

PyCAMA report generated by tropl2-proc

tropl2-proc

2025-08-01 (03:34)

1 Short Introduction

1.1 The list of parameters

You may want to keep the list given in table 1 at hand when viewing the results.

2 Definitions

The averages shown here are *unweighed* averages:

$$\bar{x} = \frac{1}{N} \sum_{i=1}^N x_i \quad (1)$$

with N the number of observations in the dataset.

The spread of the measurements is indicated with the variance $V(x)$, or rather the standard deviation $\sigma(x) = \sqrt{V(x)}$.

$$V(x) = \frac{1}{N-1} \sum_{i=1}^N (x_i - \bar{x})^2 \quad (2)$$

We also report the more robust statistics median, minimum, maximum, various percentiles and inter quartile range.

The median m is the value of parameter x for which half of the observations of x is smaller than m :

$$P(x \leq m) = P(x \geq m) = \int_{-\infty}^m f(x) dx = \frac{1}{2} \quad (3)$$

with $f(x)$ the probability density function.

The median is a special case of a percentile. Instead of 1/2 in equation 3, other threshold values can be used. We report results for 1 %, 5 %, 10 %, 15.9 %, 25 %, 75 %, 84.1 %, 90 %, 95 % and 99 %. The inter quartile range is the difference between the 75 % and 25 % percentiles. Similarly the minimum and maximum values correspond to the 0 % and 100 % percentiles respectively.

For normally distributed parameters the mean and median are the same, while the $\mu \pm \sigma$ values and the 15.9 % and 84.1 % percentiles coincide.

To get a measure for the relation of one variable $x_{(k)}$ with another $x_{(l)}$, we calculate the covariance matrix C_{kl} .

$$C_{kl} = C(x_{(k)}, x_{(l)}) = \frac{1}{N-1} \sum_{i=1}^N (x_{(k),i} - \bar{x}_{(k)})(x_{(l),i} - \bar{x}_{(l)}) \quad (4)$$

Rather than a dimensionally dependent covariance, it is often easier to interpret a correlation matrix R_{kl} , a matrix of Pearson's r coefficients:

$$R_{kl} = R(x_{(k)}, x_{(l)}) = \frac{C_{kl}}{\sqrt{C_{kk}C_{ll}}} = \frac{C_{kl}}{\sqrt{V(x_k)V(x_l)}} \quad (5)$$

The diagonal elements of the covariance matrix are the variances of the elements, $V(x_{(k)}) = C_{kk}$ and obviously $R_{kk} = 1$.

Table 1: Parameterlist and basic statistics for the analysis

Variable	mean $\pm \sigma$	Count	Mode	IQR	Median	Minimum	Maximum
qa value [1]	0.664 ± 0.402	17417286	0.995	0.770	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.911 \pm 106.070) \times 10^{-2}$	17417286	0.294	0.450	1.051×10^{-2}	-91.8	2.291×10^3
sulfurdioxide total vertical column precision [DU]	0.489 ± 0.798	17417286	0.247	0.310	0.331	4.298×10^{-2}	2.112×10^3
sulfurdioxide slant column density corrected [DU]	$(1.836 \pm 37.900) \times 10^{-2}$	17417286	0.250	0.365	9.302×10^{-3}	-17.8	217
sulfurdioxide slant column density cobra [DU]	$(1.823 \pm 36.464) \times 10^{-2}$	17417286	0.250	0.365	9.302×10^{-3}	-17.8	135
sulfurdioxide slant column density cobra precision [DU]	0.294 ± 0.138	17417286	0.213	0.135	0.252	7.729×10^{-2}	75.7
sulfurdioxide slant column density window1 [DU]	0.120 ± 0.684	17417286	0.125	0.737	0.125	-73.1	112
sulfurdioxide slant column density window1 precision [DU]	0.294 ± 0.138	17417286	0.213	0.135	0.252	7.729×10^{-2}	75.7
sulfurdioxide slant column density corrected win1 [DU]	$(1.979 \pm 67.698) \times 10^{-2}$	17417286	-2.500×10^{-2}	0.723	-2.328×10^{-4}	-73.1	113
background so2 slant column offset window1 [DU]	-0.100 ± 0.151	17417286	-0.180	0.179	-0.127	-1.01	3.15
sulfurdioxide slant column density window2 [DU]	1.04 ± 9.16	17417286	0.750	11.4	0.872	-859	1.464×10^3
sulfurdioxide slant column density window2 precision [DU]	8.33 ± 2.45	17417286	7.43	2.74	7.98	2.11	1.109×10^3
sulfurdioxide slant column density corrected win2 [DU]	-0.637 ± 9.000	17417286	-0.750	11.3	-0.626	-862	1.462×10^3
background so2 slant column offset window2 [DU]	-1.68 ± 1.98	17417286	-0.250	2.05	-1.15	-19.0	5.17
sulfurdioxide slant column density window3 [DU]	-5.04 ± 24.34	17417286	-5.04	30.3	-4.77	-676	902
sulfurdioxide slant column density window3 precision [DU]	29.2 ± 14.2	17417286	22.5	10.9	25.5	9.05	582
sulfurdioxide slant column density corrected win3 [DU]	4.46 ± 24.02	17417286	5.04	30.0	4.62	-662	913
background so2 slant column offset window3 [DU]	9.50 ± 4.59	17417286	11.8	6.80	9.53	-11.4	35.0
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.22	17417286	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.116 \pm 5.880) \times 10^{-2}$	17417286	1.800×10^{-2}	2.344×10^{-2}	1.611×10^{-2}	1.246×10^{-4}	1.73
fitted radiance shift [nm]	$(-2.581 \pm 27.535) \times 10^{-4}$	17417286	-5.000×10^{-4}	1.882×10^{-3}	-2.668×10^{-4}	-6.144×10^{-2}	4.567×10^{-2}
fitted radiance squeeze [1]	$(-5.297 \pm 18.742) \times 10^{-5}$	17417286	-3.000×10^{-5}	2.168×10^{-4}	-4.603×10^{-5}	-1.579×10^{-2}	2.016×10^{-2}
fitted root mean square [1]	$(1.290 \pm 0.554) \times 10^{-3}$	17417286	9.750×10^{-4}	5.406×10^{-4}	1.134×10^{-3}	3.277×10^{-4}	0.117
sulfurdioxide total air mass factor polluted [1]	0.873 ± 0.446	17417286	0.660	0.519	0.790	5.000×10^{-2}	2.90
sulfurdioxide total air mass factor polluted precision [1]	0.117 ± 0.126	17417286	3.500×10^{-2}	0.116	7.476×10^{-2}	3.438×10^{-3}	2.30
sulfurdioxide clear air mass factor polluted [1]	0.736 ± 0.308	17417286	0.660	0.325	0.695	7.724×10^{-2}	2.95
number of spectral points in retrieval [1]	73.4 ± 0.5	17417286	73.0	1.000	73.0	52.0	74.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	1.000×10^{-2}	6.000×10^{-2}	0.130	0.230	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	-2.05	-0.826	-0.521	-0.356	-0.211	0.239	0.395	0.577	0.925	2.39
sulfurdioxide total vertical column precision [DU]	9.115×10^{-2}	0.125	0.155	0.185	0.225	0.534	0.693	0.896	1.32	2.89
sulfurdioxide slant column density corrected [DU]	-0.864	-0.493	-0.357	-0.266	-0.171	0.193	0.293	0.392	0.548	1.03
sulfurdioxide slant column density cobra [DU]	-0.864	-0.493	-0.357	-0.266	-0.171	0.193	0.293	0.392	0.548	1.03
sulfurdioxide slant column density cobra precision [DU]	0.136	0.165	0.181	0.193	0.208	0.343	0.400	0.455	0.544	0.796
sulfurdioxide slant column density window1 [DU]	-1.70	-0.926	-0.638	-0.446	-0.247	0.490	0.683	0.869	1.15	1.94
sulfurdioxide slant column density window1 precision [DU]	0.136	0.165	0.181	0.193	0.208	0.343	0.400	0.455	0.544	0.796
sulfurdioxide slant column density corrected win1 [DU]	-1.66	-0.972	-0.714	-0.540	-0.355	0.367	0.568	0.767	1.08	1.95
background so2 slant column offset window1 [DU]	-0.402	-0.279	-0.241	-0.220	-0.198	-1.894×10^{-2}	3.796×10^{-2}	8.668×10^{-2}	0.153	0.305
sulfurdioxide slant column density window2 [DU]	-20.3	-13.4	-10.1	-7.57	-4.77	6.65	9.61	12.3	16.1	24.2
sulfurdioxide slant column density window2 precision [DU]	4.29	5.21	5.78	6.23	6.77	9.51	10.4	11.3	12.6	15.5
sulfurdioxide slant column density corrected win2 [DU]	-22.4	-15.1	-11.7	-9.11	-6.27	5.00	7.81	10.4	13.8	21.2
background so2 slant column offset window2 [DU]	-8.52	-5.98	-4.20	-3.23	-2.43	-0.386	-0.149	6.816×10^{-2}	0.395	1.46
sulfurdioxide slant column density window3 [DU]	-67.0	-45.4	-35.2	-27.9	-20.0	10.3	18.0	25.0	34.3	53.3
sulfurdioxide slant column density window3 precision [DU]	13.3	15.8	17.9	19.5	21.3	32.1	37.0	43.5	56.1	89.4
sulfurdioxide slant column density corrected win3 [DU]	-56.1	-35.2	-25.3	-18.1	-10.4	19.6	27.2	34.1	43.4	62.5
background so2 slant column offset window3 [DU]	0.101	2.48	3.68	4.62	5.90	12.7	14.1	15.3	17.0	20.7
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]	2.681×10^{-4}	7.692×10^{-4}	1.579×10^{-3}	3.683×10^{-3}	7.386×10^{-3}	3.083×10^{-2}	4.711×10^{-2}	6.634×10^{-2}	0.108	0.276
fitted radiance shift [nm]	-8.496×10^{-3}	-4.331×10^{-3}	-2.849×10^{-3}	-1.978×10^{-3}	-1.225×10^{-3}	6.565×10^{-4}	1.419×10^{-3}	2.339×10^{-3}	3.909×10^{-3}	8.322×10^{-3}
fitted radiance squeeze [1]	-5.535×10^{-4}	-3.595×10^{-4}	-2.762×10^{-4}	-2.187×10^{-4}	-1.580×10^{-4}	5.874×10^{-5}	1.113×10^{-4}	1.599×10^{-4}	2.294×10^{-4}	3.986×10^{-4}
fitted root mean square [1]	5.794×10^{-4}	7.223×10^{-4}	8.076×10^{-4}	8.706×10^{-4}	9.436×10^{-4}	1.484×10^{-3}	1.730×10^{-3}	1.971×10^{-3}	2.336×10^{-3}	3.280×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.114	0.275	0.385	0.474	0.574	1.09	1.30	1.49	1.75	2.29
sulfurdioxide total air mass factor polluted precision [1]	1.150×10^{-2}	2.035×10^{-2}	2.681×10^{-2}	3.160×10^{-2}	3.864×10^{-2}	0.154	0.199	0.245	0.335	0.647
sulfurdioxide clear air mass factor polluted [1]	0.241	0.340	0.410	0.468	0.544	0.869	0.967	1.06	1.23	1.98
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]	0.631 ± 0.411	11546900	0.790	1.000	0.0	1.000	0.210	1.000
sulfurdioxide total vertical column [DU]	$(1.768 \pm 104.085) \times 10^{-2}$	11546900	0.406	8.364×10^{-3}	-59.7	2.291×10^3	-0.193	0.213
sulfurdioxide total vertical column precision [DU]	0.437 ± 0.849	11546900	0.258	0.298	4.298×10^{-2}	2.112×10^3	0.208	0.466
sulfurdioxide slant column density corrected [DU]	$(1.291 \pm 31.713) \times 10^{-2}$	11546900	0.339	7.539×10^{-3}	-6.72	210	-0.161	0.178
sulfurdioxide slant column density cobra [DU]	$(1.290 \pm 31.107) \times 10^{-2}$	11546900	0.339	7.539×10^{-3}	-6.72	15.6	-0.161	0.178
sulfurdioxide slant column density cobra precision [DU]	0.267 ± 0.107	11546900	0.105	0.236	7.729×10^{-2}	14.8	0.200	0.305
sulfurdioxide slant column density window1 [DU]	0.114 ± 0.606	11546900	0.693	0.118	-11.6	26.2	-0.232	0.461
sulfurdioxide slant column density window1 precision [DU]	0.267 ± 0.107	11546900	0.105	0.236	7.729×10^{-2}	14.8	0.200	0.305
sulfurdioxide slant column density corrected win1 [DU]	$(9.774 \pm 594.258) \times 10^{-3}$	11546900	0.676	-3.780×10^{-3}	-11.6	26.3	-0.337	0.339
background so2 slant column offset window1 [DU]	-0.104 ± 0.138	11546900	0.188	-0.123	-0.984	2.55	-0.201	-1.283×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.584 ± 8.500	11546900	10.8	0.538	-74.7	1.464×10^3	-4.86	5.97
sulfurdioxide slant column density window2 precision [DU]	7.96 ± 2.20	11546900	2.50	7.64	2.11	426	6.51	9.01
sulfurdioxide slant column density corrected win2 [DU]	-0.597 ± 8.450	11546900	10.8	-0.578	-77.9	1.462×10^3	-5.97	4.79
background so2 slant column offset window2 [DU]	-1.18 ± 1.30	11546900	1.75	-0.947	-8.24	5.17	-2.03	-0.274
sulfurdioxide slant column density window3 [DU]	-4.26 ± 23.26	11546900	28.9	-4.15	-298	711	-18.6	10.3
sulfurdioxide slant column density window3 precision [DU]	28.2 ± 14.6	11546900	10.3	24.1	9.05	459	20.4	30.7
sulfurdioxide slant column density corrected win3 [DU]	4.34 ± 22.93	11546900	28.7	4.49	-291	712	-9.84	18.8
background so2 slant column offset window3 [DU]	8.60 ± 4.30	11546900	7.15	8.88	-8.32	23.0	4.96	12.1
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	11546900	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.270 \pm 6.523) \times 10^{-2}$	11546900	2.786×10^{-2}	1.340×10^{-2}	1.246×10^{-4}	1.73	4.114×10^{-3}	3.197×10^{-2}
fitted radiance shift [nm]	$(-8.925 \pm 285.652) \times 10^{-5}$	11546900	1.835×10^{-3}	-1.320×10^{-4}	-4.468×10^{-2}	4.567×10^{-2}	-1.025×10^{-3}	8.106×10^{-4}
fitted radiance squeeze [1]	$(-7.785 \pm 17.272) \times 10^{-5}$	11546900	2.098×10^{-4}	-6.612×10^{-5}	-6.787×10^{-3}	2.016×10^{-2}	-1.766×10^{-4}	3.320×10^{-5}
fitted root mean square [1]	$(1.194 \pm 0.448) \times 10^{-3}$	11546900	4.543×10^{-4}	1.078×10^{-3}	3.291×10^{-4}	3.255×10^{-2}	9.100×10^{-4}	1.364×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.907 ± 0.479	11546900	0.572	0.815	5.000×10^{-2}	2.90	0.577	1.15
sulfurdioxide total air mass factor polluted precision [1]	0.132 ± 0.143	11546900	0.131	8.673×10^{-2}	3.486×10^{-3}	2.30	4.126×10^{-2}	0.172
sulfurdioxide clear air mass factor polluted [1]	0.763 ± 0.349	11546900	0.377	0.715	7.724×10^{-2}	2.95	0.533	0.910
number of spectral points in retrieval [1]	73.5 ± 0.5	11546900	1.000	73.0	52.0	74.0	73.0	74.0

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

Variable	mean $\pm \sigma$	Count	IQR	Median	Minimum	Maximum	25 % percentile	75 % percentile
qa value [1]	0.729 ± 0.376	5870386	0.630	1.000	0.0	1.000	0.370	1.000
sulfurdioxide total vertical column [DU]	$(5.159 \pm 109.834) \times 10^{-2}$	5870386	0.557	1.612×10^{-2}	-91.8	358	-0.255	0.302
sulfurdioxide total vertical column precision [DU]	0.591 ± 0.675	5870386	0.386	0.411	5.242×10^{-2}	168	0.279	0.665
sulfurdioxide slant column density corrected [DU]	$(2.907 \pm 47.769) \times 10^{-2}$	5870386	0.426	1.359×10^{-2}	-17.8	217	-0.196	0.229
sulfurdioxide slant column density cobra [DU]	$(2.873 \pm 45.167) \times 10^{-2}$	5870386	0.426	1.359×10^{-2}	-17.8	135	-0.196	0.229
sulfurdioxide slant column density cobra precision [DU]	0.347 ± 0.173	5870386	0.187	0.303	9.524×10^{-2}	75.7	0.232	0.419
sulfurdioxide slant column density window1 [DU]	0.133 ± 0.815	5870386	0.837	0.139	-73.1	112	-0.281	0.555
sulfurdioxide slant column density window1 precision [DU]	0.347 ± 0.173	5870386	0.187	0.303	9.524×10^{-2}	75.7	0.232	0.419
sulfurdioxide slant column density corrected win1 [DU]	$(3.948 \pm 81.520) \times 10^{-2}$	5870386	0.832	8.237×10^{-3}	-73.1	113	-0.398	0.433
background so2 slant column offset window1 [DU]	$(-9.384 \pm 17.419) \times 10^{-2}$	5870386	0.156	-0.130	-1.01	3.15	-0.191	-3.499×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.94 ± 10.27	5870386	12.7	1.64	-859	1.169×10^3	-4.58	8.13
sulfurdioxide slant column density window2 precision [DU]	9.07 ± 2.74	5870386	2.94	8.73	2.59	1.109×10^3	7.42	10.4
sulfurdioxide slant column density corrected win2 [DU]	-0.718 ± 9.995	5870386	12.4	-0.735	-862	1.166×10^3	-6.92	5.46
background so2 slant column offset window2 [DU]	-2.66 ± 2.62	5870386	3.62	-1.69	-19.0	4.72	-4.31	-0.685
sulfurdioxide slant column density window3 [DU]	-6.56 ± 26.26	5870386	33.2	-6.16	-676	902	-22.9	10.3
sulfurdioxide slant column density window3 precision [DU]	31.2 ± 13.2	5870386	10.4	28.1	9.86	582	23.8	34.1
sulfurdioxide slant column density corrected win3 [DU]	4.70 ± 26.01	5870386	32.9	4.90	-662	913	-11.6	21.3
background so2 slant column offset window3 [DU]	11.3 ± 4.6	5870386	6.67	10.4	-11.4	35.0	7.91	14.6
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.26	5870386	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.813 \pm 4.331) \times 10^{-2}$	5870386	1.720×10^{-2}	1.859×10^{-2}	1.244×10^{-3}	1.31	1.240×10^{-2}	2.959×10^{-2}
fitted radiance shift [nm]	$(-5.901 \pm 25.057) \times 10^{-4}$	5870386	1.891×10^{-3}	-5.444×10^{-4}	-6.144×10^{-2}	4.328×10^{-2}	-1.569×10^{-3}	3.226×10^{-4}
fitted radiance squeeze [1]	$(-4.032 \pm 204.772) \times 10^{-6}$	5870386	2.250×10^{-4}	-3.035×10^{-6}	-1.579×10^{-2}	1.953×10^{-2}	-1.154×10^{-4}	1.096×10^{-4}
fitted root mean square [1]	$(1.478 \pm 0.680) \times 10^{-3}$	5870386	7.222×10^{-4}	1.276×10^{-3}	3.277×10^{-4}	0.117	1.032×10^{-3}	1.754×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.808 ± 0.366	5870386	0.426	0.751	5.000×10^{-2}	2.62	0.570	0.996
sulfurdioxide total air mass factor polluted precision [1]	$(8.842 \pm 7.619) \times 10^{-2}$	5870386	8.538×10^{-2}	5.847×10^{-2}	3.438×10^{-3}	1.39	3.522×10^{-2}	0.121
sulfurdioxide clear air mass factor polluted [1]	0.682 ± 0.193	5870386	0.236	0.668	8.131×10^{-2}	1.49	0.560	0.796
number of spectral points in retrieval [1]	73.4 ± 0.5	5870386	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]	0.653 ± 0.399	11399650	0.770	1.000	0.0	1.000	0.230	1.000
sulfurdioxide total vertical column [DU]	$(3.175 \pm 115.209) \times 10^{-2}$	11399650	0.463	1.152×10^{-2}	-91.8	2.291×10^3	-0.216	0.246
sulfurdioxide total vertical column precision [DU]	0.500 ± 0.892	11399650	0.316	0.334	4.671×10^{-2}	2.112×10^3	0.231	0.547
sulfurdioxide slant column density corrected [DU]	$(2.005 \pm 39.398) \times 10^{-2}$	11399650	0.367	9.821×10^{-3}	-17.8	217	-0.172	0.195
sulfurdioxide slant column density cobra [DU]	$(1.990 \pm 37.839) \times 10^{-2}$	11399650	0.367	9.821×10^{-3}	-17.8	135	-0.172	0.195
sulfurdioxide slant column density cobra precision [DU]	0.299 ± 0.148	11399650	0.153	0.252	7.729×10^{-2}	75.7	0.205	0.358
sulfurdioxide slant column density window1 [DU]	0.119 ± 0.703	11399650	0.742	0.129	-73.1	112	-0.248	0.494
sulfurdioxide slant column density window1 precision [DU]	0.299 ± 0.148	11399650	0.153	0.252	7.729×10^{-2}	75.7	0.205	0.358
sulfurdioxide slant column density corrected win1 [DU]	$(2.374 \pm 69.636) \times 10^{-2}$	11399650	0.729	2.798×10^{-3}	-73.1	113	-0.355	0.373
background so2 slant column offset window1 [DU]	$(-9.485 \pm 16.063) \times 10^{-2}$	11399650	0.192	-0.128	-1.01	2.76	-0.199	-6.591×10^{-3}
sulfurdioxide slant column density window2 [DU]	1.24 ± 9.12	11399650	11.4	1.00	-859	1.464×10^3	-4.58	6.78
sulfurdioxide slant column density window2 precision [DU]	8.21 ± 2.30	11399650	2.69	7.87	2.11	525	6.69	9.38
sulfurdioxide slant column density corrected win2 [DU]	-0.615 ± 8.912	11399650	11.2	-0.608	-862	1.462×10^3	-6.20	4.97
background so2 slant column offset window2 [DU]	-1.86 ± 2.21	11399650	2.38	-1.15	-19.0	5.17	-2.75	-0.376
sulfurdioxide slant column density window3 [DU]	-2.70 ± 23.88	11399650	30.0	-2.64	-676	355	-17.5	12.4
sulfurdioxide slant column density window3 precision [DU]	27.7 ± 11.9	11399650	9.77	24.7	9.05	235	20.9	30.7
sulfurdioxide slant column density corrected win3 [DU]	6.81 ± 23.32	11399650	29.4	6.68	-662	371	-7.88	21.6
background so2 slant column offset window3 [DU]	9.51 ± 4.77	11399650	6.91	9.31	-11.4	35.0	5.80	12.7
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	11399650	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.145 \pm 3.119) \times 10^{-2}$	11399650	1.565×10^{-2}	1.475×10^{-2}	1.811×10^{-4}	1.68	8.018×10^{-3}	2.367×10^{-2}
fitted radiance shift [nm]	$(-2.928 \pm 23.675) \times 10^{-4}$	11399650	1.867×10^{-3}	-2.719×10^{-4}	-6.144×10^{-2}	4.328×10^{-2}	-1.245×10^{-3}	6.218×10^{-4}
fitted radiance squeeze [1]	$(-4.437 \pm 18.995) \times 10^{-5}$	11399650	2.149×10^{-4}	-3.657×10^{-5}	-1.467×10^{-2}	2.016×10^{-2}	-1.481×10^{-4}	6.683×10^{-5}
fitted root mean square [1]	$(1.308 \pm 0.591) \times 10^{-3}$	11399650	6.145×10^{-4}	1.125×10^{-3}	3.328×10^{-4}	0.117	9.305×10^{-4}	1.545×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.845 ± 0.395	11399650	0.472	0.788	5.000×10^{-2}	2.80	0.585	1.06
sulfurdioxide total air mass factor polluted precision [1]	0.115 ± 0.129	11399650	0.104	7.158×10^{-2}	3.486×10^{-3}	2.30	4.021×10^{-2}	0.144
sulfurdioxide clear air mass factor polluted [1]	0.723 ± 0.262	11399650	0.296	0.703	8.135×10^{-2}	2.85	0.561	0.858
number of spectral points in retrieval [1]	73.4 ± 0.5	11399650	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]	0.694 ± 0.407	4185426	0.760	1.000	0.0	1.000	0.240	1.000
sulfurdioxide total vertical column [DU]	$(2.263 \pm 80.237) \times 10^{-2}$	4185426	0.403	7.808×10^{-3}	-56.5	358	-0.190	0.212
sulfurdioxide total vertical column precision [DU]	0.437 ± 0.523	4185426	0.287	0.311	4.298×10^{-2}	96.9	0.198	0.485
sulfurdioxide slant column density corrected [DU]	$(1.466 \pm 34.506) \times 10^{-2}$	4185426	0.350	7.523×10^{-3}	-14.3	145	-0.166	0.184
sulfurdioxide slant column density cobra [DU]	$(1.454 \pm 32.810) \times 10^{-2}$	4185426	0.350	7.523×10^{-3}	-14.3	37.6	-0.166	0.184
sulfurdioxide slant column density cobra precision [DU]	0.275 ± 0.112	4185426	9.495×10^{-2}	0.243	8.834×10^{-2}	16.3	0.209	0.304
sulfurdioxide slant column density window1 [DU]	0.142 ± 0.630	4185426	0.708	0.135	-72.6	55.2	-0.217	0.491
sulfurdioxide slant column density window1 precision [DU]	0.275 ± 0.112	4185426	9.495×10^{-2}	0.243	8.834×10^{-2}	16.3	0.209	0.304
sulfurdioxide slant column density corrected win1 [DU]	$(1.219 \pm 62.076) \times 10^{-2}$	4185426	0.693	-5.104×10^{-3}	-72.6	55.0	-0.346	0.348
background so2 slant column offset window1 [DU]	-0.130 ± 0.129	4185426	0.142	-0.152	-0.984	3.15	-0.207	-6.552×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.530 ± 9.186	4185426	11.4	0.490	-744	1.169×10^3	-5.22	6.22
sulfurdioxide slant column density window2 precision [DU]	8.47 ± 2.79	4185426	2.76	8.09	2.24	1.109×10^3	6.85	9.61
sulfurdioxide slant column density corrected win2 [DU]	-0.658 ± 9.123	4185426	11.3	-0.643	-745	1.166×10^3	-6.33	5.01
background so2 slant column offset window2 [DU]	-1.19 ± 1.39	4185426	1.61	-0.929	-16.8	5.17	-1.91	-0.305
sulfurdioxide slant column density window3 [DU]	-9.48 ± 24.44	4185426	30.1	-8.84	-477	711	-24.2	5.90
sulfurdioxide slant column density window3 precision [DU]	31.9 ± 17.8	4185426	12.8	27.1	9.54	459	22.1	34.8
sulfurdioxide slant column density corrected win3 [DU]	-0.657 ± 24.548	4185426	30.4	-3.113×10^{-2}	-474	712	-15.6	14.8
background so2 slant column offset window3 [DU]	8.82 ± 4.24	4185426	6.66	8.97	-8.31	31.7	5.42	12.1
sulfurdioxide slant column cobra flag [1]	2.00 ± 0.09	4185426	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.331 \pm 8.873) \times 10^{-2}$	4185426	4.972×10^{-2}	2.766×10^{-2}	1.246×10^{-4}	1.71	8.683×10^{-3}	5.840×10^{-2}
fitted radiance shift [nm]	$(-2.018 \pm 34.180) \times 10^{-4}$	4185426	1.808×10^{-3}	-2.731×10^{-4}	-4.669×10^{-2}	4.567×10^{-2}	-1.143×10^{-3}	6.652×10^{-4}
fitted radiance squeeze [1]	$(-5.593 \pm 17.698) \times 10^{-5}$	4185426	2.107×10^{-4}	-5.215×10^{-5}	-1.579×10^{-2}	1.624×10^{-2}	-1.591×10^{-4}	5.157×10^{-5}
fitted root mean square [1]	$(1.217 \pm 0.448) \times 10^{-3}$	4185426	4.032×10^{-4}	1.115×10^{-3}	3.277×10^{-4}	4.315×10^{-2}	9.511×10^{-4}	1.354×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.951 ± 0.545	4185426	0.639	0.802	5.000×10^{-2}	2.90	0.568	1.21
sulfurdioxide total air mass factor polluted precision [1]	0.121 ± 0.119	4185426	0.139	8.165×10^{-2}	3.438×10^{-3}	2.09	3.459×10^{-2}	0.174
sulfurdioxide clear air mass factor polluted [1]	0.787 ± 0.394	4185426	0.383	0.698	8.245×10^{-2}	2.90	0.539	0.922
number of spectral points in retrieval [1]	73.4 ± 0.5	4185426	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

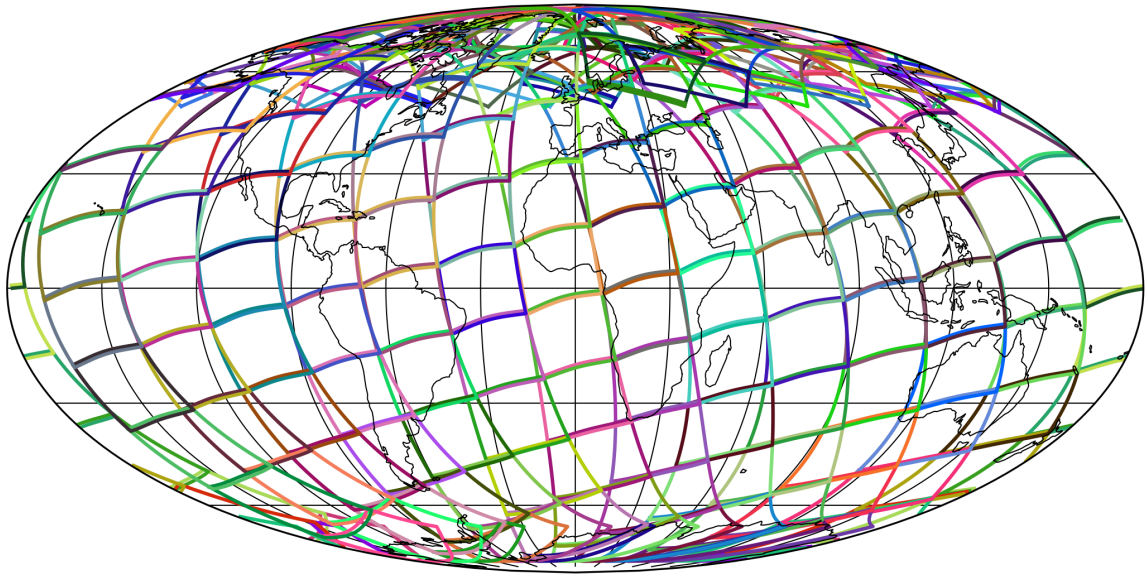


Figure 1: Outline of the granules.

4 Input data monitoring

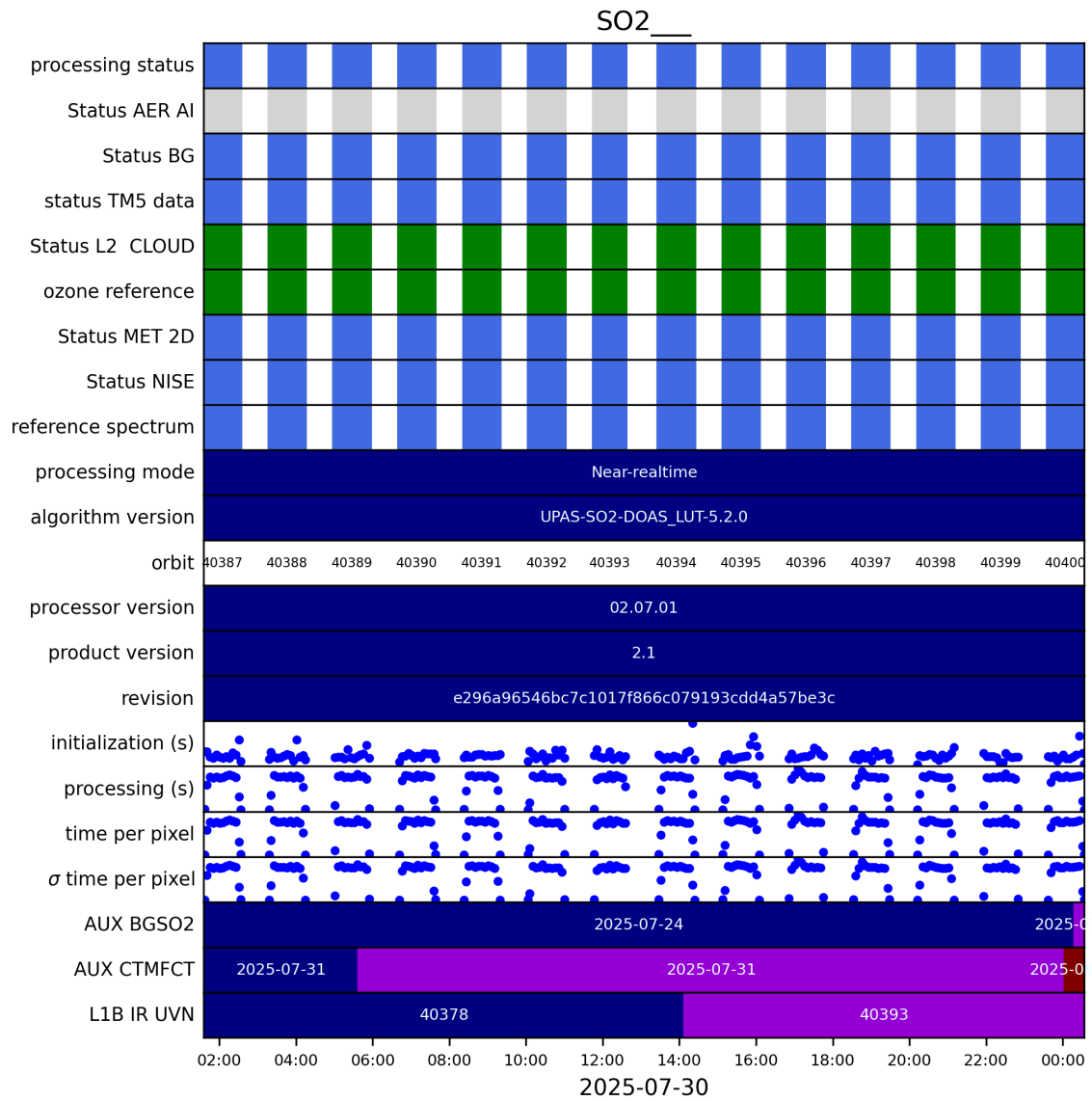


Figure 2: Input data per granule

5 Warnings and errors

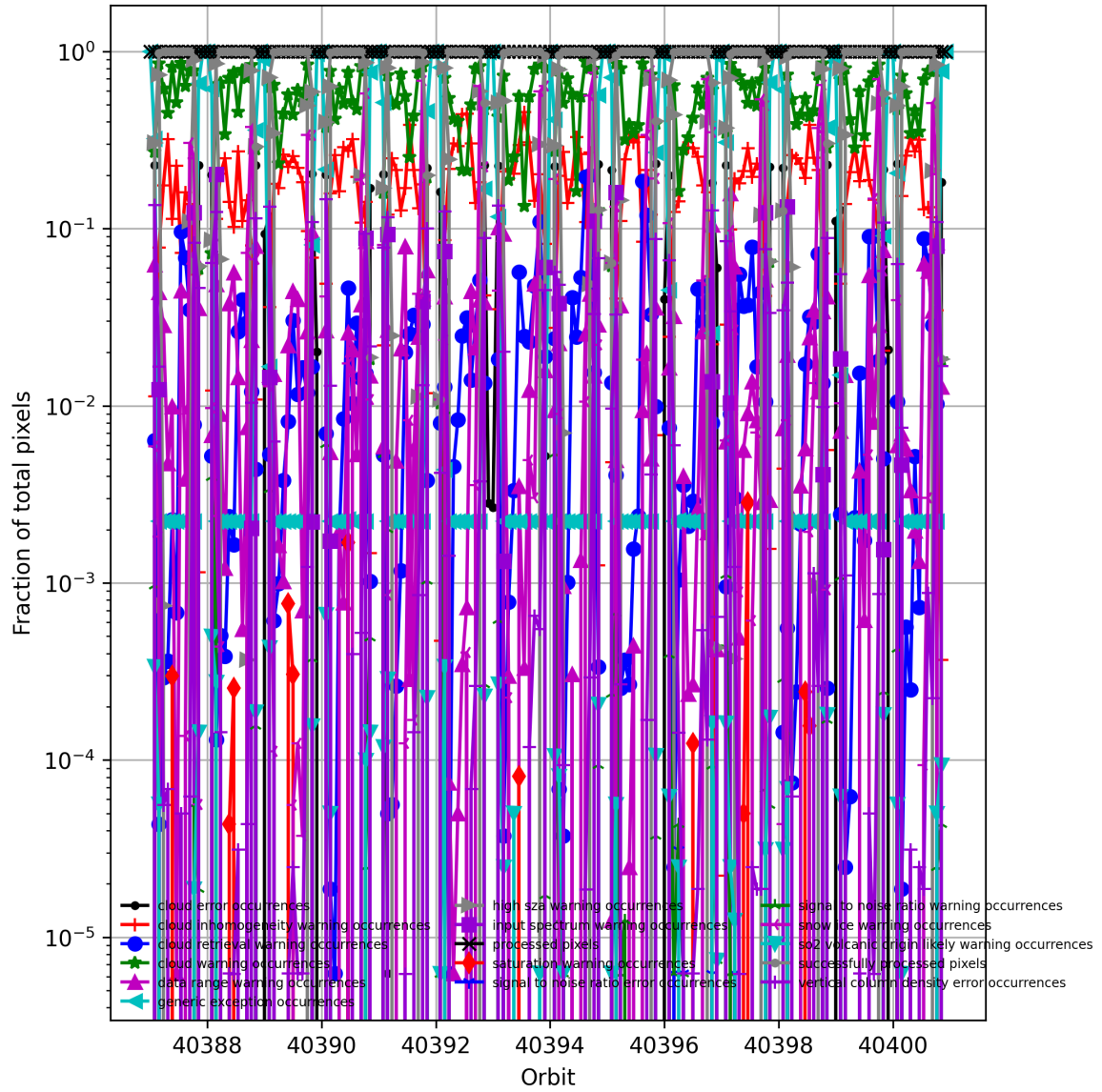


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

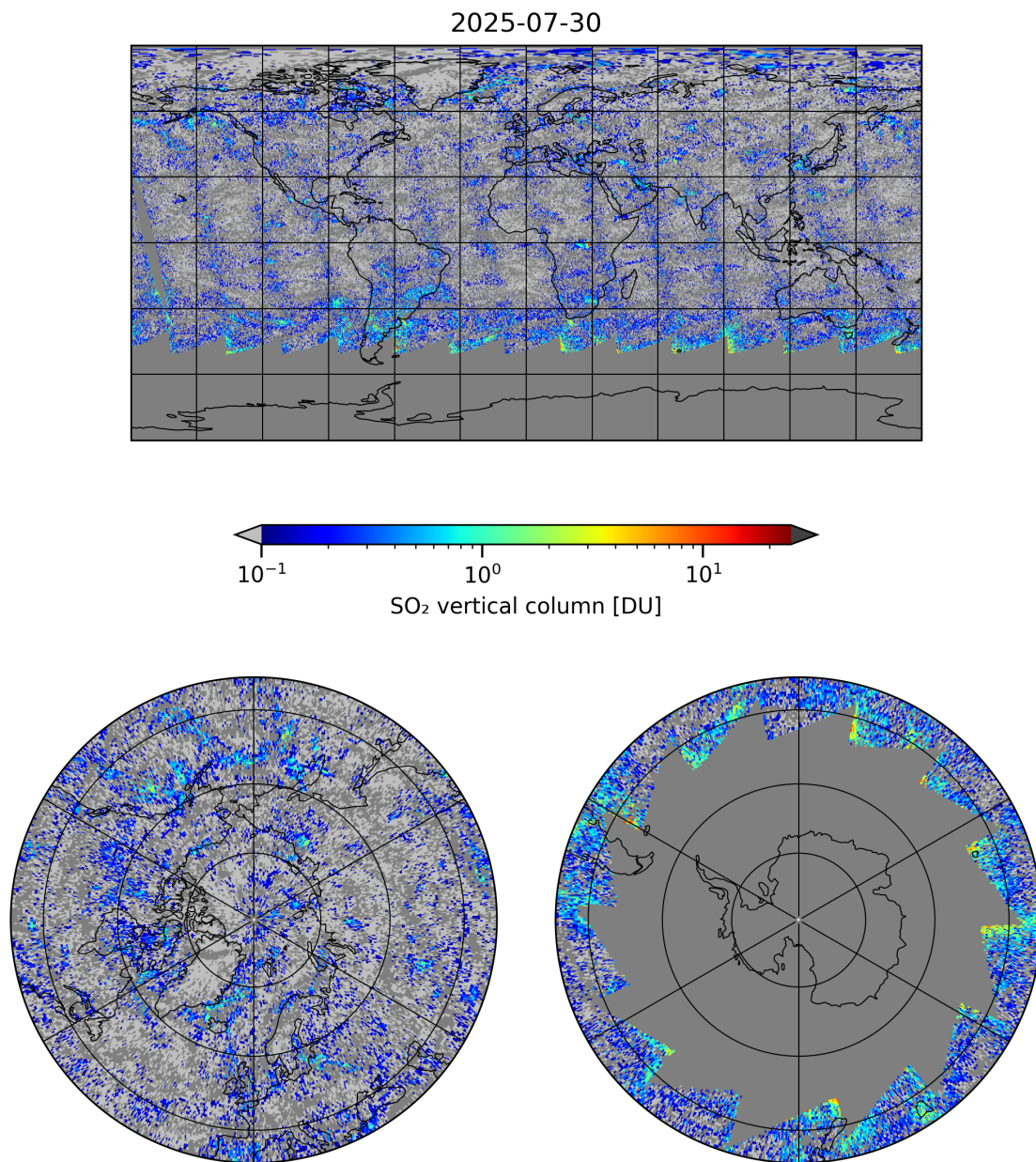


Figure 4: Map of “SO₂ vertical column” for 2025-07-30 to 2025-07-31

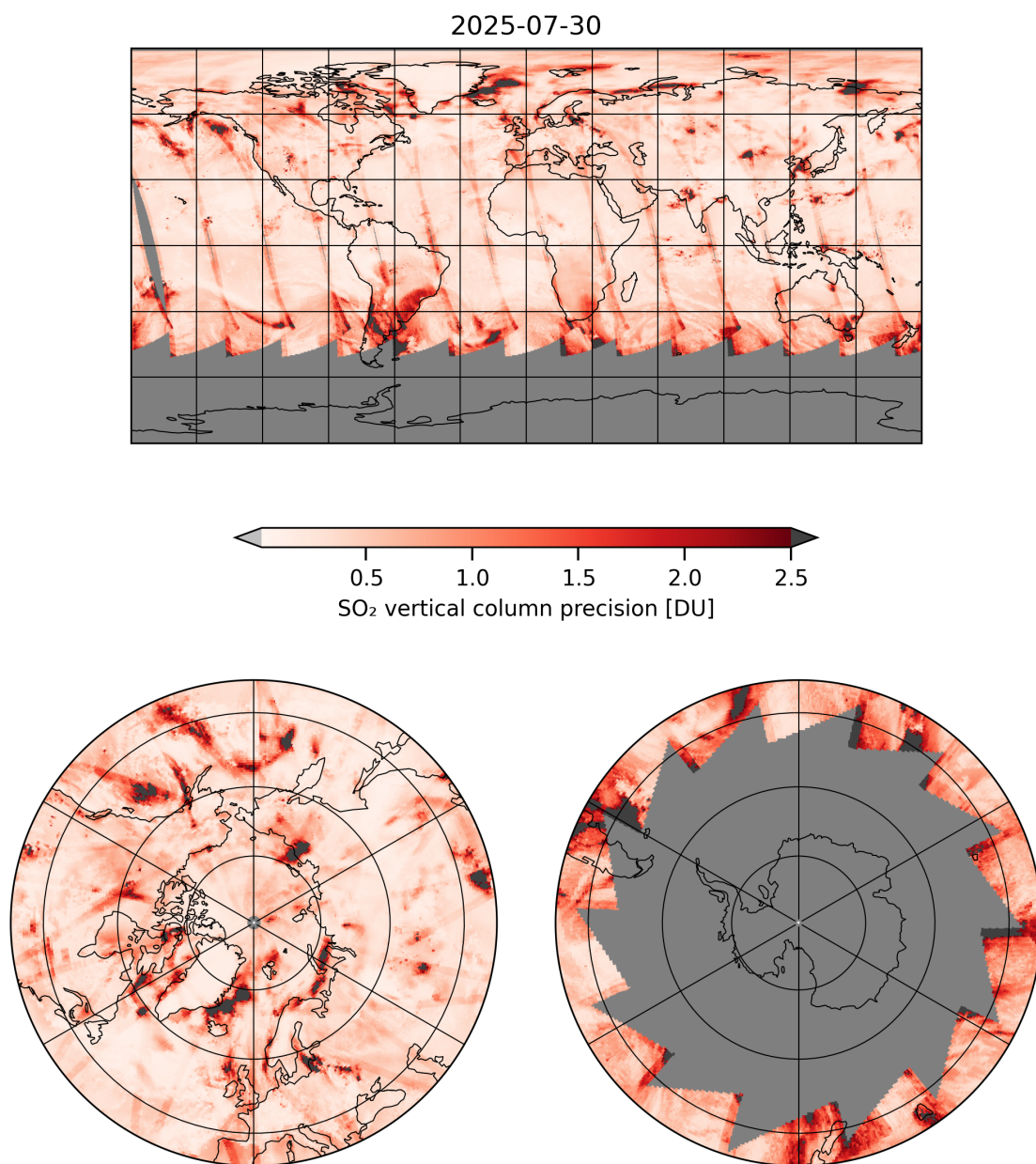


Figure 5: Map of “SO₂ vertical column precision” for 2025-07-30 to 2025-07-31

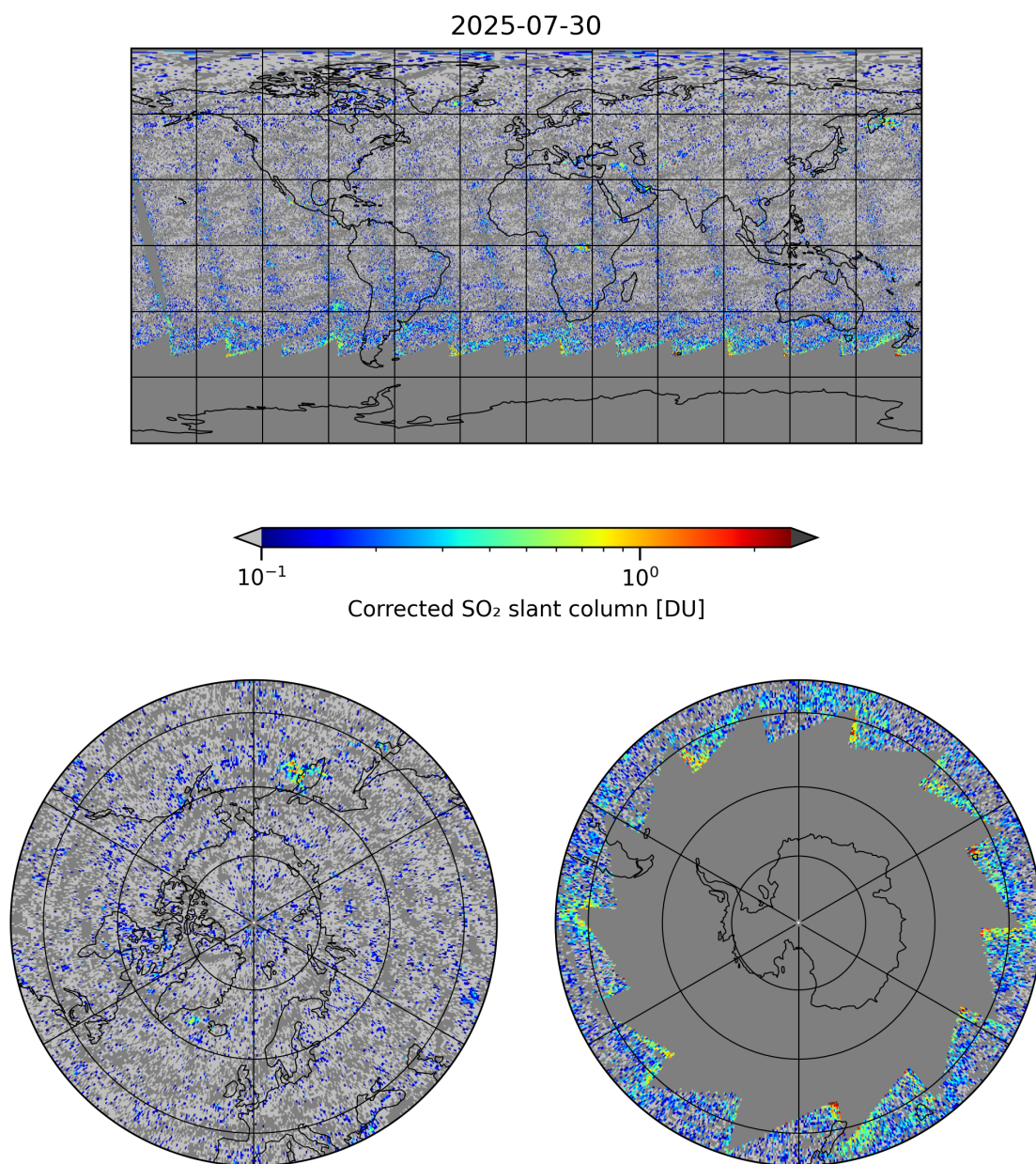


Figure 6: Map of “Corrected SO₂ slant column” for 2025-07-30 to 2025-07-31

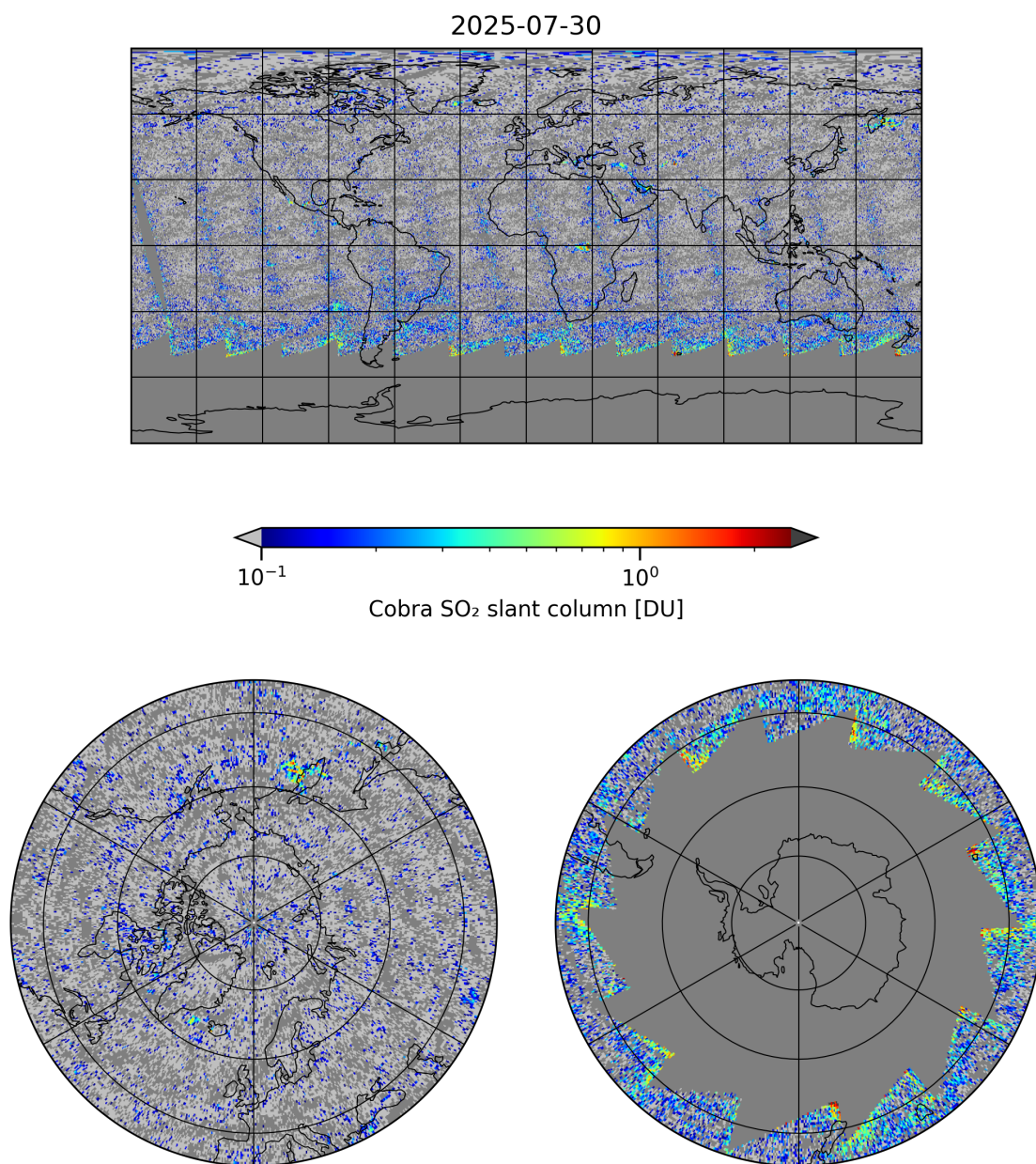


Figure 7: Map of “Cobra SO₂ slant column” for 2025-07-30 to 2025-07-31

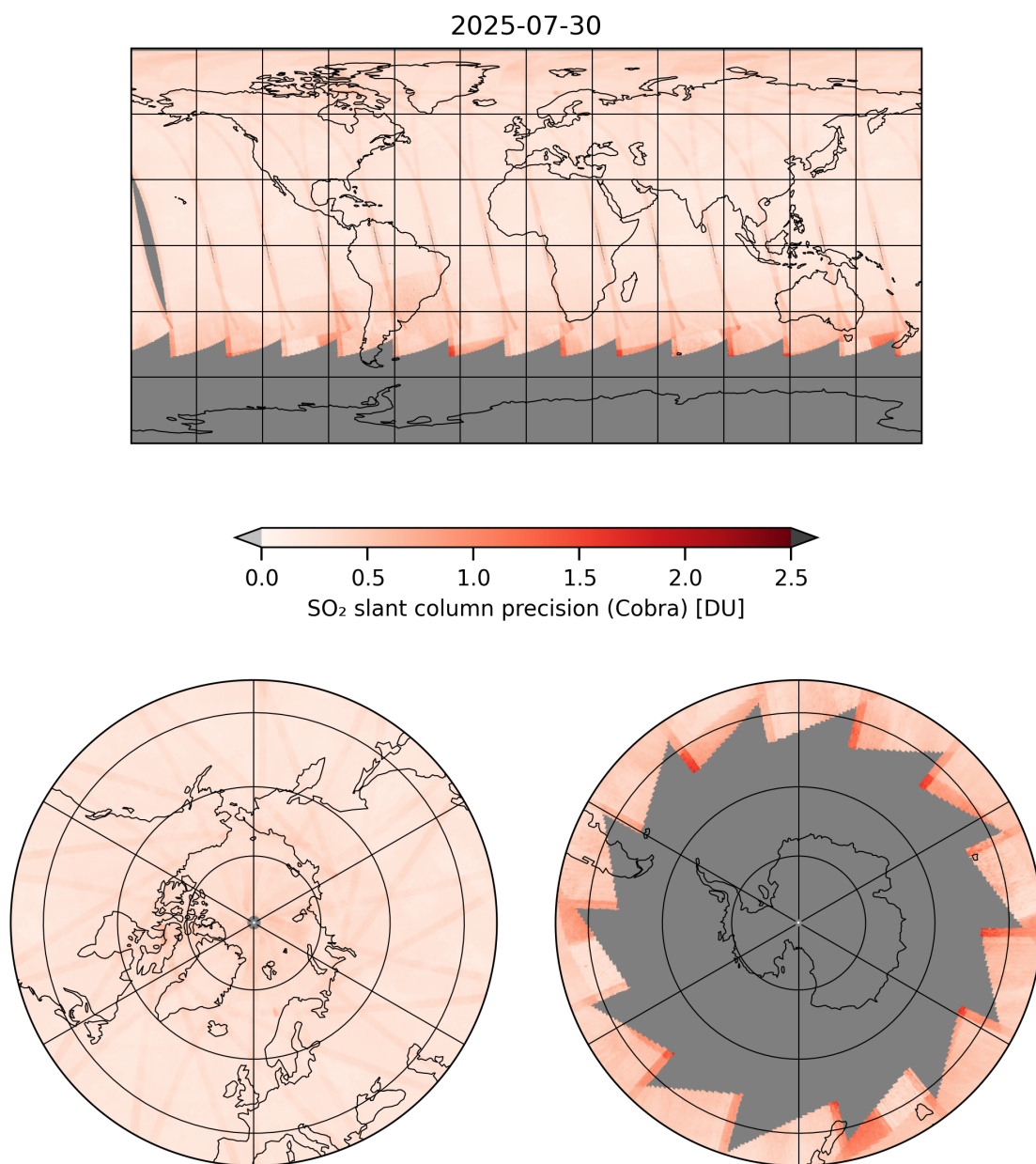


Figure 8: Map of “SO₂ slant column precision (Cobra)” for 2025-07-30 to 2025-07-31

