

PyCAMA report generated by tropl2-proc

tropl2-proc

2025-09-06 (03:34)

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]	0.684 ± 0.400	17269034	0.995	0.740	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.833 \pm 100.522) \times 10^{-2}$	17269034	0.263	0.447	1.044×10^{-2}	-78.4	1.994×10^3
sulfurdioxide total vertical column precision [DU]	0.486 ± 0.599	17269034	0.222	0.323	0.330	4.592×10^{-2}	123
sulfurdioxide slant column density corrected [DU]	$(1.960 \pm 38.316) \times 10^{-2}$	17269034	0.258	0.374	9.462×10^{-3}	-23.1	99.7
sulfurdioxide slant column density cobra [DU]	$(1.944 \pm 37.406) \times 10^{-2}$	17269034	0.258	0.374	9.462×10^{-3}	-23.1	56.1
sulfurdioxide slant column density cobra precision [DU]	0.302 ± 0.141	17269034	0.213	0.141	0.261	8.351×10^{-2}	24.0
sulfurdioxide slant column density window1 [DU]	0.149 ± 0.699	17269034	0.125	0.747	0.153	-288	113
sulfurdioxide slant column density window1 precision [DU]	0.302 ± 0.141	17269034	0.213	0.141	0.261	8.351×10^{-2}	24.0
sulfurdioxide slant column density corrected win1 [DU]	$(6.897 \pm 696.550) \times 10^{-3}$	17269034	-2.500×10^{-2}	0.739	-1.373×10^{-2}	-288	113
background so2 slant column offset window1 [DU]	-0.143 ± 0.136	17269034	-0.220	0.137	-0.167	-1.42	3.44
sulfurdioxide slant column density window2 [DU]	0.245 ± 9.335	17269034	0.250	11.8	3.623×10^{-2}	-985	1.207×10^3
sulfurdioxide slant column density window2 precision [DU]	8.45 ± 2.38	17269034	7.43	2.79	8.10	2.27	566
sulfurdioxide slant column density corrected win2 [DU]	-1.68 ± 9.16	17269034	-1.25	11.6	-1.65	-989	1.203×10^3
background so2 slant column offset window2 [DU]	-1.92 ± 2.36	17269034	-0.250	3.03	-1.22	-16.4	9.34
sulfurdioxide slant column density window3 [DU]	-0.734 ± 25.072	17269034	-0.560	31.5	-0.460	-919	879
sulfurdioxide slant column density window3 precision [DU]	30.0 ± 13.9	17269034	23.7	10.8	26.3	10.1	1.610×10^3
sulfurdioxide slant column density corrected win3 [DU]	8.07 ± 24.48	17269034	8.40	30.8	8.27	-915	882
background so2 slant column offset window3 [DU]	8.80 ± 5.95	17269034	5.04	9.33	8.50	-17.7	47.5
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	17269034	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.182 \pm 6.184) \times 10^{-2}$	17269034	1.316×10^{-2}	2.003×10^{-2}	1.431×10^{-2}	1.659×10^{-4}	1.97
fitted radiance shift [nm]	$(-3.664 \pm 27.392) \times 10^{-4}$	17269034	-5.000×10^{-4}	1.908×10^{-3}	-3.629×10^{-4}	-4.685×10^{-2}	5.986×10^{-2}
fitted radiance squeeze [1]	$(-6.550 \pm 191.336) \times 10^{-6}$	17269034	-1.000×10^{-5}	2.134×10^{-4}	-3.686×10^{-6}	-1.815×10^{-2}	2.444×10^{-2}
fitted root mean square [1]	$(1.319 \pm 0.569) \times 10^{-3}$	17269034	9.750×10^{-4}	5.796×10^{-4}	1.155×10^{-3}	3.443×10^{-4}	9.111×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.897 ± 0.442	17269034	0.700	0.536	0.819	5.000×10^{-2}	3.01
sulfurdioxide total air mass factor polluted precision [1]	0.109 ± 0.106	17269034	3.500×10^{-2}	0.107	7.355×10^{-2}	2.977×10^{-3}	1.95
sulfurdioxide clear air mass factor polluted [1]	0.744 ± 0.277	17269034	0.700	0.340	0.715	4.491×10^{-2}	2.87
number of spectral points in retrieval [1]	73.4 ± 0.5	17269034	73.0	1.000	73.0	52.0	74.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	6.000×10^{-2}	0.130	0.260	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.04	-0.828	-0.520	-0.354	-0.210	0.237	0.393	0.576	0.926	2.37
sulfurdioxide total vertical column precision [DU]	9.529×10^{-2}	0.129	0.157	0.184	0.218	0.541	0.698	0.888	1.28	2.92
sulfurdioxide slant column density corrected [DU]	-0.885	-0.507	-0.366	-0.273	-0.176	0.199	0.301	0.404	0.566	1.07
sulfurdioxide slant column density cobra [DU]	-0.885	-0.507	-0.366	-0.273	-0.176	0.199	0.301	0.404	0.566	1.07
sulfurdioxide slant column density cobra precision [DU]	0.142	0.170	0.185	0.197	0.212	0.353	0.412	0.469	0.563	0.804
sulfurdioxide slant column density window1 [DU]	-1.72	-0.914	-0.618	-0.423	-0.222	0.525	0.721	0.911	1.20	1.99
sulfurdioxide slant column density window1 precision [DU]	0.142	0.170	0.185	0.197	0.212	0.353	0.412	0.469	0.563	0.804
sulfurdioxide slant column density corrected win1 [DU]	-1.71	-1.01	-0.744	-0.565	-0.377	0.362	0.568	0.772	1.09	1.98
background so2 slant column offset window1 [DU]	-0.372	-0.294	-0.267	-0.247	-0.225	-8.817×10^{-2}	-3.753×10^{-2}	1.406×10^{-2}	9.583×10^{-2}	0.290
sulfurdioxide slant column density window2 [DU]	-21.4	-14.5	-11.1	-8.60	-5.75	6.00	9.06	11.9	15.7	23.9
sulfurdioxide slant column density window2 precision [DU]	4.40	5.34	5.90	6.35	6.88	9.66	10.6	11.5	12.7	15.3
sulfurdioxide slant column density corrected win2 [DU]	-23.9	-16.5	-13.0	-10.4	-7.44	4.11	6.99	9.57	13.1	20.5
background so2 slant column offset window2 [DU]	-8.50	-6.67	-5.40	-4.38	-3.25	-0.219	4.266×10^{-2}	0.262	0.602	2.17
sulfurdioxide slant column density window3 [DU]	-64.4	-42.4	-31.9	-24.4	-16.2	15.2	23.2	30.3	39.9	58.8
sulfurdioxide slant column density window3 precision [DU]	14.7	17.3	19.1	20.6	22.2	33.0	37.6	43.7	56.2	88.9
sulfurdioxide slant column density corrected win3 [DU]	-53.7	-32.4	-22.4	-15.1	-7.15	23.7	31.4	38.4	47.7	66.6
background so2 slant column offset window3 [DU]	-4.74	-9.811×10^{-2}	1.52	2.80	4.28	13.6	15.2	16.5	18.1	21.1
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	9.230×10^{-4}	2.433×10^{-3}	3.969×10^{-3}	5.772×10^{-3}	8.138×10^{-3}	2.817×10^{-2}	4.411×10^{-2}	7.161×10^{-2}	0.122	0.289
fitted radiance shift [nm]	-8.545×10^{-3}	-4.423×10^{-3}	-2.967×10^{-3}	-2.108×10^{-3}	-1.357×10^{-3}	5.506×10^{-4}	1.298×10^{-3}	2.219×10^{-3}	3.804×10^{-3}	8.221×10^{-3}
fitted radiance squeeze [1]	-5.284×10^{-4}	-3.078×10^{-4}	-2.242×10^{-4}	-1.687×10^{-4}	-1.112×10^{-4}	1.022×10^{-4}	1.578×10^{-4}	2.106×10^{-4}	2.885×10^{-4}	4.773×10^{-4}
fitted root mean square [1]	5.979×10^{-4}	7.412×10^{-4}	8.204×10^{-4}	8.804×10^{-4}	9.537×10^{-4}	1.533×10^{-3}	1.779×10^{-3}	2.013×10^{-3}	2.385×10^{-3}	3.386×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.110	0.294	0.402	0.491	0.592	1.13	1.33	1.53	1.77	2.17
sulfurdioxide total air mass factor polluted precision [1]	1.238×10^{-2}	2.088×10^{-2}	2.687×10^{-2}	3.180×10^{-2}	3.886×10^{-2}	0.146	0.185	0.222	0.295	0.521
sulfurdioxide clear air mass factor polluted [1]	0.270	0.363	0.425	0.485	0.557	0.897	0.988	1.07	1.18	1.66
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]	0.661 ± 0.411	10055636	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(2.071 \pm 99.869) \times 10^{-2}$	10055636	0.420	9.063×10^{-3}	-43.1	1.994×10^3	-0.198	0.221
sulfurdioxide total vertical column precision [DU]	0.459 ± 0.557	10055636	0.313	0.304	4.592×10^{-2}	123	0.204	0.517
sulfurdioxide slant column density corrected [DU]	$(1.550 \pm 33.157) \times 10^{-2}$	10055636	0.352	8.223×10^{-3}	-6.79	99.7	-0.166	0.186
sulfurdioxide slant column density cobra [DU]	$(1.548 \pm 32.938) \times 10^{-2}$	10055636	0.352	8.223×10^{-3}	-6.79	18.7	-0.166	0.186
sulfurdioxide slant column density cobra precision [DU]	0.279 ± 0.114	10055636	0.118	0.244	8.351×10^{-2}	20.8	0.204	0.322
sulfurdioxide slant column density window1 [DU]	0.146 ± 0.630	10055636	0.708	0.150	-227	46.6	-0.207	0.502
sulfurdioxide slant column density window1 precision [DU]	0.279 ± 0.114	10055636	0.118	0.244	8.351×10^{-2}	20.8	0.204	0.322
sulfurdioxide slant column density corrected win1 [DU]	$(-3.806 \pm 623.590) \times 10^{-3}$	10055636	0.699	-1.835×10^{-2}	-227	46.6	-0.363	0.336
background so2 slant column offset window1 [DU]	-0.150 ± 0.117	10055636	0.140	-0.169	-1.42	2.18	-0.227	-8.771×10^{-2}
sulfurdioxide slant column density window2 [DU]	-0.112 ± 8.912	10055636	11.3	-0.233	-894	371	-5.84	5.48
sulfurdioxide slant column density window2 precision [DU]	8.21 ± 2.30	10055636	2.72	7.86	2.33	566	6.67	9.39
sulfurdioxide slant column density corrected win2 [DU]	-1.50 ± 8.79	10055636	11.2	-1.48	-894	367	-7.08	4.09
background so2 slant column offset window2 [DU]	-1.39 ± 1.75	10055636	2.38	-0.960	-9.59	9.34	-2.56	-0.179
sulfurdioxide slant column density window3 [DU]	-0.132 ± 24.927	10055636	31.0	7.691×10^{-2}	-919	879	-15.4	15.6
sulfurdioxide slant column density window3 precision [DU]	29.4 ± 14.0	10055636	10.9	25.6	10.1	1.610×10^3	21.6	32.6
sulfurdioxide slant column density corrected win3 [DU]	7.90 ± 24.19	10055636	30.2	8.12	-915	882	-6.99	23.2
background so2 slant column offset window3 [DU]	8.03 ± 6.04	10055636	10.0	7.75	-17.7	36.5	3.24	13.3
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.20	10055636	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.762 \pm 7.378) \times 10^{-2}$	10055636	2.787×10^{-2}	1.548×10^{-2}	1.659×10^{-4}	1.97	7.021×10^{-3}	3.489×10^{-2}
fitted radiance shift [nm]	$(-1.158 \pm 28.160) \times 10^{-4}$	10055636	1.807×10^{-3}	-1.565×10^{-4}	-4.685×10^{-2}	4.519×10^{-2}	-1.040×10^{-3}	7.668×10^{-4}
fitted radiance squeeze [1]	$(-2.486 \pm 16.684) \times 10^{-5}$	10055636	1.990×10^{-4}	-1.882×10^{-5}	-1.245×10^{-2}	1.163×10^{-2}	-1.209×10^{-4}	7.808×10^{-5}
fitted root mean square [1]	$(1.229 \pm 0.471) \times 10^{-3}$	10055636	5.003×10^{-4}	1.100×10^{-3}	3.443×10^{-4}	8.813×10^{-2}	9.205×10^{-4}	1.421×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.906 ± 0.471	10055636	0.585	0.843	5.000×10^{-2}	3.01	0.566	1.15
sulfurdioxide total air mass factor polluted precision [1]	0.116 ± 0.122	10055636	0.114	7.367×10^{-2}	2.977×10^{-3}	1.95	3.985×10^{-2}	0.154
sulfurdioxide clear air mass factor polluted [1]	0.767 ± 0.318	10055636	0.417	0.735	4.491×10^{-2}	2.87	0.535	0.952
number of spectral points in retrieval [1]	73.5 ± 0.5	10055636	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]	0.716 $\pm$ 0.382	7213398	0.660	1.000	0.0	1.000	0.340	1.000
sulfurdioxide total vertical column [DU]	(3.894 $\pm$ 101.415) $\times 10^{-2}$	7213398	0.488	1.264 $\times 10^{-2}$	-78.4	112	-0.227	0.261
sulfurdioxide total vertical column precision [DU]	0.524 $\pm$ 0.651	7213398	0.327	0.361	4.840 $\times 10^{-2}$	62.1	0.245	0.572
sulfurdioxide slant column density corrected [DU]	(2.532 $\pm$ 44.515) $\times 10^{-2}$	7213398	0.410	1.146 $\times 10^{-2}$	-23.1	56.1	-0.191	0.219
sulfurdioxide slant column density cobra [DU]	(2.497 $\pm$ 42.858) $\times 10^{-2}$	7213398	0.410	1.146 $\times 10^{-2}$	-23.1	56.1	-0.191	0.219
sulfurdioxide slant column density cobra precision [DU]	0.335 $\pm$ 0.165	7213398	0.169	0.289	9.279 $\times 10^{-2}$	24.0	0.227	0.396
sulfurdioxide slant column density window1 [DU]	0.154 $\pm$ 0.786	7213398	0.806	0.159	-288	113	-0.246	0.560
sulfurdioxide slant column density window1 precision [DU]	0.335 $\pm$ 0.165	7213398	0.169	0.289	9.279 $\times 10^{-2}$	24.0	0.227	0.396
sulfurdioxide slant column density corrected win1 [DU]	(2.182 $\pm$ 78.681) $\times 10^{-2}$	7213398	0.803	-6.502 $\times 10^{-3}$	-288	113	-0.399	0.404
background so2 slant column offset window1 [DU]	-0.132 $\pm$ 0.158	7213398	0.132	-0.164	-0.673	3.44	-0.221	-8.899 $\times 10^{-2}$
sulfurdioxide slant column density window2 [DU]	0.742 $\pm$ 9.873	7213398	12.4	0.445	-985	1.207 $\times 10^3$	-5.62	6.77
sulfurdioxide slant column density window2 precision [DU]	8.78 $\pm$ 2.44	7213398	2.80	8.43	2.27	524	7.20	10.0
sulfurdioxide slant column density corrected win2 [DU]	-1.91 $\pm$ 9.64	7213398	12.1	-1.91	-989	1.203 $\times 10^3$	-7.97	4.14
background so2 slant column offset window2 [DU]	-2.66 $\pm$ 2.85	7213398	4.63	-1.84	-16.4	9.14	-4.94	-0.303
sulfurdioxide slant column density window3 [DU]	-1.57 $\pm$ 25.25	7213398	32.2	-1.23	-341	397	-17.4	14.7
sulfurdioxide slant column density window3 precision [DU]	30.8 $\pm$ 13.6	7213398	10.3	27.2	11.0	230	23.2	33.5
sulfurdioxide slant column density corrected win3 [DU]	8.30 $\pm$ 24.87	7213398	31.7	8.50	-326	410	-7.38	24.3
background so2 slant column offset window3 [DU]	9.87 $\pm$ 5.65	7213398	8.44	9.19	-15.7	47.5	5.73	14.2
sulfurdioxide slant column cobra flag [1]	1.97 $\pm$ 0.24	7213398	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	(2.373 $\pm$ 3.813) $\times 10^{-2}$	7213398	1.329 $\times 10^{-2}$	1.360 $\times 10^{-2}$	5.926 $\times 10^{-4}$	1.10	8.990 $\times 10^{-3}$	2.228 $\times 10^{-2}$
fitted radiance shift [nm]	(-7.158 $\pm$ 25.881) $\times 10^{-4}$	7213398	1.933 $\times 10^{-3}$	-6.758 $\times 10^{-4}$	-4.638 $\times 10^{-2}$	5.986 $\times 10^{-2}$	-1.728 $\times 10^{-3}$	2.042 $\times 10^{-4}$
fitted radiance squeeze [1]	(1.898 $\pm$ 21.845) $\times 10^{-5}$	7213398	2.341 $\times 10^{-4}$	2.097 $\times 10^{-5}$	-1.815 $\times 10^{-2}$	2.444 $\times 10^{-2}$	-9.481 $\times 10^{-5}$	1.393 $\times 10^{-4}$
fitted root mean square [1]	(1.443 $\pm$ 0.664) $\times 10^{-3}$	7213398	6.807 $\times 10^{-4}$	1.246 $\times 10^{-3}$	3.452 $\times 10^{-4}$	9.111 $\times 10^{-2}$	1.011 $\times 10^{-3}$	1.692 $\times 10^{-3}$
sulfurdioxide total air mass factor polluted [1]	0.883 $\pm$ 0.398	7213398	0.479	0.794	5.000 $\times 10^{-2}$	2.70	0.614	1.09
sulfurdioxide total air mass factor polluted precision [1]	(9.835 $\pm$ 7.846) $\times 10^{-2}$	7213398	9.898 $\times 10^{-2}$	7.341 $\times 10^{-2}$	5.362 $\times 10^{-3}$	1.30	3.802 $\times 10^{-2}$	0.137
sulfurdioxide clear air mass factor polluted [1]	0.712 $\pm$ 0.203	7213398	0.253	0.699	0.107	2.39	0.578	0.831
number of spectral points in retrieval [1]	73.4 $\pm$ 0.5	7213398	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]	0.696 ± 0.391	11588970	0.700	1.000	0.0	1.000	0.300	1.000
sulfurdioxide total vertical column [DU]	$(3.185 \pm 90.807) \times 10^{-2}$	11588970	0.439	1.117×10^{-2}	-78.4	112	-0.205	0.234
sulfurdioxide total vertical column precision [DU]	0.475 ± 0.603	11588970	0.301	0.315	4.821×10^{-2}	37.1	0.217	0.517
sulfurdioxide slant column density corrected [DU]	$(2.191 \pm 39.978) \times 10^{-2}$	11588970	0.373	1.009×10^{-2}	-23.1	56.1	-0.174	0.199
sulfurdioxide slant column density cobra [DU]	$(2.170 \pm 38.892) \times 10^{-2}$	11588970	0.373	1.009×10^{-2}	-23.1	56.1	-0.174	0.199
sulfurdioxide slant column density cobra precision [DU]	0.305 ± 0.152	11588970	0.153	0.255	8.351×10^{-2}	19.1	0.208	0.361
sulfurdioxide slant column density window1 [DU]	0.156 ± 0.710	11588970	0.745	0.163	-83.4	76.3	-0.212	0.533
sulfurdioxide slant column density window1 precision [DU]	0.305 ± 0.152	11588970	0.153	0.255	8.351×10^{-2}	19.1	0.208	0.361
sulfurdioxide slant column density corrected win1 [DU]	$(1.580 \pm 70.807) \times 10^{-2}$	11588970	0.738	-6.781×10^{-3}	-83.4	76.2	-0.369	0.369
background so2 slant column offset window1 [DU]	-0.140 ± 0.147	11588970	0.138	-0.170	-1.42	3.44	-0.227	-8.871×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.331 ± 9.274	11588970	11.7	5.740×10^{-2}	-894	1.207×10^3	-5.67	6.01
sulfurdioxide slant column density window2 precision [DU]	8.33 ± 2.26	11588970	2.70	7.99	2.27	524	6.81	9.51
sulfurdioxide slant column density corrected win2 [DU]	-1.72 ± 9.06	11588970	11.5	-1.70	-894	1.203×10^3	-7.45	4.01
background so2 slant column offset window2 [DU]	-2.06 ± 2.59	11588970	3.53	-1.11	-16.4	9.34	-3.70	-0.168
sulfurdioxide slant column density window3 [DU]	1.84 ± 24.65	11588970	31.3	1.90	-919	184	-13.7	17.6
sulfurdioxide slant column density window3 precision [DU]	28.9 ± 12.4	11588970	9.88	25.6	10.8	593	21.9	31.8
sulfurdioxide slant column density corrected win3 [DU]	10.4 ± 23.8	11588970	30.3	10.3	-915	196	-4.70	25.6
background so2 slant column offset window3 [DU]	8.57 ± 6.09	11588970	9.40	7.92	-17.7	47.5	4.06	13.5
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	11588970	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.070 \pm 2.998) \times 10^{-2}$	11588970	1.384×10^{-2}	1.357×10^{-2}	2.258×10^{-4}	1.97	8.705×10^{-3}	2.255×10^{-2}
fitted radiance shift [nm]	$(-4.345 \pm 24.940) \times 10^{-4}$	11588970	1.934×10^{-3}	-3.959×10^{-4}	-4.051×10^{-2}	5.986×10^{-2}	-1.443×10^{-3}	4.915×10^{-4}
fitted radiance squeeze [1]	$(2.367 \pm 196.194) \times 10^{-6}$	11588970	2.127×10^{-4}	5.895×10^{-6}	-1.815×10^{-2}	1.348×10^{-2}	-1.010×10^{-4}	1.117×10^{-4}
fitted root mean square [1]	$(1.329 \pm 0.608) \times 10^{-3}$	11588970	6.285×10^{-4}	1.135×10^{-3}	3.443×10^{-4}	6.066×10^{-2}	9.386×10^{-4}	1.567×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.894 ± 0.395	11588970	0.479	0.839	5.000×10^{-2}	2.70	0.628	1.11
sulfurdioxide total air mass factor polluted precision [1]	0.101 ± 0.089	11588970	9.370×10^{-2}	7.224×10^{-2}	4.895×10^{-3}	1.28	4.128×10^{-2}	0.135
sulfurdioxide clear air mass factor polluted [1]	0.748 ± 0.223	11588970	0.299	0.738	0.109	2.39	0.594	0.893
number of spectral points in retrieval [1]	73.4 ± 0.5	11588970	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]	0.693 ± 0.410	3999664	0.760	1.000	0.0	1.000	0.240	1.000
sulfurdioxide total vertical column [DU]	$(1.793 \pm 127.134) \times 10^{-2}$	3999664	0.455	7.952×10^{-3}	-38.9	1.994×10^3	-0.216	0.238
sulfurdioxide total vertical column precision [DU]	0.493 ± 0.560	3999664	0.344	0.363	4.592×10^{-2}	123	0.217	0.561
sulfurdioxide slant column density corrected [DU]	$(1.329 \pm 33.508) \times 10^{-2}$	3999664	0.363	7.150×10^{-3}	-16.1	99.7	-0.173	0.190
sulfurdioxide slant column density cobra [DU]	$(1.323 \pm 32.764) \times 10^{-2}$	3999664	0.363	7.150×10^{-3}	-16.1	48.2	-0.173	0.190
sulfurdioxide slant column density cobra precision [DU]	0.285 ± 0.112	3999664	0.103	0.257	8.557×10^{-2}	24.0	0.217	0.319
sulfurdioxide slant column density window1 [DU]	0.149 ± 0.649	3999664	0.721	0.145	-288	113	-0.215	0.506
sulfurdioxide slant column density window1 precision [DU]	0.285 ± 0.112	3999664	0.103	0.257	8.557×10^{-2}	24.0	0.217	0.319
sulfurdioxide slant column density corrected win1 [DU]	$(-1.452 \pm 64.455) \times 10^{-2}$	3999664	0.714	-2.969×10^{-2}	-288	113	-0.381	0.333
background so2 slant column offset window1 [DU]	-0.163 ± 0.107	3999664	0.118	-0.178	-0.657	1.70	-0.229	-0.111
sulfurdioxide slant column density window2 [DU]	-0.195 ± 9.328	3999664	11.8	-0.268	-888	941	-6.11	5.65
sulfurdioxide slant column density window2 precision [DU]	8.60 ± 2.60	3999664	2.82	8.25	2.33	566	6.98	9.80
sulfurdioxide slant column density corrected win2 [DU]	-1.53 ± 9.23	3999664	11.6	-1.51	-889	940	-7.31	4.28
background so2 slant column offset window2 [DU]	-1.34 ± 1.66	3999664	2.13	-0.985	-13.6	9.05	-2.35	-0.222
sulfurdioxide slant column density window3 [DU]	-5.89 ± 24.93	3999664	30.9	-5.15	-341	397	-21.0	9.95
sulfurdioxide slant column density window3 precision [DU]	32.4 ± 16.9	3999664	12.1	27.8	10.7	1.610×10^3	23.1	35.2
sulfurdioxide slant column density corrected win3 [DU]	2.42 ± 24.94	3999664	31.2	3.10	-326	410	-12.9	18.3
background so2 slant column offset window3 [DU]	8.32 ± 5.51	3999664	8.74	8.05	-15.6	36.4	4.11	12.8
sulfurdioxide slant column cobra flag [1]	2.00 ± 0.09	3999664	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.866 \pm 9.492) \times 10^{-2}$	3999664	6.381×10^{-2}	2.324×10^{-2}	1.659×10^{-4}	1.84	7.543×10^{-3}	7.136×10^{-2}
fitted radiance shift [nm]	$(-2.515 \pm 33.211) \times 10^{-4}$	3999664	1.819×10^{-3}	-3.373×10^{-4}	-4.685×10^{-2}	4.519×10^{-2}	-1.193×10^{-3}	6.264×10^{-4}
fitted radiance squeeze [1]	$(-1.897 \pm 17.437) \times 10^{-5}$	3999664	2.054×10^{-4}	-1.789×10^{-5}	-1.468×10^{-2}	2.444×10^{-2}	-1.212×10^{-4}	8.418×10^{-5}
fitted root mean square [1]	$(1.250 \pm 0.455) \times 10^{-3}$	3999664	4.387×10^{-4}	1.152×10^{-3}	3.448×10^{-4}	9.111×10^{-2}	9.700×10^{-4}	1.409×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.885 ± 0.512	3999664	0.624	0.739	5.000×10^{-2}	3.01	0.523	1.15
sulfurdioxide total air mass factor polluted precision [1]	0.124 ± 0.139	3999664	0.140	7.083×10^{-2}	3.063×10^{-3}	1.95	3.219×10^{-2}	0.172
sulfurdioxide clear air mass factor polluted [1]	0.734 ± 0.365	3999664	0.401	0.646	4.558×10^{-2}	2.87	0.492	0.893
number of spectral points in retrieval [1]	73.4 ± 0.5	3999664	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

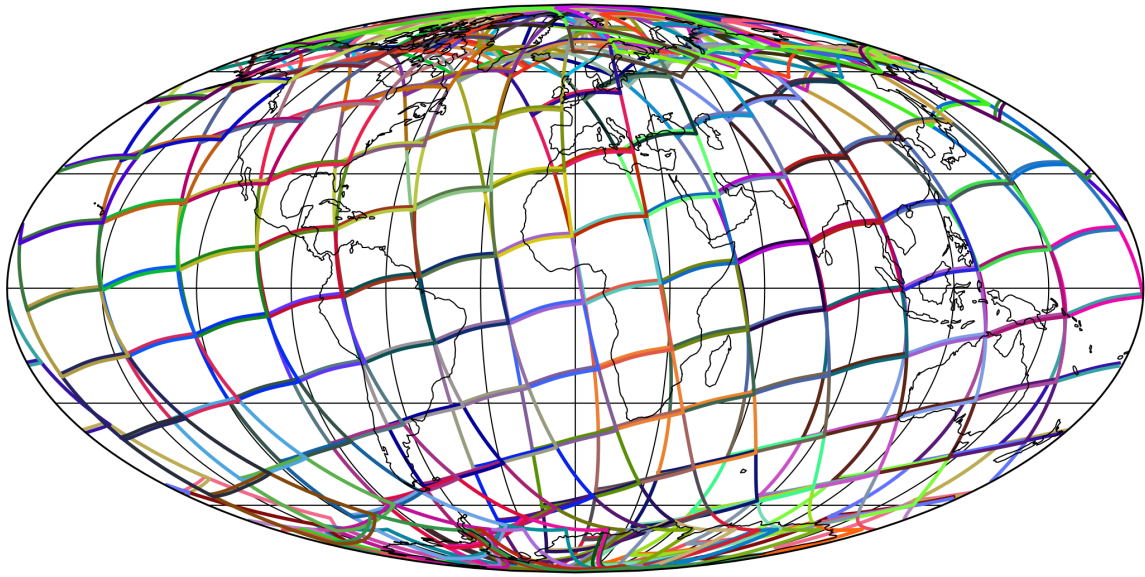


Figure 1: Outline of the granules.

