

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]	0.649 ± 0.402	17433458	0.995	0.770	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.276 \pm 92.159) \times 10^{-2}$	17433458	0.263	0.431	1.118×10^{-2}	-84.8	1.002×10^3
sulfurdioxide total vertical column precision [DU]	0.476 ± 0.602	17433458	0.222	0.305	0.313	4.605×10^{-2}	212
sulfurdioxide slant column density corrected [DU]	$(2.252 \pm 43.019) \times 10^{-2}$	17433458	0.242	0.364	1.024×10^{-2}	-26.7	680
sulfurdioxide slant column density cobra [DU]	$(2.225 \pm 38.200) \times 10^{-2}$	17433458	0.242	0.364	1.024×10^{-2}	-26.7	63.6
sulfurdioxide slant column density cobra precision [DU]	0.295 ± 0.143	17433458	0.213	0.136	0.249	8.097×10^{-2}	34.5
sulfurdioxide slant column density window1 [DU]	0.128 ± 0.689	17433458	0.125	0.734	0.131	-77.8	78.4
sulfurdioxide slant column density window1 precision [DU]	0.295 ± 0.143	17433458	0.213	0.136	0.249	8.097×10^{-2}	34.5
sulfurdioxide slant column density corrected win1 [DU]	$(4.034 \pm 68.214) \times 10^{-2}$	17433458	2.500×10^{-2}	0.720	2.031×10^{-2}	-77.8	78.6
background so2 slant column offset window1 [DU]	$(-8.762 \pm 14.769) \times 10^{-2}$	17433458	-0.180	0.186	-0.121	-1.21	5.14
sulfurdioxide slant column density window2 [DU]	1.05 ± 9.20	17433458	0.750	11.3	0.903	-1.505×10^3	1.527×10^3
sulfurdioxide slant column density window2 precision [DU]	8.30 ± 2.55	17433458	7.43	2.78	7.93	2.22	814
sulfurdioxide slant column density corrected win2 [DU]	-0.571 ± 9.051	17433458	-0.250	11.2	-0.546	-1.506×10^3	1.526×10^3
background so2 slant column offset window2 [DU]	-1.62 ± 1.81	17433458	-0.250	2.05	-1.23	-16.2	3.52
sulfurdioxide slant column density window3 [DU]	-3.59 ± 24.26	17433458	-3.92	30.0	-3.30	-780	1.104×10^3
sulfurdioxide slant column density window3 precision [DU]	29.0 ± 14.0	17433458	22.5	10.9	25.4	8.91	1.651×10^3
sulfurdioxide slant column density corrected win3 [DU]	4.27 ± 23.97	17433458	5.04	29.8	4.47	-793	1.106×10^3
background so2 slant column offset window3 [DU]	7.86 ± 4.71	17433458	9.52	6.16	7.95	-14.0	38.3
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17433458	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.013 \pm 5.757) \times 10^{-2}$	17433458	1.423×10^{-2}	2.588×10^{-2}	1.491×10^{-2}	1.345×10^{-4}	2.14
fitted radiance shift [nm]	$(-1.906 \pm 27.007) \times 10^{-4}$	17433458	1.000×10^{-4}	1.847×10^{-3}	-1.946×10^{-4}	-4.712×10^{-2}	5.228×10^{-2}
fitted radiance squeeze [1]	$(-5.573 \pm 18.886) \times 10^{-5}$	17433458	-3.000×10^{-5}	2.202×10^{-4}	-4.804×10^{-5}	-1.566×10^{-2}	1.573×10^{-2}
fitted root mean square [1]	$(1.286 \pm 0.553) \times 10^{-3}$	17433458	9.750×10^{-4}	5.377×10^{-4}	1.127×10^{-3}	3.357×10^{-4}	7.811×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.915 ± 0.479	17433458	0.660	0.585	0.821	5.000×10^{-2}	3.01
sulfurdioxide total air mass factor polluted precision [1]	0.126 ± 0.155	17433458	3.500×10^{-2}	0.118	7.694×10^{-2}	2.876×10^{-3}	2.29
sulfurdioxide clear air mass factor polluted [1]	0.761 ± 0.353	17433458	0.660	0.352	0.698	5.773×10^{-2}	2.90
number of spectral points in retrieval [1]	73.4 ± 0.5	17433458	73.0	1.000	73.0	52.0	155

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	0.230	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.07	-0.809	-0.500	-0.340	-0.201	0.230	0.382	0.562	0.917	2.45
sulfurdioxide total vertical column precision [DU]	9.009×10^{-2}	0.123	0.150	0.176	0.212	0.518	0.688	0.902	1.33	2.83
sulfurdioxide slant column density corrected [DU]	-0.874	-0.493	-0.355	-0.264	-0.170	0.194	0.295	0.396	0.560	1.09
sulfurdioxide slant column density cobra [DU]	-0.874	-0.493	-0.355	-0.264	-0.170	0.194	0.295	0.396	0.560	1.09
sulfurdioxide slant column density cobra precision [DU]	0.137	0.165	0.180	0.192	0.207	0.343	0.405	0.464	0.558	0.814
sulfurdioxide slant column density window1 [DU]	-1.70	-0.918	-0.628	-0.437	-0.239	0.495	0.688	0.873	1.16	1.95
sulfurdioxide slant column density window1 precision [DU]	0.137	0.165	0.180	0.192	0.207	0.343	0.405	0.464	0.558	0.814
sulfurdioxide slant column density corrected win1 [DU]	-1.64	-0.951	-0.692	-0.518	-0.334	0.386	0.586	0.783	1.09	1.97
background so2 slant column offset window1 [DU]	-0.383	-0.266	-0.227	-0.209	-0.186	-8.237×10^{-4}	5.512×10^{-2}	0.104	0.168	0.303
sulfurdioxide slant column density window2 [DU]	-20.4	-13.4	-10.0	-7.51	-4.72	6.63	9.56	12.2	16.0	24.2
sulfurdioxide slant column density window2 precision [DU]	4.26	5.14	5.70	6.16	6.70	9.48	10.4	11.4	12.7	15.6
sulfurdioxide slant column density corrected win2 [DU]	-22.5	-15.1	-11.6	-9.00	-6.16	5.04	7.84	10.4	13.8	21.2
background so2 slant column offset window2 [DU]	-7.66	-5.34	-3.93	-3.12	-2.43	-0.382	-0.133	0.102	0.431	1.77
sulfurdioxide slant column density window3 [DU]	-65.9	-43.9	-33.6	-26.2	-18.3	11.6	19.3	26.2	35.6	54.6
sulfurdioxide slant column density window3 precision [DU]	13.1	15.5	17.6	19.3	21.2	32.1	37.0	43.1	55.2	87.7
sulfurdioxide slant column density corrected win3 [DU]	-56.5	-35.3	-25.3	-18.2	-10.4	19.3	26.9	33.7	43.1	62.3
background so2 slant column offset window3 [DU]	-2.86	0.201	2.02	3.35	4.70	10.9	12.2	13.4	15.7	19.7
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	3.188×10^{-4}	7.137×10^{-4}	1.394×10^{-3}	2.664×10^{-3}	6.357×10^{-3}	3.224×10^{-2}	4.682×10^{-2}	6.788×10^{-2}	0.105	0.238
fitted radiance shift [nm]	-8.319×10^{-3}	-4.209×10^{-3}	-2.743×10^{-3}	-1.878×10^{-3}	-1.135×10^{-3}	7.121×10^{-4}	1.452×10^{-3}	2.352×10^{-3}	3.907×10^{-3}	8.222×10^{-3}
fitted radiance squeeze [1]	-5.612×10^{-4}	-3.666×10^{-4}	-2.823×10^{-4}	-2.238×10^{-4}	-1.621×10^{-4}	5.806×10^{-5}	1.108×10^{-4}	1.592×10^{-4}	2.281×10^{-4}	3.954×10^{-4}
fitted root mean square [1]	5.827×10^{-4}	7.194×10^{-4}	8.023×10^{-4}	8.652×10^{-4}	9.388×10^{-4}	1.476×10^{-3}	1.730×10^{-3}	1.978×10^{-3}	2.353×10^{-3}	3.263×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.105	0.281	0.392	0.476	0.583	1.17	1.40	1.61	1.86	2.32
sulfurdioxide total air mass factor polluted precision [1]	1.102×10^{-2}	2.048×10^{-2}	2.646×10^{-2}	3.174×10^{-2}	3.904×10^{-2}	0.157	0.206	0.261	0.366	0.806
sulfurdioxide clear air mass factor polluted [1]	0.241	0.336	0.402	0.462	0.539	0.891	1.00	1.14	1.48	2.06
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]	0.600 ± 0.413	11807377	0.820	0.490	0.0	1.000	0.180	1.000
sulfurdioxide total vertical column [DU]	$(2.331 \pm 76.360) \times 10^{-2}$	11807377	0.387	9.413×10^{-3}	-77.1	86.4	-0.182	0.205
sulfurdioxide total vertical column precision [DU]	0.418 ± 0.555	11807377	0.246	0.279	4.605×10^{-2}	140	0.196	0.442
sulfurdioxide slant column density corrected [DU]	$(1.860 \pm 34.492) \times 10^{-2}$	11807377	0.337	8.838×10^{-3}	-9.39	133	-0.158	0.179
sulfurdioxide slant column density cobra [DU]	$(1.847 \pm 33.401) \times 10^{-2}$	11807377	0.337	8.838×10^{-3}	-9.39	25.2	-0.158	0.179
sulfurdioxide slant column density cobra precision [DU]	0.266 ± 0.110	11807377	0.104	0.232	8.097×10^{-2}	20.3	0.198	0.302
sulfurdioxide slant column density window1 [DU]	0.122 ± 0.615	11807377	0.688	0.125	-11.4	28.6	-0.222	0.466
sulfurdioxide slant column density window1 precision [DU]	0.266 ± 0.110	11807377	0.104	0.232	8.097×10^{-2}	20.3	0.198	0.302
sulfurdioxide slant column density corrected win1 [DU]	$(3.417 \pm 60.360) \times 10^{-2}$	11807377	0.671	1.899×10^{-2}	-11.4	28.4	-0.312	0.360
background so2 slant column offset window1 [DU]	$(-8.799 \pm 13.724) \times 10^{-2}$	11807377	0.195	-0.112	-1.07	2.52	-0.188	6.513×10^{-3}
sulfurdioxide slant column density window2 [DU]	0.624 ± 8.384	11807377	10.7	0.609	-655	675	-4.73	5.96
sulfurdioxide slant column density window2 precision [DU]	7.85 ± 2.20	11807377	2.49	7.53	2.22	441	6.40	8.89
sulfurdioxide slant column density corrected win2 [DU]	-0.614 ± 8.333	11807377	10.6	-0.563	-656	675	-5.89	4.72
background so2 slant column offset window2 [DU]	-1.24 ± 1.33	11807377	1.88	-1.05	-8.00	3.52	-2.15	-0.275
sulfurdioxide slant column density window3 [DU]	-2.61 ± 22.80	11807377	28.2	-2.58	-780	1.104×10^3	-16.6	11.6
sulfurdioxide slant column density window3 precision [DU]	27.6 ± 14.2	11807377	9.78	23.7	8.91	1.651×10^3	20.1	29.9
sulfurdioxide slant column density corrected win3 [DU]	4.29 ± 22.54	11807377	28.1	4.47	-793	1.106×10^3	-9.58	18.5
background so2 slant column offset window3 [DU]	6.90 ± 4.27	11807377	6.36	7.44	-14.0	20.8	3.89	10.2
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.18	11807377	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.011 \pm 5.824) \times 10^{-2}$	11807377	2.903×10^{-2}	1.225×10^{-2}	1.345×10^{-4}	1.32	2.989×10^{-3}	3.202×10^{-2}
fitted radiance shift [nm]	$(-3.117 \pm 277.575) \times 10^{-5}$	11807377	1.787×10^{-3}	-7.489×10^{-5}	-4.311×10^{-2}	4.059×10^{-2}	-9.386×10^{-4}	8.486×10^{-4}
fitted radiance squeeze [1]	$(-8.043 \pm 17.441) \times 10^{-5}$	11807377	2.128×10^{-4}	-6.799×10^{-5}	-1.105×10^{-2}	1.720×10^{-3}	-1.804×10^{-4}	3.244×10^{-5}
fitted root mean square [1]	$(1.184 \pm 0.449) \times 10^{-3}$	11807377	4.516×10^{-4}	1.068×10^{-3}	3.357×10^{-4}	1.980×10^{-2}	8.995×10^{-4}	1.351×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.963 ± 0.521	11807377	0.675	0.861	5.000×10^{-2}	3.01	0.588	1.26
sulfurdioxide total air mass factor polluted precision [1]	0.140 ± 0.175	11807377	0.130	8.950×10^{-2}	2.876×10^{-3}	2.29	4.241×10^{-2}	0.173
sulfurdioxide clear air mass factor polluted [1]	0.801 ± 0.401	11807377	0.402	0.735	5.773×10^{-2}	2.90	0.533	0.936
number of spectral points in retrieval [1]	73.5 ± 0.5	11807377	1.000	73.0	52.0	155	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]	0.750 ± 0.357	5626081	0.580	1.000	0.0	1.000	0.420	1.000
sulfurdioxide total vertical column [DU]	$(5.259 \pm 118.639) \times 10^{-2}$	5626081	0.553	1.628×10^{-2}	-84.8	1.002×10^3	-0.254	0.299
sulfurdioxide total vertical column precision [DU]	0.596 ± 0.674	5626081	0.427	0.400	5.480×10^{-2}	212	0.270	0.697
sulfurdioxide slant column density corrected [DU]	$(3.075 \pm 56.892) \times 10^{-2}$	5626081	0.434	1.403×10^{-2}	-26.7	680	-0.200	0.234
sulfurdioxide slant column density cobra [DU]	$(3.018 \pm 46.684) \times 10^{-2}$	5626081	0.434	1.403×10^{-2}	-26.7	63.6	-0.200	0.234
sulfurdioxide slant column density cobra precision [DU]	0.356 ± 0.179	5626081	0.196	0.302	0.102	34.5	0.235	0.431
sulfurdioxide slant column density window1 [DU]	0.140 ± 0.822	5626081	0.848	0.146	-77.8	78.4	-0.280	0.568
sulfurdioxide slant column density window1 precision [DU]	0.356 ± 0.179	5626081	0.196	0.302	0.102	34.5	0.235	0.431
sulfurdioxide slant column density corrected win1 [DU]	$(5.328 \pm 82.281) \times 10^{-2}$	5626081	0.844	2.367×10^{-2}	-77.8	78.6	-0.389	0.454
background so2 slant column offset window1 [DU]	$(-8.685 \pm 16.750) \times 10^{-2}$	5626081	0.157	-0.131	-1.21	5.14	-0.182	-2.525×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.94 ± 10.67	5626081	12.9	1.65	-1.505×10^3	1.527×10^3	-4.69	8.25
sulfurdioxide slant column density window2 precision [DU]	9.26 ± 2.94	5626081	3.02	8.85	2.50	814	7.54	10.6
sulfurdioxide slant column density corrected win2 [DU]	-0.483 ± 10.399	5626081	12.6	-0.503	-1.506×10^3	1.526×10^3	-6.81	5.82
background so2 slant column offset window2 [DU]	-2.43 ± 2.36	5626081	3.20	-1.66	-16.2	3.24	-3.87	-0.666
sulfurdioxide slant column density window3 [DU]	-5.65 ± 26.97	5626081	34.2	-5.13	-404	577	-22.4	11.8
sulfurdioxide slant column density window3 precision [DU]	32.0 ± 13.1	5626081	10.8	28.8	9.67	350	24.5	35.3
sulfurdioxide slant column density corrected win3 [DU]	4.22 ± 26.71	5626081	33.9	4.48	-386	591	-12.5	21.4
background so2 slant column offset window3 [DU]	9.87 ± 4.94	5626081	7.08	8.83	-10.7	38.3	6.33	13.4
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.27	5626081	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.017 \pm 5.613) \times 10^{-2}$	5626081	2.071×10^{-2}	1.865×10^{-2}	1.440×10^{-3}	2.14	1.177×10^{-2}	3.249×10^{-2}
fitted radiance shift [nm]	$(-5.251 \pm 25.033) \times 10^{-4}$	5626081	1.918×10^{-3}	-4.652×10^{-4}	-4.712×10^{-2}	5.228×10^{-2}	-1.520×10^{-3}	3.985×10^{-4}
fitted radiance squeeze [1]	$(-3.889 \pm 206.683) \times 10^{-6}$	5626081	2.297×10^{-4}	-1.949×10^{-6}	-1.566×10^{-2}	1.573×10^{-2}	-1.173×10^{-4}	1.125×10^{-4}
fitted root mean square [1]	$(1.498 \pm 0.676) \times 10^{-3}$	5626081	7.364×10^{-4}	1.281×10^{-3}	3.626×10^{-4}	7.811×10^{-2}	1.045×10^{-3}	1.781×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.815 ± 0.354	5626081	0.448	0.748	5.000×10^{-2}	2.64	0.574	1.02
sulfurdioxide total air mass factor polluted precision [1]	$(9.499 \pm 9.339) \times 10^{-2}$	5626081	8.811×10^{-2}	5.763×10^{-2}	5.077×10^{-3}	1.40	3.480×10^{-2}	0.123
sulfurdioxide clear air mass factor polluted [1]	0.678 ± 0.196	5626081	0.241	0.662	0.102	1.56	0.547	0.789
number of spectral points in retrieval [1]	73.4 ± 0.5	5626081	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]	0.655 ± 0.390	11332031	0.750	1.000	0.0	1.000	0.250	1.000
sulfurdioxide total vertical column [DU]	$(3.507 \pm 90.813) \times 10^{-2}$	11332031	0.438	1.178×10^{-2}	-84.8	216	-0.204	0.234
sulfurdioxide total vertical column precision [DU]	0.478 ± 0.606	11332031	0.294	0.313	4.969×10^{-2}	87.3	0.218	0.512
sulfurdioxide slant column density corrected [DU]	$(2.340 \pm 41.031) \times 10^{-2}$	11332031	0.368	1.058×10^{-2}	-18.2	104	-0.171	0.197
sulfurdioxide slant column density cobra [DU]	$(2.313 \pm 39.483) \times 10^{-2}$	11332031	0.368	1.058×10^{-2}	-18.2	63.6	-0.171	0.197
sulfurdioxide slant column density cobra precision [DU]	0.301 ± 0.149	11332031	0.154	0.251	8.097×10^{-2}	34.5	0.205	0.359
sulfurdioxide slant column density window1 [DU]	0.125 ± 0.711	11332031	0.747	0.133	-50.9	57.0	-0.245	0.501
sulfurdioxide slant column density window1 precision [DU]	0.301 ± 0.149	11332031	0.154	0.251	8.097×10^{-2}	34.5	0.205	0.359
sulfurdioxide slant column density corrected win1 [DU]	$(4.188 \pm 70.323) \times 10^{-2}$	11332031	0.732	2.118×10^{-2}	-50.9	57.0	-0.339	0.393
background so2 slant column offset window1 [DU]	$(-8.276 \pm 15.718) \times 10^{-2}$	11332031	0.196	-0.123	-1.21	5.14	-0.187	8.979×10^{-3}
sulfurdioxide slant column density window2 [DU]	1.21 ± 9.14	11332031	11.4	0.992	-1.461×10^3	940	-4.61	6.77
sulfurdioxide slant column density window2 precision [DU]	8.25 ± 2.36	11332031	2.72	7.88	2.38	656	6.70	9.42
sulfurdioxide slant column density corrected win2 [DU]	-0.553 ± 8.947	11332031	11.2	-0.543	-1.462×10^3	937	-6.16	5.06
background so2 slant column offset window2 [DU]	-1.77 ± 2.01	11332031	2.32	-1.23	-16.2	3.52	-2.70	-0.377
sulfurdioxide slant column density window3 [DU]	-1.14 ± 23.98	11332031	29.9	-1.03	-404	1.104×10^3	-15.9	14.0
sulfurdioxide slant column density window3 precision [DU]	27.7 ± 11.7	11332031	9.87	24.8	8.91	851	21.0	30.9
sulfurdioxide slant column density corrected win3 [DU]	6.79 ± 23.43	11332031	29.5	6.72	-386	1.106×10^3	-7.90	21.6
background so2 slant column offset window3 [DU]	7.93 ± 4.88	11332031	6.15	7.74	-14.0	38.3	4.65	10.8
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	11332031	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.159 \pm 4.046) \times 10^{-2}$	11332031	1.803×10^{-2}	1.357×10^{-2}	1.690×10^{-4}	2.14	7.022×10^{-3}	2.506×10^{-2}
fitted radiance shift [nm]	$(-2.090 \pm 23.253) \times 10^{-4}$	11332031	1.808×10^{-3}	-1.851×10^{-4}	-4.712×10^{-2}	5.228×10^{-2}	-1.129×10^{-3}	6.787×10^{-4}
fitted radiance squeeze [1]	$(-4.686 \pm 19.068) \times 10^{-5}$	11332031	2.199×10^{-4}	-3.806×10^{-5}	-1.566×10^{-2}	1.400×10^{-2}	-1.526×10^{-4}	6.739×10^{-5}
fitted root mean square [1]	$(1.311 \pm 0.584) \times 10^{-3}$	11332031	6.075×10^{-4}	1.129×10^{-3}	3.357×10^{-4}	7.811×10^{-2}	9.339×10^{-4}	1.541×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.901 ± 0.437	11332031	0.534	0.827	5.000×10^{-2}	2.62	0.605	1.14
sulfurdioxide total air mass factor polluted precision [1]	0.125 ± 0.170	11332031	0.101	7.319×10^{-2}	3.341×10^{-3}	2.29	4.066×10^{-2}	0.141
sulfurdioxide clear air mass factor polluted [1]	0.759 ± 0.328	11332031	0.328	0.709	6.422×10^{-2}	2.64	0.558	0.886
number of spectral points in retrieval [1]	73.5 ± 0.5	11332031	1.000	73.0	52.0	155	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]	0.666 ± 0.417	4243449	0.800	1.000	0.0	1.000	0.200	1.000
sulfurdioxide total vertical column [DU]	$(2.508 \pm 77.424) \times 10^{-2}$	4243449	0.408	9.329×10^{-3}	-83.5	209	-0.191	0.217
sulfurdioxide total vertical column precision [DU]	0.450 ± 0.519	4243449	0.317	0.307	4.605×10^{-2}	50.4	0.194	0.511
sulfurdioxide slant column density corrected [DU]	$(2.059 \pm 36.158) \times 10^{-2}$	4243449	0.351	9.014×10^{-3}	-26.7	97.1	-0.165	0.186
sulfurdioxide slant column density cobra [DU]	$(2.046 \pm 35.139) \times 10^{-2}$	4243449	0.351	9.014×10^{-3}	-26.7	30.9	-0.165	0.186
sulfurdioxide slant column density cobra precision [DU]	0.277 ± 0.125	4243449	9.634×10^{-2}	0.241	8.561×10^{-2}	27.9	0.206	0.303
sulfurdioxide slant column density window1 [DU]	0.155 ± 0.634	4243449	0.697	0.147	-77.8	78.4	-0.200	0.497
sulfurdioxide slant column density window1 precision [DU]	0.277 ± 0.125	4243449	9.634×10^{-2}	0.241	8.561×10^{-2}	27.9	0.206	0.303
sulfurdioxide slant column density corrected win1 [DU]	$(3.743 \pm 62.958) \times 10^{-2}$	4243449	0.688	1.896×10^{-2}	-77.8	78.6	-0.319	0.369
background so2 slant column offset window1 [DU]	-0.118 ± 0.125	4243449	0.148	-0.146	-1.07	2.10	-0.196	-4.797×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.586 ± 9.379	4243449	11.3	0.571	-1.505×10^3	1.527×10^3	-5.08	6.22
sulfurdioxide slant column density window2 precision [DU]	8.42 ± 2.97	4243449	2.84	8.01	2.22	814	6.73	9.57
sulfurdioxide slant column density corrected win2 [DU]	-0.607 ± 9.308	4243449	11.2	-0.559	-1.506×10^3	1.526×10^3	-6.18	5.01
background so2 slant column offset window2 [DU]	-1.19 ± 1.35	4243449	1.69	-0.970	-11.3	3.52	-1.97	-0.287
sulfurdioxide slant column density window3 [DU]	-8.34 ± 24.31	4243449	29.7	-7.56	-780	577	-22.8	6.88
sulfurdioxide slant column density window3 precision [DU]	31.6 ± 17.7	4243449	13.1	26.7	9.11	1.651×10^3	21.8	35.0
sulfurdioxide slant column density corrected win3 [DU]	-1.24 ± 24.42	4243449	30.1	-0.517	-793	591	-16.0	14.1
background so2 slant column offset window3 [DU]	7.10 ± 4.46	4243449	6.31	7.44	-14.0	27.8	4.10	10.4
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.13	4243449	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.093 \pm 8.017) \times 10^{-2}$	4243449	5.475×10^{-2}	2.657×10^{-2}	1.345×10^{-4}	1.42	8.328×10^{-3}	6.308×10^{-2}
fitted radiance shift [nm]	$(-1.650 \pm 33.943) \times 10^{-4}$	4243449	1.826×10^{-3}	-2.234×10^{-4}	-4.411×10^{-2}	4.133×10^{-2}	-1.107×10^{-3}	7.195×10^{-4}
fitted radiance squeeze [1]	$(-5.732 \pm 18.068) \times 10^{-5}$	4243449	2.122×10^{-4}	-5.269×10^{-5}	-1.531×10^{-2}	1.573×10^{-2}	-1.611×10^{-4}	5.107×10^{-5}
fitted root mean square [1]	$(1.209 \pm 0.463) \times 10^{-3}$	4243449	4.074×10^{-4}	1.103×10^{-3}	3.487×10^{-4}	6.145×10^{-2}	9.364×10^{-4}	1.344×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.947 ± 0.560	4243449	0.661	0.797	5.000×10^{-2}	3.01	0.548	1.21
sulfurdioxide total air mass factor polluted precision [1]	0.125 ± 0.121	4243449	0.150	8.236×10^{-2}	2.876×10^{-3}	1.91	3.393×10^{-2}	0.184
sulfurdioxide clear air mass factor polluted [1]	0.785 ± 0.411	4243449	0.390	0.683	5.854×10^{-2}	2.90	0.522	0.912
number of spectral points in retrieval [1]	73.4 ± 0.5	4243449	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

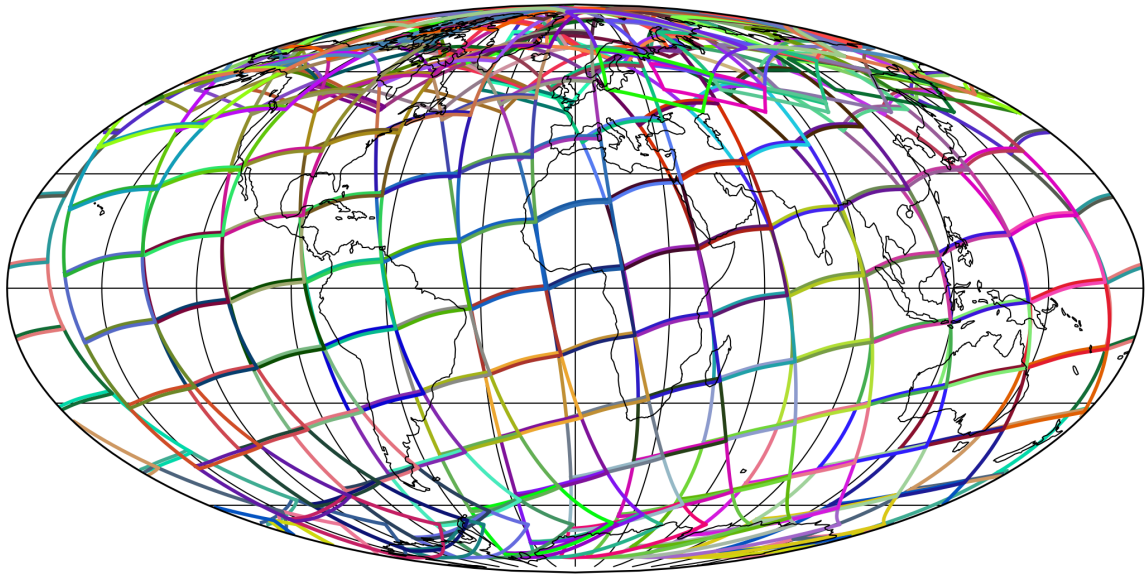


Figure 1: Outline of the granules.

4 Input data monitoring

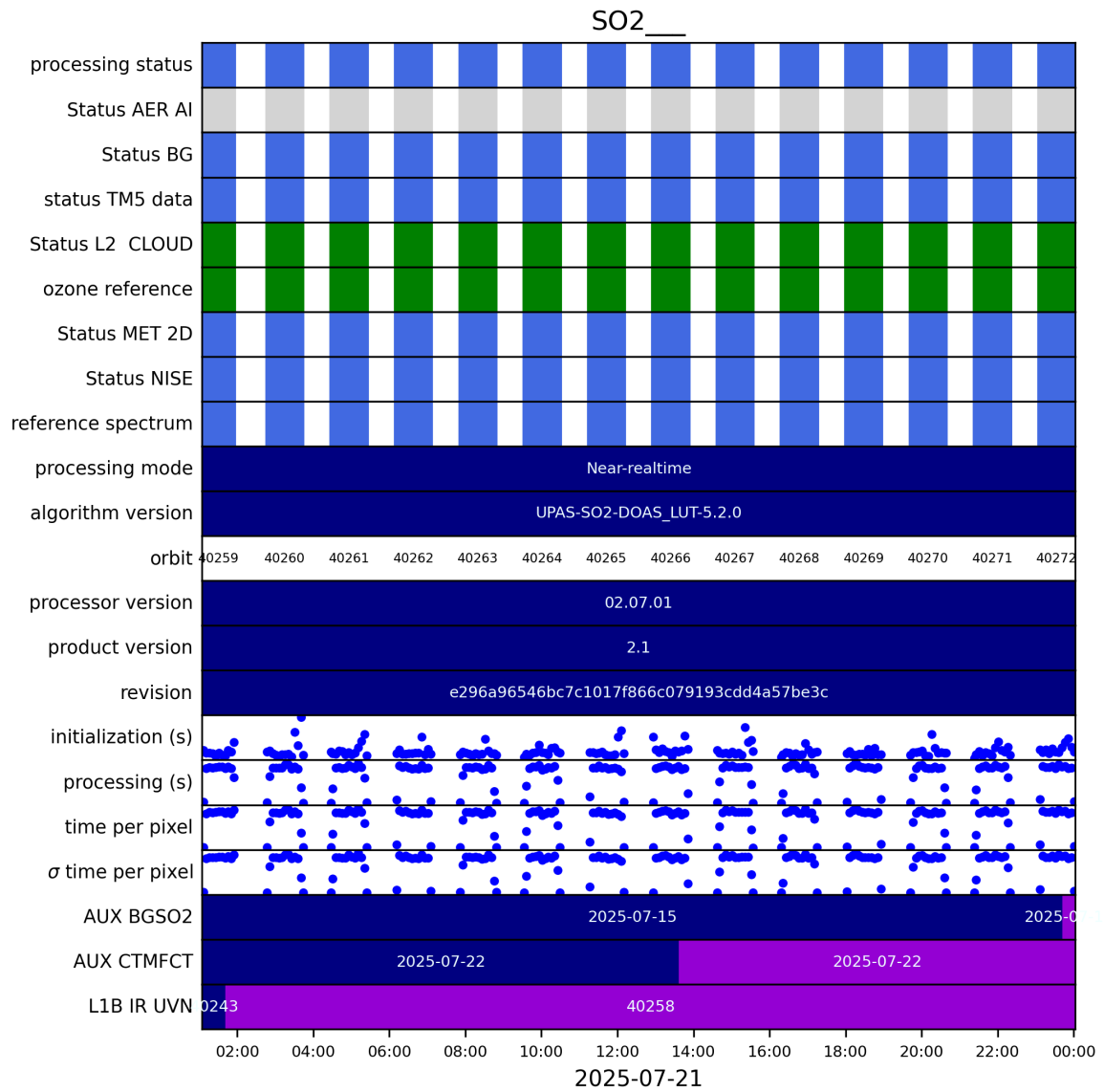


Figure 2: Input data per granule

5 Warnings and errors

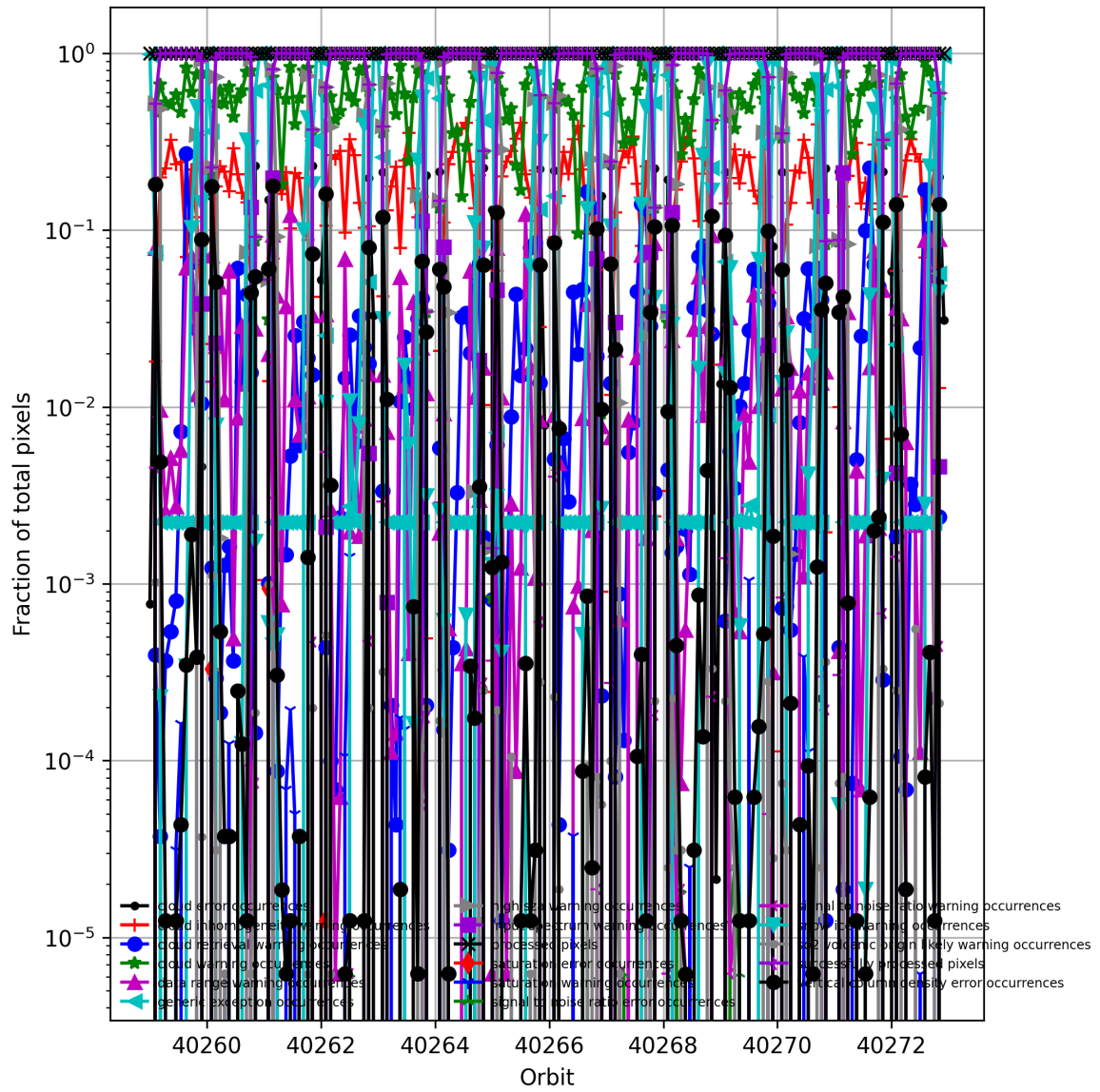


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

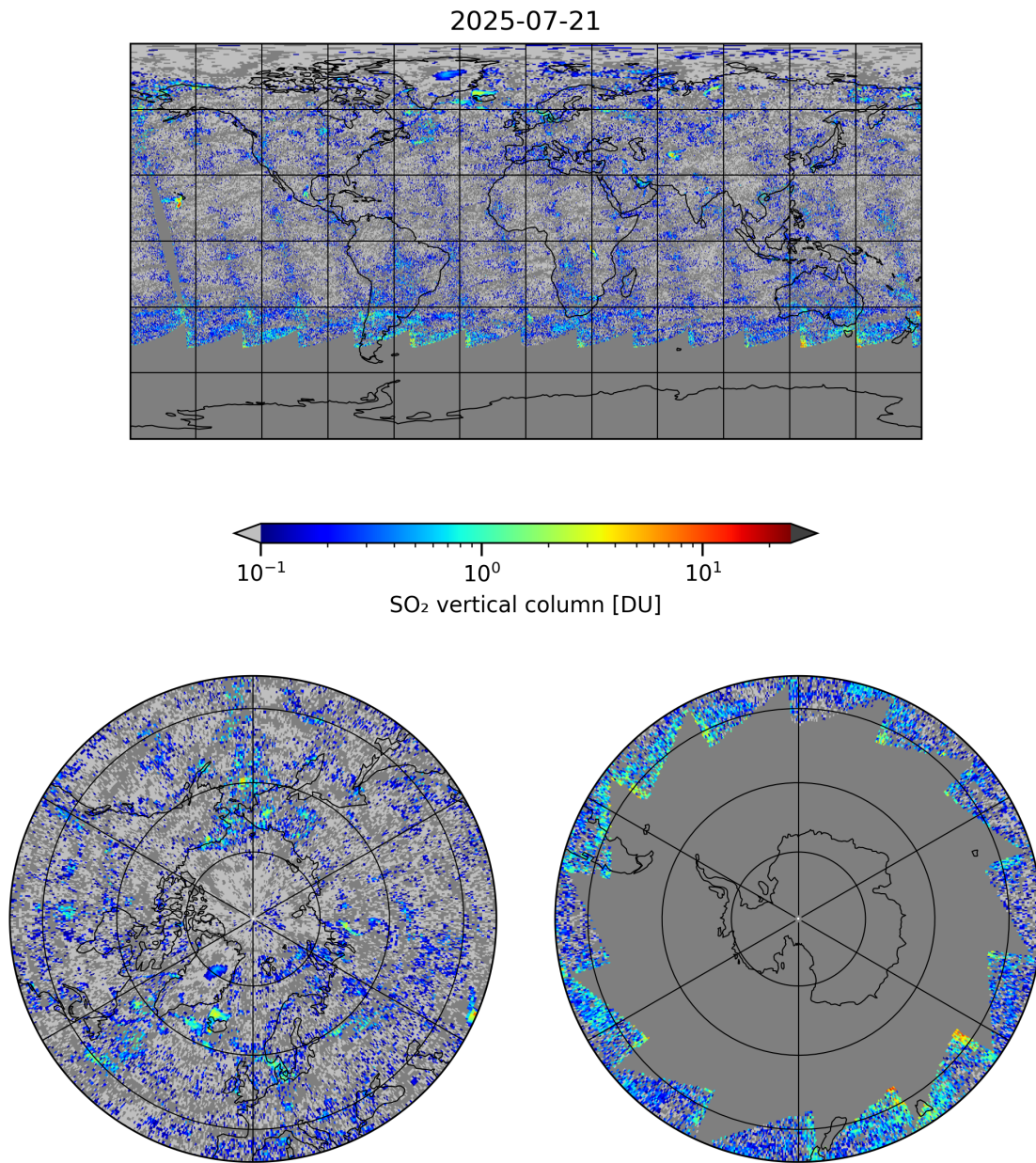


Figure 4: Map of “SO₂ vertical column” for 2025-07-21 to 2025-07-22

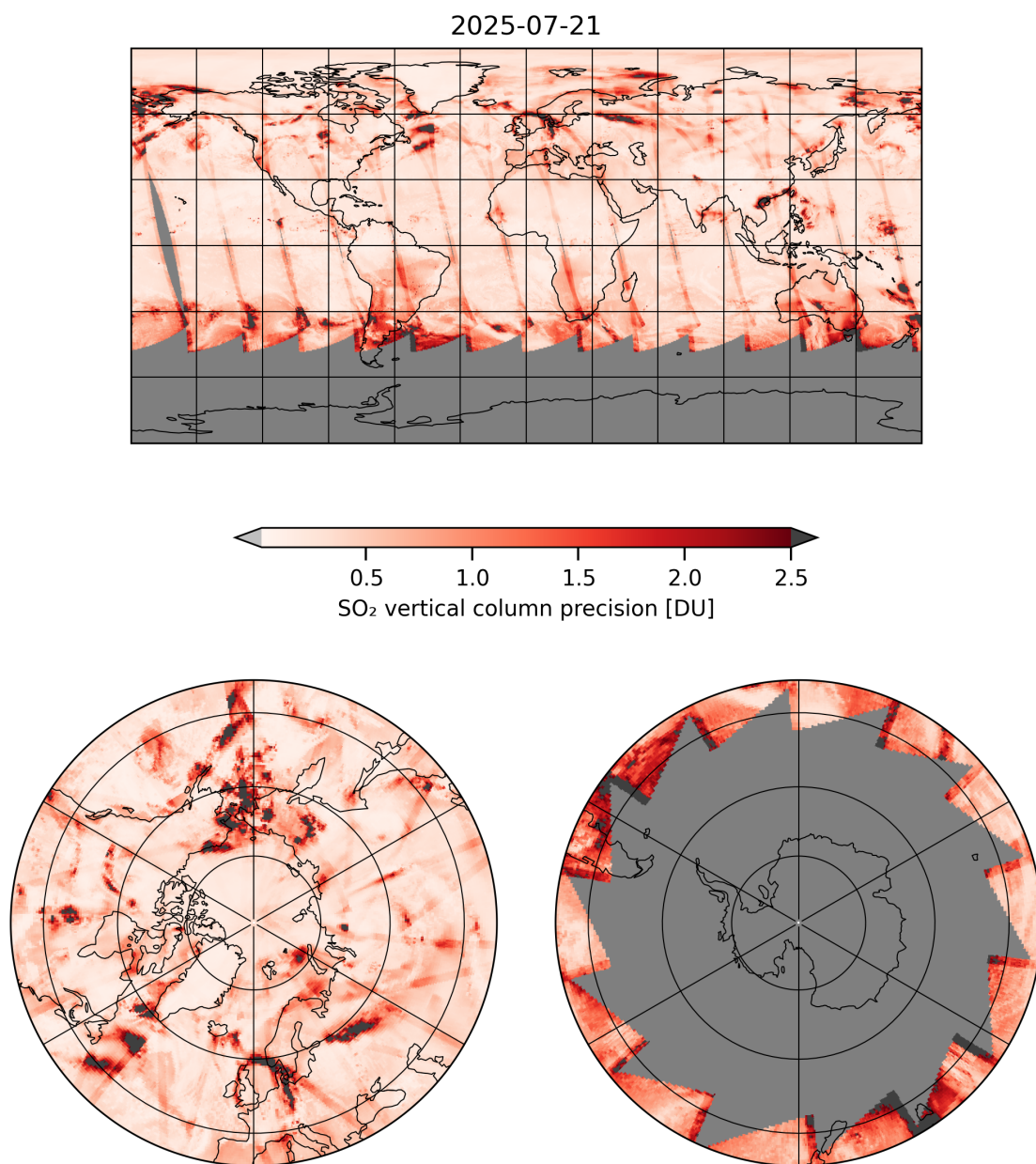


Figure 5: Map of “SO₂ vertical column precision” for 2025-07-21 to 2025-07-22

2025-07-21

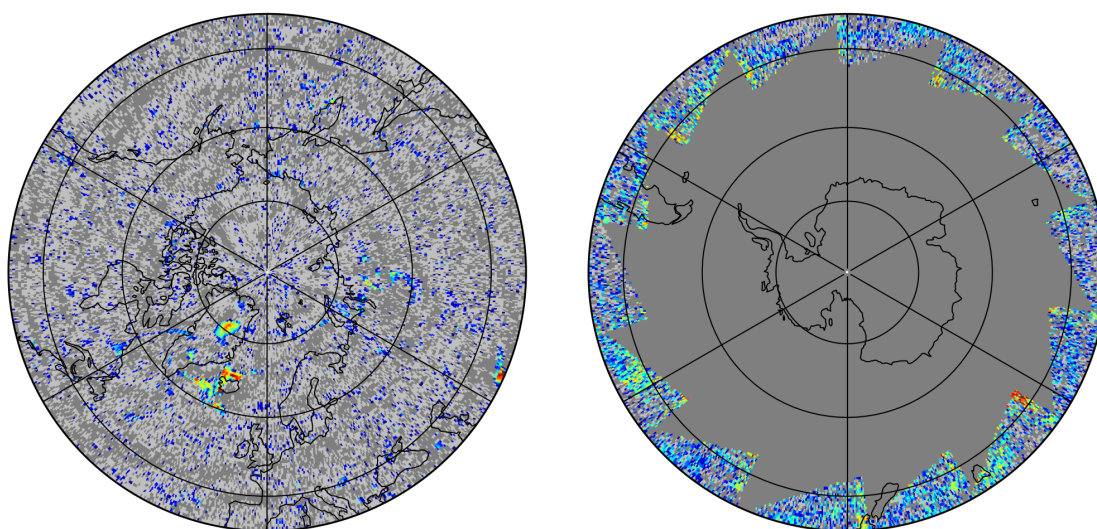
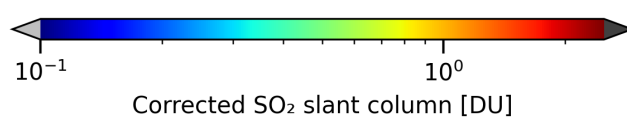
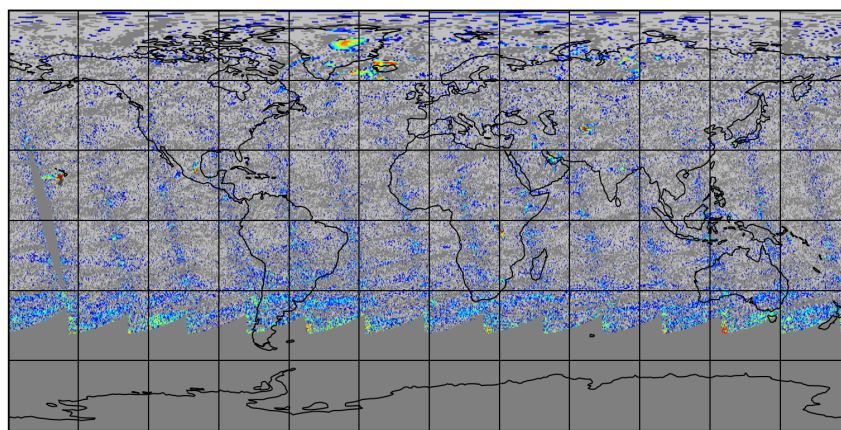


Figure 6: Map of “Corrected SO₂ slant column” for 2025-07-21 to 2025-07-22

2025-07-21

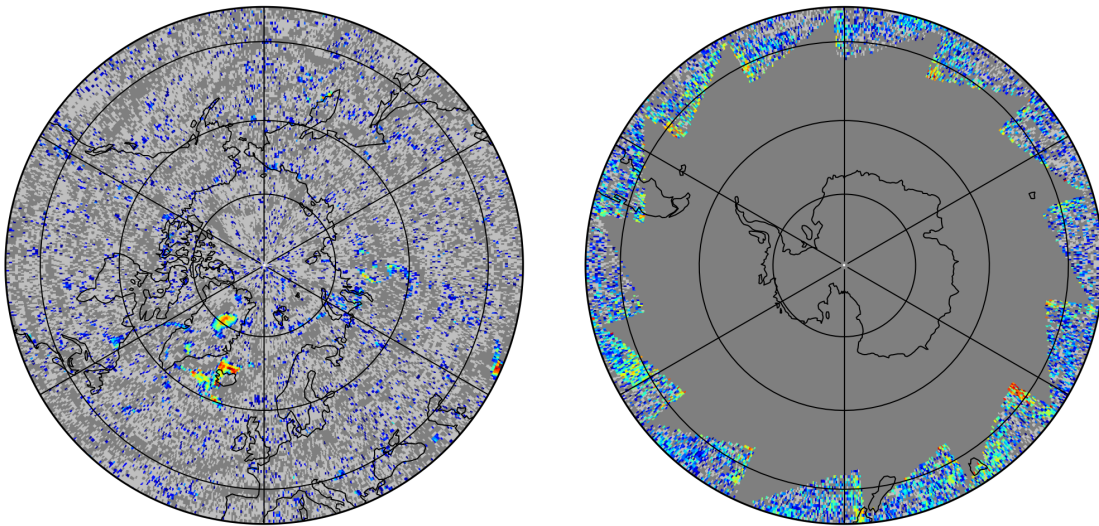
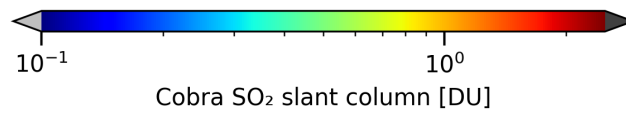
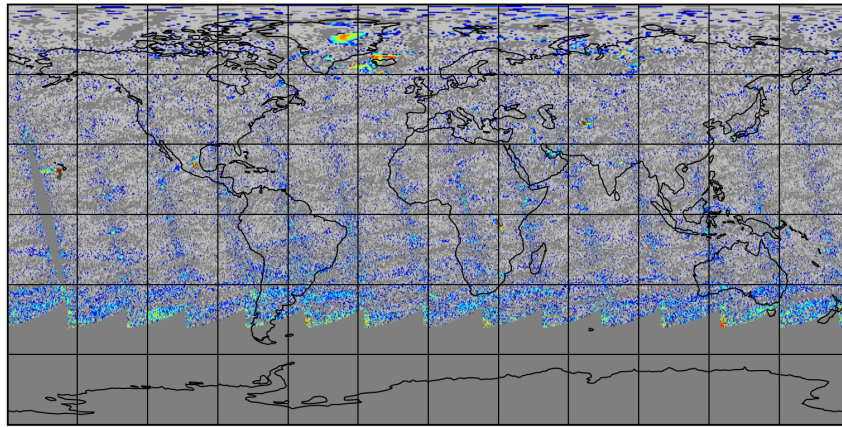


