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]	0.643 ± 0.403	17317719	0.995	0.780	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(2.802 \pm 95.811) \times 10^{-2}$	17317719	0.263	0.461	1.075×10^{-2}	-99.2	564
sulfurdioxide total vertical column precision [DU]	0.510 ± 0.672	17317719	0.222	0.333	0.326	4.171×10^{-2}	178
sulfurdioxide slant column density corrected [DU]	$(1.946 \pm 38.321) \times 10^{-2}$	17317719	0.250	0.379	9.478×10^{-3}	-14.3	202
sulfurdioxide slant column density cobra [DU]	$(1.937 \pm 37.115) \times 10^{-2}$	17317719	0.250	0.379	9.478×10^{-3}	-14.3	43.2
sulfurdioxide slant column density cobra precision [DU]	0.302 ± 0.130	17317719	0.213	0.134	0.265	8.194×10^{-2}	24.6
sulfurdioxide slant column density window1 [DU]	0.126 ± 0.695	17317719	0.125	0.752	0.134	-112	62.5
sulfurdioxide slant column density window1 precision [DU]	0.302 ± 0.130	17317719	0.213	0.134	0.265	8.194×10^{-2}	24.6
sulfurdioxide slant column density corrected win1 [DU]	$(-1.620 \pm 68.878) \times 10^{-2}$	17317719	-2.500×10^{-2}	0.742	-3.546×10^{-2}	-112	62.2
background so2 slant column offset window1 [DU]	-0.142 ± 0.143	17317719	-0.220	0.150	-0.167	-1.43	3.23
sulfurdioxide slant column density window2 [DU]	0.649 ± 9.072	17317719	-0.250	11.6	0.560	-882	1.232×10^{3}
sulfurdioxide slant column density window2 precision [DU]	8.14 ± 2.32	17317719	7.43	2.54	7.79	2.06	831
sulfurdioxide slant column density corrected win2 [DU]	-1.89 ± 8.82	17317719	-1.75	11.1	-1.89	-884	1.232×10^{3}
background so2 slant column offset window2 [DU]	-2.54 ± 2.91	17317719	-0.250	3.88	-1.68	-17.3	9.16
sulfurdioxide slant column density window3 [DU]	-3.21 ± 23.87	17317719	-5.04	29.8	-3.60	-1.373×10^{3}	799
sulfurdioxide slant column density window3 precision [DU]	29.0 ± 13.4	17317719	22.5	9.52	25.2	10.7	443
sulfurdioxide slant column density corrected win3 [DU]	8.18 ± 23.19	17317719	8.40	28.8	8.27	-1.371×10^{3}	809
background so2 slant column offset window3 [DU]	11.4 ± 6.2	17317719	6.16	10.4	11.0	-11.7	30.3
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17317719	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.316 \pm 8.952) \times 10^{-2}$	17317719	1.946×10^{-2}	1.813×10^{-2}	1.281×10^{-2}	2.410×10^{-4}	2.35
fitted radiance shift [nm]	$(-2.499 \pm 26.216) \times 10^{-4}$	17317719	1.000×10^{-4}	1.702×10^{-3}	-2.383×10^{-4}	-4.324×10^{-2}	4.165×10^{-2}
fitted radiance squeeze [1]	$(-1.333 \pm 18.117) \times 10^{-5}$	17317719	-1.000×10^{-5}	2.071×10^{-4}	-8.593×10^{-6}	-1.603×10^{-2}	2.302×10^{-2}
fitted root mean square [1]	$(1.310 \pm 0.537) \times 10^{-3}$	17317719	9.750×10^{-4}	5.374×10^{-4}	1.165×10^{-3}	3.010×10^{-4}	6.873×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.887 ± 0.451	17317719	0.740	0.571	0.815	5.000×10^{-2}	2.93
sulfurdioxide total air mass factor polluted precision [1]	0.107 ± 0.110	17317719	3.500×10^{-2}	0.101	6.649×10^{-2}	3.278×10^{-3}	1.71
sulfurdioxide clear air mass factor polluted [1]	0.759 ± 0.320	17317719	0.740	0.396	0.723	6.885×10^{-2}	2.55
number of spectral points in retrieval [1]	73.4 ± 0.5	17317719	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	0.220	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.19	−0.865	−0.534	−0.363	−0.216	0.244	0.402	0.592	0.966	2.47
sulfurdioxide total vertical column precision [DU]	0.107	0.142	0.169	0.193	0.225	0.558	0.742	0.950	1.36	3.23
sulfurdioxide slant column density corrected [DU]	−0.871	−0.507	−0.368	−0.276	−0.178	0.201	0.304	0.405	0.564	1.05
sulfurdioxide slant column density cobra [DU]	−0.871	−0.507	−0.368	−0.276	−0.178	0.201	0.304	0.405	0.564	1.05
sulfurdioxide slant column density cobra precision [DU]	0.147	0.175	0.190	0.201	0.216	0.350	0.402	0.453	0.547	0.781
sulfurdioxide slant column density window1 [DU]	−1.75	−0.950	−0.649	−0.451	−0.246	0.506	0.700	0.885	1.16	1.95
sulfurdioxide slant column density window1 precision [DU]	0.147	0.175	0.190	0.201	0.216	0.350	0.402	0.453	0.547	0.781
sulfurdioxide slant column density corrected win1 [DU]	−1.72	−1.03	−0.769	−0.590	−0.401	0.341	0.546	0.745	1.06	1.95
background so2 slant column offset window1 [DU]	−0.395	−0.306	−0.280	−0.261	−0.236	-8.563×10^{-2}	-3.124×10^{-2}	3.223×10^{-2}	0.133	0.349
sulfurdioxide slant column density window2 [DU]	−20.7	−13.9	−10.5	−8.00	−5.18	6.37	9.29	11.9	15.4	22.9
sulfurdioxide slant column density window2 precision [DU]	4.36	5.23	5.76	6.17	6.67	9.21	10.1	11.0	12.2	15.0
sulfurdioxide slant column density corrected win2 [DU]	−23.1	−16.1	−12.7	−10.3	−7.46	3.67	6.45	8.94	12.3	19.4
background so2 slant column offset window2 [DU]	−10.1	−8.28	−6.97	−5.76	−4.28	−0.396	-8.248×10^{-2}	0.148	0.490	2.82
sulfurdioxide slant column density window3 [DU]	−62.1	−41.6	−32.2	−25.5	−18.2	11.6	19.6	26.8	36.5	55.8
sulfurdioxide slant column density window3 precision [DU]	14.9	17.4	19.1	20.4	21.8	31.4	36.1	42.2	54.4	87.0
sulfurdioxide slant column density corrected win3 [DU]	−50.4	−30.0	−20.3	−13.5	−6.11	22.7	30.1	36.8	45.9	64.7
background so2 slant column offset window3 [DU]	−0.983	2.53	3.85	4.87	6.22	16.6	18.3	19.7	21.1	23.7
sulfurdioxide slant column cobra flag [1]	0.0	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
integrated so2 profile apriori [DU]	4.638×10^{-4}	8.655×10^{-4}	1.360×10^{-3}	2.720×10^{-3}	6.043×10^{-3}	2.417×10^{-2}	3.728×10^{-2}	6.277×10^{-2}	0.117	0.452
fitted radiance shift [nm]	-8.281×10^{-3}	-4.115×10^{-3}	-2.645×10^{-3}	-1.812×10^{-3}	-1.124×10^{-3}	5.774×10^{-4}	1.244×10^{-3}	2.115×10^{-3}	3.669×10^{-3}	8.054×10^{-3}
fitted radiance squeeze [1]	-5.081×10^{-4}	-3.050×10^{-4}	-2.244×10^{-4}	-1.703×10^{-4}	-1.138×10^{-4}	9.324×10^{-5}	1.454×10^{-4}	1.937×10^{-4}	2.629×10^{-4}	4.282×10^{-4}
fitted root mean square [1]	6.061×10^{-4}	7.558×10^{-4}	8.345×10^{-4}	8.937×10^{-4}	9.662×10^{-4}	1.504×10^{-3}	1.740×10^{-3}	1.972×10^{-3}	2.317×10^{-3}	3.290×10^{-3}
sulfurdioxide total air mass factor polluted [1]	9.488×10^{-2}	0.256	0.358	0.448	0.567	1.14	1.35	1.54	1.78	2.09
sulfurdioxide total air mass factor polluted precision [1]	1.101×10^{-2}	1.889×10^{-2}	2.535×10^{-2}	3.118×10^{-2}	3.836×10^{-2}	0.139	0.182	0.227	0.312	0.557
sulfurdioxide clear air mass factor polluted [1]	0.223	0.314	0.380	0.444	0.532	0.929	1.05	1.16	1.36	1.77
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]	0.594 ± 0.410	11122235	0.820	0.490	0.0	1.000	0.180	1.000
sulfurdioxide total vertical column [DU]	$(2.741 \pm 100.525) \times 10^{-2}$	11122235	0.440	9.135×10^{-3}	-99.2	129	-0.208	0.232
sulfurdioxide total vertical column precision [DU]	0.510 ± 0.729	11122235	0.330	0.308	4.171×10^{-2}	41.0	0.212	0.543
sulfurdioxide slant column density corrected [DU]	$(1.934 \pm 37.284) \times 10^{-2}$	11122235	0.371	8.260×10^{-3}	-8.70	42.0	-0.175	0.196
sulfurdioxide slant column density cobra [DU]	$(1.930 \pm 37.074) \times 10^{-2}$	11122235	0.371	8.260×10^{-3}	-8.70	16.7	-0.175	0.196
sulfurdioxide slant column density cobra precision [DU]	0.298 ± 0.132	11122235	0.136	0.259	8.194×10^{-2}	21.7	0.210	0.346
sulfurdioxide slant column density window1 [DU]	0.118 ± 0.698	11122235	0.740	0.130	-112	62.5	-0.246	0.494
sulfurdioxide slant column density window1 precision [DU]	0.298 ± 0.132	11122235	0.136	0.259	8.194×10^{-2}	21.7	0.210	0.346
sulfurdioxide slant column density corrected win1 [DU]	$(-1.704 \pm 69.055) \times 10^{-2}$	11122235	0.729	-3.794×10^{-2}	-112	62.2	-0.397	0.332
background so2 slant column offset window1 [DU]	-0.135 ± 0.156	11122235	0.166	-0.170	-0.611	1.81	-0.240	-7.338×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.03 ± 8.63	11122235	11.2	0.935	-518	653	-4.60	6.56
sulfurdioxide slant column density window2 precision [DU]	7.73 ± 2.04	11122235	2.28	7.43	2.06	405	6.40	8.67
sulfurdioxide slant column density corrected win2 [DU]	-2.03 ± 8.26	11122235	10.6	-1.99	-524	650	-7.32	3.29
background so2 slant column offset window2 [DU]	-3.05 ± 3.25	11122235	5.21	-2.29	-17.3	9.16	-5.53	-0.321
sulfurdioxide slant column density window3 [DU]	-4.22 ± 22.33	11122235	27.9	-4.75	-202	158	-18.4	9.51
sulfurdioxide slant column density window3 precision [DU]	27.4 ± 12.8	11122235	7.65	23.9	10.7	241	21.0	28.7
sulfurdioxide slant column density corrected win3 [DU]	8.29 ± 21.51	11122235	26.8	8.34	-191	174	-5.05	21.8
background so2 slant column offset window3 [DU]	12.5 ± 6.4	11122235	11.1	13.5	-10.2	27.8	6.72	17.8
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.19	11122235	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.990 \pm 10.613) \times 10^{-2}$	11122235	2.658×10^{-2}	1.220×10^{-2}	2.410×10^{-4}	2.35	2.877×10^{-3}	2.946×10^{-2}
fitted radiance shift [nm]	$(-9.992 \pm 254.924) \times 10^{-5}$	11122235	1.549×10^{-3}	-1.223×10^{-4}	-4.036×10^{-2}	3.800×10^{-2}	-8.987×10^{-4}	6.502×10^{-4}
fitted radiance squeeze [1]	$(-3.362 \pm 17.756) \times 10^{-5}$	11122235	2.030×10^{-4}	-2.285×10^{-5}	-1.443×10^{-2}	1.281×10^{-2}	-1.284×10^{-4}	7.458×10^{-5}
fitted root mean square [1]	$(1.294 \pm 0.557) \times 10^{-3}$	11122235	5.395×10^{-4}	1.138×10^{-3}	3.010×10^{-4}	5.124×10^{-2}	9.413×10^{-4}	1.481×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.924 ± 0.495	11122235	0.681	0.845	5.000×10^{-2}	2.93	0.549	1.23
sulfurdioxide total air mass factor polluted precision [1]	0.115 ± 0.122	11122235	0.108	7.292×10^{-2}	3.278×10^{-3}	1.64	3.907×10^{-2}	0.147
sulfurdioxide clear air mass factor polluted [1]	0.775 ± 0.367	11122235	0.493	0.731	6.885×10^{-2}	2.55	0.488	0.981
number of spectral points in retrieval [1]	73.5 ± 0.5	11122235	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]	0.732 ± 0.375	6195484	0.620	1.000	0.0	1.000	0.380	1.000
sulfurdioxide total vertical column [DU]	$(2.911 \pm 86.708) \times 10^{-2}$	6195484	0.500	1.409×10^{-2}	-31.7	564	-0.233	0.267
sulfurdioxide total vertical column precision [DU]	0.511 ± 0.553	6195484	0.331	0.357	4.750×10^{-2}	178	0.248	0.579
sulfurdioxide slant column density corrected [DU]	$(1.968 \pm 40.116) \times 10^{-2}$	6195484	0.393	1.181×10^{-2}	-14.3	202	-0.183	0.210
sulfurdioxide slant column density cobra [DU]	$(1.950 \pm 37.189) \times 10^{-2}$	6195484	0.393	1.181×10^{-2}	-14.3	43.2	-0.183	0.210
sulfurdioxide slant column density cobra precision [DU]	0.310 ± 0.127	6195484	0.130	0.274	9.367×10^{-2}	24.6	0.227	0.357
sulfurdioxide slant column density window1 [DU]	0.141 ± 0.688	6195484	0.775	0.142	-60.8	54.8	-0.247	0.528
sulfurdioxide slant column density window1 precision [DU]	0.310 ± 0.127	6195484	0.130	0.274	9.367×10^{-2}	24.6	0.227	0.357
sulfurdioxide slant column density corrected win1 [DU]	$(-1.469 \pm 68.560) \times 10^{-2}$	6195484	0.767	-3.071×10^{-2}	-60.8	55.1	-0.409	0.357
background so2 slant column offset window1 [DU]	-0.155 ± 0.115	6195484	0.126	-0.164	-1.43	3.23	-0.226	-9.975×10^{-2}
sulfurdioxide slant column density window2 [DU]	$(-2.537 \pm 978.614) \times 10^{-2}$	6195484	12.2	-0.176	-882	1.232×10^{3}	-6.23	6.00
sulfurdioxide slant column density window2 precision [DU]	8.88 ± 2.58	6195484	2.73	8.53	2.51	831	7.33	10.1
sulfurdioxide slant column density corrected win2 [DU]	-1.65 ± 9.73	6195484	12.2	-1.67	-884	1.232×10^{3}	-7.75	4.42
background so2 slant column offset window2 [DU]	-1.62 ± 1.84	6195484	2.03	-1.28	-11.7	8.60	-2.52	-0.495
sulfurdioxide slant column density window3 [DU]	-1.40 ± 26.30	6195484	33.4	-1.11	-1.373×10^{3}	799	-17.8	15.5
sulfurdioxide slant column density window3 precision [DU]	31.9 ± 13.9	6195484	10.8	28.1	11.1	443	24.0	34.8
sulfurdioxide slant column density corrected win3 [DU]	7.98 ± 25.94	6195484	32.9	8.12	-1.371×10^{3}	809	-8.33	24.6
background so2 slant column offset window3 [DU]	9.38 ± 5.10	6195484	7.27	8.42	-11.7	30.3	5.73	13.0
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	6195484	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.106 \pm 4.416) \times 10^{-2}$	6195484	1.182×10^{-2}	1.340×10^{-2}	9.826×10^{-4}	1.90	8.801×10^{-3}	2.062×10^{-2}
fitted radiance shift [nm]	$(-5.193 \pm 27.262) \times 10^{-4}$	6195484	1.933×10^{-3}	-4.912×10^{-4}	-4.324×10^{-2}	4.165×10^{-2}	-1.529×10^{-3}	4.039×10^{-4}
fitted radiance squeeze [1]	$(2.311 \pm 18.187) \times 10^{-5}$	6195484	2.140×10^{-4}	1.866×10^{-5}	-1.603×10^{-2}	2.302×10^{-2}	-8.659×10^{-5}	1.274×10^{-4}
fitted root mean square [1]	$(1.338 \pm 0.498) \times 10^{-3}$	6195484	5.265×10^{-4}	1.207×10^{-3}	3.517×10^{-4}	6.873×10^{-2}	1.014×10^{-3}	1.540×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.820 ± 0.348	6195484	0.428	0.783	5.000×10^{-2}	2.61	0.590	1.02
sulfurdioxide total air mass factor polluted precision [1]	$(9.155 \pm 8.112) \times 10^{-2}$	6195484	8.710×10^{-2}	5.697×10^{-2}	4.859×10^{-3}	1.71	3.773×10^{-2}	0.125
sulfurdioxide clear air mass factor polluted [1]	0.730 ± 0.209	6195484	0.278	0.715	0.123	1.59	0.583	0.861
number of spectral points in retrieval [1]	73.4 ± 0.5	6195484	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]	0.678 ± 0.392	11380817	0.730	1.000	0.0	1.000	0.270	1.000
sulfurdioxide total vertical column [DU]	$(2.360 \pm 87.105) \times 10^{-2}$	11380817	0.448	9.949×10^{-3}	-87.7	564	-0.212	0.236
sulfurdioxide total vertical column precision [DU]	0.475 ± 0.593	11380817	0.292	0.313	5.580×10^{-2}	130	0.224	0.517
sulfurdioxide slant column density corrected [DU]	$(1.663 \pm 37.219) \times 10^{-2}$	11380817	0.375	8.799×10^{-3}	-11.2	202	-0.177	0.198
sulfurdioxide slant column density cobra [DU]	$(1.657 \pm 36.413) \times 10^{-2}$	11380817	0.375	8.799×10^{-3}	-11.2	20.5	-0.177	0.198
sulfurdioxide slant column density cobra precision [DU]	0.301 ± 0.132	11380817	0.143	0.259	8.194×10^{-2}	21.7	0.213	0.356
sulfurdioxide slant column density window1 [DU]	0.124 ± 0.691	11380817	0.750	0.136	-112	62.5	-0.244	0.506
sulfurdioxide slant column density window1 precision [DU]	0.301 ± 0.132	11380817	0.143	0.259	8.194×10^{-2}	21.7	0.213	0.356
sulfurdioxide slant column density corrected win1 [DU]	$(-2.096 \pm 68.415) \times 10^{-2}$	11380817	0.740	-3.673×10^{-2}	-112	62.2	-0.402	0.338
background so2 slant column offset window1 [DU]	-0.145 ± 0.141	11380817	0.148	-0.170	-1.43	3.23	-0.236	-8.865×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.420 ± 9.080	11380817	11.5	0.275	-882	1.232×10^{3}	-5.44	6.11
sulfurdioxide slant column density window2 precision [DU]	8.15 ± 2.23	11380817	2.50	7.82	2.06	831	6.72	9.22
sulfurdioxide slant column density corrected win2 [DU]	-1.86 ± 8.85	11380817	11.2	-1.85	-884	1.232×10^{3}	-7.46	3.74
background so2 slant column offset window2 [DU]	-2.28 ± 2.83	11380817	3.31	-1.41	-17.3	9.16	-3.63	-0.319
sulfurdioxide slant column density window3 [DU]	-0.322 ± 24.059	11380817	30.5	-0.764	-703	799	-15.7	14.9
sulfurdioxide slant column density window3 precision [DU]	28.3 ± 11.8	11380817	8.78	25.0	10.7	443	21.9	30.7
sulfurdioxide slant column density corrected win3 [DU]	10.4 ± 23.1	11380817	29.2	10.2	-696	809	-4.23	24.9
background so2 slant column offset window3 [DU]	10.7 ± 6.1	11380817	9.83	9.70	-11.7	30.3	5.84	15.7
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	11380817	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.198 \pm 5.497) \times 10^{-2}$	11380817	1.411×10^{-2}	1.242×10^{-2}	2.708×10^{-4}	1.90	6.840×10^{-3}	2.095×10^{-2}
fitted radiance shift [nm]	$(-2.886 \pm 23.437) \times 10^{-4}$	11380817	1.646×10^{-3}	-2.523×10^{-4}	-4.048×10^{-2}	3.800×10^{-2}	-1.128×10^{-3}	5.186×10^{-4}
fitted radiance squeeze [1]	$(-5.655 \pm 181.255) \times 10^{-6}$	11380817	2.054×10^{-4}	-1.371×10^{-6}	-1.576×10^{-2}	2.302×10^{-2}	-1.055×10^{-4}	9.992×10^{-5}
fitted root mean square [1]	$(1.311 \pm 0.542) \times 10^{-3}$	11380817	5.882×10^{-4}	1.148×10^{-3}	3.010×10^{-4}	6.873×10^{-2}	9.525×10^{-4}	1.541×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.887 ± 0.400	11380817	0.493	0.838	5.000×10^{-2}	2.51	0.620	1.11
sulfurdioxide total air mass factor polluted precision [1]	$(9.663 \pm 9.248) \times 10^{-2}$	11380817	8.297×10^{-2}	6.412×10^{-2}	3.318×10^{-3}	1.63	4.011×10^{-2}	0.123
sulfurdioxide clear air mass factor polluted [1]	0.776 ± 0.294	11380817	0.338	0.748	8.309×10^{-2}	2.35	0.584	0.922
number of spectral points in retrieval [1]	73.4 ± 0.5	11380817	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]	0.624 ± 0.416	4140311	0.830	1.000	0.0	1.000	0.170	1.000
sulfurdioxide total vertical column [DU]	$(3.028 \pm 99.842) \times 10^{-2}$	4140311	0.481	1.092×10^{-2}	-42.8	388	-0.225	0.256
sulfurdioxide total vertical column precision [DU]	0.547 ± 0.721	4140311	0.379	0.354	4.171×10^{-2}	178	0.230	0.609
sulfurdioxide slant column density corrected [DU]	$(2.022 \pm 38.262) \times 10^{-2}$	4140311	0.371	9.323×10^{-3}	-14.3	196	-0.174	0.197
sulfurdioxide slant column density cobra [DU]	$(2.007 \pm 35.635) \times 10^{-2}$	4140311	0.371	9.323×10^{-3}	-14.3	43.2	-0.174	0.197
sulfurdioxide slant column density cobra precision [DU]	0.291 ± 0.119	4140311	0.107	0.262	9.345×10^{-2}	24.6	0.218	0.326
sulfurdioxide slant column density window1 [DU]	0.145 ± 0.659	4140311	0.727	0.144	-60.8	40.8	-0.221	0.507
sulfurdioxide slant column density window1 precision [DU]	0.291 ± 0.119	4140311	0.107	0.262	9.345×10^{-2}	24.6	0.218	0.326
sulfurdioxide slant column density corrected win1 [DU]	$(-1.563 \pm 65.435) \times 10^{-2}$	4140311	0.719	-3.568×10^{-2}	-60.8	40.8	-0.389	0.330
background so2 slant column offset window1 [DU]	-0.161 ± 0.129	4140311	0.140	-0.181	-1.35	1.37	-0.244	-0.105
sulfurdioxide slant column density window2 [DU]	0.539 ± 9.102	4140311	11.5	0.520	-789	951	-5.24	6.30
sulfurdioxide slant column density window2 precision [DU]	8.25 ± 2.55	4140311	2.62	7.86	2.14	711	6.69	9.31
sulfurdioxide slant column density corrected win2 [DU]	-1.91 ± 8.88	4140311	11.1	-1.91	-790	950	-7.48	3.65
background so2 slant column offset window2 [DU]	-2.45 ± 2.81	4140311	3.71	-1.62	-16.5	9.16	-4.12	-0.404
sulfurdioxide slant column density window3 [DU]	-8.68 ± 23.13	4140311	28.5	-8.35	-1.373×10^{3}	413	-22.7	5.73
sulfurdioxide slant column density window3 precision [DU]	31.5 ± 16.8	4140311	11.9	26.5	11.0	299	22.0	34.0
sulfurdioxide slant column density corrected win3 [DU]	2.93 ± 23.37	4140311	28.9	3.73	-1.371×10^{3}	419	-11.1	17.7
background so2 slant column offset window3 [DU]	11.6 ± 6.1	4140311	10.4	11.4	-11.7	29.8	6.44	16.9
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.10	4140311	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.939 \pm 13.128) \times 10^{-2}$	4140311	4.525×10^{-2}	1.797×10^{-2}	2.410×10^{-4}	2.35	6.565×10^{-3}	5.182×10^{-2}
fitted radiance shift [nm]	$(-1.631 \pm 32.927) \times 10^{-4}$	4140311	1.900×10^{-3}	-2.056×10^{-4}	-4.324×10^{-2}	4.165×10^{-2}	-1.143×10^{-3}	7.570×10^{-4}
fitted radiance squeeze [1]	$(-1.787 \pm 17.391) \times 10^{-5}$	4140311	2.041×10^{-4}	-1.437×10^{-5}	-1.603×10^{-2}	1.391×10^{-2}	-1.177×10^{-4}	8.634×10^{-5}
fitted root mean square [1]	$(1.261 \pm 0.480) \times 10^{-3}$	4140311	4.267×10^{-4}	1.155×10^{-3}	3.517×10^{-4}	4.850×10^{-2}	9.748×10^{-4}	1.402×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.860 ± 0.510	4140311	0.657	0.723	5.000×10^{-2}	2.83	0.485	1.14
sulfurdioxide total air mass factor polluted precision [1]	0.127 ± 0.138	4140311	0.140	7.371×10^{-2}	3.372×10^{-3}	1.71	3.269×10^{-2}	0.173
sulfurdioxide clear air mass factor polluted [1]	0.713 ± 0.342	4140311	0.449	0.637	9.182×10^{-2}	2.51	0.458	0.907
number of spectral points in retrieval [1]	73.4 ± 0.5	4140311	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

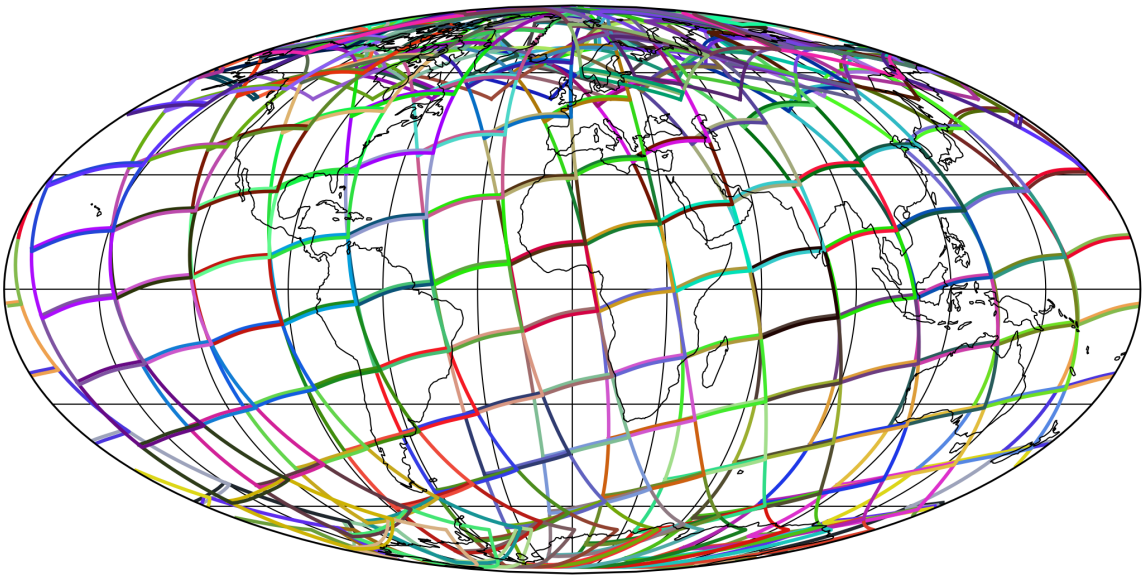

Figure 1: Outline of the granules.

