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]	0.648 ± 0.402	17341292	0.995	0.770	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.835 \pm 99.998) \times 10^{-2}$	17341292	0.263	0.468	1.122×10^{-2}	-123	997
sulfurdioxide total vertical column precision [DU]	0.519 ± 0.676	17341292	0.222	0.325	0.336	4.704×10^{-2}	85.5
sulfurdioxide slant column density corrected [DU]	$(2.070 \pm 41.805) \times 10^{-2}$	17341292	0.267	0.379	9.756×10^{-3}	-60.4	430
sulfurdioxide slant column density cobra [DU]	$(2.054 \pm 37.974) \times 10^{-2}$	17341292	0.267	0.379	9.756×10^{-3}	-60.4	88.2
sulfurdioxide slant column density cobra precision [DU]	0.303 ± 0.133	17341292	0.213	0.137	0.266	8.370×10^{-2}	42.0
sulfurdioxide slant column density window1 [DU]	0.140 ± 0.702	17341292	0.175	0.754	0.149	-67.8	121
sulfurdioxide slant column density window1 precision [DU]	0.303 ± 0.133	17341292	0.213	0.137	0.266	8.370×10^{-2}	42.0
sulfurdioxide slant column density corrected win1 [DU]	$(-6.153 \pm 696.668) \times 10^{-3}$	17341292	-2.500×10^{-2}	0.744	-2.536×10^{-2}	-67.8	121
background so2 slant column offset window1 [DU]	-0.146 ± 0.149	17341292	-0.220	0.155	-0.172	-1.05	2.65
sulfurdioxide slant column density window2 [DU]	0.969 ± 9.138	17341292	0.750	11.6	0.858	-2.198×10^{3}	1.141×10^{3}
sulfurdioxide slant column density window2 precision [DU]	8.14 ± 2.32	17341292	7.43	2.56	7.81	2.17	927
sulfurdioxide slant column density corrected win2 [DU]	-2.04 ± 8.88	17341292	-2.25	11.1	-2.04	-2.199×10^{3}	1.139×10^{3}
background so2 slant column offset window2 [DU]	-3.01 ± 3.00	17341292	-0.750	3.91	-2.13	-19.2	15.8
sulfurdioxide slant column density window3 [DU]	-4.50 ± 23.90	17341292	-6.16	29.9	-4.85	-1.762×10^{3}	511
sulfurdioxide slant column density window3 precision [DU]	28.7 ± 13.1	17341292	22.5	9.53	25.1	9.94	1.134×10^{3}
sulfurdioxide slant column density corrected win3 [DU]	9.16 ± 23.20	17341292	8.40	28.8	9.25	-1.755×10^{3}	520
background so2 slant column offset window3 [DU]	13.7 ± 6.3	17341292	8.40	10.4	13.3	-11.6	32.8
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.22	17341292	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.195 \pm 8.301) \times 10^{-2}$	17341292	1.664×10^{-2}	1.781×10^{-2}	1.283×10^{-2}	2.050×10^{-4}	1.83
fitted radiance shift [nm]	$(-2.648 \pm 25.527) \times 10^{-4}$	17341292	-5.000×10^{-4}	1.682×10^{-3}	-2.615×10^{-4}	-4.000×10^{-2}	4.561×10^{-2}
fitted radiance squeeze [1]	$(-1.588 \pm 18.238) \times 10^{-5}$	17341292	-1.000×10^{-5}	2.076×10^{-4}	-1.086×10^{-5}	-1.828×10^{-2}	3.694×10^{-2}
fitted root mean square [1]	$(1.316 \pm 0.548) \times 10^{-3}$	17341292	9.750×10^{-4}	5.503×10^{-4}	1.168×10^{-3}	3.397×10^{-4}	8.233×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.875 ± 0.448	17341292	0.660	0.558	0.804	5.000×10^{-2}	2.93
sulfurdioxide total air mass factor polluted precision [1]	0.106 ± 0.111	17341292	3.500×10^{-2}	9.984×10^{-2}	6.493×10^{-2}	2.902×10^{-3}	1.67
sulfurdioxide clear air mass factor polluted [1]	0.751 ± 0.315	17341292	0.660	0.393	0.707	5.804×10^{-2}	2.78
number of spectral points in retrieval [1]	73.4 ± 0.5	17341292	73.0	1.000	73.0	52.0	74.0

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.0	0.0	4.000×10^{-2}	0.110	0.230	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.26	−0.873	−0.541	−0.369	−0.220	0.248	0.409	0.601	0.976	2.56
sulfurdioxide total vertical column precision [DU]	0.105	0.142	0.171	0.196	0.229	0.553	0.740	0.962	1.40	3.38
sulfurdioxide slant column density corrected [DU]	−0.878	−0.509	−0.369	−0.276	−0.178	0.201	0.305	0.407	0.567	1.07
sulfurdioxide slant column density cobra [DU]	−0.878	−0.509	−0.369	−0.276	−0.178	0.201	0.305	0.407	0.567	1.07
sulfurdioxide slant column density cobra precision [DU]	0.145	0.174	0.189	0.200	0.216	0.353	0.404	0.455	0.552	0.785
sulfurdioxide slant column density window1 [DU]	−1.77	−0.947	−0.639	−0.439	−0.232	0.521	0.716	0.902	1.18	1.98
sulfurdioxide slant column density window1 precision [DU]	0.145	0.174	0.189	0.200	0.216	0.353	0.404	0.455	0.552	0.785
sulfurdioxide slant column density corrected win1 [DU]	−1.74	−1.03	−0.763	−0.583	−0.392	0.352	0.557	0.759	1.07	1.98
background so2 slant column offset window1 [DU]	−0.423	−0.316	−0.289	−0.269	−0.243	-8.764×10^{-2}	-3.156×10^{-2}	3.514×10^{-2}	0.139	0.366
sulfurdioxide slant column density window2 [DU]	−20.4	−13.6	−10.2	−7.72	−4.89	6.71	9.65	12.3	15.9	23.4
sulfurdioxide slant column density window2 precision [DU]	4.32	5.22	5.75	6.17	6.67	9.23	10.1	10.9	12.2	14.9
sulfurdioxide slant column density corrected win2 [DU]	−23.3	−16.3	−12.9	−10.4	−7.62	3.51	6.28	8.78	12.2	19.5
background so2 slant column offset window2 [DU]	−10.8	−8.86	−7.54	−6.27	−4.76	−0.853	−0.547	−0.298	4.066×10^{-2}	2.21
sulfurdioxide slant column density window3 [DU]	−63.6	−43.0	−33.6	−26.8	−19.5	10.4	18.3	25.6	35.3	54.4
sulfurdioxide slant column density window3 precision [DU]	14.4	17.0	18.7	20.1	21.6	31.1	35.6	41.5	53.4	85.3
sulfurdioxide slant column density corrected win3 [DU]	−49.6	−29.0	−19.4	−12.5	−5.11	23.7	31.0	37.8	46.9	65.7
background so2 slant column offset window3 [DU]	0.974	4.62	6.00	7.06	8.44	18.9	20.7	22.1	23.7	26.4
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	4.535×10^{-4}	7.410×10^{-4}	1.266×10^{-3}	2.866×10^{-3}	6.107×10^{-3}	2.392×10^{-2}	3.580×10^{-2}	6.084×10^{-2}	0.119	0.413
fitted radiance shift [nm]	-8.070×10^{-3}	-4.021×10^{-3}	-2.601×10^{-3}	-1.800×10^{-3}	-1.135×10^{-3}	5.469×10^{-4}	1.204×10^{-3}	2.061×10^{-3}	3.591×10^{-3}	7.860×10^{-3}
fitted radiance squeeze [1]	-5.141×10^{-4}	-3.092×10^{-4}	-2.277×10^{-4}	-1.732×10^{-4}	-1.164×10^{-4}	9.116×10^{-5}	1.434×10^{-4}	1.918×10^{-4}	2.612×10^{-4}	4.264×10^{-4}
fitted root mean square [1]	5.993×10^{-4}	7.516×10^{-4}	8.323×10^{-4}	8.921×10^{-4}	9.656×10^{-4}	1.516×10^{-3}	1.753×10^{-3}	1.988×10^{-3}	2.335×10^{-3}	3.335×10^{-3}
sulfurdioxide total air mass factor polluted [1]	9.129×10^{-2}	0.255	0.354	0.447	0.561	1.12	1.33	1.52	1.77	2.11
sulfurdioxide total air mass factor polluted precision [1]	1.166×10^{-2}	1.868×10^{-2}	2.480×10^{-2}	3.040×10^{-2}	3.735×10^{-2}	0.137	0.179	0.224	0.311	0.576
sulfurdioxide clear air mass factor polluted [1]	0.218	0.310	0.379	0.446	0.531	0.924	1.04	1.15	1.34	1.75
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]	0.596 ± 0.410	11106156	0.810	0.490	0.0	1.000	0.190	1.000
sulfurdioxide total vertical column [DU]	$(2.807 \pm 98.865) \times 10^{-2}$	11106156	0.451	9.956×10^{-3}	-54.2	76.9	-0.212	0.239
sulfurdioxide total vertical column precision [DU]	0.530 ± 0.740	11106156	0.336	0.320	4.978×10^{-2}	26.6	0.216	0.553
sulfurdioxide slant column density corrected [DU]	$(2.160 \pm 38.688) \times 10^{-2}$	11106156	0.372	8.858×10^{-3}	-9.86	36.4	-0.175	0.197
sulfurdioxide slant column density cobra [DU]	$(2.153 \pm 38.393) \times 10^{-2}$	11106156	0.372	8.858×10^{-3}	-9.86	15.8	-0.175	0.197
sulfurdioxide slant column density cobra precision [DU]	0.299 ± 0.135	11106156	0.138	0.259	8.870×10^{-2}	7.21	0.210	0.348
sulfurdioxide slant column density window1 [DU]	0.132 ± 0.708	11106156	0.742	0.145	-10.4	32.8	-0.232	0.510
sulfurdioxide slant column density window1 precision [DU]	0.299 ± 0.135	11106156	0.138	0.259	8.870×10^{-2}	7.21	0.210	0.348
sulfurdioxide slant column density corrected win1 [DU]	$(-5.463 \pm 701.280) \times 10^{-3}$	11106156	0.731	-2.731×10^{-2}	-10.0	32.9	-0.387	0.344
background so2 slant column offset window1 [DU]	-0.138 ± 0.164	11106156	0.175	-0.174	-0.728	2.04	-0.247	-7.239×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.38 ± 8.66	11106156	11.2	1.27	-884	173	-4.28	6.93
sulfurdioxide slant column density window2 precision [DU]	7.73 ± 2.03	11106156	2.27	7.43	2.17	359	6.40	8.67
sulfurdioxide slant column density corrected win2 [DU]	-2.16 ± 8.28	11106156	10.6	-2.14	-896	166	-7.45	3.14
background so2 slant column offset window2 [DU]	-3.55 ± 3.34	11106156	5.25	-2.79	-19.2	15.8	-6.05	-0.795
sulfurdioxide slant column density window3 [DU]	-5.61 ± 22.35	11106156	27.9	-6.08	-1.762×10^{3}	156	-19.7	8.15
sulfurdioxide slant column density window3 precision [DU]	27.1 ± 12.6	11106156	7.69	23.7	9.94	1.134×10^{3}	20.8	28.4
sulfurdioxide slant column density corrected win3 [DU]	9.20 ± 21.51	11106156	26.7	9.30	-1.755×10^{3}	172	-4.07	22.7
background so2 slant column offset window3 [DU]	14.8 ± 6.5	11106156	11.1	15.7	-9.35	31.3	9.01	20.2
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.20	11106156	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.859 \pm 9.873) \times 10^{-2}$	11106156	2.653×10^{-2}	1.282×10^{-2}	2.050×10^{-4}	1.83	3.027×10^{-3}	2.956×10^{-2}
fitted radiance shift [nm]	$(-1.178 \pm 24.920) \times 10^{-4}$	11106156	1.540×10^{-3}	-1.461×10^{-4}	-3.908×10^{-2}	4.222×10^{-2}	-9.186×10^{-4}	6.214×10^{-4}
fitted radiance squeeze [1]	$(-3.592 \pm 17.859) \times 10^{-5}$	11106156	2.037×10^{-4}	-2.490×10^{-5}	-2.621×10^{-3}	1.320×10^{-2}	-1.308×10^{-4}	7.288×10^{-5}
fitted root mean square [1]	$(1.302 \pm 0.569) \times 10^{-3}$	11106156	5.524×10^{-4}	1.138×10^{-3}	3.397×10^{-4}	2.870×10^{-2}	9.412×10^{-4}	1.494×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.907 ± 0.494	11106156	0.680	0.826	5.000×10^{-2}	2.93	0.534	1.21
sulfurdioxide total air mass factor polluted precision [1]	0.114 ± 0.125	11106156	0.107	6.986×10^{-2}	2.902×10^{-3}	1.67	3.765×10^{-2}	0.145
sulfurdioxide clear air mass factor polluted [1]	0.764 ± 0.360	11106156	0.471	0.712	5.804×10^{-2}	2.78	0.491	0.963
number of spectral points in retrieval [1]	73.5 ± 0.5	11106156	1.000	73.0	53.0	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]	0.739 ± 0.372	6235136	0.610	1.000	0.0	1.000	0.390	1.000
sulfurdioxide total vertical column [DU]	$(2.886 \pm 101.984) \times 10^{-2}$	6235136	0.499	1.371×10^{-2}	-123	997	-0.233	0.266
sulfurdioxide total vertical column precision [DU]	0.498 ± 0.541	6235136	0.303	0.361	4.704×10^{-2}	85.5	0.252	0.554
sulfurdioxide slant column density corrected [DU]	$(1.911 \pm 46.846) \times 10^{-2}$	6235136	0.392	1.146×10^{-2}	-60.4	430	-0.183	0.209
sulfurdioxide slant column density cobra [DU]	$(1.879 \pm 37.215) \times 10^{-2}$	6235136	0.392	1.146×10^{-2}	-60.4	88.2	-0.183	0.209
sulfurdioxide slant column density cobra precision [DU]	0.310 ± 0.129	6235136	0.133	0.278	8.370×10^{-2}	42.0	0.227	0.360
sulfurdioxide slant column density window1 [DU]	0.153 ± 0.692	6235136	0.776	0.157	-67.8	121	-0.233	0.543
sulfurdioxide slant column density window1 precision [DU]	0.310 ± 0.129	6235136	0.133	0.278	8.370×10^{-2}	42.0	0.227	0.360
sulfurdioxide slant column density corrected win1 [DU]	$(-7.382 \pm 688.375) \times 10^{-3}$	6235136	0.767	-2.171×10^{-2}	-67.8	121	-0.401	0.367
background so2 slant column offset window1 [DU]	-0.161 ± 0.119	6235136	0.129	-0.169	-1.05	2.65	-0.233	-0.104
sulfurdioxide slant column density window2 [DU]	0.232 ± 9.883	6235136	12.3	6.012×10^{-2}	-2.198×10^{3}	1.141×10^{3}	-6.00	6.26
sulfurdioxide slant column density window2 precision [DU]	8.89 ± 2.62	6235136	2.73	8.57	2.42	927	7.34	10.1
sulfurdioxide slant column density corrected win2 [DU]	-1.83 ± 9.84	6235136	12.2	-1.85	-2.199×10^{3}	1.139×10^{3}	-7.95	4.24
background so2 slant column offset window2 [DU]	-2.06 ± 1.93	6235136	2.06	-1.70	-15.0	15.1	-2.99	-0.923
sulfurdioxide slant column density window3 [DU]	-2.51 ± 26.32	6235136	33.4	-2.22	-437	511	-18.9	14.4
sulfurdioxide slant column density window3 precision [DU]	31.6 ± 13.6	6235136	10.5	28.1	10.7	329	23.9	34.4
sulfurdioxide slant column density corrected win3 [DU]	9.09 ± 25.94	6235136	33.0	9.16	-427	520	-7.25	25.7
background so2 slant column offset window3 [DU]	11.6 ± 5.2	6235136	7.34	10.6	-11.6	32.8	7.94	15.3
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.23	6235136	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.011 \pm 3.981) \times 10^{-2}$	6235136	1.079×10^{-2}	1.284×10^{-2}	1.144×10^{-3}	1.80	8.855×10^{-3}	1.964×10^{-2}
fitted radiance shift [nm]	$(-5.267 \pm 26.372) \times 10^{-4}$	6235136	1.886×10^{-3}	-5.095×10^{-4}	-4.000×10^{-2}	4.561×10^{-2}	-1.513×10^{-3}	3.735×10^{-4}
fitted radiance squeeze [1]	$(1.983 \pm 18.358) \times 10^{-5}$	6235136	2.141×10^{-4}	1.575×10^{-5}	-1.828×10^{-2}	3.694×10^{-2}	-8.965×10^{-5}	1.244×10^{-4}
fitted root mean square [1]	$(1.342 \pm 0.508) \times 10^{-3}$	6235136	5.345×10^{-4}	1.217×10^{-3}	3.687×10^{-4}	8.233×10^{-2}	1.014×10^{-3}	1.548×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.819 ± 0.345	6235136	0.412	0.780	5.000×10^{-2}	2.76	0.594	1.01
sulfurdioxide total air mass factor polluted precision [1]	$(9.124 \pm 8.021) \times 10^{-2}$	6235136	8.717×10^{-2}	5.707×10^{-2}	5.454×10^{-3}	1.29	3.701×10^{-2}	0.124
sulfurdioxide clear air mass factor polluted [1]	0.728 ± 0.211	6235136	0.290	0.702	0.120	1.53	0.581	0.871
number of spectral points in retrieval [1]	73.4 ± 0.5	6235136	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]	0.686 ± 0.389	11384303	0.710	1.000	0.0	1.000	0.290	1.000
sulfurdioxide total vertical column [DU]	$(2.680 \pm 86.203) \times 10^{-2}$	11384303	0.457	1.057×10^{-2}	-108	369	-0.215	0.242
sulfurdioxide total vertical column precision [DU]	0.478 ± 0.579	11384303	0.289	0.323	5.252×10^{-2}	40.2	0.230	0.519
sulfurdioxide slant column density corrected [DU]	$(1.997 \pm 38.913) \times 10^{-2}$	11384303	0.374	9.147×10^{-3}	-8.16	249	-0.176	0.198
sulfurdioxide slant column density cobra [DU]	$(1.988 \pm 37.922) \times 10^{-2}$	11384303	0.374	9.147×10^{-3}	-8.16	88.2	-0.176	0.198
sulfurdioxide slant column density cobra precision [DU]	0.301 ± 0.132	11384303	0.146	0.260	8.370×10^{-2}	27.3	0.212	0.358
sulfurdioxide slant column density window1 [DU]	0.140 ± 0.702	11384303	0.751	0.152	-67.8	121	-0.229	0.522
sulfurdioxide slant column density window1 precision [DU]	0.301 ± 0.132	11384303	0.146	0.260	8.370×10^{-2}	27.3	0.212	0.358
sulfurdioxide slant column density corrected win1 [DU]	$(-8.976 \pm 696.155) \times 10^{-3}$	11384303	0.741	-2.674×10^{-2}	-67.8	121	-0.392	0.349
background so2 slant column offset window1 [DU]	-0.149 ± 0.147	11384303	0.153	-0.174	-1.05	2.65	-0.244	-9.078×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.757 ± 9.101	11384303	11.6	0.582	-884	682	-5.14	6.46
sulfurdioxide slant column density window2 precision [DU]	8.16 ± 2.19	11384303	2.52	7.84	2.17	574	6.72	9.25
sulfurdioxide slant column density corrected win2 [DU]	-1.97 ± 8.86	11384303	11.2	-1.98	-896	680	-7.59	3.62
background so2 slant column offset window2 [DU]	-2.73 ± 2.91	11384303	3.33	-1.84	-19.2	15.8	-4.10	-0.766
sulfurdioxide slant column density window3 [DU]	-1.61 ± 24.11	11384303	30.6	-2.02	-468	320	-17.0	13.6
sulfurdioxide slant column density window3 precision [DU]	28.1 ± 11.8	11384303	8.86	24.9	10.4	211	21.7	30.6
sulfurdioxide slant column density corrected win3 [DU]	11.3 ± 23.2	11384303	29.2	11.1	-460	332	-3.32	25.9
background so2 slant column offset window3 [DU]	12.9 ± 6.2	11384303	9.91	12.0	-11.6	32.8	7.98	17.9
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	11384303	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.031 \pm 4.460) \times 10^{-2}$	11384303	1.319×10^{-2}	1.232×10^{-2}	2.650×10^{-4}	1.83	7.034×10^{-3}	2.023×10^{-2}
fitted radiance shift [nm]	$(-3.105 \pm 23.174) \times 10^{-4}$	11384303	1.641×10^{-3}	-2.851×10^{-4}	-3.761×10^{-2}	4.287×10^{-2}	-1.154×10^{-3}	4.875×10^{-4}
fitted radiance squeeze [1]	$(-8.413 \pm 181.106) \times 10^{-6}$	11384303	2.057×10^{-4}	-3.893×10^{-6}	-1.828×10^{-2}	1.192×10^{-2}	-1.082×10^{-4}	9.750×10^{-5}
fitted root mean square [1]	$(1.315 \pm 0.549) \times 10^{-3}$	11384303	6.025×10^{-4}	1.151×10^{-3}	3.397×10^{-4}	6.899×10^{-2}	9.507×10^{-4}	1.553×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.868 ± 0.389	11384303	0.480	0.822	5.000×10^{-2}	2.78	0.605	1.08
sulfurdioxide total air mass factor polluted precision [1]	$(9.508 \pm 9.162) \times 10^{-2}$	11384303	8.175×10^{-2}	6.282×10^{-2}	3.239×10^{-3}	1.67	3.943×10^{-2}	0.121
sulfurdioxide clear air mass factor polluted [1]	0.763 ± 0.284	11384303	0.342	0.730	6.303×10^{-2}	2.78	0.575	0.918
number of spectral points in retrieval [1]	73.4 ± 0.5	11384303	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]	0.628 ± 0.414	4154643	0.820	1.000	0.0	1.000	0.180	1.000
sulfurdioxide total vertical column [DU]	$(2.637 \pm 112.788) \times 10^{-2}$	4154643	0.481	1.161×10^{-2}	-123	997	-0.225	0.257
sulfurdioxide total vertical column precision [DU]	0.554 ± 0.733	4154643	0.371	0.362	4.704×10^{-2}	85.5	0.229	0.601
sulfurdioxide slant column density corrected [DU]	$(1.967 \pm 43.910) \times 10^{-2}$	4154643	0.374	1.006×10^{-2}	-60.4	430	-0.175	0.199
sulfurdioxide slant column density cobra [DU]	$(1.943 \pm 35.875) \times 10^{-2}$	4154643	0.374	1.006×10^{-2}	-60.4	63.5	-0.175	0.199
sulfurdioxide slant column density cobra precision [DU]	0.295 ± 0.127	4154643	0.112	0.264	8.991×10^{-2}	42.0	0.219	0.331
sulfurdioxide slant column density window1 [DU]	0.160 ± 0.663	4154643	0.733	0.160	-64.3	56.0	-0.207	0.526
sulfurdioxide slant column density window1 precision [DU]	0.295 ± 0.127	4154643	0.112	0.264	8.991×10^{-2}	42.0	0.219	0.331
sulfurdioxide slant column density corrected win1 [DU]	$(-6.018 \pm 658.282) \times 10^{-3}$	4154643	0.725	-2.429×10^{-2}	-64.3	55.8	-0.381	0.344
background so2 slant column offset window1 [DU]	-0.166 ± 0.132	4154643	0.142	-0.186	-0.728	1.30	-0.251	-0.109
sulfurdioxide slant column density window2 [DU]	0.802 ± 9.300	4154643	11.6	0.787	-2.198×10^{3}	1.141×10^{3}	-5.01	6.59
sulfurdioxide slant column density window2 precision [DU]	8.25 ± 2.66	4154643	2.61	7.88	2.28	927	6.70	9.32
sulfurdioxide slant column density corrected win2 [DU]	-2.14 ± 9.08	4154643	11.1	-2.14	-2.199×10^{3}	1.139×10^{3}	-7.72	3.42
background so2 slant column offset window2 [DU]	-2.94 ± 2.91	4154643	3.70	-2.11	-19.2	15.8	-4.59	-0.896
sulfurdioxide slant column density window3 [DU]	-9.96 ± 23.20	4154643	28.5	-9.64	-1.762×10^{3}	372	-24.0	4.50
sulfurdioxide slant column density window3 precision [DU]	30.8 ± 16.0	4154643	11.6	26.2	9.94	1.134×10^{3}	21.7	33.4
sulfurdioxide slant column density corrected win3 [DU]	3.99 ± 23.41	4154643	28.8	4.79	-1.755×10^{3}	383	-10.0	18.8
background so2 slant column offset window3 [DU]	13.9 ± 6.1	4154643	10.3	13.6	-10.0	32.6	8.83	19.1
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.13	4154643	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.862 \pm 12.338) \times 10^{-2}$	4154643	4.666×10^{-2}	1.879×10^{-2}	2.050×10^{-4}	1.80	5.848×10^{-3}	5.251×10^{-2}
fitted radiance shift [nm]	$(-1.575 \pm 31.314) \times 10^{-4}$	4154643	1.816×10^{-3}	-2.021×10^{-4}	-4.000×10^{-2}	4.561×10^{-2}	-1.103×10^{-3}	7.130×10^{-4}
fitted radiance squeeze [1]	$(-1.925 \pm 17.768) \times 10^{-5}$	4154643	2.050×10^{-4}	-1.587×10^{-5}	-1.563×10^{-2}	3.694×10^{-2}	-1.196×10^{-4}	8.535×10^{-5}
fitted root mean square [1]	$(1.271 \pm 0.497) \times 10^{-3}$	4154643	4.340×10^{-4}	1.161×10^{-3}	3.557×10^{-4}	8.233×10^{-2}	9.783×10^{-4}	1.412×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.870 ± 0.524	4154643	0.664	0.725	5.000×10^{-2}	2.93	0.490	1.15
sulfurdioxide total air mass factor polluted precision [1]	0.124 ± 0.140	4154643	0.138	6.893×10^{-2}	2.902×10^{-3}	1.61	3.196×10^{-2}	0.170
sulfurdioxide clear air mass factor polluted [1]	0.720 ± 0.344	4154643	0.441	0.648	5.804×10^{-2}	2.46	0.467	0.908
number of spectral points in retrieval [1]	73.4 ± 0.5	4154643	1.000	73.0	53.0	74.0	73.0	74.0

3 Granule outlines

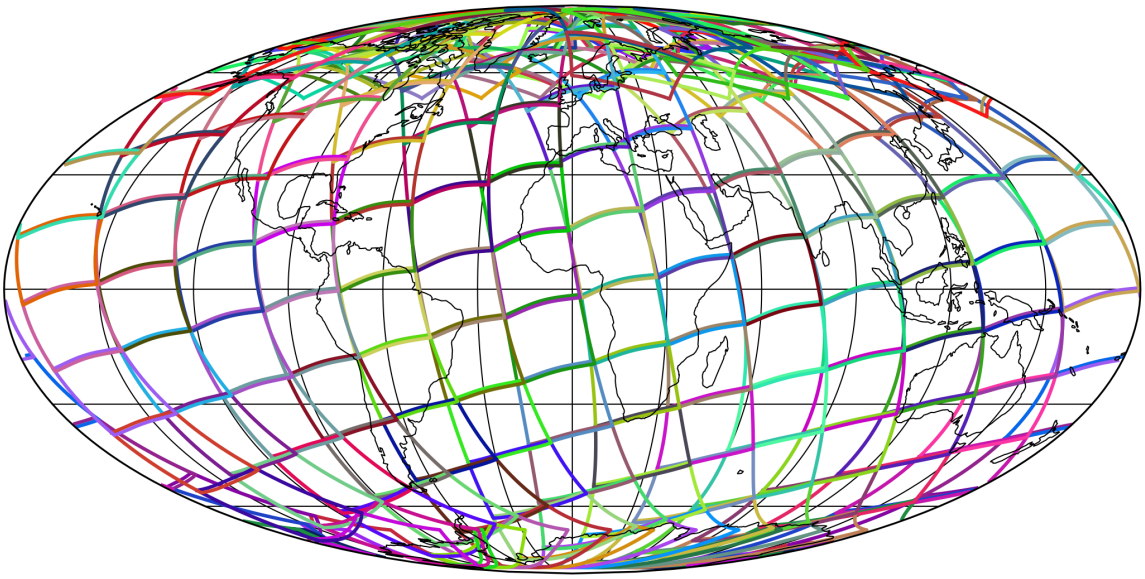

Figure 1: Outline of the granules.