Figure 7: Map of “Cobra SO₂ slant column” for 2025-07-21 to 2025-07-22

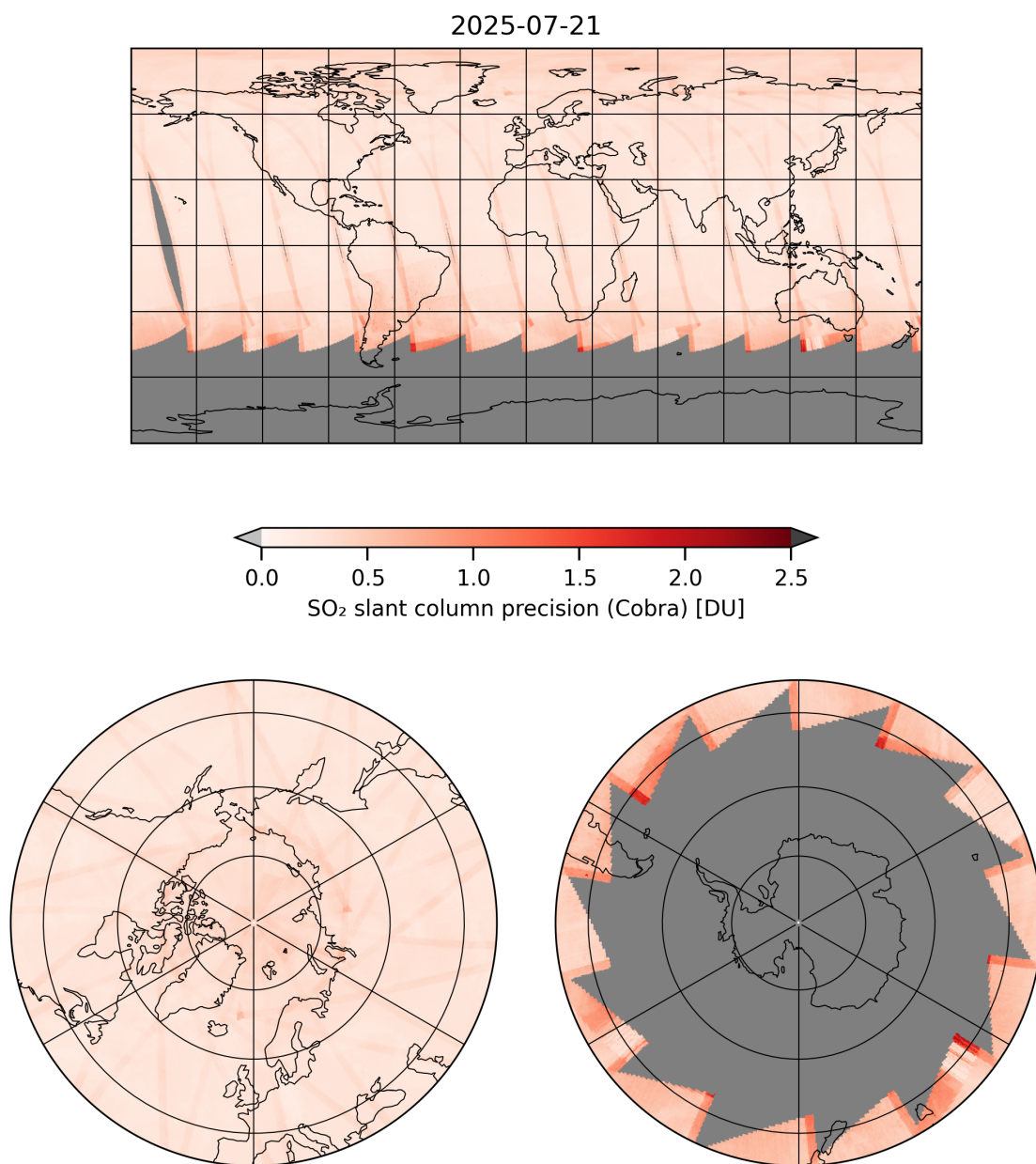


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-07-21 to 2025-07-22

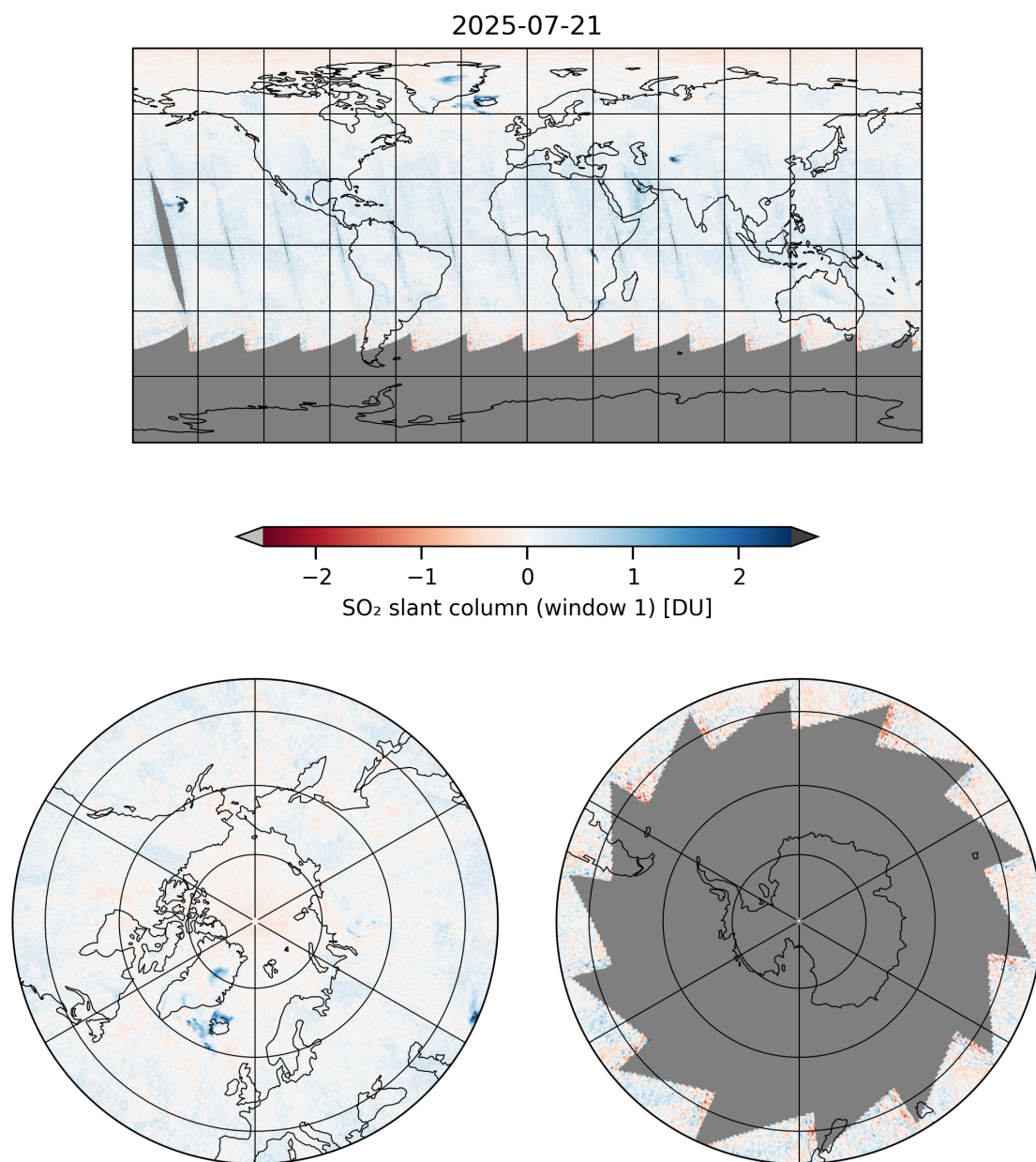


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-07-21 to 2025-07-22

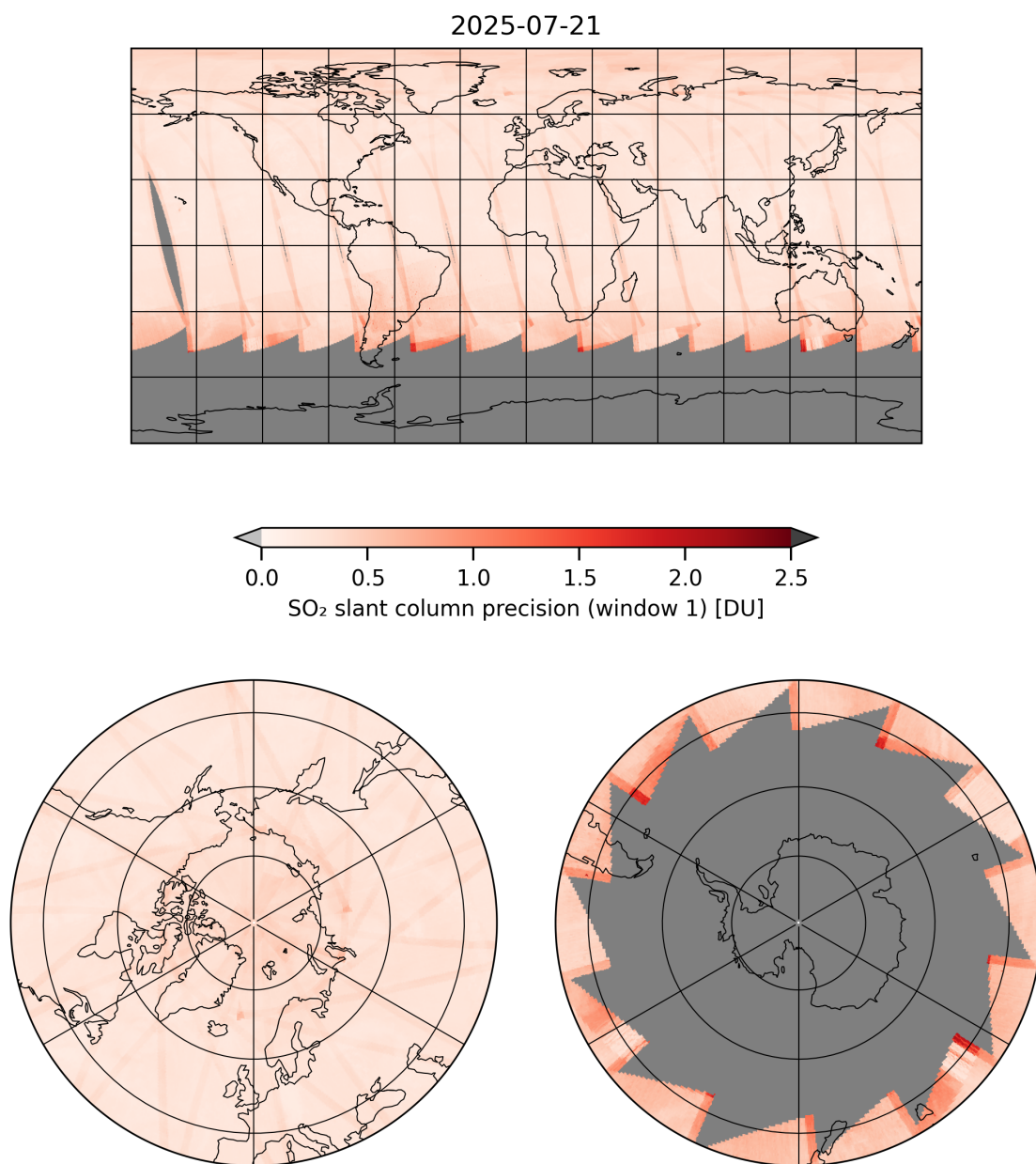


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-07-21 to 2025-07-22

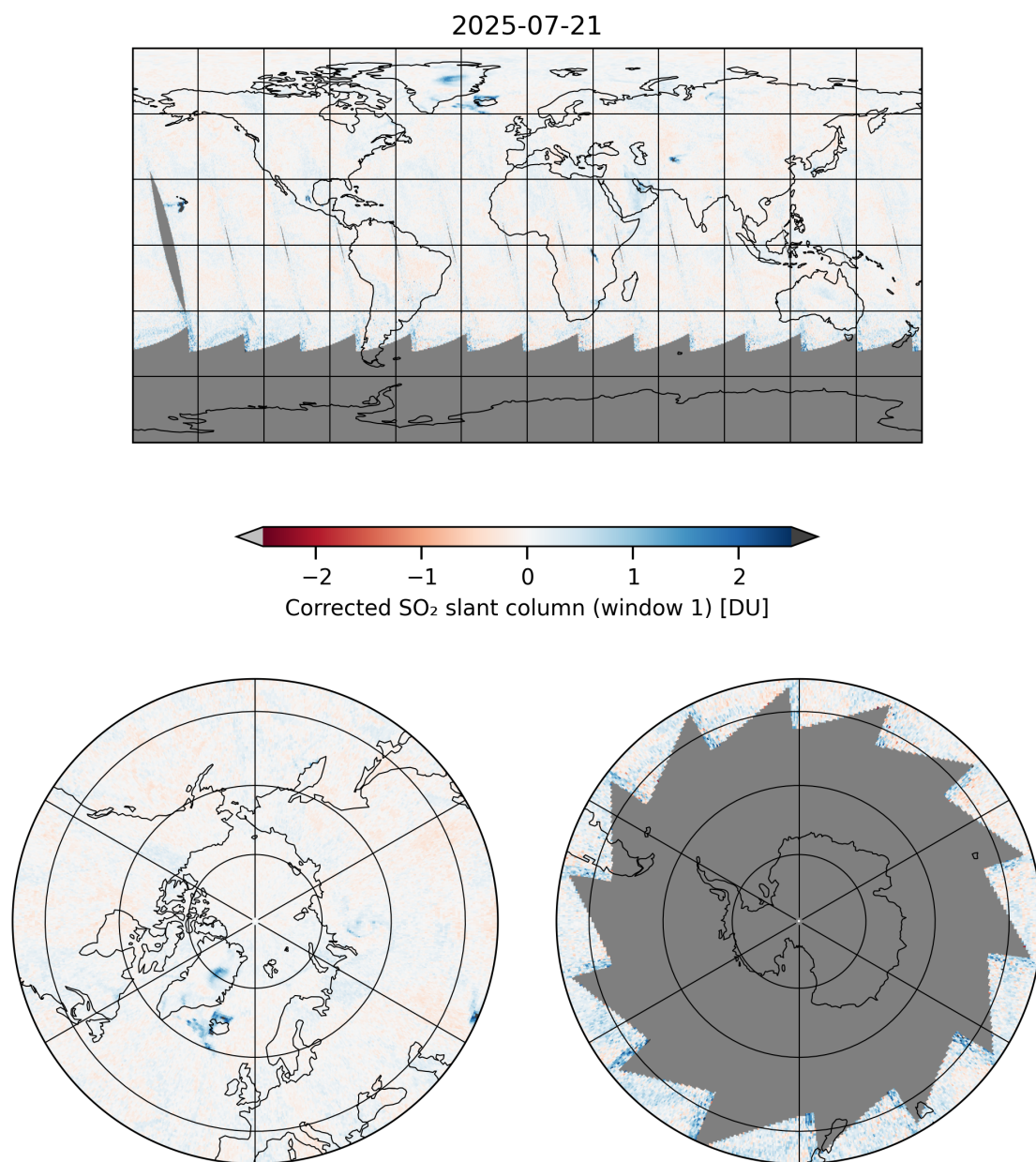


Figure 11: Map of “Corrected SO₂ slant column (window 1)” for 2025-07-21 to 2025-07-22

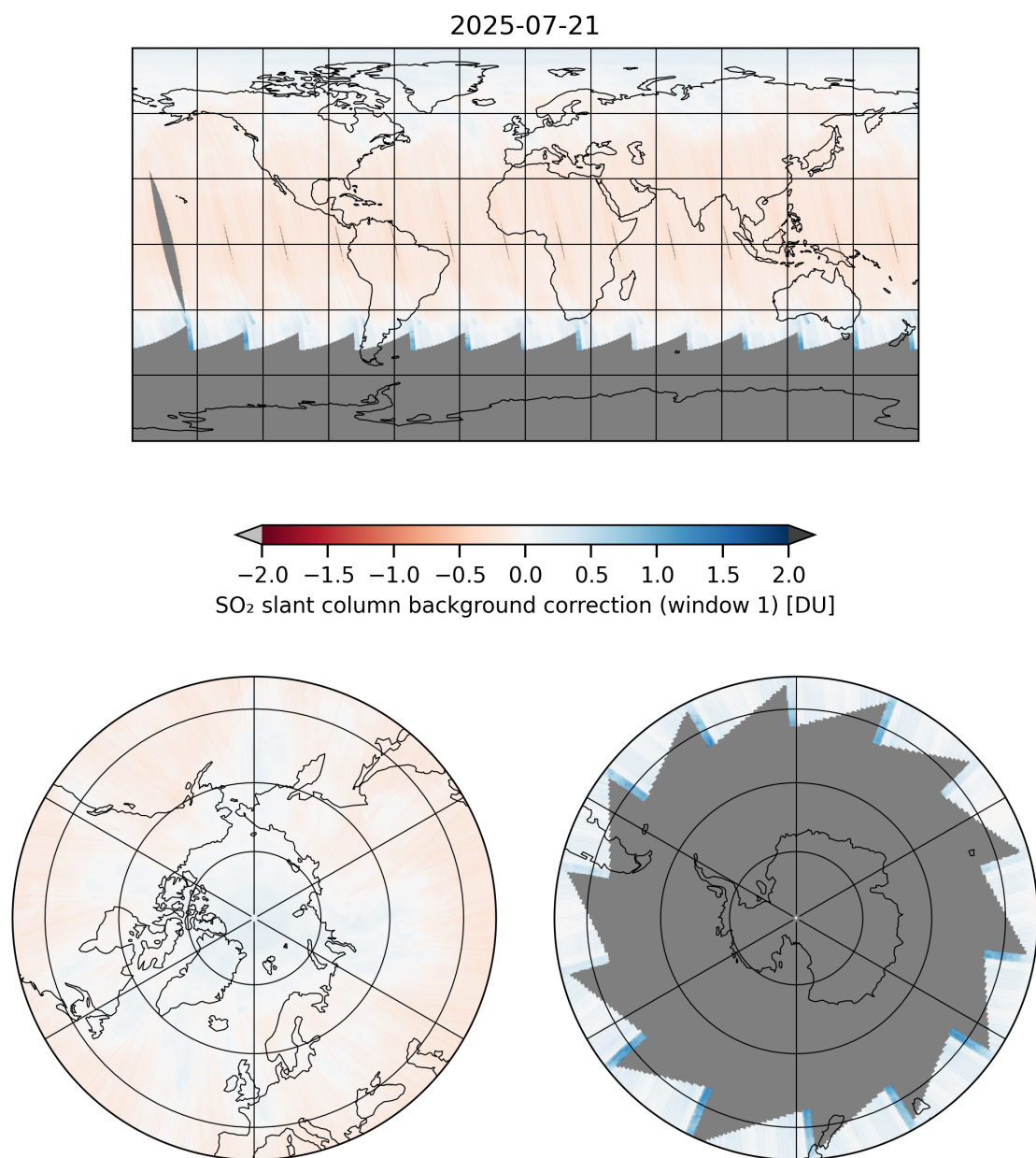


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-07-21 to 2025-07-22

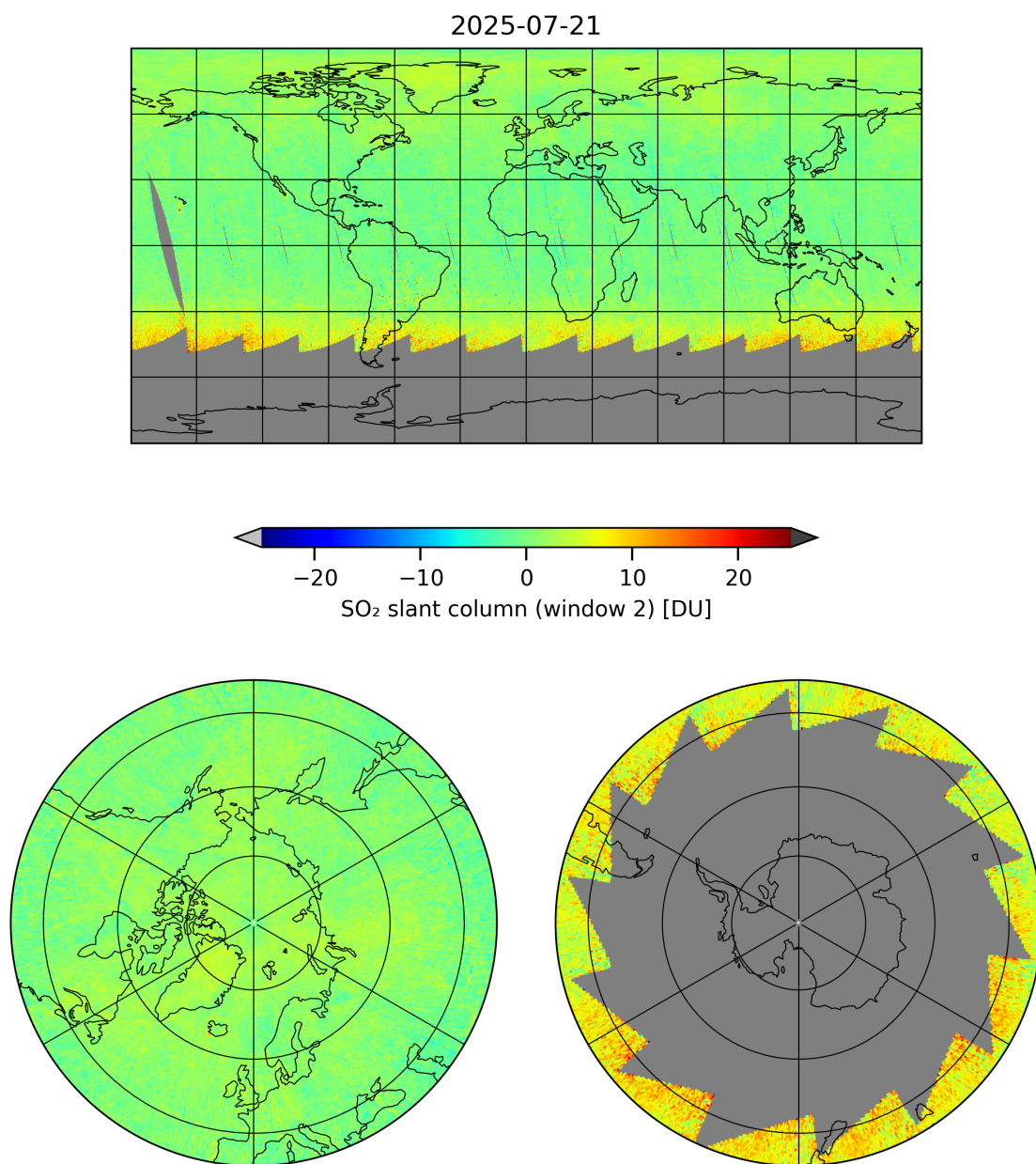


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-07-21 to 2025-07-22

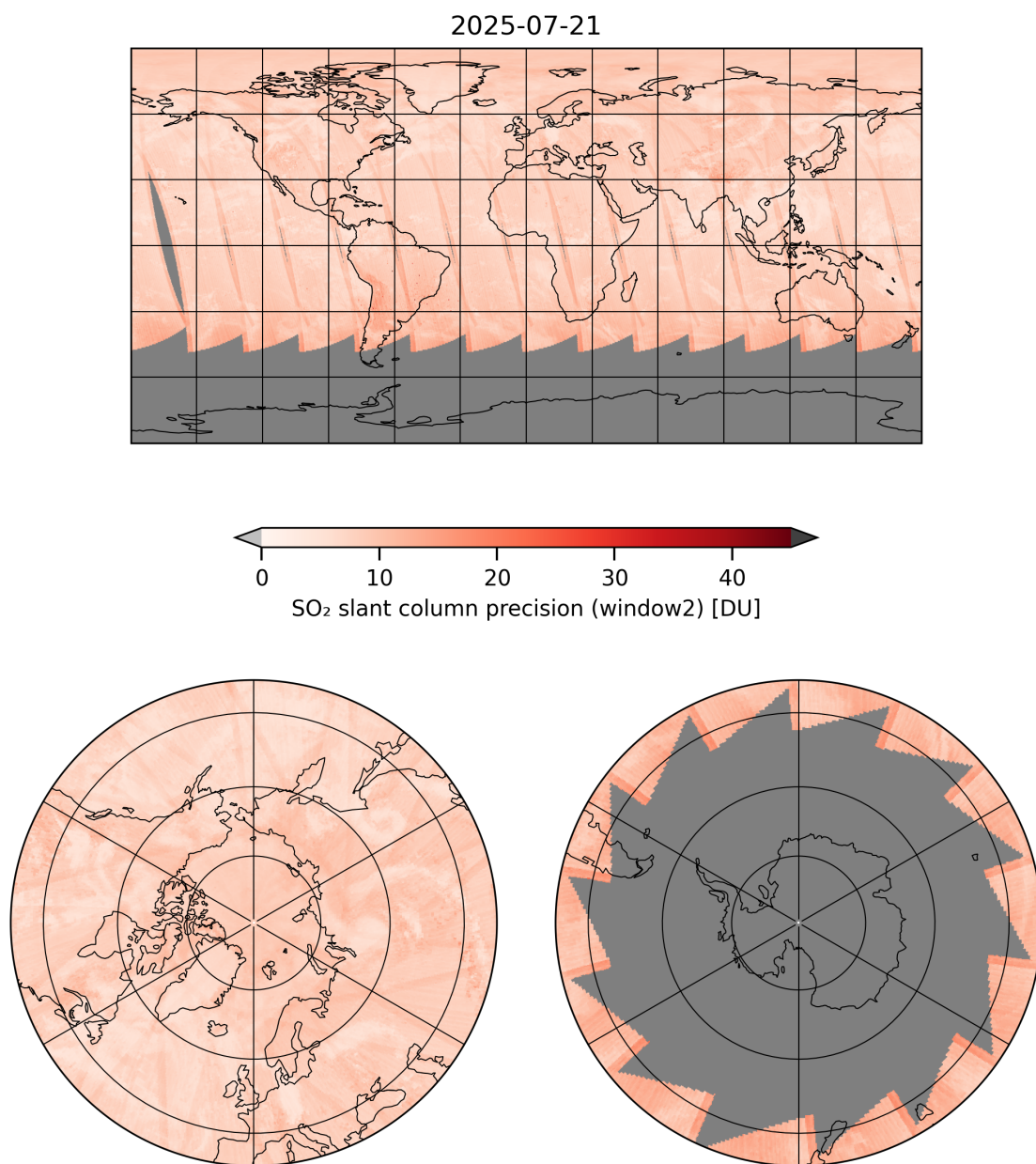


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-07-21 to 2025-07-22

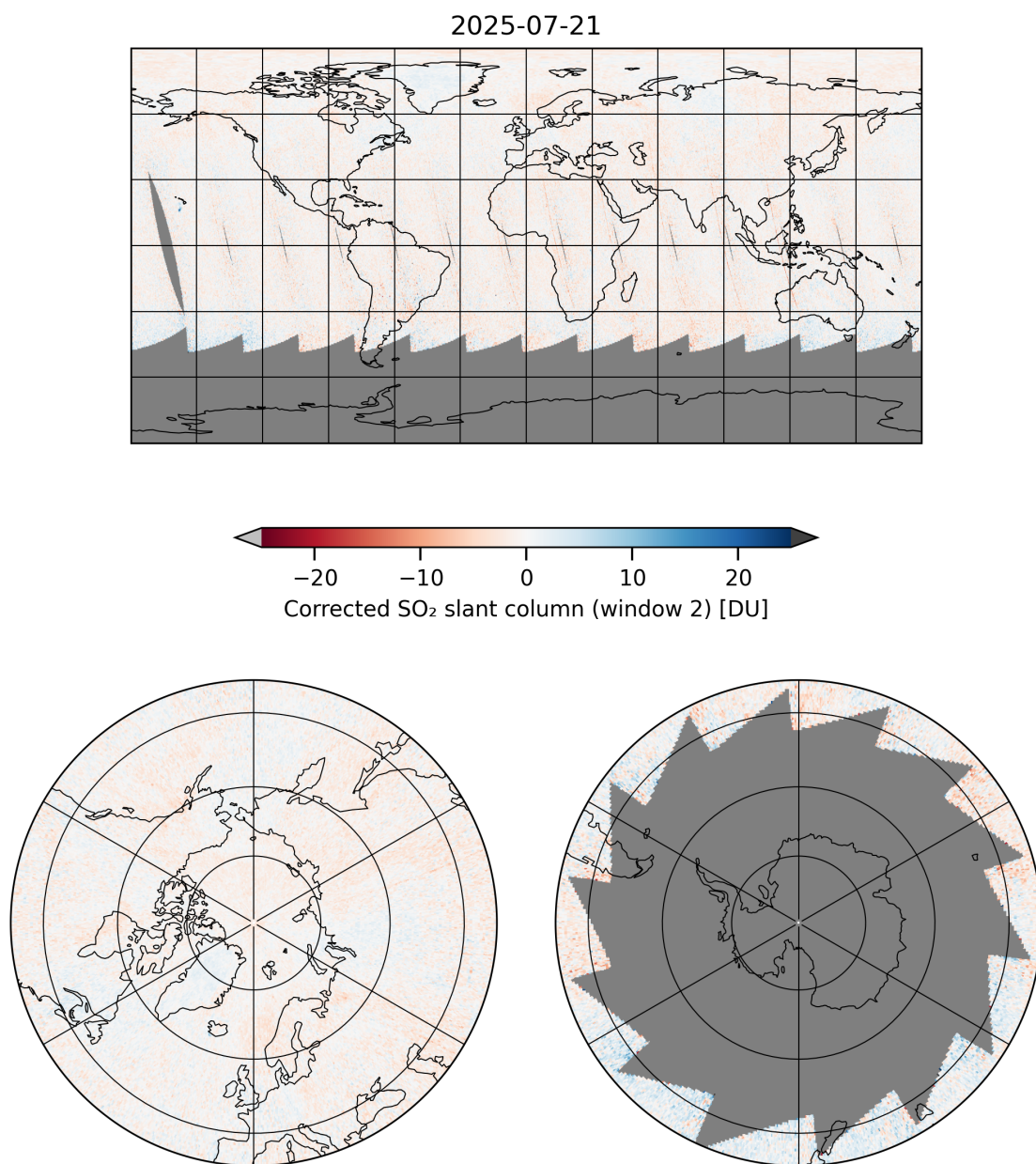


Figure 15: Map of “Corrected SO₂ slant column (window 2)” for 2025-07-21 to 2025-07-22

