

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]	0.682 ± 0.399	17377807	0.995	0.740	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(6.163 \pm 129.127) \times 10^{-2}$	17377807	0.263	0.449	1.310×10^{-2}	-273	1.192×10^3
sulfurdioxide total vertical column precision [DU]	0.498 ± 0.642	17377807	0.222	0.340	0.326	4.290×10^{-2}	225
sulfurdioxide slant column density corrected [DU]	$(3.385 \pm 55.679) \times 10^{-2}$	17377807	0.242	0.372	1.191×10^{-2}	-55.0	723
sulfurdioxide slant column density cobra [DU]	$(3.312 \pm 46.551) \times 10^{-2}$	17377807	0.242	0.372	1.191×10^{-2}	-55.0	90.7
sulfurdioxide slant column density cobra precision [DU]	0.298 ± 0.139	17377807	0.213	0.141	0.254	8.586×10^{-2}	45.7
sulfurdioxide slant column density window1 [DU]	0.129 ± 0.754	17377807	0.125	0.747	0.121	-85.6	282
sulfurdioxide slant column density window1 precision [DU]	0.298 ± 0.139	17377807	0.213	0.141	0.254	8.586×10^{-2}	45.7
sulfurdioxide slant column density corrected win1 [DU]	$(5.932 \pm 74.957) \times 10^{-2}$	17377807	2.500×10^{-2}	0.737	2.868×10^{-2}	-85.6	283
background so2 slant column offset window1 [DU]	$(-6.973 \pm 13.633) \times 10^{-2}$	17377807	-0.140	0.158	-9.347×10^{-2}	-1.46	3.90
sulfurdioxide slant column density window2 [DU]	1.23 ± 9.26	17377807	0.750	11.6	1.05	-766	1.367×10^3
sulfurdioxide slant column density window2 precision [DU]	8.37 ± 2.41	17377807	7.43	2.76	8.00	2.03	683
sulfurdioxide slant column density corrected win2 [DU]	0.495 ± 9.053	17377807	0.250	11.4	0.516	-768	1.367×10^3
background so2 slant column offset window2 [DU]	-0.735 ± 2.129	17377807	0.750	2.40	-0.186	-24.0	8.13
sulfurdioxide slant column density window3 [DU]	-5.93 ± 24.77	17377807	-6.16	31.0	-5.68	-2.740×10^3	772
sulfurdioxide slant column density window3 precision [DU]	29.2 ± 13.6	17377807	22.5	10.7	25.7	8.77	2.342×10^3
sulfurdioxide slant column density corrected win3 [DU]	-2.42 ± 24.38	17377807	-2.80	30.6	-2.25	-2.744×10^3	768
background so2 slant column offset window3 [DU]	3.51 ± 5.19	17377807	7.28	7.78	3.71	-17.3	34.0
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.22	17377807	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.156 \pm 5.848) \times 10^{-2}$	17377807	1.539×10^{-2}	1.930×10^{-2}	1.592×10^{-2}	1.267×10^{-4}	2.01
fitted radiance shift [nm]	$(-2.132 \pm 26.825) \times 10^{-4}$	17377807	1.000×10^{-4}	1.827×10^{-3}	-2.094×10^{-4}	-0.102	8.699×10^{-2}
fitted radiance squeeze [1]	$(-4.077 \pm 18.728) \times 10^{-5}$	17377807	-3.000×10^{-5}	2.159×10^{-4}	-3.530×10^{-5}	-2.095×10^{-2}	3.870×10^{-2}
fitted root mean square [1]	$(1.299 \pm 0.558) \times 10^{-3}$	17377807	9.750×10^{-4}	5.574×10^{-4}	1.137×10^{-3}	2.888×10^{-4}	0.131
sulfurdioxide total air mass factor polluted [1]	0.893 ± 0.463	17377807	0.660	0.558	0.806	5.000×10^{-2}	3.00
sulfurdioxide total air mass factor polluted precision [1]	0.111 ± 0.114	17377807	3.500×10^{-2}	0.111	7.113×10^{-2}	2.967×10^{-3}	1.71
sulfurdioxide clear air mass factor polluted [1]	0.743 ± 0.315	17377807	0.660	0.355	0.702	5.536×10^{-2}	3.08
number of spectral points in retrieval [1]	73.4 ± 0.5	17377807	73.0	1.000	73.0	52.0	156

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	1.000×10^{-2}	7.000×10^{-2}	0.140	0.260	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.11	-0.846	-0.523	-0.352	-0.206	0.243	0.407	0.607	1.01	2.88
sulfurdioxide total vertical column precision [DU]	8.869×10^{-2}	0.123	0.152	0.179	0.216	0.556	0.727	0.931	1.35	3.03
sulfurdioxide slant column density corrected [DU]	-0.874	-0.498	-0.359	-0.267	-0.171	0.201	0.305	0.410	0.585	1.22
sulfurdioxide slant column density cobra [DU]	-0.874	-0.498	-0.359	-0.267	-0.171	0.201	0.305	0.410	0.585	1.22
sulfurdioxide slant column density cobra precision [DU]	0.145	0.169	0.183	0.194	0.208	0.349	0.407	0.463	0.552	0.803
sulfurdioxide slant column density window1 [DU]	-1.71	-0.936	-0.645	-0.453	-0.254	0.493	0.692	0.886	1.19	2.09
sulfurdioxide slant column density window1 precision [DU]	0.145	0.169	0.183	0.194	0.208	0.349	0.407	0.463	0.552	0.803
sulfurdioxide slant column density corrected win1 [DU]	-1.65	-0.957	-0.695	-0.519	-0.332	0.405	0.612	0.819	1.15	2.14
background so2 slant column offset window1 [DU]	-0.333	-0.242	-0.198	-0.178	-0.159	-1.397×10^{-3}	5.336×10^{-2}	0.103	0.167	0.303
sulfurdioxide slant column density window2 [DU]	-20.3	-13.4	-10.0	-7.50	-4.68	6.91	9.91	12.7	16.5	24.7
sulfurdioxide slant column density window2 precision [DU]	4.39	5.29	5.84	6.28	6.80	9.56	10.5	11.4	12.6	15.4
sulfurdioxide slant column density corrected win2 [DU]	-21.5	-14.1	-10.6	-8.05	-5.19	6.19	9.03	11.6	15.0	22.4
background so2 slant column offset window2 [DU]	-7.53	-5.28	-3.57	-2.52	-1.68	0.718	0.983	1.20	1.55	2.99
sulfurdioxide slant column density window3 [DU]	-68.8	-47.0	-36.7	-29.2	-21.2	9.76	17.6	24.7	34.2	53.2
sulfurdioxide slant column density window3 precision [DU]	13.6	16.2	18.3	19.8	21.6	32.2	36.7	42.6	54.5	86.4
sulfurdioxide slant column density corrected win3 [DU]	-63.6	-42.7	-32.7	-25.4	-17.6	13.0	20.8	27.7	37.1	56.2
background so2 slant column offset window3 [DU]	-8.34	-4.76	-3.30	-2.08	-0.392	7.39	8.71	9.84	11.6	14.9
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]	4.657×10^{-4}	1.202×10^{-3}	2.849×10^{-3}	5.253×10^{-3}	8.937×10^{-3}	2.824×10^{-2}	4.437×10^{-2}	6.722×10^{-2}	0.119	0.286
fitted radiance shift [nm]	-8.246×10^{-3}	-4.179×10^{-3}	-2.751×10^{-3}	-1.900×10^{-3}	-1.156×10^{-3}	6.708×10^{-4}	1.398×10^{-3}	2.293×10^{-3}	3.844×10^{-3}	8.207×10^{-3}
fitted radiance squeeze [1]	-5.368×10^{-4}	-3.443×10^{-4}	-2.622×10^{-4}	-2.055×10^{-4}	-1.460×10^{-4}	6.991×10^{-5}	1.231×10^{-4}	1.723×10^{-4}	2.432×10^{-4}	4.181×10^{-4}
fitted root mean square [1]	6.024×10^{-4}	7.388×10^{-4}	8.155×10^{-4}	8.740×10^{-4}	9.445×10^{-4}	1.502×10^{-3}	1.744×10^{-3}	1.987×10^{-3}	2.366×10^{-3}	3.308×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.103	0.271	0.385	0.470	0.573	1.13	1.34	1.54	1.80	2.28
sulfurdioxide total air mass factor polluted precision [1]	1.111×10^{-2}	1.981×10^{-2}	2.564×10^{-2}	3.091×10^{-2}	3.815×10^{-2}	0.149	0.190	0.233	0.314	0.574
sulfurdioxide clear air mass factor polluted [1]	0.247	0.342	0.406	0.462	0.534	0.890	0.994	1.09	1.26	1.87
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]	0.651 ± 0.412	11187244	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(7.064 \pm 136.524) \times 10^{-2}$	11187244	0.406	1.212×10^{-2}	-273	447	-0.186	0.220
sulfurdioxide total vertical column precision [DU]	0.463 ± 0.678	11187244	0.284	0.289	4.290×10^{-2}	225	0.198	0.483
sulfurdioxide slant column density corrected [DU]	$(3.656 \pm 52.082) \times 10^{-2}$	11187244	0.346	1.126×10^{-2}	-55.0	114	-0.159	0.187
sulfurdioxide slant column density cobra [DU]	$(3.571 \pm 47.333) \times 10^{-2}$	11187244	0.346	1.126×10^{-2}	-55.0	90.7	-0.159	0.187
sulfurdioxide slant column density cobra precision [DU]	0.269 ± 0.106	11187244	0.110	0.237	8.586×10^{-2}	45.7	0.200	0.309
sulfurdioxide slant column density window1 [DU]	0.134 ± 0.723	11187244	0.704	0.119	-35.2	282	-0.234	0.470
sulfurdioxide slant column density window1 precision [DU]	0.269 ± 0.106	11187244	0.110	0.237	8.586×10^{-2}	45.7	0.200	0.309
sulfurdioxide slant column density corrected win1 [DU]	$(6.012 \pm 71.552) \times 10^{-2}$	11187244	0.693	2.826×10^{-2}	-35.2	283	-0.311	0.381
background so2 slant column offset window1 [DU]	$(-7.402 \pm 12.292) \times 10^{-2}$	11187244	0.164	-9.535×10^{-2}	-1.10	0.739	-0.161	2.641×10^{-3}
sulfurdioxide slant column density window2 [DU]	0.724 ± 8.608	11187244	11.0	0.684	-345	648	-4.81	6.20
sulfurdioxide slant column density window2 precision [DU]	8.01 ± 2.19	11187244	2.53	7.68	2.03	498	6.56	9.09
sulfurdioxide slant column density corrected win2 [DU]	0.515 ± 8.526	11187244	10.9	0.550	-347	645	-4.91	5.98
background so2 slant column offset window2 [DU]	-0.209 ± 1.496	11187244	2.11	9.362×10^{-2}	-8.35	8.13	-1.25	0.862
sulfurdioxide slant column density window3 [DU]	-5.11 ± 23.88	11187244	29.8	-5.04	-2.740×10^3	772	-19.9	9.90
sulfurdioxide slant column density window3 precision [DU]	28.3 ± 14.1	11187244	10.2	24.4	8.77	2.342×10^3	20.7	30.9
sulfurdioxide slant column density corrected win3 [DU]	-2.56 ± 23.45	11187244	29.5	-2.40	-2.744×10^3	768	-17.1	12.3
background so2 slant column offset window3 [DU]	2.55 ± 5.18	11187244	8.63	2.77	-17.3	18.7	-1.67	6.96
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.18	11187244	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.358 \pm 5.996) \times 10^{-2}$	11187244	2.844×10^{-2}	1.645×10^{-2}	1.267×10^{-4}	1.84	5.729×10^{-3}	3.417×10^{-2}
fitted radiance shift [nm]	$(-4.296 \pm 2787.428) \times 10^{-6}$	11187244	1.721×10^{-3}	-4.830×10^{-5}	-0.102	4.051×10^{-2}	-8.802×10^{-4}	8.405×10^{-4}
fitted radiance squeeze [1]	$(-6.534 \pm 17.143) \times 10^{-5}$	11187244	2.076×10^{-4}	-5.509×10^{-5}	-2.095×10^{-2}	3.870×10^{-2}	-1.636×10^{-4}	4.405×10^{-5}
fitted root mean square [1]	$(1.197 \pm 0.443) \times 10^{-3}$	11187244	4.686×10^{-4}	1.078×10^{-3}	2.888×10^{-4}	0.131	9.098×10^{-4}	1.378×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.930 ± 0.508	11187244	0.638	0.840	5.000×10^{-2}	3.00	0.566	1.20
sulfurdioxide total air mass factor polluted precision [1]	0.122 ± 0.127	11187244	0.121	7.937×10^{-2}	2.967×10^{-3}	1.71	4.041×10^{-2}	0.161
sulfurdioxide clear air mass factor polluted [1]	0.776 ± 0.362	11187244	0.434	0.734	6.718×10^{-2}	3.08	0.517	0.951
number of spectral points in retrieval [1]	73.5 ± 0.5	11187244	1.000	73.0	52.0	156	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]	0.738 ± 0.366	6190563	0.600	1.000	0.0	1.000	0.400	1.000
sulfurdioxide total vertical column [DU]	$(4.534 \pm 114.538) \times 10^{-2}$	6190563	0.542	1.546×10^{-2}	-70.5	1.192×10^3	-0.250	0.292
sulfurdioxide total vertical column precision [DU]	0.561 ± 0.567	6190563	0.399	0.403	4.778×10^{-2}	118	0.266	0.665
sulfurdioxide slant column density corrected [DU]	$(2.895 \pm 61.647) \times 10^{-2}$	6190563	0.427	1.338×10^{-2}	-33.3	723	-0.198	0.230
sulfurdioxide slant column density cobra [DU]	$(2.844 \pm 45.100) \times 10^{-2}$	6190563	0.427	1.338×10^{-2}	-33.3	37.6	-0.198	0.230
sulfurdioxide slant column density cobra precision [DU]	0.351 ± 0.172	6190563	0.191	0.303	9.328×10^{-2}	21.2	0.232	0.423
sulfurdioxide slant column density window1 [DU]	0.120 ± 0.807	6190563	0.835	0.125	-85.6	78.4	-0.294	0.541
sulfurdioxide slant column density window1 precision [DU]	0.351 ± 0.172	6190563	0.191	0.303	9.328×10^{-2}	21.2	0.232	0.423
sulfurdioxide slant column density corrected win1 [DU]	$(5.788 \pm 80.747) \times 10^{-2}$	6190563	0.830	2.959×10^{-2}	-85.6	78.3	-0.377	0.454
background so2 slant column offset window1 [DU]	$(-6.197 \pm 15.740) \times 10^{-2}$	6190563	0.144	-9.105×10^{-2}	-1.46	3.90	-0.153	-9.237×10^{-3}
sulfurdioxide slant column density window2 [DU]	2.14 ± 10.26	6190563	12.7	1.80	-766	1.367×10^3	-4.41	8.32
sulfurdioxide slant column density window2 precision [DU]	9.02 ± 2.66	6190563	2.96	8.65	2.29	683	7.35	10.3
sulfurdioxide slant column density corrected win2 [DU]	0.461 ± 9.933	6190563	12.3	0.446	-768	1.367×10^3	-5.73	6.61
background so2 slant column offset window2 [DU]	-1.68 ± 2.70	6190563	3.89	-0.763	-24.0	6.52	-3.52	0.368
sulfurdioxide slant column density window3 [DU]	-7.40 ± 26.23	6190563	33.2	-6.95	-549	254	-23.7	9.49
sulfurdioxide slant column density window3 precision [DU]	30.8 ± 12.5	6190563	10.3	27.9	10.2	509	23.7	33.9
sulfurdioxide slant column density corrected win3 [DU]	-2.17 ± 25.96	6190563	32.9	-1.96	-545	257	-18.5	14.5
background so2 slant column offset window3 [DU]	5.23 ± 4.76	6190563	6.66	4.56	-12.7	34.0	1.94	8.60
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.28	6190563	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.789 \pm 5.552) \times 10^{-2}$	6190563	1.133×10^{-2}	1.550×10^{-2}	1.312×10^{-3}	2.01	1.130×10^{-2}	2.263×10^{-2}
fitted radiance shift [nm]	$(-5.907 \pm 24.365) \times 10^{-4}$	6190563	1.904×10^{-3}	-5.379×10^{-4}	-4.911×10^{-2}	8.699×10^{-2}	-1.586×10^{-3}	3.181×10^{-4}
fitted radiance squeeze [1]	$(3.627 \pm 205.644) \times 10^{-6}$	6190563	2.265×10^{-4}	4.125×10^{-6}	-1.702×10^{-2}	2.836×10^{-2}	-1.087×10^{-4}	1.177×10^{-4}
fitted root mean square [1]	$(1.485 \pm 0.681) \times 10^{-3}$	6190563	7.382×10^{-4}	1.272×10^{-3}	3.585×10^{-4}	0.101	1.028×10^{-3}	1.767×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.827 ± 0.361	6190563	0.439	0.759	5.000×10^{-2}	2.63	0.582	1.02
sulfurdioxide total air mass factor polluted precision [1]	$(9.119 \pm 7.973) \times 10^{-2}$	6190563	8.908×10^{-2}	5.928×10^{-2}	3.524×10^{-3}	1.52	3.568×10^{-2}	0.125
sulfurdioxide clear air mass factor polluted [1]	0.684 ± 0.190	6190563	0.233	0.675	5.536×10^{-2}	1.71	0.559	0.792
number of spectral points in retrieval [1]	73.4 ± 0.5	6190563	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]	0.693 ± 0.388	11437390	0.710	1.000	0.0	1.000	0.290	1.000
sulfurdioxide total vertical column [DU]	$(7.691 \pm 136.249) \times 10^{-2}$	11437390	0.452	1.478×10^{-2}	-273	1.192×10^3	-0.205	0.246
sulfurdioxide total vertical column precision [DU]	0.496 ± 0.637	11437390	0.332	0.321	4.290×10^{-2}	225	0.217	0.549
sulfurdioxide slant column density corrected [DU]	$(4.090 \pm 57.342) \times 10^{-2}$	11437390	0.377	1.333×10^{-2}	-55.0	723	-0.172	0.205
sulfurdioxide slant column density cobra [DU]	$(4.015 \pm 50.007) \times 10^{-2}$	11437390	0.377	1.333×10^{-2}	-55.0	90.7	-0.172	0.205
sulfurdioxide slant column density cobra precision [DU]	0.305 ± 0.150	11437390	0.161	0.254	8.586×10^{-2}	45.7	0.207	0.368
sulfurdioxide slant column density window1 [DU]	0.139 ± 0.796	11437390	0.759	0.132	-85.6	282	-0.250	0.510
sulfurdioxide slant column density window1 precision [DU]	0.305 ± 0.150	11437390	0.161	0.254	8.586×10^{-2}	45.7	0.207	0.368
sulfurdioxide slant column density corrected win1 [DU]	$(7.330 \pm 79.186) \times 10^{-2}$	11437390	0.750	3.712×10^{-2}	-85.6	283	-0.330	0.420
background so2 slant column offset window1 [DU]	$(-6.618 \pm 14.655) \times 10^{-2}$	11437390	0.165	-9.724×10^{-2}	-1.46	3.90	-0.160	5.004×10^{-3}
sulfurdioxide slant column density window2 [DU]	1.43 ± 9.31	11437390	11.6	1.16	-766	1.367×10^3	-4.55	7.09
sulfurdioxide slant column density window2 precision [DU]	8.33 ± 2.34	11437390	2.74	7.95	2.25	664	6.78	9.51
sulfurdioxide slant column density corrected win2 [DU]	0.509 ± 9.049	11437390	11.4	0.519	-768	1.367×10^3	-5.18	6.20
background so2 slant column offset window2 [DU]	-0.919 ± 2.364	11437390	2.76	-0.166	-24.0	8.13	-2.04	0.725
sulfurdioxide slant column density window3 [DU]	-3.50 ± 24.62	11437390	31.0	-3.37	-1.163×10^3	562	-18.8	12.2
sulfurdioxide slant column density window3 precision [DU]	28.2 ± 11.9	11437390	9.93	25.1	8.77	2.342×10^3	21.4	31.3
sulfurdioxide slant column density corrected win3 [DU]	$(-1.027 \pm 2395.666) \times 10^{-2}$	11437390	30.4	-5.928×10^{-2}	-1.167×10^3	558	-15.2	15.3
background so2 slant column offset window3 [DU]	3.49 ± 5.34	11437390	7.87	3.43	-17.3	34.0	-0.476	7.39
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	11437390	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.156 \pm 3.400) \times 10^{-2}$	11437390	1.300×10^{-2}	1.526×10^{-2}	2.827×10^{-4}	1.84	9.963×10^{-3}	2.297×10^{-2}
fitted radiance shift [nm]	$(-2.674 \pm 23.859) \times 10^{-4}$	11437390	1.812×10^{-3}	-2.291×10^{-4}	-0.102	8.699×10^{-2}	-1.197×10^{-3}	6.156×10^{-4}
fitted radiance squeeze [1]	$(-3.042 \pm 19.048) \times 10^{-5}$	11437390	2.150×10^{-4}	-2.425×10^{-5}	-1.584×10^{-2}	3.870×10^{-2}	-1.347×10^{-4}	8.037×10^{-5}
fitted root mean square [1]	$(1.328 \pm 0.602) \times 10^{-3}$	11437390	6.357×10^{-4}	1.131×10^{-3}	2.888×10^{-4}	0.131	9.361×10^{-4}	1.572×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.883 ± 0.408	11437390	0.500	0.821	5.000×10^{-2}	2.58	0.609	1.11
sulfurdioxide total air mass factor polluted precision [1]	0.105 ± 0.108	11437390	9.567×10^{-2}	6.846×10^{-2}	2.967×10^{-3}	1.61	3.991×10^{-2}	0.136
sulfurdioxide clear air mass factor polluted [1]	0.739 ± 0.260	11437390	0.319	0.716	6.718×10^{-2}	2.60	0.567	0.886
number of spectral points in retrieval [1]	73.4 ± 0.5	11437390	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]	0.677 ± 0.414	4145404	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(2.590 \pm 96.699) \times 10^{-2}$	4145404	0.425	9.011×10^{-3}	-70.5	262	-0.200	0.225
sulfurdioxide total vertical column precision [DU]	0.470 ± 0.580	4145404	0.342	0.327	4.437×10^{-2}	118	0.202	0.544
sulfurdioxide slant column density corrected [DU]	$(1.810 \pm 42.625) \times 10^{-2}$	4145404	0.352	8.448×10^{-3}	-18.7	114	-0.166	0.186
sulfurdioxide slant column density cobra [DU]	$(1.759 \pm 38.169) \times 10^{-2}$	4145404	0.352	8.448×10^{-3}	-18.7	49.7	-0.166	0.186
sulfurdioxide slant column density cobra precision [DU]	0.275 ± 0.111	4145404	9.743×10^{-2}	0.246	8.661×10^{-2}	16.5	0.208	0.305
sulfurdioxide slant column density window1 [DU]	0.120 ± 0.646	4145404	0.703	0.111	-53.1	51.9	-0.239	0.464
sulfurdioxide slant column density window1 precision [DU]	0.275 ± 0.111	4145404	9.743×10^{-2}	0.246	8.661×10^{-2}	16.5	0.208	0.305
sulfurdioxide slant column density corrected win1 [DU]	$(2.618 \pm 64.011) \times 10^{-2}$	4145404	0.692	9.164×10^{-3}	-53.1	51.8	-0.331	0.361
background so2 slant column offset window1 [DU]	$(-9.348 \pm 11.150) \times 10^{-2}$	4145404	0.132	-0.111	-1.10	1.08	-0.165	-3.250×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.700 ± 9.078	4145404	11.4	0.685	-606	982	-5.02	6.39
sulfurdioxide slant column density window2 precision [DU]	8.39 ± 2.58	4145404	2.72	8.03	2.03	497	6.80	9.52
sulfurdioxide slant column density corrected win2 [DU]	0.519 ± 8.992	4145404	11.3	0.555	-603	979	-5.10	6.17
background so2 slant column offset window2 [DU]	-0.182 ± 1.497	4145404	1.89	9.871×10^{-2}	-12.2	6.76	-1.08	0.817
sulfurdioxide slant column density window3 [DU]	-10.6 ± 24.3	4145404	30.0	-9.99	-2.740×10^3	772	-25.3	4.68
sulfurdioxide slant column density window3 precision [DU]	31.2 ± 16.7	4145404	12.0	26.9	9.20	777	22.0	34.0
sulfurdioxide slant column density corrected win3 [DU]	-7.87 ± 24.41	4145404	30.3	-7.24	-2.744×10^3	768	-22.8	7.57
background so2 slant column offset window3 [DU]	2.75 ± 4.91	4145404	7.70	2.98	-17.3	25.0	-1.01	6.69
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.14	4145404	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.600 \pm 8.739) \times 10^{-2}$	4145404	6.148×10^{-2}	2.381×10^{-2}	1.267×10^{-4}	2.01	7.124×10^{-3}	6.861×10^{-2}
fitted radiance shift [nm]	$(-1.182 \pm 32.864) \times 10^{-4}$	4145404	1.808×10^{-3}	-1.883×10^{-4}	-5.662×10^{-2}	4.606×10^{-2}	-1.061×10^{-3}	7.470×10^{-4}
fitted radiance squeeze [1]	$(-4.881 \pm 17.510) \times 10^{-5}$	4145404	2.081×10^{-4}	-4.602×10^{-5}	-2.095×10^{-2}	2.836×10^{-2}	-1.514×10^{-4}	5.667×10^{-5}
fitted root mean square [1]	$(1.209 \pm 0.432) \times 10^{-3}$	4145404	4.039×10^{-4}	1.116×10^{-3}	3.223×10^{-4}	6.705×10^{-2}	9.470×10^{-4}	1.351×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.923 ± 0.565	4145404	0.666	0.767	5.000×10^{-2}	3.00	0.520	1.19
sulfurdioxide total air mass factor polluted precision [1]	0.123 ± 0.125	4145404	0.144	7.595×10^{-2}	3.166×10^{-3}	1.67	3.268×10^{-2}	0.177
sulfurdioxide clear air mass factor polluted [1]	0.768 ± 0.421	4145404	0.406	0.672	5.715×10^{-2}	3.08	0.498	0.904
number of spectral points in retrieval [1]	73.4 ± 0.5	4145404	1.000	73.0	52.0	156	73.0	74.0

3 Granule outlines

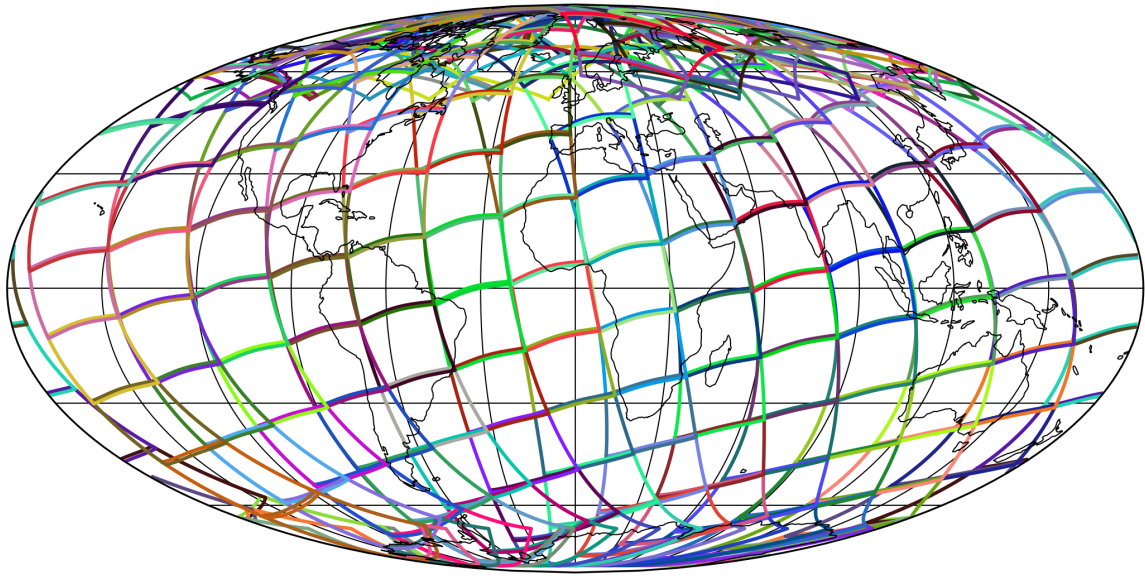


Figure 1: Outline of the granules.

