

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]	0.645 ± 0.406	15647288	0.995	0.780	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.911 \pm 102.322) \times 10^{-2}$	15647288	0.278	0.437	9.981×10^{-3}	-80.9	800
sulfurdioxide total vertical column precision [DU]	0.498 ± 0.726	15647288	0.222	0.323	0.320	4.404×10^{-2}	137
sulfurdioxide slant column density corrected [DU]	$(1.774 \pm 38.708) \times 10^{-2}$	15647288	0.242	0.370	9.199×10^{-3}	-26.9	432
sulfurdioxide slant column density cobra [DU]	$(1.758 \pm 36.363) \times 10^{-2}$	15647288	0.242	0.370	9.199×10^{-3}	-26.9	45.8
sulfurdioxide slant column density cobra precision [DU]	0.297 ± 0.135	15647288	0.213	0.130	0.256	7.830×10^{-2}	29.7
sulfurdioxide slant column density window1 [DU]	0.131 ± 0.681	15647288	0.175	0.745	0.135	-84.2	65.6
sulfurdioxide slant column density window1 precision [DU]	0.297 ± 0.135	15647288	0.213	0.130	0.256	7.830×10^{-2}	29.7
sulfurdioxide slant column density corrected win1 [DU]	$(3.324 \pm 67.056) \times 10^{-2}$	15647288	2.500×10^{-2}	0.729	1.714×10^{-2}	-84.2	65.4
background so2 slant column offset window1 [DU]	$(-9.728 \pm 14.070) \times 10^{-2}$	15647288	-0.180	0.164	-0.127	-1.27	3.83
sulfurdioxide slant column density window2 [DU]	1.03 ± 9.06	15647288	0.750	11.3	0.944	-1.405×10^3	1.542×10^3
sulfurdioxide slant column density window2 precision [DU]	8.19 ± 2.44	15647288	7.43	2.67	7.82	2.19	615
sulfurdioxide slant column density corrected win2 [DU]	-0.403 ± 8.967	15647288	-0.250	11.2	-0.380	-1.409×10^3	1.539×10^3
background so2 slant column offset window2 [DU]	-1.43 ± 1.85	15647288	-0.250	2.41	-1.03	-14.3	6.86
sulfurdioxide slant column density window3 [DU]	-9.51 ± 23.95	15647288	-9.52	29.4	-9.47	-978	3.779×10^3
sulfurdioxide slant column density window3 precision [DU]	28.4 ± 13.5	15647288	22.5	10.7	24.8	9.48	1.551×10^3
sulfurdioxide slant column density corrected win3 [DU]	-2.59 ± 23.71	15647288	-2.80	29.2	-2.41	-970	3.781×10^3
background so2 slant column offset window3 [DU]	6.93 ± 4.94	15647288	10.6	7.09	7.29	-26.6	37.9
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	15647288	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.242 \pm 6.754) \times 10^{-2}$	15647288	1.664×10^{-2}	2.480×10^{-2}	1.607×10^{-2}	1.818×10^{-4}	3.47
fitted radiance shift [nm]	$(-1.328 \pm 25.947) \times 10^{-4}$	15647288	1.000×10^{-4}	1.724×10^{-3}	-1.374×10^{-4}	-6.413×10^{-2}	9.830×10^{-2}
fitted radiance squeeze [1]	$(-4.503 \pm 19.244) \times 10^{-5}$	15647288	-3.000×10^{-5}	2.221×10^{-4}	-3.822×10^{-5}	-1.843×10^{-2}	2.315×10^{-2}
fitted root mean square [1]	$(1.292 \pm 0.532) \times 10^{-3}$	15647288	1.025×10^{-3}	5.267×10^{-4}	1.145×10^{-3}	3.338×10^{-4}	0.105
sulfurdioxide total air mass factor polluted [1]	0.924 ± 0.499	15647288	0.740	0.612	0.821	5.000×10^{-2}	2.76
sulfurdioxide total air mass factor polluted precision [1]	0.118 ± 0.125	15647288	3.500×10^{-2}	0.119	7.620×10^{-2}	2.678×10^{-3}	1.99
sulfurdioxide clear air mass factor polluted [1]	0.773 ± 0.367	15647288	0.700	0.399	0.714	6.405×10^{-2}	2.79
number of spectral points in retrieval [1]	73.4 ± 0.5	15647288	73.0	1.000	73.0	52.0	74.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	4.000×10^{-2}	0.1000	0.220	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.14	-0.834	-0.515	-0.348	-0.205	0.232	0.385	0.569	0.924	2.46
sulfurdioxide total vertical column precision [DU]	8.985×10^{-2}	0.125	0.152	0.178	0.212	0.534	0.707	0.906	1.33	3.25
sulfurdioxide slant column density corrected [DU]	-0.870	-0.498	-0.361	-0.270	-0.174	0.196	0.297	0.395	0.551	1.02
sulfurdioxide slant column density cobra [DU]	-0.870	-0.498	-0.361	-0.270	-0.174	0.196	0.297	0.395	0.551	1.02
sulfurdioxide slant column density cobra precision [DU]	0.143	0.171	0.186	0.198	0.212	0.343	0.402	0.458	0.550	0.777
sulfurdioxide slant column density window1 [DU]	-1.67	-0.920	-0.633	-0.441	-0.241	0.504	0.698	0.883	1.16	1.92
sulfurdioxide slant column density window1 precision [DU]	0.143	0.171	0.186	0.198	0.212	0.343	0.402	0.458	0.550	0.777
sulfurdioxide slant column density corrected win1 [DU]	-1.63	-0.962	-0.703	-0.528	-0.342	0.386	0.586	0.779	1.08	1.90
background so2 slant column offset window1 [DU]	-0.378	-0.266	-0.233	-0.212	-0.190	-2.581×10^{-2}	3.413×10^{-2}	9.010×10^{-2}	0.165	0.322
sulfurdioxide slant column density window2 [DU]	-20.3	-13.3	-9.97	-7.47	-4.68	6.61	9.48	12.1	15.7	23.4
sulfurdioxide slant column density window2 precision [DU]	4.29	5.15	5.69	6.13	6.65	9.32	10.3	11.2	12.5	15.2
sulfurdioxide slant column density corrected win2 [DU]	-22.1	-14.8	-11.3	-8.80	-5.98	5.18	7.97	10.5	13.9	21.2
background so2 slant column offset window2 [DU]	-6.47	-4.83	-3.99	-3.27	-2.51	-0.100	0.163	0.363	0.718	2.14
sulfurdioxide slant column density window3 [DU]	-70.5	-48.8	-38.8	-31.7	-24.1	5.31	13.0	20.0	29.6	49.0
sulfurdioxide slant column density window3 precision [DU]	13.4	15.6	17.6	19.1	20.8	31.5	36.1	41.7	53.5	85.4
sulfurdioxide slant column density corrected win3 [DU]	-62.9	-41.6	-31.7	-24.7	-17.0	12.2	19.6	26.4	35.8	55.3
background so2 slant column offset window3 [DU]	-4.72	-0.813	0.686	1.90	3.46	10.6	11.7	12.6	14.0	17.0
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]	3.195×10^{-4}	5.239×10^{-4}	7.911×10^{-4}	1.968×10^{-3}	6.112×10^{-3}	3.091×10^{-2}	4.680×10^{-2}	6.913×10^{-2}	0.112	0.324
fitted radiance shift [nm]	-8.007×10^{-3}	-3.945×10^{-3}	-2.508×10^{-3}	-1.691×10^{-3}	-1.021×10^{-3}	7.031×10^{-4}	1.374×10^{-3}	2.239×10^{-3}	3.778×10^{-3}	8.083×10^{-3}
fitted radiance squeeze [1]	-5.598×10^{-4}	-3.588×10^{-4}	-2.732×10^{-4}	-2.145×10^{-4}	-1.526×10^{-4}	6.947×10^{-5}	1.236×10^{-4}	1.737×10^{-4}	2.453×10^{-4}	4.176×10^{-4}
fitted root mean square [1]	5.965×10^{-4}	7.378×10^{-4}	8.213×10^{-4}	8.838×10^{-4}	9.569×10^{-4}	1.484×10^{-3}	1.726×10^{-3}	1.962×10^{-3}	2.300×10^{-3}	3.169×10^{-3}
sulfurdioxide total air mass factor polluted [1]	8.915×10^{-2}	0.260	0.374	0.465	0.573	1.19	1.44	1.68	1.94	2.29
sulfurdioxide total air mass factor polluted precision [1]	1.011×10^{-2}	1.888×10^{-2}	2.477×10^{-2}	2.987×10^{-2}	3.760×10^{-2}	0.156	0.200	0.249	0.344	0.641
sulfurdioxide clear air mass factor polluted [1]	0.223	0.315	0.382	0.445	0.527	0.926	1.04	1.21	1.56	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]	0.594 ± 0.415	10824188	0.830	0.490	0.0	1.000	0.170	1.000
sulfurdioxide total vertical column [DU]	$(2.210 \pm 99.680) \times 10^{-2}$	10824188	0.392	8.059×10^{-3}	-57.2	257	-0.186	0.206
sulfurdioxide total vertical column precision [DU]	0.462 ± 0.772	10824188	0.270	0.280	4.404×10^{-2}	136	0.195	0.464
sulfurdioxide slant column density corrected [DU]	$(1.403 \pm 32.932) \times 10^{-2}$	10824188	0.347	7.695×10^{-3}	-7.20	53.5	-0.165	0.183
sulfurdioxide slant column density cobra [DU]	$(1.399 \pm 32.709) \times 10^{-2}$	10824188	0.347	7.695×10^{-3}	-7.20	17.6	-0.165	0.183
sulfurdioxide slant column density cobra precision [DU]	0.275 ± 0.117	10824188	0.106	0.239	7.830×10^{-2}	9.34	0.204	0.310
sulfurdioxide slant column density window1 [DU]	0.119 ± 0.629	10824188	0.707	0.129	-15.3	54.5	-0.230	0.477
sulfurdioxide slant column density window1 precision [DU]	0.275 ± 0.117	10824188	0.106	0.239	7.830×10^{-2}	9.34	0.204	0.310
sulfurdioxide slant column density corrected win1 [DU]	$(2.633 \pm 61.319) \times 10^{-2}$	10824188	0.686	1.392×10^{-2}	-15.2	54.8	-0.325	0.361
background so2 slant column offset window1 [DU]	$(-9.296 \pm 14.768) \times 10^{-2}$	10824188	0.198	-0.126	-0.632	1.05	-0.200	-1.953×10^{-3}
sulfurdioxide slant column density window2 [DU]	0.864 ± 8.290	10824188	10.6	0.854	-195	568	-4.47	6.18
sulfurdioxide slant column density window2 precision [DU]	7.69 ± 2.06	10824188	2.27	7.39	2.19	338	6.35	8.63
sulfurdioxide slant column density corrected win2 [DU]	-0.430 ± 8.209	10824188	10.5	-0.393	-198	568	-5.68	4.84
background so2 slant column offset window2 [DU]	-1.29 ± 1.78	10824188	2.43	-0.926	-13.3	6.86	-2.41	2.313×10^{-2}
sulfurdioxide slant column density window3 [DU]	-9.03 ± 22.17	10824188	27.4	-9.25	-719	3.779×10^3	-22.8	4.62
sulfurdioxide slant column density window3 precision [DU]	26.6 ± 13.3	10824188	8.54	23.0	9.48	1.551×10^3	19.8	28.3
sulfurdioxide slant column density corrected win3 [DU]	-2.47 ± 21.89	10824188	27.2	-2.36	-720	3.781×10^3	-16.0	11.2
background so2 slant column offset window3 [DU]	6.55 ± 5.00	10824188	7.84	7.46	-25.2	19.8	2.67	10.5
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	10824188	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.432 \pm 7.570) \times 10^{-2}$	10824188	3.115×10^{-2}	1.240×10^{-2}	1.818×10^{-4}	3.47	2.476×10^{-3}	3.362×10^{-2}
fitted radiance shift [nm]	$(-5.301 \pm 2636.421) \times 10^{-6}$	10824188	1.641×10^{-3}	-2.754×10^{-5}	-4.336×10^{-2}	4.220×10^{-2}	-8.458×10^{-4}	7.952×10^{-4}
fitted radiance squeeze [1]	$(-7.387 \pm 17.912) \times 10^{-5}$	10824188	2.151×10^{-4}	-6.016×10^{-5}	-1.080×10^{-2}	1.320×10^{-2}	-1.738×10^{-4}	4.130×10^{-5}
fitted root mean square [1]	$(1.215 \pm 0.479) \times 10^{-3}$	10824188	4.427×10^{-4}	1.082×10^{-3}	3.338×10^{-4}	3.721×10^{-2}	9.211×10^{-4}	1.364×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.980 ± 0.541	10824188	0.723	0.877	5.000×10^{-2}	2.76	0.582	1.31
sulfurdioxide total air mass factor polluted precision [1]	0.130 ± 0.136	10824188	0.128	8.764×10^{-2}	2.678×10^{-3}	1.99	4.183×10^{-2}	0.170
sulfurdioxide clear air mass factor polluted [1]	0.813 ± 0.413	10824188	0.471	0.751	6.405×10^{-2}	2.79	0.514	0.985
number of spectral points in retrieval [1]	73.4 ± 0.5	10824188	1.000	73.0	53.0	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]	0.759 ± 0.358	4823100	0.560	1.000	0.0	1.000	0.440	1.000
sulfurdioxide total vertical column [DU]	$(4.485 \pm 108.000) \times 10^{-2}$	4823100	0.567	1.611×10^{-2}	-80.9	800	-0.262	0.305
sulfurdioxide total vertical column precision [DU]	0.580 ± 0.600	4823100	0.383	0.423	4.922×10^{-2}	137	0.285	0.668
sulfurdioxide slant column density corrected [DU]	$(2.607 \pm 49.255) \times 10^{-2}$	4823100	0.431	1.339×10^{-2}	-26.9	432	-0.200	0.231
sulfurdioxide slant column density cobra [DU]	$(2.562 \pm 43.449) \times 10^{-2}$	4823100	0.431	1.339×10^{-2}	-26.9	45.8	-0.200	0.231
sulfurdioxide slant column density cobra precision [DU]	0.345 ± 0.158	4823100	0.163	0.303	9.391×10^{-2}	29.7	0.244	0.407
sulfurdioxide slant column density window1 [DU]	0.156 ± 0.784	4823100	0.844	0.152	-84.2	65.6	-0.269	0.575
sulfurdioxide slant column density window1 precision [DU]	0.345 ± 0.158	4823100	0.163	0.303	9.391×10^{-2}	29.7	0.244	0.407
sulfurdioxide slant column density corrected win1 [DU]	$(4.874 \pm 78.395) \times 10^{-2}$	4823100	0.840	2.590×10^{-2}	-84.2	65.4	-0.387	0.453
background so2 slant column offset window1 [DU]	-0.107 ± 0.123	4823100	9.758×10^{-2}	-0.128	-1.27	3.83	-0.167	-6.903×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.39 ± 10.58	4823100	12.9	1.19	-1.405×10^3	1.542×10^3	-5.20	7.75
sulfurdioxide slant column density window2 precision [DU]	9.32 ± 2.82	4823100	2.94	8.99	2.41	615	7.68	10.6
sulfurdioxide slant column density corrected win2 [DU]	-0.341 ± 10.469	4823100	12.8	-0.345	-1.409×10^3	1.539×10^3	-6.77	6.07
background so2 slant column offset window2 [DU]	-1.73 ± 1.97	4823100	2.45	-1.17	-14.3	6.70	-2.83	-0.376
sulfurdioxide slant column density window3 [DU]	-10.6 ± 27.5	4823100	34.7	-10.1	-978	436	-27.7	7.07
sulfurdioxide slant column density window3 precision [DU]	32.4 ± 13.2	4823100	10.6	29.4	10.2	269	24.9	35.5
sulfurdioxide slant column density corrected win3 [DU]	-2.85 ± 27.36	4823100	34.6	-2.55	-970	453	-19.9	14.7
background so2 slant column offset window3 [DU]	7.76 ± 4.69	4823100	5.81	7.05	-26.6	37.9	4.94	10.8
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.28	4823100	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.816 \pm 4.372) \times 10^{-2}$	4823100	1.423×10^{-2}	1.906×10^{-2}	1.339×10^{-3}	1.38	1.369×10^{-2}	2.792×10^{-2}
fitted radiance shift [nm]	$(-4.188 \pm 24.747) \times 10^{-4}$	4823100	1.814×10^{-3}	-4.166×10^{-4}	-6.413×10^{-2}	9.830×10^{-2}	-1.364×10^{-3}	4.502×10^{-4}
fitted radiance squeeze [1]	$(1.969 \pm 20.514) \times 10^{-5}$	4823100	2.321×10^{-4}	1.598×10^{-5}	-1.843×10^{-2}	2.315×10^{-2}	-9.812×10^{-5}	1.339×10^{-4}
fitted root mean square [1]	$(1.465 \pm 0.599) \times 10^{-3}$	4823100	6.260×10^{-4}	1.319×10^{-3}	3.731×10^{-4}	0.105	1.078×10^{-3}	1.704×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.799 ± 0.357	4823100	0.422	0.735	5.000×10^{-2}	2.62	0.561	0.983
sulfurdioxide total air mass factor polluted precision [1]	$(9.107 \pm 9.159) \times 10^{-2}$	4823100	8.956×10^{-2}	5.380×10^{-2}	3.639×10^{-3}	1.48	3.298×10^{-2}	0.123
sulfurdioxide clear air mass factor polluted [1]	0.682 ± 0.203	4823100	0.257	0.664	9.699×10^{-2}	1.81	0.544	0.800
number of spectral points in retrieval [1]	73.4 ± 0.5	4823100	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]	0.661 ± 0.393	9777182	0.750	1.000	0.0	1.000	0.250	1.000
sulfurdioxide total vertical column [DU]	$(3.150 \pm 103.470) \times 10^{-2}$	9777182	0.445	1.060×10^{-2}	-80.9	139	-0.209	0.236
sulfurdioxide total vertical column precision [DU]	0.505 ± 0.746	9777182	0.308	0.318	5.054×10^{-2}	43.9	0.217	0.525
sulfurdioxide slant column density corrected [DU]	$(1.845 \pm 38.491) \times 10^{-2}$	9777182	0.377	9.531×10^{-3}	-24.8	59.2	-0.177	0.200
sulfurdioxide slant column density cobra [DU]	$(1.829 \pm 37.597) \times 10^{-2}$	9777182	0.377	9.531×10^{-3}	-24.8	45.8	-0.177	0.200
sulfurdioxide slant column density cobra precision [DU]	0.305 ± 0.142	9777182	0.147	0.261	7.830×10^{-2}	21.8	0.212	0.359
sulfurdioxide slant column density window1 [DU]	0.126 ± 0.701	9777182	0.762	0.136	-81.6	53.9	-0.251	0.511
sulfurdioxide slant column density window1 precision [DU]	0.305 ± 0.142	9777182	0.147	0.261	7.830×10^{-2}	21.8	0.212	0.359
sulfurdioxide slant column density corrected win1 [DU]	$(3.496 \pm 69.022) \times 10^{-2}$	9777182	0.746	1.889×10^{-2}	-81.6	53.9	-0.349	0.397
background so2 slant column offset window1 [DU]	$(-9.058 \pm 15.107) \times 10^{-2}$	9777182	0.176	-0.128	-1.27	3.83	-0.190	-1.423×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.15 ± 9.11	9777182	11.4	1.01	-1.405×10^3	1.542×10^3	-4.64	6.76
sulfurdioxide slant column density window2 precision [DU]	8.20 ± 2.33	9777182	2.64	7.82	2.25	615	6.69	9.32
sulfurdioxide slant column density corrected win2 [DU]	-0.375 ± 8.999	9777182	11.3	-0.360	-1.409×10^3	1.539×10^3	-6.00	5.25
background so2 slant column offset window2 [DU]	-1.52 ± 1.98	9777182	2.73	-0.969	-14.3	6.86	-2.80	-7.728×10^{-2}
sulfurdioxide slant column density window3 [DU]	-7.03 ± 23.95	9777182	29.8	-7.20	-452	436	-21.9	7.88
sulfurdioxide slant column density window3 precision [DU]	27.4 ± 11.6	9777182	9.66	24.3	9.55	269	20.8	30.4
sulfurdioxide slant column density corrected win3 [DU]	-0.299 ± 23.469	9777182	29.2	-0.424	-445	453	-14.9	14.3
background so2 slant column offset window3 [DU]	6.74 ± 5.02	9777182	7.09	6.86	-26.6	37.9	3.24	10.3
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.27	9777182	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.275 \pm 4.576) \times 10^{-2}$	9777182	1.750×10^{-2}	1.476×10^{-2}	1.818×10^{-4}	3.33	7.048×10^{-3}	2.454×10^{-2}
fitted radiance shift [nm]	$(-1.519 \pm 22.418) \times 10^{-4}$	9777182	1.659×10^{-3}	-1.317×10^{-4}	-5.760×10^{-2}	9.830×10^{-2}	-1.000×10^{-3}	6.590×10^{-4}
fitted radiance squeeze [1]	$(-3.790 \pm 19.809) \times 10^{-5}$	9777182	2.263×10^{-4}	-2.923×10^{-5}	-1.843×10^{-2}	2.315×10^{-2}	-1.469×10^{-4}	7.941×10^{-5}
fitted root mean square [1]	$(1.326 \pm 0.555) \times 10^{-3}$	9777182	6.021×10^{-4}	1.165×10^{-3}	3.338×10^{-4}	8.219×10^{-2}	9.591×10^{-4}	1.561×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.909 ± 0.450	9777182	0.535	0.835	5.000×10^{-2}	2.53	0.605	1.14
sulfurdioxide total air mass factor polluted precision [1]	0.109 ± 0.119	9777182	9.609×10^{-2}	7.094×10^{-2}	2.904×10^{-3}	1.88	3.967×10^{-2}	0.136
sulfurdioxide clear air mass factor polluted [1]	0.791 ± 0.366	9777182	0.379	0.737	7.398×10^{-2}	2.46	0.557	0.936
number of spectral points in retrieval [1]	73.4 ± 0.5	9777182	1.000	73.0	70.0	74.0	73.0	74.0

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

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.652 ± 0.421	4112389	0.820	1.000	0.0	1.000	0.180	1.000
sulfurdioxide total vertical column [DU]	$(2.313 \pm 78.450) \times 10^{-2}$	4112389	0.416	8.975×10^{-3}	-45.8	125	-0.196	0.220
sulfurdioxide total vertical column precision [DU]	0.452 ± 0.540	4112389	0.338	0.321	4.404×10^{-2}	137	0.197	0.535
sulfurdioxide slant column density corrected [DU]	$(1.621 \pm 33.878) \times 10^{-2}$	4112389	0.352	8.604×10^{-3}	-26.9	45.3	-0.166	0.186
sulfurdioxide slant column density cobra [DU]	$(1.611 \pm 33.220) \times 10^{-2}$	4112389	0.352	8.604×10^{-3}	-26.9	43.5	-0.166	0.186
sulfurdioxide slant column density cobra precision [DU]	0.277 ± 0.117	4112389	9.643×10^{-2}	0.242	8.367×10^{-2}	29.7	0.209	0.305
sulfurdioxide slant column density window1 [DU]	0.159 ± 0.627	4112389	0.707	0.152	-74.1	65.6	-0.200	0.507
sulfurdioxide slant column density window1 precision [DU]	0.277 ± 0.117	4112389	9.643×10^{-2}	0.242	8.367×10^{-2}	29.7	0.209	0.305
sulfurdioxide slant column density corrected win1 [DU]	$(3.074 \pm 61.770) \times 10^{-2}$	4112389	0.690	1.625×10^{-2}	-74.1	65.4	-0.324	0.366
background so2 slant column offset window1 [DU]	-0.128 ± 0.115	4112389	0.130	-0.147	-0.686	1.31	-0.200	-7.038×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.635 ± 9.054	4112389	11.2	0.649	-1.355×10^3	1.414×10^3	-4.96	6.21
sulfurdioxide slant column density window2 precision [DU]	8.22 ± 2.70	4112389	2.76	7.85	2.19	580	6.61	9.37
sulfurdioxide slant column density corrected win2 [DU]	-0.437 ± 9.000	4112389	11.1	-0.406	-1.356×10^3	1.413×10^3	-5.96	5.09
background so2 slant column offset window2 [DU]	-1.07 ± 1.58	4112389	1.92	-0.766	-13.4	6.86	-1.94	-1.995×10^{-2}
sulfurdioxide slant column density window3 [DU]	-13.9 ± 23.7	4112389	28.8	-13.2	-978	3.779×10^3	-27.9	0.882
sulfurdioxide slant column density window3 precision [DU]	30.3 ± 16.4	4112389	12.4	25.9	9.48	1.551×10^3	21.2	33.6
sulfurdioxide slant column density corrected win3 [DU]	-7.30 ± 23.99	4112389	29.4	-6.51	-970	3.781×10^3	-21.6	7.74
background so2 slant column offset window3 [DU]	6.56 ± 4.81	4112389	7.16	6.95	-26.6	37.7	3.12	10.3
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.14	4112389	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.347 \pm 9.276) \times 10^{-2}$	4112389	5.242×10^{-2}	2.549×10^{-2}	2.177×10^{-4}	3.38	7.707×10^{-3}	6.013×10^{-2}
fitted radiance shift [nm]	$(-1.040 \pm 31.609) \times 10^{-4}$	4112389	1.720×10^{-3}	-1.552×10^{-4}	-6.413×10^{-2}	4.220×10^{-2}	-1.003×10^{-3}	7.169×10^{-4}
fitted radiance squeeze [1]	$(-4.249 \pm 17.757) \times 10^{-5}$	4112389	2.092×10^{-4}	-3.967×10^{-5}	-1.595×10^{-2}	2.309×10^{-2}	-1.454×10^{-4}	6.370×10^{-5}
fitted root mean square [1]	$(1.208 \pm 0.453) \times 10^{-3}$	4112389	4.012×10^{-4}	1.102×10^{-3}	3.369×10^{-4}	0.105	9.434×10^{-4}	1.345×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.950 ± 0.577	4112389	0.737	0.773	5.000×10^{-2}	2.76	0.522	1.26
sulfurdioxide total air mass factor polluted precision [1]	0.128 ± 0.130	4112389	0.157	8.545×10^{-2}	3.286×10^{-3}	1.99	3.170×10^{-2}	0.189
sulfurdioxide clear air mass factor polluted [1]	0.755 ± 0.377	4112389	0.394	0.669	7.832×10^{-2}	2.79	0.500	0.894
number of spectral points in retrieval [1]	73.4 ± 0.5	4112389	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

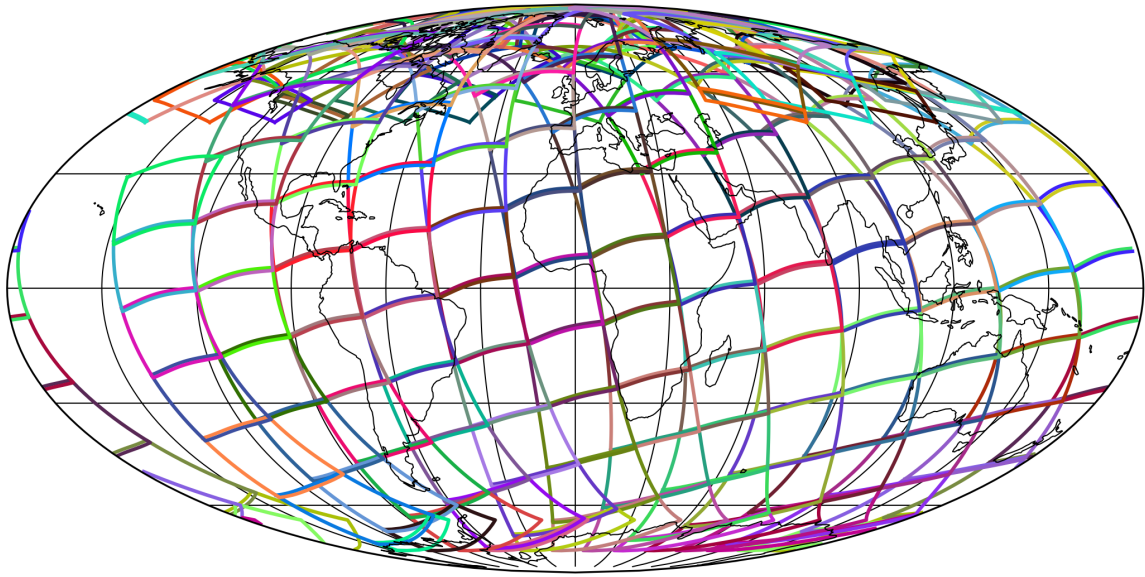


Figure 1: Outline of the granules.

