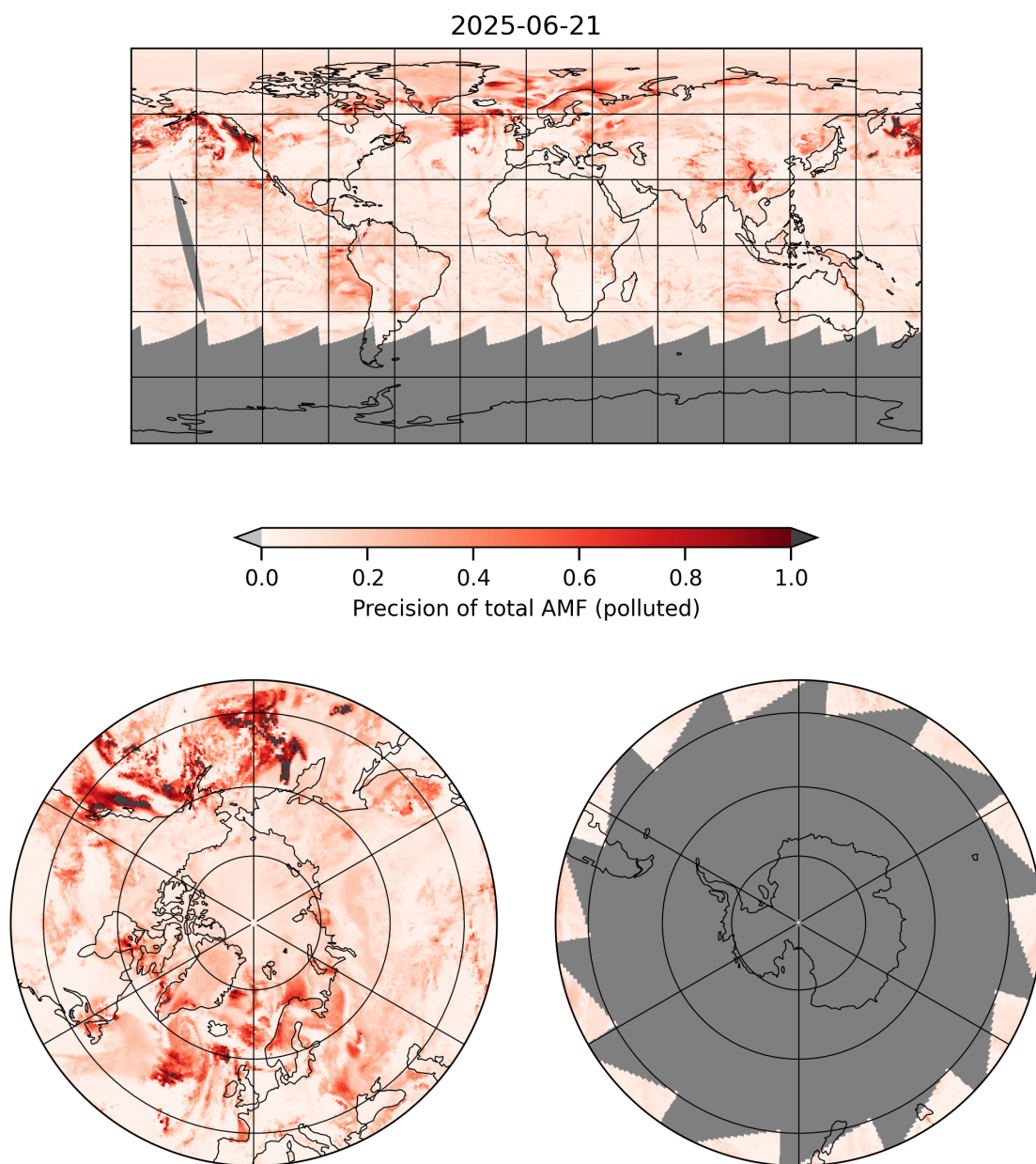


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-06-21 to 2025-06-22

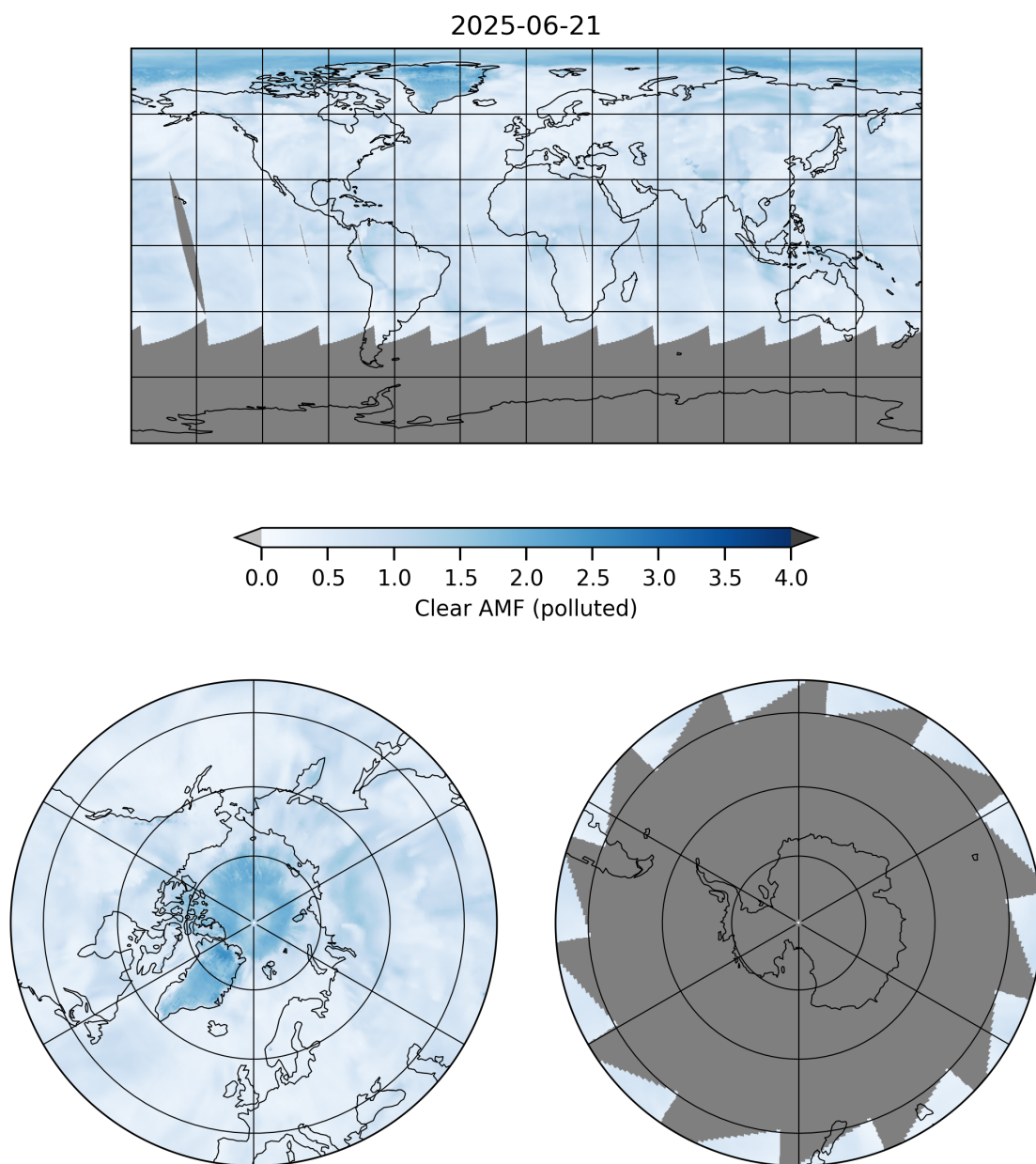


Figure 27: Map of “Clear AMF (polluted)” for 2025-06-21 to 2025-06-22

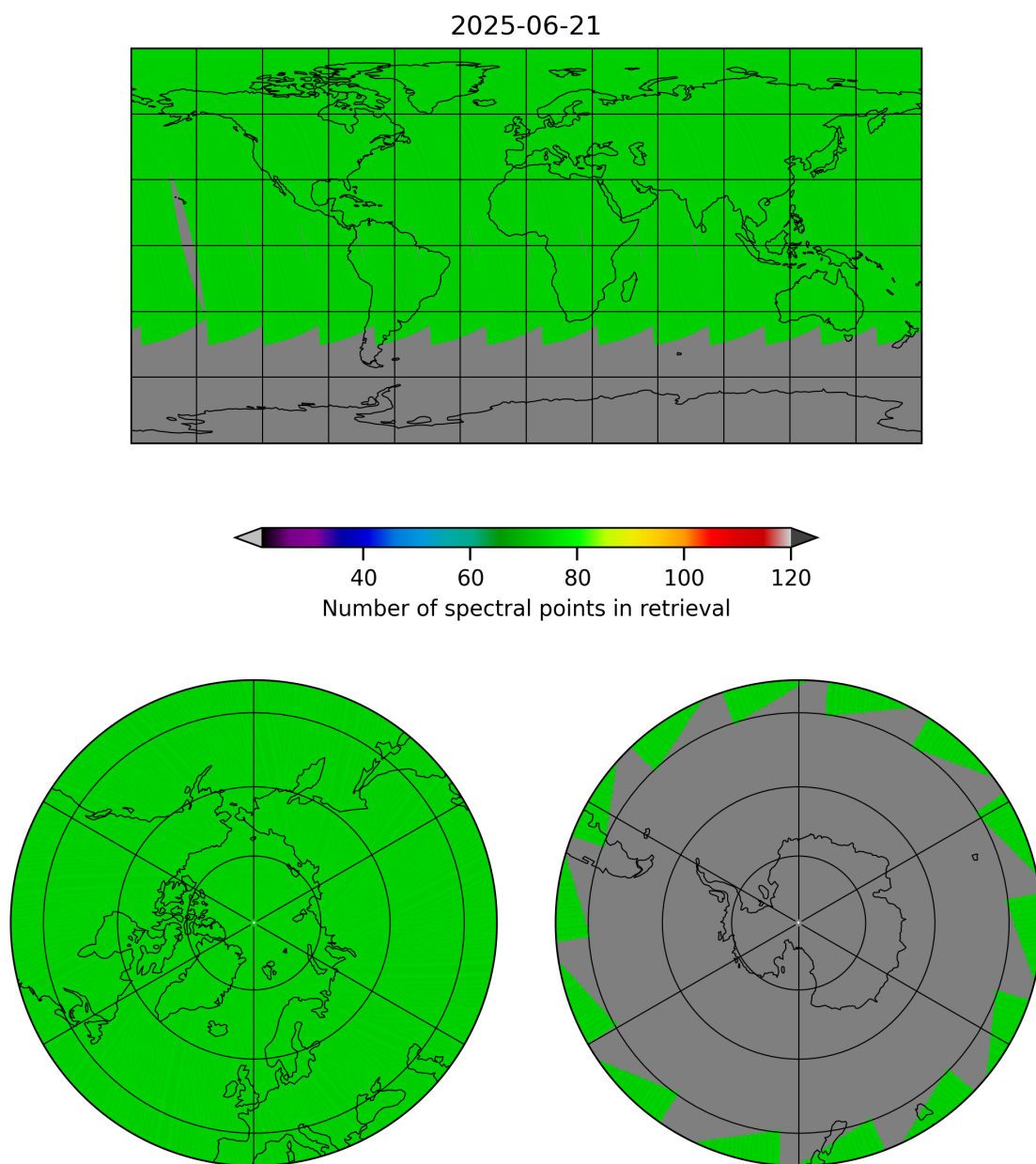


Figure 28: Map of “Number of spectral points in retrieval” for 2025-06-21 to 2025-06-22

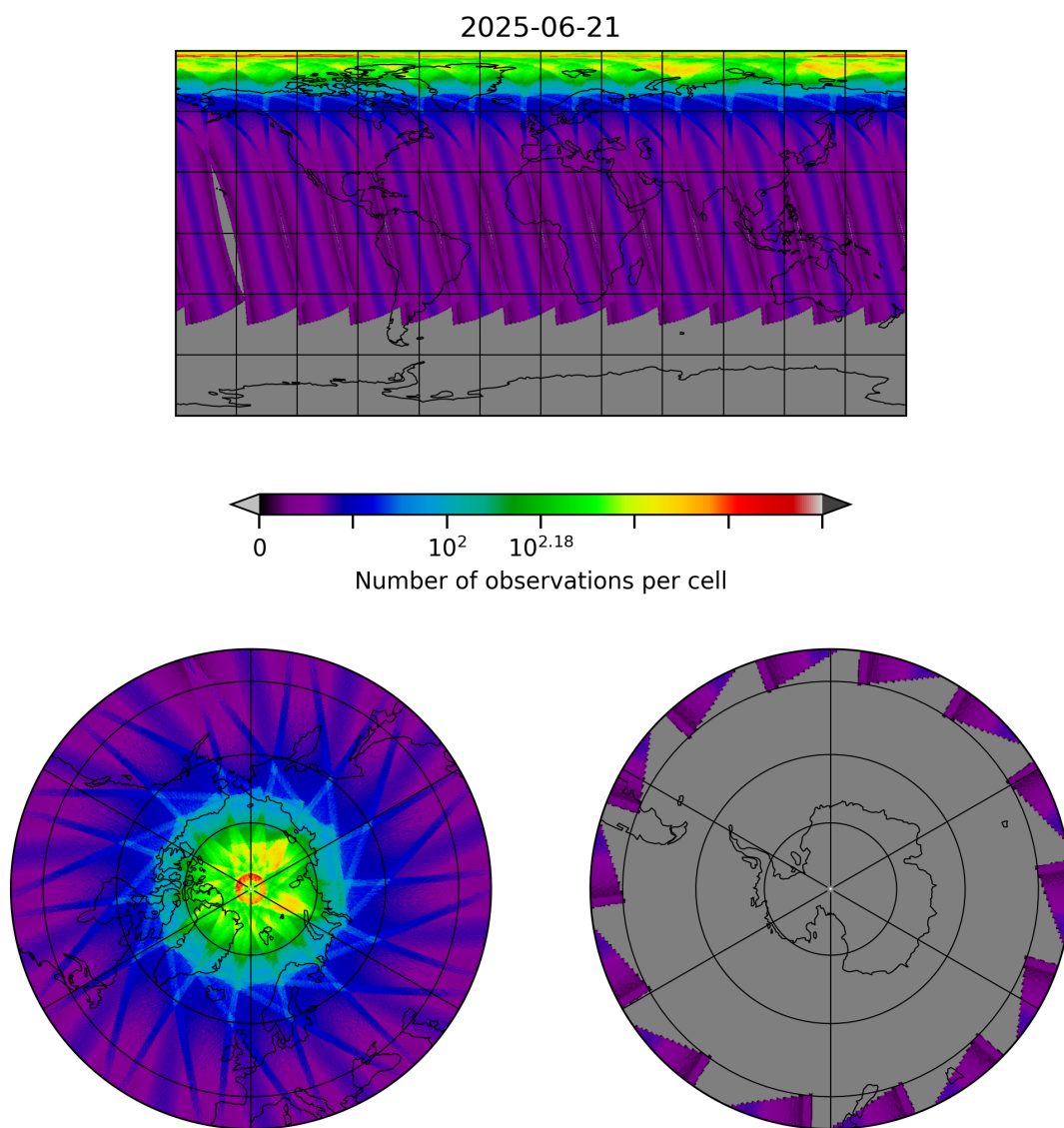


Figure 29: Map of the number of observations for 2025-06-21 to 2025-06-22

7 Zonal average

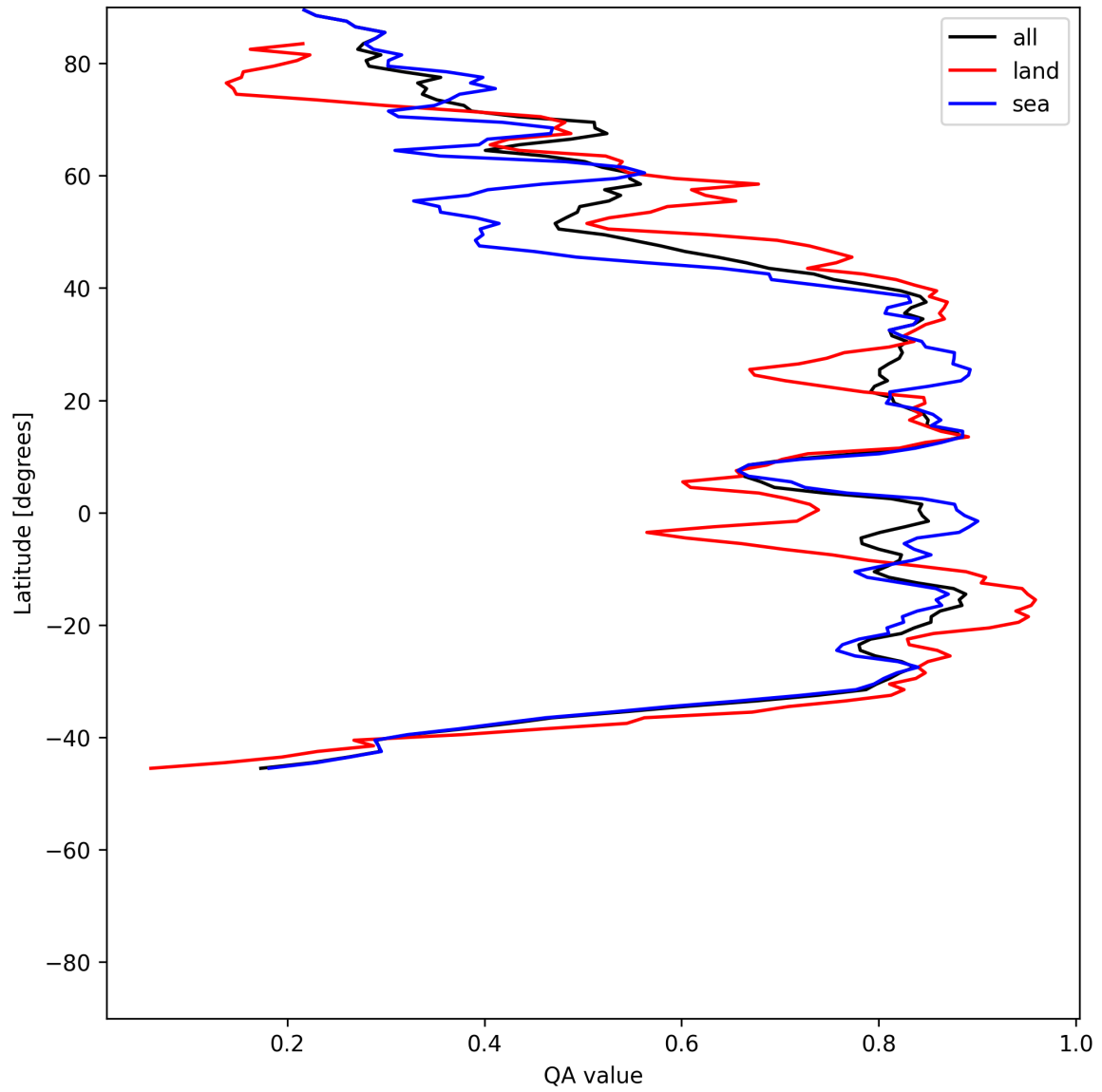


Figure 30: Zonal average of “QA value” for 2025-06-21 to 2025-06-22.

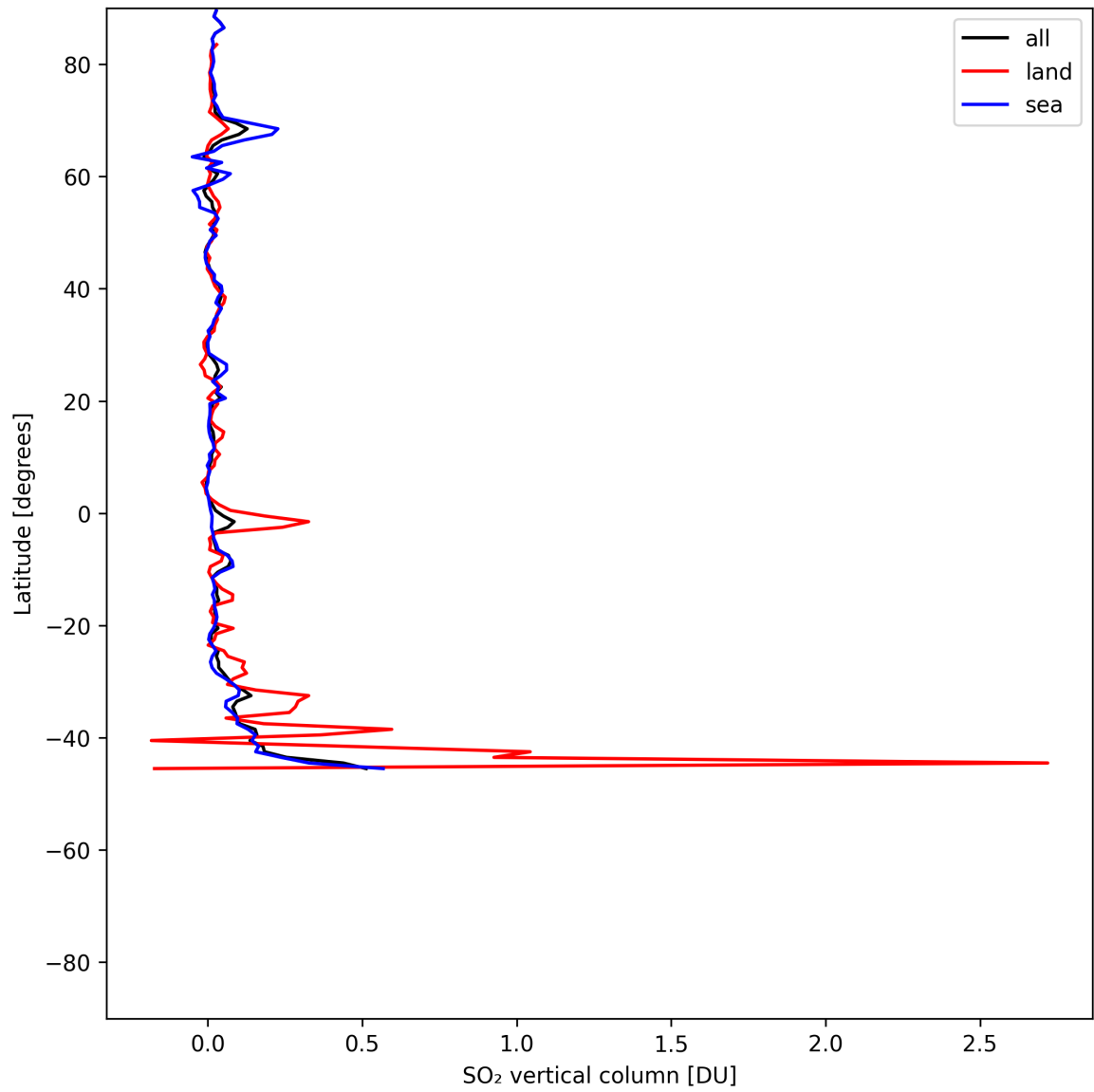


Figure 31: Zonal average of “SO₂ vertical column” for 2025-06-21 to 2025-06-22.

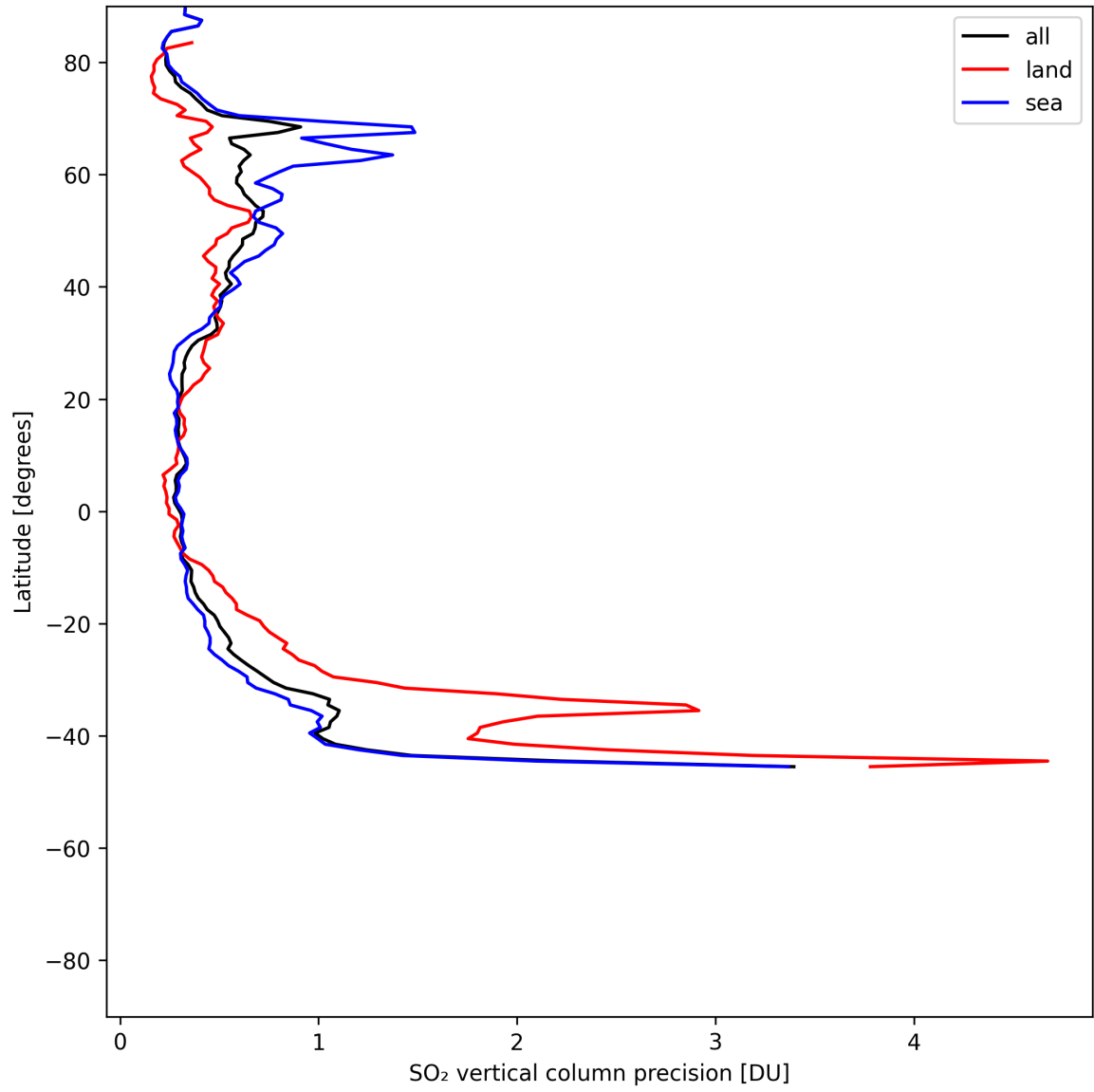


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-06-21 to 2025-06-22.

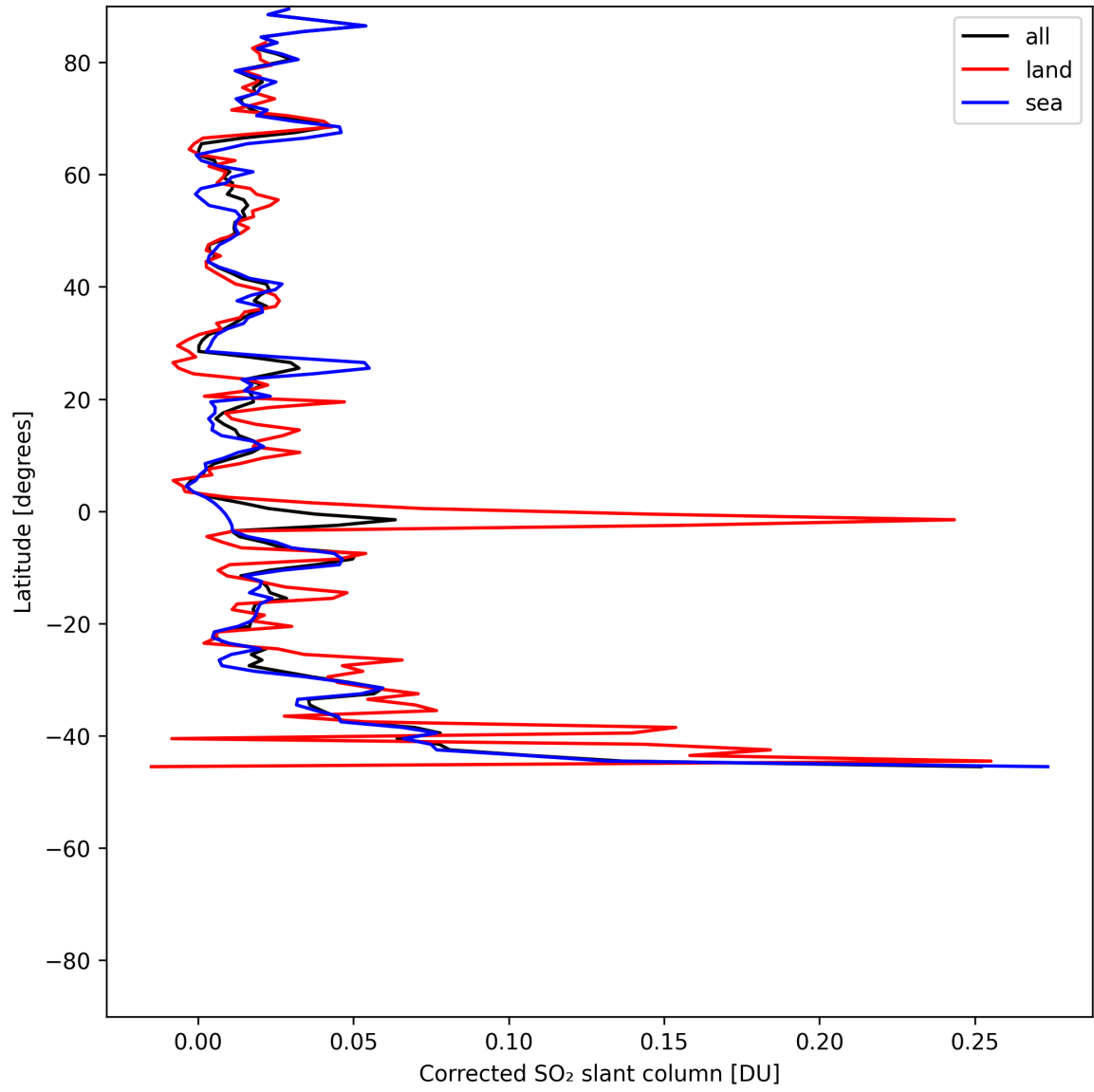


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-06-21 to 2025-06-22.

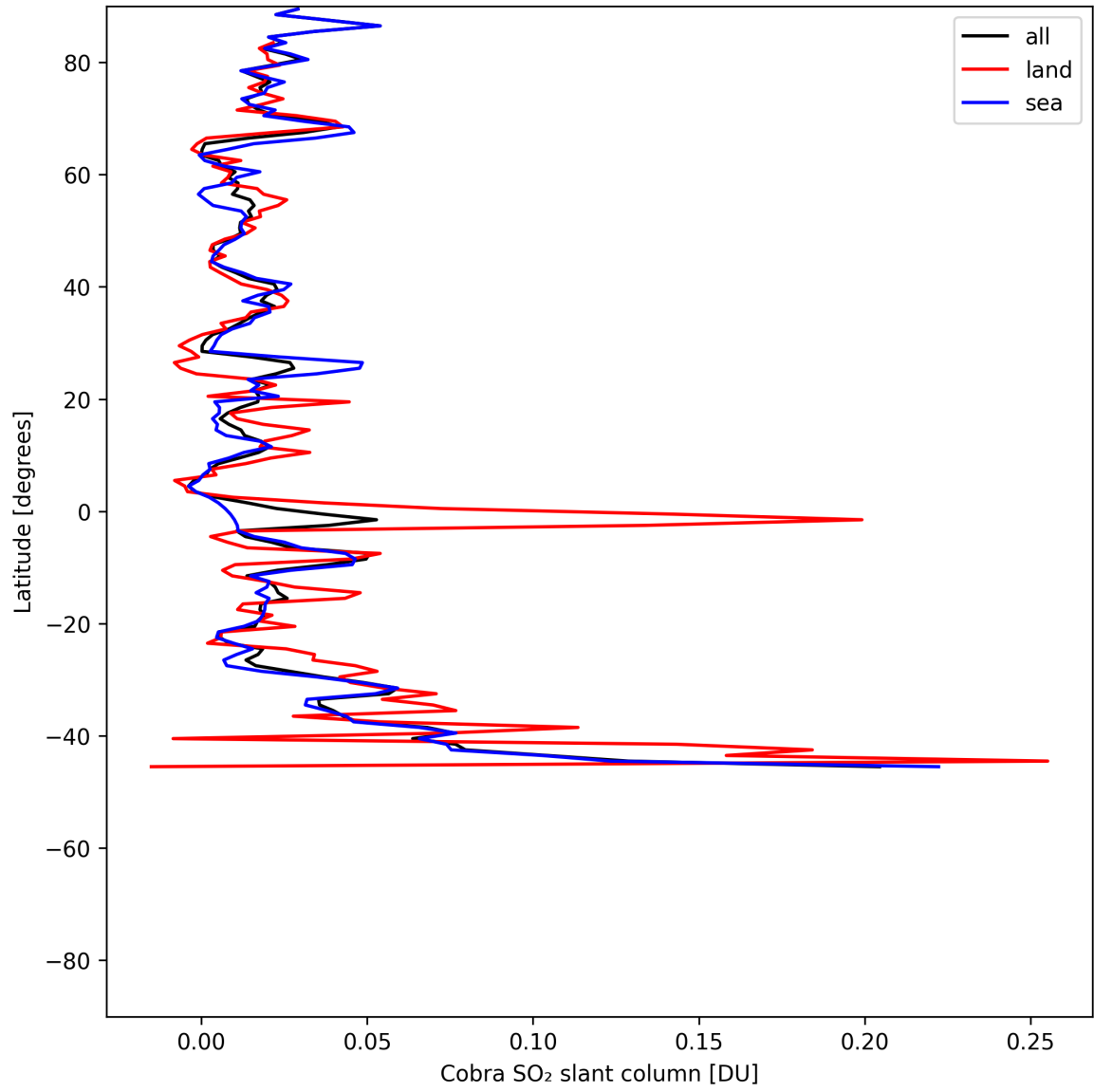


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-06-21 to 2025-06-22.

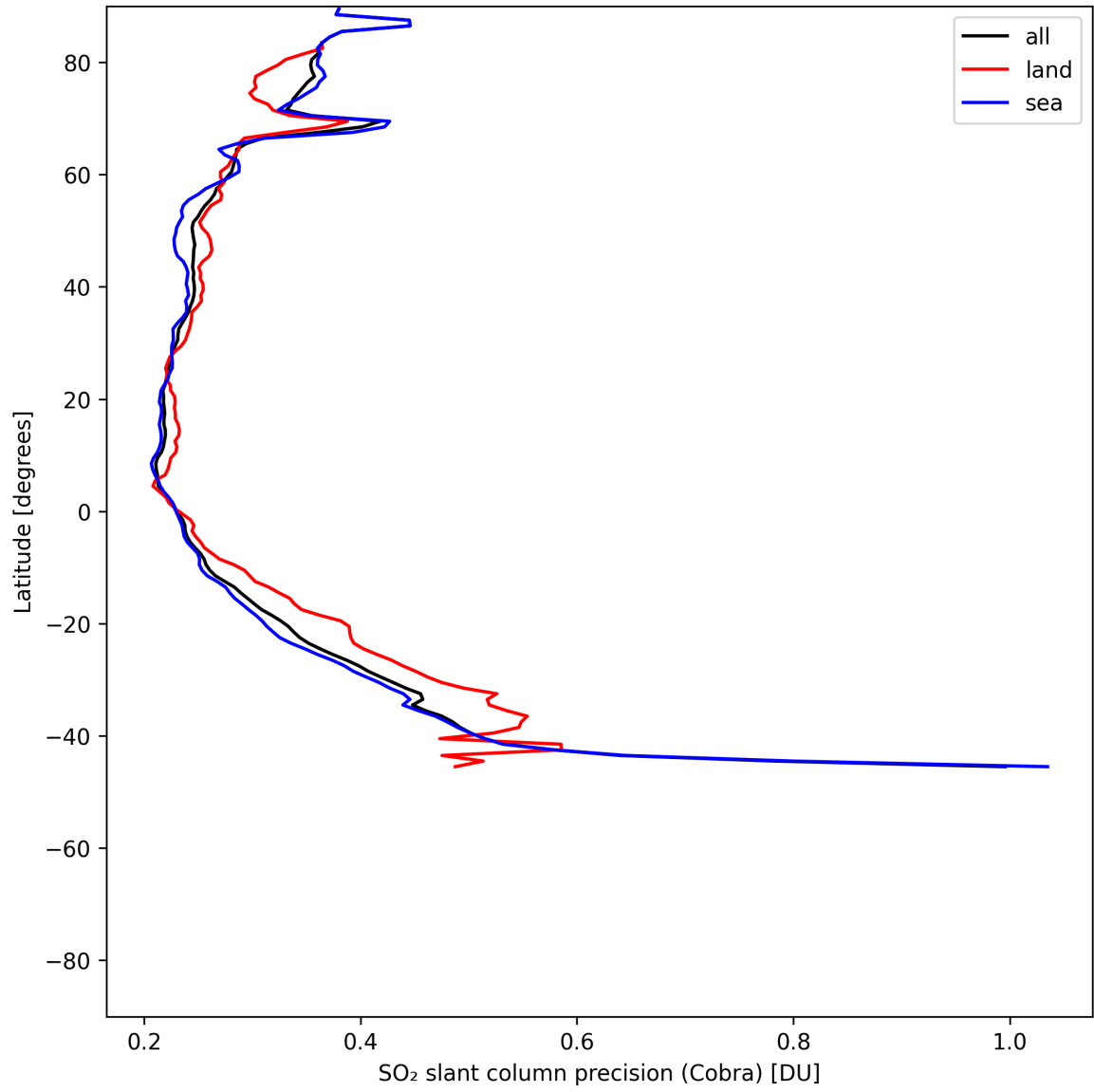


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-06-21 to 2025-06-22.