4 Input data monitoring

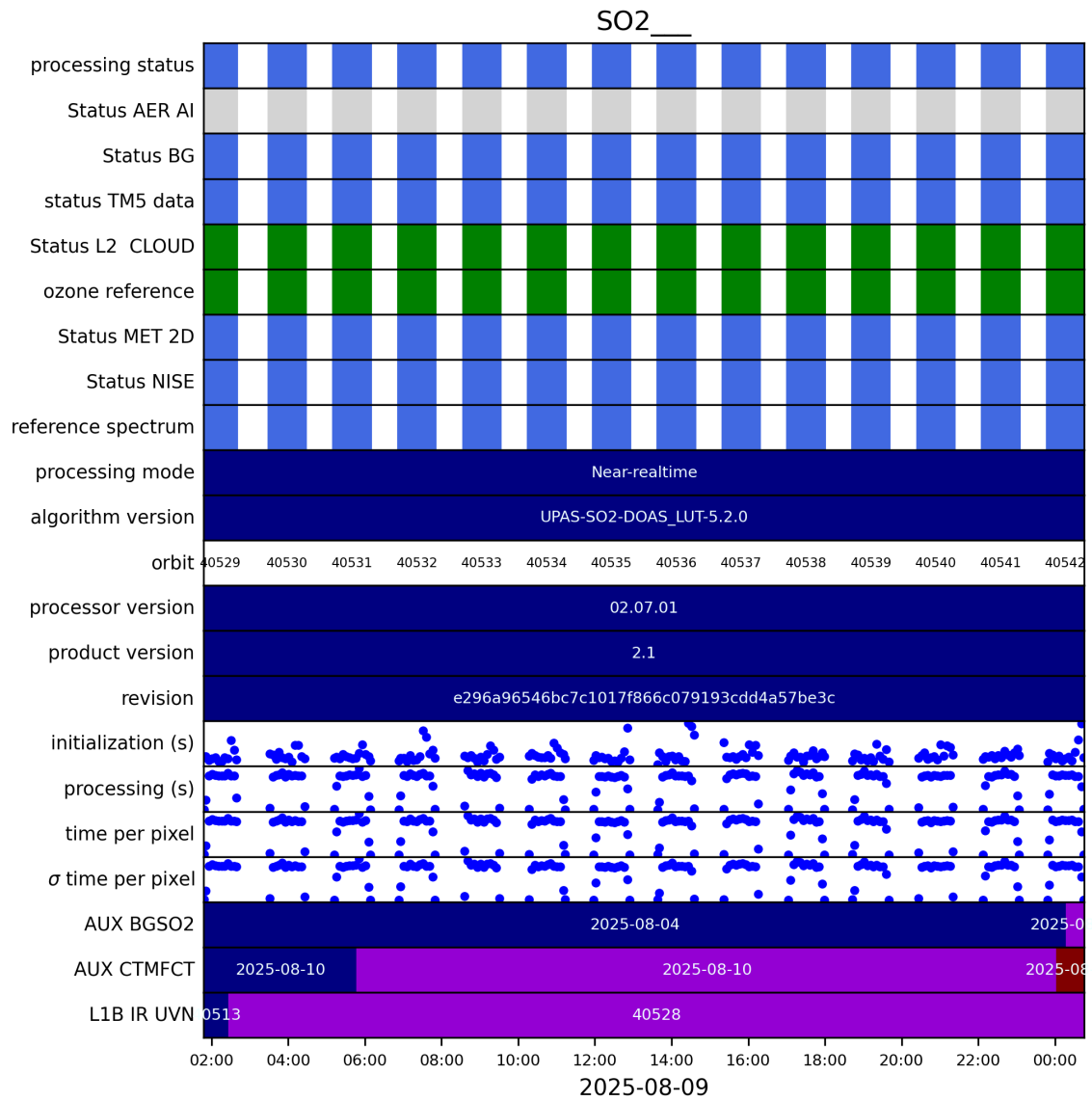


Figure 2: Input data per granule

5 Warnings and errors

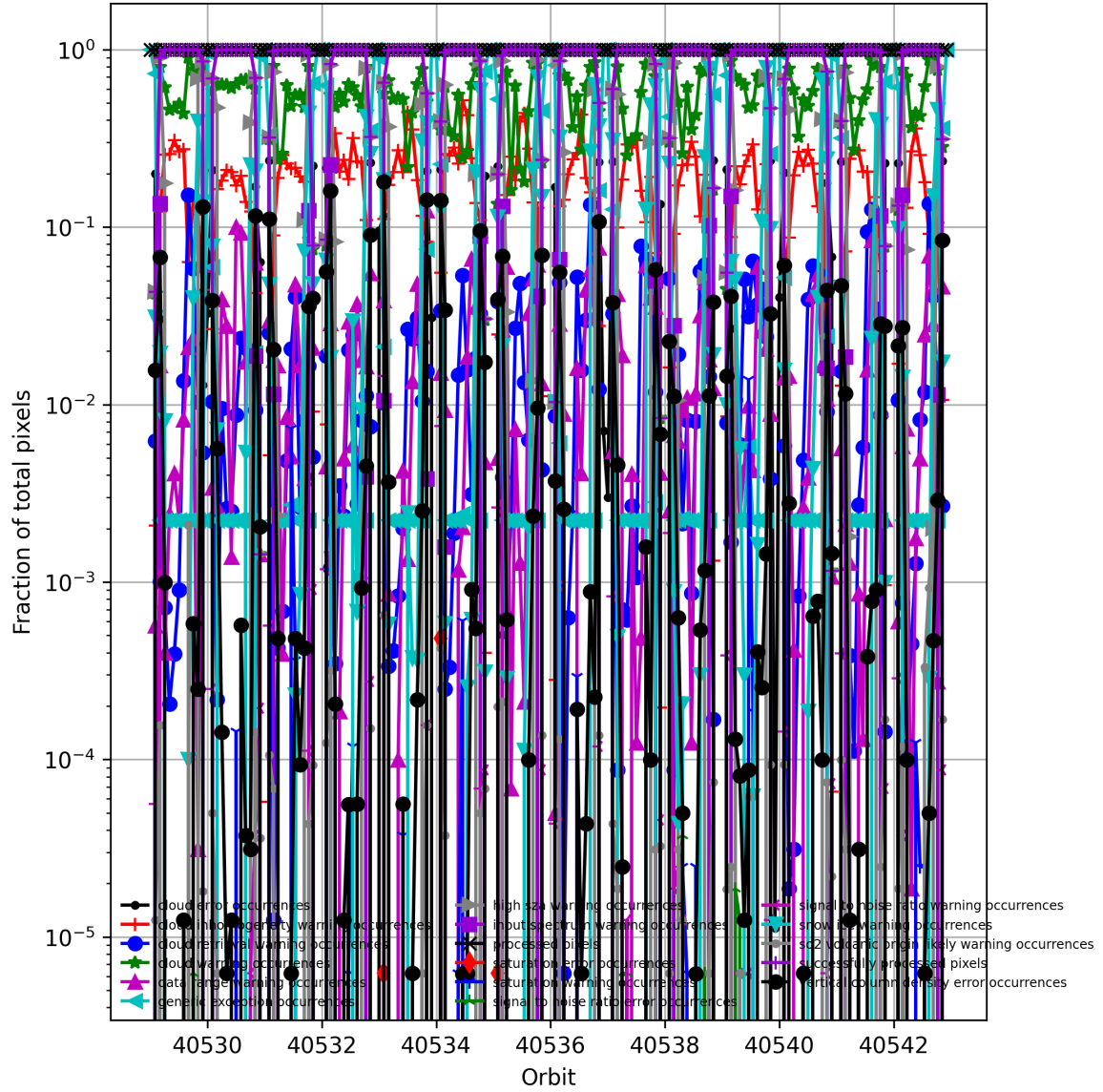


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

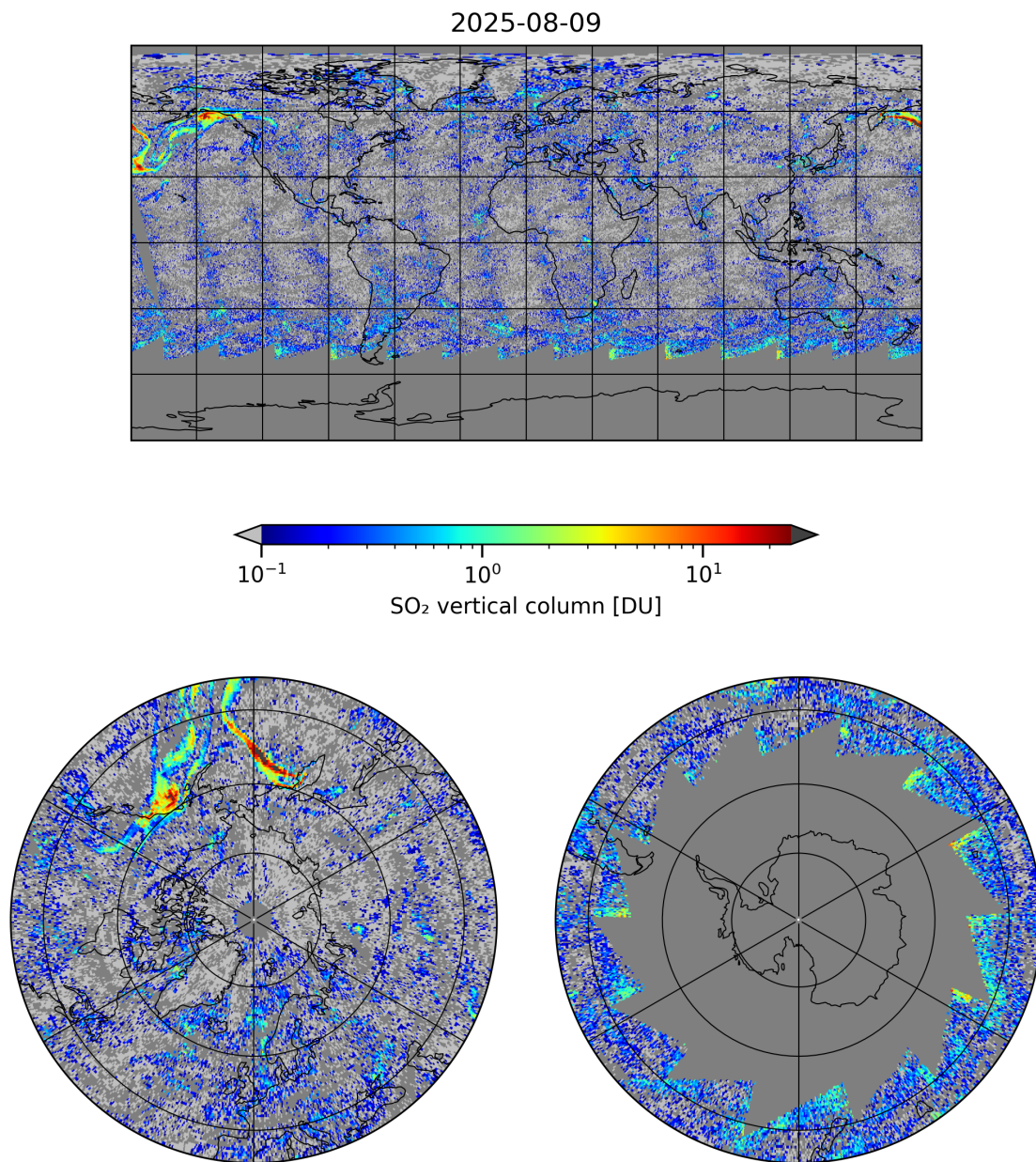


Figure 4: Map of “SO₂ vertical column” for 2025-08-09 to 2025-08-10

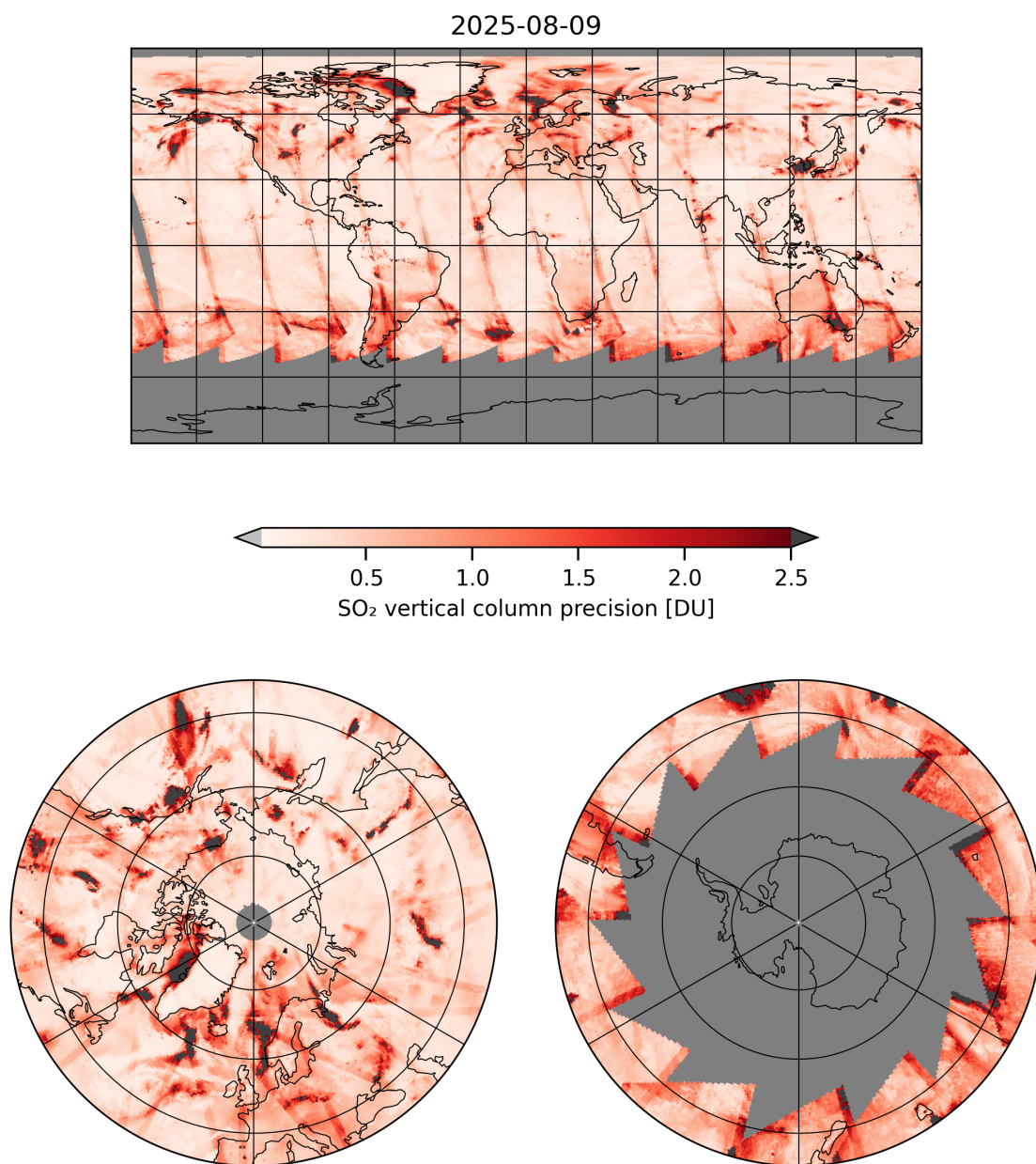


Figure 5: Map of “SO₂ vertical column precision” for 2025-08-09 to 2025-08-10

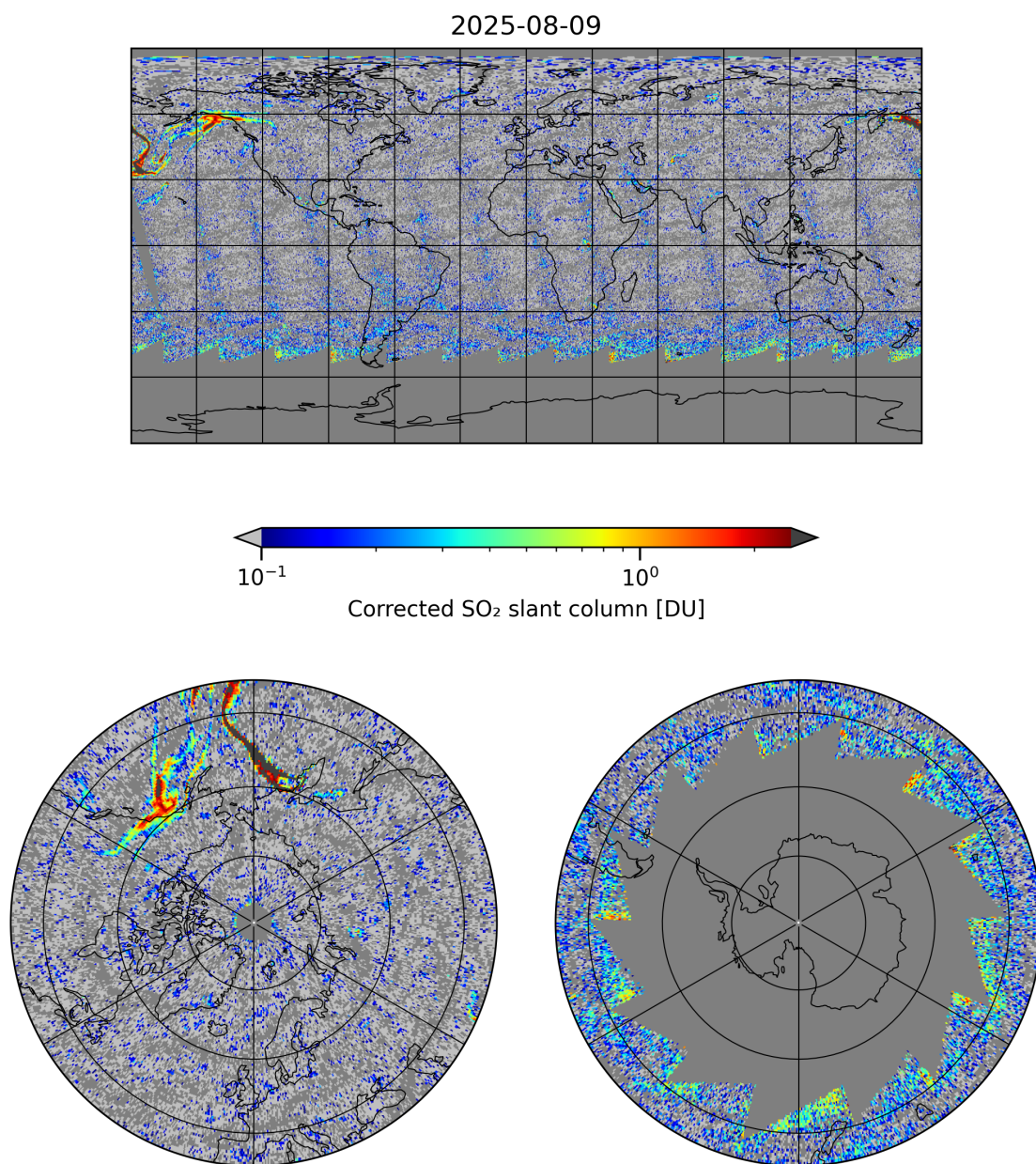


Figure 6: Map of “Corrected SO₂ slant column” for 2025-08-09 to 2025-08-10

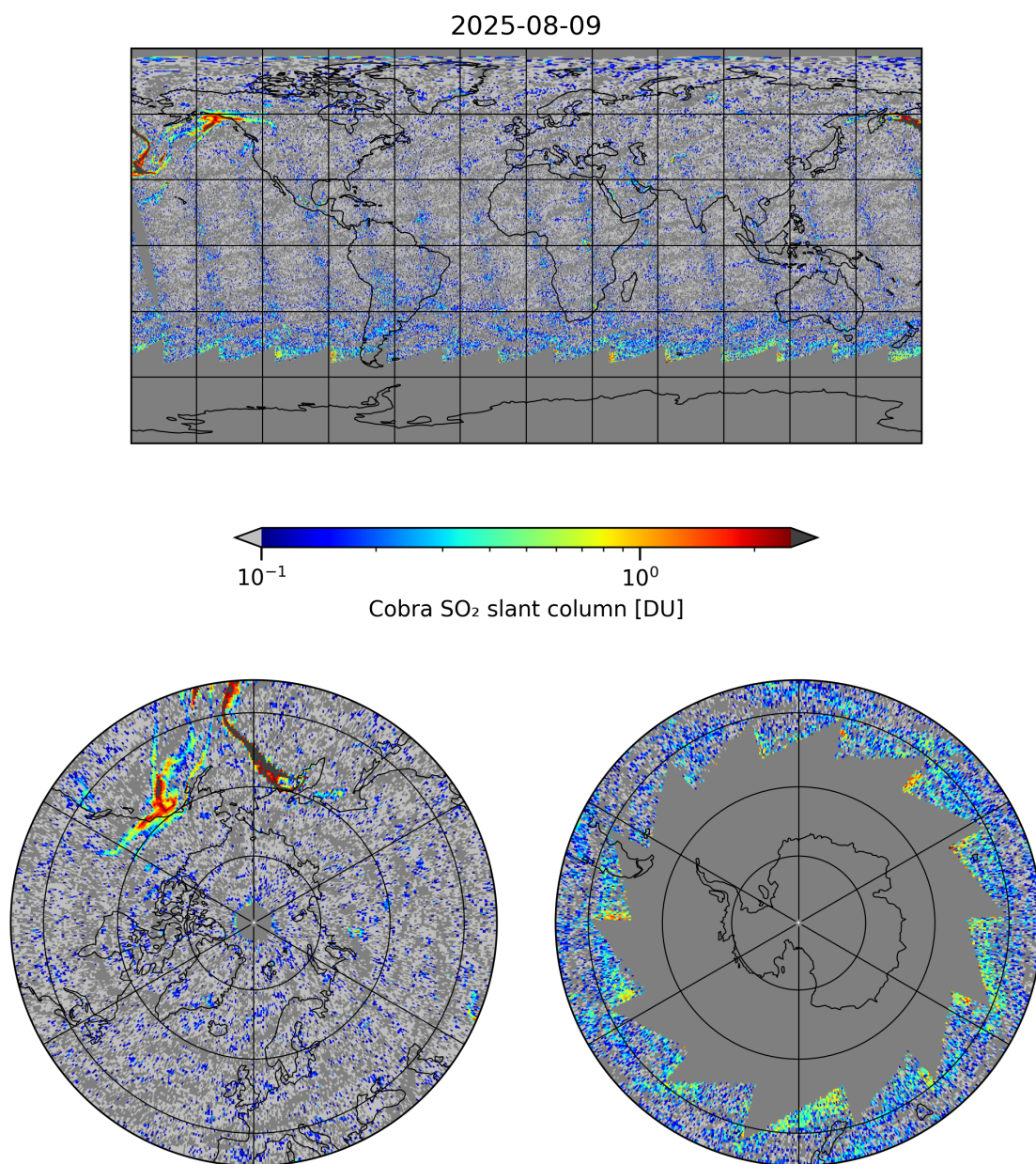


Figure 7: Map of “Cobra SO₂ slant column” for 2025-08-09 to 2025-08-10

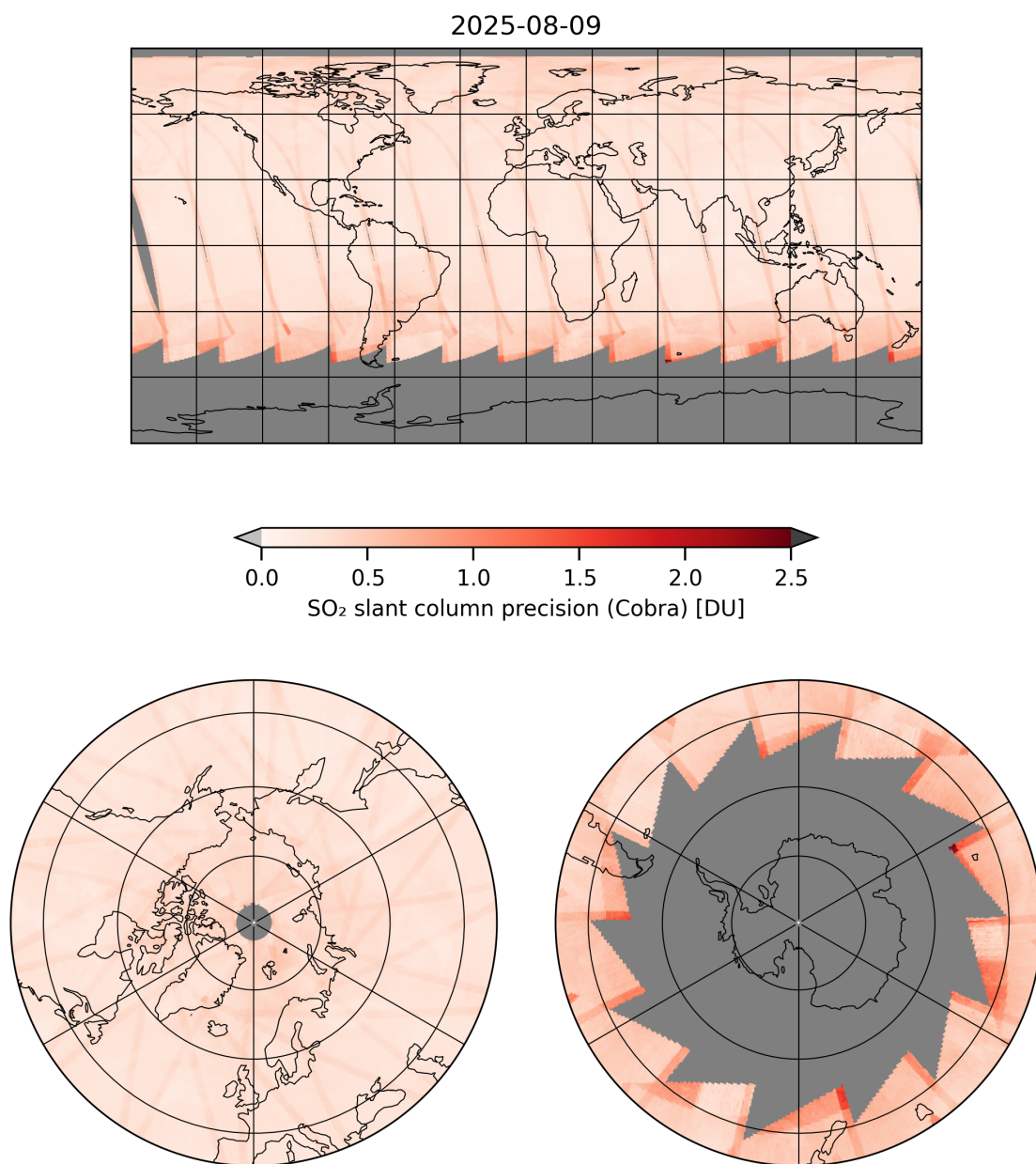


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-08-09 to 2025-08-10

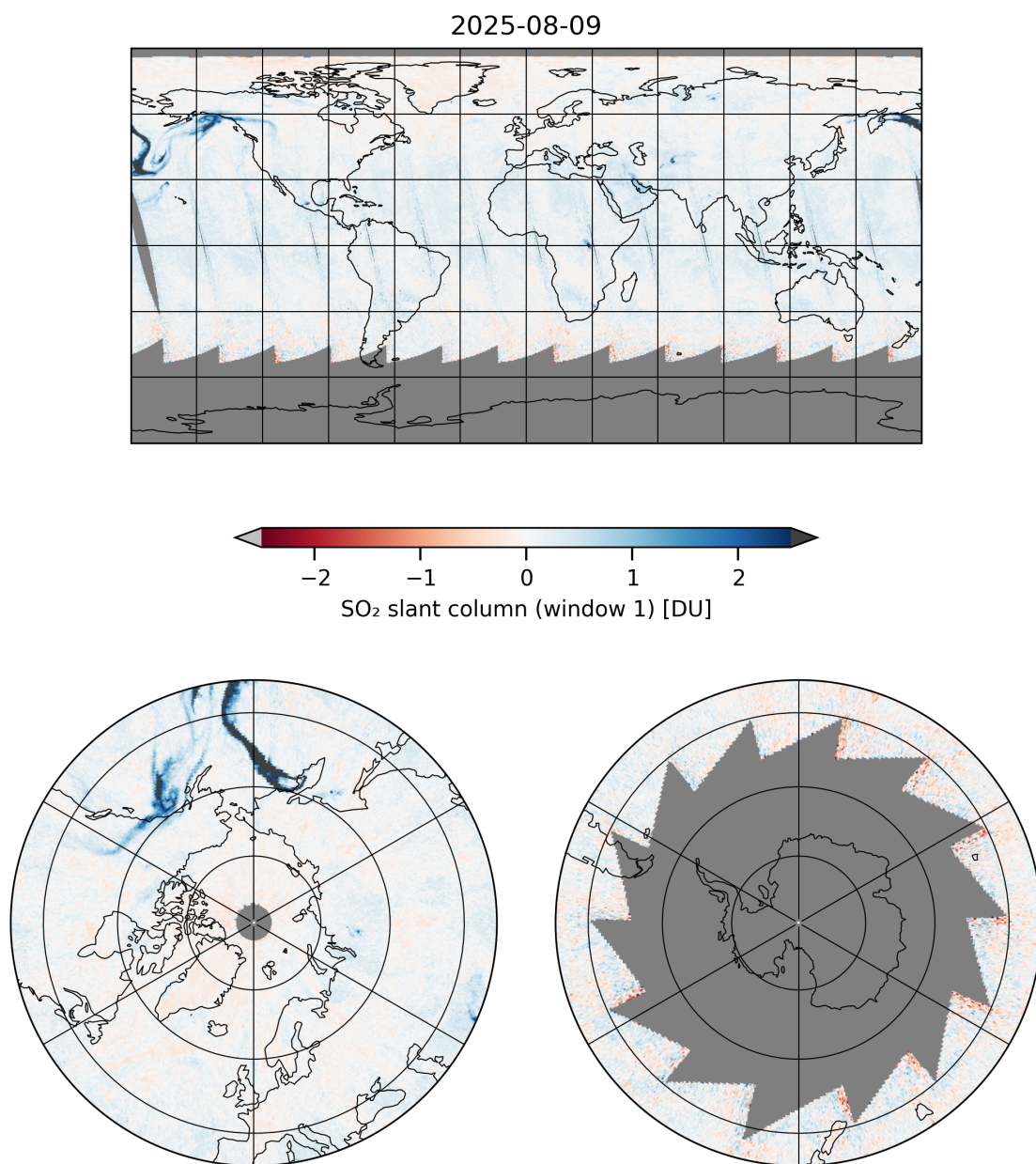


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-08-09 to 2025-08-10

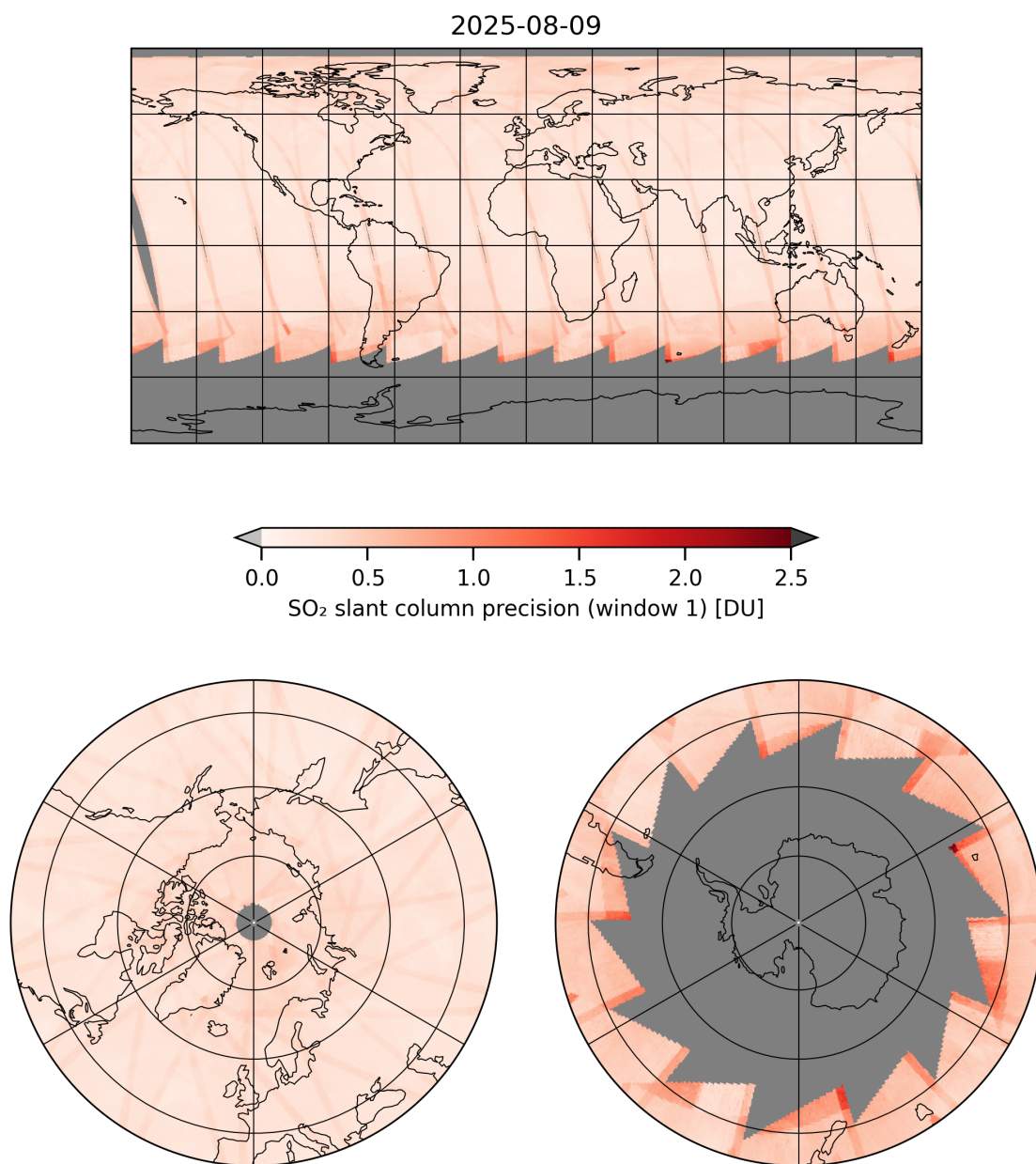


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-08-09 to 2025-08-10

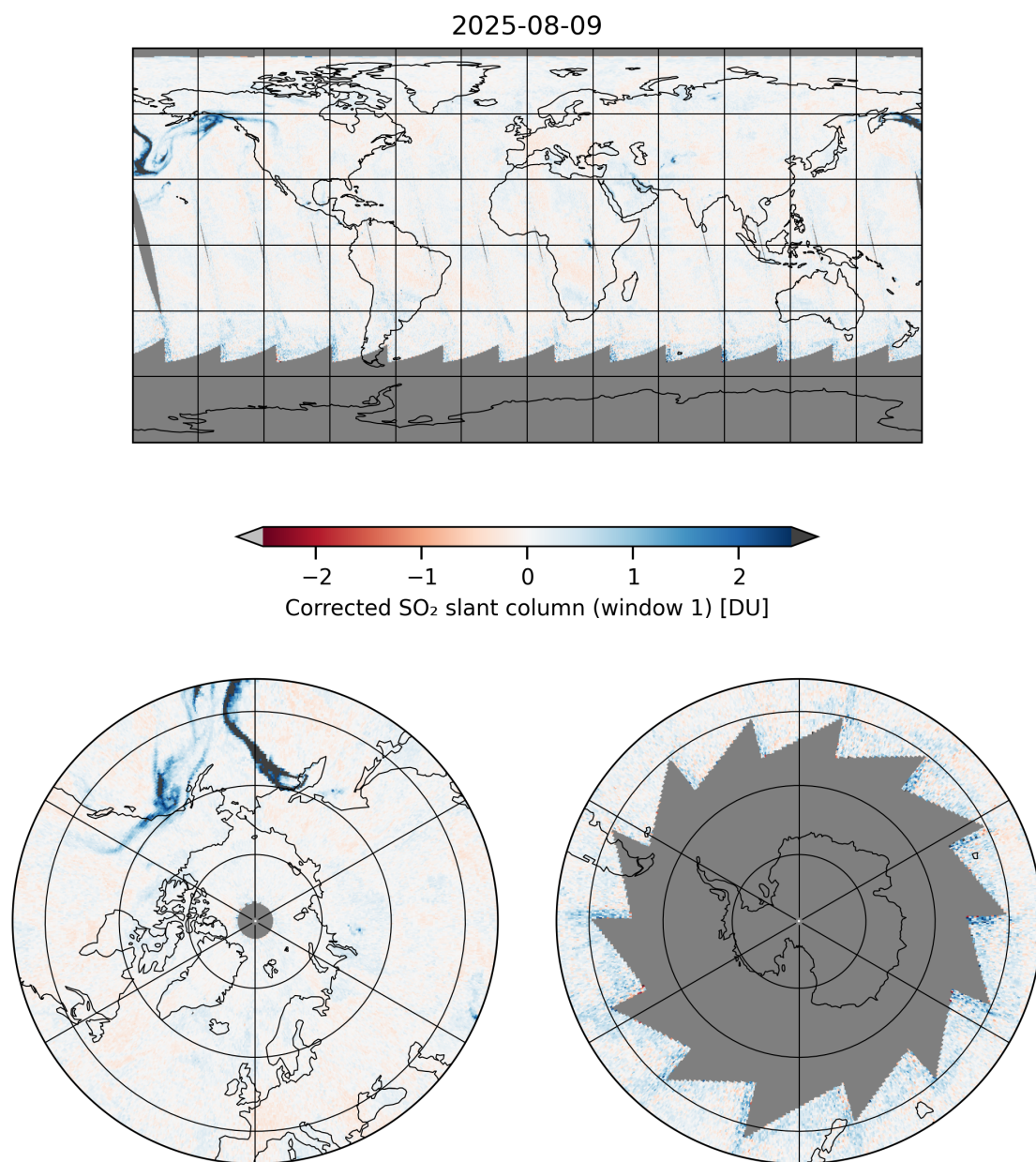


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-08-09 to 2025-08-10

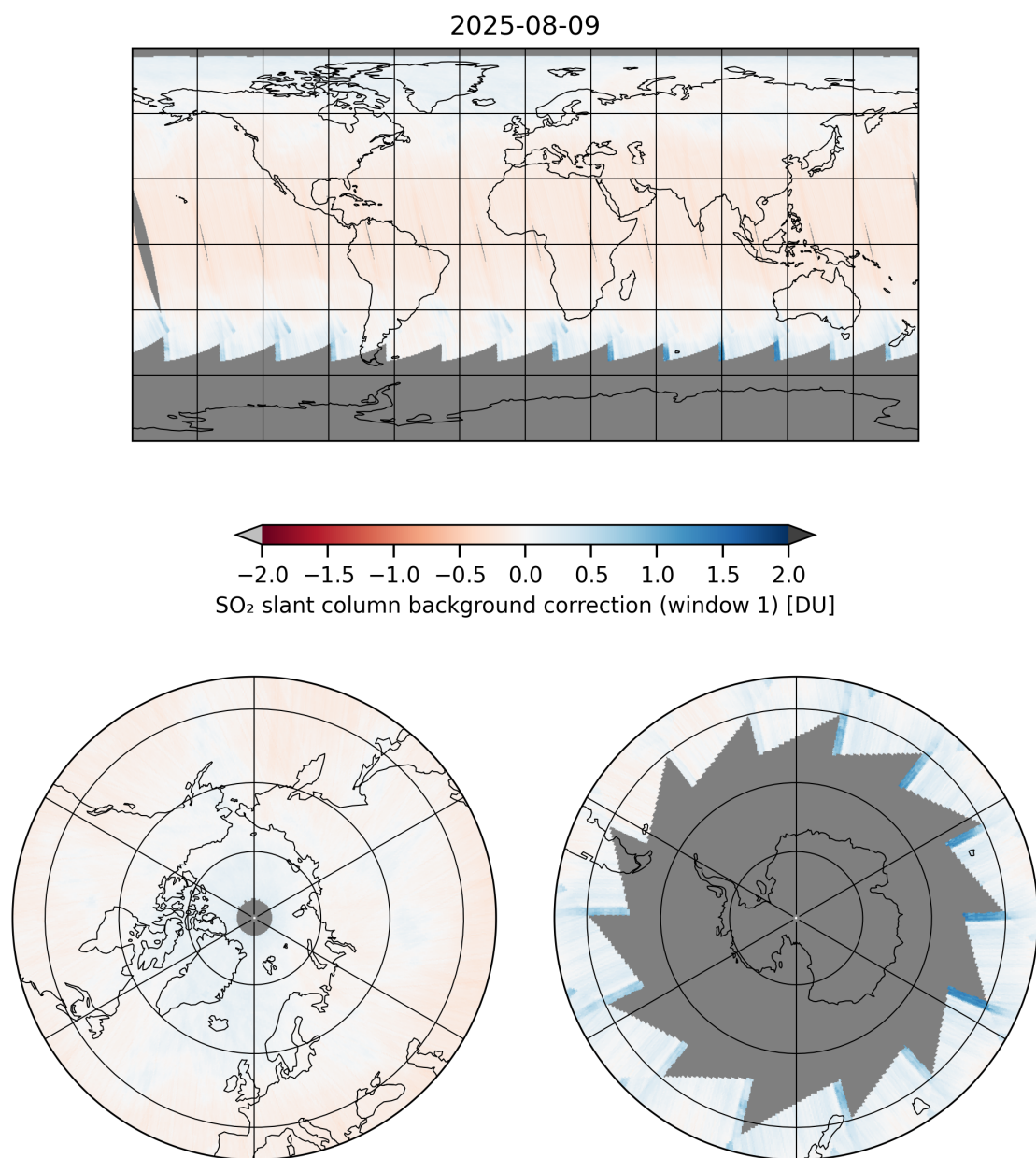


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-08-09 to 2025-08-10

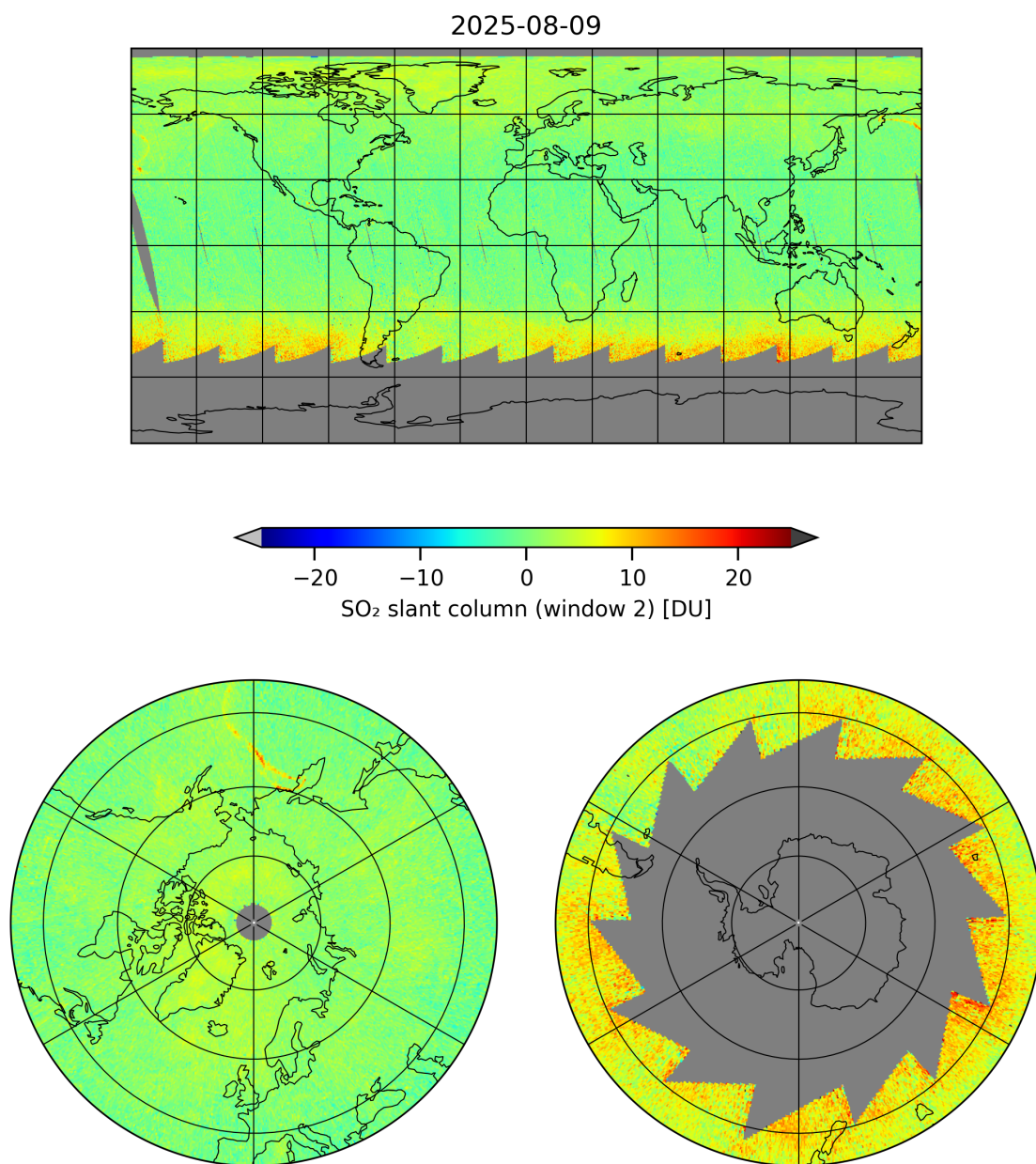


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-08-09 to 2025-08-10

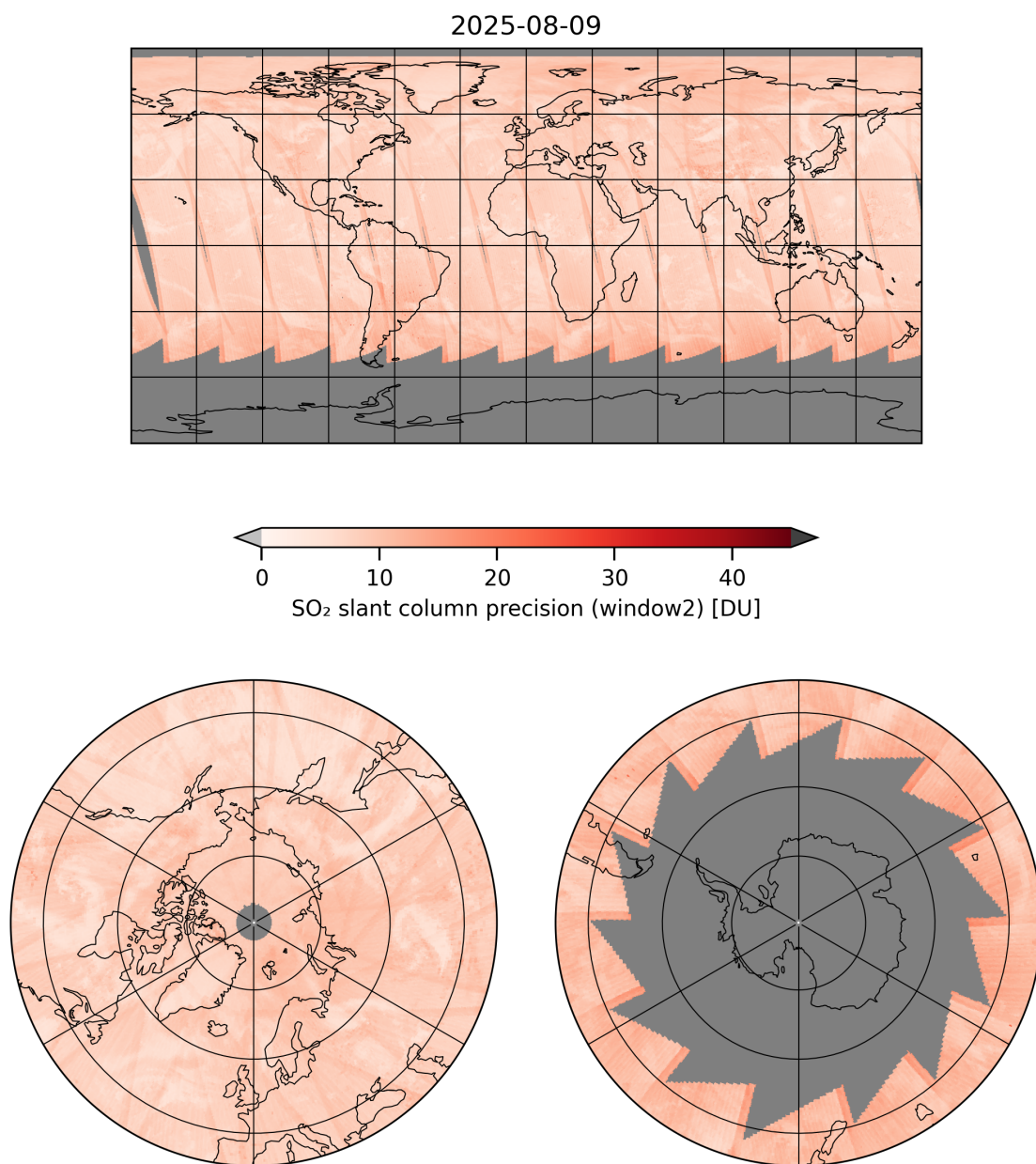


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-08-09 to 2025-08-10

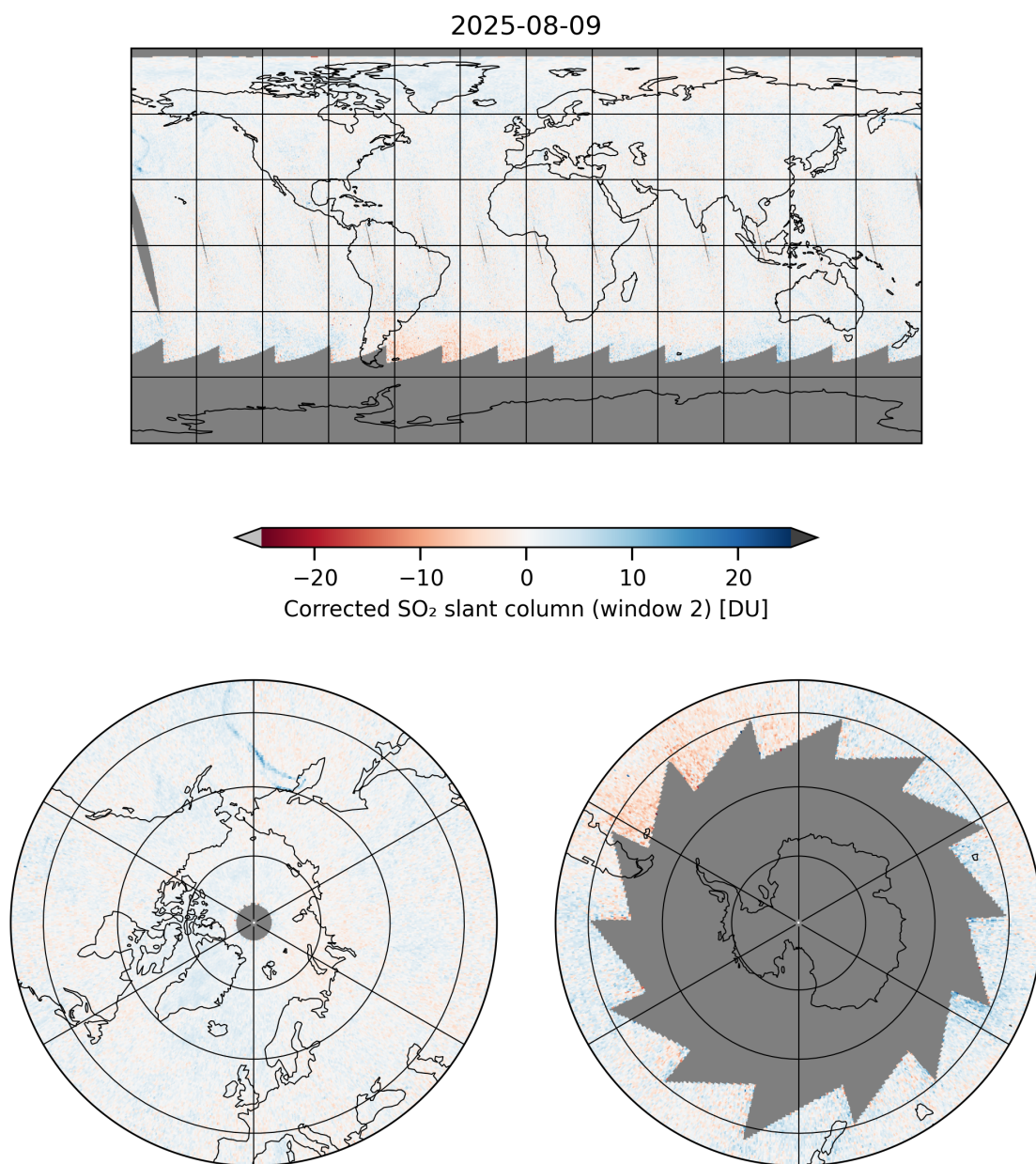


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-08-09 to 2025-08-10

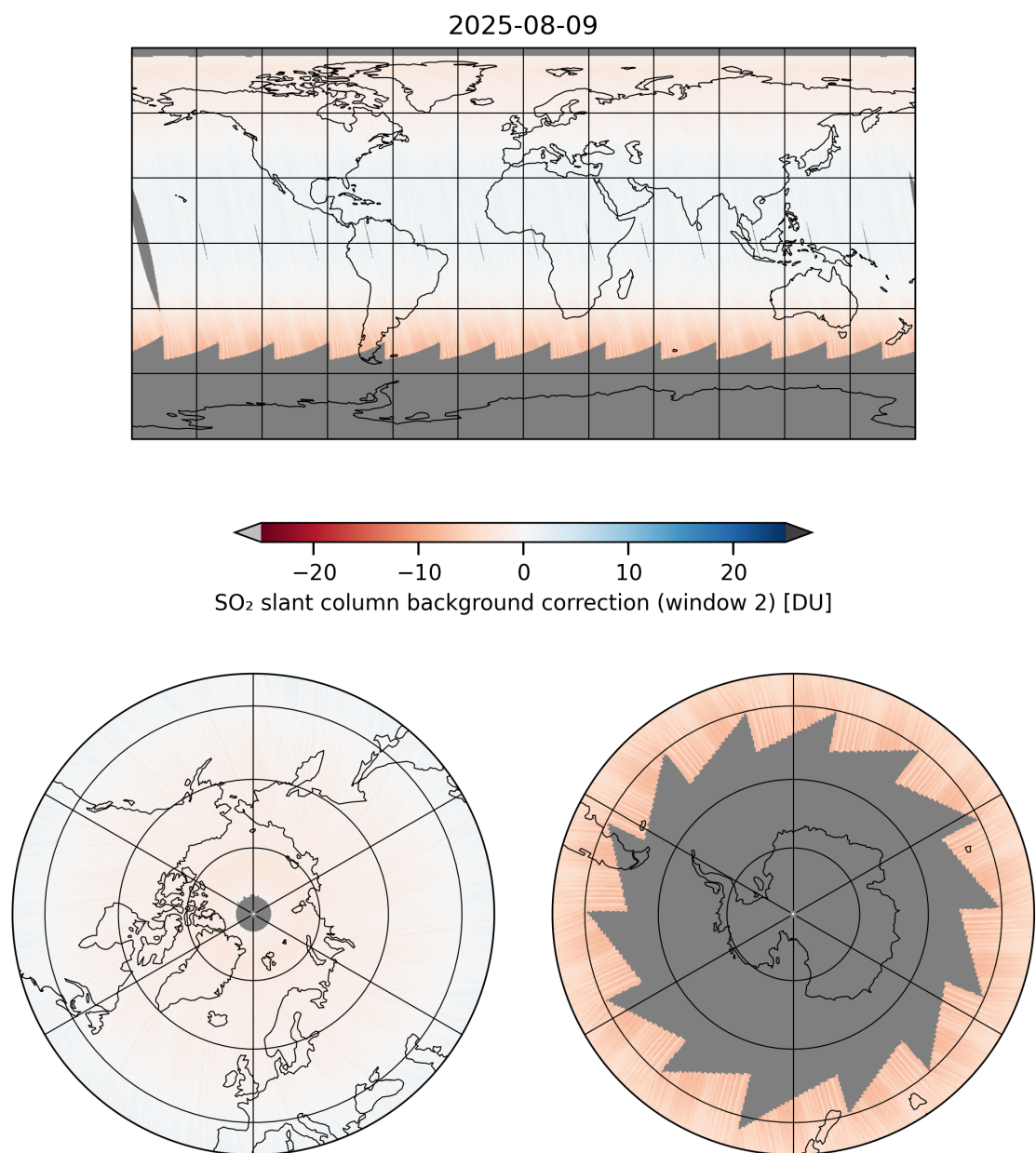


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-08-09 to 2025-08-10

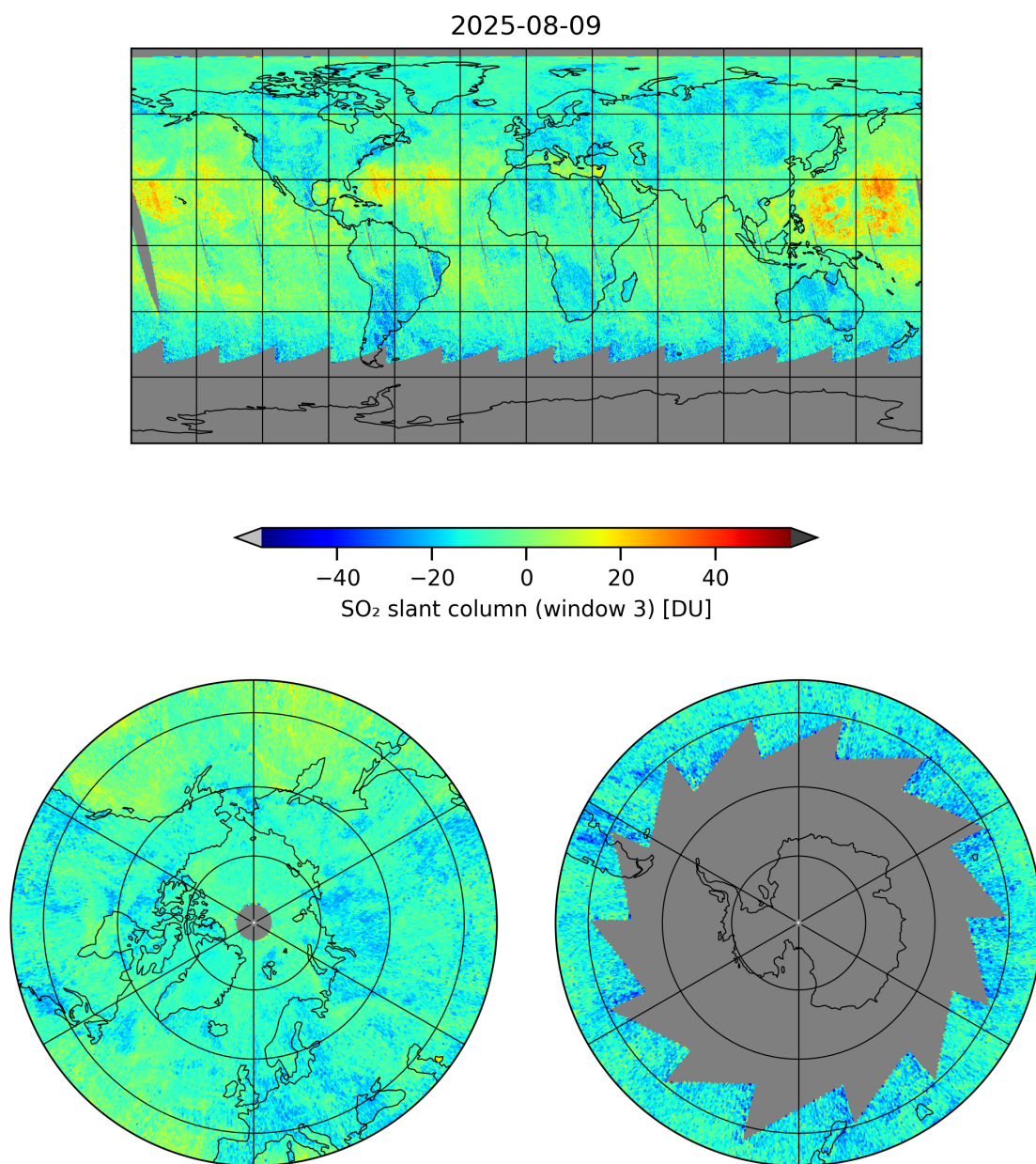


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-08-09 to 2025-08-10

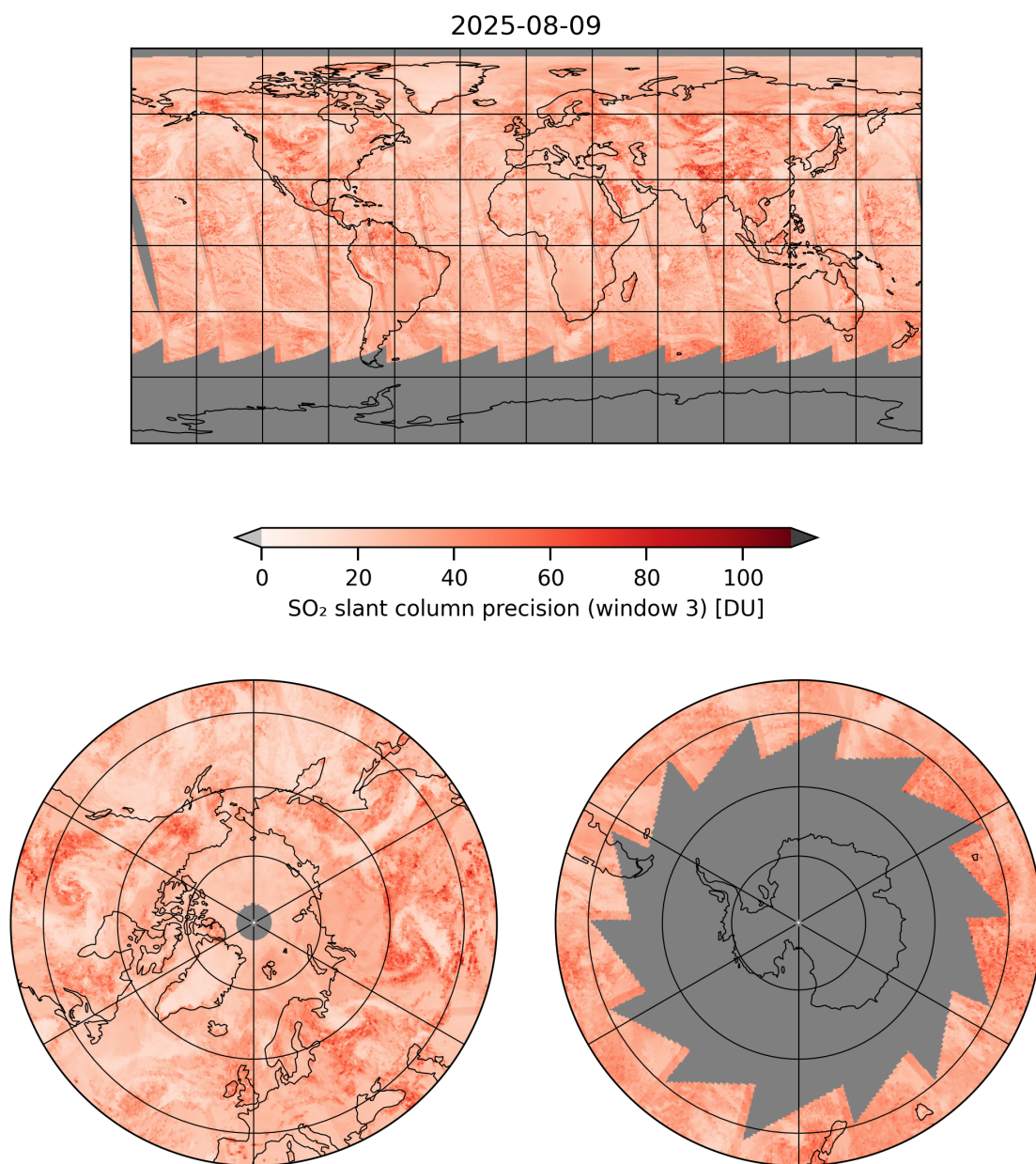


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-08-09 to 2025-08-10

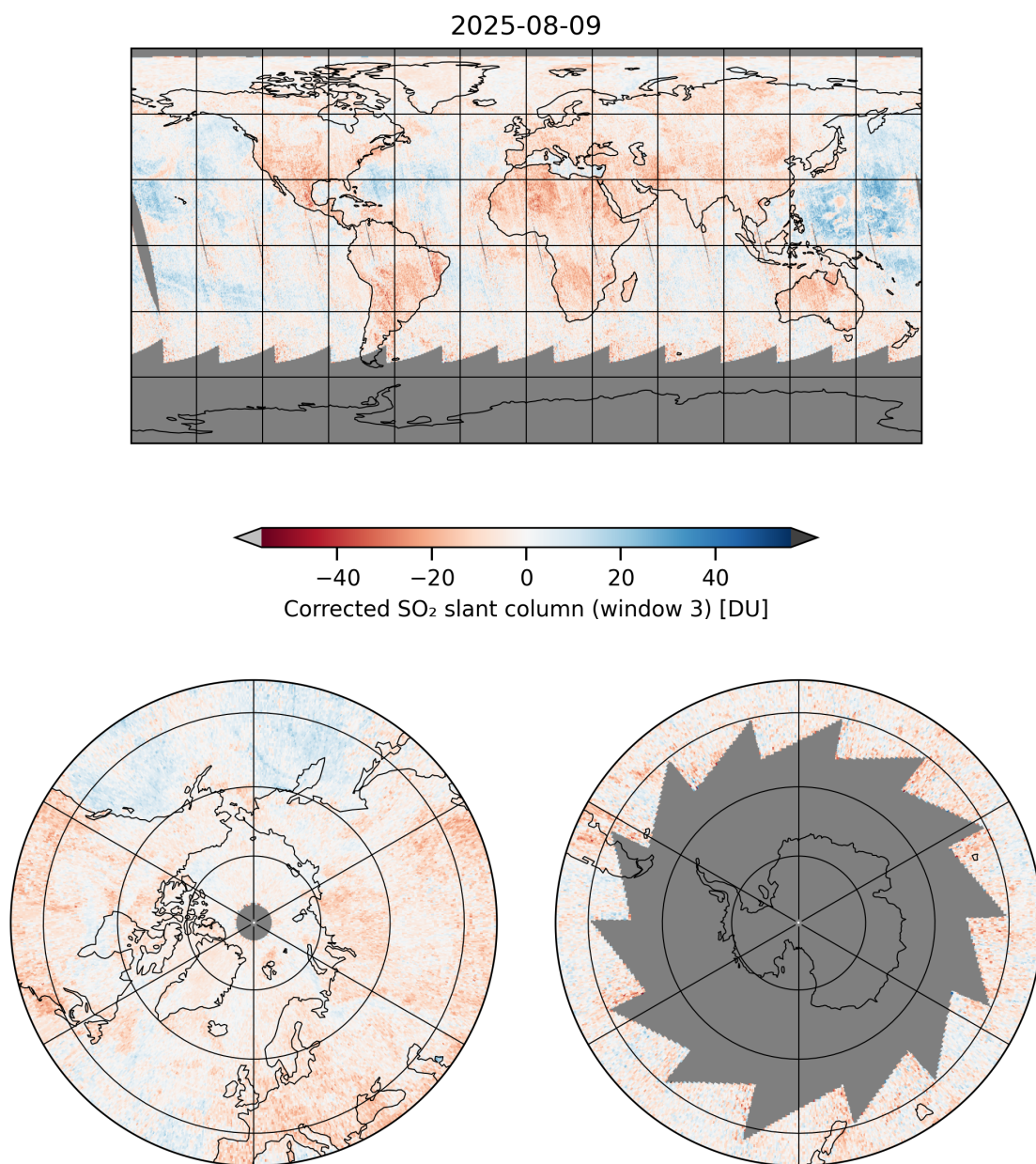