4 Input data monitoring

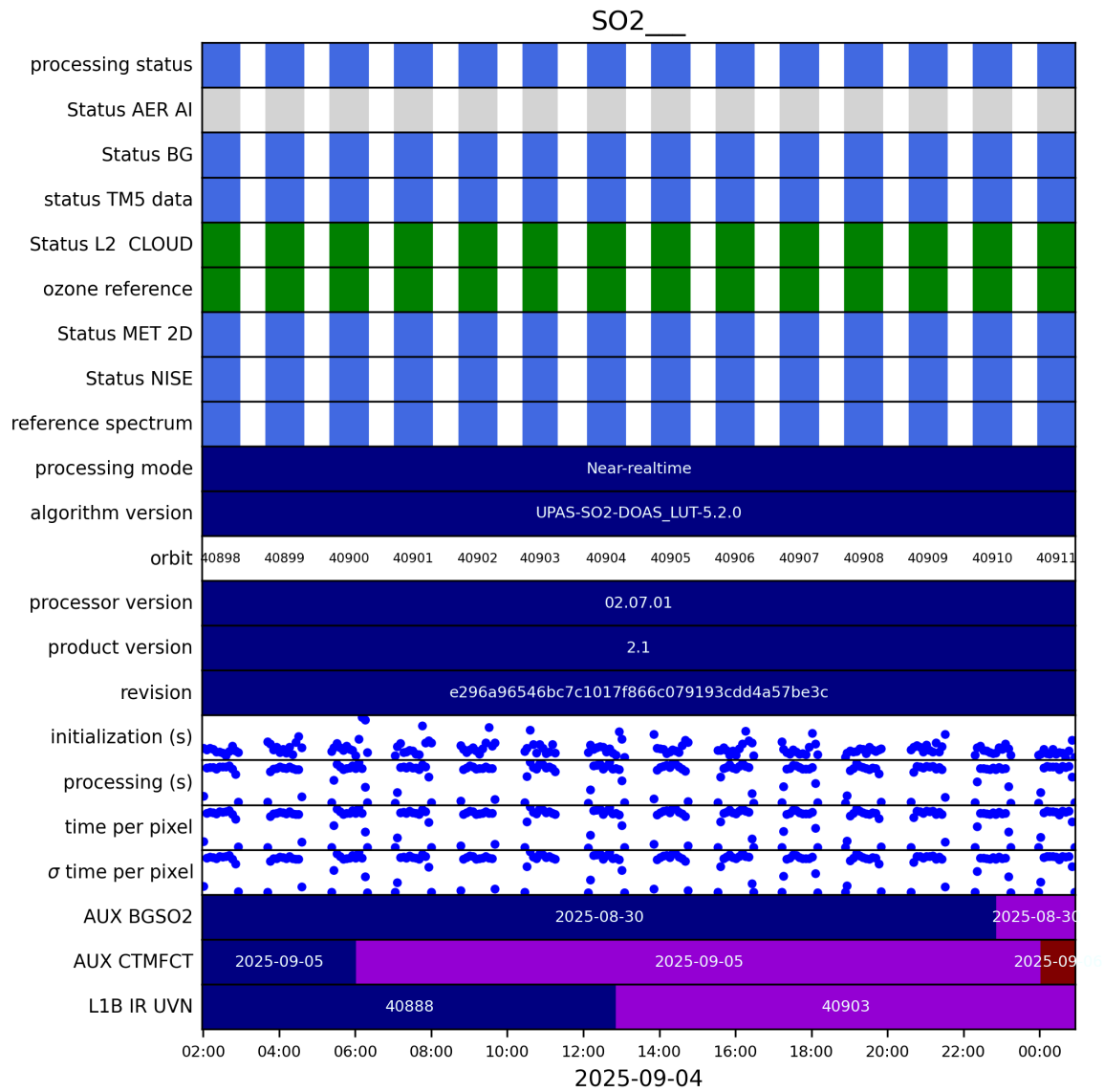


Figure 2: Input data per granule

5 Warnings and errors

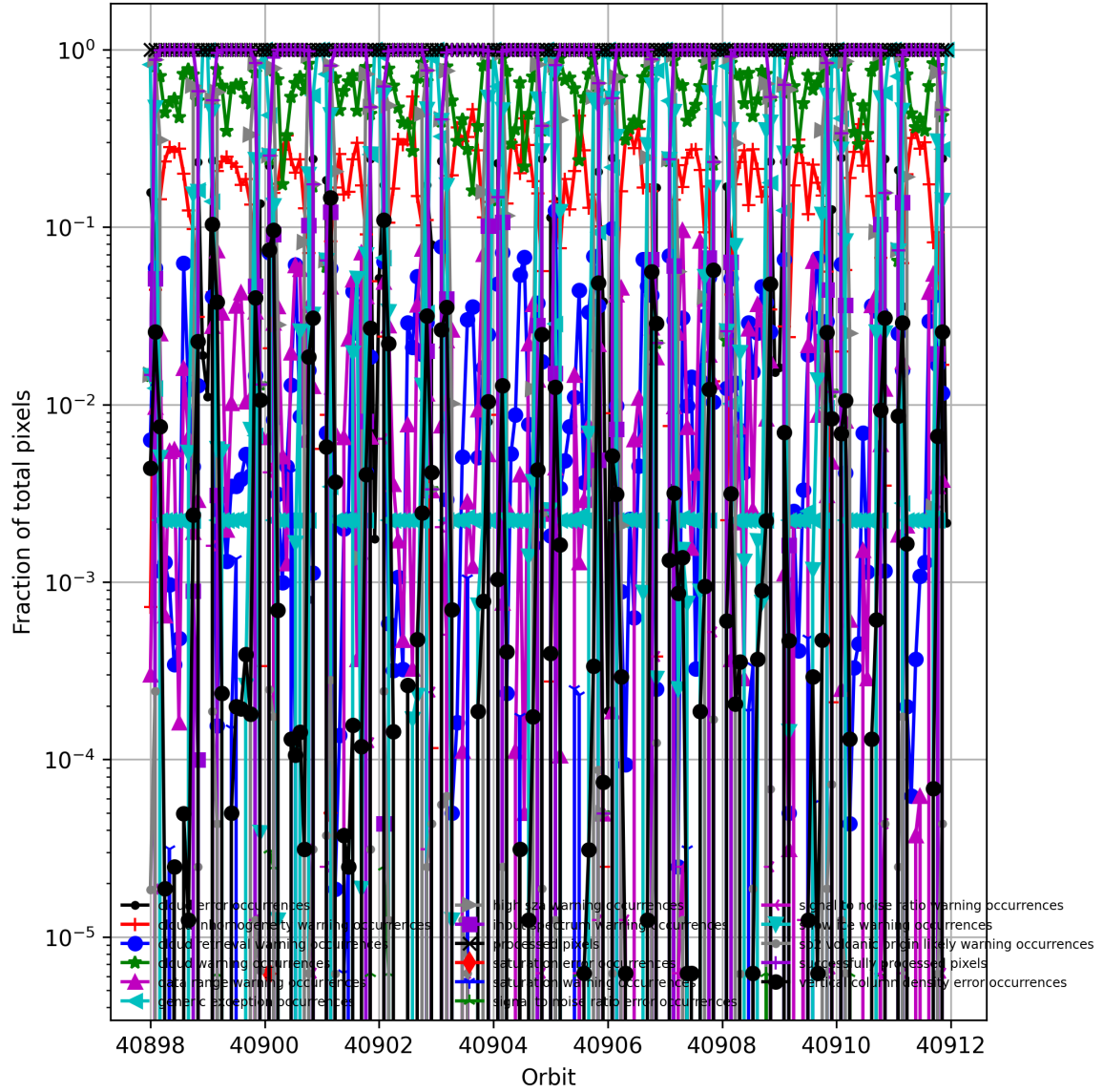


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

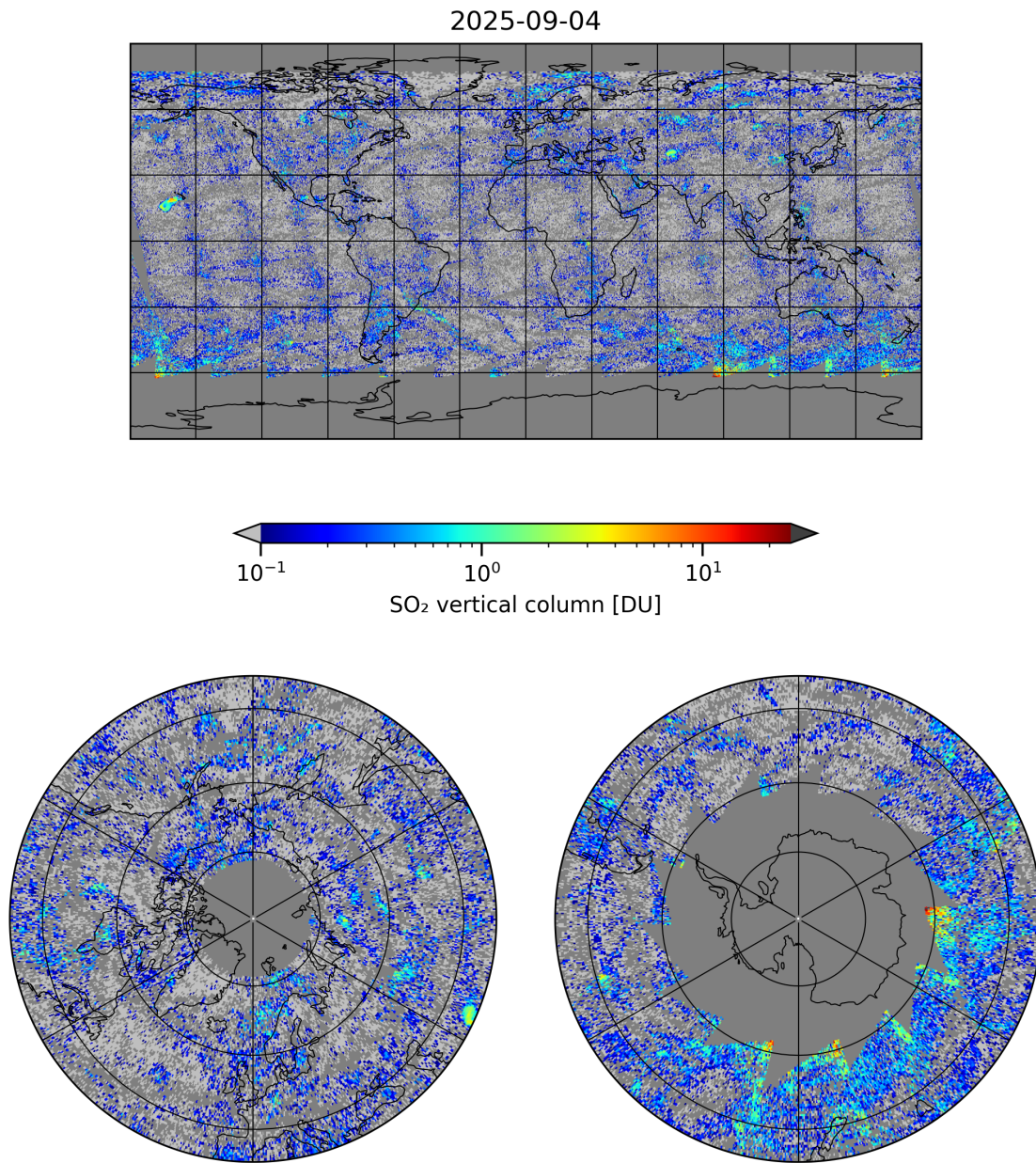


Figure 4: Map of “SO₂ vertical column” for 2025-09-04 to 2025-09-05

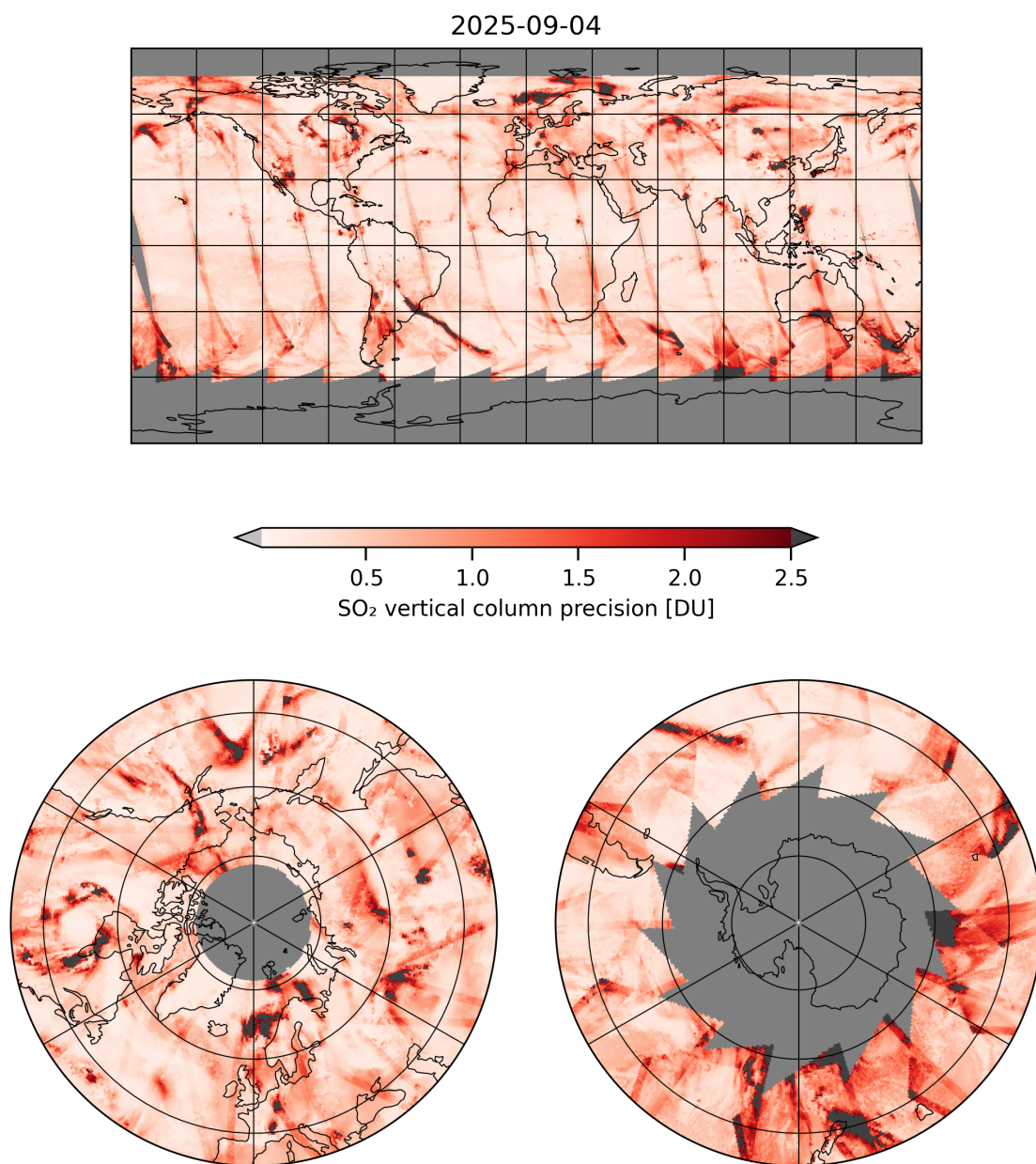


Figure 5: Map of “SO₂ vertical column precision” for 2025-09-04 to 2025-09-05

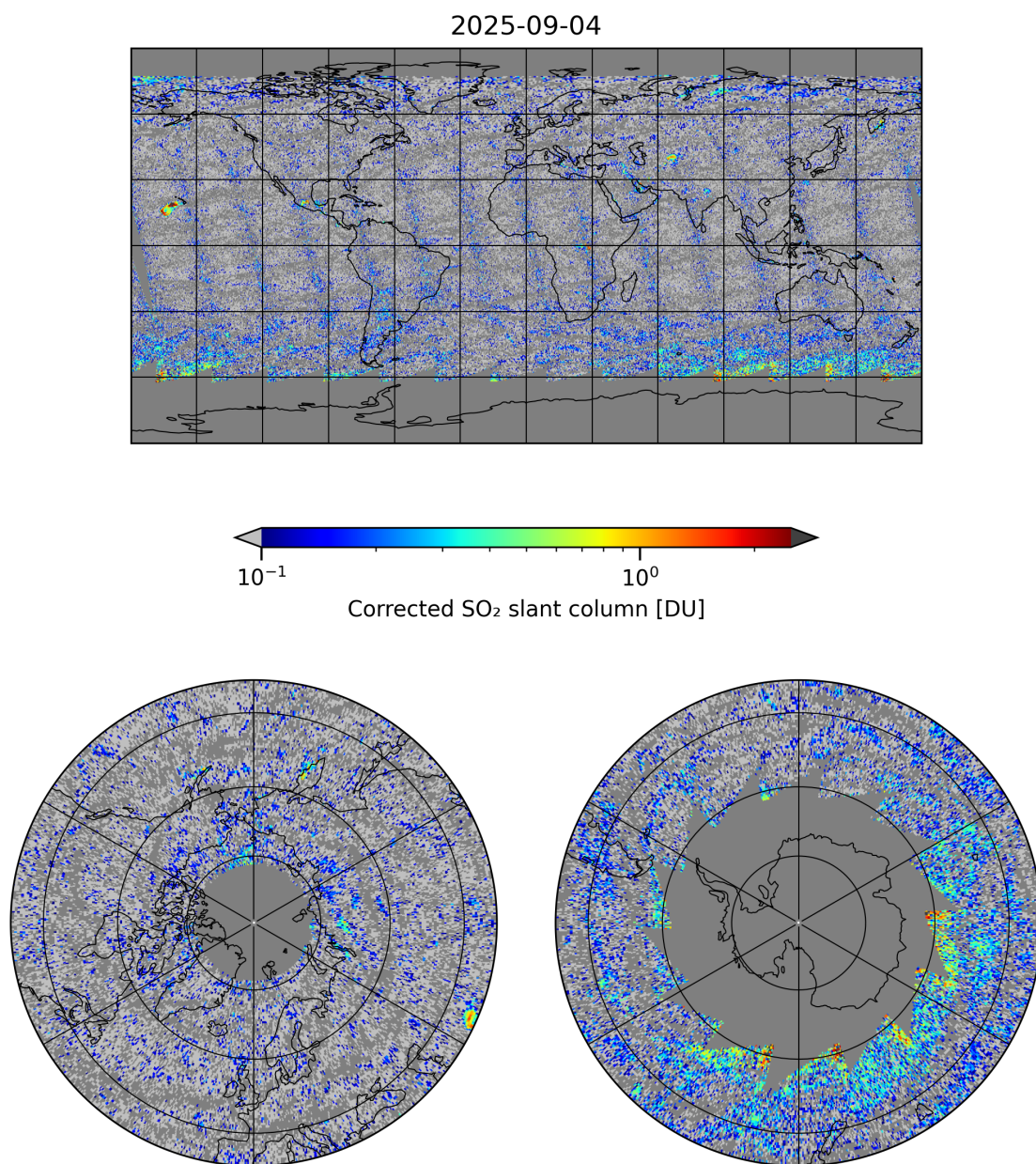


Figure 6: Map of “Corrected SO₂ slant column” for 2025-09-04 to 2025-09-05

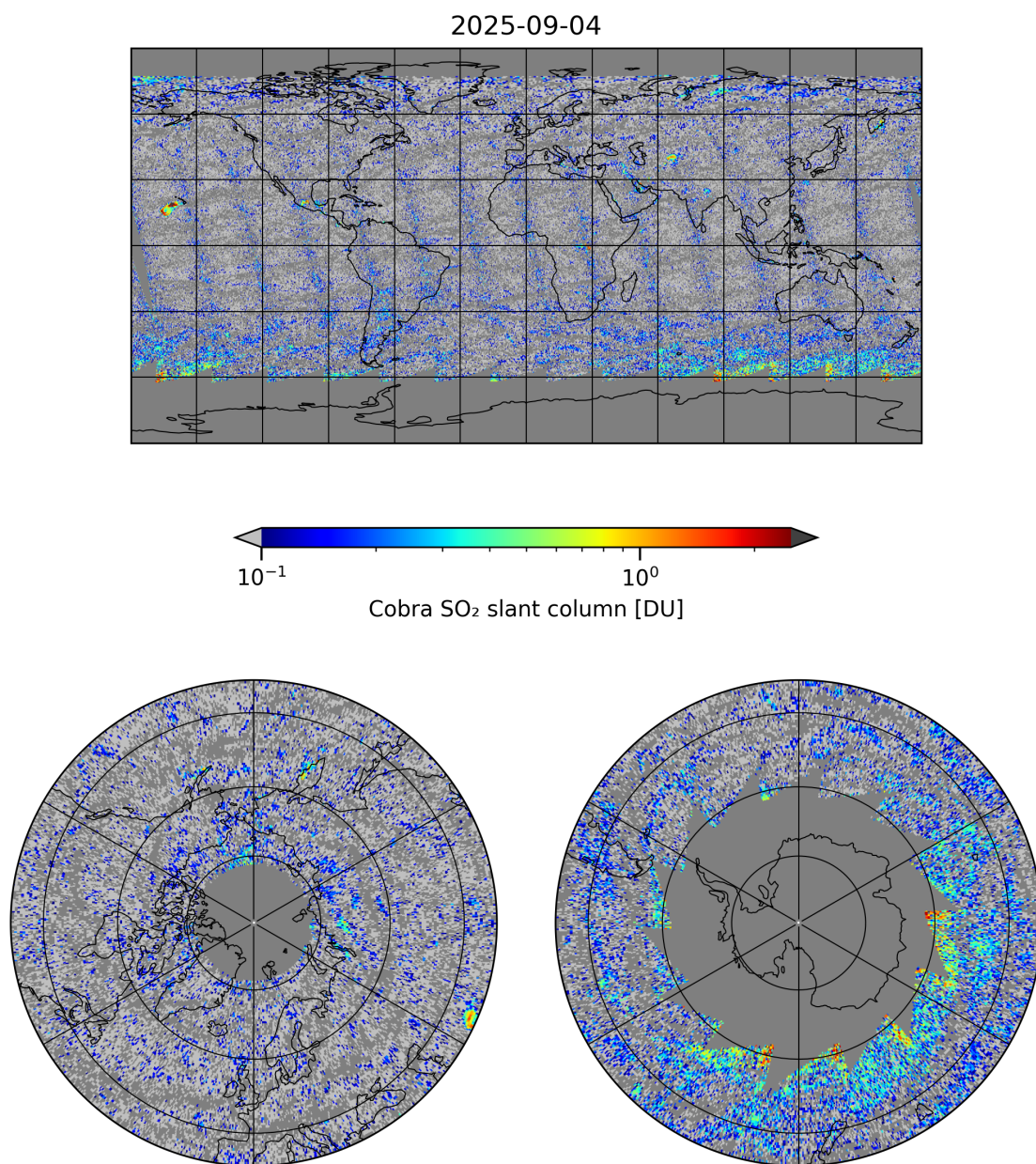


Figure 7: Map of “Cobra SO₂ slant column” for 2025-09-04 to 2025-09-05

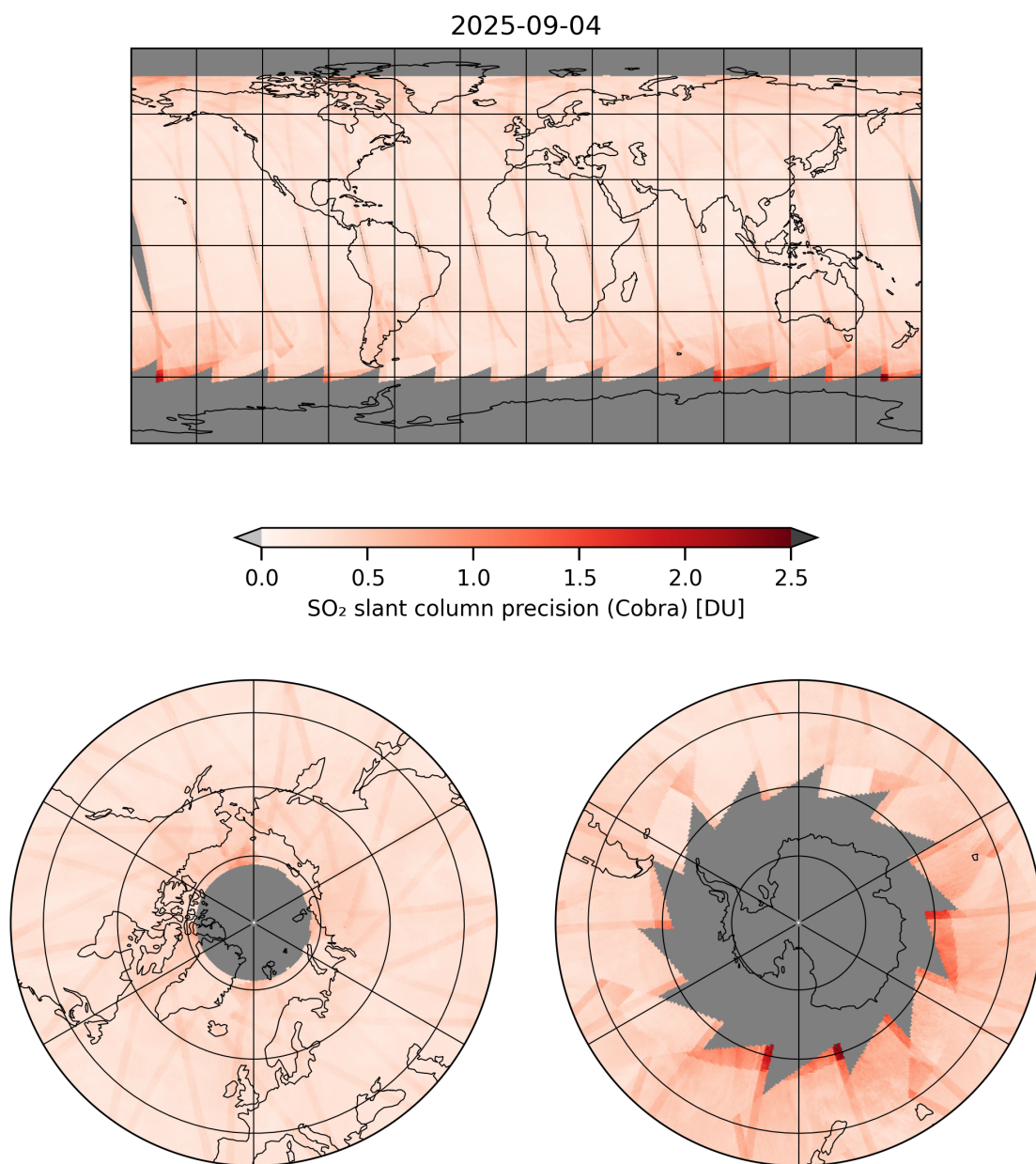


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-09-04 to 2025-09-05

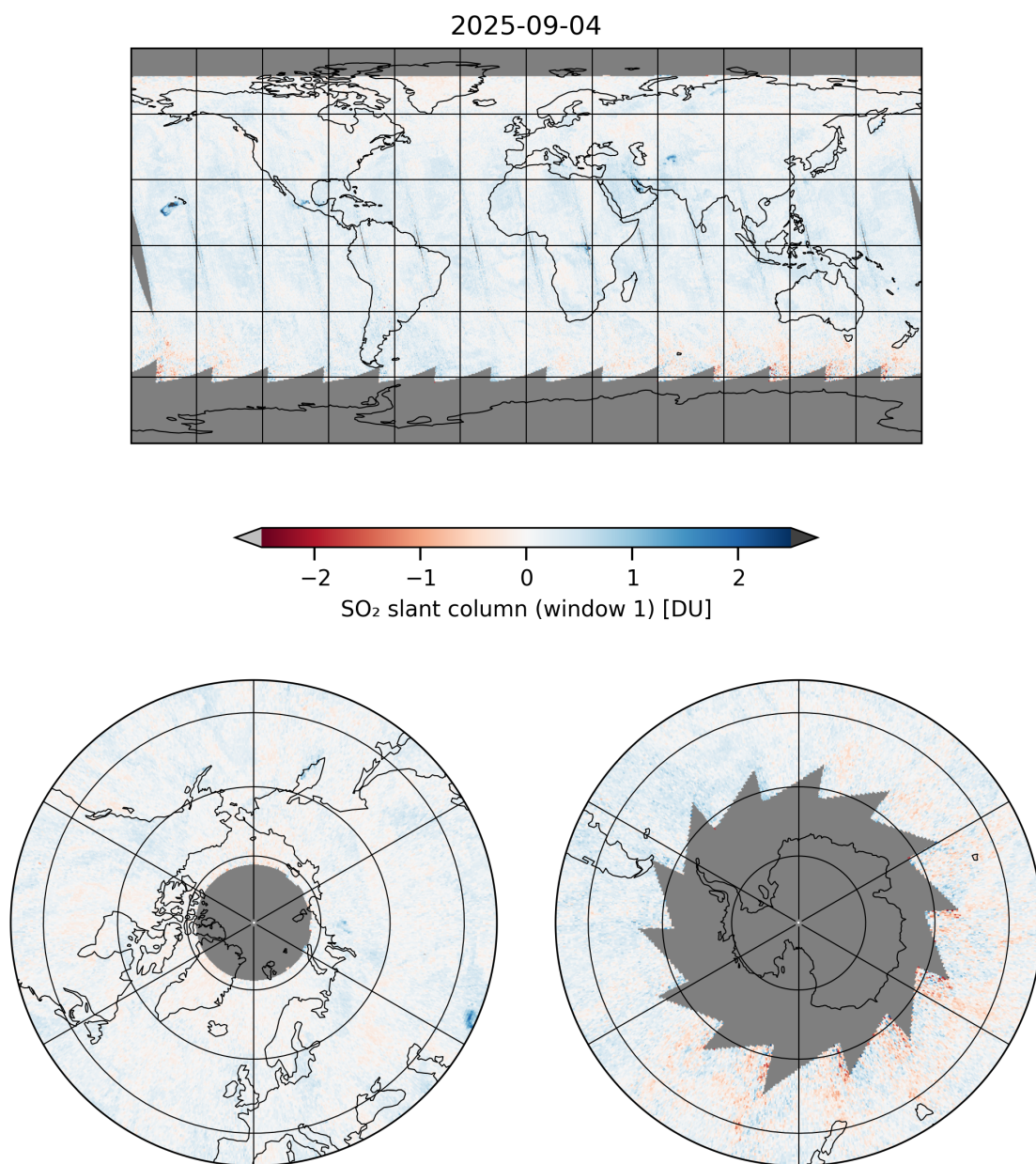


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-09-04 to 2025-09-05

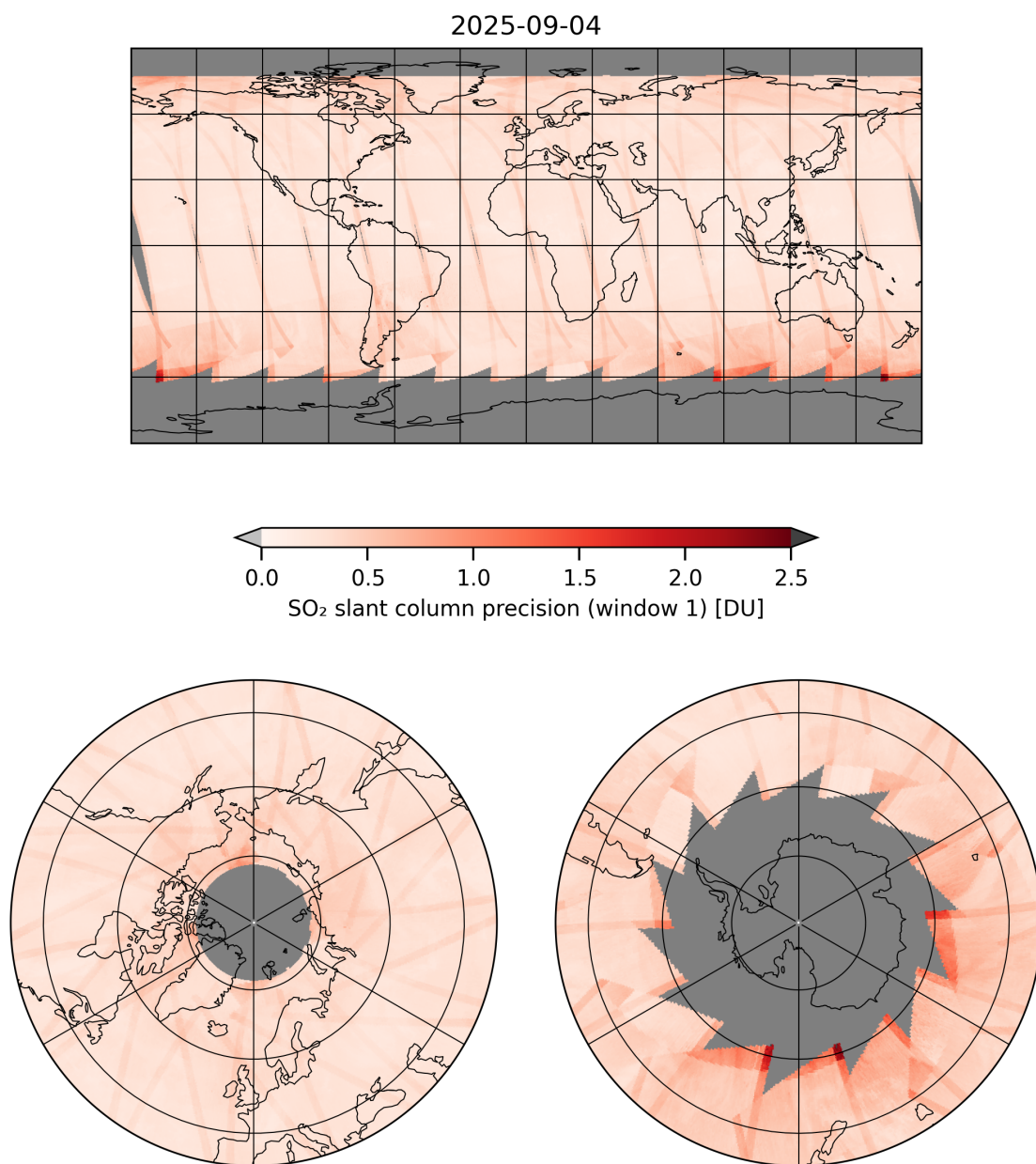


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-09-04 to 2025-09-05

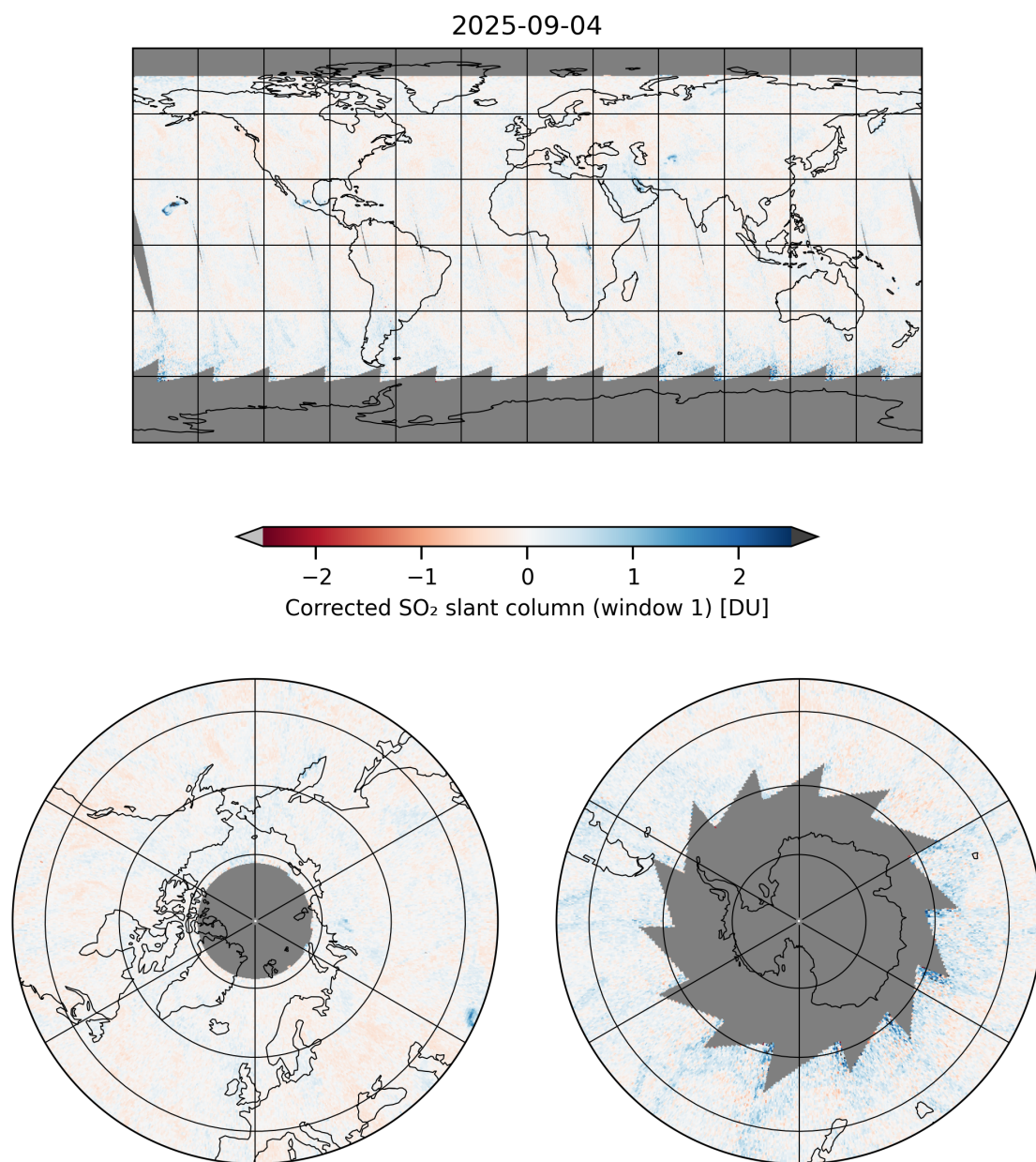


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-09-04 to 2025-09-05

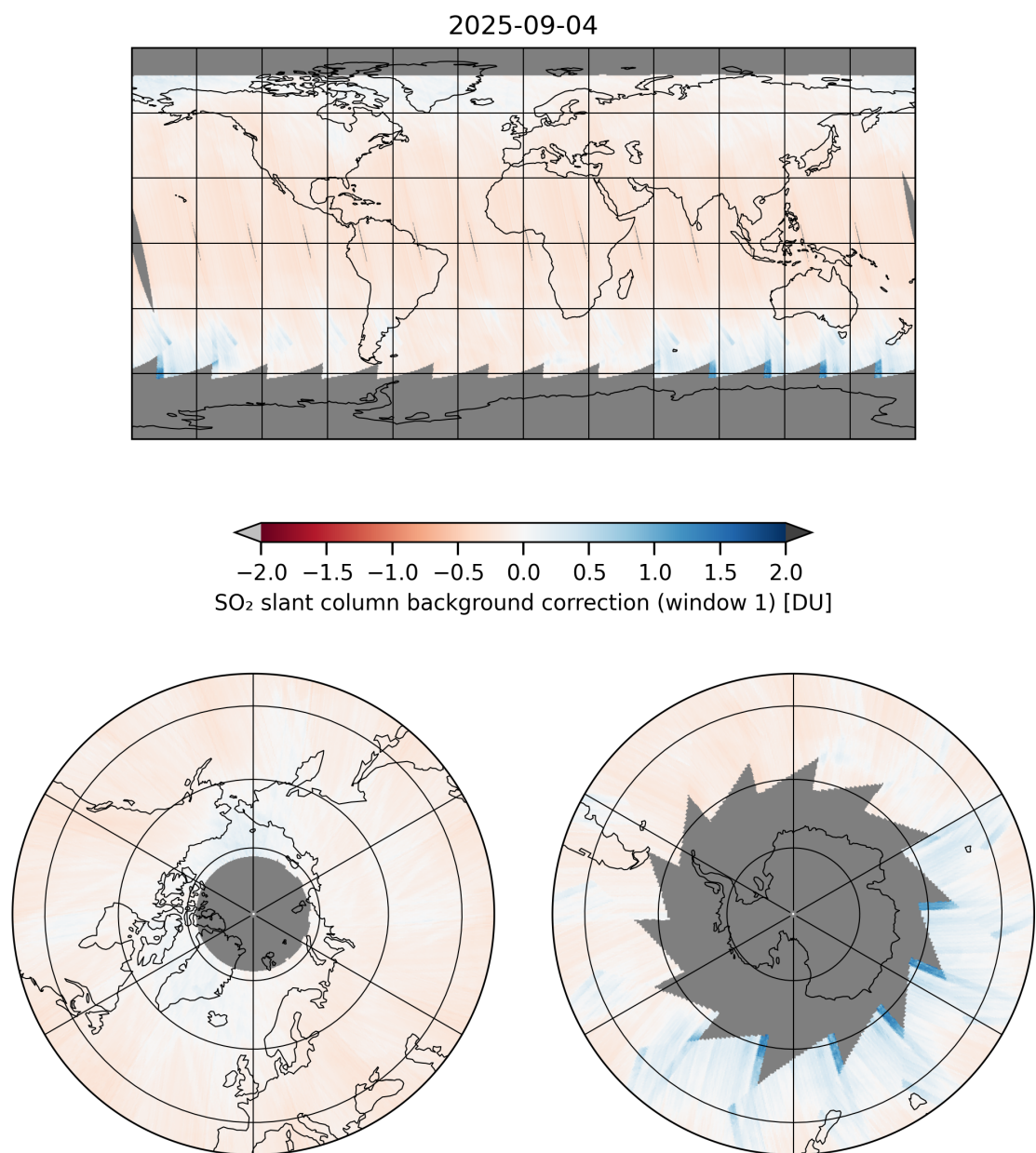


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-09-04 to 2025-09-05

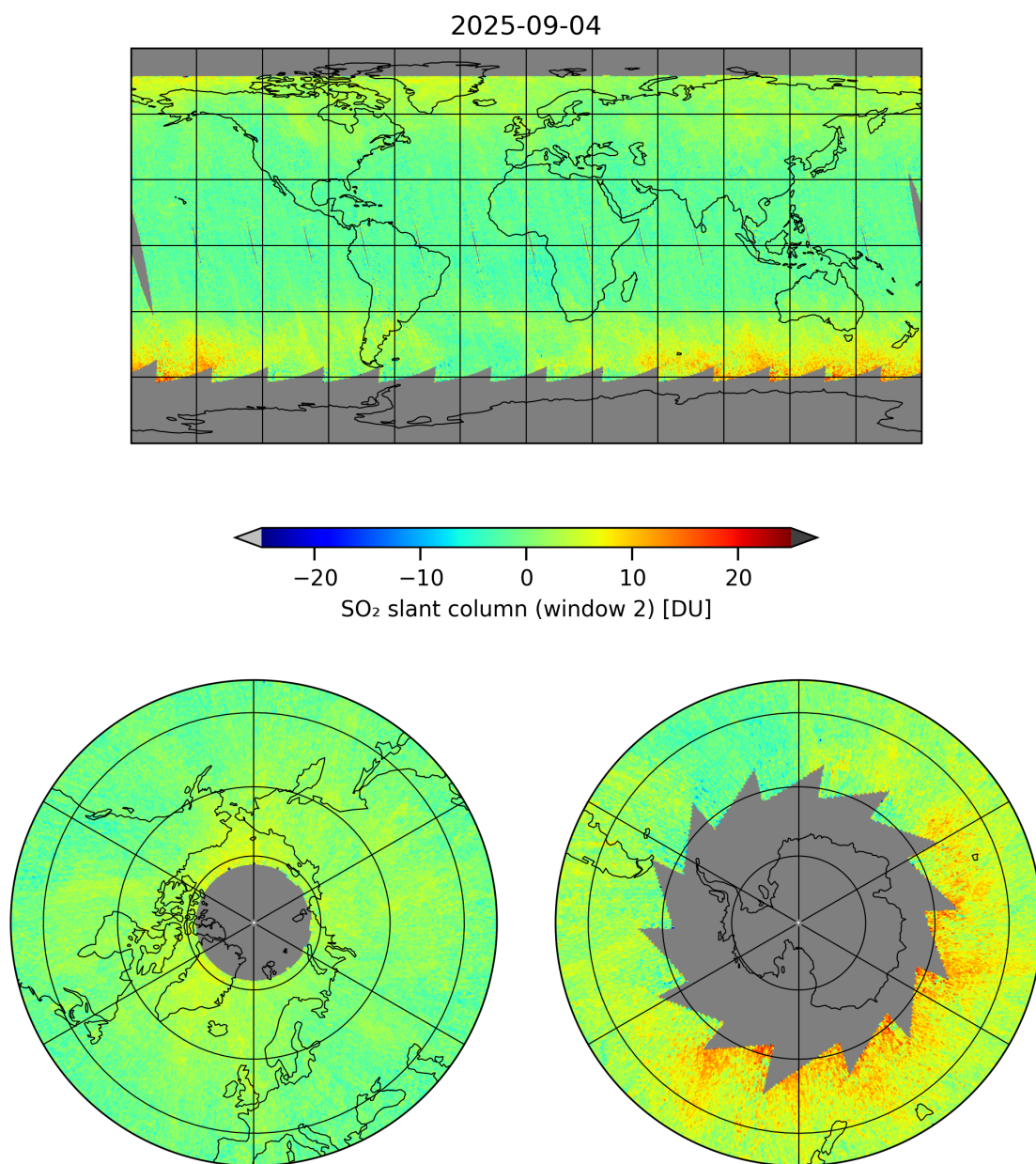


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-09-04 to 2025-09-05

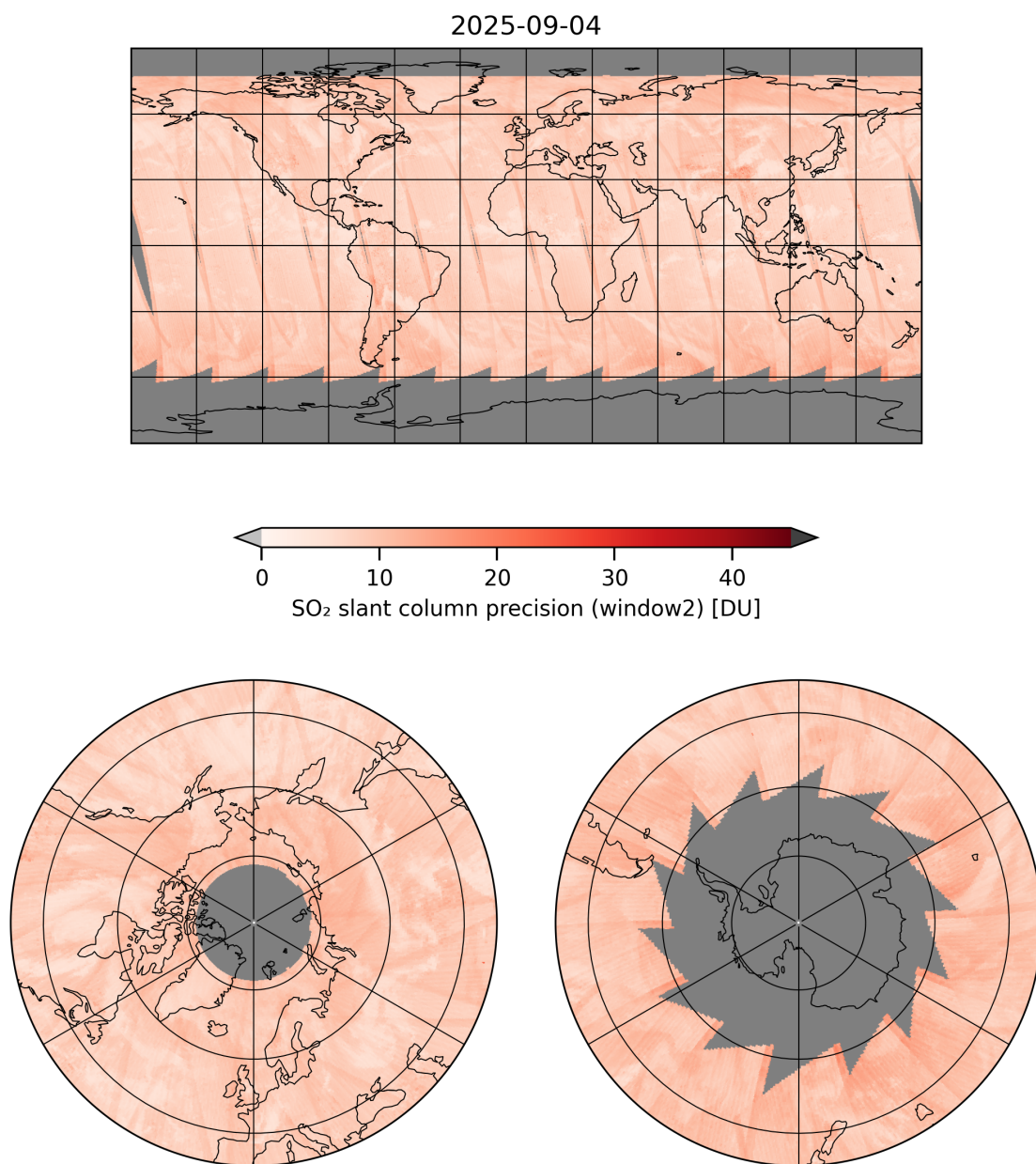


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-09-04 to 2025-09-05

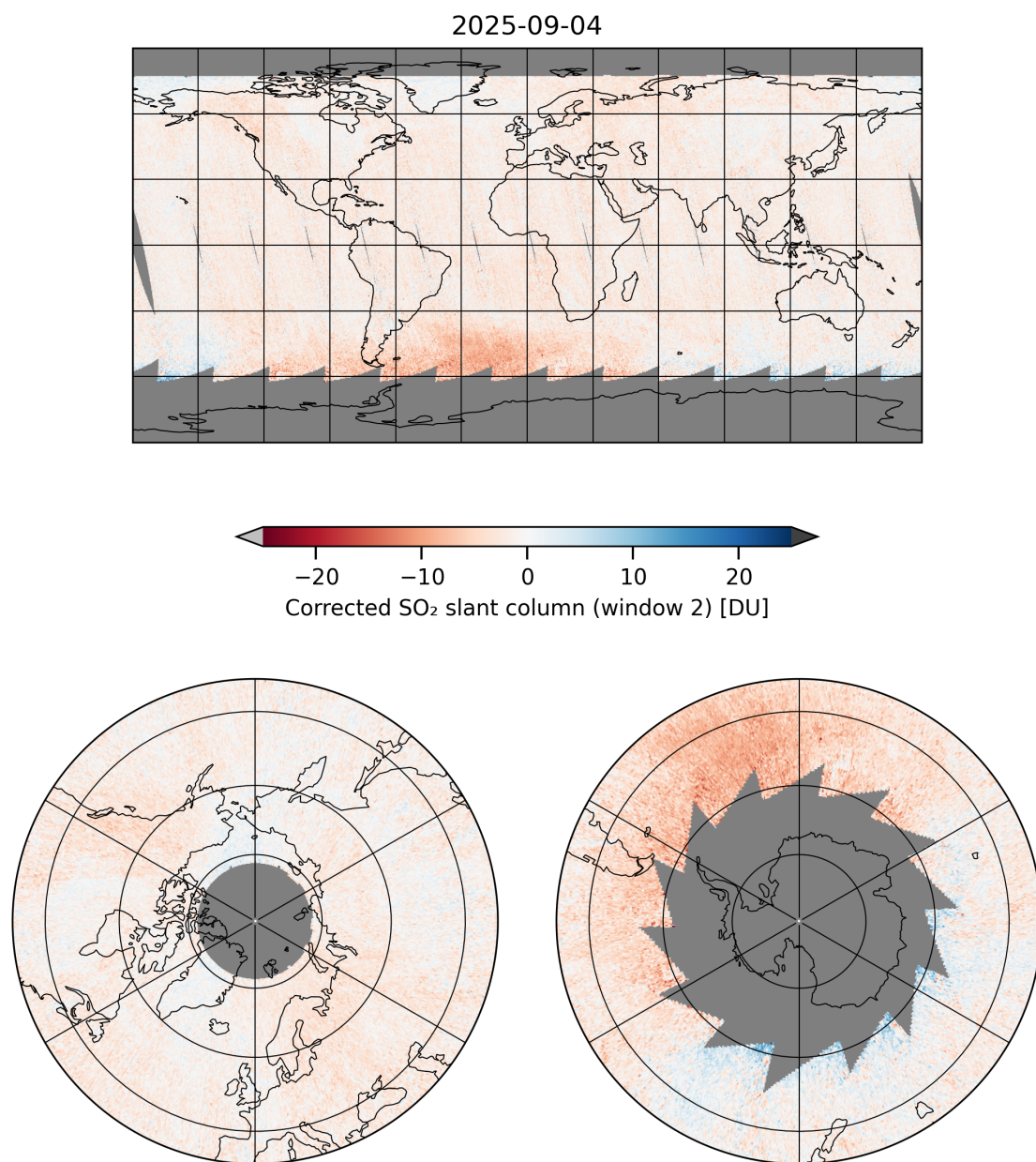


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-09-04 to 2025-09-05

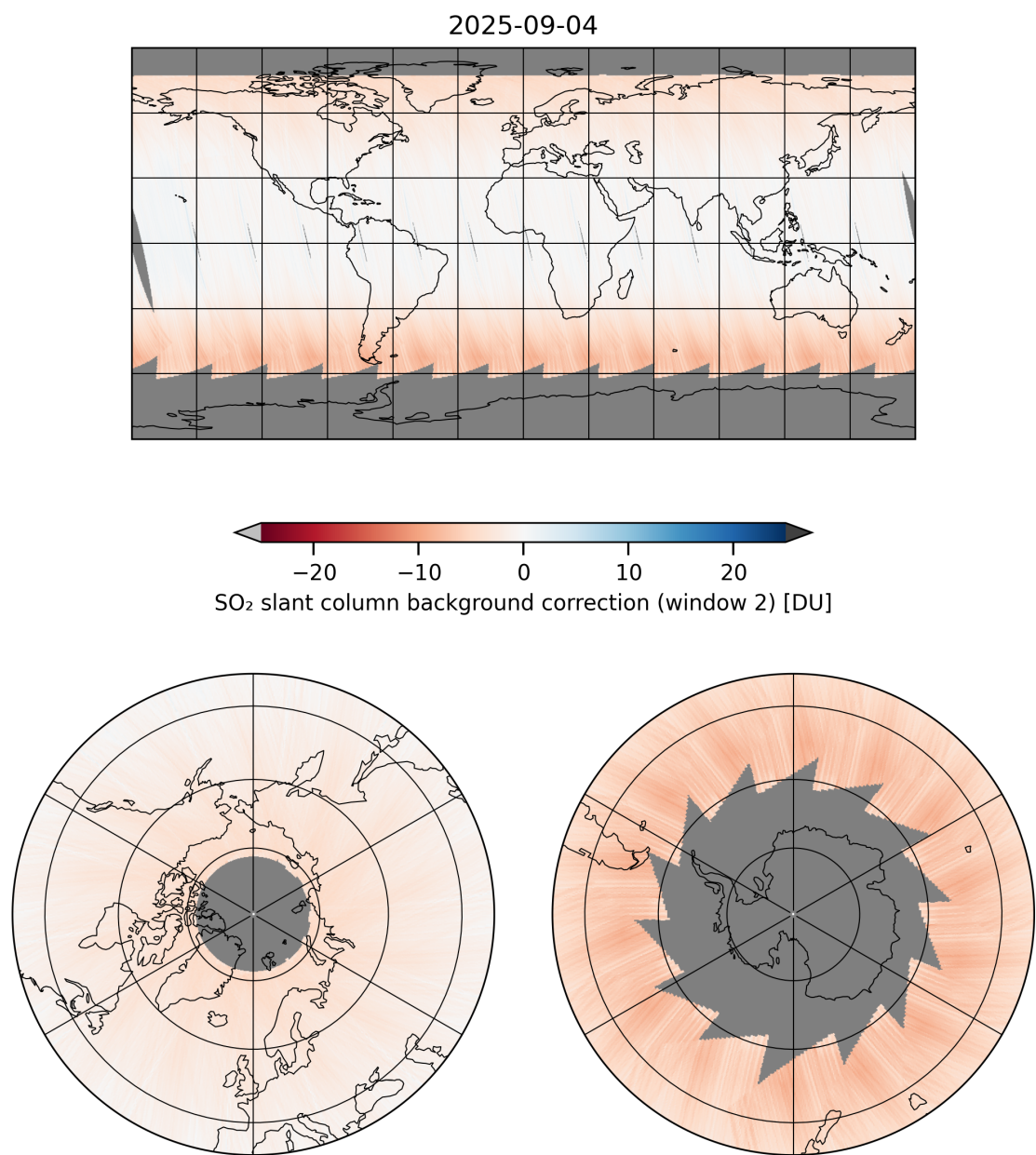


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-09-04 to 2025-09-05

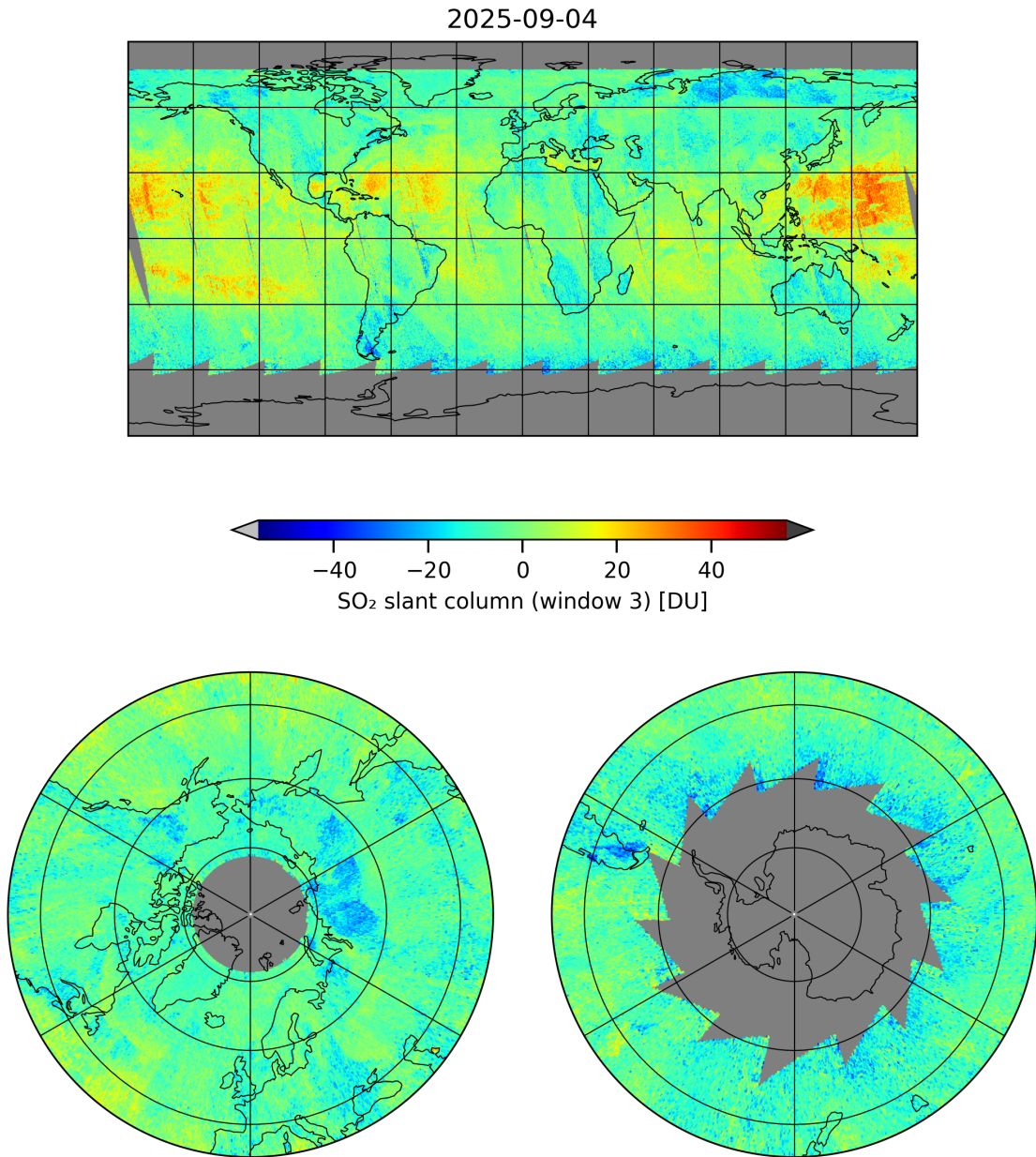


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-09-04 to 2025-09-05

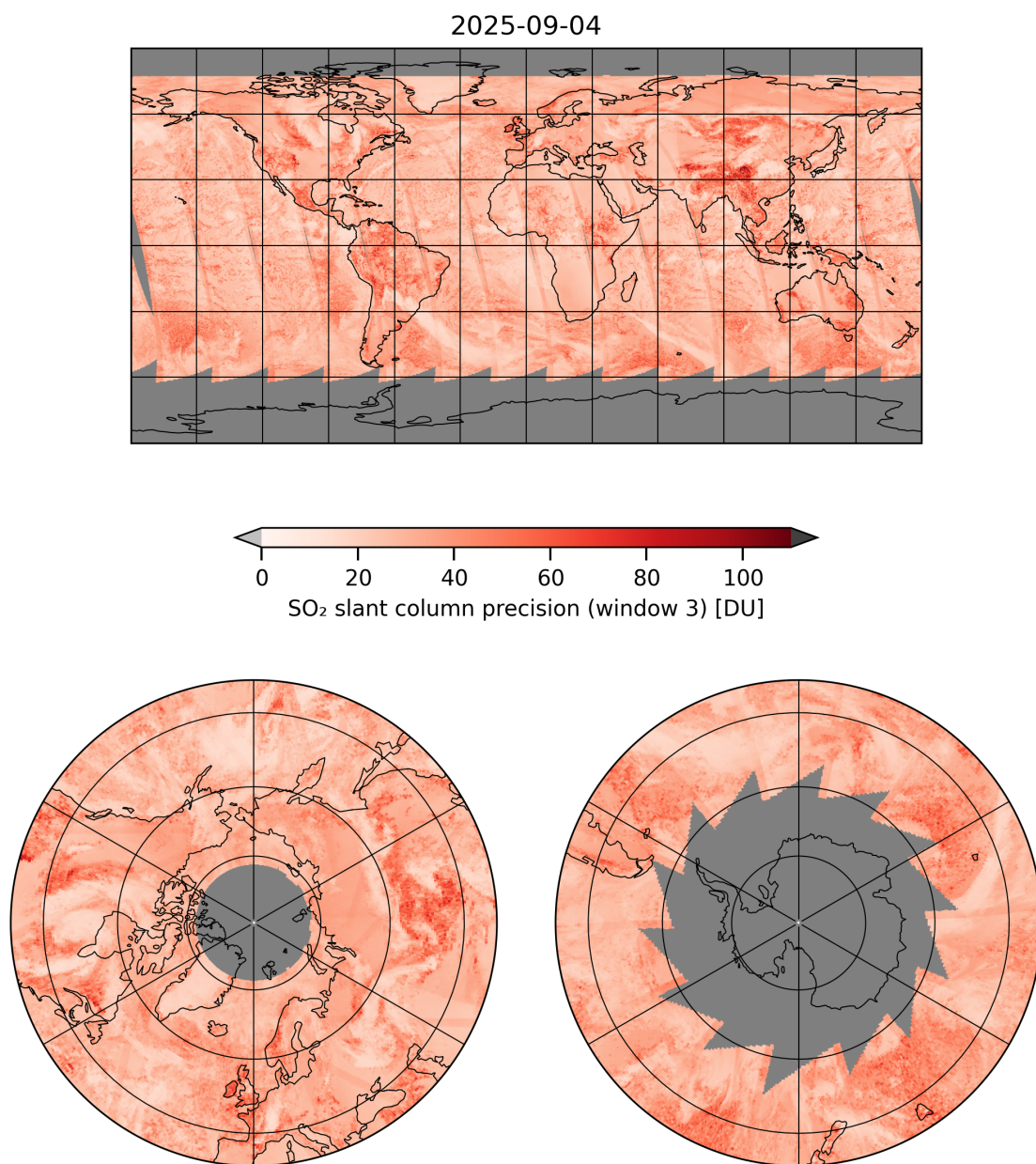


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-09-04 to 2025-09-05

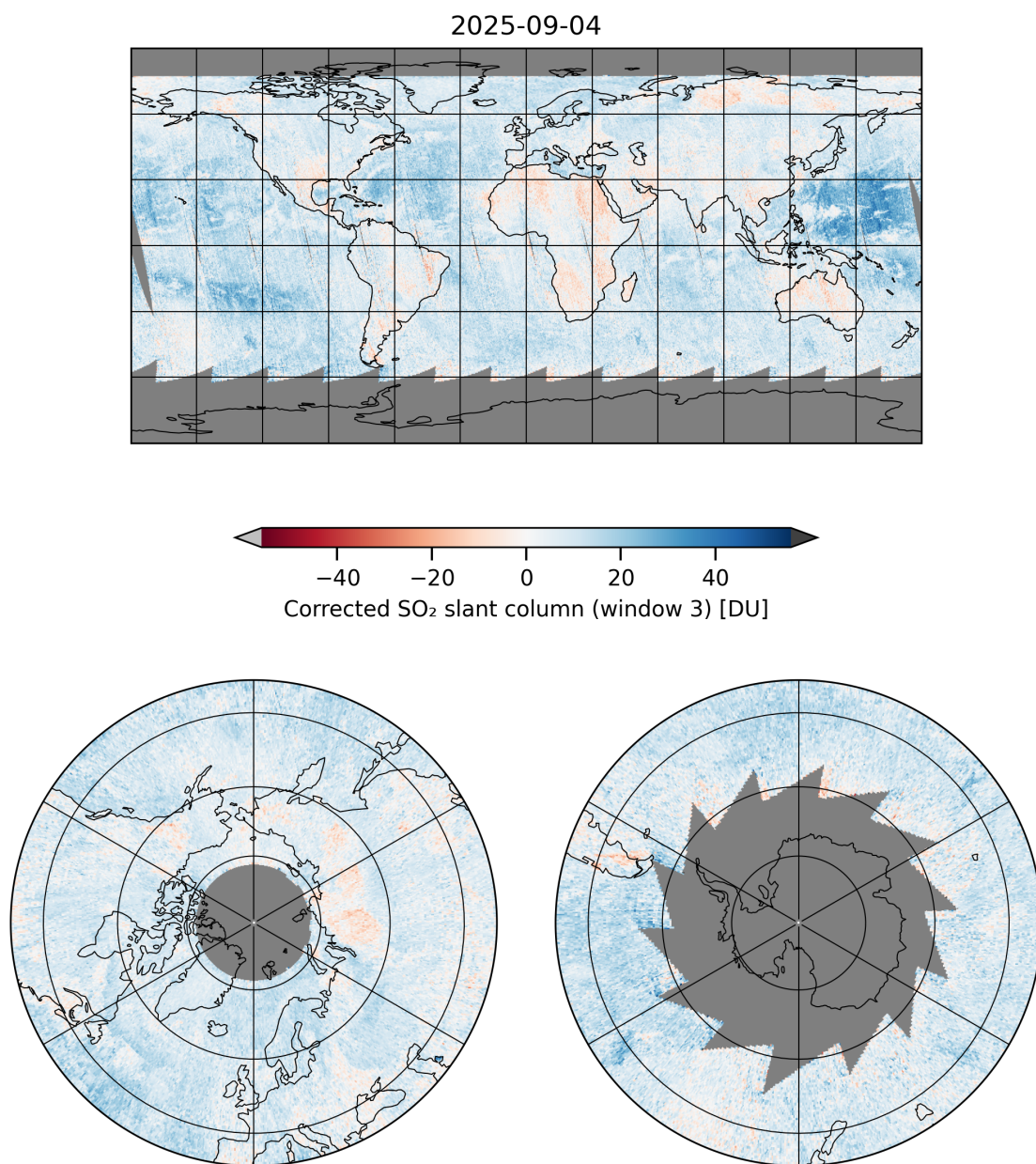