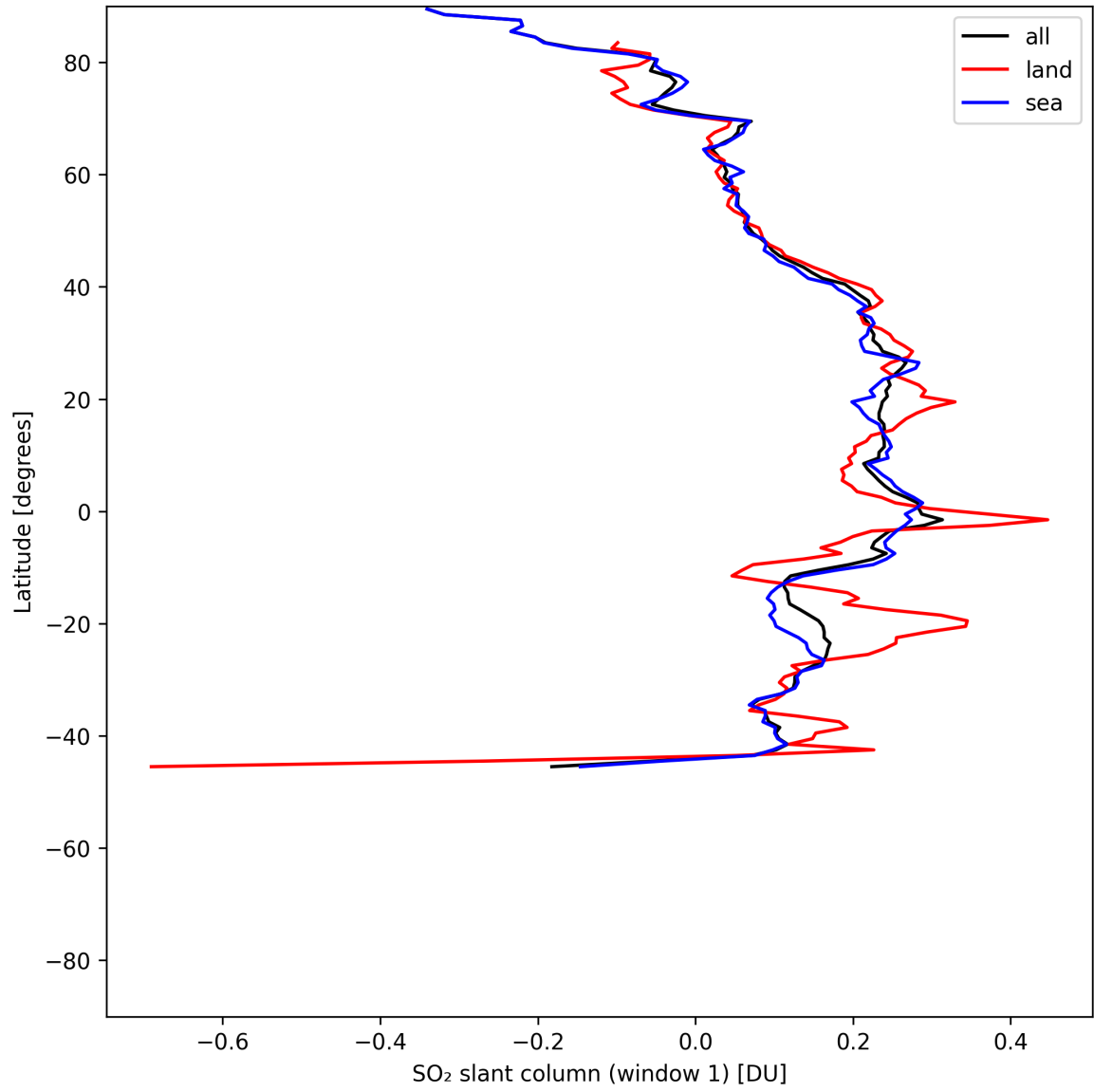


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-06-21 to 2025-06-22.

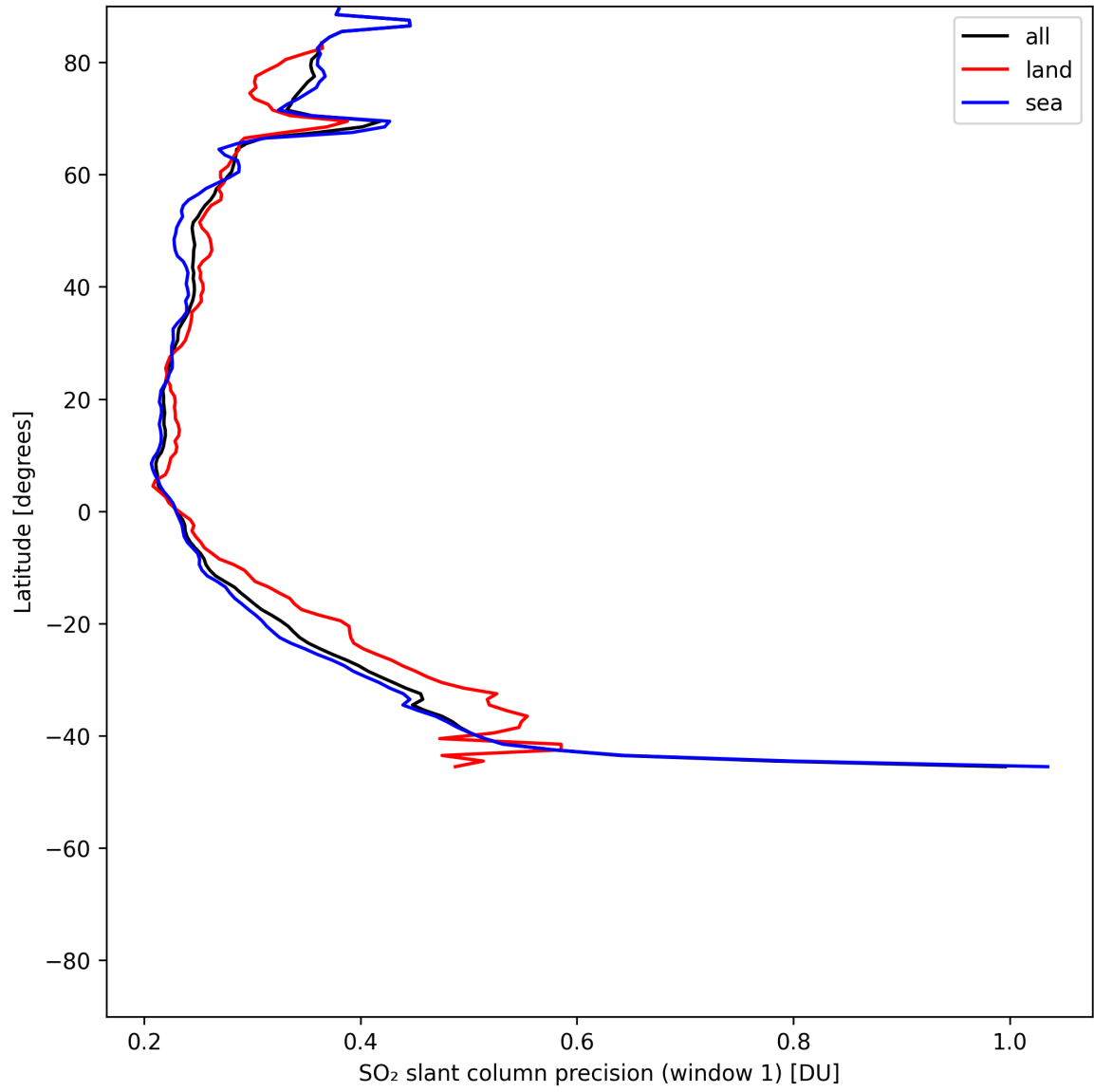


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-06-21 to 2025-06-22.

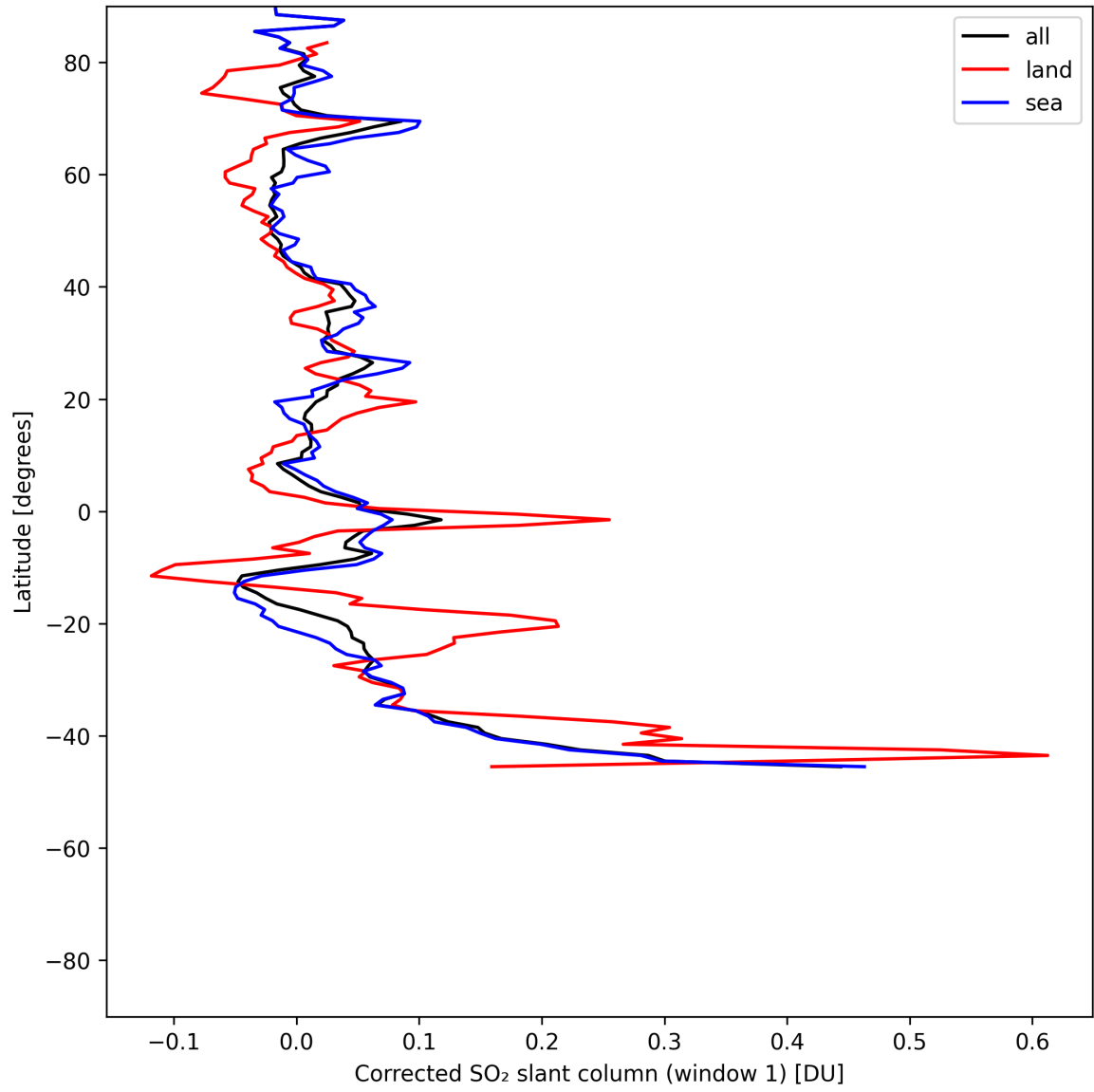


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-06-21 to 2025-06-22.

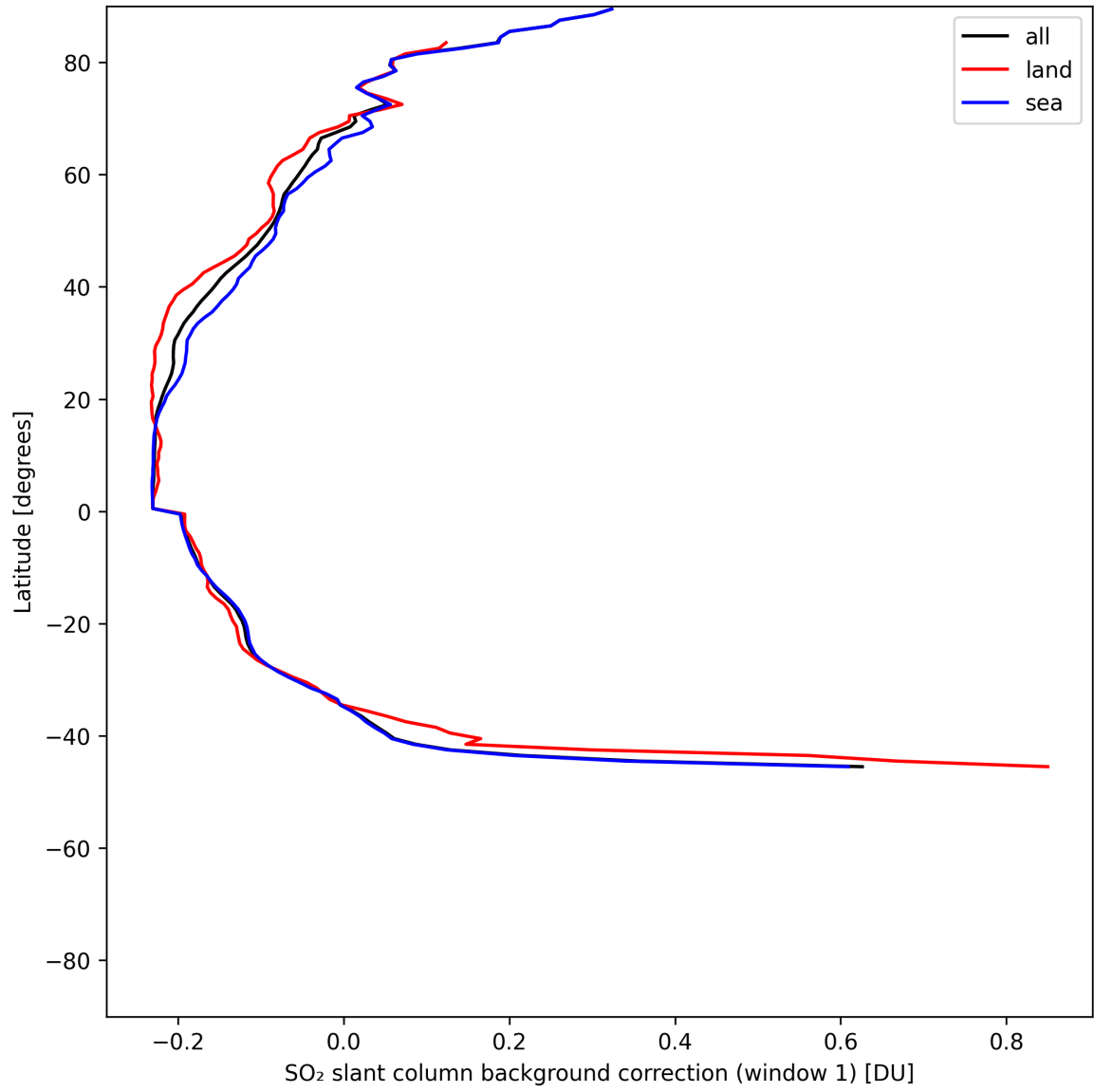


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-06-21 to 2025-06-22.

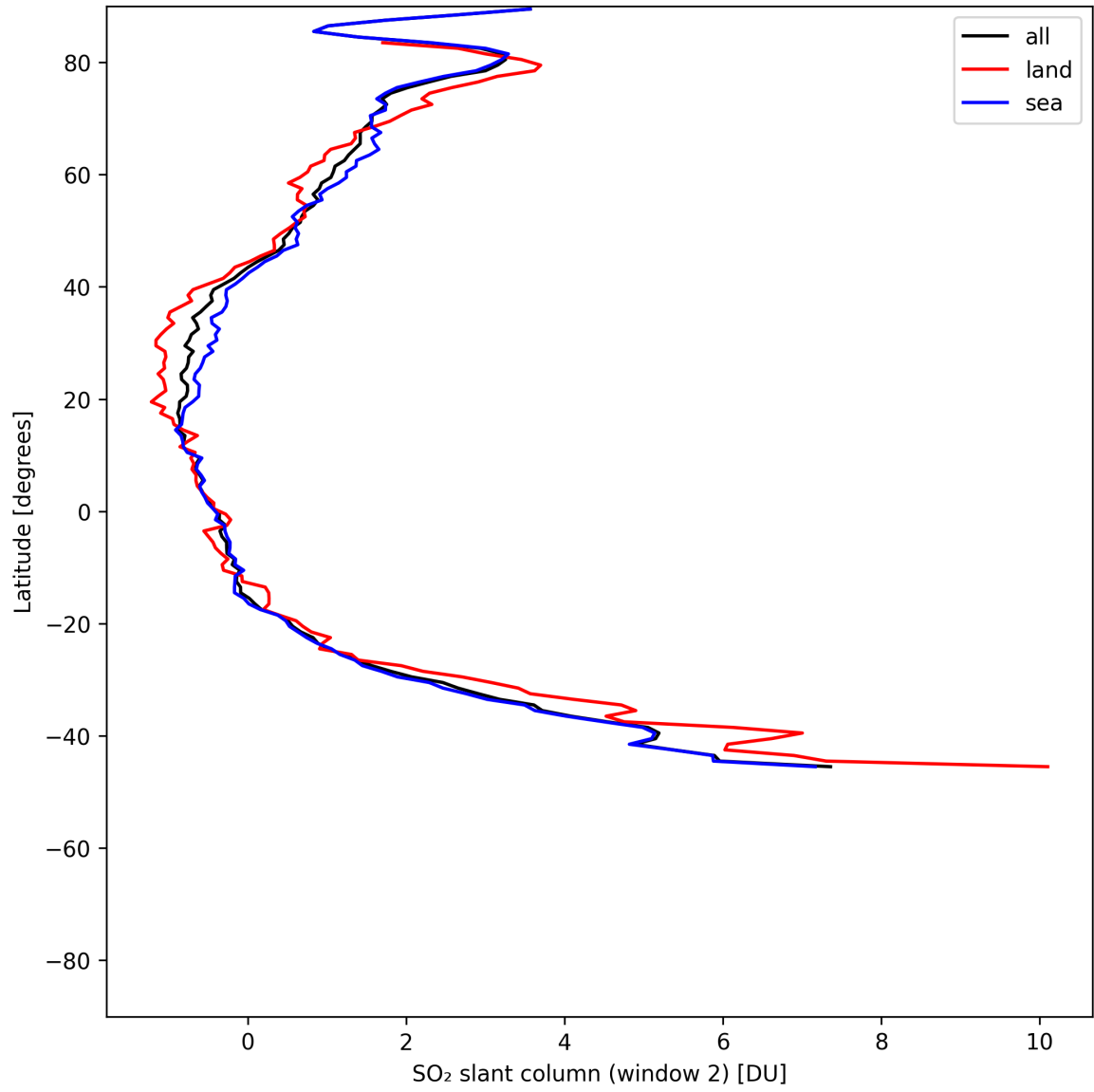


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-06-21 to 2025-06-22.

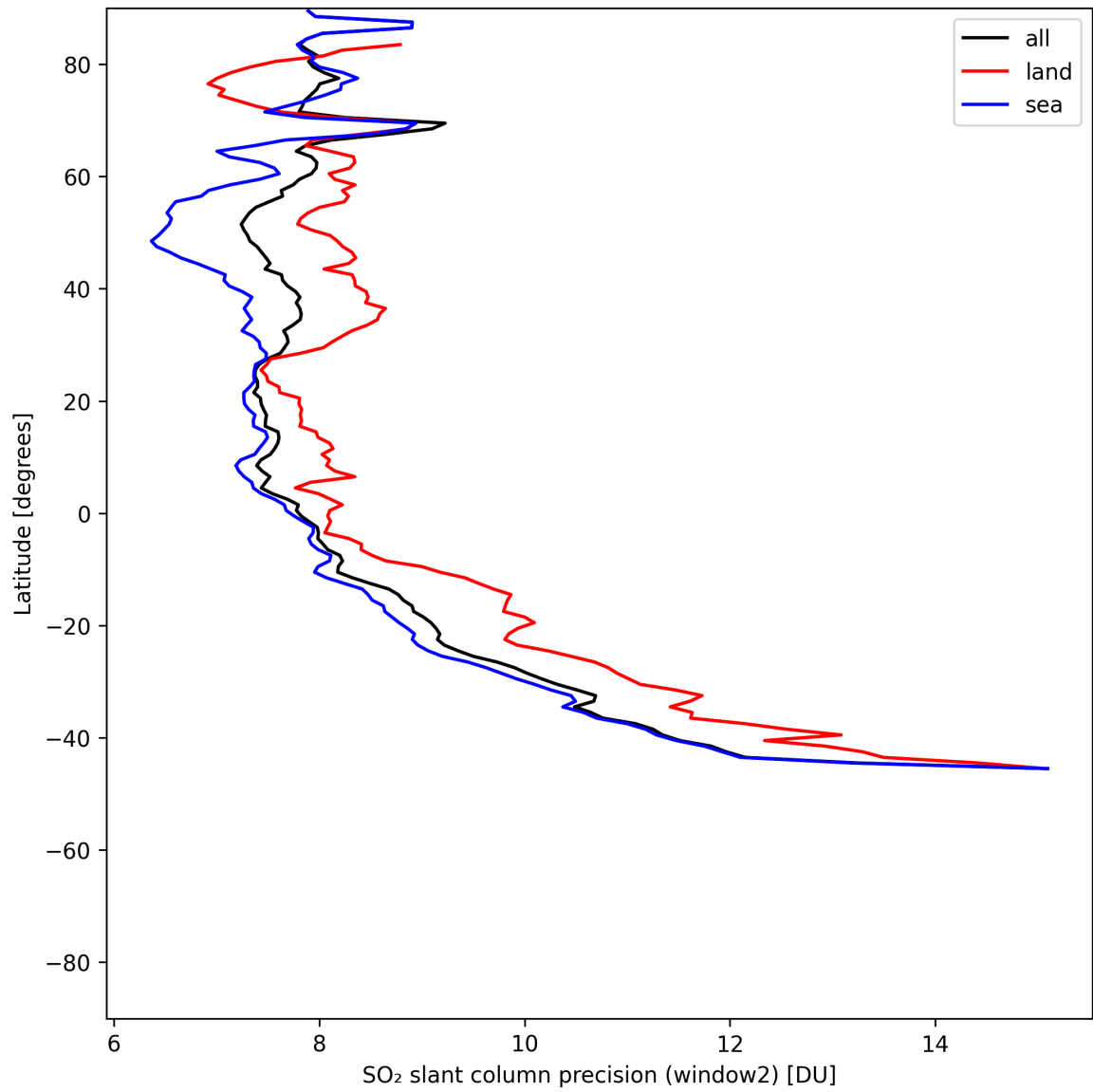


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-06-21 to 2025-06-22.

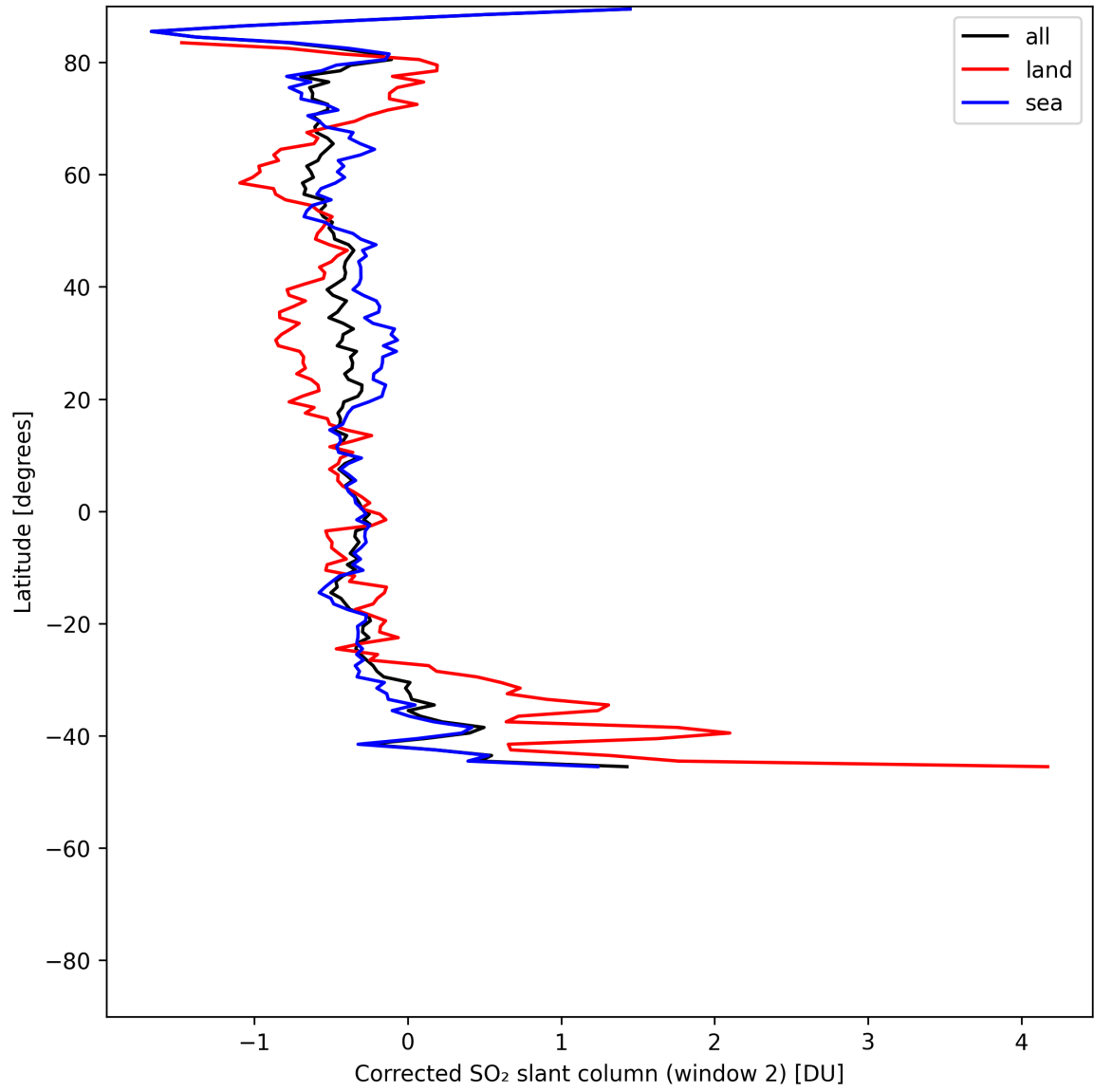


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-06-21 to 2025-06-22.

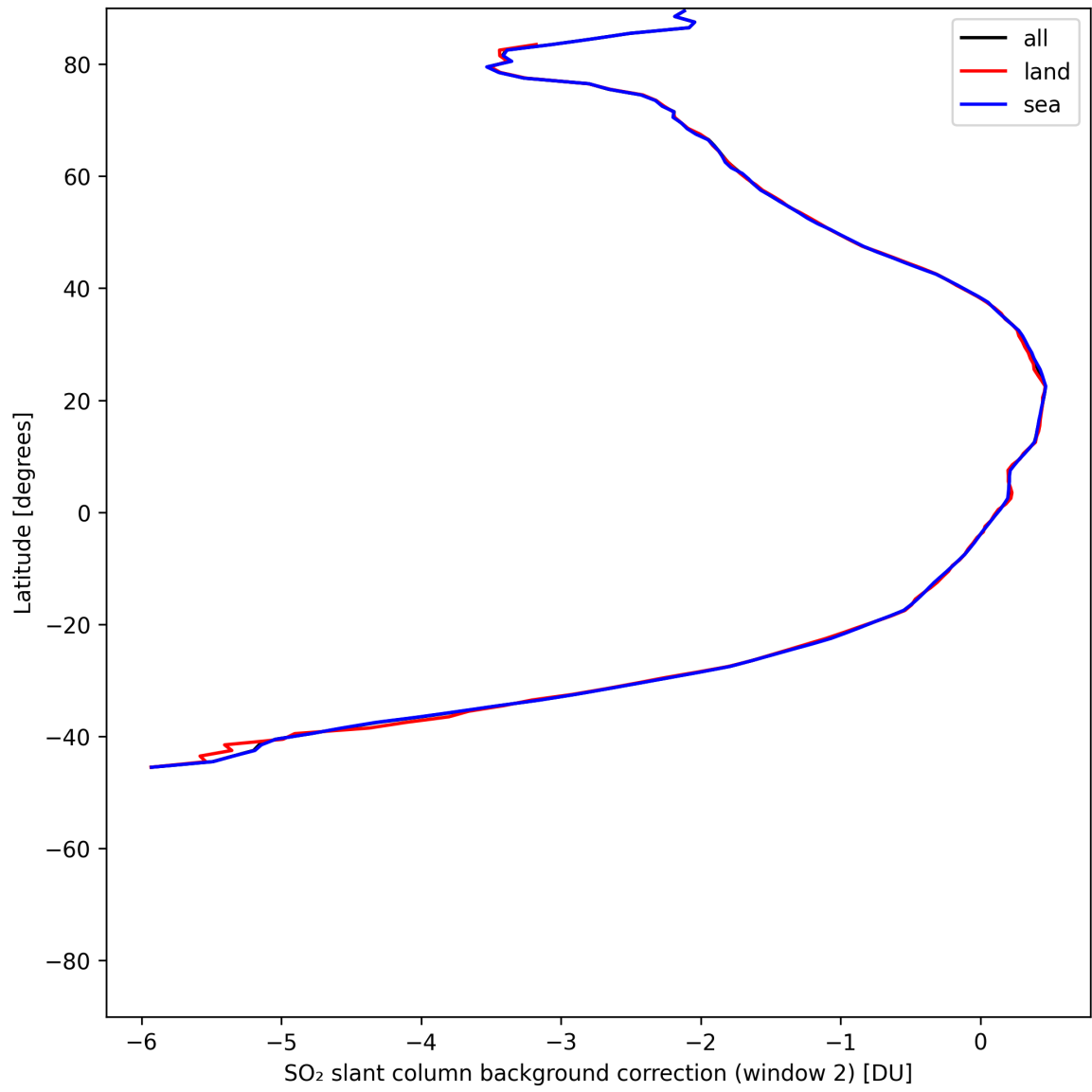


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-06-21 to 2025-06-22.

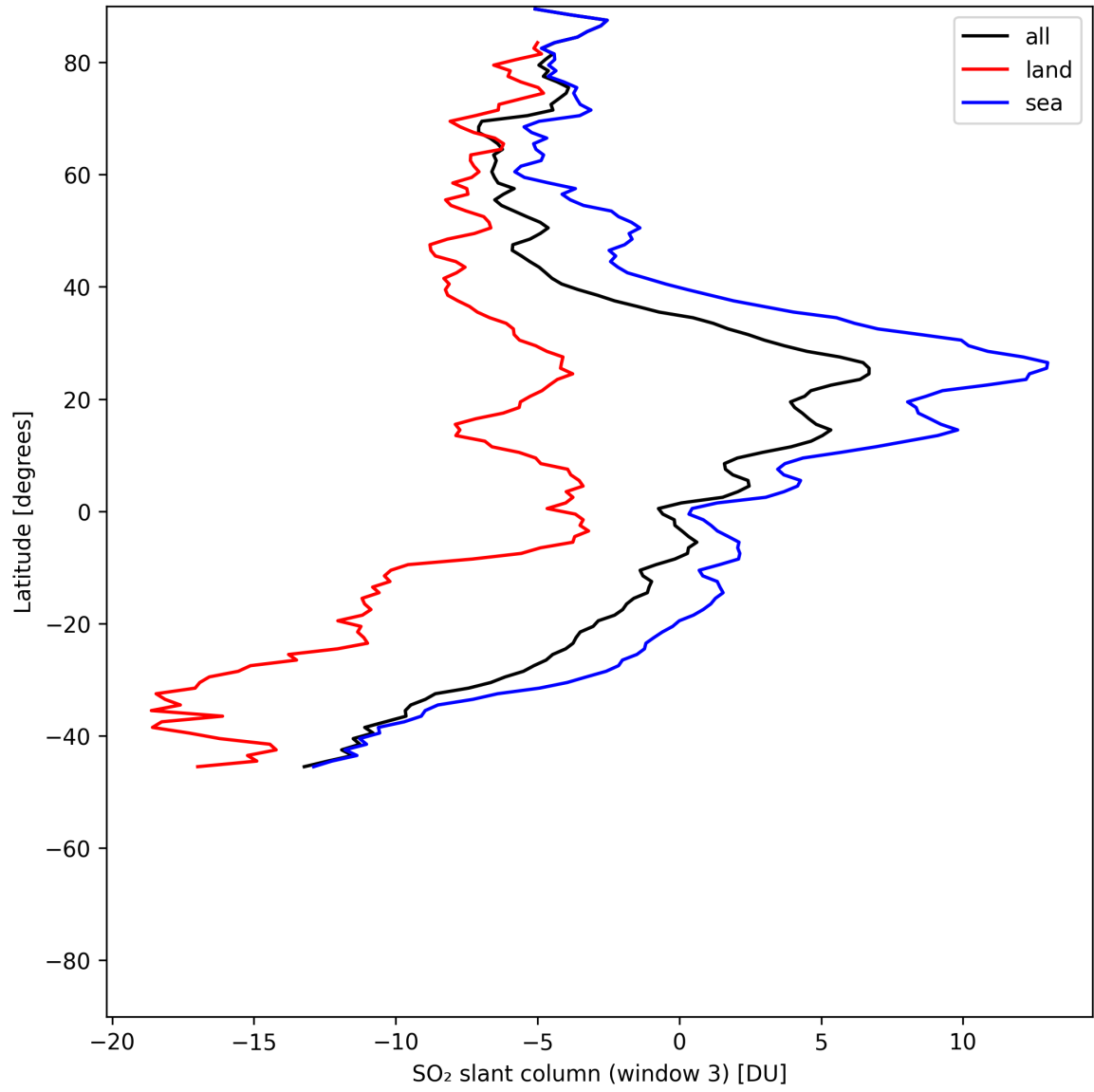


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-06-21 to 2025-06-22.

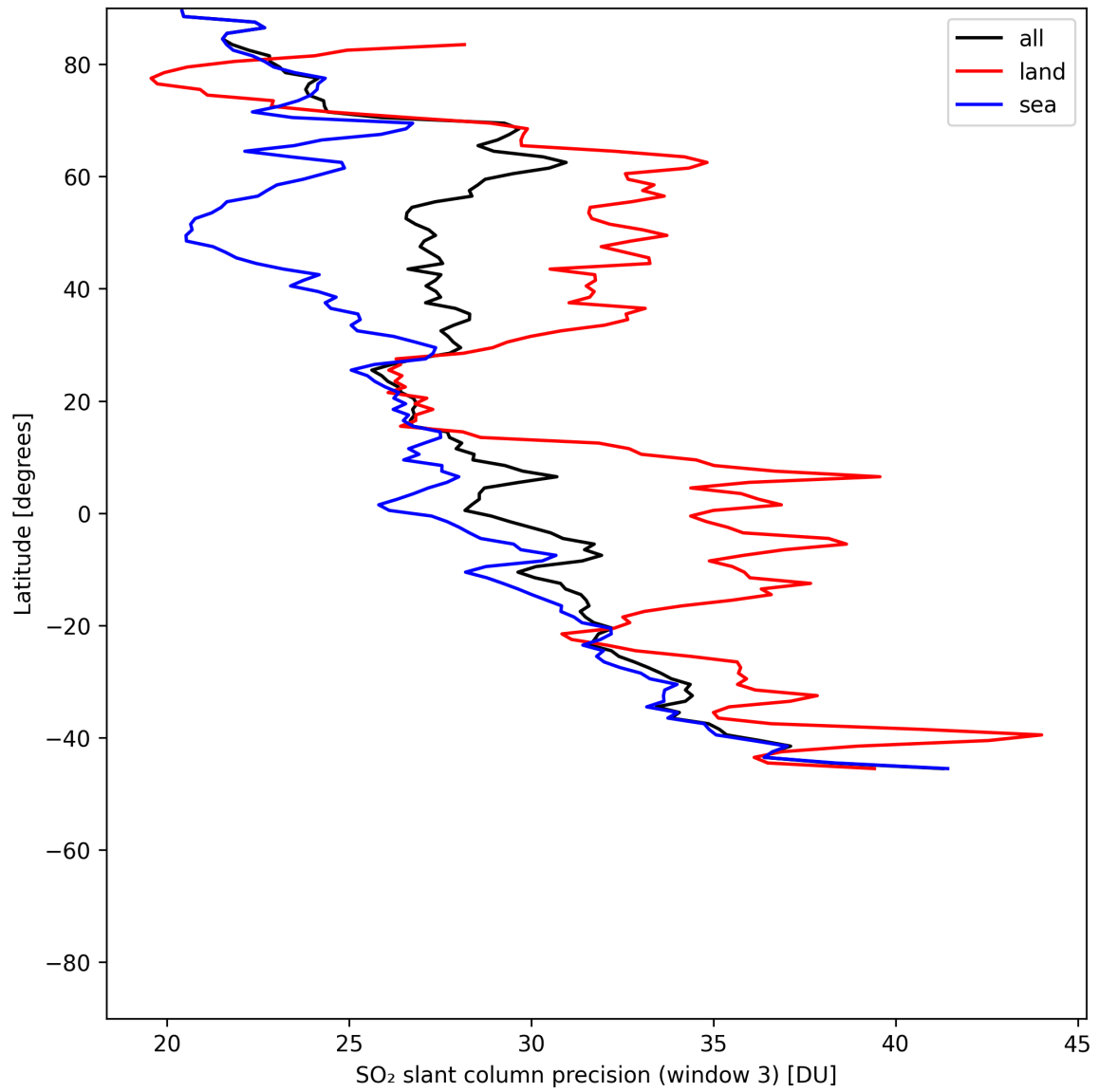


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-06-21 to 2025-06-22.

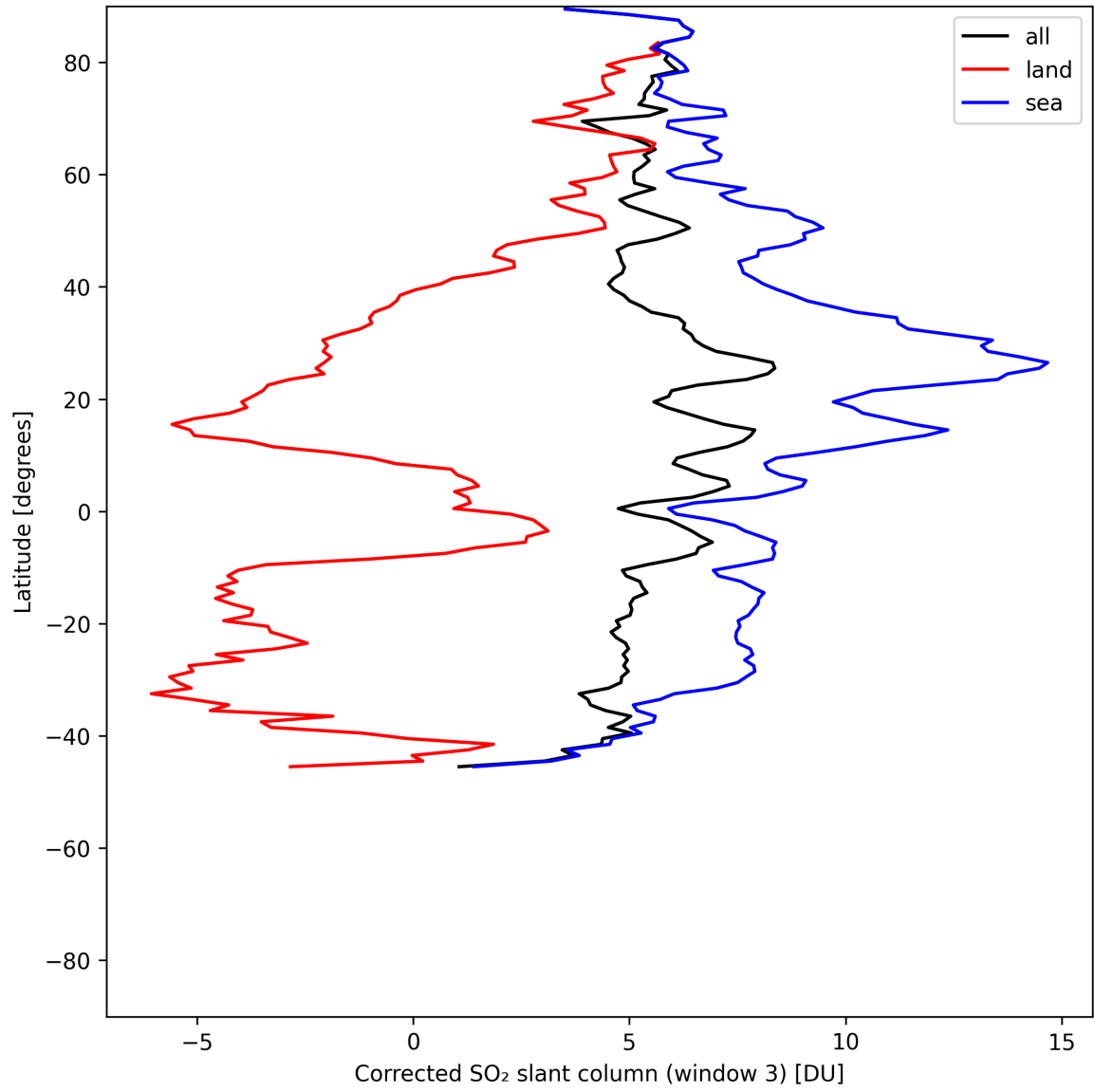


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-06-21 to 2025-06-22.

