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:

$$\overline{x} = \frac{1}{N}\sum_{i=1}^{N} x_i \tag{1}$$

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 $\sigma(x) = \sqrt{V(x)}$.

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

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:

$$P(x \leq m) = P(x \geq m) = \int_{-\infty}^{m} f(x)\,\mathrm{d}x = \frac{1}{2} \tag{3}$$

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

The median is a special case of a percentile. Instead of ½ 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}.

$$C_{kl} = C(x_{(k)}, x_{(l)}) = \frac{1}{N-1}\sum_{i=1}^{N}(x_{(k),i} - \overline{x_{(k)}})(x_{(l),i} - \overline{x_{(l)}}) \tag{4}$$

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

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

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]	0.635 ± 0.405	17398061	0.995	0.780	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.532 \pm 87.625) \times 10^{-2}$	17398061	0.249	0.435	9.926×10^{-3}	-90.2	231
sulfurdioxide total vertical column precision [DU]	0.478 ± 0.609	17398061	0.222	0.323	0.322	4.235×10^{-2}	168
sulfurdioxide slant column density corrected [DU]	$(1.805 \pm 37.794) \times 10^{-2}$	17398061	0.258	0.373	9.259×10^{-3}	-17.6	235
sulfurdioxide slant column density cobra [DU]	$(1.790 \pm 36.233) \times 10^{-2}$	17398061	0.258	0.373	9.259×10^{-3}	-20.5	49.6
sulfurdioxide slant column density cobra precision [DU]	0.297 ± 0.131	17398061	0.213	0.130	0.259	9.037×10^{-2}	37.9
sulfurdioxide slant column density window1 [DU]	0.110 ± 0.680	17398061	0.125	0.745	0.114	-107	110
sulfurdioxide slant column density window1 precision [DU]	0.297 ± 0.131	17398061	0.213	0.130	0.259	9.037×10^{-2}	37.9
sulfurdioxide slant column density corrected win1 [DU]	$(3.230 \pm 67.079) \times 10^{-2}$	17398061	2.500×10^{-2}	0.731	1.559×10^{-2}	-107	110
background so2 slant column offset window1 [DU]	$(-7.800 \pm 13.749) \times 10^{-2}$	17398061	-0.140	0.166	-0.105	-0.917	2.07
sulfurdioxide slant column density window2 [DU]	0.958 ± 9.034	17398061	0.750	11.2	0.885	-1.736×10^{3}	3.153×10^{3}
sulfurdioxide slant column density window2 precision [DU]	8.13 ± 2.45	17398061	7.43	2.69	7.76	2.20	964
sulfurdioxide slant column density corrected win2 [DU]	-0.204 ± 8.914	17398061	-0.250	11.0	-0.200	-1.739×10^{3}	3.152×10^{3}
background so2 slant column offset window2 [DU]	-1.16 ± 1.77	17398061	0.250	2.54	-0.841	-10.00	5.50
sulfurdioxide slant column density window3 [DU]	-2.52 ± 23.82	17398061	-2.80	29.2	-2.59	-1.619×10^{3}	485
sulfurdioxide slant column density window3 precision [DU]	28.3 ± 13.8	17398061	21.5	10.6	24.6	9.56	229
sulfurdioxide slant column density corrected win3 [DU]	6.17 ± 23.41	17398061	7.28	28.7	6.35	-1.613×10^{3}	489
background so2 slant column offset window3 [DU]	8.68 ± 4.76	17398061	12.9	7.88	9.08	-9.62	26.4
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17398061	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.195 \pm 6.953) \times 10^{-2}$	17398061	1.800×10^{-2}	2.334×10^{-2}	1.476×10^{-2}	2.951×10^{-4}	2.73
fitted radiance shift [nm]	$(-7.702 \pm 263.308) \times 10^{-5}$	17398061	1.000×10^{-4}	1.707×10^{-3}	-7.539×10^{-5}	-6.395×10^{-2}	4.311×10^{-2}
fitted radiance squeeze [1]	$(-4.719 \pm 18.826) \times 10^{-5}$	17398061	-3.000×10^{-5}	2.174×10^{-4}	-4.223×10^{-5}	-1.424×10^{-2}	2.345×10^{-2}
fitted root mean square [1]	$(1.293 \pm 0.521) \times 10^{-3}$	17398061	1.025×10^{-3}	5.207×10^{-4}	1.150×10^{-3}	3.230×10^{-4}	8.794×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.936 ± 0.512	17398061	0.660	0.627	0.821	5.000×10^{-2}	2.85
sulfurdioxide total air mass factor polluted precision [1]	0.118 ± 0.133	17398061	3.500×10^{-2}	0.114	7.416×10^{-2}	2.500×10^{-3}	2.07
sulfurdioxide clear air mass factor polluted [1]	0.784 ± 0.377	17398061	0.620	0.394	0.701	4.020×10^{-2}	2.73
number of spectral points in retrieval [1]	73.4 ± 0.5	17398061	73.0	1.000	73.0	52.0	156

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	3.000×10^{-2}	0.1000	0.220	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.02	−0.819	−0.512	−0.347	−0.205	0.231	0.383	0.564	0.905	2.29
sulfurdioxide total vertical column precision [DU]	9.306×10^{-2}	0.123	0.148	0.174	0.212	0.535	0.695	0.872	1.27	2.94
sulfurdioxide slant column density corrected [DU]	−0.861	−0.498	−0.362	−0.271	−0.175	0.197	0.298	0.397	0.552	1.02
sulfurdioxide slant column density cobra [DU]	−0.861	−0.498	−0.362	−0.271	−0.175	0.197	0.298	0.397	0.552	1.02
sulfurdioxide slant column density cobra precision [DU]	0.146	0.173	0.187	0.199	0.214	0.344	0.398	0.451	0.547	0.765
sulfurdioxide slant column density window1 [DU]	−1.67	−0.939	−0.653	−0.462	−0.262	0.483	0.677	0.862	1.14	1.90
sulfurdioxide slant column density window1 precision [DU]	0.146	0.173	0.187	0.199	0.214	0.344	0.398	0.451	0.547	0.765
sulfurdioxide slant column density corrected win1 [DU]	−1.63	−0.963	−0.705	−0.530	−0.344	0.386	0.586	0.780	1.08	1.90
background so2 slant column offset window1 [DU]	−0.318	−0.240	−0.212	−0.195	−0.172	-6.297×10^{-3}	5.026×10^{-2}	0.103	0.177	0.334
sulfurdioxide slant column density window2 [DU]	−20.3	−13.3	−9.99	−7.49	−4.71	6.52	9.36	11.9	15.5	23.2
sulfurdioxide slant column density window2 precision [DU]	4.27	5.11	5.63	6.06	6.58	9.27	10.2	11.1	12.4	15.2
sulfurdioxide slant column density corrected win2 [DU]	−21.6	−14.4	−11.0	−8.51	−5.73	5.31	8.07	10.6	14.0	21.4
background so2 slant column offset window2 [DU]	−5.63	−4.37	−3.68	−3.07	−2.35	0.198	0.487	0.696	0.996	2.32
sulfurdioxide slant column density window3 [DU]	−62.8	−41.3	−31.5	−24.5	−17.1	12.1	19.8	26.9	36.6	56.4
sulfurdioxide slant column density window3 precision [DU]	13.4	15.7	17.6	19.0	20.7	31.2	35.9	41.7	53.9	87.5
sulfurdioxide slant column density corrected win3 [DU]	−53.6	−32.4	−22.5	−15.6	−8.05	20.7	28.0	34.8	44.1	63.6
background so2 slant column offset window3 [DU]	−1.51	1.18	2.48	3.47	4.76	12.6	13.6	14.4	15.5	18.3
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]	5.612×10^{-4}	7.965×10^{-4}	1.193×10^{-3}	2.445×10^{-3}	6.332×10^{-3}	2.967×10^{-2}	4.581×10^{-2}	7.221×10^{-2}	0.117	0.302
fitted radiance shift [nm]	-8.194×10^{-3}	-3.909×10^{-3}	-2.435×10^{-3}	-1.620×10^{-3}	-9.559×10^{-4}	7.511×10^{-4}	1.416×10^{-3}	2.282×10^{-3}	3.837×10^{-3}	8.306×10^{-3}
fitted radiance squeeze [1]	-5.429×10^{-4}	-3.507×10^{-4}	-2.693×10^{-4}	-2.131×10^{-4}	-1.535×10^{-4}	6.391×10^{-5}	1.176×10^{-4}	1.675×10^{-4}	2.393×10^{-4}	4.131×10^{-4}
fitted root mean square [1]	6.049×10^{-4}	7.430×10^{-4}	8.264×10^{-4}	8.893×10^{-4}	9.629×10^{-4}	1.484×10^{-3}	1.723×10^{-3}	1.955×10^{-3}	2.288×10^{-3}	3.151×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.101	0.278	0.382	0.471	0.577	1.20	1.48	1.73	2.00	2.32
sulfurdioxide total air mass factor polluted precision [1]	1.125×10^{-2}	2.011×10^{-2}	2.636×10^{-2}	3.105×10^{-2}	3.805×10^{-2}	0.152	0.197	0.248	0.342	0.689
sulfurdioxide clear air mass factor polluted [1]	0.248	0.337	0.399	0.457	0.535	0.929	1.08	1.27	1.60	2.09
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]	0.580 ± 0.414	12125101	0.840	0.490	0.0	1.000	0.160	1.000
sulfurdioxide total vertical column [DU]	$(1.919 \pm 79.425) \times 10^{-2}$	12125101	0.396	8.176×10^{-3}	-66.7	95.5	-0.188	0.209
sulfurdioxide total vertical column precision [DU]	0.440 ± 0.583	12125101	0.278	0.292	4.235×10^{-2}	36.1	0.194	0.471
sulfurdioxide slant column density corrected [DU]	$(1.564 \pm 33.791) \times 10^{-2}$	12125101	0.352	7.871×10^{-3}	-7.97	42.6	-0.167	0.185
sulfurdioxide slant column density cobra [DU]	$(1.559 \pm 33.508) \times 10^{-2}$	12125101	0.352	7.871×10^{-3}	-7.97	22.2	-0.167	0.185
sulfurdioxide slant column density cobra precision [DU]	0.278 ± 0.117	12125101	0.108	0.244	9.037×10^{-2}	22.6	0.206	0.314
sulfurdioxide slant column density window1 [DU]	$(9.748 \pm 63.847) \times 10^{-2}$	12125101	0.711	0.105	-11.3	74.0	-0.255	0.456
sulfurdioxide slant column density window1 precision [DU]	0.278 ± 0.117	12125101	0.108	0.244	9.037×10^{-2}	22.6	0.206	0.314
sulfurdioxide slant column density corrected win1 [DU]	$(2.669 \pm 62.477) \times 10^{-2}$	12125101	0.692	1.212×10^{-2}	-11.4	73.8	-0.329	0.362
background so2 slant column offset window1 [DU]	$(-7.079 \pm 14.876) \times 10^{-2}$	12125101	0.199	-9.752×10^{-2}	-0.916	1.33	-0.181	1.723×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.877 ± 8.274	12125101	10.6	0.864	-195	334	-4.45	6.18
sulfurdioxide slant column density window2 precision [DU]	7.63 ± 2.06	12125101	2.30	7.33	2.20	195	6.28	8.58
sulfurdioxide slant column density corrected win2 [DU]	-0.254 ± 8.143	12125101	10.4	-0.225	-197	332	-5.45	4.96
background so2 slant column offset window2 [DU]	-1.13 ± 1.79	12125101	2.71	-0.887	-8.95	5.50	-2.39	0.317
sulfurdioxide slant column density window3 [DU]	-2.40 ± 22.01	12125101	27.2	-2.69	-194	214	-16.1	11.1
sulfurdioxide slant column density window3 precision [DU]	26.5 ± 13.5	12125101	8.34	22.9	9.56	229	19.7	28.0
sulfurdioxide slant column density corrected win3 [DU]	6.42 ± 21.53	12125101	26.6	6.54	-180	217	-6.81	19.8
background so2 slant column offset window3 [DU]	8.83 ± 4.92	12125101	8.52	10.1	-9.62	24.1	4.38	12.9
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.17	12125101	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.339 \pm 7.657) \times 10^{-2}$	12125101	2.733×10^{-2}	1.205×10^{-2}	2.951×10^{-4}	2.73	3.111×10^{-3}	3.044×10^{-2}
fitted radiance shift [nm]	$(6.090 \pm 264.164) \times 10^{-5}$	12125101	1.591×10^{-3}	4.389×10^{-5}	-4.121×10^{-2}	3.955×10^{-2}	-7.516×10^{-4}	8.398×10^{-4}
fitted radiance squeeze [1]	$(-7.404 \pm 17.582) \times 10^{-5}$	12125101	2.103×10^{-4}	-6.222×10^{-5}	-1.225×10^{-2}	1.289×10^{-2}	-1.725×10^{-4}	3.779×10^{-5}
fitted root mean square [1]	$(1.225 \pm 0.483) \times 10^{-3}$	12125101	4.454×10^{-4}	1.096×10^{-3}	3.230×10^{-4}	6.541×10^{-2}	9.289×10^{-4}	1.374×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.989 ± 0.560	12125101	0.764	0.857	5.000×10^{-2}	2.85	0.572	1.34
sulfurdioxide total air mass factor polluted precision [1]	0.133 ± 0.150	12125101	0.130	8.689×10^{-2}	2.831×10^{-3}	2.07	4.052×10^{-2}	0.171
sulfurdioxide clear air mass factor polluted [1]	0.808 ± 0.424	12125101	0.465	0.705	6.139×10^{-2}	2.73	0.509	0.974
number of spectral points in retrieval [1]	73.5 ± 0.5	12125101	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]	0.762 ± 0.355	5272960	0.560	1.000	0.0	1.000	0.440	1.000
sulfurdioxide total vertical column [DU]	$(3.940 \pm 104.043) \times 10^{-2}$	5272960	0.546	1.551×10^{-2}	-90.2	231	-0.253	0.293
sulfurdioxide total vertical column precision [DU]	0.566 ± 0.655	5272960	0.384	0.410	6.016×10^{-2}	168	0.266	0.650
sulfurdioxide slant column density corrected [DU]	$(2.359 \pm 45.683) \times 10^{-2}$	5272960	0.428	1.315×10^{-2}	-17.6	235	-0.199	0.229
sulfurdioxide slant column density cobra [DU]	$(2.322 \pm 41.827) \times 10^{-2}$	5272960	0.428	1.315×10^{-2}	-20.5	49.6	-0.199	0.229
sulfurdioxide slant column density cobra precision [DU]	0.341 ± 0.152	5272960	0.159	0.304	9.883×10^{-2}	37.9	0.241	0.400
sulfurdioxide slant column density window1 [DU]	0.140 ± 0.766	5272960	0.836	0.136	-107	110	-0.281	0.555
sulfurdioxide slant column density window1 precision [DU]	0.341 ± 0.152	5272960	0.159	0.304	9.883×10^{-2}	37.9	0.241	0.400
sulfurdioxide slant column density corrected win1 [DU]	$(4.520 \pm 76.605) \times 10^{-2}$	5272960	0.834	2.517×10^{-2}	-107	110	-0.385	0.449
background so2 slant column offset window1 [DU]	$(-9.457 \pm 10.532) \times 10^{-2}$	5272960	0.101	-0.112	-0.917	2.07	-0.150	-4.931×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.14 ± 10.58	5272960	12.8	0.942	-1.736×10^{3}	3.153×10^{3}	-5.40	7.45
sulfurdioxide slant column density window2 precision [DU]	9.28 ± 2.84	5272960	2.95	8.94	2.39	964	7.63	10.6
sulfurdioxide slant column density corrected win2 [DU]	$(-9.096 \pm 1047.381) \times 10^{-2}$	5272960	12.7	-0.129	-1.739×10^{3}	3.152×10^{3}	-6.48	6.24
background so2 slant column offset window2 [DU]	-1.23 ± 1.73	5272960	2.21	-0.782	-10.00	5.09	-2.22	-1.103×10^{-2}
sulfurdioxide slant column density window3 [DU]	-2.78 ± 27.53	5272960	34.8	-2.31	-1.619×10^{3}	485	-19.9	14.9
sulfurdioxide slant column density window3 precision [DU]	32.4 ± 13.5	5272960	10.6	29.3	10.2	227	24.9	35.4
sulfurdioxide slant column density corrected win3 [DU]	5.58 ± 27.24	5272960	34.4	5.80	-1.613×10^{3}	489	-11.5	23.0
background so2 slant column offset window3 [DU]	8.36 ± 4.35	5272960	6.00	7.43	-4.71	26.4	5.33	11.3
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.27	5272960	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.864 \pm 4.953) \times 10^{-2}$	5272960	1.631×10^{-2}	1.797×10^{-2}	2.306×10^{-3}	2.56	1.245×10^{-2}	2.876×10^{-2}
fitted radiance shift [nm]	$(-3.942 \pm 25.855) \times 10^{-4}$	5272960	1.843×10^{-3}	-4.009×10^{-4}	-6.395×10^{-2}	4.311×10^{-2}	-1.360×10^{-3}	4.826×10^{-4}
fitted radiance squeeze [1]	$(1.455 \pm 20.097) \times 10^{-5}$	5272960	2.289×10^{-4}	8.683×10^{-6}	-1.424×10^{-2}	2.345×10^{-2}	-1.035×10^{-4}	1.254×10^{-4}
fitted root mean square [1]	$(1.451 \pm 0.570) \times 10^{-3}$	5272960	6.379×10^{-4}	1.305×10^{-3}	3.802×10^{-4}	8.794×10^{-2}	1.068×10^{-3}	1.706×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.816 ± 0.351	5272960	0.426	0.759	5.000×10^{-2}	2.66	0.584	1.01
sulfurdioxide total air mass factor polluted precision [1]	$(8.435 \pm 7.257) \times 10^{-2}$	5272960	7.898×10^{-2}	5.611×10^{-2}	2.500×10^{-3}	1.21	3.457×10^{-2}	0.114
sulfurdioxide clear air mass factor polluted [1]	0.729 ± 0.226	5272960	0.287	0.695	4.020×10^{-2}	1.70	0.578	0.865
number of spectral points in retrieval [1]	73.4 ± 0.5	5272960	1.000	73.0	52.0	156	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]	0.644 ± 0.396	11266279	0.770	1.000	0.0	1.000	0.230	1.000
sulfurdioxide total vertical column [DU]	$(2.281 \pm 82.268) \times 10^{-2}$	11266279	0.437	9.369×10^{-3}	-66.7	95.5	-0.207	0.231
sulfurdioxide total vertical column precision [DU]	0.478 ± 0.586	11266279	0.320	0.317	5.072×10^{-2}	168	0.215	0.535
sulfurdioxide slant column density corrected [DU]	$(1.598 \pm 36.257) \times 10^{-2}$	11266279	0.373	8.598×10^{-3}	-14.0	85.1	-0.176	0.197
sulfurdioxide slant column density cobra [DU]	$(1.591 \pm 35.729) \times 10^{-2}$	11266279	0.373	8.598×10^{-3}	-15.9	44.7	-0.176	0.197
sulfurdioxide slant column density cobra precision [DU]	0.299 ± 0.132	11266279	0.145	0.259	9.037×10^{-2}	37.9	0.211	0.356
sulfurdioxide slant column density window1 [DU]	0.109 ± 0.684	11266279	0.752	0.118	-72.6	110	-0.263	0.489
sulfurdioxide slant column density window1 precision [DU]	0.299 ± 0.132	11266279	0.145	0.259	9.037×10^{-2}	37.9	0.211	0.356
sulfurdioxide slant column density corrected win1 [DU]	$(3.392 \pm 67.311) \times 10^{-2}$	11266279	0.737	1.855×10^{-2}	-72.6	110	-0.345	0.392
background so2 slant column offset window1 [DU]	$(-7.531 \pm 14.531) \times 10^{-2}$	11266279	0.175	-0.111	-0.917	2.07	-0.174	9.568×10^{-4}
sulfurdioxide slant column density window2 [DU]	0.993 ± 9.005	11266279	11.2	0.879	-1.736×10^{3}	3.153×10^{3}	-4.69	6.53
sulfurdioxide slant column density window2 precision [DU]	8.06 ± 2.33	11266279	2.65	7.70	2.20	964	6.55	9.20
sulfurdioxide slant column density corrected win2 [DU]	-0.180 ± 8.866	11266279	11.0	-0.181	-1.739×10^{3}	3.152×10^{3}	-5.69	5.32
background so2 slant column offset window2 [DU]	-1.17 ± 1.85	11266279	2.68	-0.732	-10.00	5.50	-2.45	0.236
sulfurdioxide slant column density window3 [DU]	$(-3.109 \pm 2363.015) \times 10^{-2}$	11266279	29.3	-0.363	-380	257	-14.7	14.5
sulfurdioxide slant column density window3 precision [DU]	27.0 ± 11.3	11266279	9.39	24.0	9.56	209	20.6	29.9
sulfurdioxide slant column density corrected win3 [DU]	8.36 ± 22.98	11266279	28.4	8.21	-367	264	-5.87	22.6
background so2 slant column offset window3 [DU]	8.40 ± 4.80	11266279	7.90	8.24	-9.62	26.4	4.53	12.4
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	11266279	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.240 \pm 4.454) \times 10^{-2}$	11266279	1.654×10^{-2}	1.357×10^{-2}	2.951×10^{-4}	2.64	6.906×10^{-3}	2.345×10^{-2}
fitted radiance shift [nm]	$(-1.040 \pm 22.050) \times 10^{-4}$	11266279	1.610×10^{-3}	-8.137×10^{-5}	-6.395×10^{-2}	3.939×10^{-2}	-9.267×10^{-4}	6.833×10^{-4}
fitted radiance squeeze [1]	$(-3.909 \pm 18.935) \times 10^{-5}$	11266279	2.172×10^{-4}	-3.302×10^{-5}	-1.422×10^{-2}	1.896×10^{-2}	-1.448×10^{-4}	7.235×10^{-5}
fitted root mean square [1]	$(1.306 \pm 0.531) \times 10^{-3}$	11266279	5.881×10^{-4}	1.151×10^{-3}	3.230×10^{-4}	8.794×10^{-2}	9.528×10^{-4}	1.541×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.926 ± 0.486	11266279	0.585	0.832	5.000×10^{-2}	2.60	0.594	1.18
sulfurdioxide total air mass factor polluted precision [1]	0.111 ± 0.136	11266279	9.439×10^{-2}	6.756×10^{-2}	4.484×10^{-3}	2.07	3.897×10^{-2}	0.133
sulfurdioxide clear air mass factor polluted [1]	0.805 ± 0.385	11266279	0.384	0.724	8.536×10^{-2}	2.66	0.559	0.943
number of spectral points in retrieval [1]	73.4 ± 0.5	11266279	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]	0.659 ± 0.415	4256502	0.800	1.000	0.0	1.000	0.200	1.000
sulfurdioxide total vertical column [DU]	$(3.019 \pm 94.469) \times 10^{-2}$	4256502	0.427	1.073×10^{-2}	-90.2	189	-0.199	0.228
sulfurdioxide total vertical column precision [DU]	0.458 ± 0.602	4256502	0.312	0.332	4.235×10^{-2}	79.3	0.206	0.519
sulfurdioxide slant column density corrected [DU]	$(2.063 \pm 38.770) \times 10^{-2}$	4256502	0.364	1.025×10^{-2}	-17.6	173	-0.170	0.194
sulfurdioxide slant column density cobra [DU]	$(2.038 \pm 36.451) \times 10^{-2}$	4256502	0.364	1.025×10^{-2}	-17.6	49.6	-0.170	0.194
sulfurdioxide slant column density cobra precision [DU]	0.288 ± 0.128	4256502	0.100	0.253	9.123×10^{-2}	32.9	0.214	0.315
sulfurdioxide slant column density window1 [DU]	0.129 ± 0.658	4256502	0.718	0.122	-107	81.6	-0.236	0.482
sulfurdioxide slant column density window1 precision [DU]	0.288 ± 0.128	4256502	0.100	0.253	9.123×10^{-2}	32.9	0.214	0.315
sulfurdioxide slant column density corrected win1 [DU]	$(2.916 \pm 65.205) \times 10^{-2}$	4256502	0.706	1.172×10^{-2}	-107	81.5	-0.336	0.370
background so2 slant column offset window1 [DU]	-0.100 ± 0.119	4256502	0.144	-0.116	-0.917	0.893	-0.181	-3.715×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.722 ± 9.168	4256502	11.4	0.725	-1.105×10^{3}	968	-4.98	6.39
sulfurdioxide slant column density window2 precision [DU]	8.37 ± 2.72	4256502	2.77	7.95	2.41	521	6.72	9.50
sulfurdioxide slant column density corrected win2 [DU]	-0.163 ± 9.076	4256502	11.2	-0.148	-1.108×10^{3}	967	-5.76	5.42
background so2 slant column offset window2 [DU]	-0.885 ± 1.590	4256502	2.15	-0.602	-10.00	5.50	-1.88	0.268
sulfurdioxide slant column density window3 [DU]	-7.31 ± 23.98	4256502	29.2	-6.80	-1.619×10^{3}	485	-21.6	7.58
sulfurdioxide slant column density window3 precision [DU]	31.7 ± 17.8	4256502	13.5	26.6	9.57	229	21.6	35.1
sulfurdioxide slant column density corrected win3 [DU]	1.09 ± 24.13	4256502	29.6	1.85	-1.613×10^{3}	489	-13.3	16.2
background so2 slant column offset window3 [DU]	8.40 ± 4.69	4256502	7.74	8.81	-9.62	26.4	4.58	12.3
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.14	4256502	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.287 \pm 9.875) \times 10^{-2}$	4256502	5.071×10^{-2}	2.248×10^{-2}	3.435×10^{-4}	2.71	7.481×10^{-3}	5.819×10^{-2}
fitted radiance shift [nm]	$(-3.660 \pm 342.384) \times 10^{-5}$	4256502	1.891×10^{-3}	-8.204×10^{-5}	-6.242×10^{-2}	4.311×10^{-2}	-1.019×10^{-3}	8.718×10^{-4}
fitted radiance squeeze [1]	$(-4.959 \pm 18.307) \times 10^{-5}$	4256502	2.118×10^{-4}	-4.769×10^{-5}	-1.381×10^{-2}	2.345×10^{-2}	-1.543×10^{-4}	5.744×10^{-5}
fitted root mean square [1]	$(1.244 \pm 0.478) \times 10^{-3}$	4256502	4.027×10^{-4}	1.130×10^{-3}	3.519×10^{-4}	6.541×10^{-2}	9.688×10^{-4}	1.371×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.942 ± 0.547	4256502	0.649	0.772	5.000×10^{-2}	2.85	0.556	1.20
sulfurdioxide total air mass factor polluted precision [1]	0.128 ± 0.128	4256502	0.147	8.821×10^{-2}	2.500×10^{-3}	1.82	3.431×10^{-2}	0.181
sulfurdioxide clear air mass factor polluted [1]	0.749 ± 0.358	4256502	0.356	0.661	4.020×10^{-2}	2.73	0.517	0.873
number of spectral points in retrieval [1]	73.4 ± 0.5	4256502	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

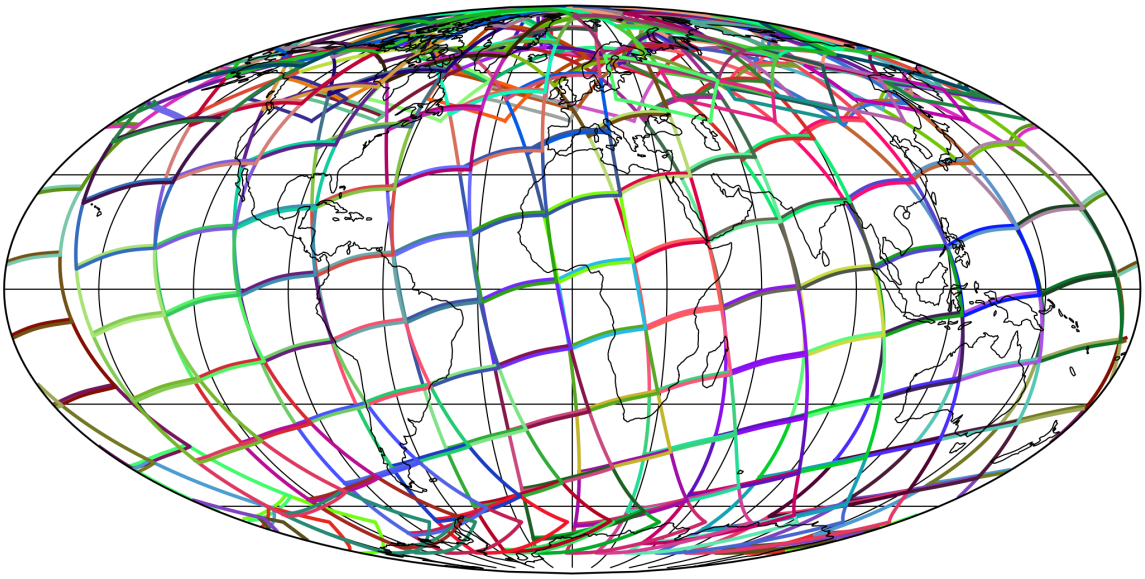


Figure 1: Outline of the granules.