4 Input data monitoring

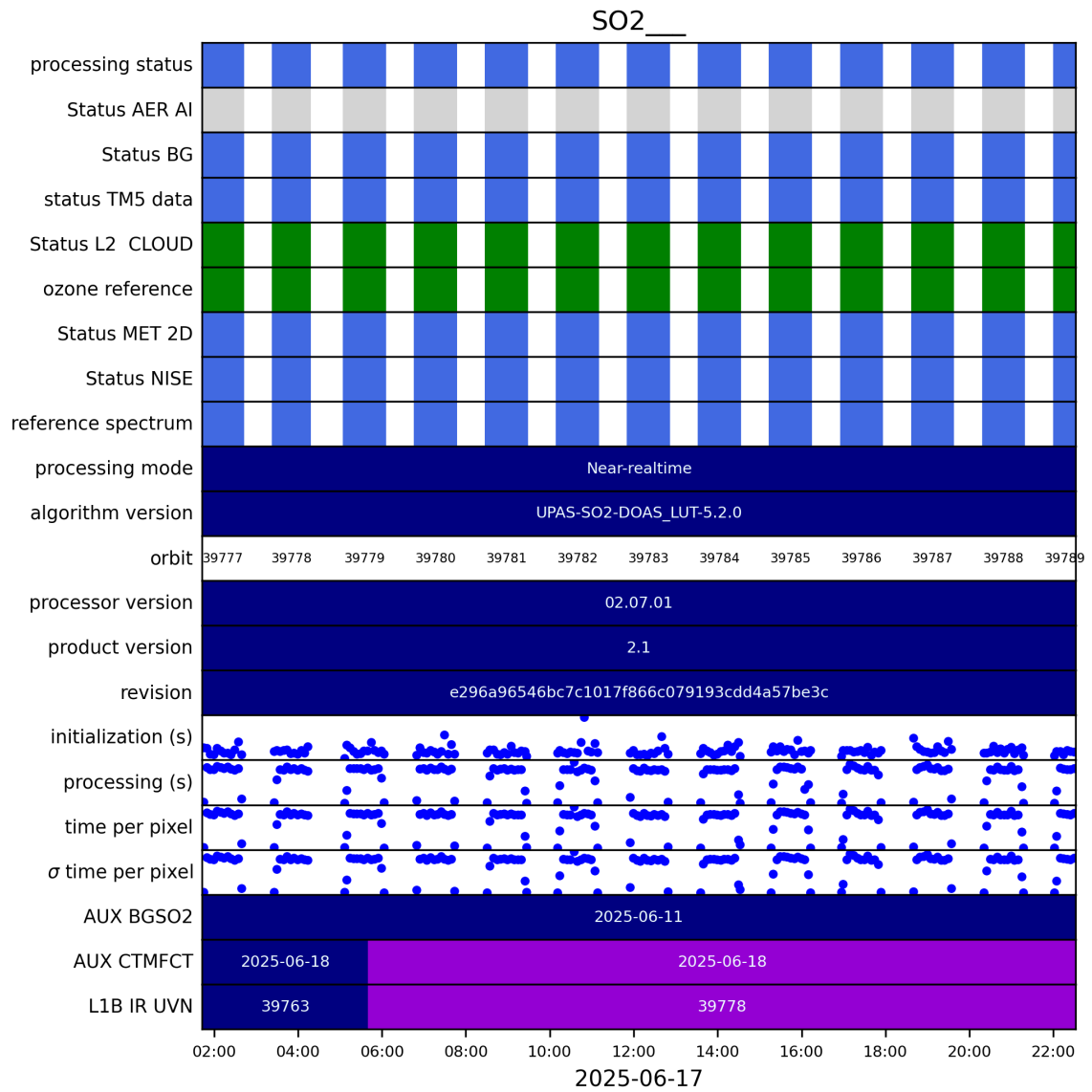


Figure 2: Input data per granule

5 Warnings and errors

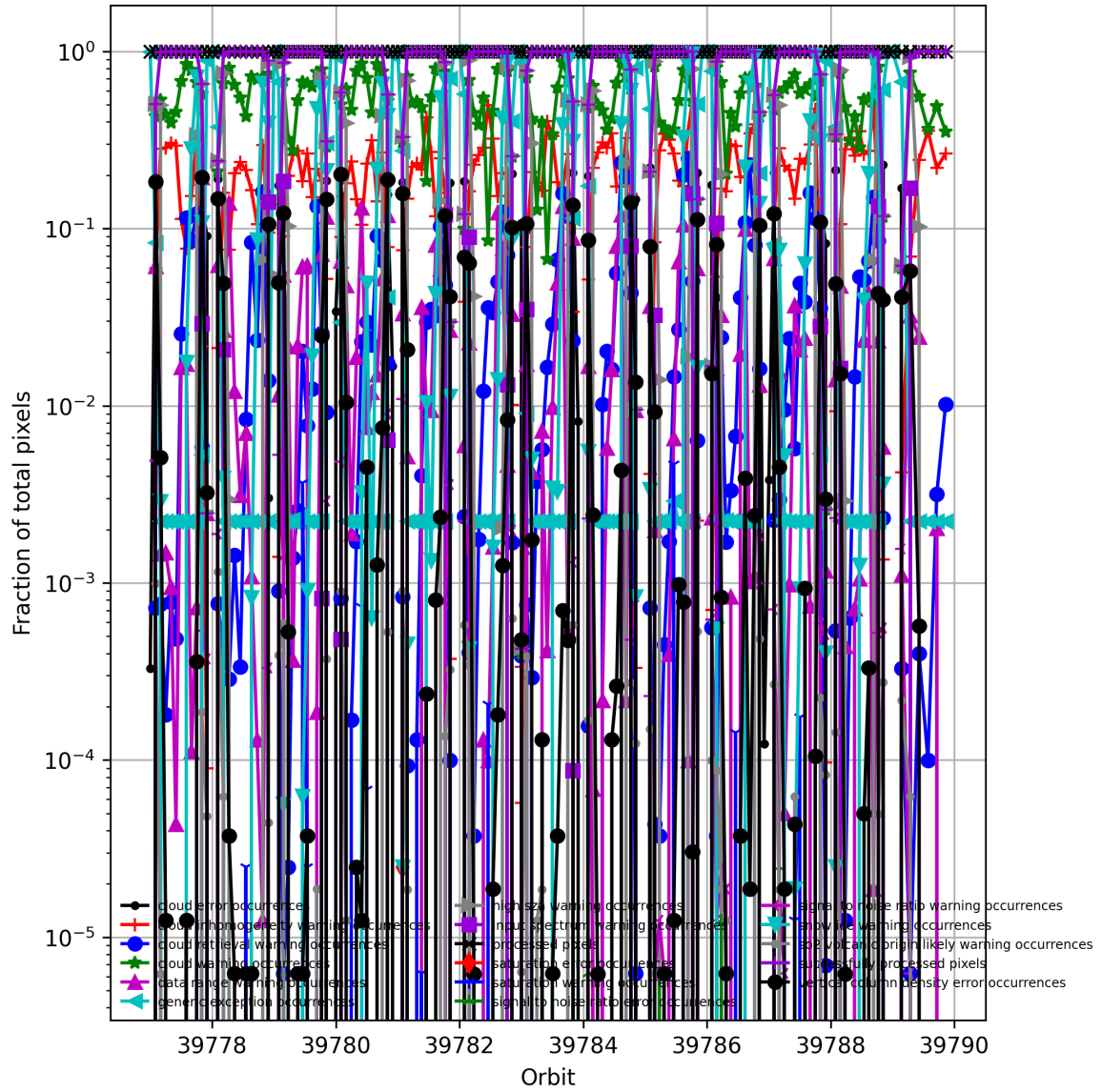


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

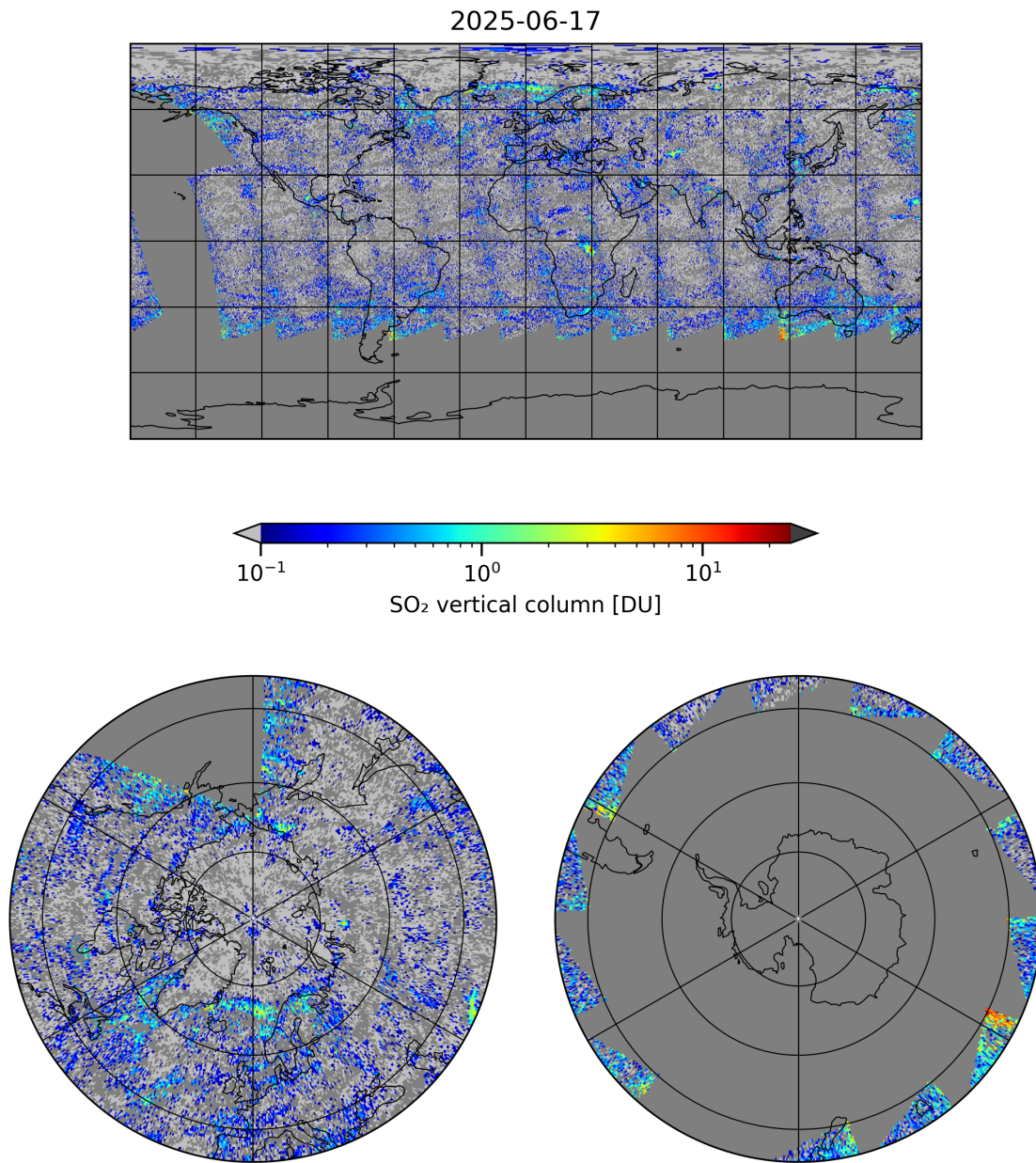


Figure 4: Map of “SO₂ vertical column” for 2025-06-17 to 2025-06-17

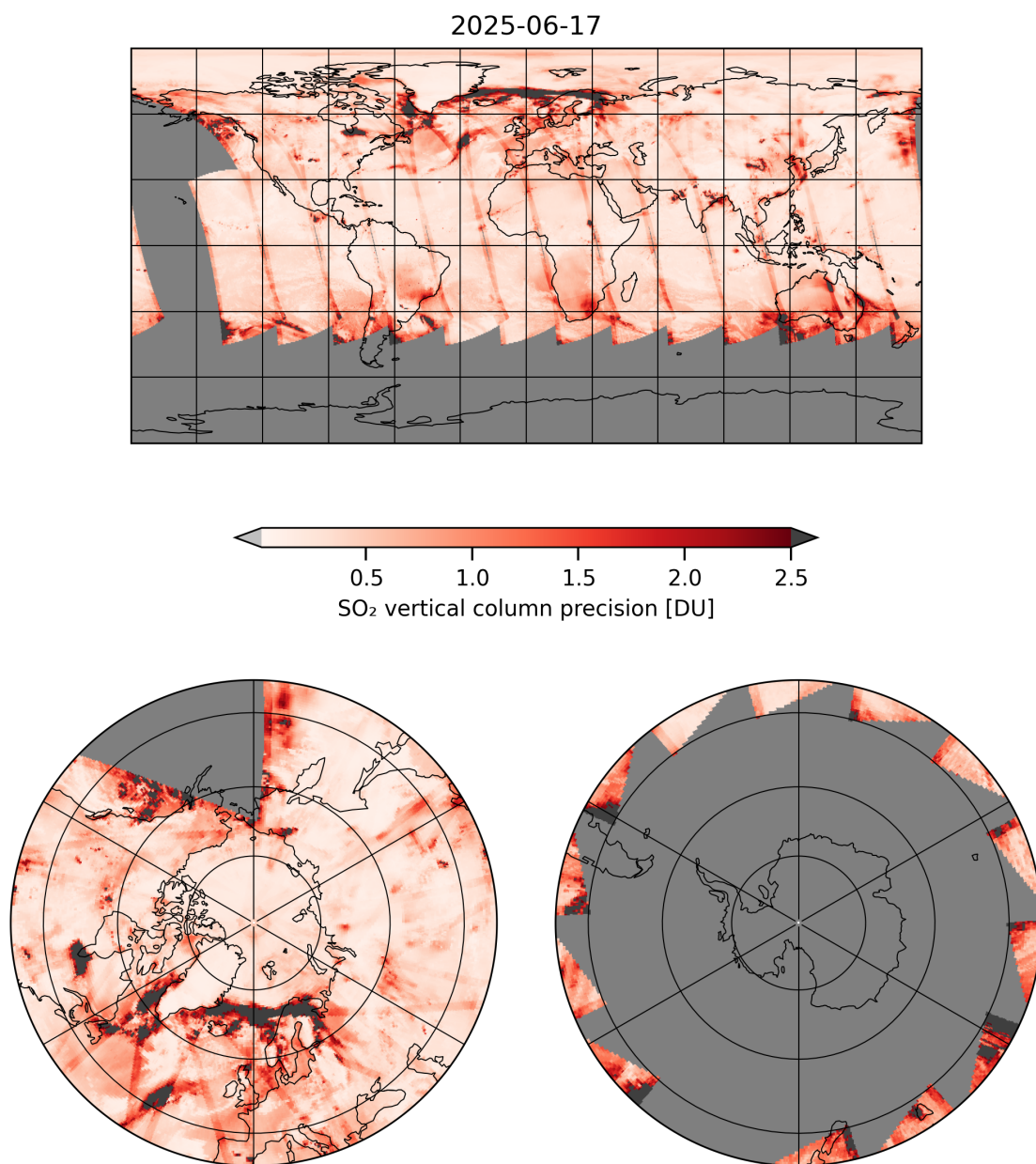


Figure 5: Map of “SO₂ vertical column precision” for 2025-06-17 to 2025-06-17

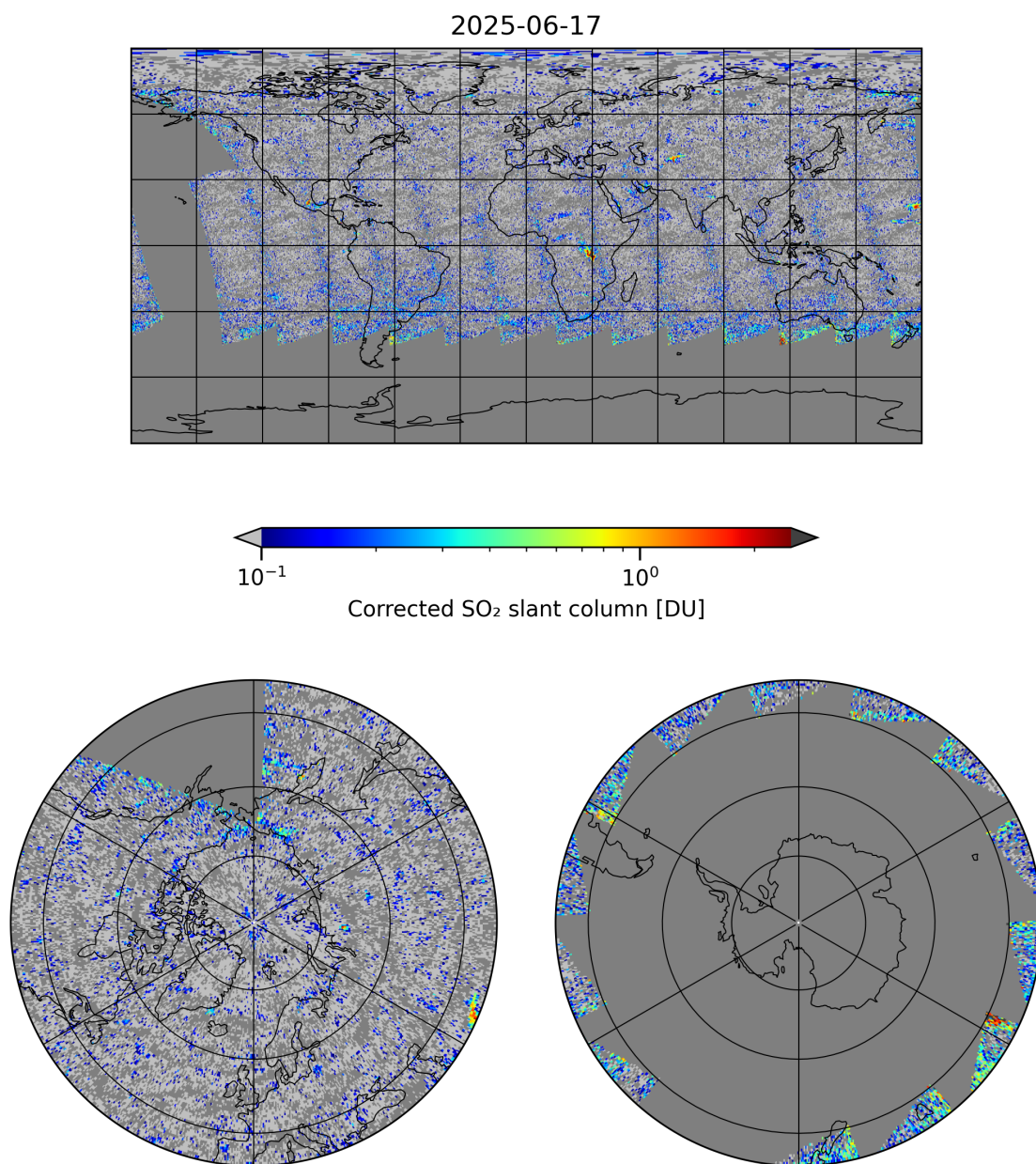


Figure 6: Map of “Corrected SO₂ slant column” for 2025-06-17 to 2025-06-17

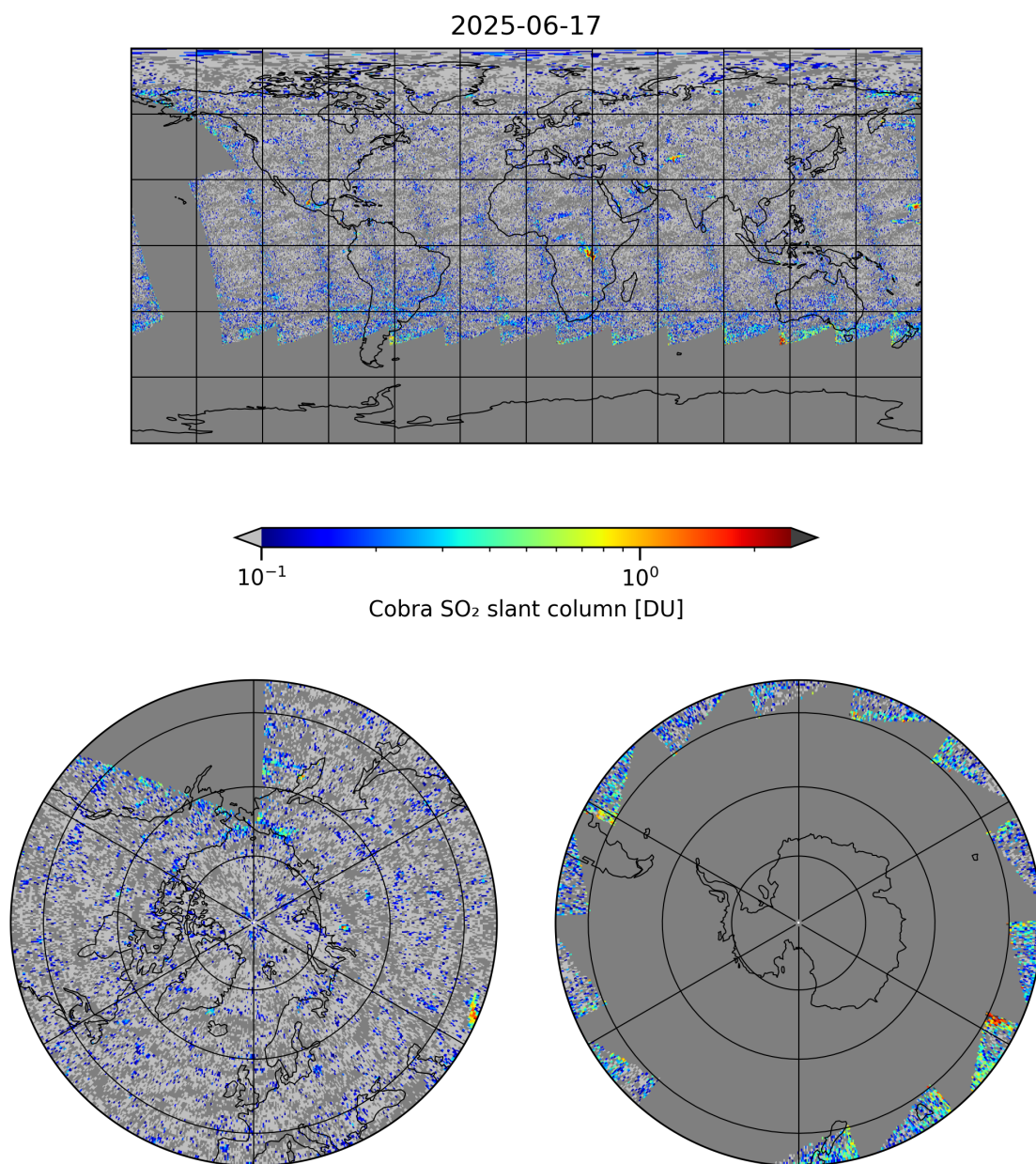


Figure 7: Map of “Cobra SO₂ slant column” for 2025-06-17 to 2025-06-17

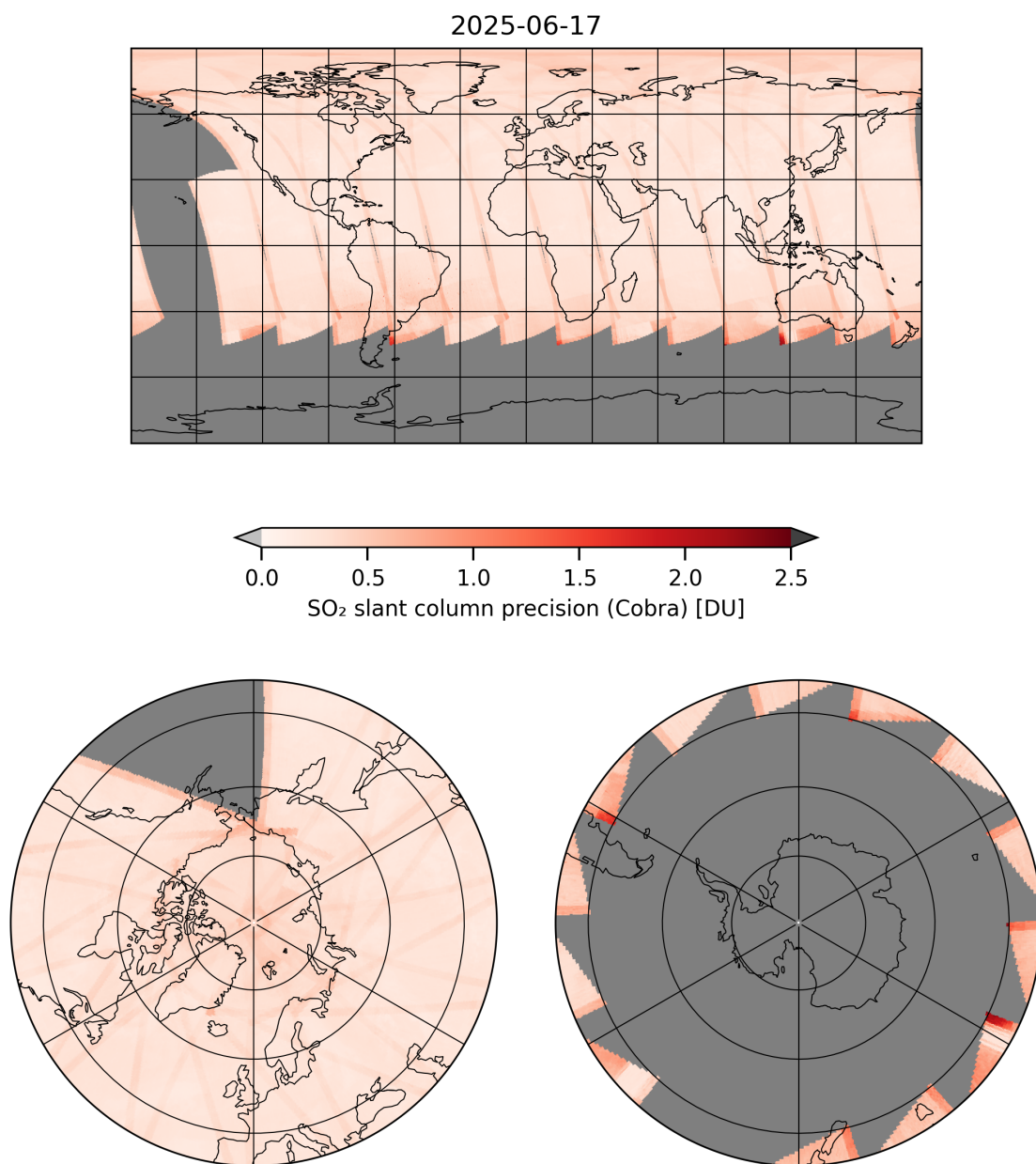


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-06-17 to 2025-06-17

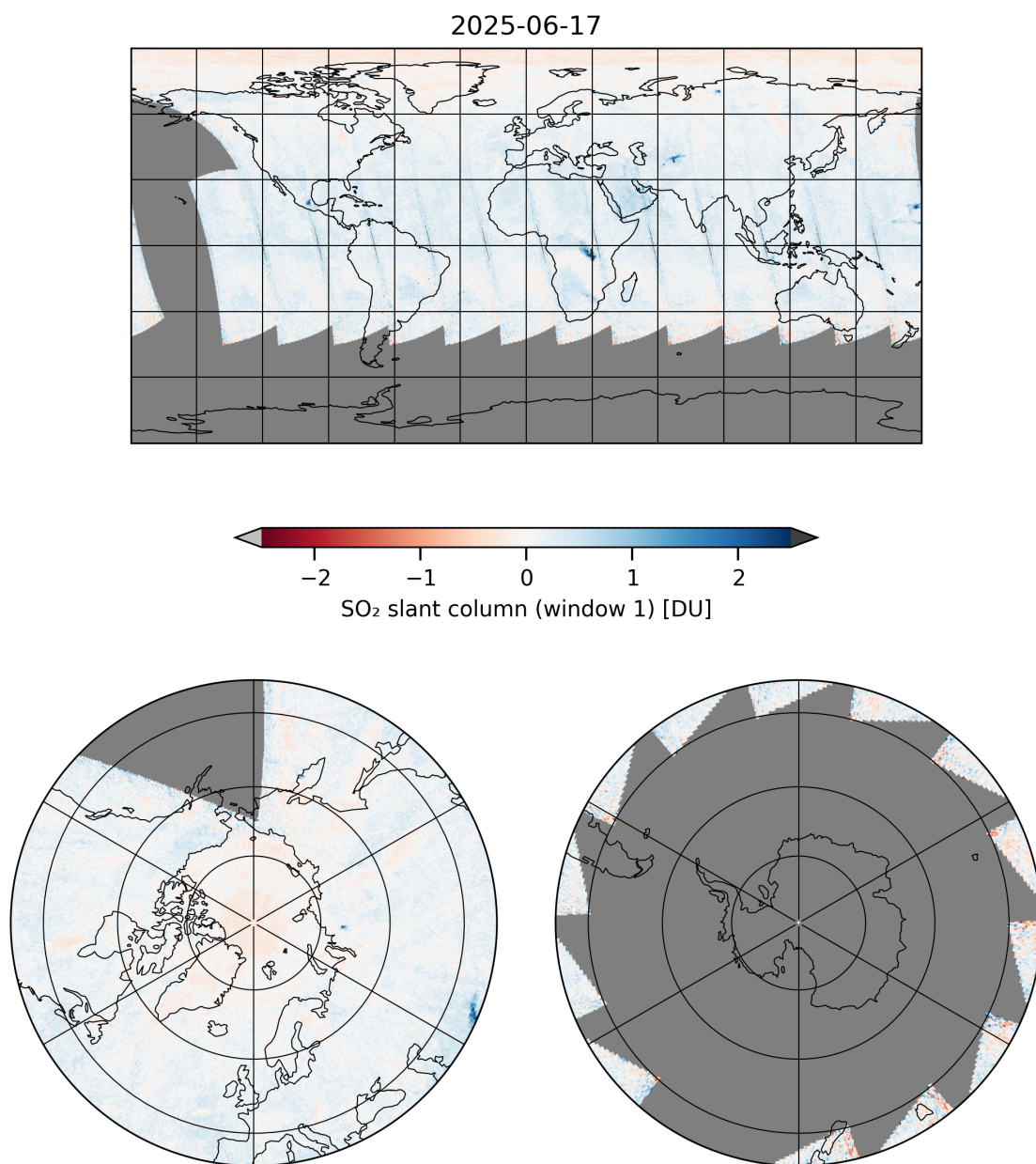


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-06-17 to 2025-06-17

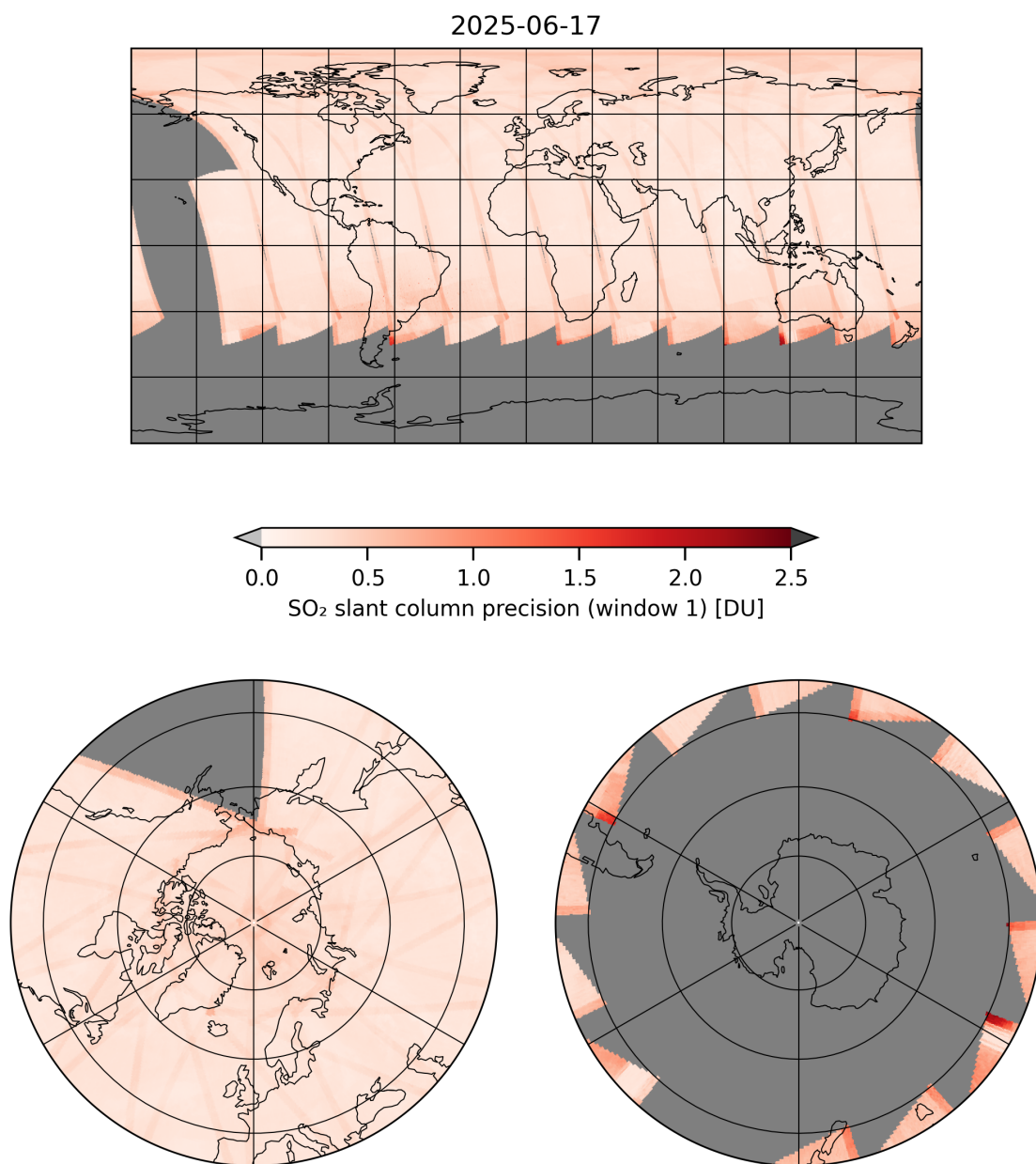


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-06-17 to 2025-06-17

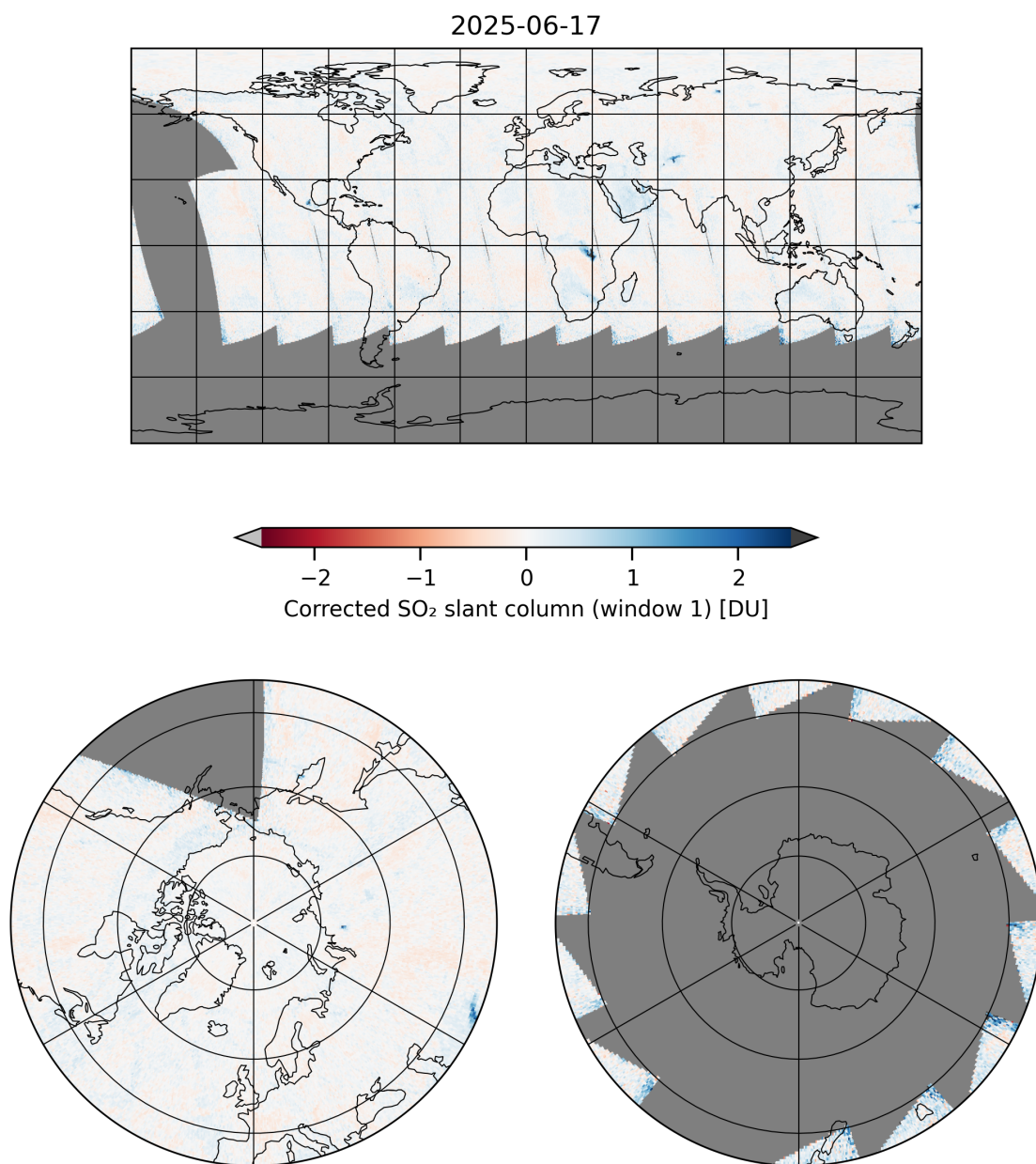


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-06-17 to 2025-06-17

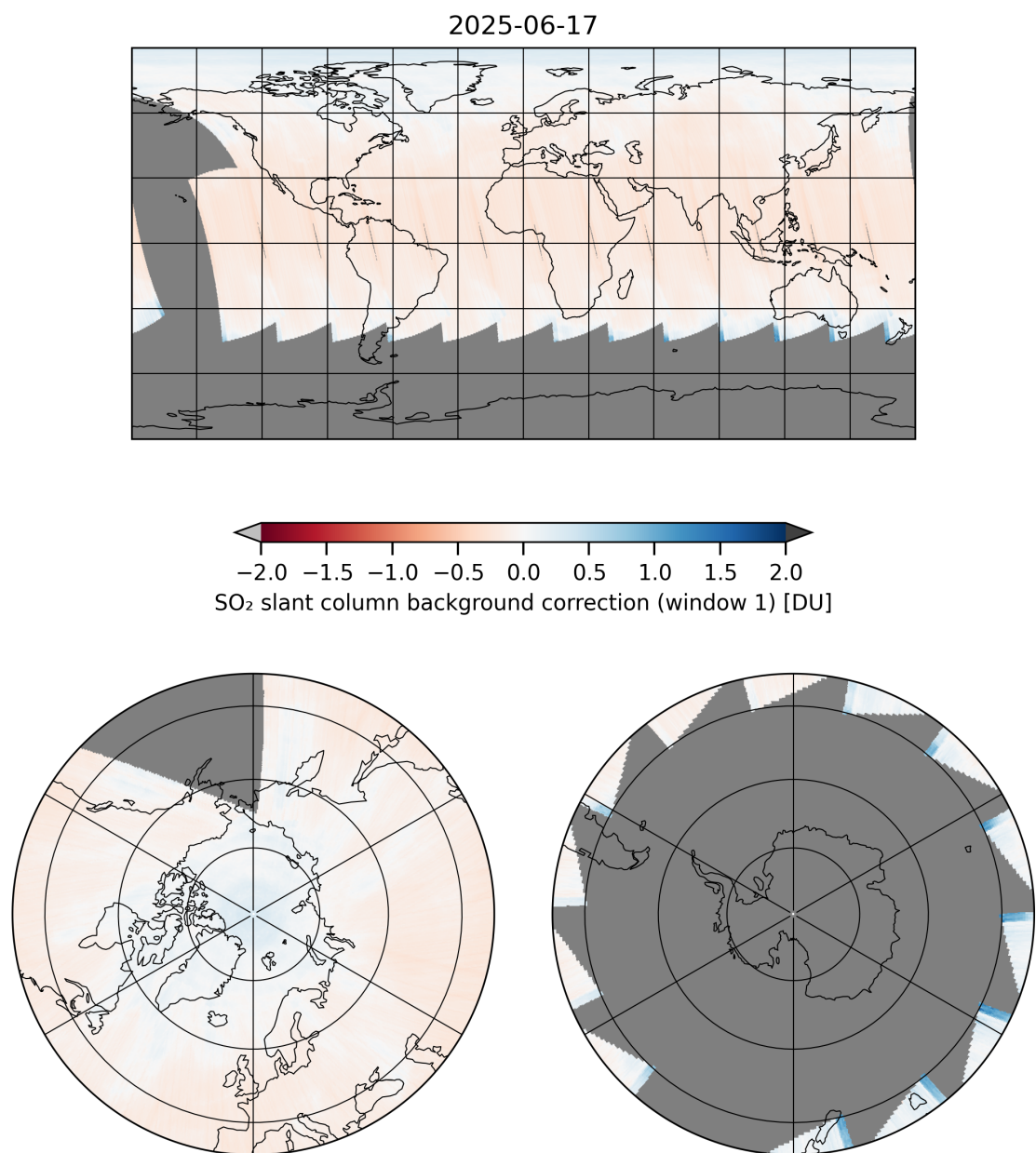


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-06-17 to 2025-06-17

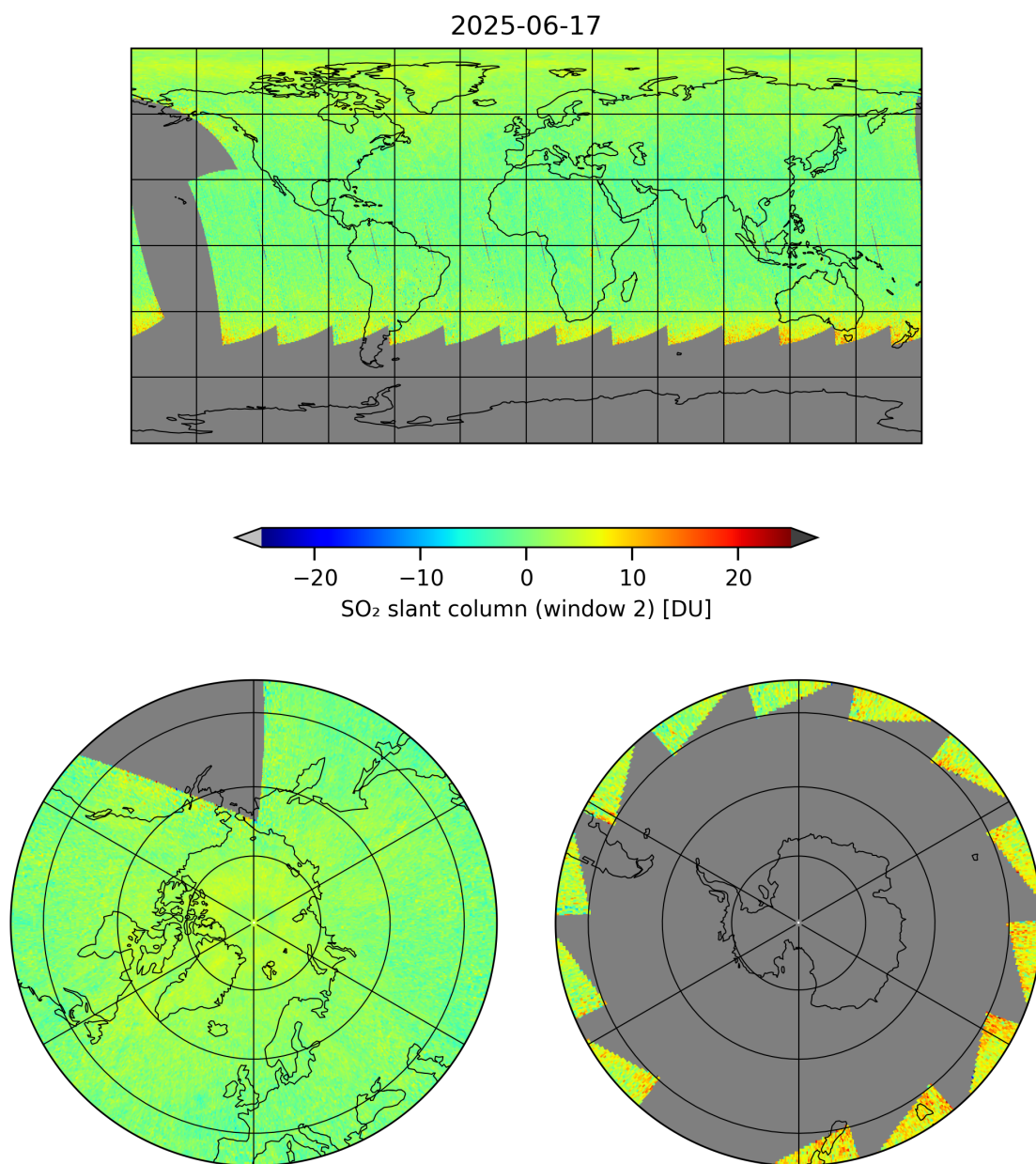


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-06-17 to 2025-06-17

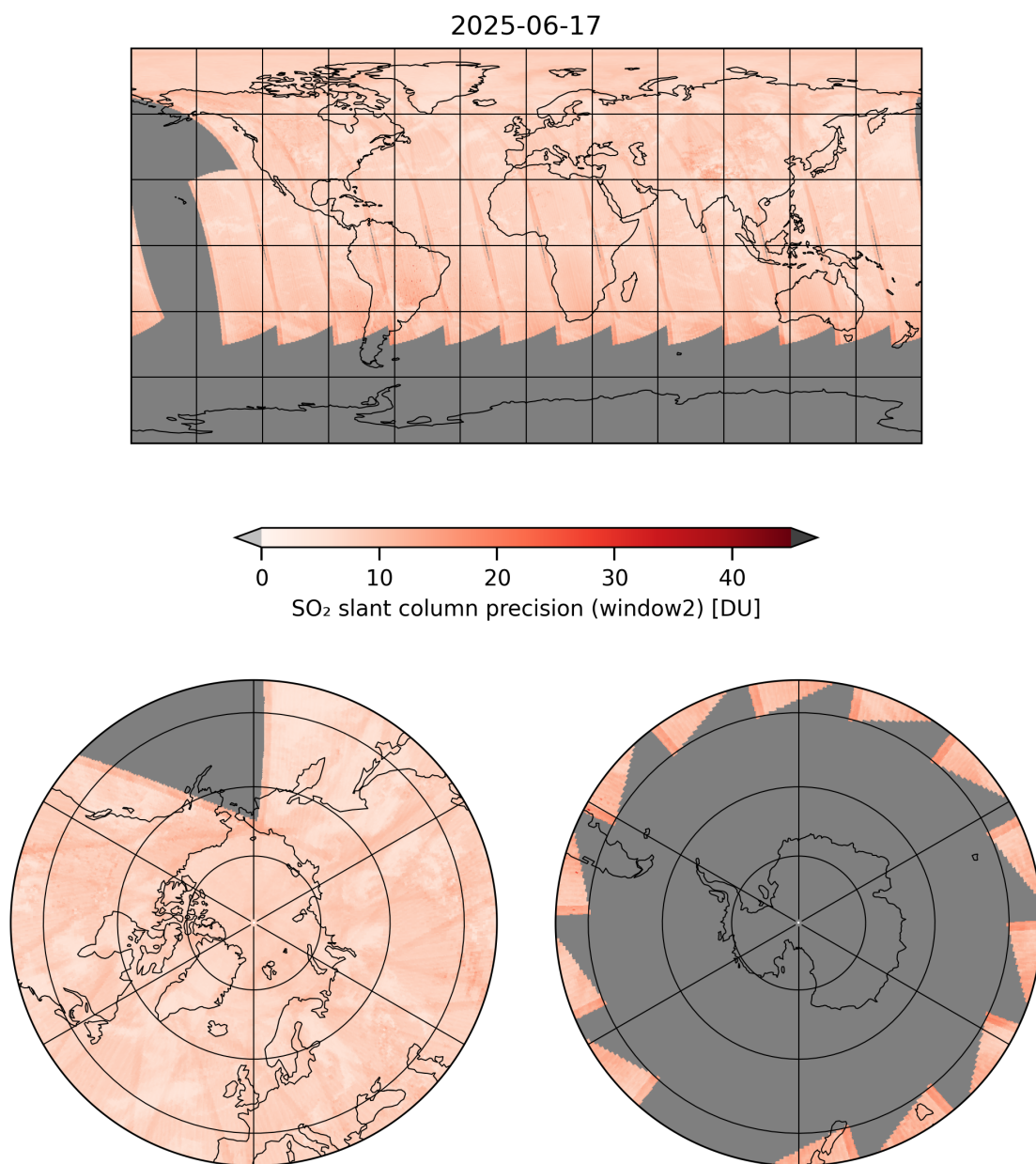


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-06-17 to 2025-06-17

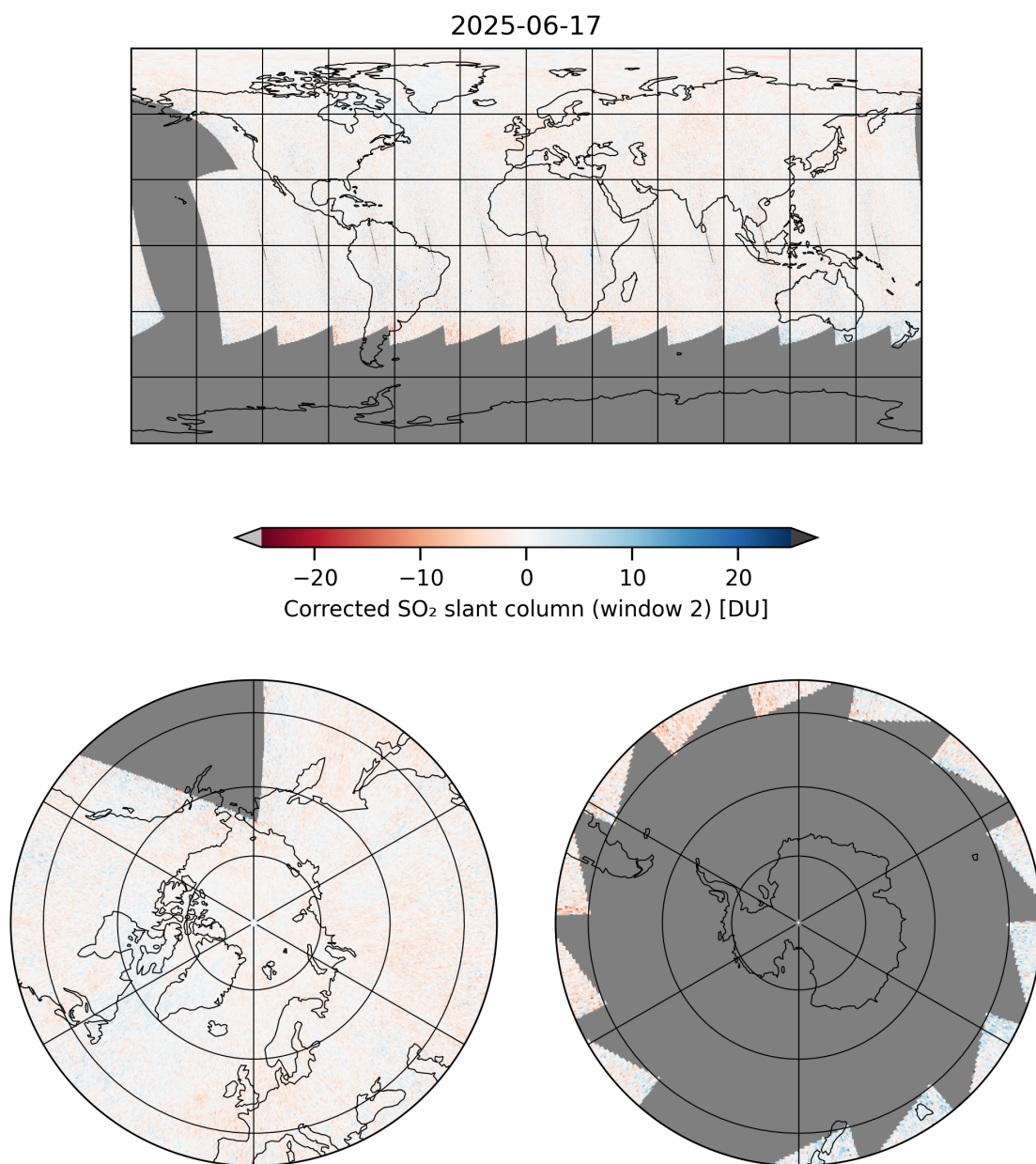


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-06-17 to 2025-06-17

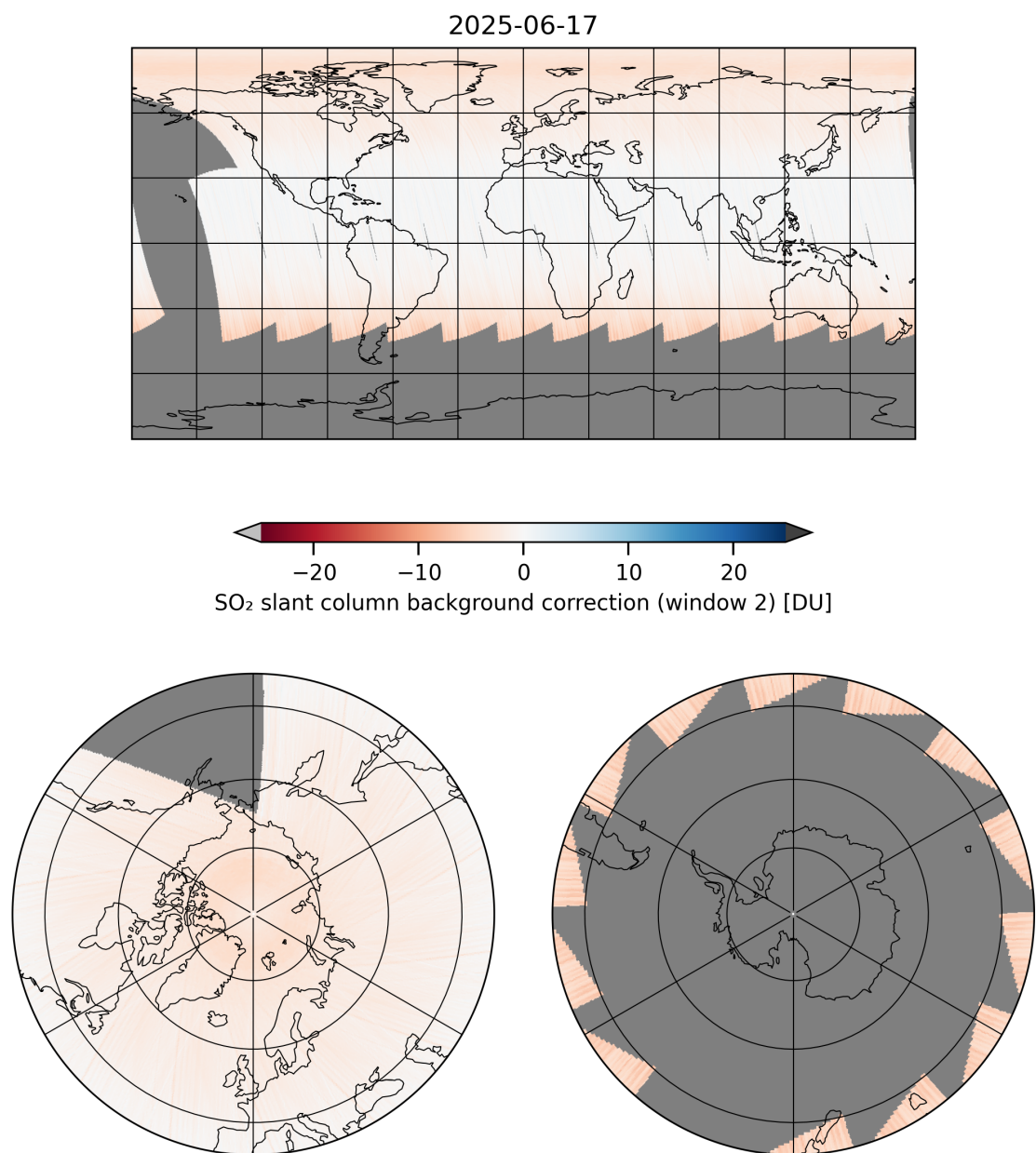


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-06-17 to 2025-06-17

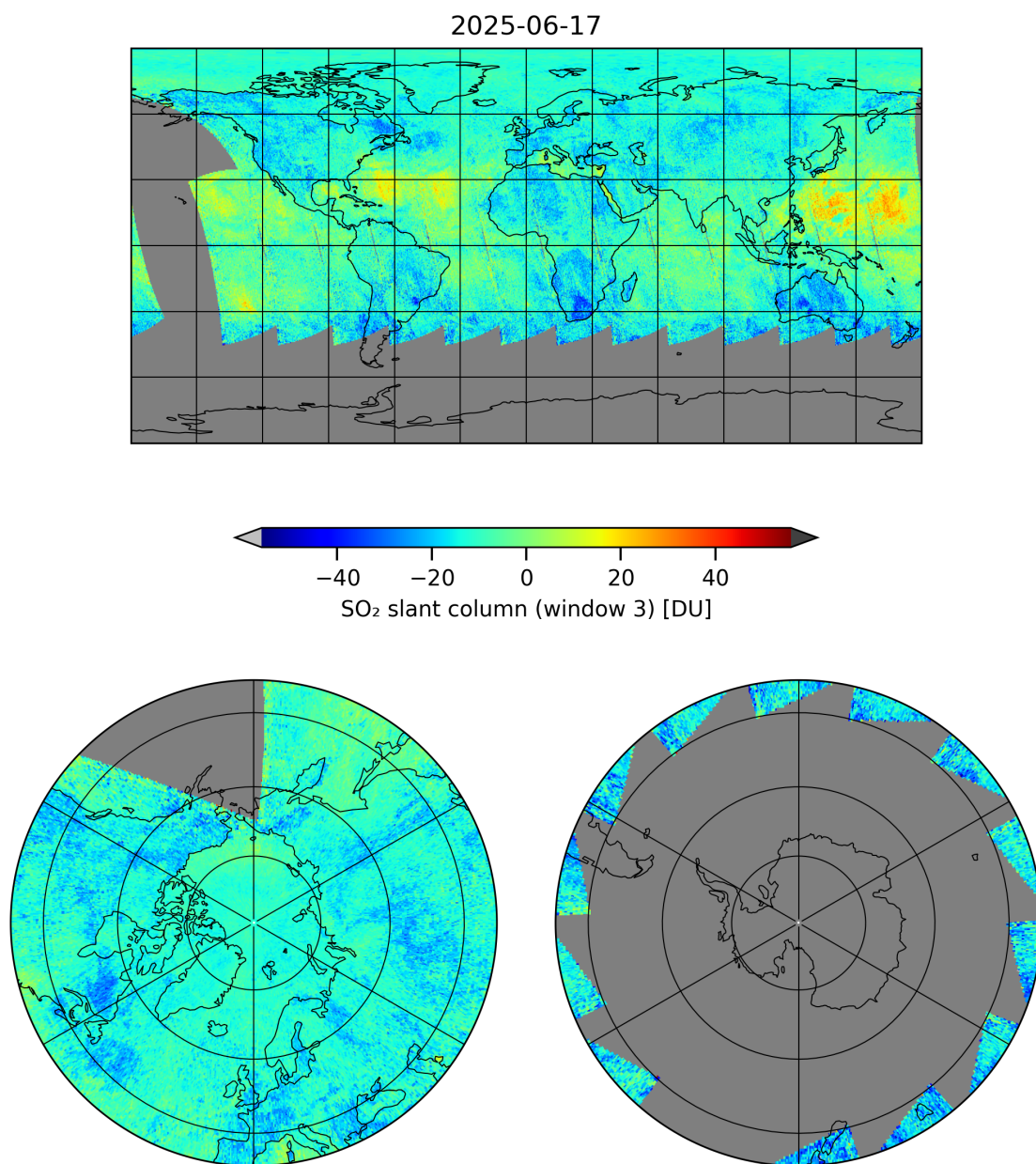


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-06-17 to 2025-06-17

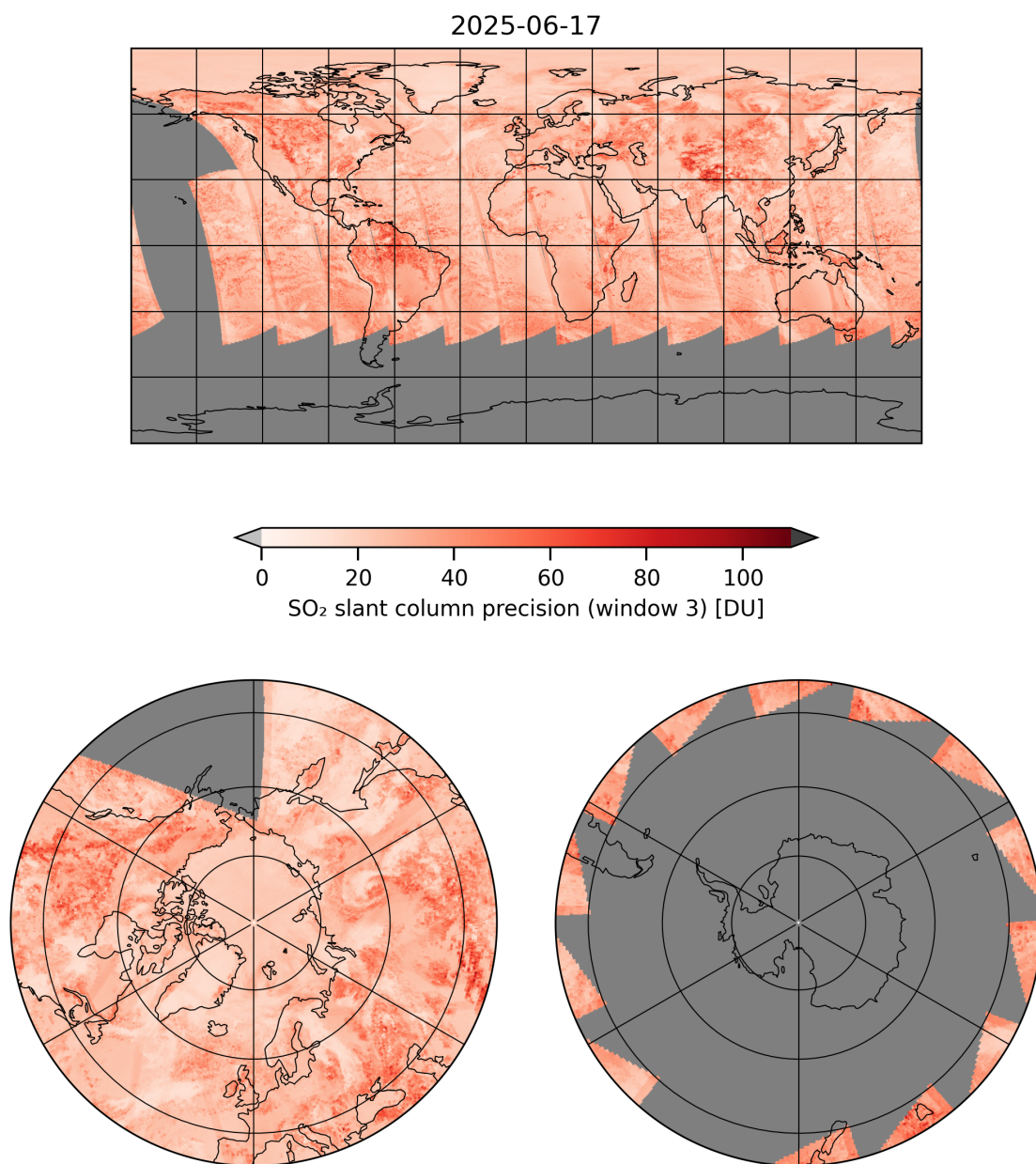


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-06-17 to 2025-06-17

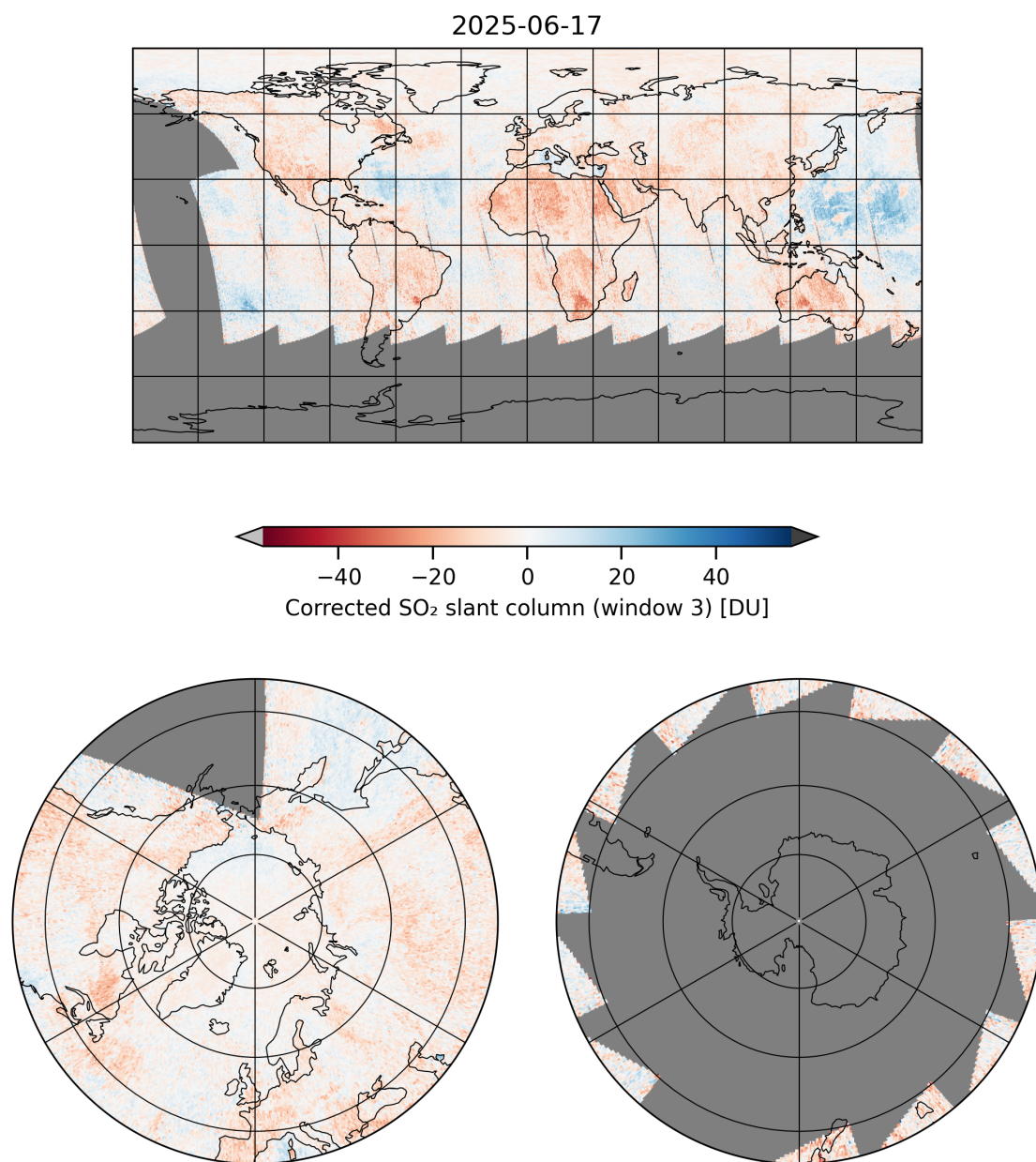
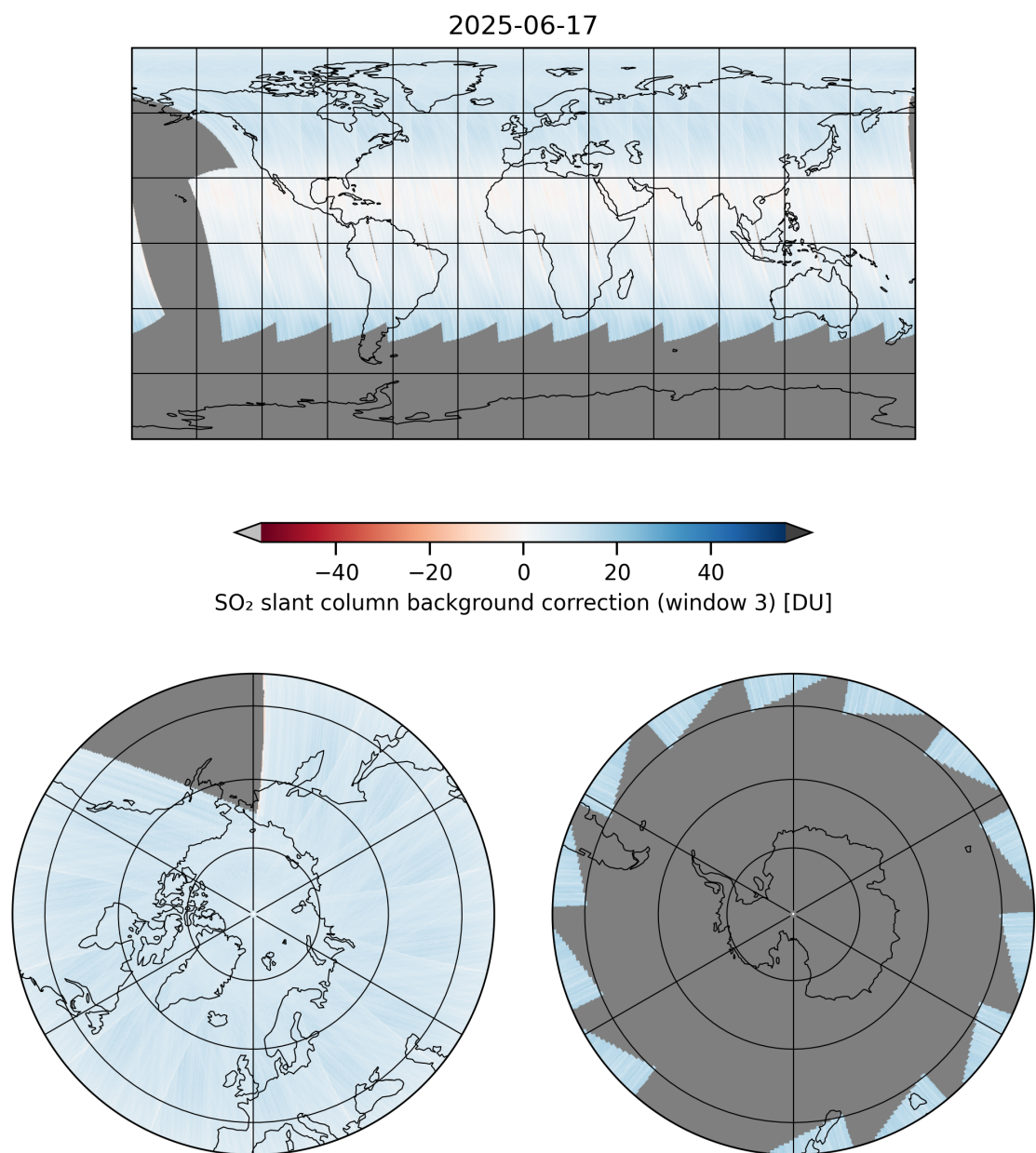


Figure 19: Map of "Corrected SO₂ slant column (window 3)" for 2025-06-17 to 2025-06-17