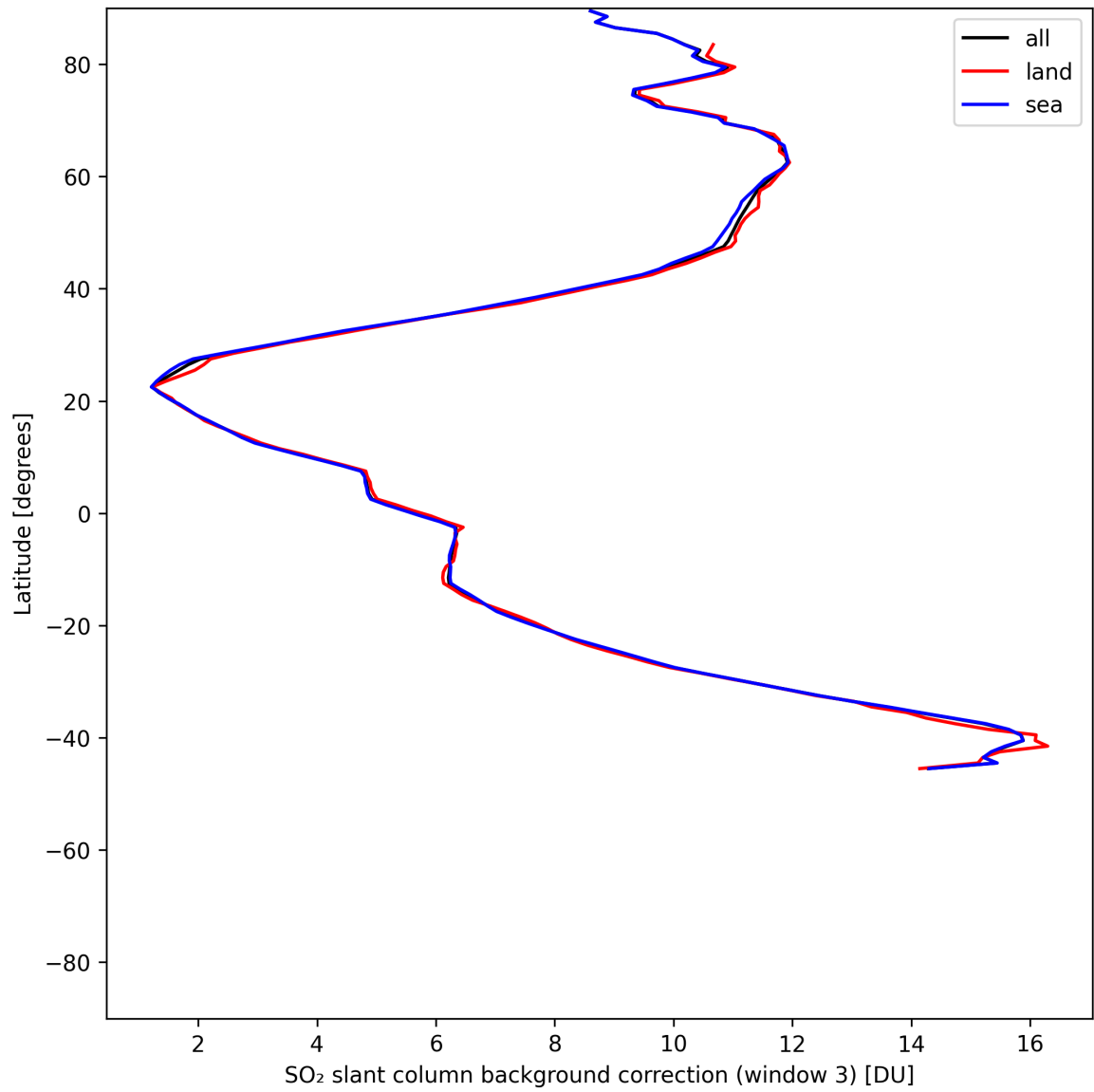


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-06-21 to 2025-06-22.

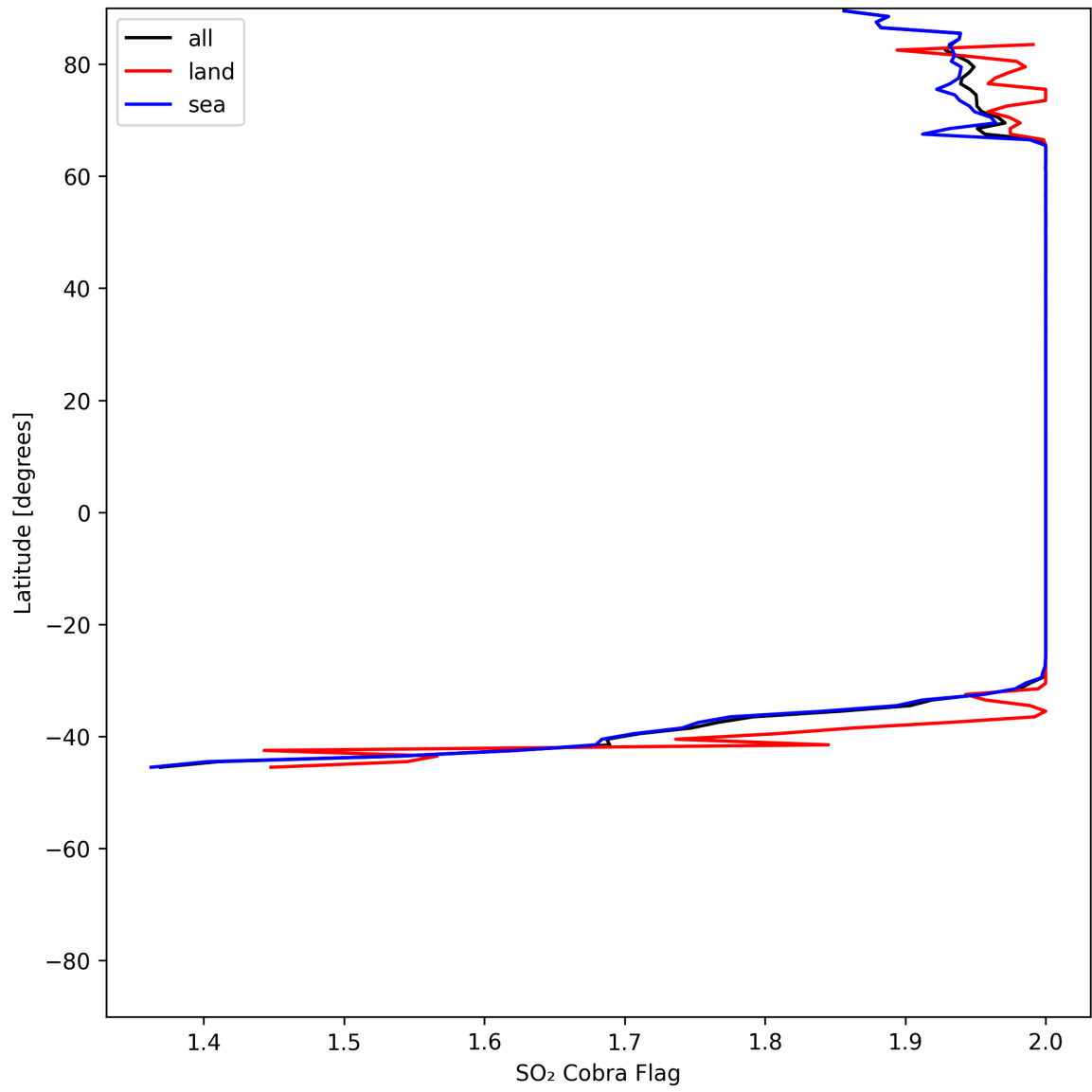


Figure 48: Zonal average of "SO₂ Cobra Flag" for 2025-06-21 to 2025-06-22.

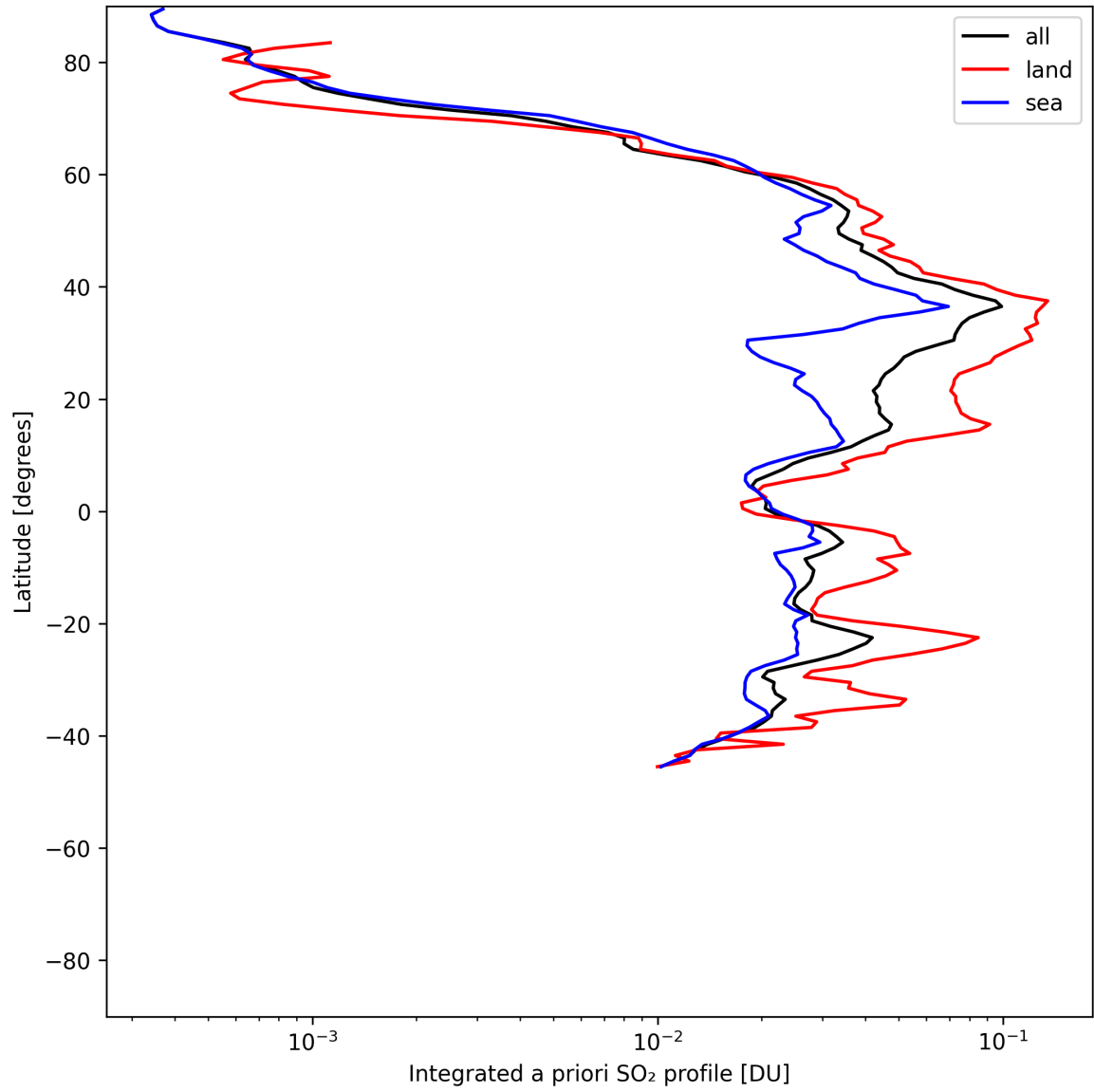


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-06-21 to 2025-06-22.

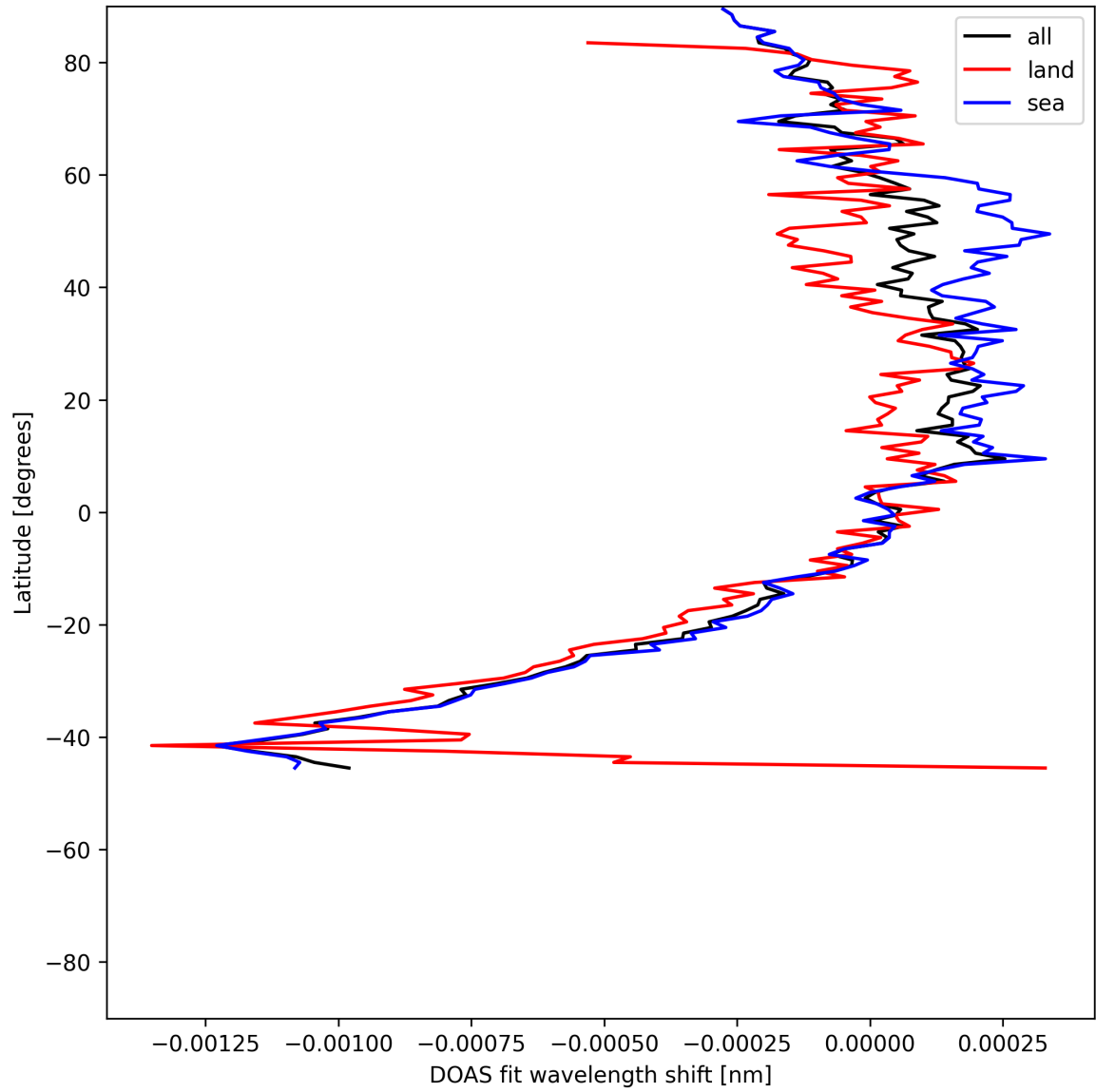


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-06-21 to 2025-06-22.

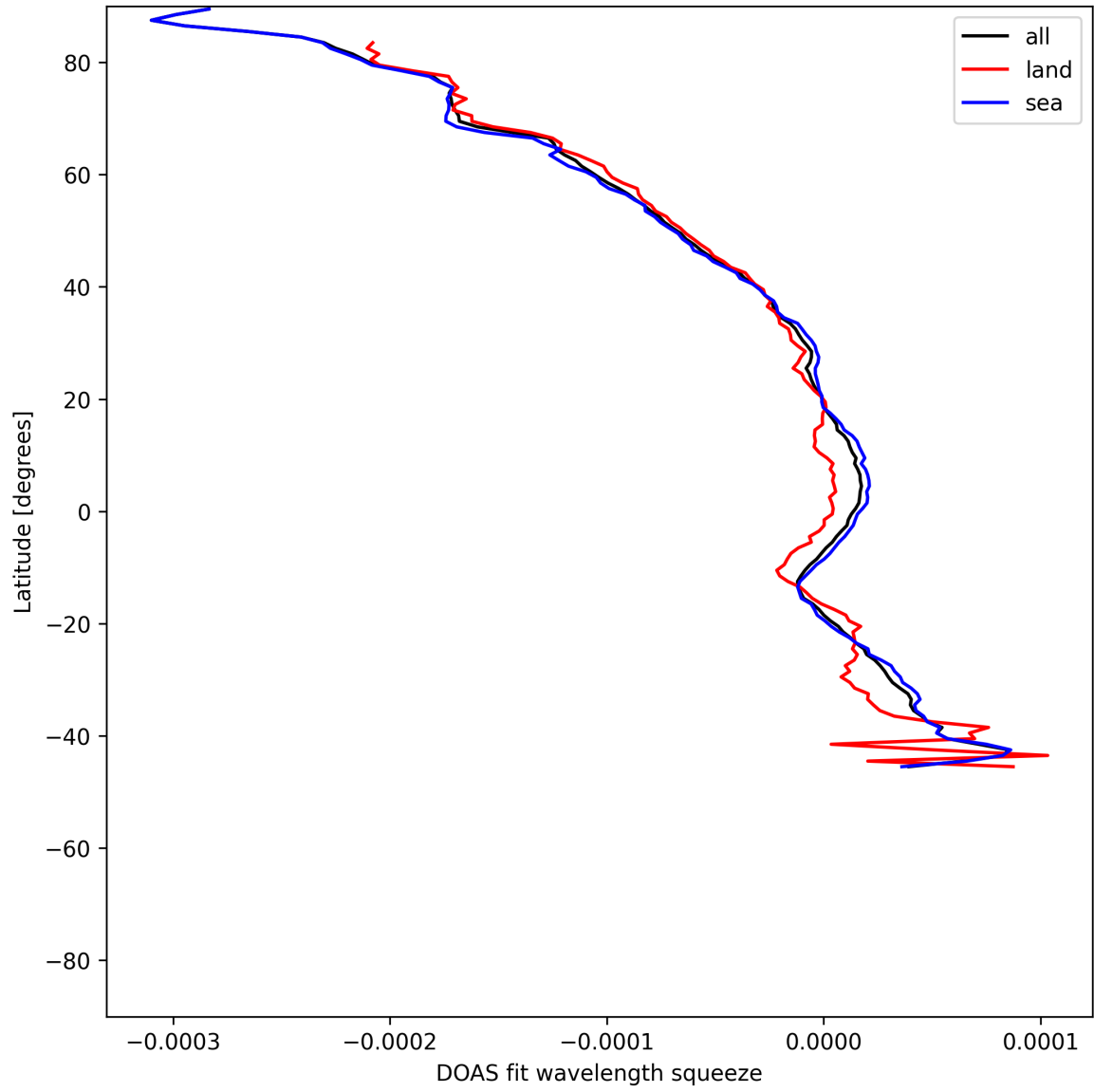


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-06-21 to 2025-06-22.

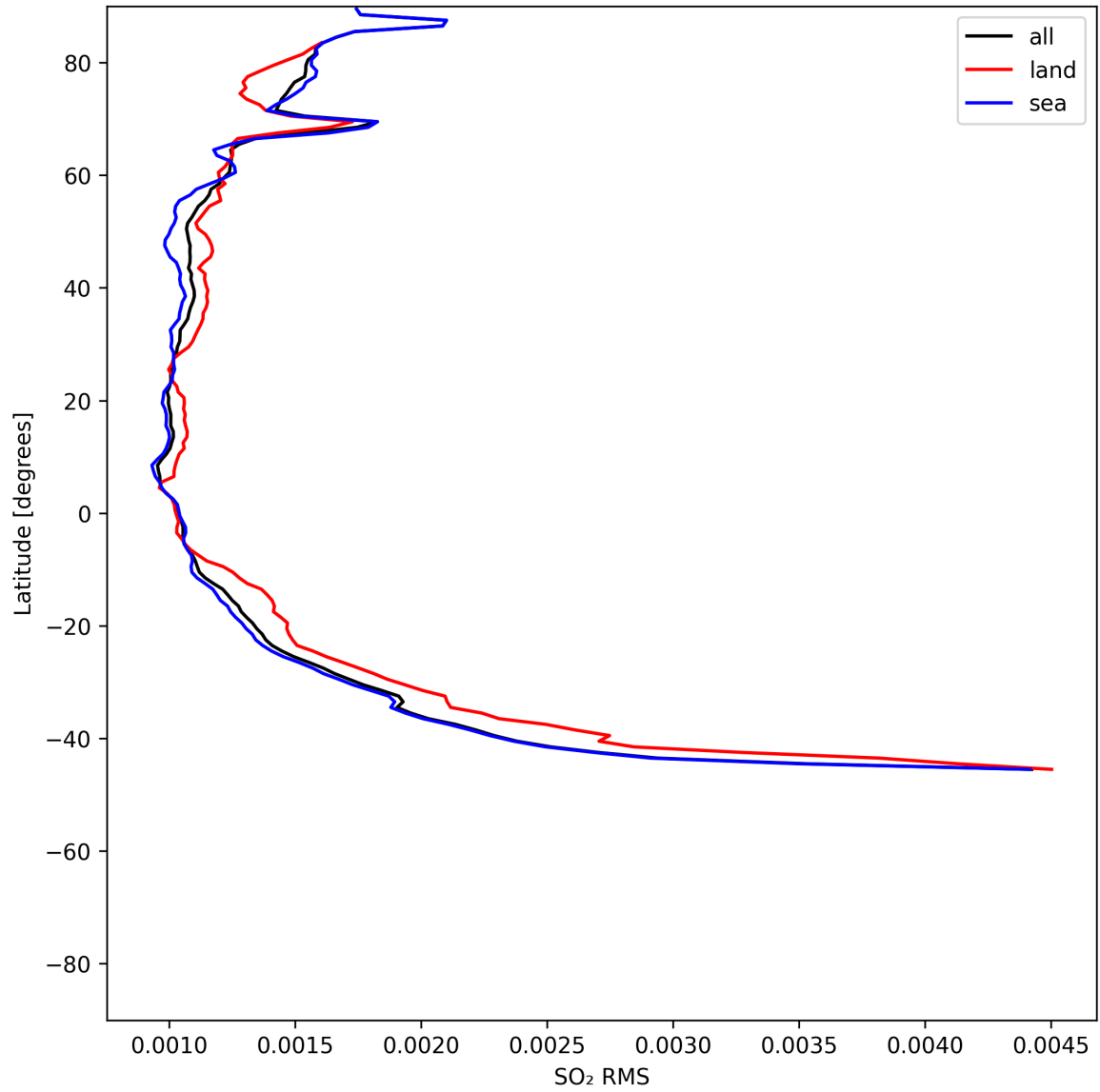


Figure 52: Zonal average of “SO₂ RMS” for 2025-06-21 to 2025-06-22.

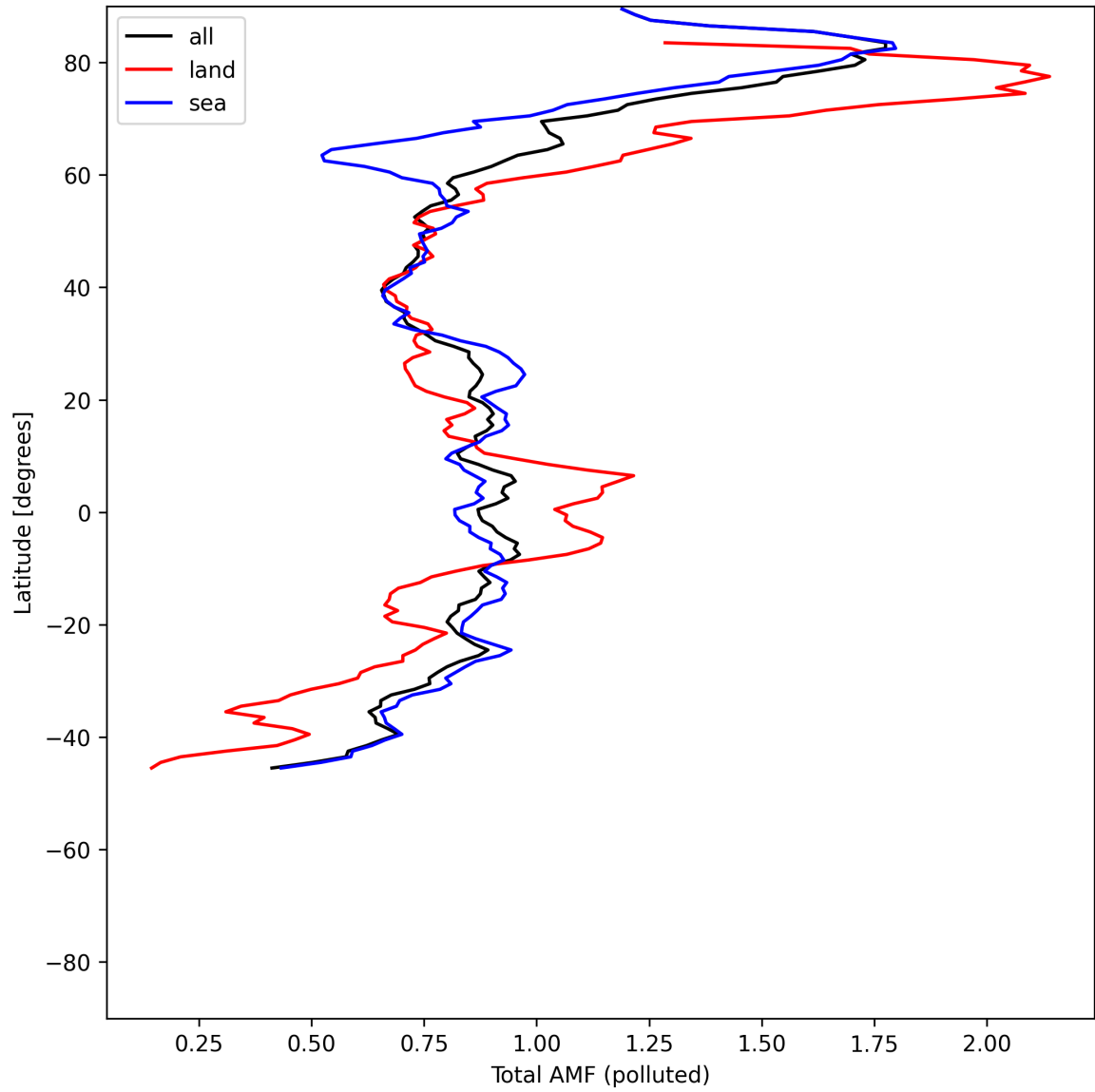


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-06-21 to 2025-06-22.

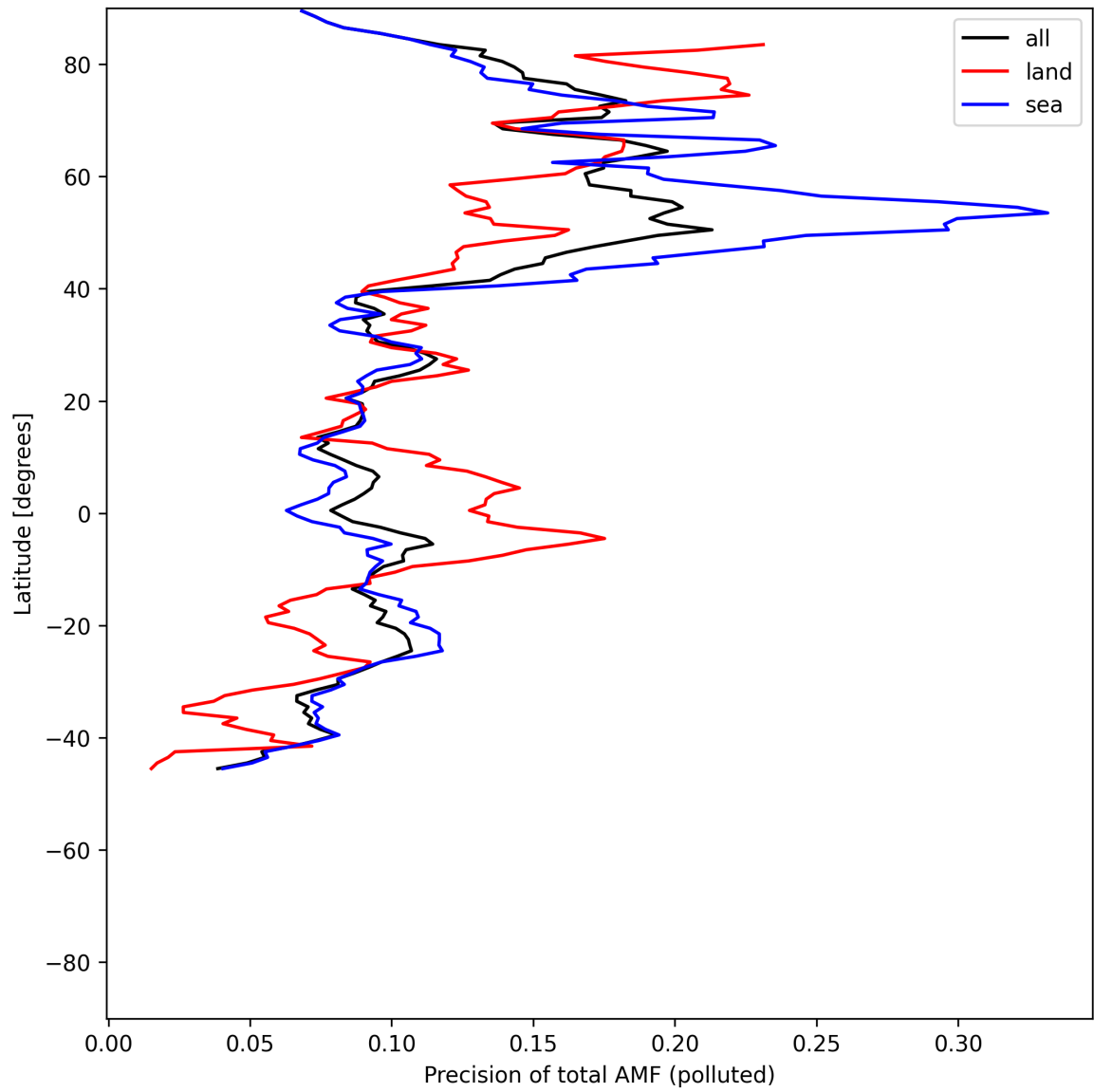


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-06-21 to 2025-06-22.

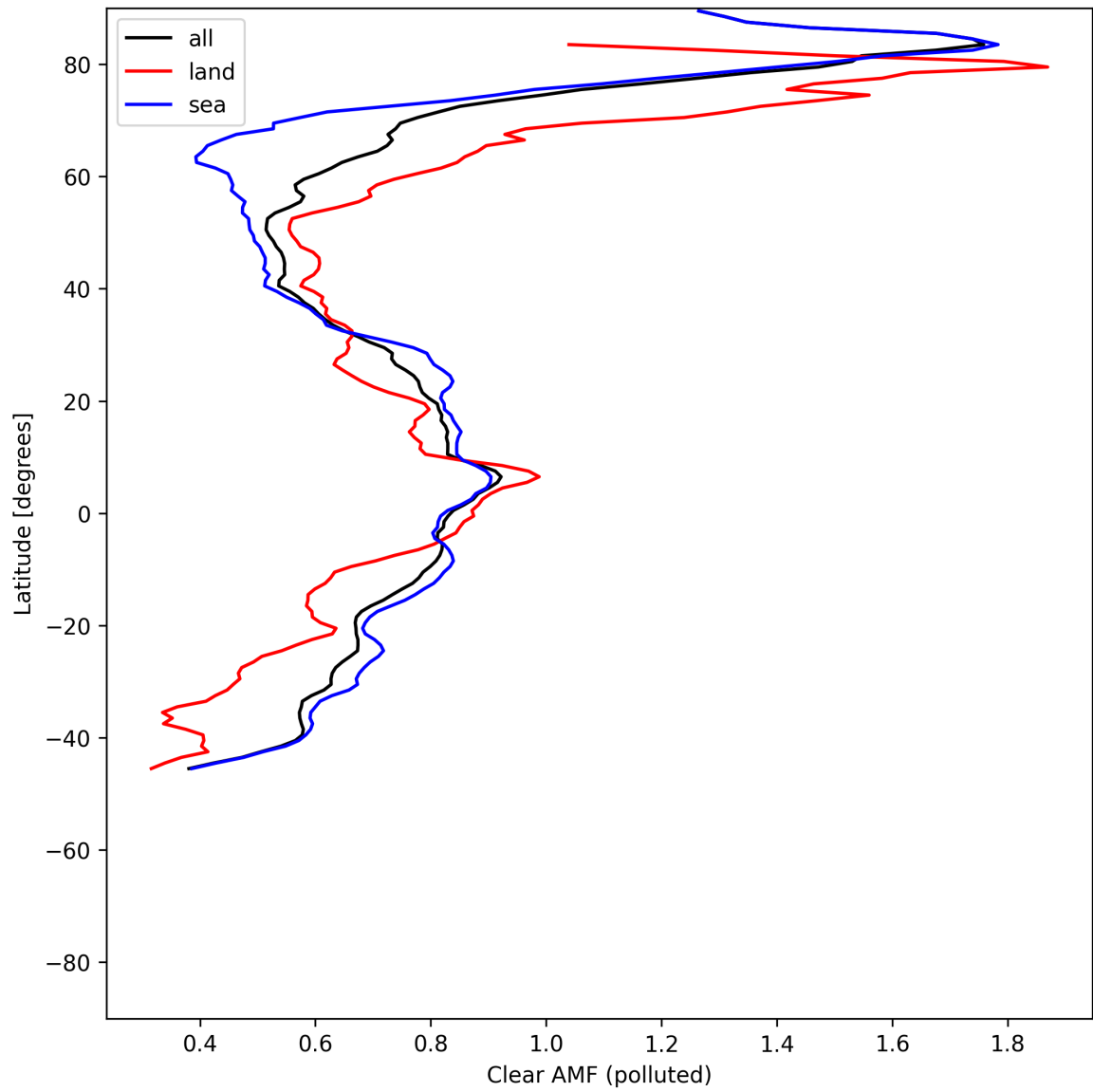


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-06-21 to 2025-06-22.

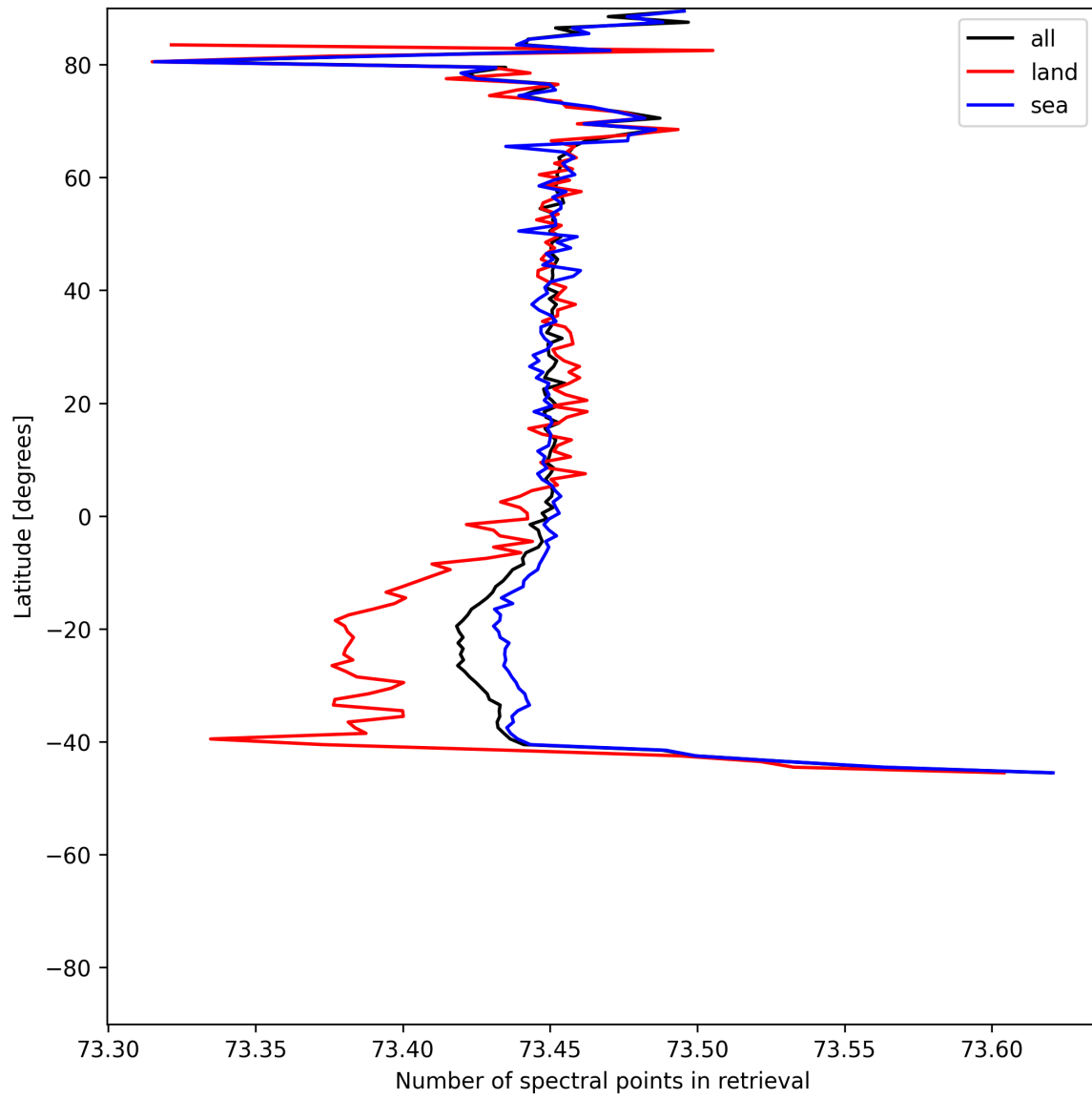


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-06-21 to 2025-06-22.