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-08-09 to 2025-08-10

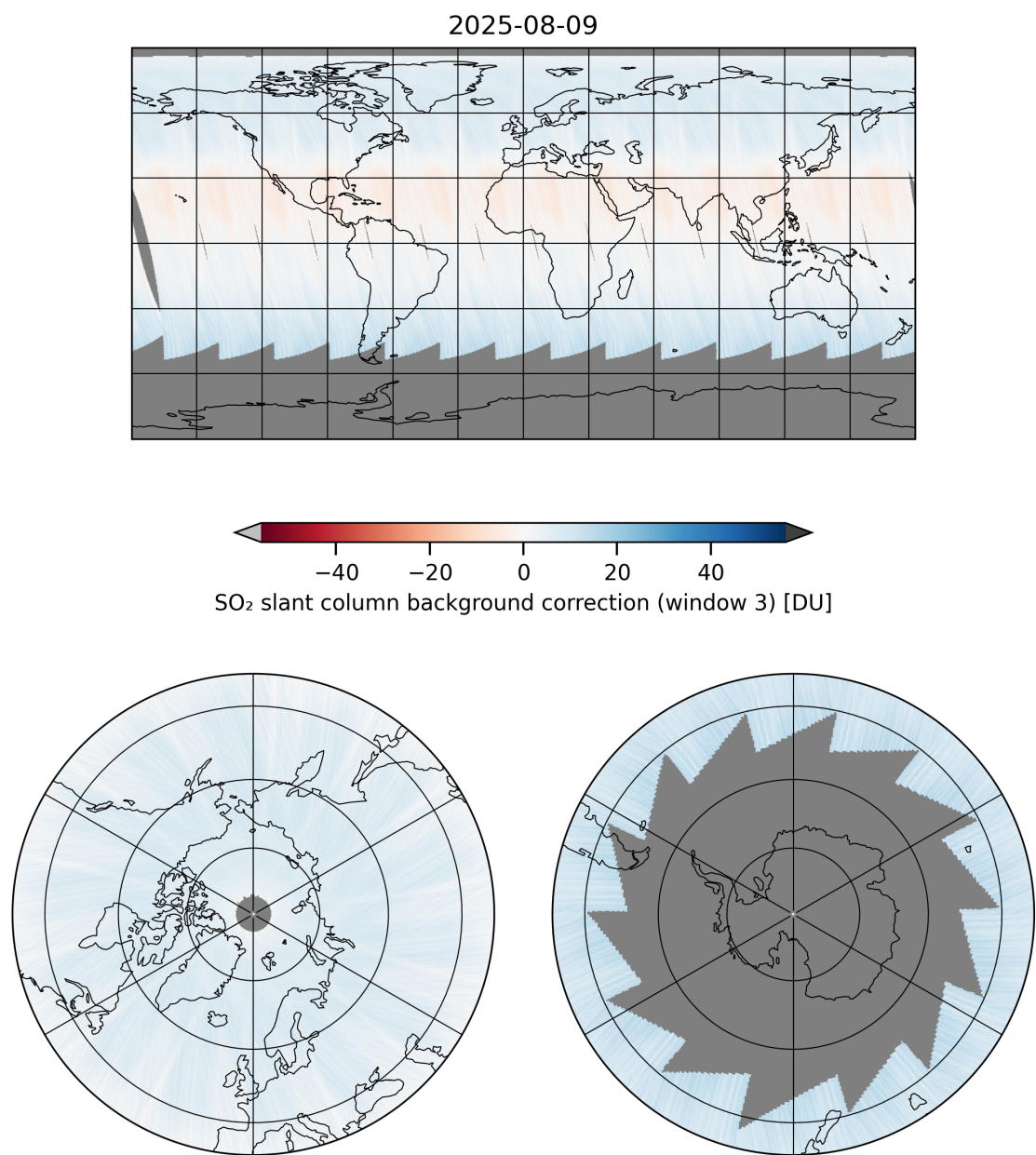


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-08-09 to 2025-08-10

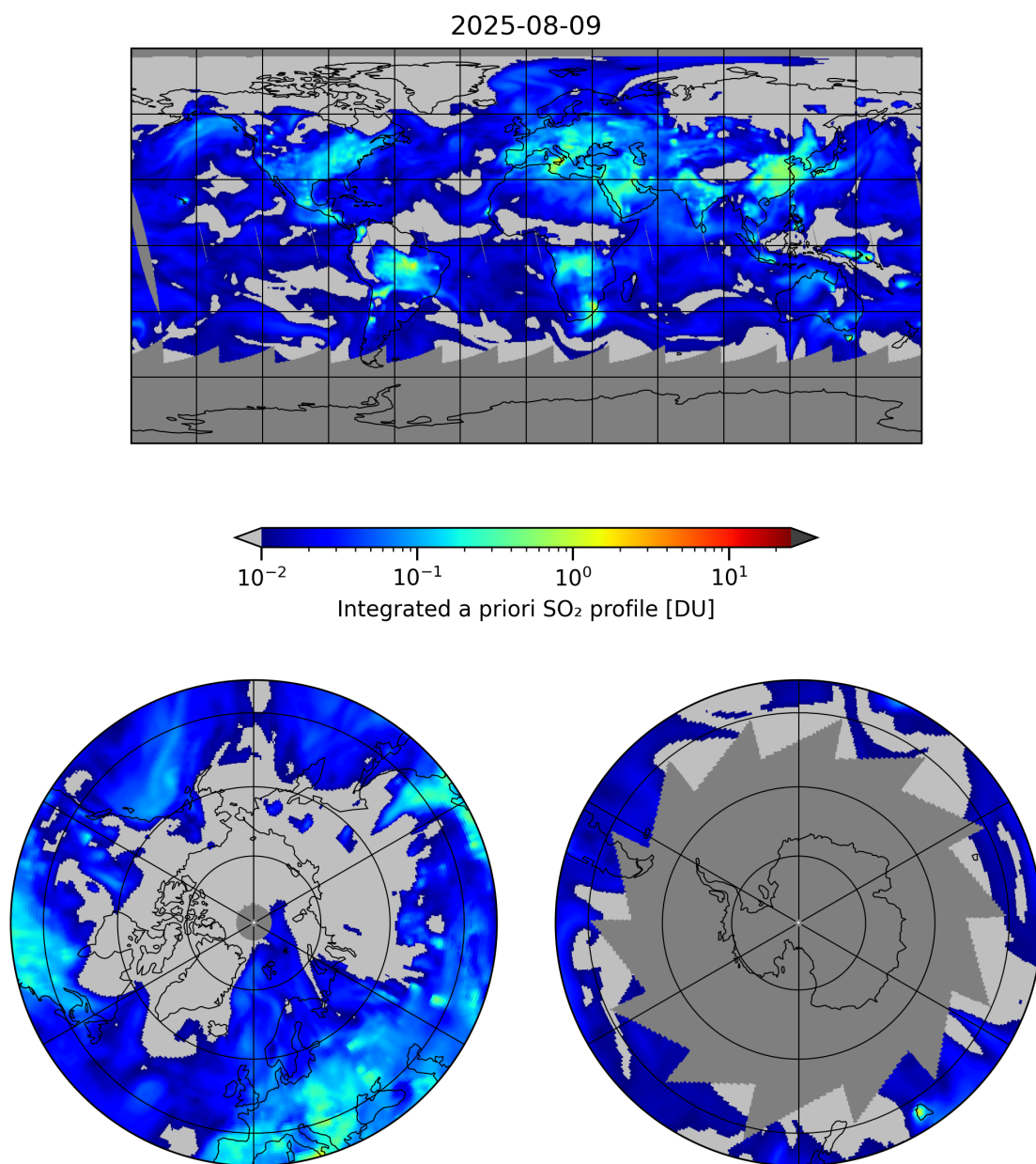


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-08-09 to 2025-08-10

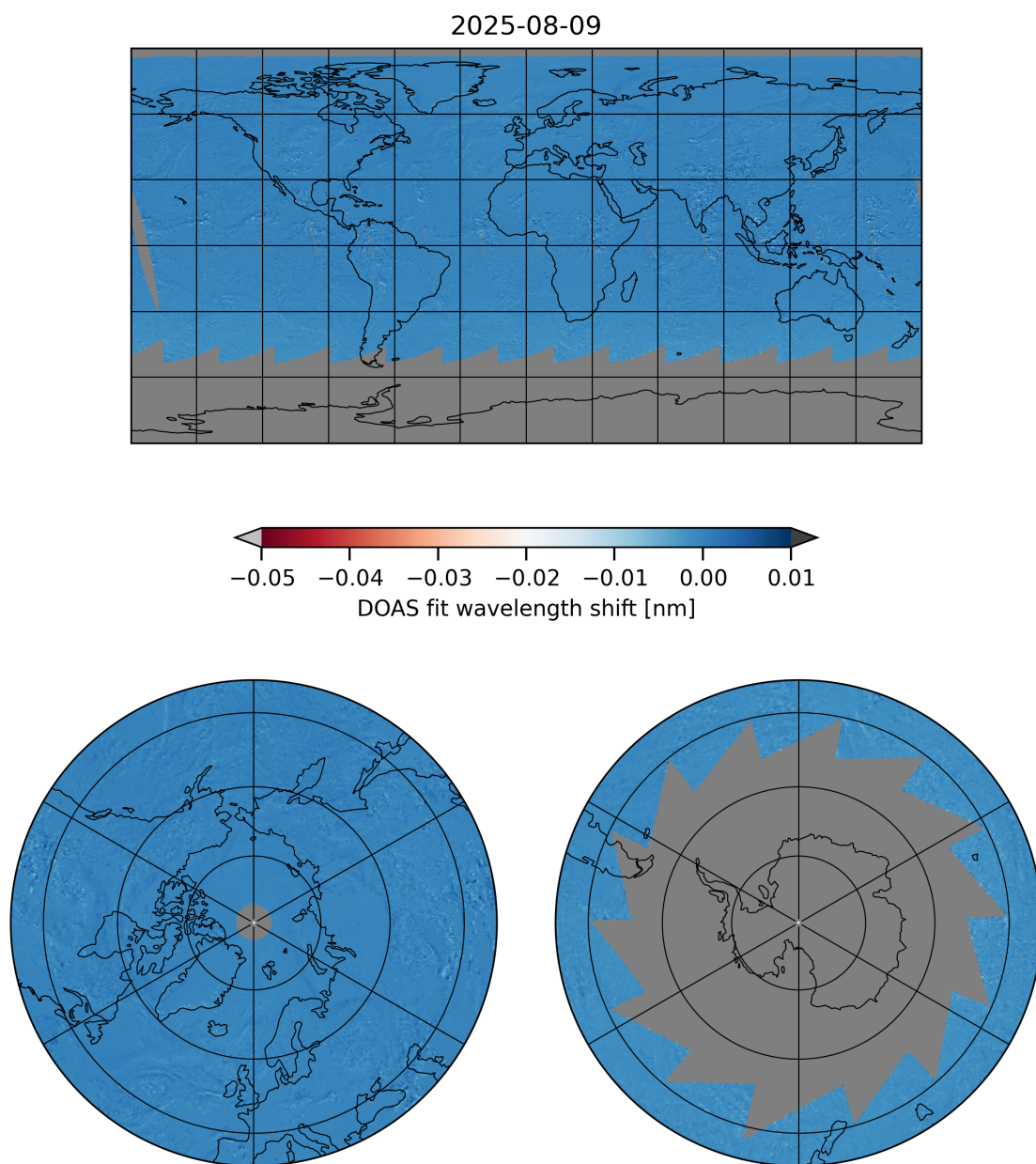


Figure 22: Map of “DOAS fit wavelength shift” for 2025-08-09 to 2025-08-10

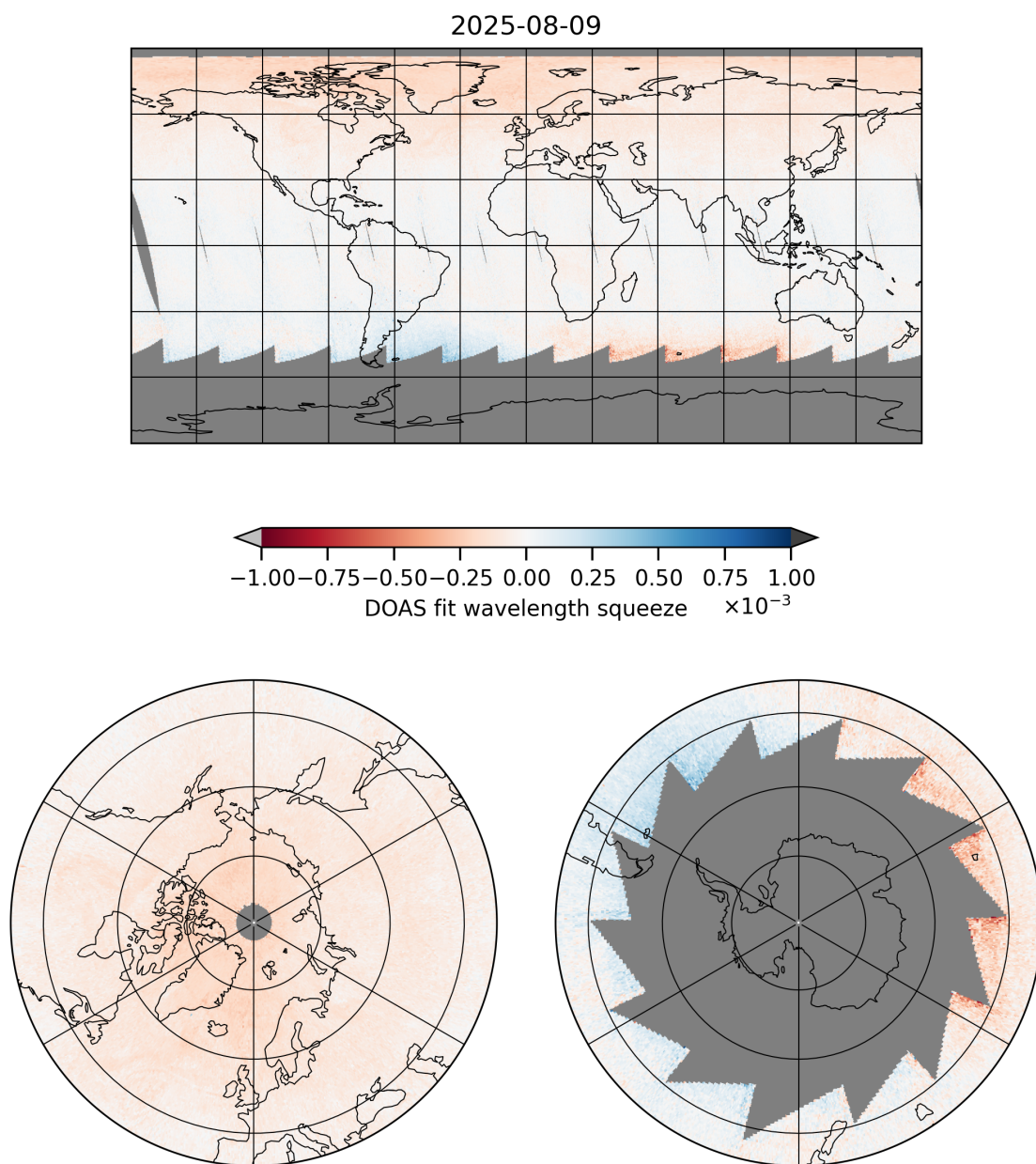


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-08-09 to 2025-08-10

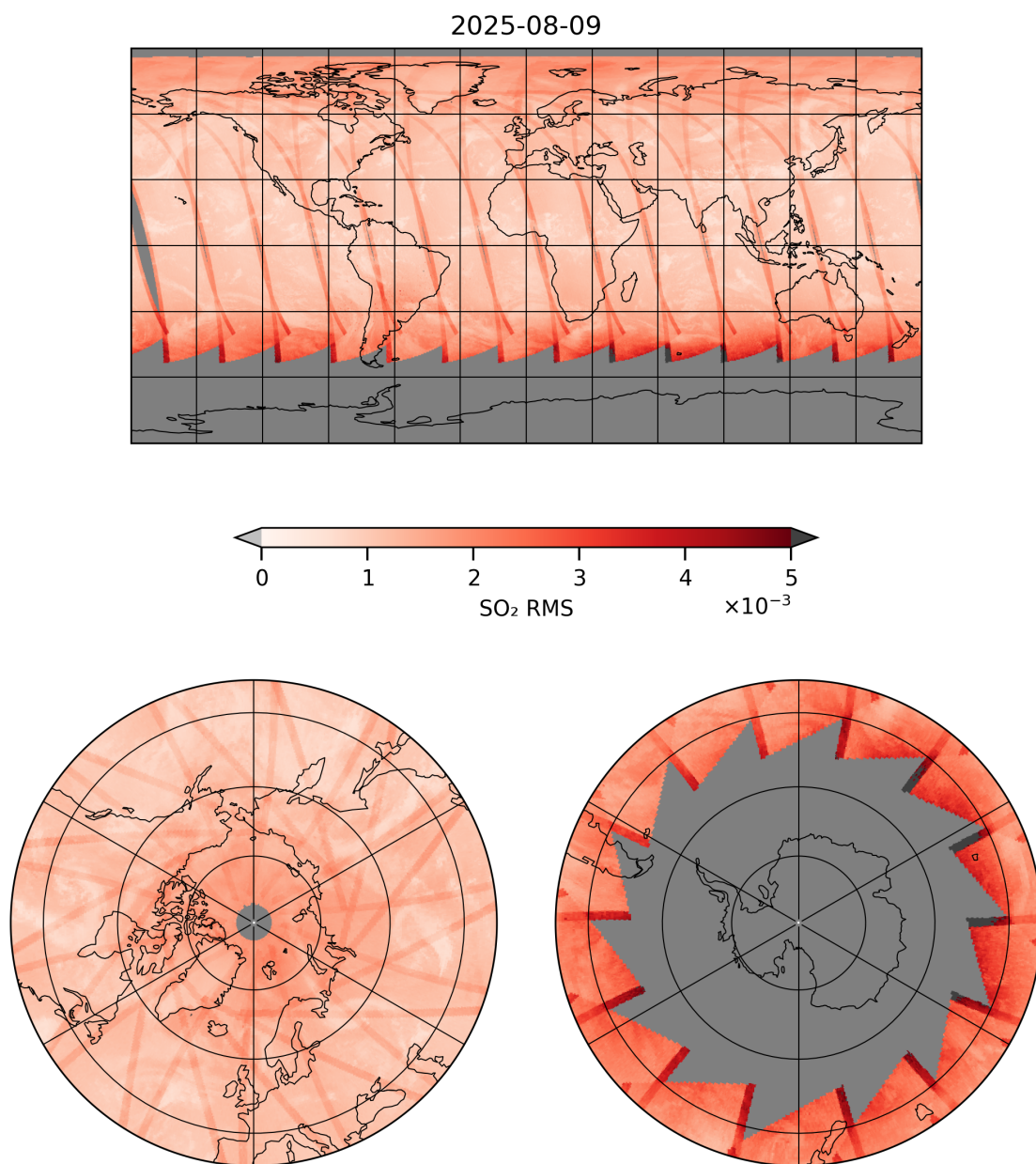


Figure 24: Map of “SO₂ RMS” for 2025-08-09 to 2025-08-10

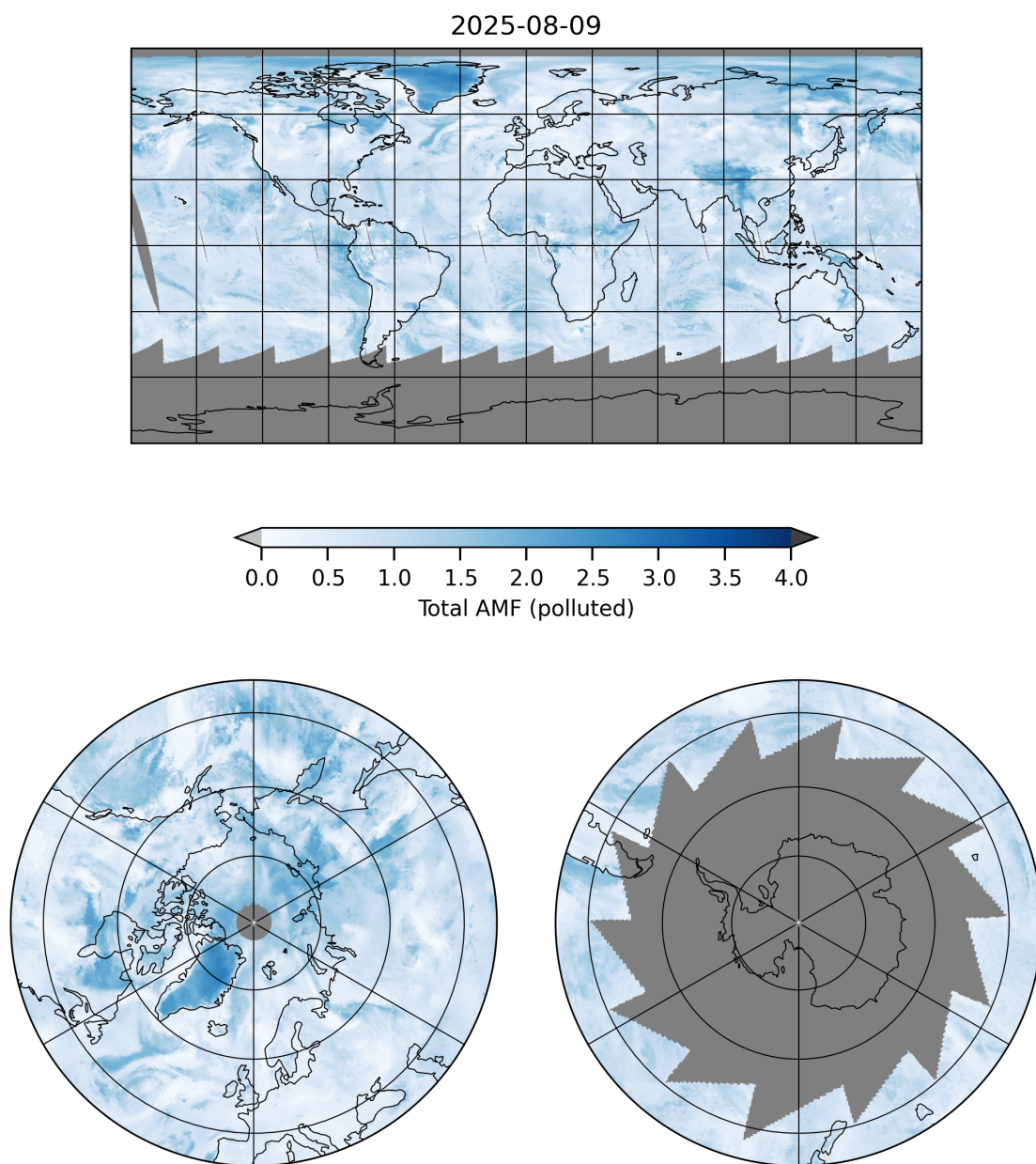


Figure 25: Map of “Total AMF (polluted)” for 2025-08-09 to 2025-08-10

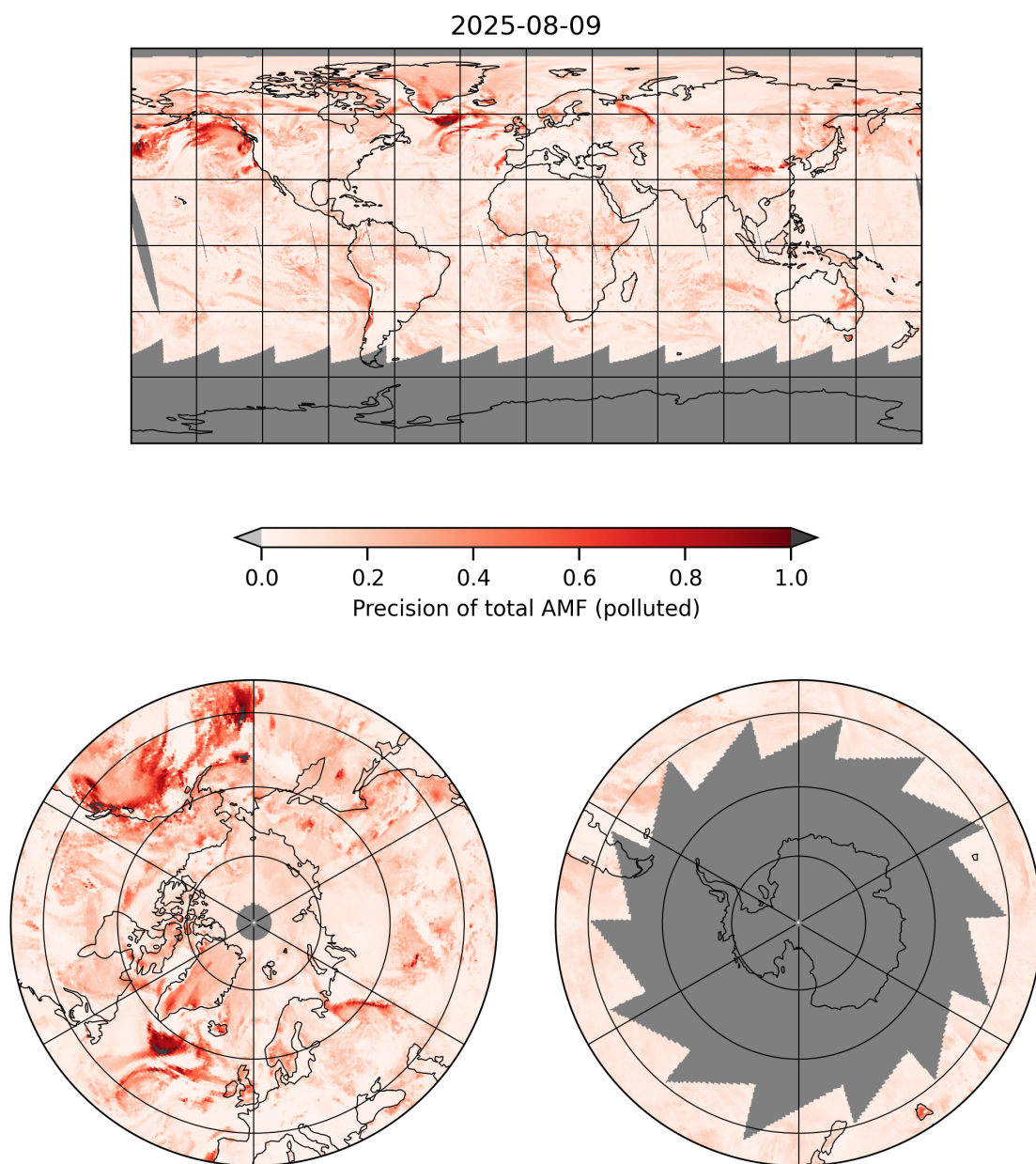


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-08-09 to 2025-08-10

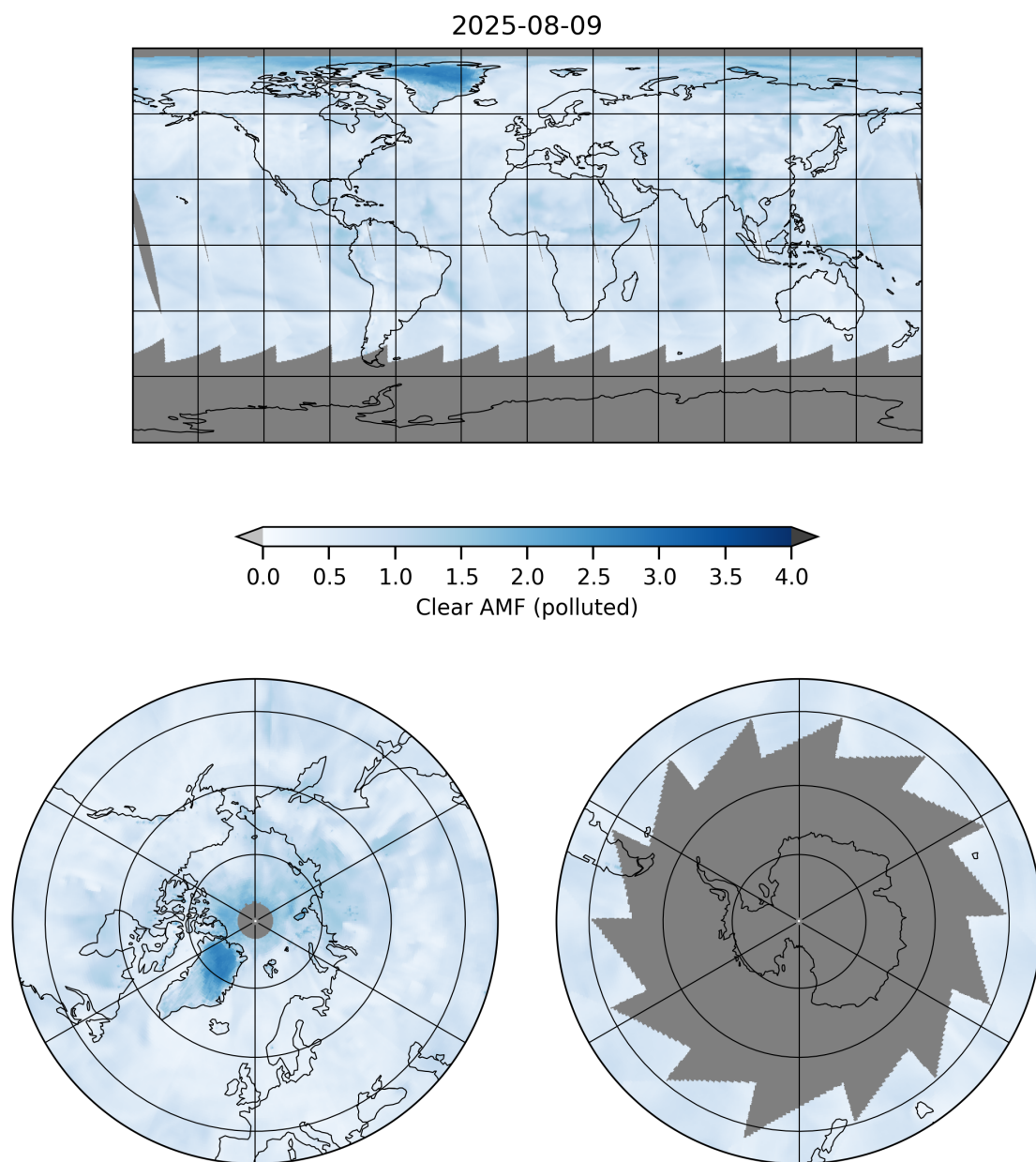


Figure 27: Map of “Clear AMF (polluted)” for 2025-08-09 to 2025-08-10

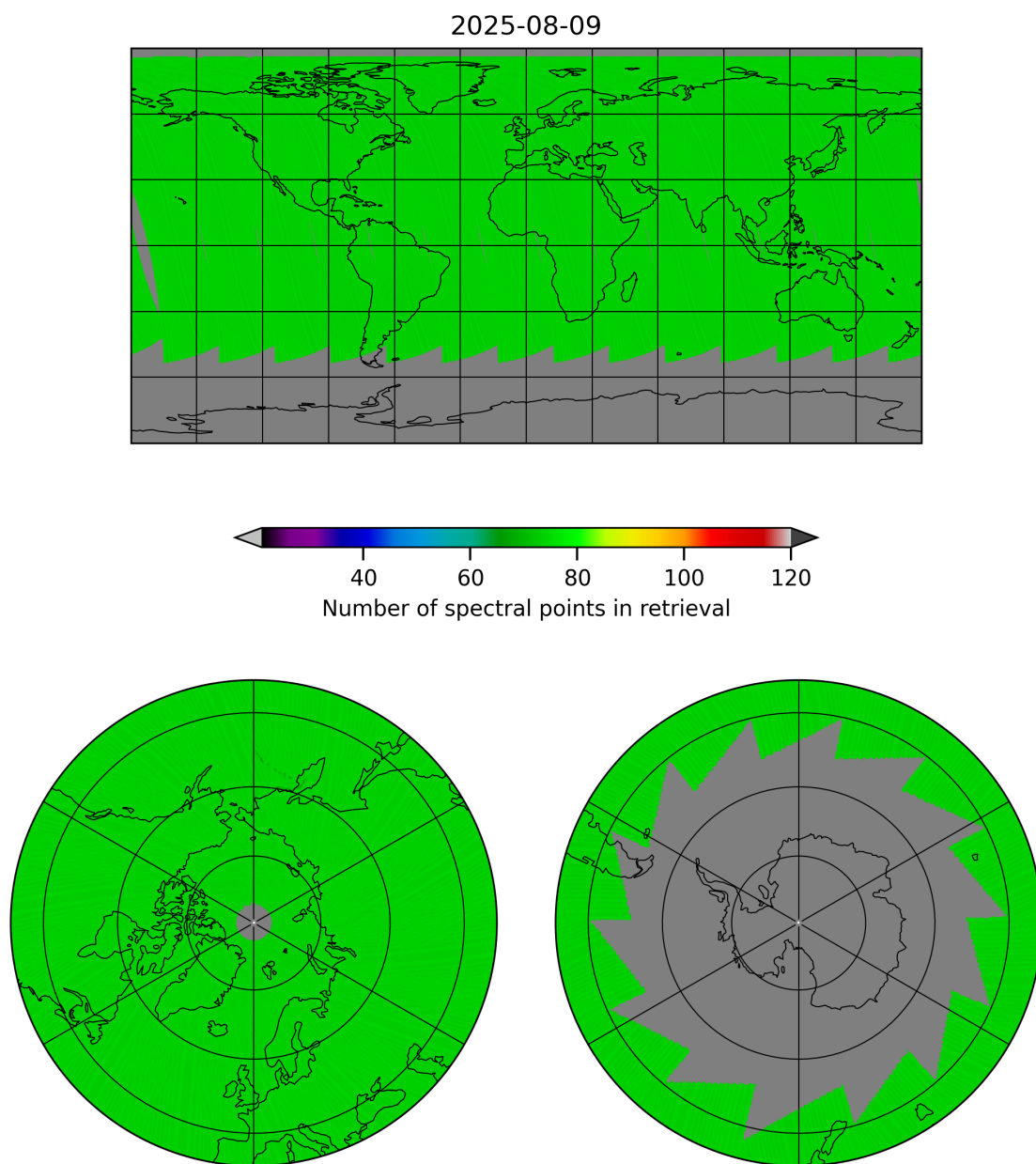


Figure 28: Map of “Number of spectral points in retrieval” for 2025-08-09 to 2025-08-10

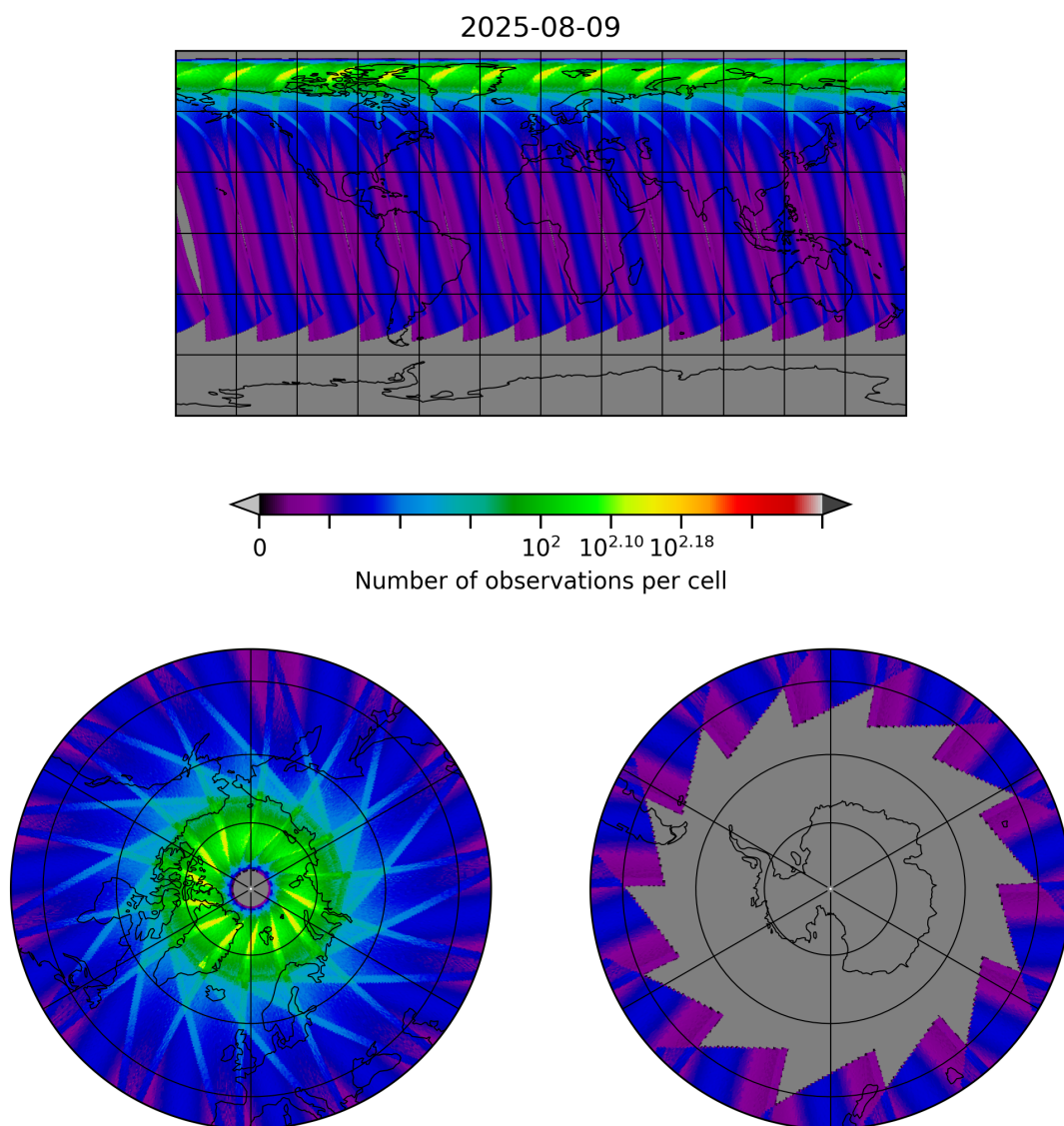


Figure 29: Map of the number of observations for 2025-08-09 to 2025-08-10

7 Zonal average

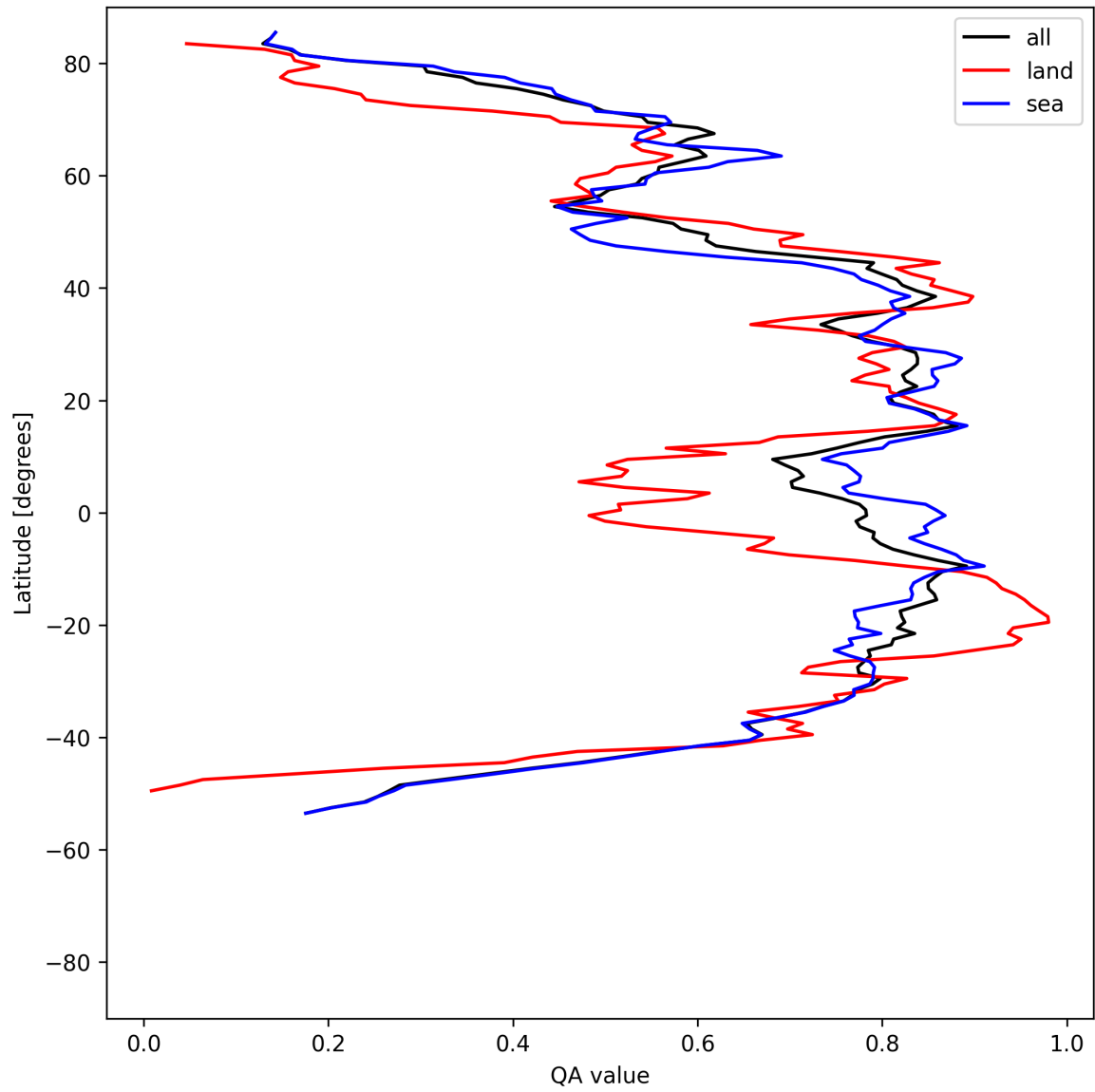


Figure 30: Zonal average of “QA value” for 2025-08-09 to 2025-08-10.

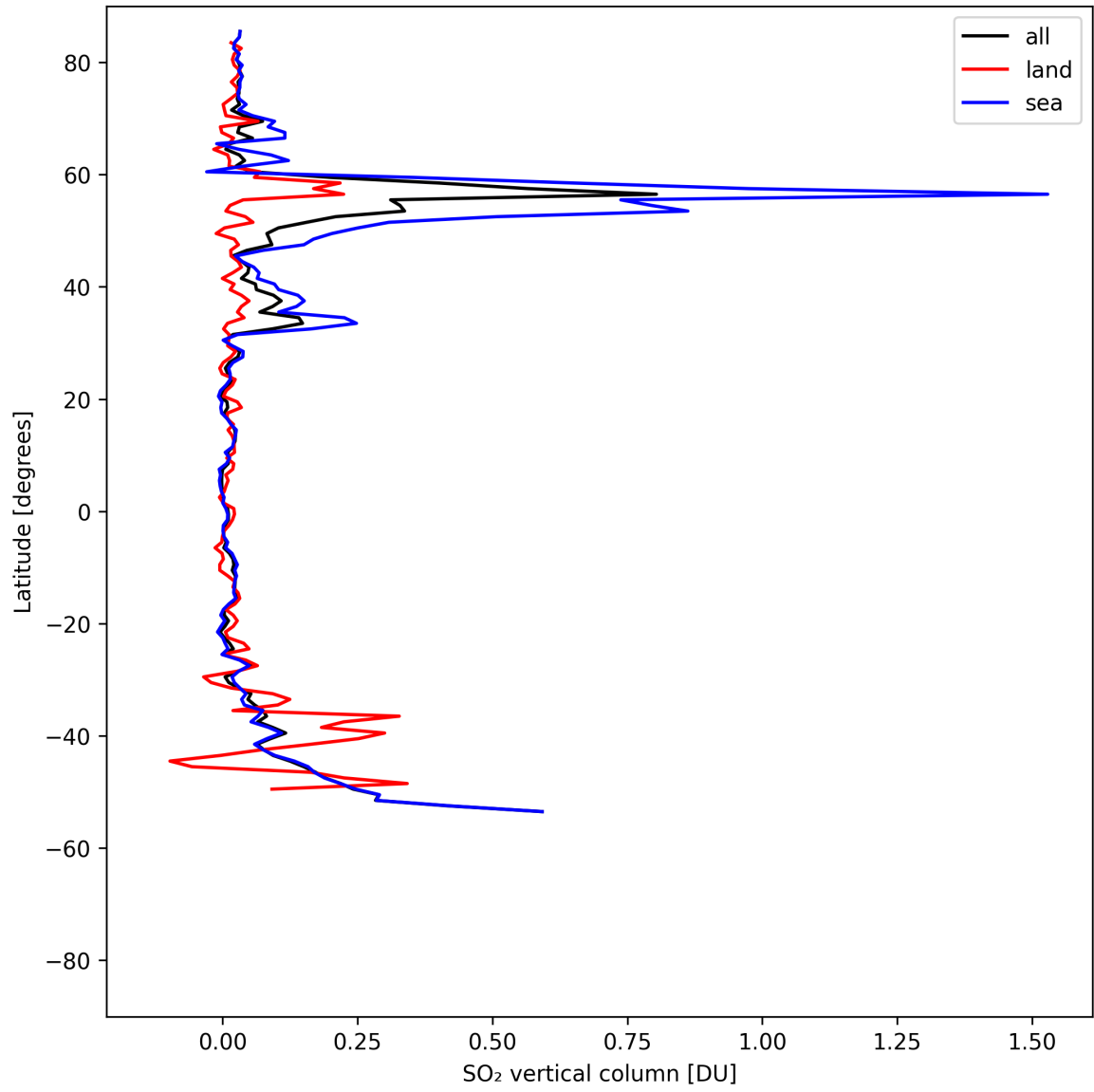


Figure 31: Zonal average of “SO₂ vertical column” for 2025-08-09 to 2025-08-10.

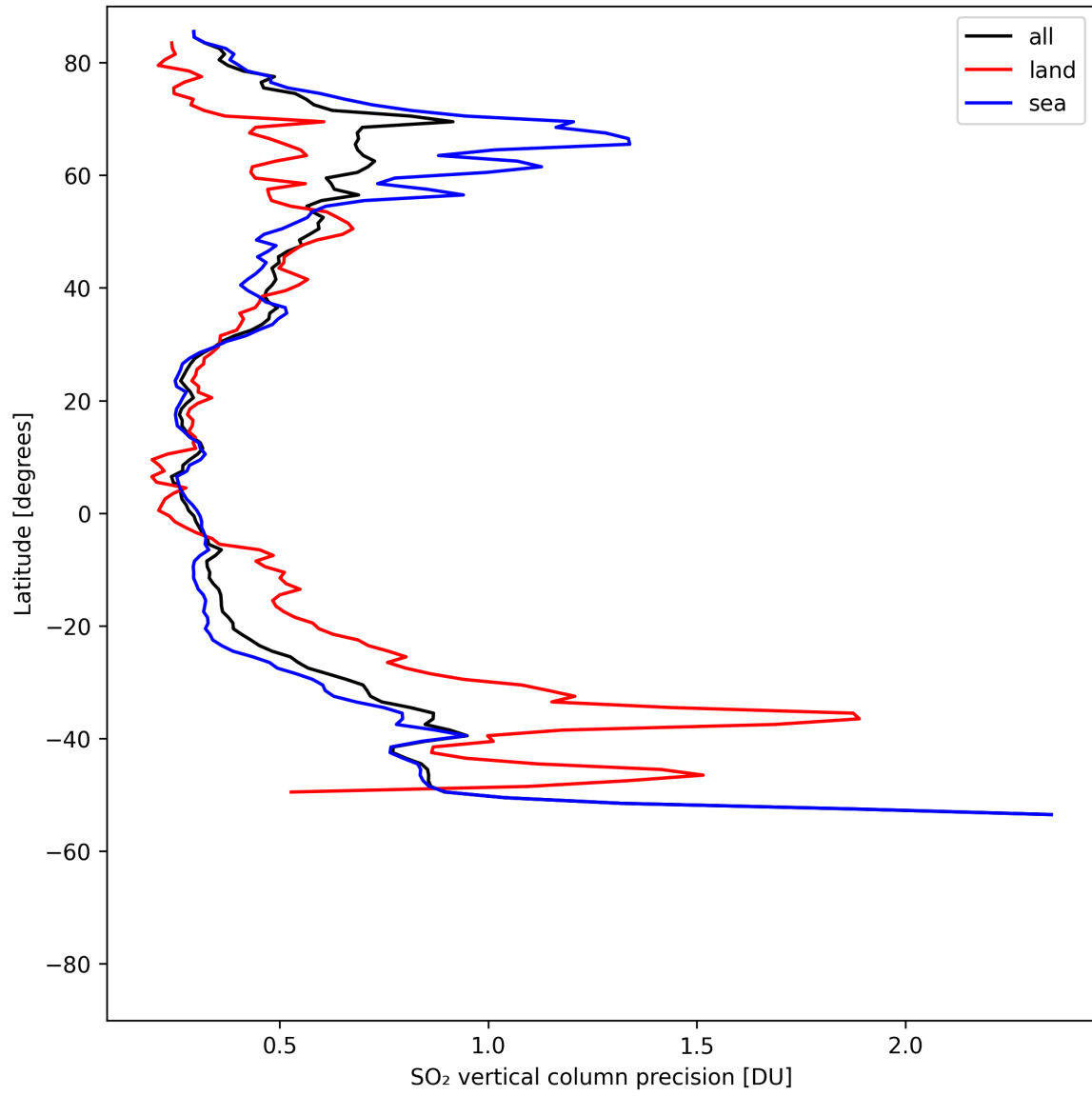


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-08-09 to 2025-08-10.

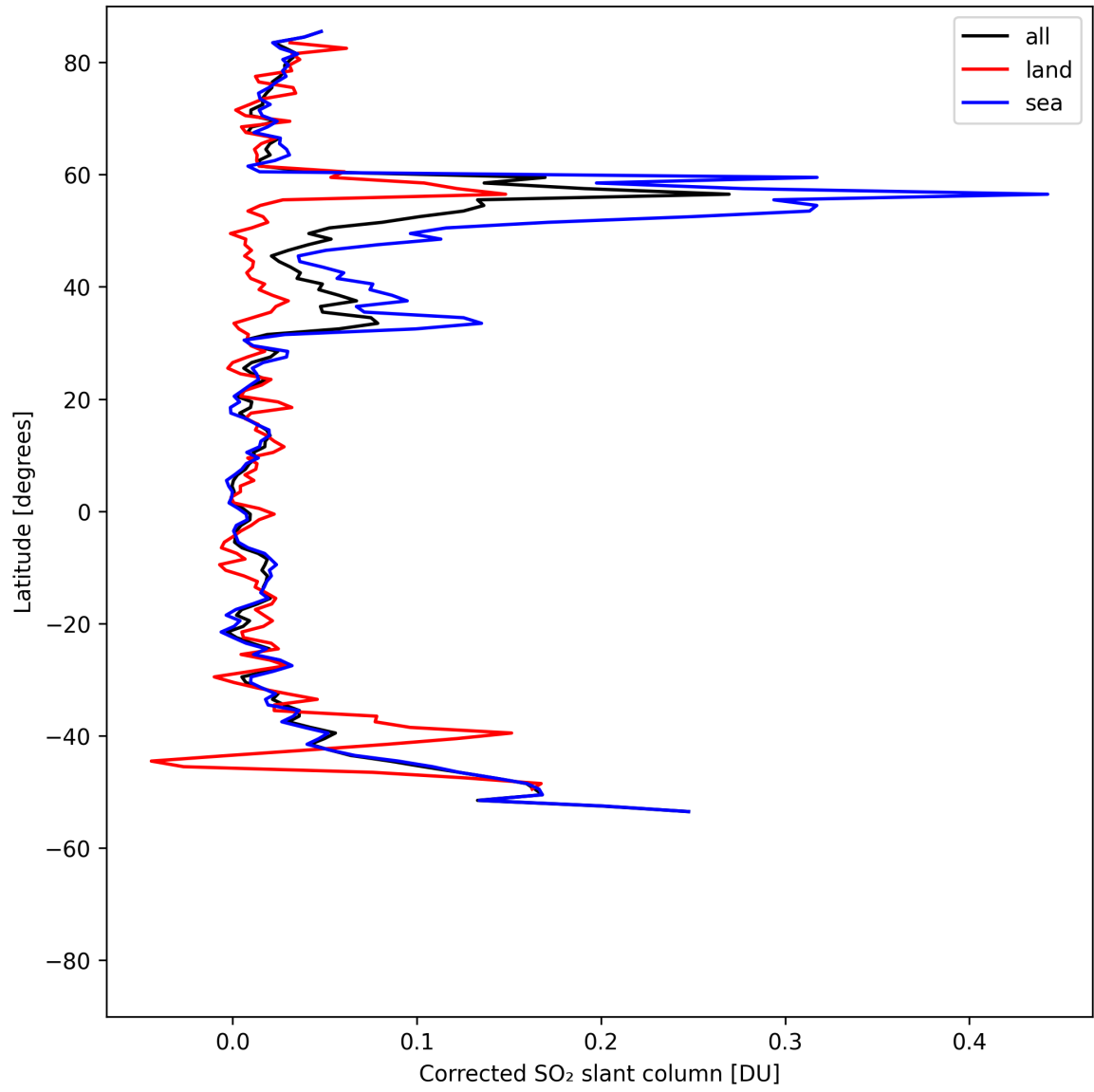


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-08-09 to 2025-08-10.

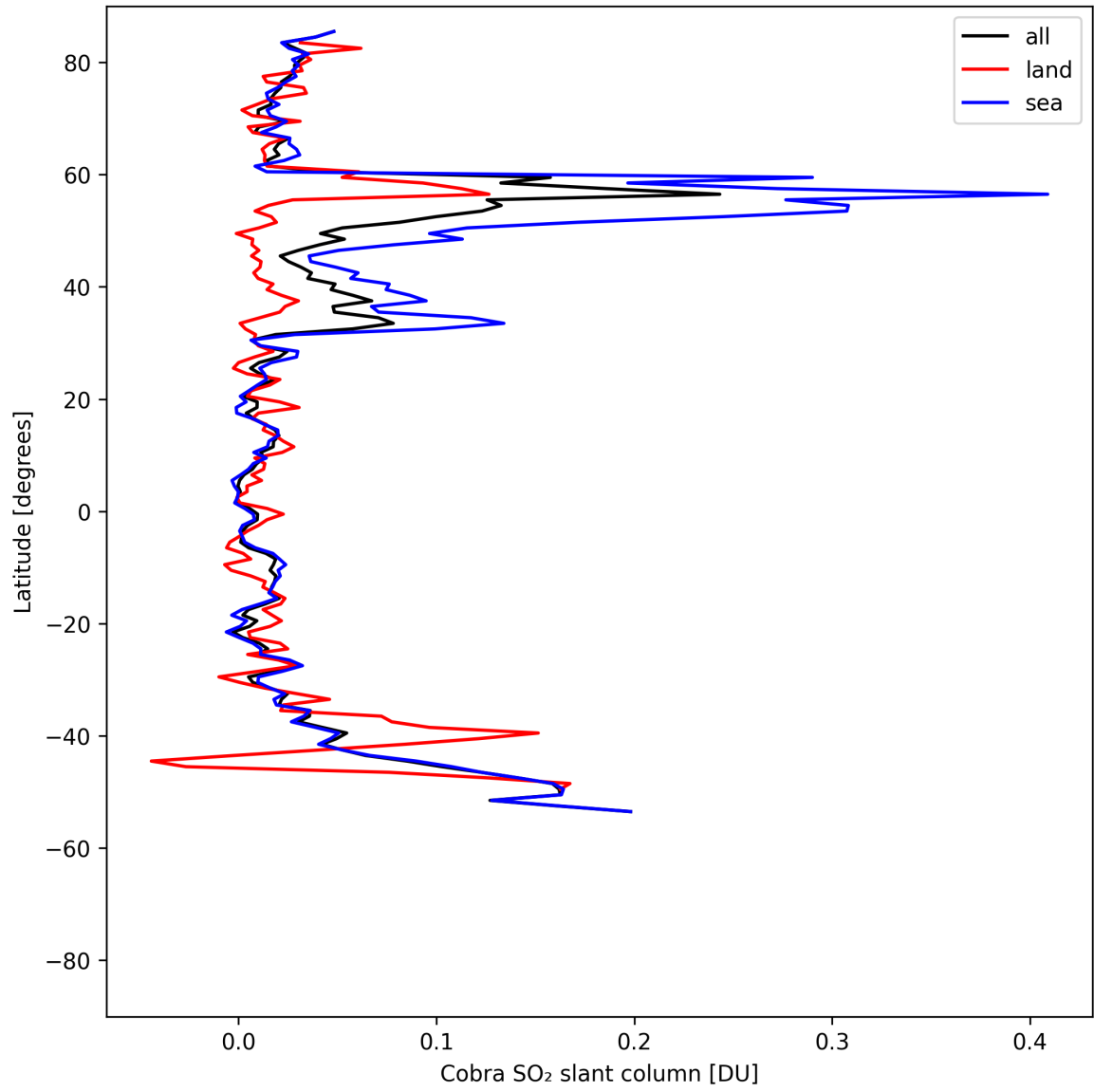


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-08-09 to 2025-08-10.

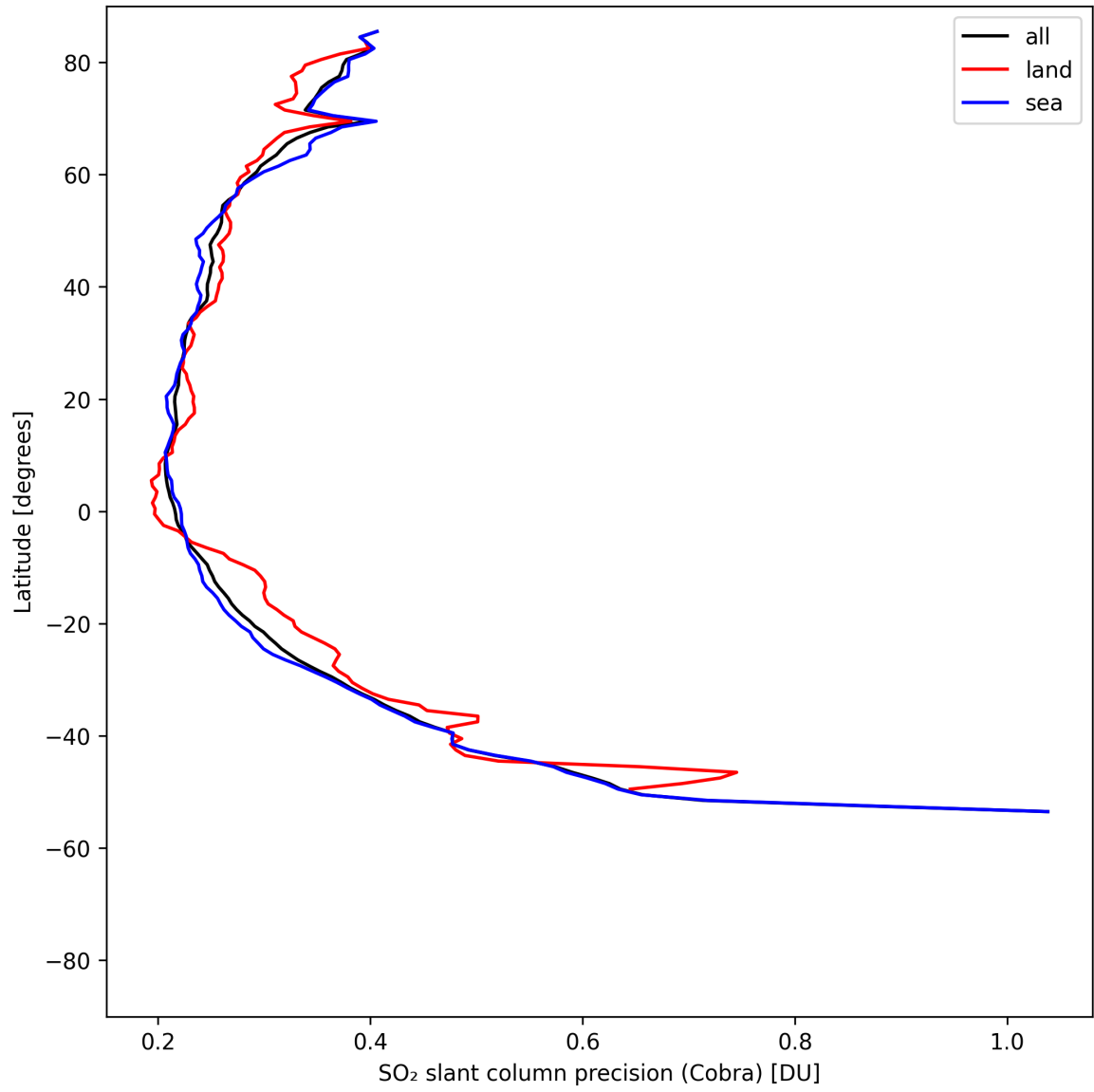


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-08-09 to 2025-08-10.

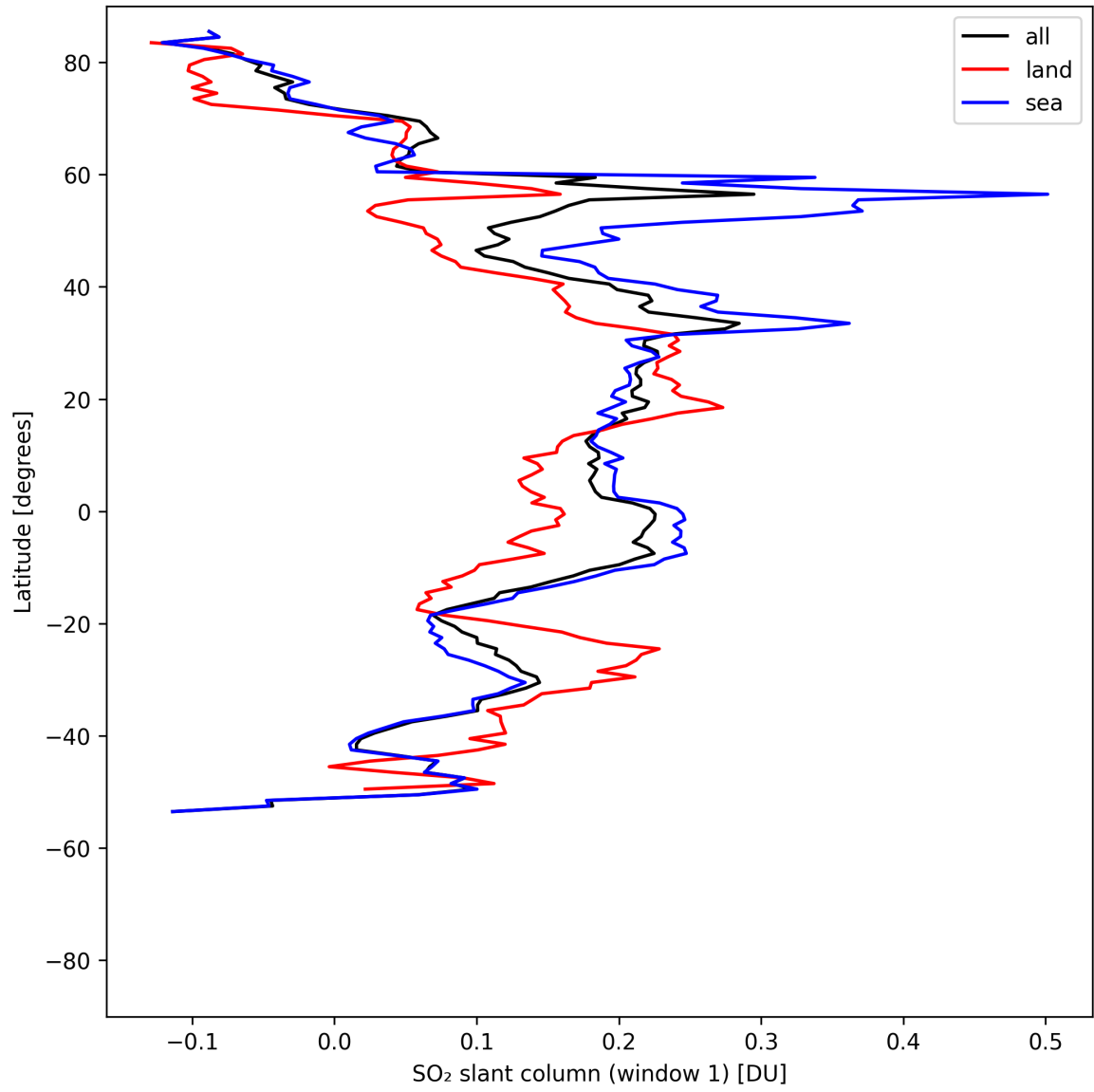


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-08-09 to 2025-08-10.