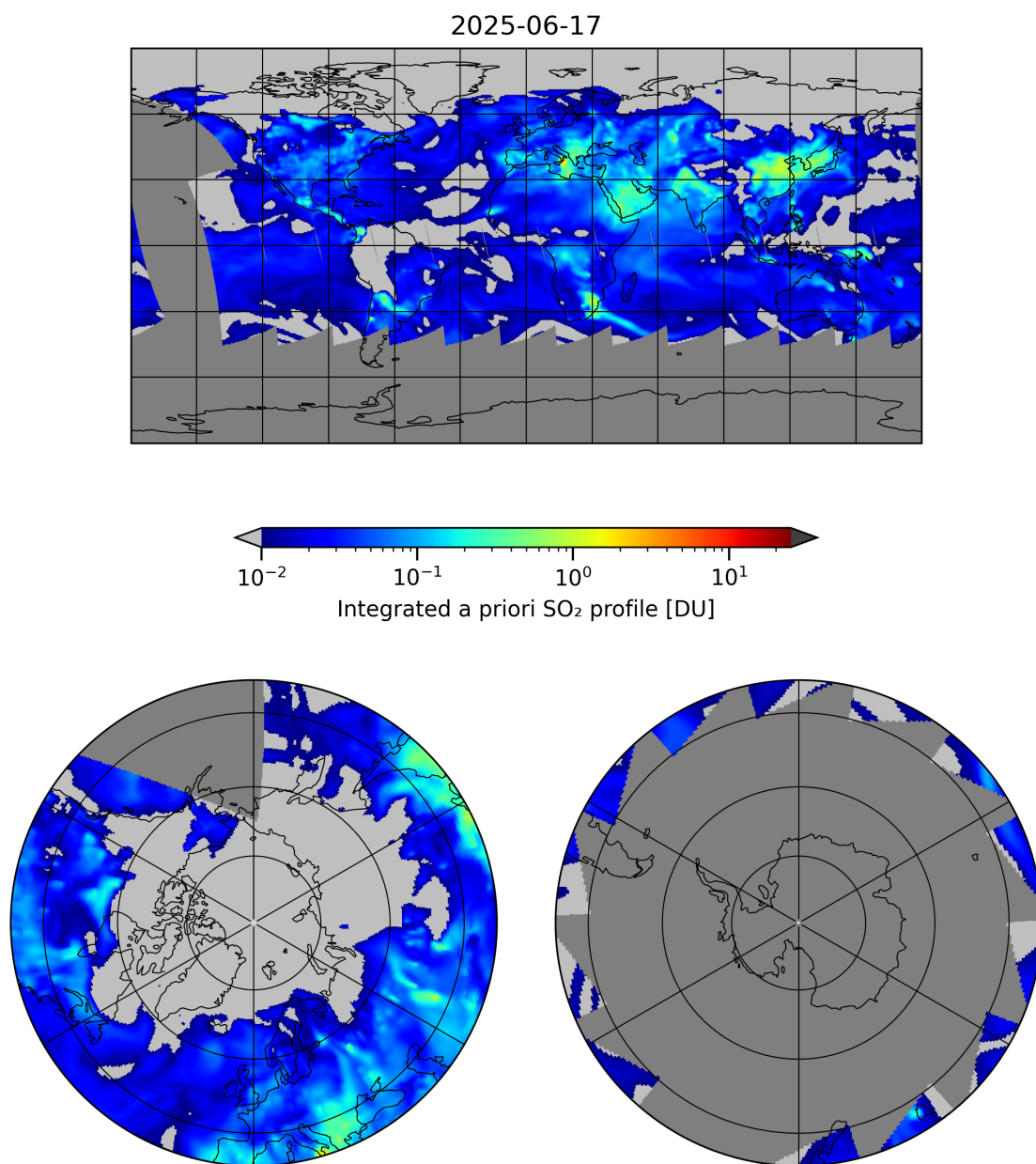


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-06-17 to 2025-06-17

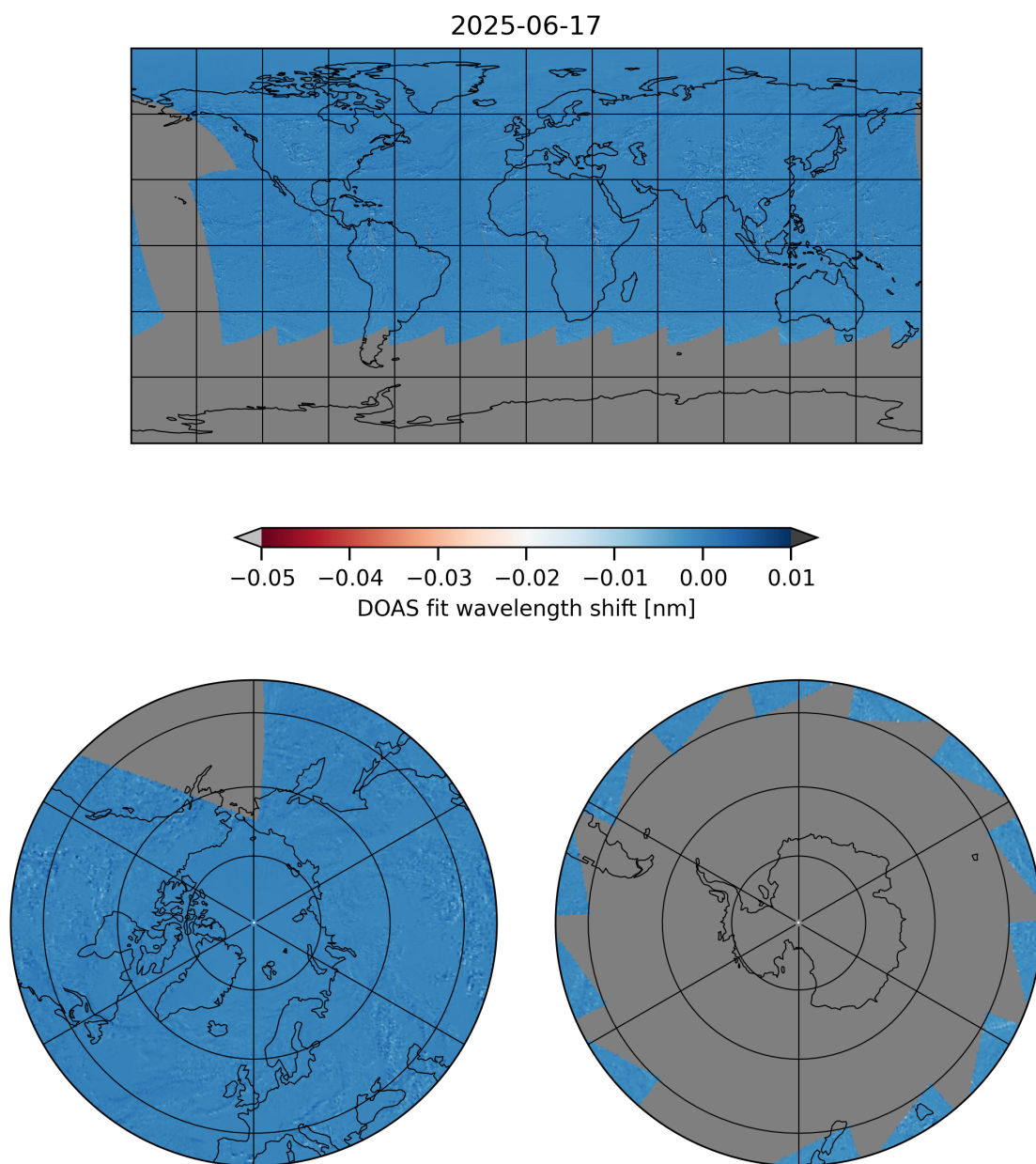


Figure 22: Map of “DOAS fit wavelength shift” for 2025-06-17 to 2025-06-17

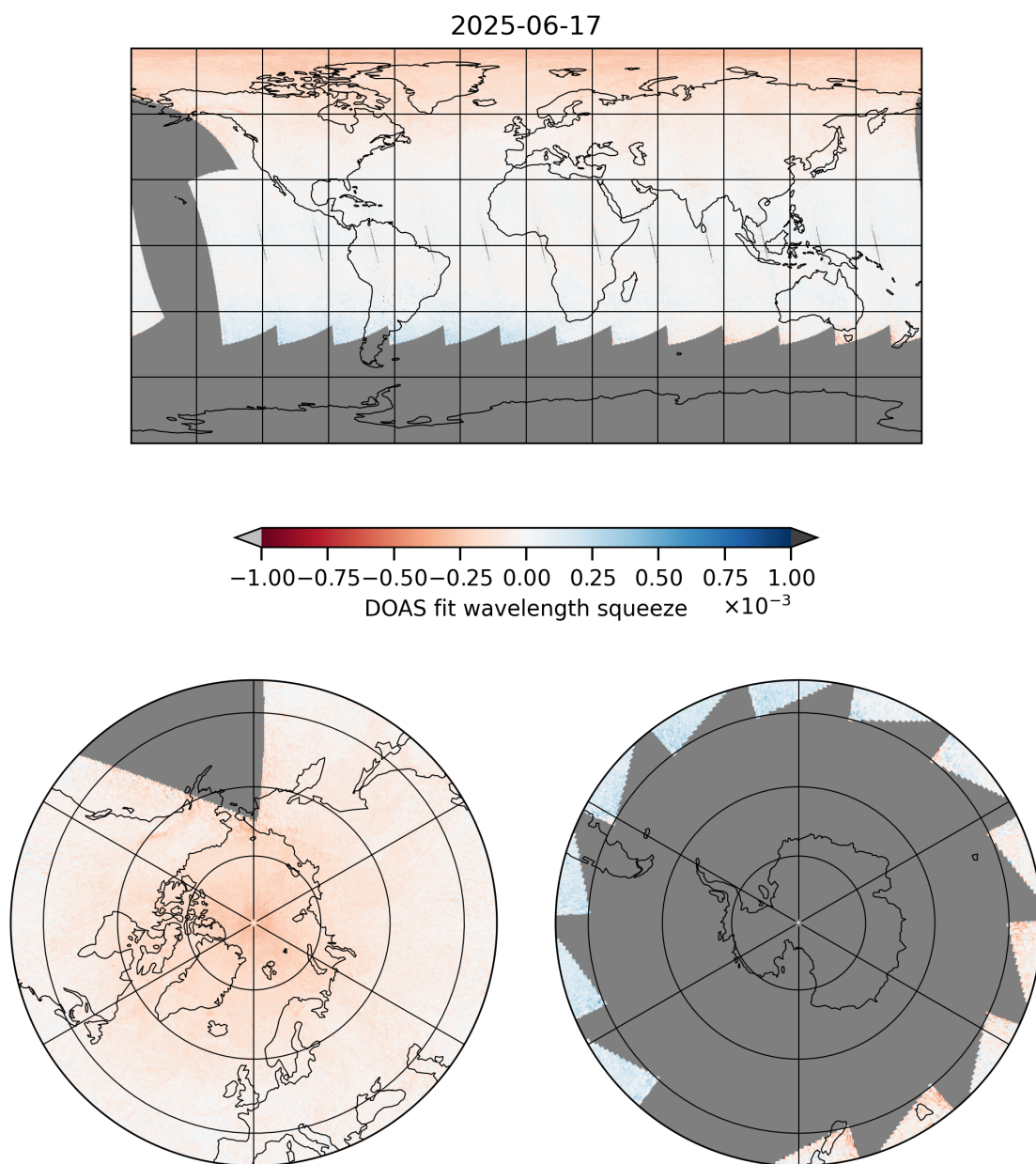


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-06-17 to 2025-06-17

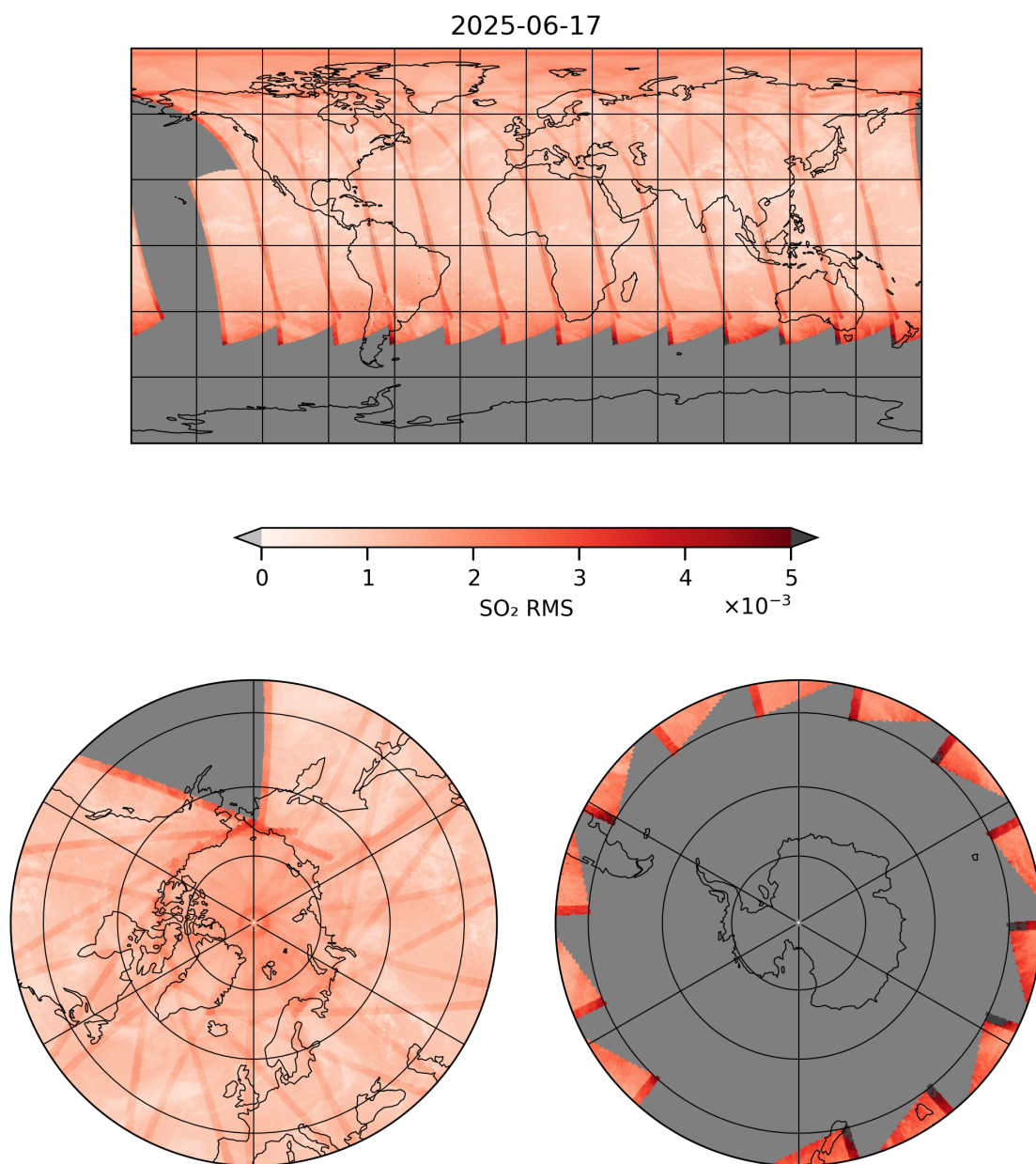


Figure 24: Map of “SO₂ RMS” for 2025-06-17 to 2025-06-17

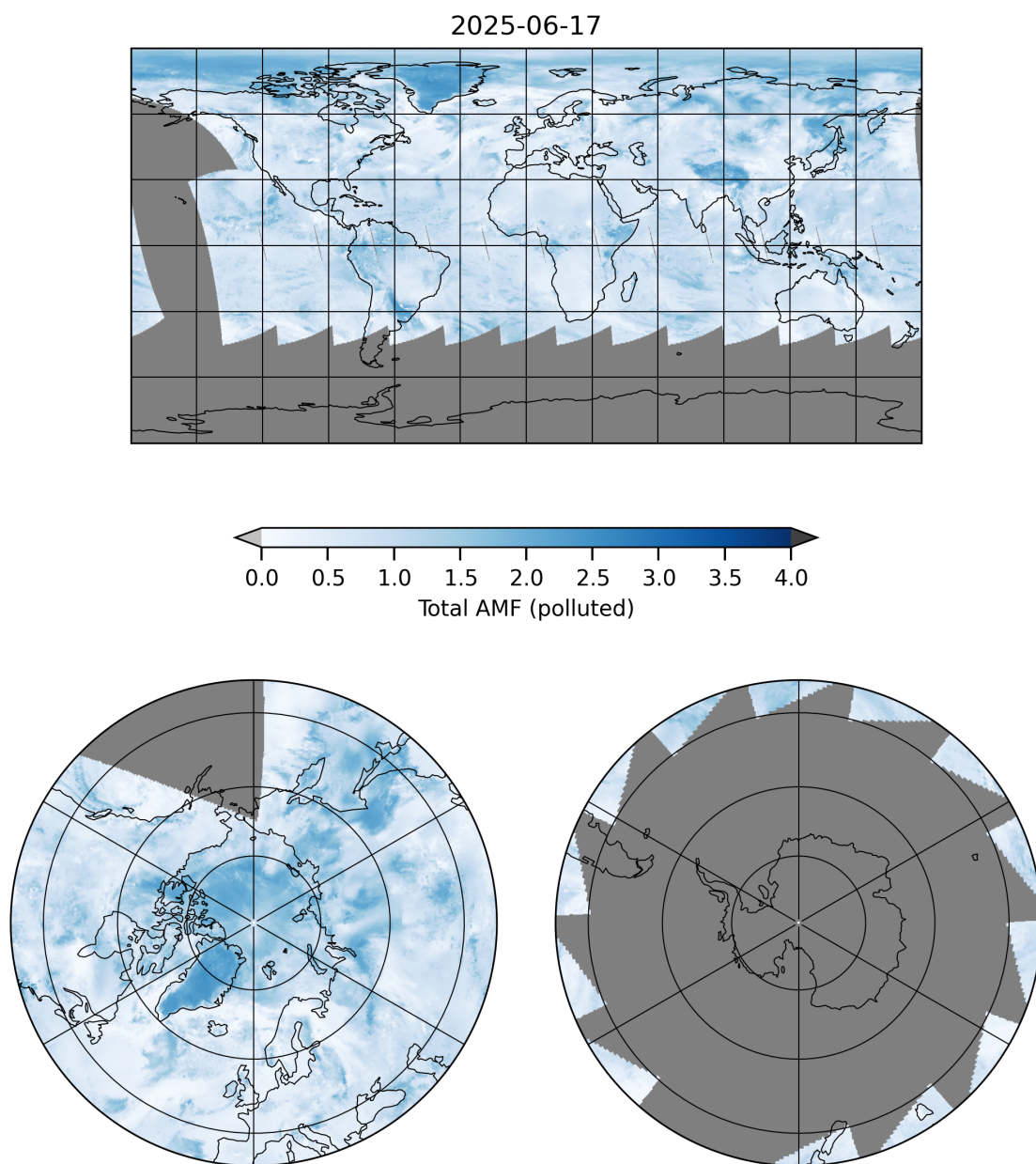


Figure 25: Map of “Total AMF (polluted)” for 2025-06-17 to 2025-06-17

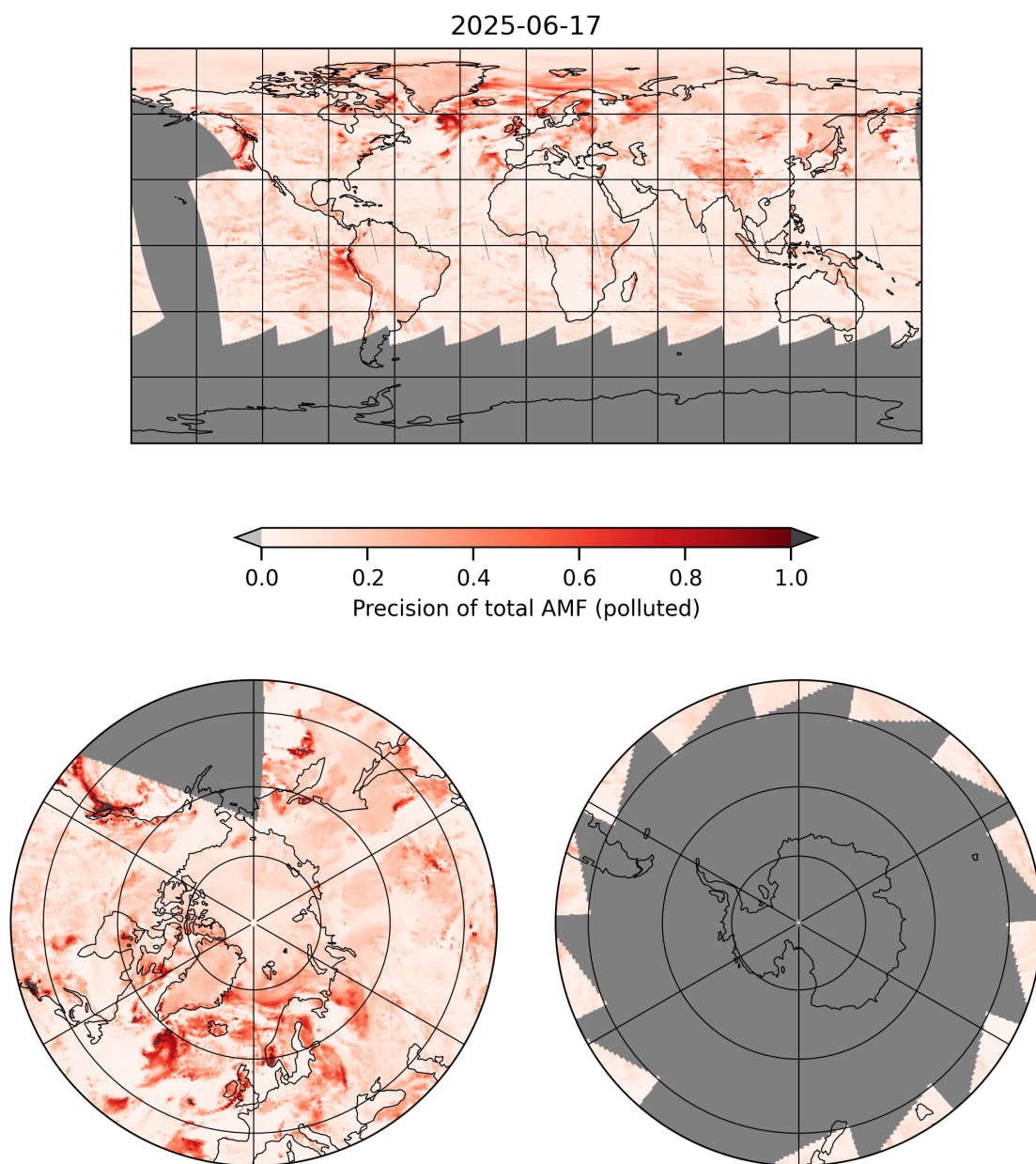


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-06-17 to 2025-06-17

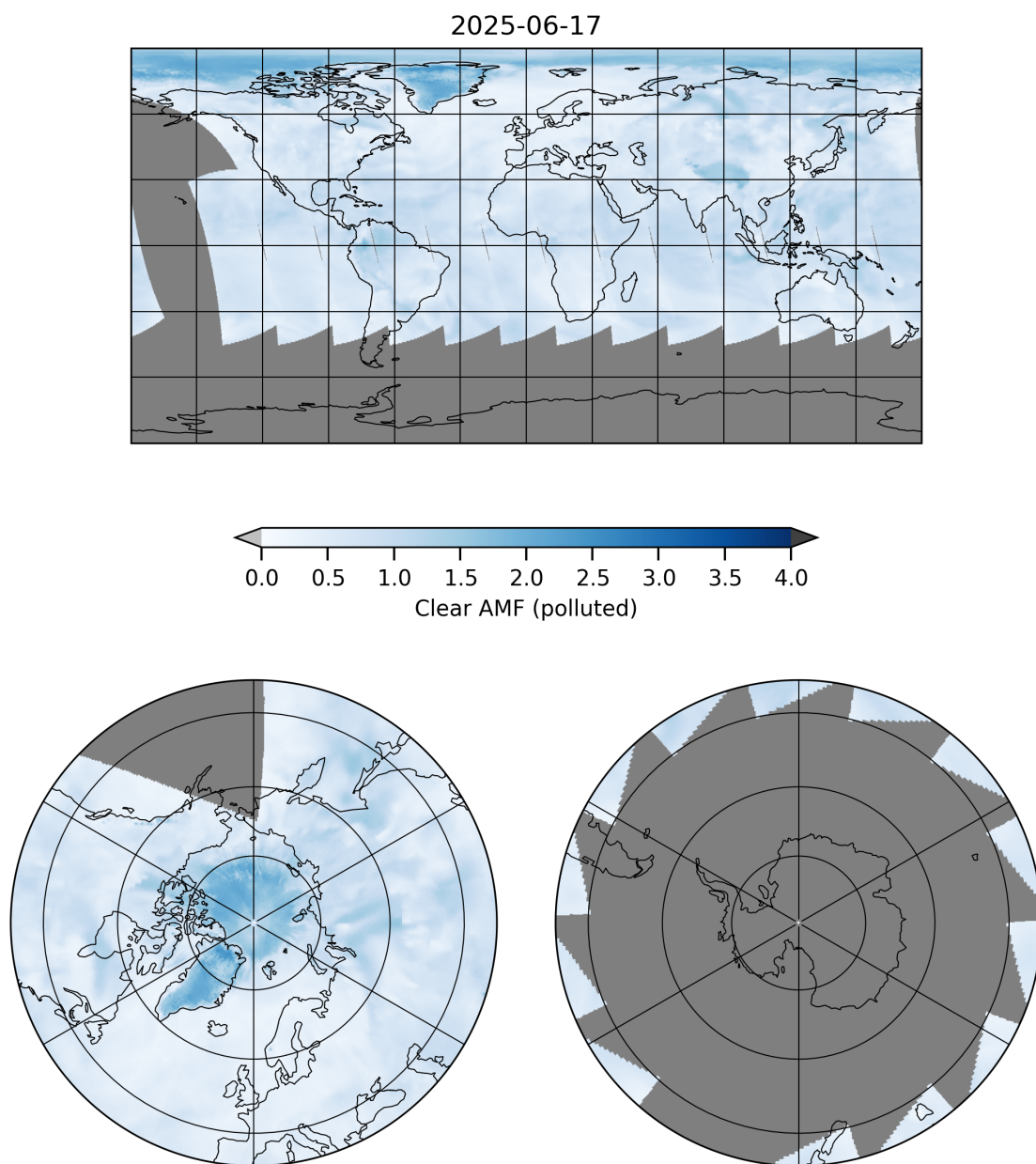


Figure 27: Map of “Clear AMF (polluted)” for 2025-06-17 to 2025-06-17

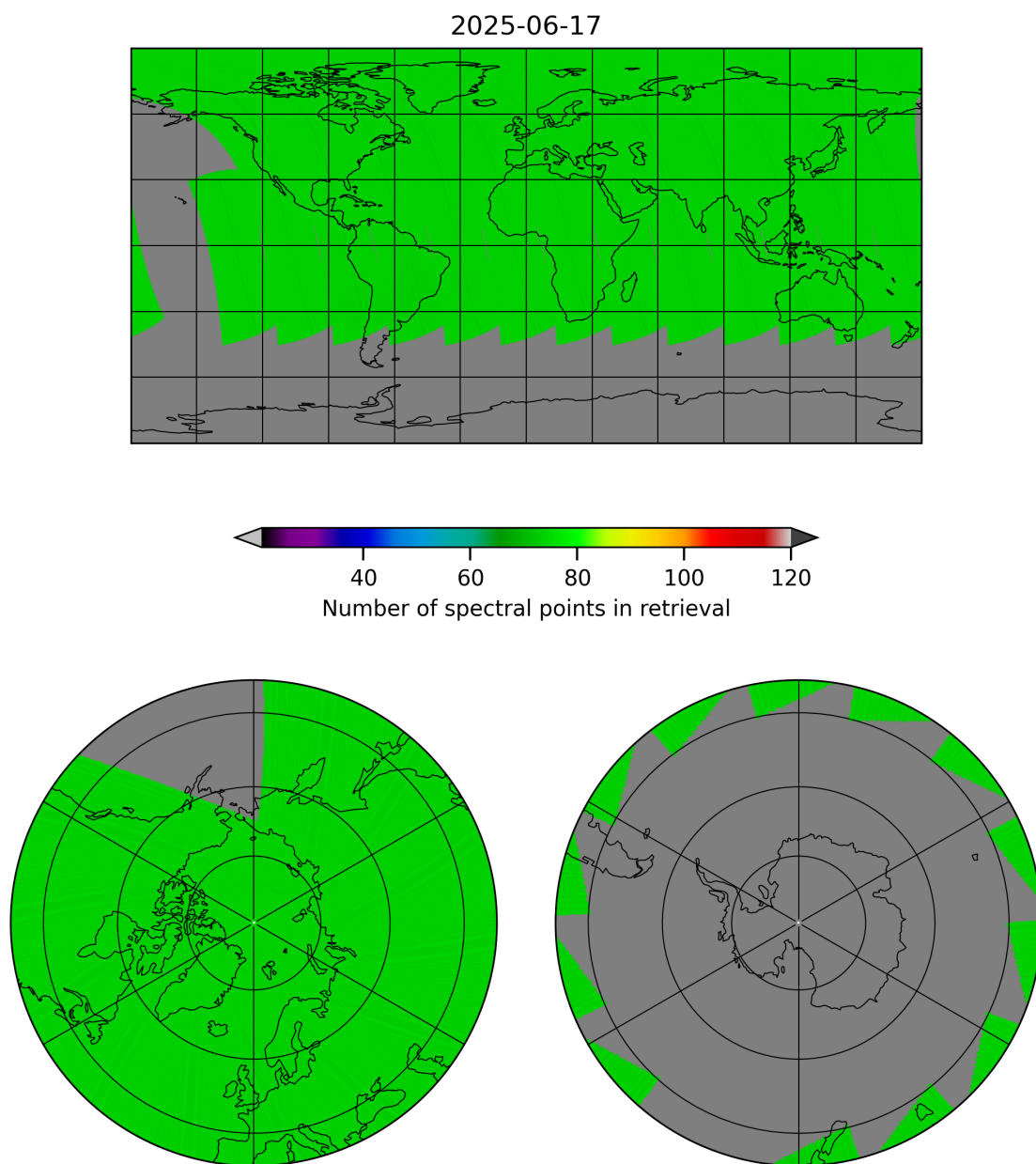


Figure 28: Map of “Number of spectral points in retrieval” for 2025-06-17 to 2025-06-17

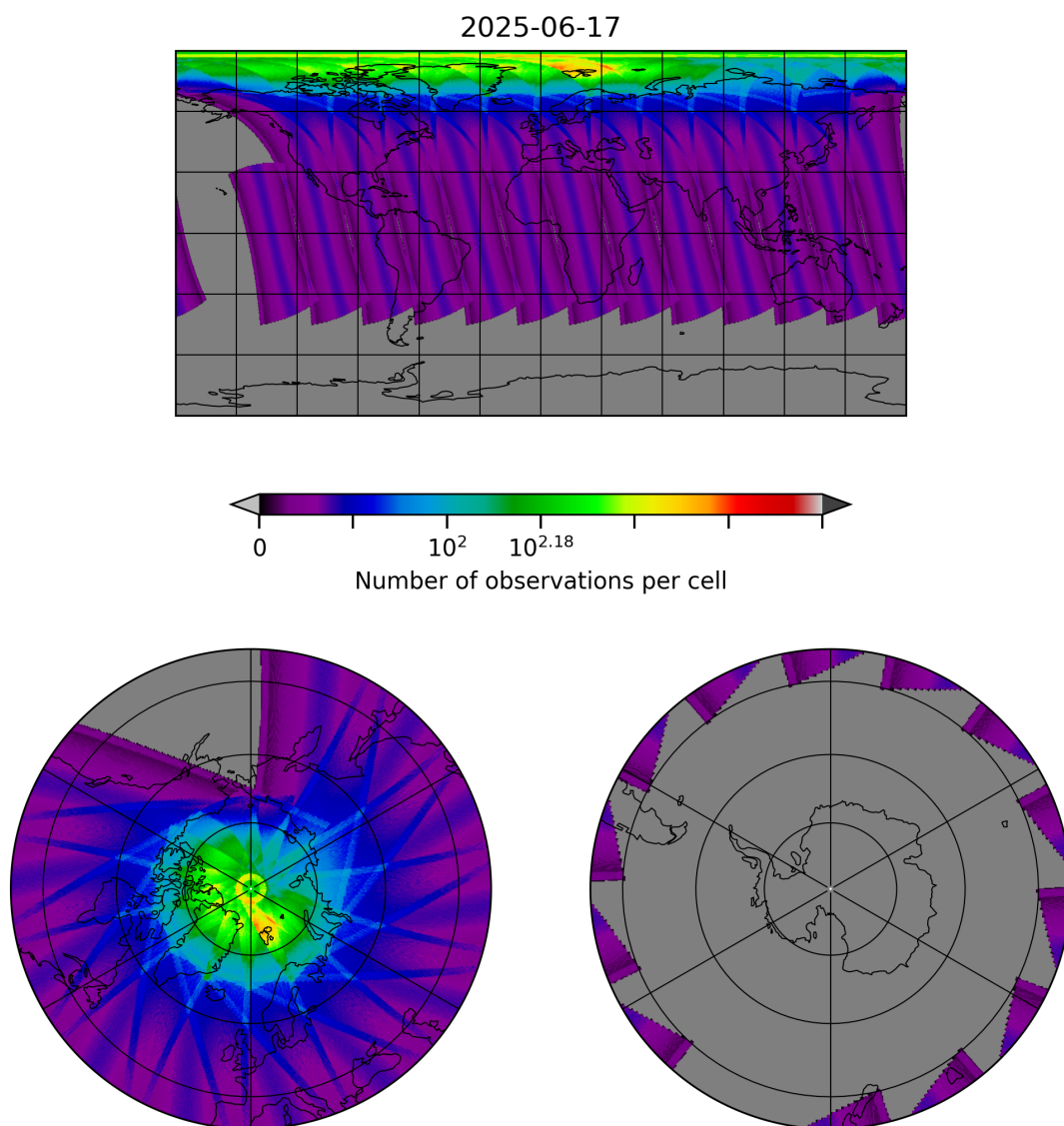


Figure 29: Map of the number of observations for 2025-06-17 to 2025-06-17

7 Zonal average

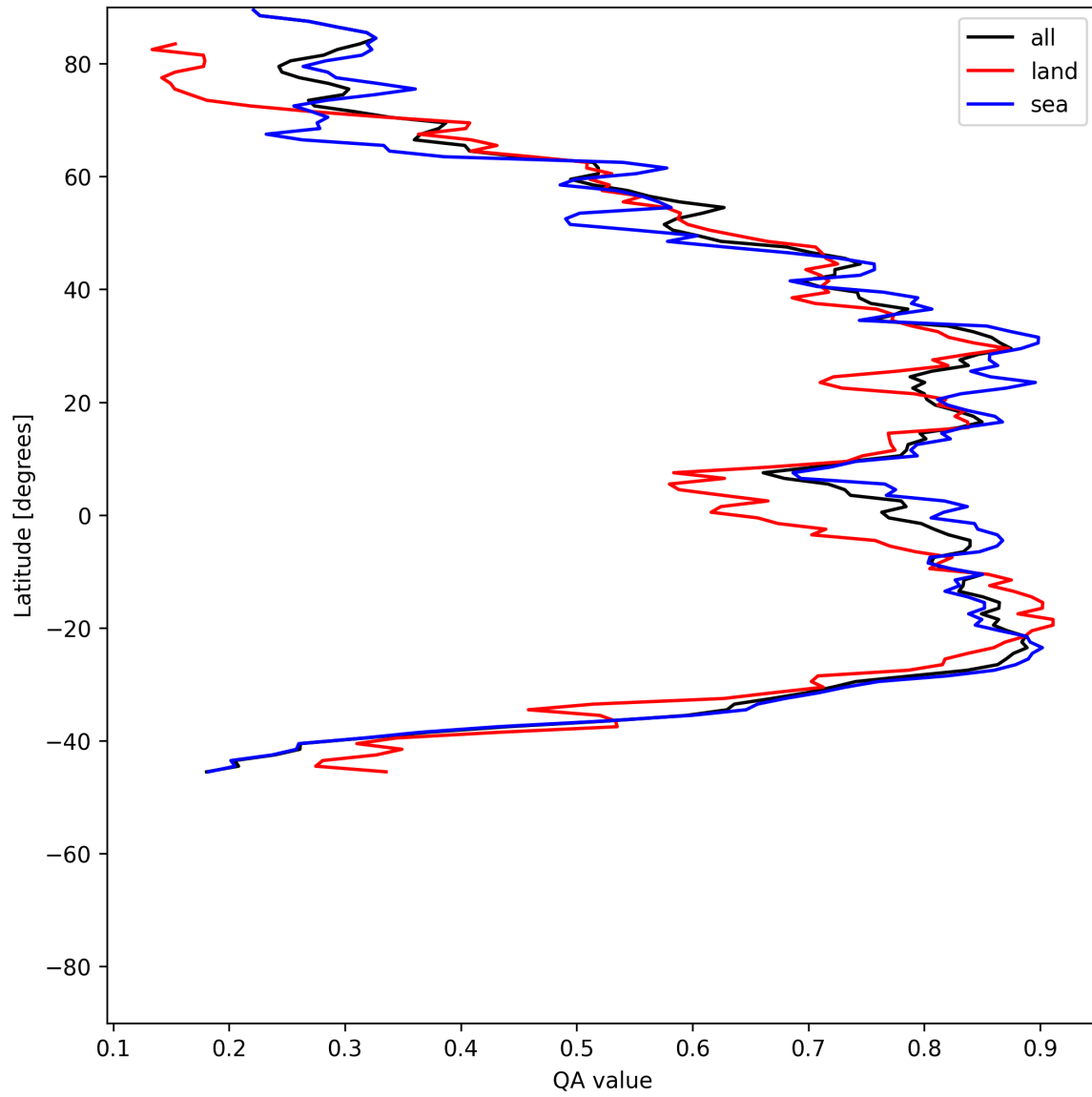


Figure 30: Zonal average of “QA value” for 2025-06-17 to 2025-06-17.

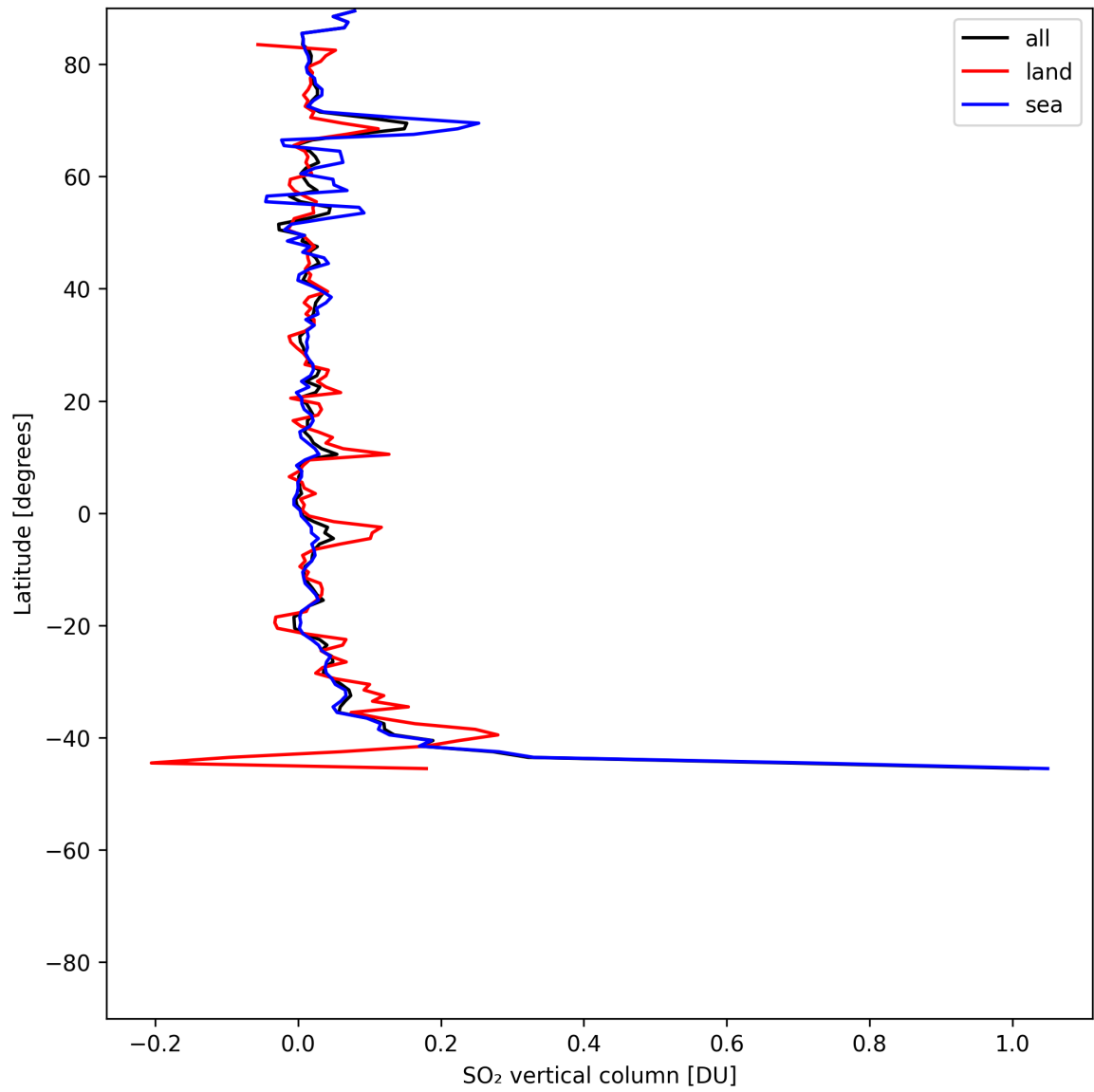


Figure 31: Zonal average of “SO₂ vertical column” for 2025-06-17 to 2025-06-17.

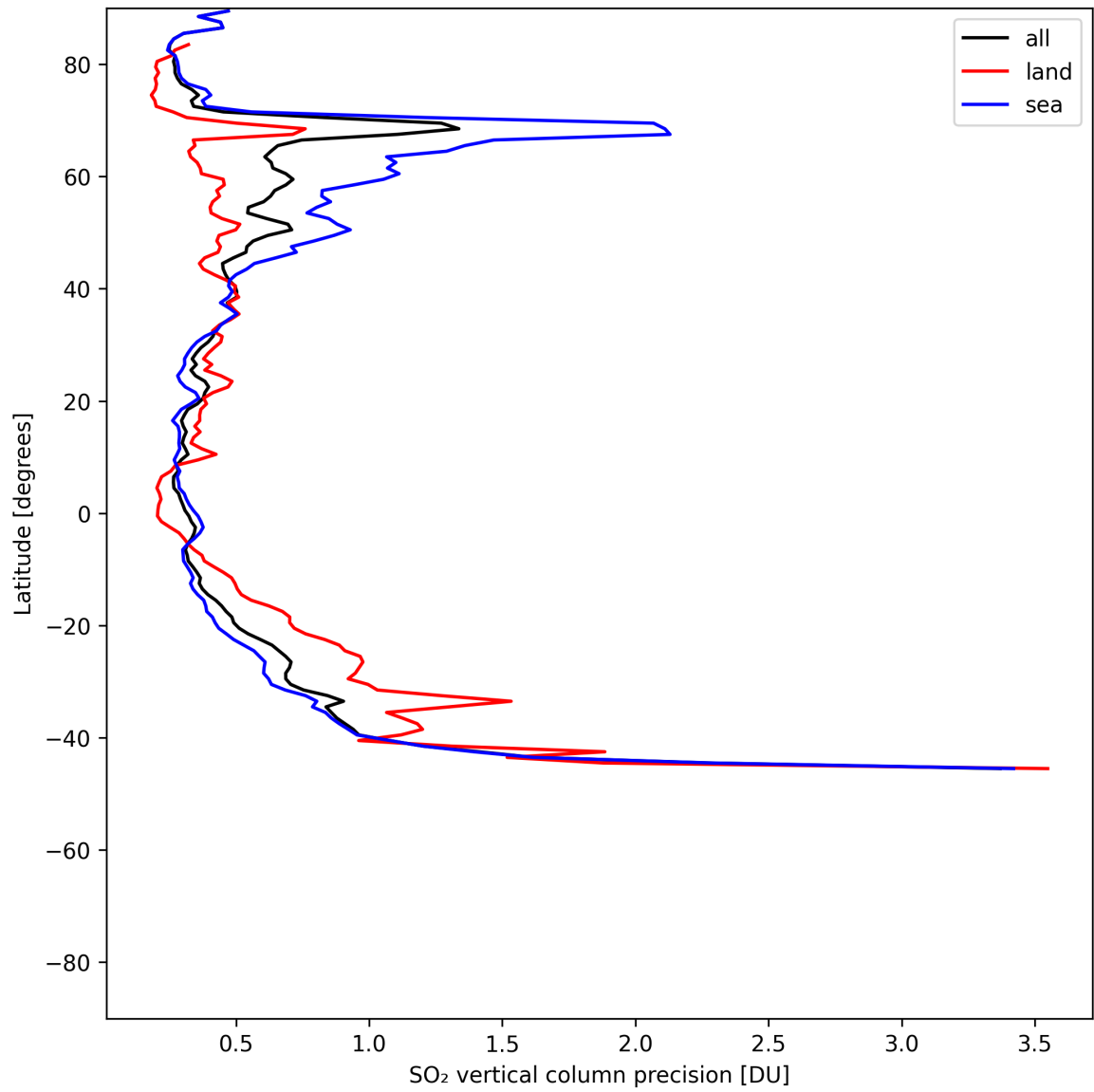


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-06-17 to 2025-06-17.

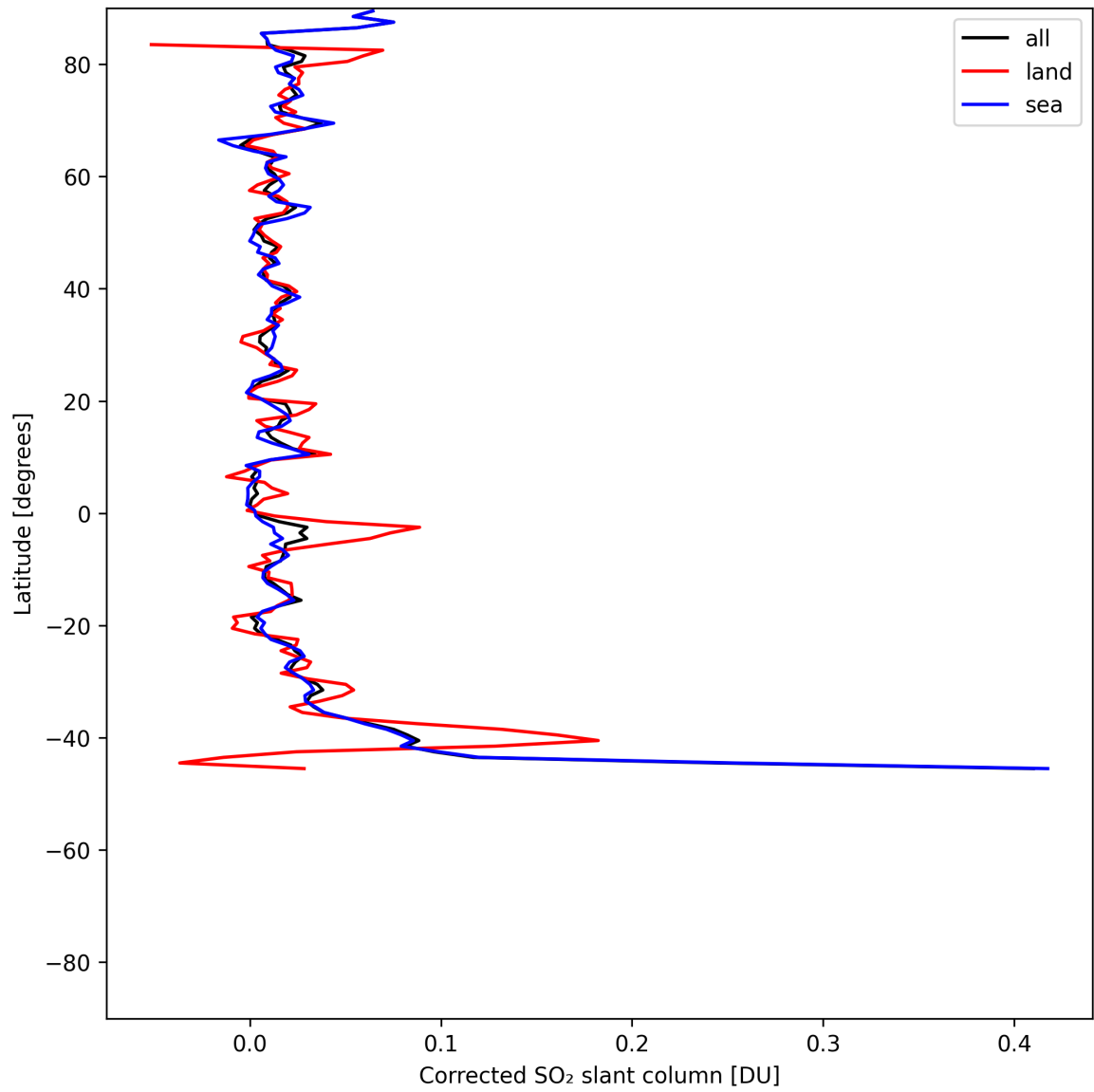


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-06-17 to 2025-06-17.

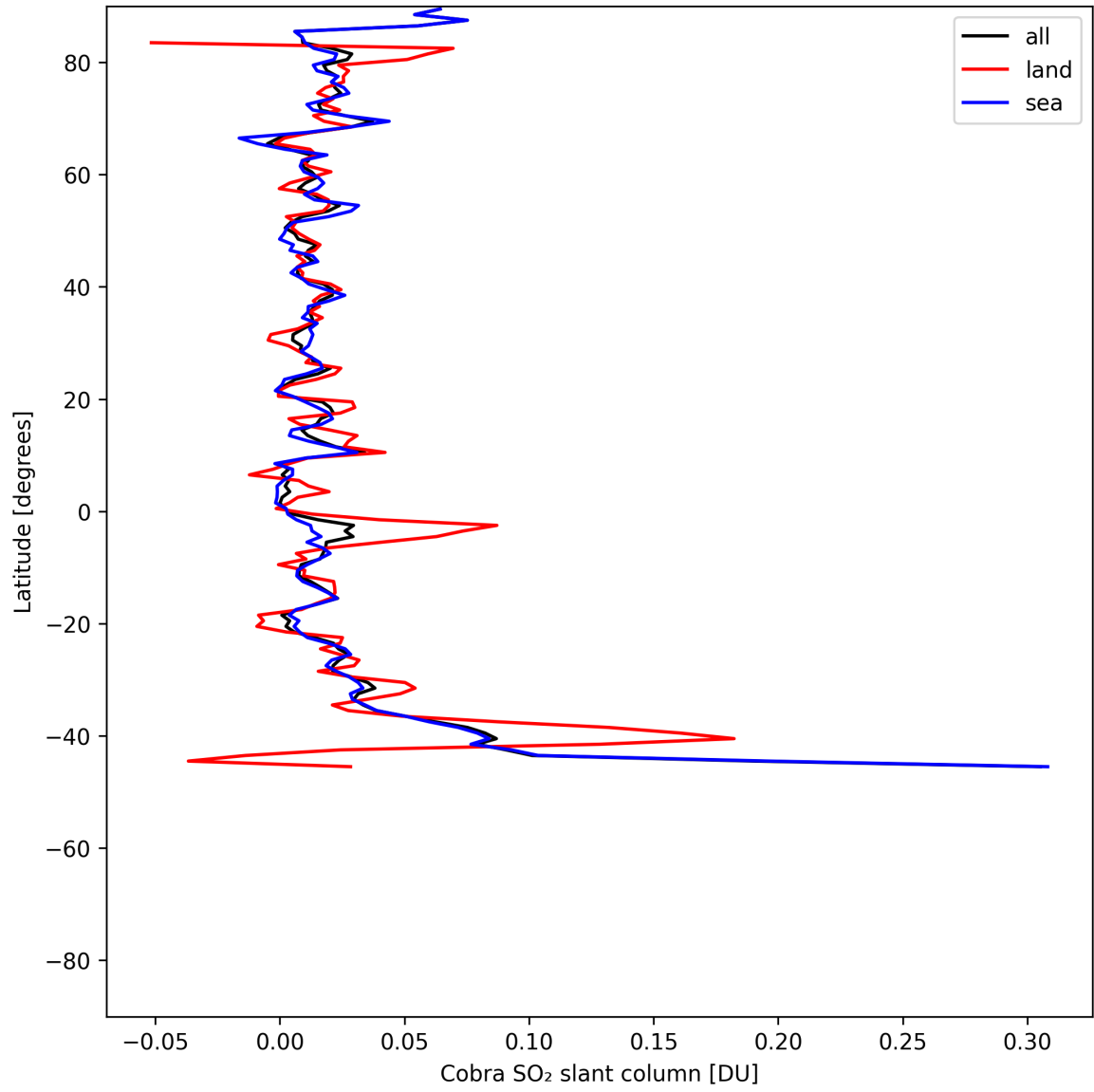


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-06-17 to 2025-06-17.

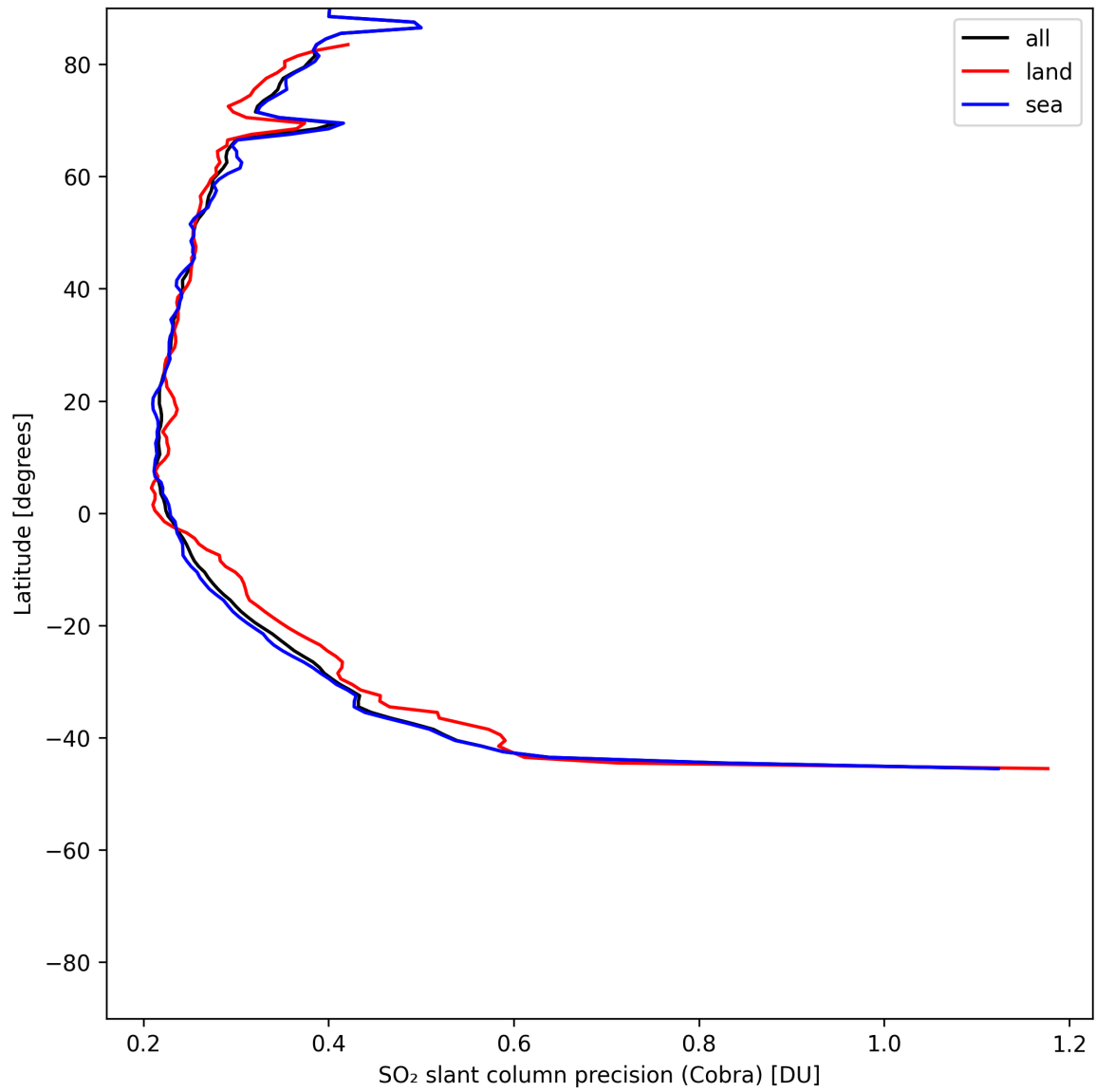


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-06-17 to 2025-06-17.

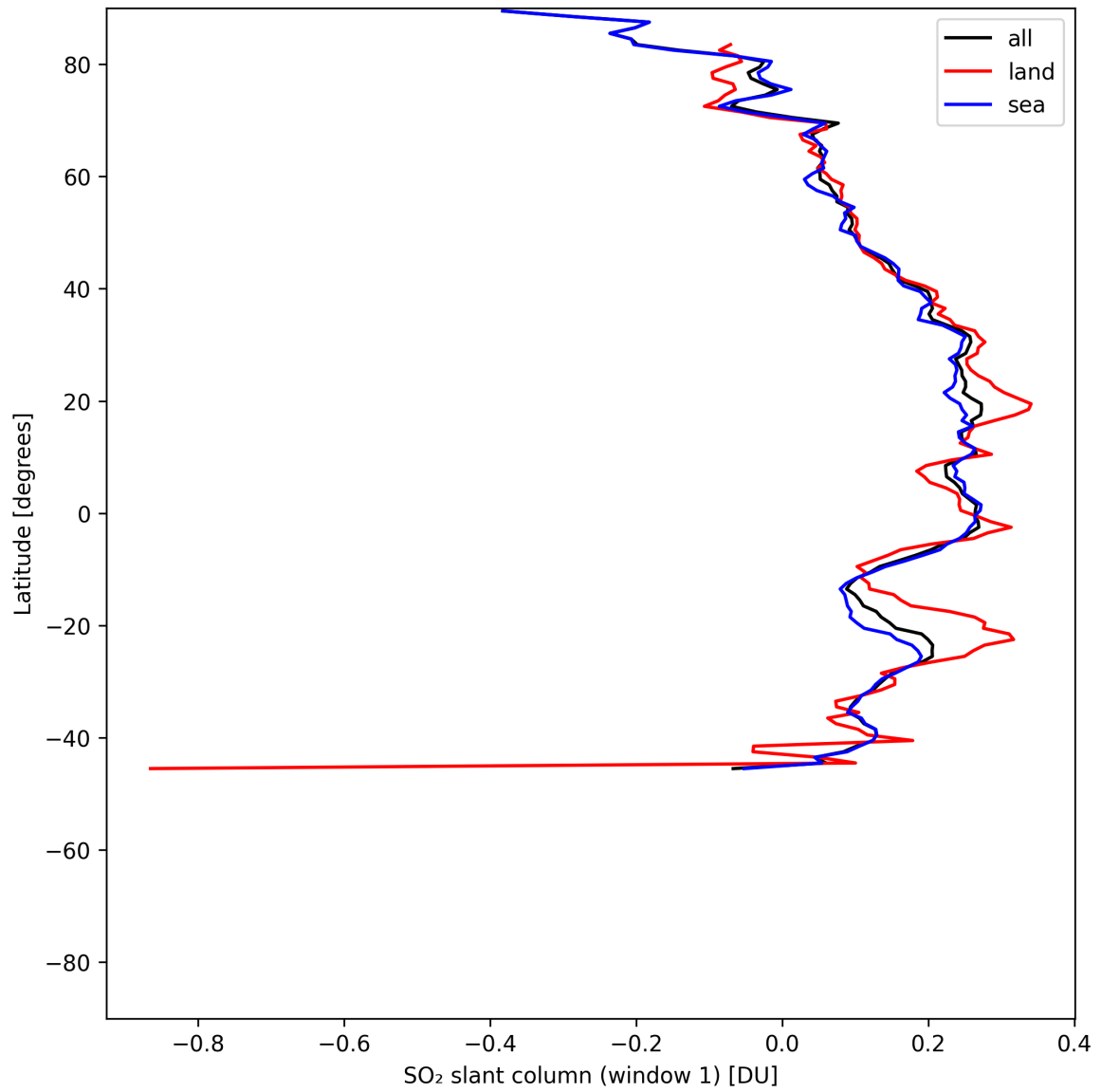


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-06-17 to 2025-06-17.