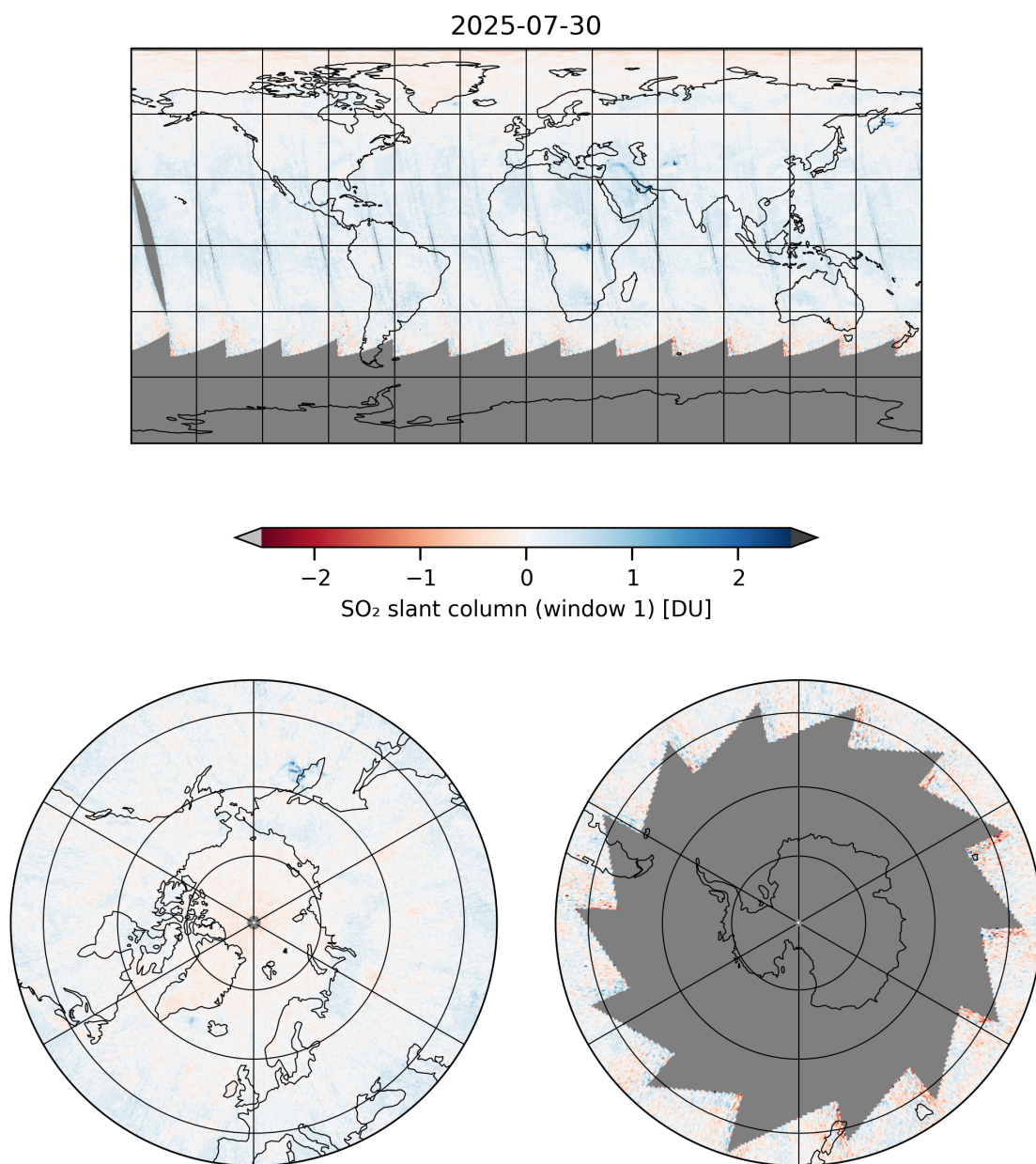


Figure 9: Map of “SO₂ slant column (window 1)” for 2025-07-30 to 2025-07-31

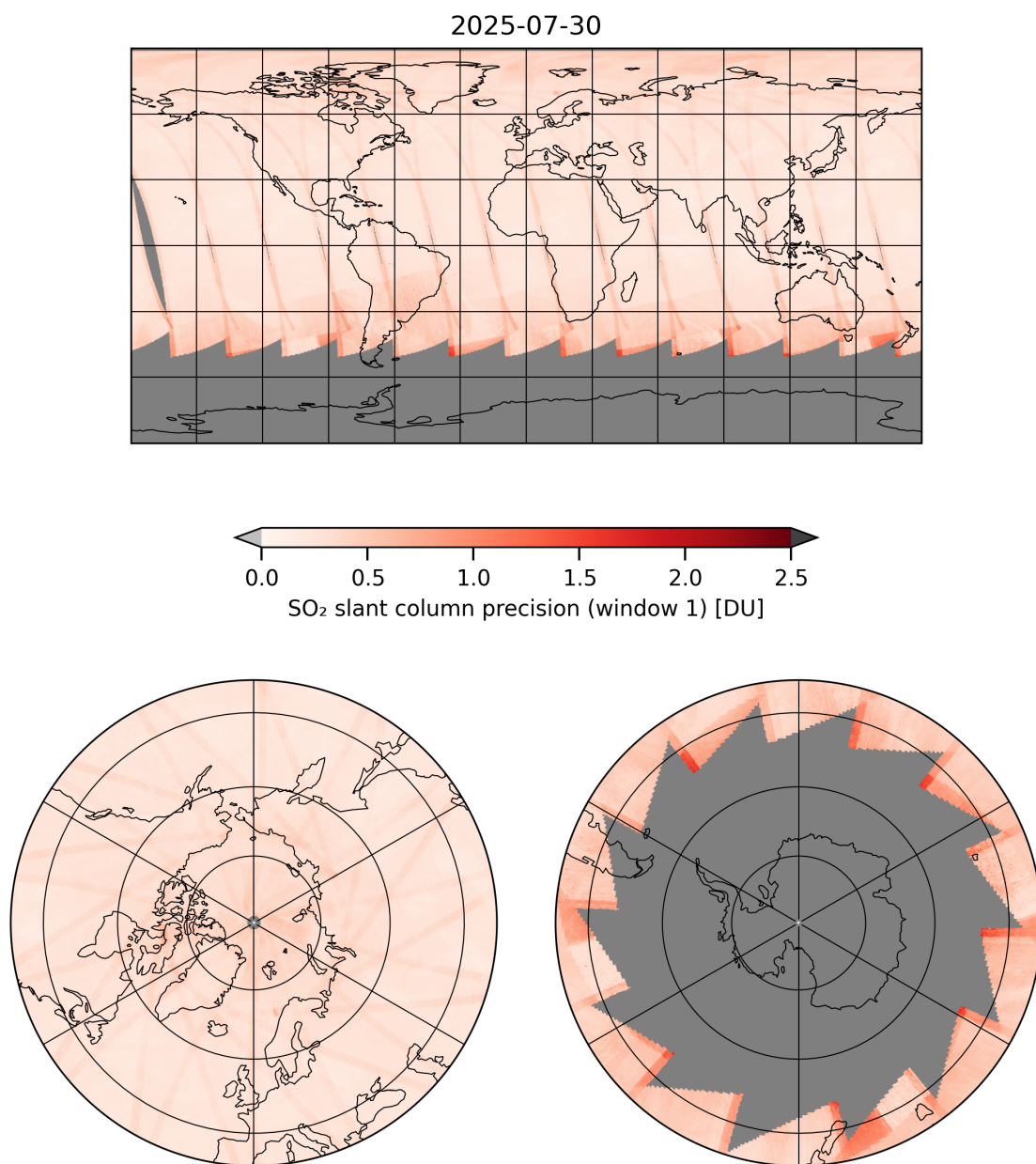


Figure 10: Map of “SO₂ slant column precision (window 1)” for 2025-07-30 to 2025-07-31

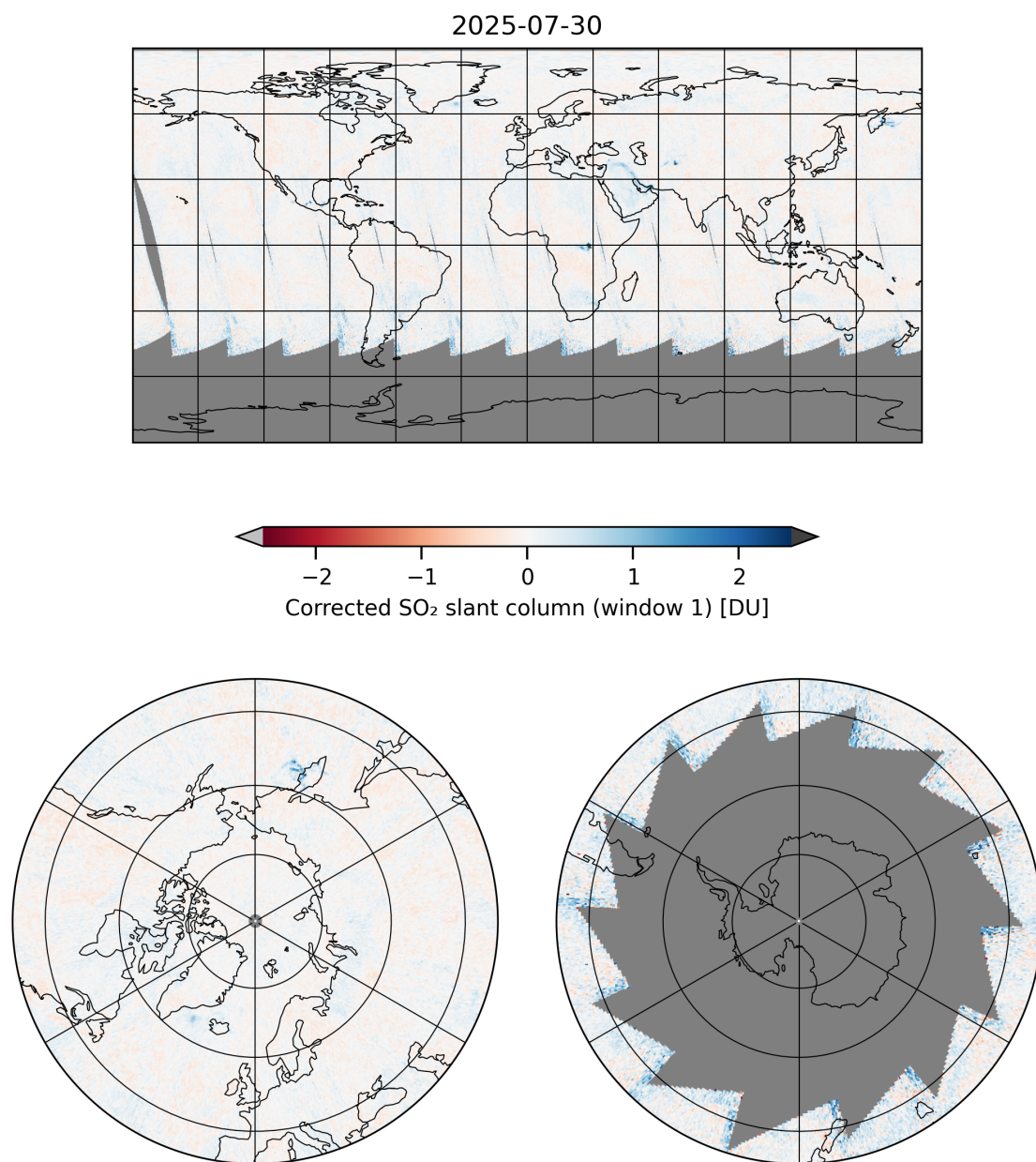


Figure 11: Map of "Corrected SO₂ slant column (window 1)" for 2025-07-30 to 2025-07-31

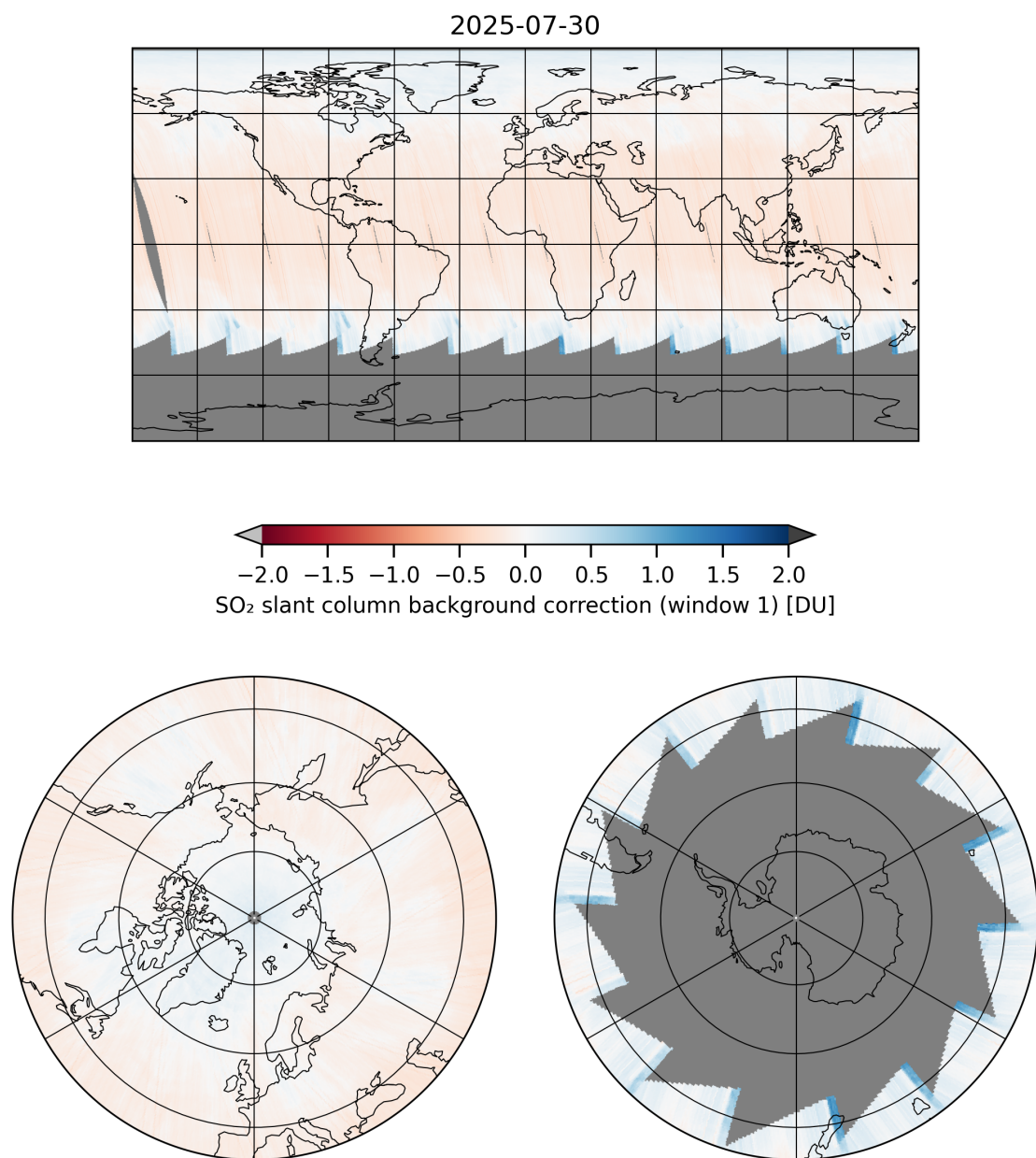


Figure 12: Map of “SO₂ slant column background correction (window 1)” for 2025-07-30 to 2025-07-31

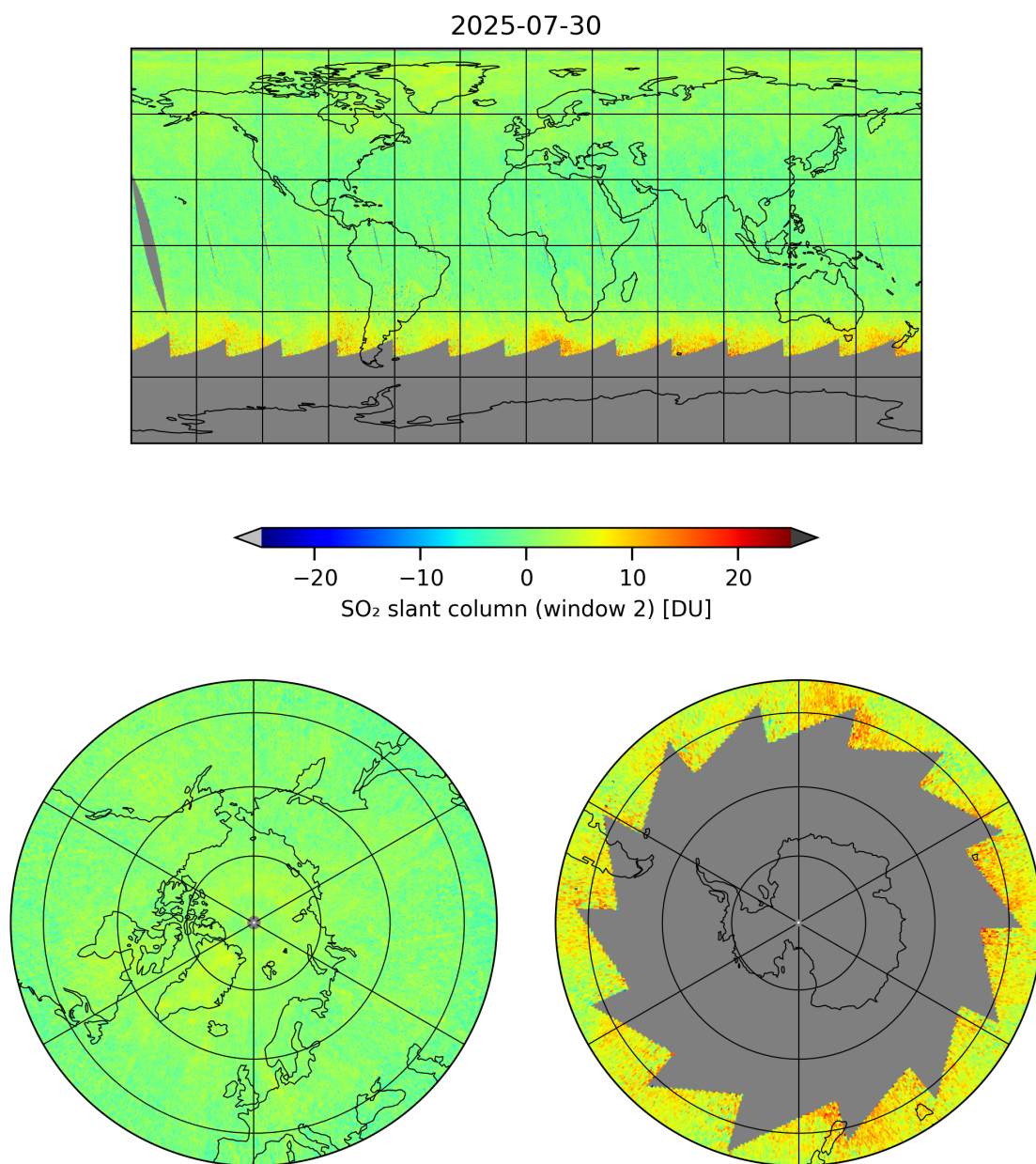


Figure 13: Map of “SO₂ slant column (window 2)” for 2025-07-30 to 2025-07-31

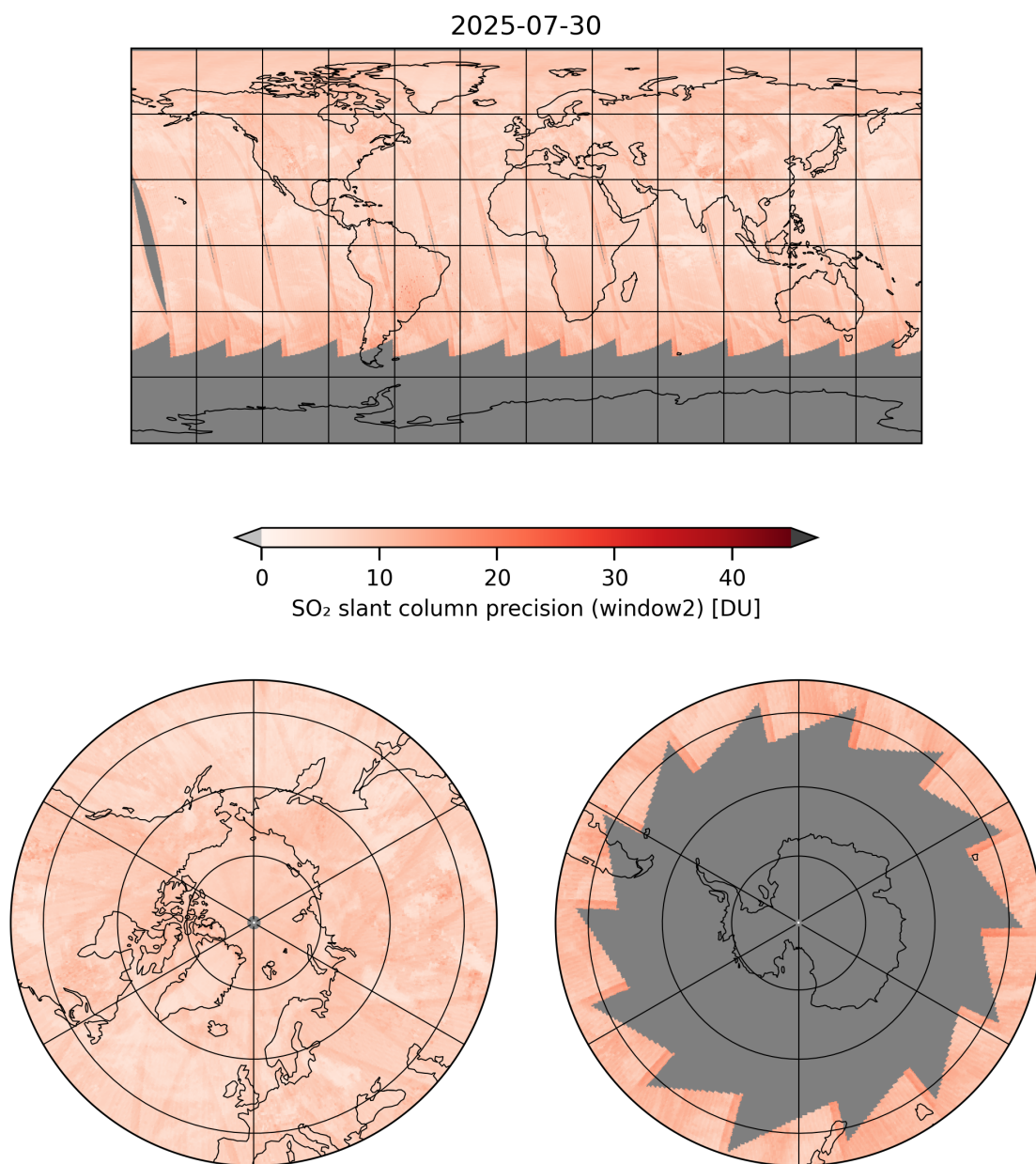


Figure 14: Map of “SO₂ slant column precision (window2)” for 2025-07-30 to 2025-07-31

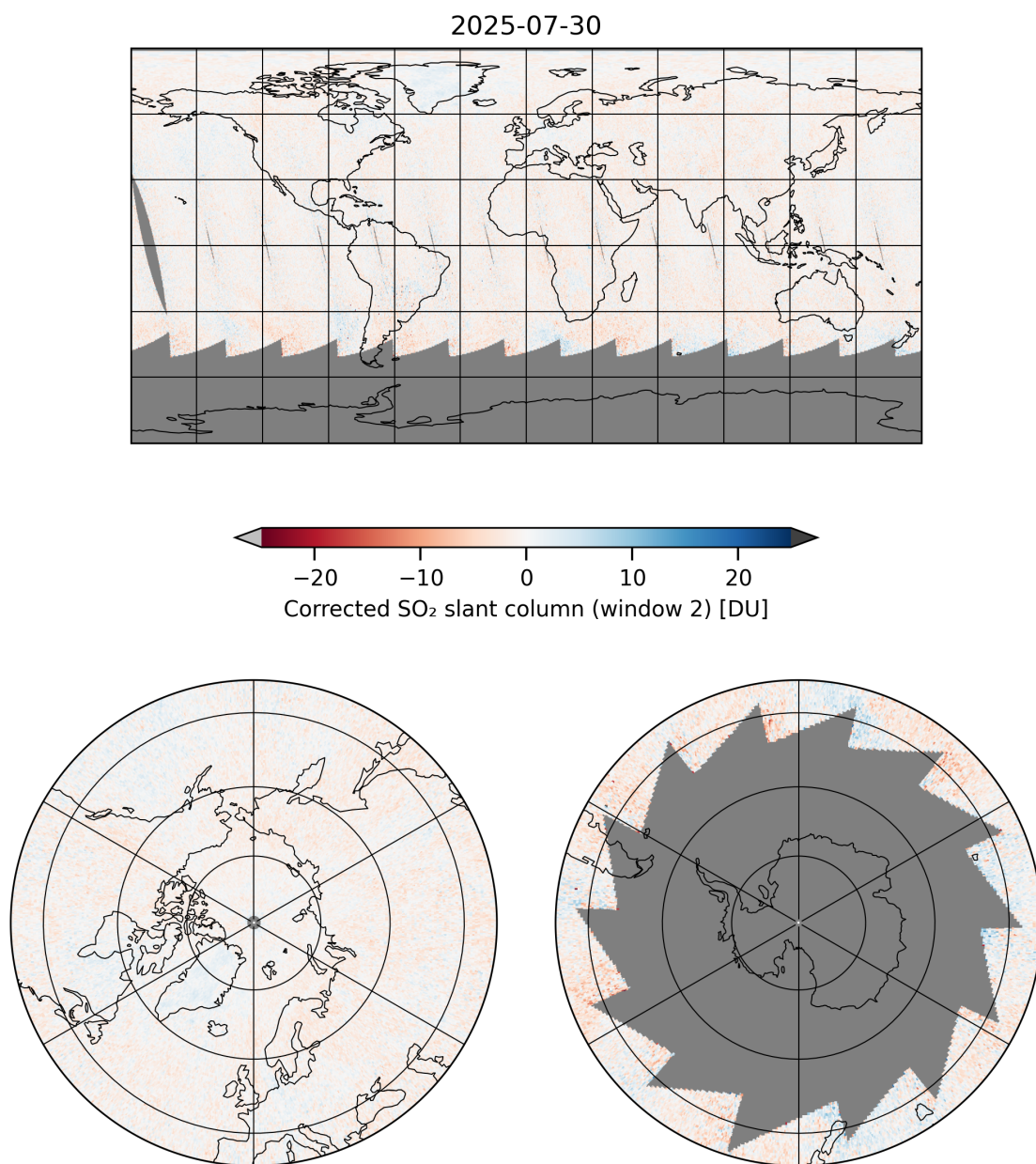


Figure 15: Map of "Corrected SO₂ slant column (window 2)" for 2025-07-30 to 2025-07-31

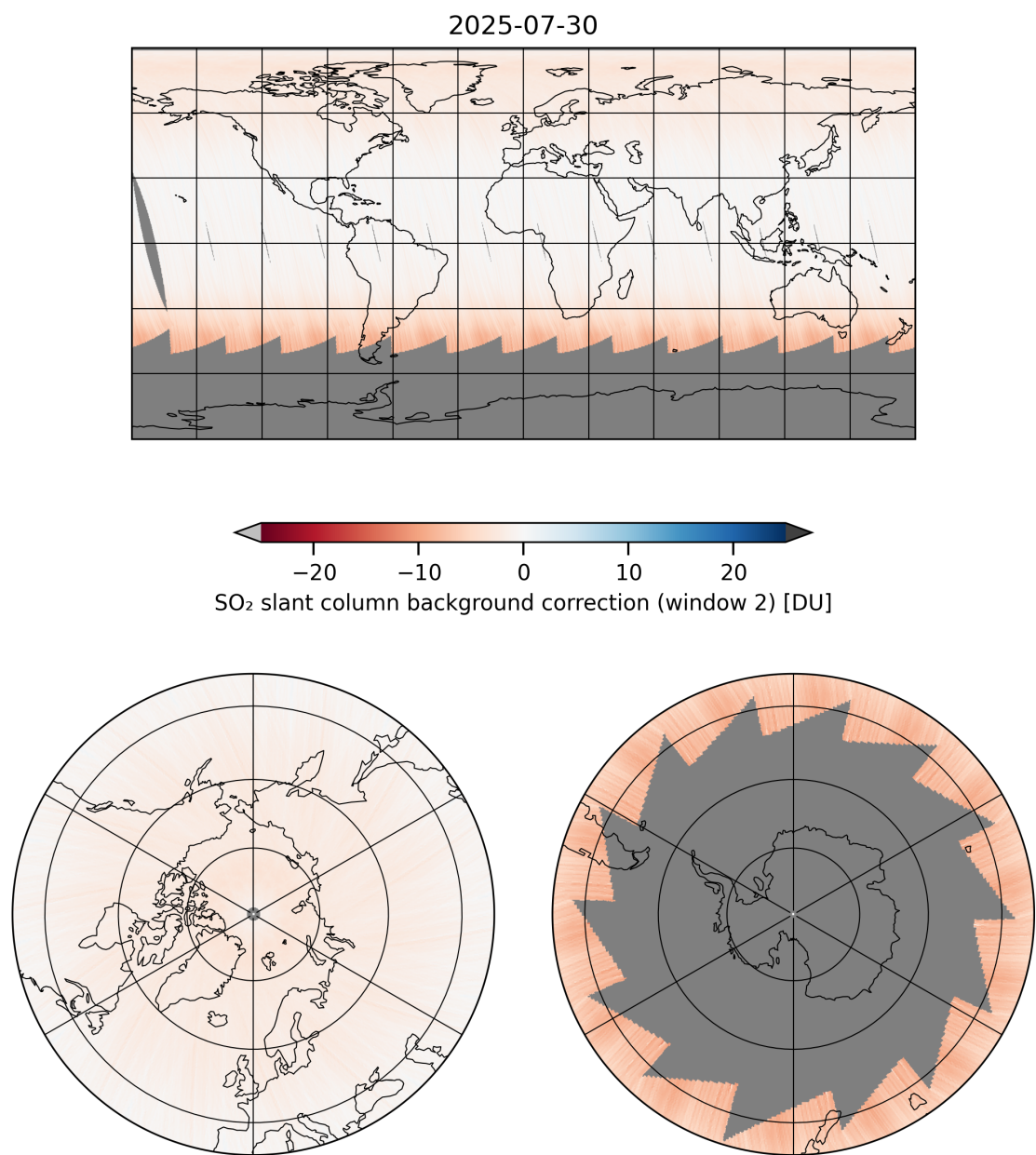


Figure 16: Map of “SO₂ slant column background correction (window 2)” for 2025-07-30 to 2025-07-31

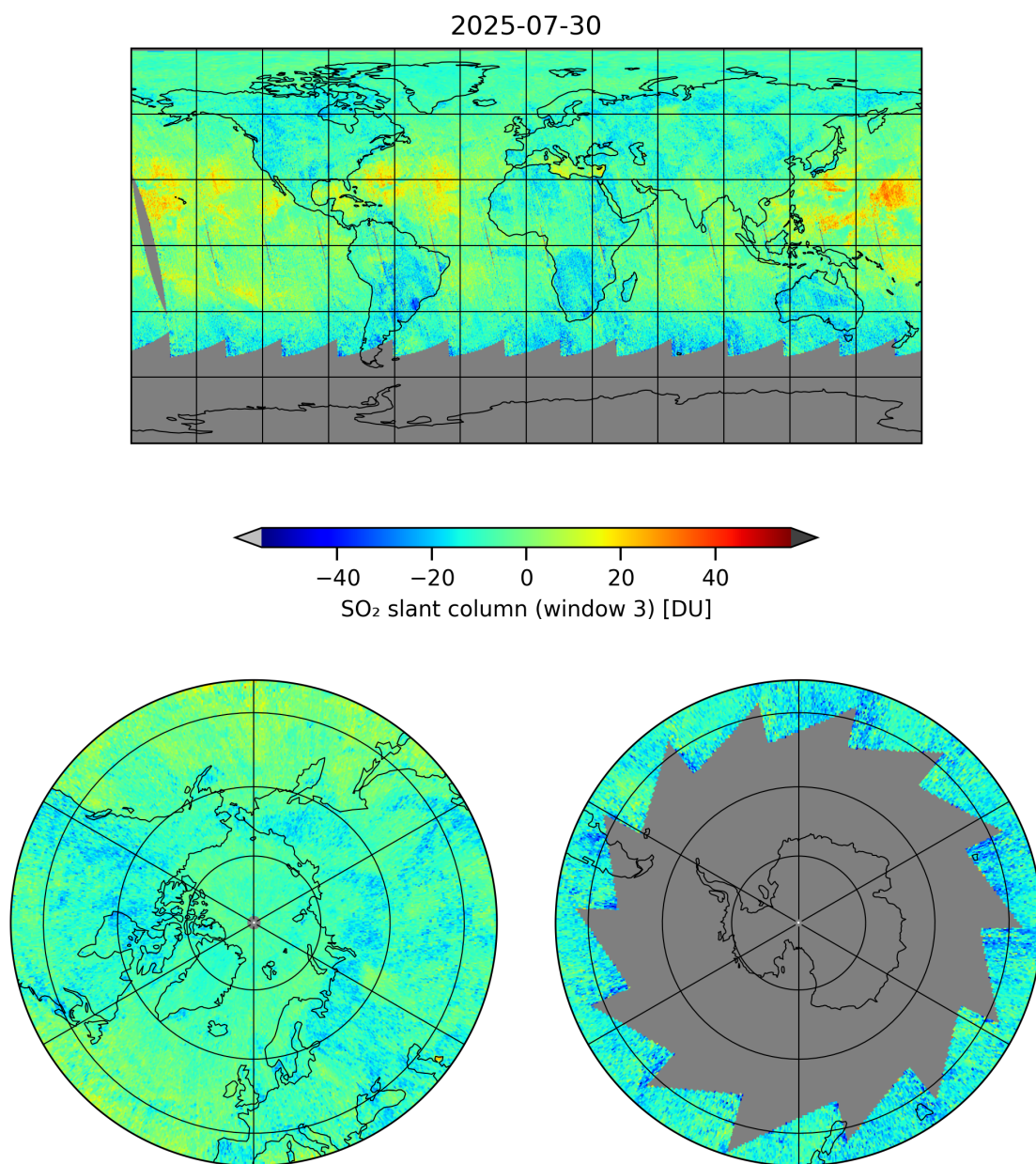


Figure 17: Map of “SO₂ slant column (window 3)” for 2025-07-30 to 2025-07-31

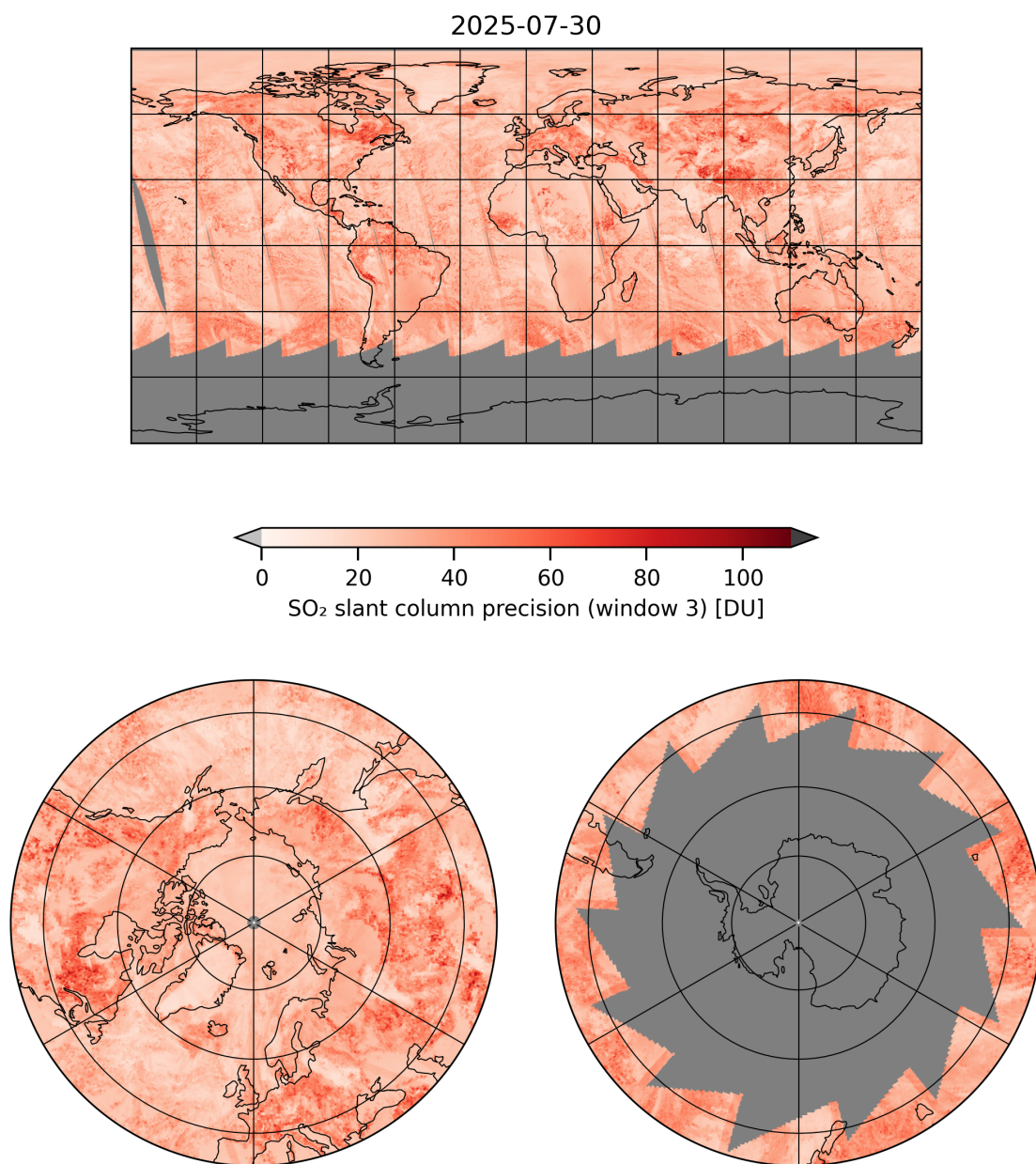


Figure 18: Map of “SO₂ slant column precision (window 3)” for 2025-07-30 to 2025-07-31

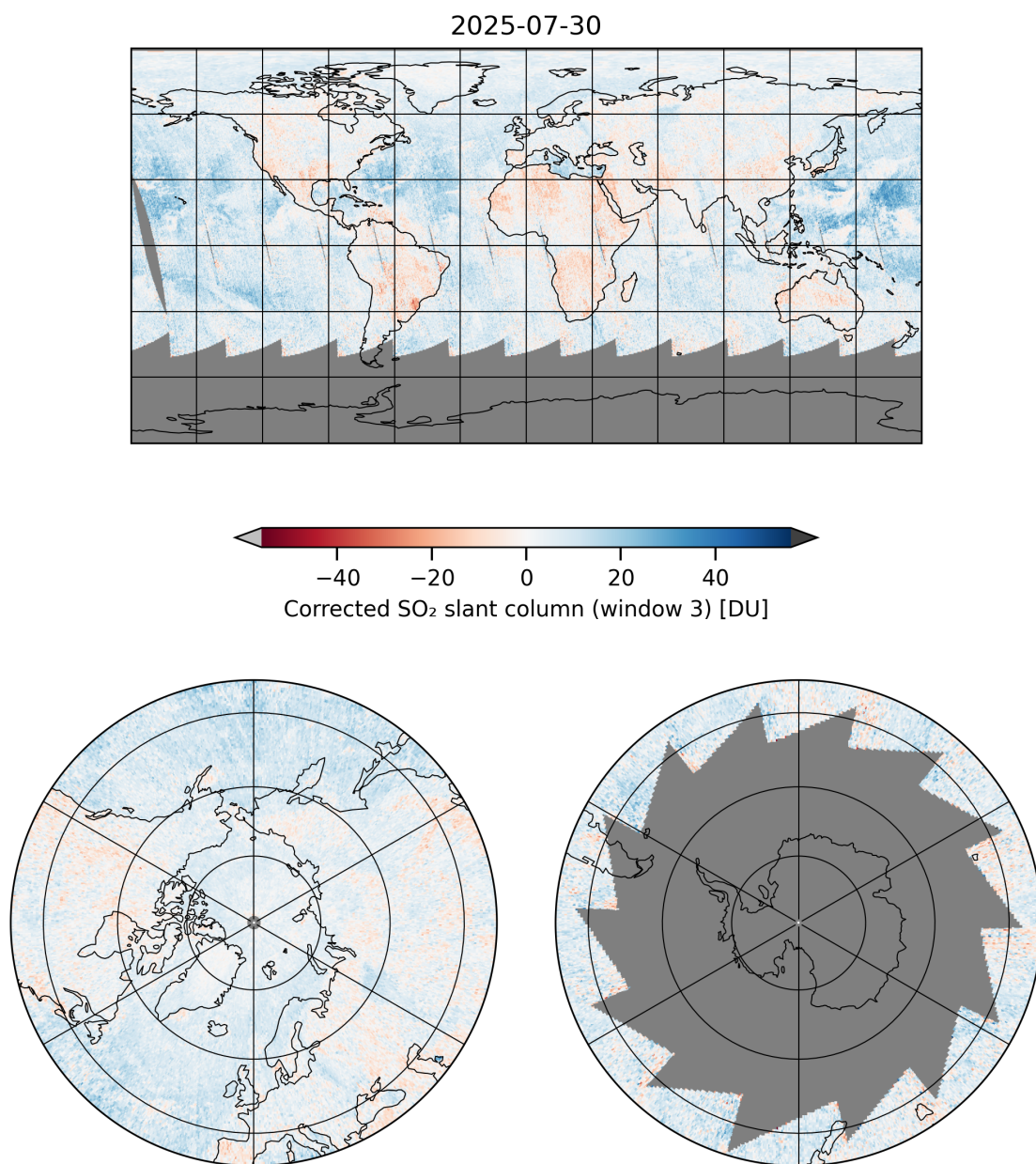


Figure 19: Map of “Corrected SO₂ slant column (window 3)” for 2025-07-30 to 2025-07-31

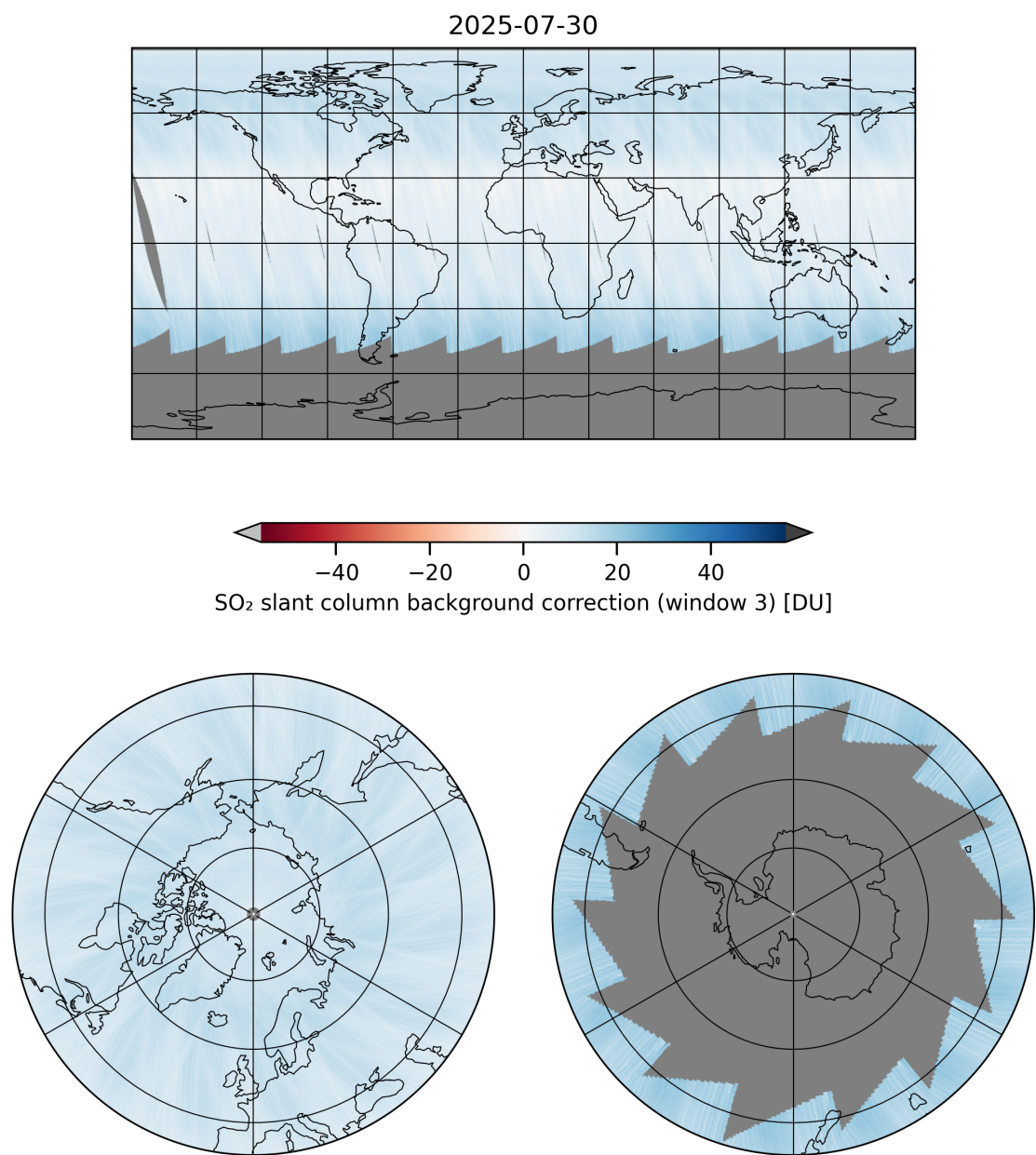


Figure 20: Map of “SO₂ slant column background correction (window 3)” for 2025-07-30 to 2025-07-31