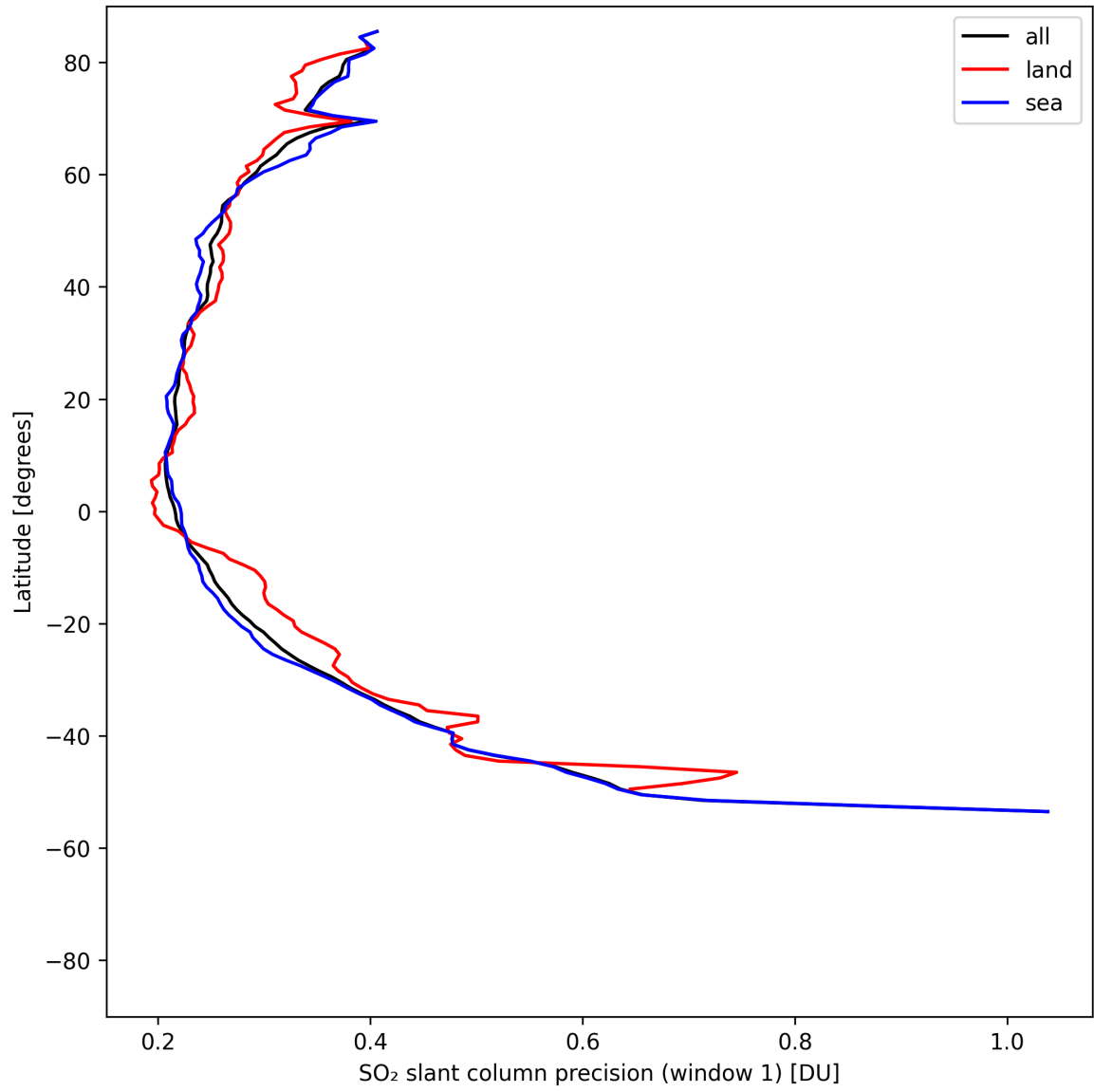


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-08-09 to 2025-08-10.

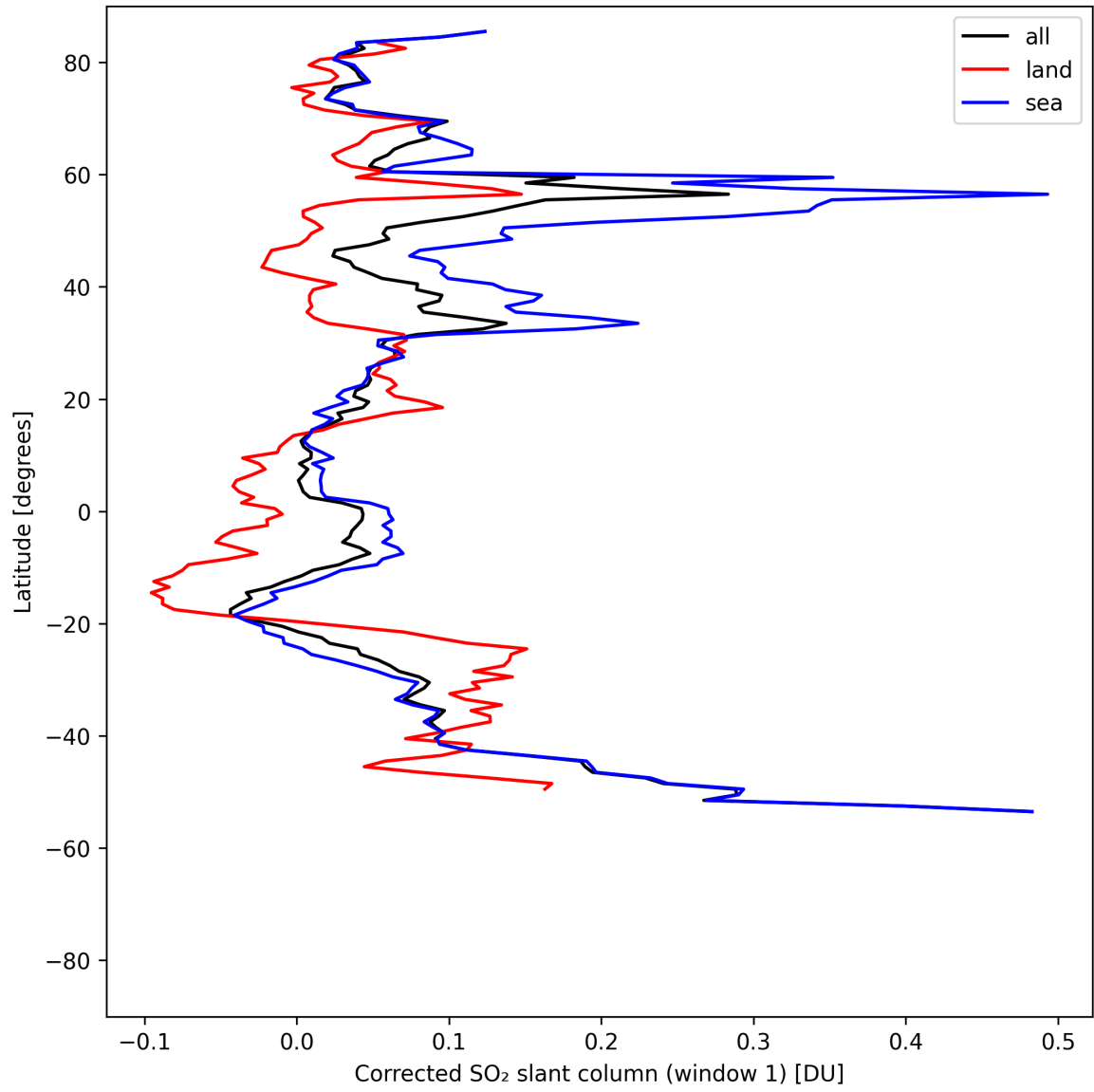


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-08-09 to 2025-08-10.

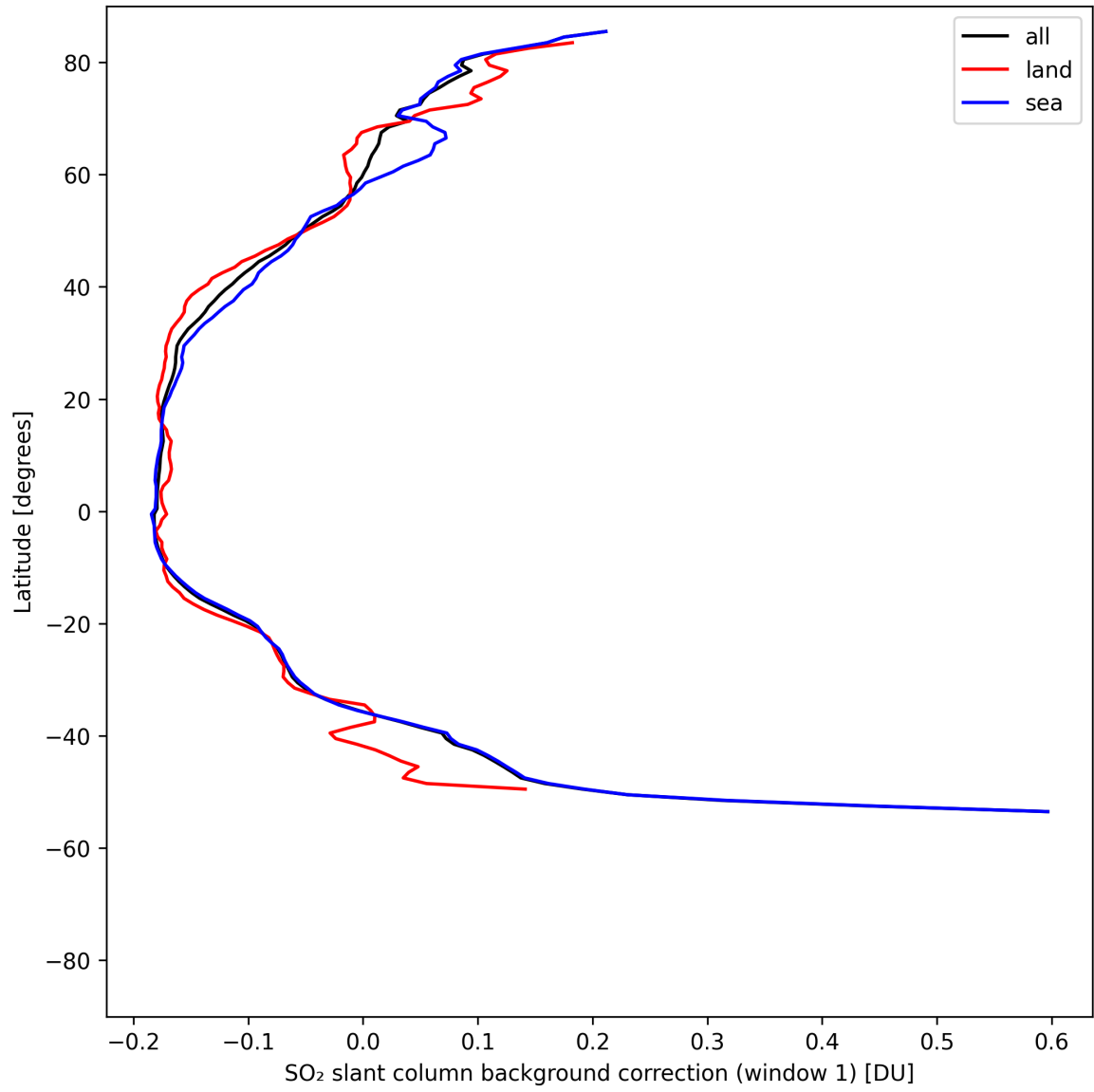


Figure 39: Zonal average of "SO₂ slant column background correction (window 1)" for 2025-08-09 to 2025-08-10.

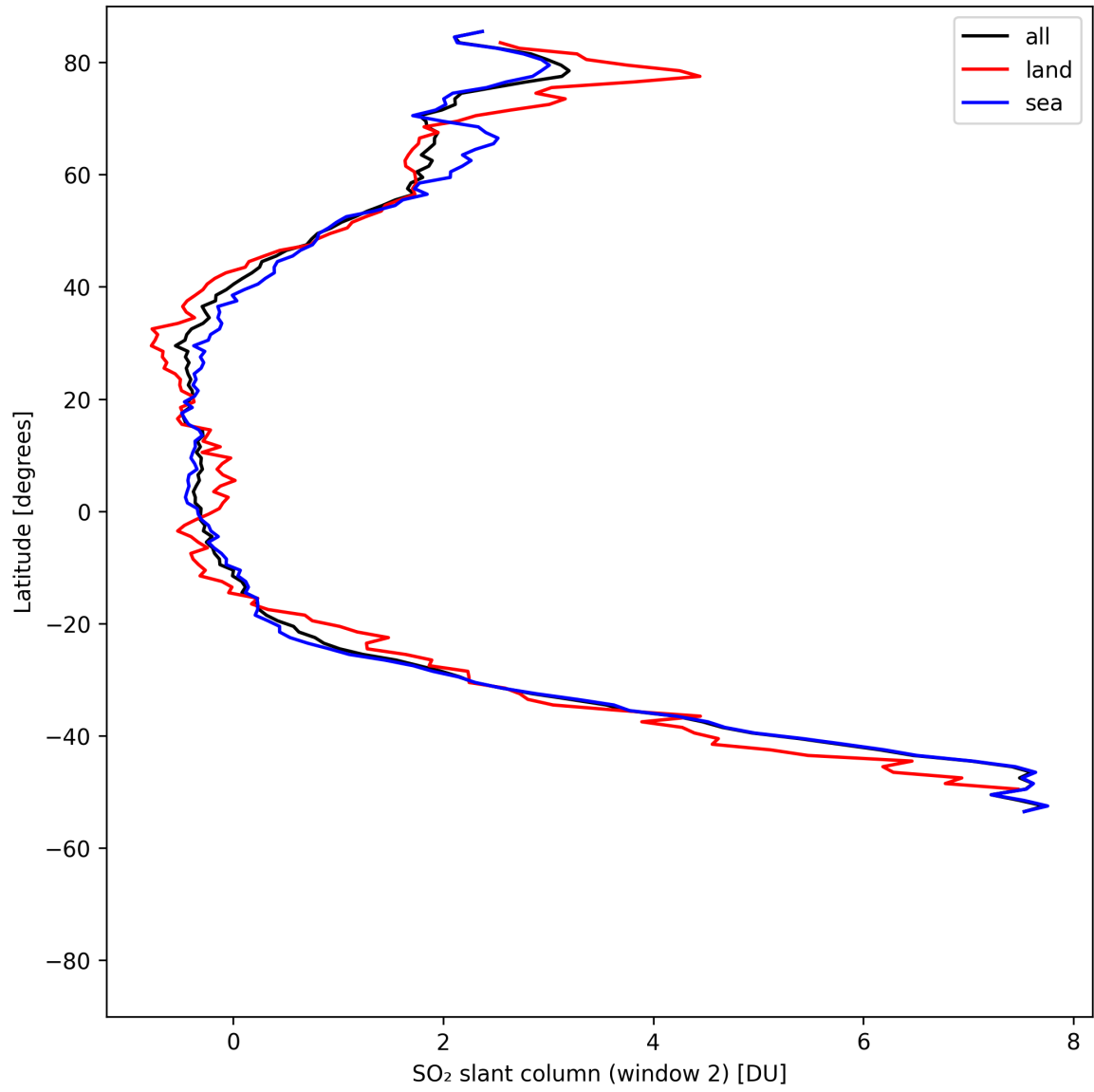


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-08-09 to 2025-08-10.

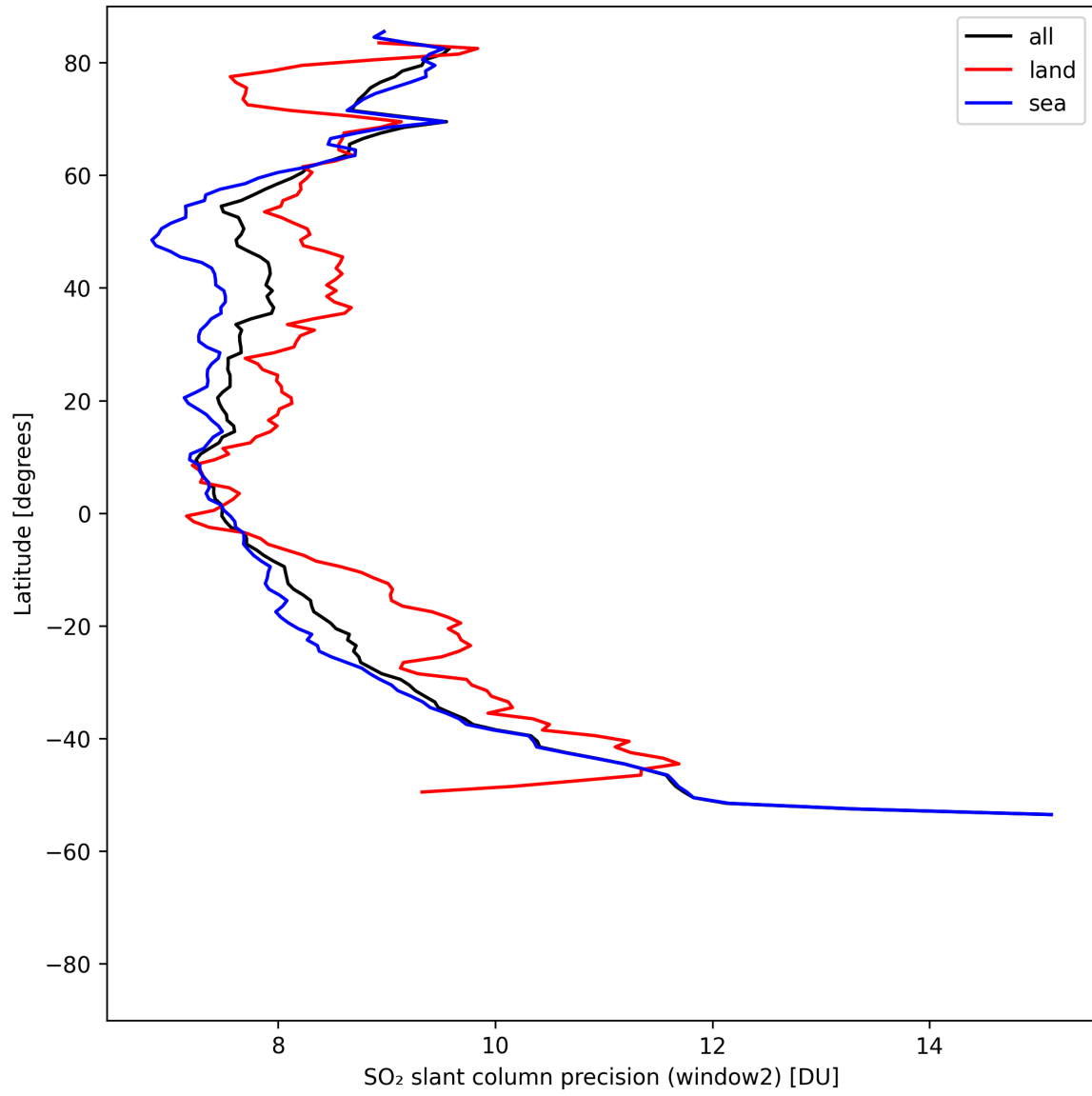


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-08-09 to 2025-08-10.

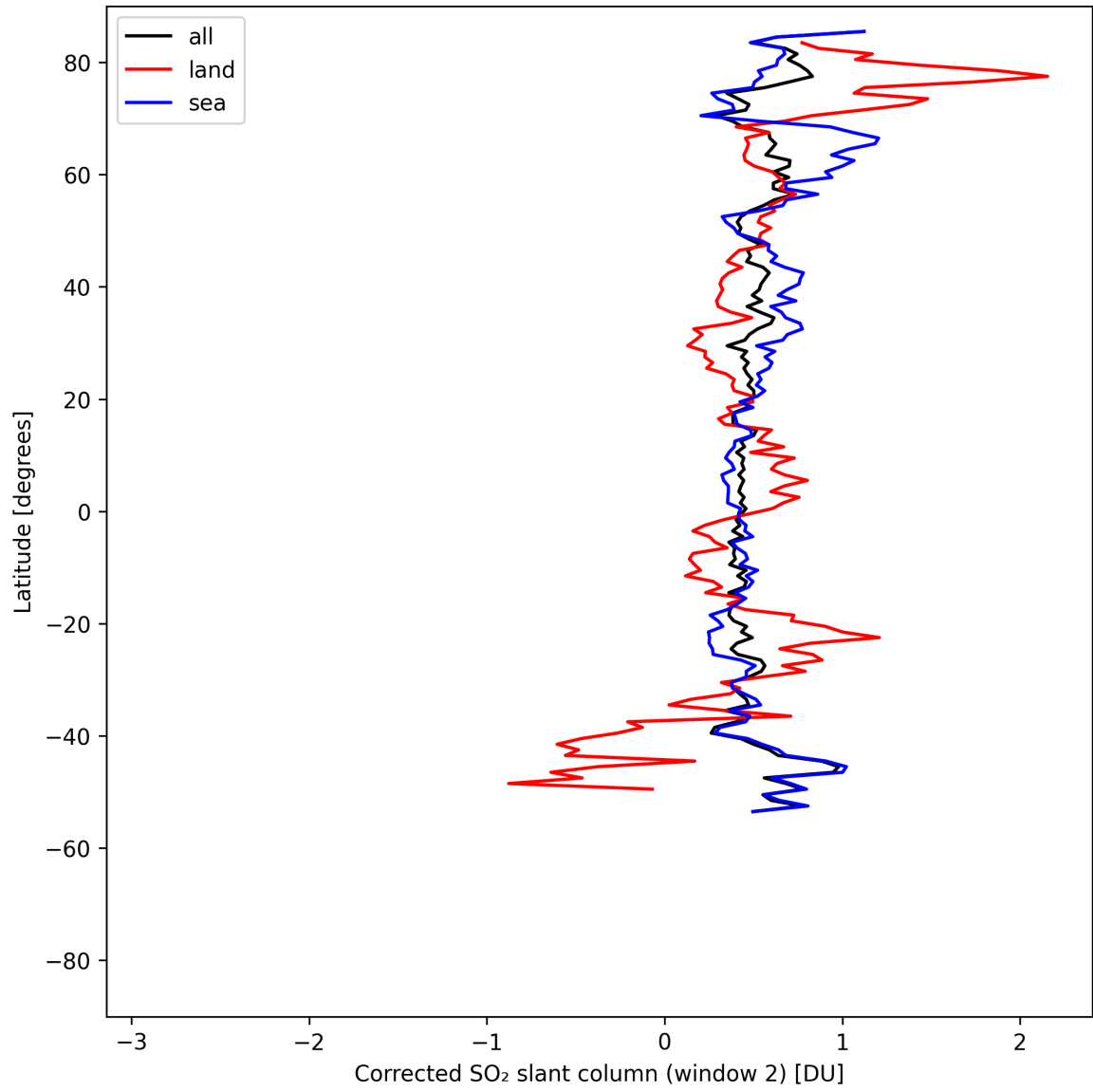


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-08-09 to 2025-08-10.

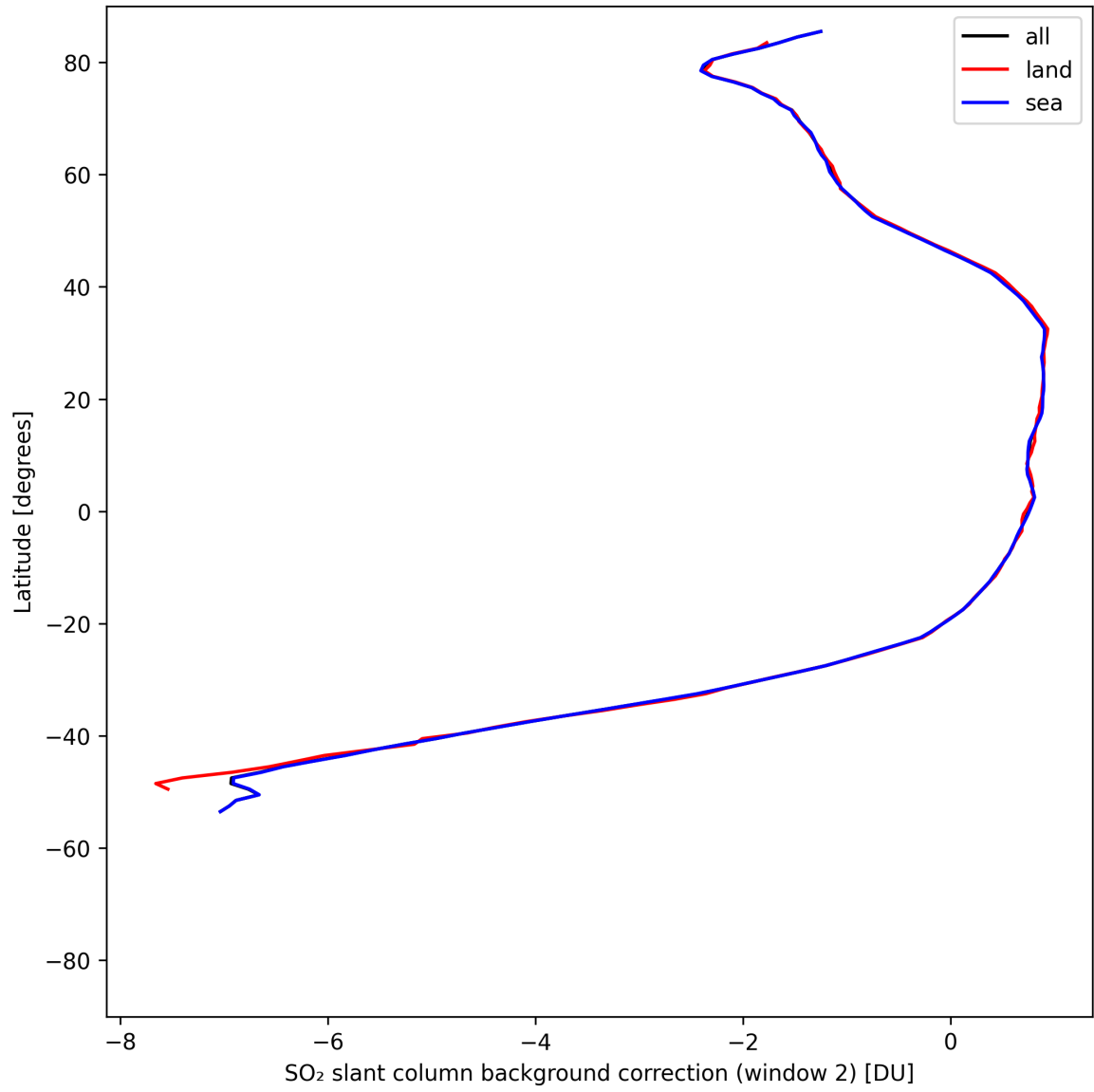


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-08-09 to 2025-08-10.

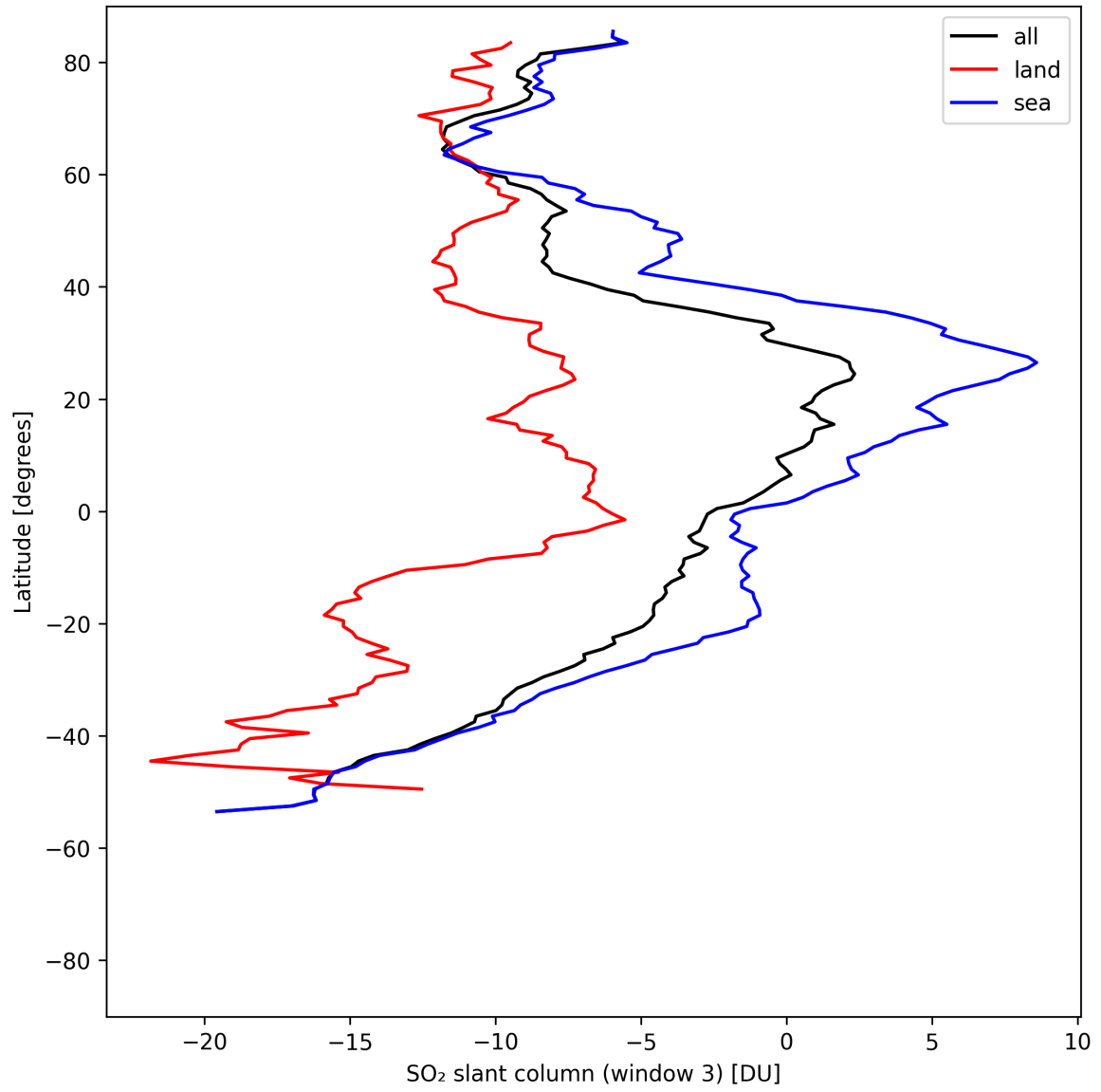


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-08-09 to 2025-08-10.

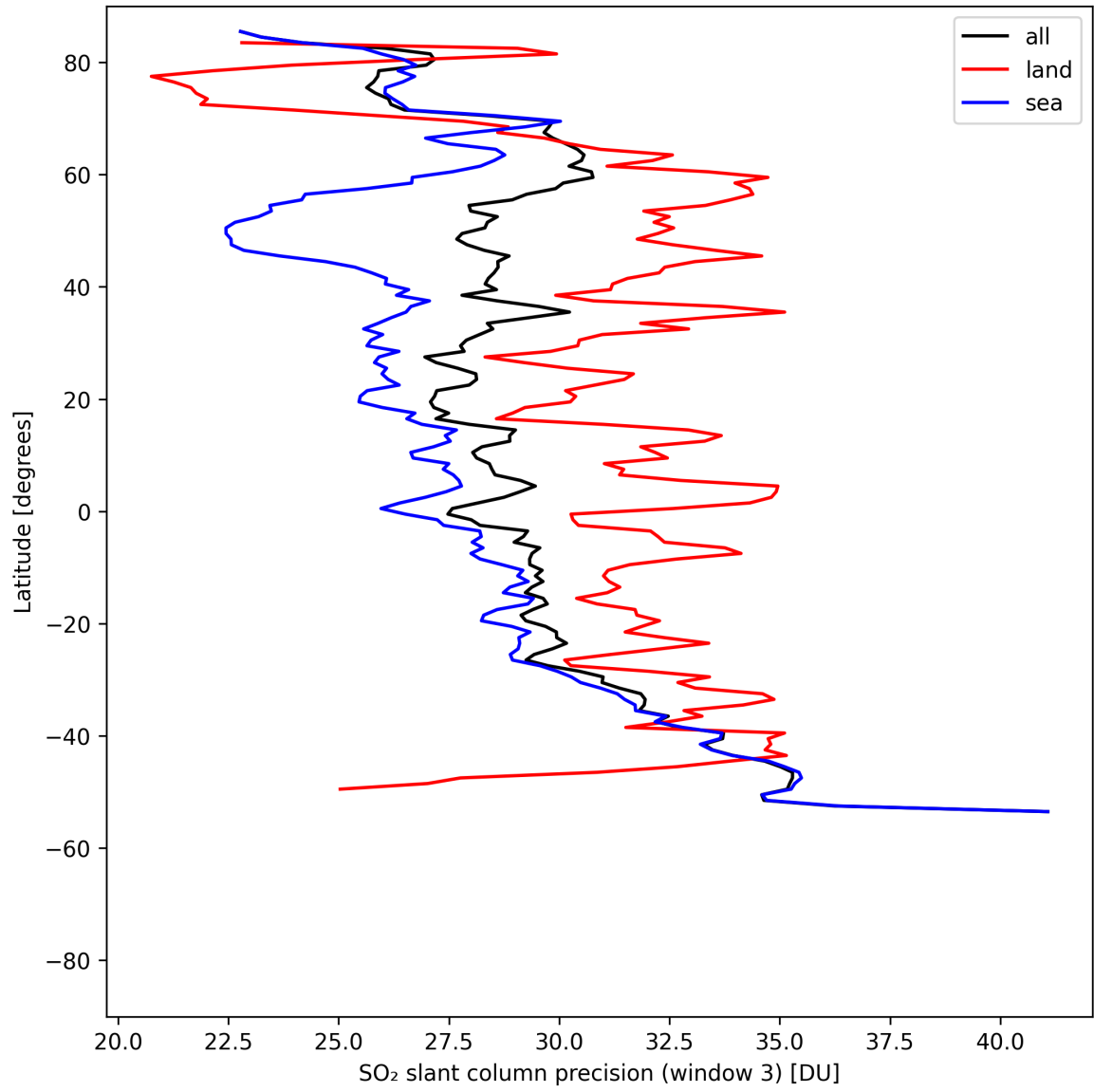


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-08-09 to 2025-08-10.

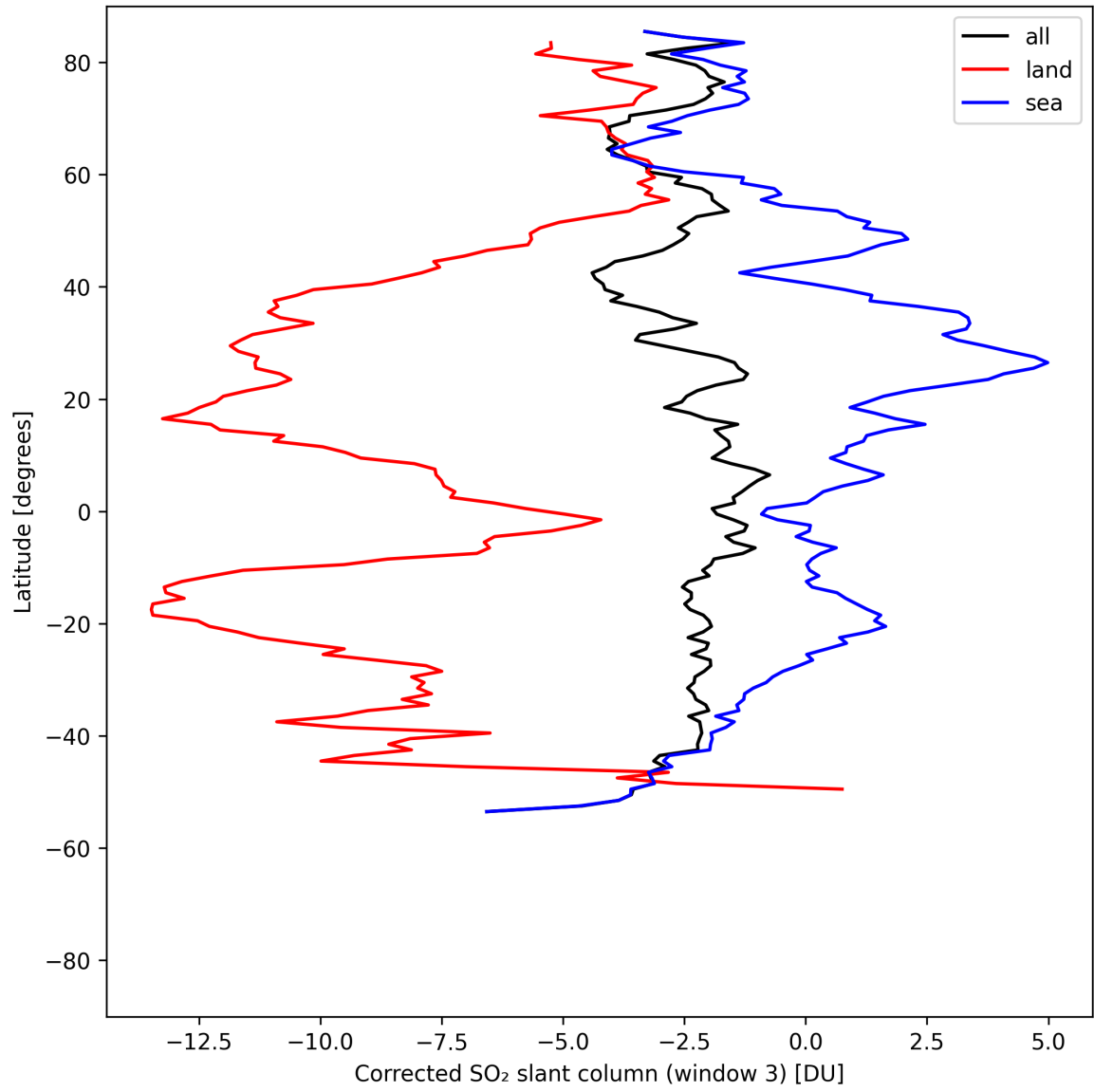


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-08-09 to 2025-08-10.

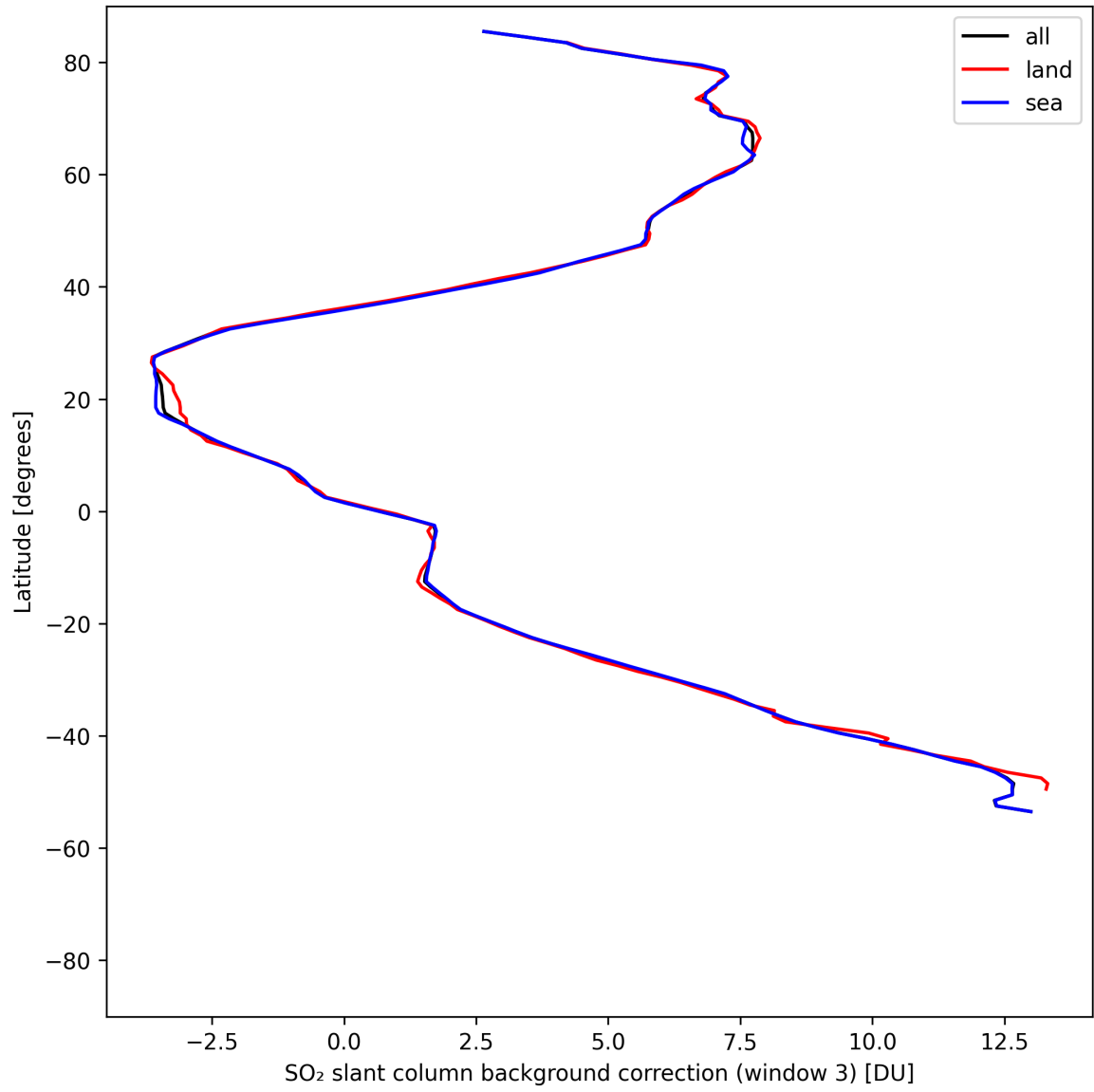


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-08-09 to 2025-08-10.

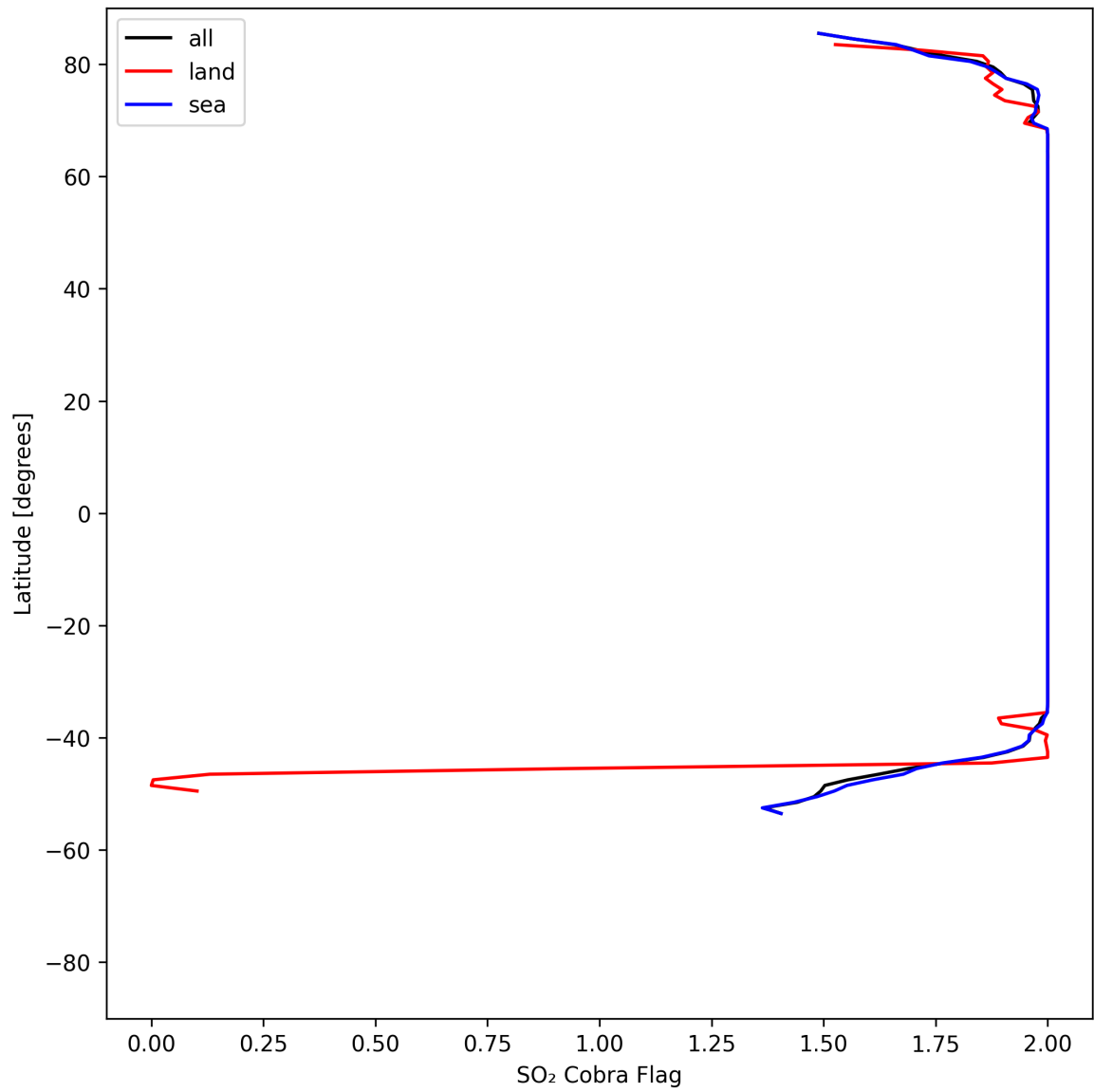


Figure 48: Zonal average of "SO₂ Cobra Flag" for 2025-08-09 to 2025-08-10.

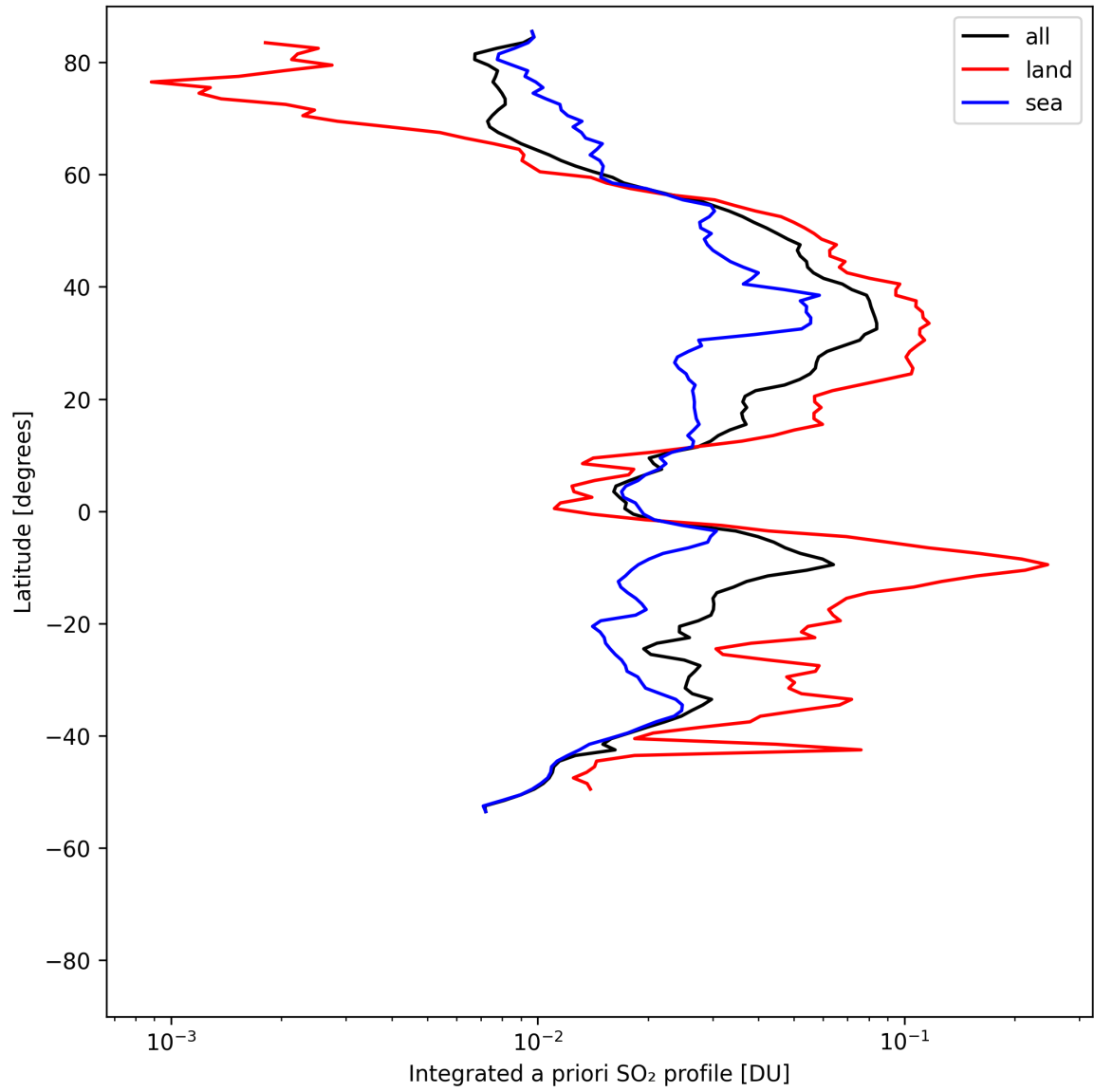


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-08-09 to 2025-08-10.

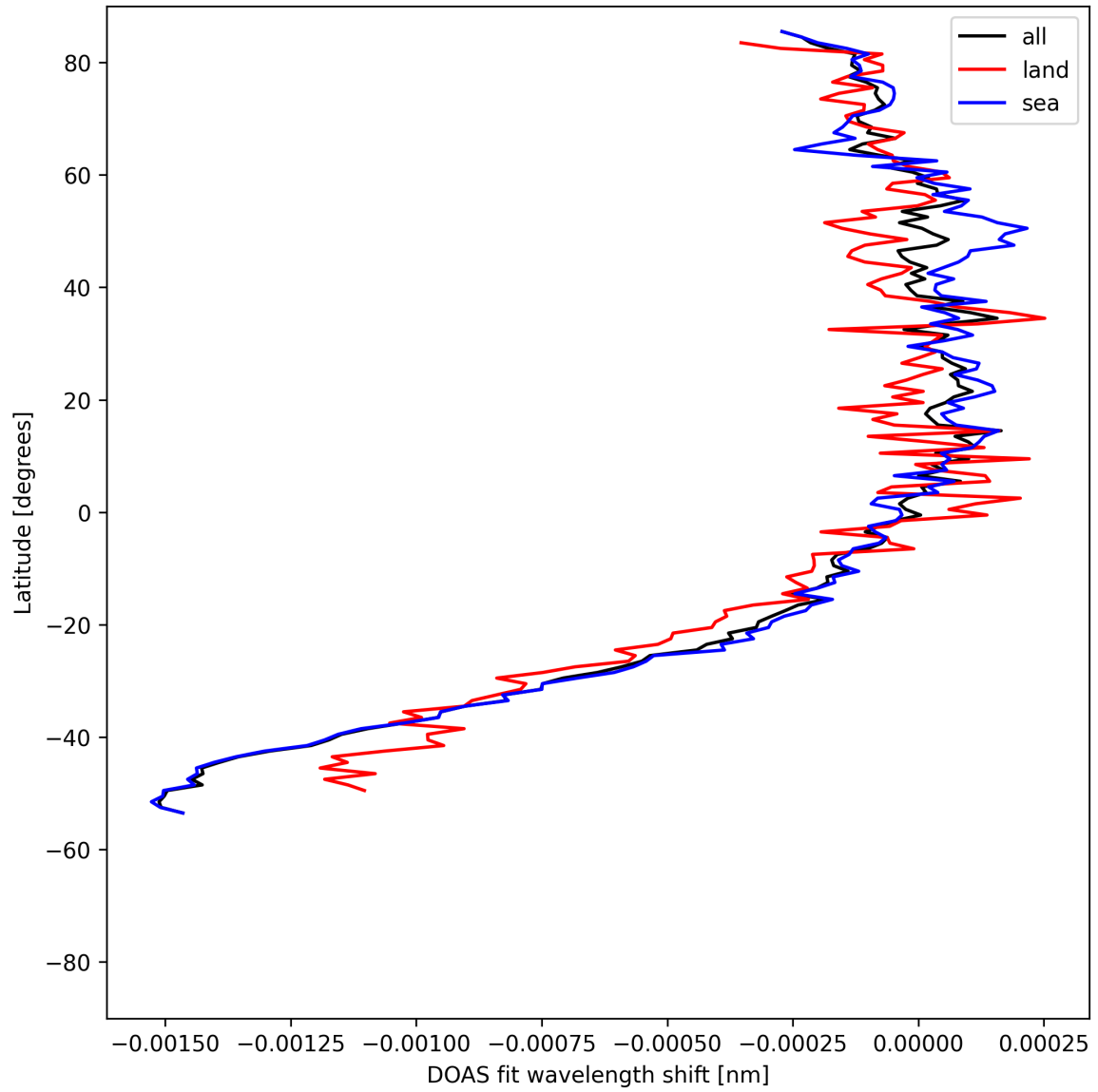


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-08-09 to 2025-08-10.

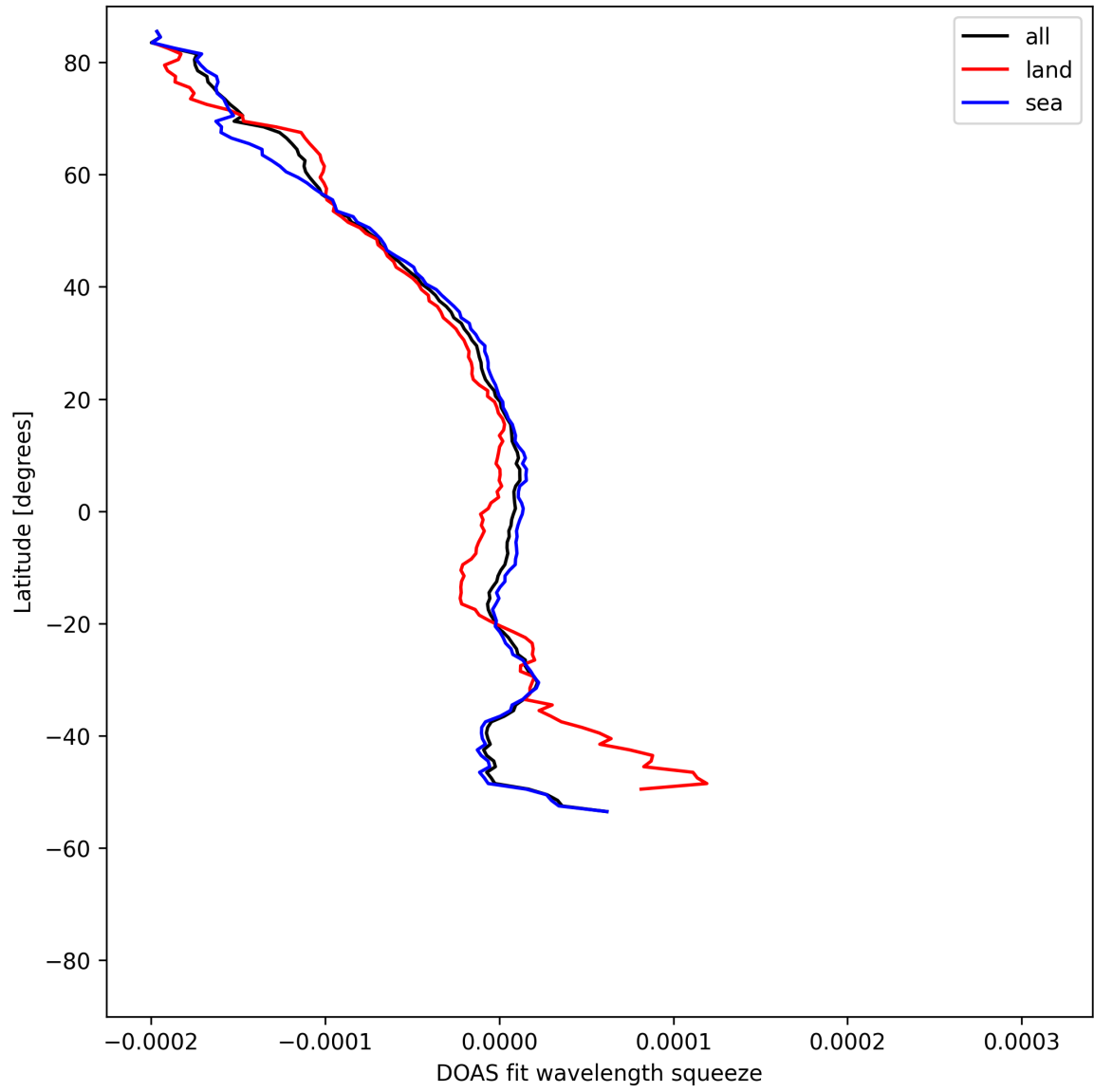


Figure 51: Zonal average of "DOAS fit wavelength squeeze" for 2025-08-09 to 2025-08-10.