4 Input data monitoring

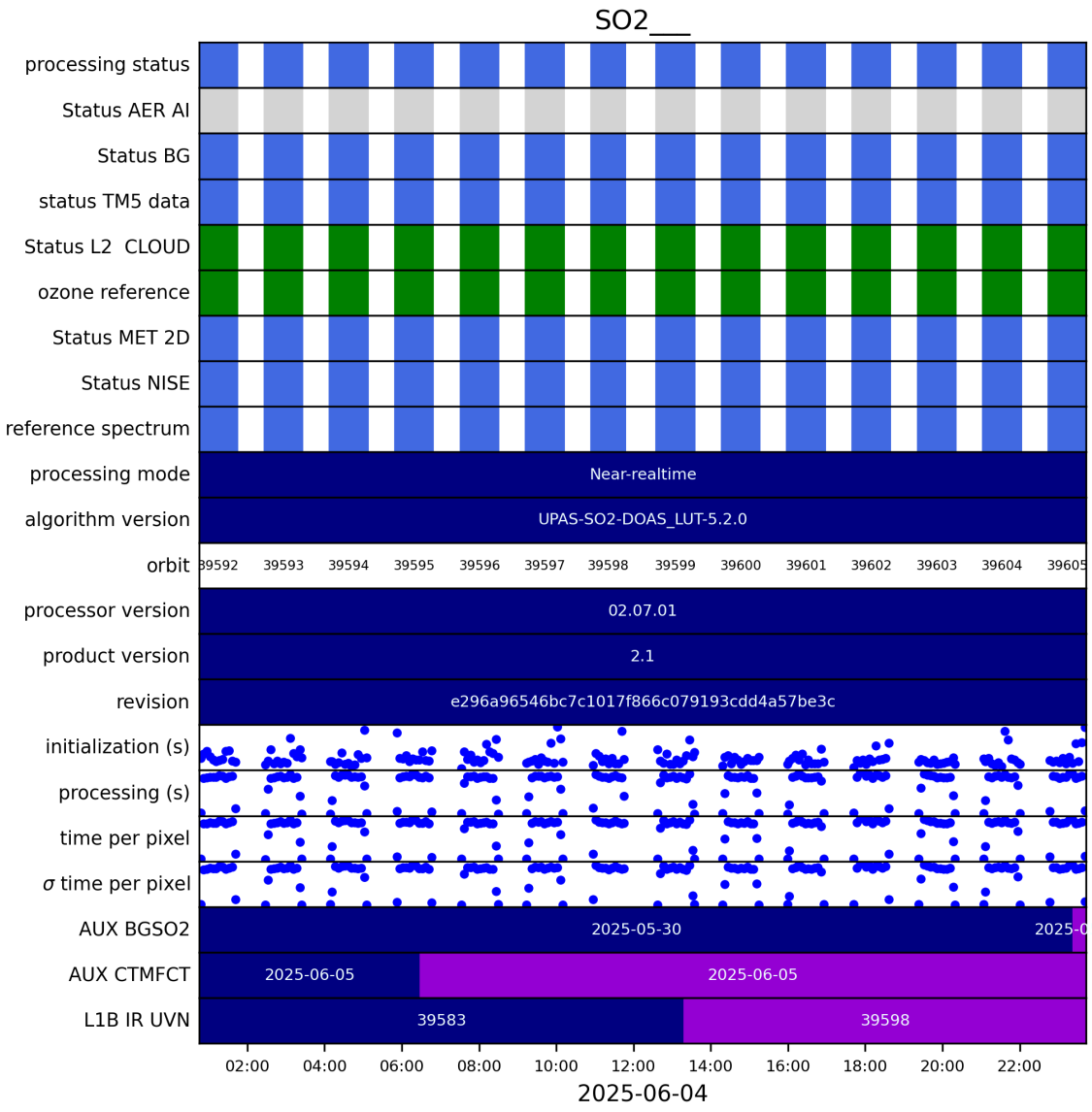


Figure 2: Input data per granule

5 Warnings and errors

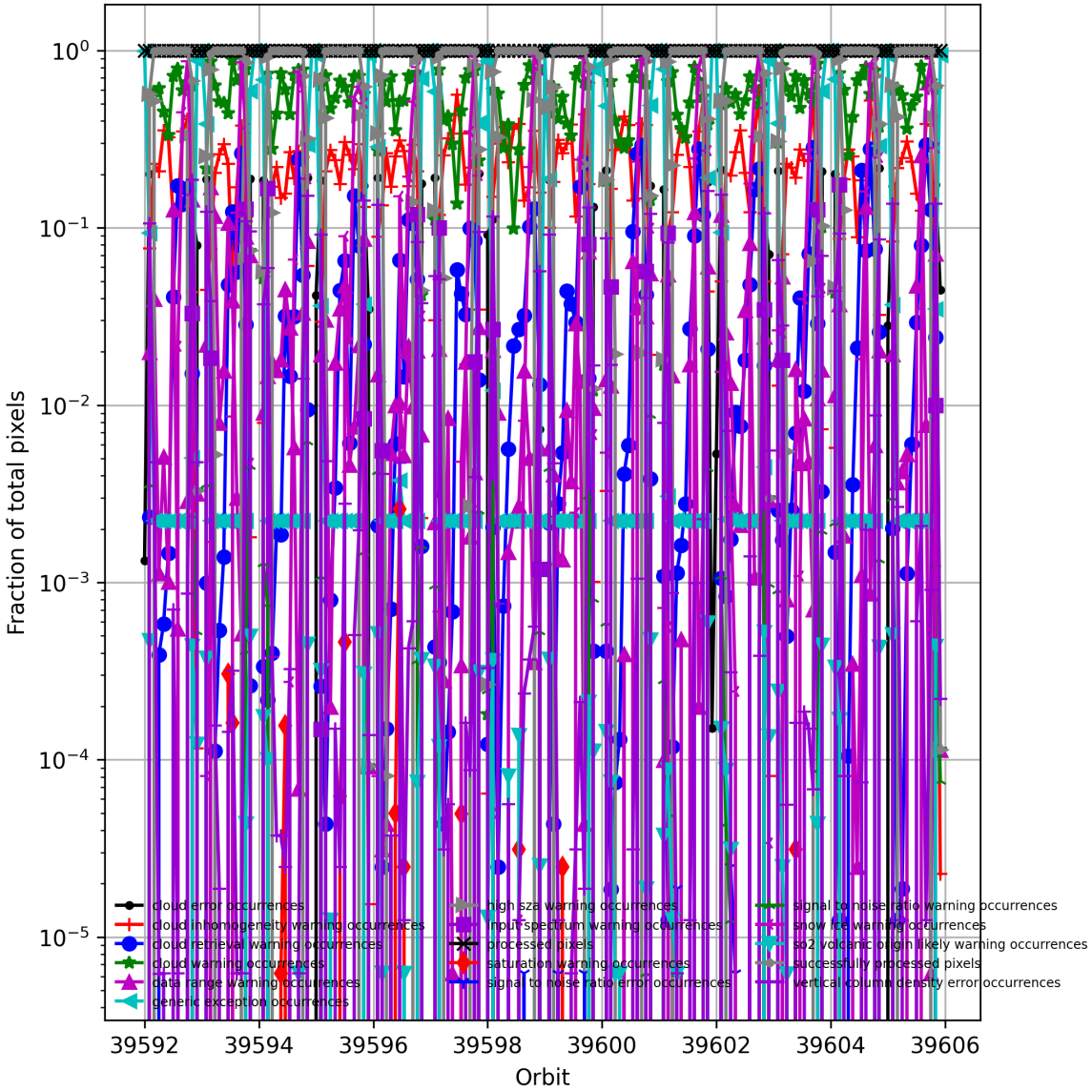


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

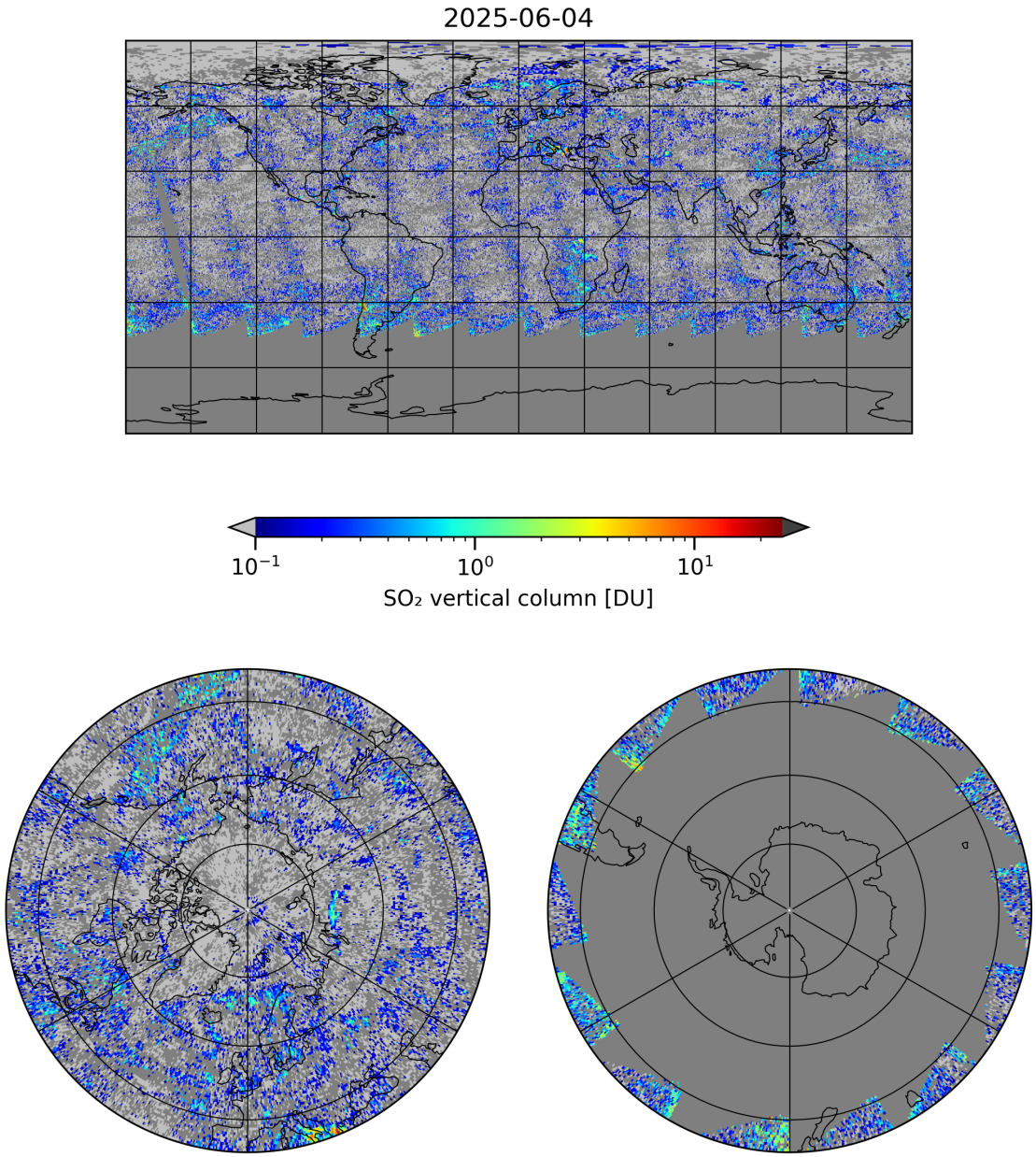


Figure 4: Map of "SO_2 vertical column" for 2025-06-04 to 2025-06-04

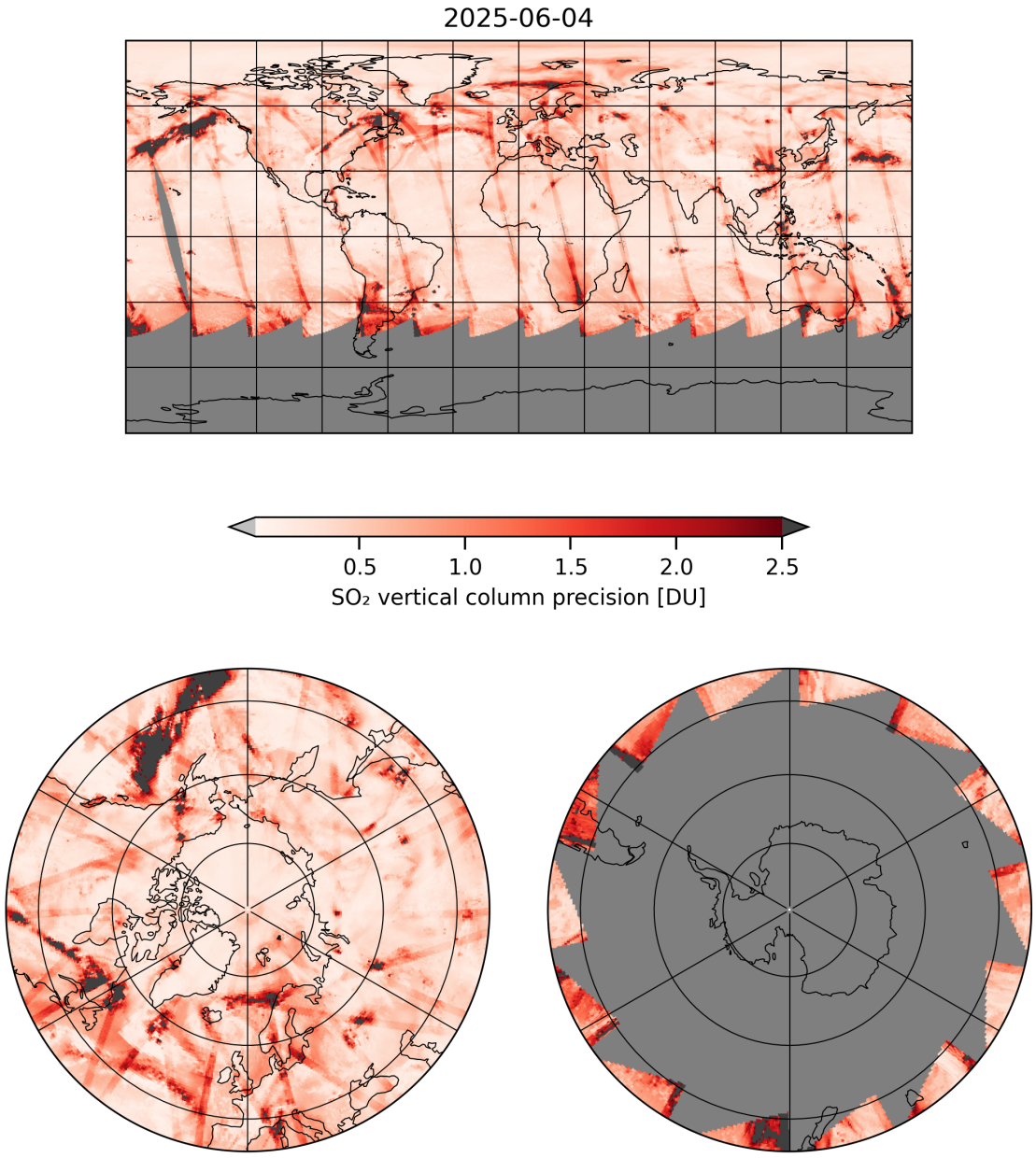


Figure 5: Map of "SO_2 vertical column precision" for 2025-06-04 to 2025-06-04

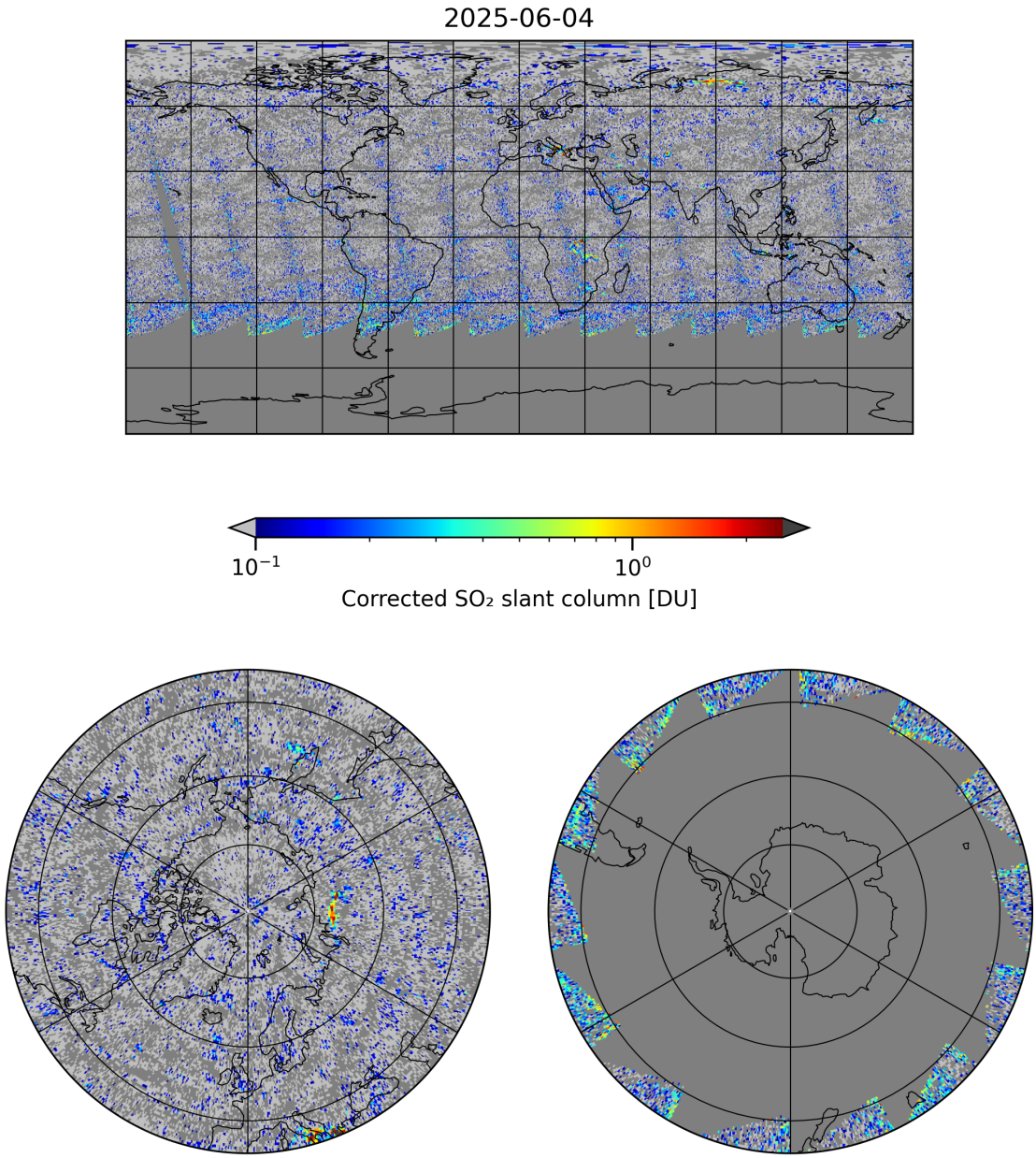


Figure 6: Map of “Corrected SO_2 slant column” for 2025-06-04 to 2025-06-04

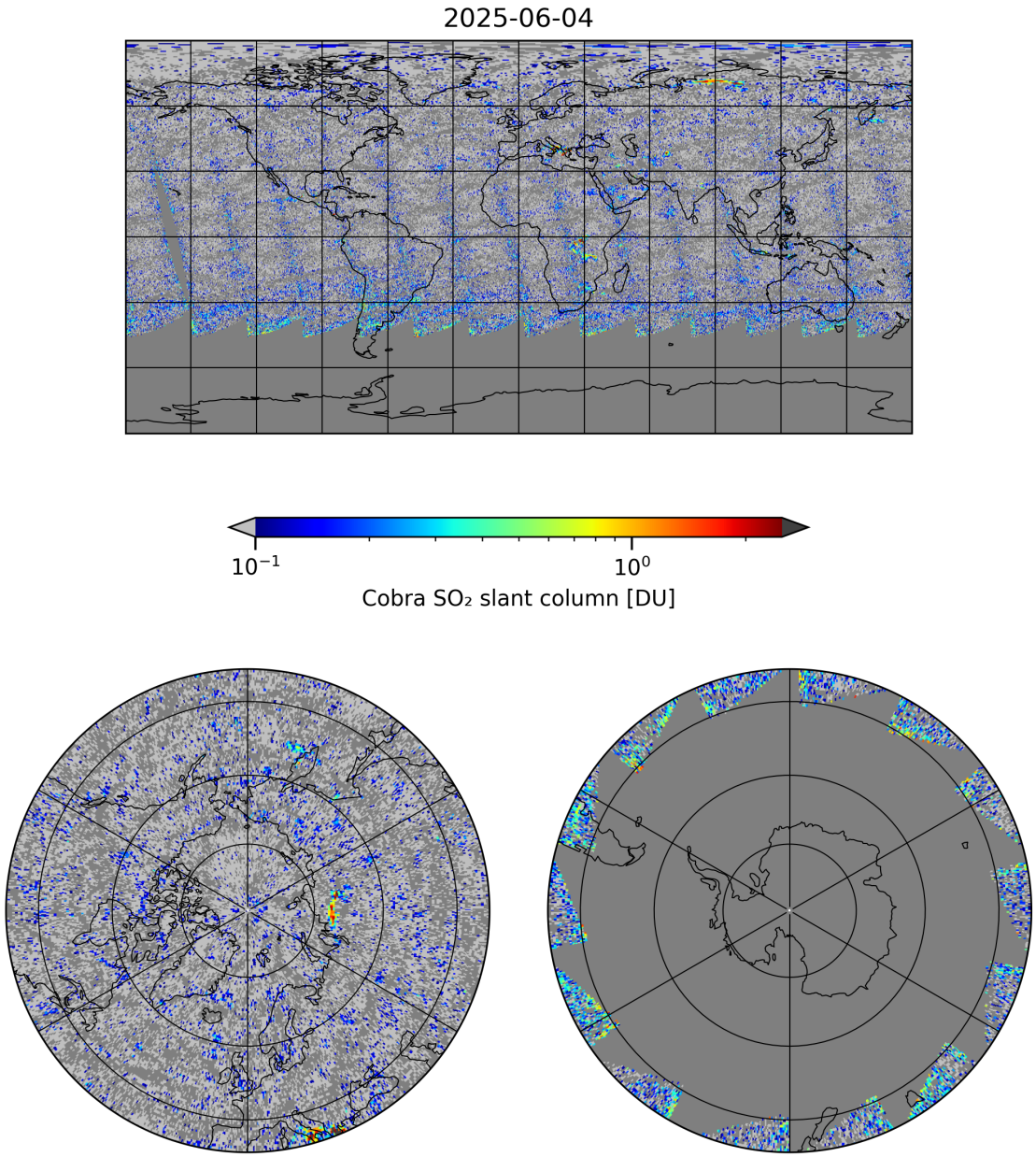


Figure 7: Map of “Cobra SO_2 slant column” for 2025-06-04 to 2025-06-04

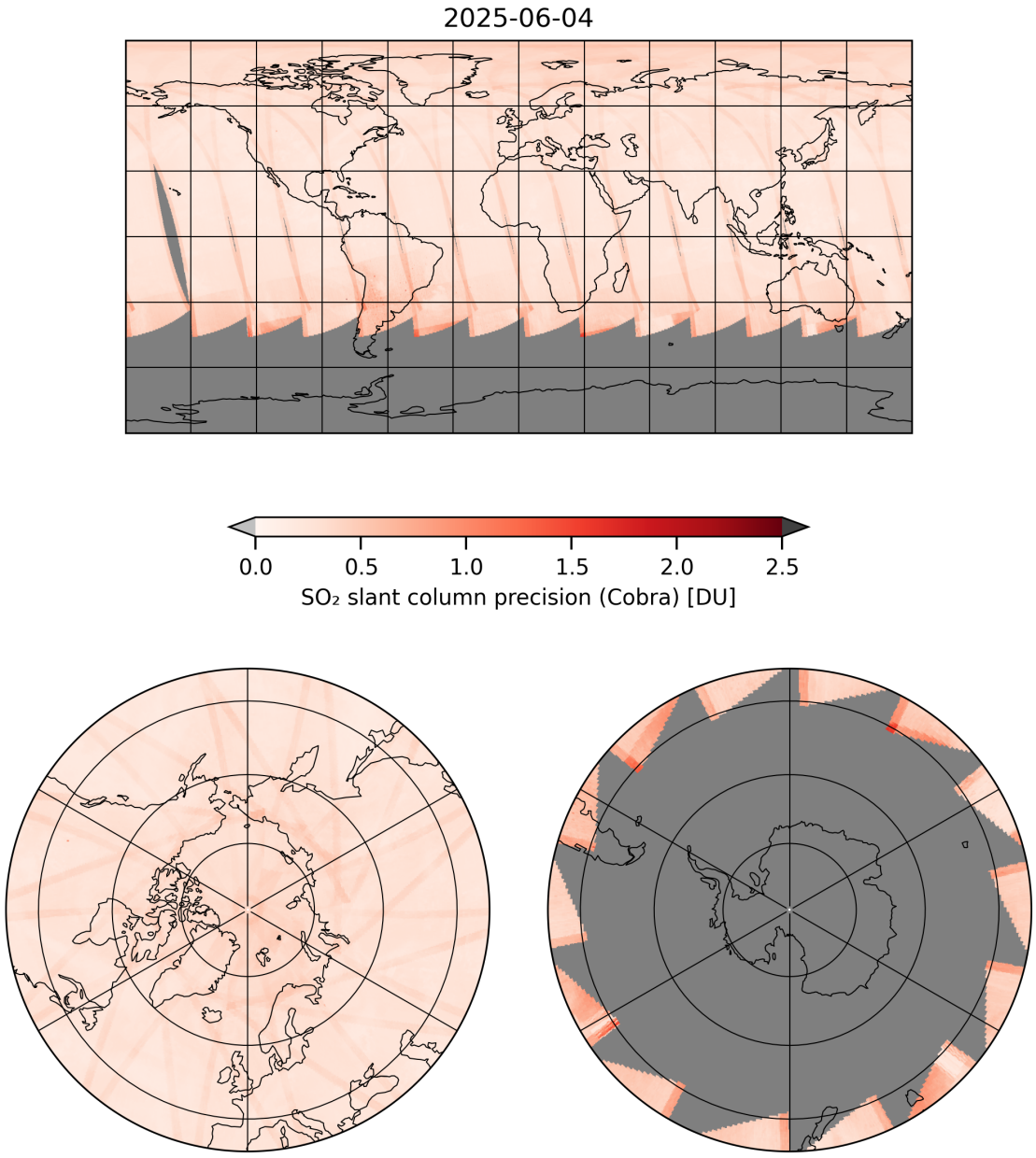


Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-06-04 to 2025-06-04

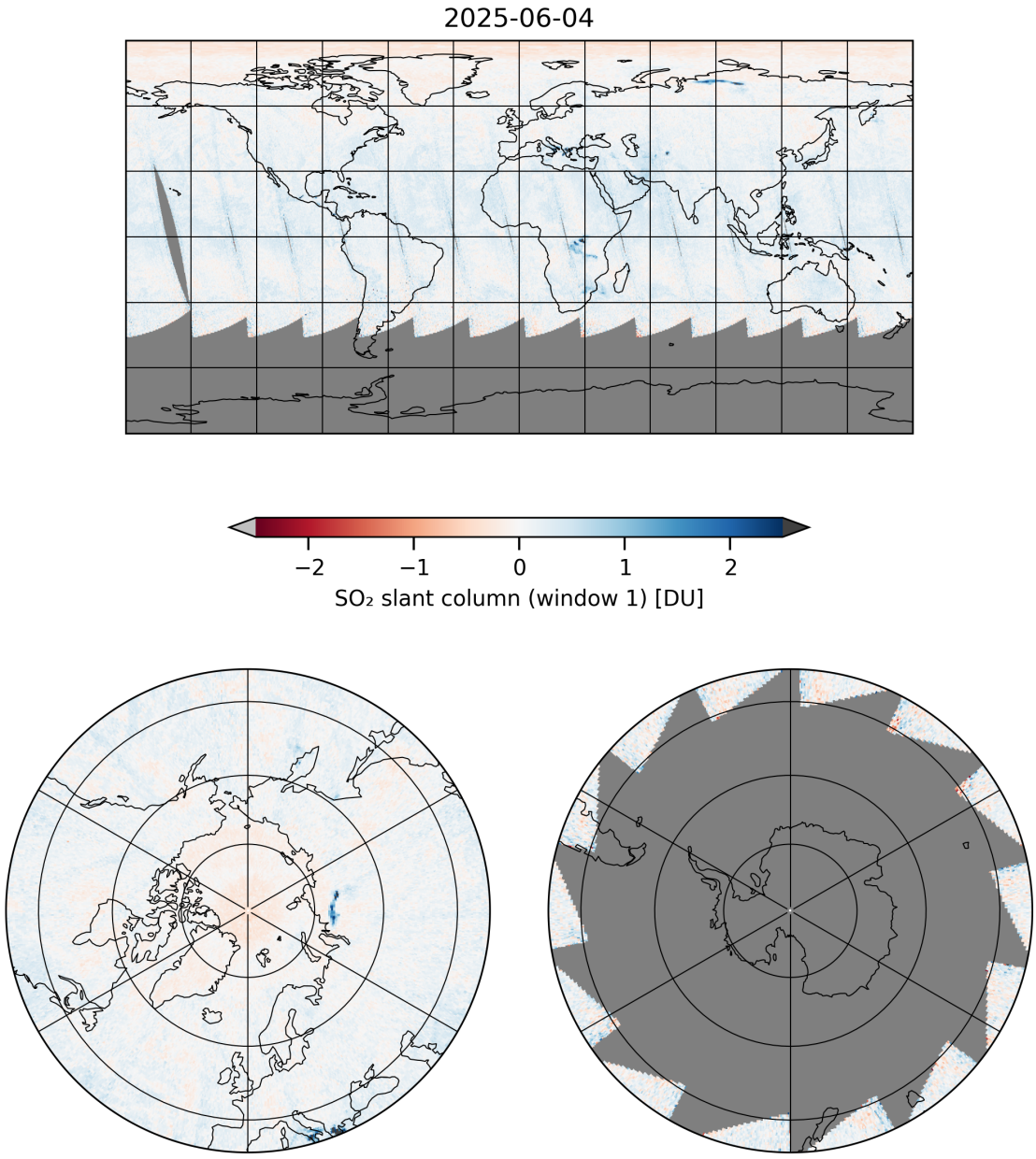


Figure 9: Map of "SO_2 slant column (window 1)" for 2025-06-04 to 2025-06-04

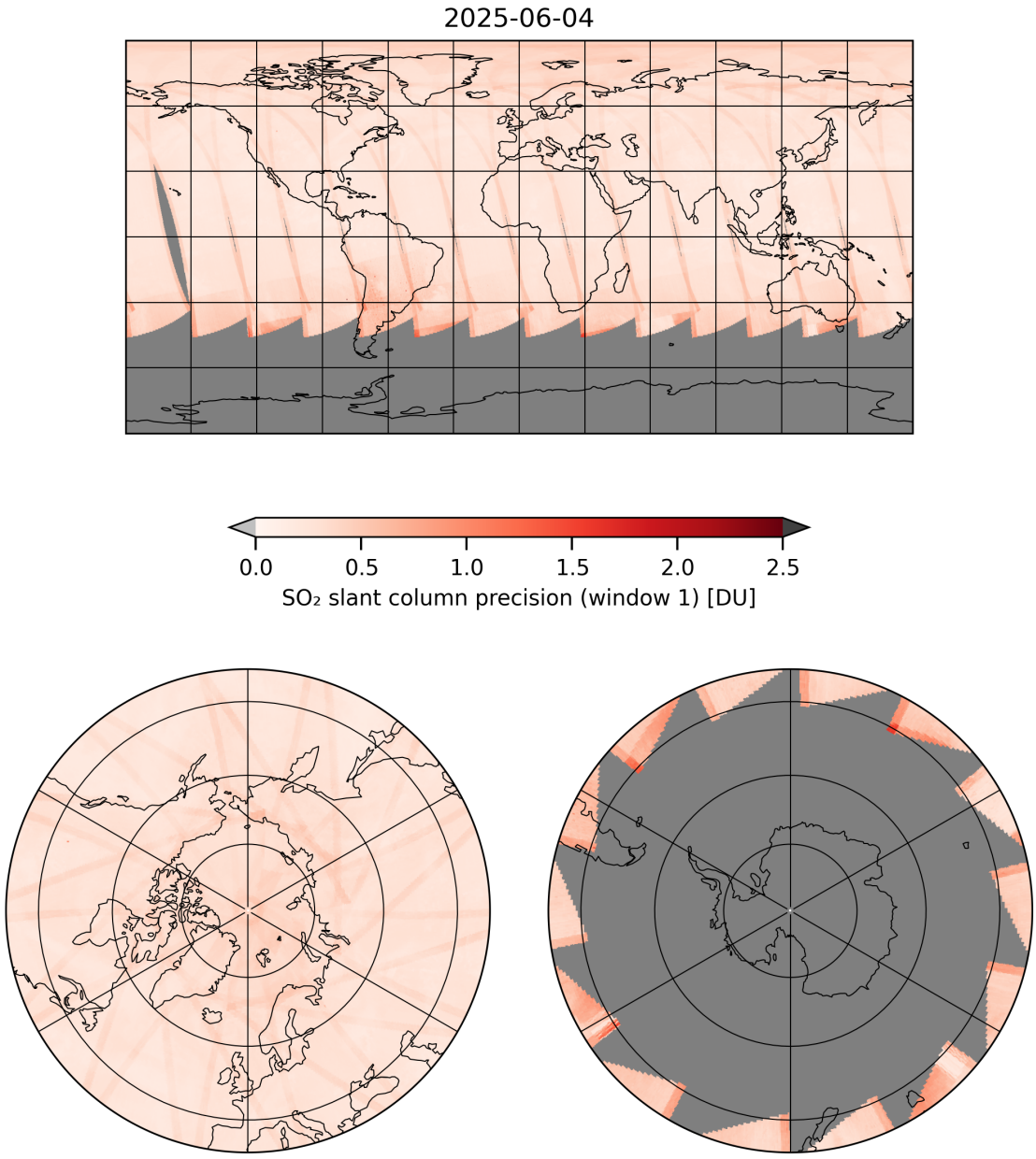


Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-06-04 to 2025-06-04

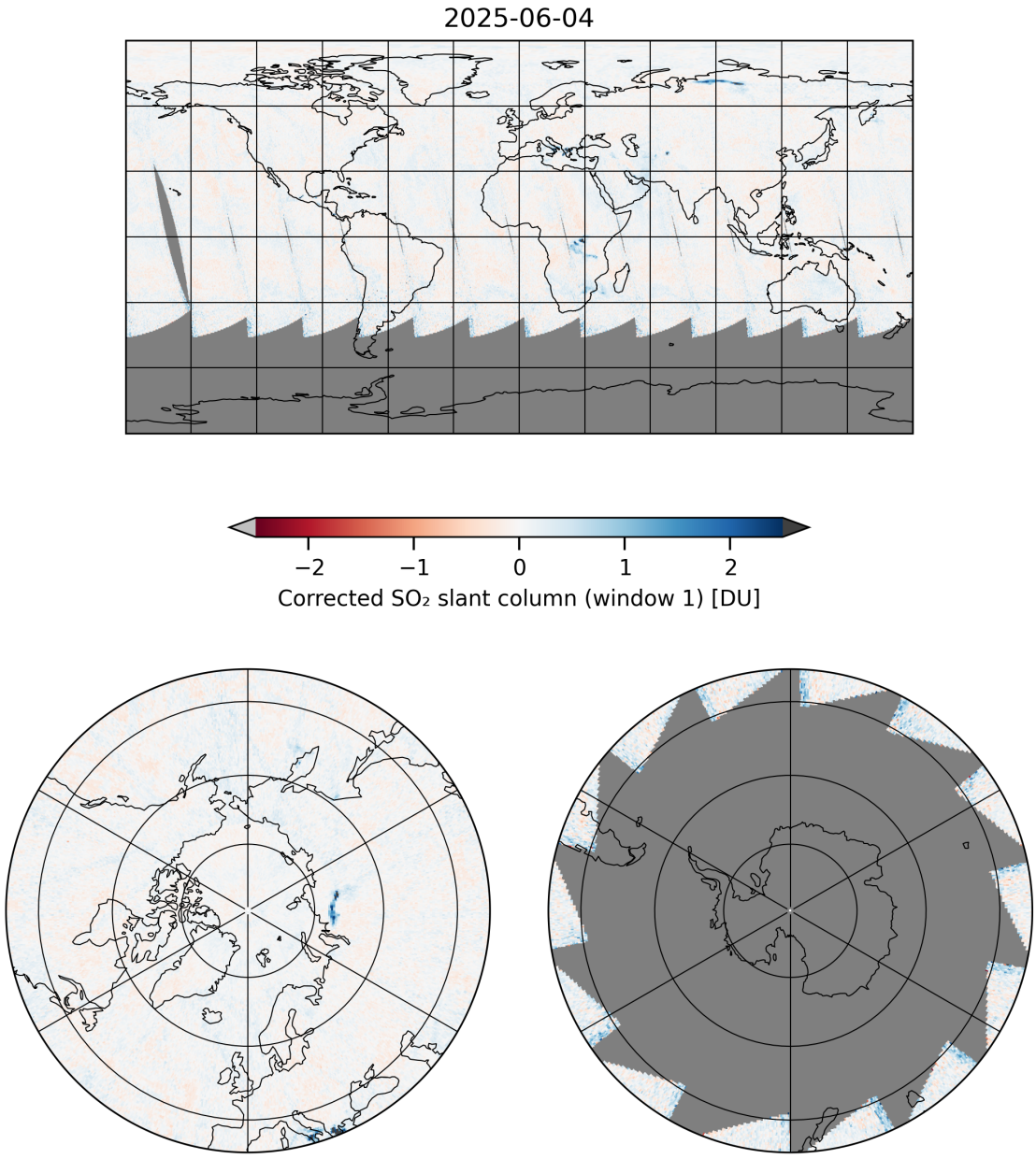


Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-06-04 to 2025-06-04

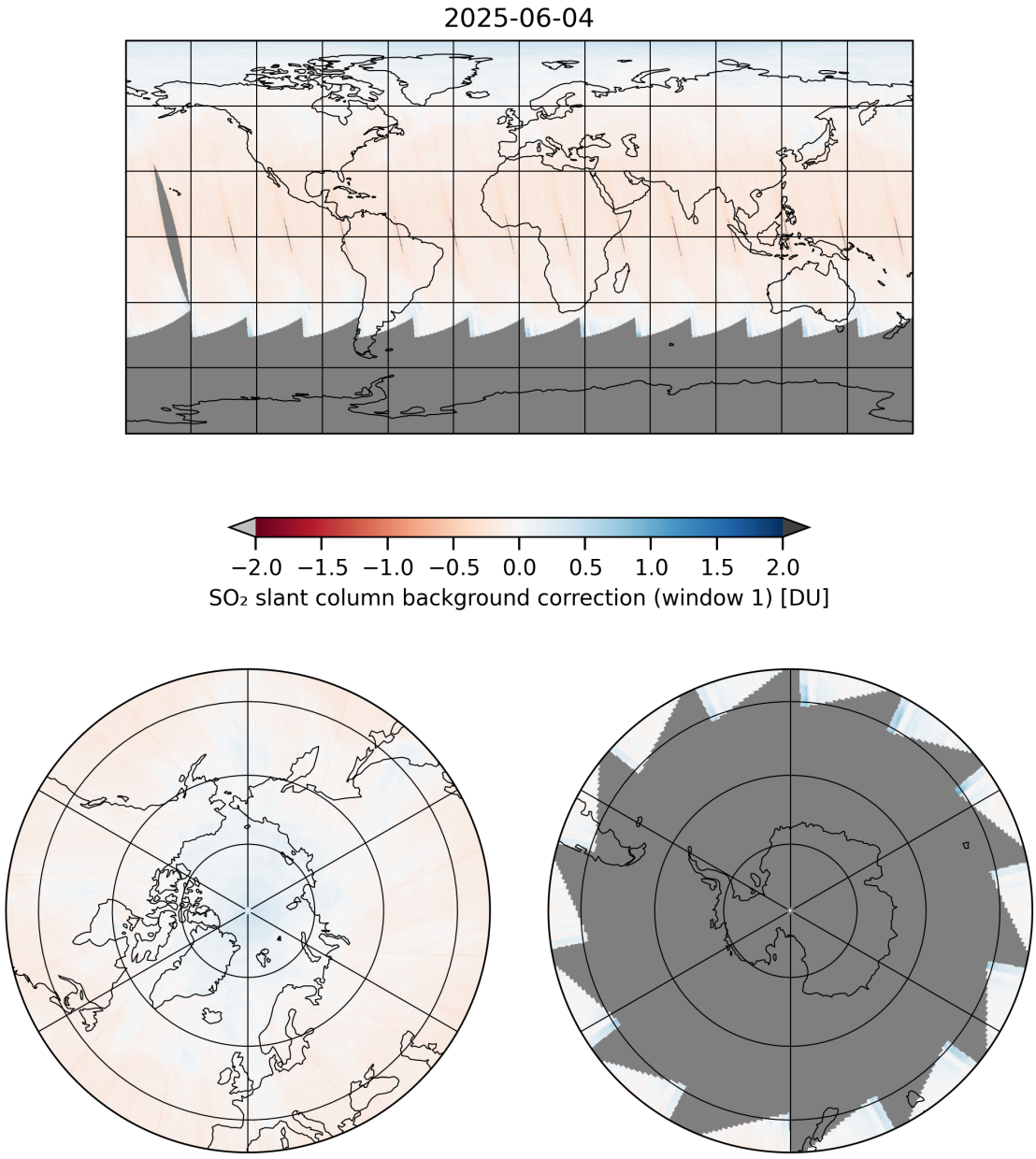


Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-06-04 to 2025-06-04

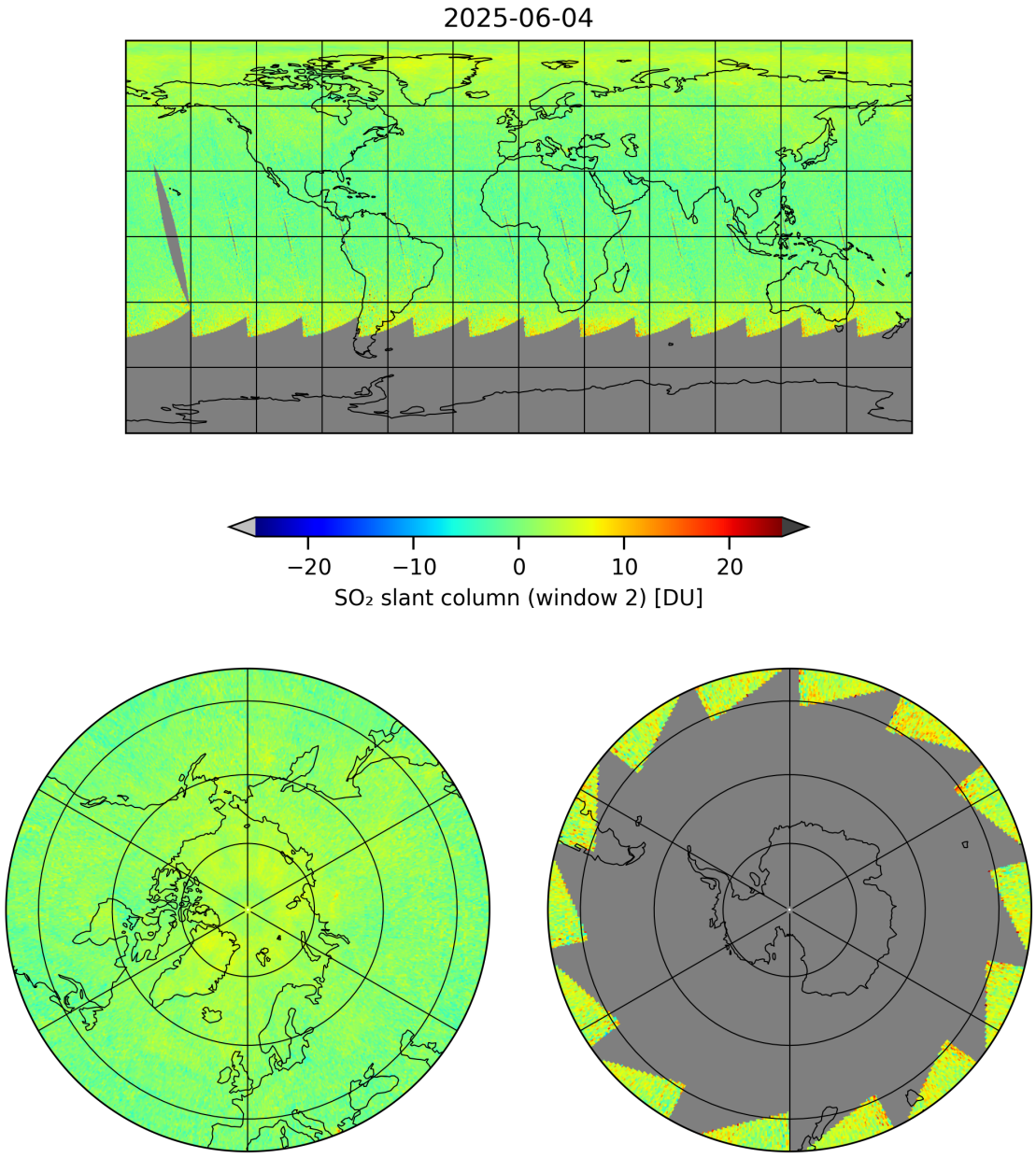


Figure 13: Map of "SO_2 slant column (window 2)" for 2025-06-04 to 2025-06-04

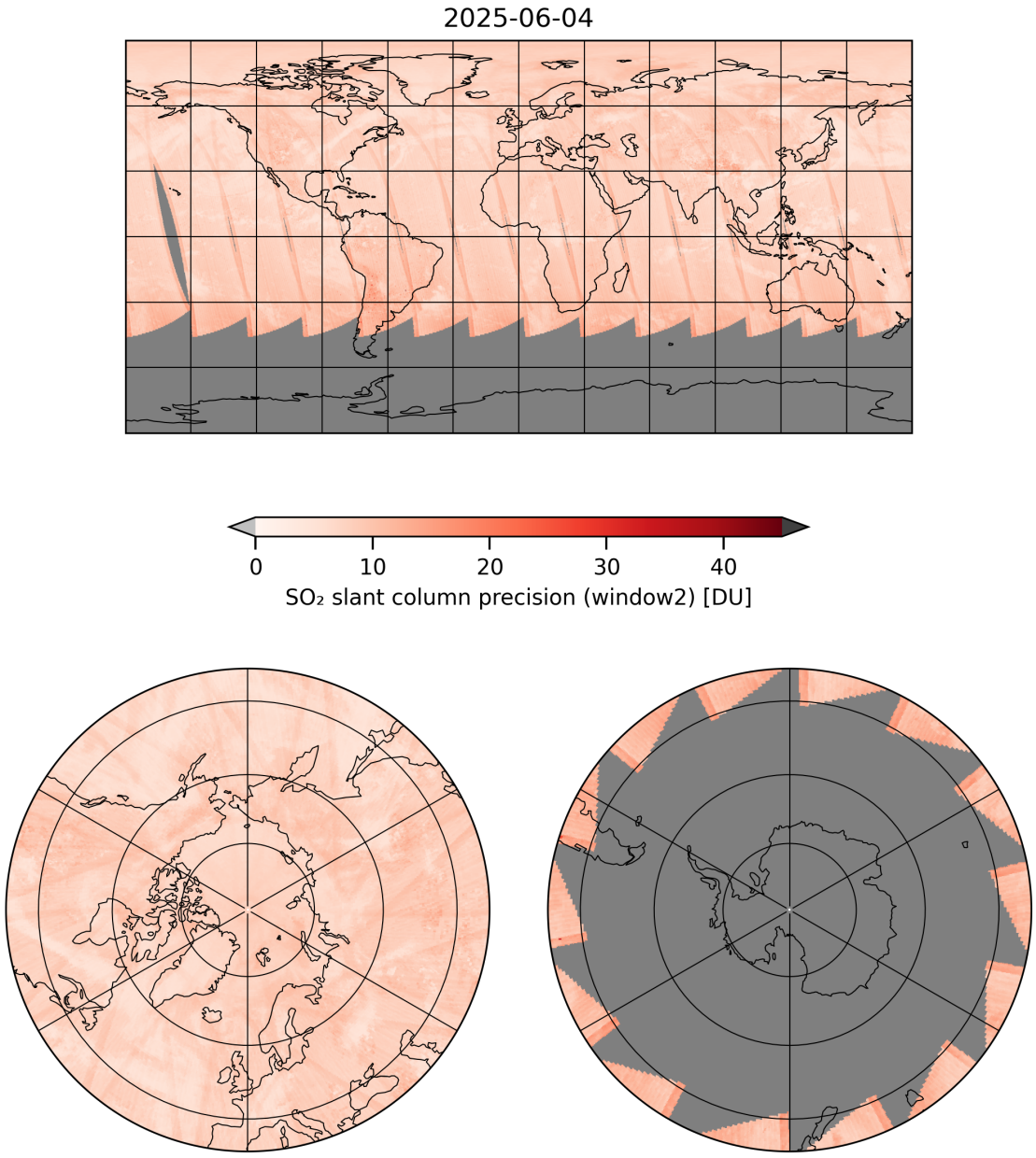


Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-06-04 to 2025-06-04

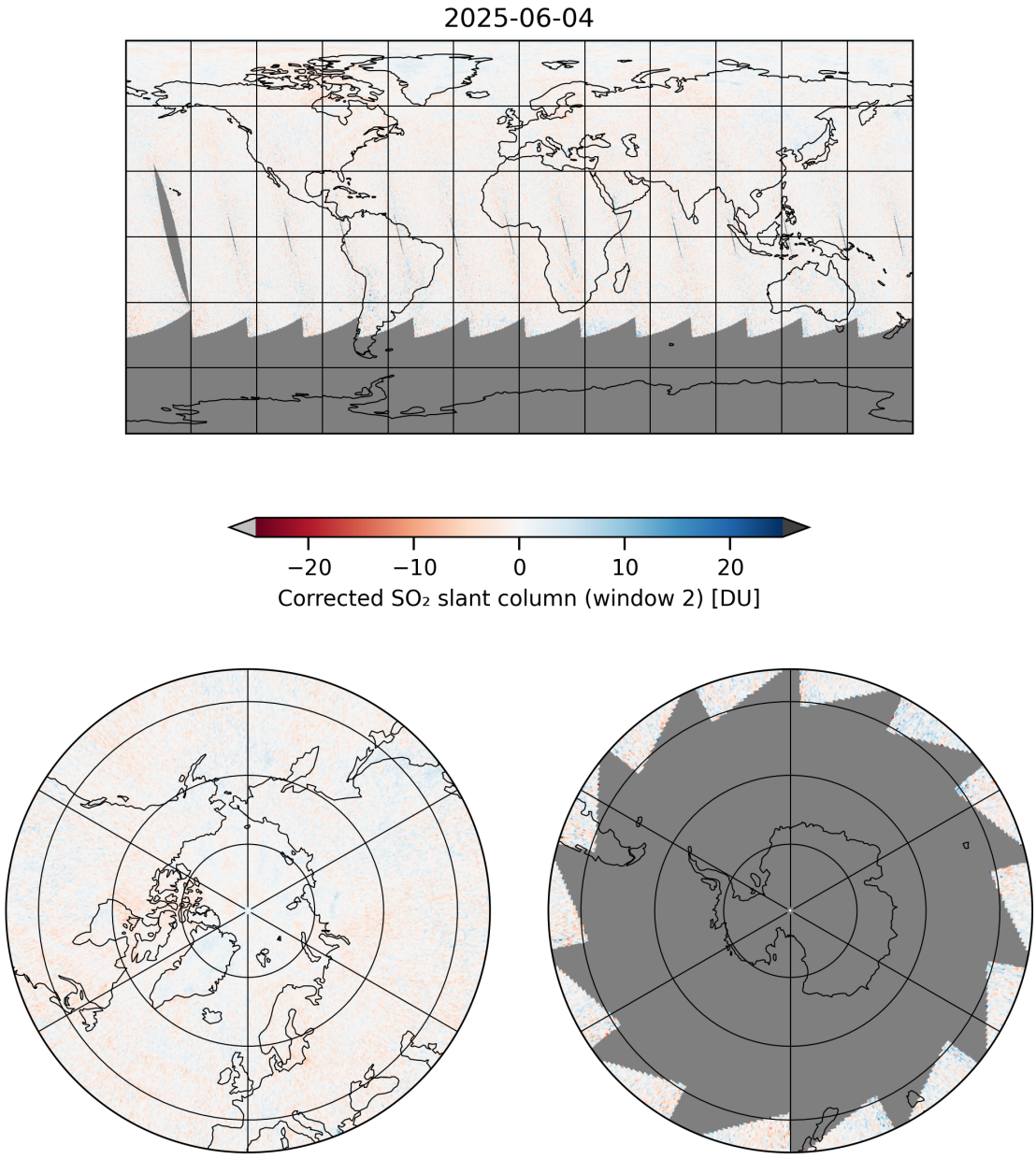


Figure 15: Map of “Corrected SO_2 slant column (window 2)” for 2025-06-04 to 2025-06-04