8 Histograms

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

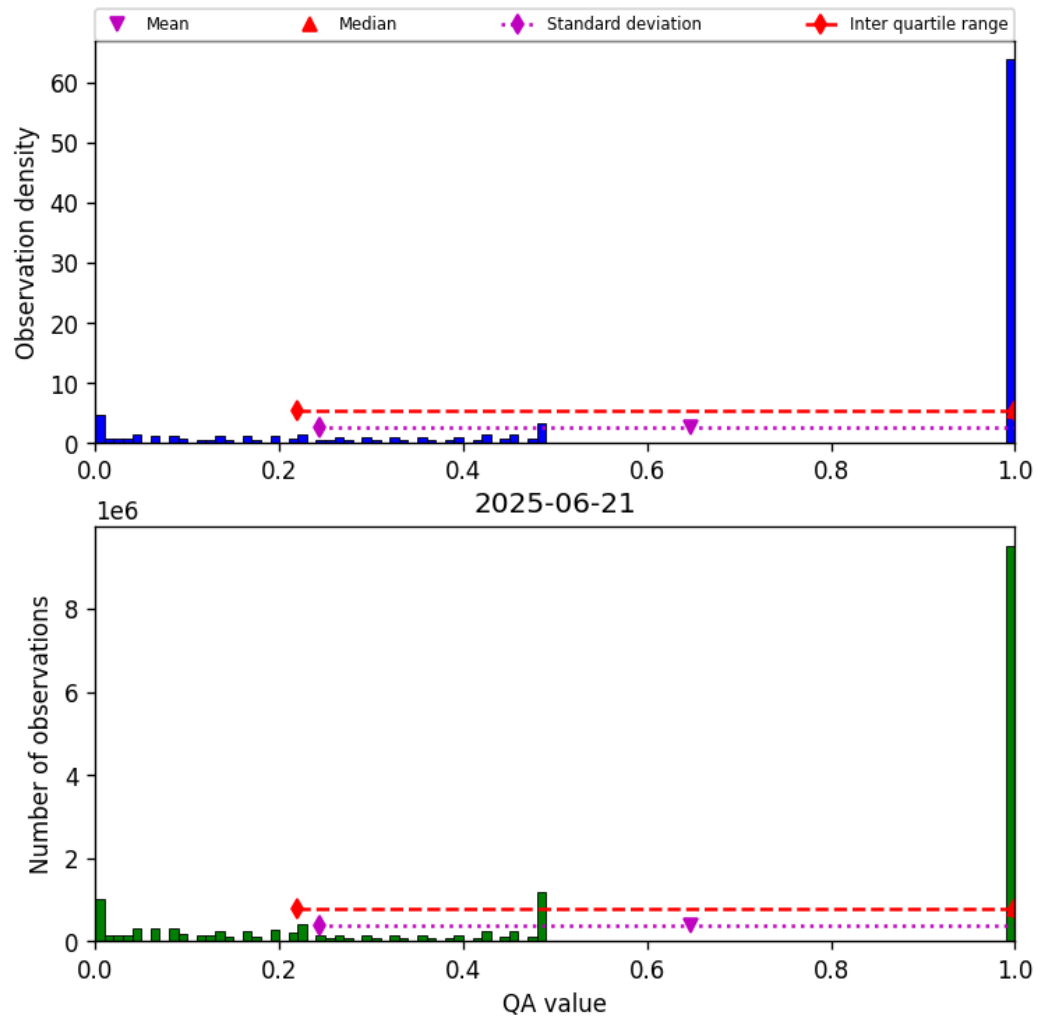


Figure 57: Histogram of “QA value” for 2025-06-21 to 2025-06-22

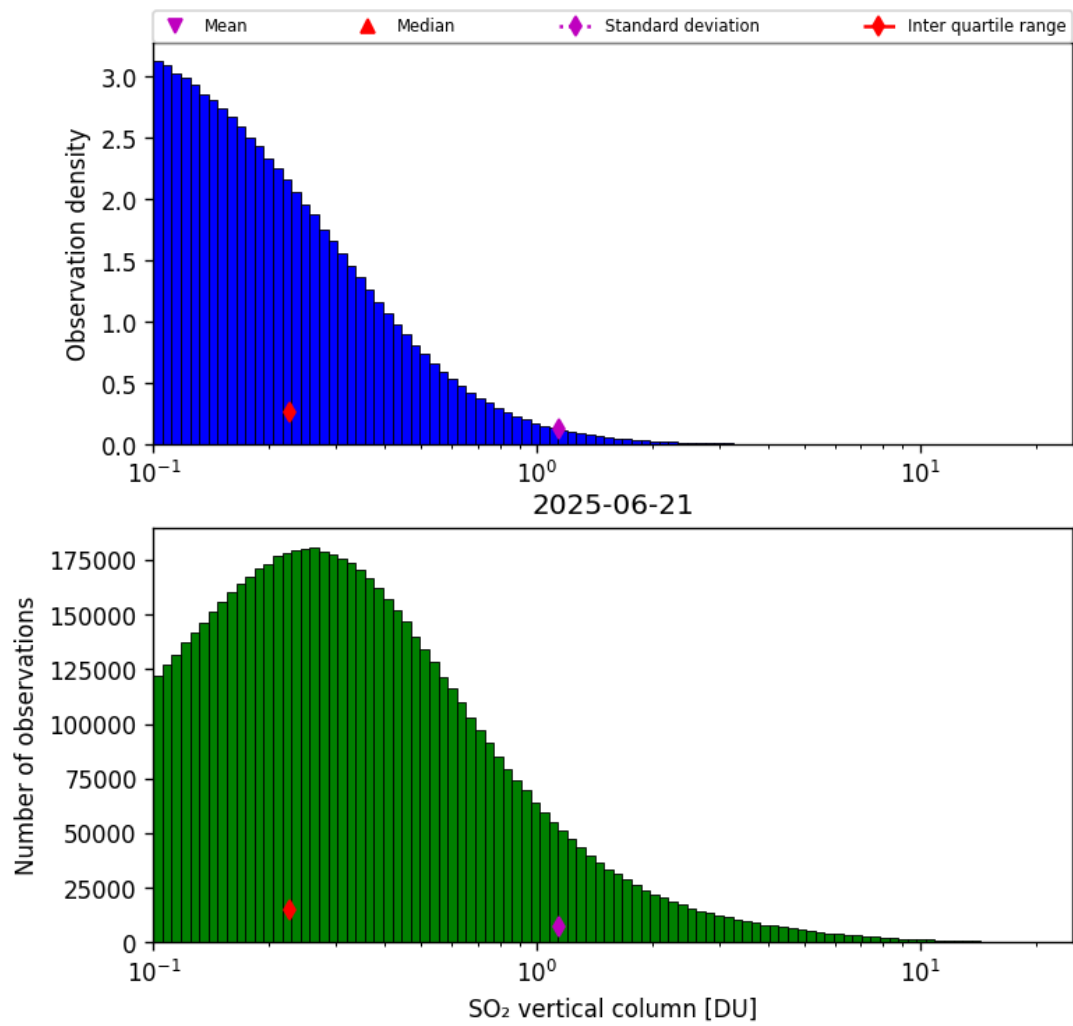


Figure 58: Histogram of “SO₂ vertical column” for 2025-06-21 to 2025-06-22

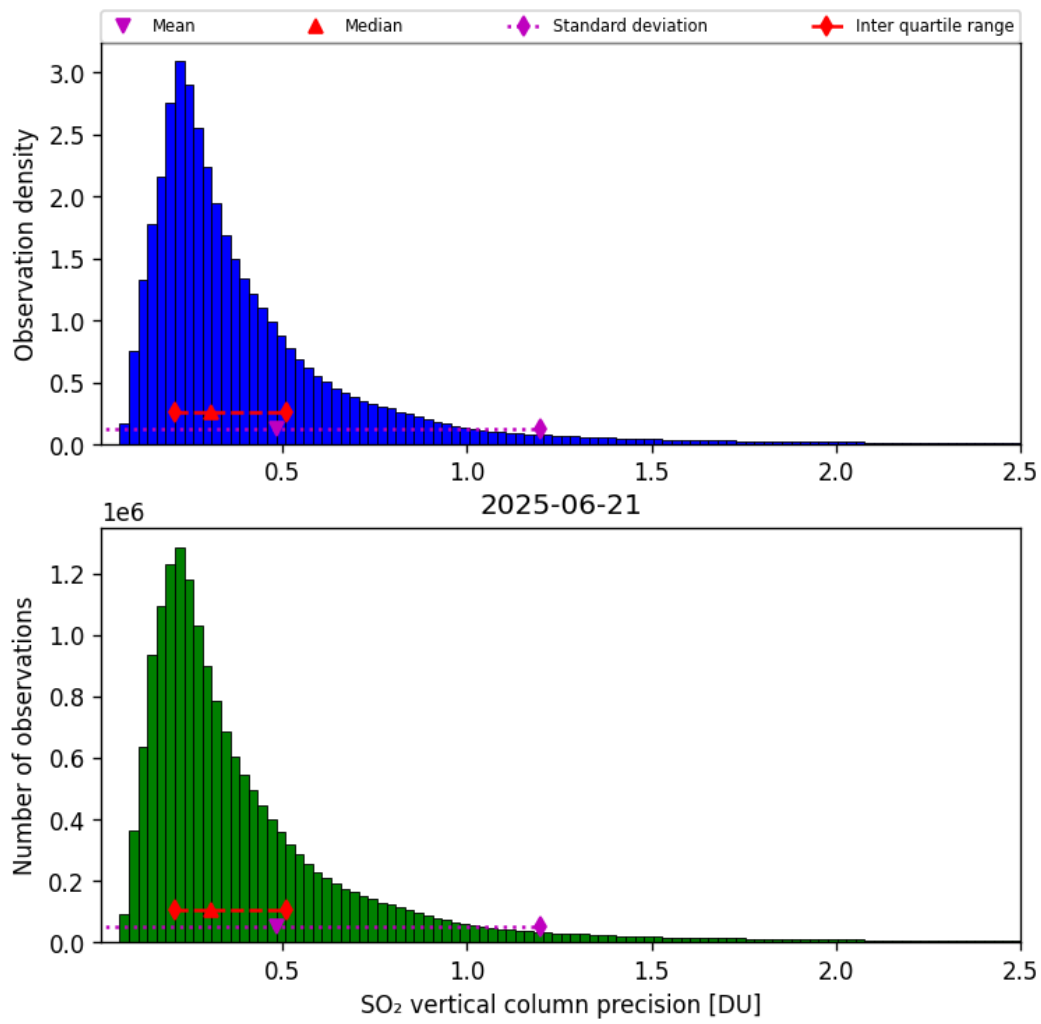


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-06-21 to 2025-06-22

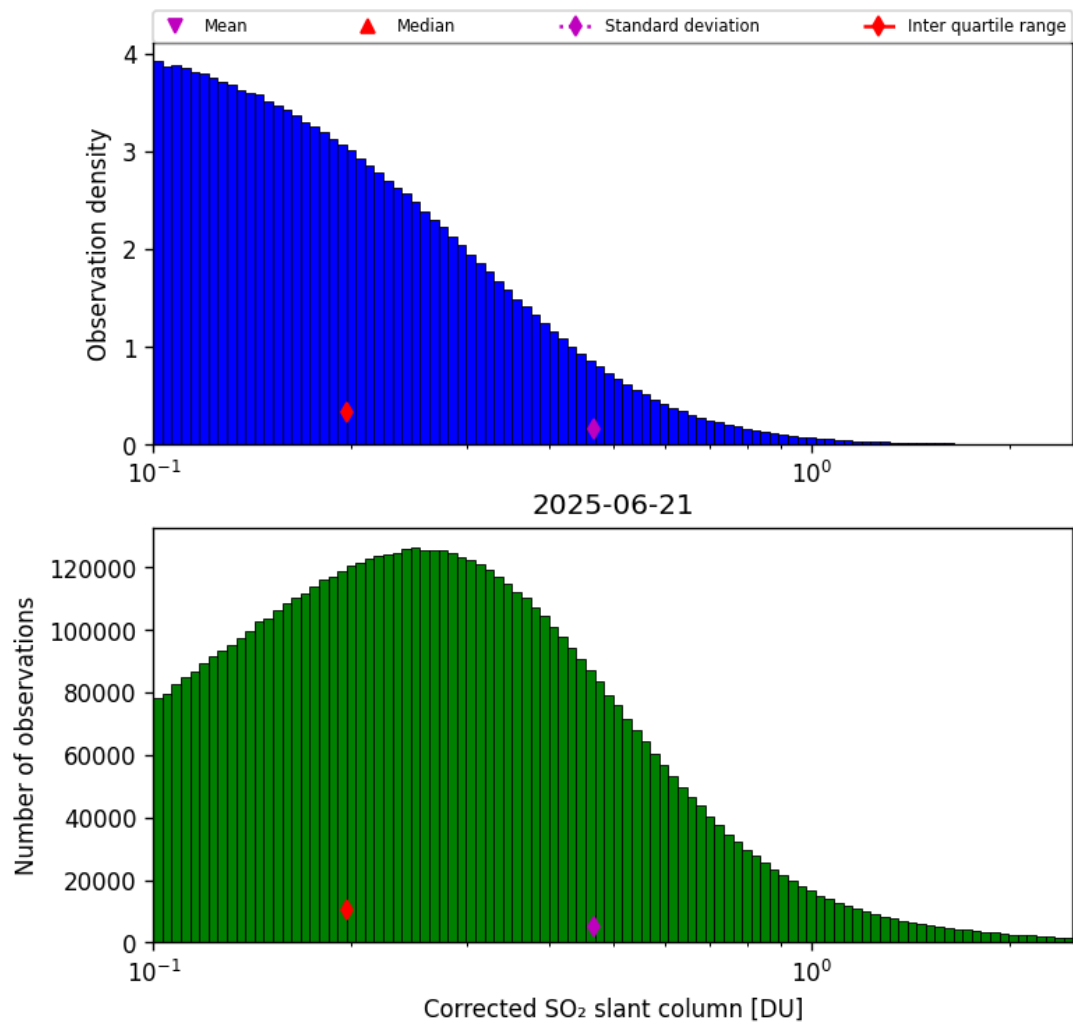


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-06-21 to 2025-06-22

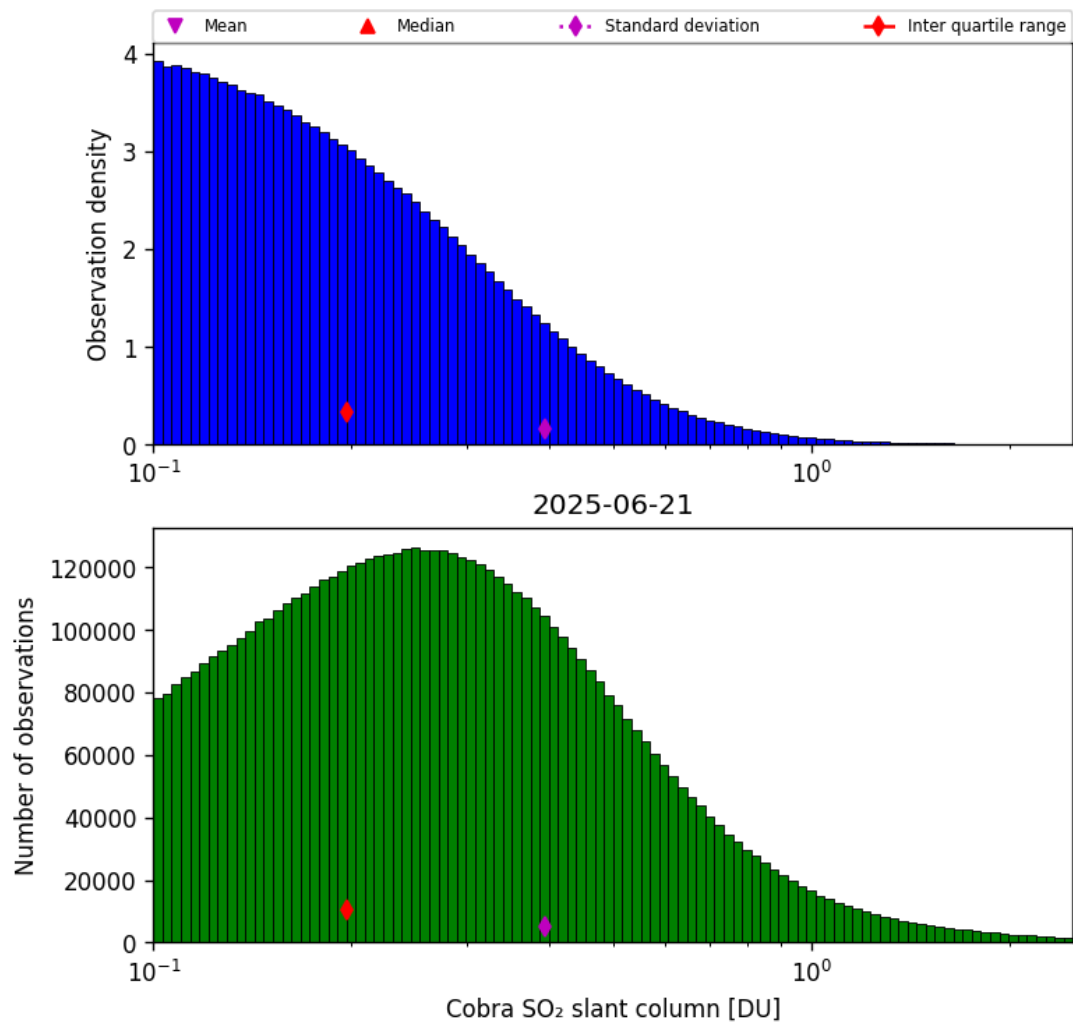


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-06-21 to 2025-06-22

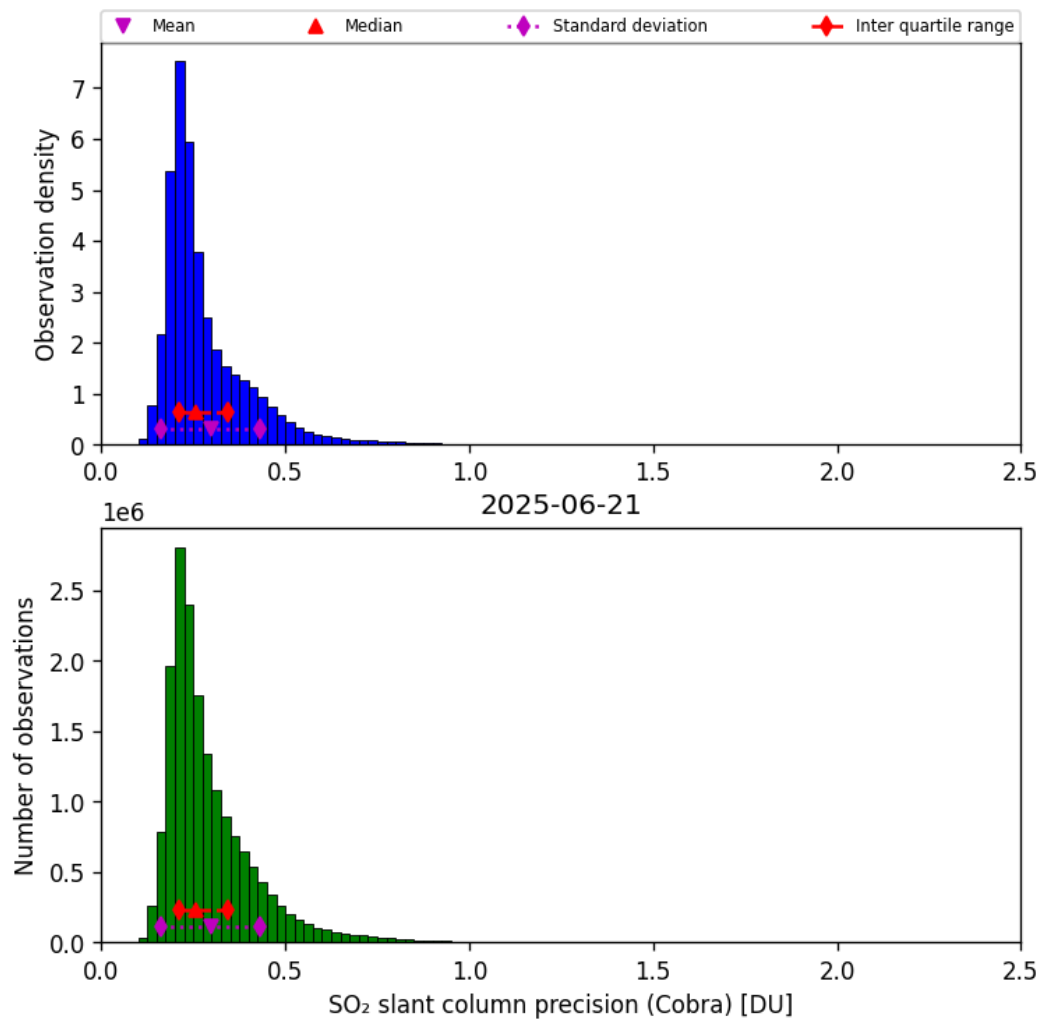


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-06-21 to 2025-06-22

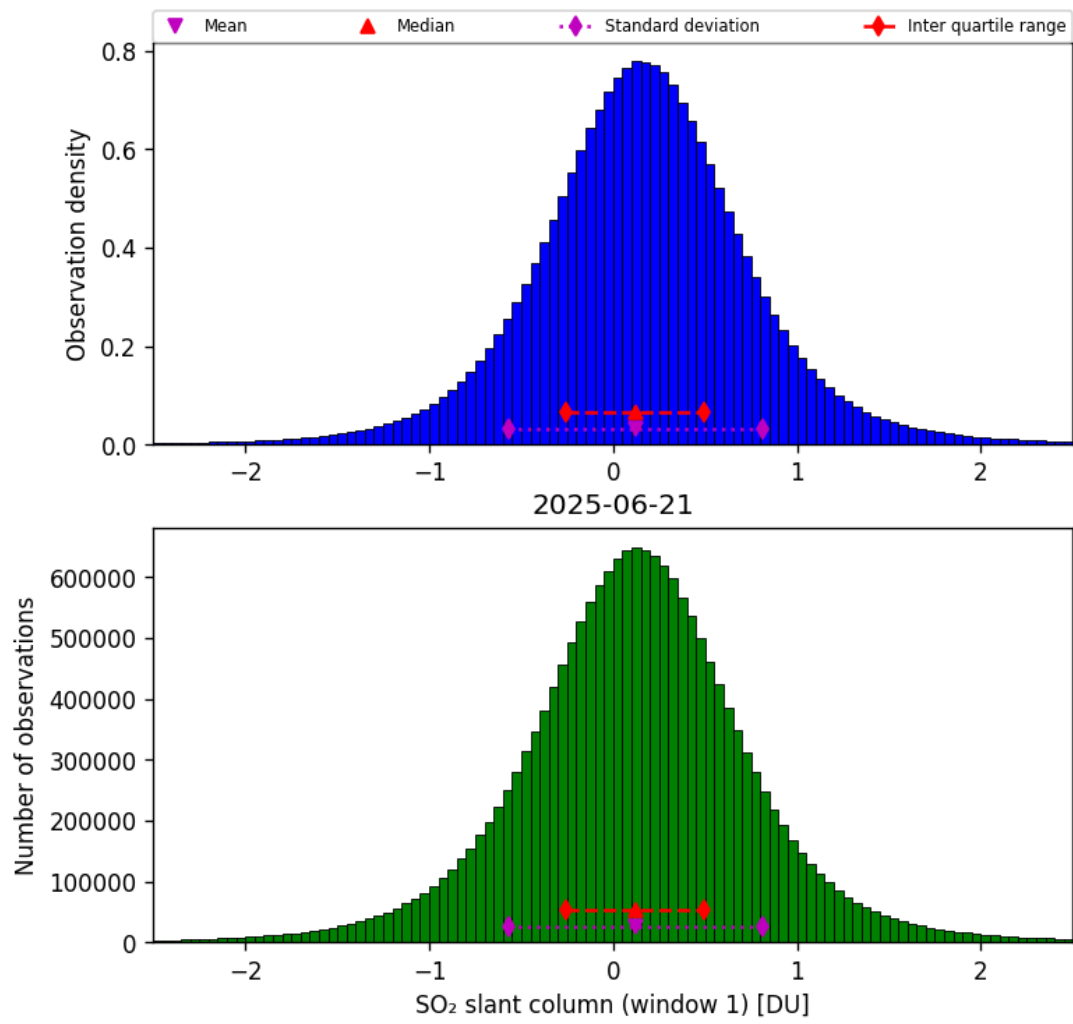


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-06-21 to 2025-06-22

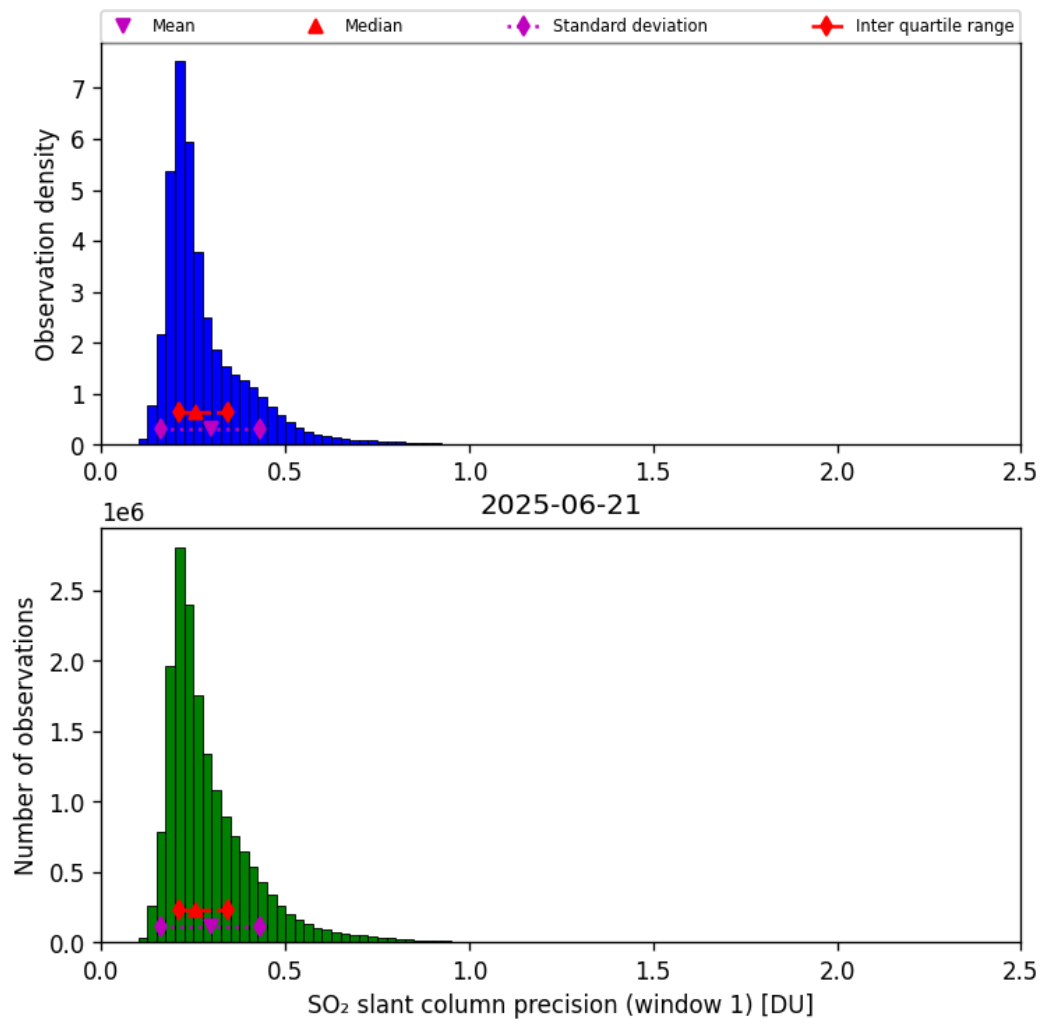


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-06-21 to 2025-06-22

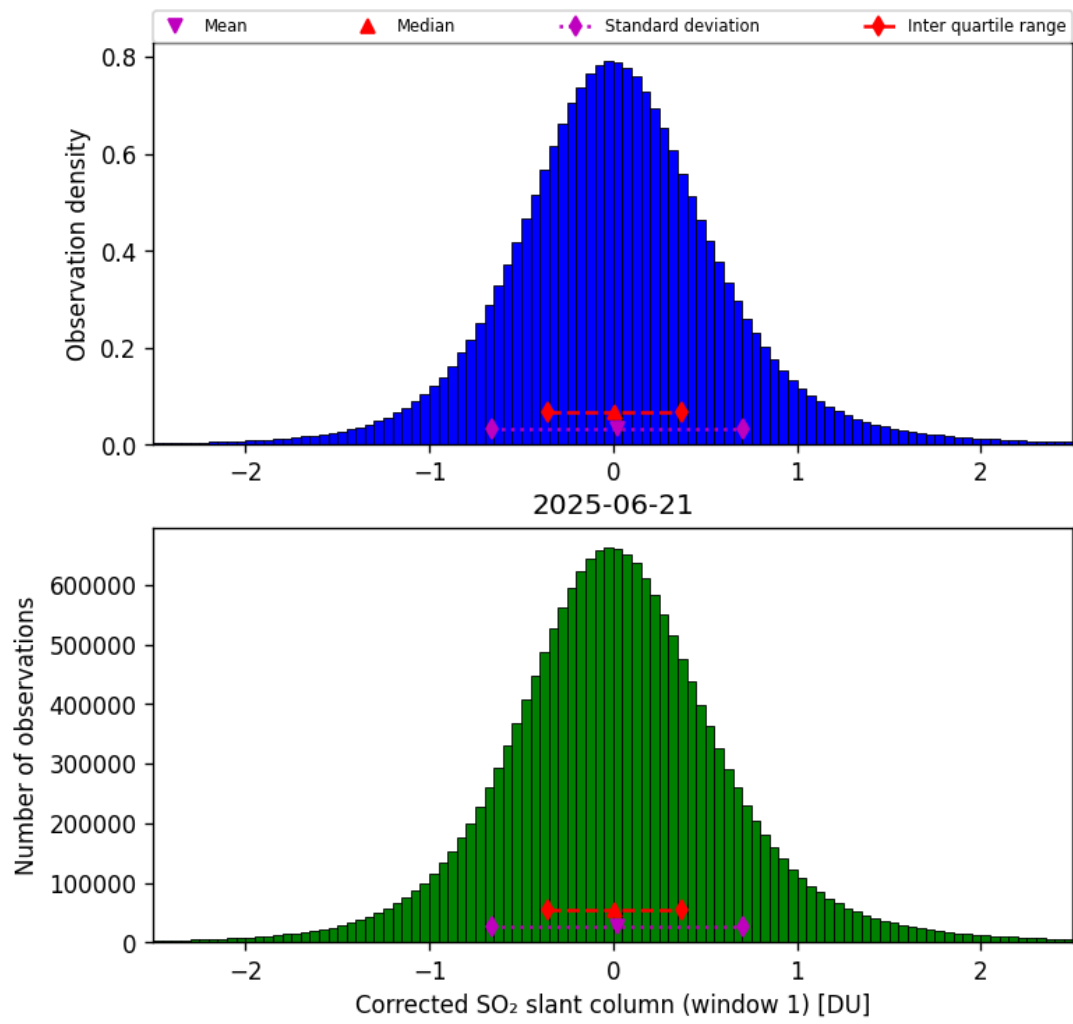


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-06-21 to 2025-06-22

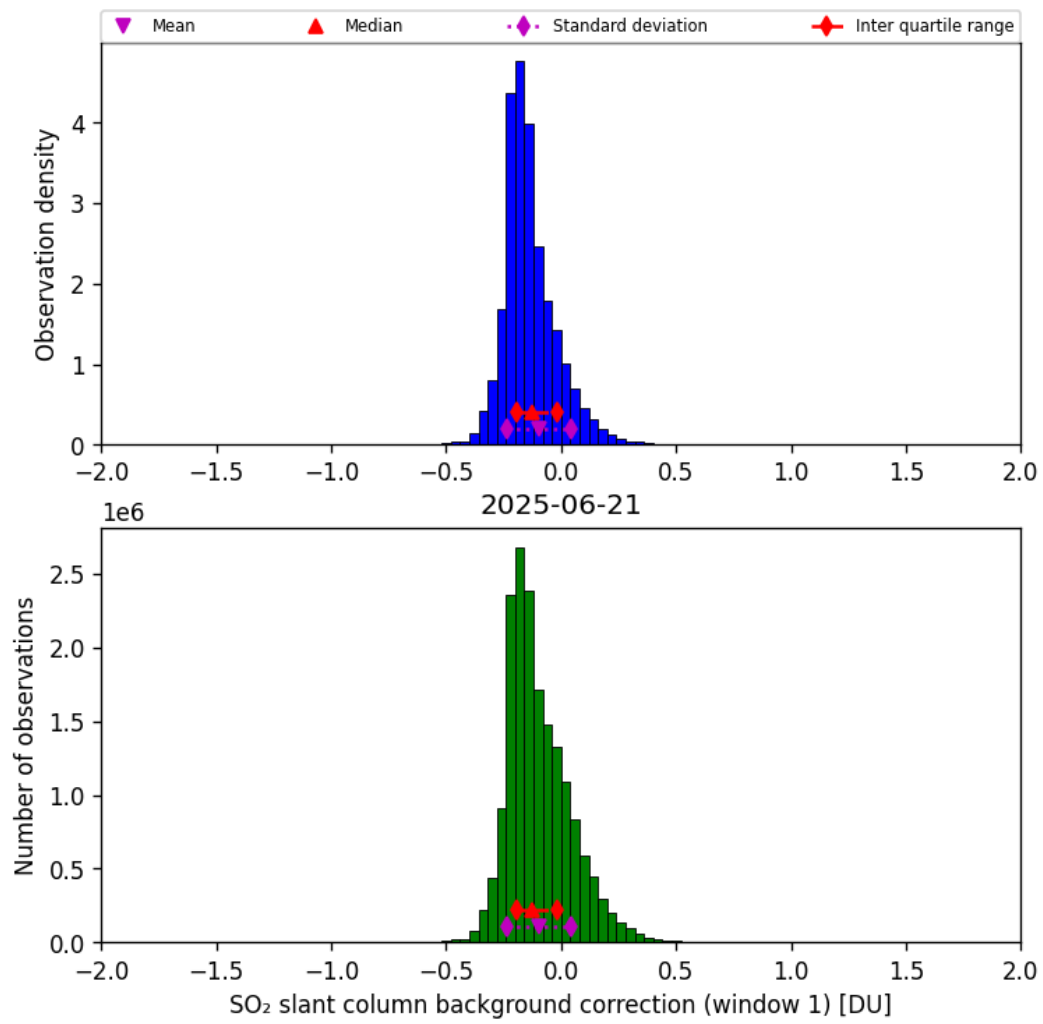


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-06-21 to 2025-06-22

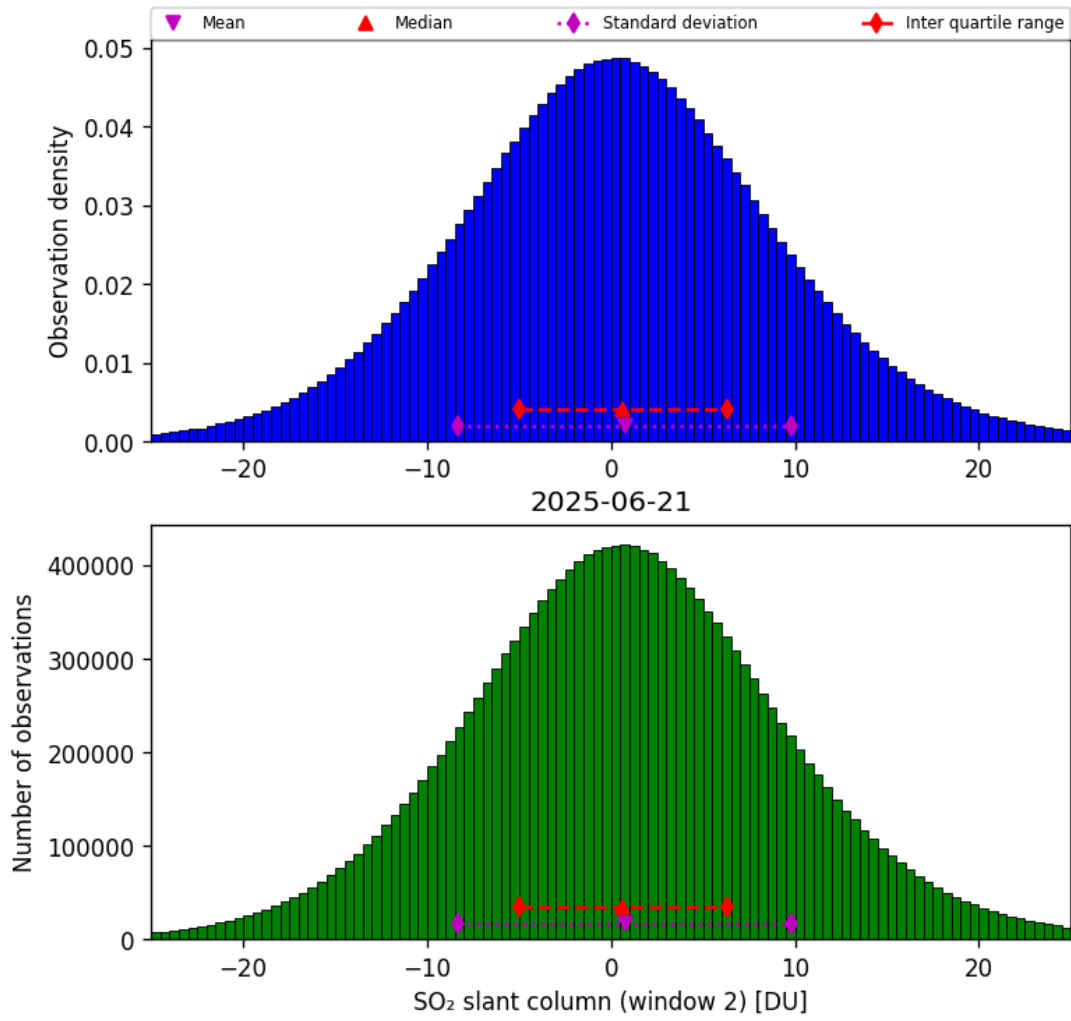


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-06-21 to 2025-06-22

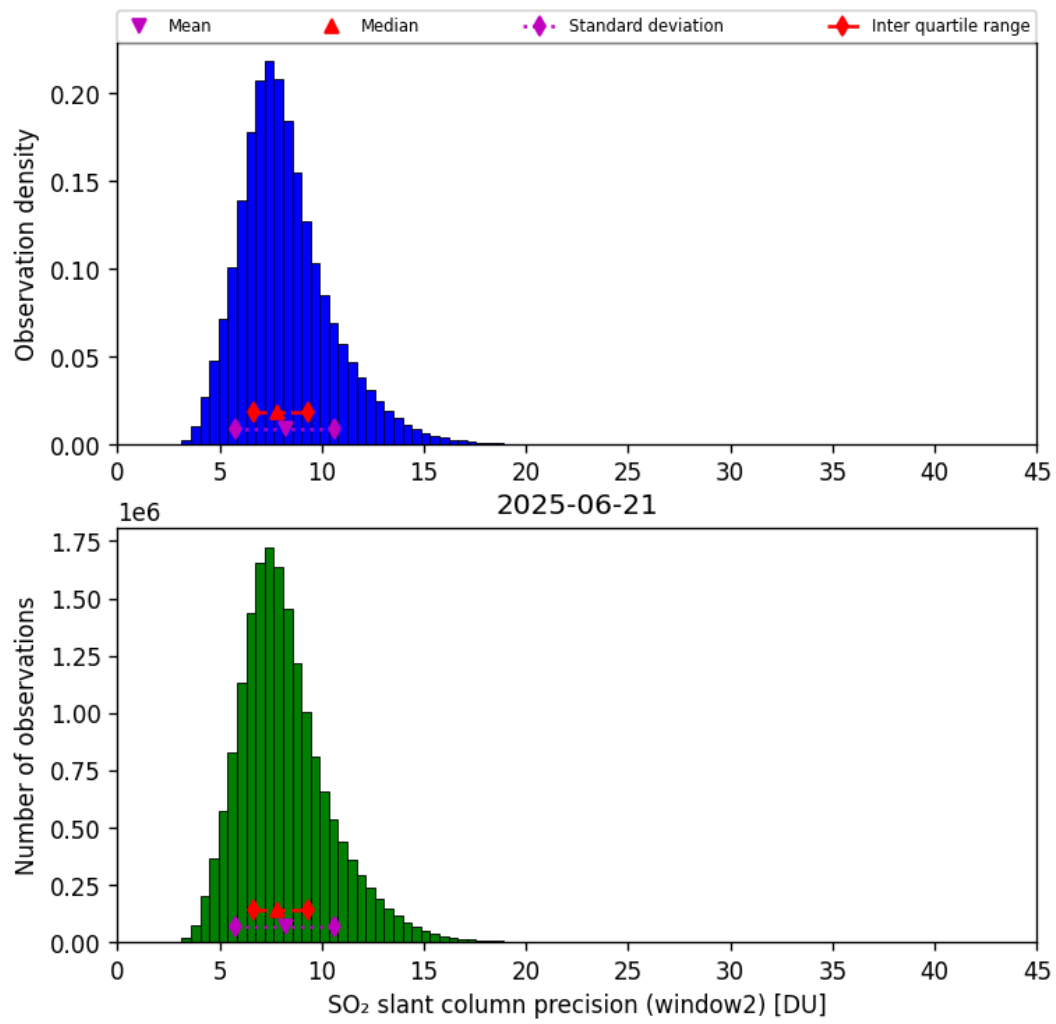


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-06-21 to 2025-06-22

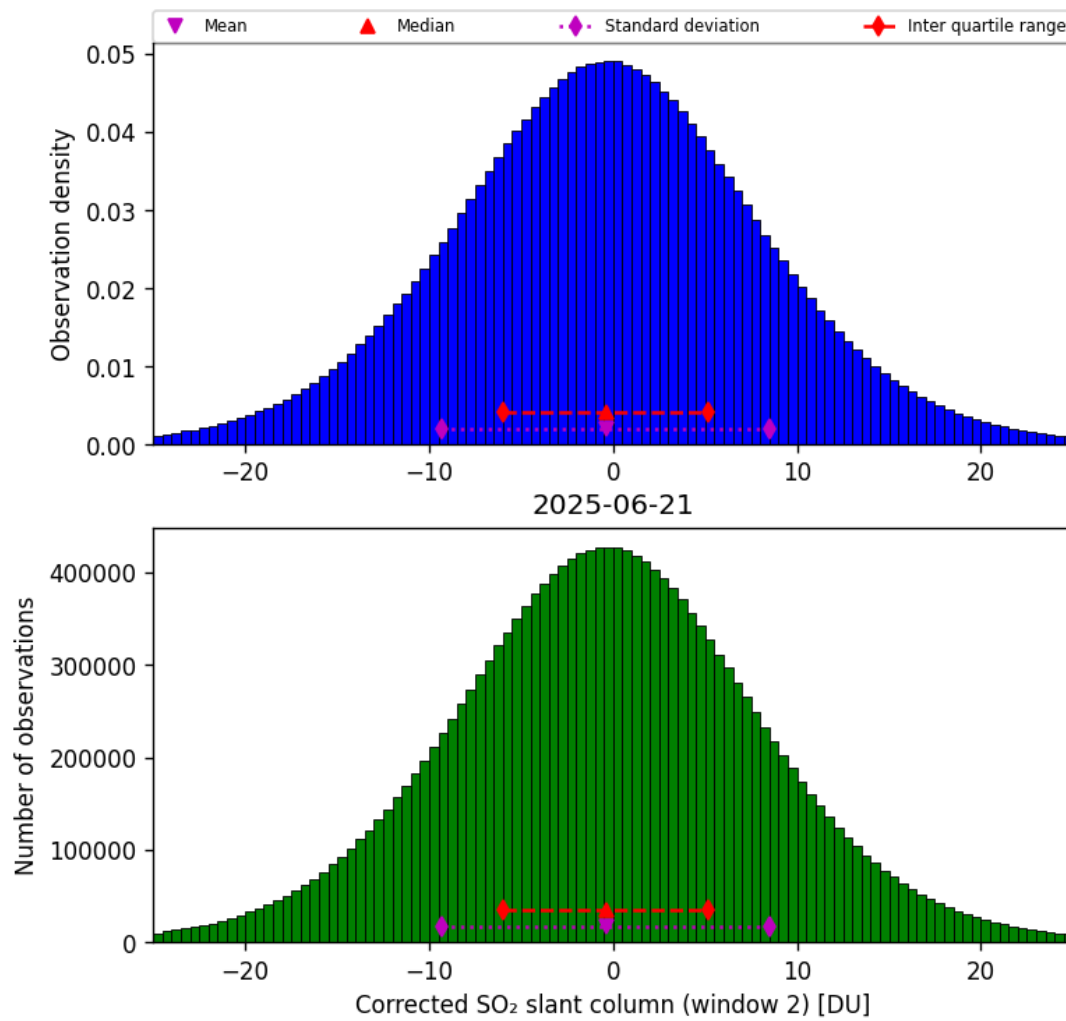


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-06-21 to 2025-06-22

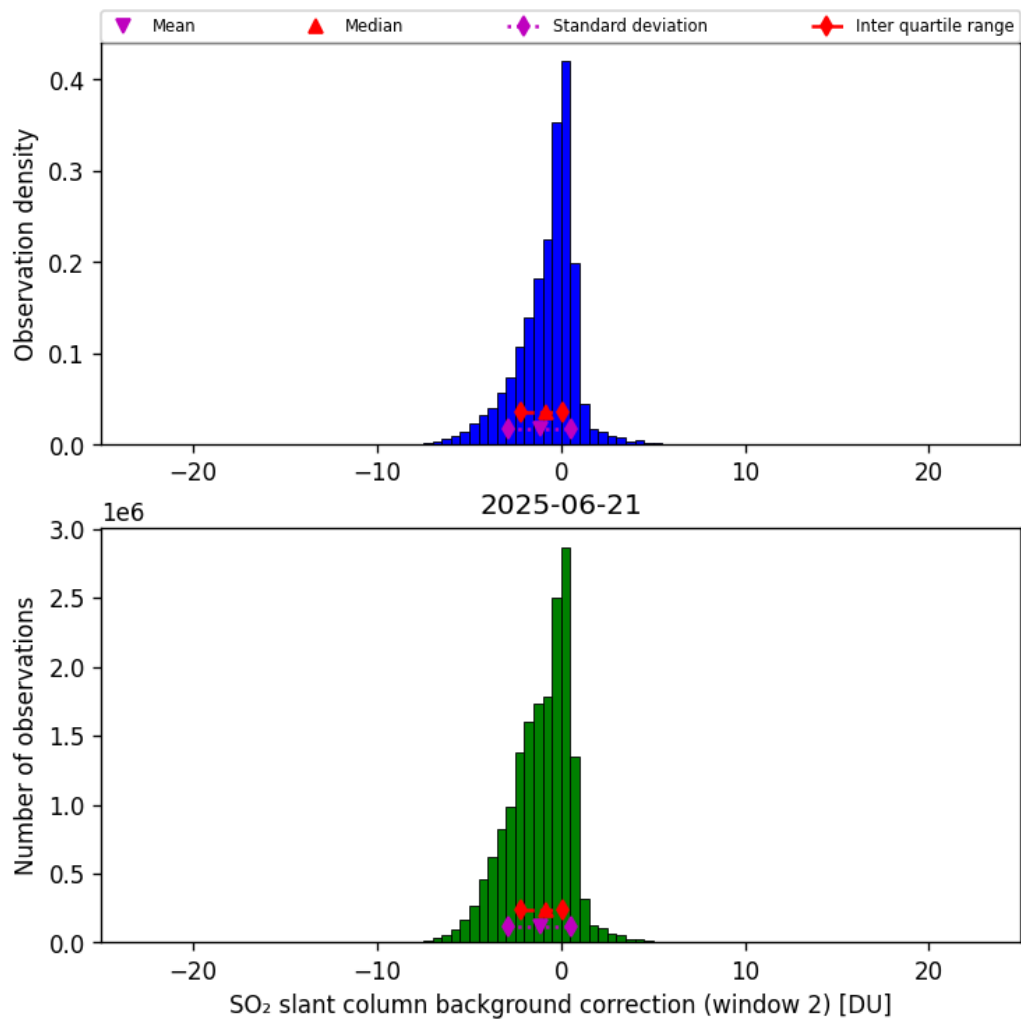