4 Input data monitoring

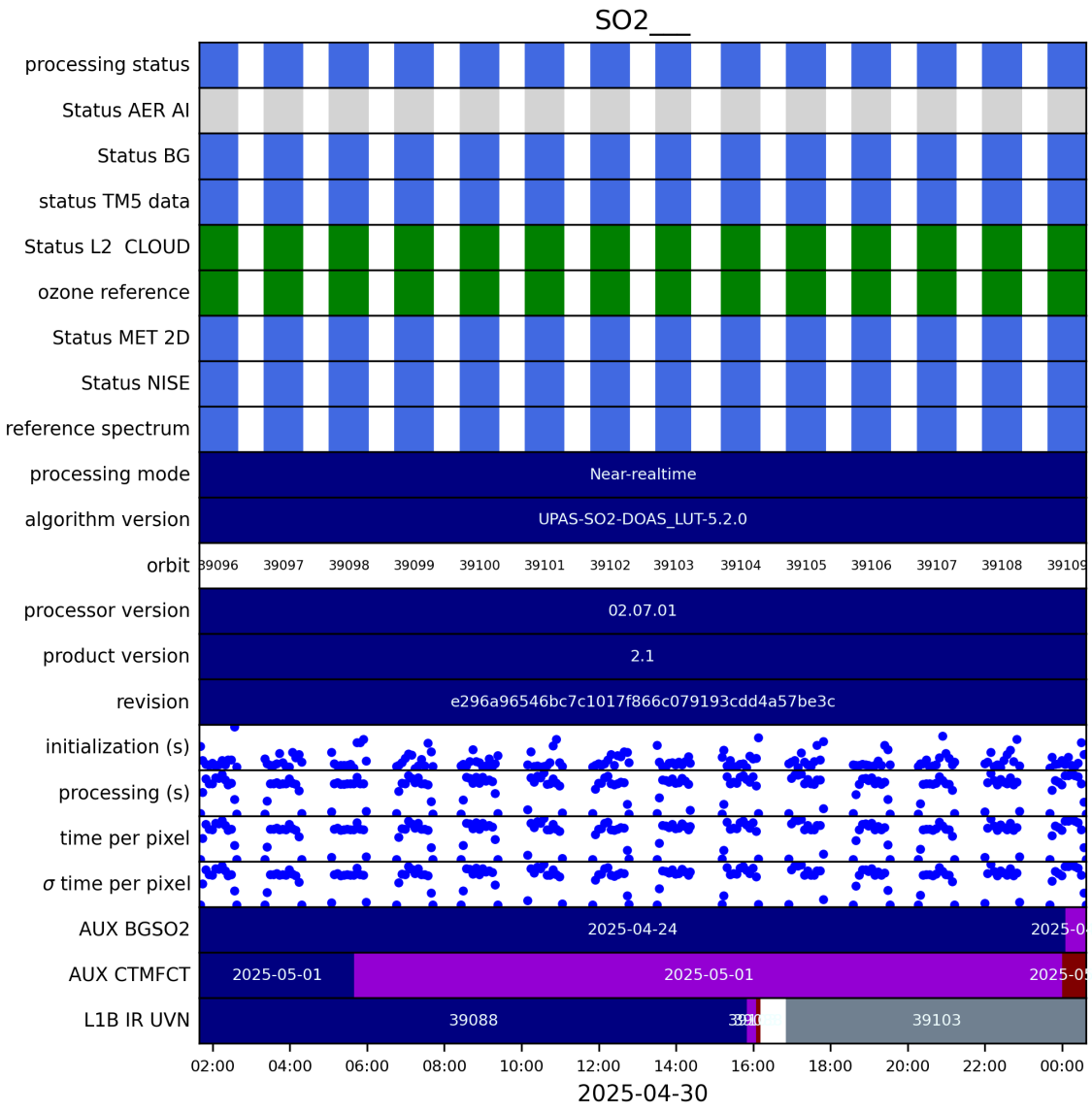

Figure 2: Input data per granule

5 Warnings and errors

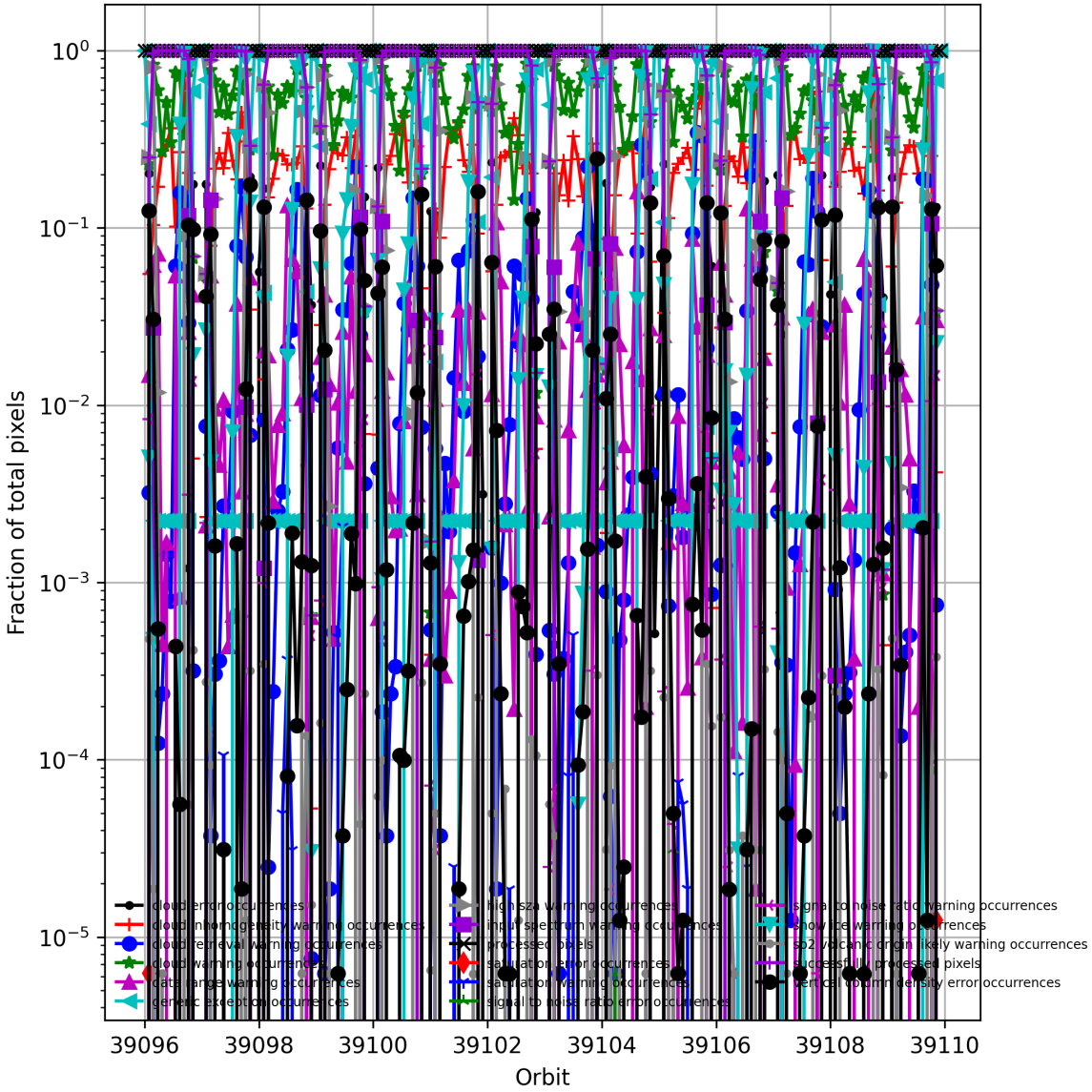

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

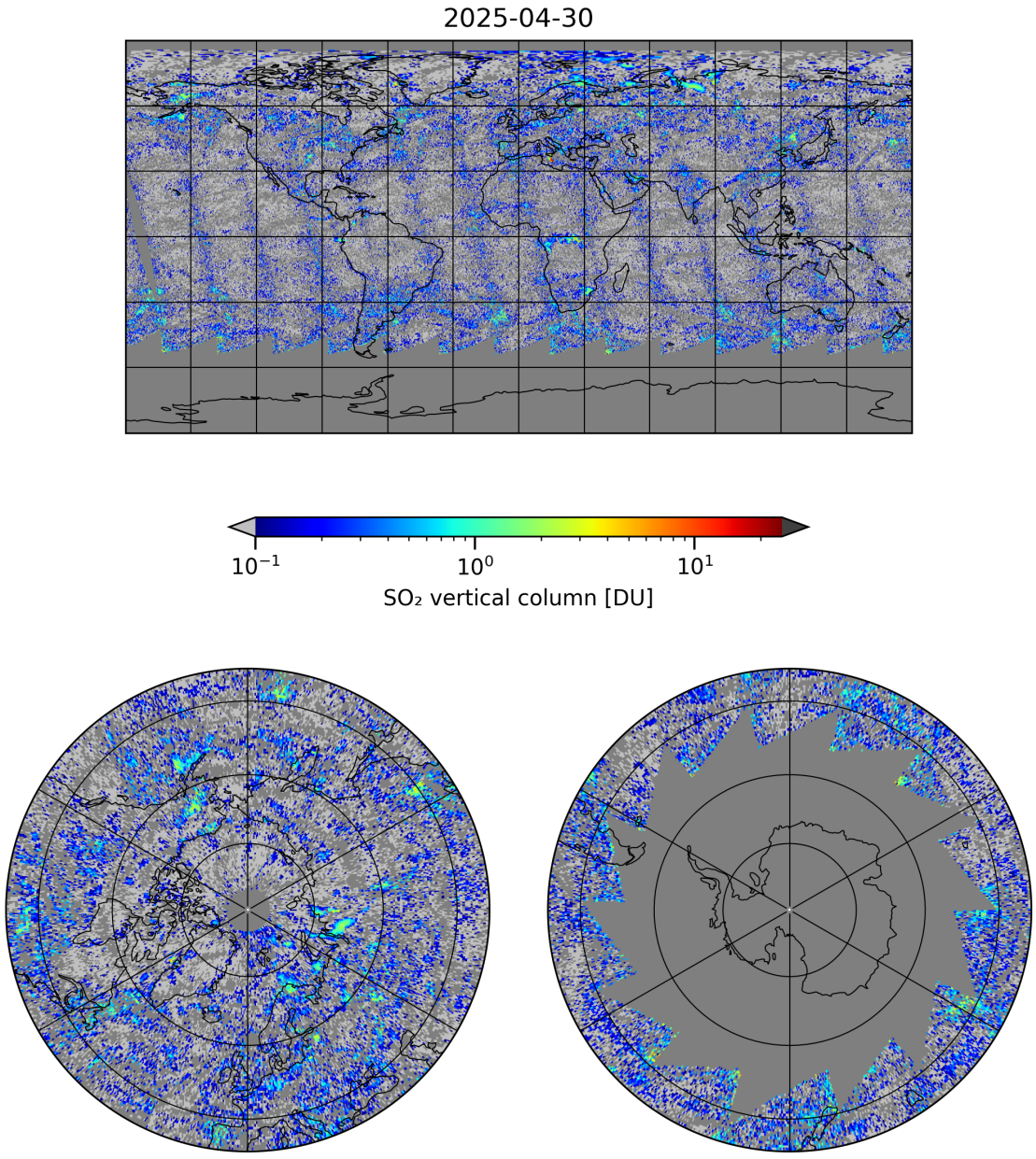

Figure 4: Map of "SO_2 vertical column" for 2025-04-30 to 2025-05-01

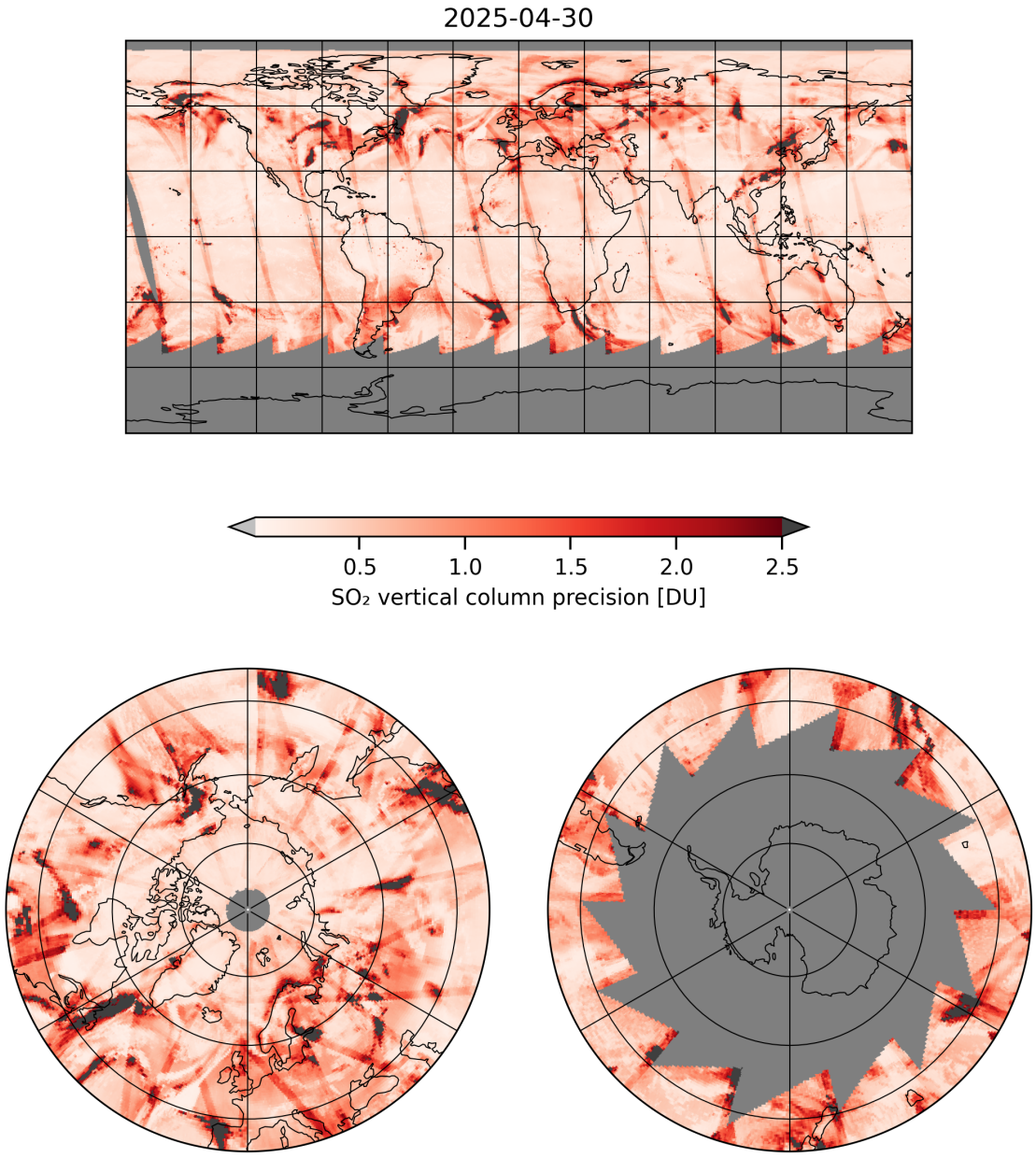

Figure 5: Map of "SO_2 vertical column precision" for 2025-04-30 to 2025-05-01

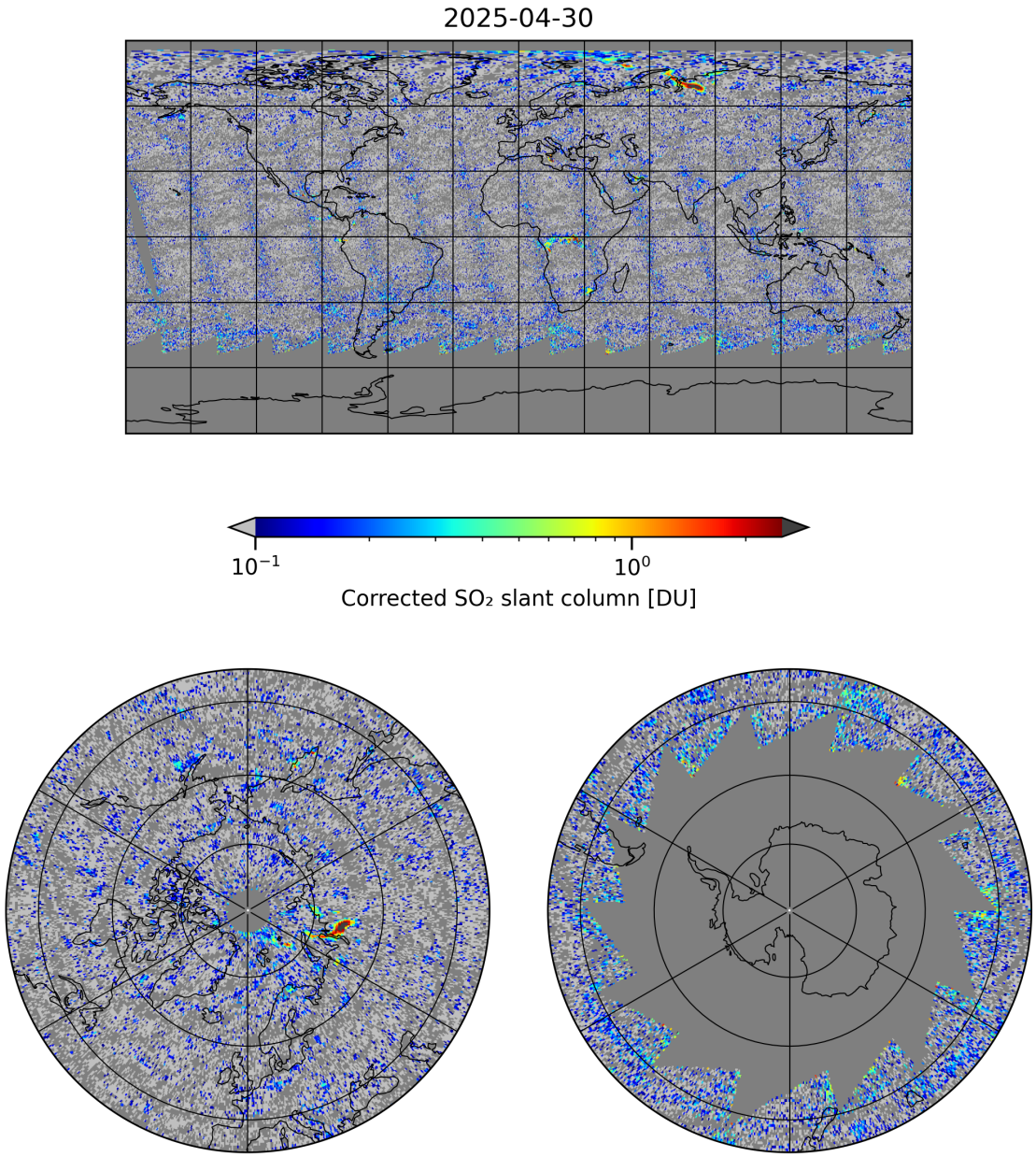

Figure 6: Map of “Corrected SO_2 slant column” for 2025-04-30 to 2025-05-01