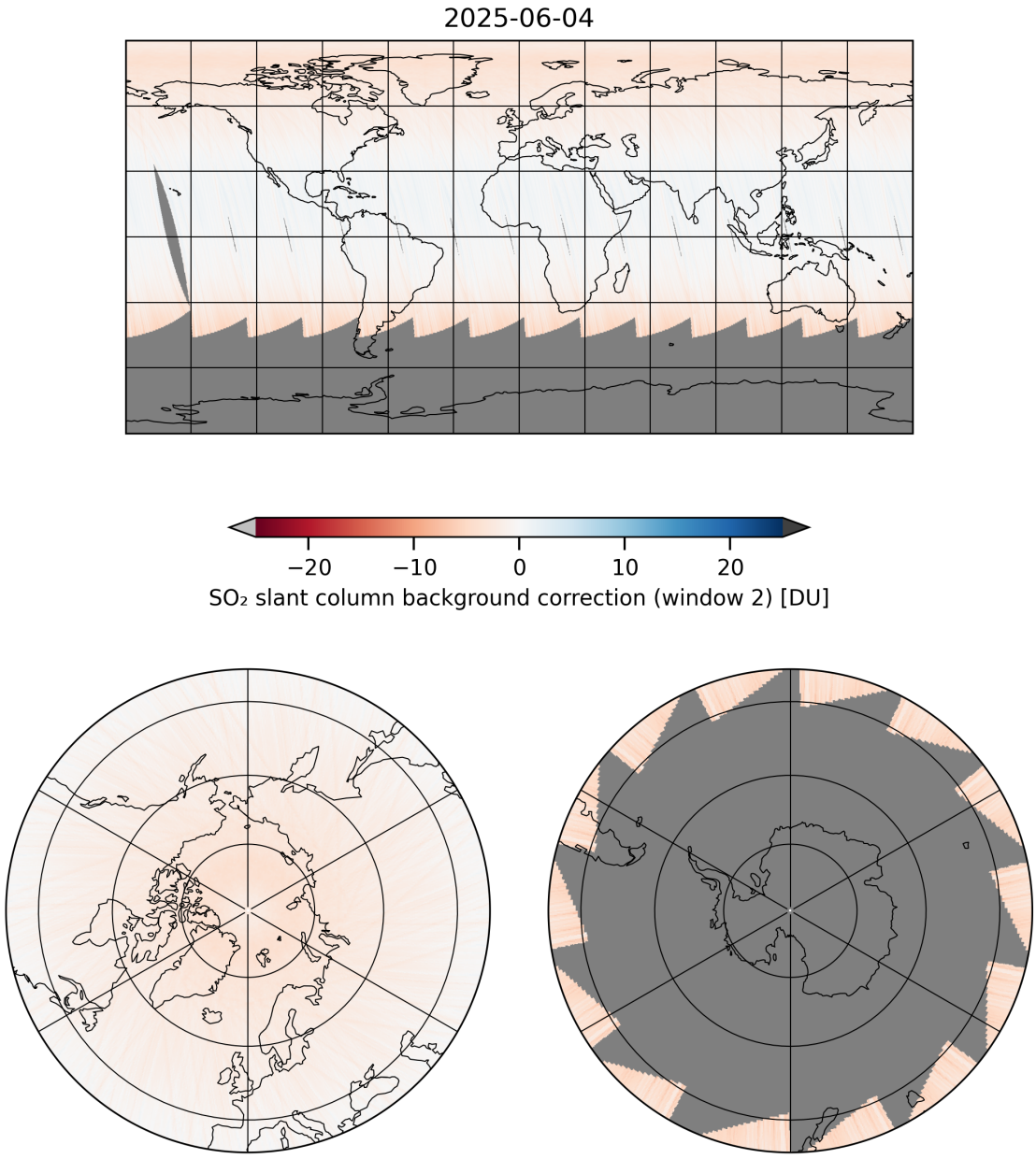


Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-06-04 to 2025-06-04

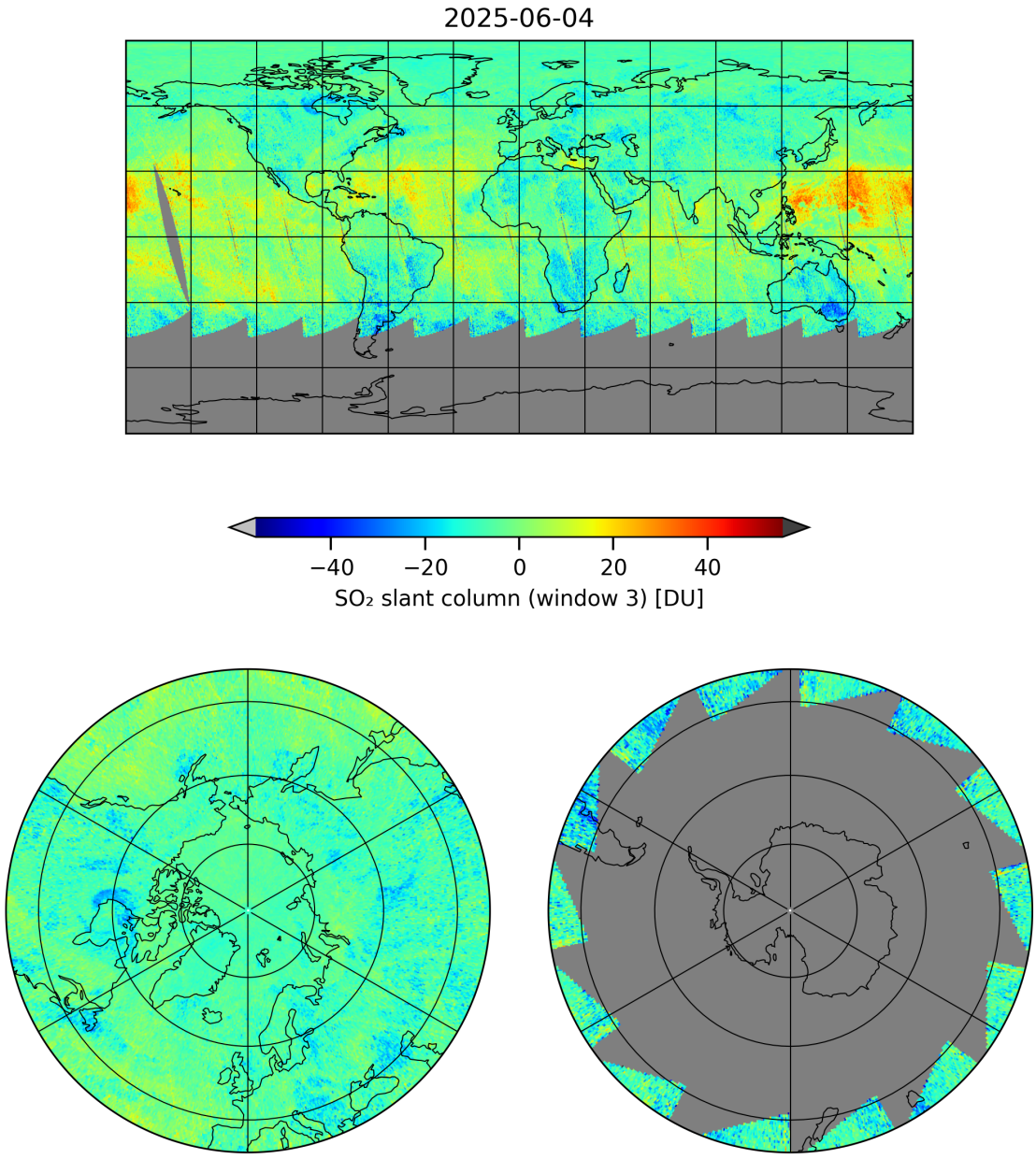


Figure 17: Map of "SO_2 slant column (window 3)" for 2025-06-04 to 2025-06-04

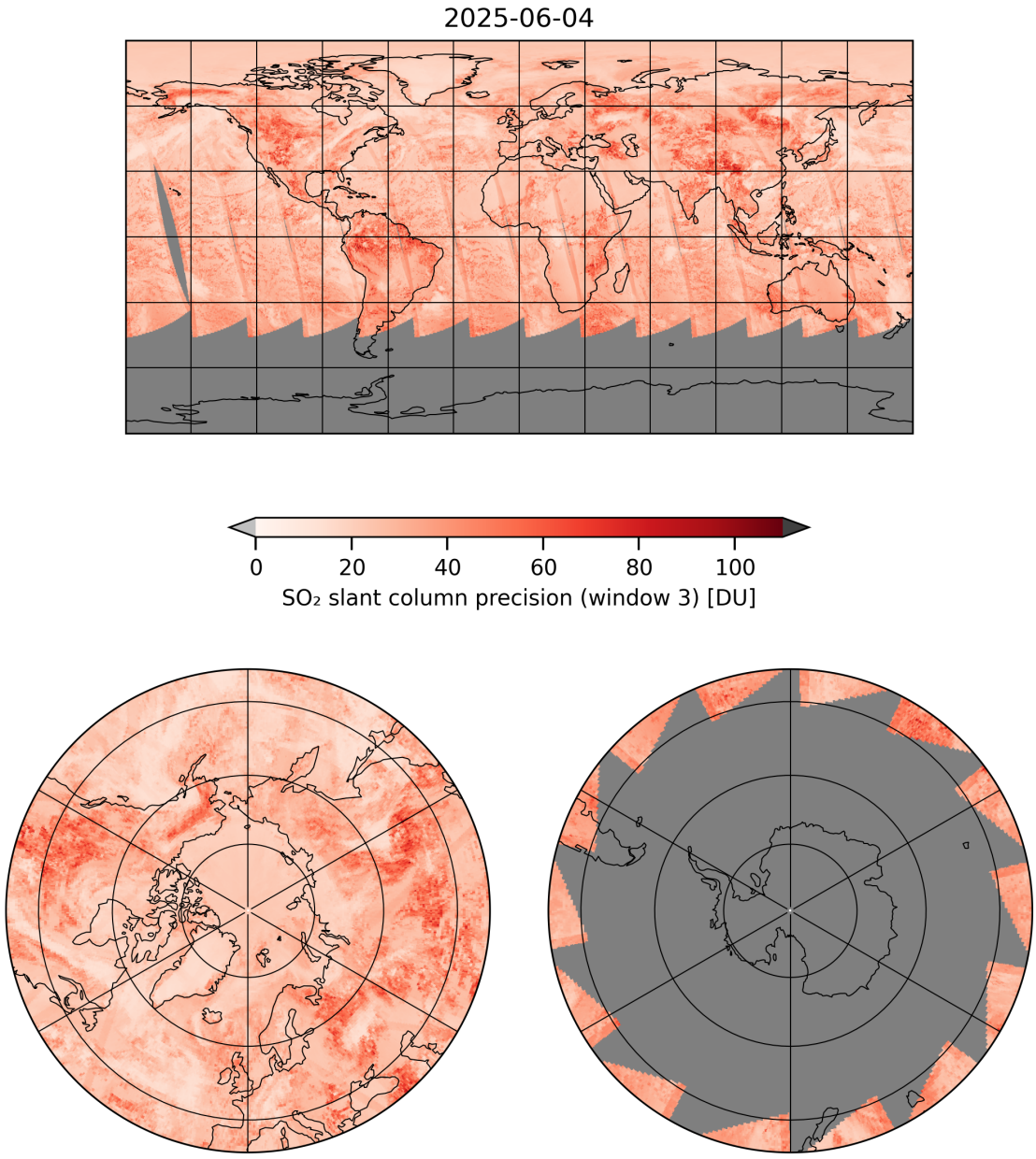


Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-06-04 to 2025-06-04

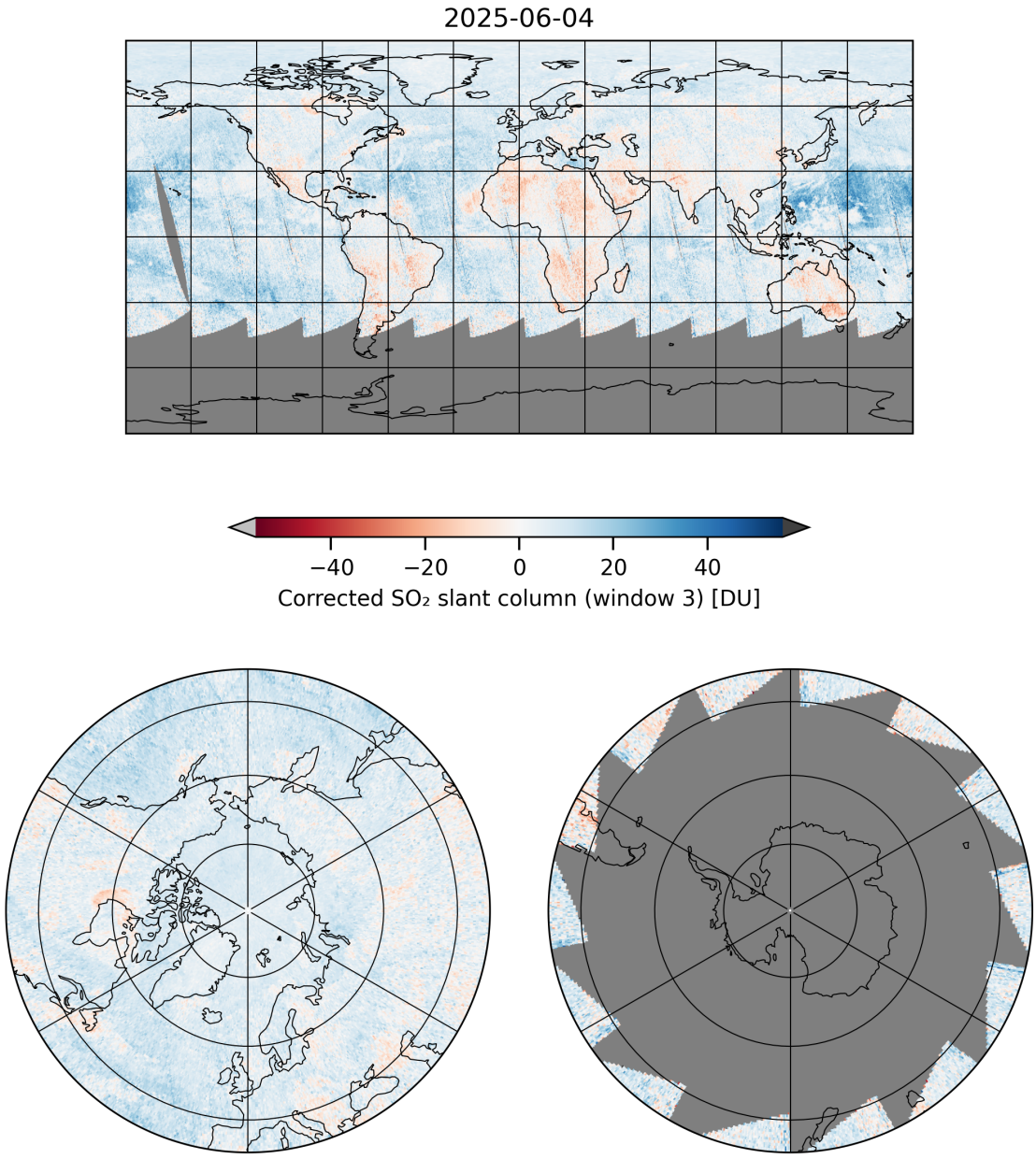


Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-06-04 to 2025-06-04

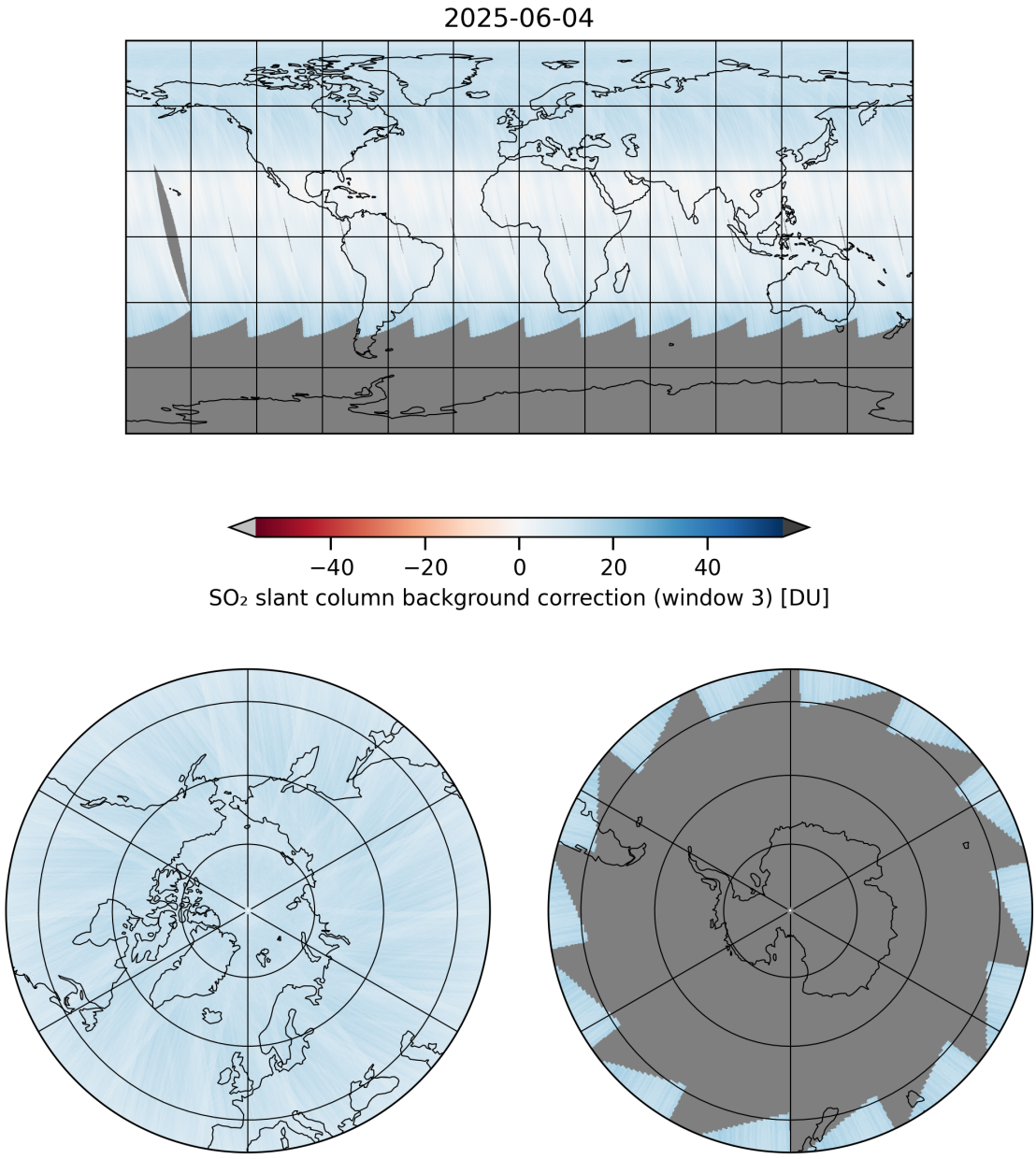


Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-06-04 to 2025-06-04

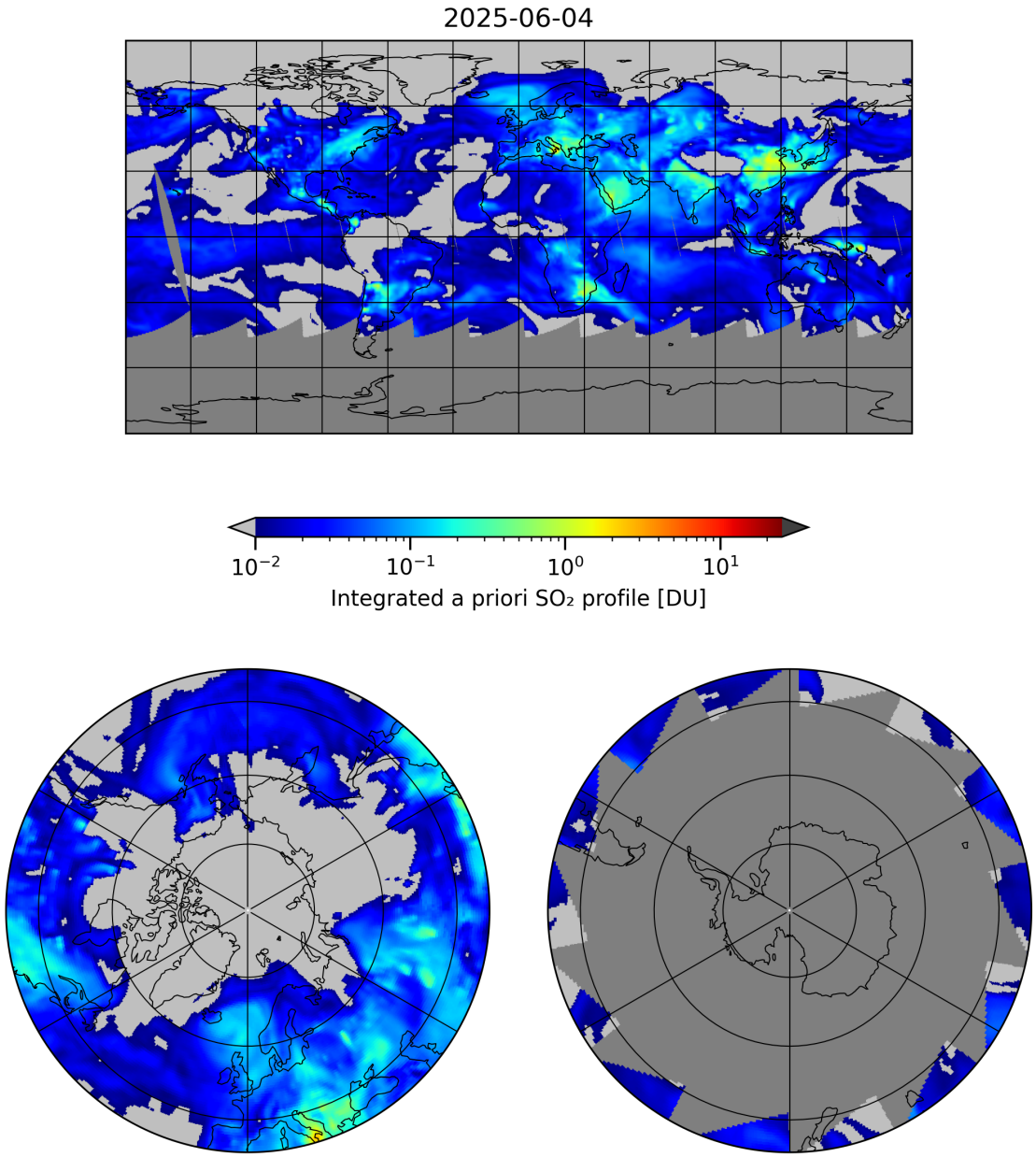


Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-06-04 to 2025-06-04

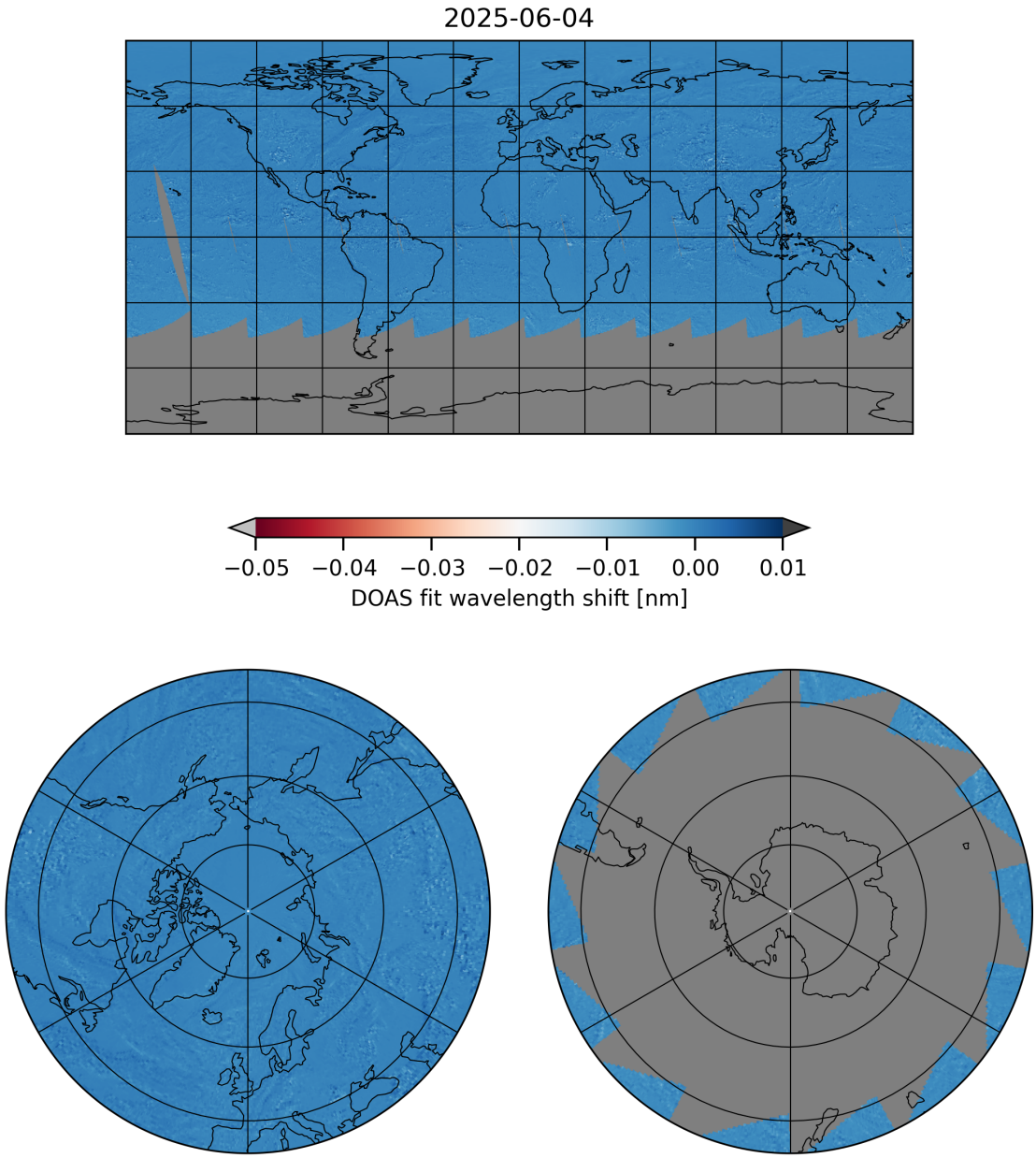


Figure 22: Map of “DOAS fit wavelength shift” for 2025-06-04 to 2025-06-04

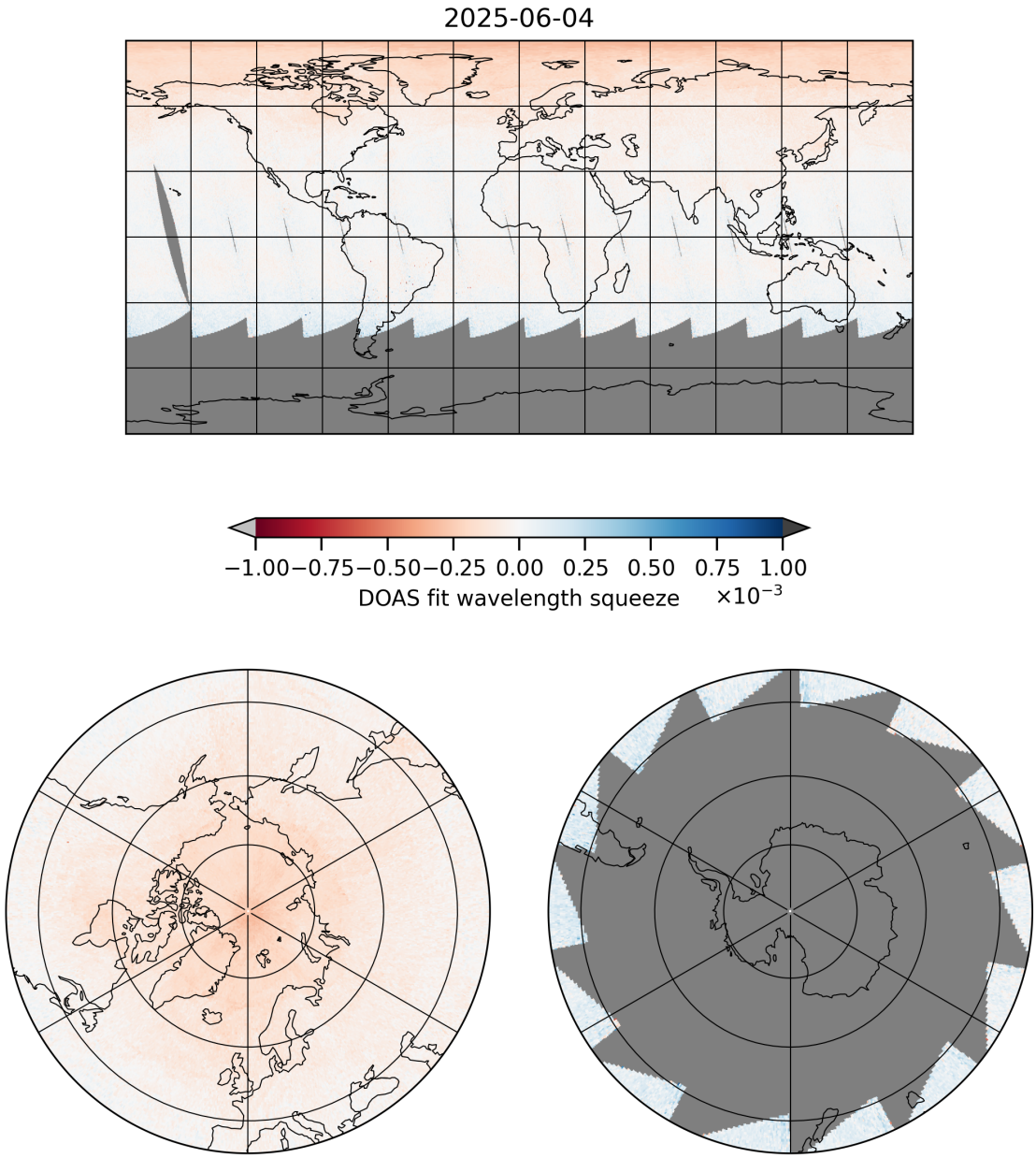


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-06-04 to 2025-06-04

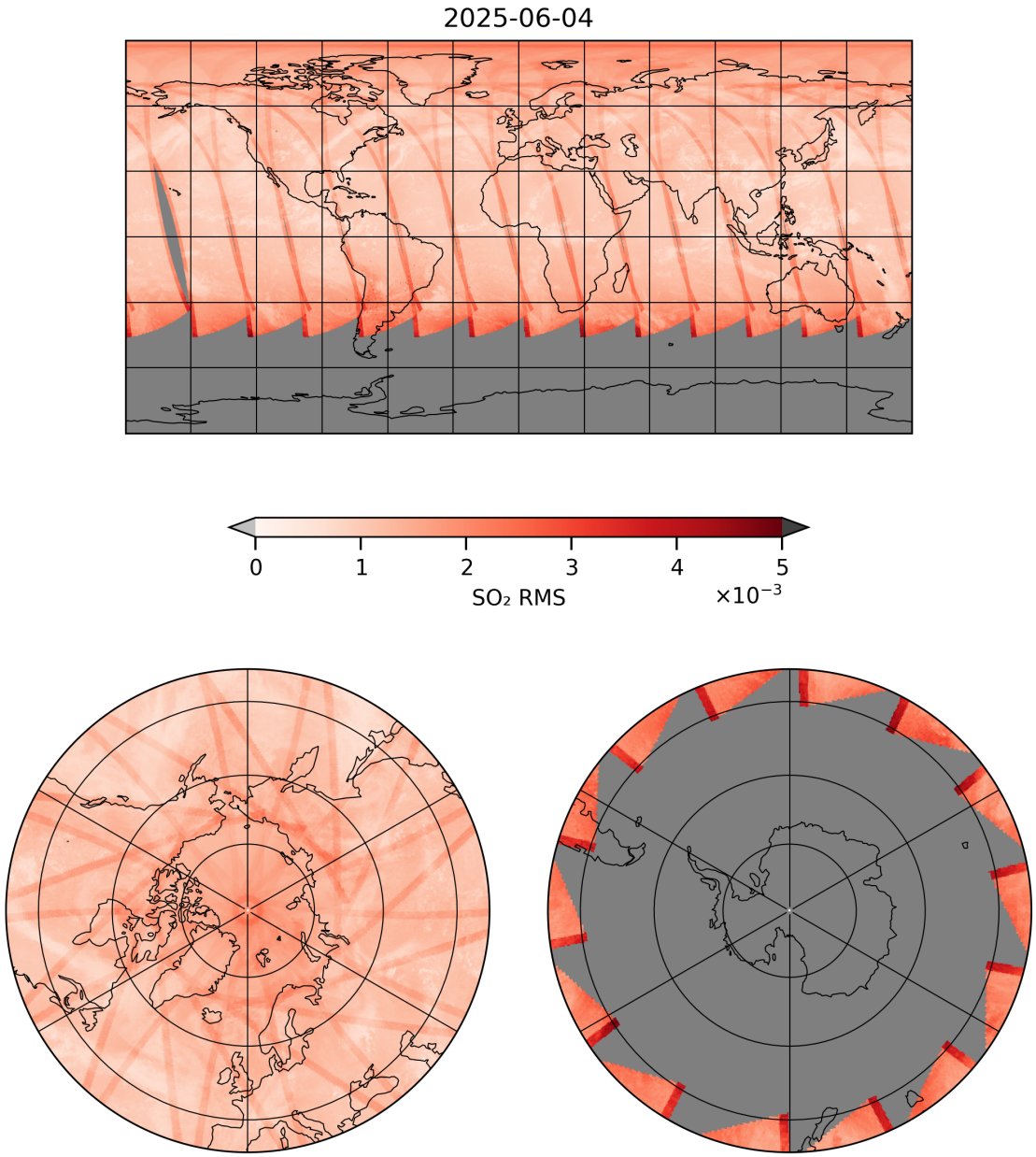


Figure 24: Map of "SO_2 RMS" for 2025-06-04 to 2025-06-04

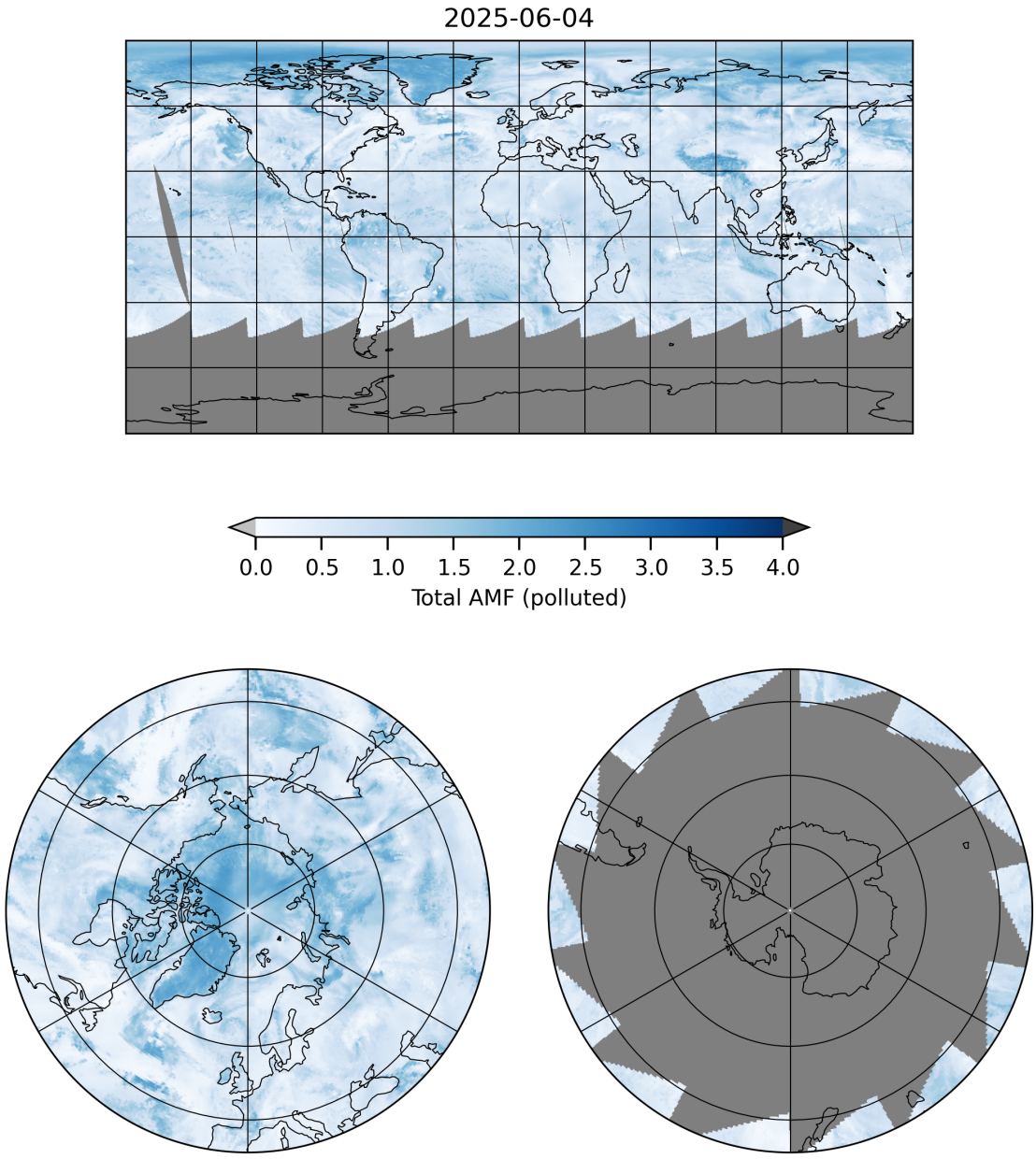


Figure 25: Map of “Total AMF (polluted)” for 2025-06-04 to 2025-06-04

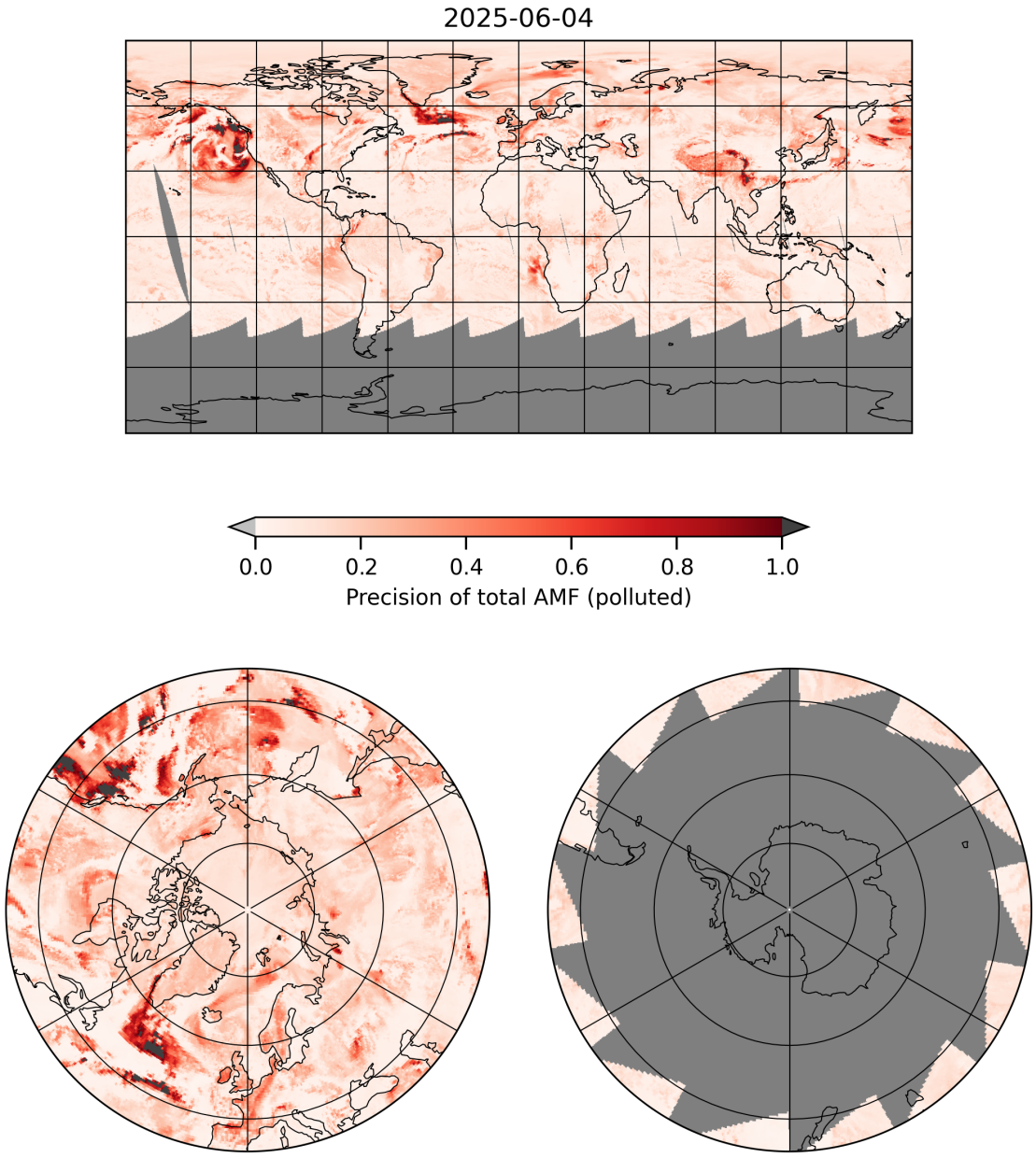


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-06-04 to 2025-06-04

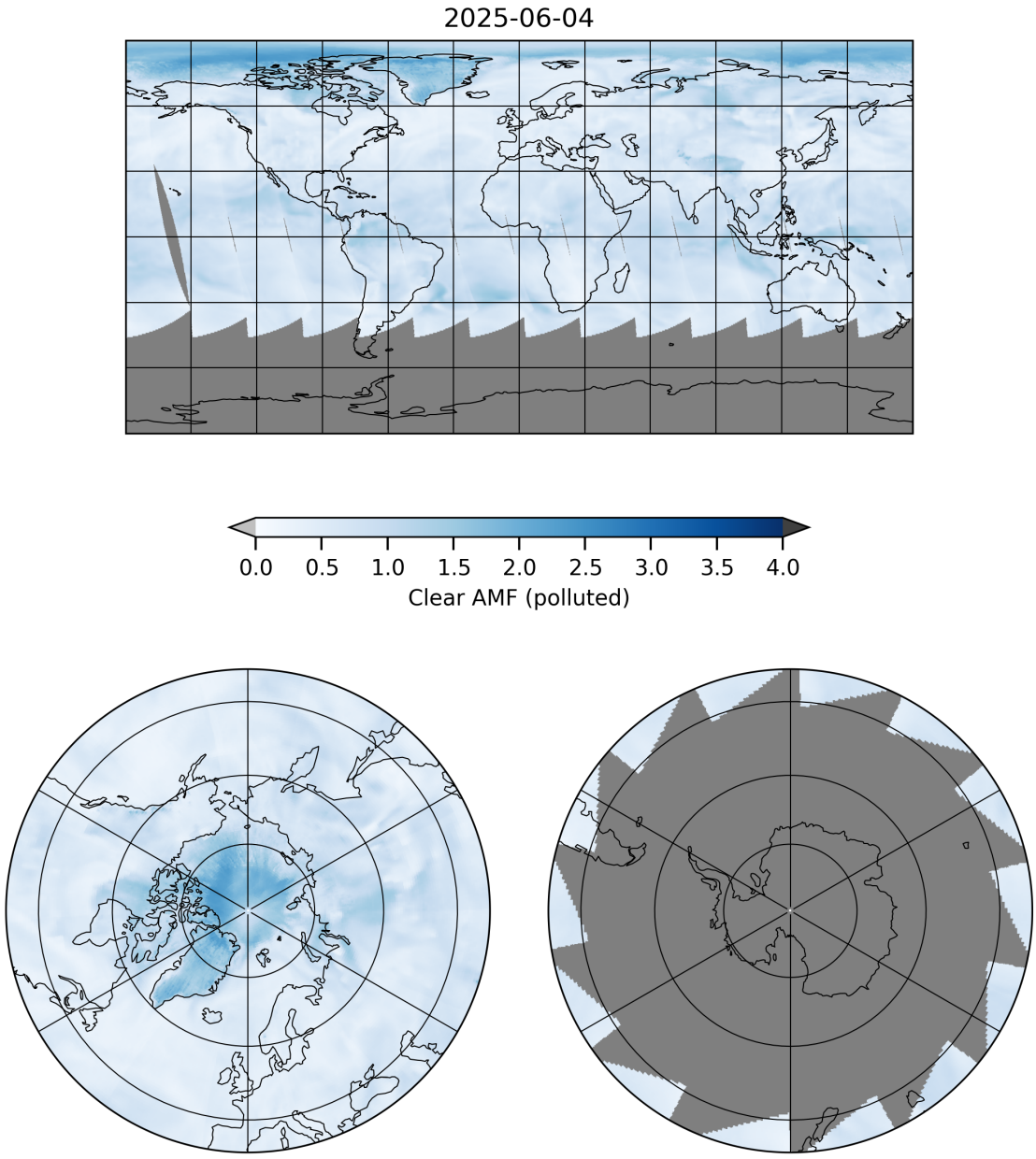


Figure 27: Map of “Clear AMF (polluted)” for 2025-06-04 to 2025-06-04

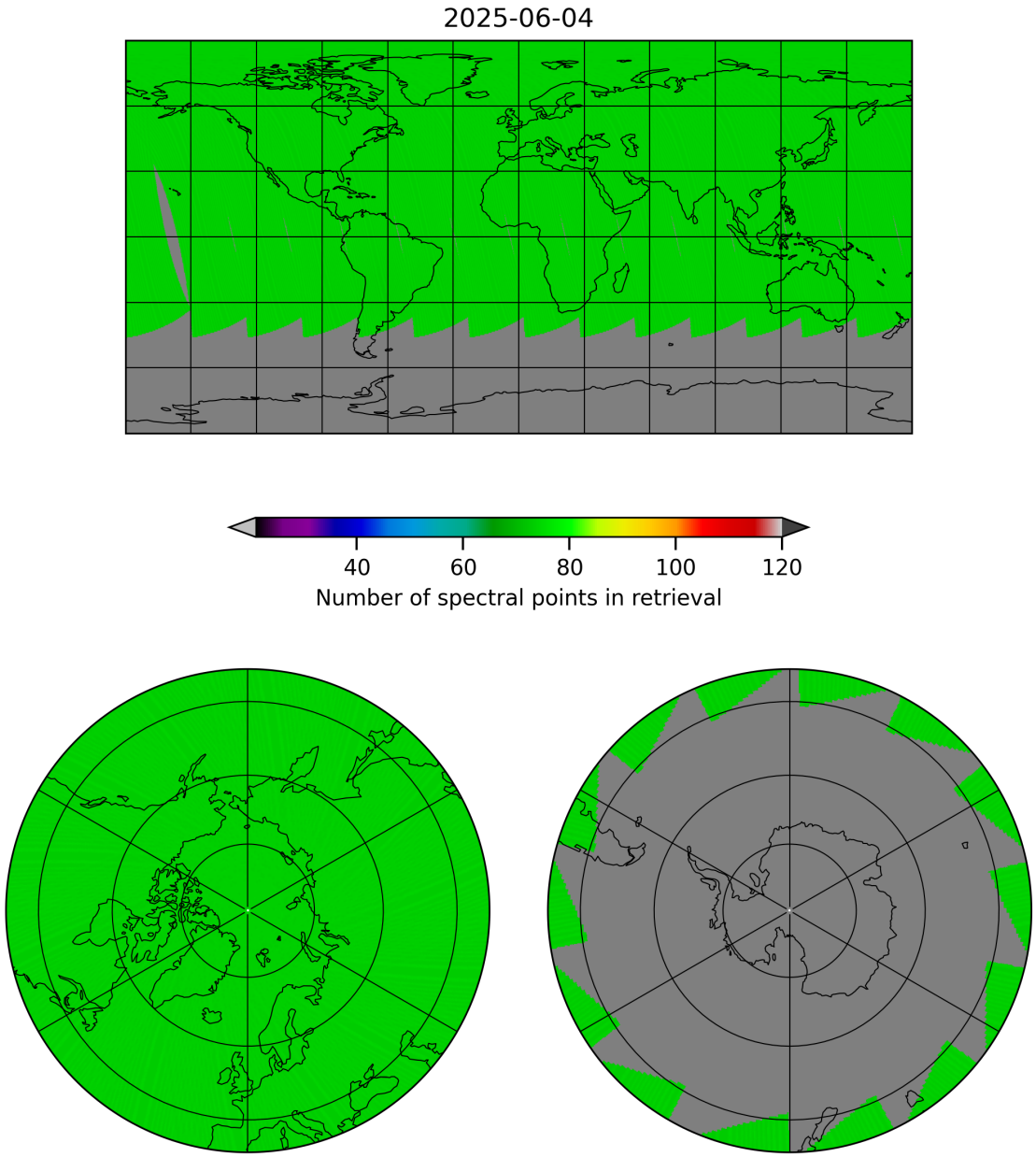


Figure 28: Map of “Number of spectral points in retrieval” for 2025-06-04 to 2025-06-04

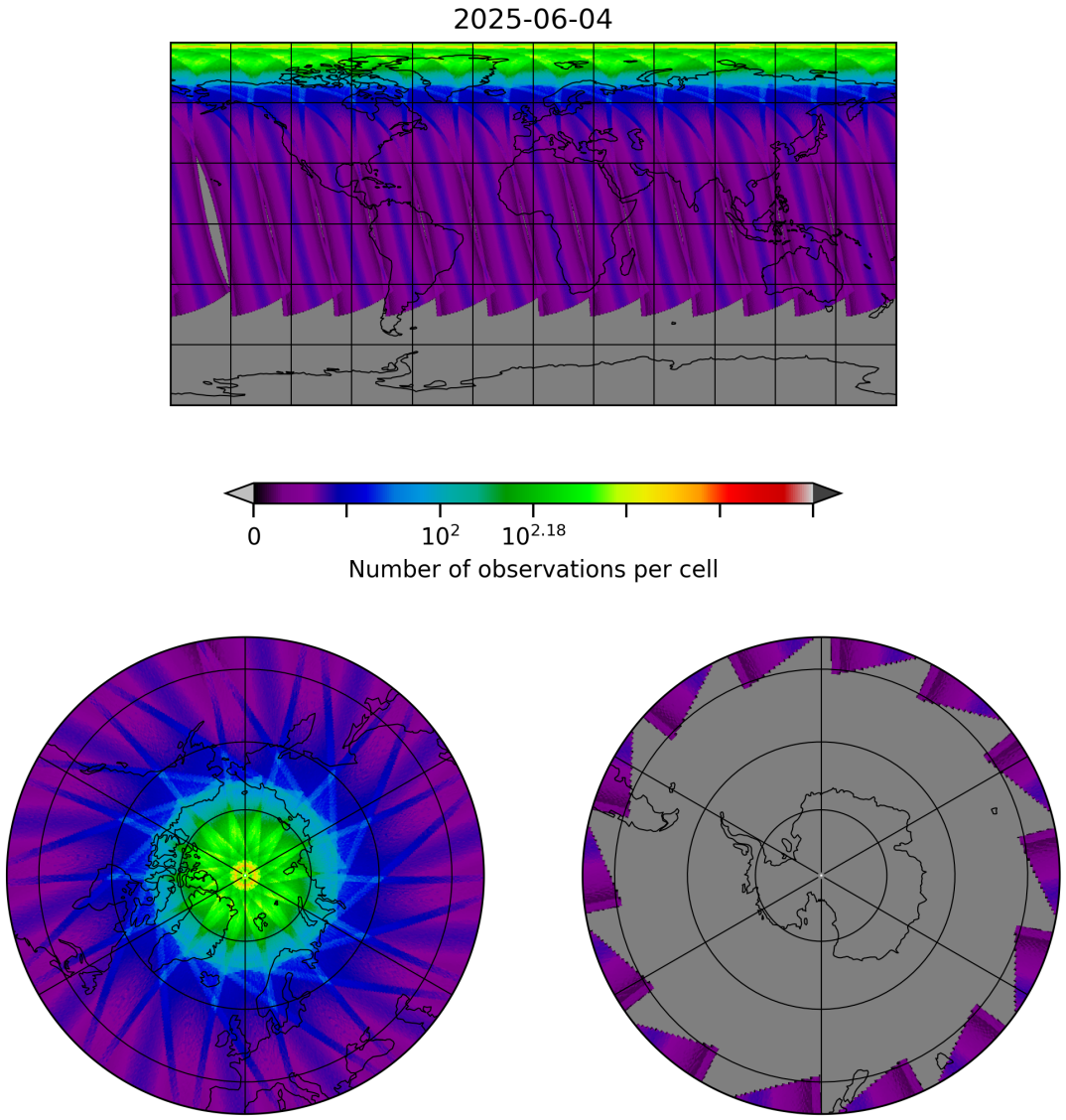


Figure 29: Map of the number of observations for 2025-06-04 to 2025-06-04

7 Zonal average

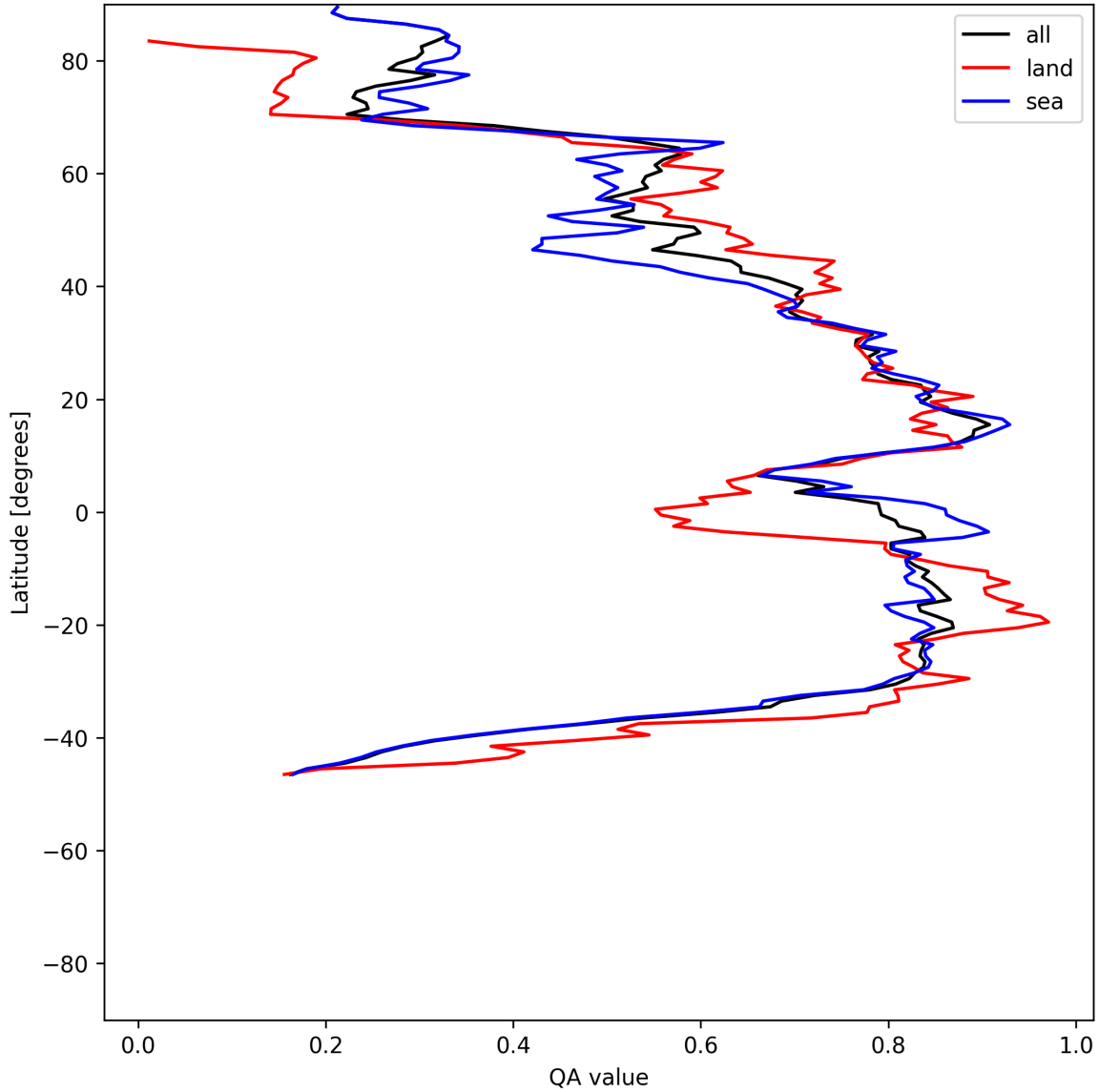


Figure 30: Zonal average of “QA value” for 2025-06-04 to 2025-06-04.

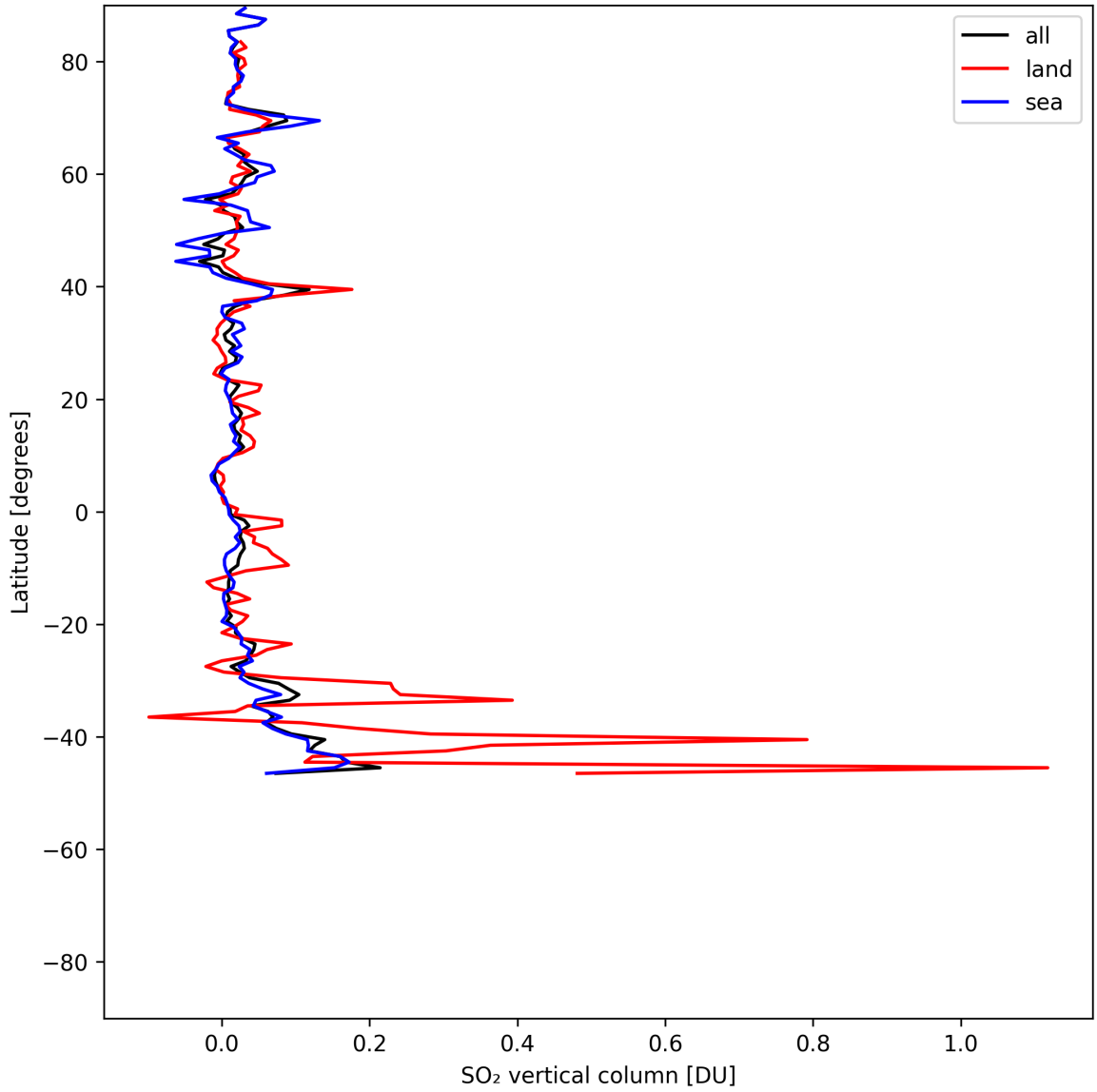


Figure 31: Zonal average of "SO_2 vertical column" for 2025-06-04 to 2025-06-04.

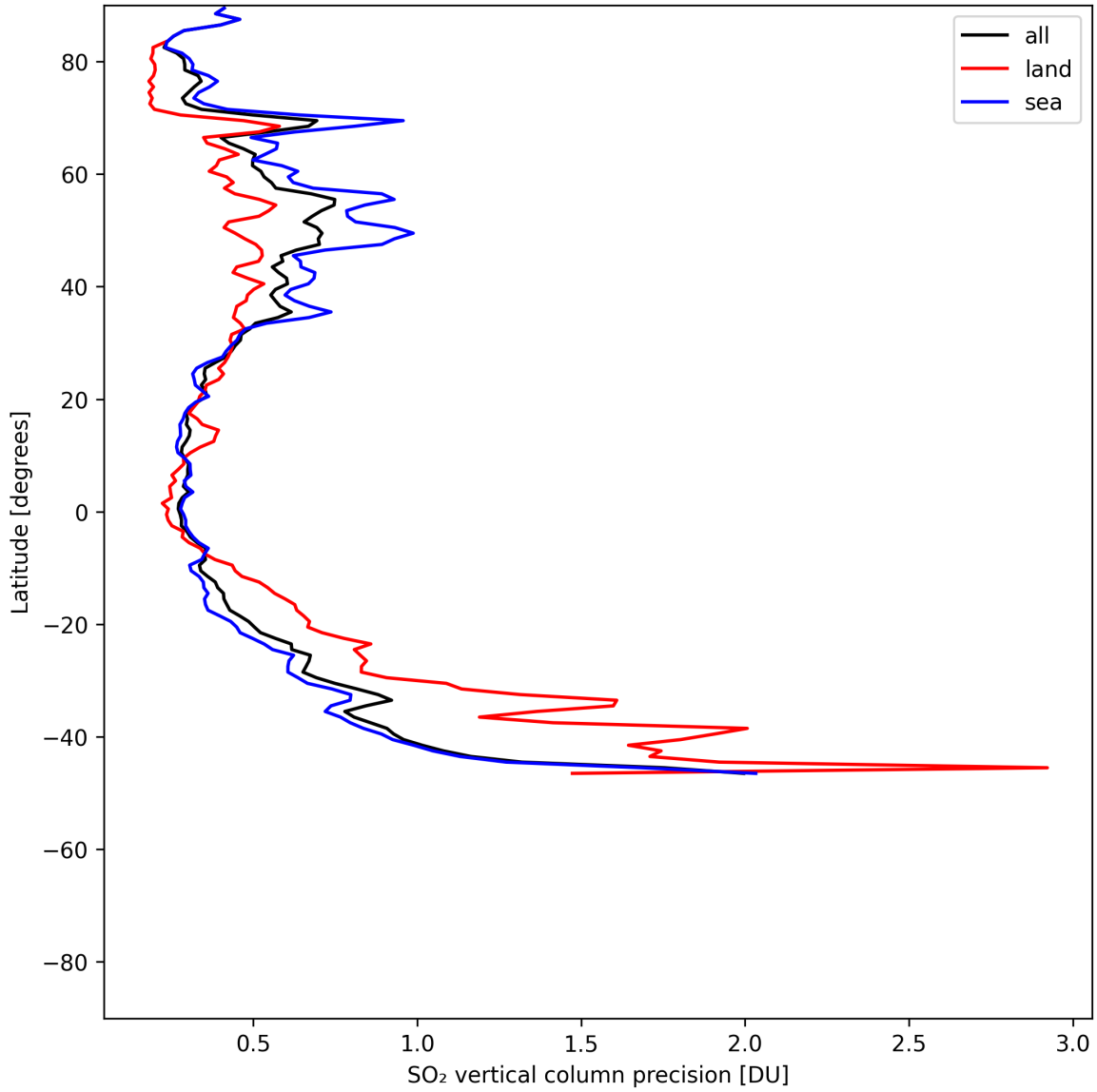


Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-06-04 to 2025-06-04.

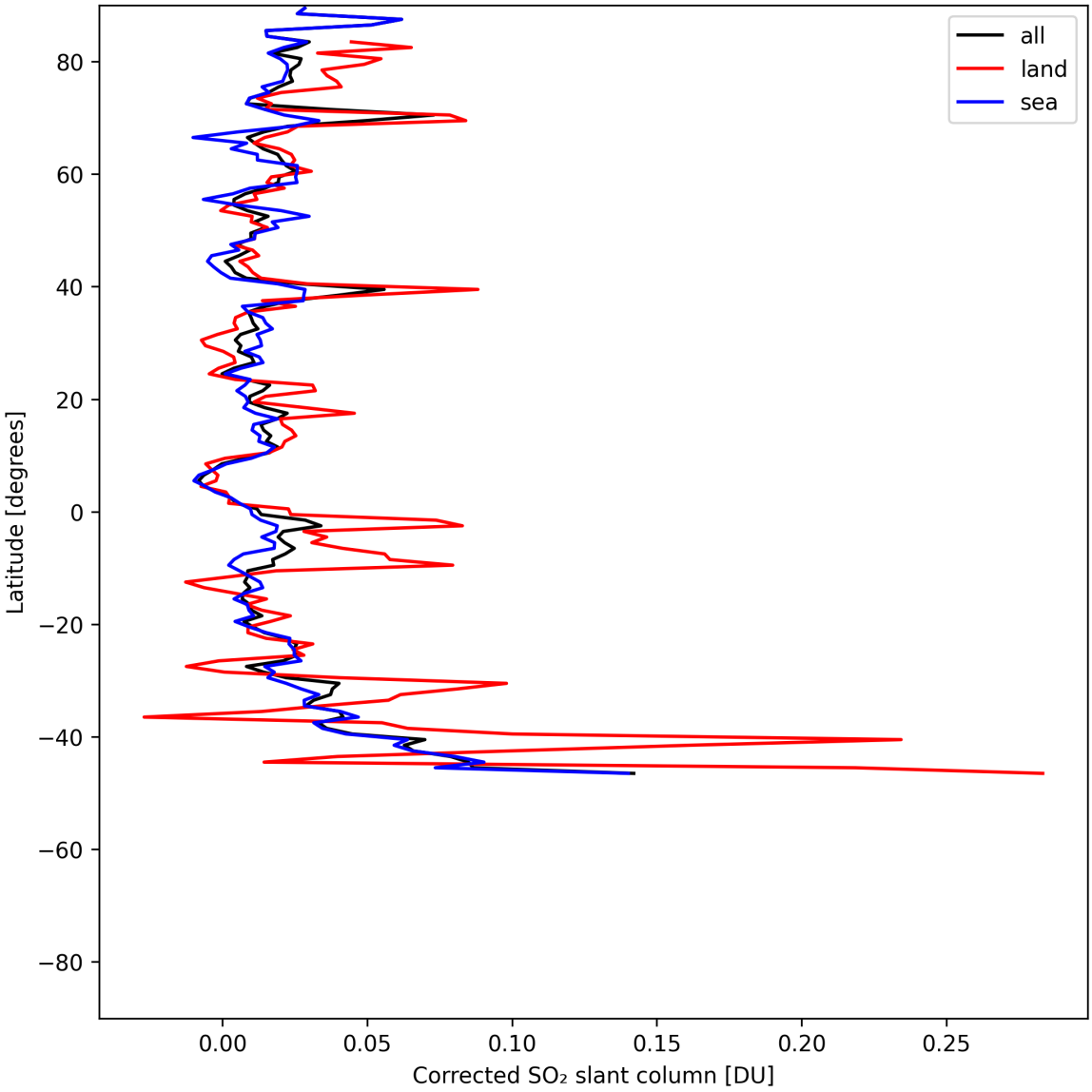


Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-06-04 to 2025-06-04.

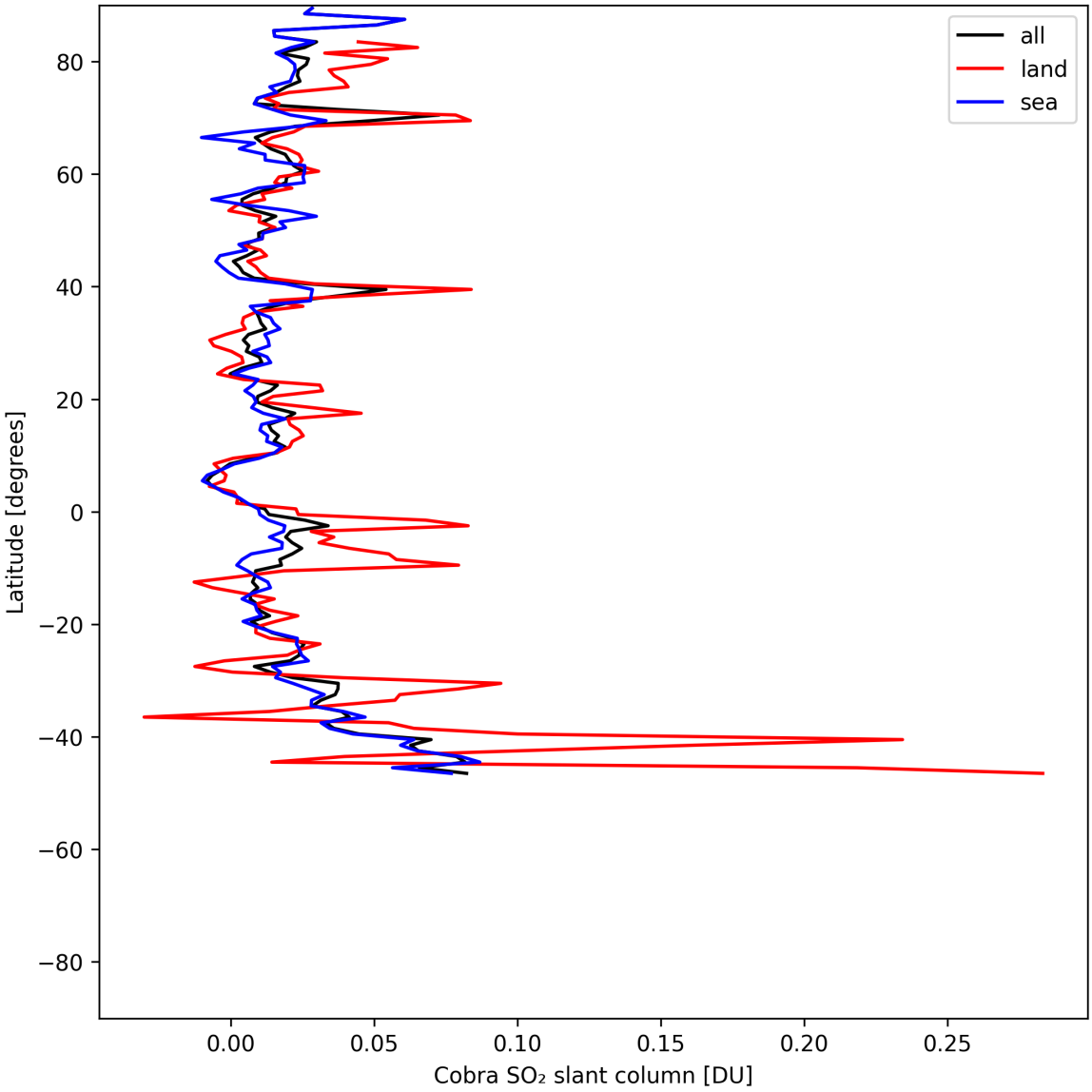


Figure 34: Zonal average of "Cobra SO_2 slant column" for 2025-06-04 to 2025-06-04.

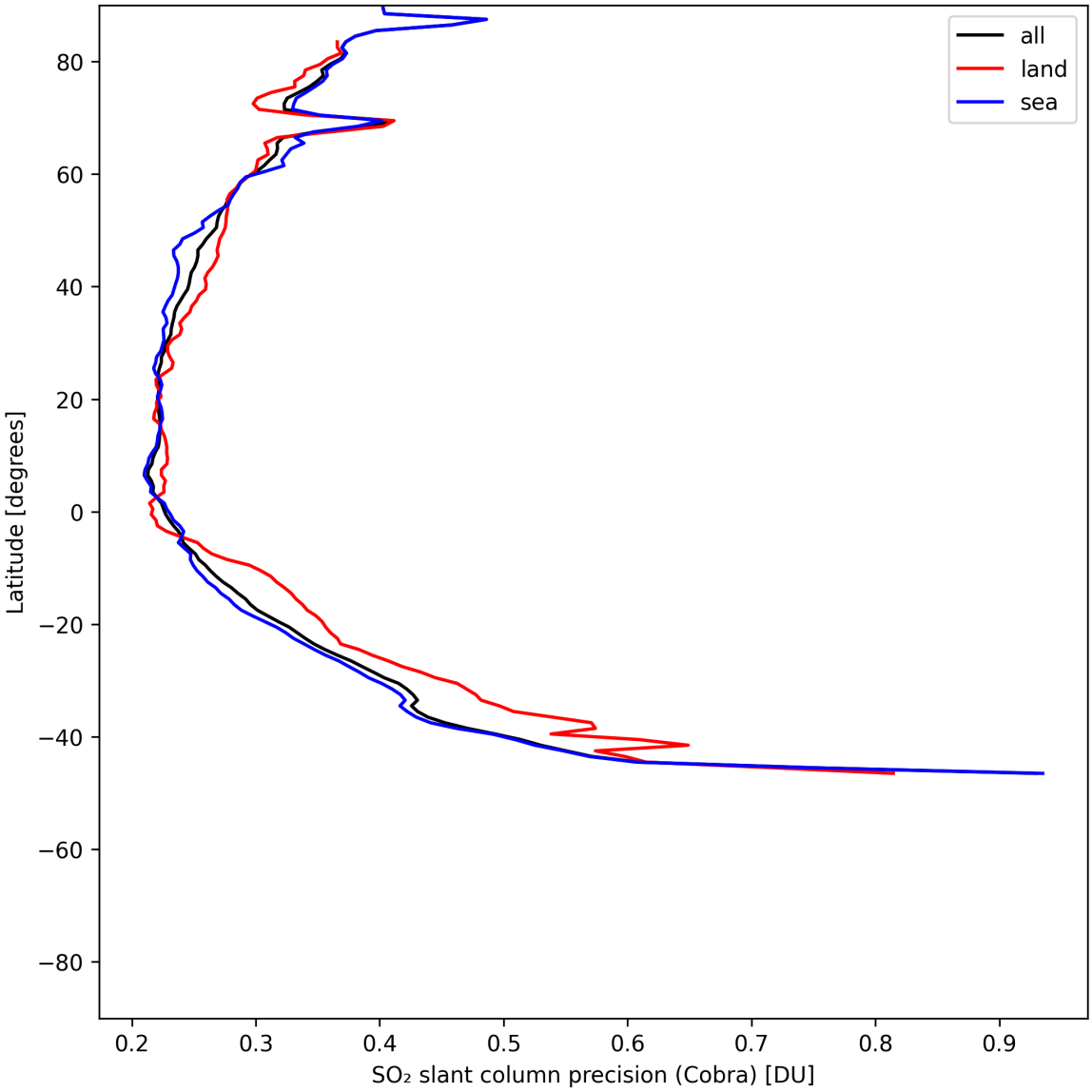


Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-06-04 to 2025-06-04.

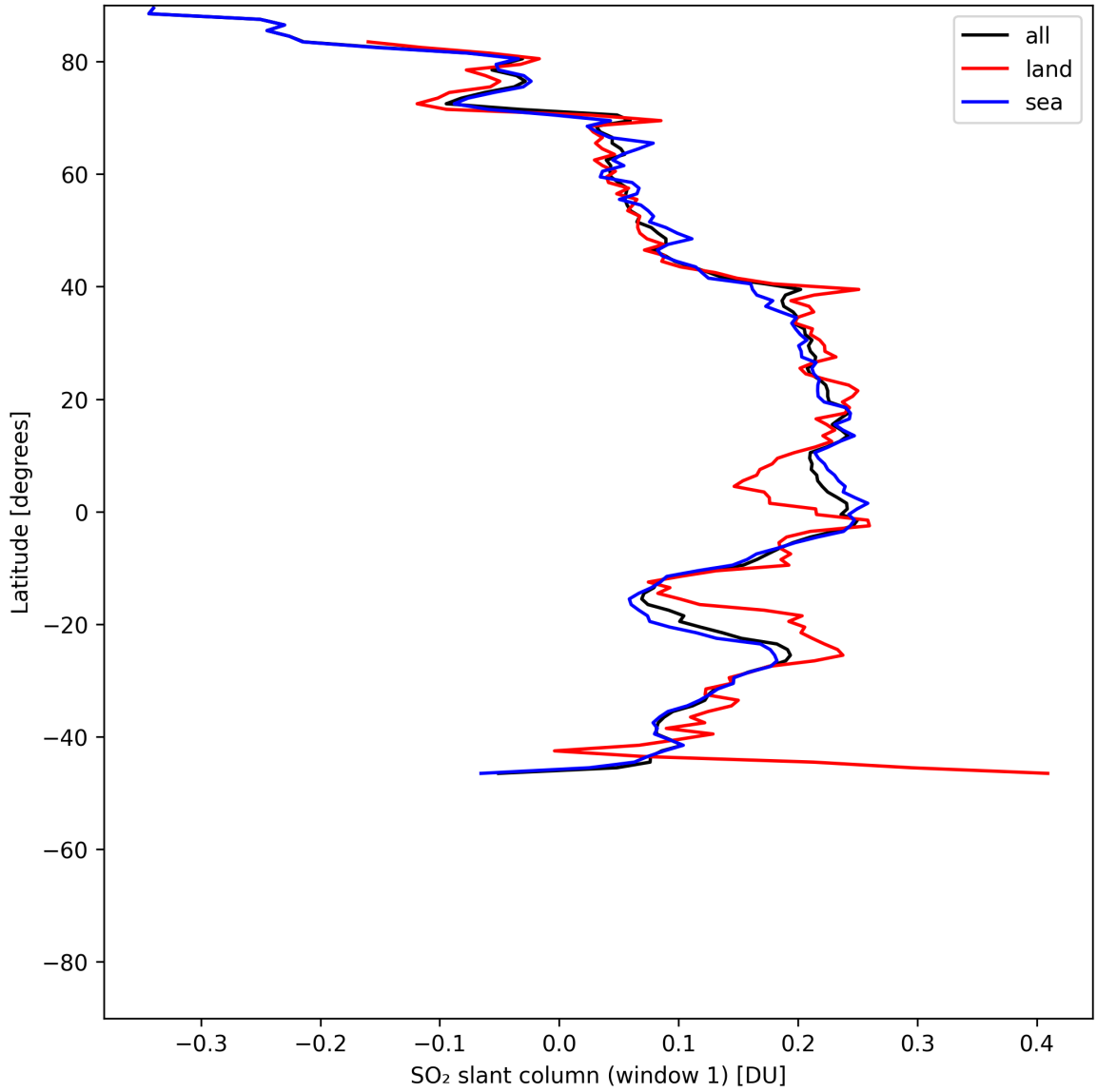


Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-06-04 to 2025-06-04.