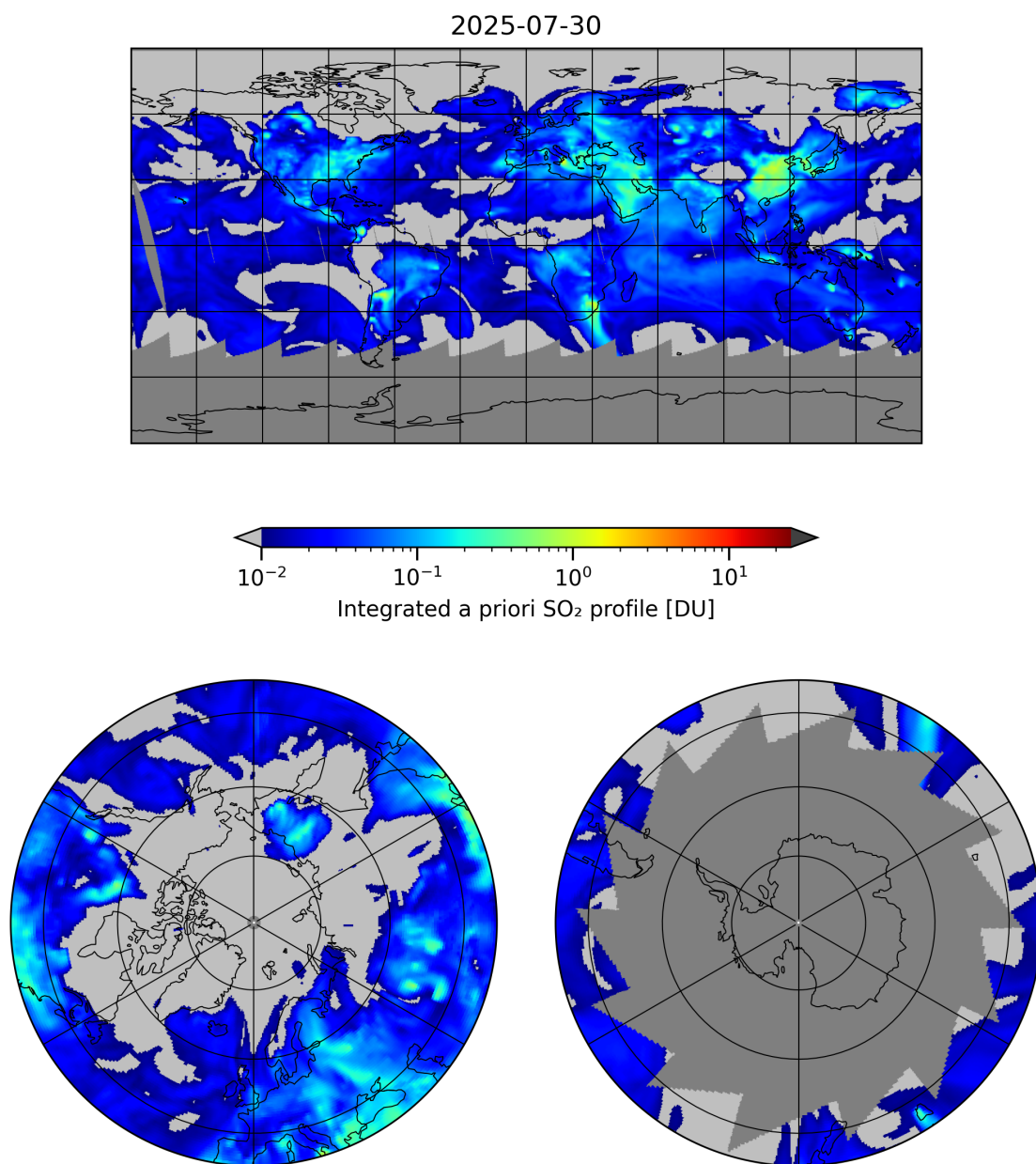


Figure 21: Map of “Integrated a priori SO₂ profile” for 2025-07-30 to 2025-07-31

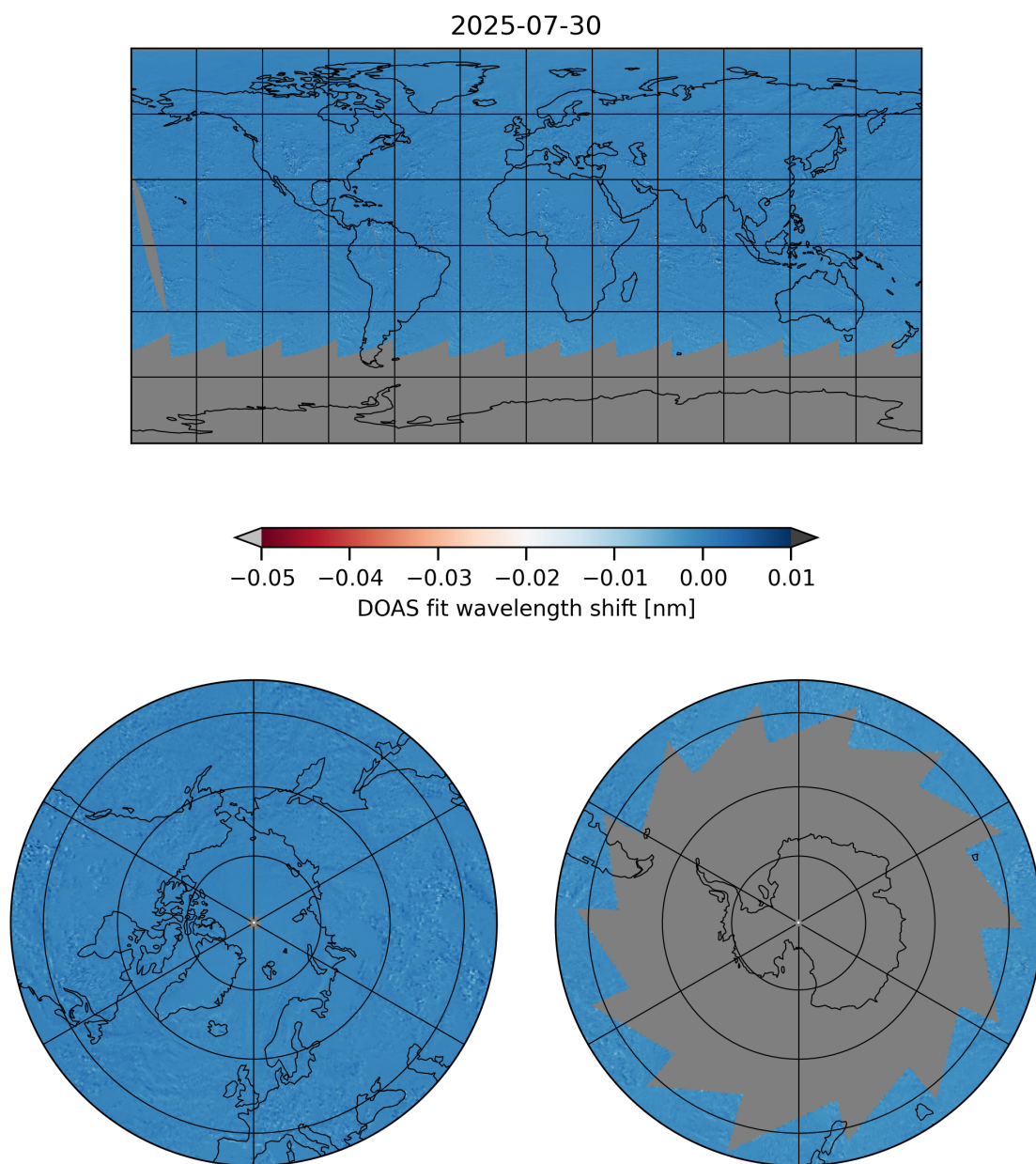


Figure 22: Map of “DOAS fit wavelength shift” for 2025-07-30 to 2025-07-31

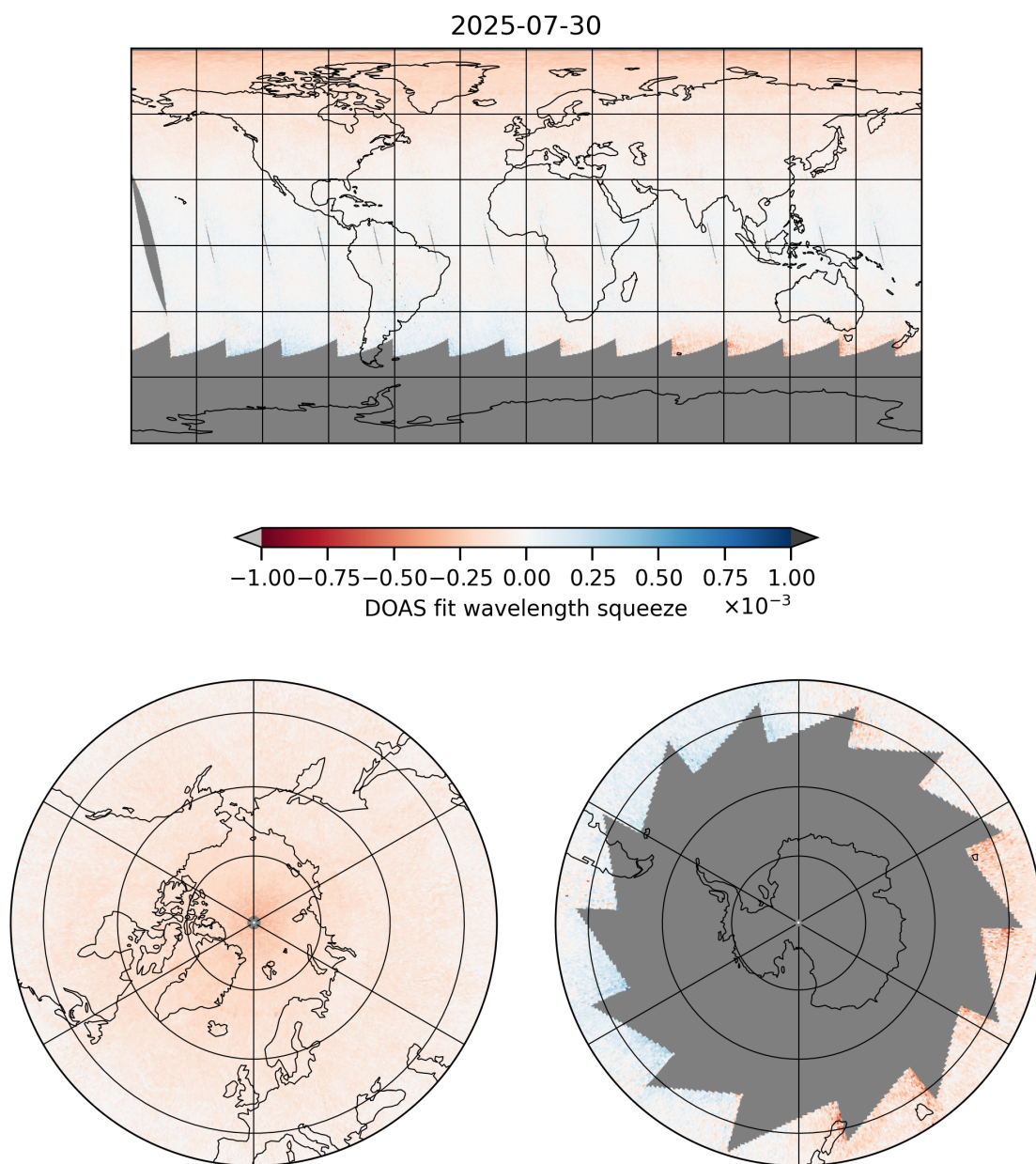


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-07-30 to 2025-07-31

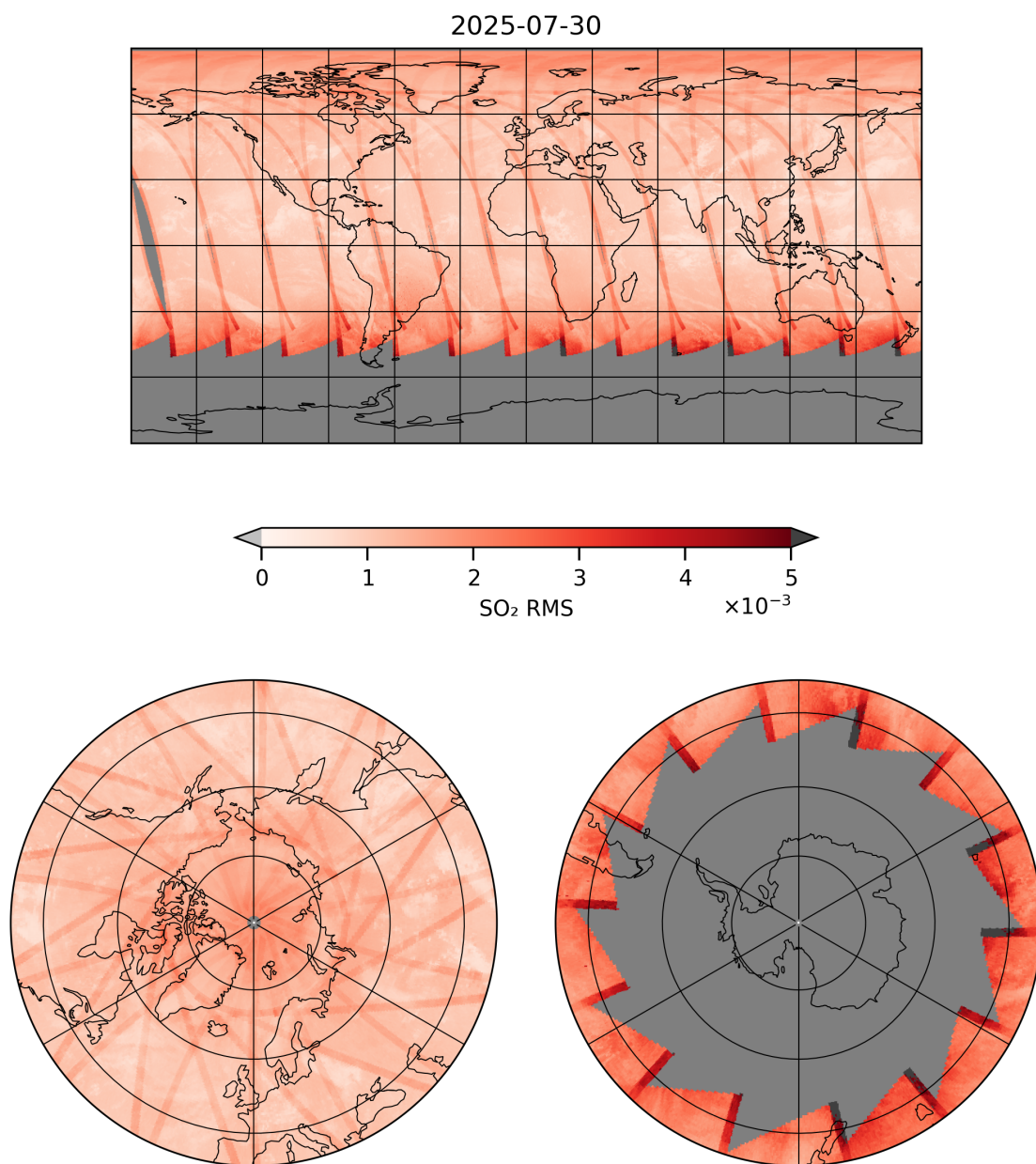


Figure 24: Map of “SO₂ RMS” for 2025-07-30 to 2025-07-31

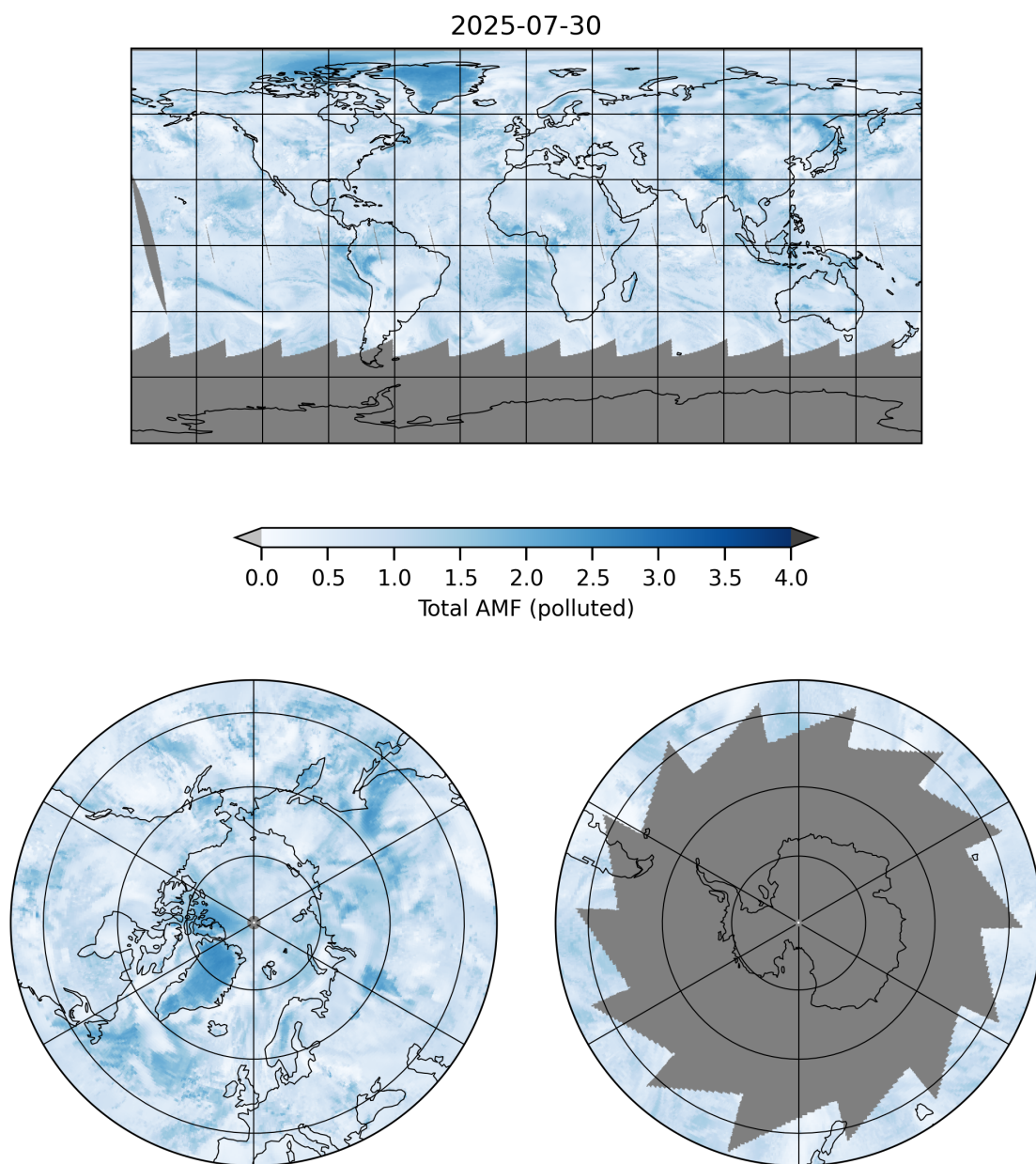


Figure 25: Map of “Total AMF (polluted)” for 2025-07-30 to 2025-07-31

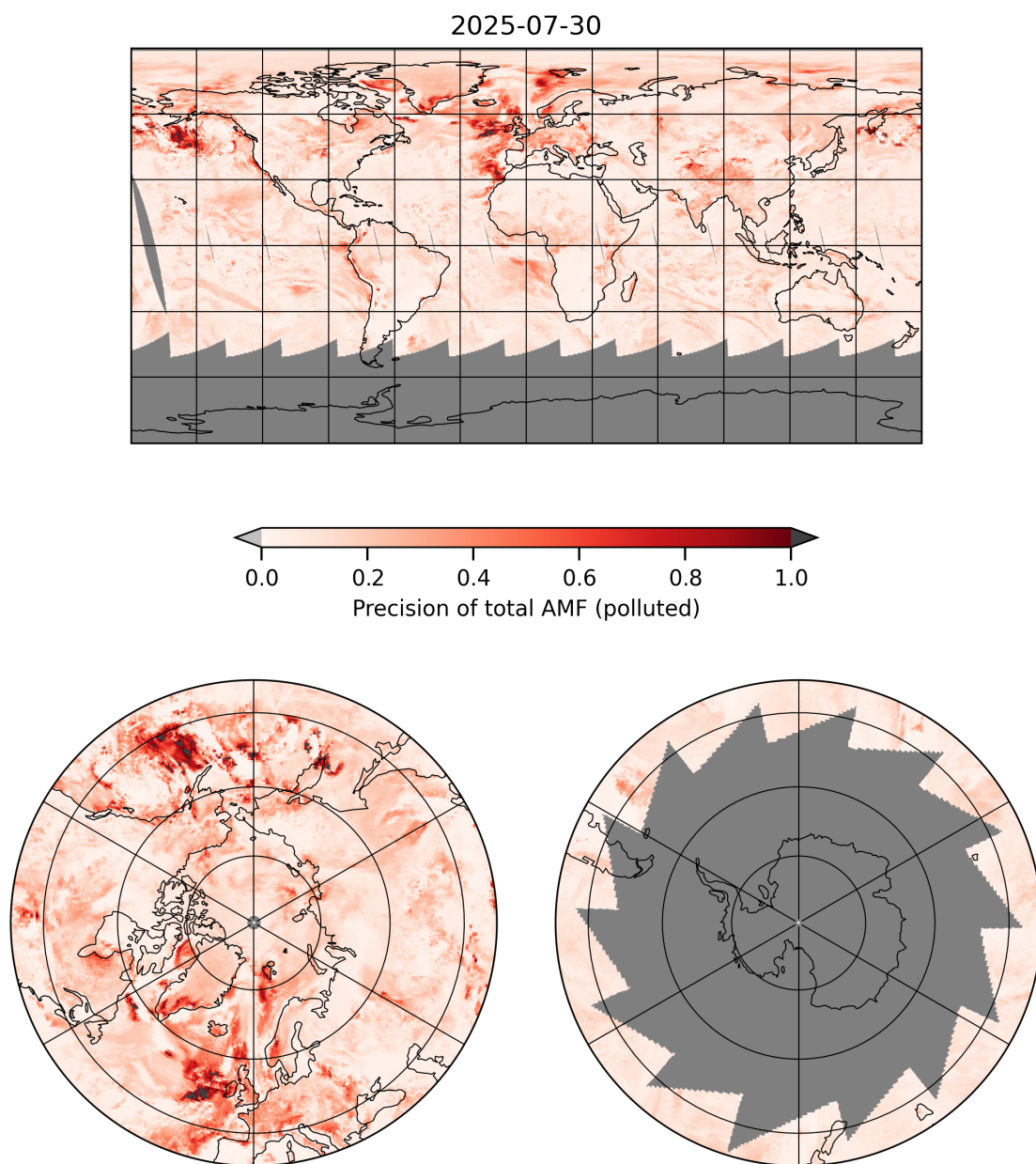


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-07-30 to 2025-07-31

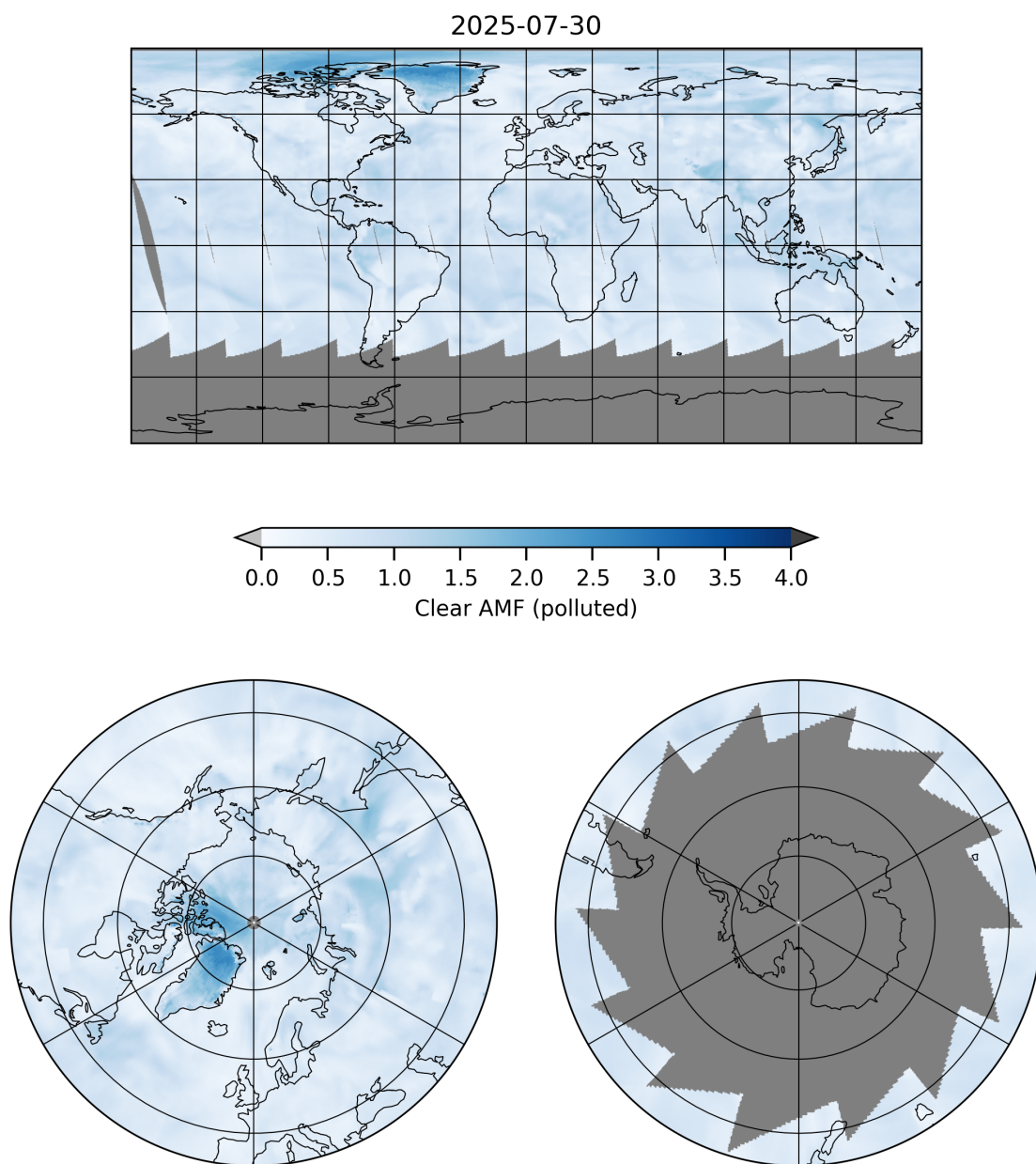


Figure 27: Map of “Clear AMF (polluted)” for 2025-07-30 to 2025-07-31

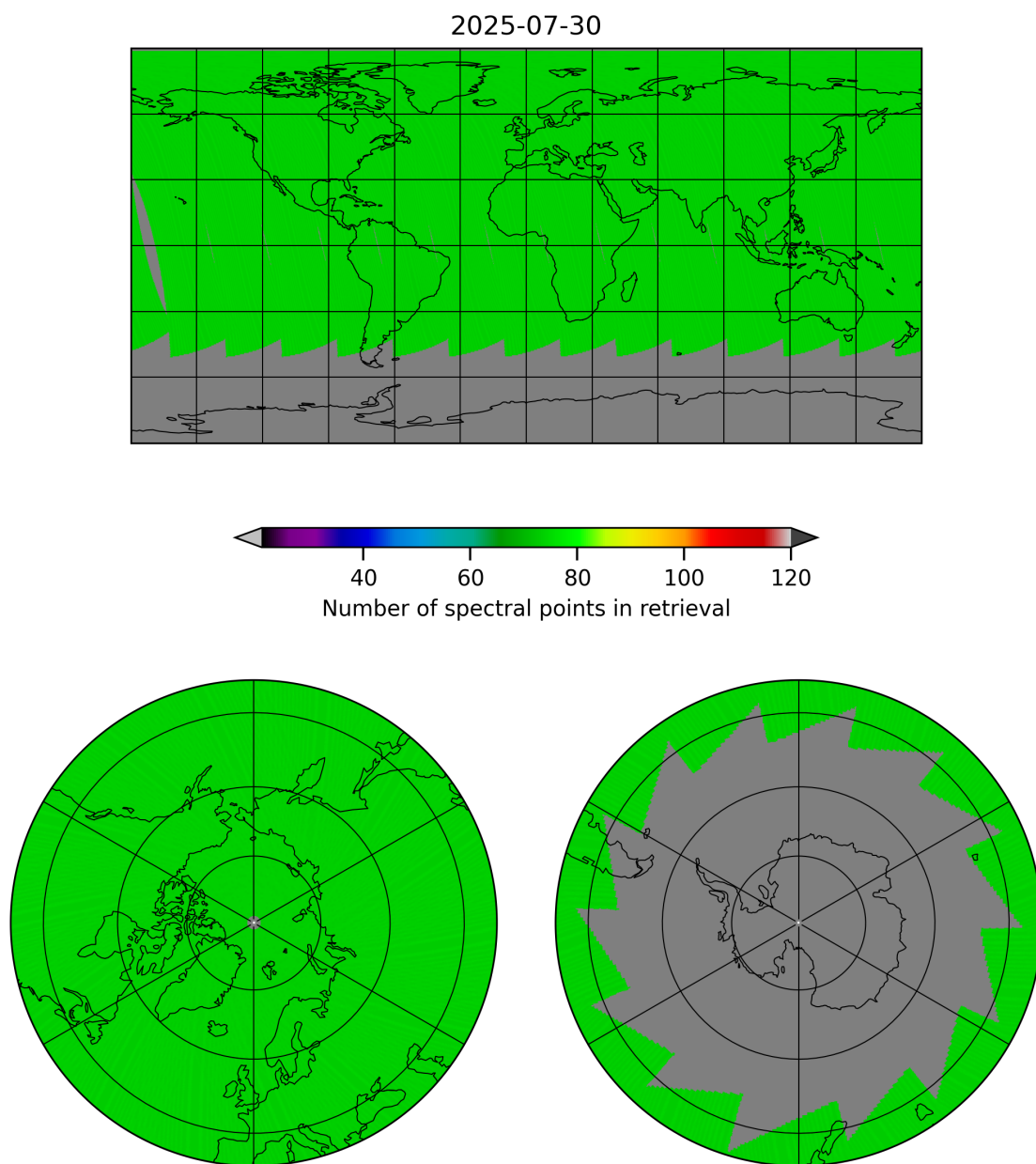


Figure 28: Map of “Number of spectral points in retrieval” for 2025-07-30 to 2025-07-31

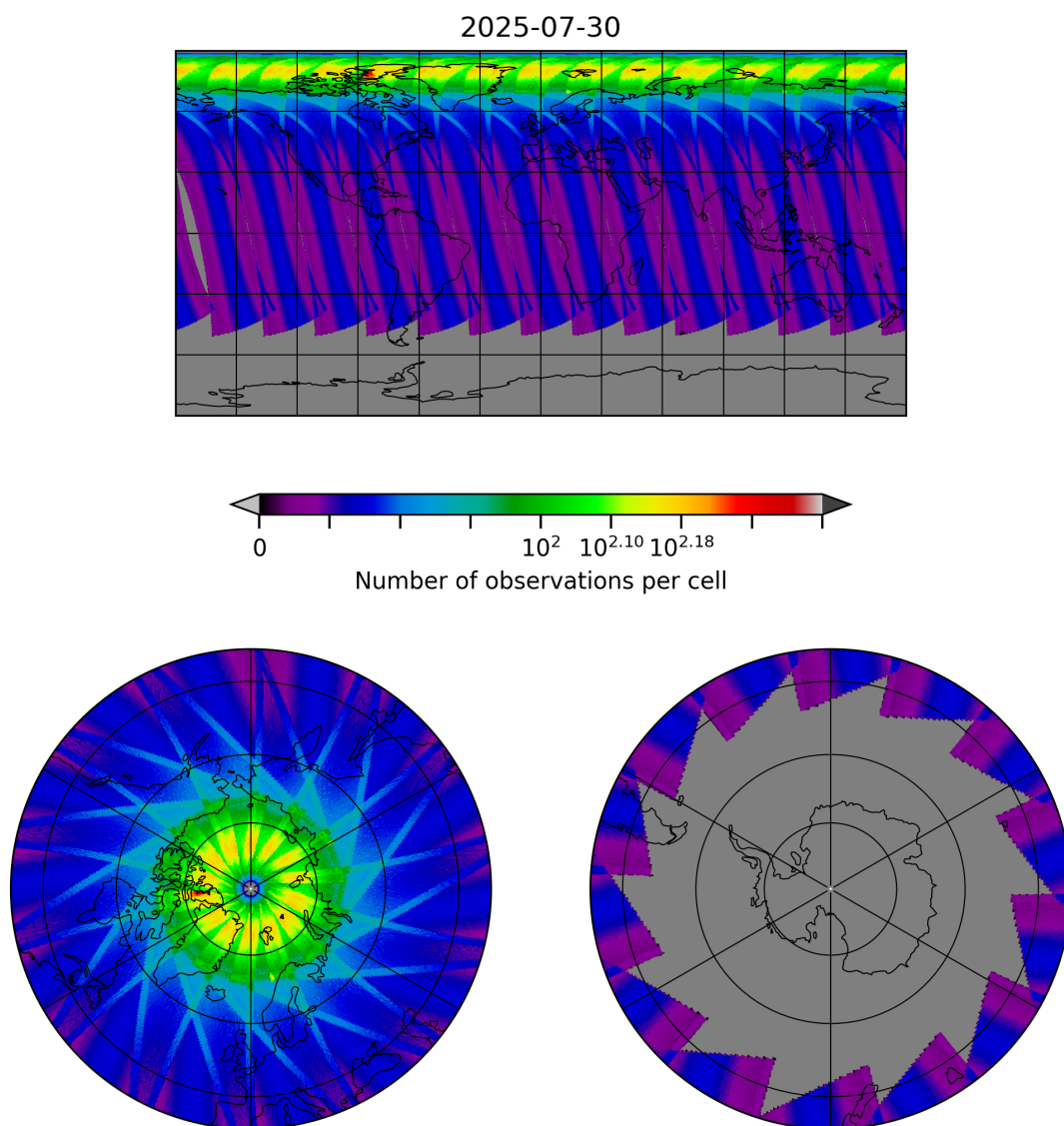


Figure 29: Map of the number of observations for 2025-07-30 to 2025-07-31

7 Zonal average

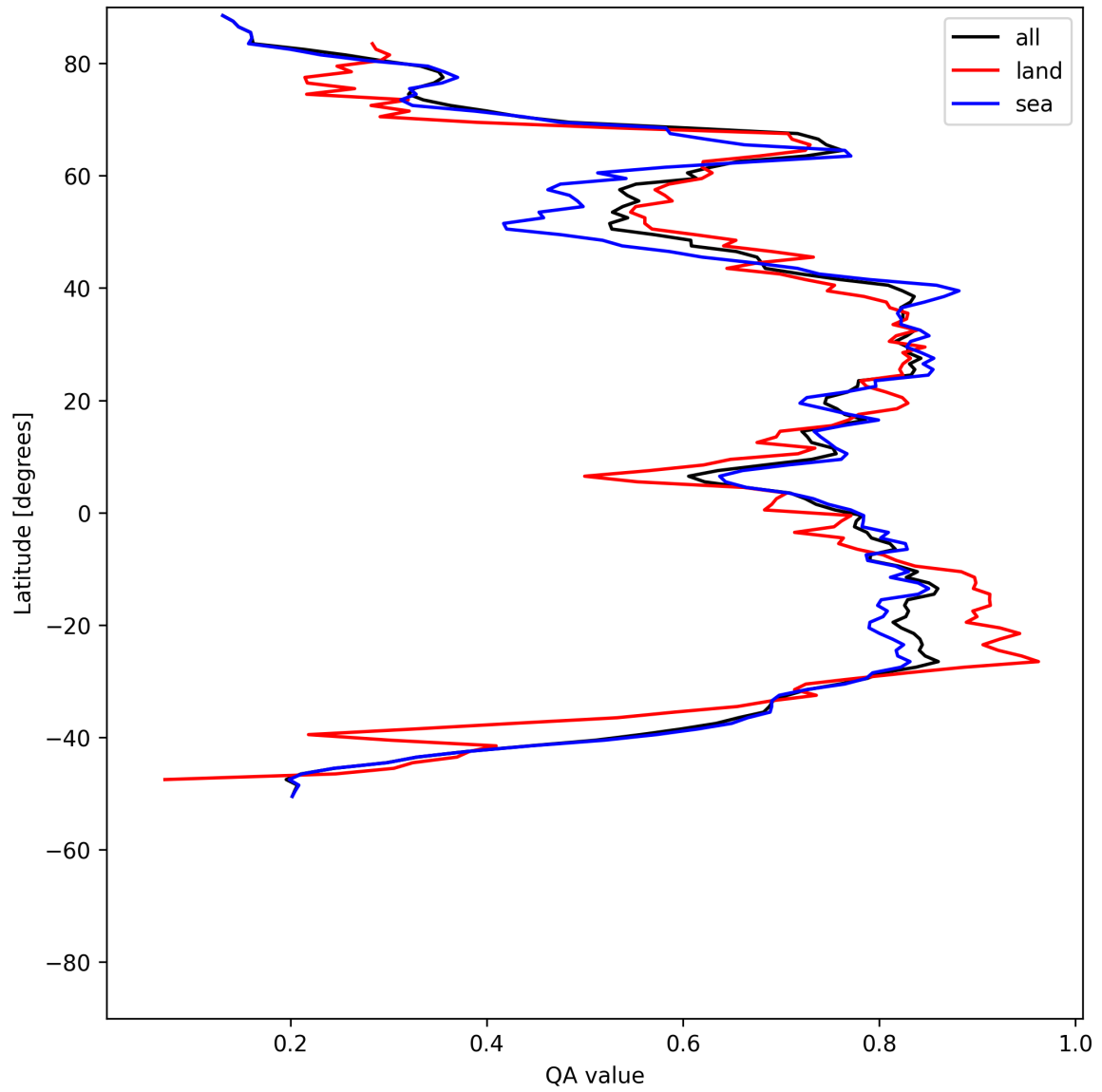


Figure 30: Zonal average of “QA value” for 2025-07-30 to 2025-07-31.

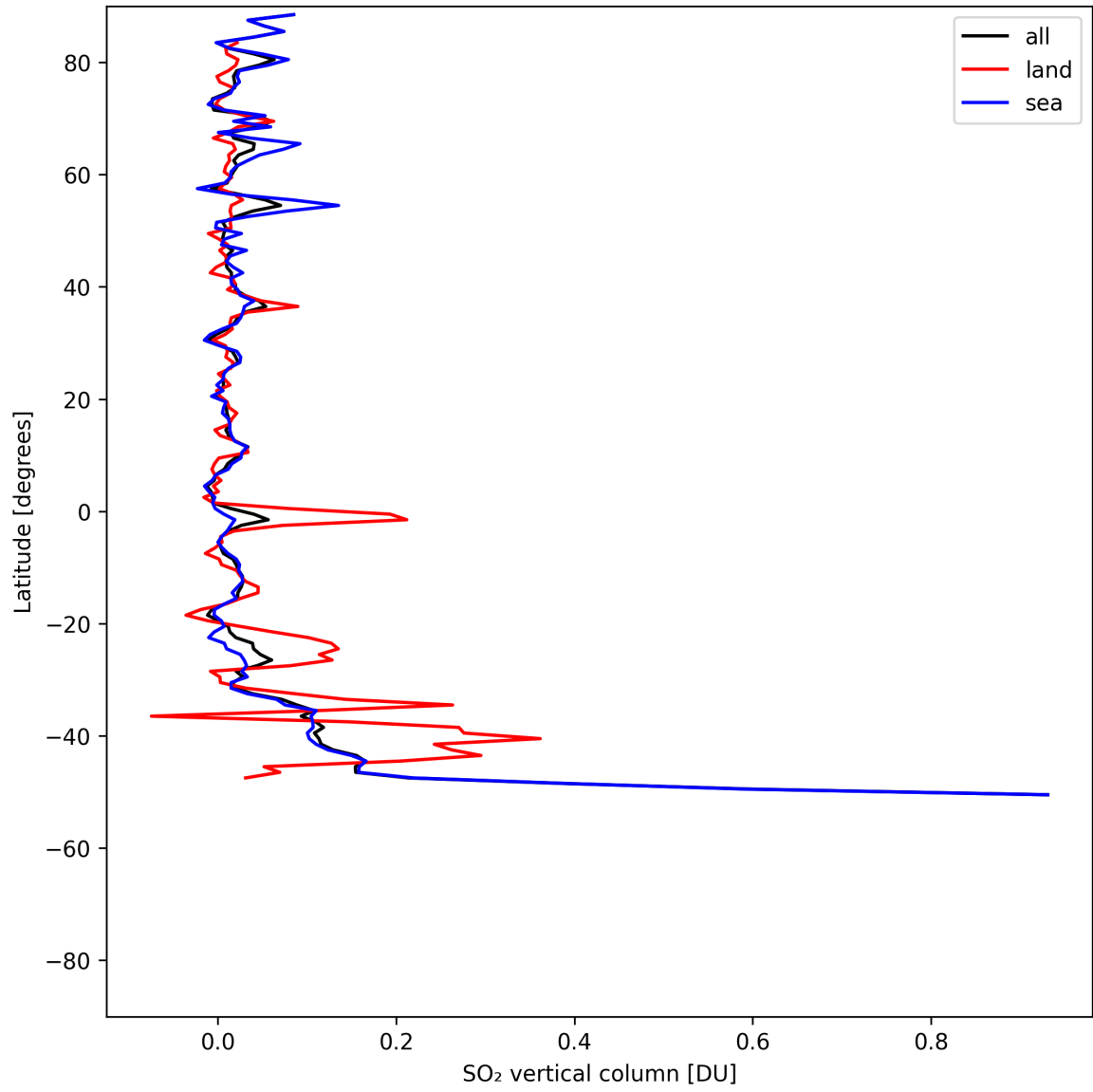


Figure 31: Zonal average of “SO₂ vertical column” for 2025-07-30 to 2025-07-31.

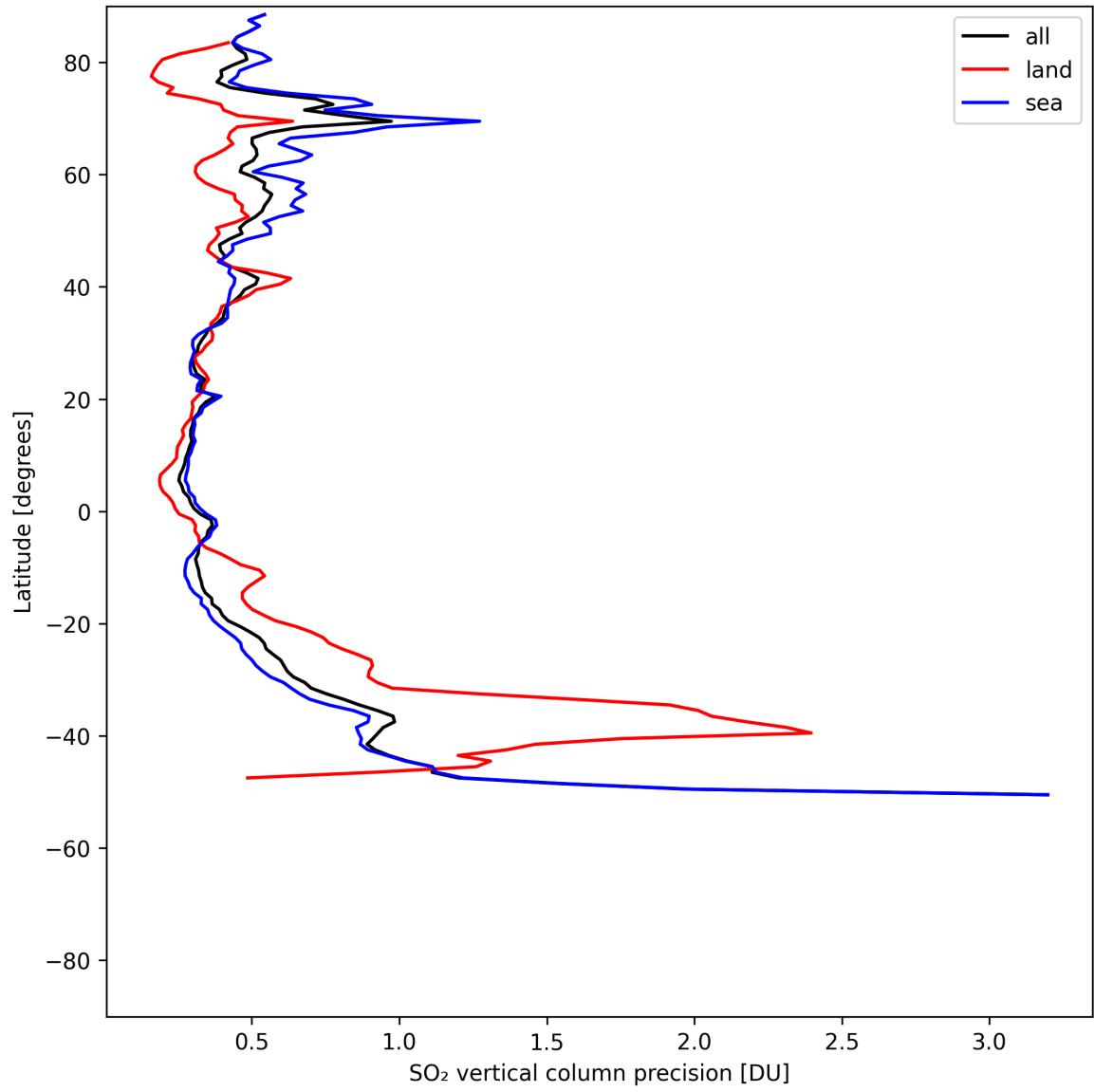


Figure 32: Zonal average of “SO₂ vertical column precision” for 2025-07-30 to 2025-07-31.

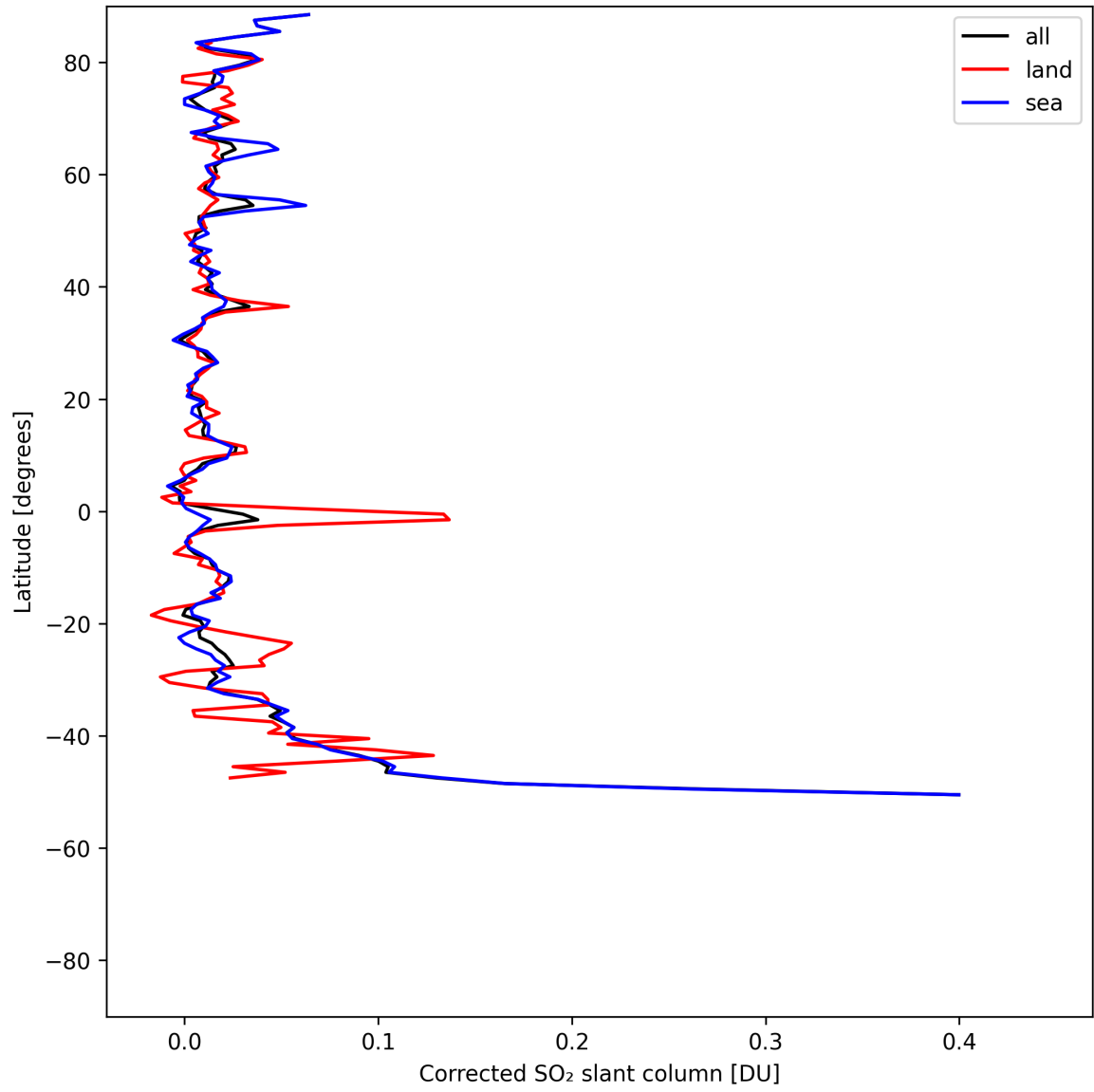


Figure 33: Zonal average of “Corrected SO₂ slant column” for 2025-07-30 to 2025-07-31.

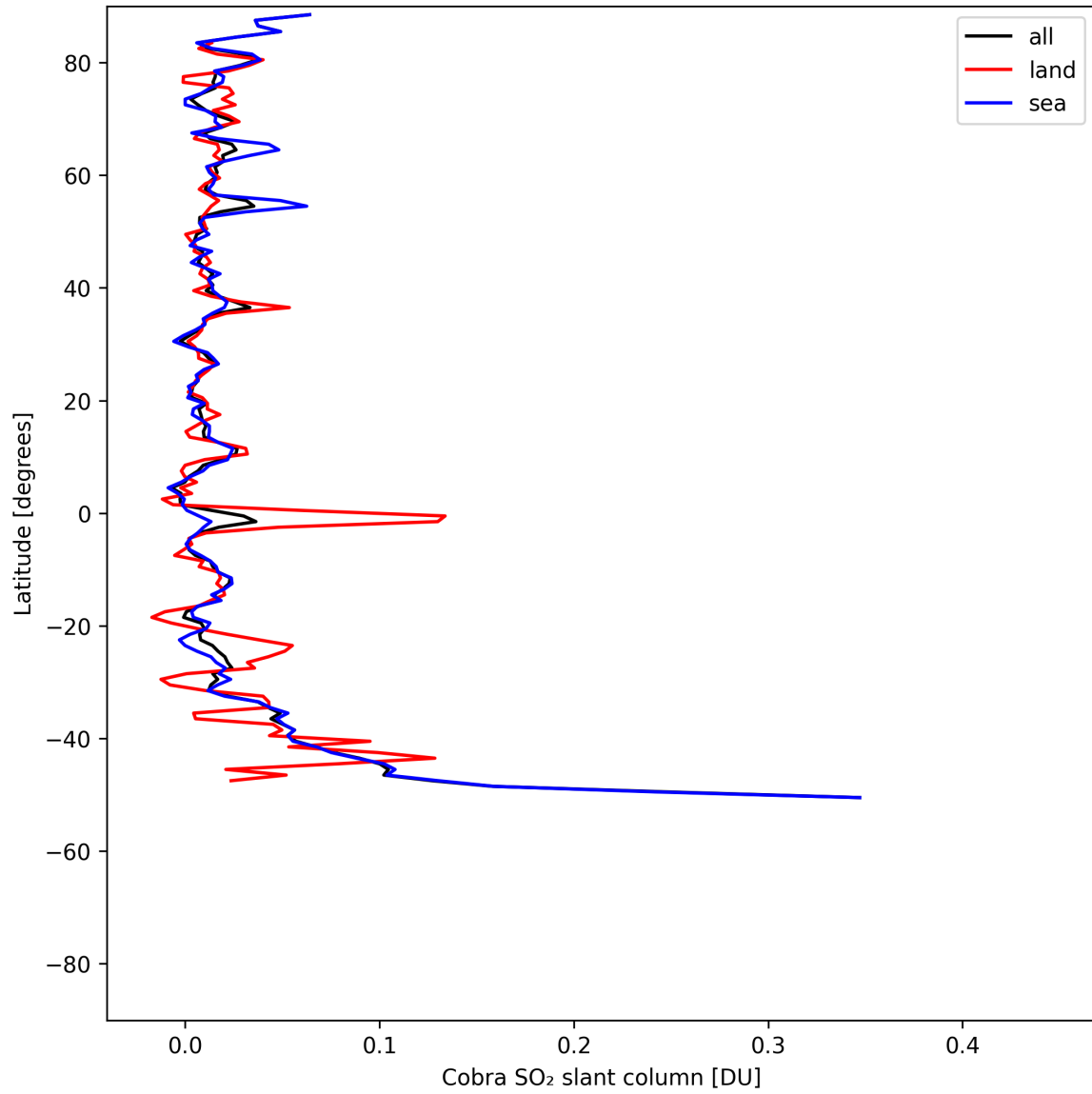


Figure 34: Zonal average of “Cobra SO₂ slant column” for 2025-07-30 to 2025-07-31.

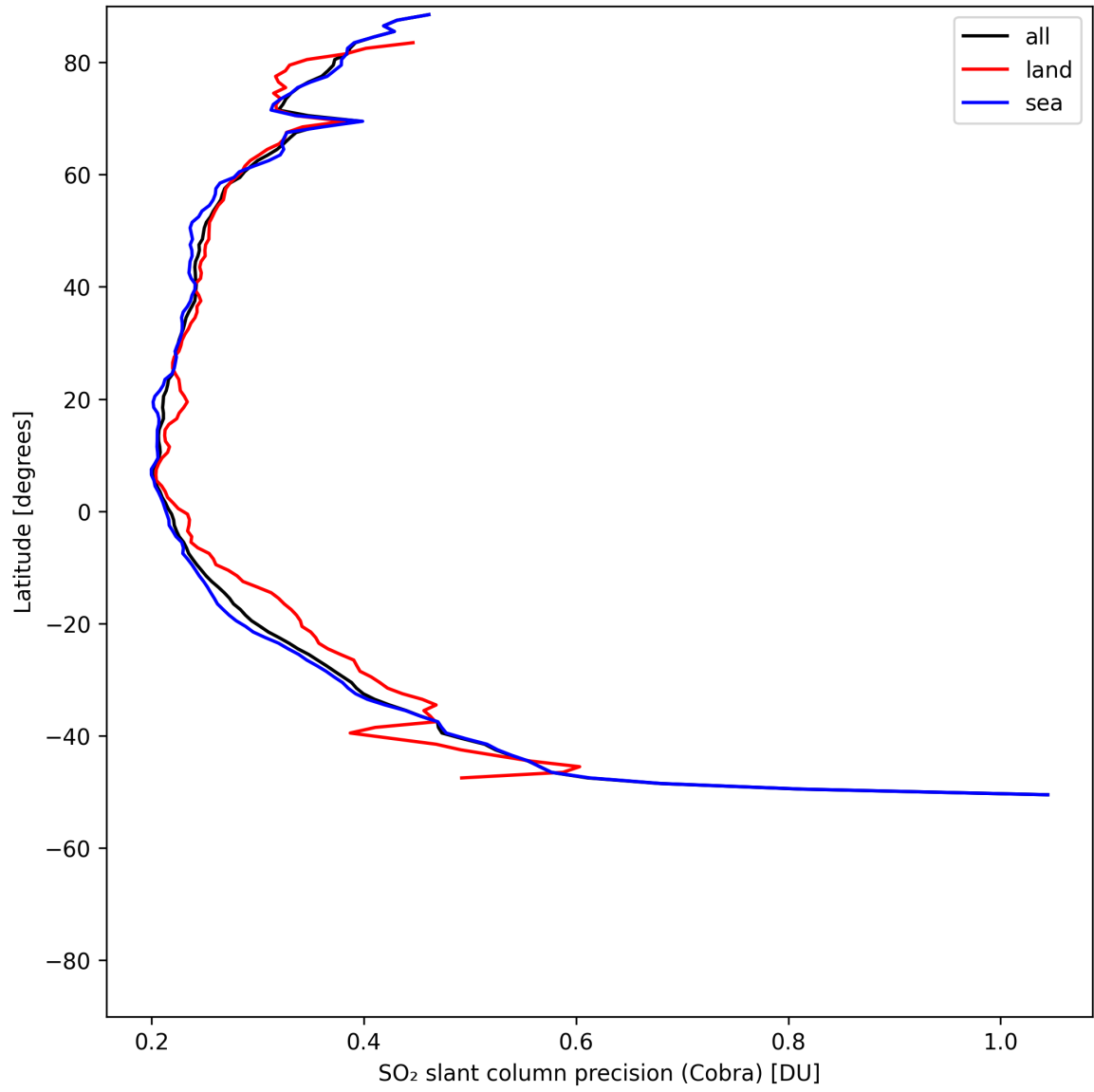


Figure 35: Zonal average of "SO₂ slant column precision (Cobra)" for 2025-07-30 to 2025-07-31.

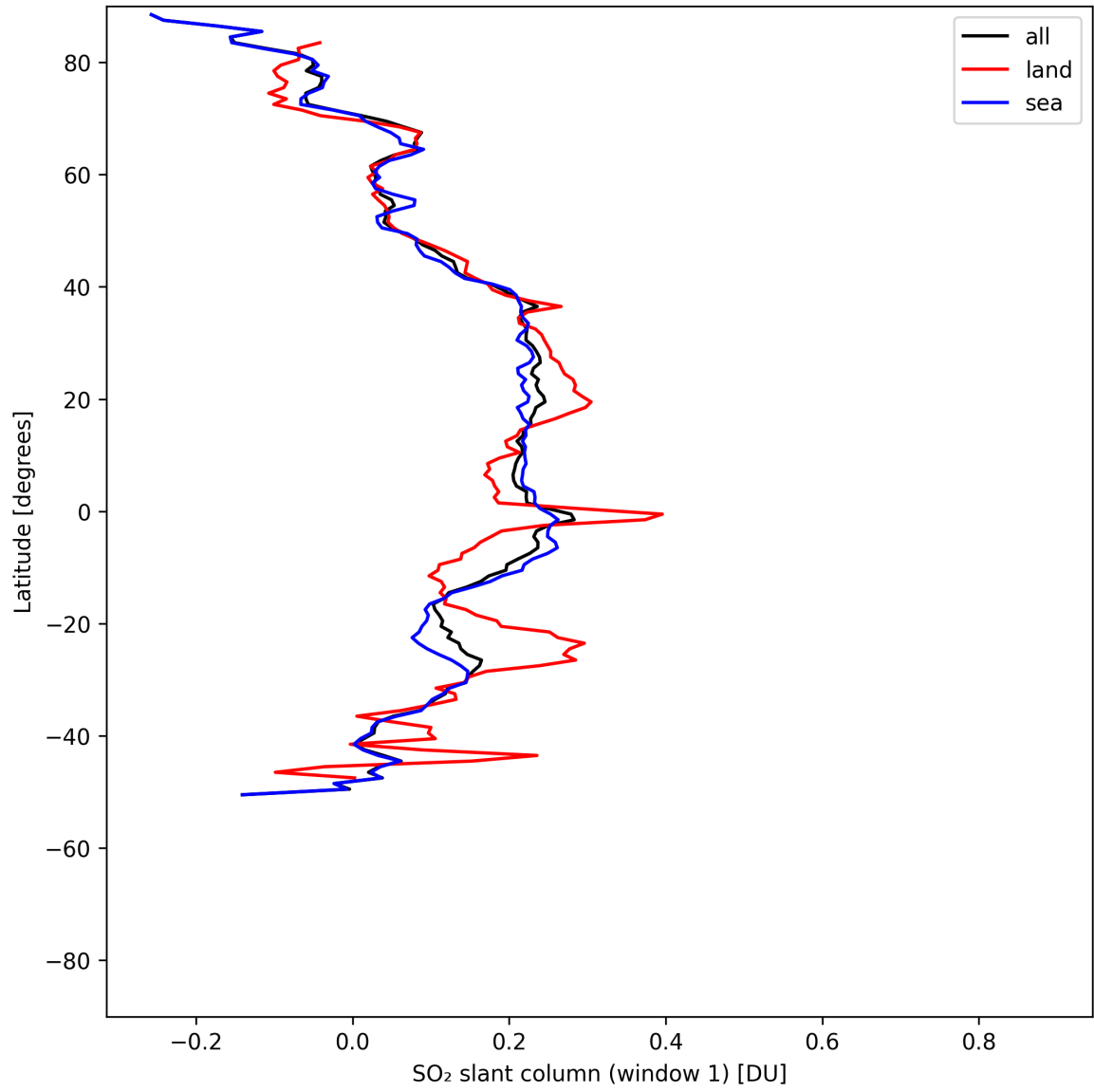


Figure 36: Zonal average of “SO₂ slant column (window 1)” for 2025-07-30 to 2025-07-31.