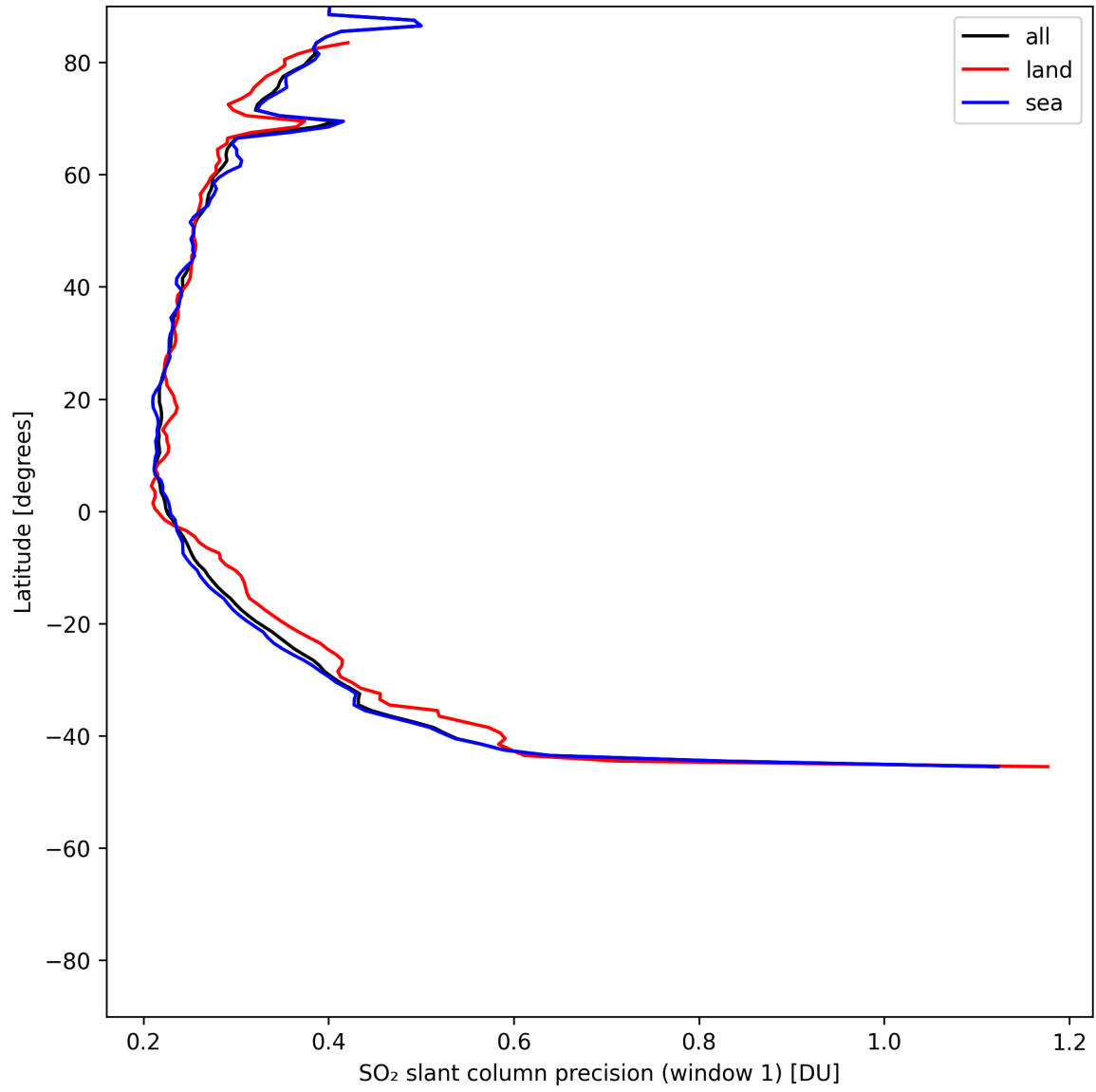


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-06-17 to 2025-06-17.

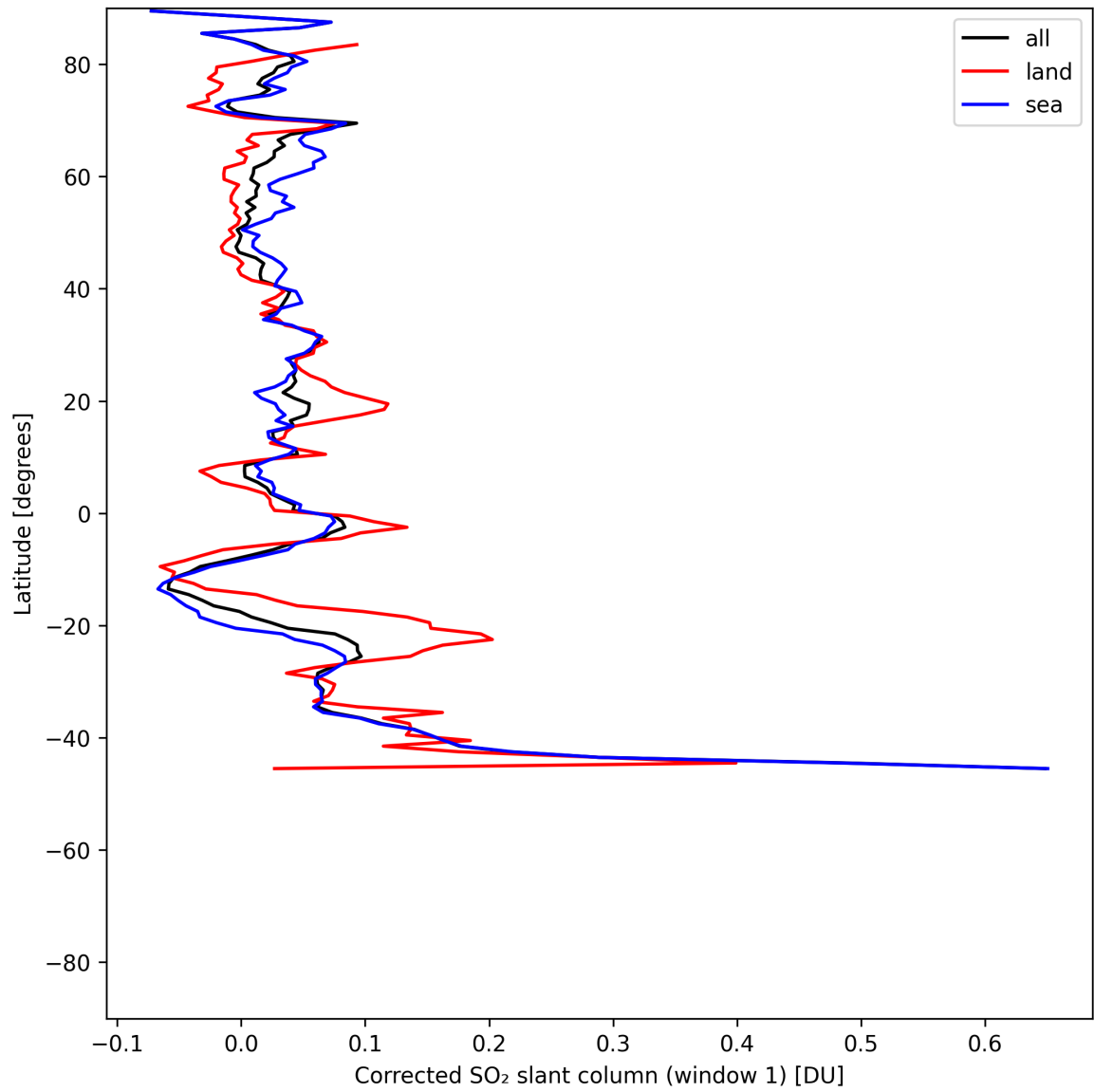


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-06-17 to 2025-06-17.

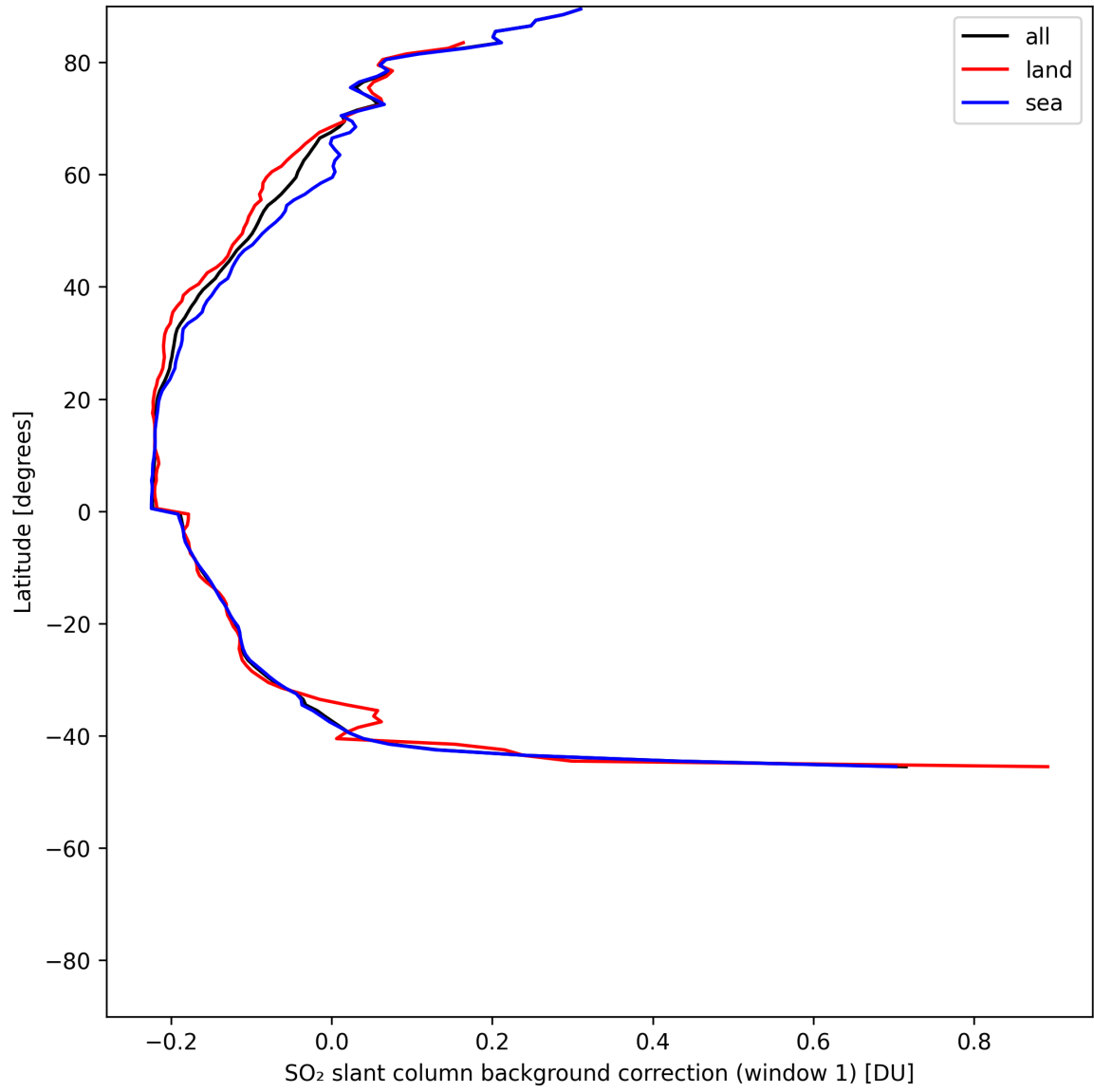


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-06-17 to 2025-06-17.

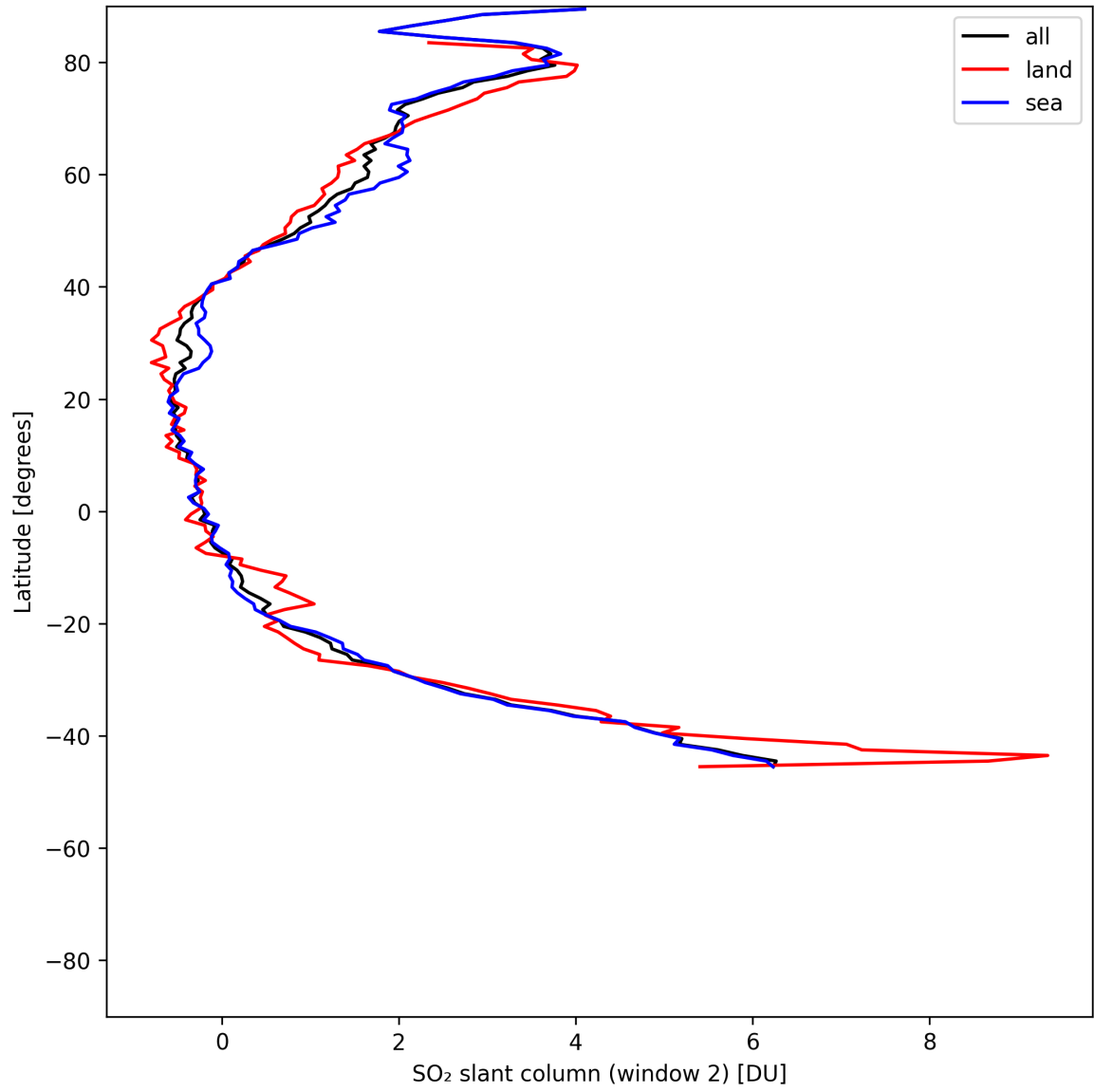


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-06-17 to 2025-06-17.

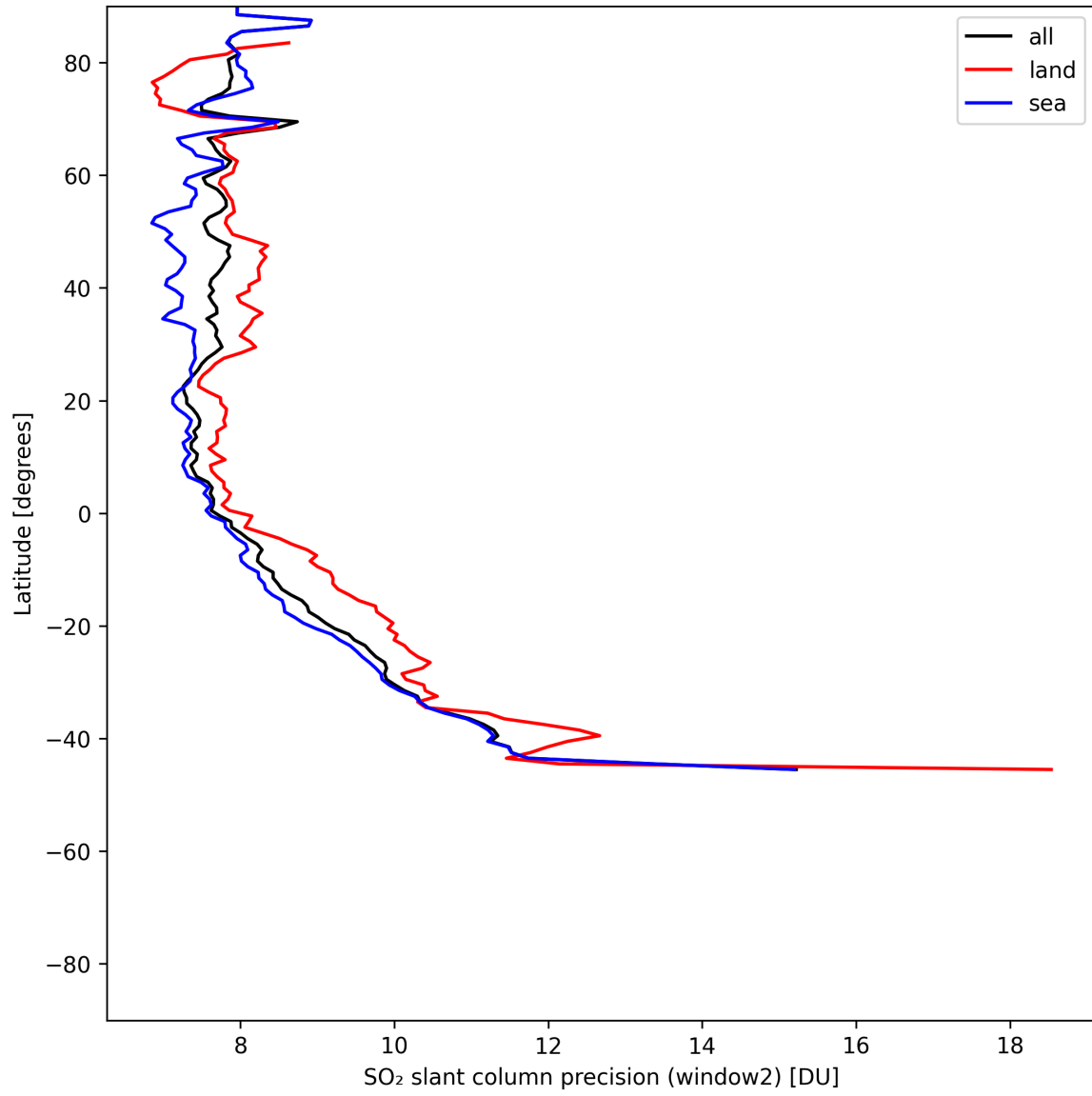


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-06-17 to 2025-06-17.

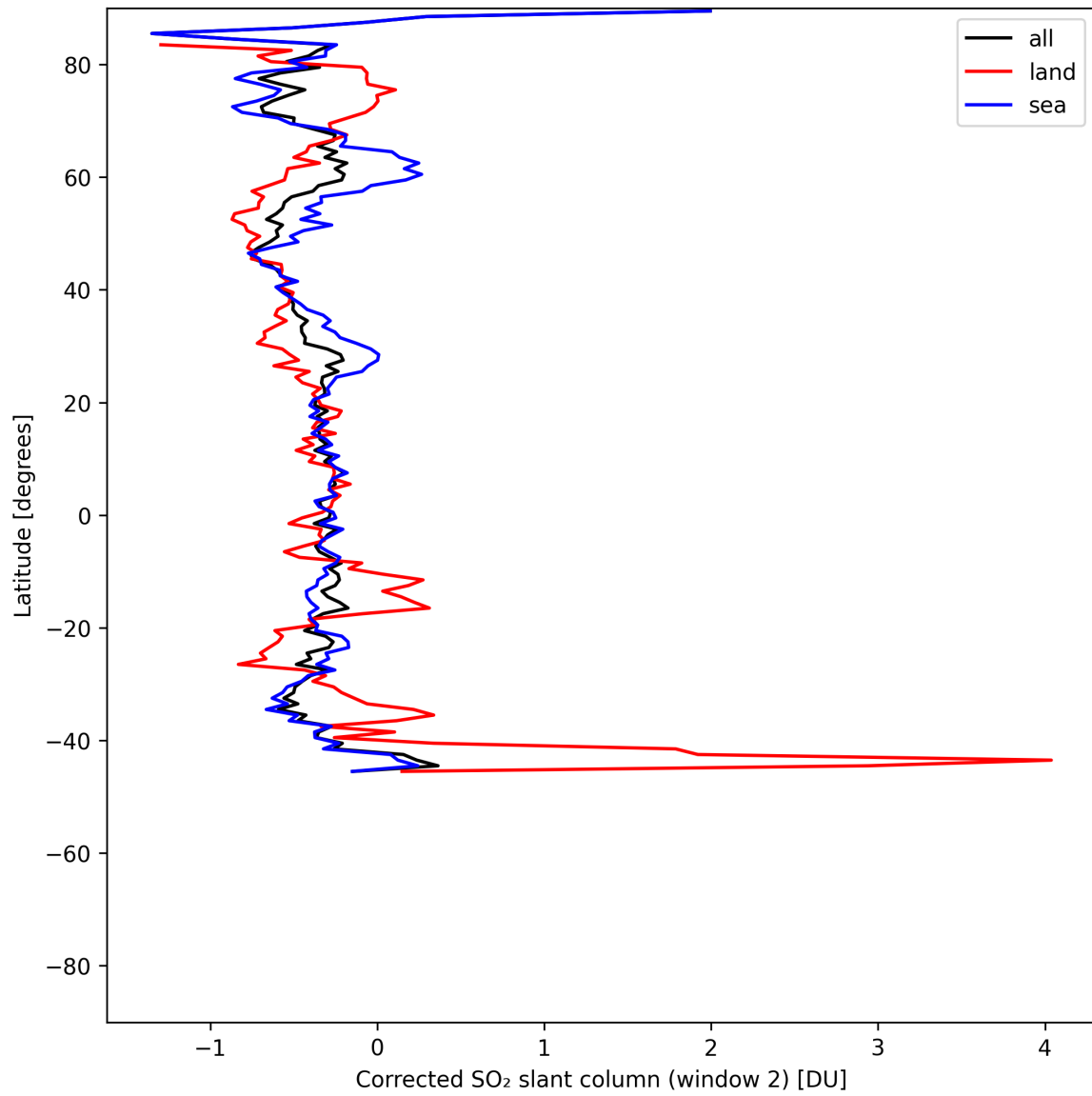


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-06-17 to 2025-06-17.

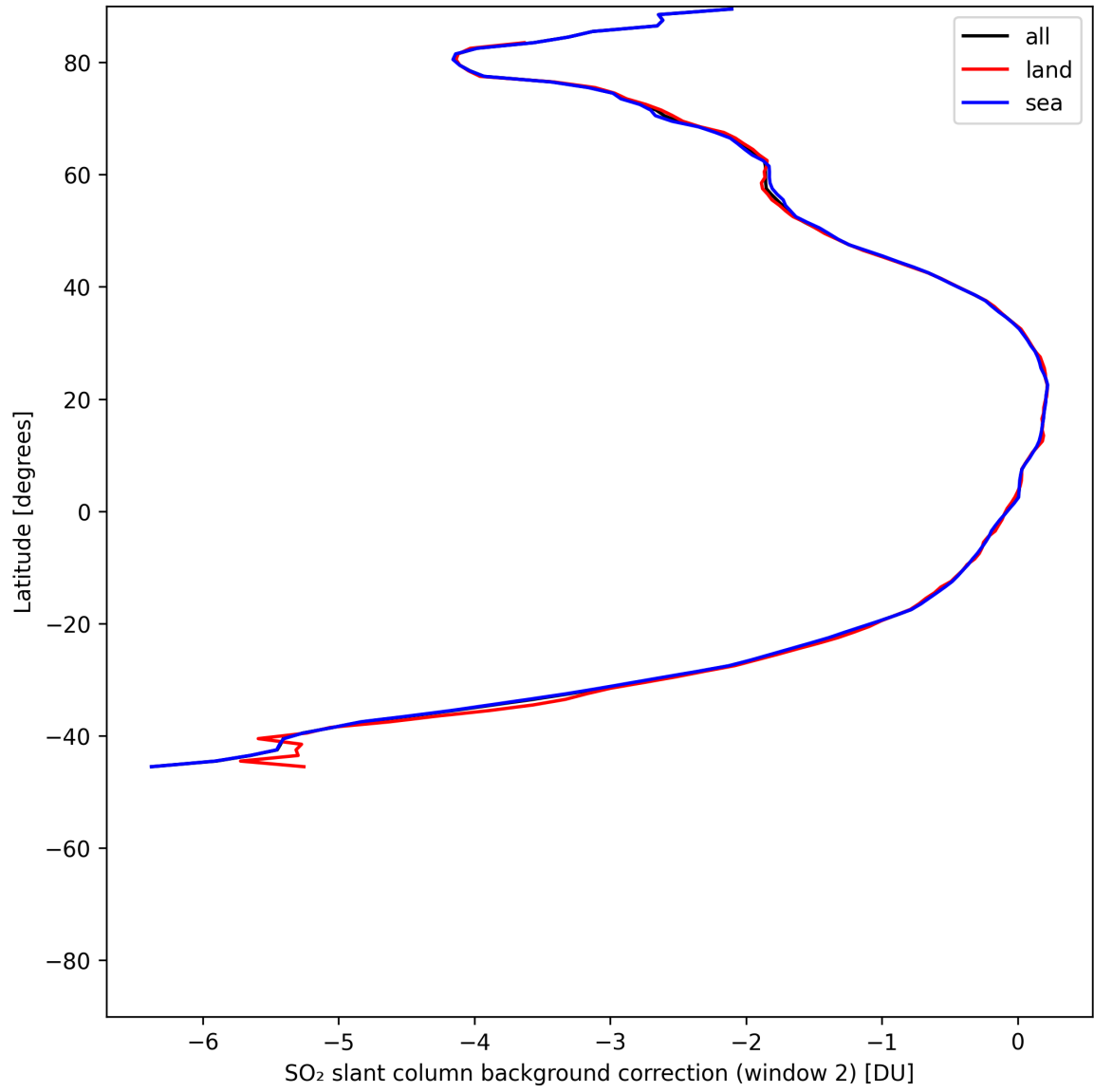


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-06-17 to 2025-06-17.

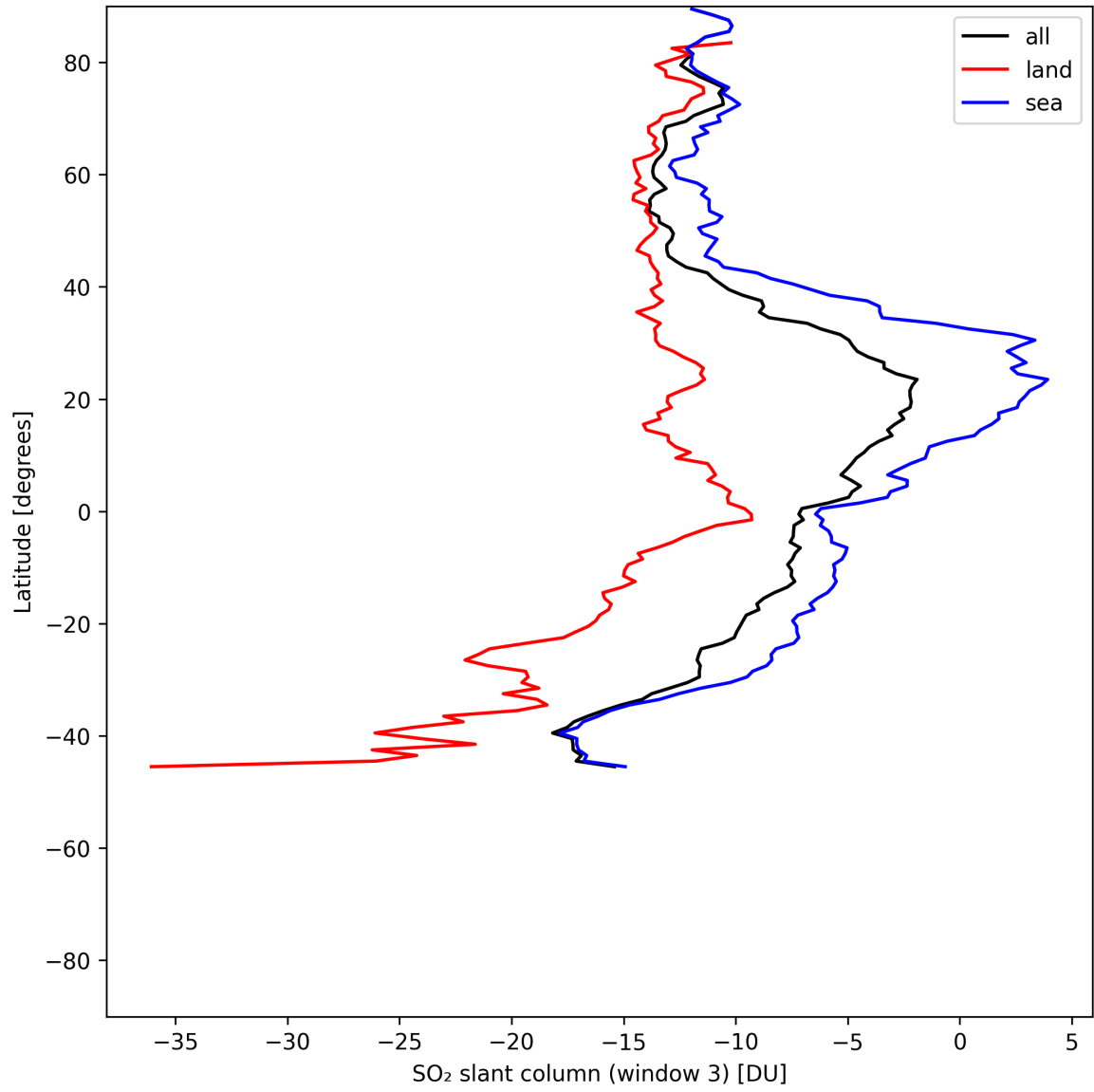


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-06-17 to 2025-06-17.

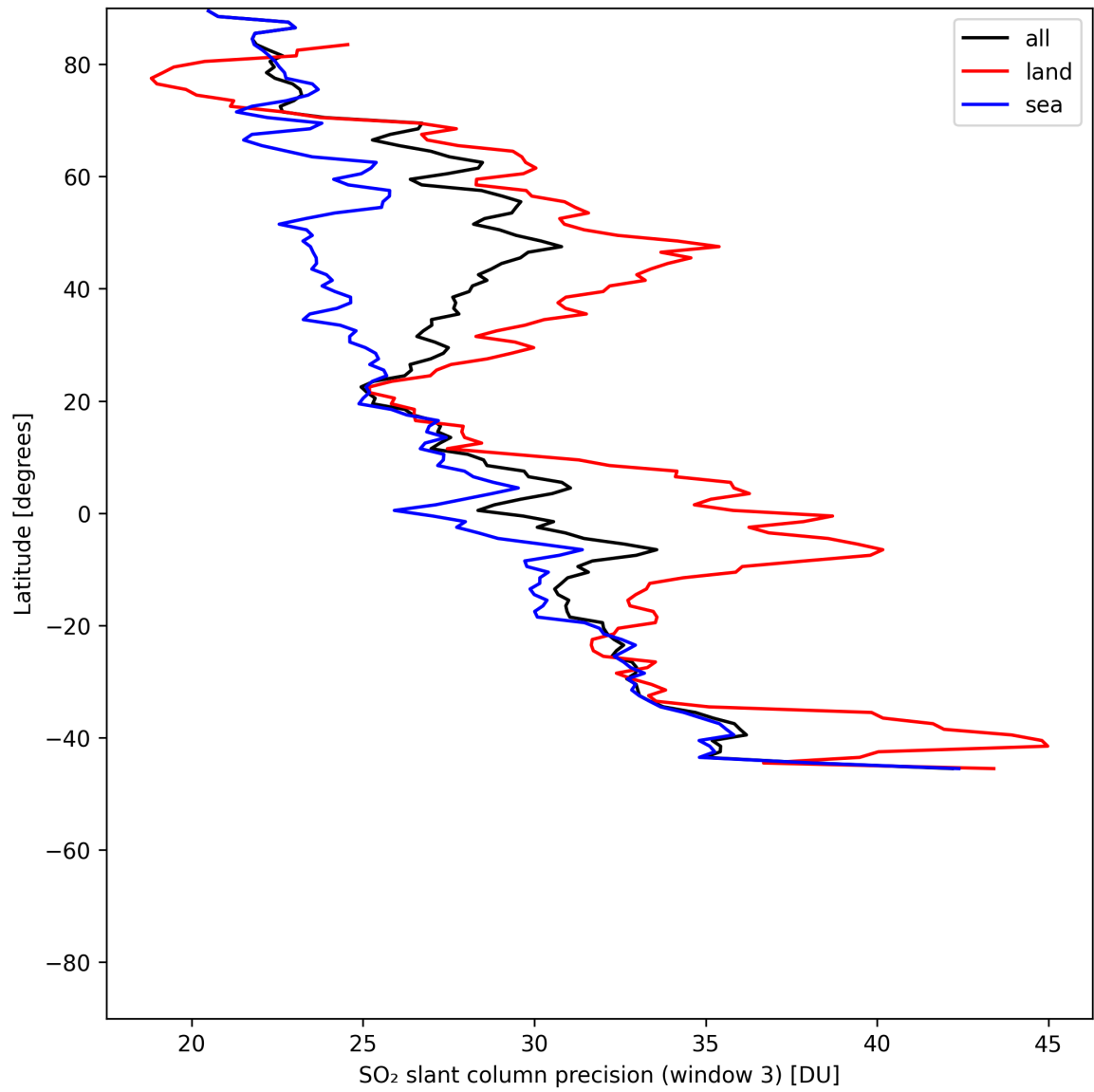


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-06-17 to 2025-06-17.

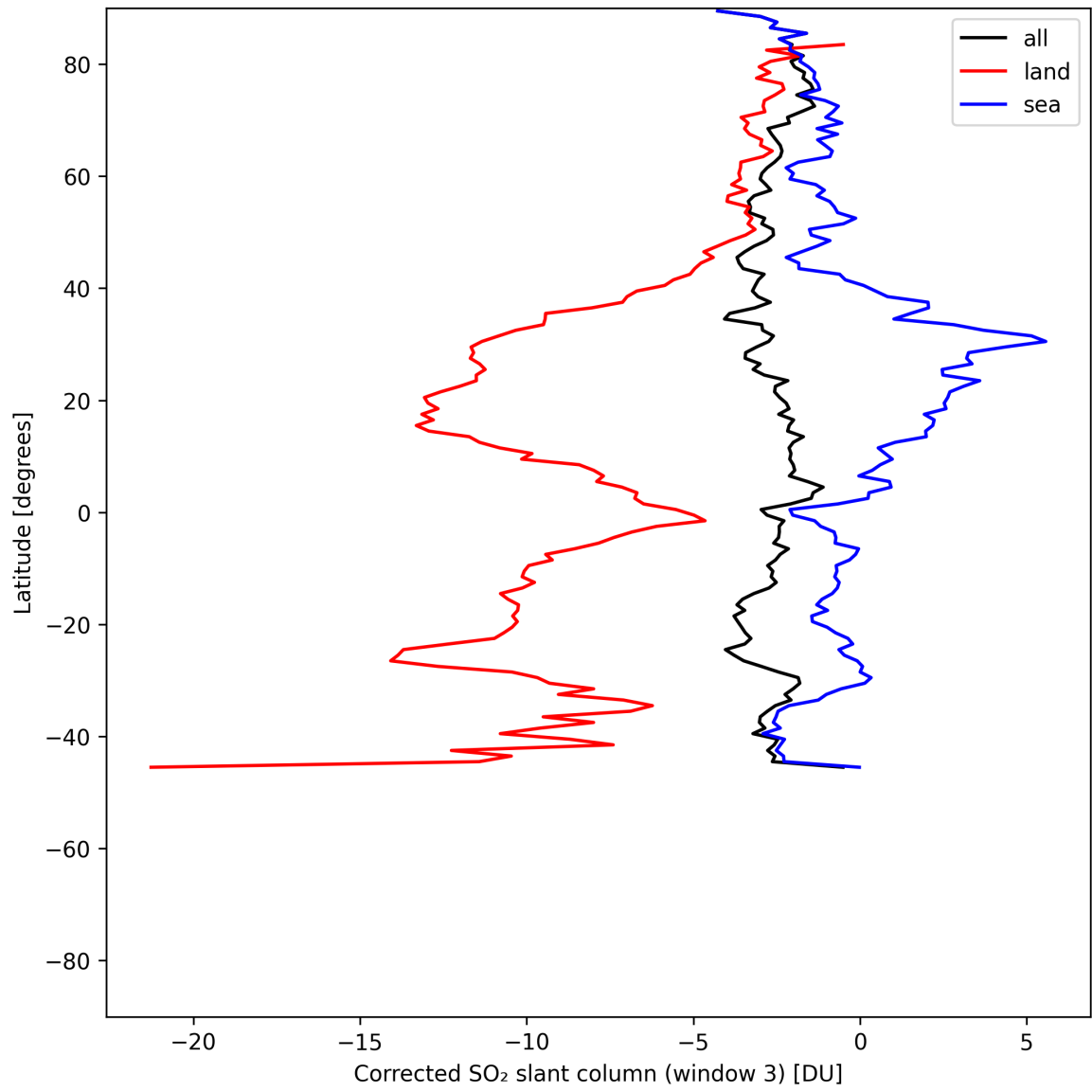


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-06-17 to 2025-06-17.

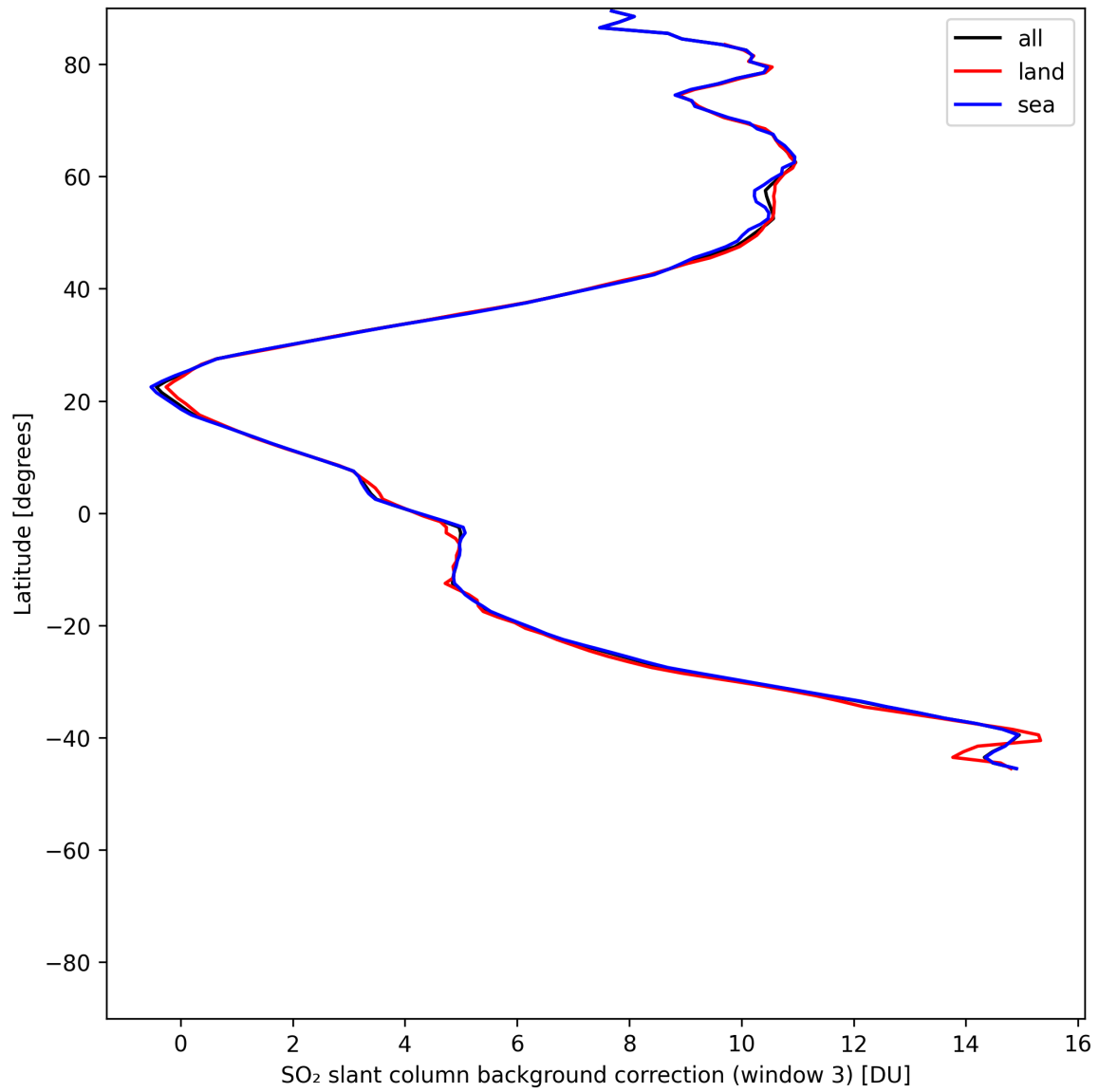


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-06-17 to 2025-06-17.

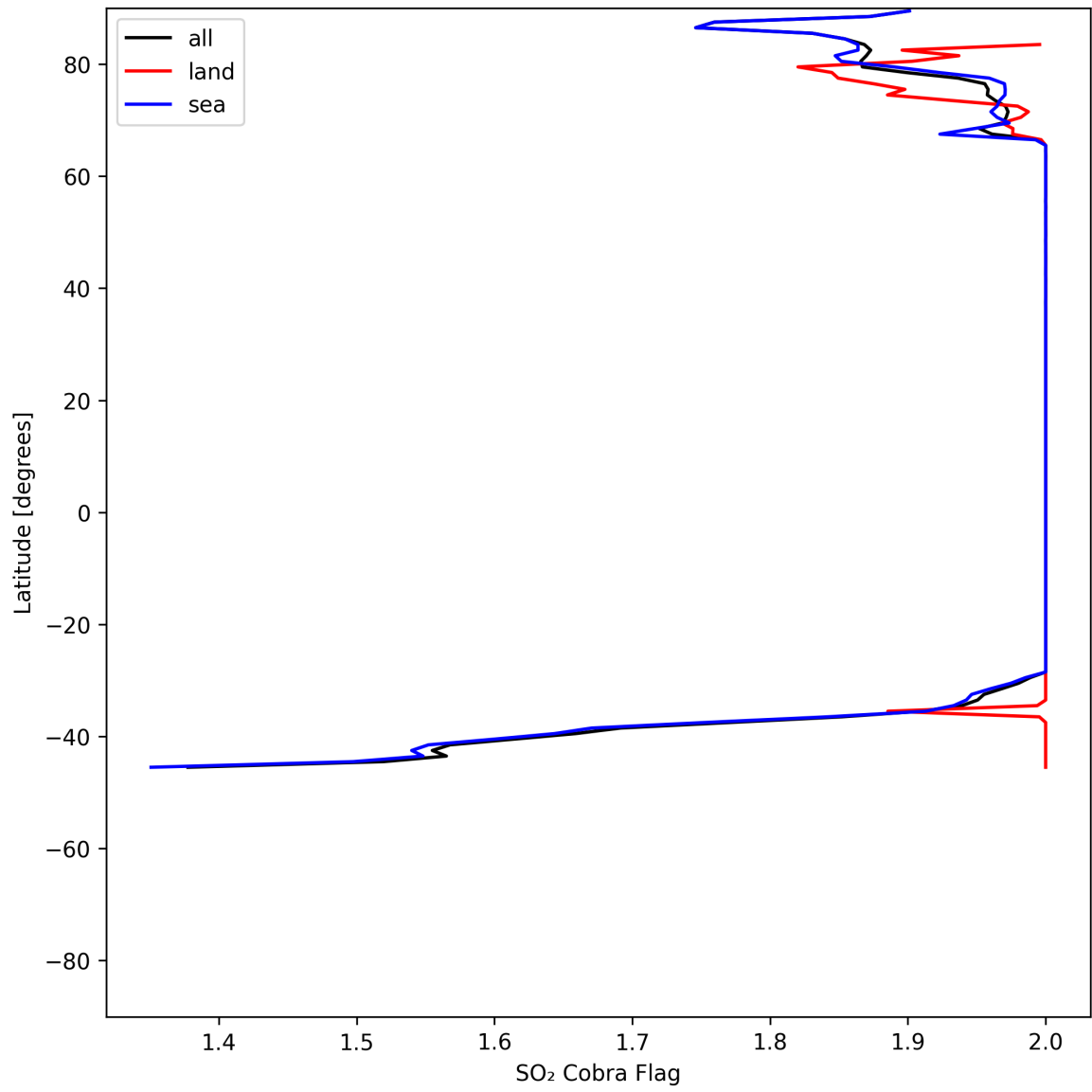


Figure 48: Zonal average of "SO₂ Cobra Flag" for 2025-06-17 to 2025-06-17.

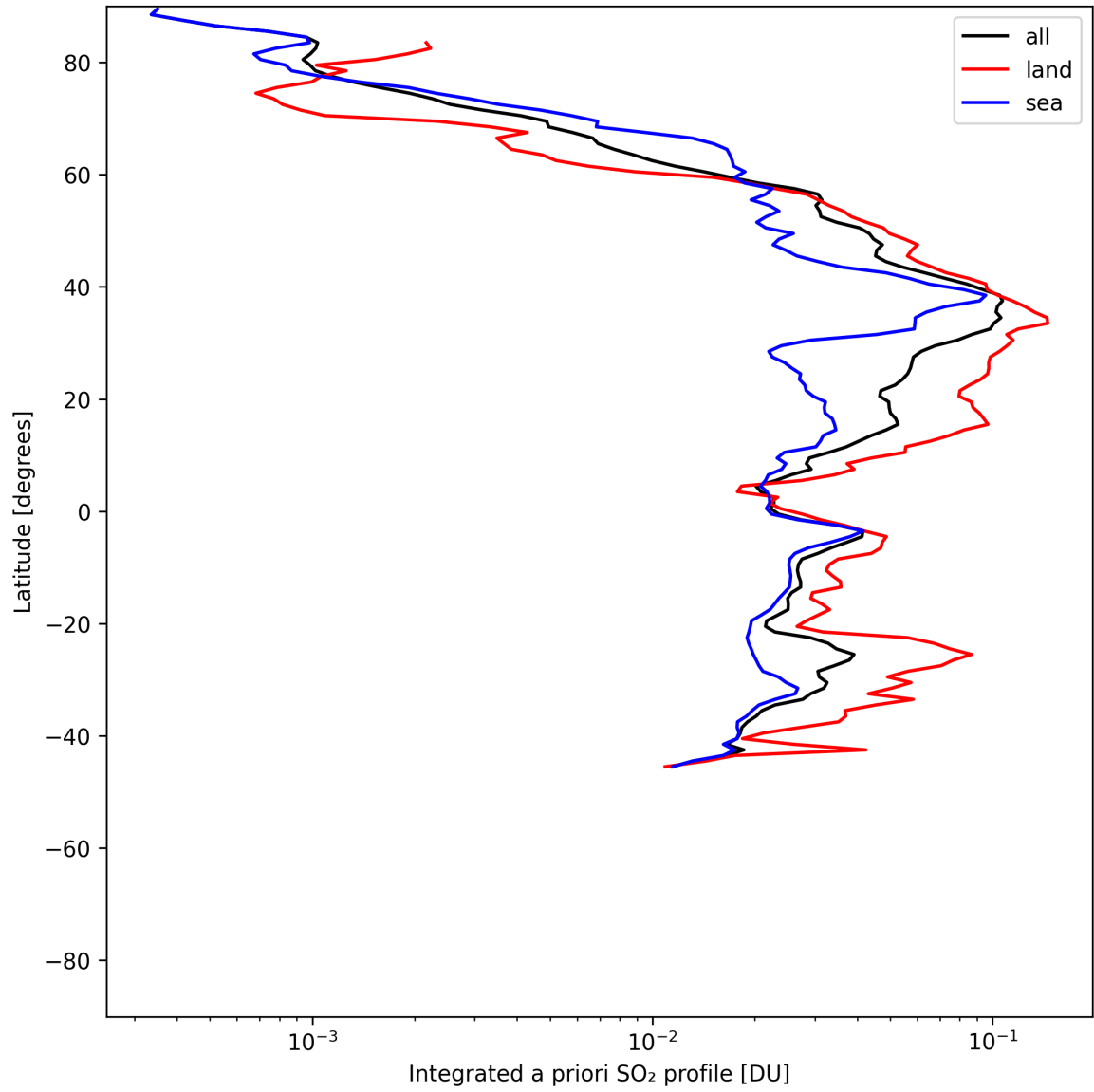


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-06-17 to 2025-06-17.

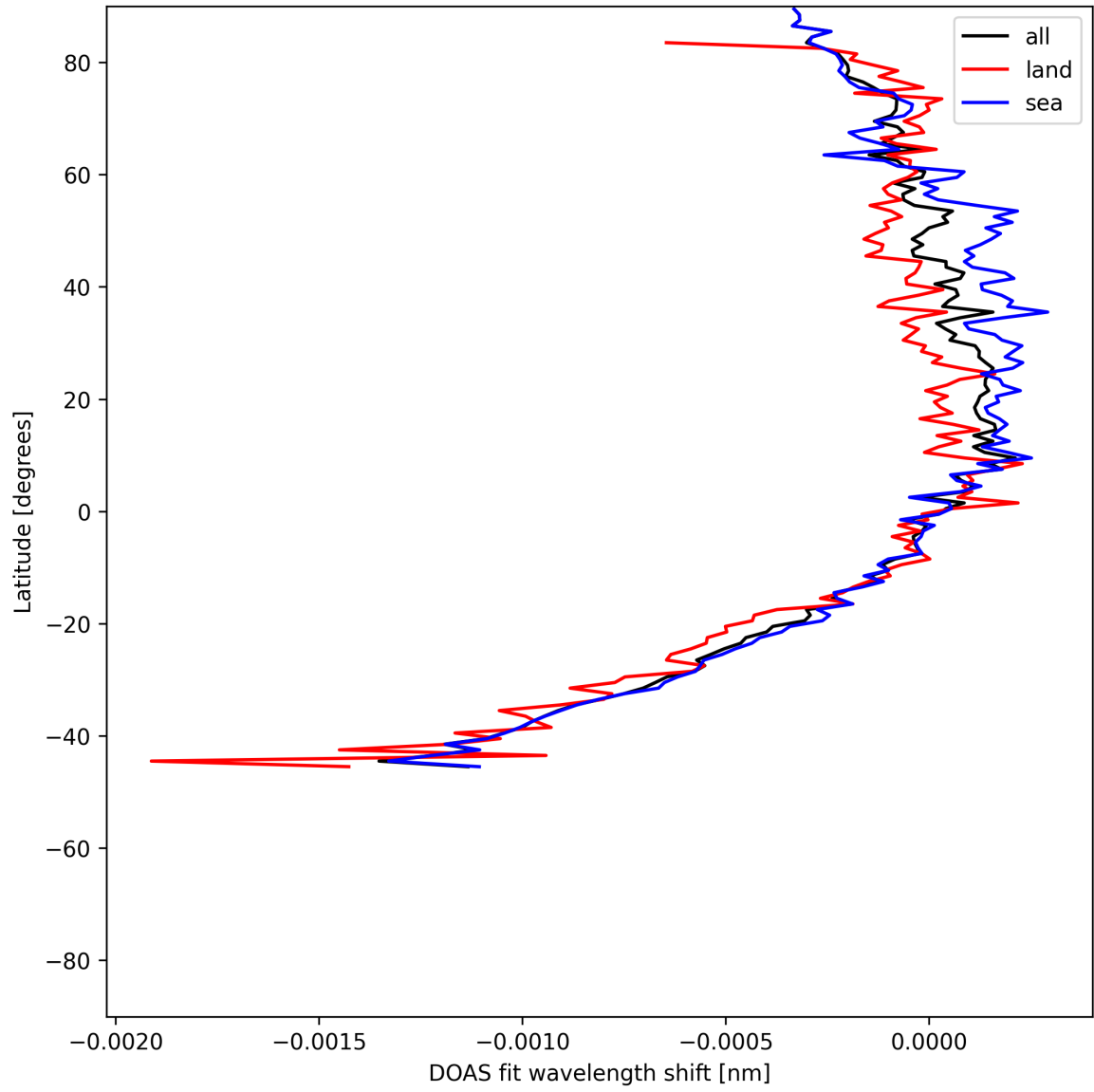


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-06-17 to 2025-06-17.

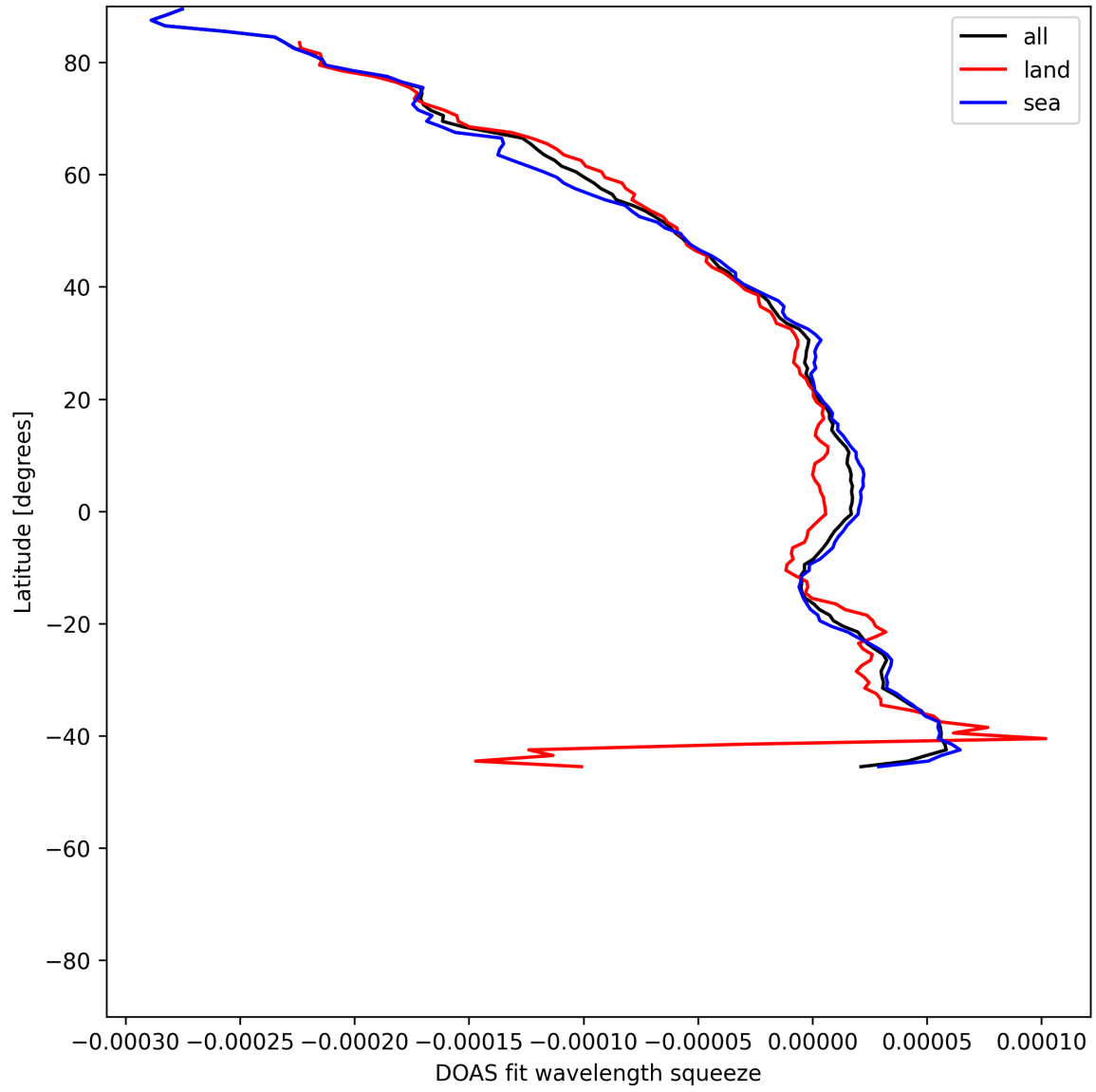


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-06-17 to 2025-06-17.