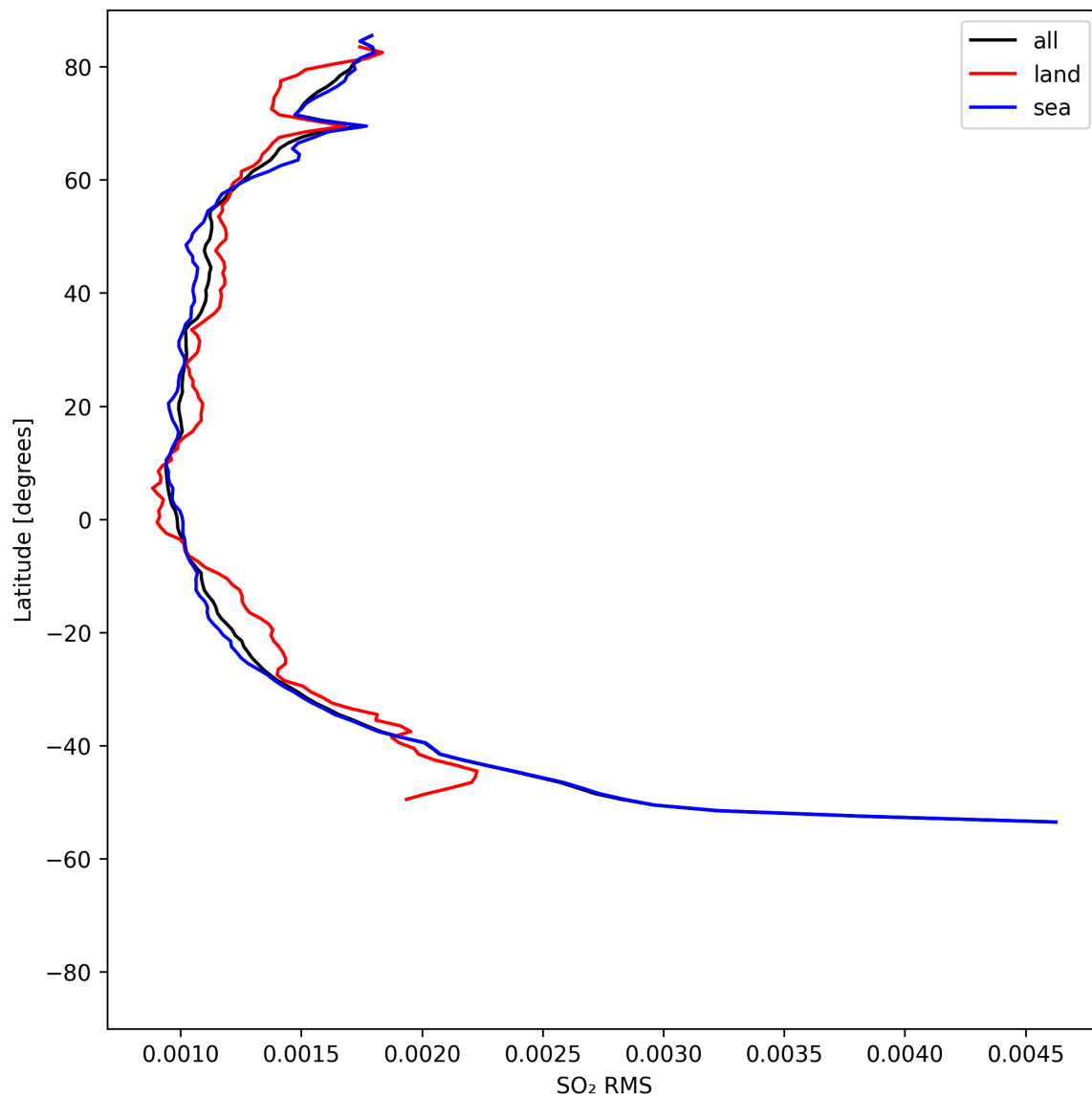


Figure 52: Zonal average of “SO₂ RMS” for 2025-08-09 to 2025-08-10.

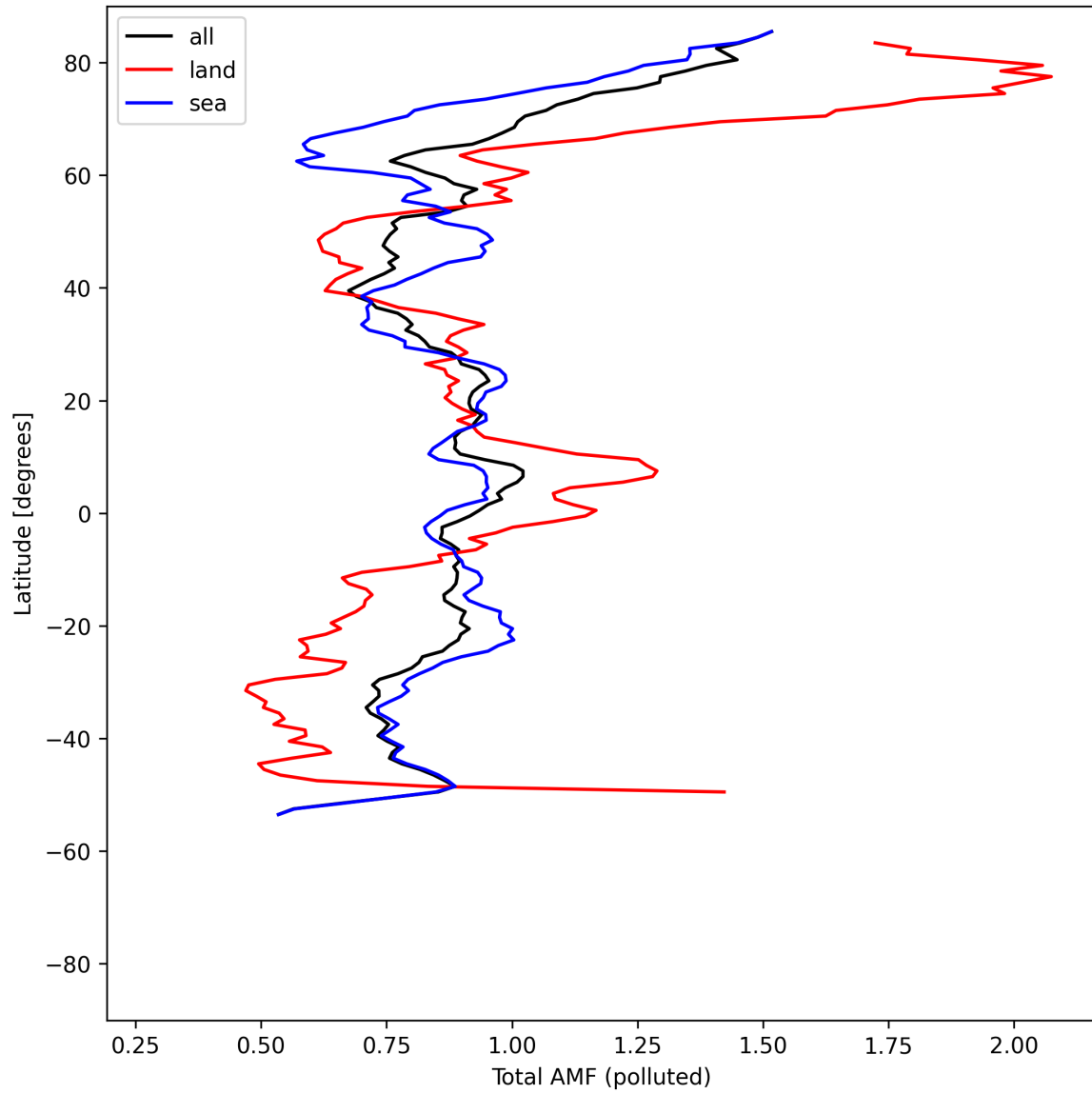


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-08-09 to 2025-08-10.

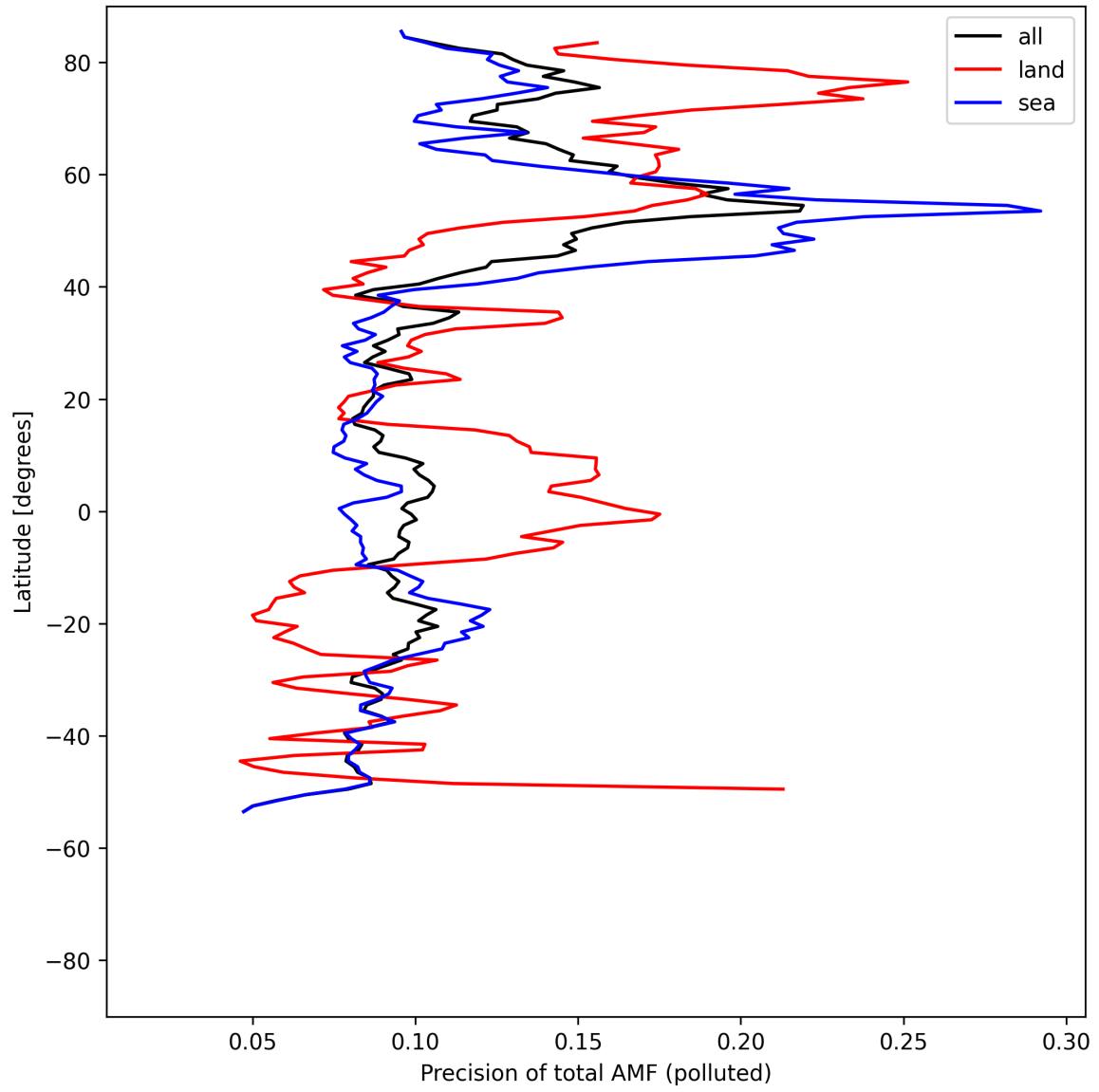


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-08-09 to 2025-08-10.

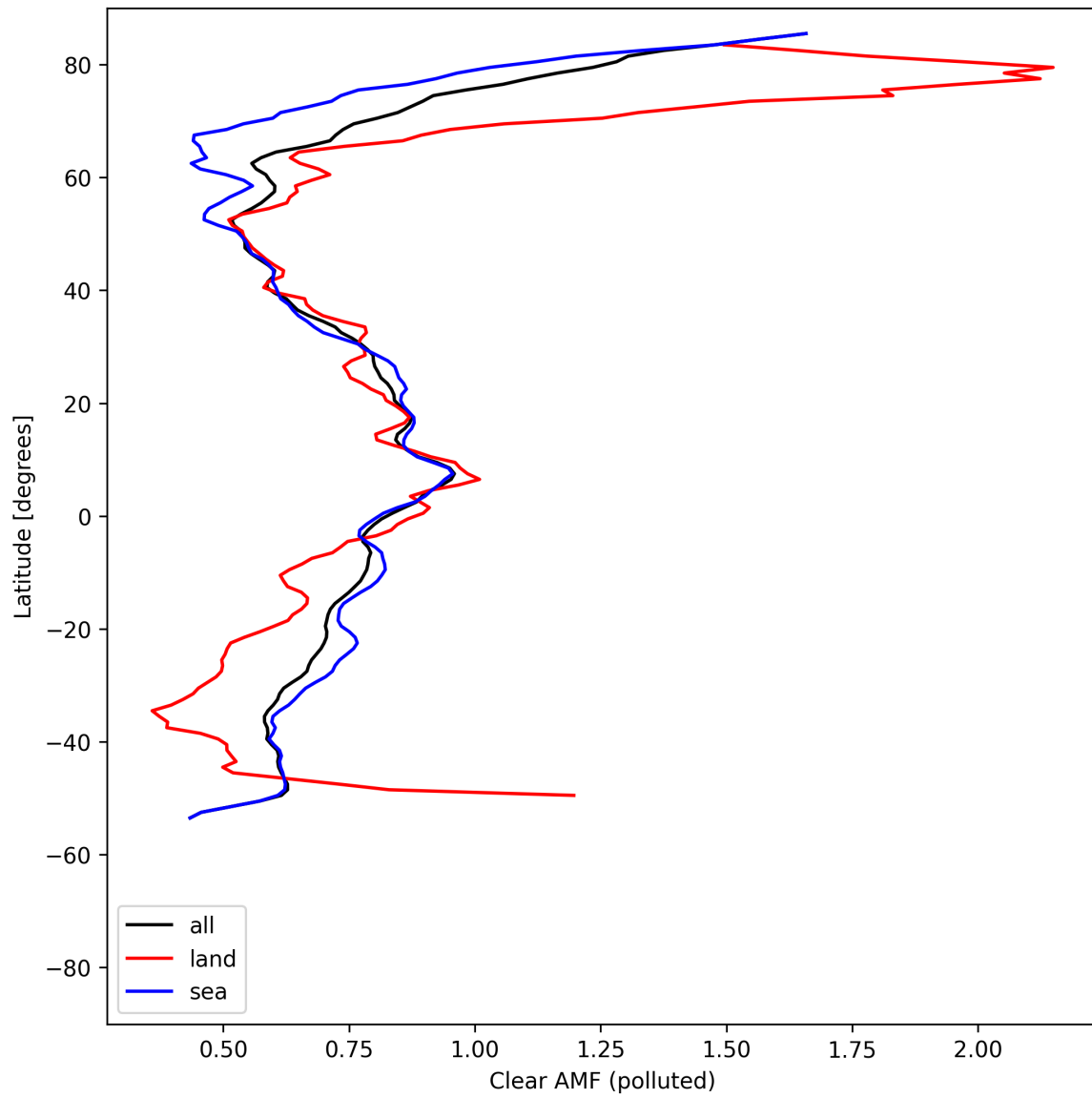


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-08-09 to 2025-08-10.

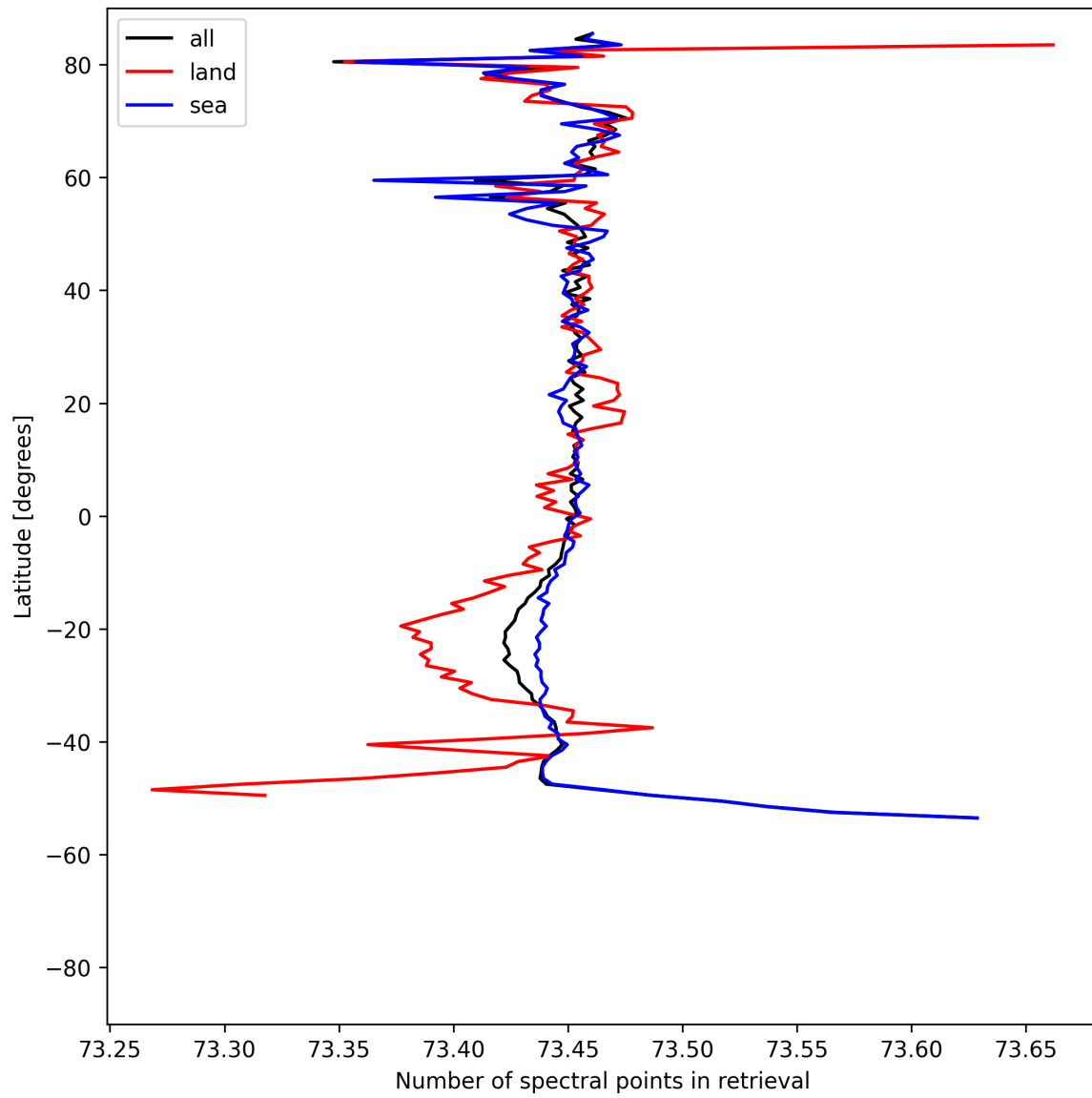


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-08-09 to 2025-08-10.