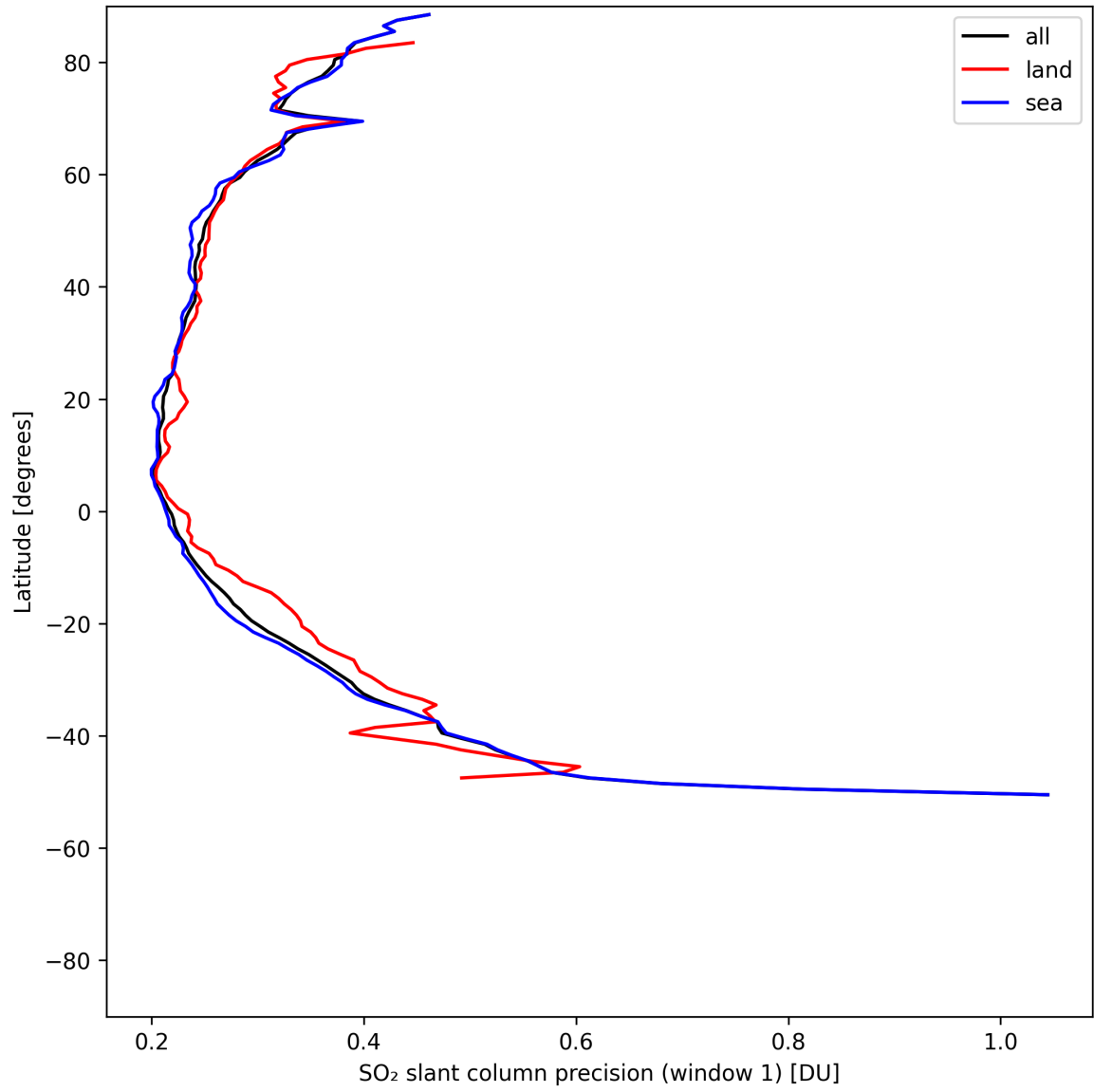


Figure 37: Zonal average of “SO₂ slant column precision (window 1)” for 2025-07-30 to 2025-07-31.

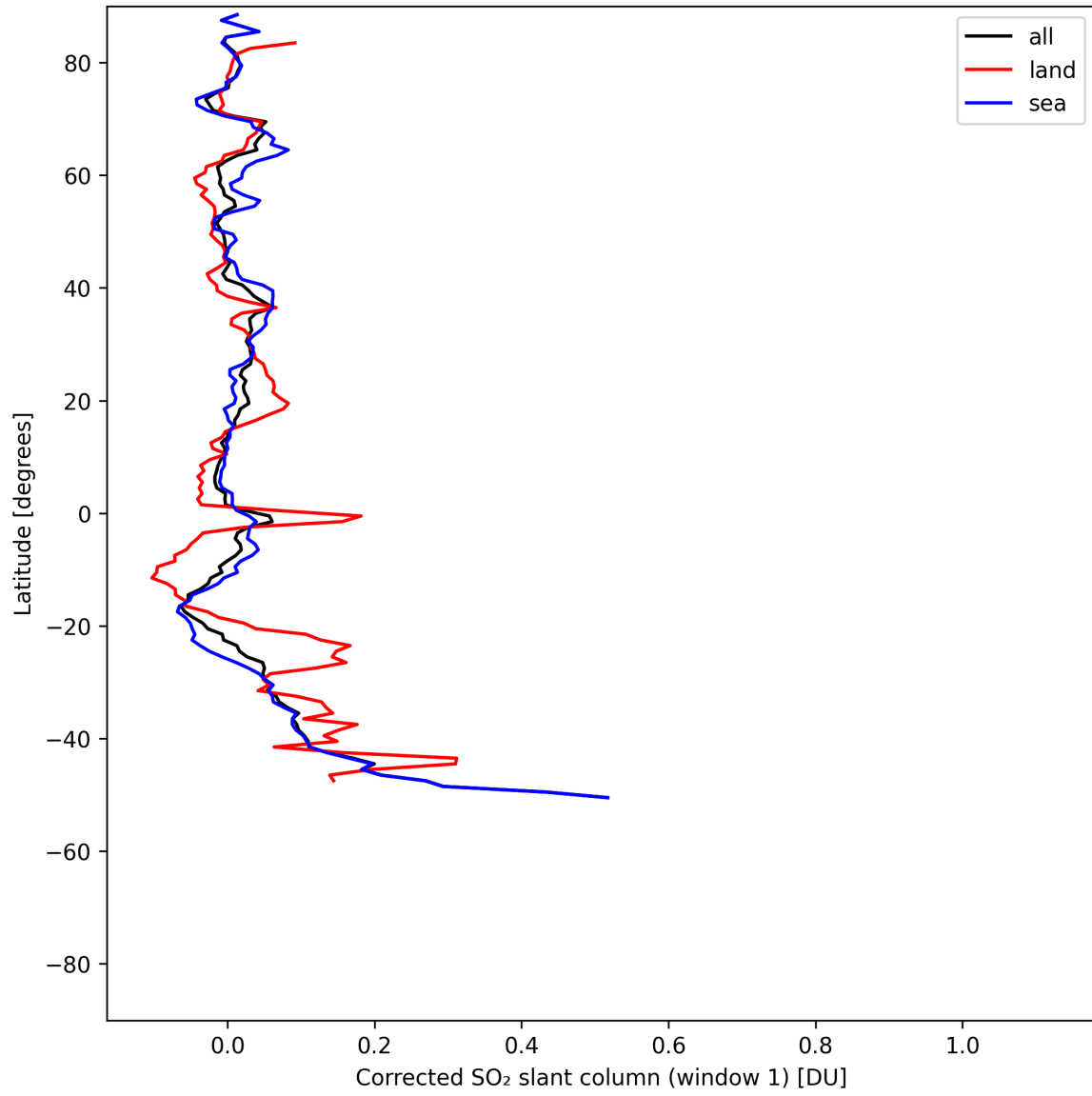


Figure 38: Zonal average of "Corrected SO₂ slant column (window 1)" for 2025-07-30 to 2025-07-31.

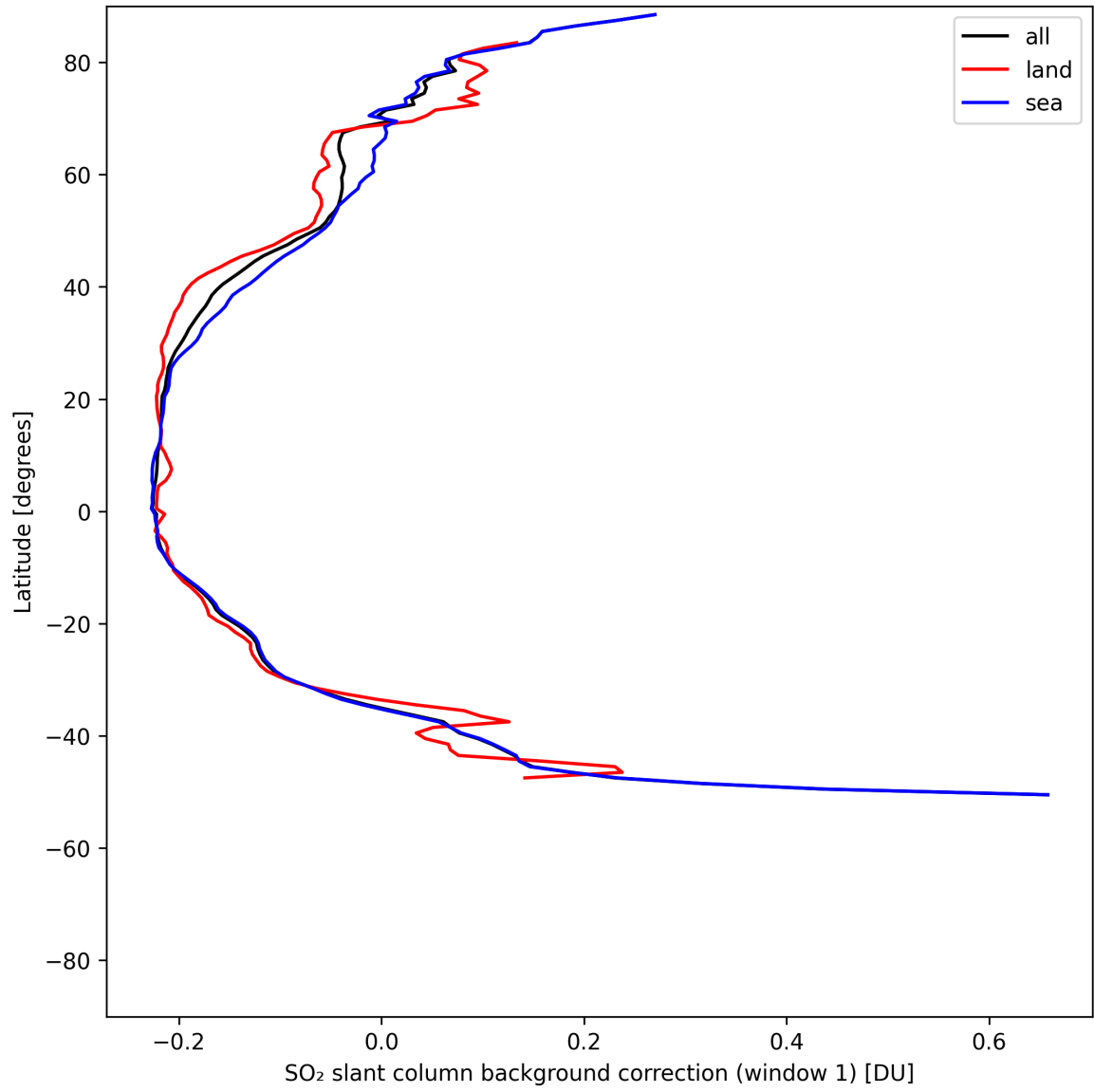


Figure 39: Zonal average of "SO₂ slant column background correction (window 1)" for 2025-07-30 to 2025-07-31.

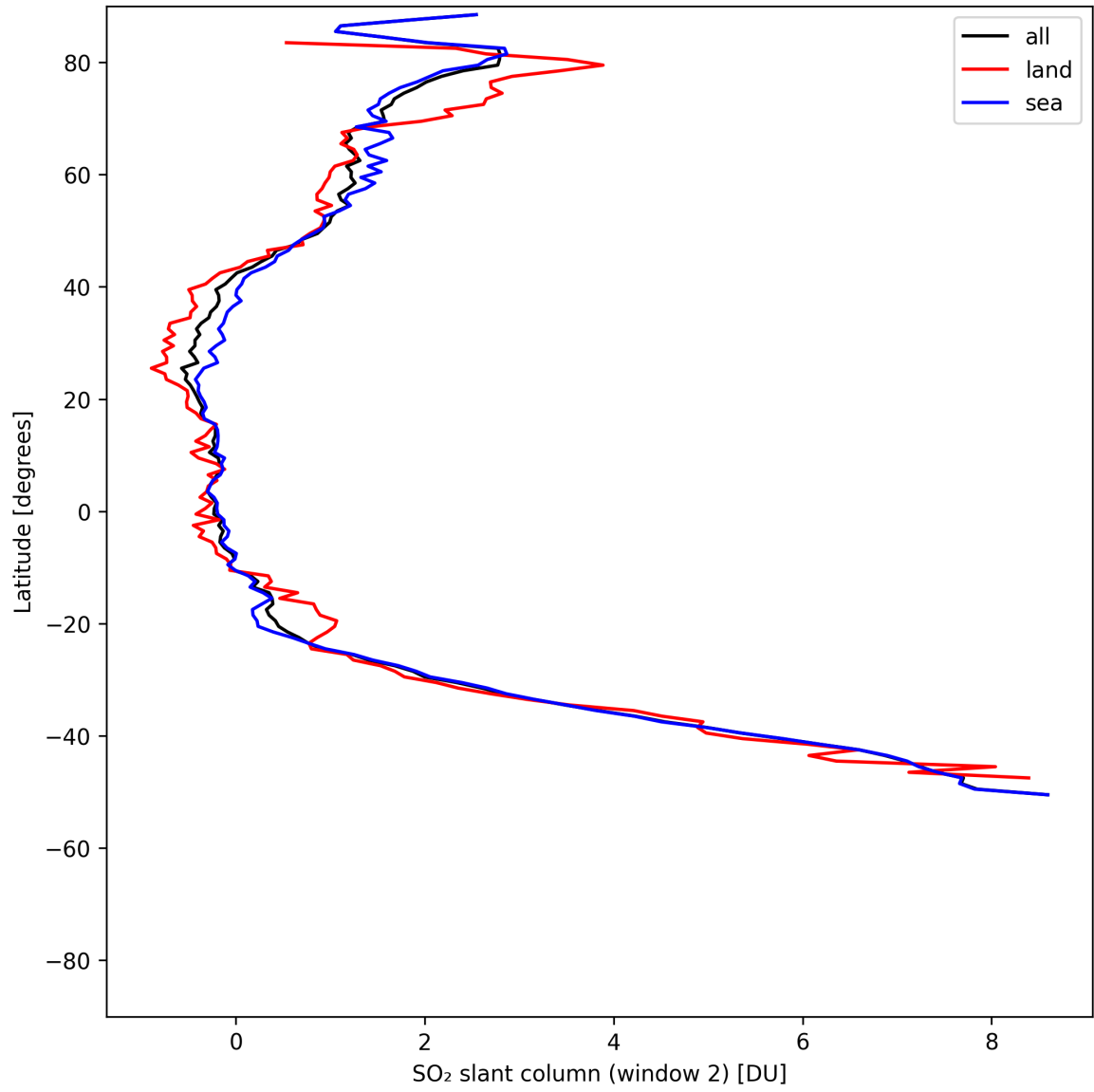


Figure 40: Zonal average of “SO₂ slant column (window 2)” for 2025-07-30 to 2025-07-31.

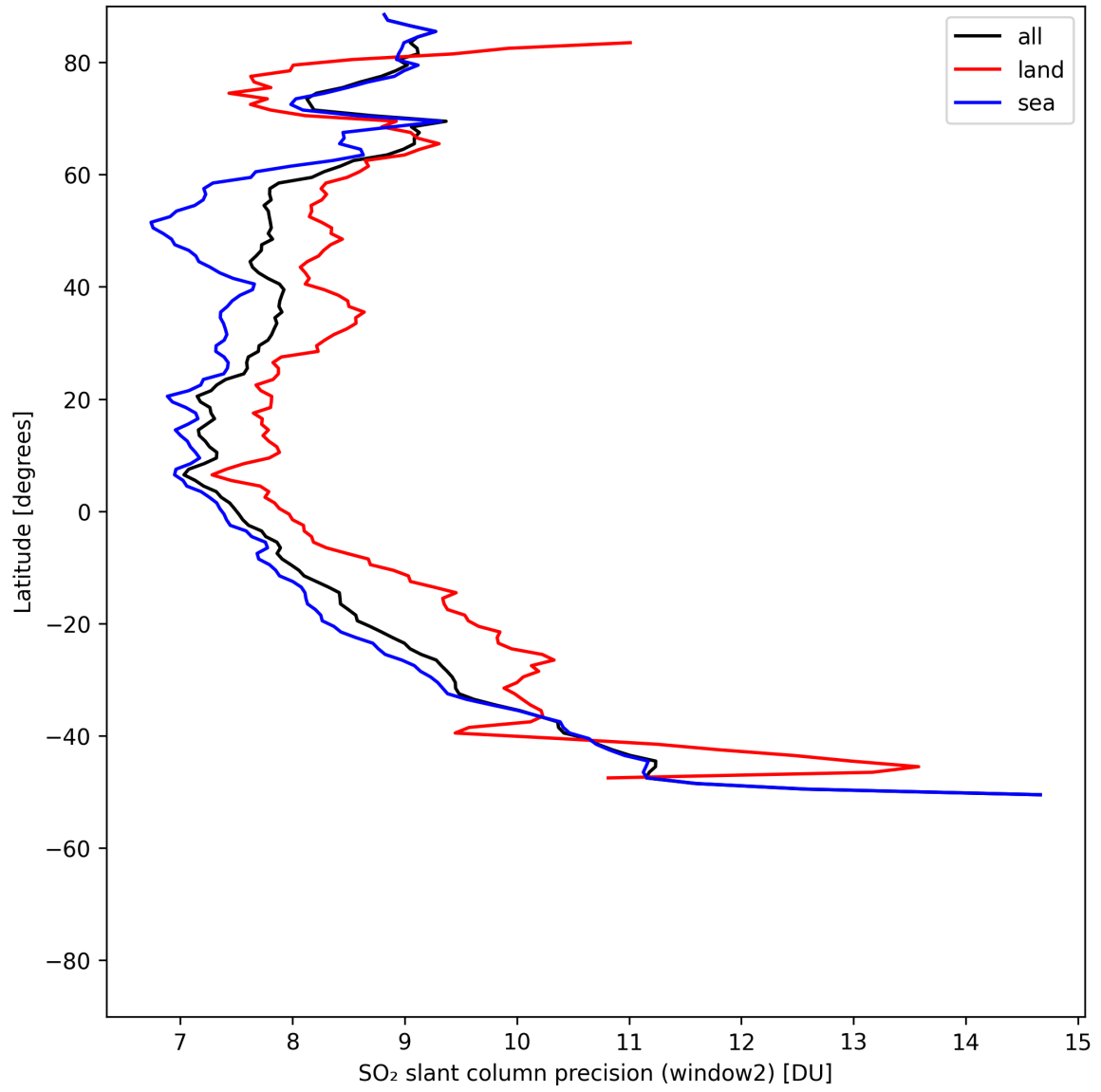


Figure 41: Zonal average of “SO₂ slant column precision (window2)” for 2025-07-30 to 2025-07-31.

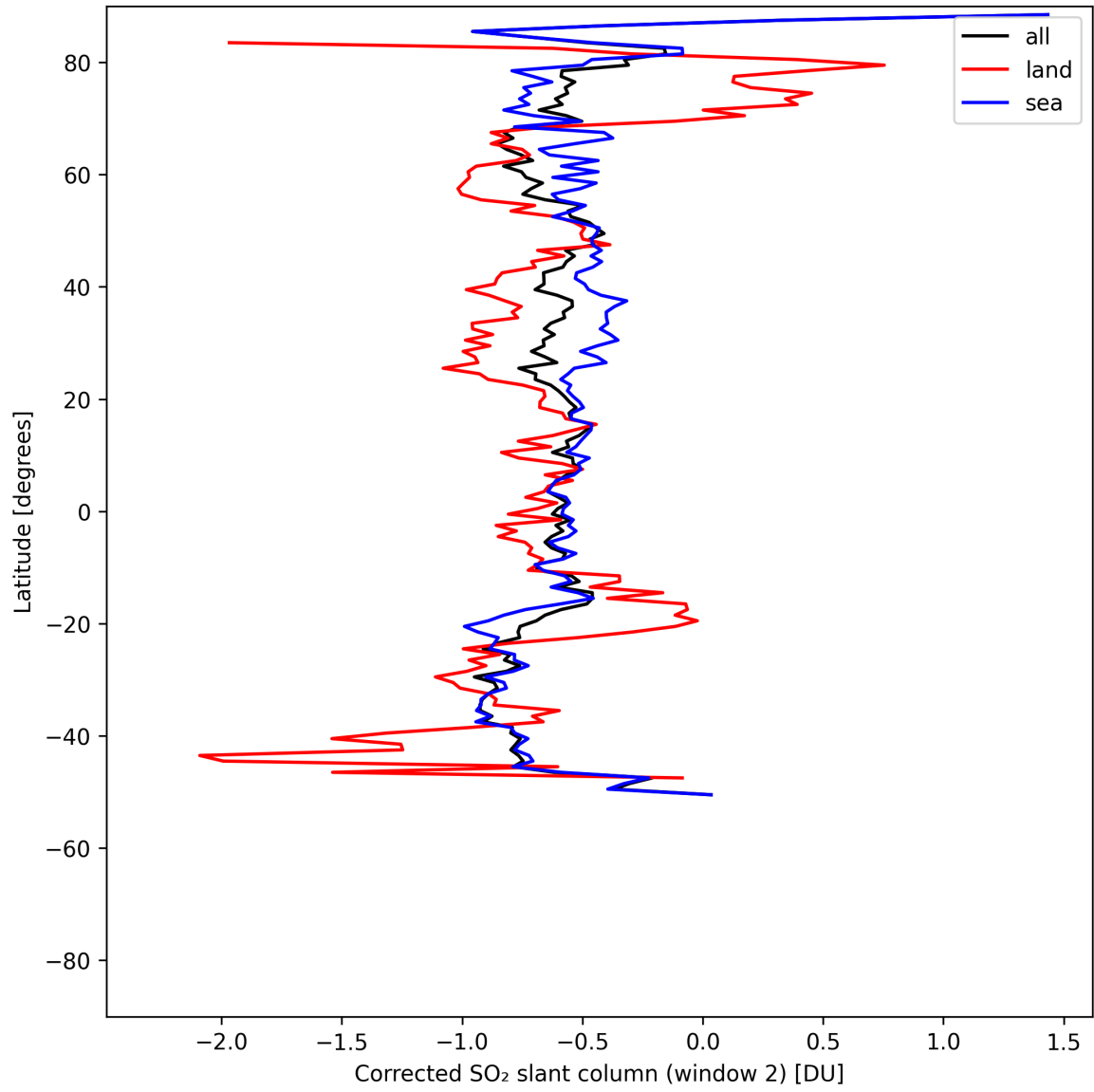


Figure 42: Zonal average of “Corrected SO₂ slant column (window 2)” for 2025-07-30 to 2025-07-31.

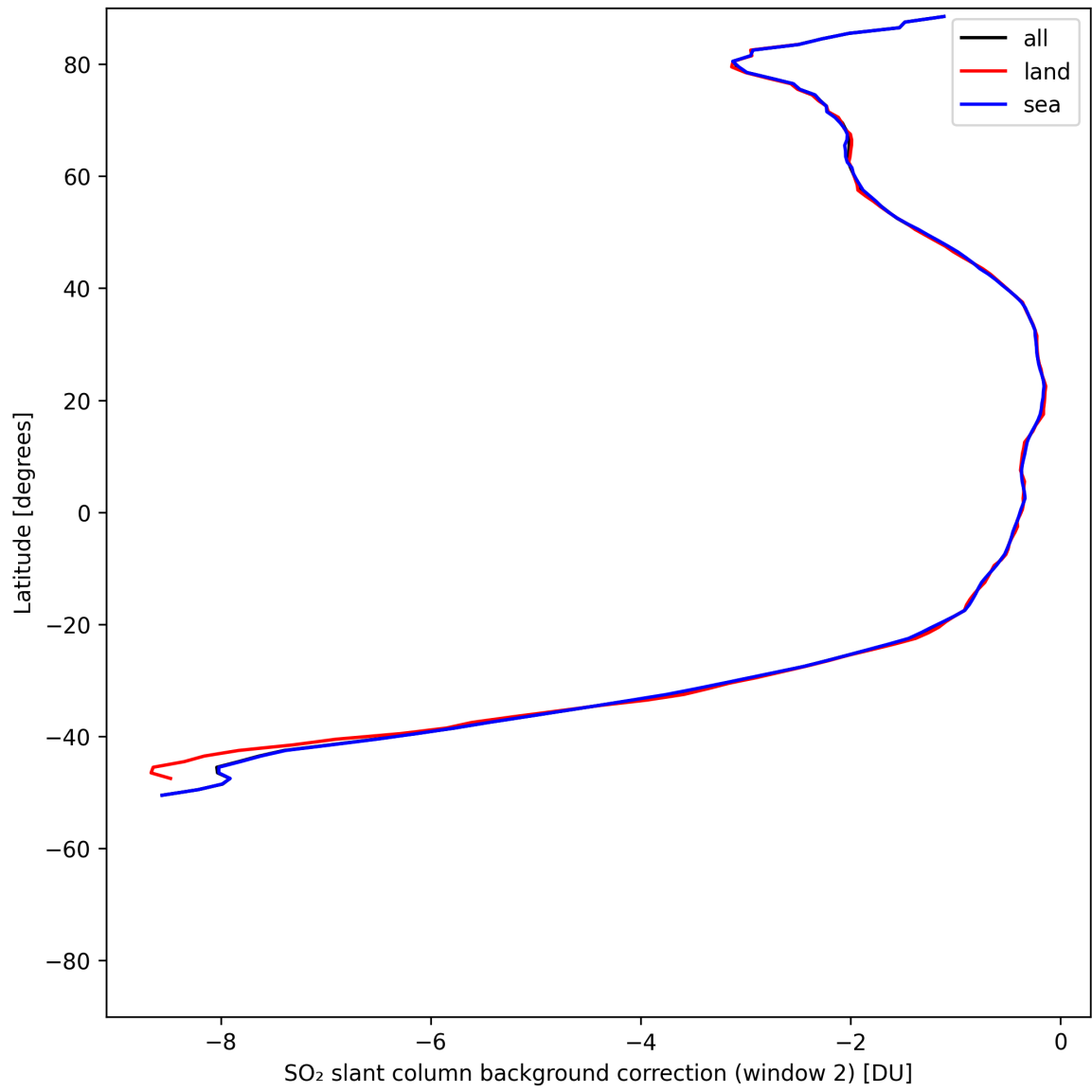


Figure 43: Zonal average of “SO₂ slant column background correction (window 2)” for 2025-07-30 to 2025-07-31.

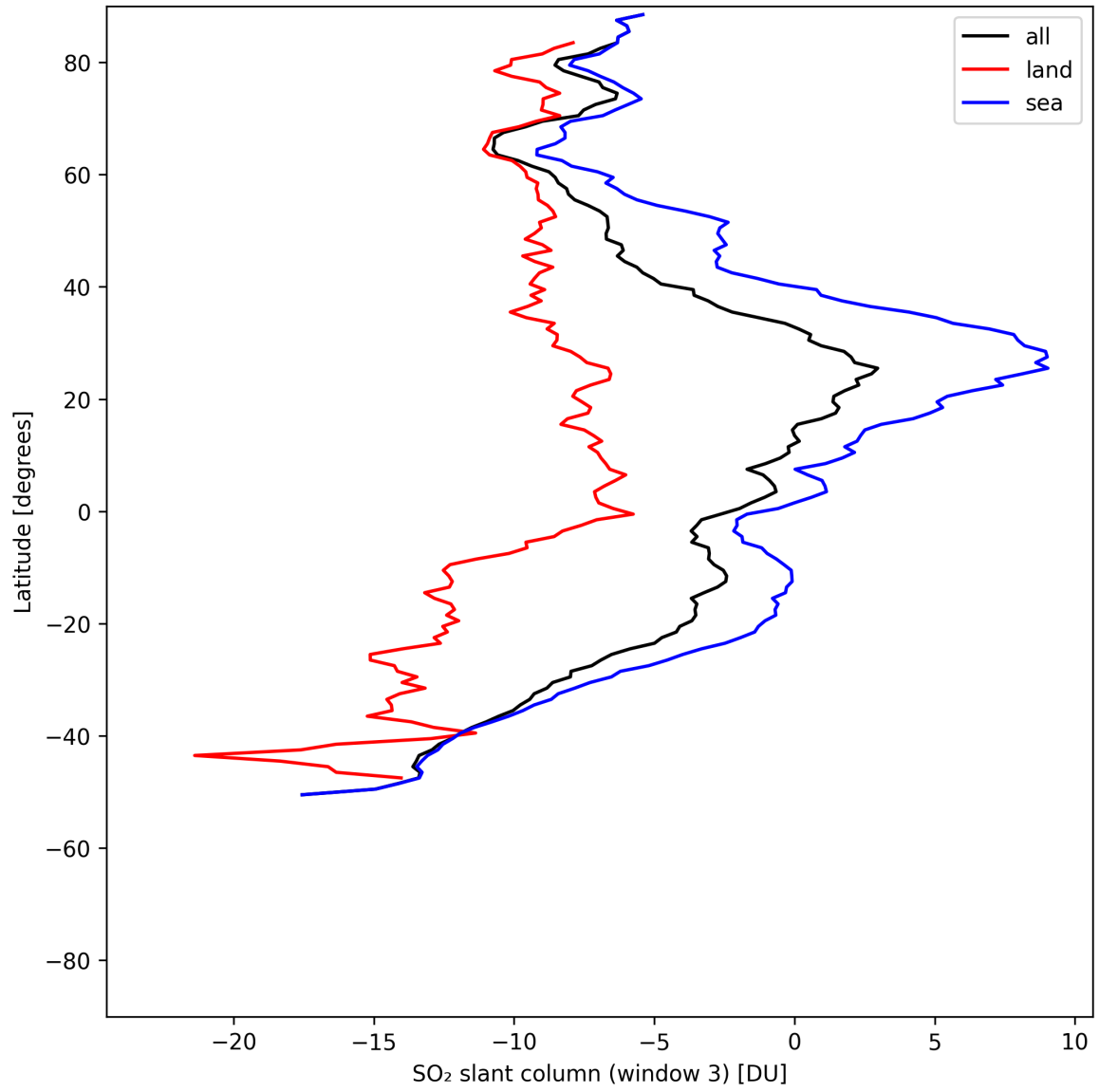


Figure 44: Zonal average of “SO₂ slant column (window 3)” for 2025-07-30 to 2025-07-31.

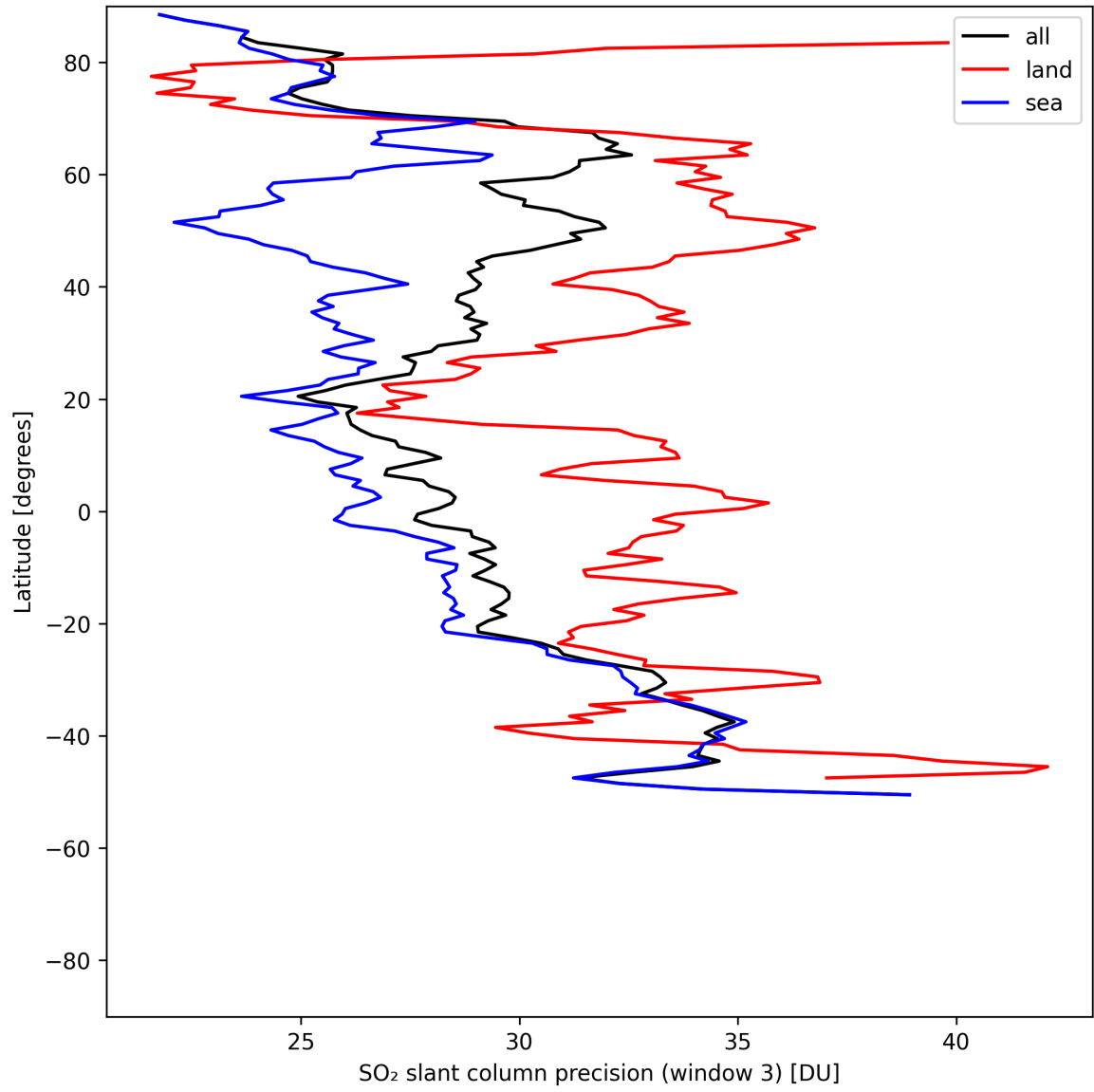


Figure 45: Zonal average of “SO₂ slant column precision (window 3)” for 2025-07-30 to 2025-07-31.

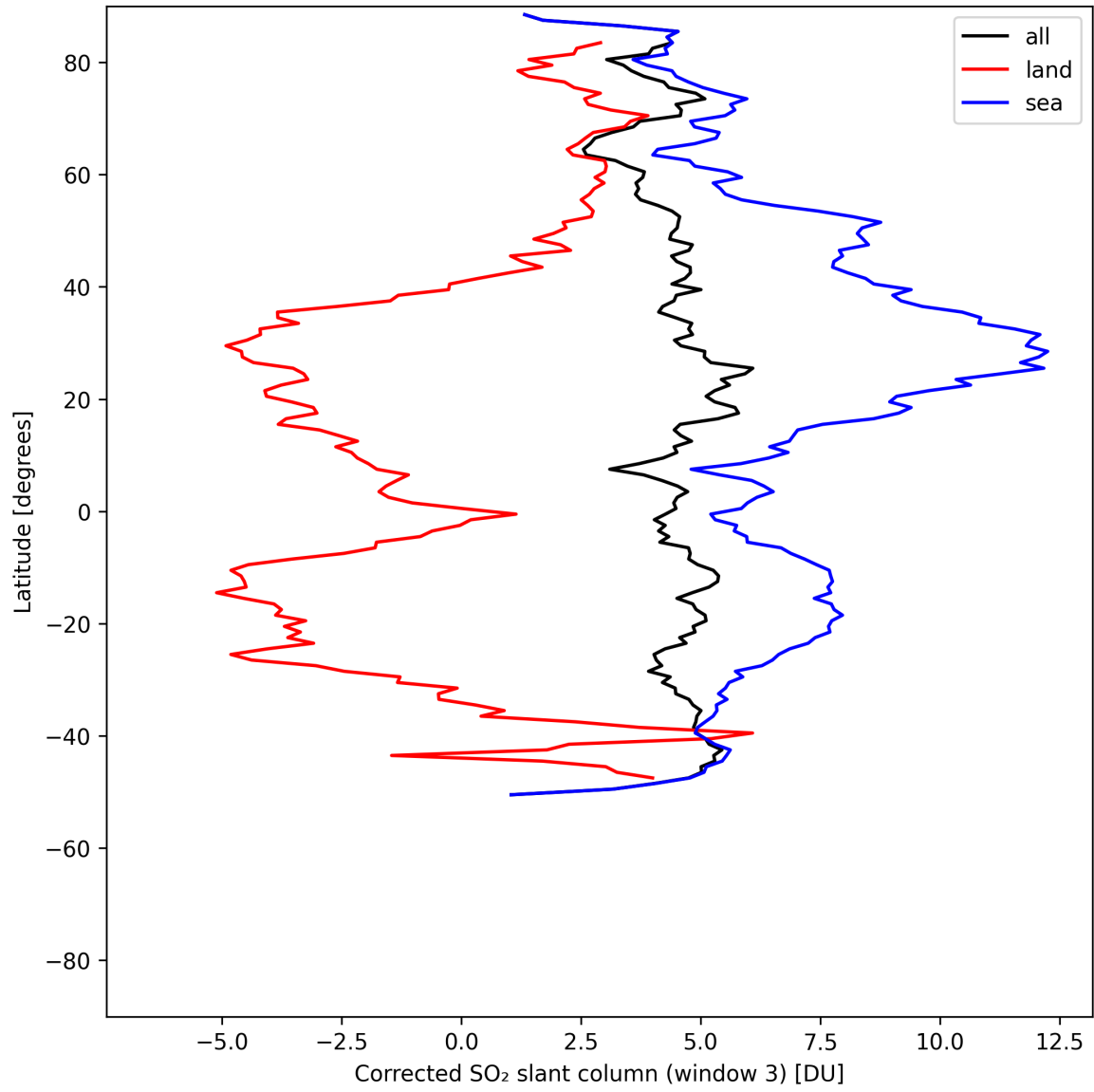


Figure 46: Zonal average of “Corrected SO₂ slant column (window 3)” for 2025-07-30 to 2025-07-31.

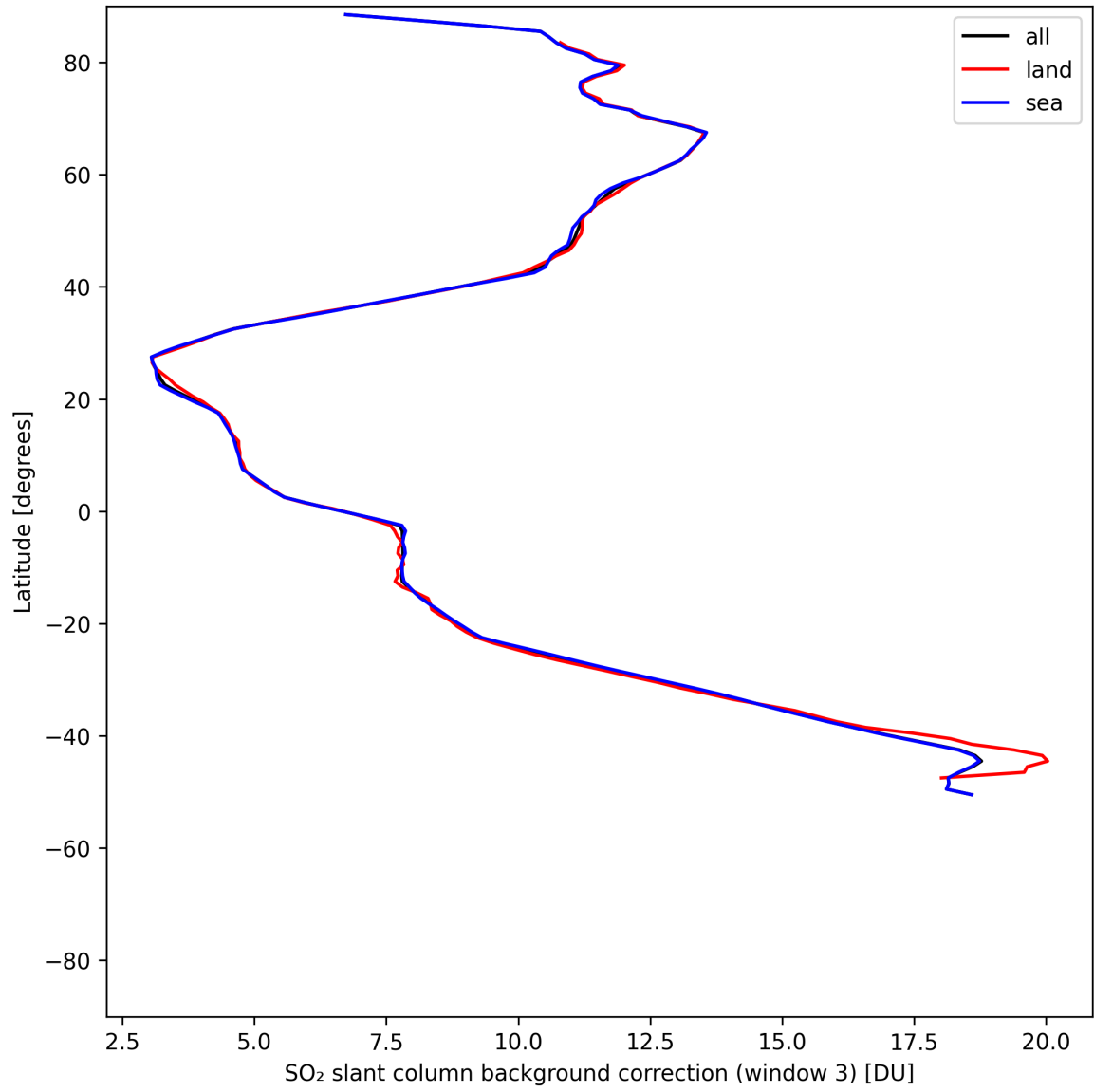


Figure 47: Zonal average of “SO₂ slant column background correction (window 3)” for 2025-07-30 to 2025-07-31.

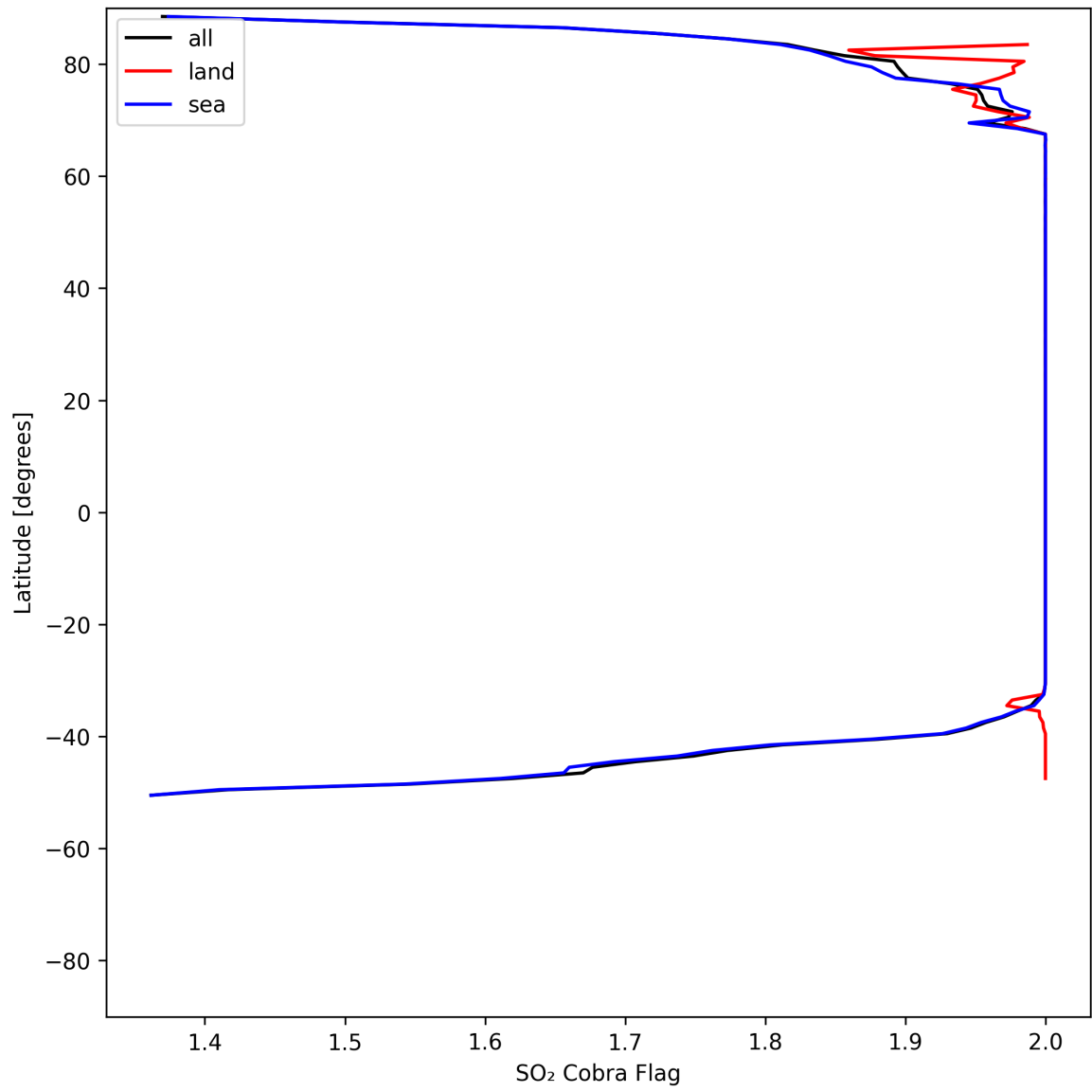


Figure 48: Zonal average of “SO₂ Cobra Flag” for 2025-07-30 to 2025-07-31.

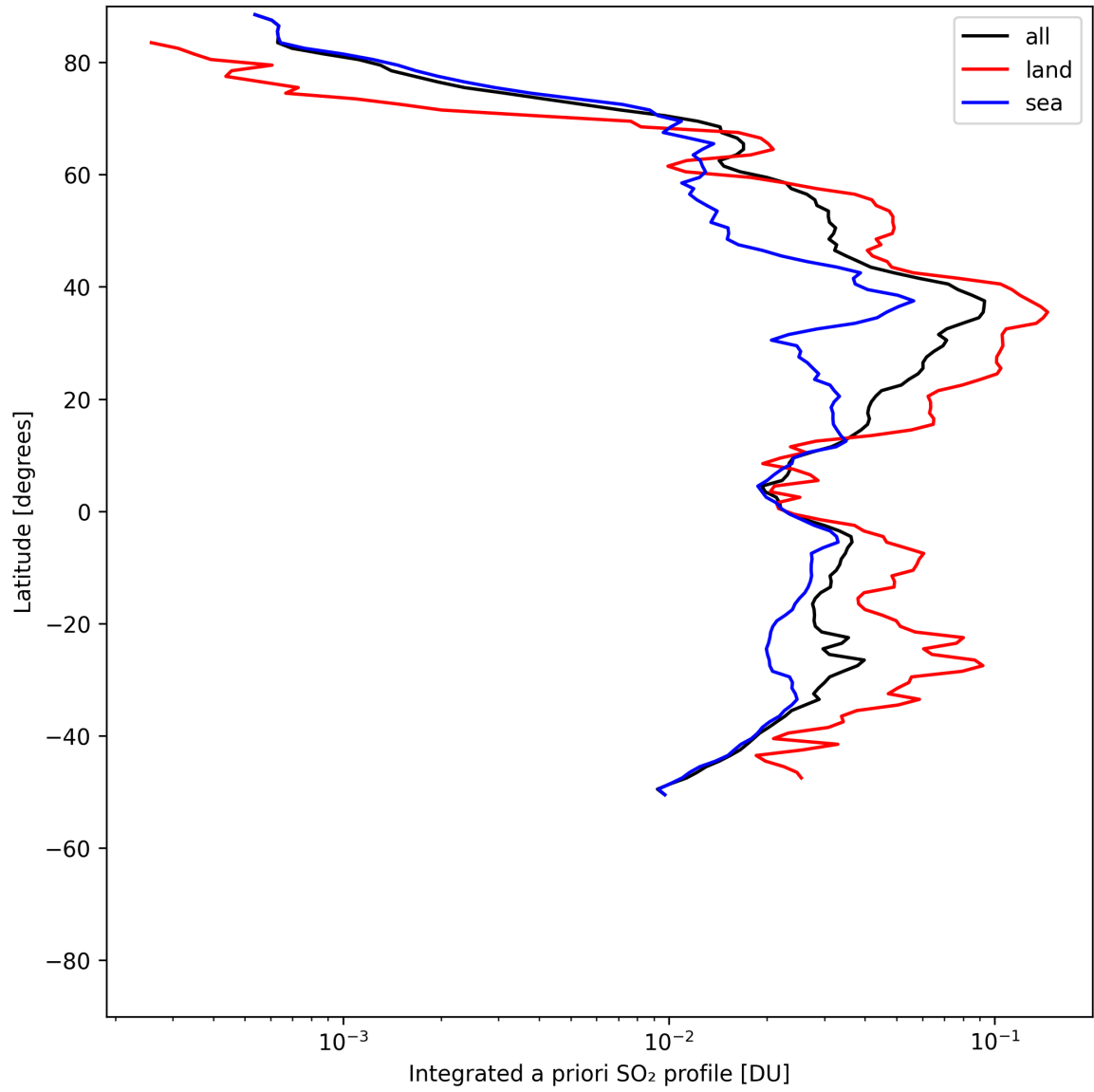


Figure 49: Zonal average of “Integrated a priori SO₂ profile” for 2025-07-30 to 2025-07-31.

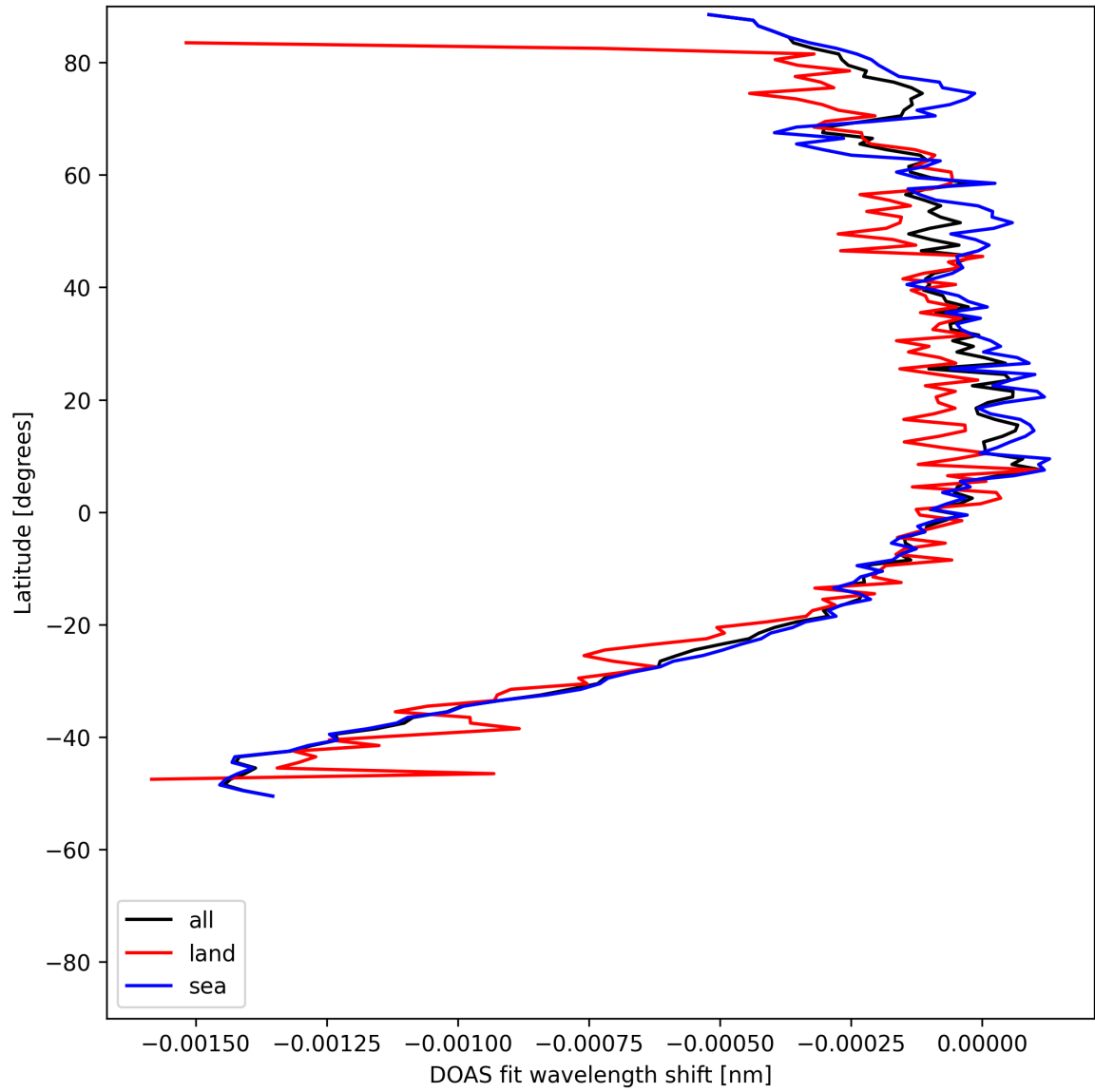


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-07-30 to 2025-07-31.