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-06-21 to 2025-06-22

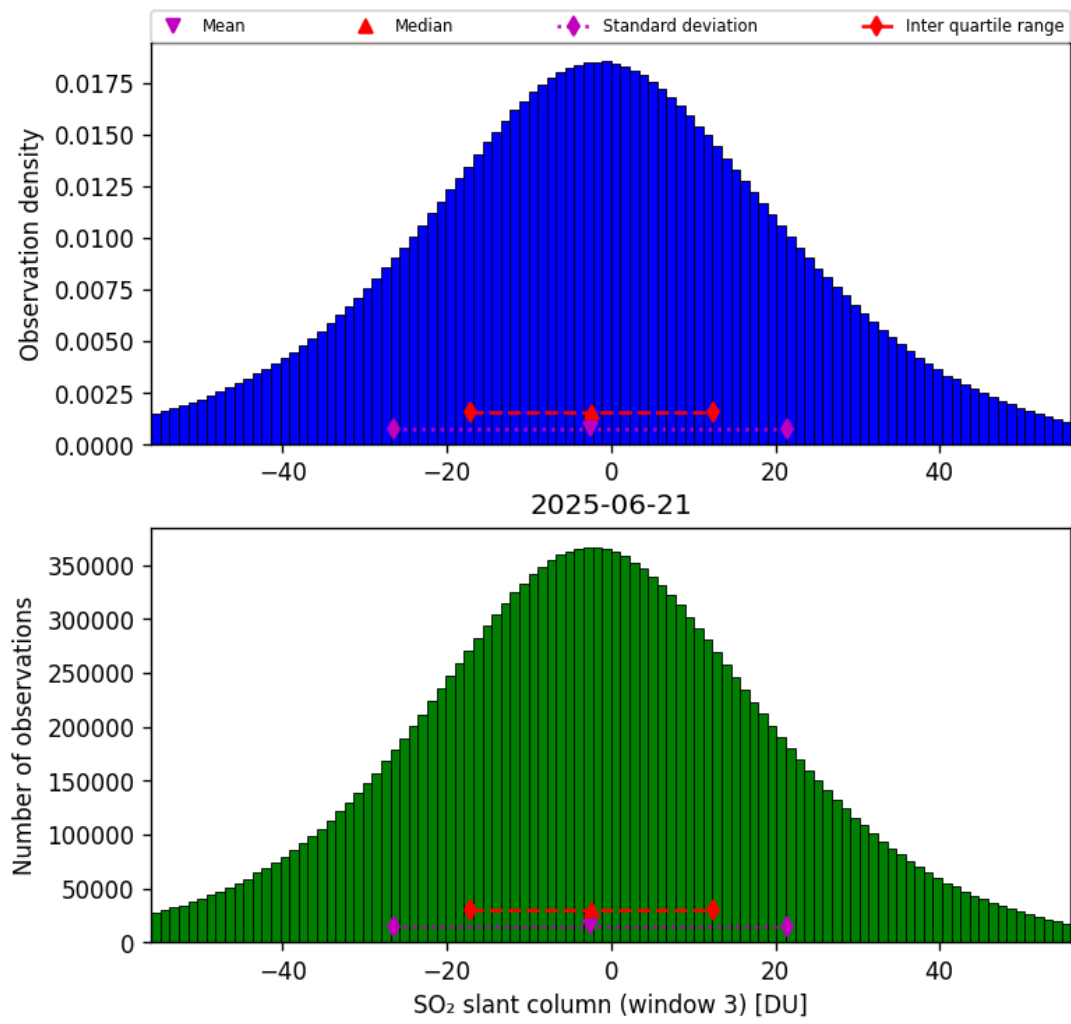


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-06-21 to 2025-06-22

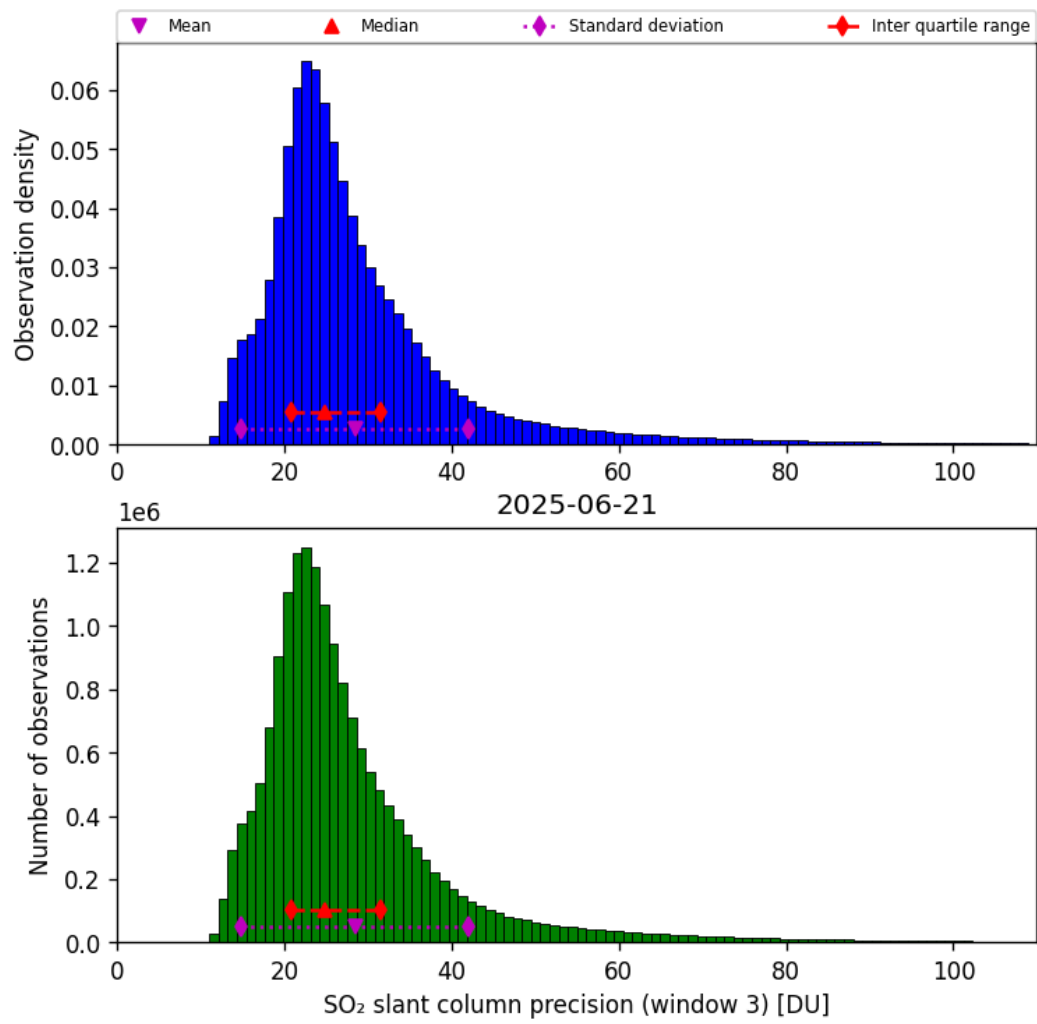


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-06-21 to 2025-06-22

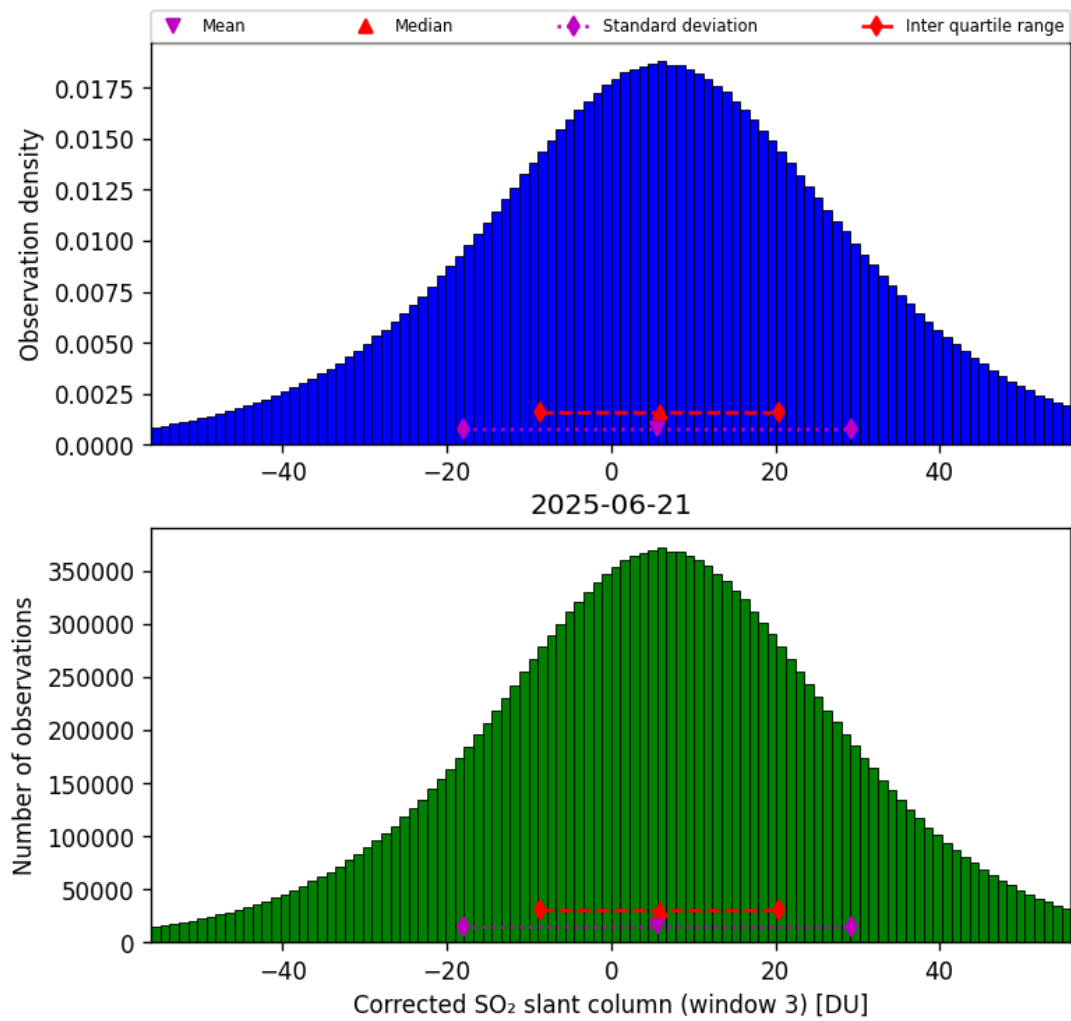


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-06-21 to 2025-06-22

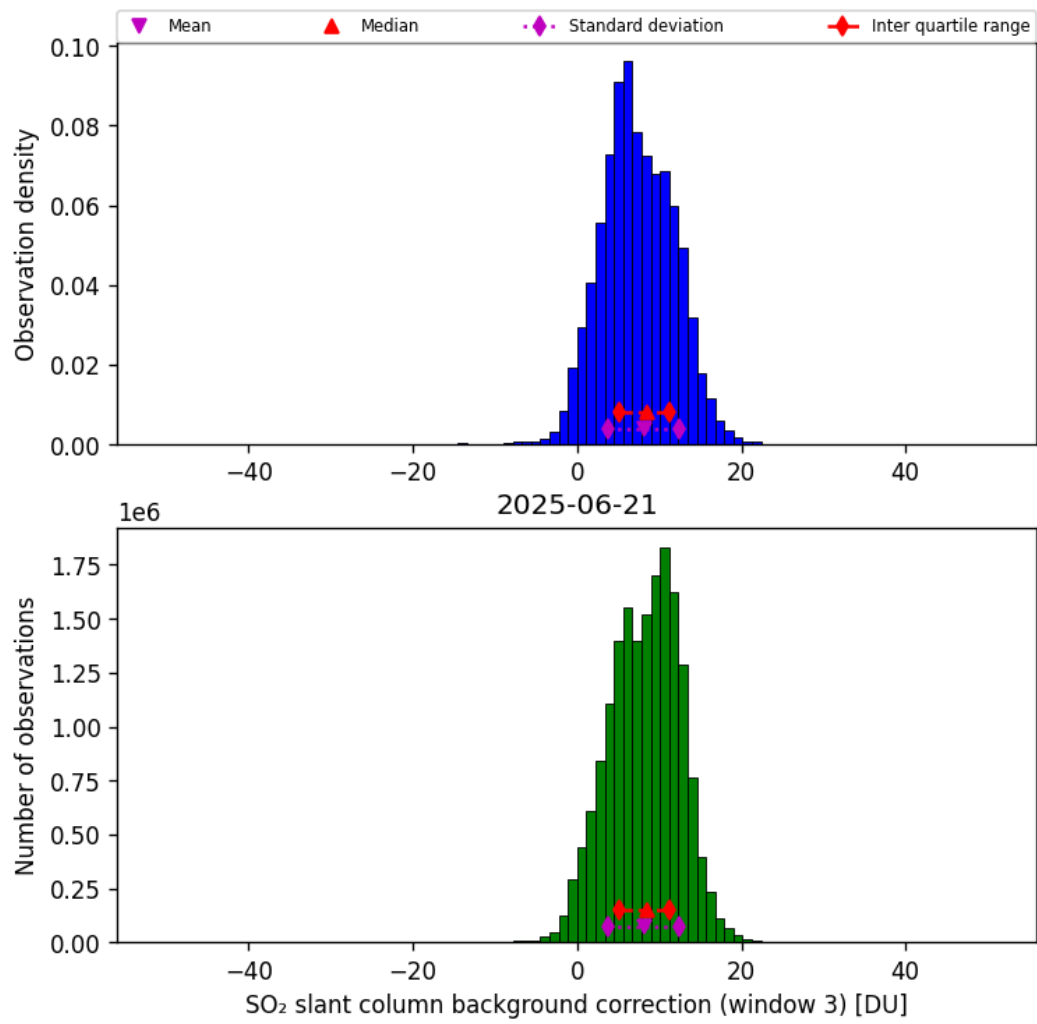


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-06-21 to 2025-06-22

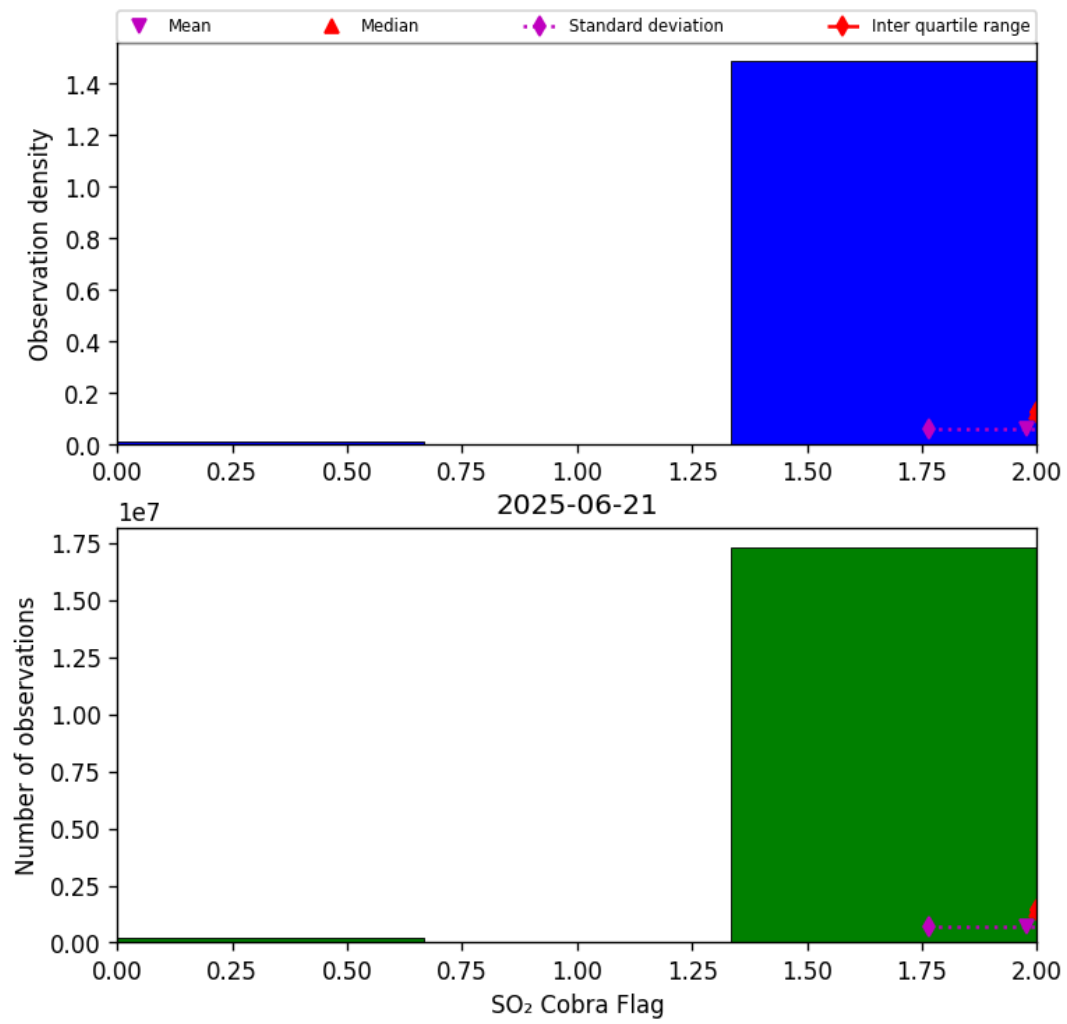


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-06-21 to 2025-06-22

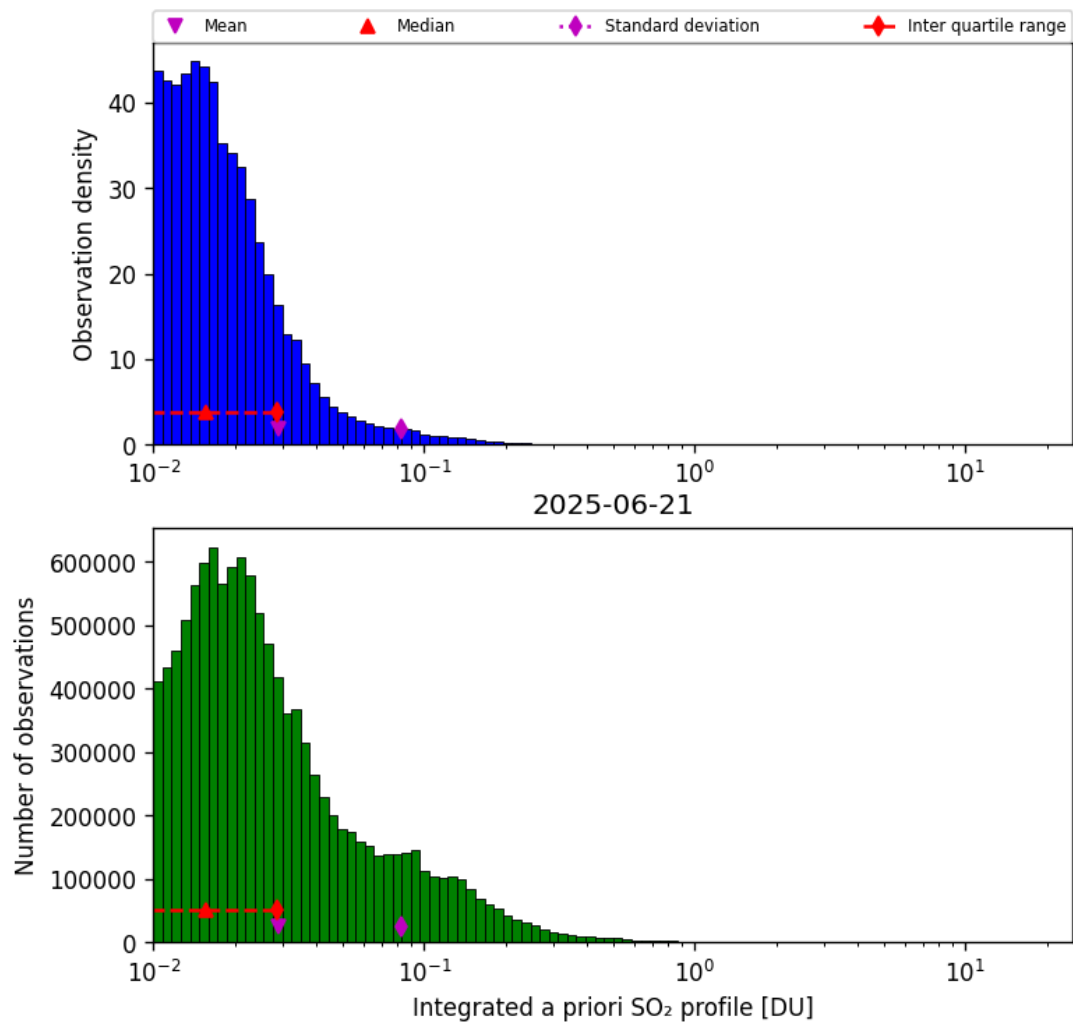


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-06-21 to 2025-06-22

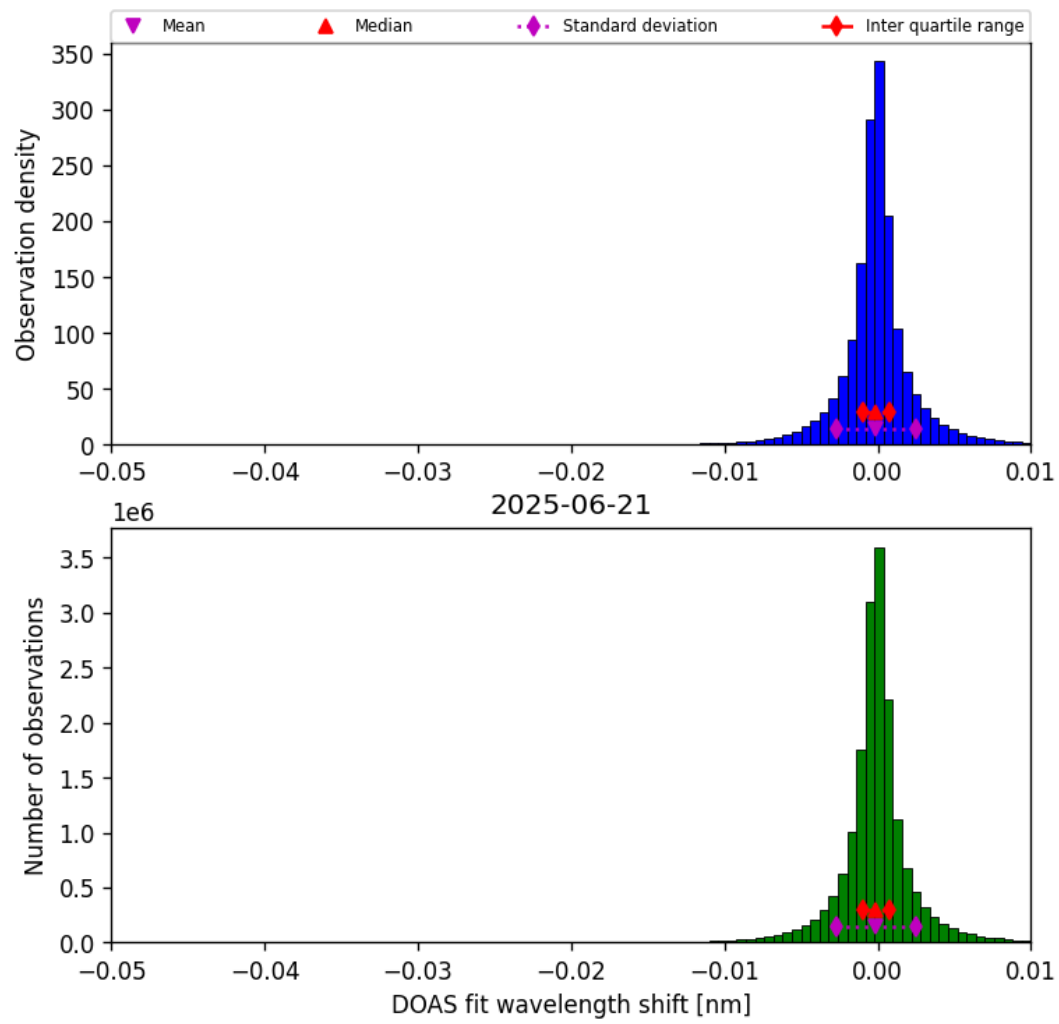


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-06-21 to 2025-06-22

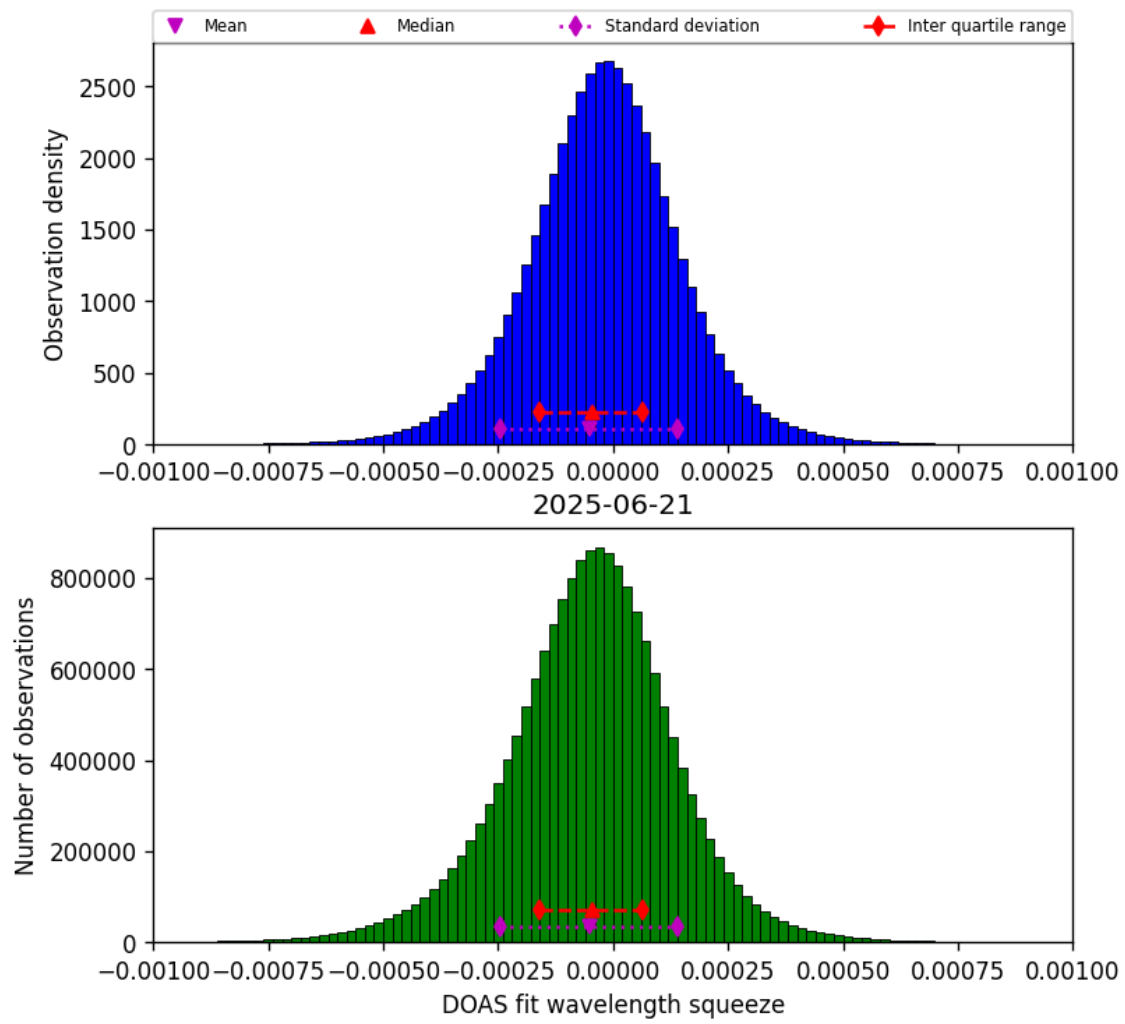


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-06-21 to 2025-06-22

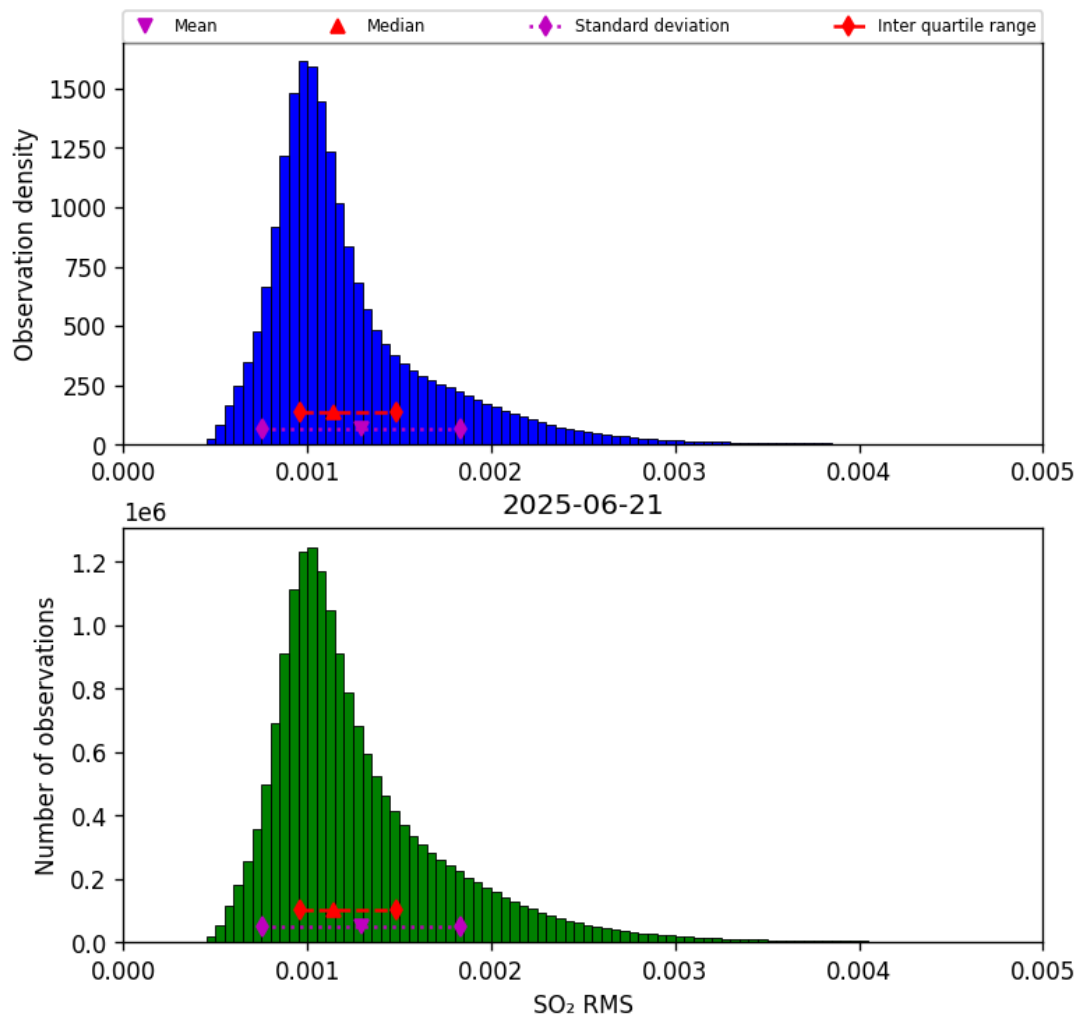


Figure 79: Histogram of “SO₂ RMS” for 2025-06-21 to 2025-06-22

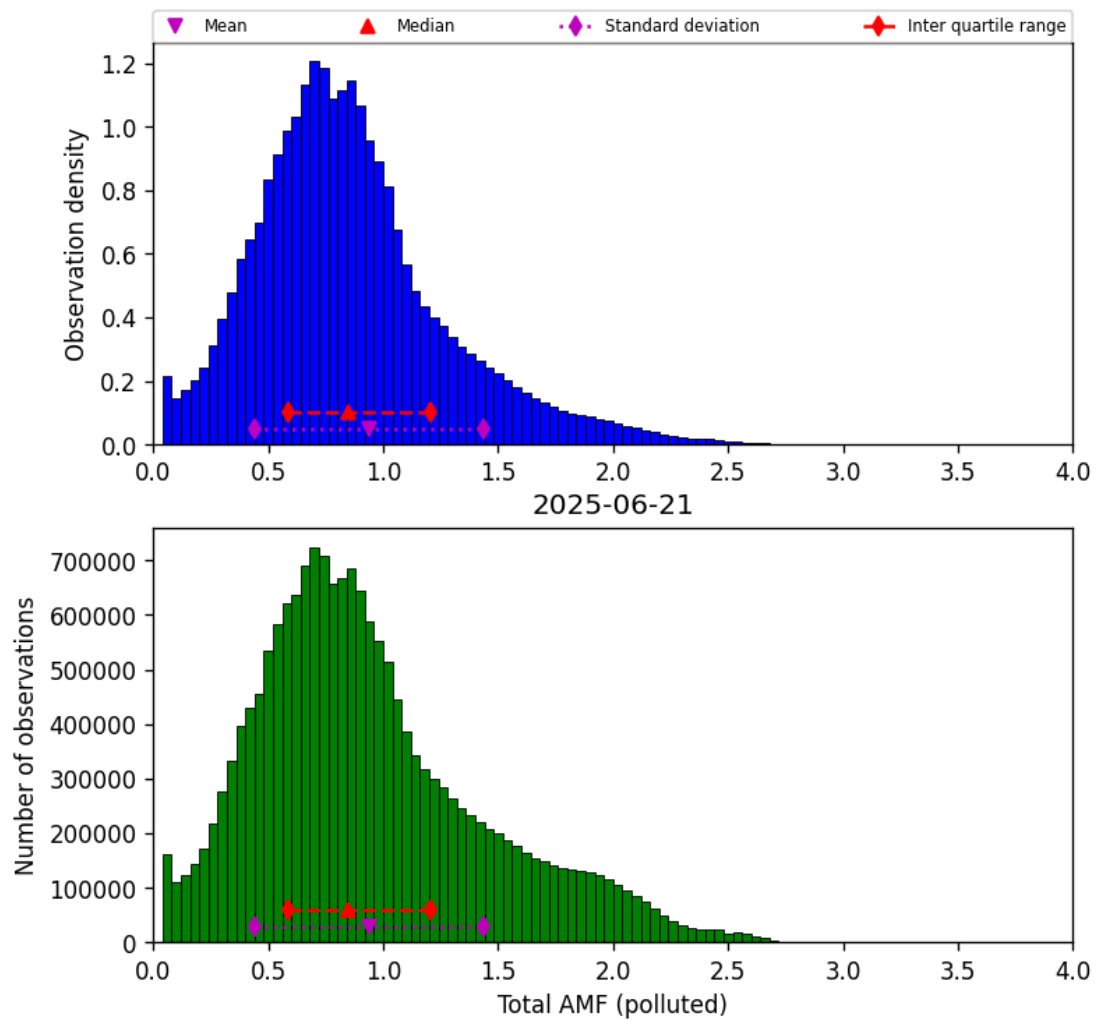


Figure 80: Histogram of “Total AMF (polluted)” for 2025-06-21 to 2025-06-22

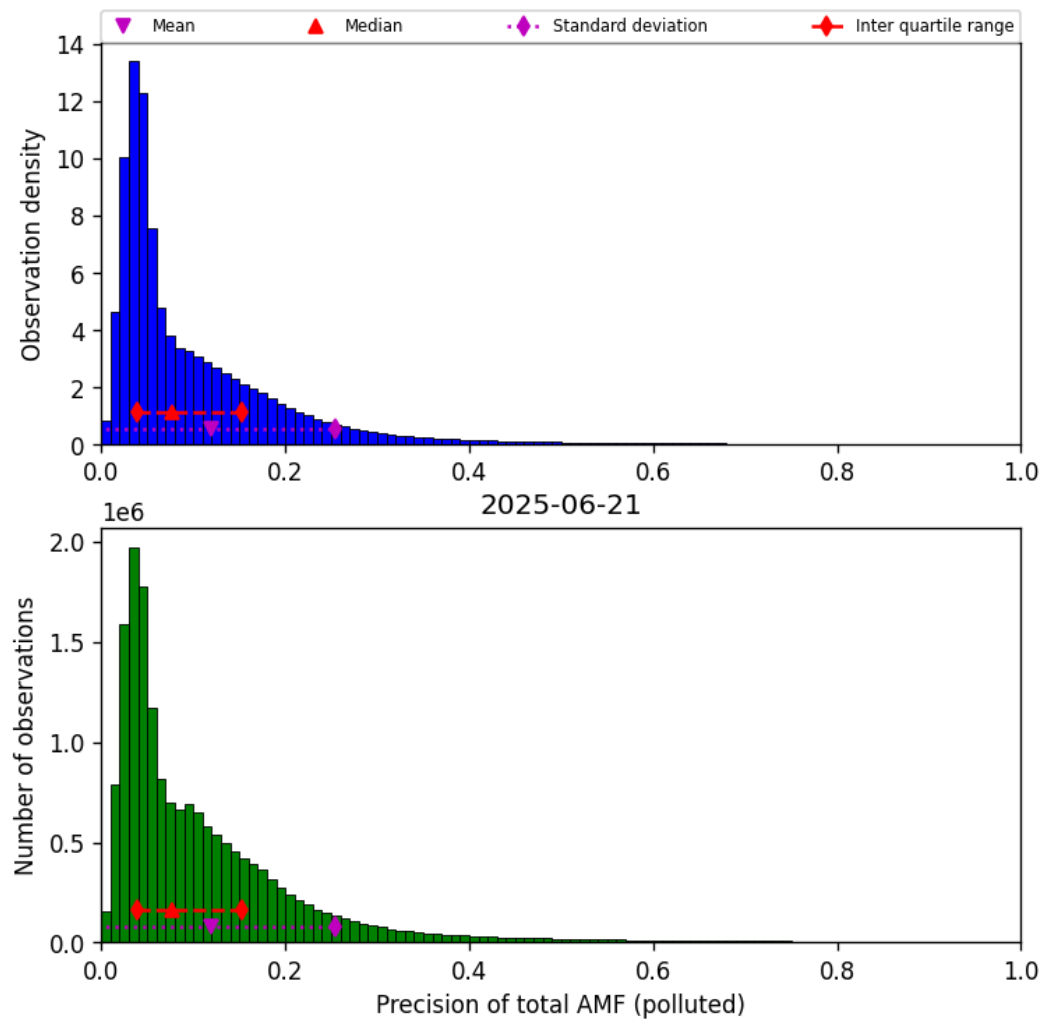


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-06-21 to 2025-06-22

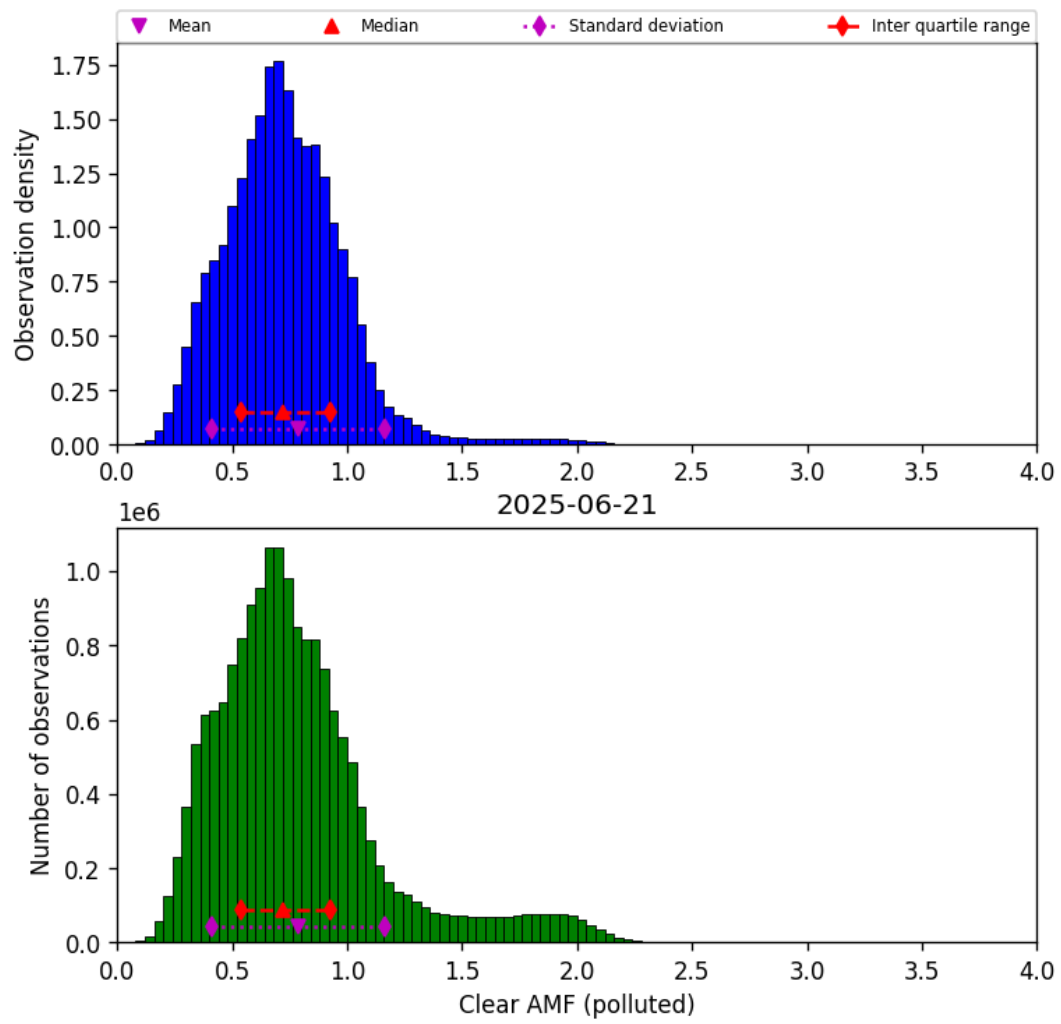


Figure 82: Histogram of "Clear AMF (polluted)" for 2025-06-21 to 2025-06-22

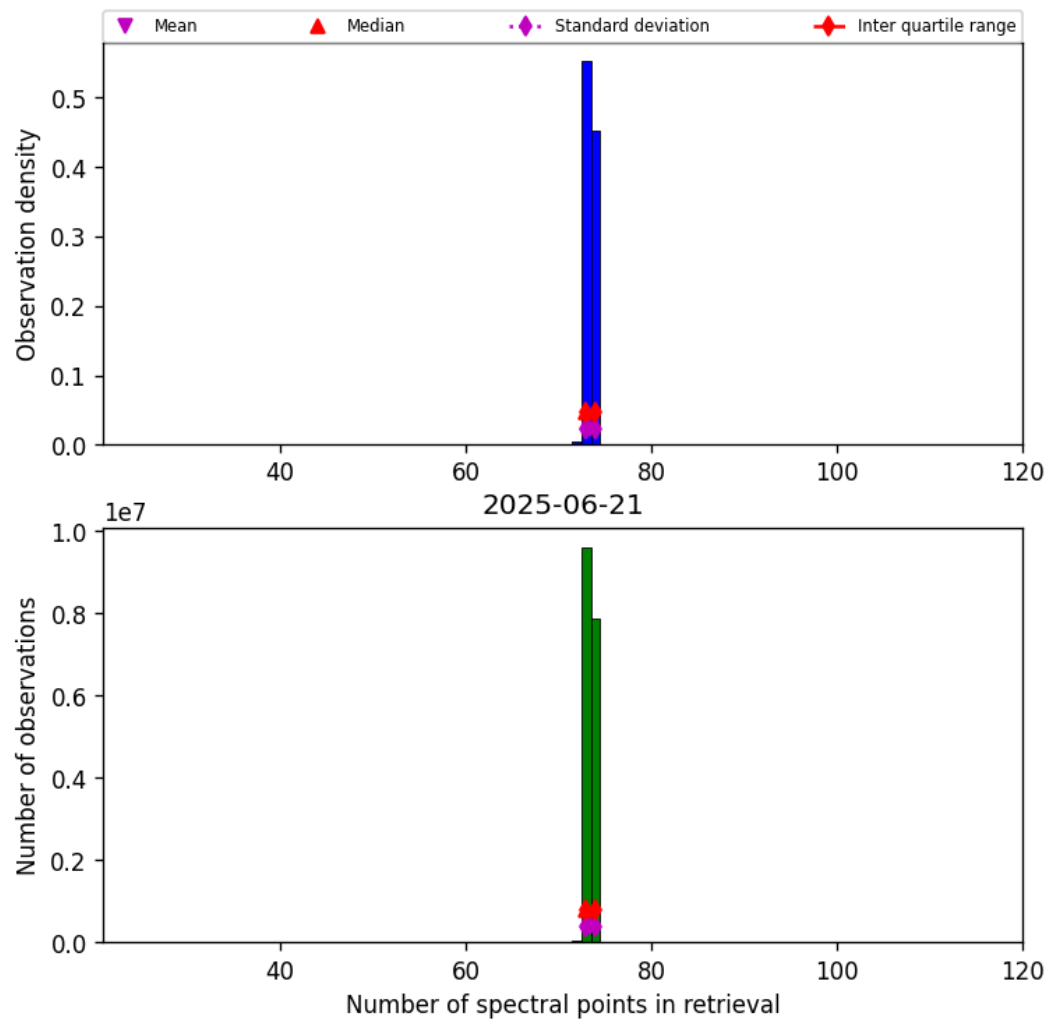


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-06-21 to 2025-06-22

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.