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-09-04 to 2025-09-05

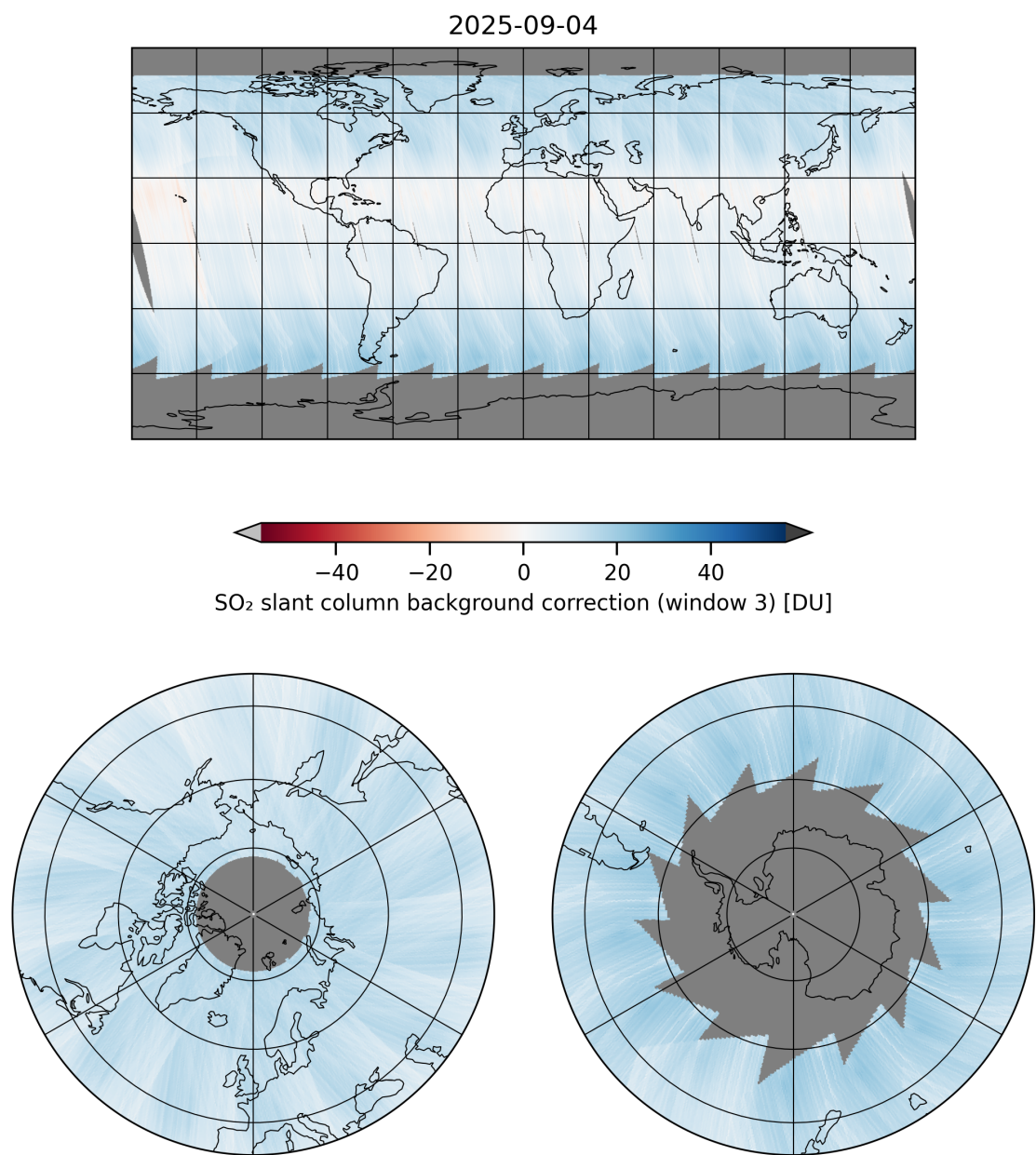


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-09-04 to 2025-09-05

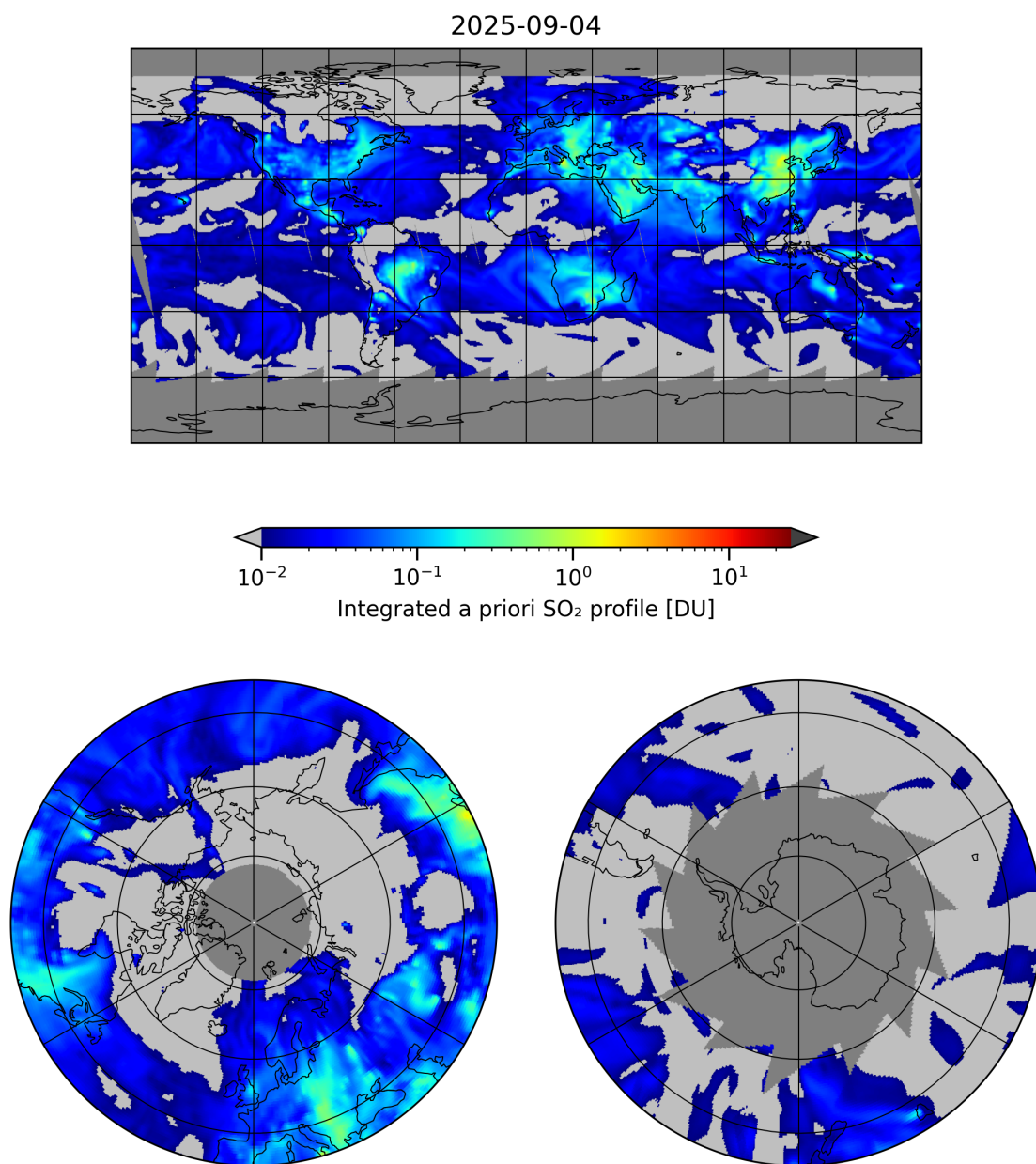


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-09-04 to 2025-09-05

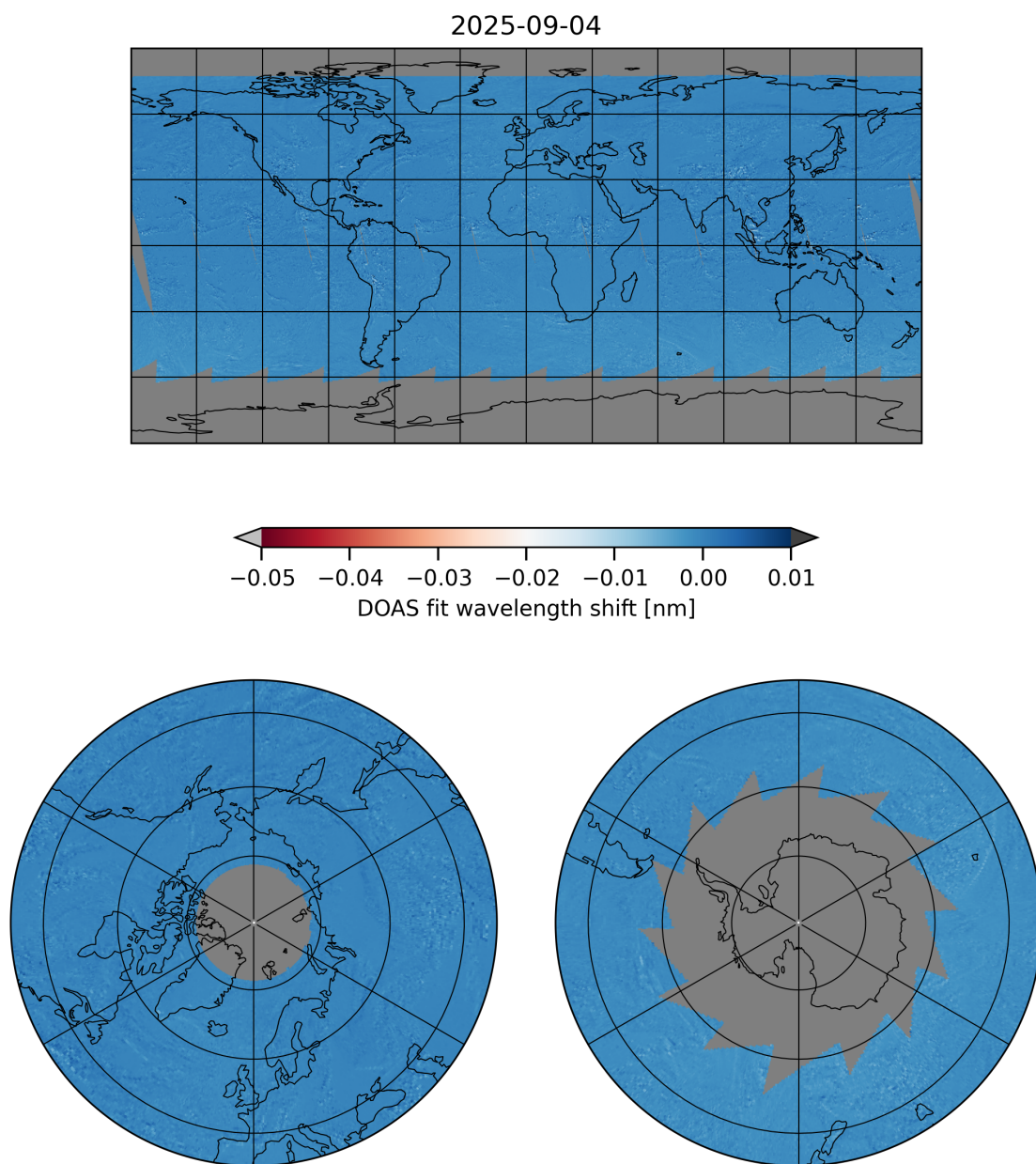


Figure 22: Map of “DOAS fit wavelength shift” for 2025-09-04 to 2025-09-05

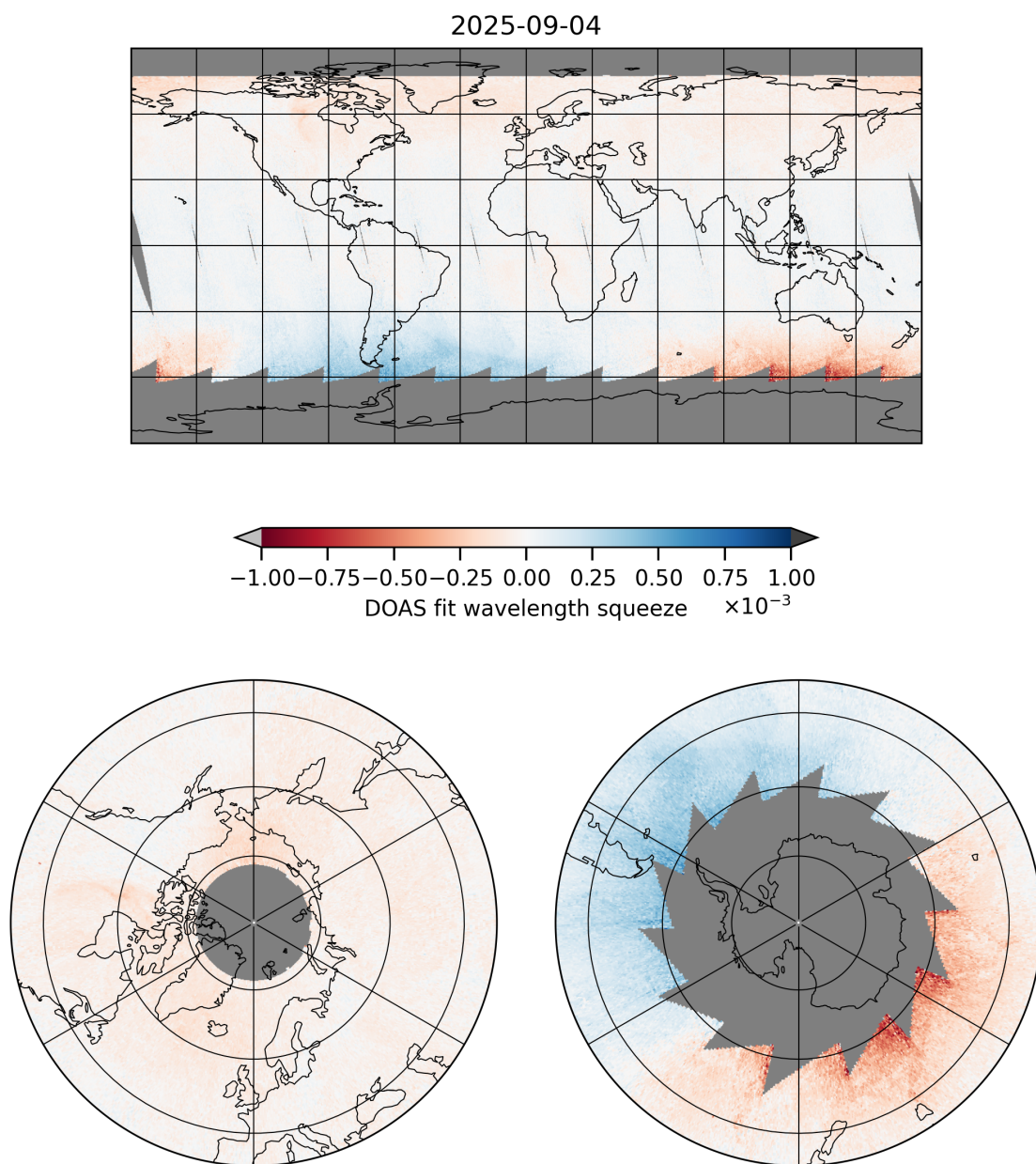


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-09-04 to 2025-09-05

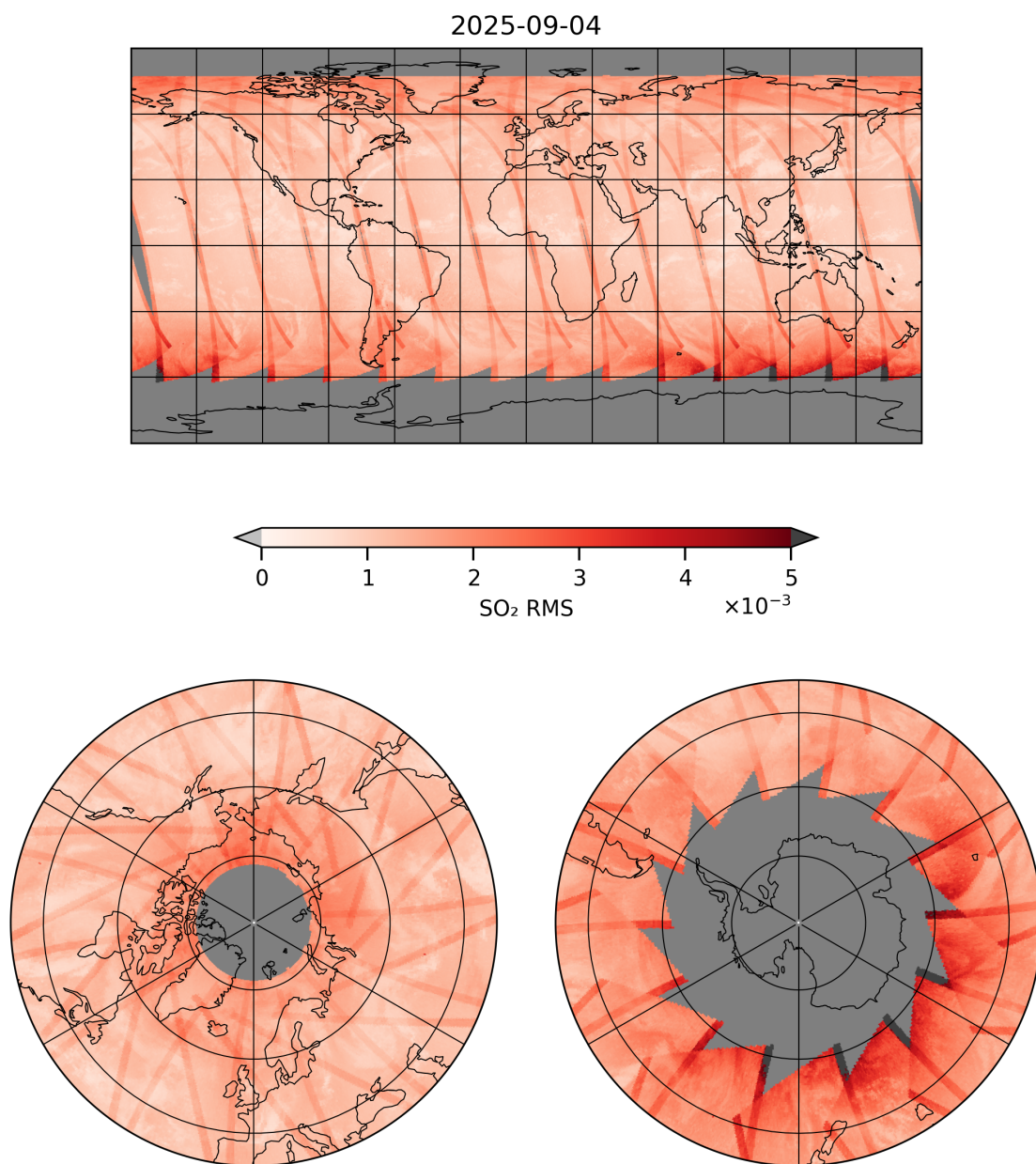


Figure 24: Map of “SO₂ RMS” for 2025-09-04 to 2025-09-05

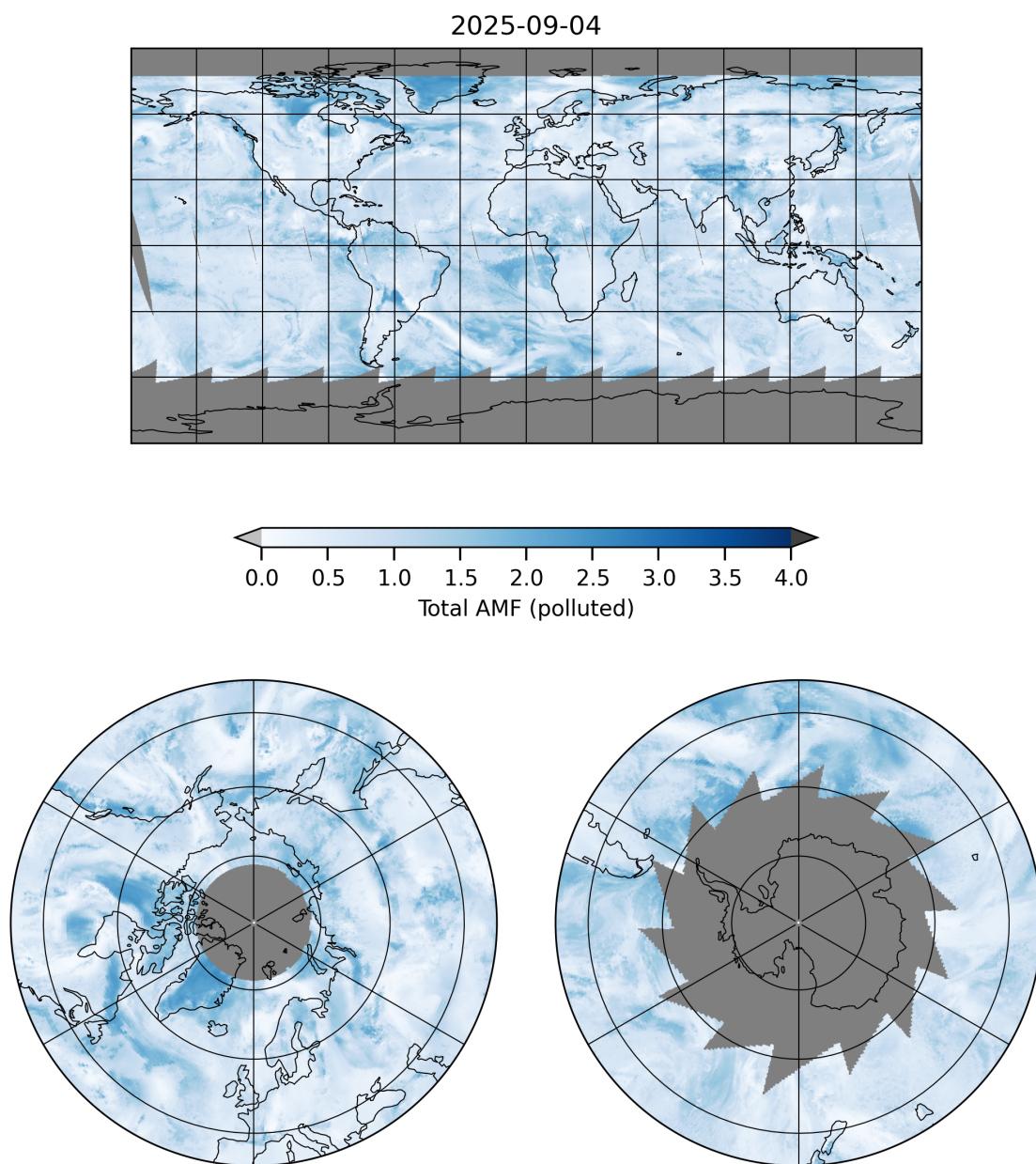


Figure 25: Map of “Total AMF (polluted)” for 2025-09-04 to 2025-09-05

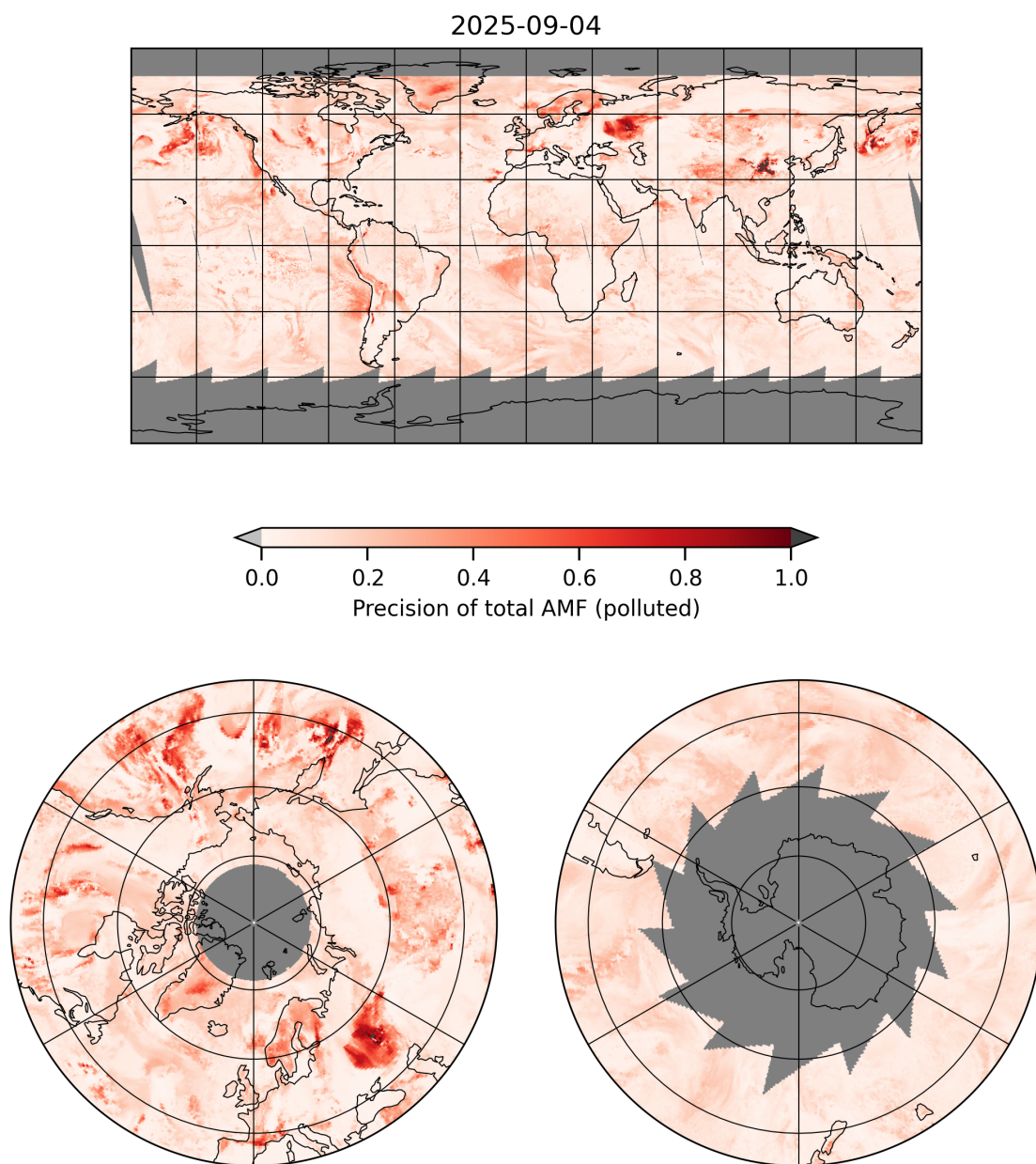


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-09-04 to 2025-09-05

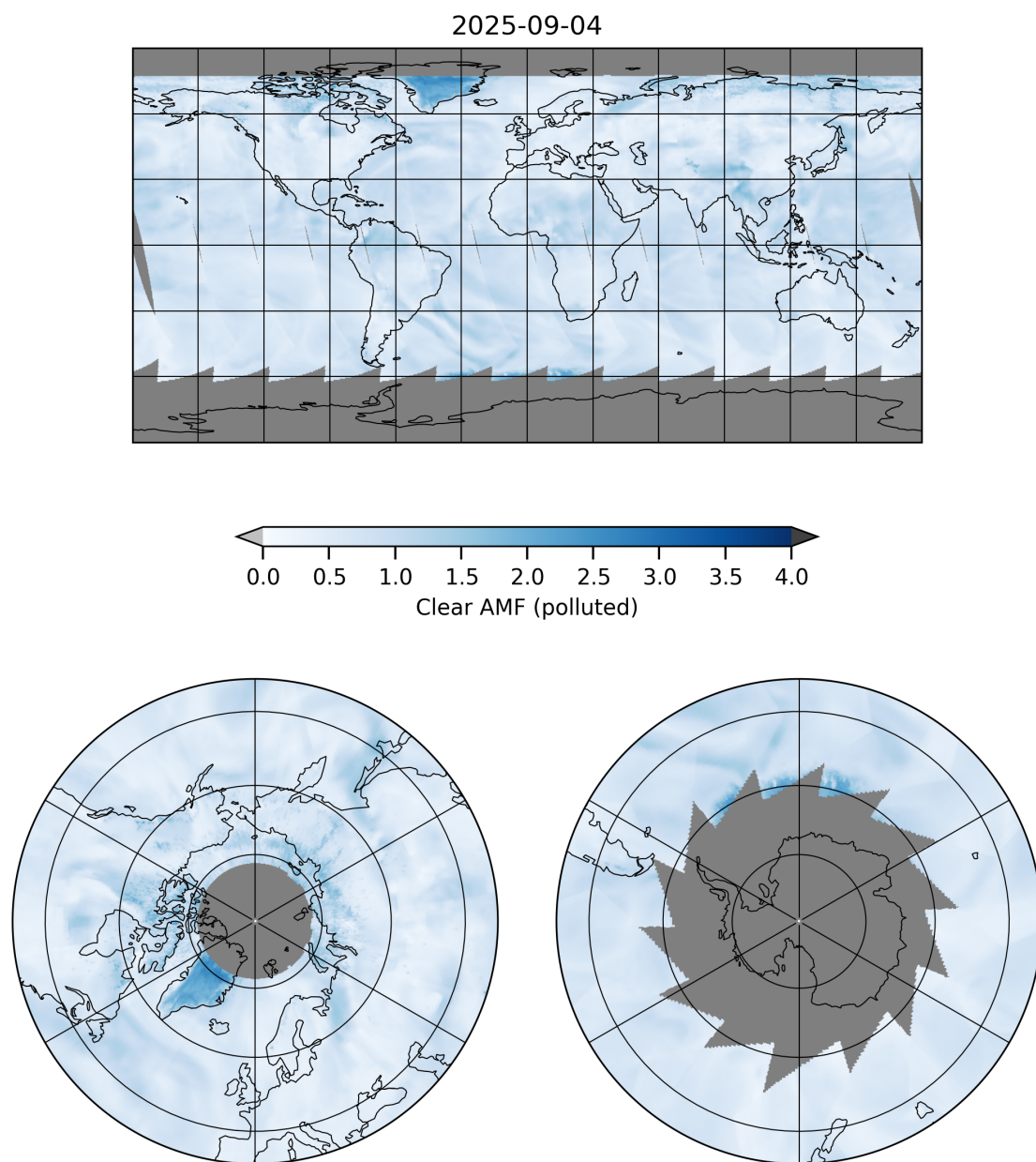


Figure 27: Map of “Clear AMF (polluted)” for 2025-09-04 to 2025-09-05

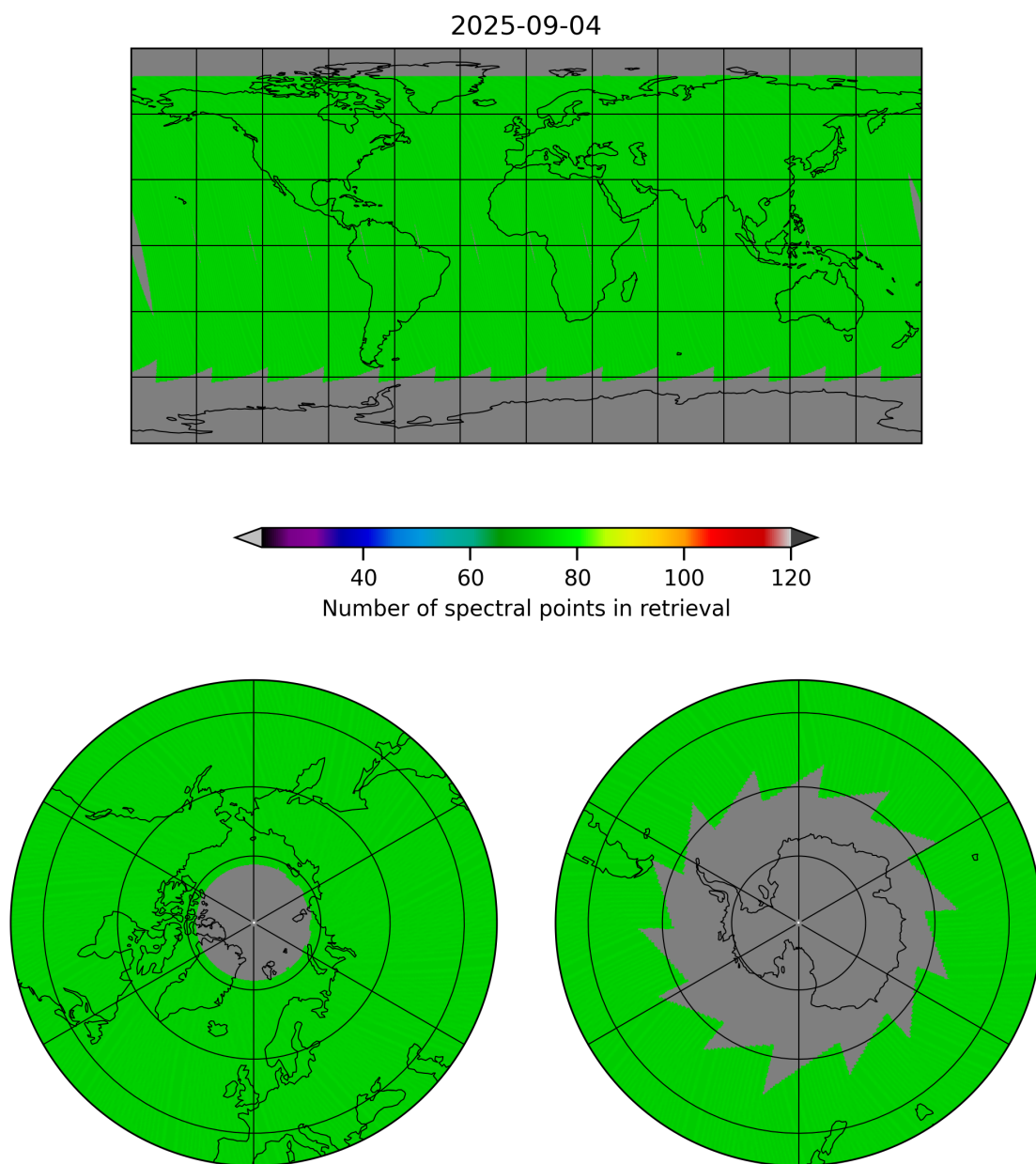


Figure 28: Map of “Number of spectral points in retrieval” for 2025-09-04 to 2025-09-05

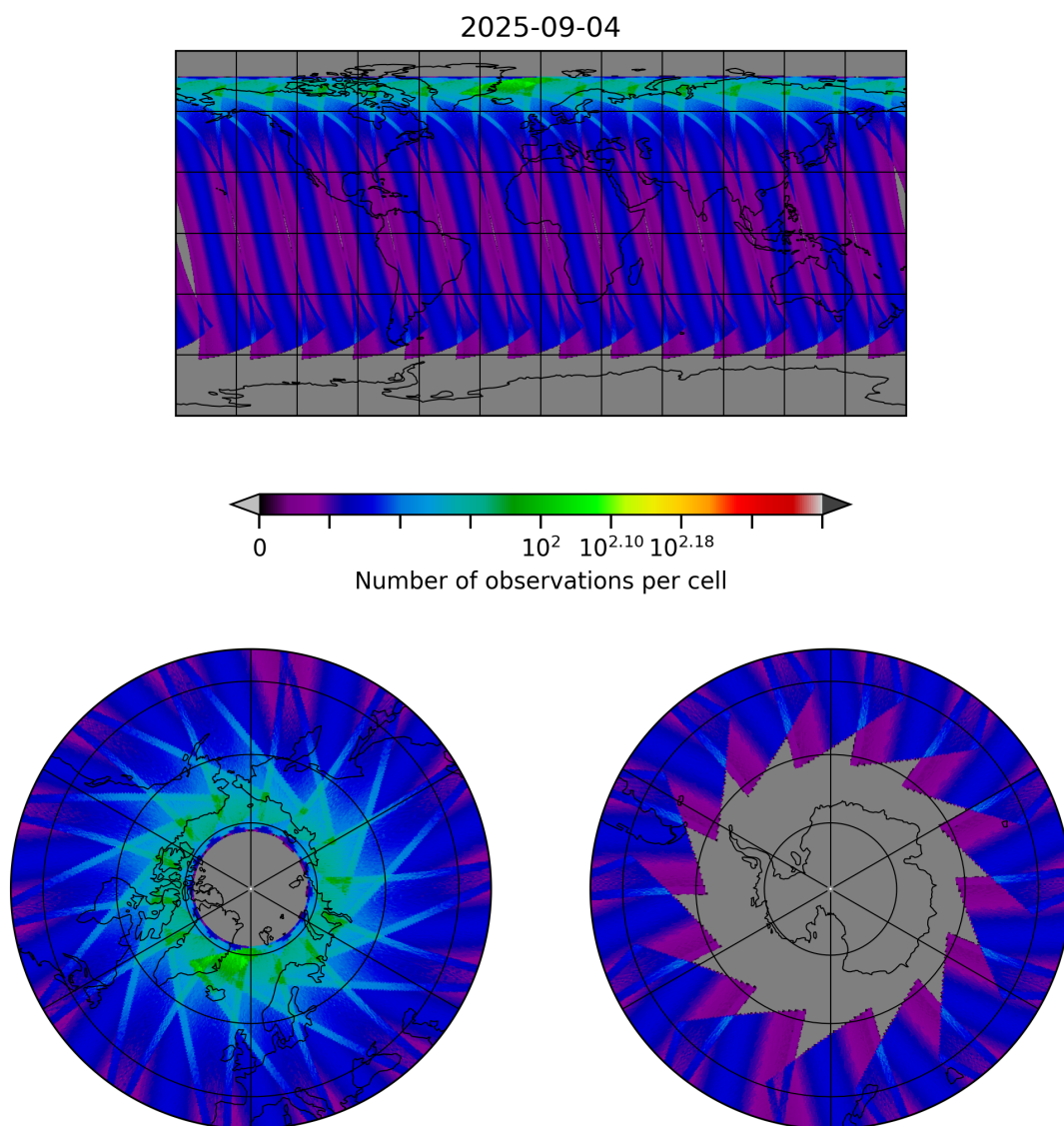


Figure 29: Map of the number of observations for 2025-09-04 to 2025-09-05

7 Zonal average

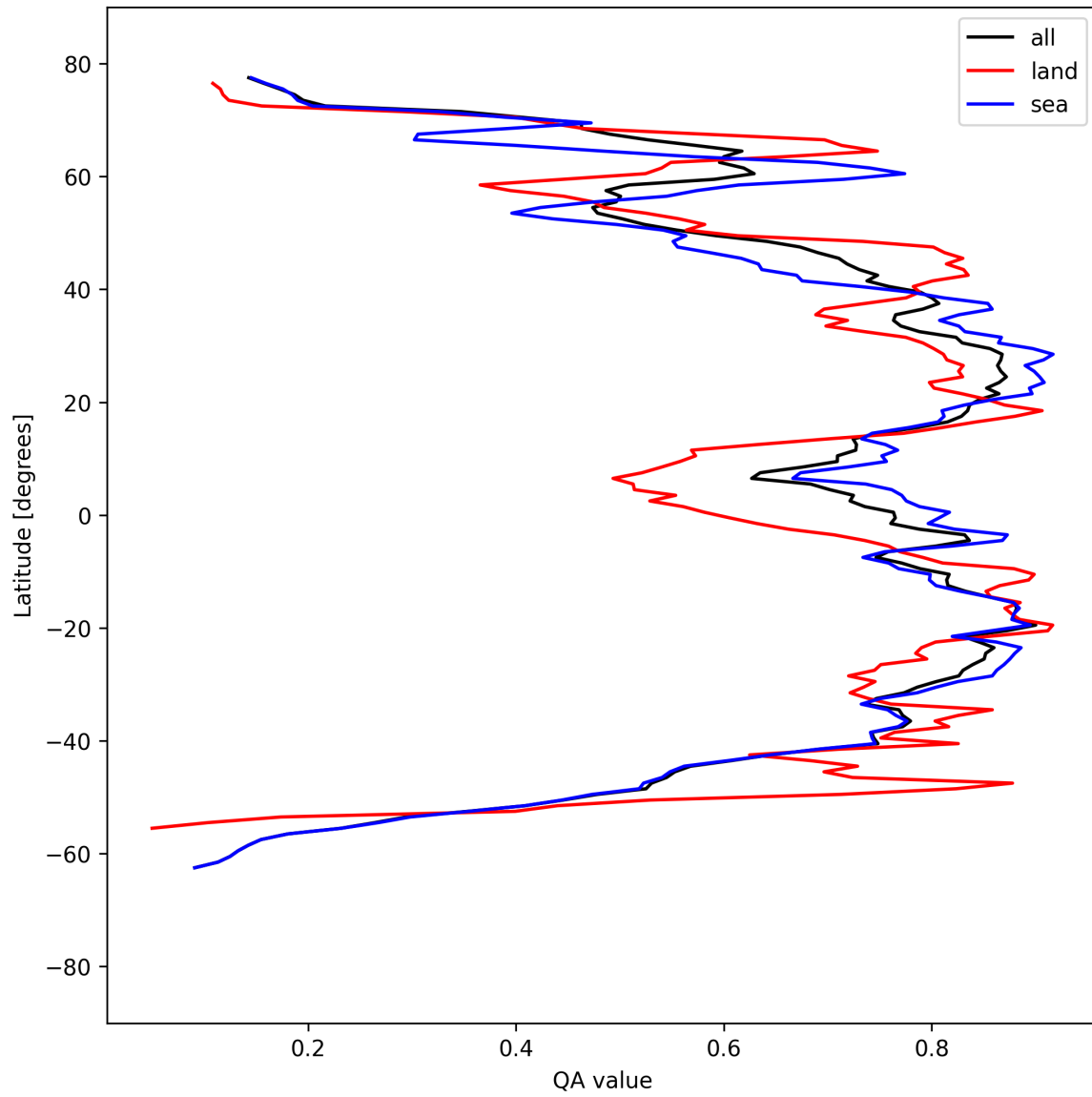


Figure 30: Zonal average of “QA value” for 2025-09-04 to 2025-09-05.

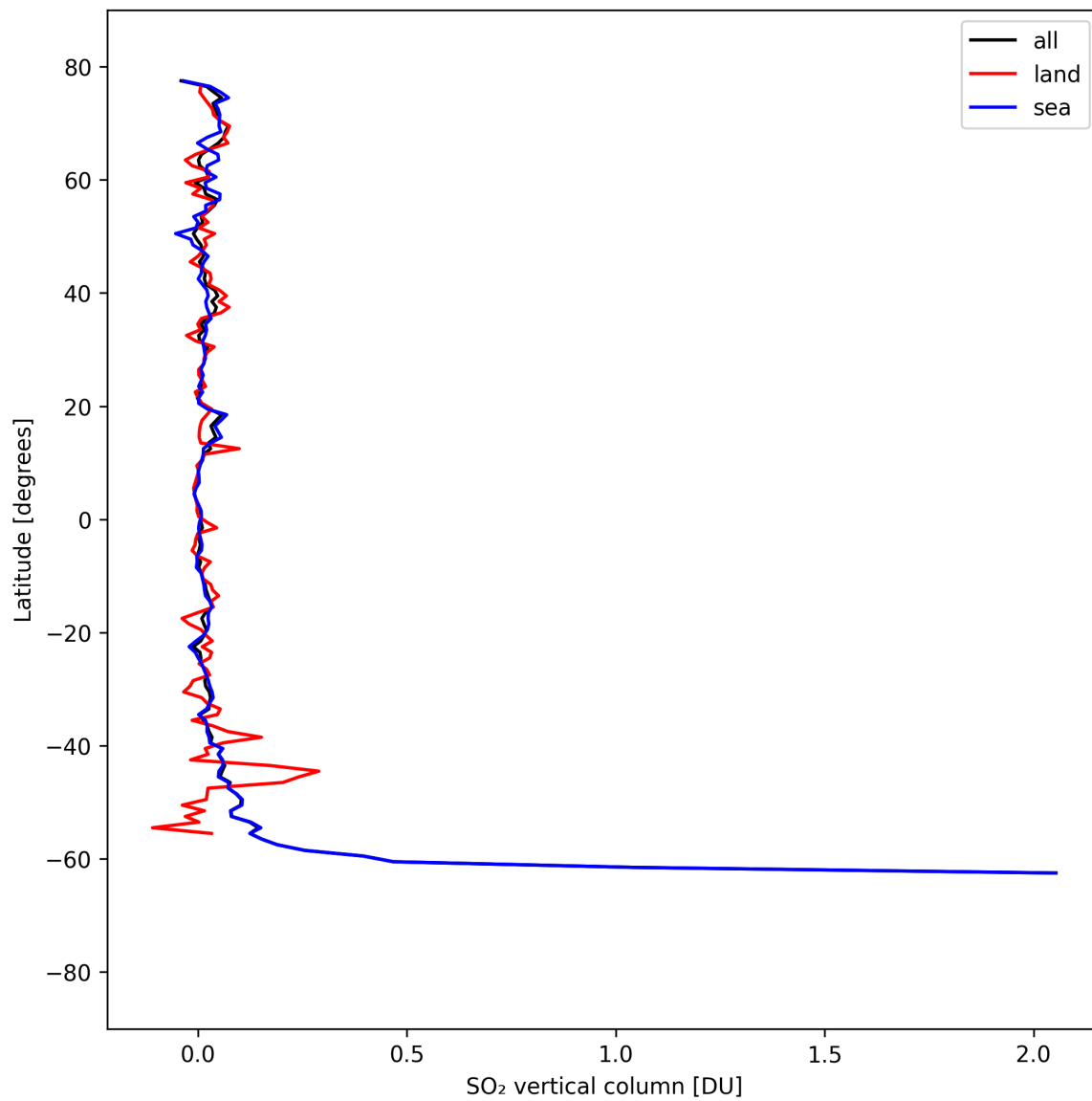


Figure 31: Zonal average of “SO₂ vertical column” for 2025-09-04 to 2025-09-05.

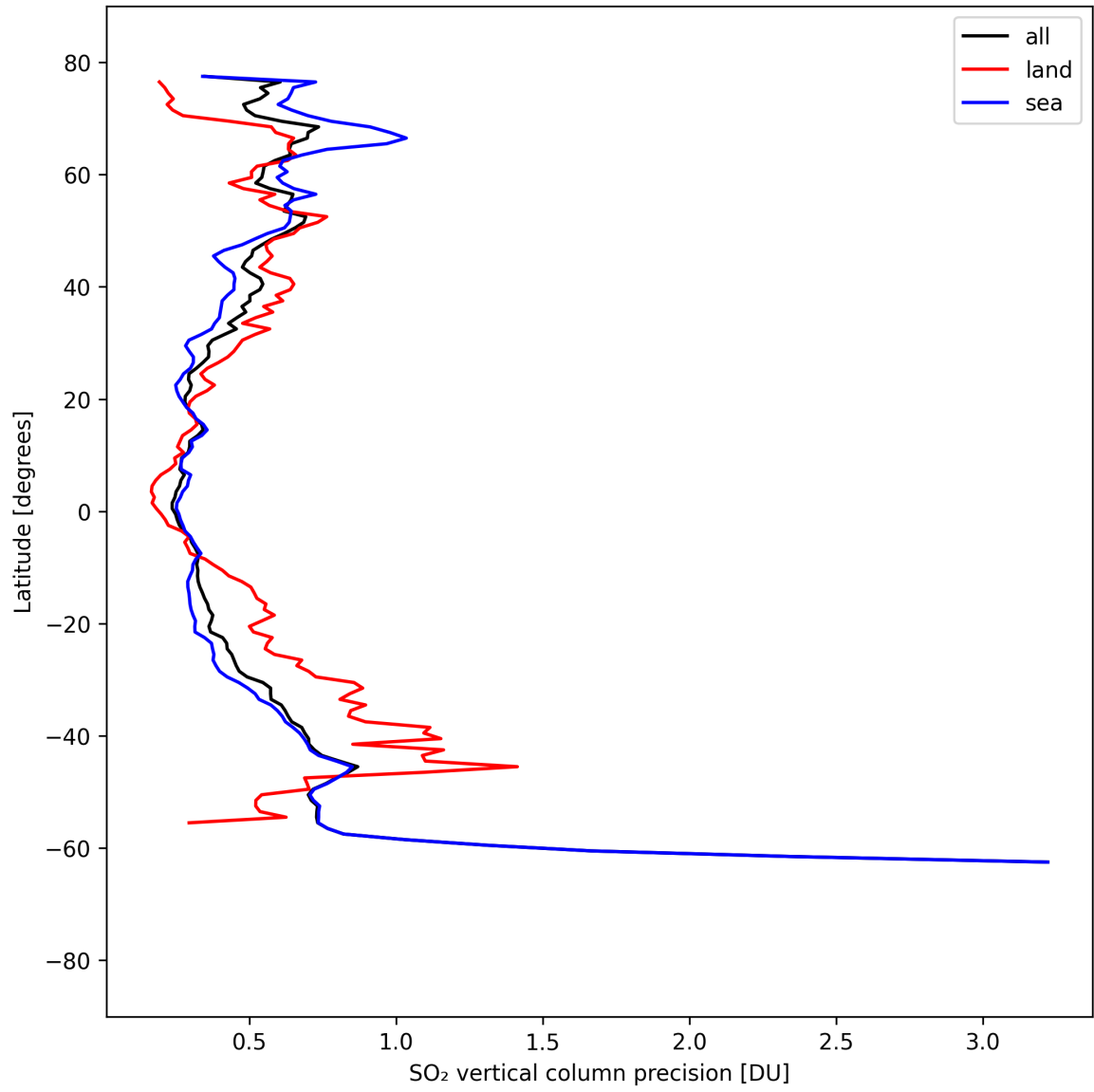


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-09-04 to 2025-09-05.

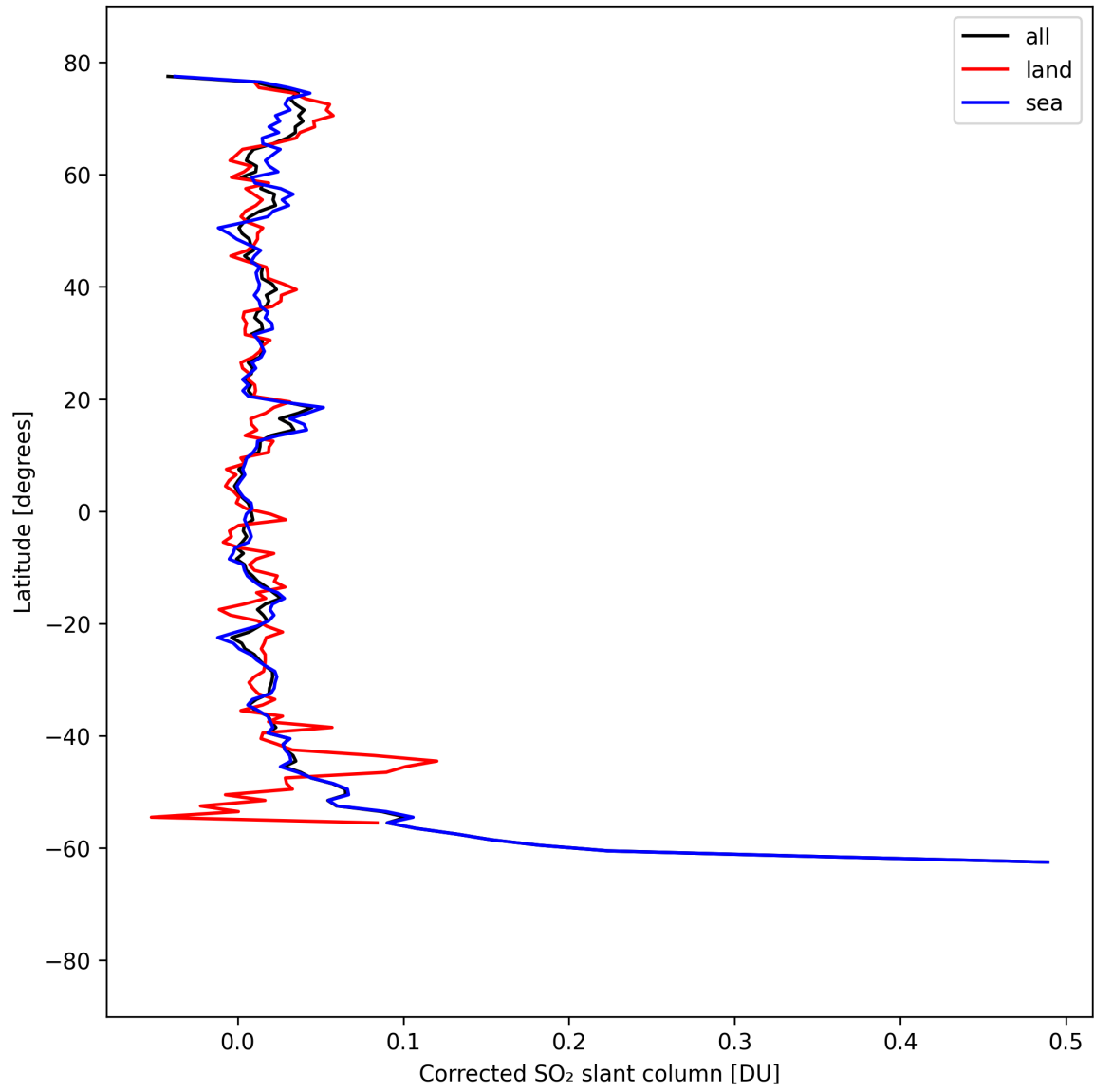


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-09-04 to 2025-09-05.

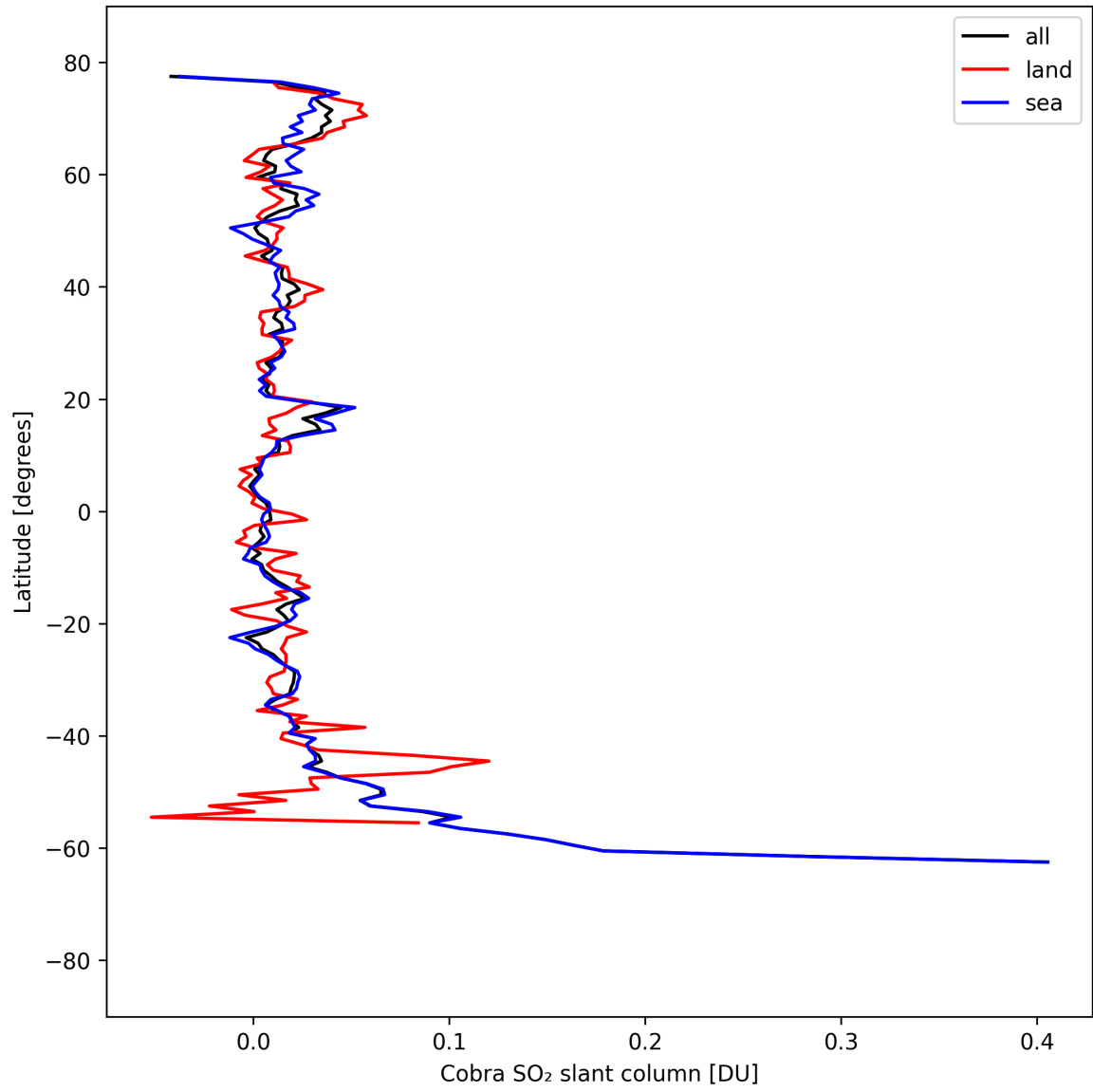


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-09-04 to 2025-09-05.

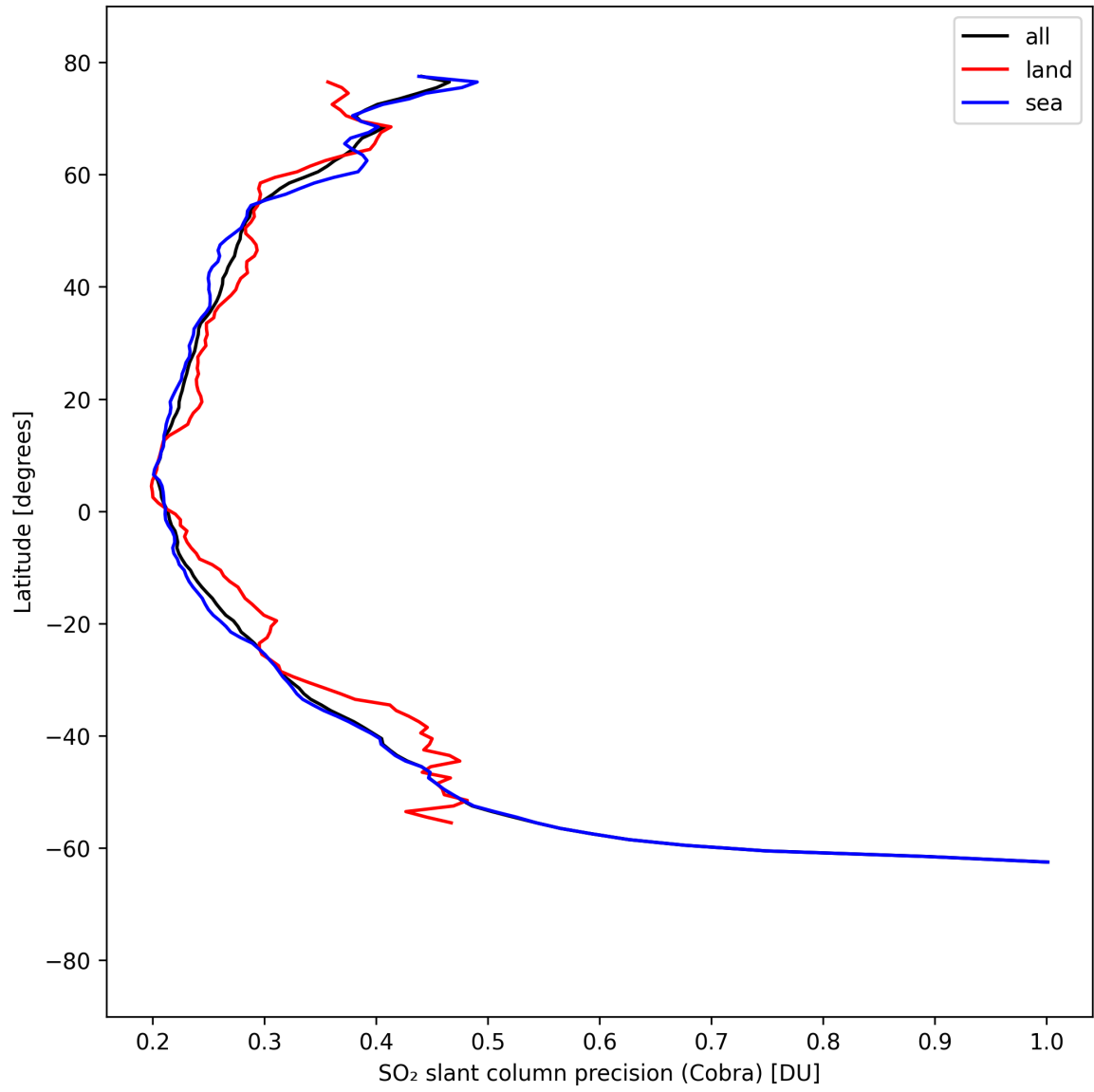


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-09-04 to 2025-09-05.

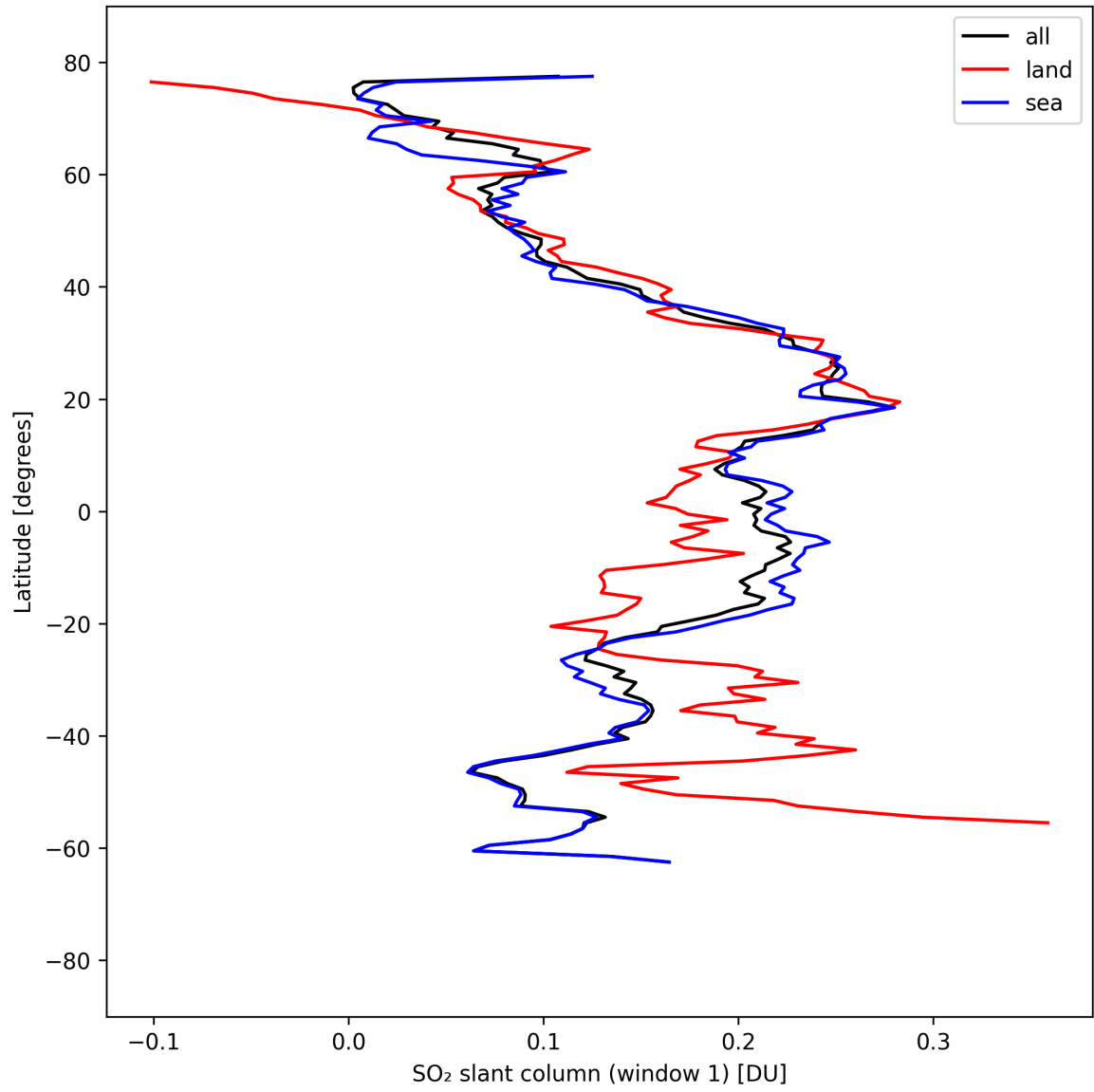


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-09-04 to 2025-09-05.