4 Input data monitoring

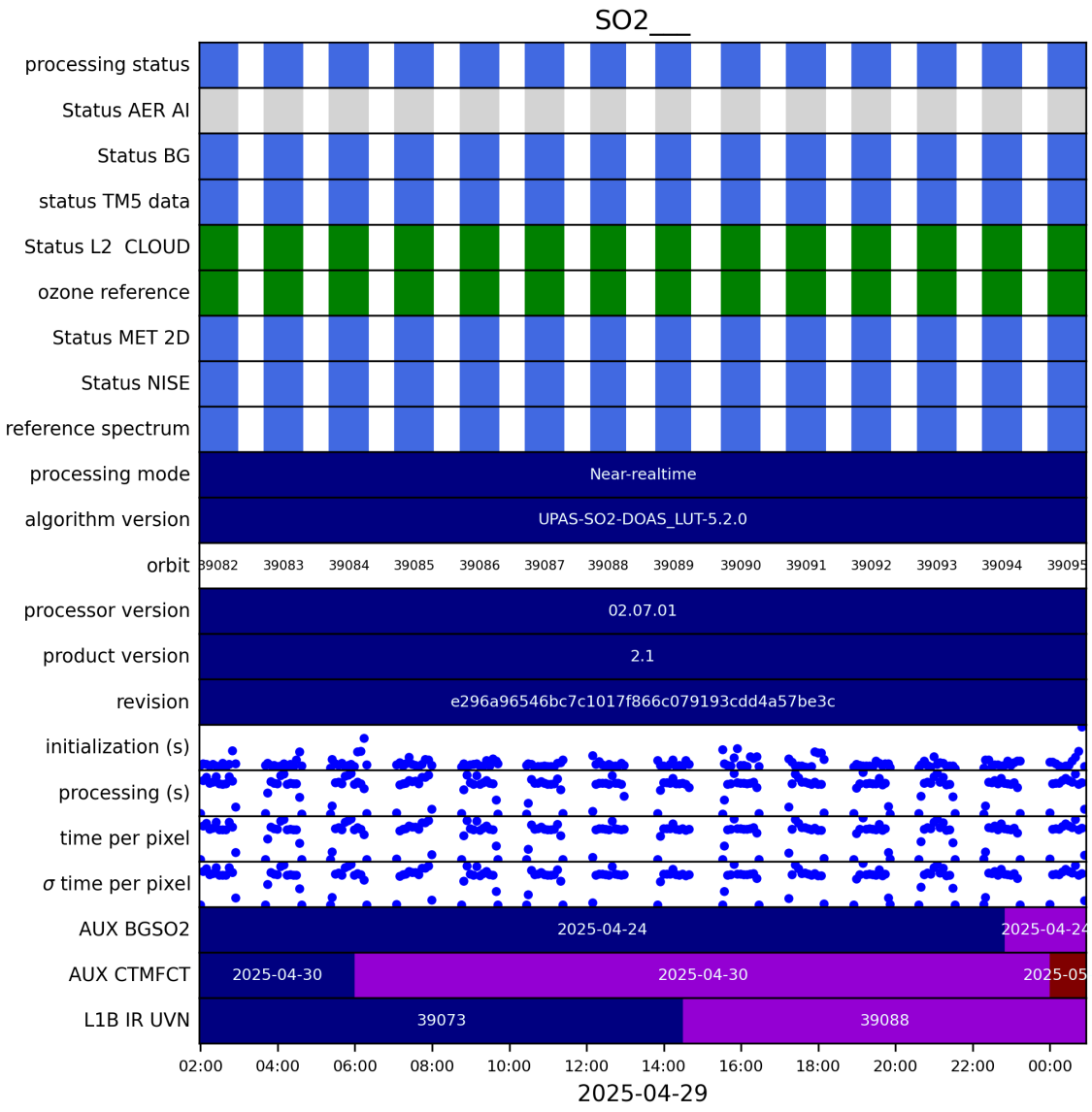

Figure 2: Input data per granule

5 Warnings and errors

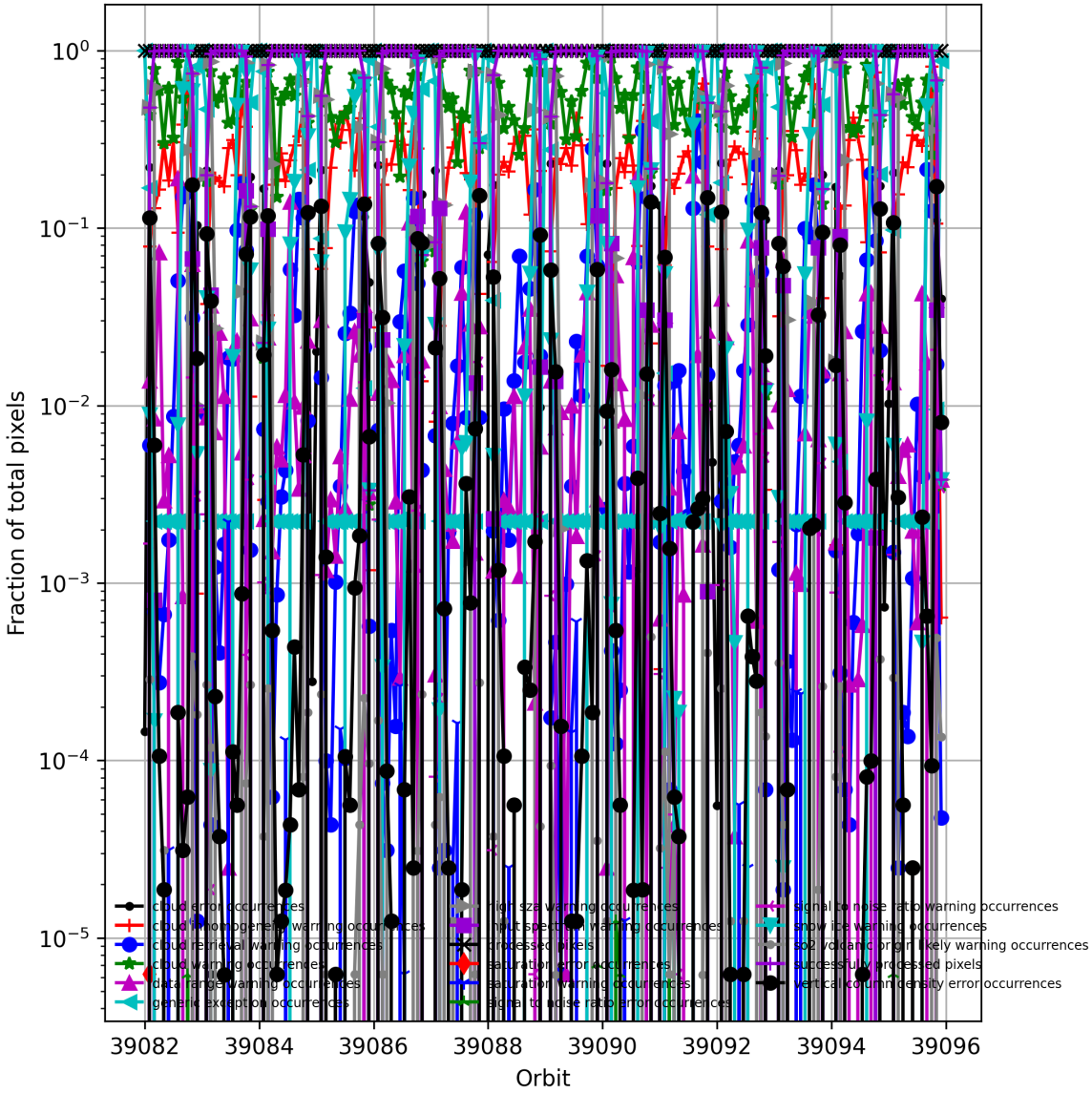

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

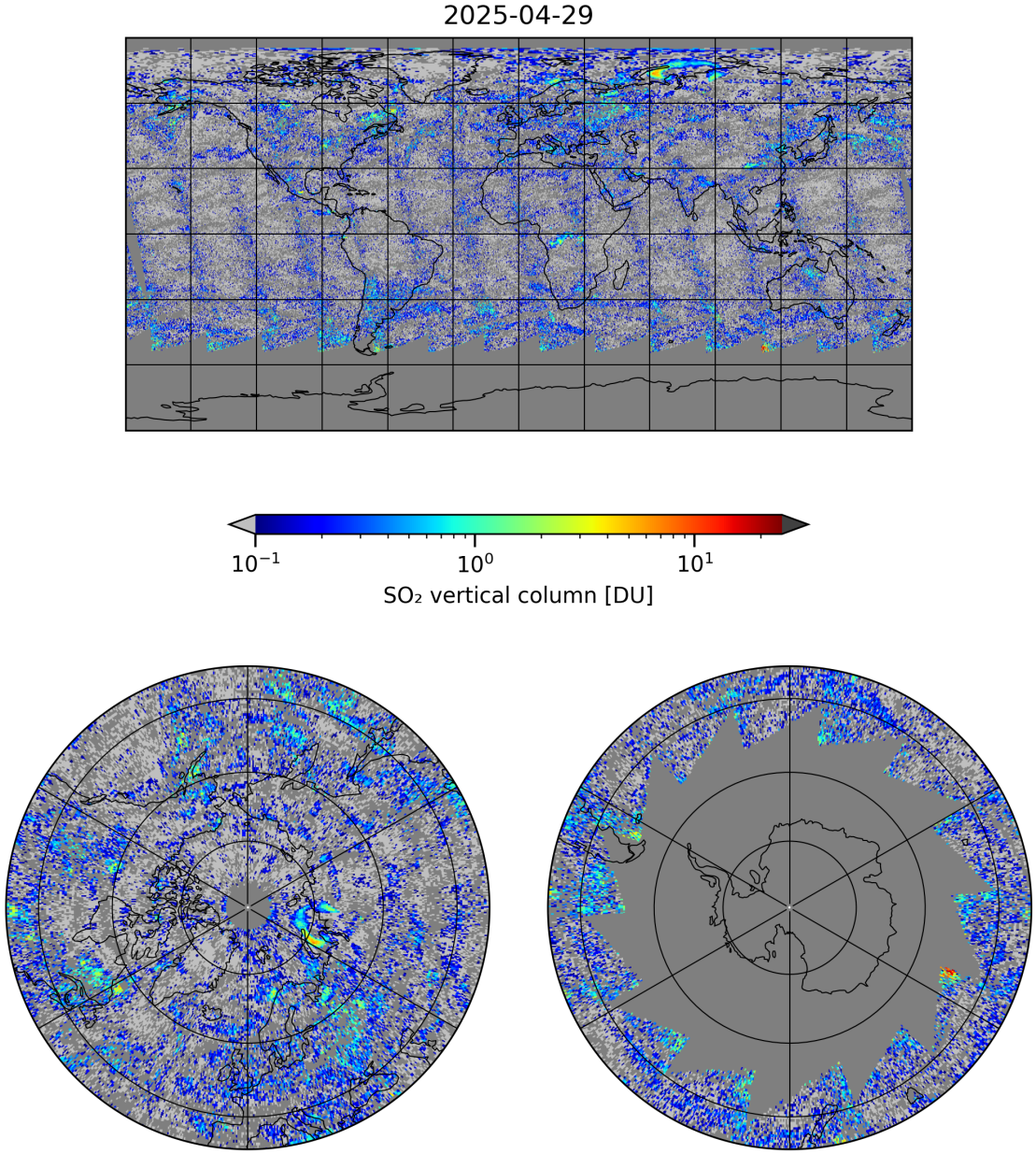

Figure 4: Map of "SO_2 vertical column" for 2025-04-29 to 2025-04-30

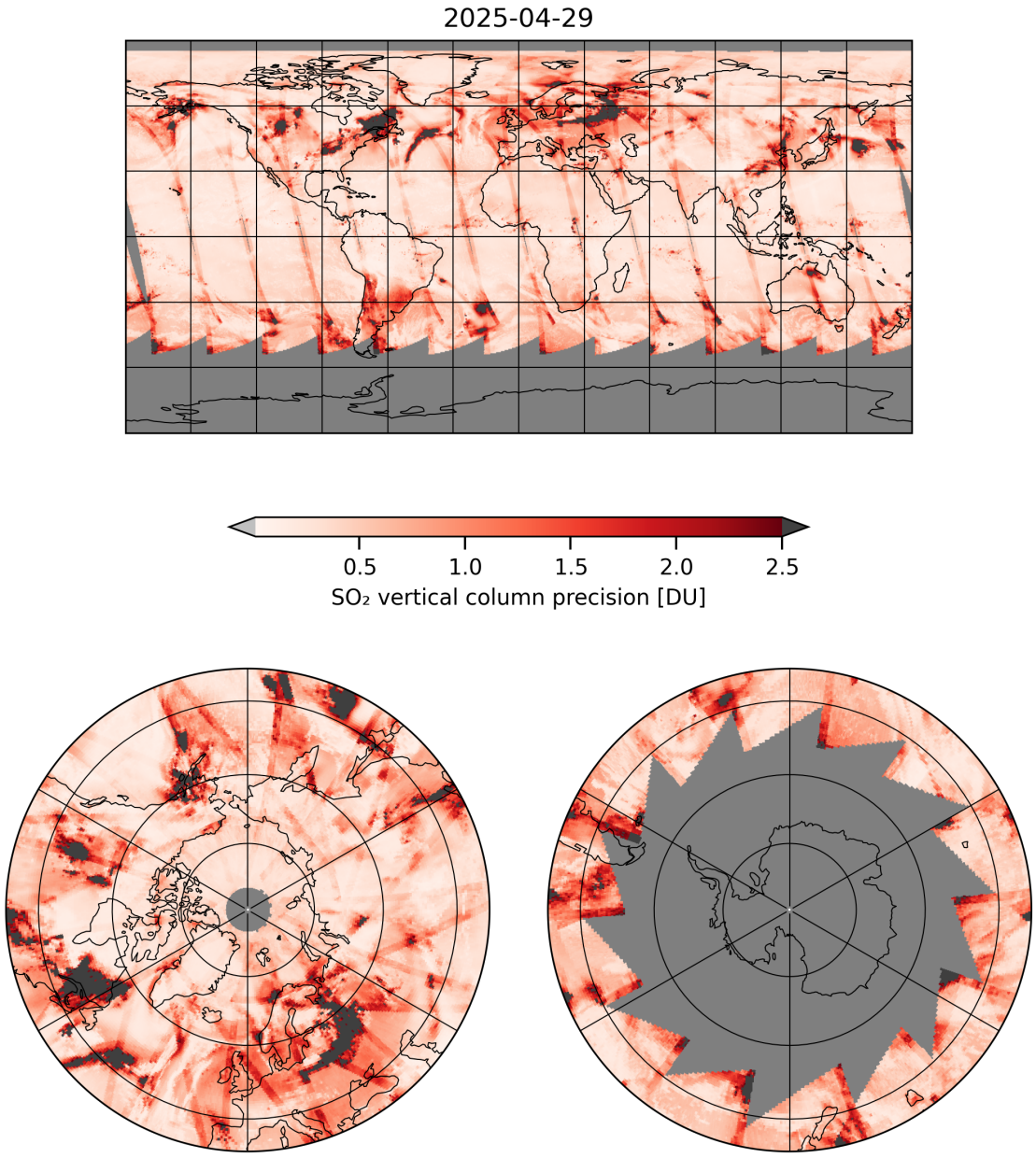

Figure 5: Map of "SO_2 vertical column precision" for 2025-04-29 to 2025-04-30

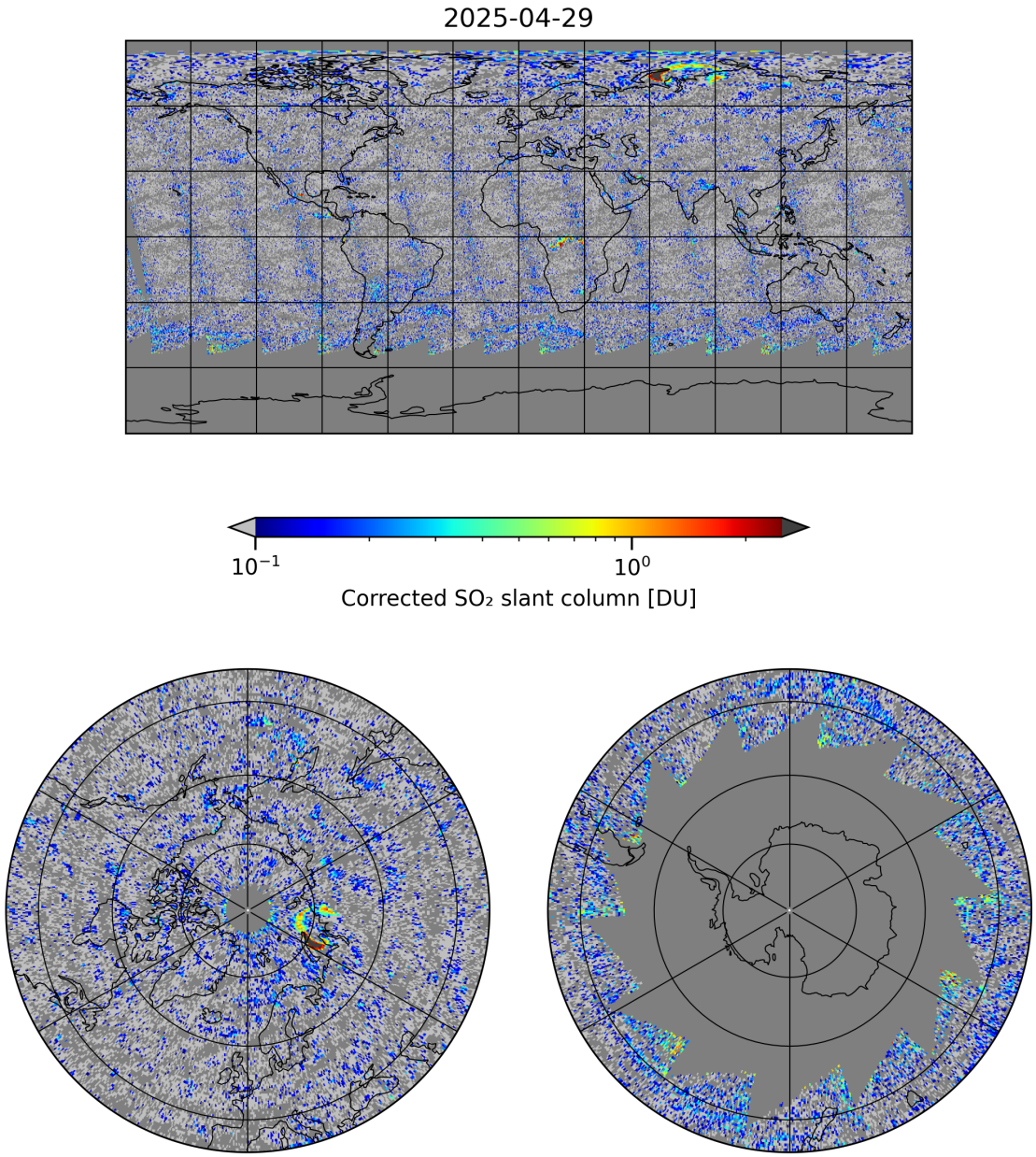

Figure 6: Map of "Corrected SO_2 slant column" for 2025-04-29 to 2025-04-30

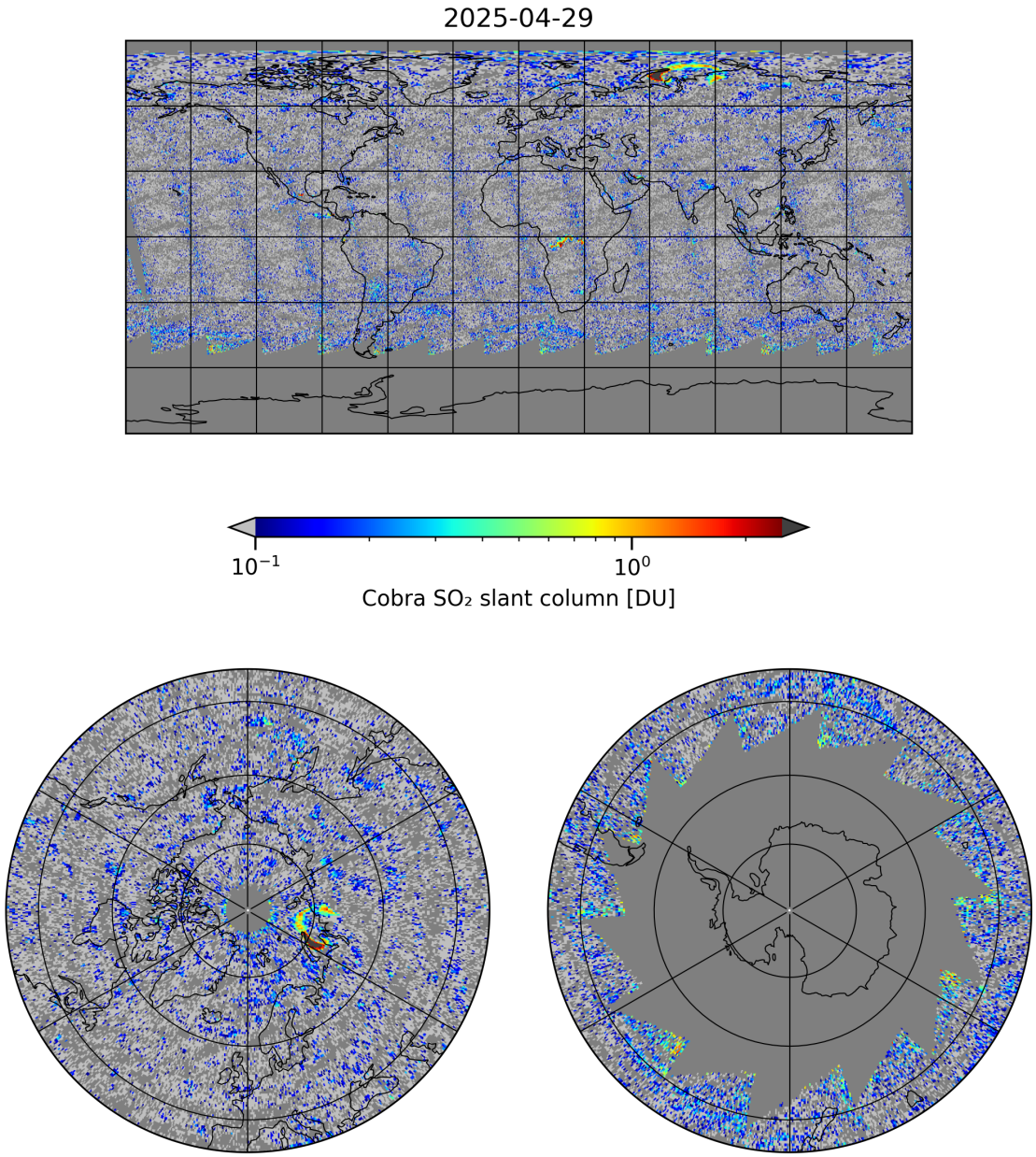

Figure 7: Map of "Cobra SO_2 slant column" for 2025-04-29 to 2025-04-30

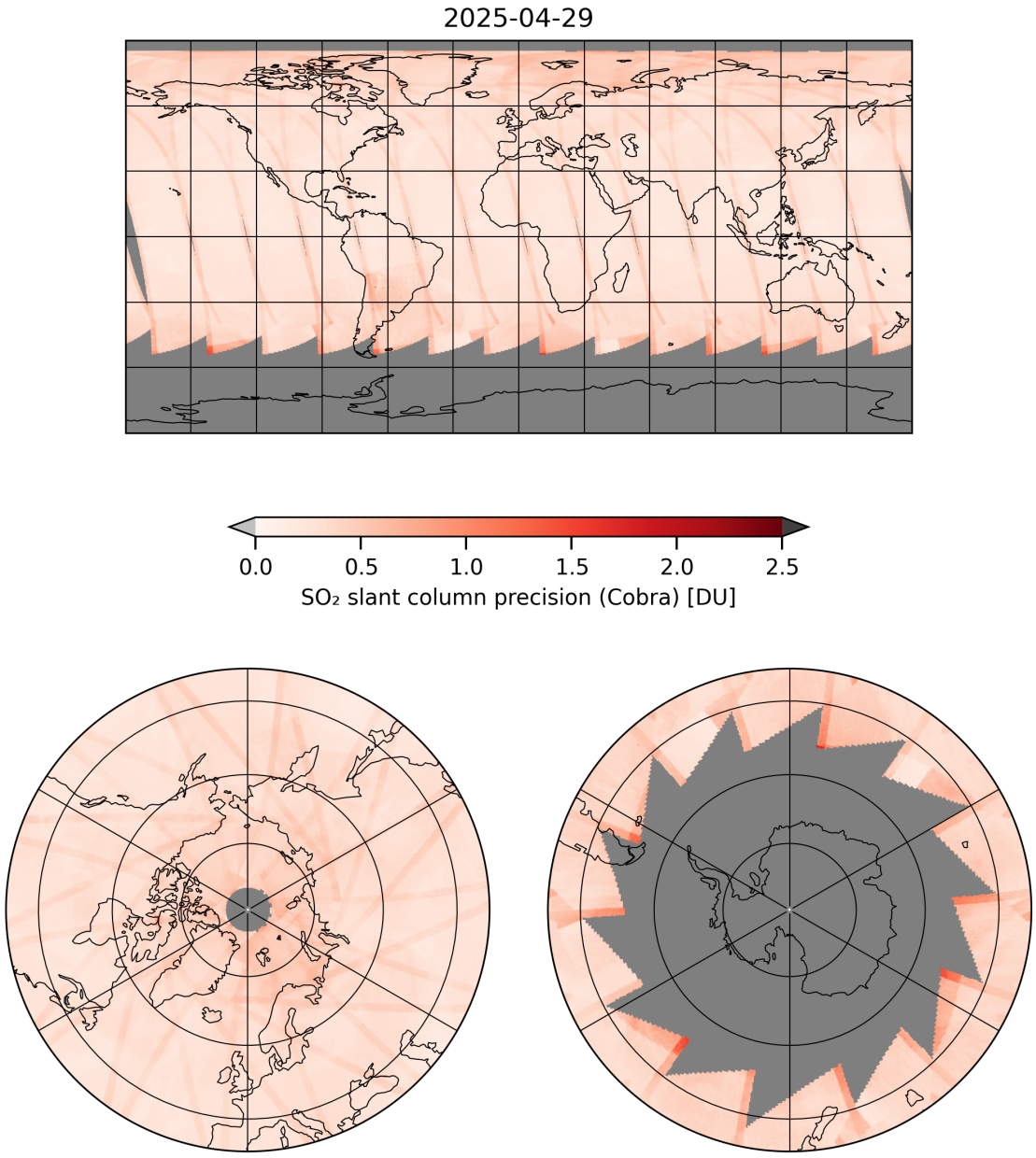

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-04-29 to 2025-04-30

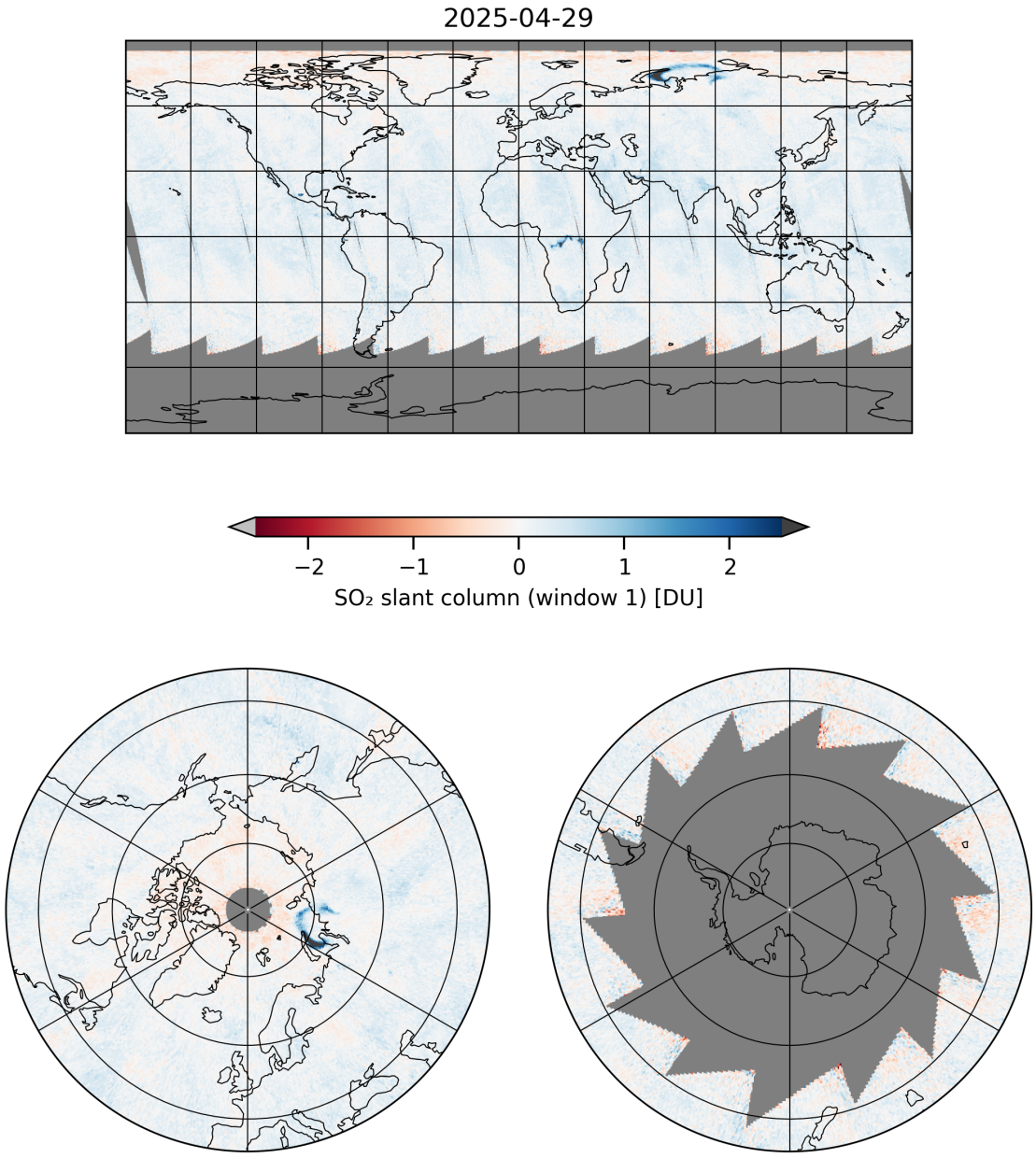

Figure 9: Map of "SO_2 slant column (window 1)" for 2025-04-29 to 2025-04-30

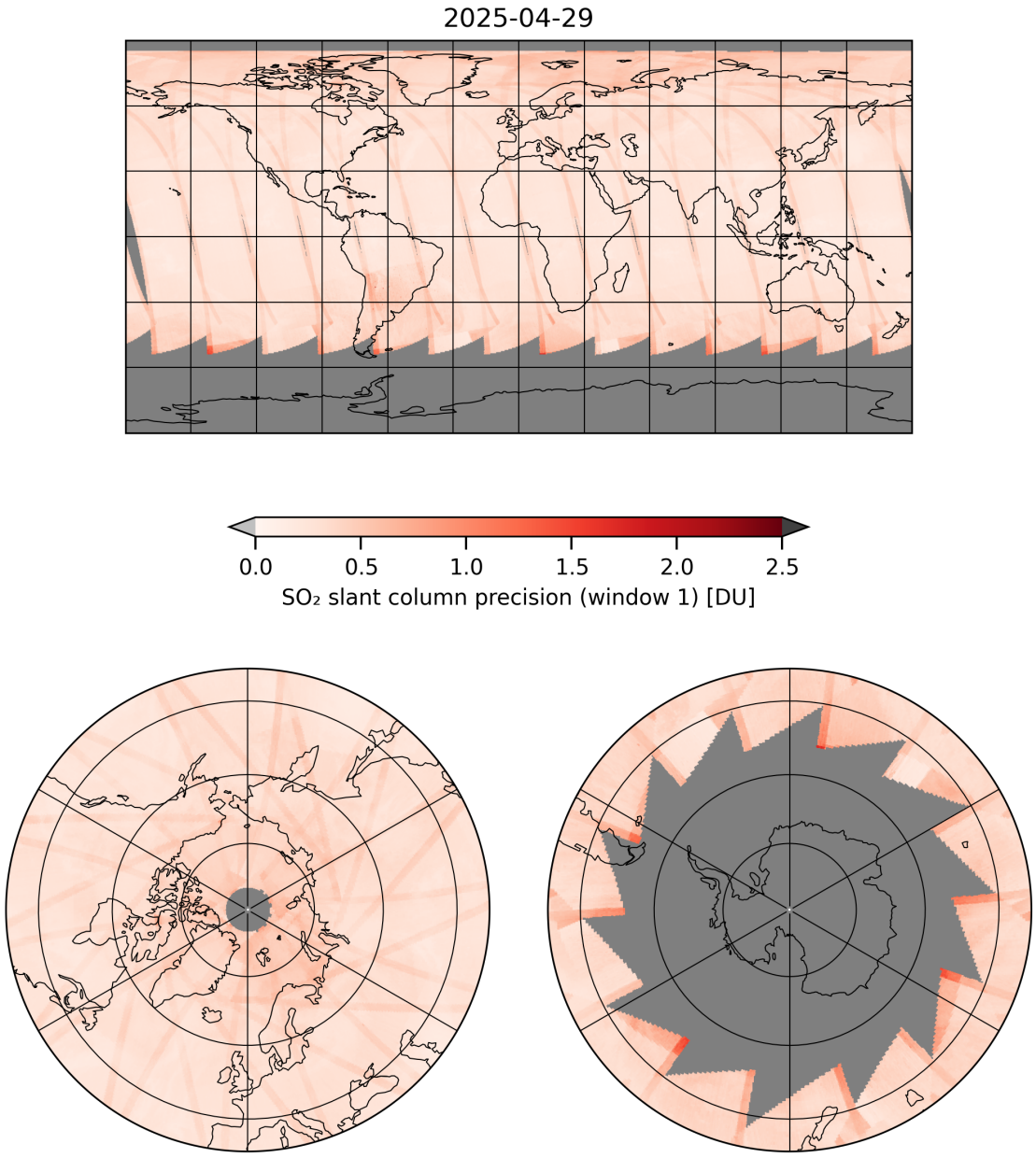

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-04-29 to 2025-04-30

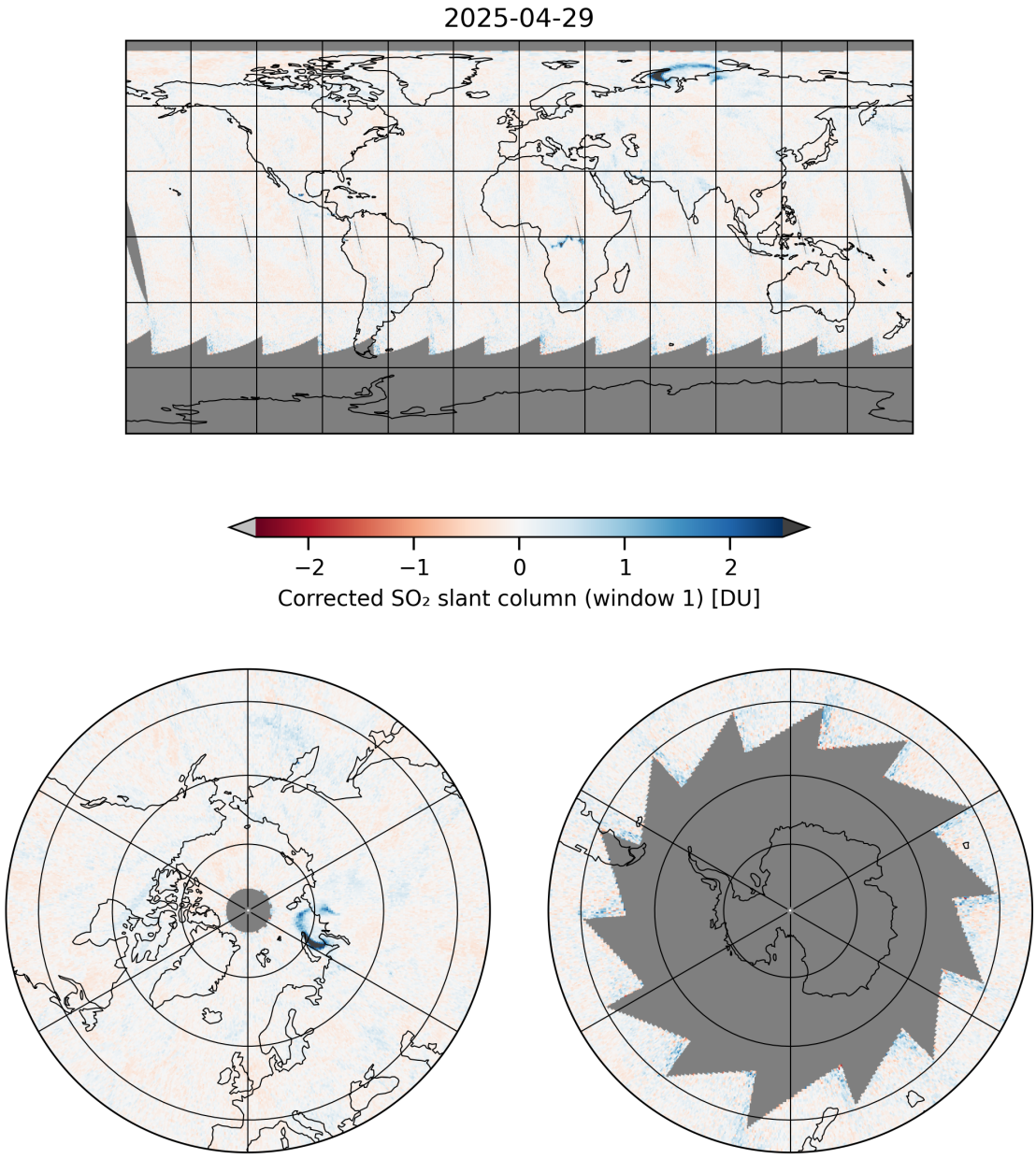

Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-04-29 to 2025-04-30

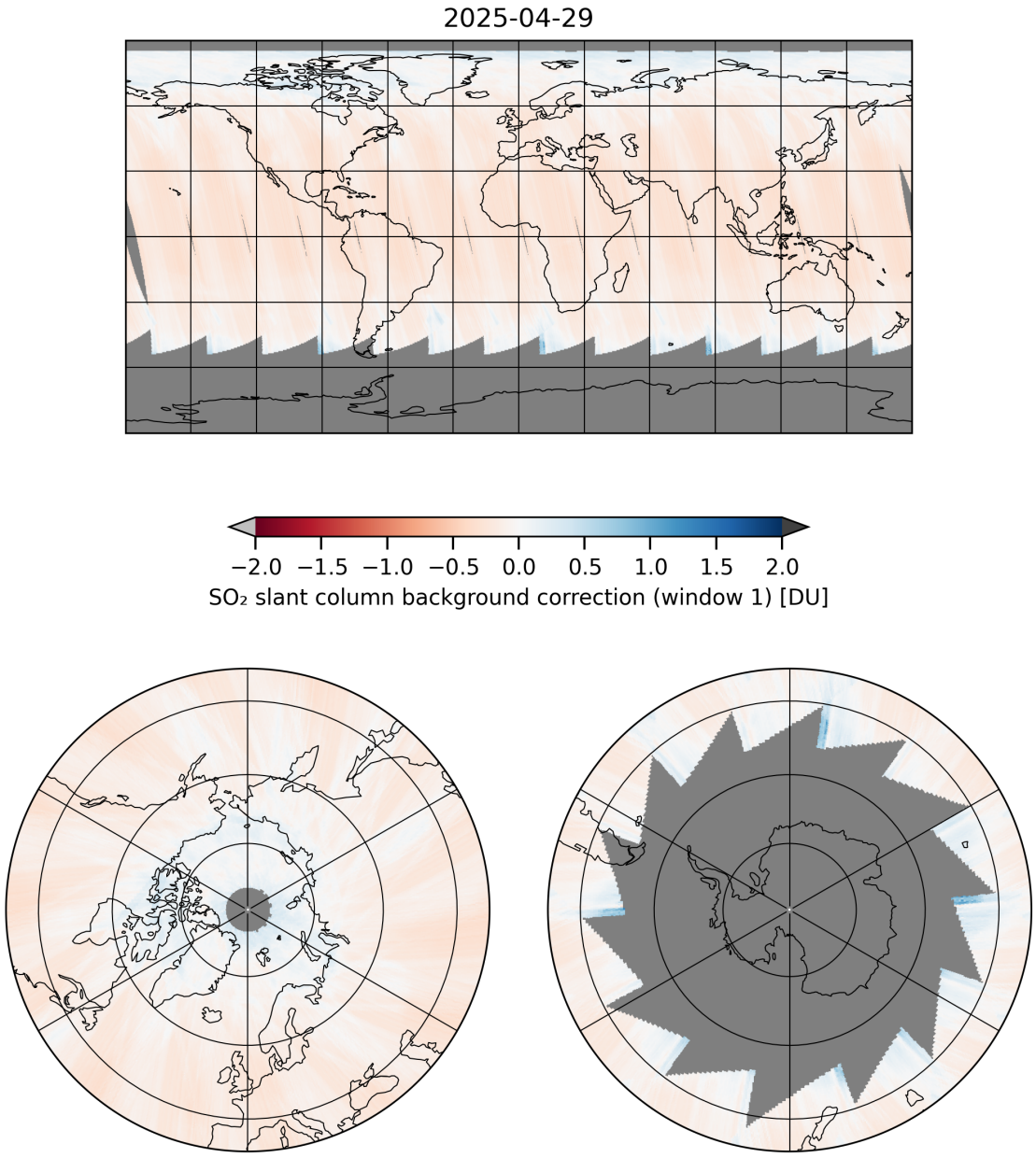

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-04-29 to 2025-04-30

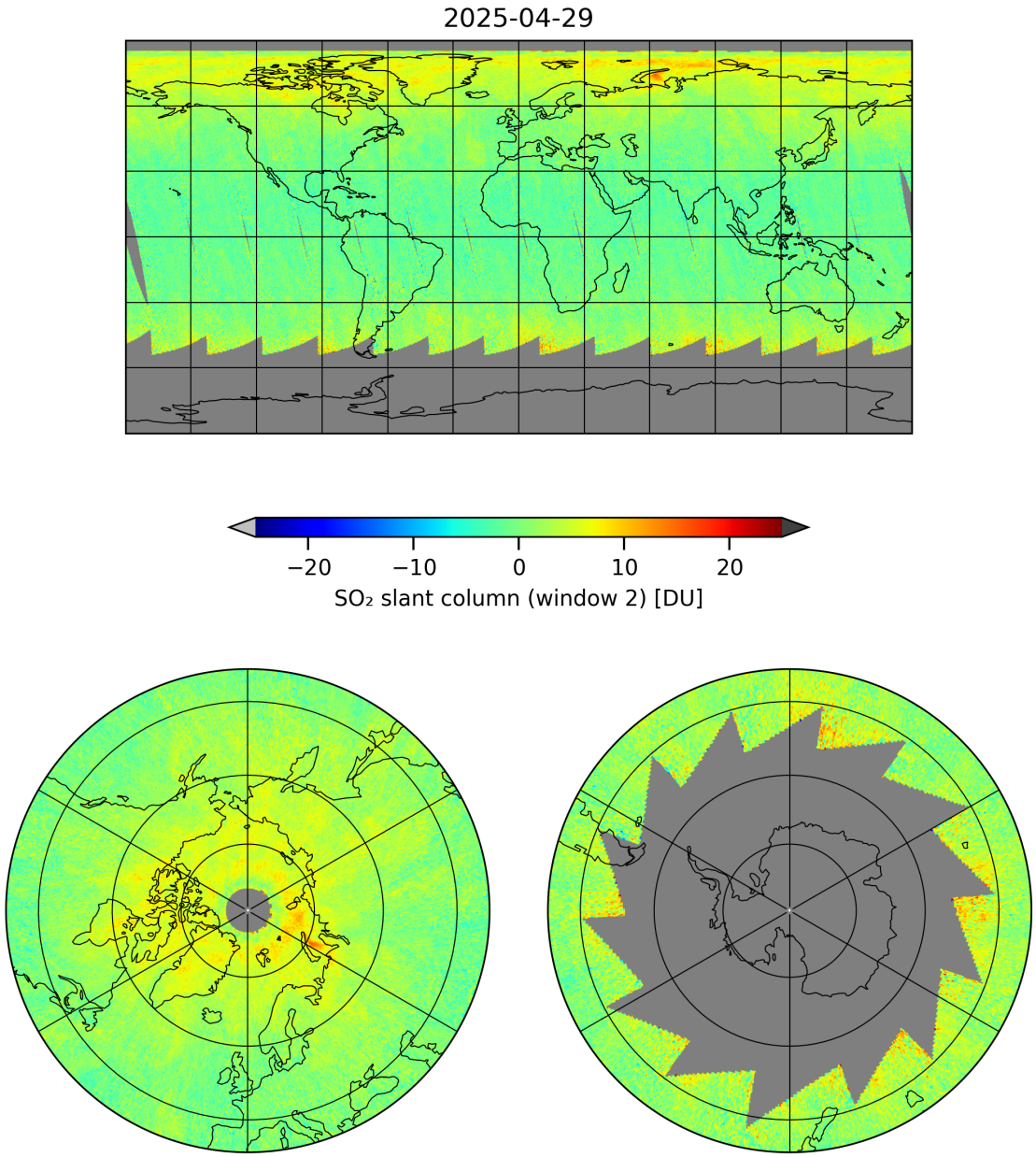

Figure 13: Map of "SO_2 slant column (window 2)" for 2025-04-29 to 2025-04-30

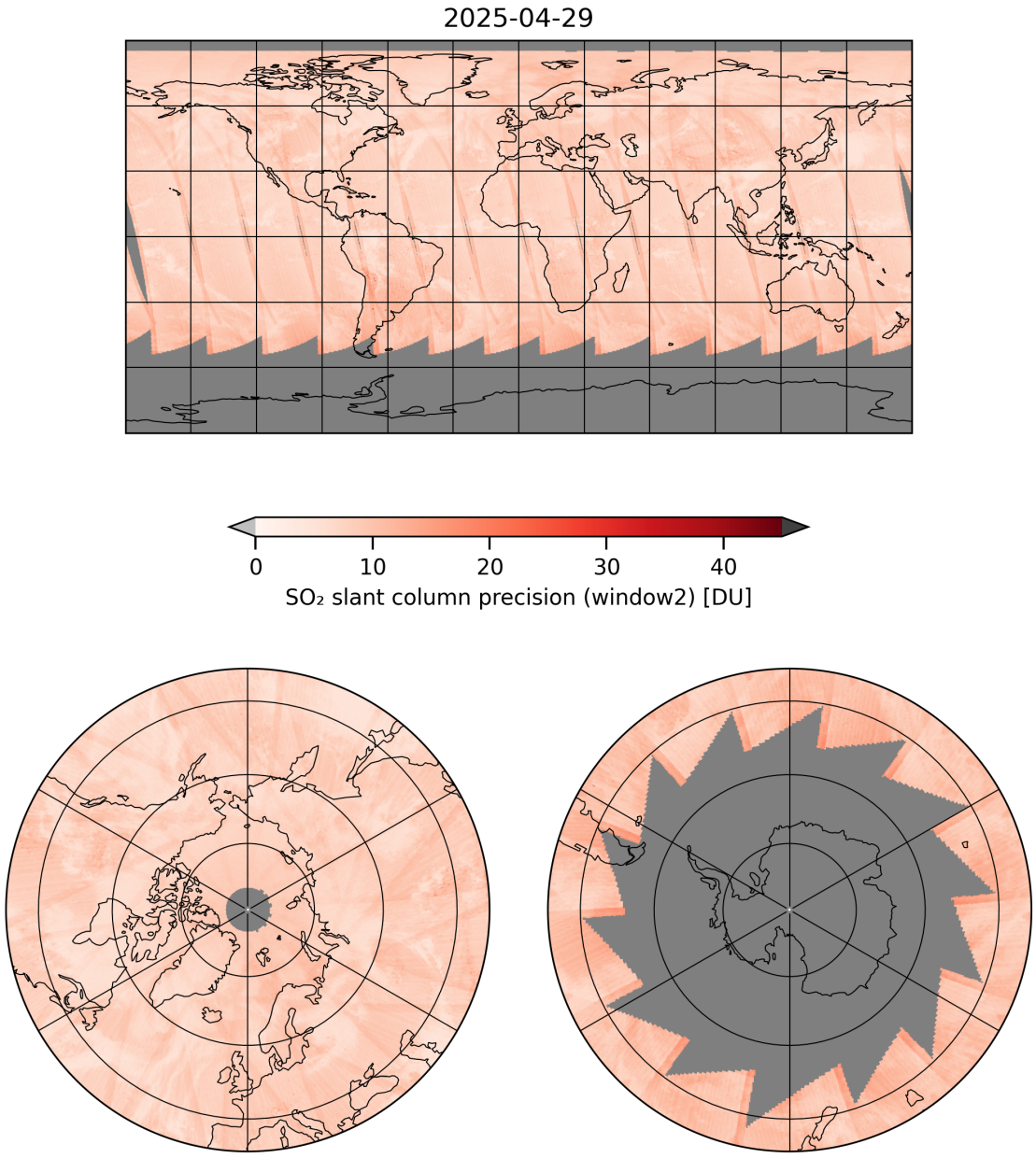

Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-04-29 to 2025-04-30

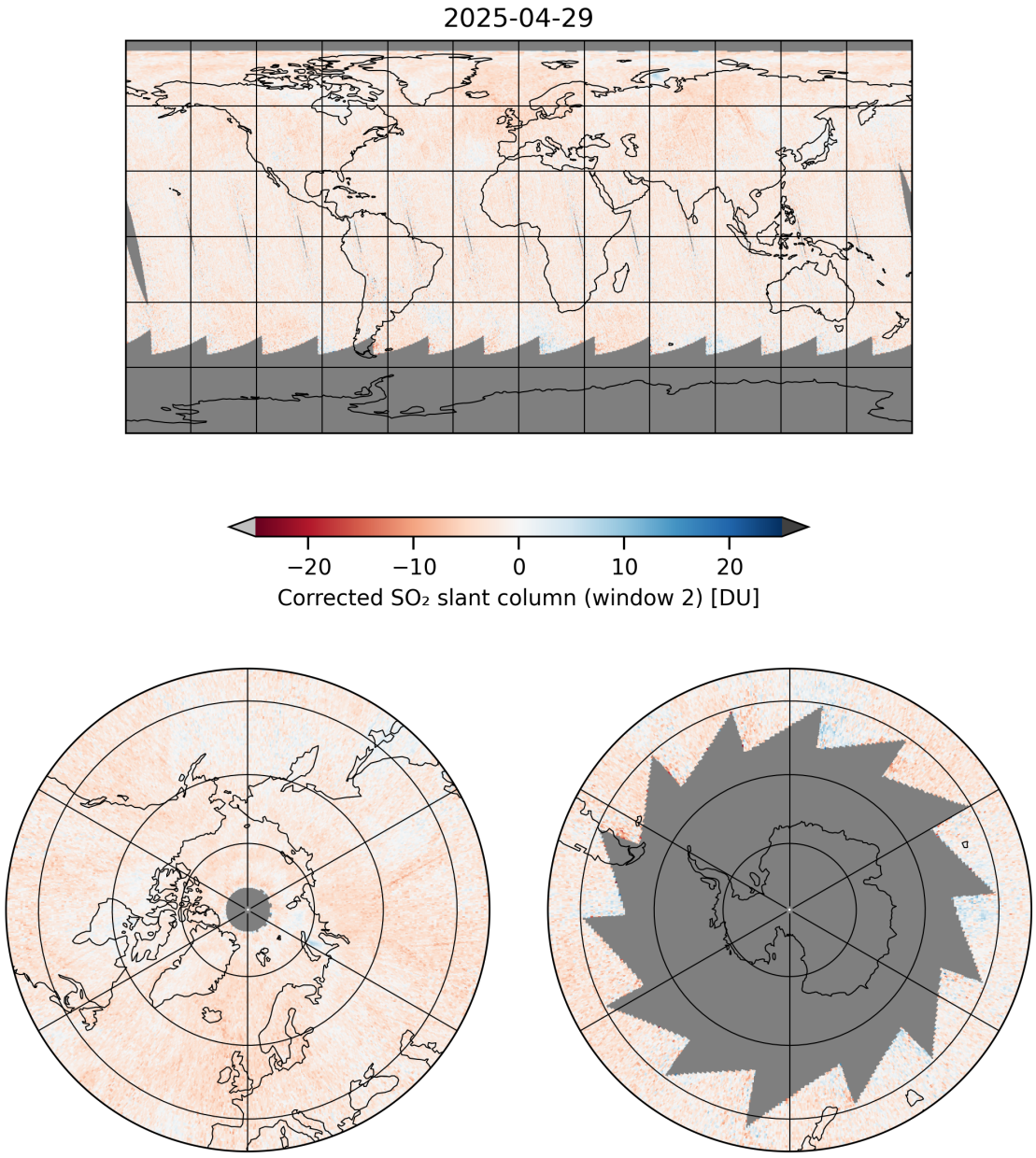

Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2025-04-29 to 2025-04-30

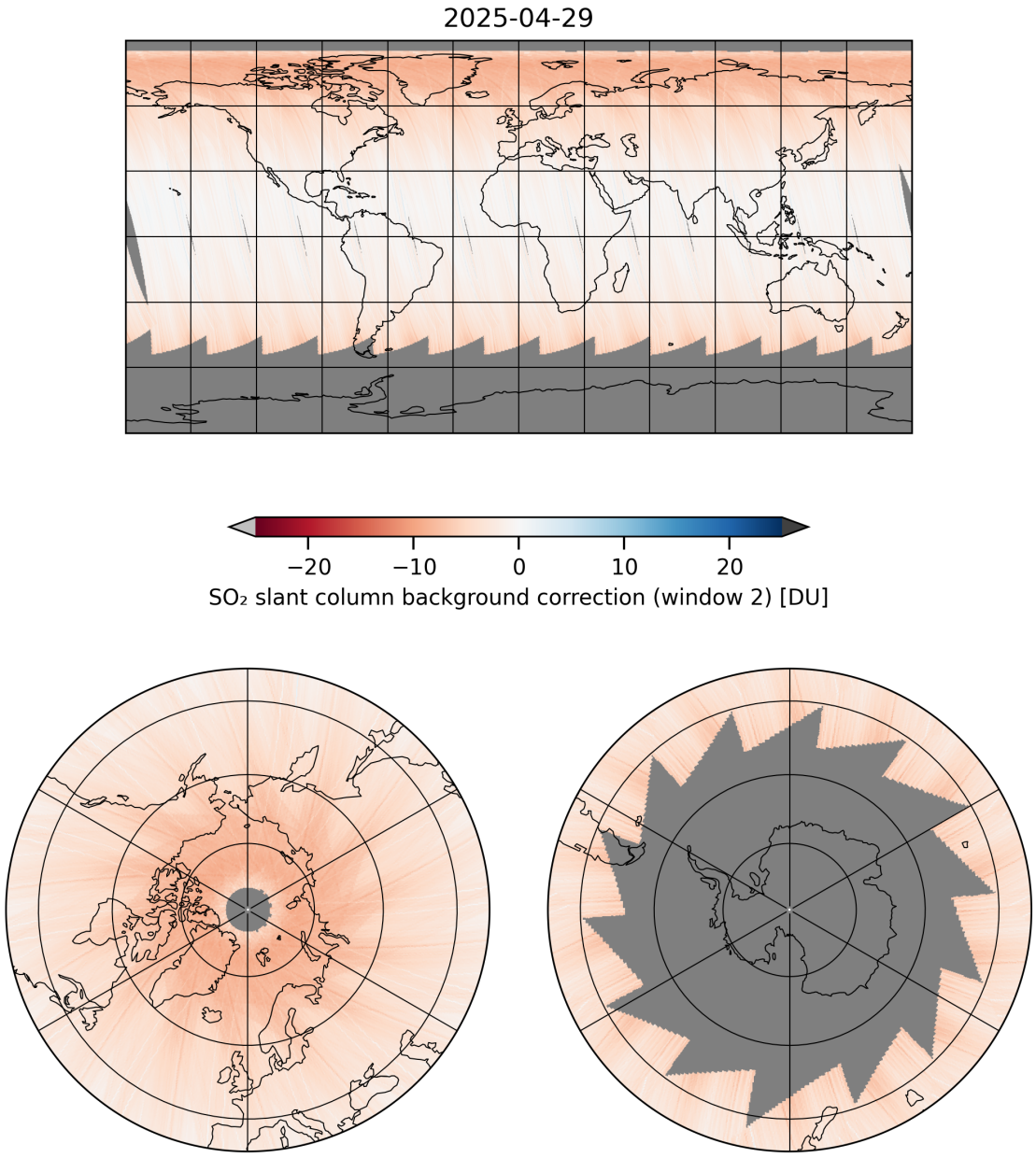

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-04-29 to 2025-04-30

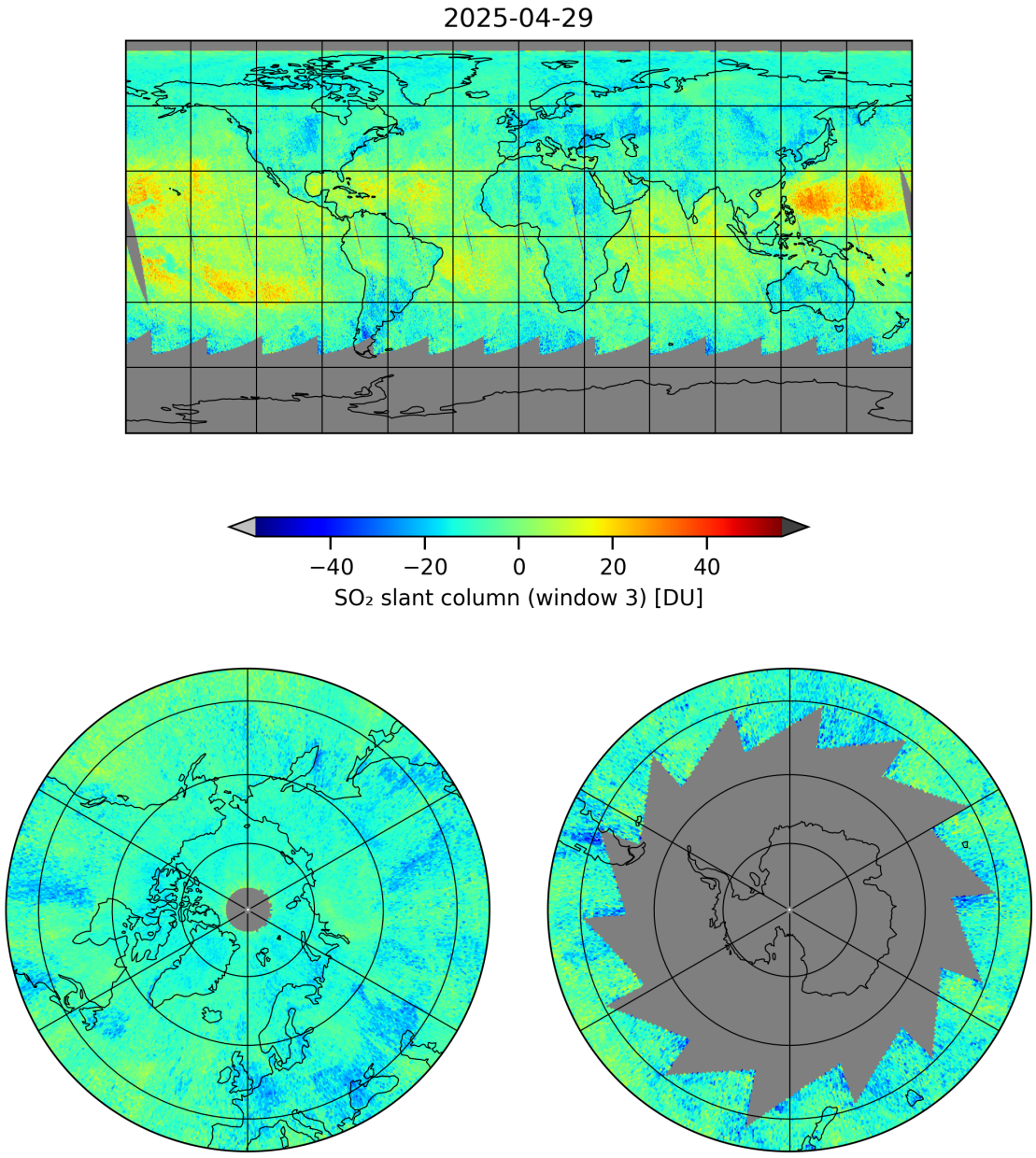

Figure 17: Map of "SO_2 slant column (window 3)" for 2025-04-29 to 2025-04-30

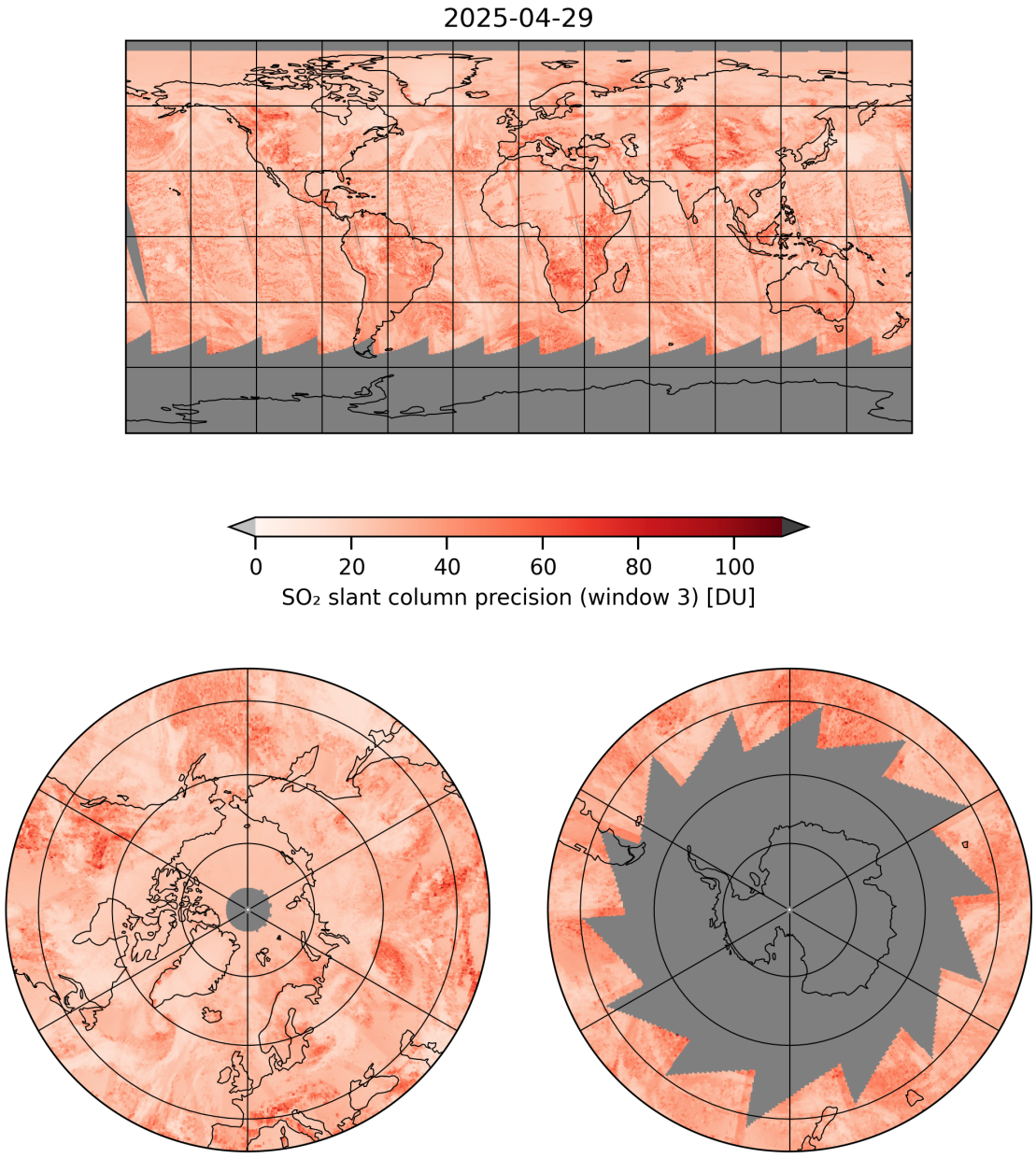

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-04-29 to 2025-04-30

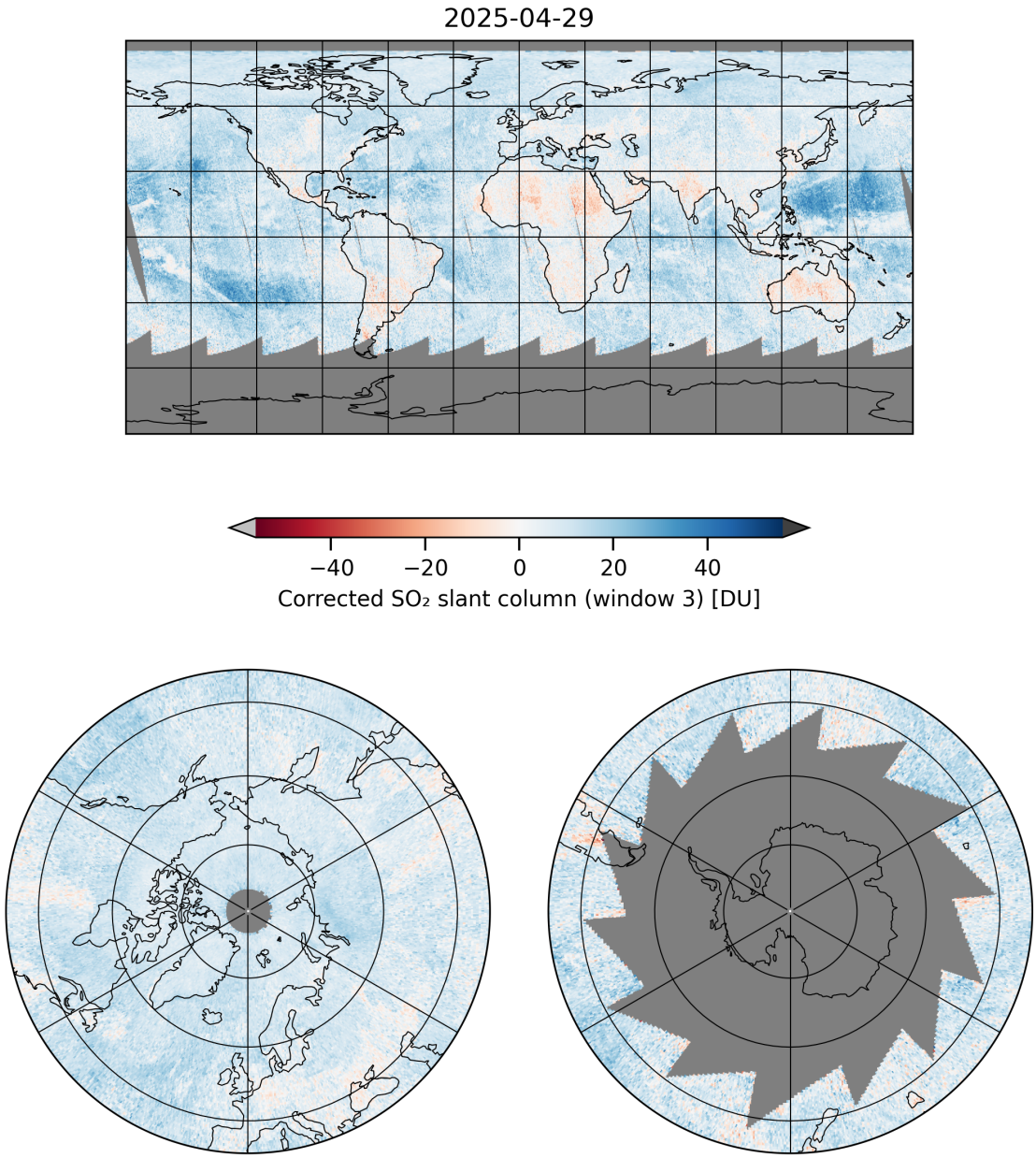

Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-04-29 to 2025-04-30

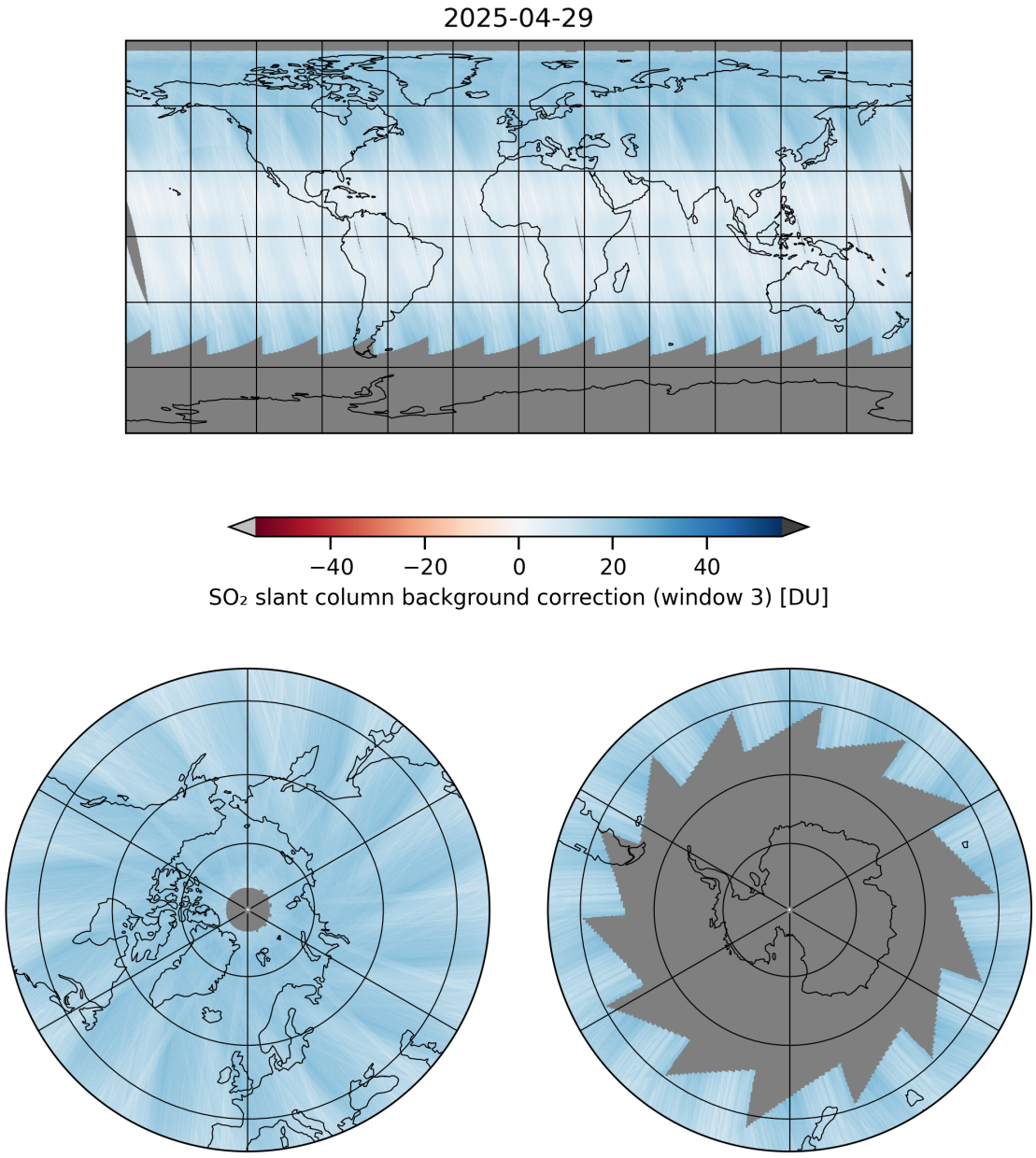

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-04-29 to 2025-04-30

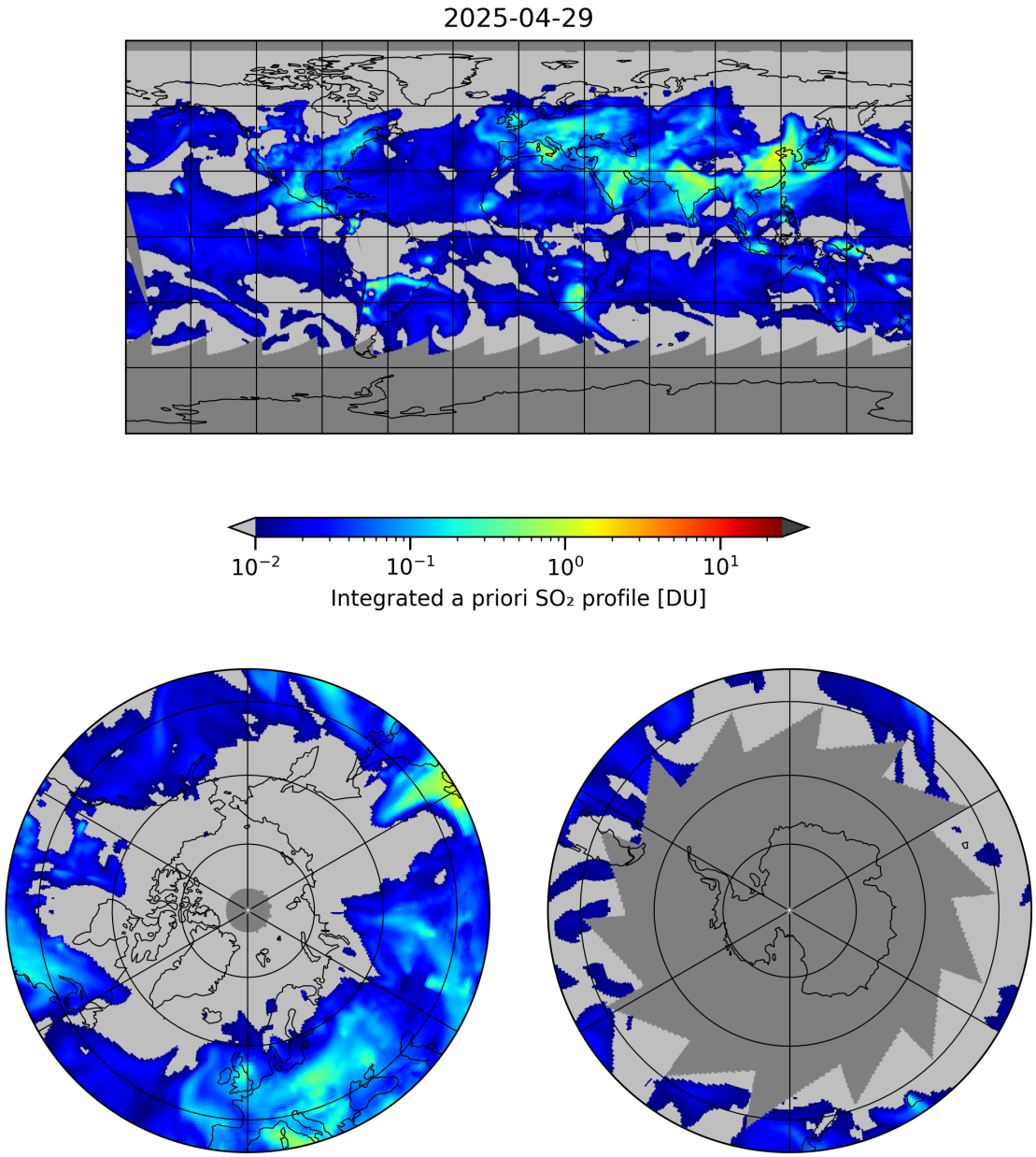

Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-04-29 to 2025-04-30

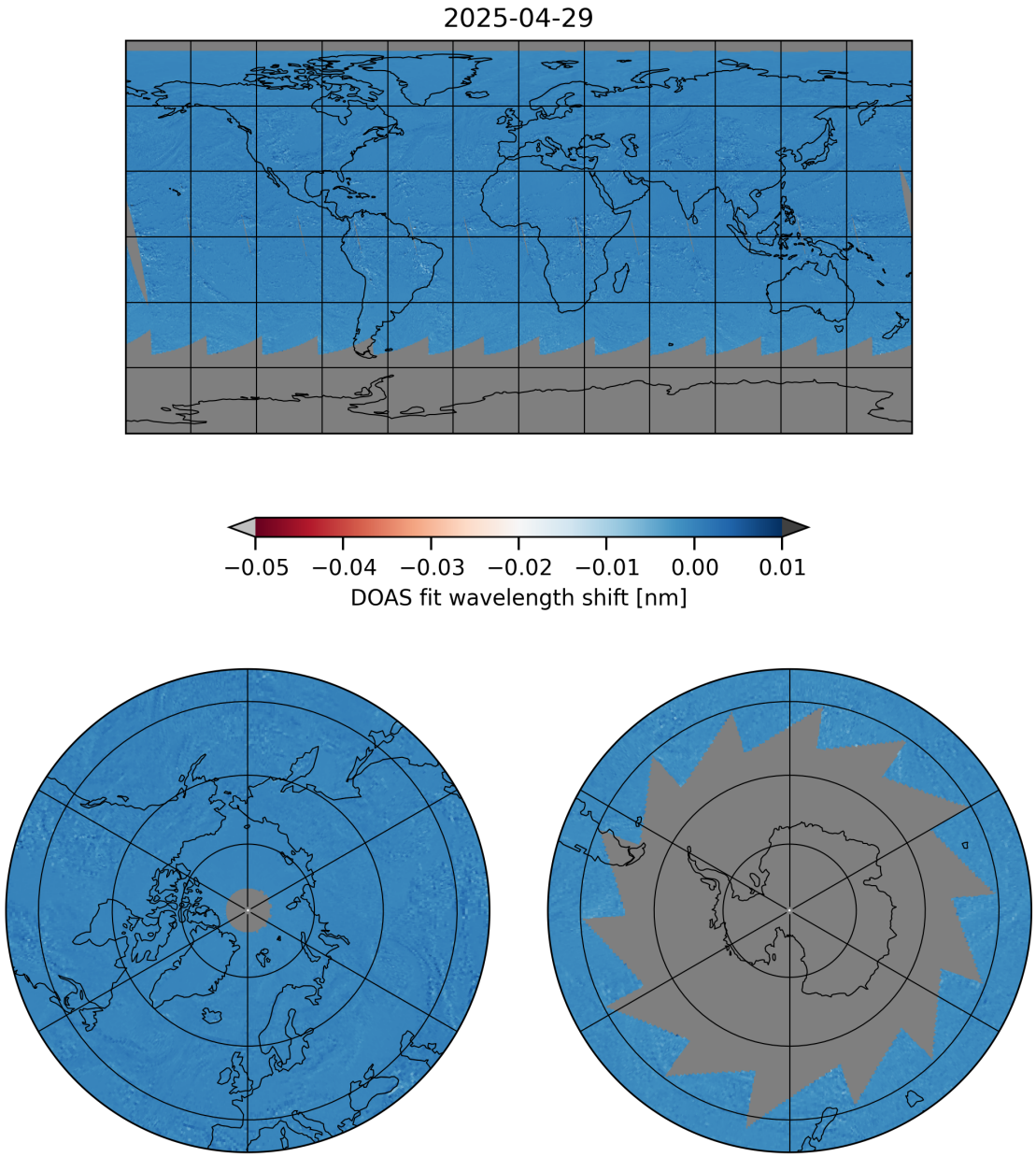

Figure 22: Map of “DOAS fit wavelength shift” for 2025-04-29 to 2025-04-30

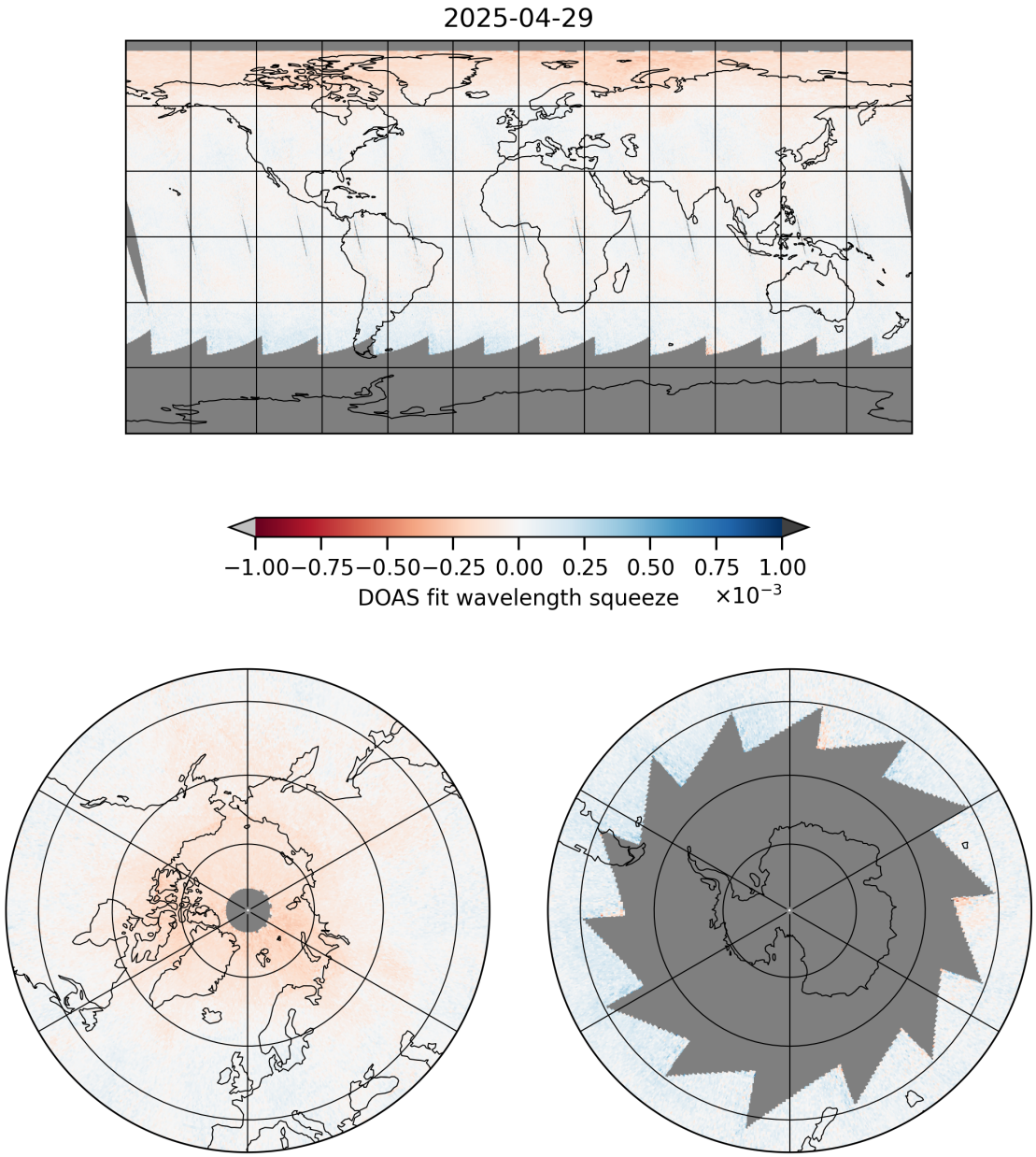

Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-04-29 to 2025-04-30

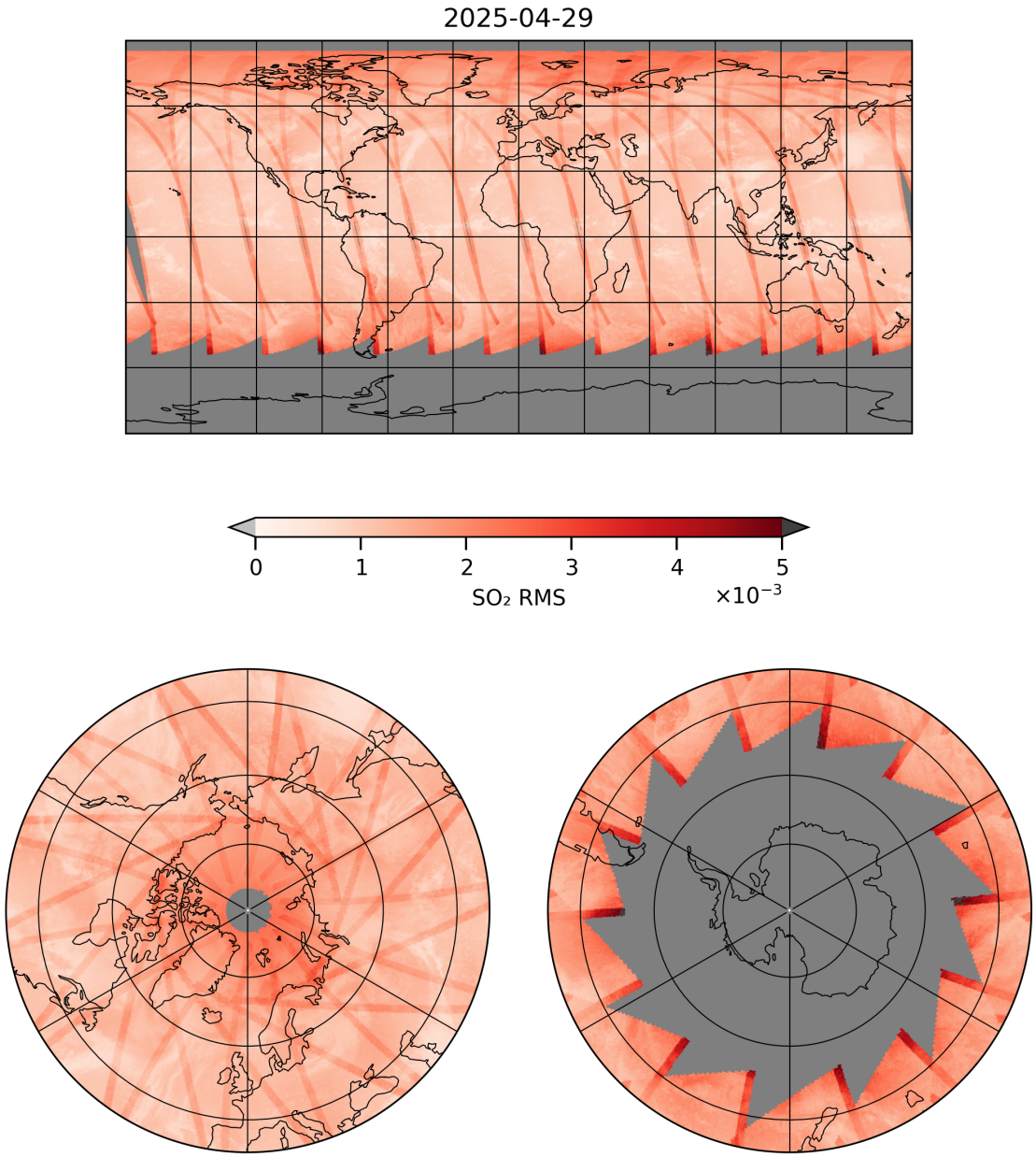

Figure 24: Map of "SO_2 RMS" for 2025-04-29 to 2025-04-30

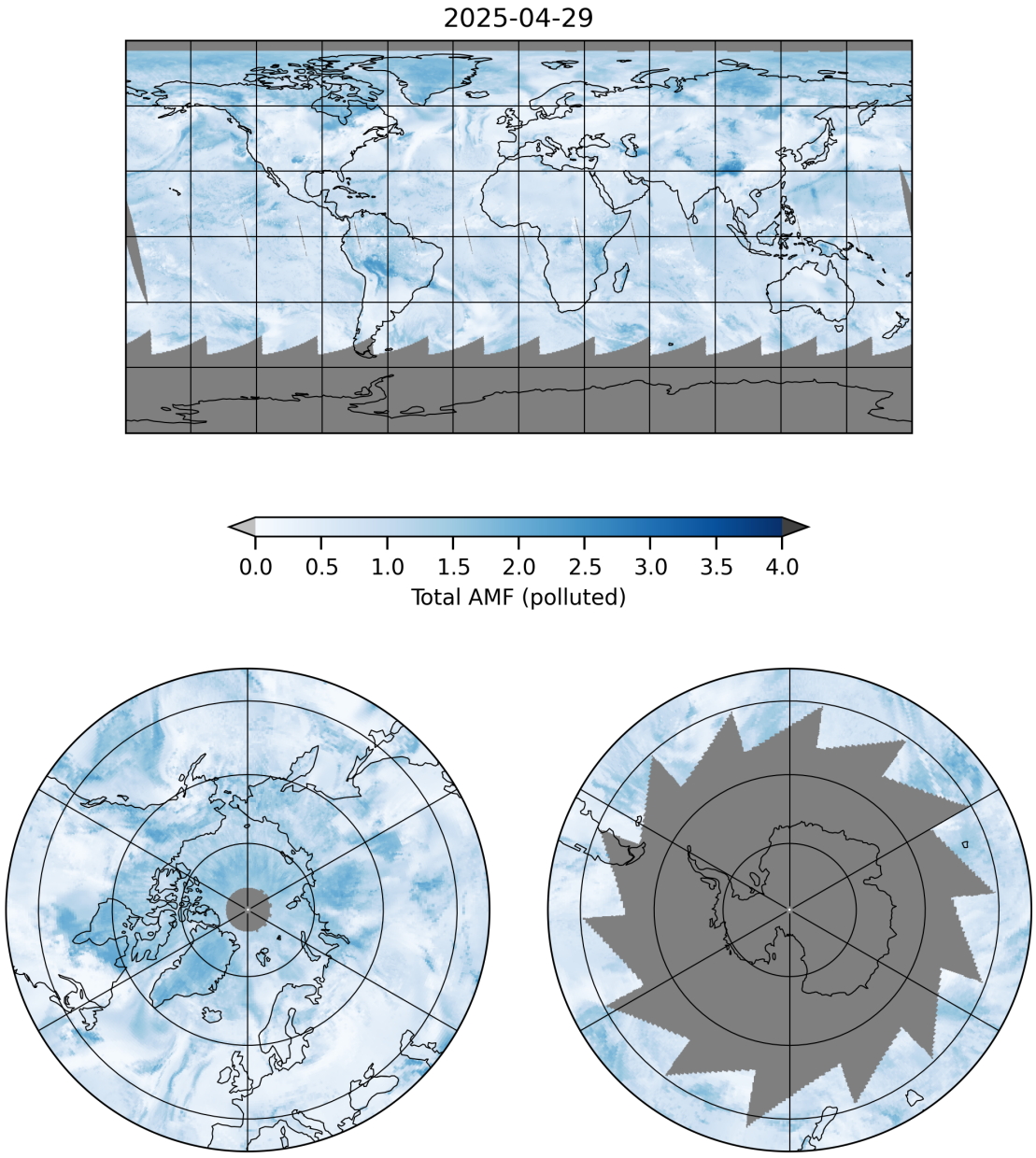

Figure 25: Map of “Total AMF (polluted)” for 2025-04-29 to 2025-04-30

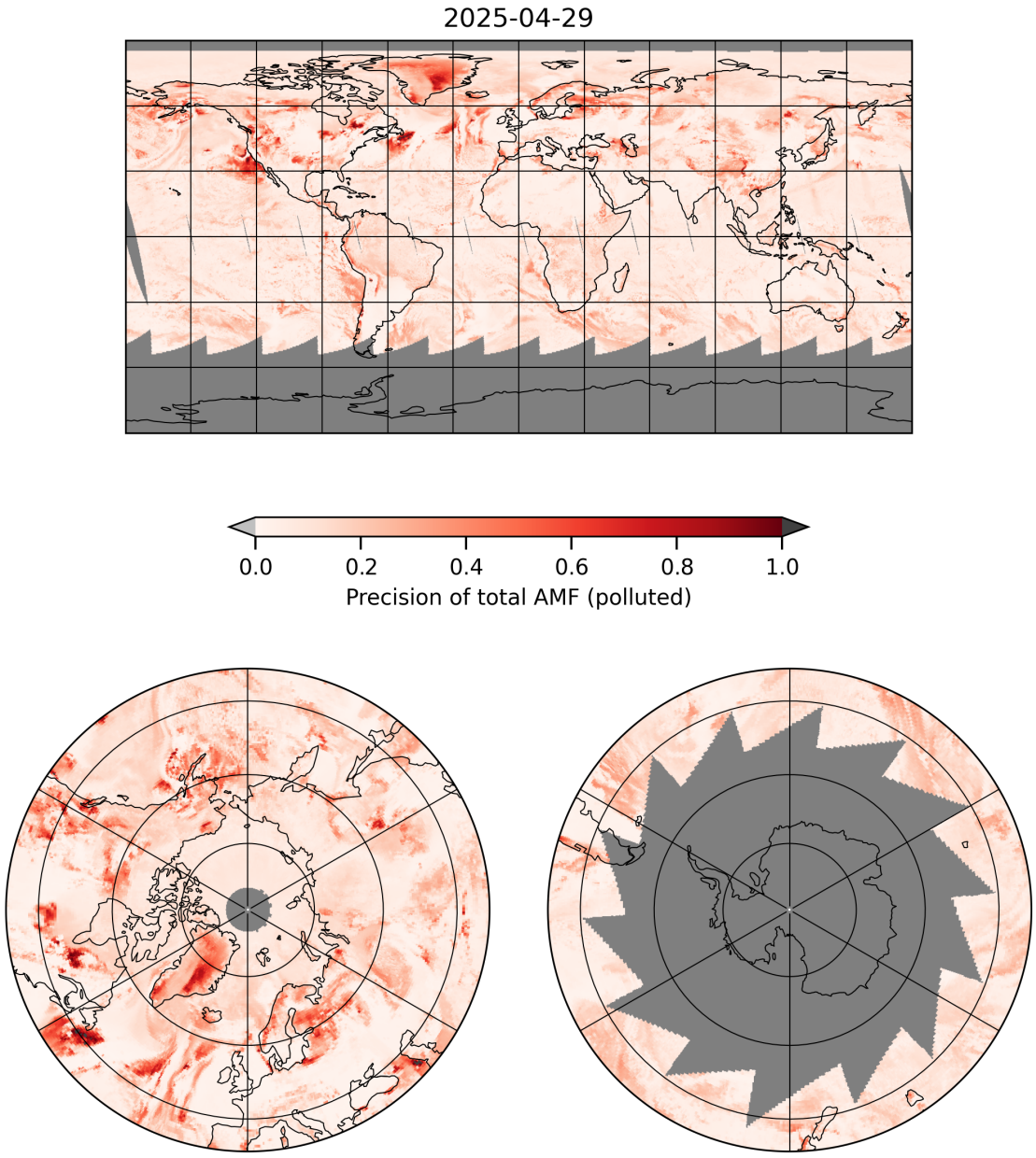

Figure 26: Map of “Precision of total AMF (polluted)” for 2025-04-29 to 2025-04-30

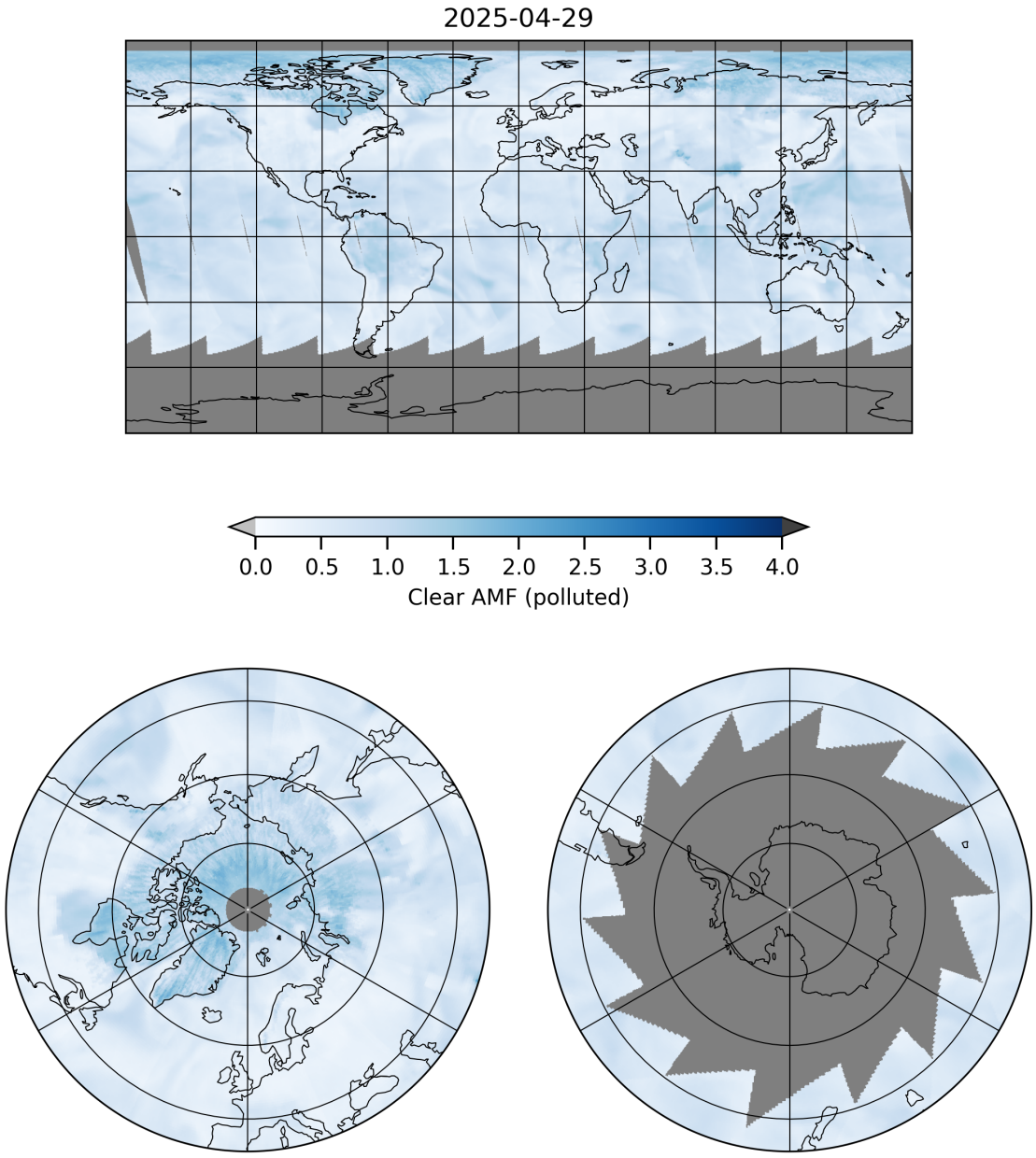

Figure 27: Map of “Clear AMF (polluted)” for 2025-04-29 to 2025-04-30

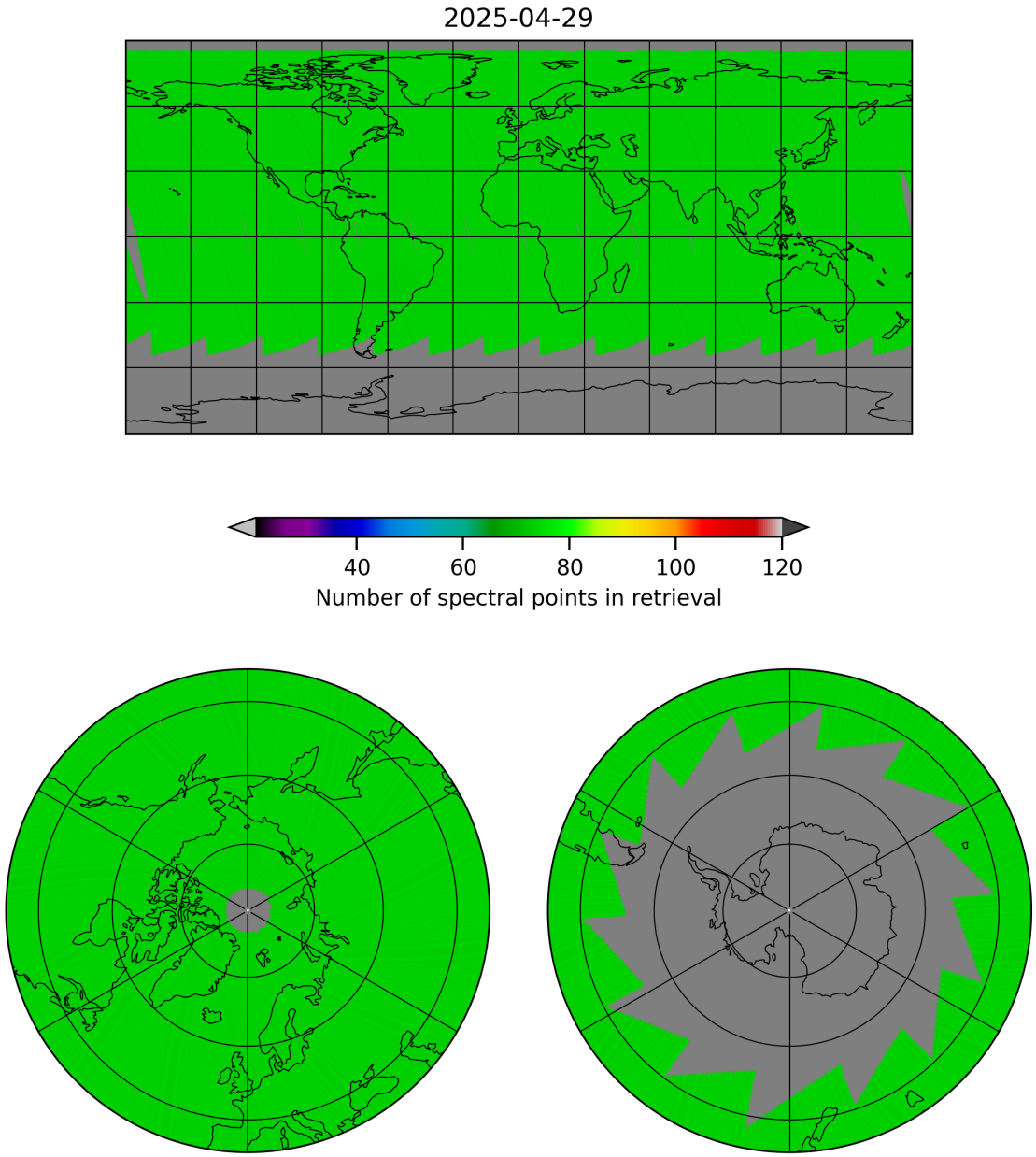

Figure 28: Map of “Number of spectral points in retrieval” for 2025-04-29 to 2025-04-30

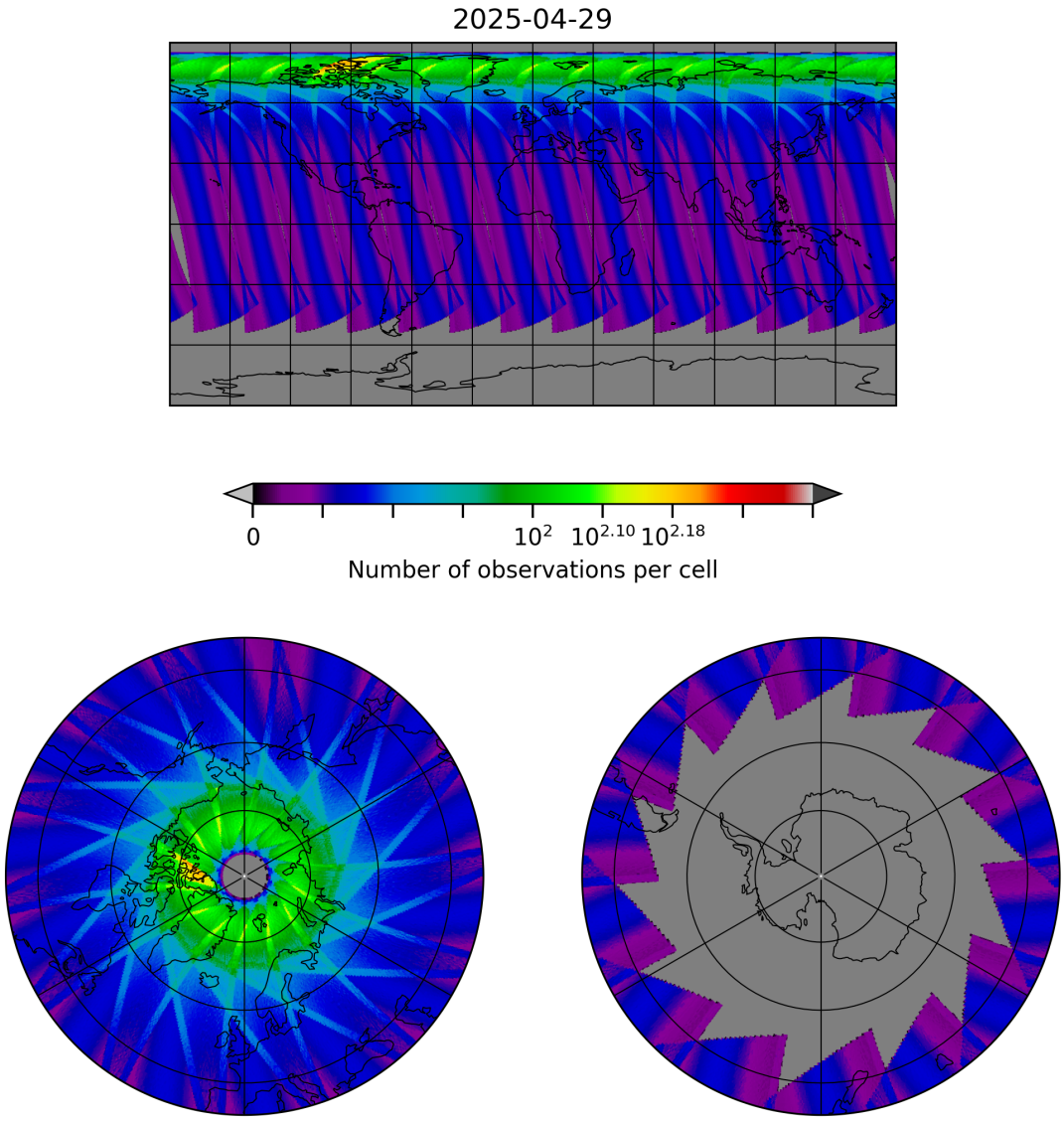

Figure 29: Map of the number of observations for 2025-04-29 to 2025-04-30

7 Zonal average

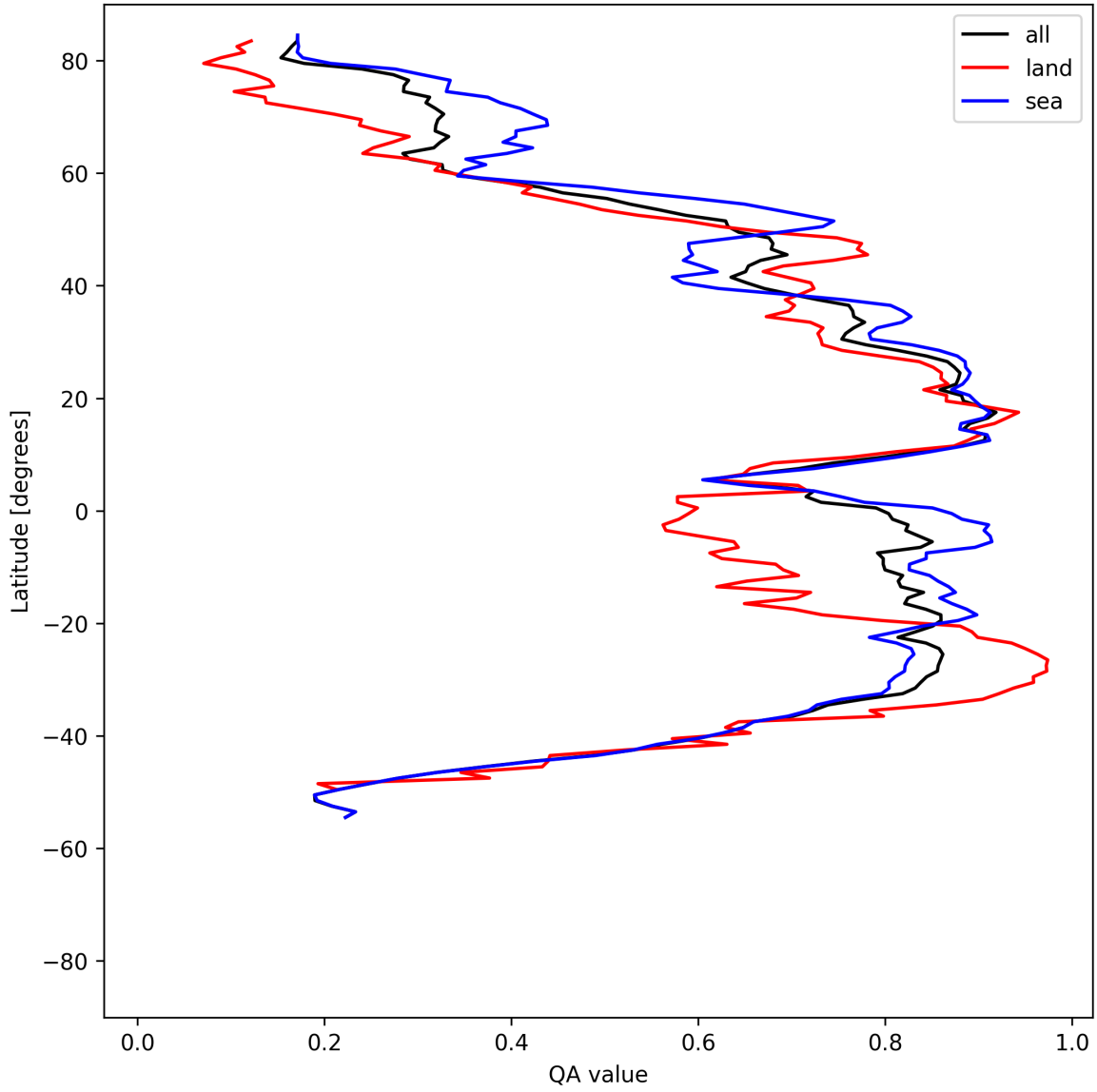

Figure 30: Zonal average of “QA value” for 2025-04-29 to 2025-04-30.

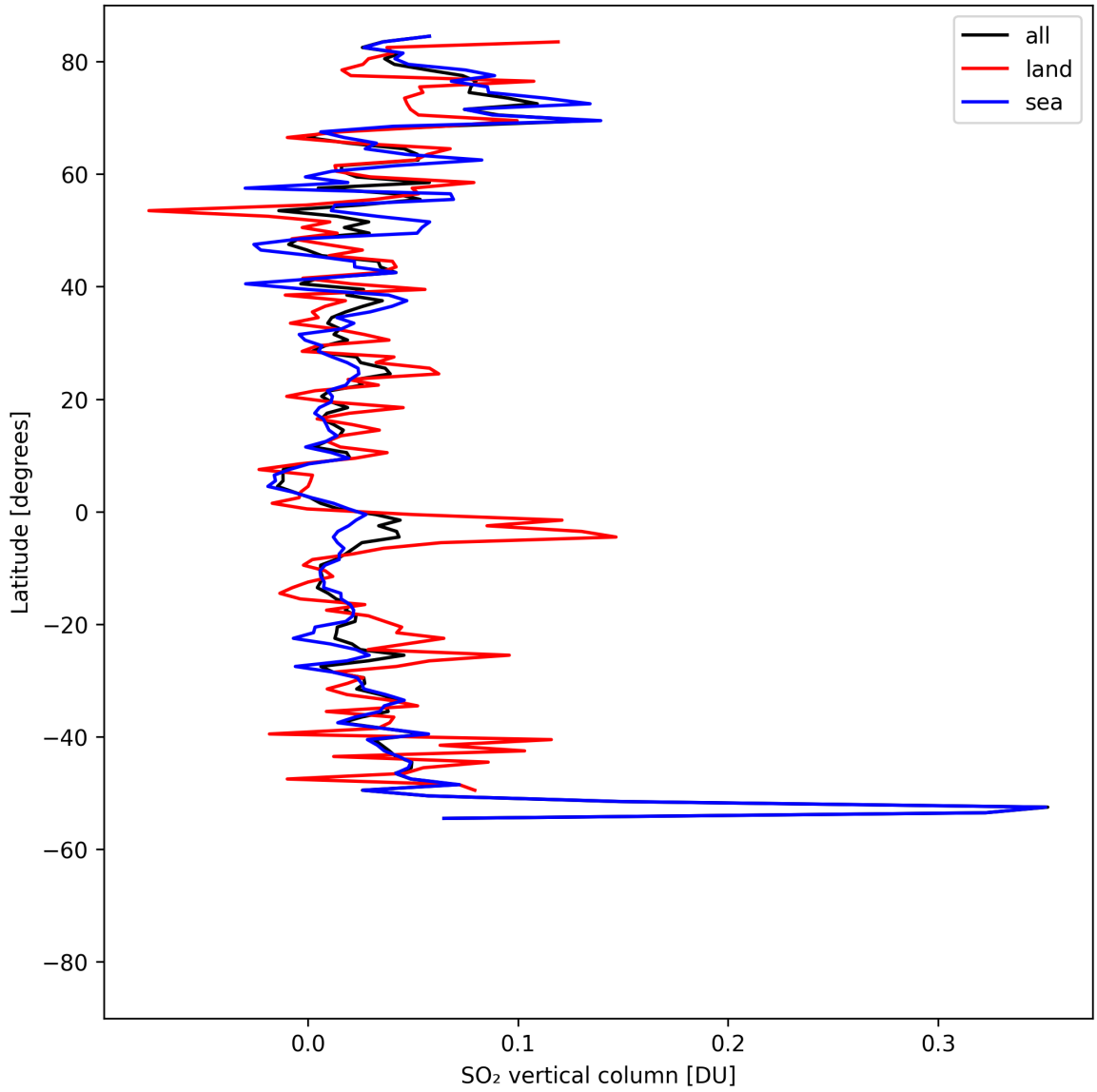

Figure 31: Zonal average of "SO_2 vertical column" for 2025-04-29 to 2025-04-30.

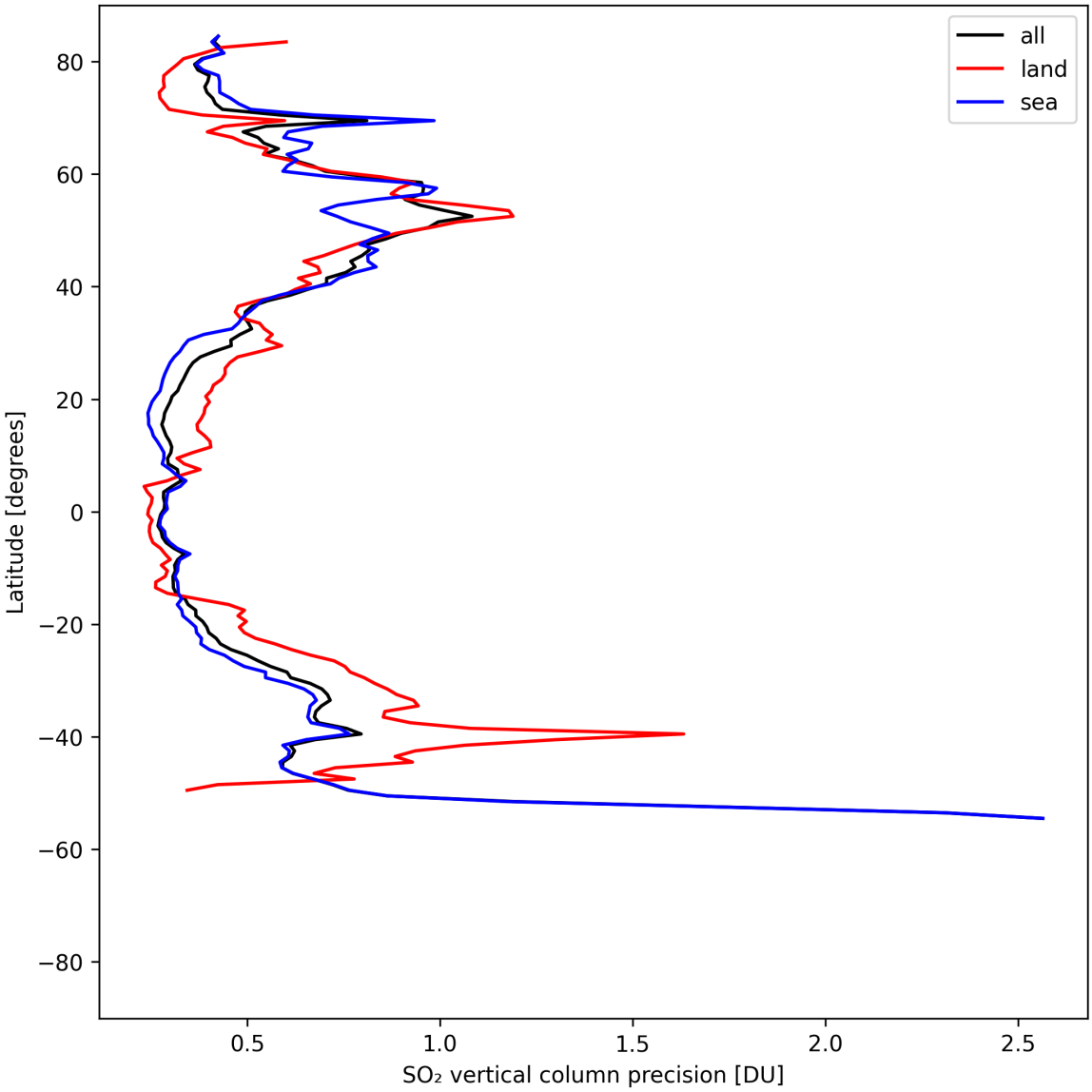

Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-04-29 to 2025-04-30.

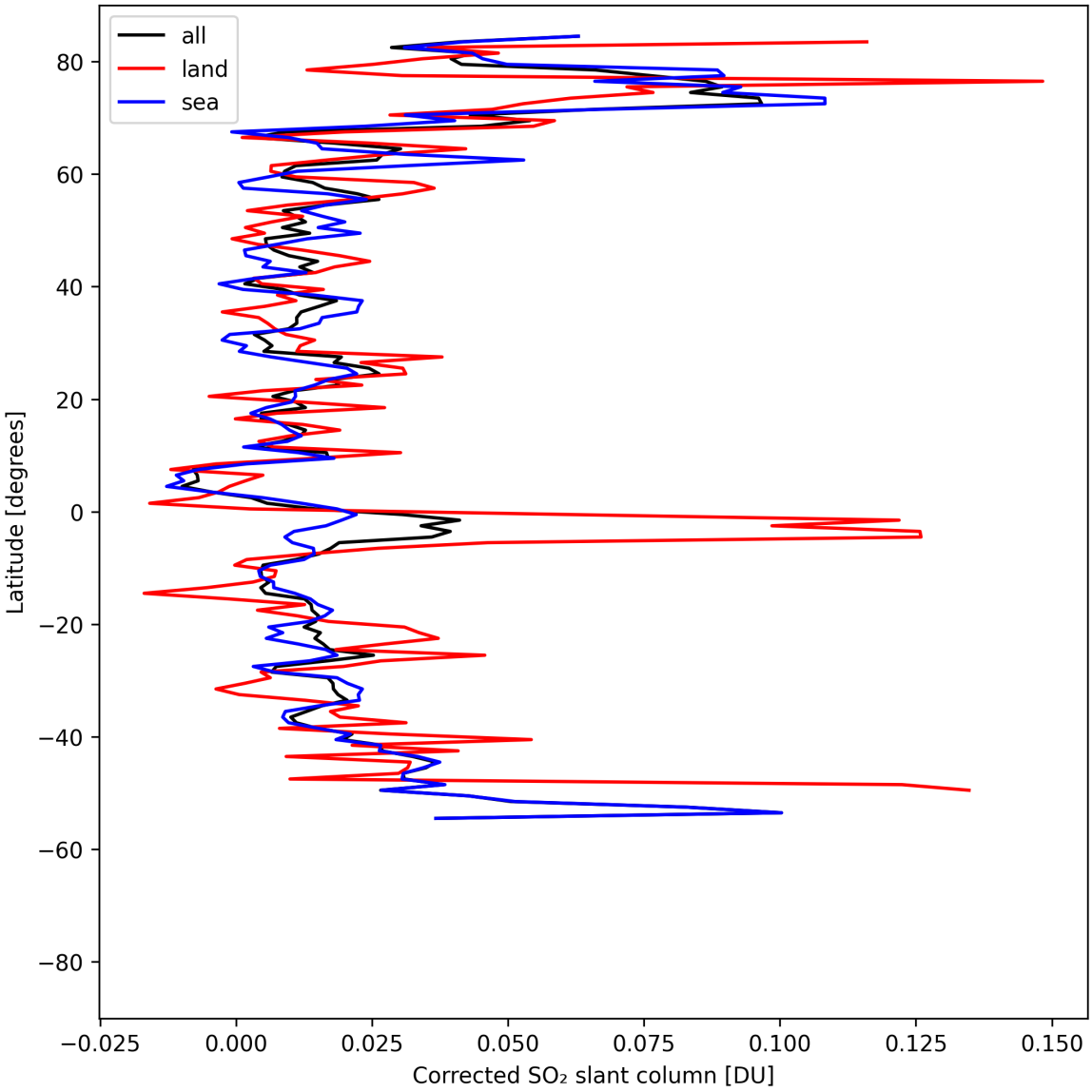

Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-04-29 to 2025-04-30.

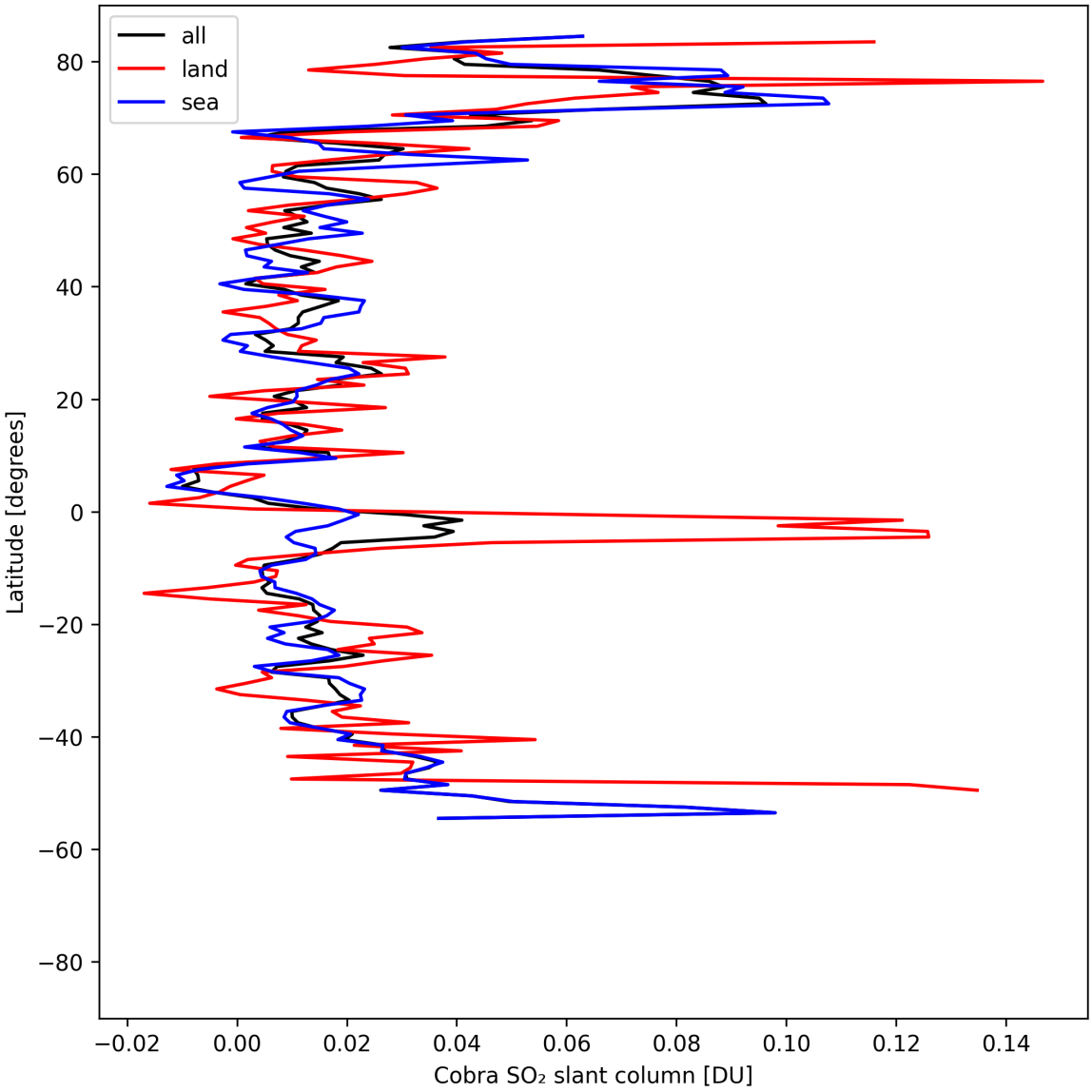

Figure 34: Zonal average of “Cobra SO_2 slant column” for 2025-04-29 to 2025-04-30.

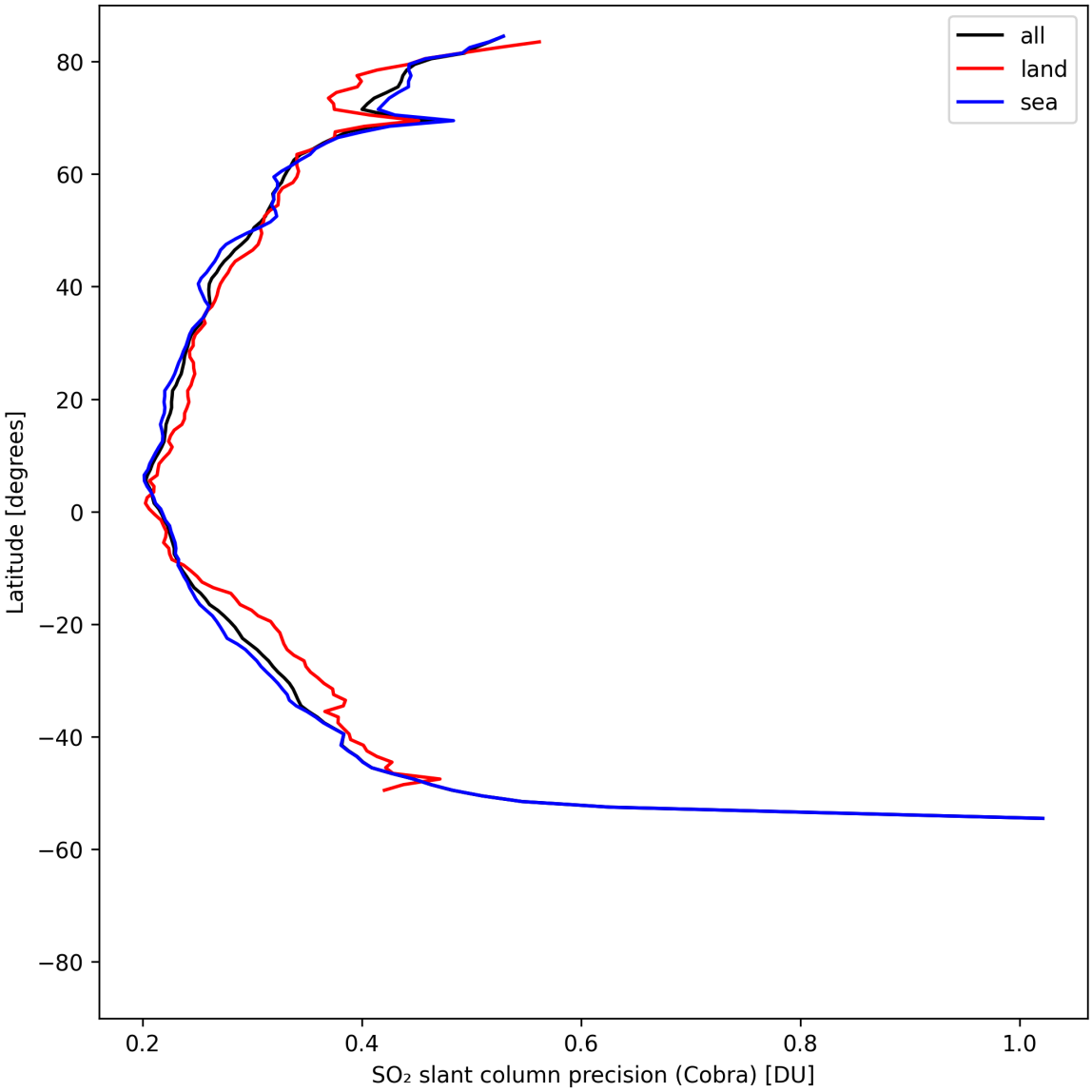

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-04-29 to 2025-04-30.

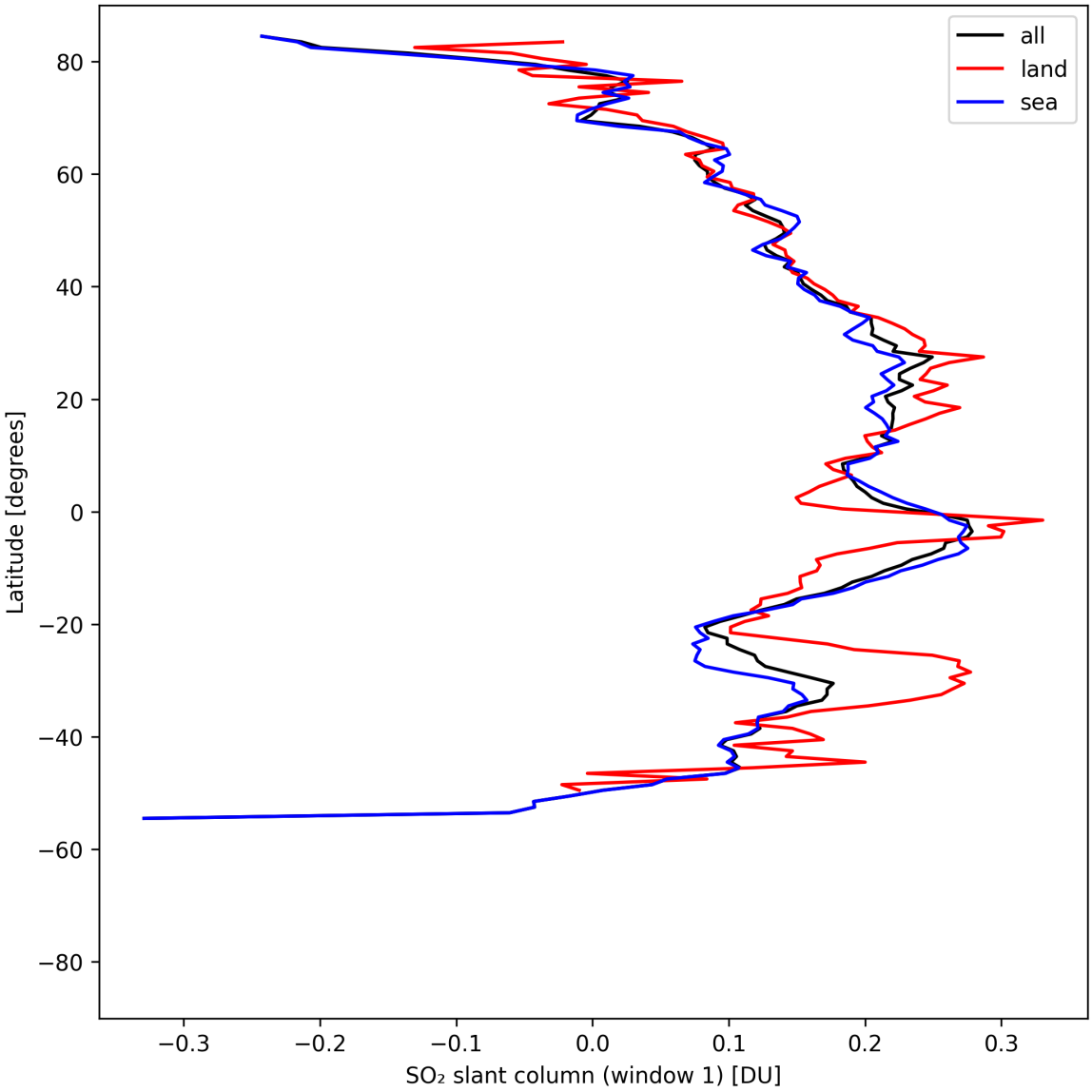

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-04-29 to 2025-04-30.