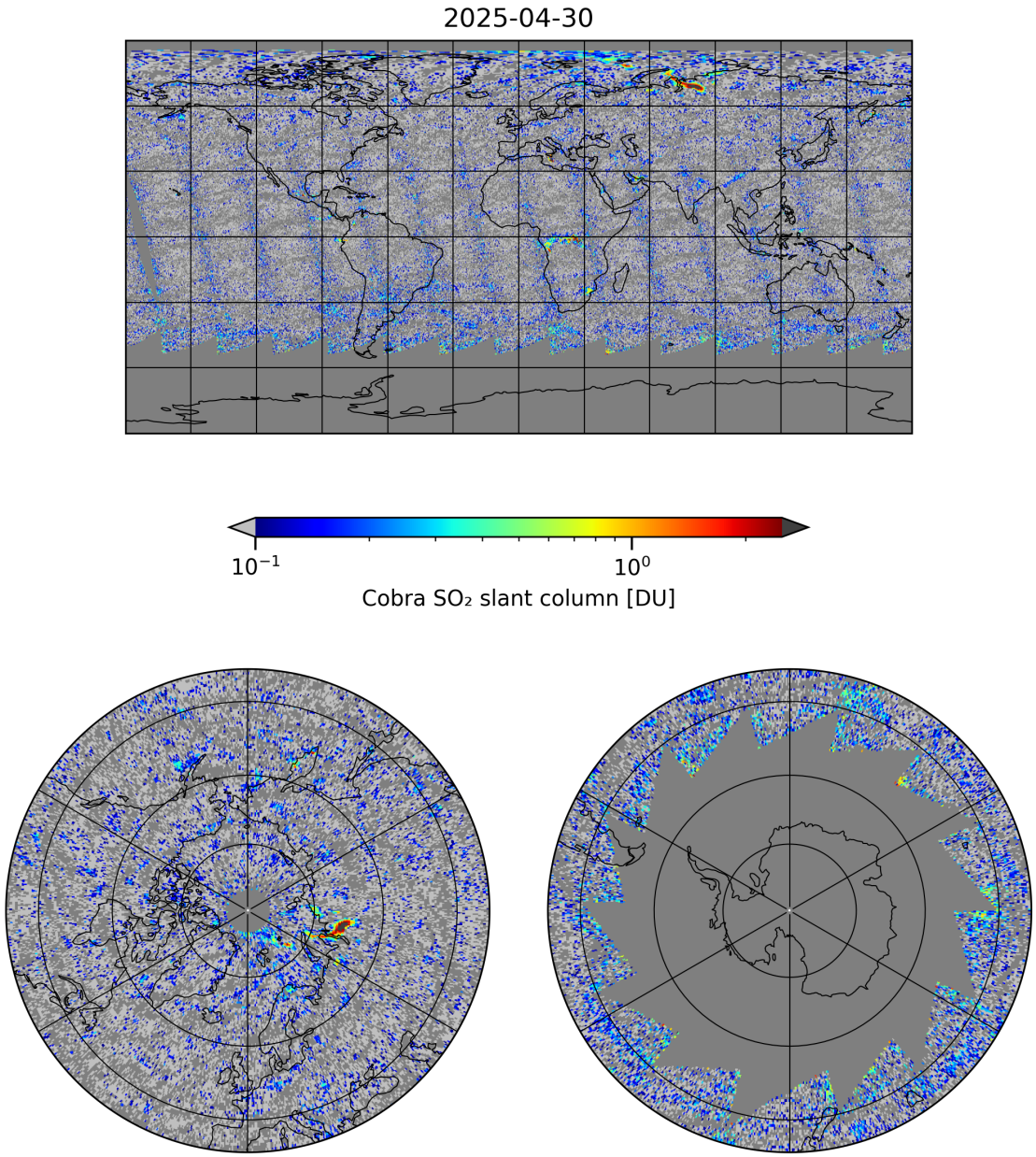

Figure 7: Map of "Cobra SO_2 slant column" for 2025-04-30 to 2025-05-01

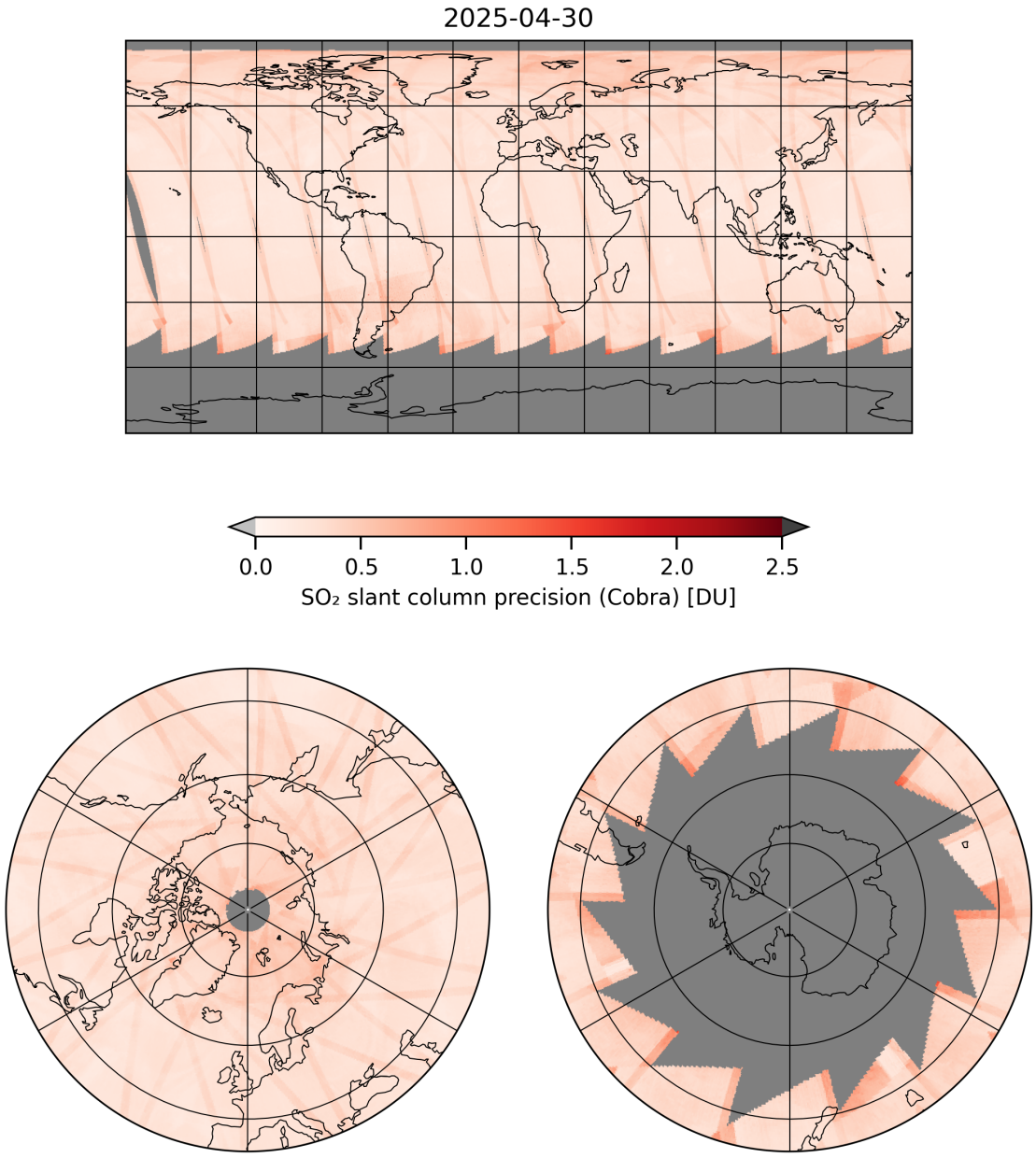

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-04-30 to 2025-05-01

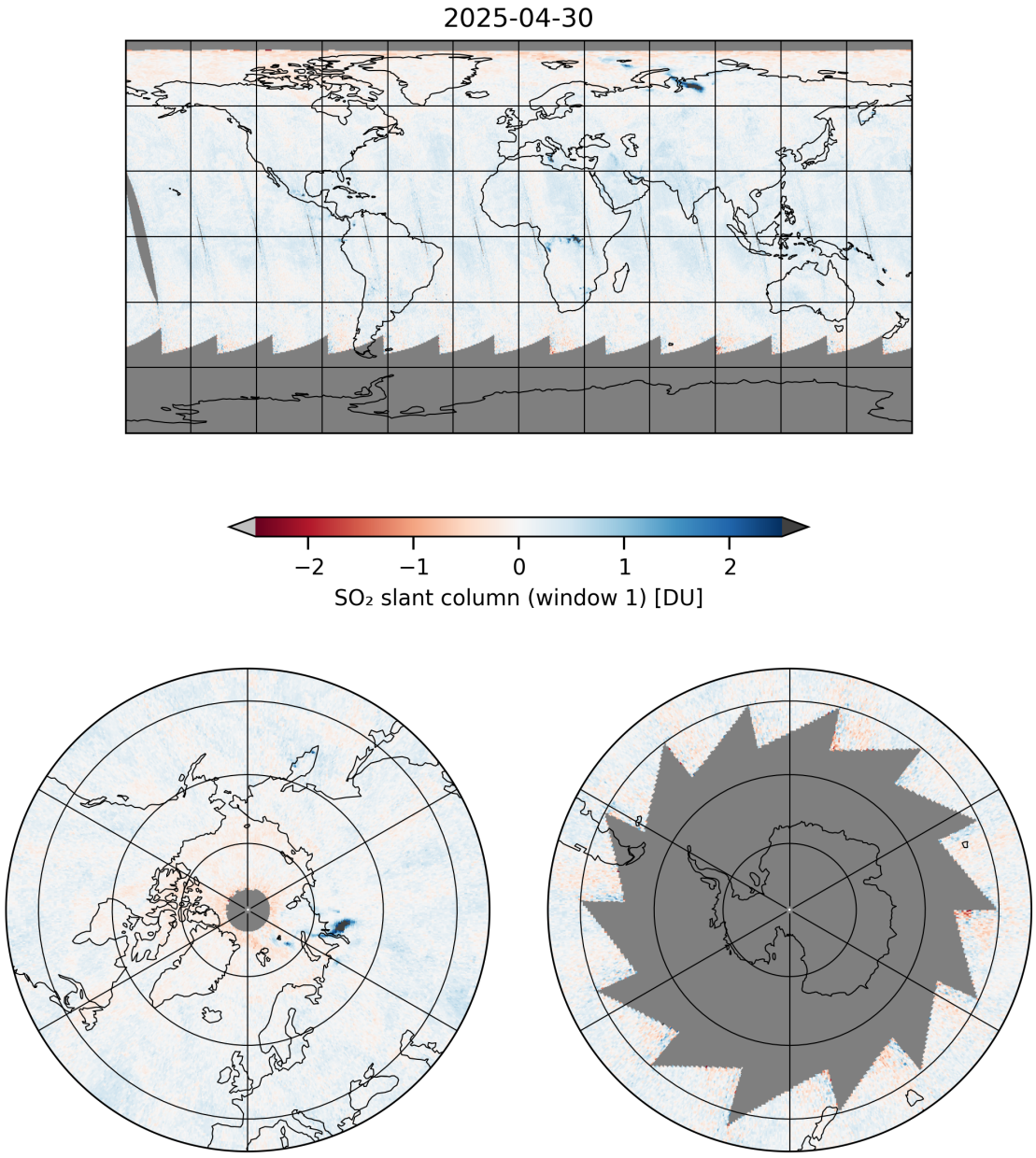

Figure 9: Map of "SO_2 slant column (window 1)" for 2025-04-30 to 2025-05-01

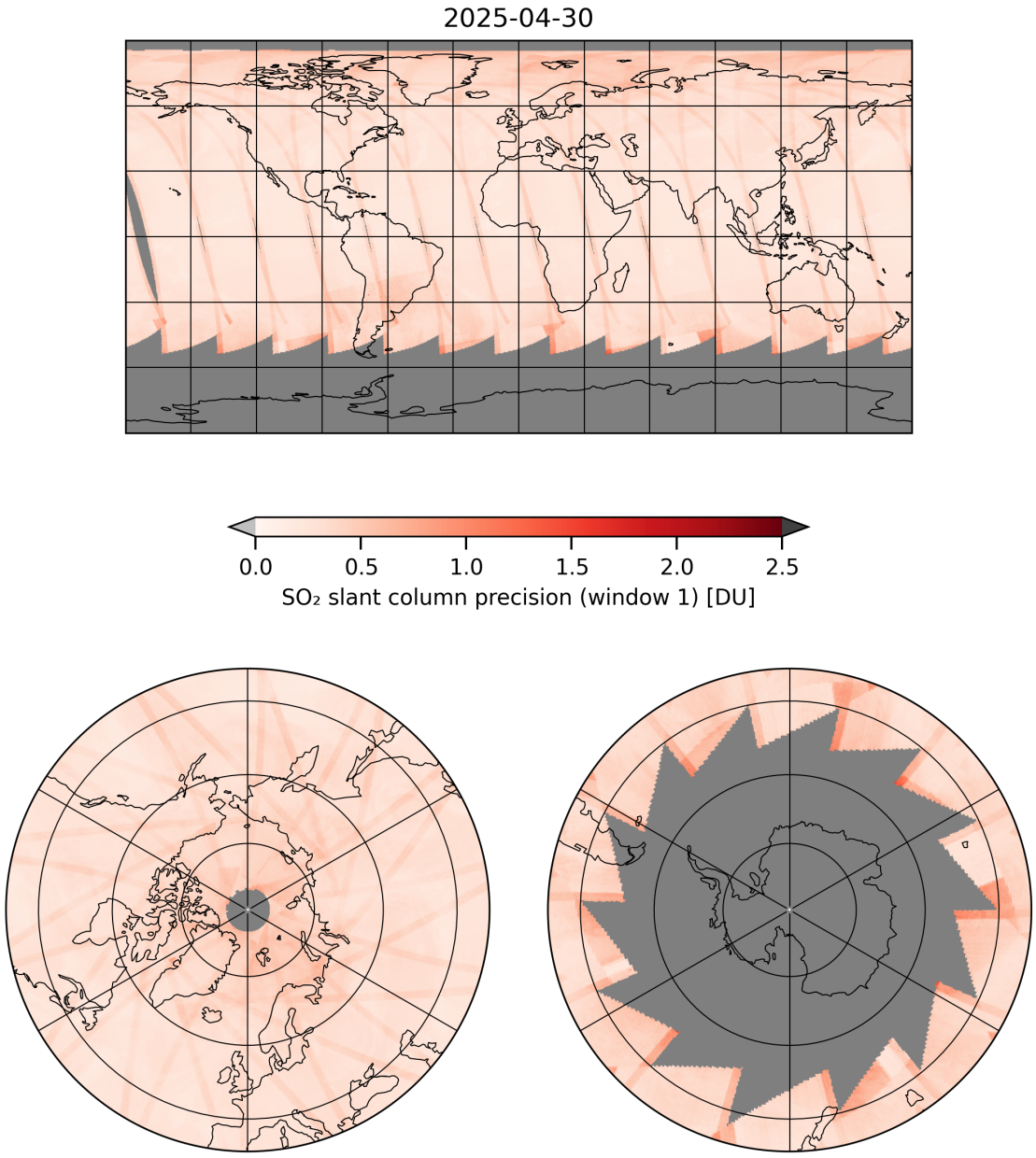

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-04-30 to 2025-05-01

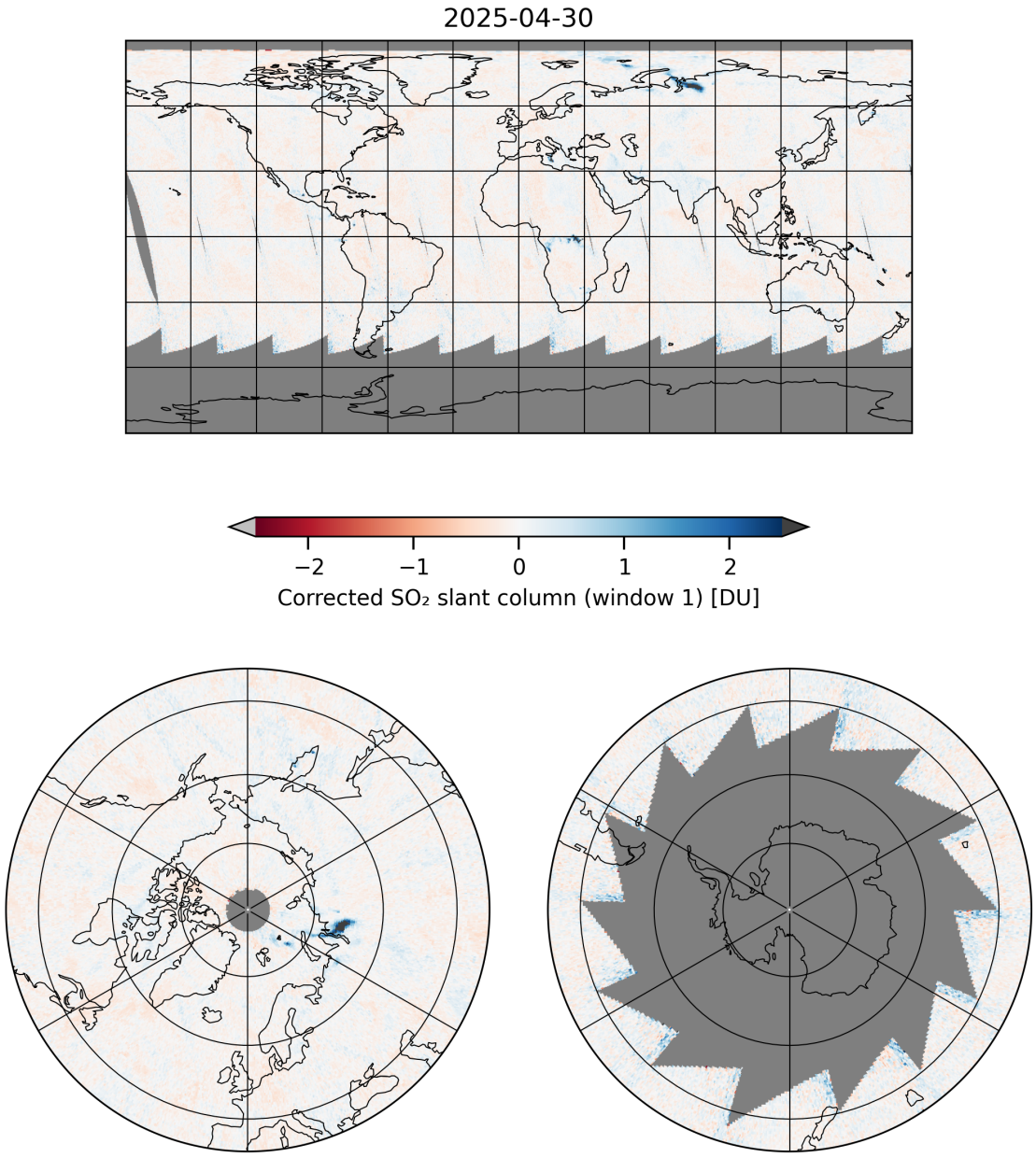

Figure 11: Map of “Corrected SO_2 slant column (window 1)” for 2025-04-30 to 2025-05-01