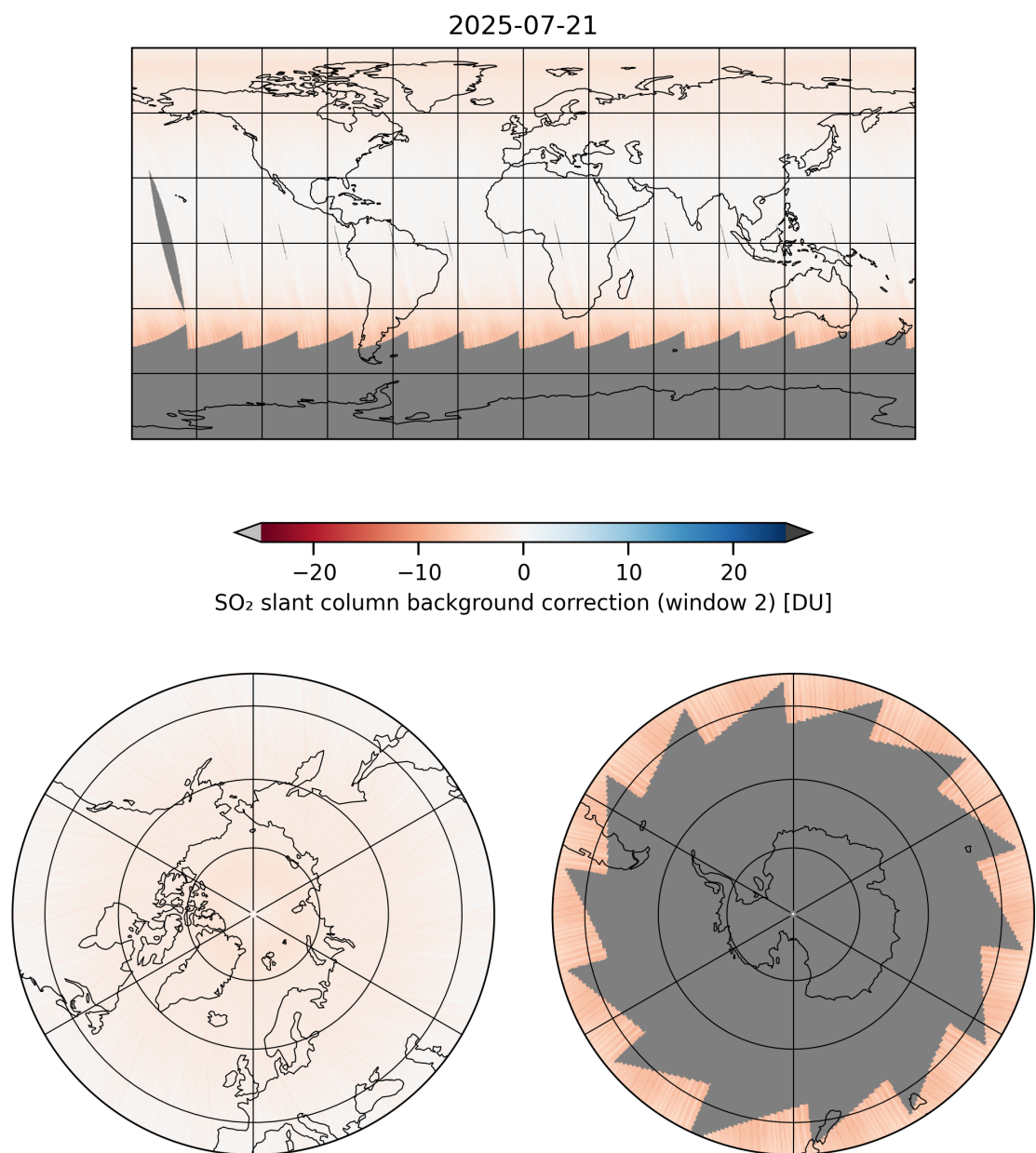


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-07-21 to 2025-07-22

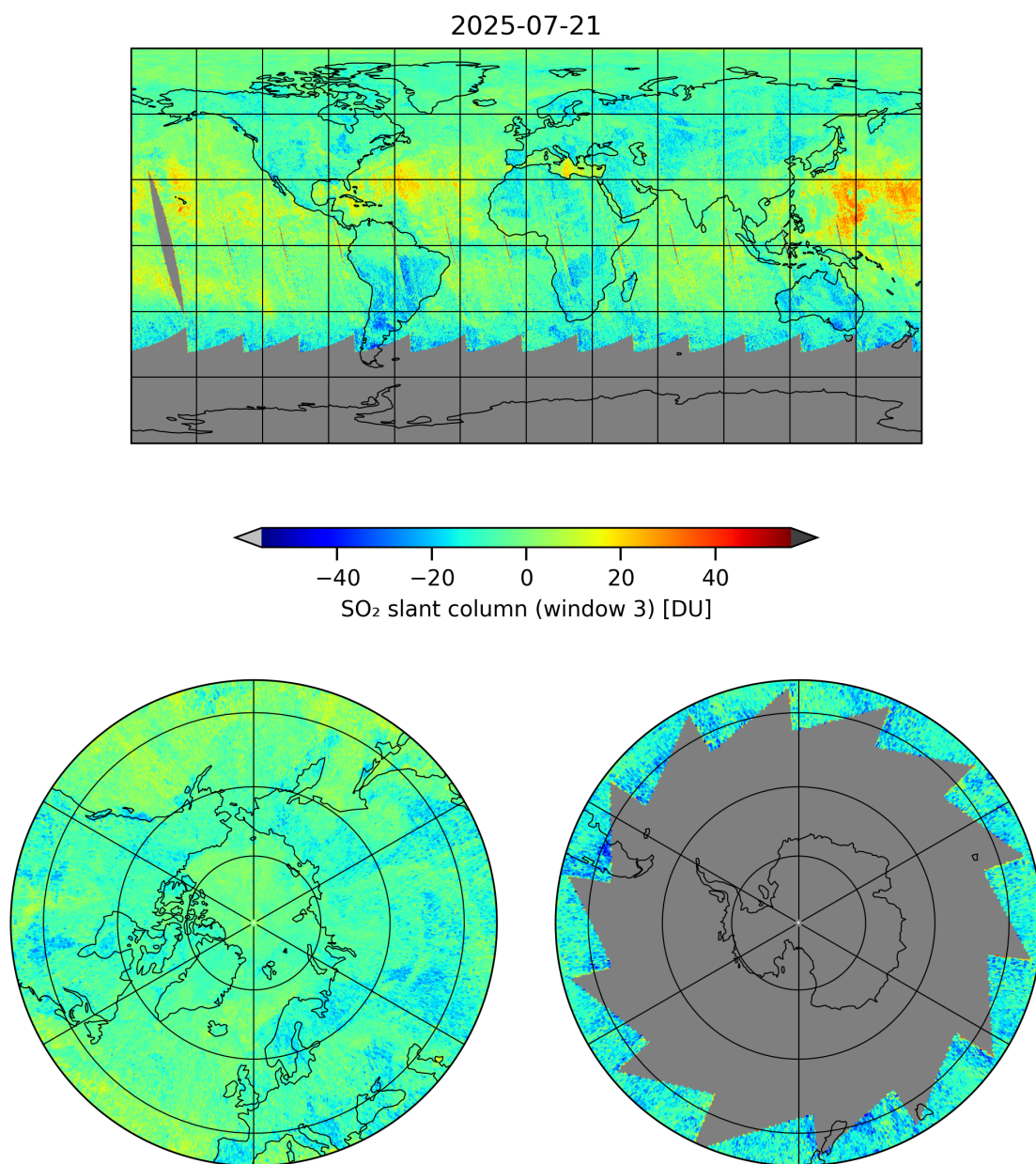


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-07-21 to 2025-07-22

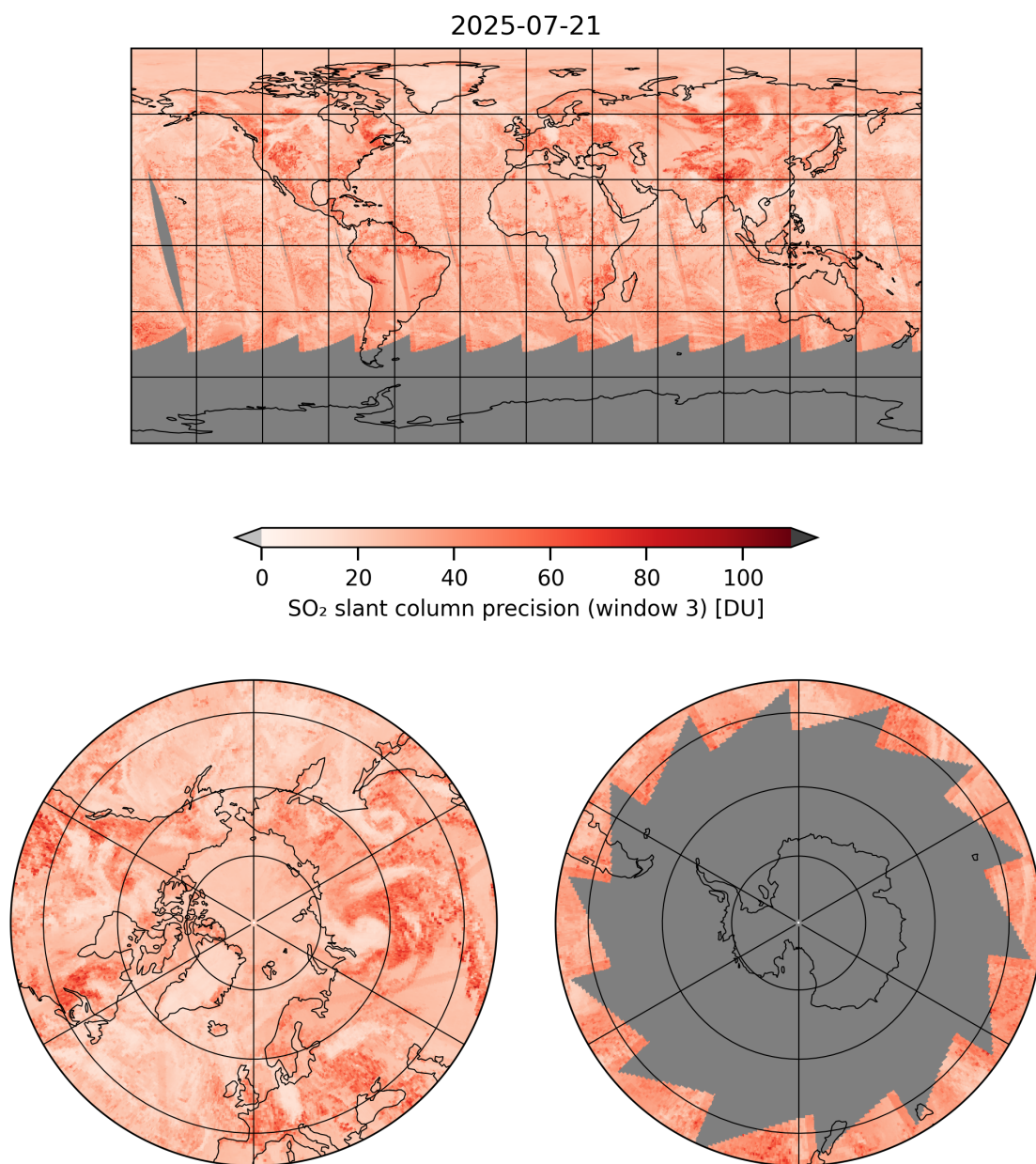


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-07-21 to 2025-07-22

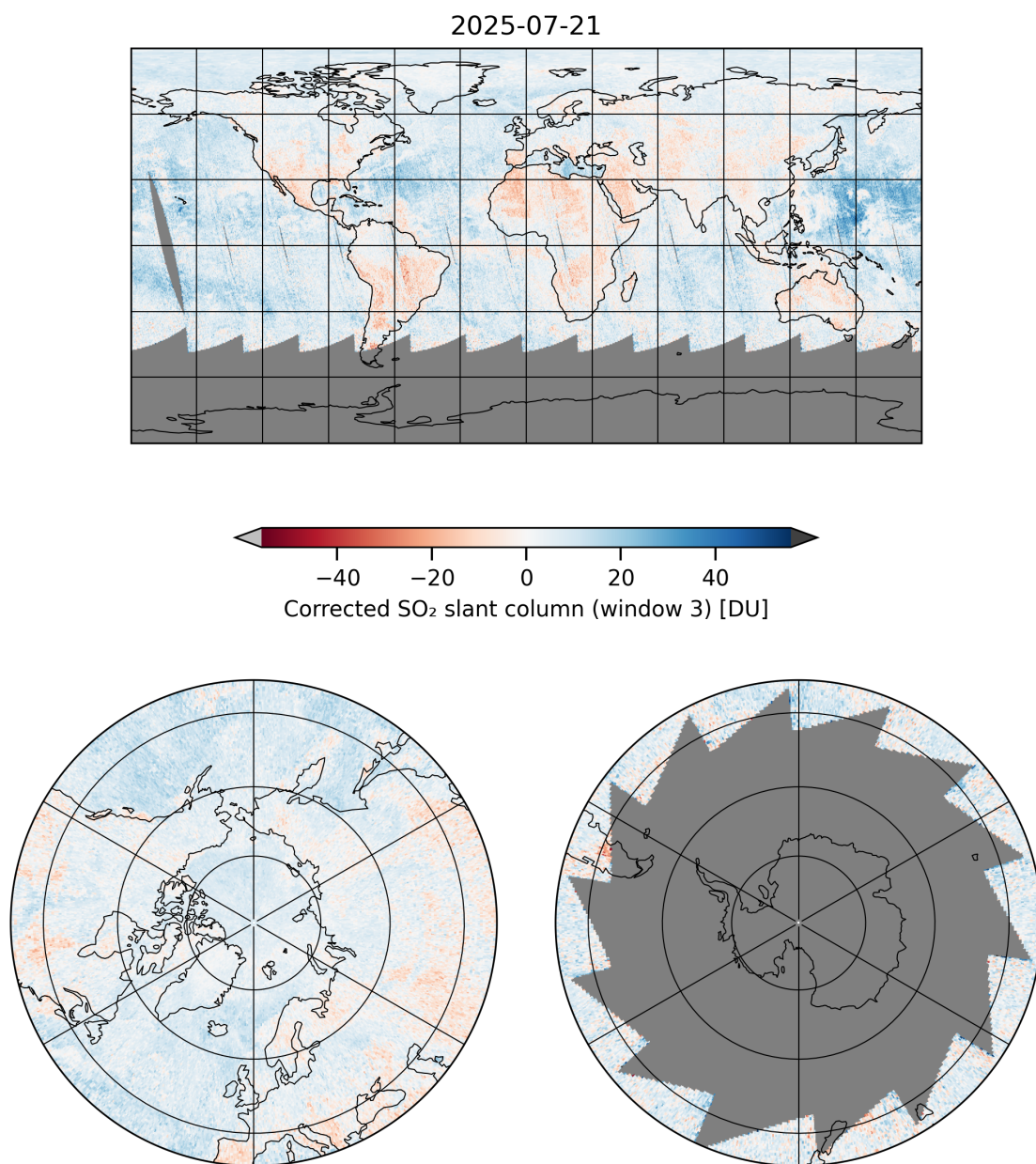


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-07-21 to 2025-07-22

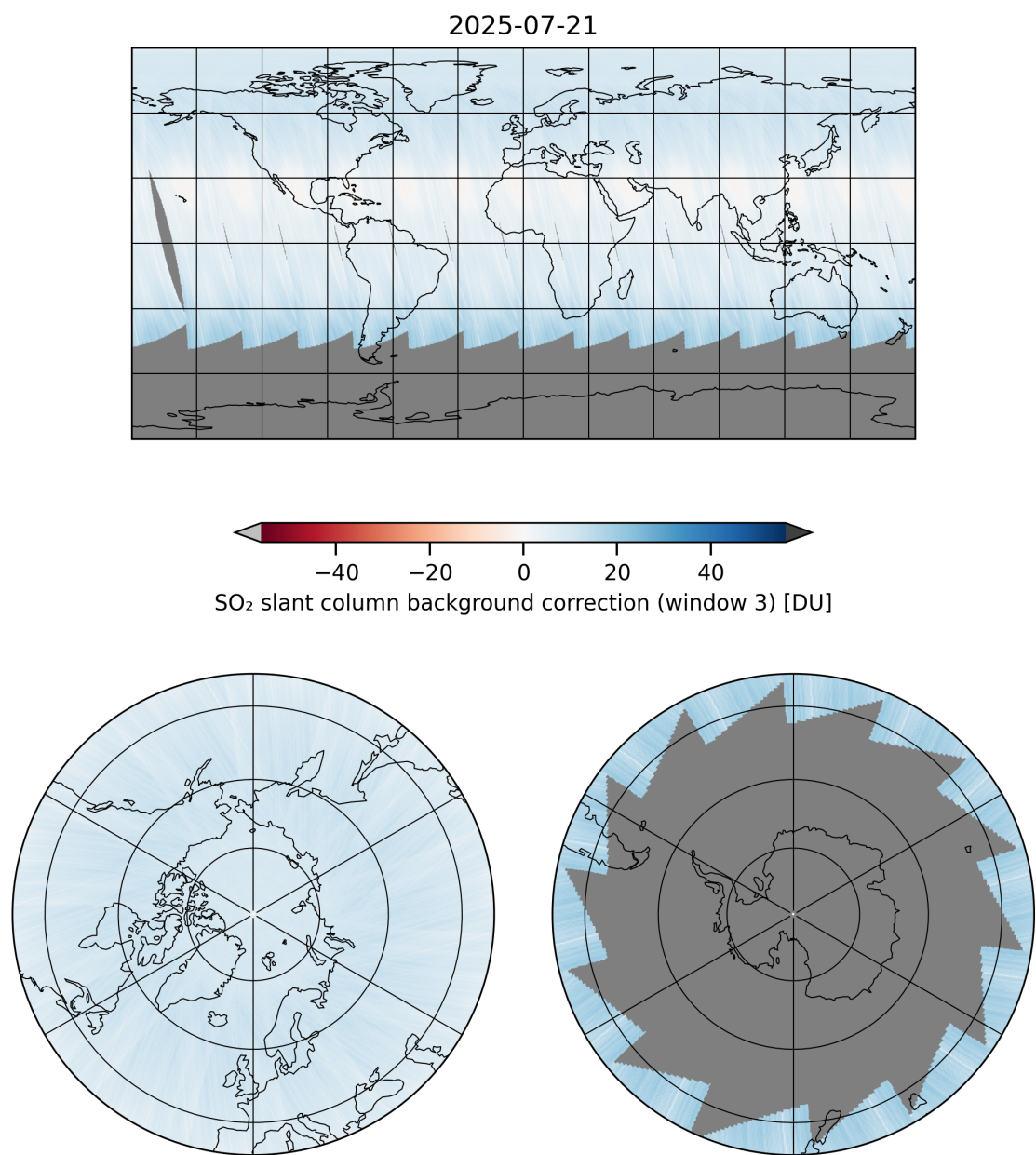


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-07-21 to 2025-07-22

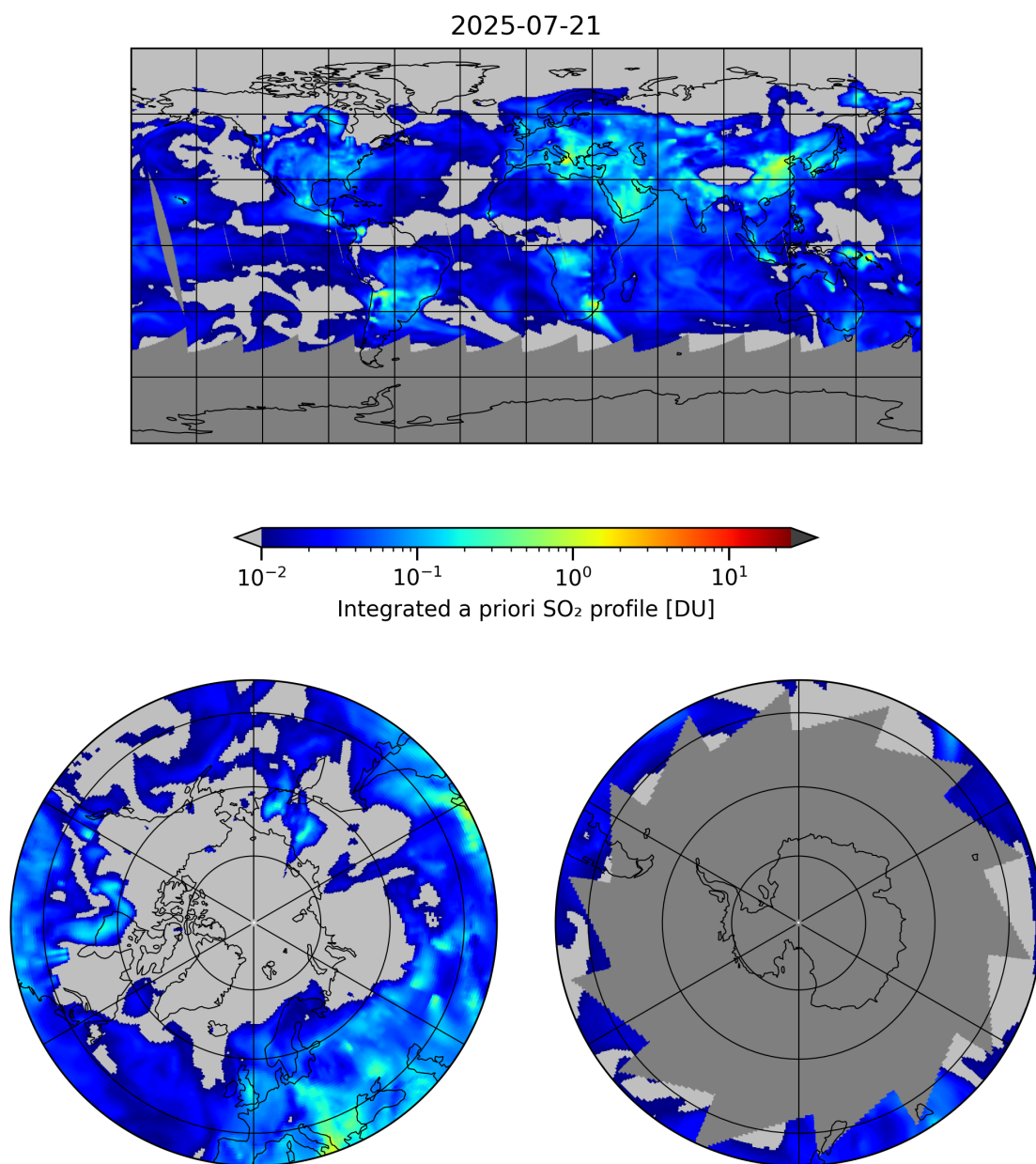


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-07-21 to 2025-07-22

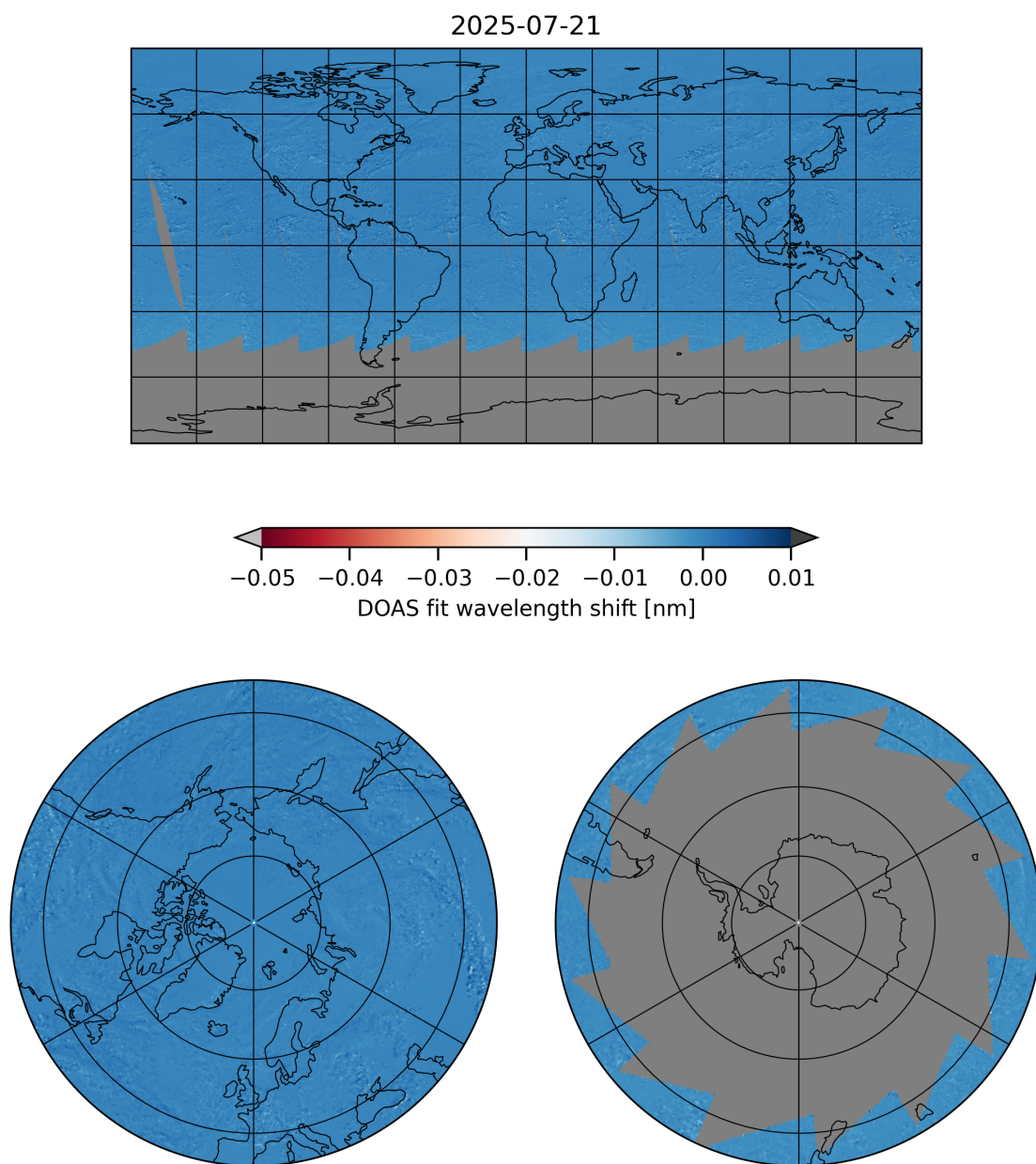


Figure 22: Map of “DOAS fit wavelength shift” for 2025-07-21 to 2025-07-22

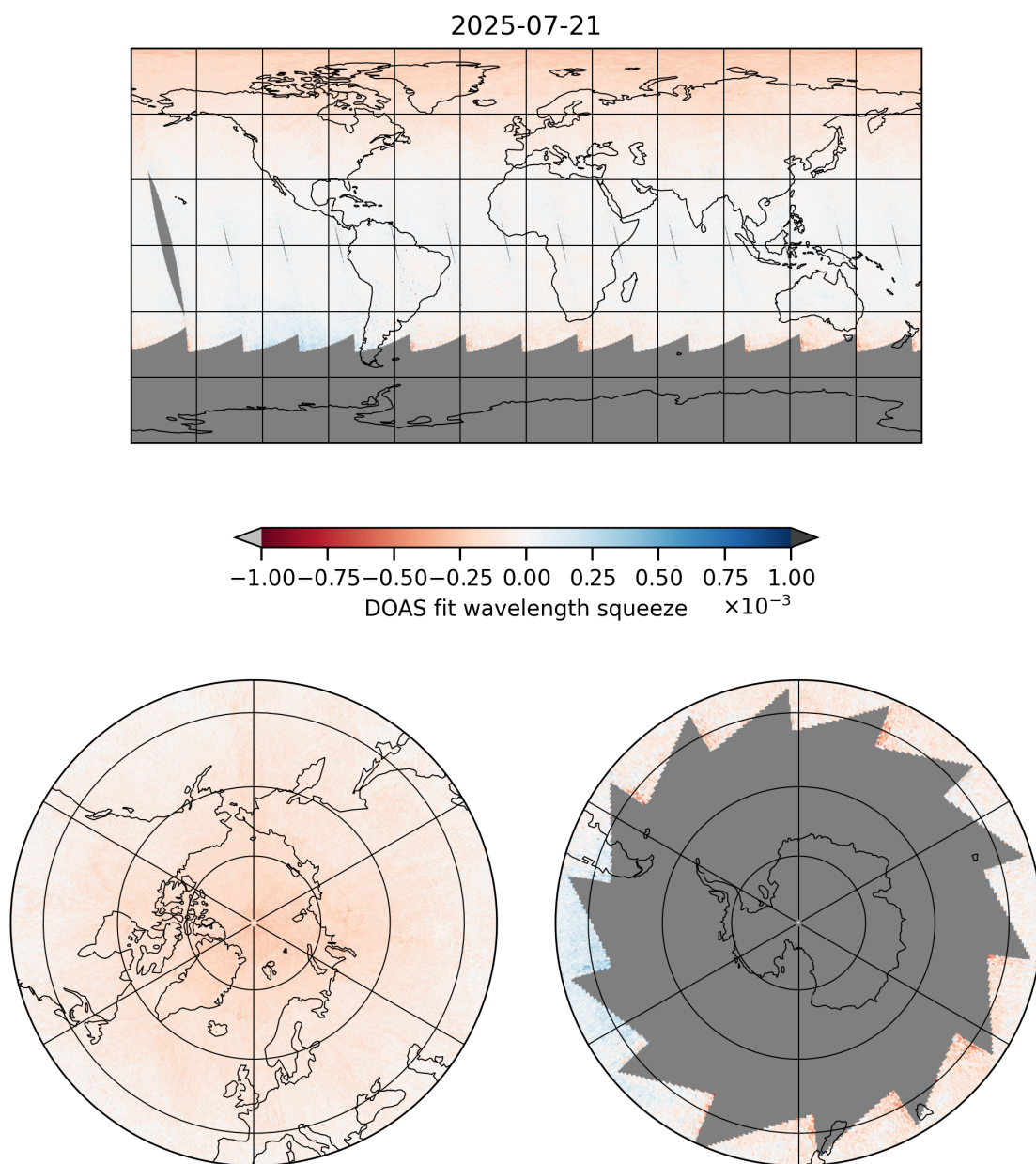


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-07-21 to 2025-07-22

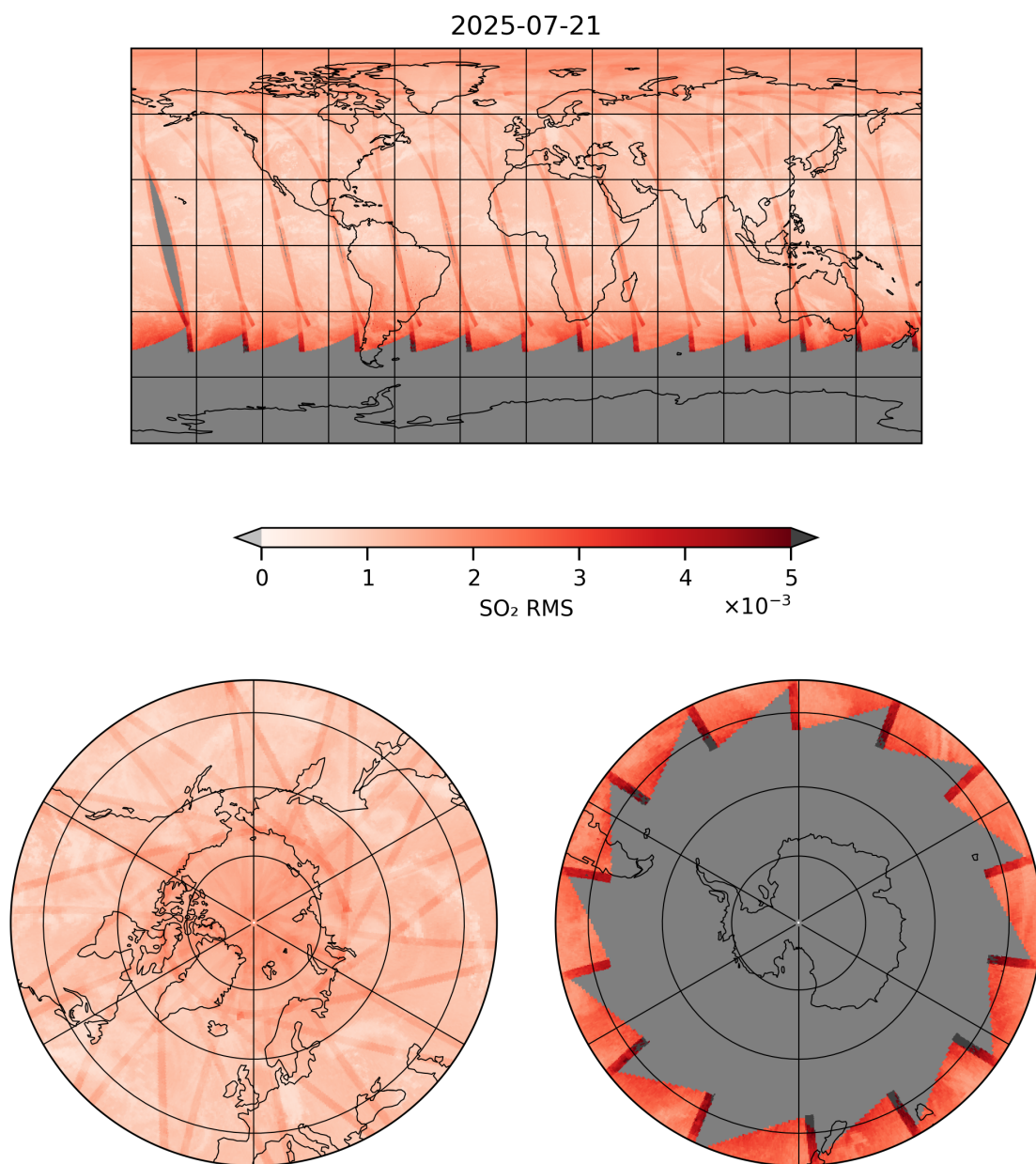


Figure 24: Map of “SO₂ RMS” for 2025-07-21 to 2025-07-22

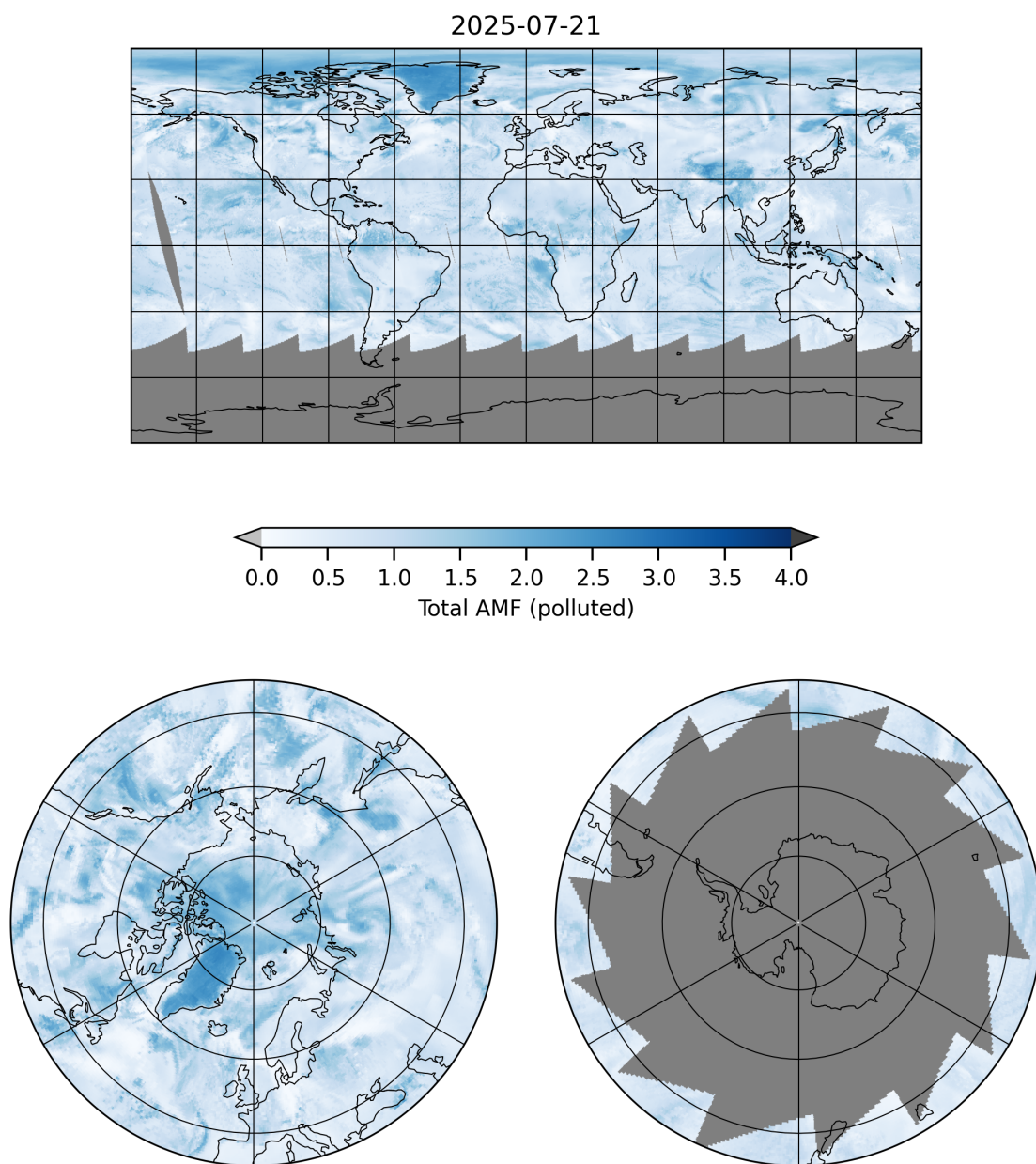


Figure 25: Map of “Total AMF (polluted)” for 2025-07-21 to 2025-07-22

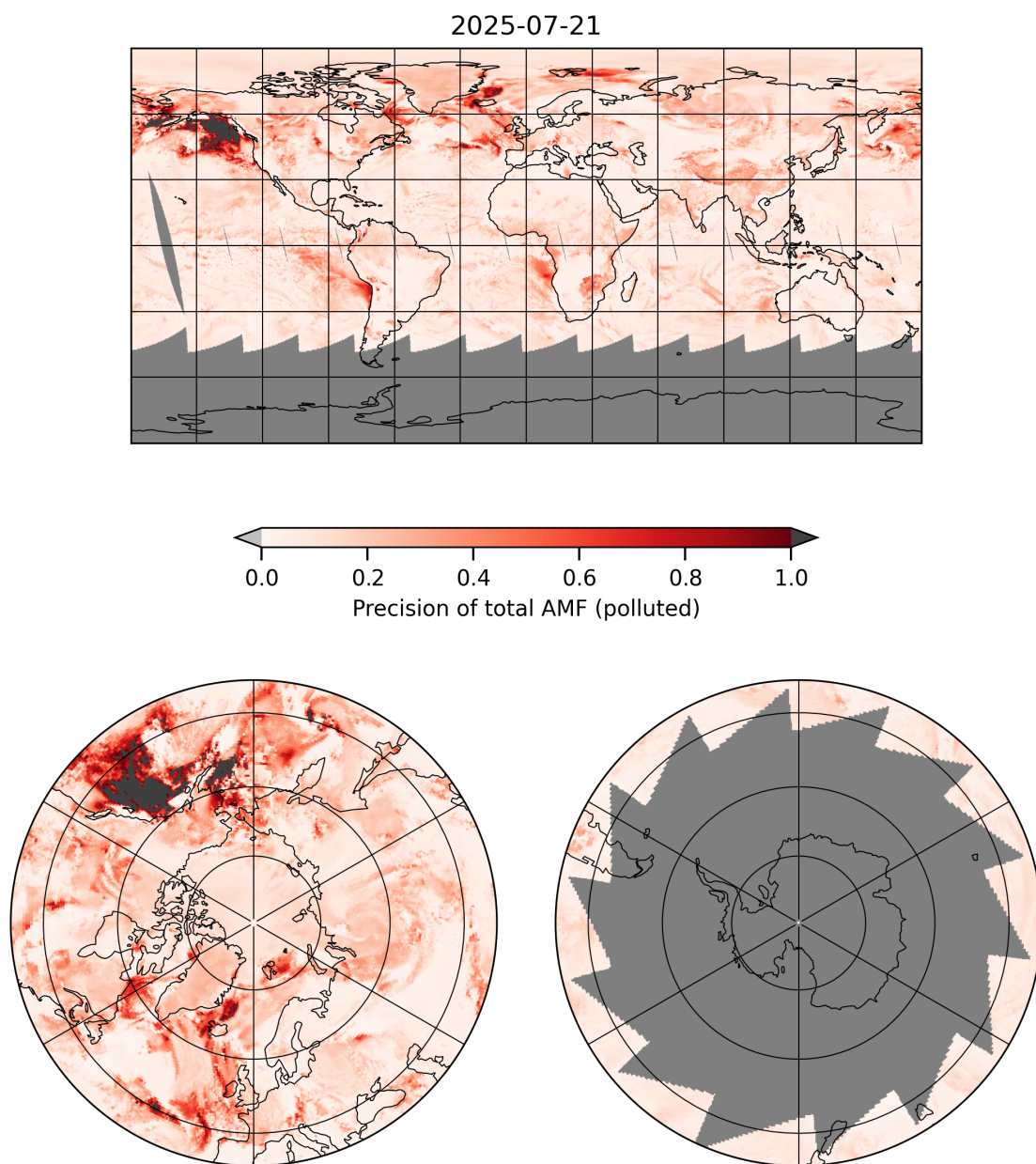


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-07-21 to 2025-07-22

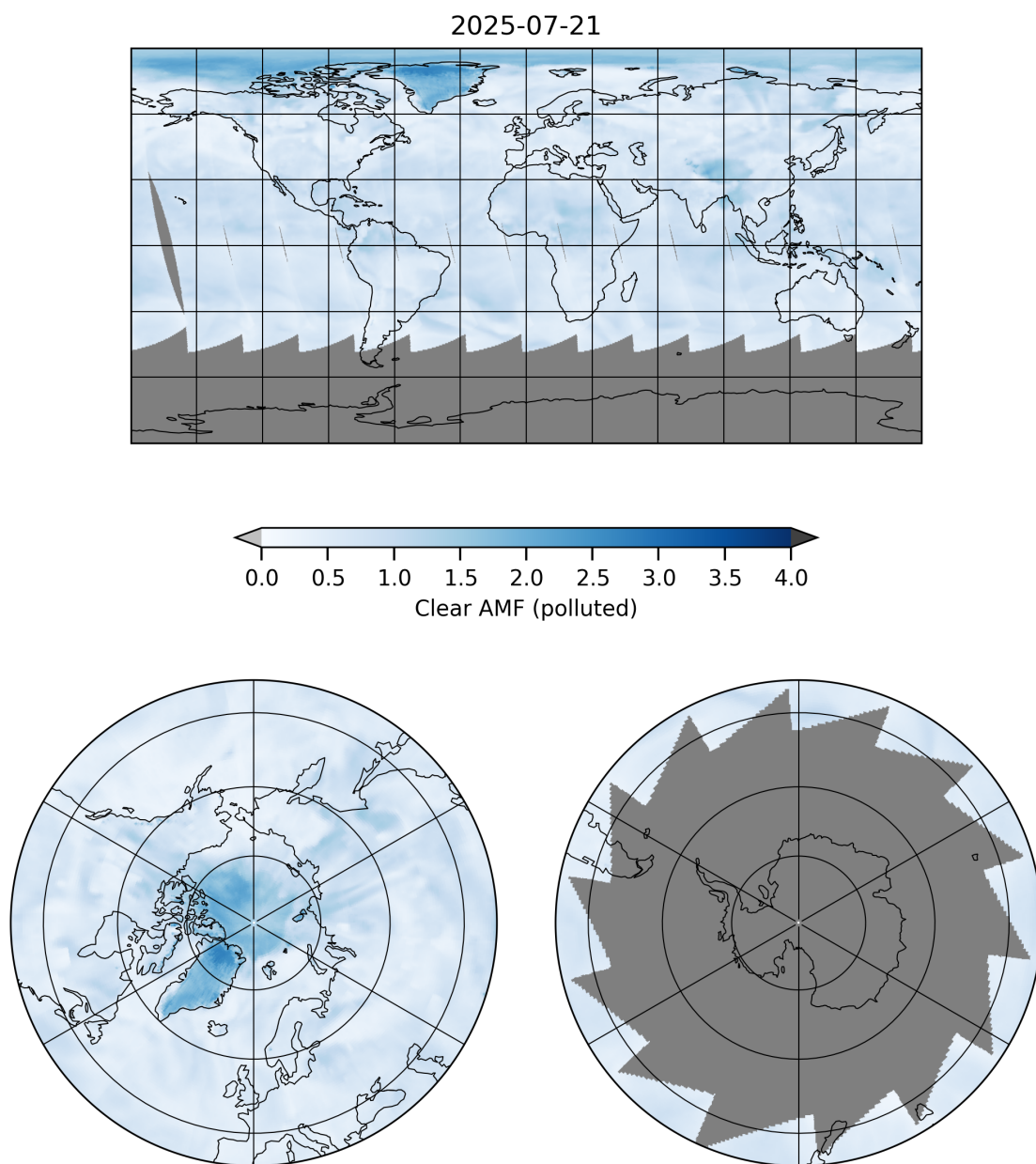


Figure 27: Map of “Clear AMF (polluted)” for 2025-07-21 to 2025-07-22

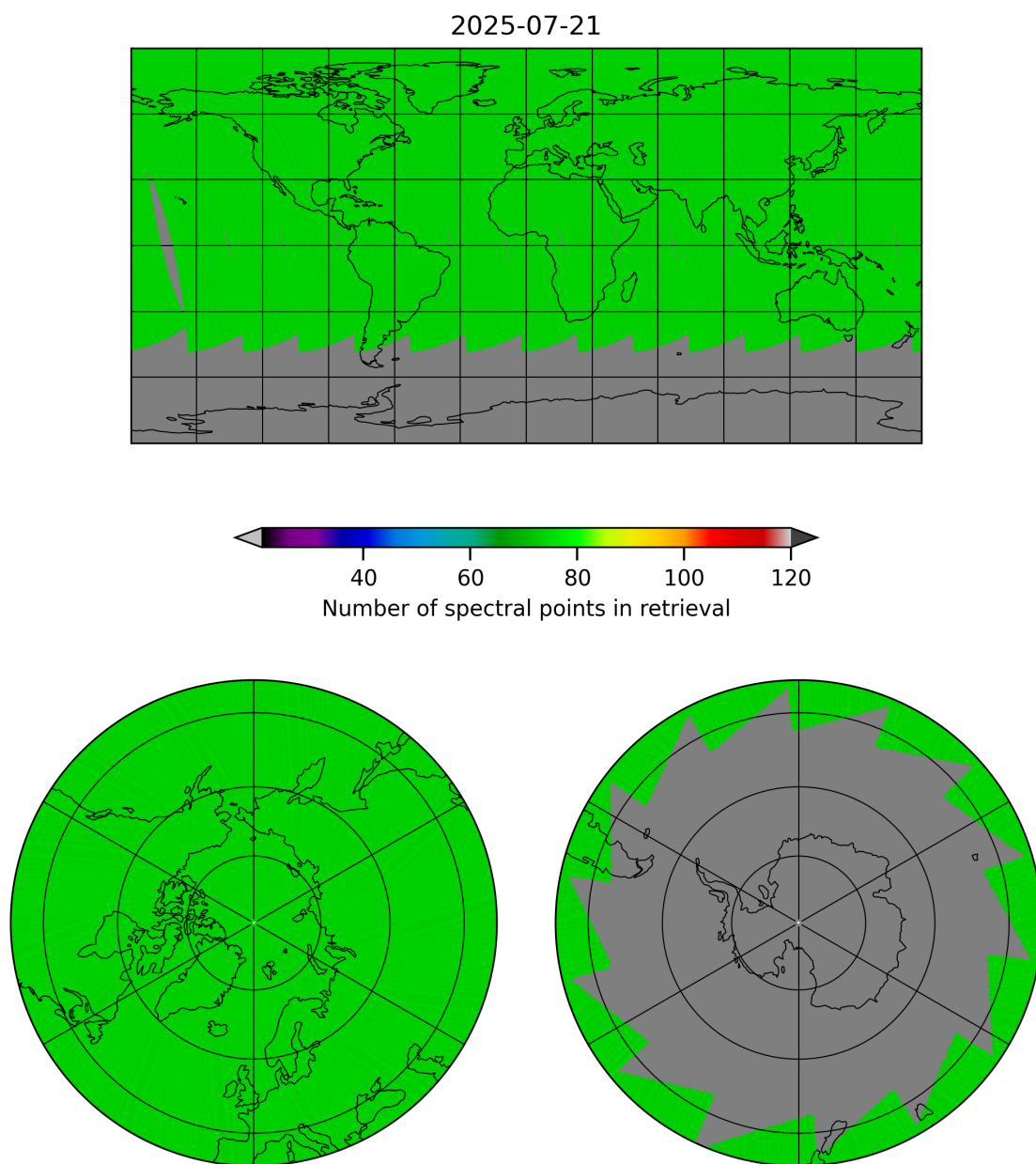


Figure 28: Map of “Number of spectral points in retrieval” for 2025-07-21 to 2025-07-22

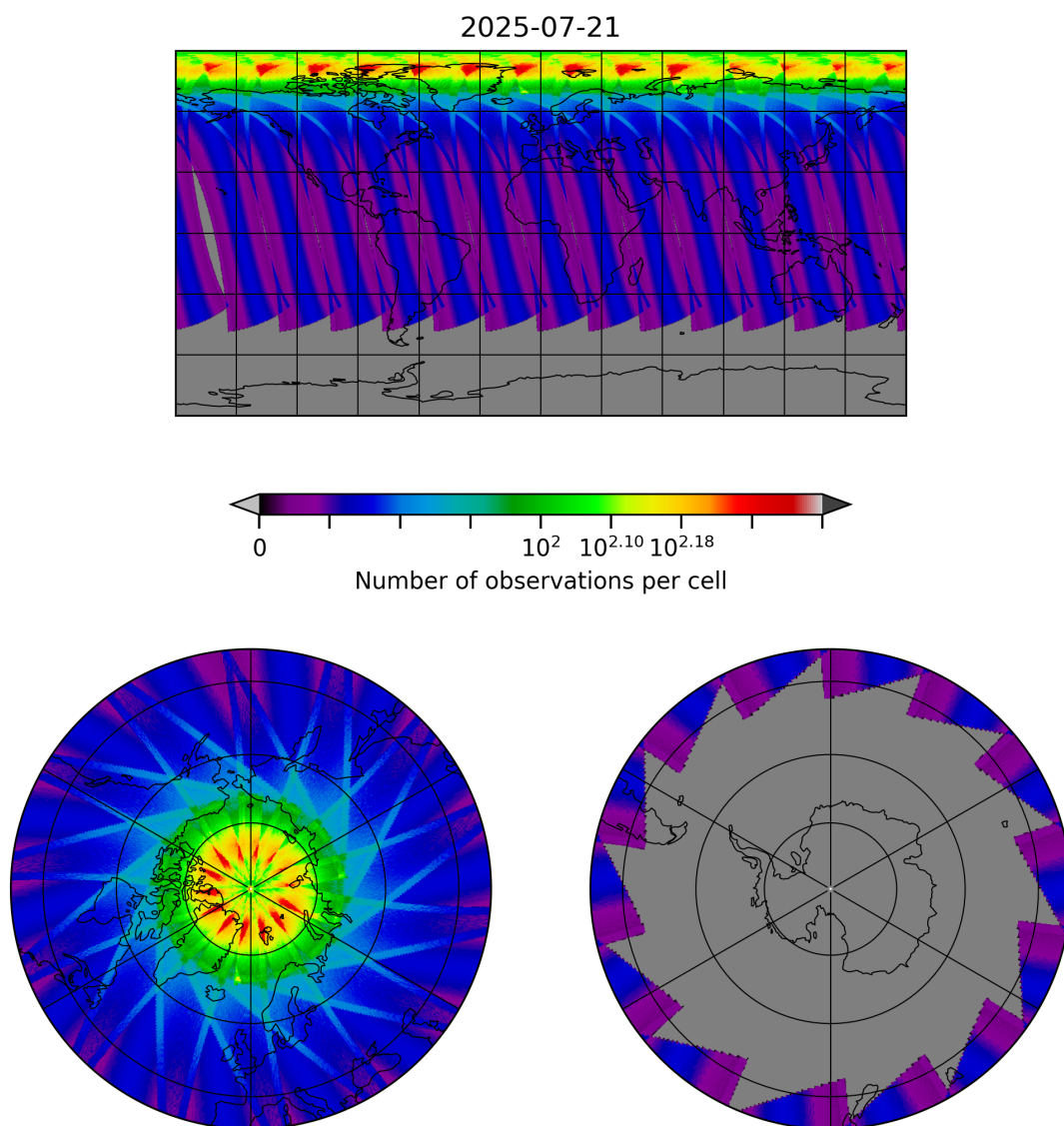


Figure 29: Map of the number of observations for 2025-07-21 to 2025-07-22

7 Zonal average

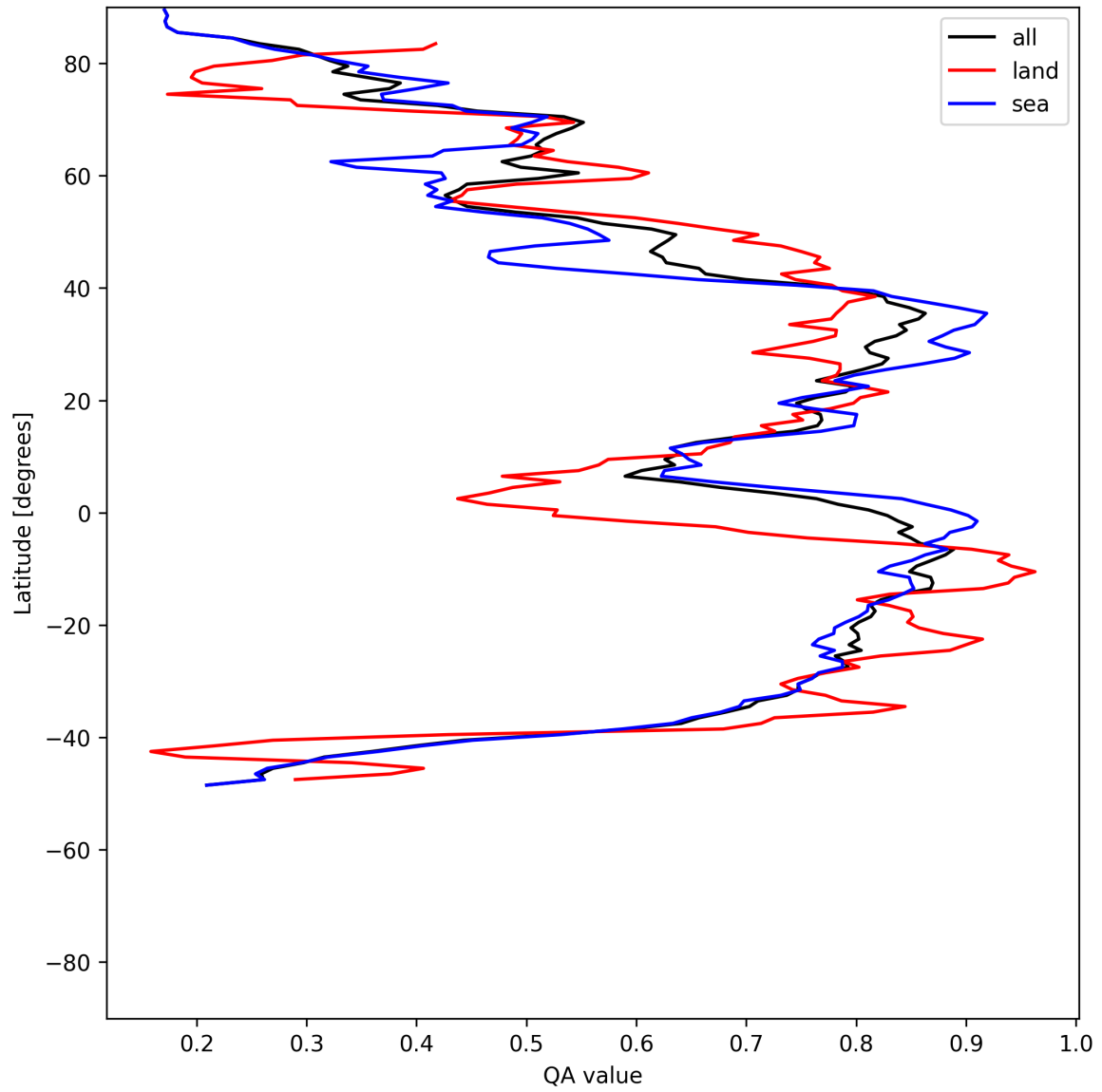


Figure 30: Zonal average of “QA value” for 2025-07-21 to 2025-07-22.

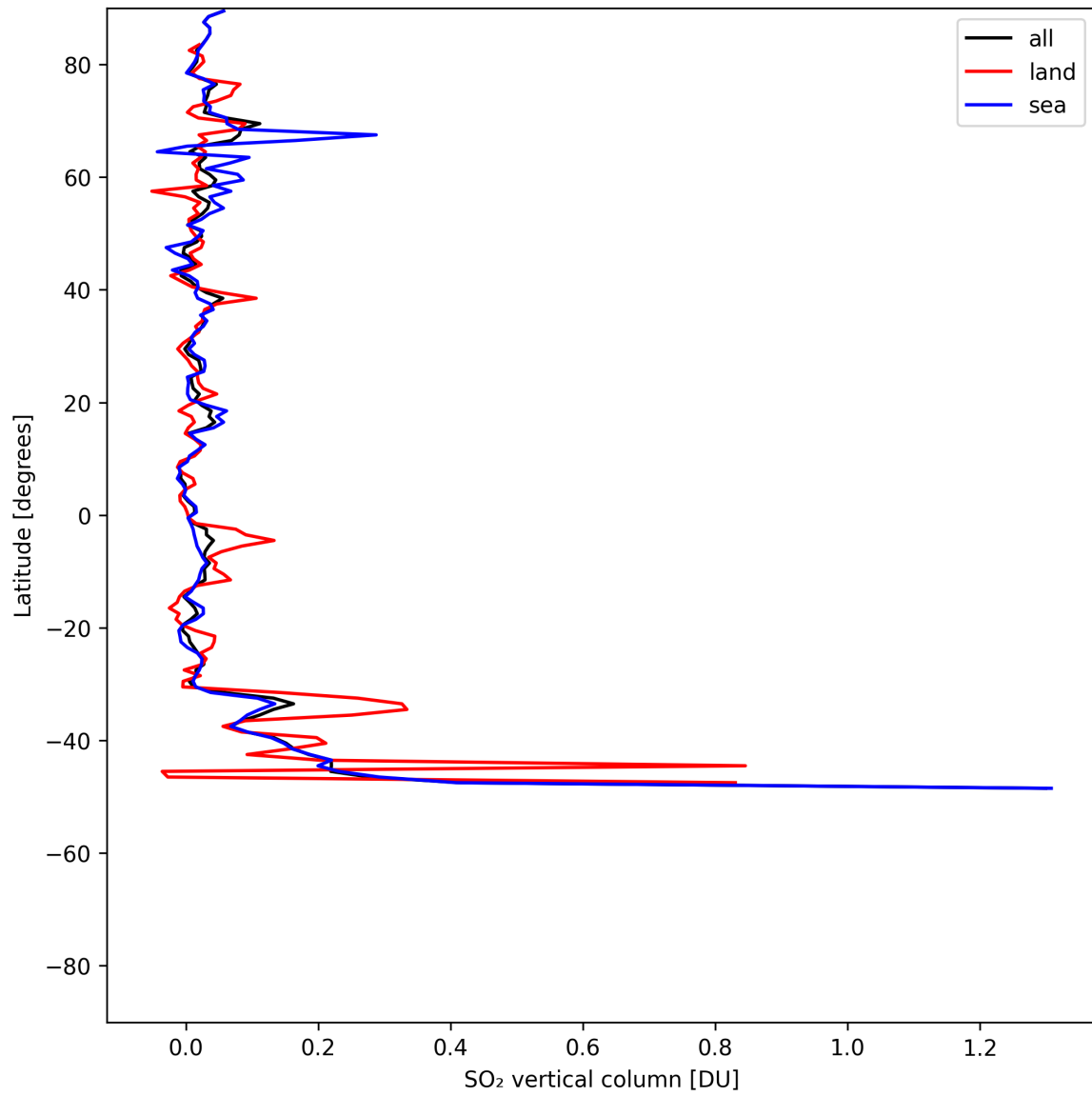


Figure 31: Zonal average of “SO₂ vertical column” for 2025-07-21 to 2025-07-22.

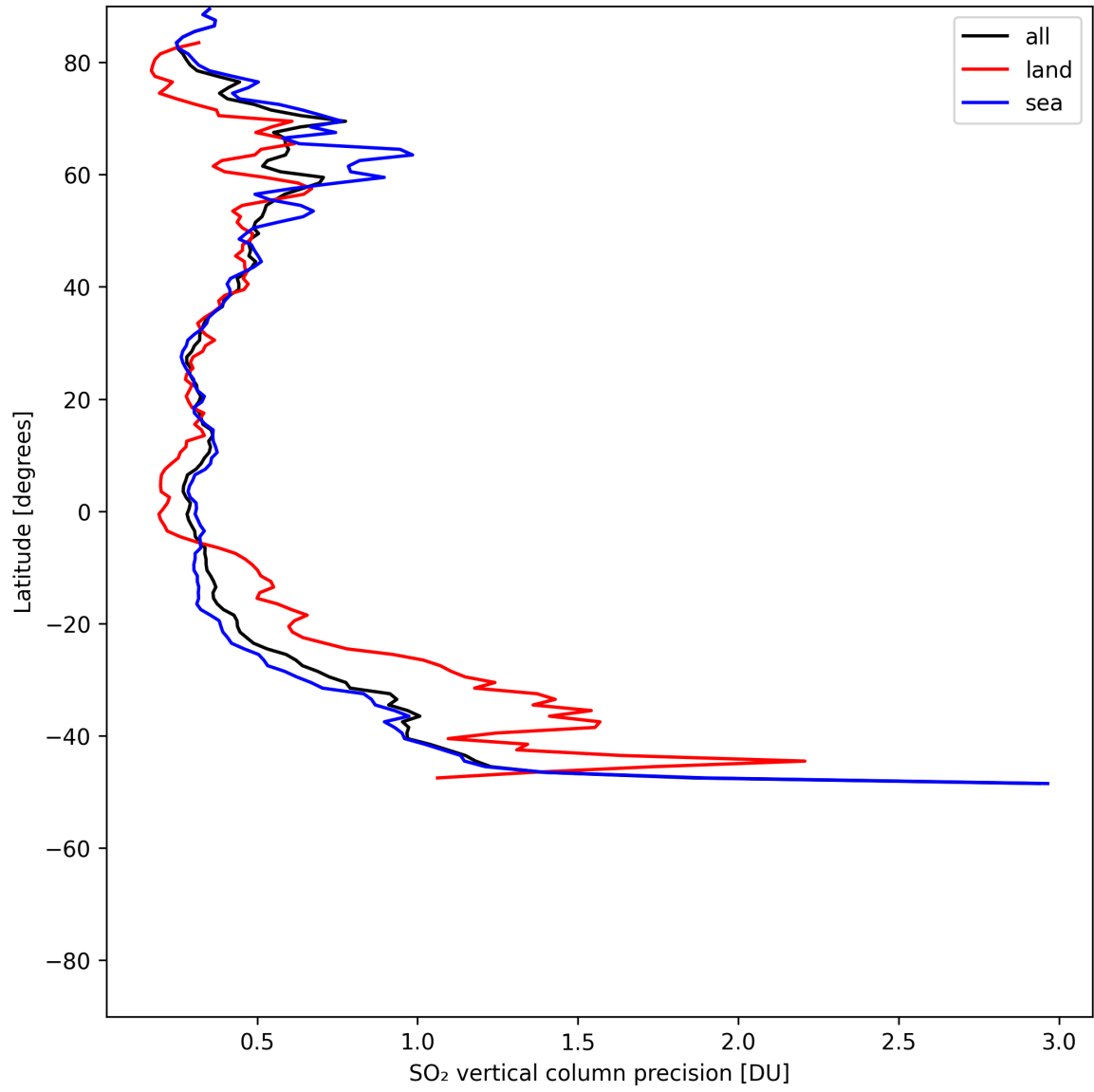


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-07-21 to 2025-07-22.

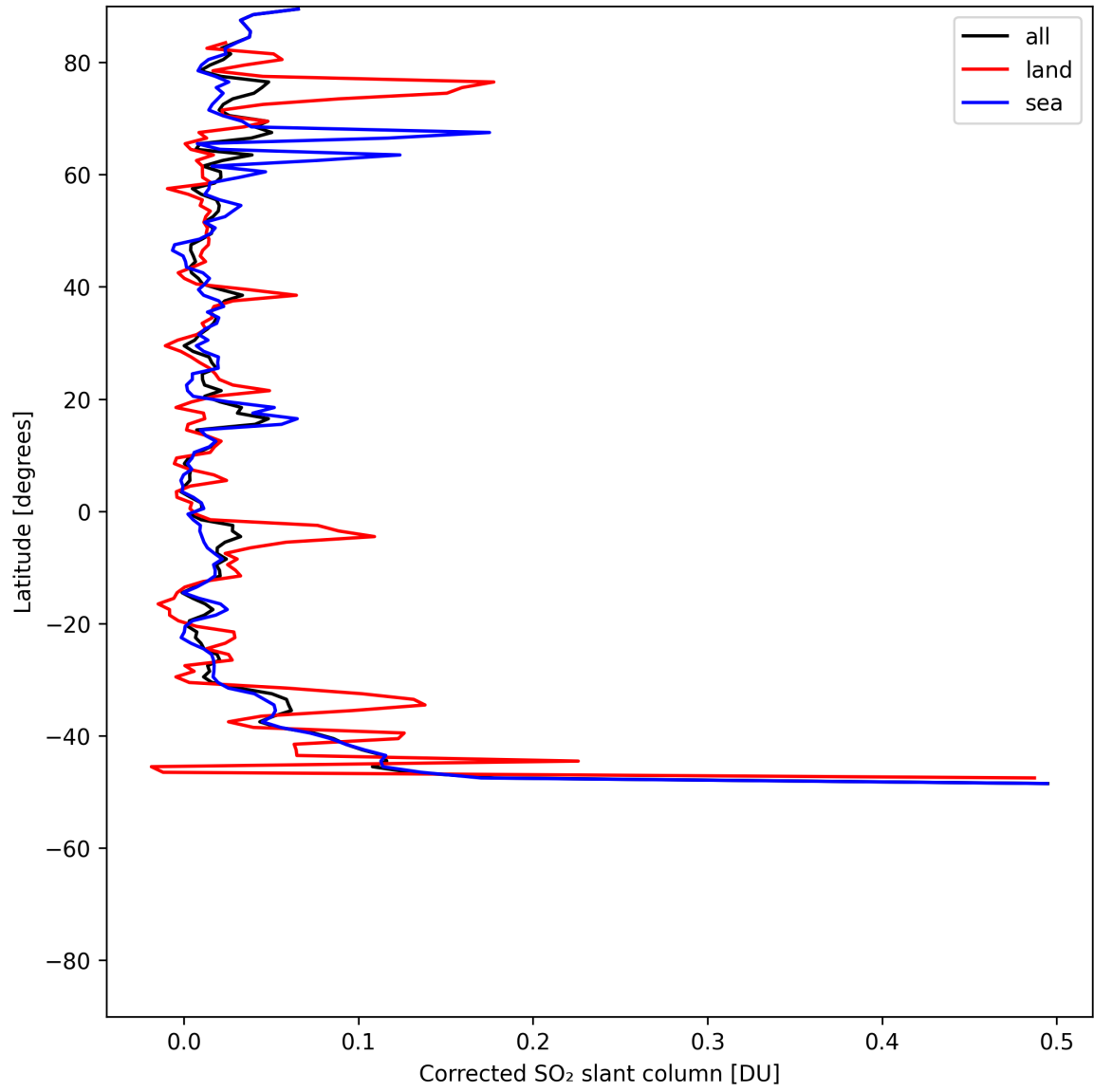


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-07-21 to 2025-07-22.

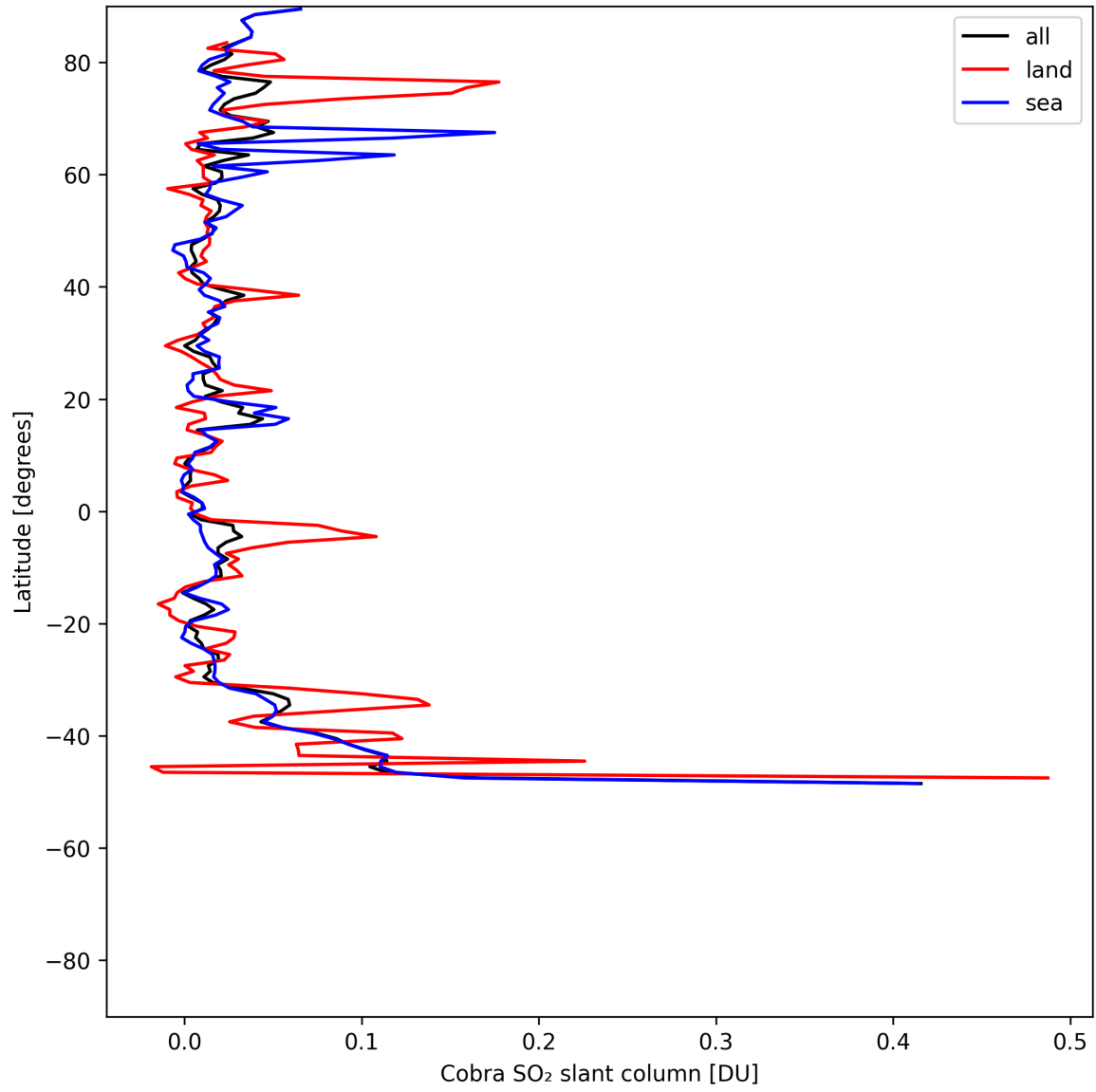


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-07-21 to 2025-07-22.

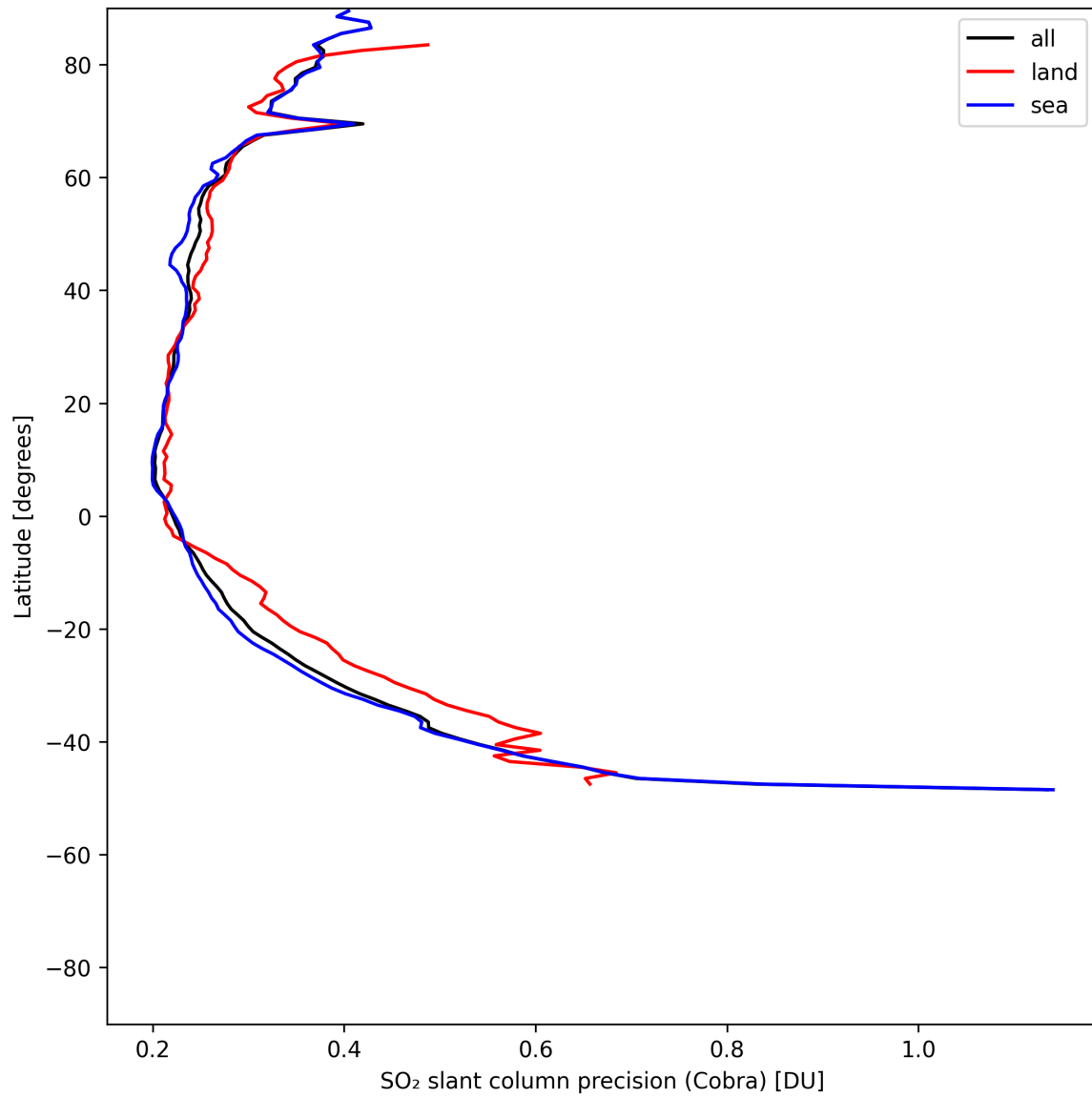


Figure 35: Zonal average of “SO₂ slant column precision (Cobra)” for 2025-07-21 to 2025-07-22.

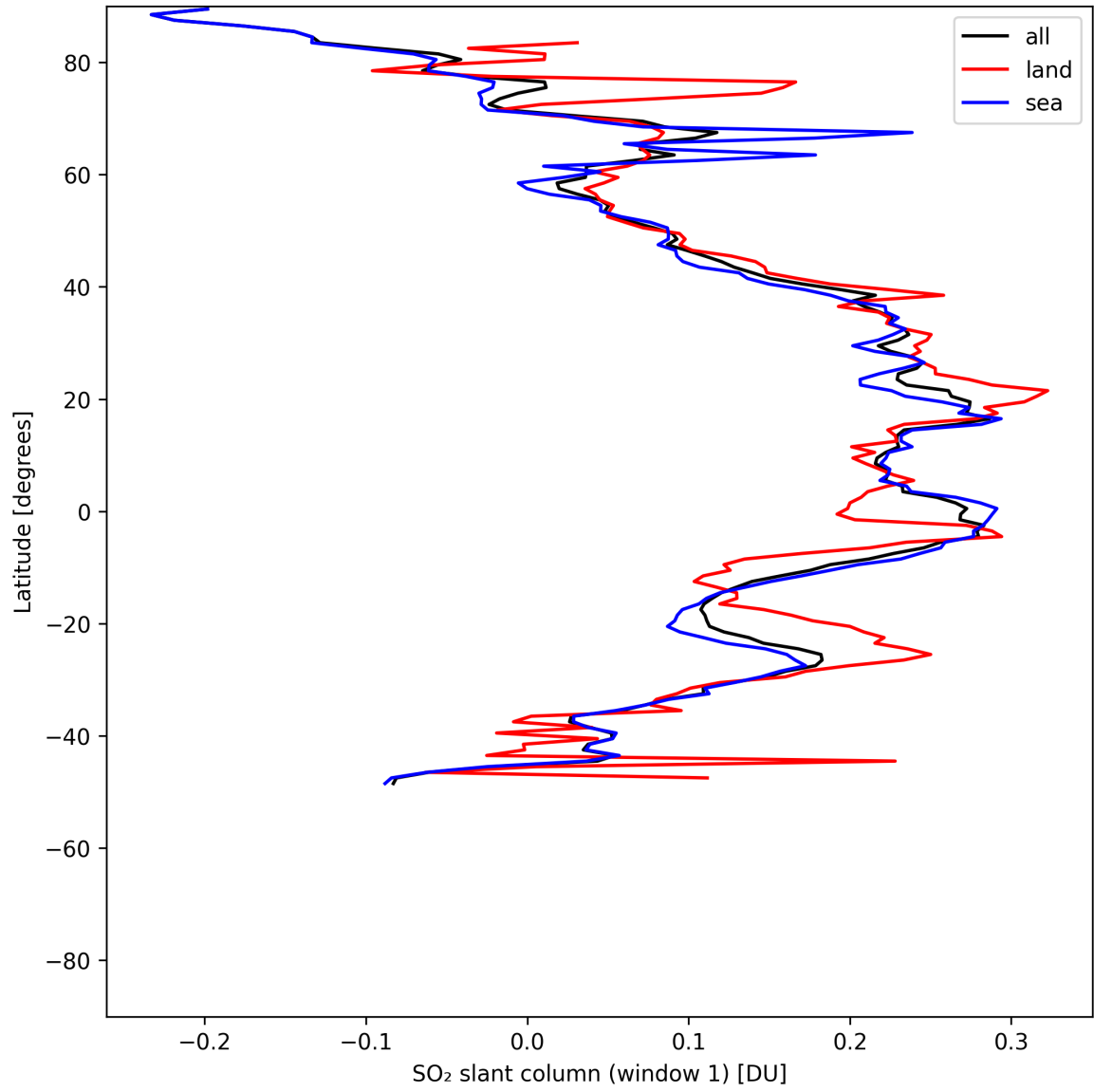


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-07-21 to 2025-07-22.