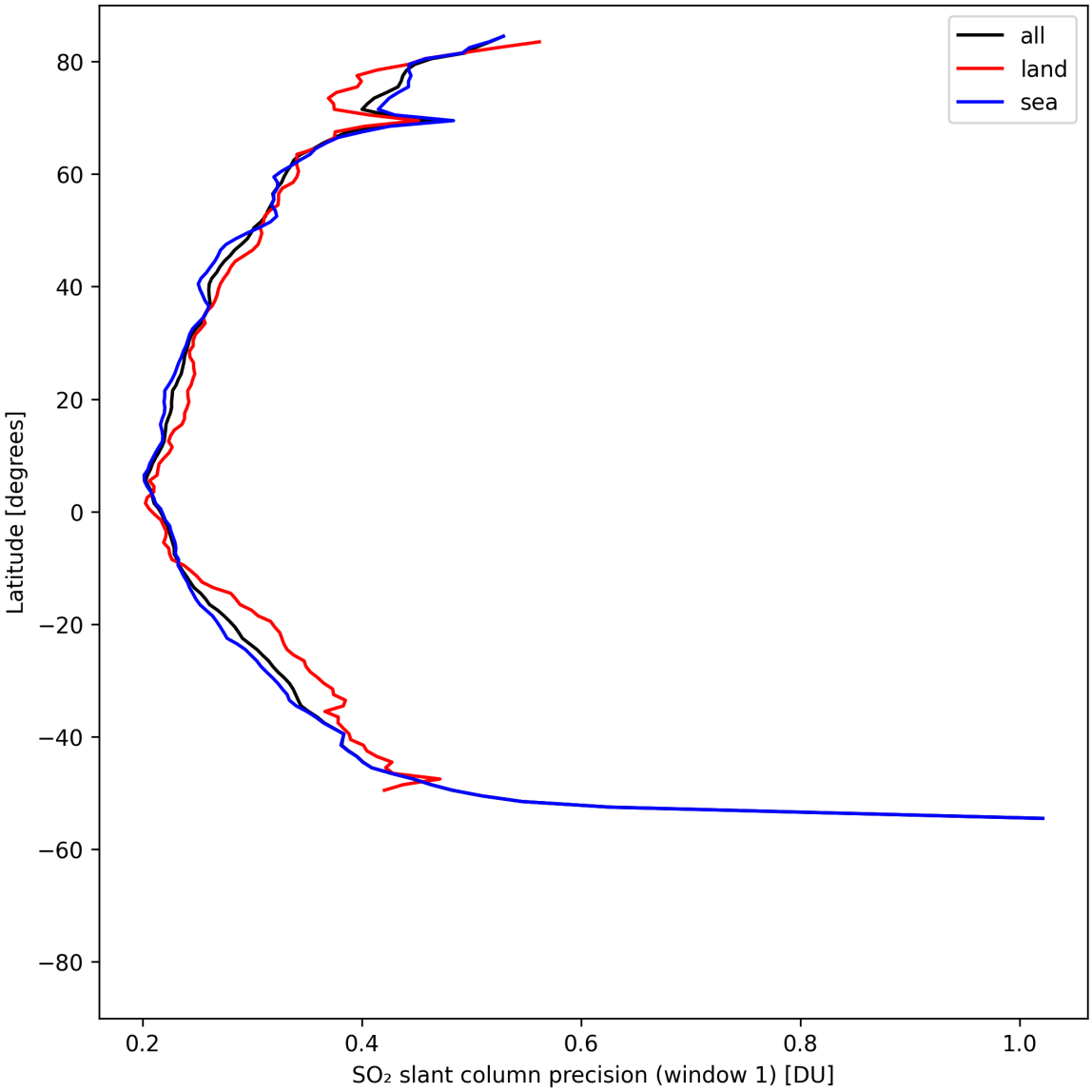

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-04-29 to 2025-04-30.

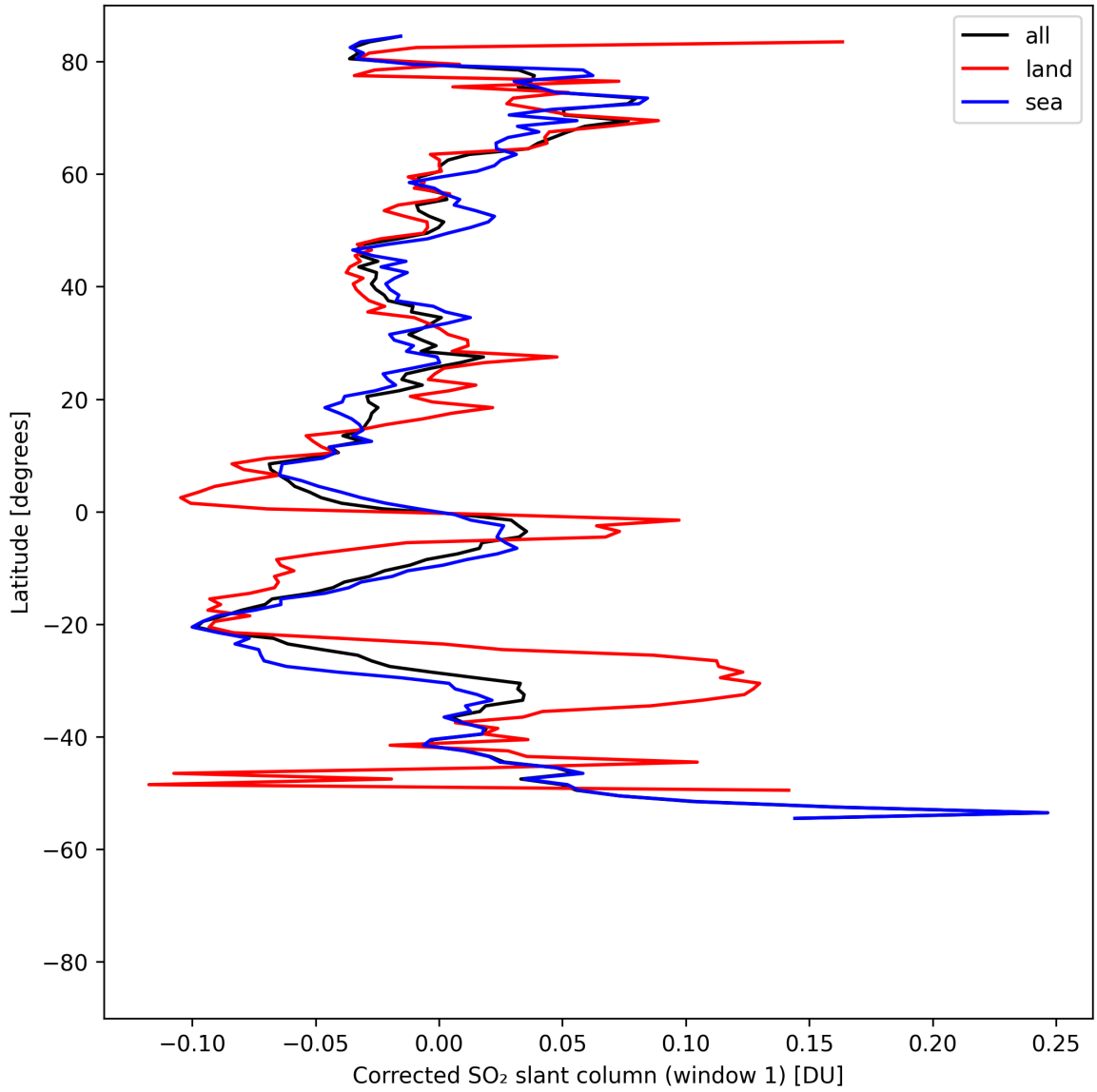

Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-04-29 to 2025-04-30.

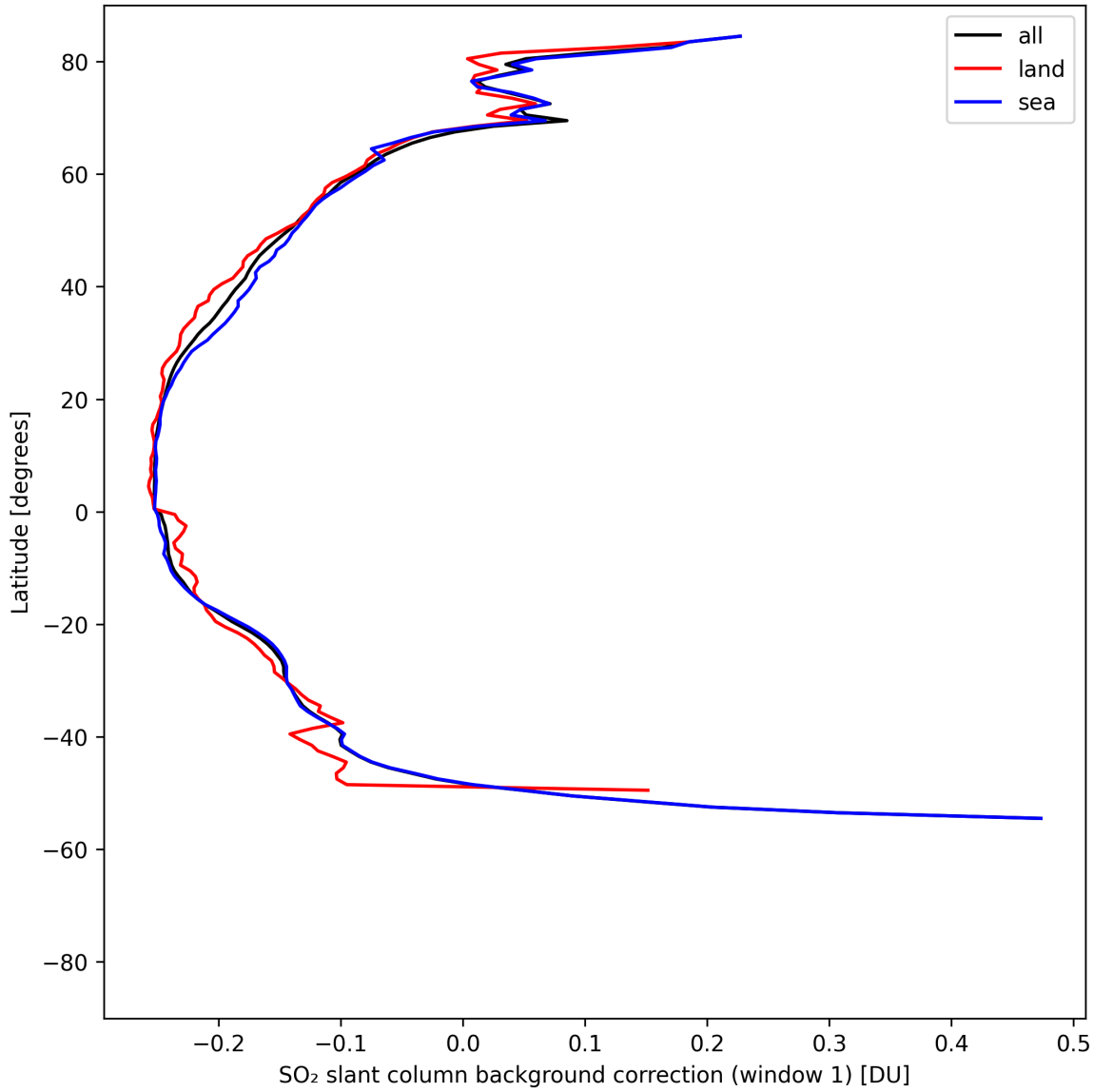

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-04-29 to 2025-04-30.

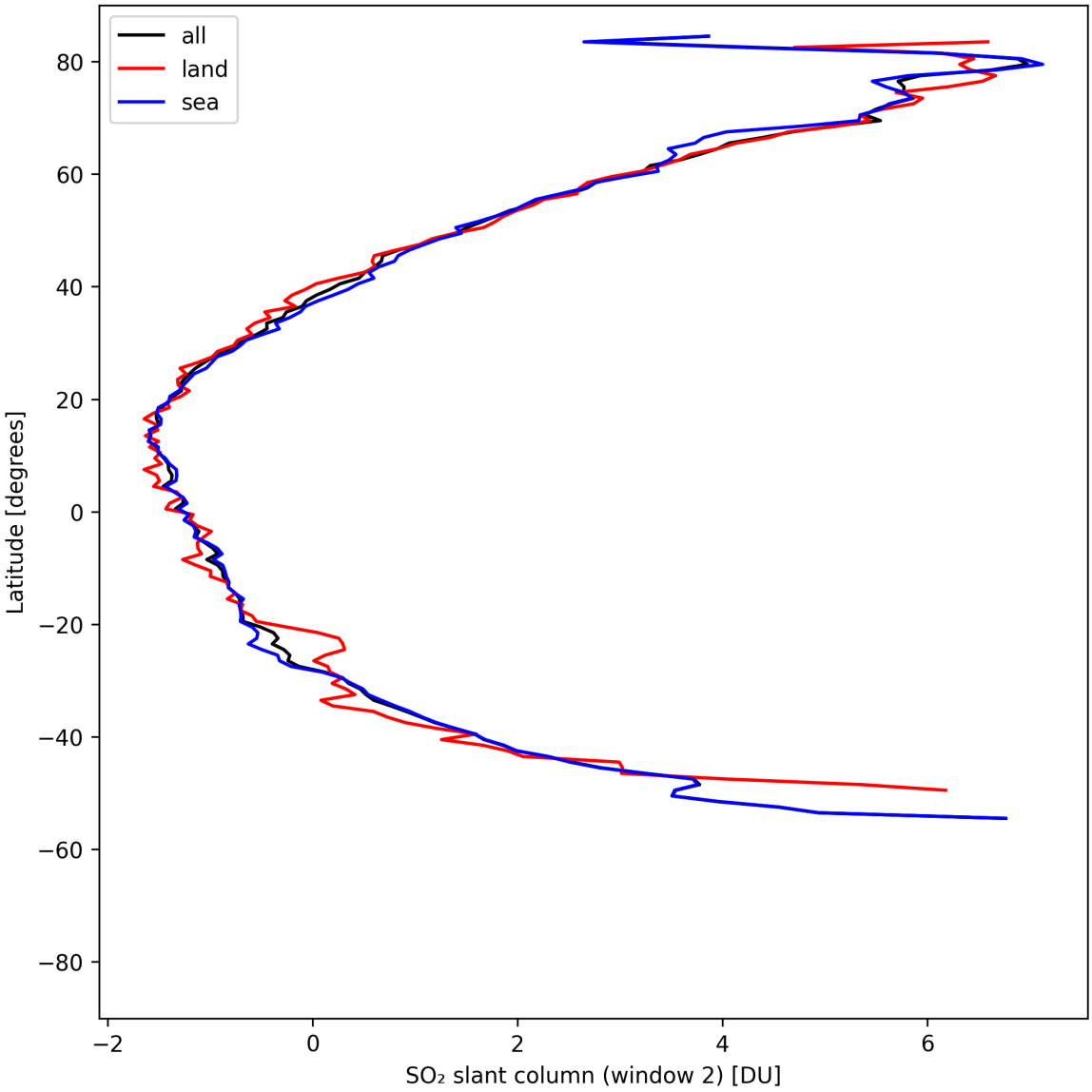

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-04-29 to 2025-04-30.

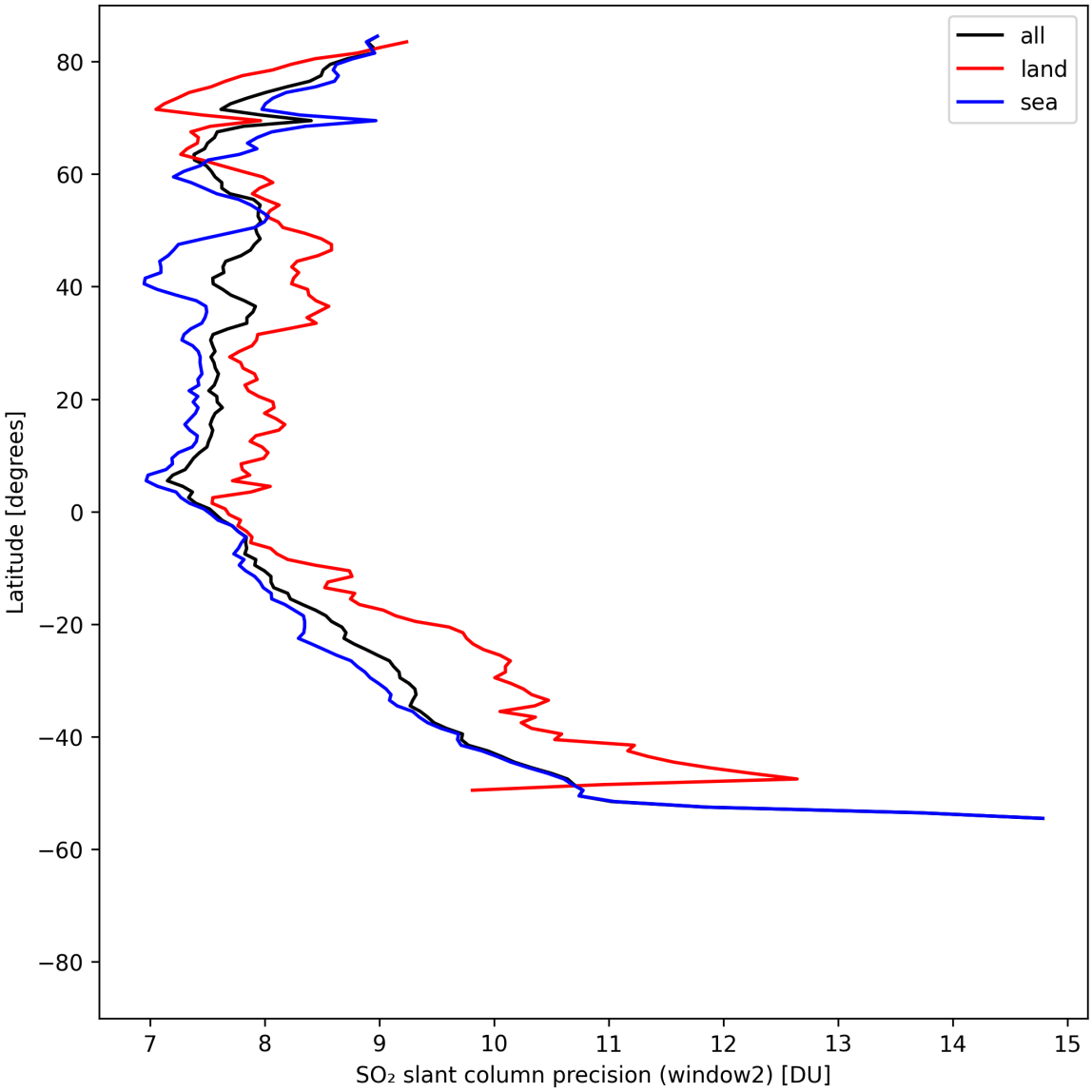

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-04-29 to 2025-04-30.

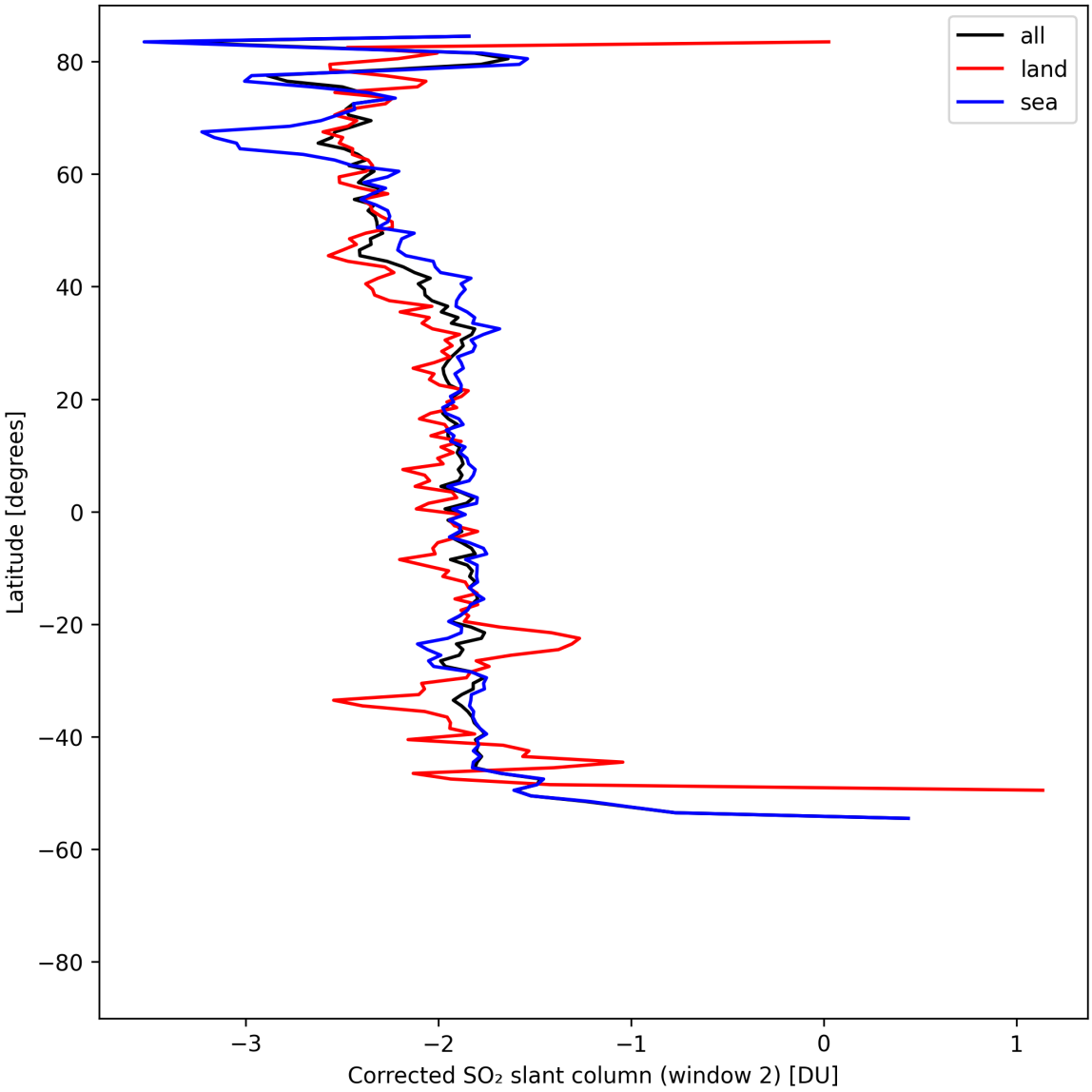

Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-04-29 to 2025-04-30.

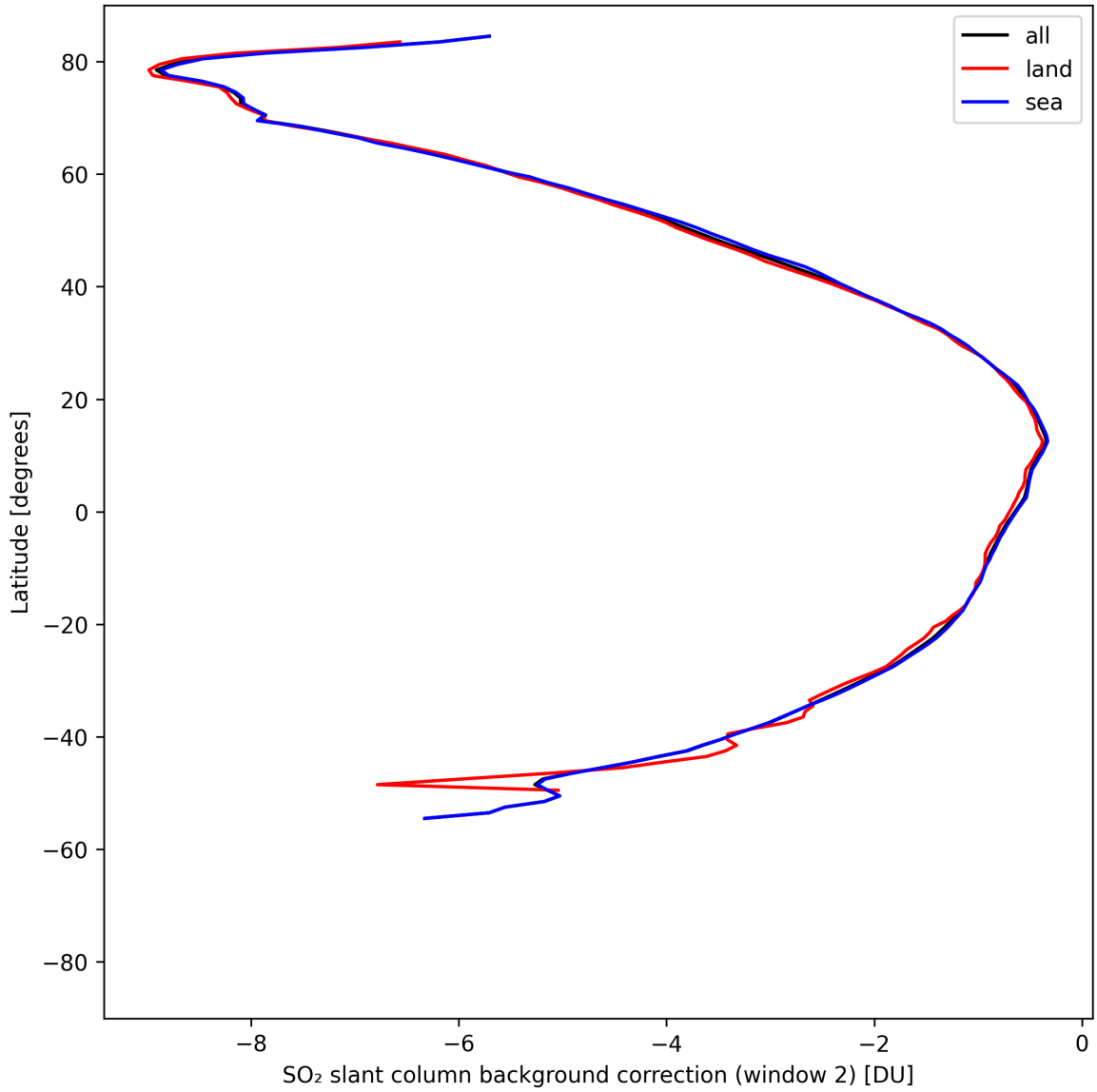

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-04-29 to 2025-04-30.

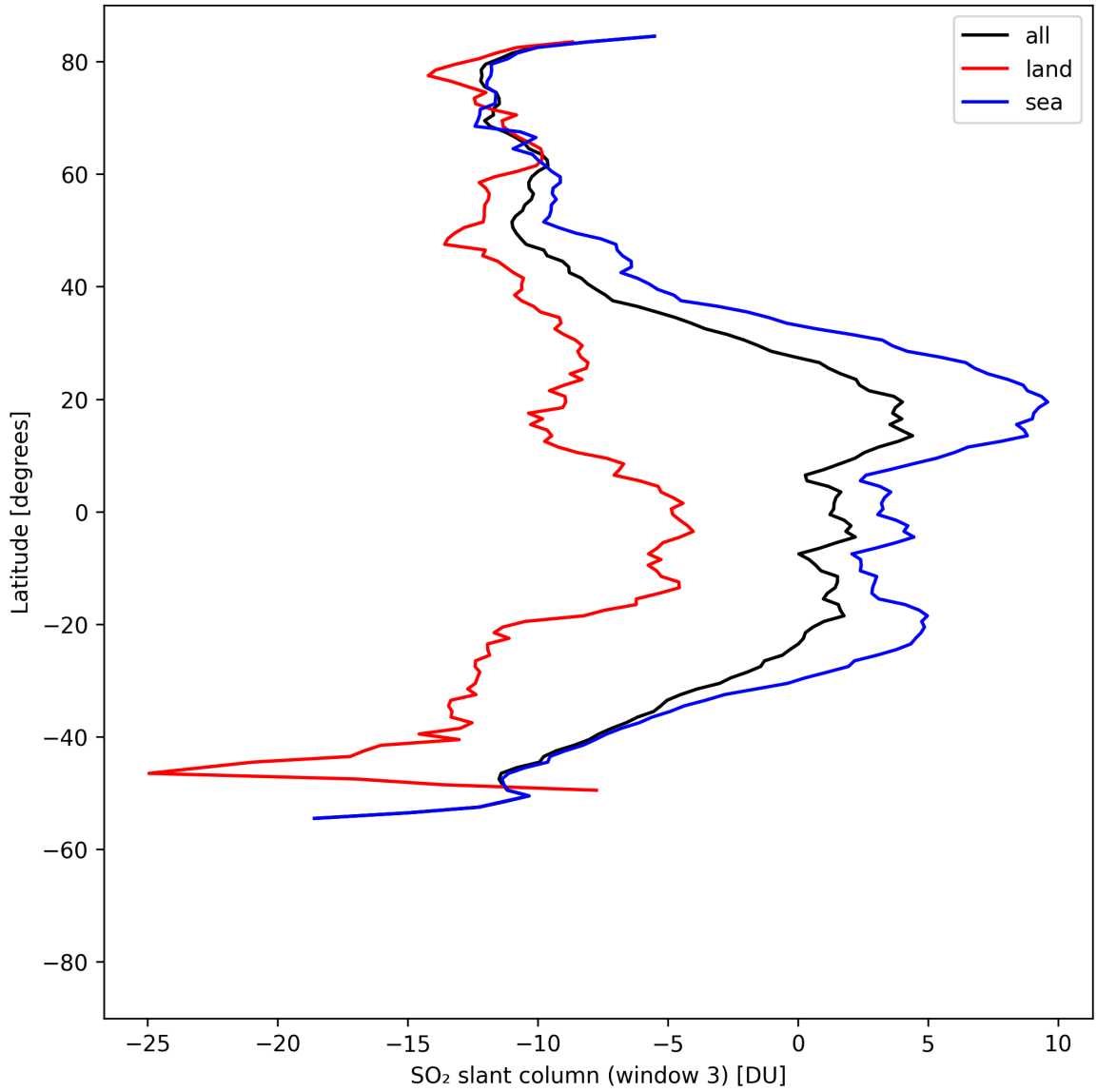

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-04-29 to 2025-04-30.

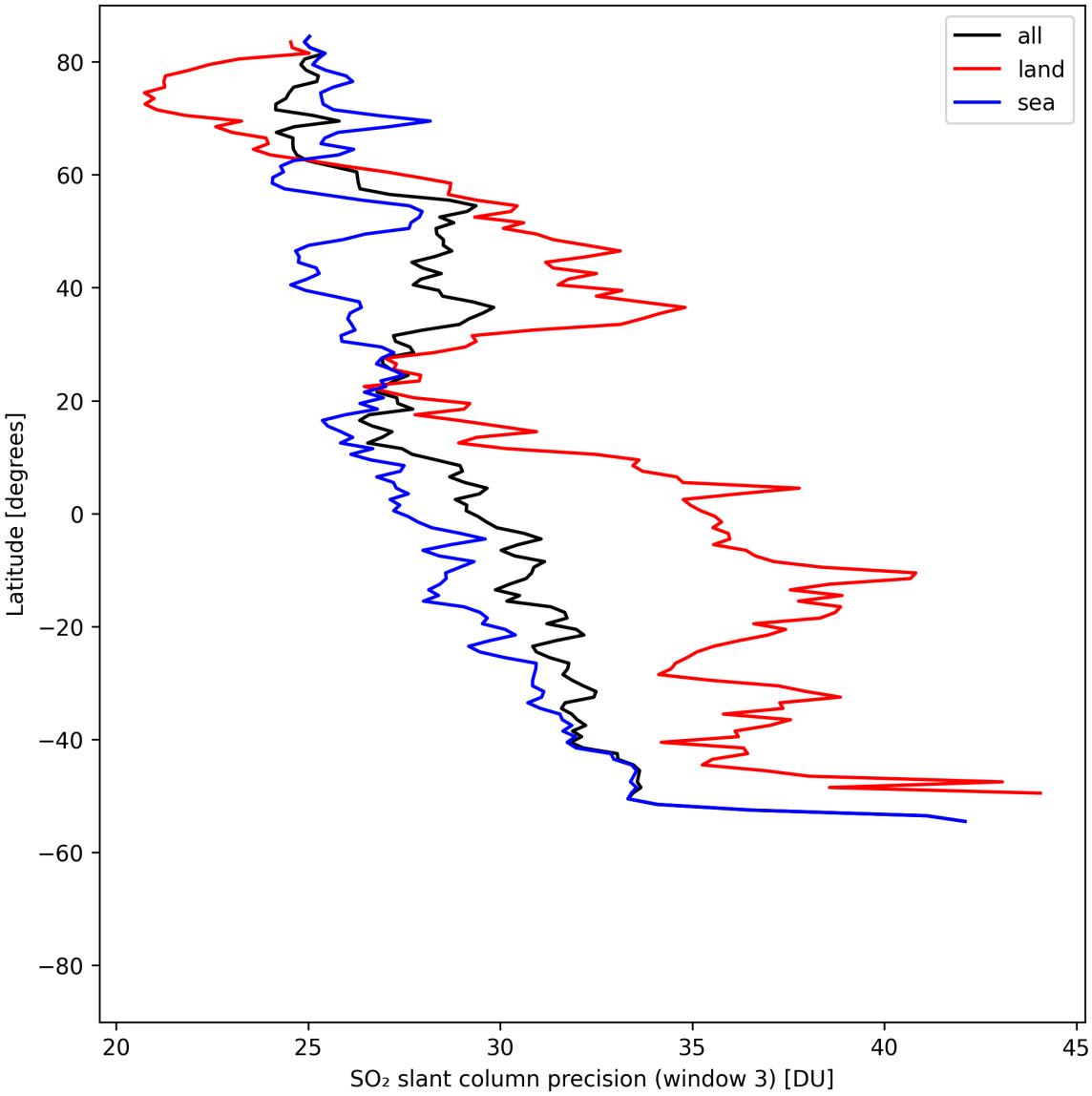

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-04-29 to 2025-04-30.

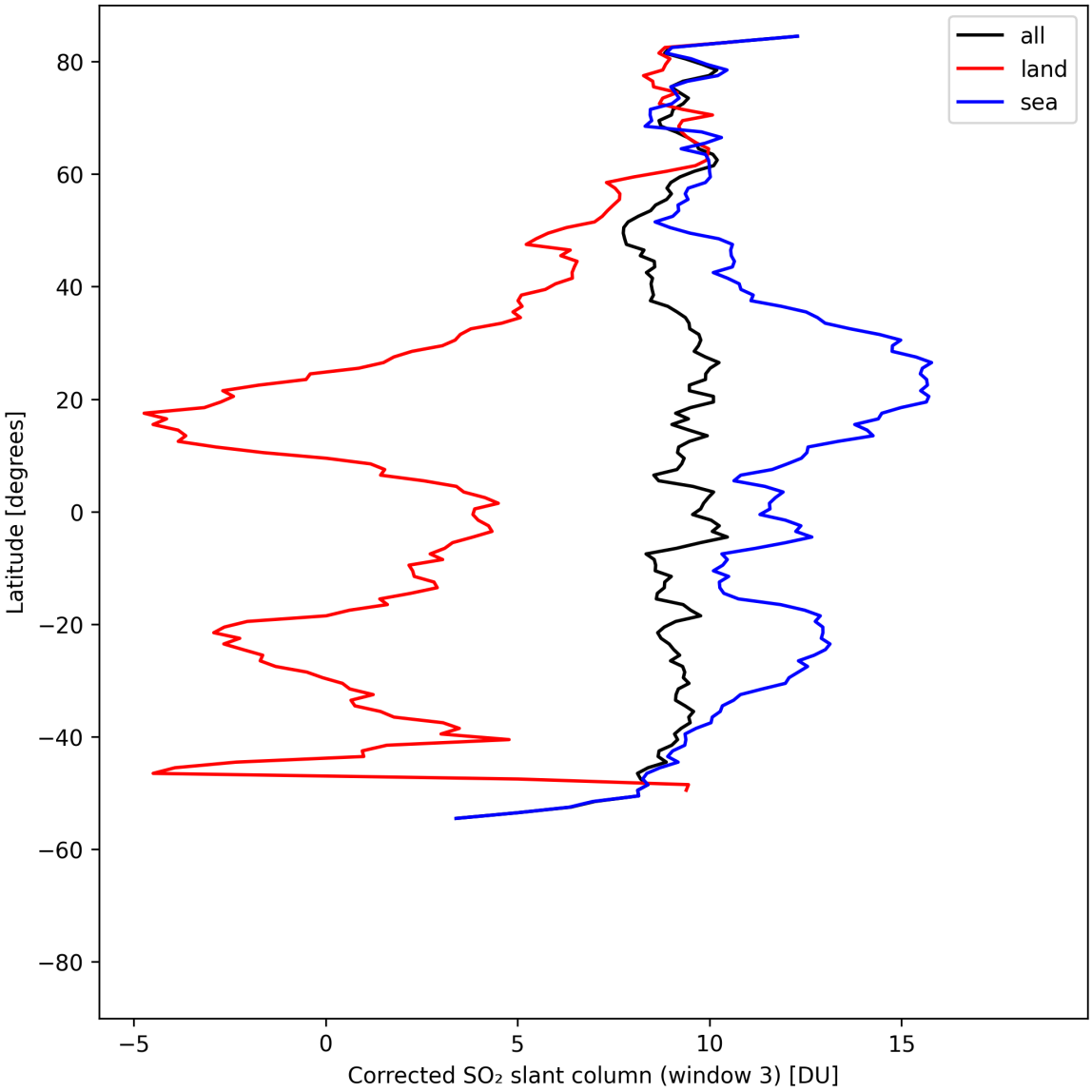

Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-04-29 to 2025-04-30.

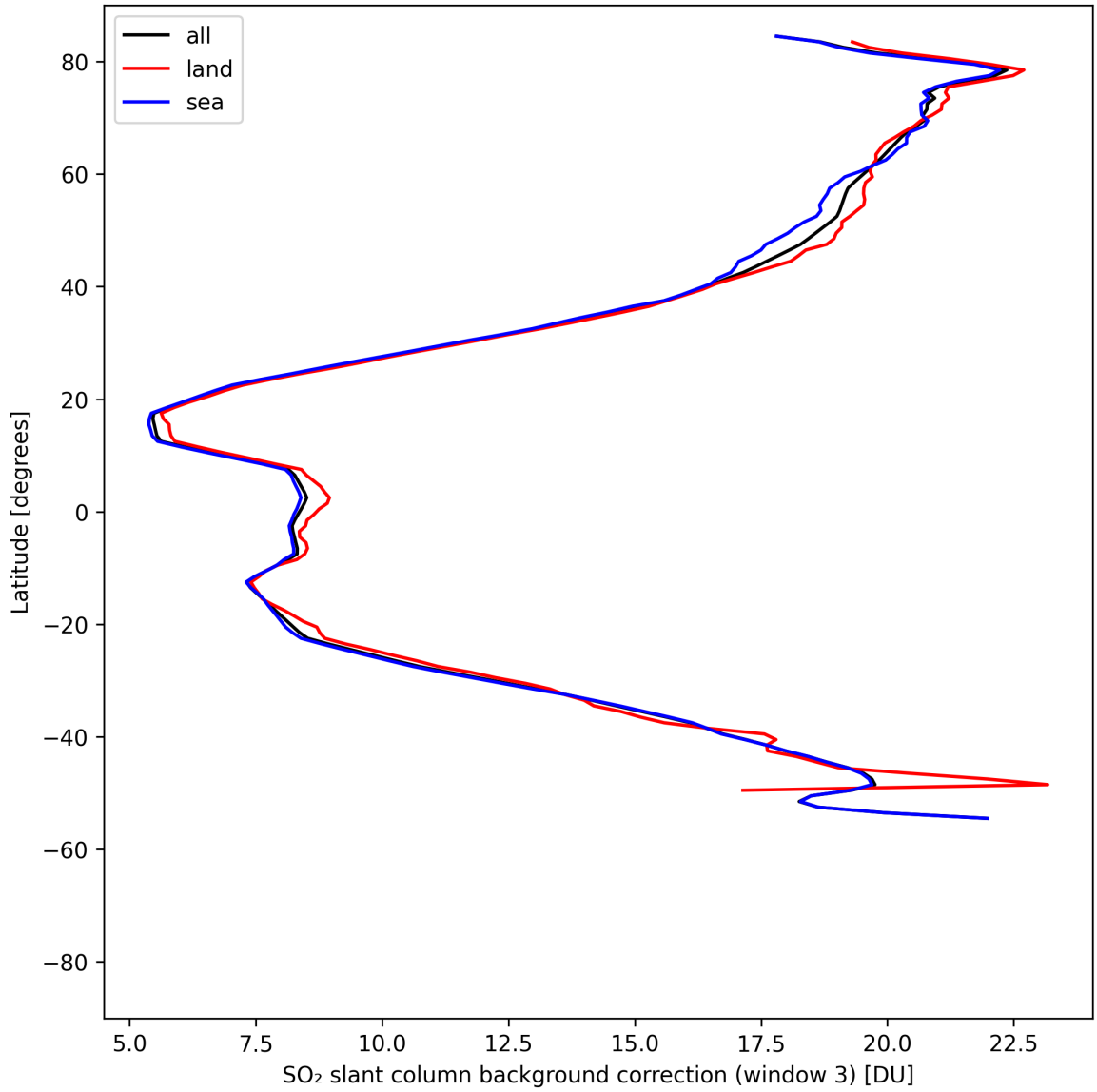

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-04-29 to 2025-04-30.

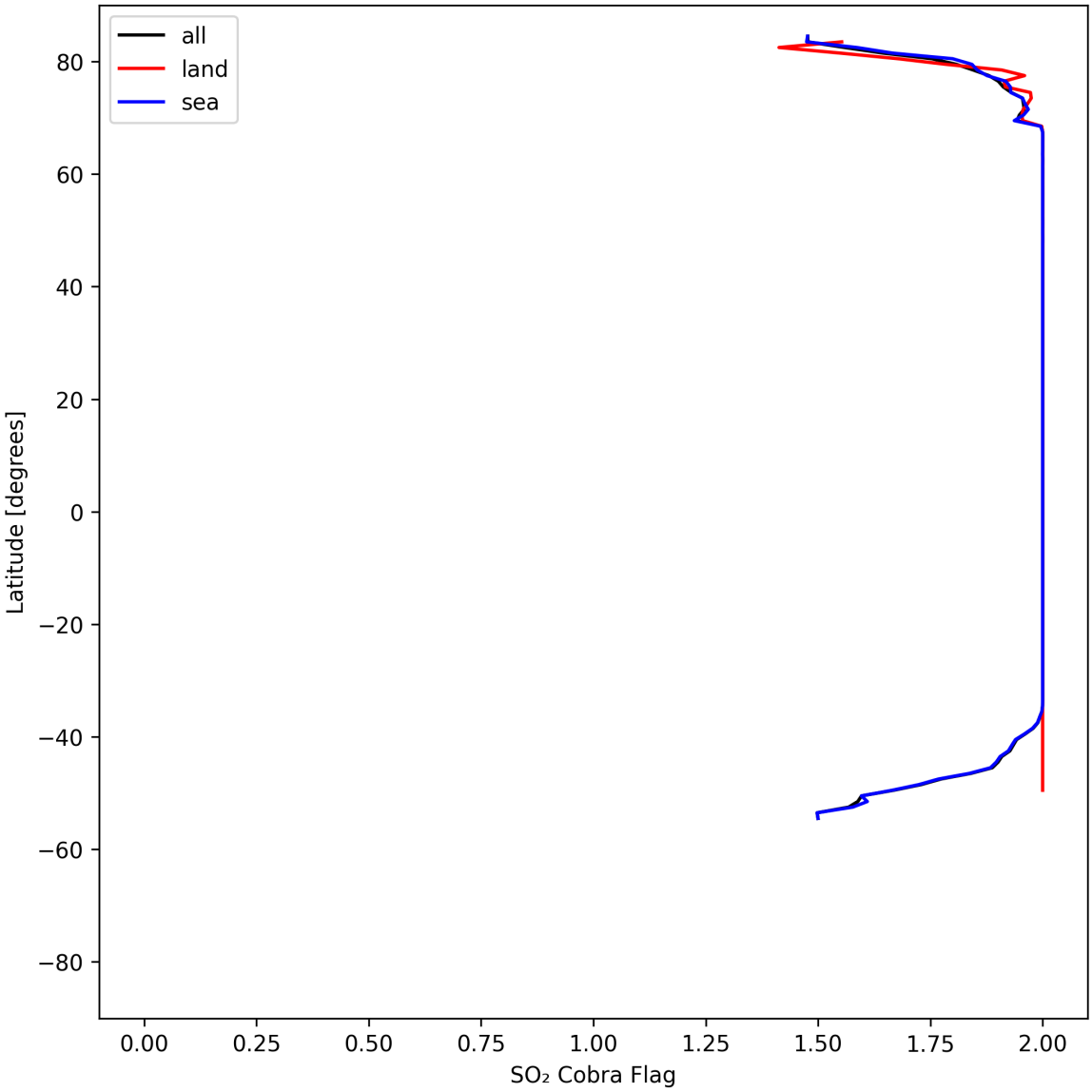

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-04-29 to 2025-04-30.

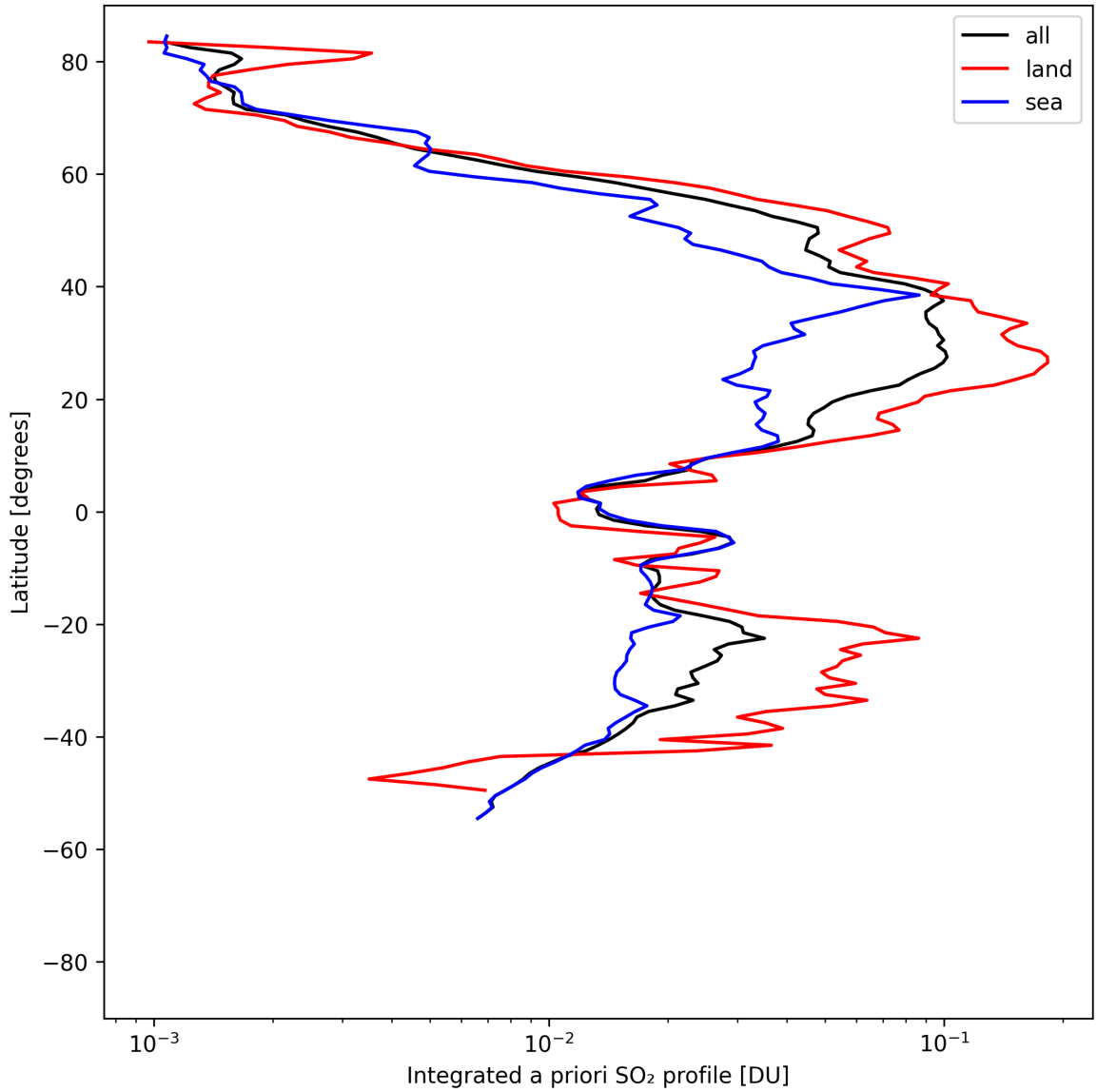

Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-04-29 to 2025-04-30.

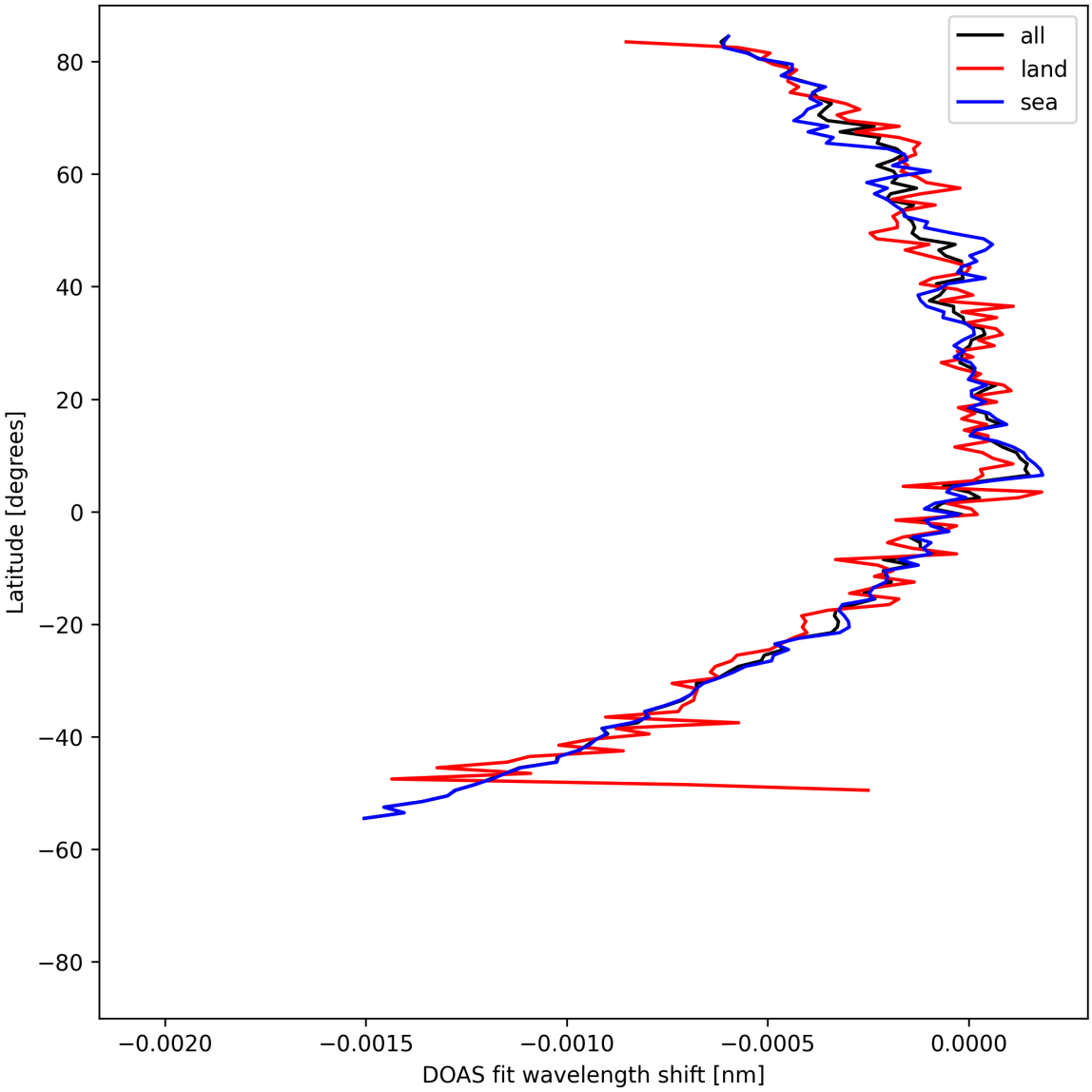

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-04-29 to 2025-04-30.

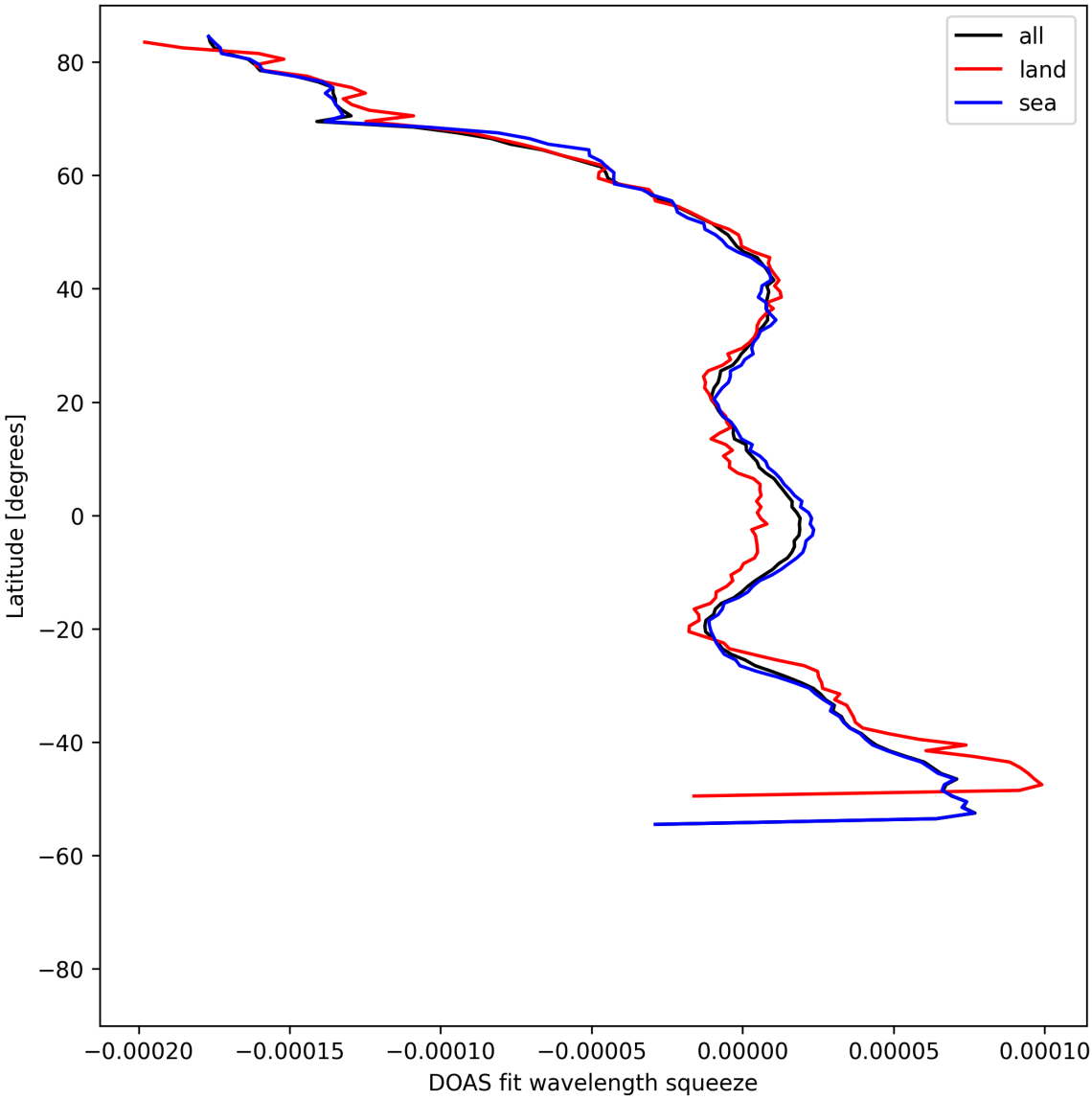

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-04-29 to 2025-04-30.