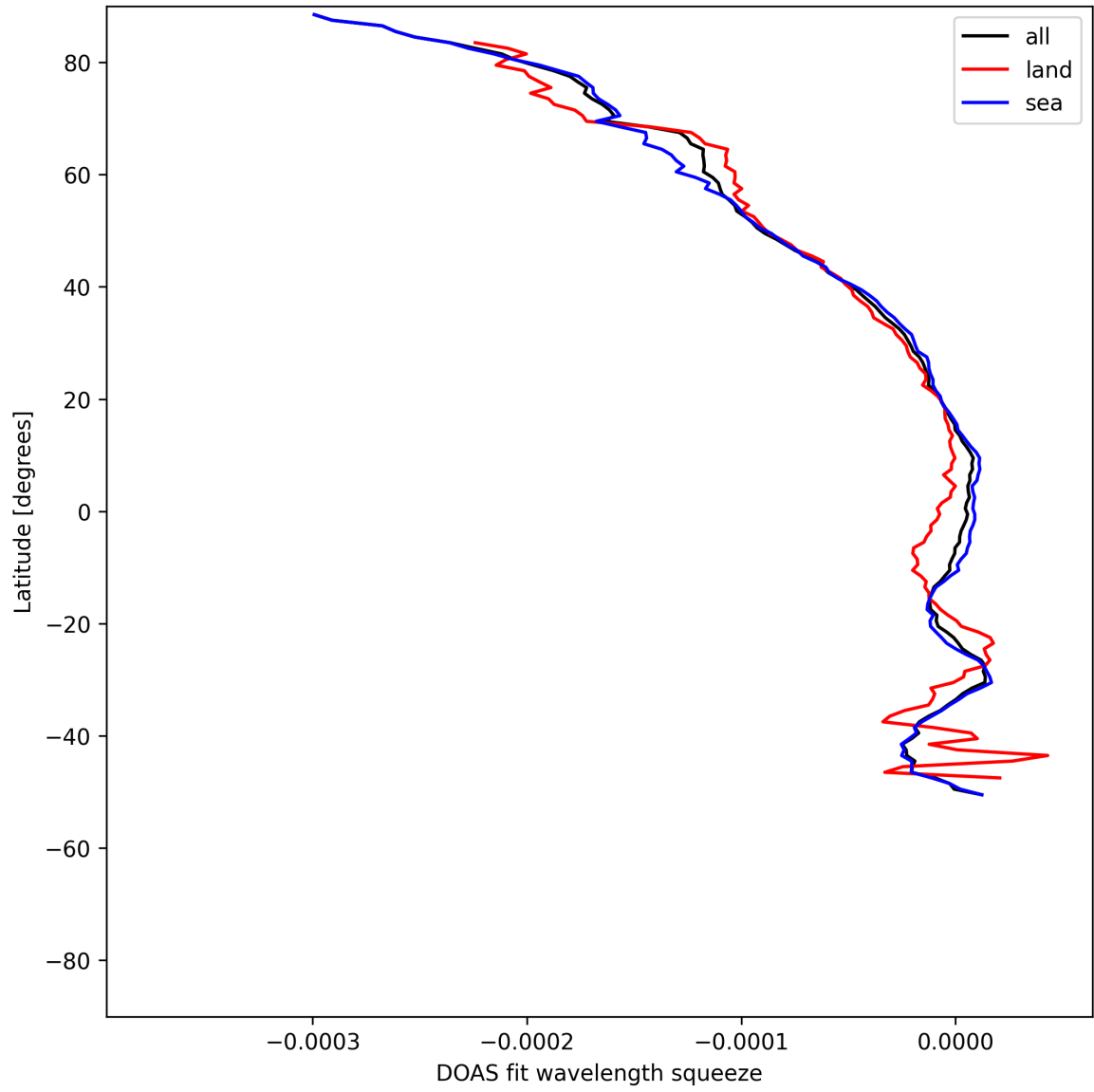


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-07-30 to 2025-07-31.

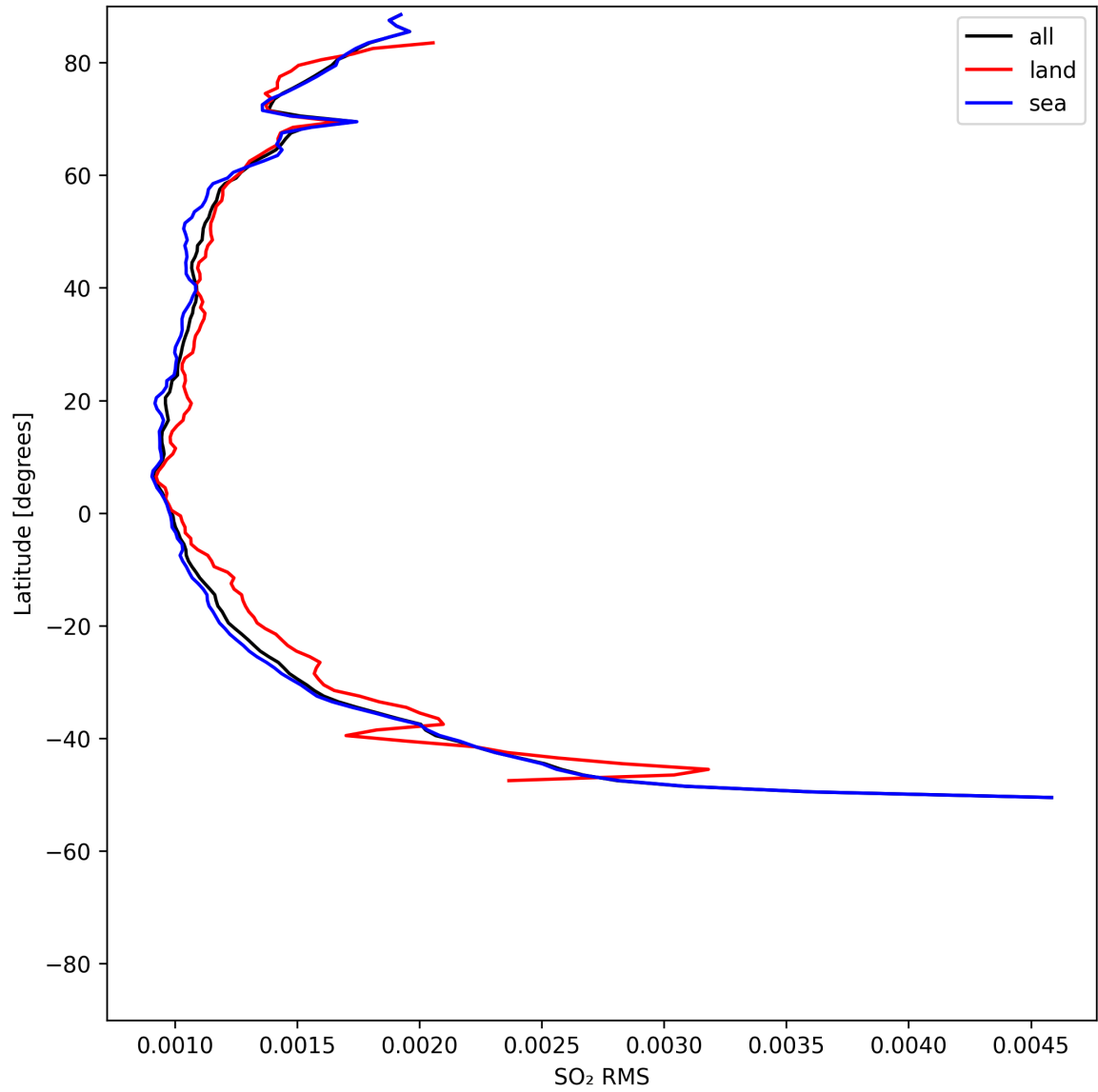


Figure 52: Zonal average of “SO₂ RMS” for 2025-07-30 to 2025-07-31.

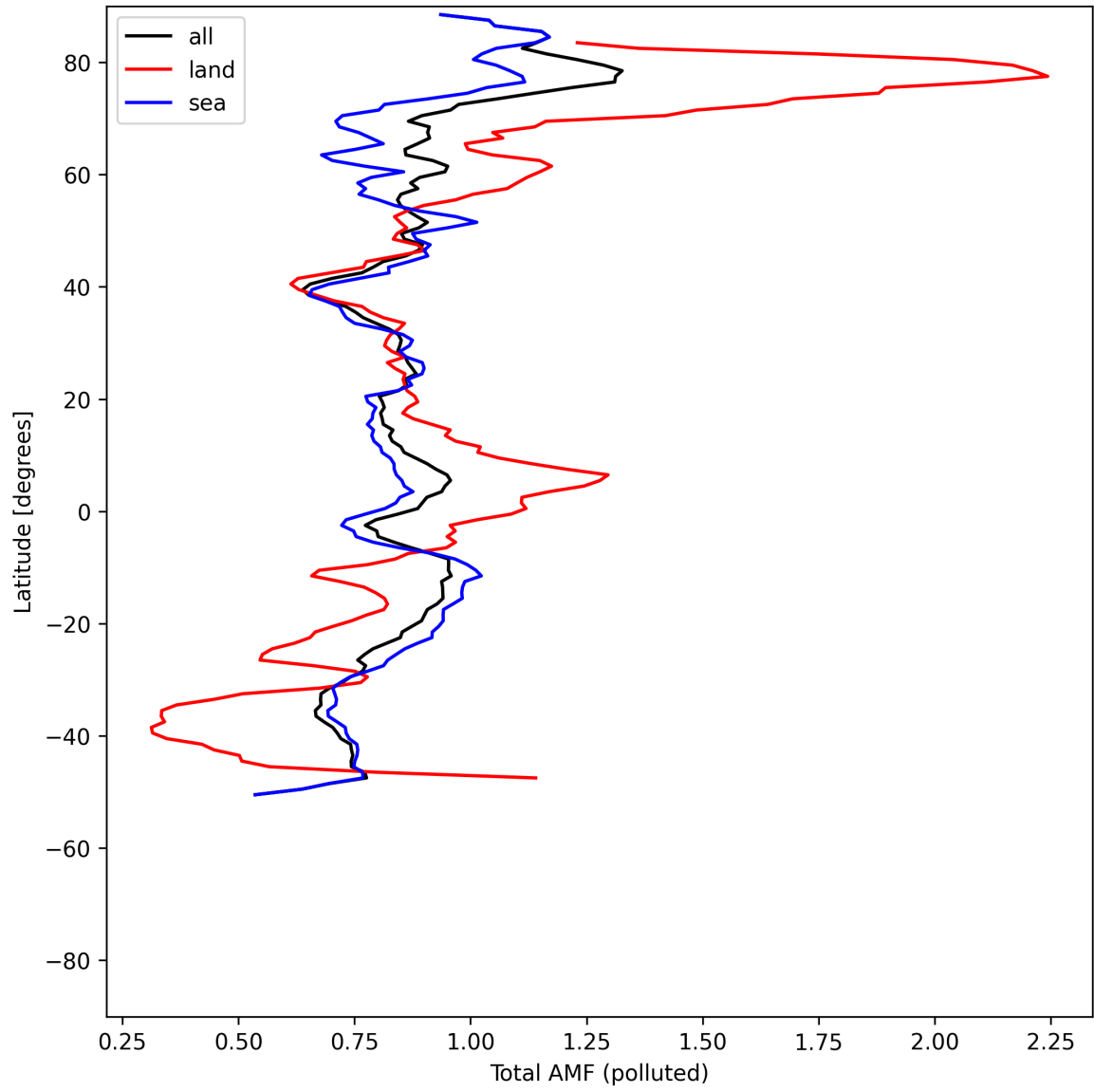


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-07-30 to 2025-07-31.

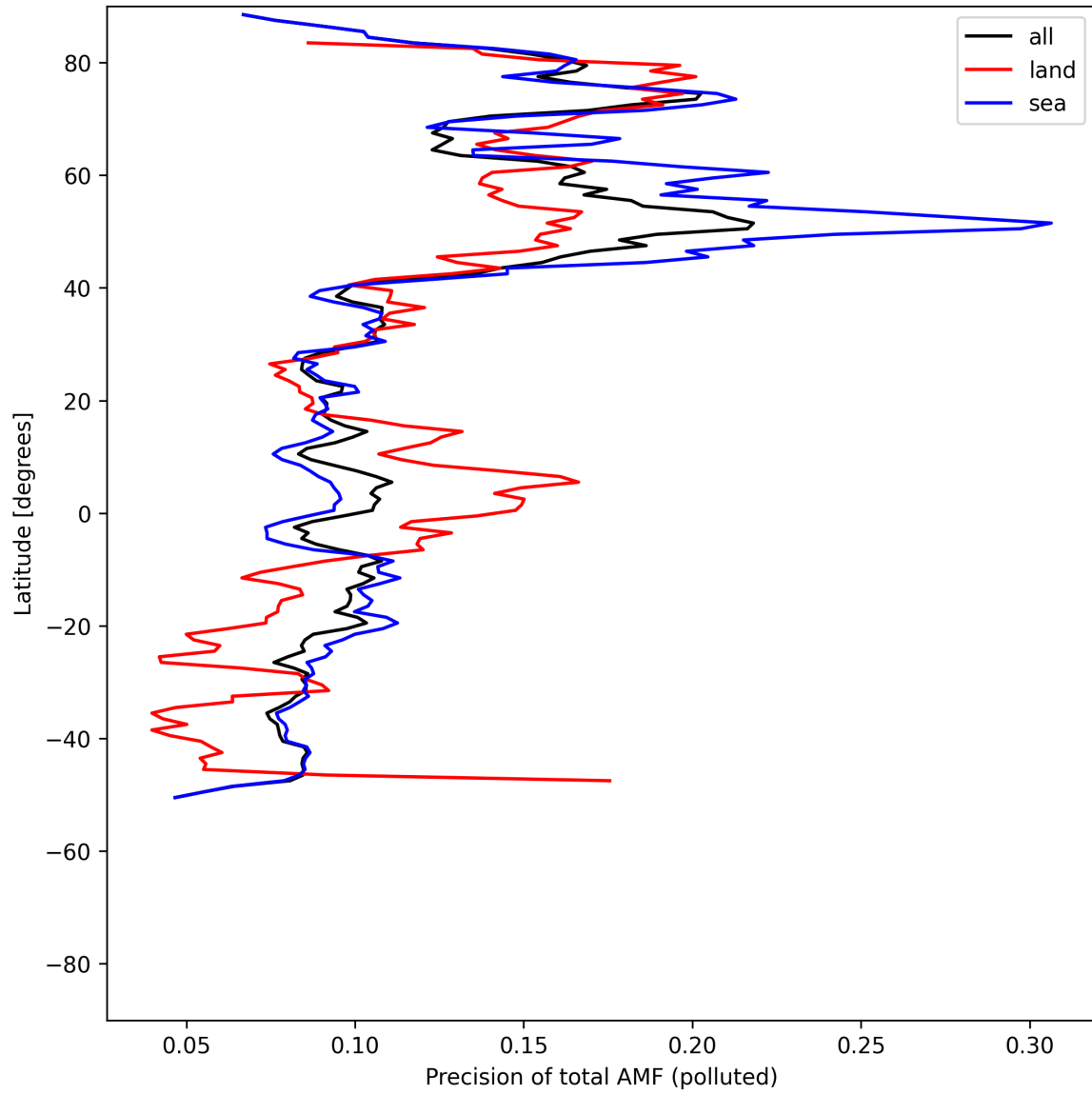


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-07-30 to 2025-07-31.

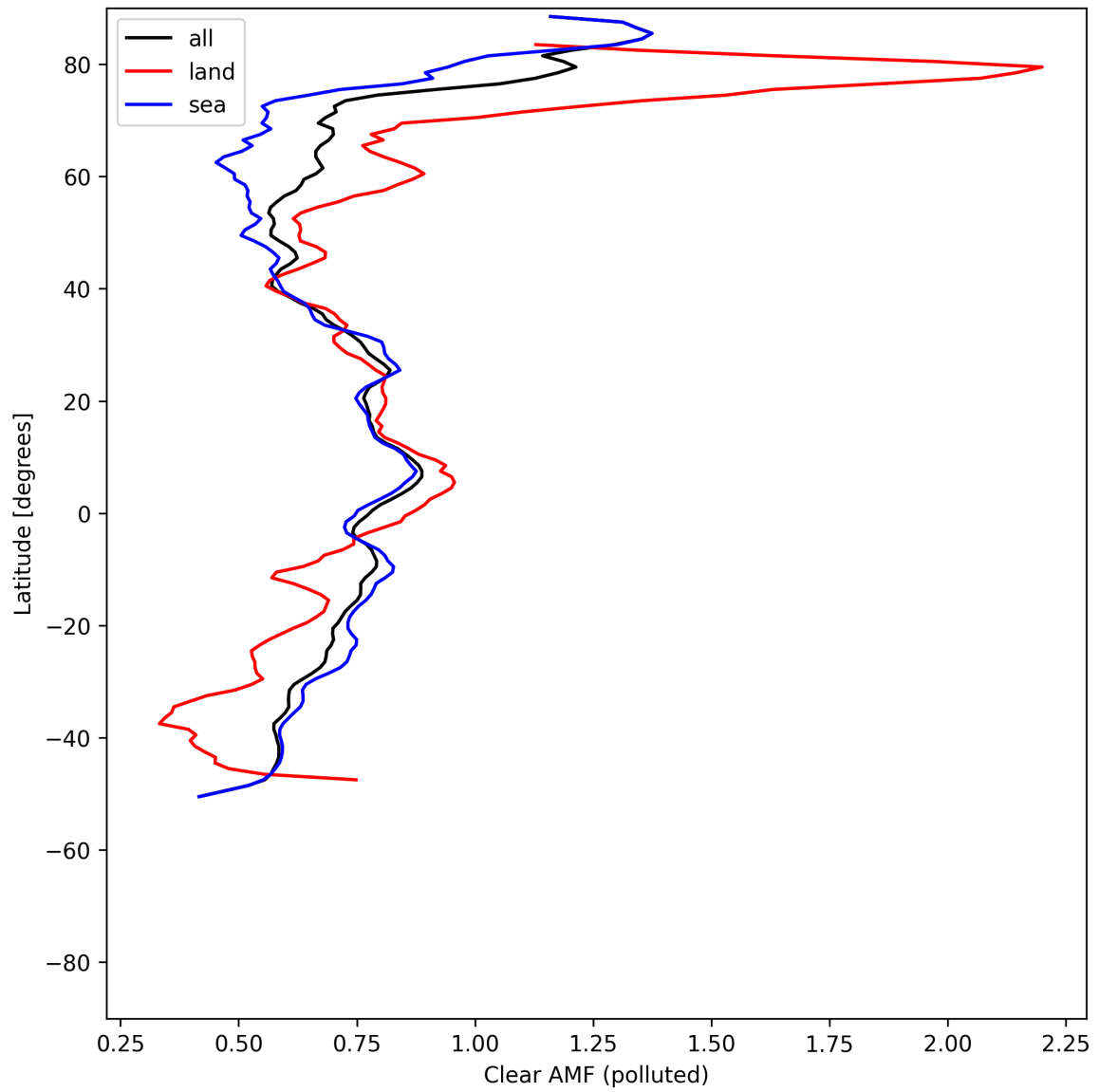


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-07-30 to 2025-07-31.

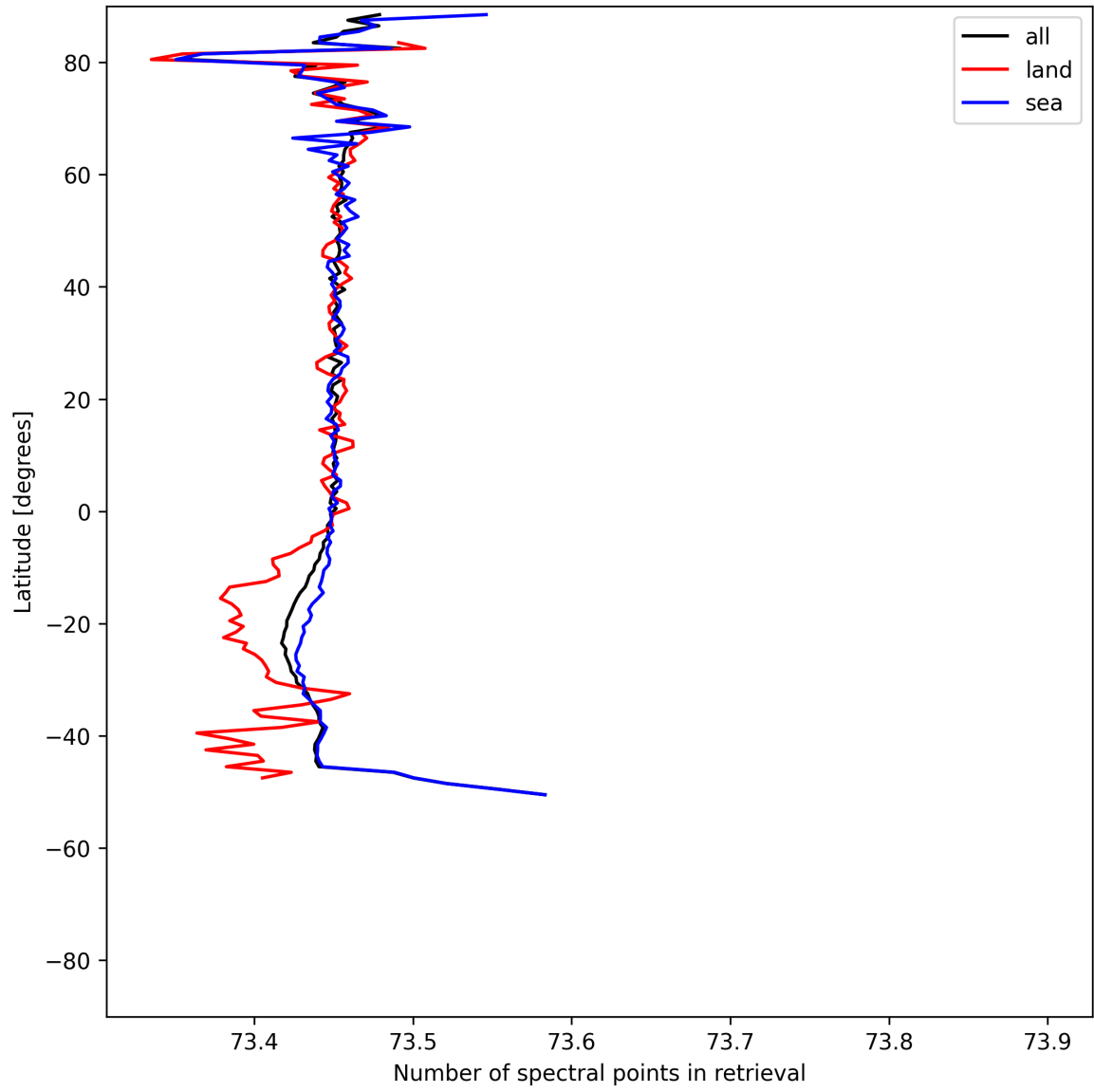


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-07-30 to 2025-07-31.

8 Histograms

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

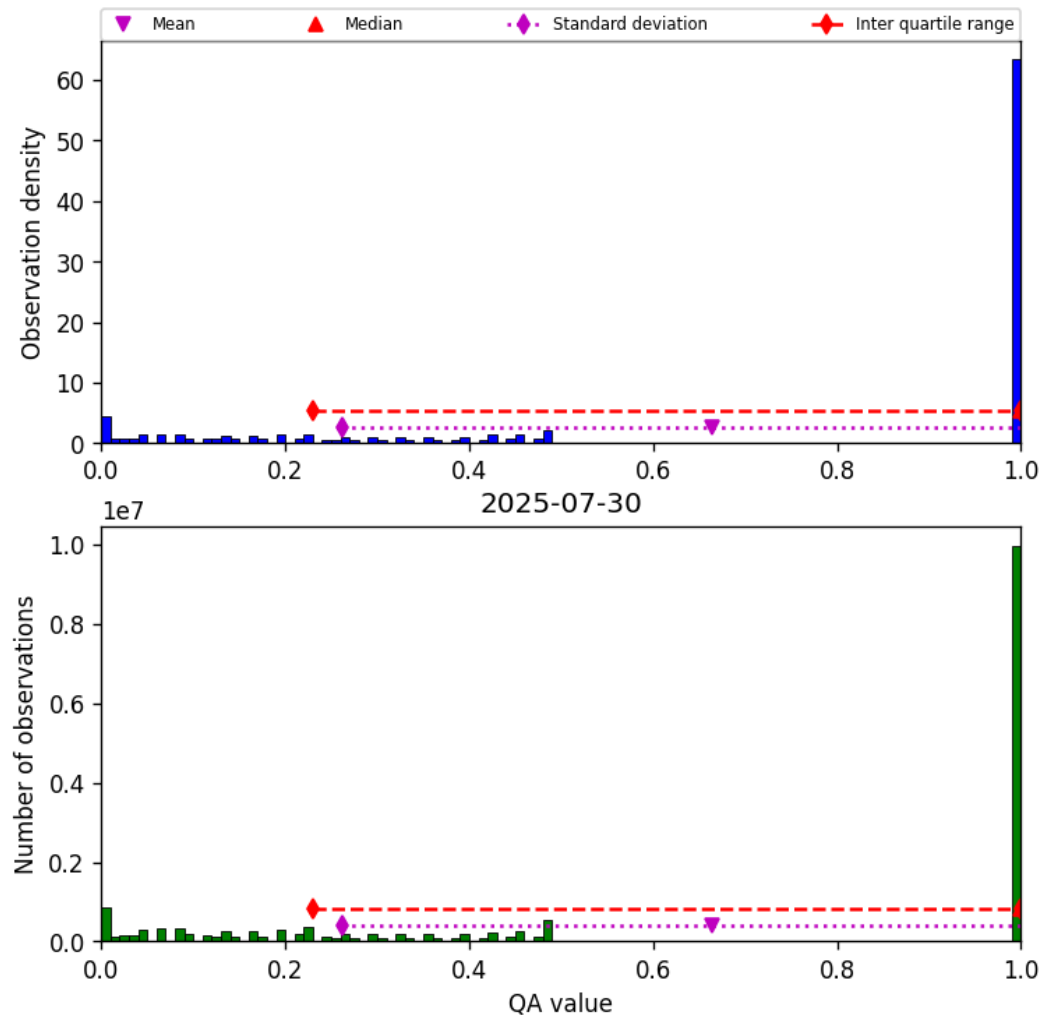


Figure 57: Histogram of “QA value” for 2025-07-30 to 2025-07-31

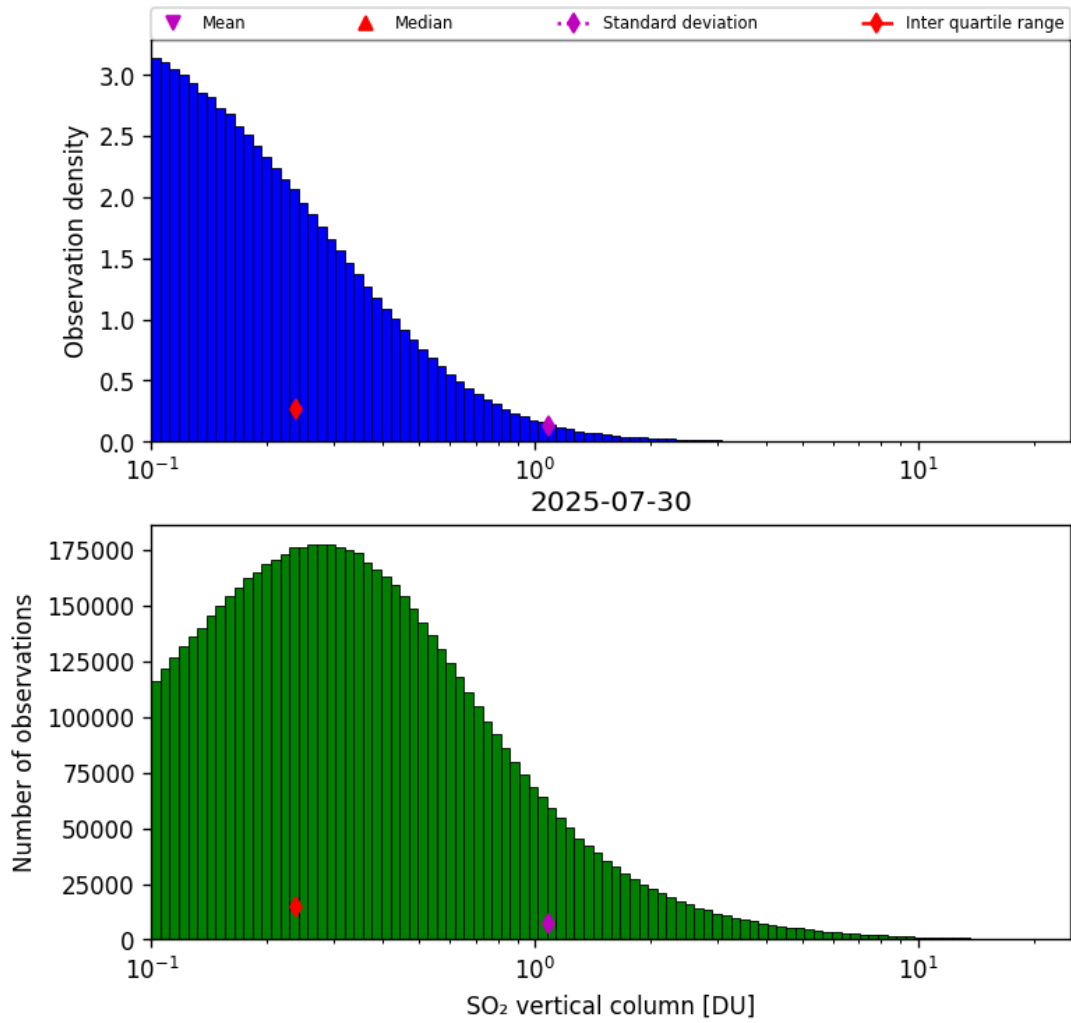


Figure 58: Histogram of “SO₂ vertical column” for 2025-07-30 to 2025-07-31

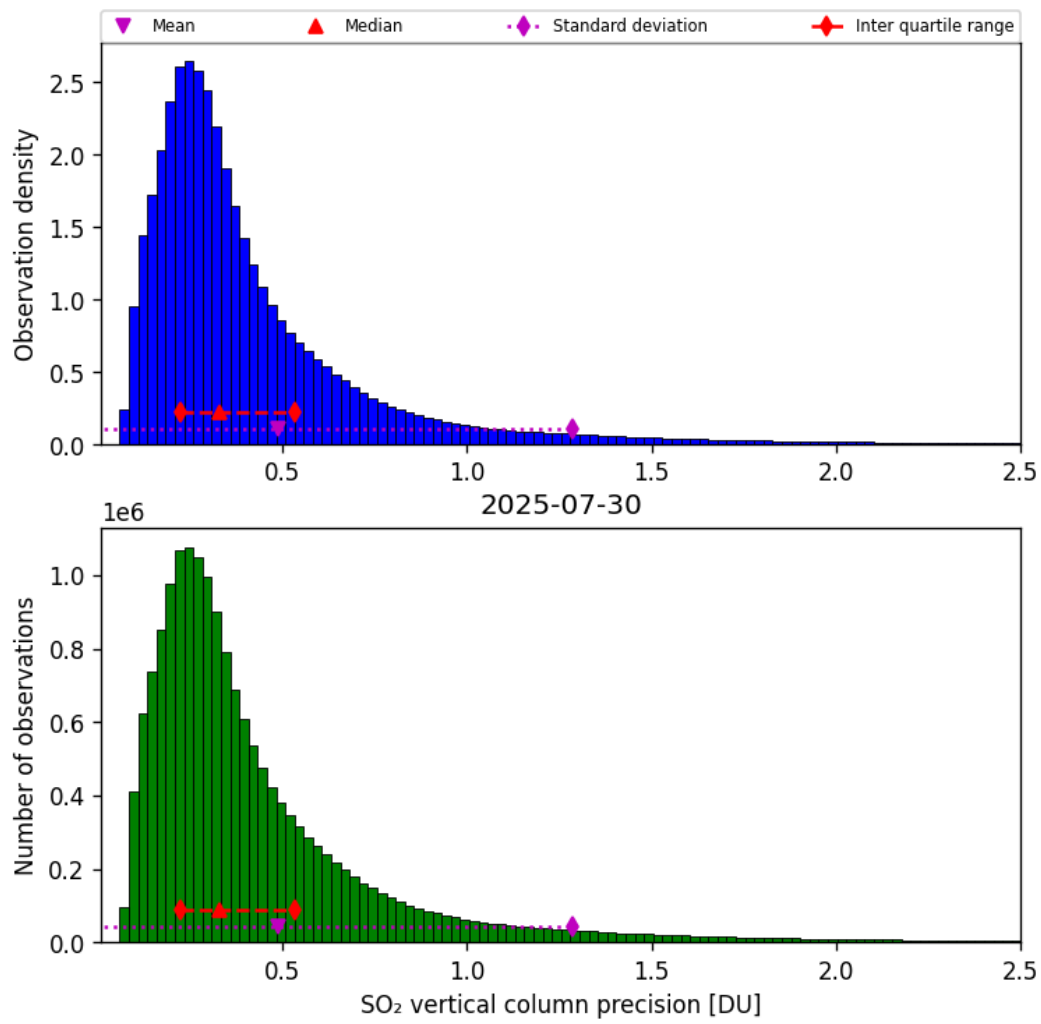


Figure 59: Histogram of “SO₂ vertical column precision” for 2025-07-30 to 2025-07-31

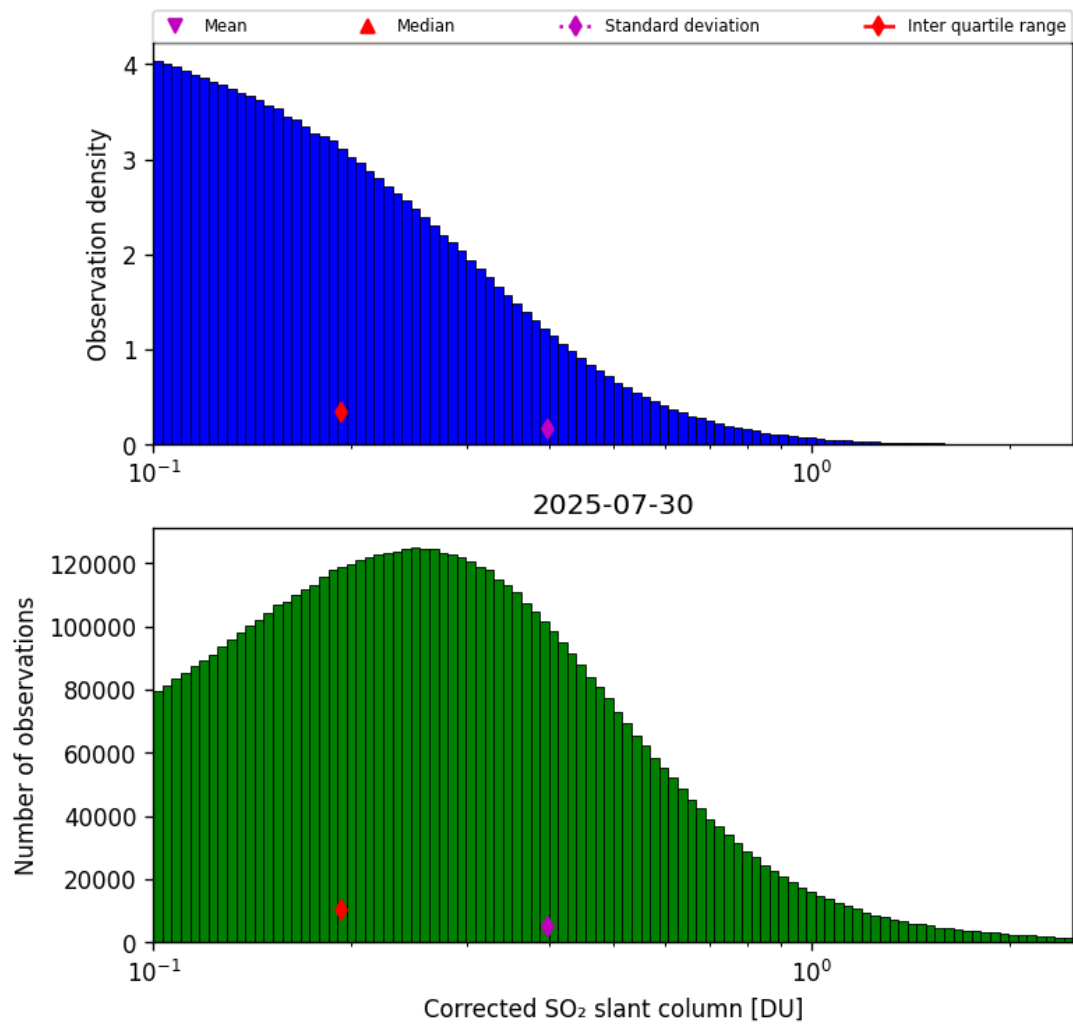


Figure 60: Histogram of “Corrected SO₂ slant column” for 2025-07-30 to 2025-07-31

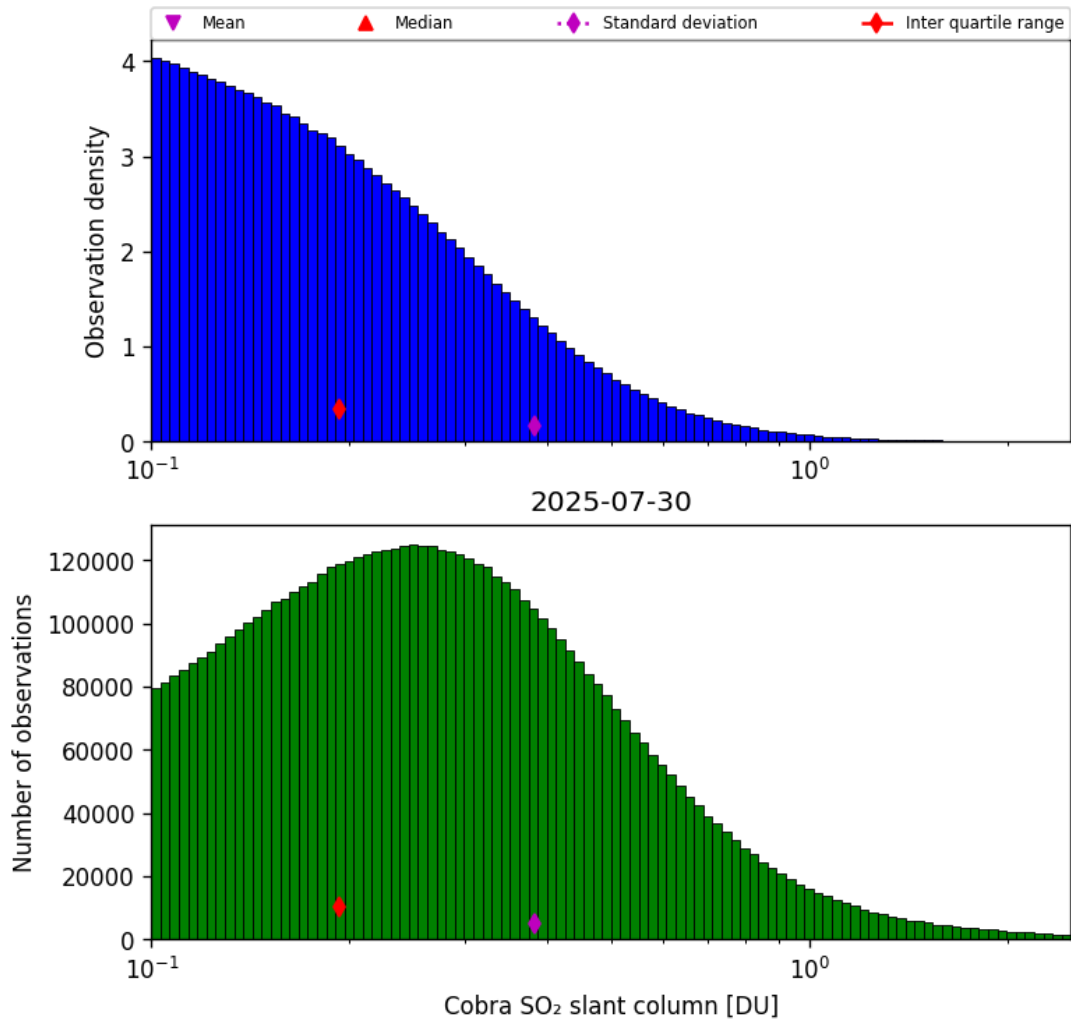


Figure 61: Histogram of “Cobra SO₂ slant column” for 2025-07-30 to 2025-07-31

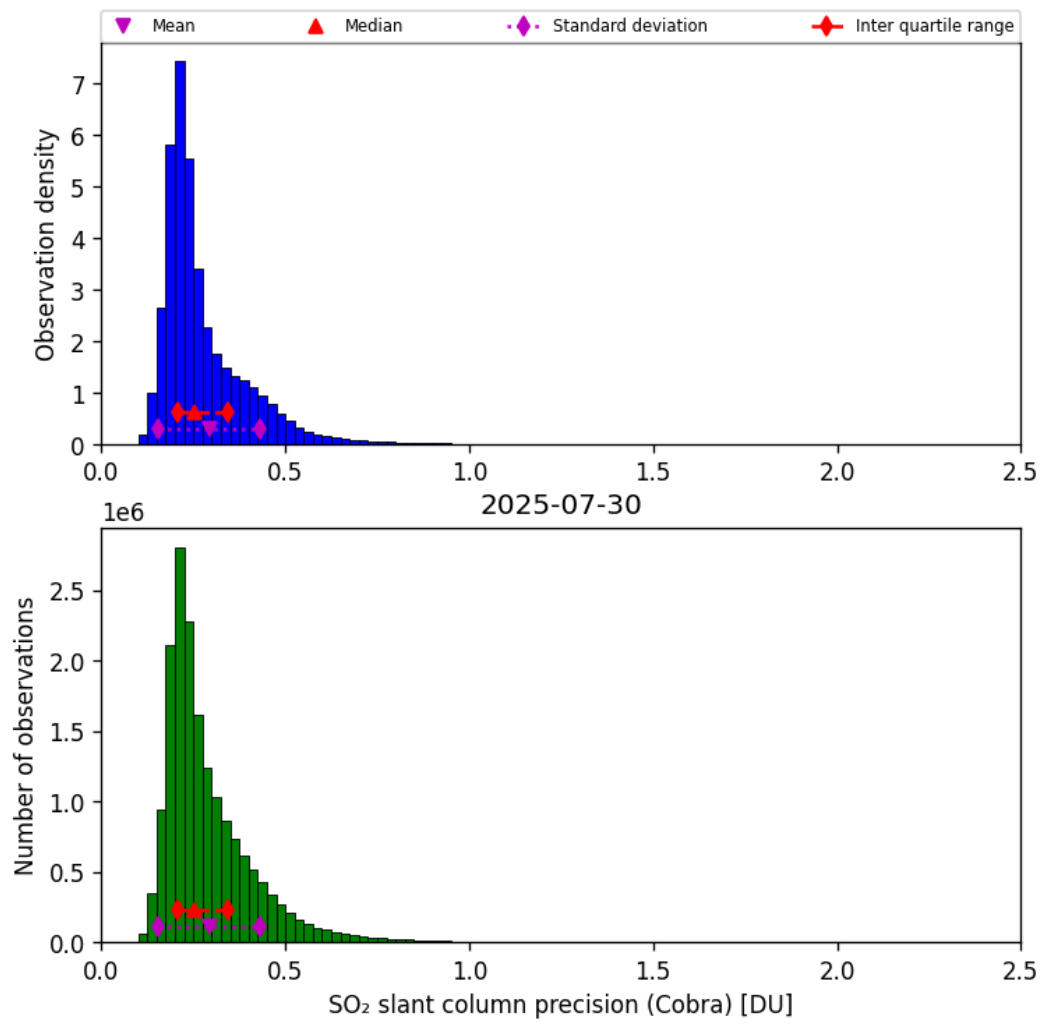


Figure 62: Histogram of “SO₂ slant column precision (Cobra)” for 2025-07-30 to 2025-07-31

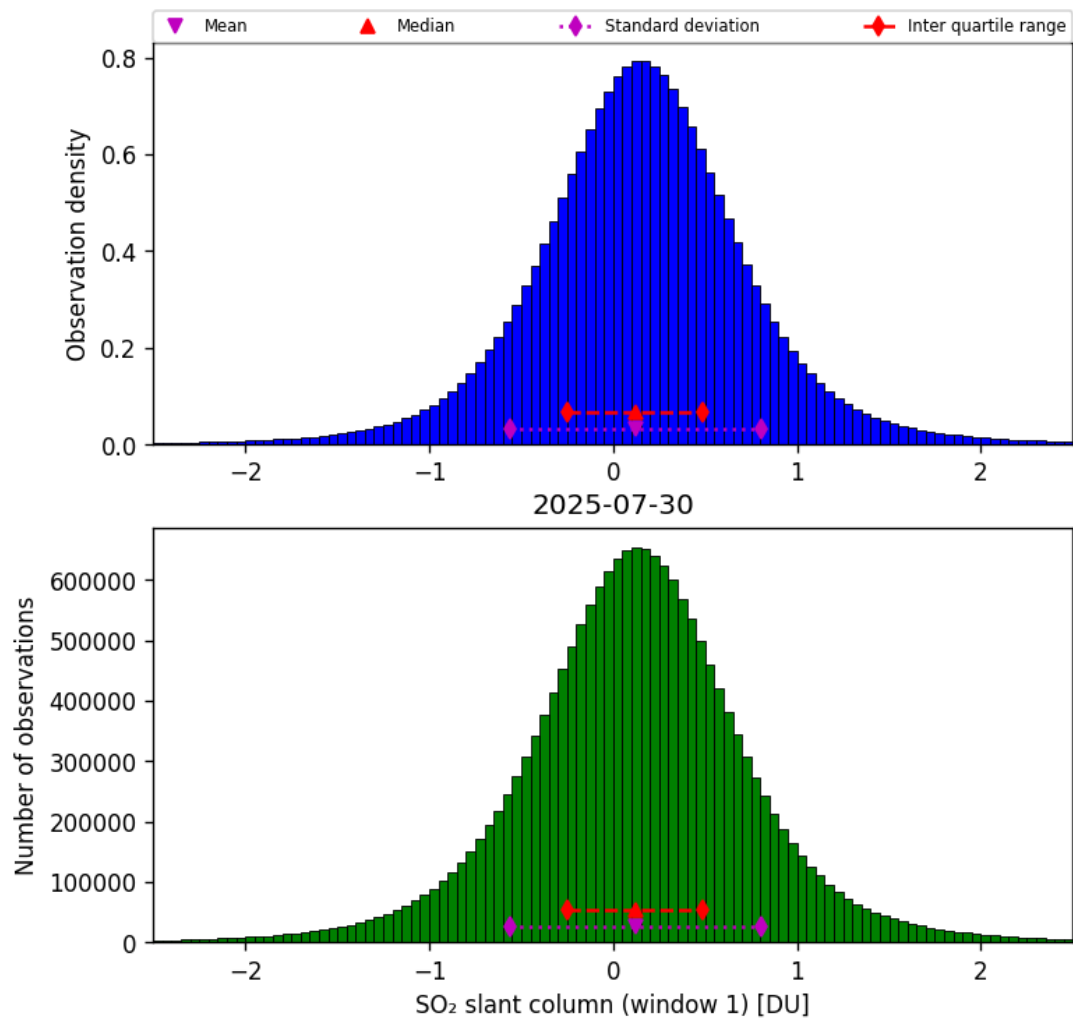


Figure 63: Histogram of “SO₂ slant column (window 1)” for 2025-07-30 to 2025-07-31

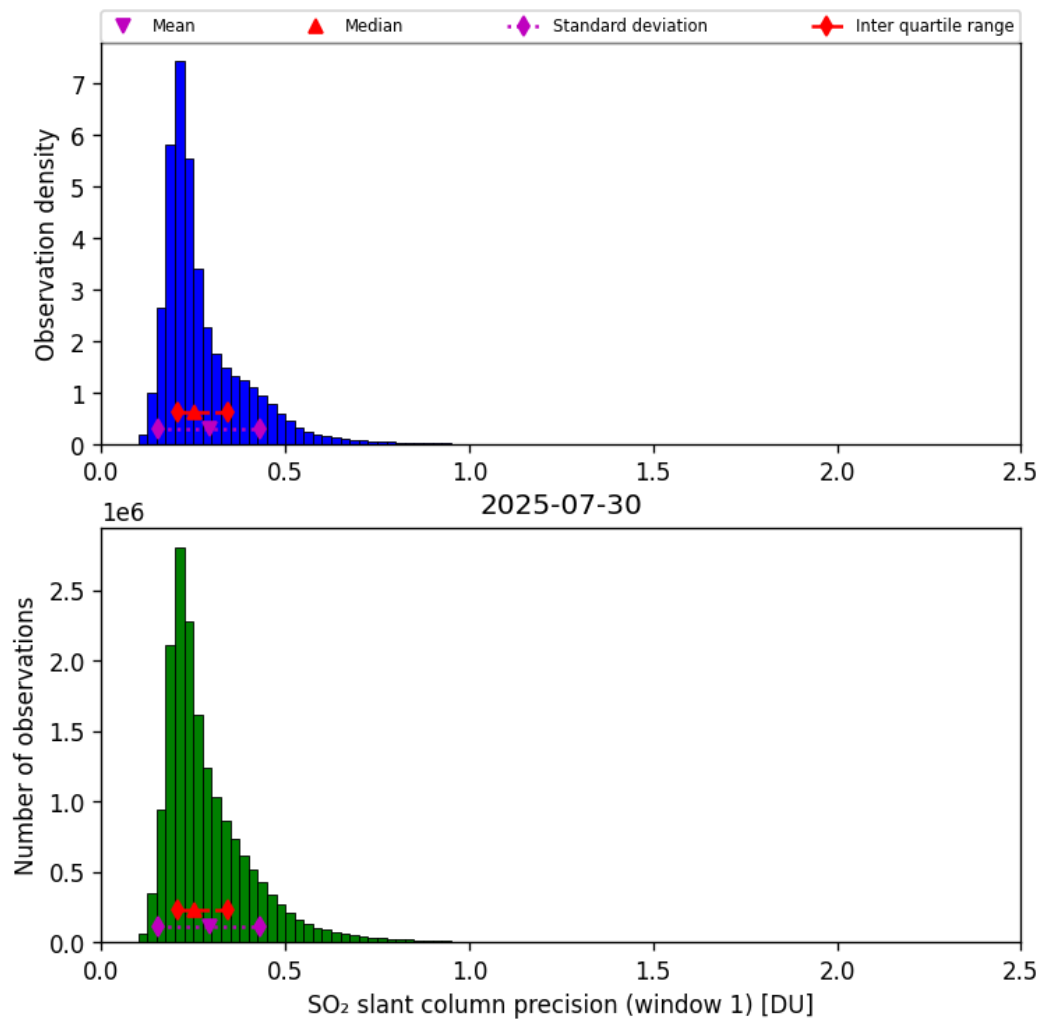


Figure 64: Histogram of “SO₂ slant column precision (window 1)” for 2025-07-30 to 2025-07-31

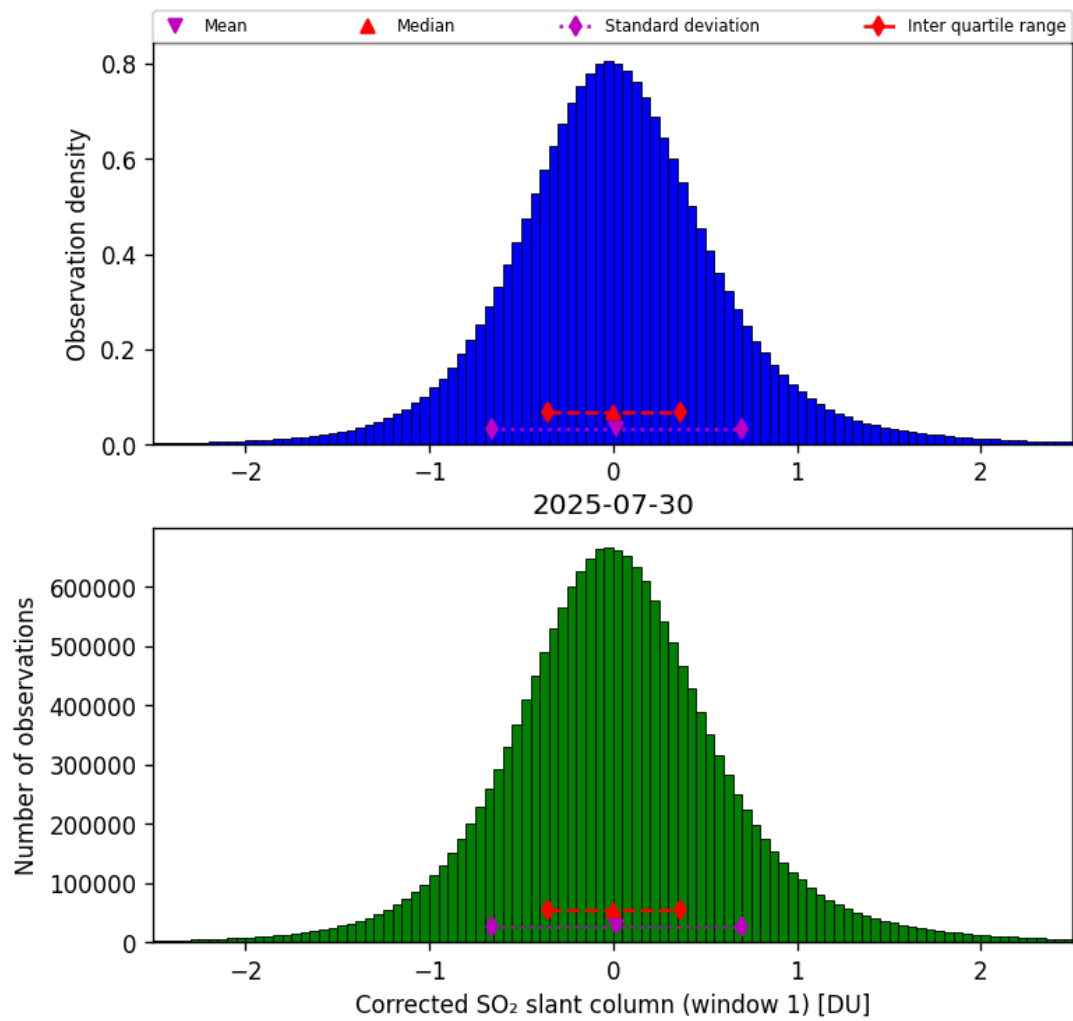


Figure 65: Histogram of “Corrected SO₂ slant column (window 1)” for 2025-07-30 to 2025-07-31

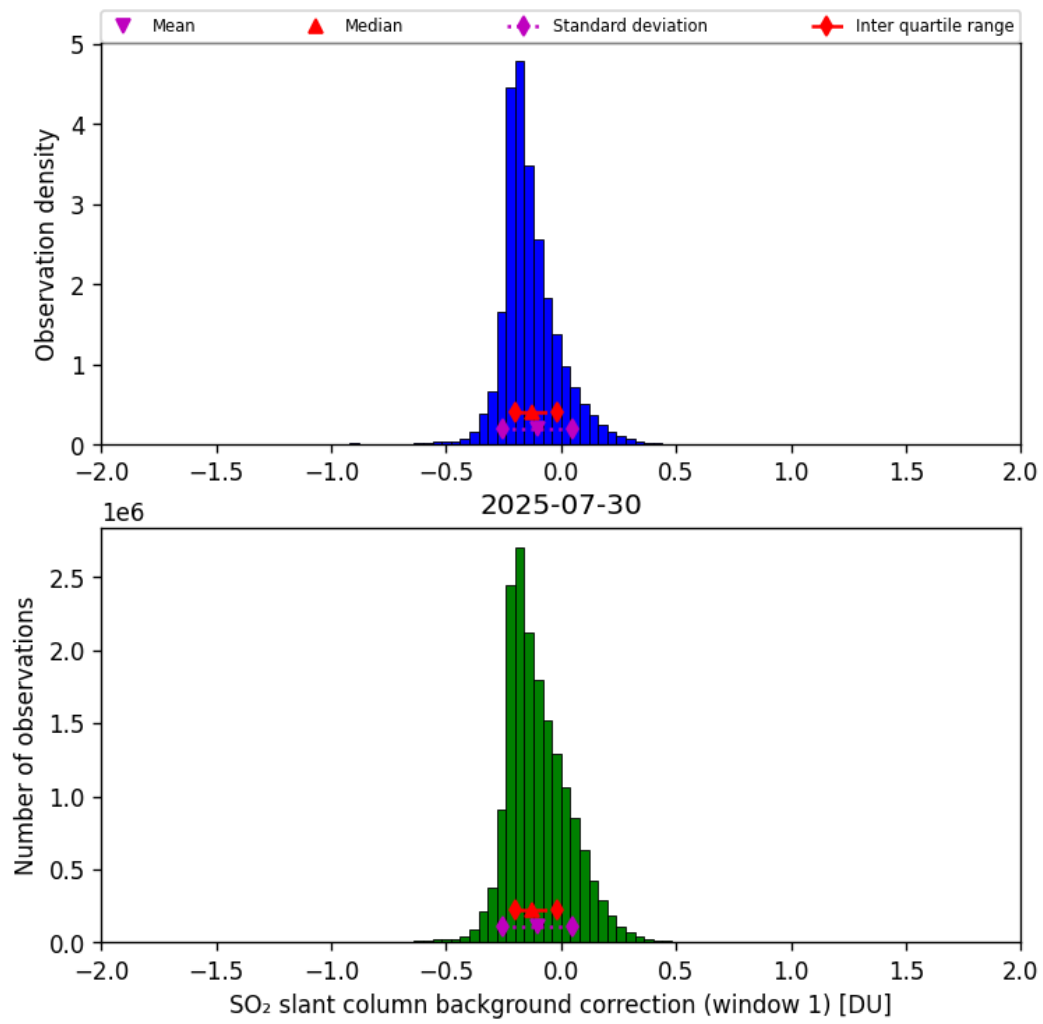


Figure 66: Histogram of “SO₂ slant column background correction (window 1)” for 2025-07-30 to 2025-07-31