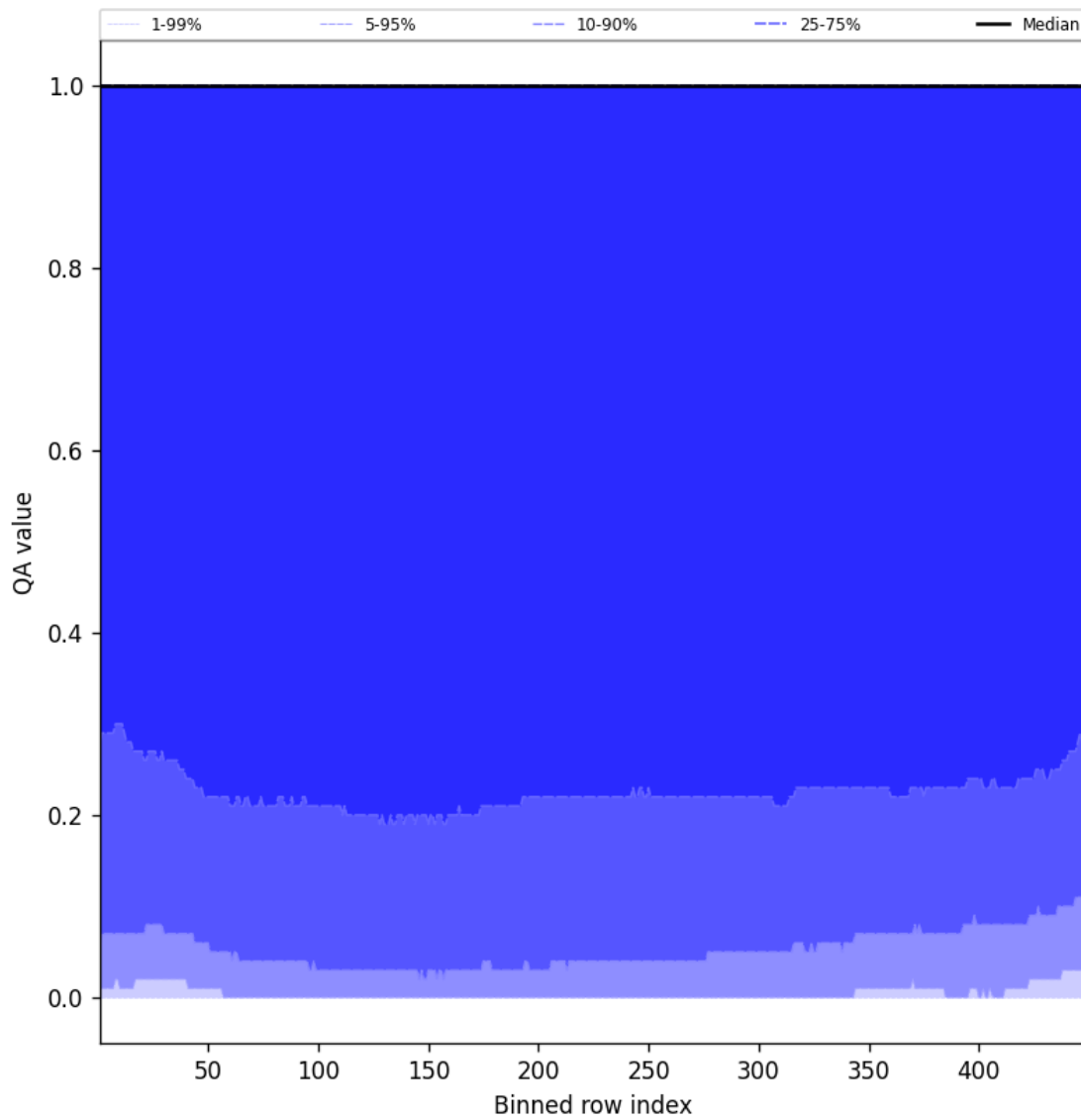


Figure 84: Along track statistics of “QA value” for 2025-06-21 to 2025-06-22

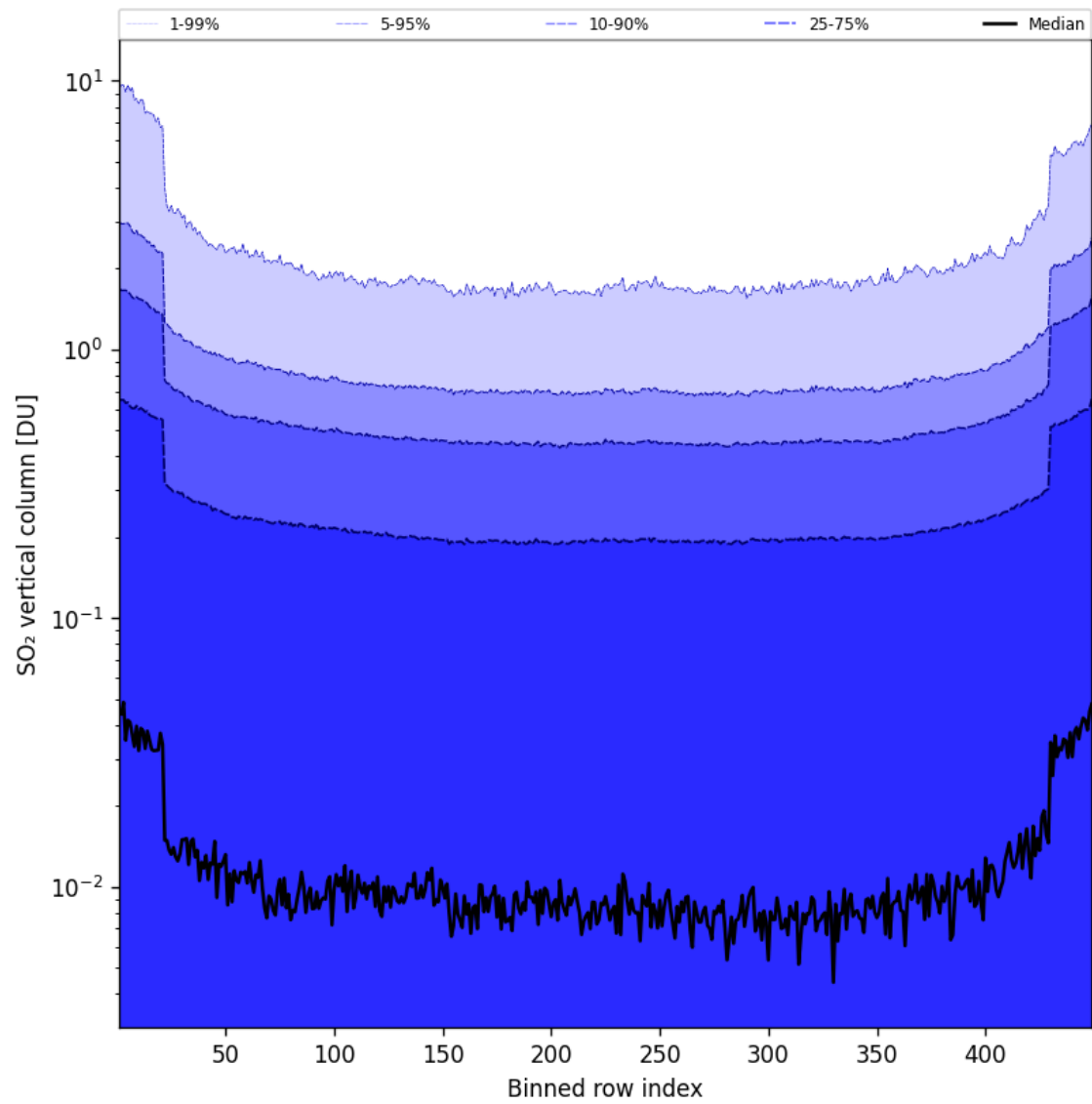


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-06-21 to 2025-06-22

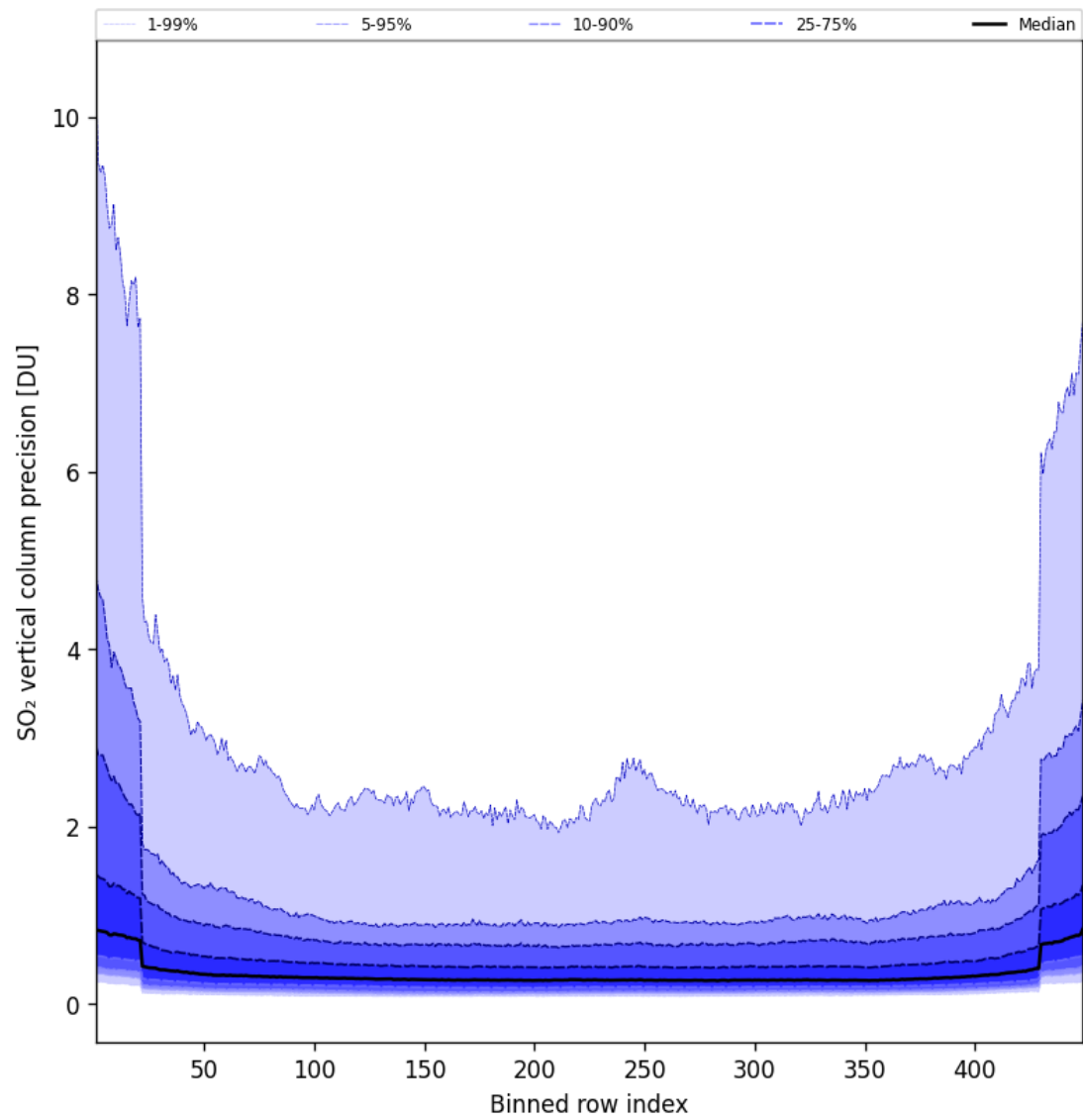


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-06-21 to 2025-06-22

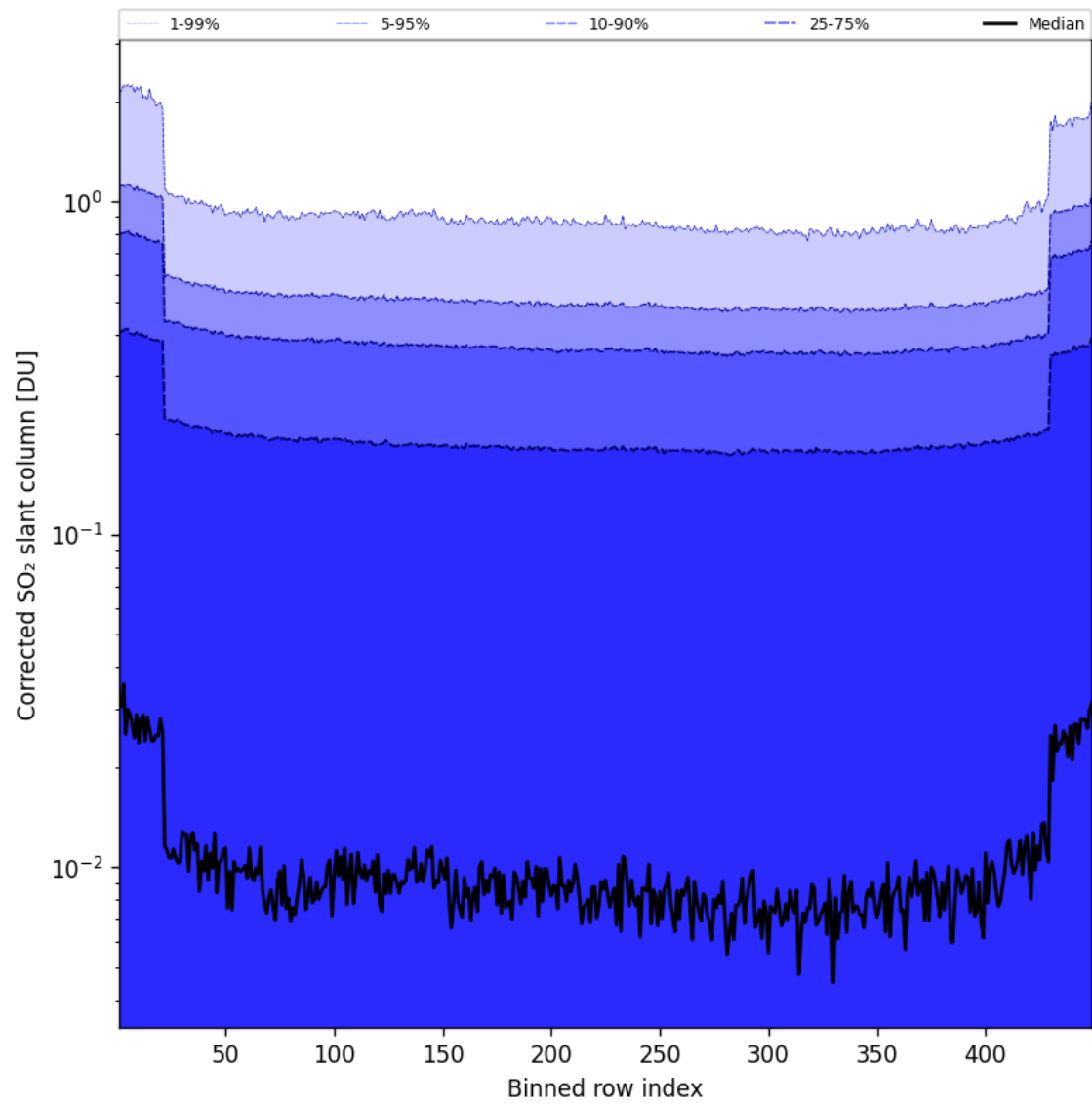


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-06-21 to 2025-06-22

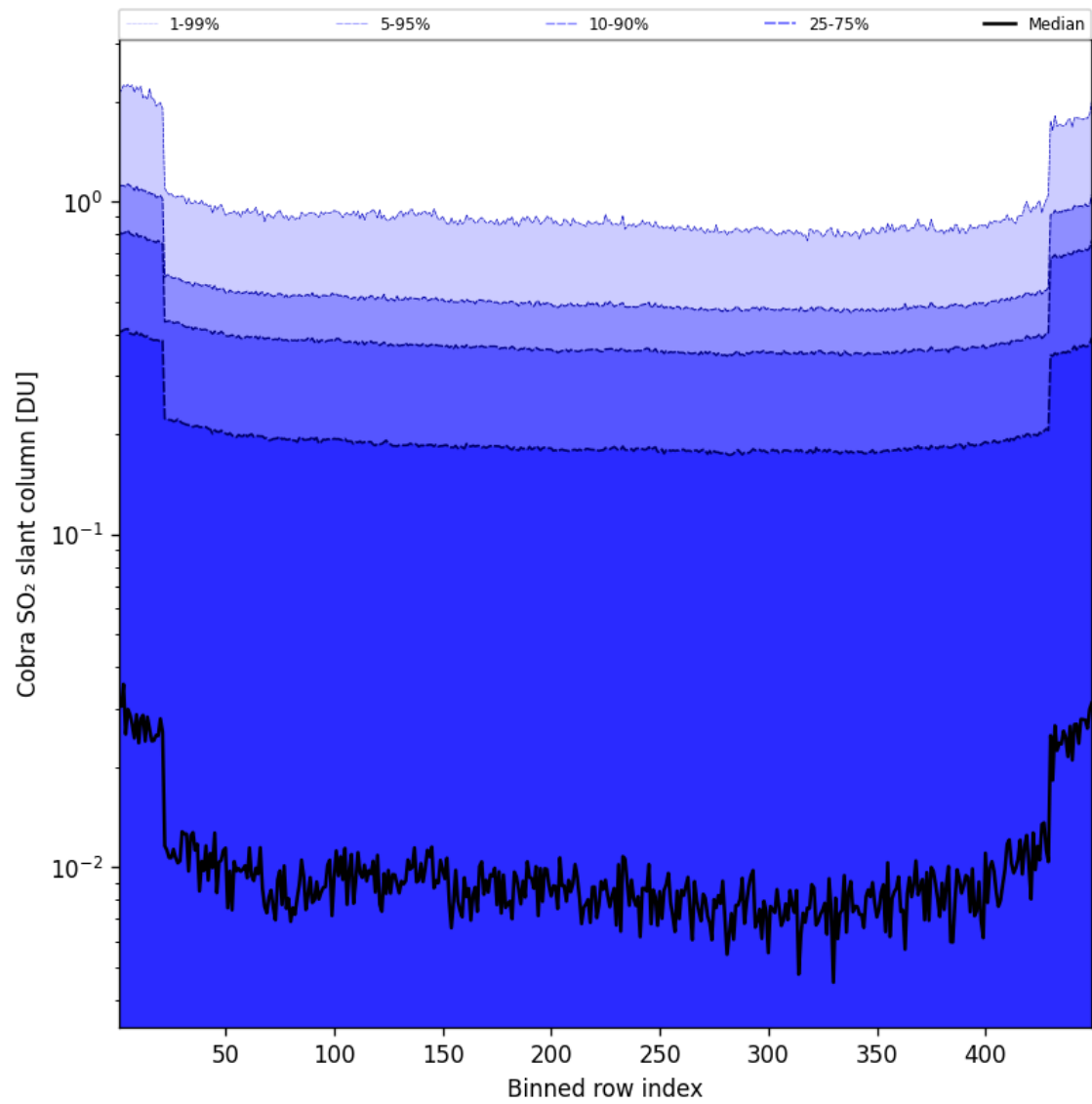


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-06-21 to 2025-06-22

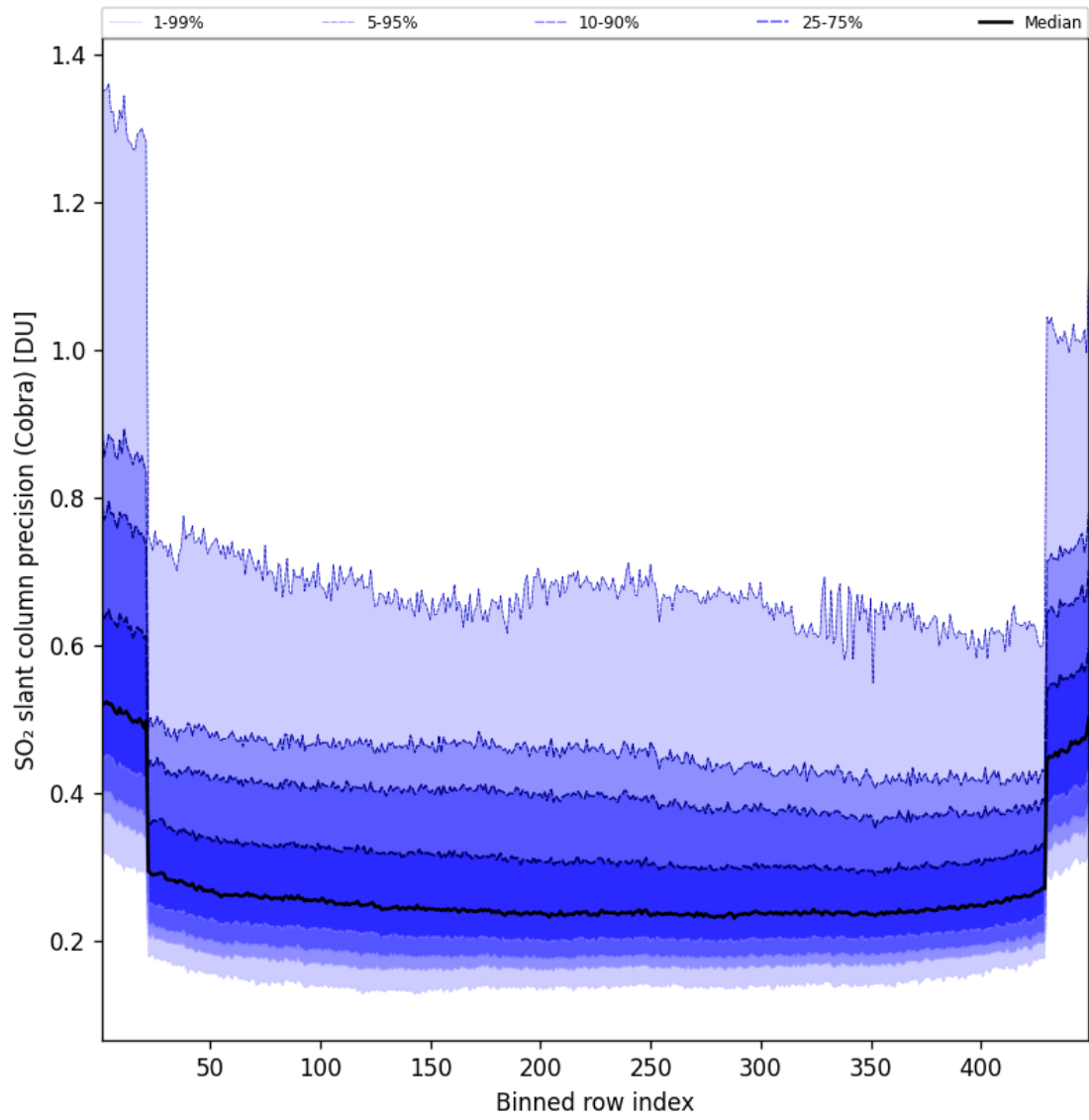


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-06-21 to 2025-06-22

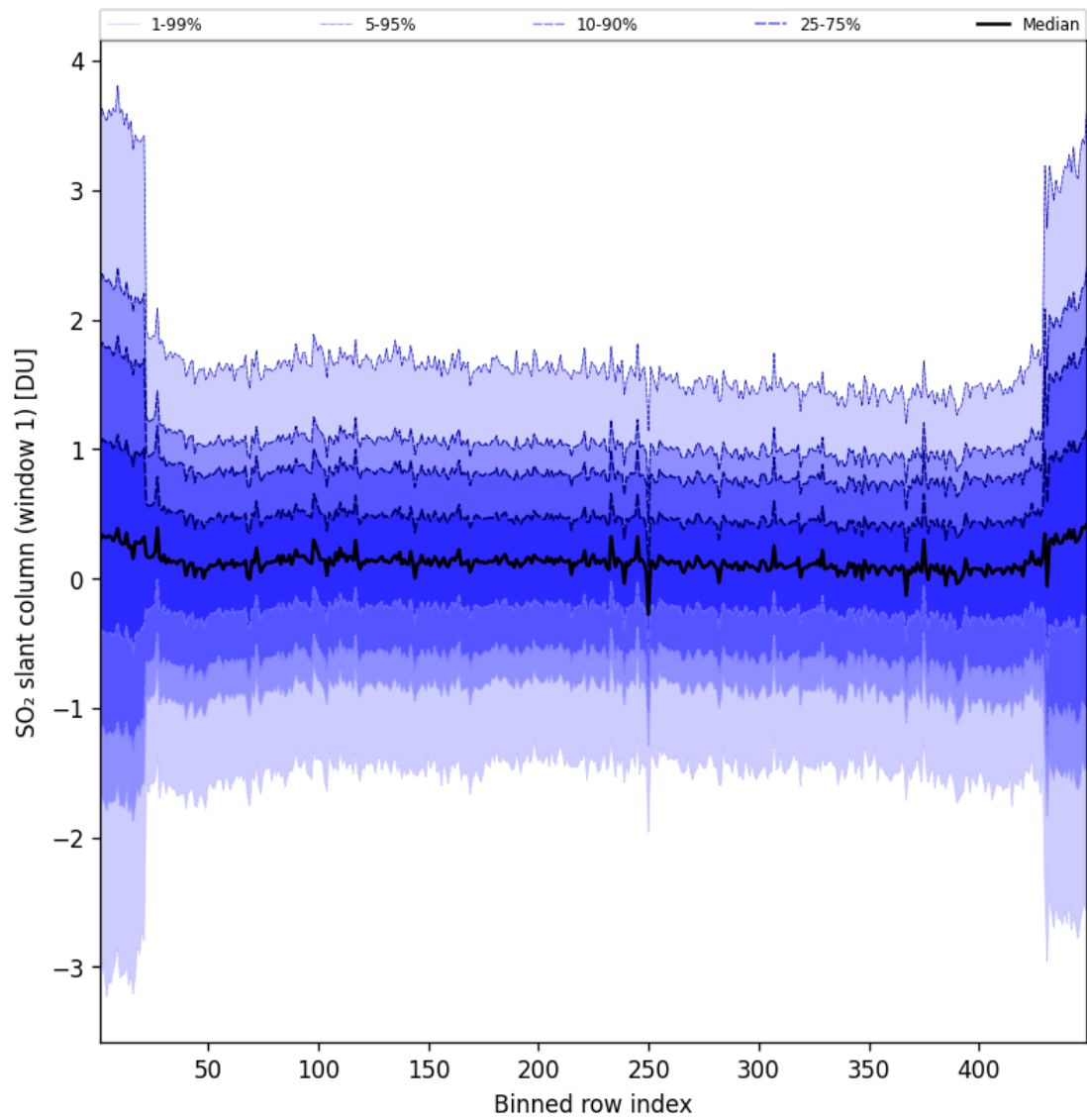


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-06-21 to 2025-06-22

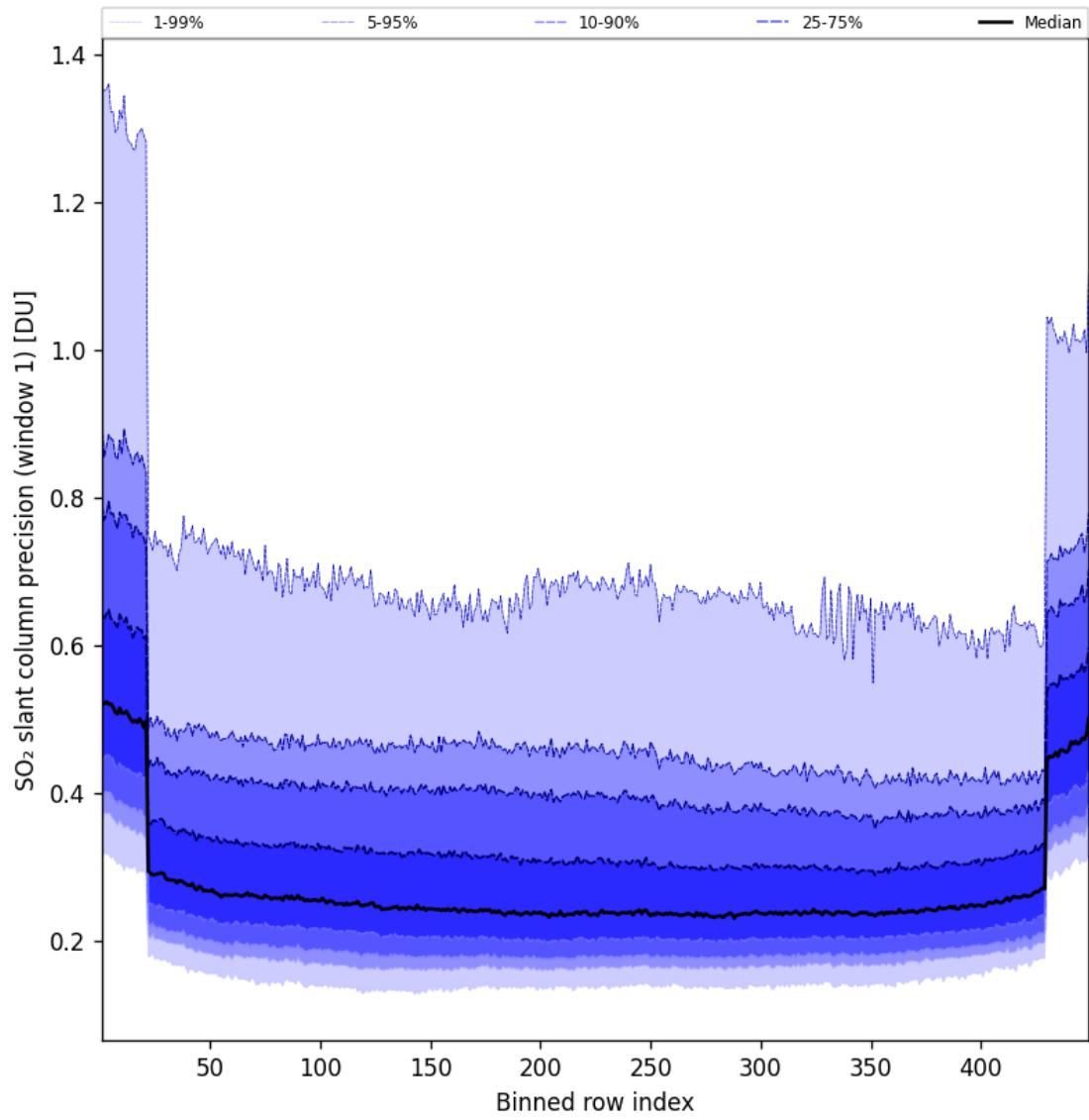


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-06-21 to 2025-06-22

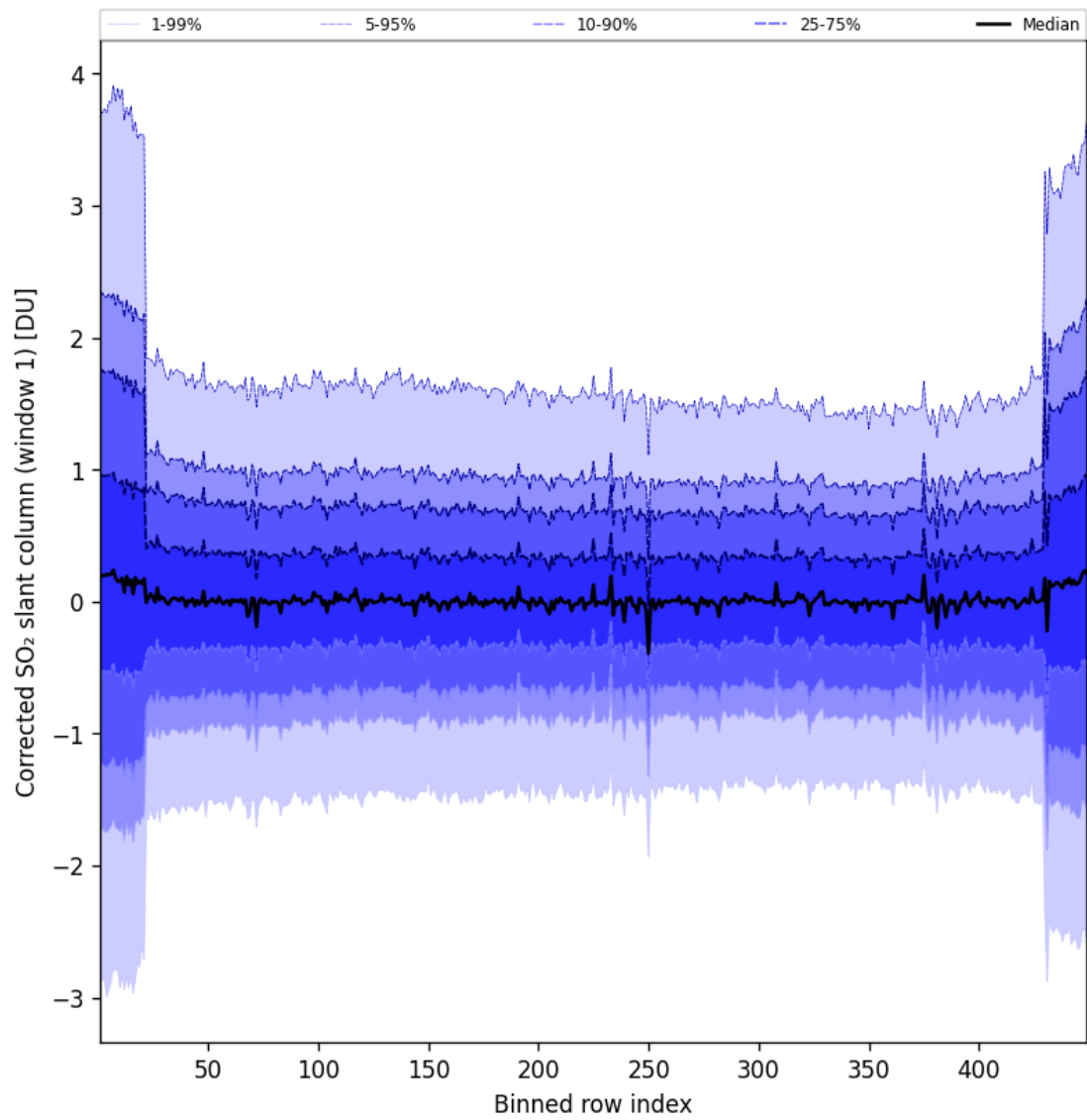