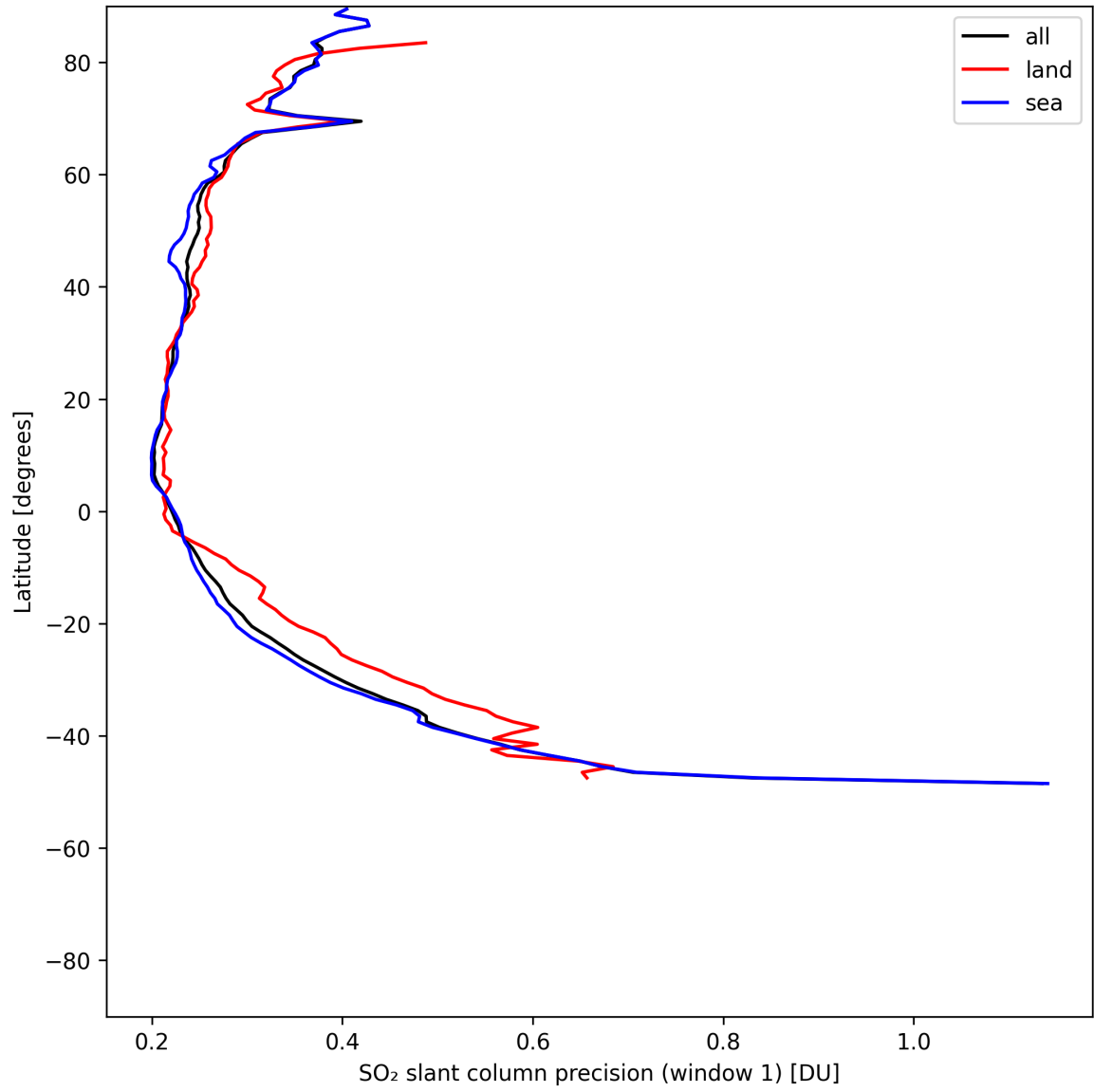


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-07-21 to 2025-07-22.

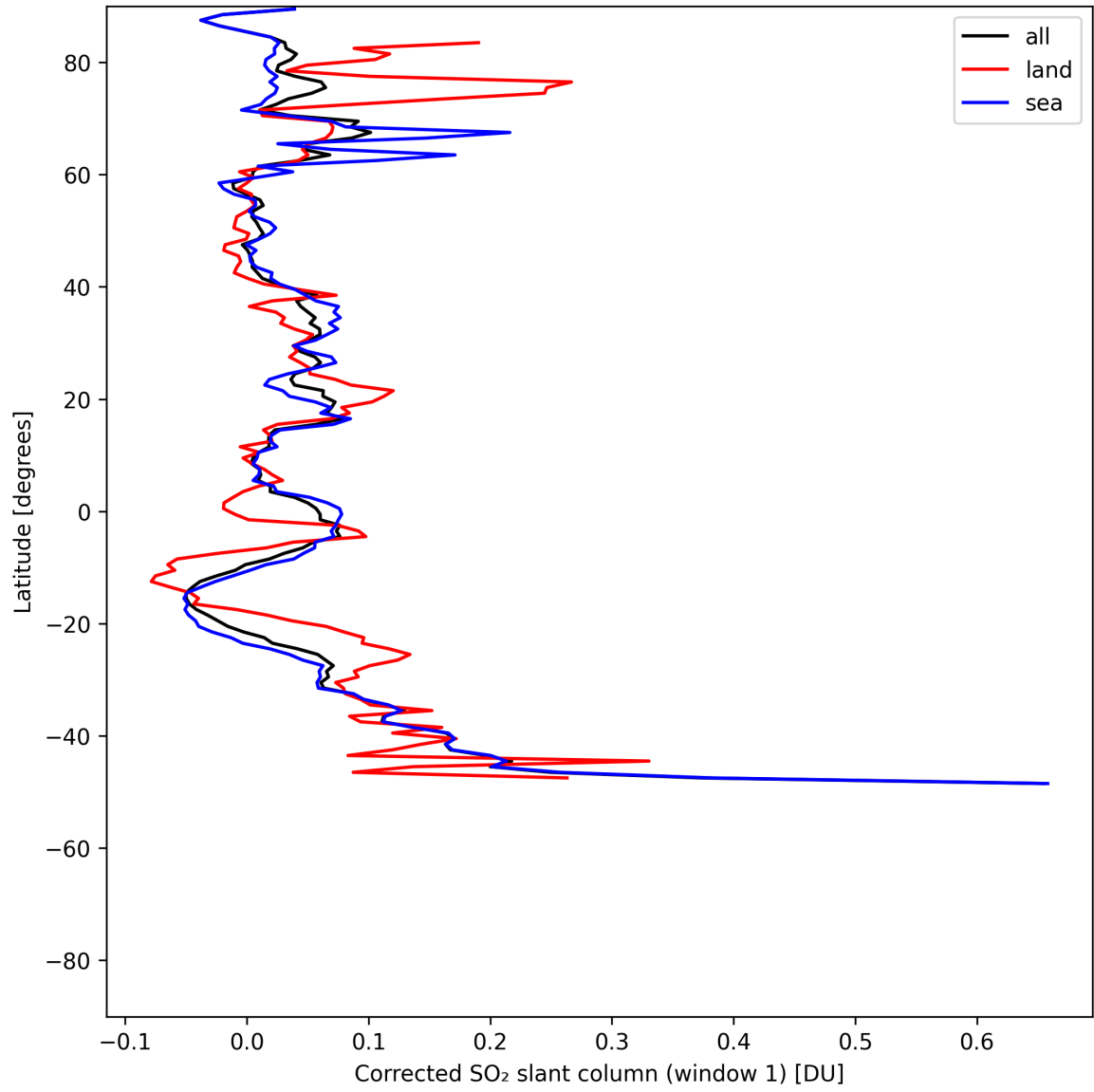


Figure 38: Zonal average of “Corrected SO₂ slant column (window 1)” for 2025-07-21 to 2025-07-22.

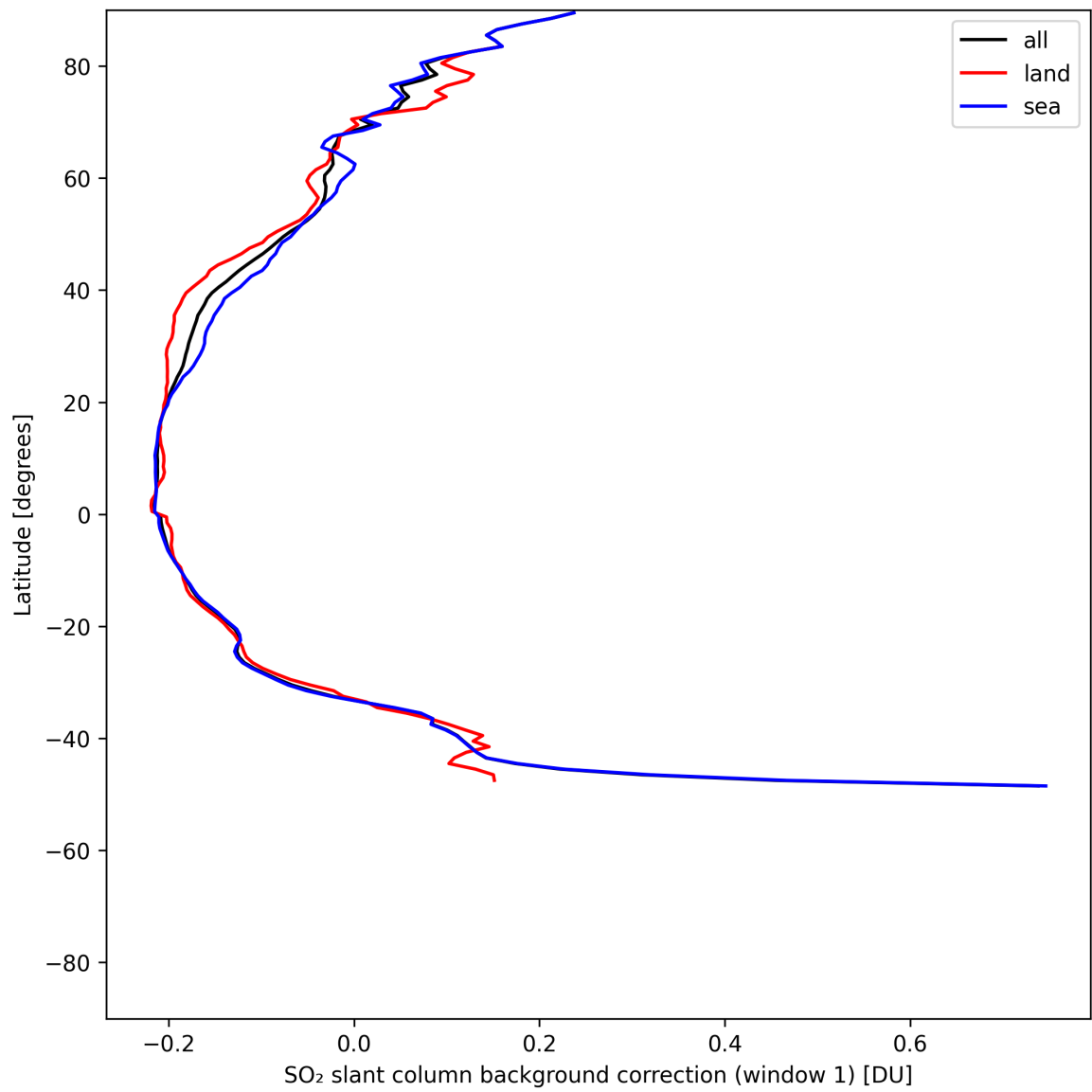


Figure 39: Zonal average of “SO₂ slant column background correction (window 1)” for 2025-07-21 to 2025-07-22.

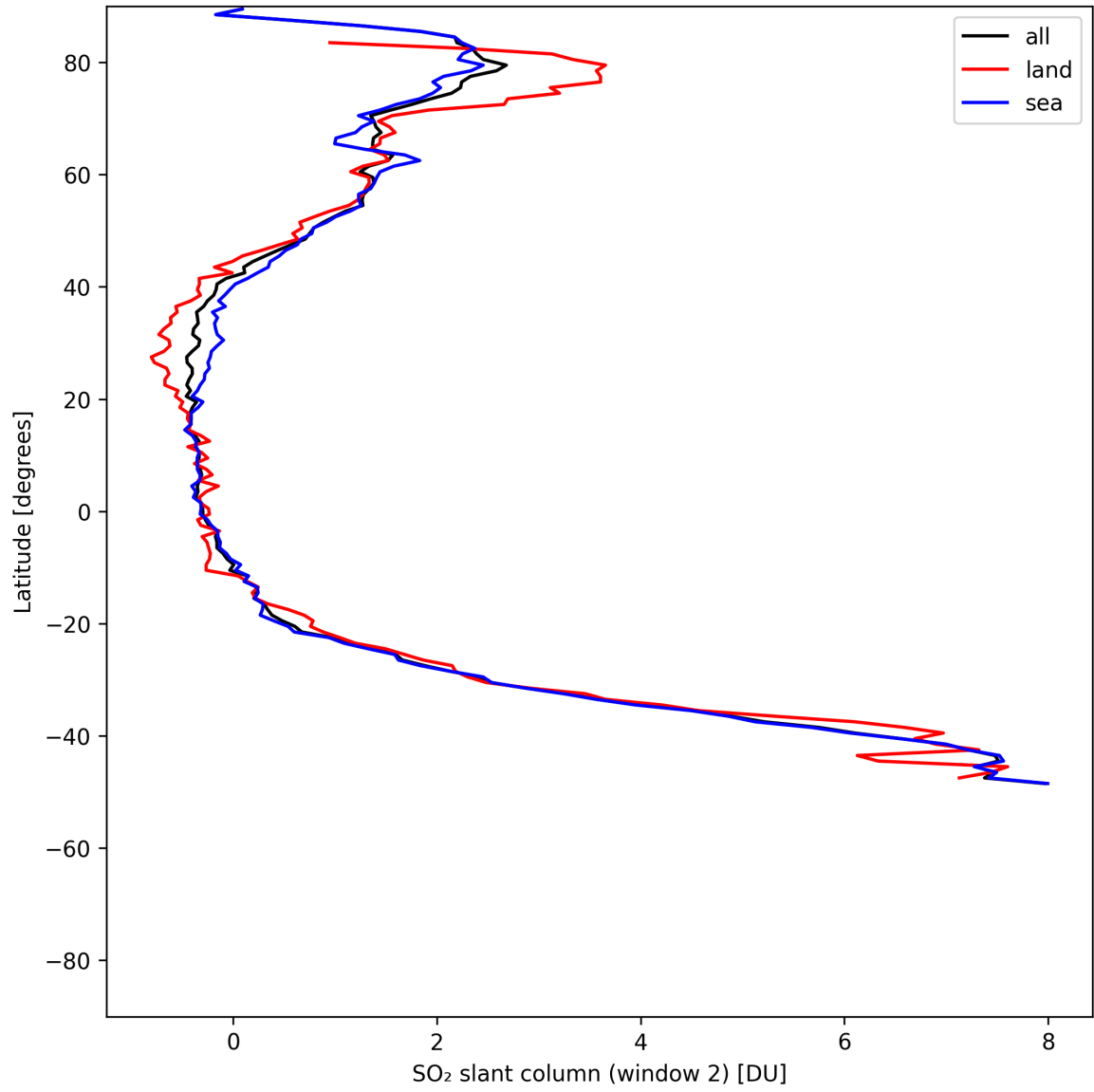


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-07-21 to 2025-07-22.

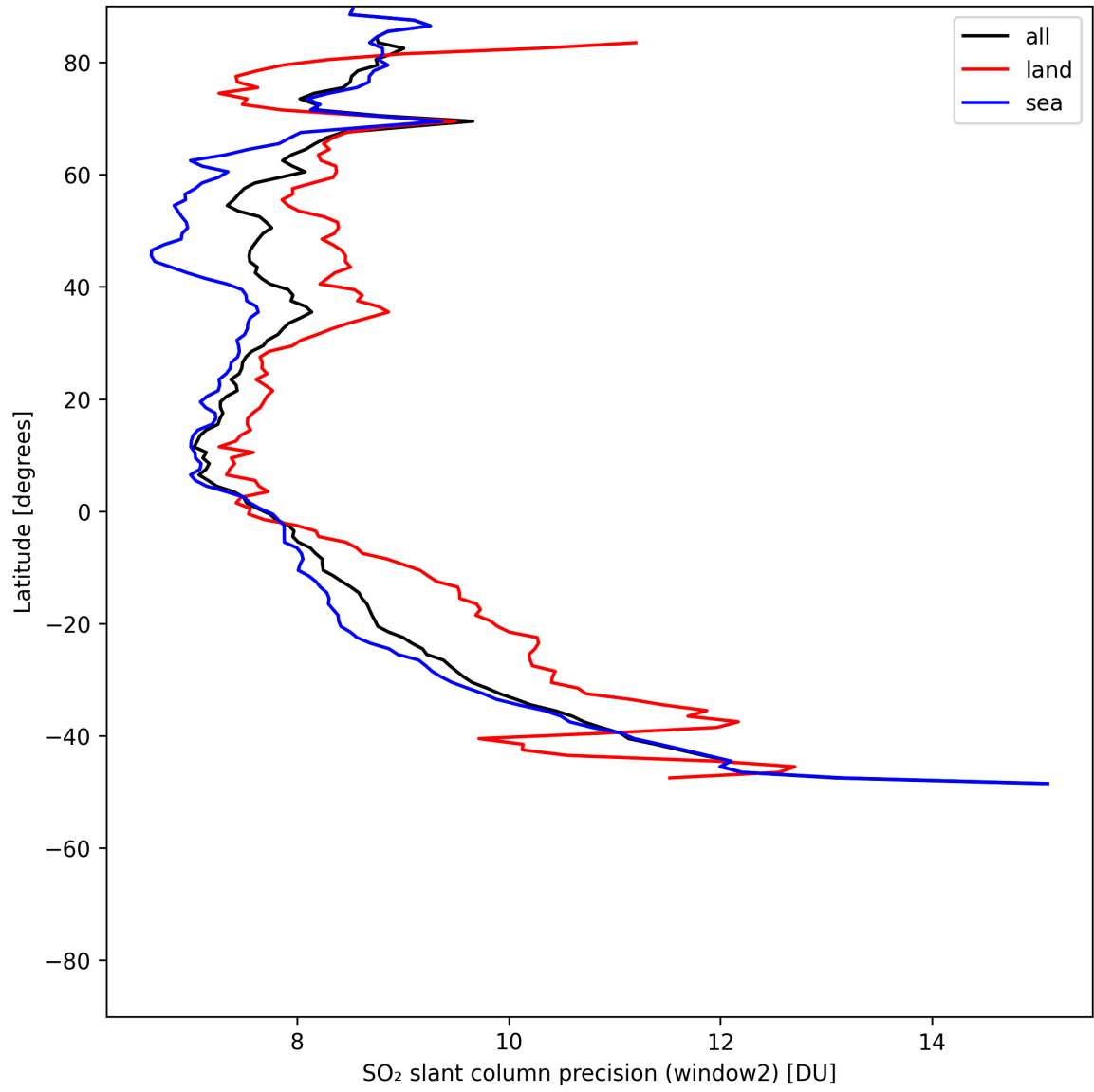


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-07-21 to 2025-07-22.

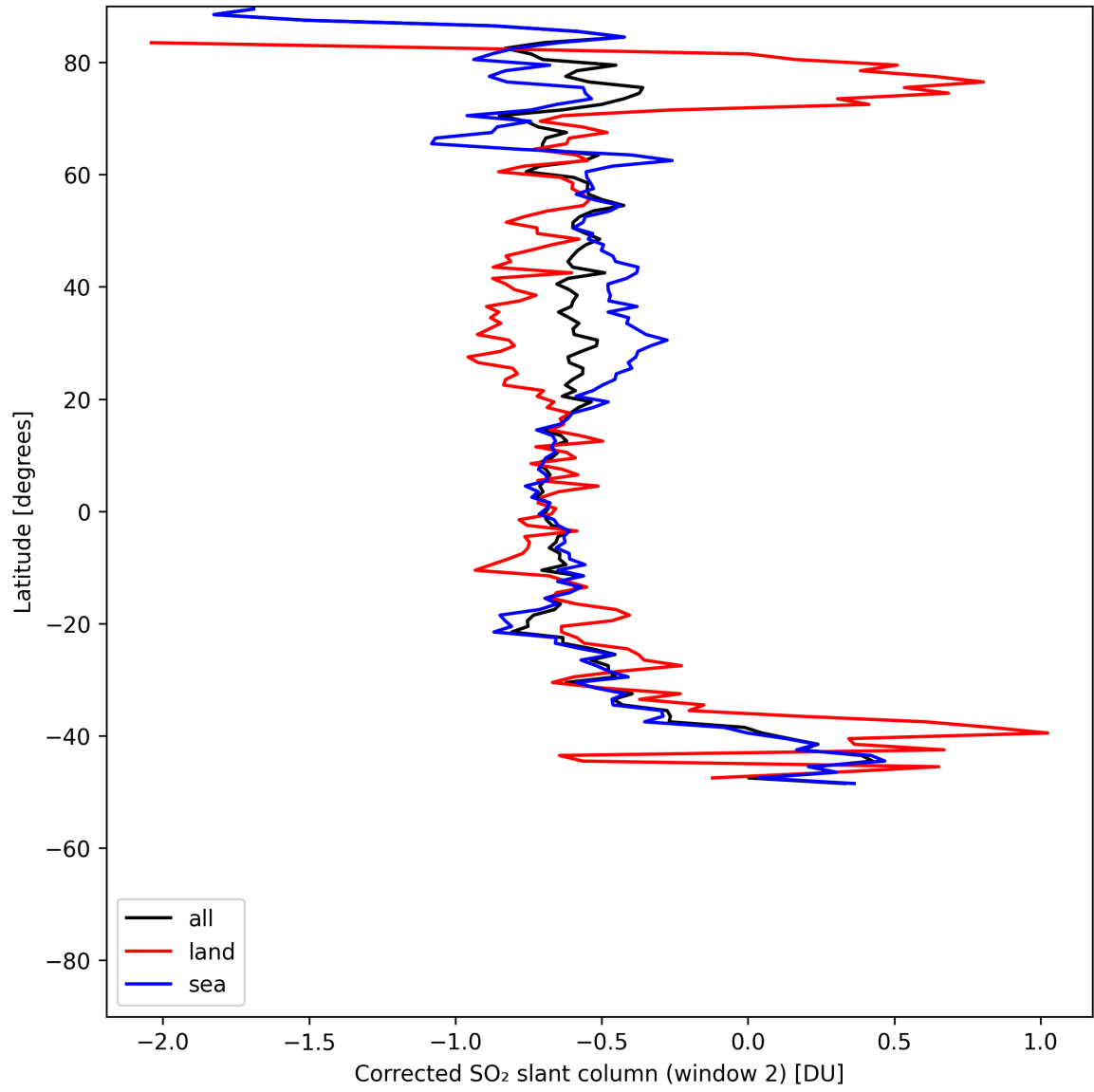


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-07-21 to 2025-07-22.

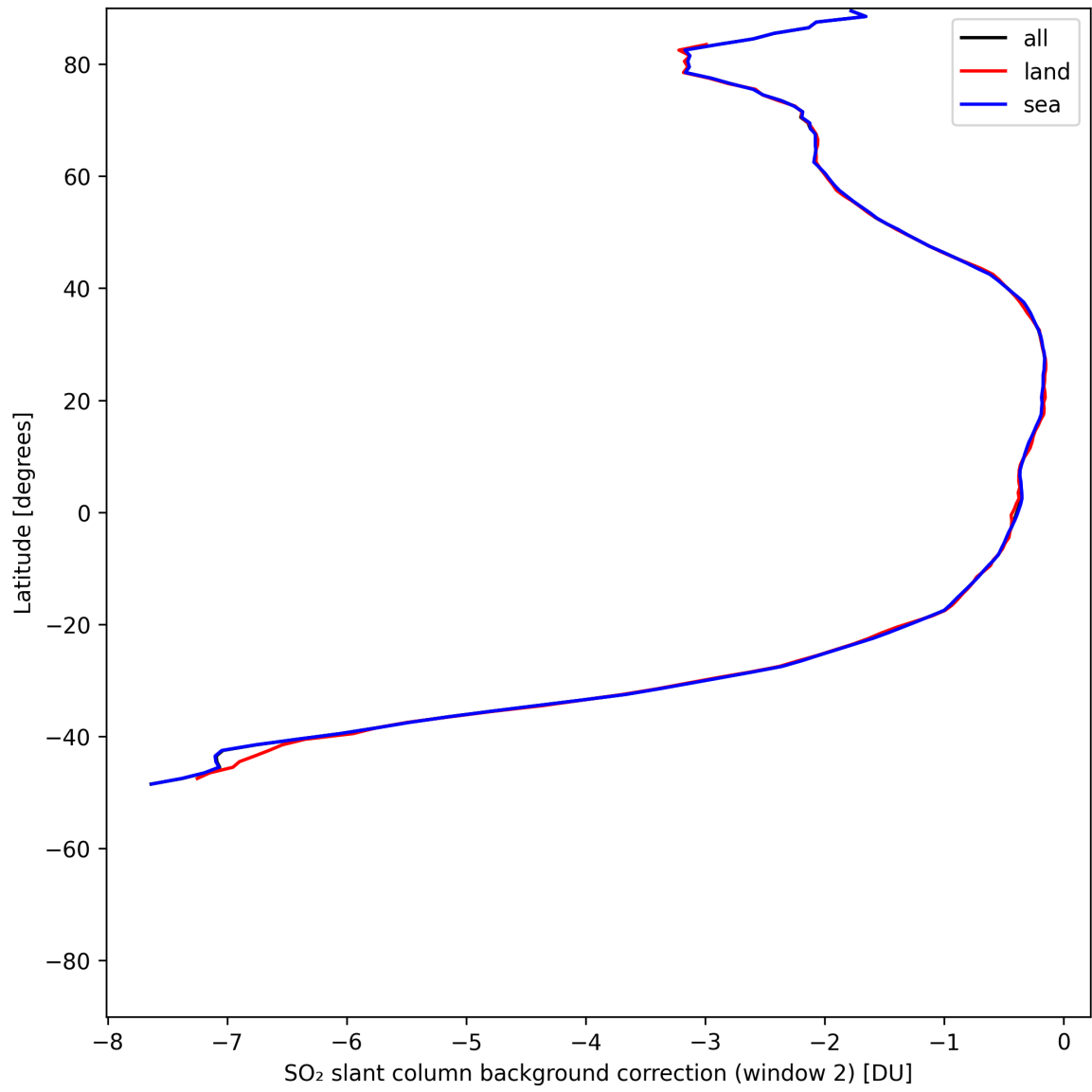


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-07-21 to 2025-07-22.

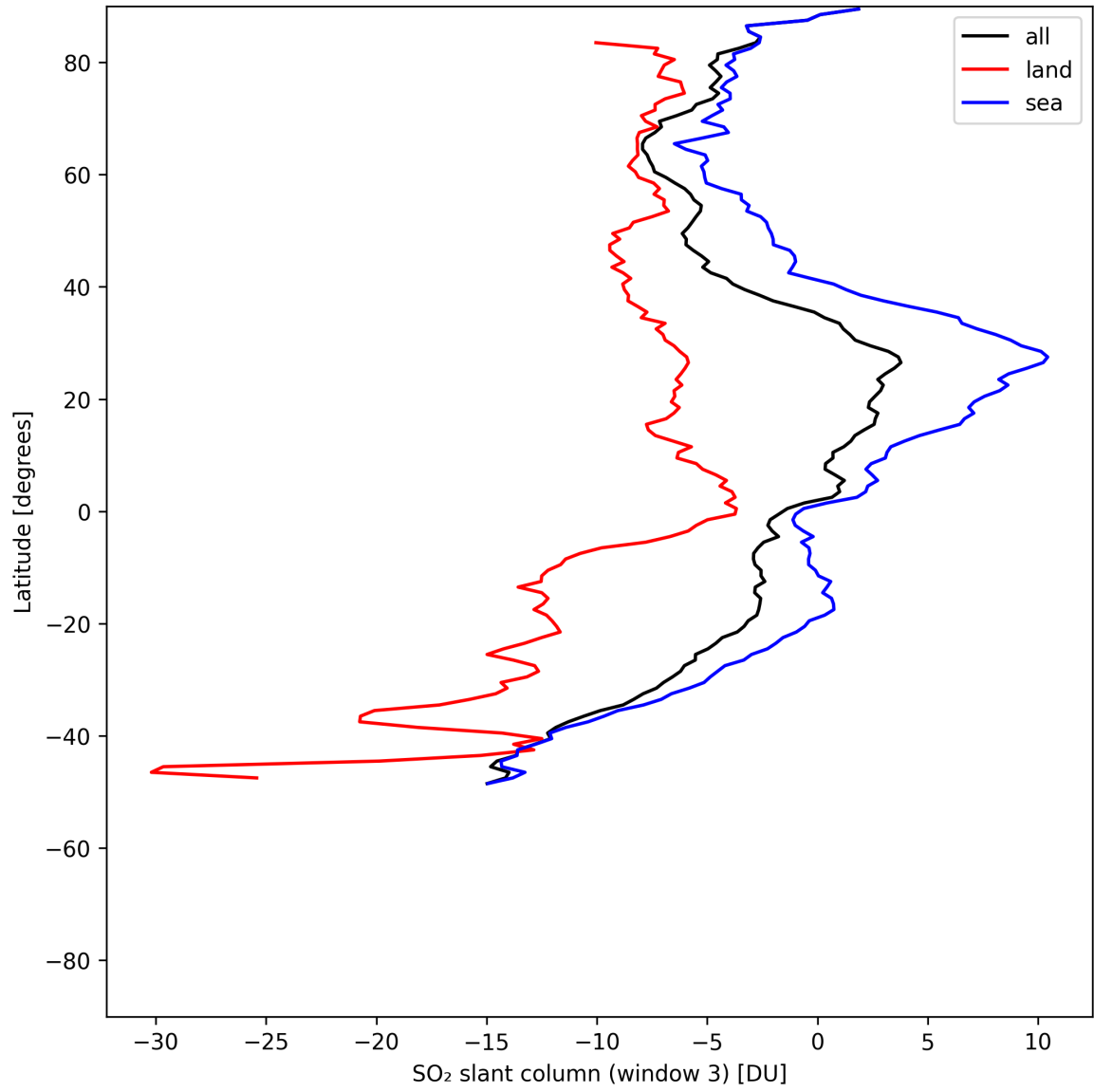


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-07-21 to 2025-07-22.

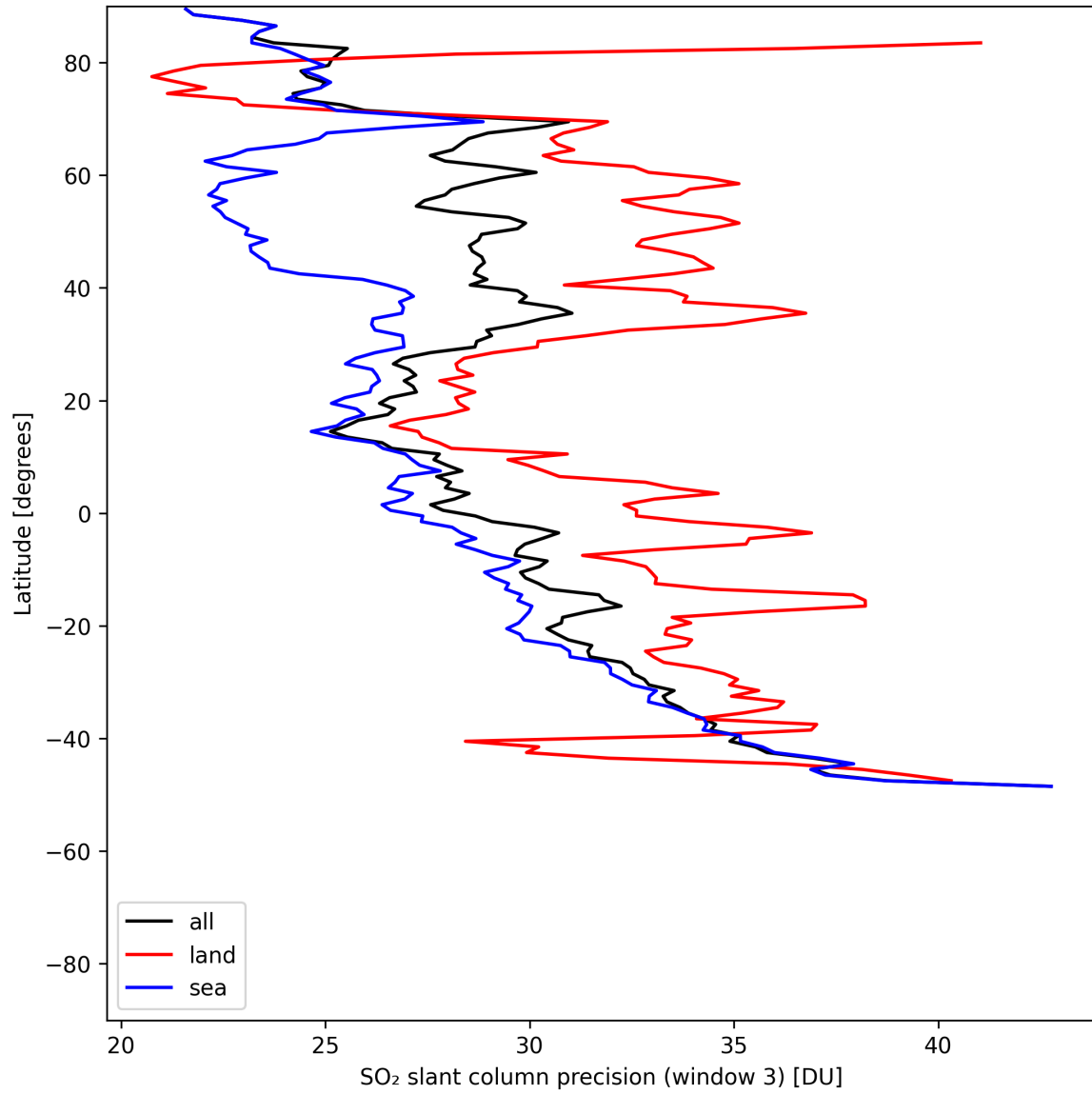


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-07-21 to 2025-07-22.

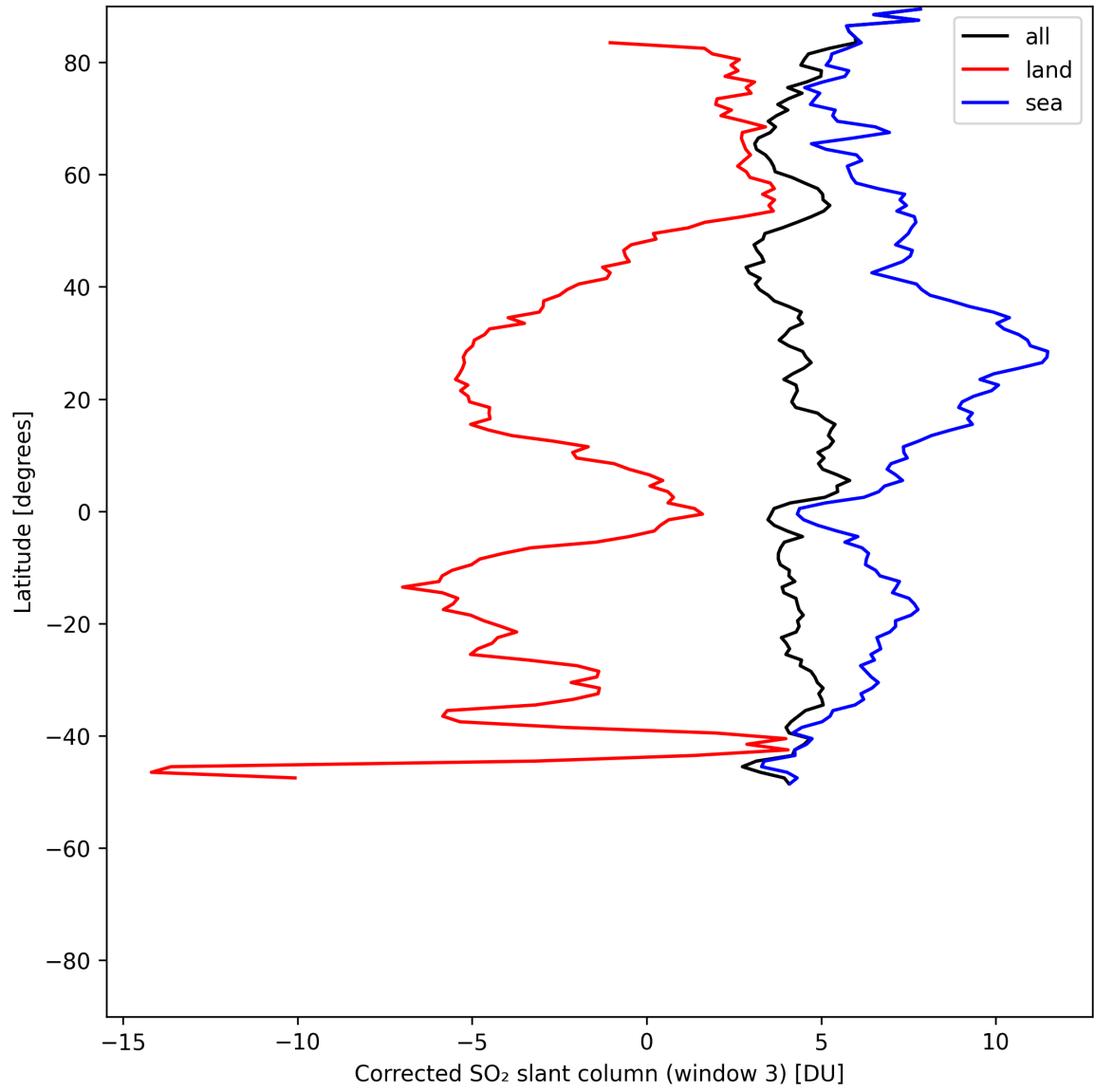


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-07-21 to 2025-07-22.

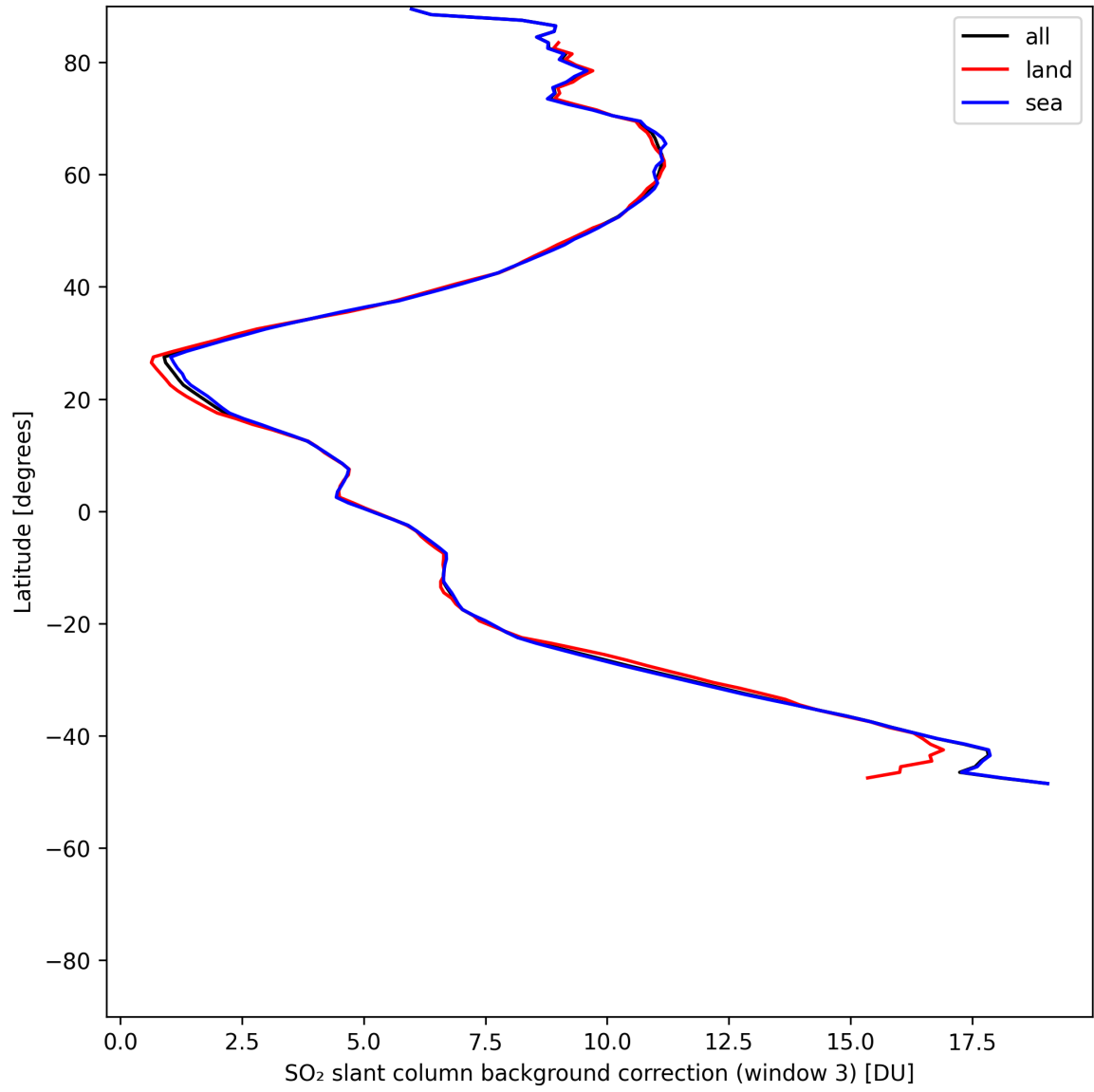


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-07-21 to 2025-07-22.

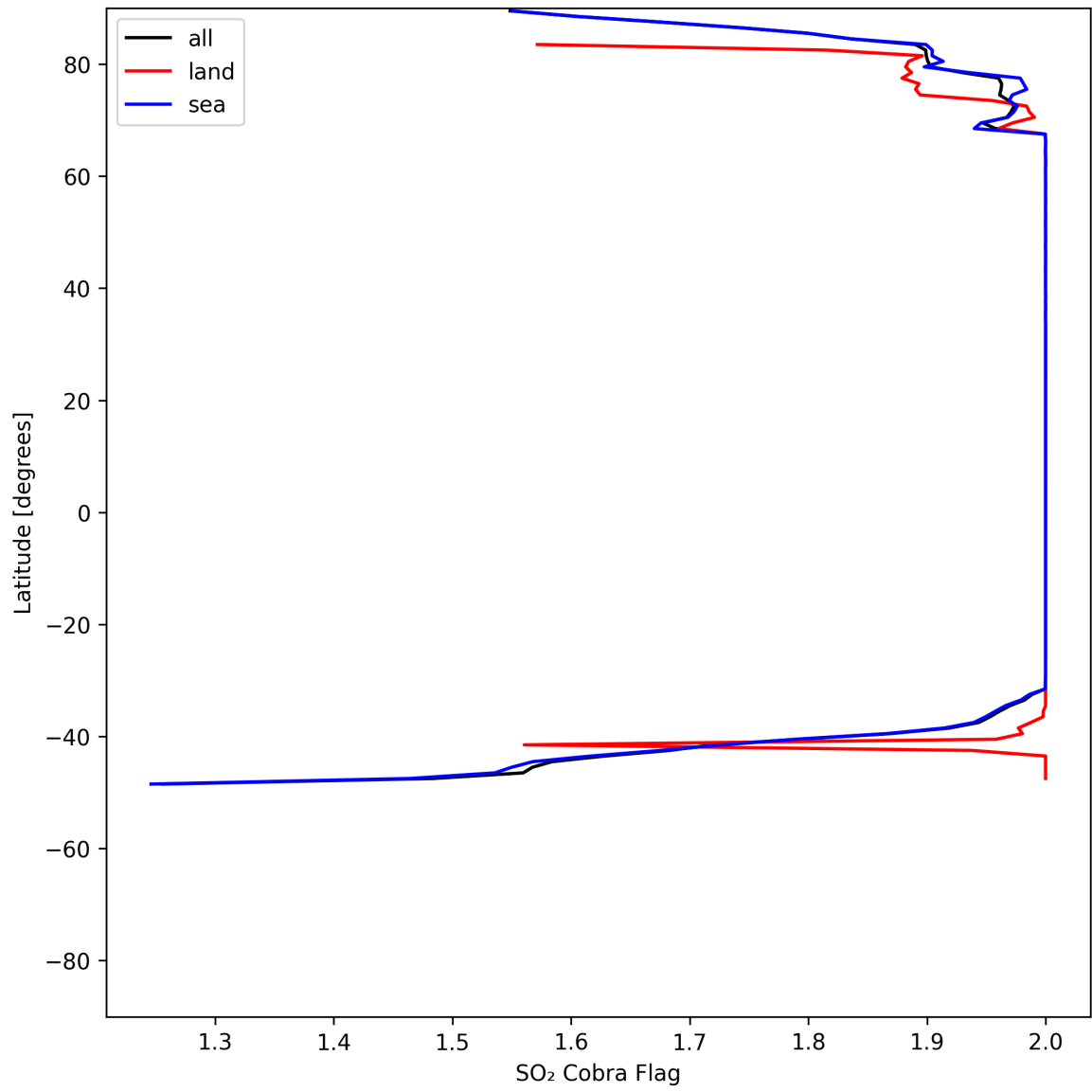


Figure 48: Zonal average of "SO₂ Cobra Flag" for 2025-07-21 to 2025-07-22.

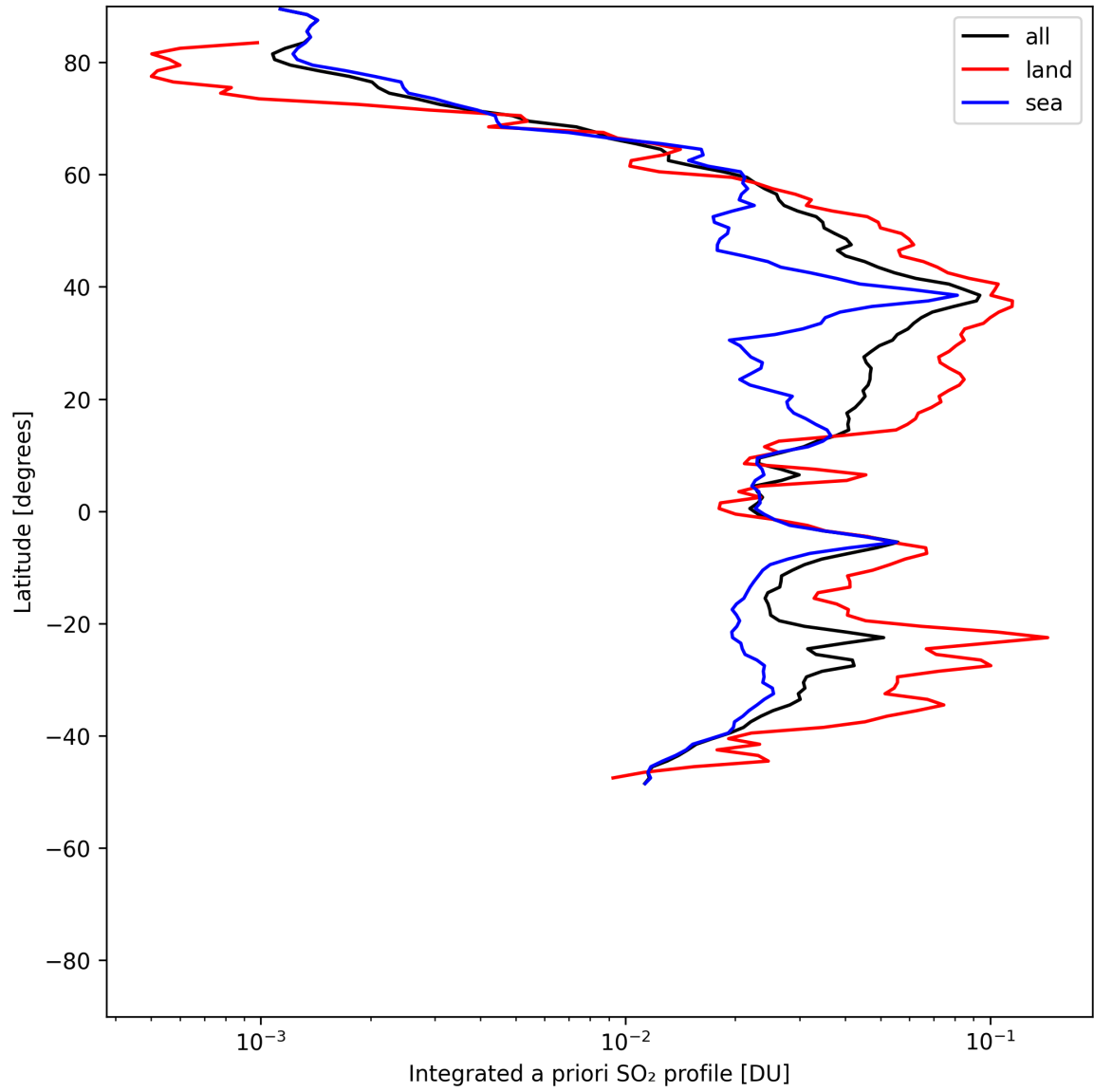


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-07-21 to 2025-07-22.

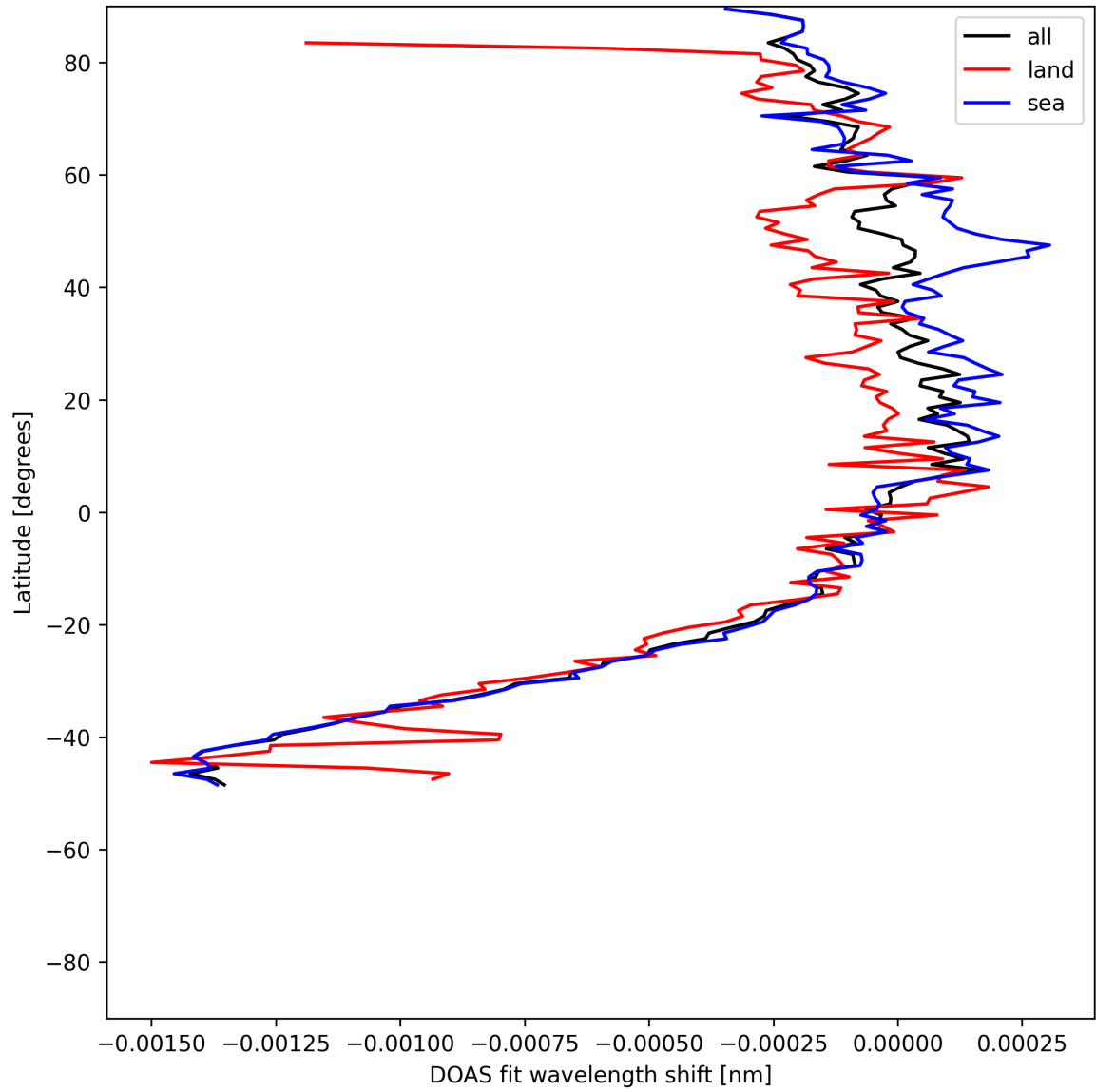


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-07-21 to 2025-07-22.

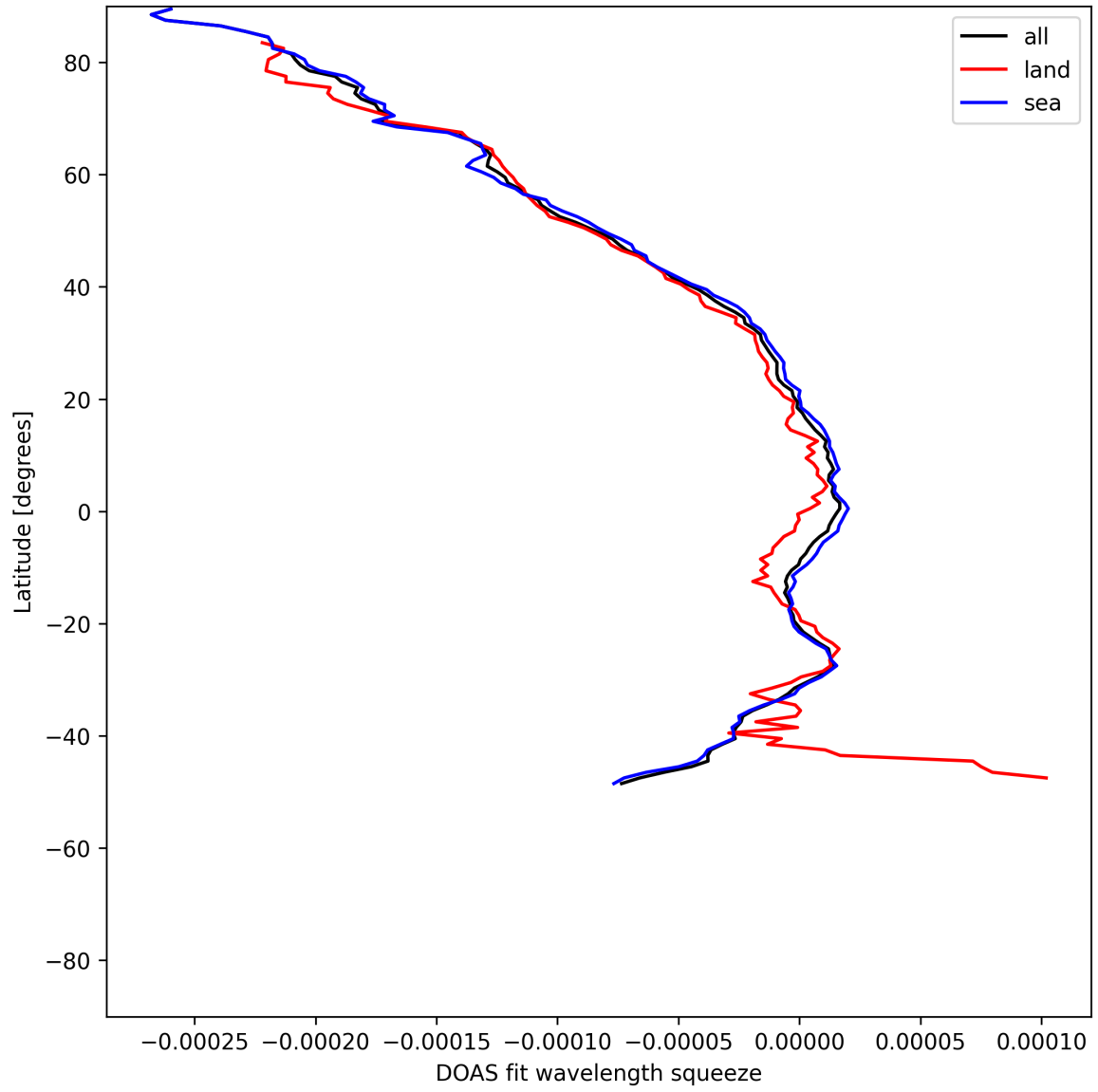


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-07-21 to 2025-07-22.