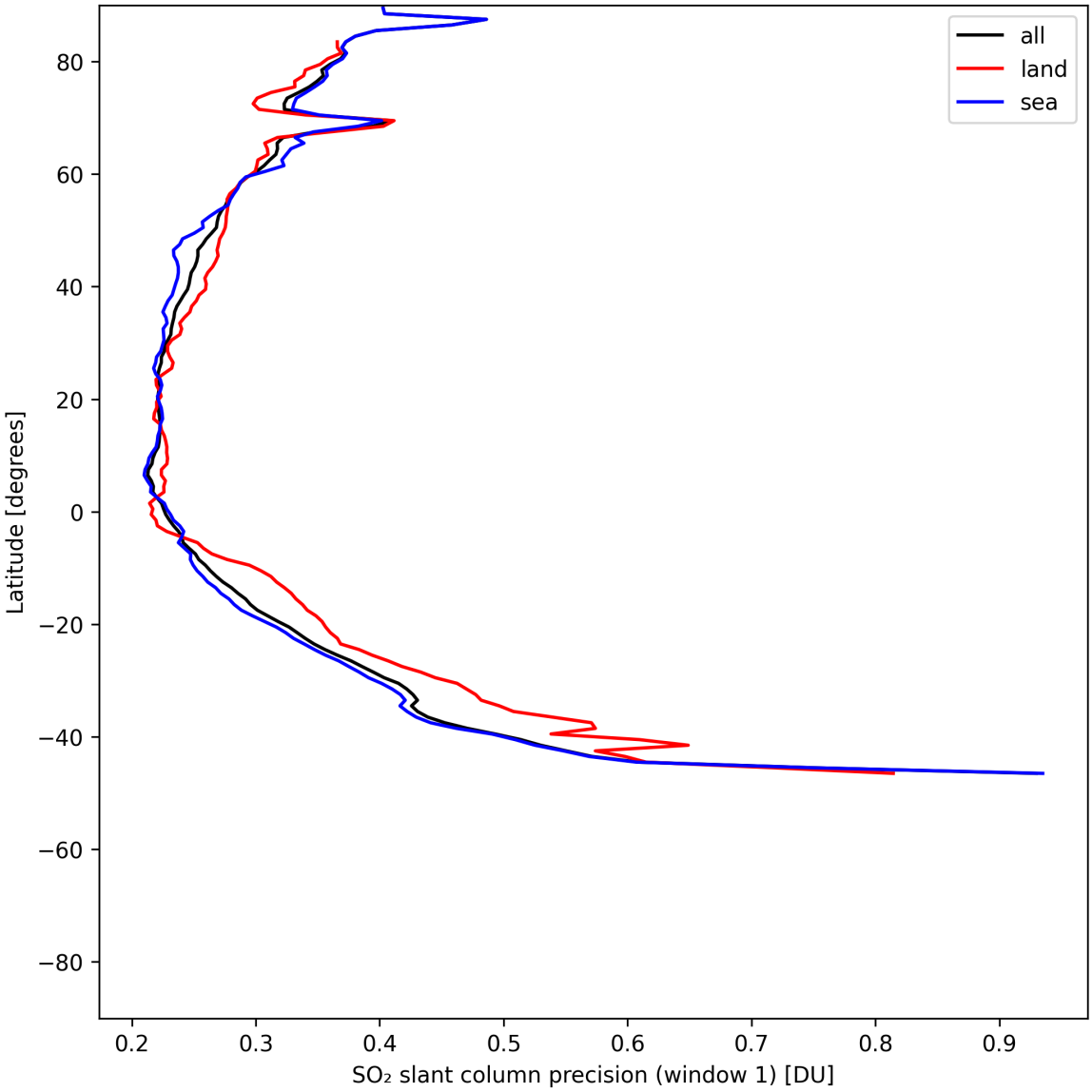


Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-06-04 to 2025-06-04.

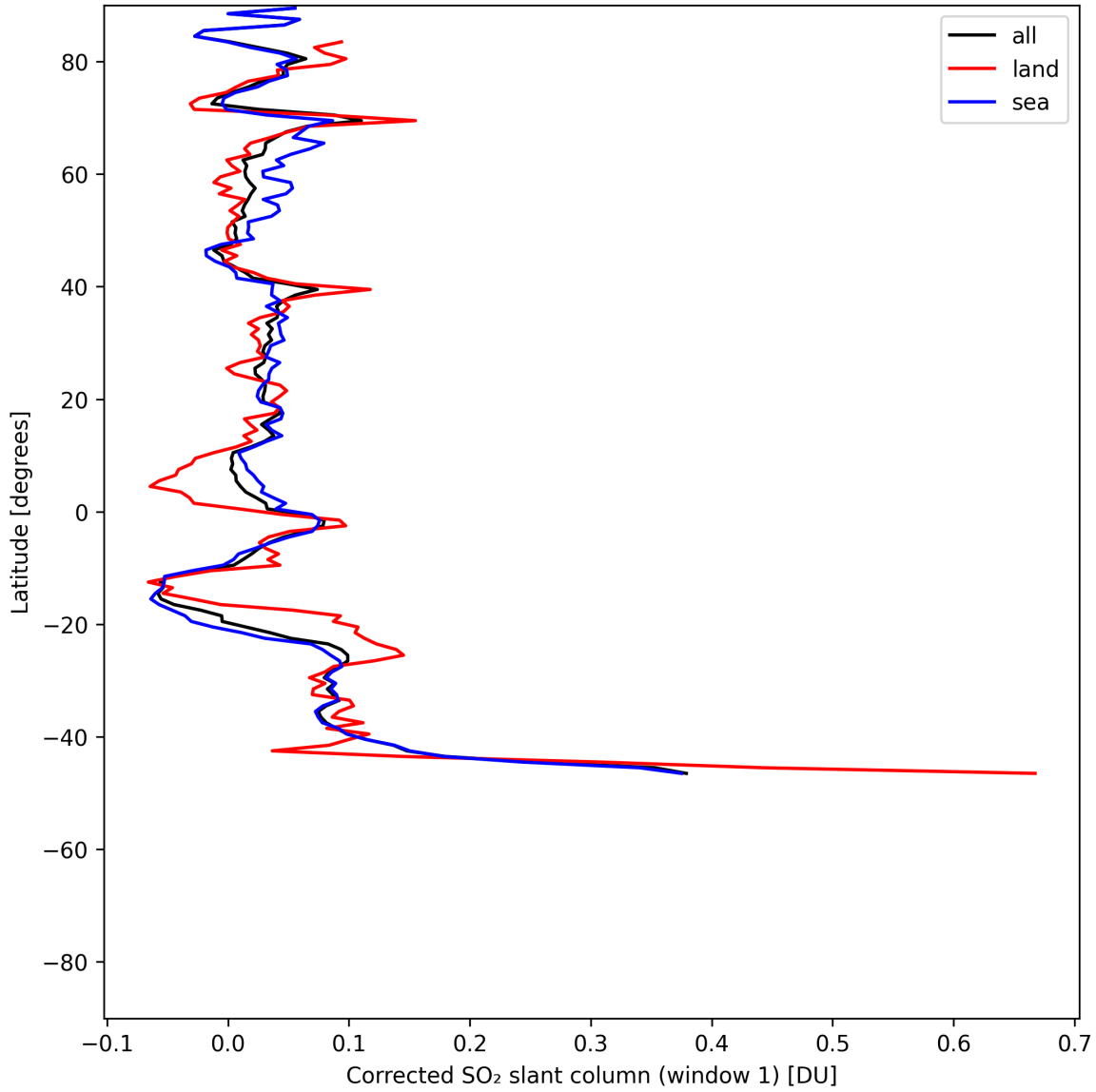


Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-06-04 to 2025-06-04.

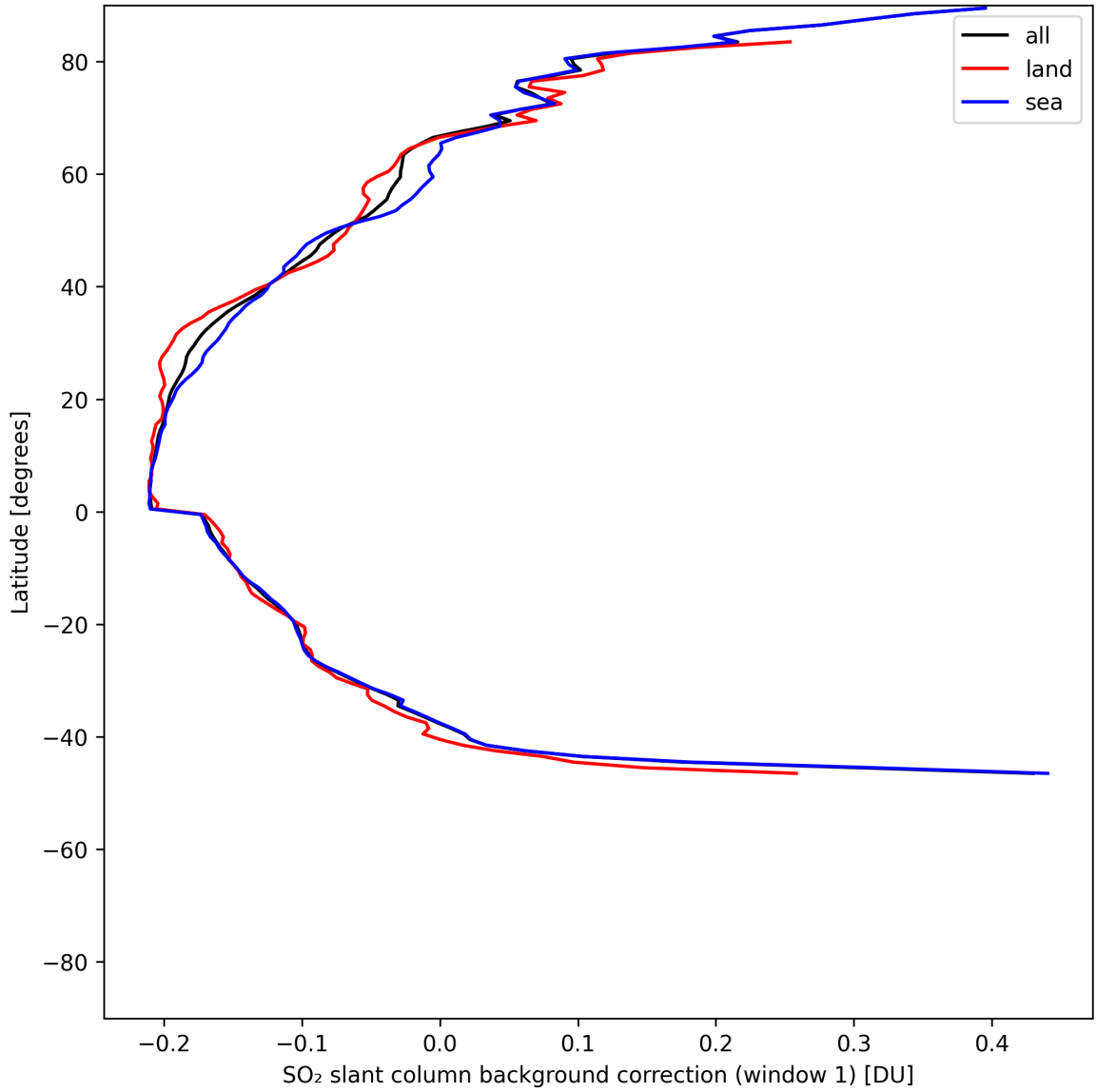


Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-06-04 to 2025-06-04.

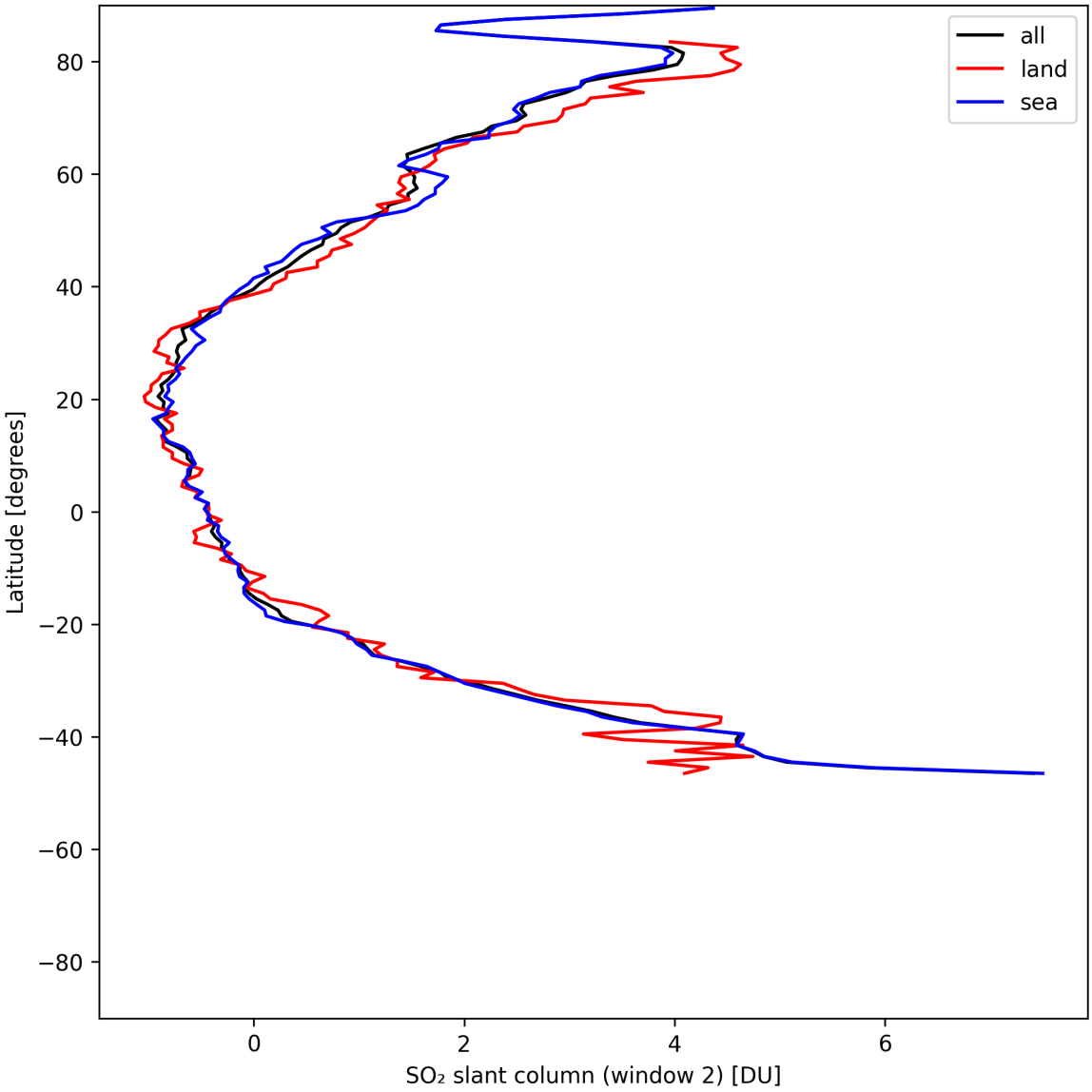


Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-06-04 to 2025-06-04.

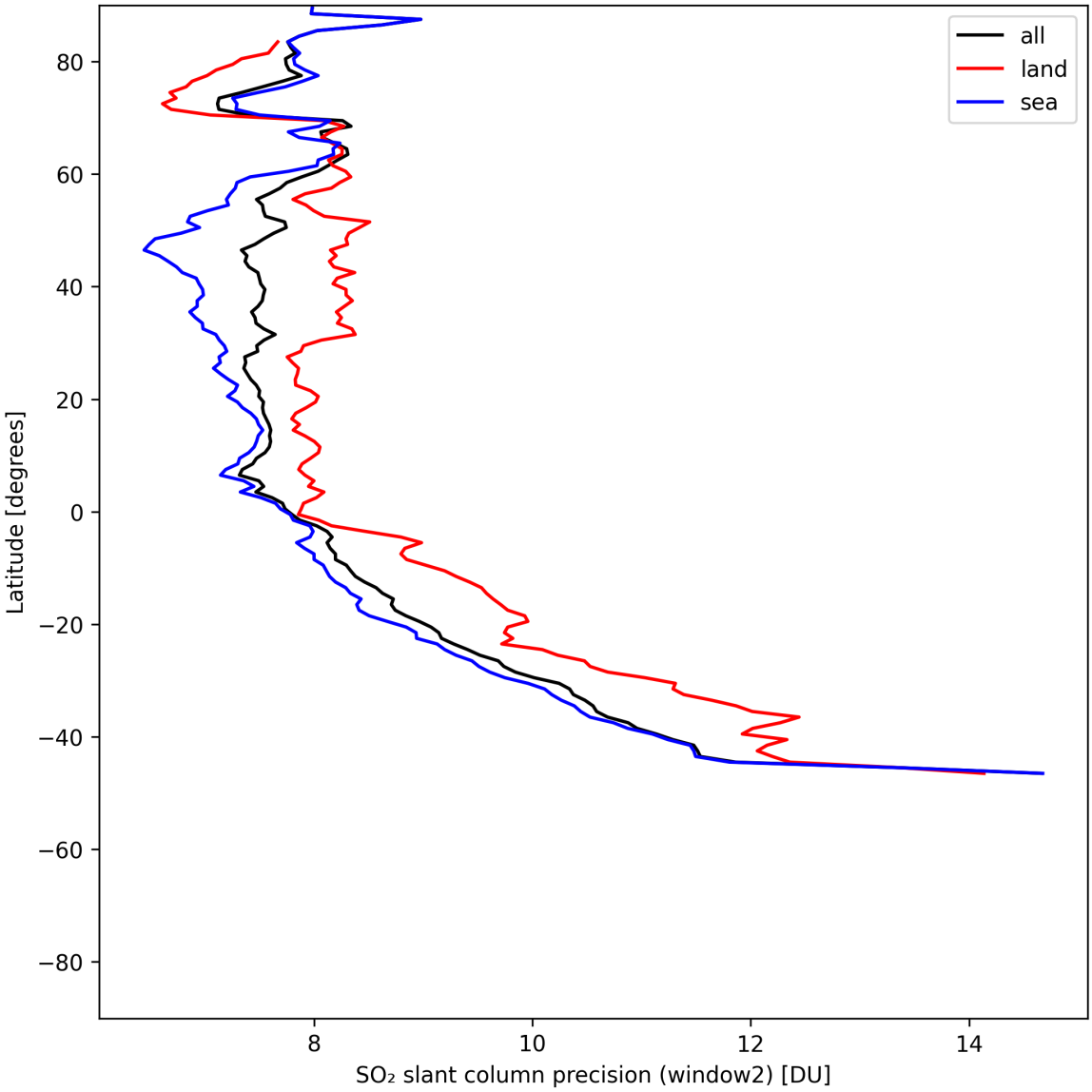


Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-06-04 to 2025-06-04.

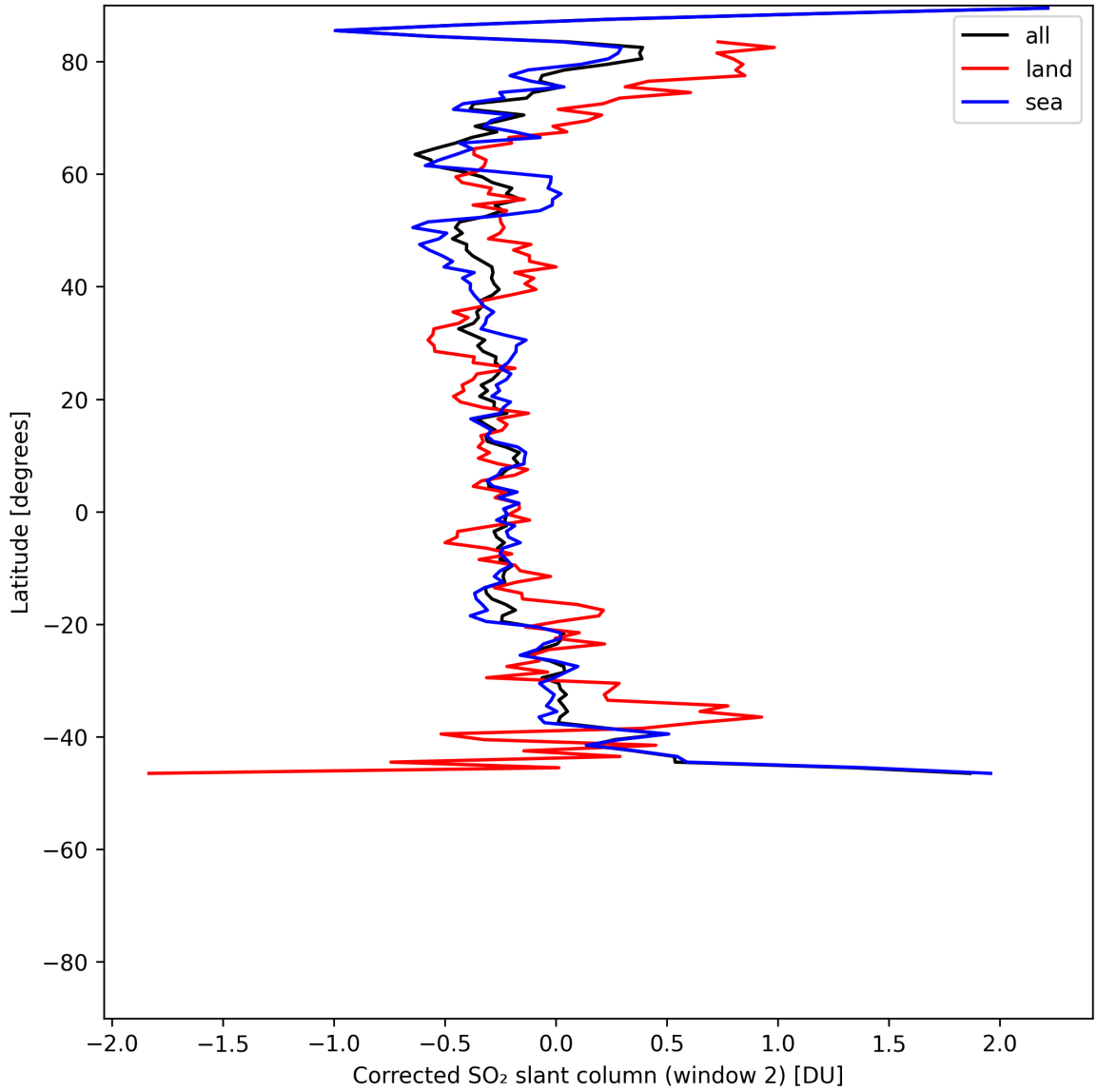


Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-06-04 to 2025-06-04.

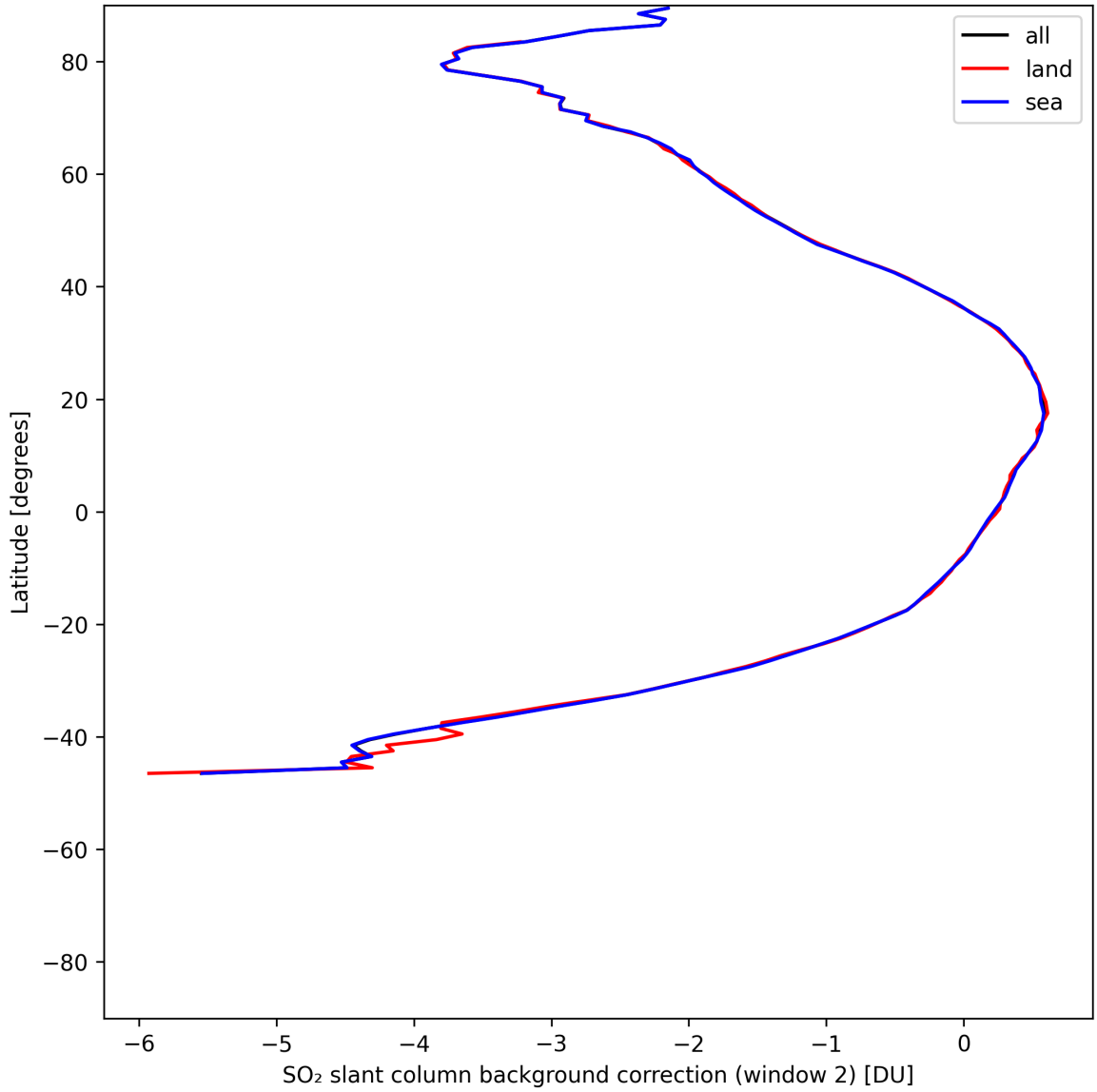


Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-06-04 to 2025-06-04.

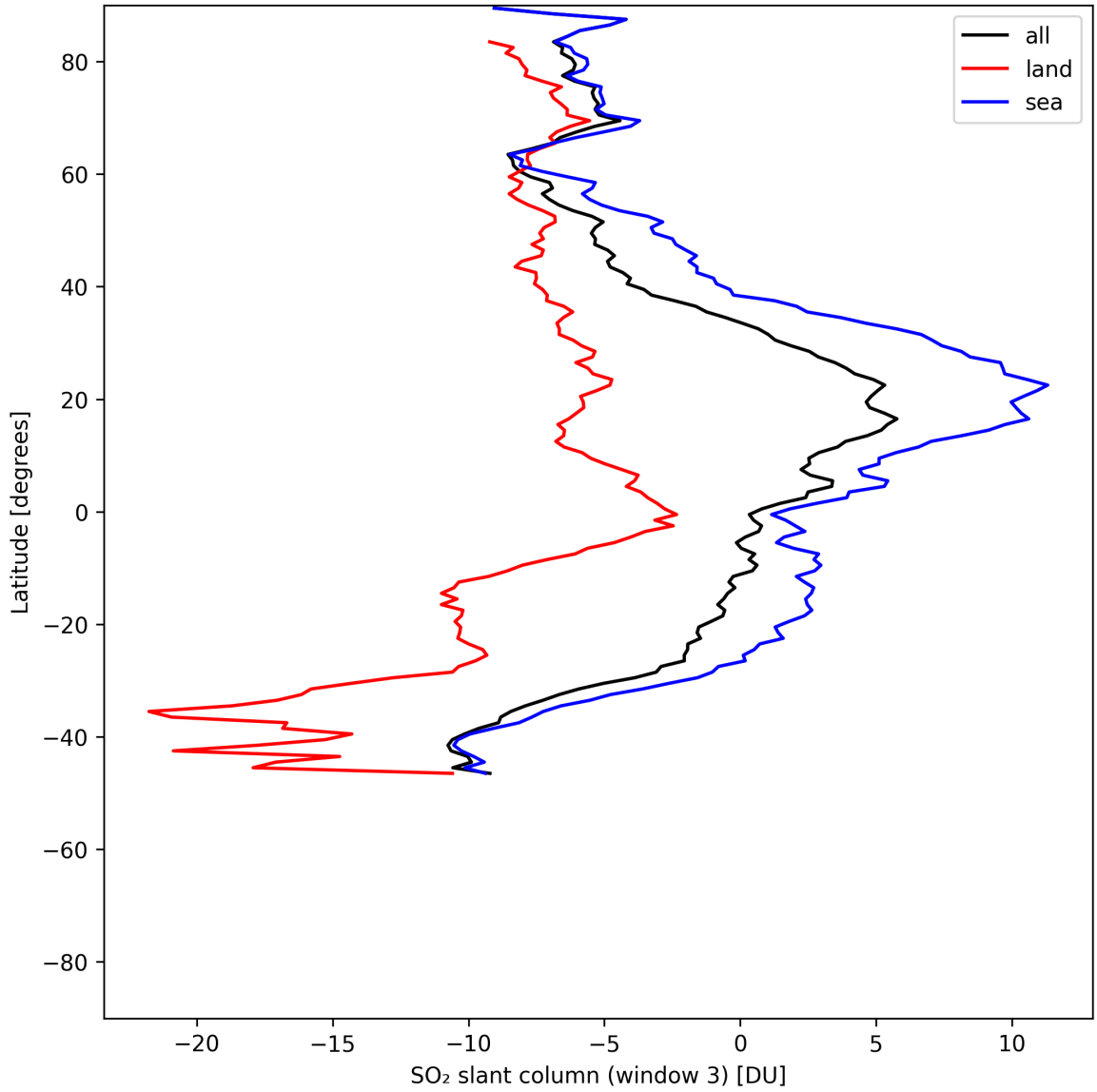


Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-06-04 to 2025-06-04.

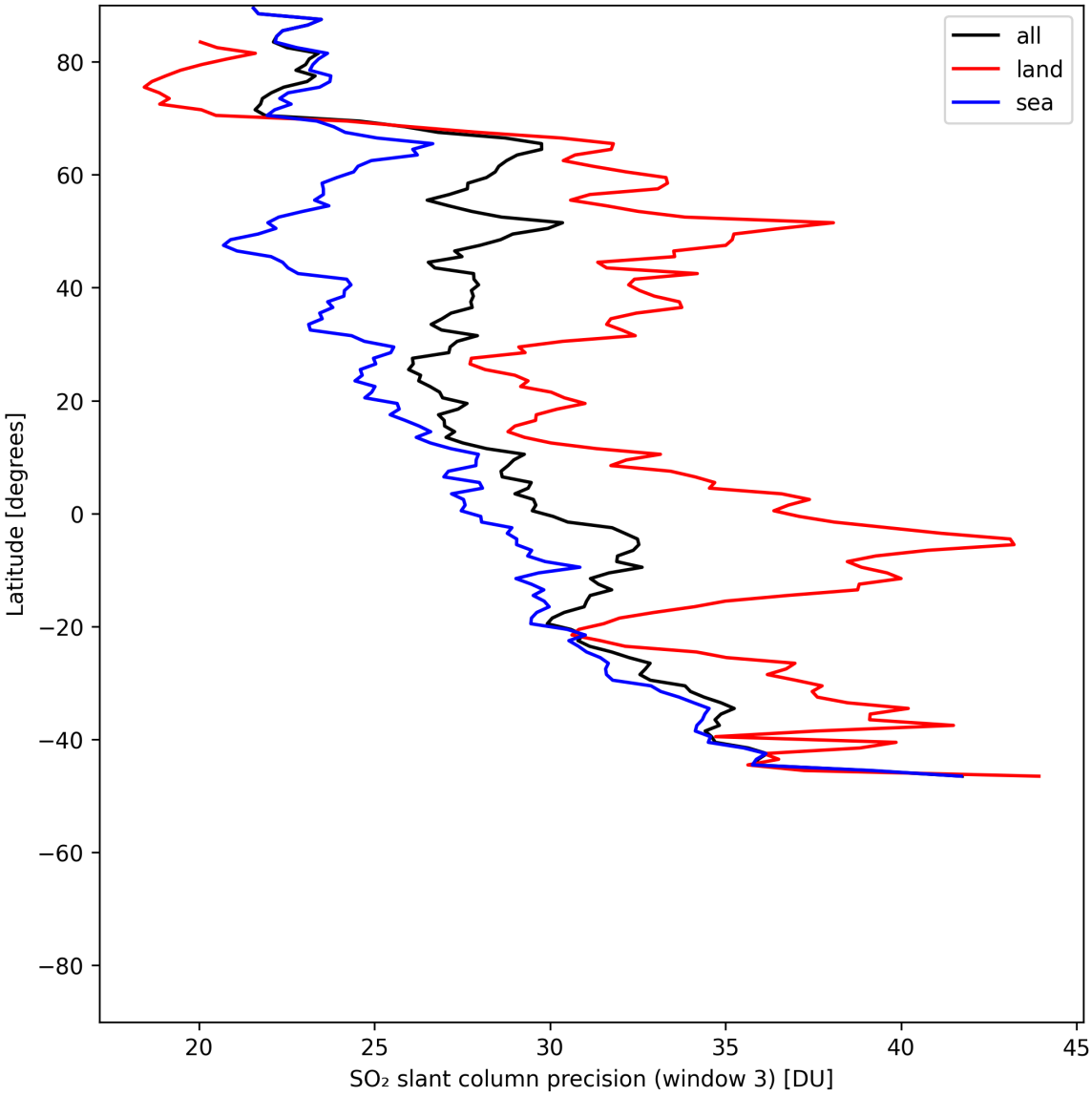


Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-06-04 to 2025-06-04.

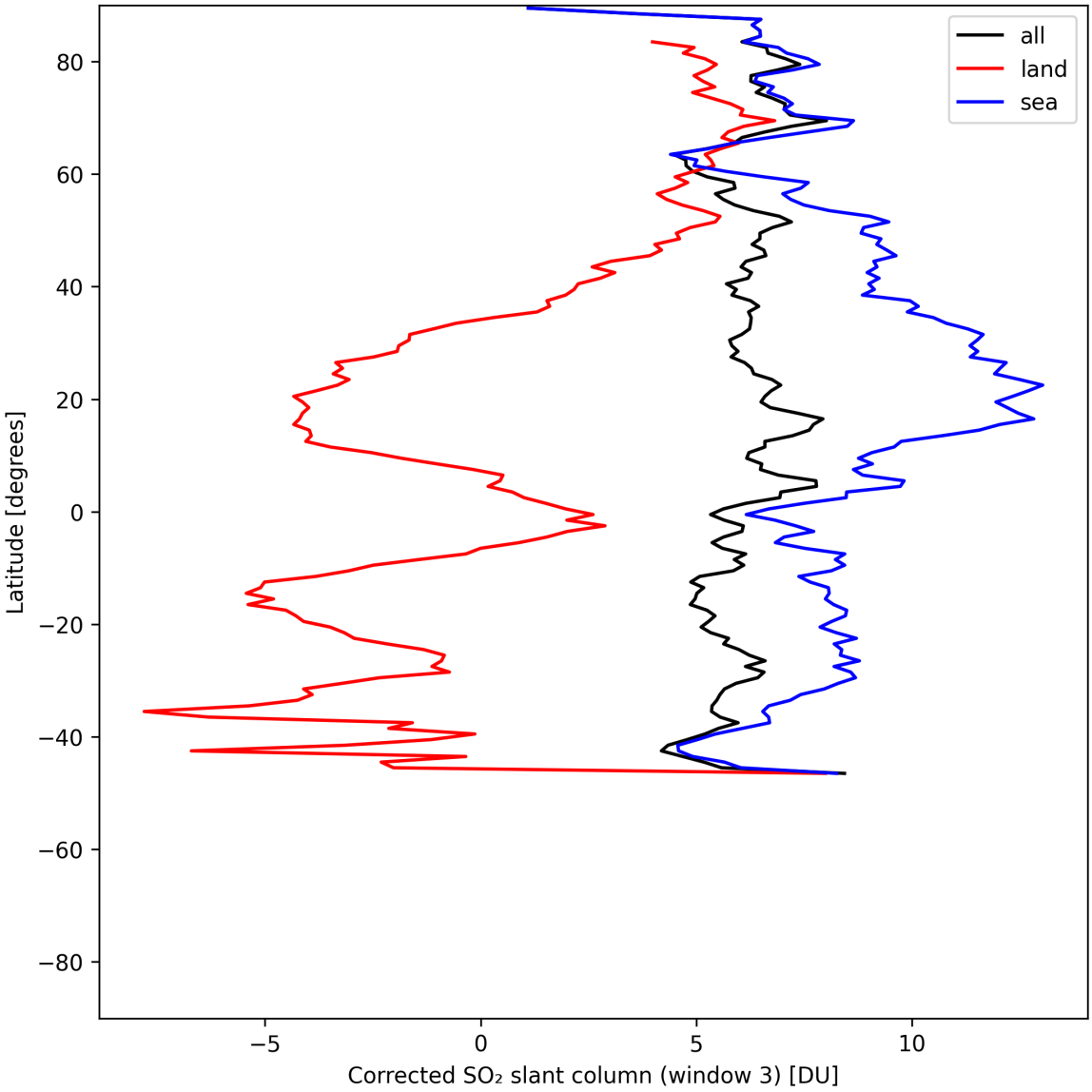


Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-06-04 to 2025-06-04.

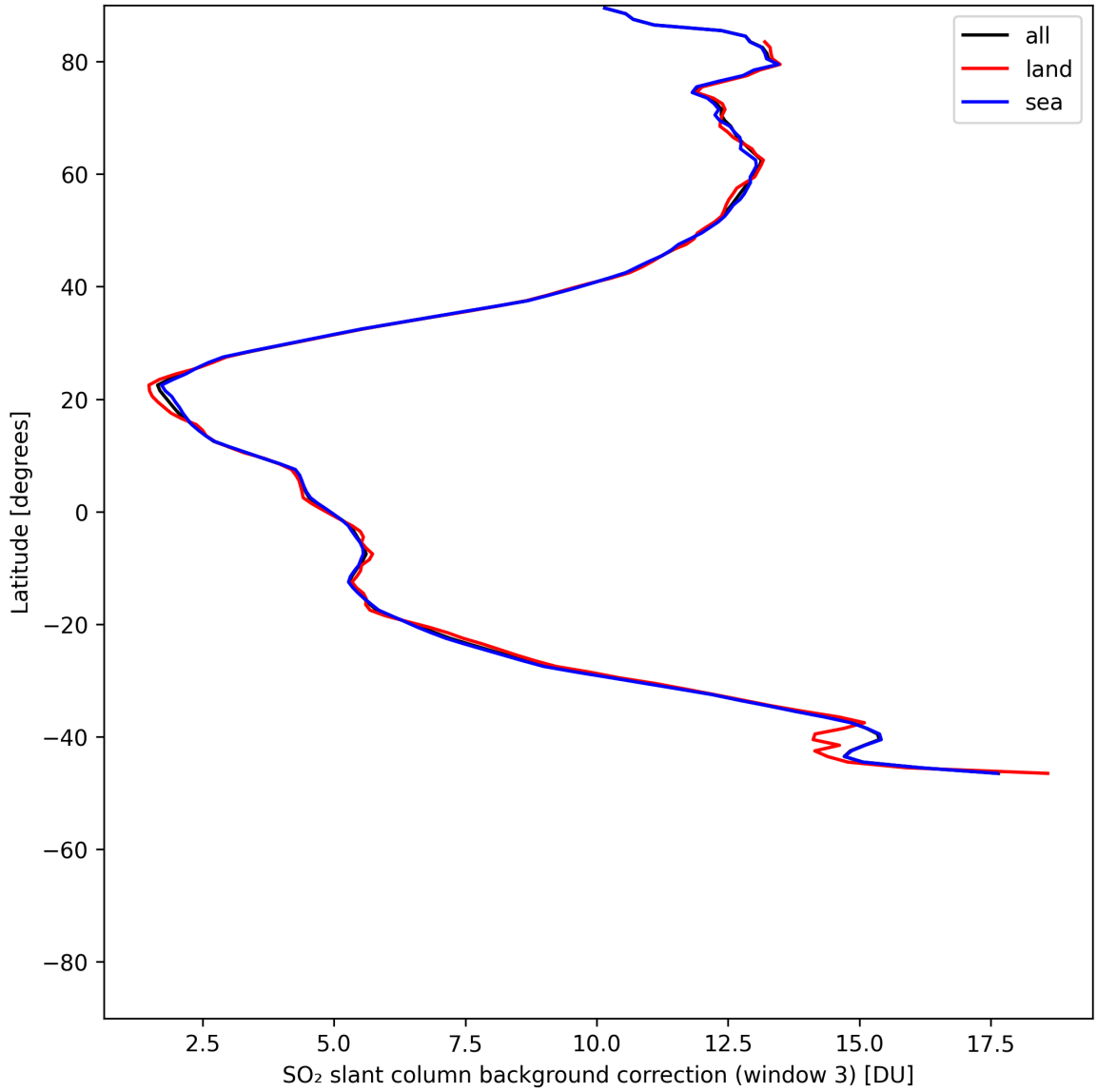


Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-06-04 to 2025-06-04.

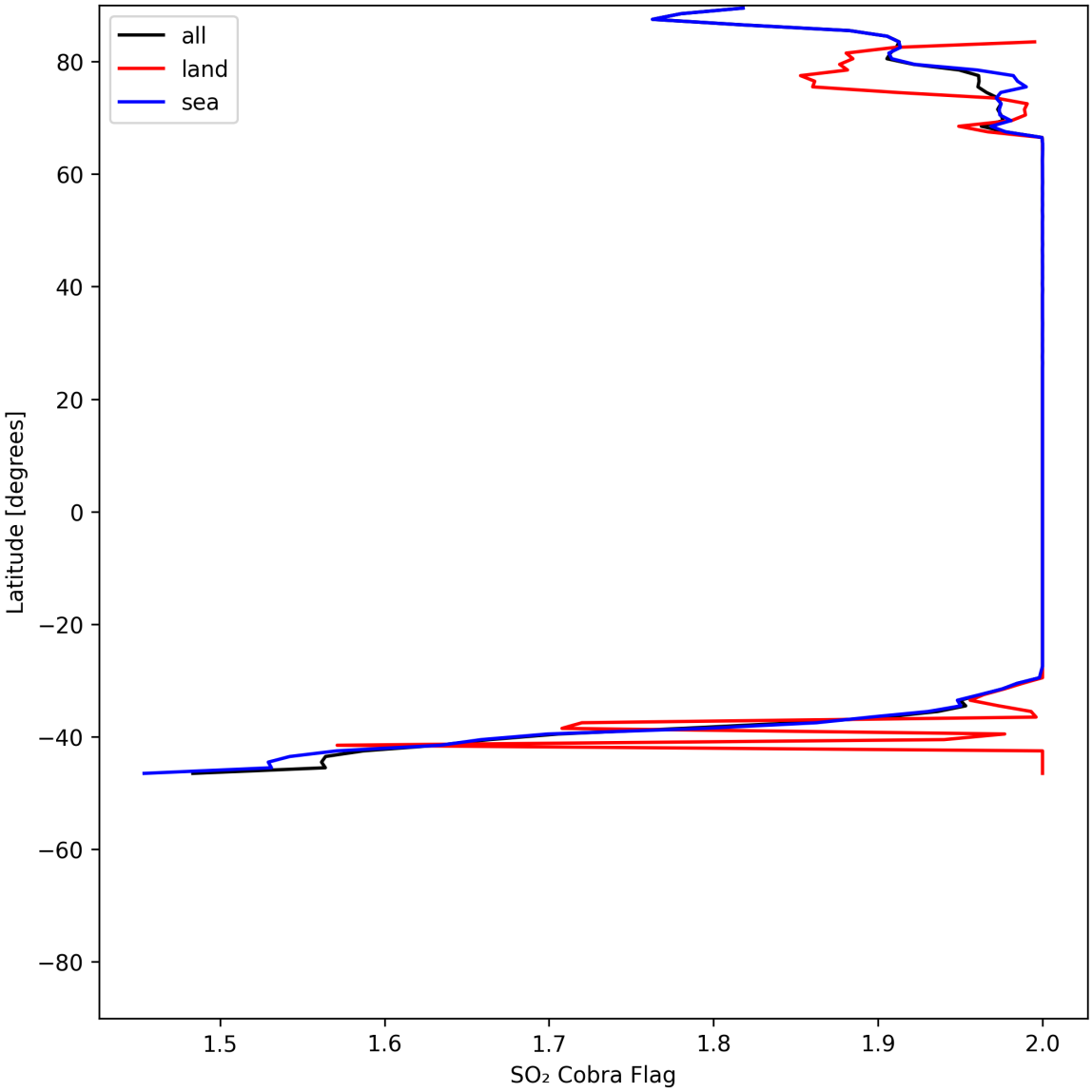


Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-06-04 to 2025-06-04.

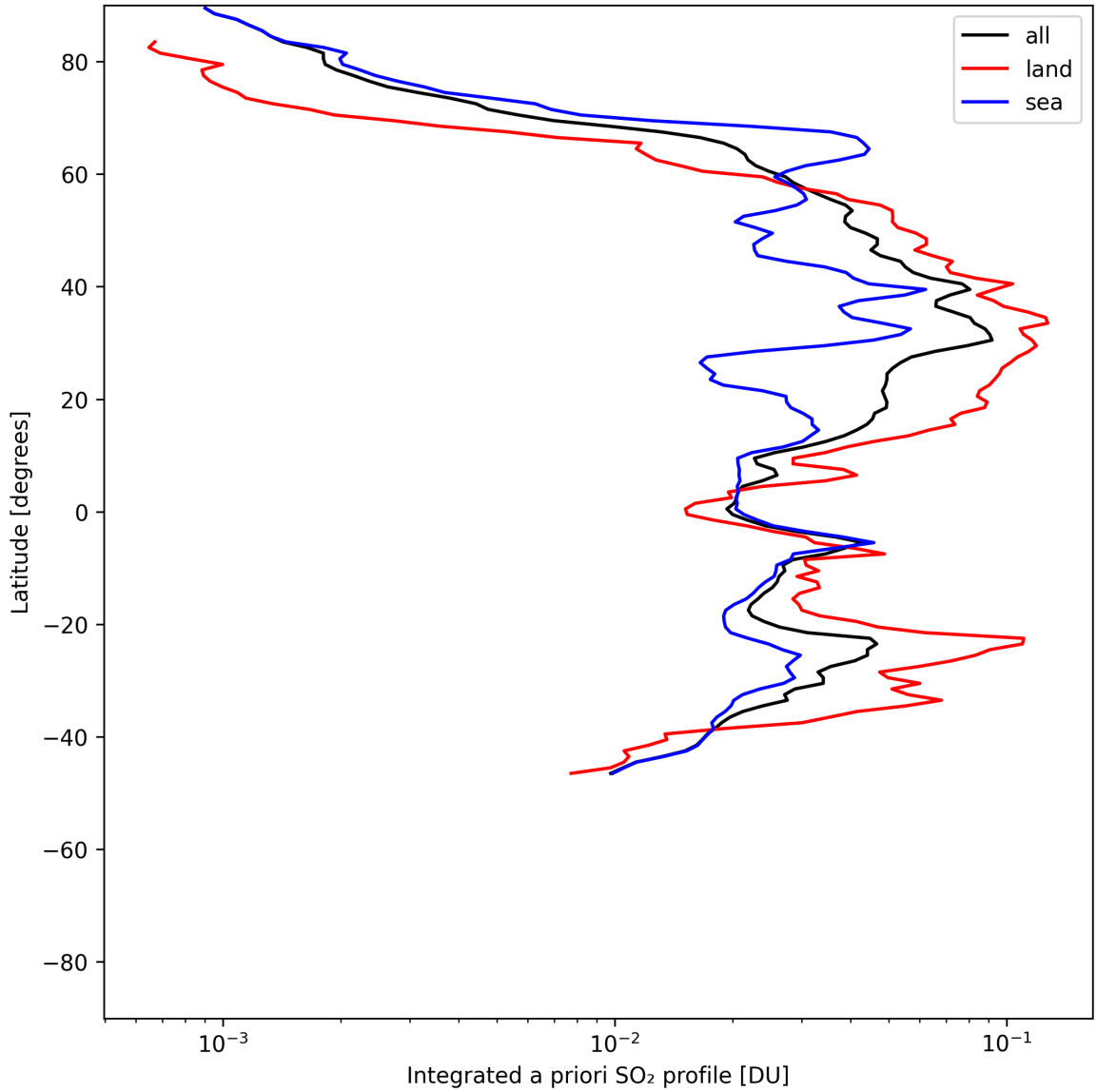


Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-06-04 to 2025-06-04.

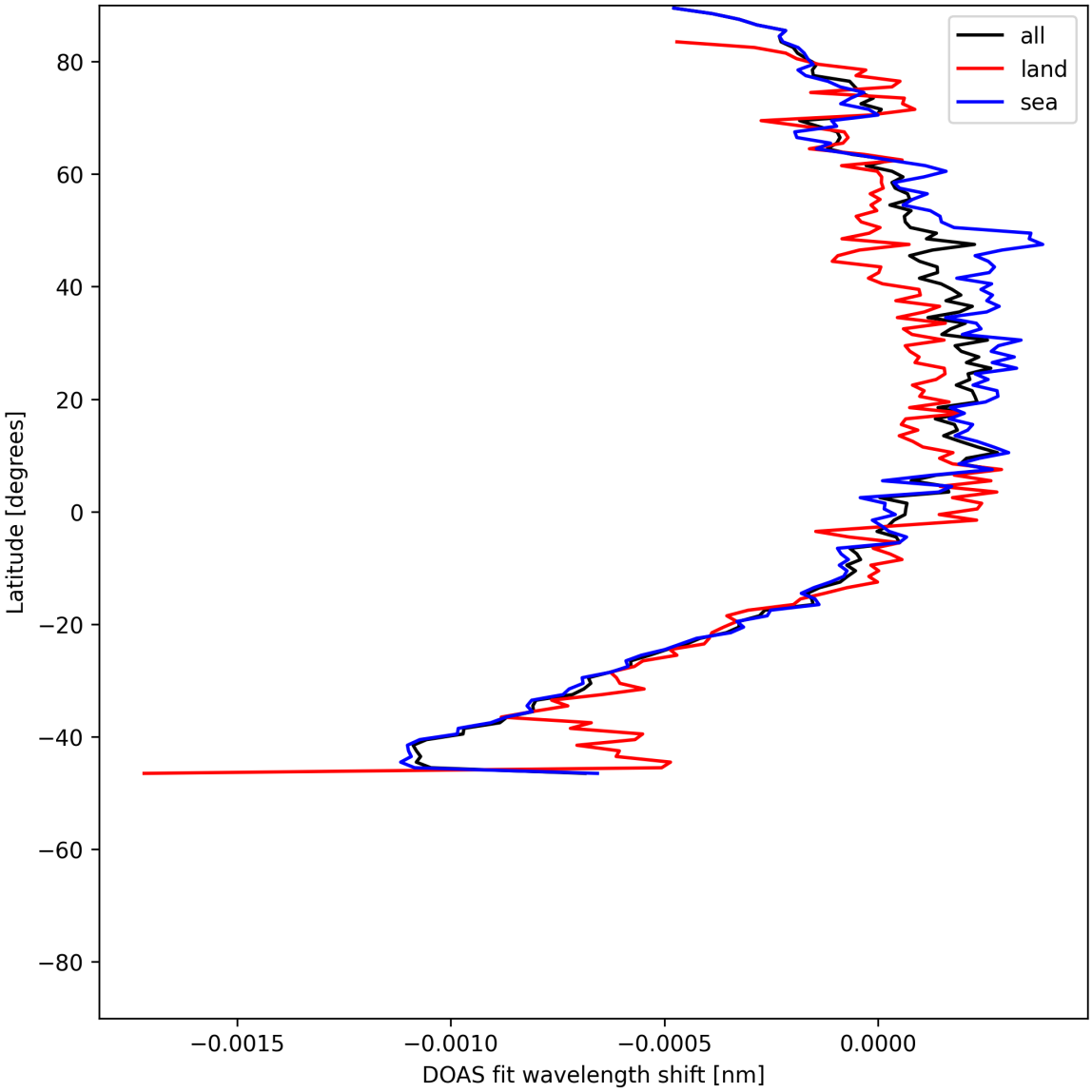


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-06-04 to 2025-06-04.