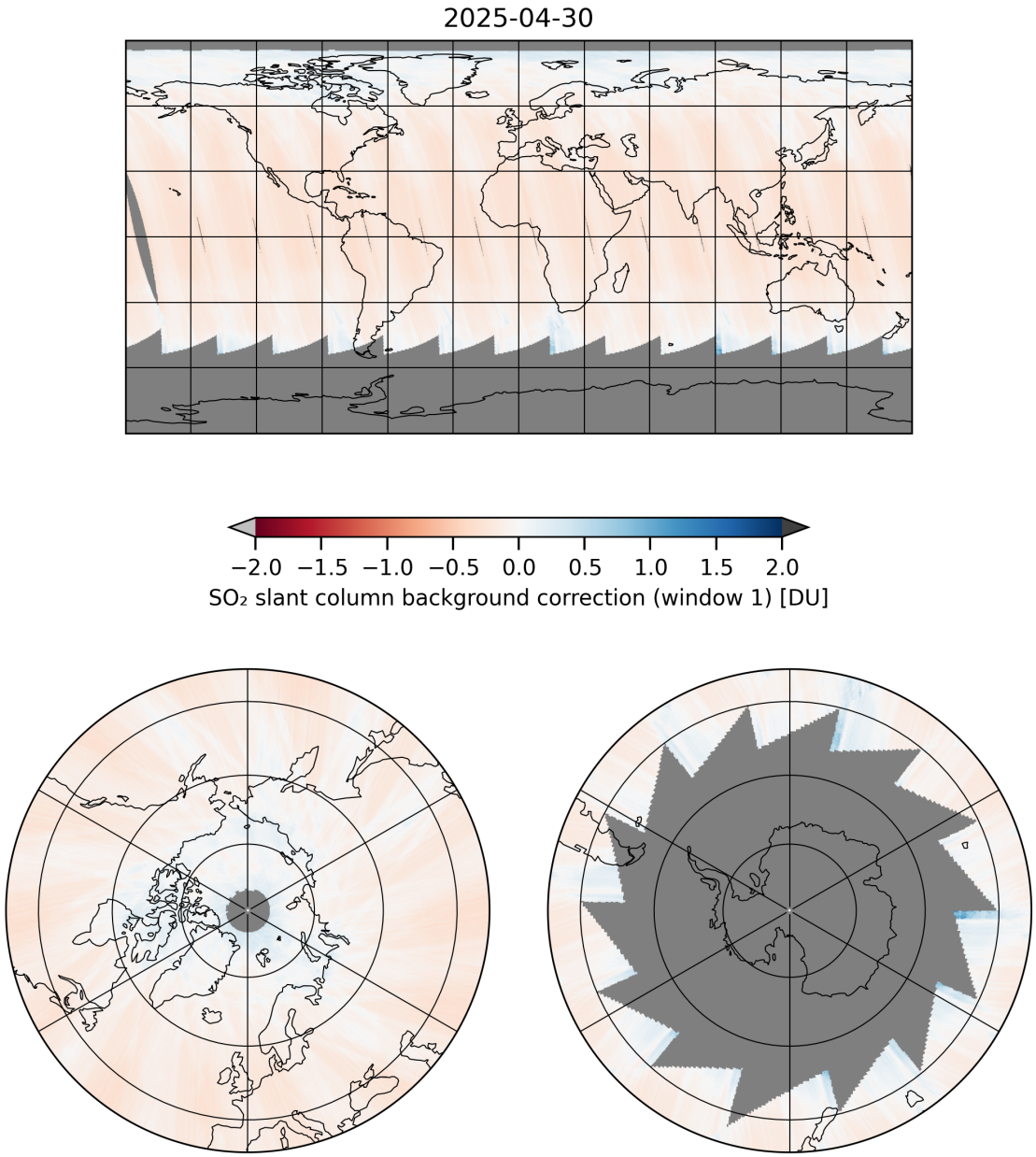

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-04-30 to 2025-05-01

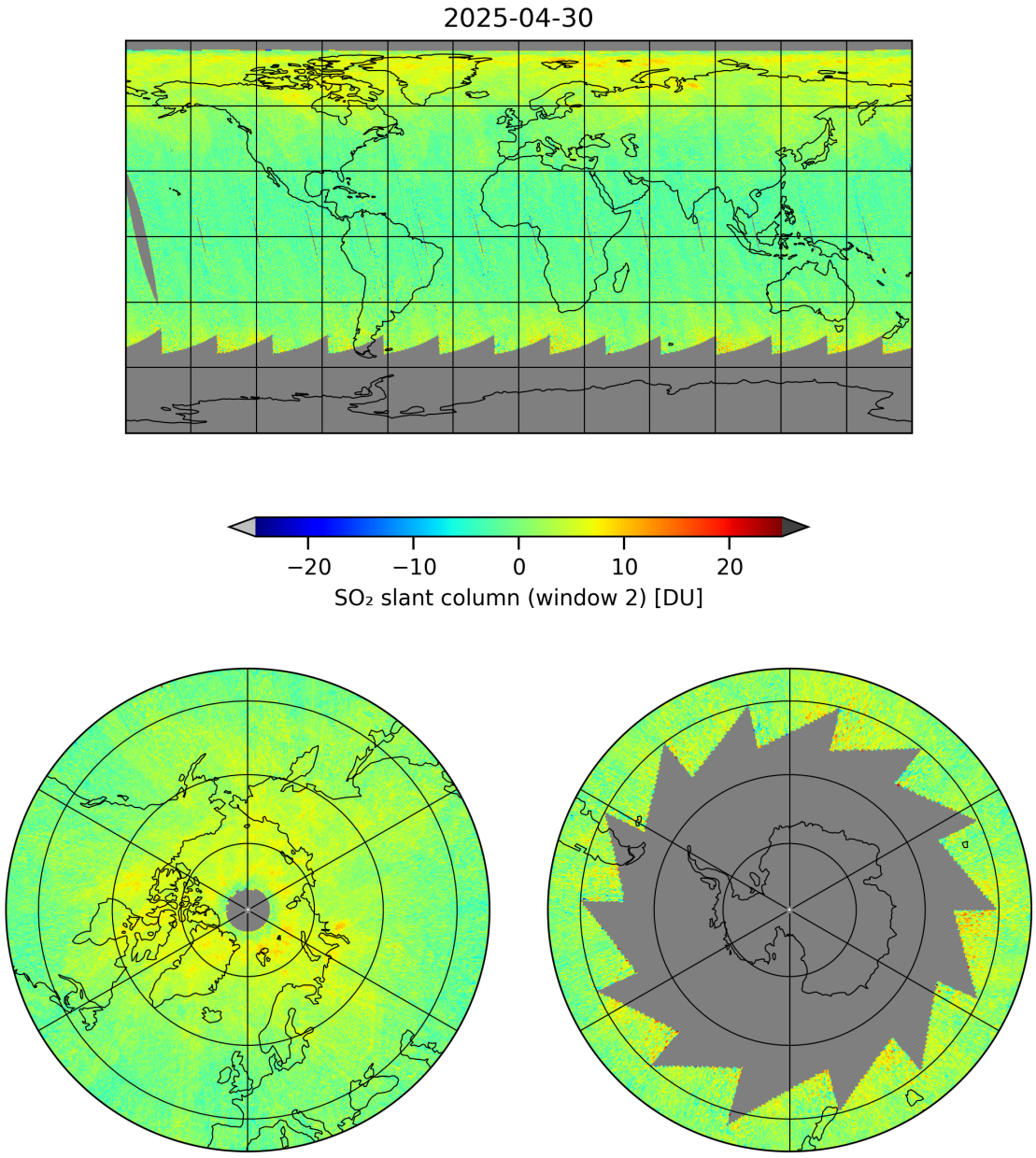

Figure 13: Map of "SO_2 slant column (window 2)" for 2025-04-30 to 2025-05-01

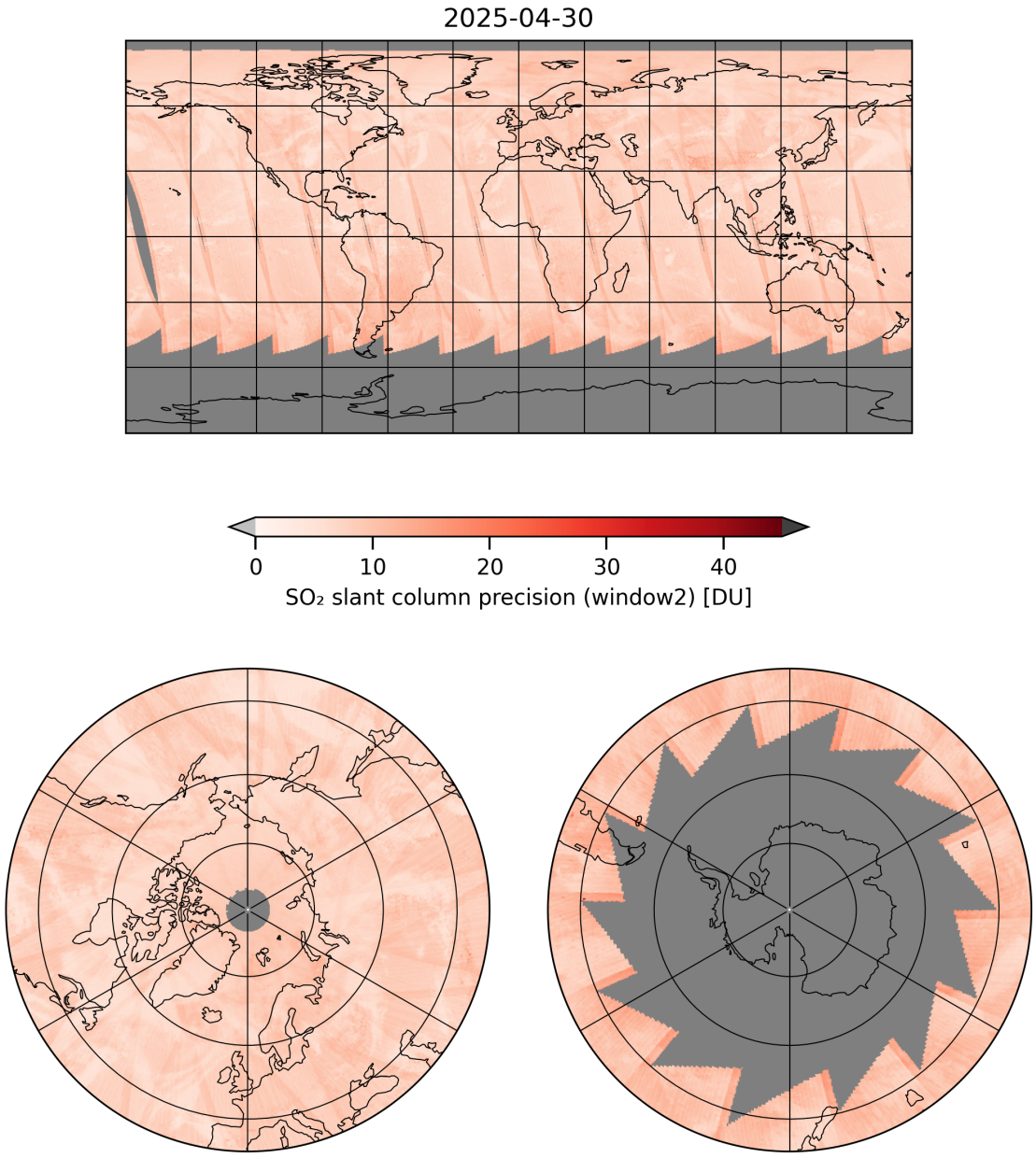

Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-04-30 to 2025-05-01

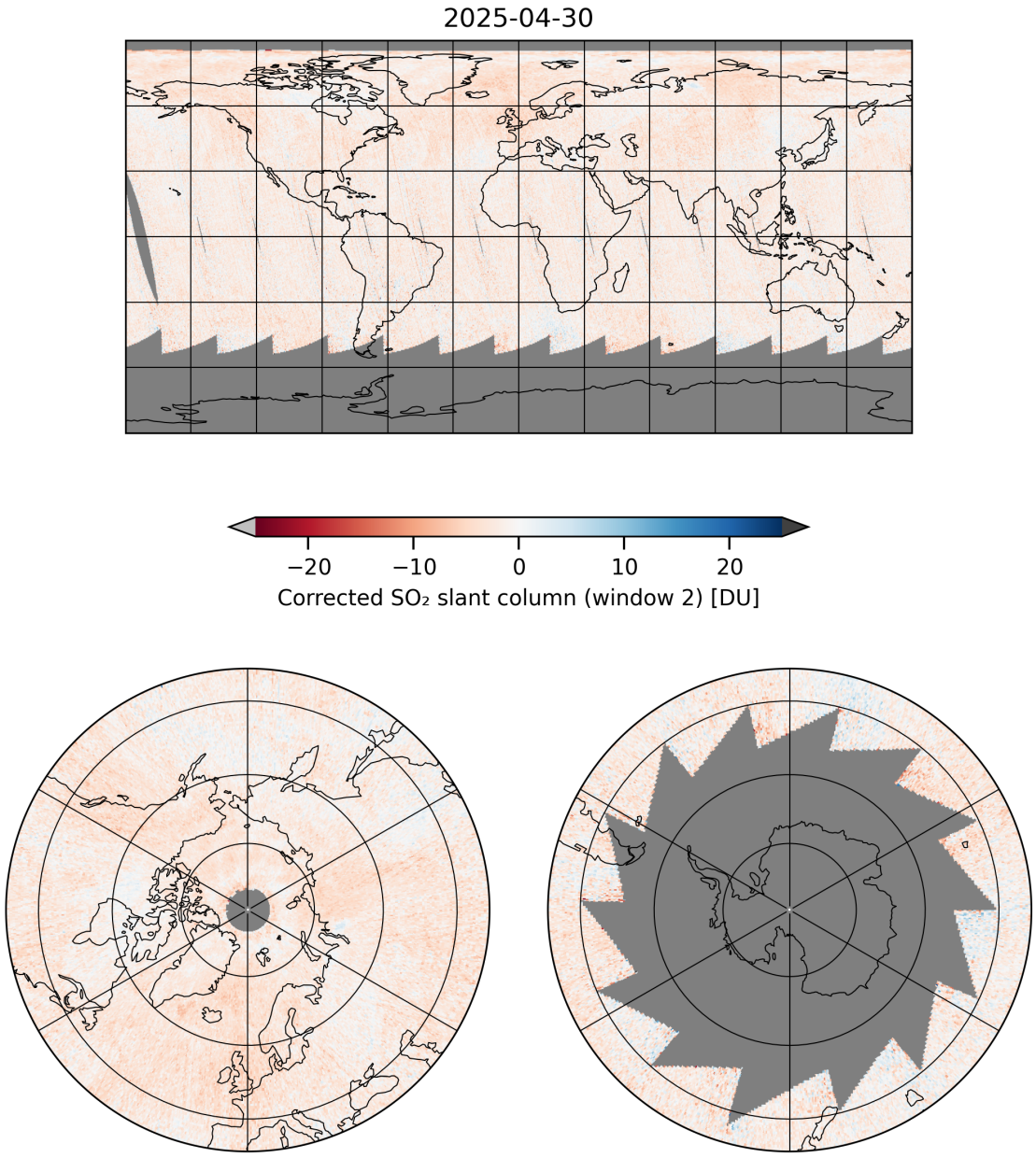

Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2025-04-30 to 2025-05-01

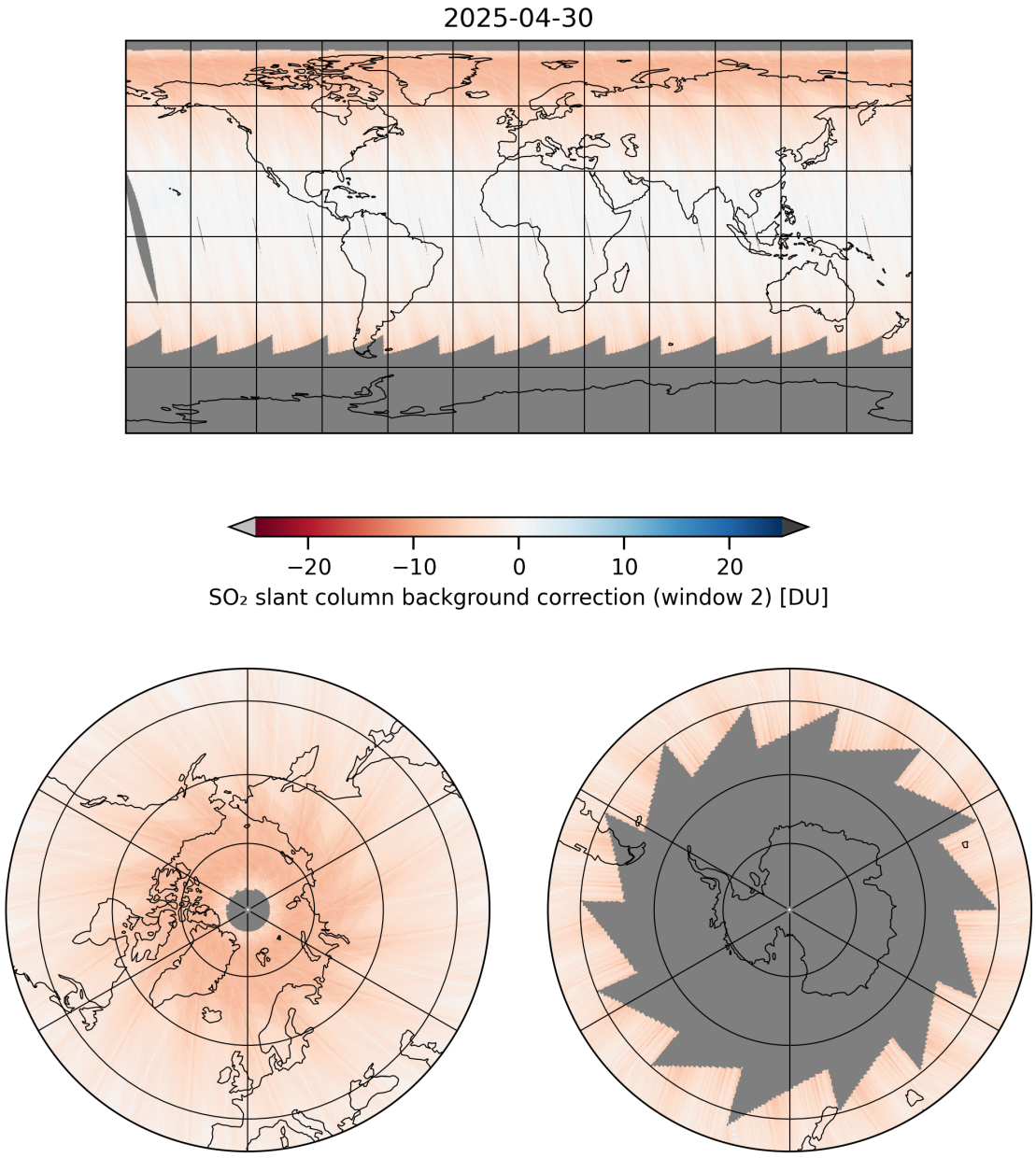

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-04-30 to 2025-05-01

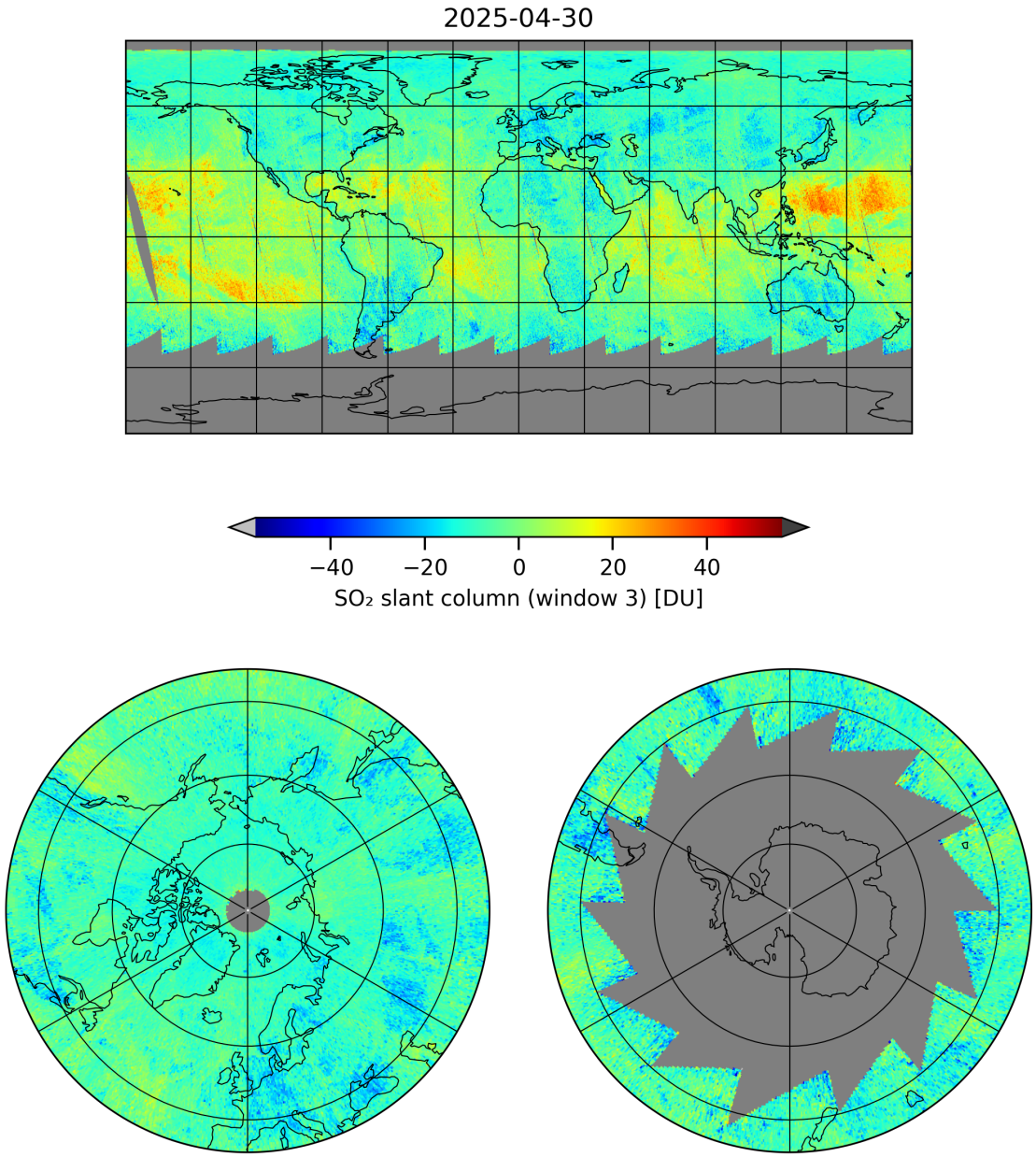

Figure 17: Map of "SO_2 slant column (window 3)" for 2025-04-30 to 2025-05-01

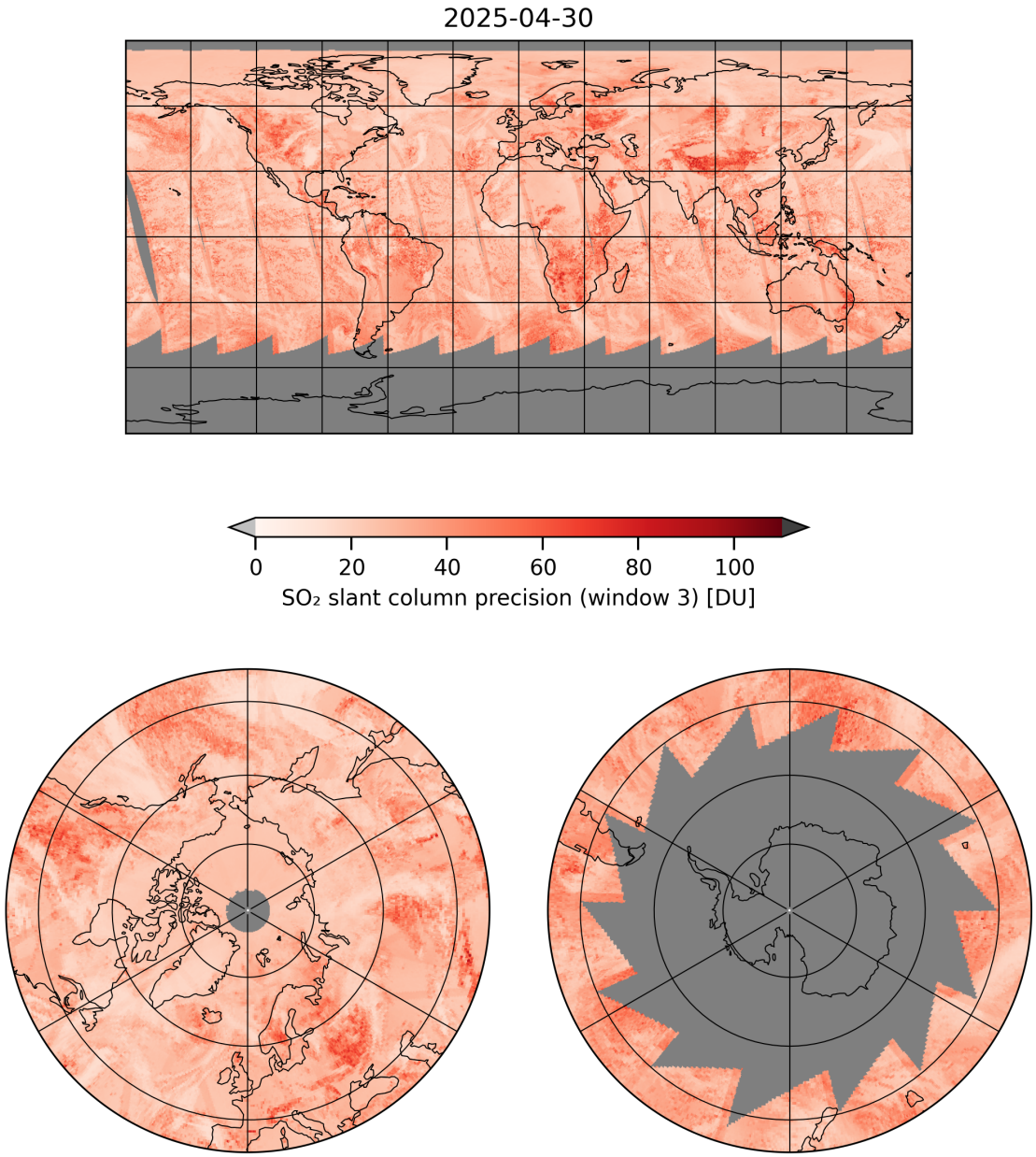

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-04-30 to 2025-05-01

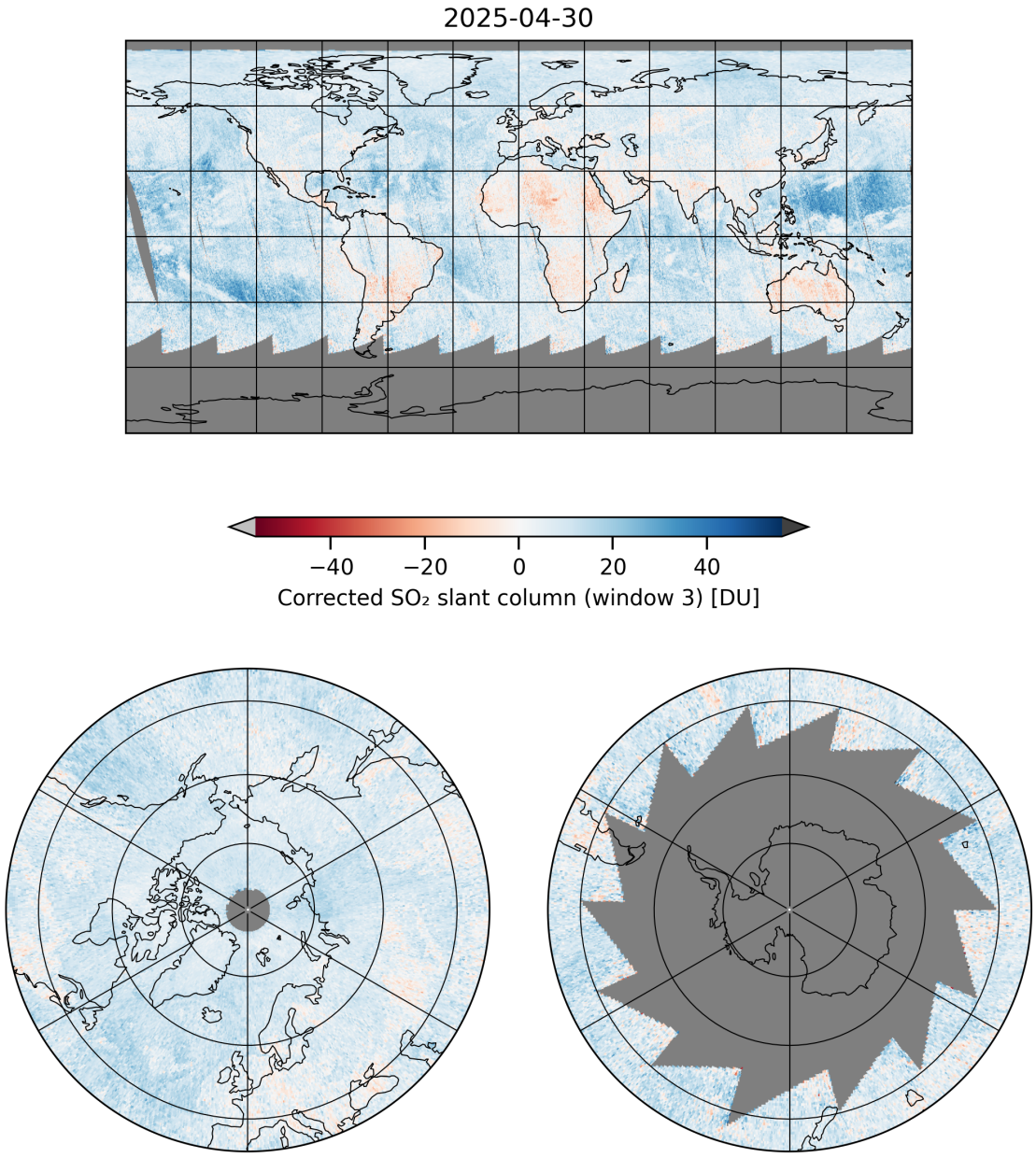

Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-04-30 to 2025-05-01

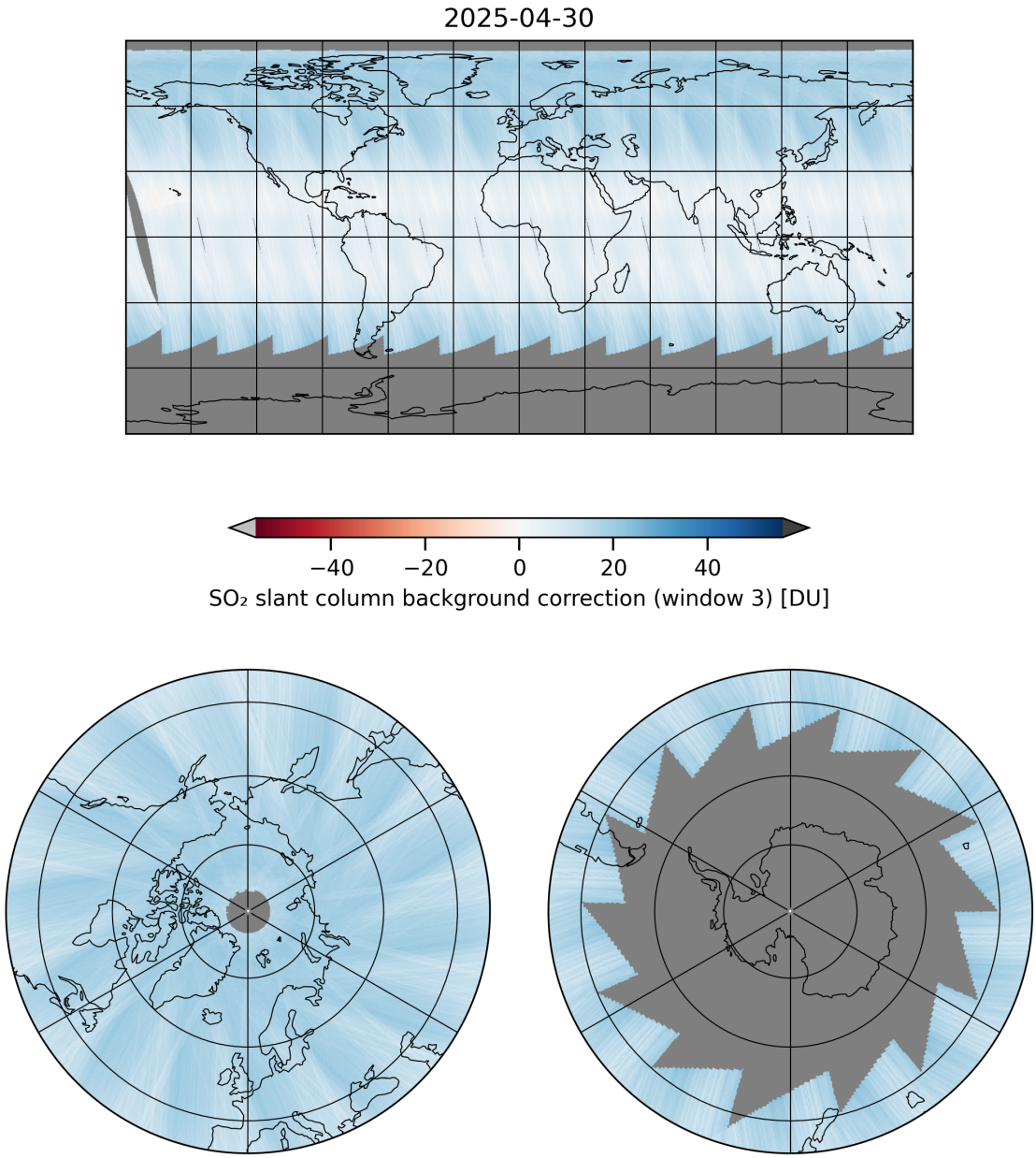

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-04-30 to 2025-05-01

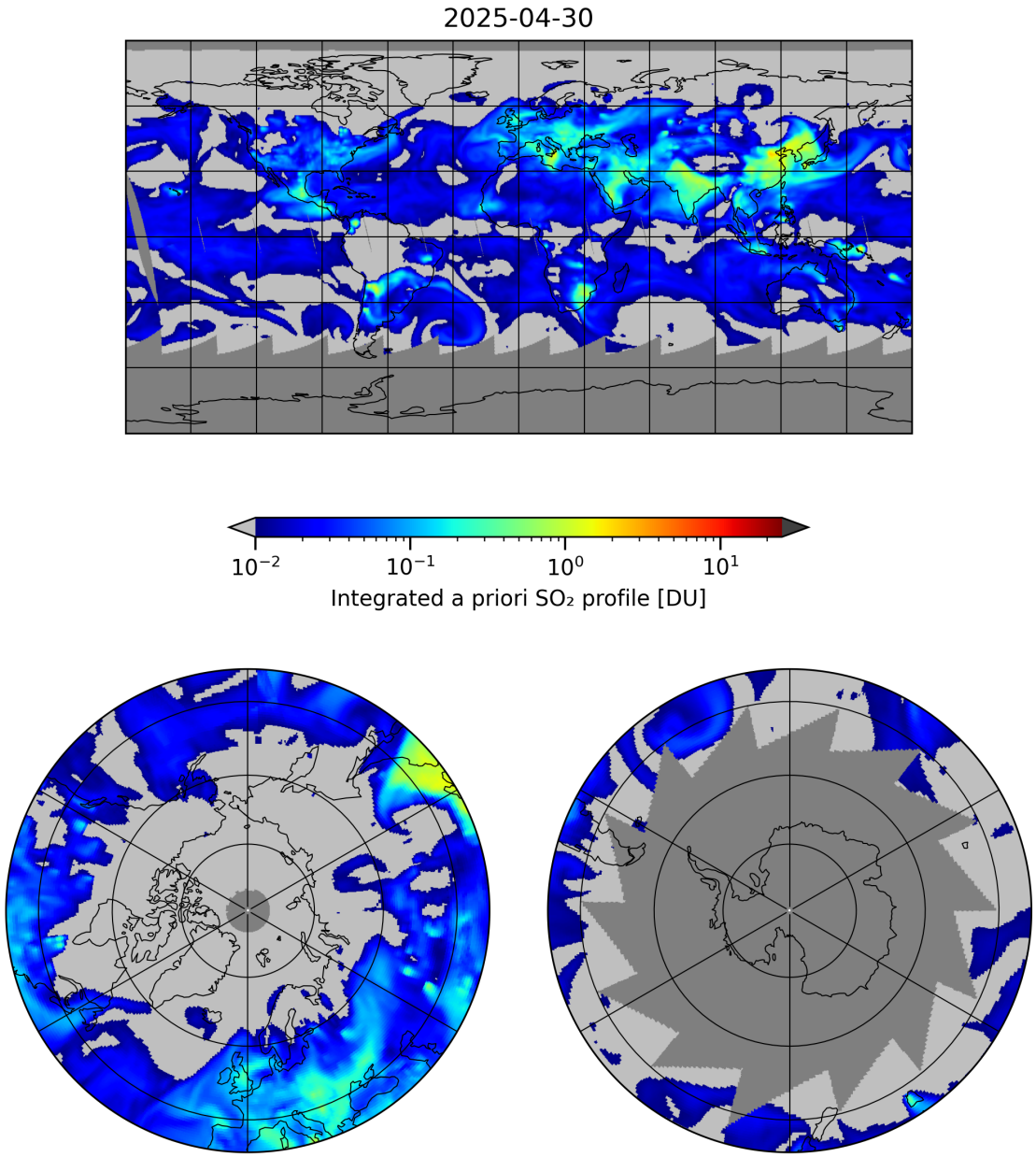

Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-04-30 to 2025-05-01

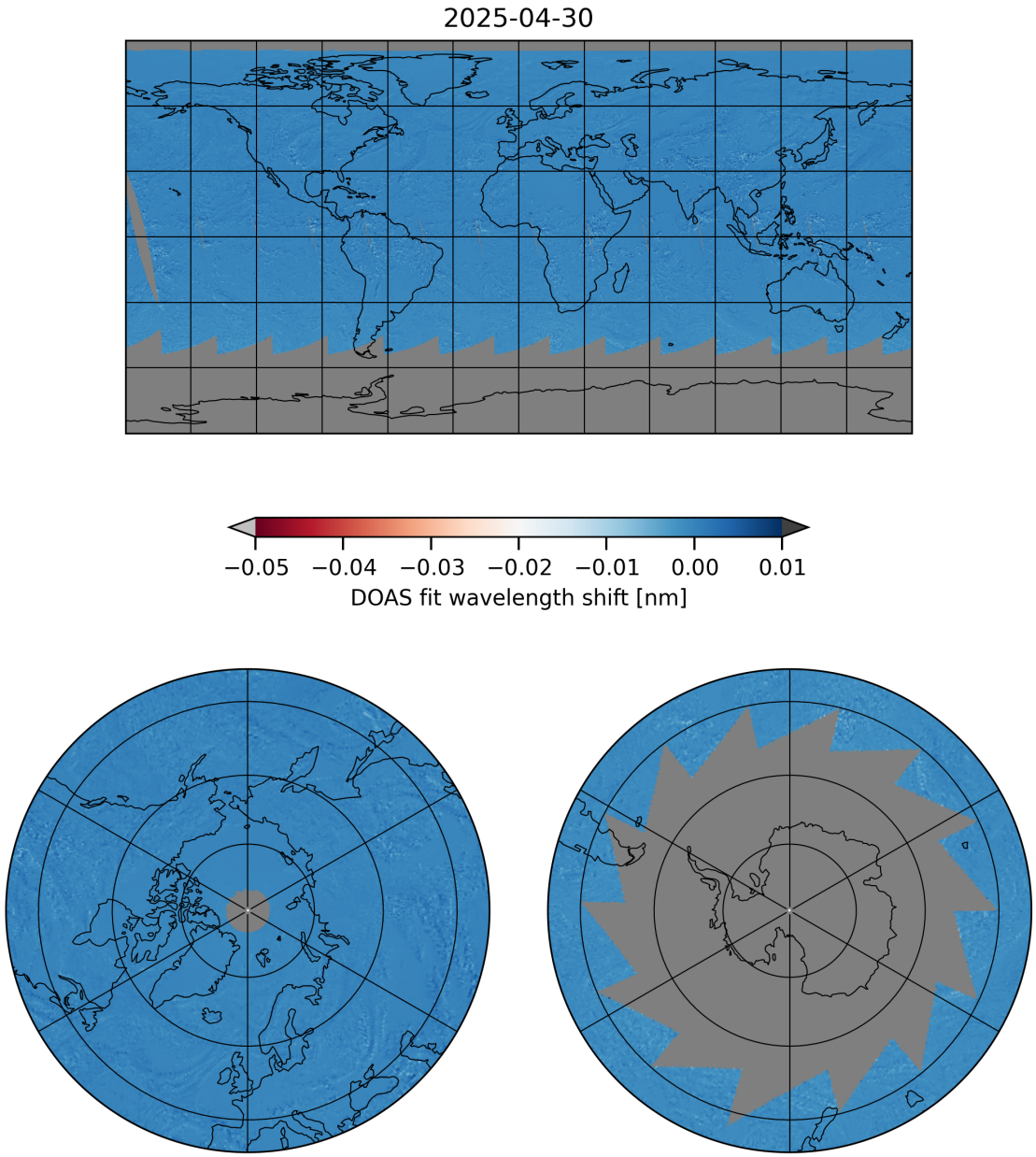

Figure 22: Map of “DOAS fit wavelength shift” for 2025-04-30 to 2025-05-01

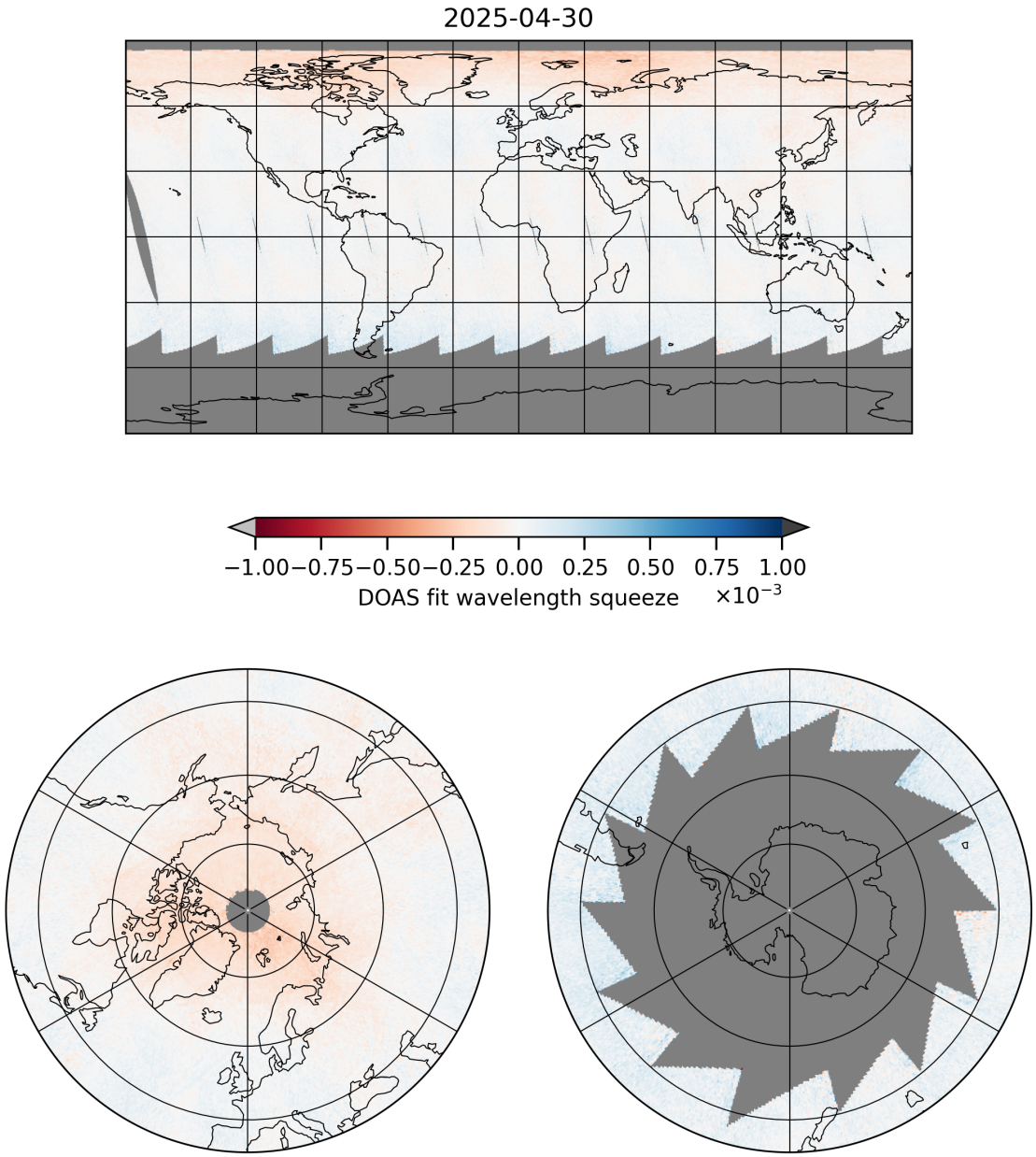

Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-04-30 to 2025-05-01

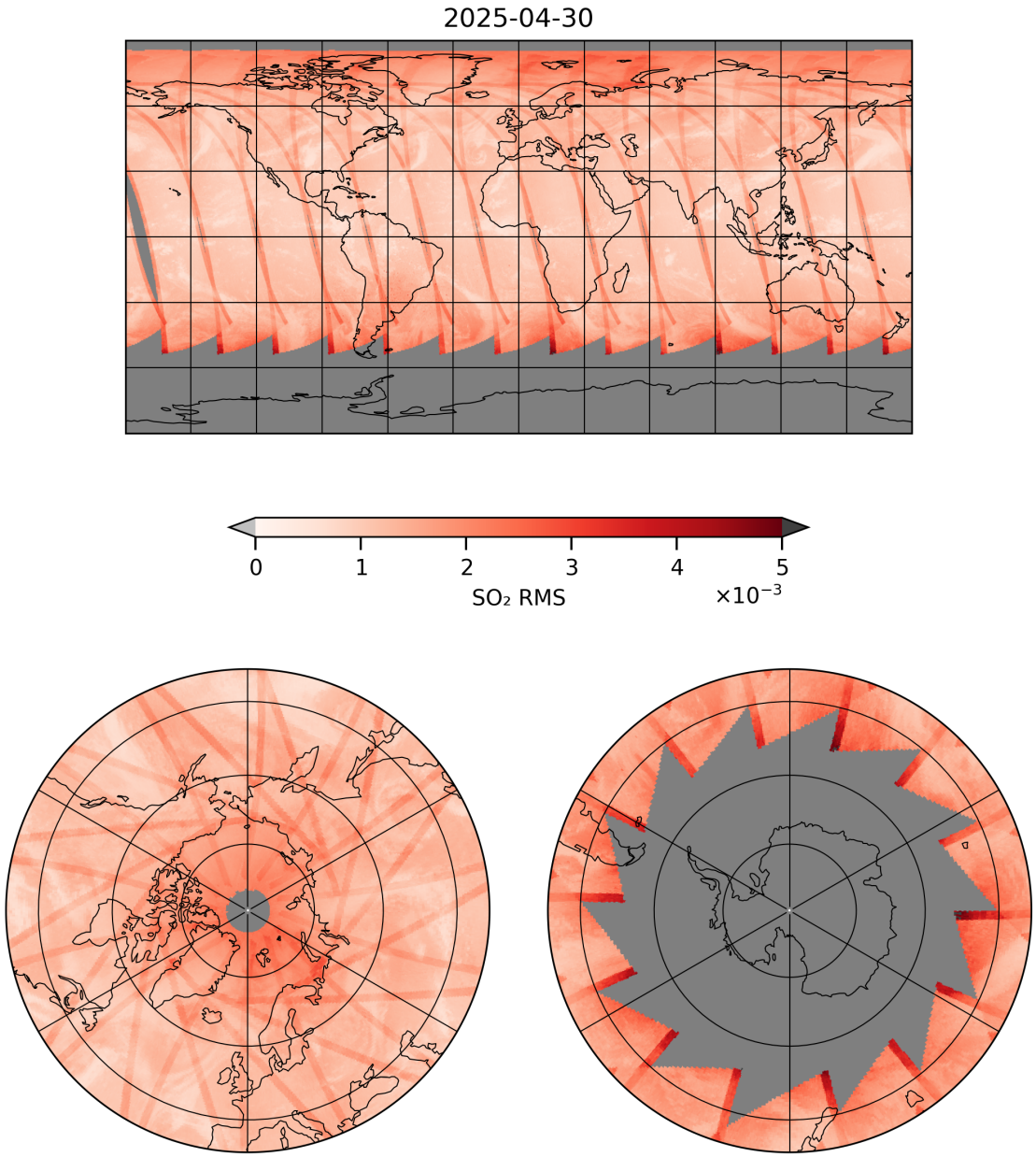

Figure 24: Map of "SO_2 RMS" for 2025-04-30 to 2025-05-01

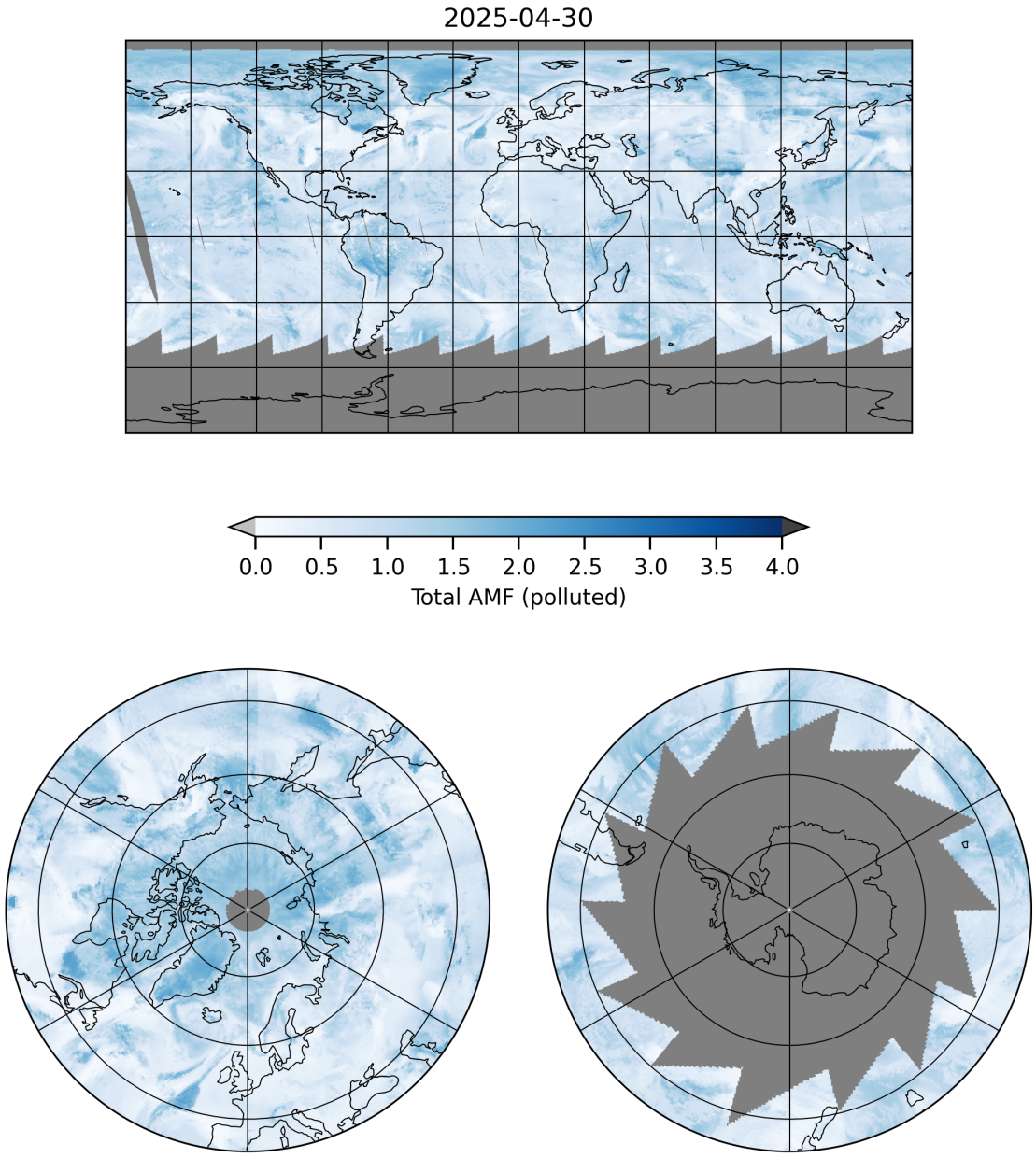

Figure 25: Map of “Total AMF (polluted)” for 2025-04-30 to 2025-05-01

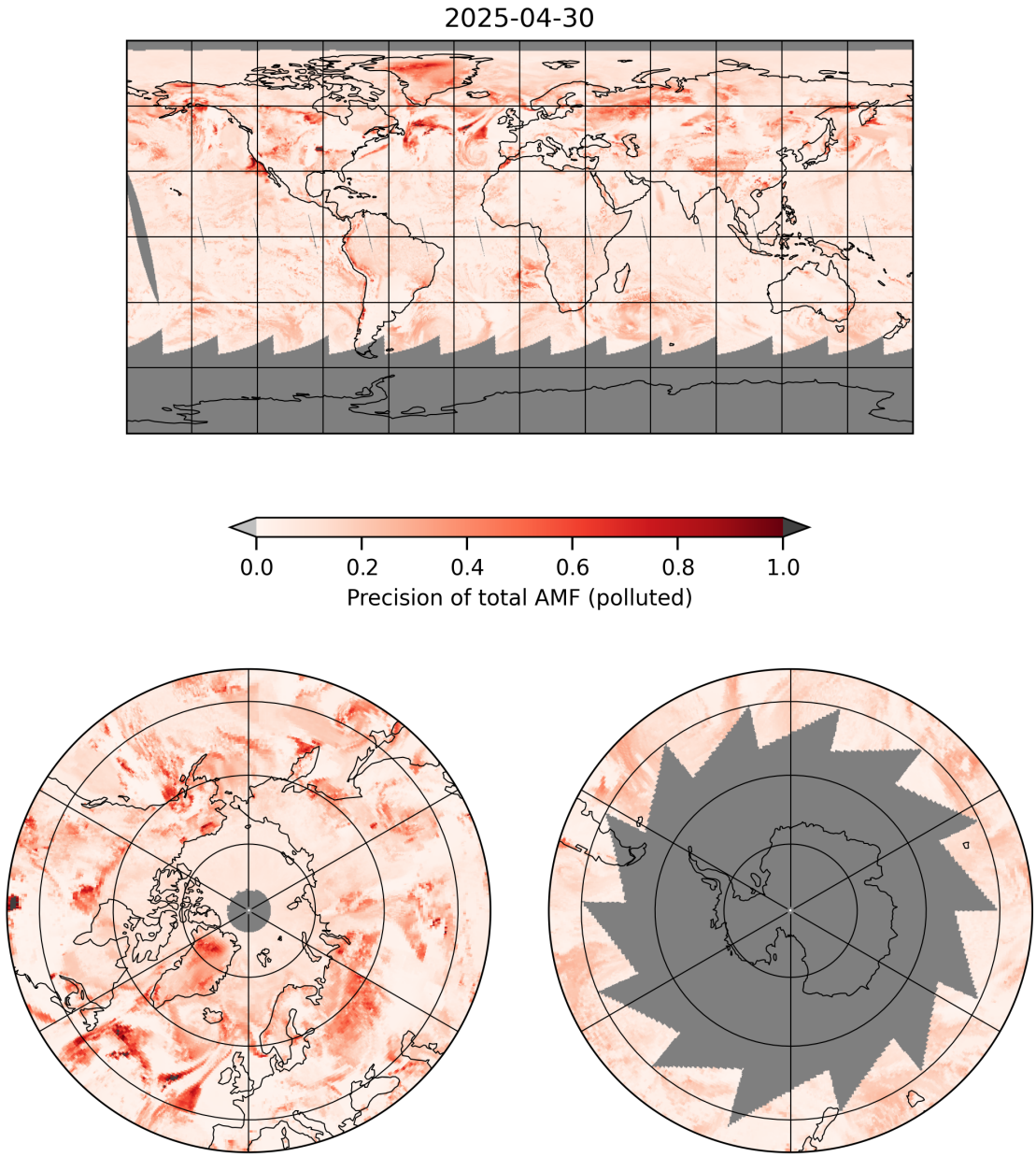

Figure 26: Map of “Precision of total AMF (polluted)” for 2025-04-30 to 2025-05-01