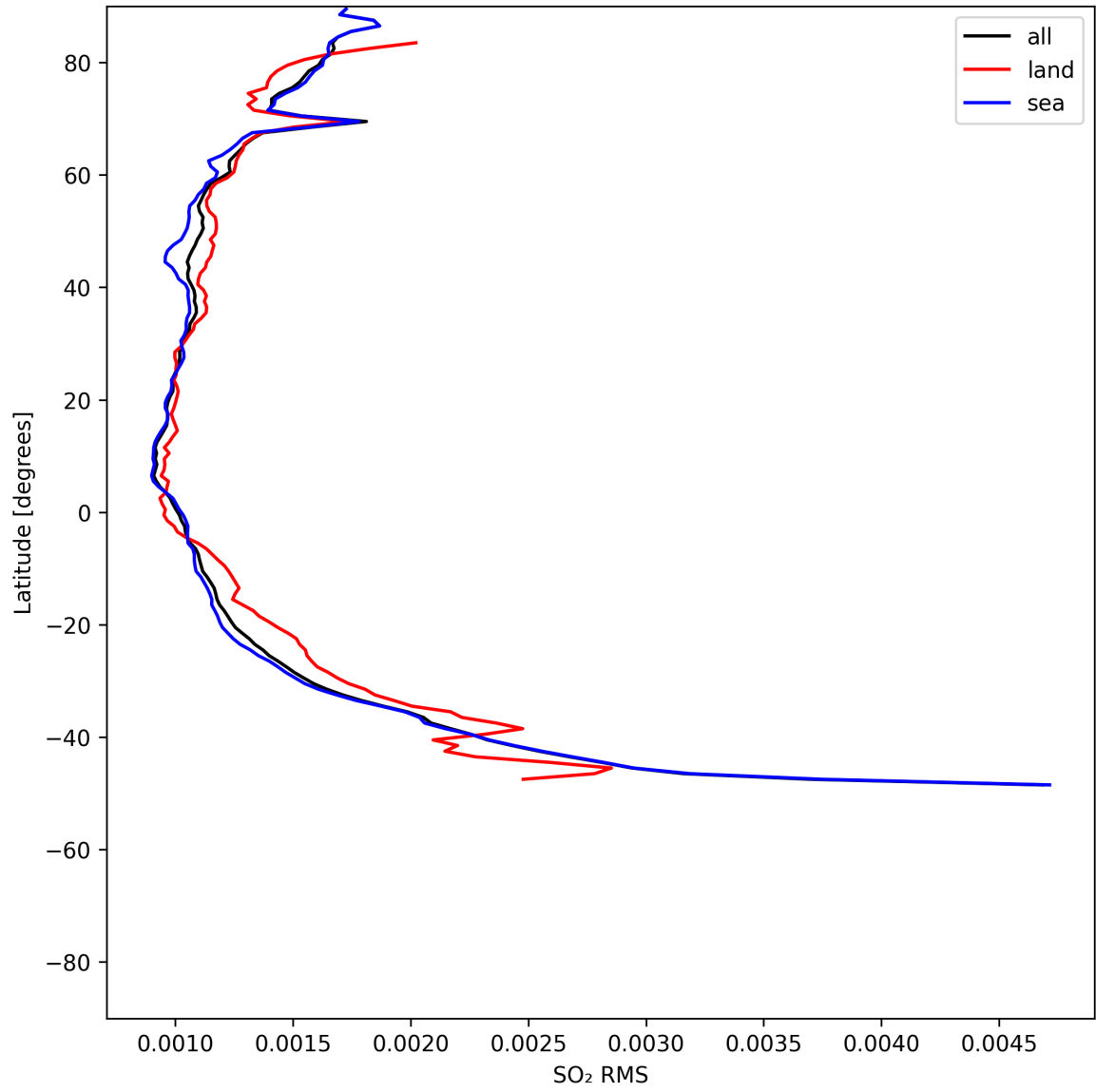


Figure 52: Zonal average of “SO₂ RMS” for 2025-07-21 to 2025-07-22.

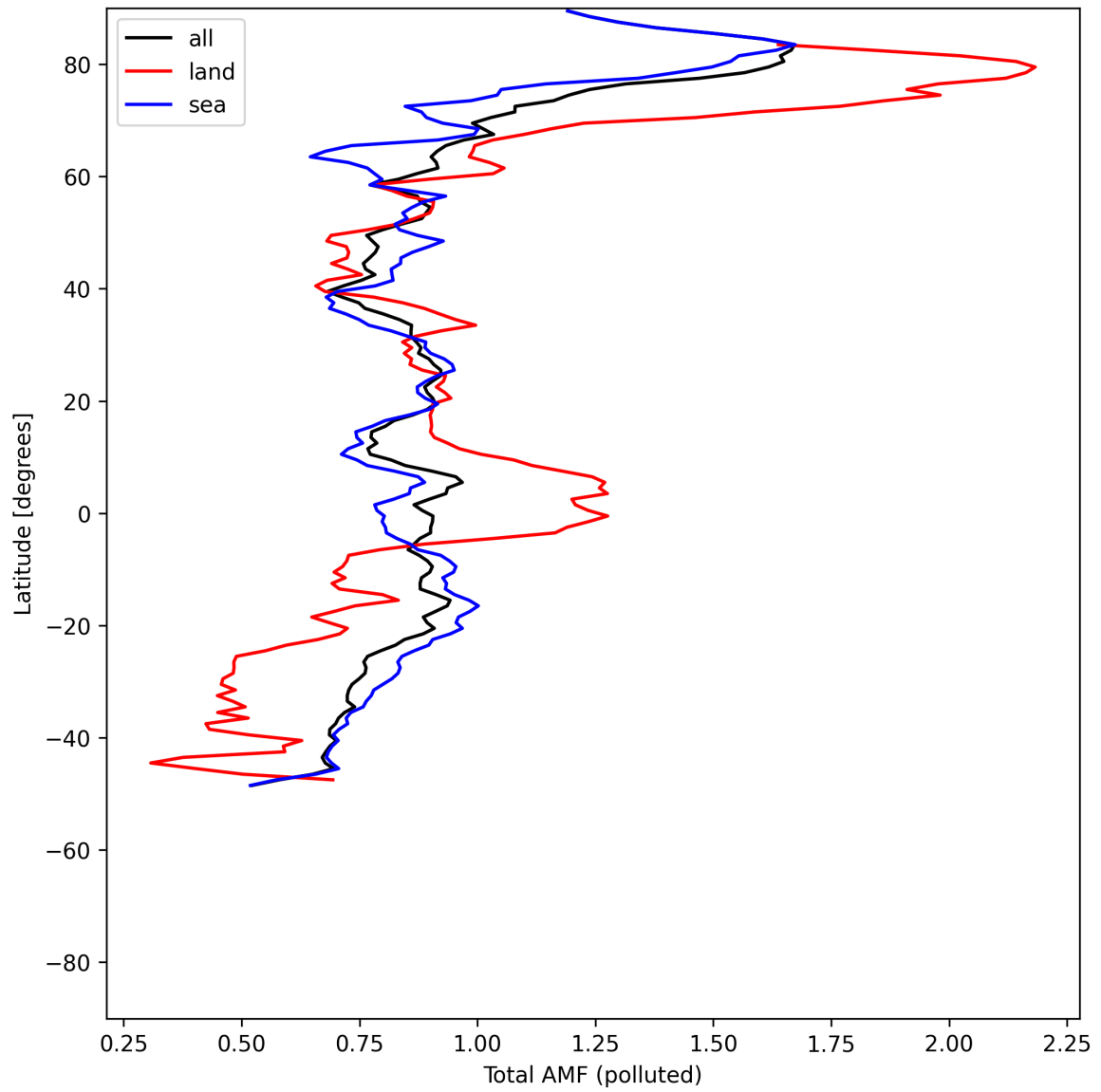


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-07-21 to 2025-07-22.

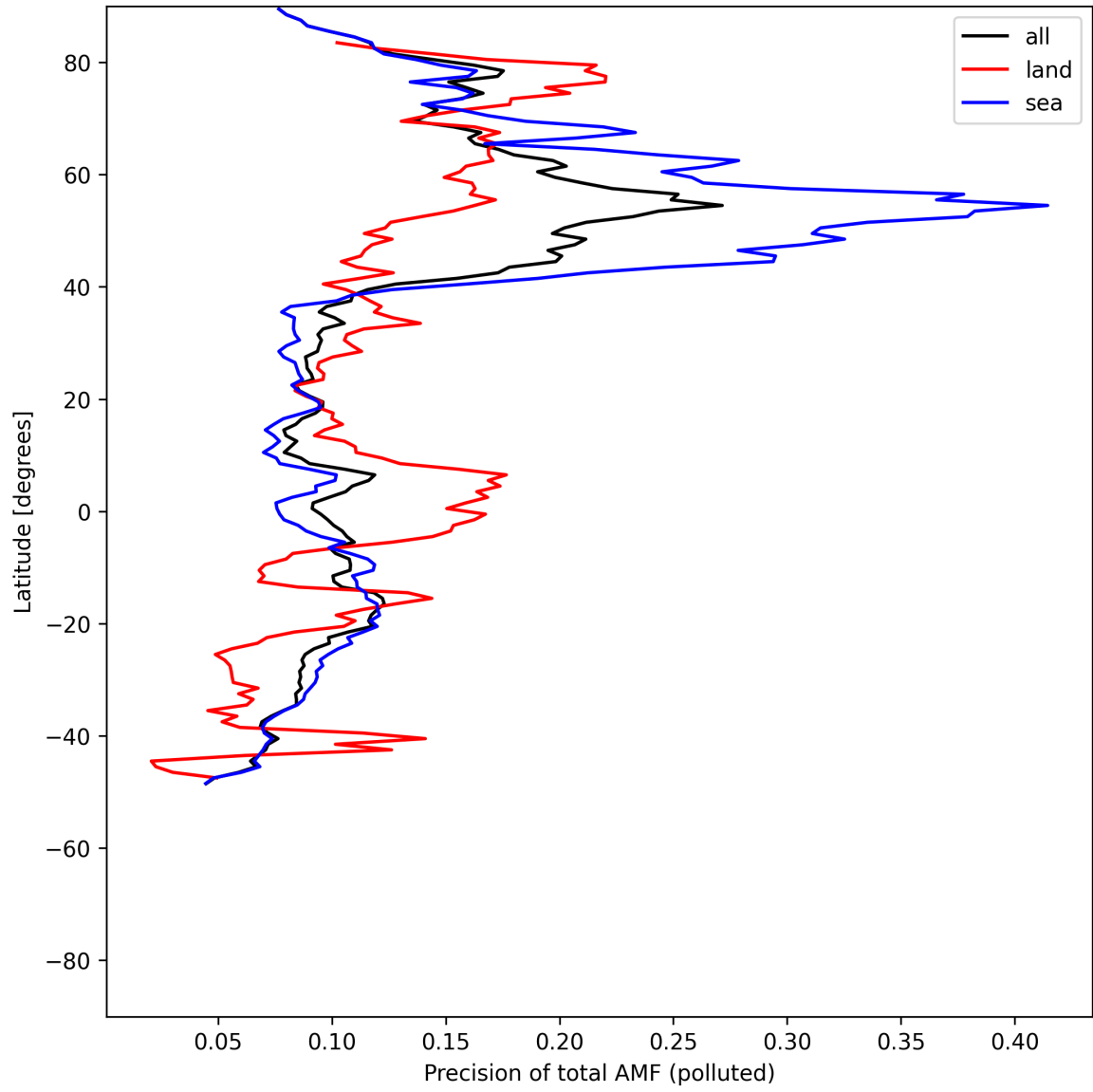


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-07-21 to 2025-07-22.

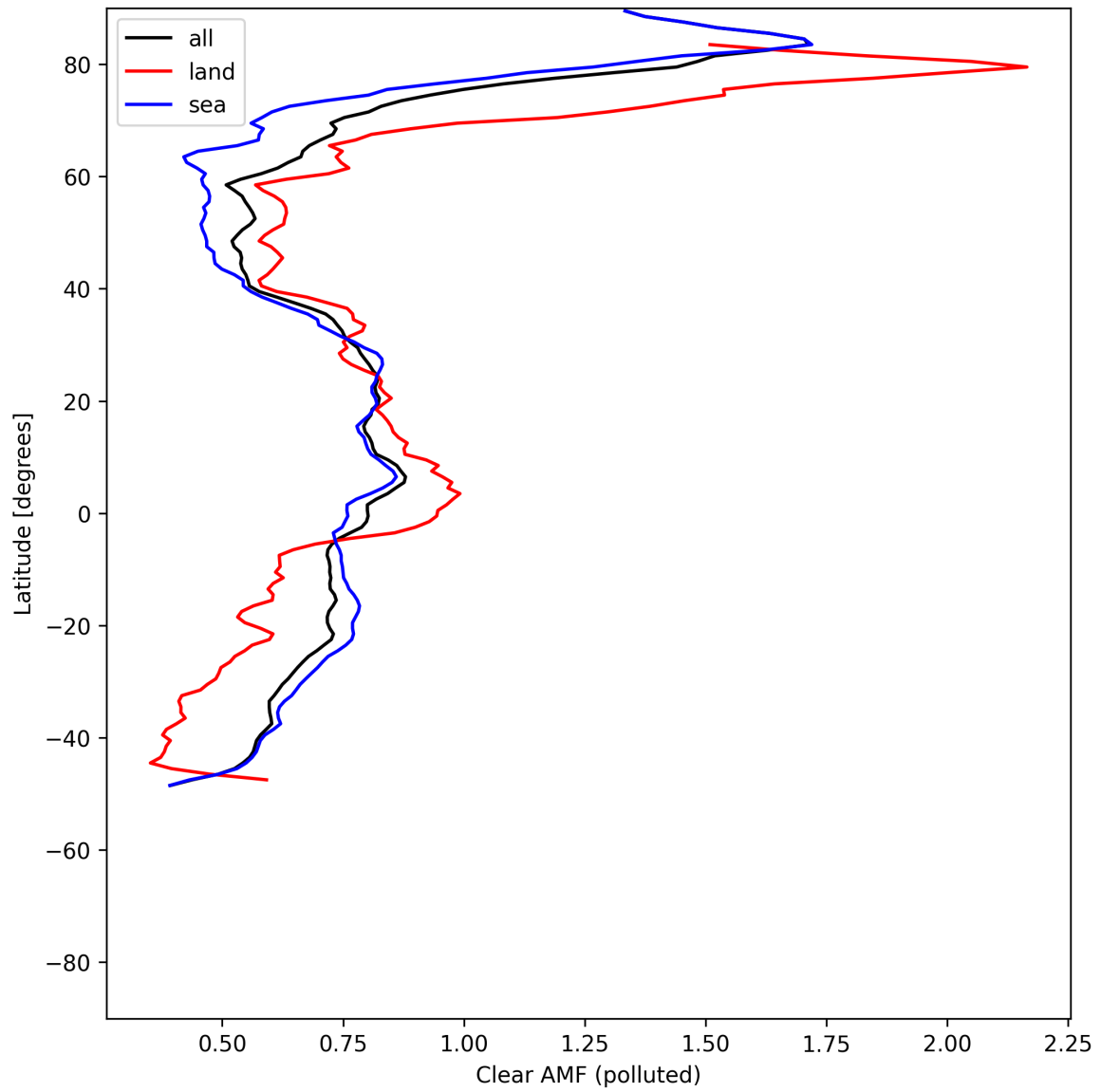


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-07-21 to 2025-07-22.

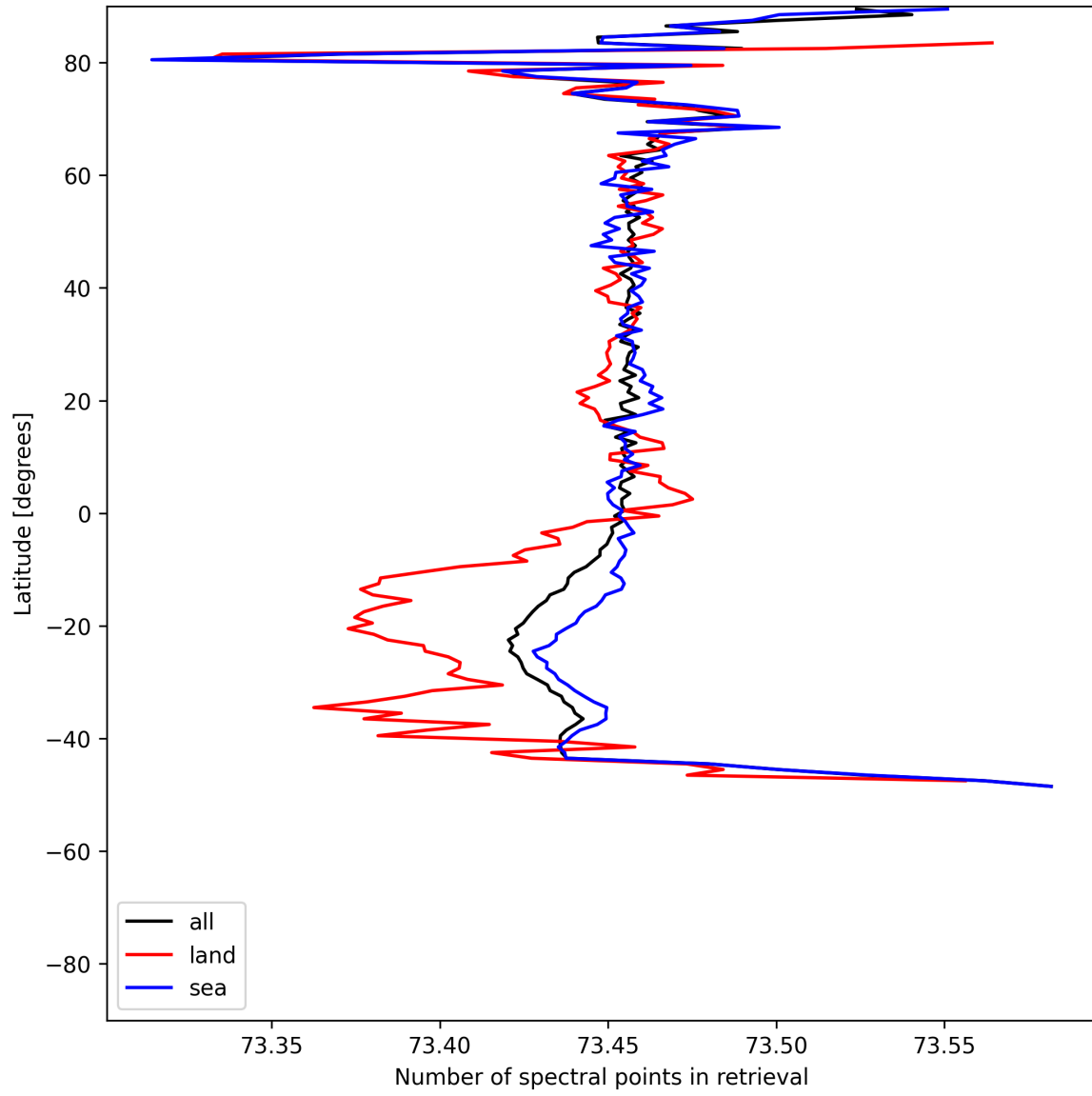


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-07-21 to 2025-07-22.