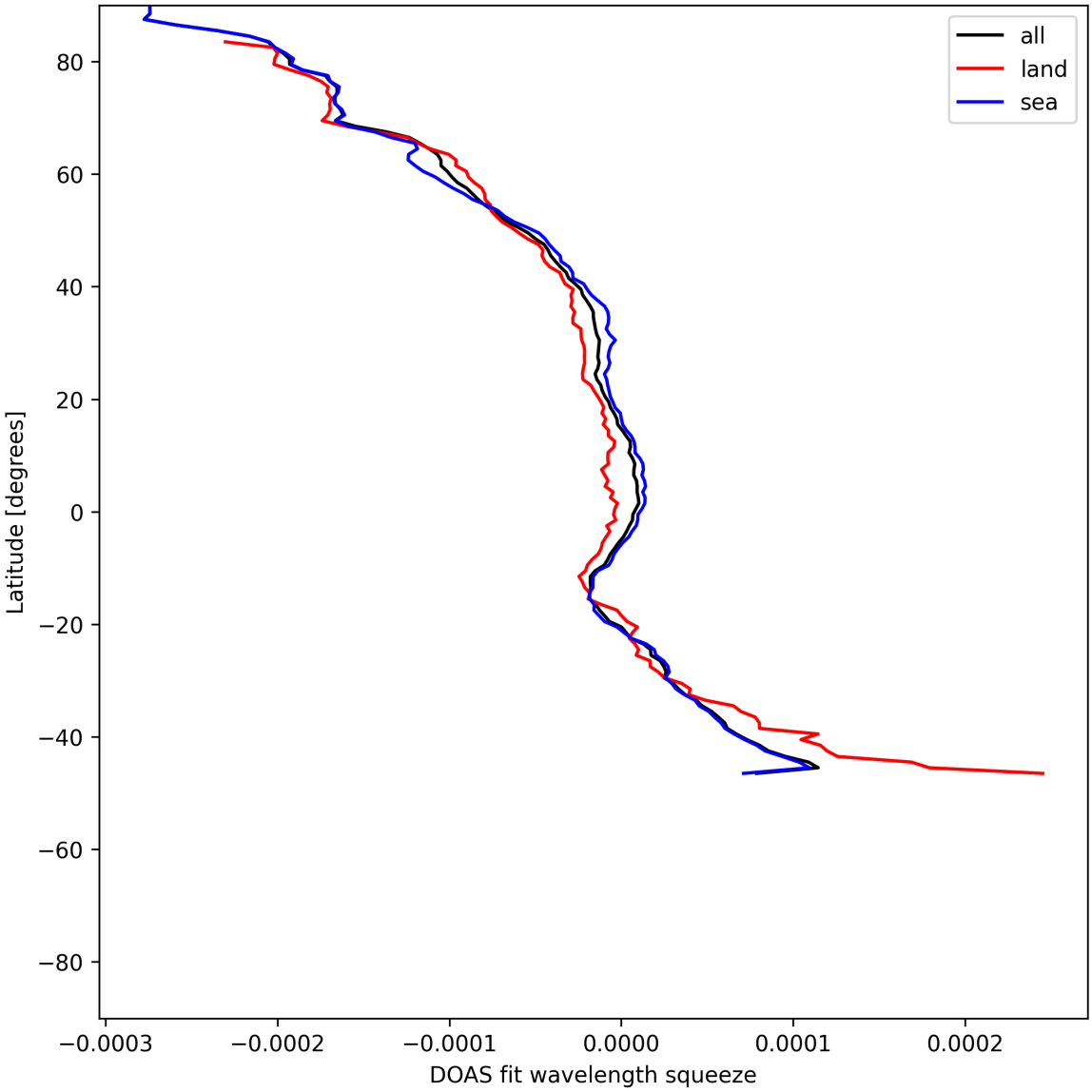


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-06-04 to 2025-06-04.

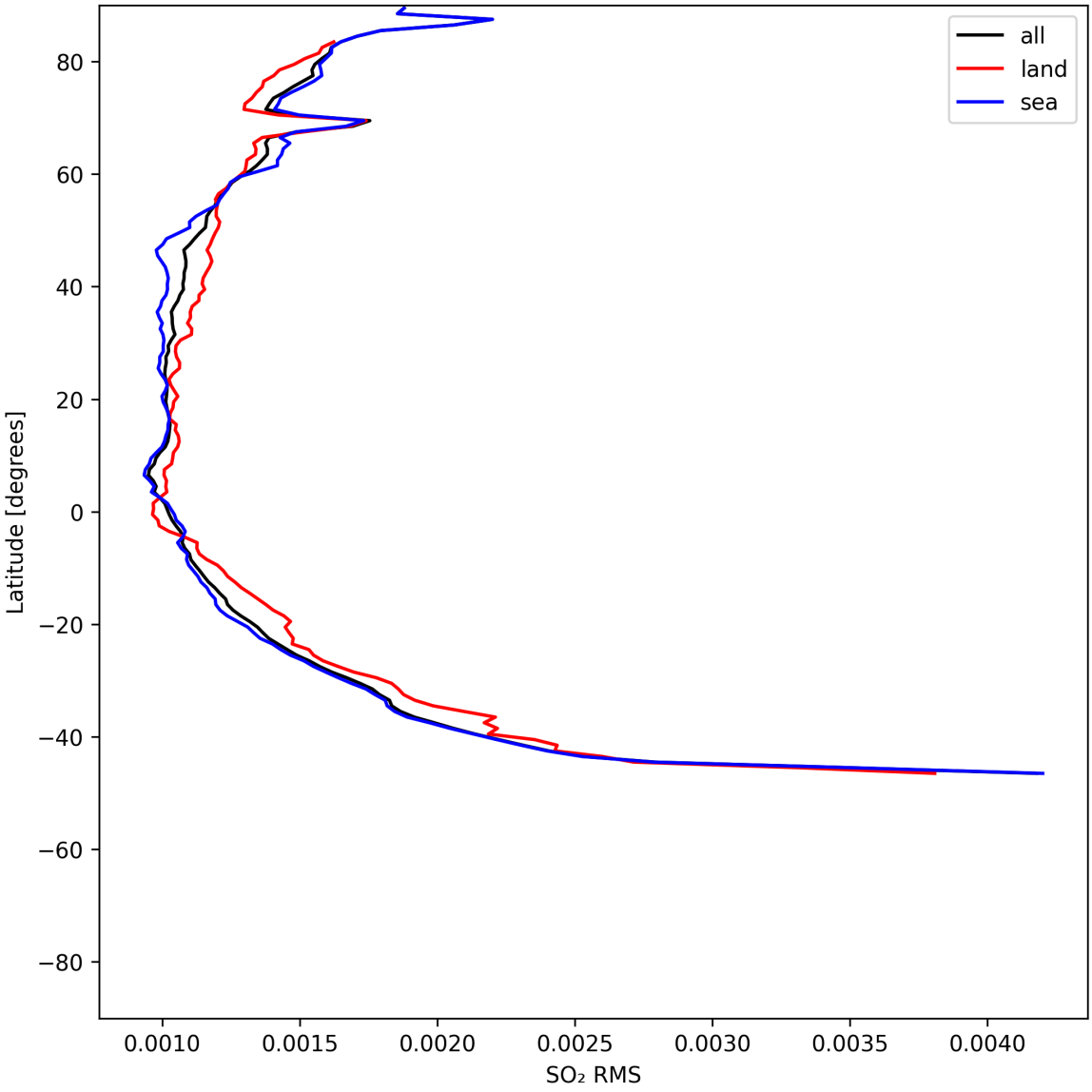


Figure 52: Zonal average of "SO_2 RMS" for 2025-06-04 to 2025-06-04.

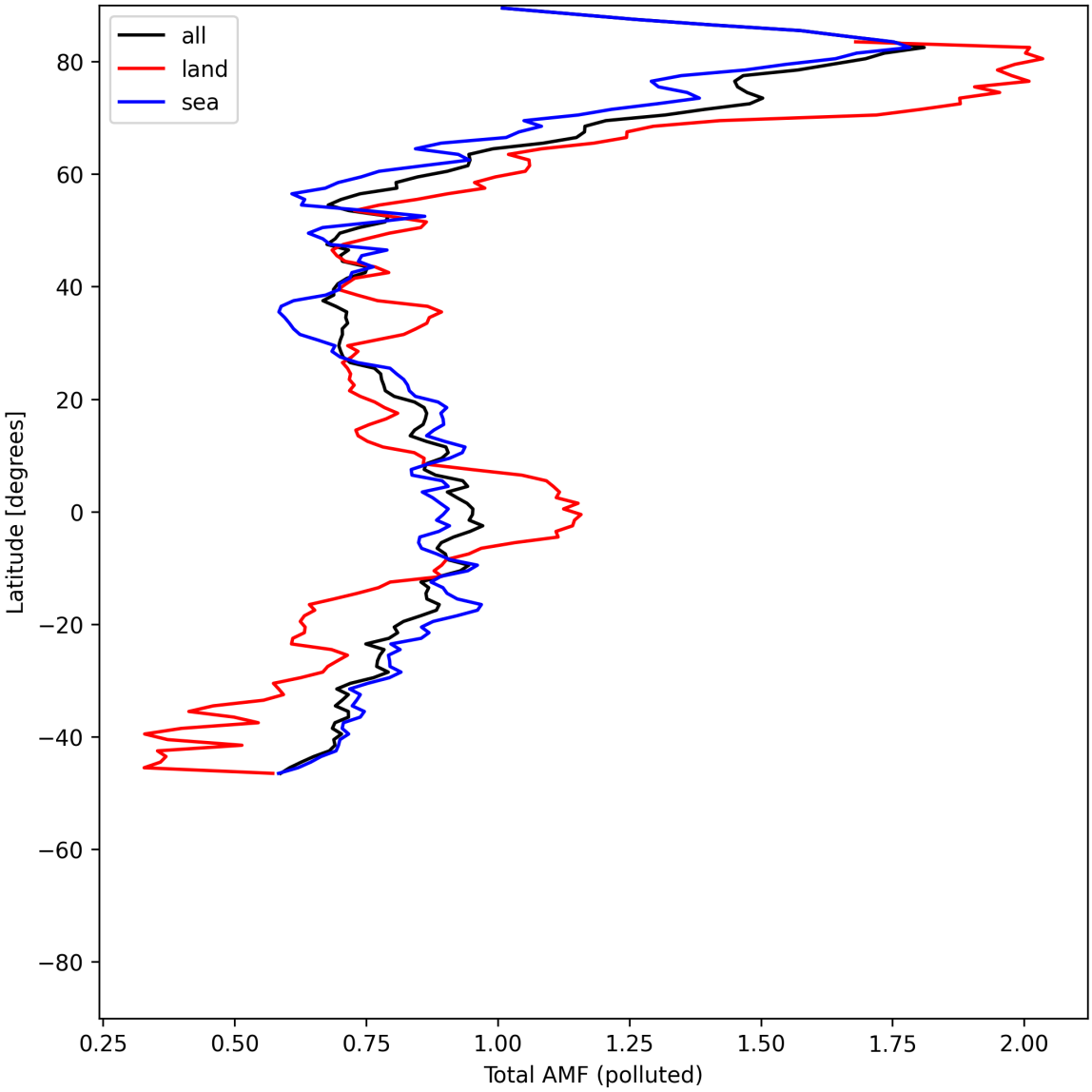


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-06-04 to 2025-06-04.

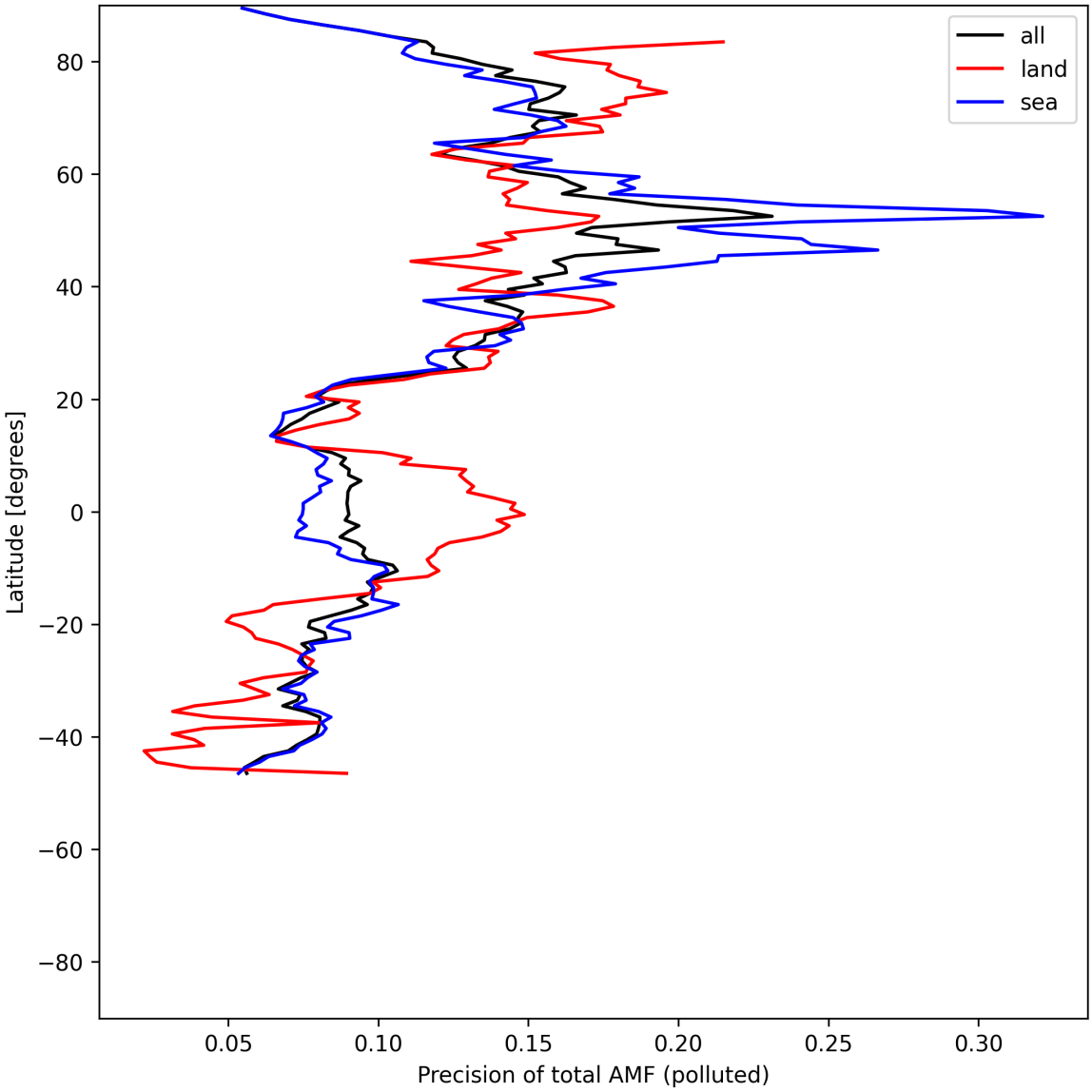


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-06-04 to 2025-06-04.

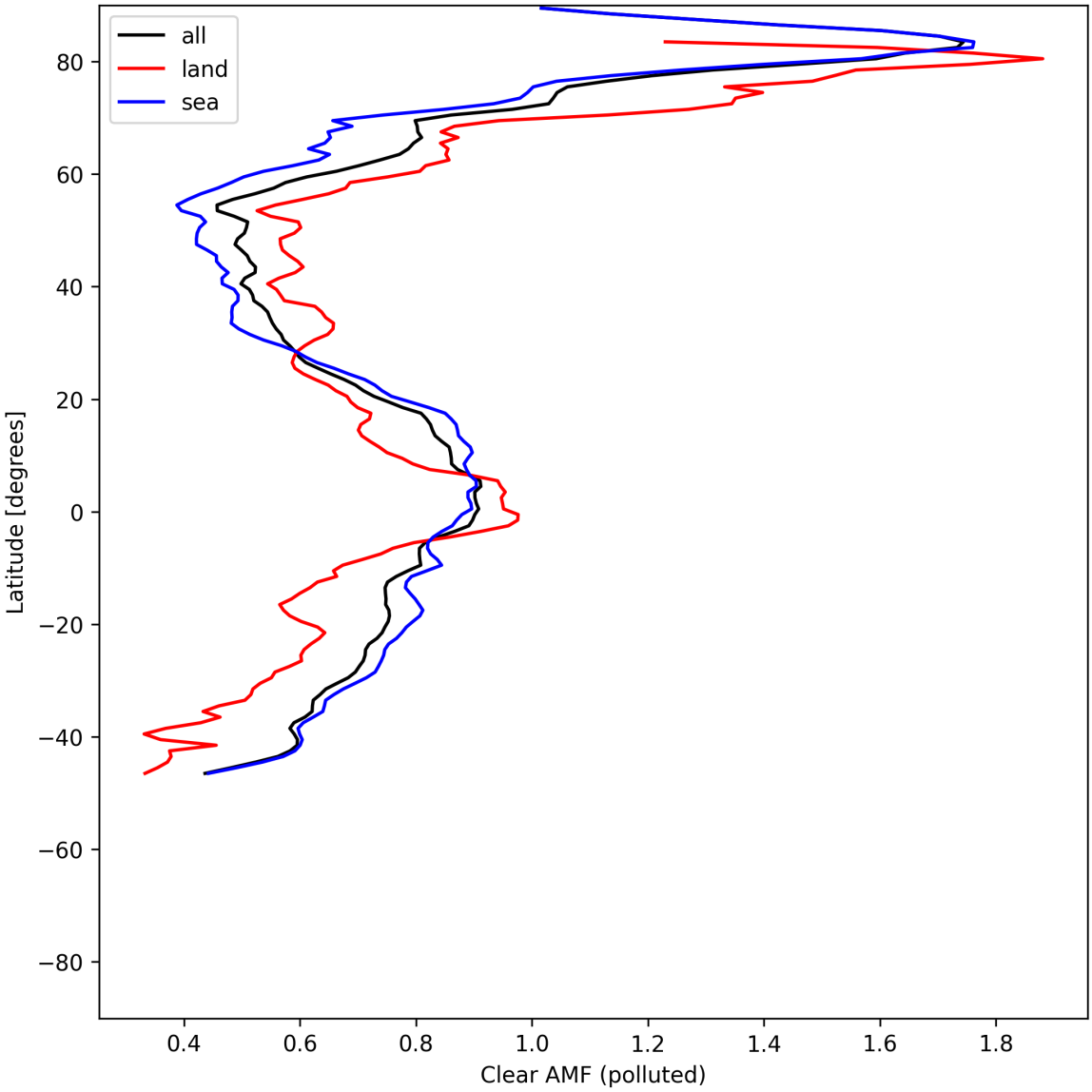


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-06-04 to 2025-06-04.

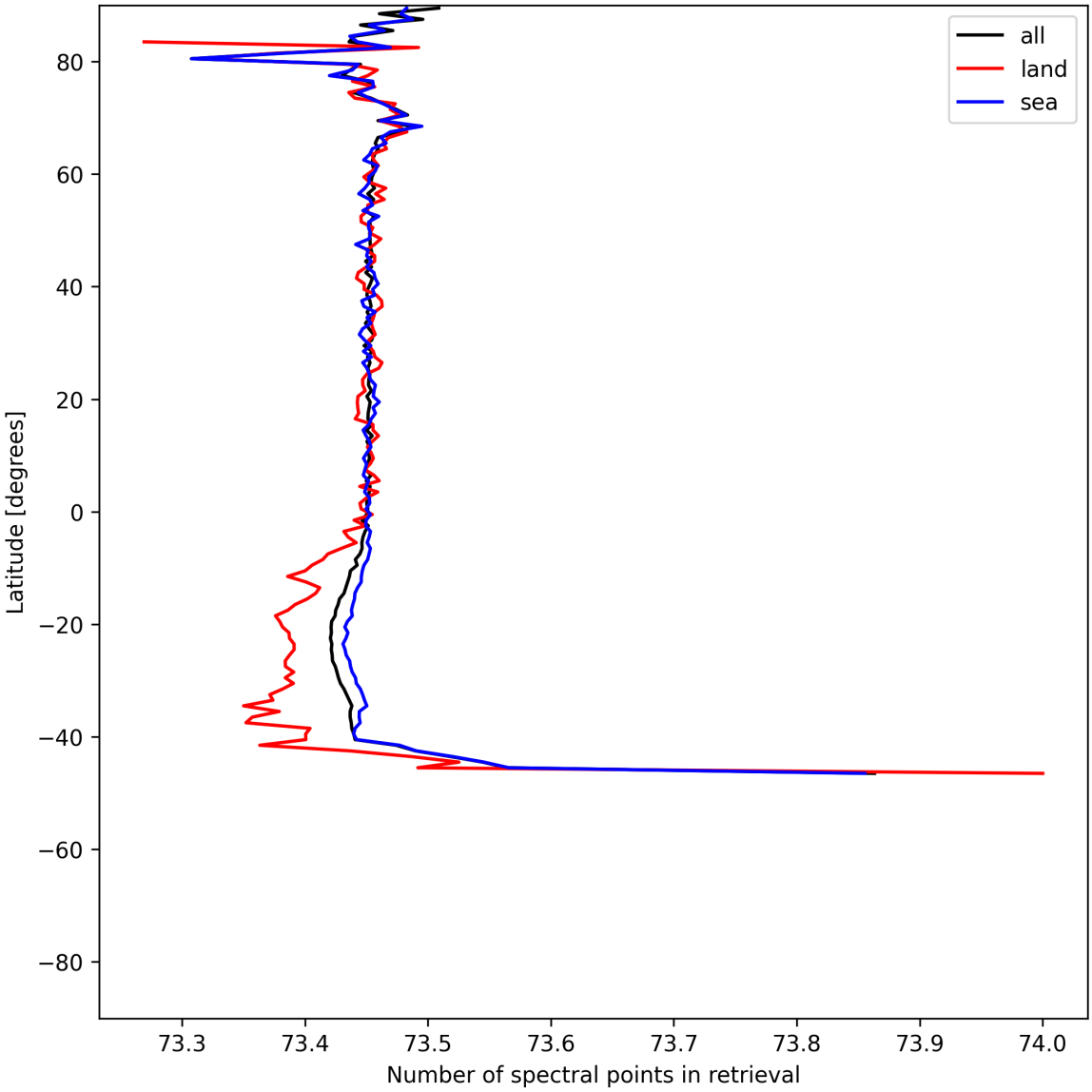


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-06-04 to 2025-06-04.

8 Histograms

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

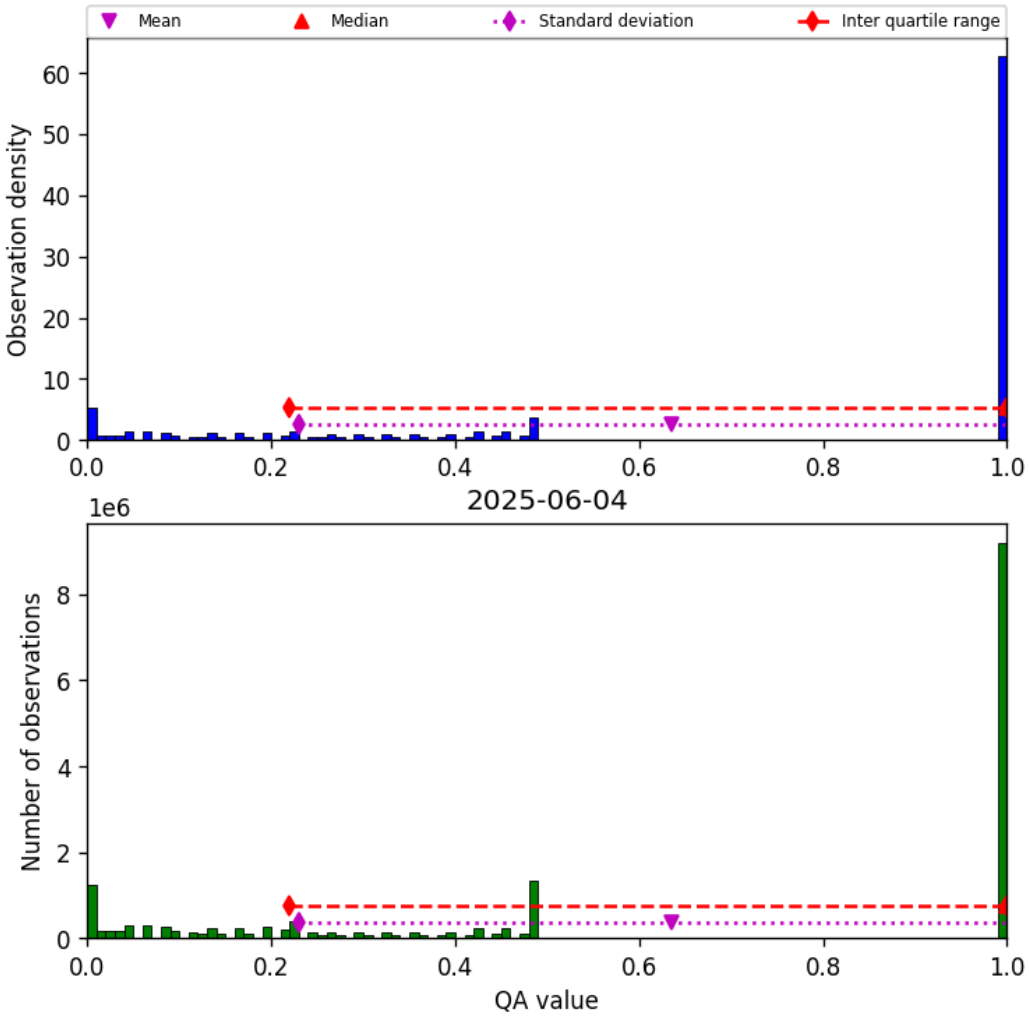


Figure 57: Histogram of “QA value” for 2025-06-04 to 2025-06-04

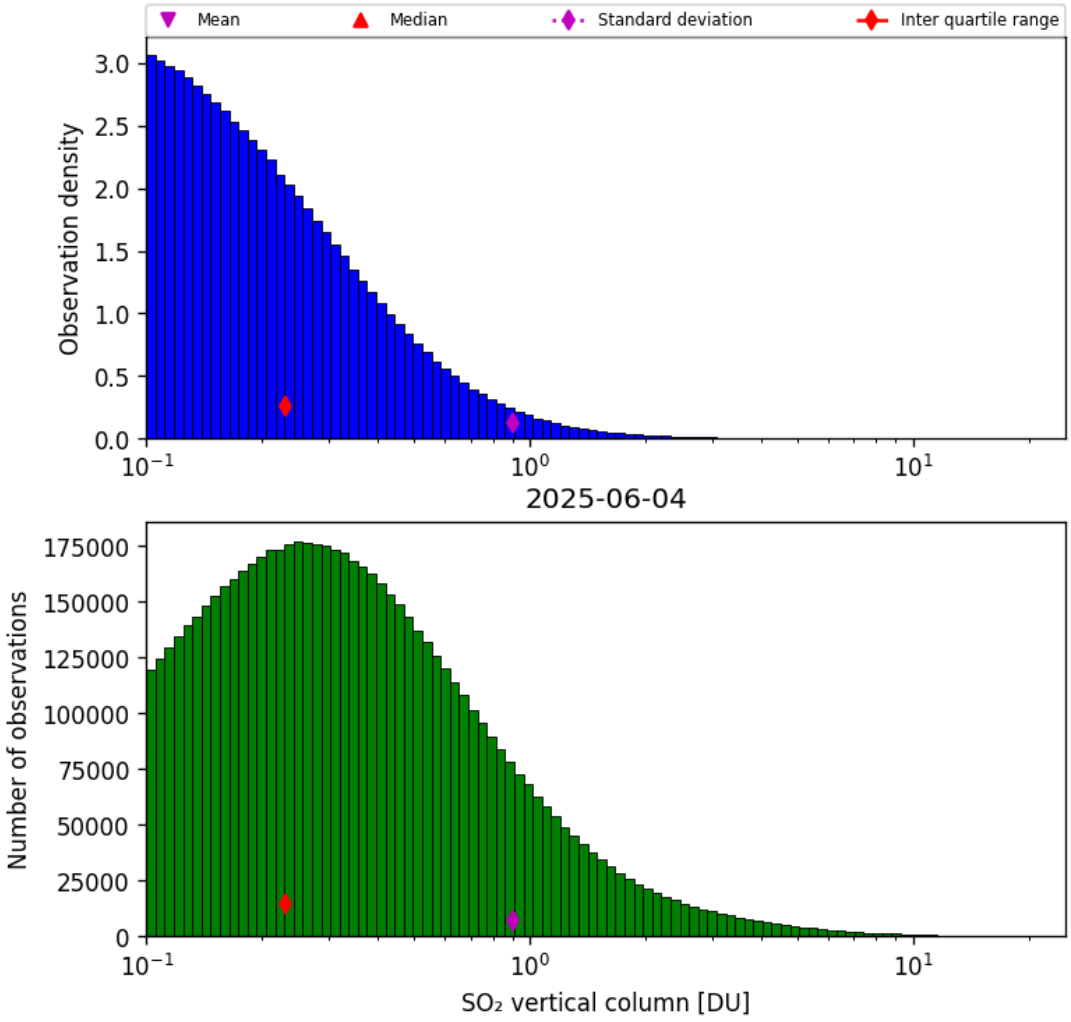


Figure 58: Histogram of "SO_2 vertical column" for 2025-06-04 to 2025-06-04

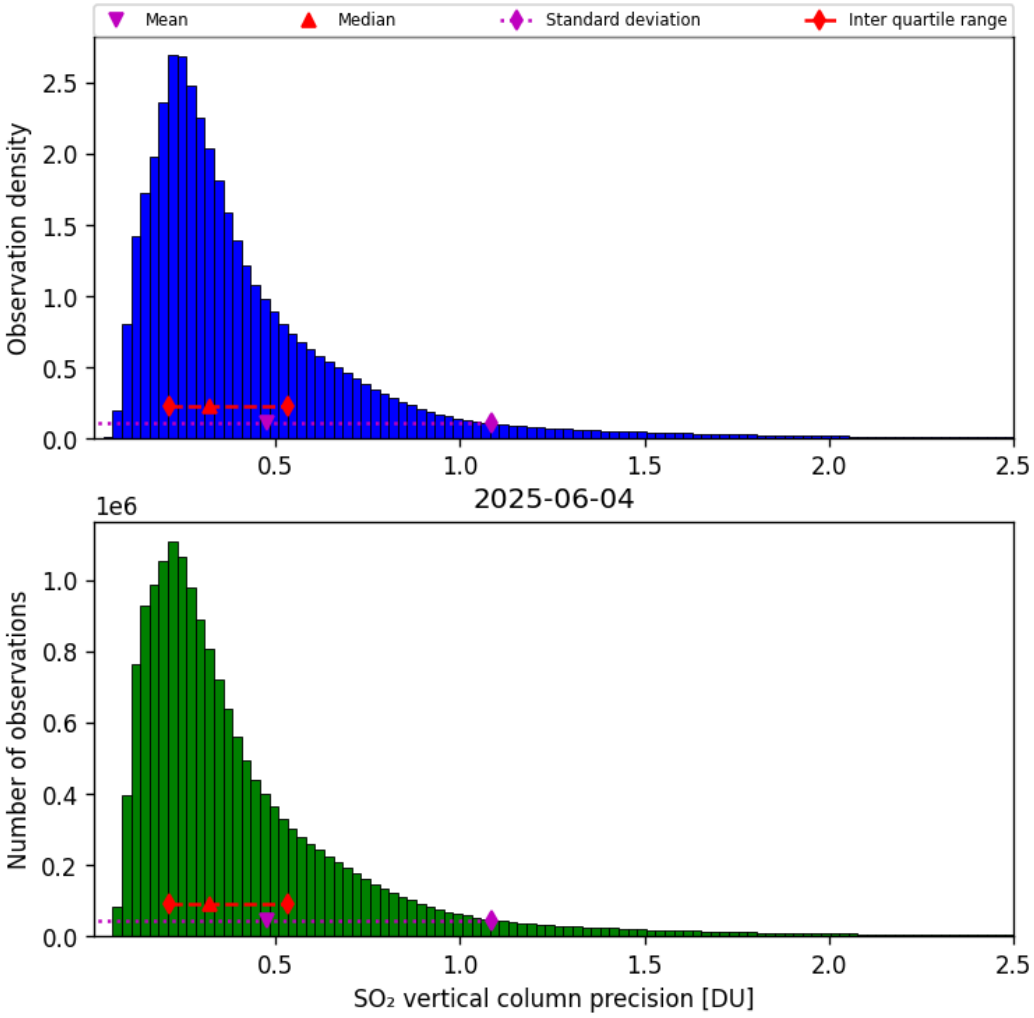


Figure 59: Histogram of "SO_2 vertical column precision" for 2025-06-04 to 2025-06-04