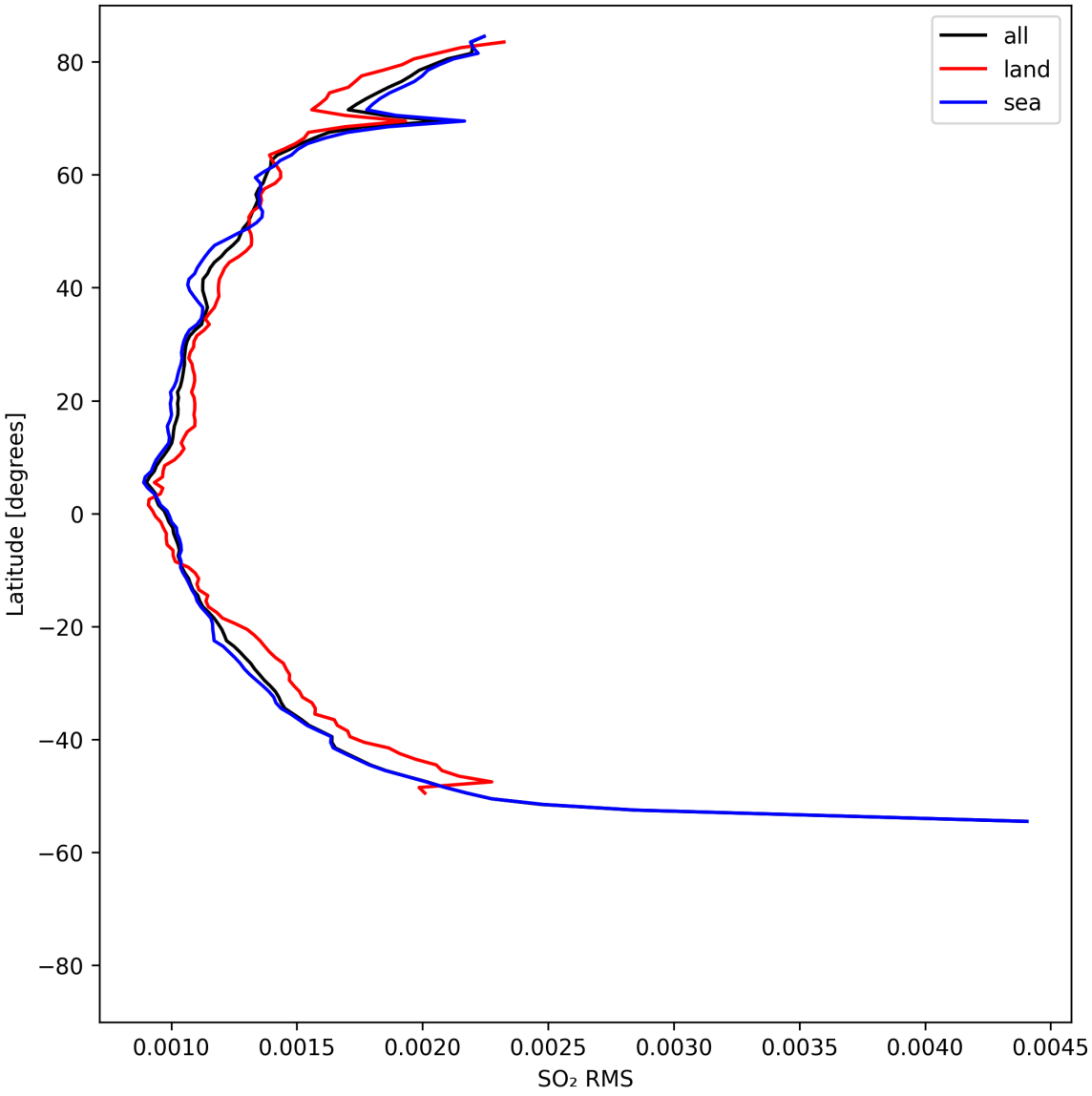

Figure 52: Zonal average of "SO_2 RMS" for 2025-04-29 to 2025-04-30.

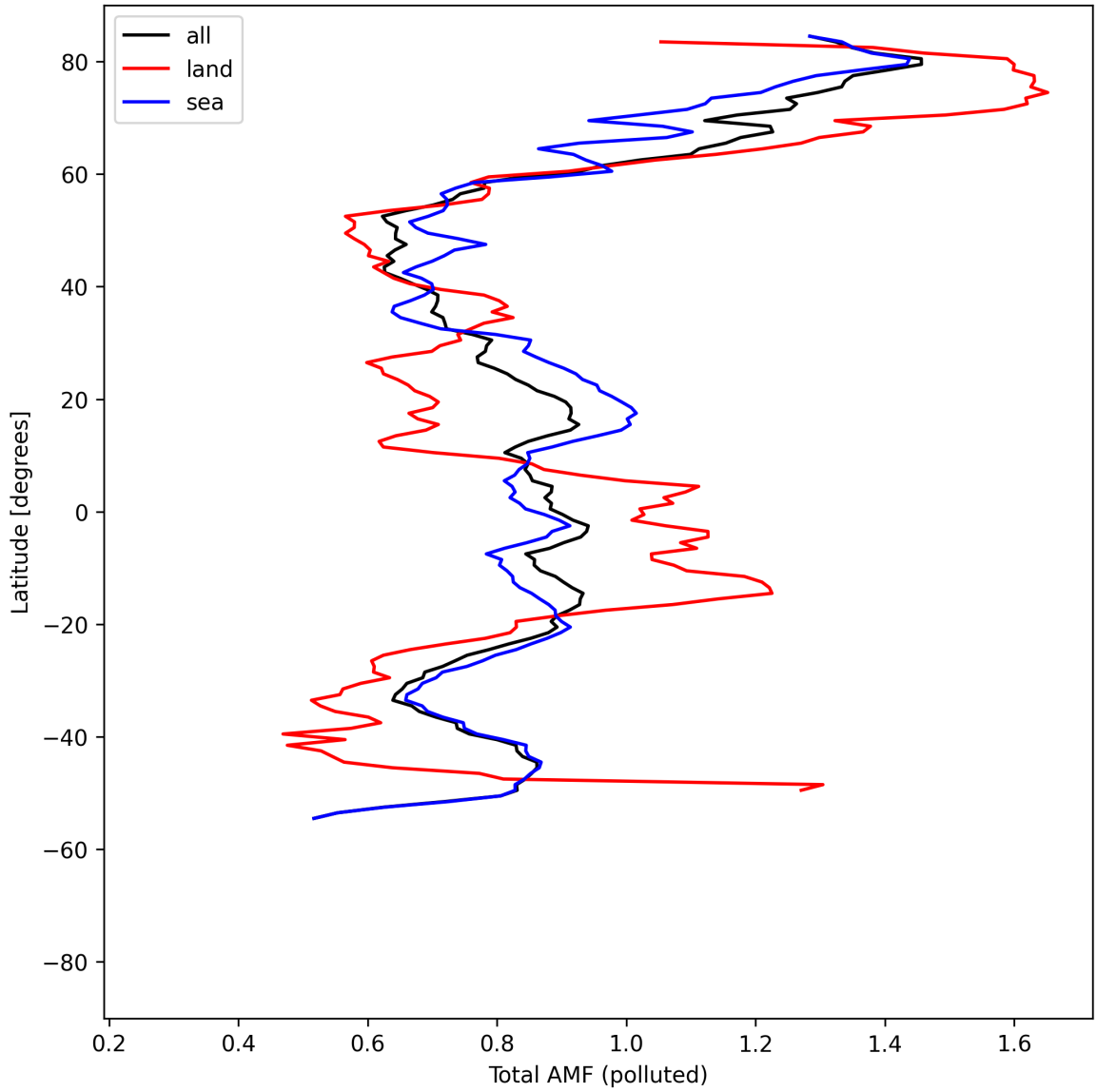

Figure 53: Zonal average of “Total AMF (polluted)” for 2025-04-29 to 2025-04-30.

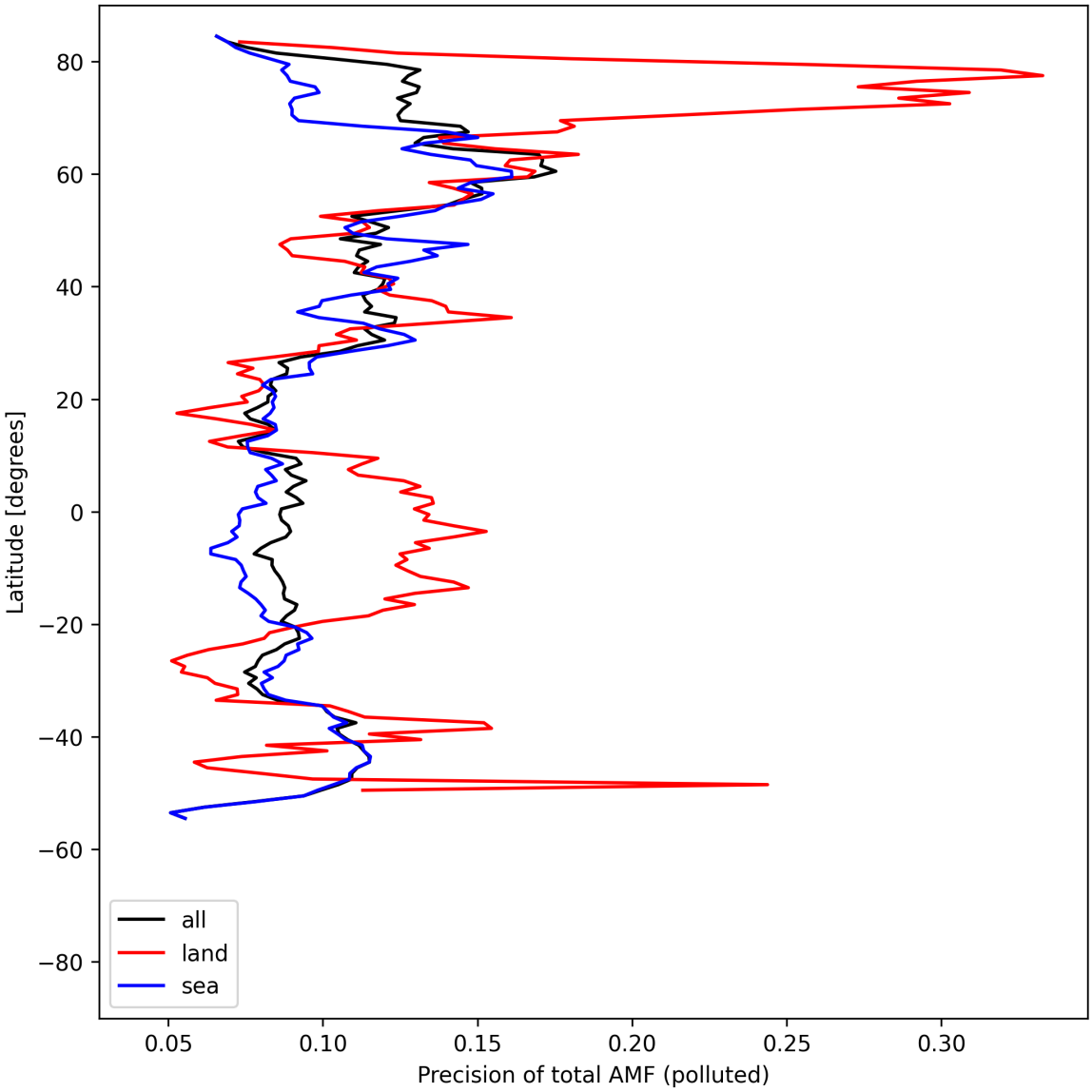

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-04-29 to 2025-04-30.

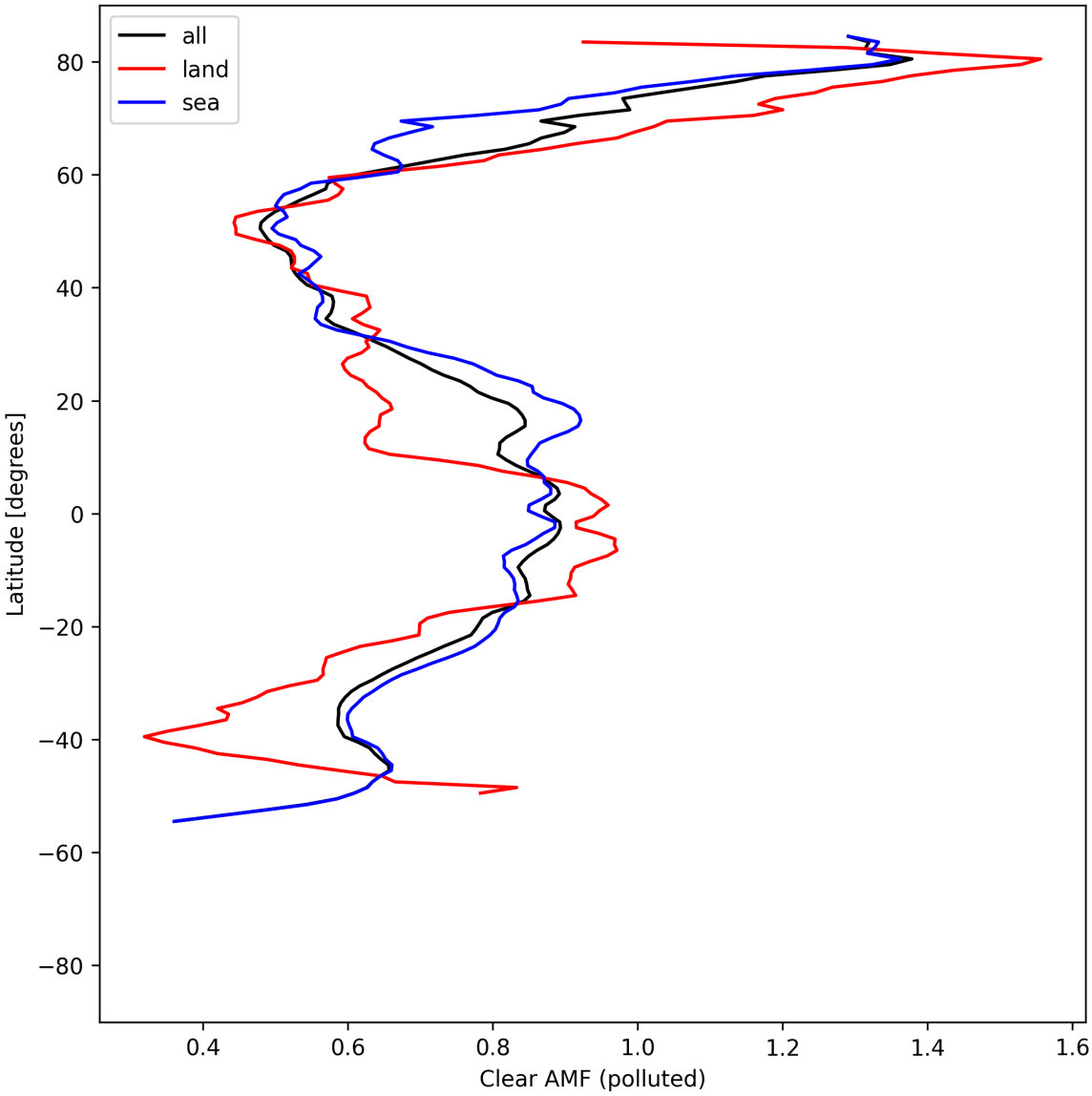

Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-04-29 to 2025-04-30.

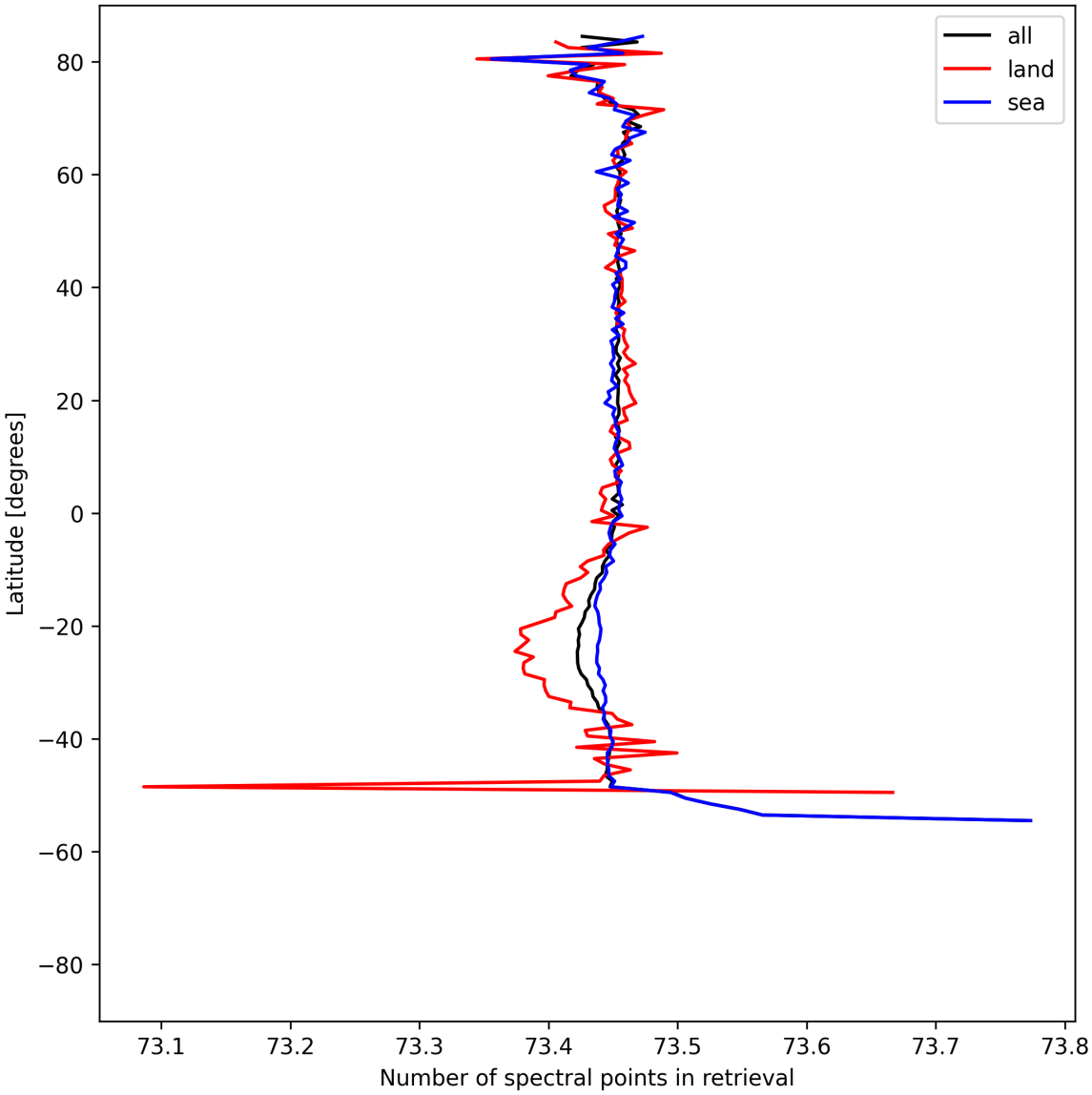

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-04-29 to 2025-04-30.

8 Histograms

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

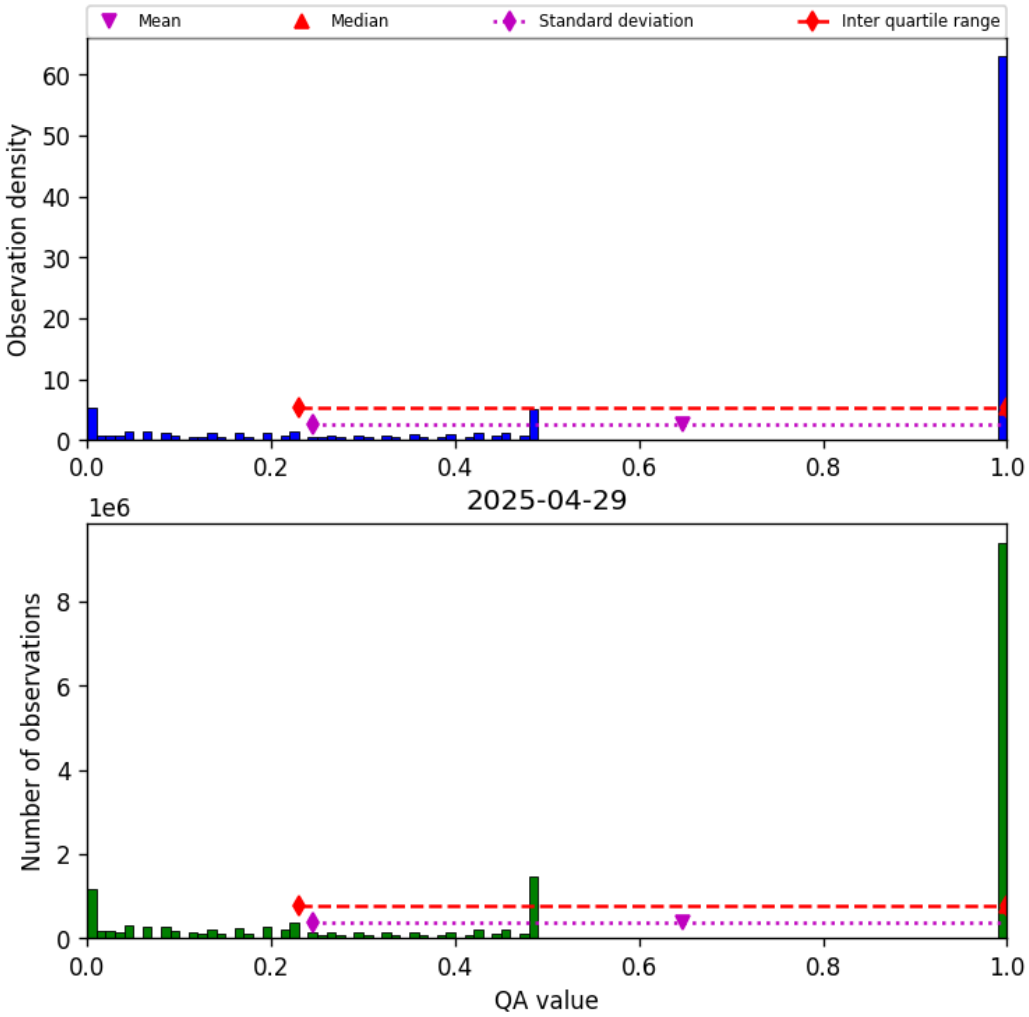

Figure 57: Histogram of “QA value” for 2025-04-29 to 2025-04-30

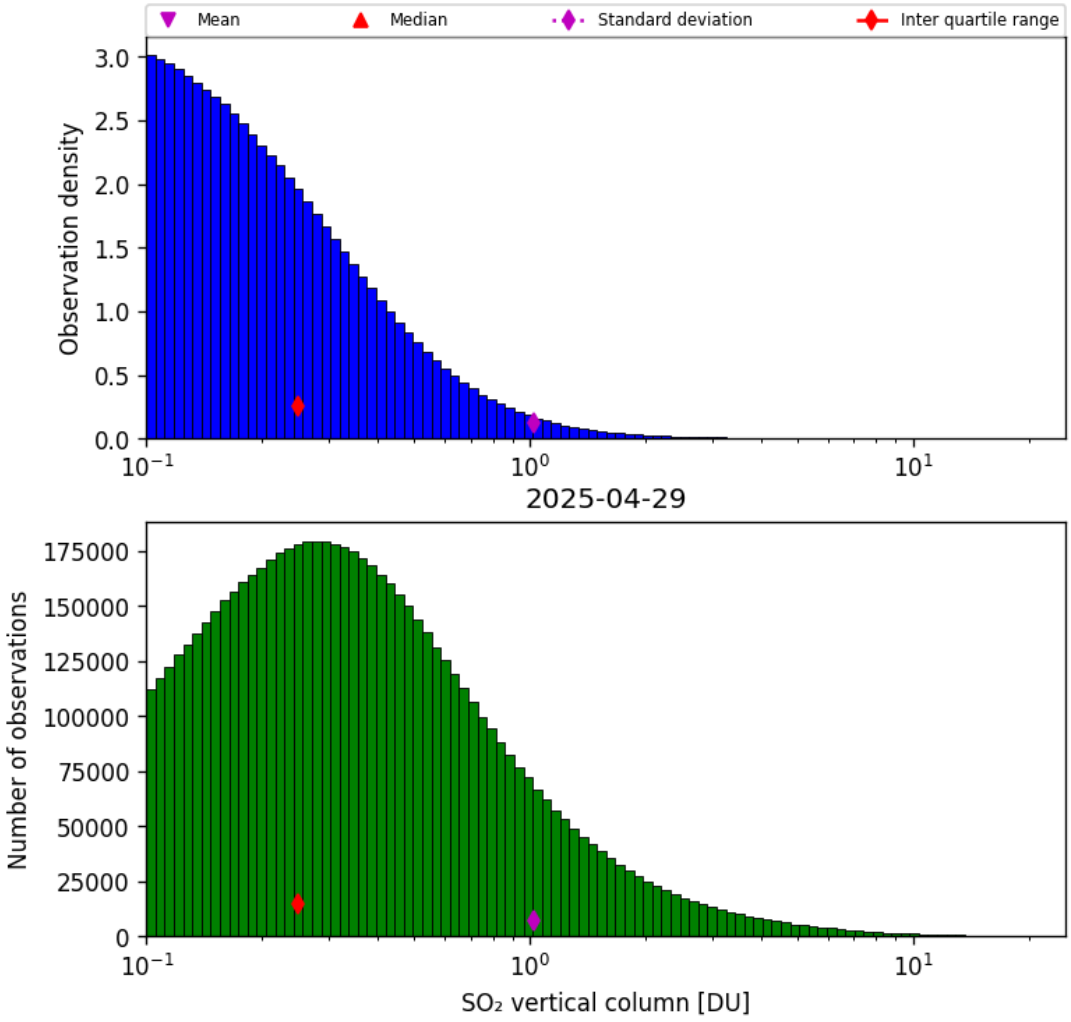

Figure 58: Histogram of "SO_2 vertical column" for 2025-04-29 to 2025-04-30

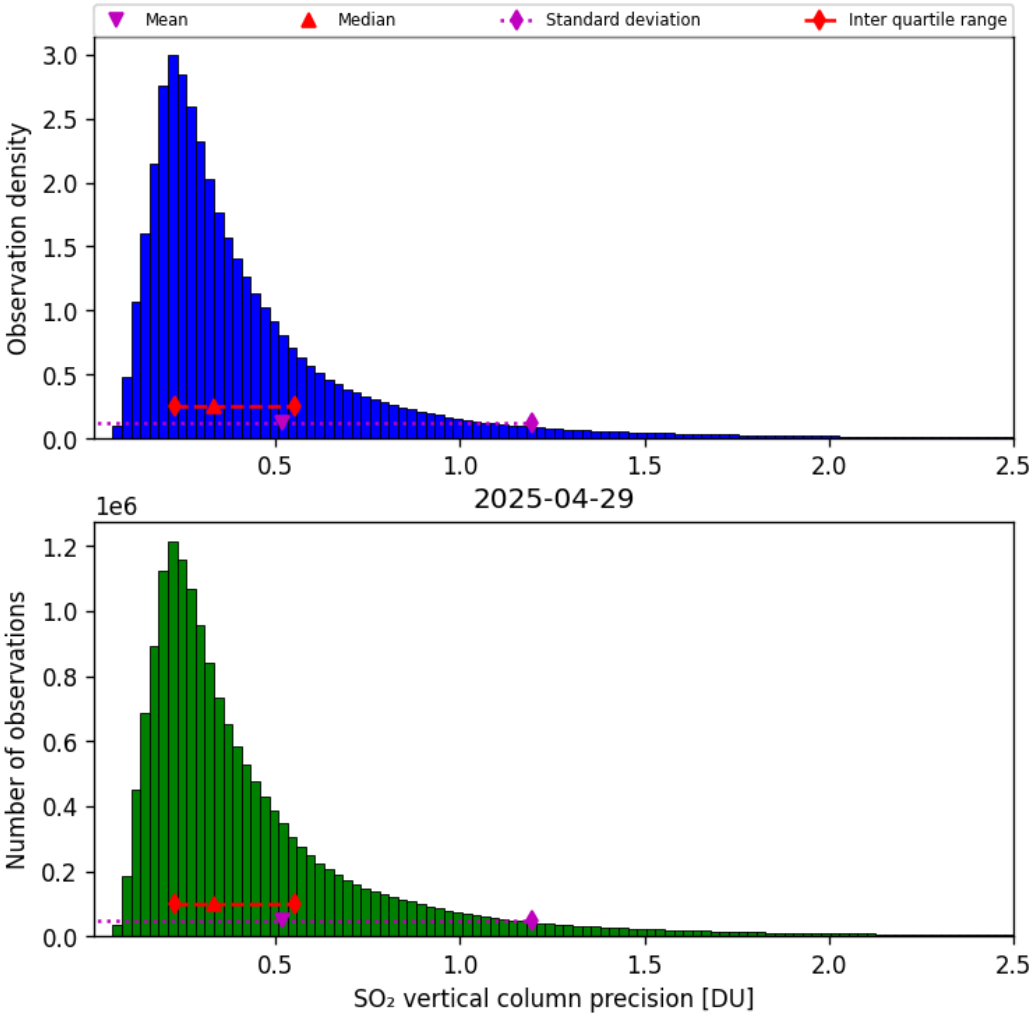

Figure 59: Histogram of "SO_2 vertical column precision" for 2025-04-29 to 2025-04-30