8 Histograms

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

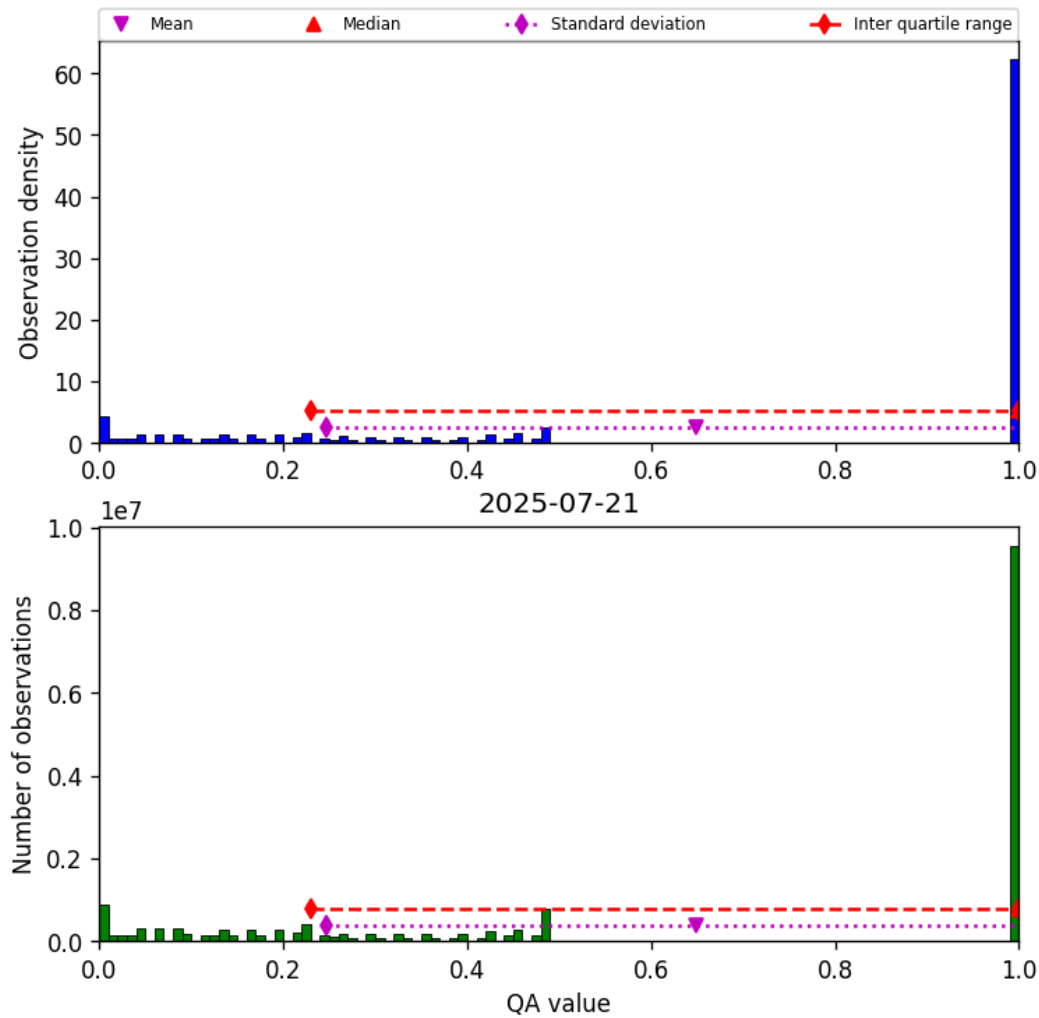


Figure 57: Histogram of “QA value” for 2025-07-21 to 2025-07-22

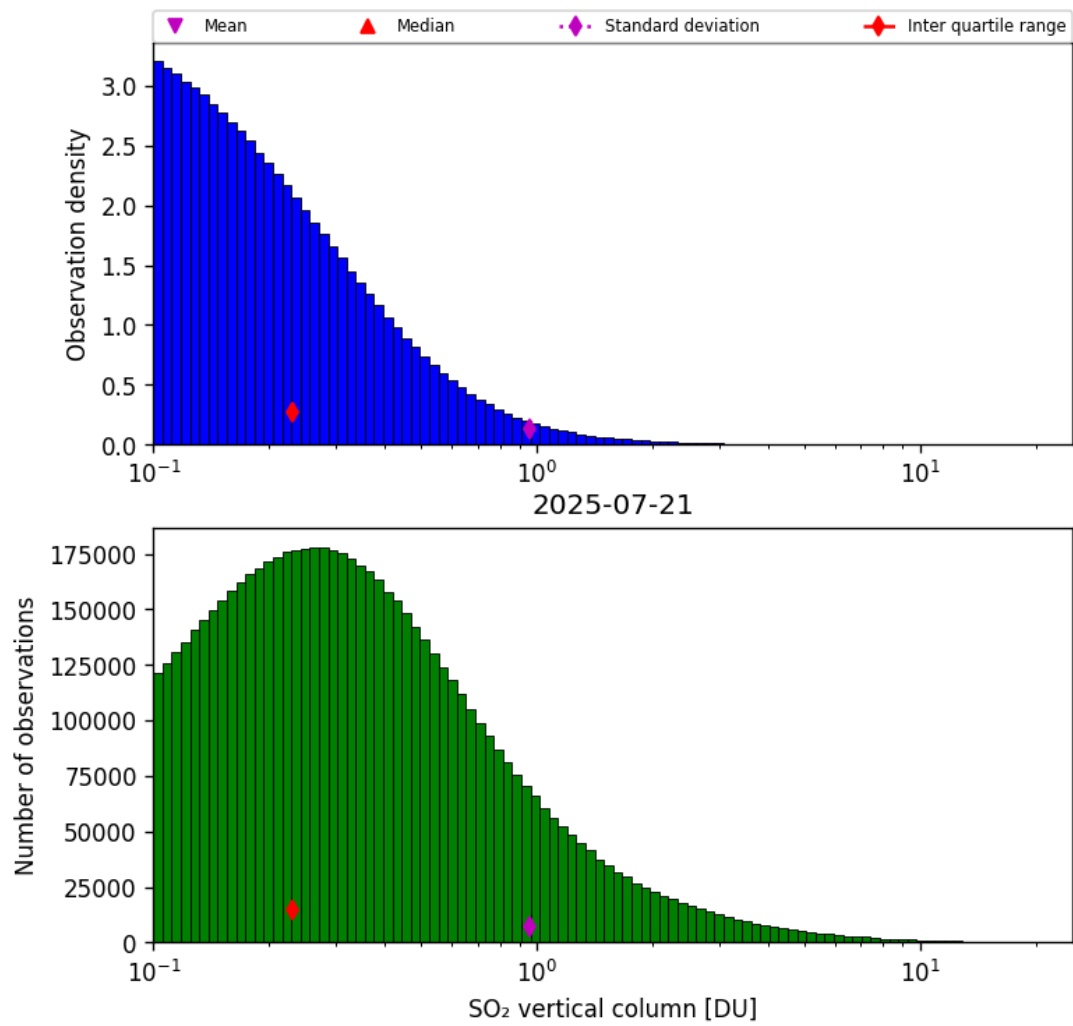


Figure 58: Histogram of “SO₂ vertical column” for 2025-07-21 to 2025-07-22

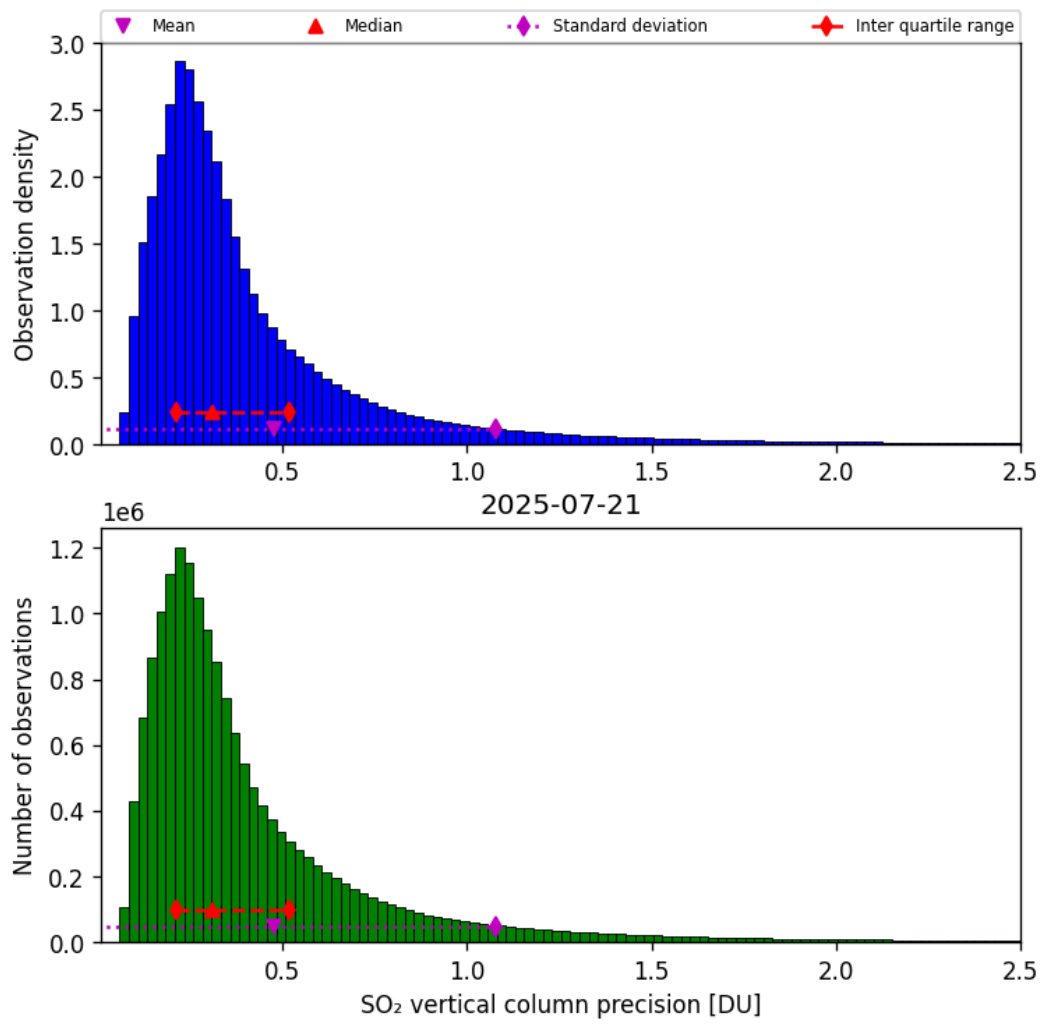


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-07-21 to 2025-07-22

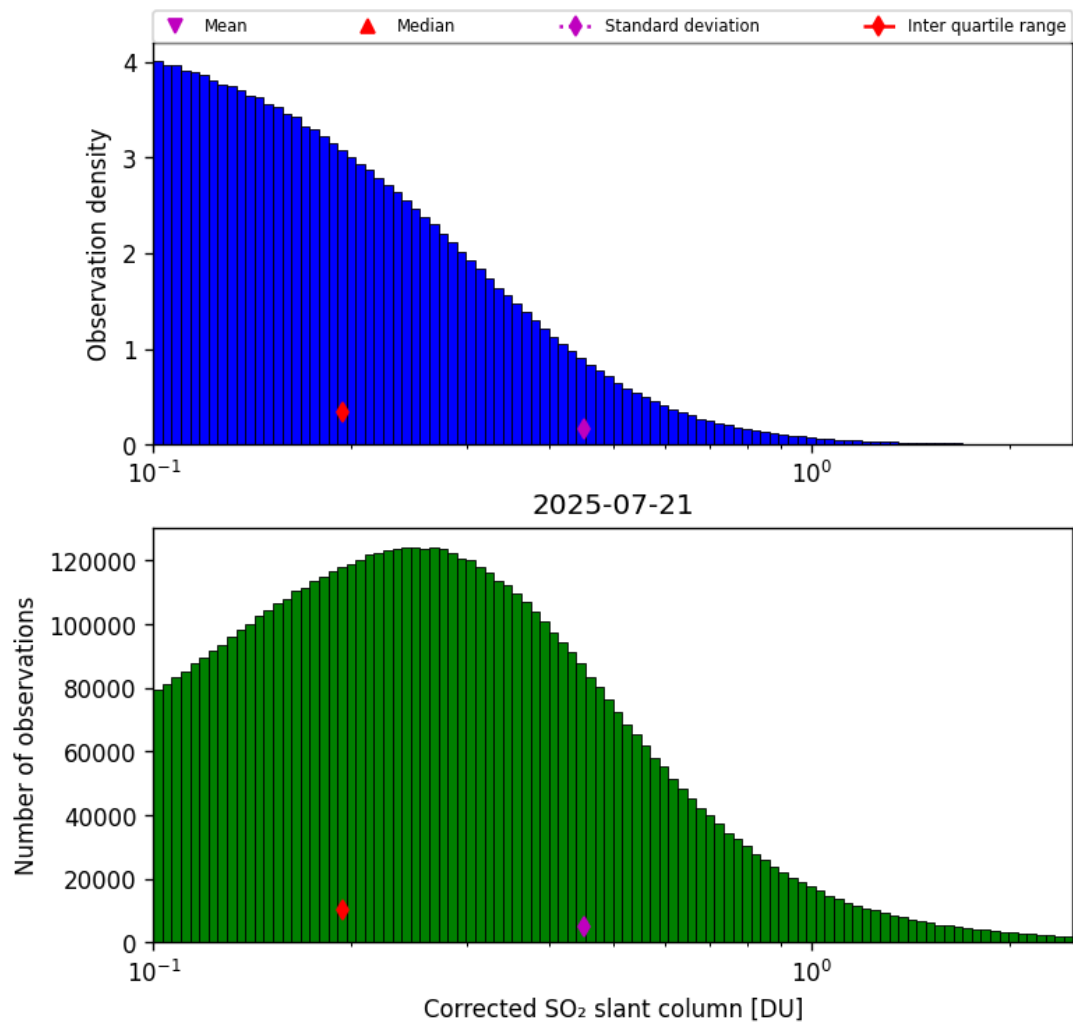


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-07-21 to 2025-07-22

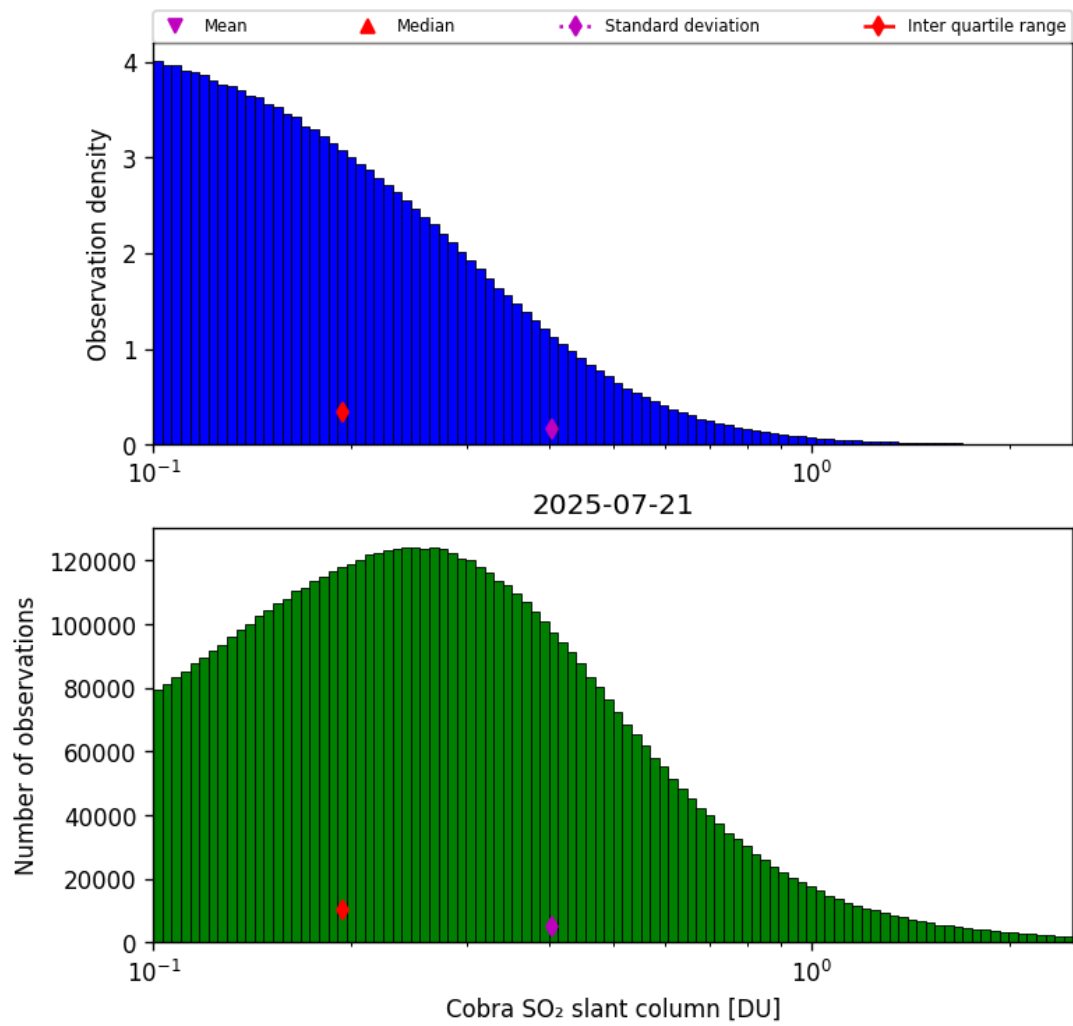


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-07-21 to 2025-07-22

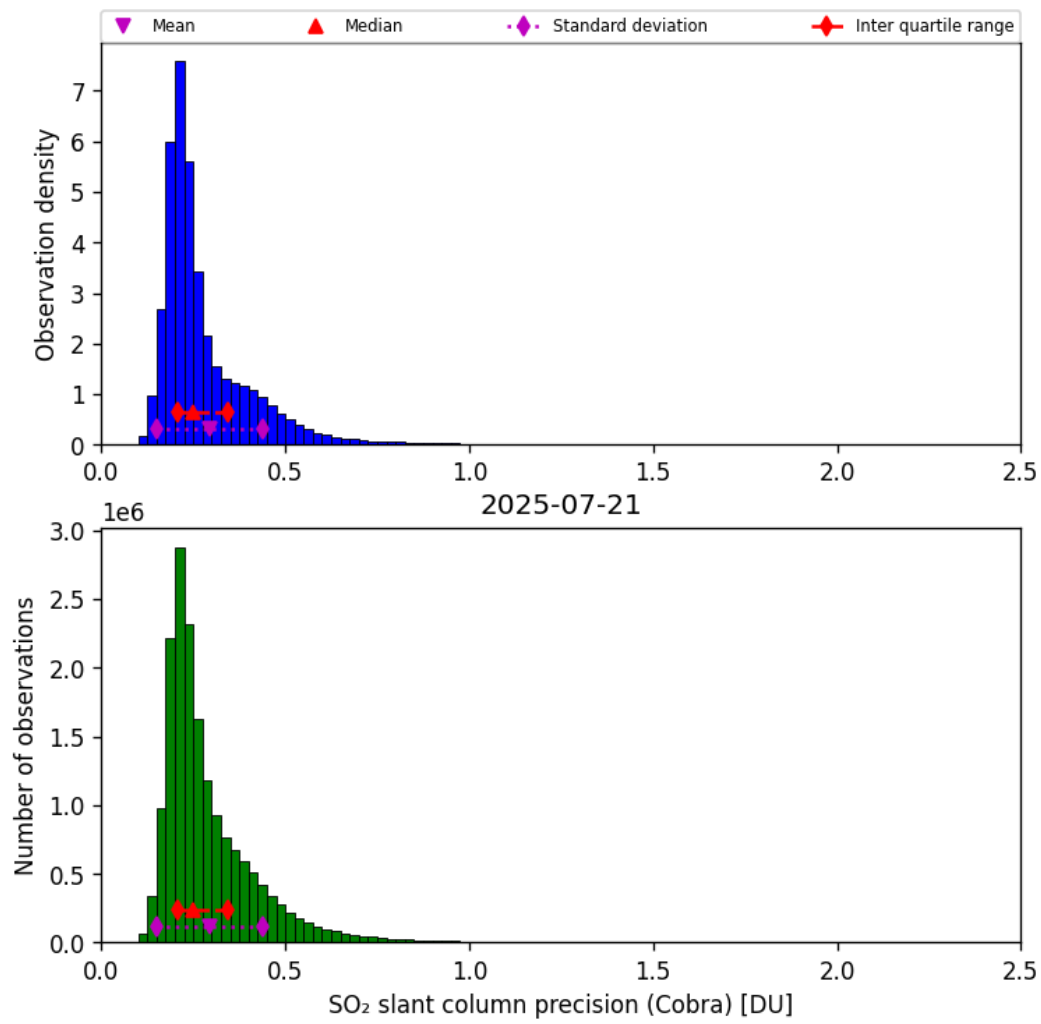


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-07-21 to 2025-07-22

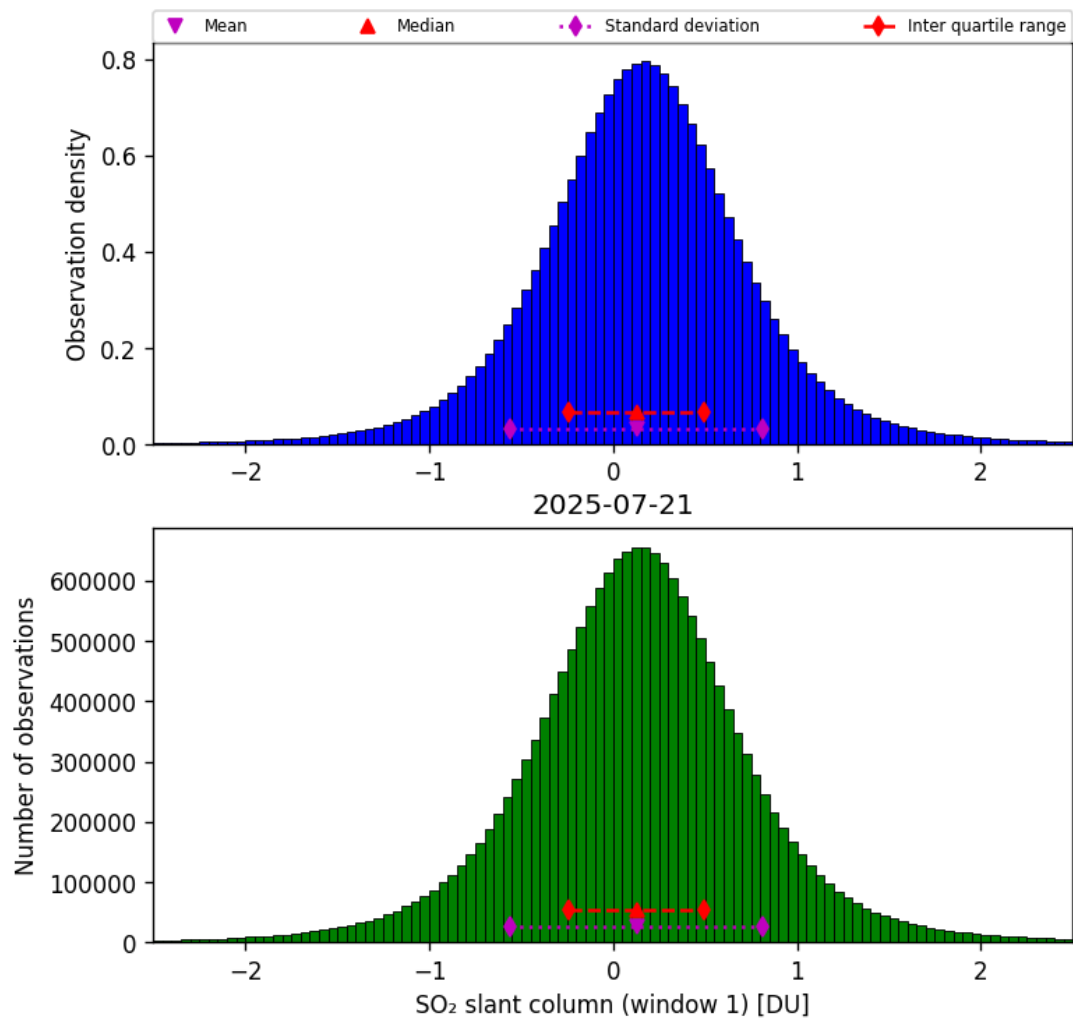


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-07-21 to 2025-07-22

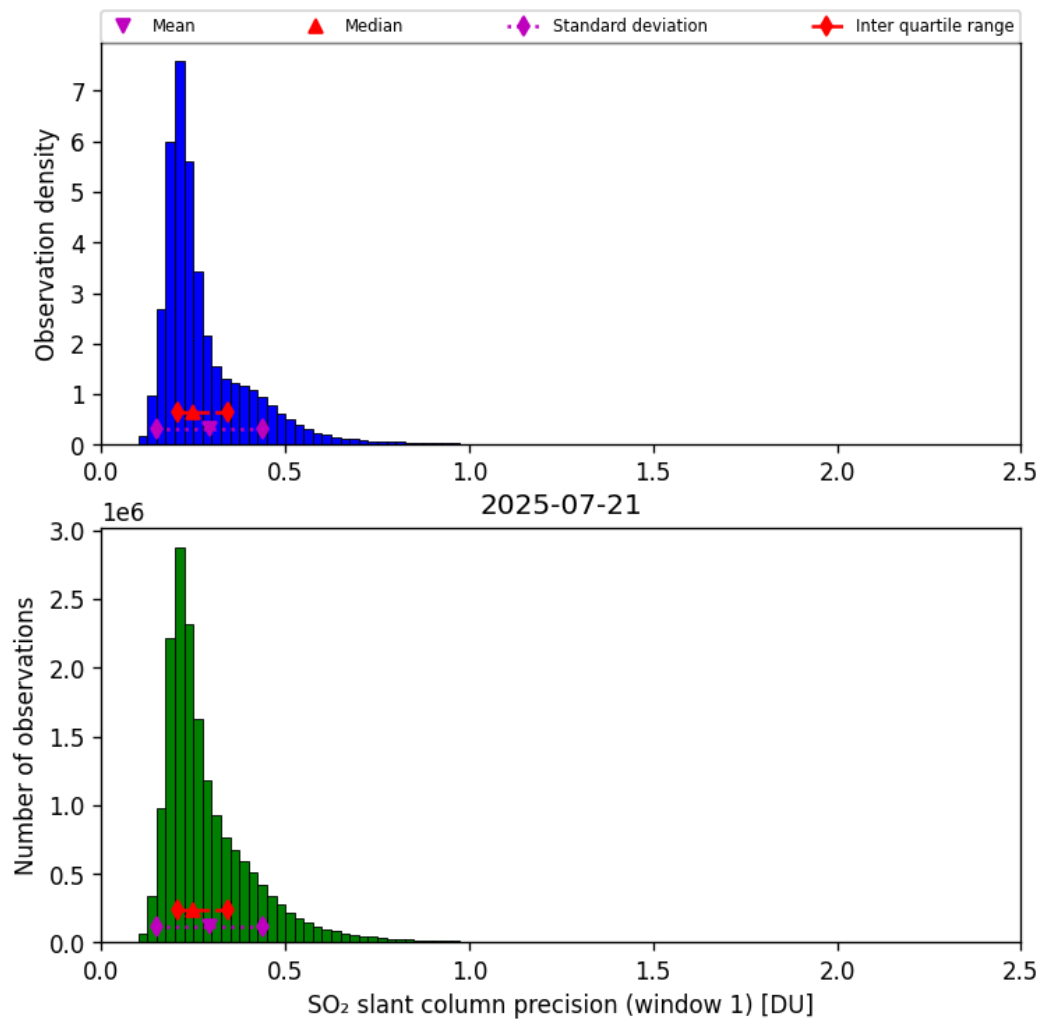


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-07-21 to 2025-07-22

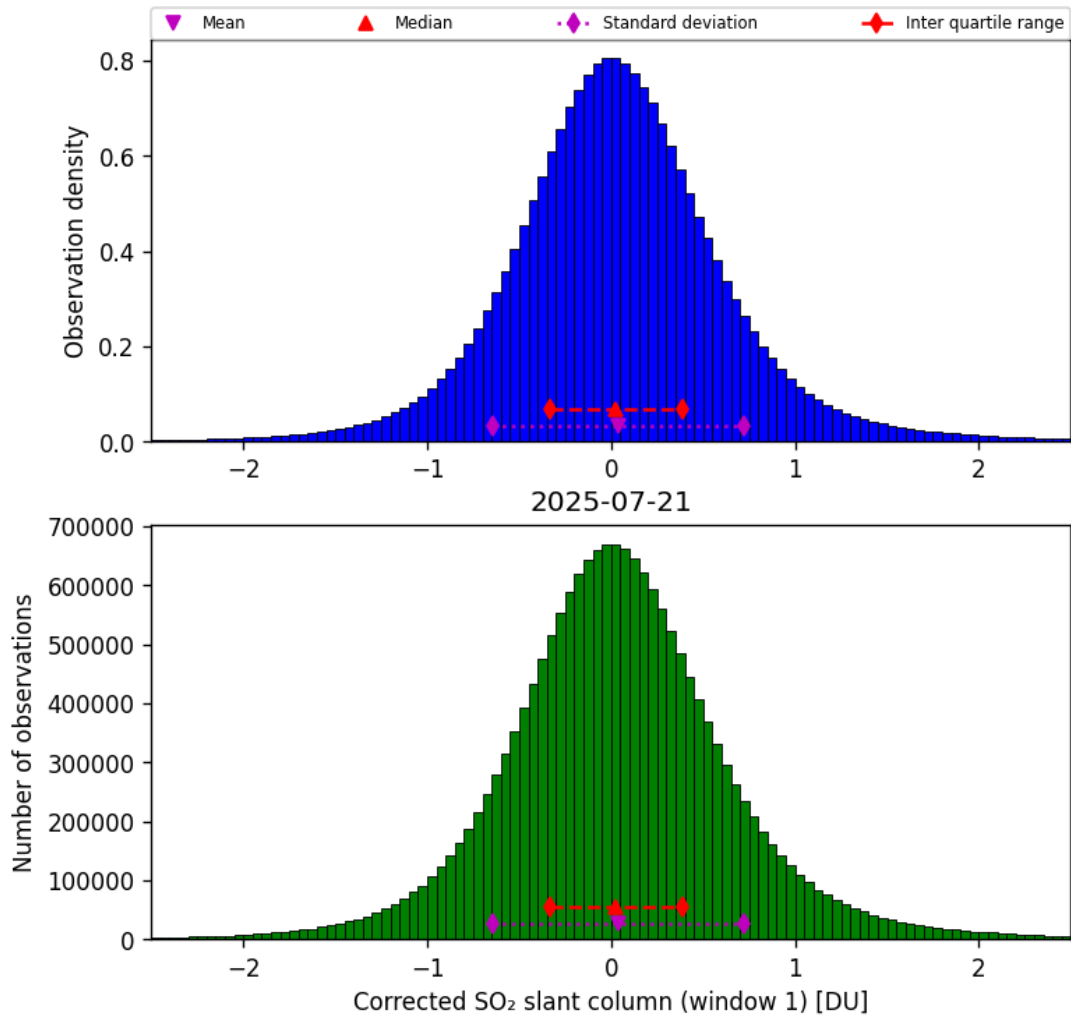


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-07-21 to 2025-07-22

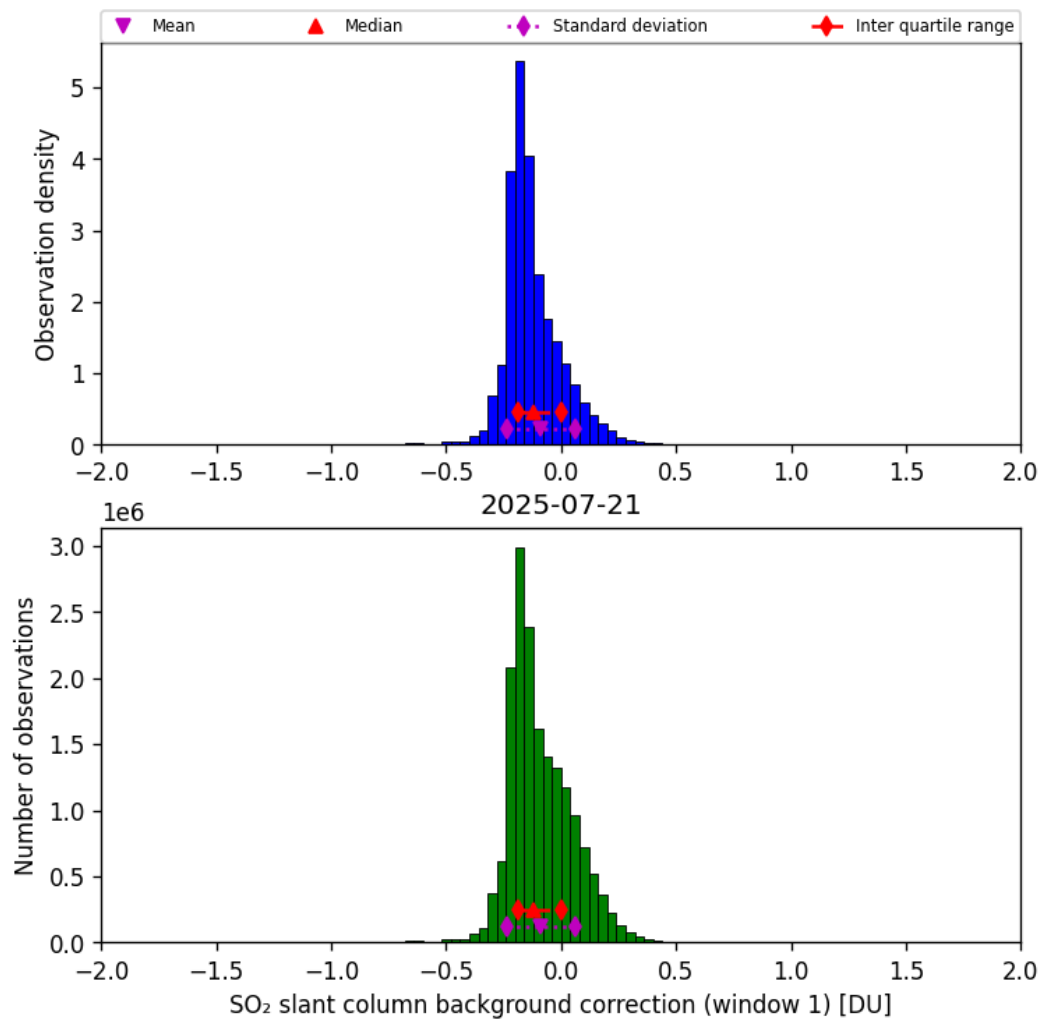


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-07-21 to 2025-07-22

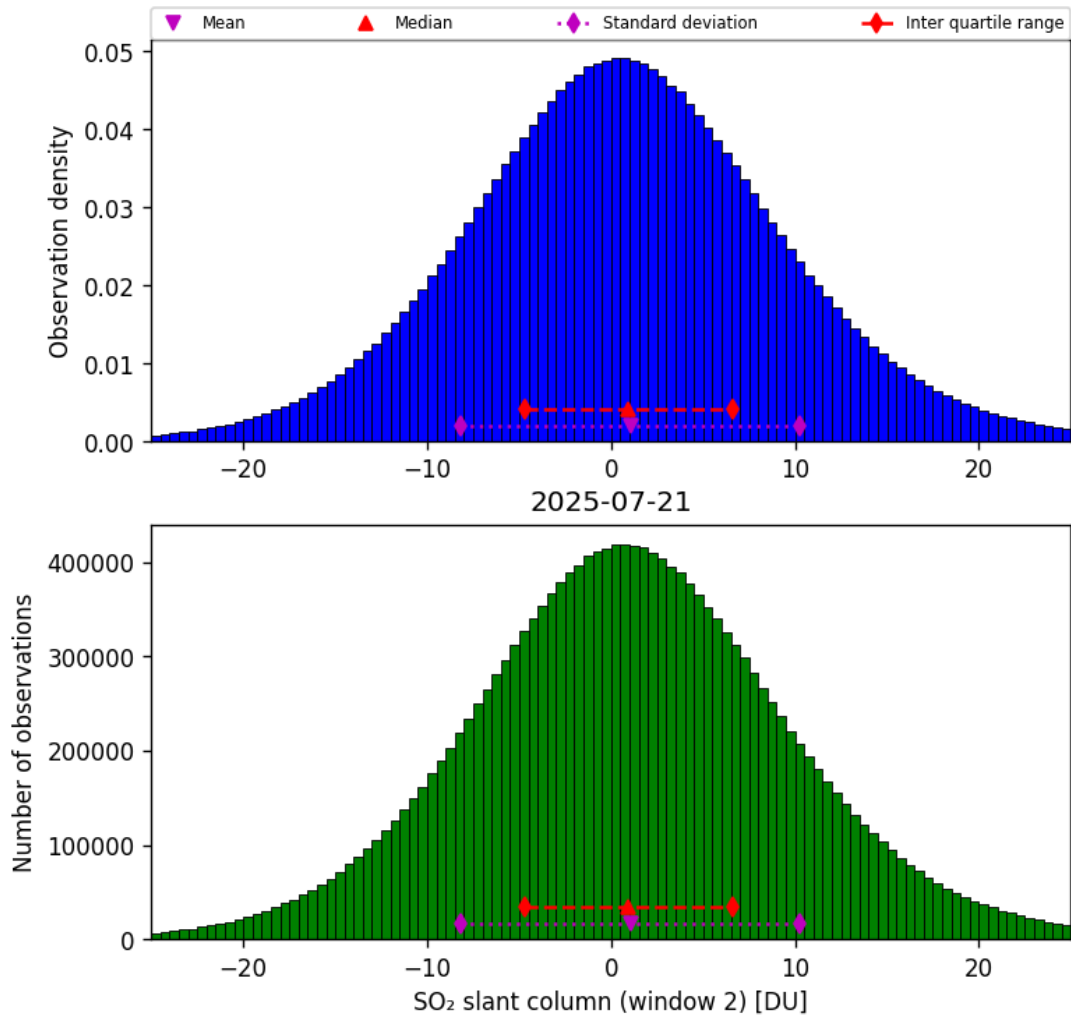


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-07-21 to 2025-07-22

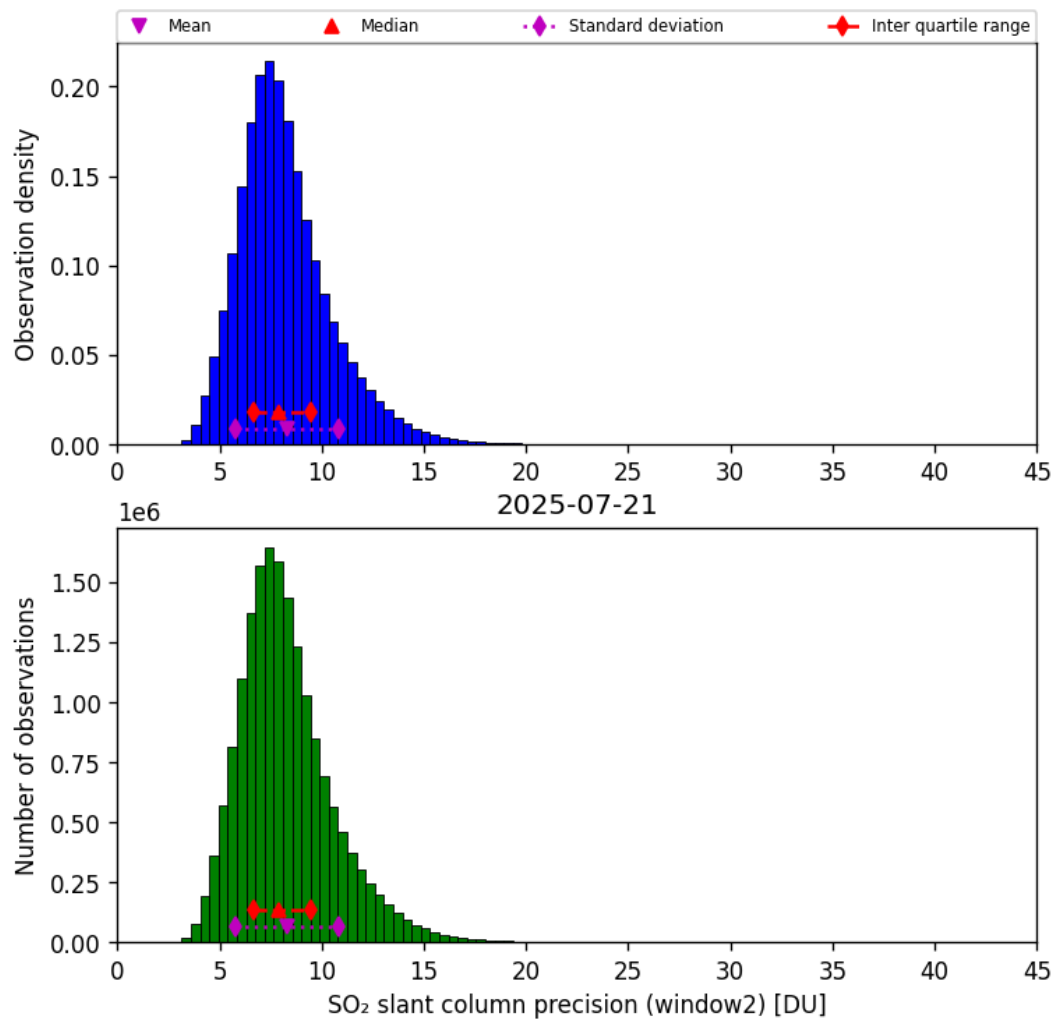


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-07-21 to 2025-07-22

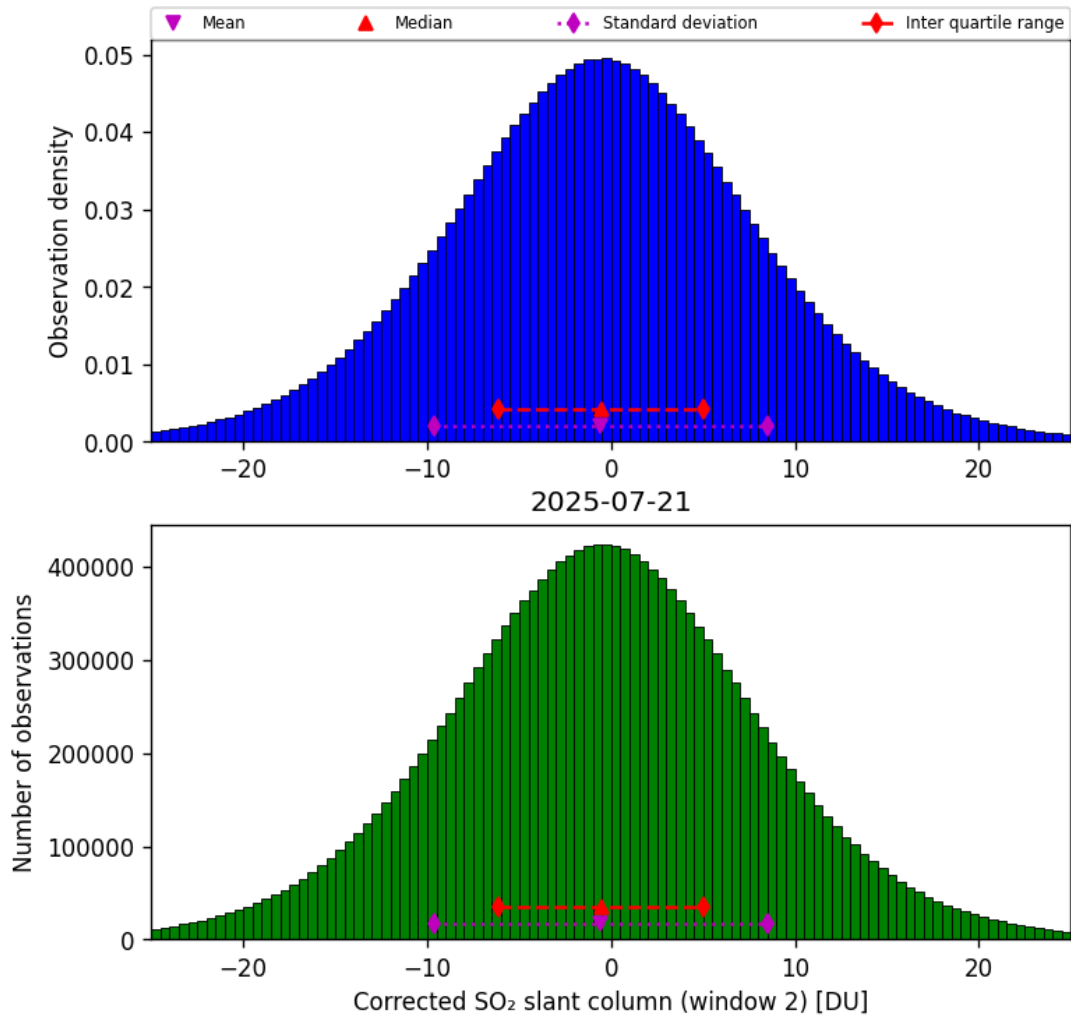


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-07-21 to 2025-07-22

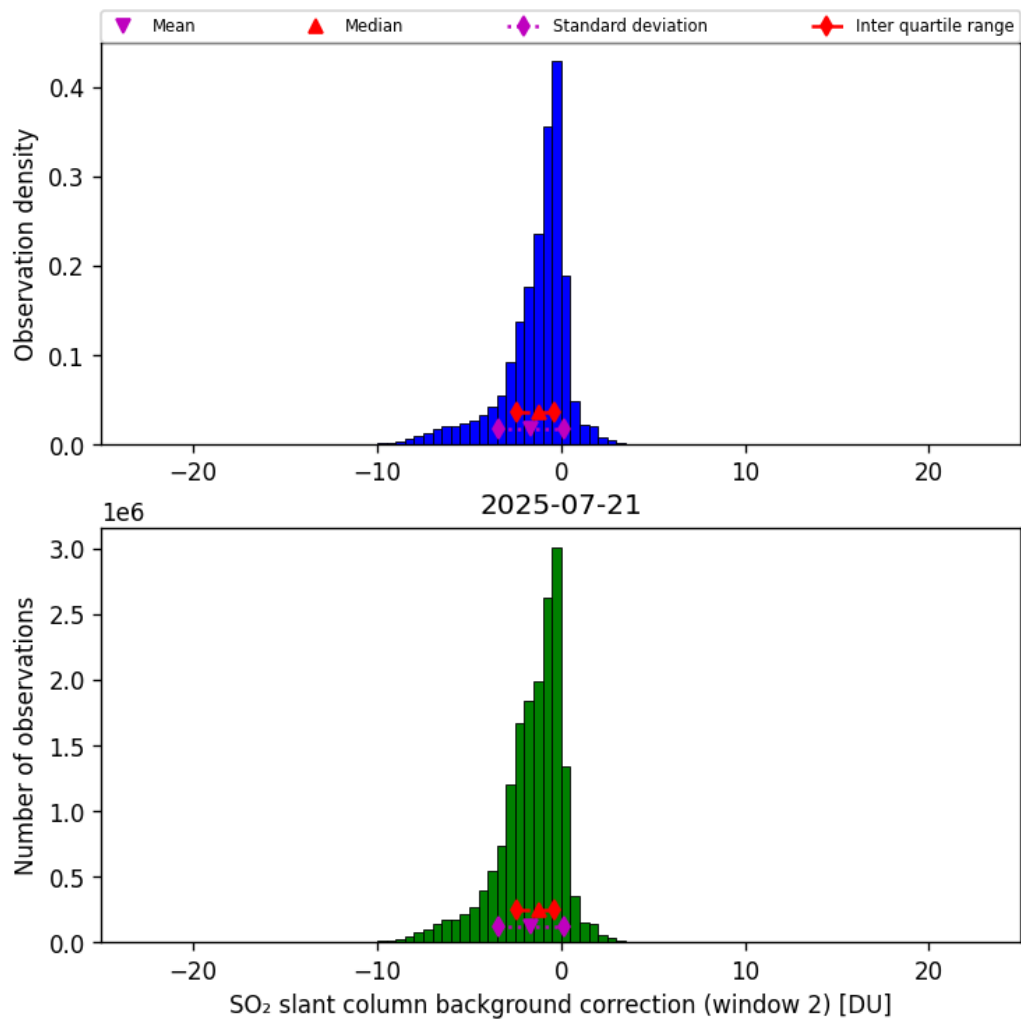


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-07-21 to 2025-07-22

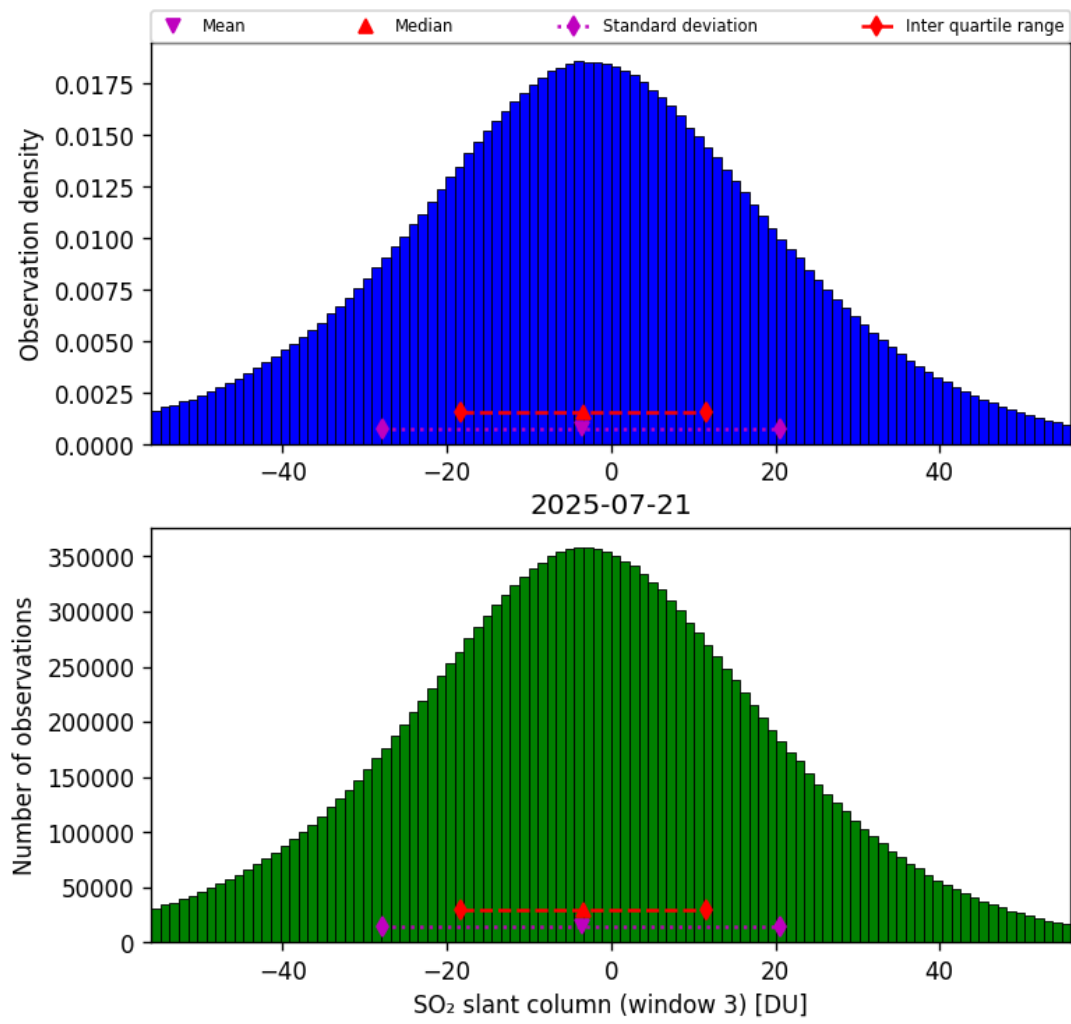


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-07-21 to 2025-07-22

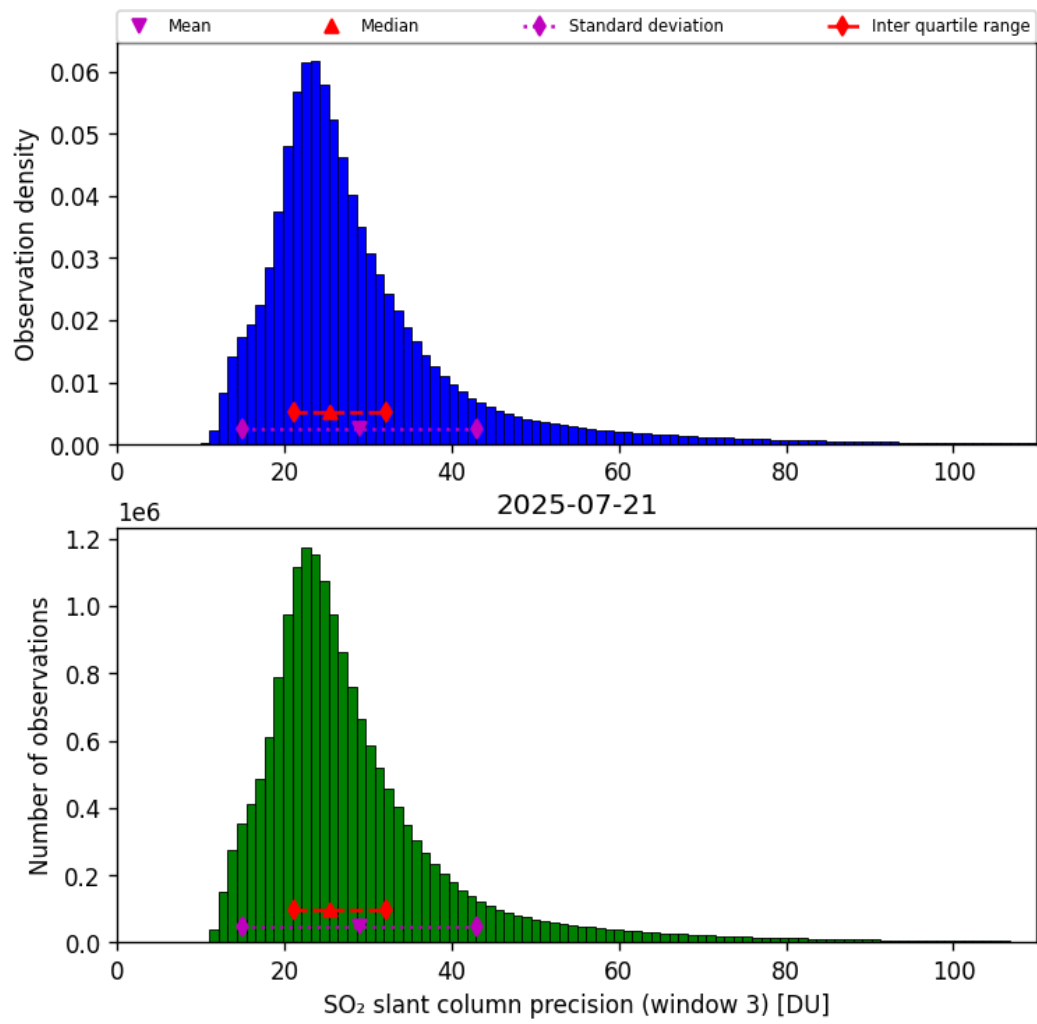


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-07-21 to 2025-07-22

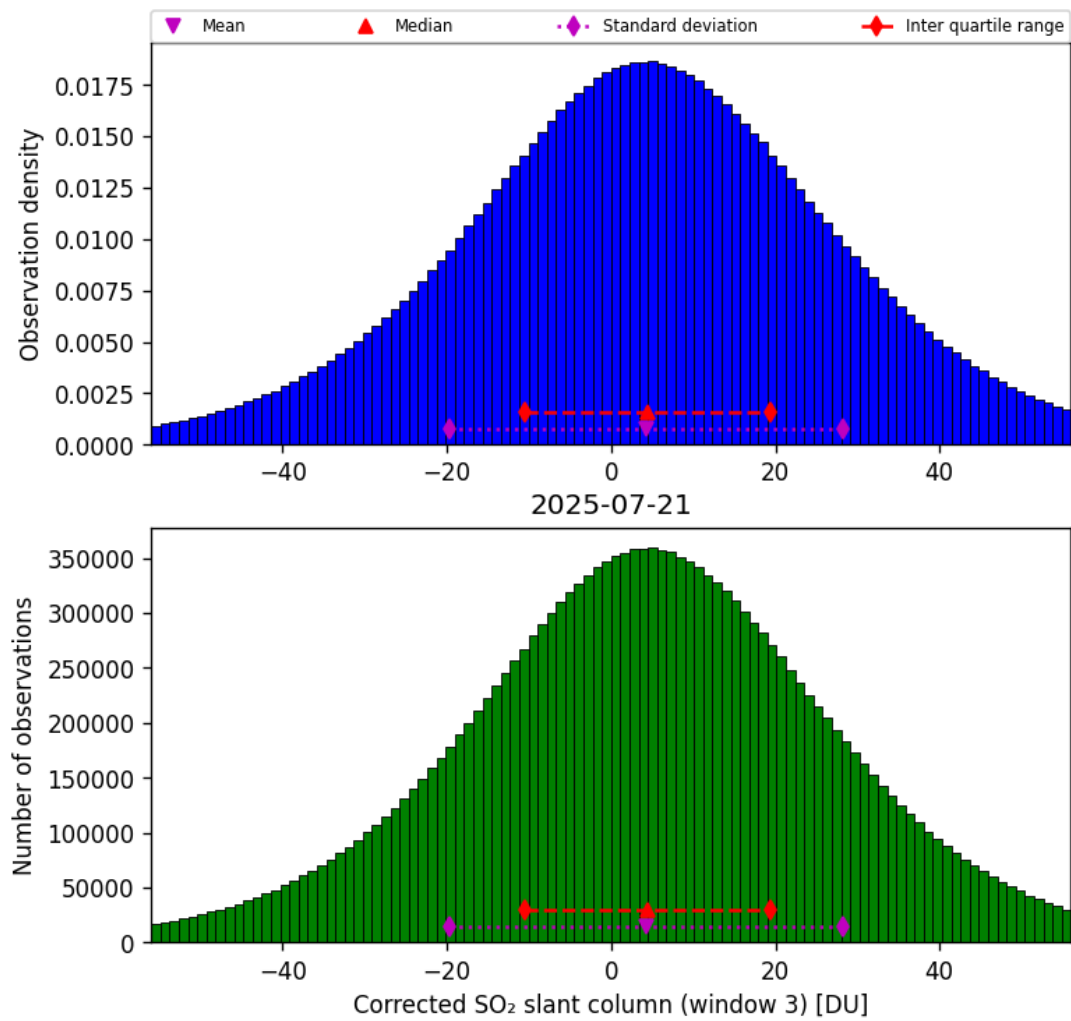


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-07-21 to 2025-07-22

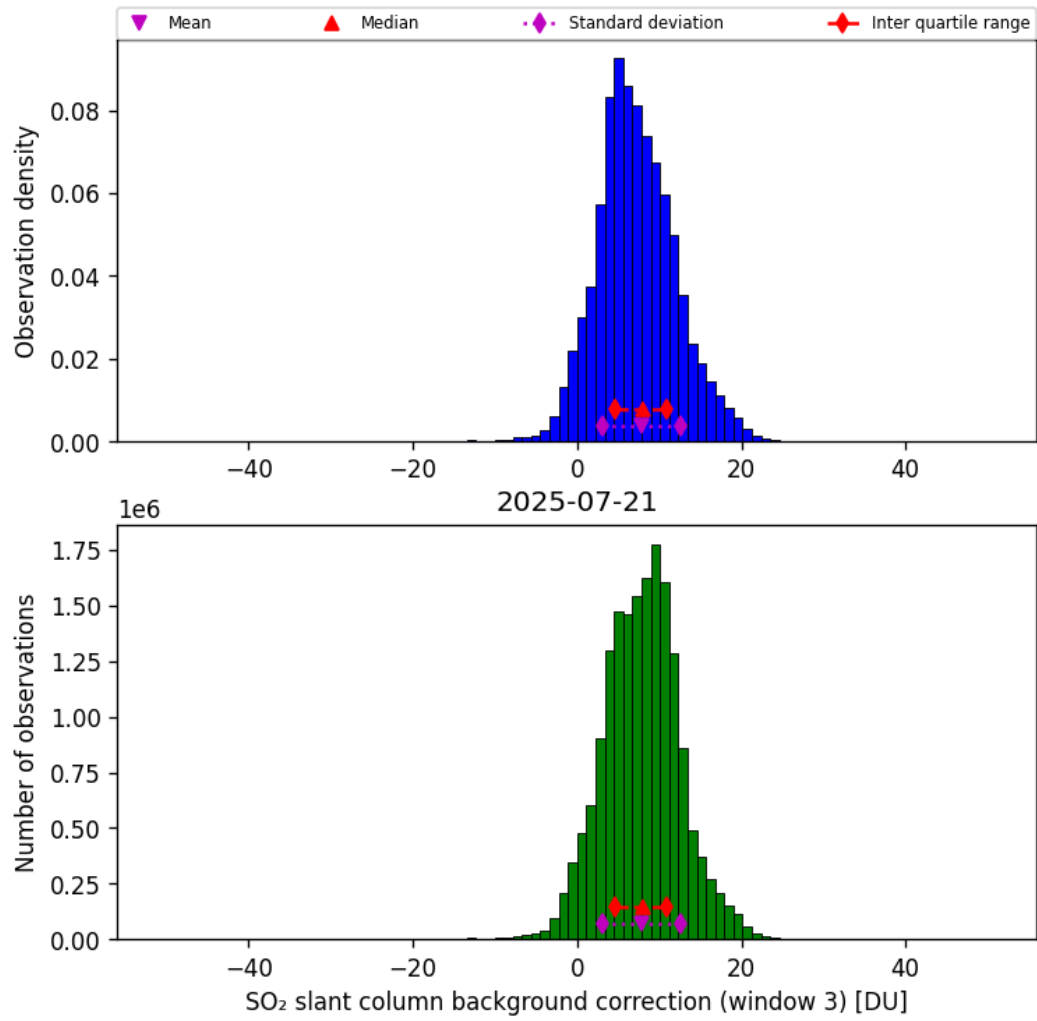


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-07-21 to 2025-07-22

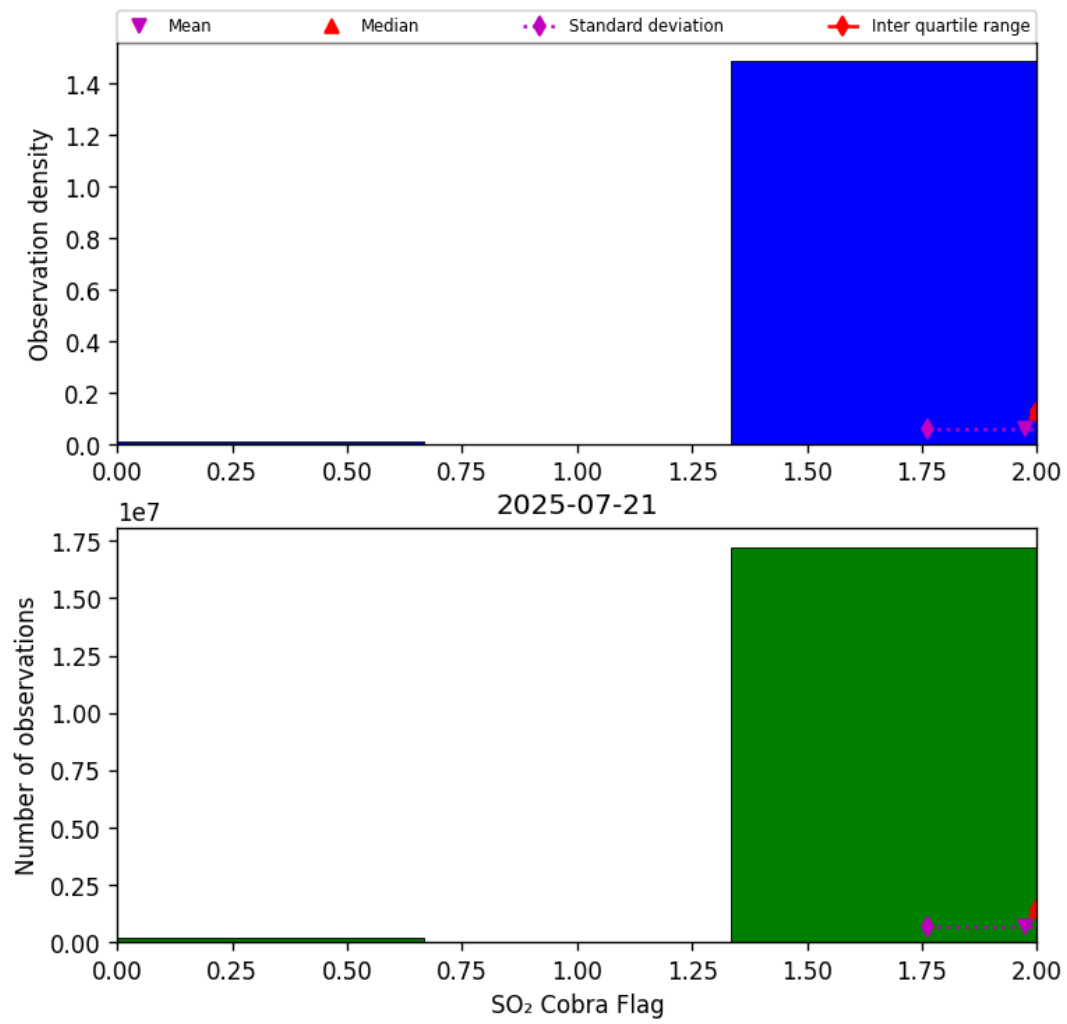


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-07-21 to 2025-07-22

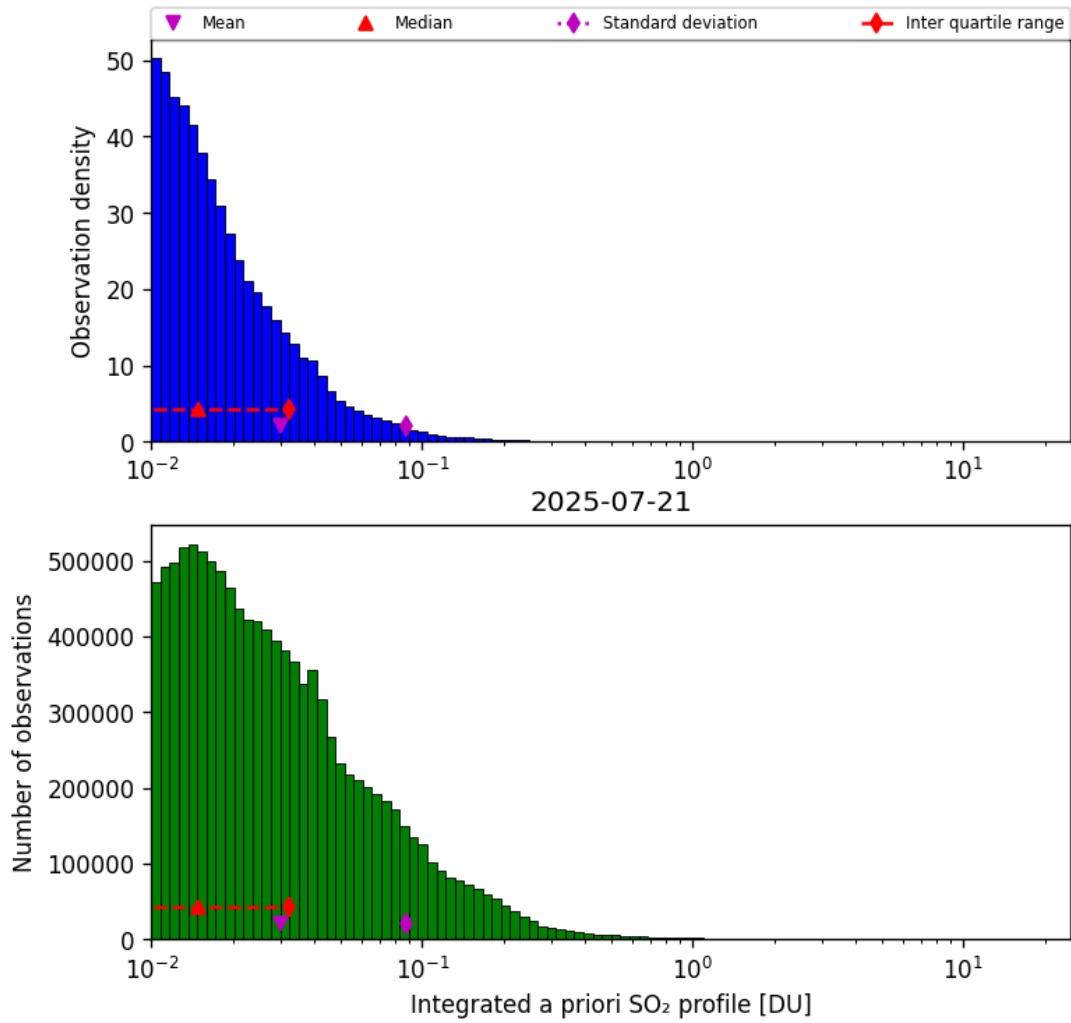


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-07-21 to 2025-07-22

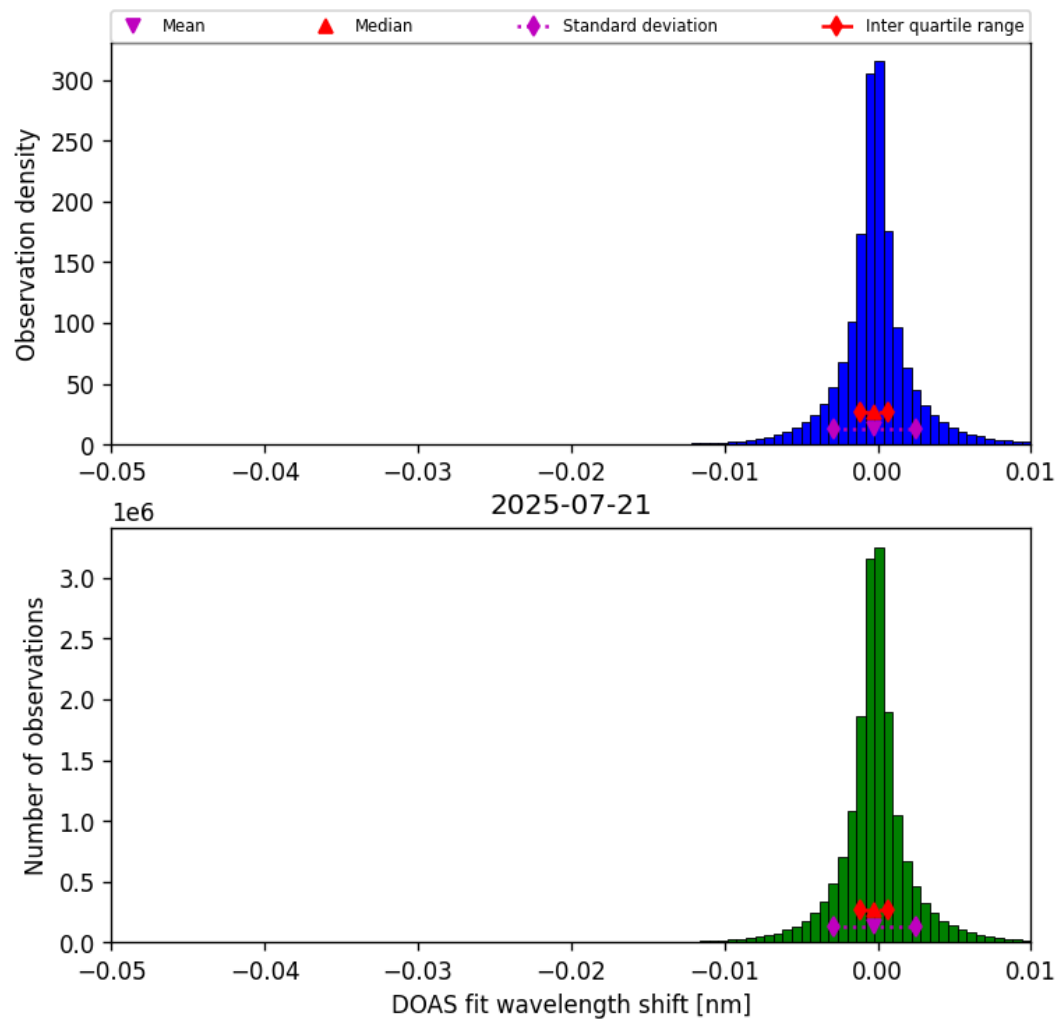