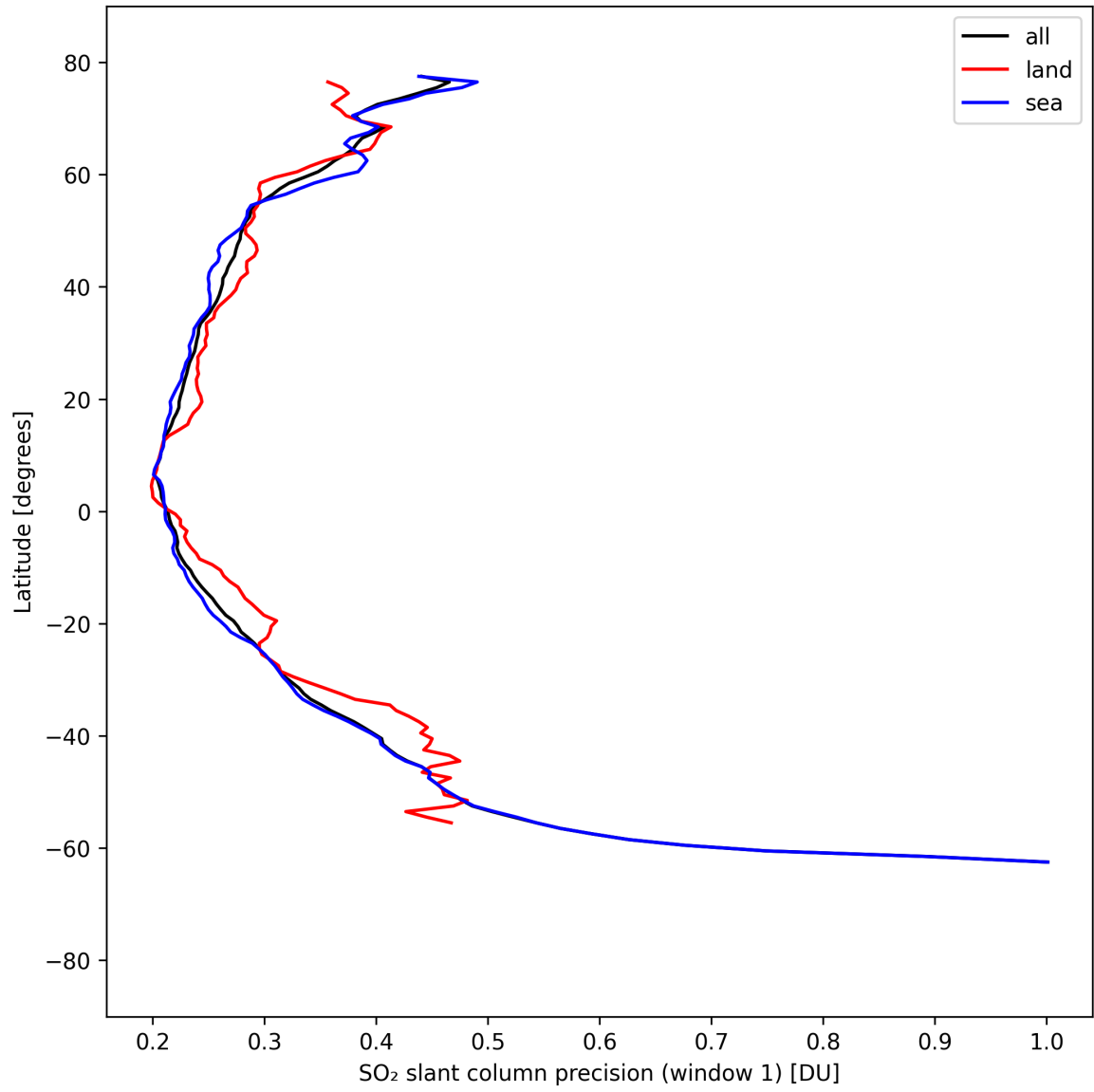


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-09-04 to 2025-09-05.

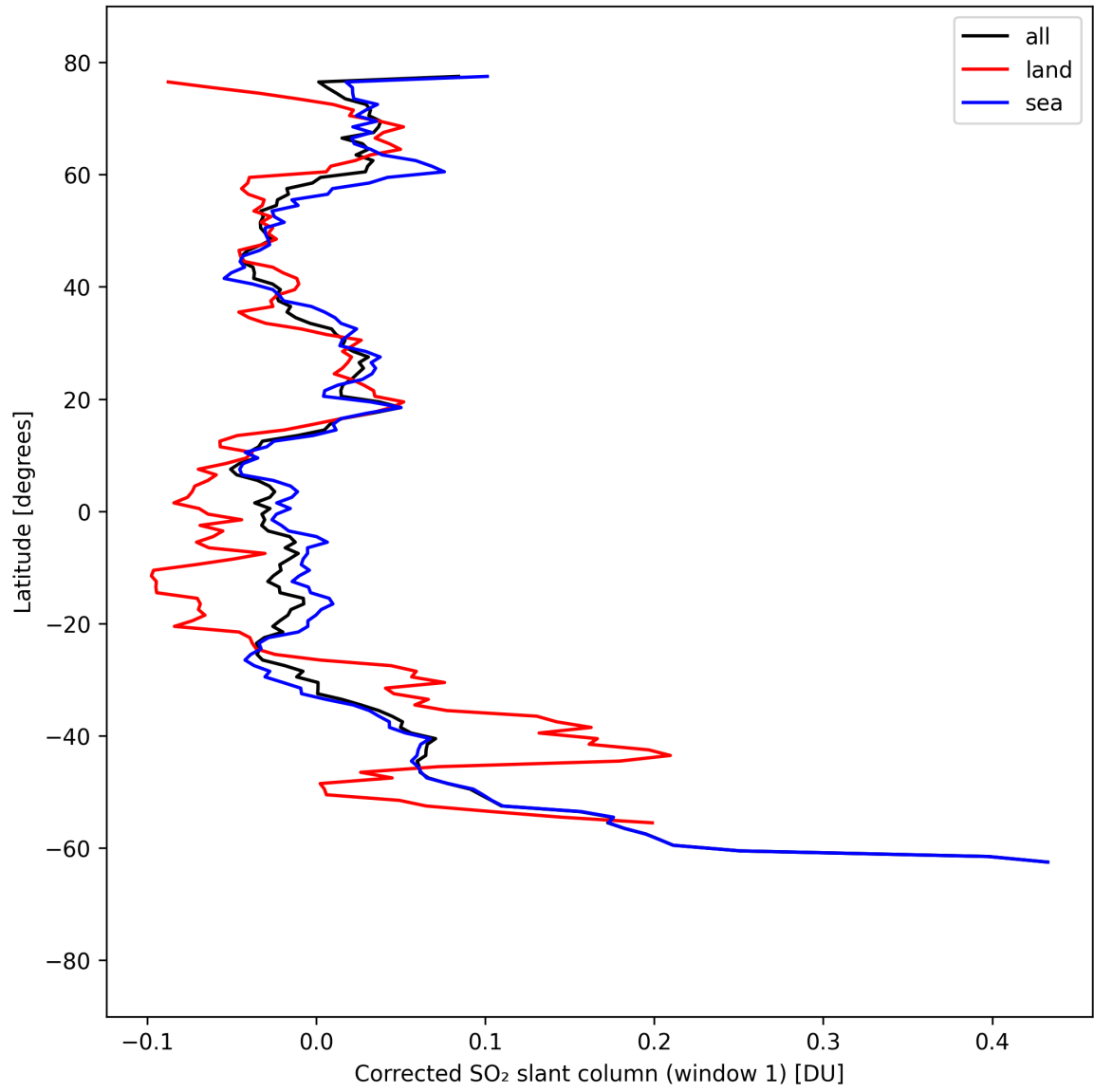


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-09-04 to 2025-09-05.

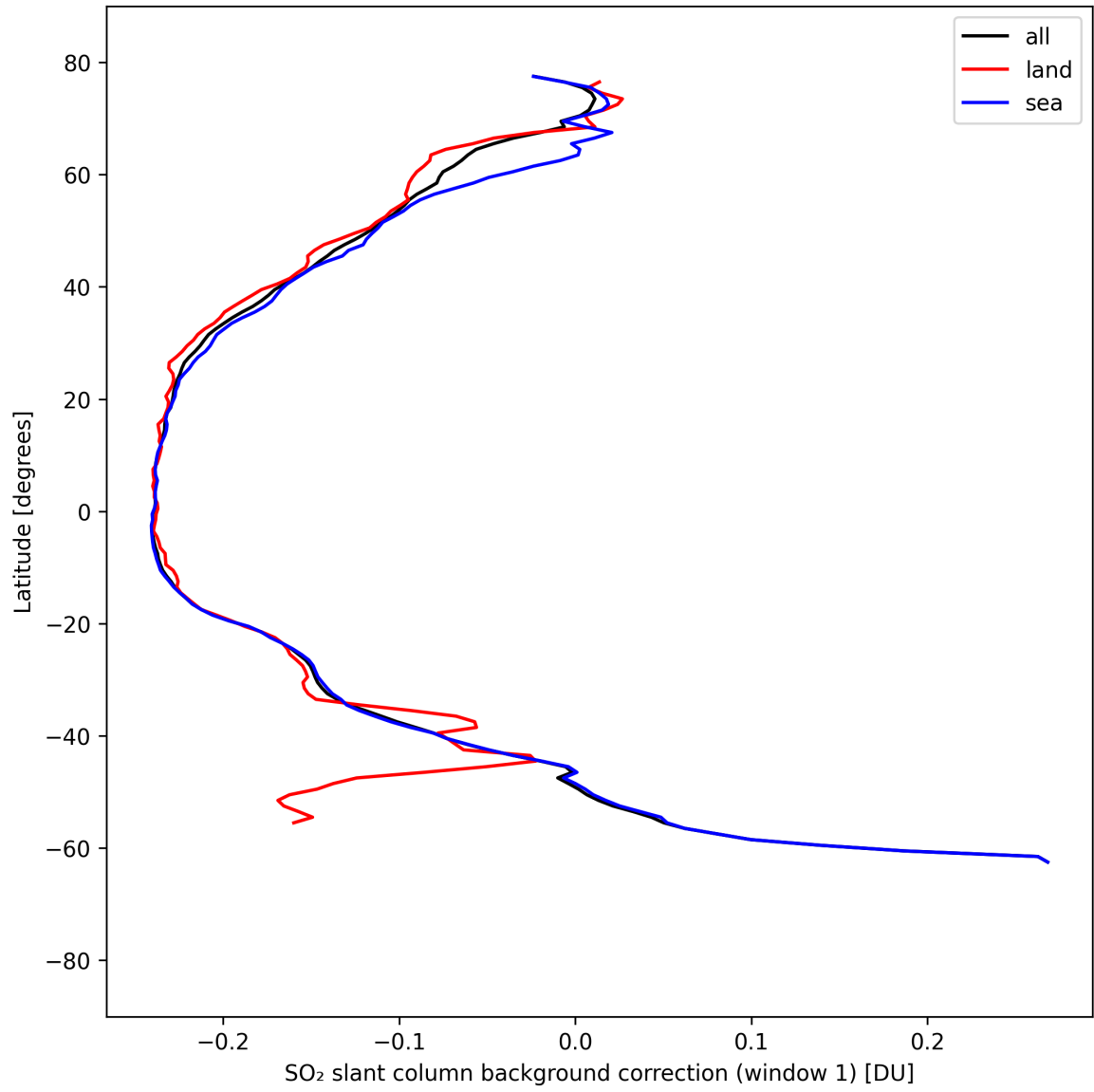


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-09-04 to 2025-09-05.

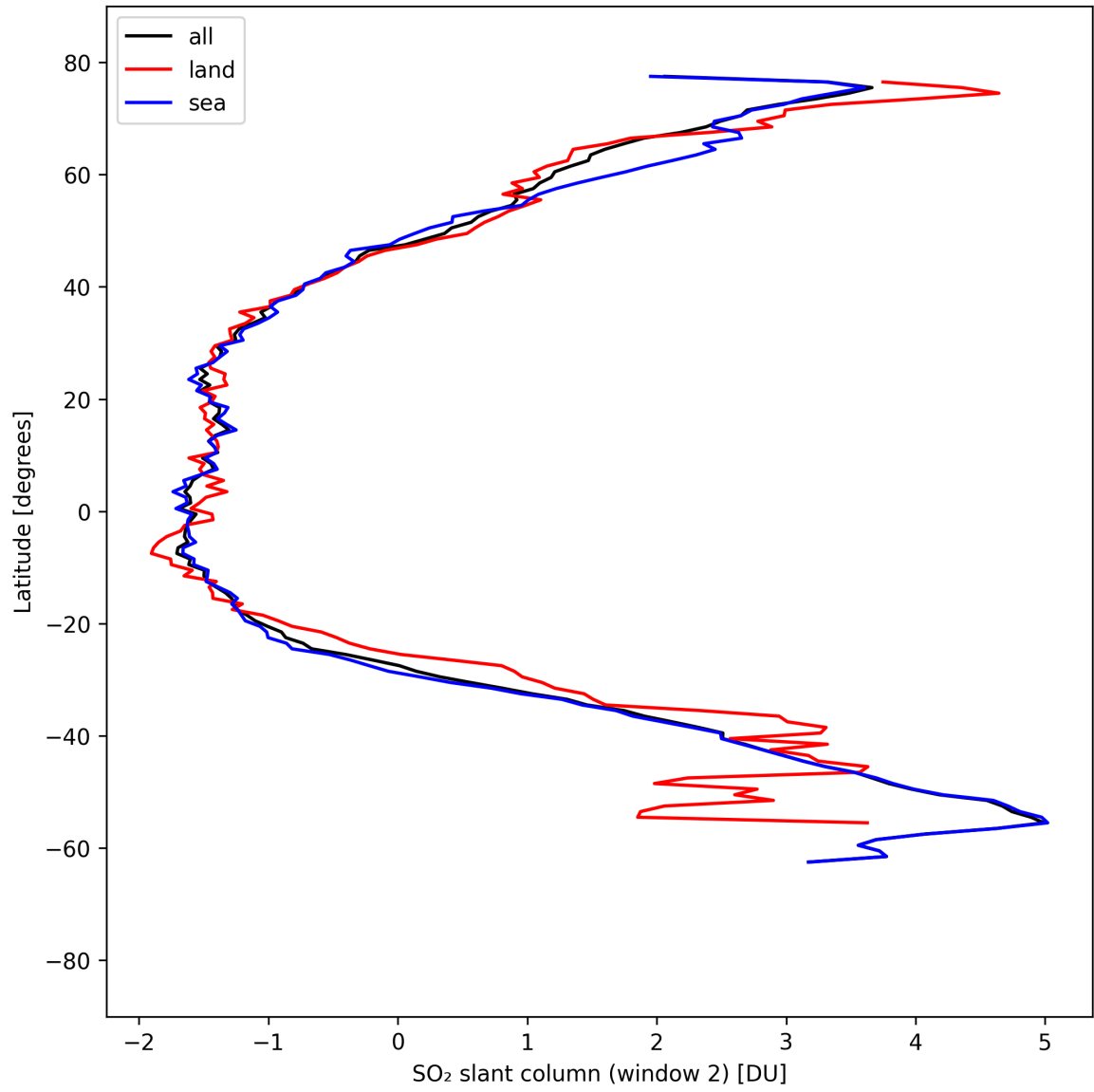


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-09-04 to 2025-09-05.

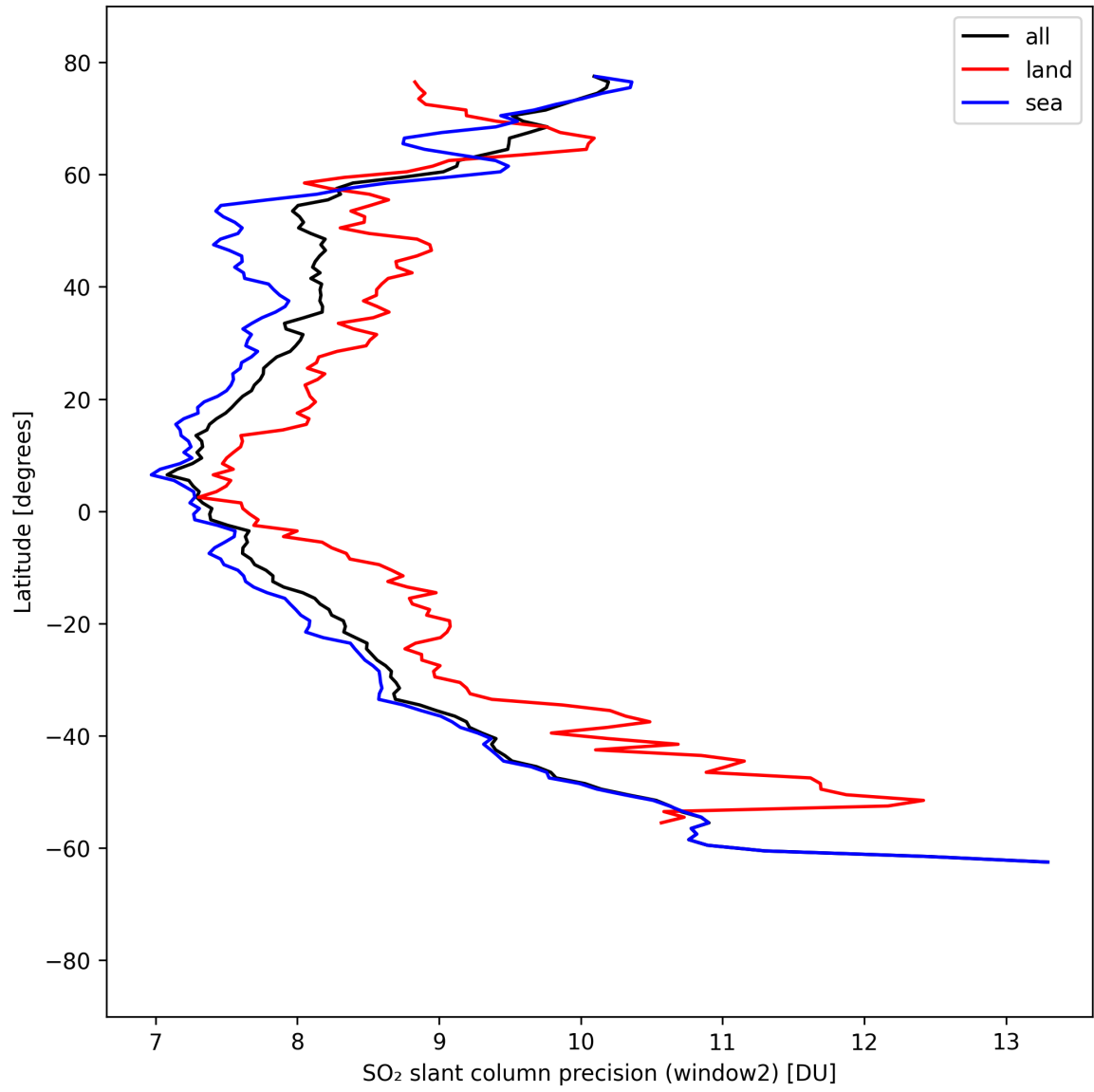


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-09-04 to 2025-09-05.

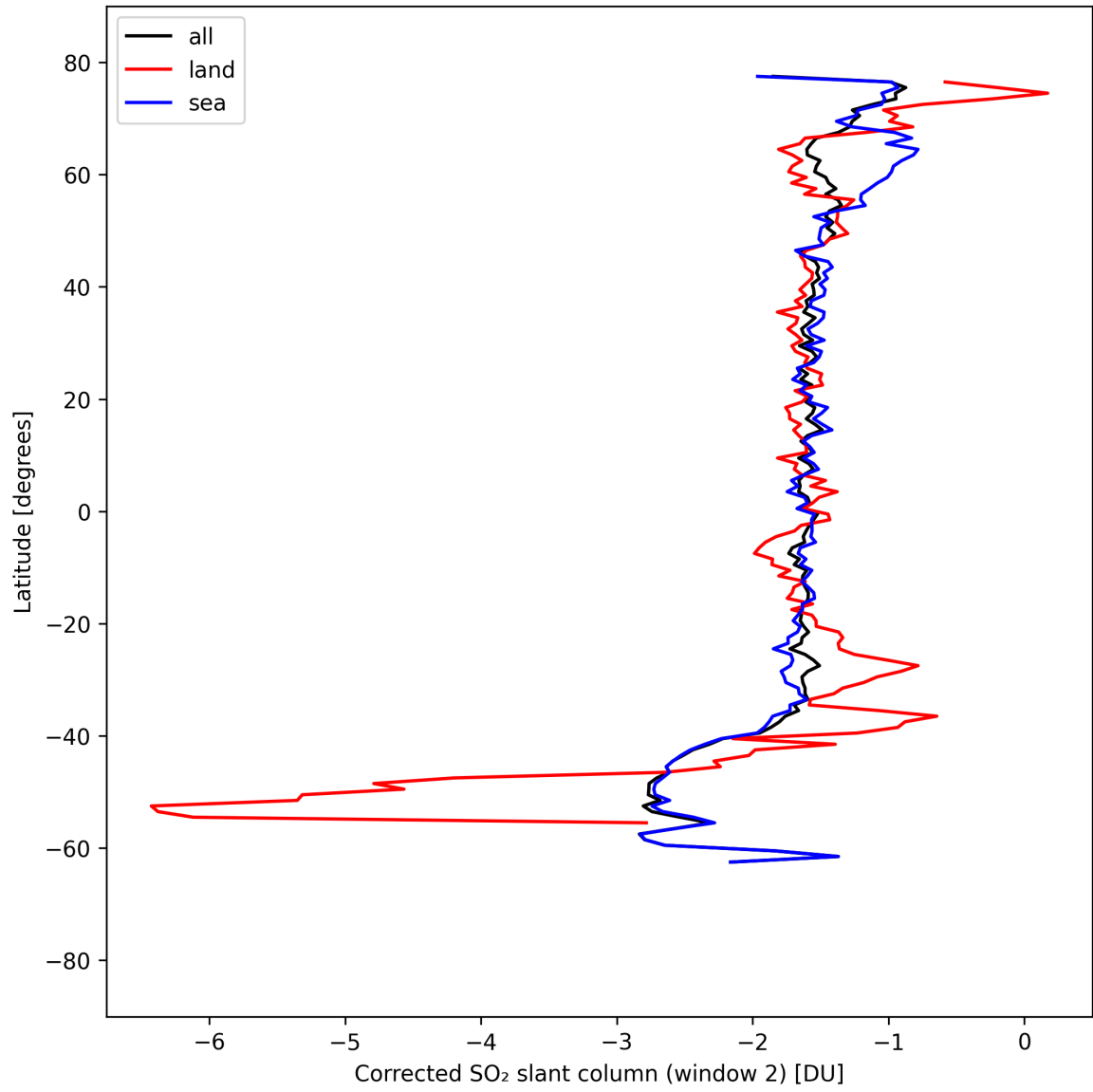


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-09-04 to 2025-09-05.

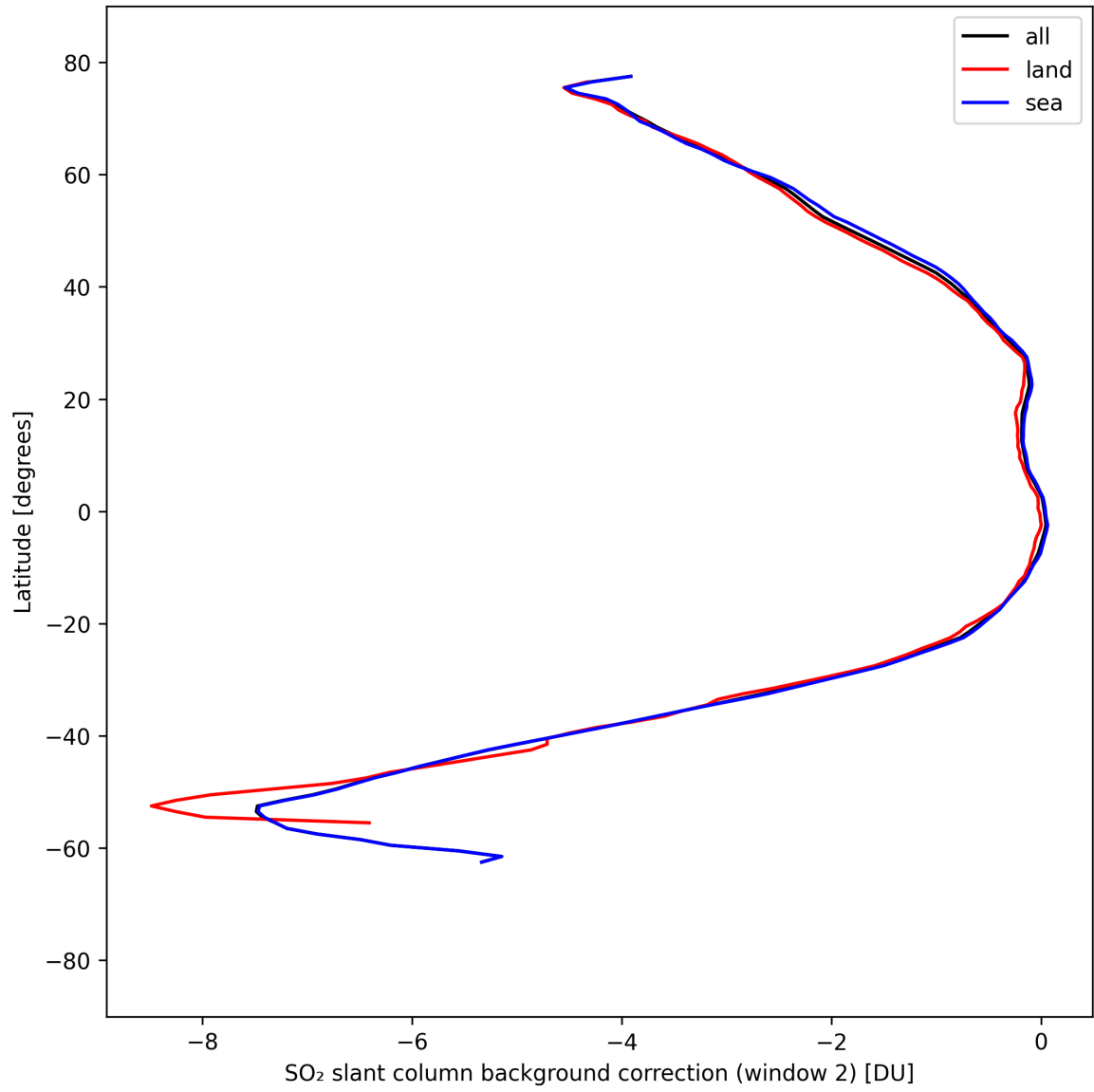


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-09-04 to 2025-09-05.

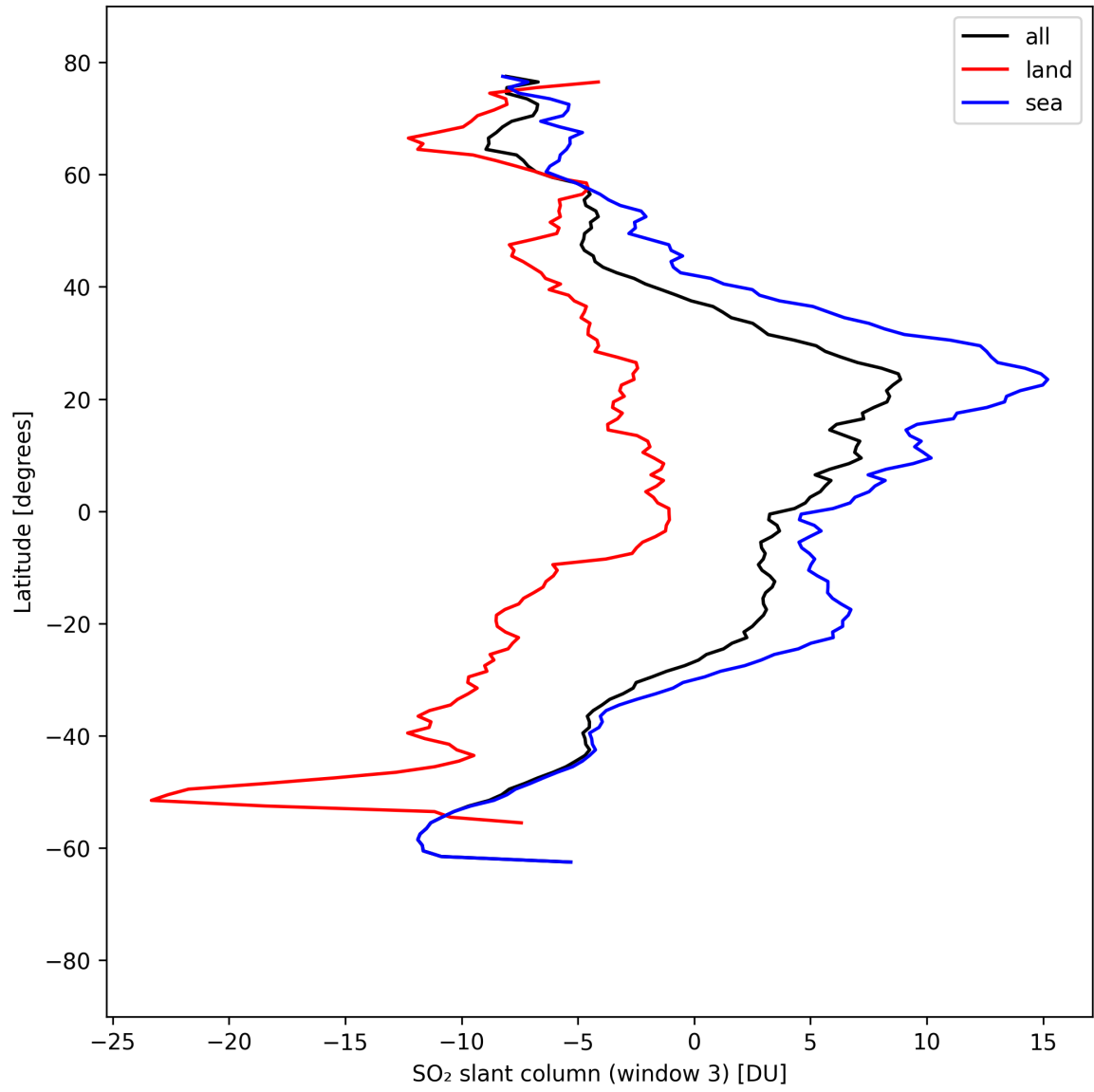


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-09-04 to 2025-09-05.

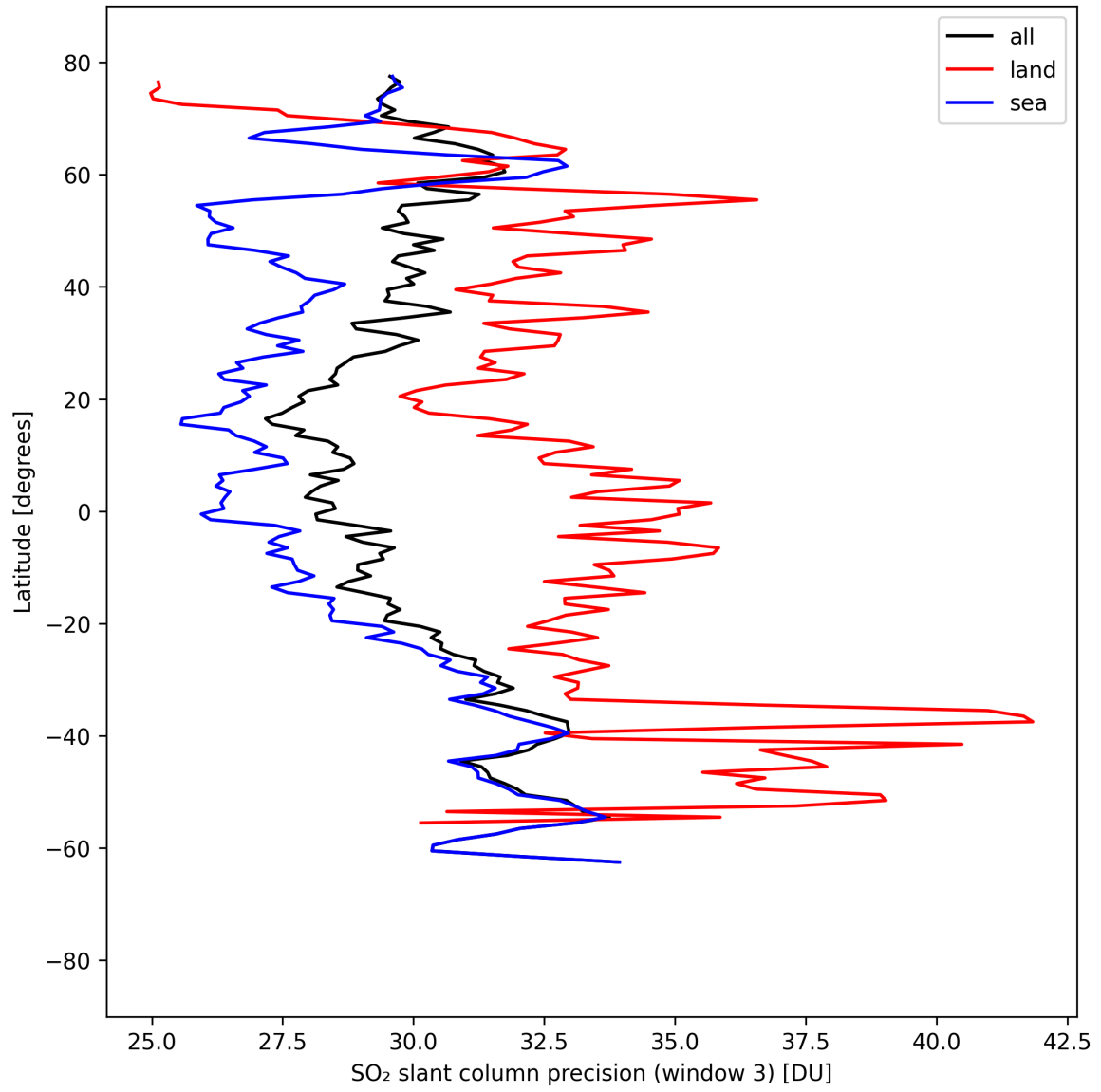


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-09-04 to 2025-09-05.

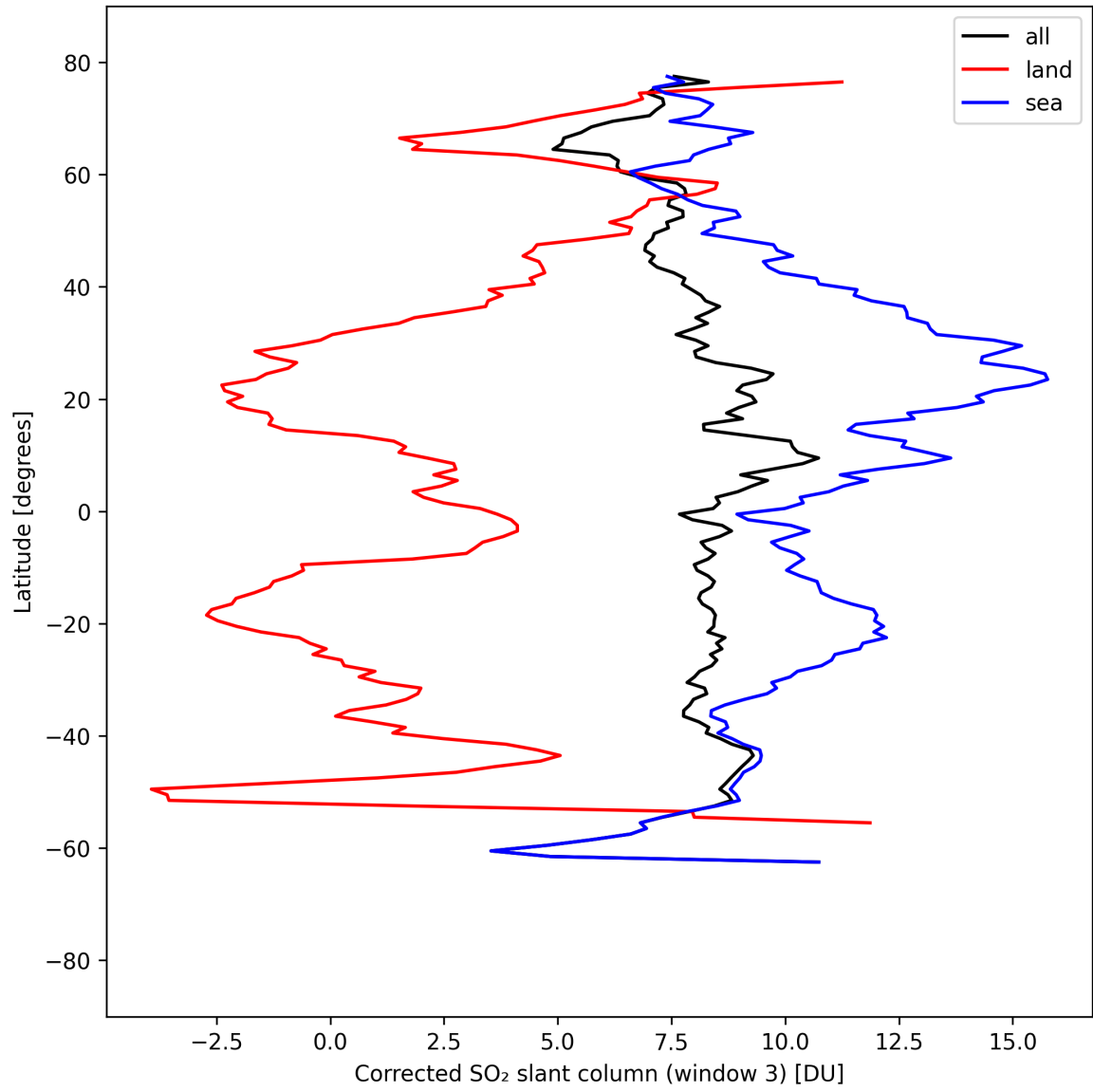


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-09-04 to 2025-09-05.

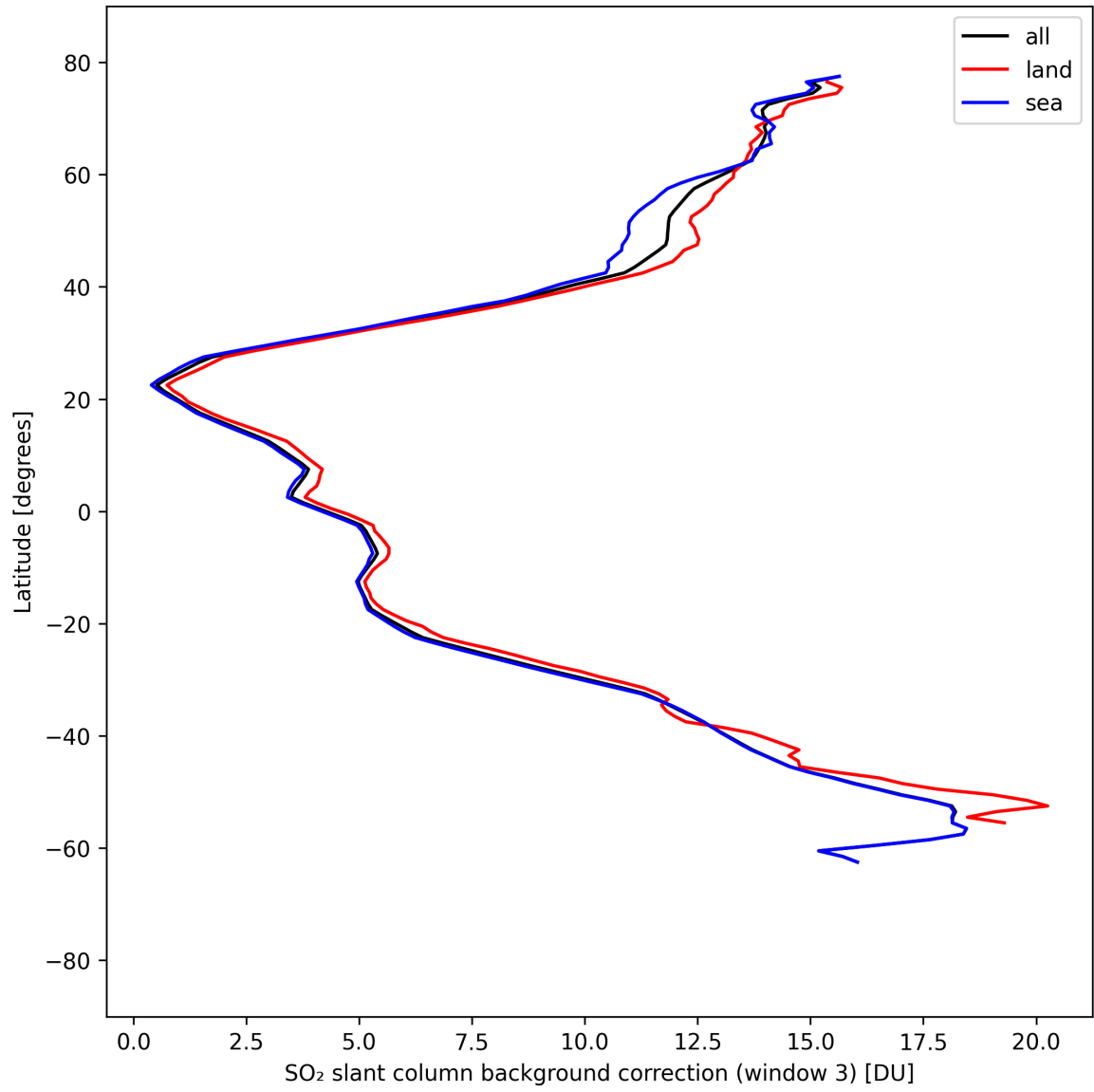


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-09-04 to 2025-09-05.

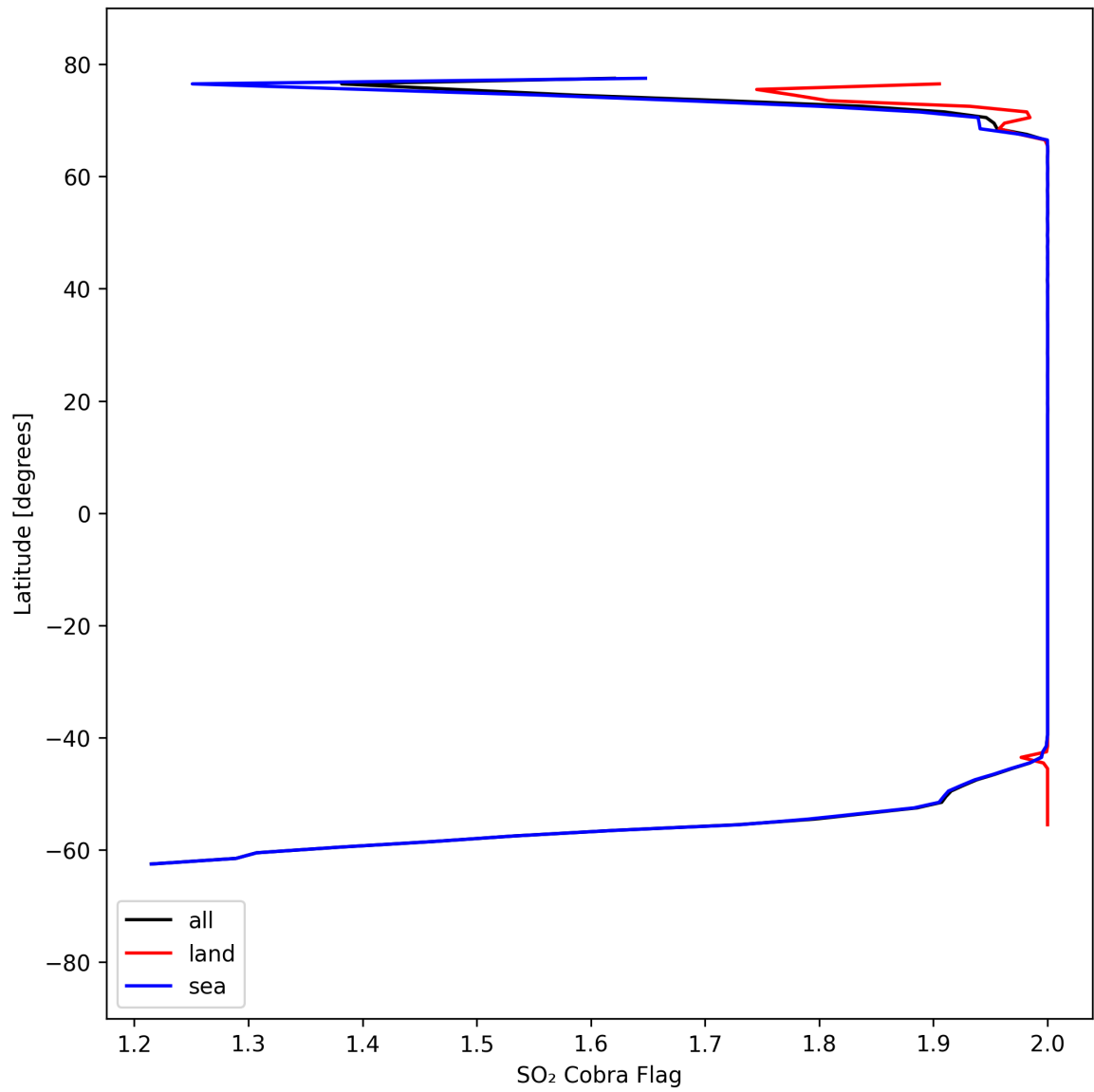


Figure 48: Zonal average of "SO₂ Cobra Flag" for 2025-09-04 to 2025-09-05.

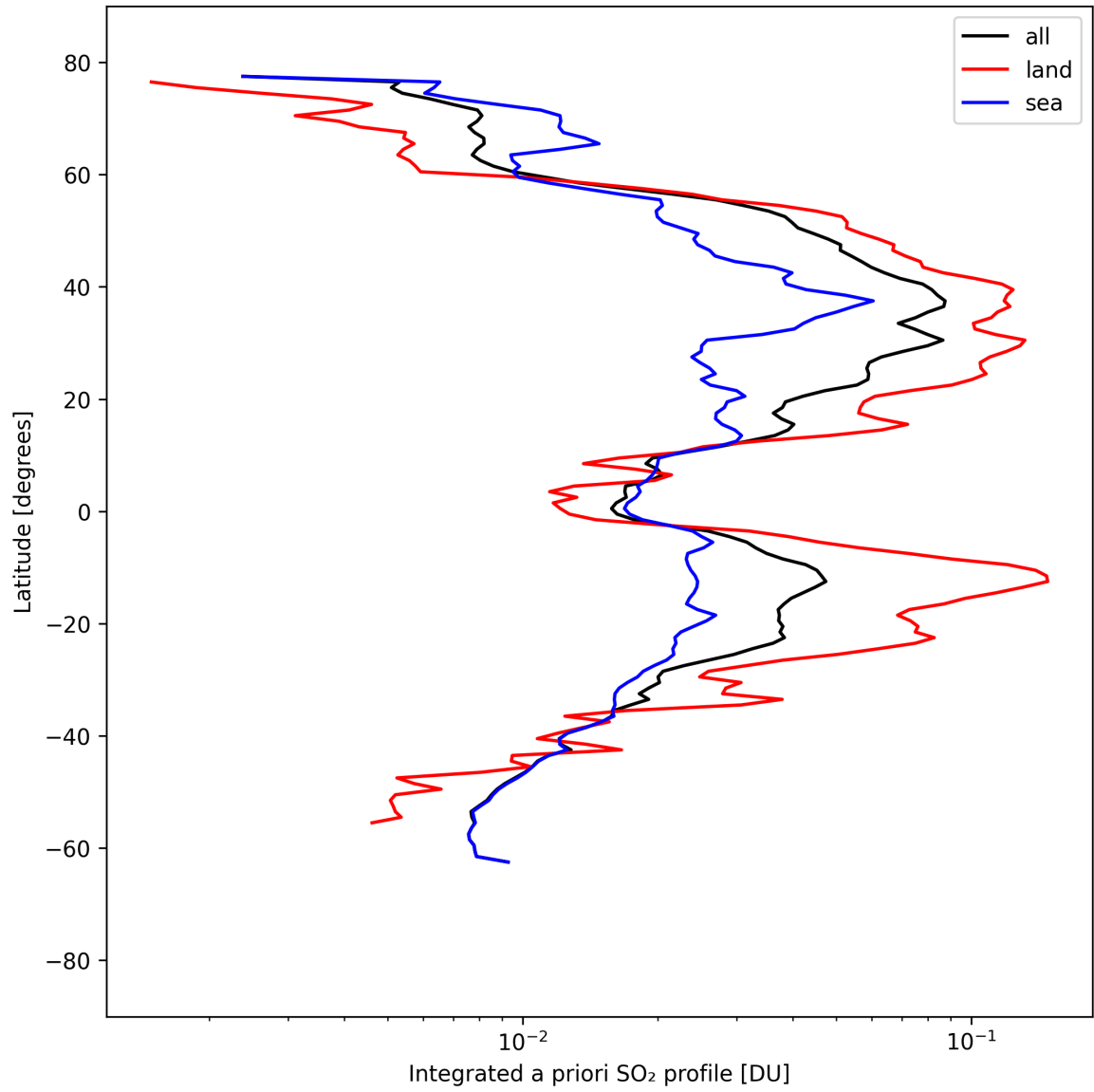


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-09-04 to 2025-09-05.

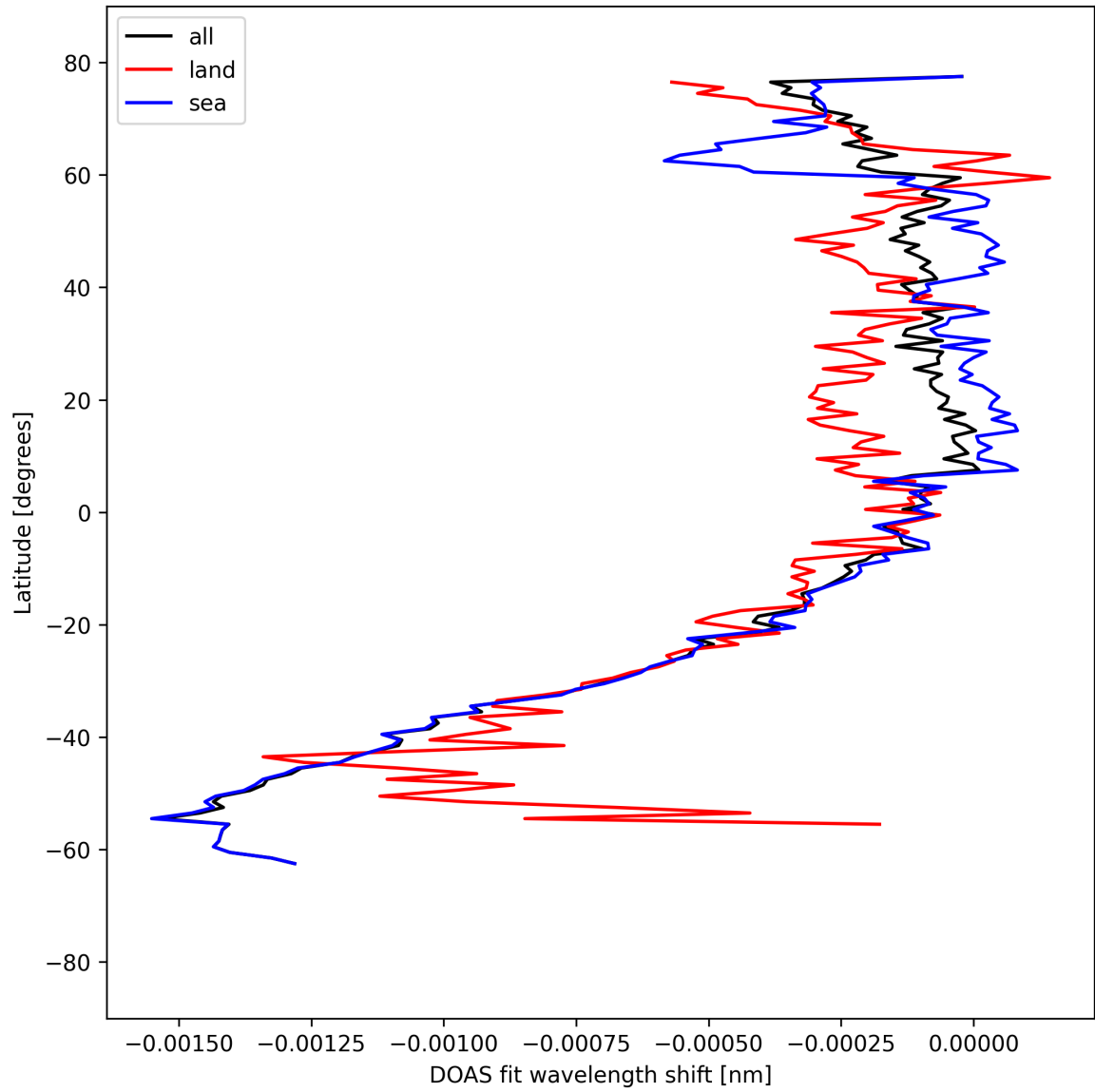


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-09-04 to 2025-09-05.

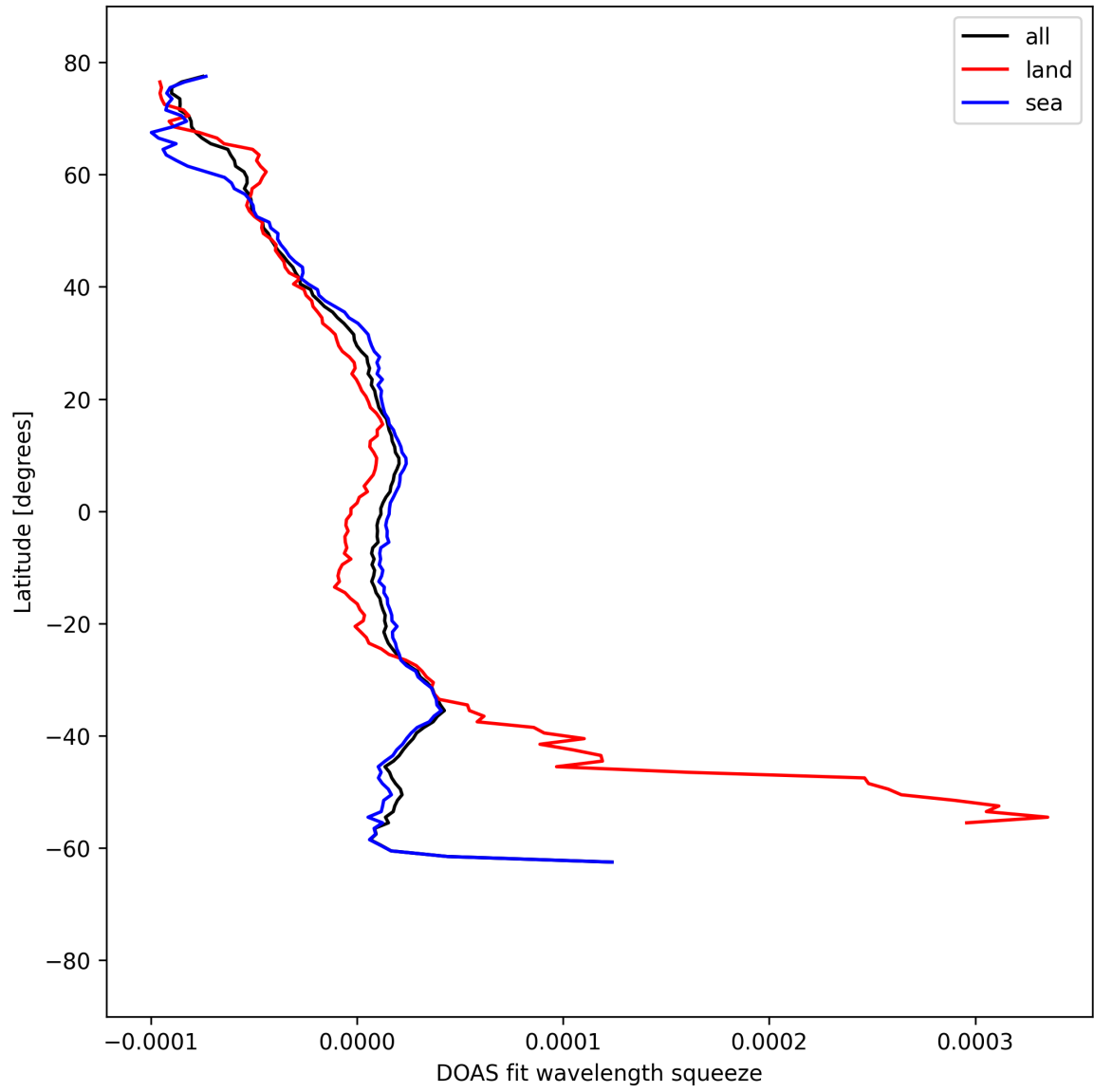


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-09-04 to 2025-09-05.