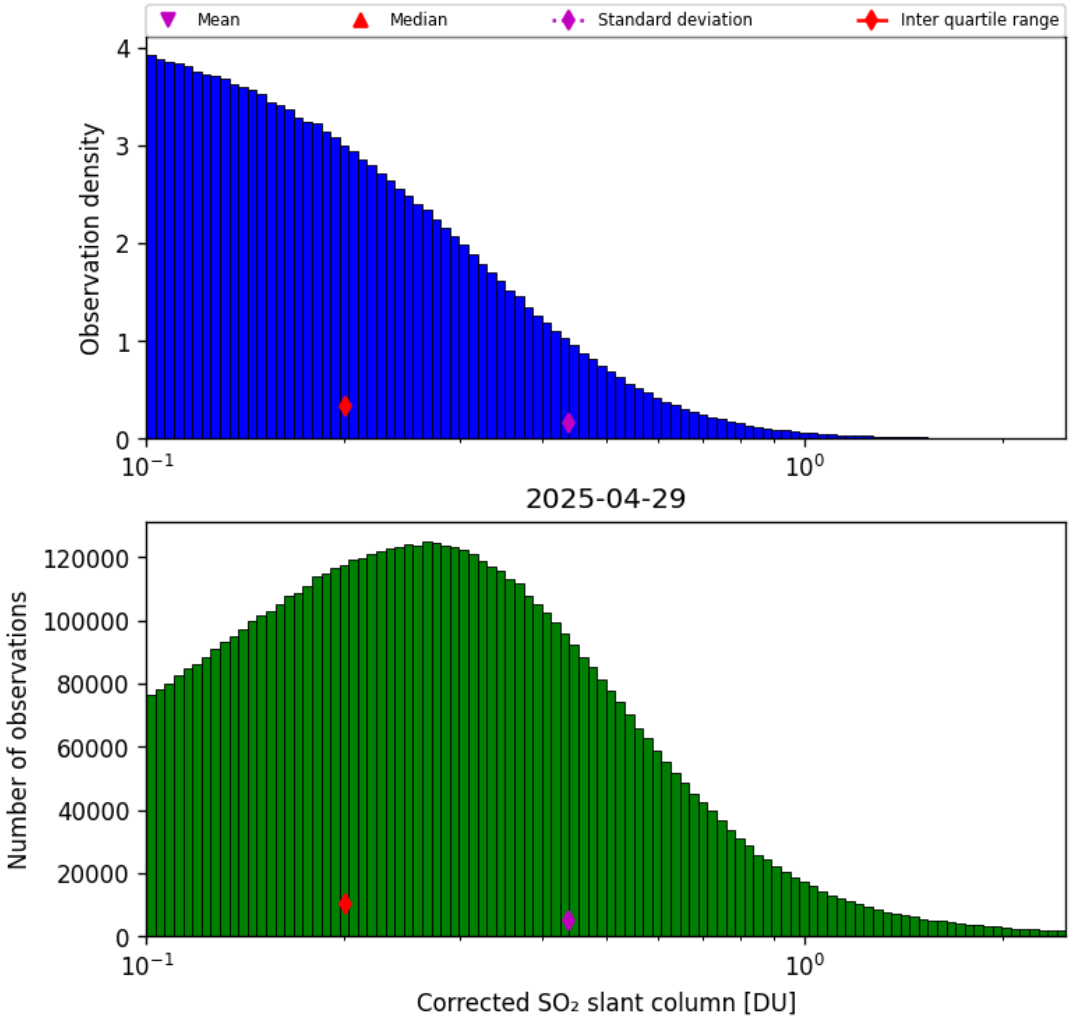

Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-04-29 to 2025-04-30

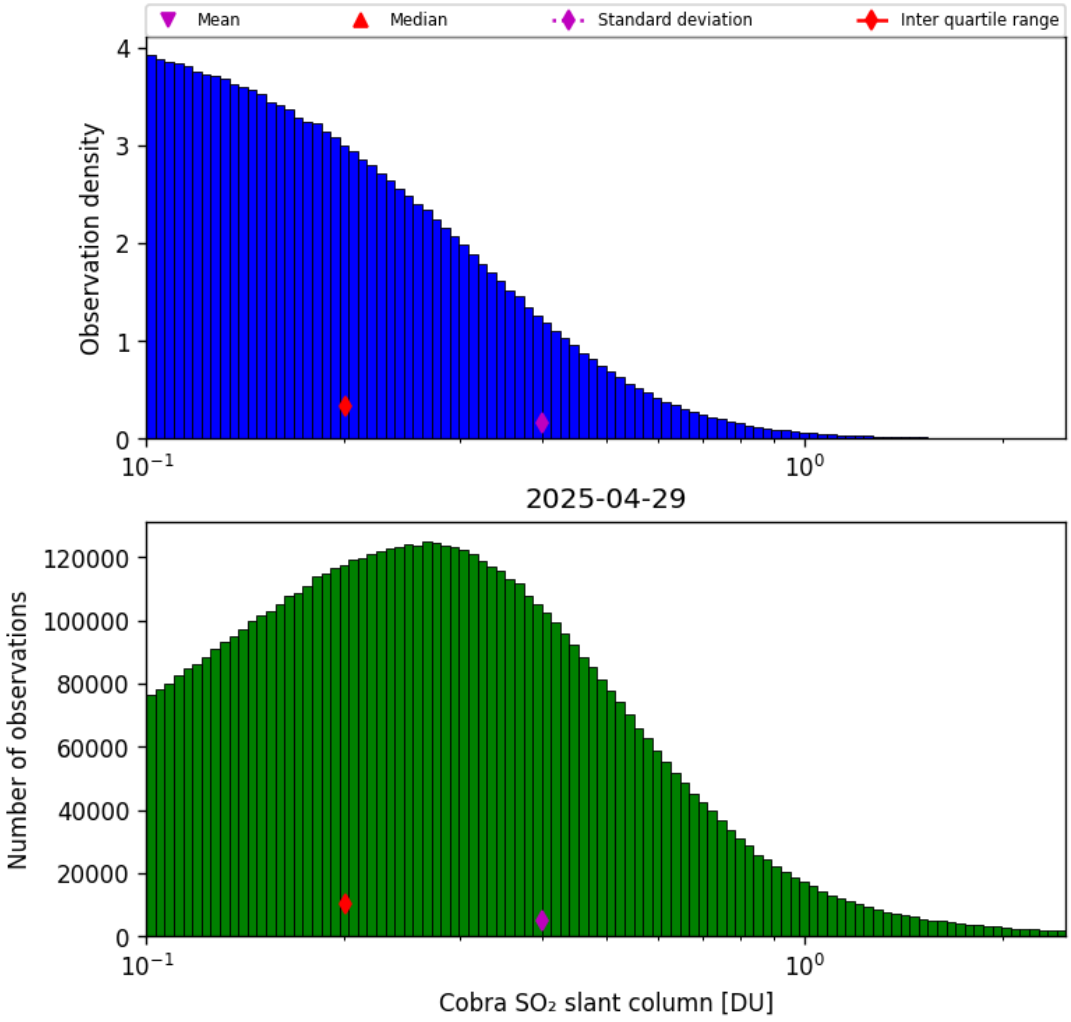

Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-04-29 to 2025-04-30

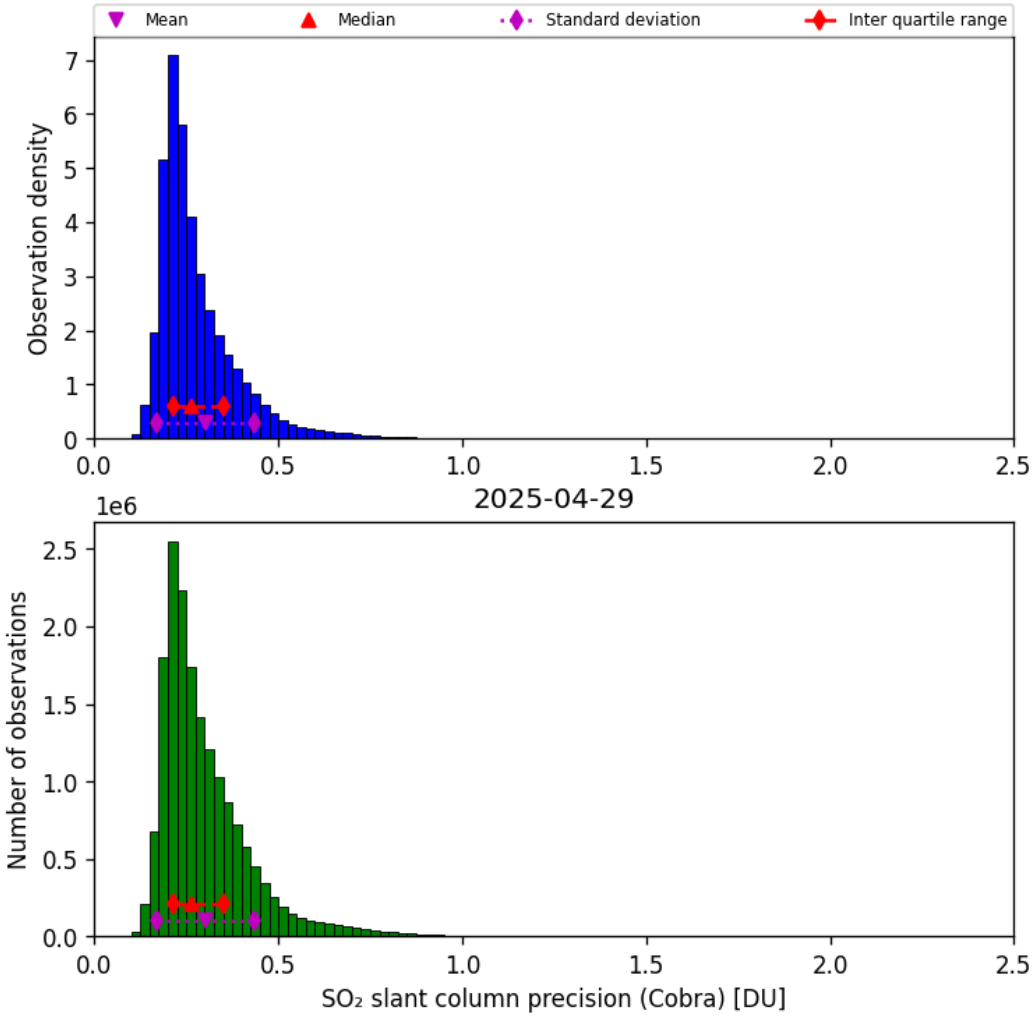

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-04-29 to 2025-04-30

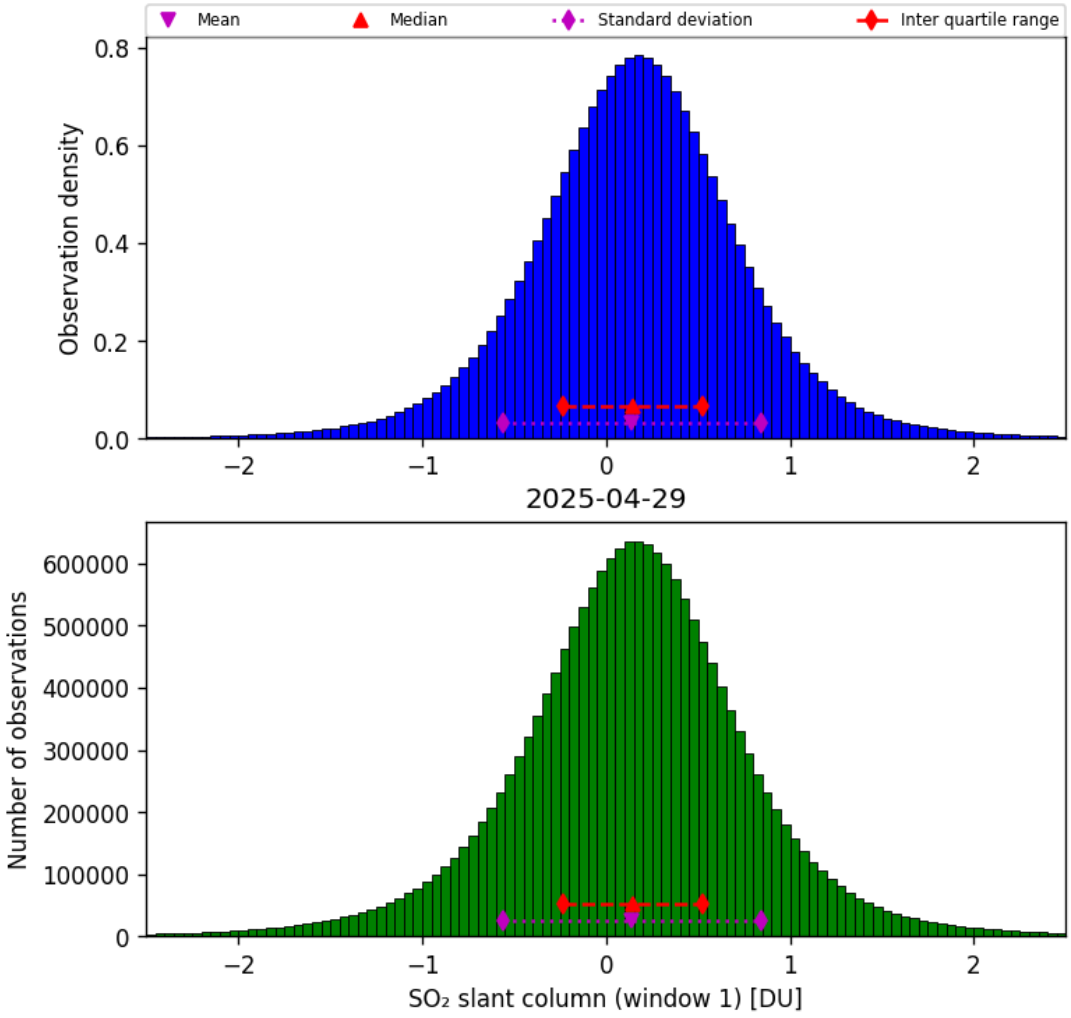

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-04-29 to 2025-04-30

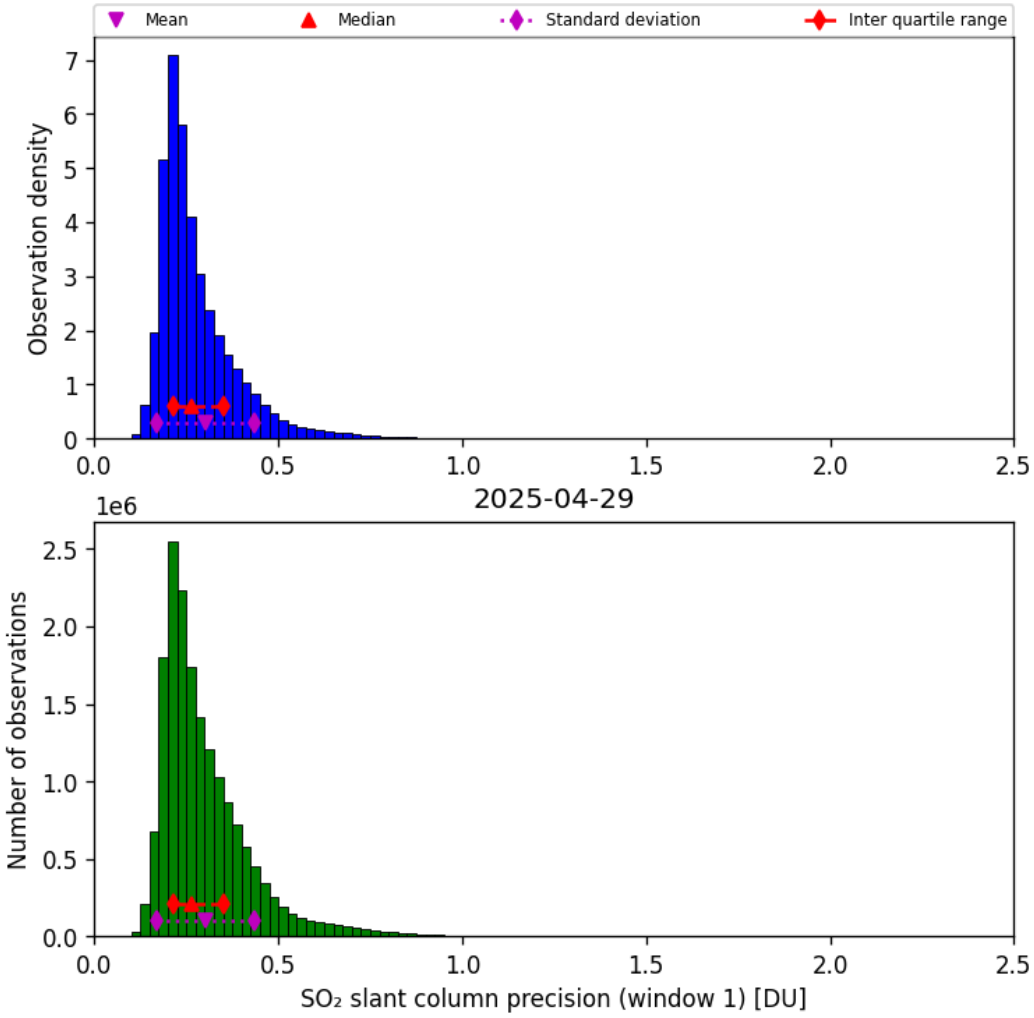

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-04-29 to 2025-04-30

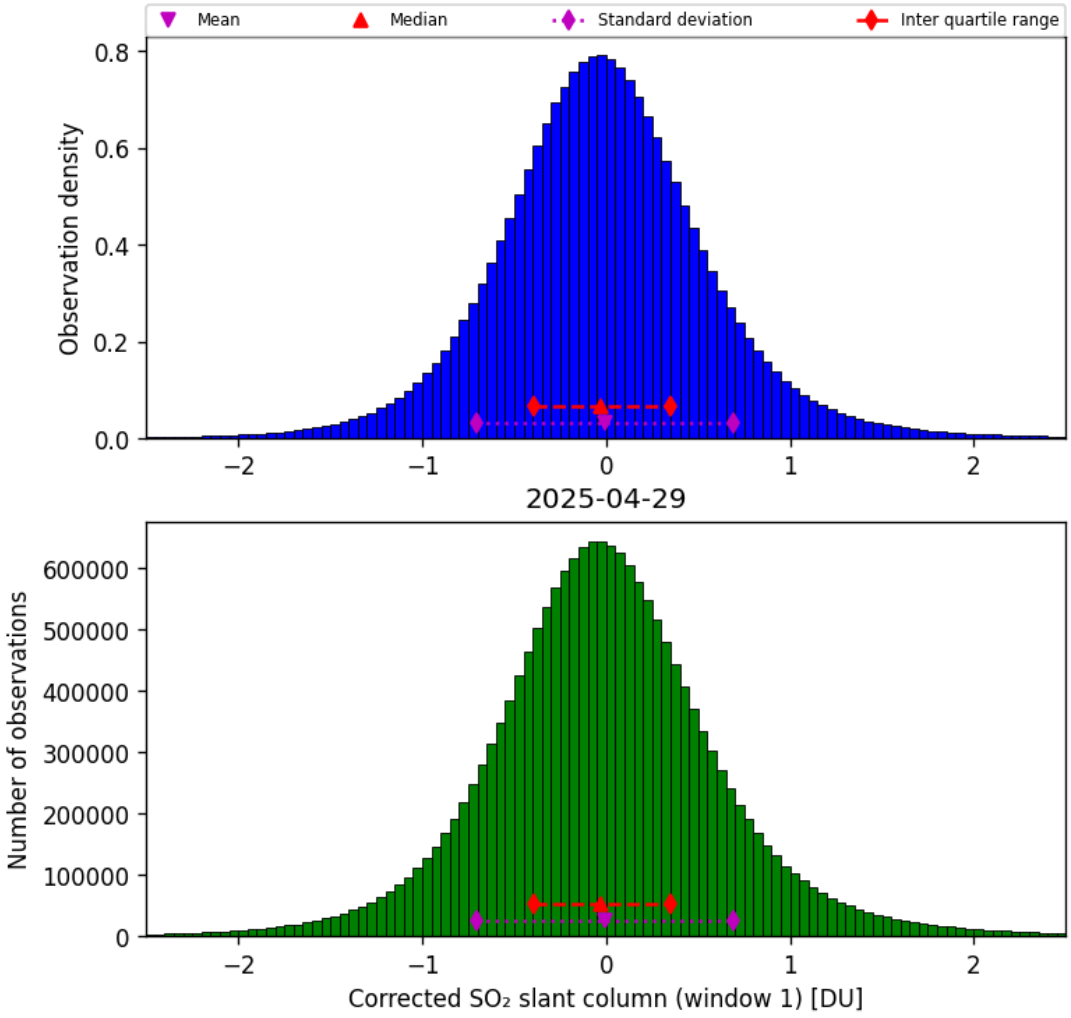

Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-04-29 to 2025-04-30

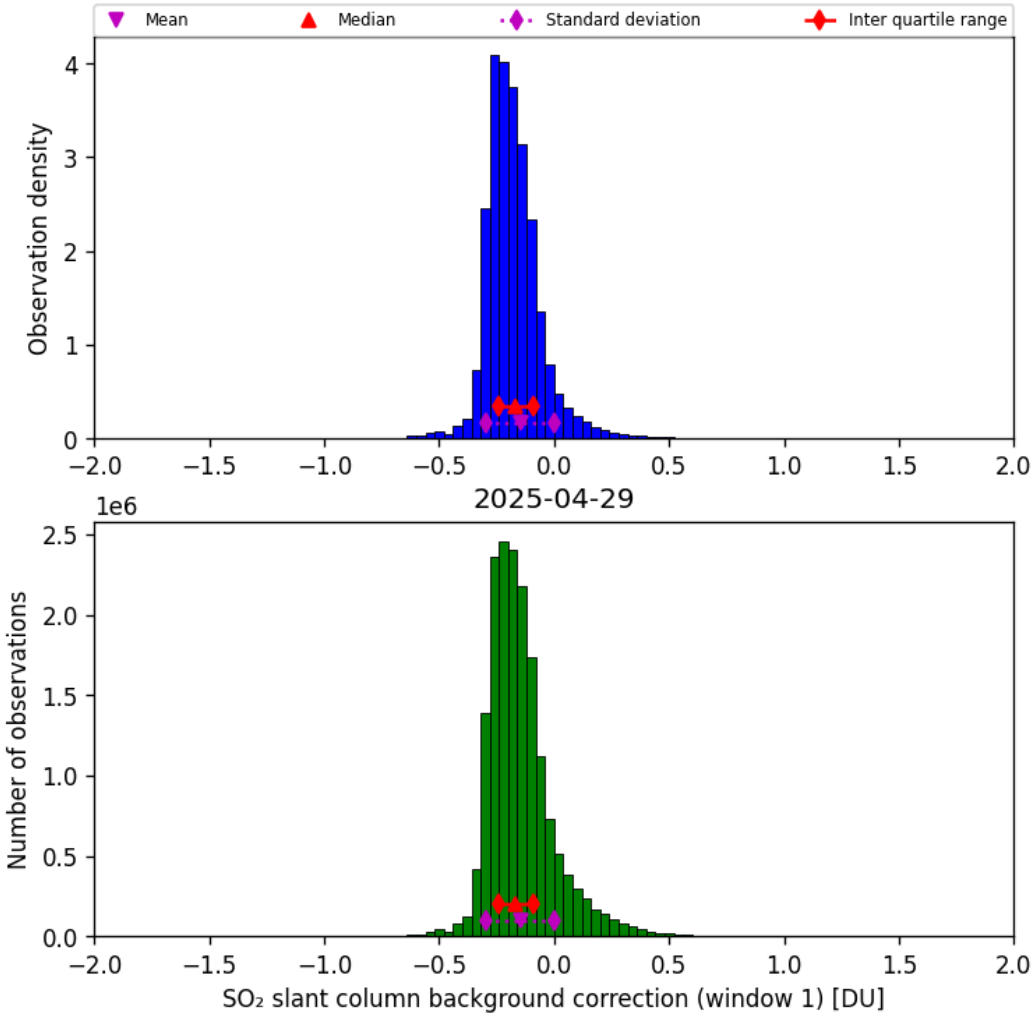

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-04-29 to 2025-04-30

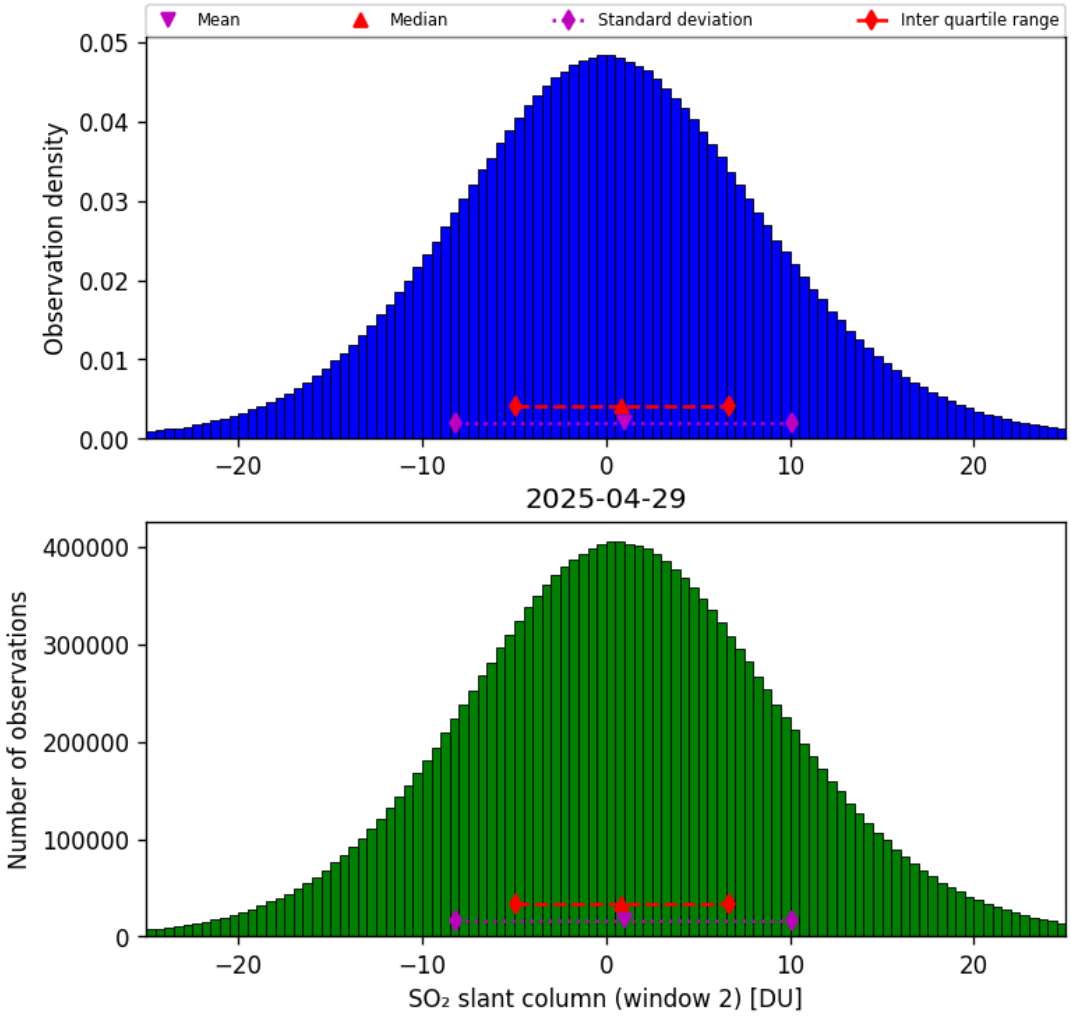

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-04-29 to 2025-04-30

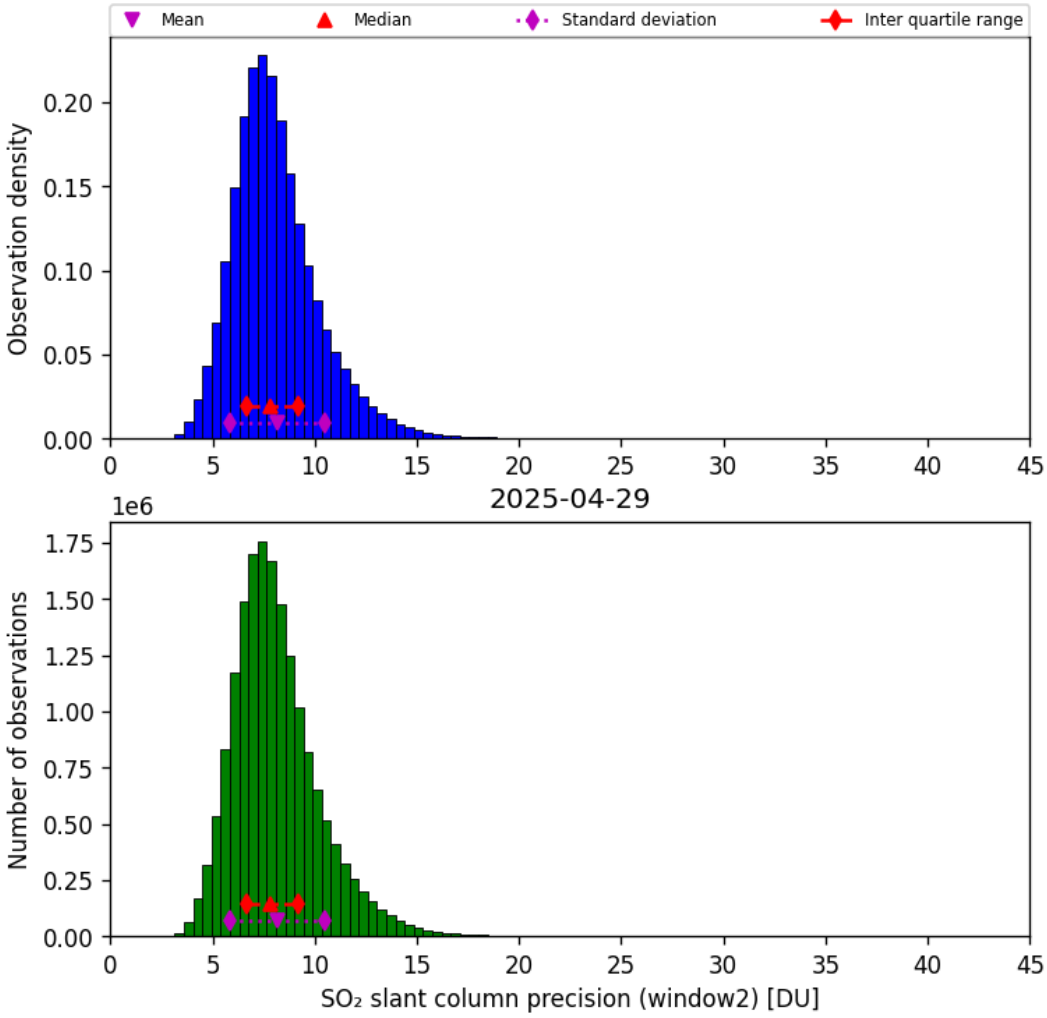

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-04-29 to 2025-04-30

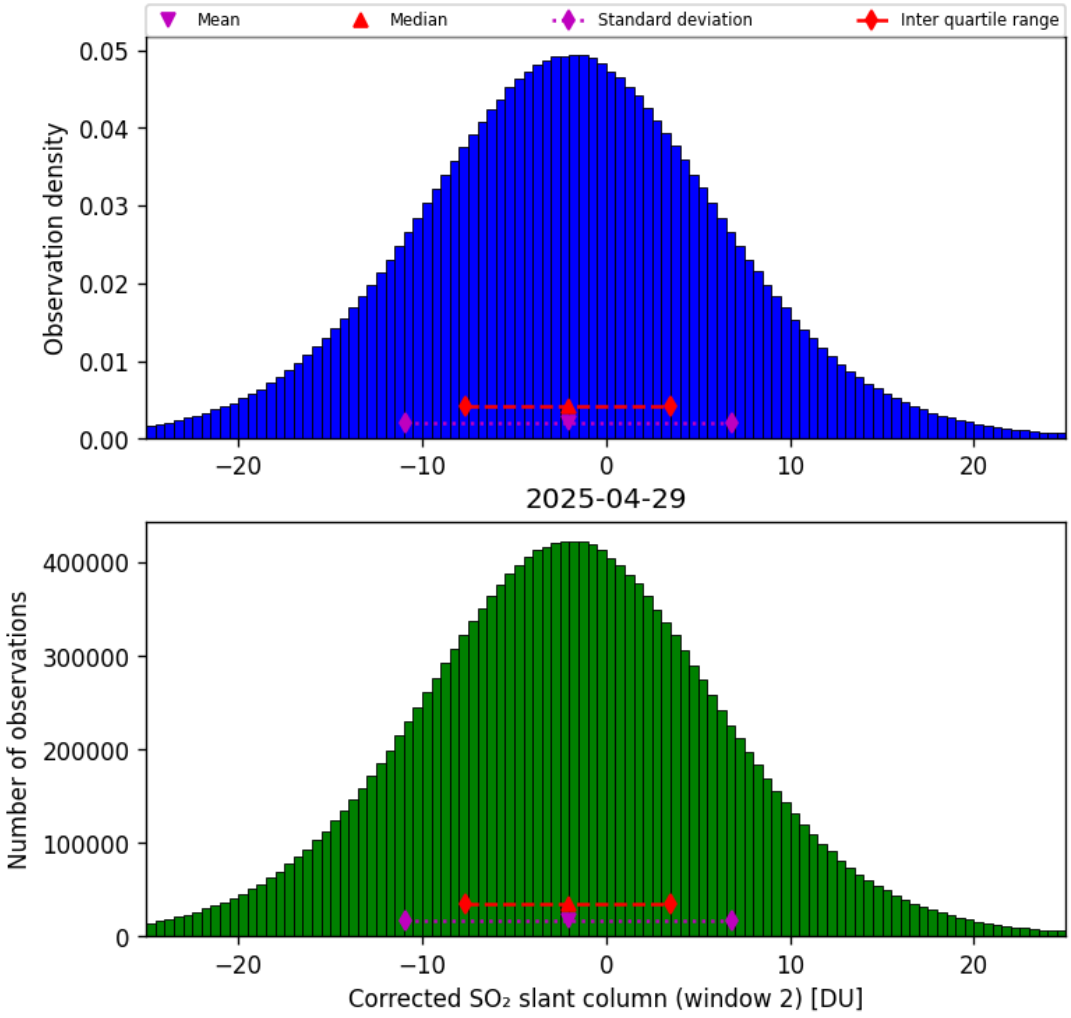

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-04-29 to 2025-04-30

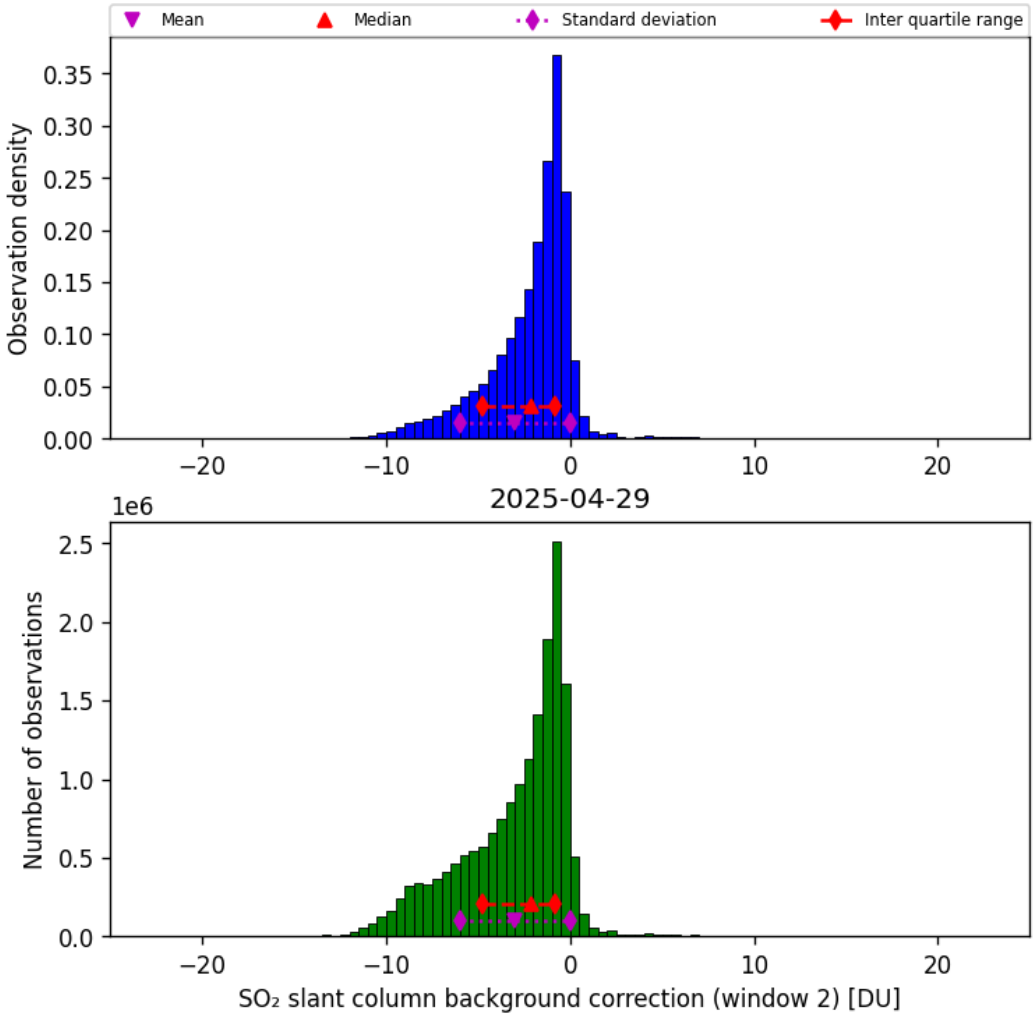

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-04-29 to 2025-04-30

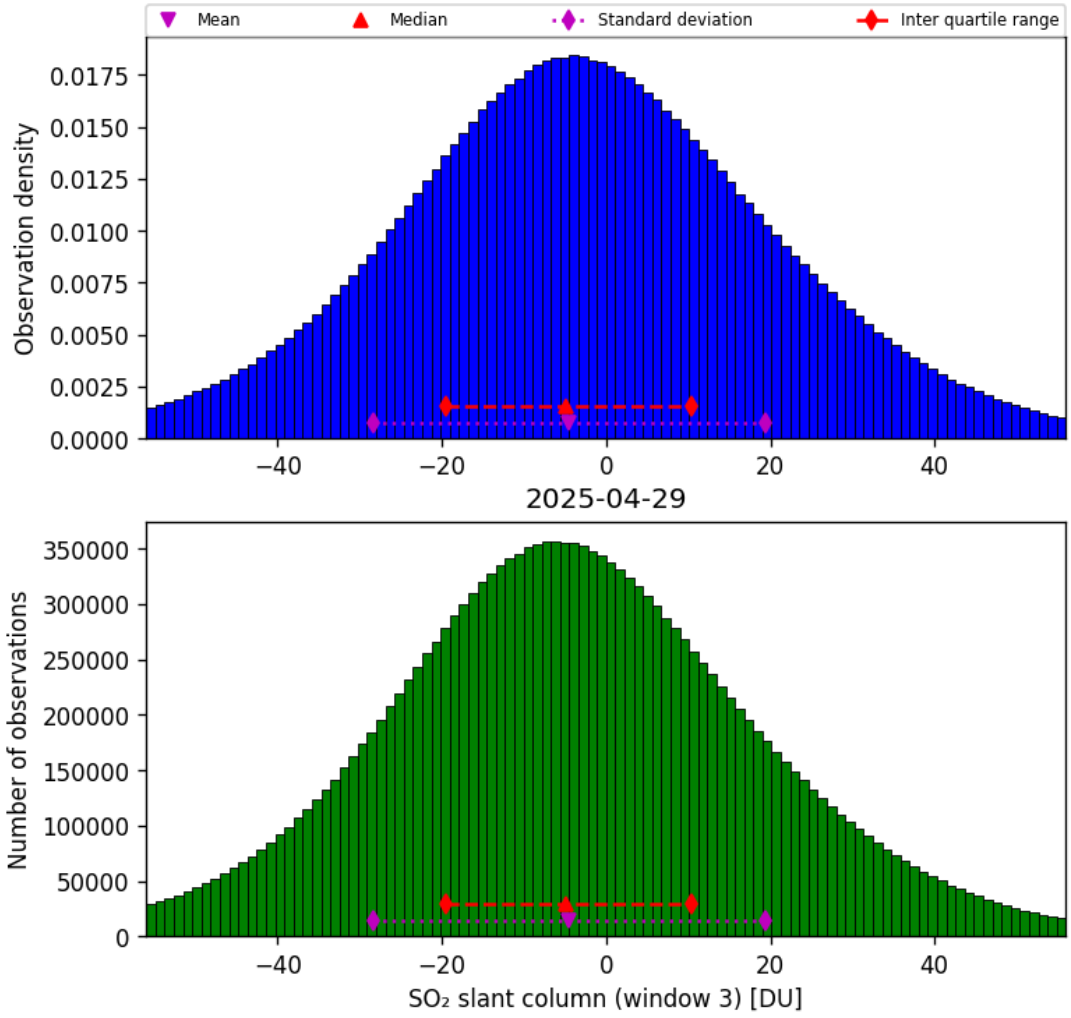

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-04-29 to 2025-04-30

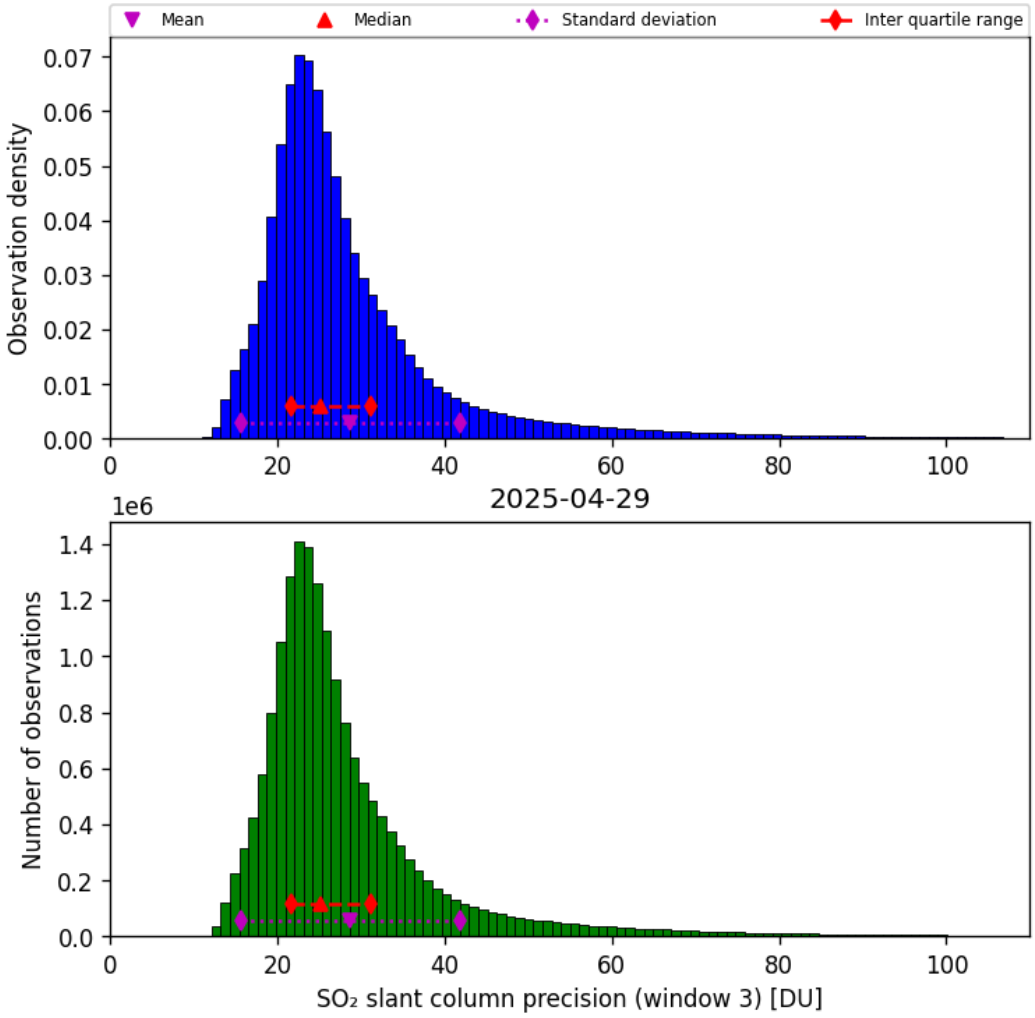

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-04-29 to 2025-04-30

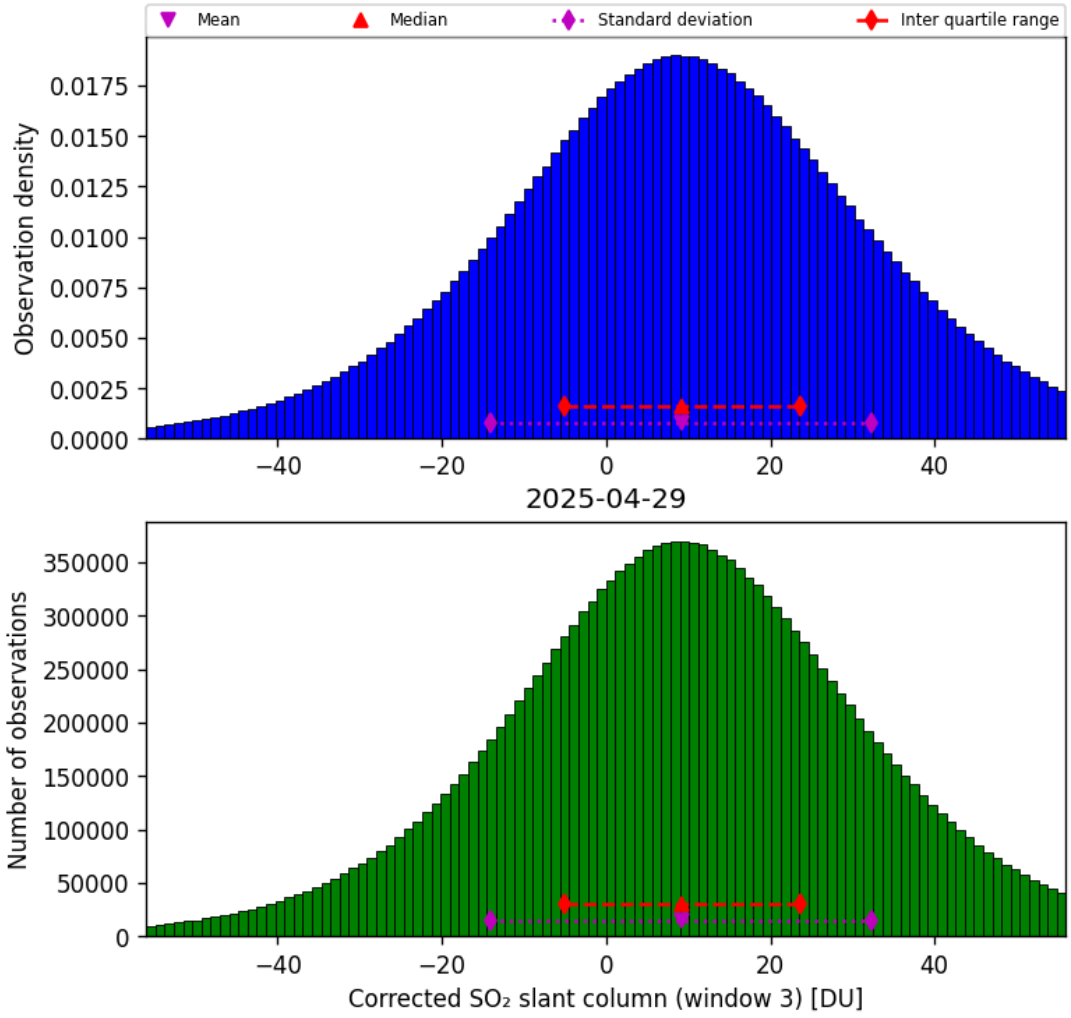

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-04-29 to 2025-04-30

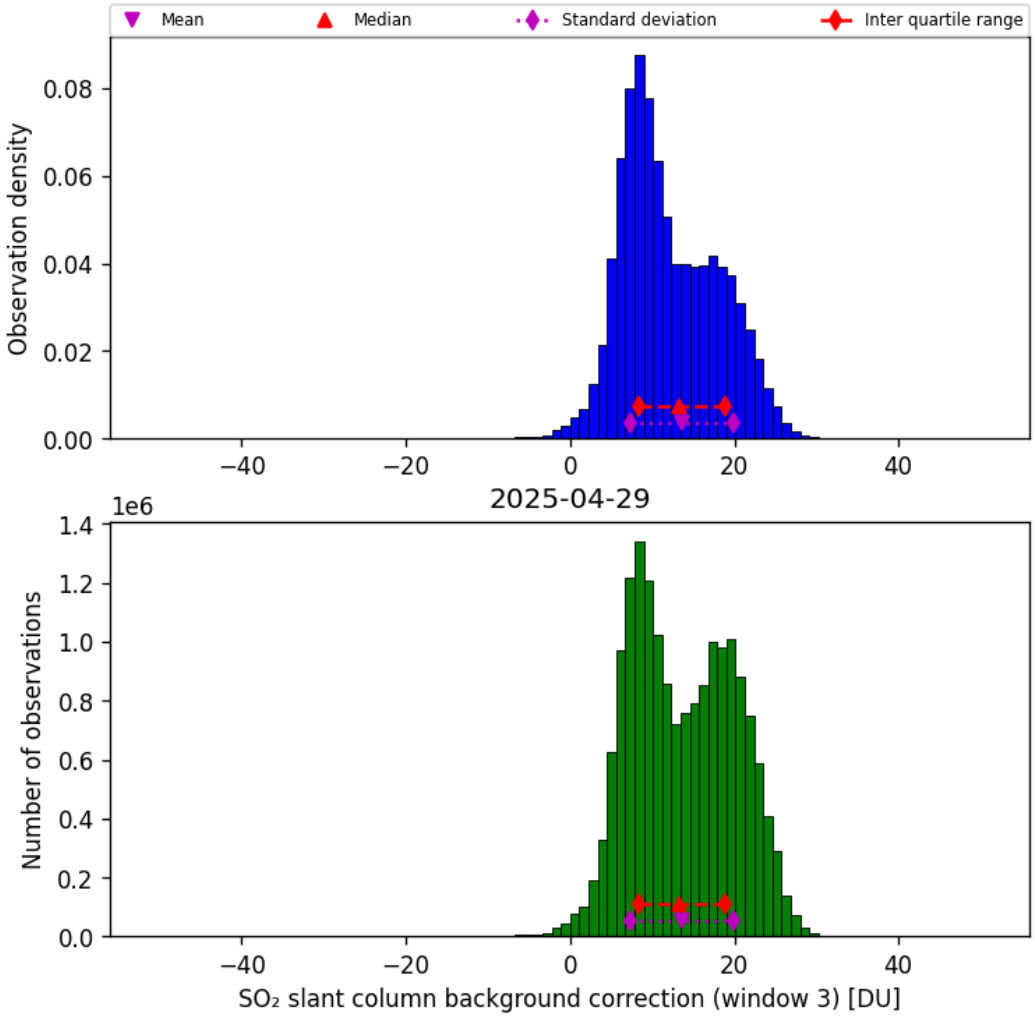

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-04-29 to 2025-04-30

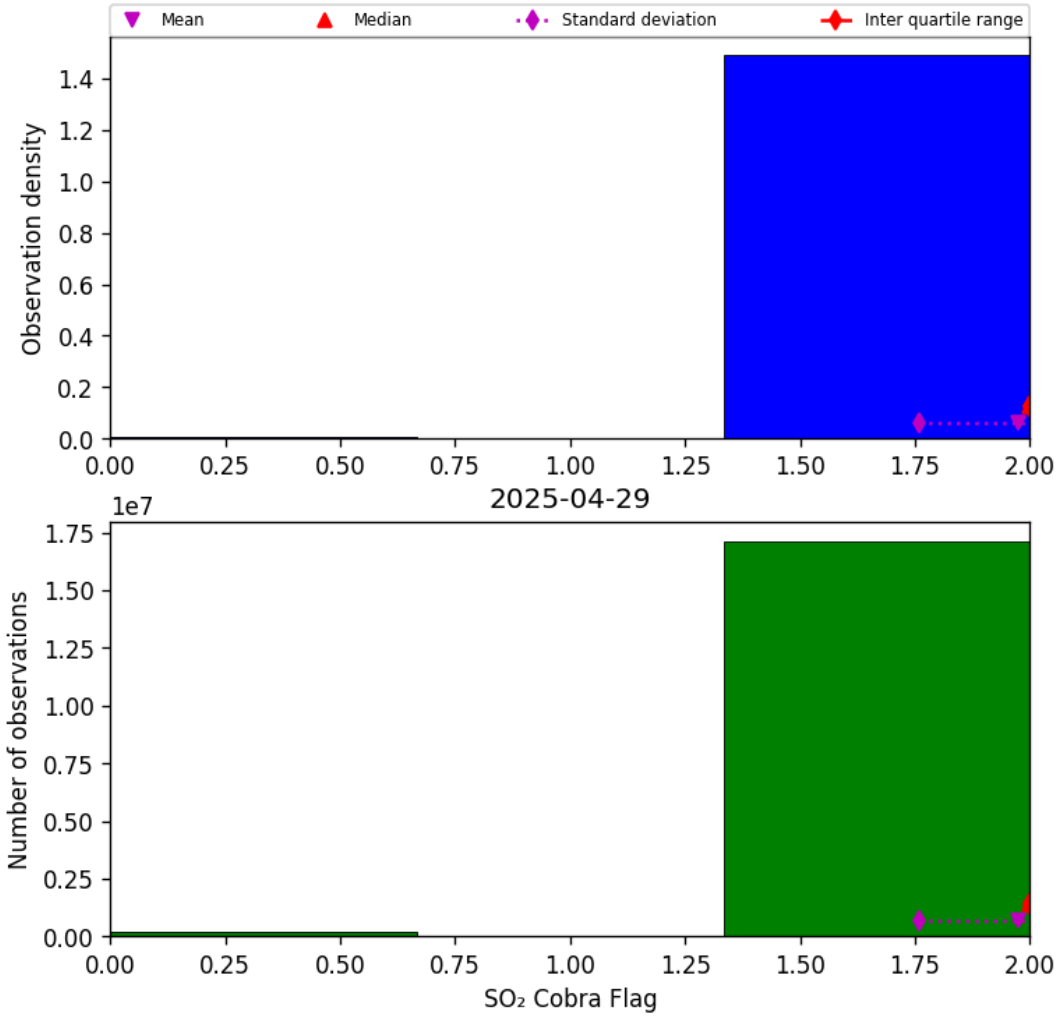

Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-04-29 to 2025-04-30

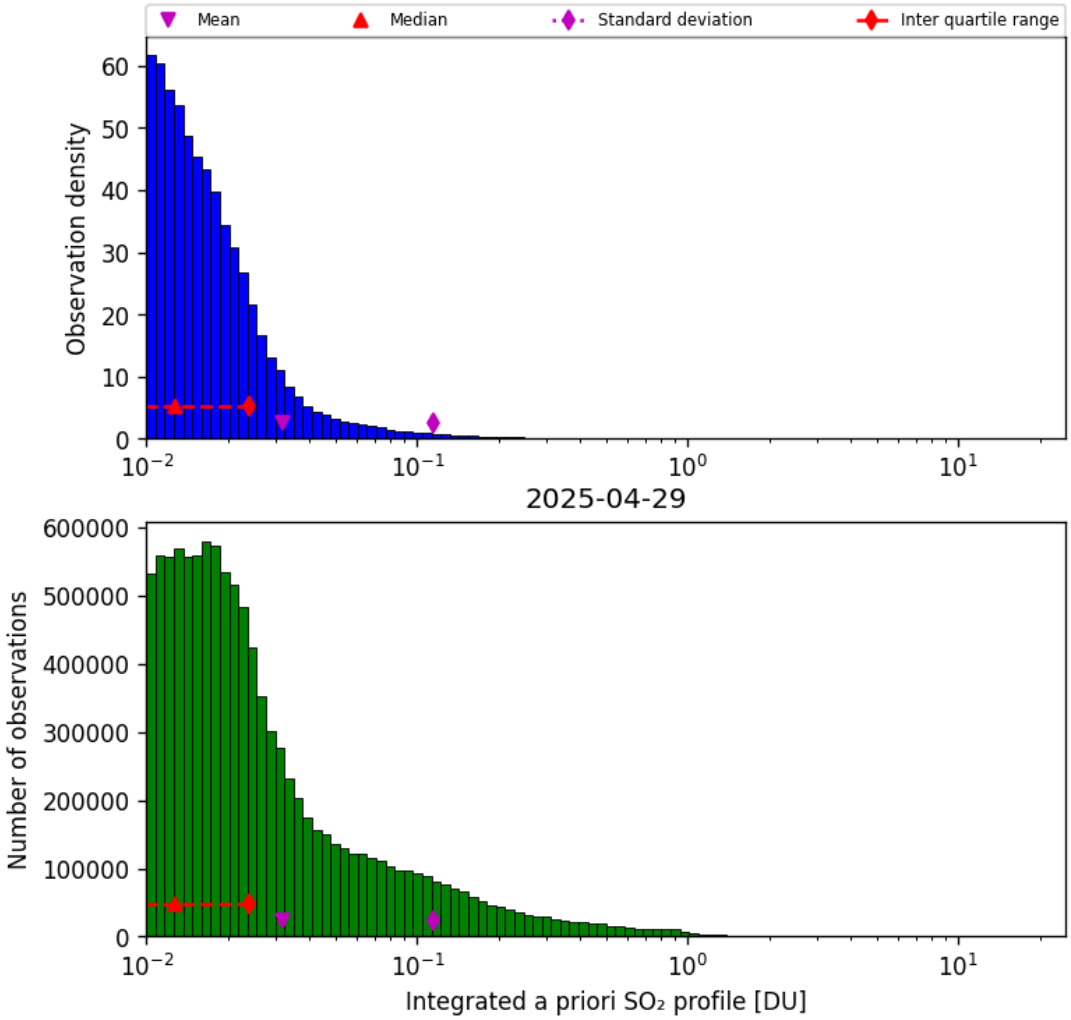

Figure 76: Histogram of "Integrated a priori SO_2 profile" for 2025-04-29 to 2025-04-30

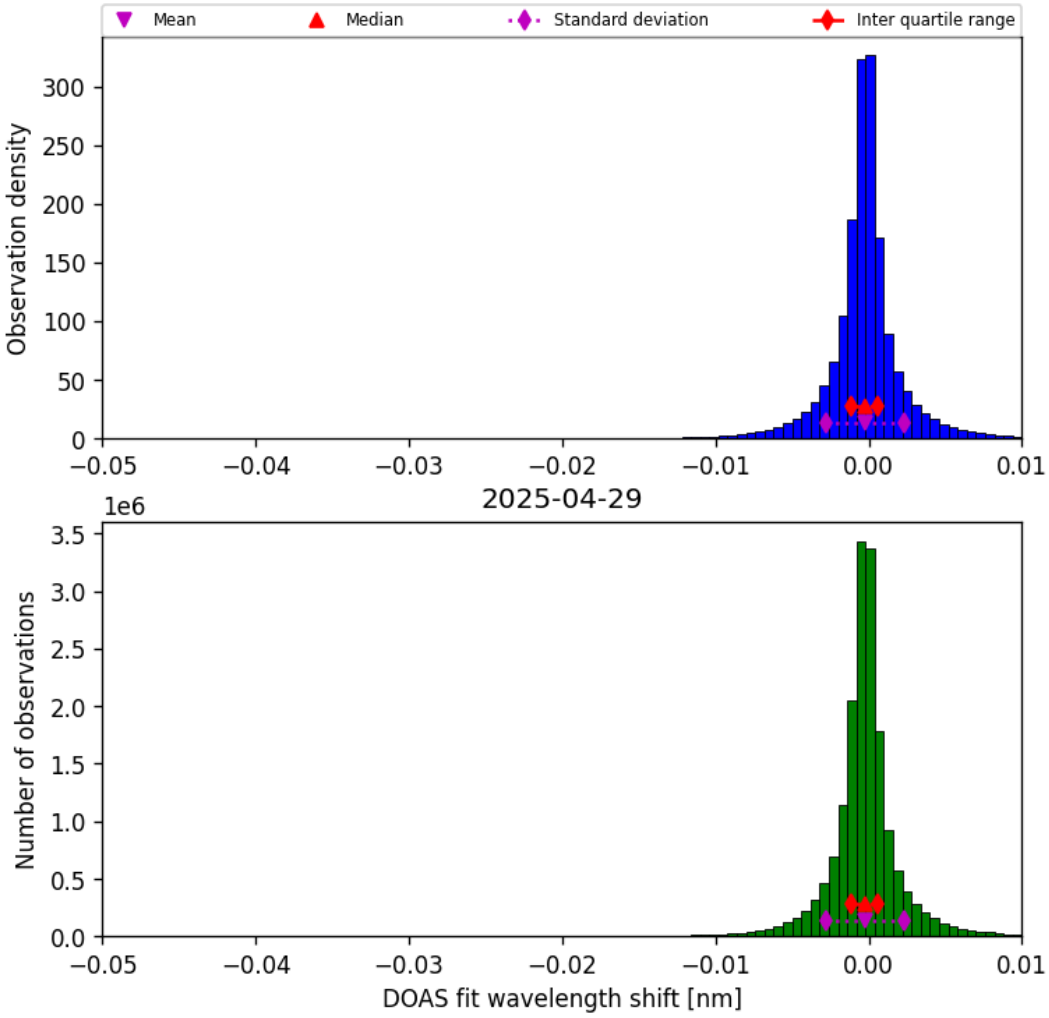

Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-04-29 to 2025-04-30

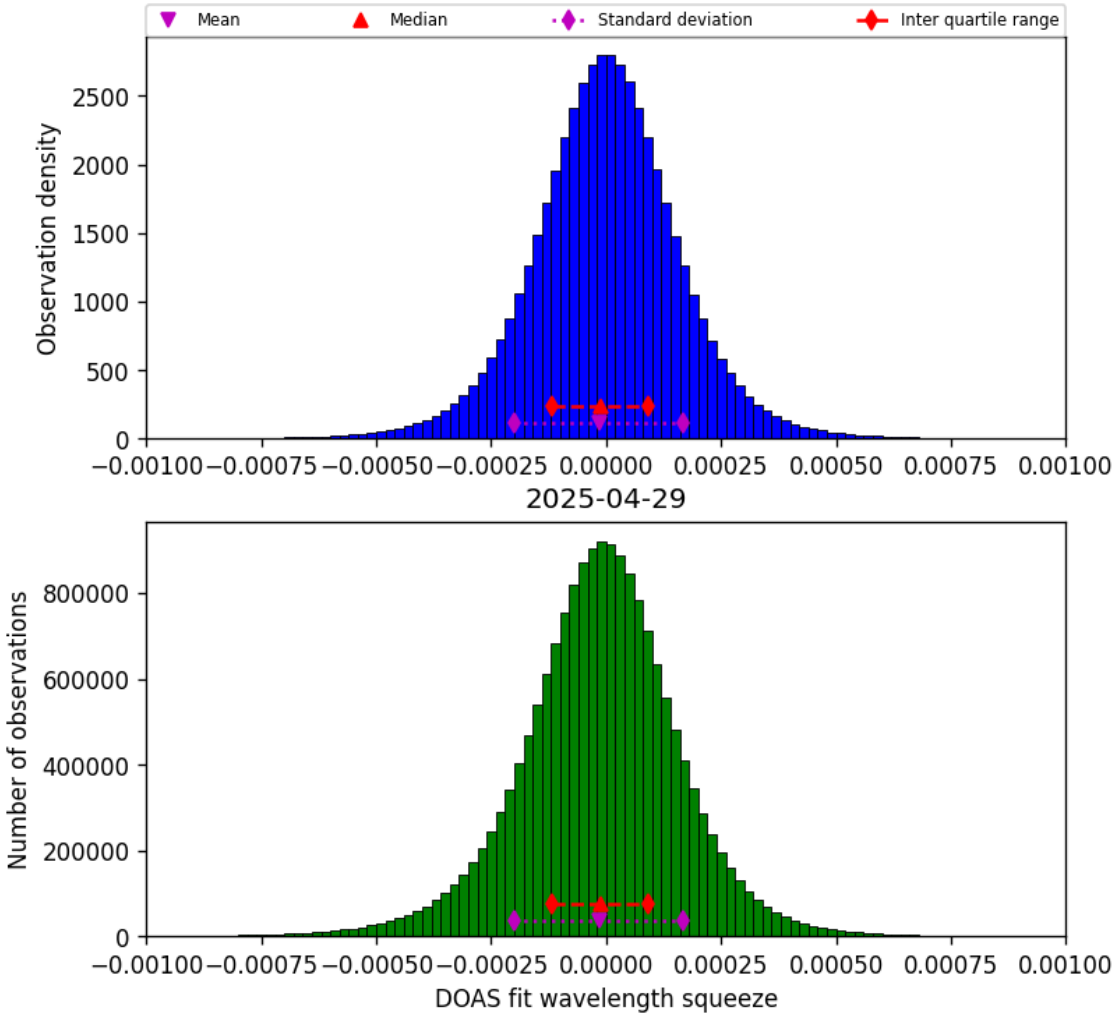

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-04-29 to 2025-04-30

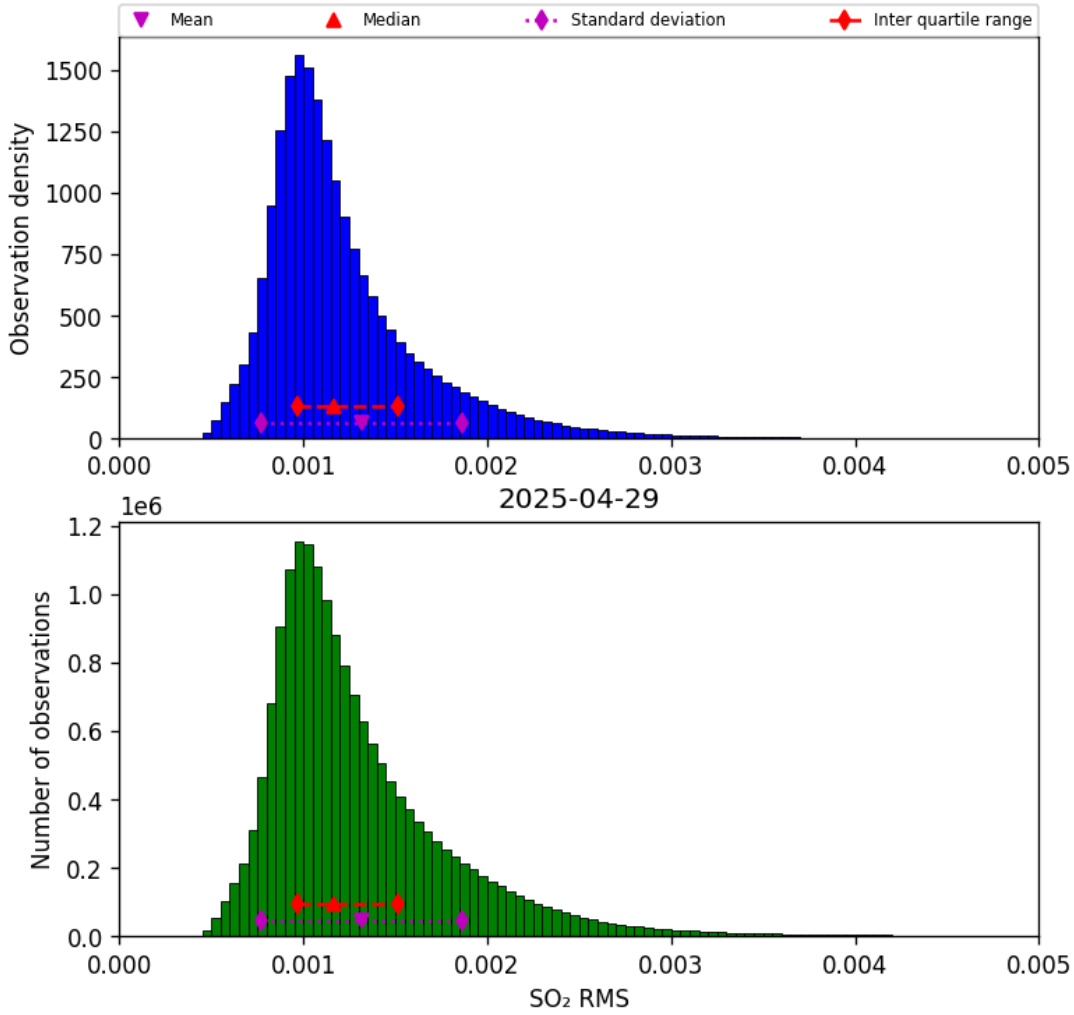

Figure 79: Histogram of "SO_2 RMS" for 2025-04-29 to 2025-04-30

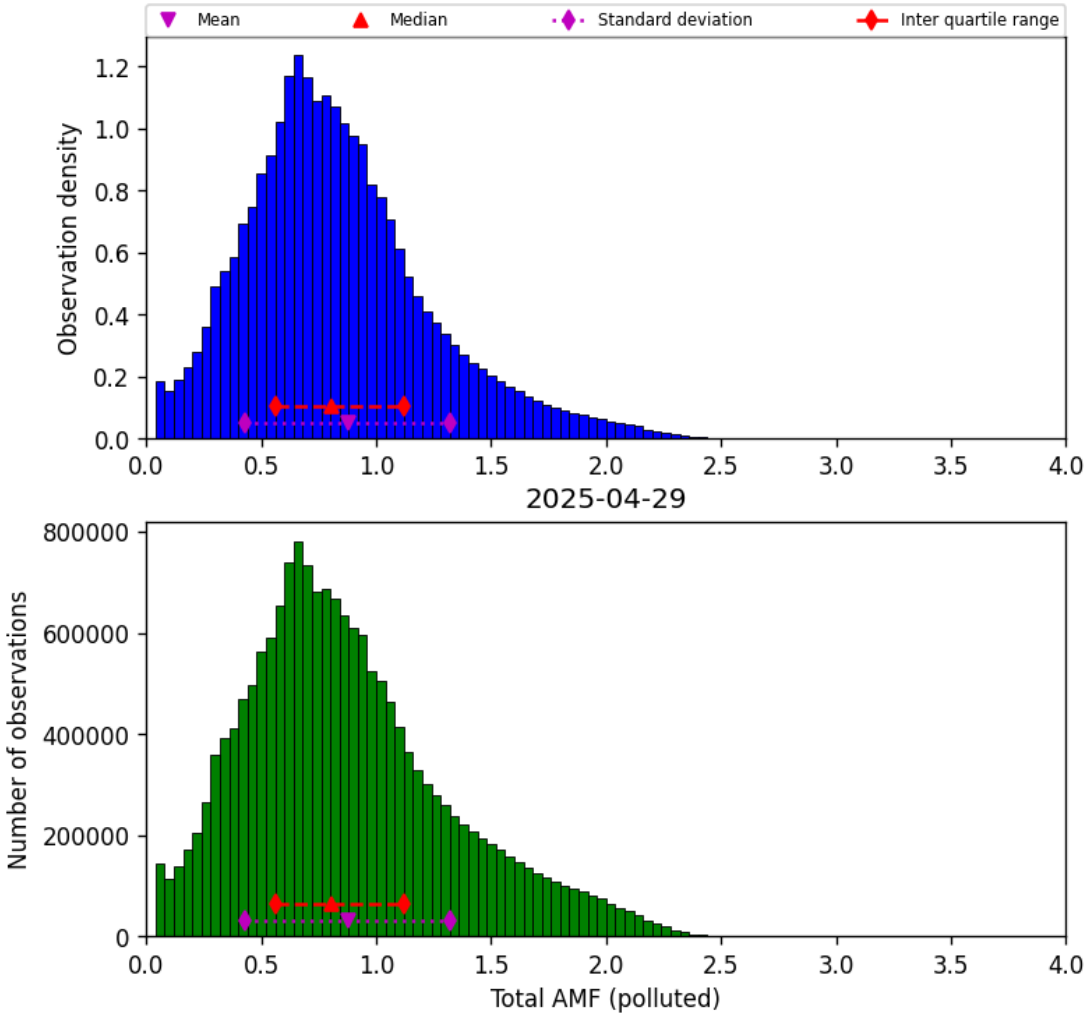

Figure 80: Histogram of “Total AMF (polluted)” for 2025-04-29 to 2025-04-30

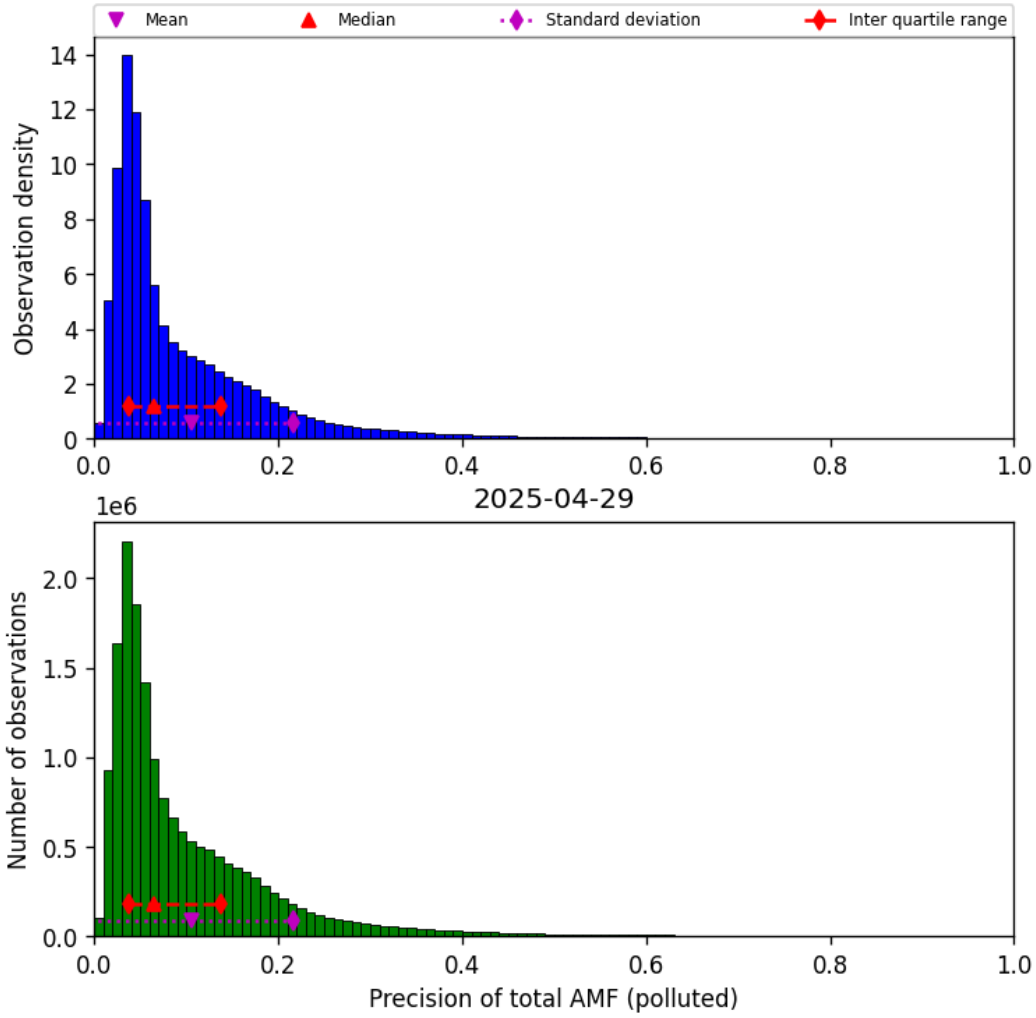

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-04-29 to 2025-04-30

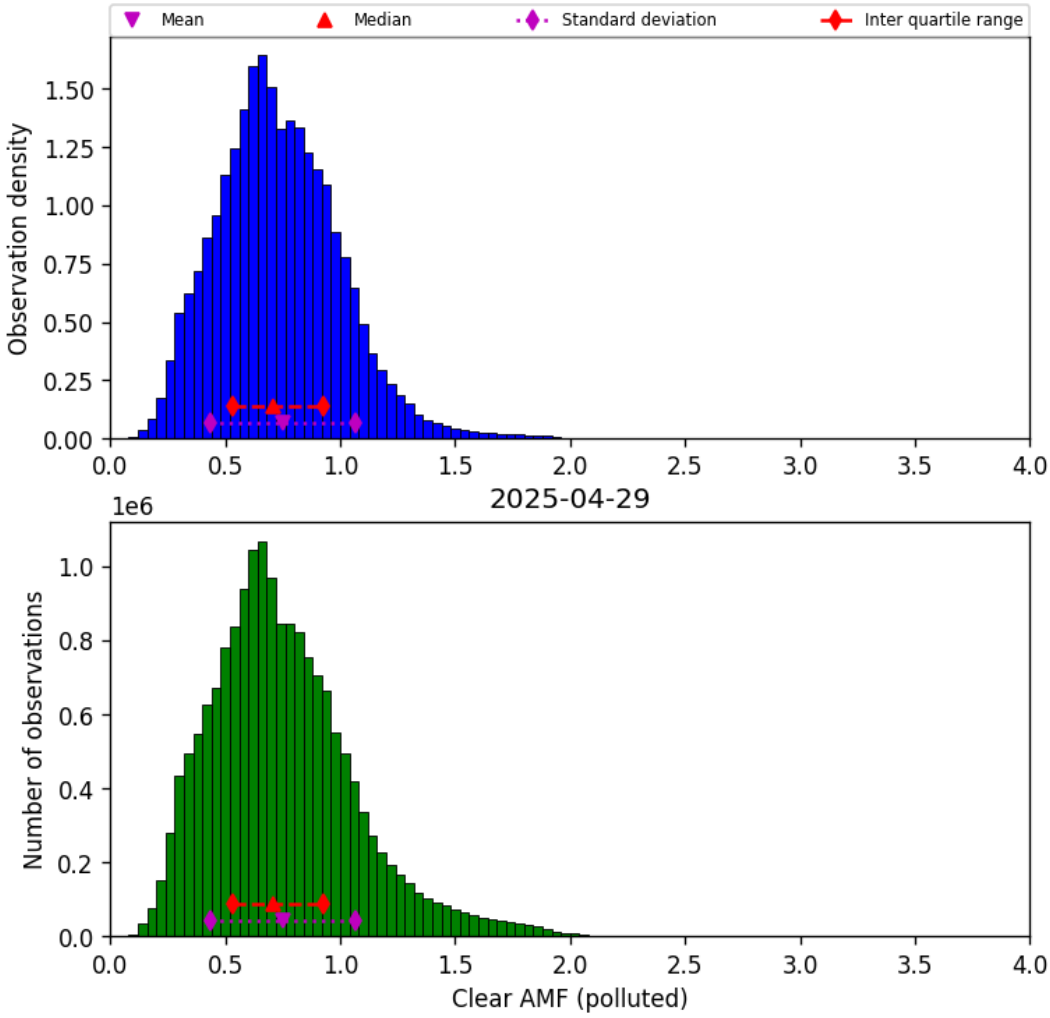

Figure 82: Histogram of “Clear AMF (polluted)” for 2025-04-29 to 2025-04-30

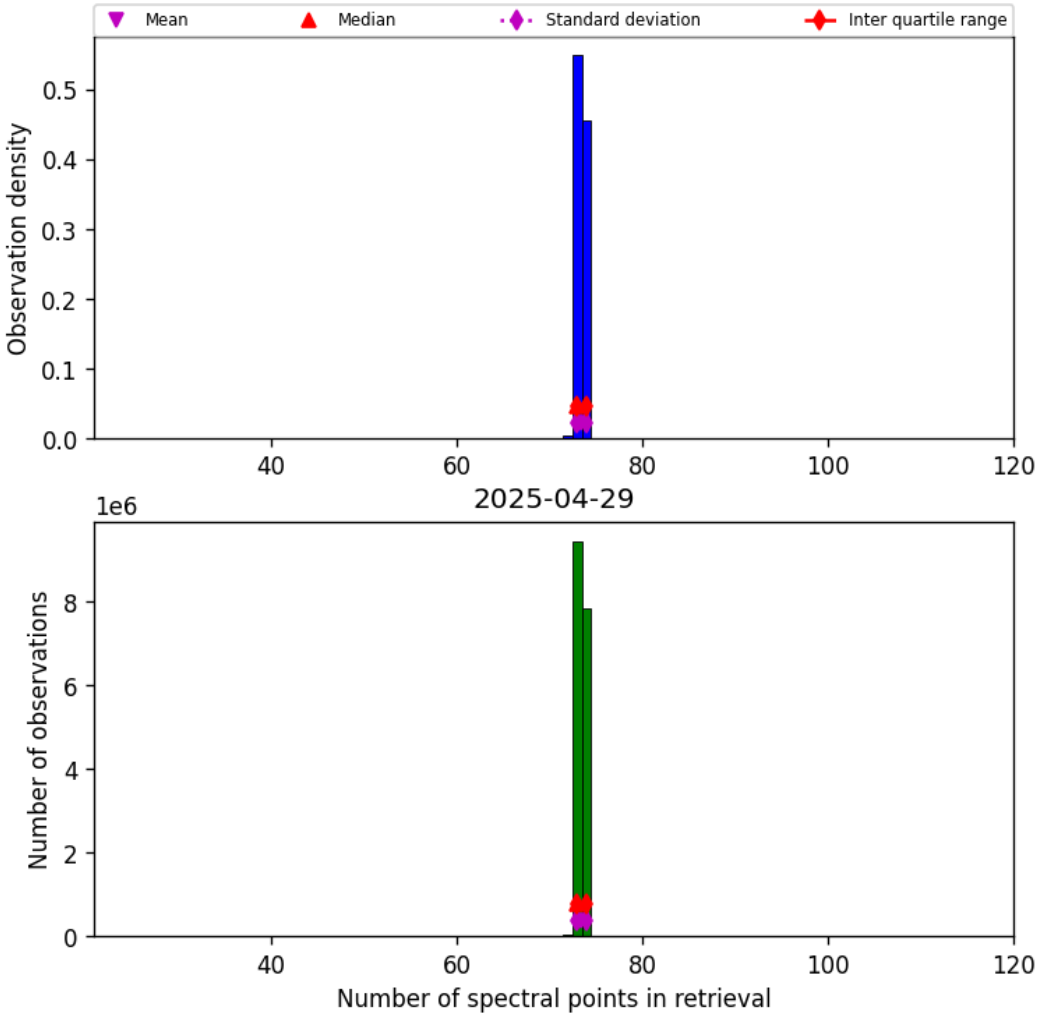

Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-04-29 to 2025-04-30

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.