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-07-21 to 2025-07-22

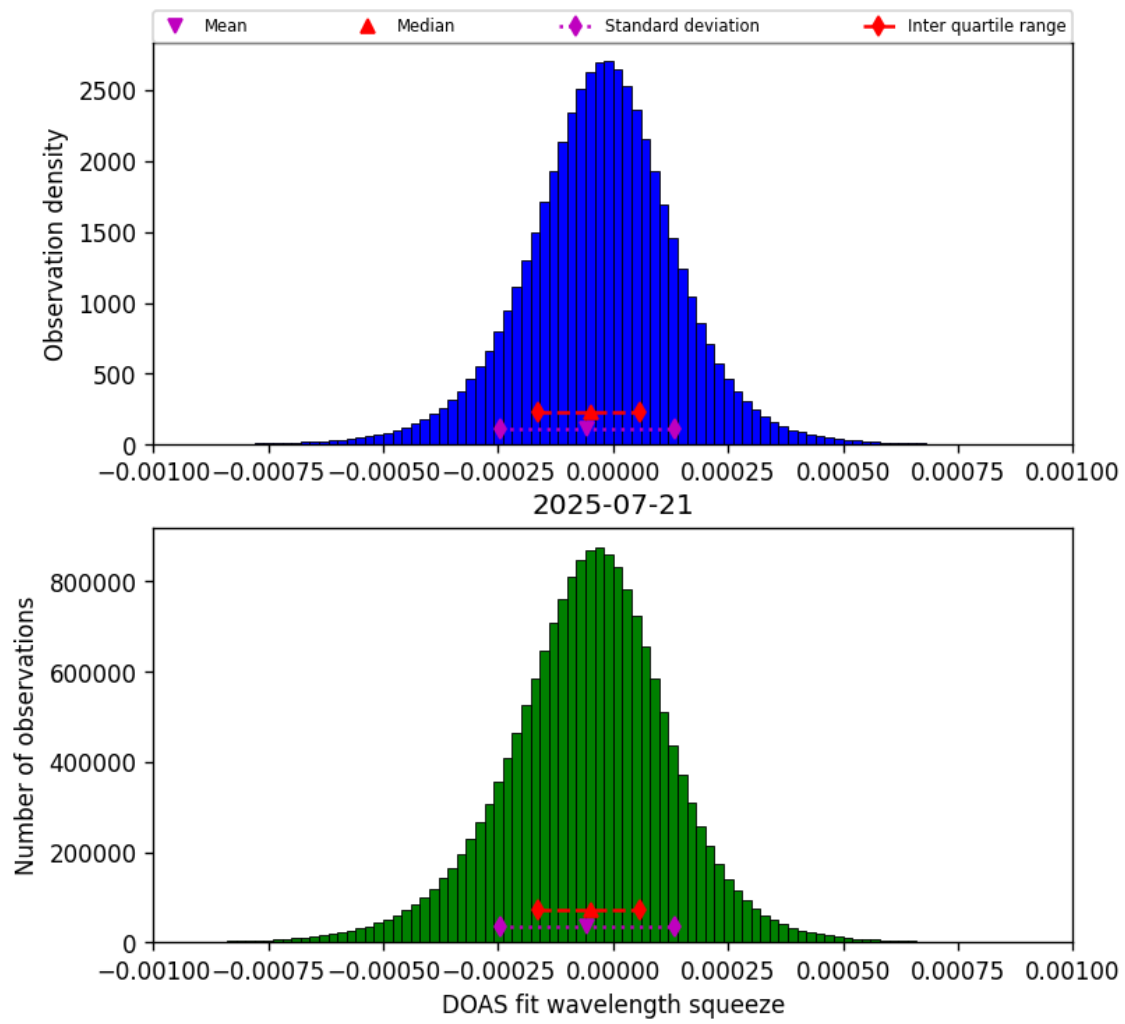


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-07-21 to 2025-07-22

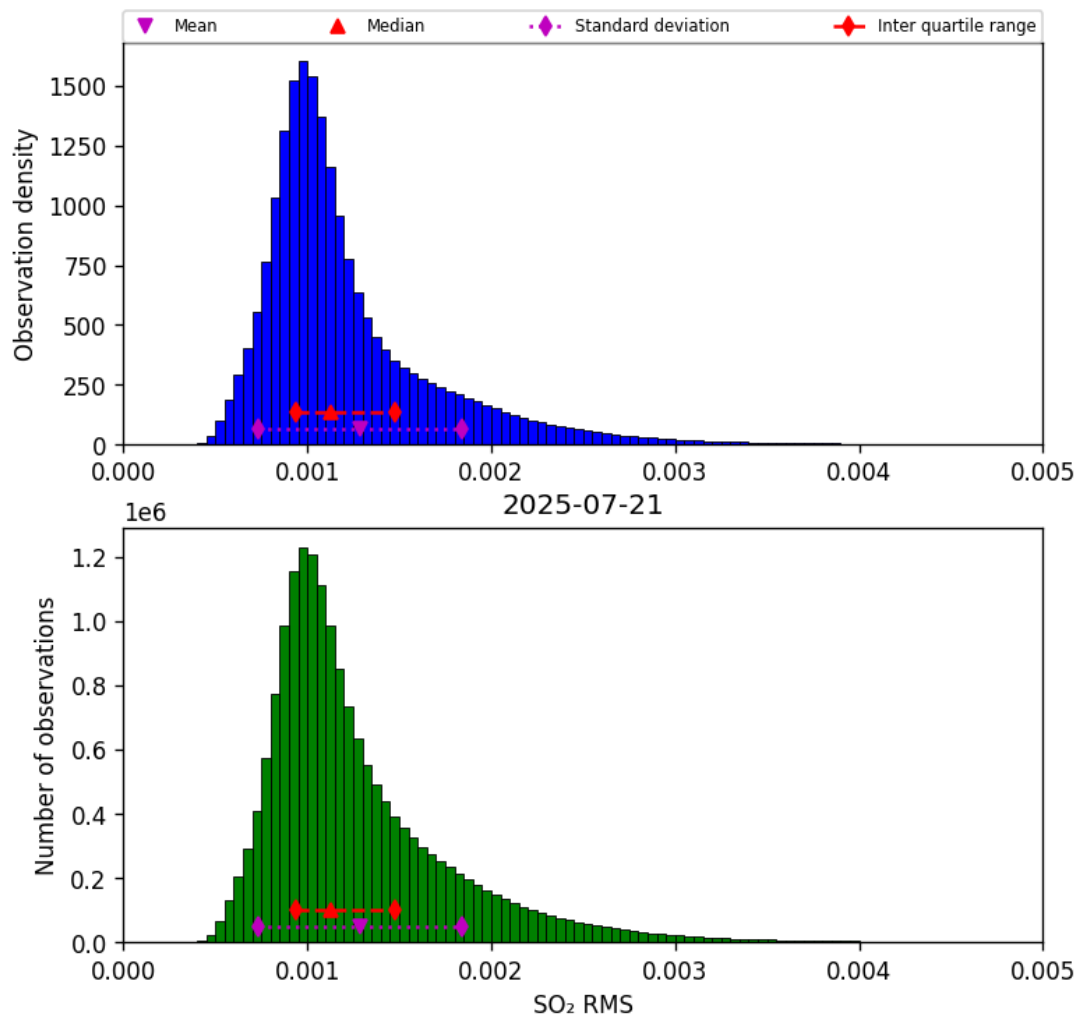


Figure 79: Histogram of “SO₂ RMS” for 2025-07-21 to 2025-07-22

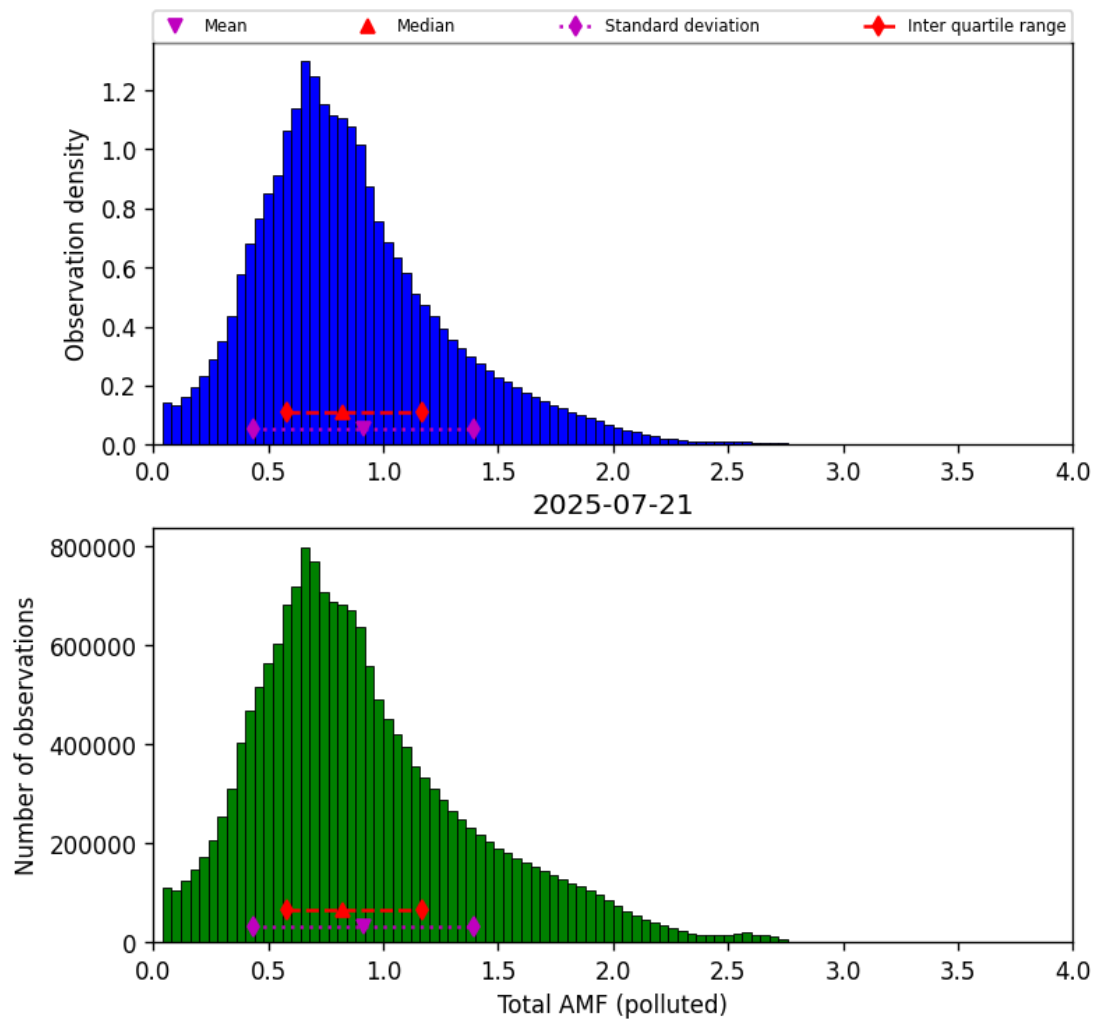


Figure 80: Histogram of “Total AMF (polluted)” for 2025-07-21 to 2025-07-22

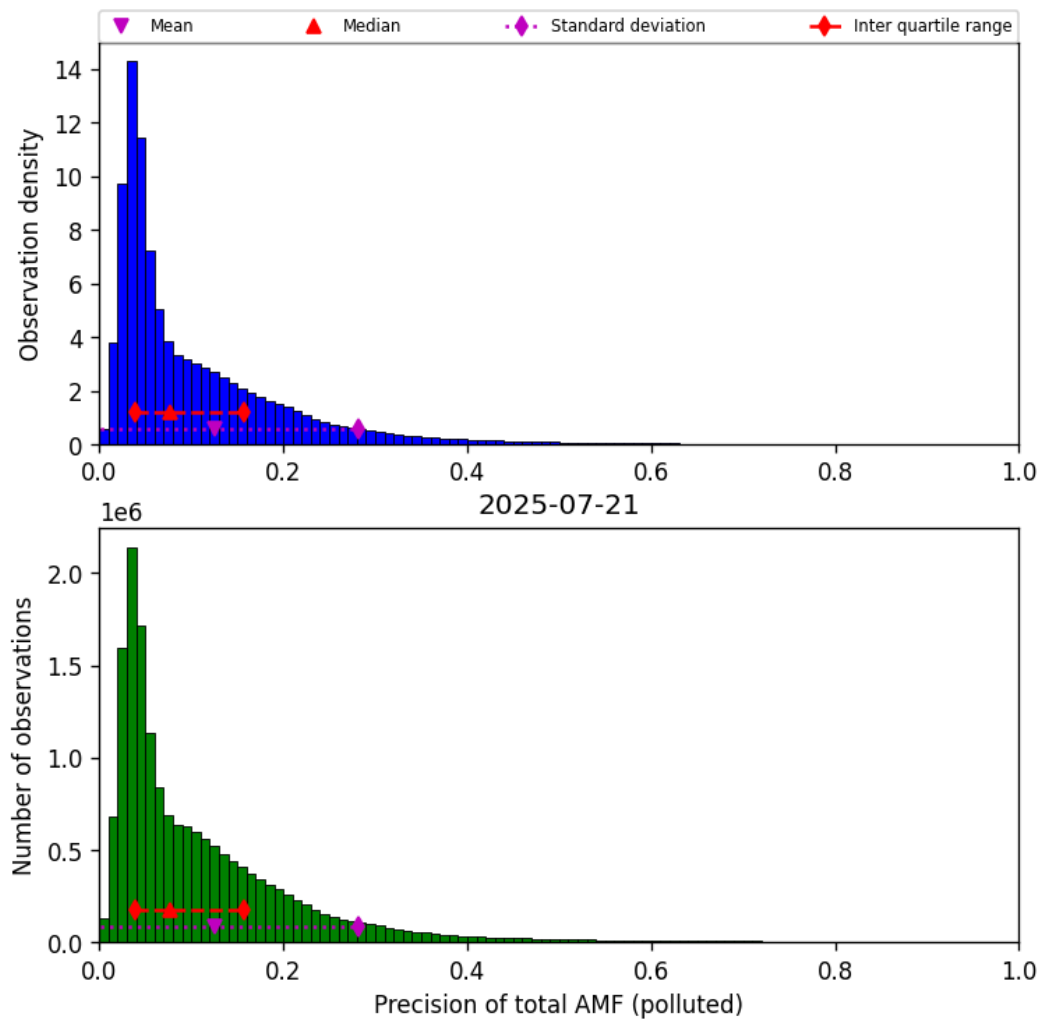


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-07-21 to 2025-07-22

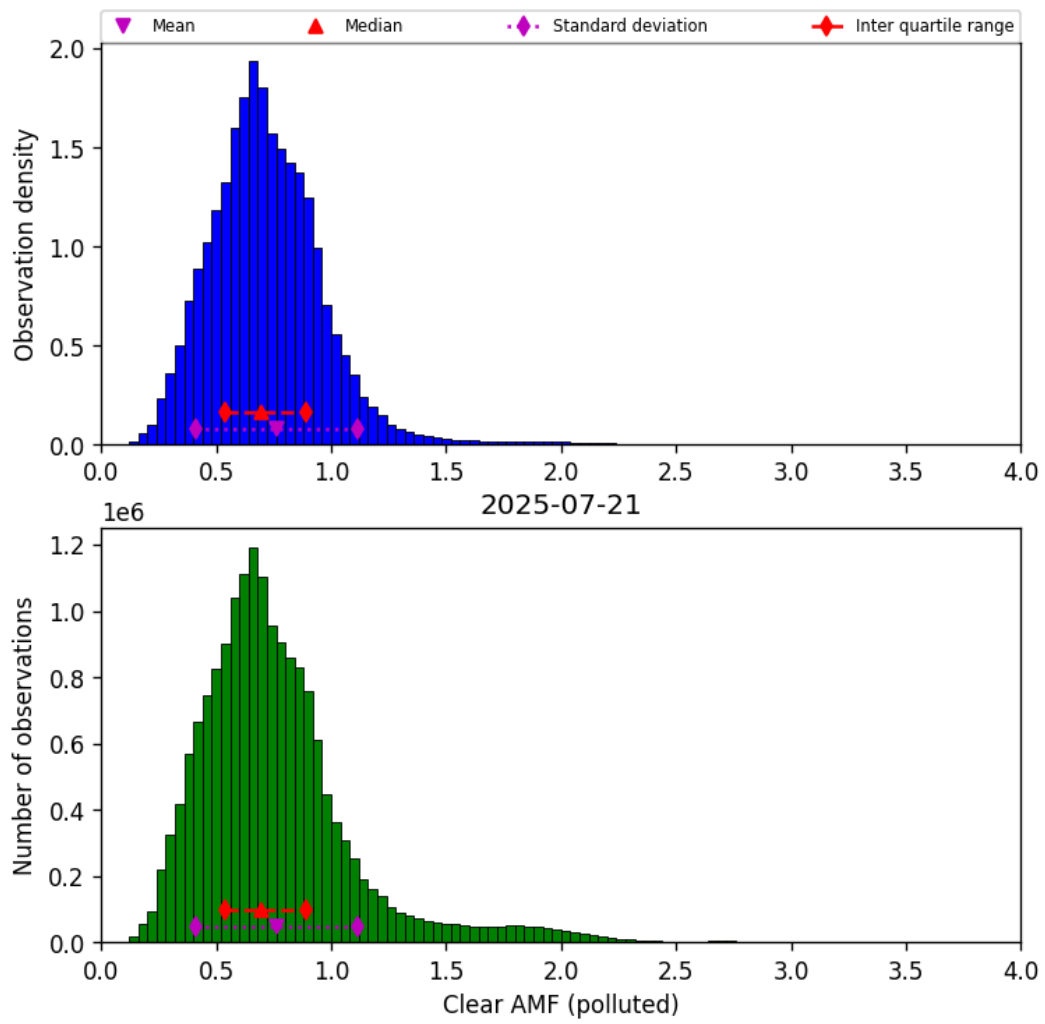


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-07-21 to 2025-07-22

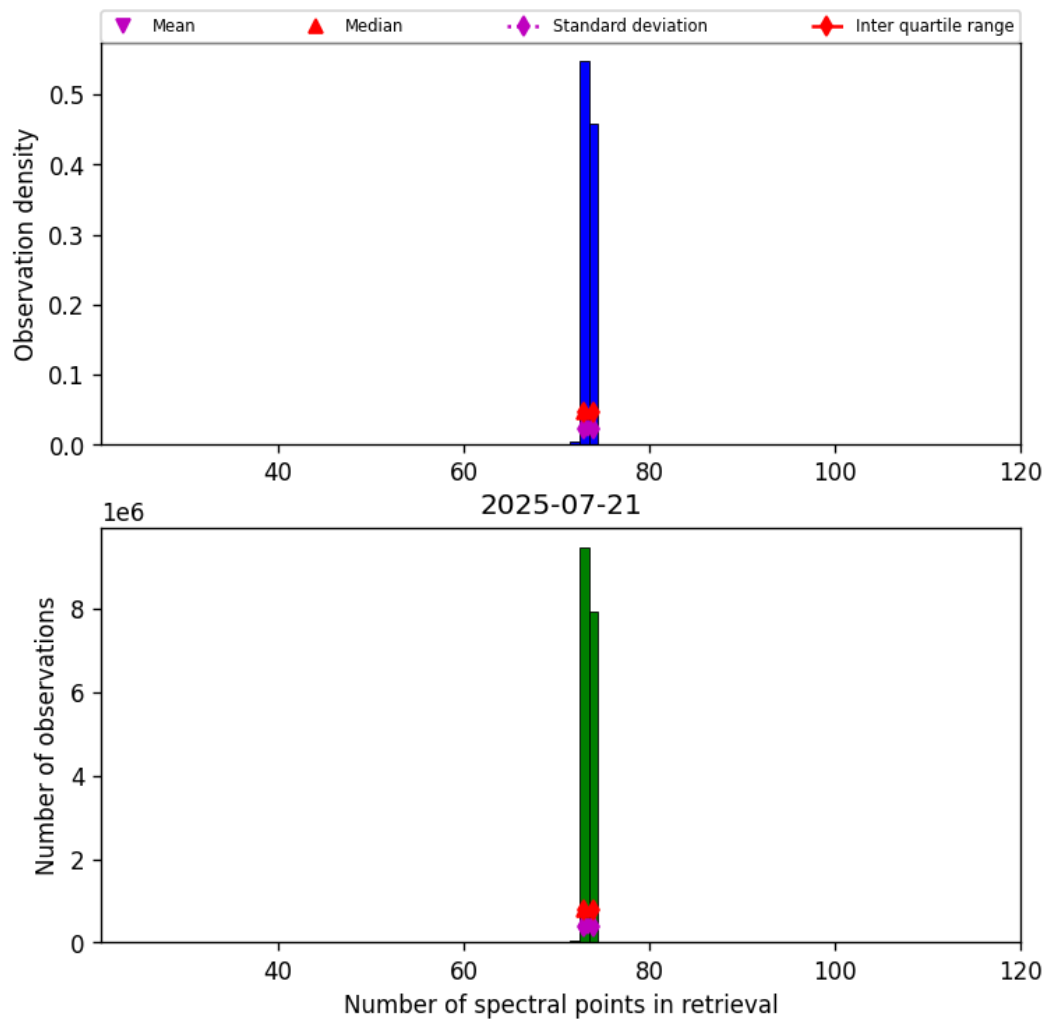


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-07-21 to 2025-07-22

9 Along track statistics

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

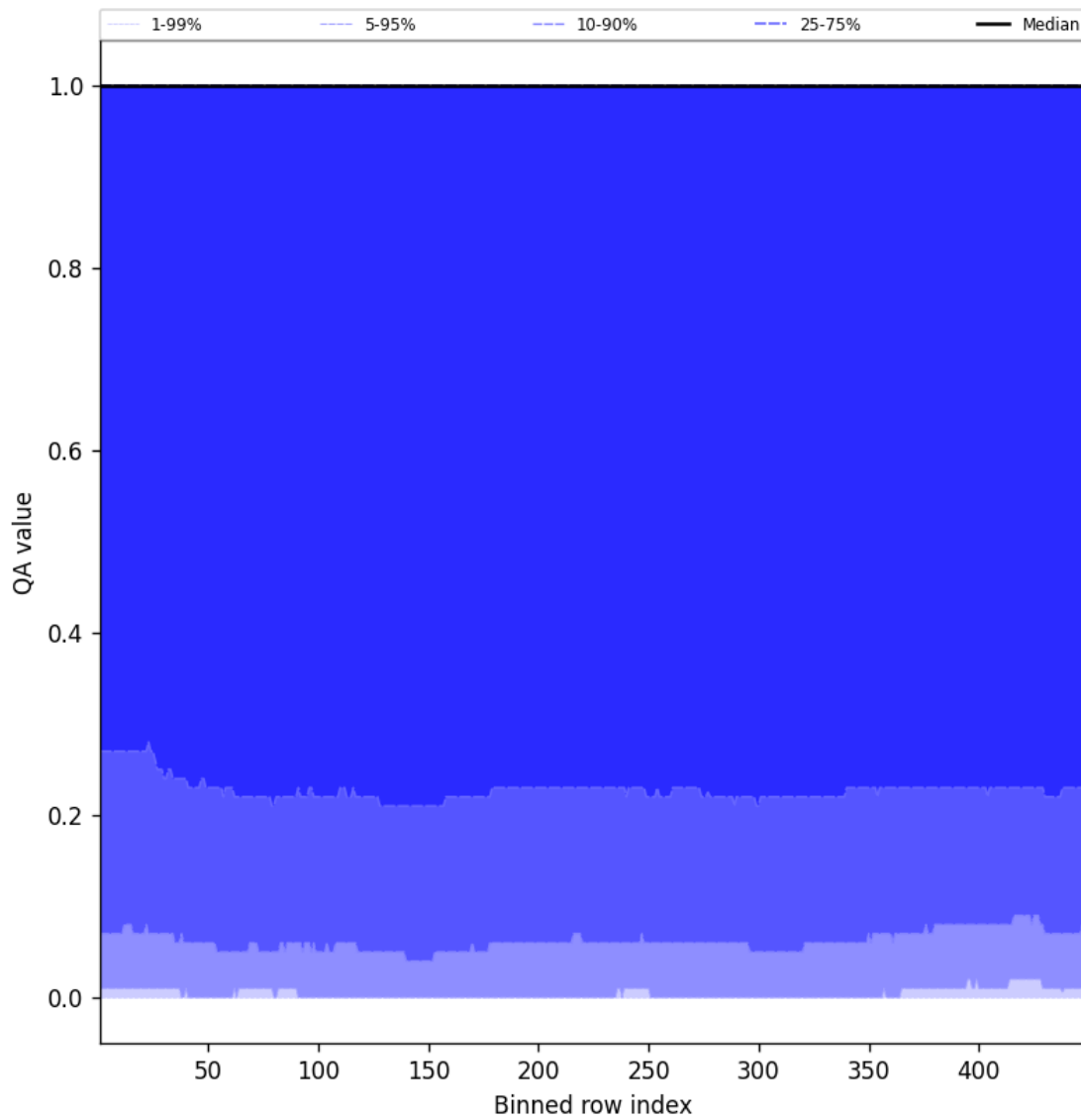


Figure 84: Along track statistics of “QA value” for 2025-07-21 to 2025-07-22

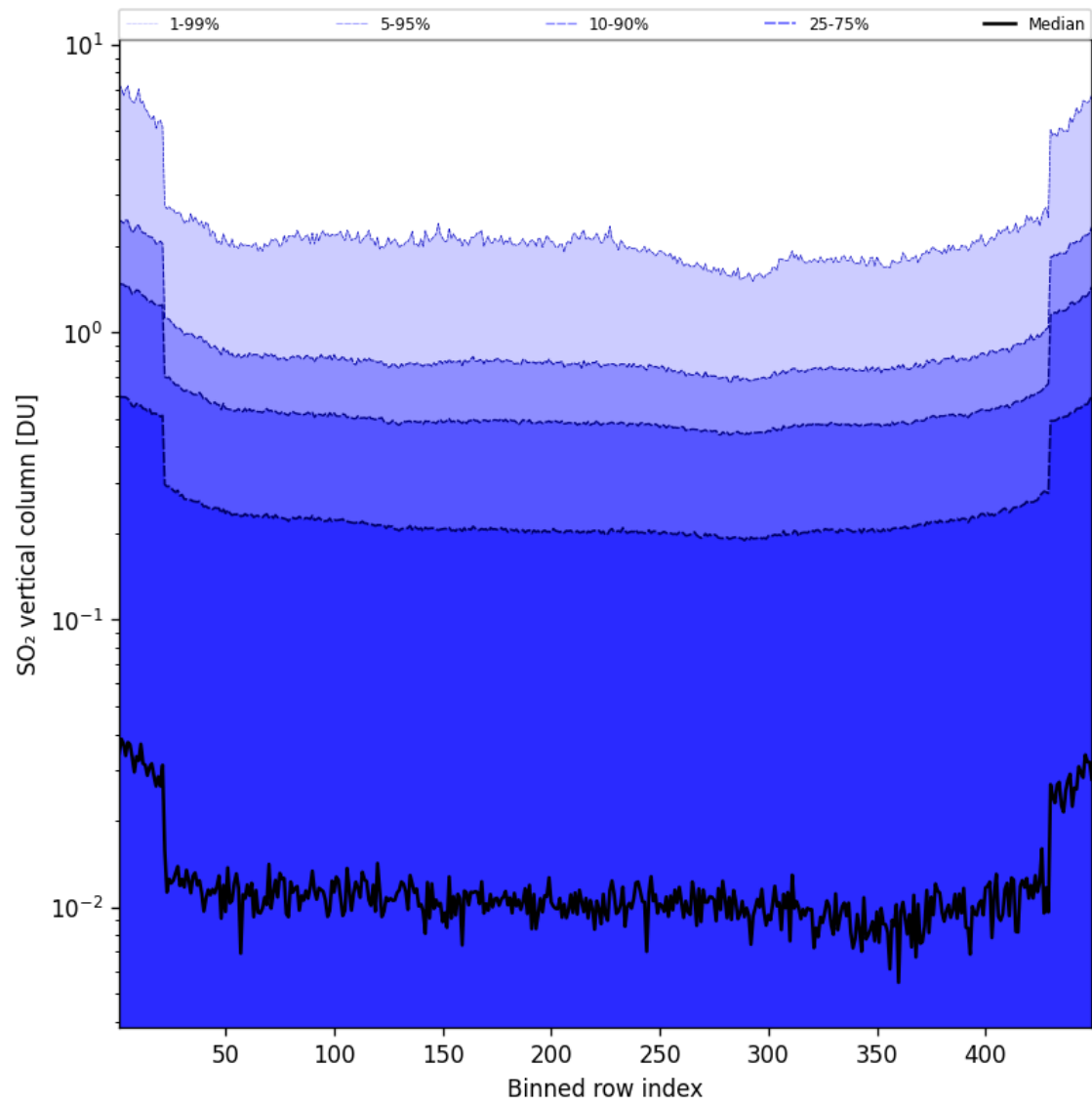


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-07-21 to 2025-07-22

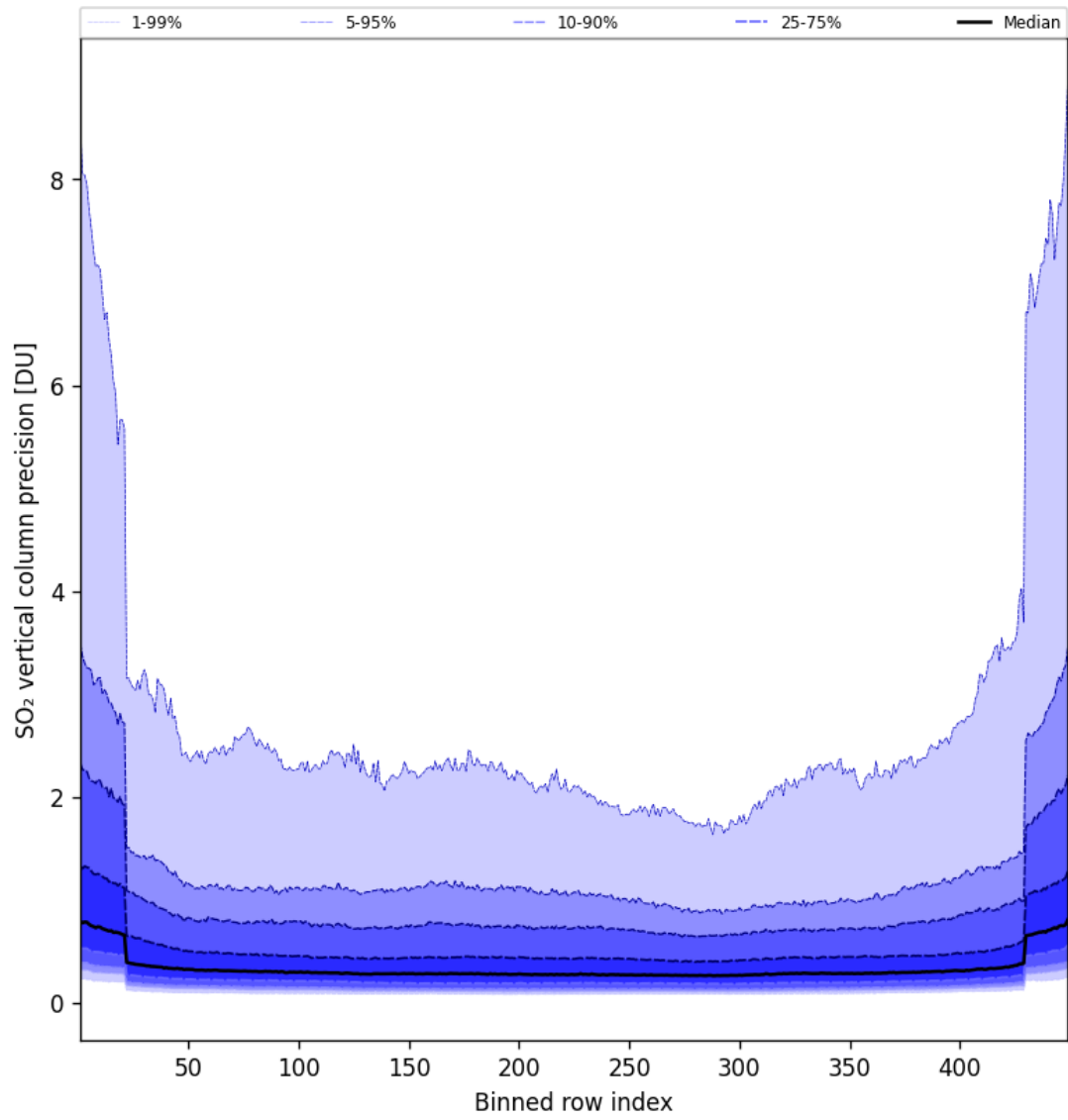


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-07-21 to 2025-07-22

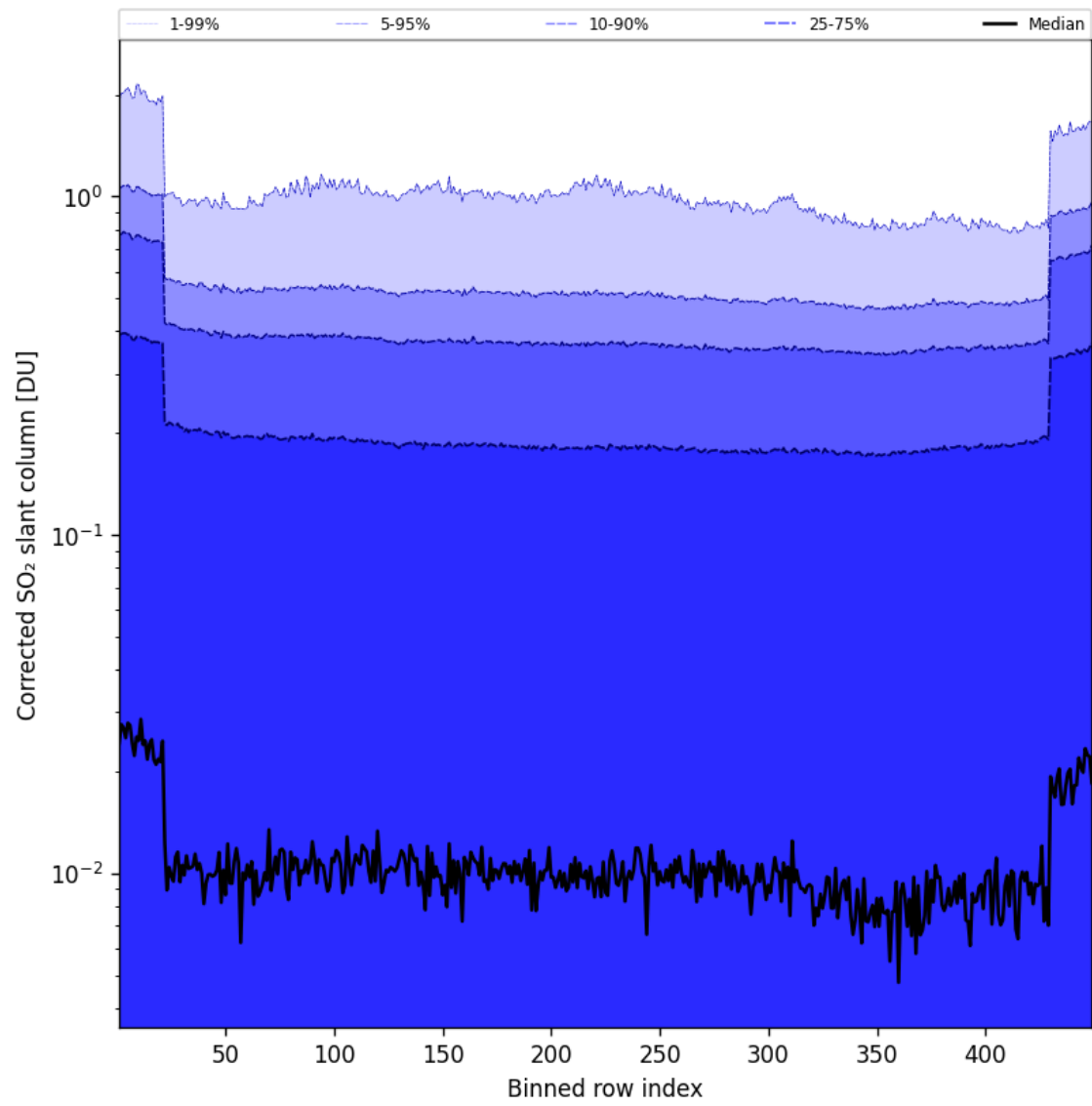


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-07-21 to 2025-07-22

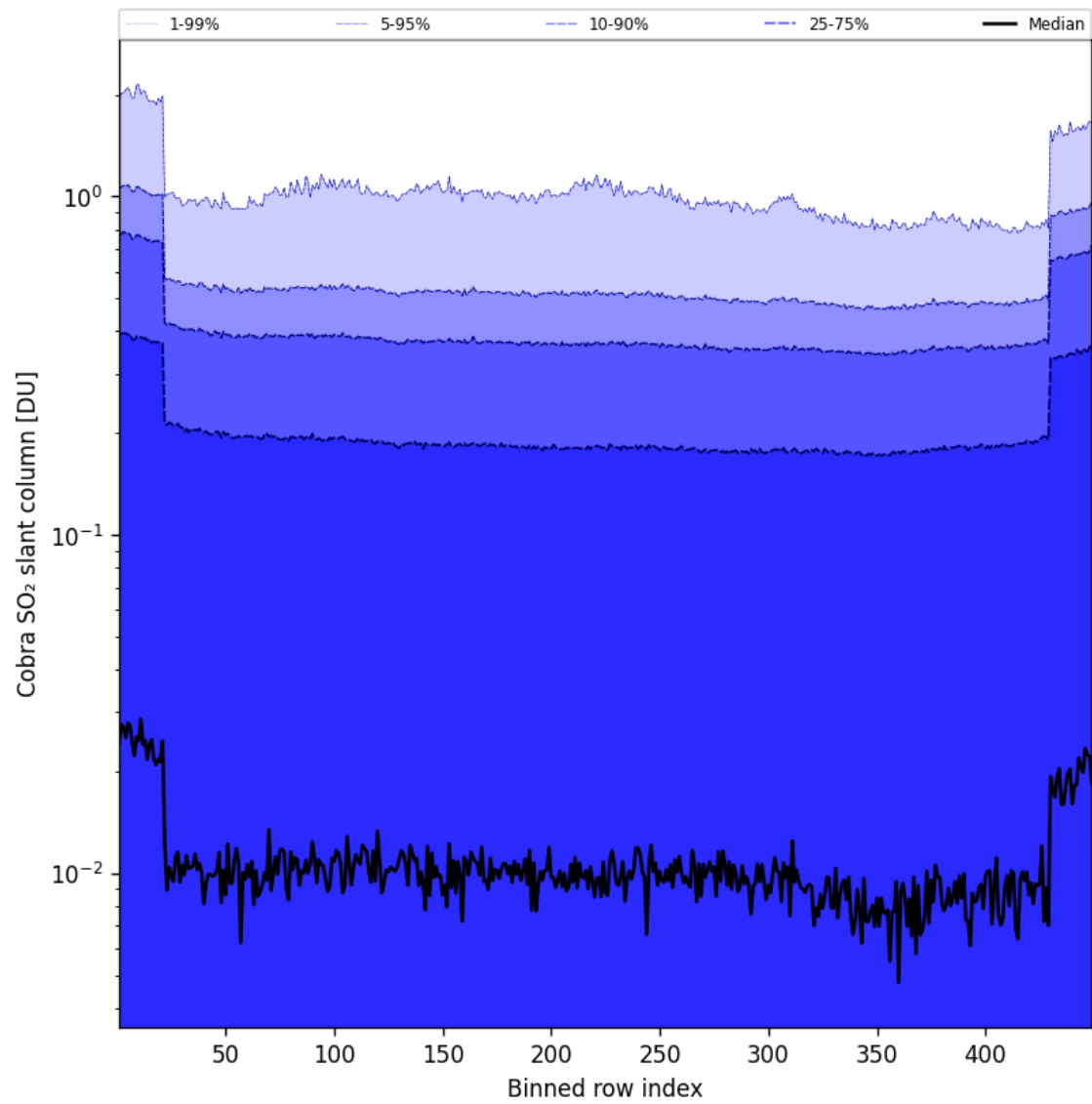


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-07-21 to 2025-07-22

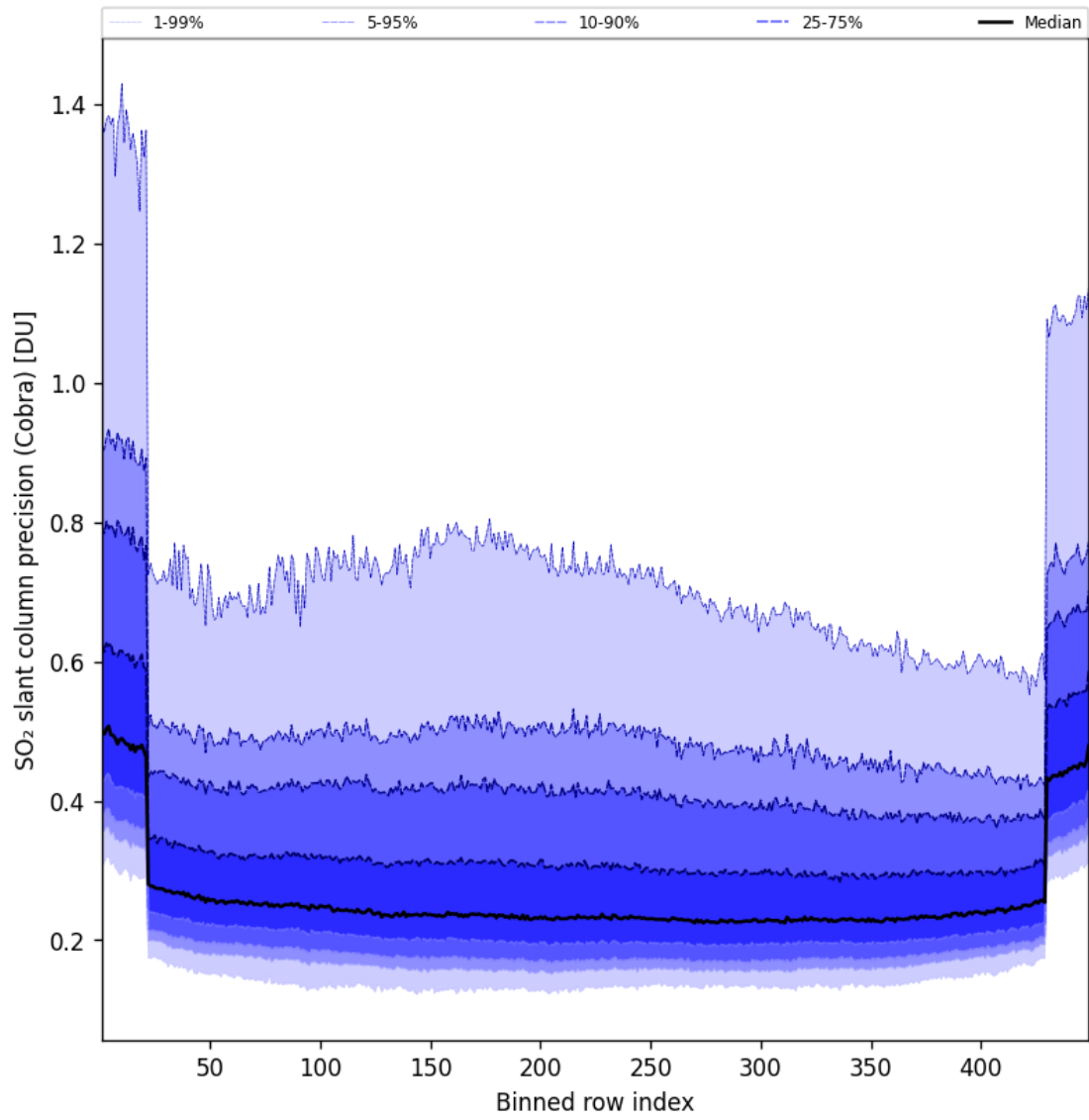


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-07-21 to 2025-07-22

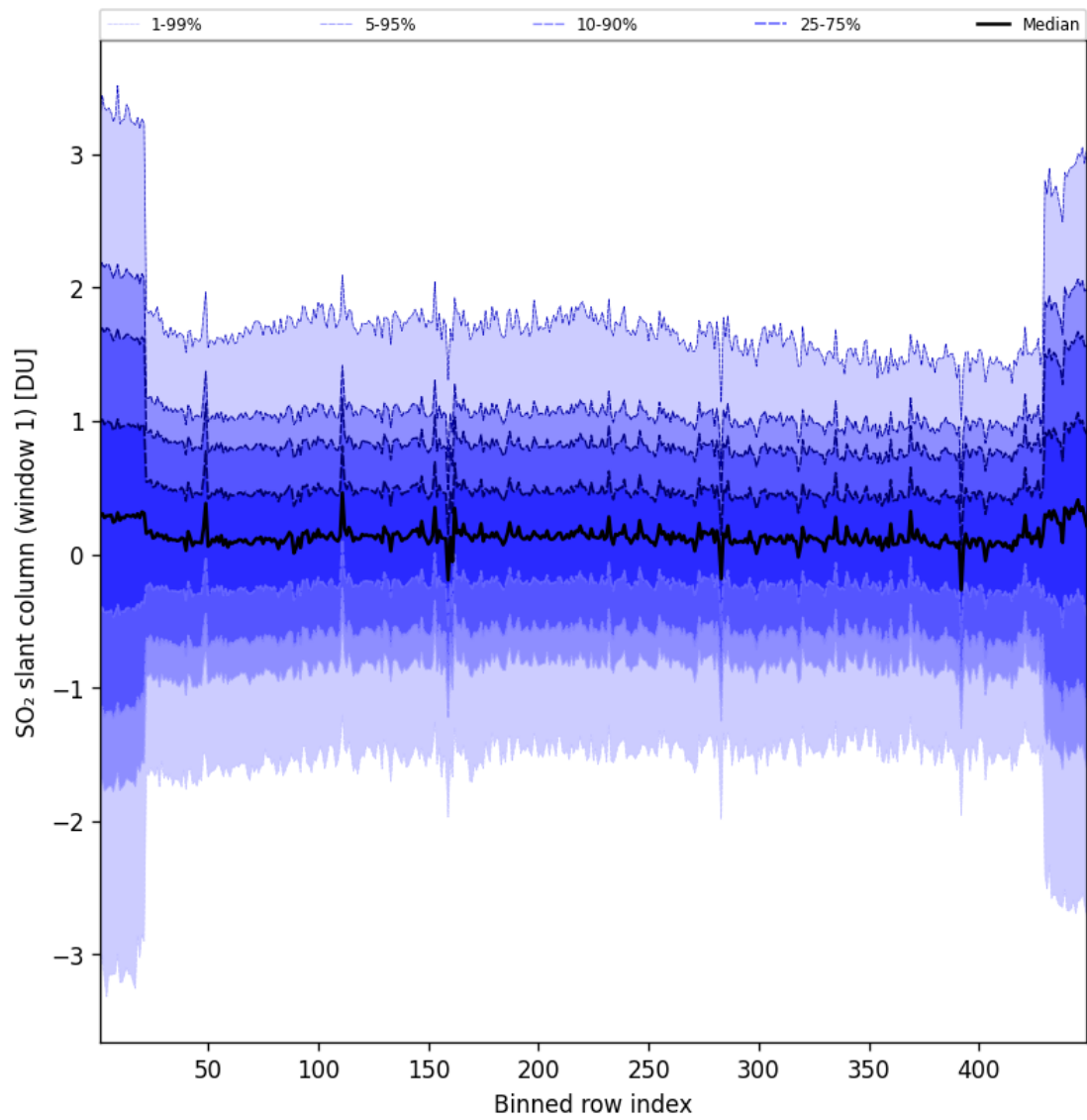


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-07-21 to 2025-07-22

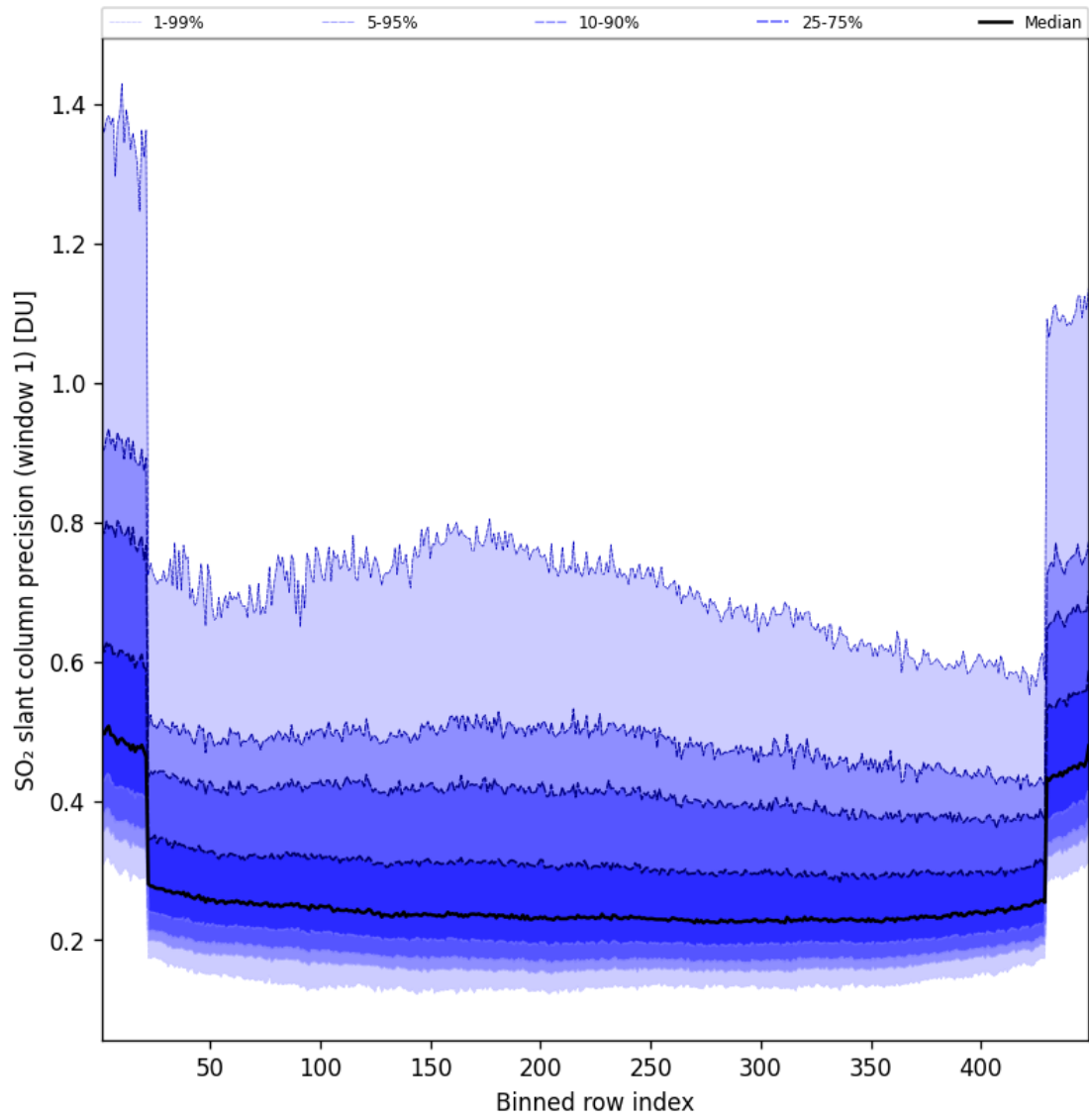


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-07-21 to 2025-07-22

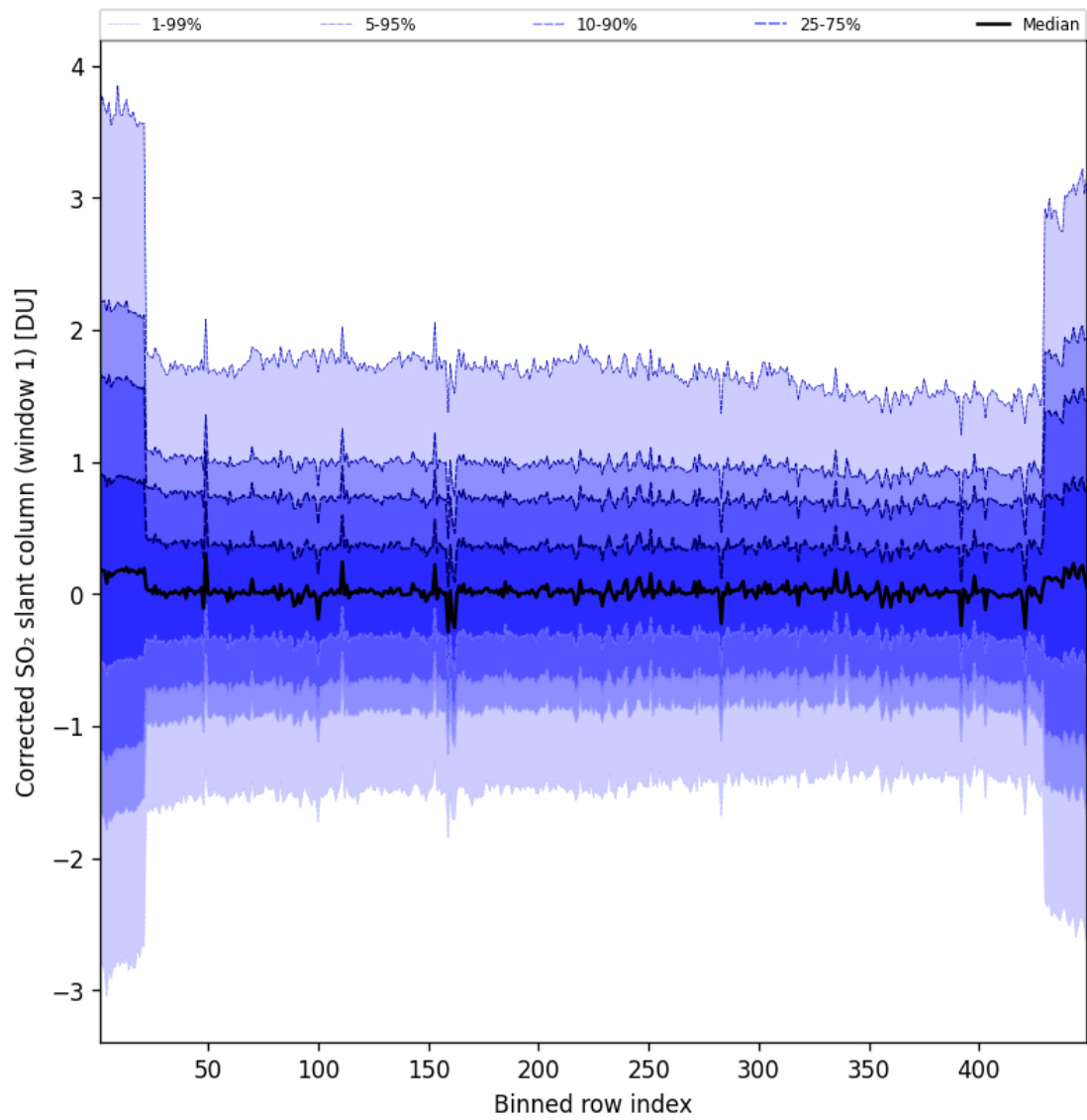


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-07-21 to 2025-07-22

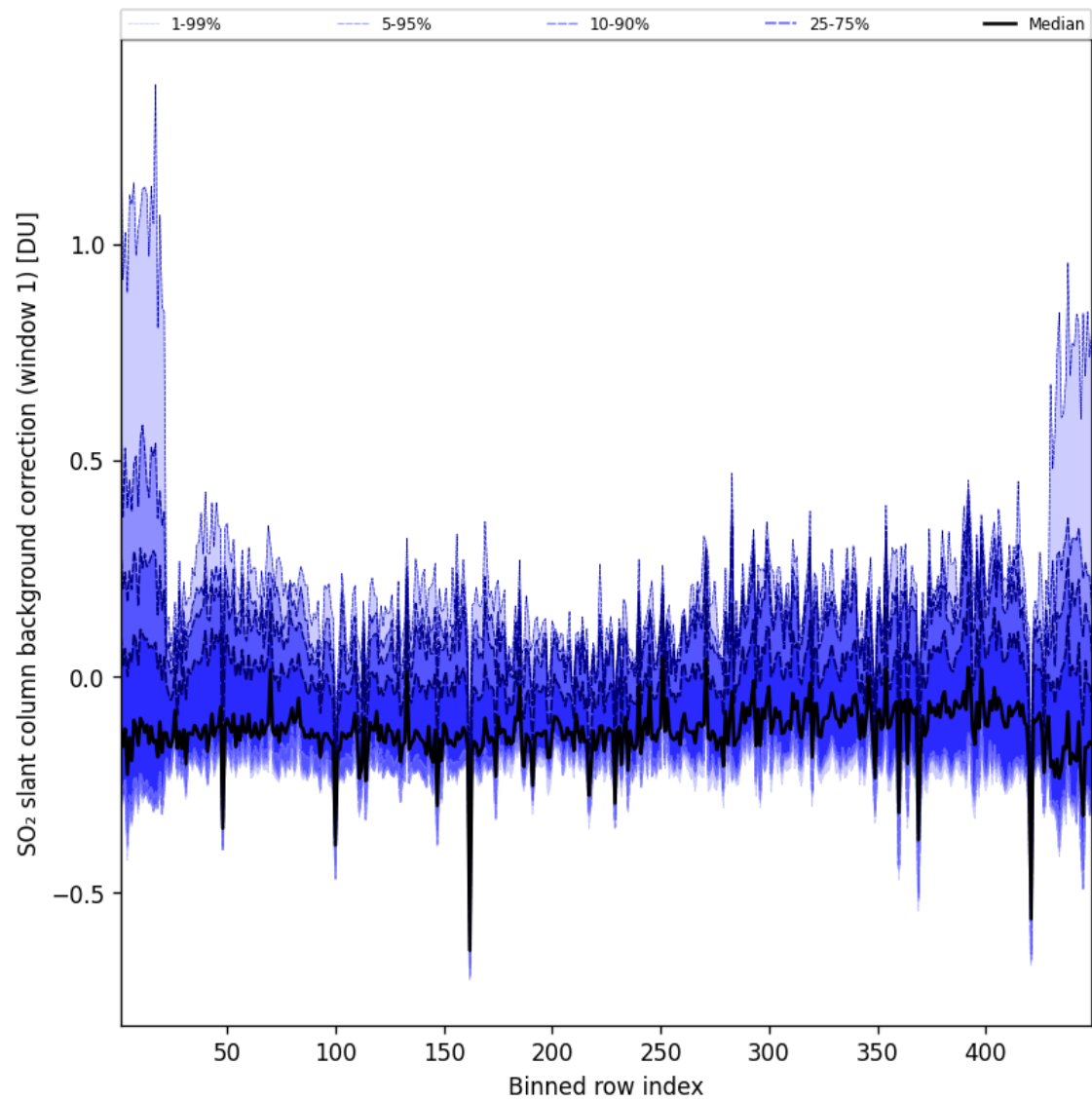


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-07-21 to 2025-07-22

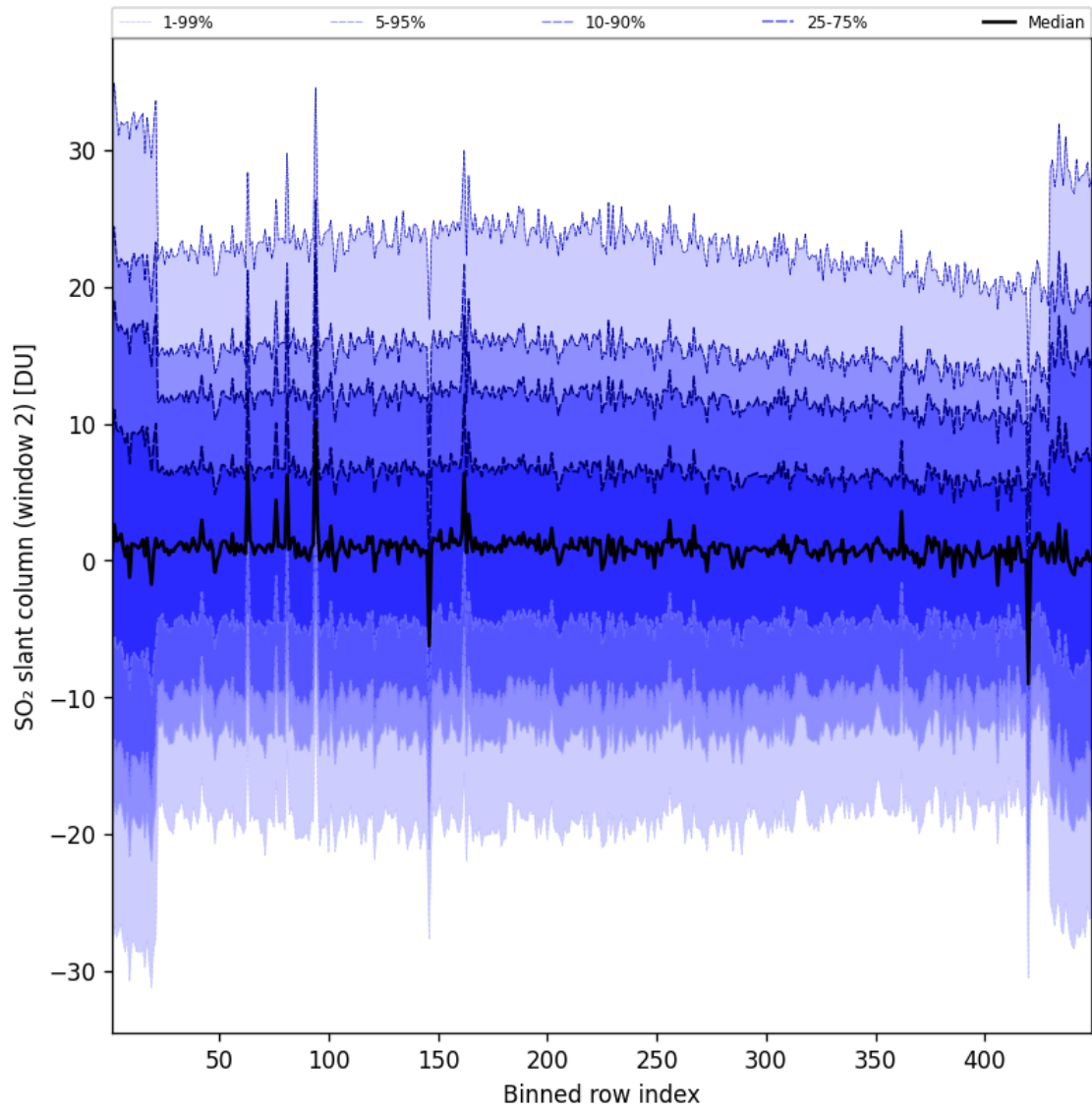


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-07-21 to 2025-07-22

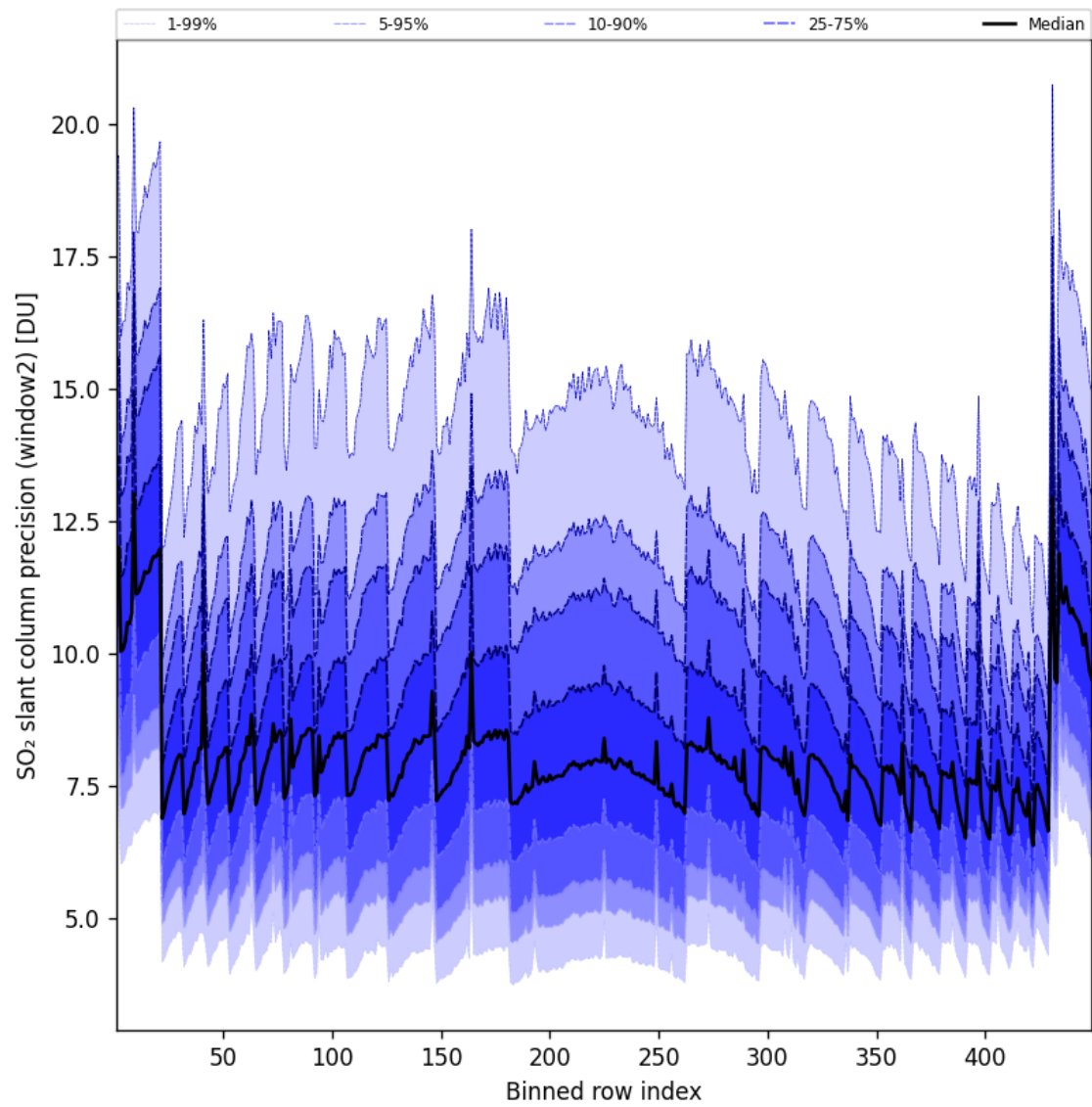


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-07-21 to 2025-07-22

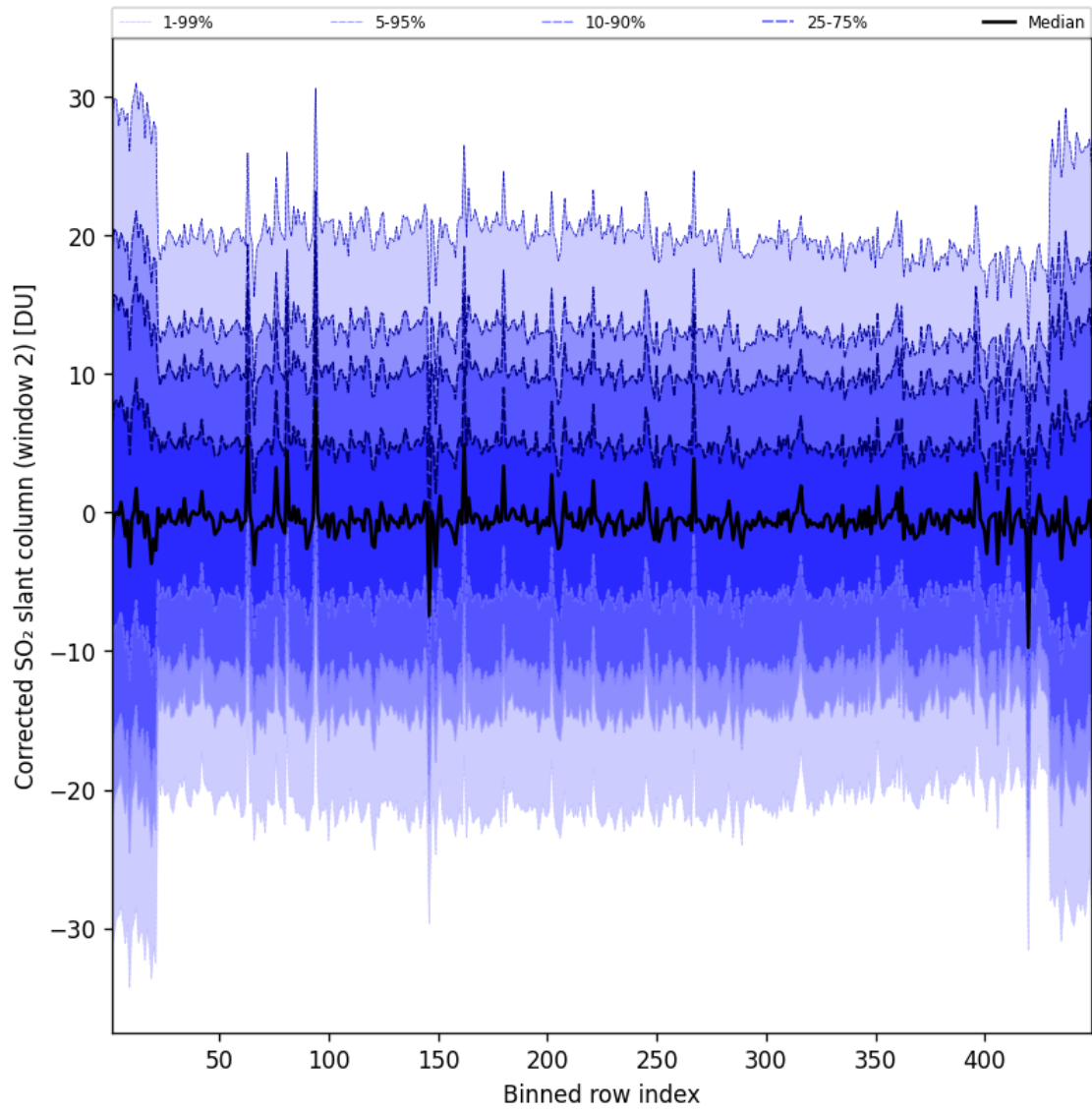


Figure 96: Along track statistics of "Corrected SO₂ slant column (window 2)" for 2025-07-21 to 2025-07-22