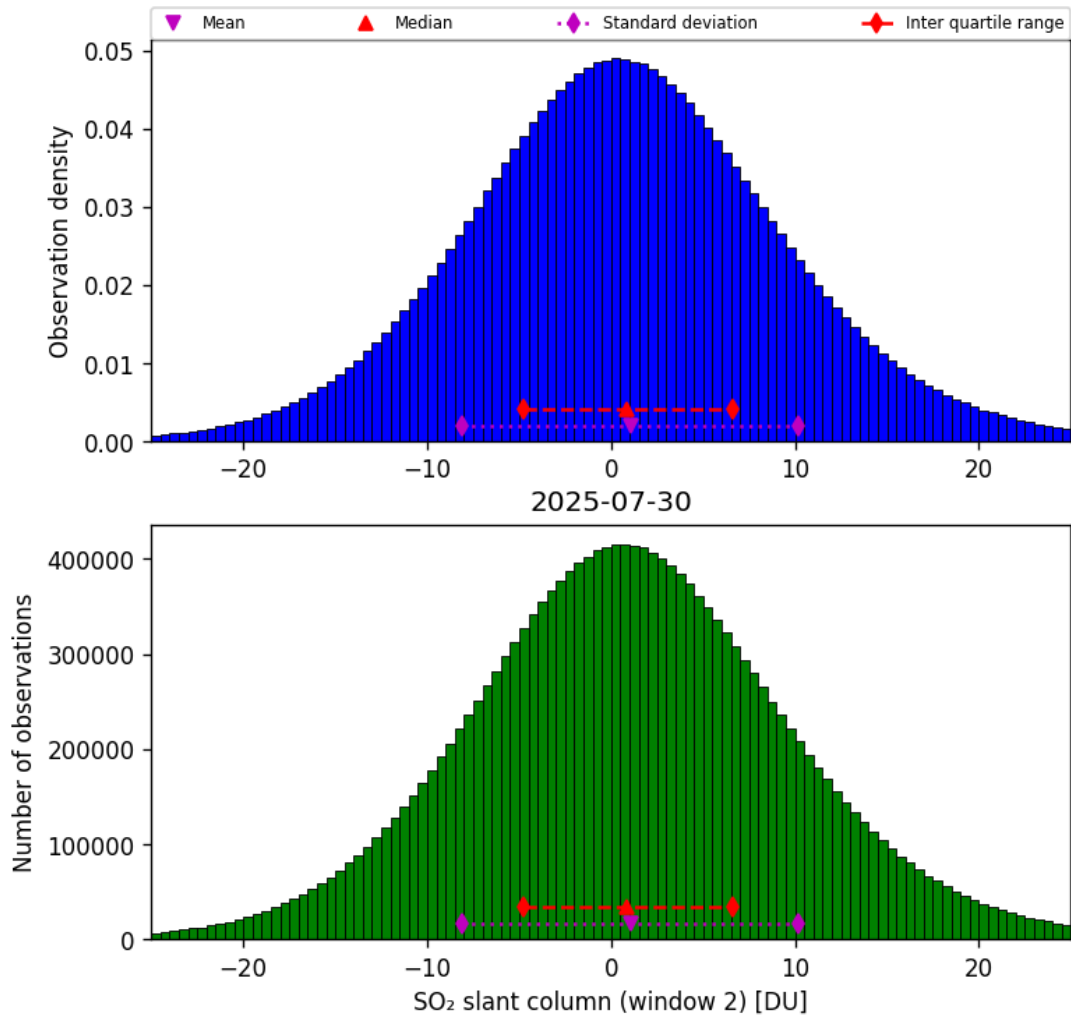


Figure 67: Histogram of “SO₂ slant column (window 2)” for 2025-07-30 to 2025-07-31

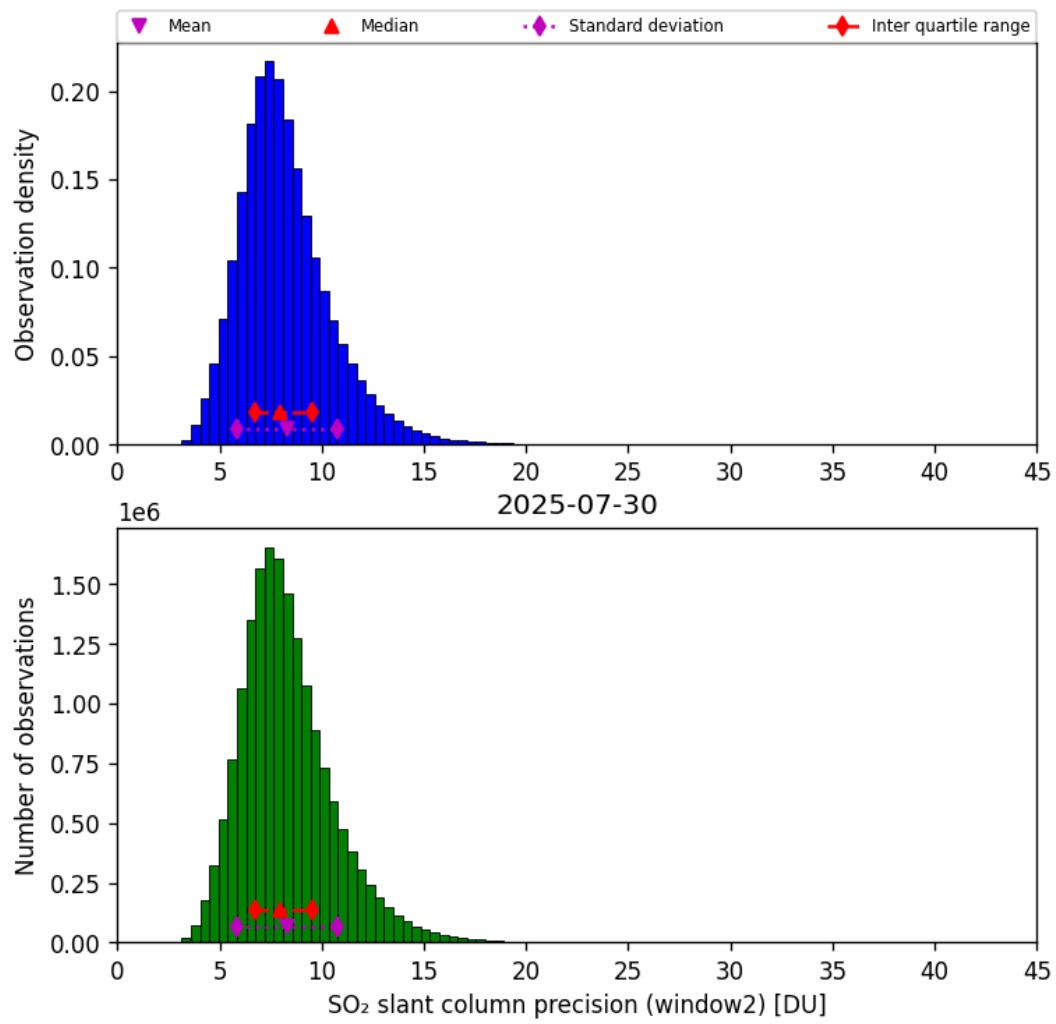


Figure 68: Histogram of “SO₂ slant column precision (window2)” for 2025-07-30 to 2025-07-31

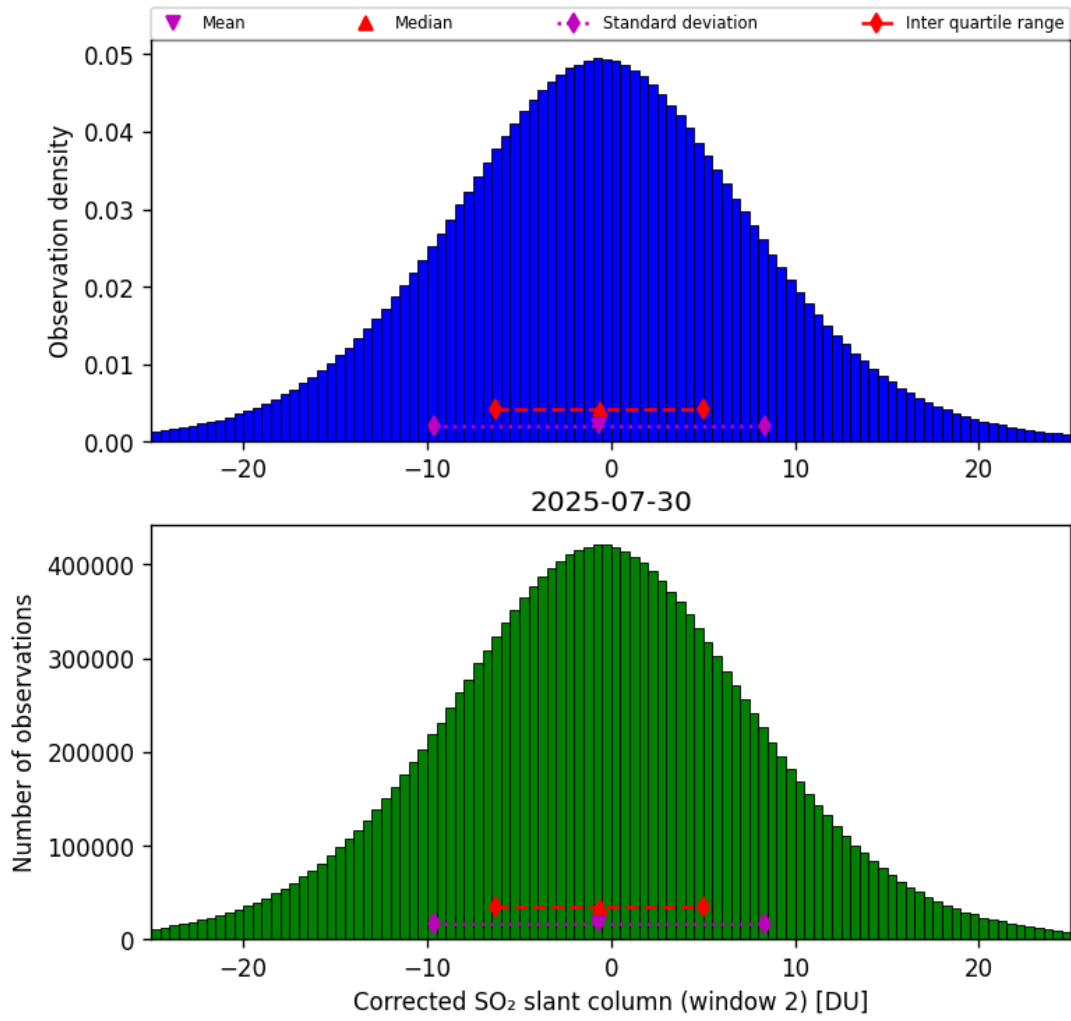


Figure 69: Histogram of “Corrected SO₂ slant column (window 2)” for 2025-07-30 to 2025-07-31

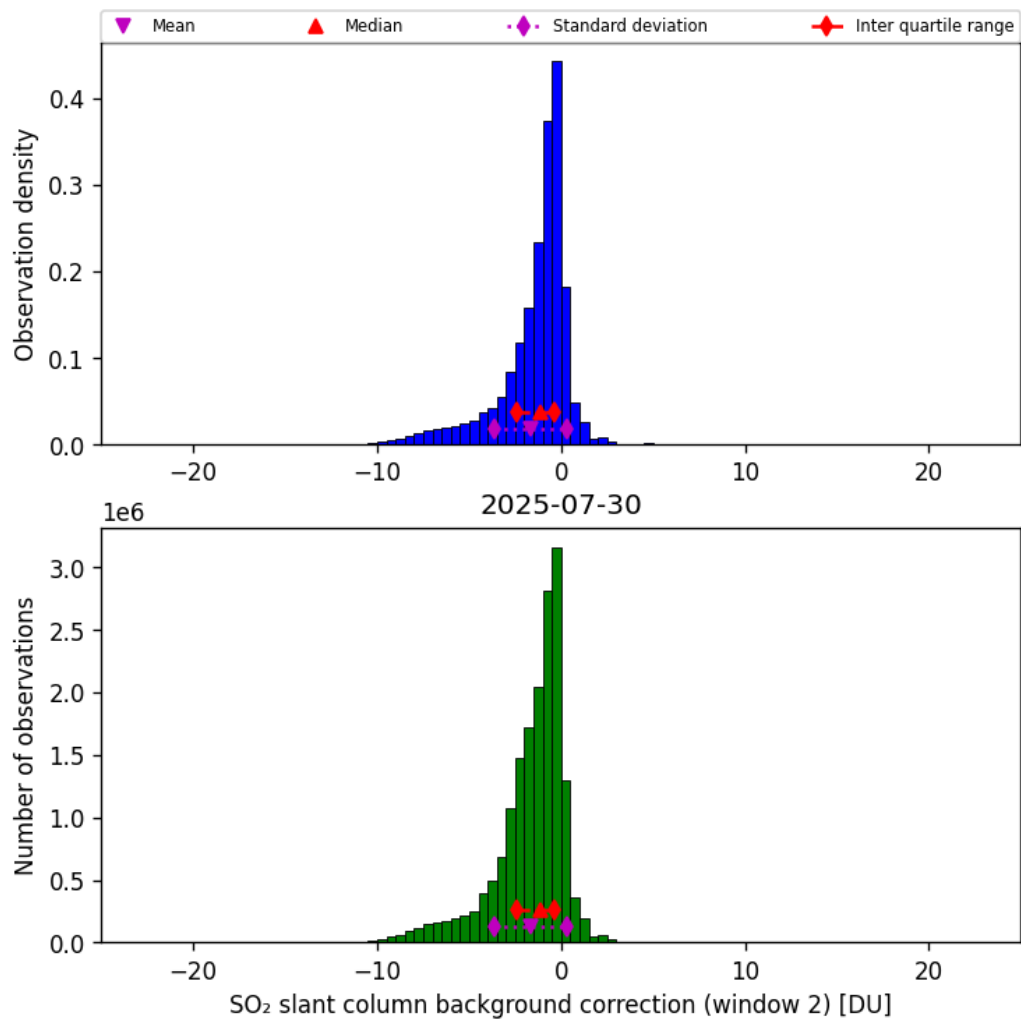


Figure 70: Histogram of “SO₂ slant column background correction (window 2)” for 2025-07-30 to 2025-07-31

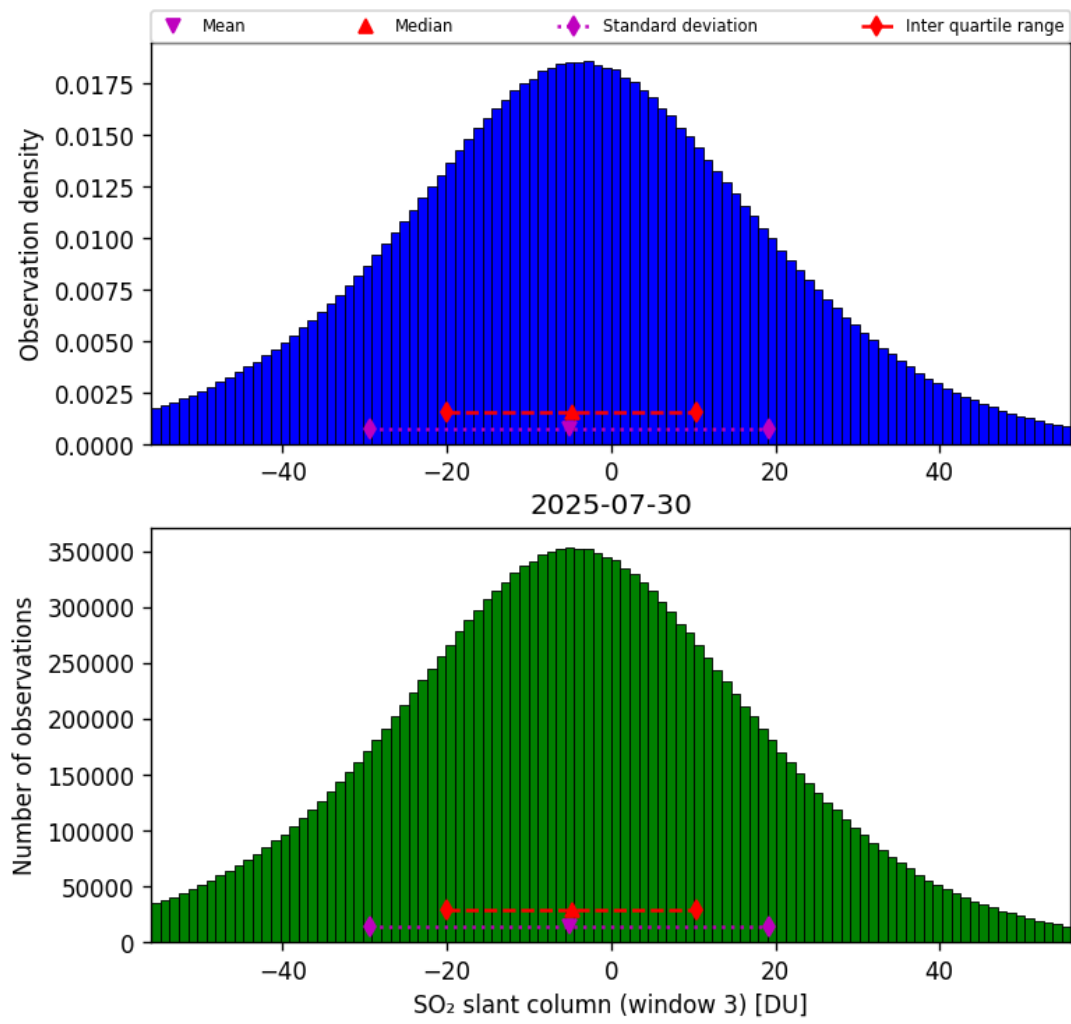


Figure 71: Histogram of “SO₂ slant column (window 3)” for 2025-07-30 to 2025-07-31

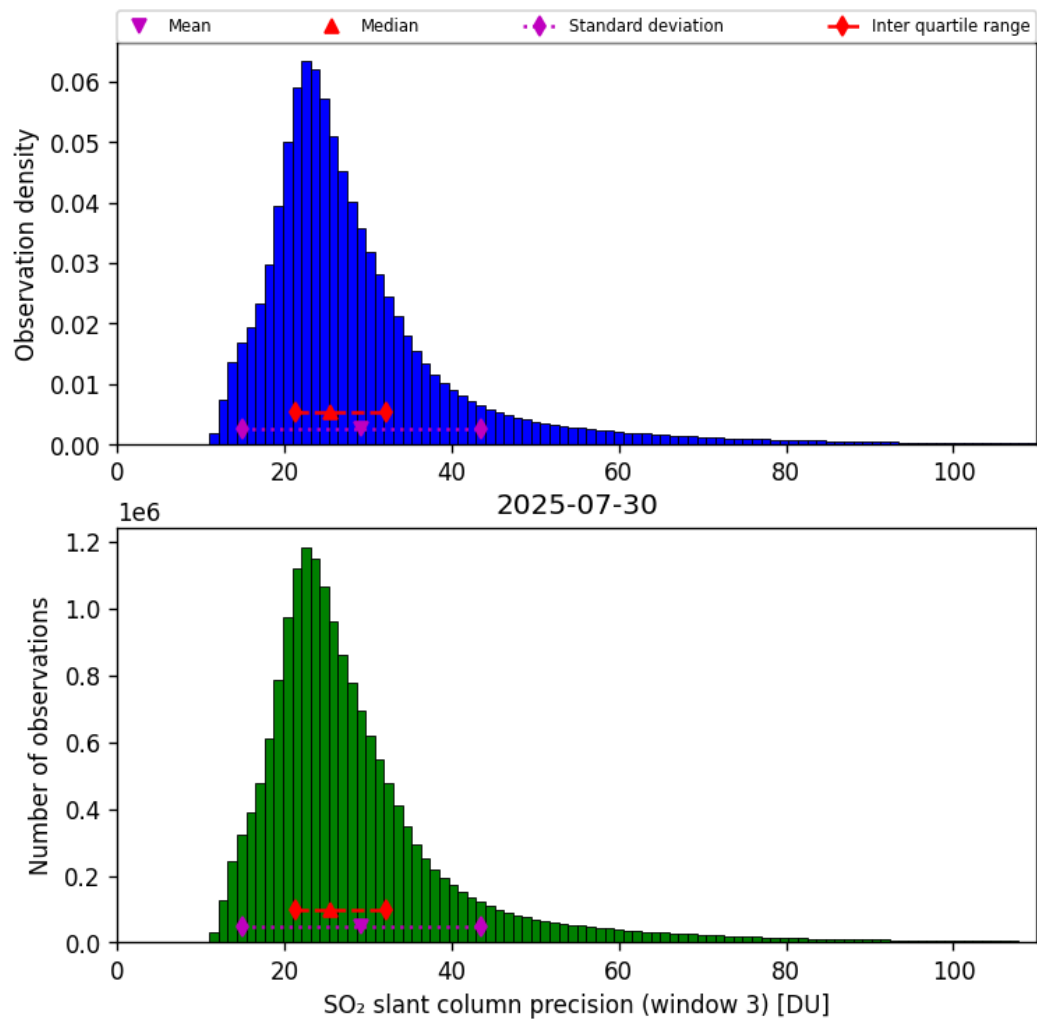


Figure 72: Histogram of “SO₂ slant column precision (window 3)” for 2025-07-30 to 2025-07-31

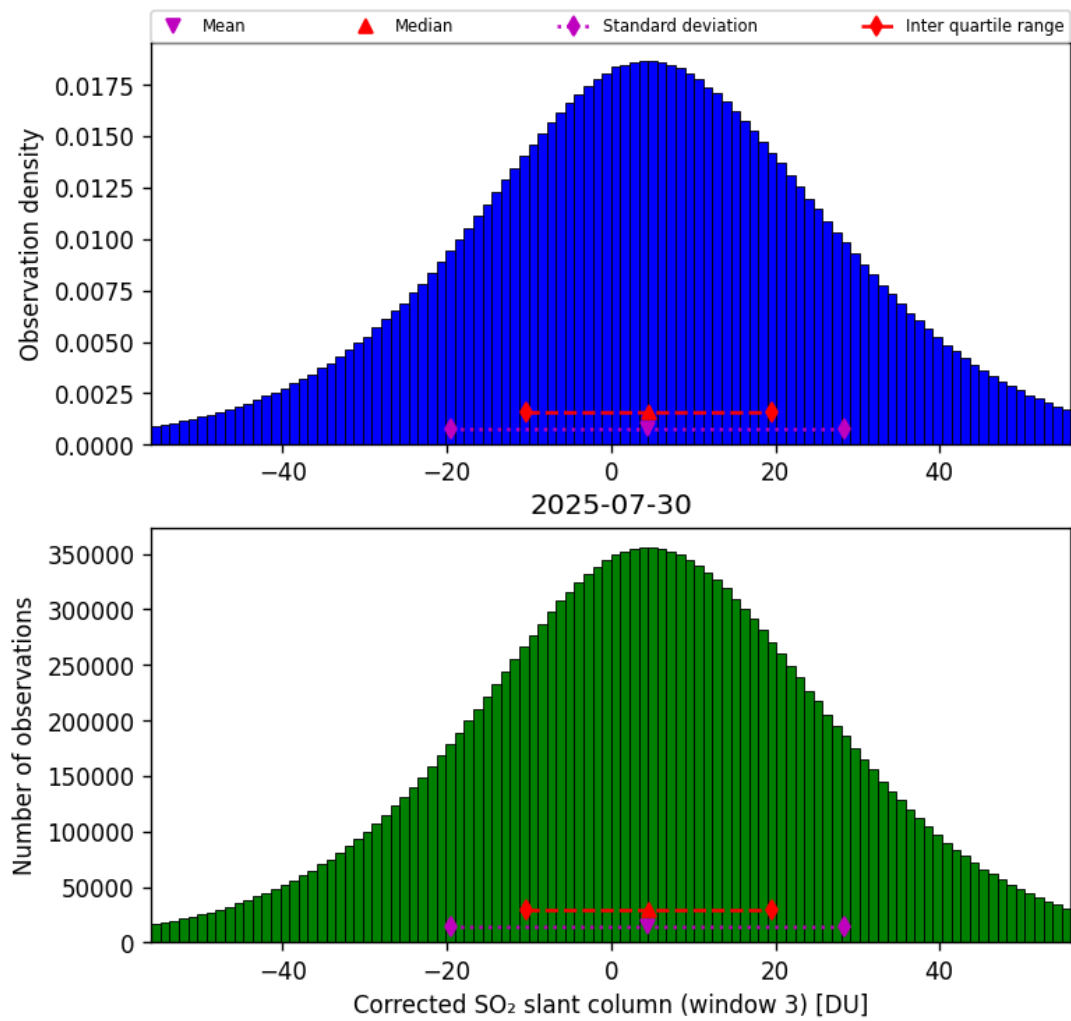


Figure 73: Histogram of “Corrected SO₂ slant column (window 3)” for 2025-07-30 to 2025-07-31

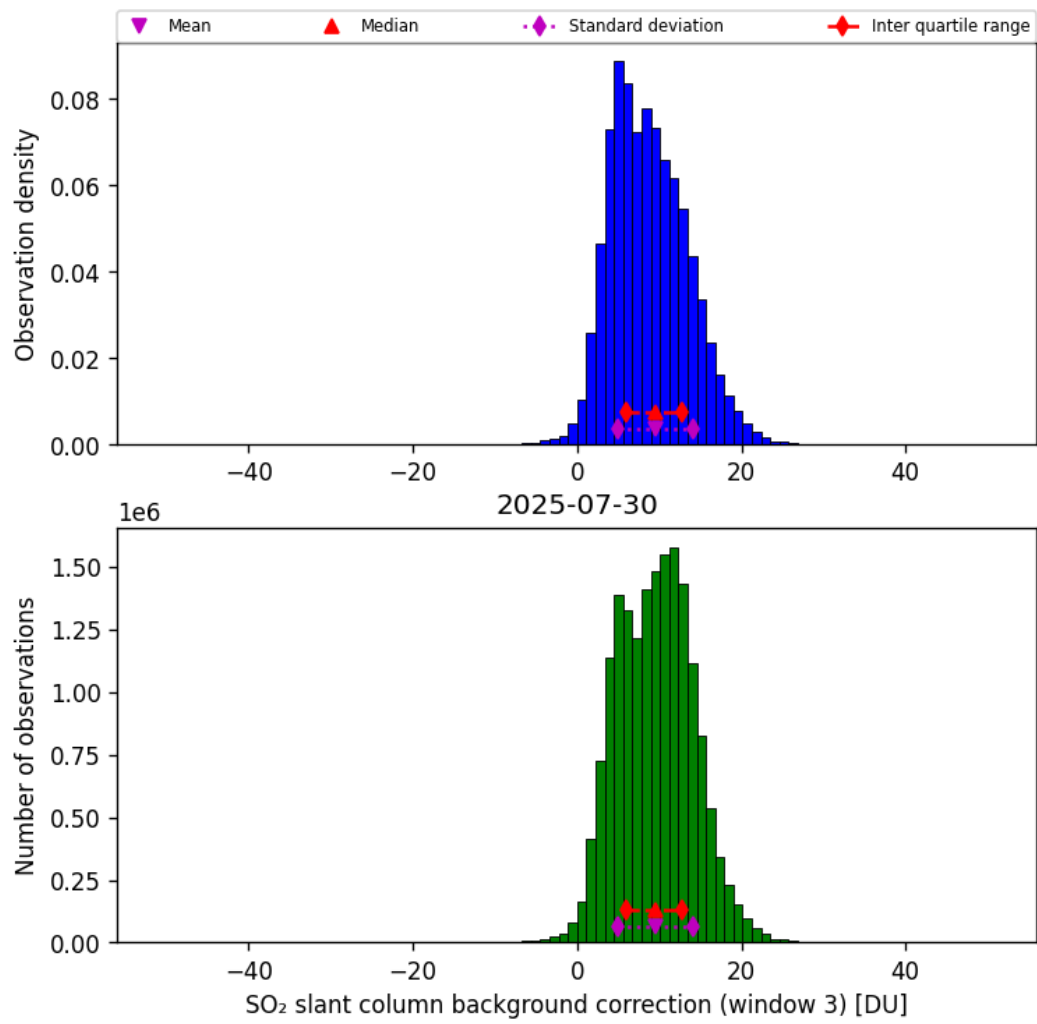


Figure 74: Histogram of “SO₂ slant column background correction (window 3)” for 2025-07-30 to 2025-07-31

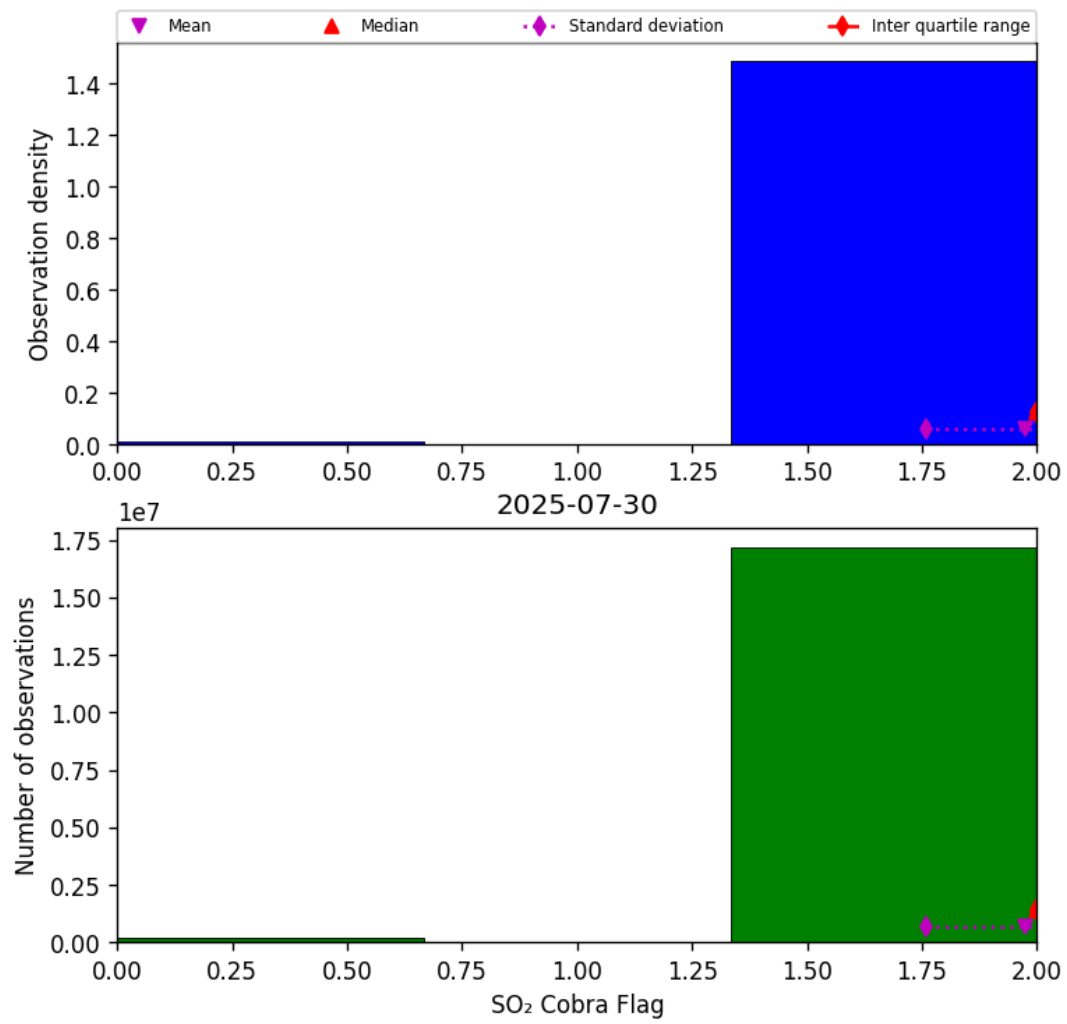


Figure 75: Histogram of “SO₂ Cobra Flag” for 2025-07-30 to 2025-07-31

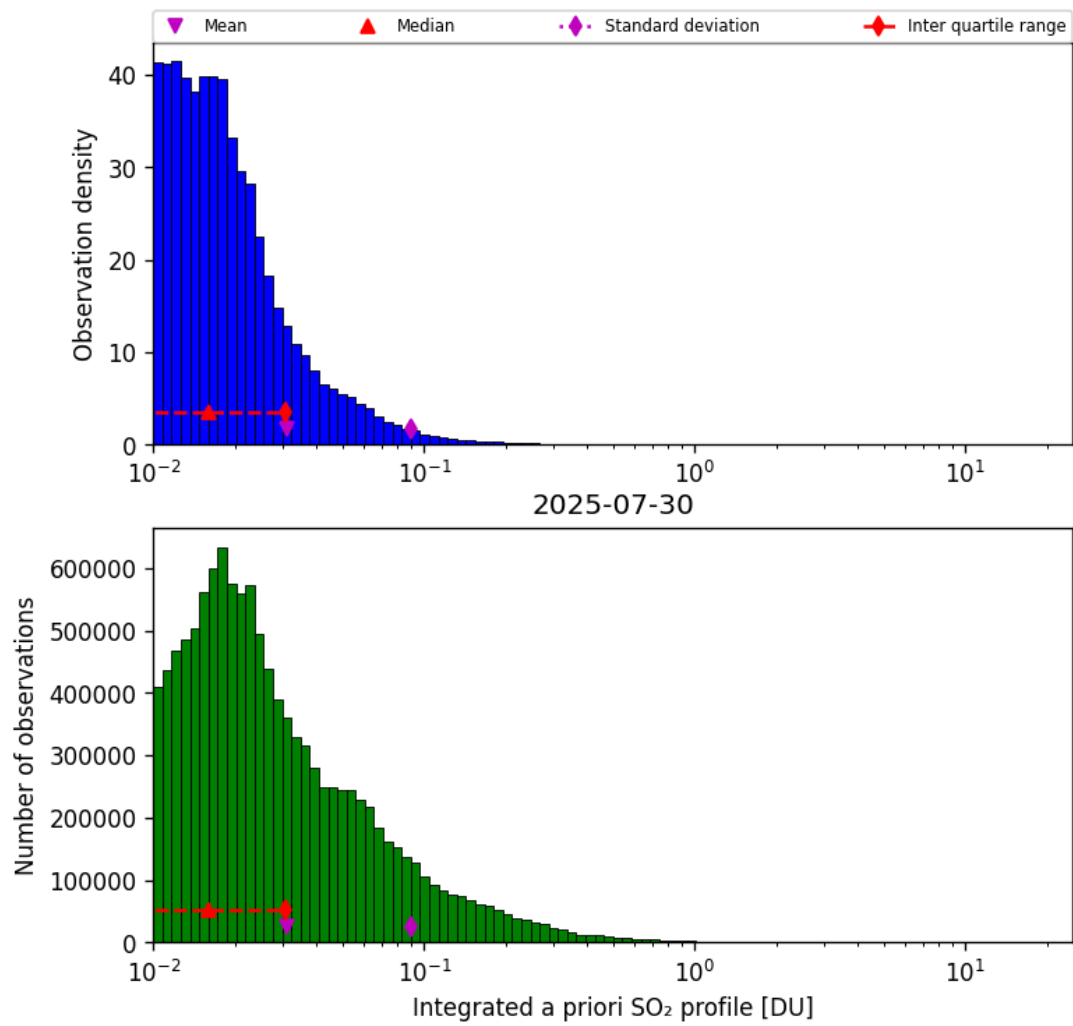


Figure 76: Histogram of “Integrated a priori SO₂ profile” for 2025-07-30 to 2025-07-31

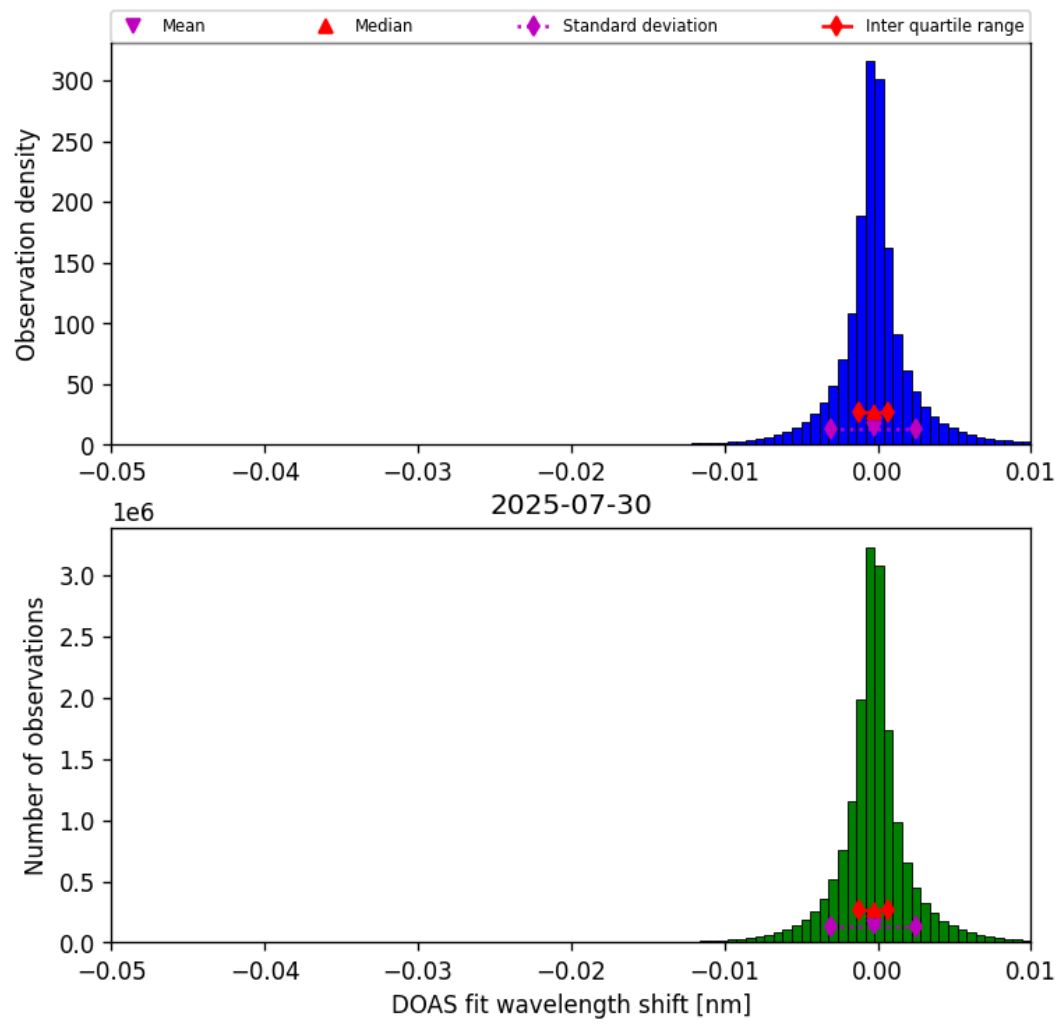


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-07-30 to 2025-07-31

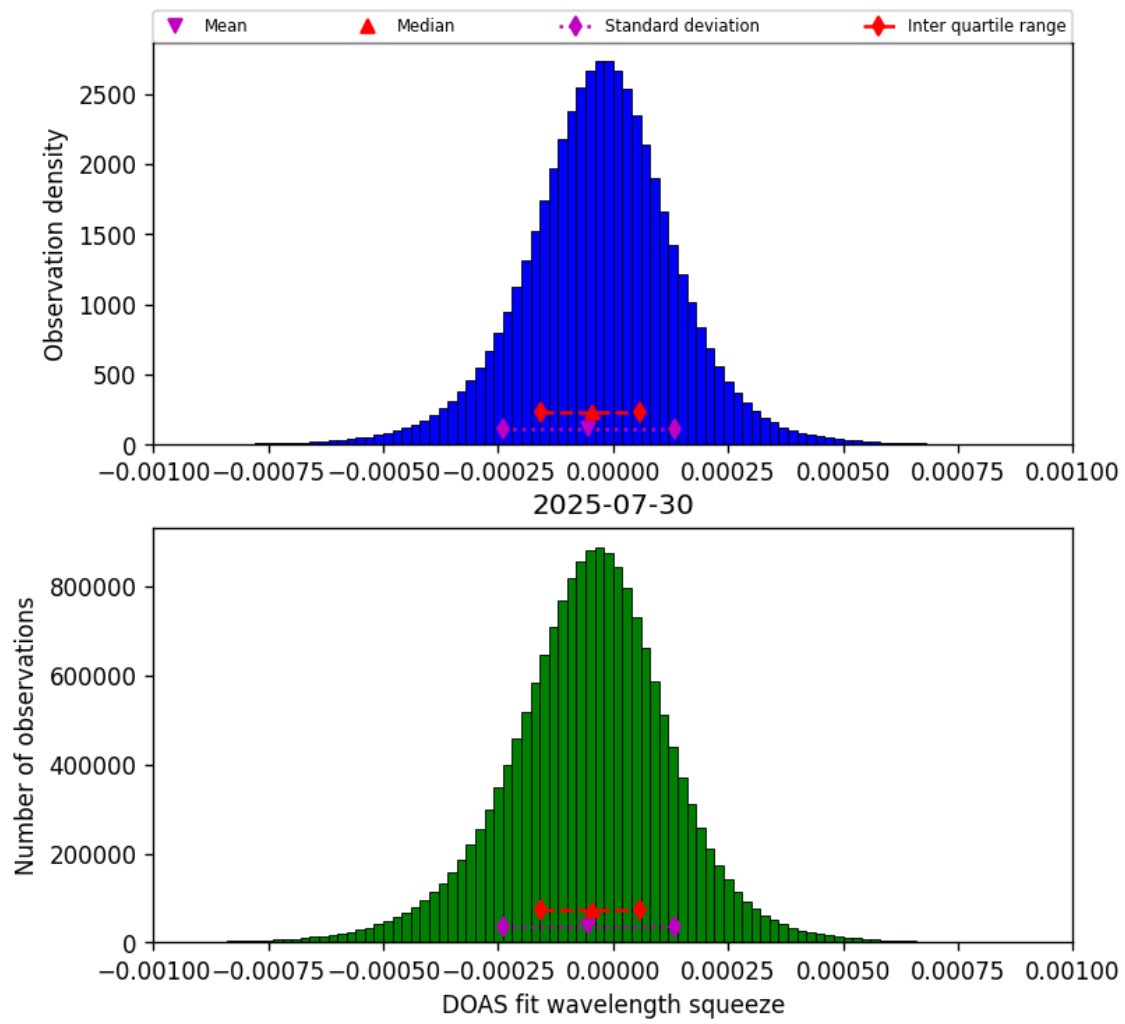


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-07-30 to 2025-07-31

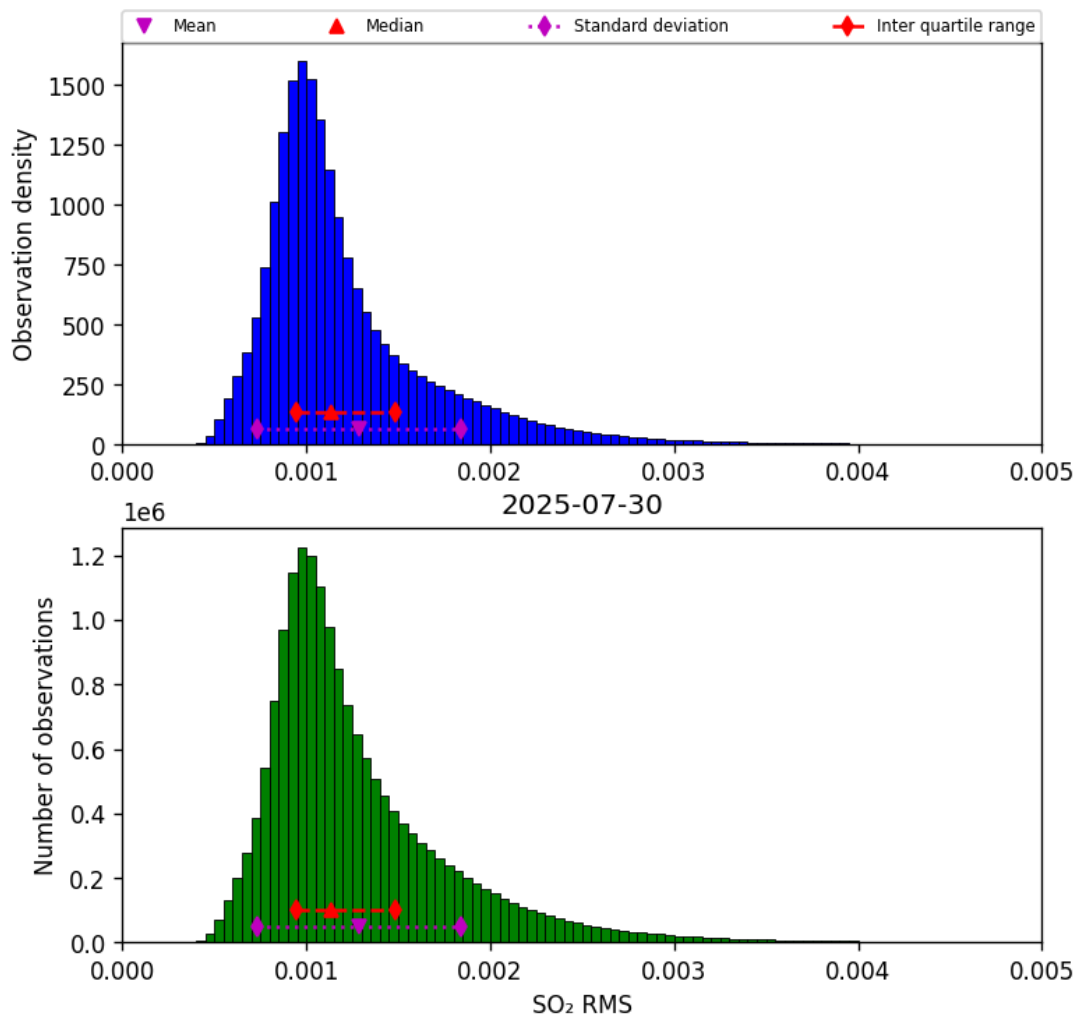


Figure 79: Histogram of “SO₂ RMS” for 2025-07-30 to 2025-07-31

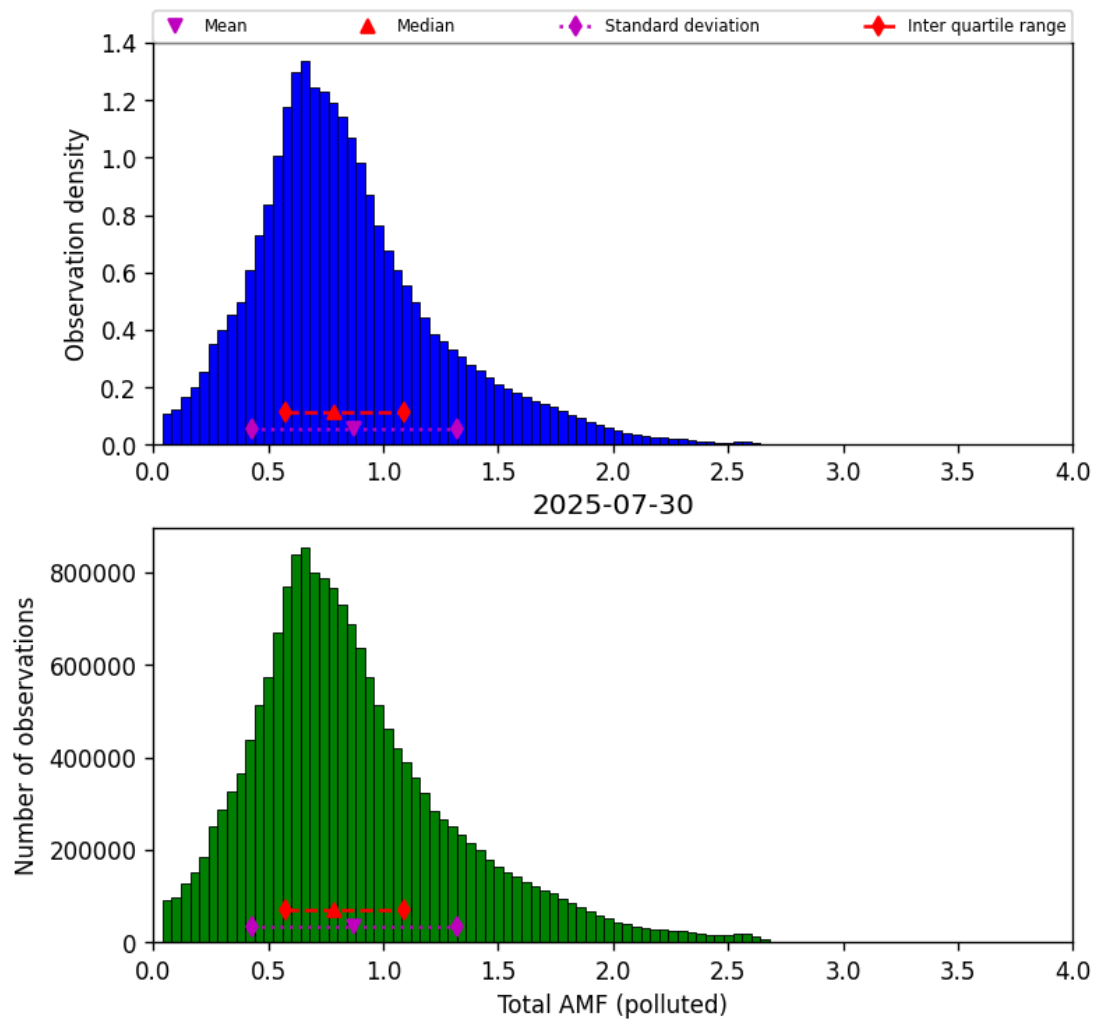


Figure 80: Histogram of “Total AMF (polluted)” for 2025-07-30 to 2025-07-31

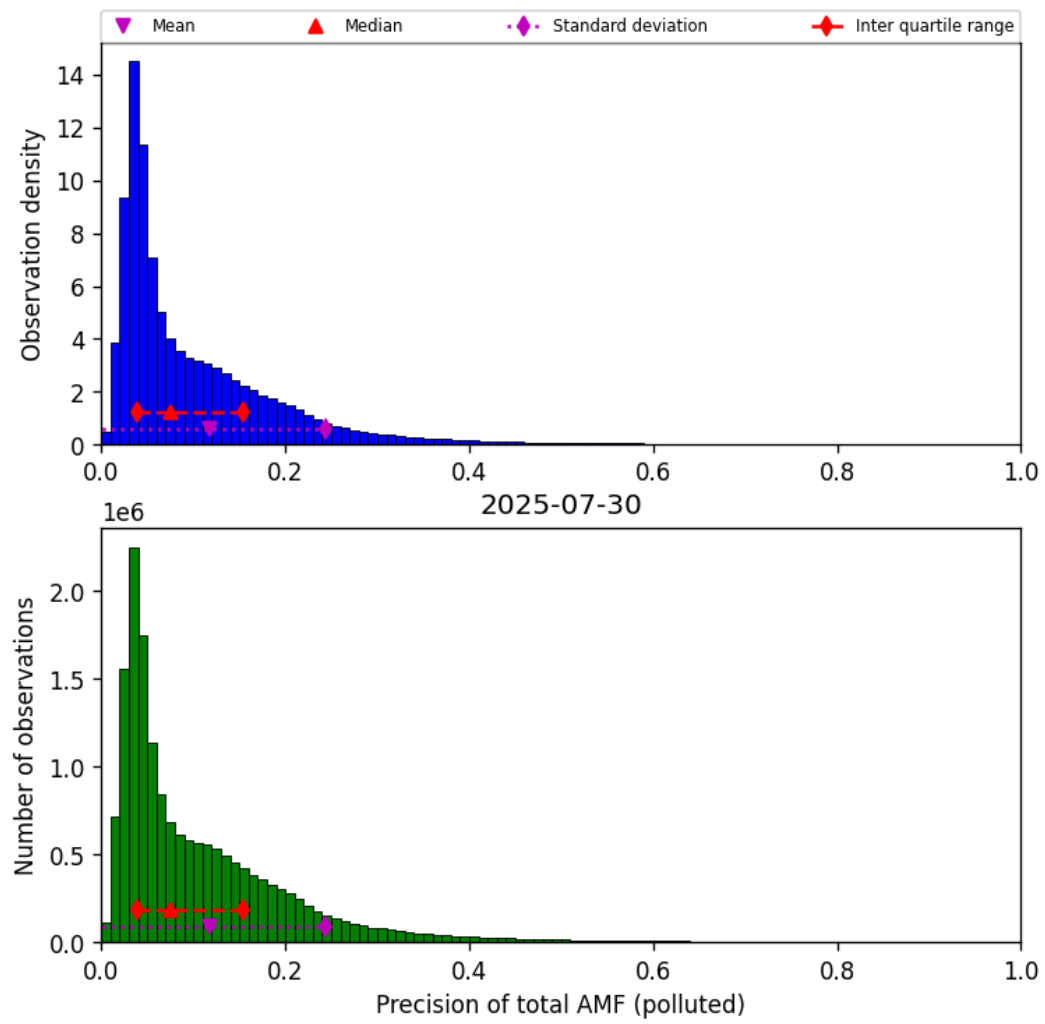


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-07-30 to 2025-07-31

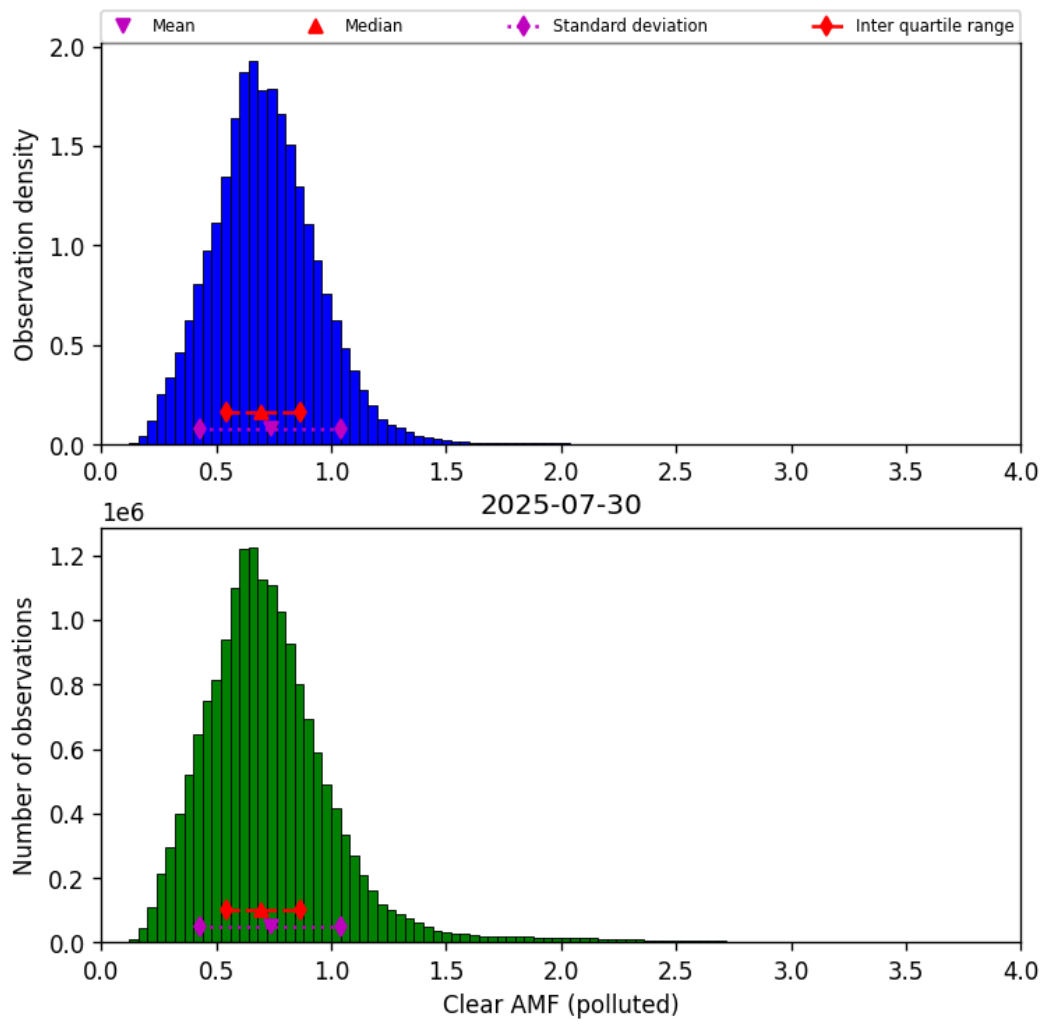


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-07-30 to 2025-07-31

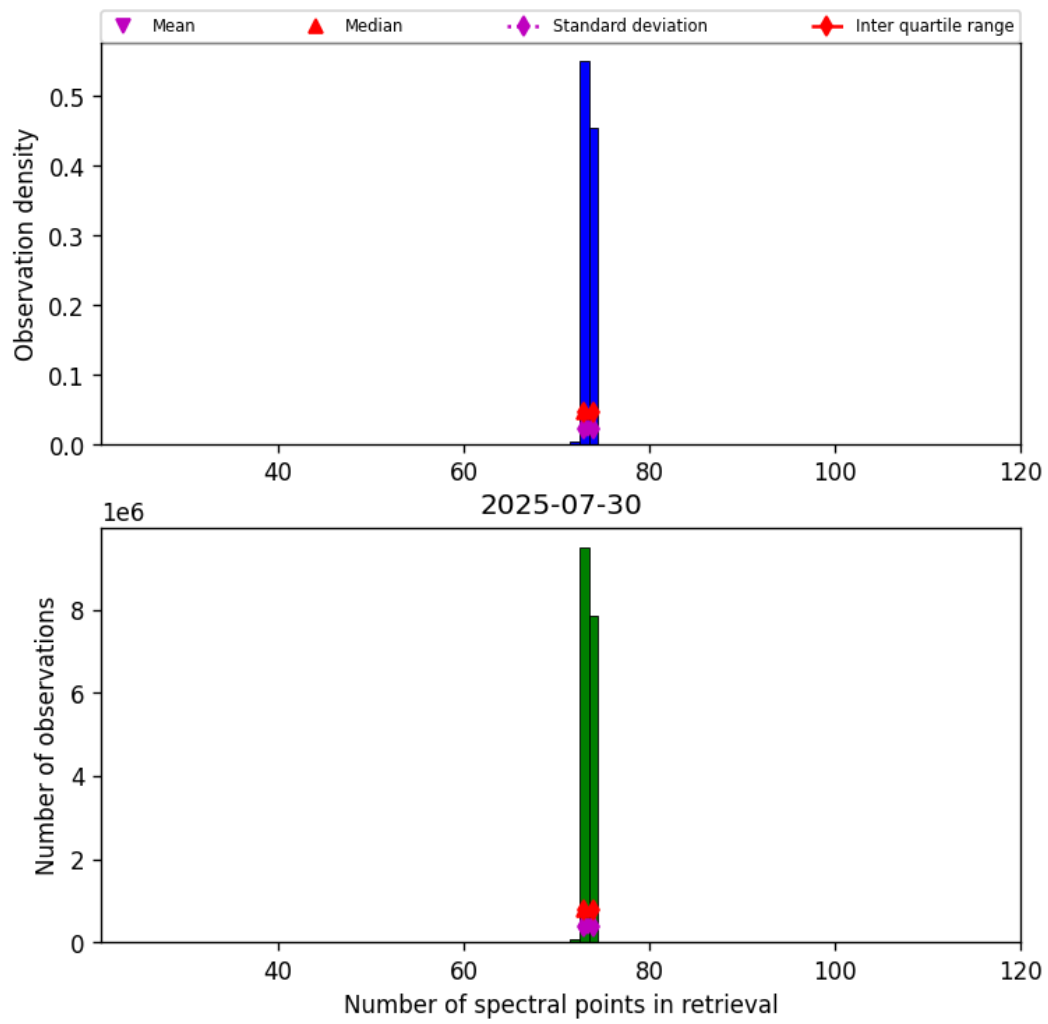


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-07-30 to 2025-07-31

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.