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-06-21 to 2025-06-22

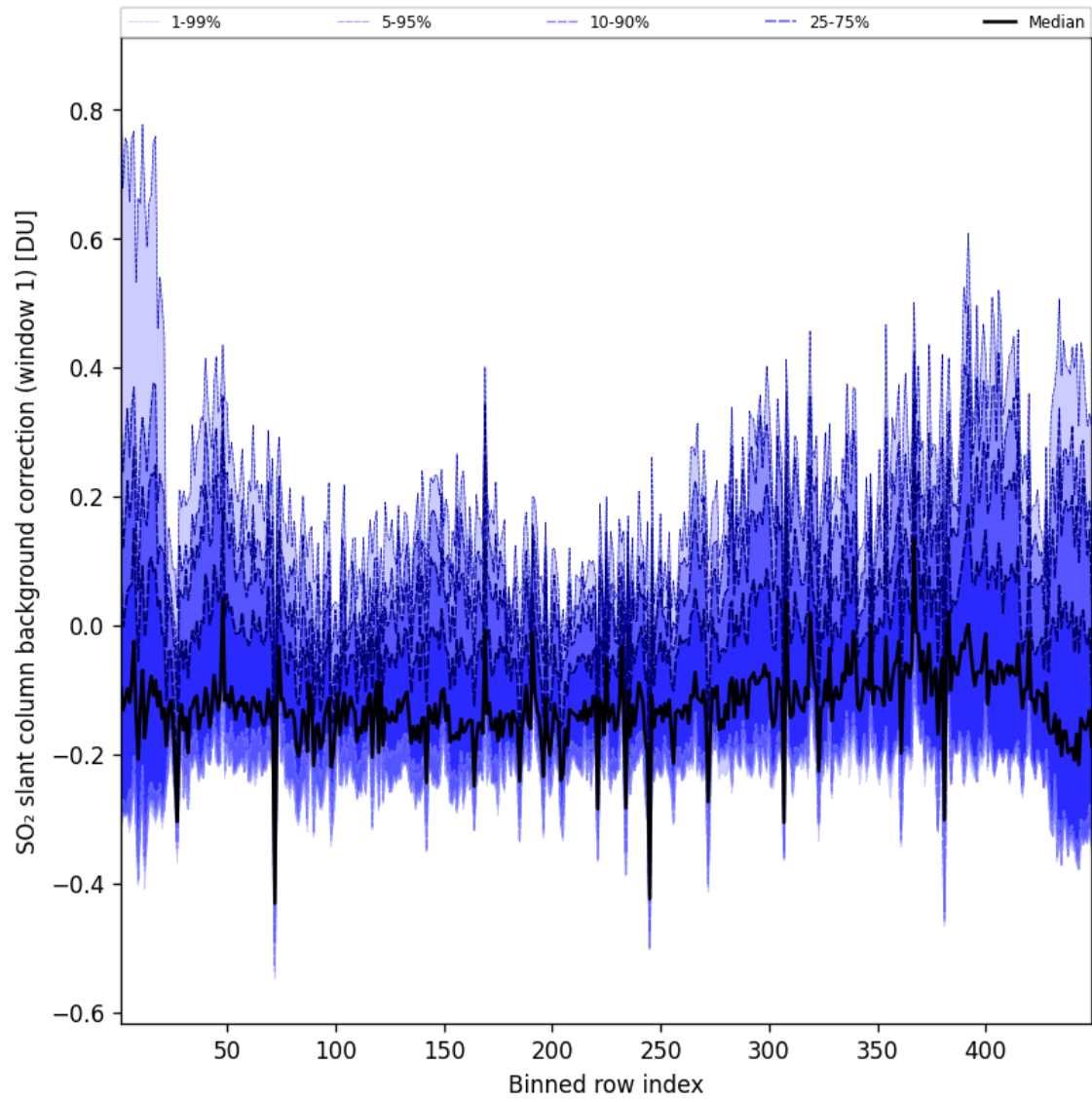


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-06-21 to 2025-06-22

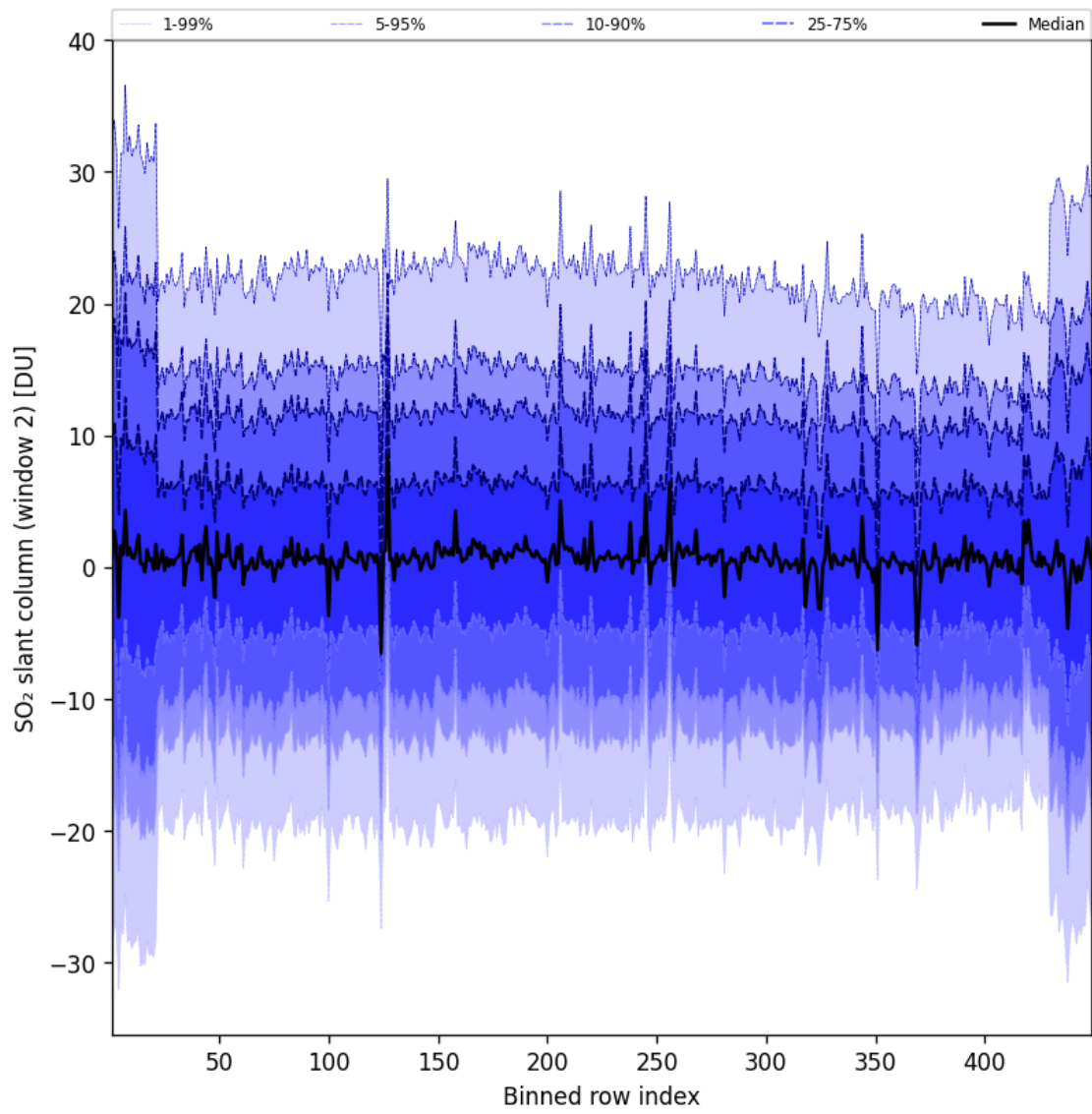


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-06-21 to 2025-06-22

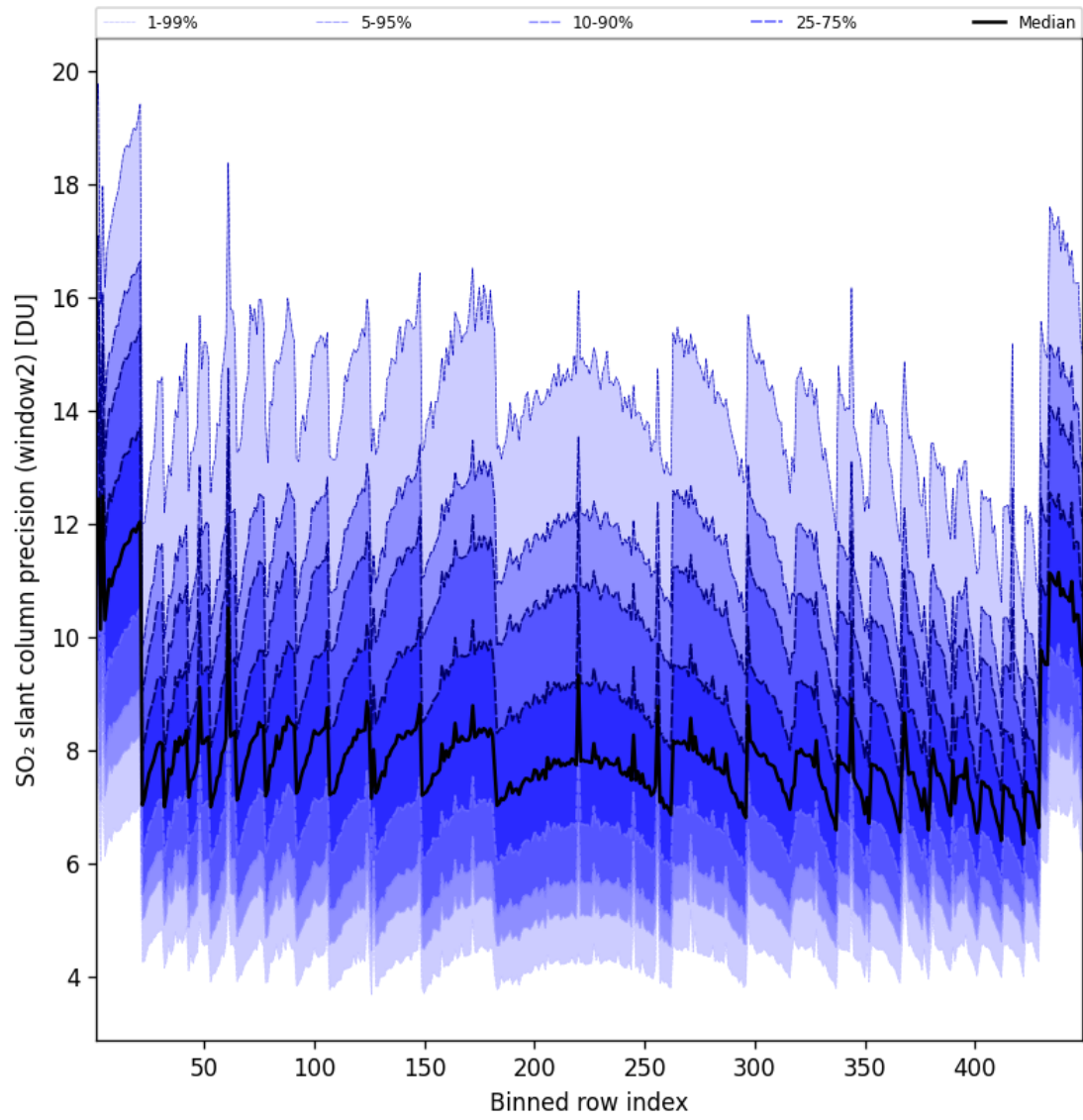


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-06-21 to 2025-06-22

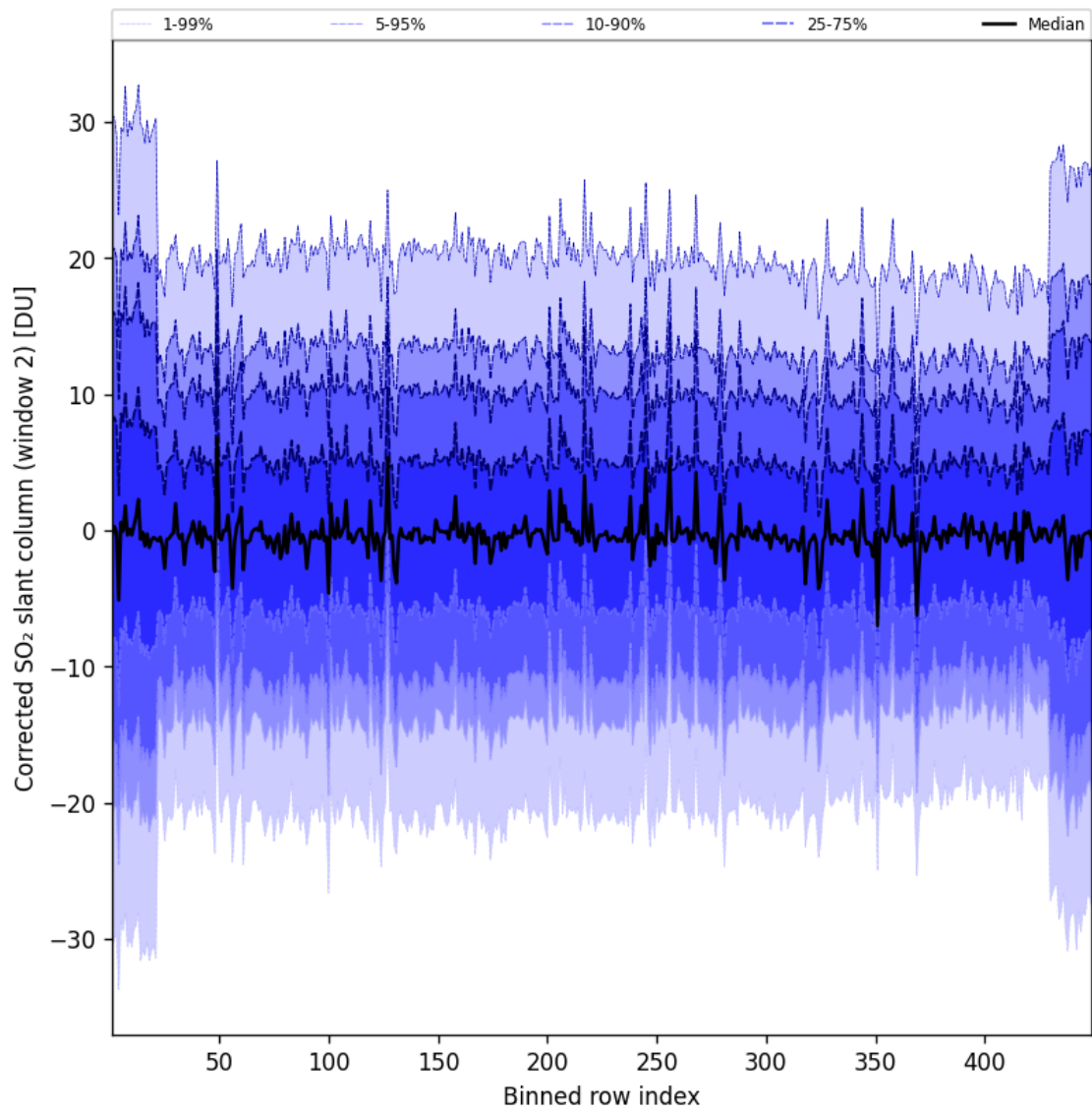


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-06-21 to 2025-06-22

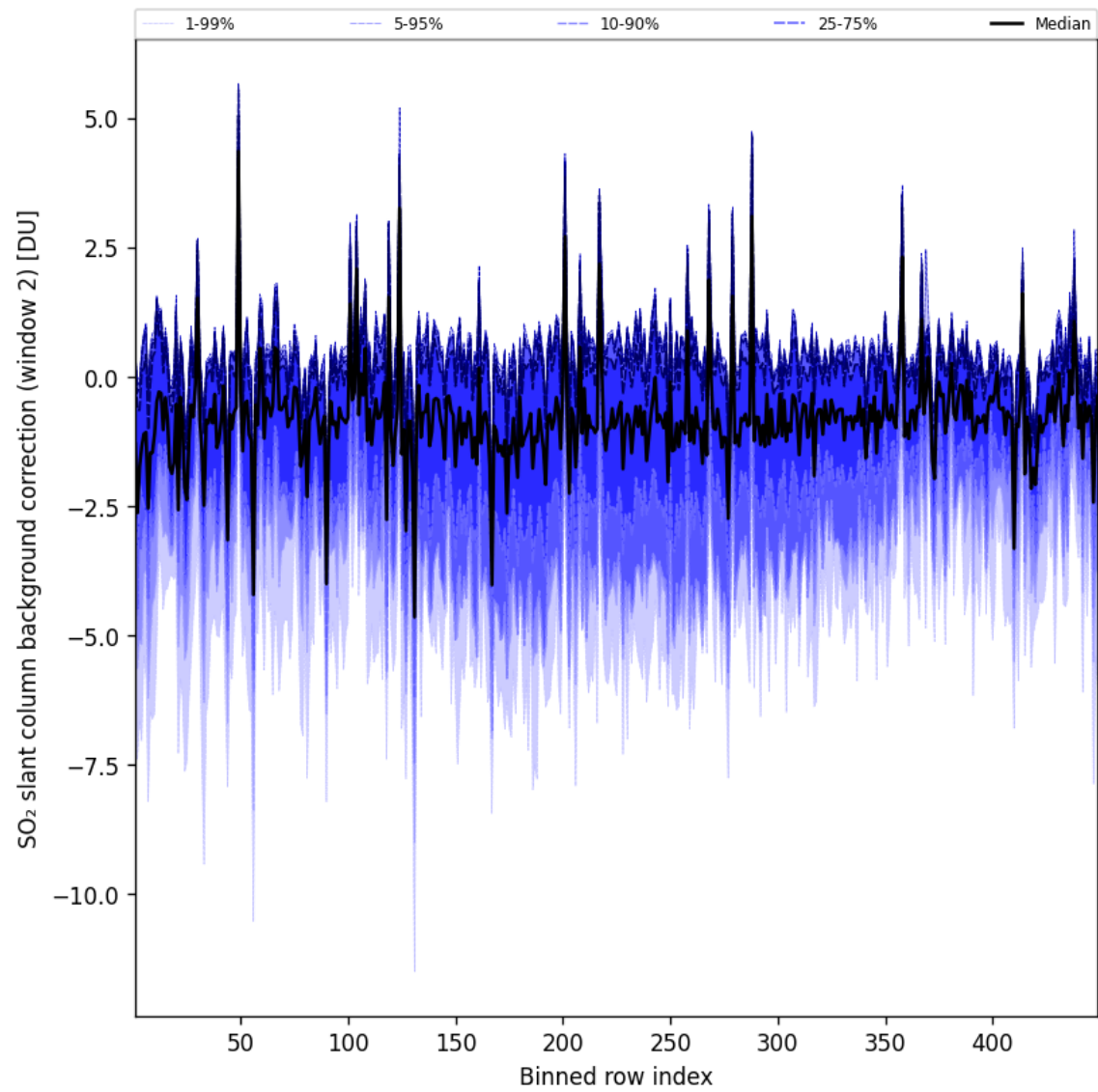


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-06-21 to 2025-06-22

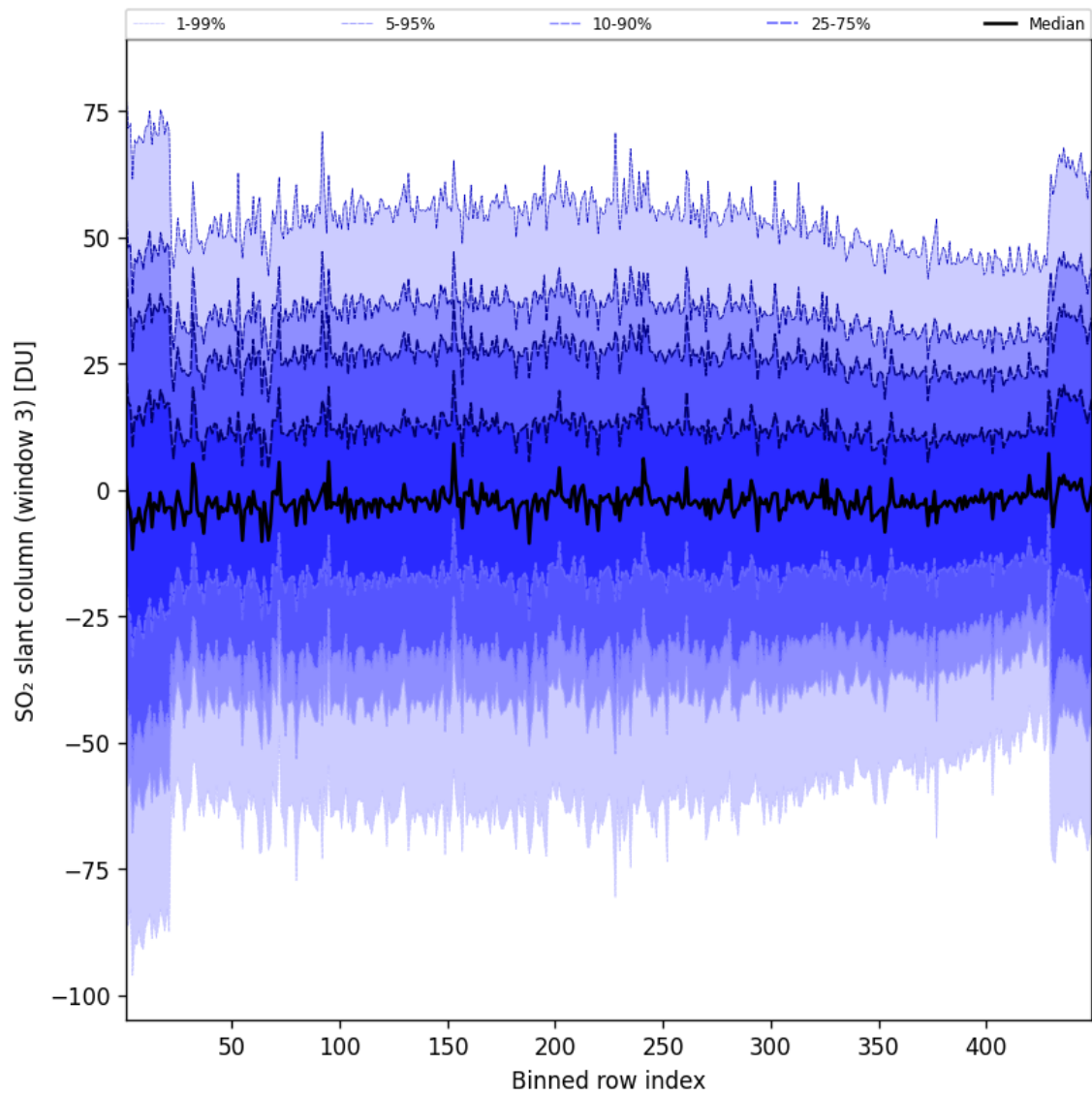


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-06-21 to 2025-06-22

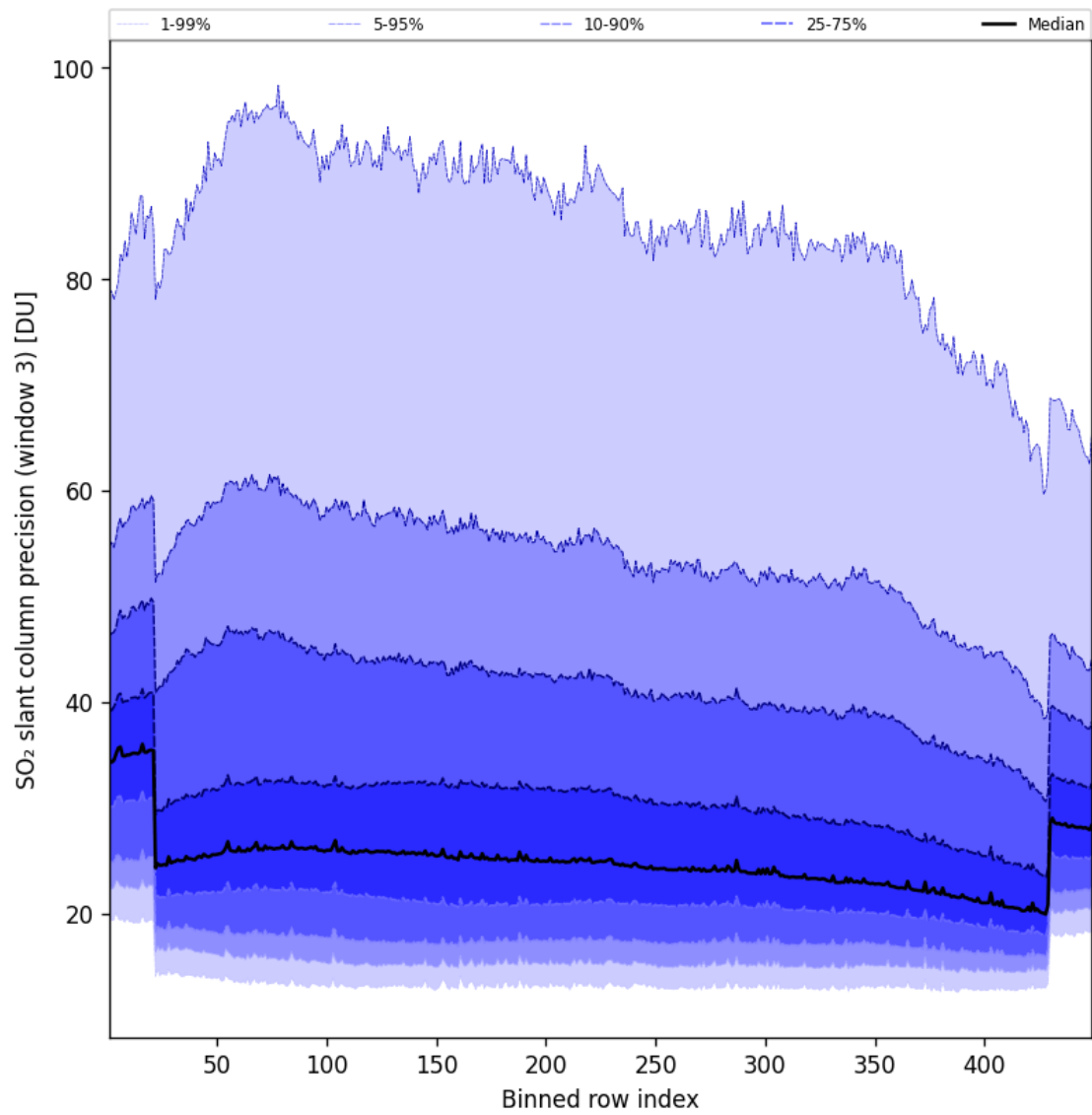


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-06-21 to 2025-06-22

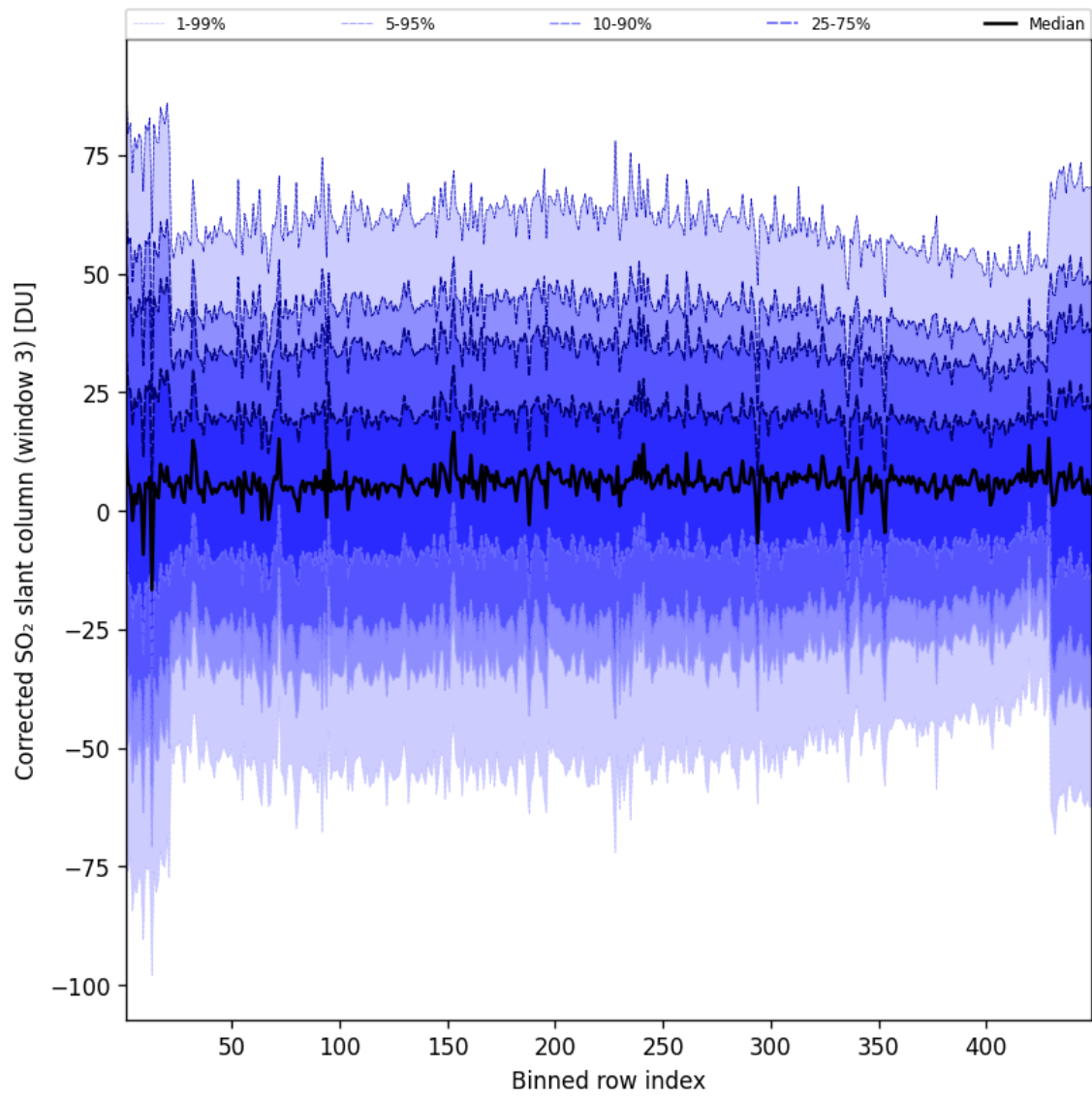


Figure 100: Along track statistics of "Corrected SO₂ slant column (window 3)" for 2025-06-21 to 2025-06-22