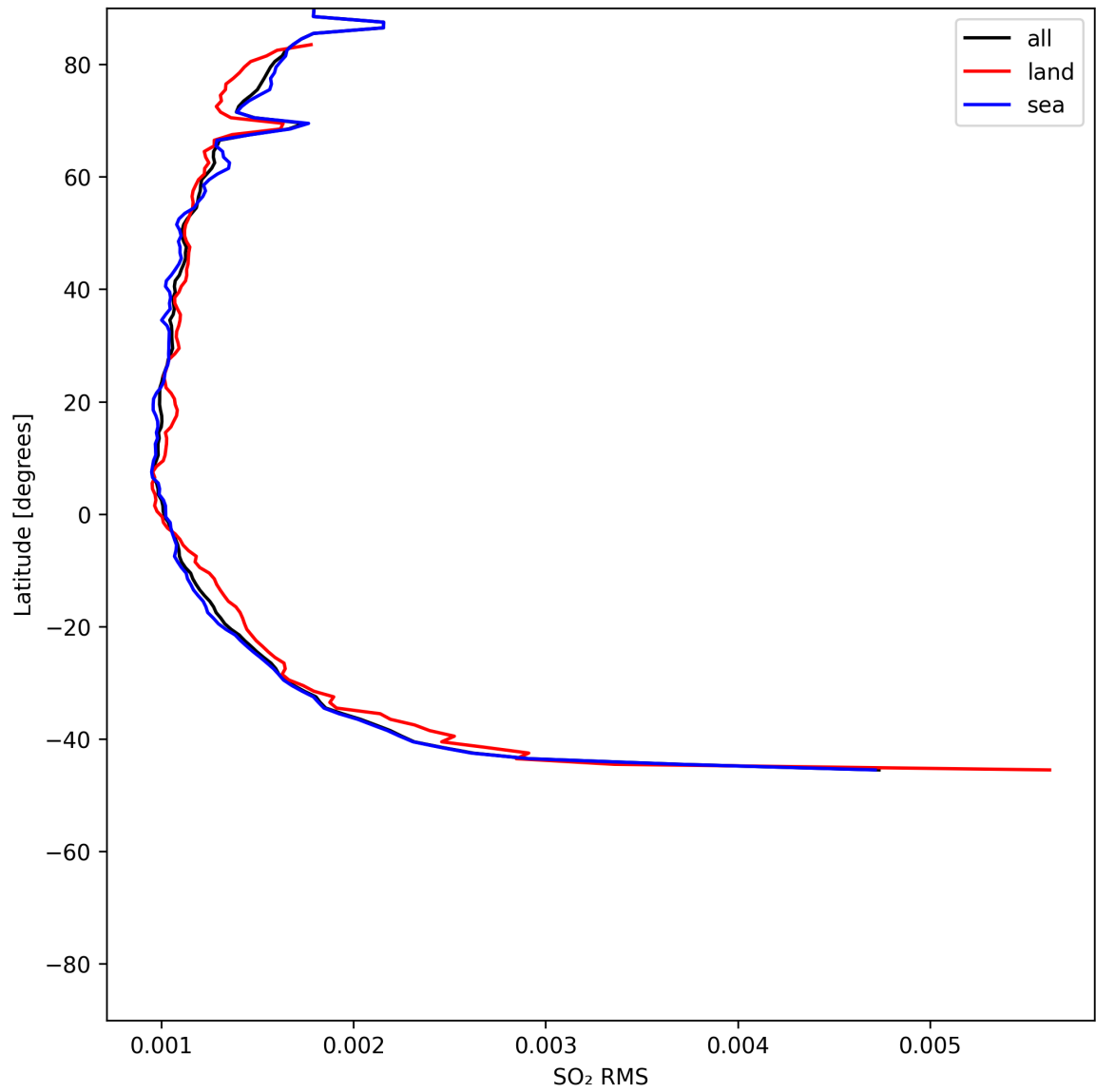


Figure 52: Zonal average of “SO₂ RMS” for 2025-06-17 to 2025-06-17.

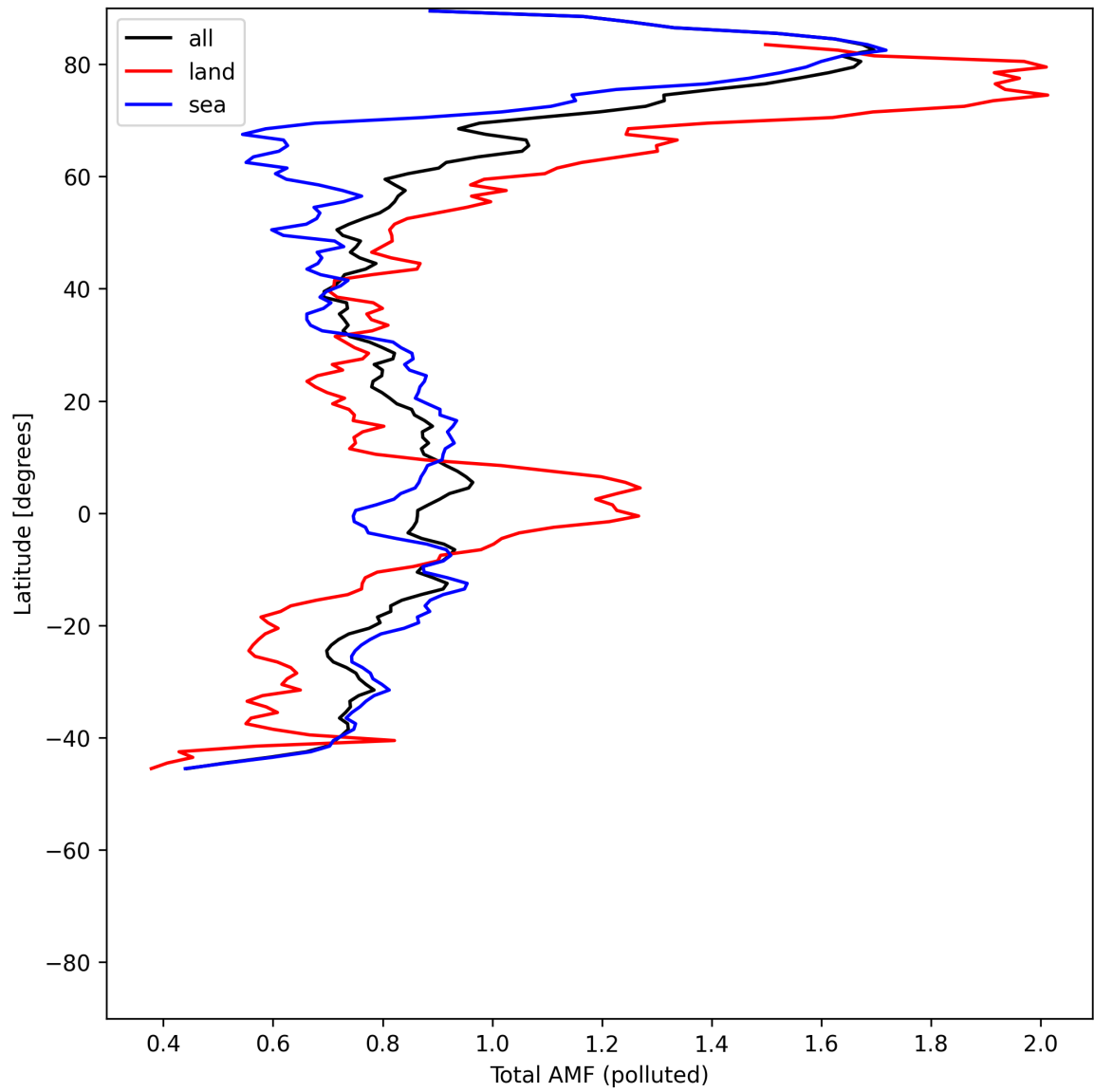


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-06-17 to 2025-06-17.

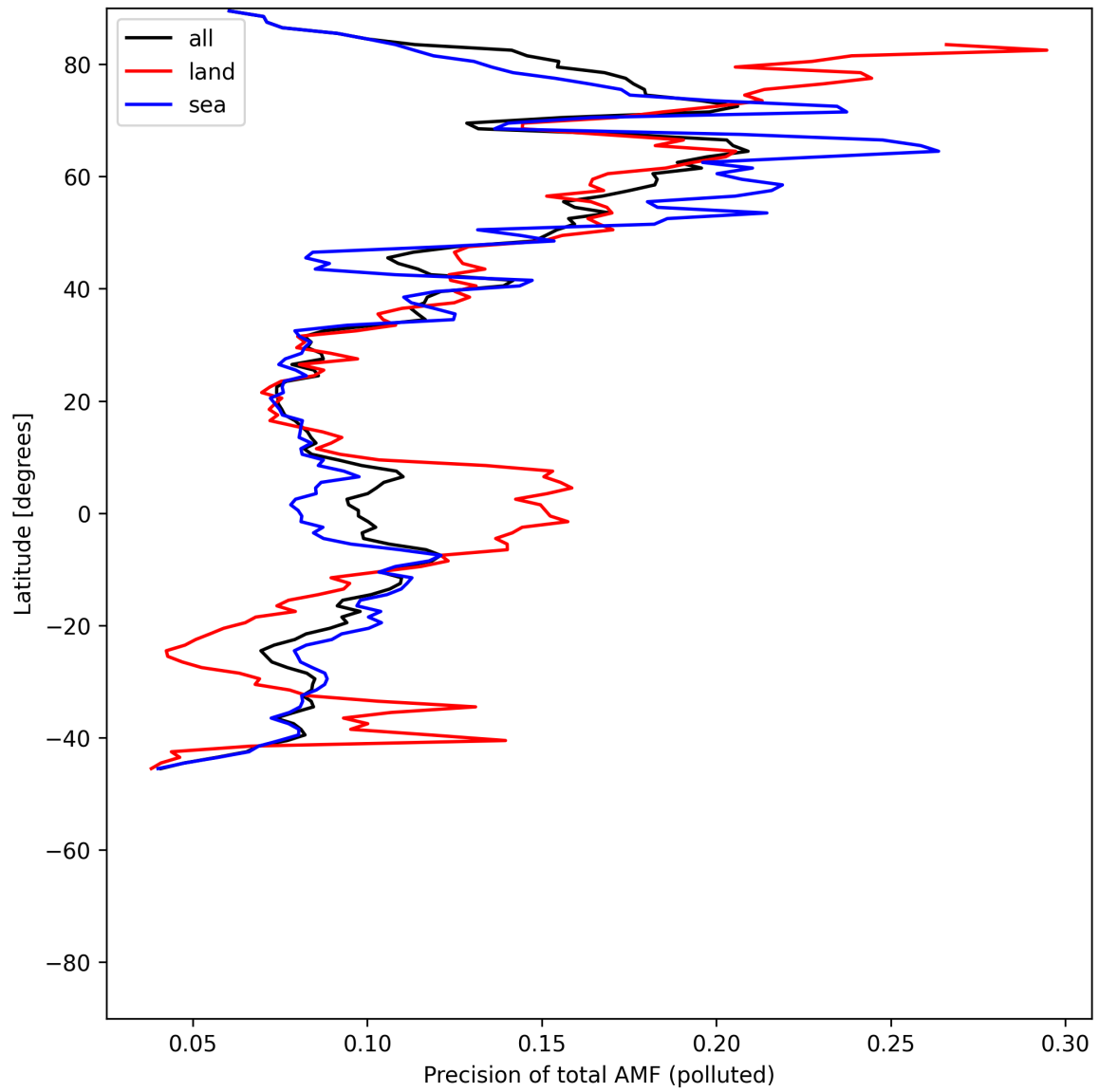


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-06-17 to 2025-06-17.

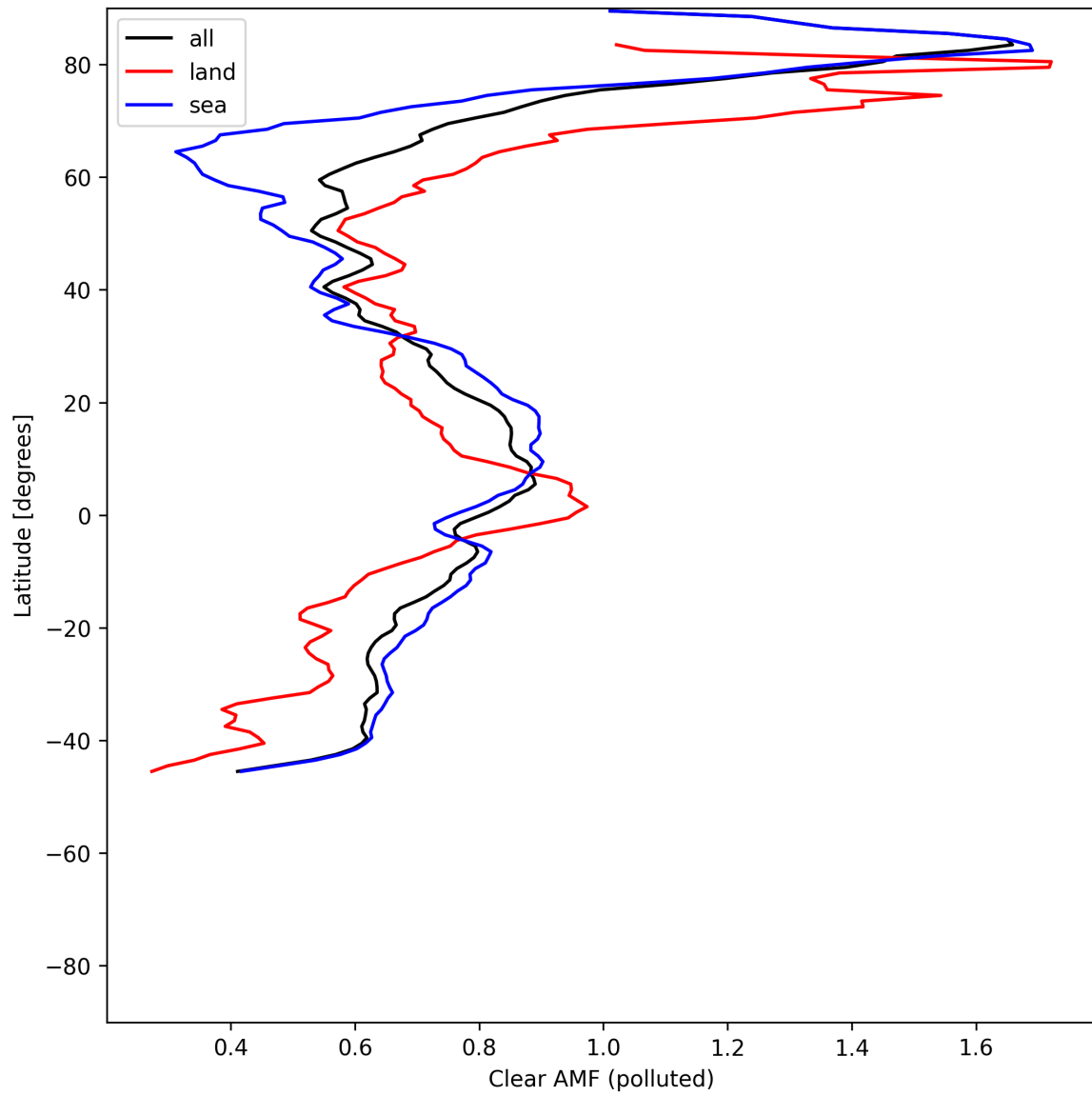


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-06-17 to 2025-06-17.

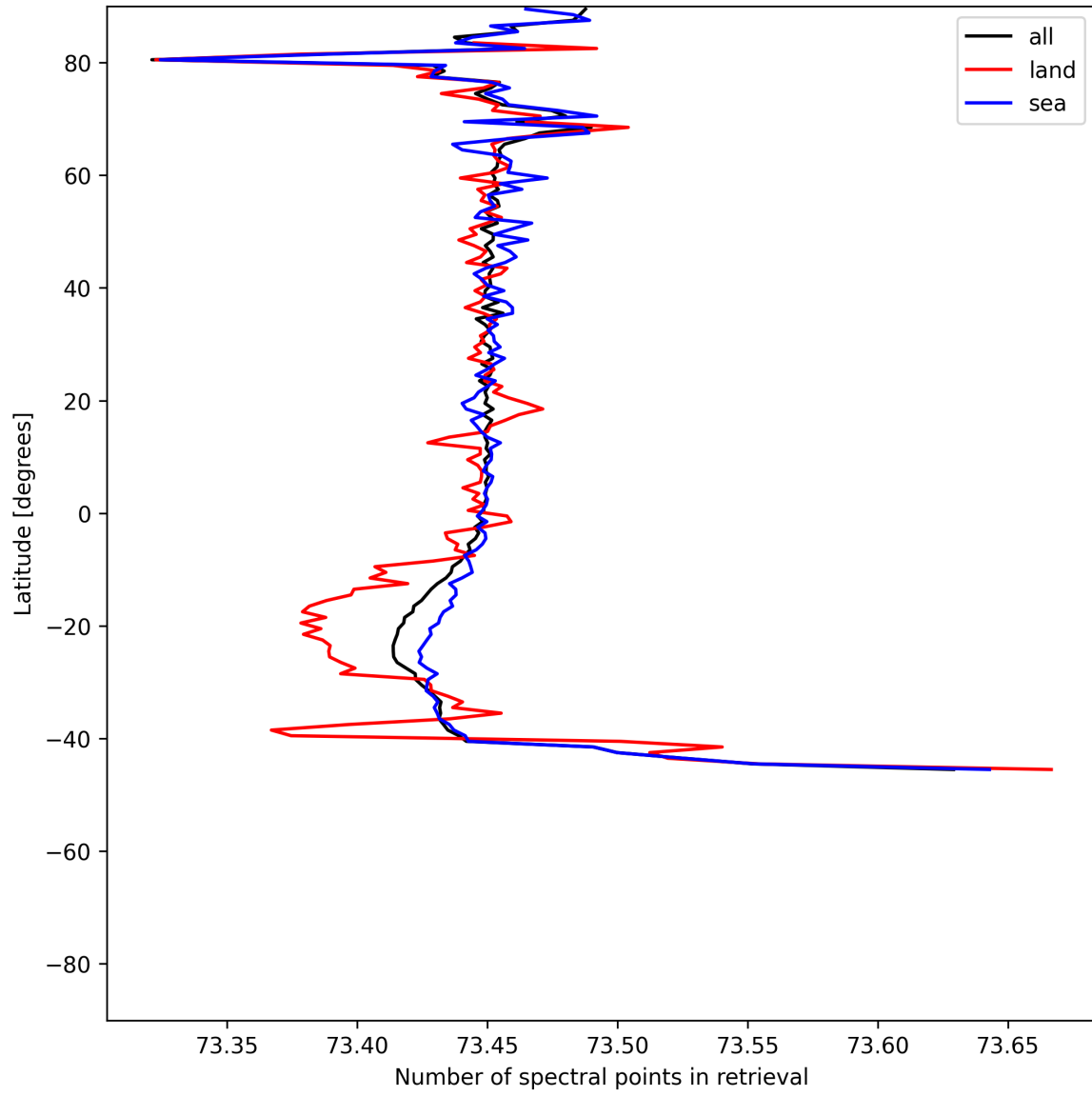


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-06-17 to 2025-06-17.