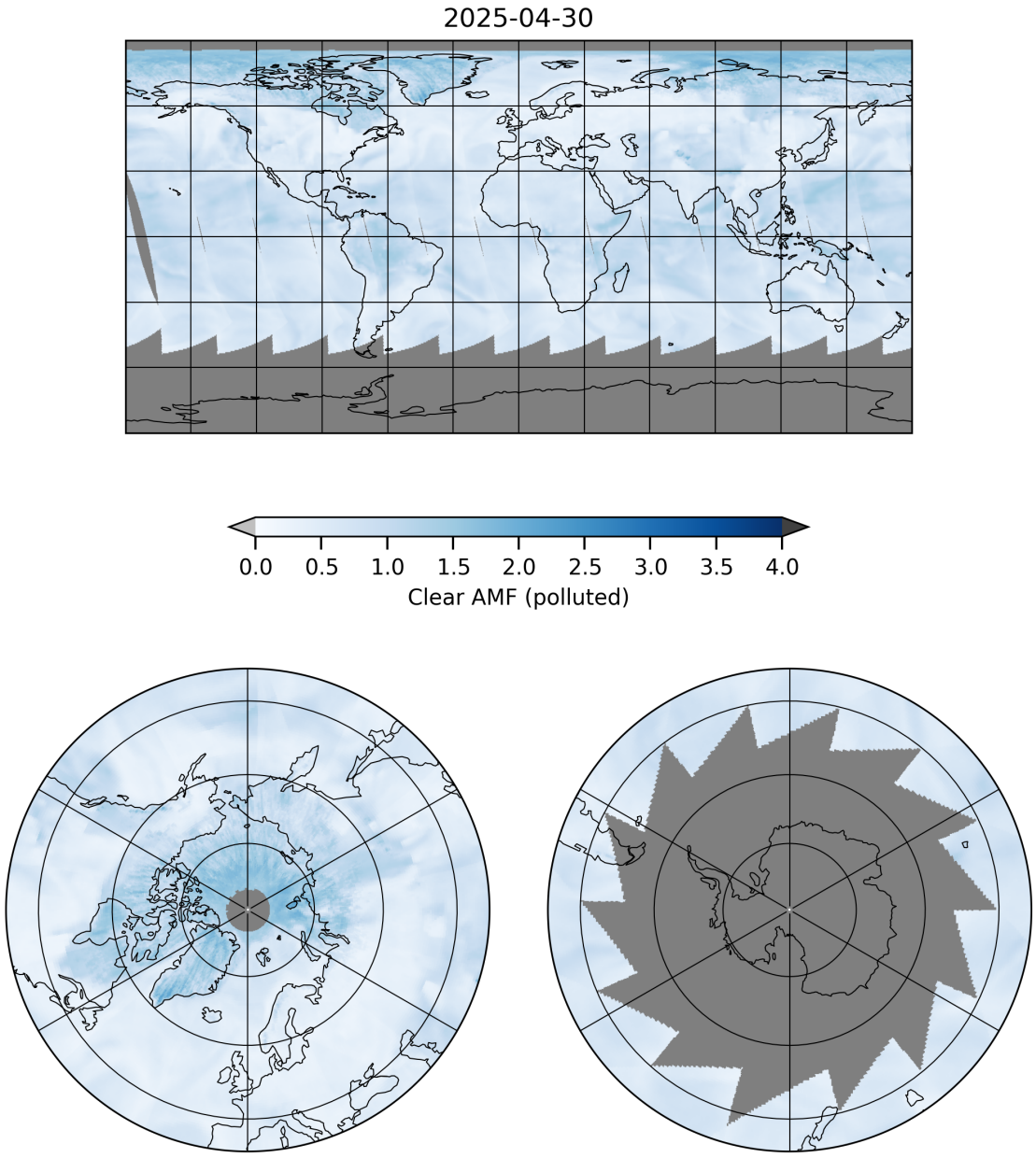

Figure 27: Map of “Clear AMF (polluted)” for 2025-04-30 to 2025-05-01

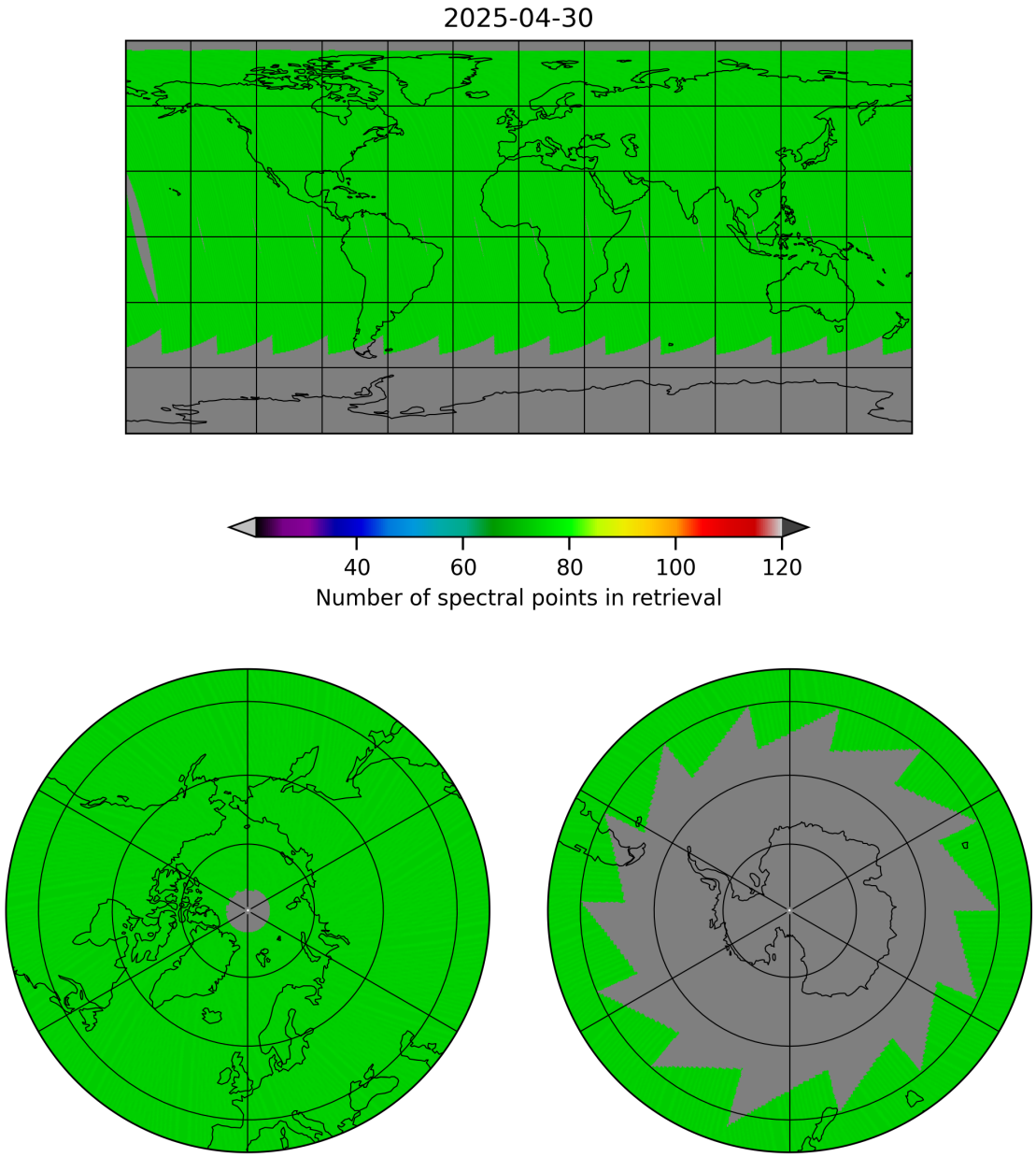

Figure 28: Map of “Number of spectral points in retrieval” for 2025-04-30 to 2025-05-01

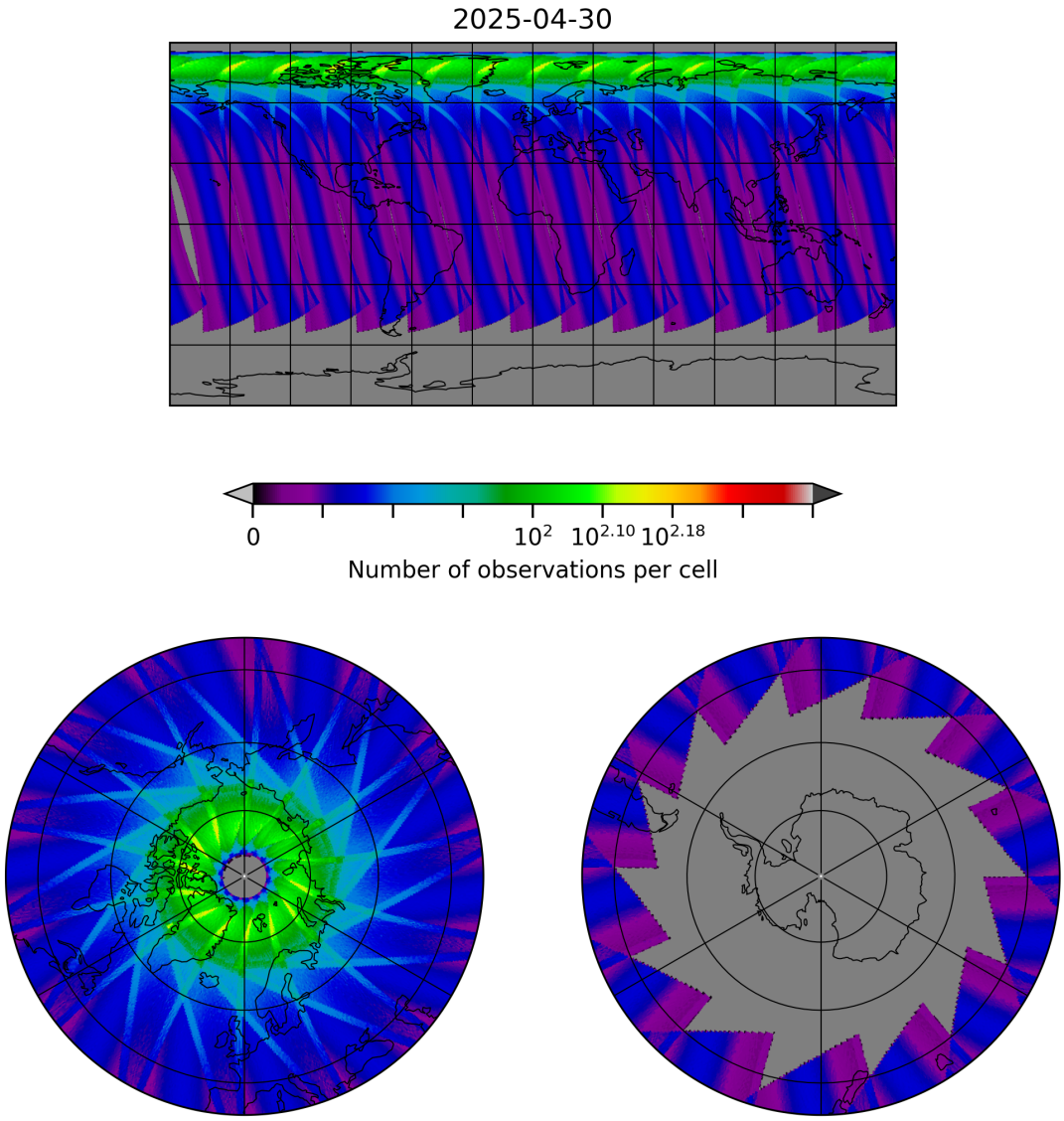

Figure 29: Map of the number of observations for 2025-04-30 to 2025-05-01

7 Zonal average

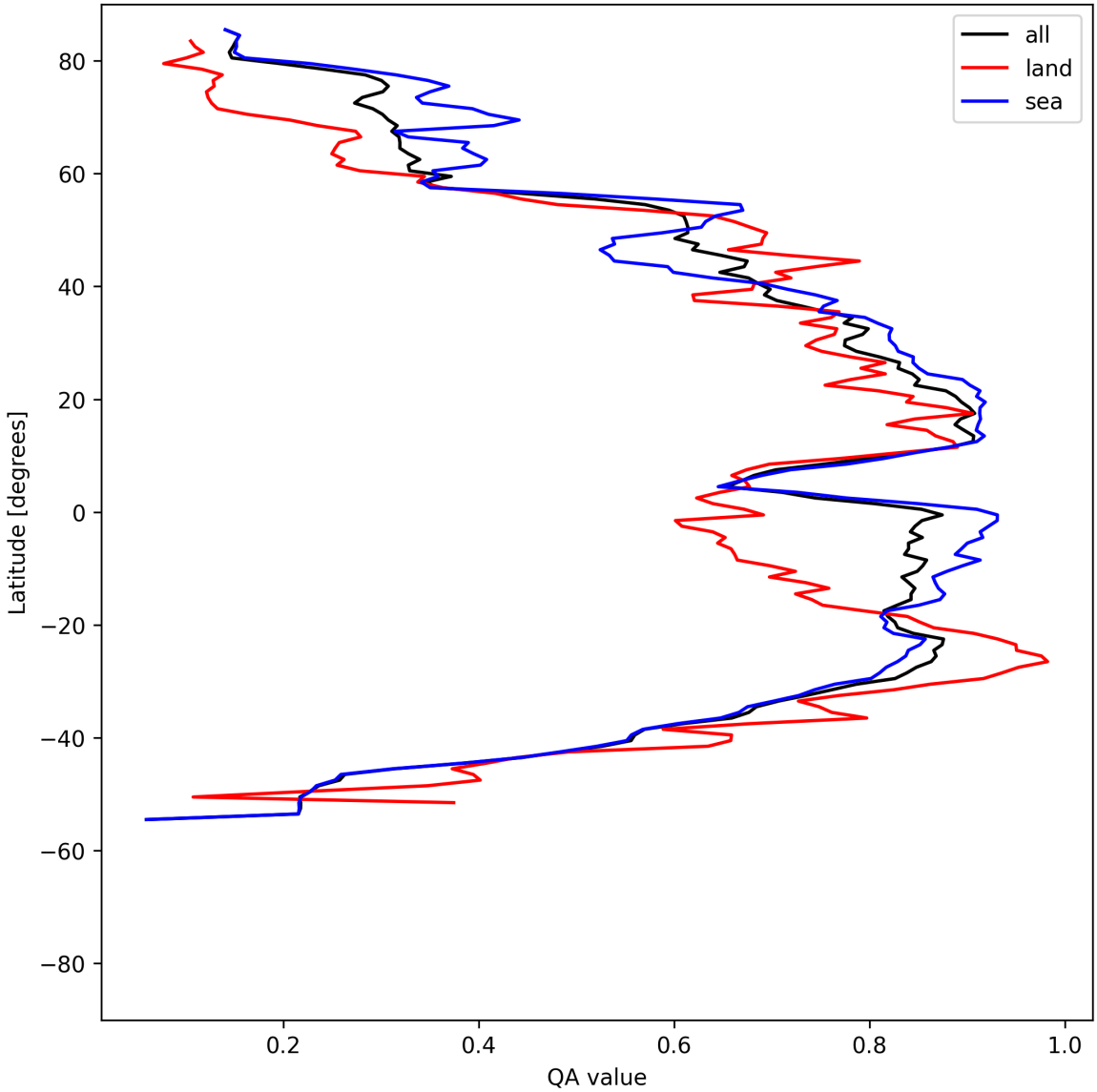

Figure 30: Zonal average of “QA value” for 2025-04-30 to 2025-05-01.

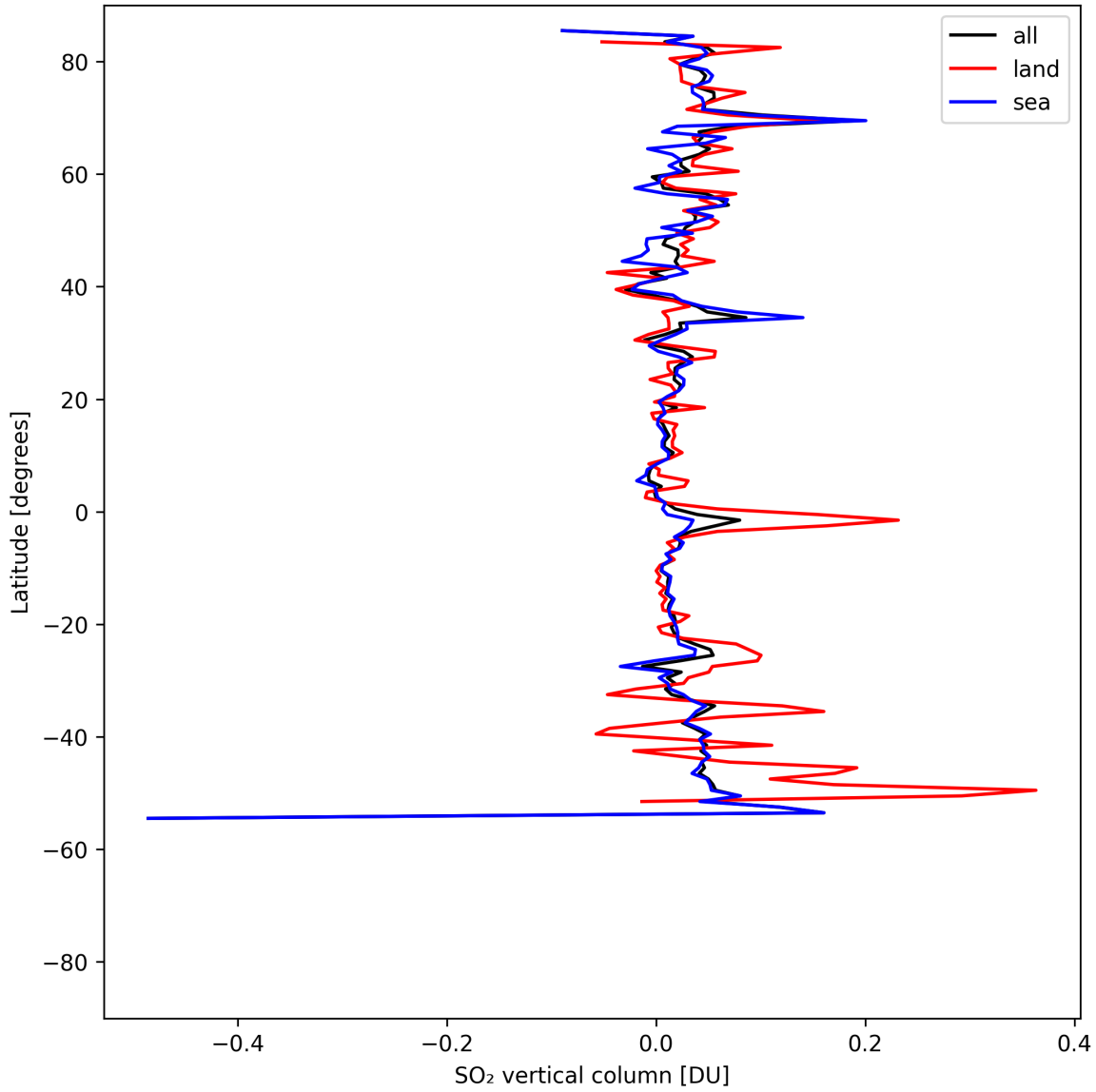

Figure 31: Zonal average of "SO_2 vertical column" for 2025-04-30 to 2025-05-01.

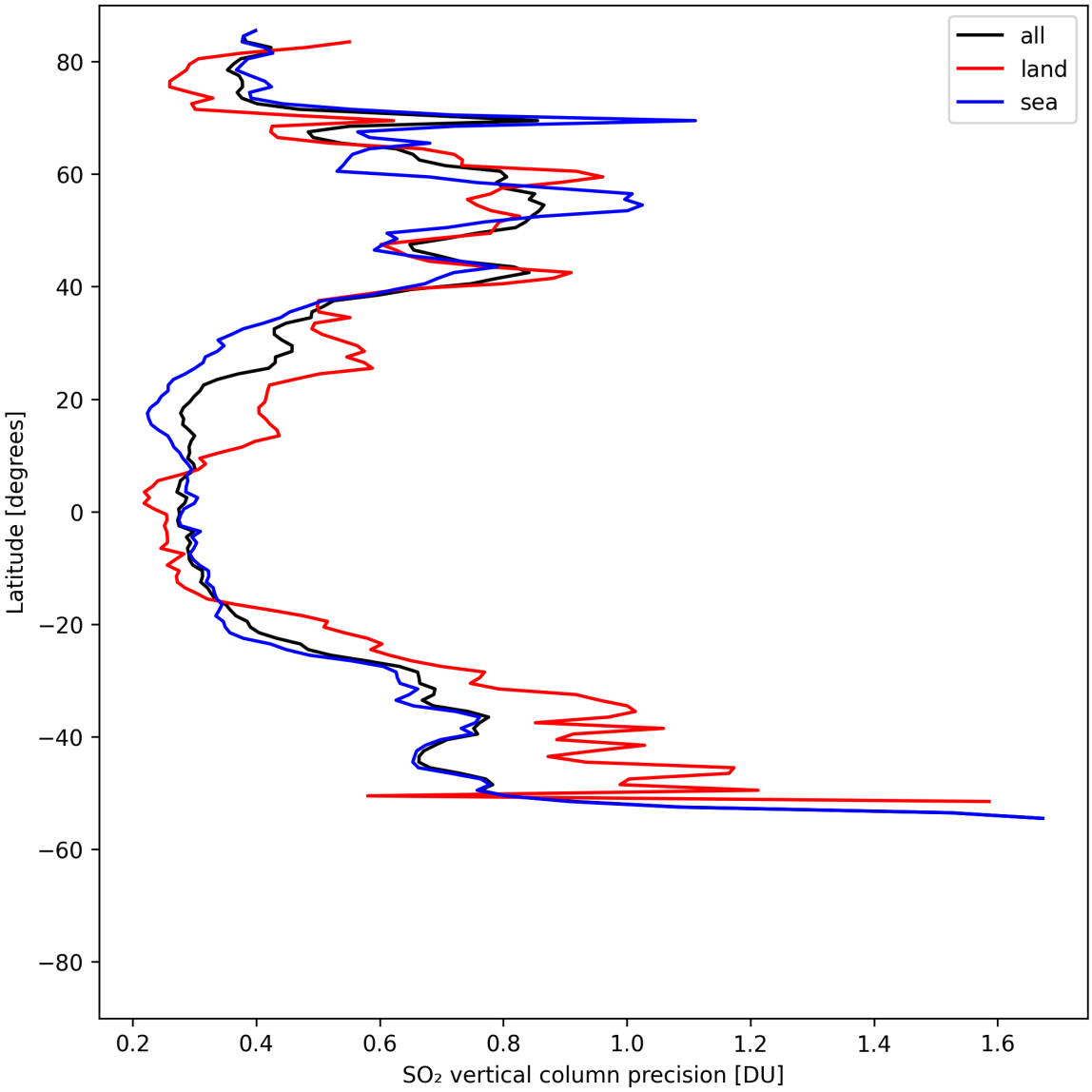

Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-04-30 to 2025-05-01.

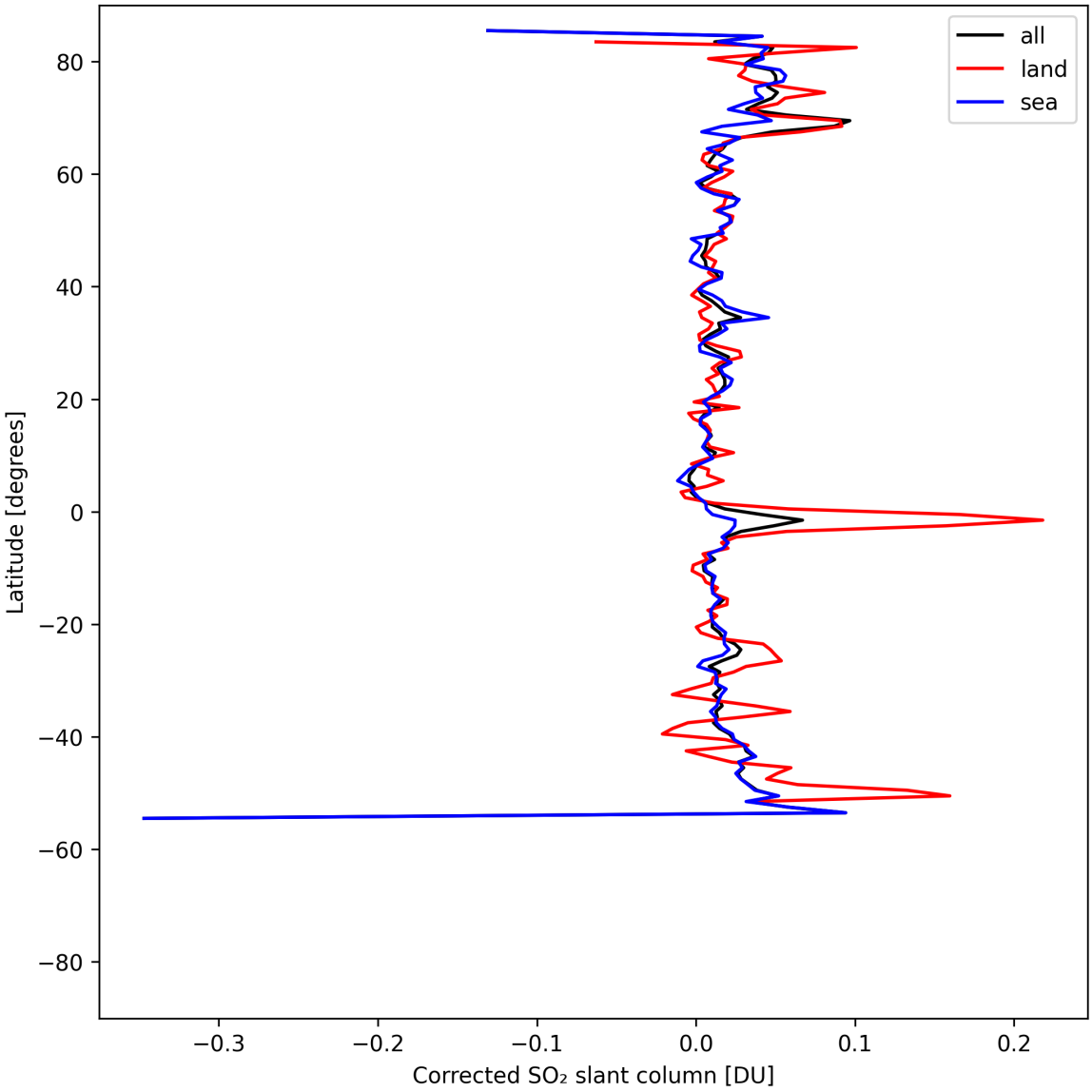

Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-04-30 to 2025-05-01.