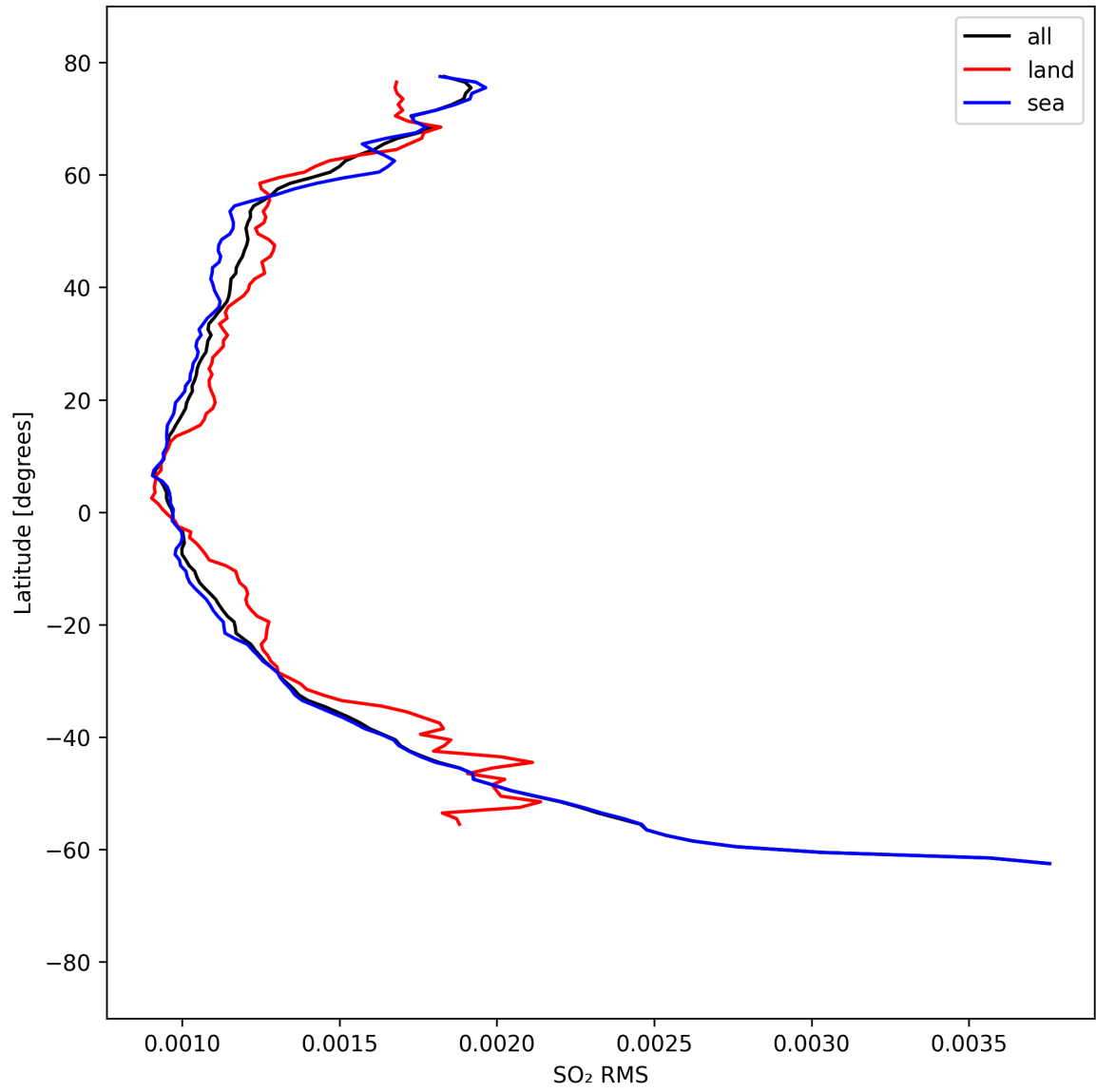


Figure 52: Zonal average of “SO₂ RMS” for 2025-09-04 to 2025-09-05.

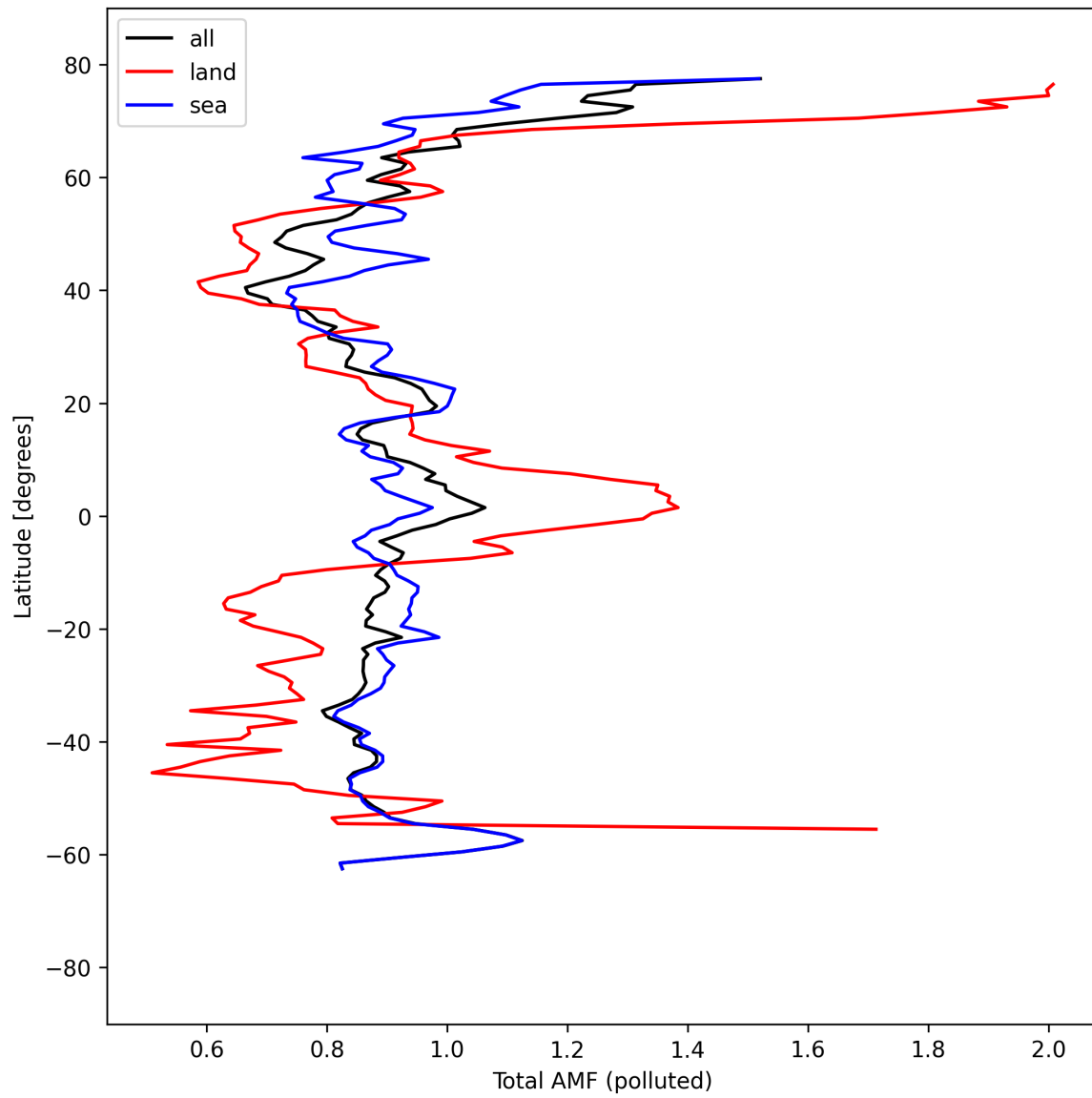


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-09-04 to 2025-09-05.

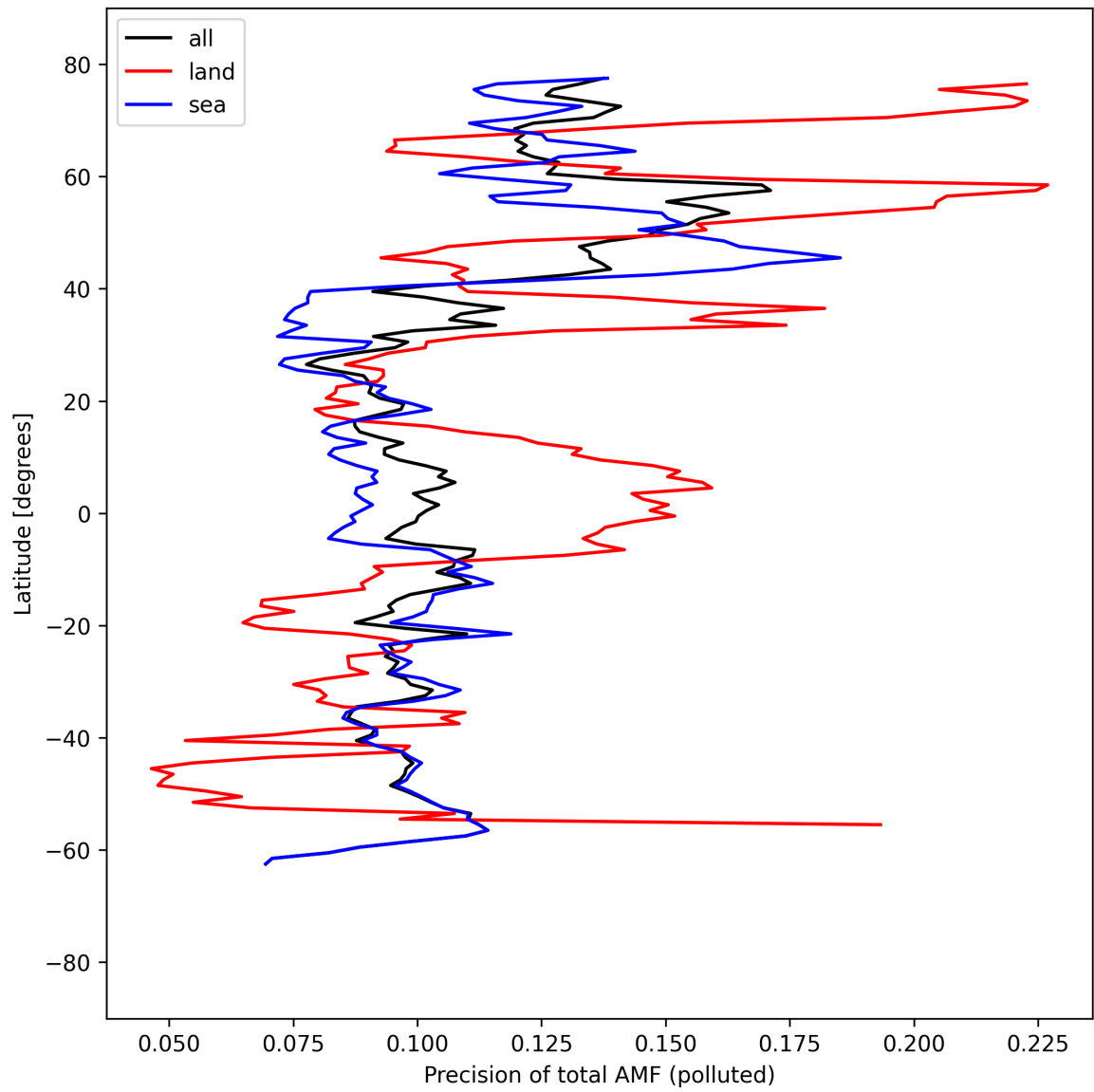


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-09-04 to 2025-09-05.

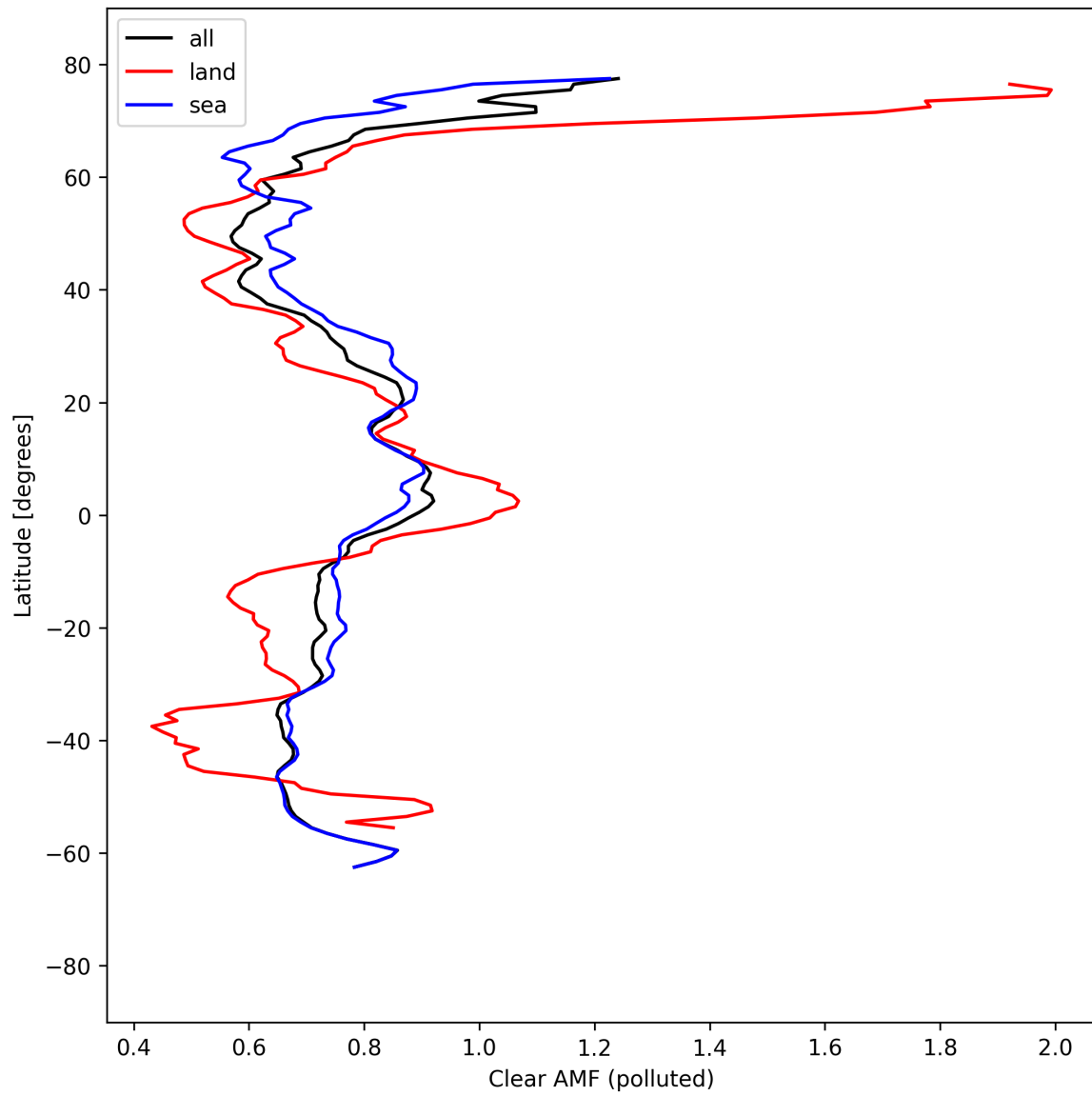


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-09-04 to 2025-09-05.

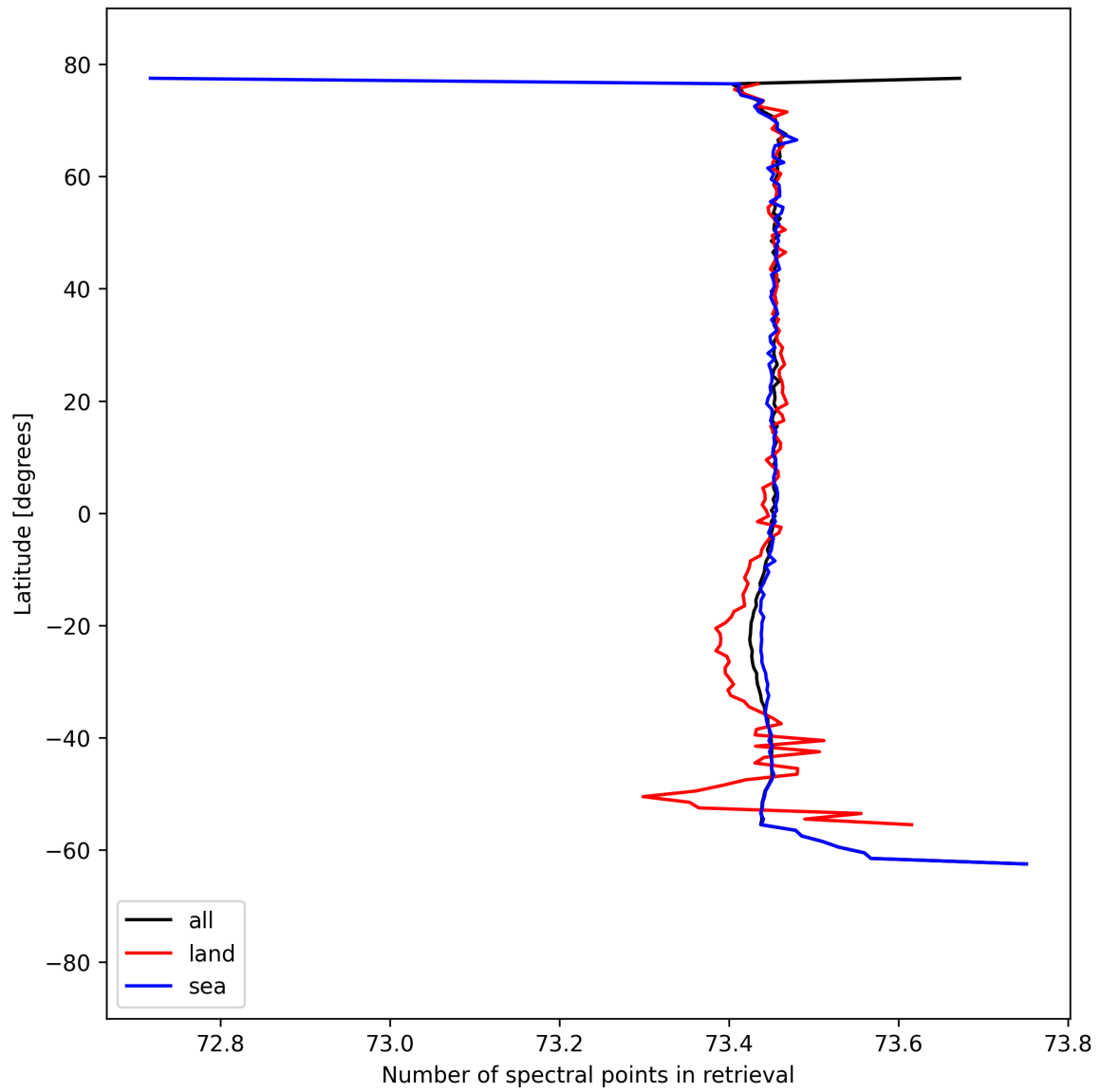


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-09-04 to 2025-09-05.