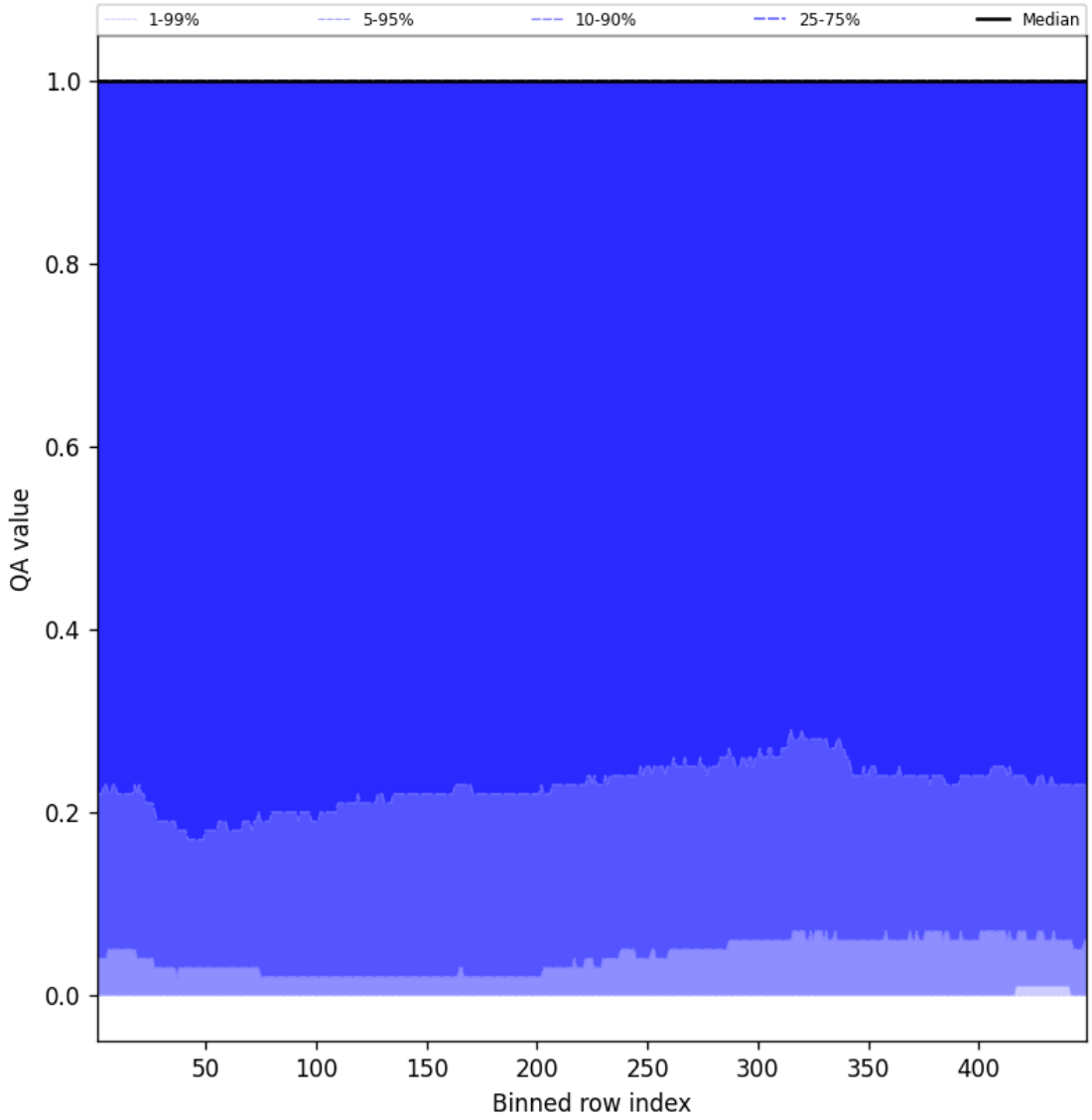

Figure 84: Along track statistics of “QA value” for 2025-04-29 to 2025-04-30

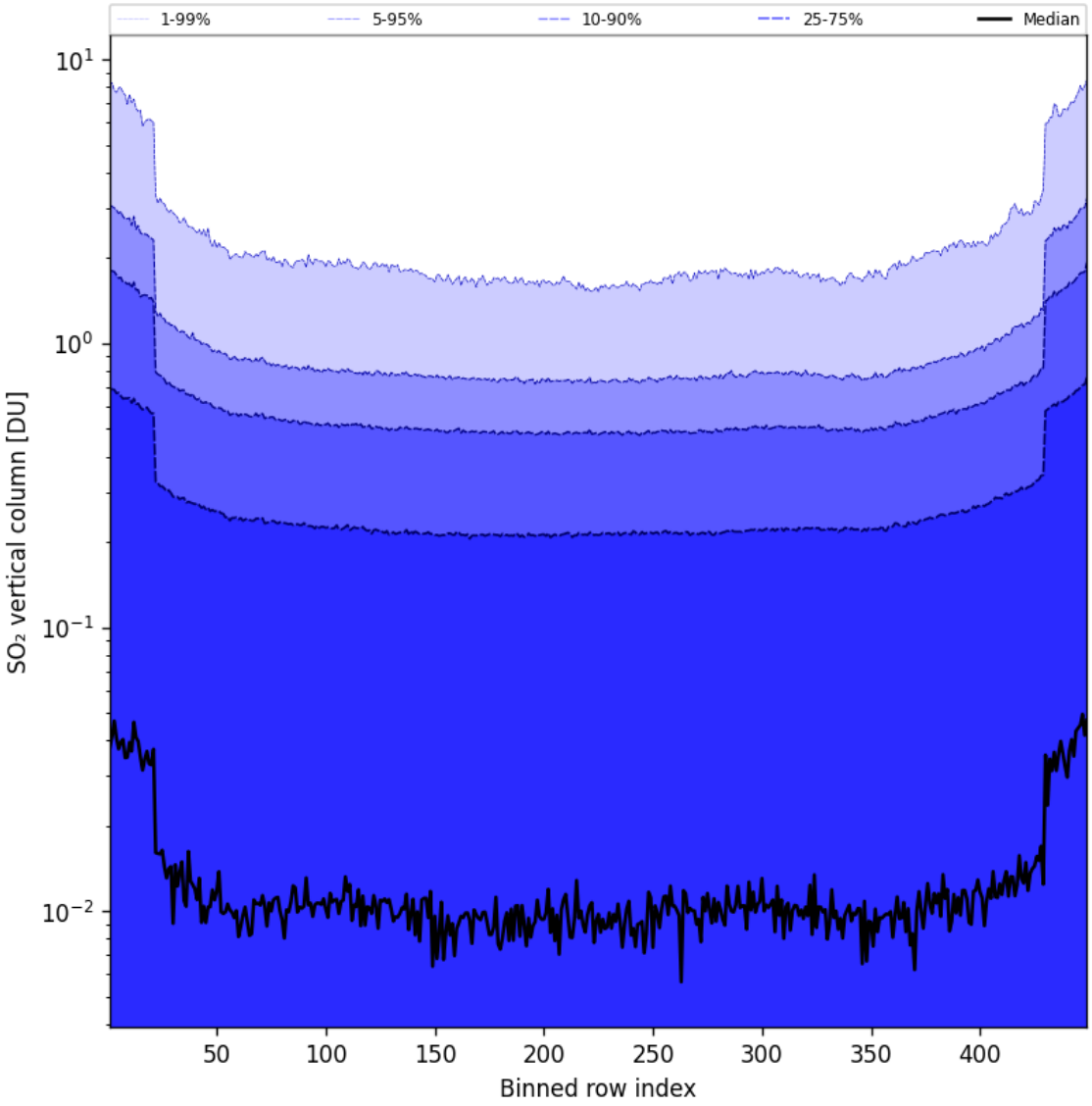

Figure 85: Along track statistics of "SO_2 vertical column" for 2025-04-29 to 2025-04-30

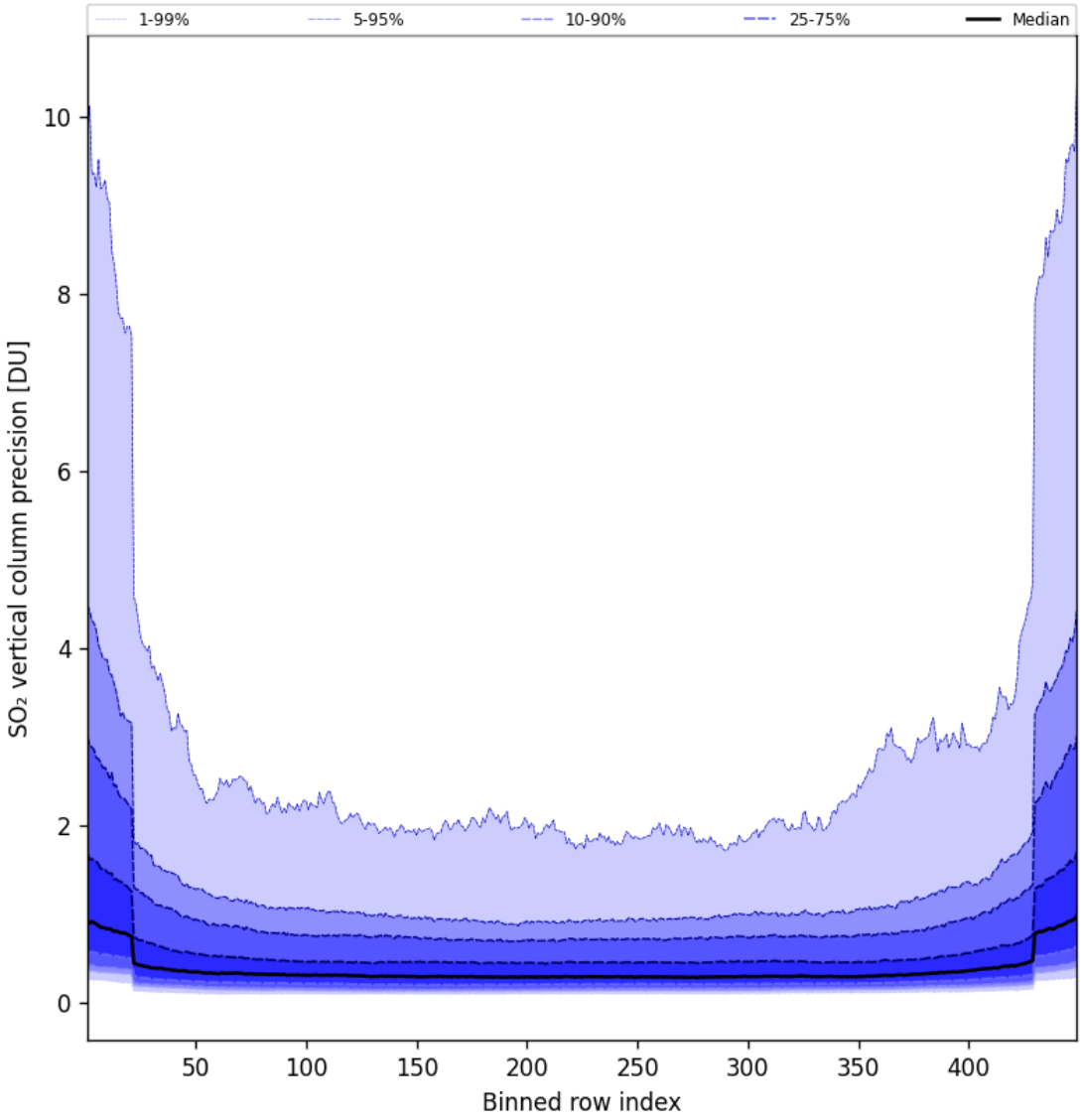

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-04-29 to 2025-04-30

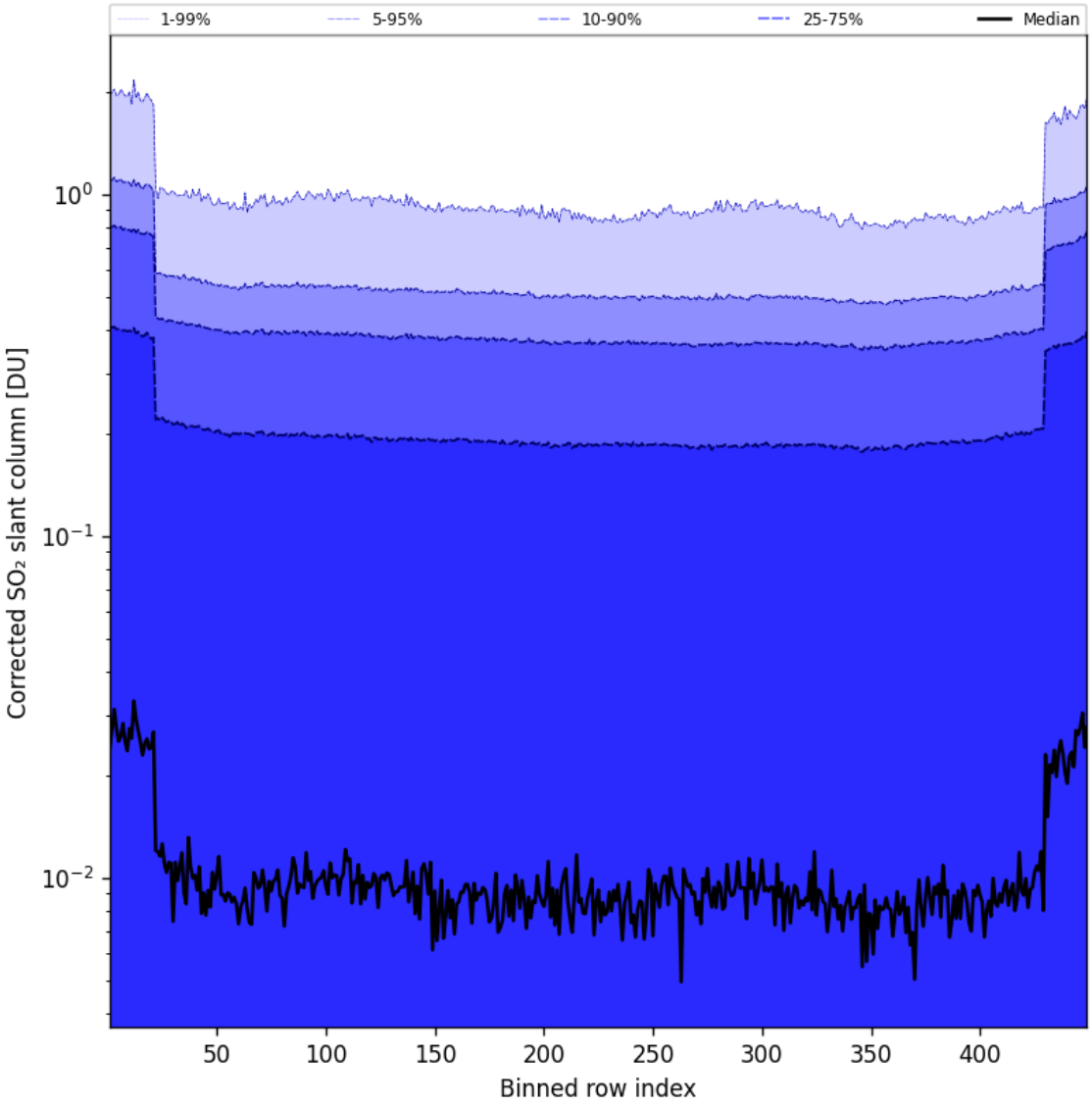

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-04-29 to 2025-04-30

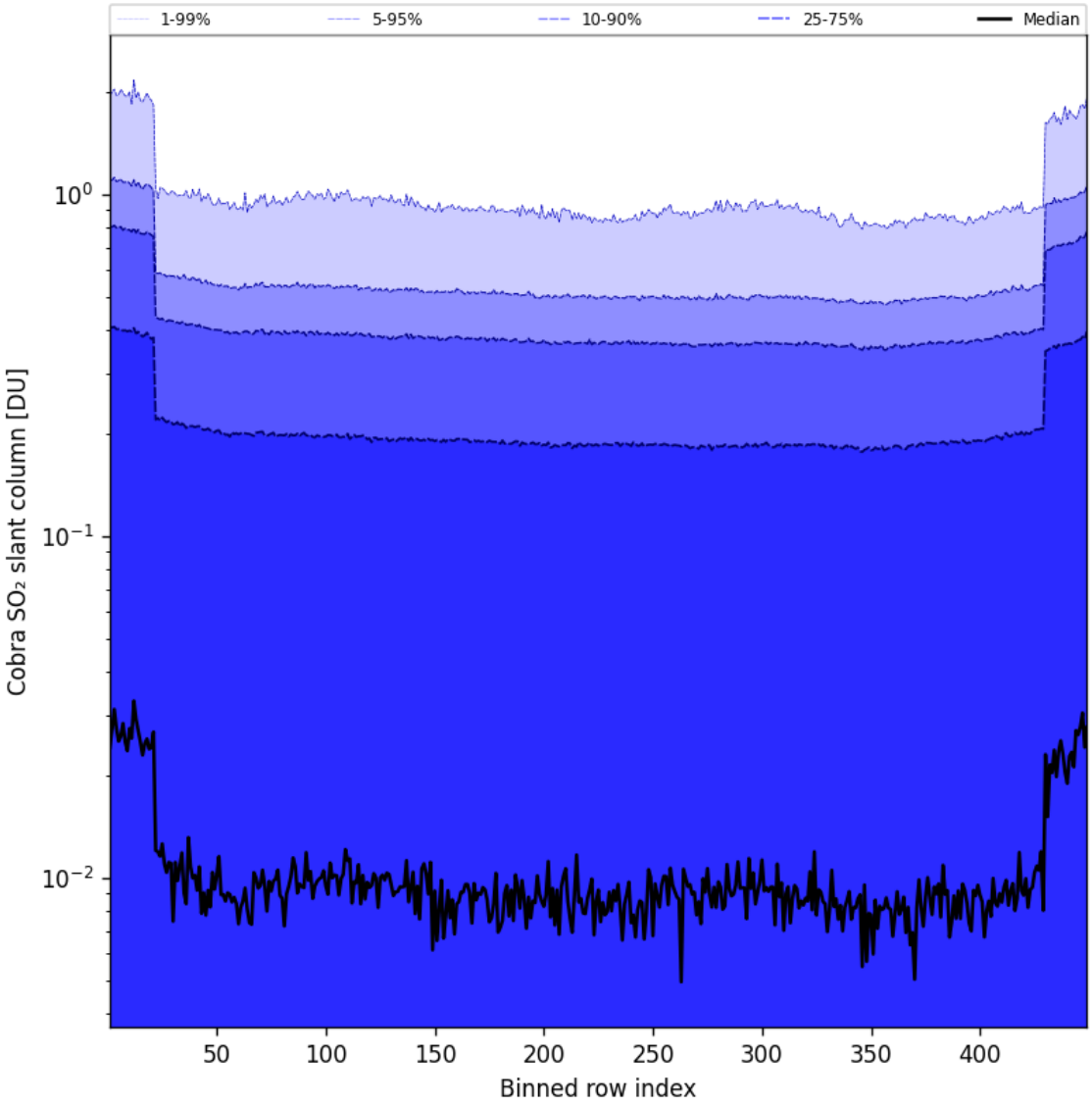

Figure 88: Along track statistics of "Cobra SO_2 slant column" for 2025-04-29 to 2025-04-30

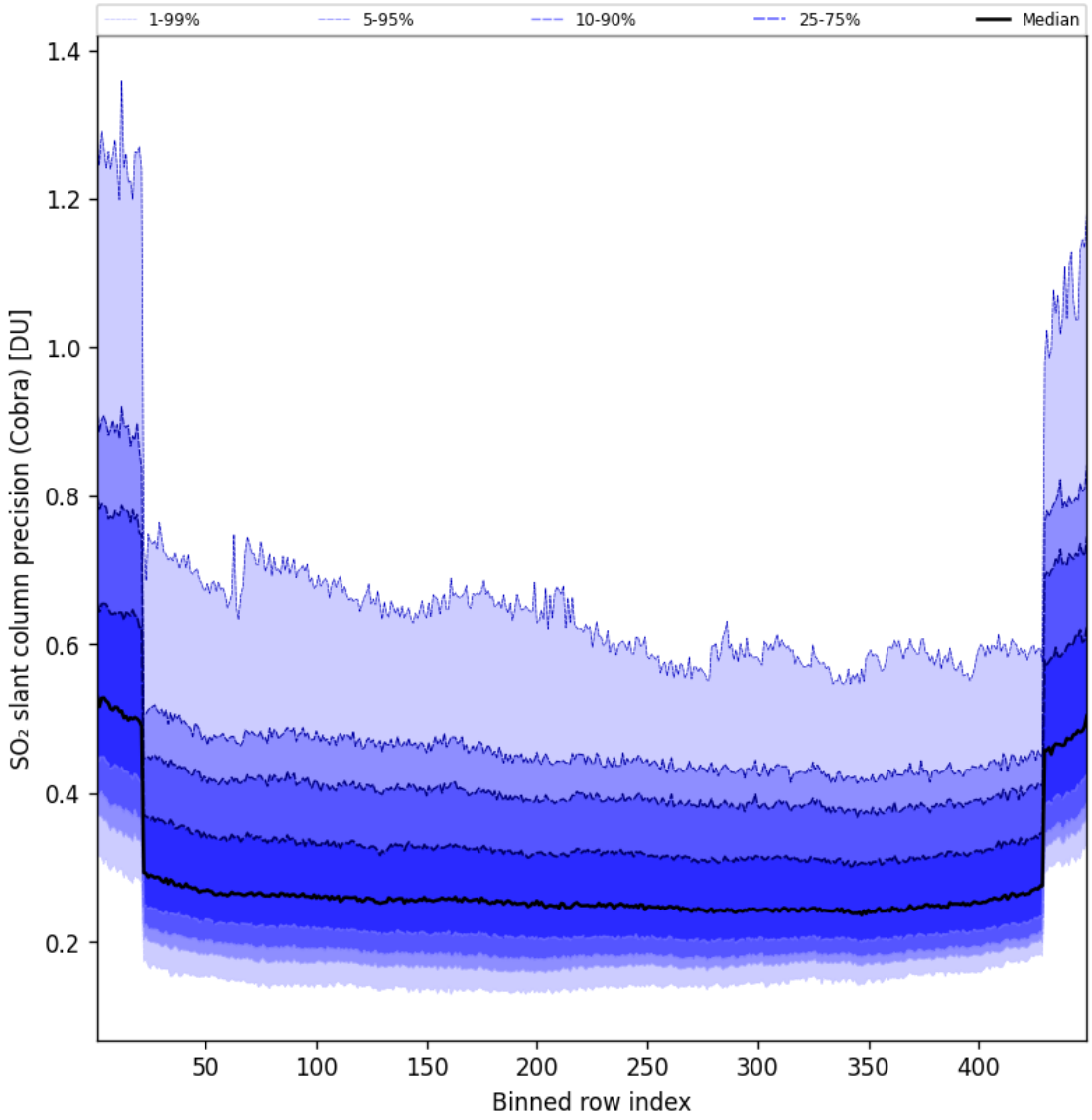

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-04-29 to 2025-04-30

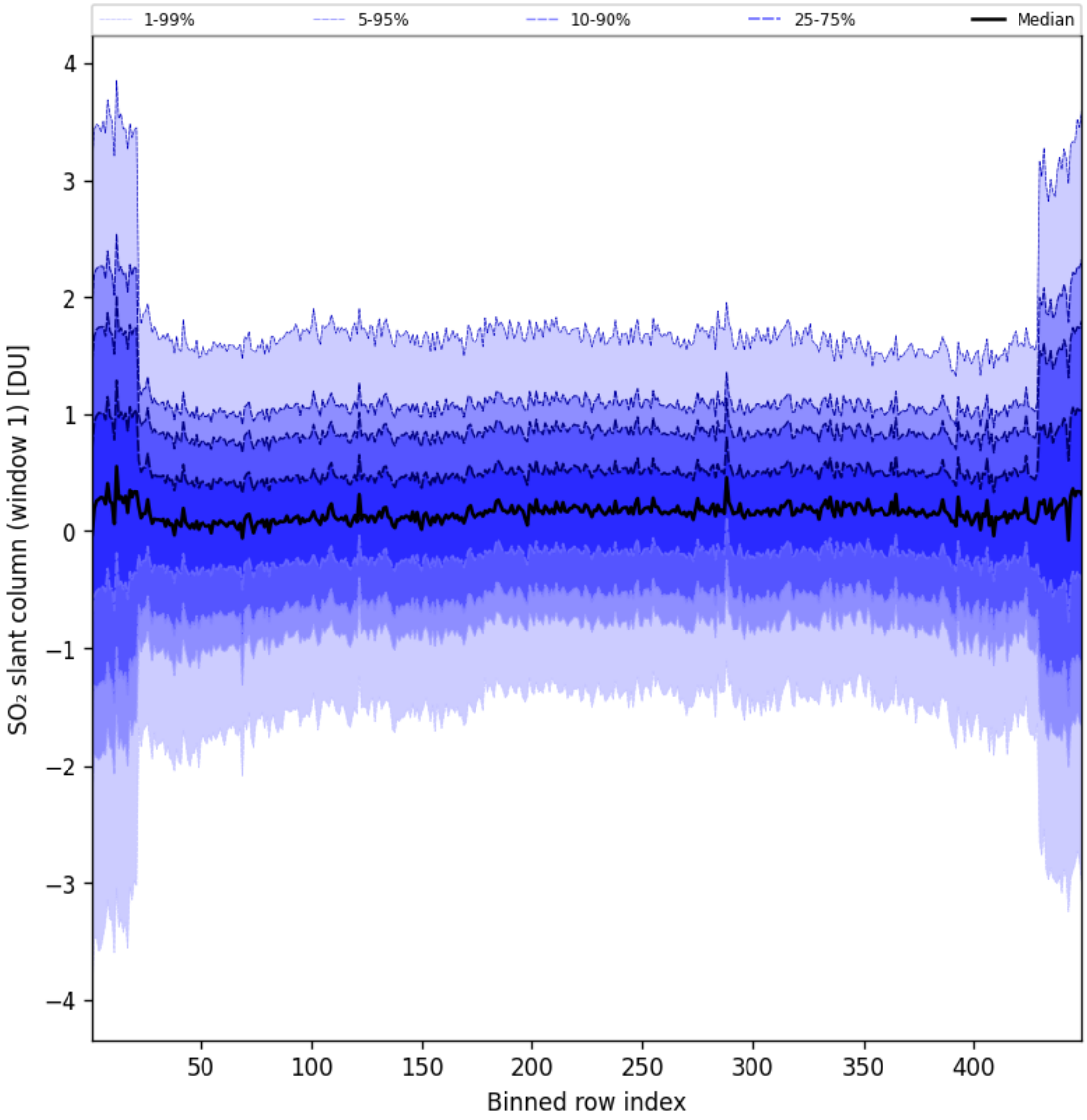

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-04-29 to 2025-04-30

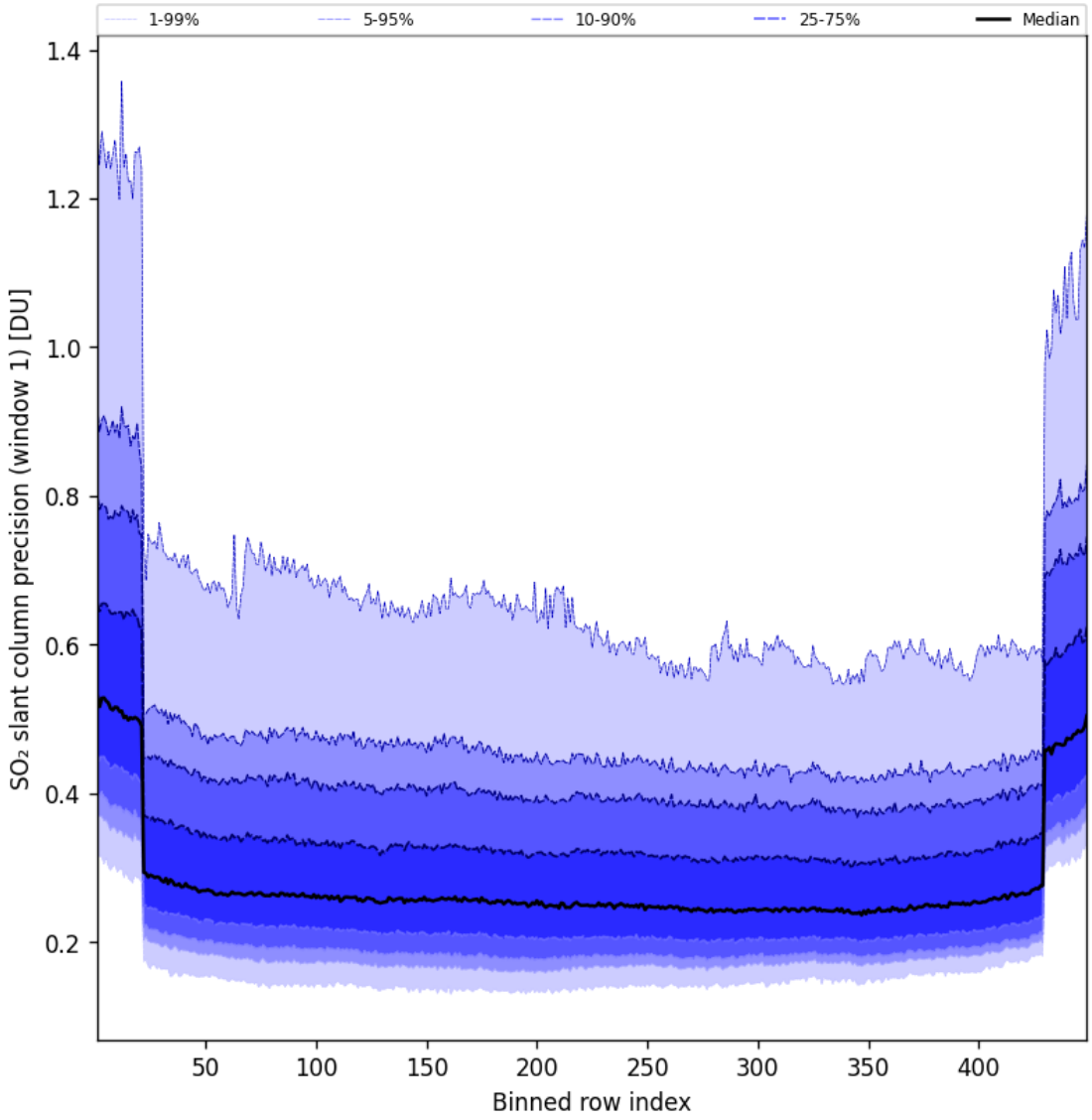

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-04-29 to 2025-04-30

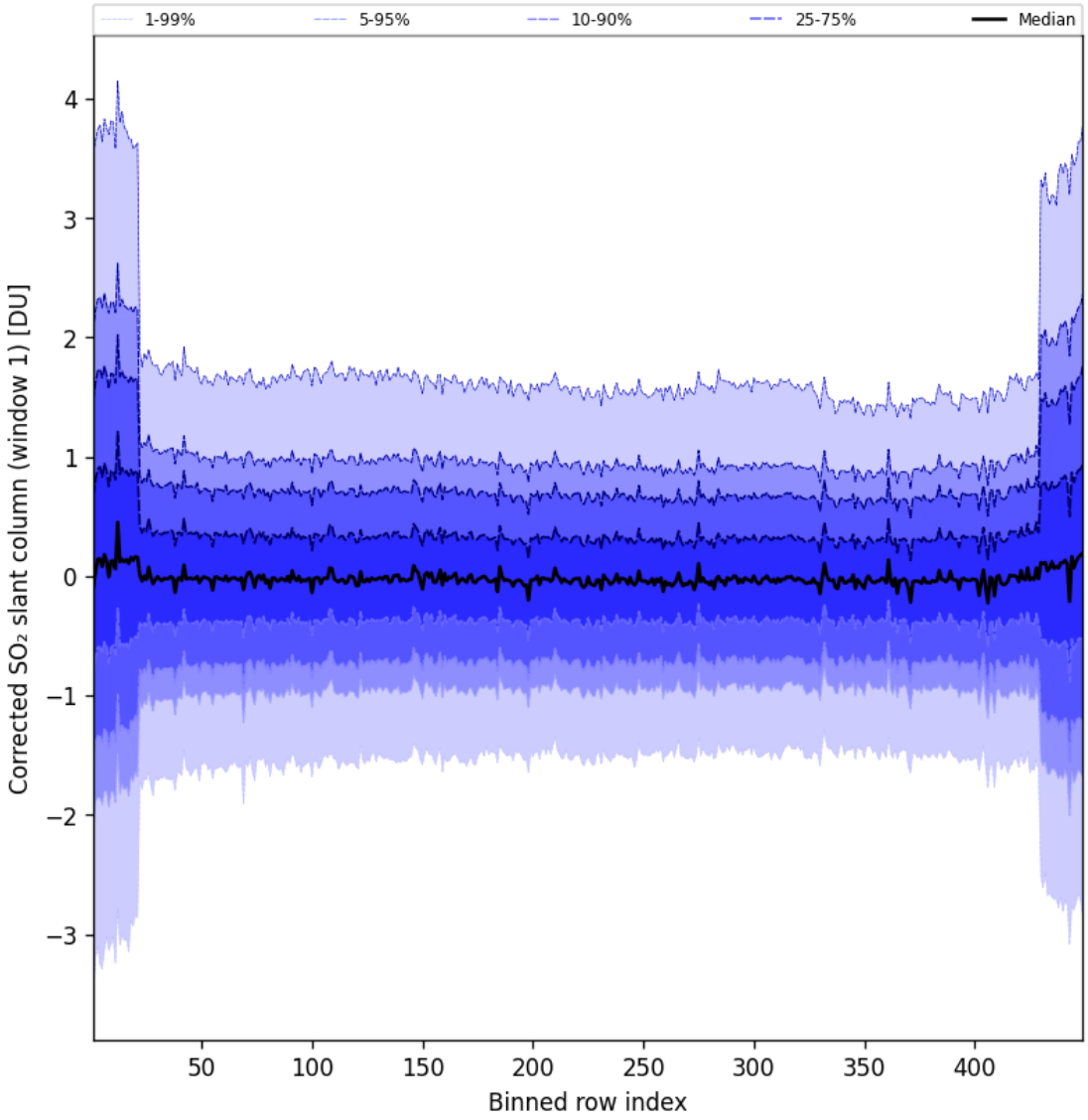

Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-04-29 to 2025-04-30

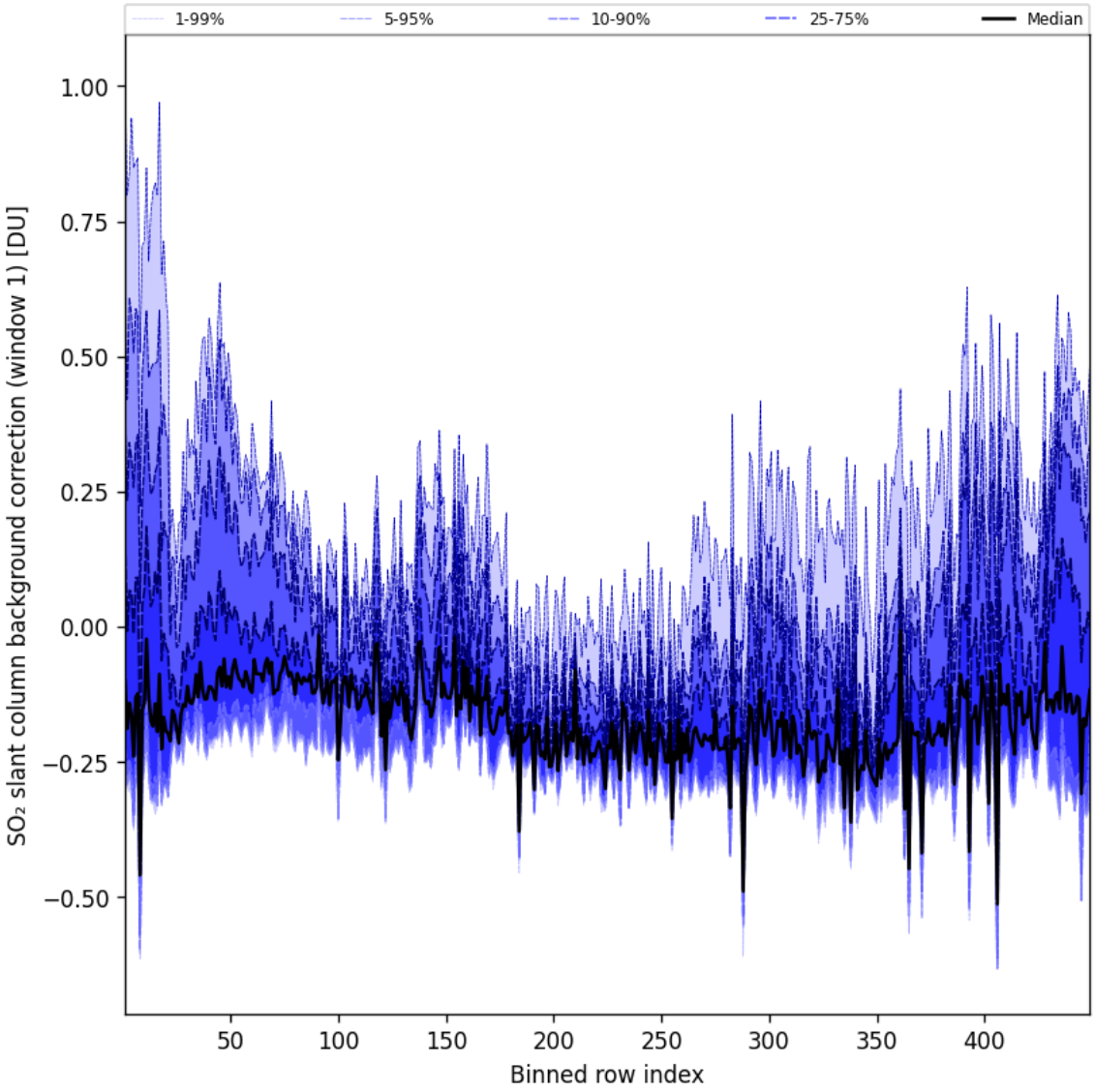

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-04-29 to 2025-04-30

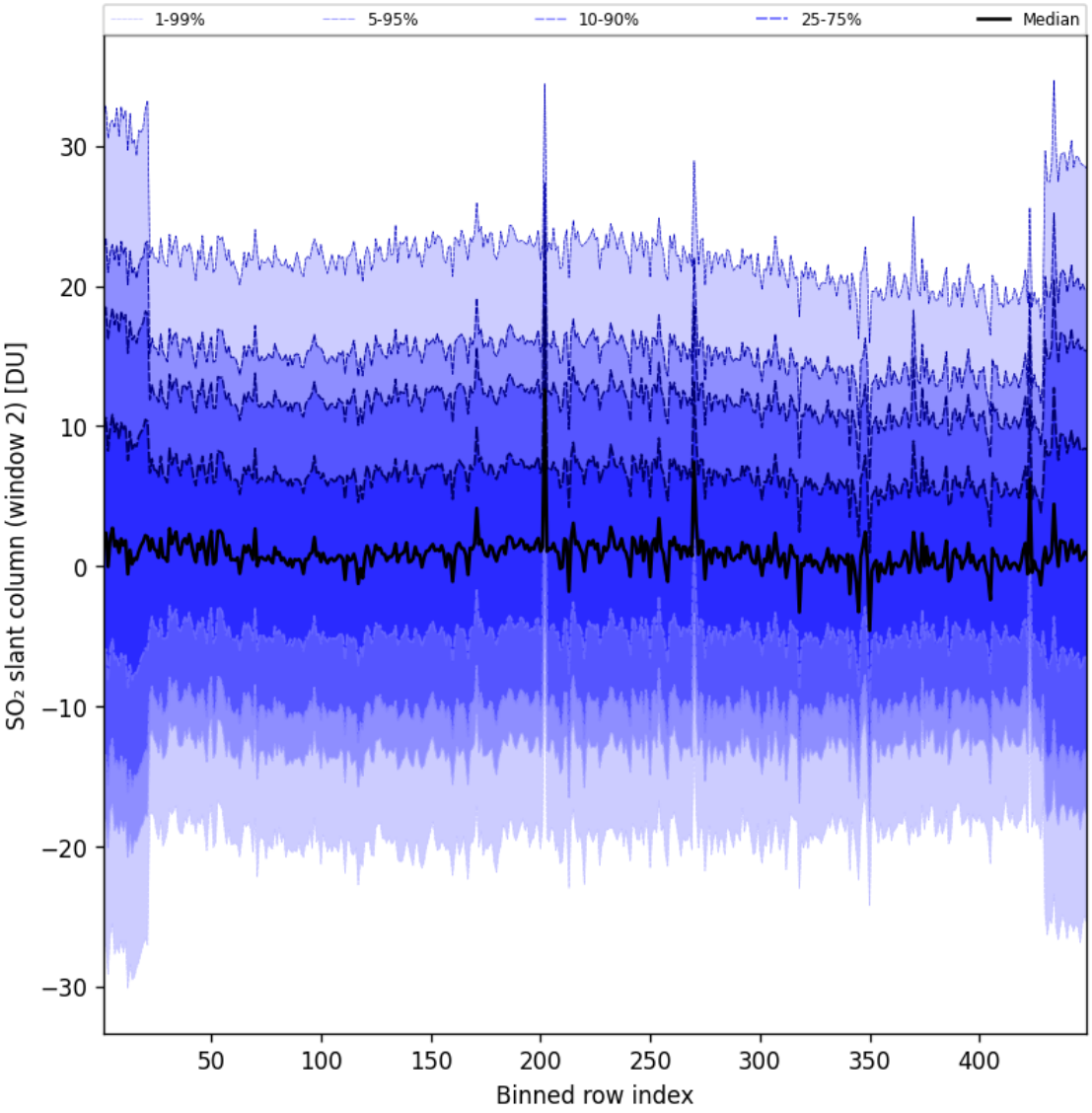

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-04-29 to 2025-04-30

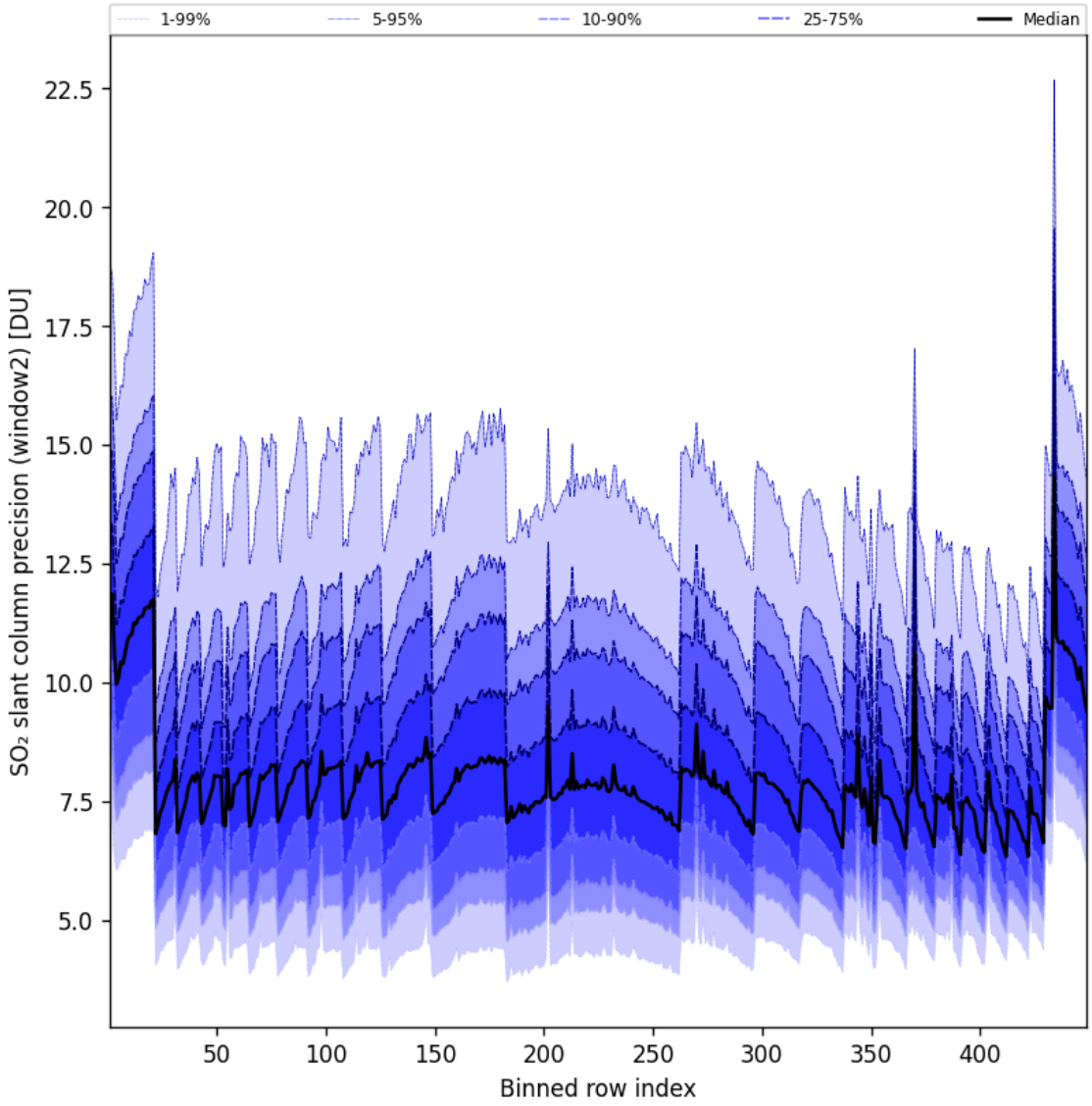

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-04-29 to 2025-04-30

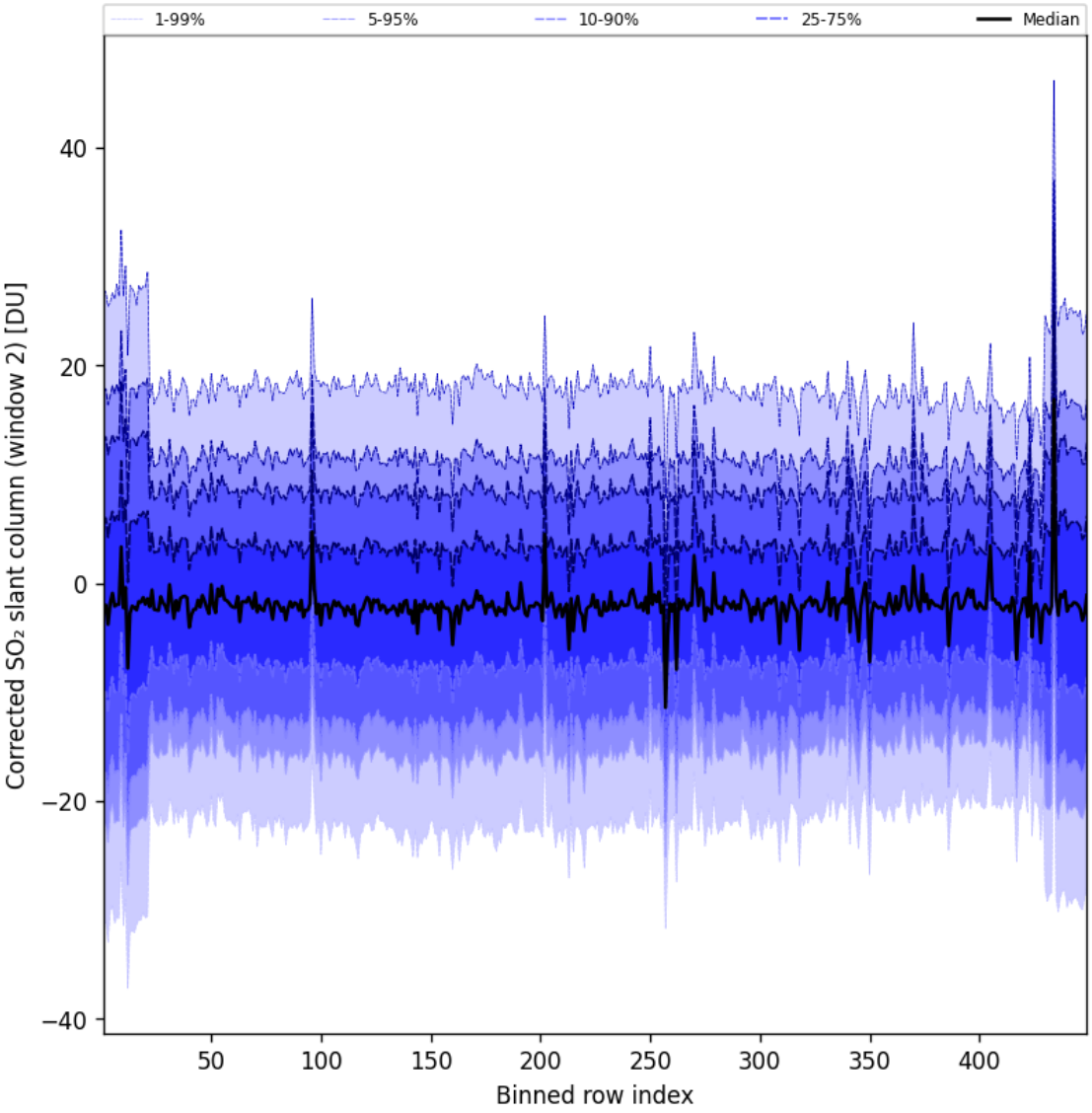

Figure 96: Along track statistics of “Corrected SO_2 slant column (window 2)” for 2025-04-29 to 2025-04-30