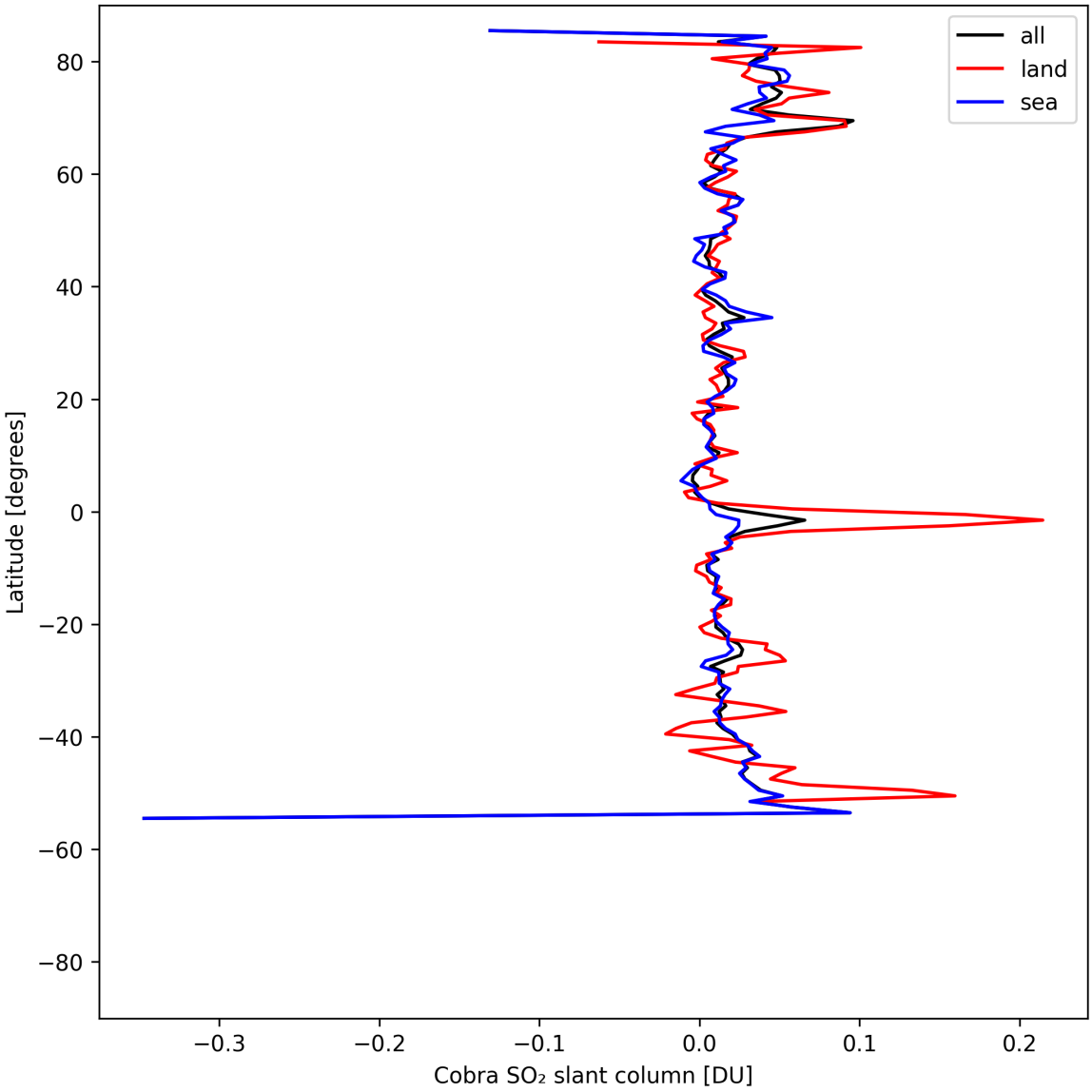

Figure 34: Zonal average of "Cobra SO_2 slant column" for 2025-04-30 to 2025-05-01.

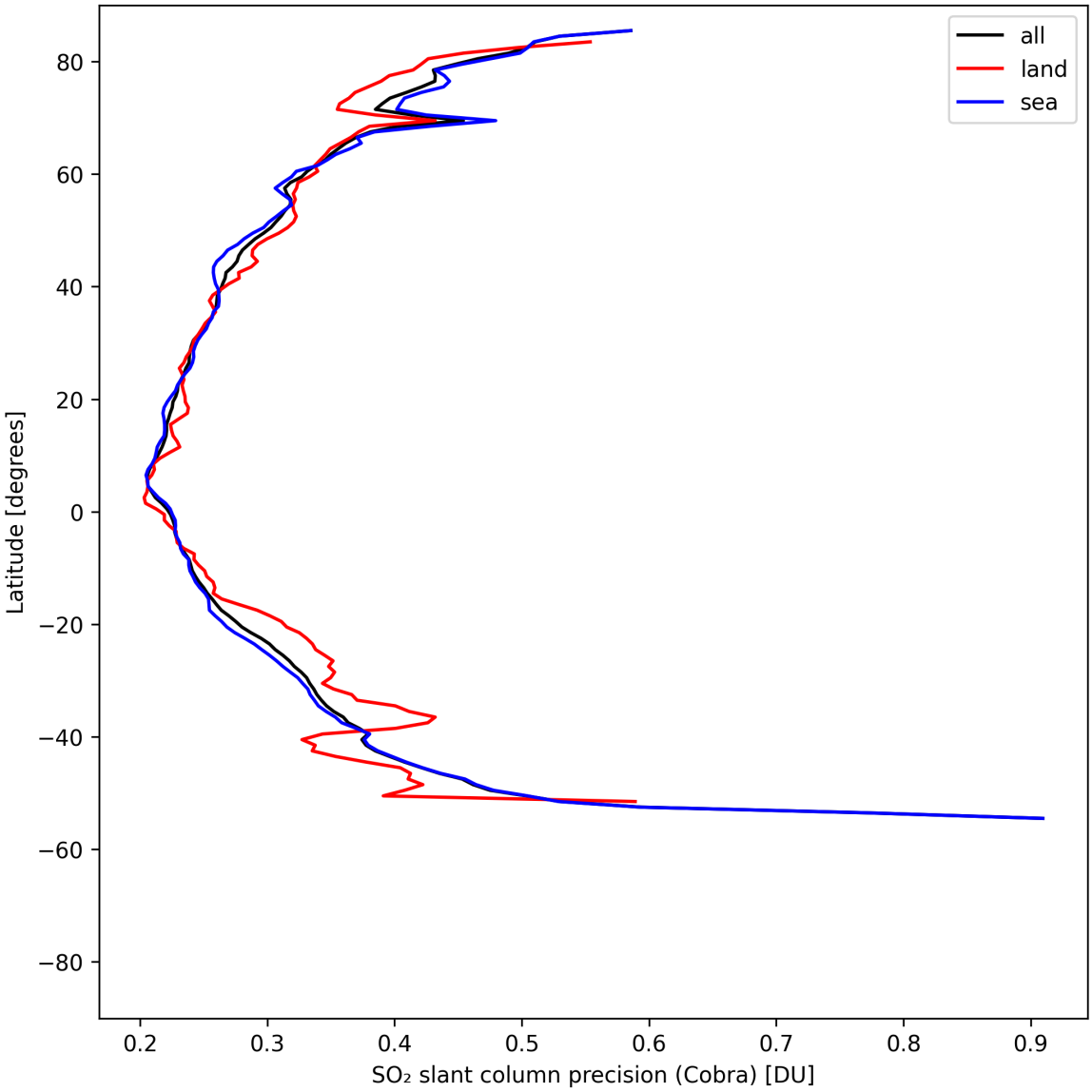

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-04-30 to 2025-05-01.

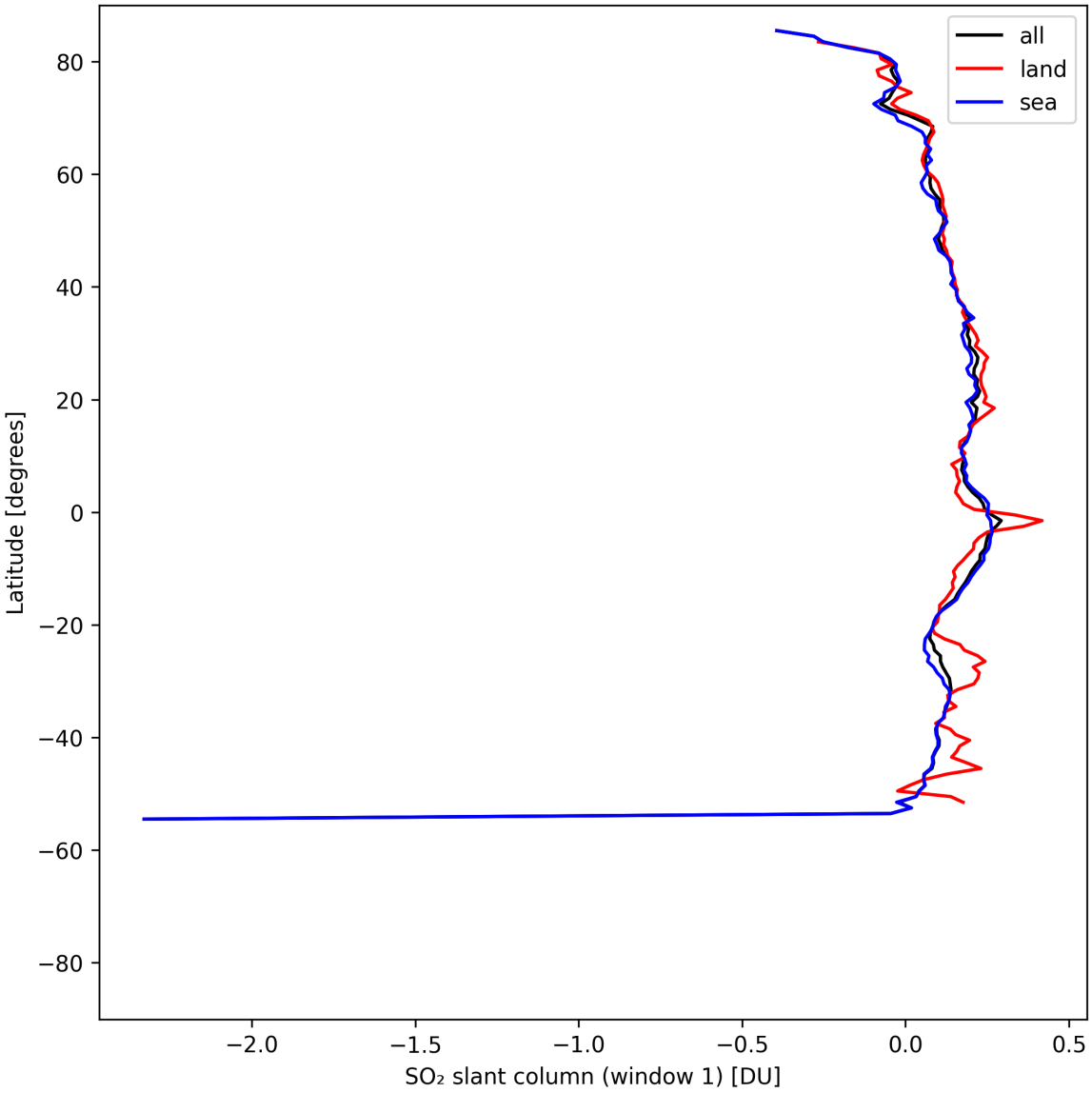

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-04-30 to 2025-05-01.

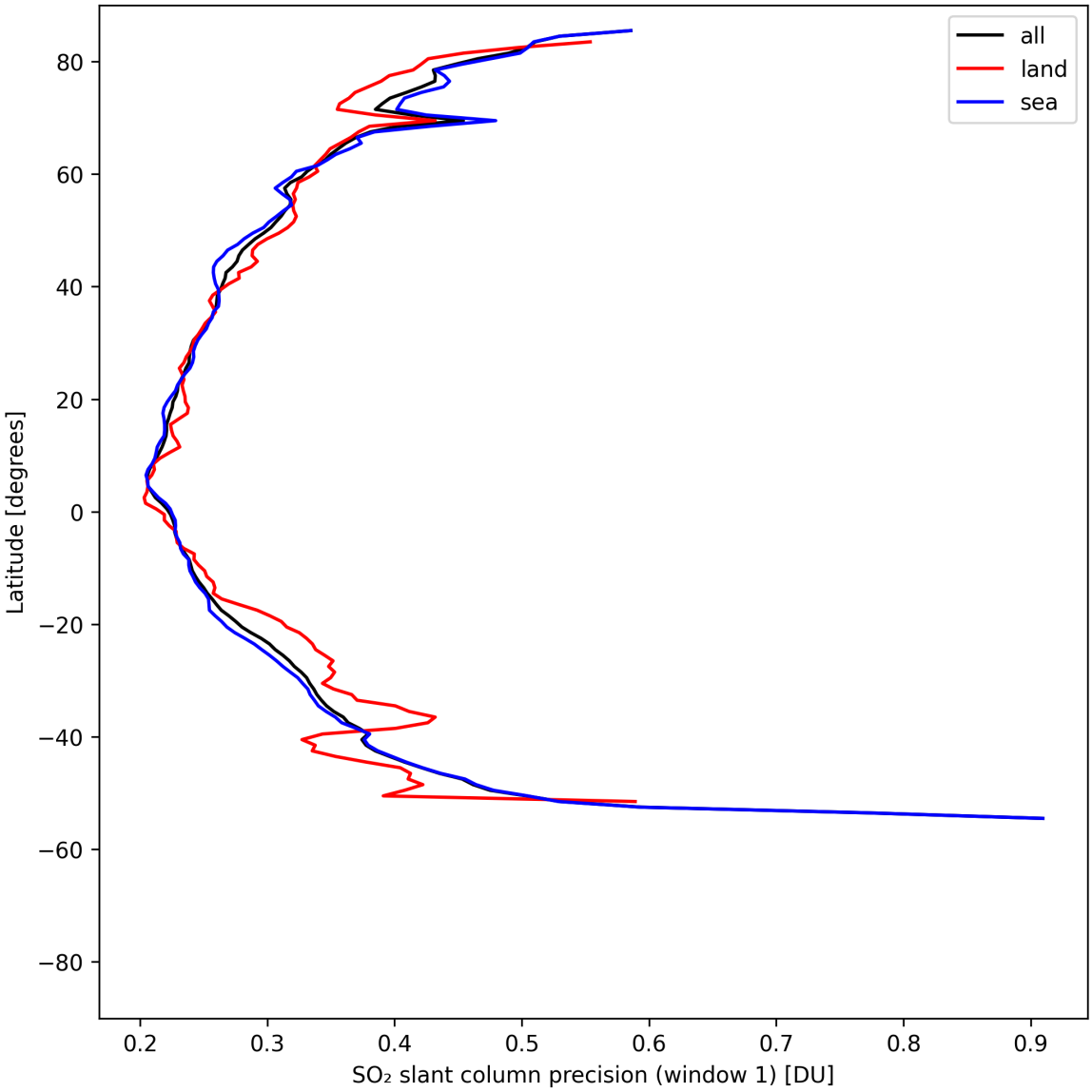

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-04-30 to 2025-05-01.

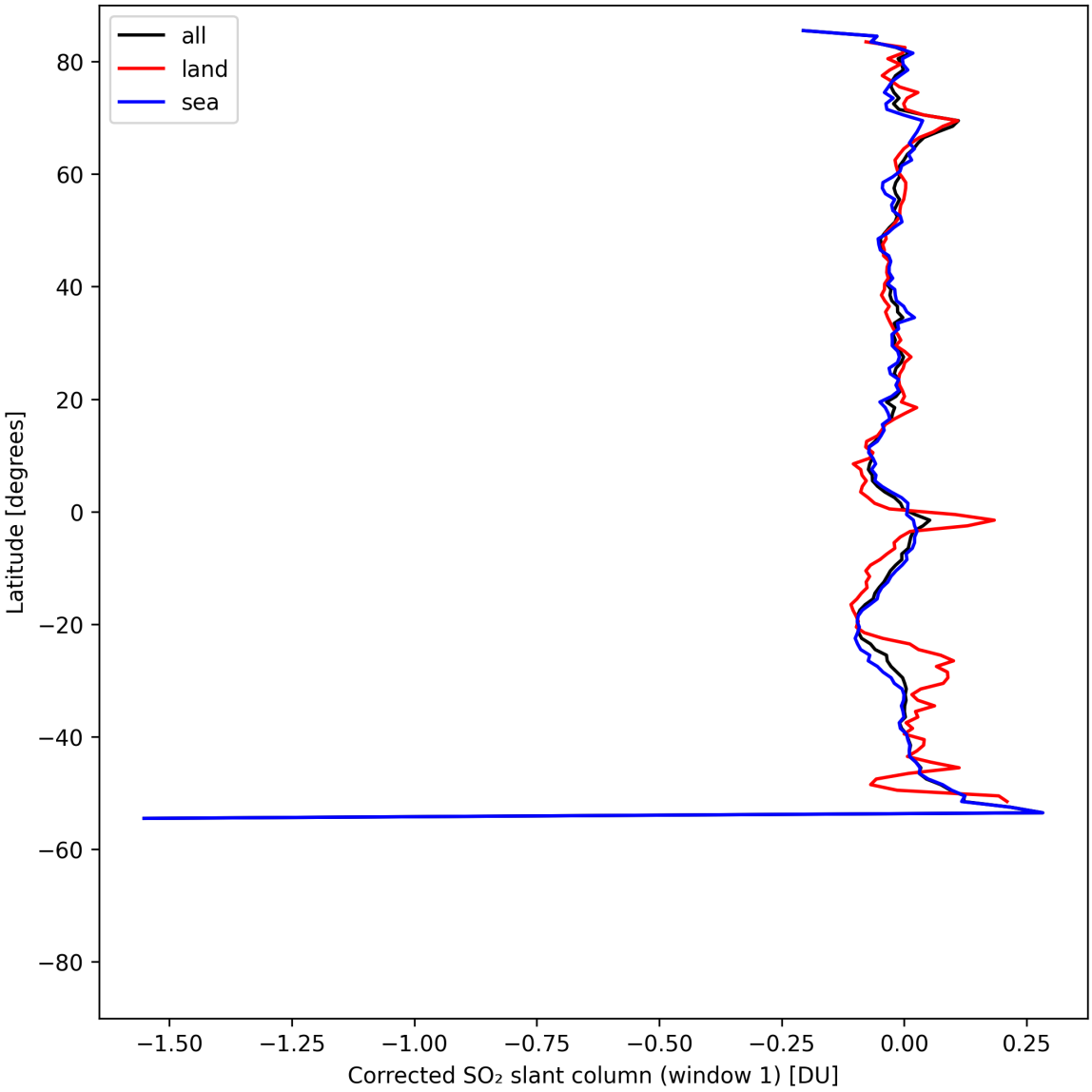

Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-04-30 to 2025-05-01.

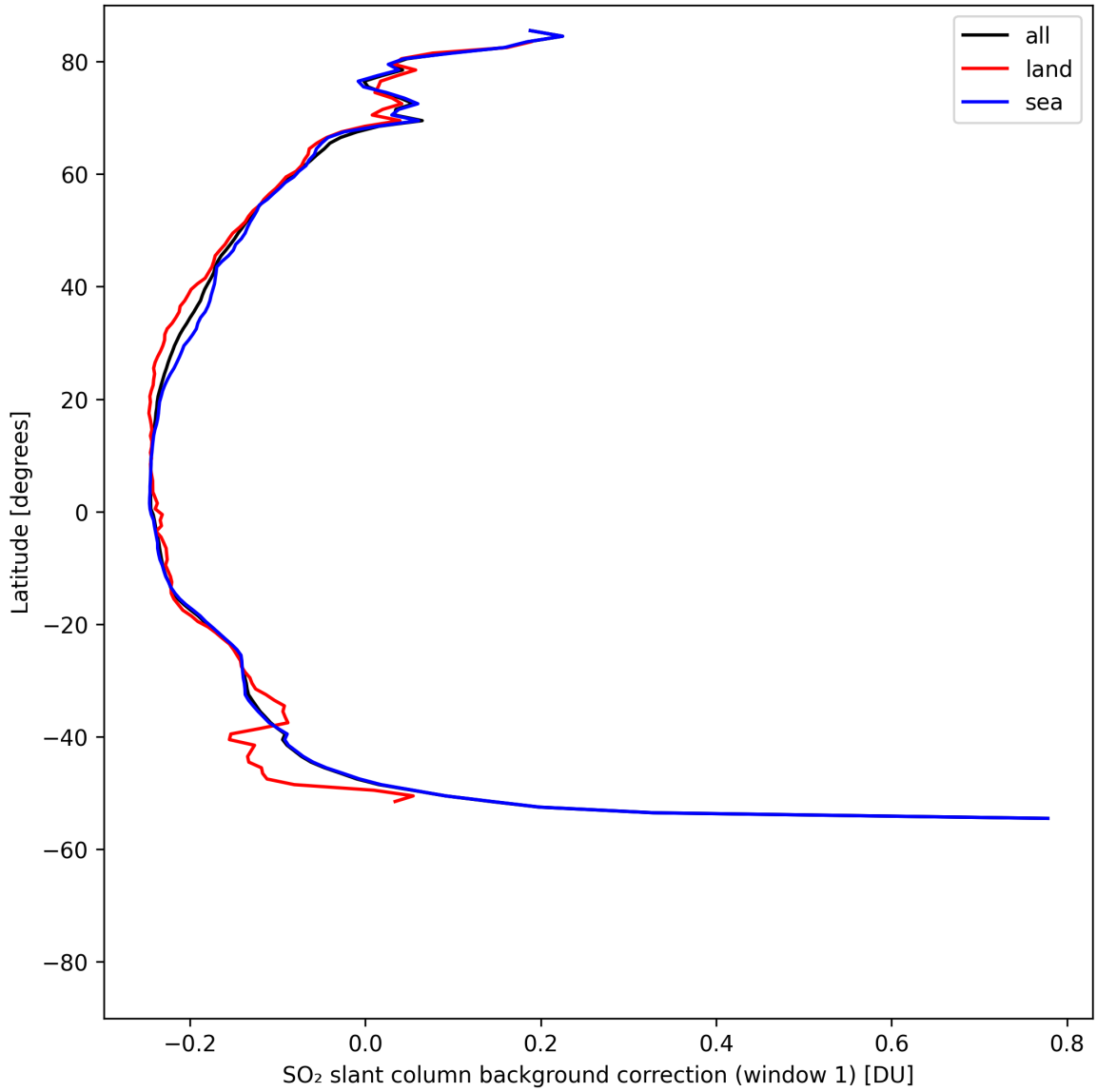

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-04-30 to 2025-05-01.

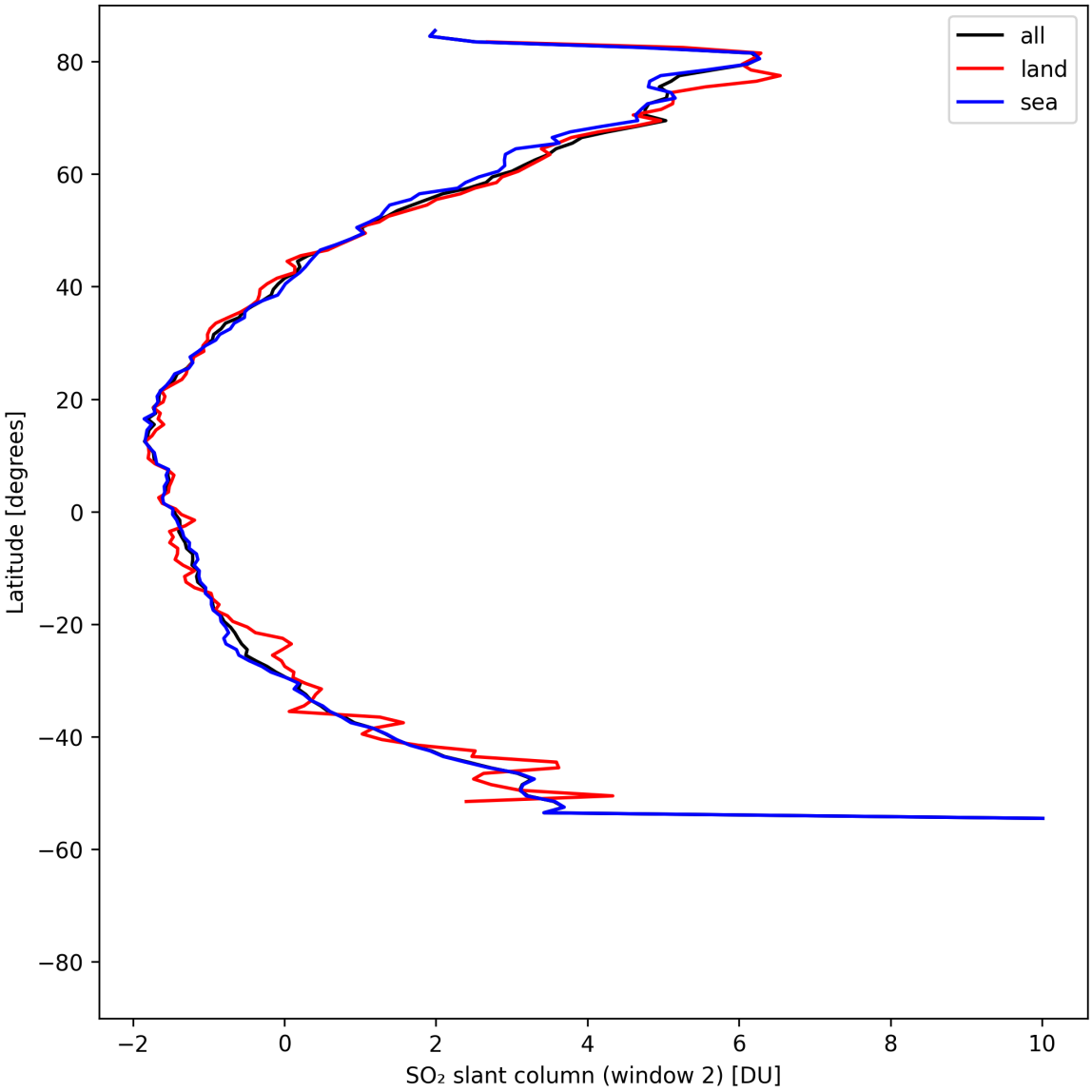

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-04-30 to 2025-05-01.