8 Histograms

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

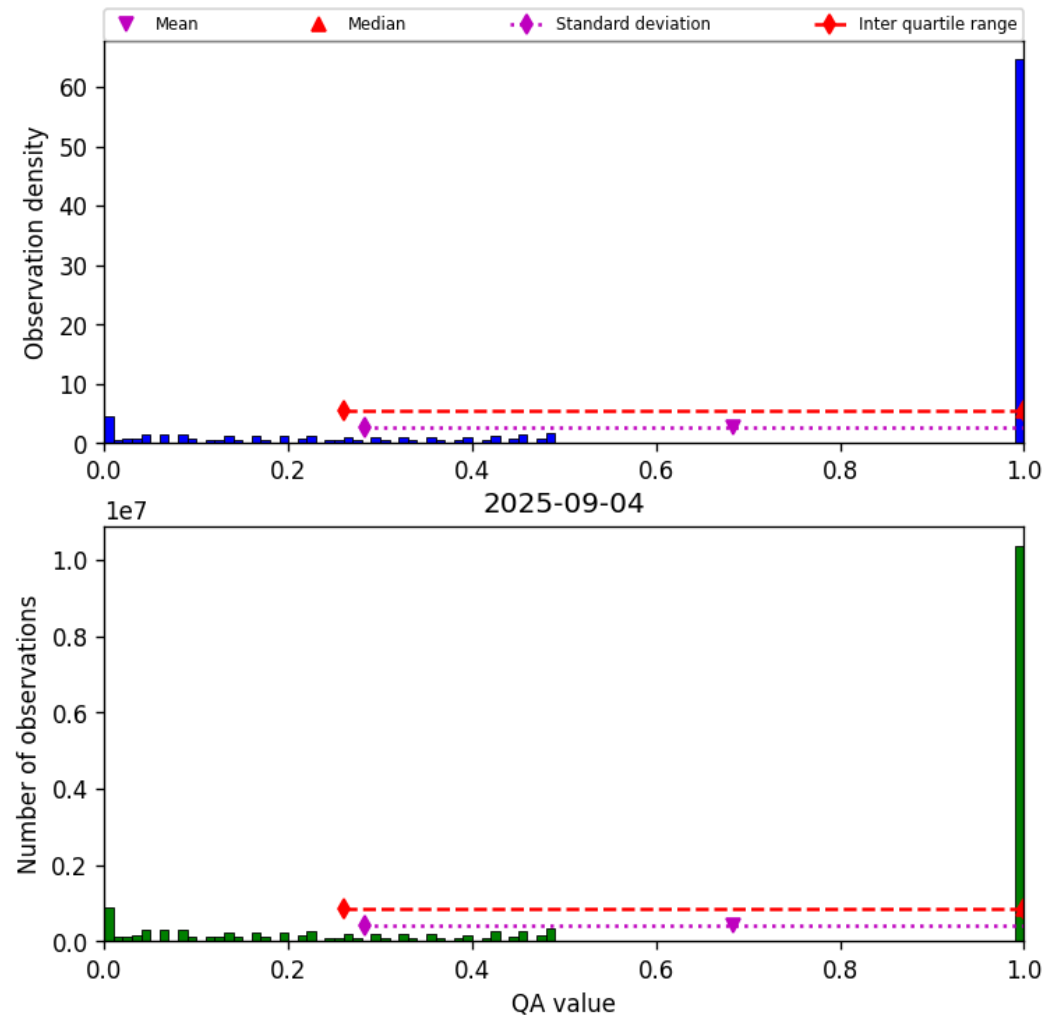


Figure 57: Histogram of “QA value” for 2025-09-04 to 2025-09-05

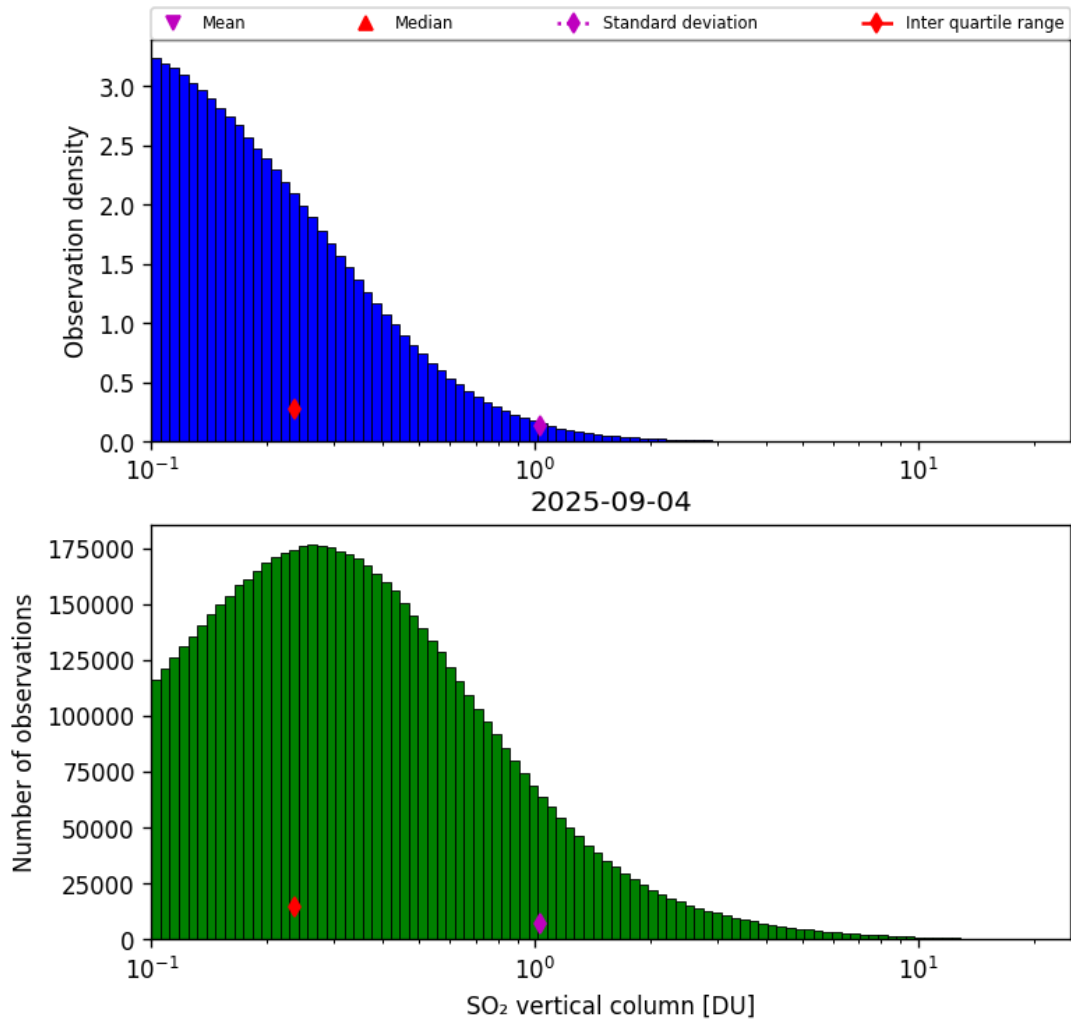


Figure 58: Histogram of “SO₂ vertical column” for 2025-09-04 to 2025-09-05

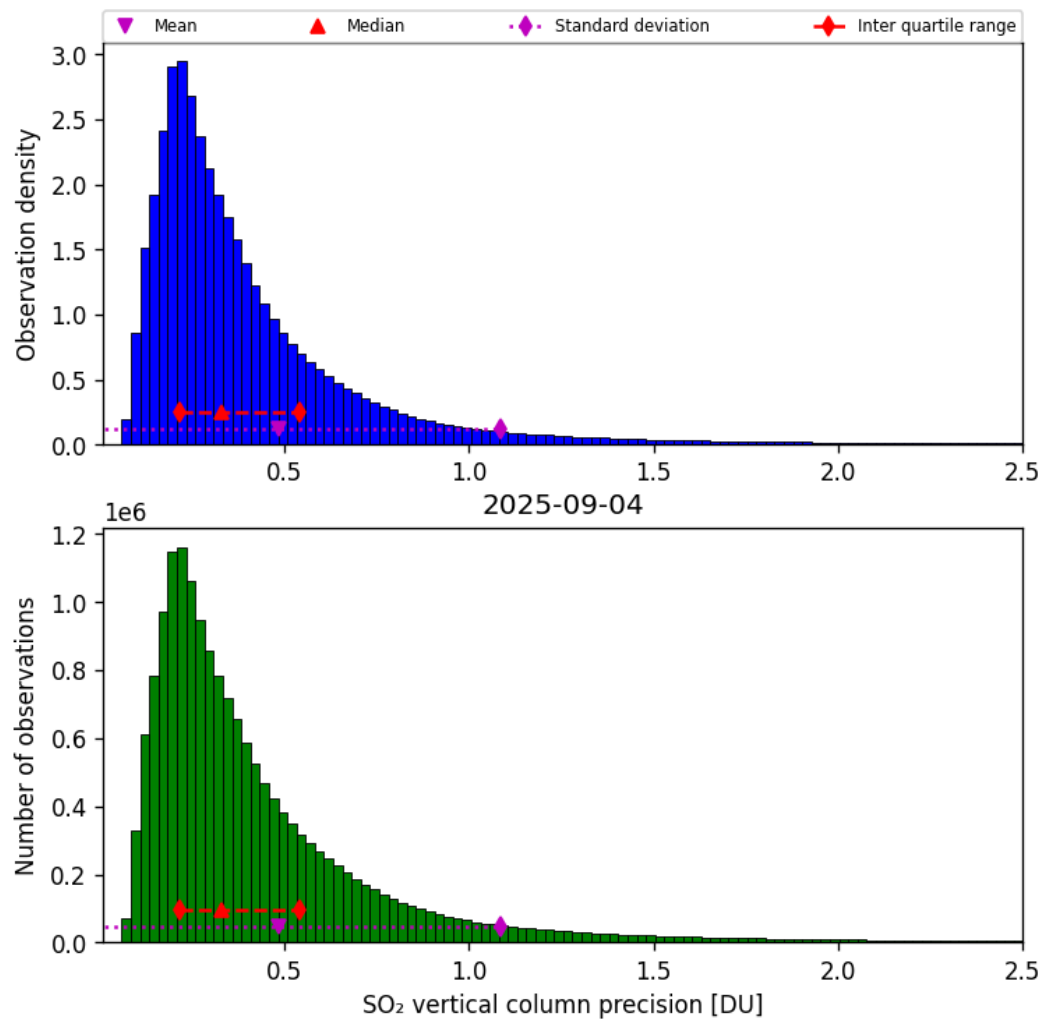


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-09-04 to 2025-09-05

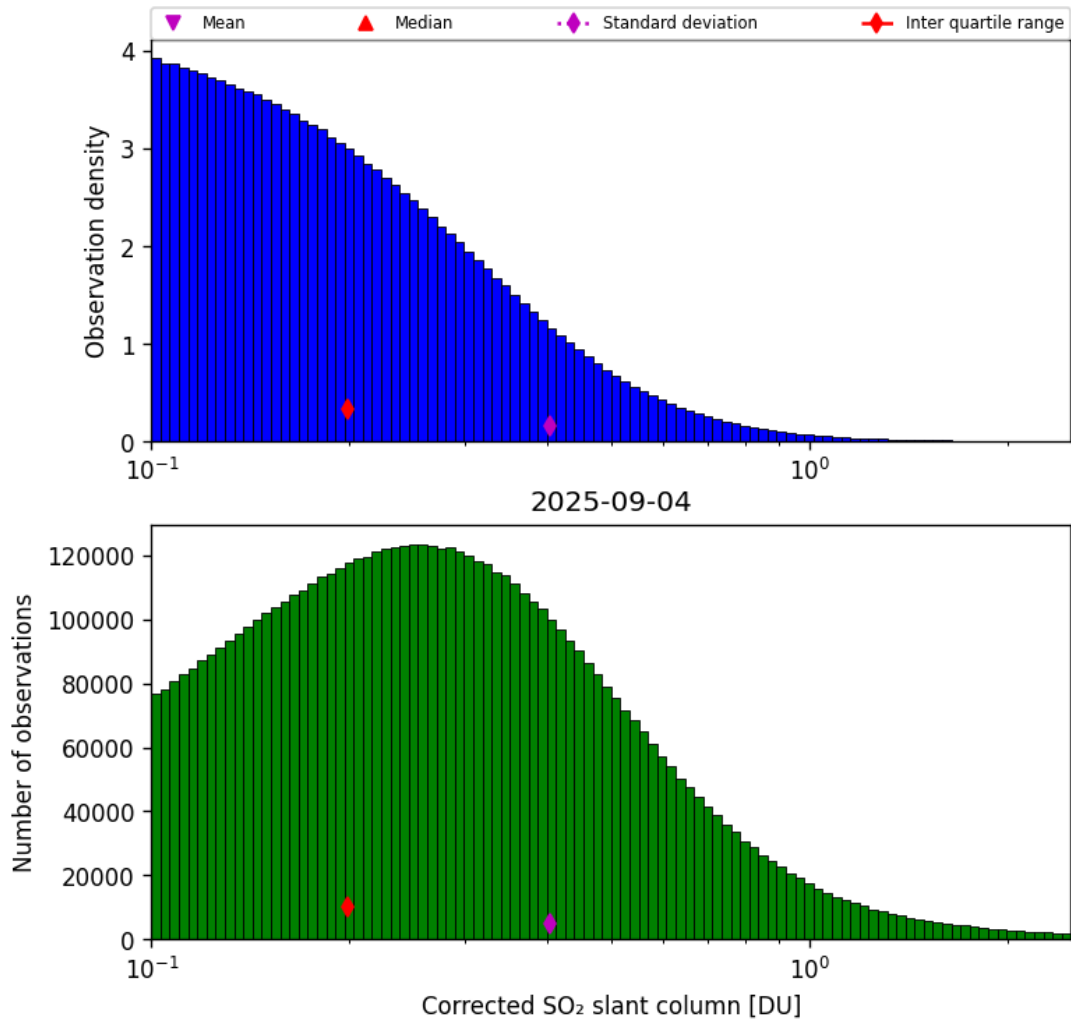


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-09-04 to 2025-09-05

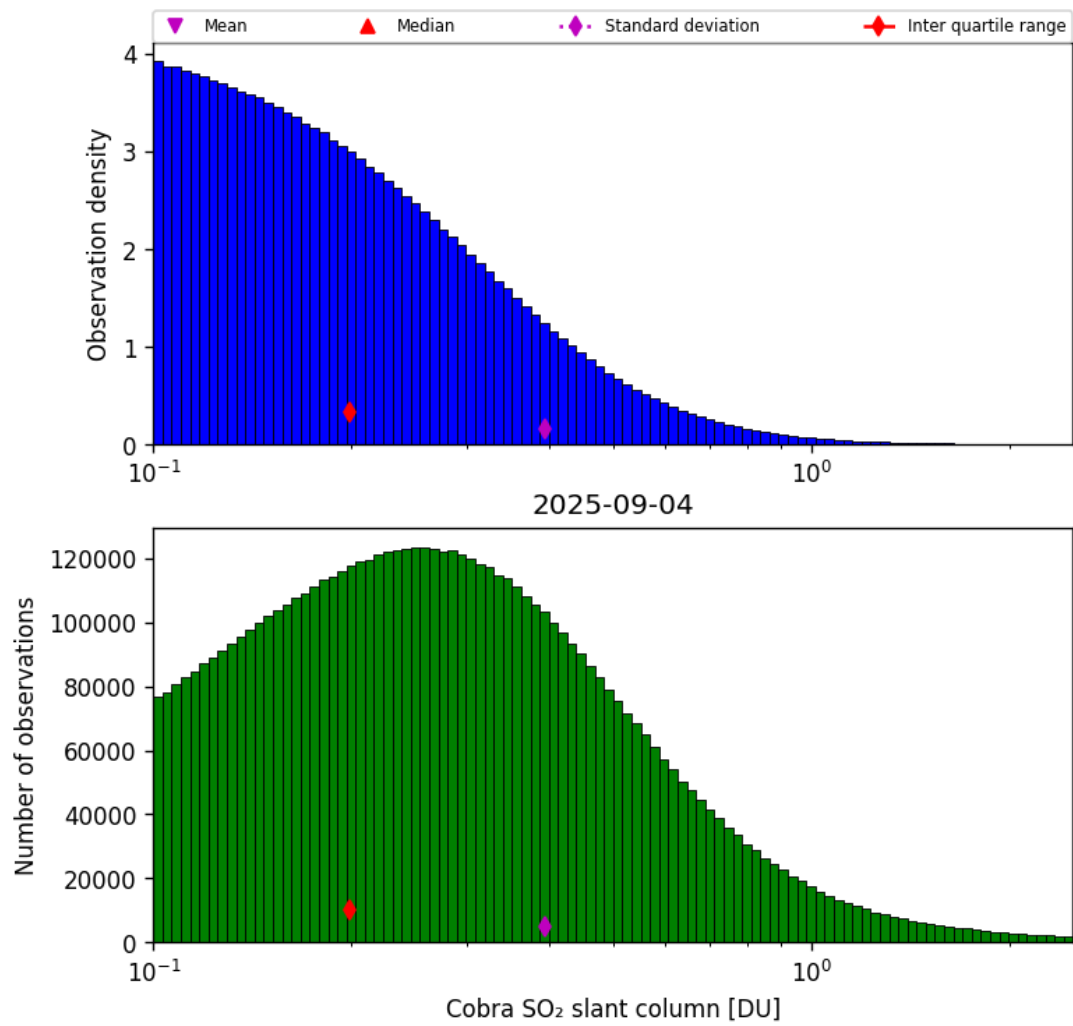


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-09-04 to 2025-09-05

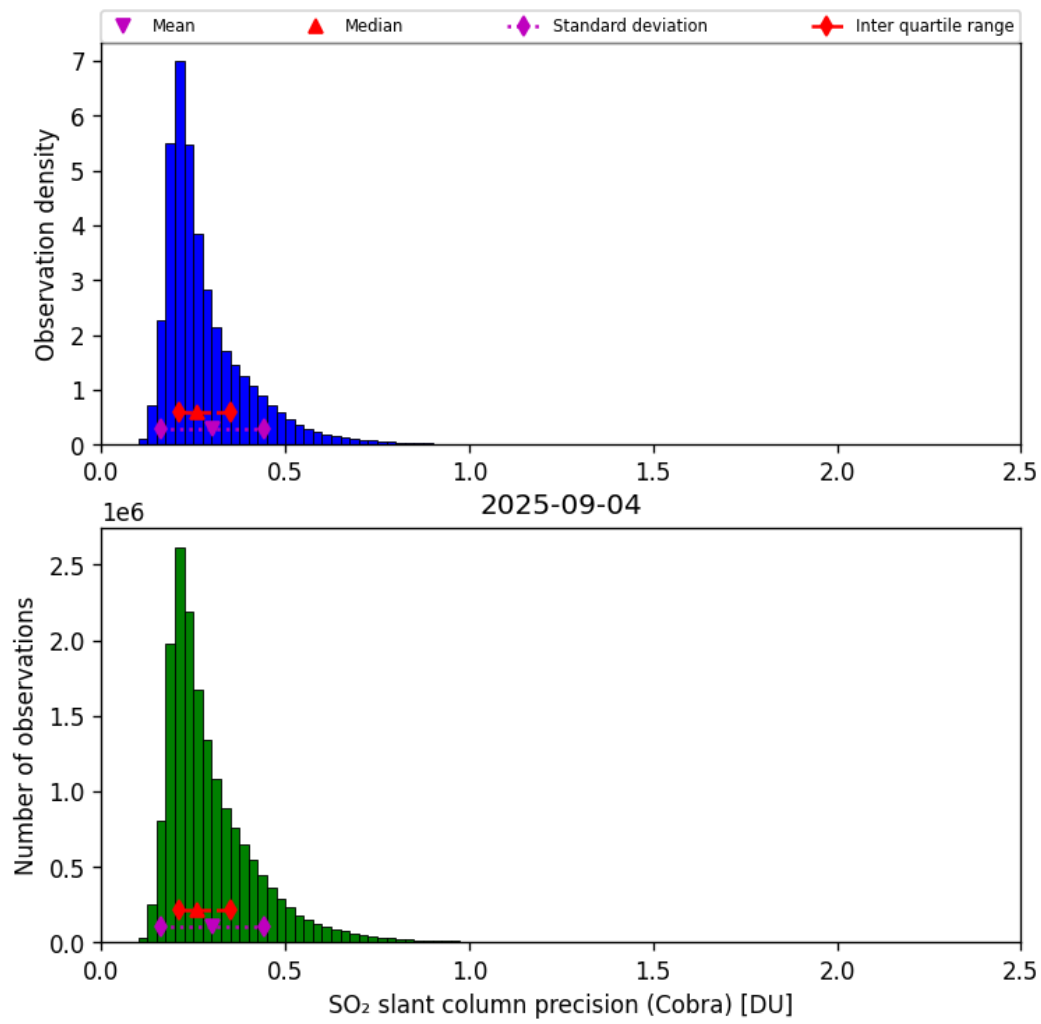


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-09-04 to 2025-09-05

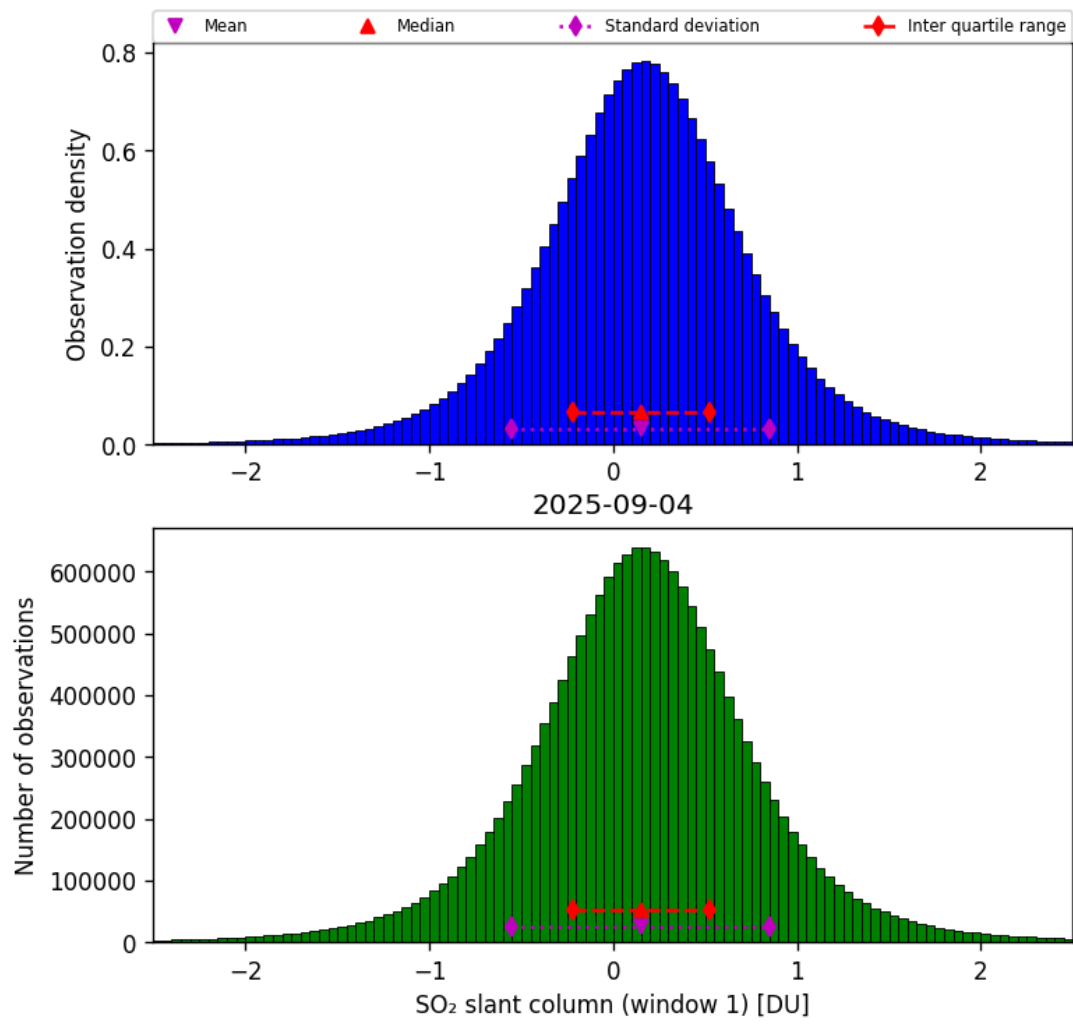


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-09-04 to 2025-09-05

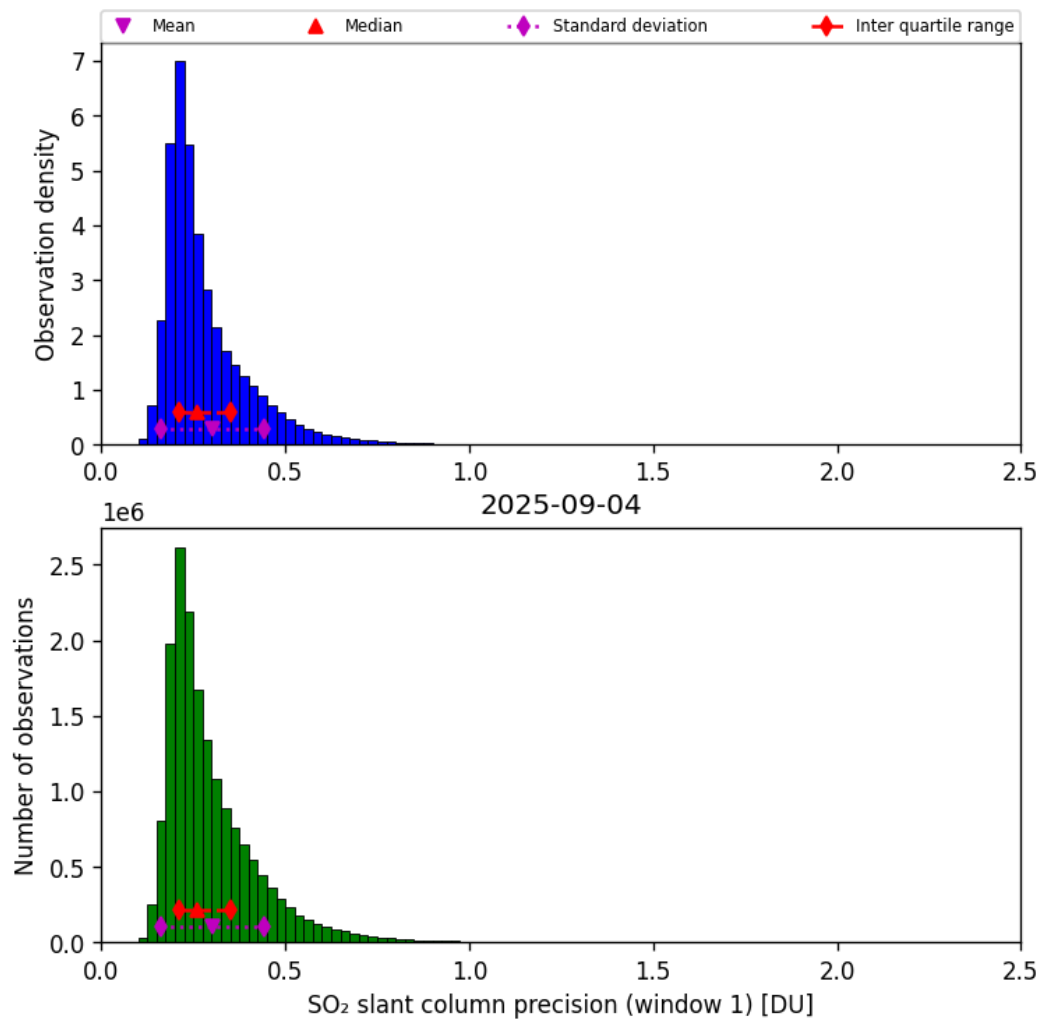


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-09-04 to 2025-09-05

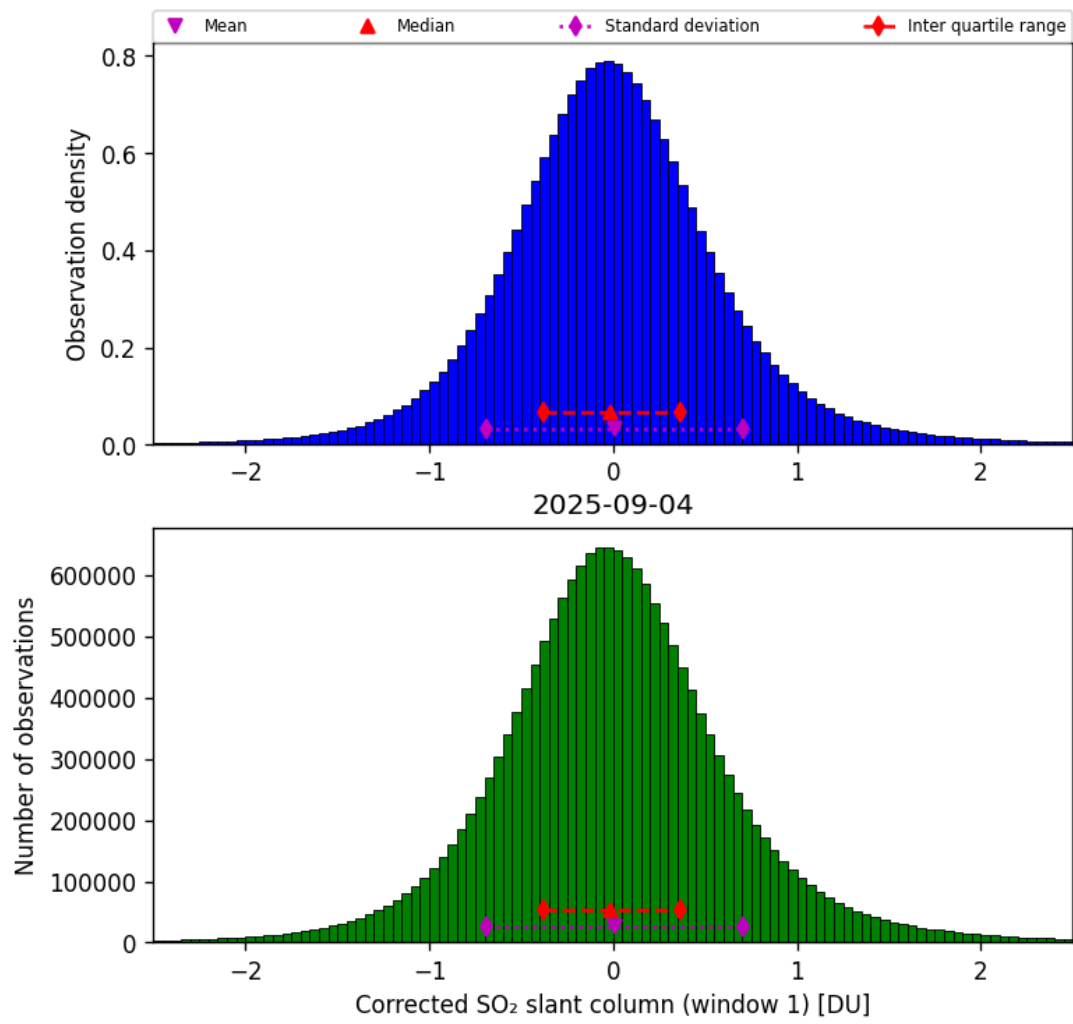


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-09-04 to 2025-09-05

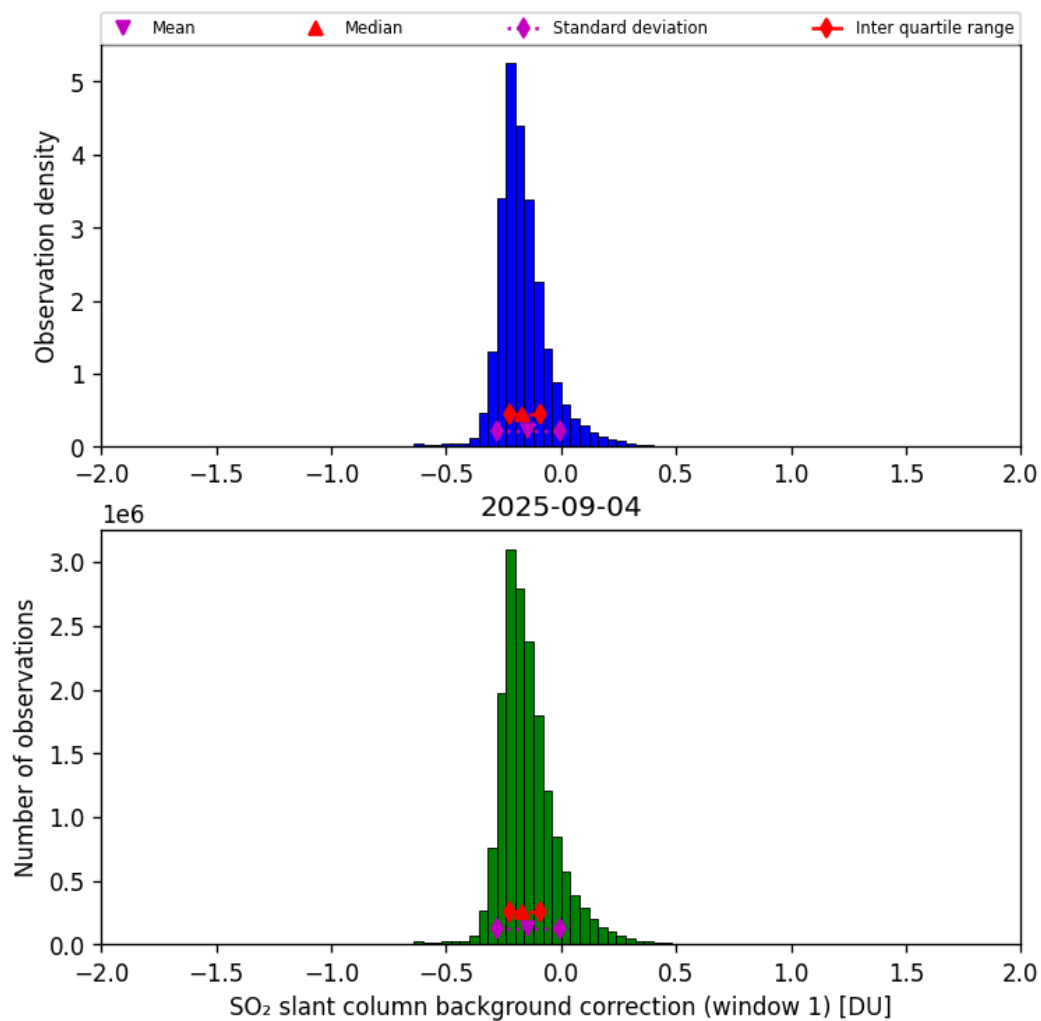


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-09-04 to 2025-09-05

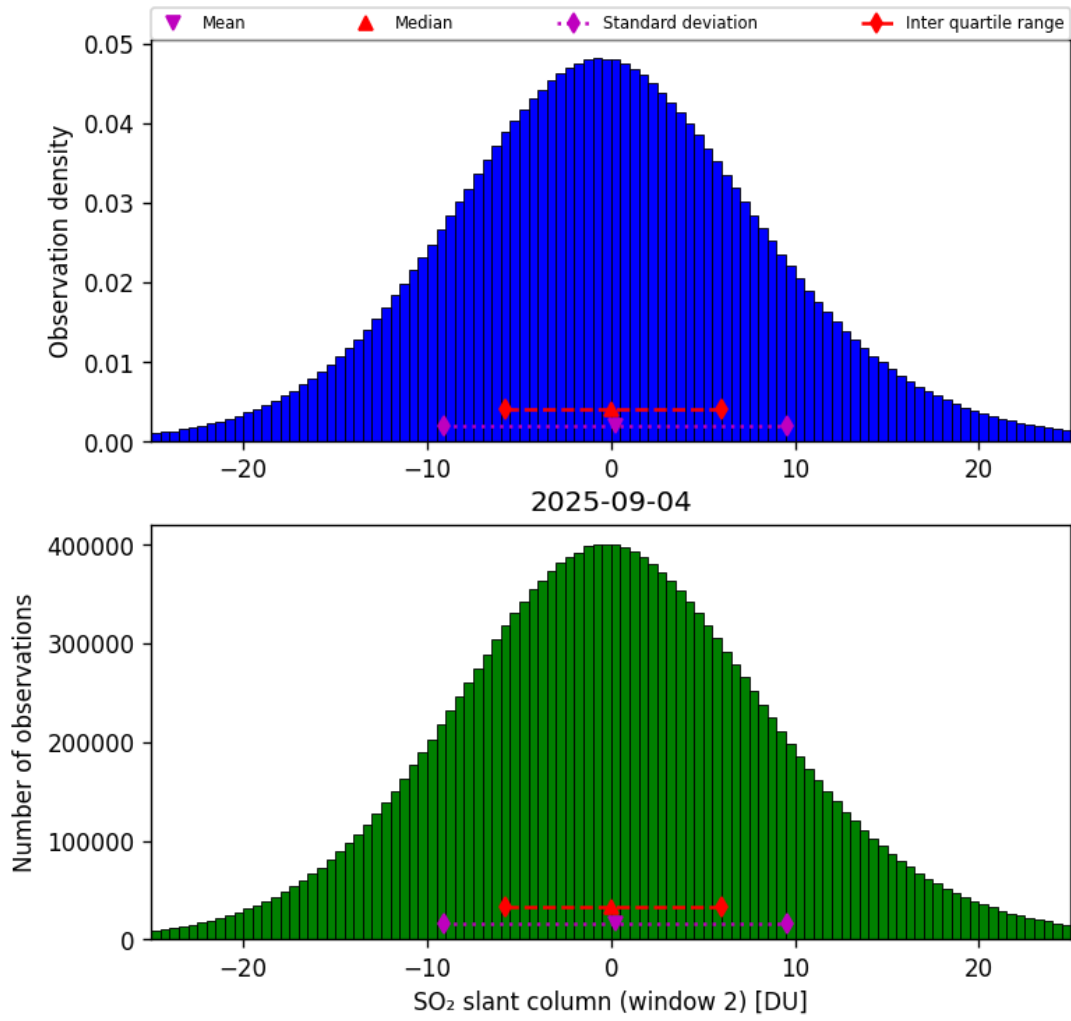


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-09-04 to 2025-09-05

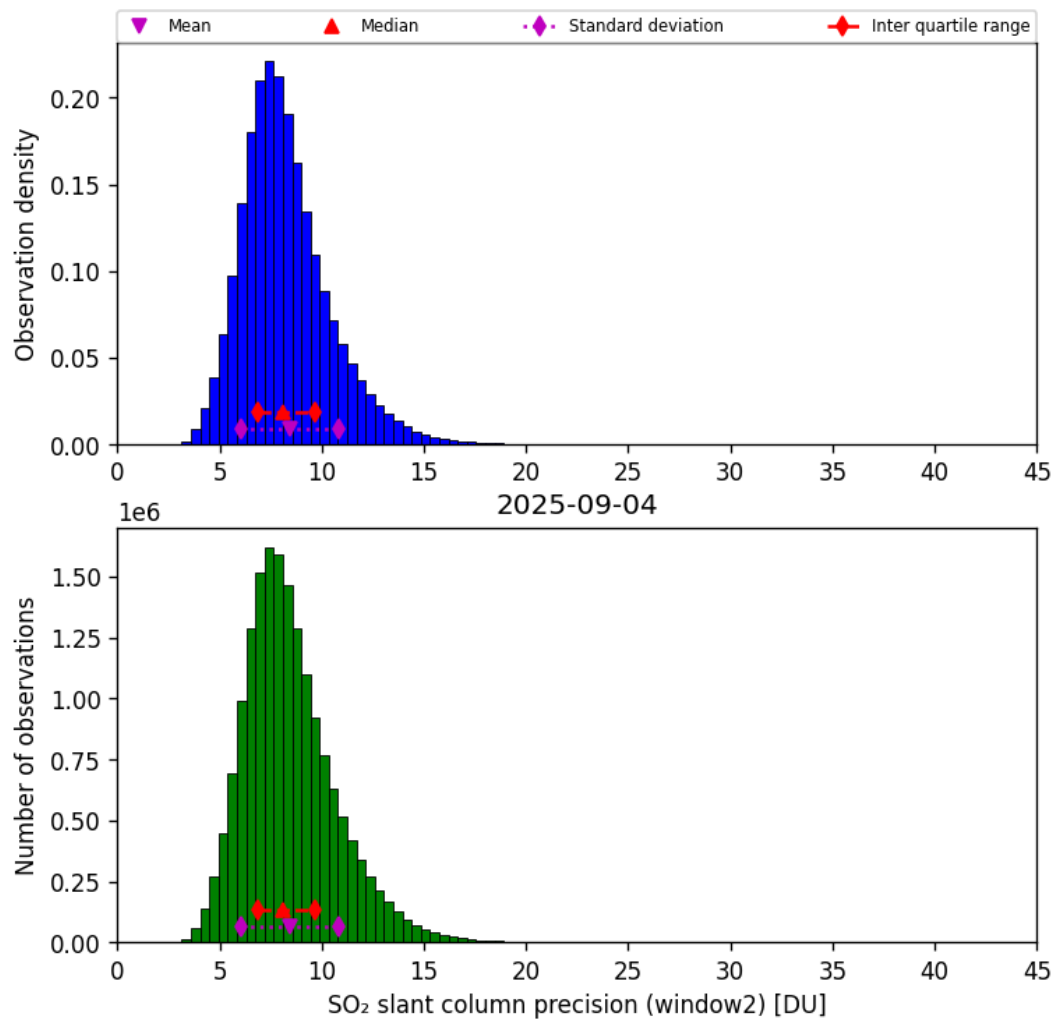


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-09-04 to 2025-09-05

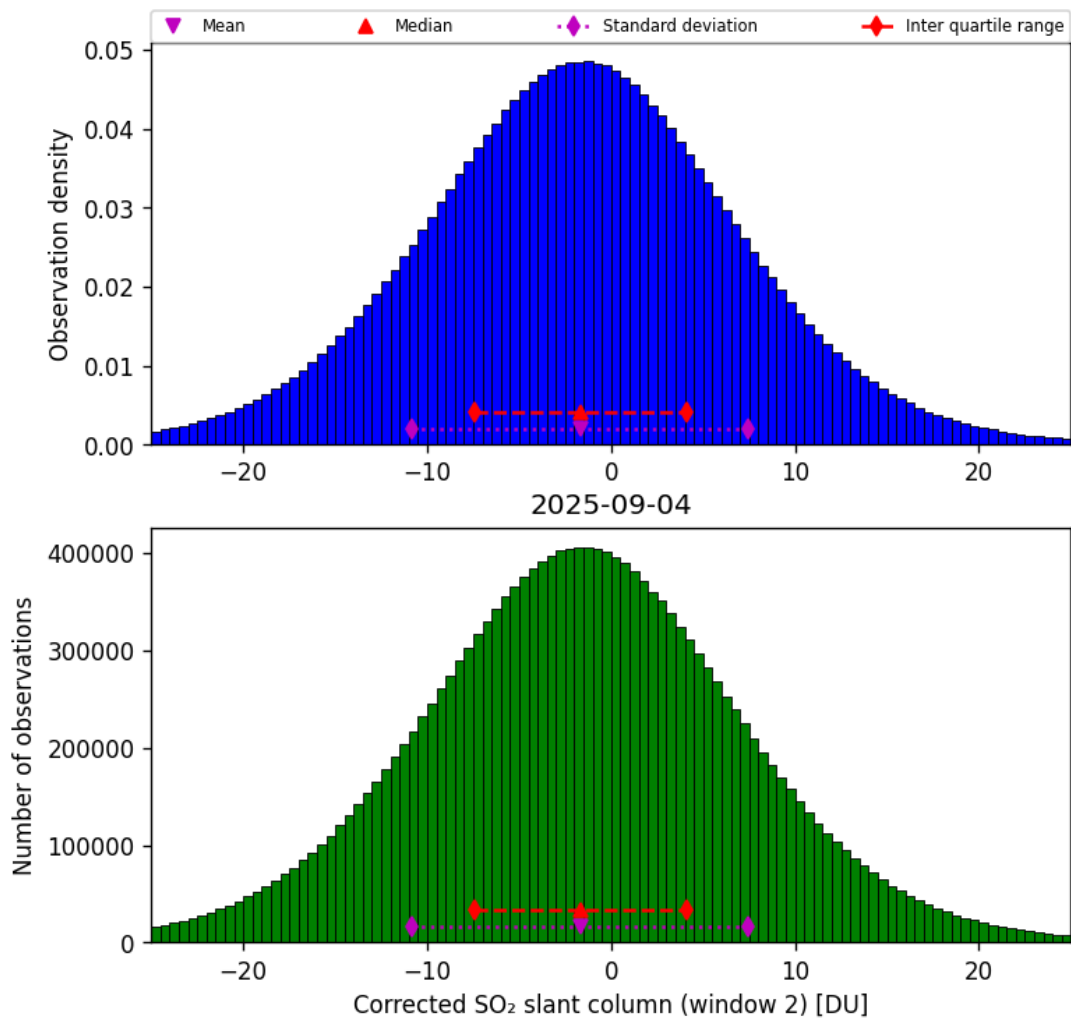


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-09-04 to 2025-09-05

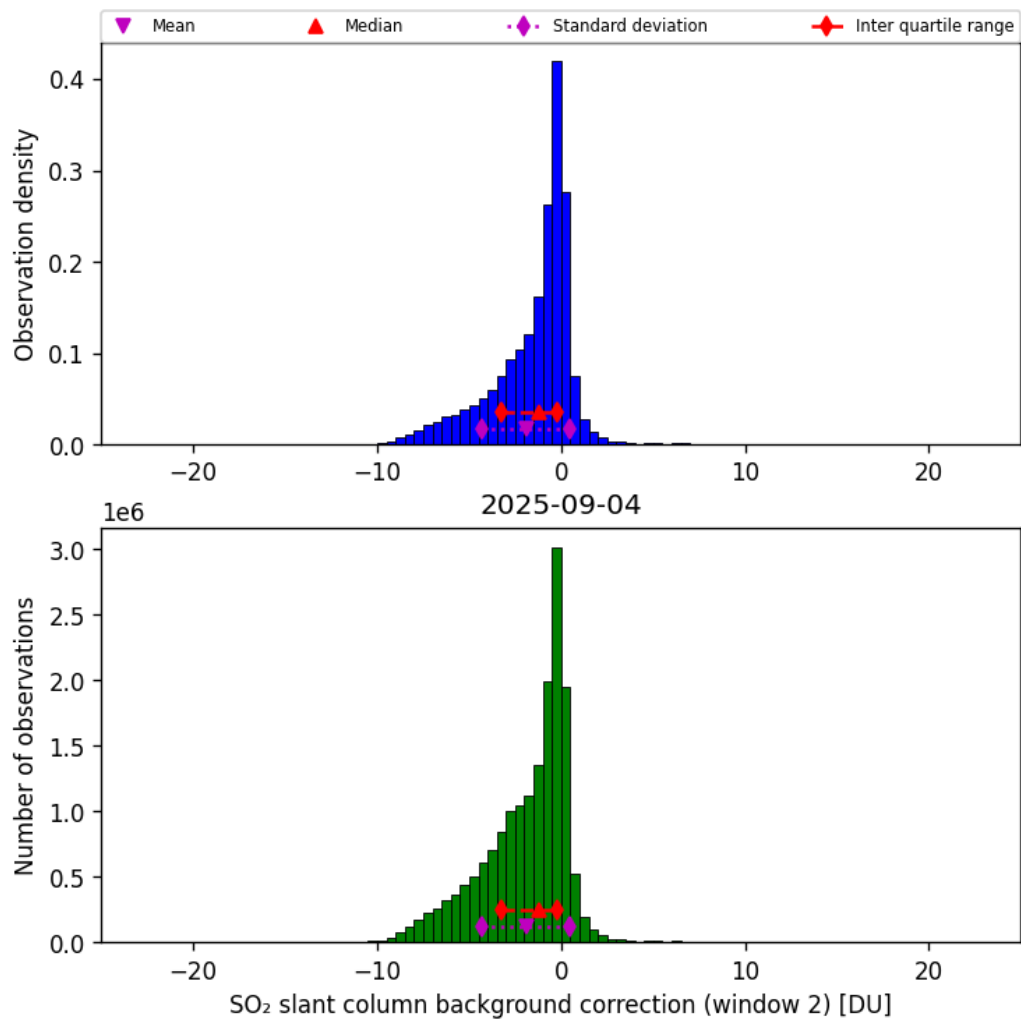


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-09-04 to 2025-09-05

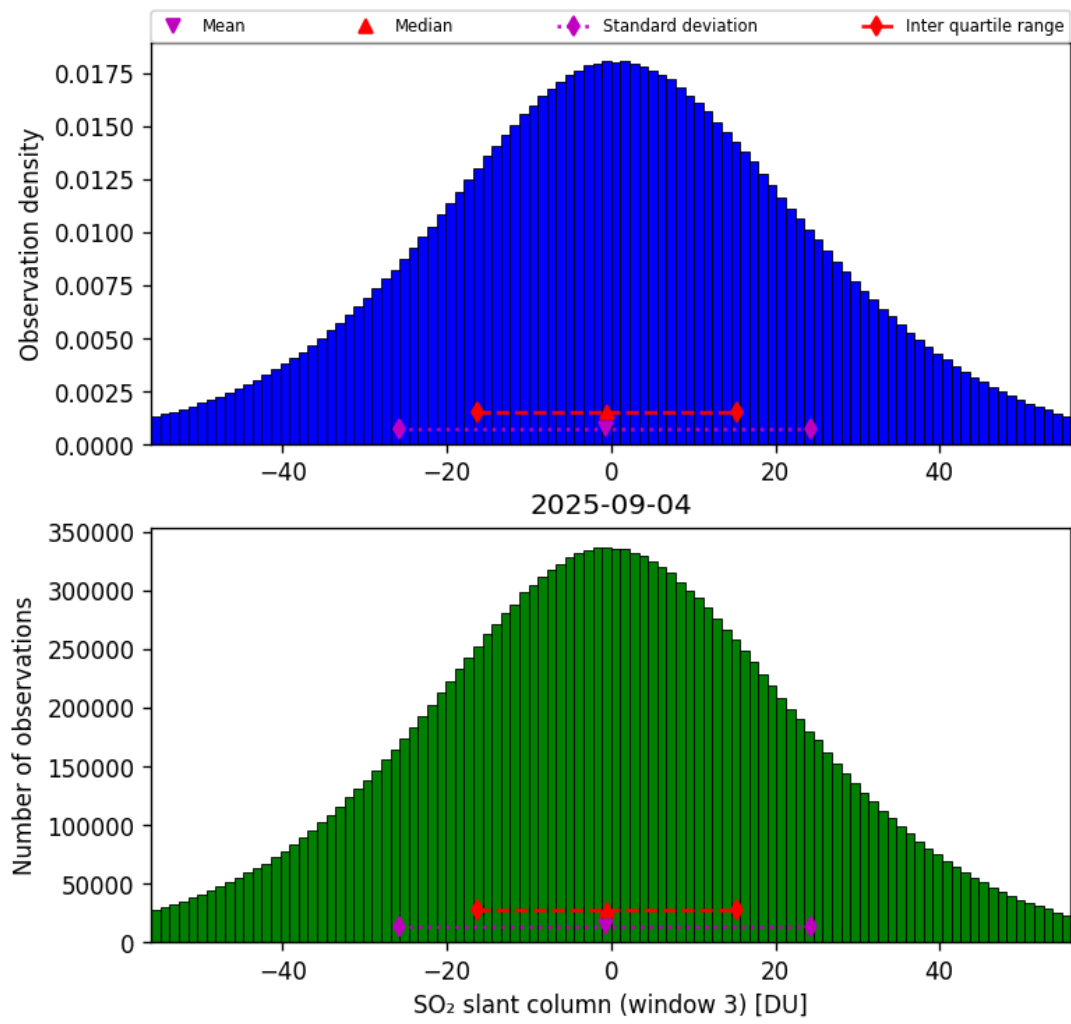


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-09-04 to 2025-09-05

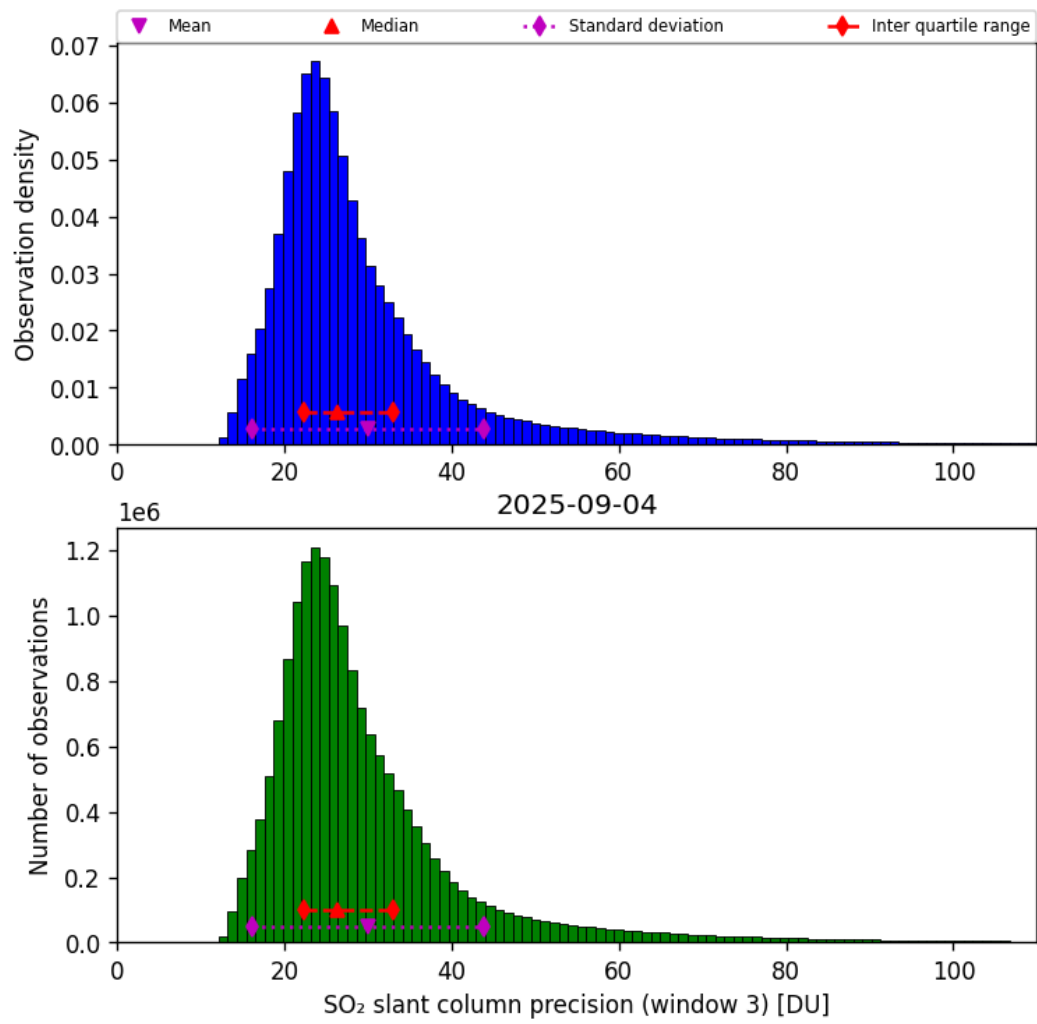


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-09-04 to 2025-09-05

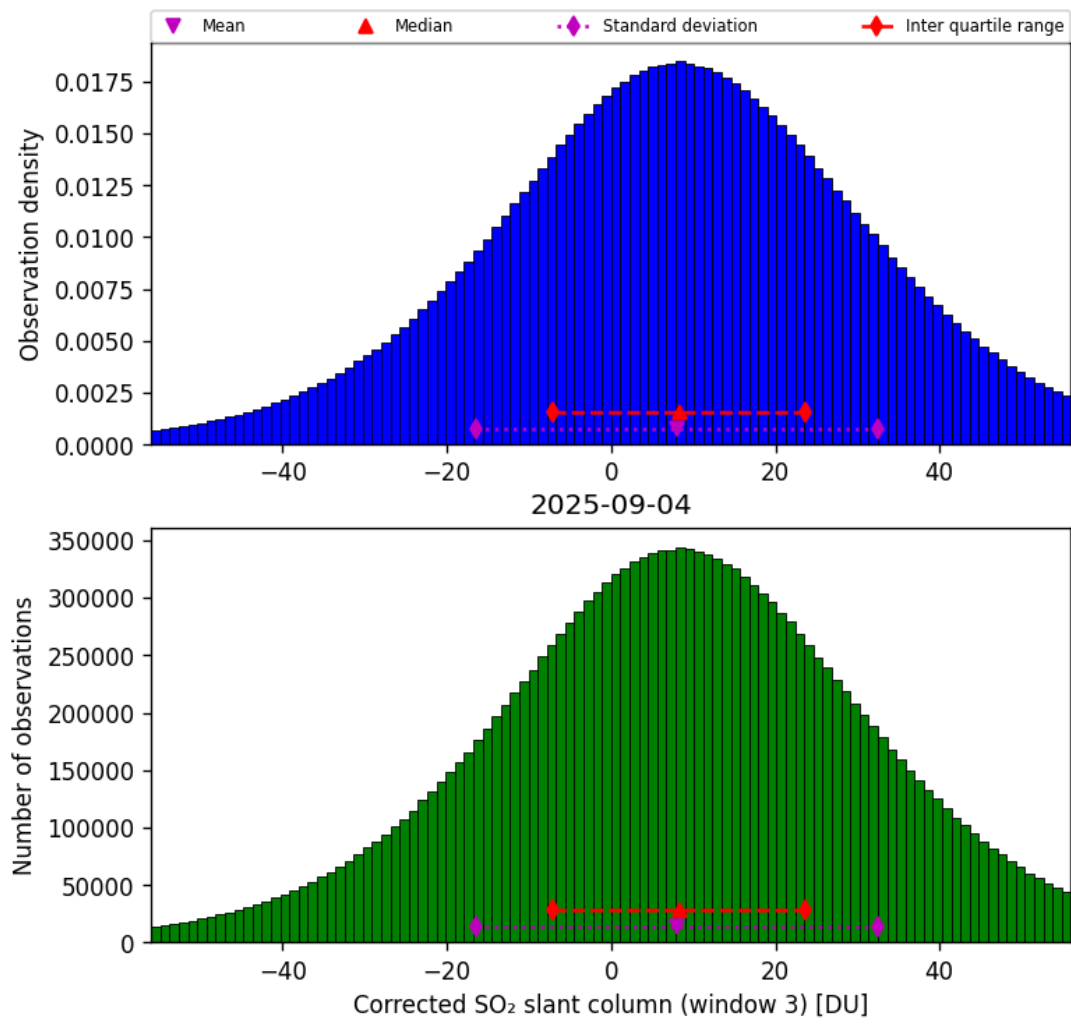


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-09-04 to 2025-09-05

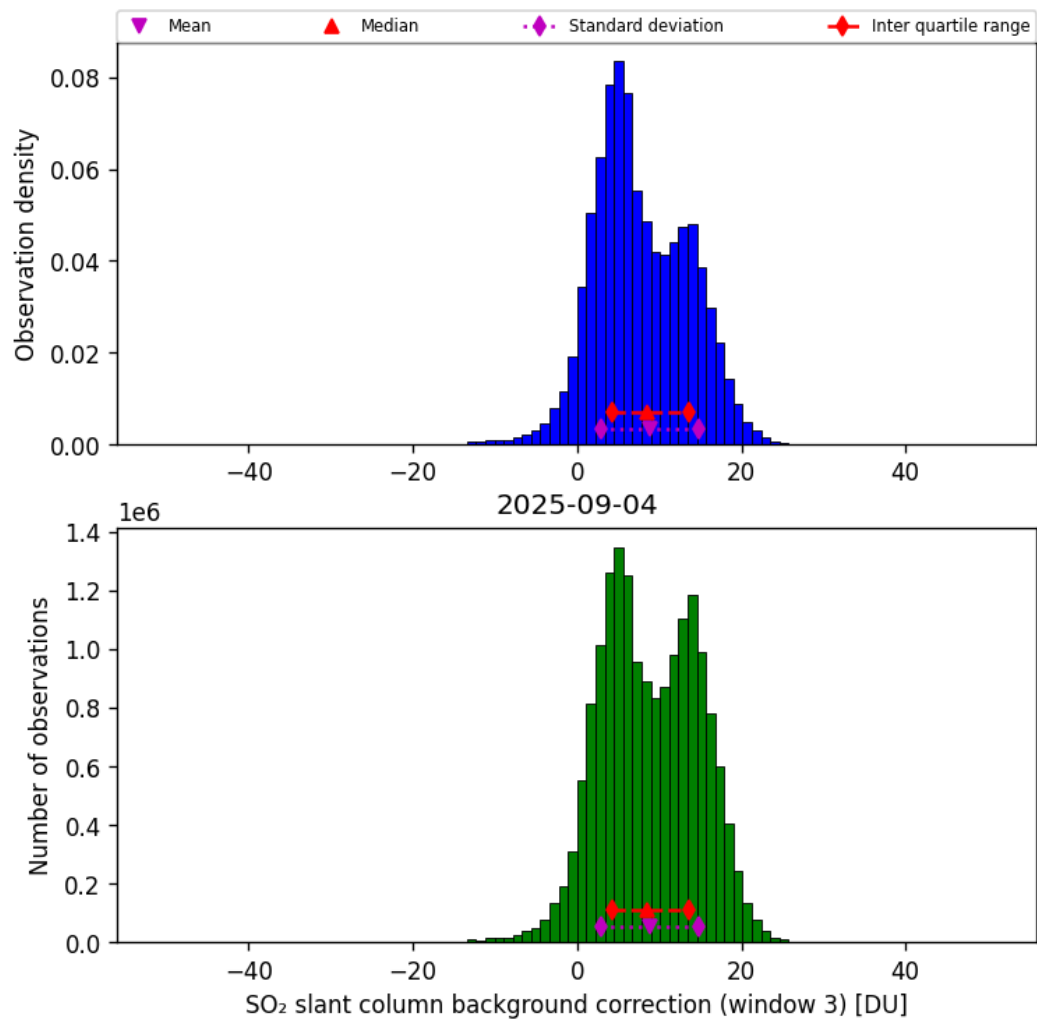


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-09-04 to 2025-09-05

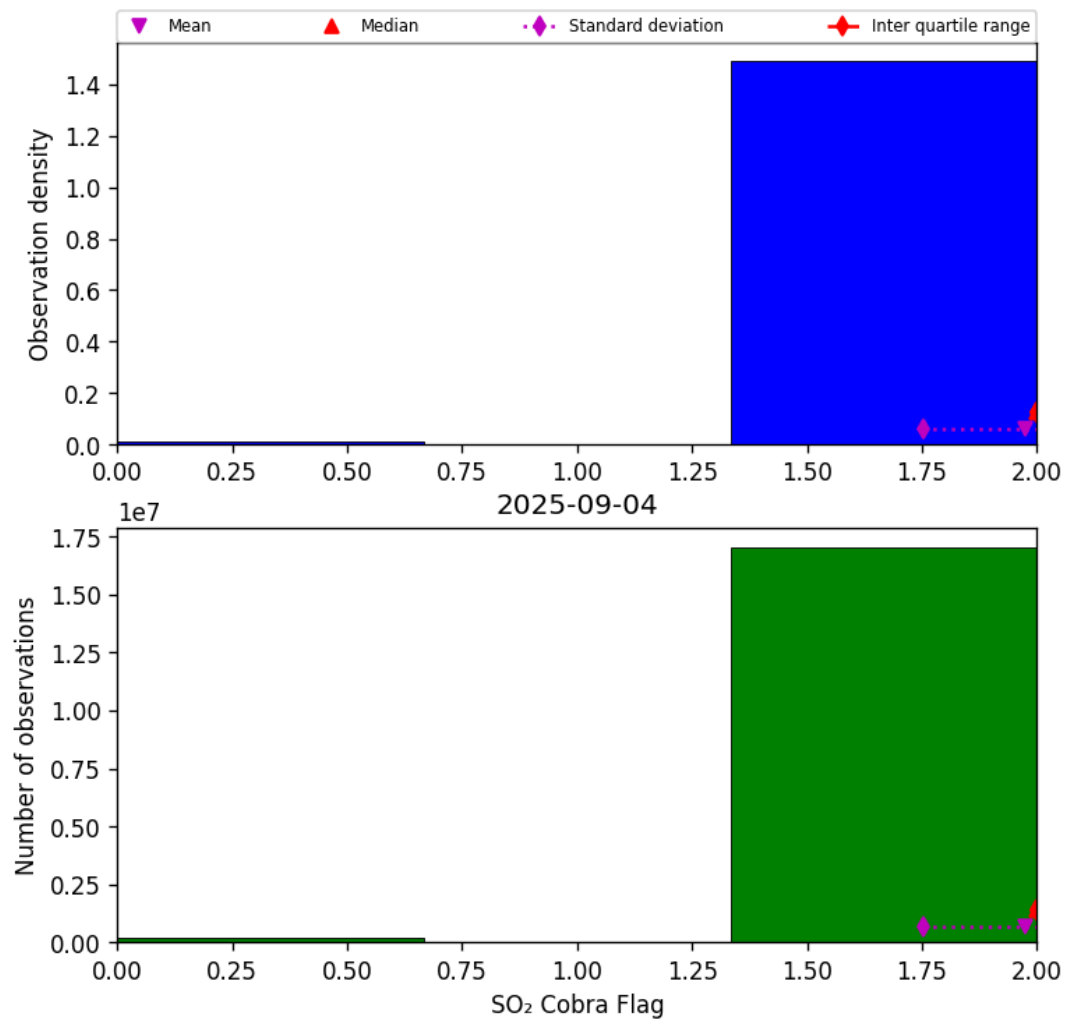


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-09-04 to 2025-09-05

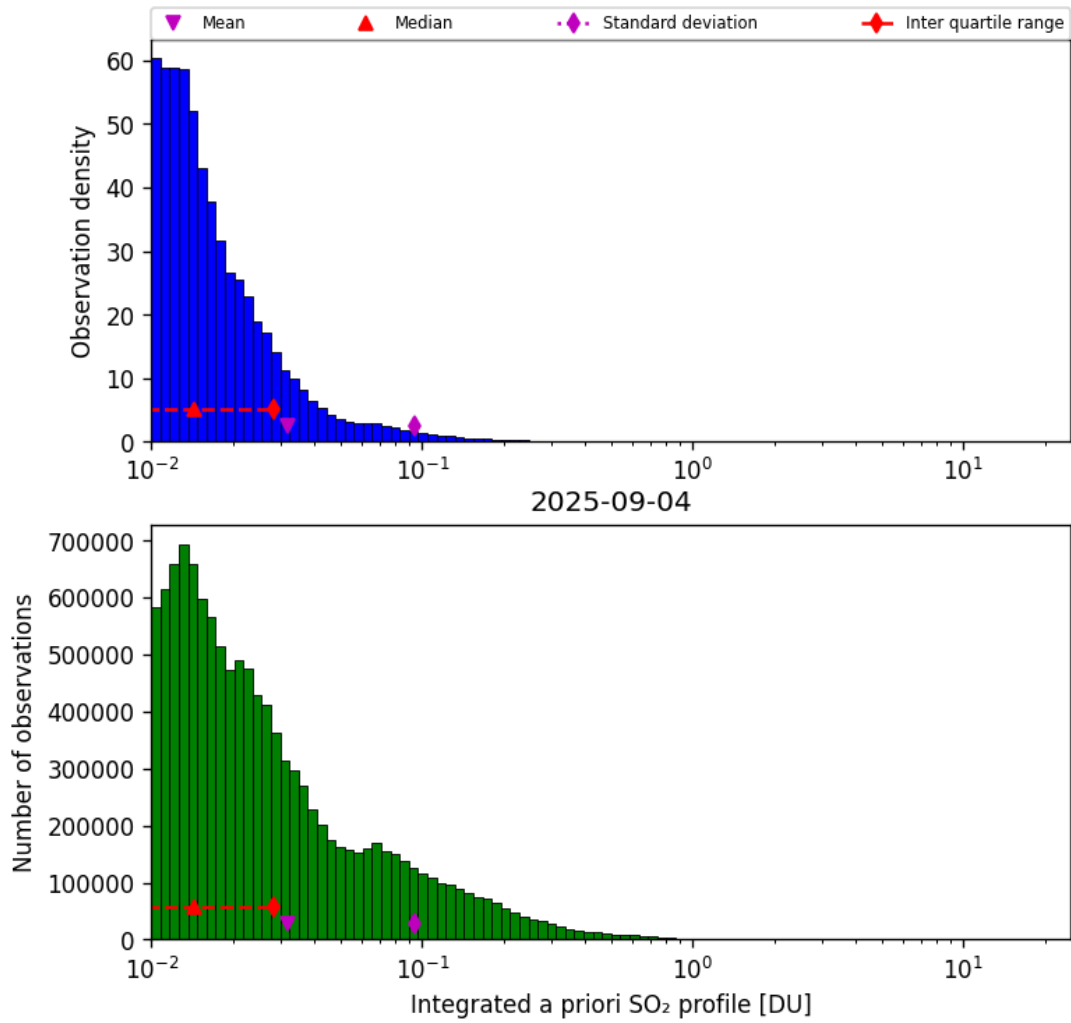


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-09-04 to 2025-09-05

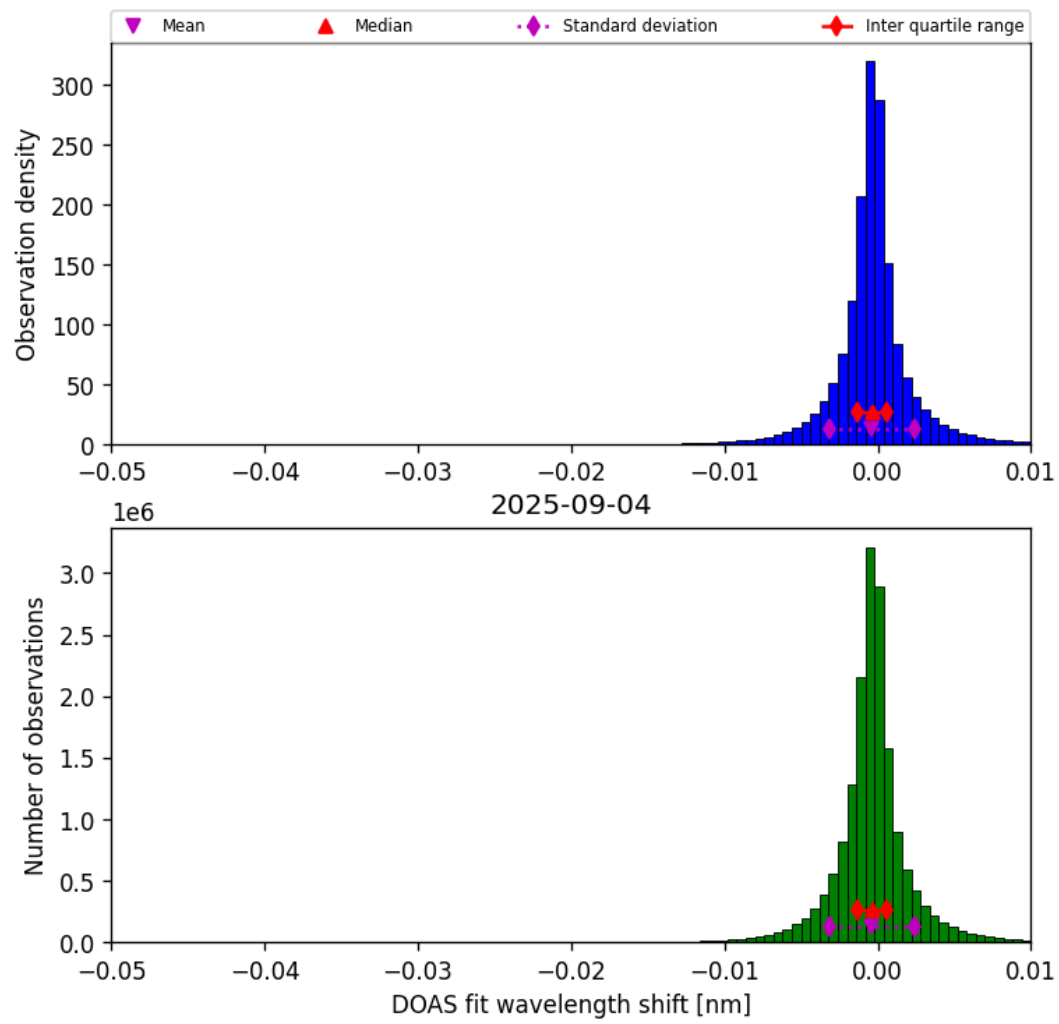


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-09-04 to 2025-09-05

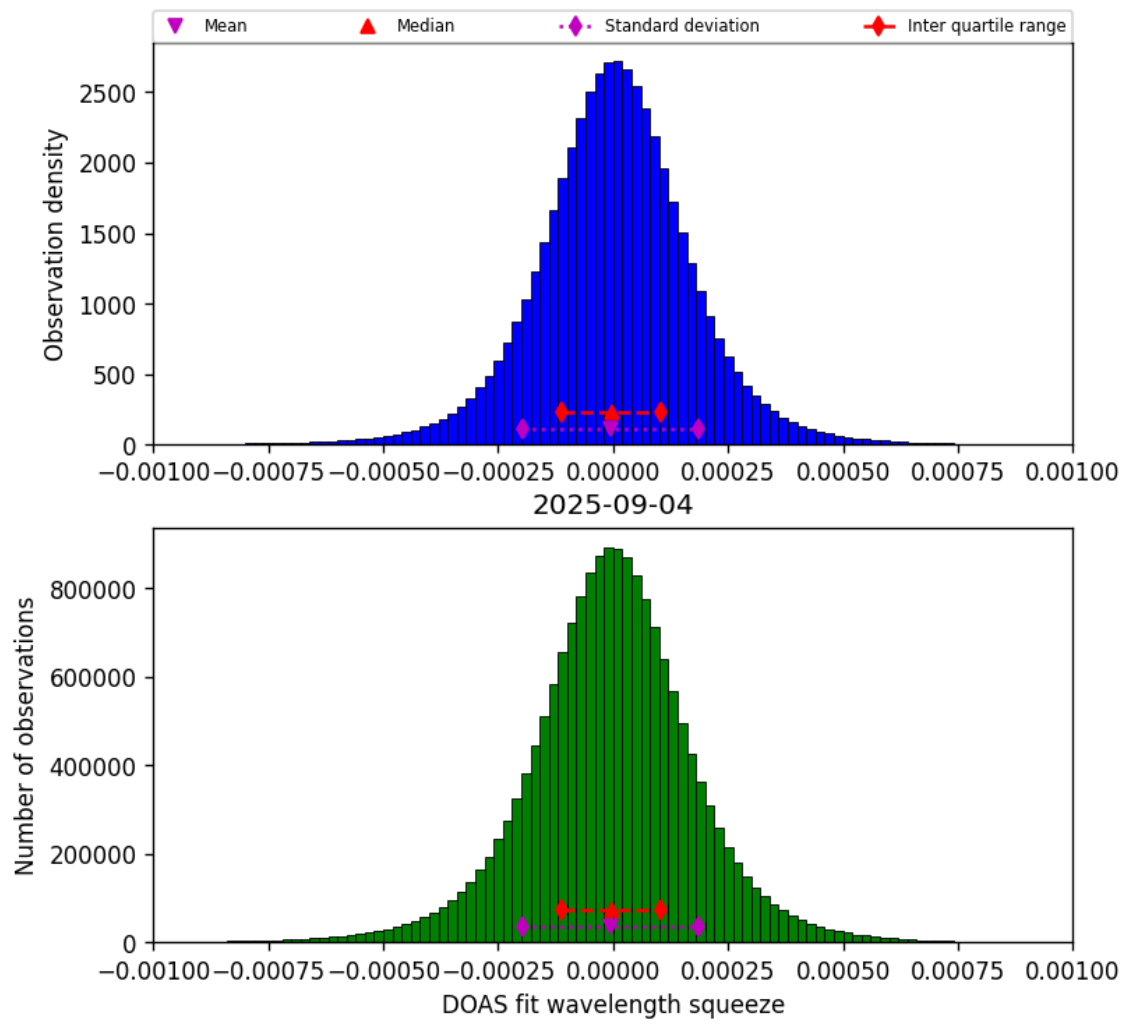


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-09-04 to 2025-09-05

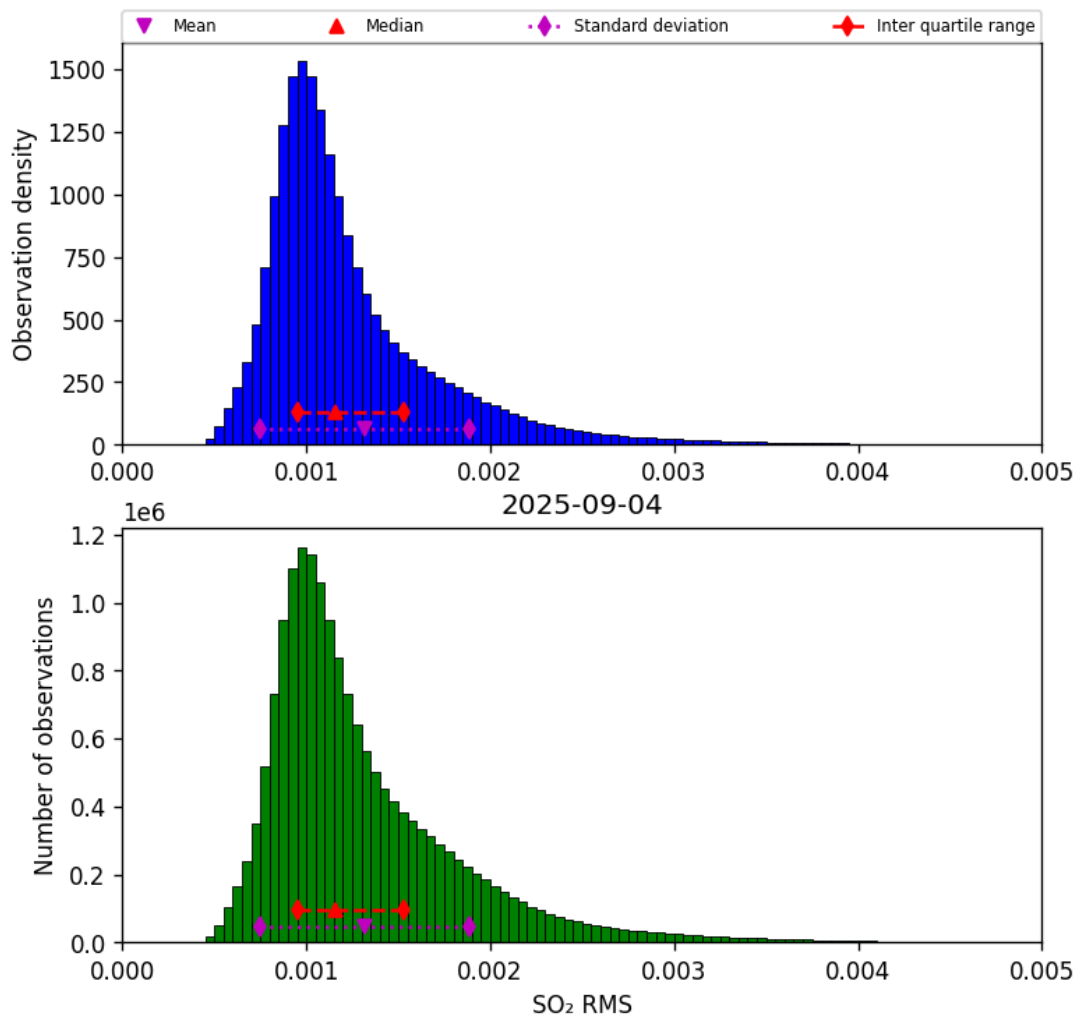


Figure 79: Histogram of “SO₂ RMS” for 2025-09-04 to 2025-09-05

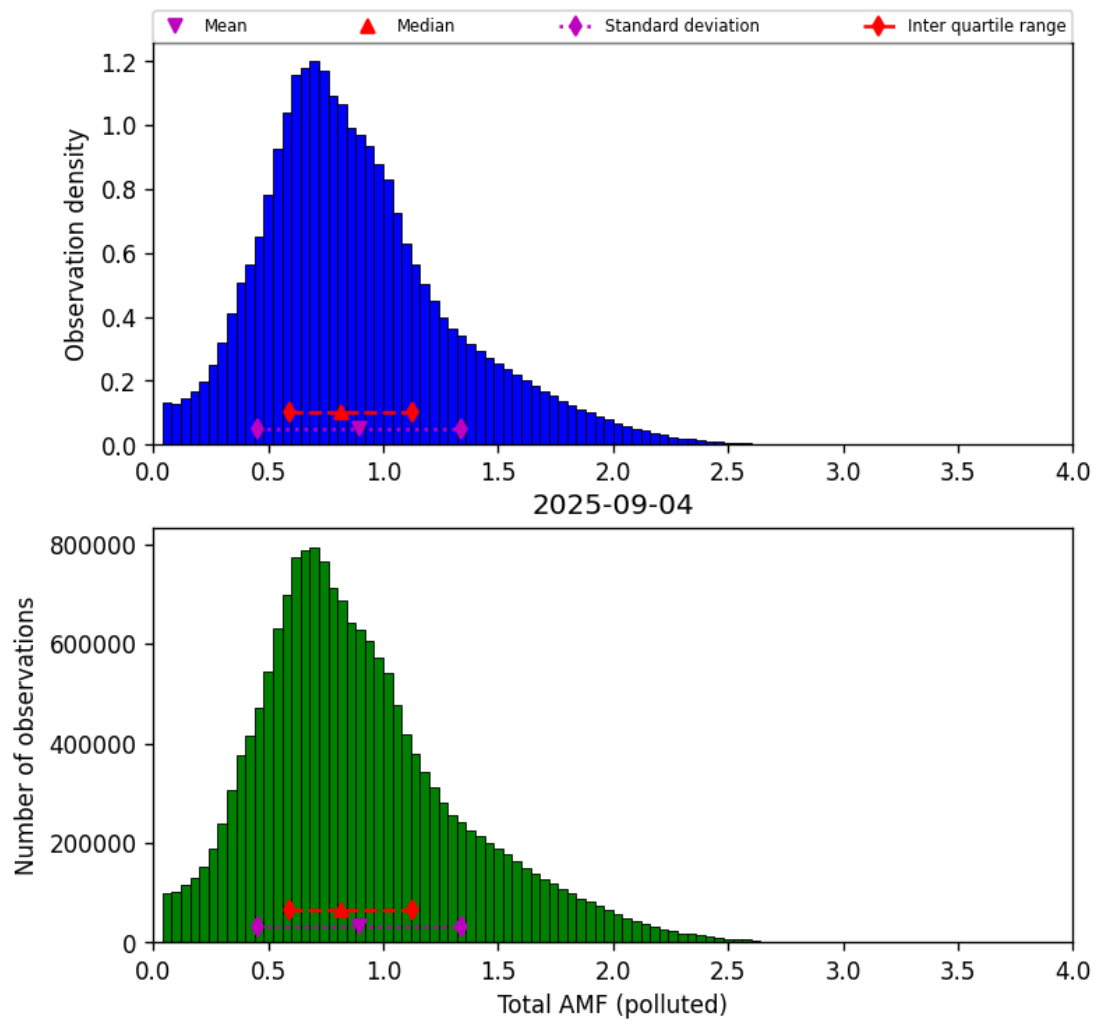


Figure 80: Histogram of “Total AMF (polluted)” for 2025-09-04 to 2025-09-05

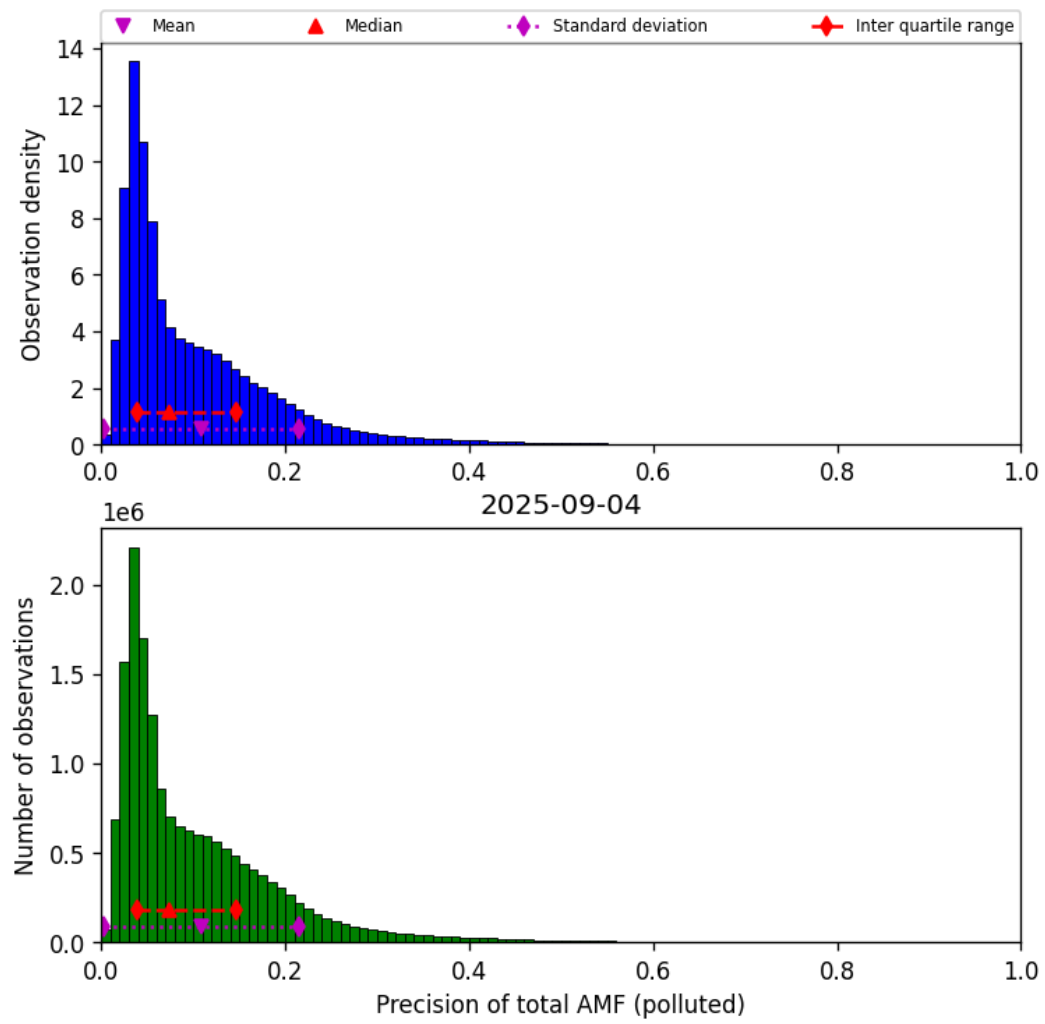


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-09-04 to 2025-09-05

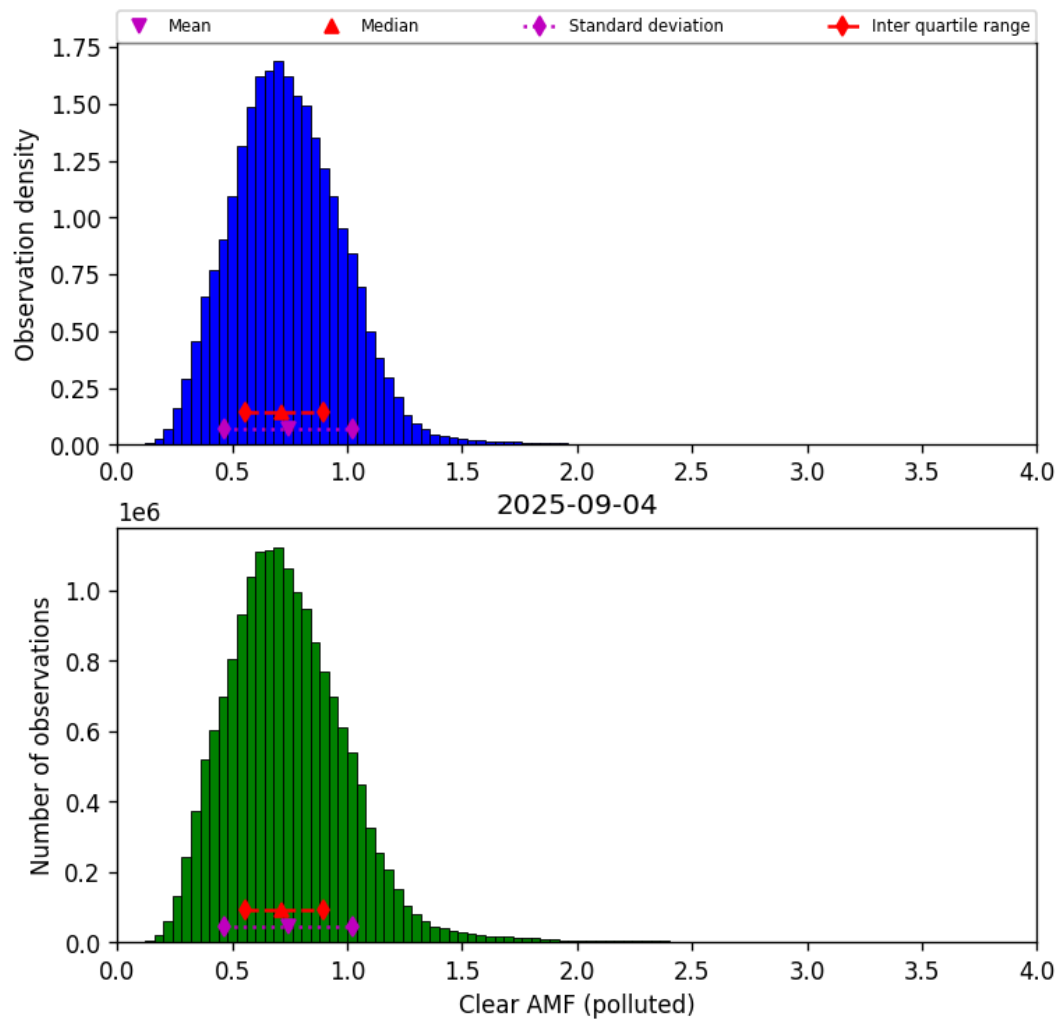


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-09-04 to 2025-09-05

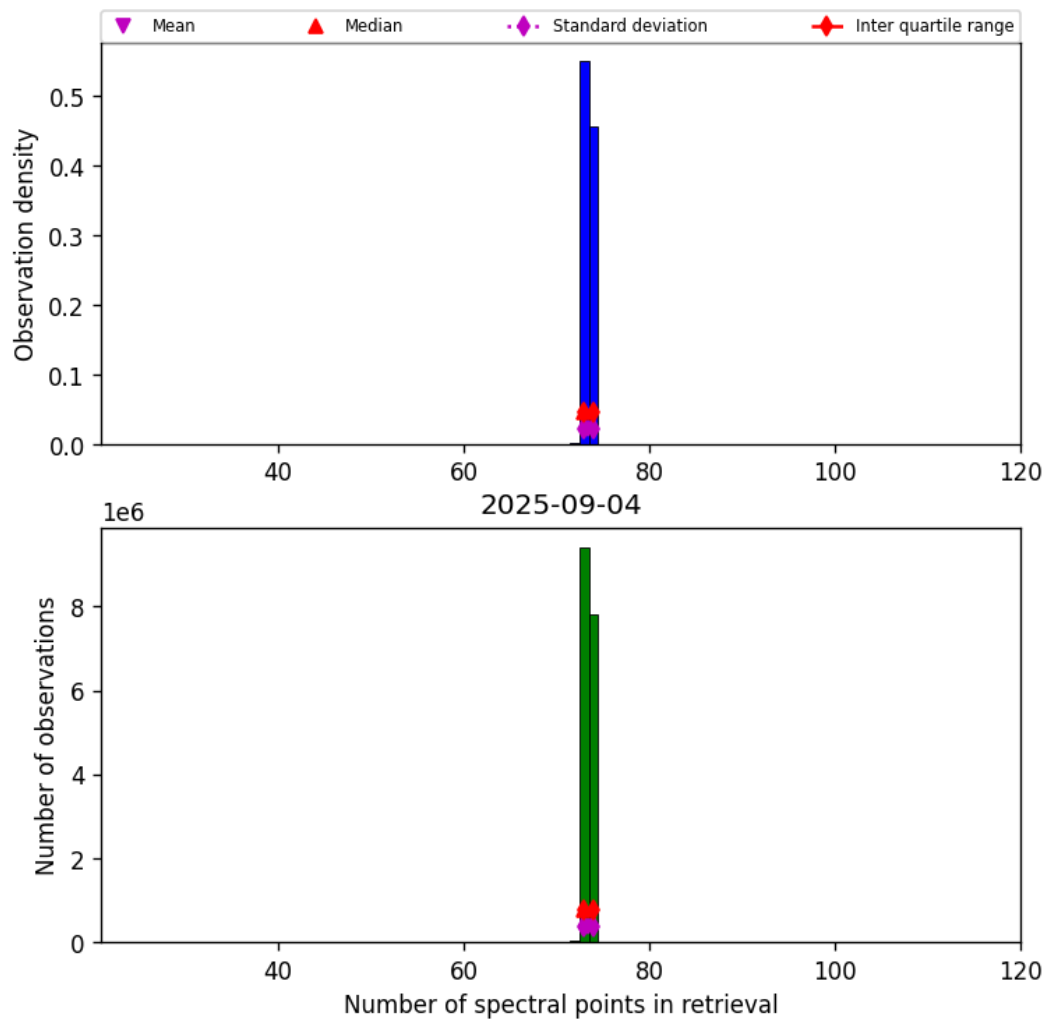


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-09-04 to 2025-09-05

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.