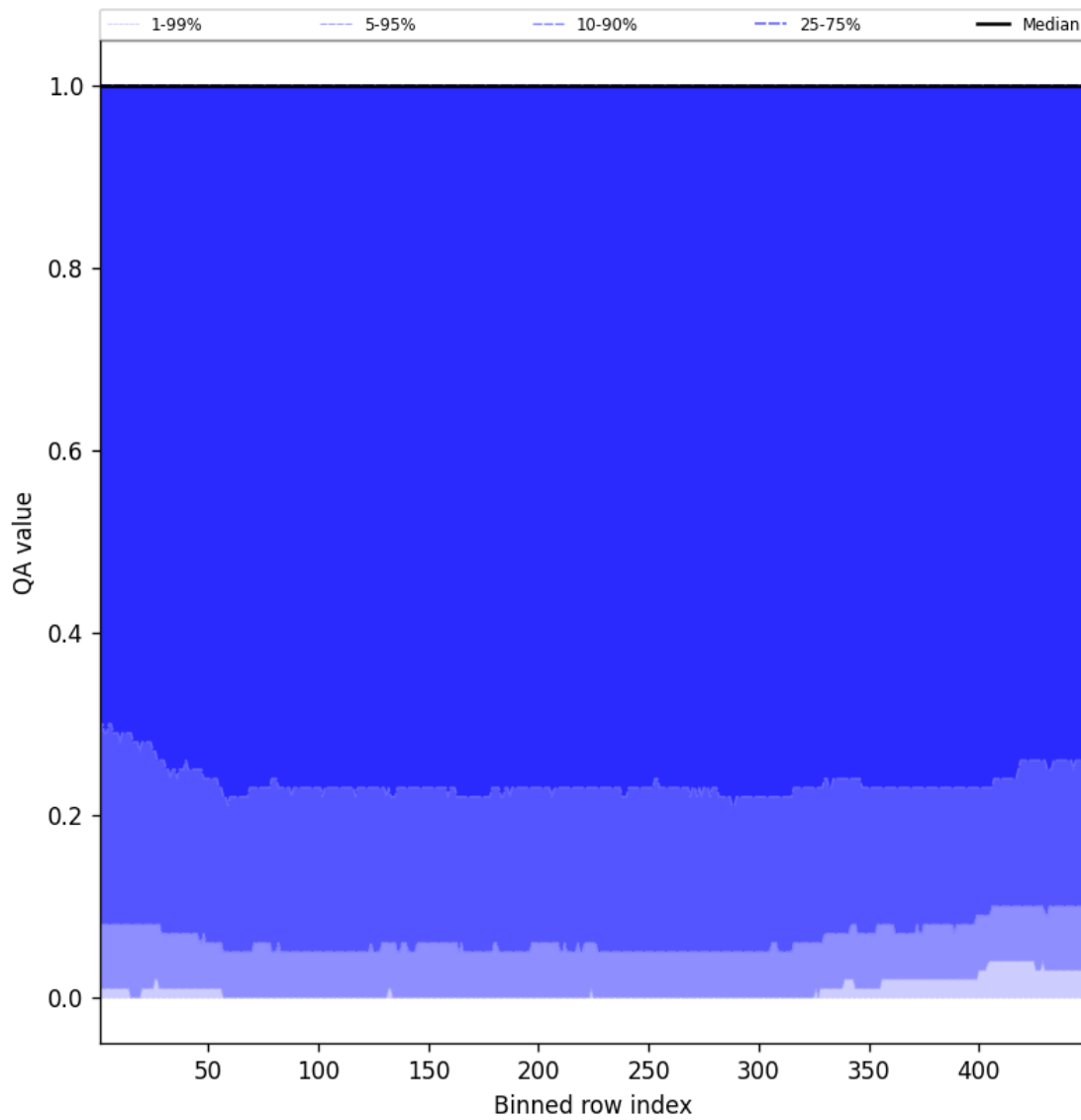


Figure 84: Along track statistics of “QA value” for 2025-07-30 to 2025-07-31

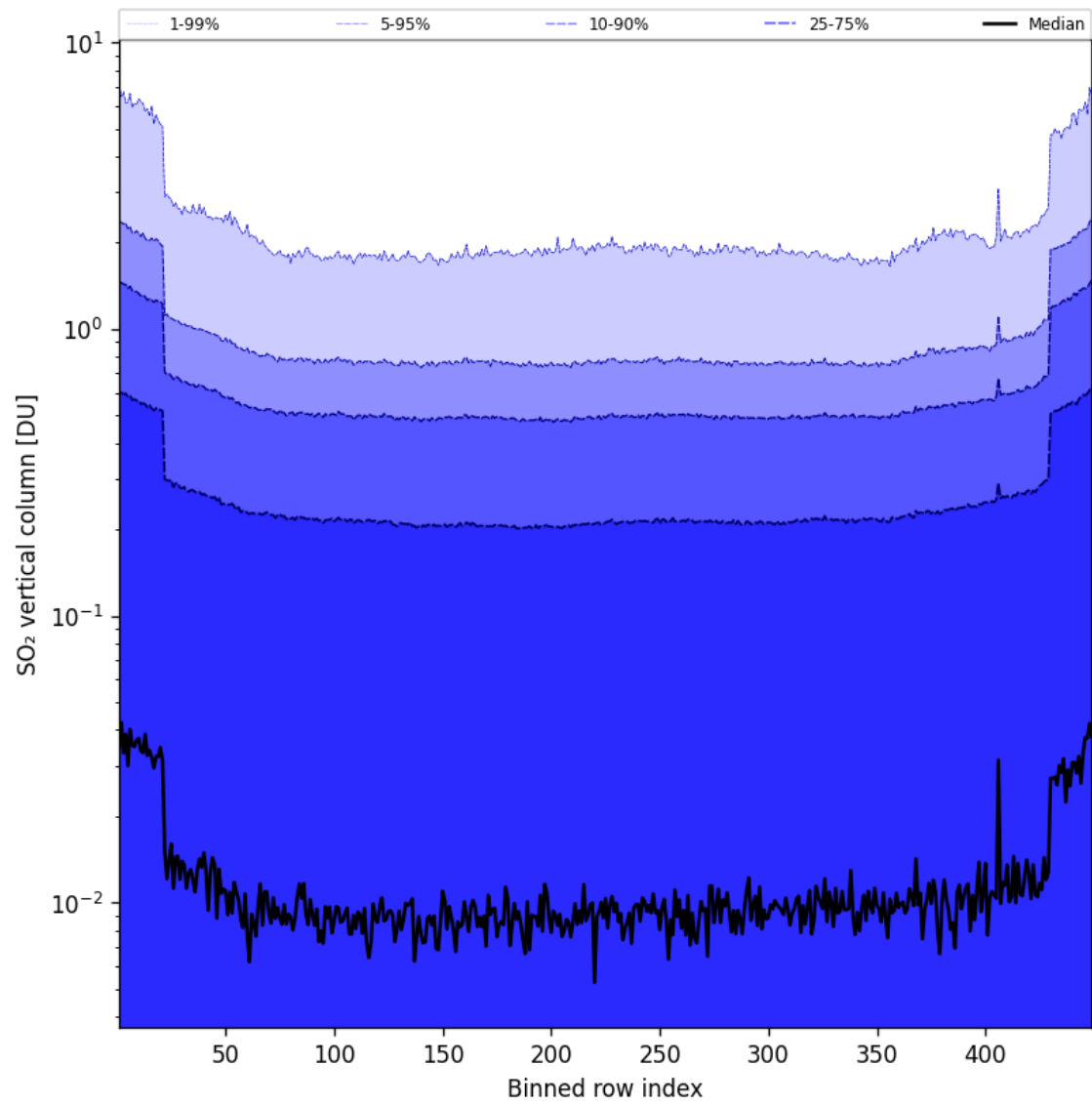


Figure 85: Along track statistics of “SO₂ vertical column” for 2025-07-30 to 2025-07-31

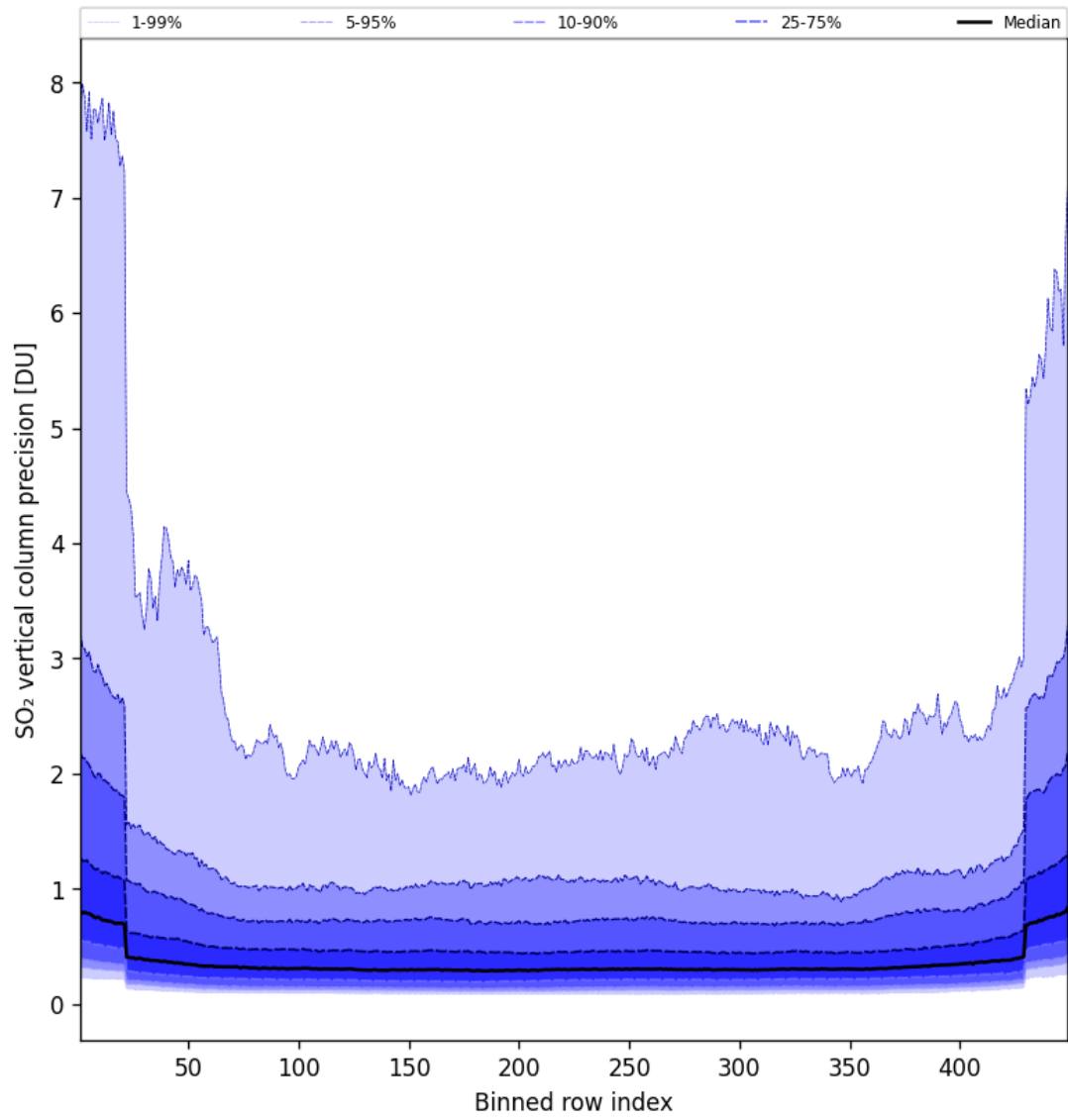


Figure 86: Along track statistics of “SO₂ vertical column precision” for 2025-07-30 to 2025-07-31

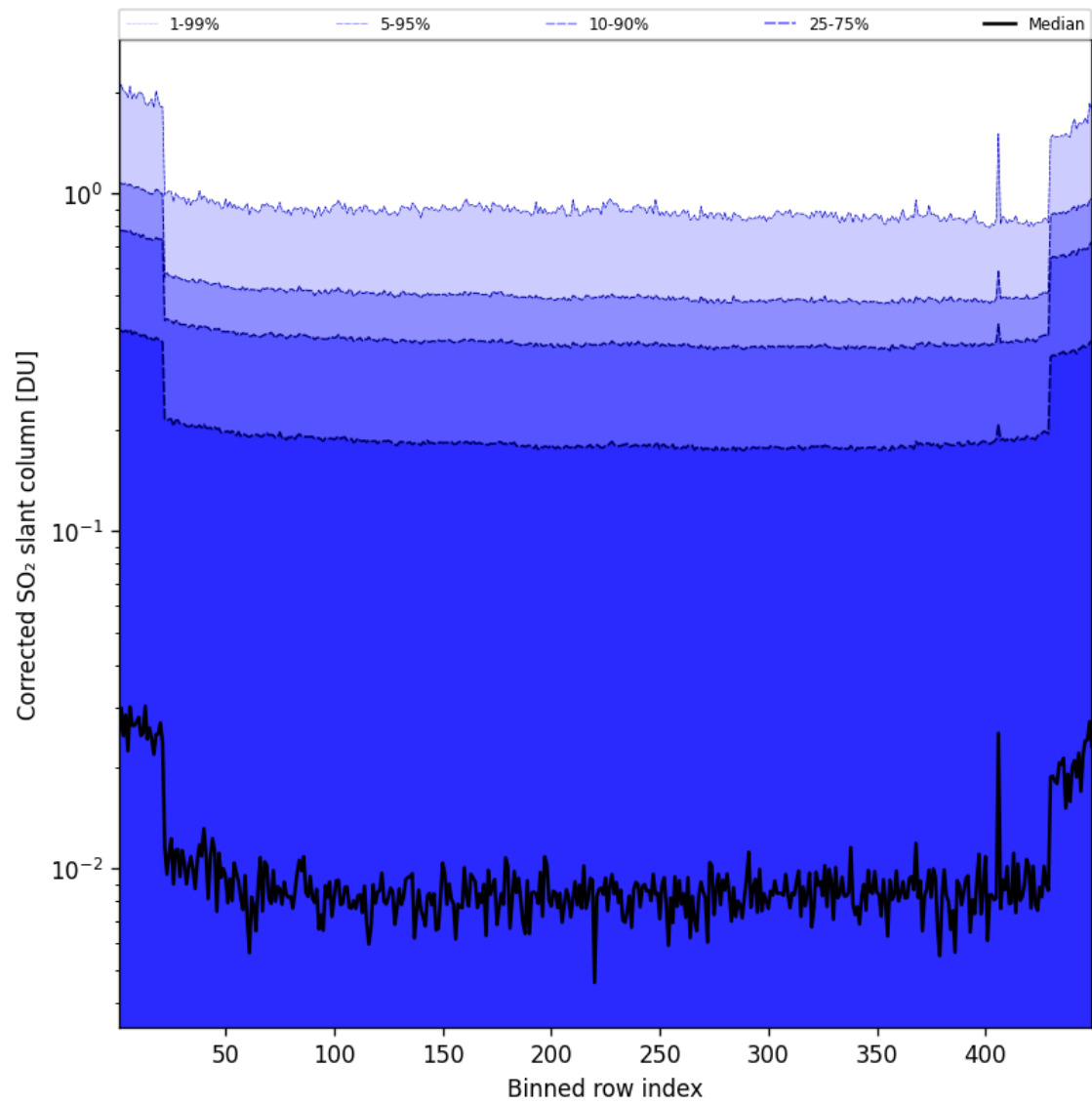


Figure 87: Along track statistics of “Corrected SO₂ slant column” for 2025-07-30 to 2025-07-31

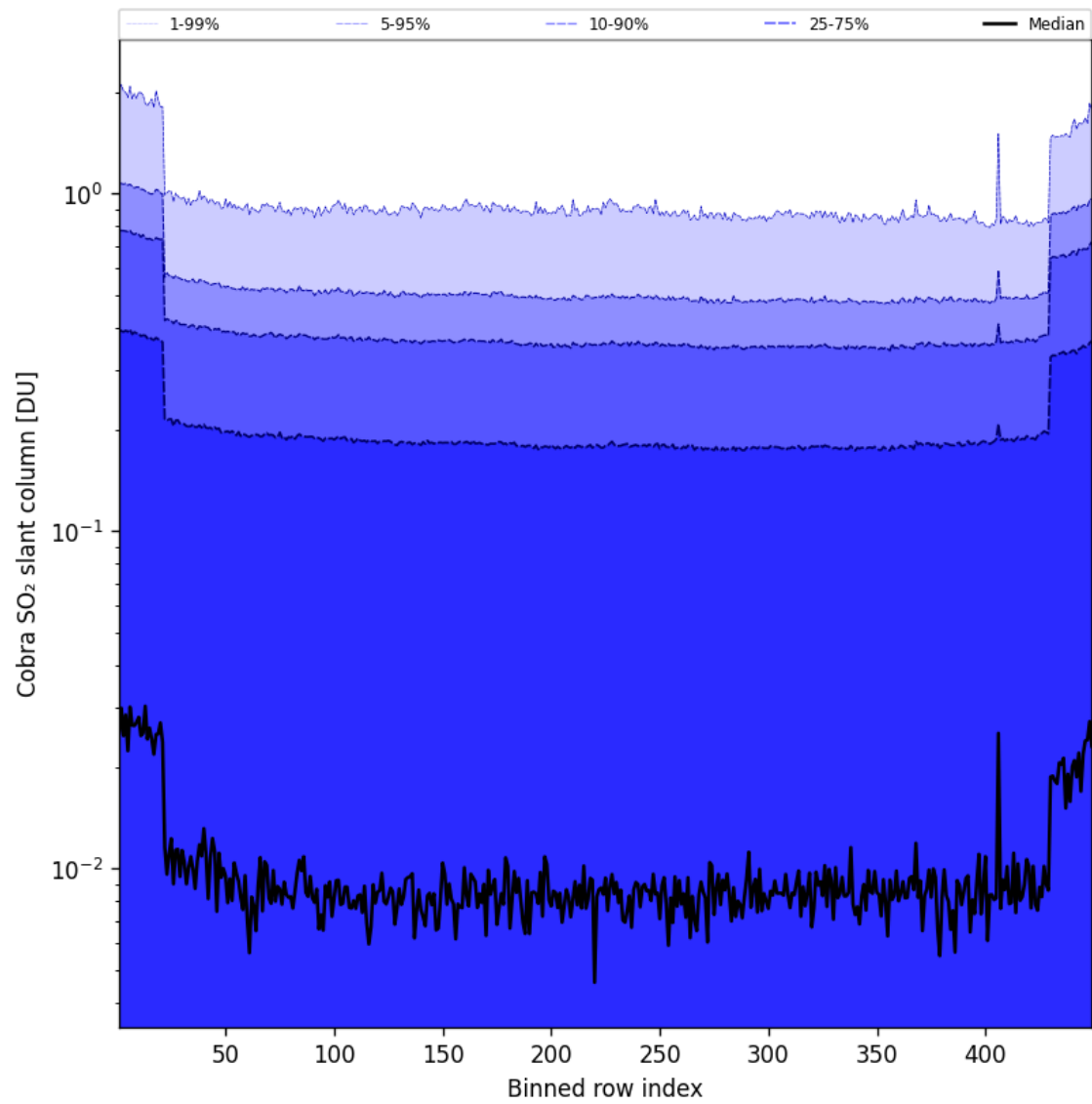


Figure 88: Along track statistics of “Cobra SO₂ slant column” for 2025-07-30 to 2025-07-31

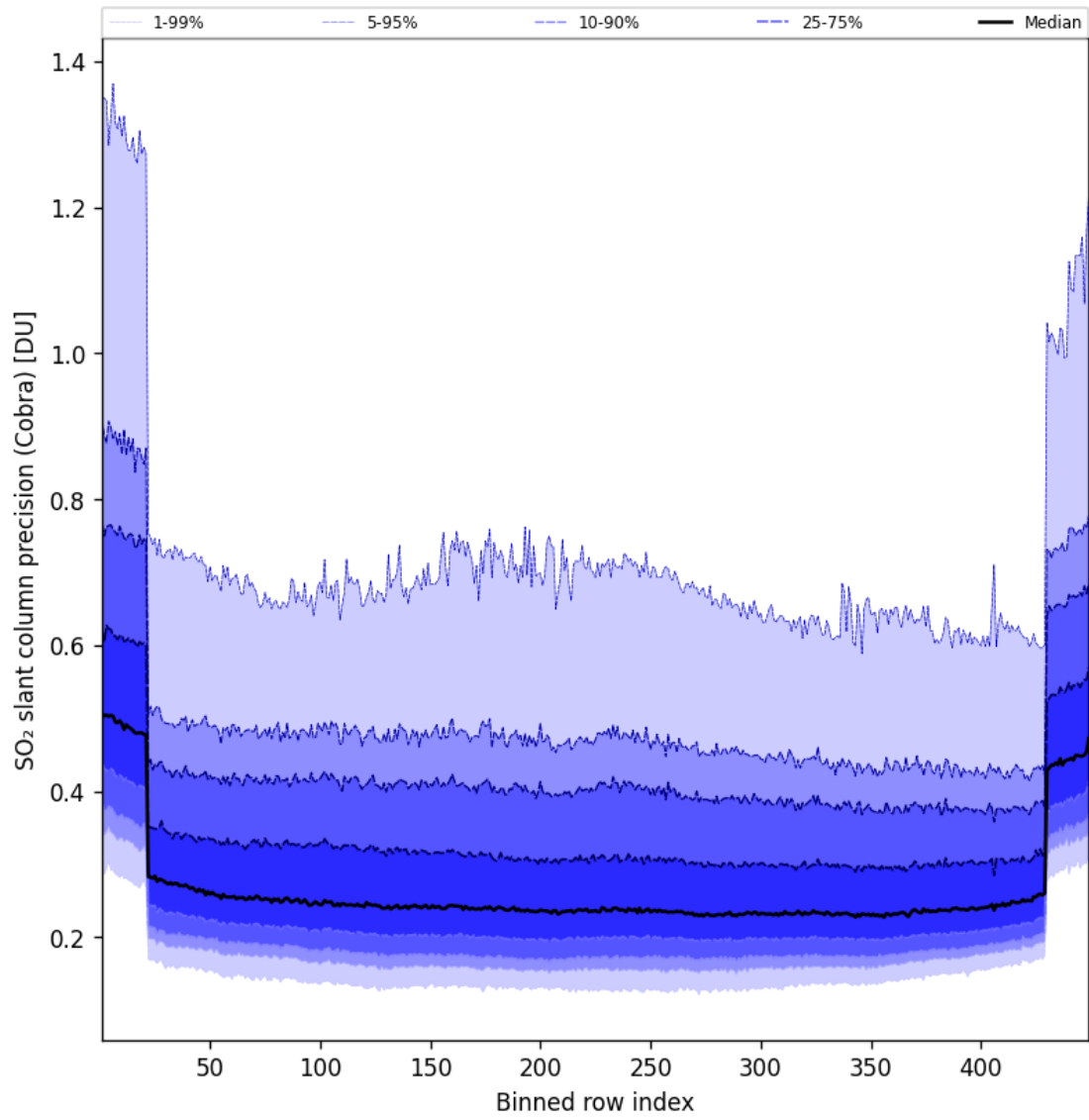


Figure 89: Along track statistics of “SO₂ slant column precision (Cobra)” for 2025-07-30 to 2025-07-31

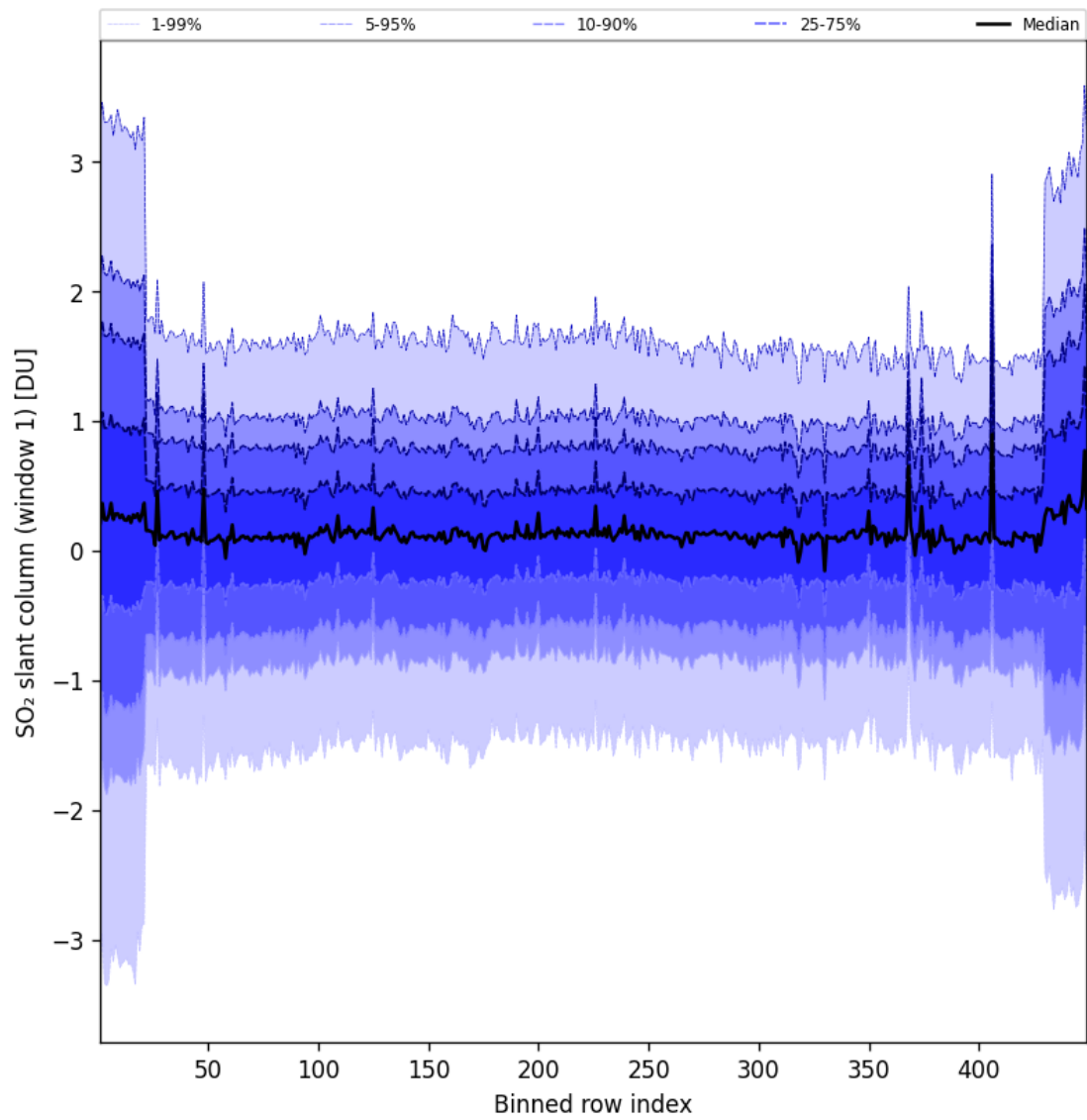


Figure 90: Along track statistics of “SO₂ slant column (window 1)” for 2025-07-30 to 2025-07-31

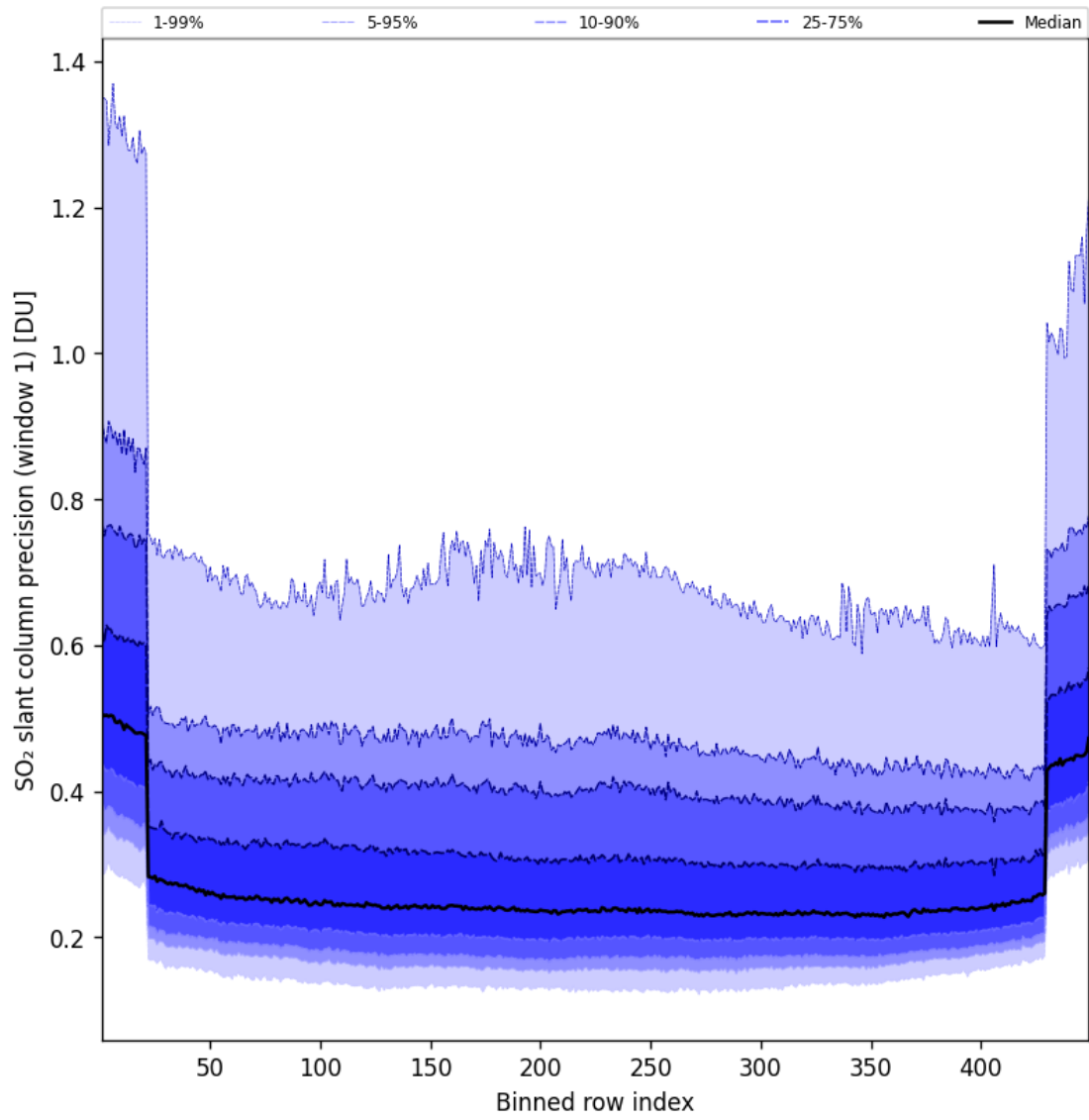


Figure 91: Along track statistics of “SO₂ slant column precision (window 1)” for 2025-07-30 to 2025-07-31

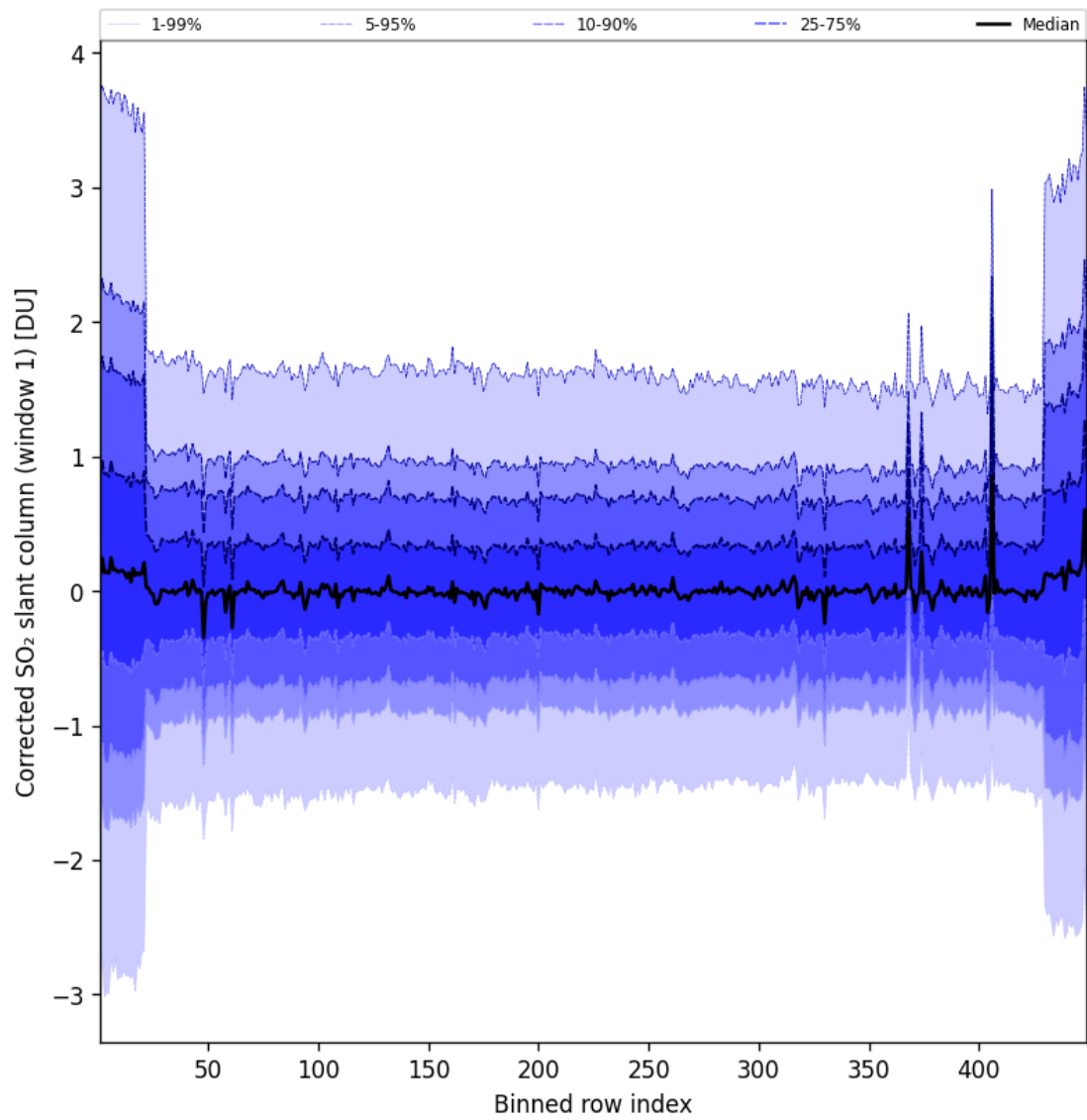


Figure 92: Along track statistics of “Corrected SO₂ slant column (window 1)” for 2025-07-30 to 2025-07-31

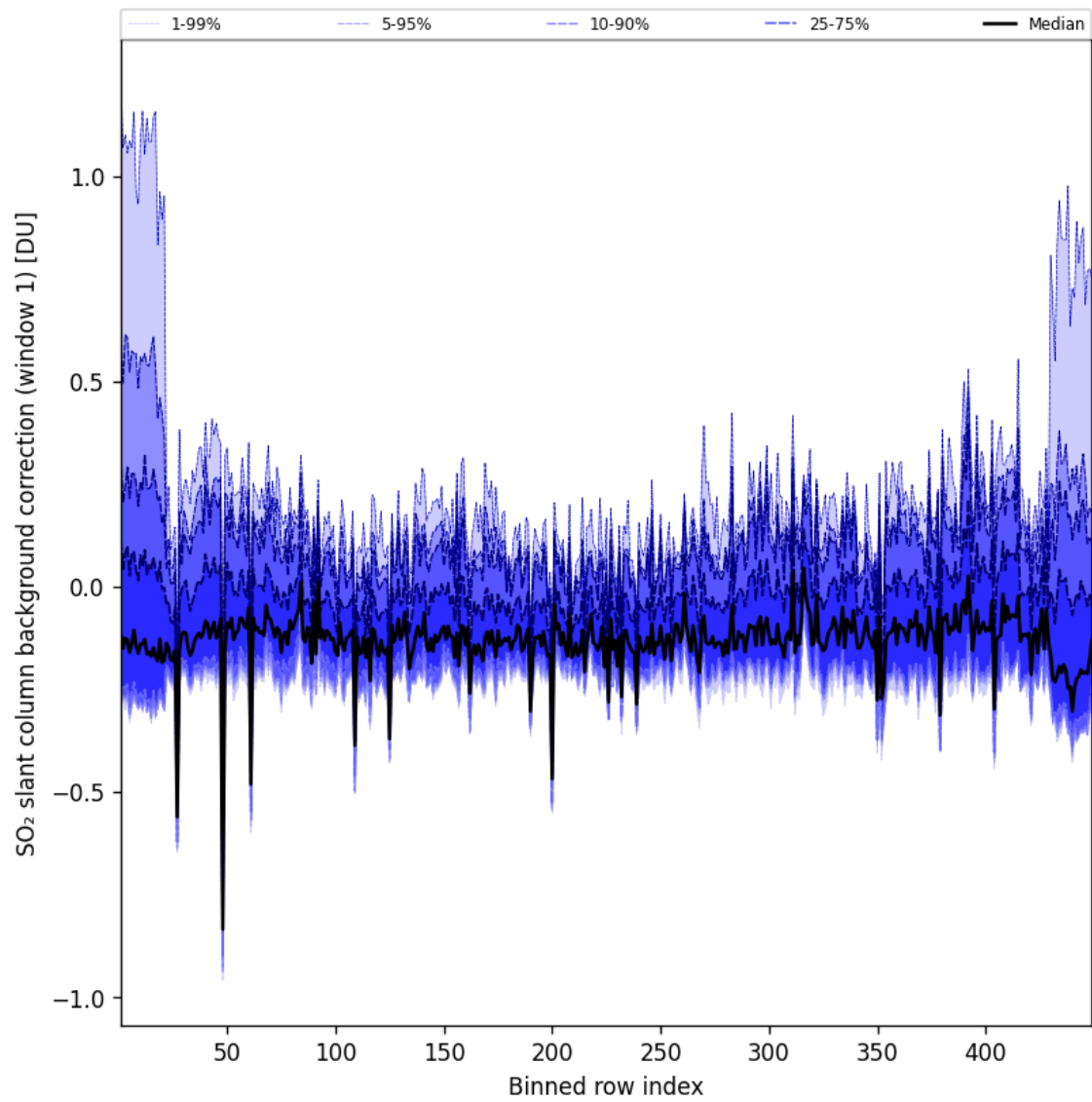


Figure 93: Along track statistics of “SO₂ slant column background correction (window 1)” for 2025-07-30 to 2025-07-31

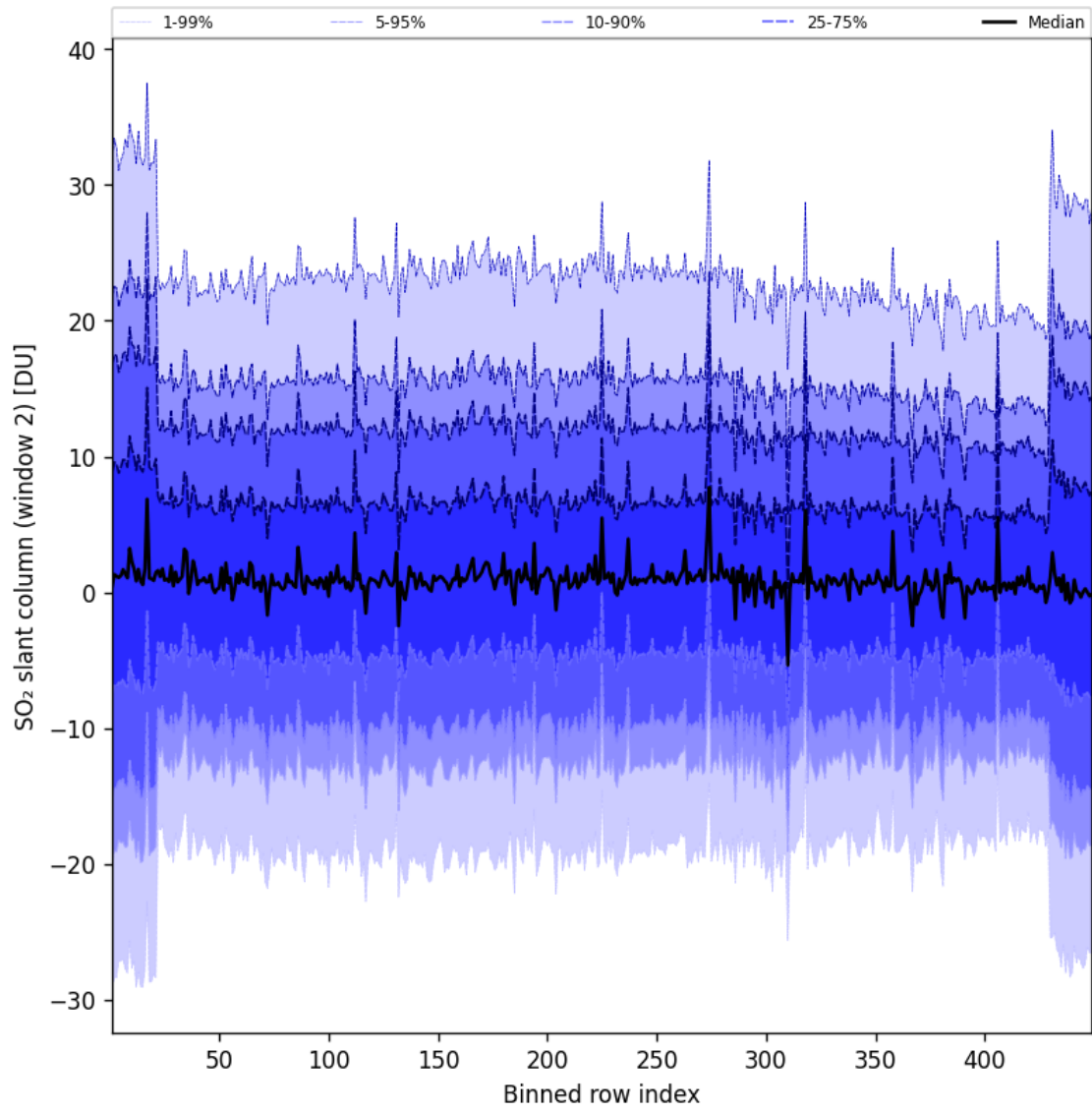


Figure 94: Along track statistics of “SO₂ slant column (window 2)” for 2025-07-30 to 2025-07-31

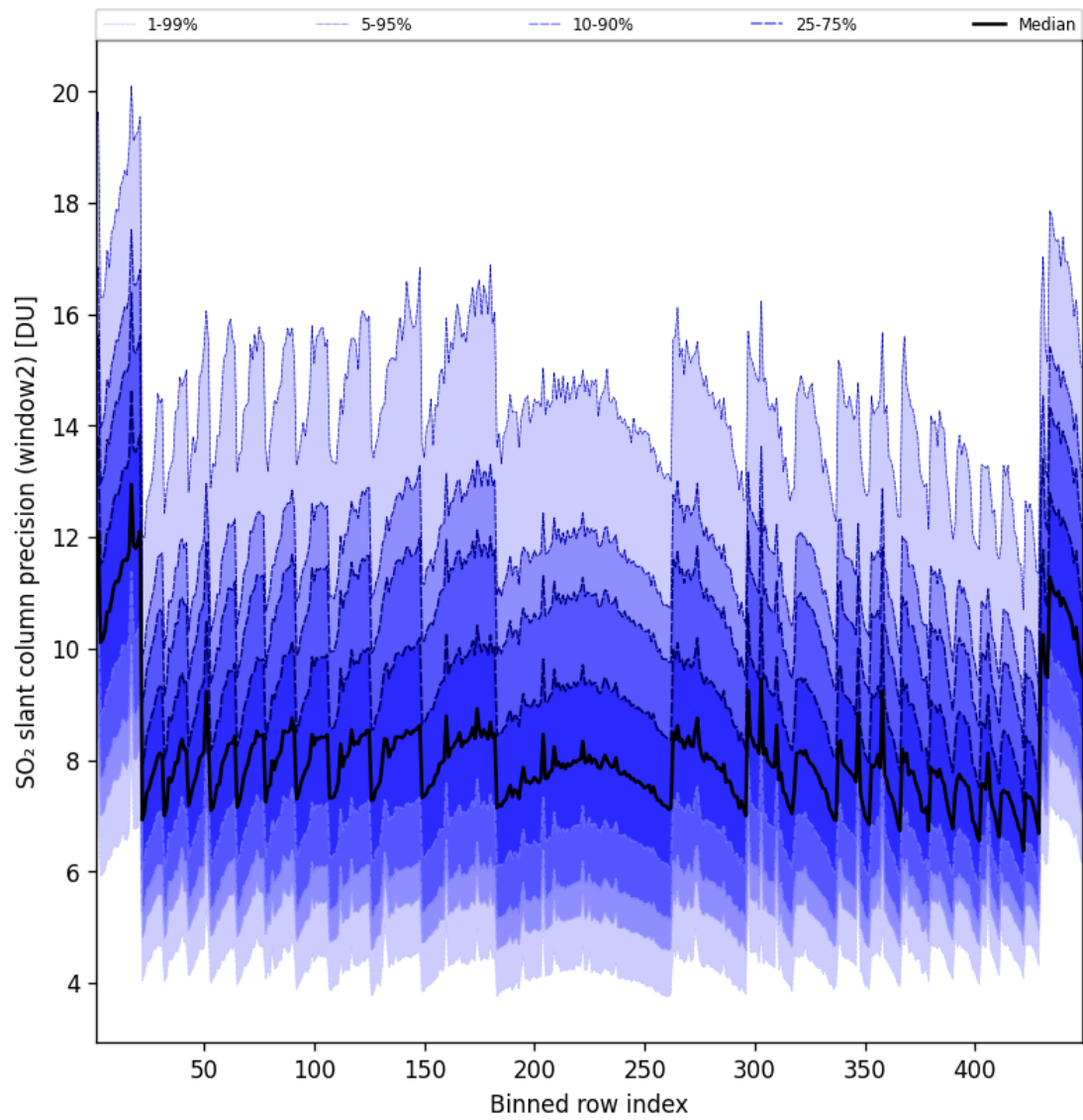


Figure 95: Along track statistics of “SO₂ slant column precision (window2)” for 2025-07-30 to 2025-07-31

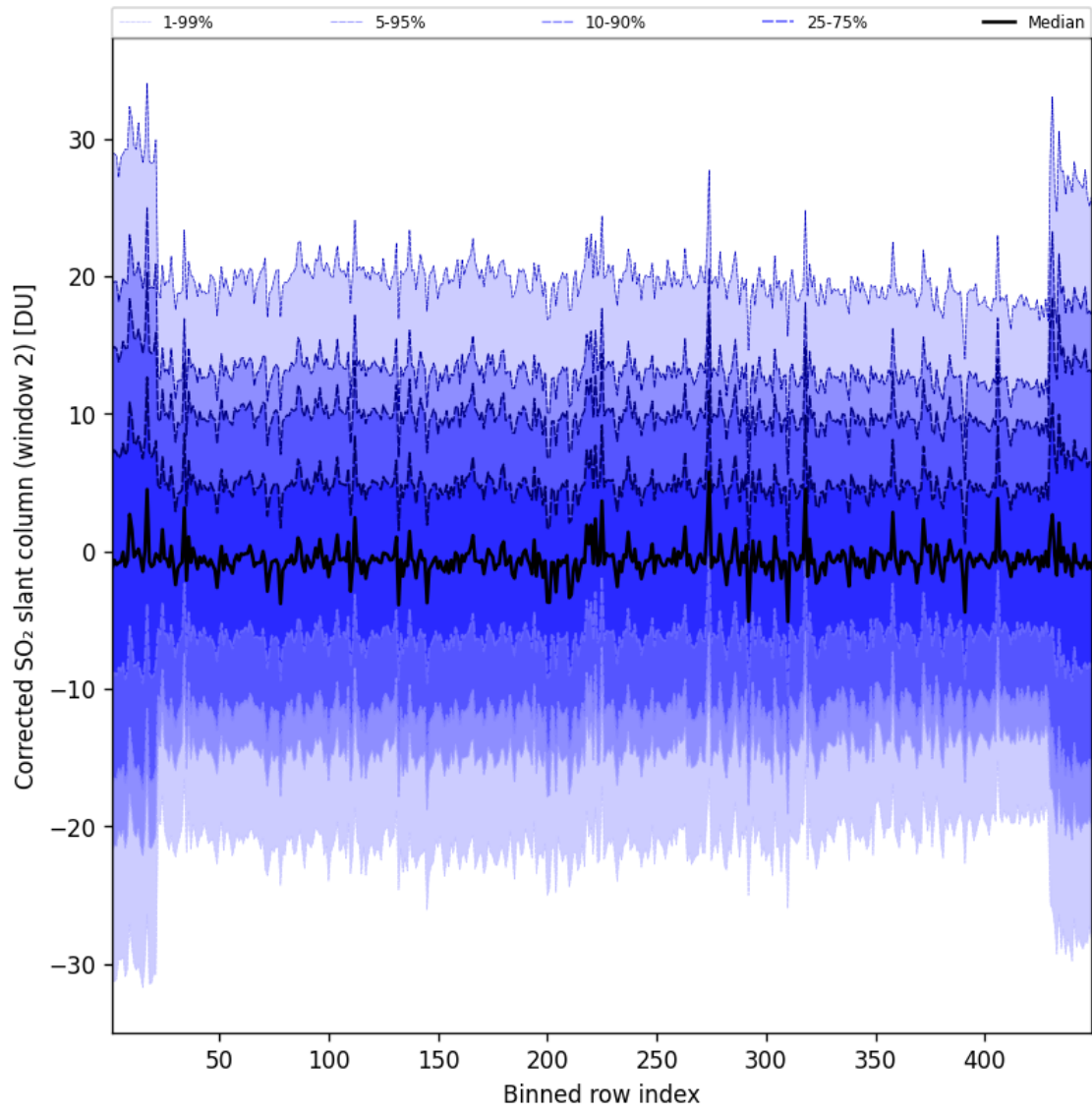


Figure 96: Along track statistics of “Corrected SO₂ slant column (window 2)” for 2025-07-30 to 2025-07-31