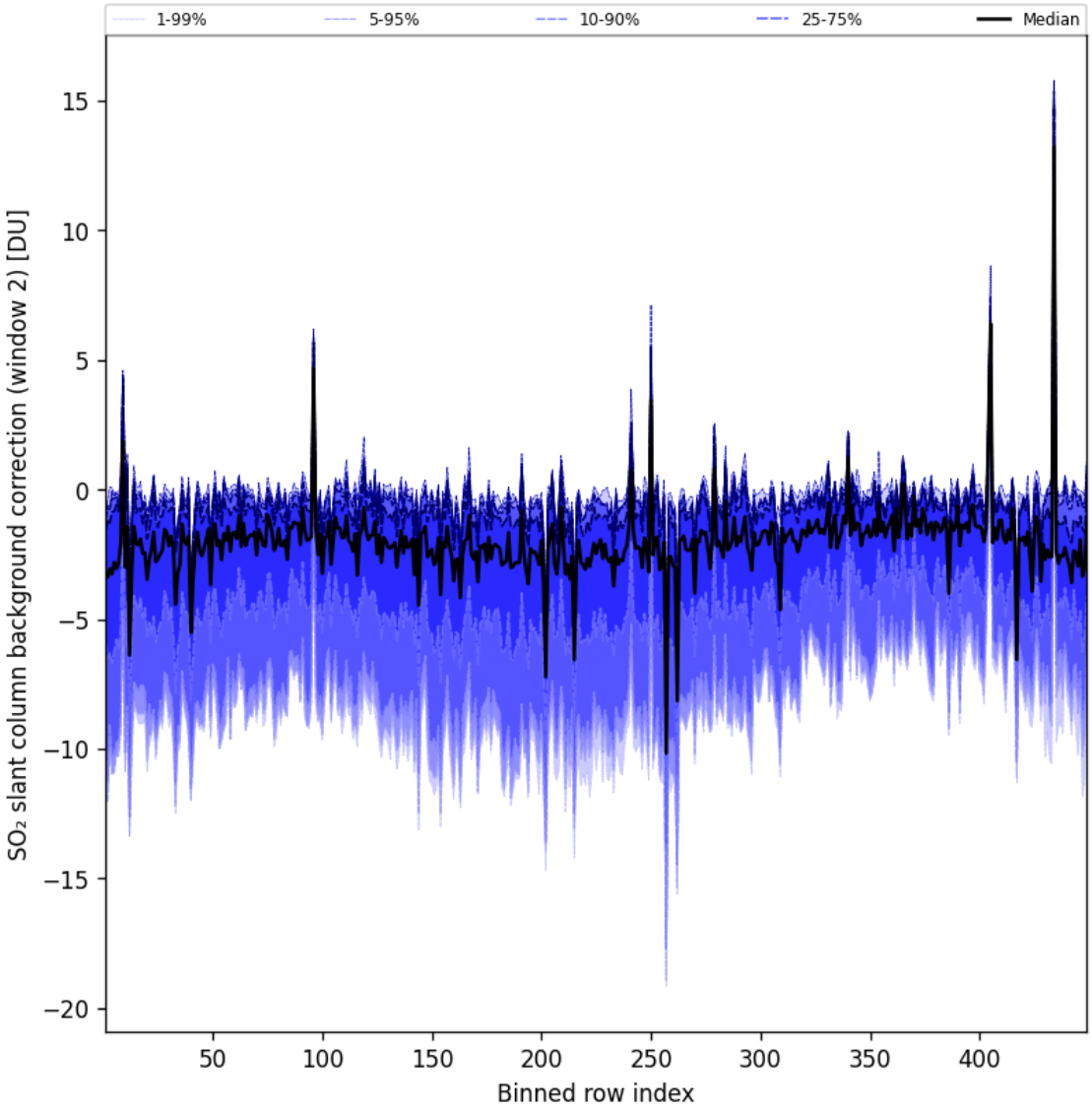

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-04-29 to 2025-04-30

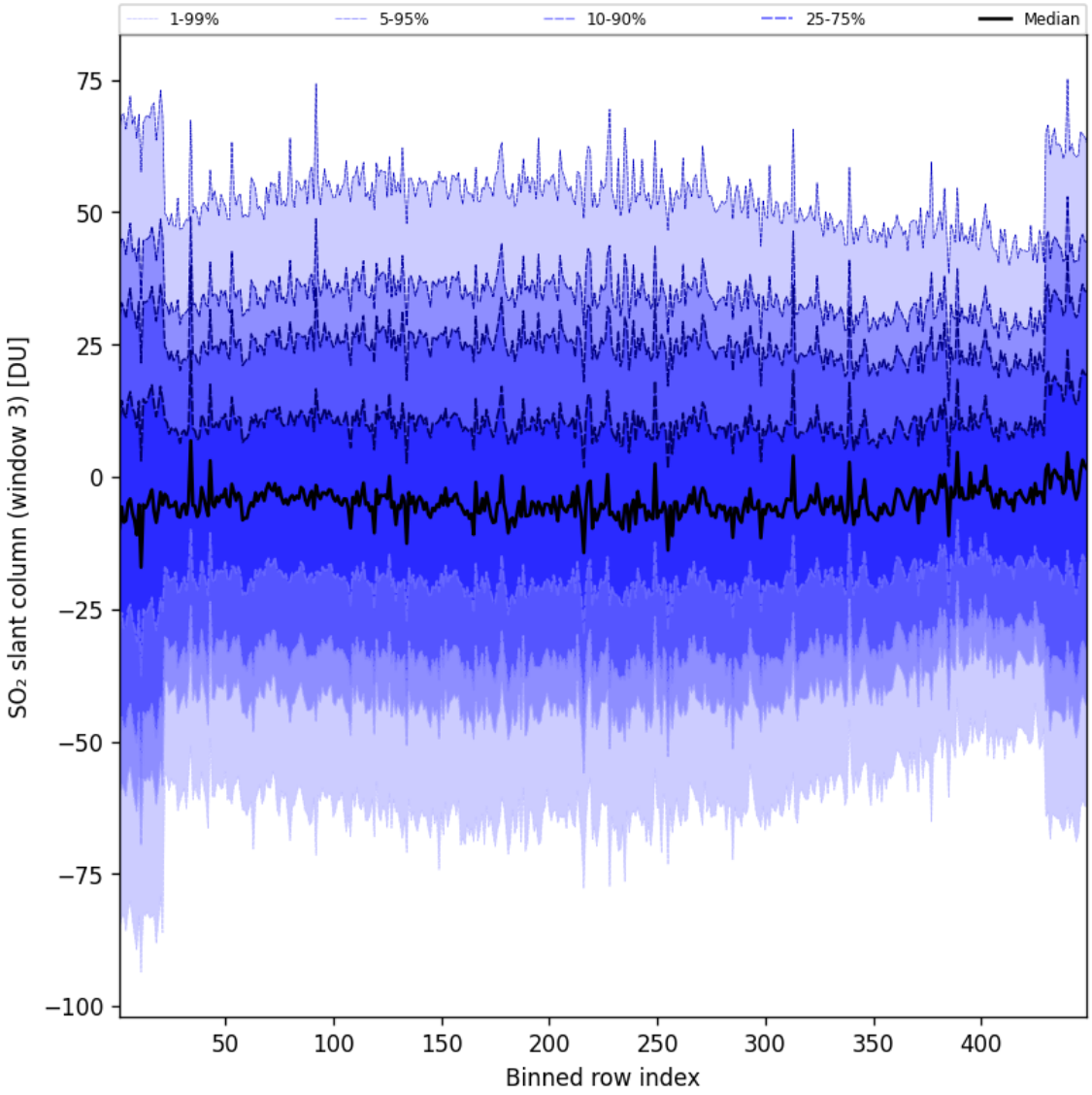

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-04-29 to 2025-04-30

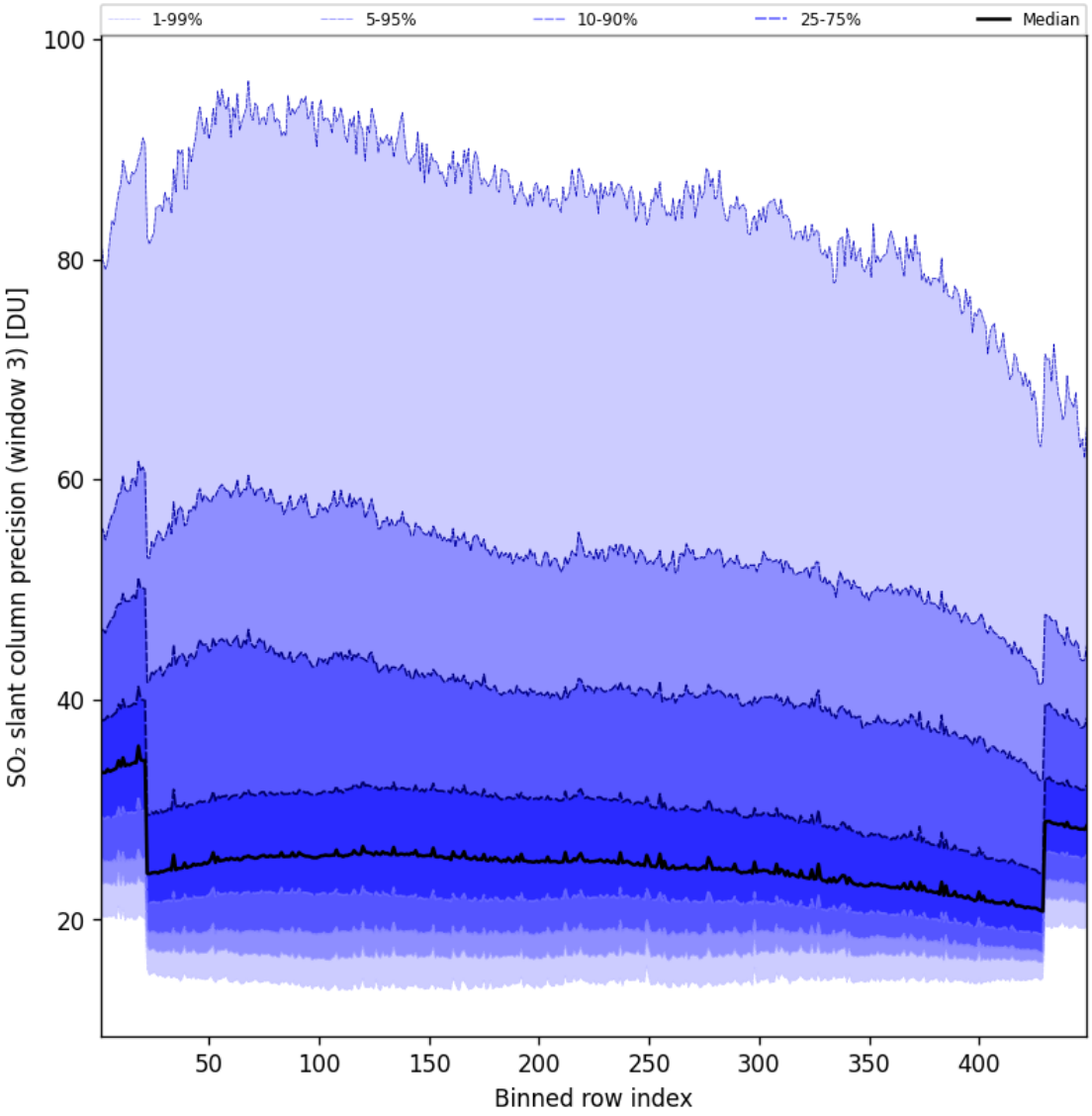

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-04-29 to 2025-04-30

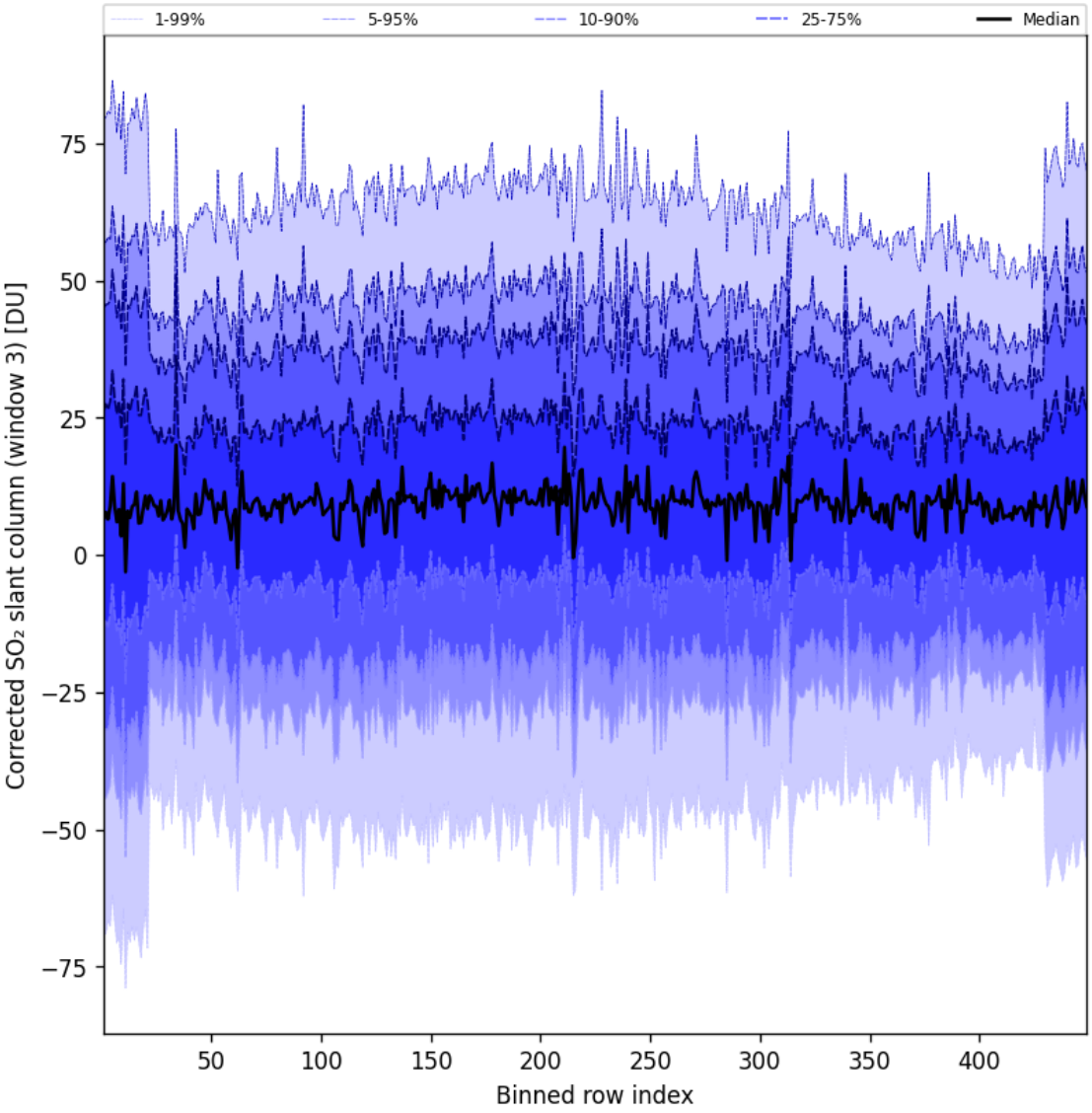

Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-04-29 to 2025-04-30

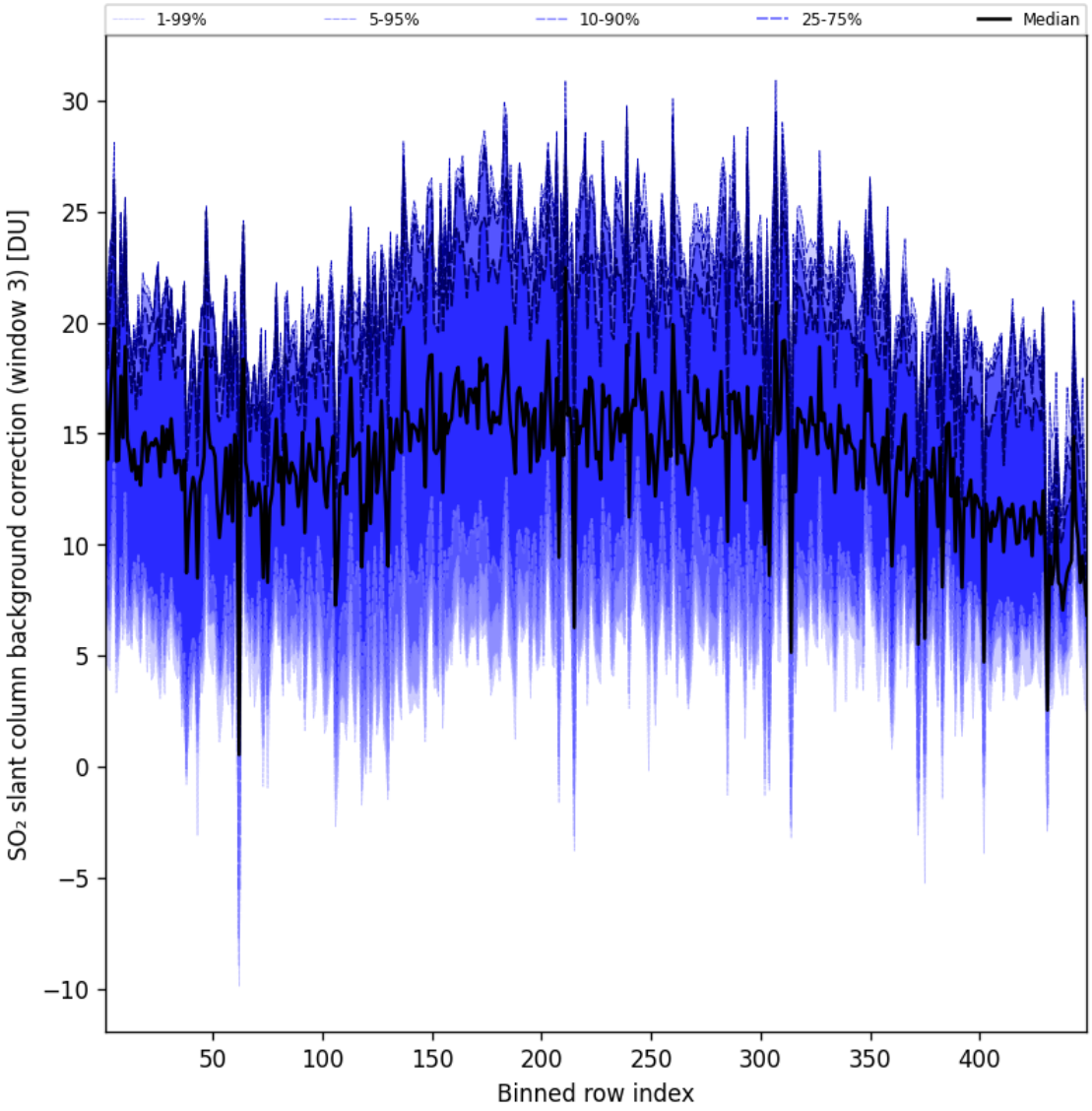

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-04-29 to 2025-04-30

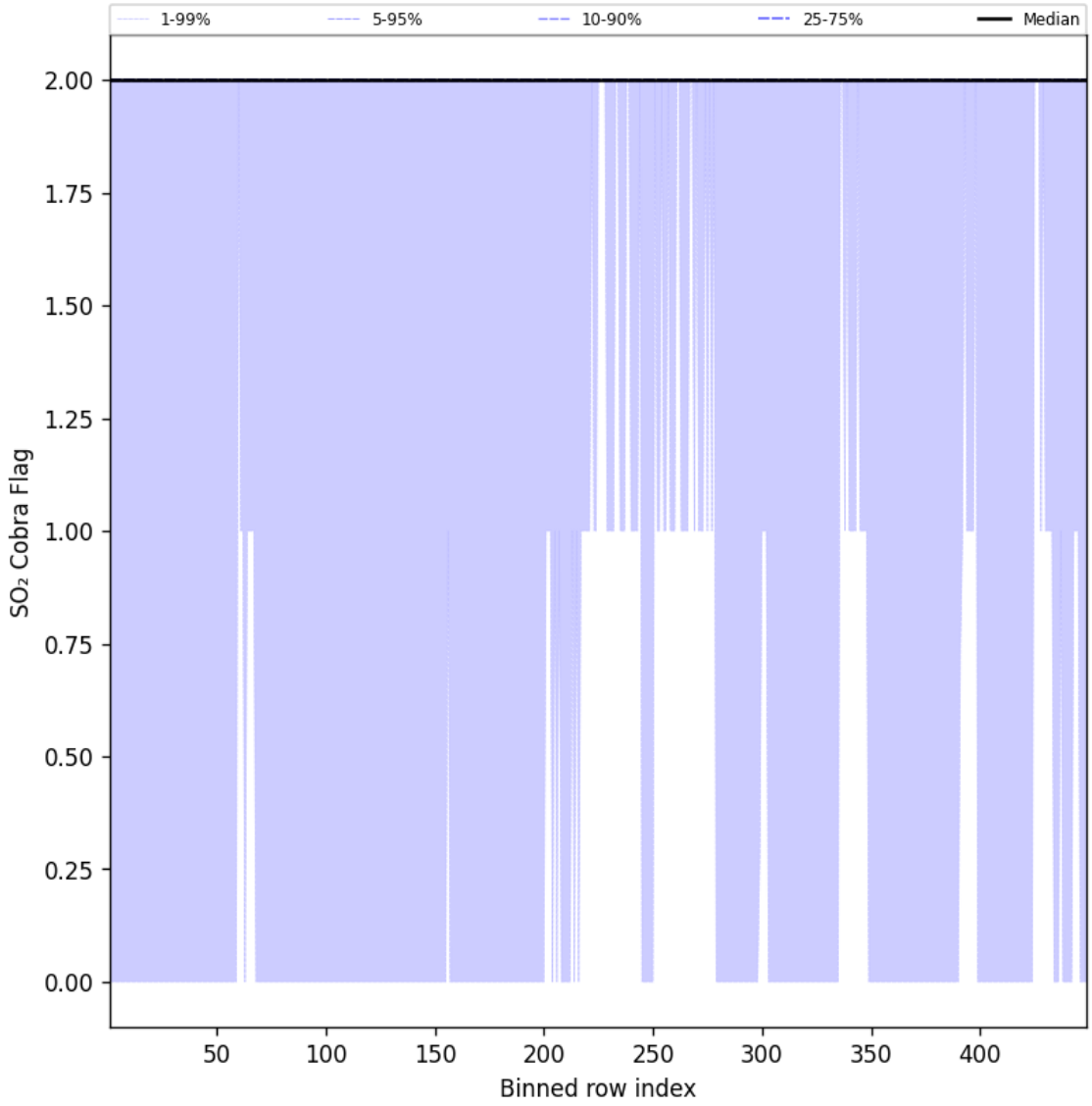

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-04-29 to 2025-04-30

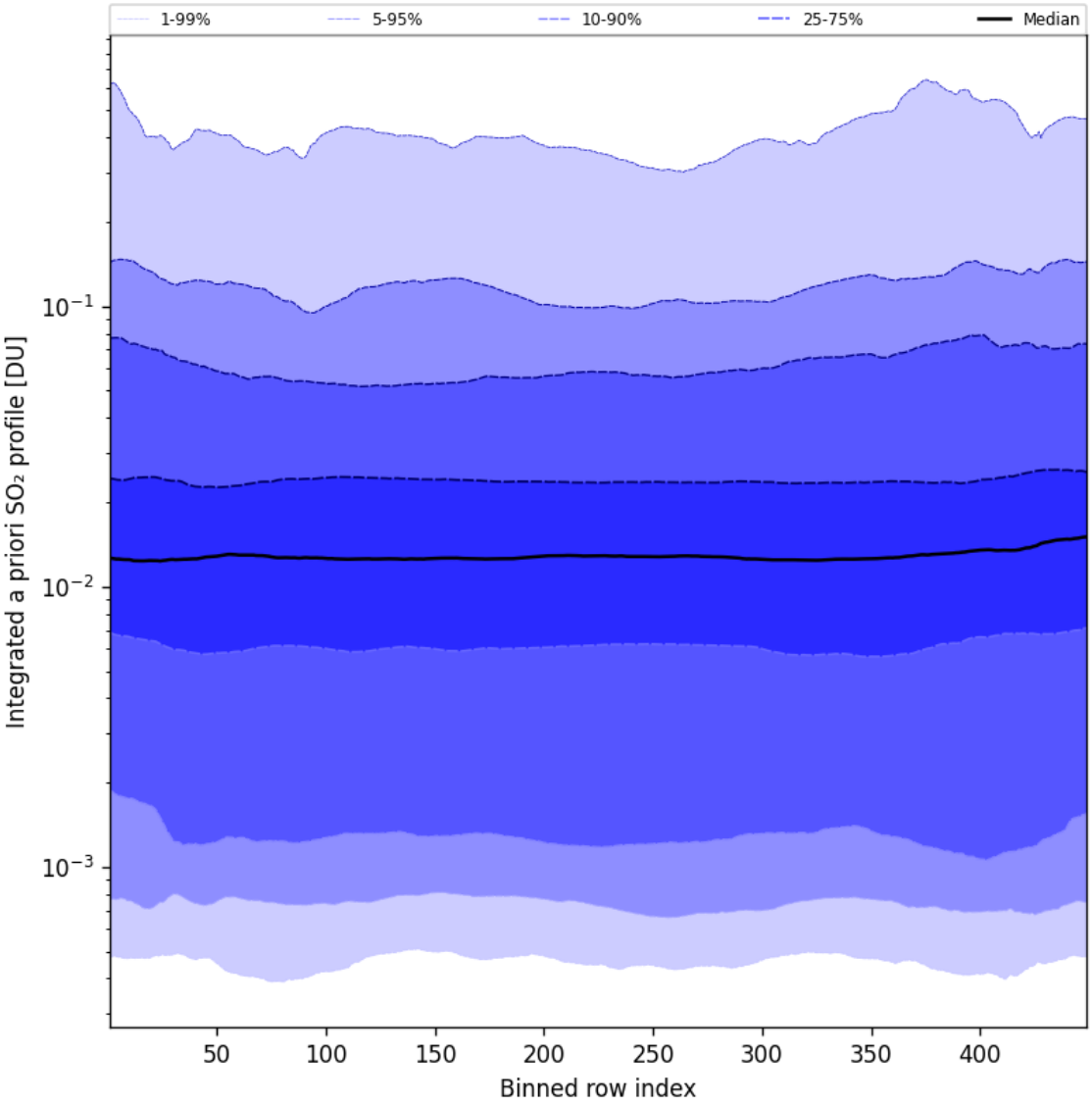

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-04-29 to 2025-04-30

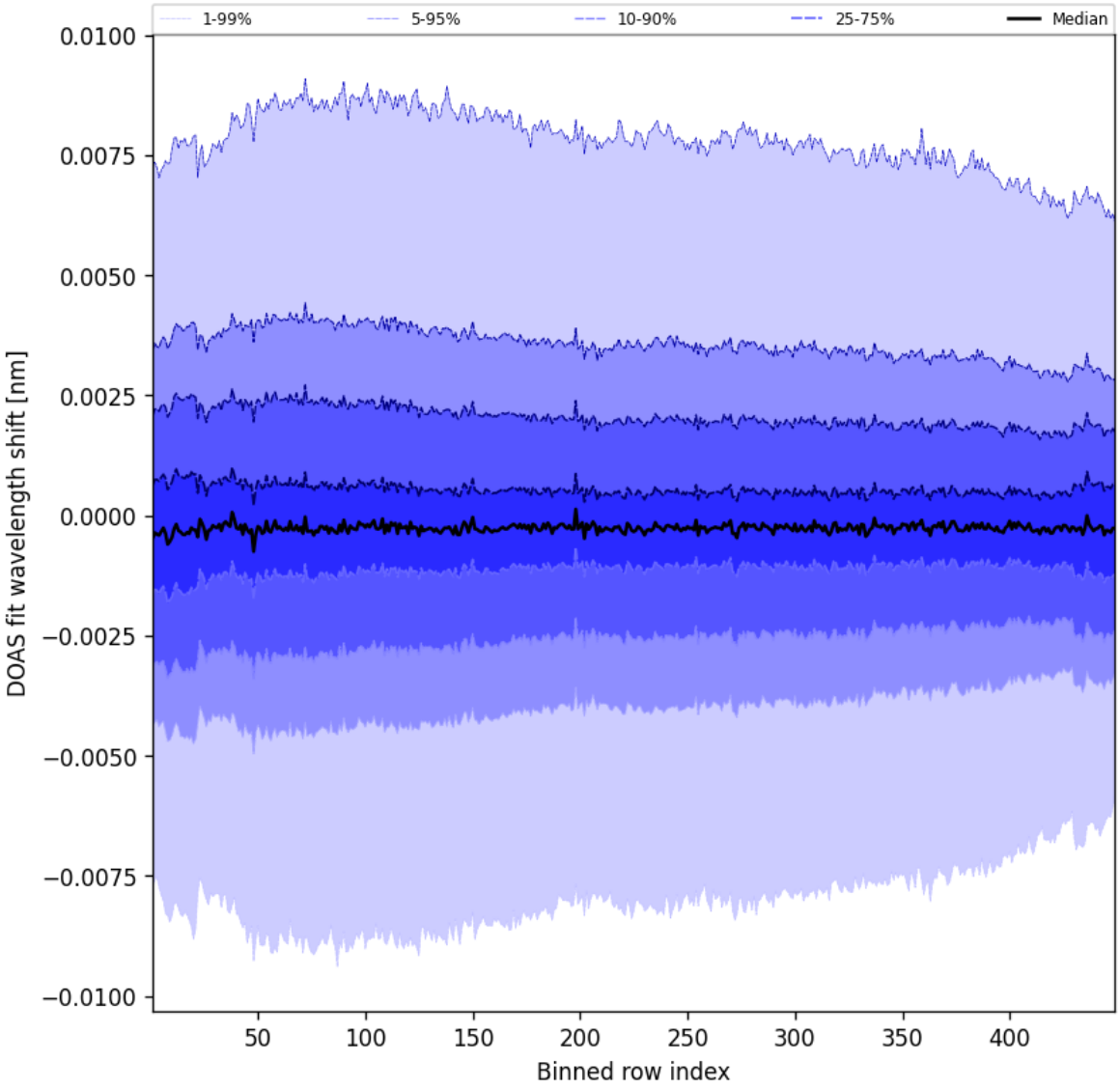

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-04-29 to 2025-04-30

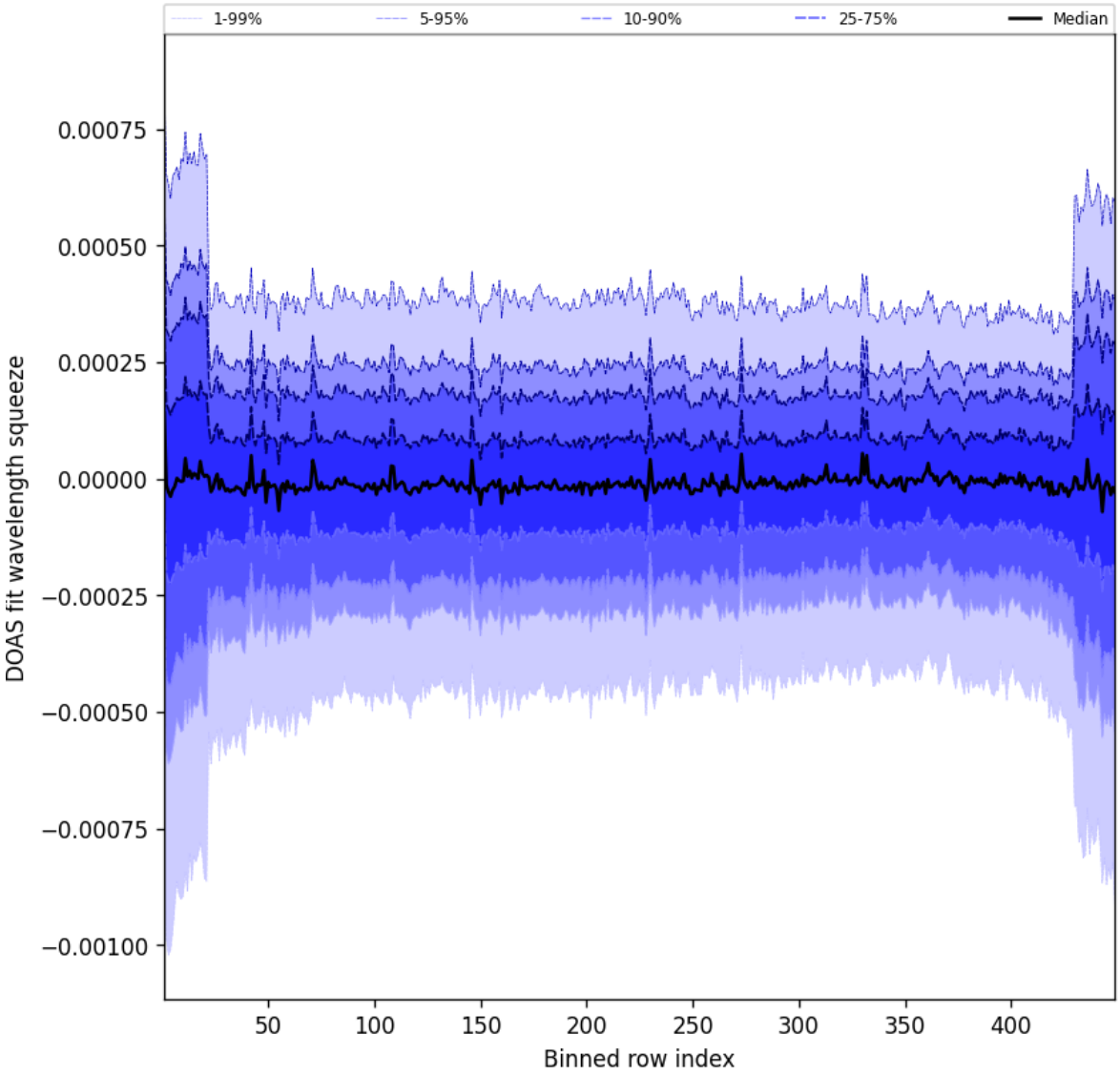

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-04-29 to 2025-04-30

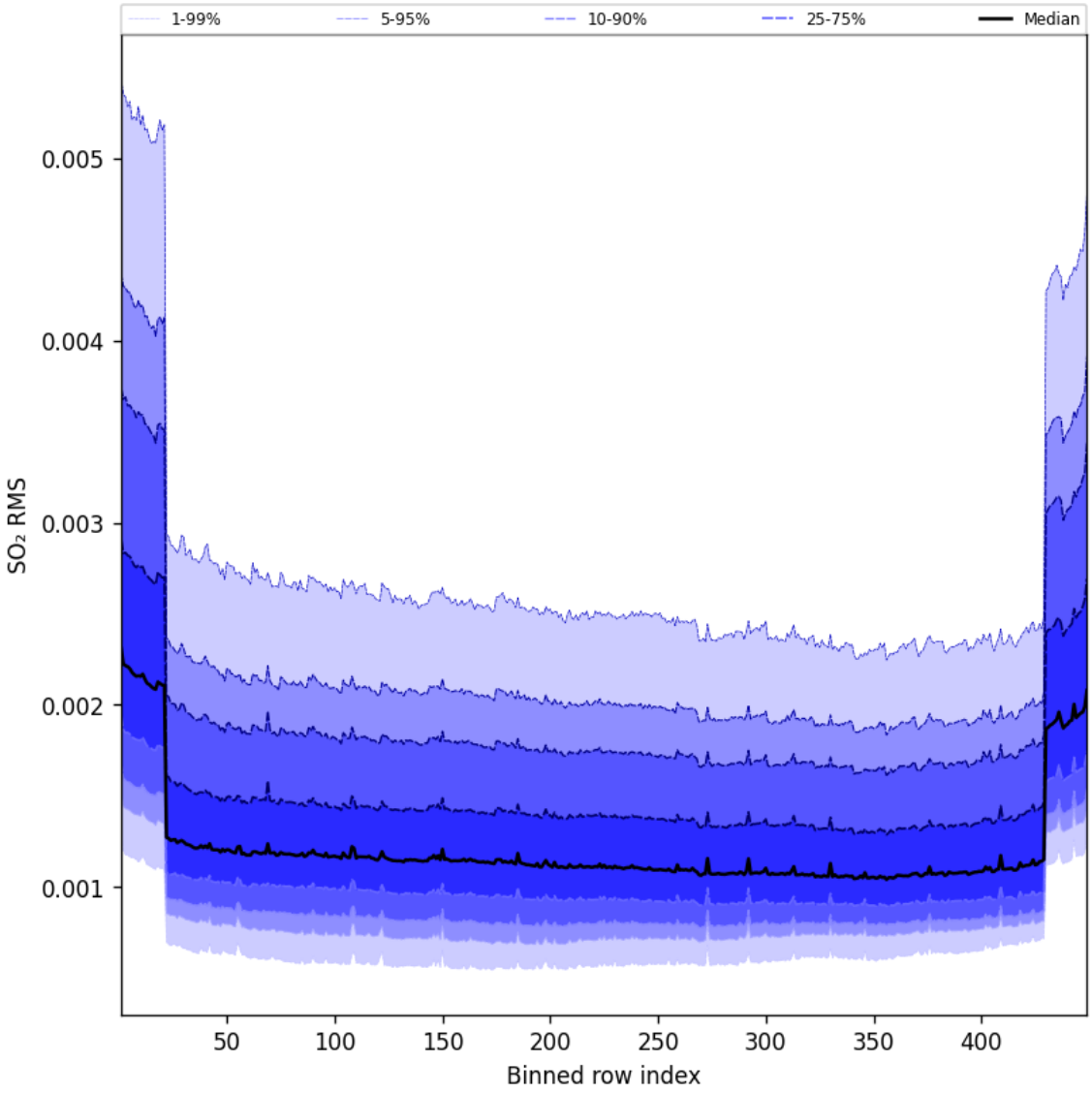

Figure 106: Along track statistics of "SO_2 RMS" for 2025-04-29 to 2025-04-30

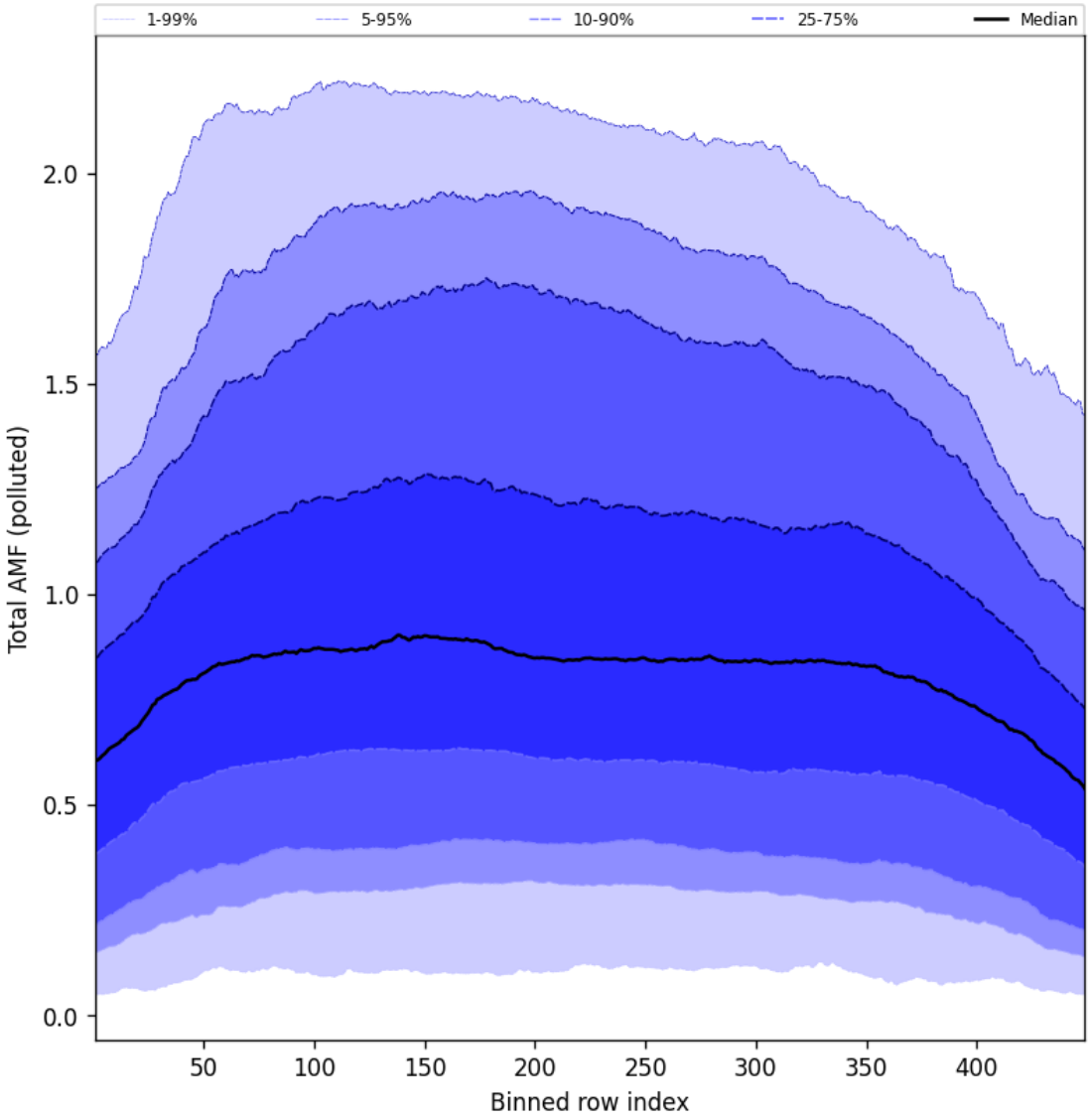

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-04-29 to 2025-04-30

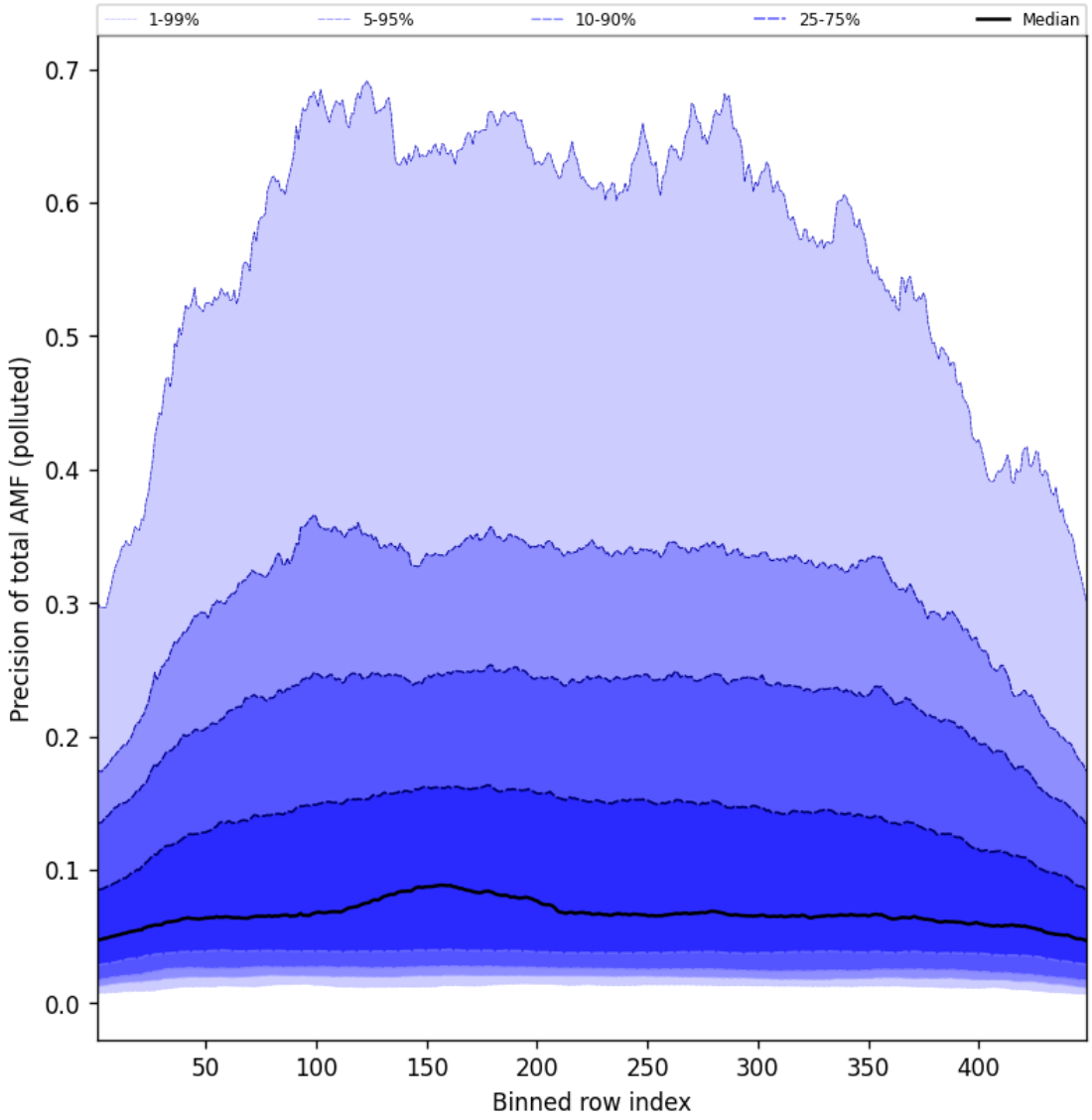

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-04-29 to 2025-04-30

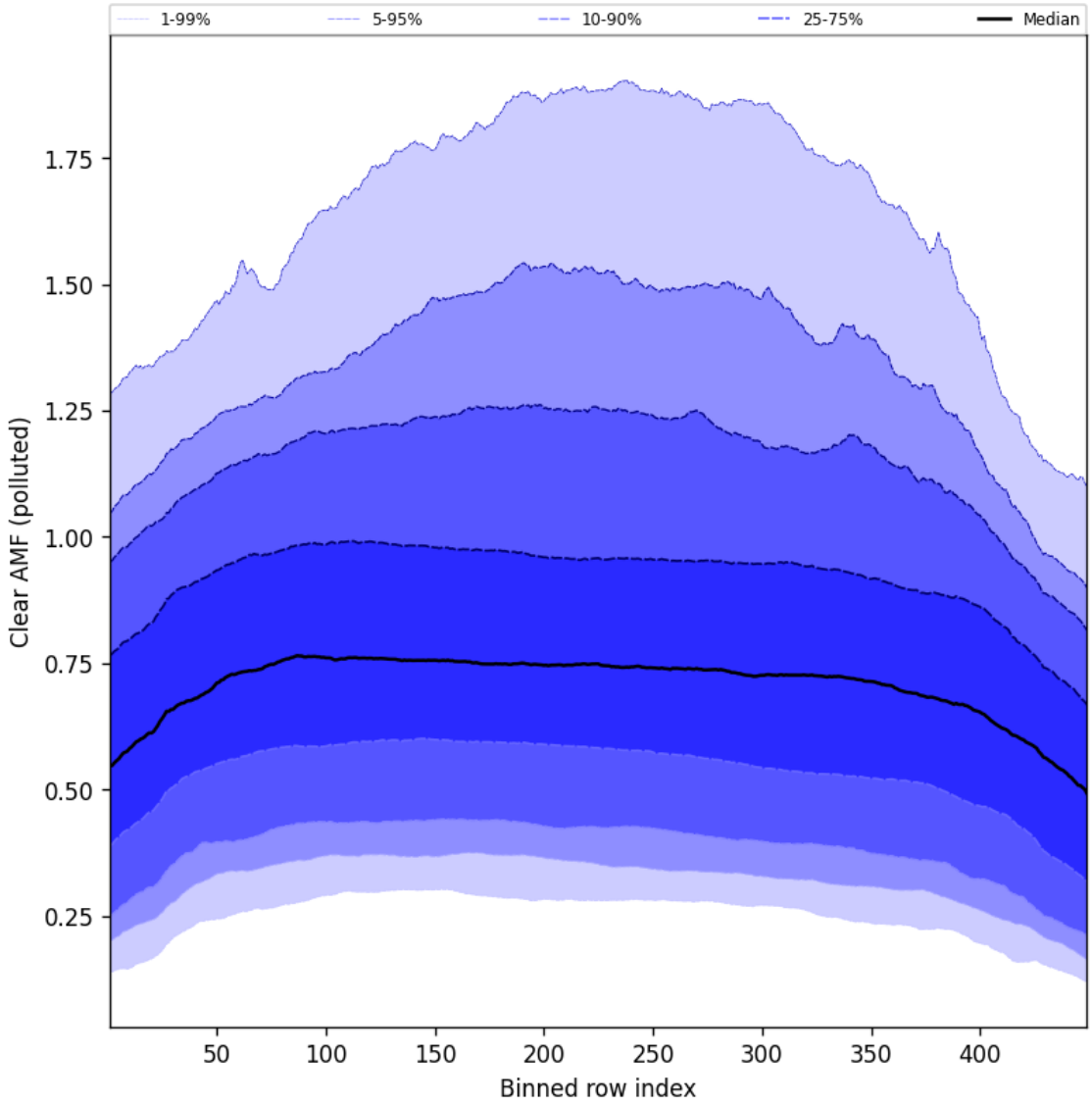

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-04-29 to 2025-04-30

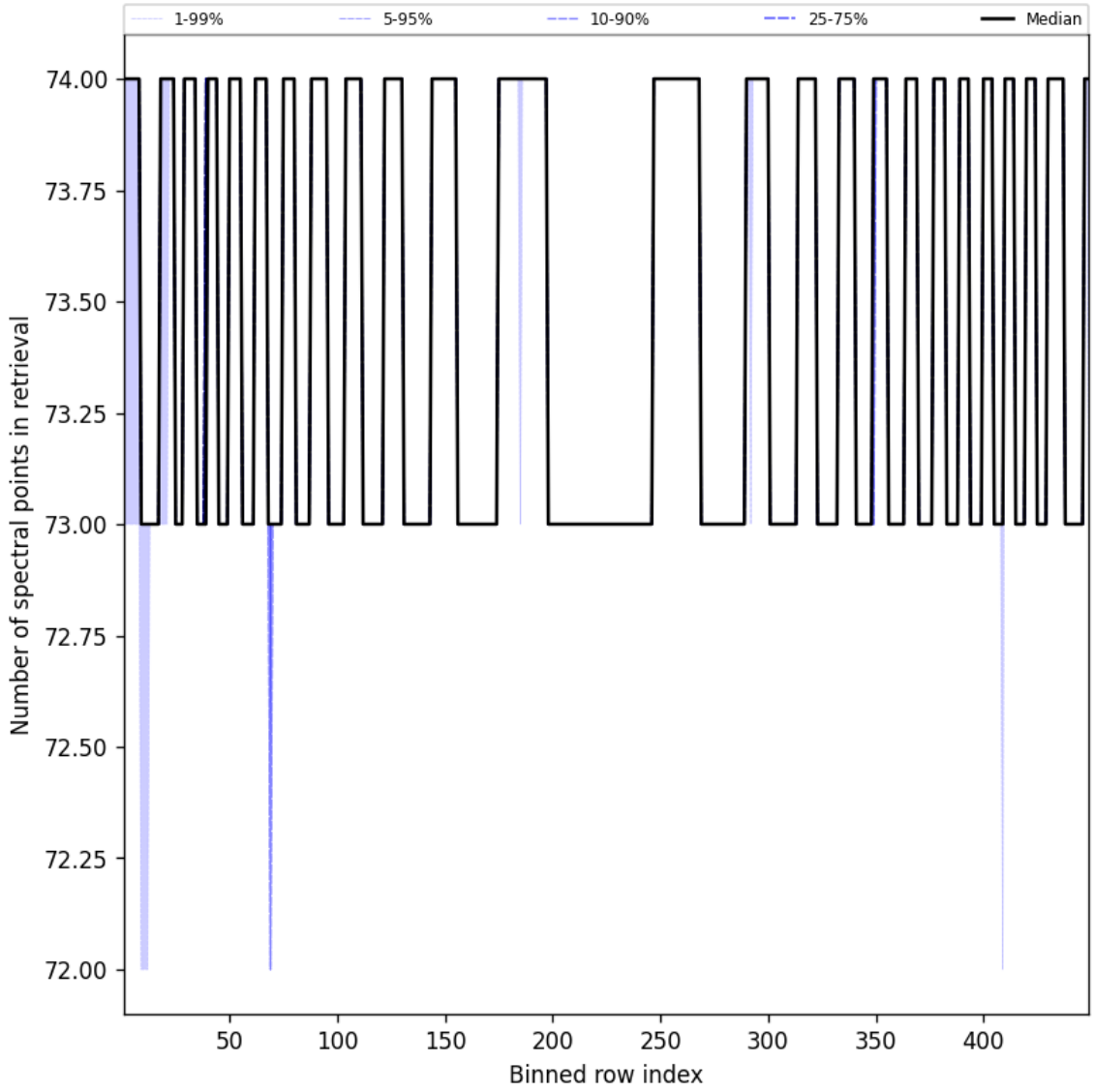

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-04-29 to 2025-04-30

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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