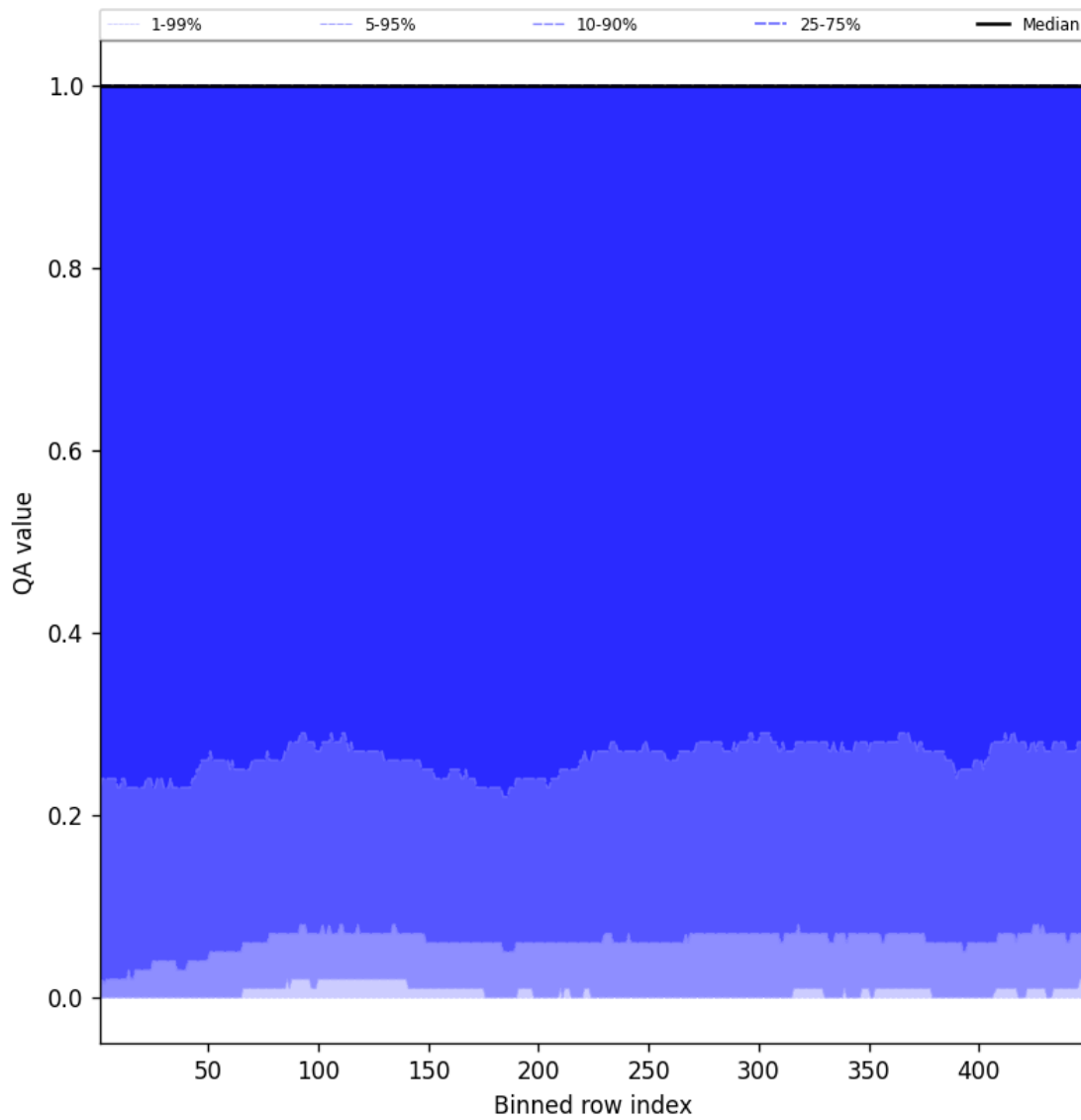


Figure 84: Along track statistics of “QA value” for 2025-09-04 to 2025-09-05

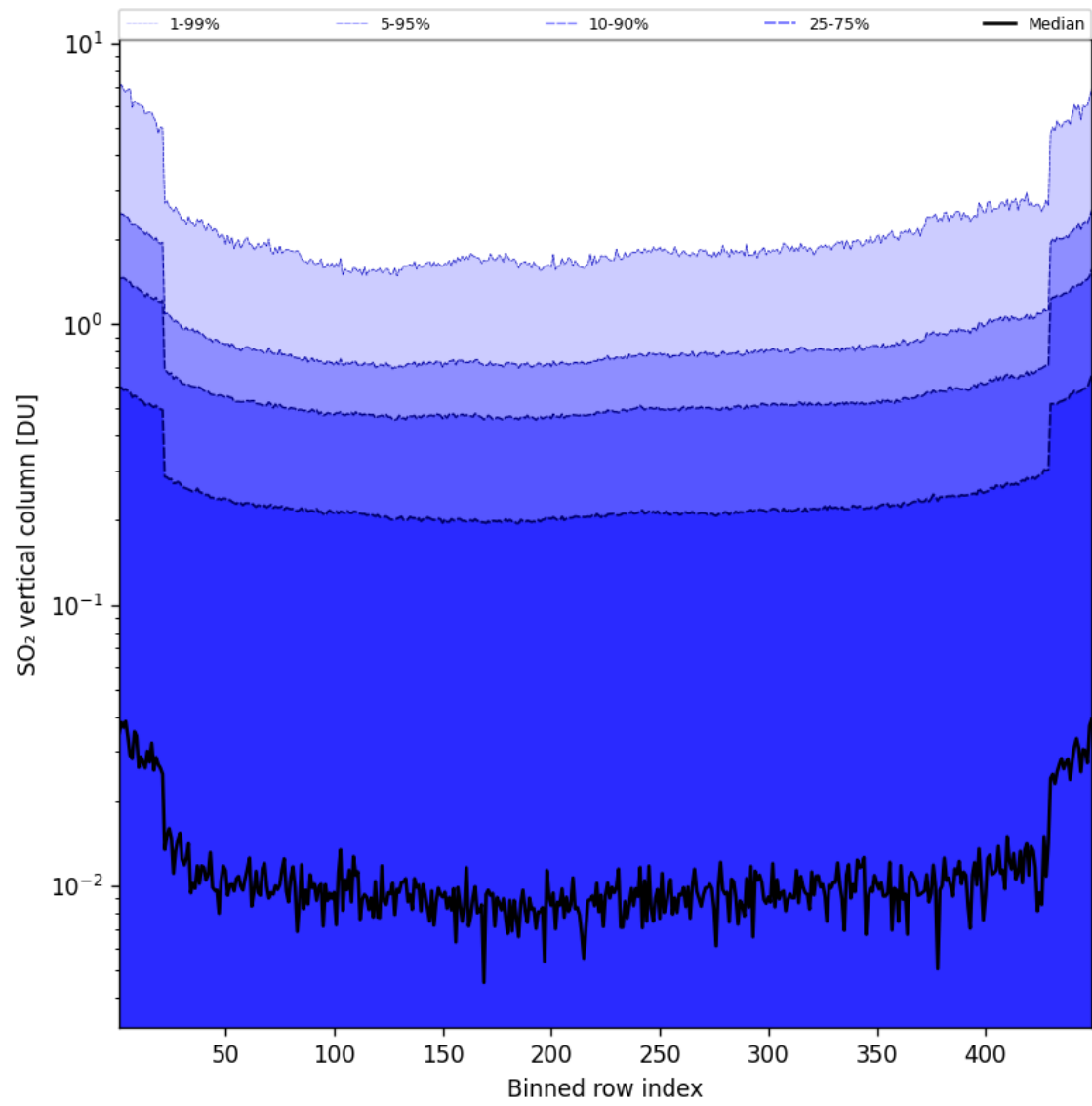


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-09-04 to 2025-09-05

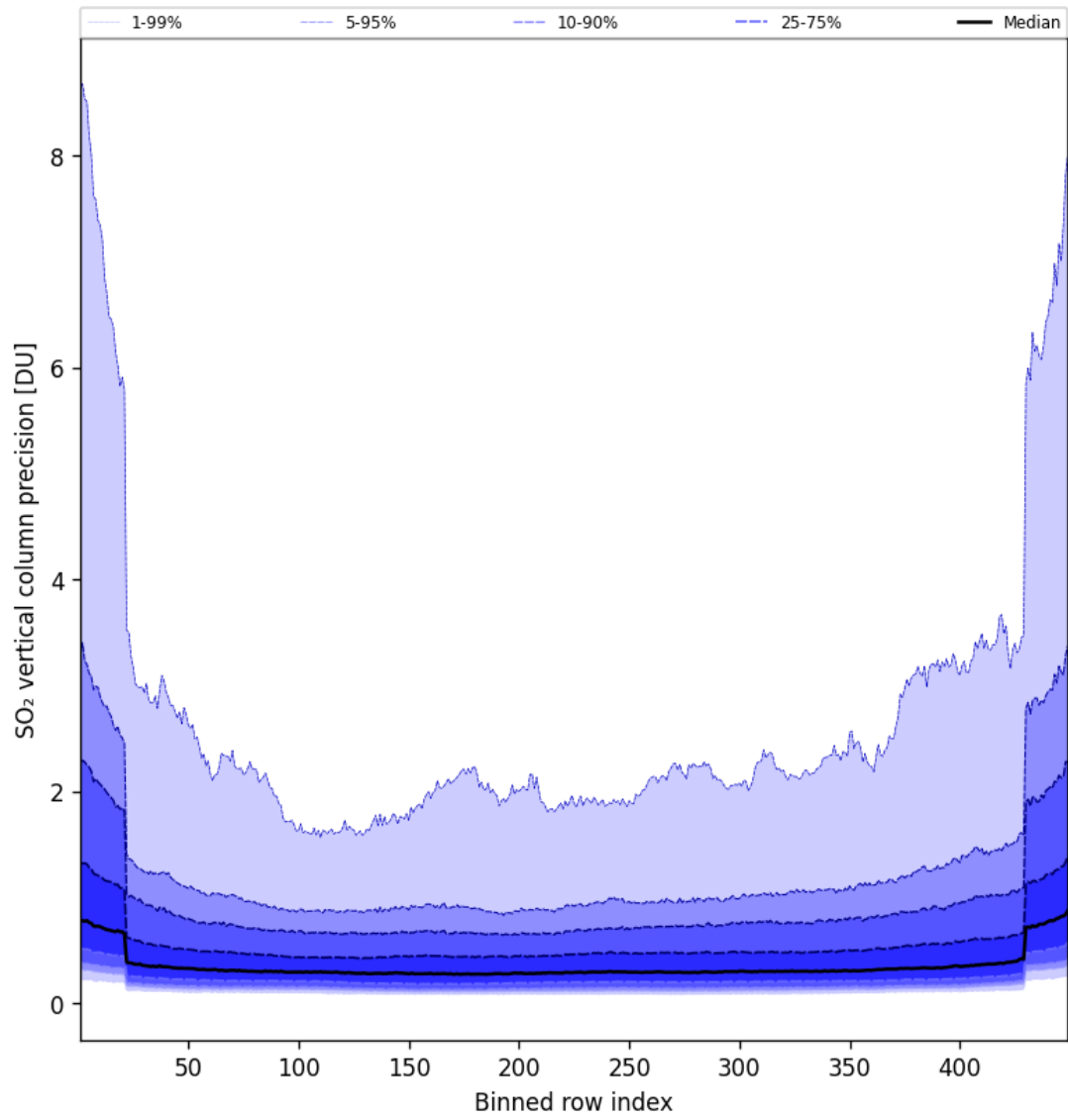


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-09-04 to 2025-09-05

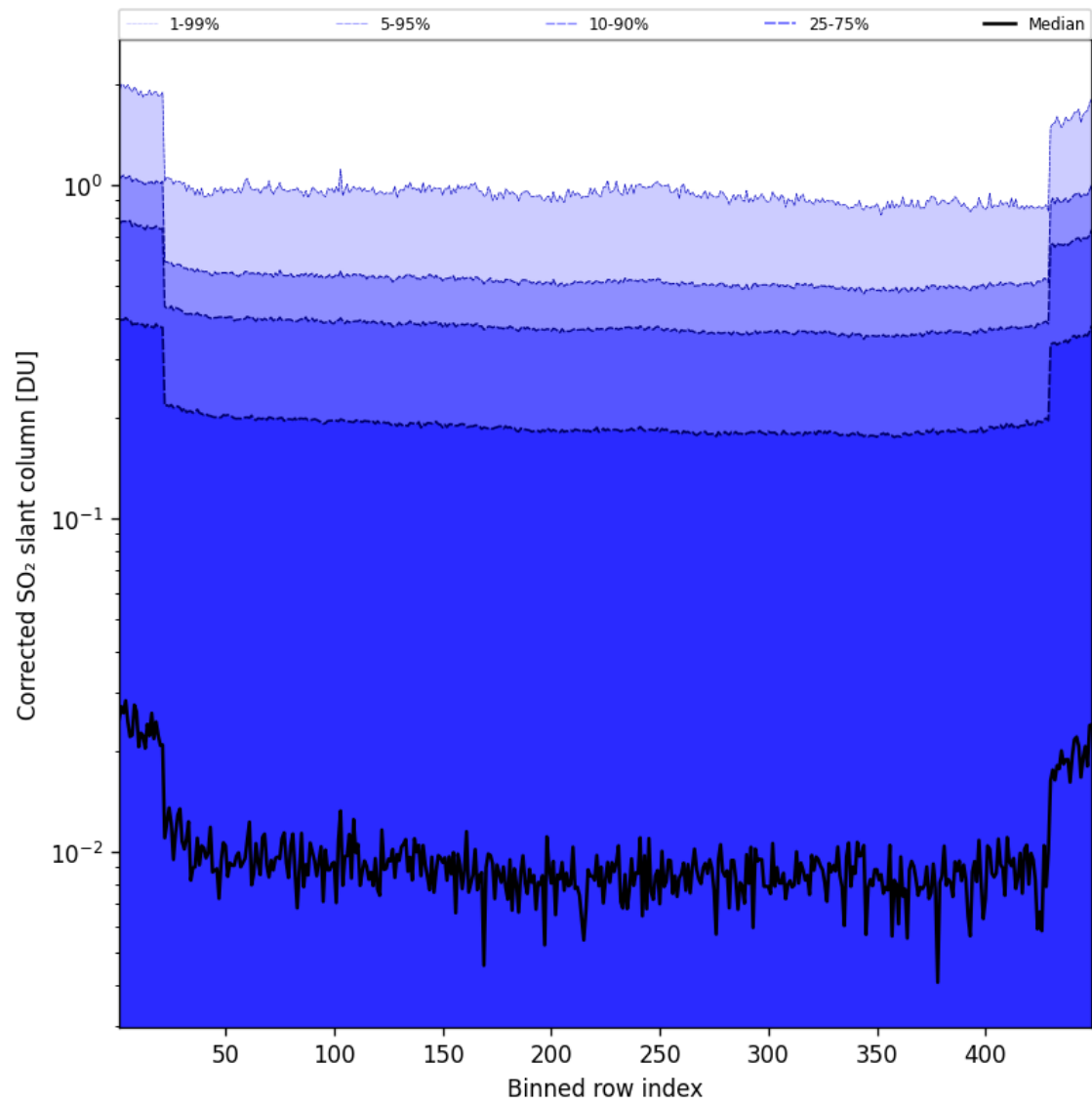


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-09-04 to 2025-09-05

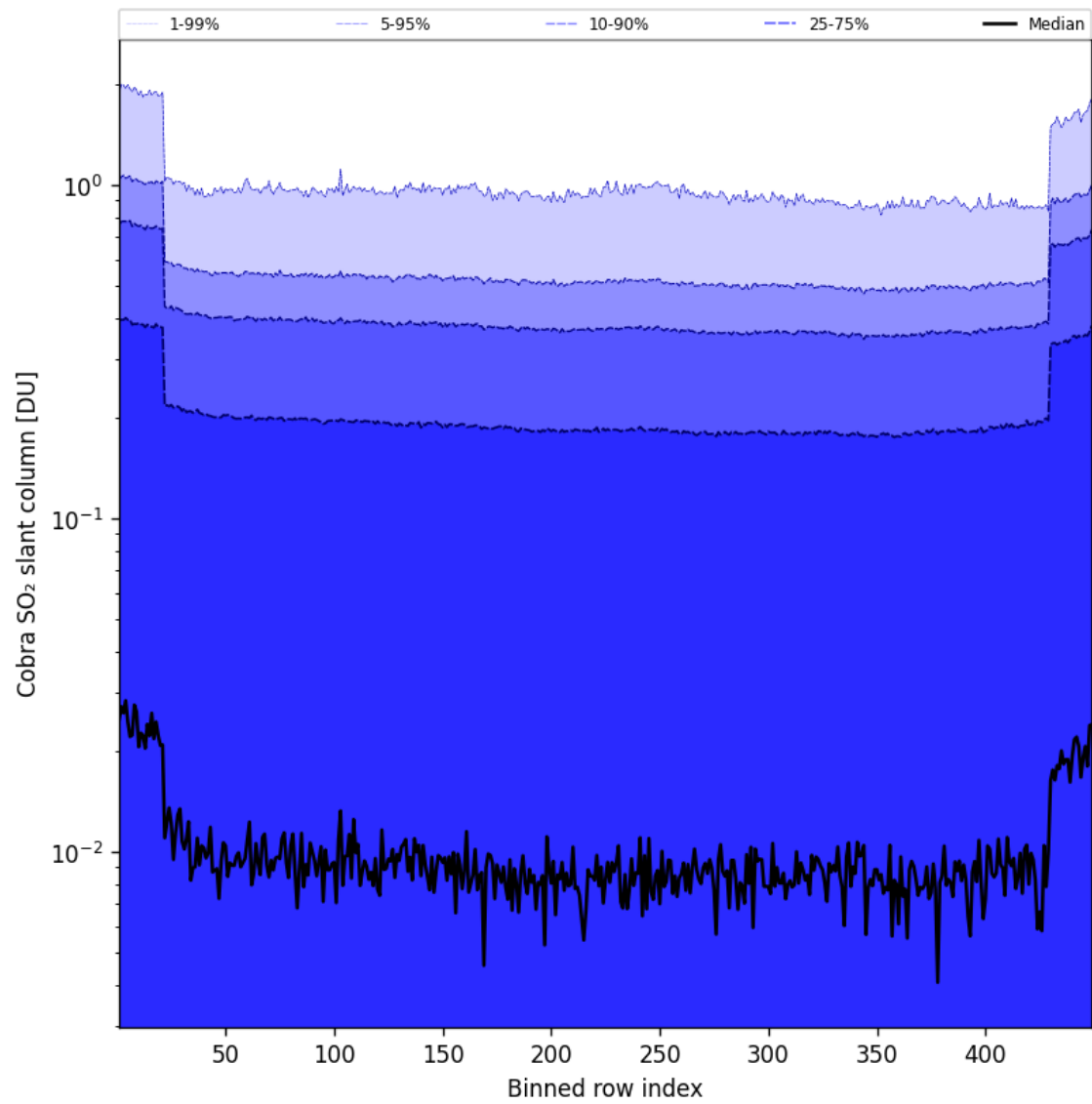


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-09-04 to 2025-09-05

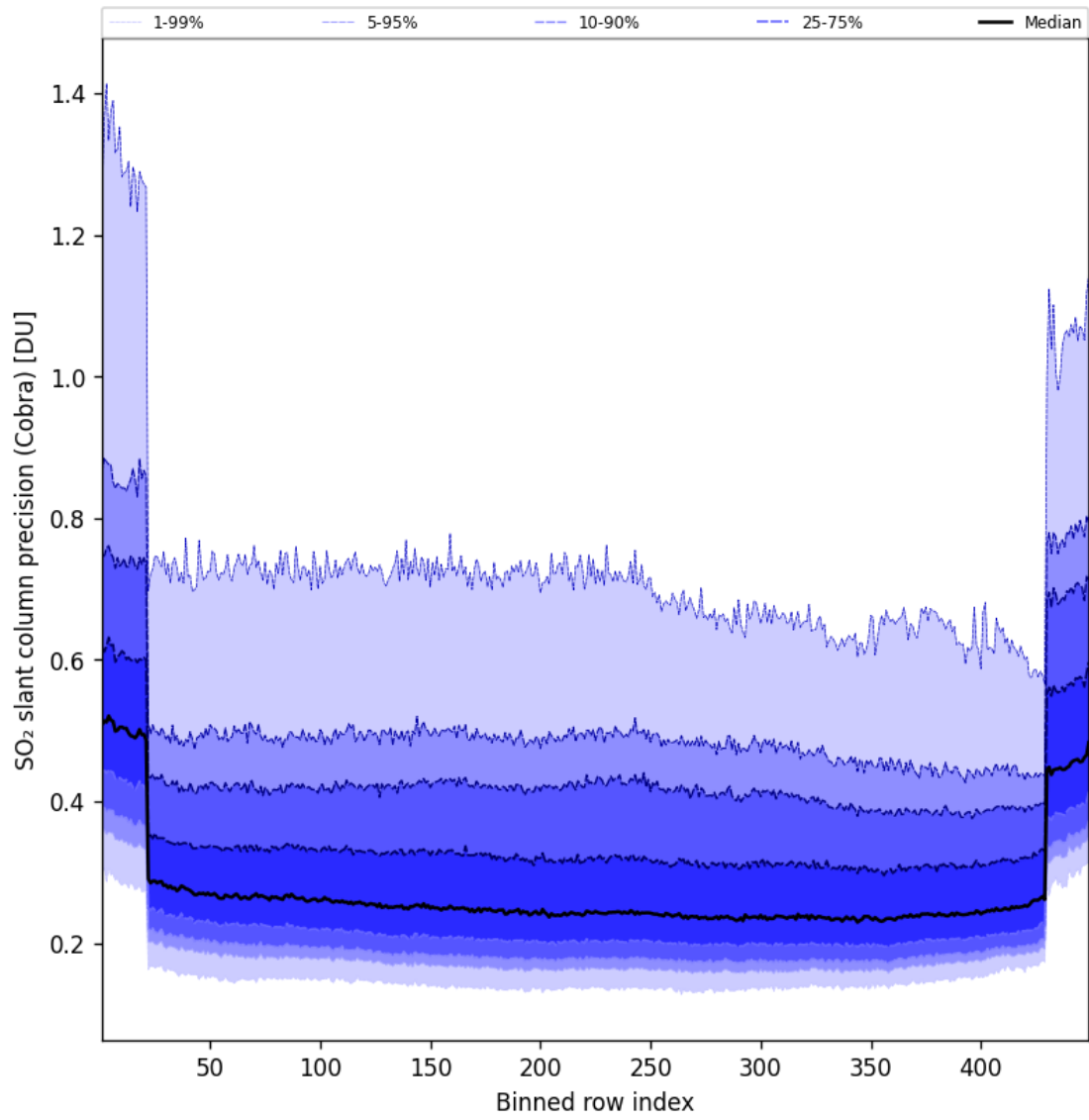


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-09-04 to 2025-09-05

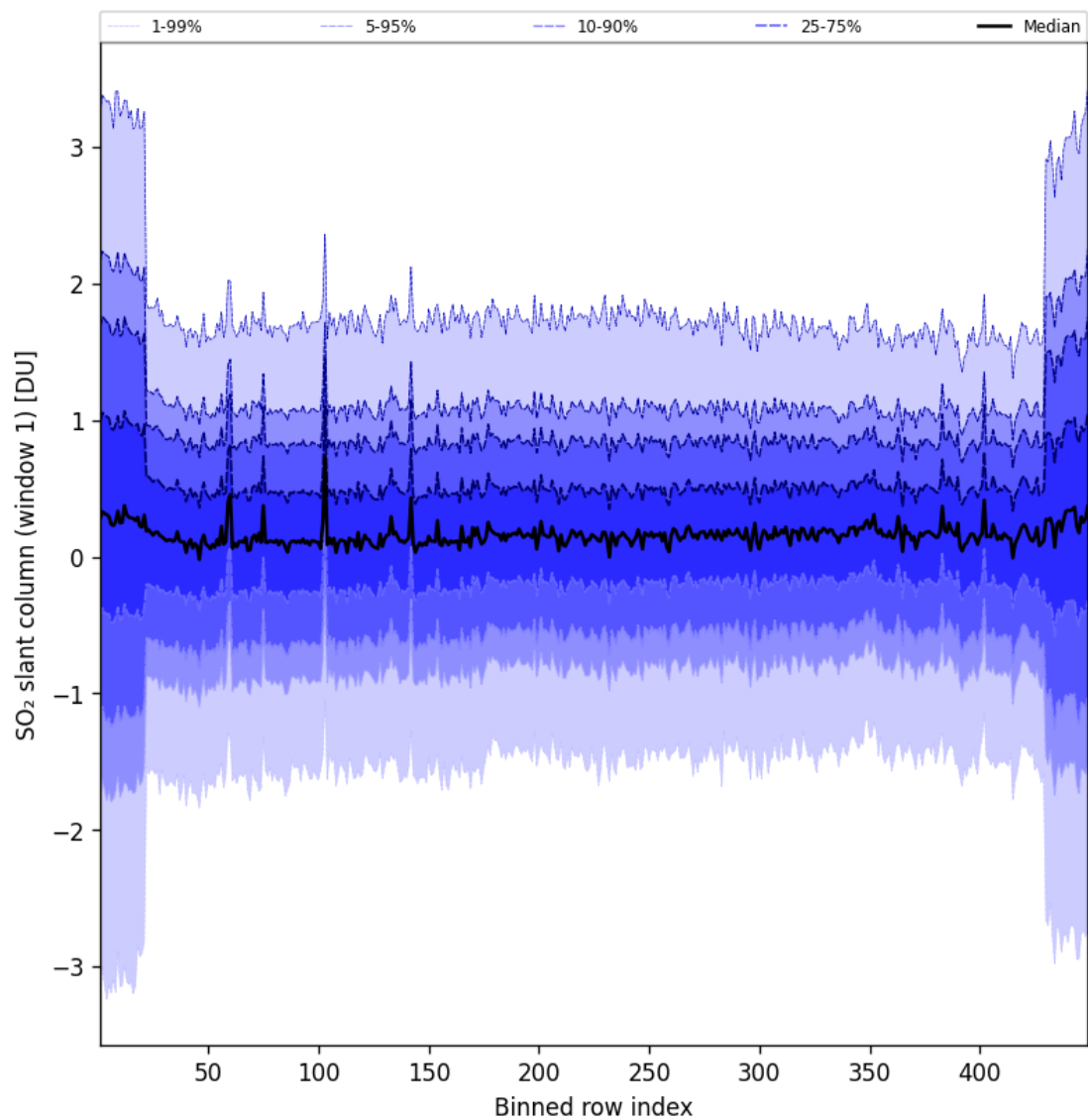


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-09-04 to 2025-09-05

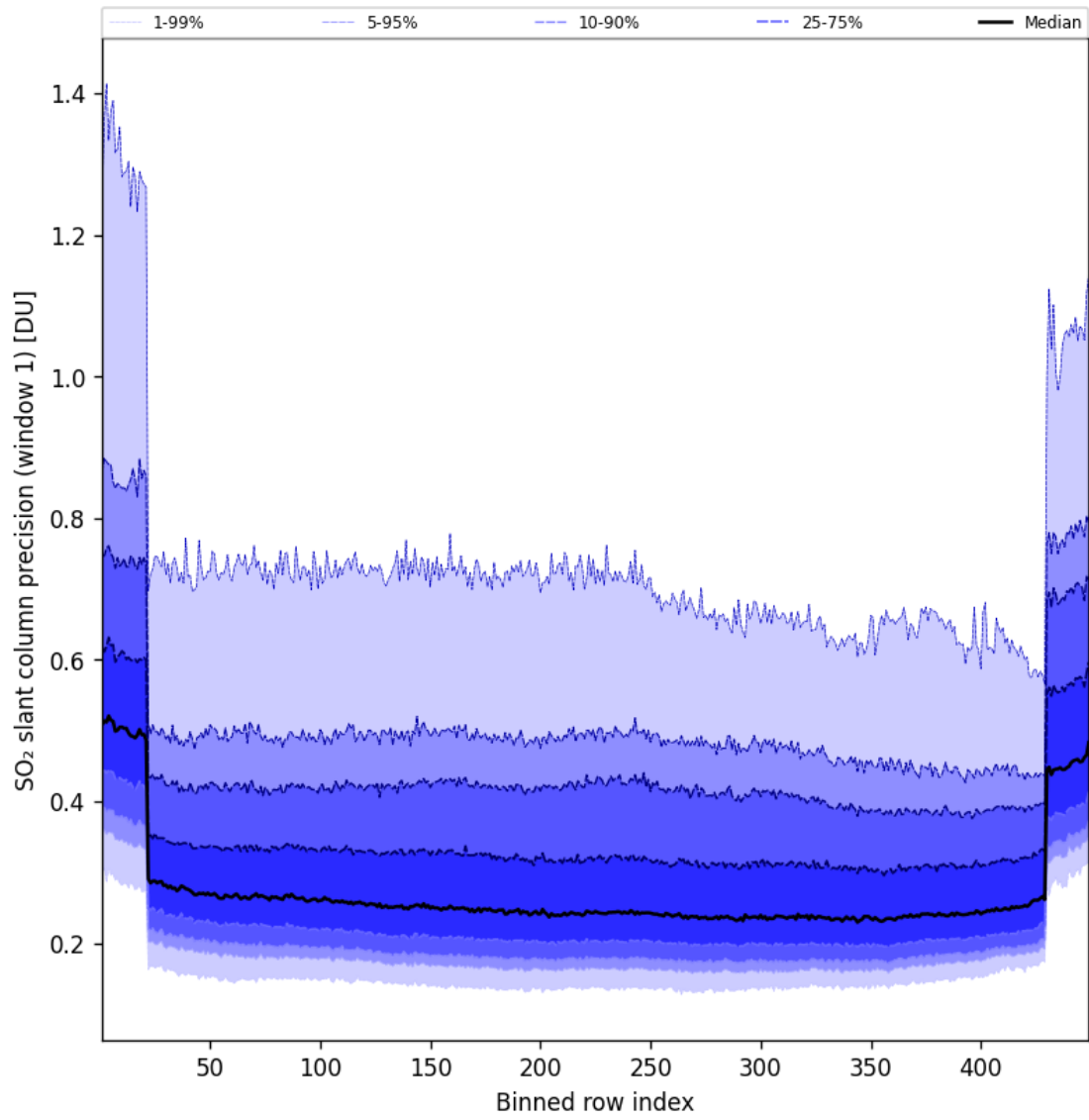


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-09-04 to 2025-09-05

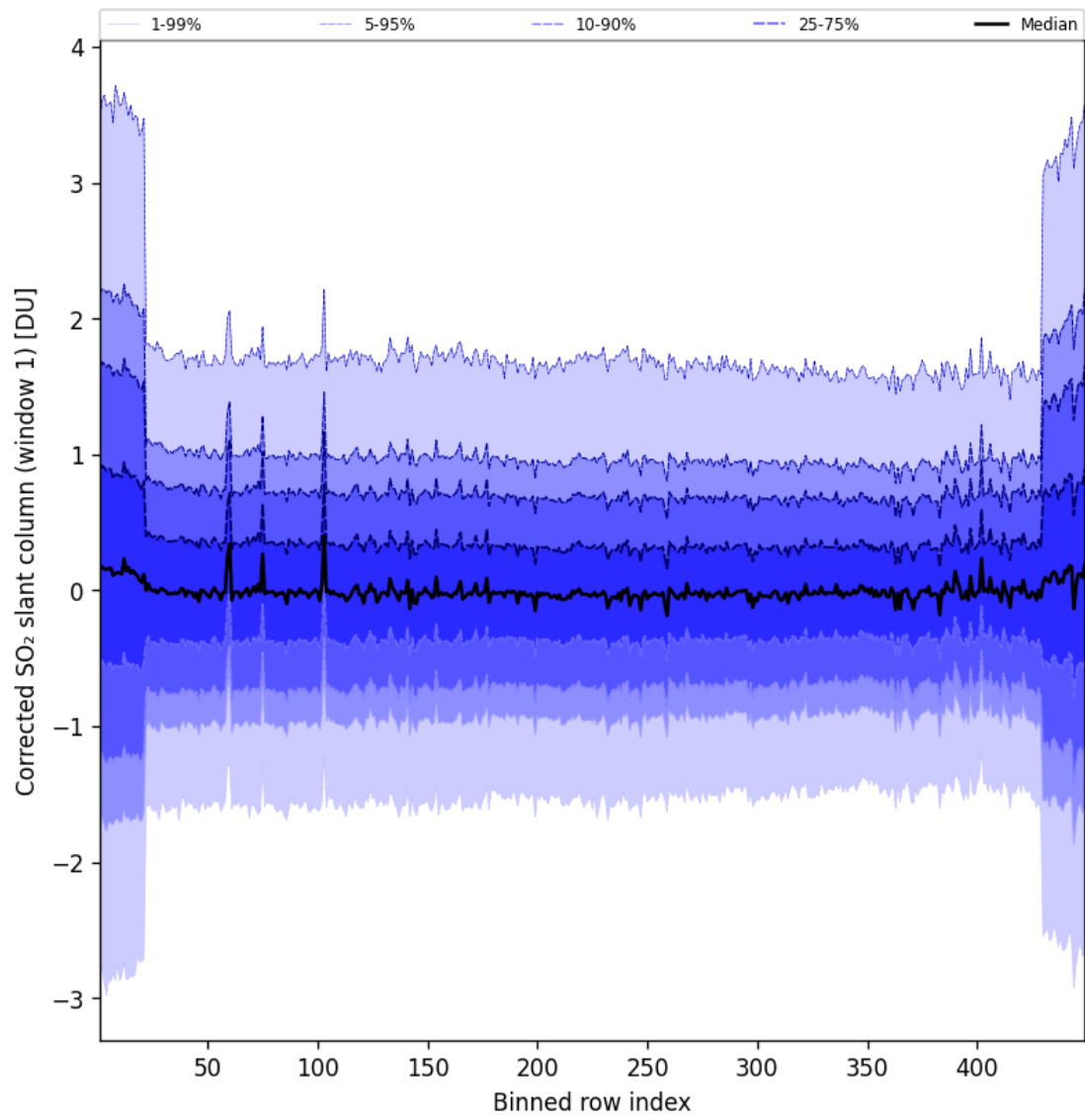


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-09-04 to 2025-09-05

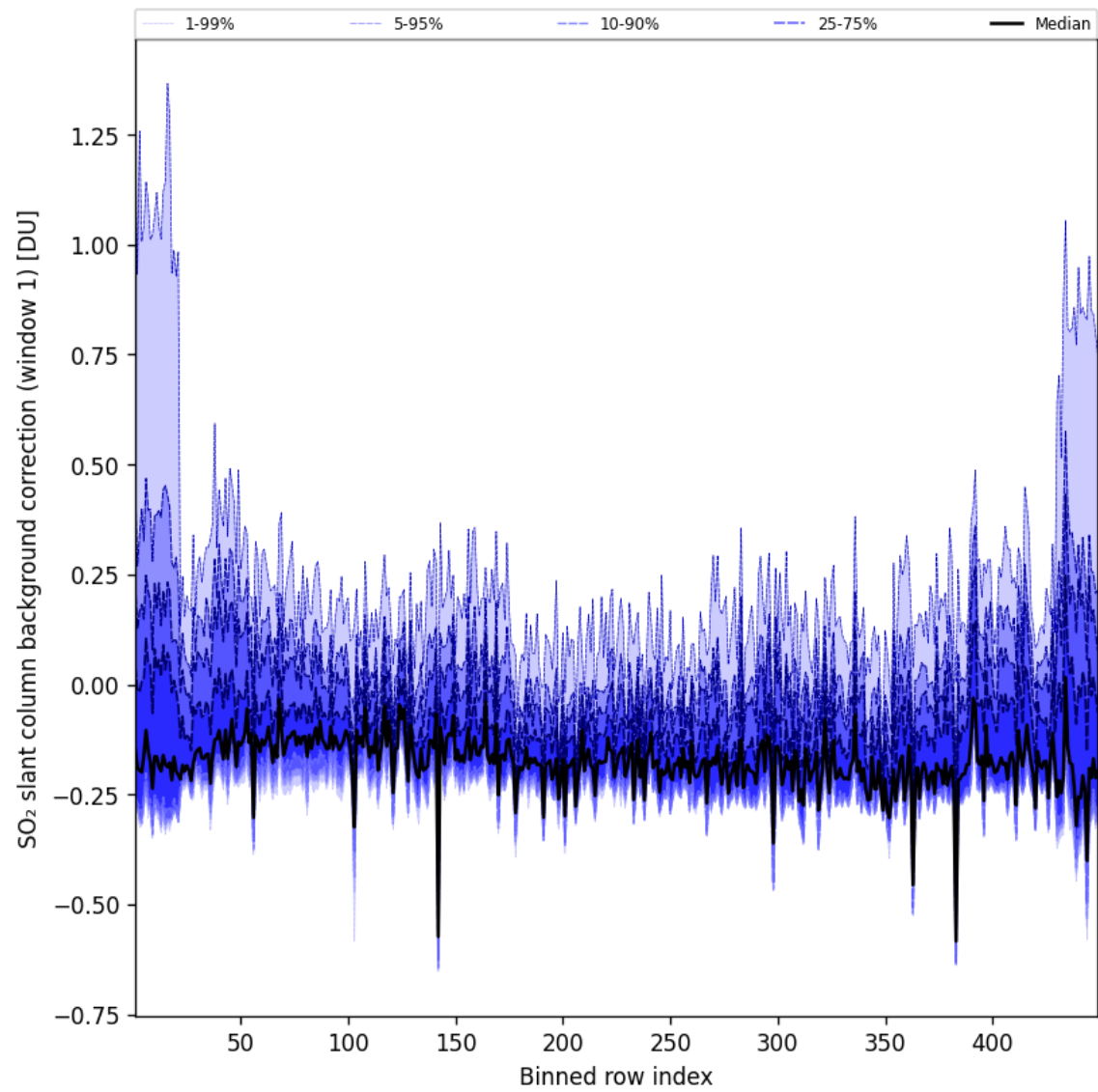


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-09-04 to 2025-09-05

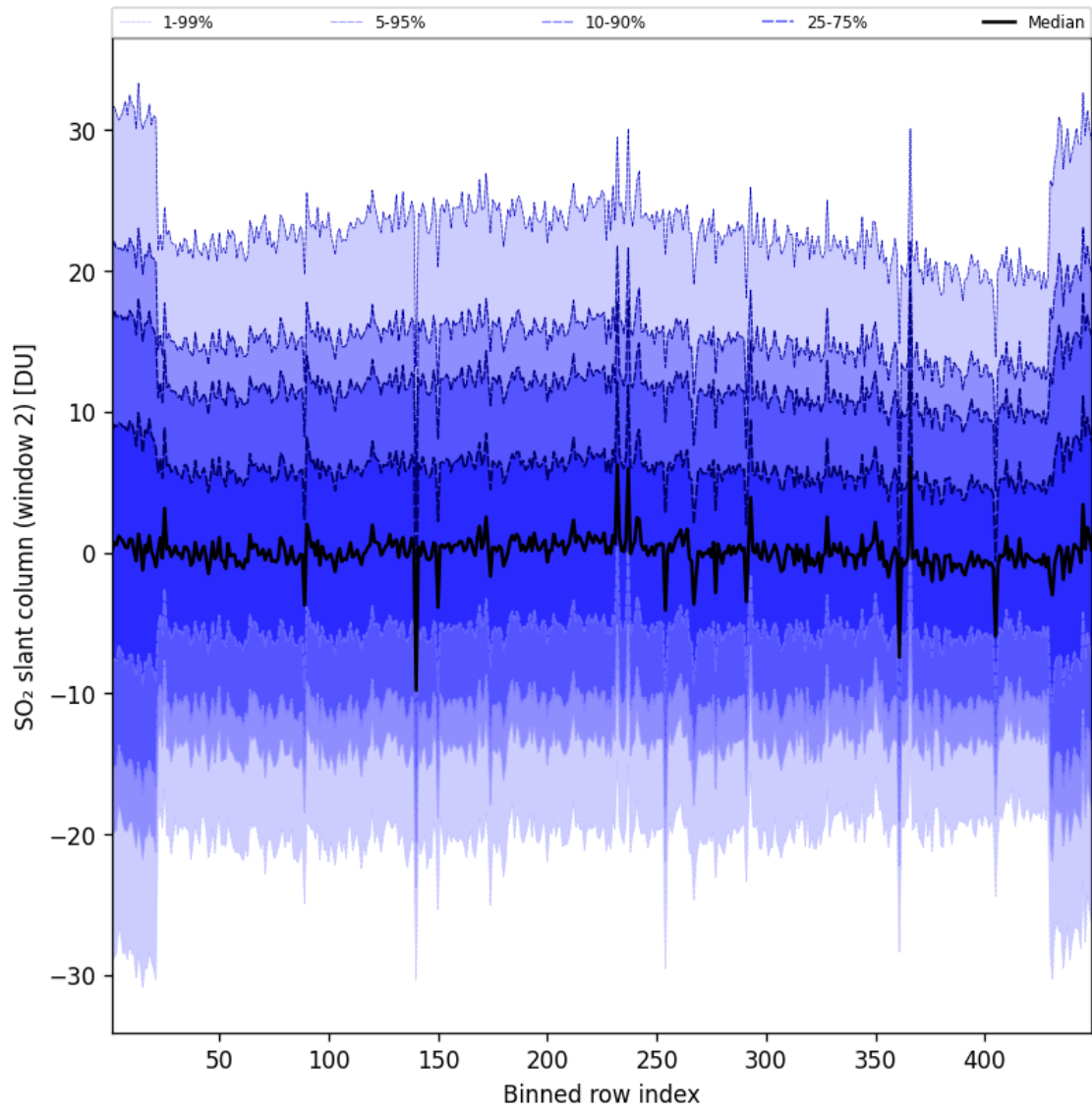


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-09-04 to 2025-09-05

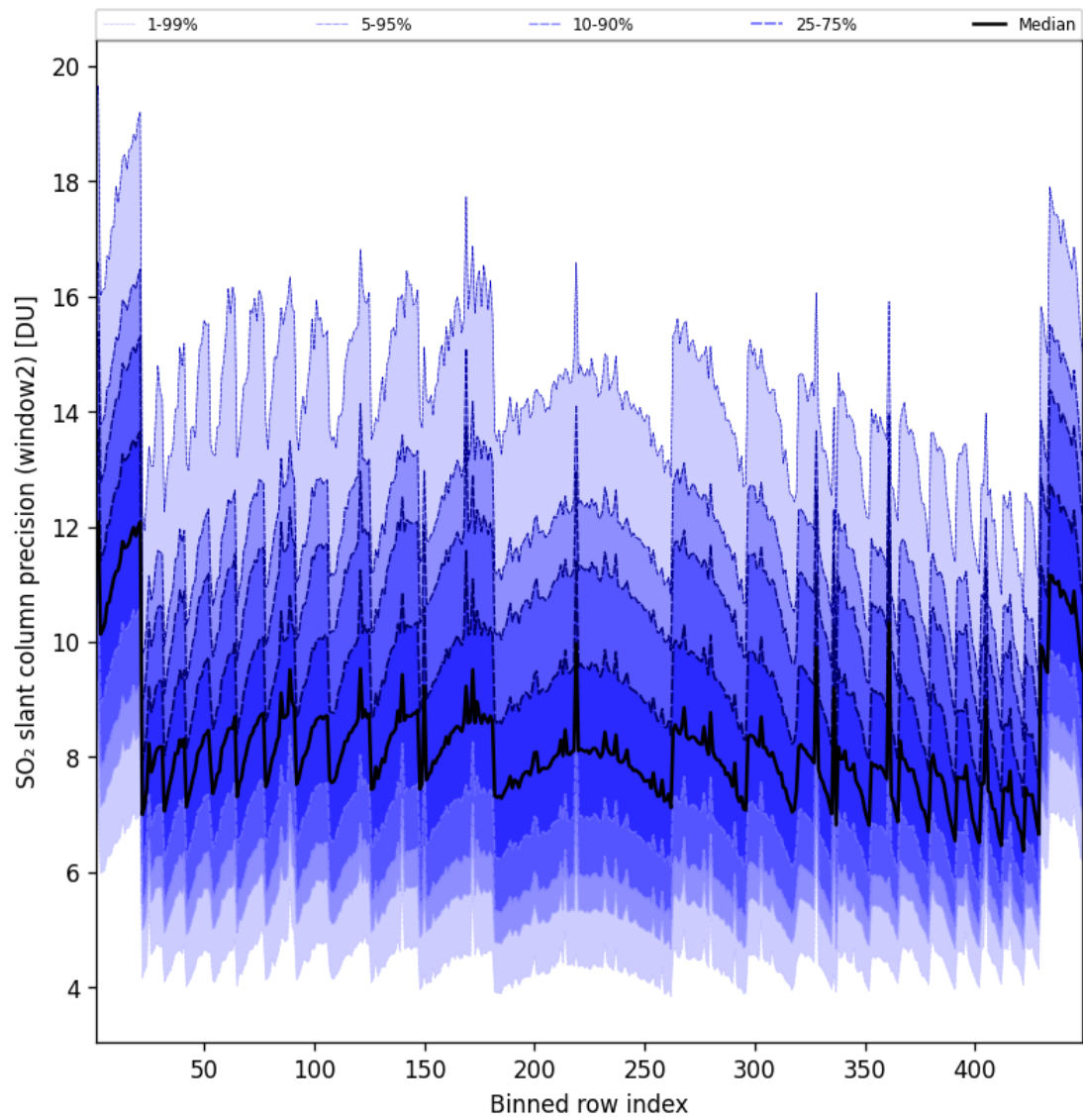


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-09-04 to 2025-09-05

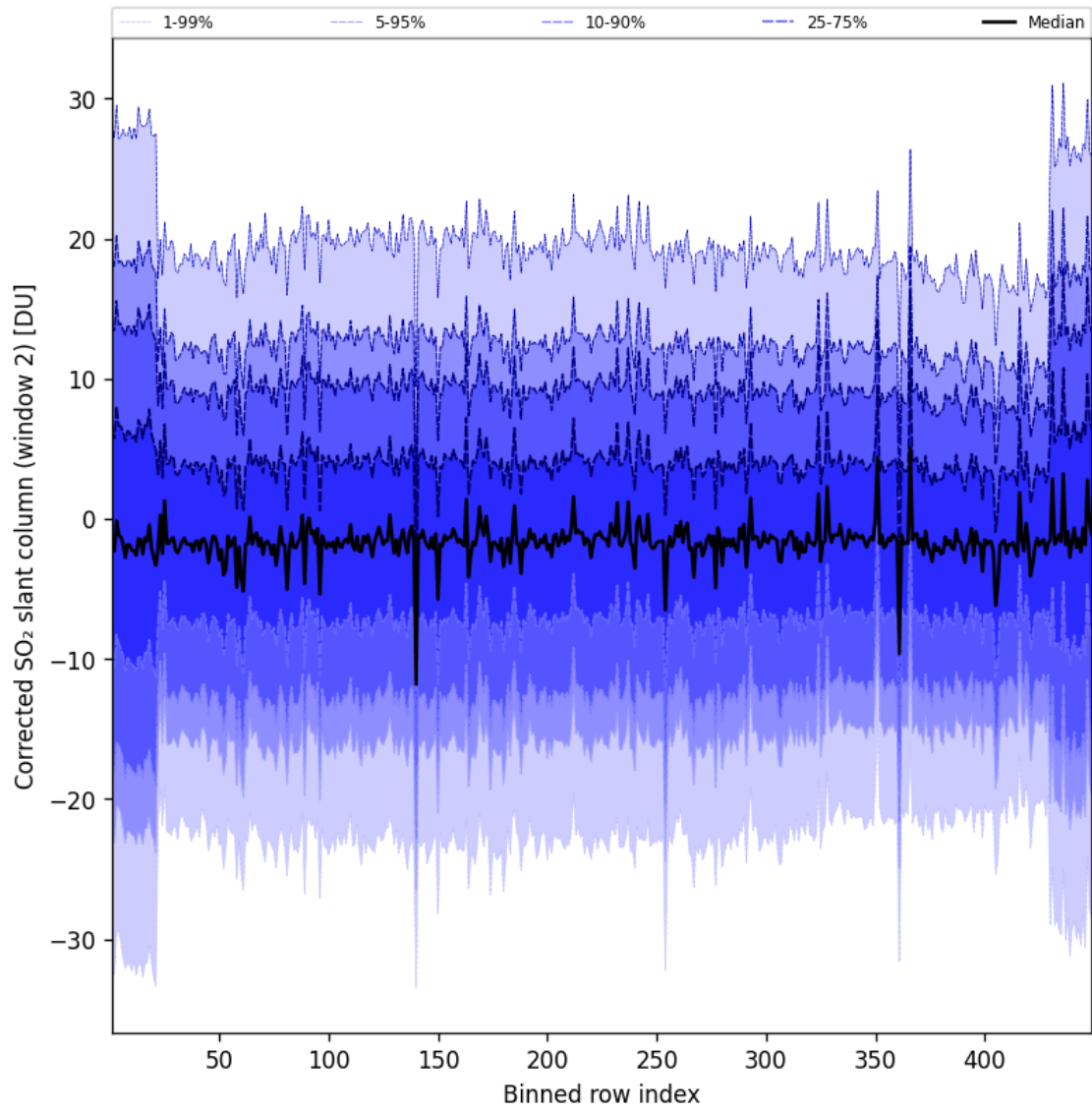


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-09-04 to 2025-09-05

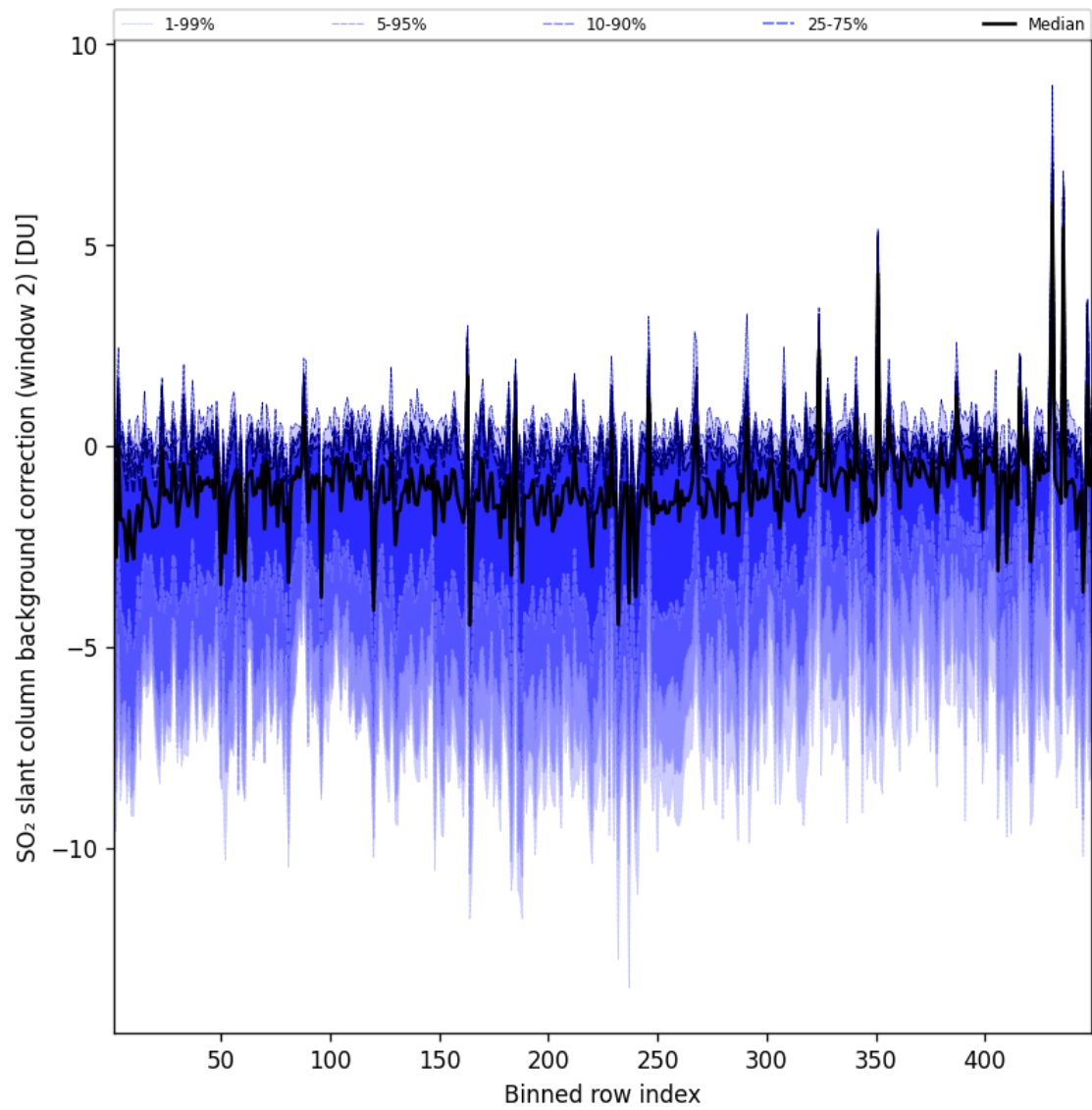


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-09-04 to 2025-09-05