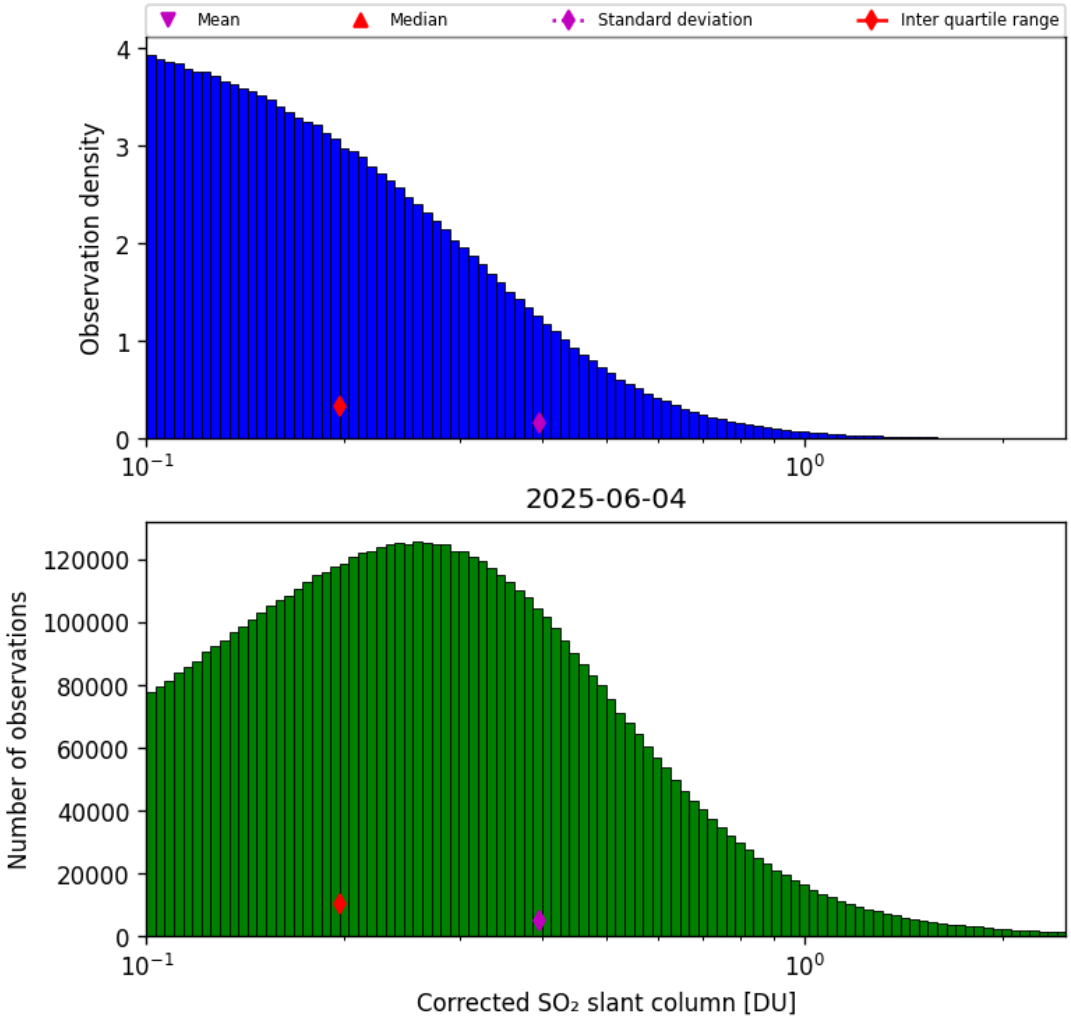


Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-06-04 to 2025-06-04

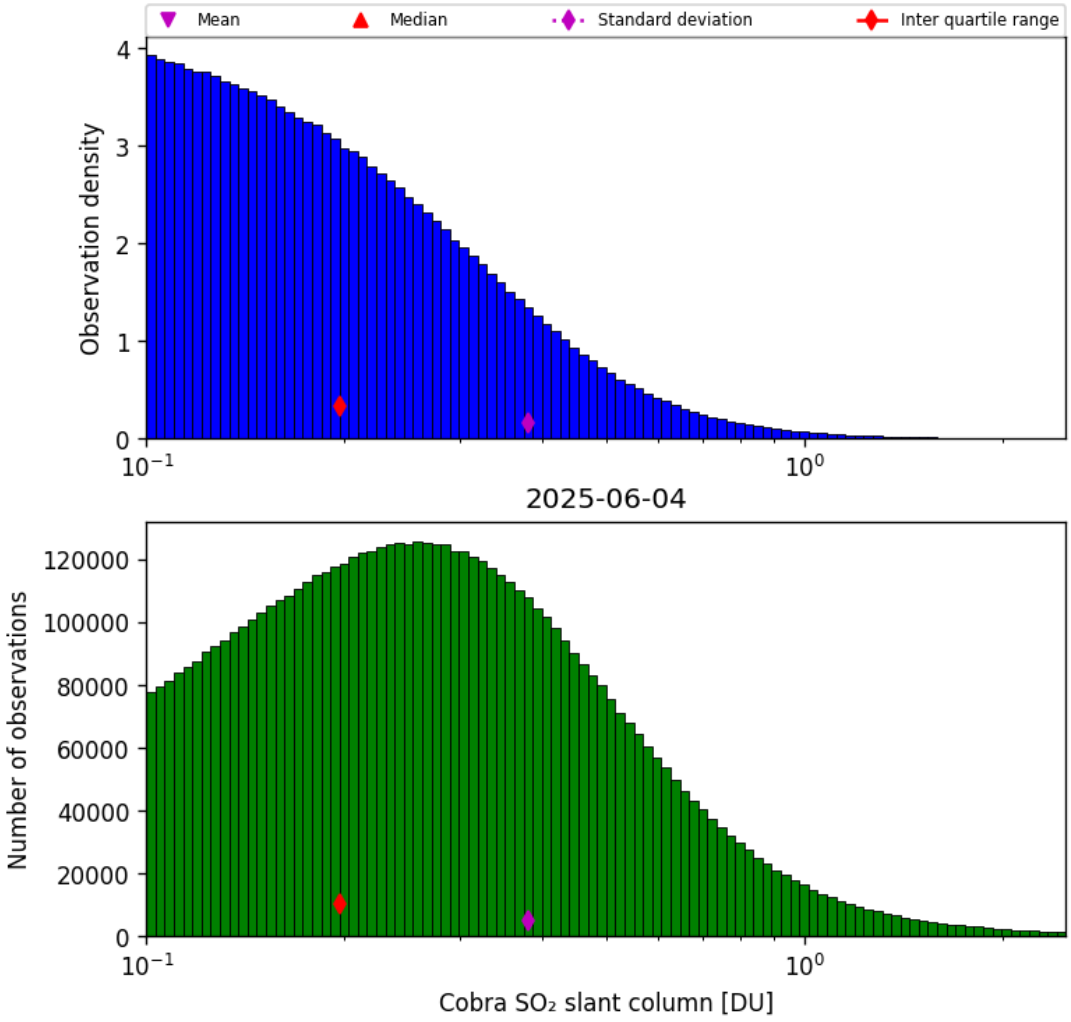


Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-06-04 to 2025-06-04

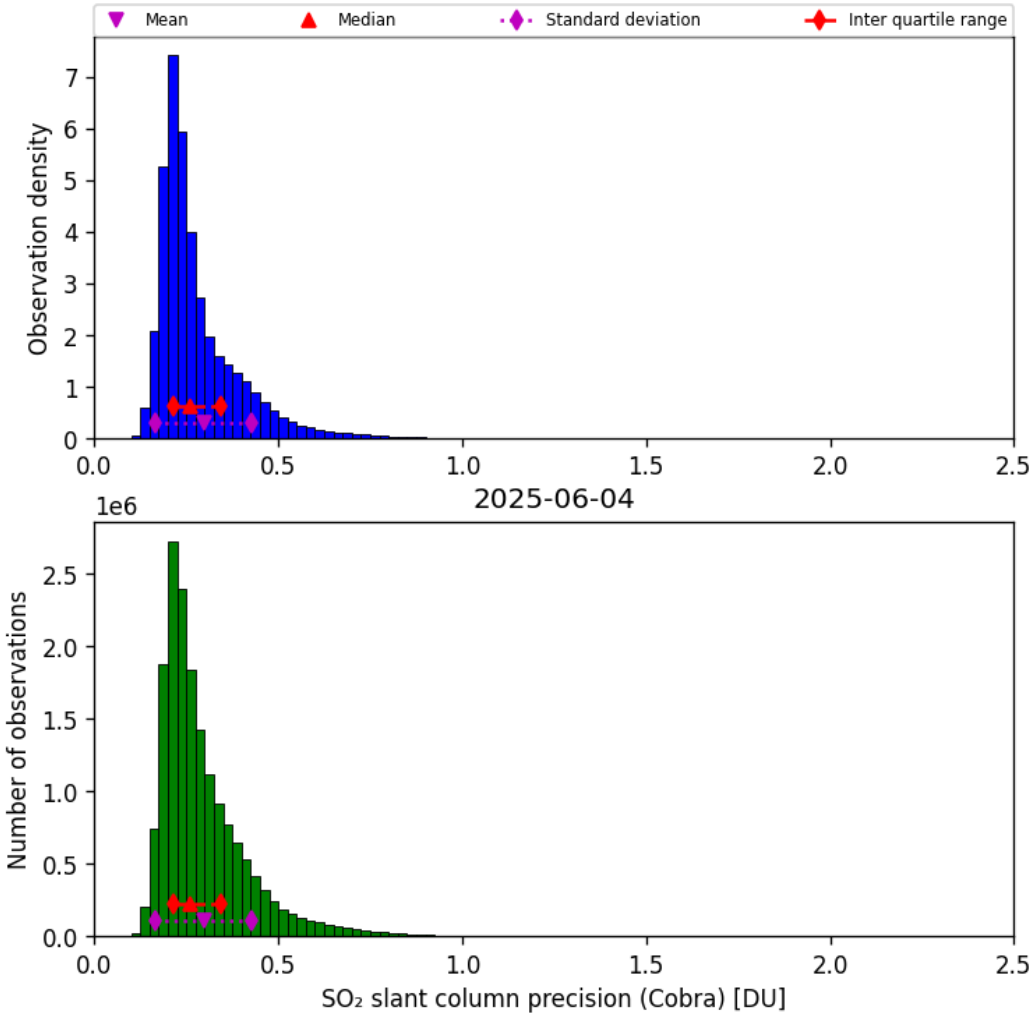


Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-06-04 to 2025-06-04

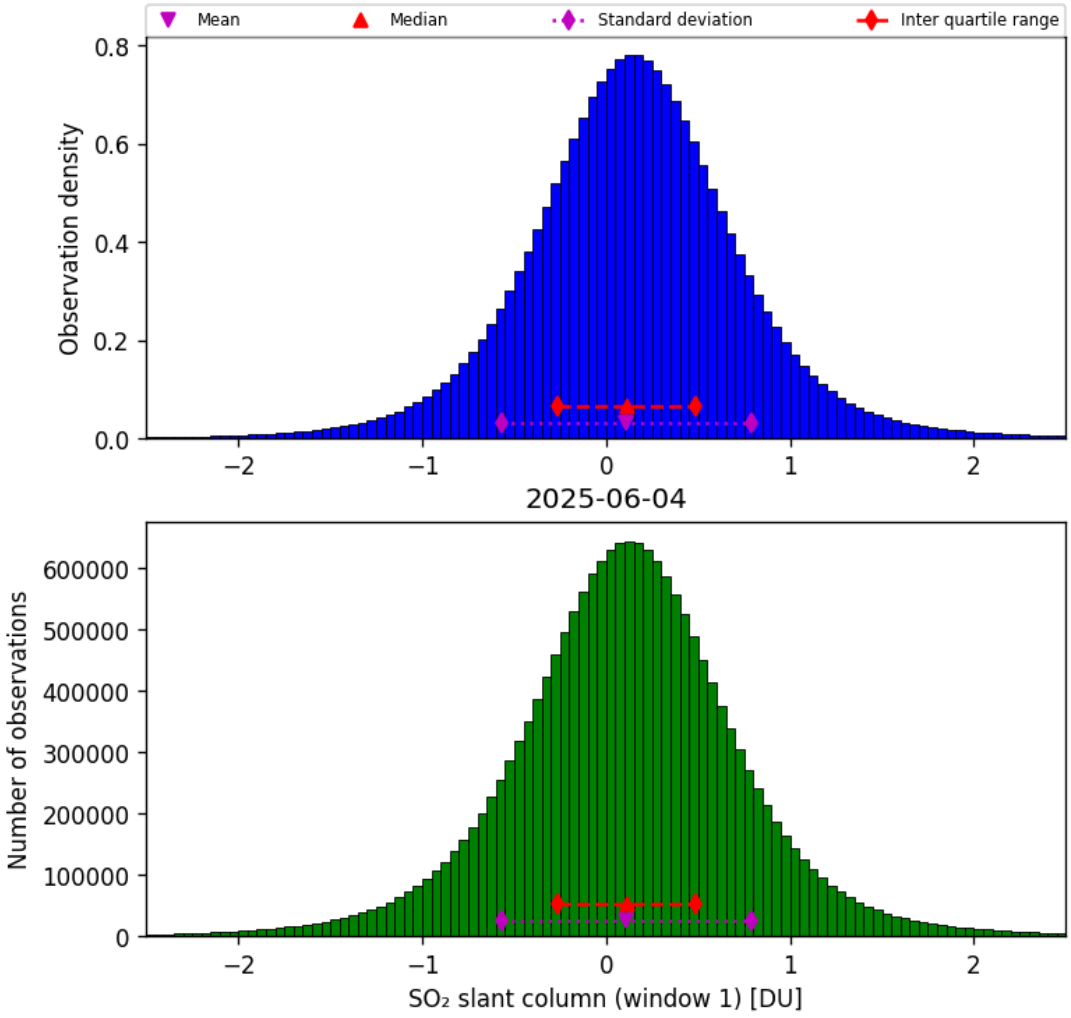


Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-06-04 to 2025-06-04

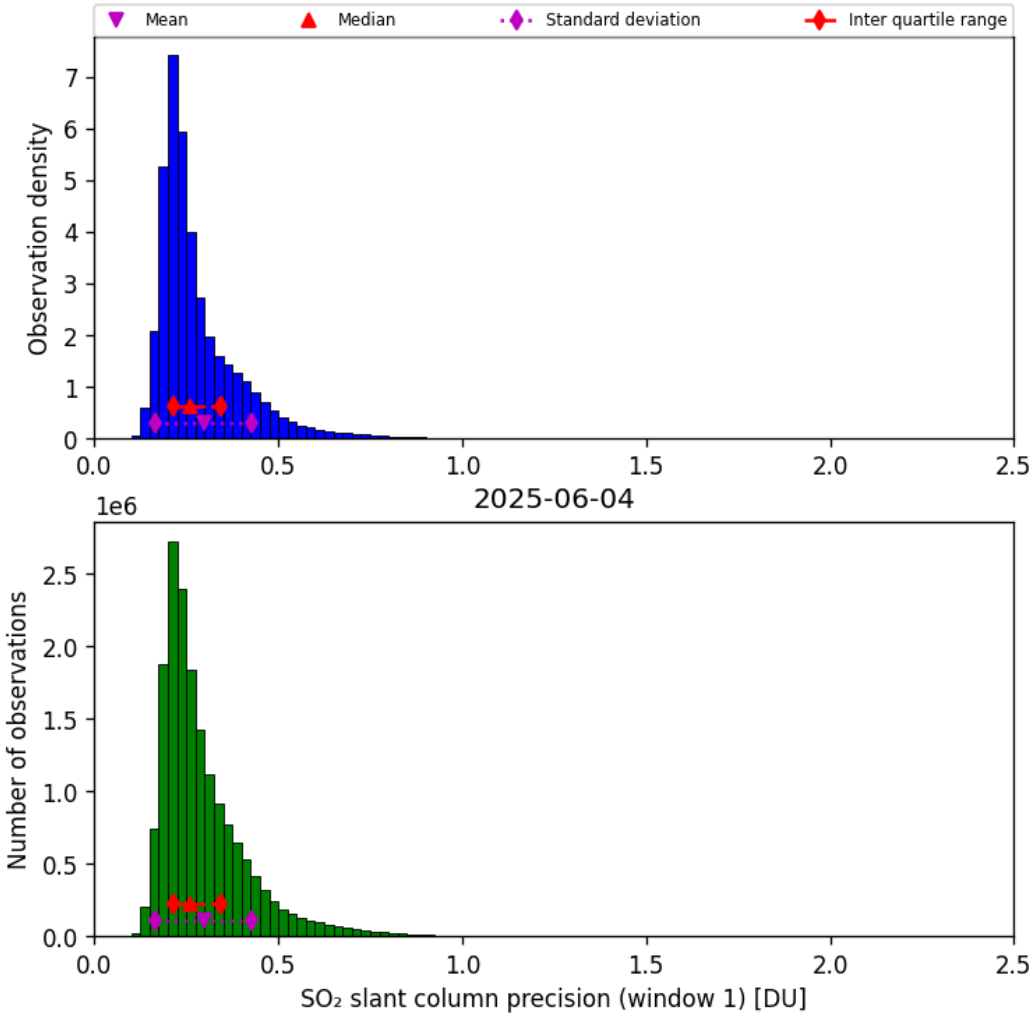


Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-06-04 to 2025-06-04

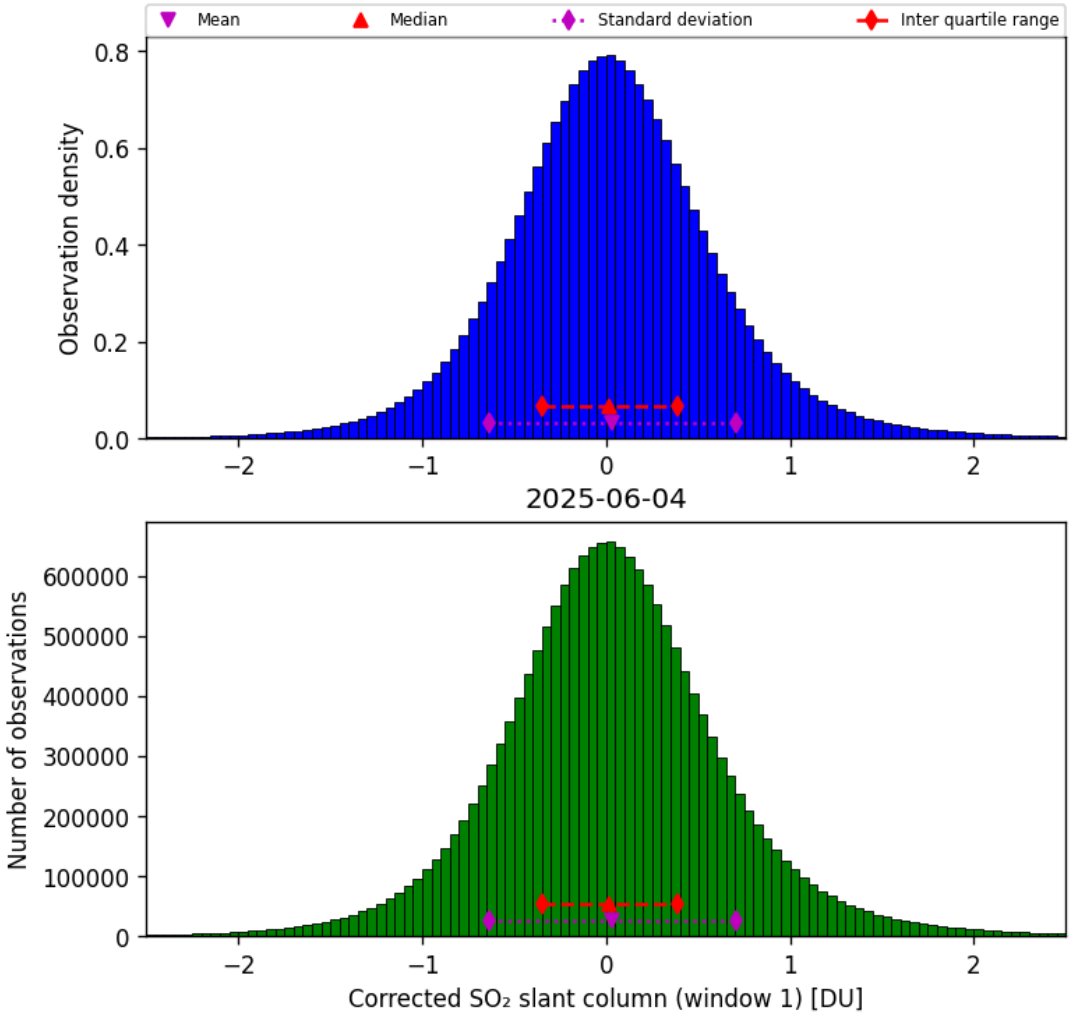


Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-06-04 to 2025-06-04

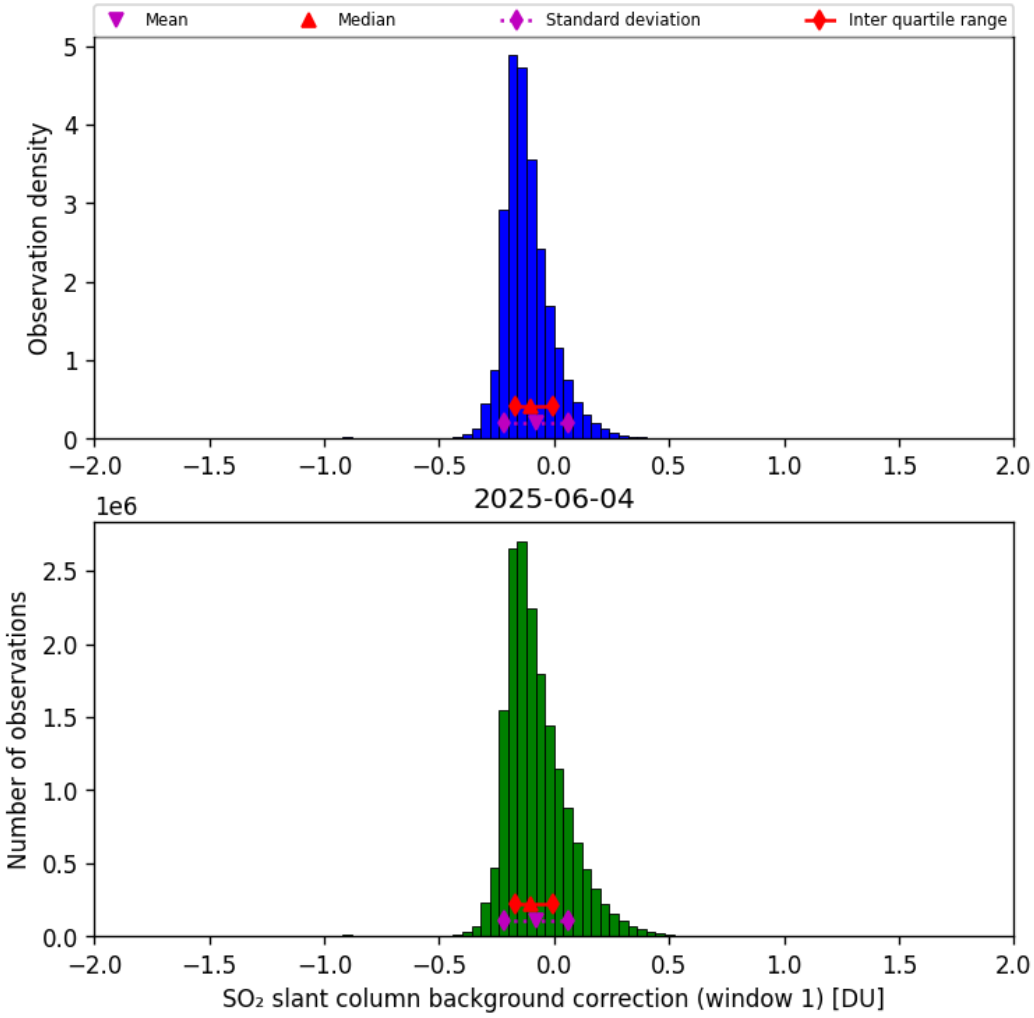


Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-06-04 to 2025-06-04

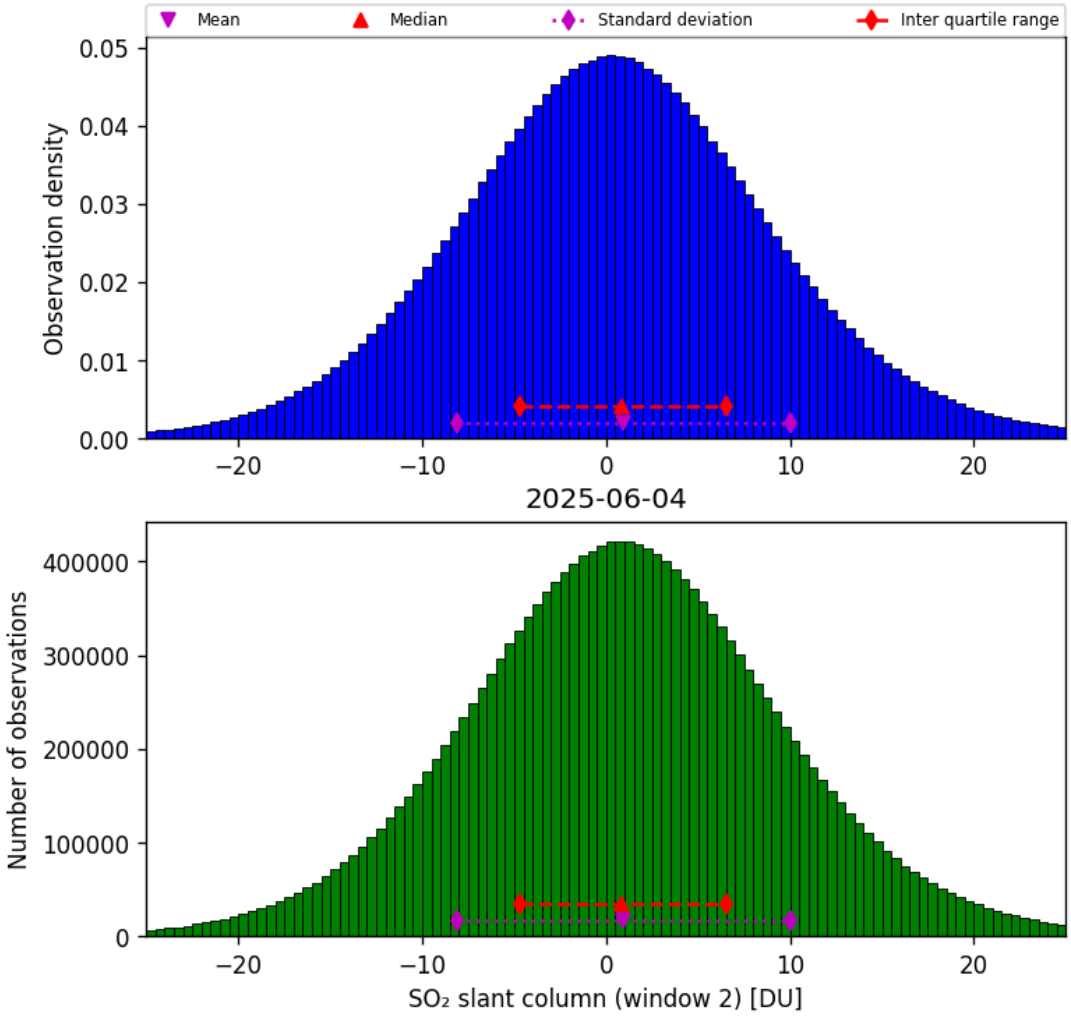


Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-06-04 to 2025-06-04

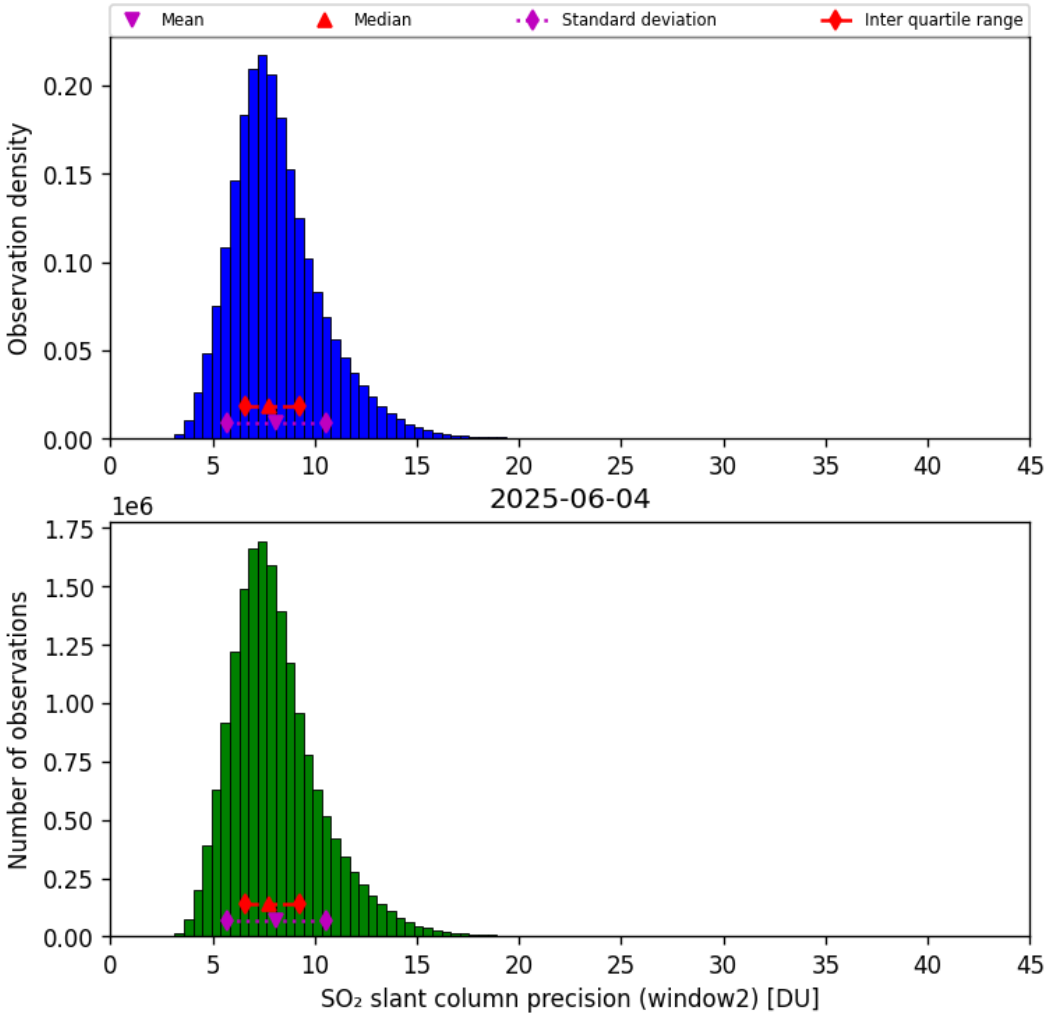


Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-06-04 to 2025-06-04

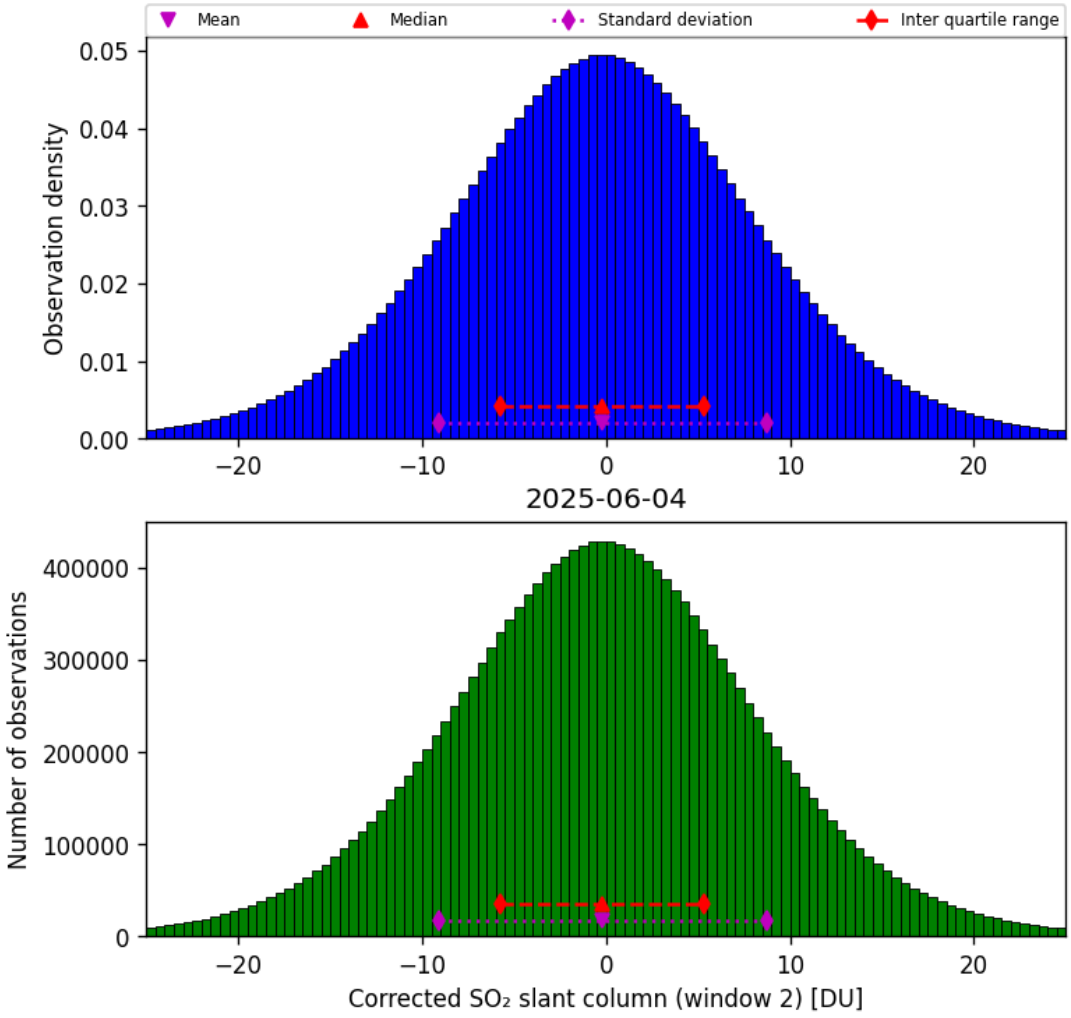


Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-06-04 to 2025-06-04

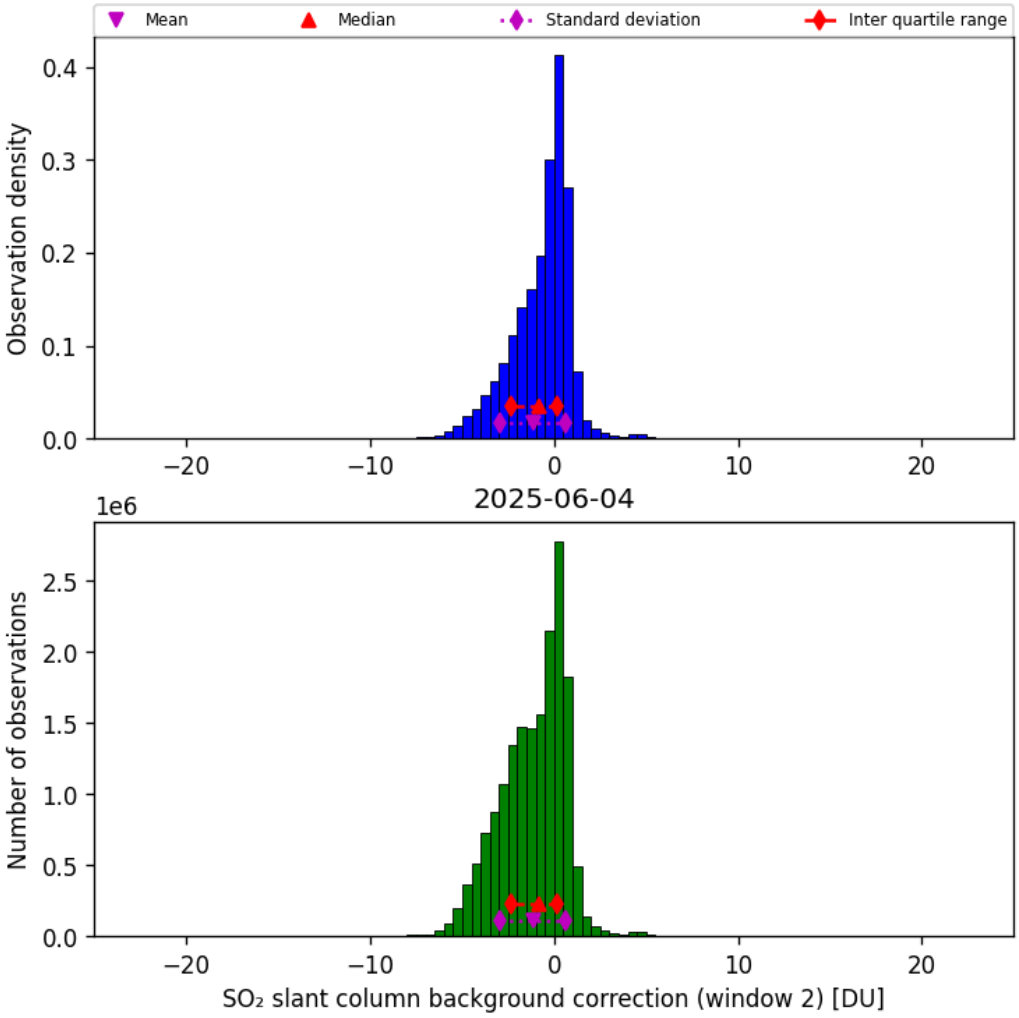


Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-06-04 to 2025-06-04

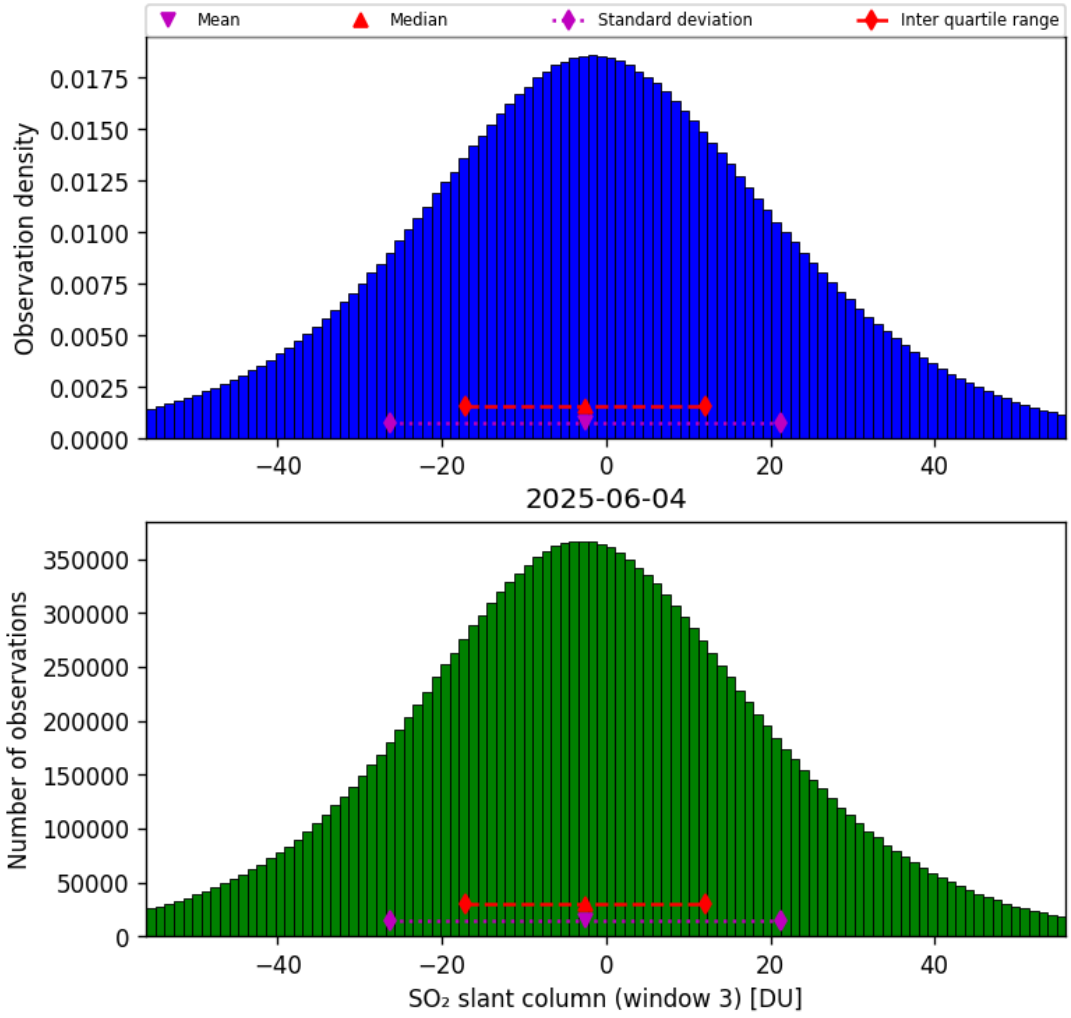


Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-06-04 to 2025-06-04

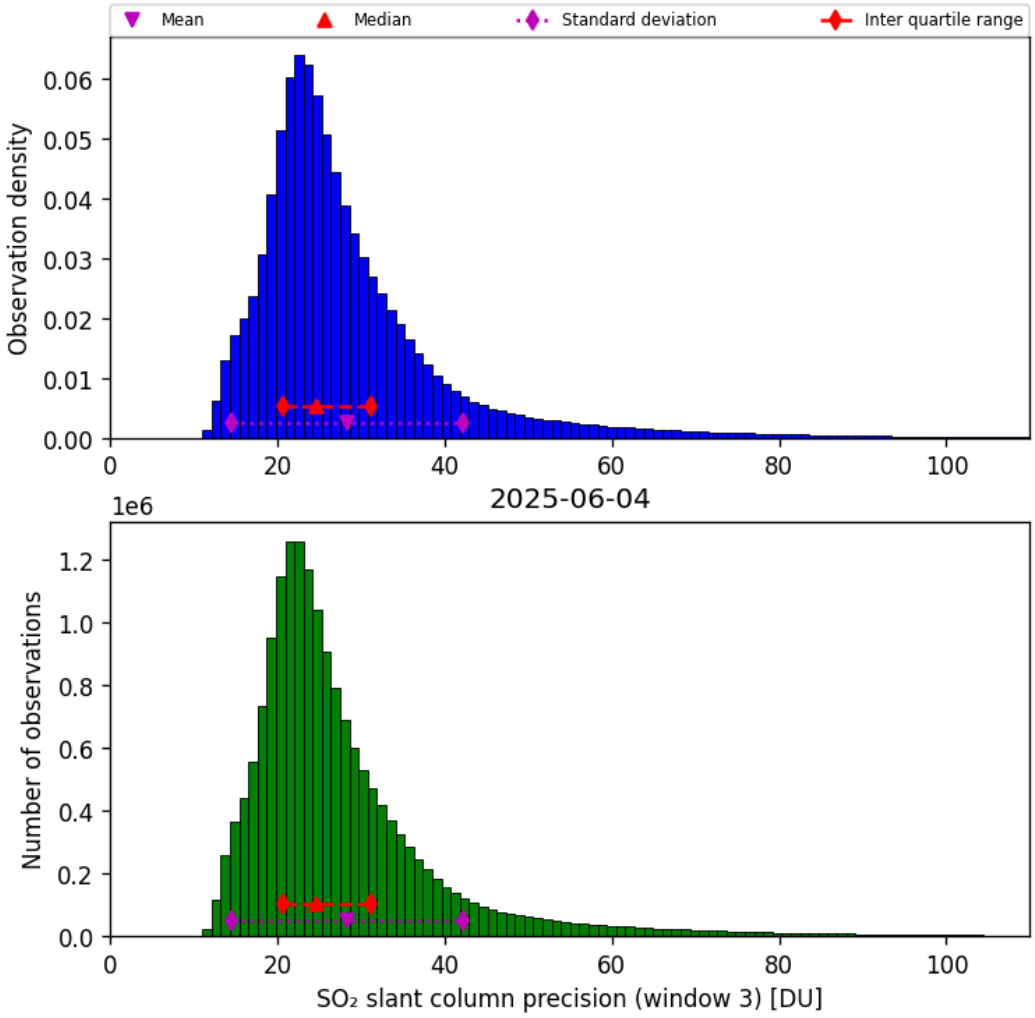


Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-06-04 to 2025-06-04

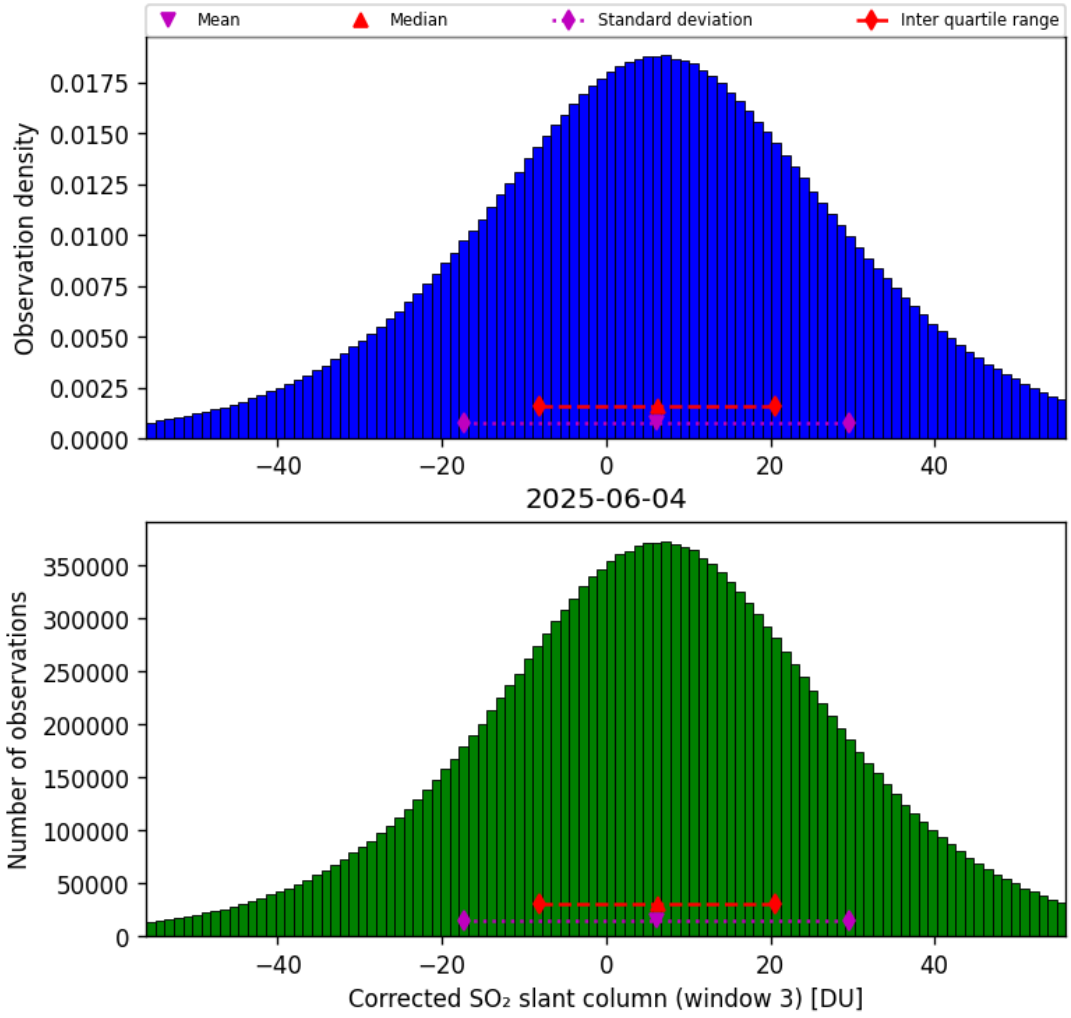


Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-06-04 to 2025-06-04

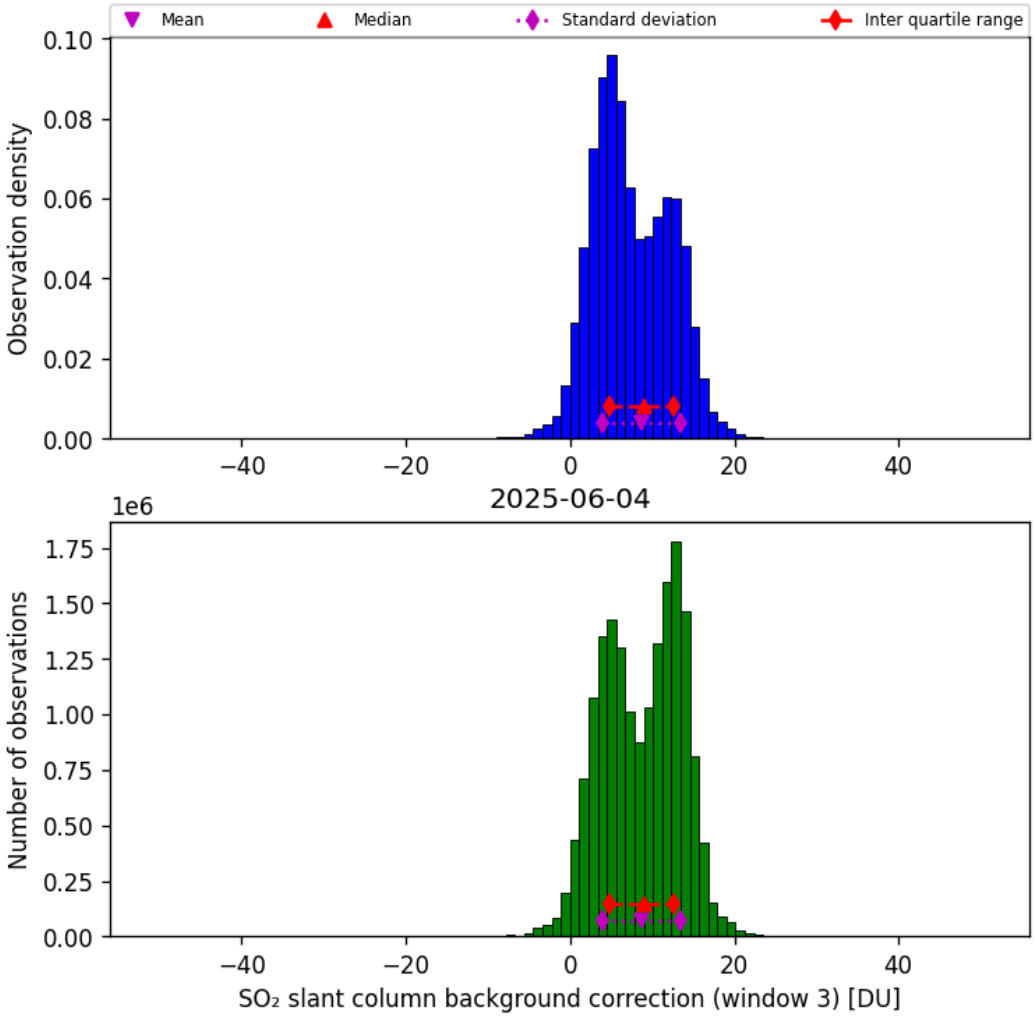


Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-06-04 to 2025-06-04

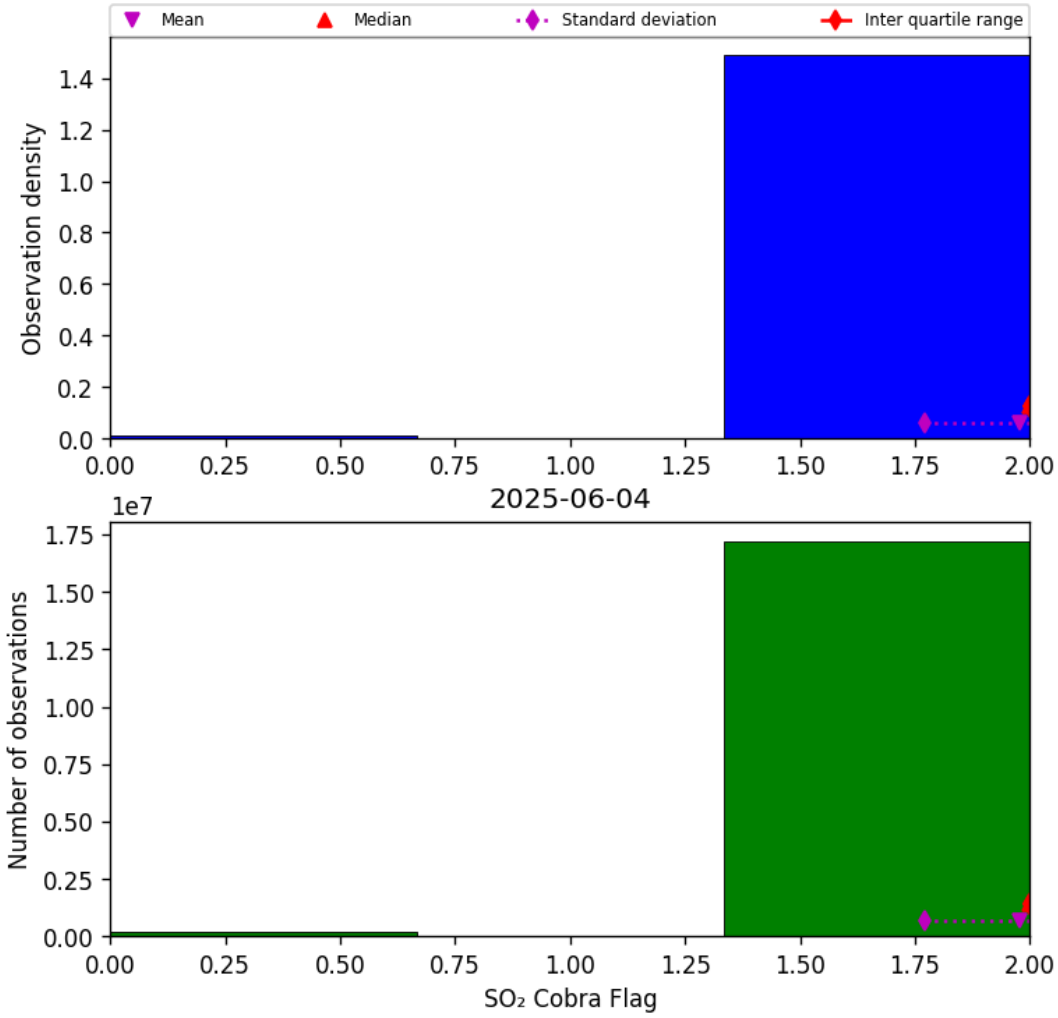


Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-06-04 to 2025-06-04

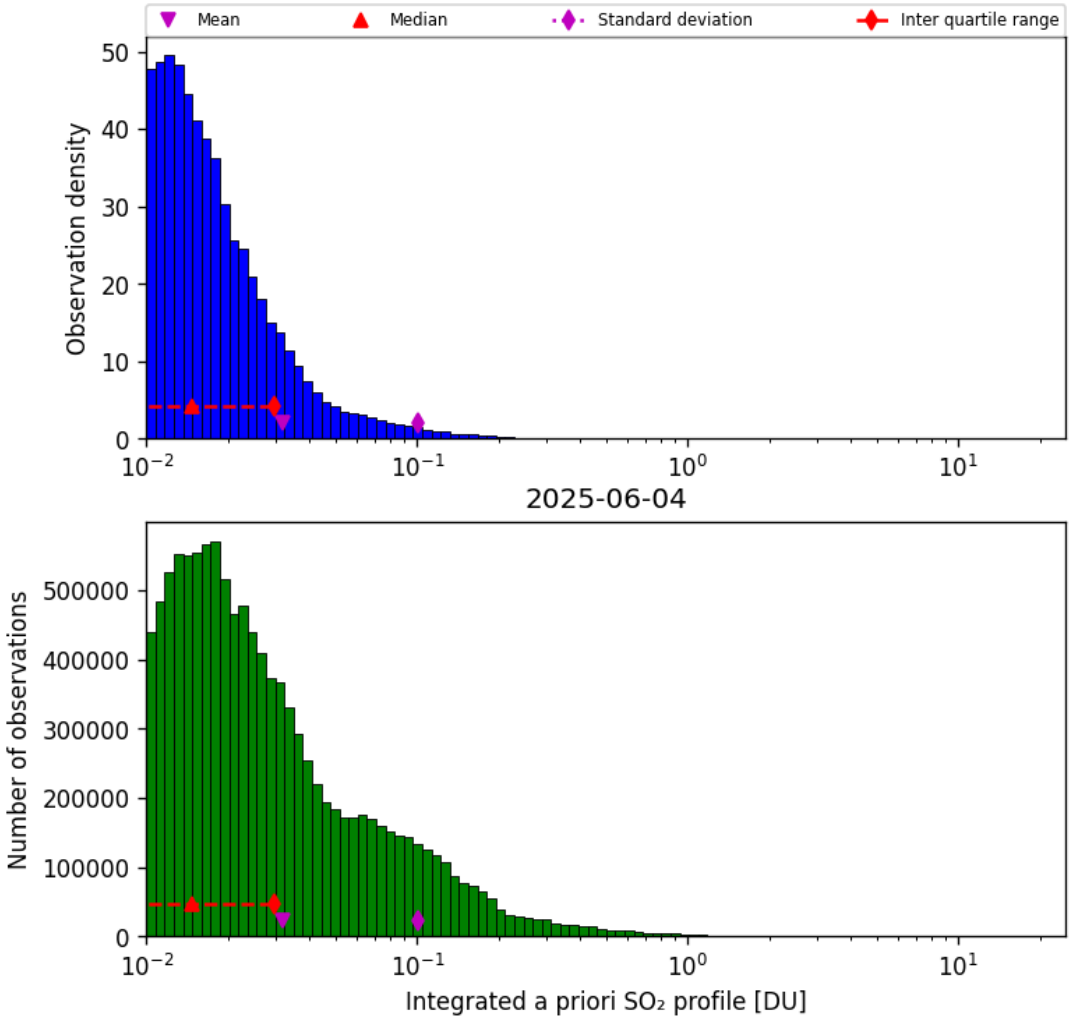


Figure 76: Histogram of “Integrated a priori SO_2 profile” for 2025-06-04 to 2025-06-04