8 Histograms

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

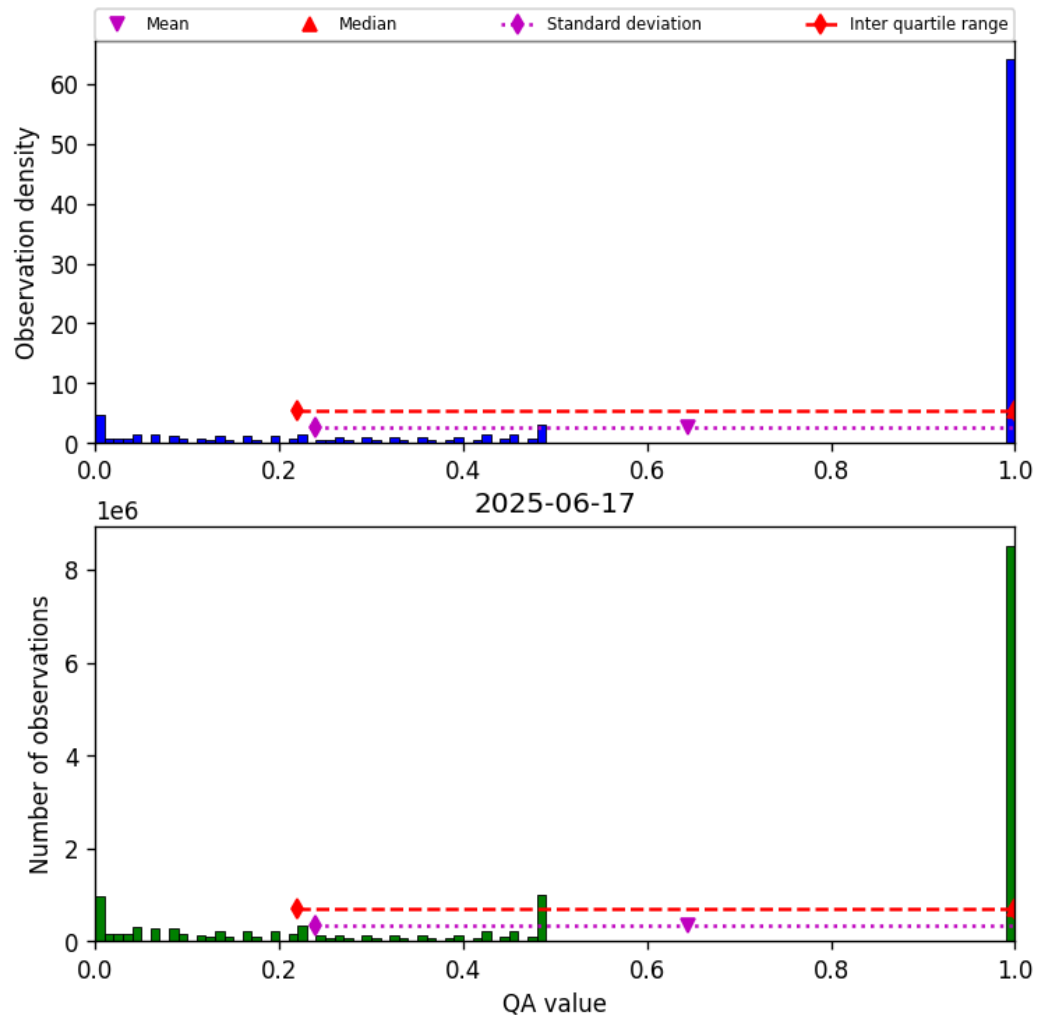


Figure 57: Histogram of “QA value” for 2025-06-17 to 2025-06-17

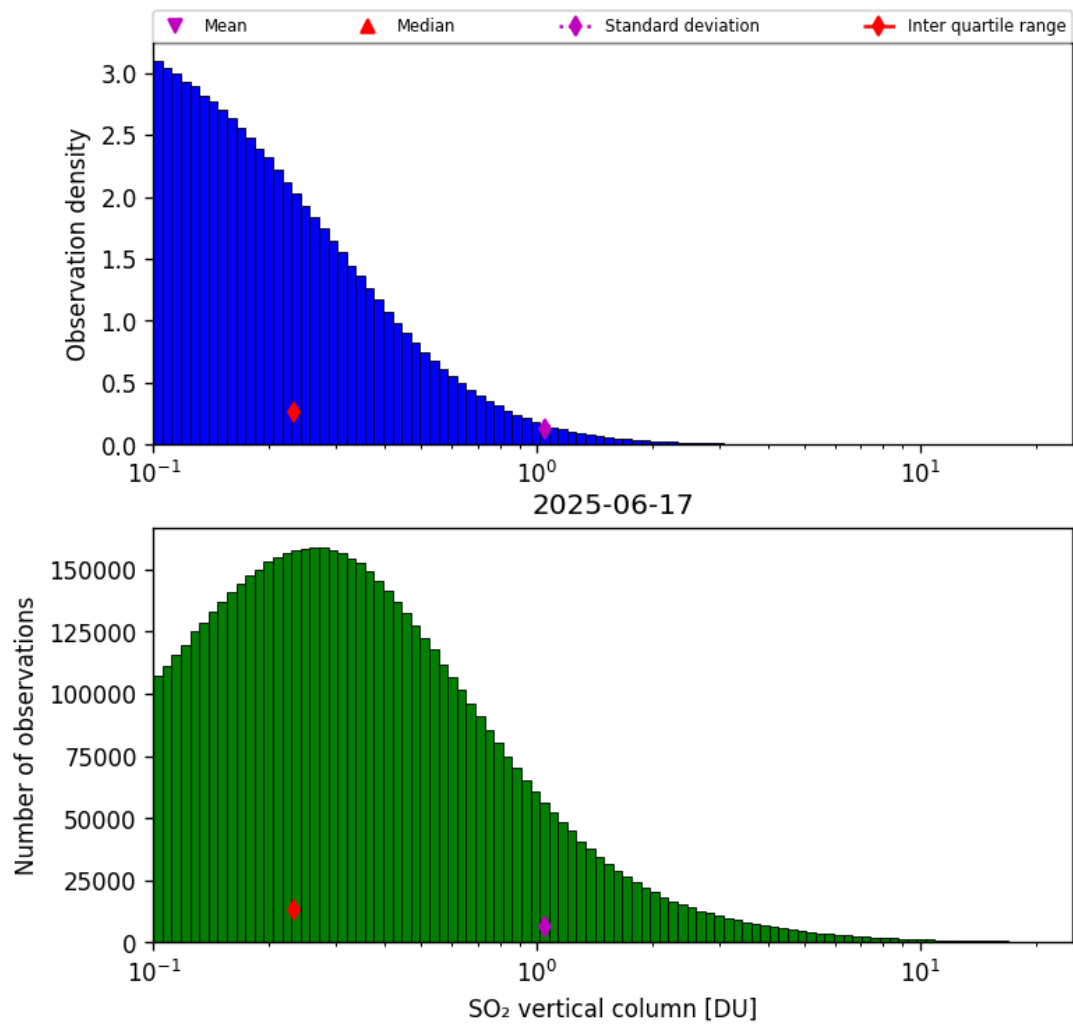


Figure 58: Histogram of “SO₂ vertical column” for 2025-06-17 to 2025-06-17

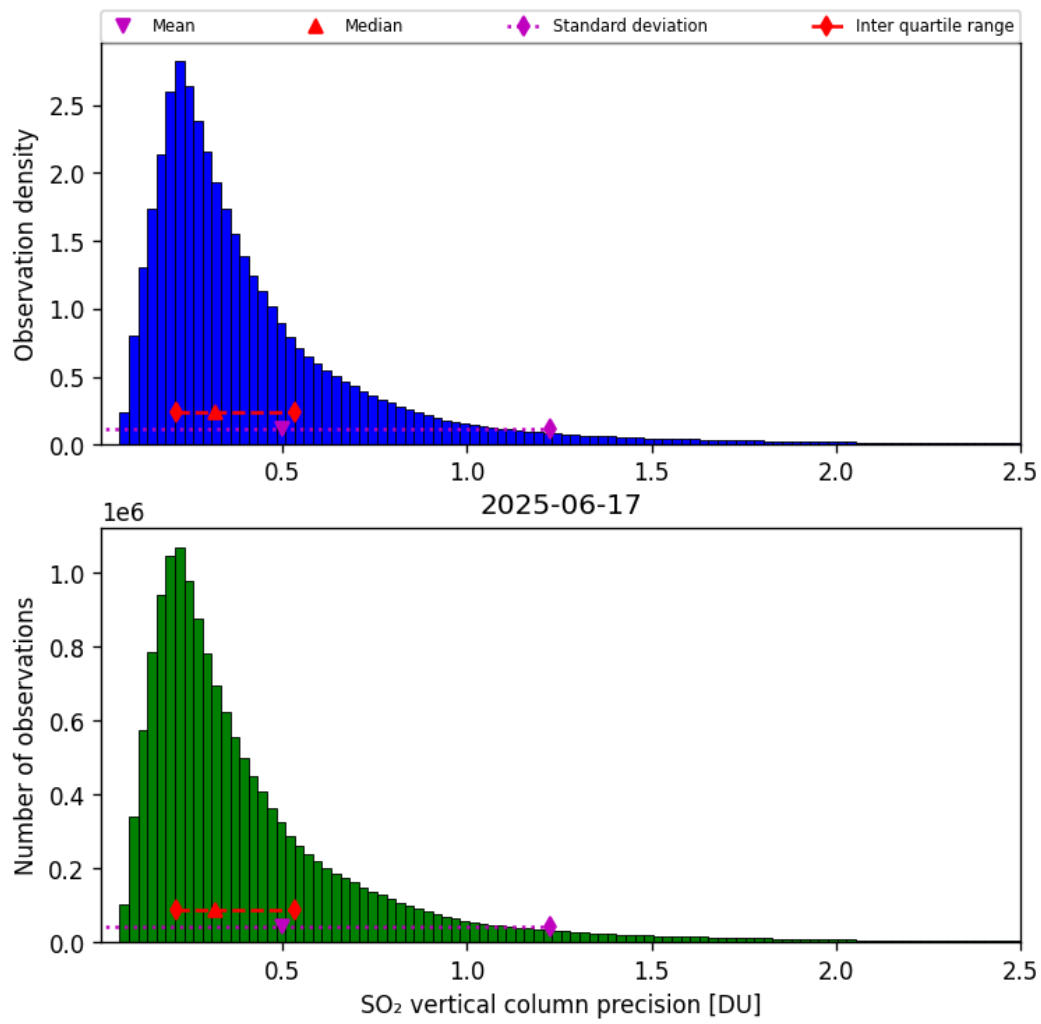


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-06-17 to 2025-06-17

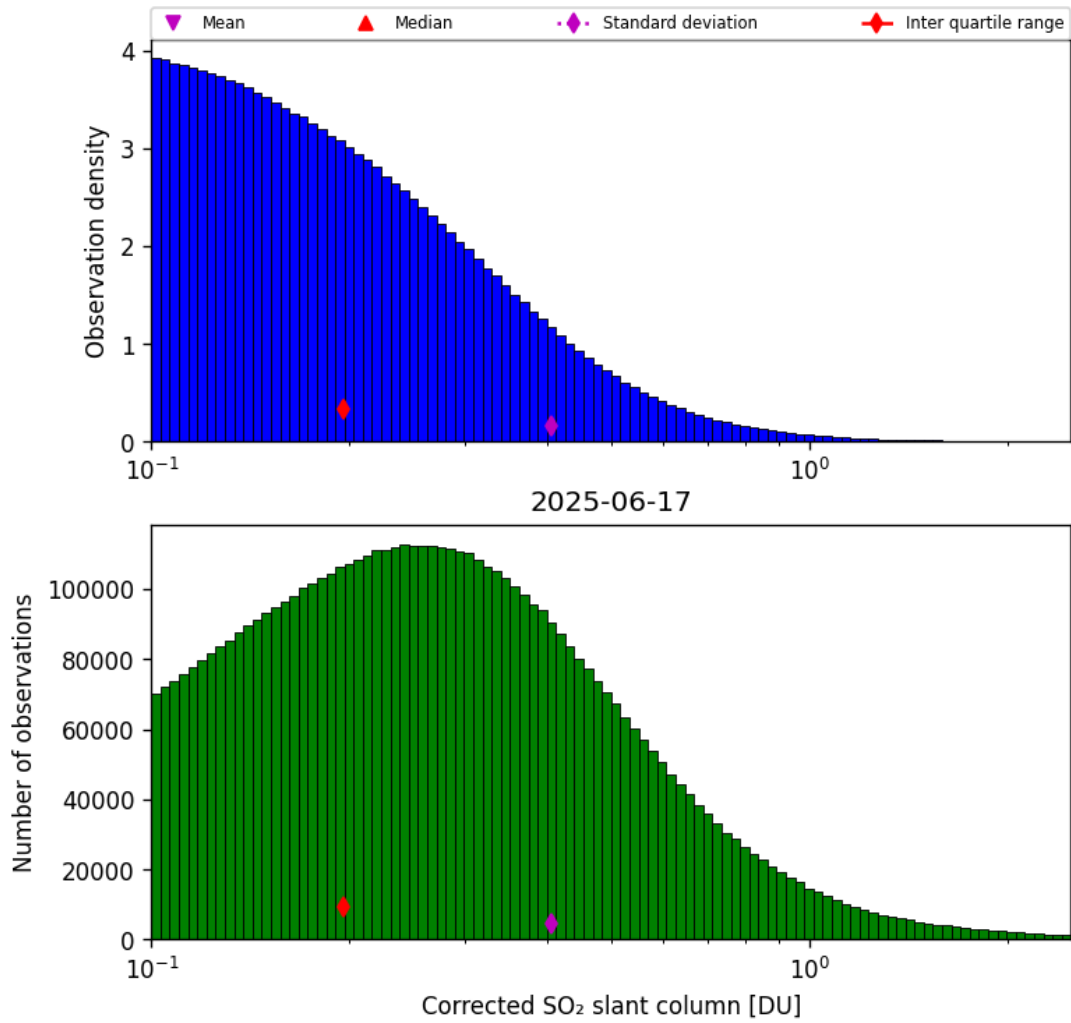


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-06-17 to 2025-06-17

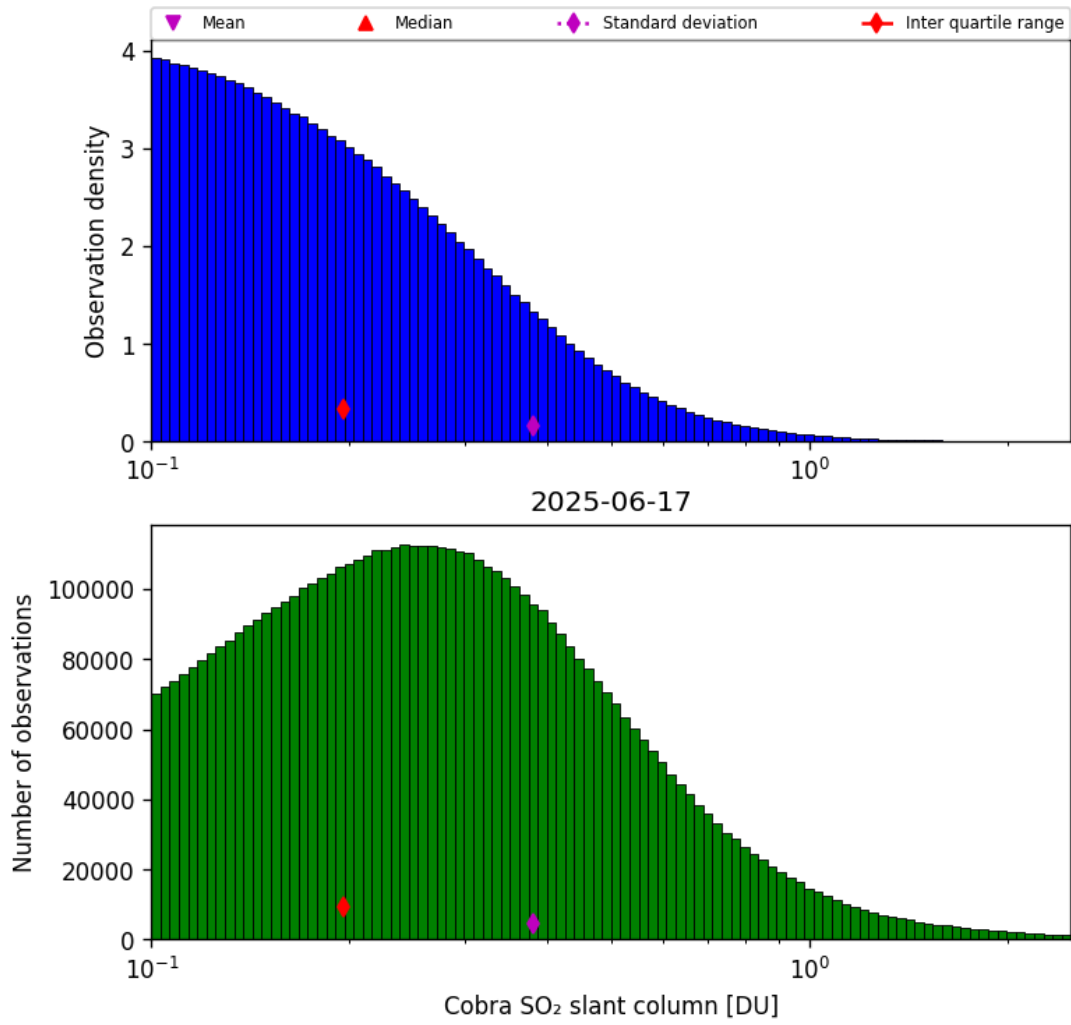


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-06-17 to 2025-06-17

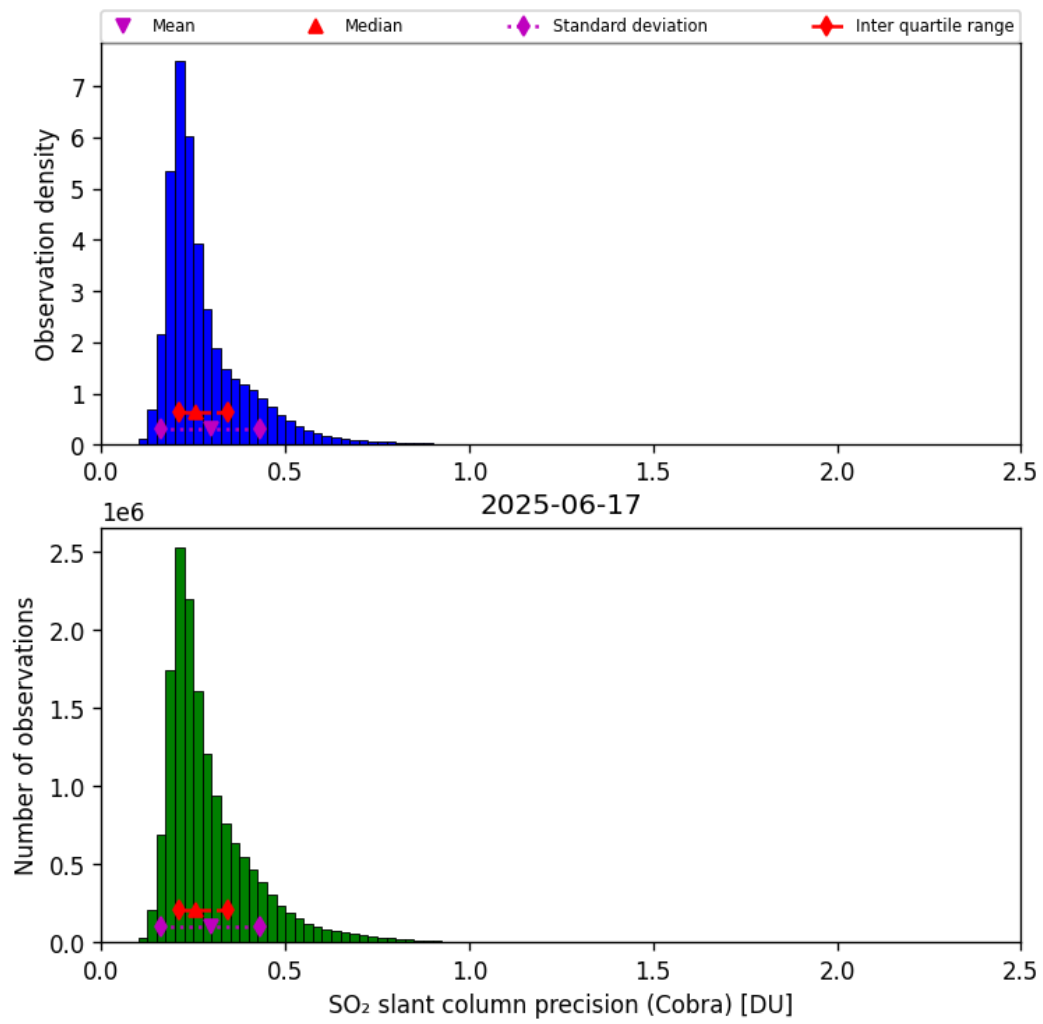


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-06-17 to 2025-06-17

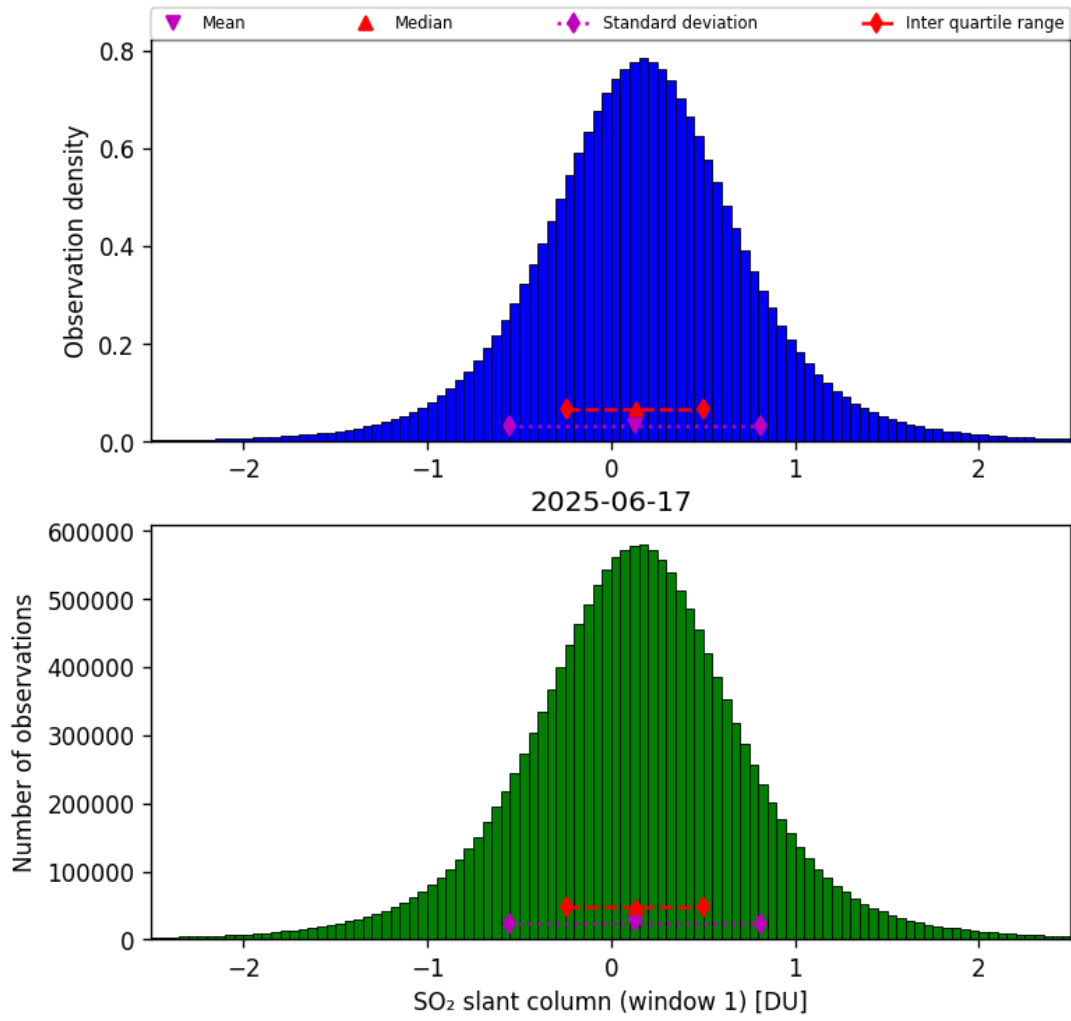


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-06-17 to 2025-06-17

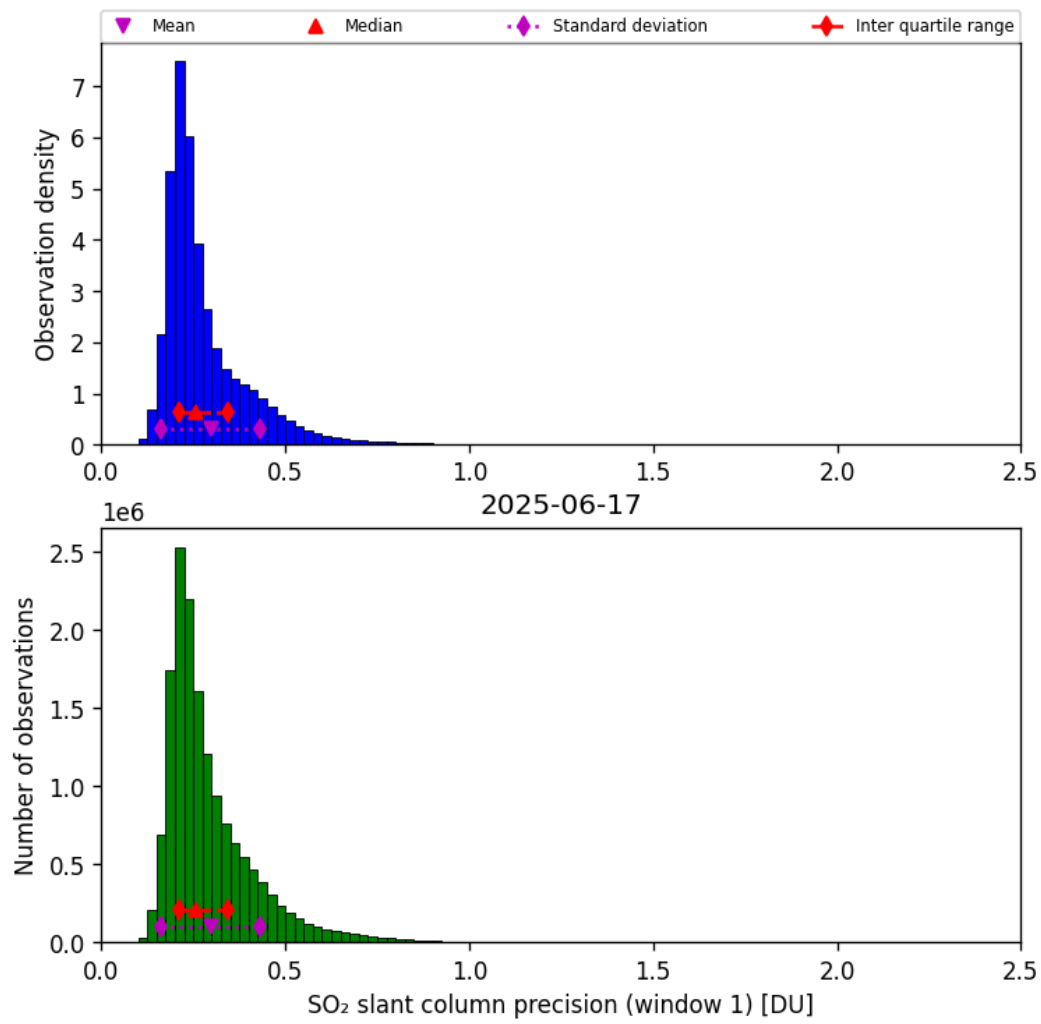


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-06-17 to 2025-06-17

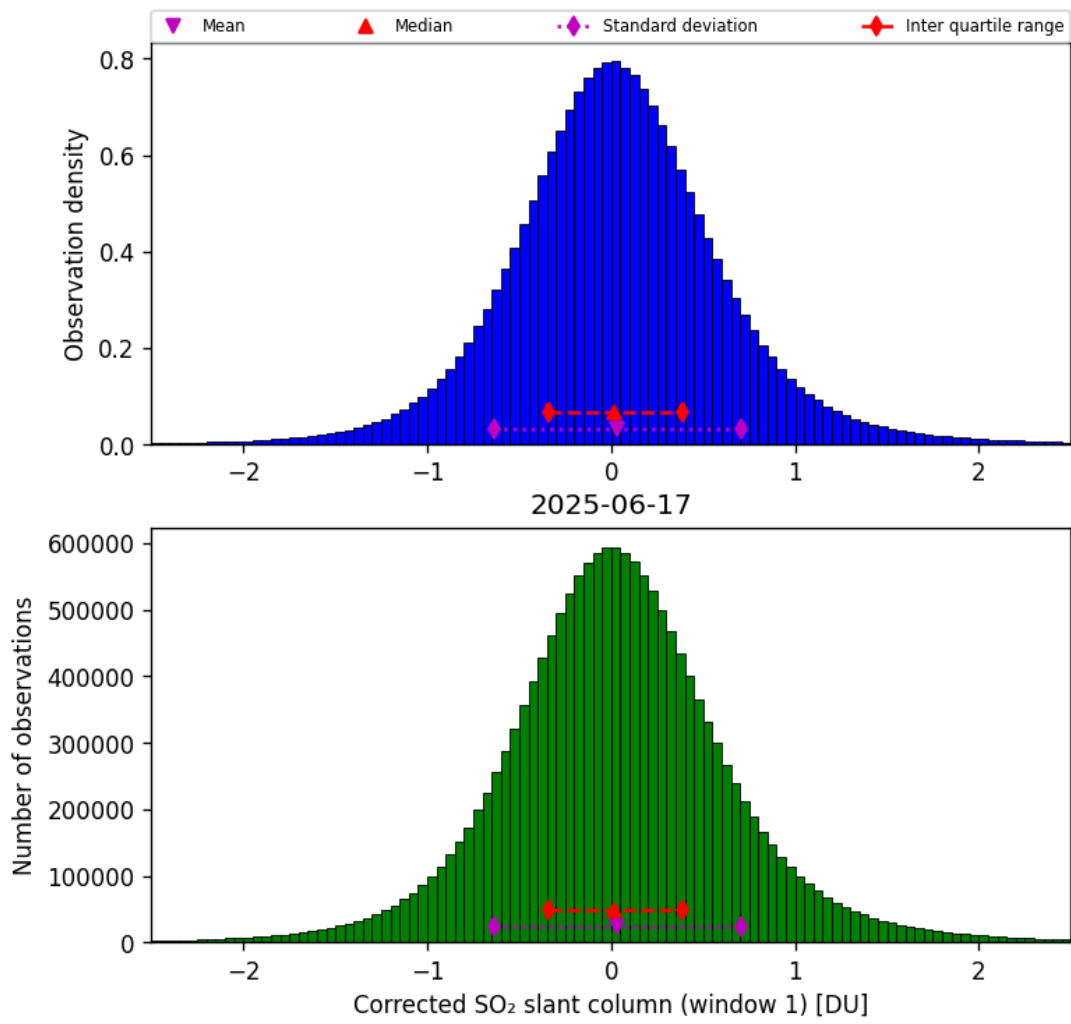


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-06-17 to 2025-06-17

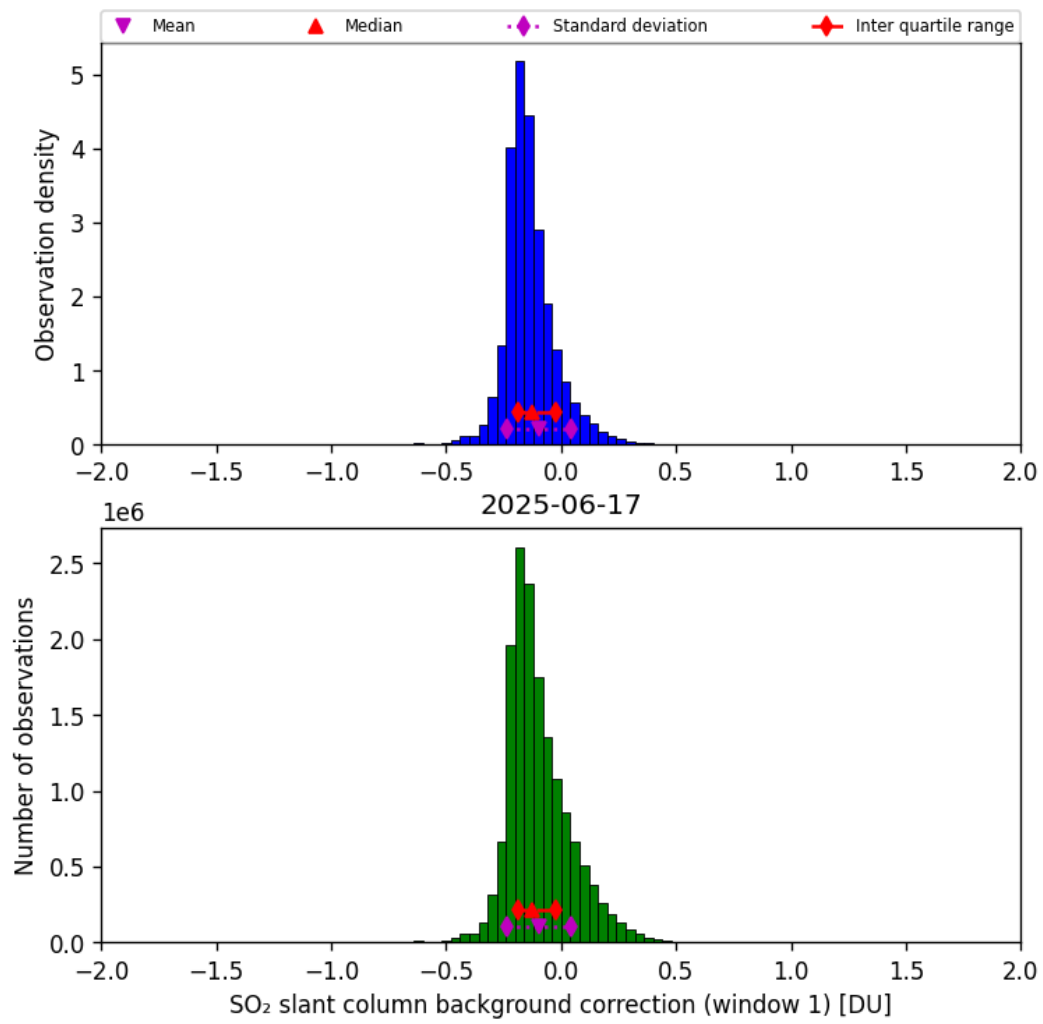


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-06-17 to 2025-06-17

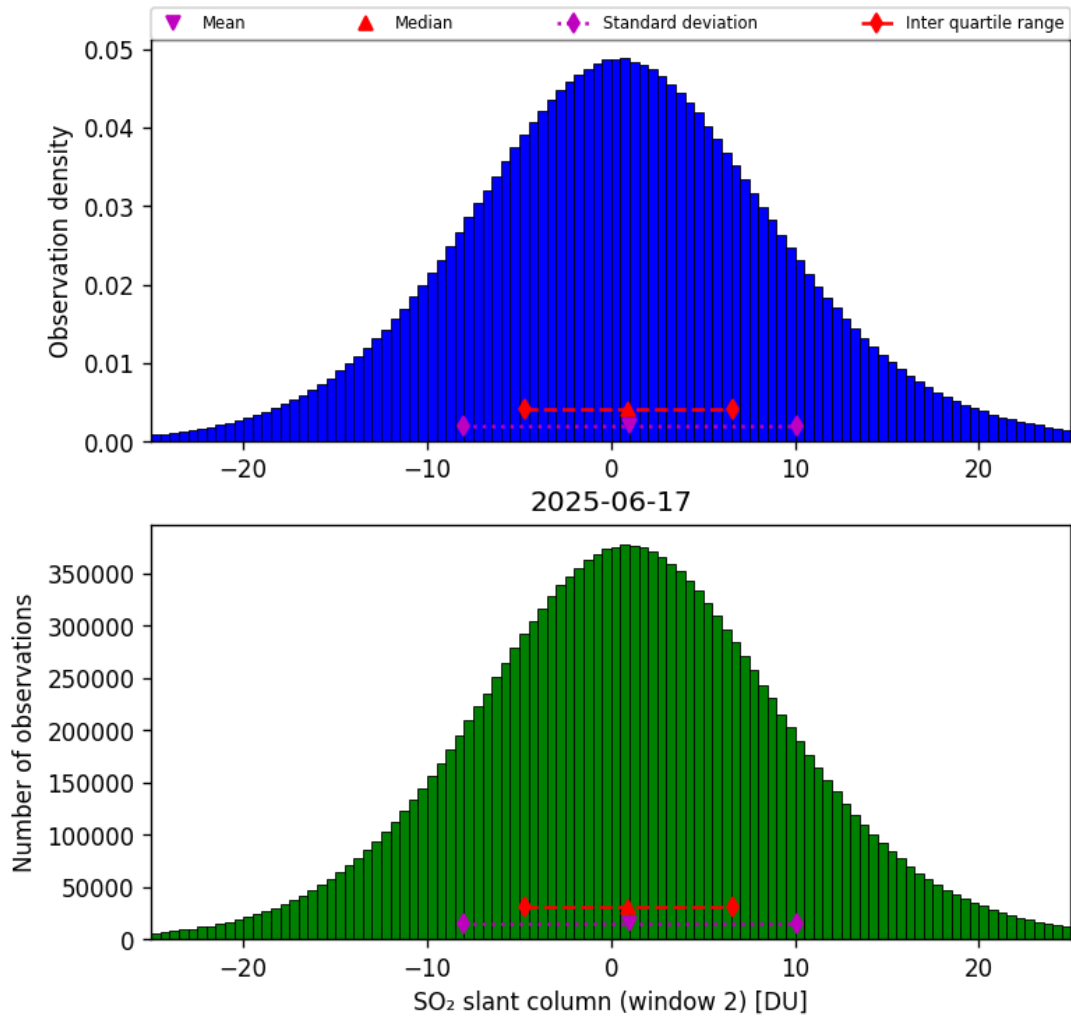


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-06-17 to 2025-06-17

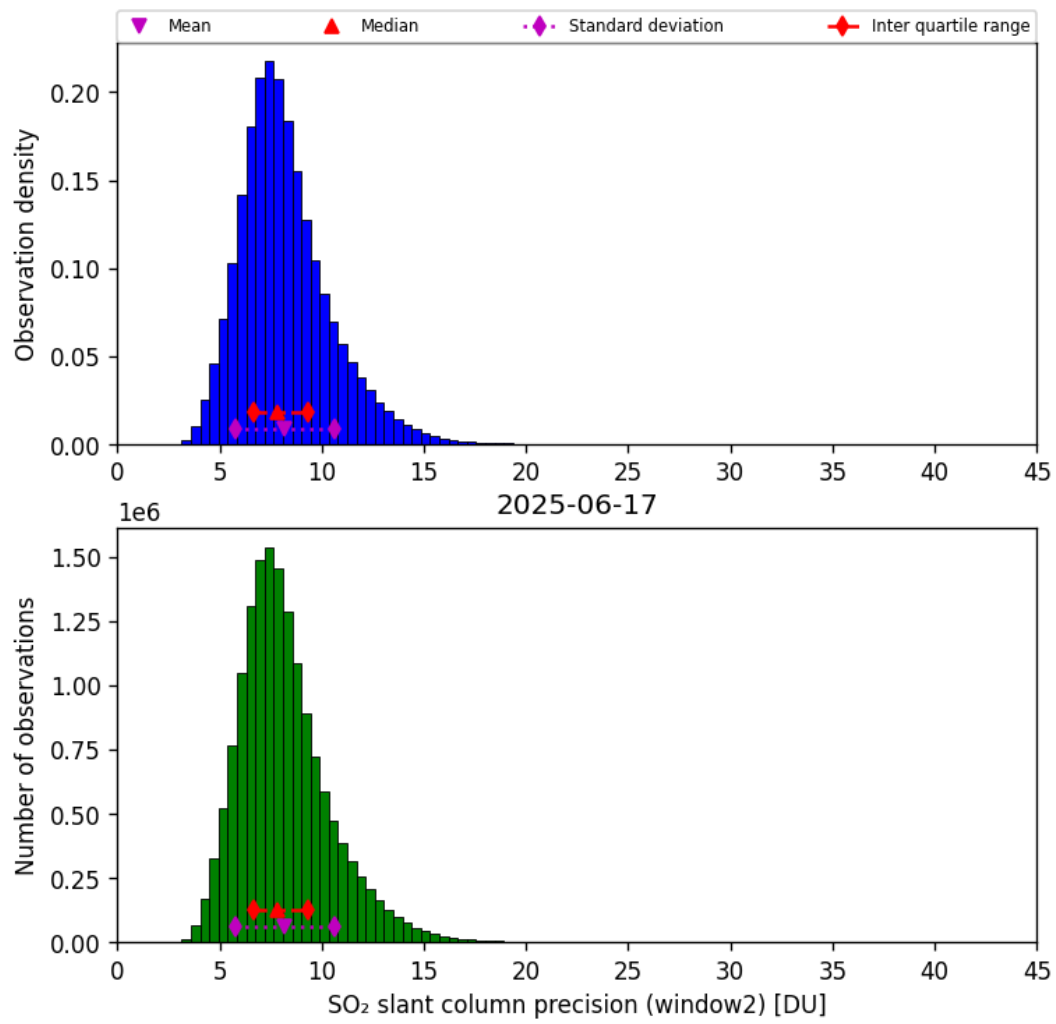


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-06-17 to 2025-06-17

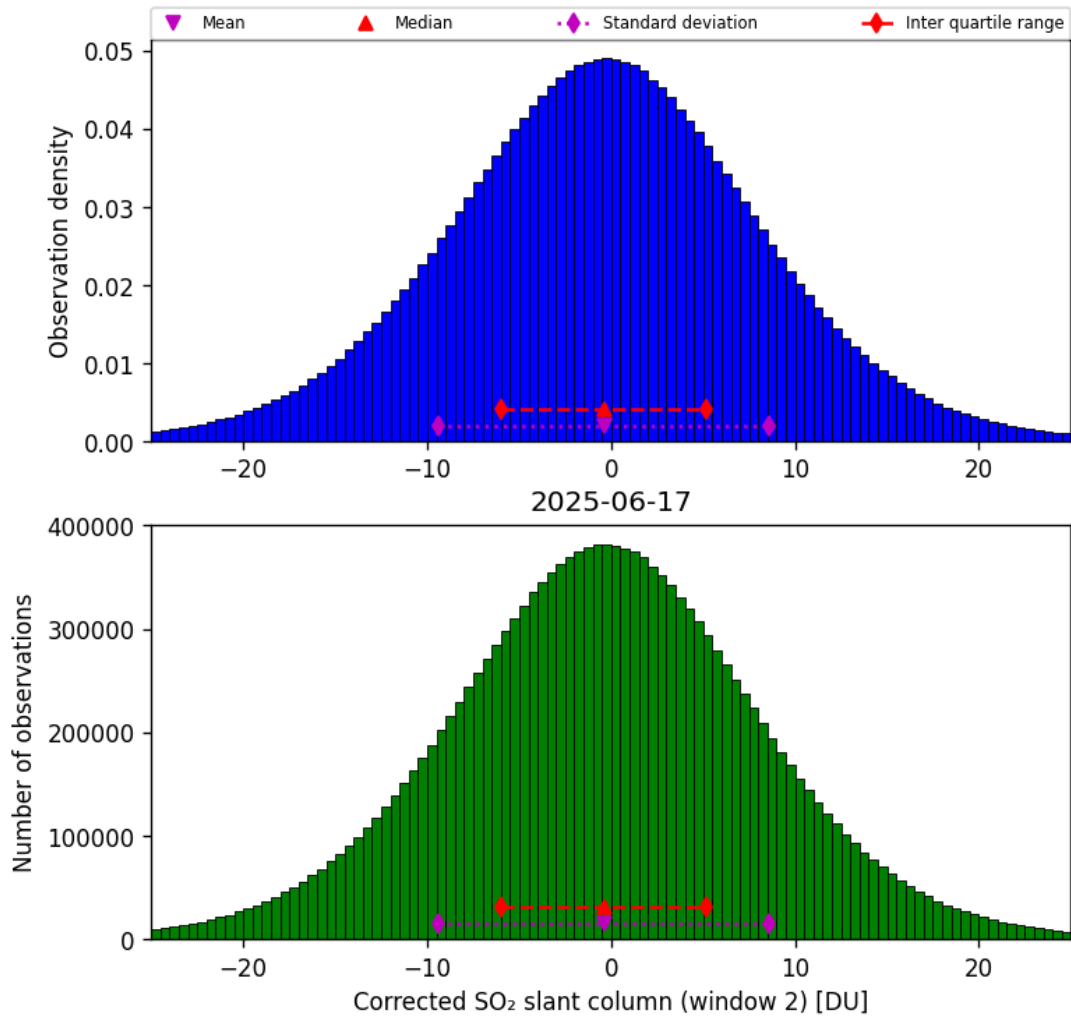


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-06-17 to 2025-06-17

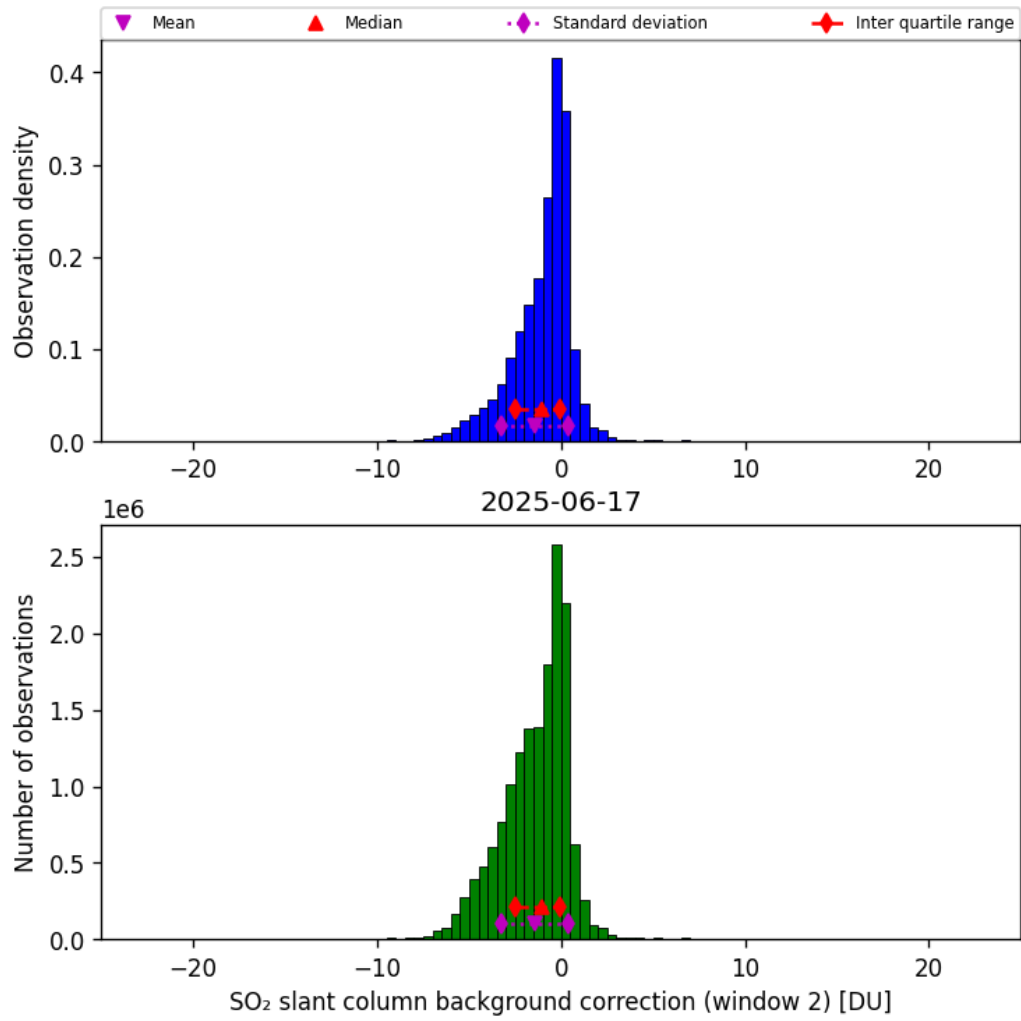


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-06-17 to 2025-06-17

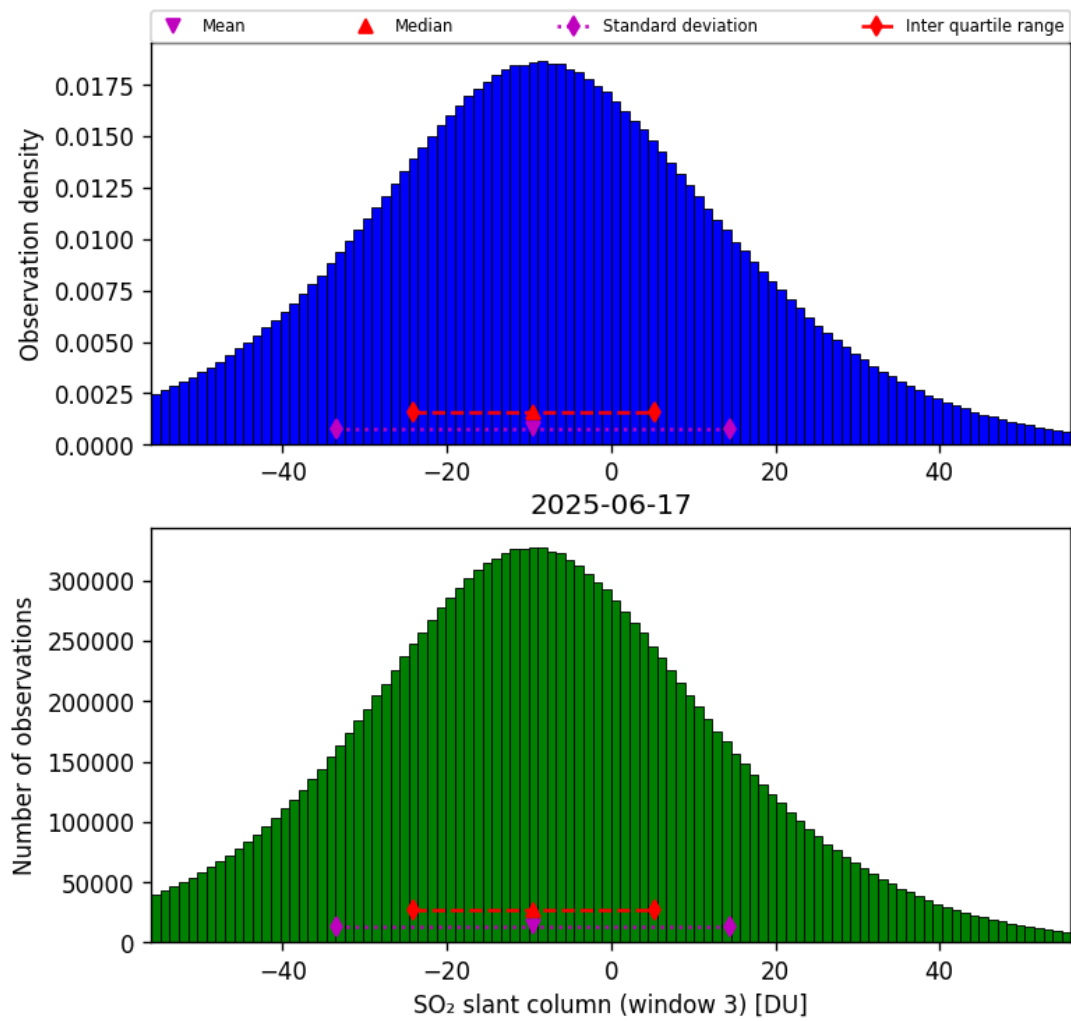


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-06-17 to 2025-06-17

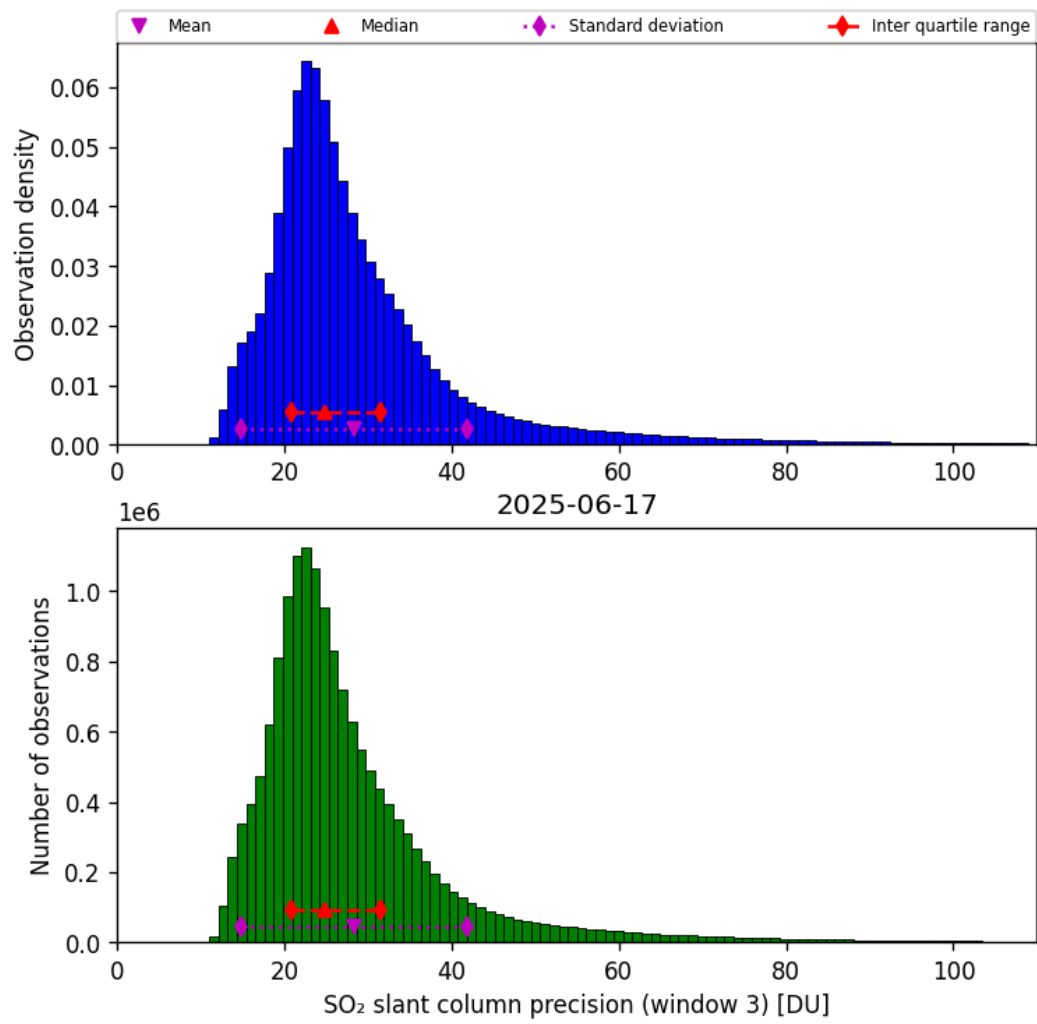


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-06-17 to 2025-06-17

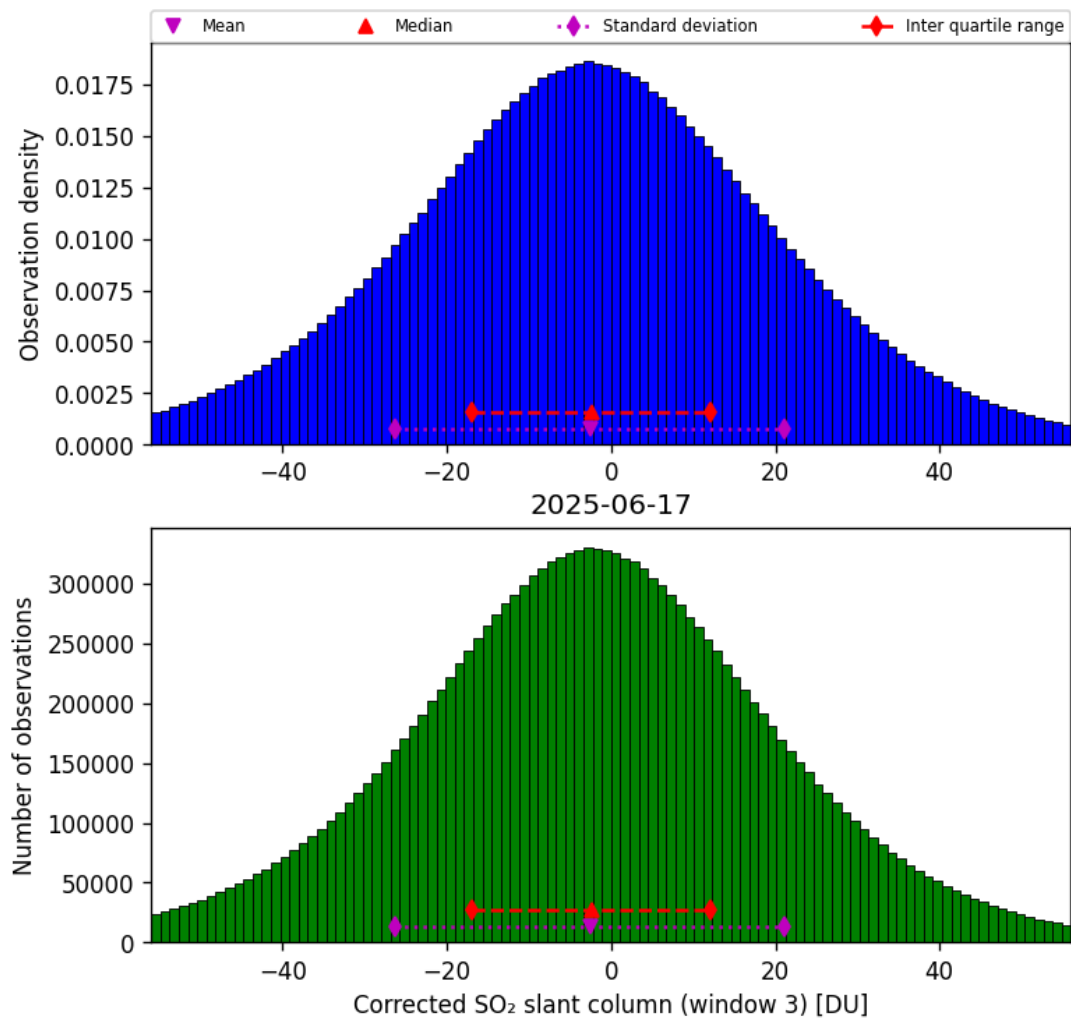


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-06-17 to 2025-06-17

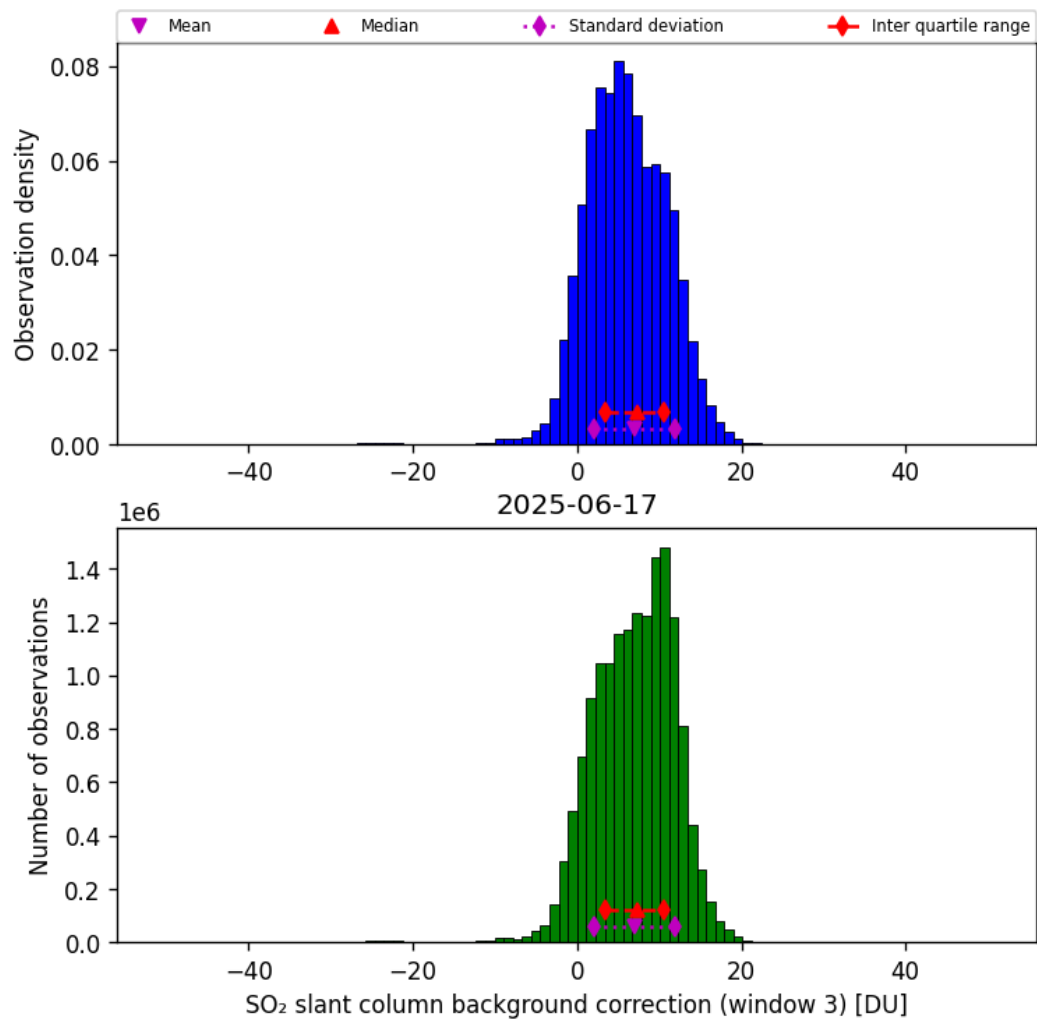


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-06-17 to 2025-06-17

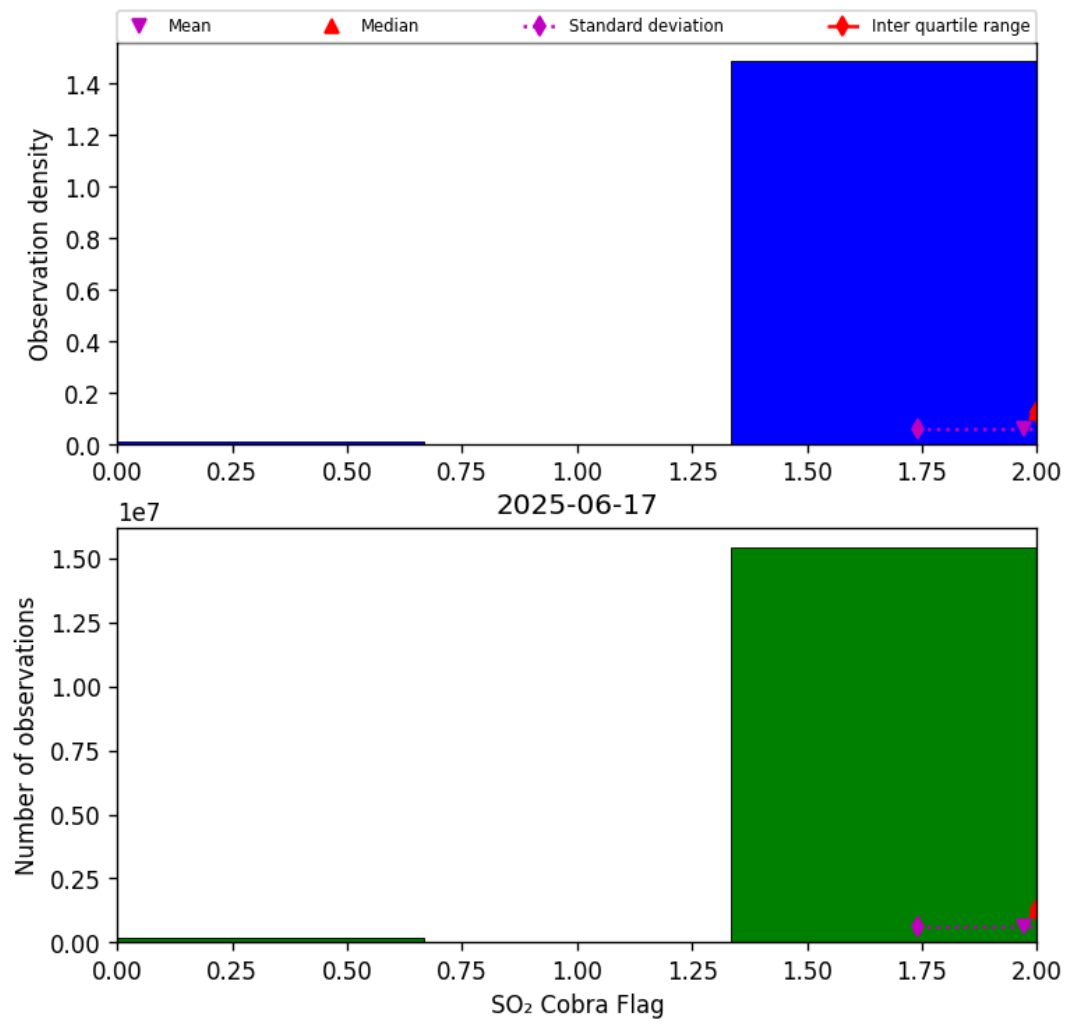


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-06-17 to 2025-06-17

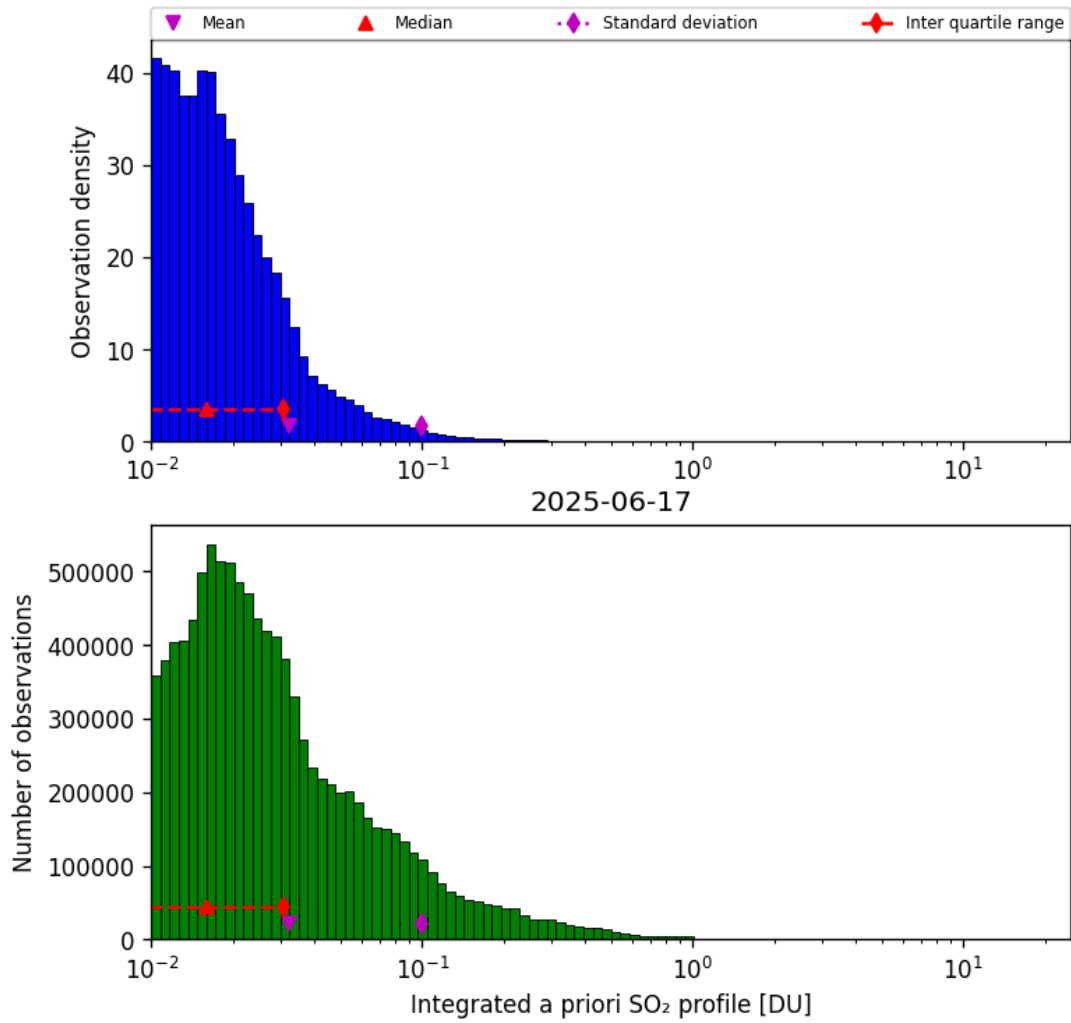


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-06-17 to 2025-06-17

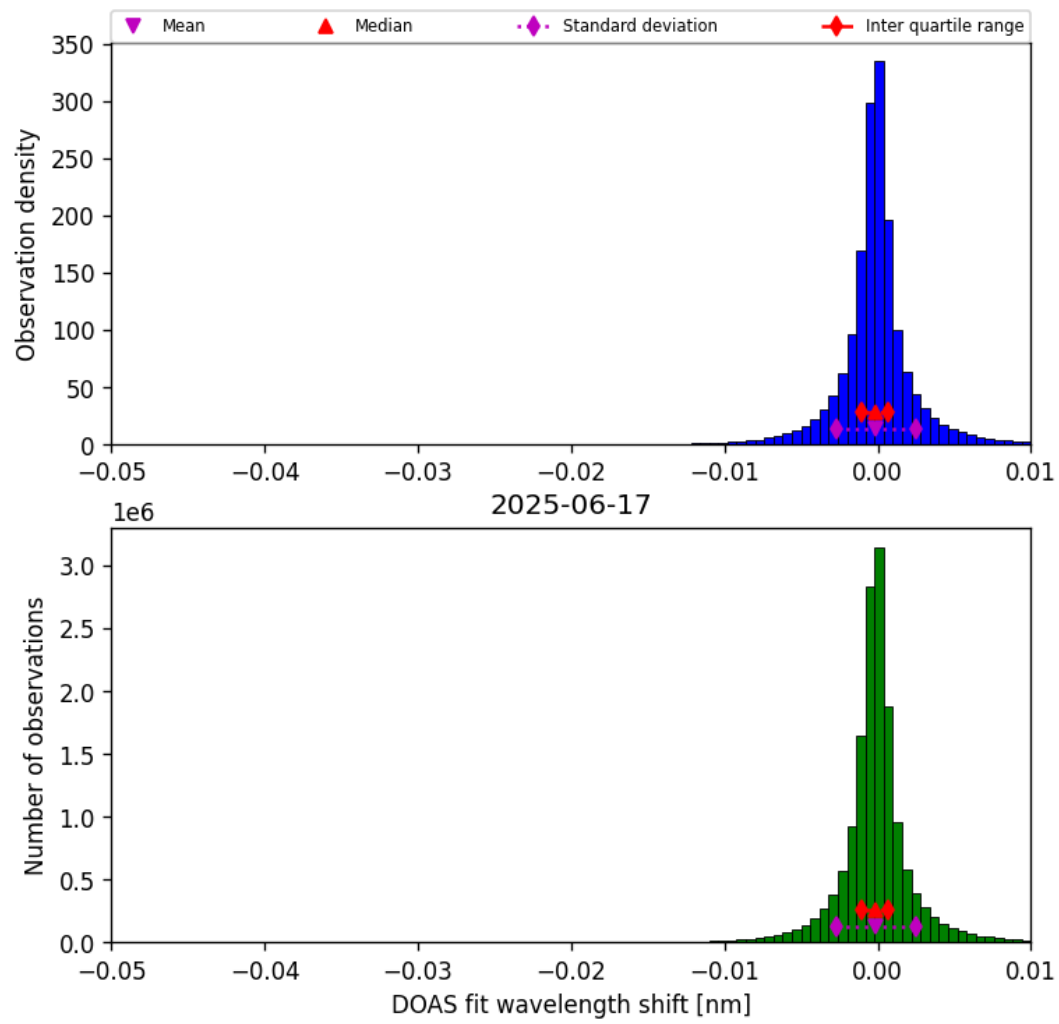


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-06-17 to 2025-06-17

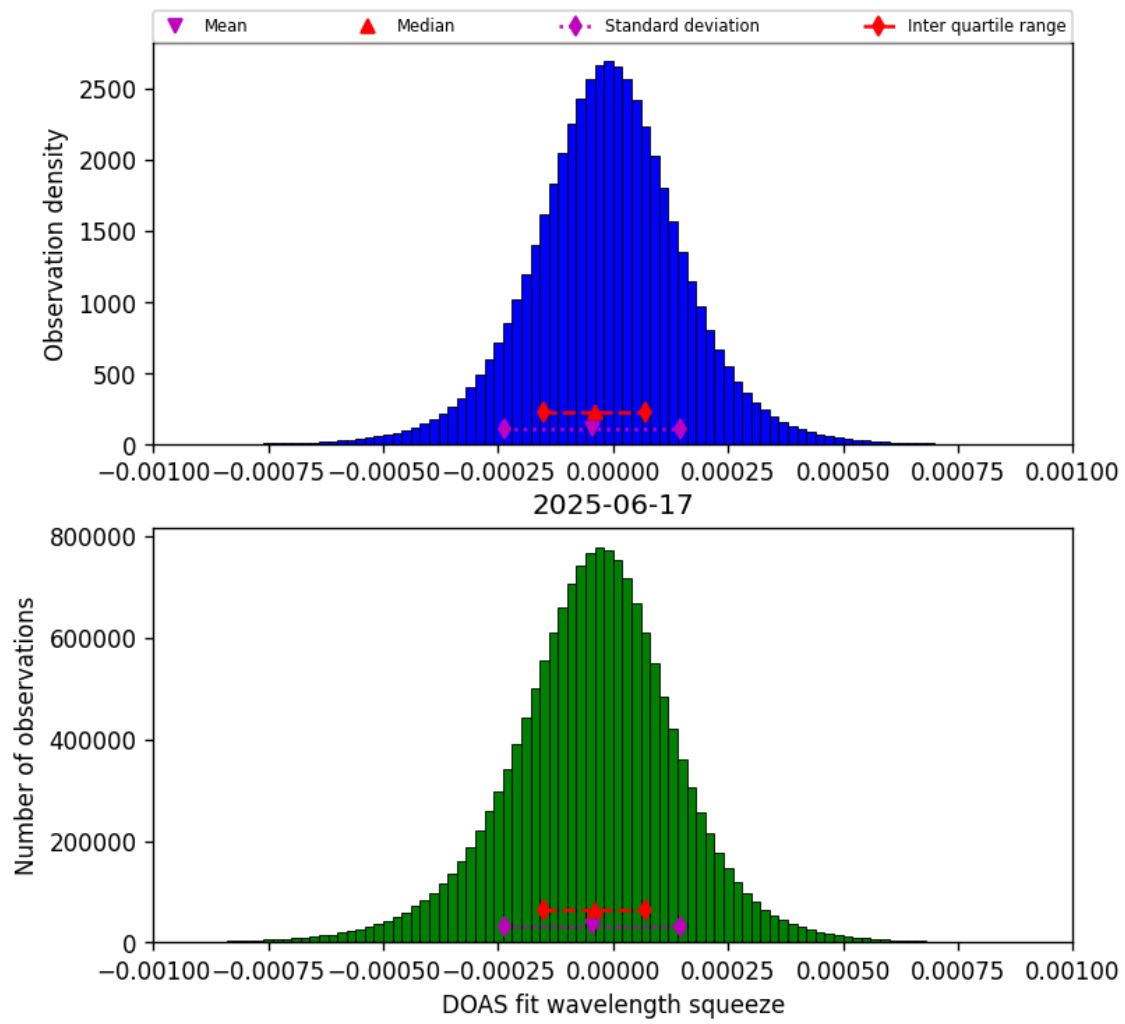


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-06-17 to 2025-06-17

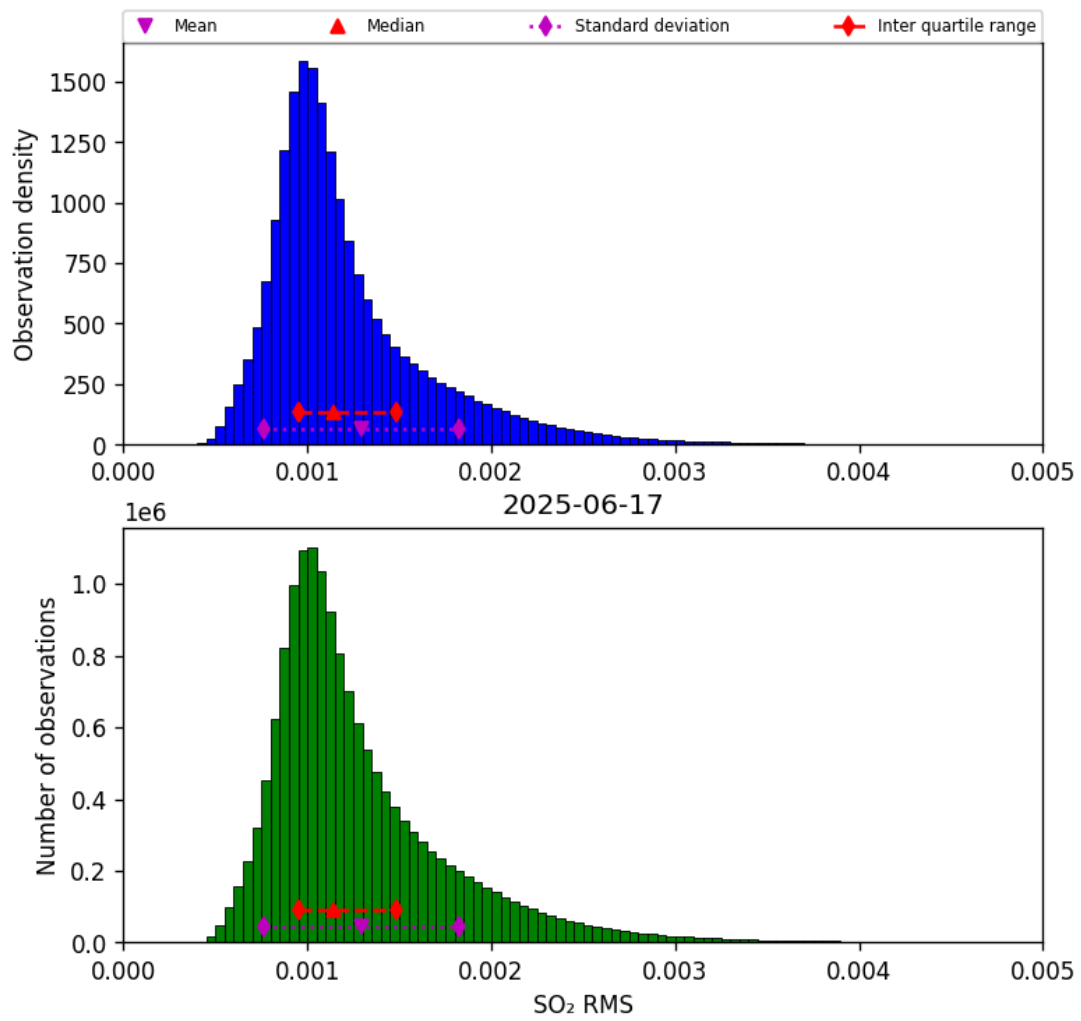


Figure 79: Histogram of “SO₂ RMS” for 2025-06-17 to 2025-06-17

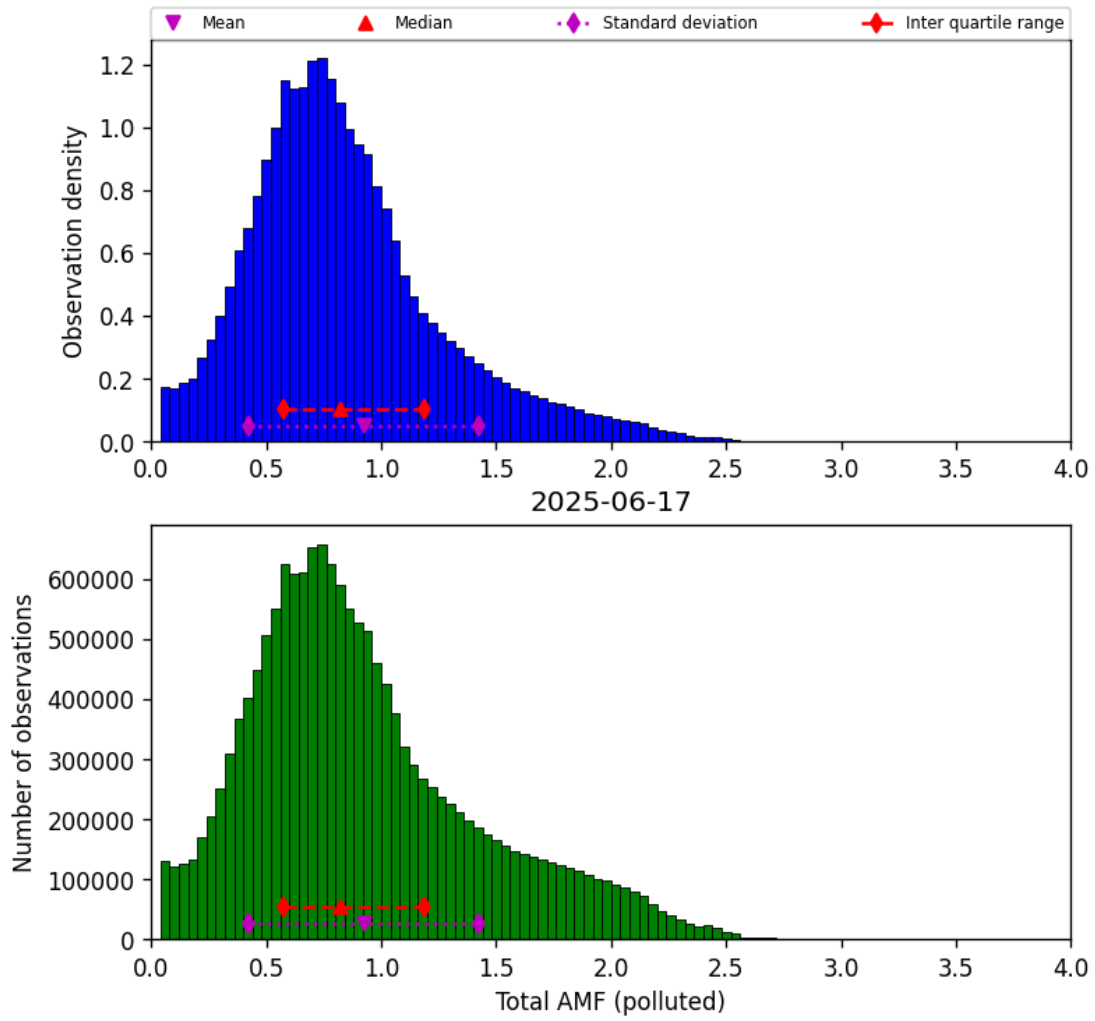


Figure 80: Histogram of “Total AMF (polluted)” for 2025-06-17 to 2025-06-17

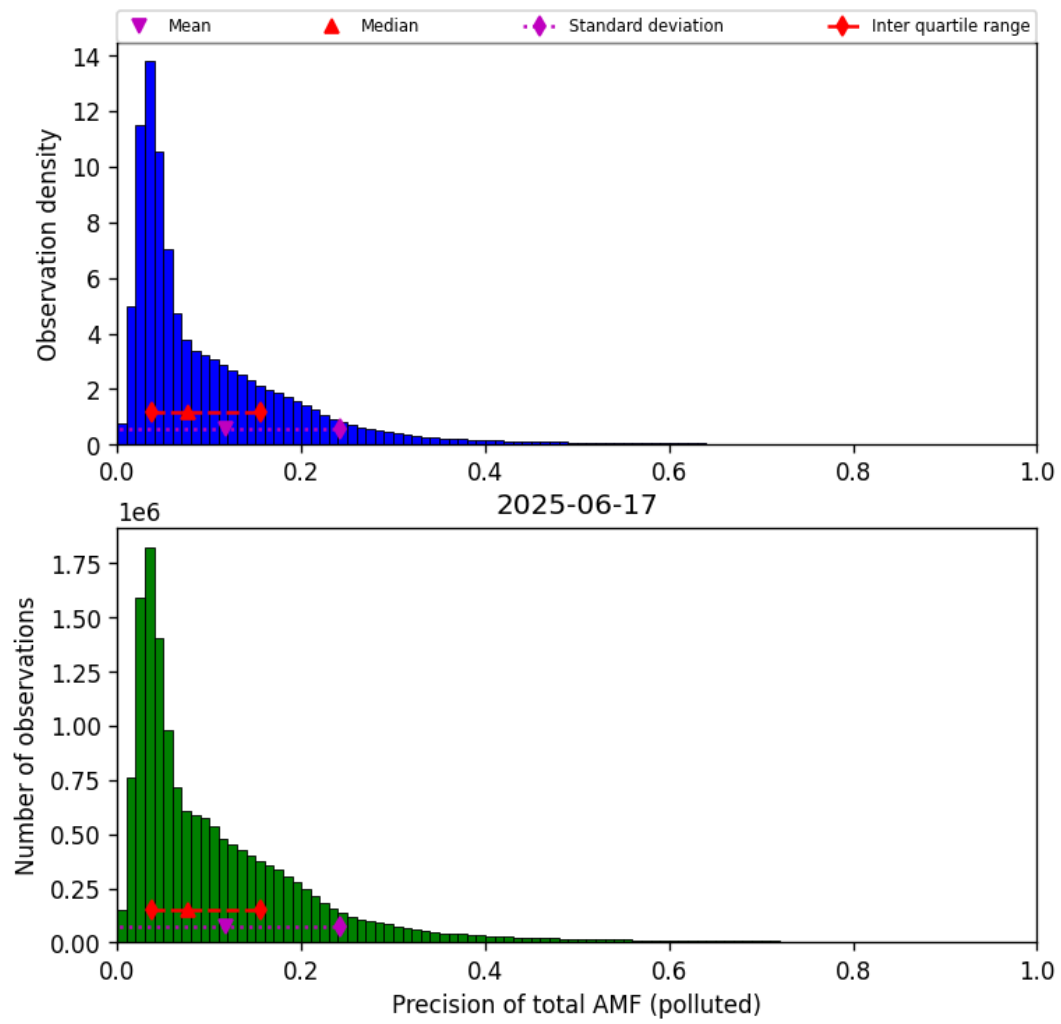


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-06-17 to 2025-06-17

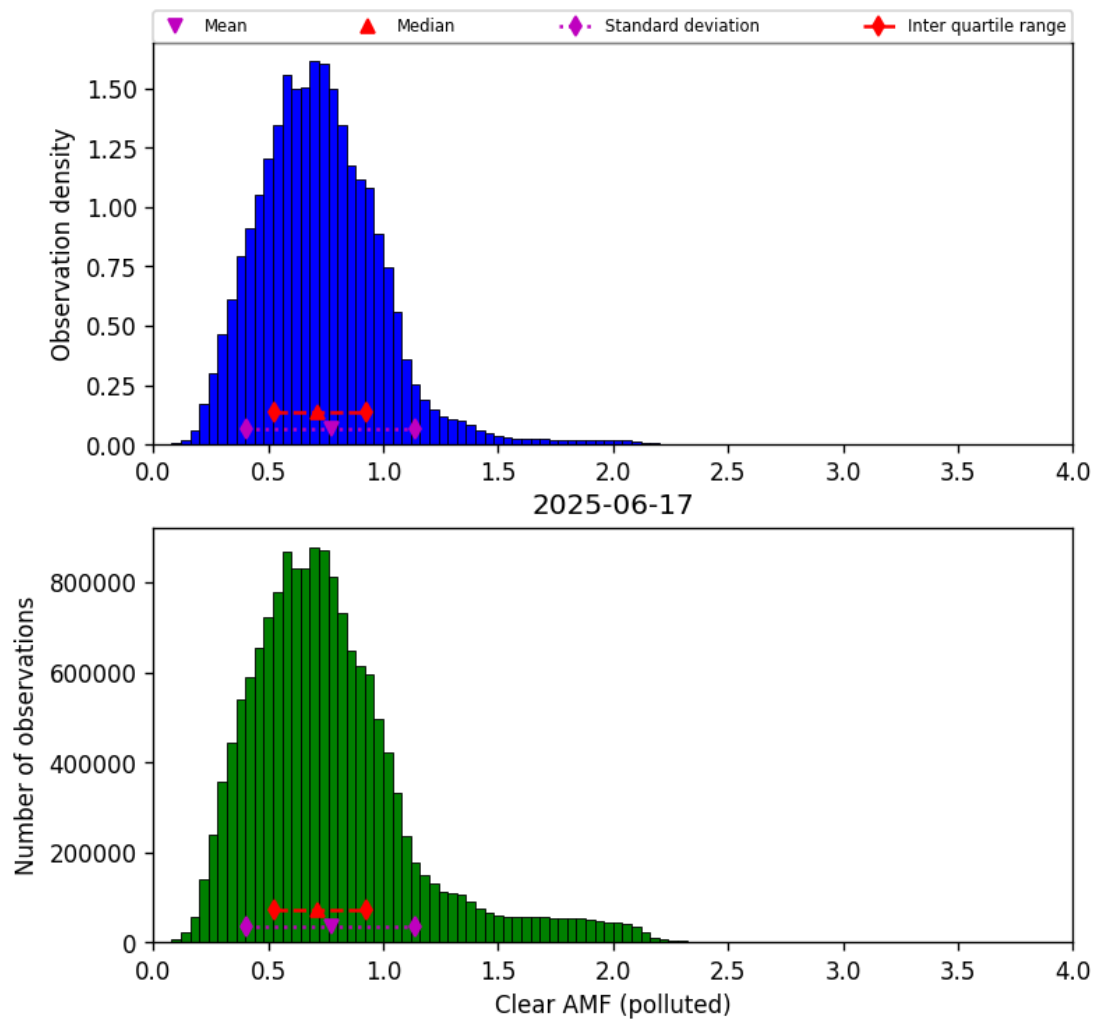


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-06-17 to 2025-06-17

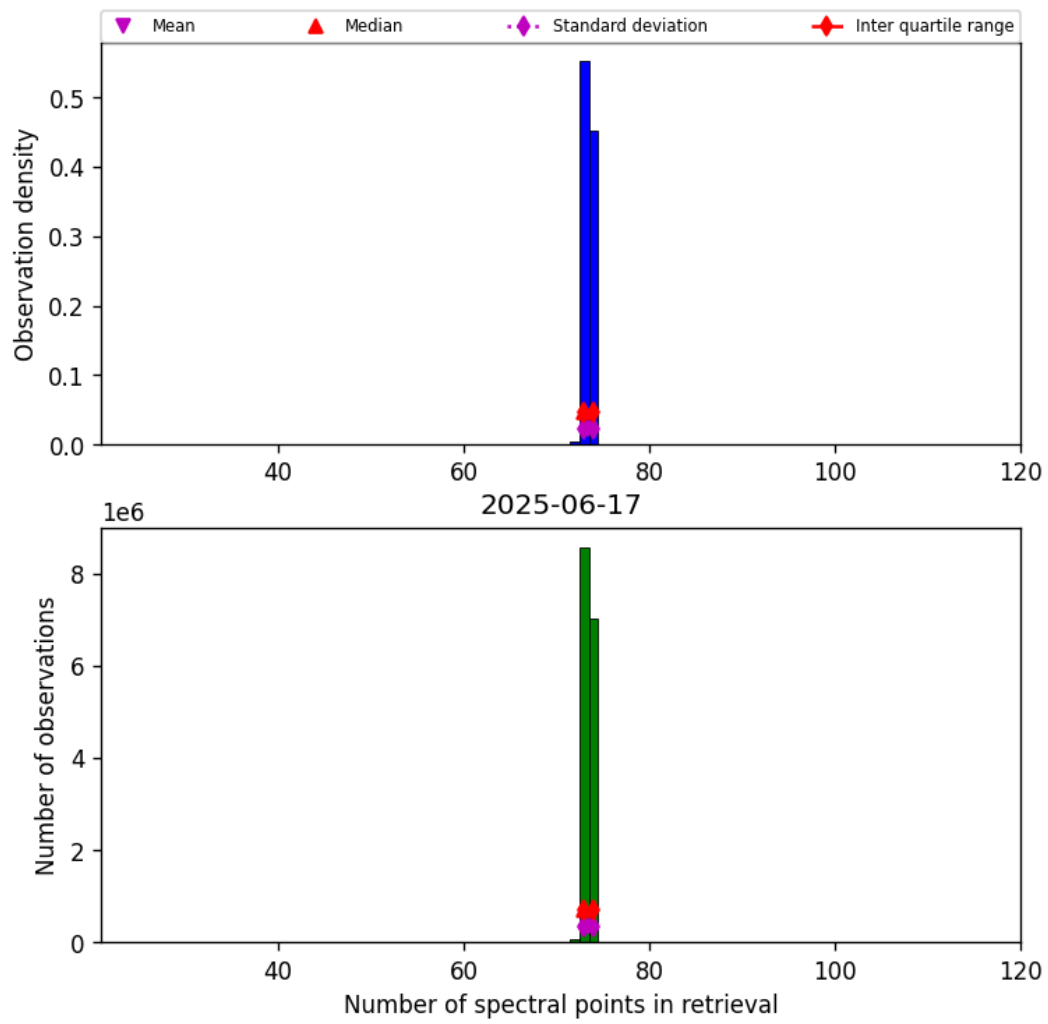


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-06-17 to 2025-06-17

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.