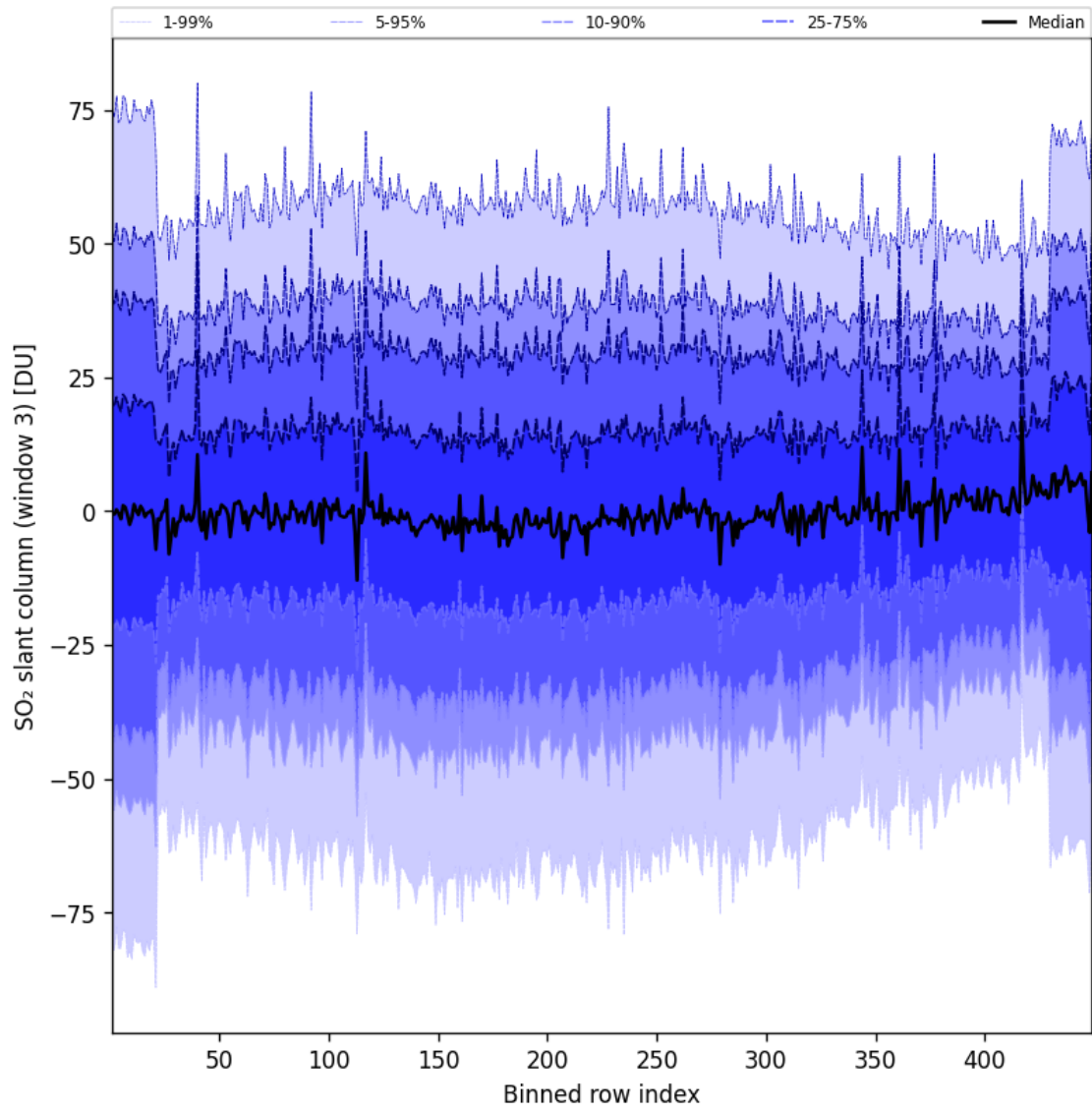


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-09-04 to 2025-09-05

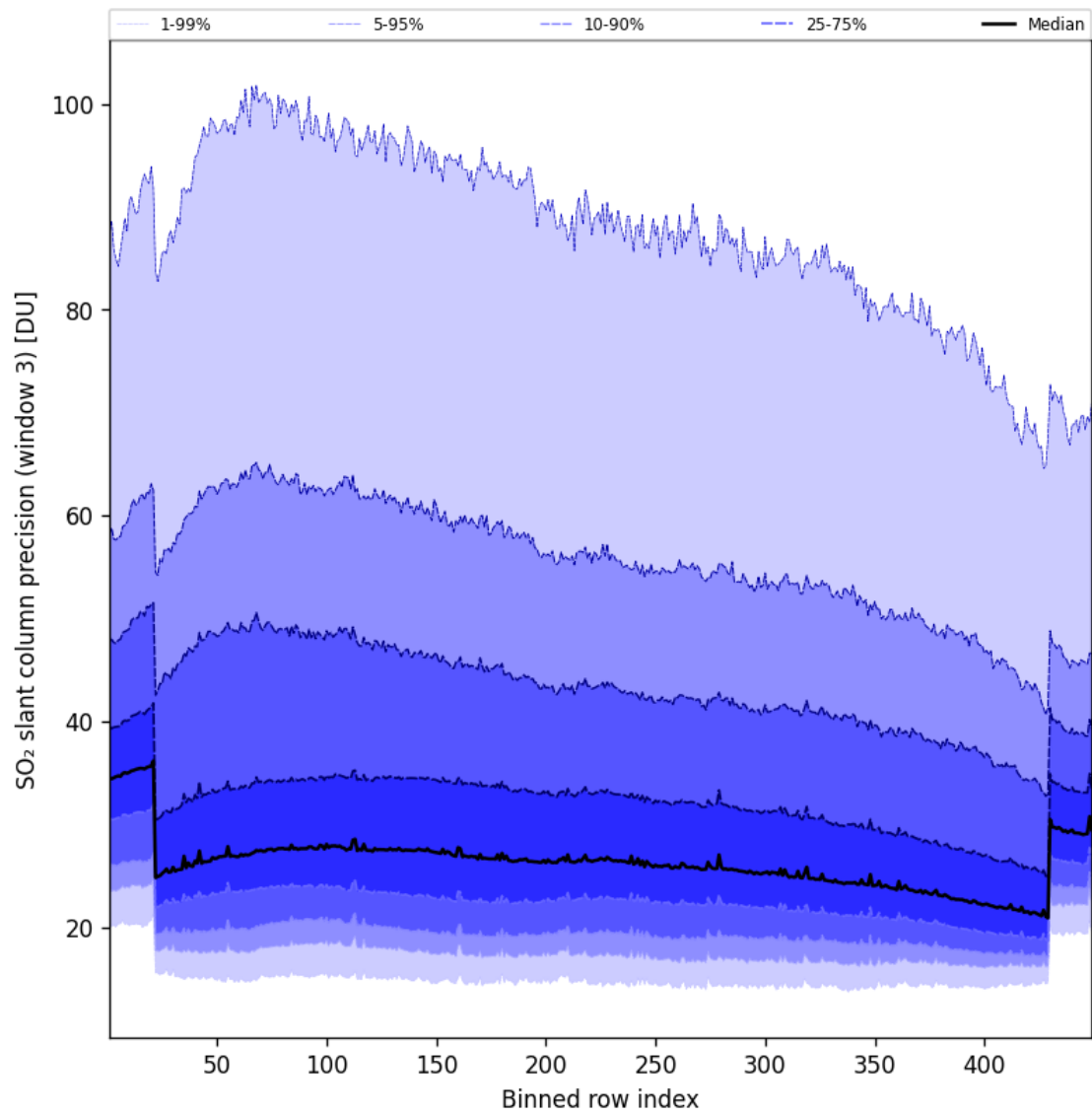


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-09-04 to 2025-09-05

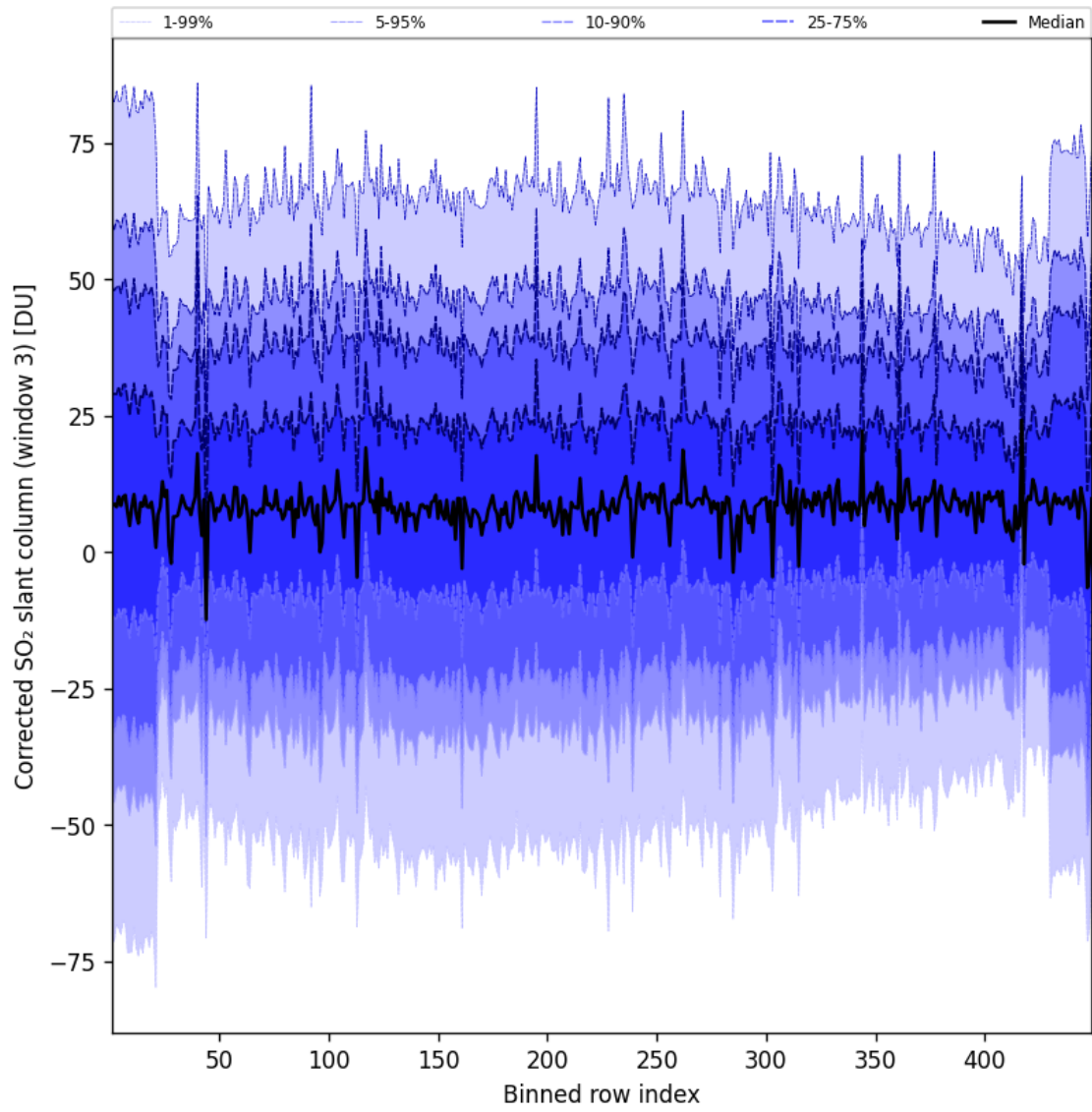


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-09-04 to 2025-09-05

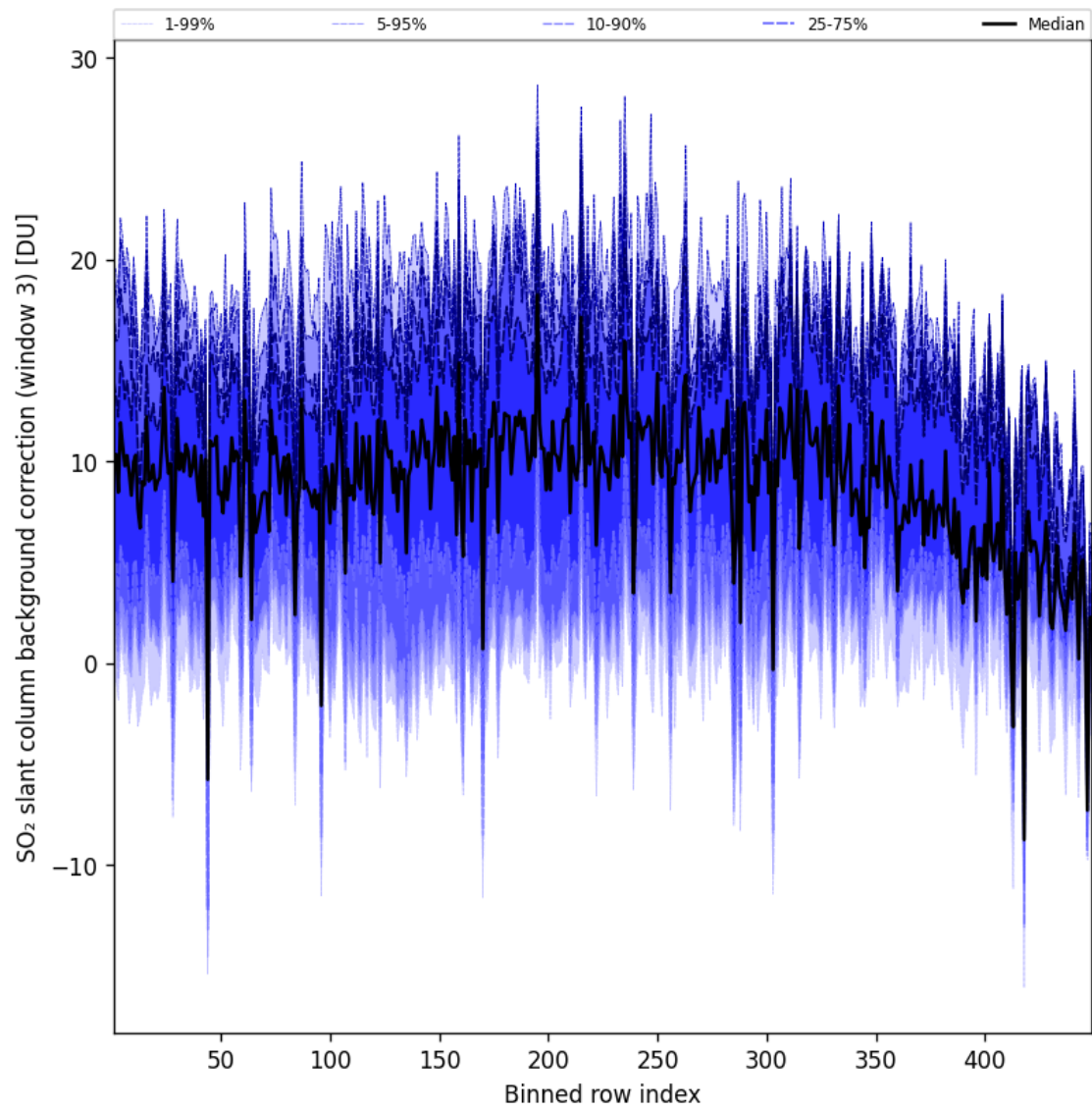


Figure 101: Along track statistics of "SO₂ slant column background correction (window 3)" for 2025-09-04 to 2025-09-05

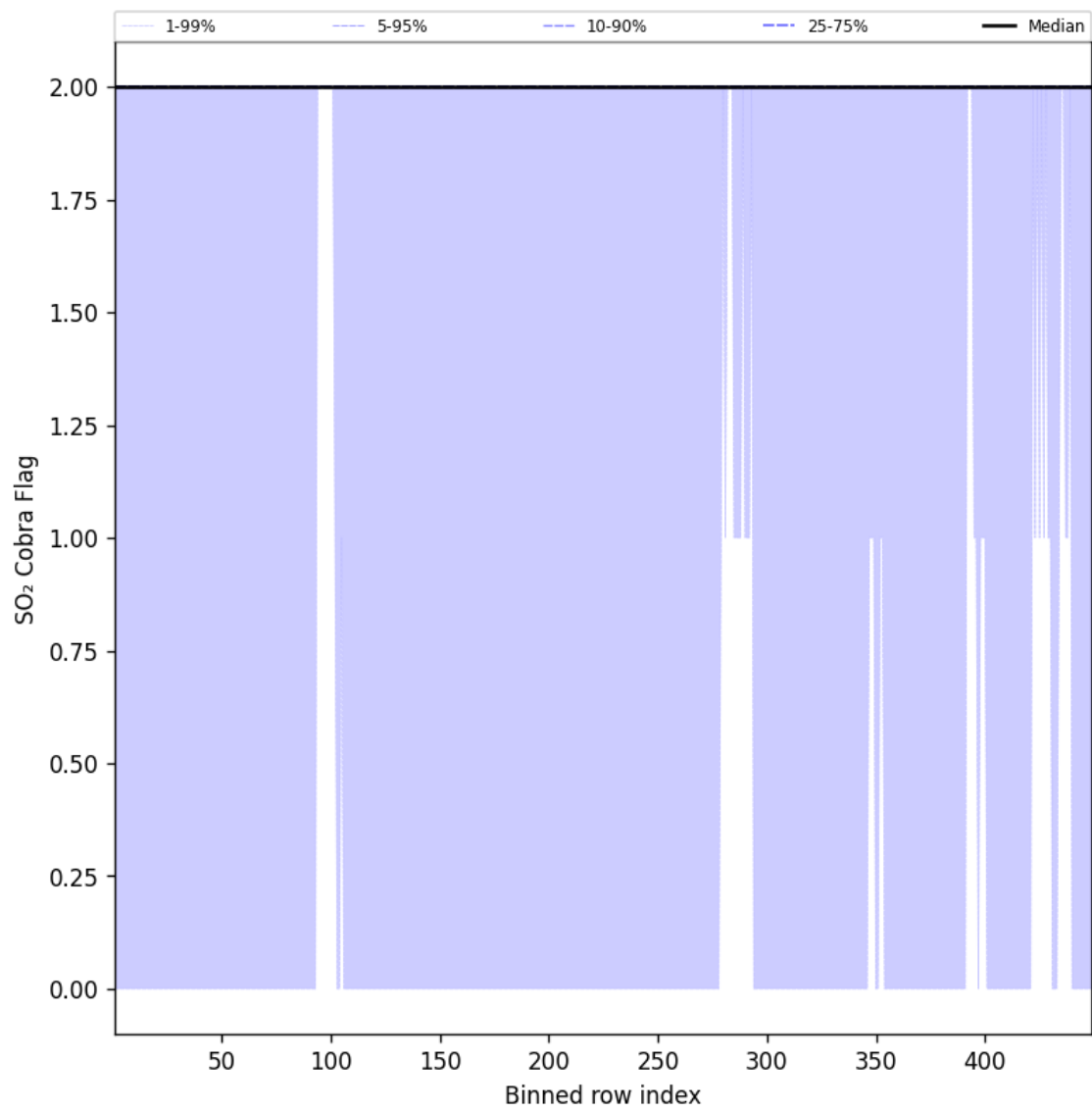


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-09-04 to 2025-09-05

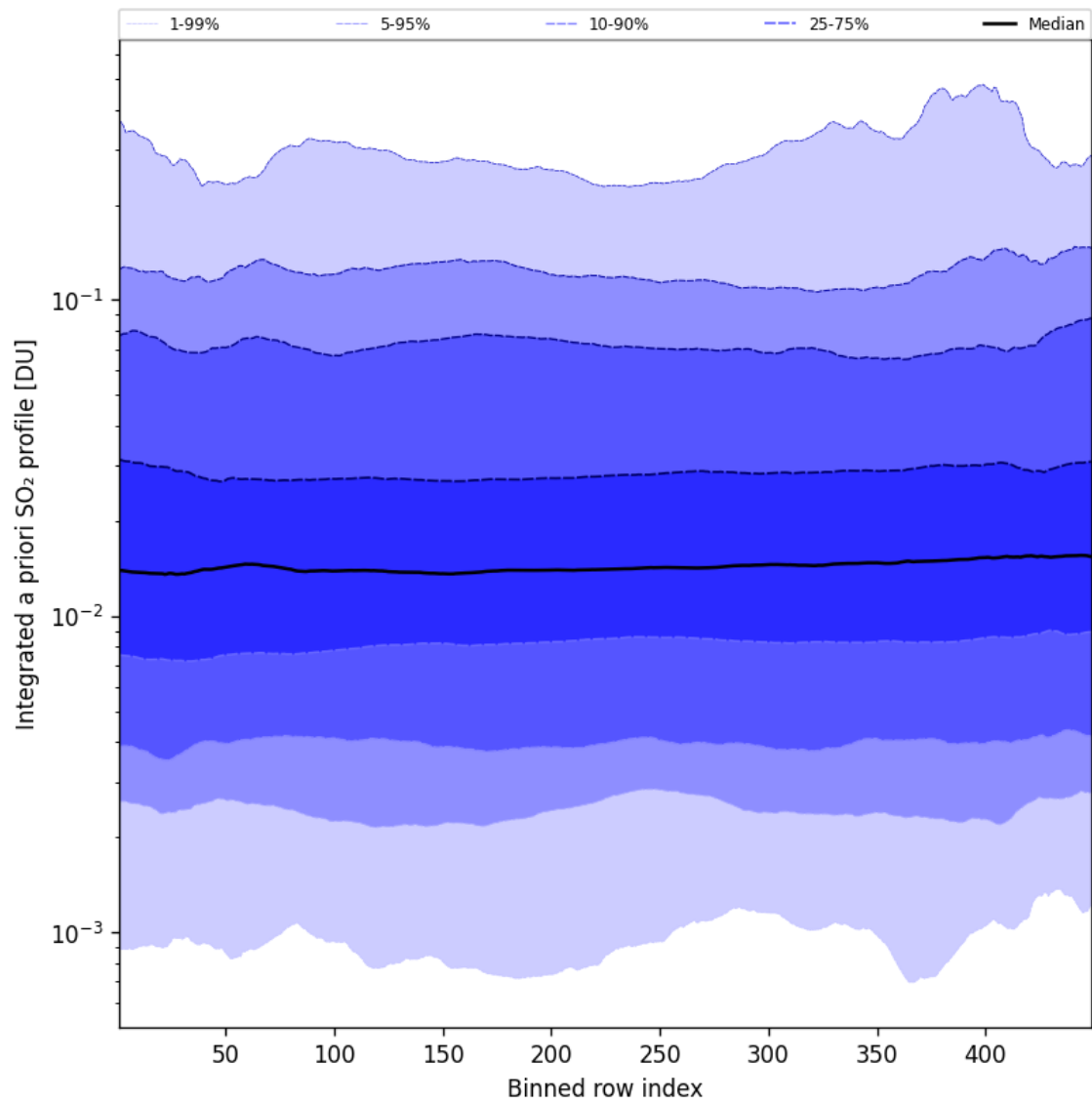


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-09-04 to 2025-09-05

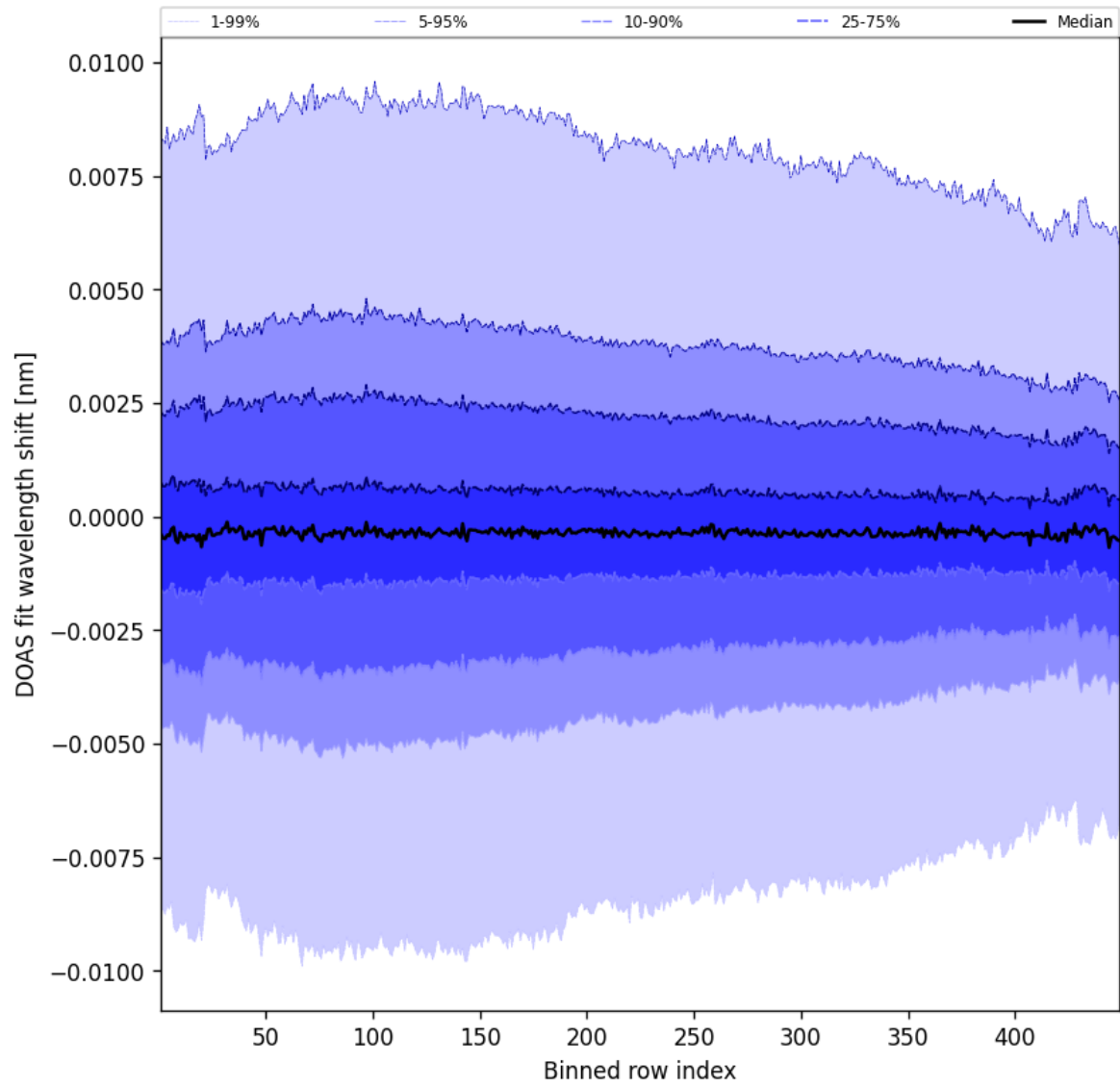


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-09-04 to 2025-09-05

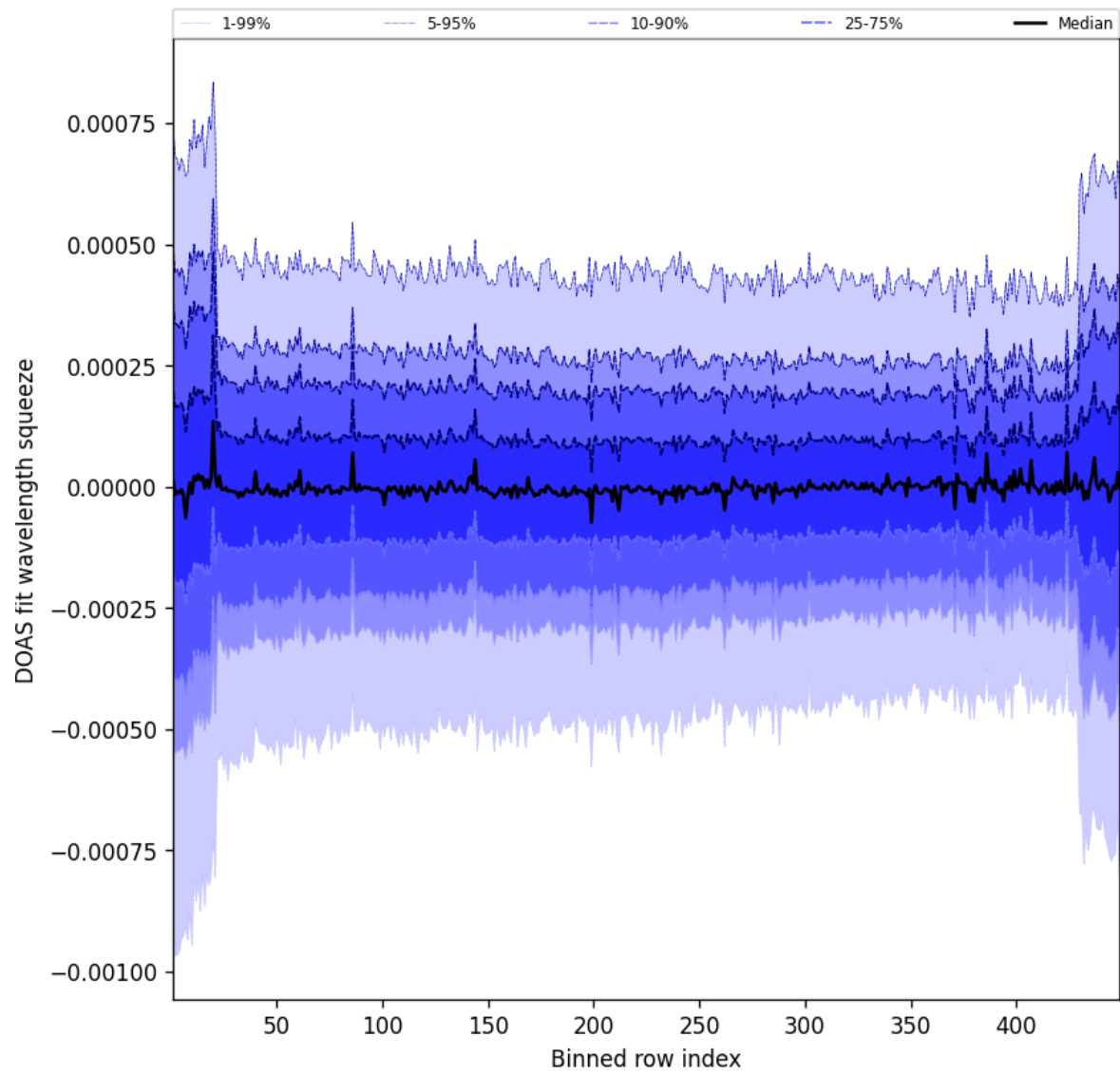


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-09-04 to 2025-09-05

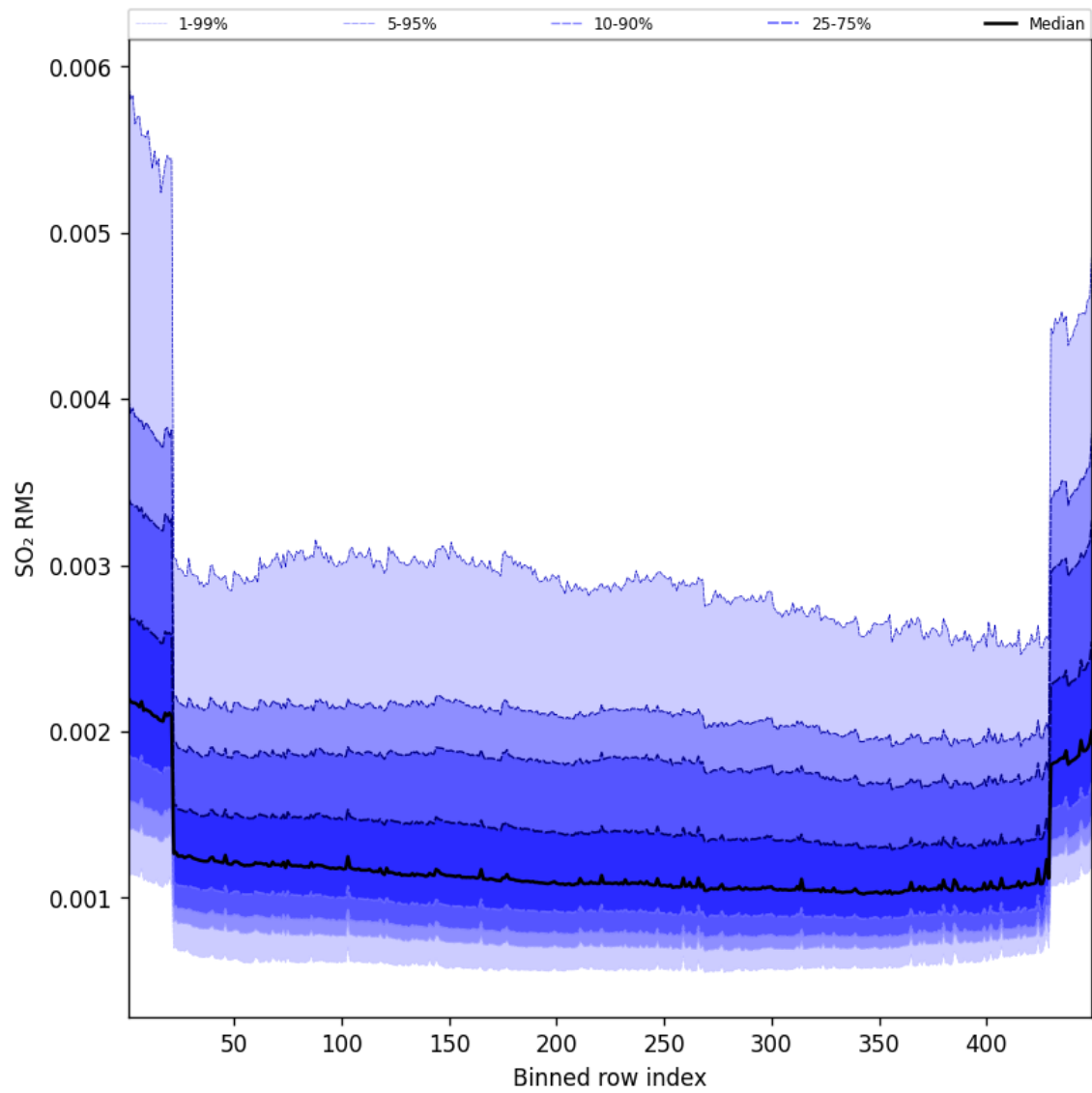


Figure 106: Along track statistics of “SO₂ RMS” for 2025-09-04 to 2025-09-05

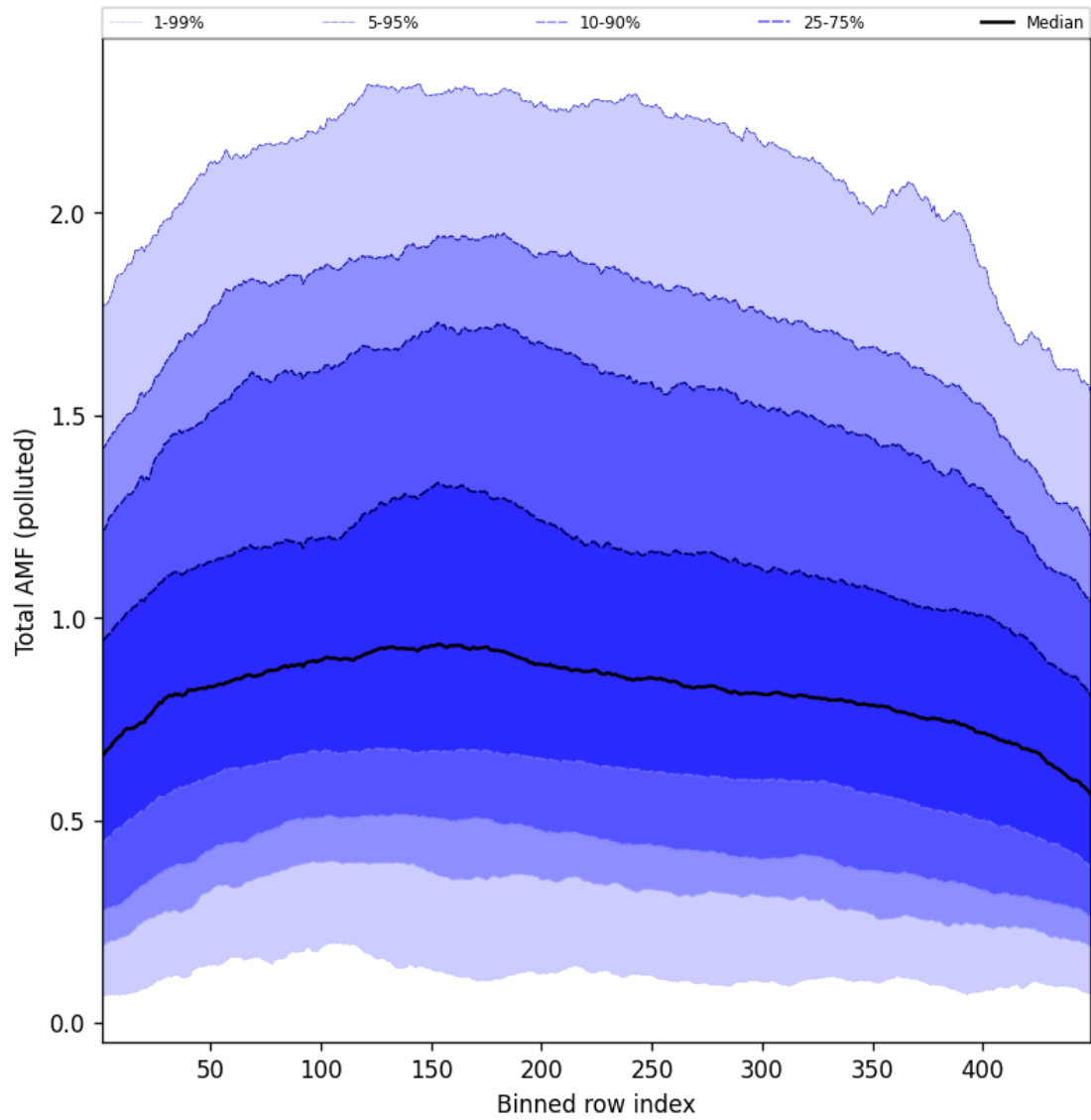


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-09-04 to 2025-09-05

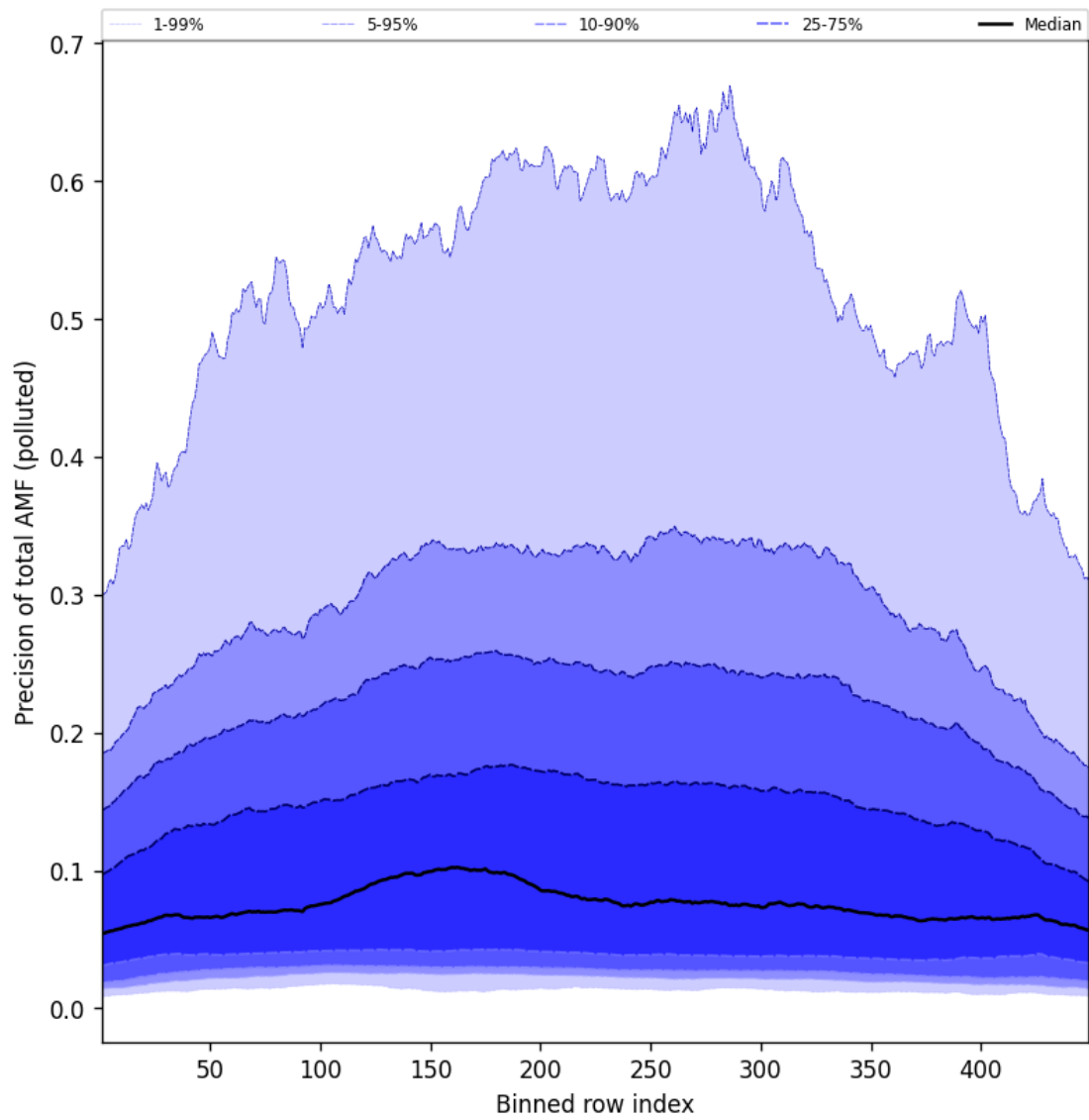


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-09-04 to 2025-09-05

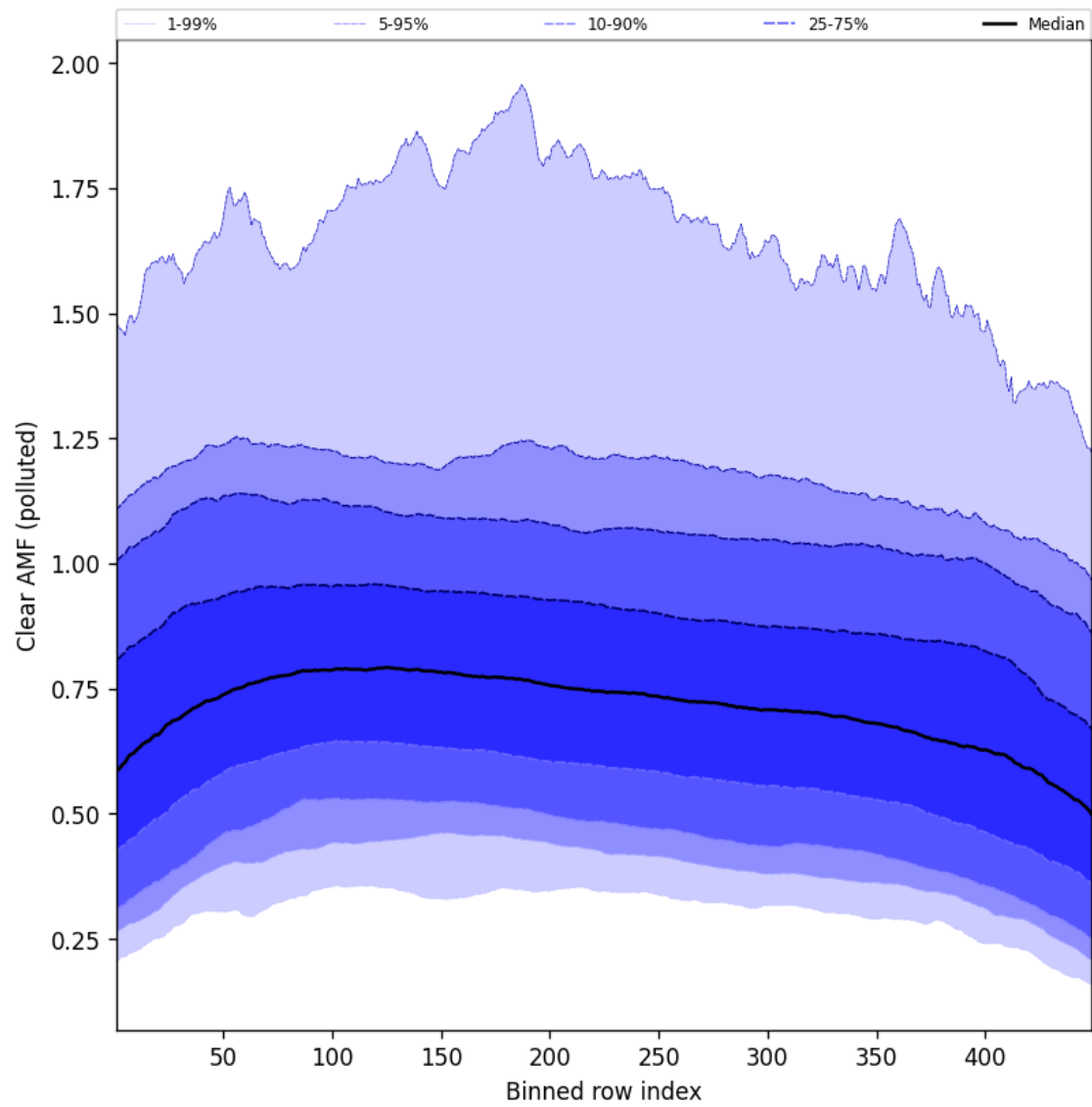


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-09-04 to 2025-09-05

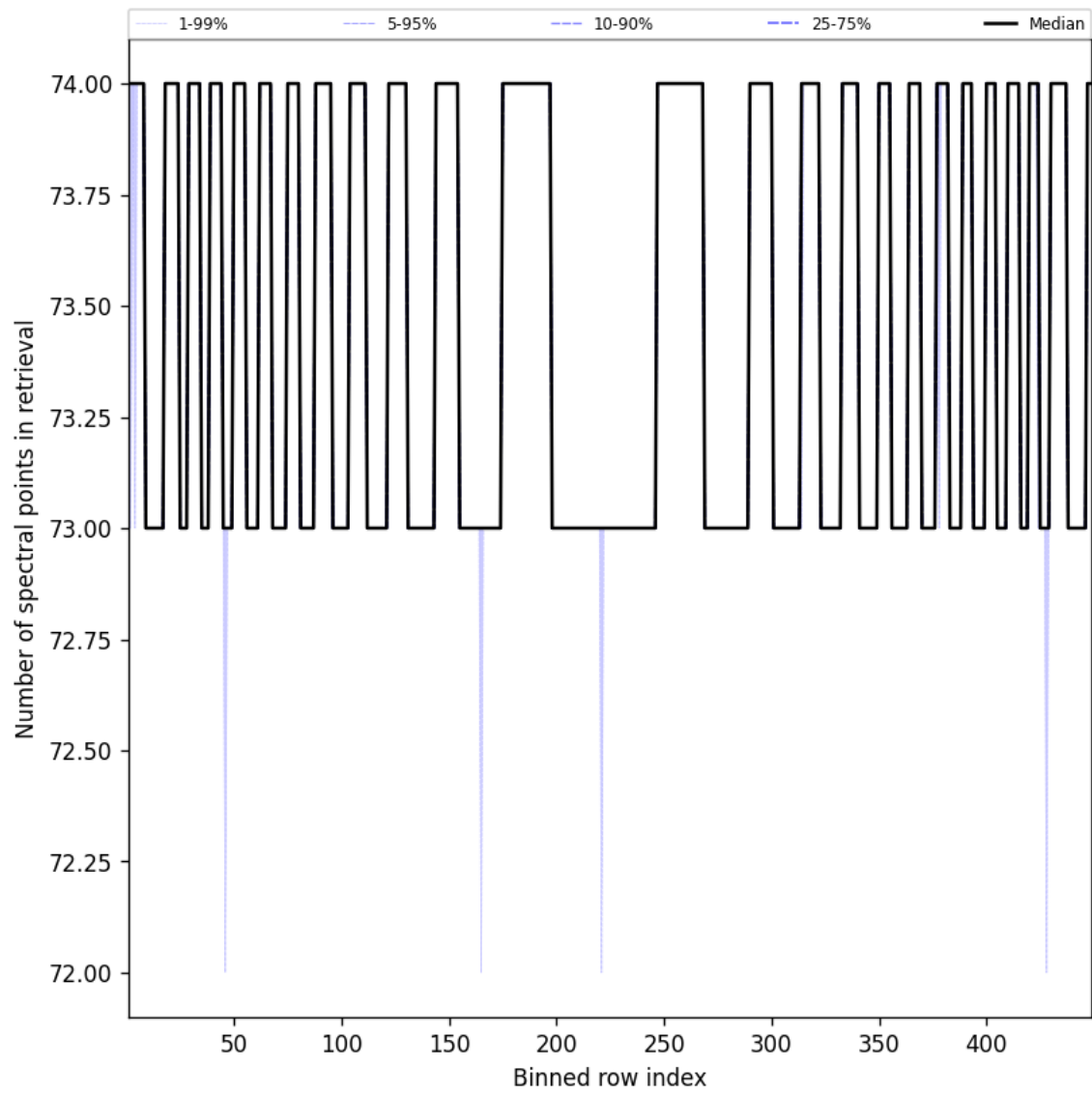


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-09-04 to 2025-09-05

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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