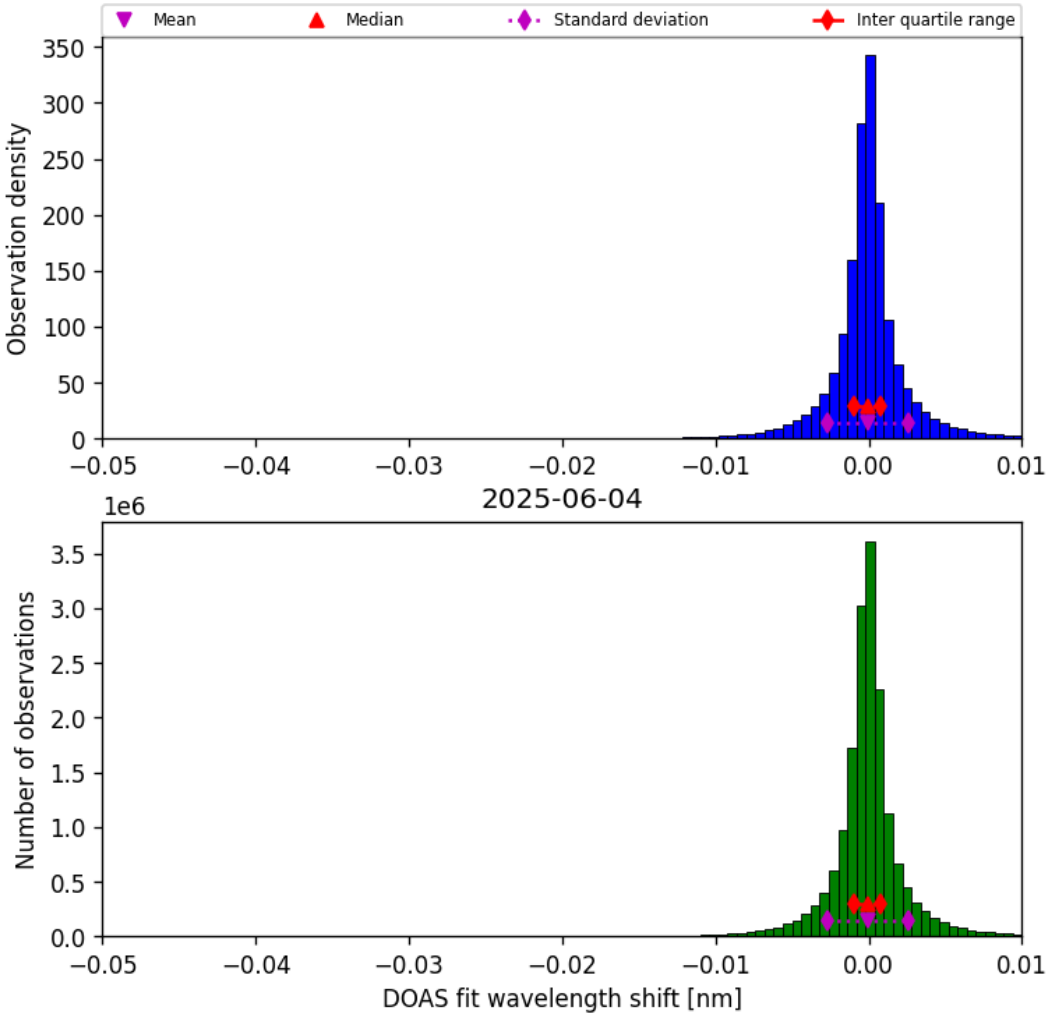


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-06-04 to 2025-06-04

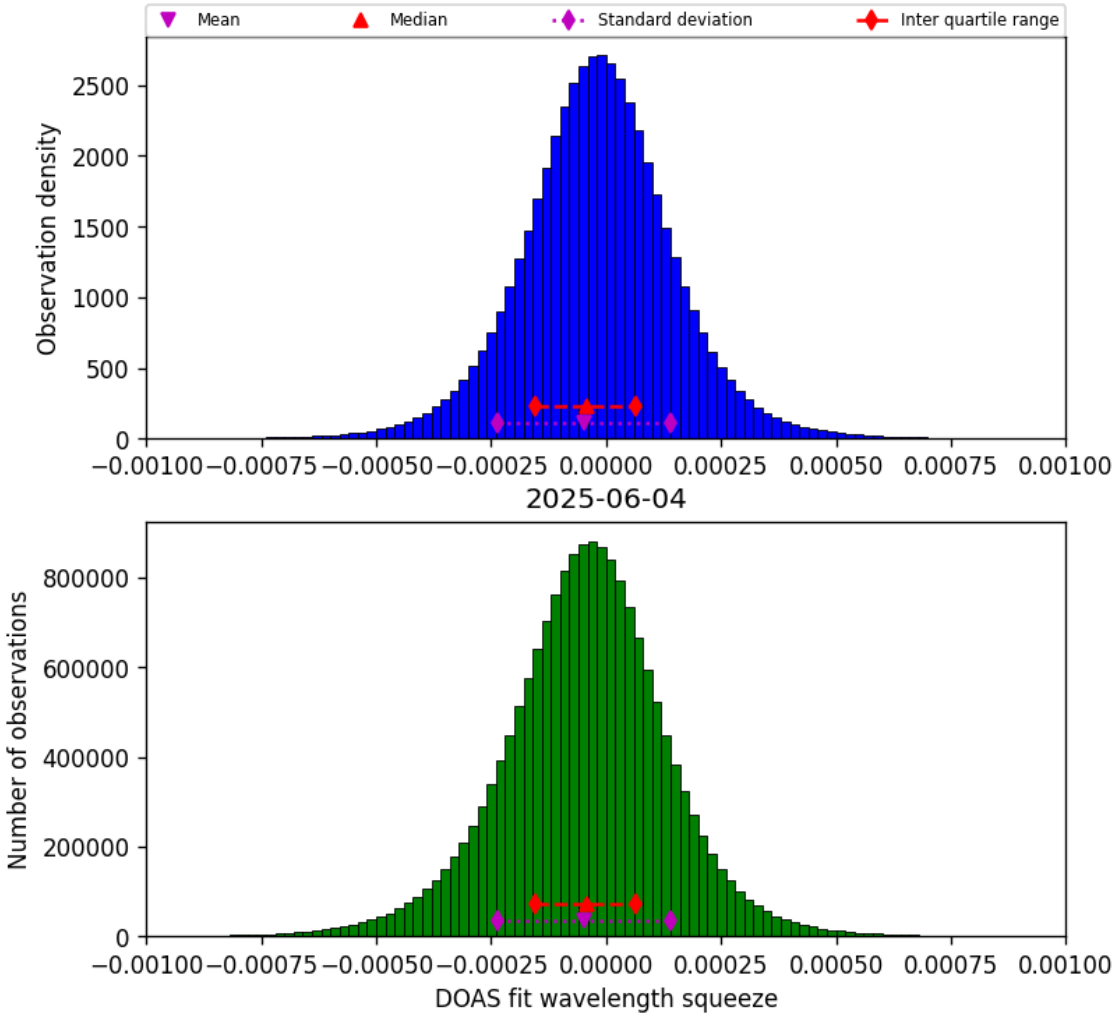


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-06-04 to 2025-06-04

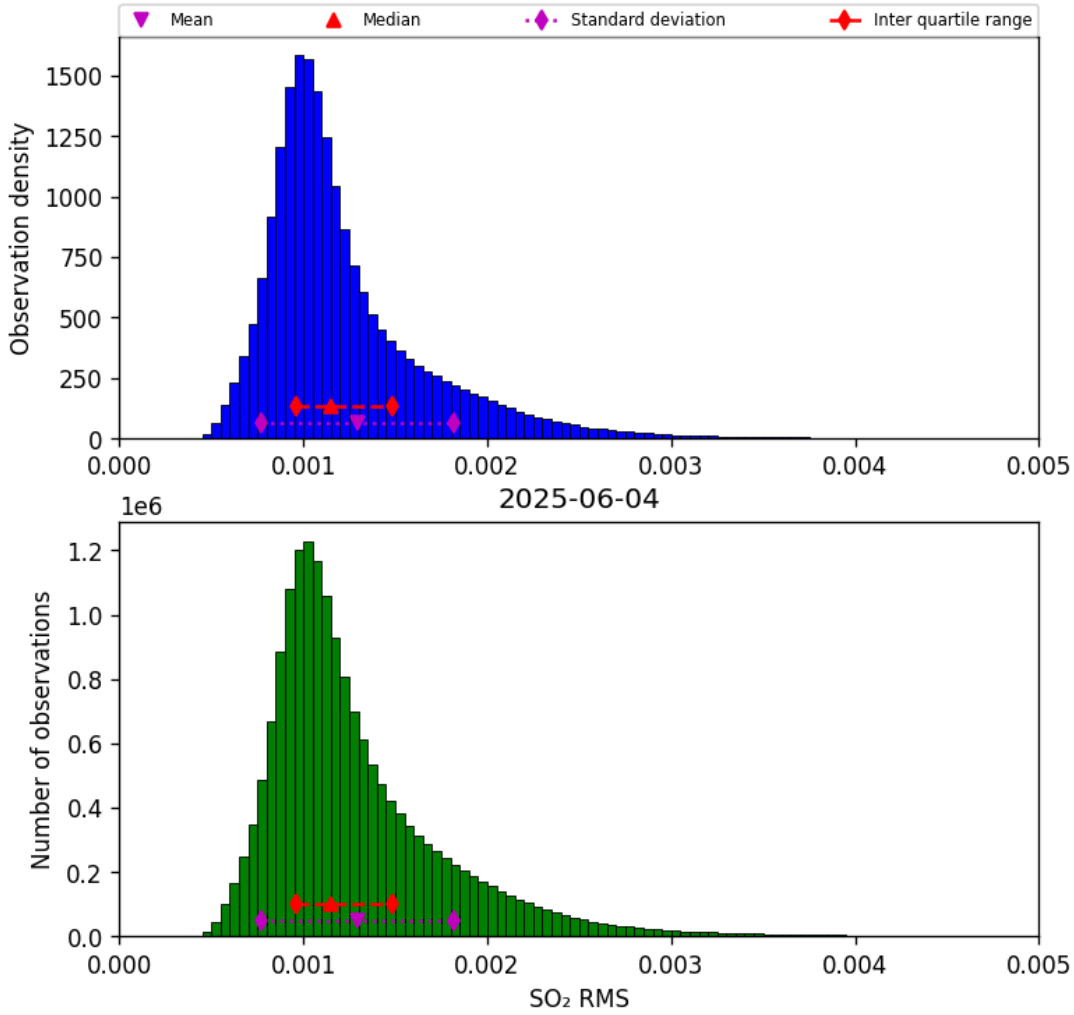


Figure 79: Histogram of "SO_2 RMS" for 2025-06-04 to 2025-06-04

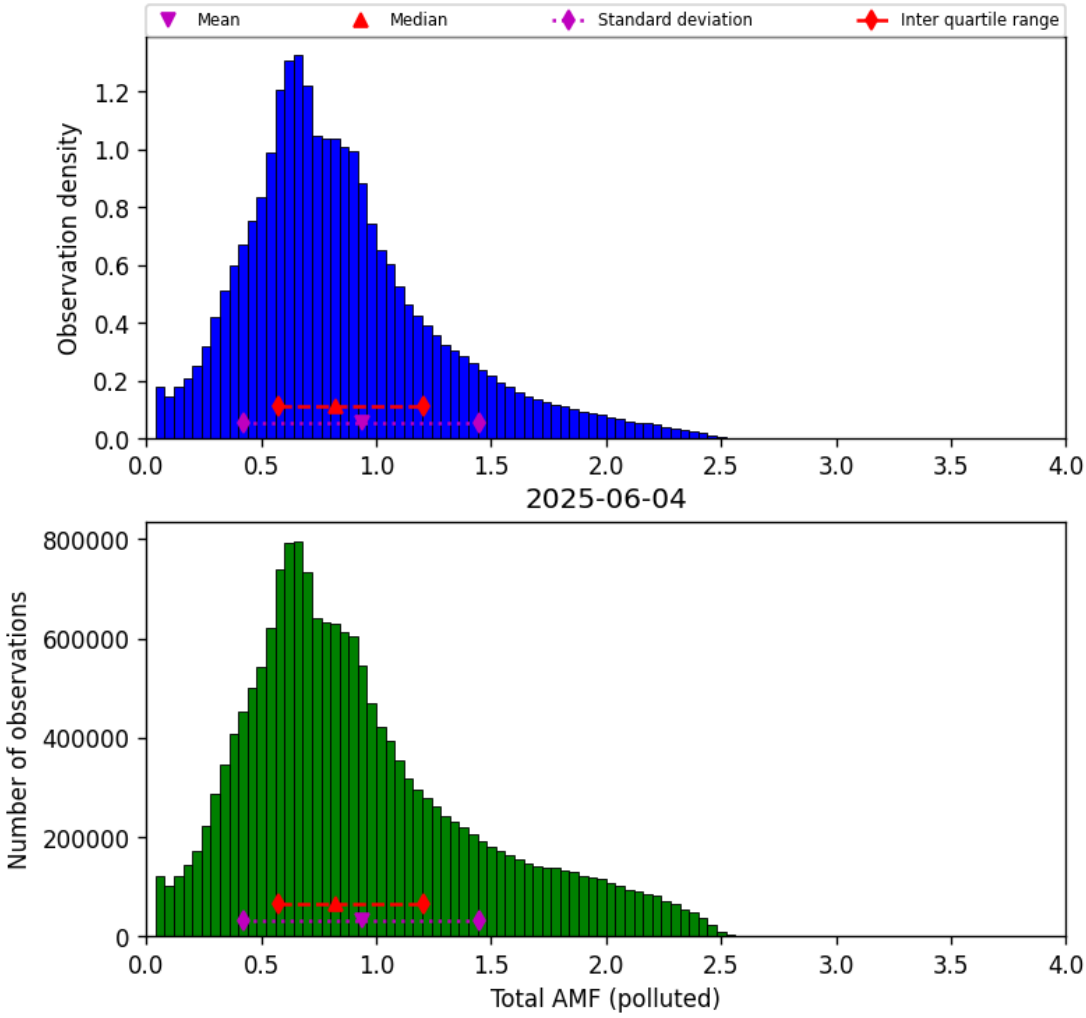


Figure 80: Histogram of “Total AMF (polluted)” for 2025-06-04 to 2025-06-04

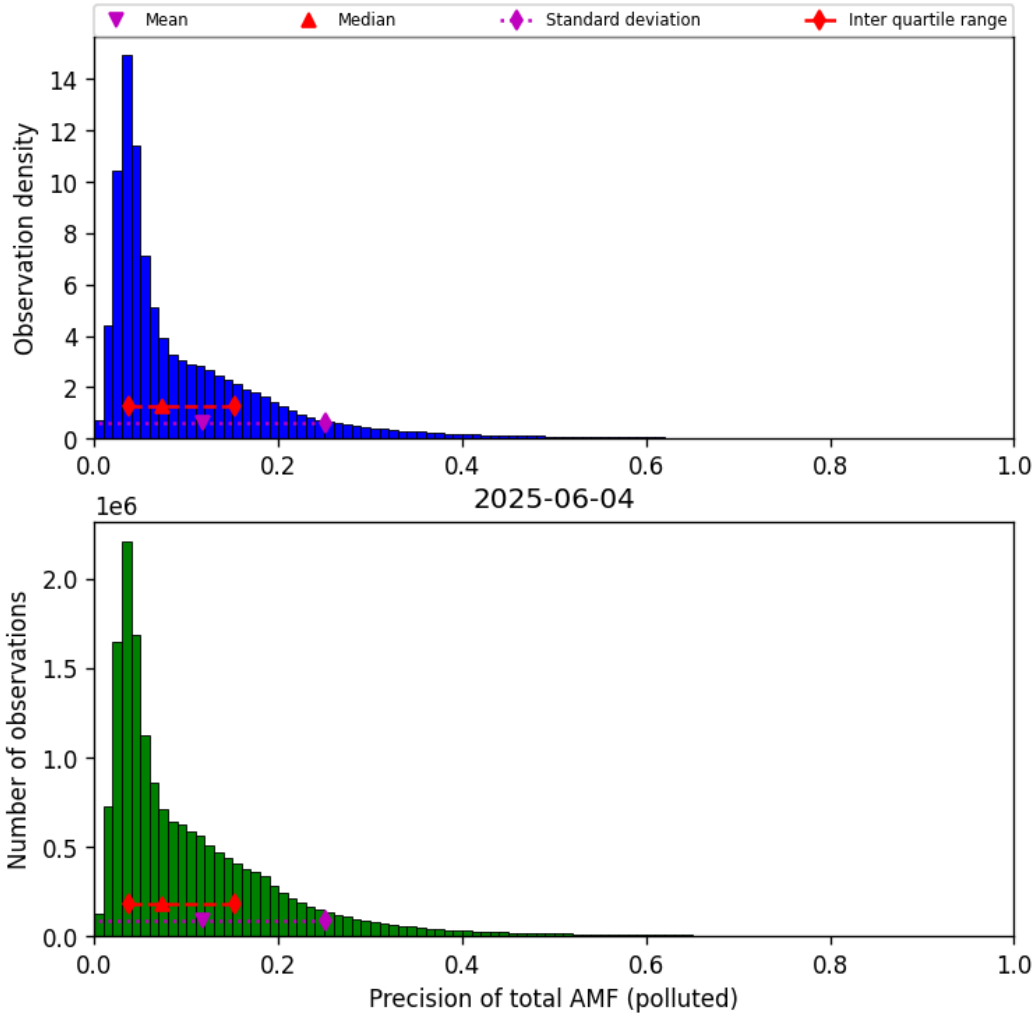


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-06-04 to 2025-06-04

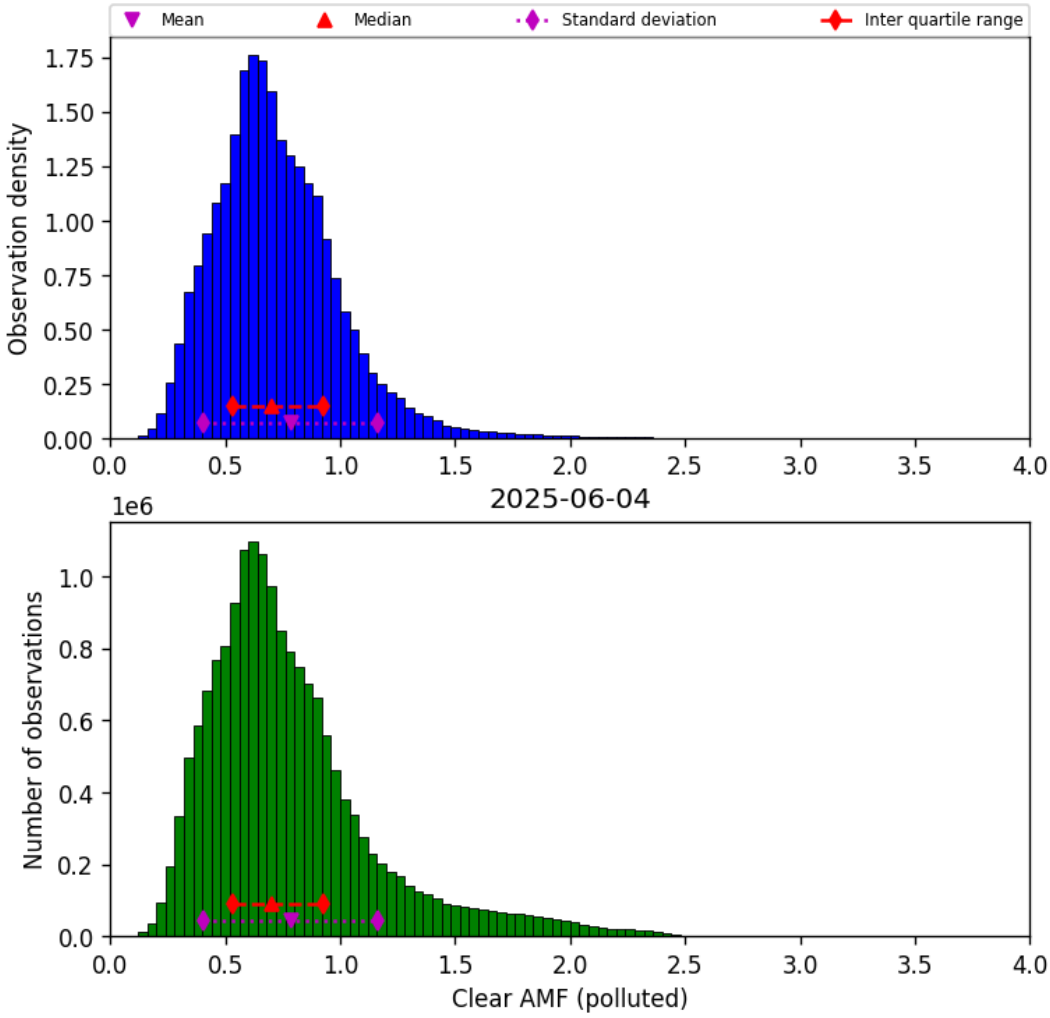


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-06-04 to 2025-06-04

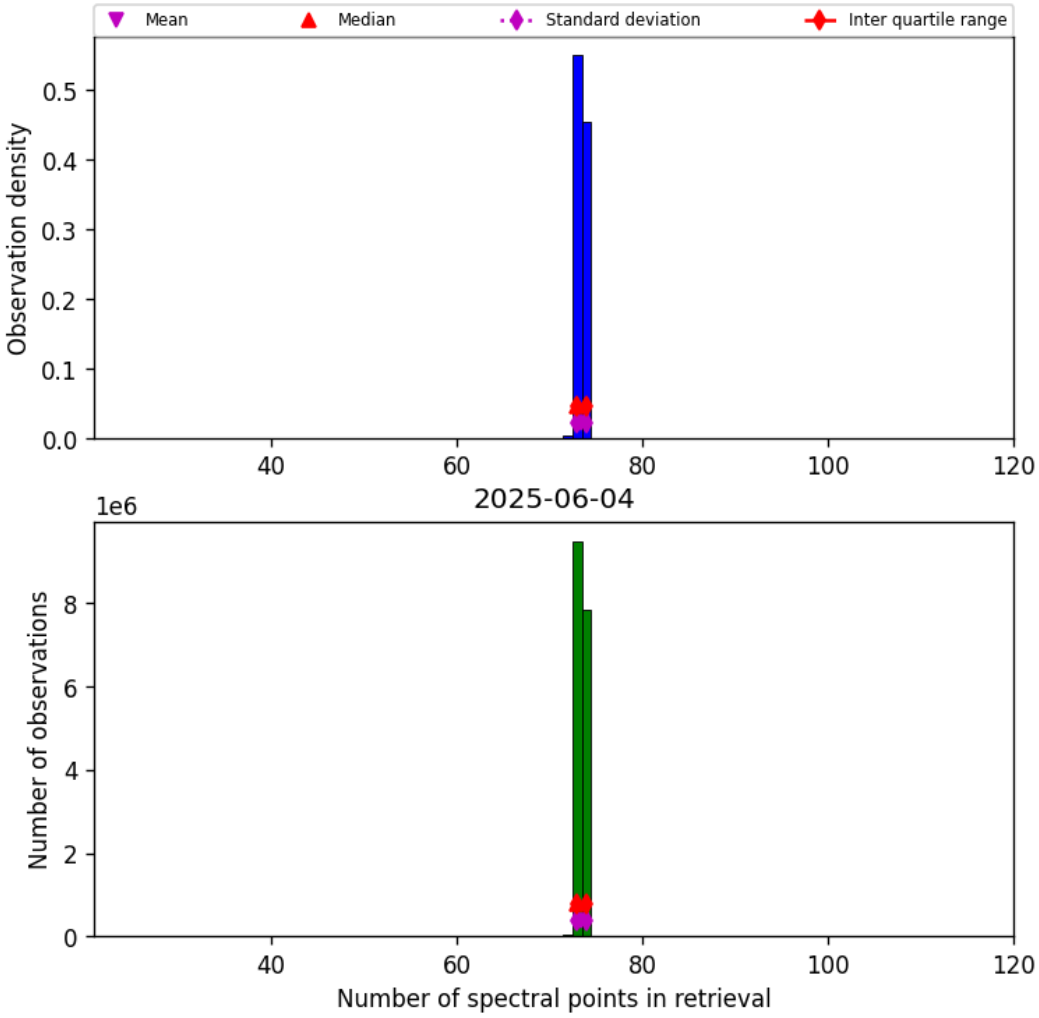


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-06-04 to 2025-06-04

9 Along track statistics

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

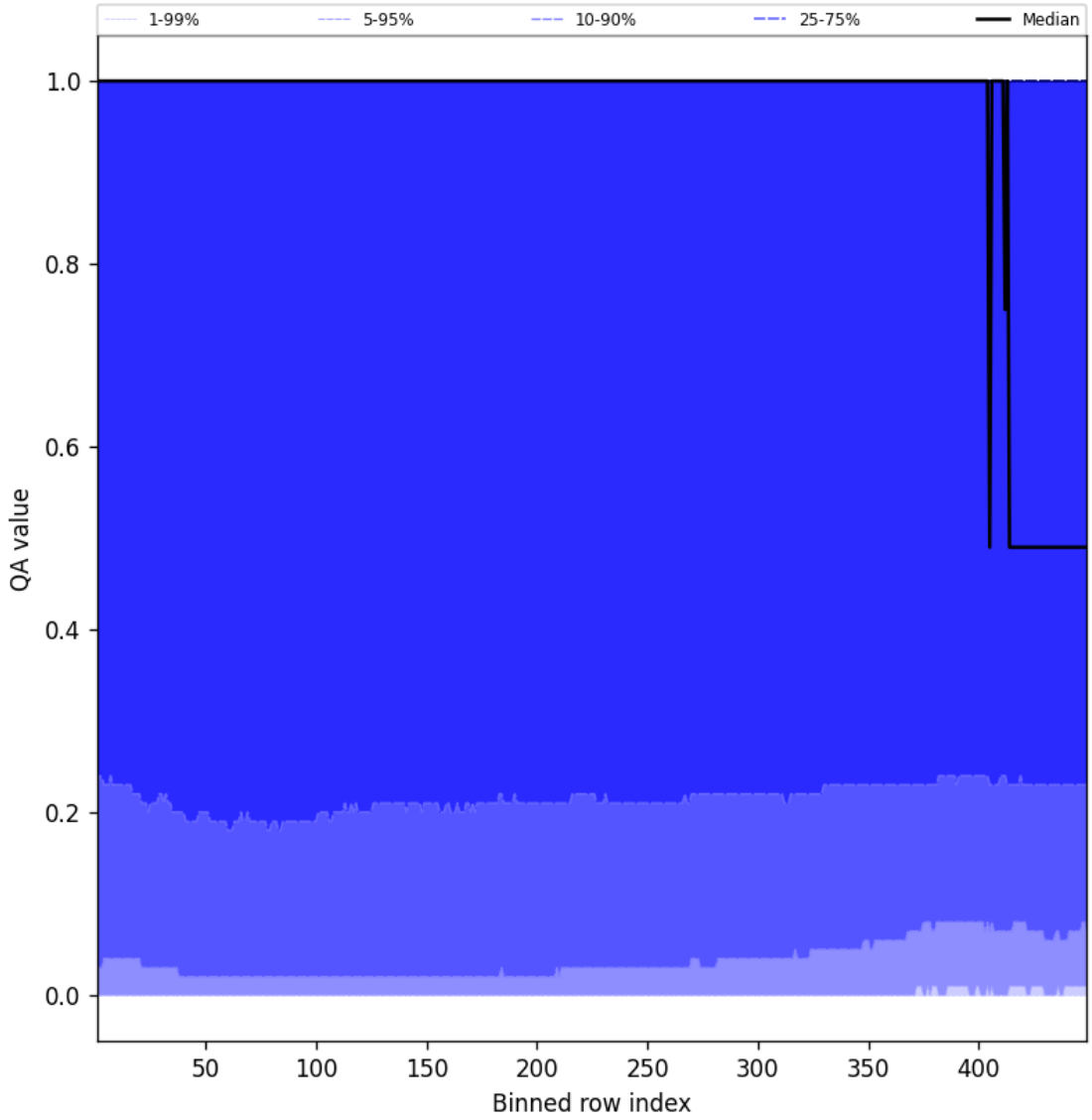


Figure 84: Along track statistics of “QA value” for 2025-06-04 to 2025-06-04

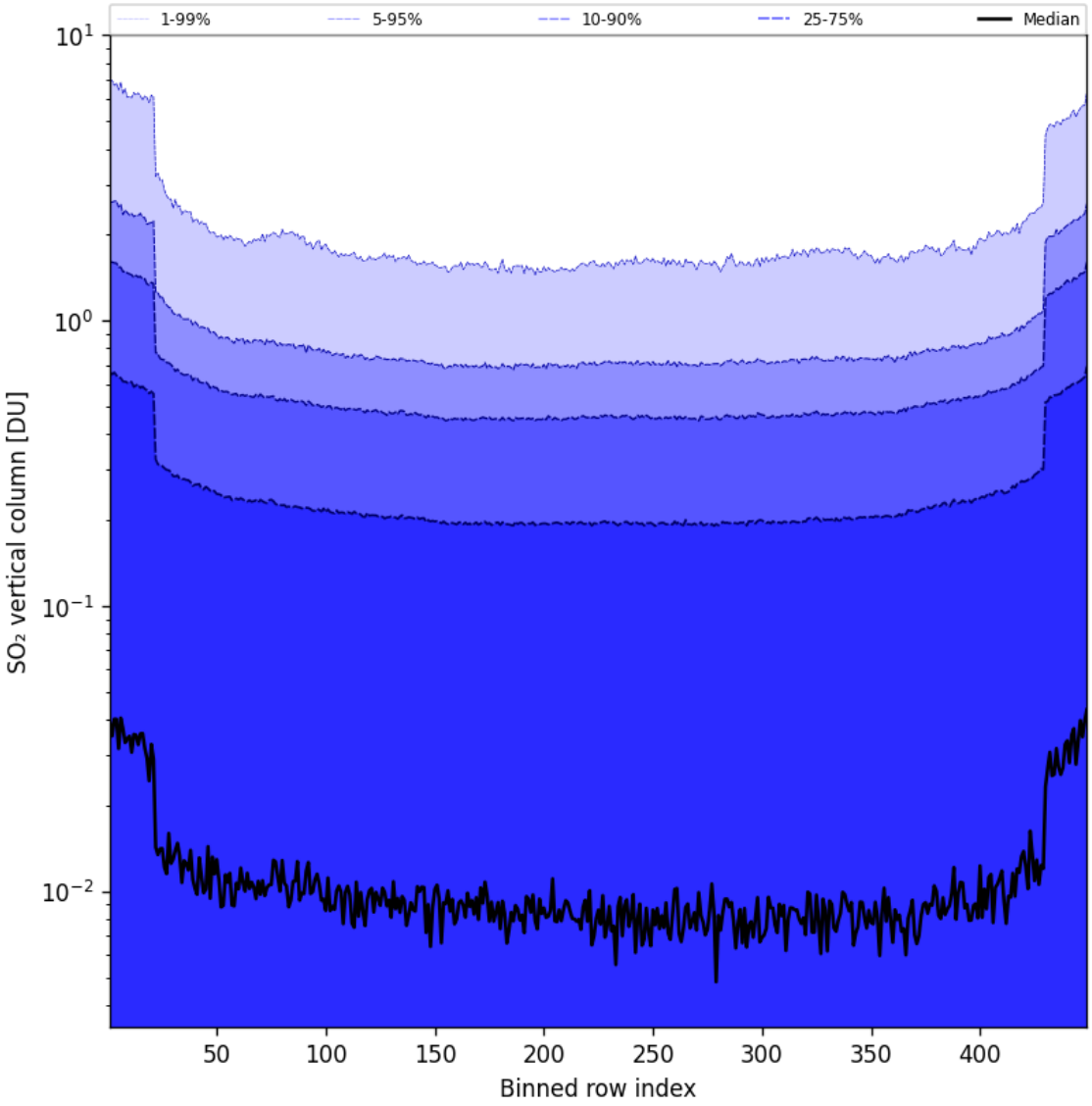


Figure 85: Along track statistics of "SO_2 vertical column" for 2025-06-04 to 2025-06-04

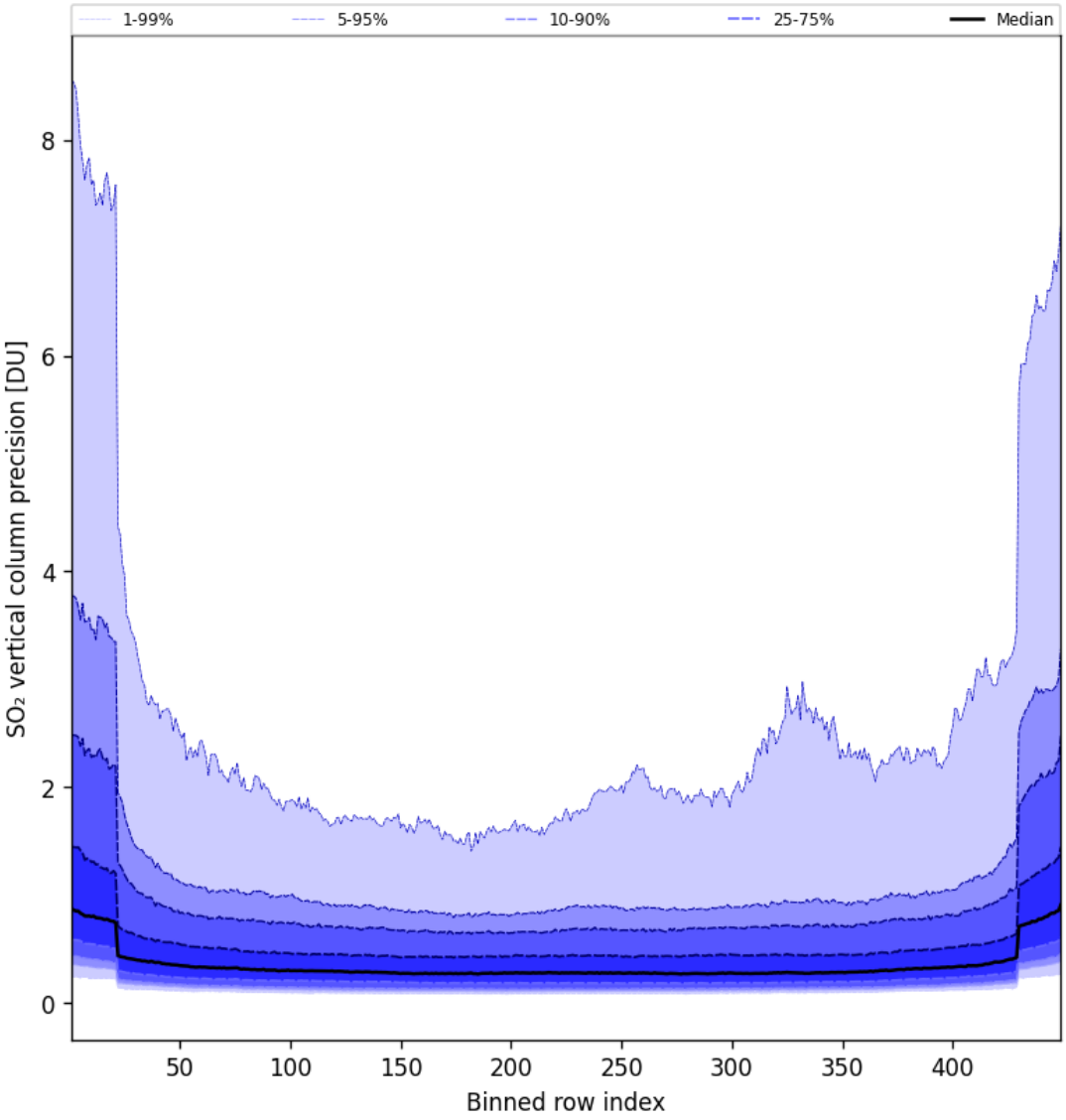


Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-06-04 to 2025-06-04

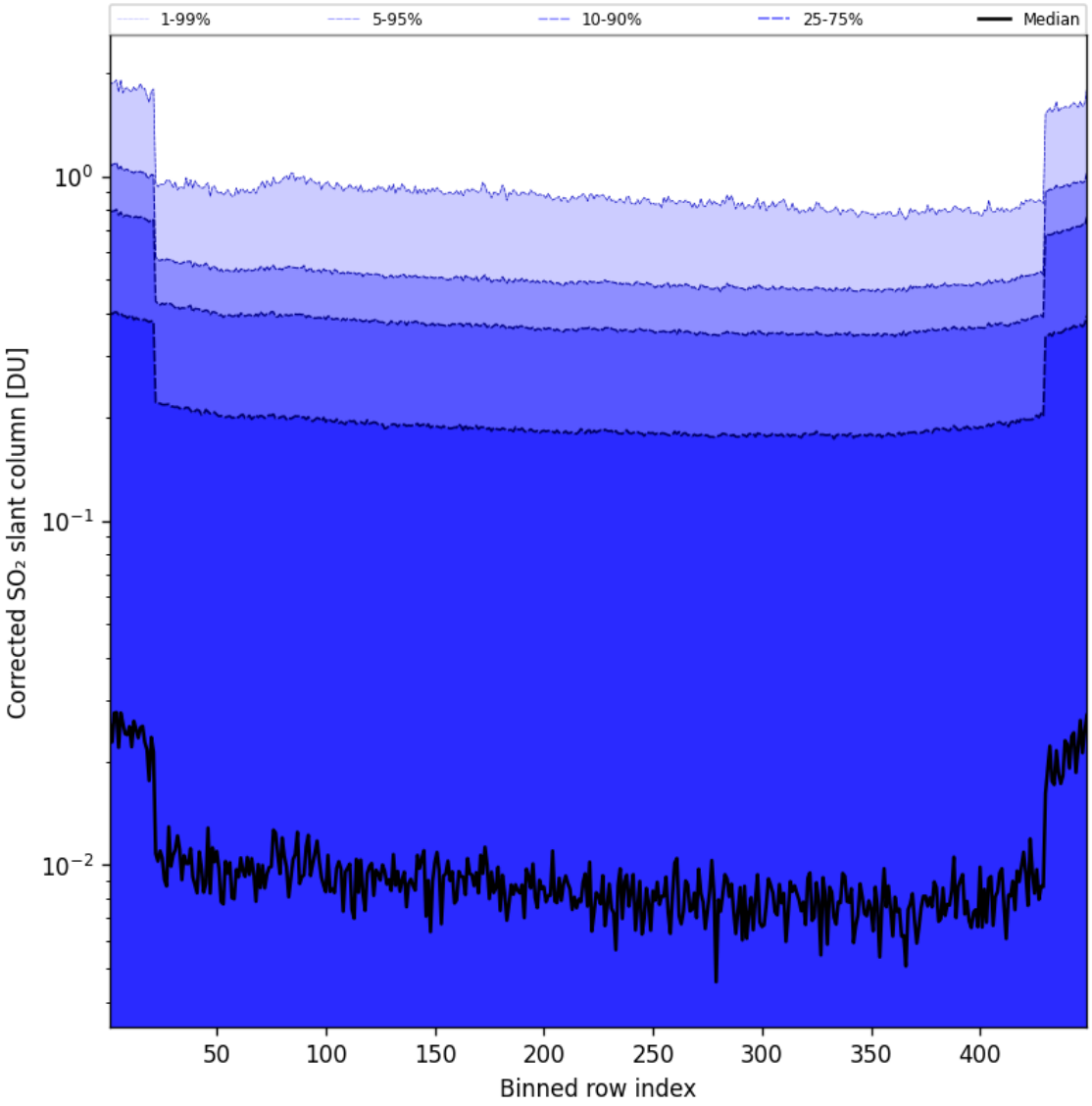


Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-06-04 to 2025-06-04

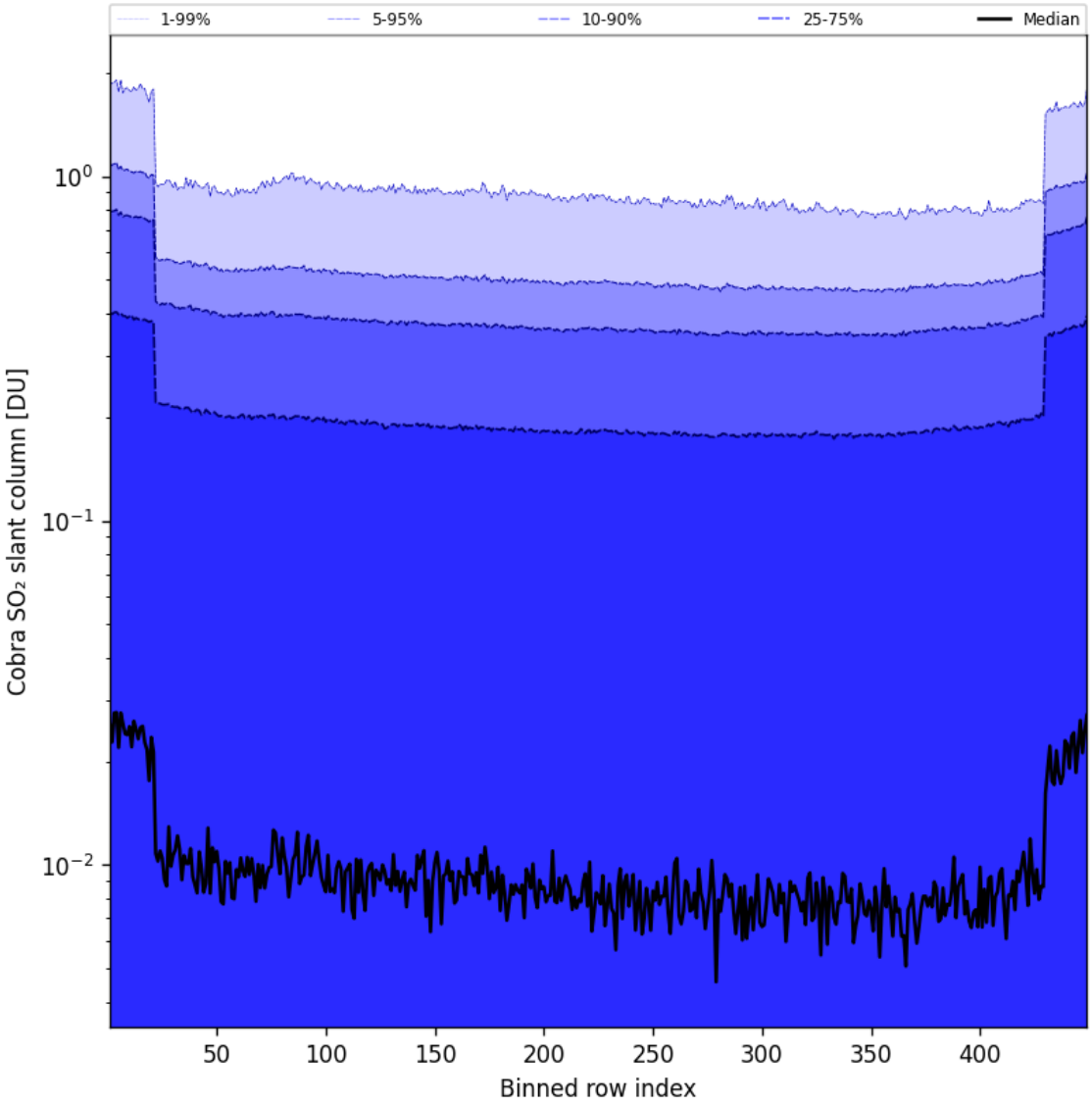


Figure 88: Along track statistics of “Cobra SO_2 slant column” for 2025-06-04 to 2025-06-04

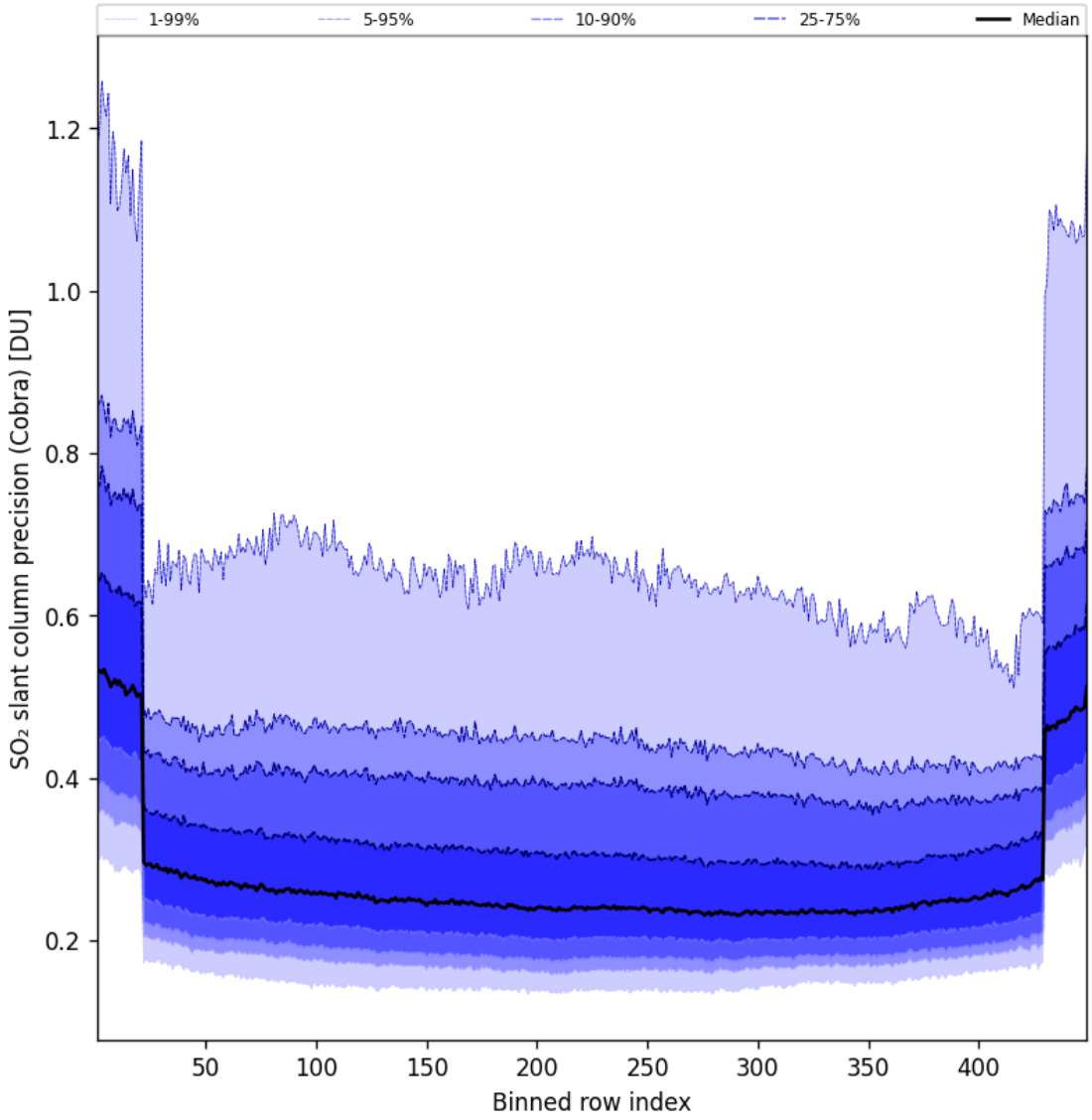


Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-06-04 to 2025-06-04

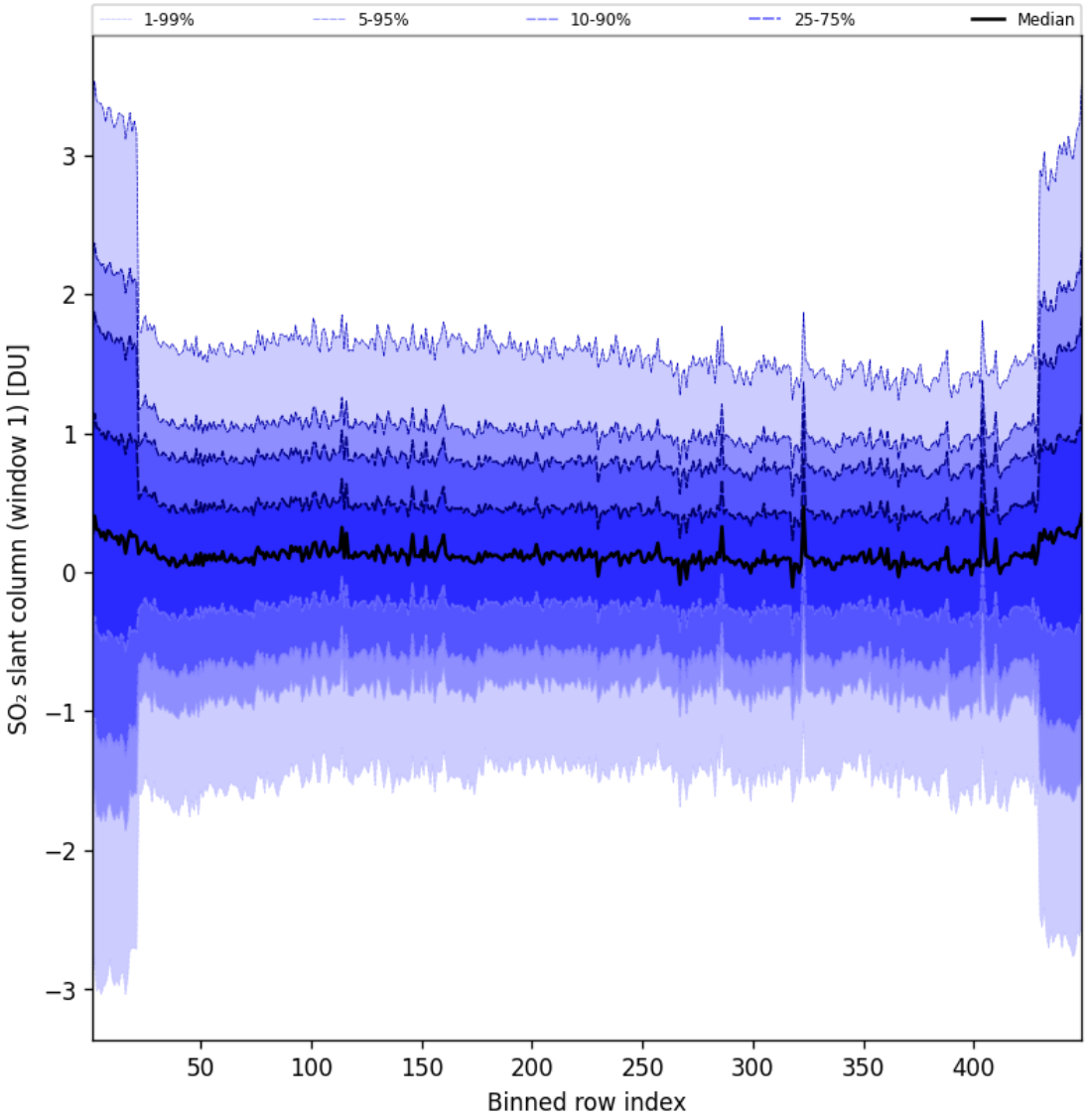


Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-06-04 to 2025-06-04

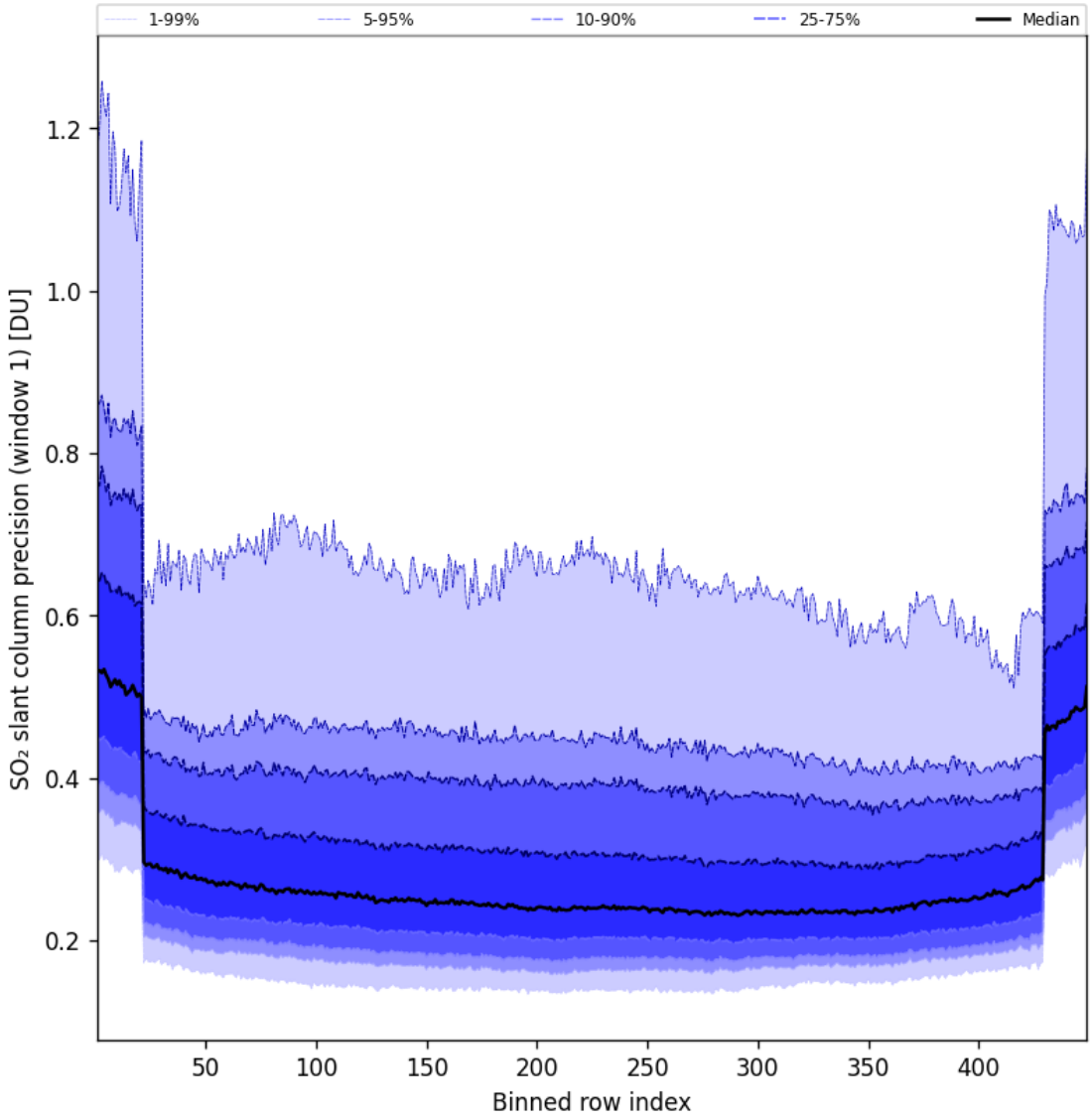


Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-06-04 to 2025-06-04

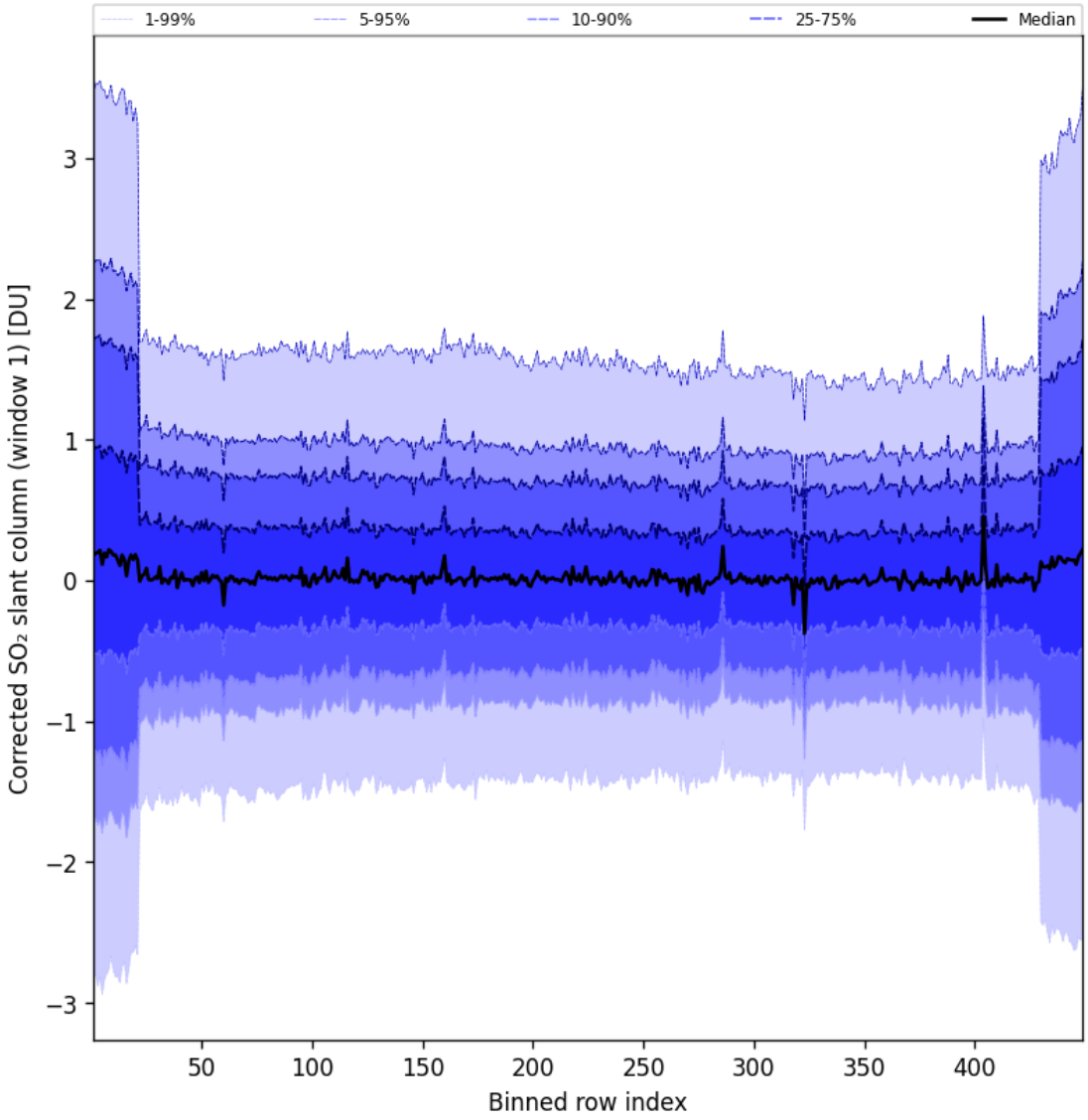


Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-06-04 to 2025-06-04

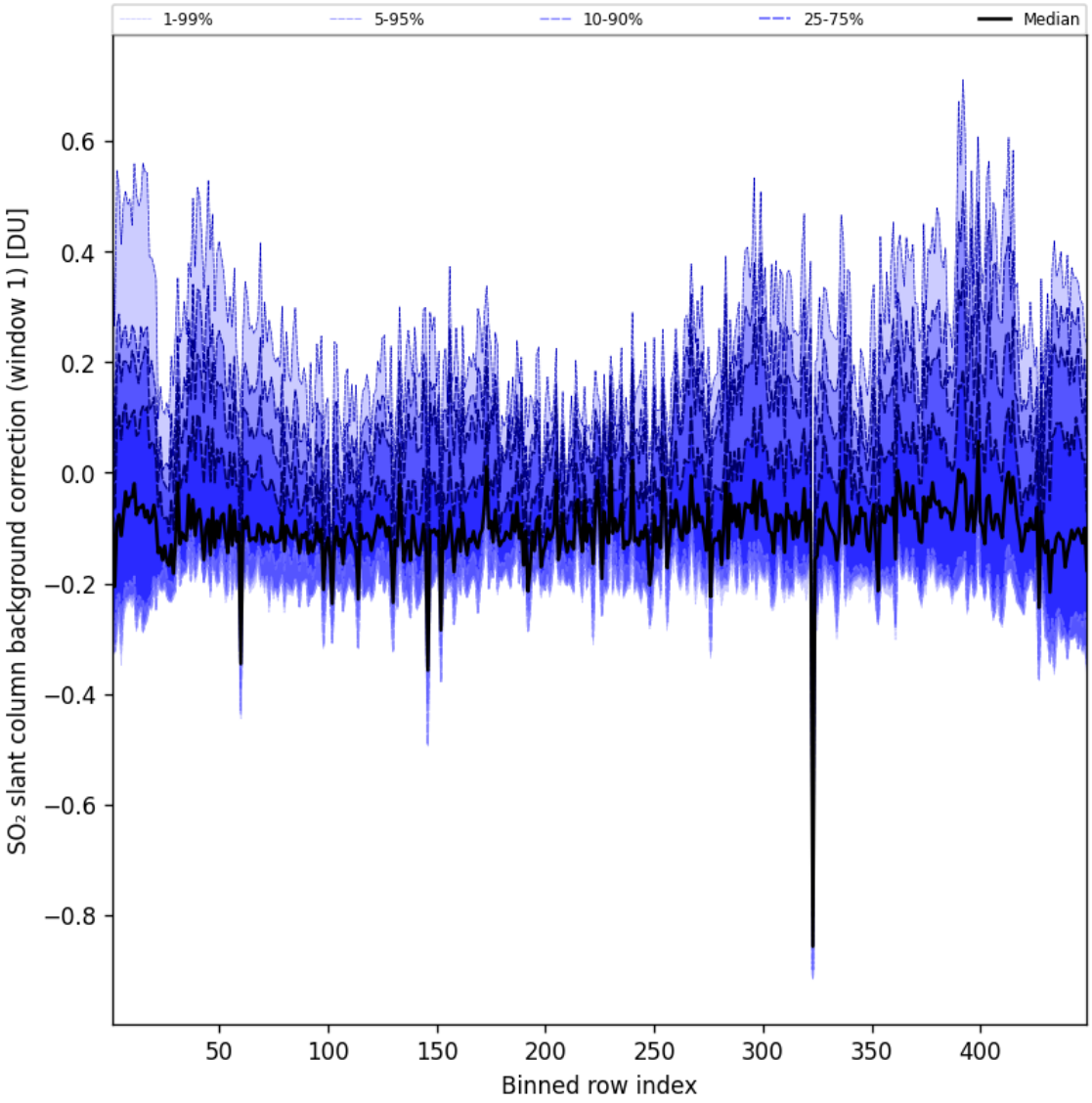


Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-06-04 to 2025-06-04

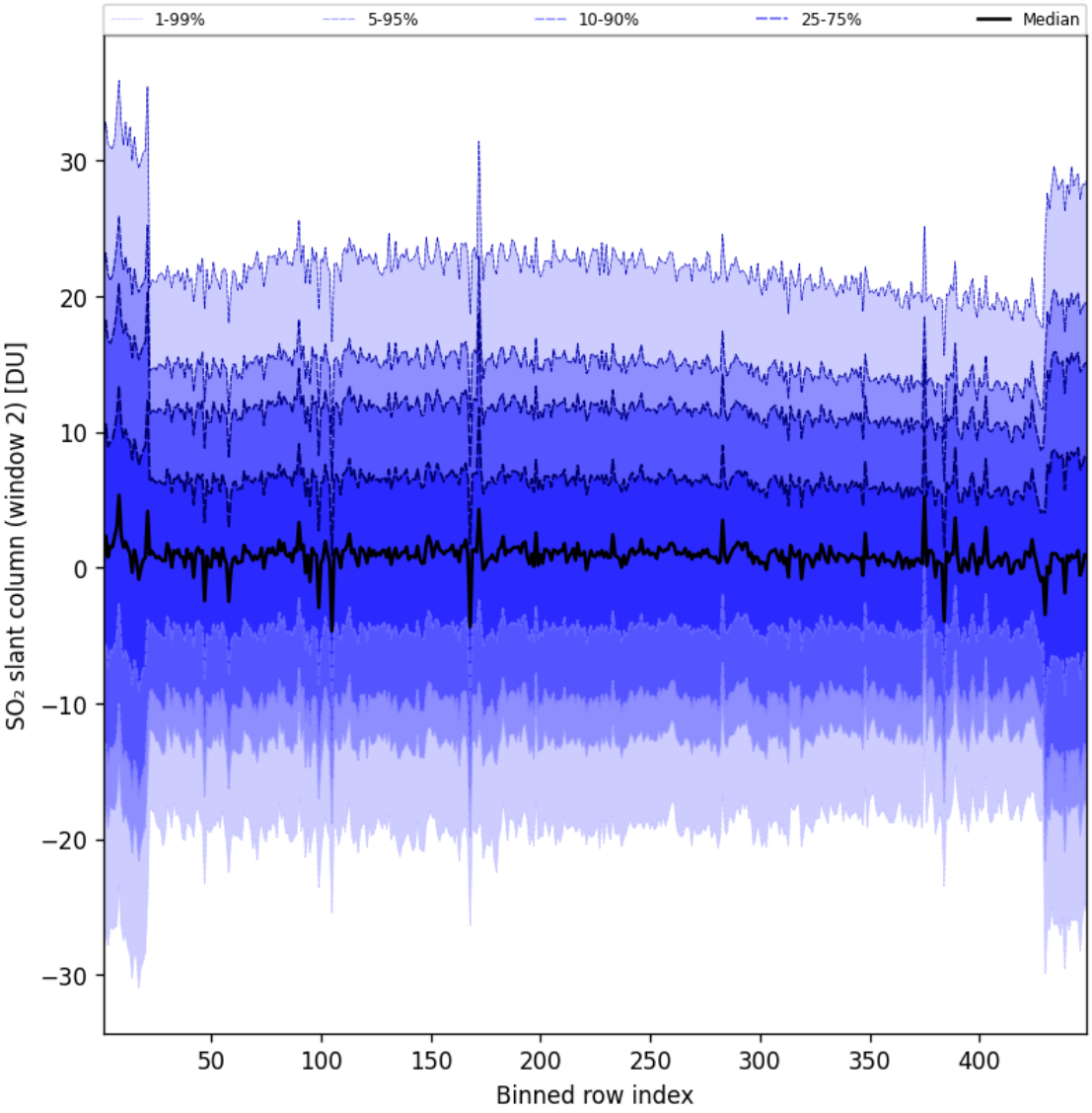


Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-06-04 to 2025-06-04

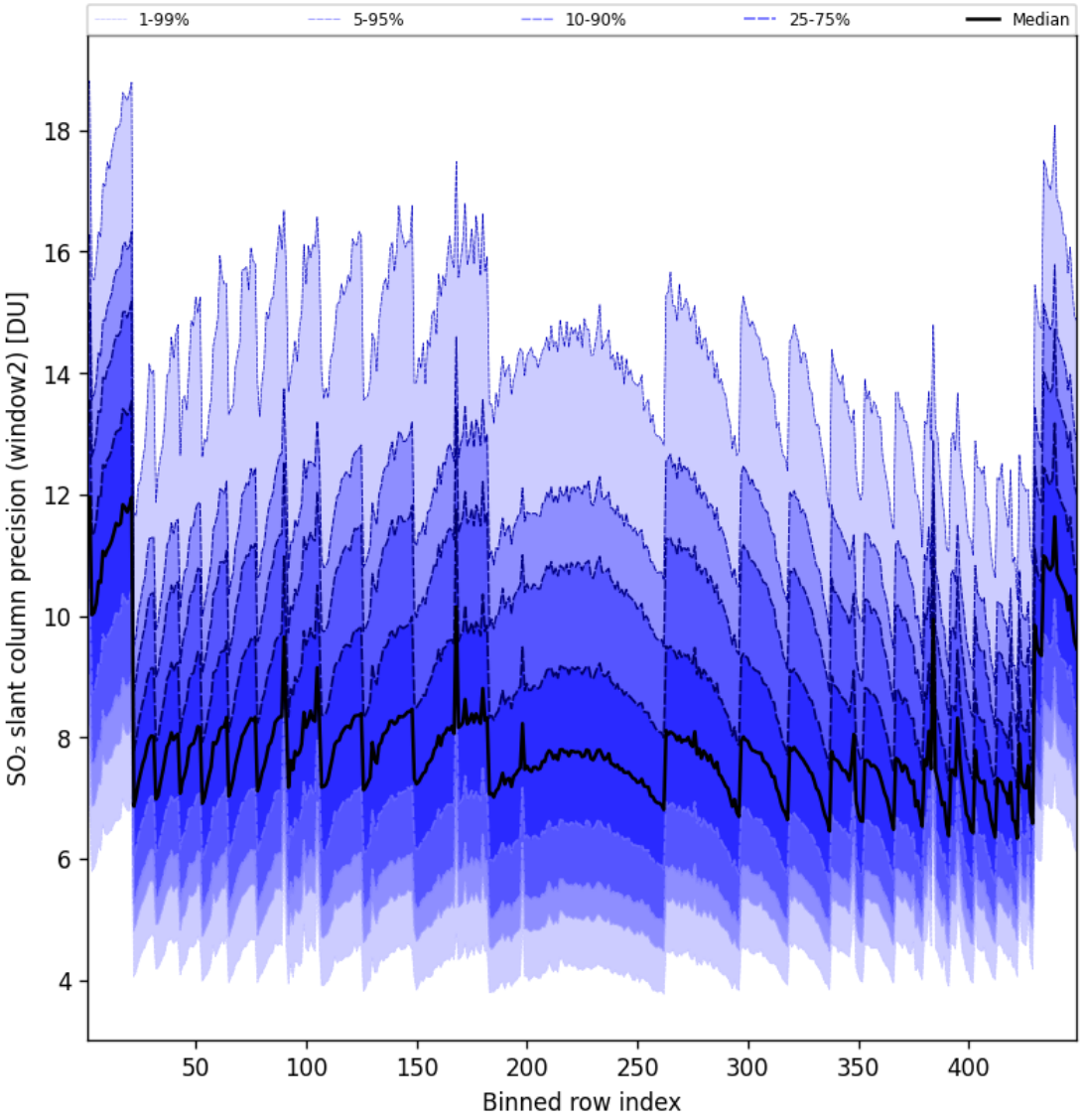


Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-06-04 to 2025-06-04

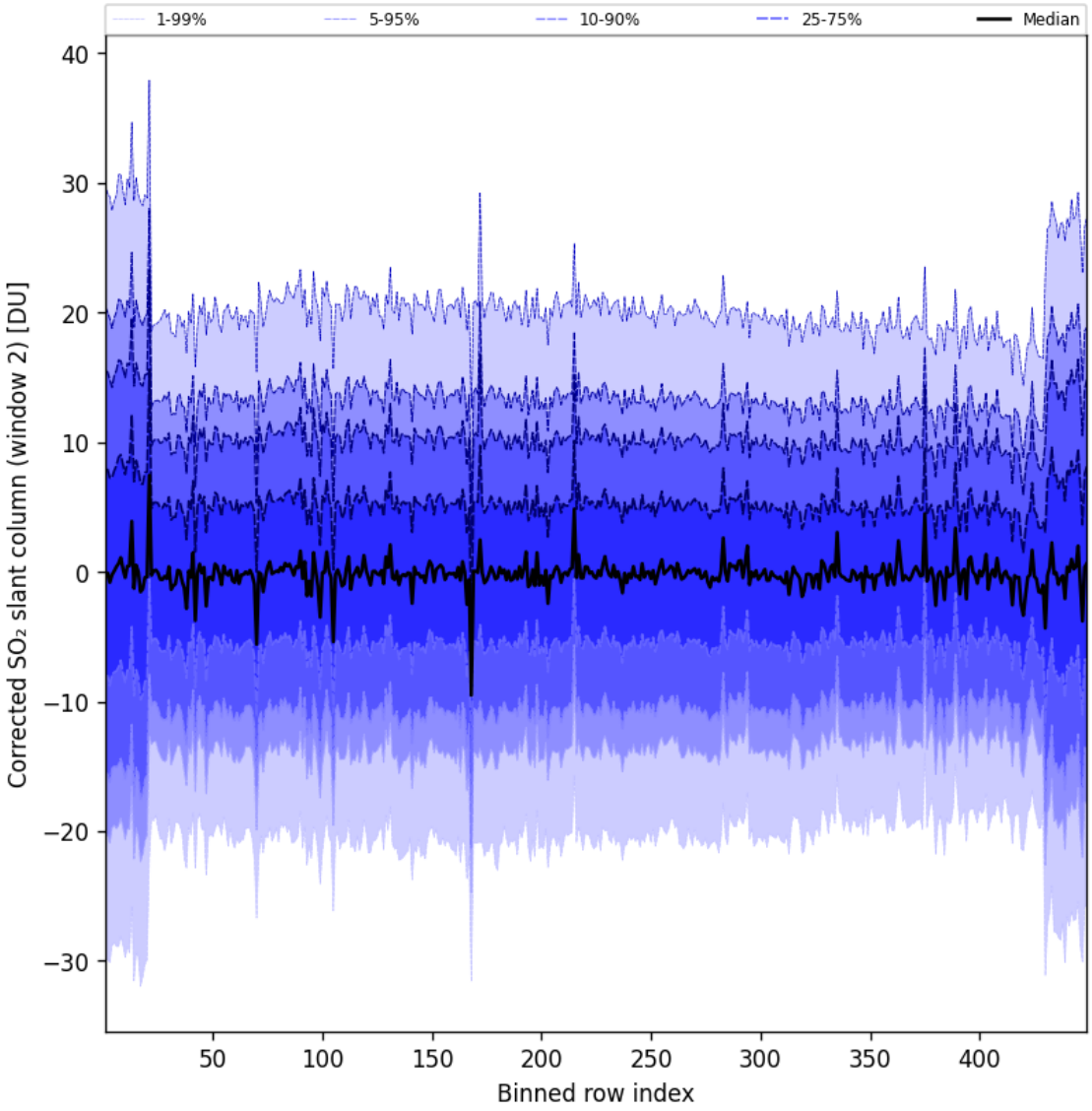


Figure 96: Along track statistics of “Corrected SO_2 slant column (window 2)” for 2025-06-04 to 2025-06-04