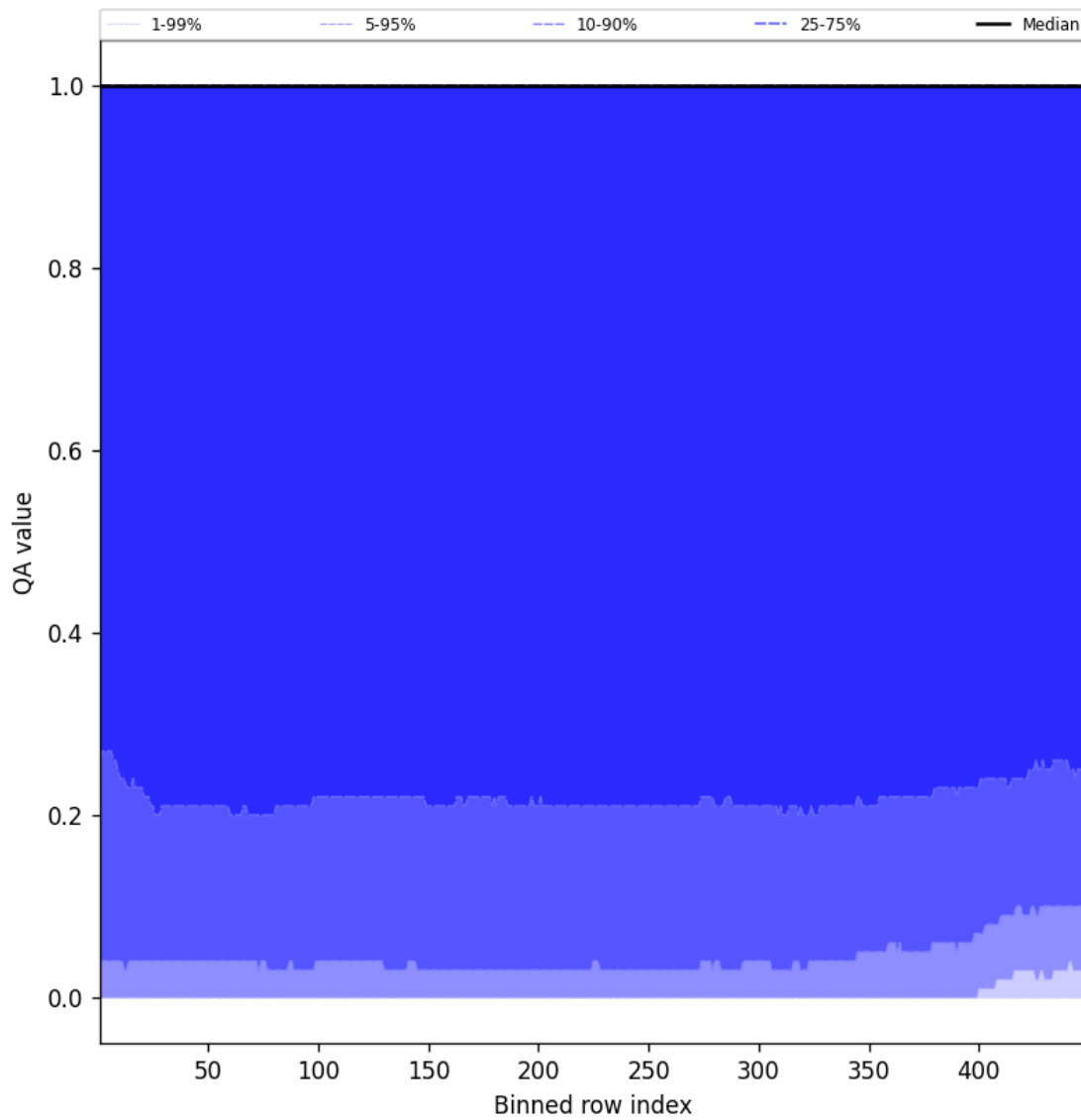


Figure 84: Along track statistics of “QA value” for 2025-06-17 to 2025-06-17

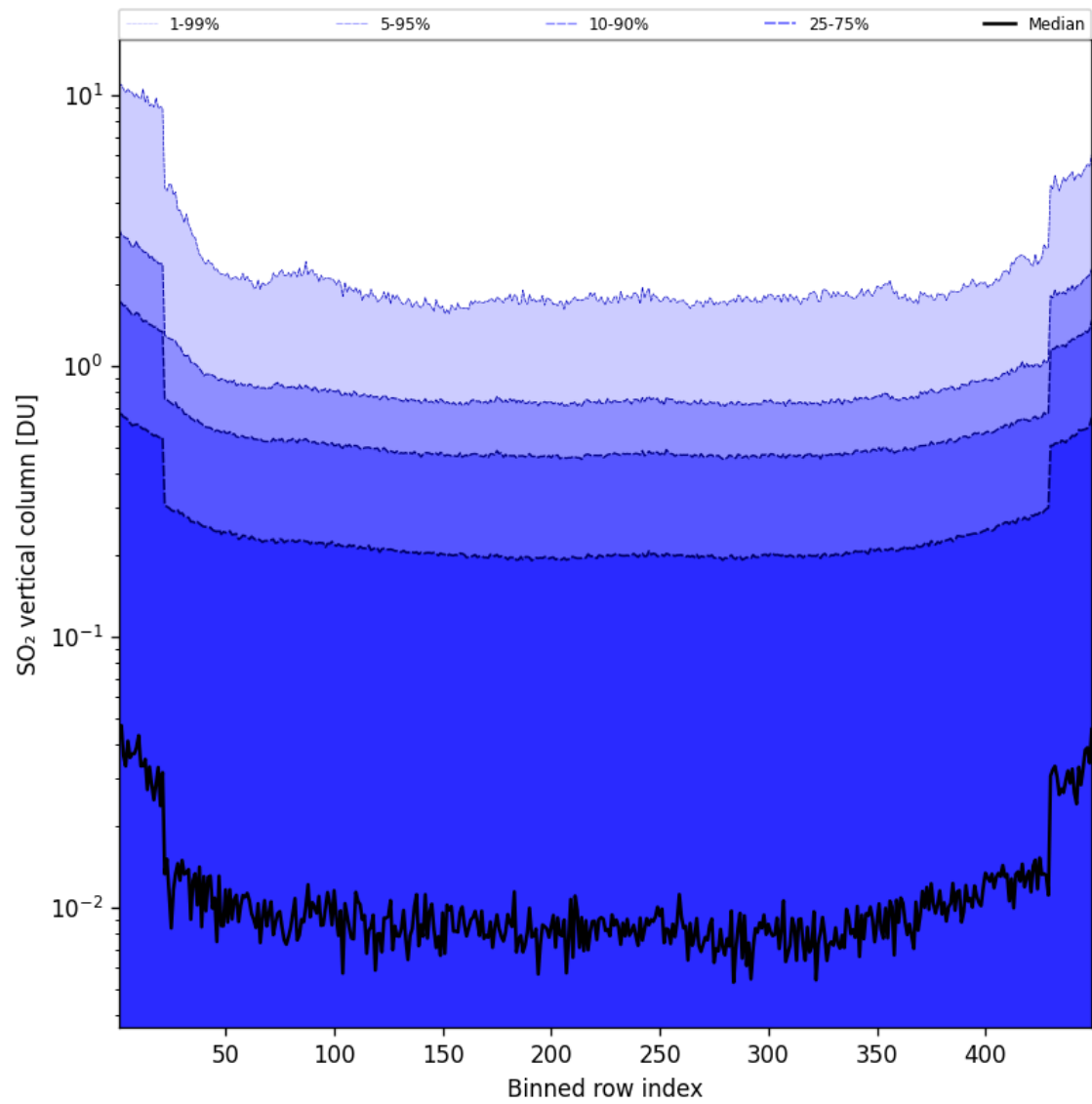


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-06-17 to 2025-06-17

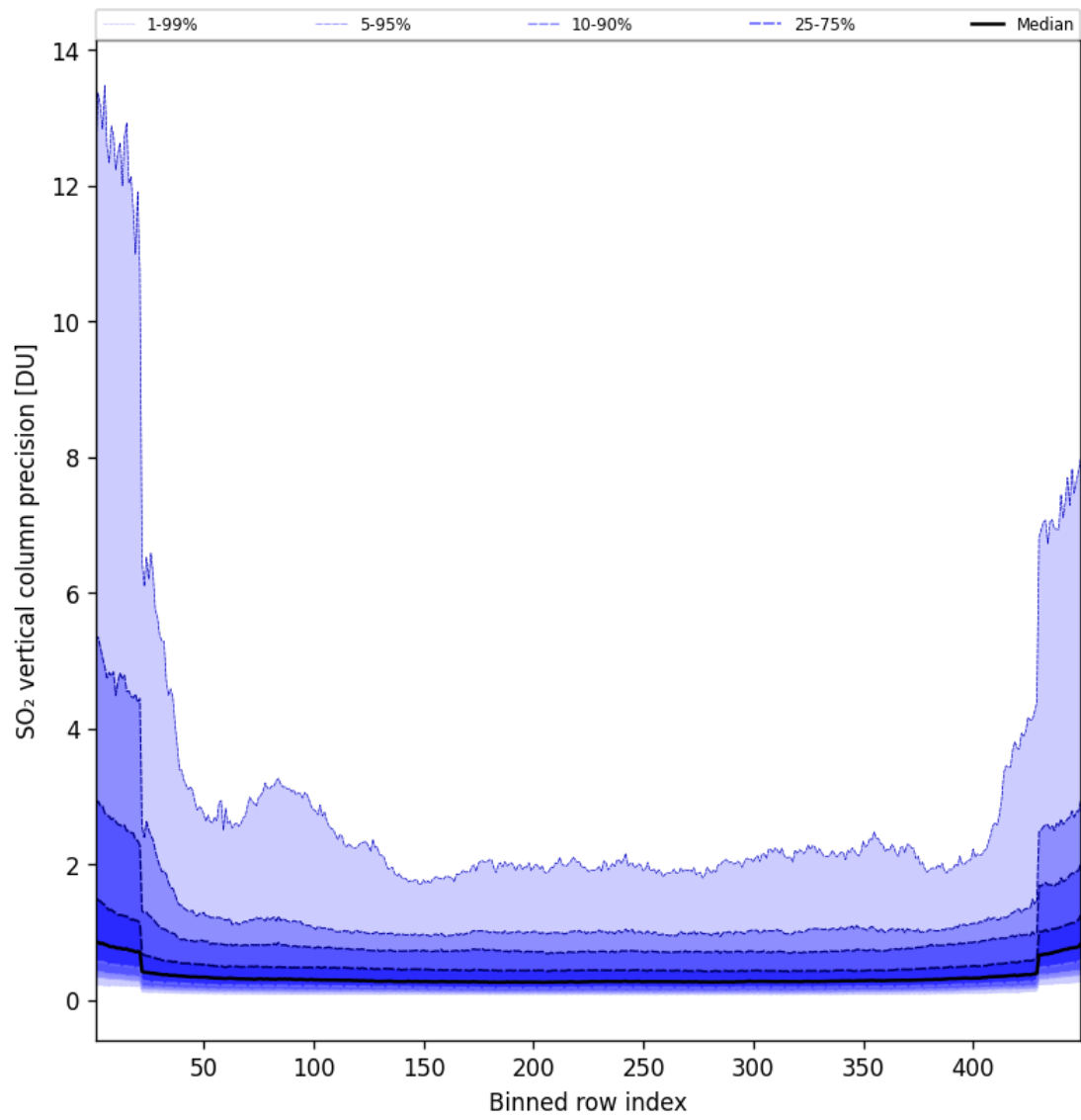


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-06-17 to 2025-06-17

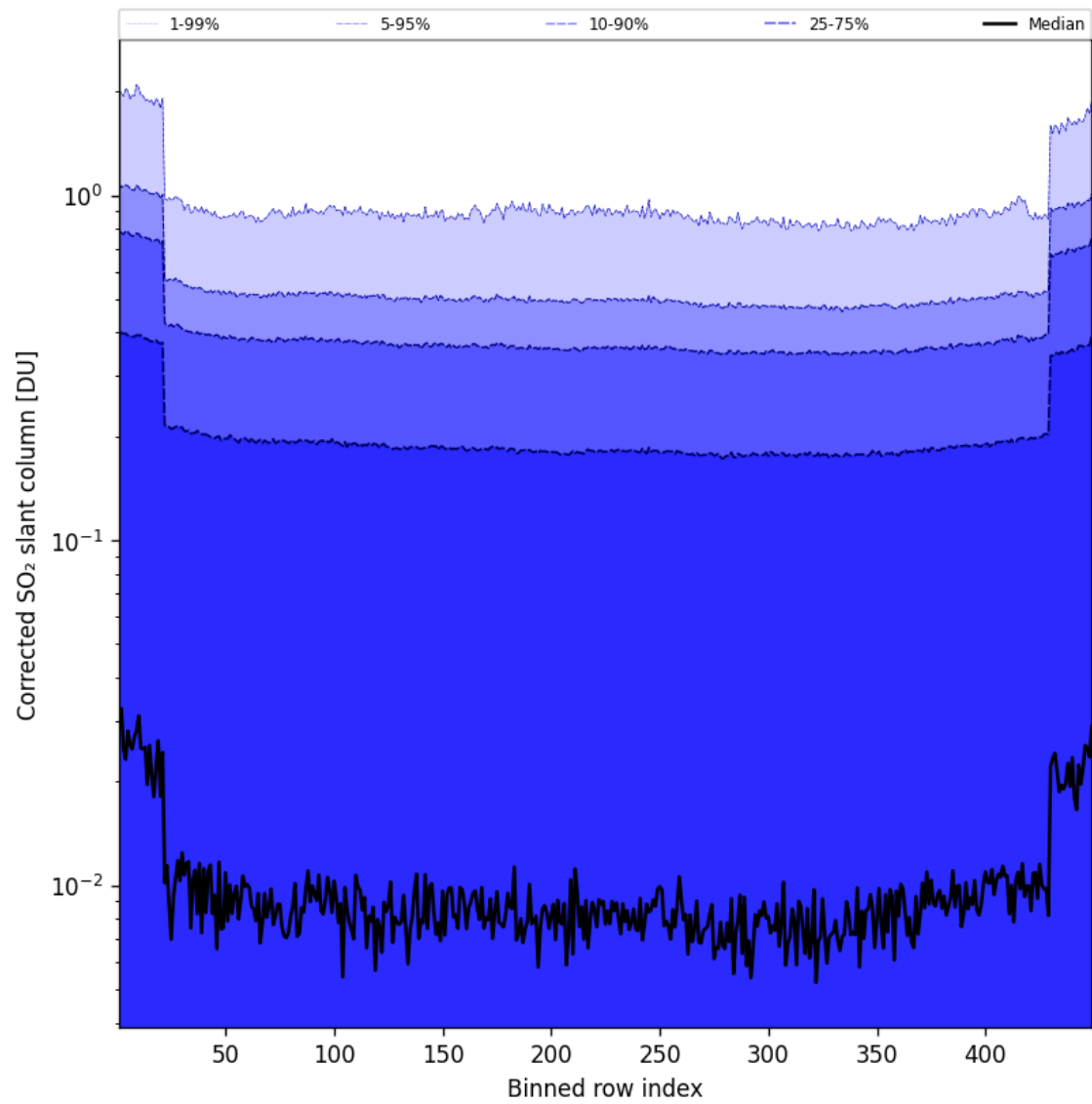


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-06-17 to 2025-06-17

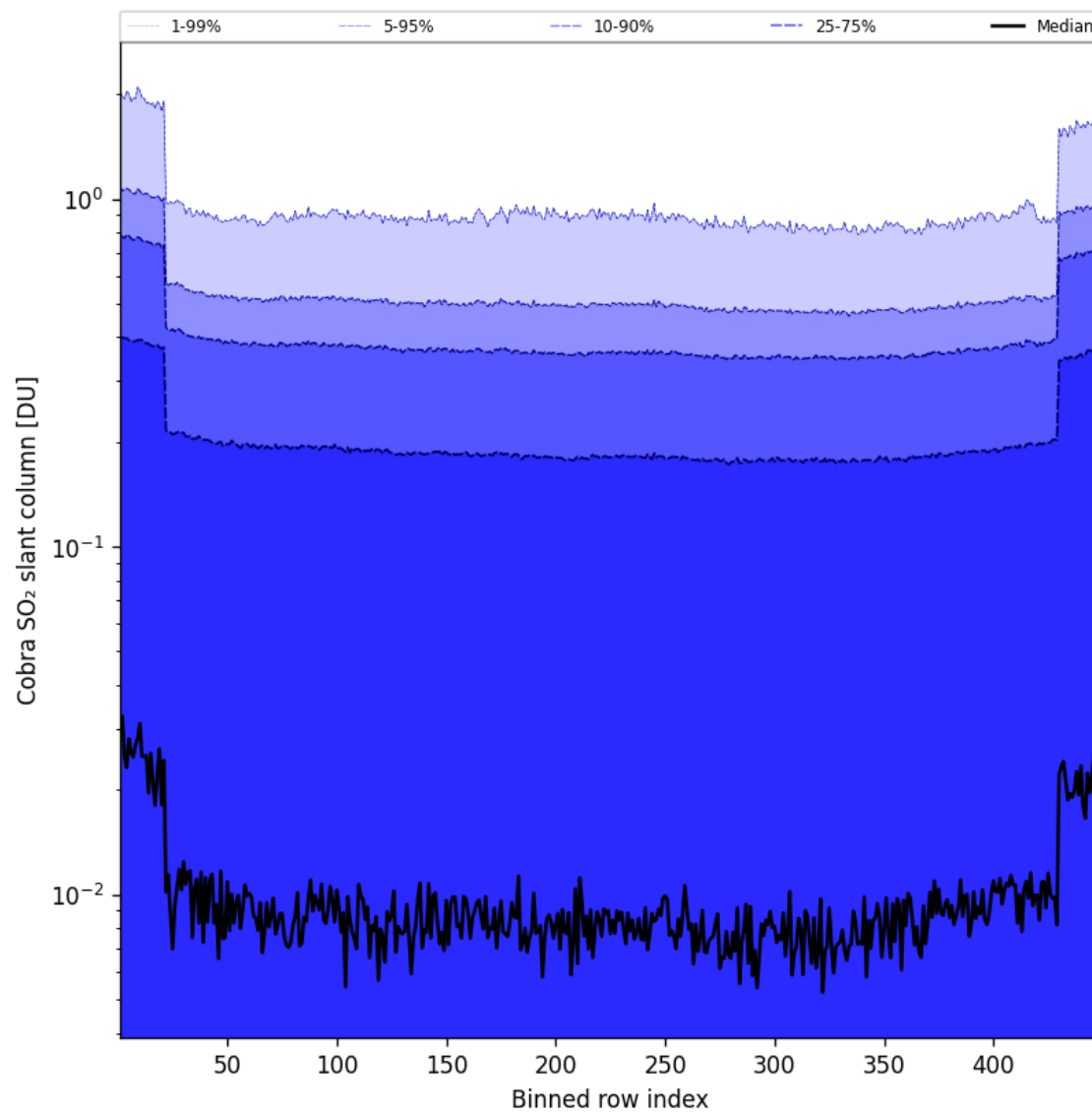


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-06-17 to 2025-06-17

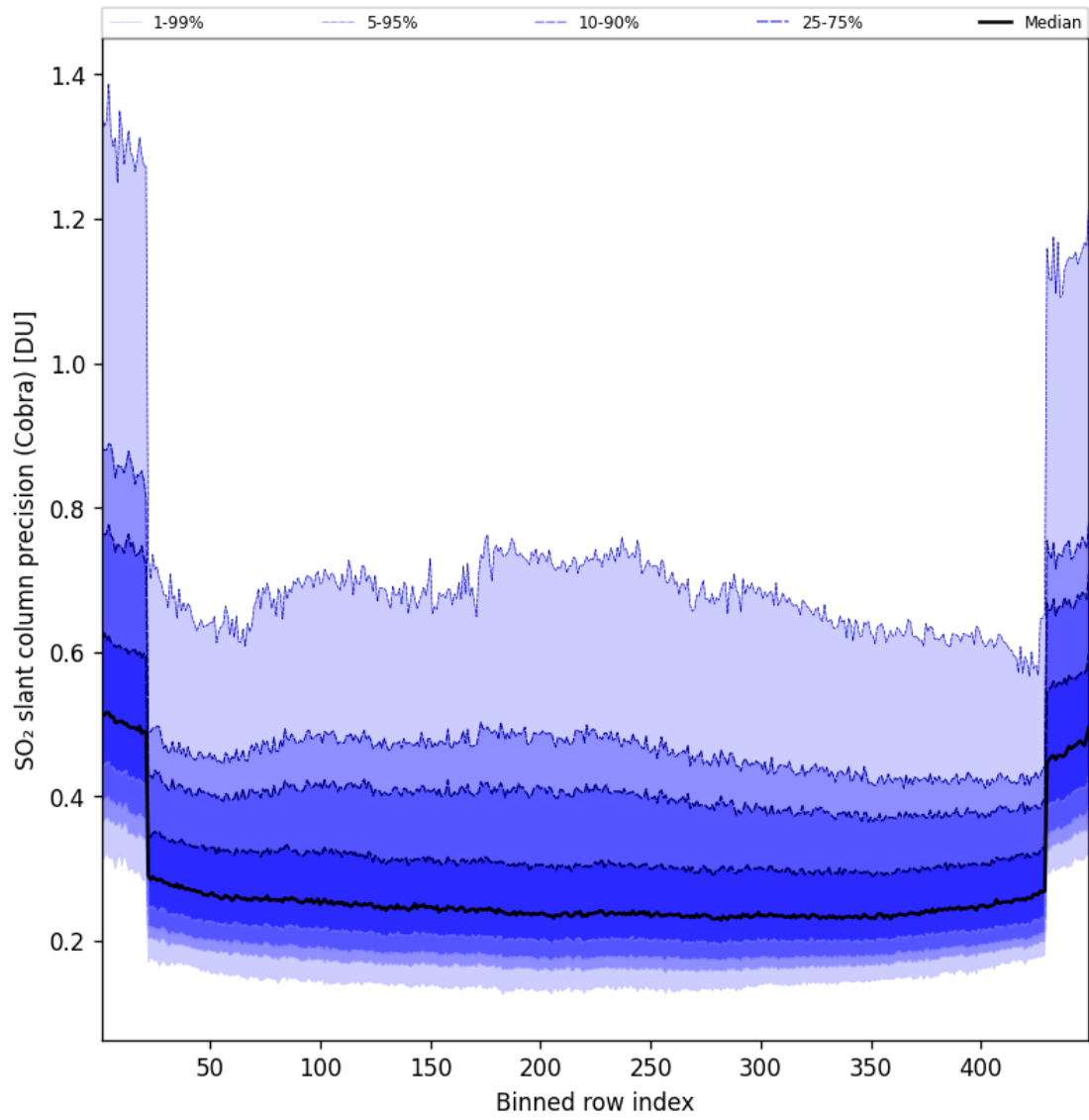


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-06-17 to 2025-06-17

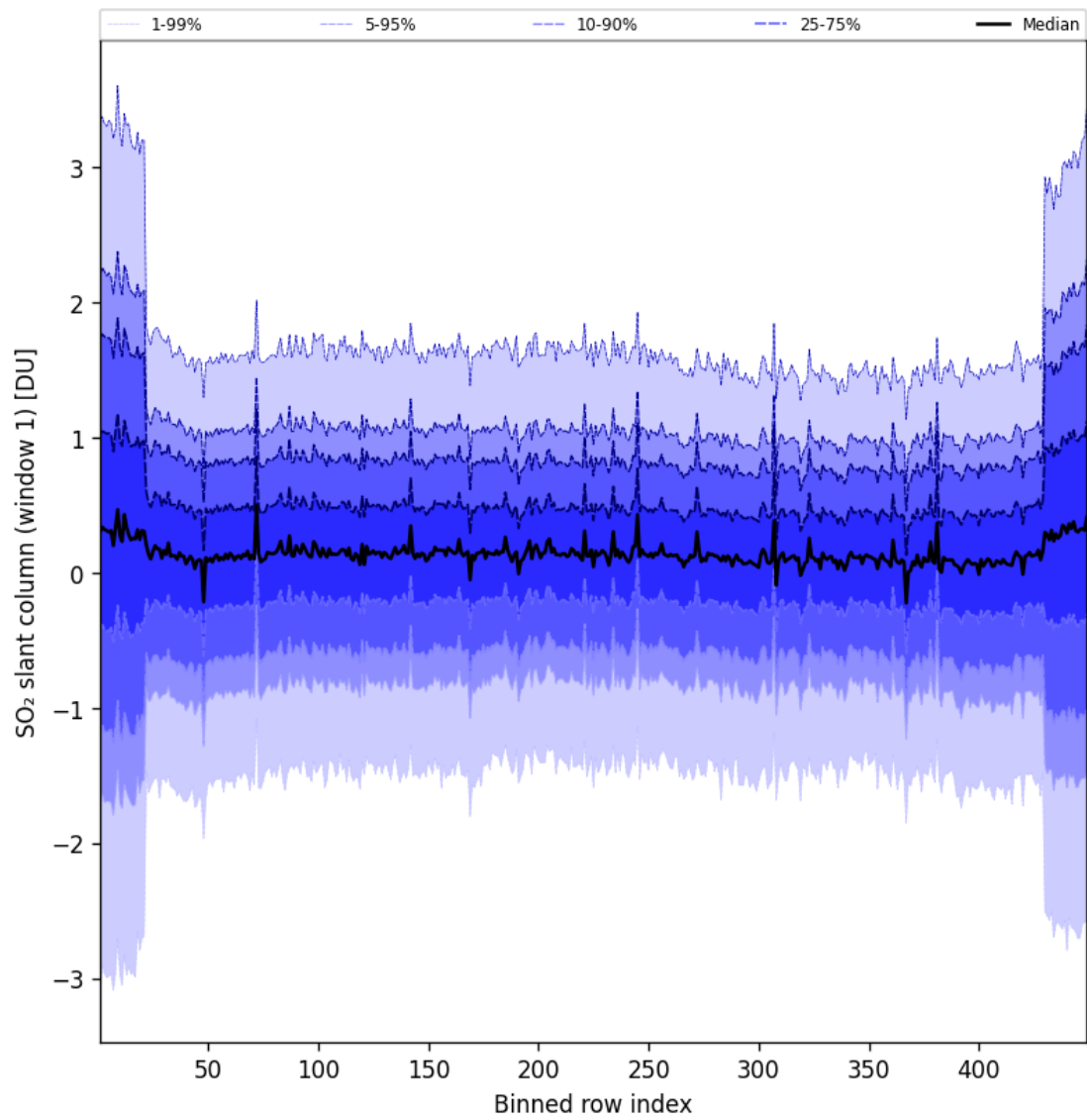


Figure 90: Along track statistics of "SO₂ slant column (window 1)" for 2025-06-17 to 2025-06-17