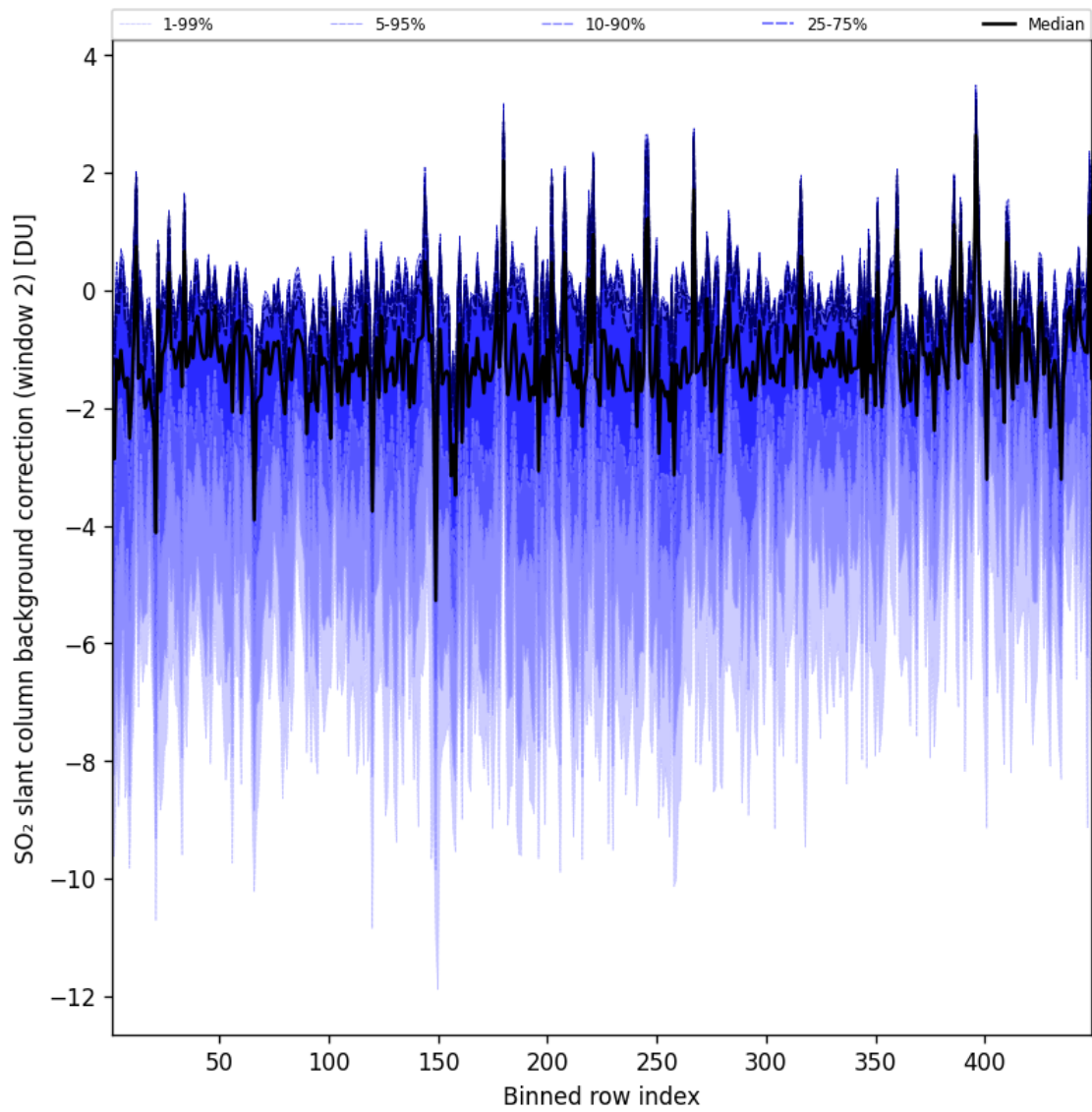


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-07-21 to 2025-07-22

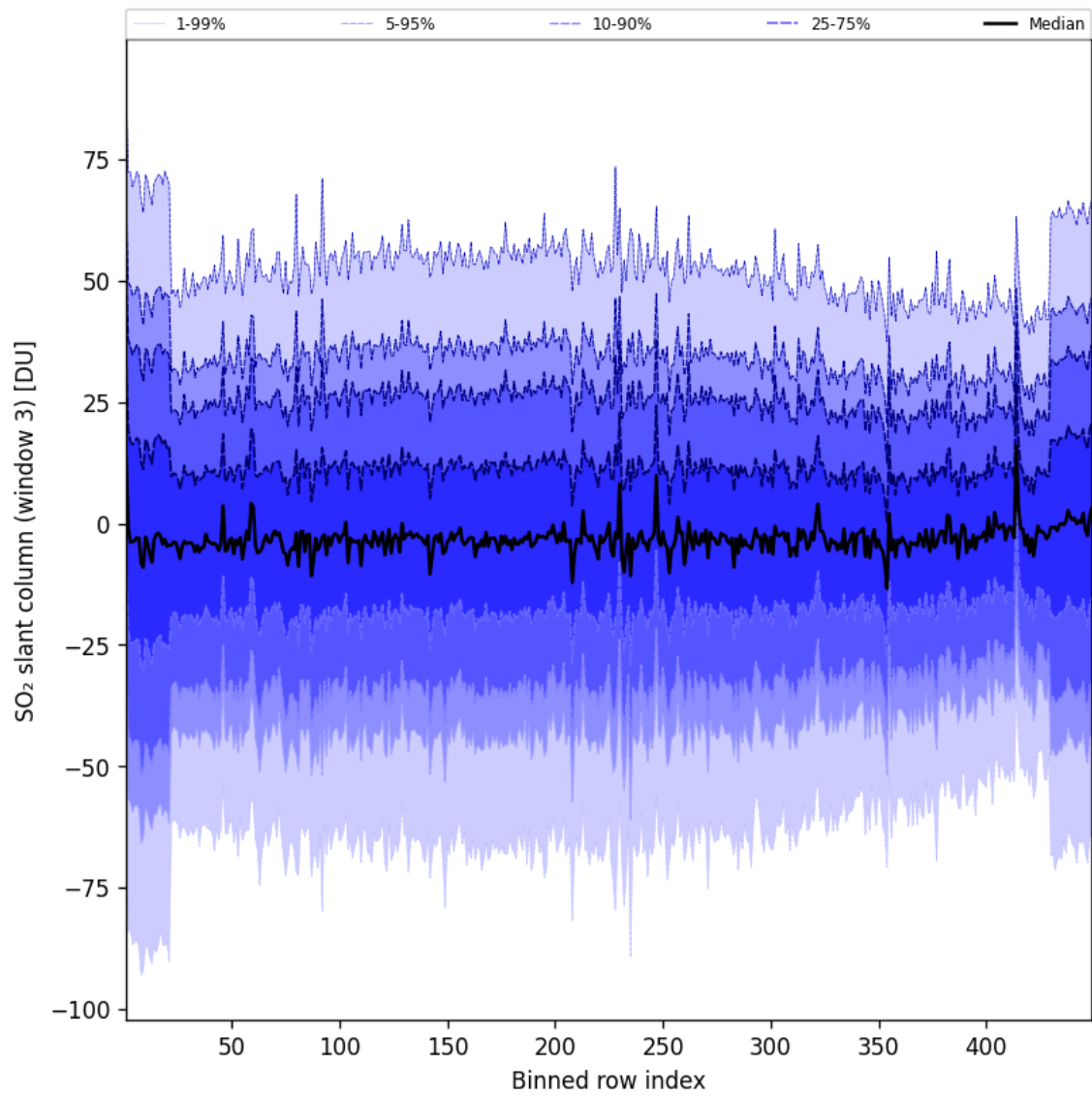


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-07-21 to 2025-07-22

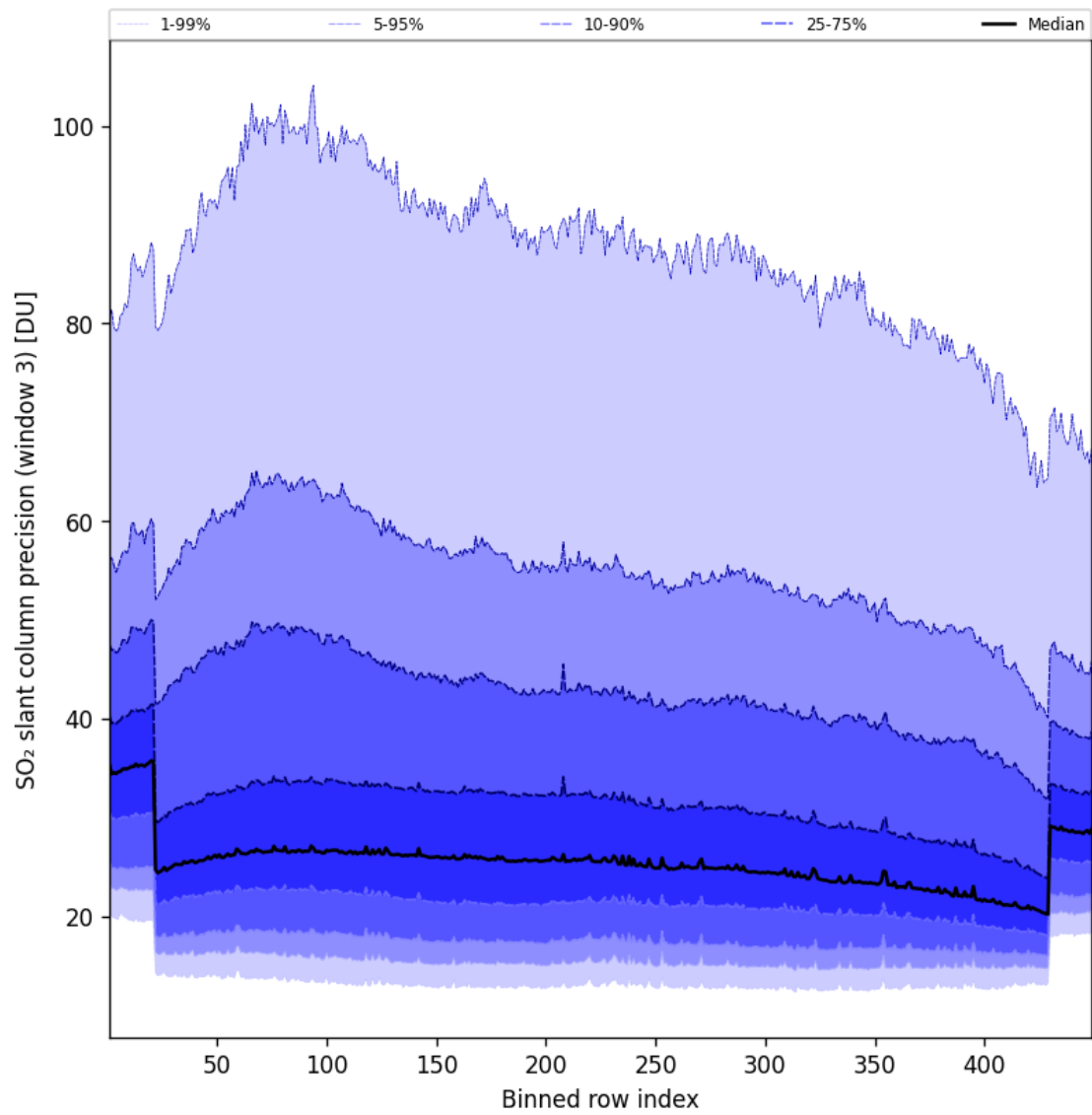


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-07-21 to 2025-07-22

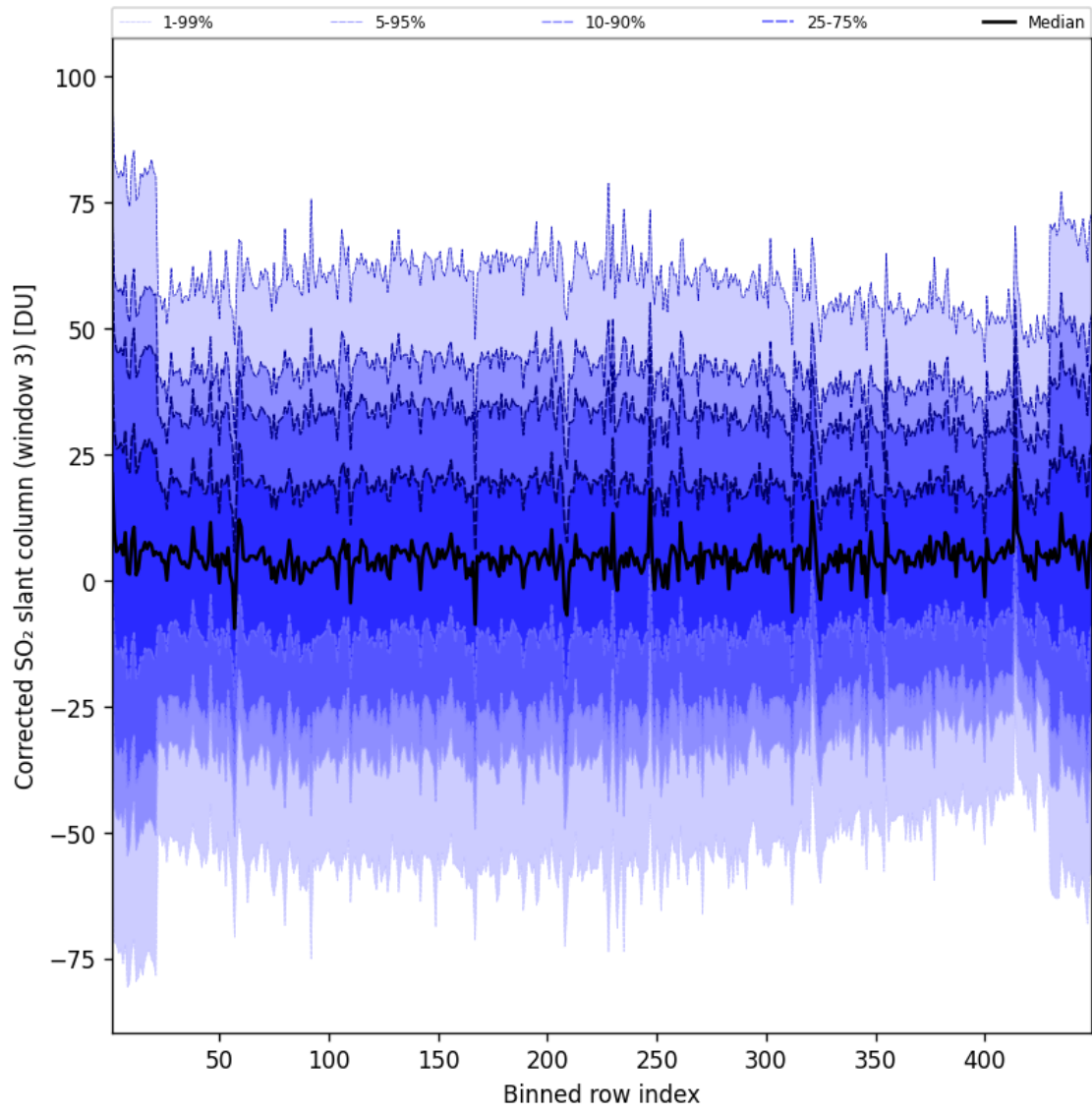


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-07-21 to 2025-07-22

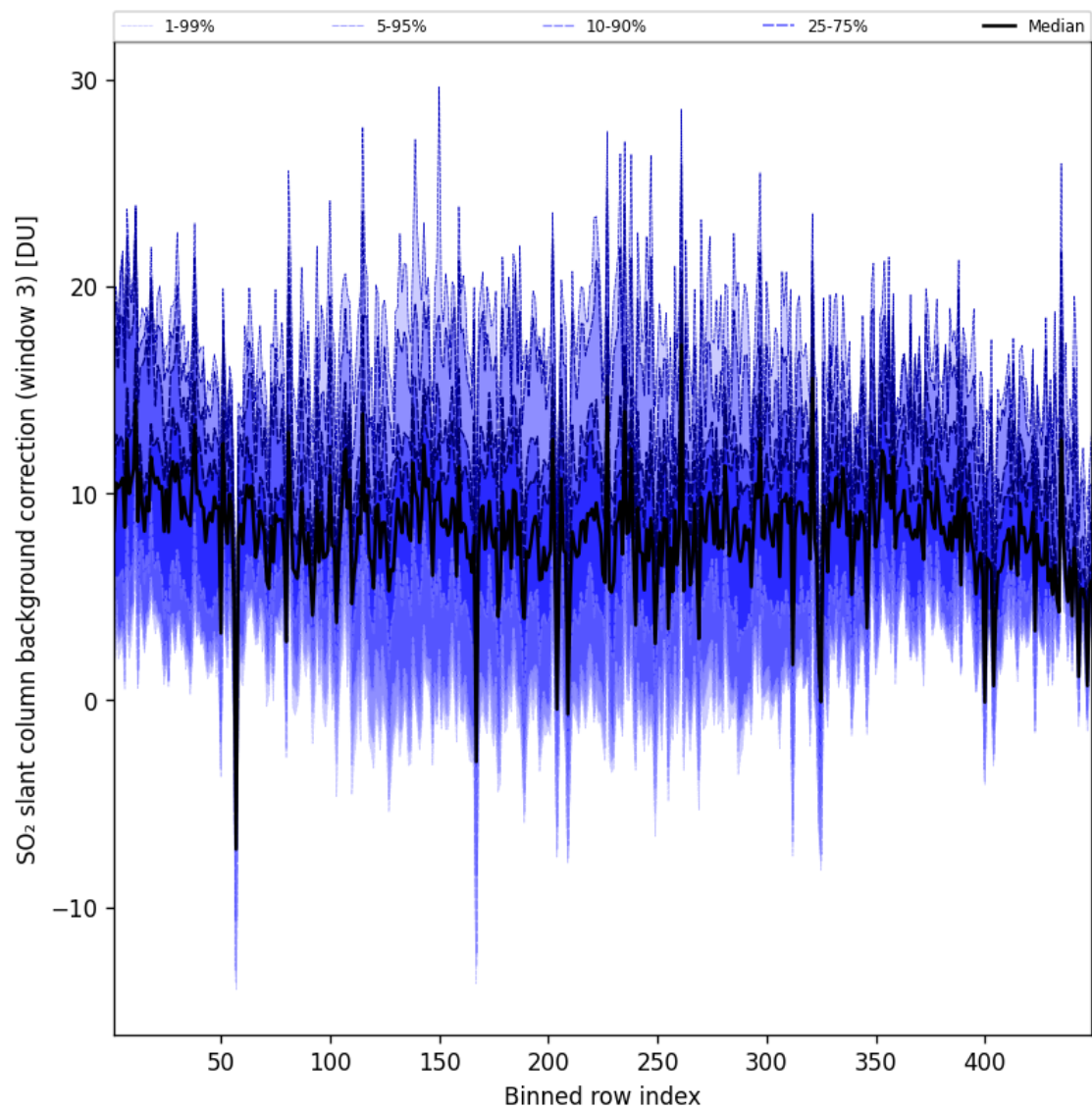


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-07-21 to 2025-07-22

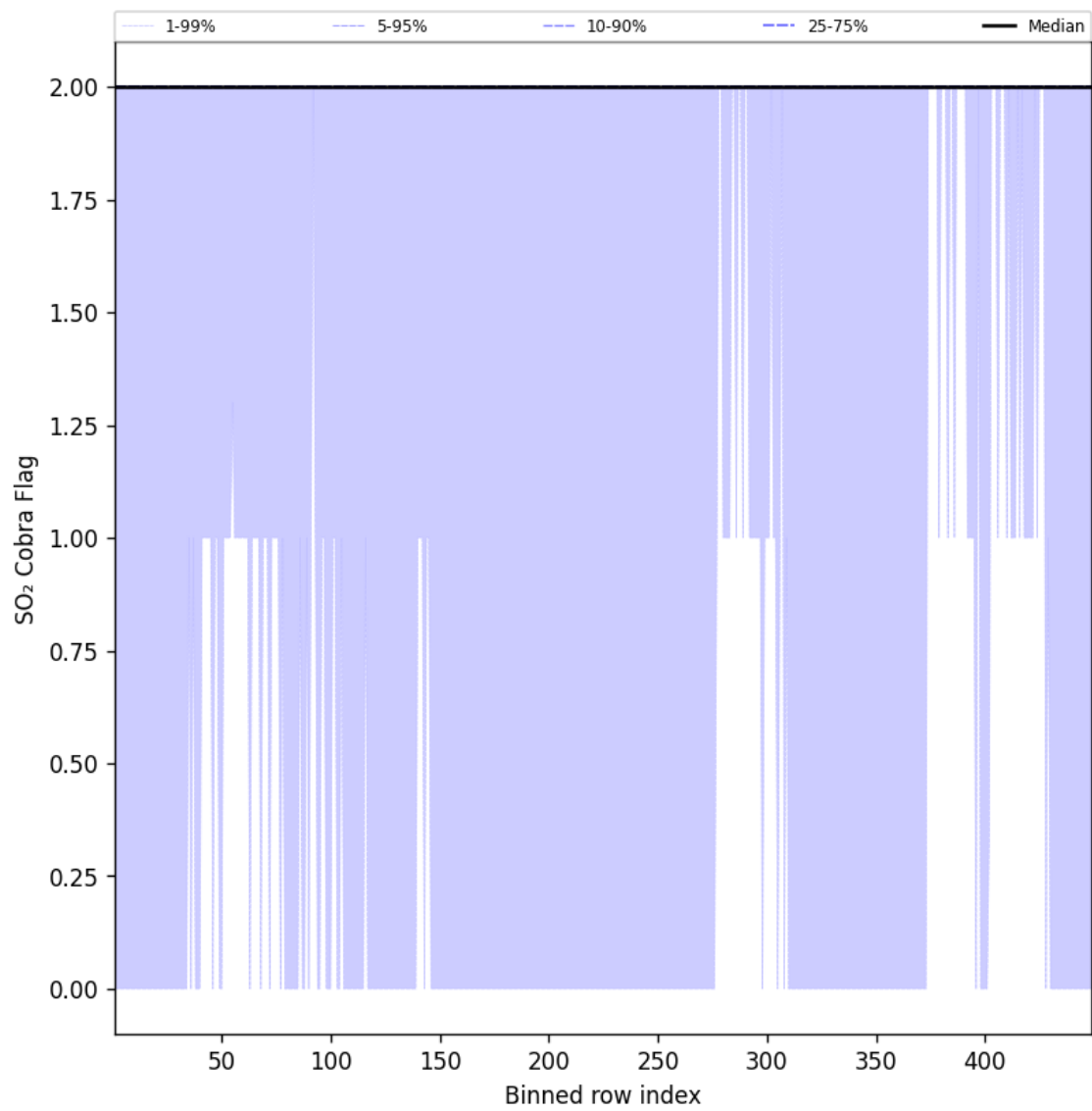


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-07-21 to 2025-07-22

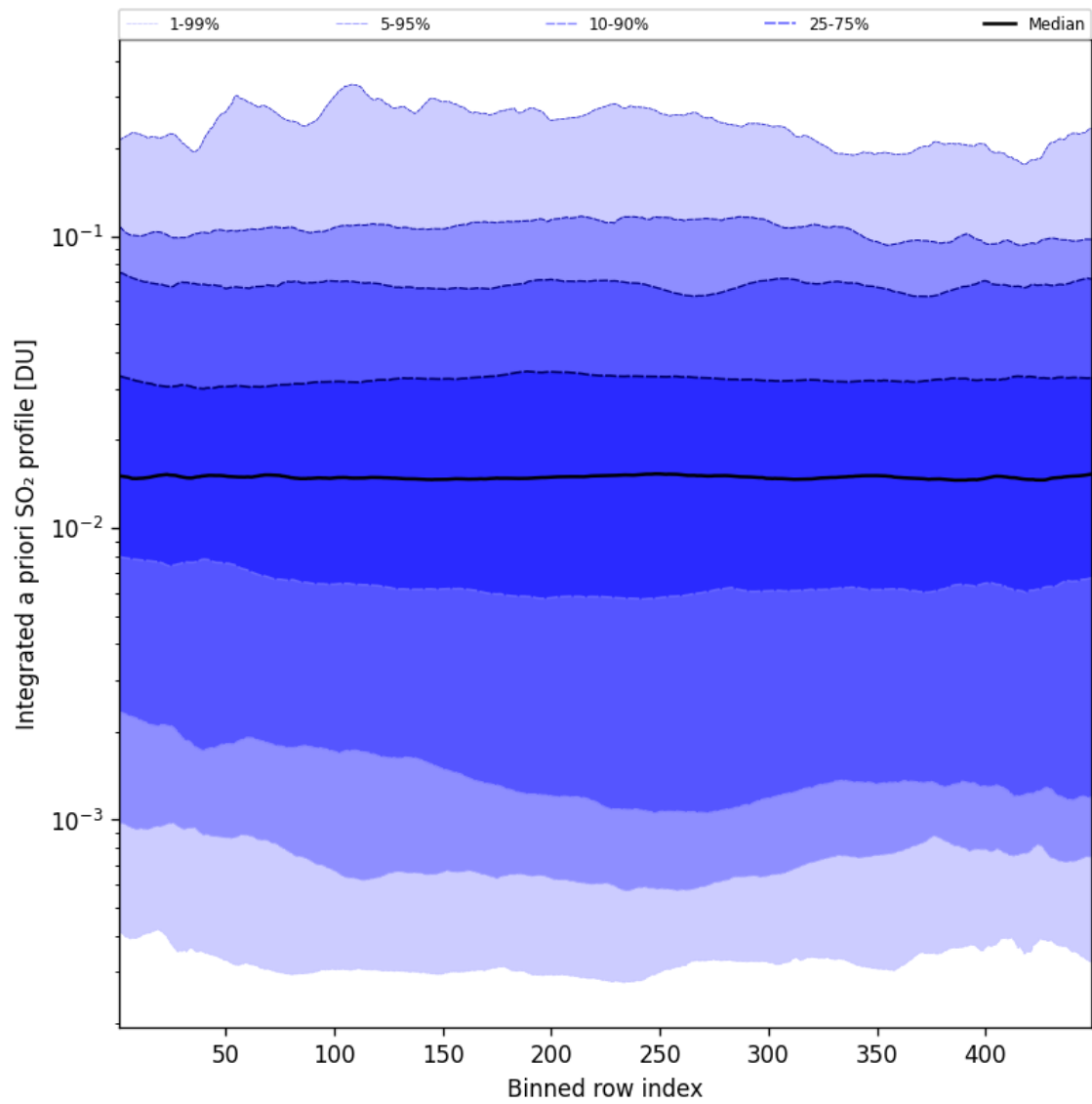


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-07-21 to 2025-07-22

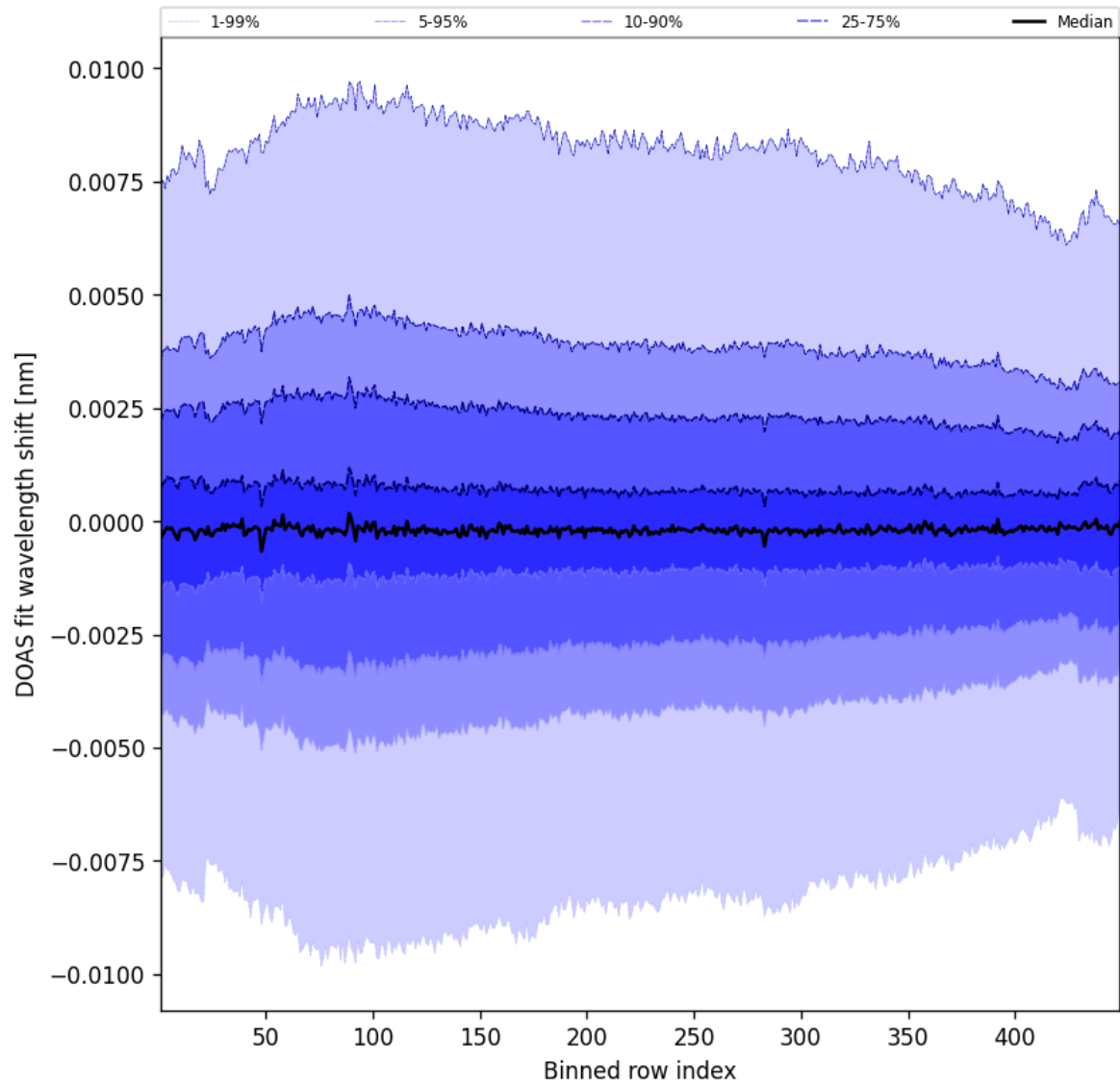


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-07-21 to 2025-07-22

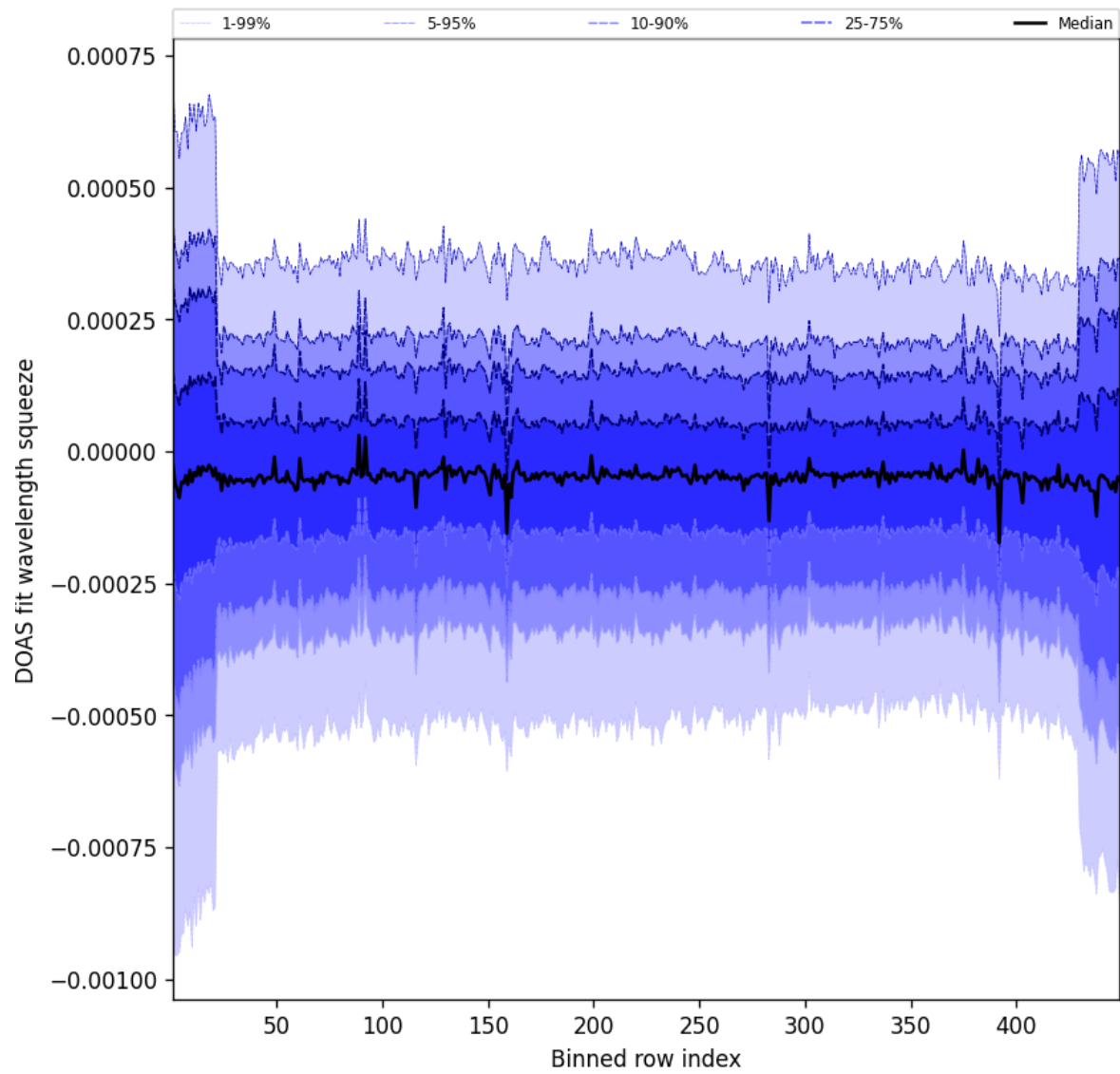


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-07-21 to 2025-07-22

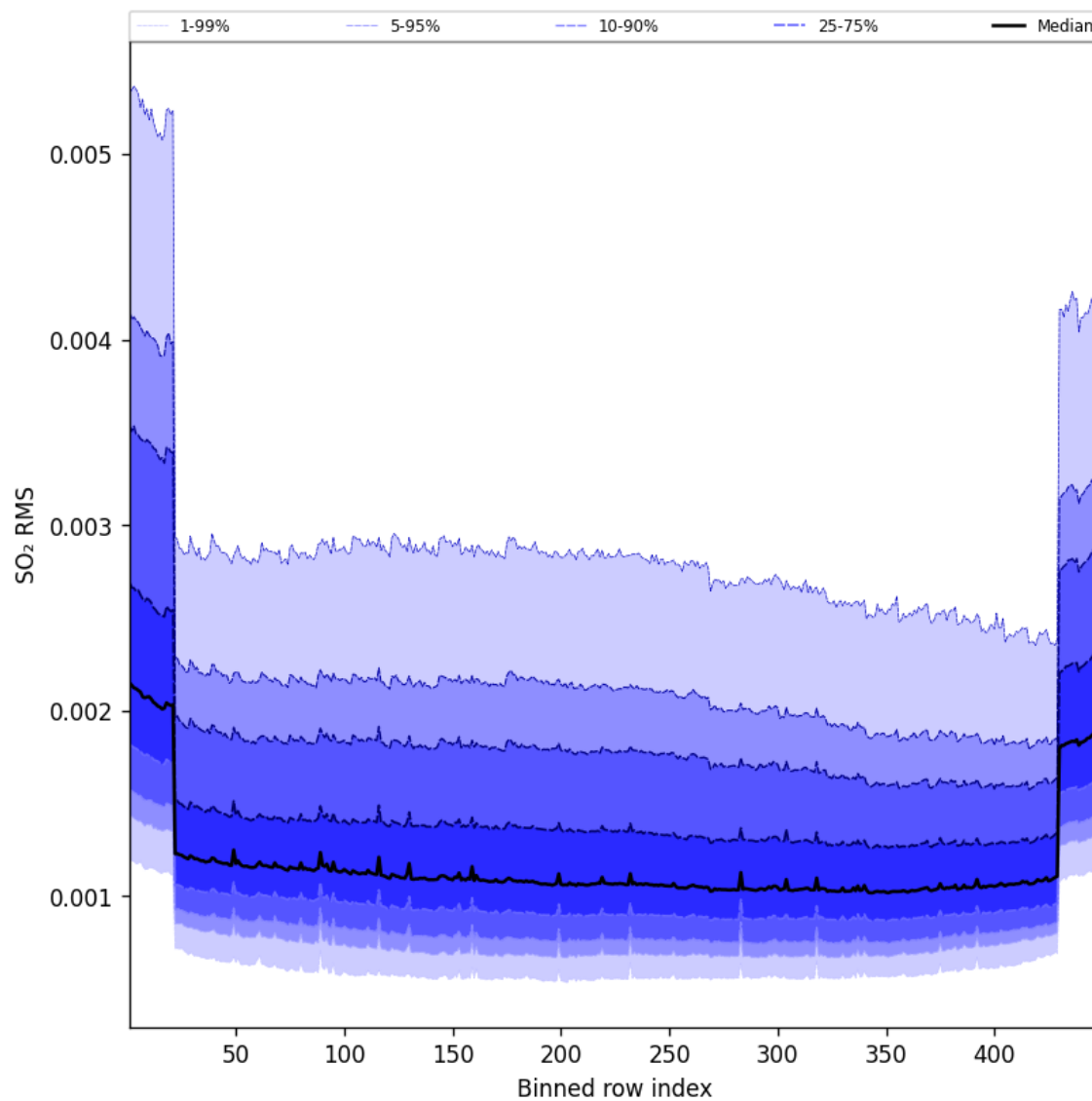


Figure 106: Along track statistics of “SO₂ RMS” for 2025-07-21 to 2025-07-22

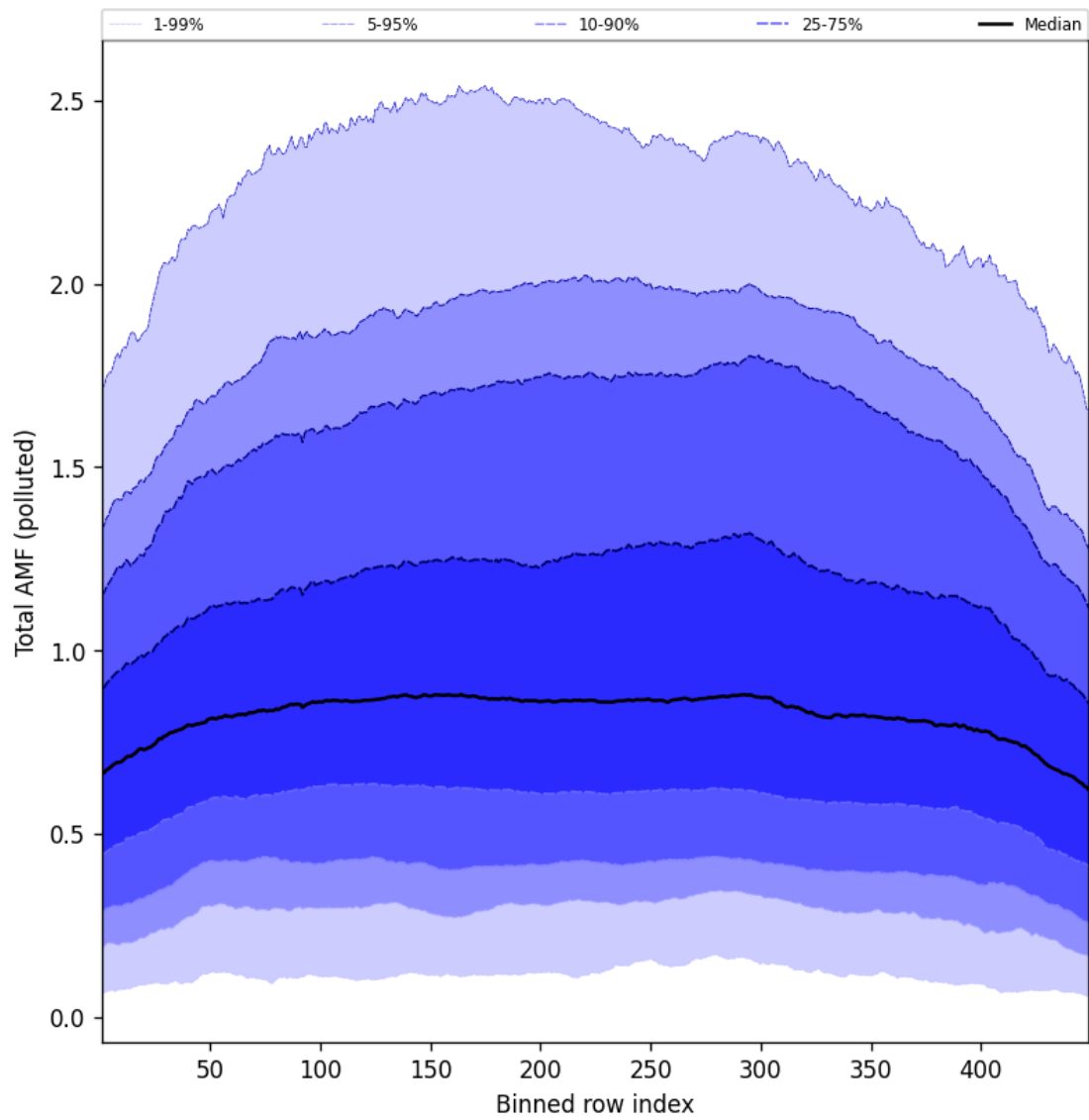


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-07-21 to 2025-07-22

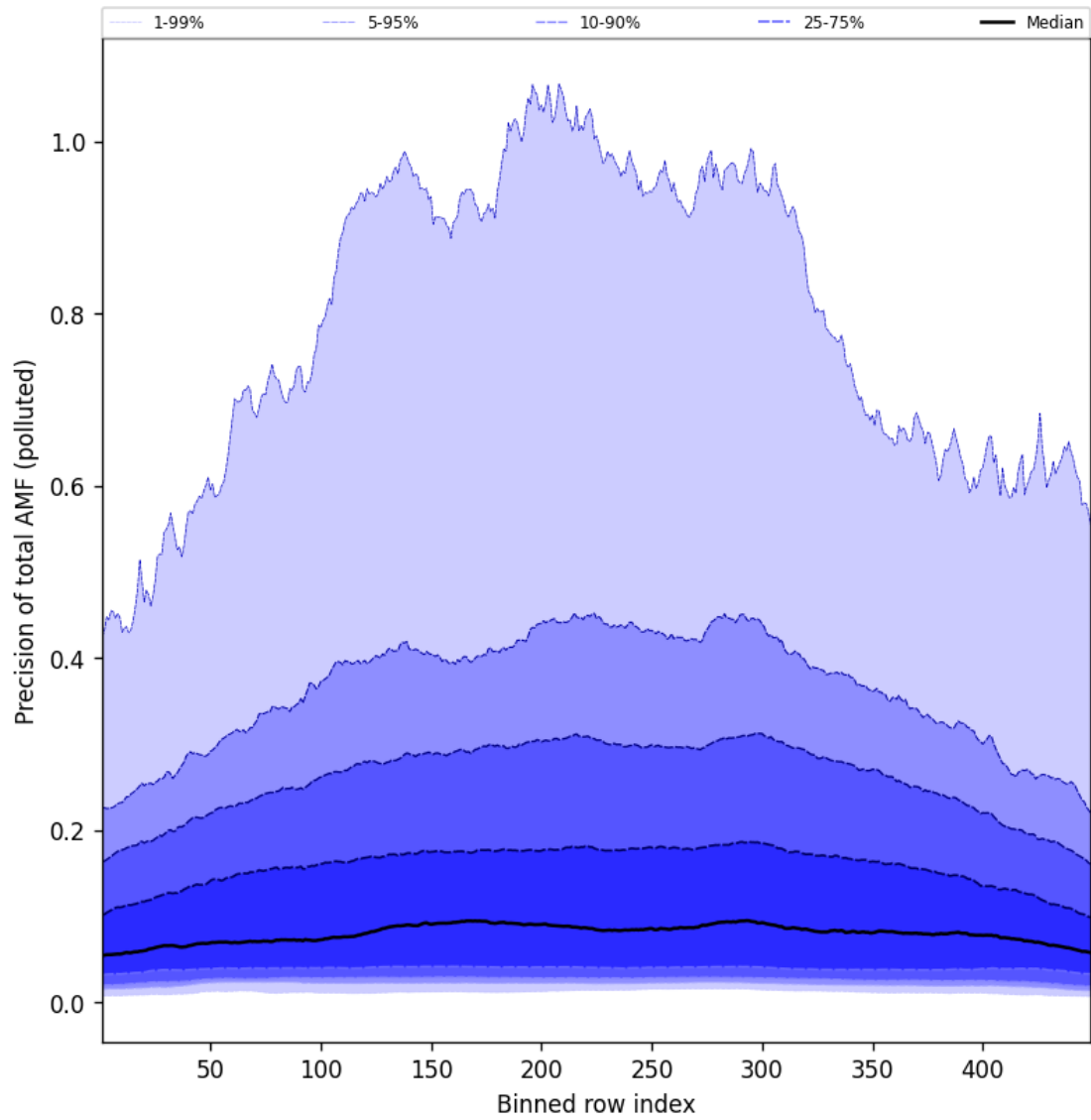


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-07-21 to 2025-07-22

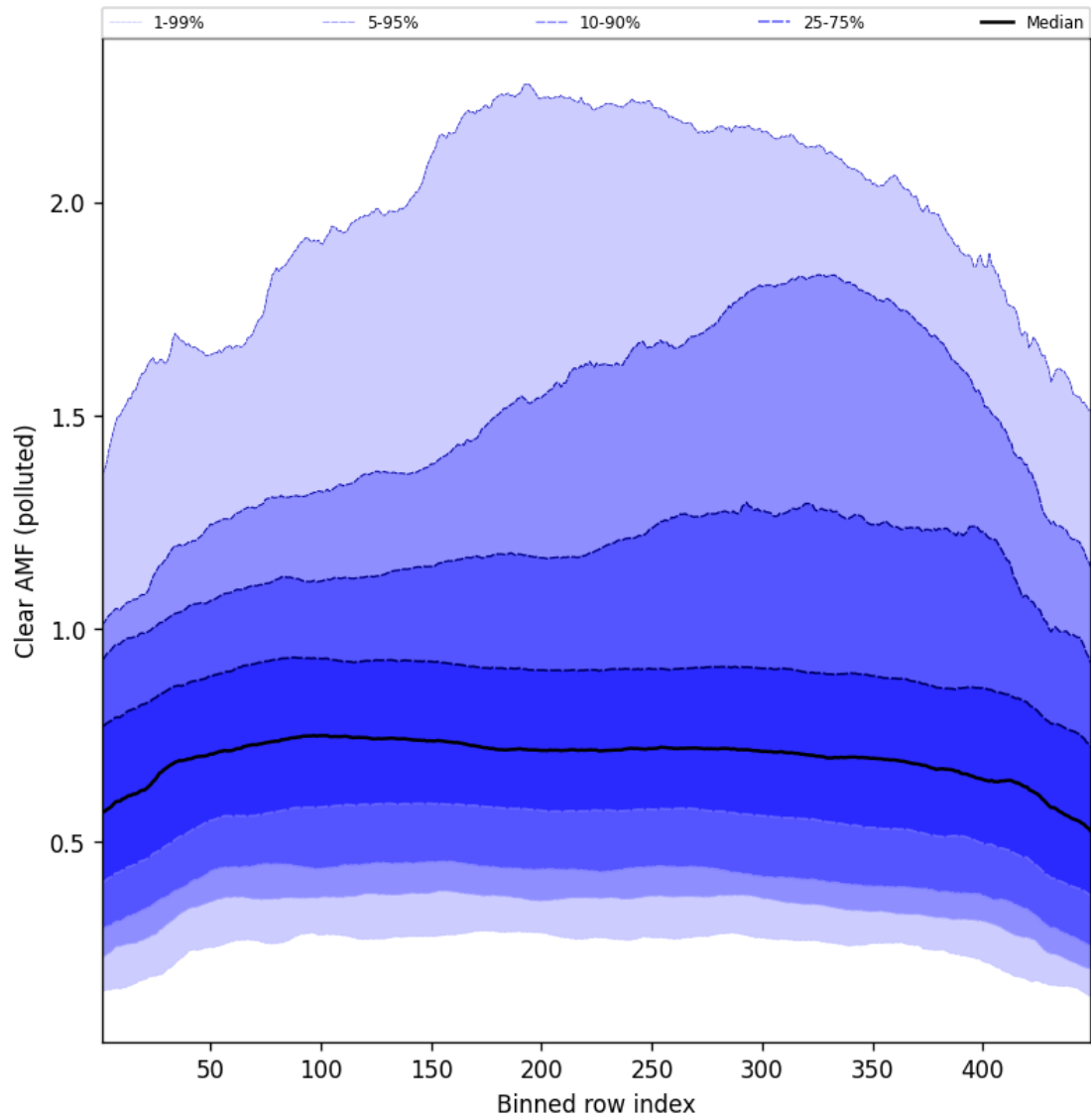


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-07-21 to 2025-07-22

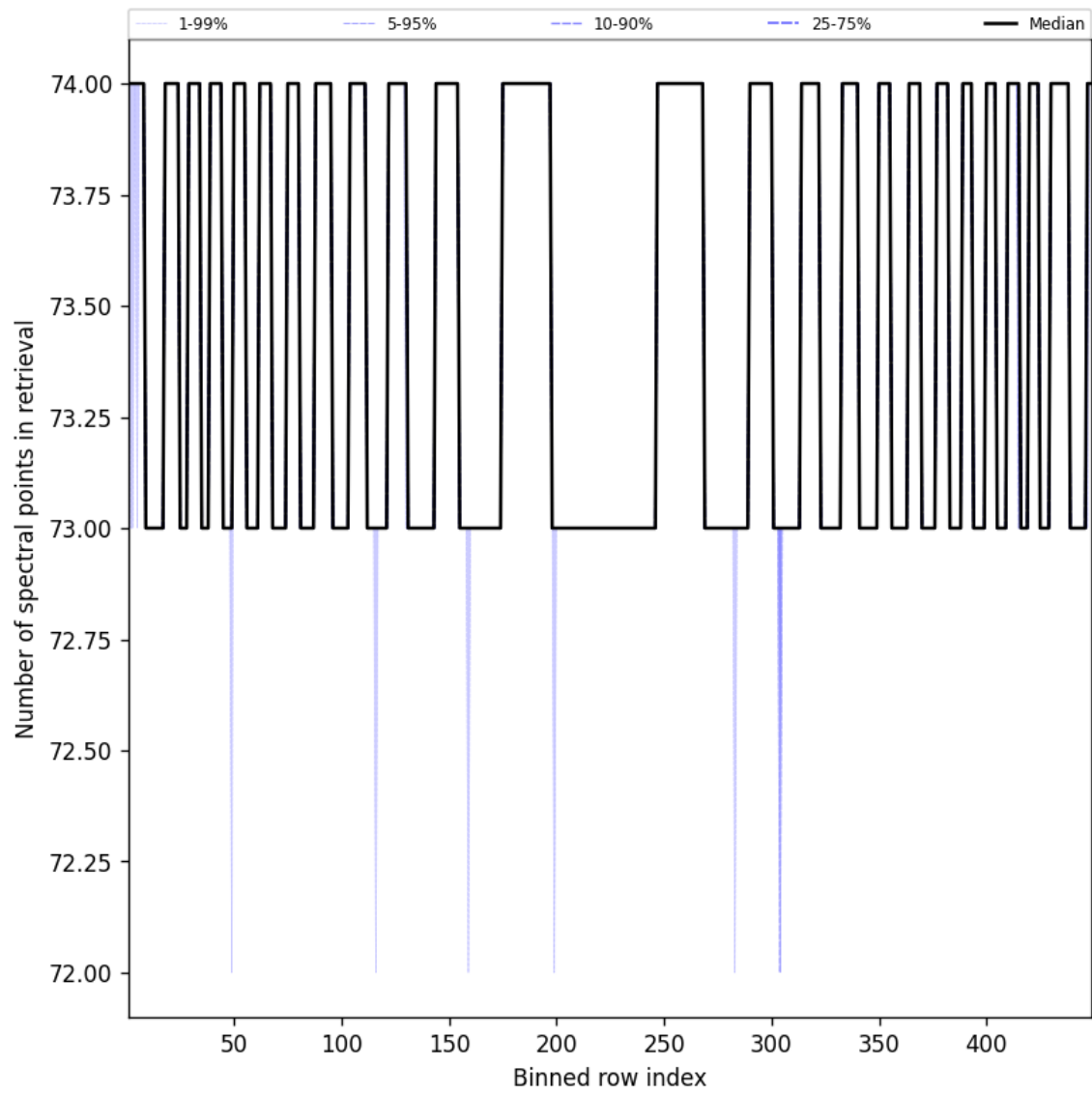


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-07-21 to 2025-07-22

10 Coincidence density

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

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