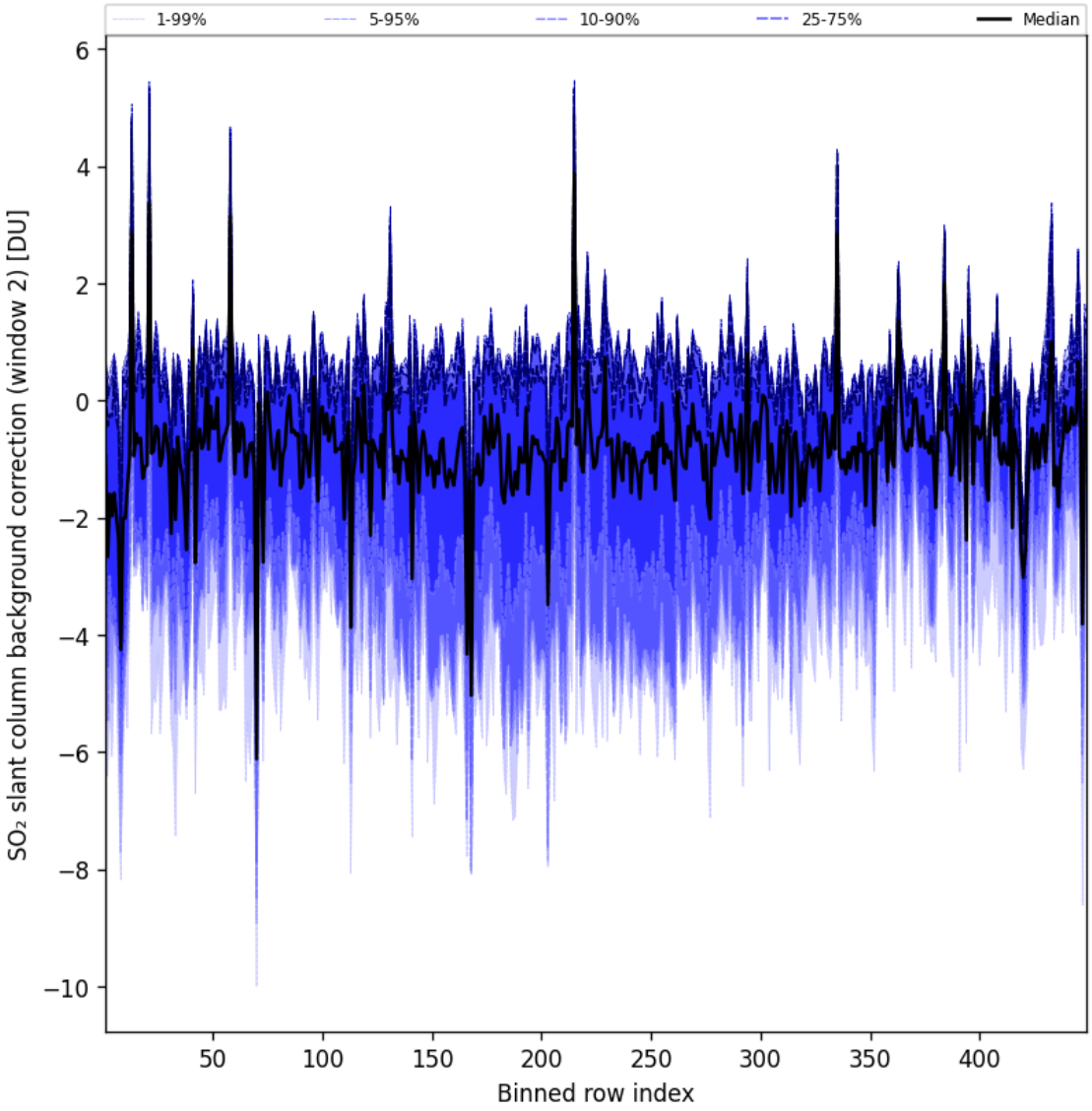


Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-06-04 to 2025-06-04

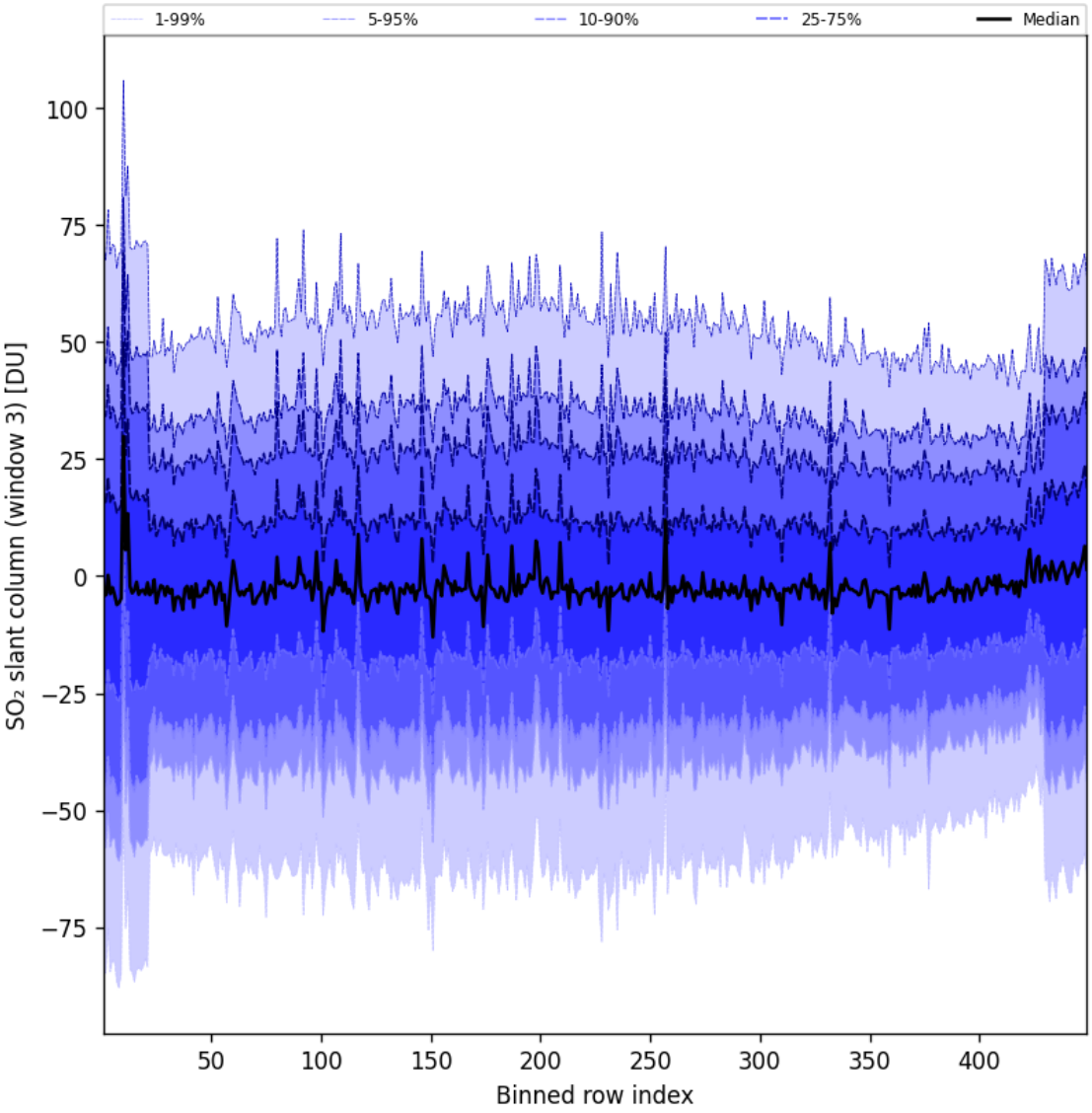


Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-06-04 to 2025-06-04

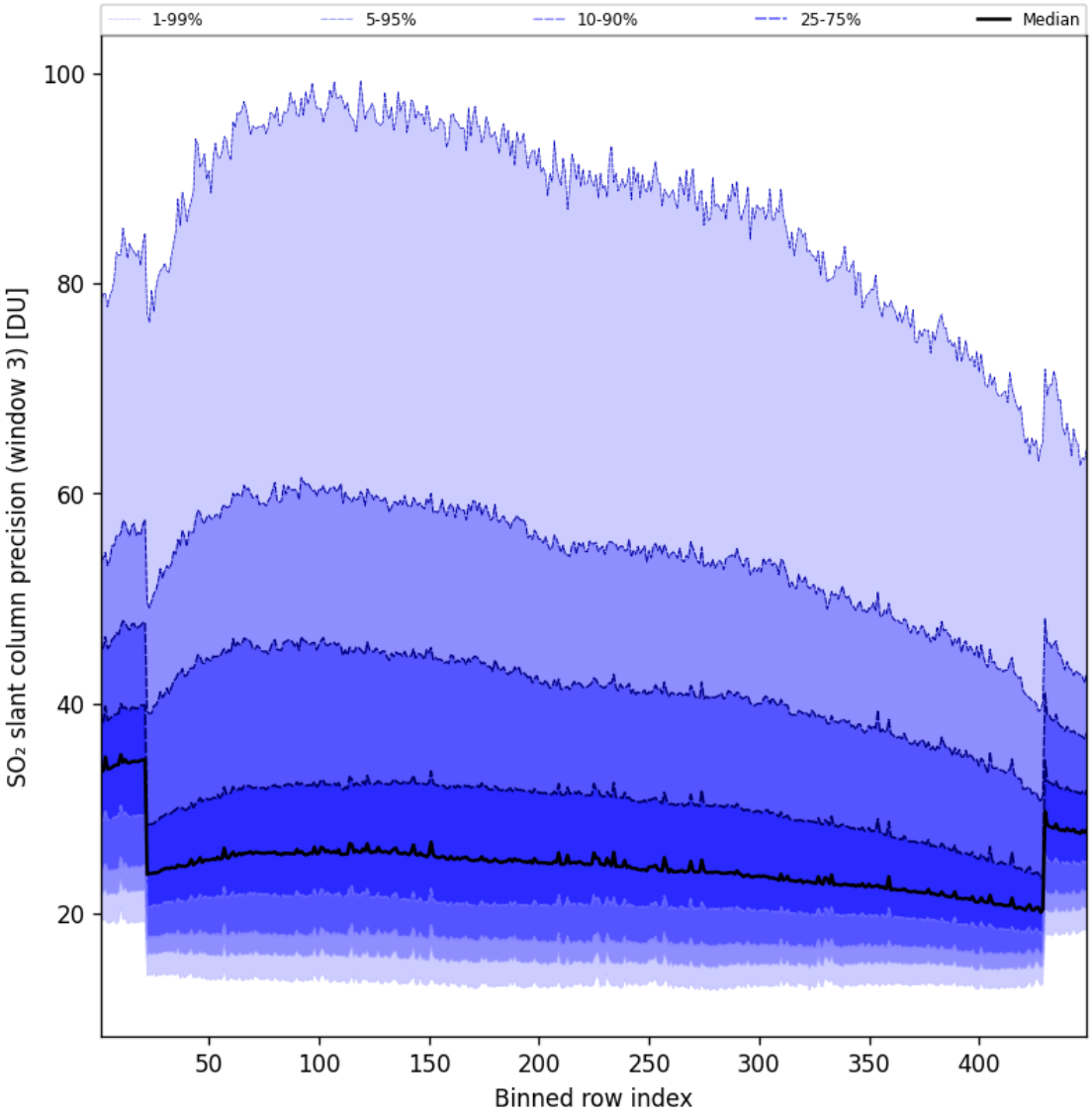


Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-06-04 to 2025-06-04

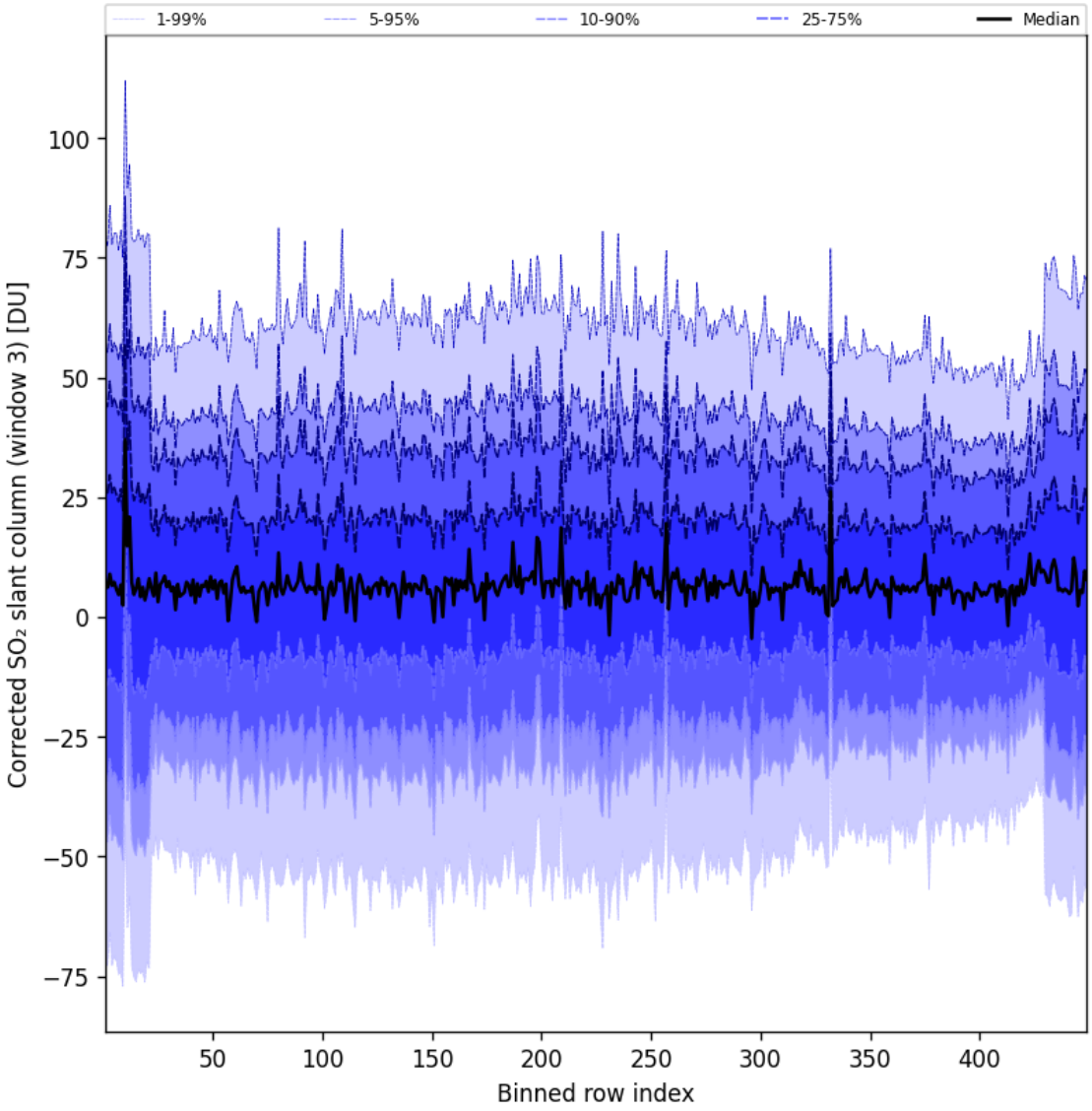


Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-06-04 to 2025-06-04

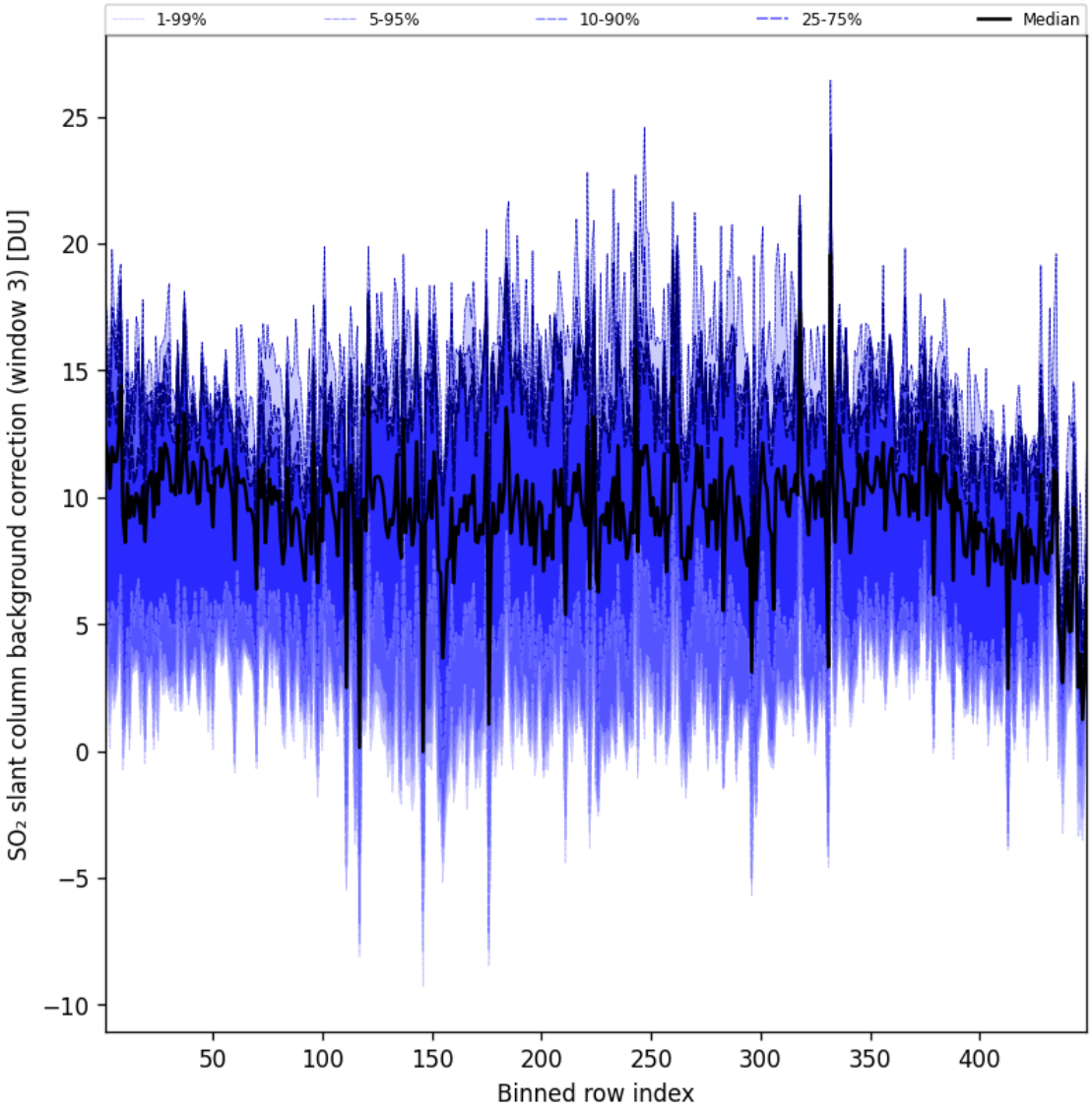


Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-06-04 to 2025-06-04

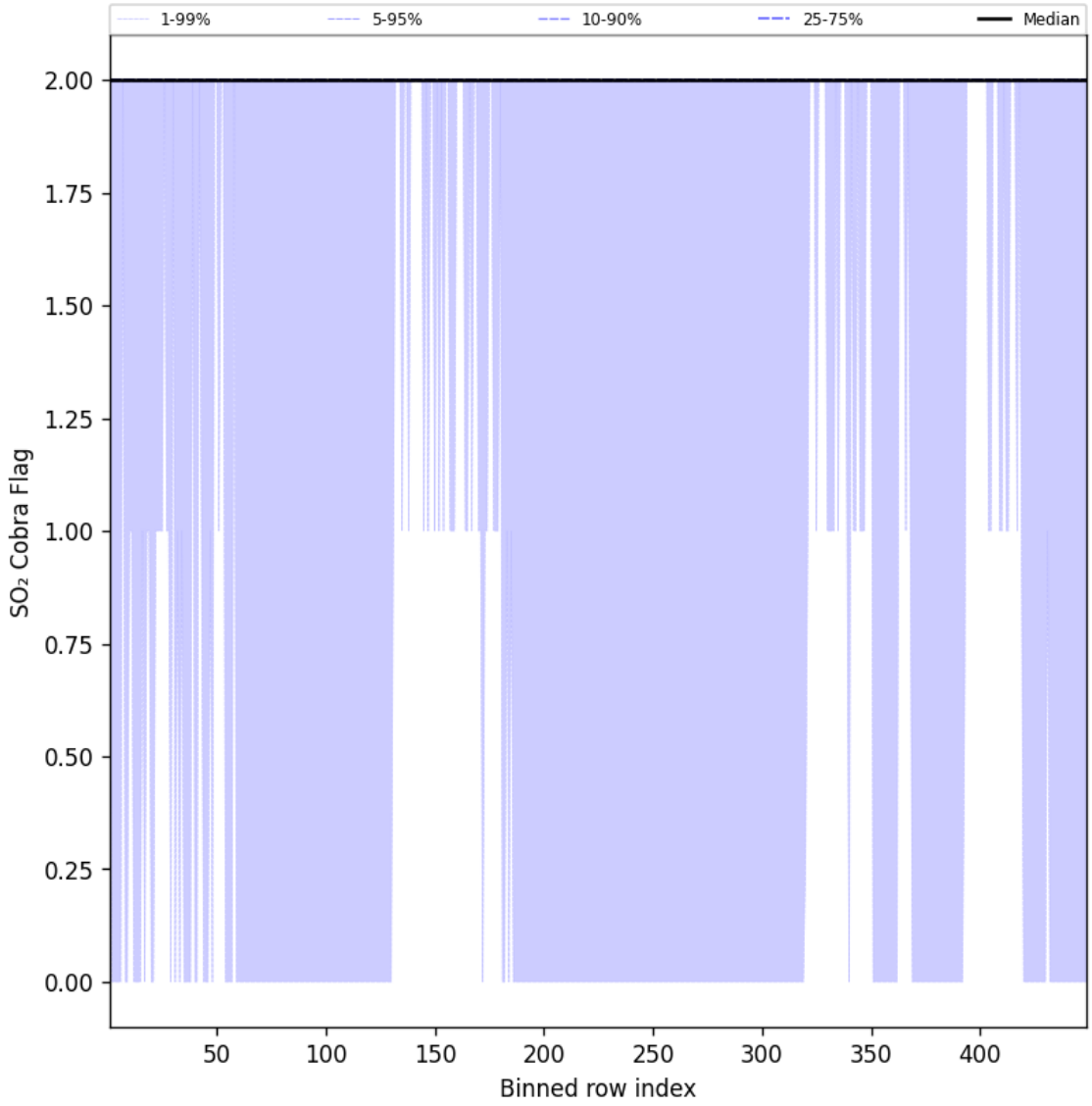


Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-06-04 to 2025-06-04

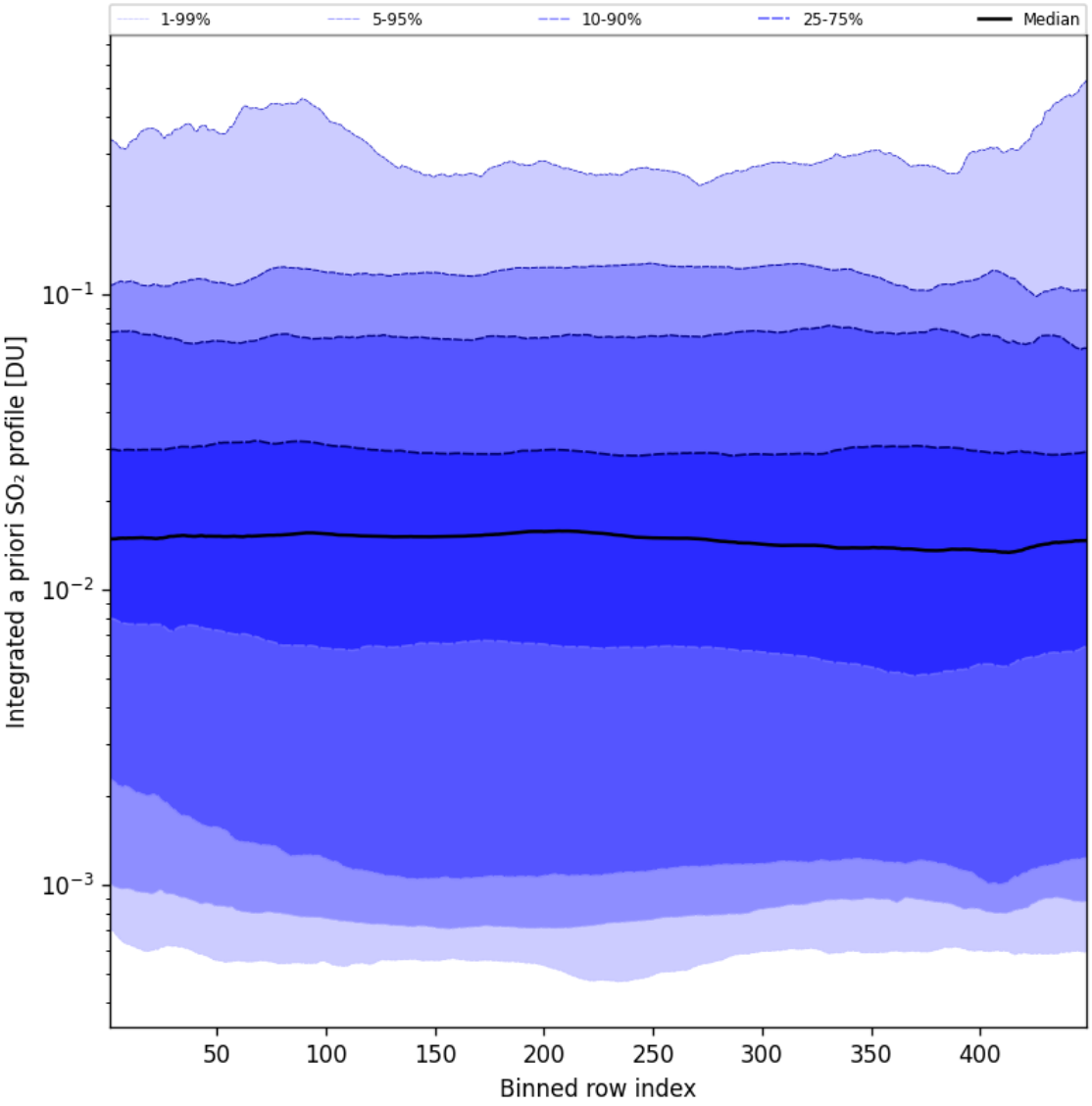
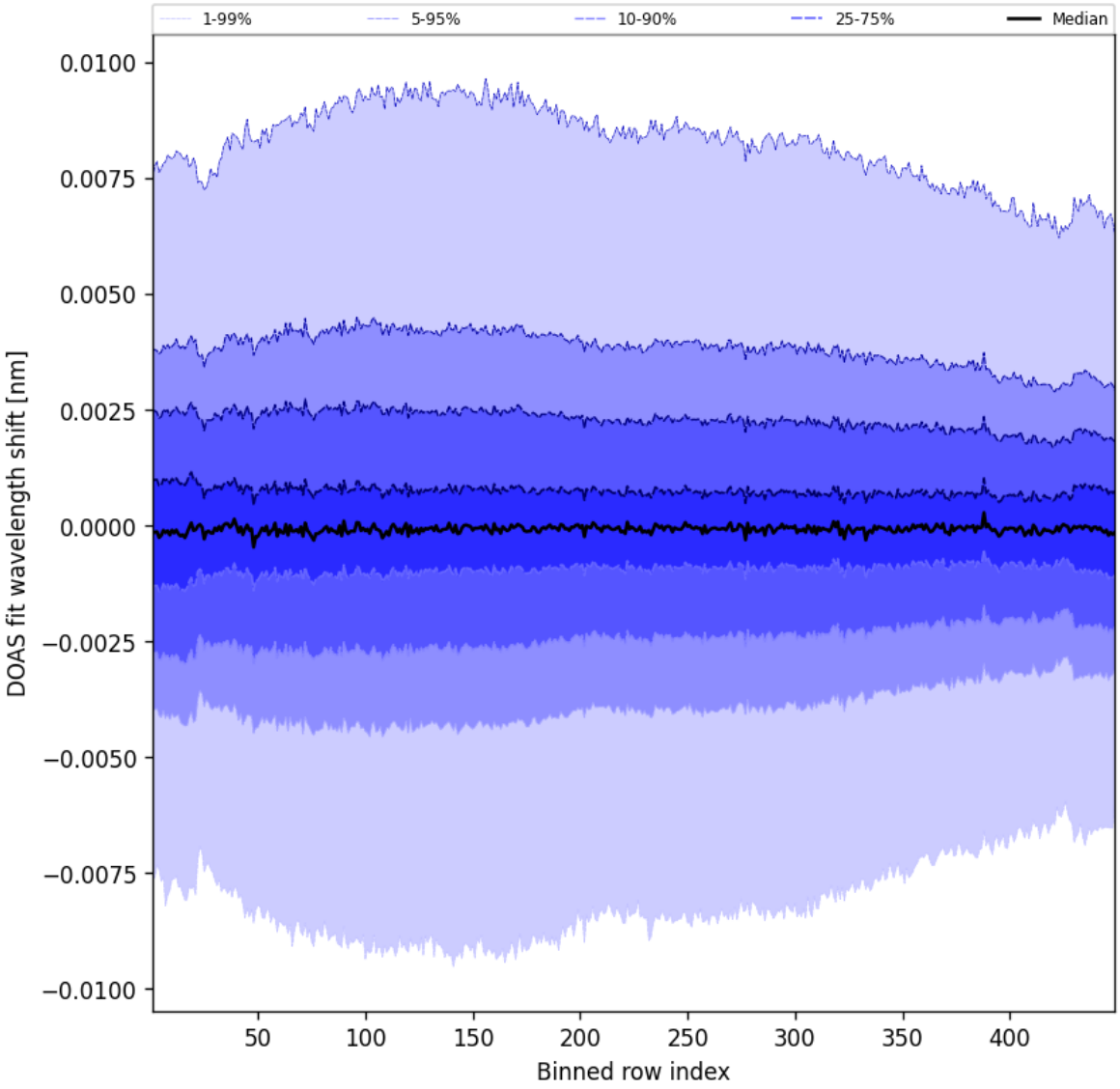


Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-06-04 to 2025-06-04



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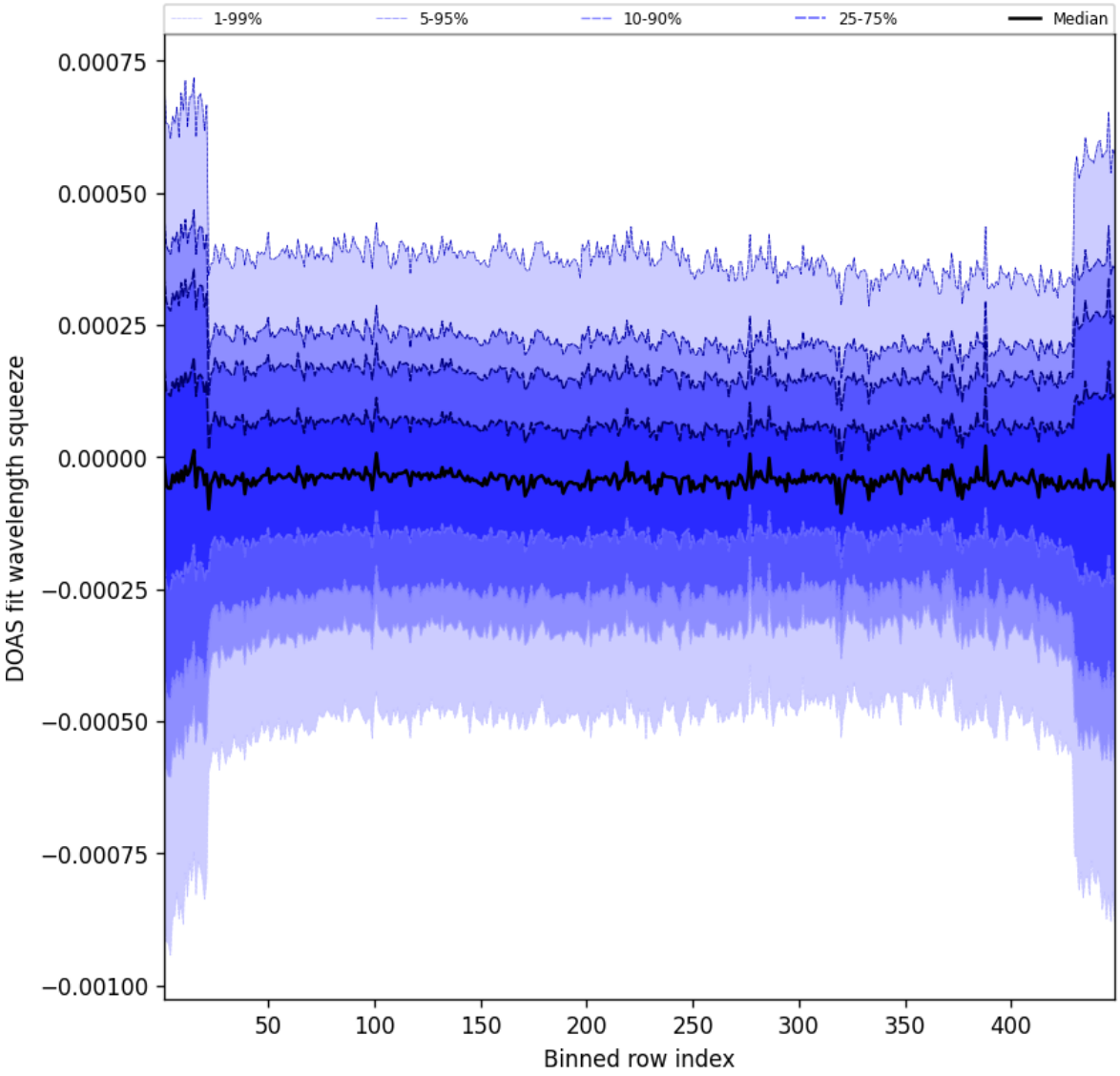

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-06-04 to 2025-06-04

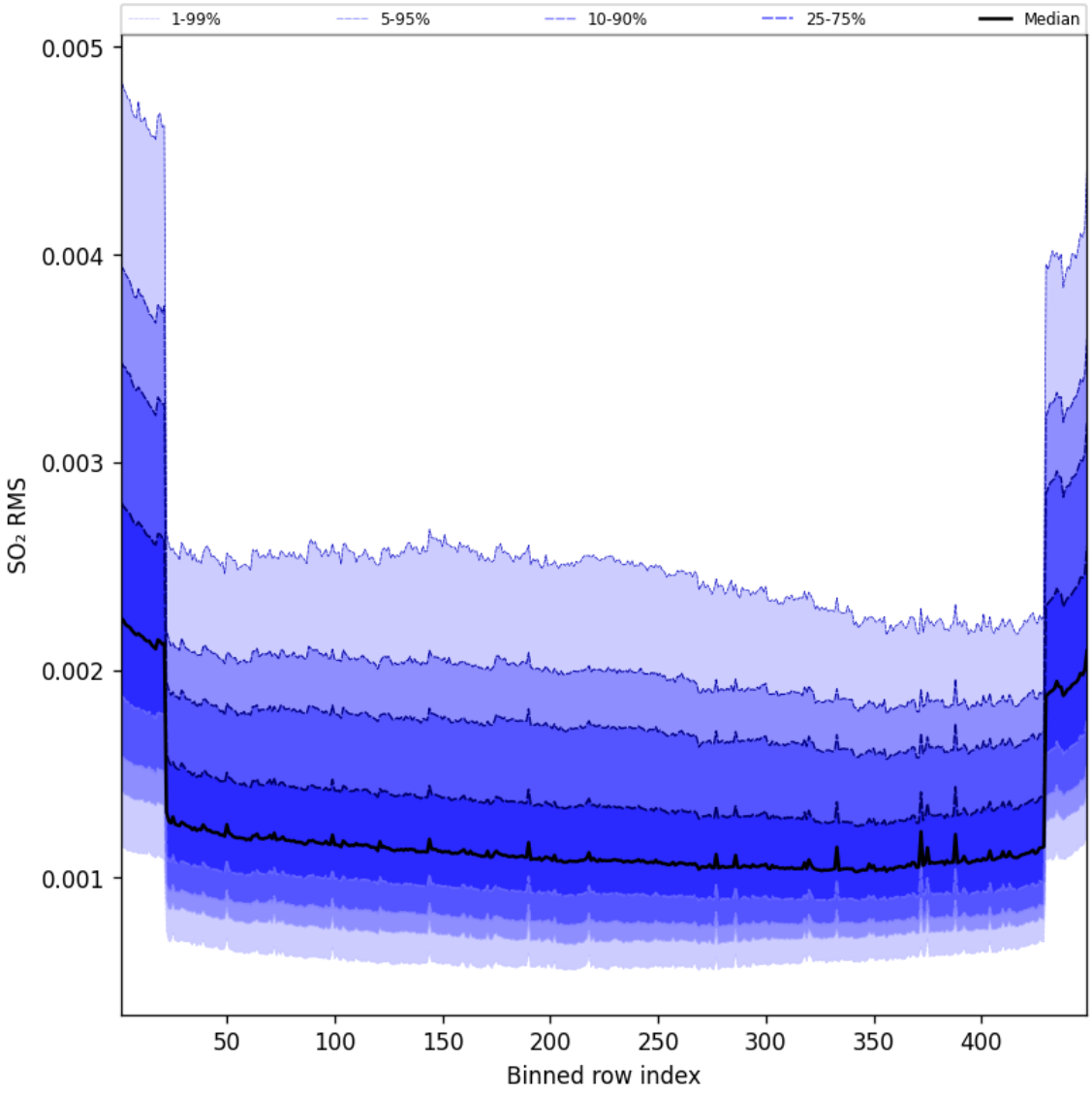

Figure 106: Along track statistics of "SO_2 RMS" for 2025-06-04 to 2025-06-04

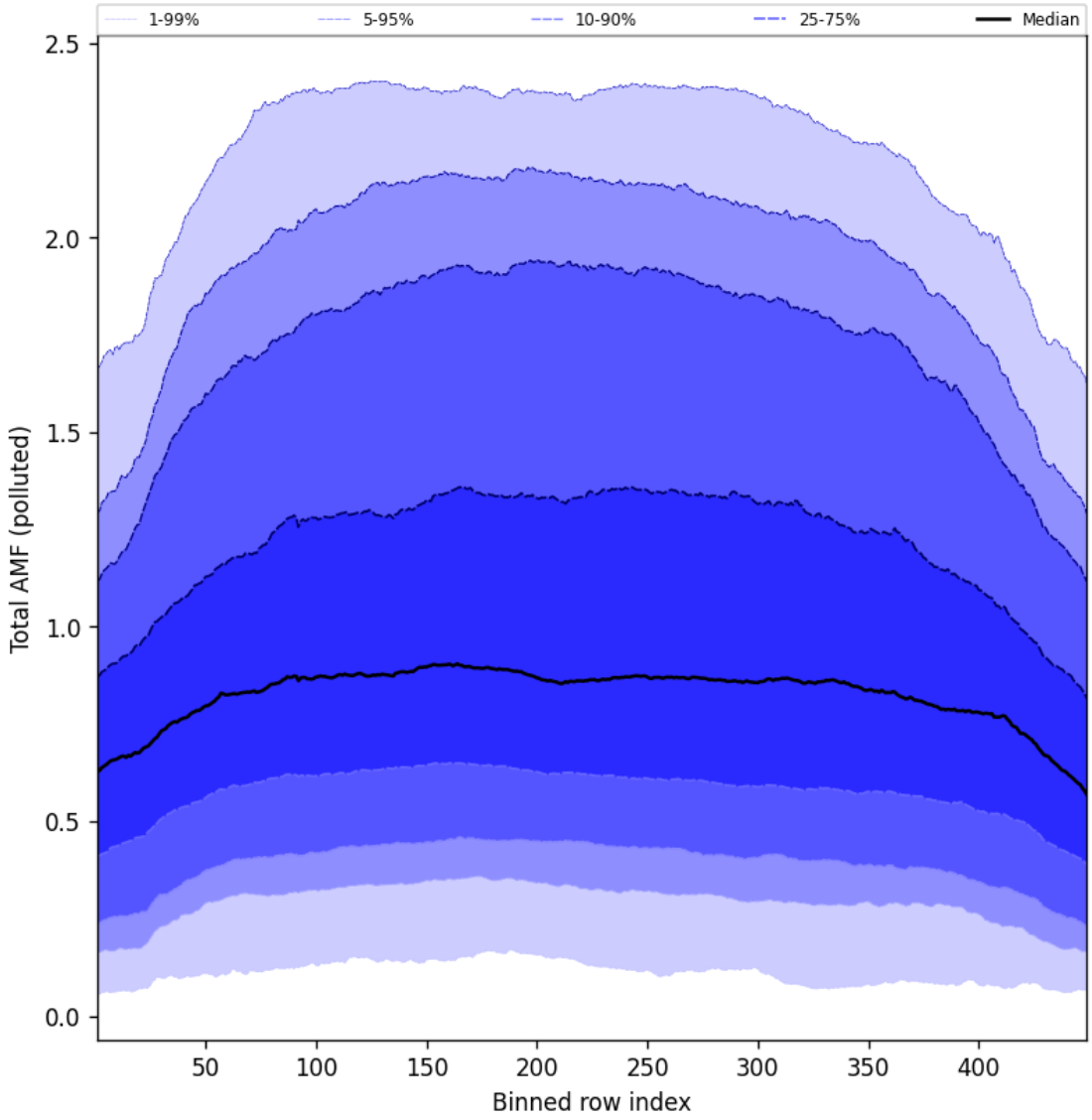

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-06-04 to 2025-06-04

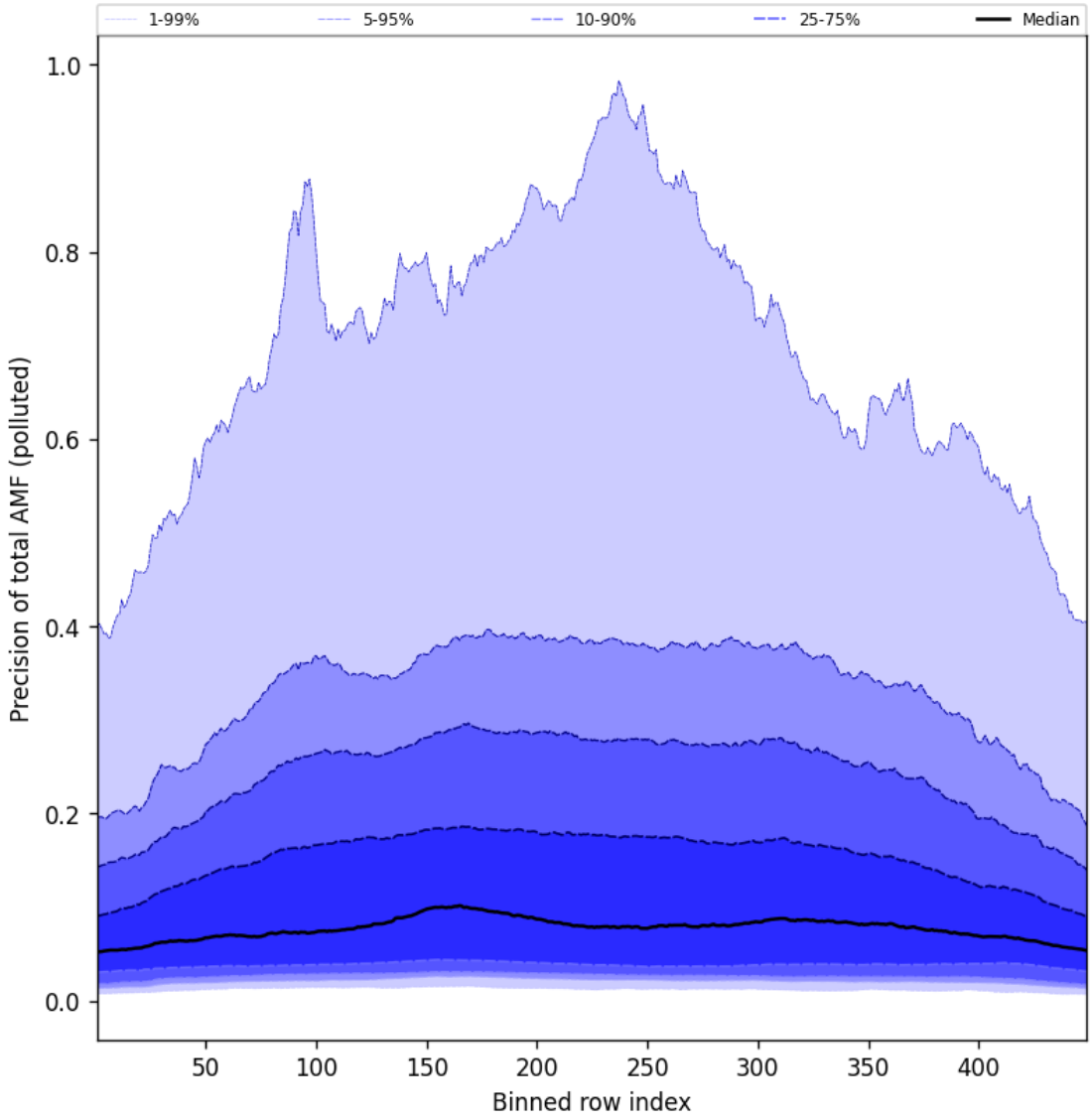

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-06-04 to 2025-06-04

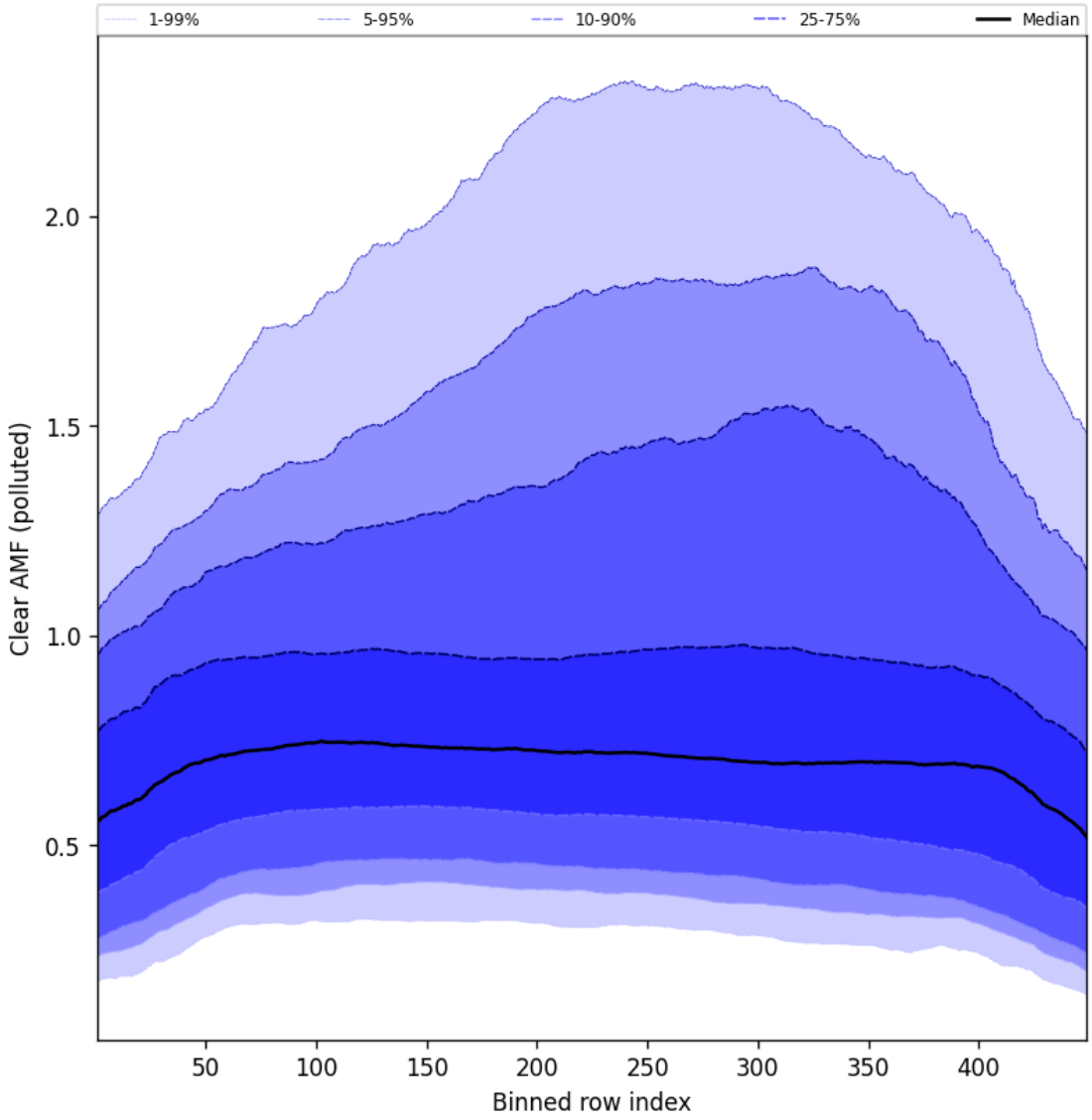

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-06-04 to 2025-06-04

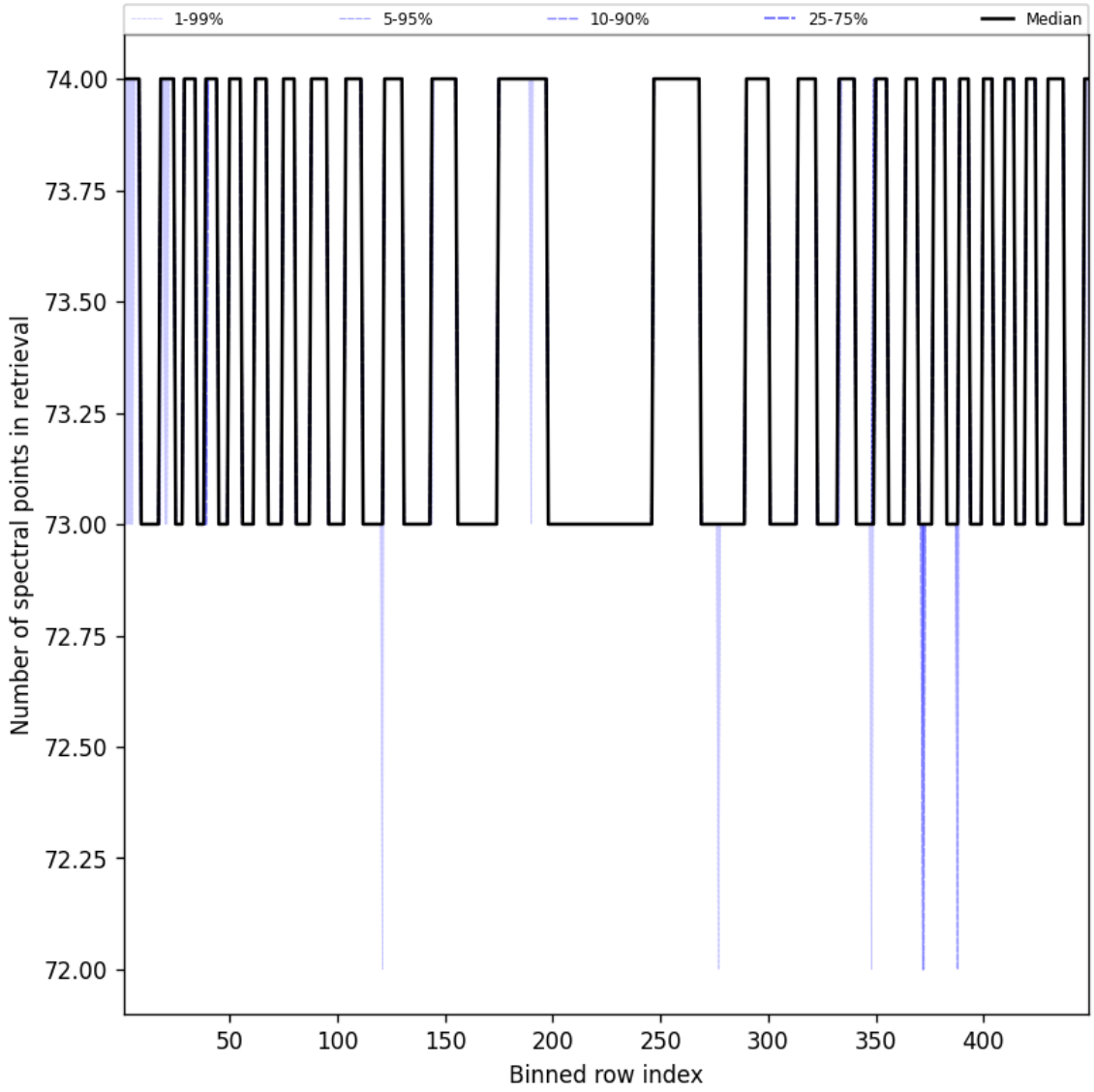

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-06-04 to 2025-06-04

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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