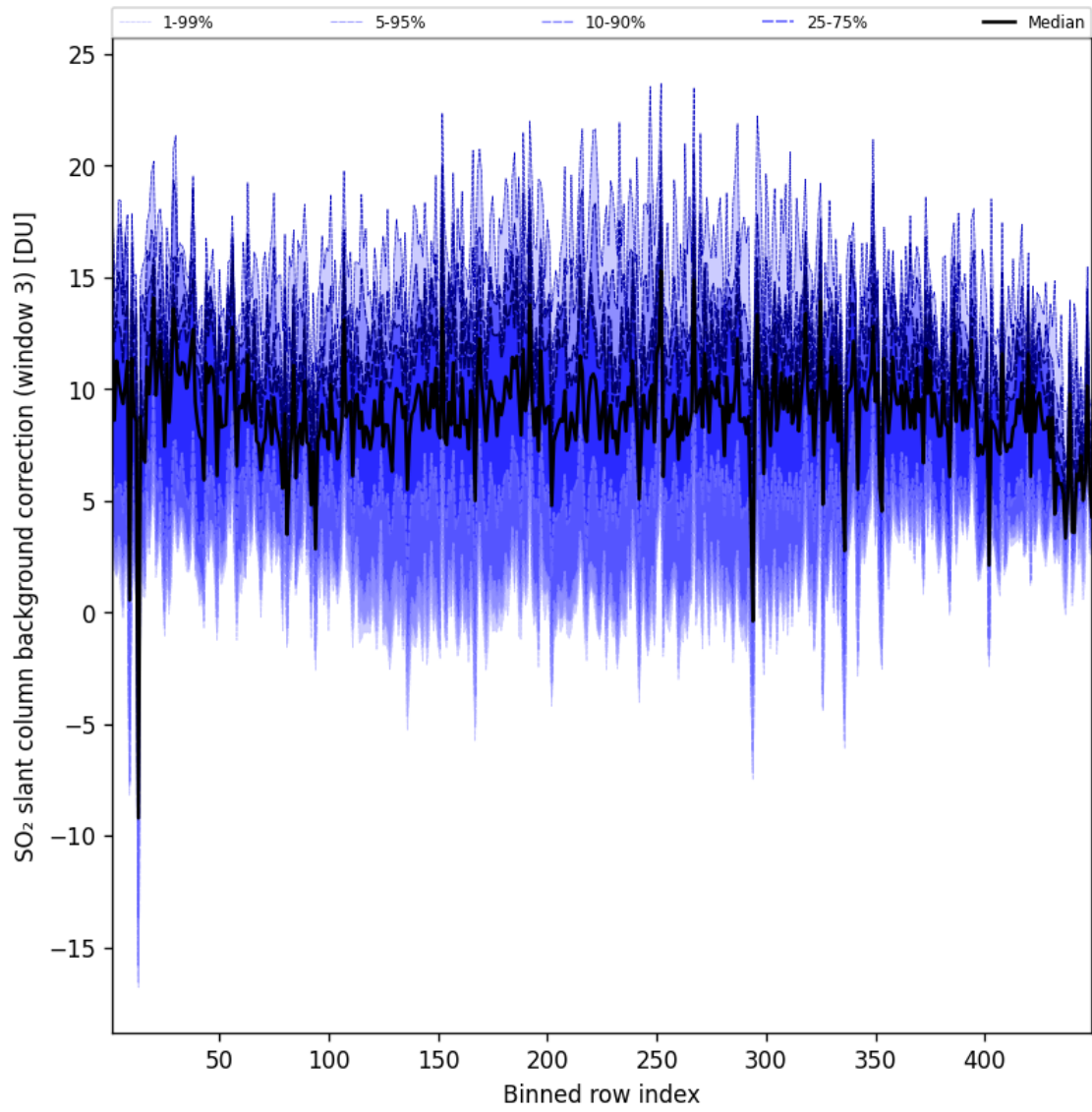


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-06-21 to 2025-06-22

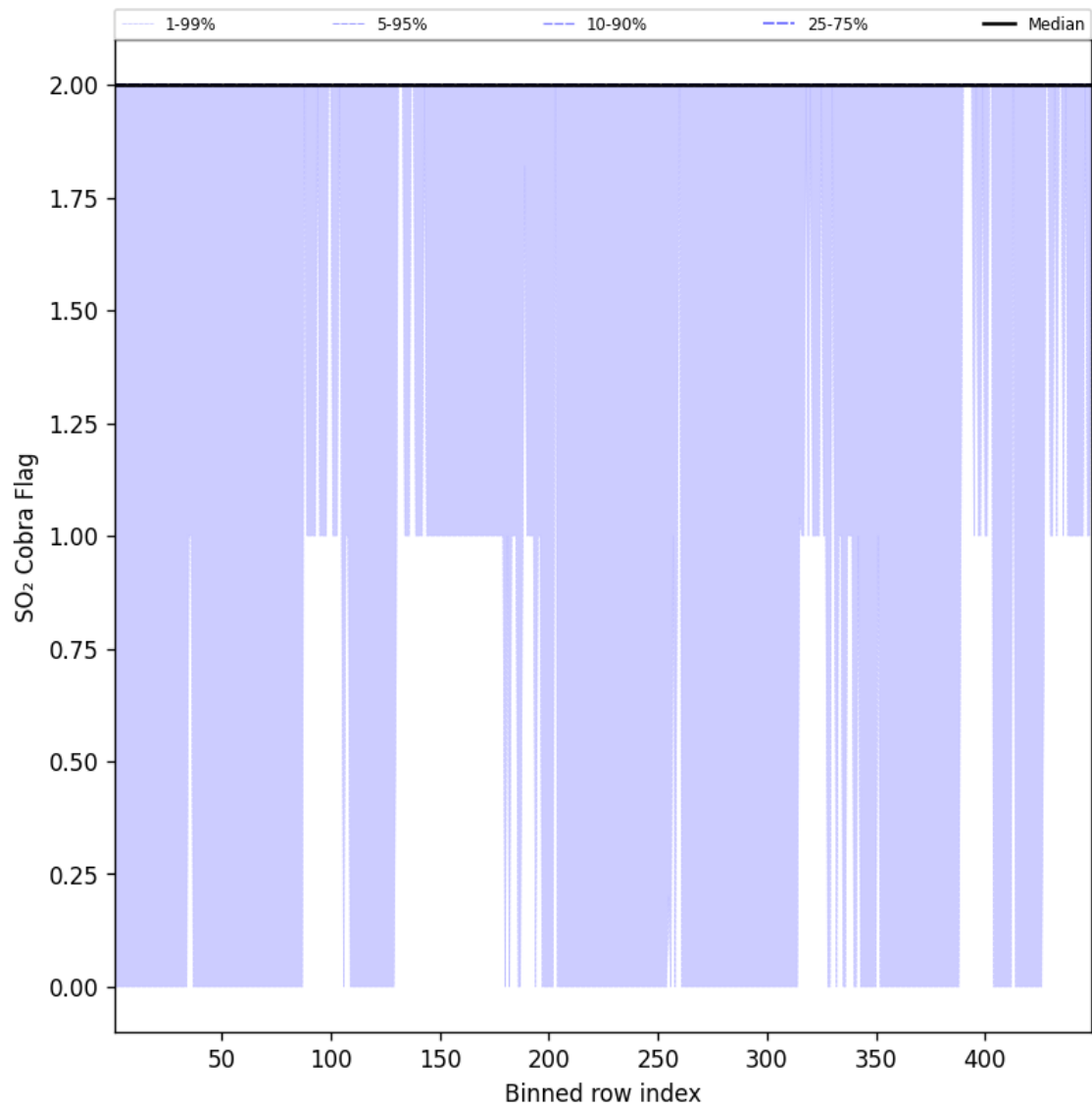


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-06-21 to 2025-06-22

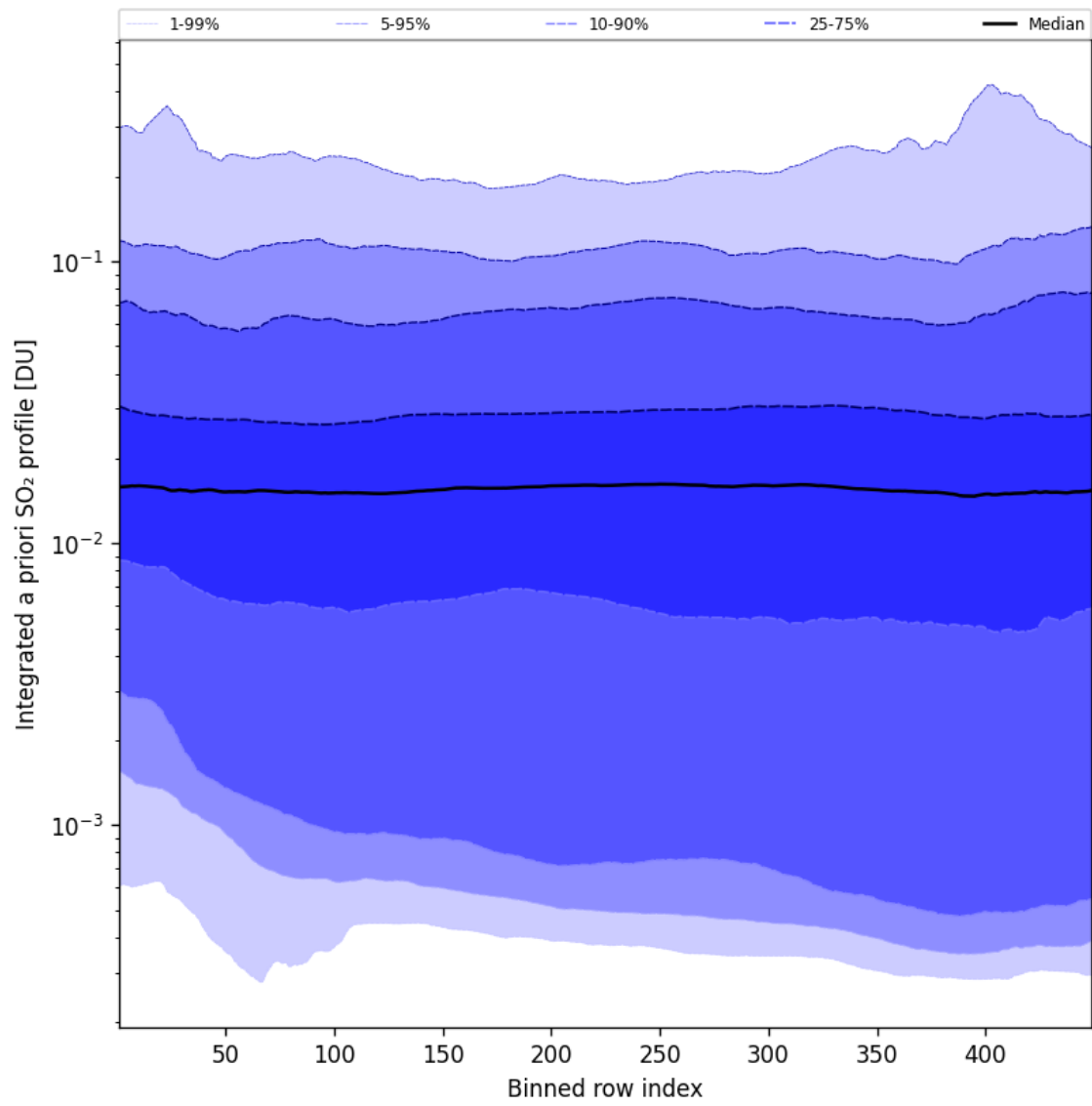


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-06-21 to 2025-06-22

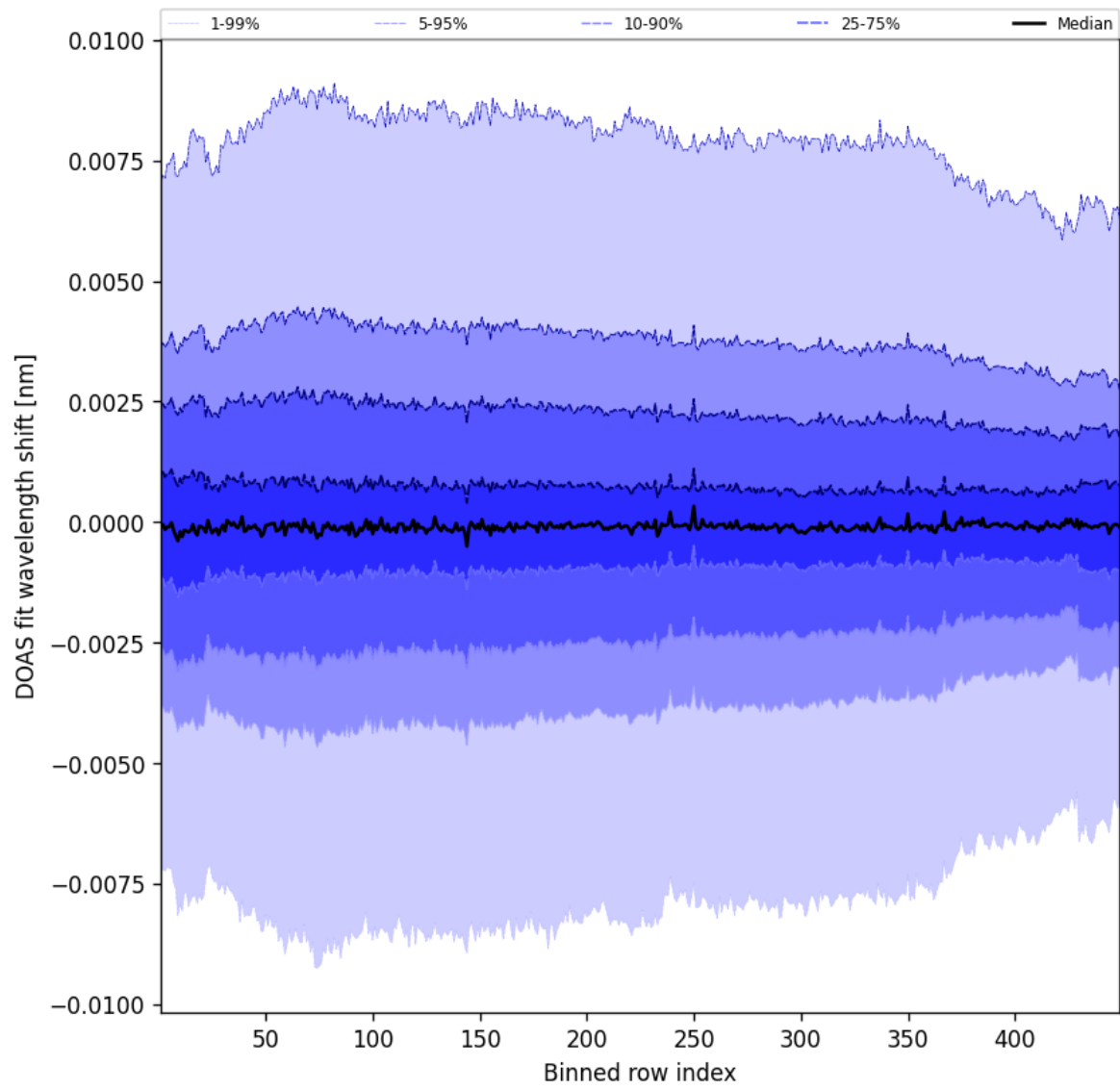


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-06-21 to 2025-06-22

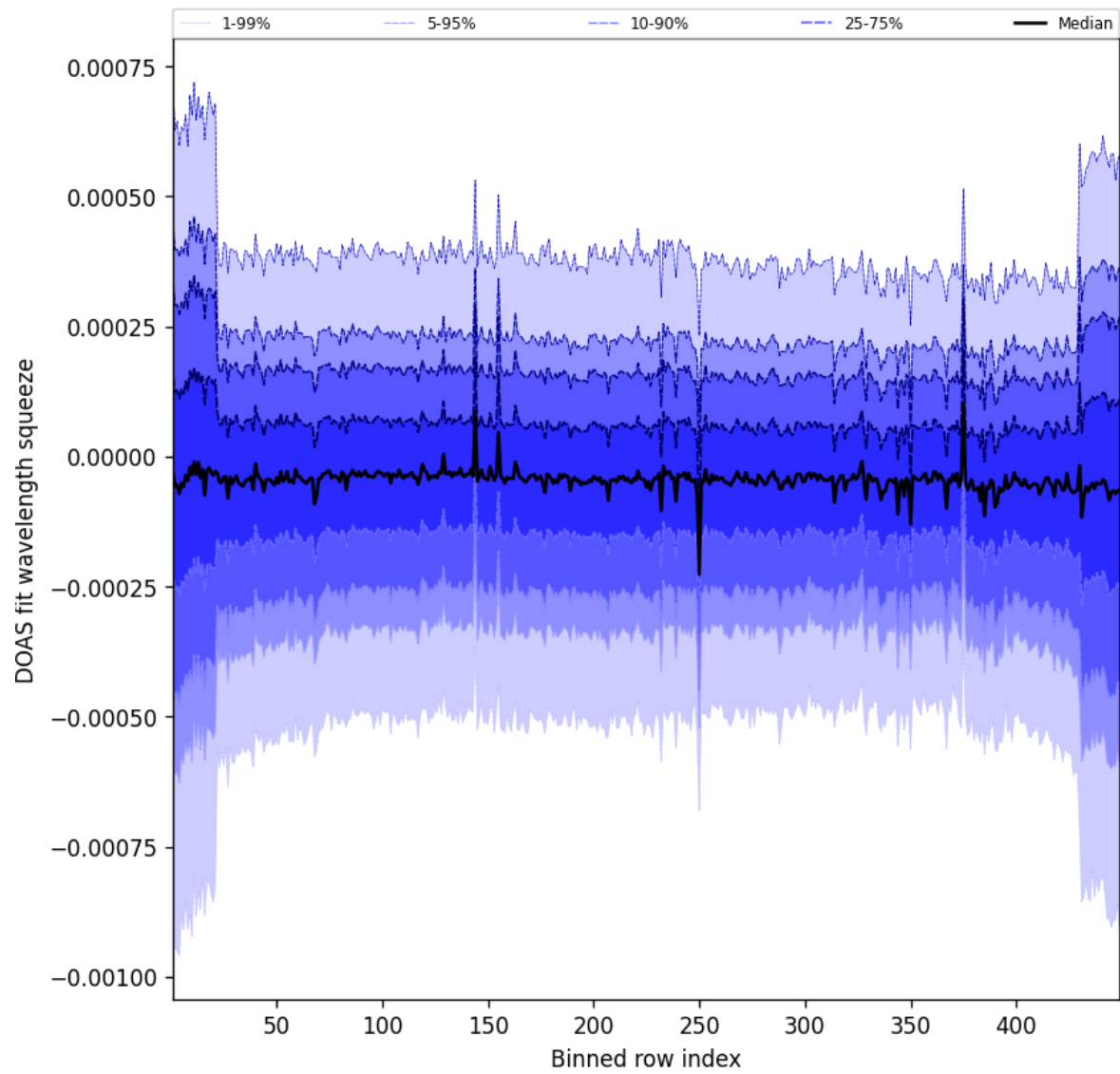


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-06-21 to 2025-06-22

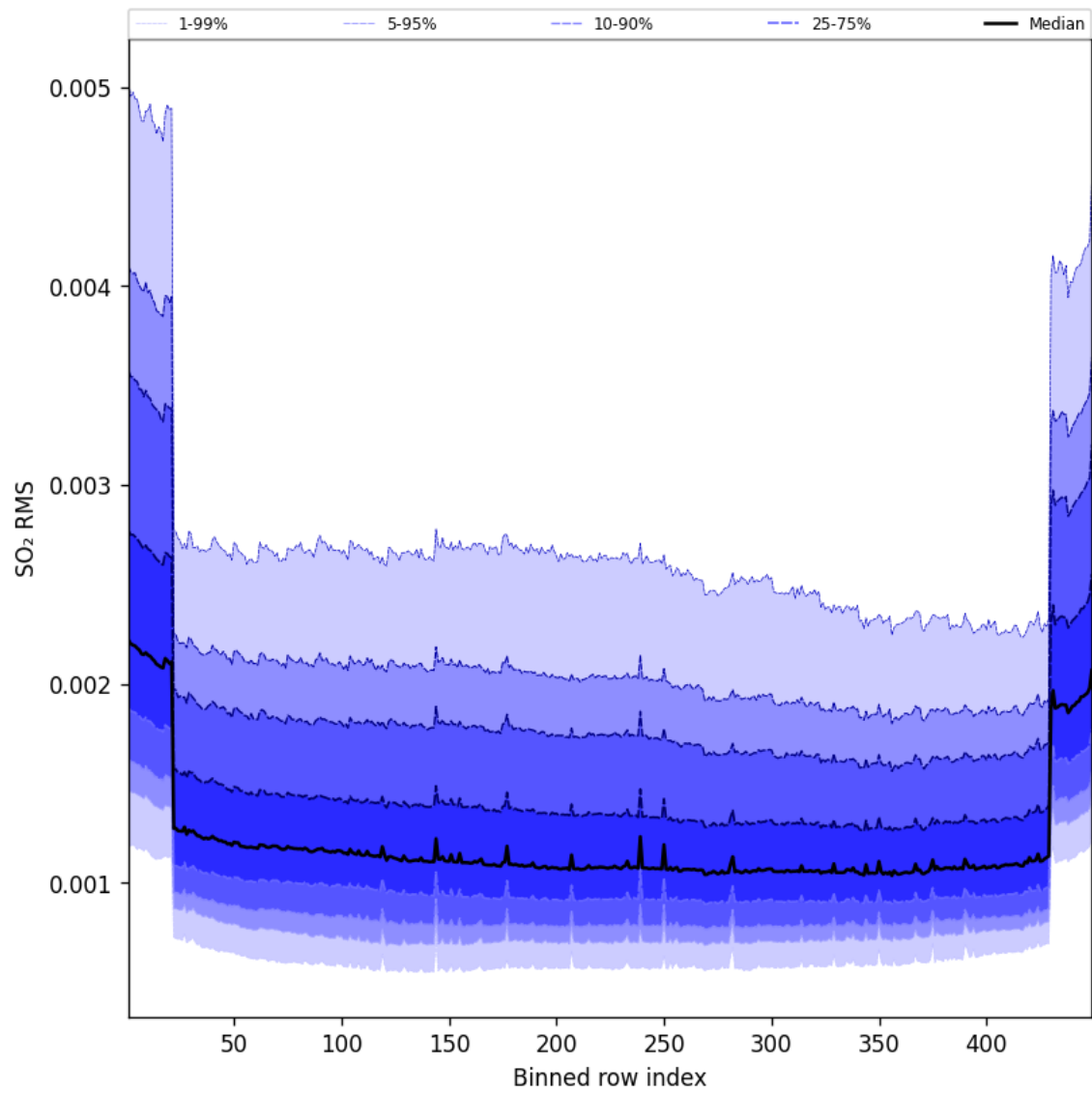


Figure 106: Along track statistics of “SO₂ RMS” for 2025-06-21 to 2025-06-22

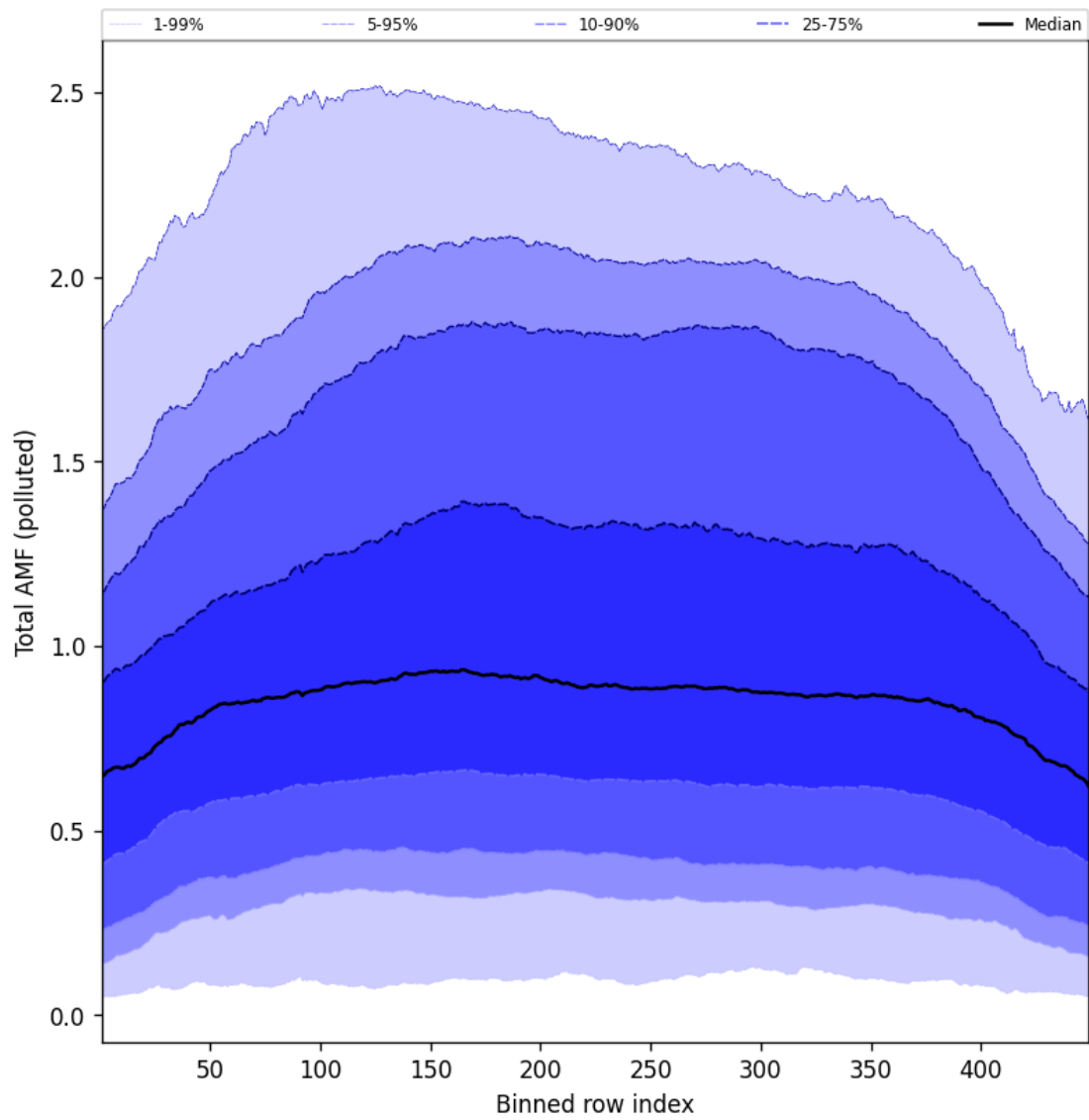


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-06-21 to 2025-06-22

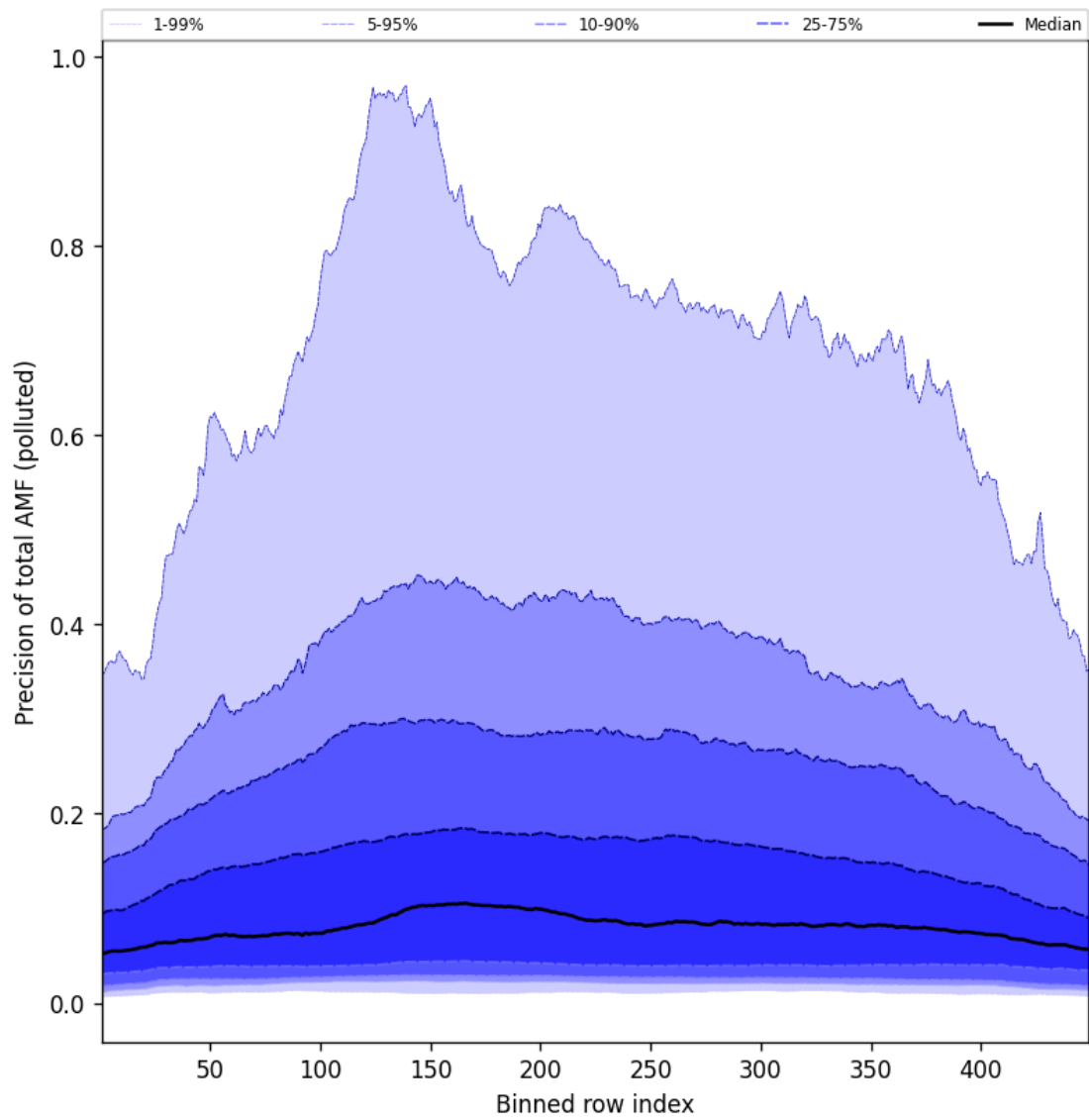


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-06-21 to 2025-06-22

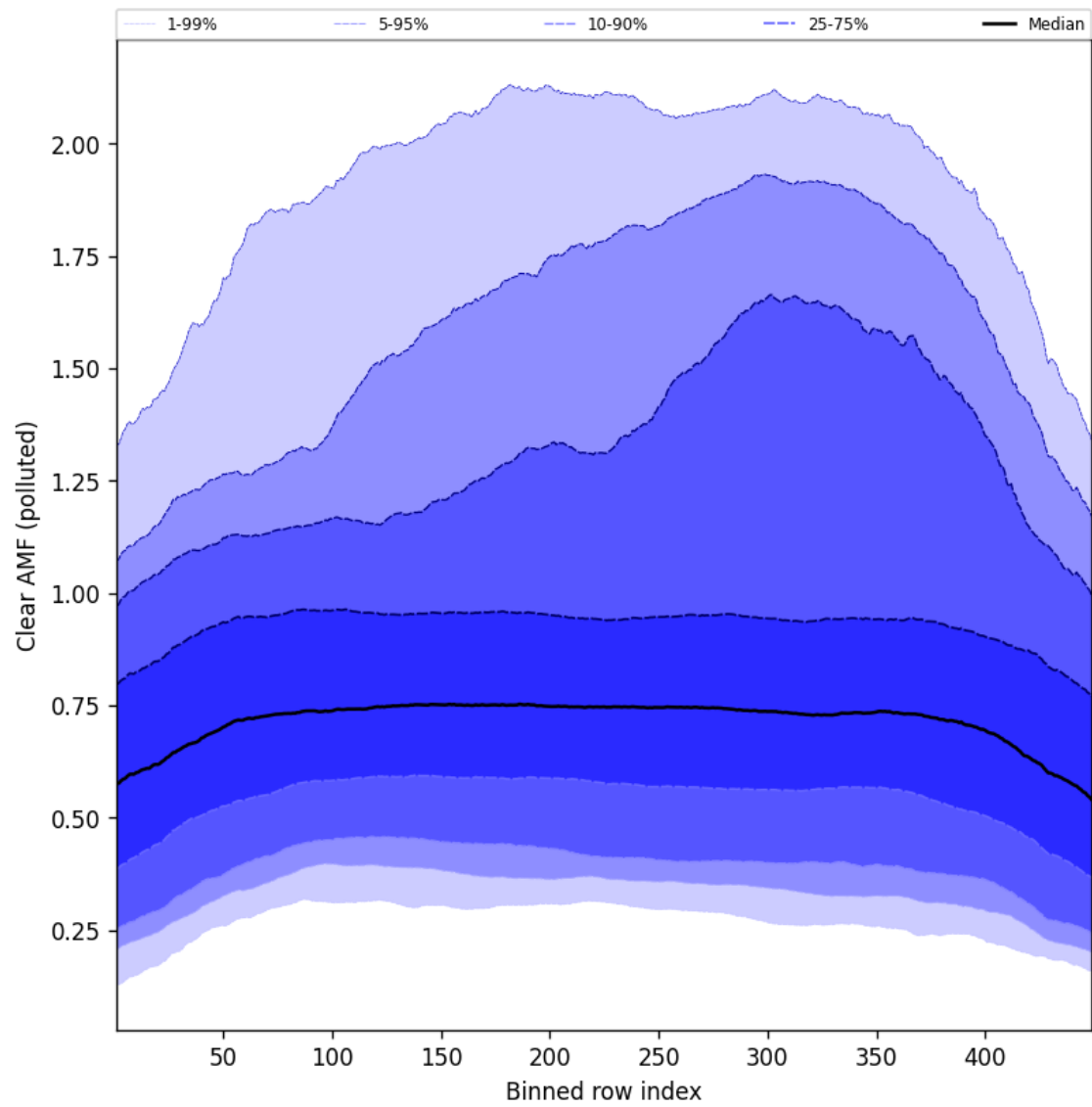


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-06-21 to 2025-06-22

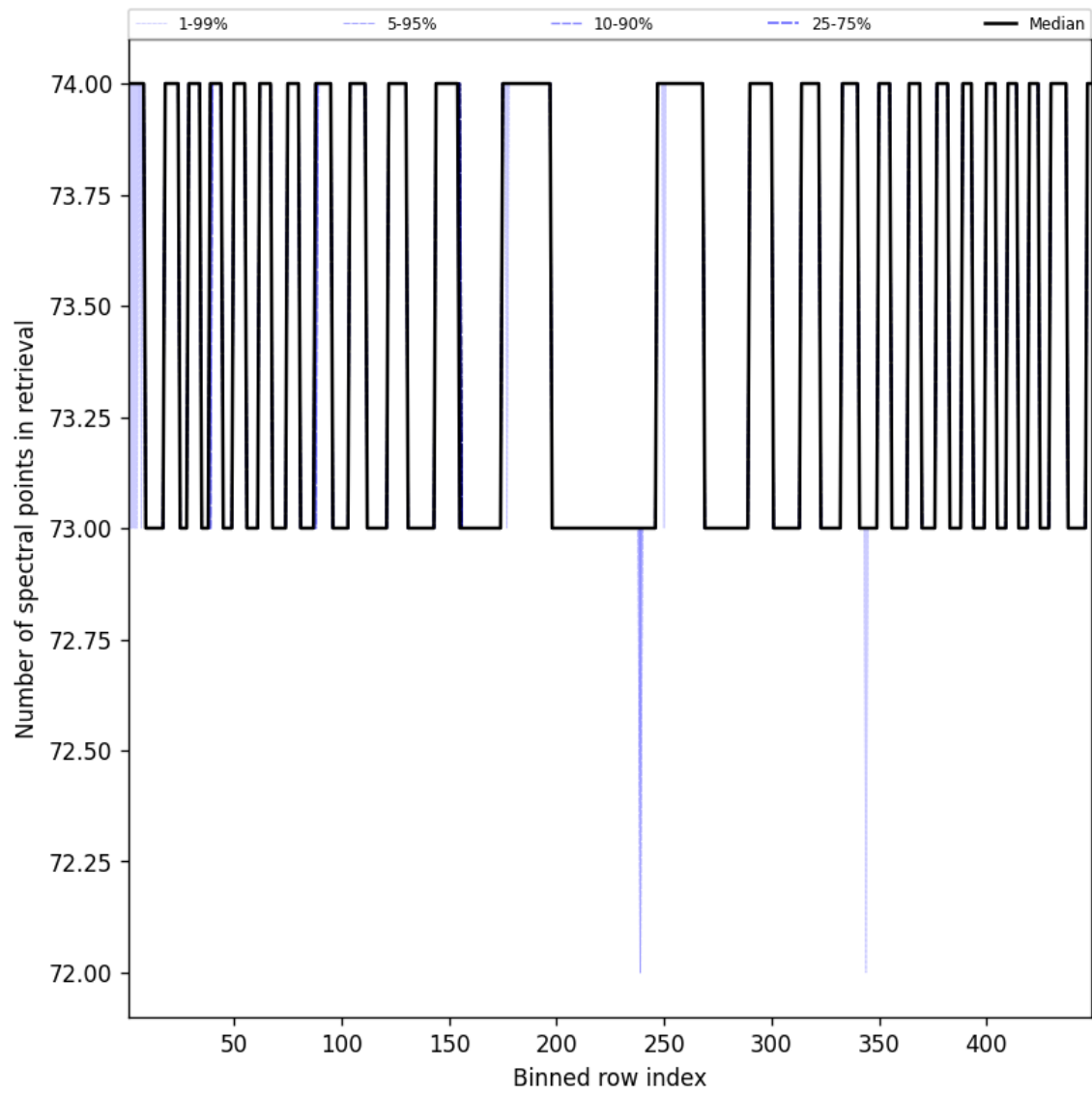


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-06-21 to 2025-06-22

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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