8 Histograms

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

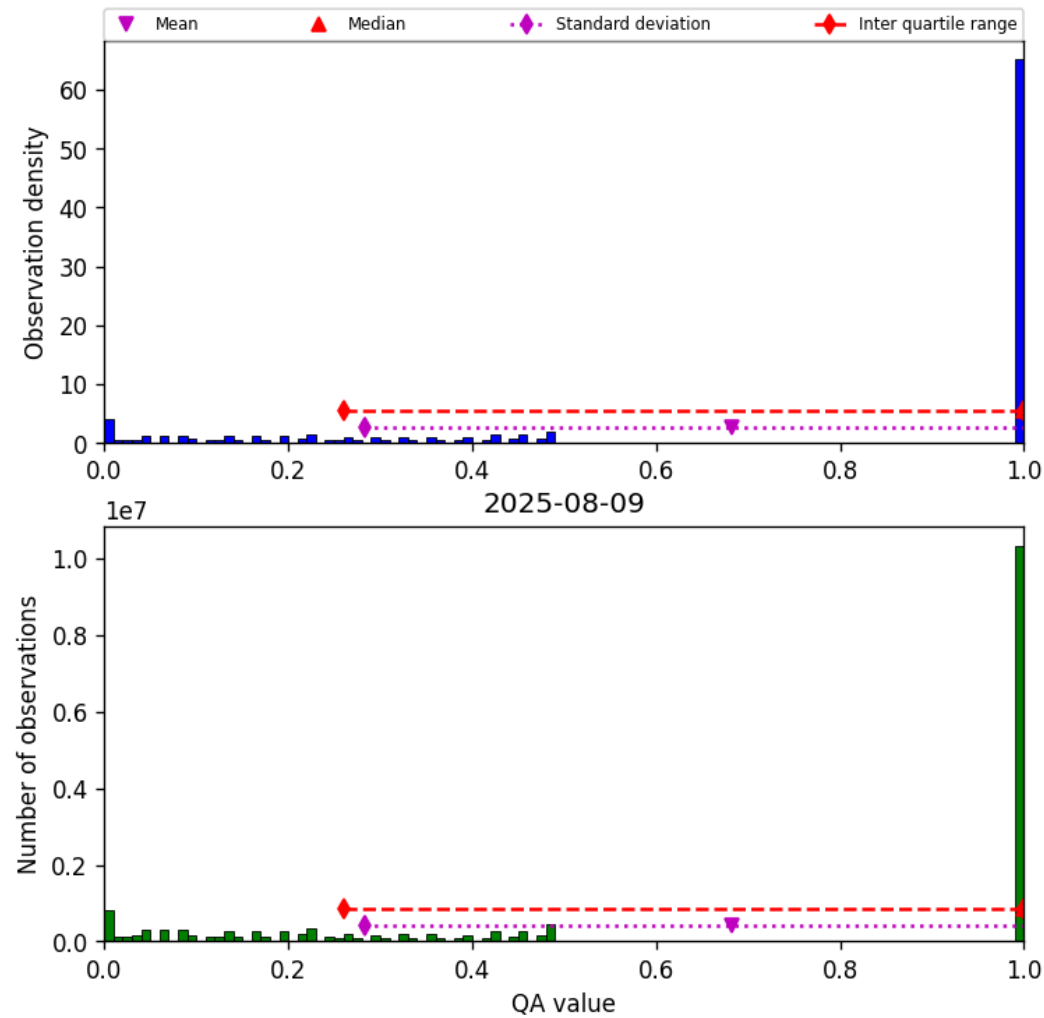


Figure 57: Histogram of “QA value” for 2025-08-09 to 2025-08-10

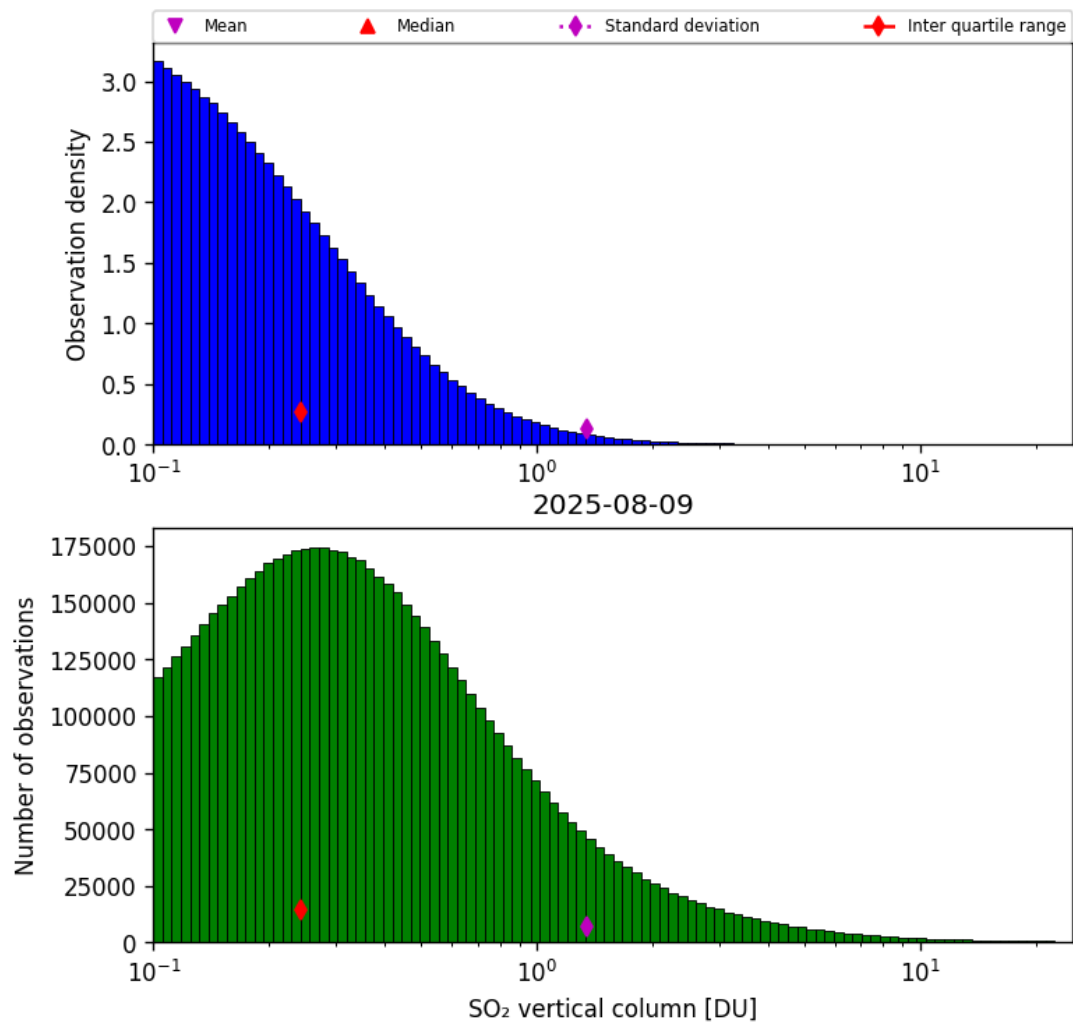


Figure 58: Histogram of “SO₂ vertical column” for 2025-08-09 to 2025-08-10

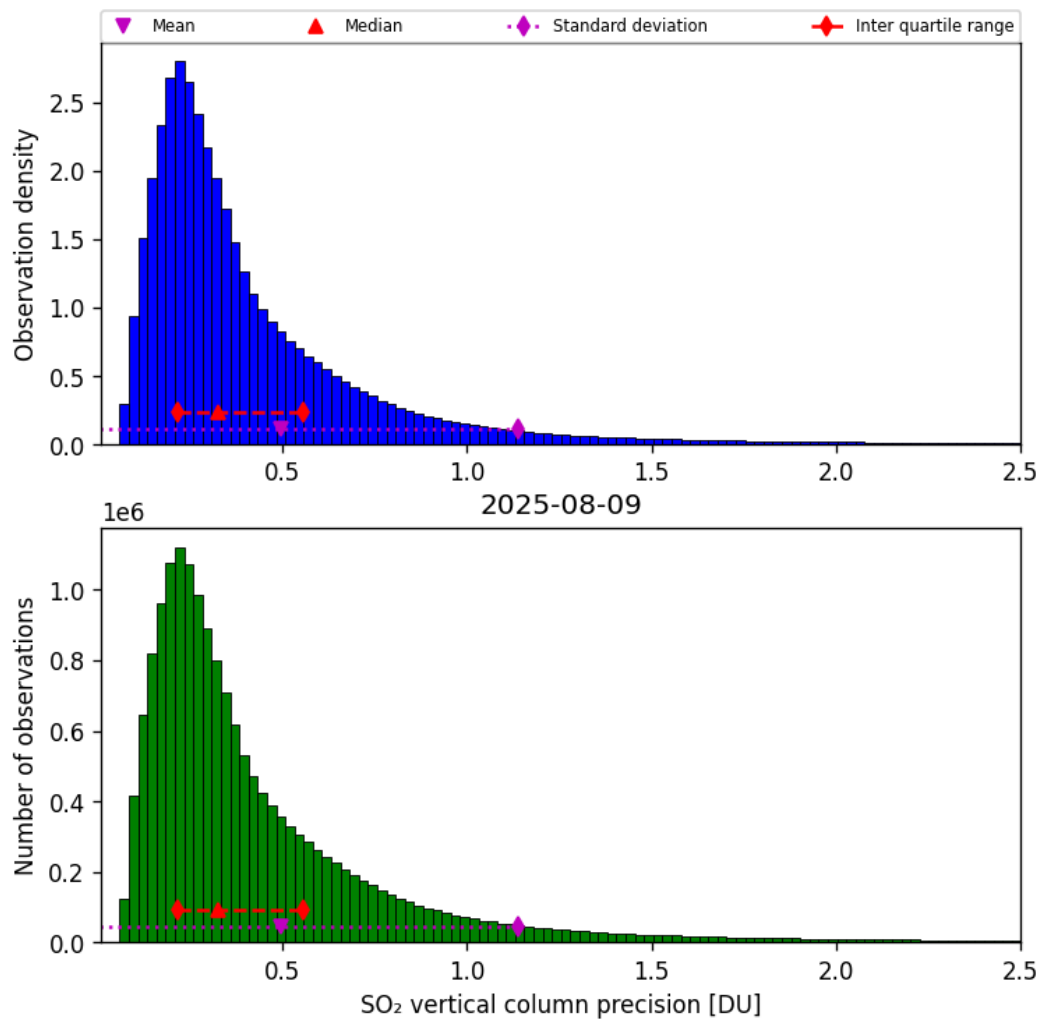


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-08-09 to 2025-08-10

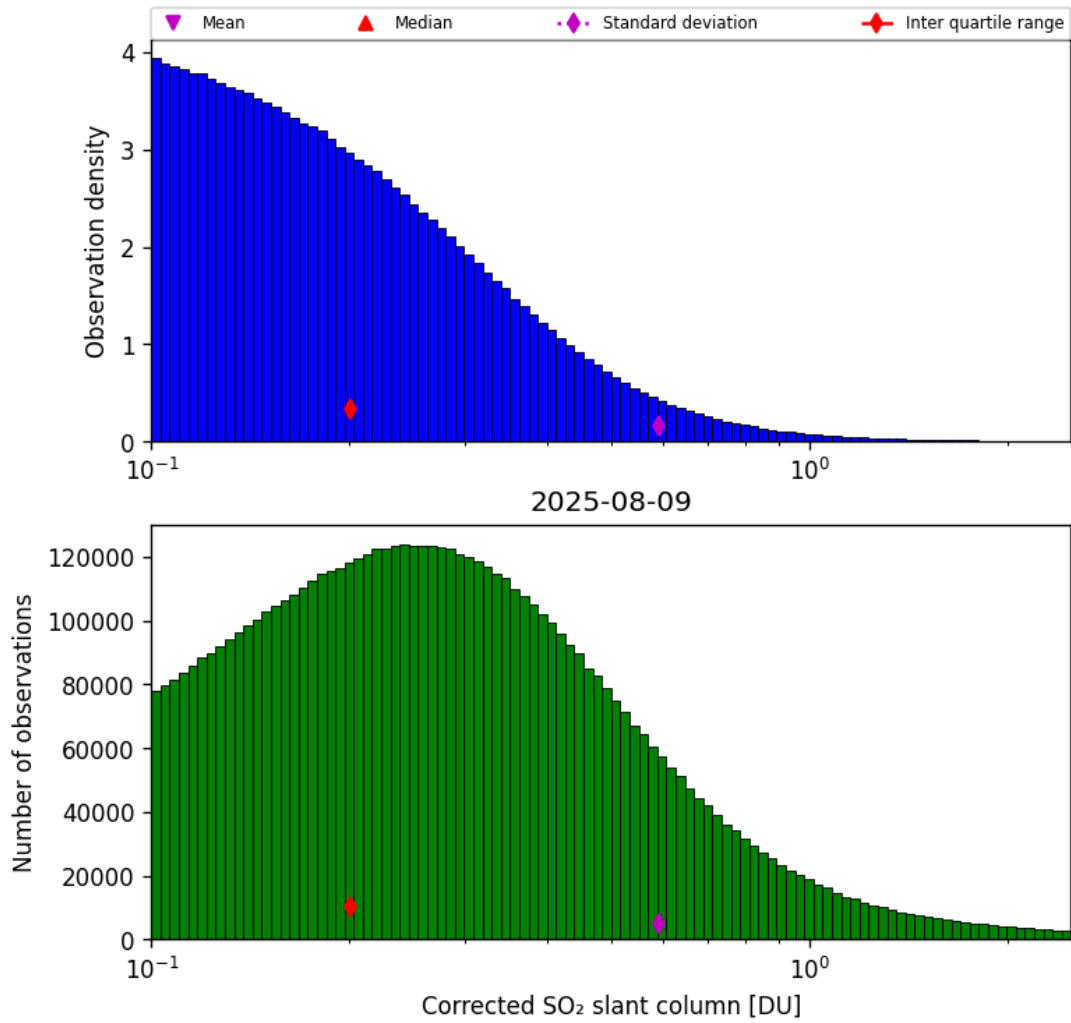


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-08-09 to 2025-08-10

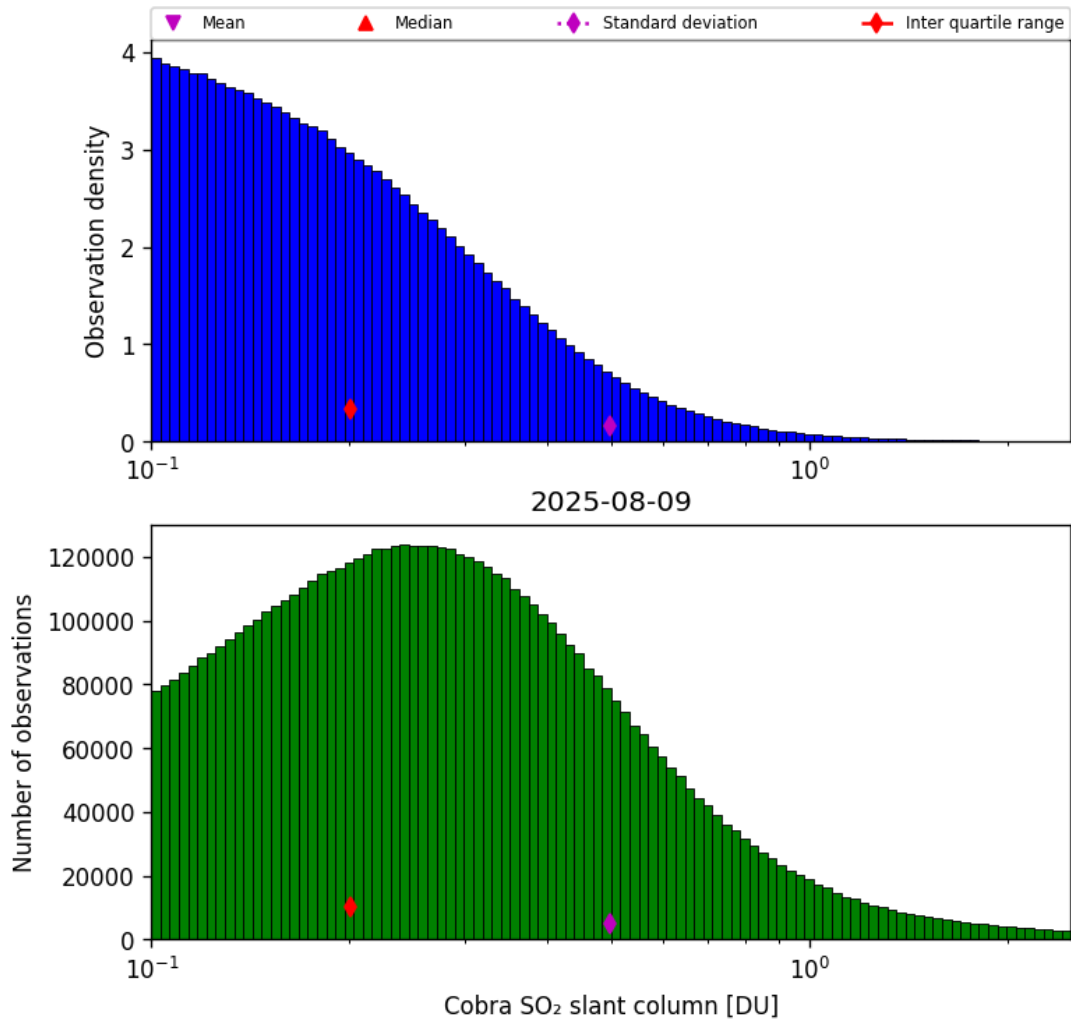


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-08-09 to 2025-08-10

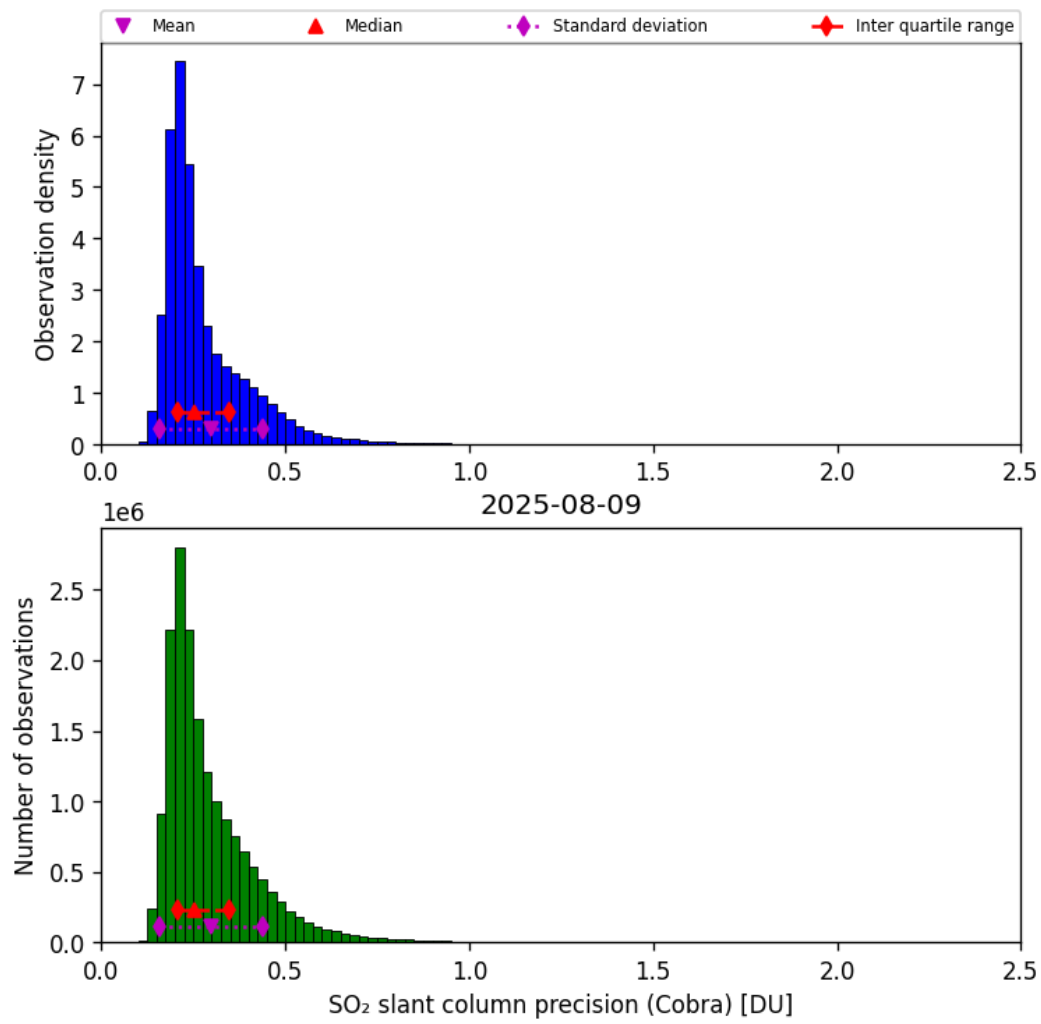


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-08-09 to 2025-08-10

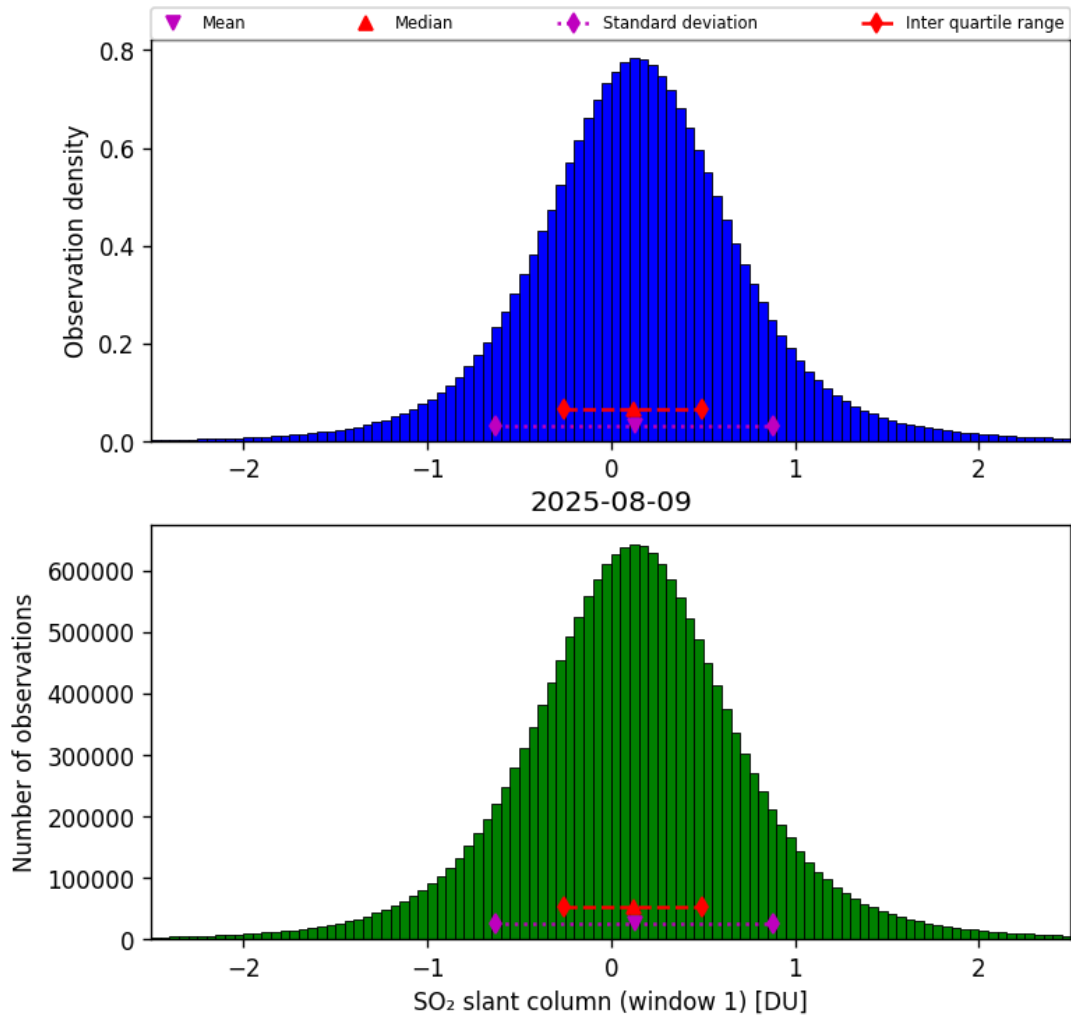


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-08-09 to 2025-08-10

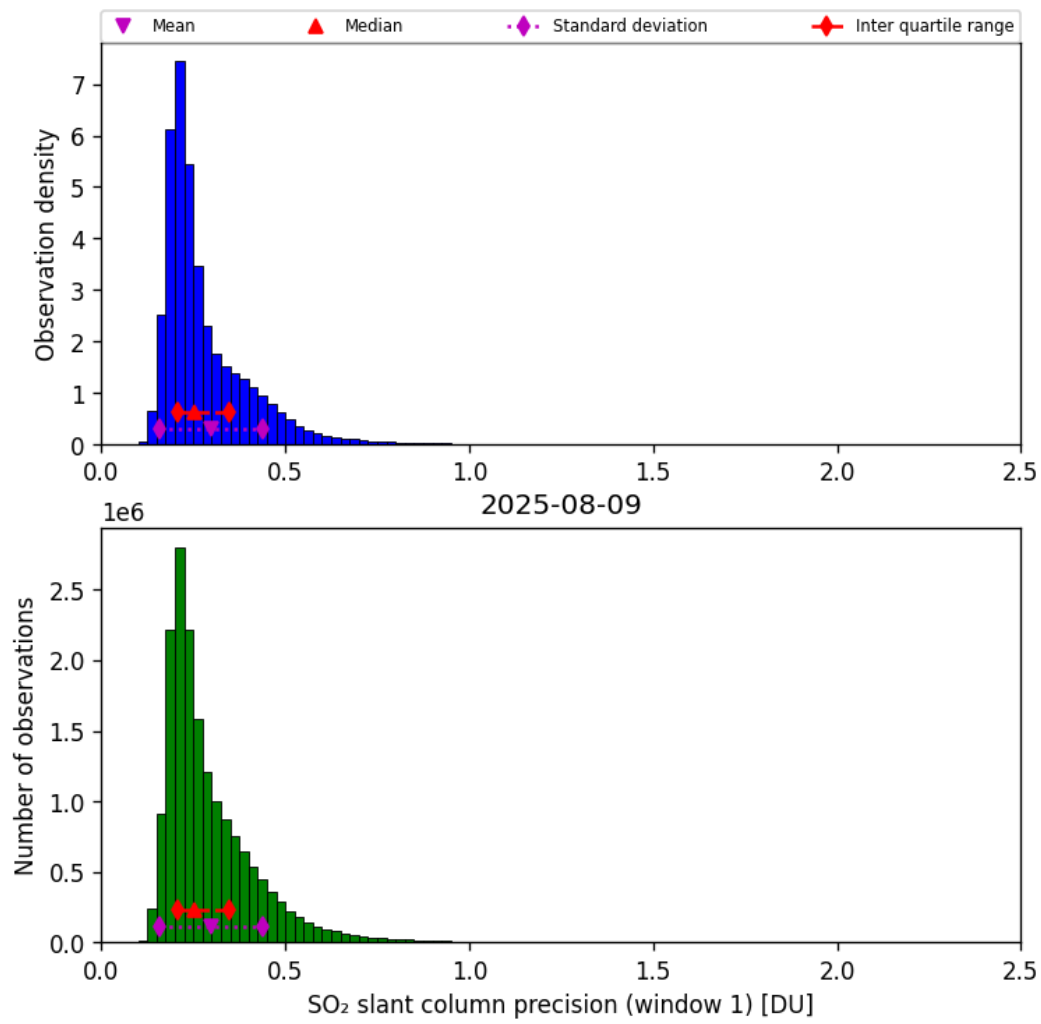


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-08-09 to 2025-08-10

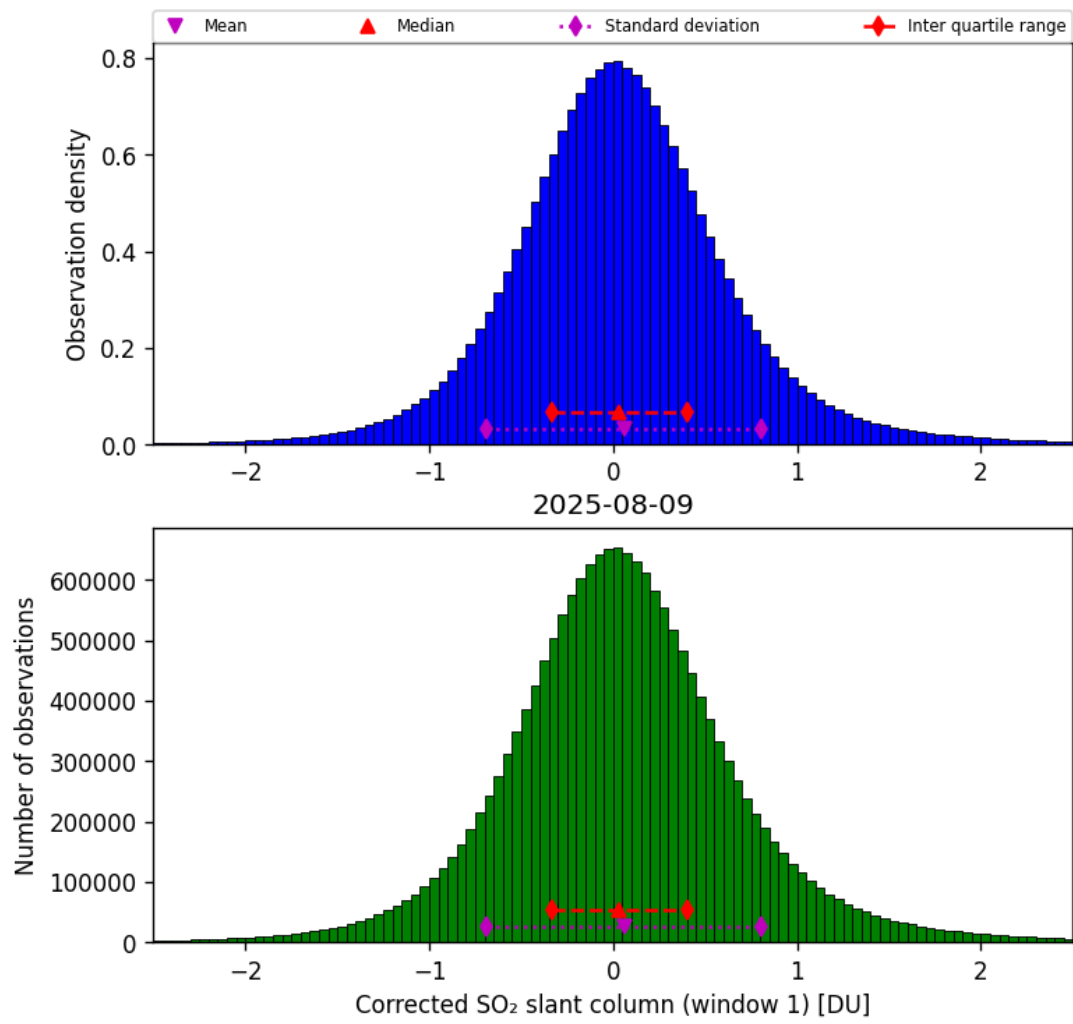


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-08-09 to 2025-08-10

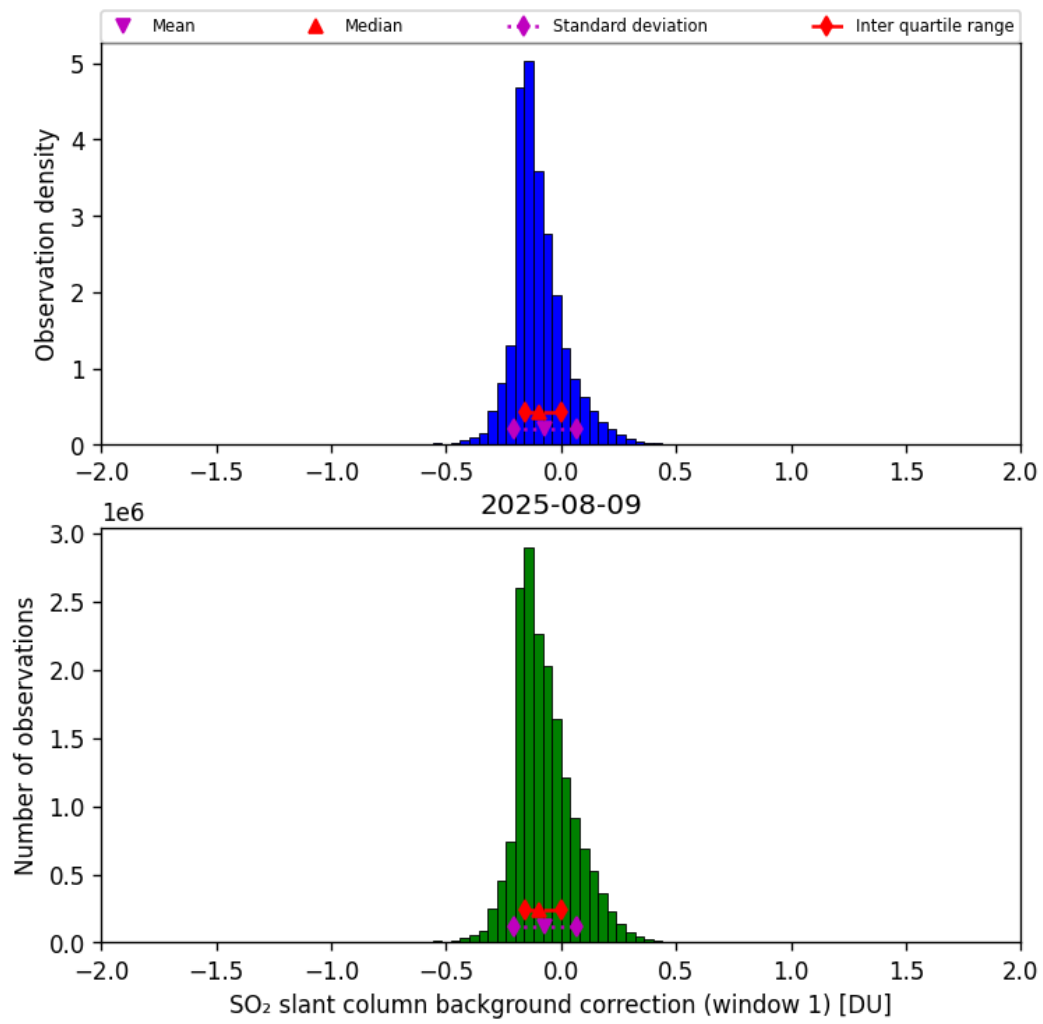


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-08-09 to 2025-08-10

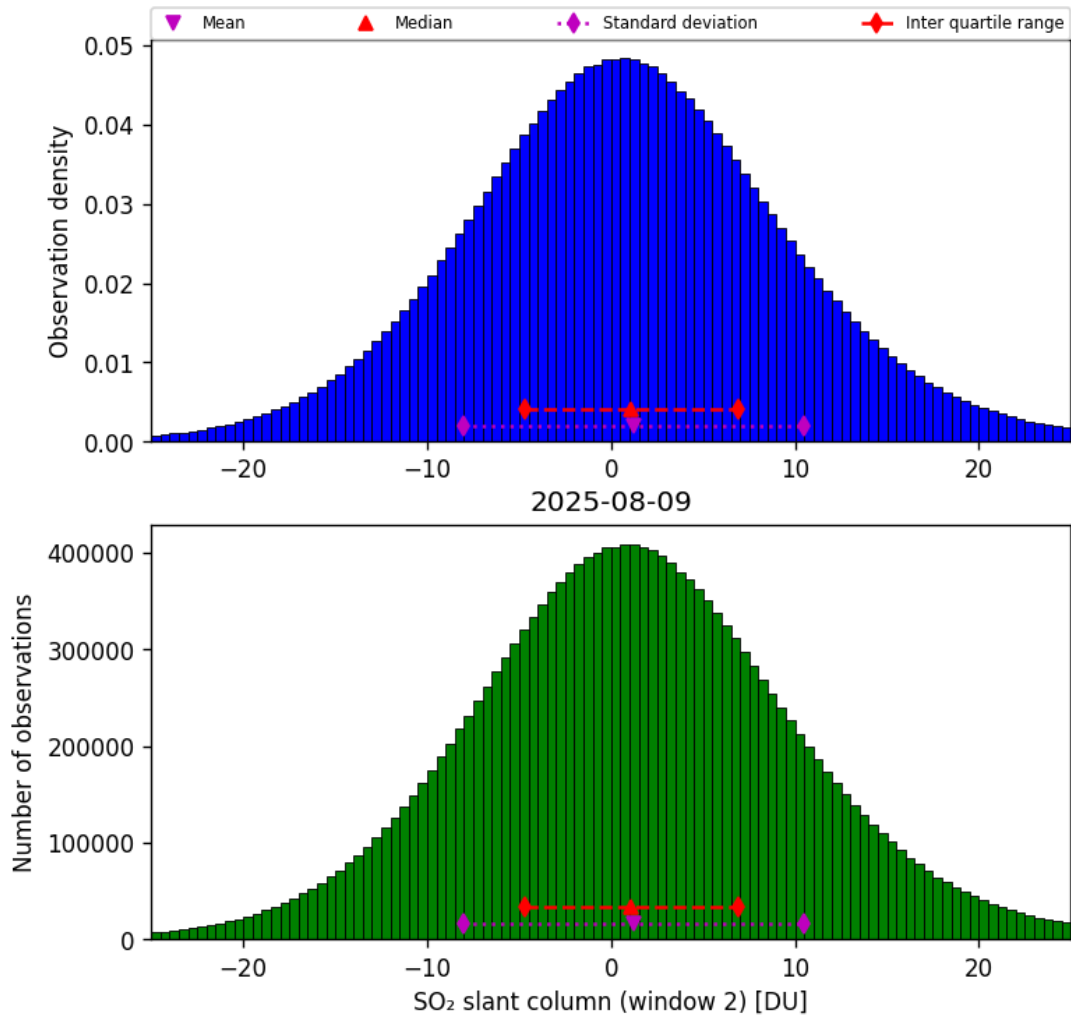


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-08-09 to 2025-08-10

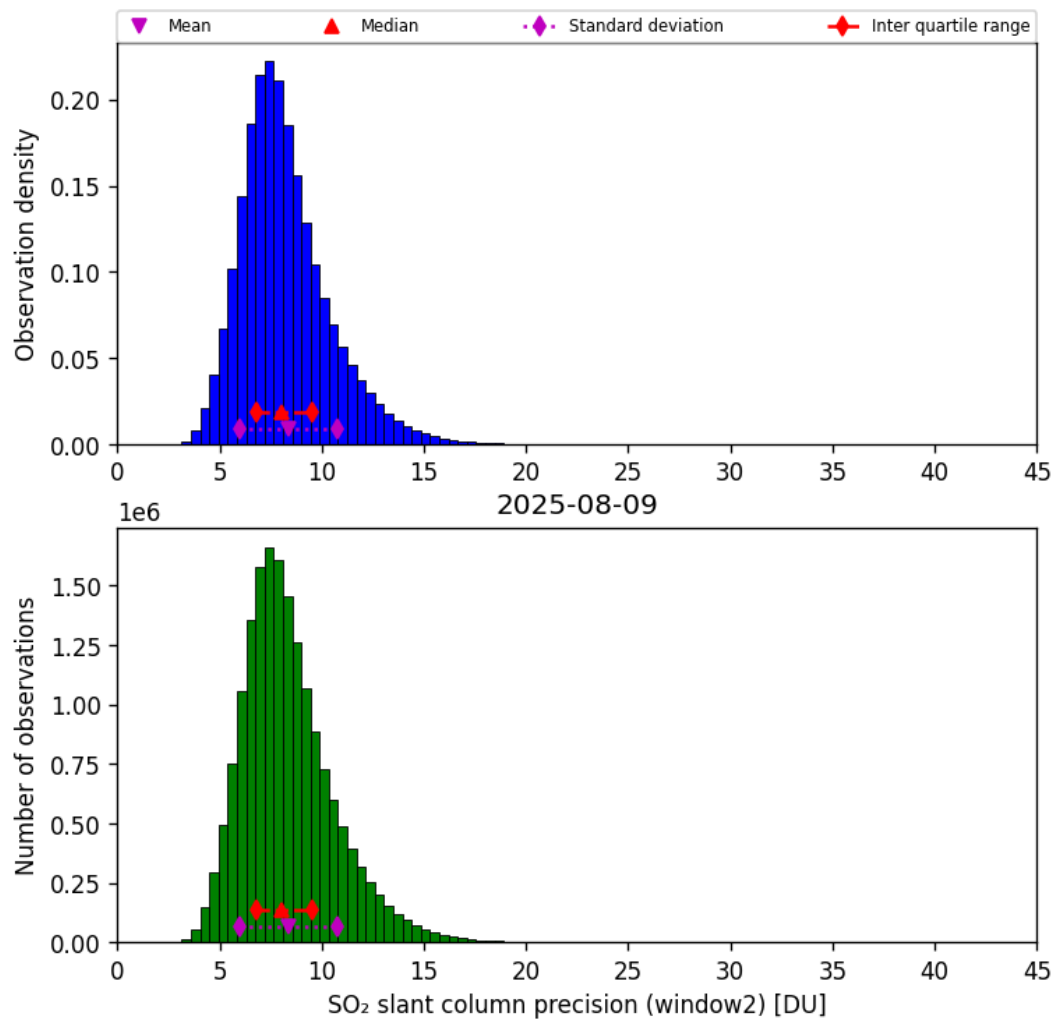


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-08-09 to 2025-08-10

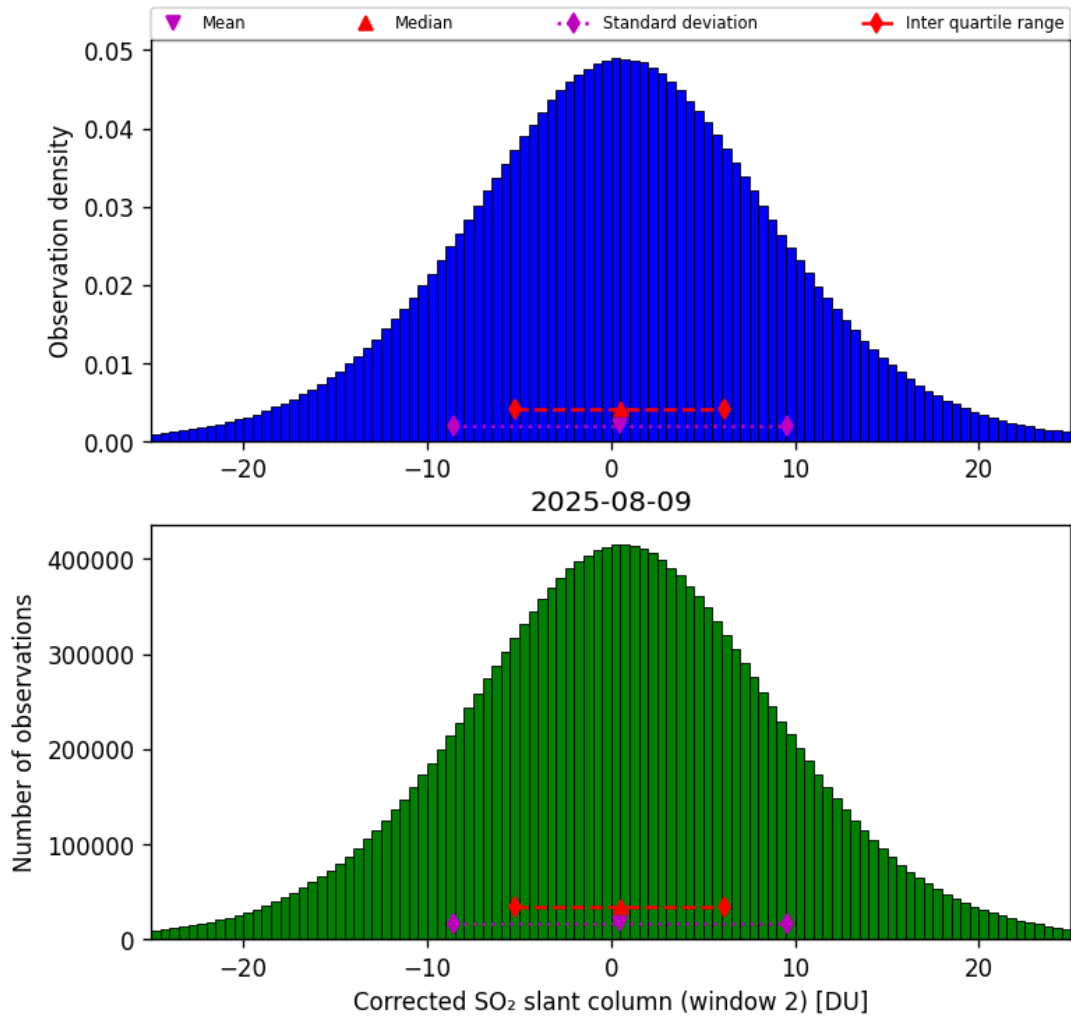


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-08-09 to 2025-08-10

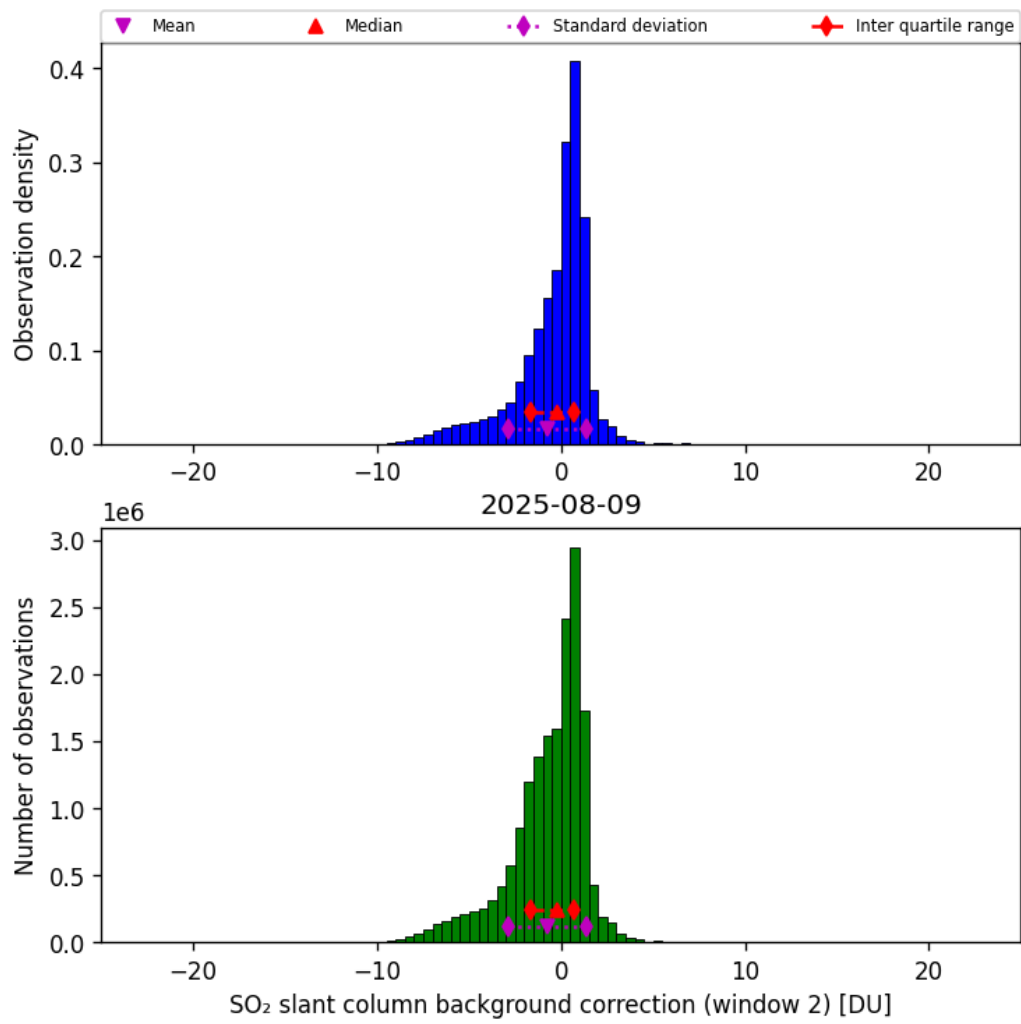


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-08-09 to 2025-08-10

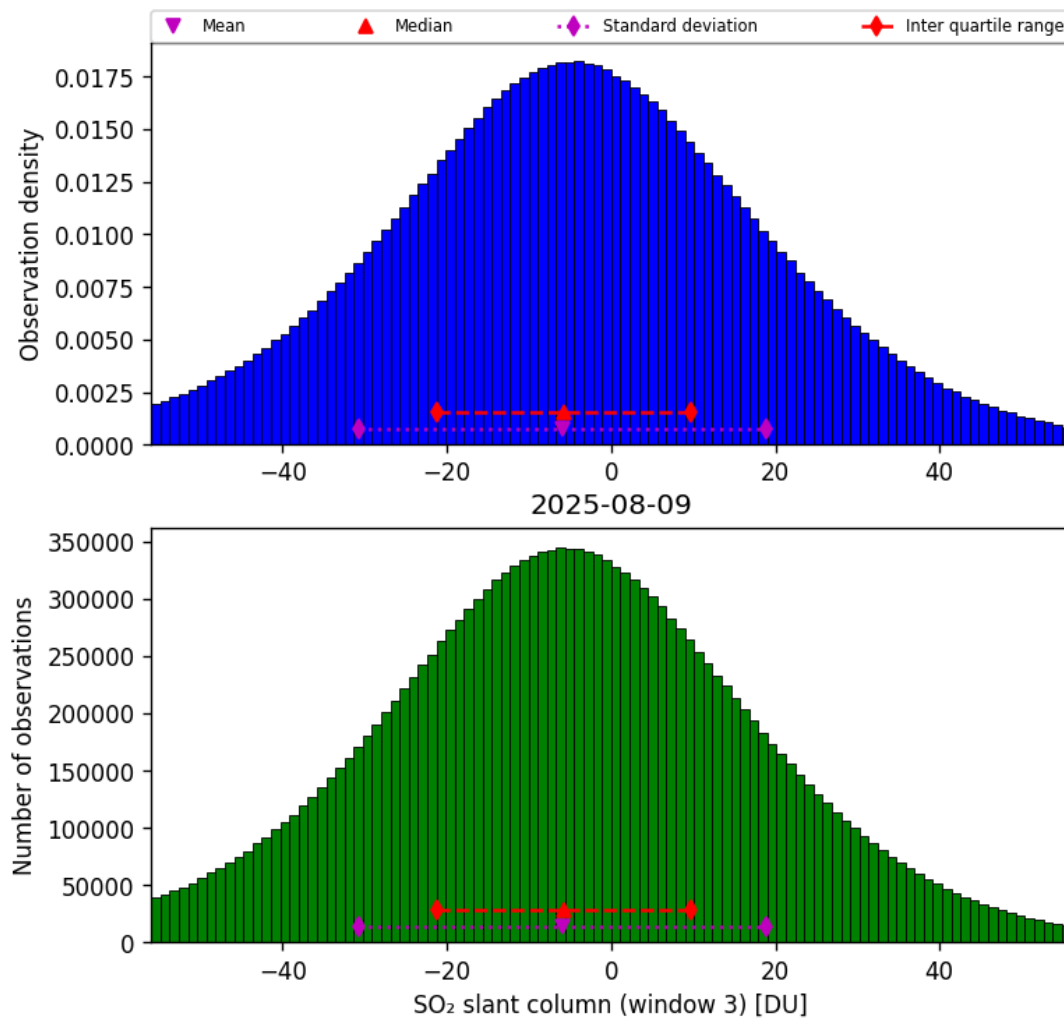


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-08-09 to 2025-08-10

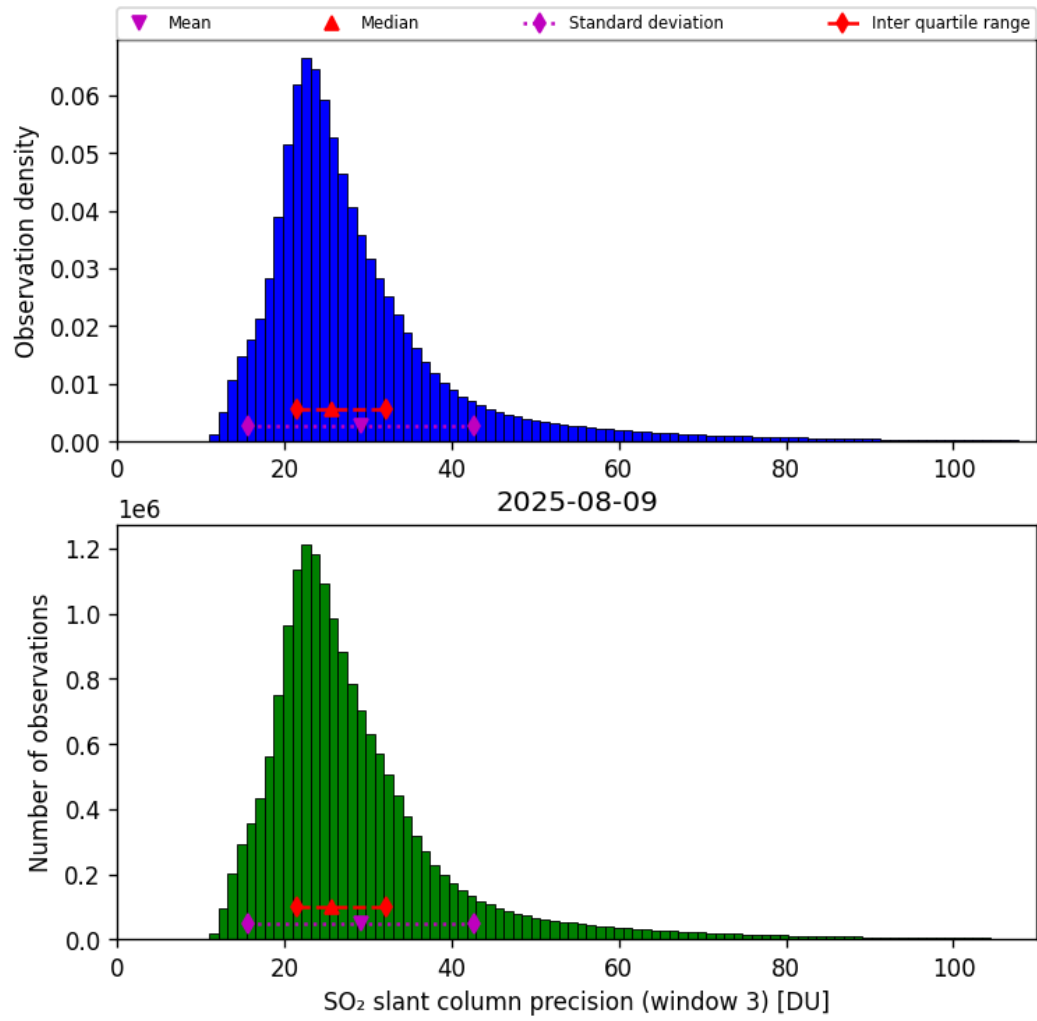


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-08-09 to 2025-08-10

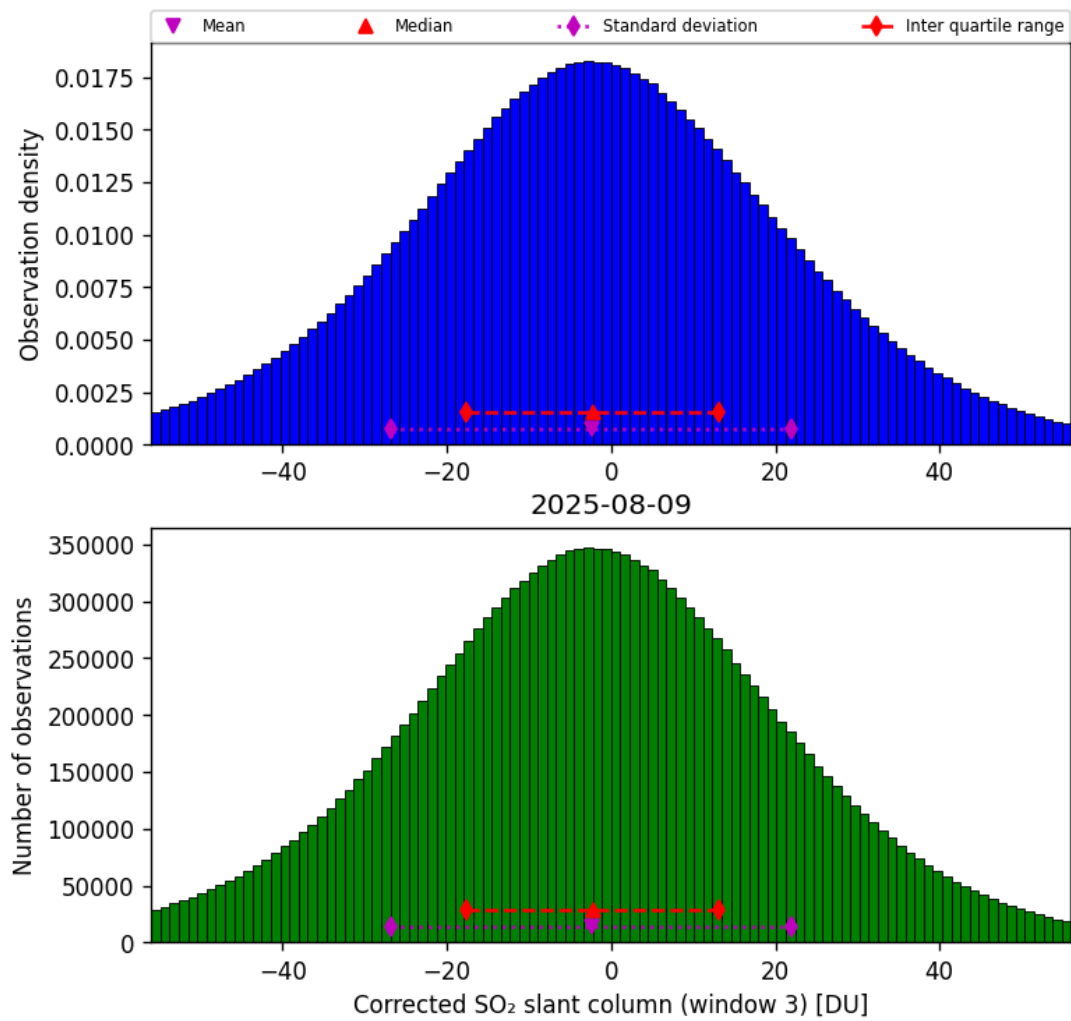


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-08-09 to 2025-08-10

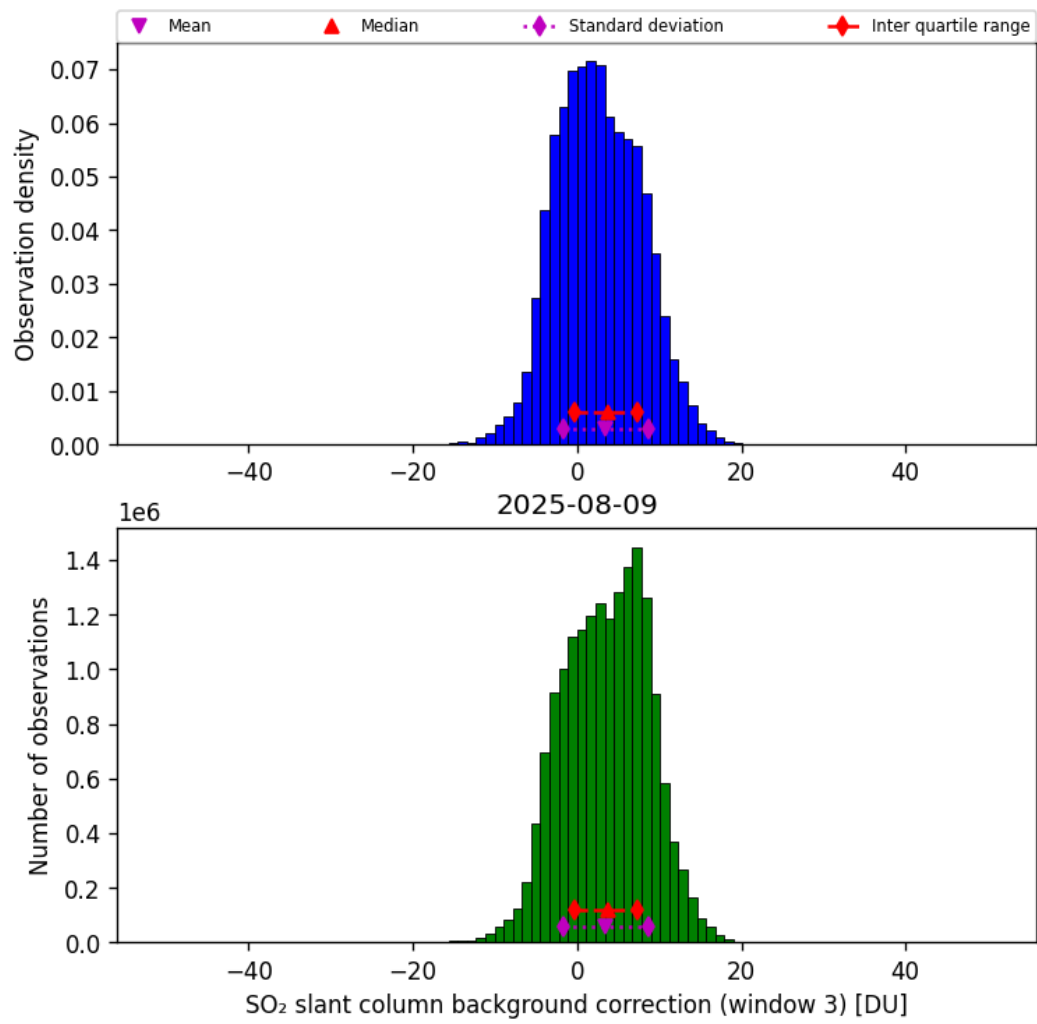


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-08-09 to 2025-08-10

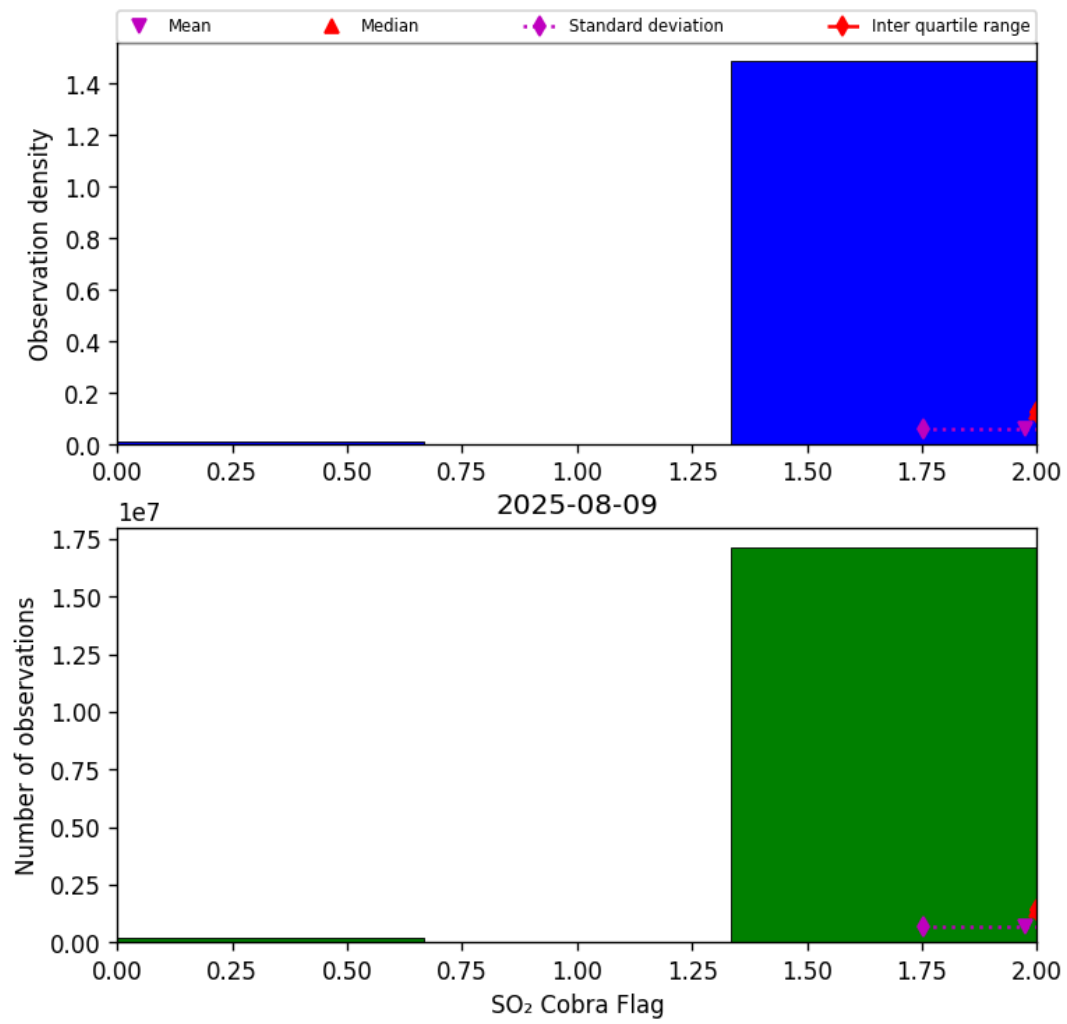


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-08-09 to 2025-08-10

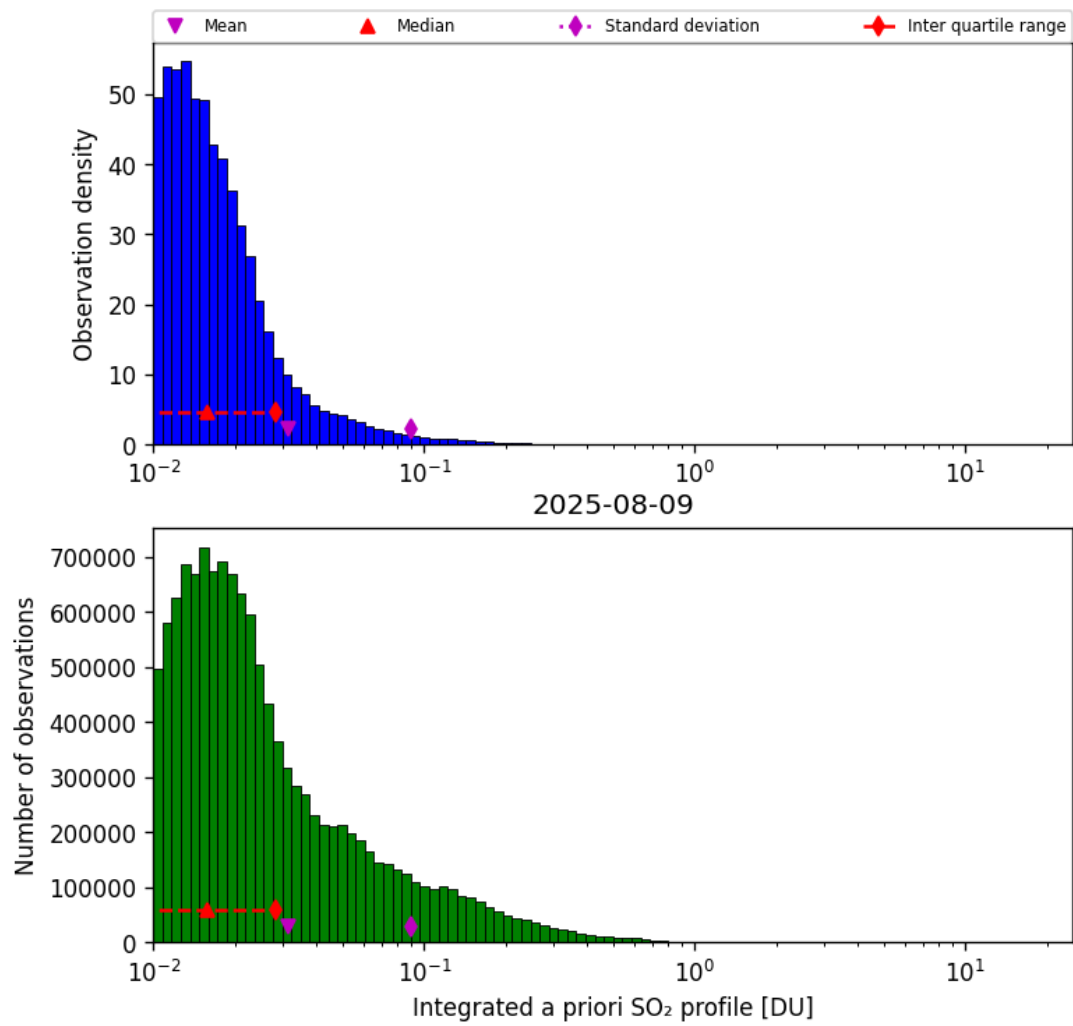


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-08-09 to 2025-08-10

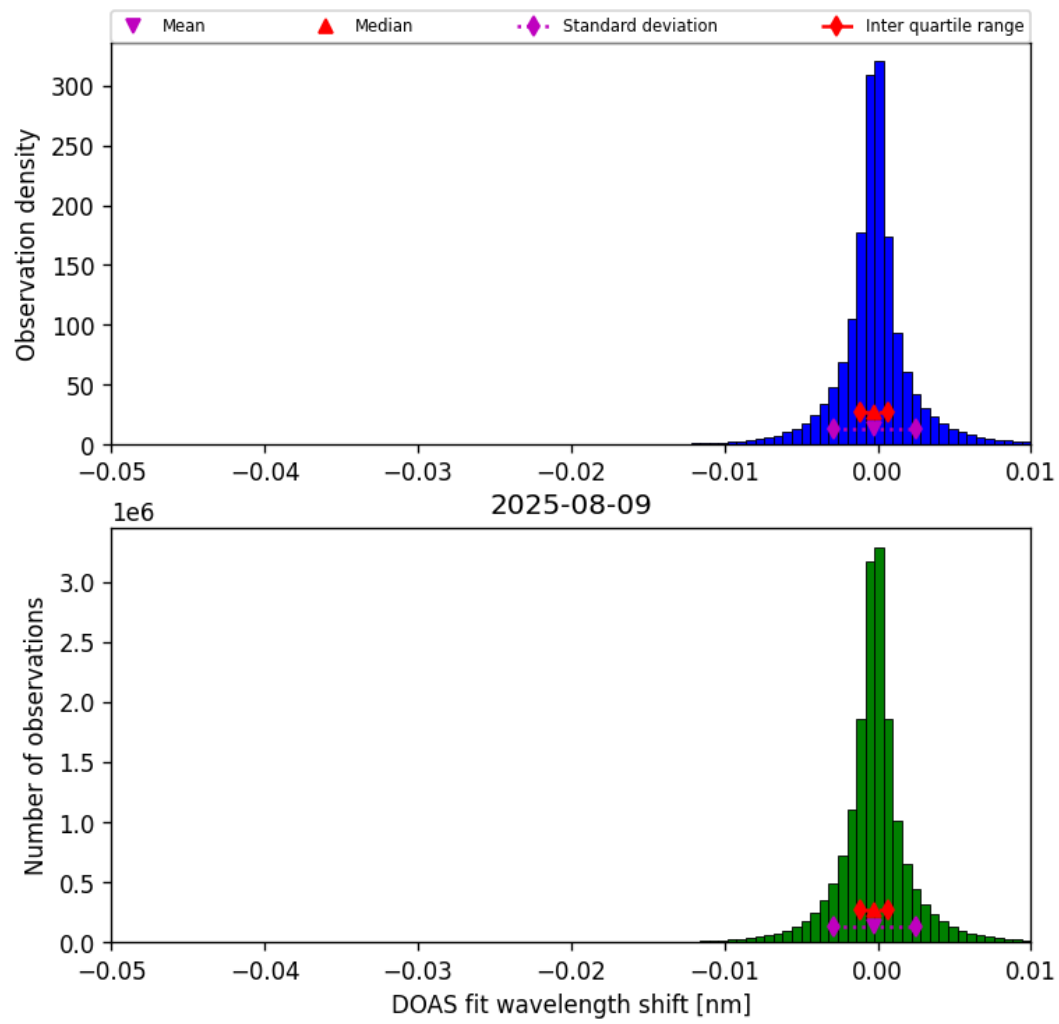


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-08-09 to 2025-08-10

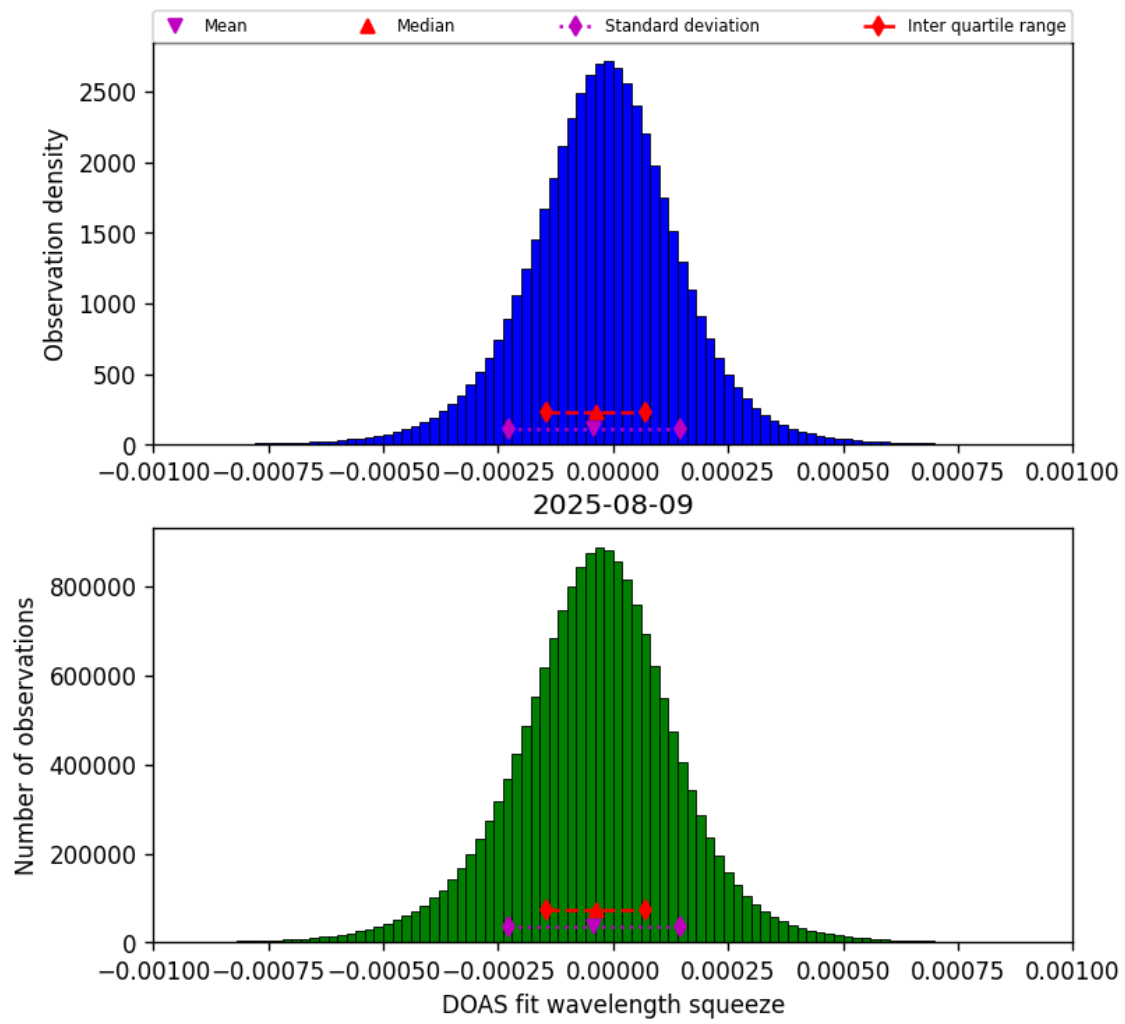


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-08-09 to 2025-08-10

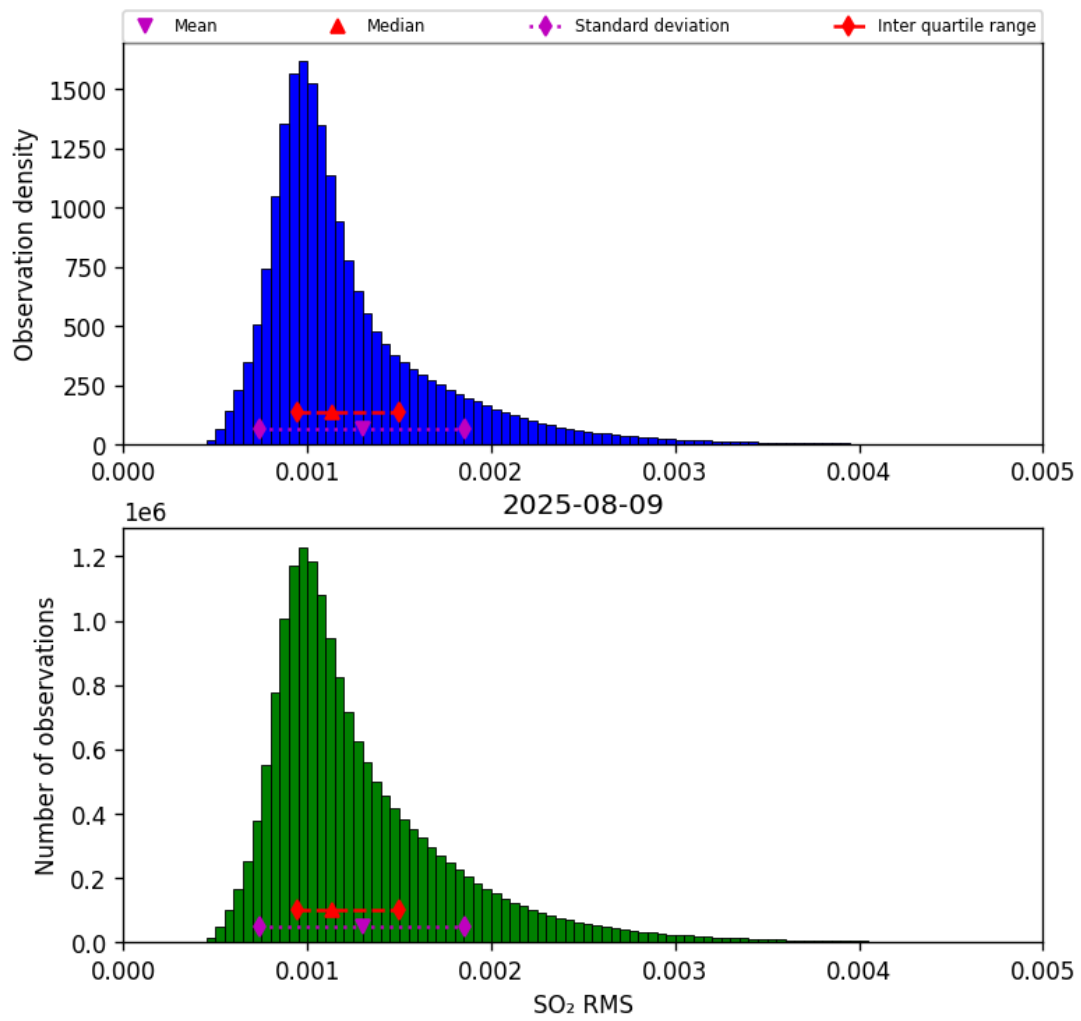


Figure 79: Histogram of “SO₂ RMS” for 2025-08-09 to 2025-08-10

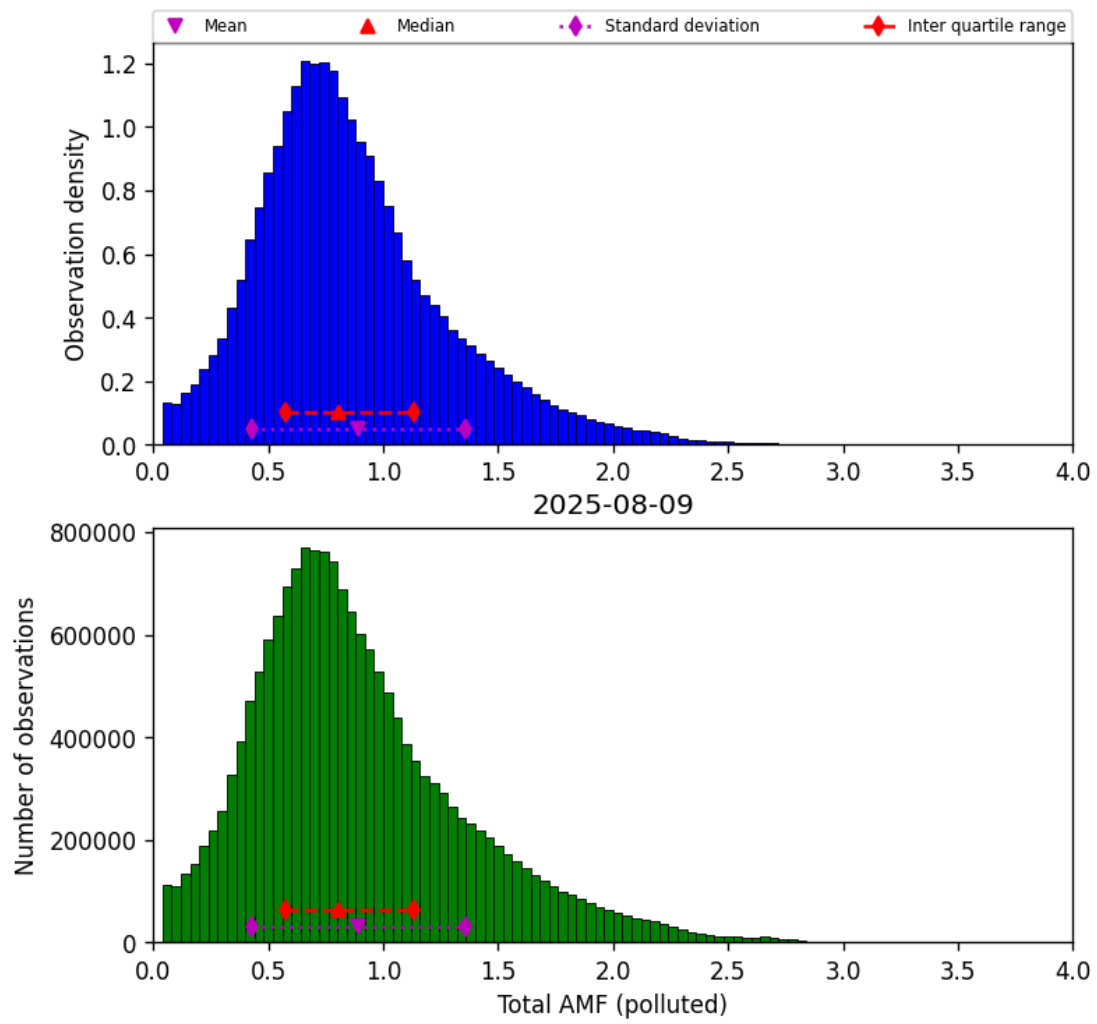


Figure 80: Histogram of “Total AMF (polluted)” for 2025-08-09 to 2025-08-10

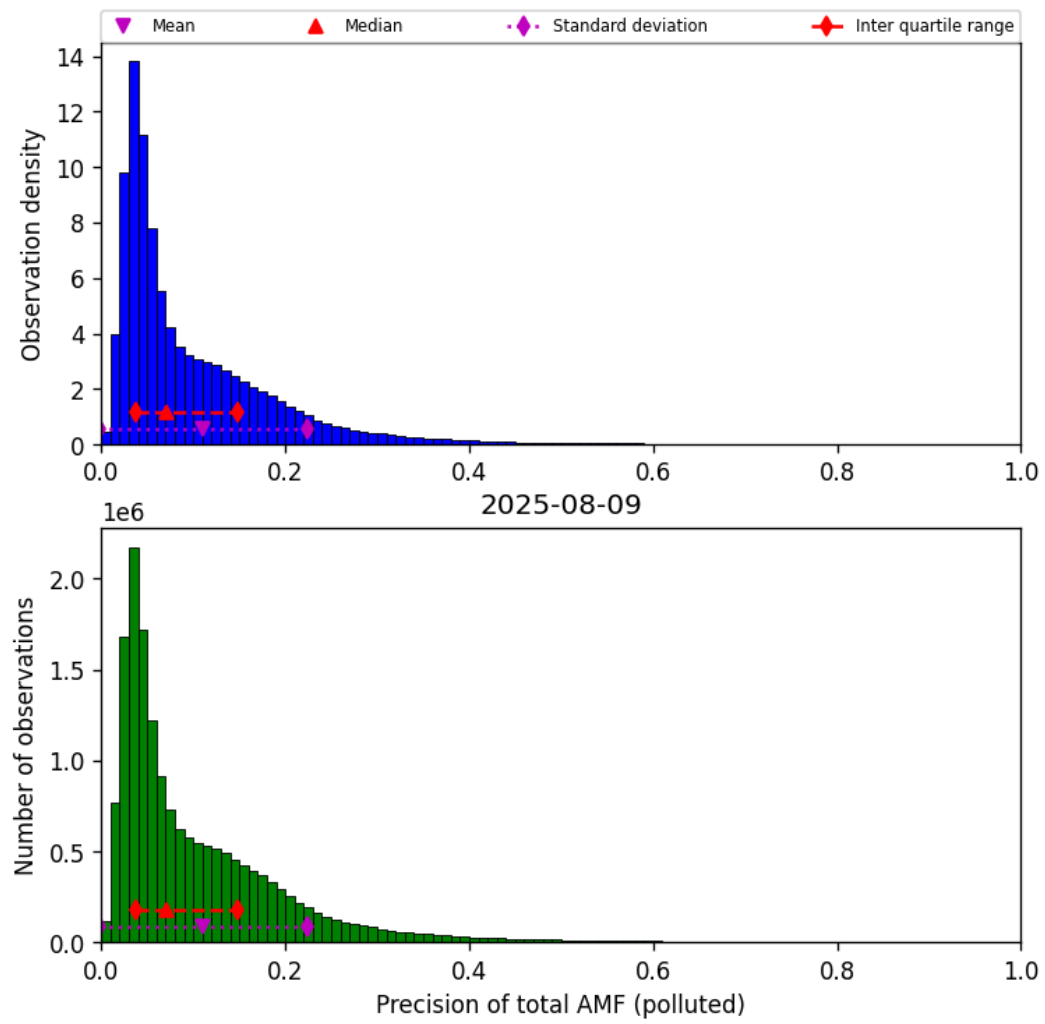


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-08-09 to 2025-08-10

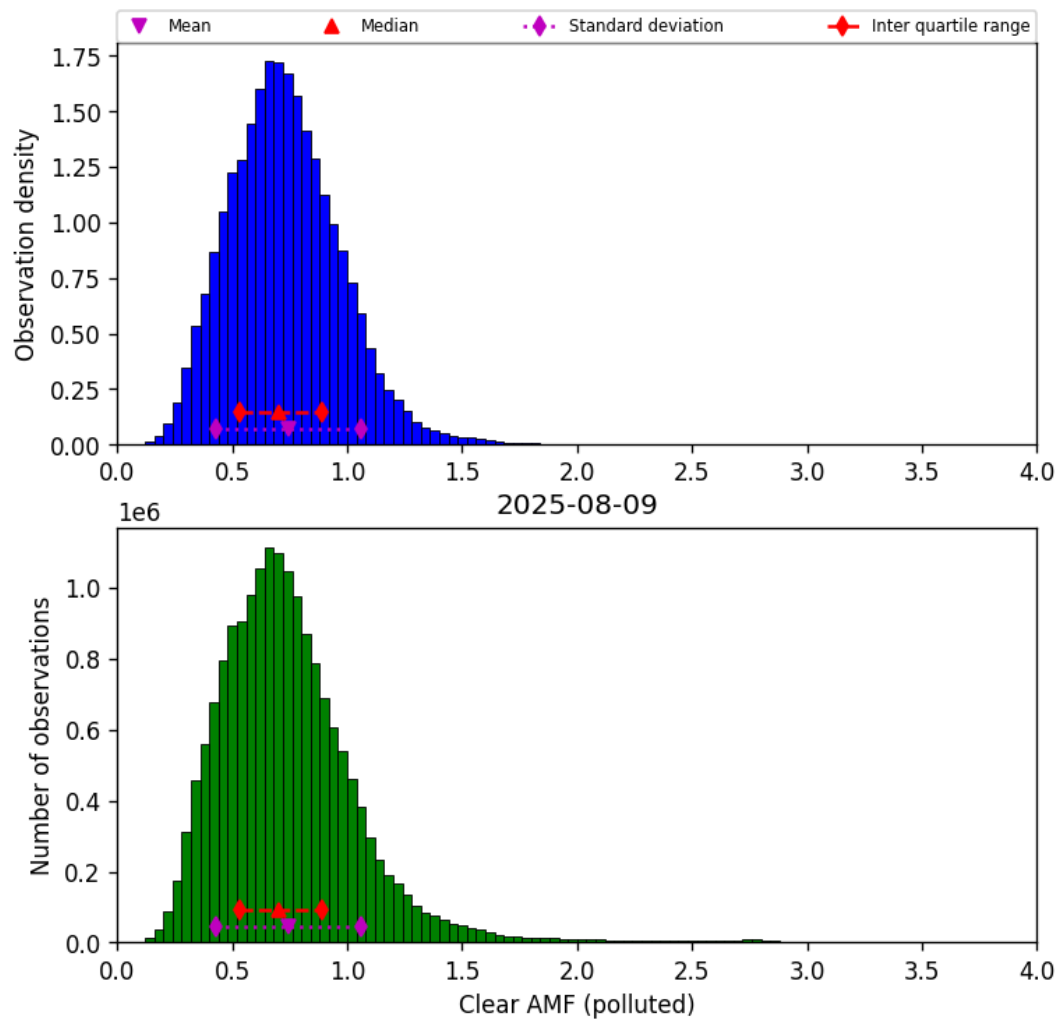


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-08-09 to 2025-08-10

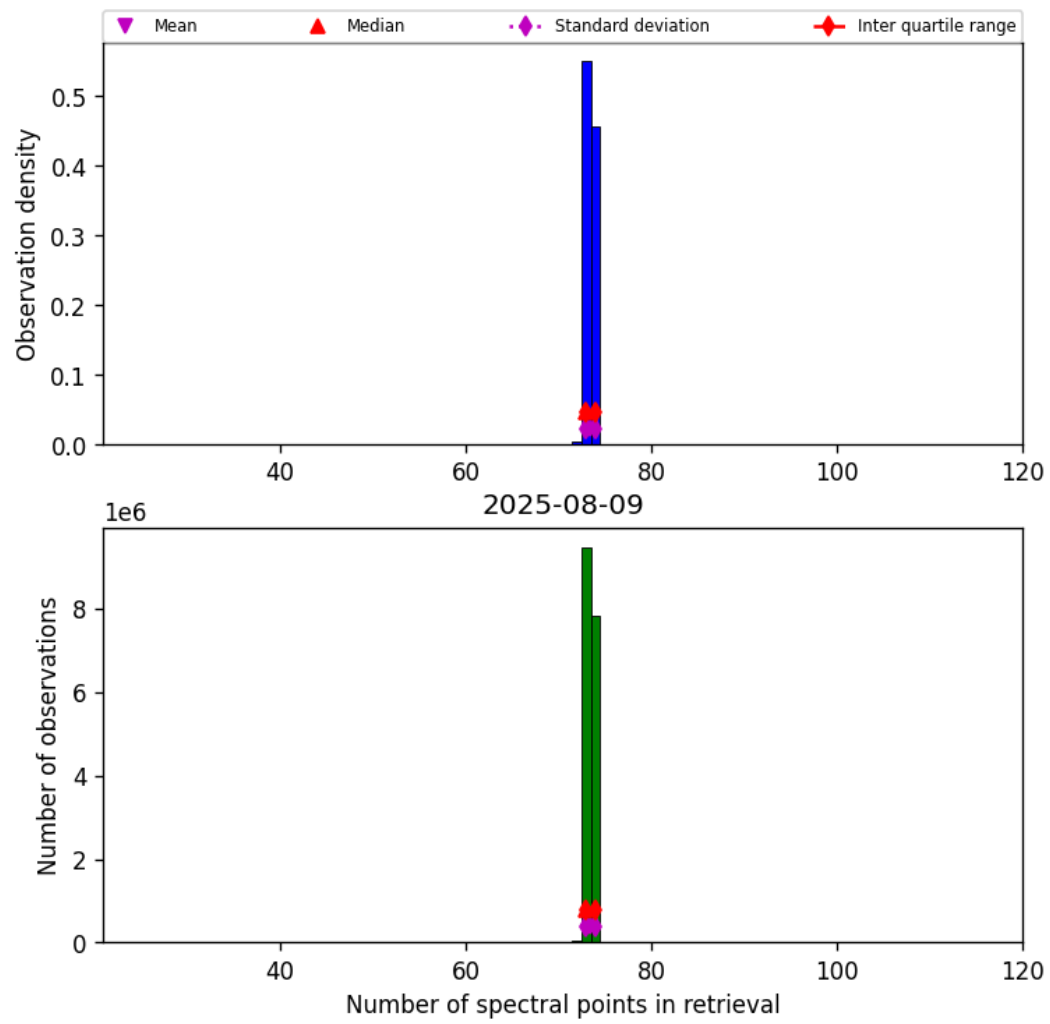


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-08-09 to 2025-08-10

9 Along track statistics

The TROPOMI instrument uses different binned detector rows for different viewing directions. In this section statistics are presented for each of the binned rows in the instrument.