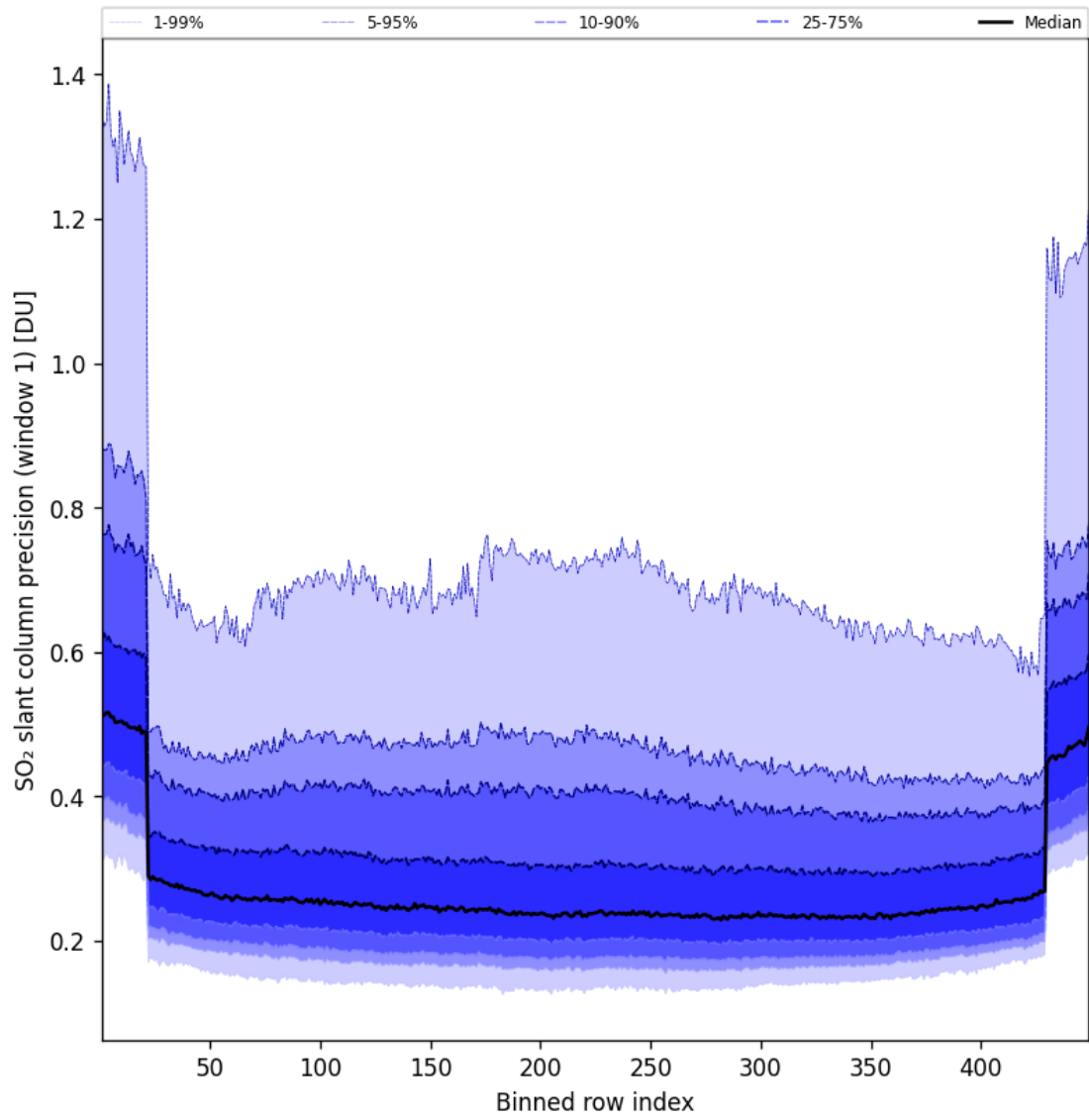


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-06-17 to 2025-06-17

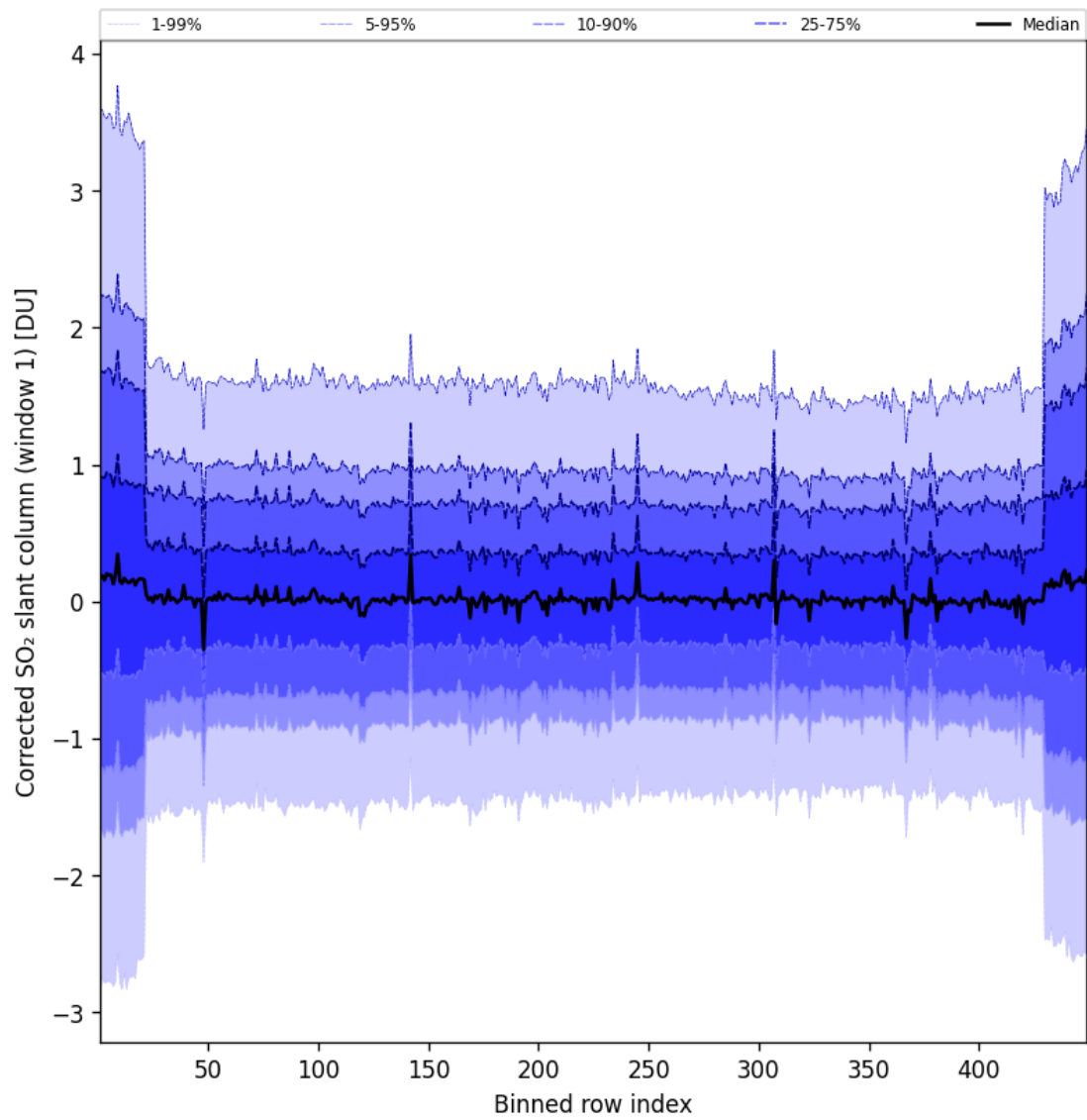


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-06-17 to 2025-06-17

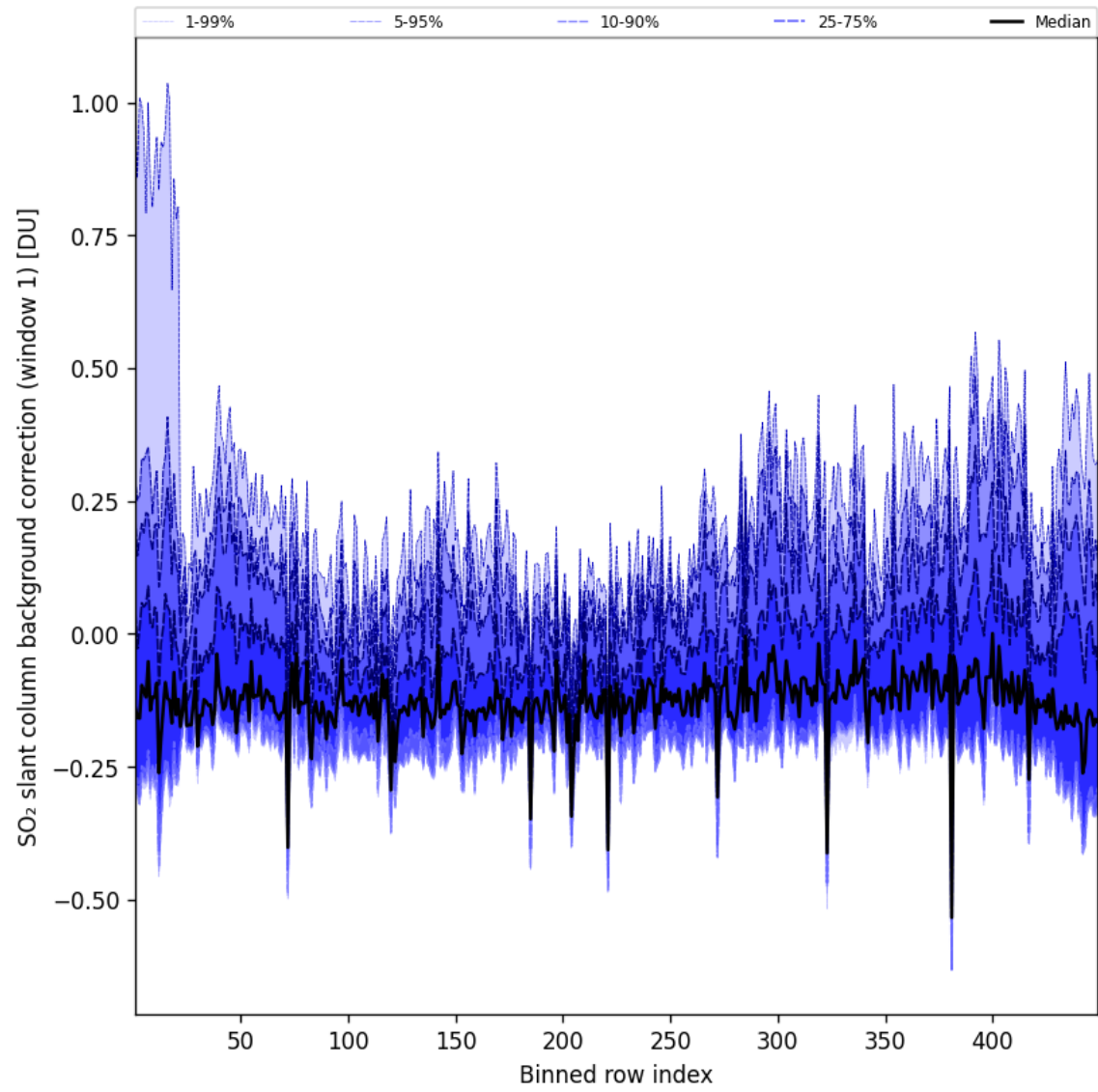


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-06-17 to 2025-06-17

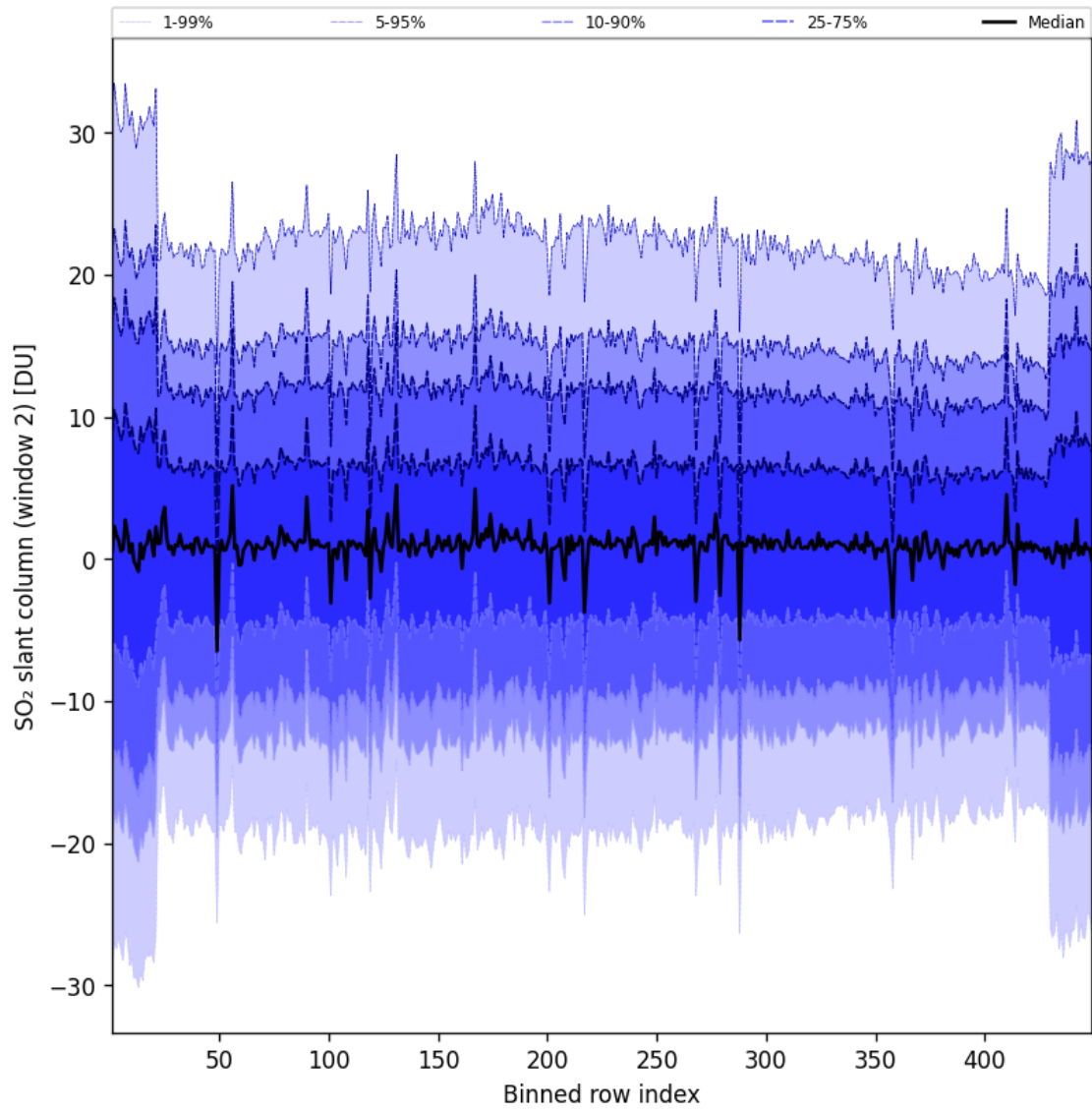


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-06-17 to 2025-06-17

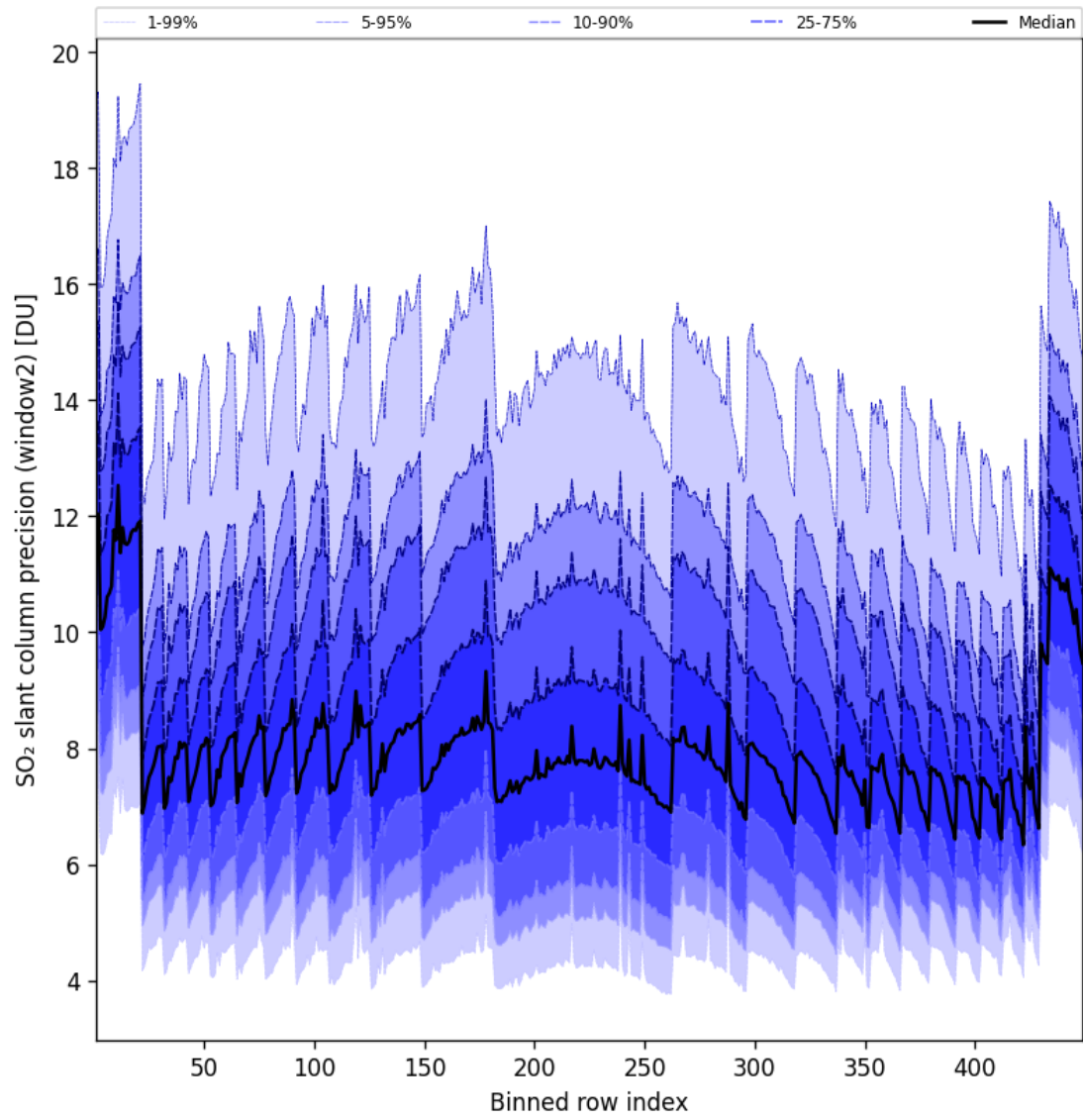


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-06-17 to 2025-06-17

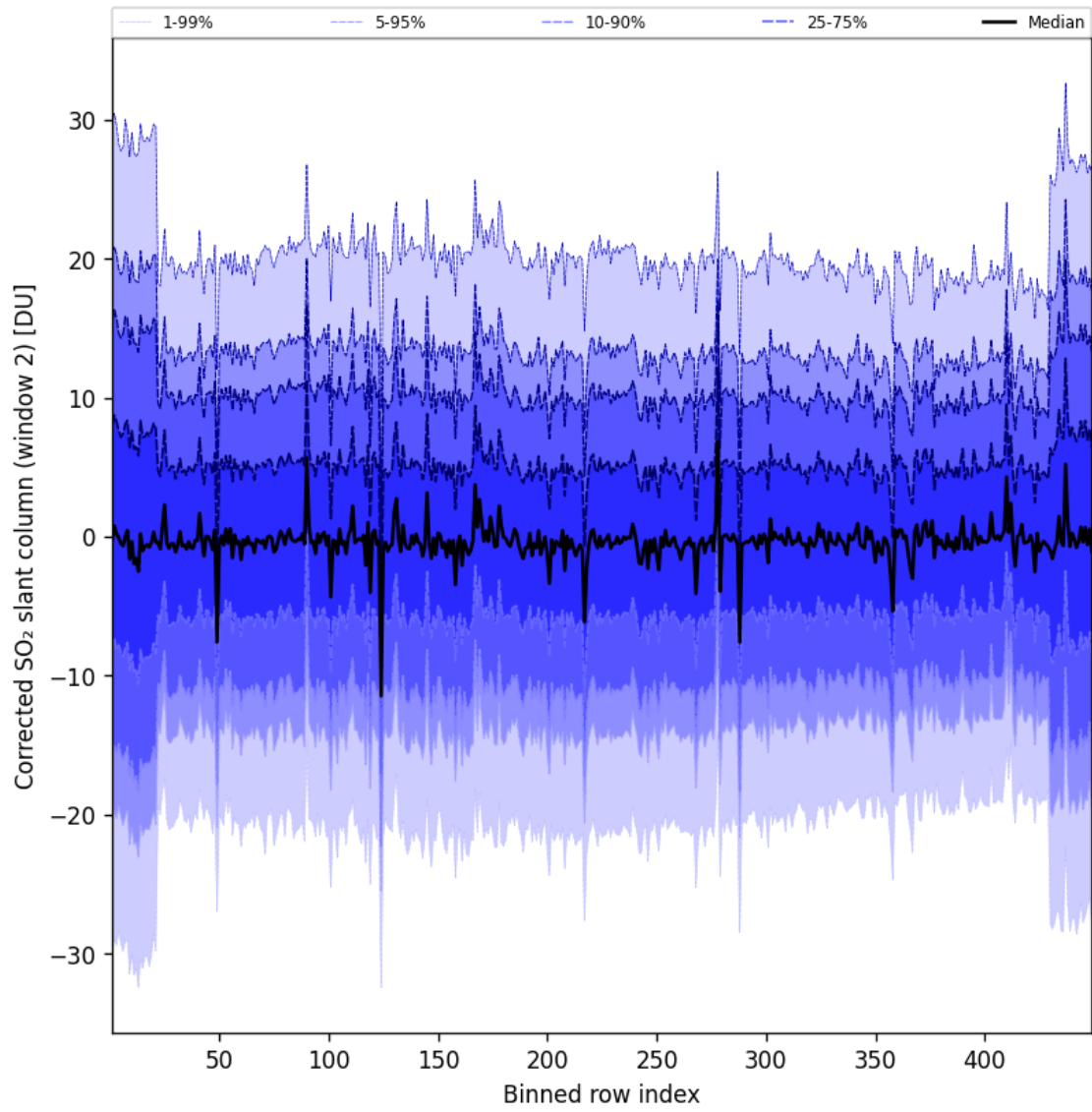


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-06-17 to 2025-06-17

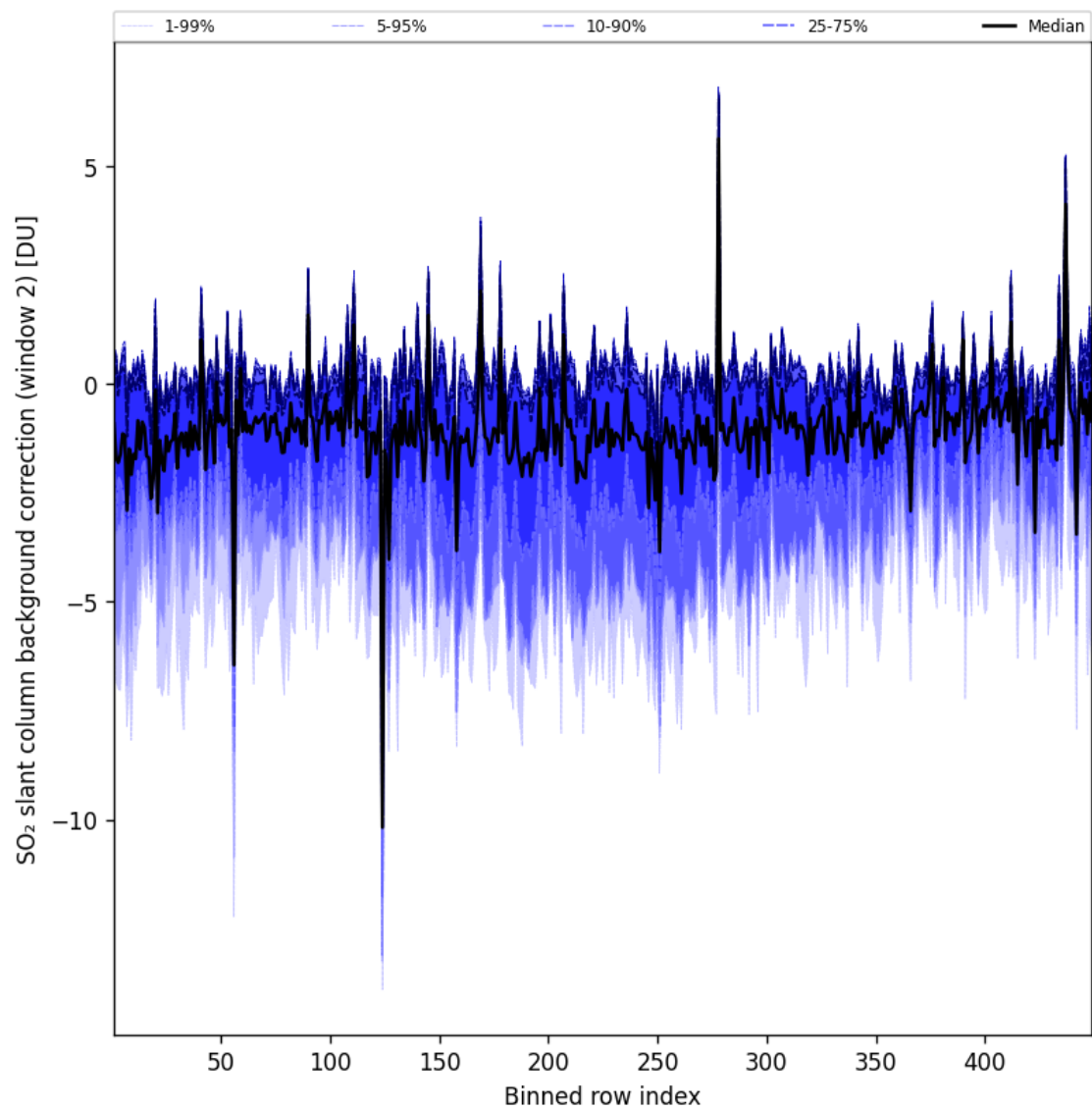


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-06-17 to 2025-06-17

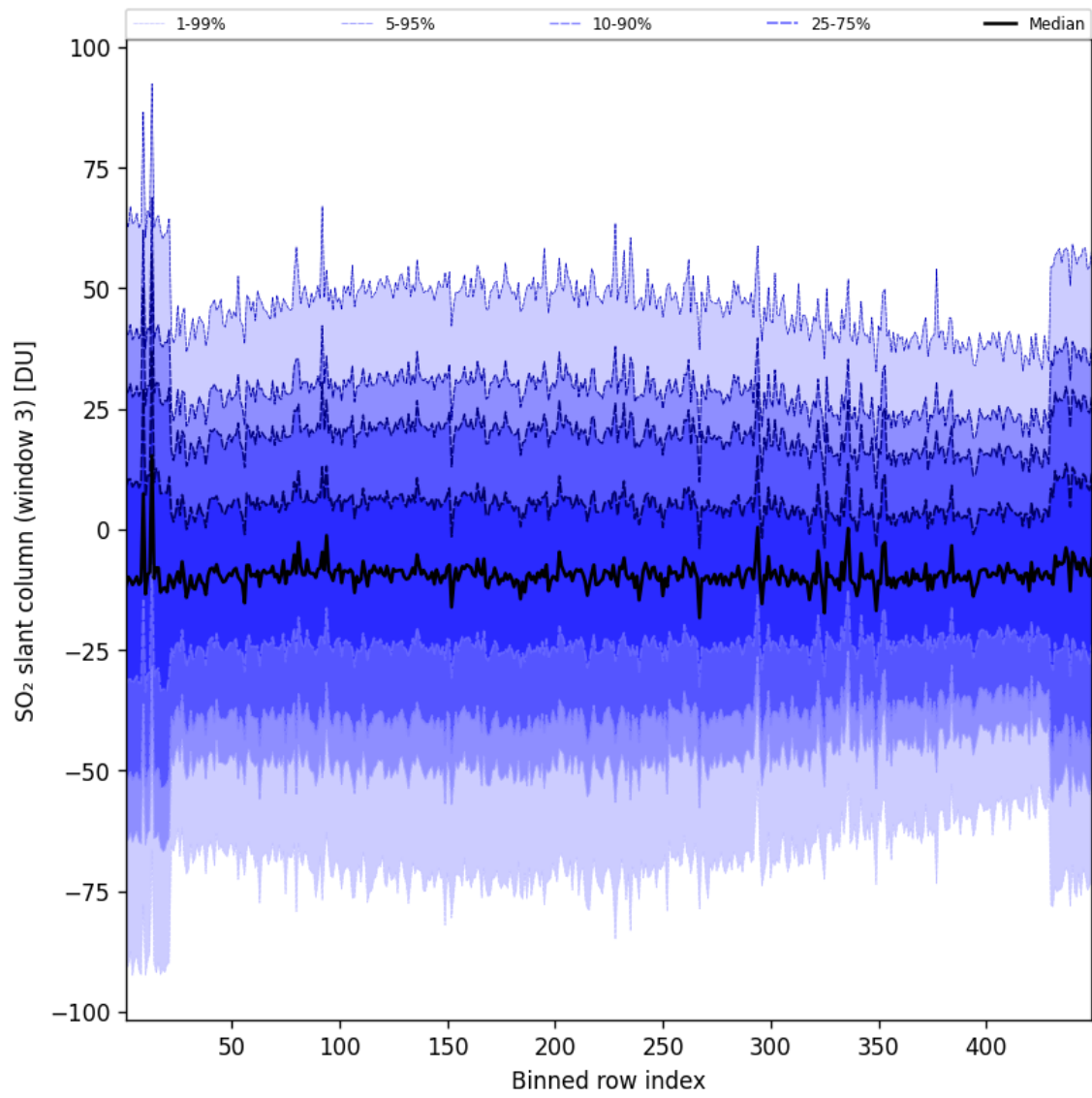


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-06-17 to 2025-06-17

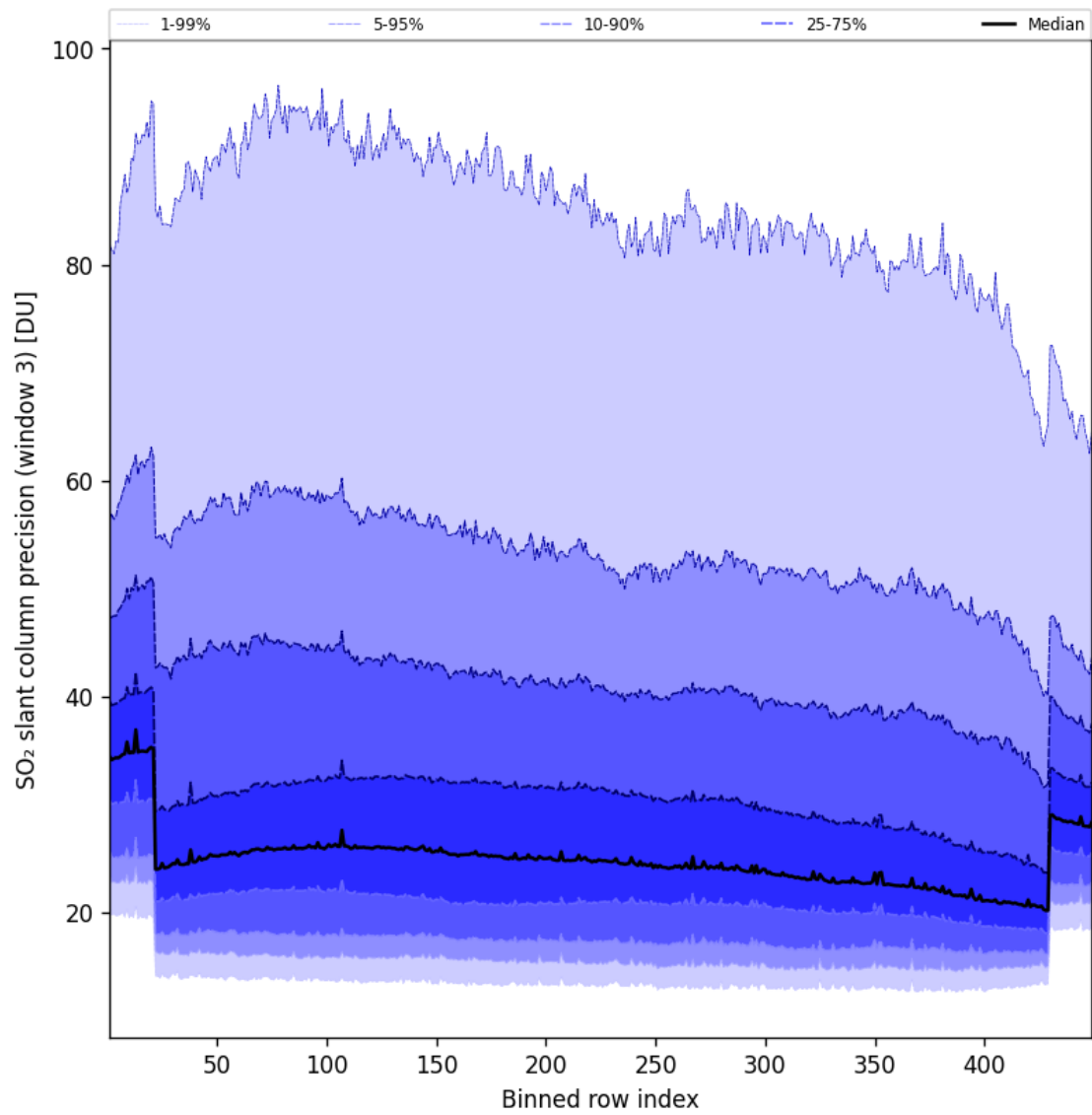


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-06-17 to 2025-06-17

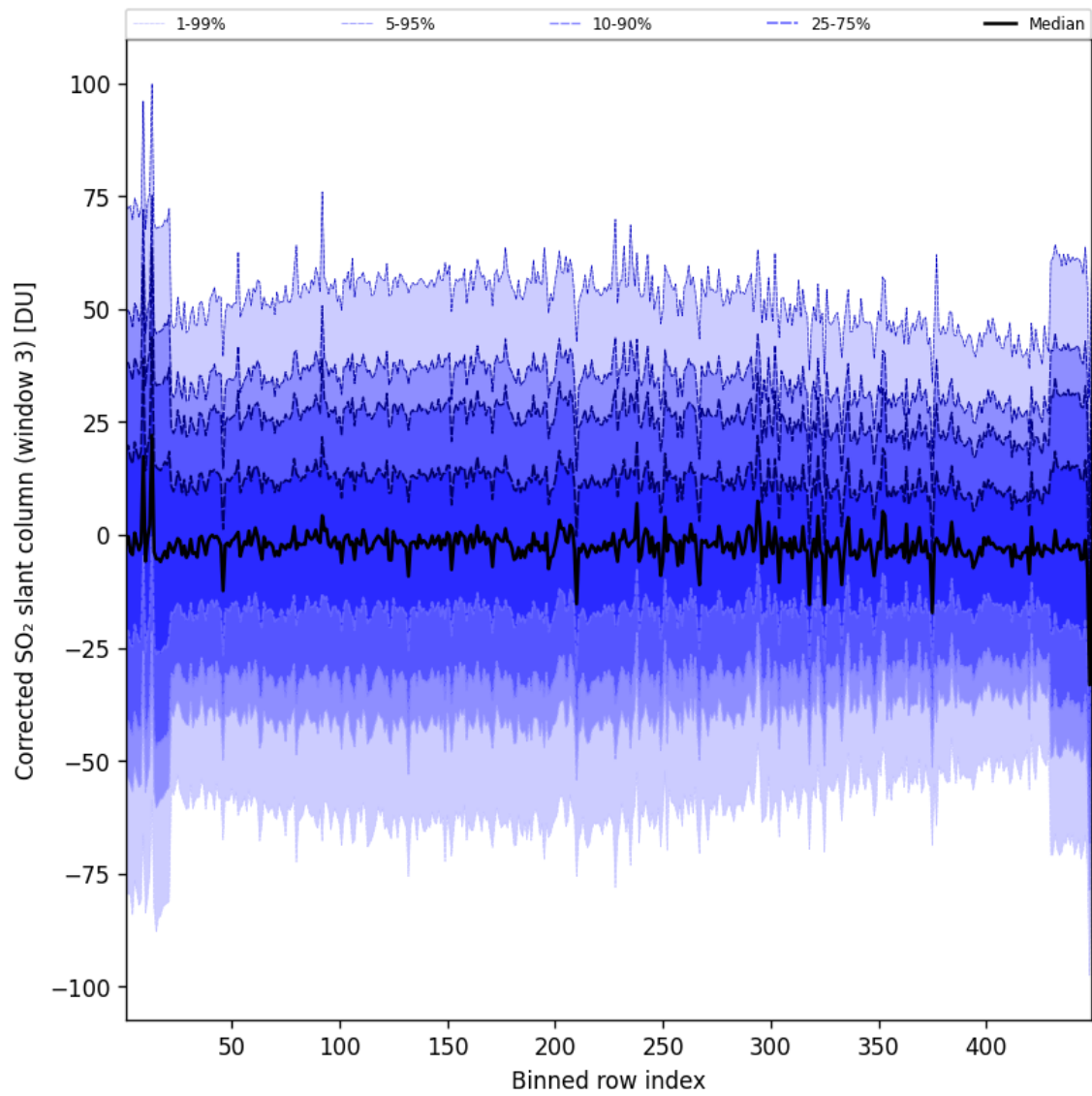


Figure 100: Along track statistics of "Corrected SO₂ slant column (window 3)" for 2025-06-17 to 2025-06-17

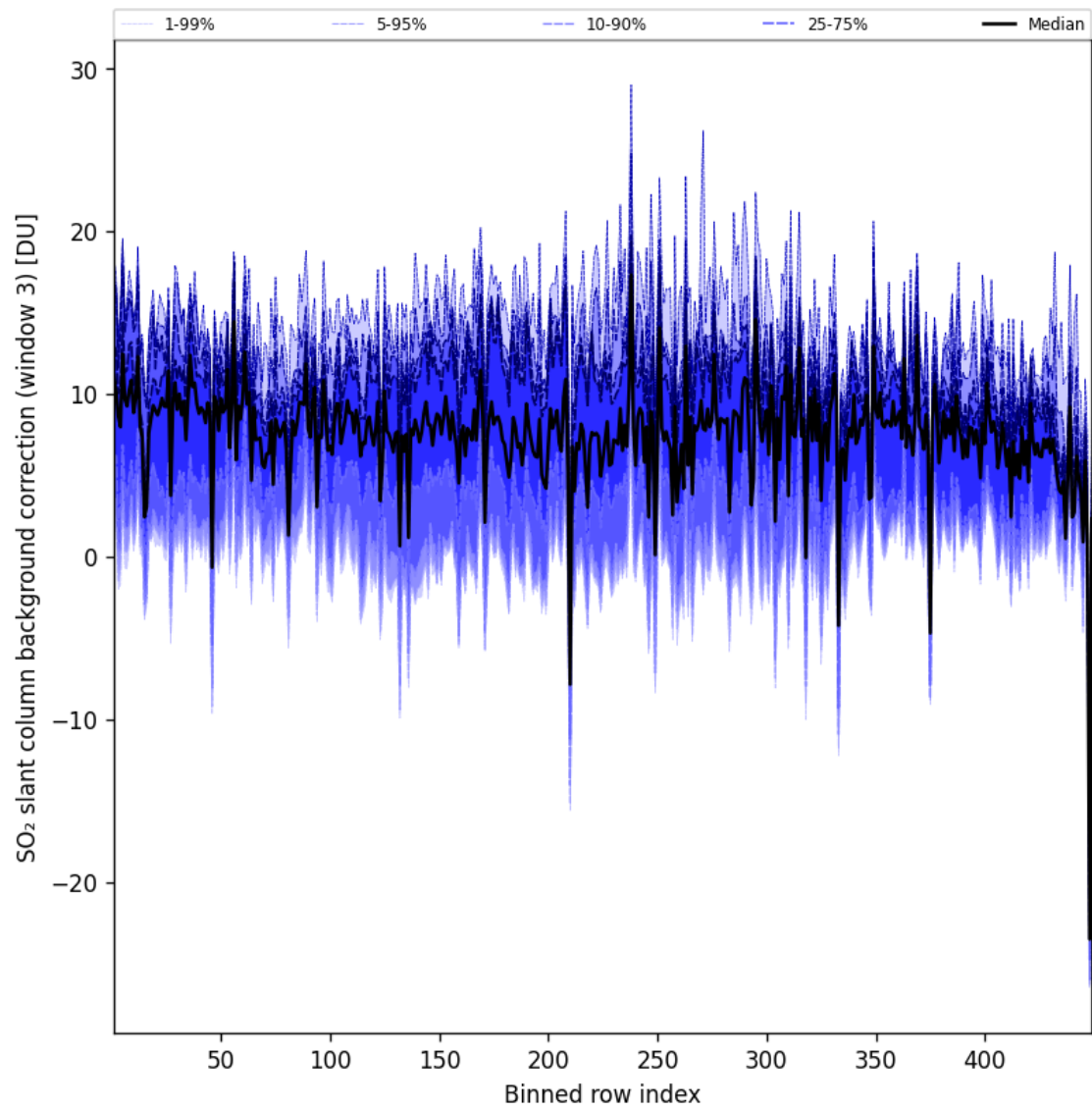


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-06-17 to 2025-06-17

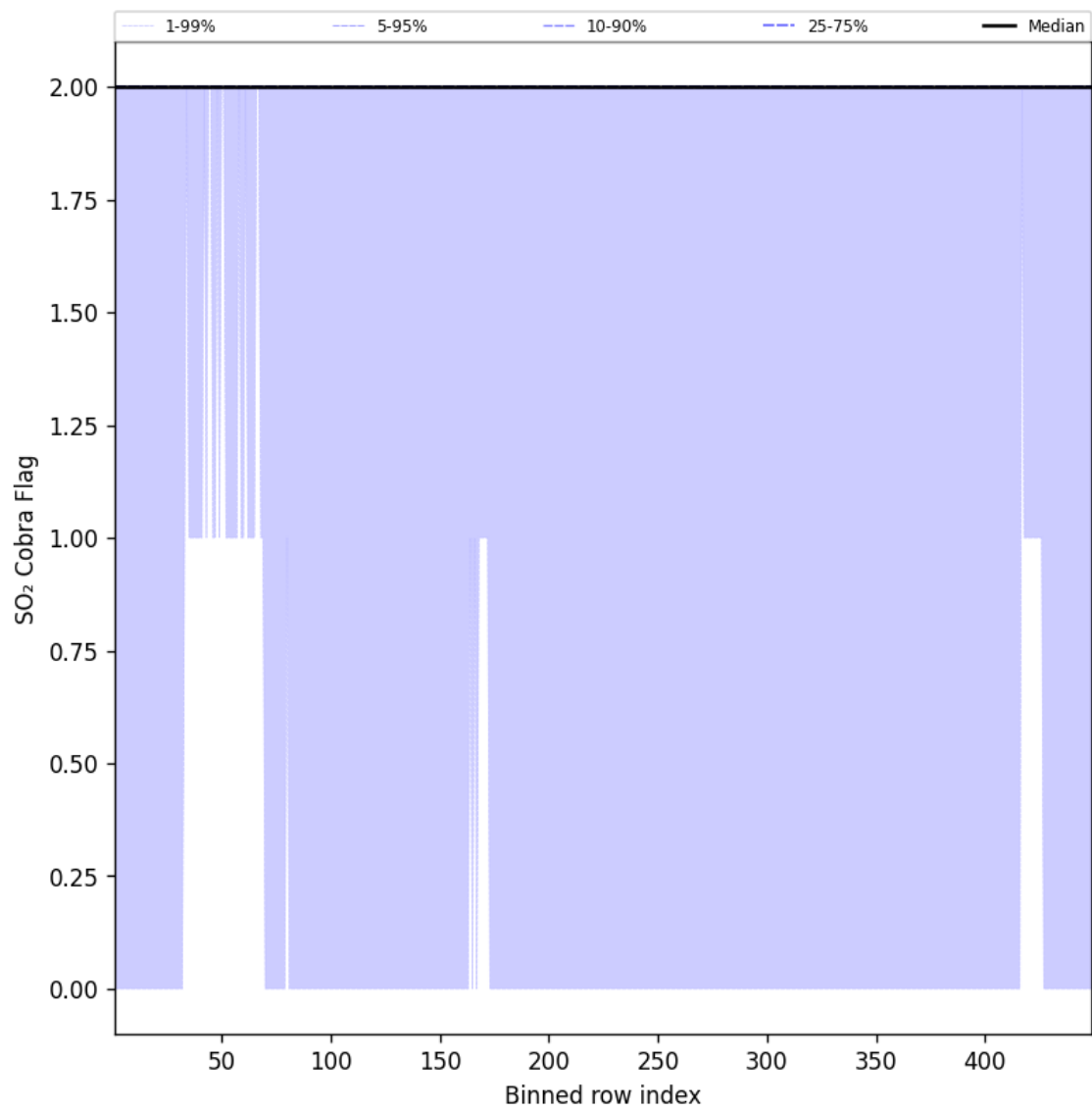


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-06-17 to 2025-06-17

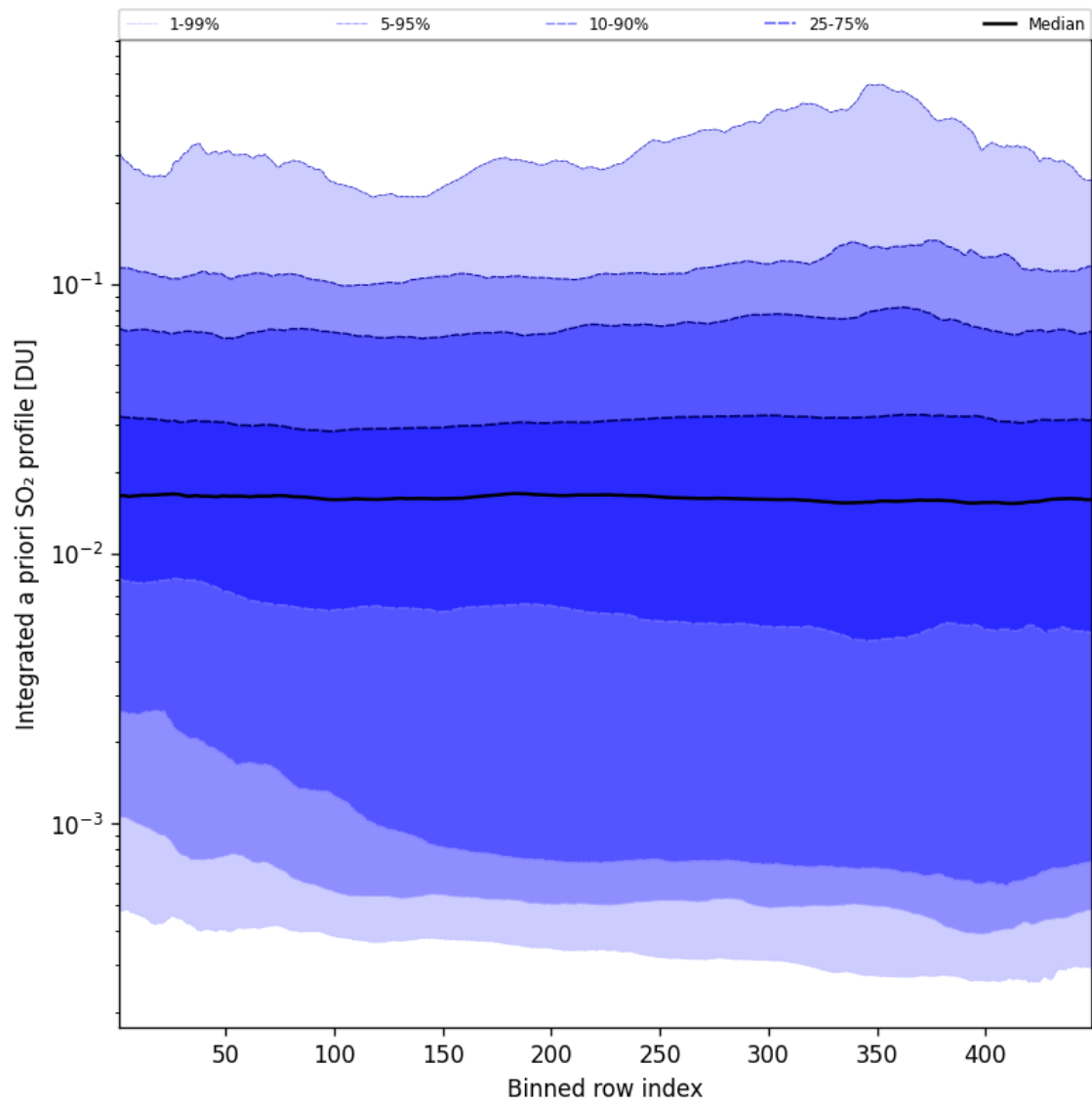


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-06-17 to 2025-06-17

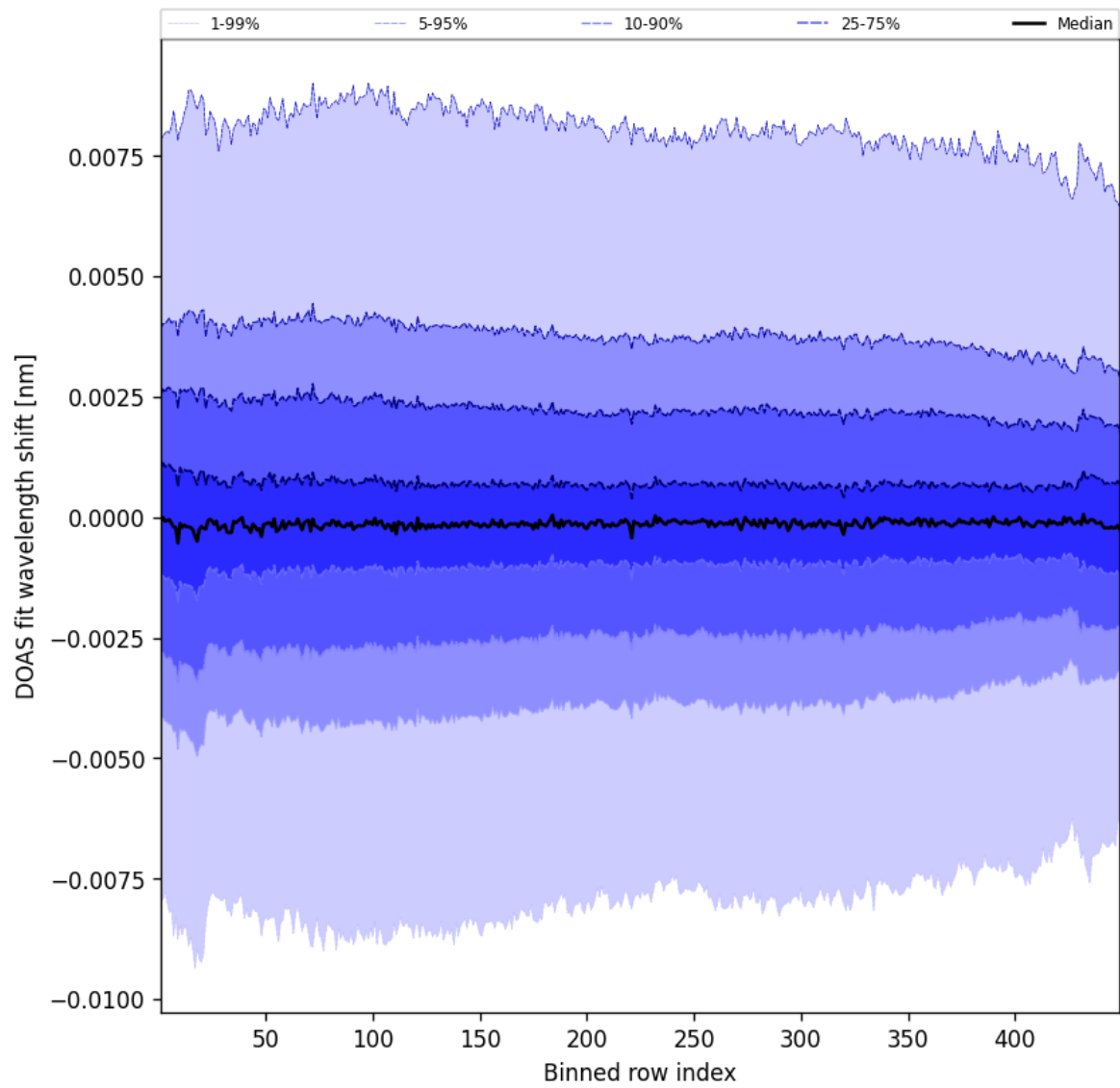


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-06-17 to 2025-06-17

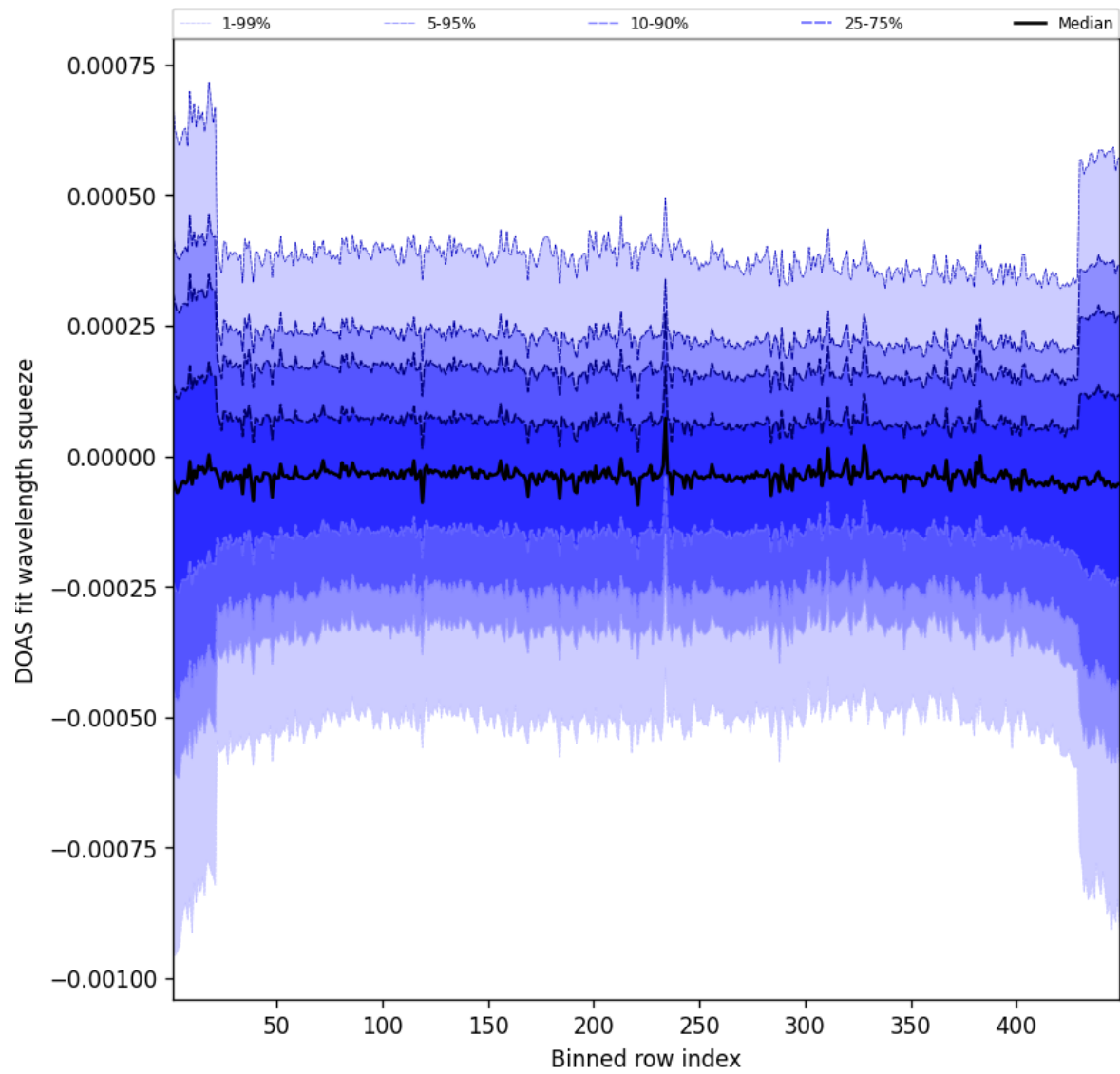


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-06-17 to 2025-06-17

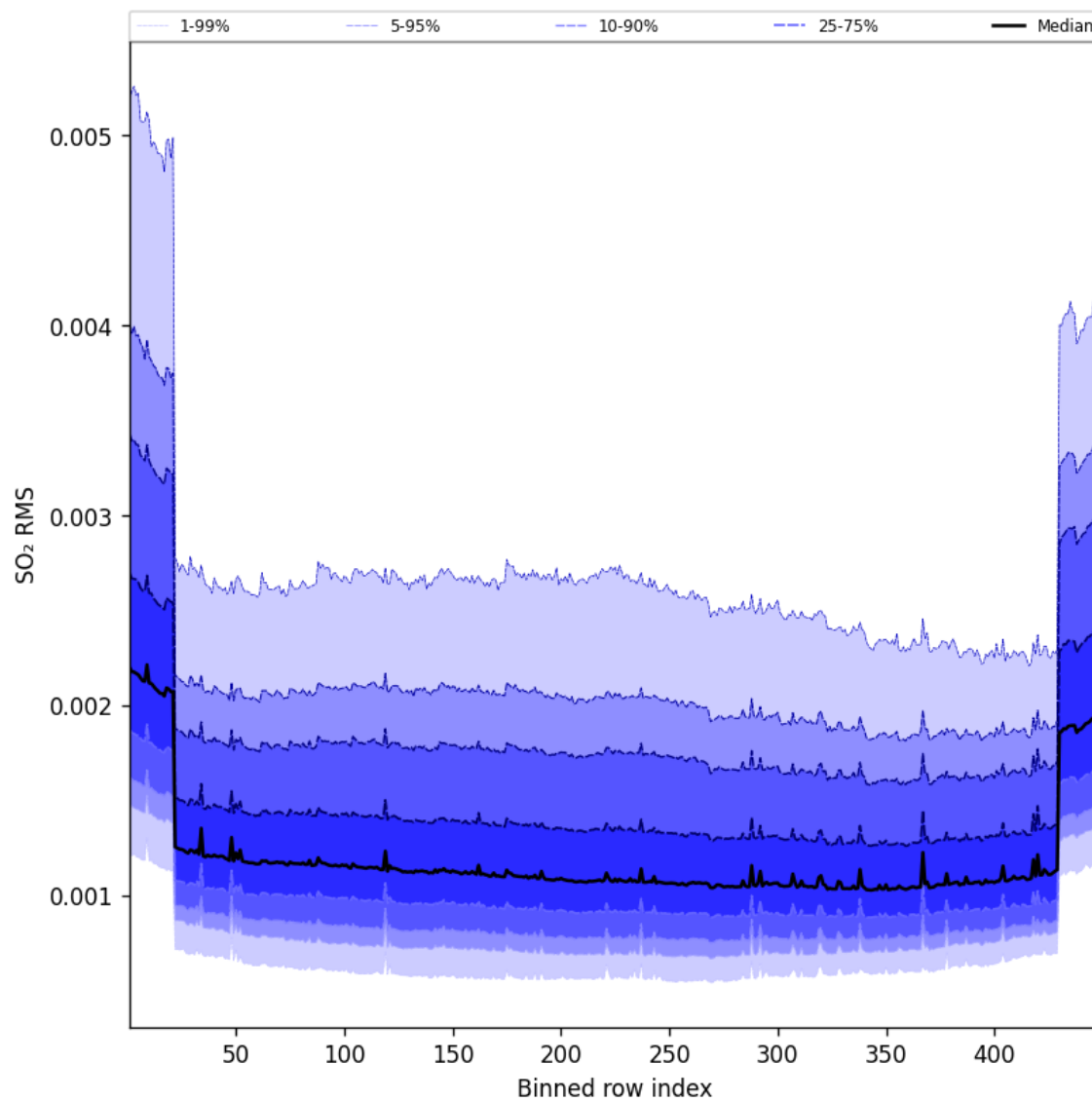


Figure 106: Along track statistics of “SO₂ RMS” for 2025-06-17 to 2025-06-17

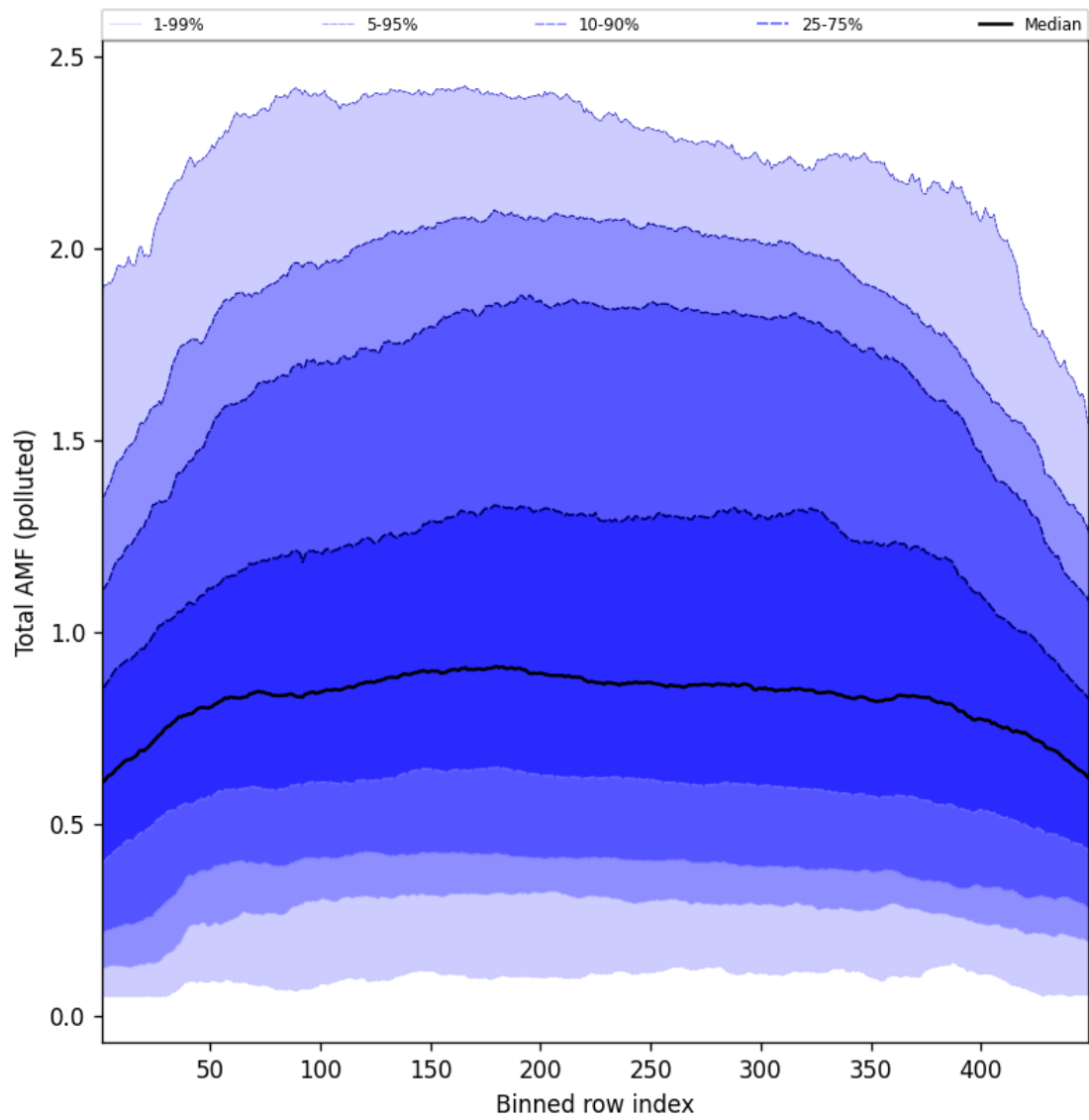


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-06-17 to 2025-06-17

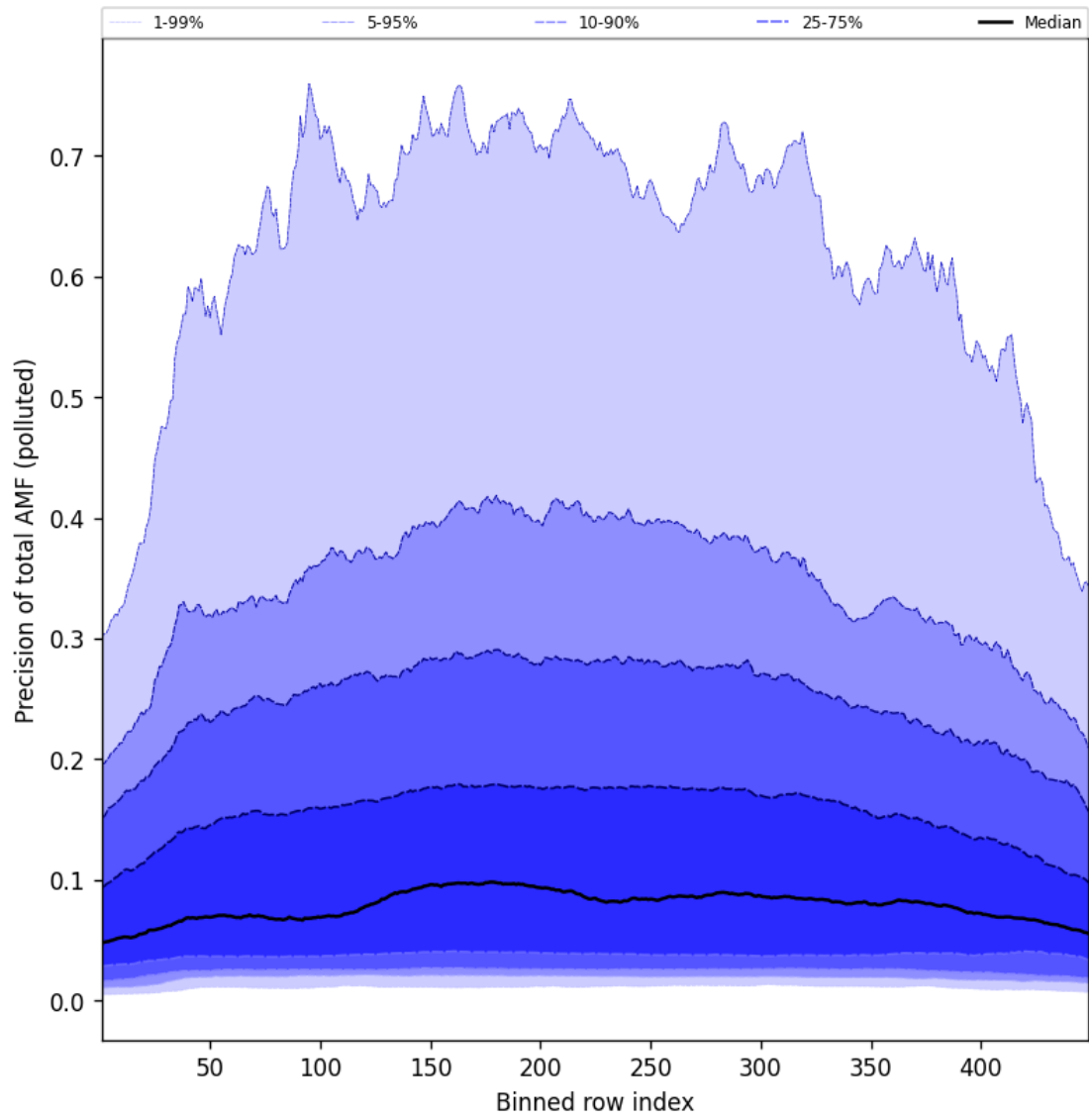


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-06-17 to 2025-06-17

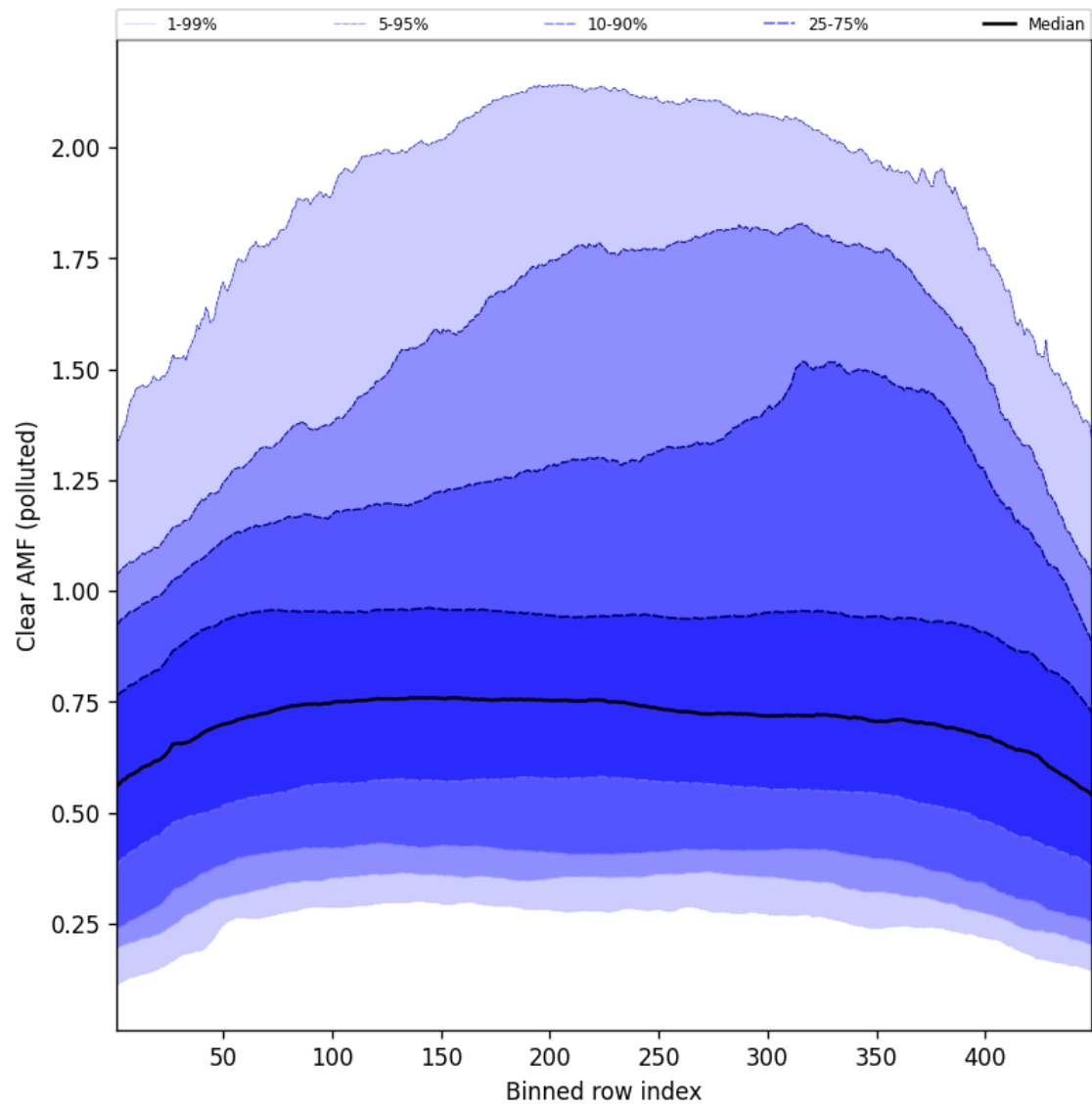


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-06-17 to 2025-06-17

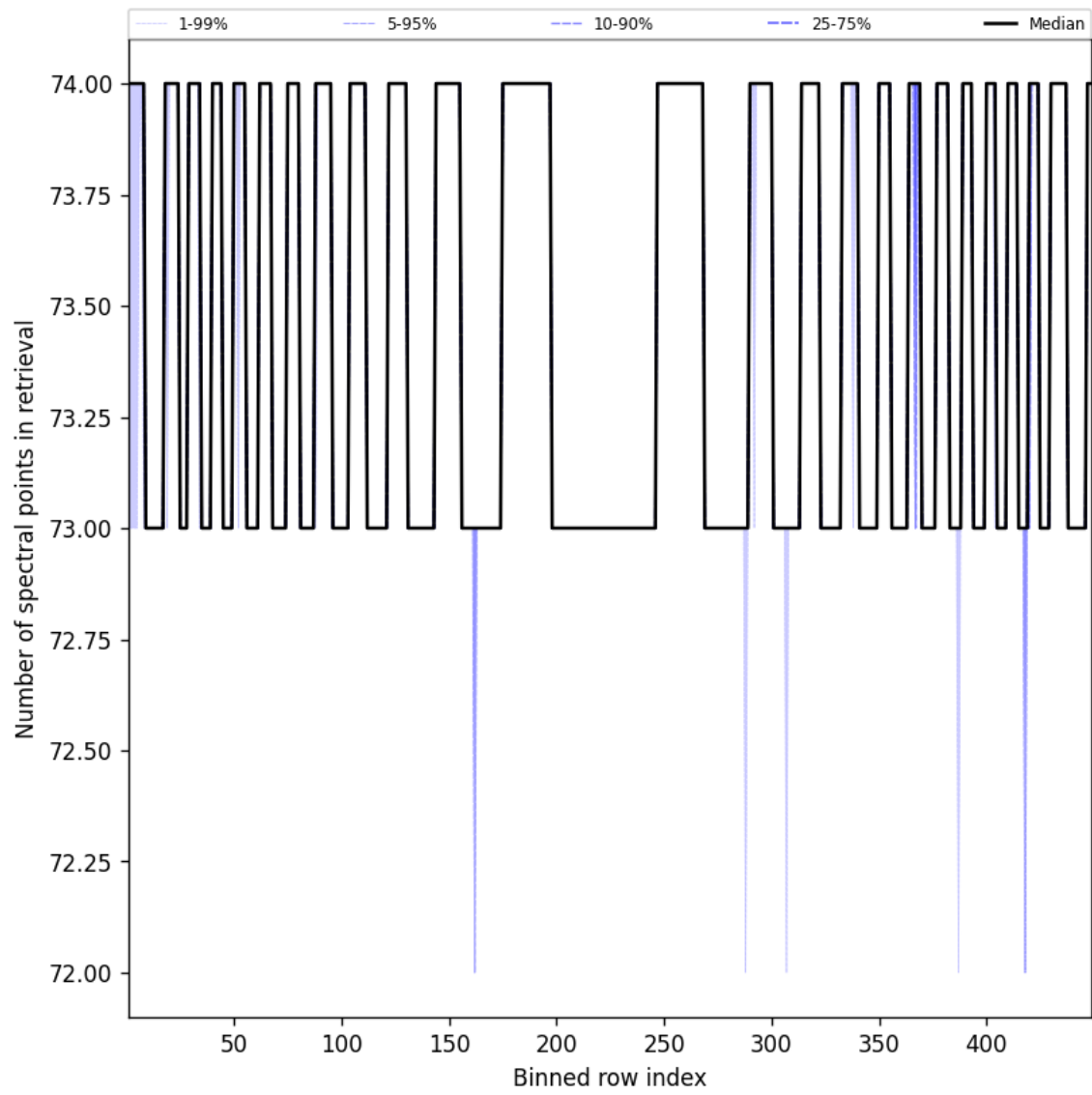


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-06-17 to 2025-06-17

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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