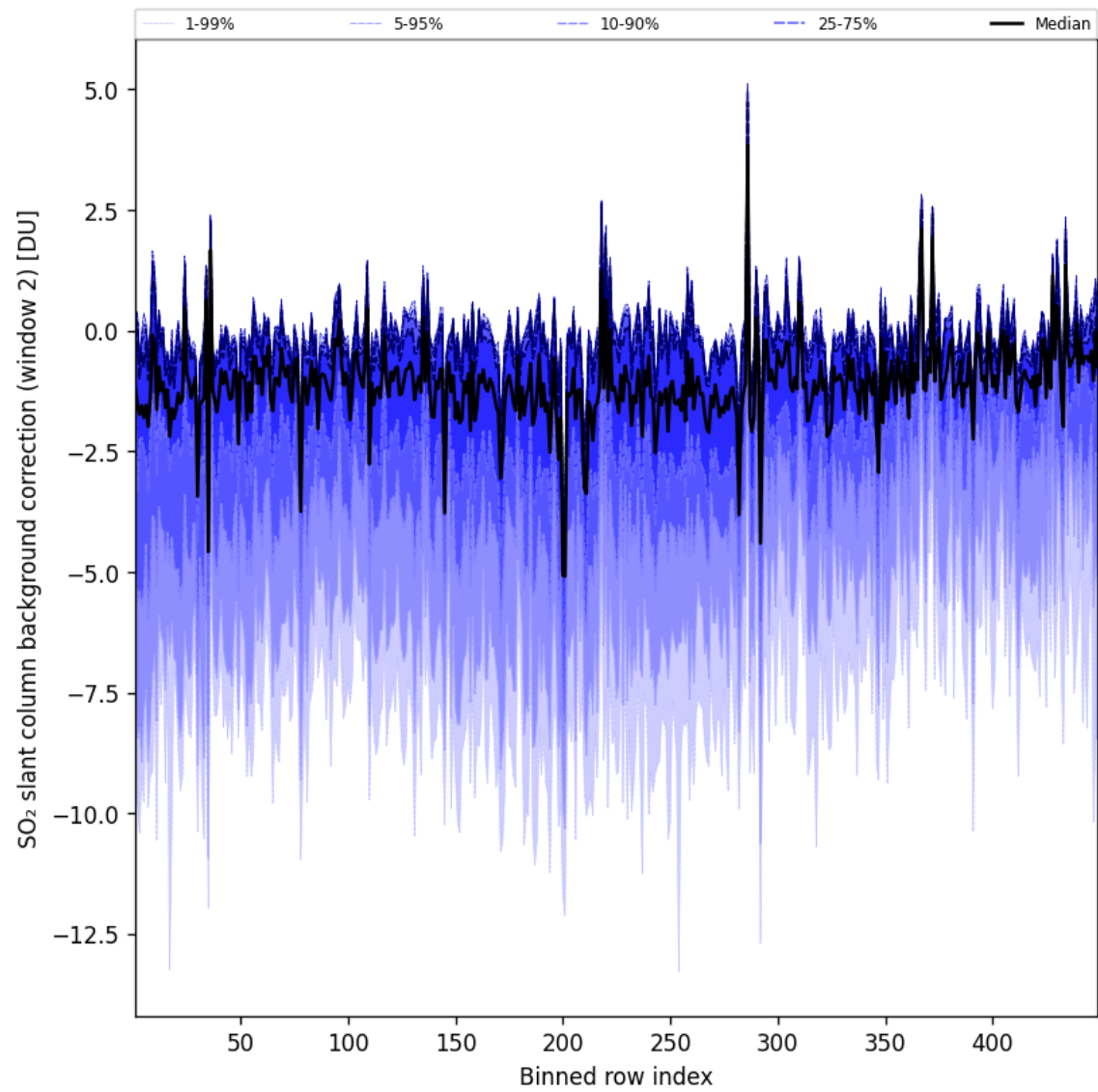


Figure 97: Along track statistics of “SO₂ slant column background correction (window 2)” for 2025-07-30 to 2025-07-31

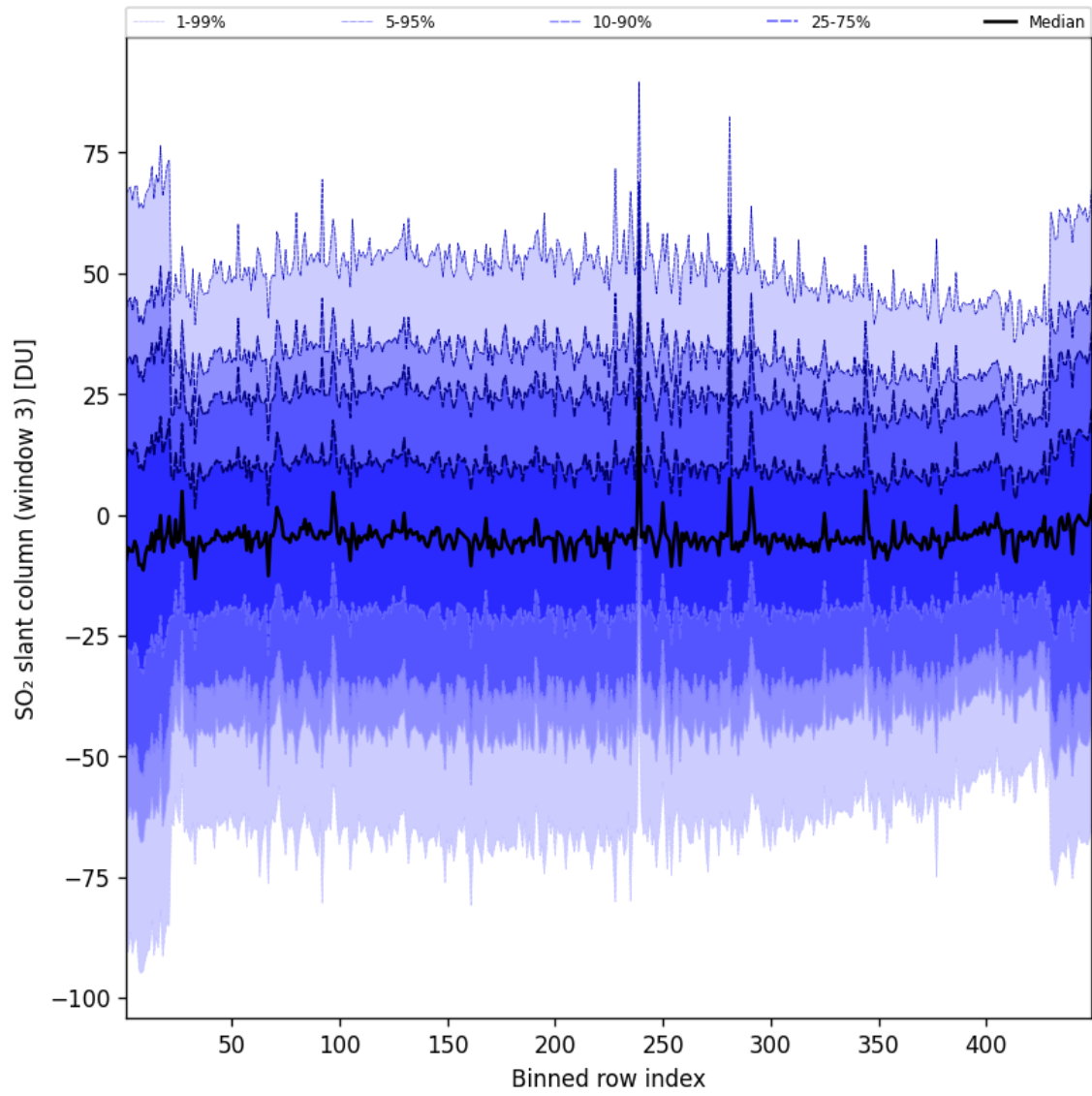


Figure 98: Along track statistics of “SO₂ slant column (window 3)” for 2025-07-30 to 2025-07-31

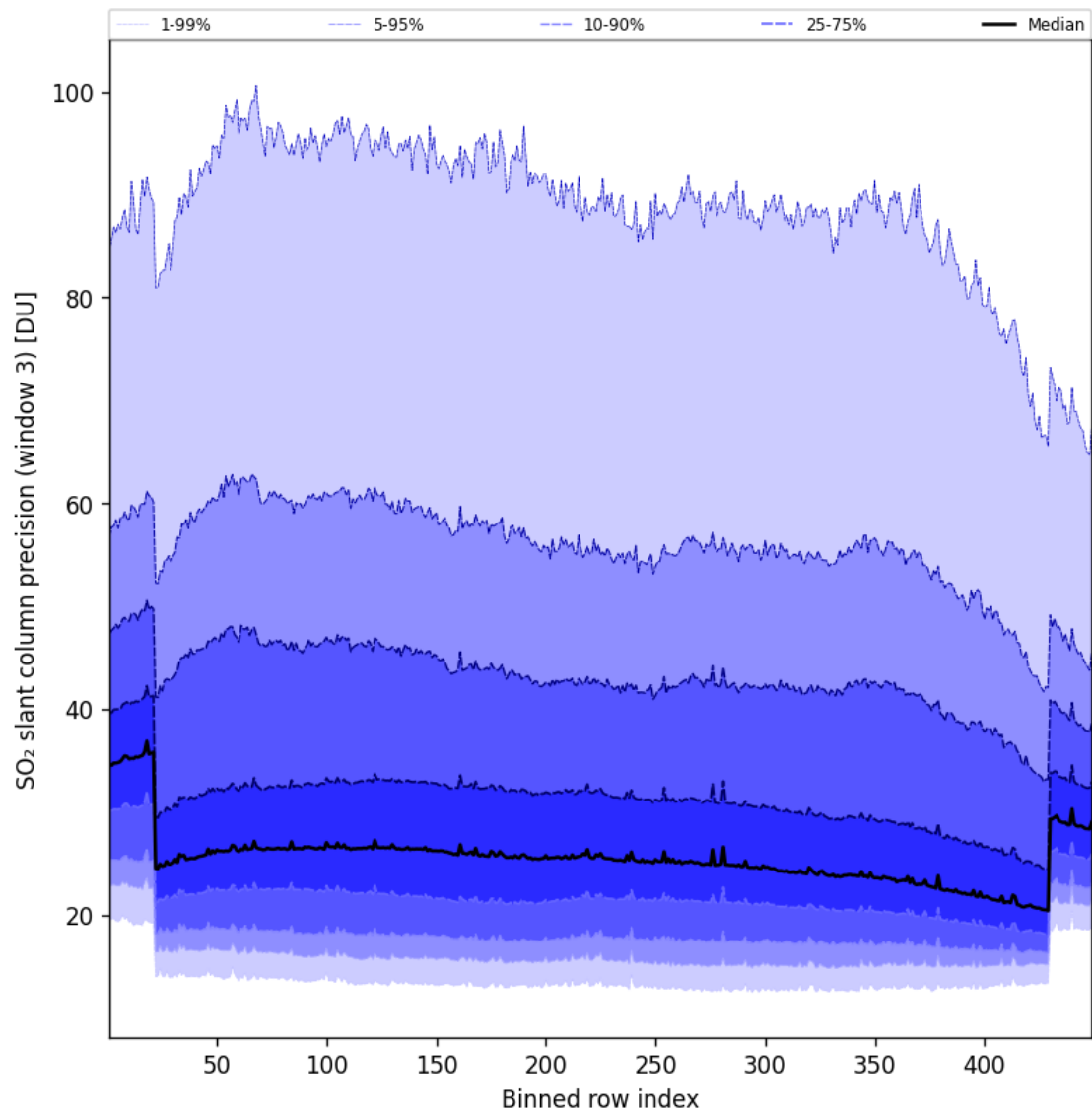


Figure 99: Along track statistics of “SO₂ slant column precision (window 3)” for 2025-07-30 to 2025-07-31

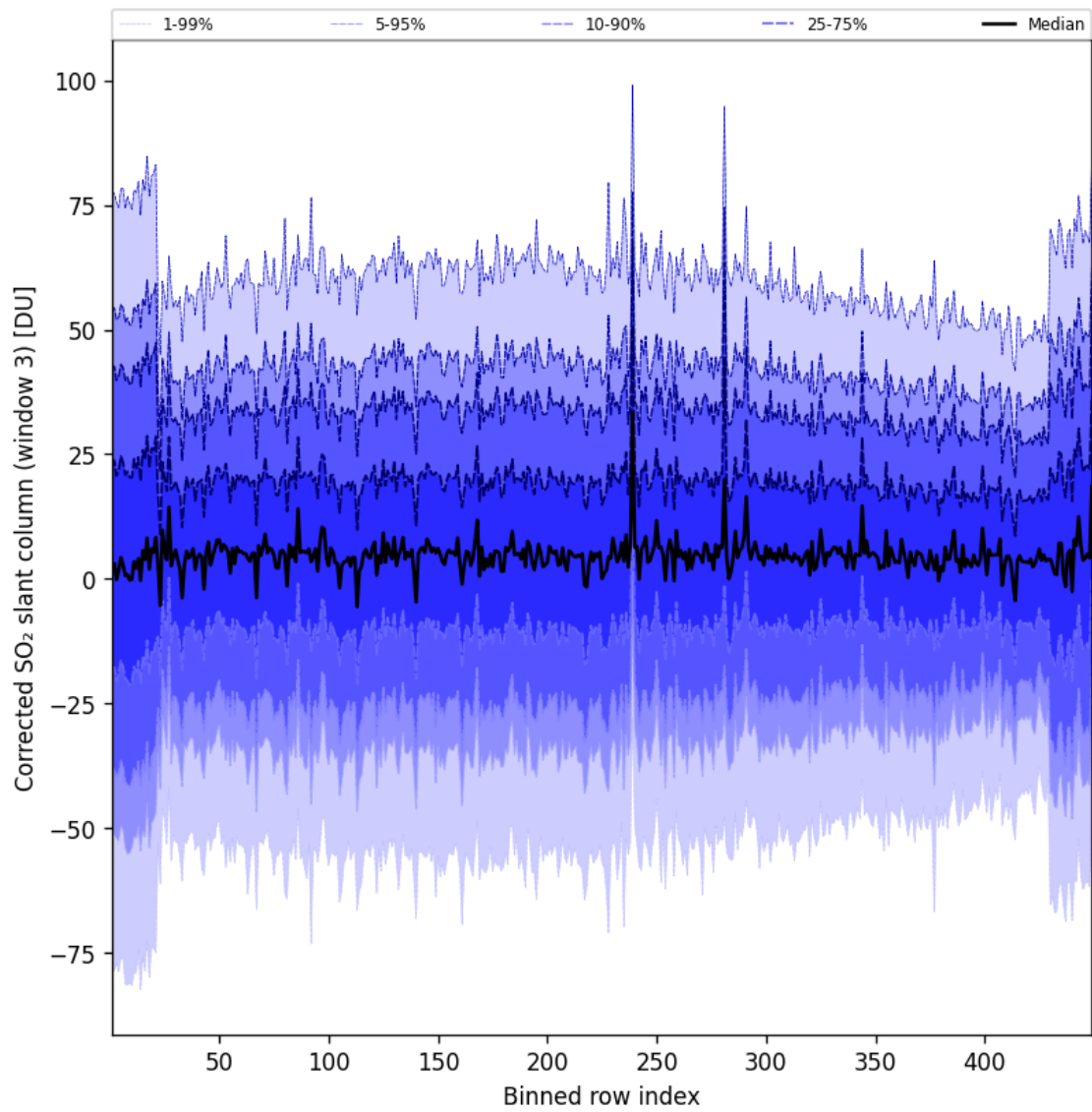


Figure 100: Along track statistics of “Corrected SO₂ slant column (window 3)” for 2025-07-30 to 2025-07-31

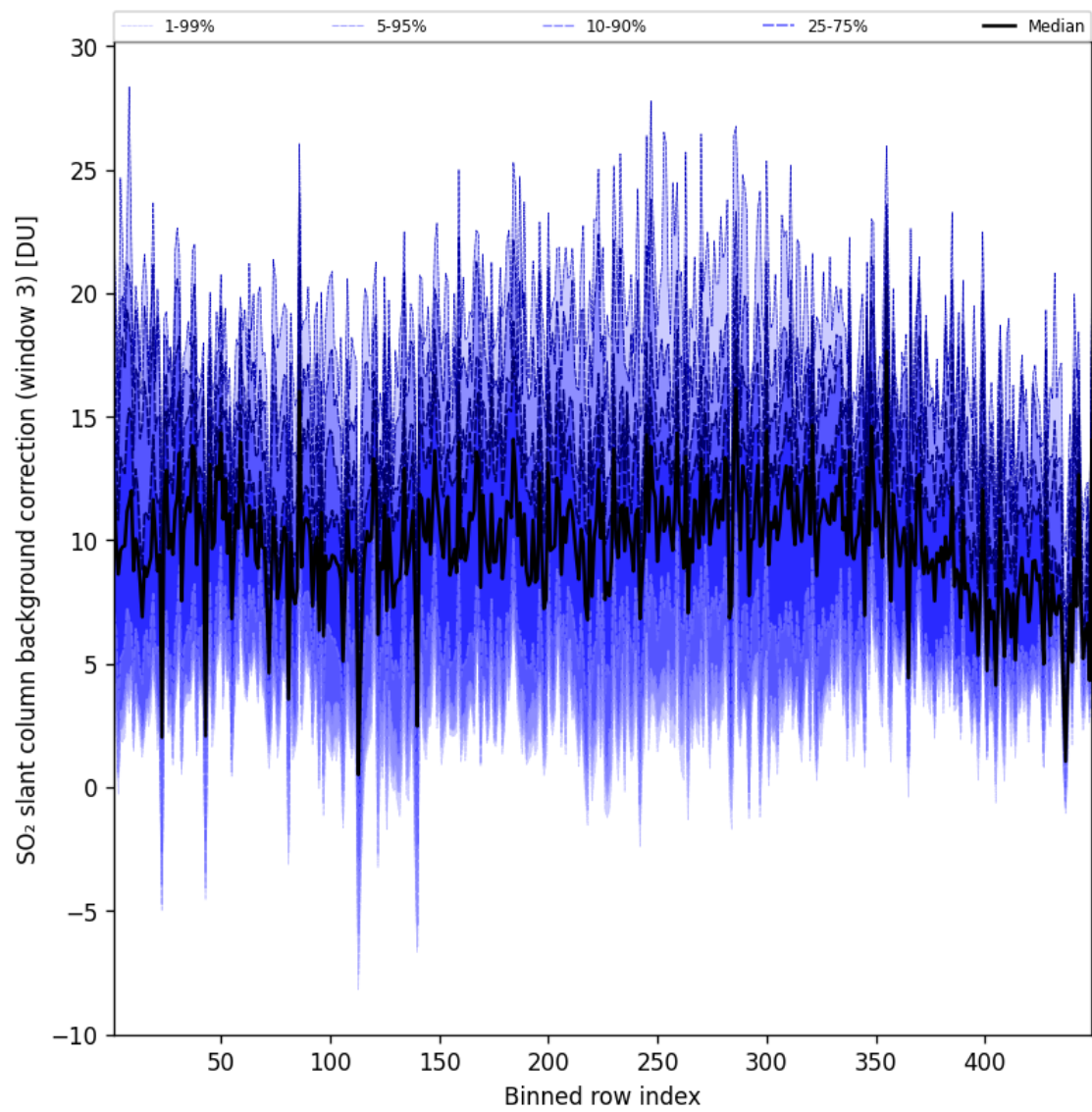


Figure 101: Along track statistics of “SO₂ slant column background correction (window 3)” for 2025-07-30 to 2025-07-31

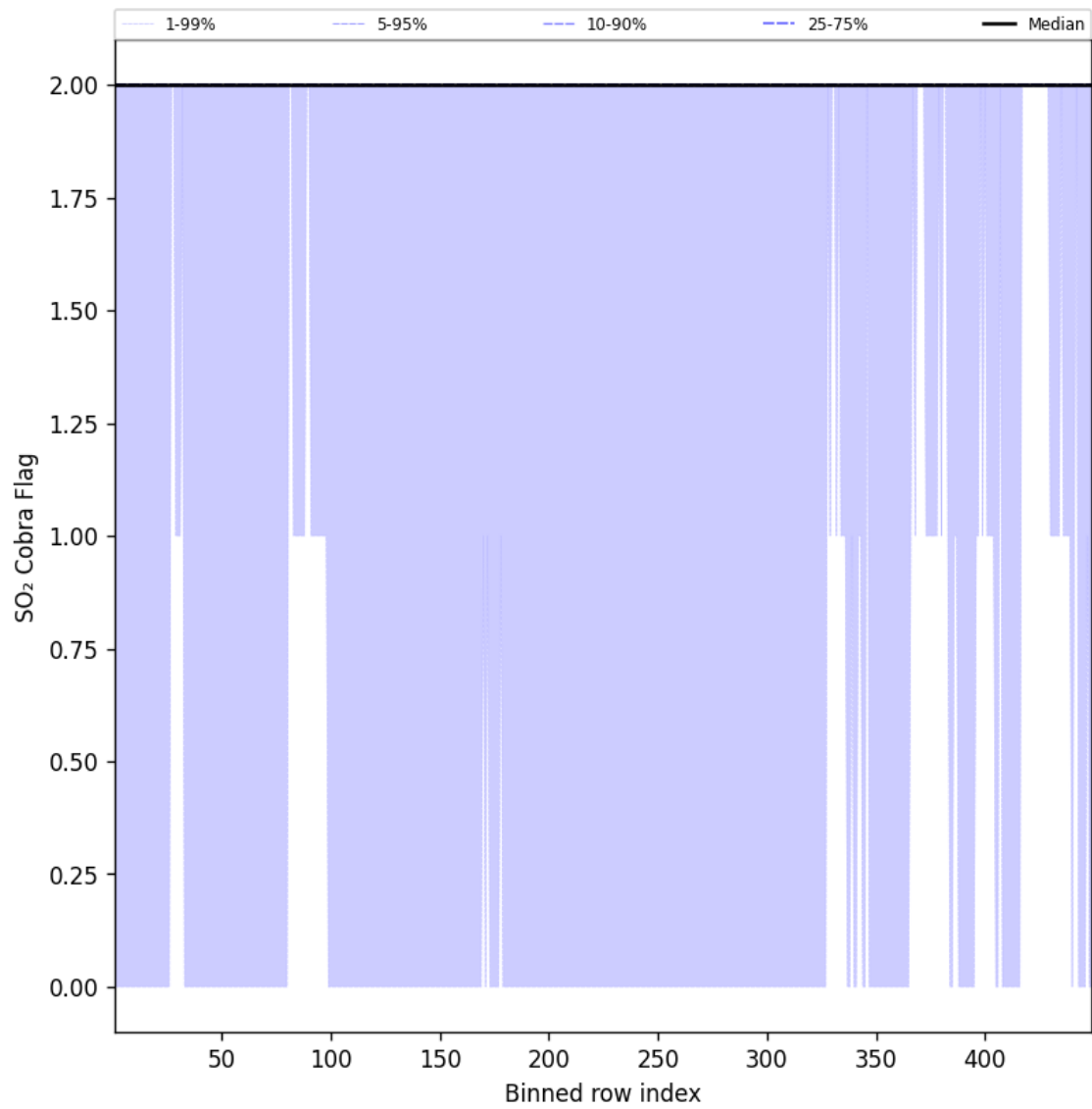


Figure 102: Along track statistics of “SO₂ Cobra Flag” for 2025-07-30 to 2025-07-31

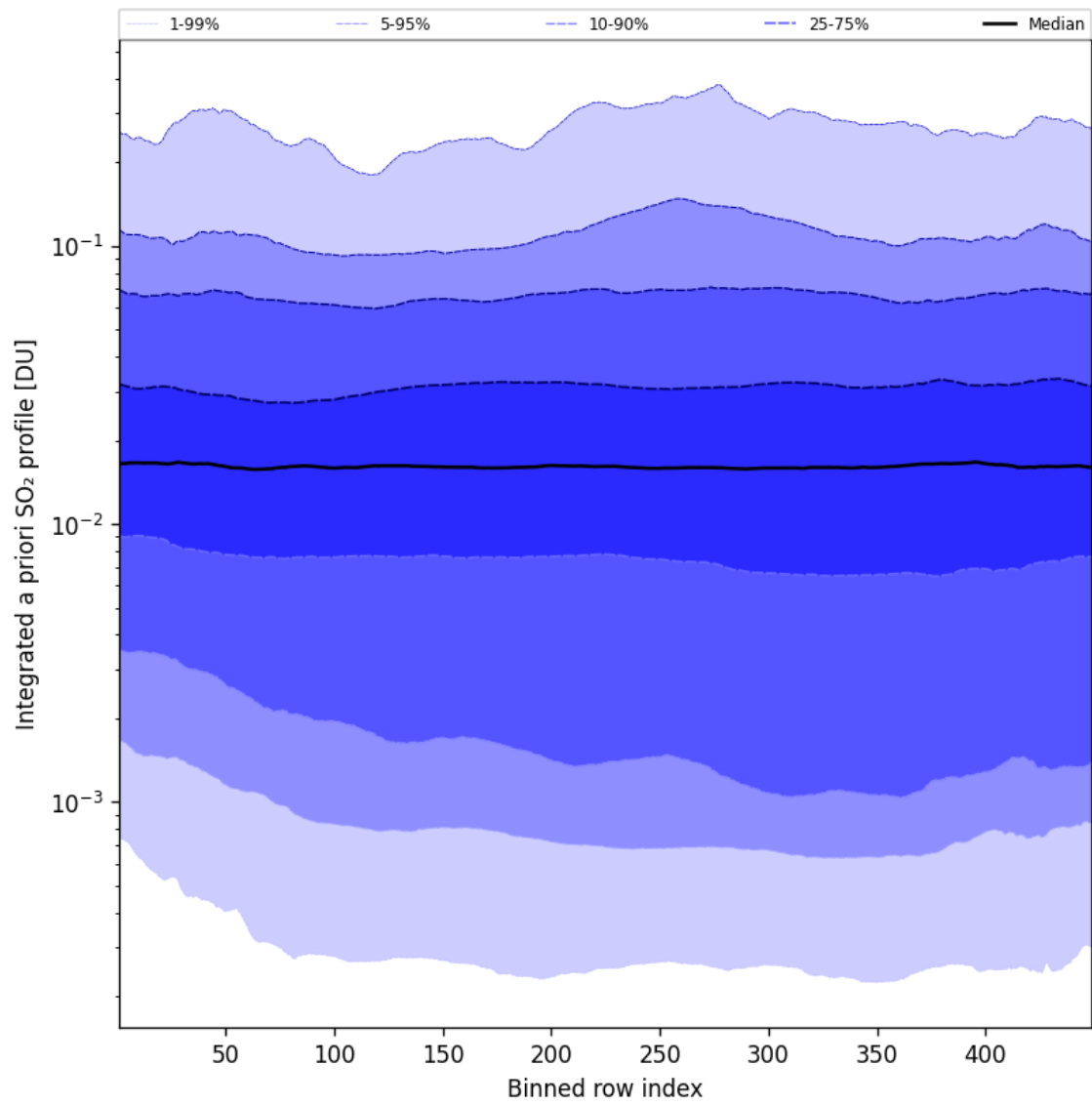


Figure 103: Along track statistics of “Integrated a priori SO₂ profile” for 2025-07-30 to 2025-07-31

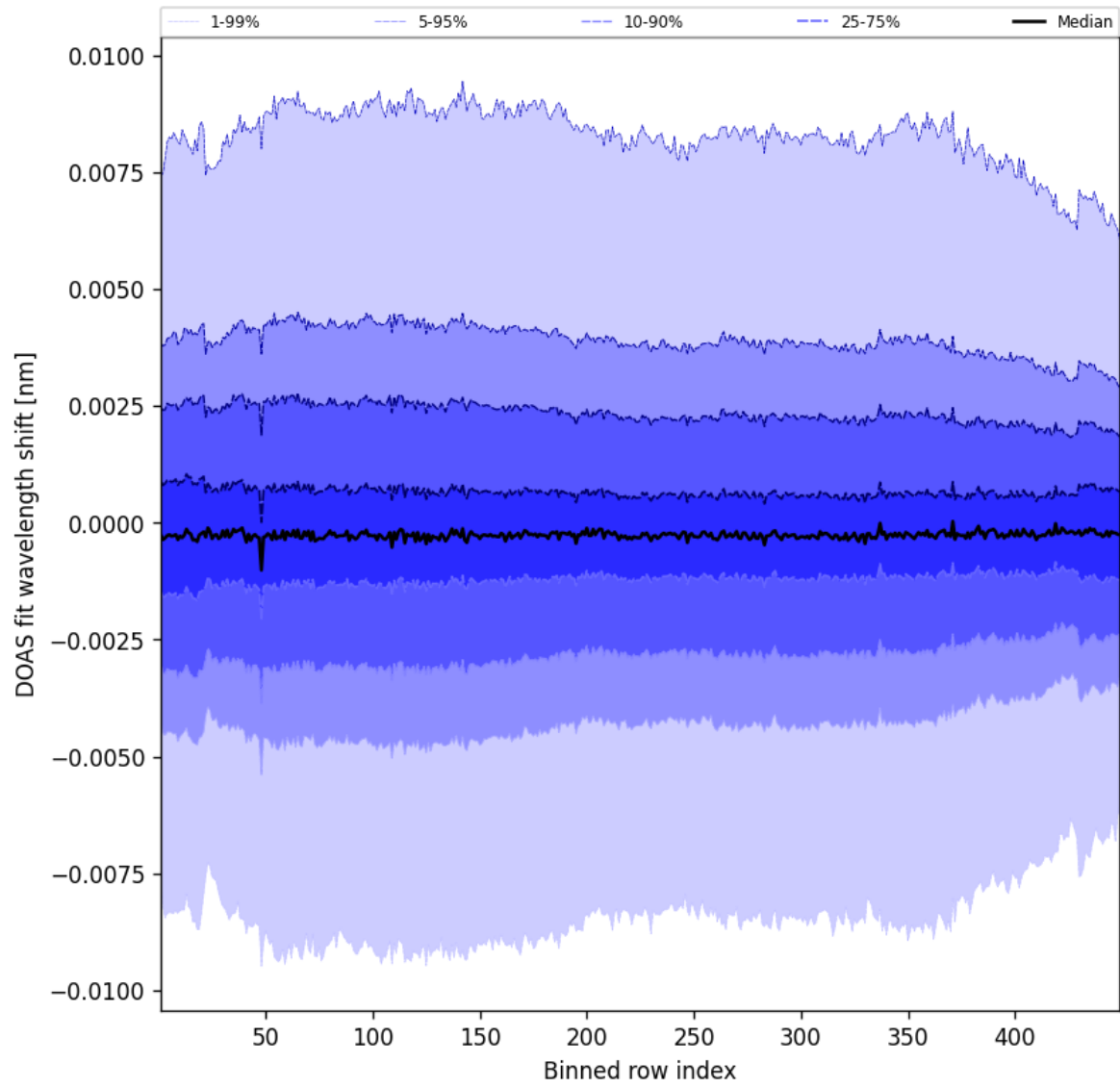


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-07-30 to 2025-07-31

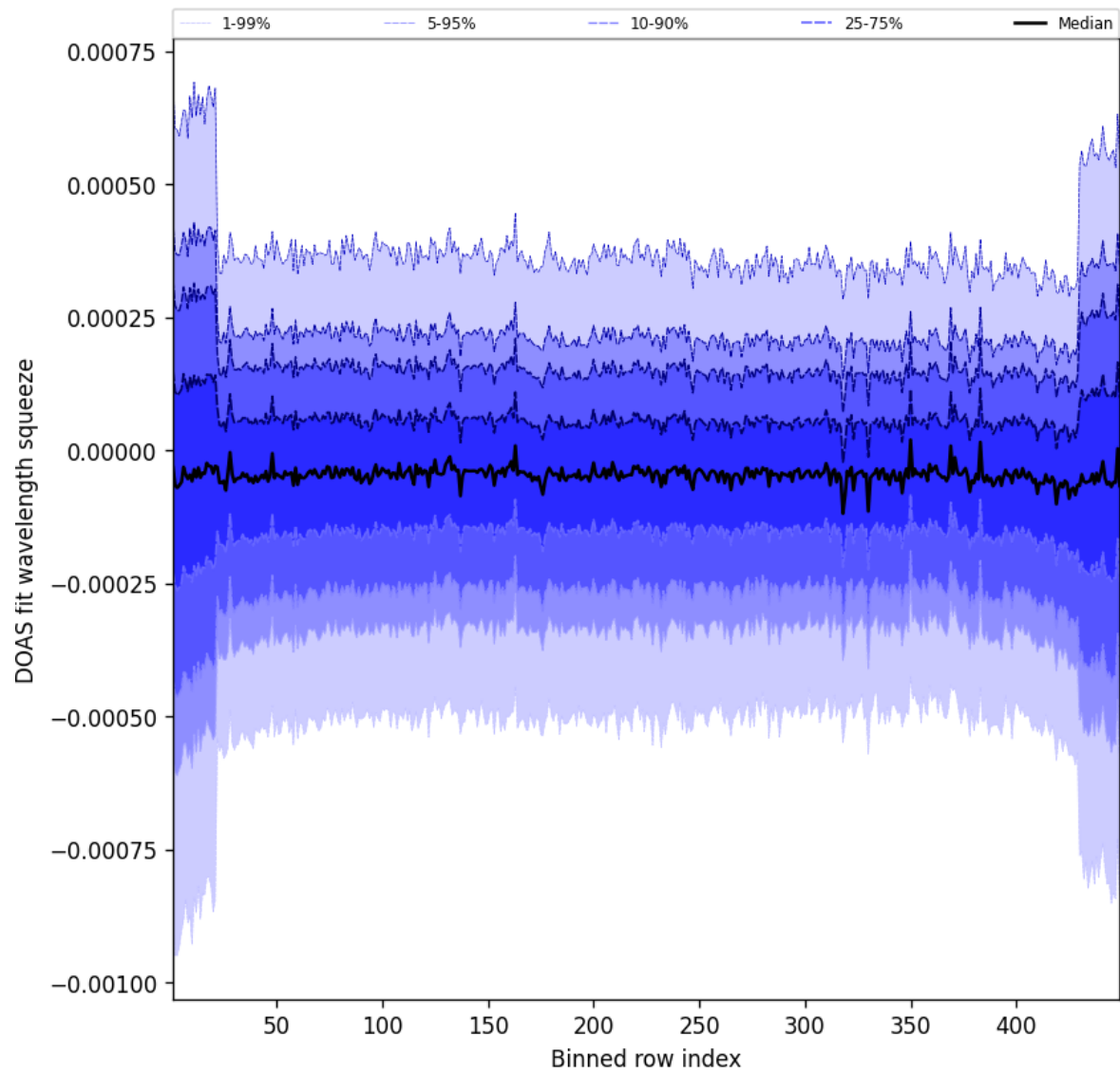


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-07-30 to 2025-07-31

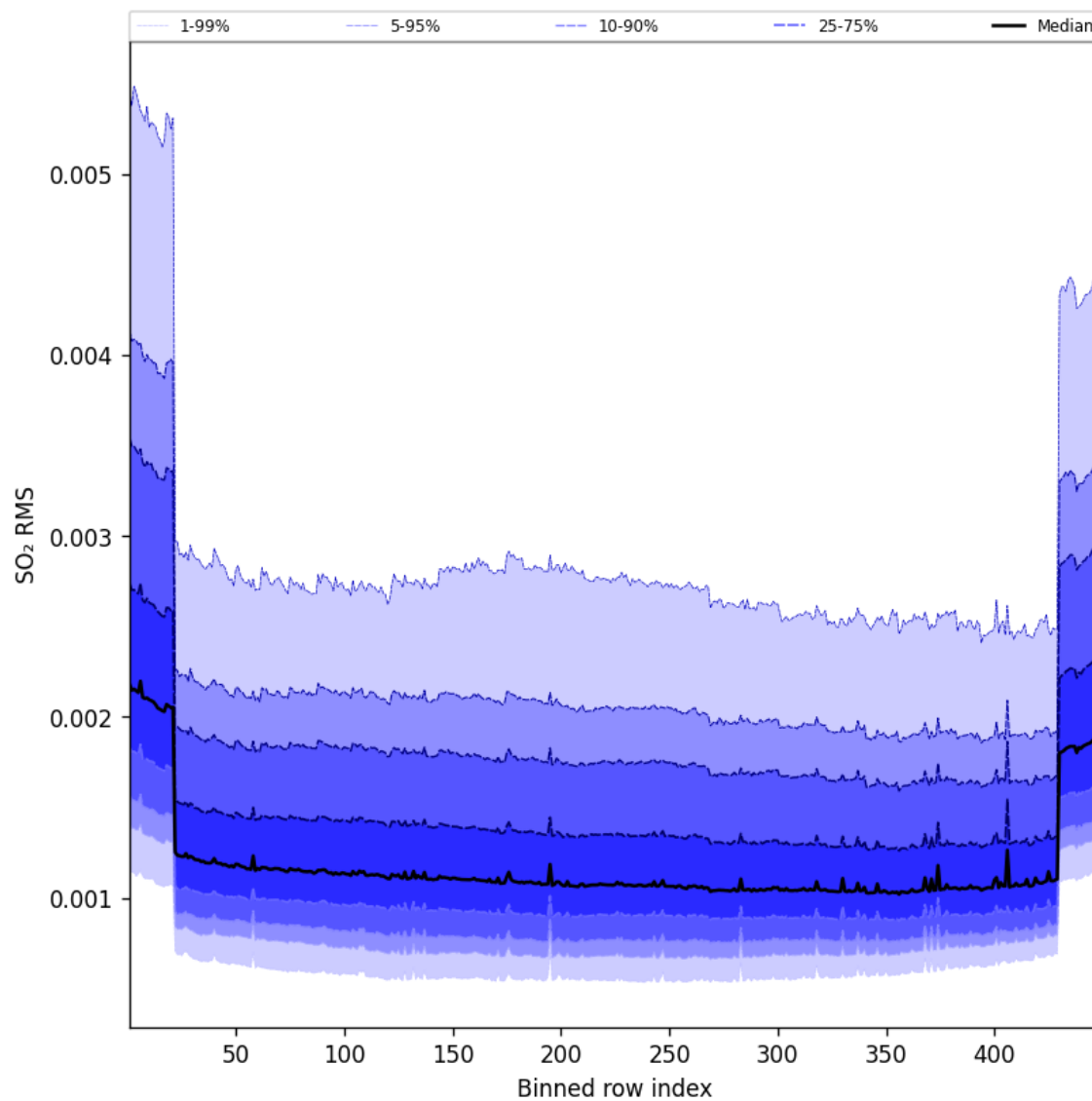


Figure 106: Along track statistics of “SO₂ RMS” for 2025-07-30 to 2025-07-31

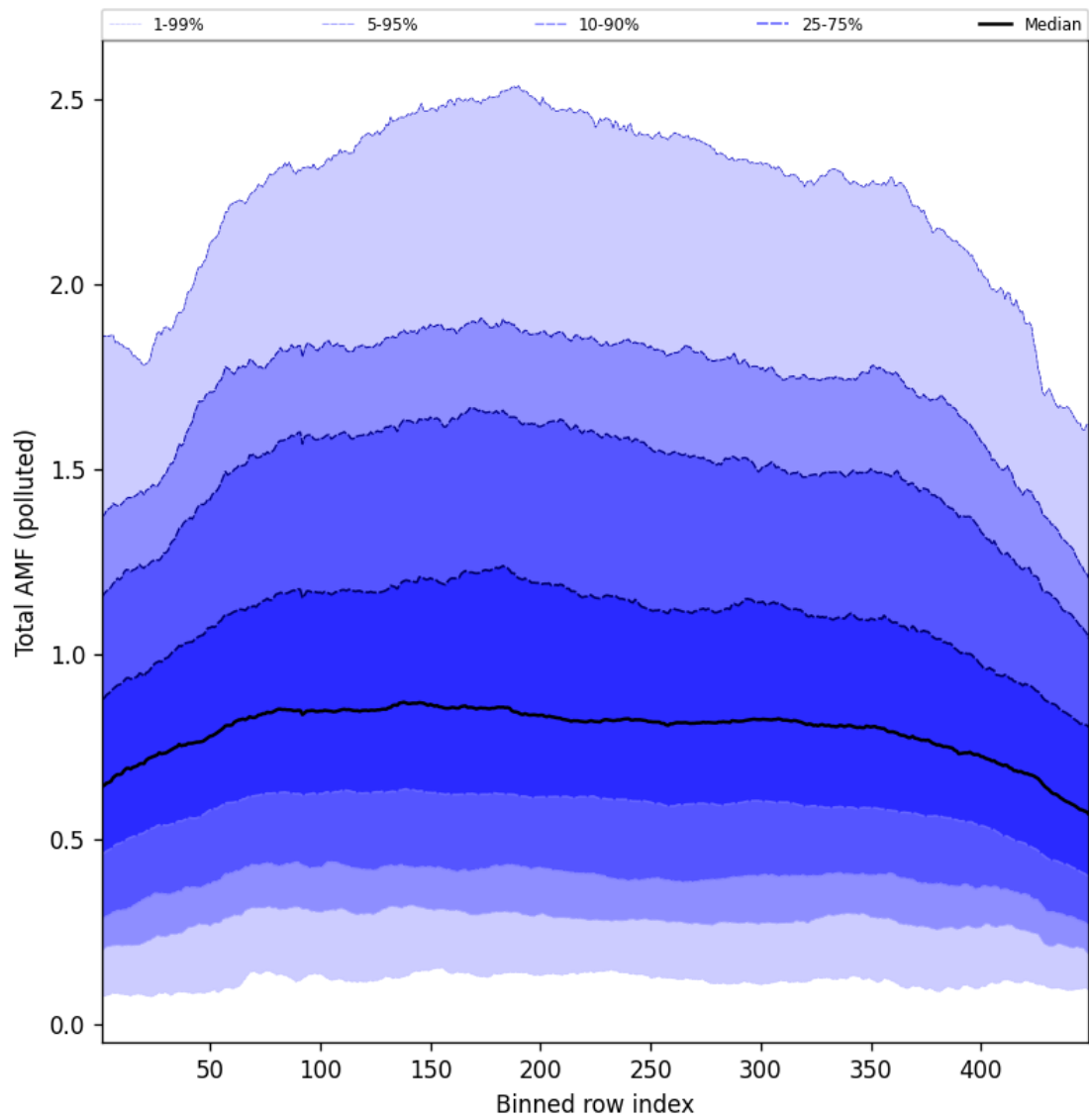


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-07-30 to 2025-07-31

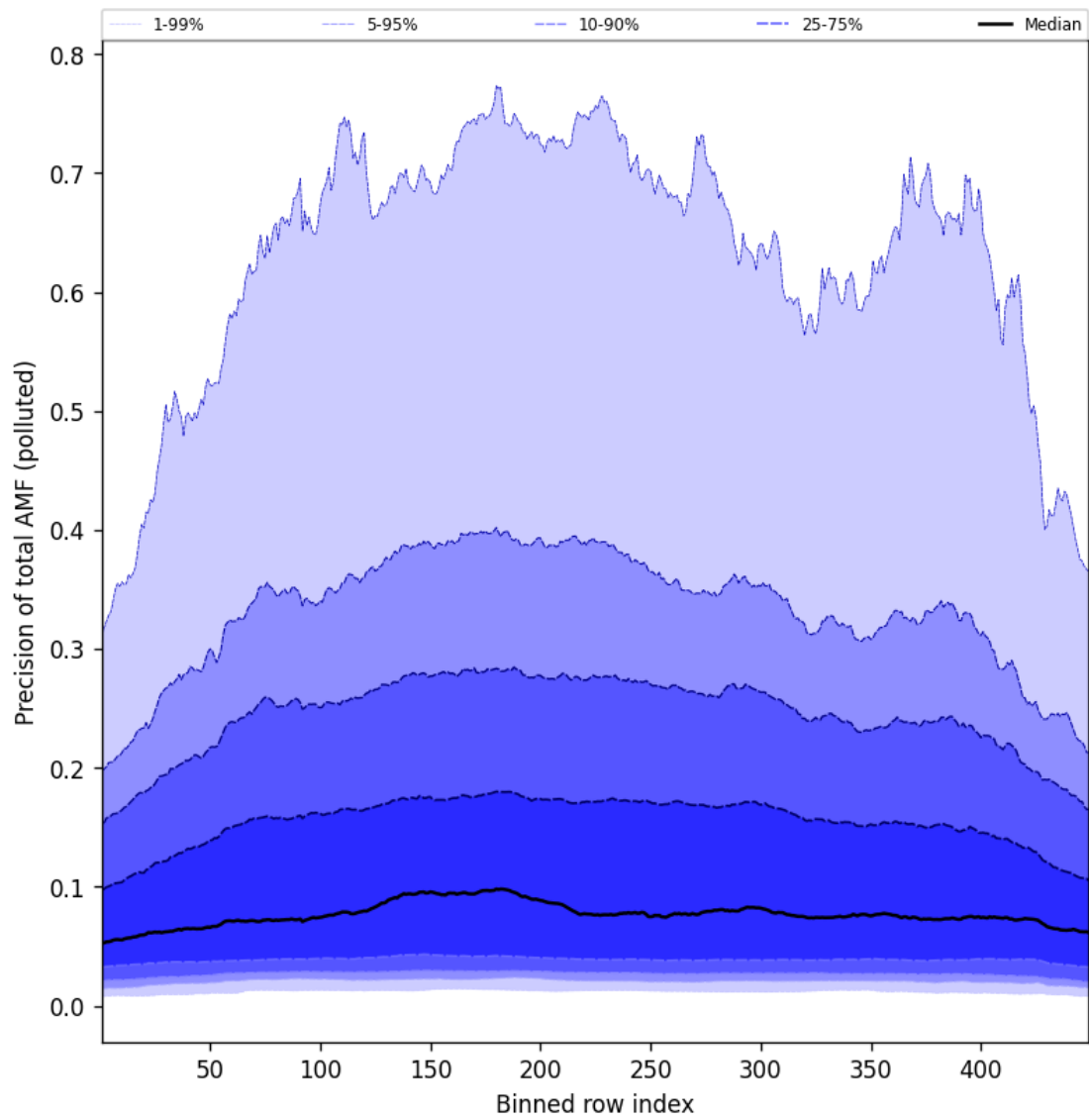


Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-07-30 to 2025-07-31

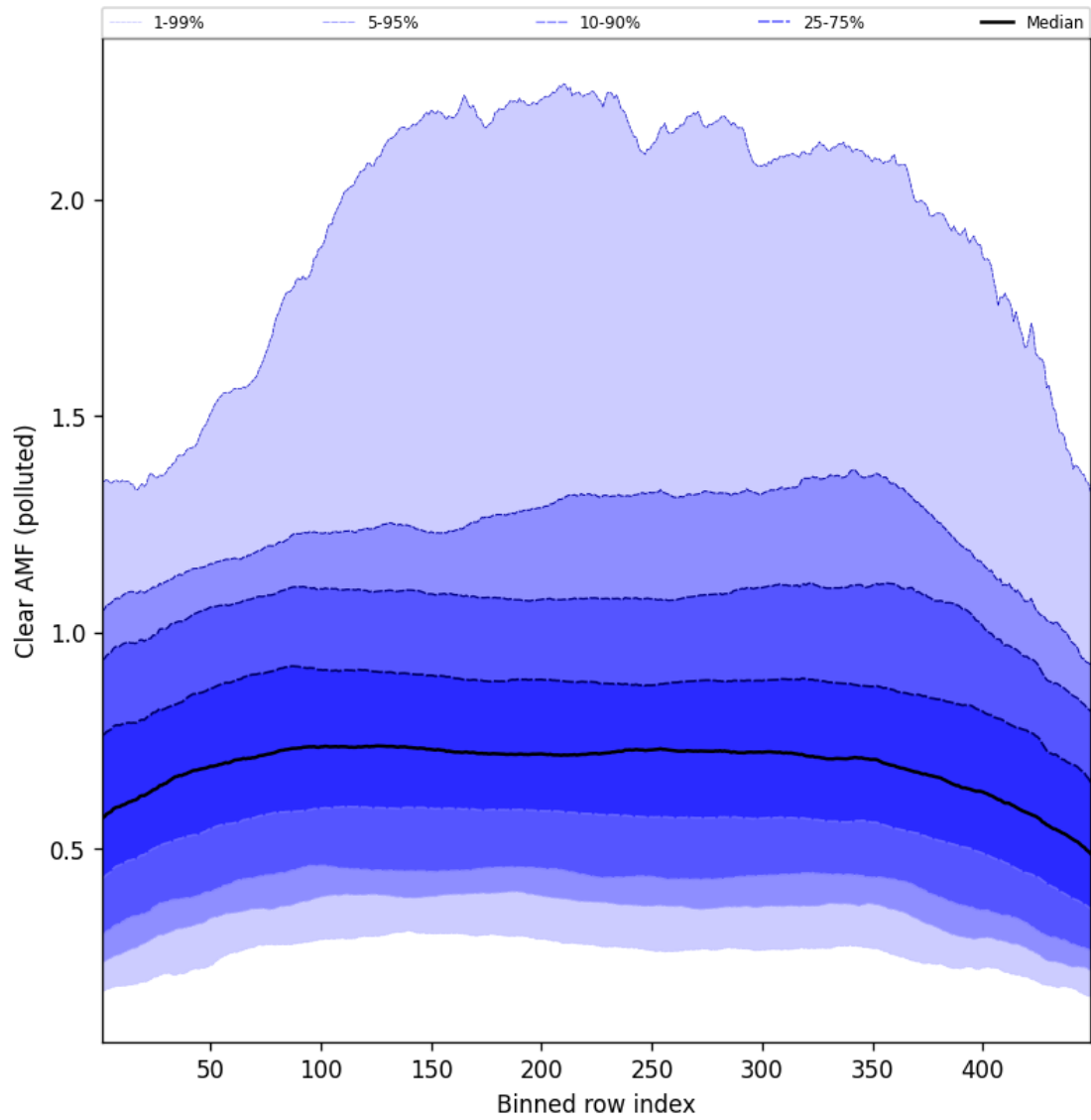


Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-07-30 to 2025-07-31

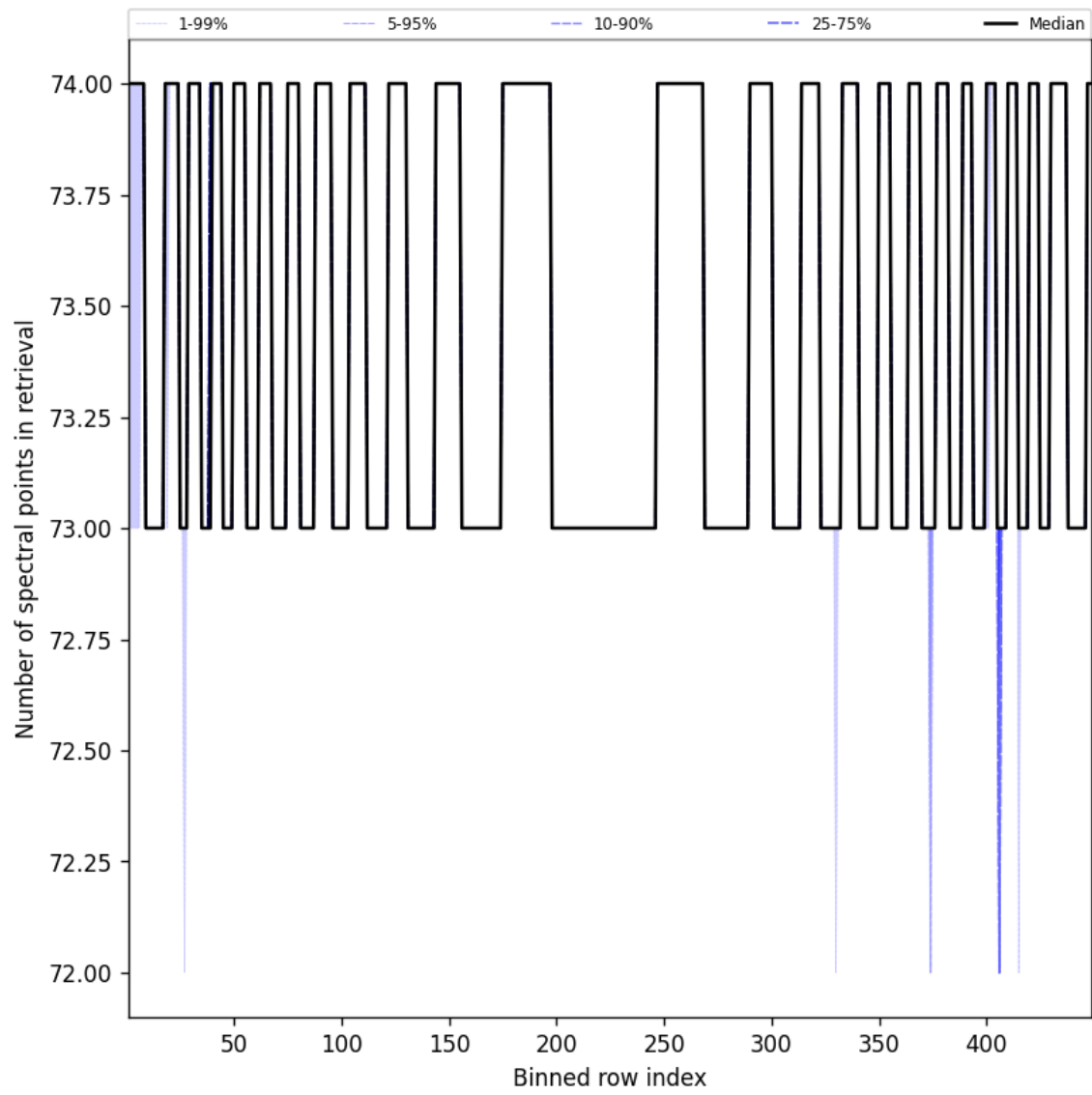


Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-07-30 to 2025-07-31

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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