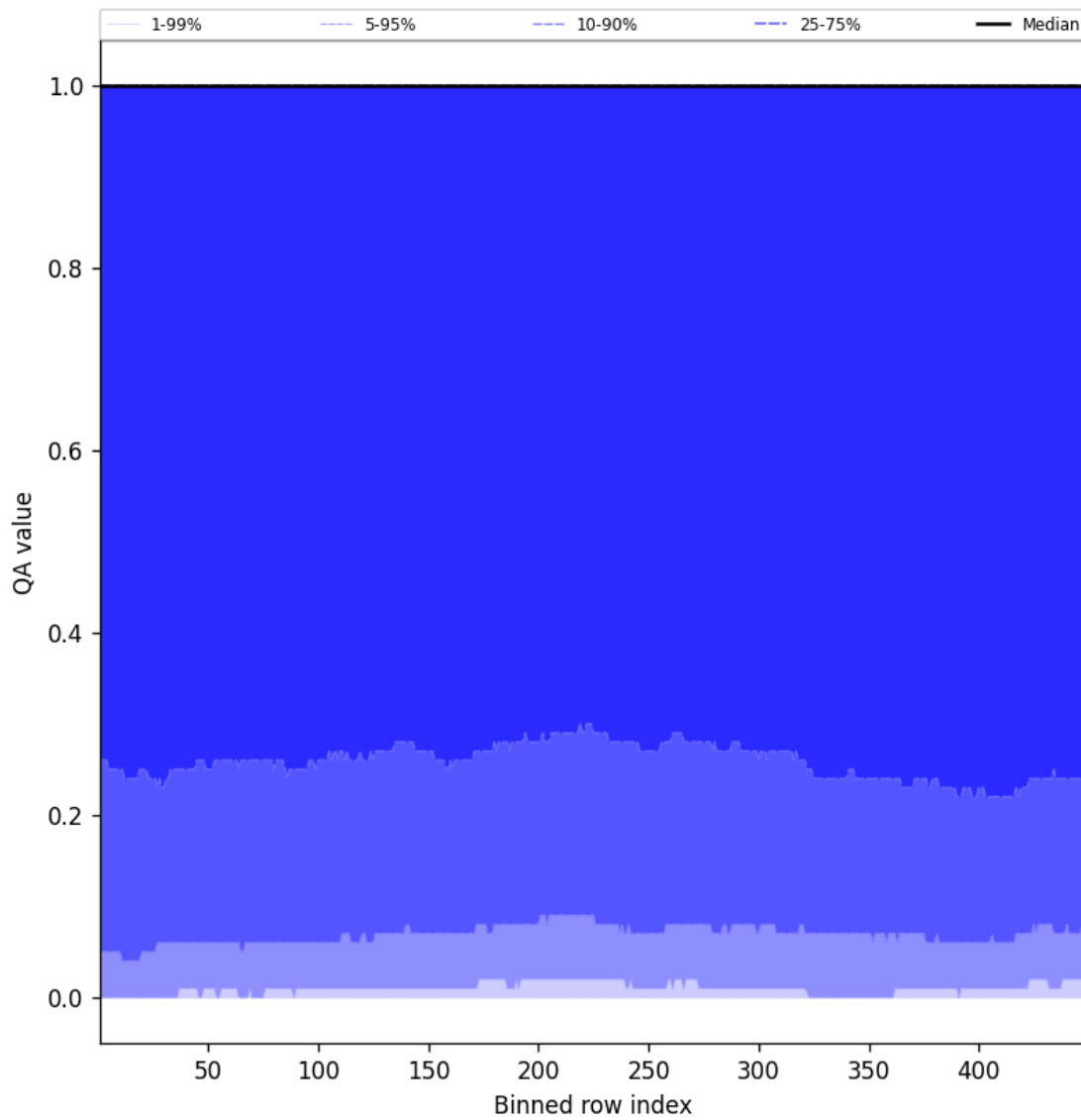


Figure 84: Along track statistics of “QA value” for 2025-08-09 to 2025-08-10

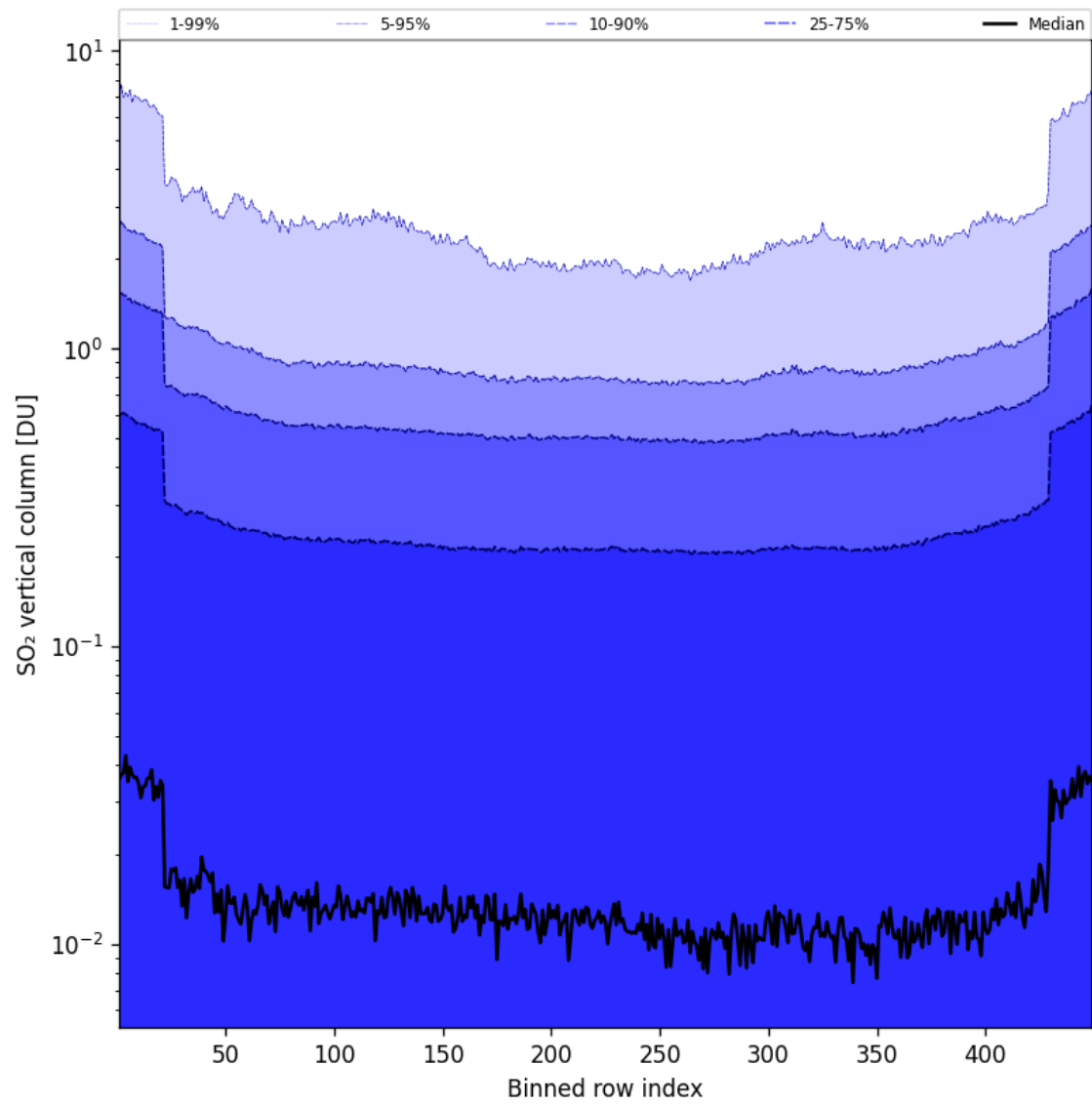


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-08-09 to 2025-08-10

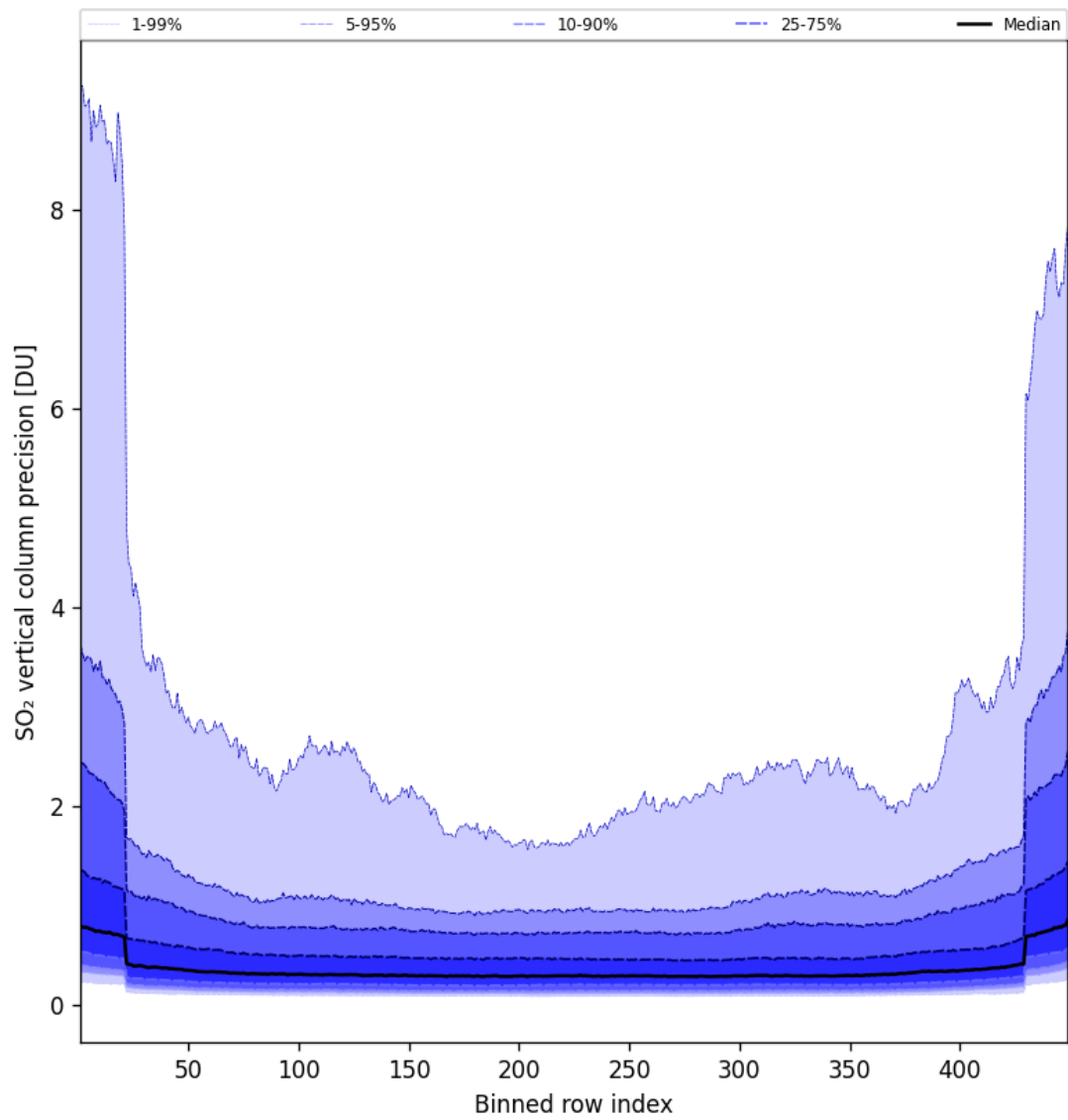


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-08-09 to 2025-08-10

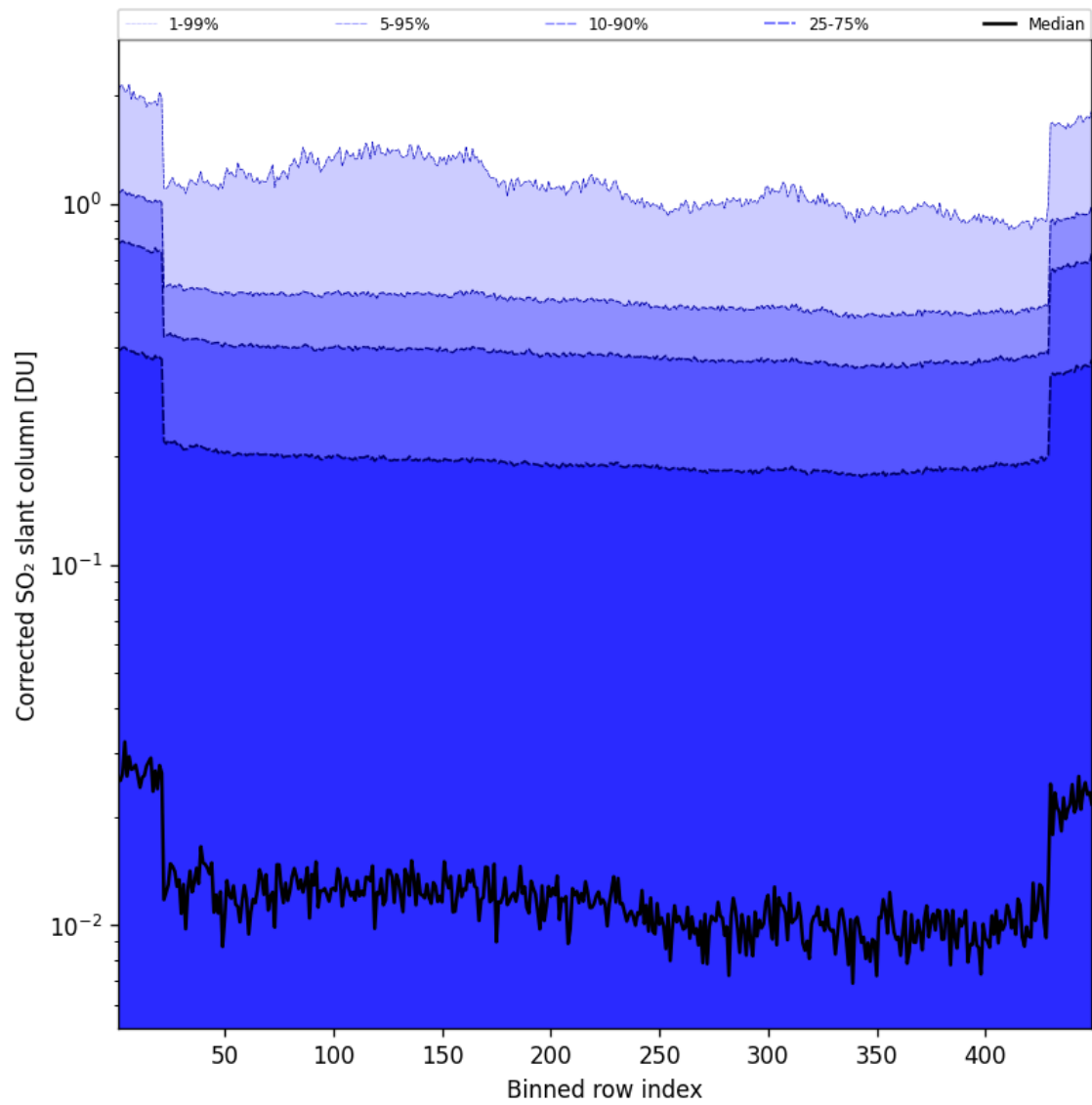


Figure 87: Along track statistics of "Corrected SO₂ slant column" for 2025-08-09 to 2025-08-10

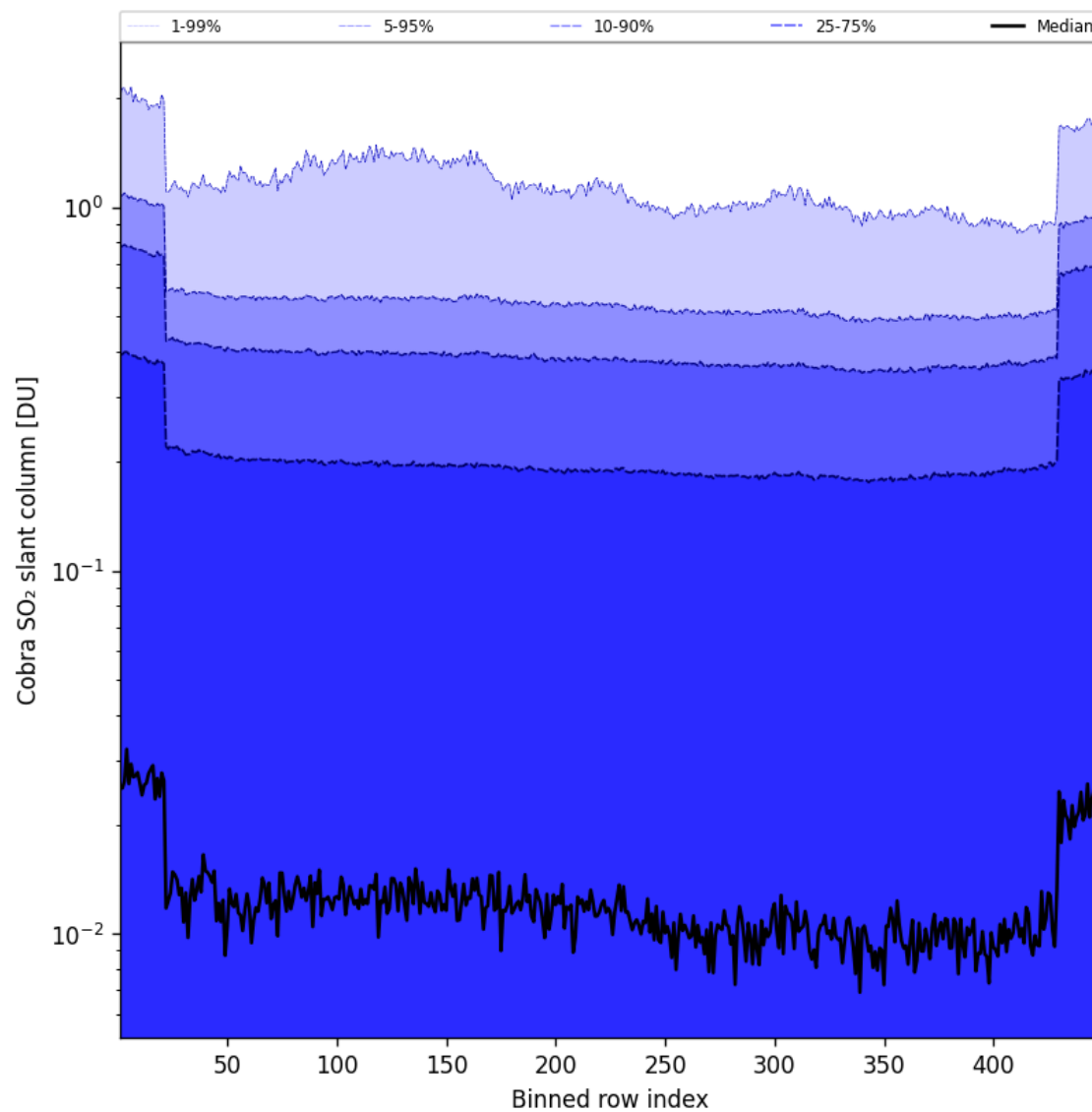


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-08-09 to 2025-08-10

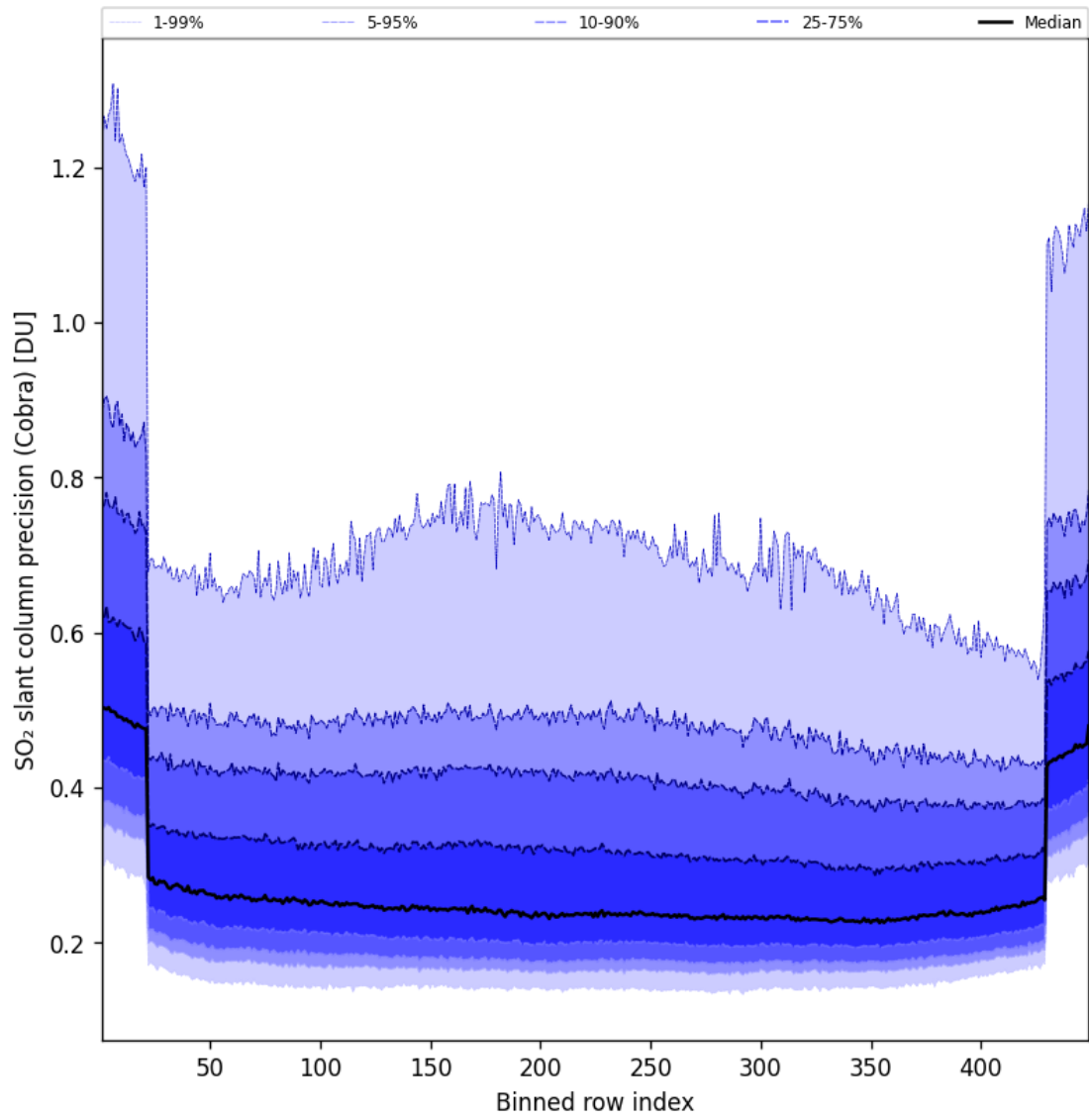


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-08-09 to 2025-08-10

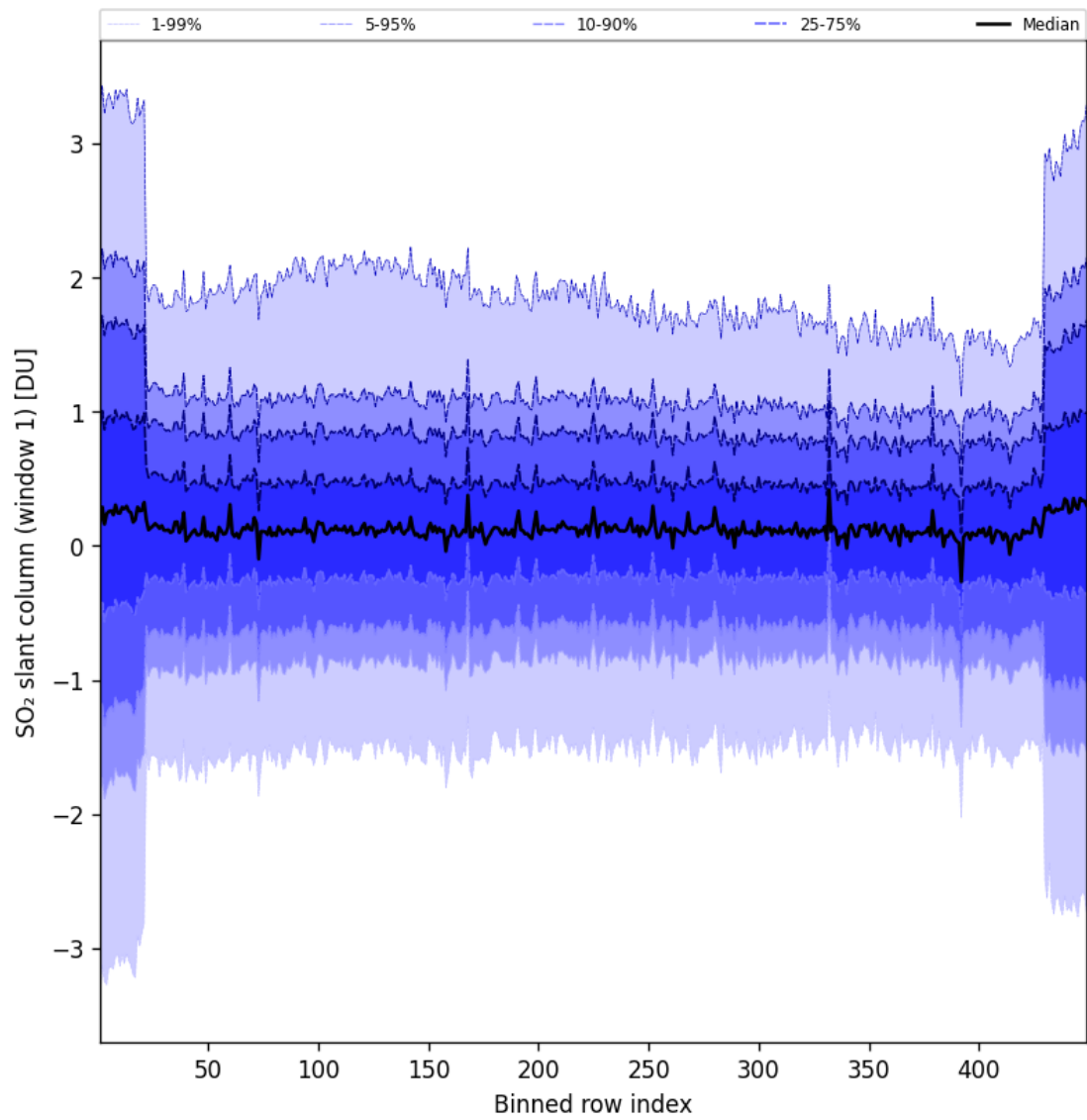


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-08-09 to 2025-08-10

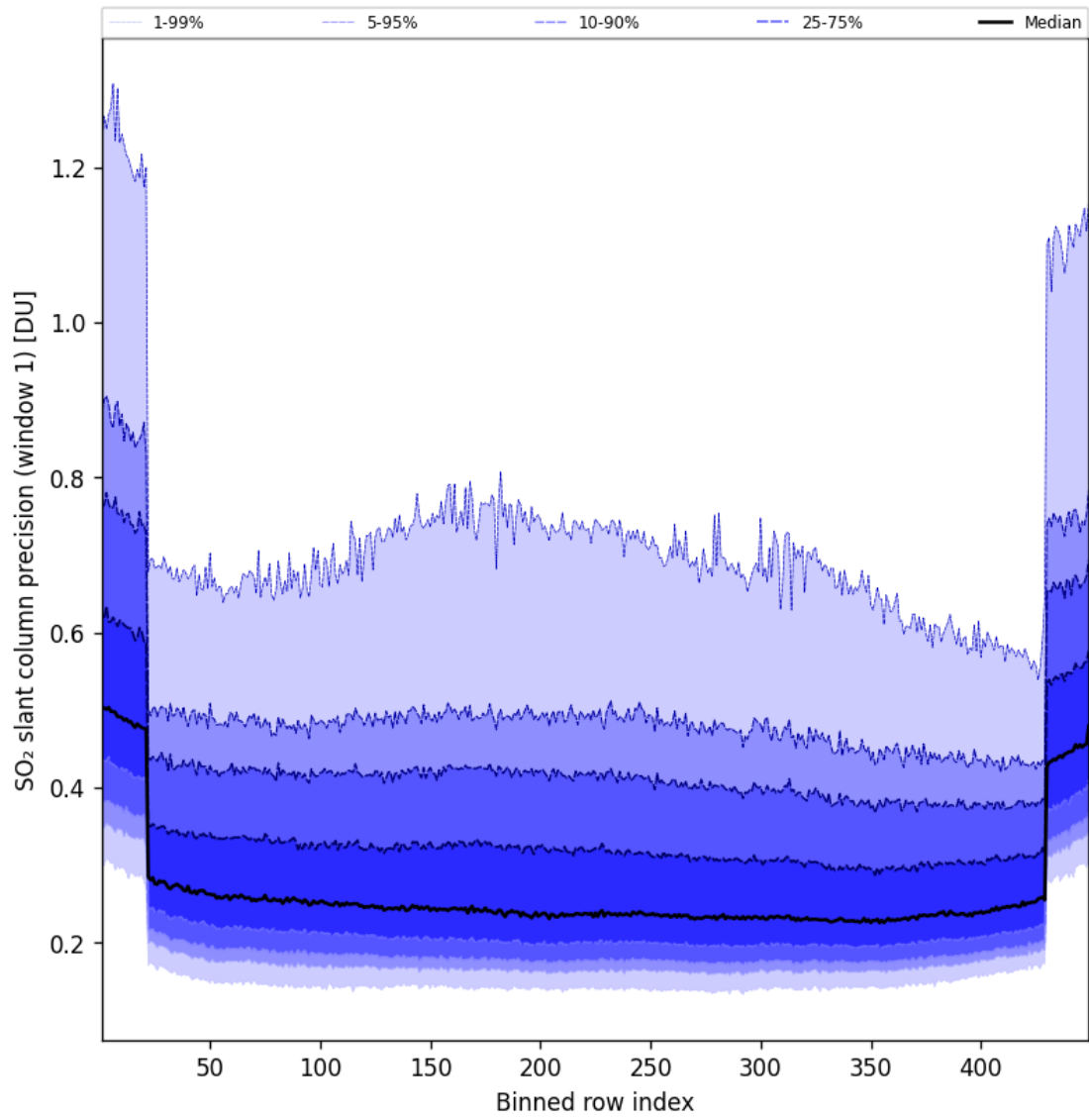


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-08-09 to 2025-08-10

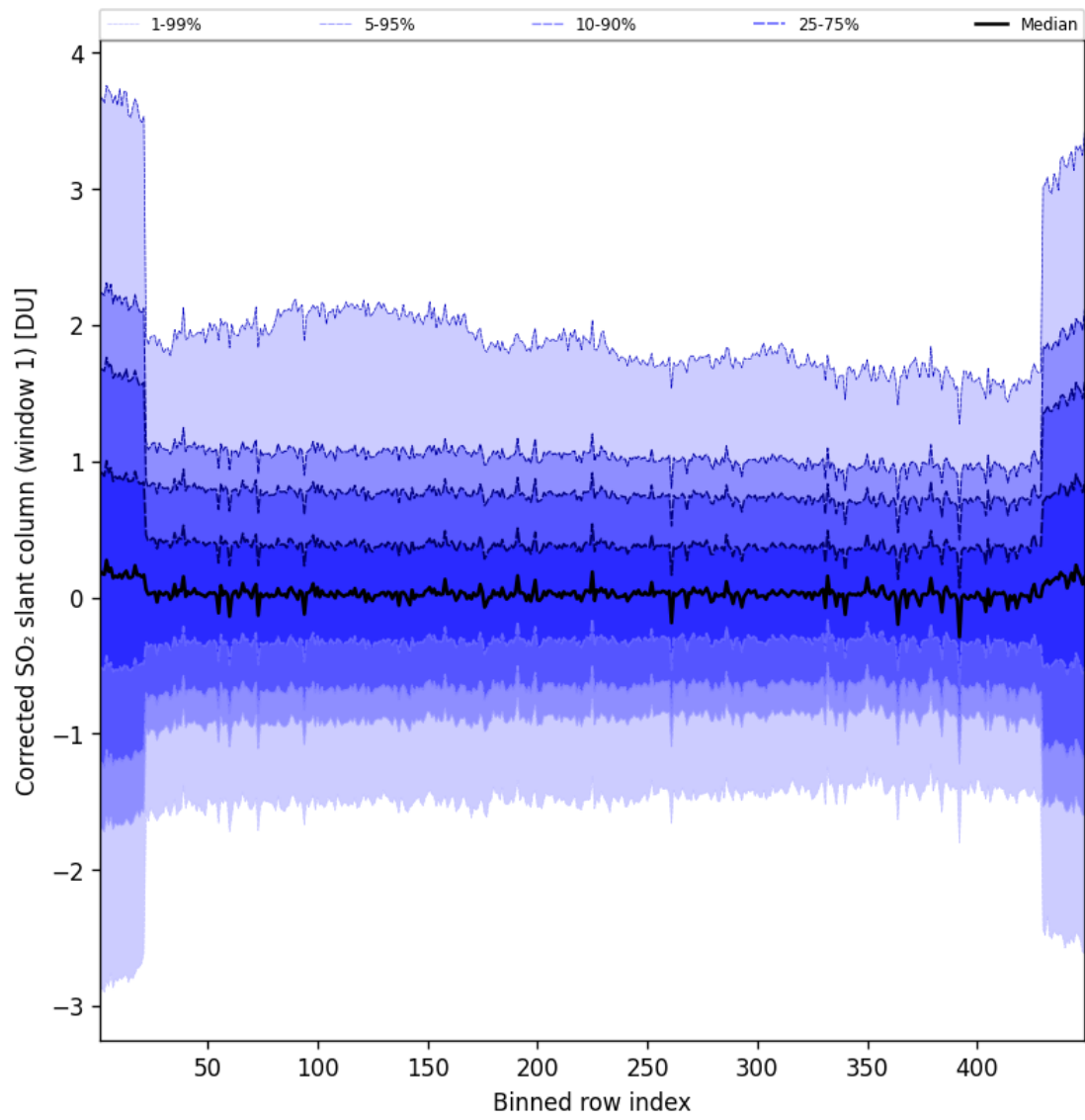


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-08-09 to 2025-08-10

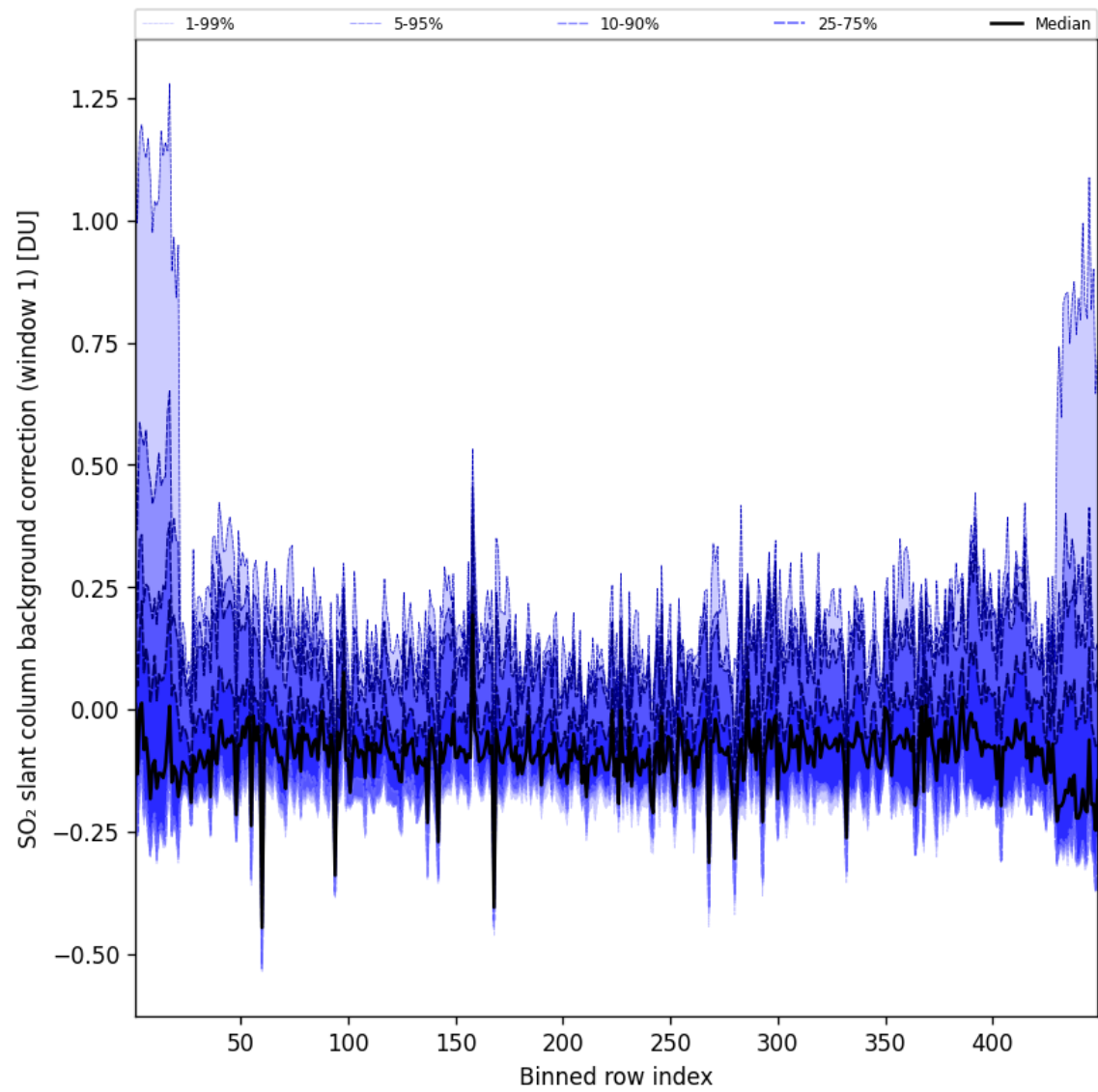


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-08-09 to 2025-08-10

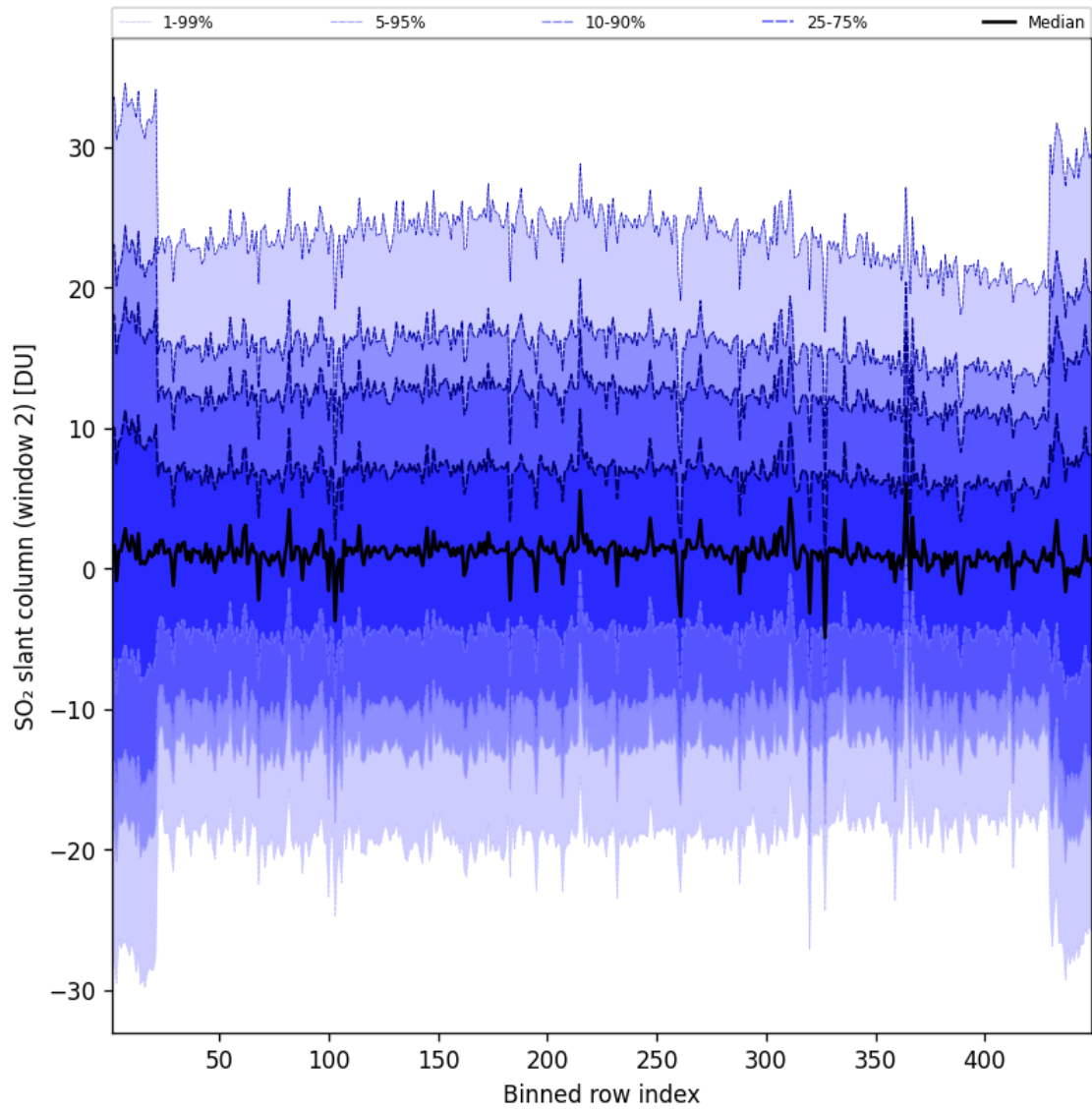


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-08-09 to 2025-08-10

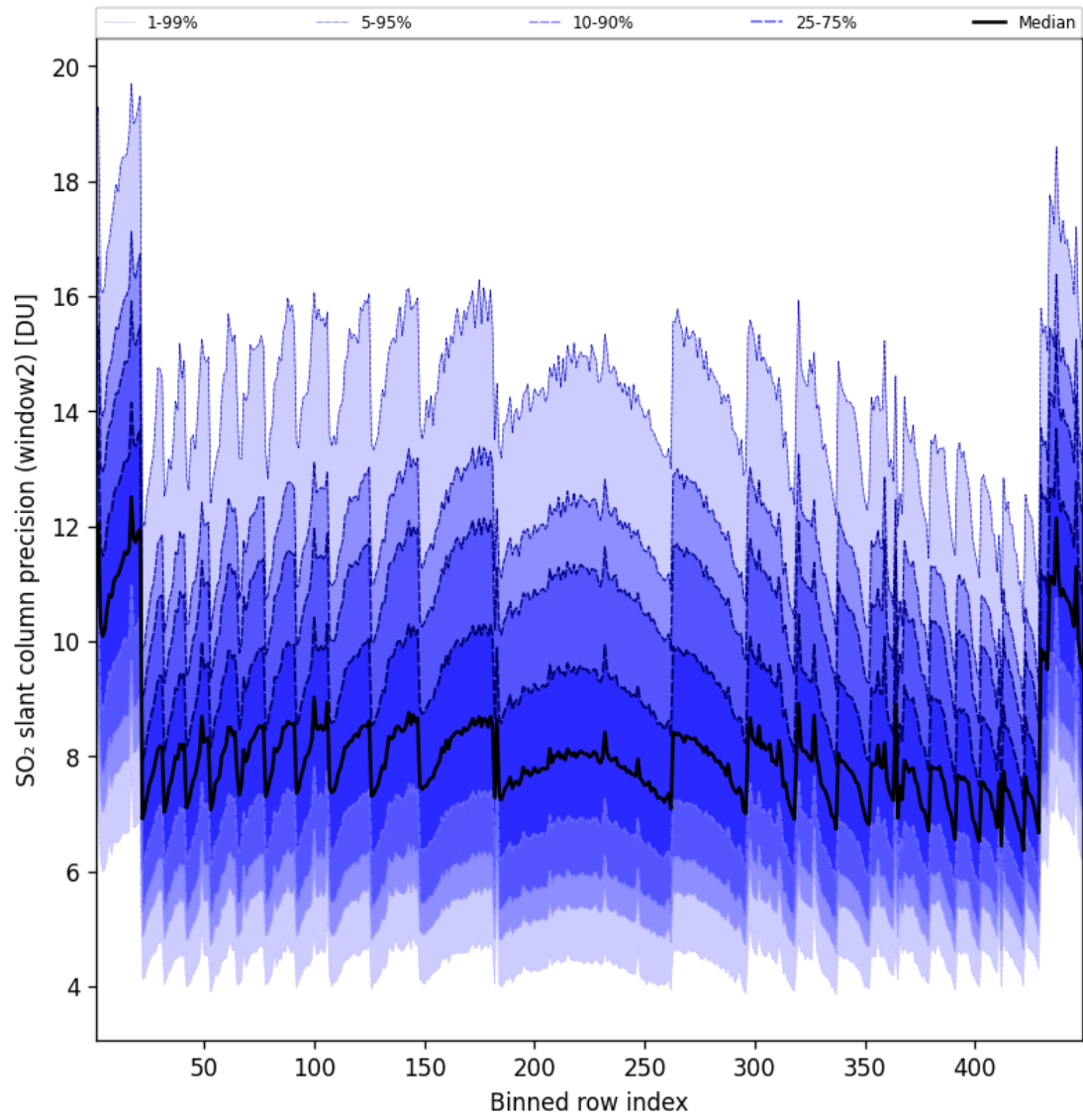


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-08-09 to 2025-08-10

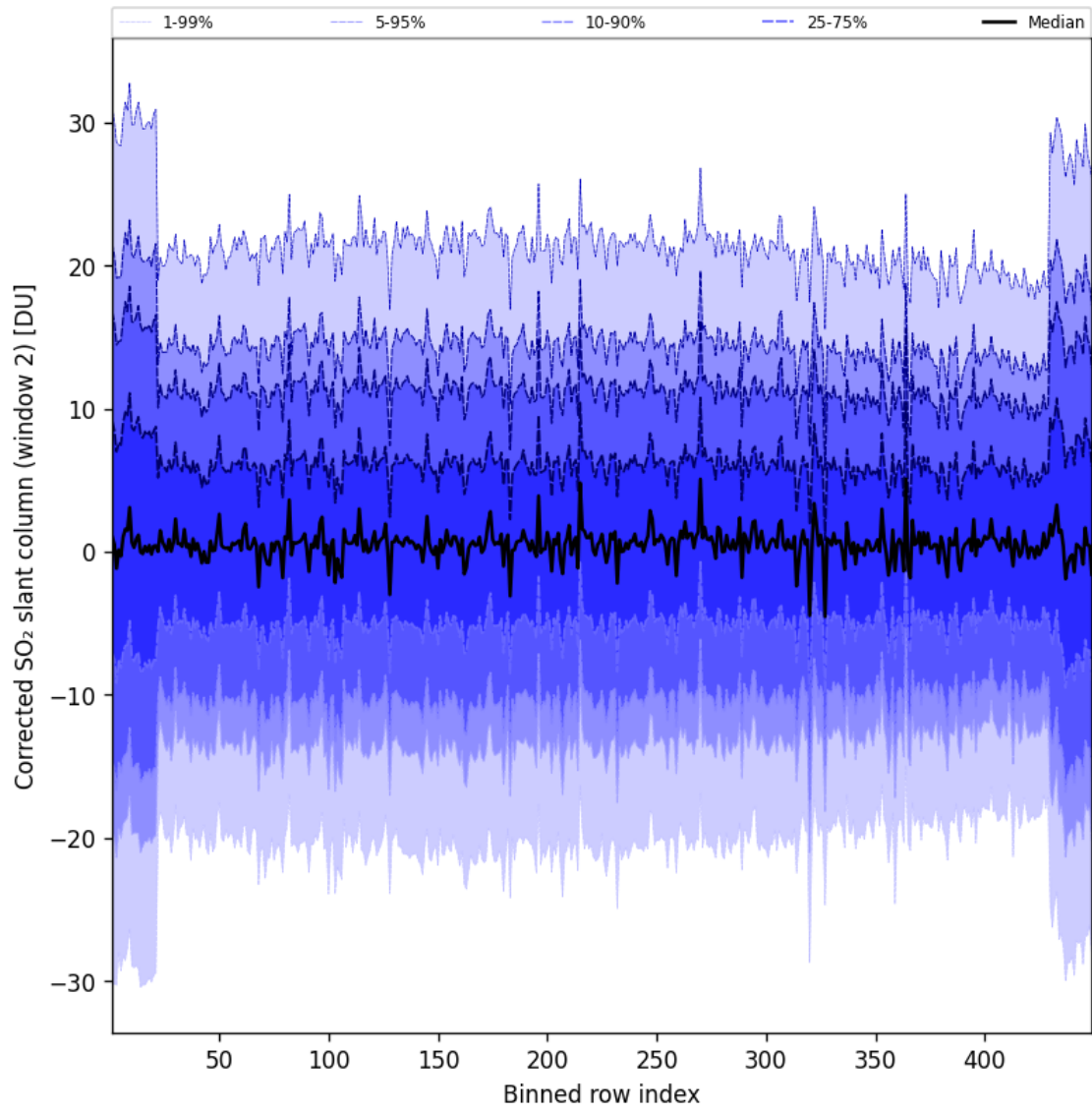


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-08-09 to 2025-08-10

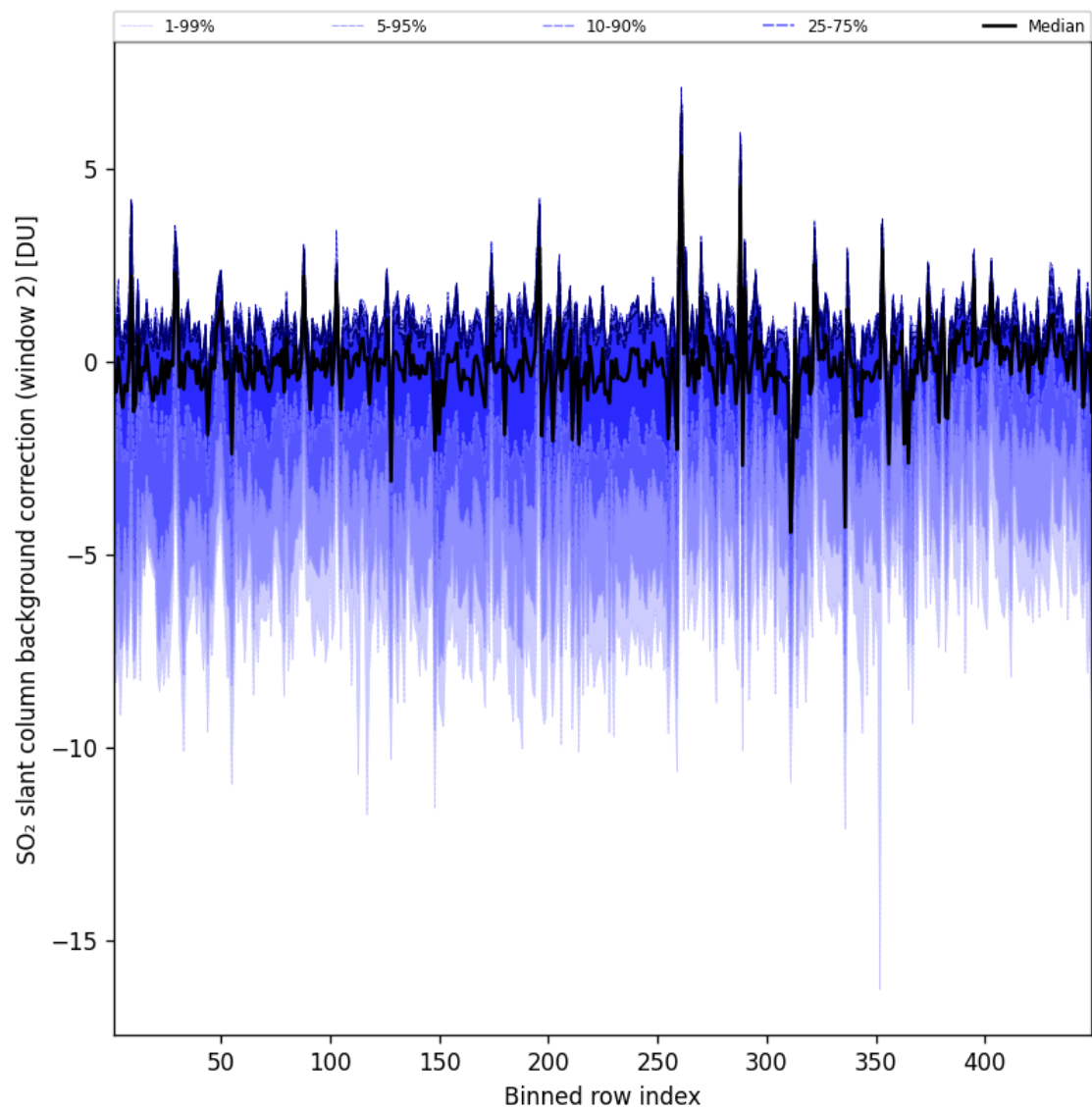


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-08-09 to 2025-08-10

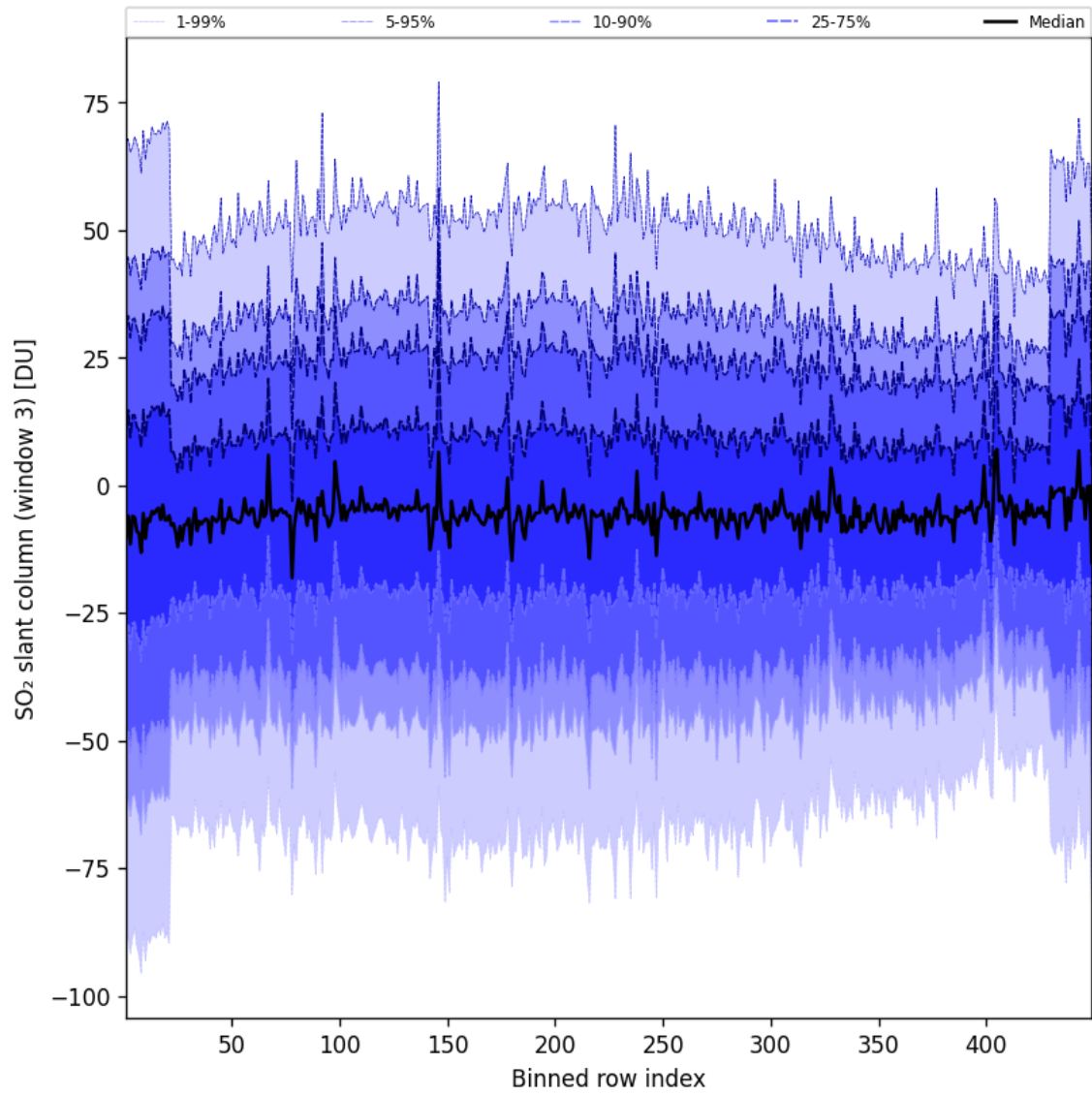


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-08-09 to 2025-08-10

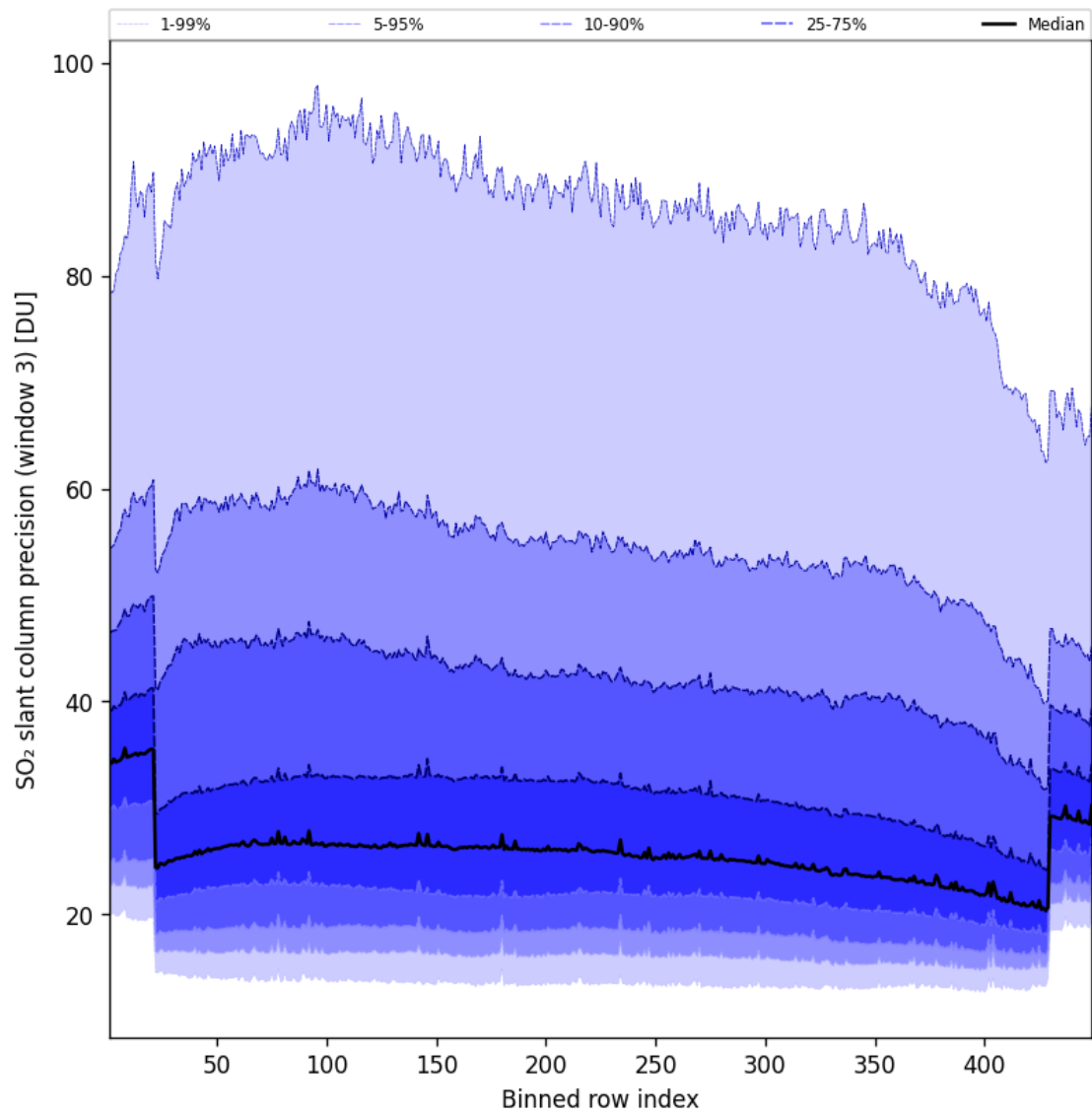


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-08-09 to 2025-08-10

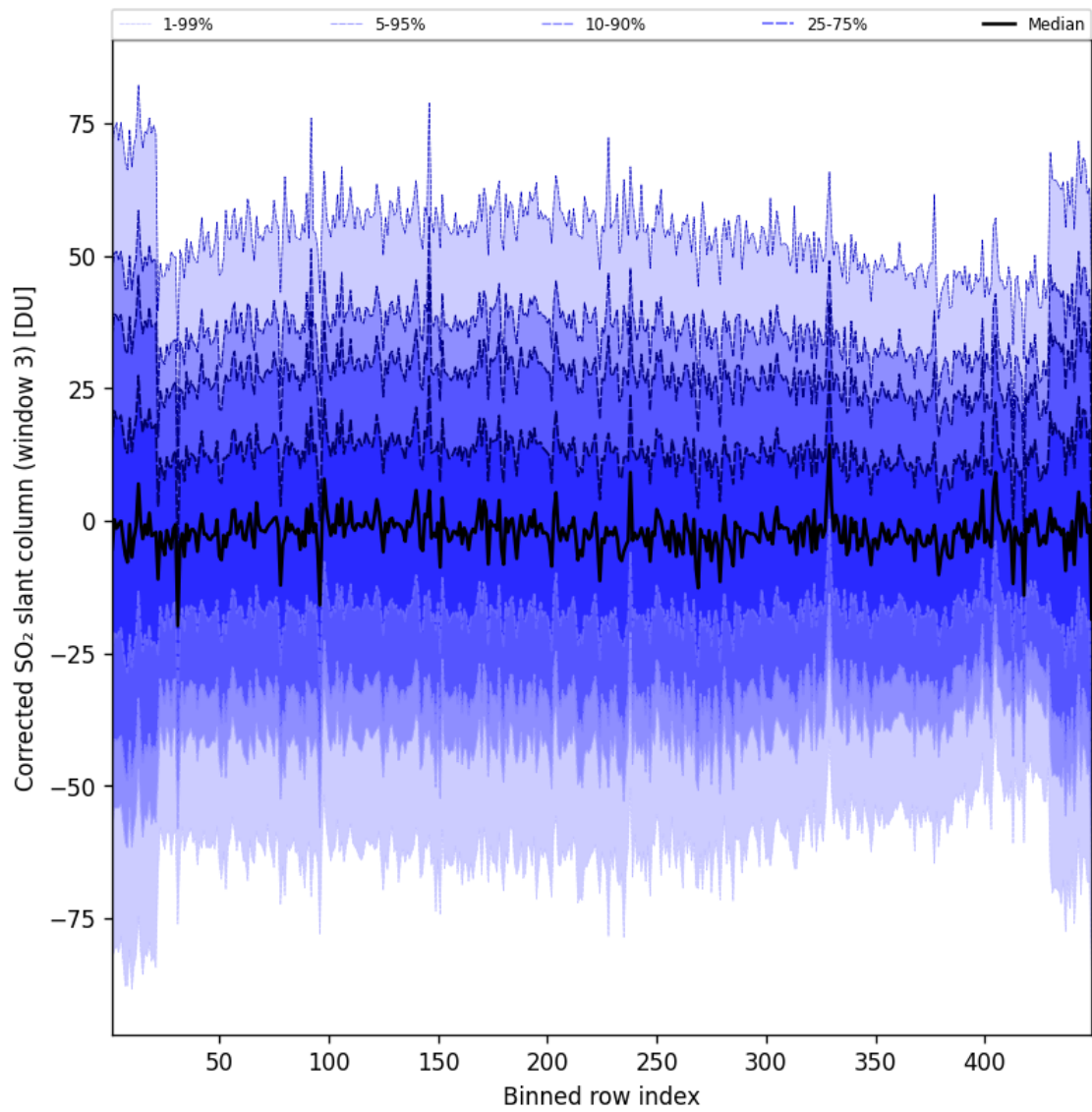


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-08-09 to 2025-08-10

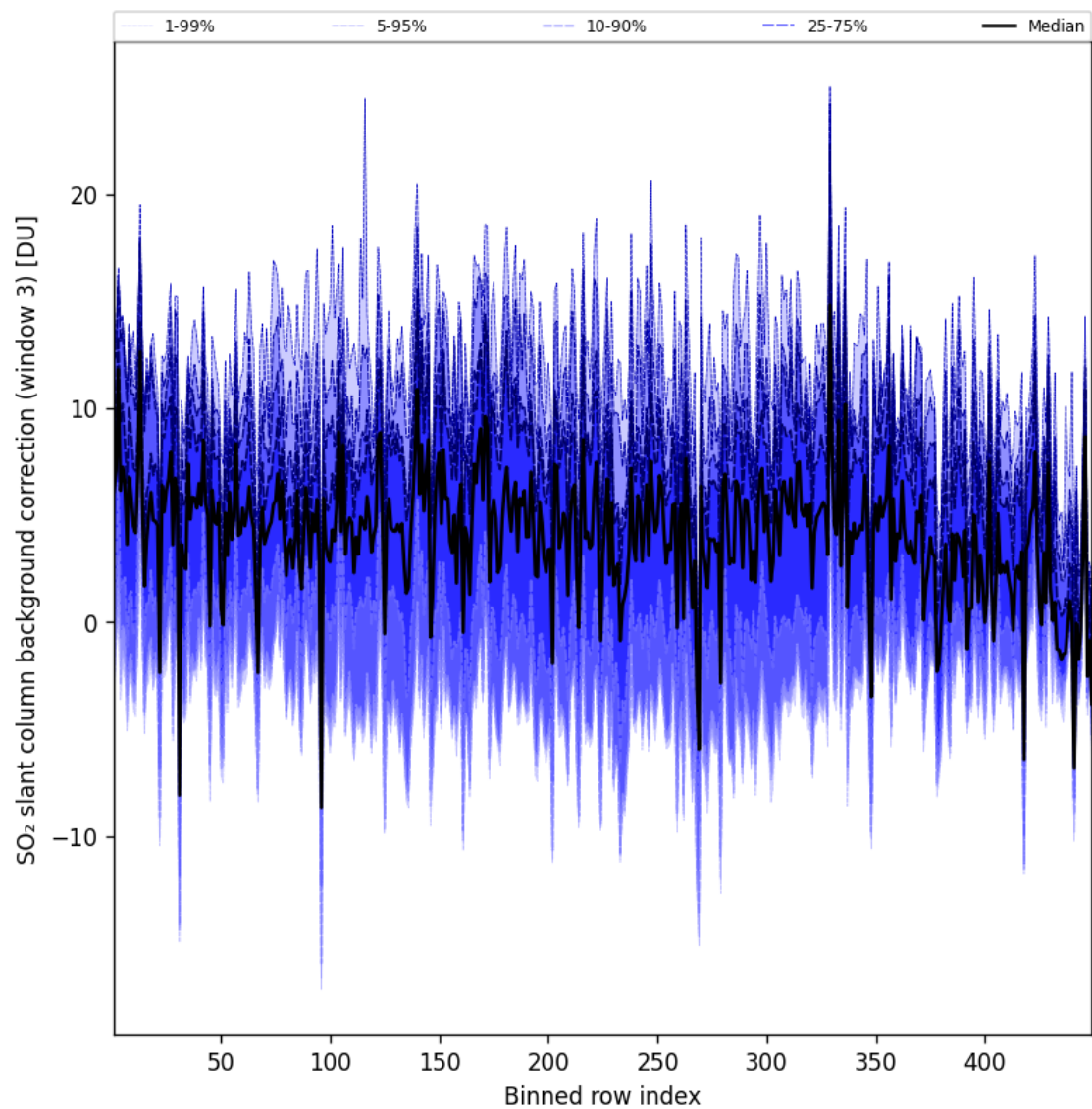


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-08-09 to 2025-08-10

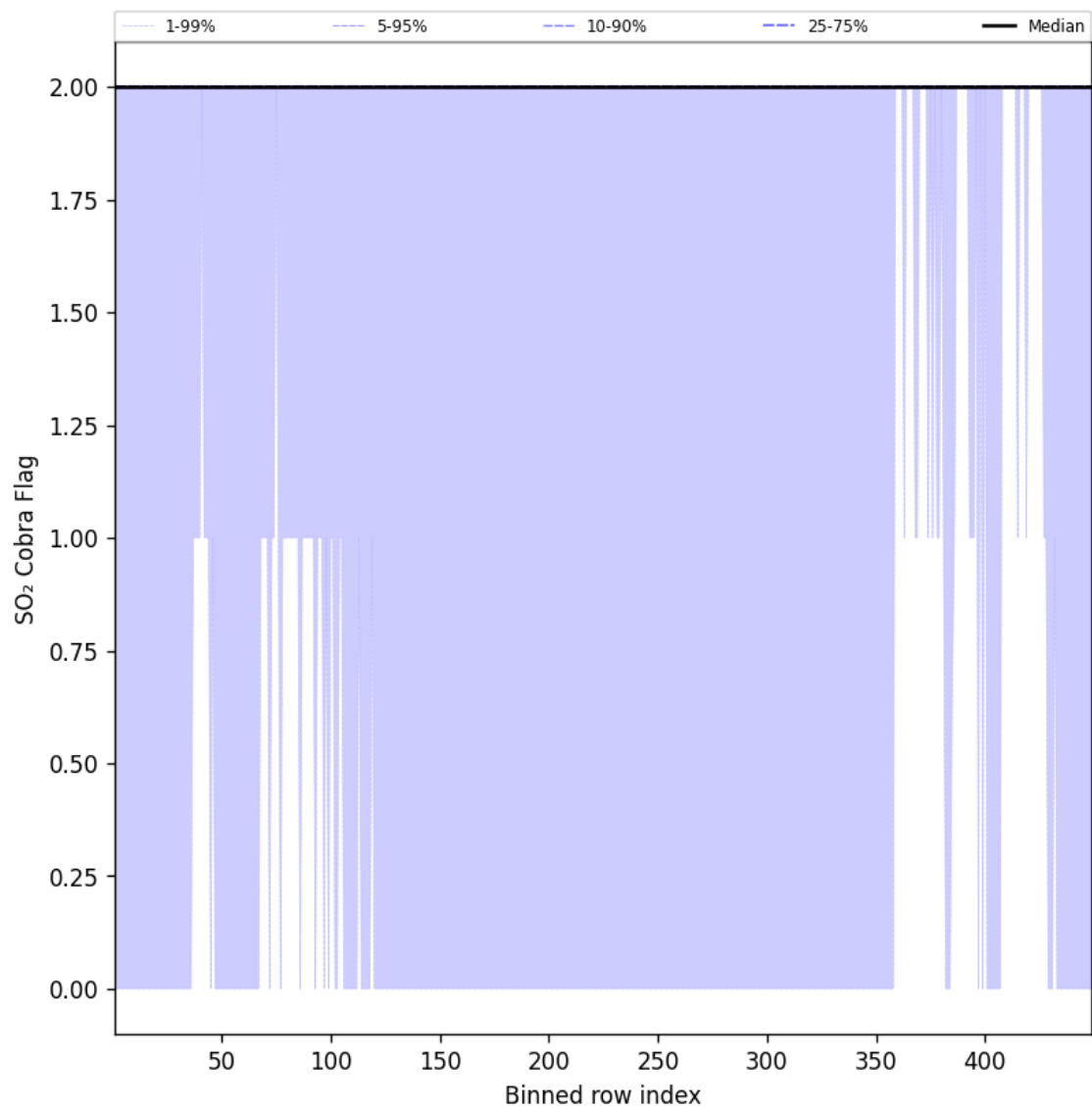


Figure 102: Along track statistics of "SO₂ Cobra Flag" for 2025-08-09 to 2025-08-10

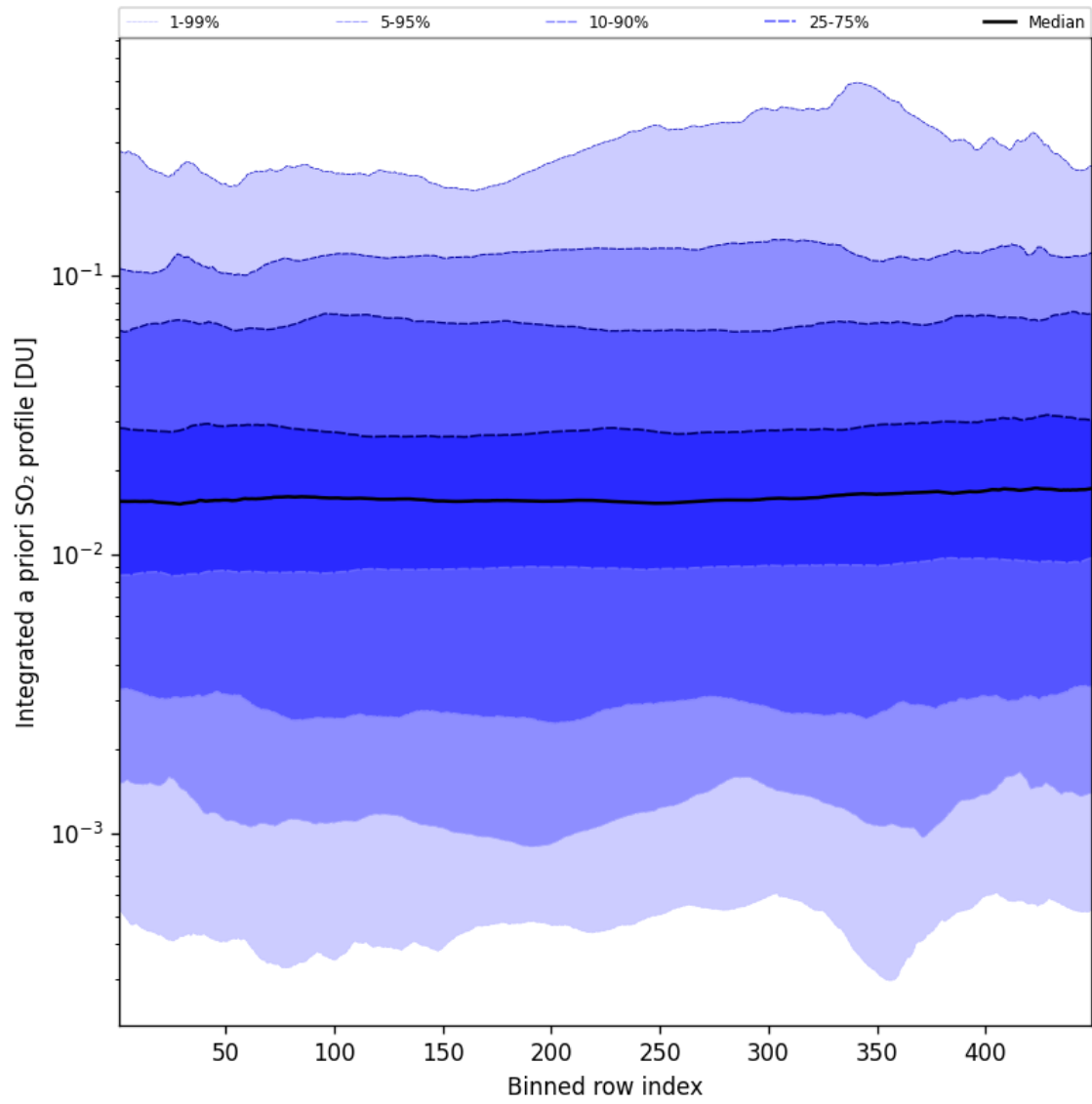


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-08-09 to 2025-08-10

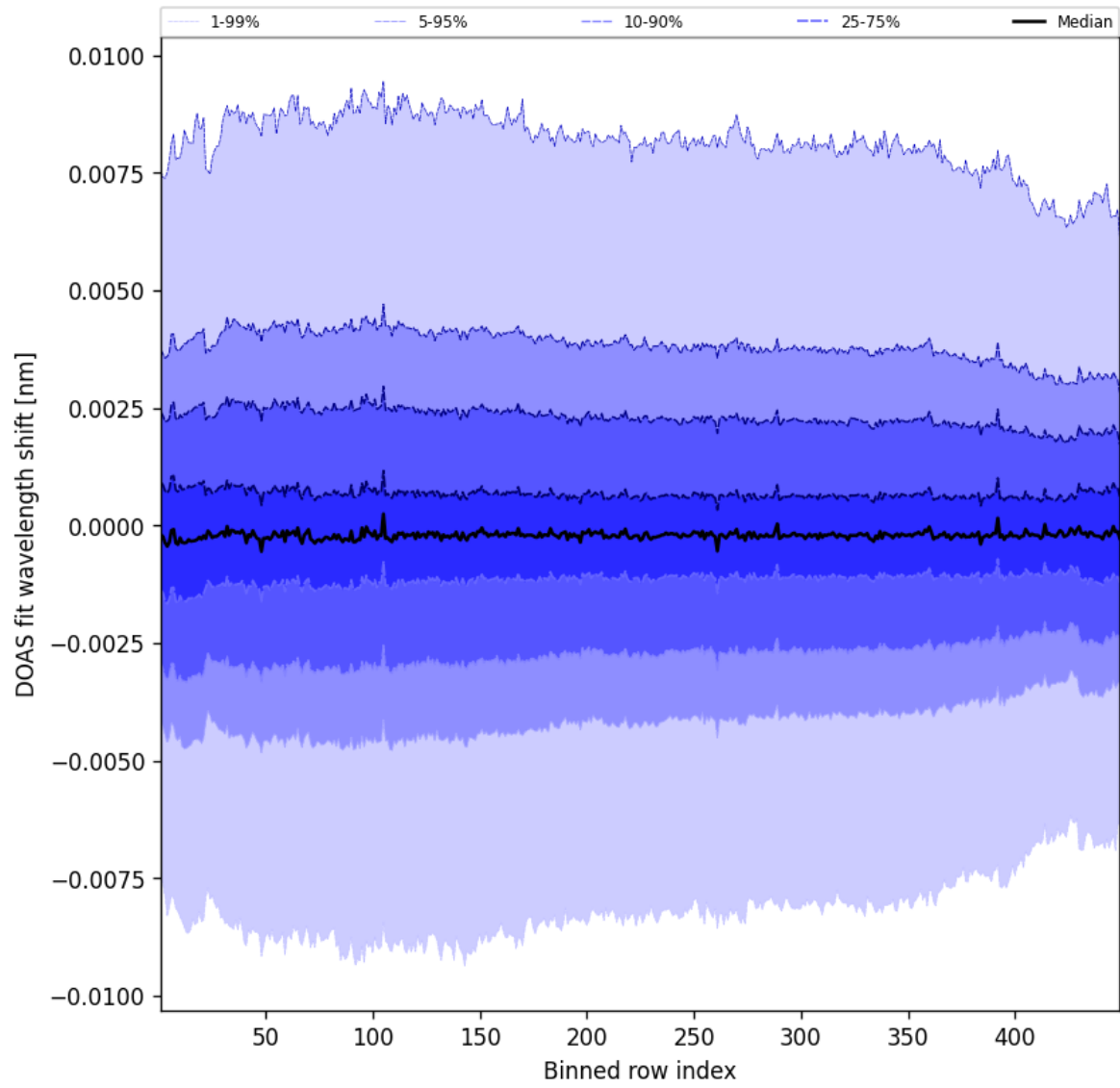


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-08-09 to 2025-08-10

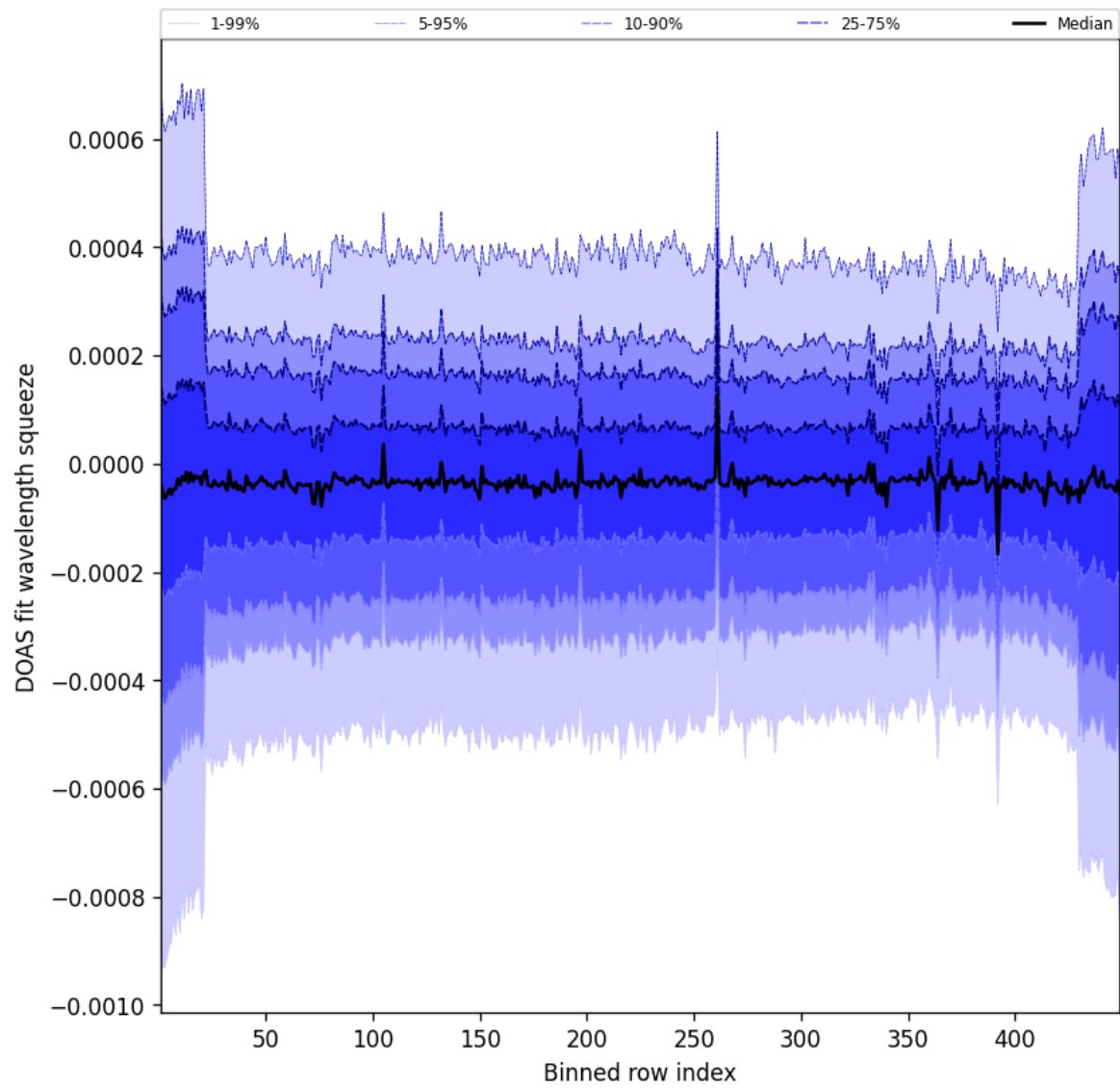


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-08-09 to 2025-08-10

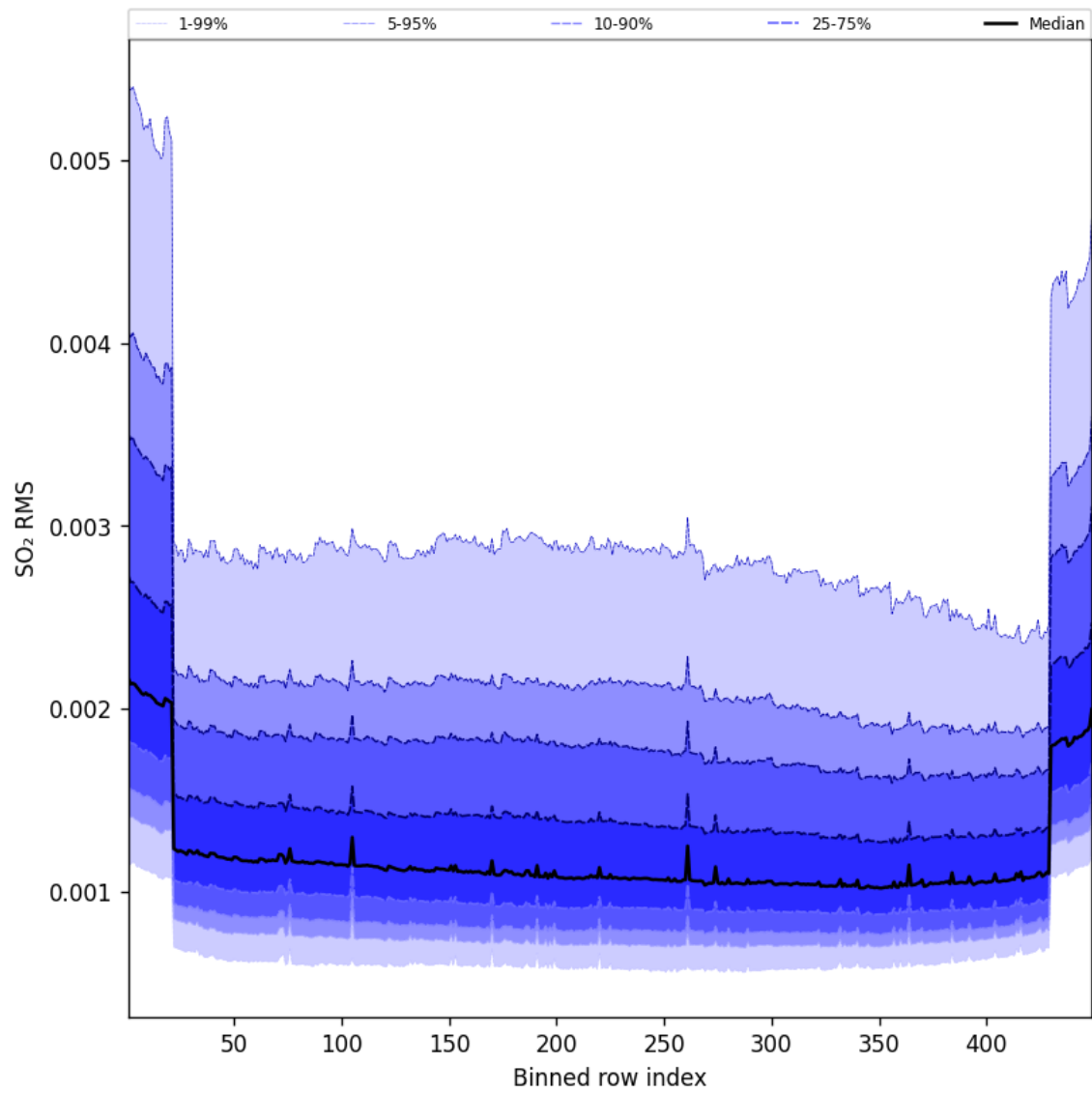


Figure 106: Along track statistics of “SO₂ RMS” for 2025-08-09 to 2025-08-10

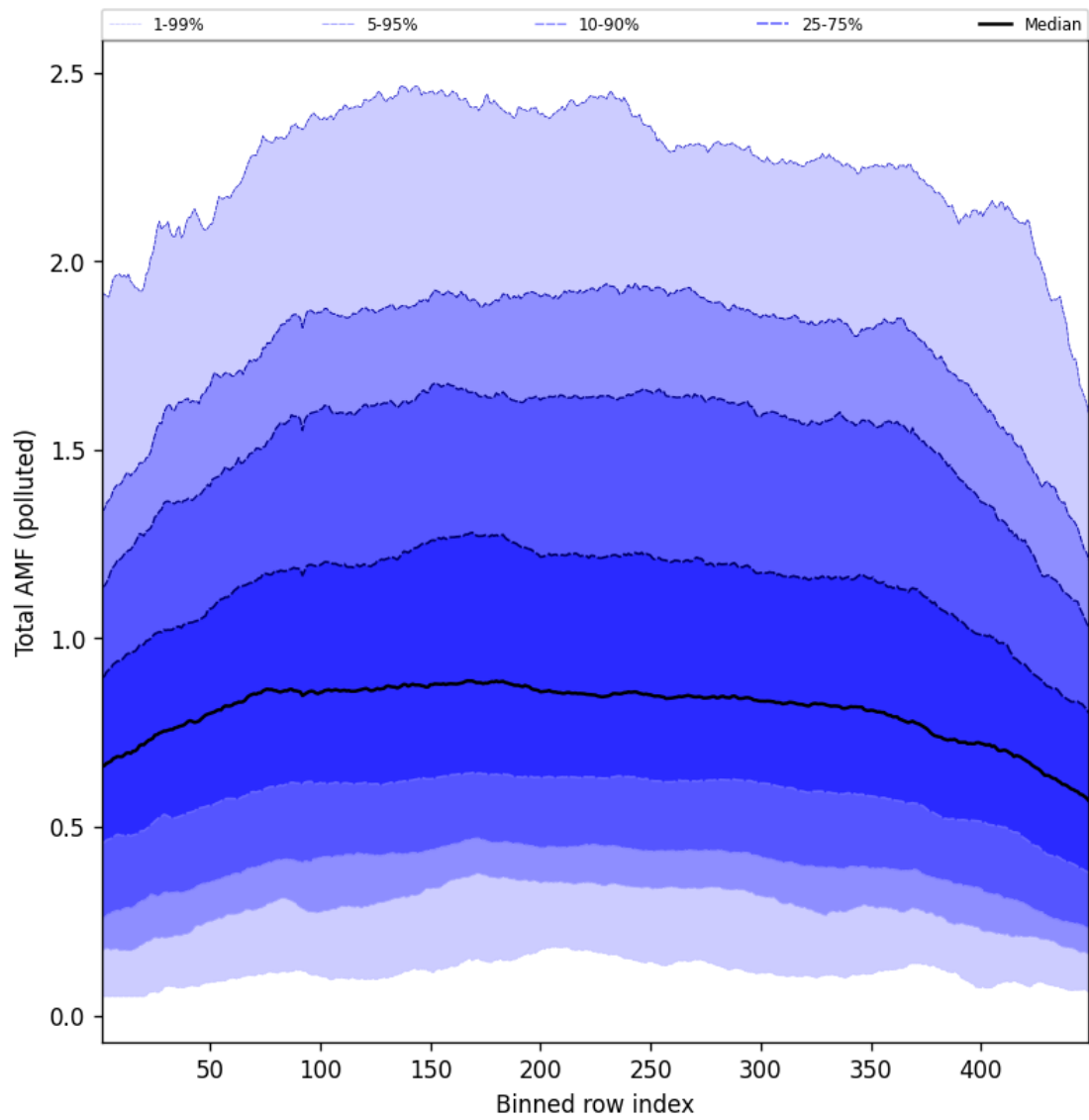


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-08-09 to 2025-08-10

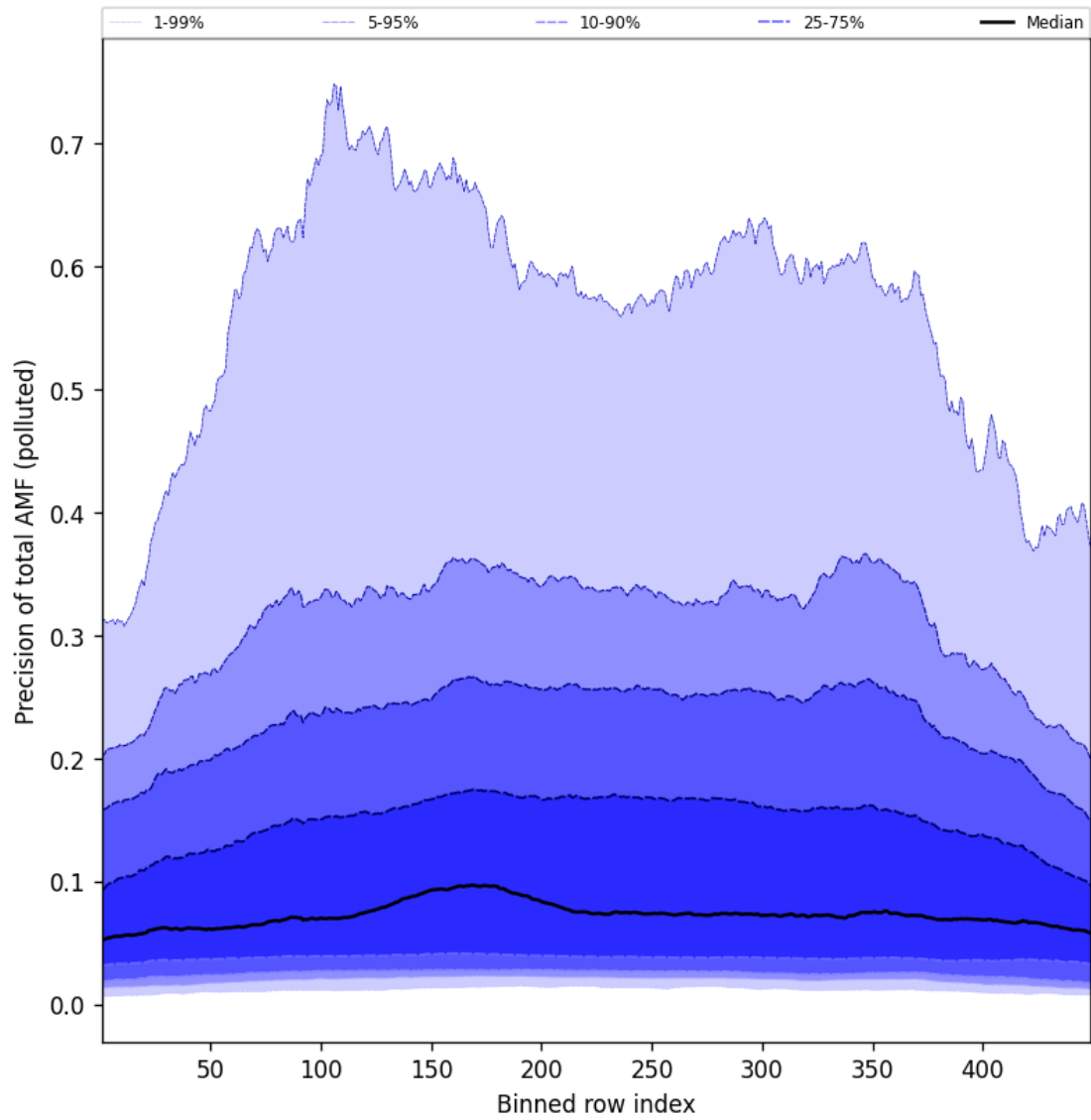


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-08-09 to 2025-08-10

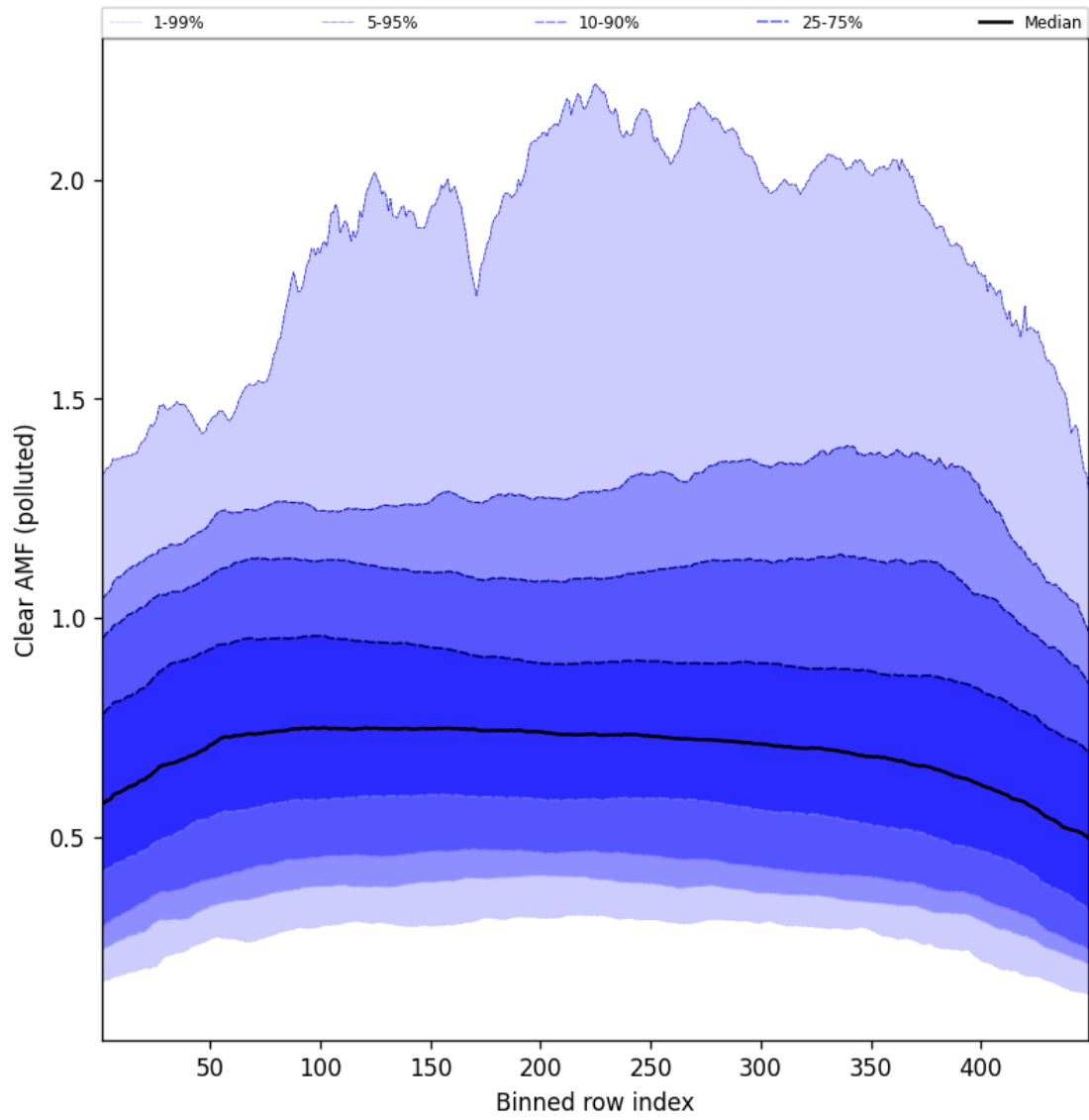


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-08-09 to 2025-08-10

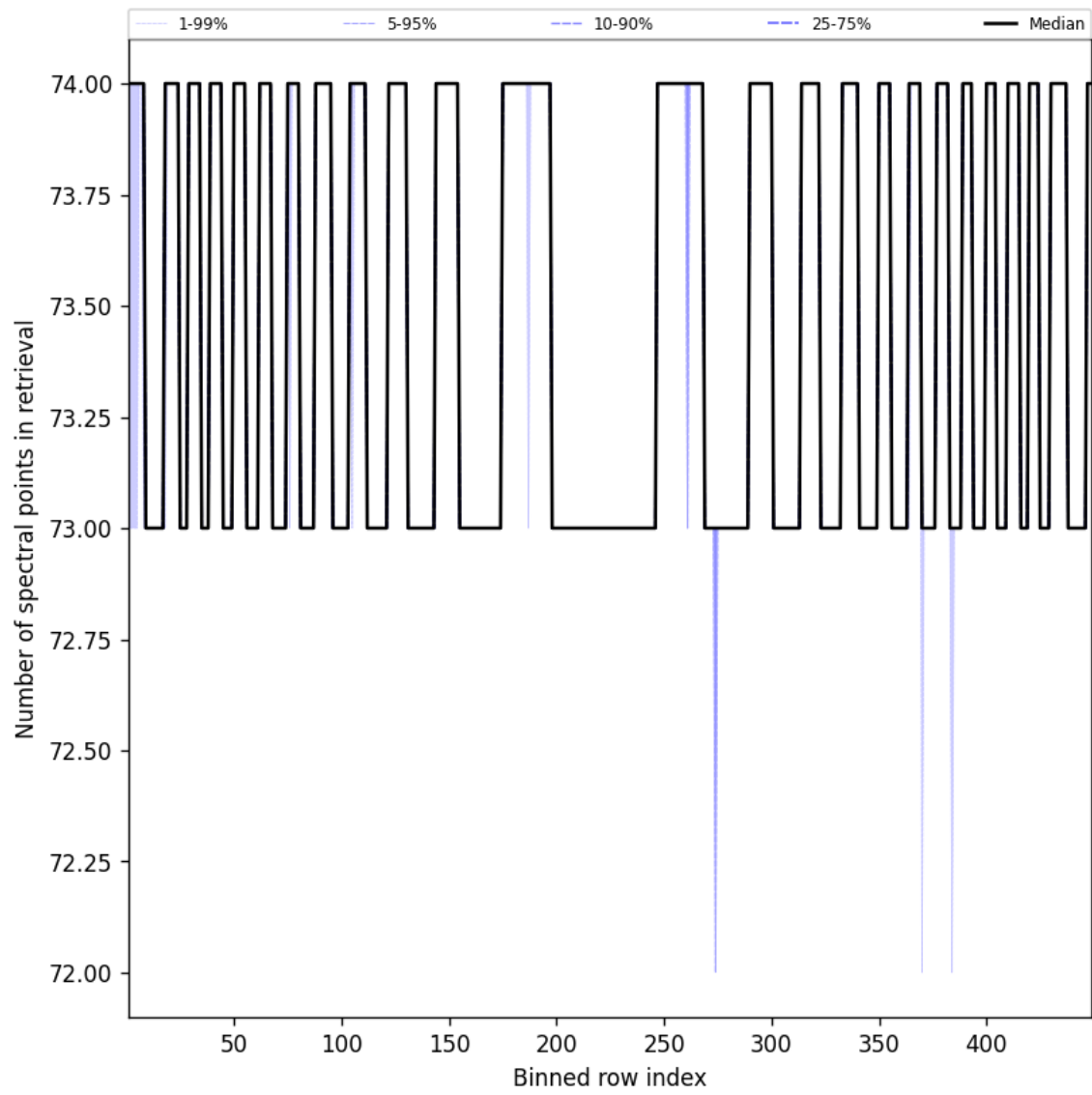


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-08-09 to 2025-08-10

10 Coincidence density

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

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