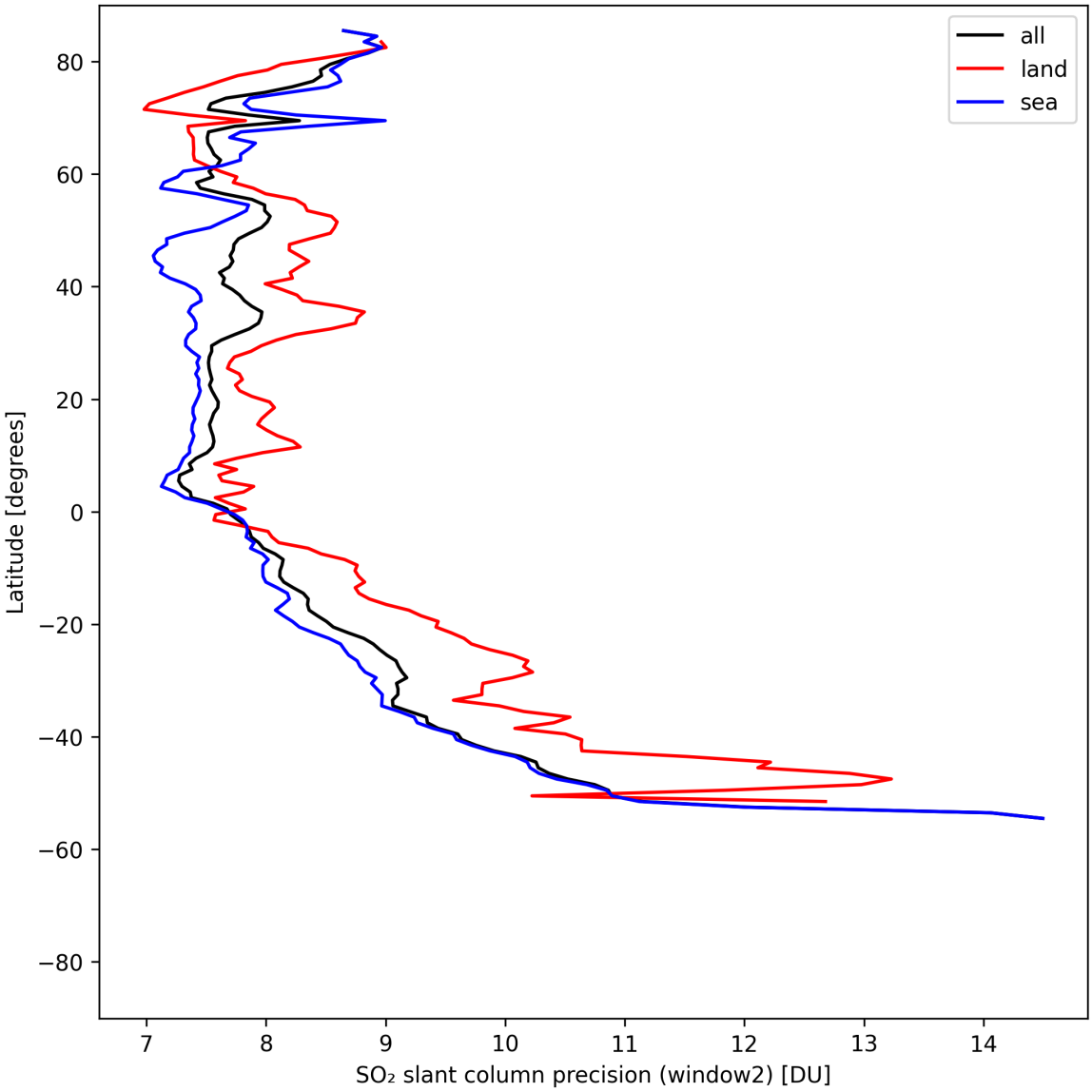

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-04-30 to 2025-05-01.

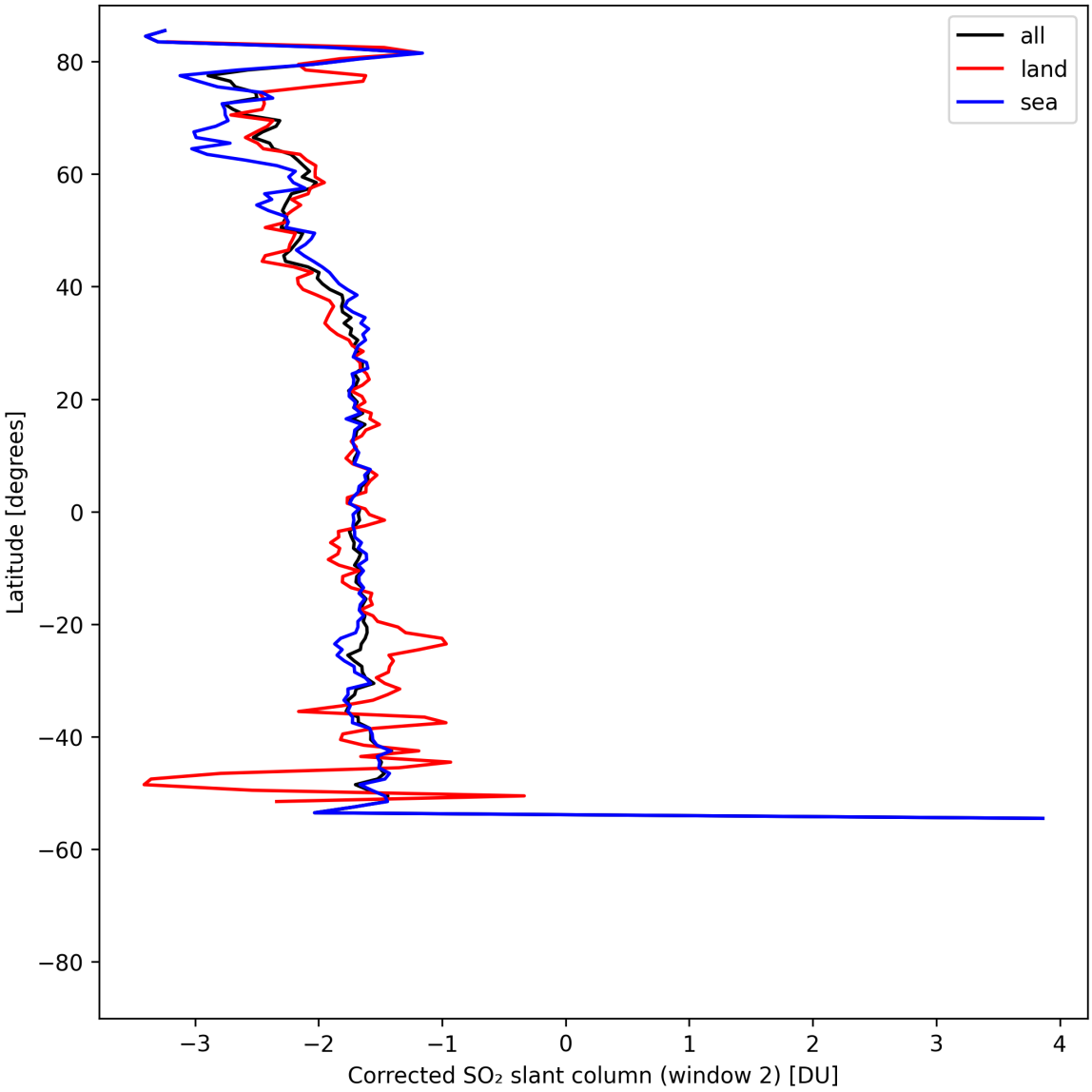

Figure 42: Zonal average of “Corrected SO_2 slant column (window 2)” for 2025-04-30 to 2025-05-01.

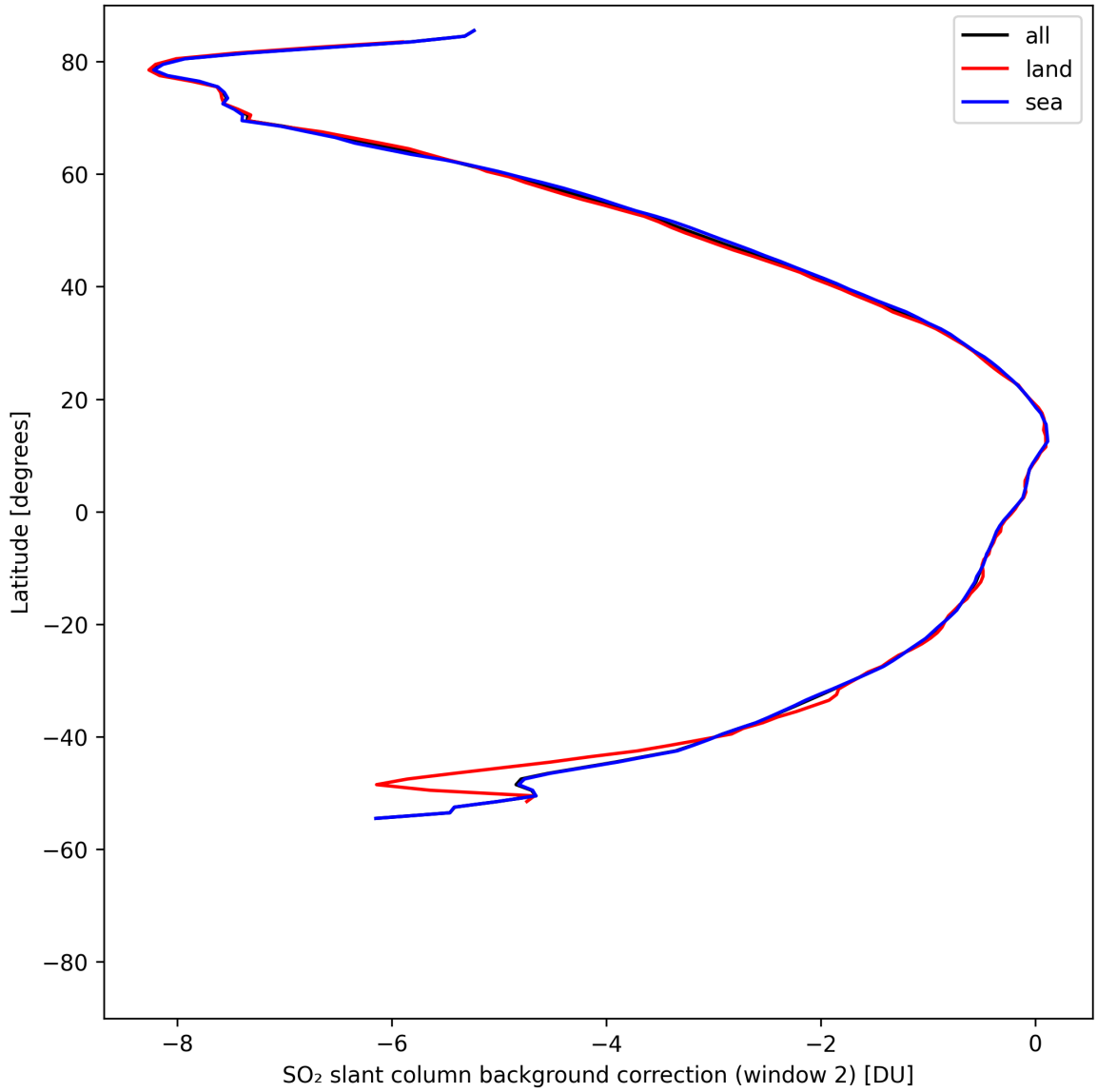

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-04-30 to 2025-05-01.

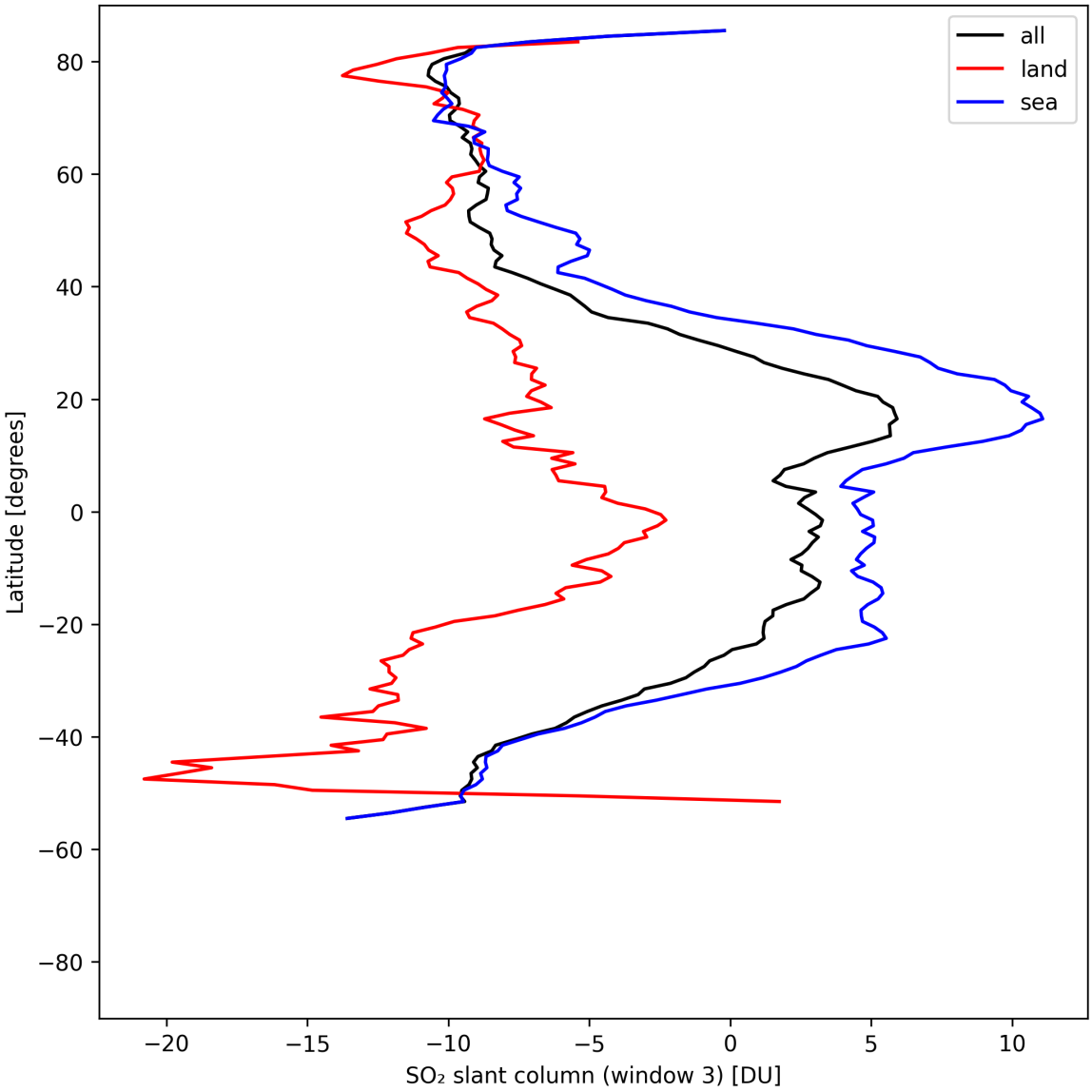

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-04-30 to 2025-05-01.

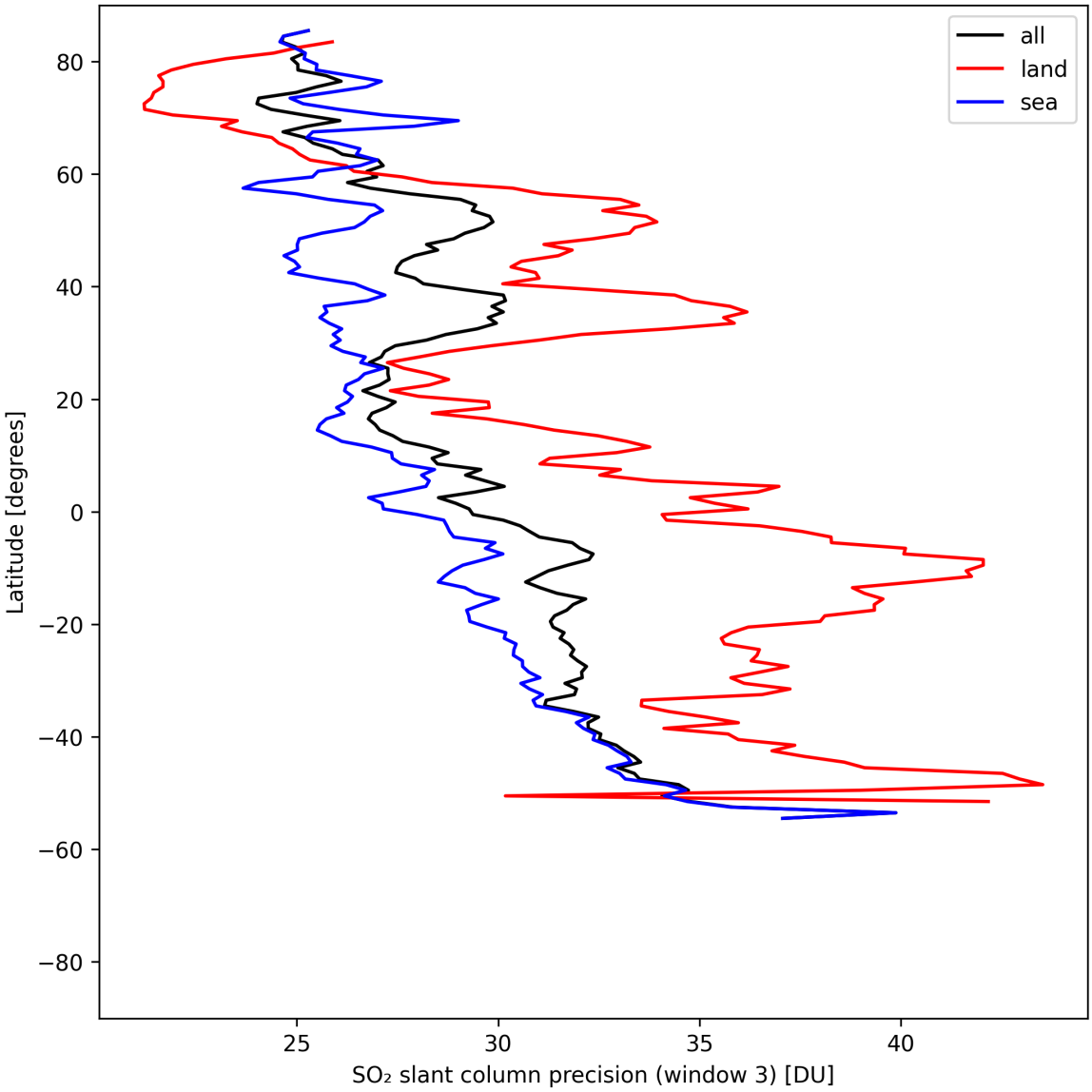

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-04-30 to 2025-05-01.

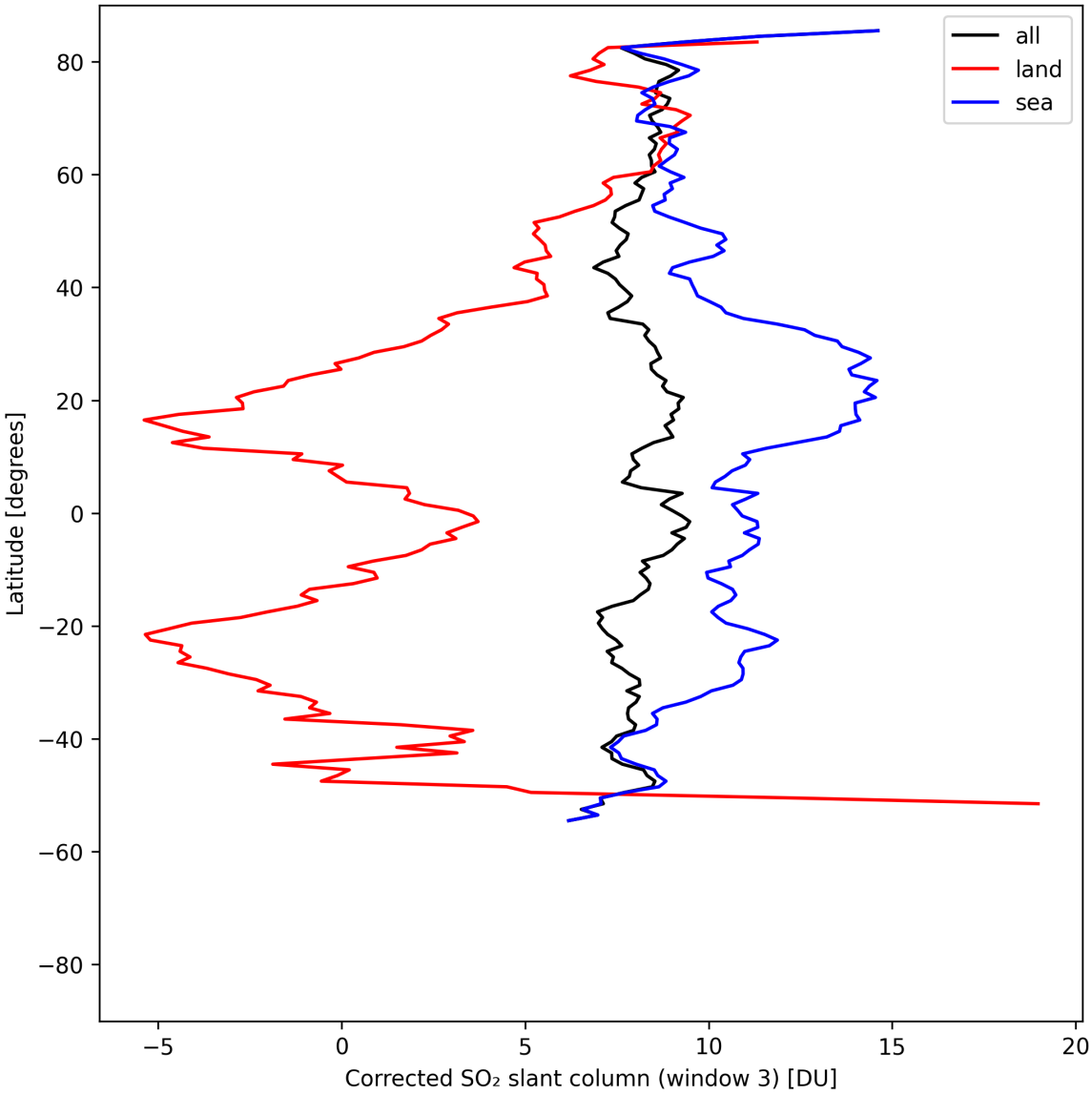

Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-04-30 to 2025-05-01.

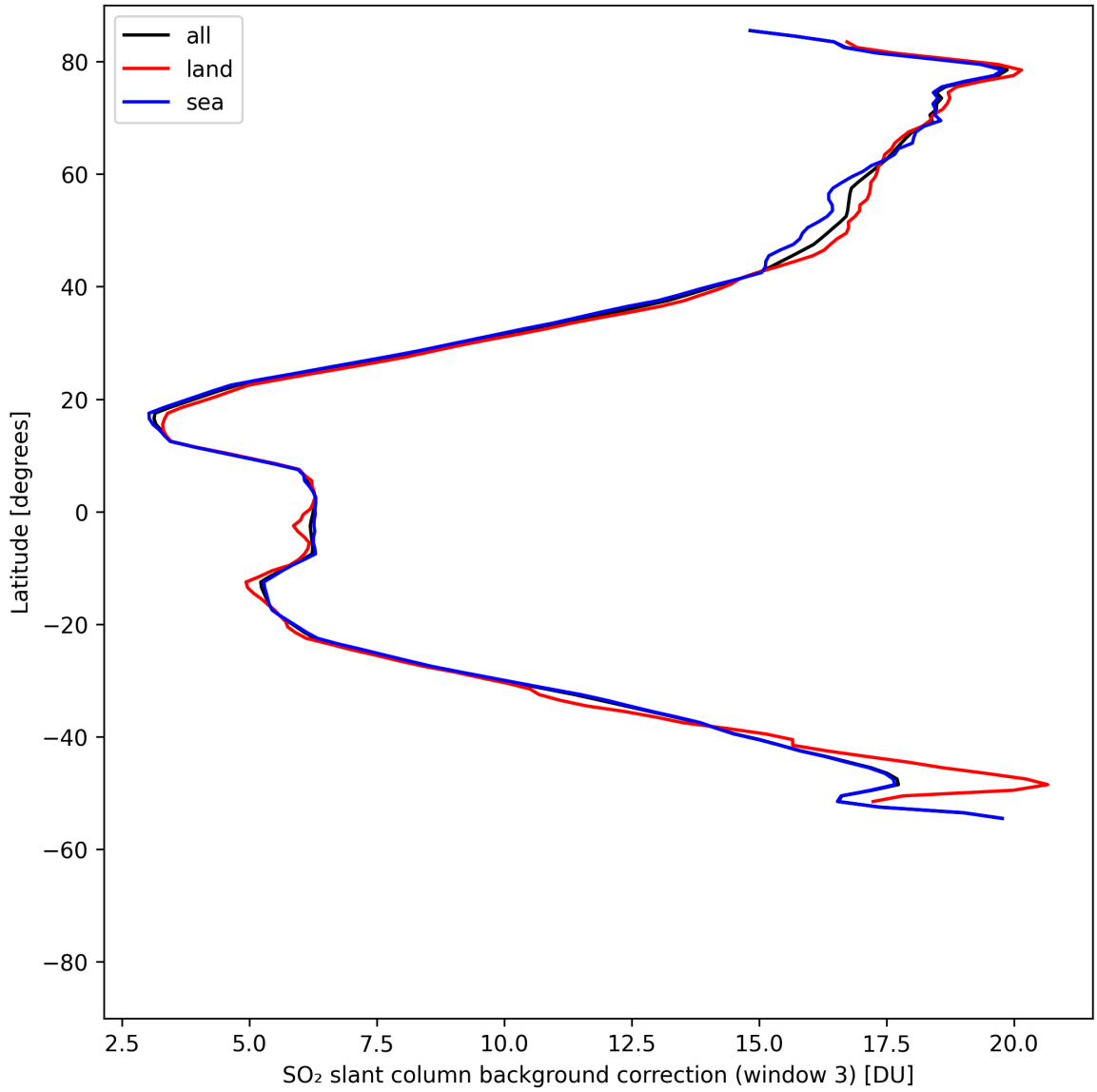

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-04-30 to 2025-05-01.

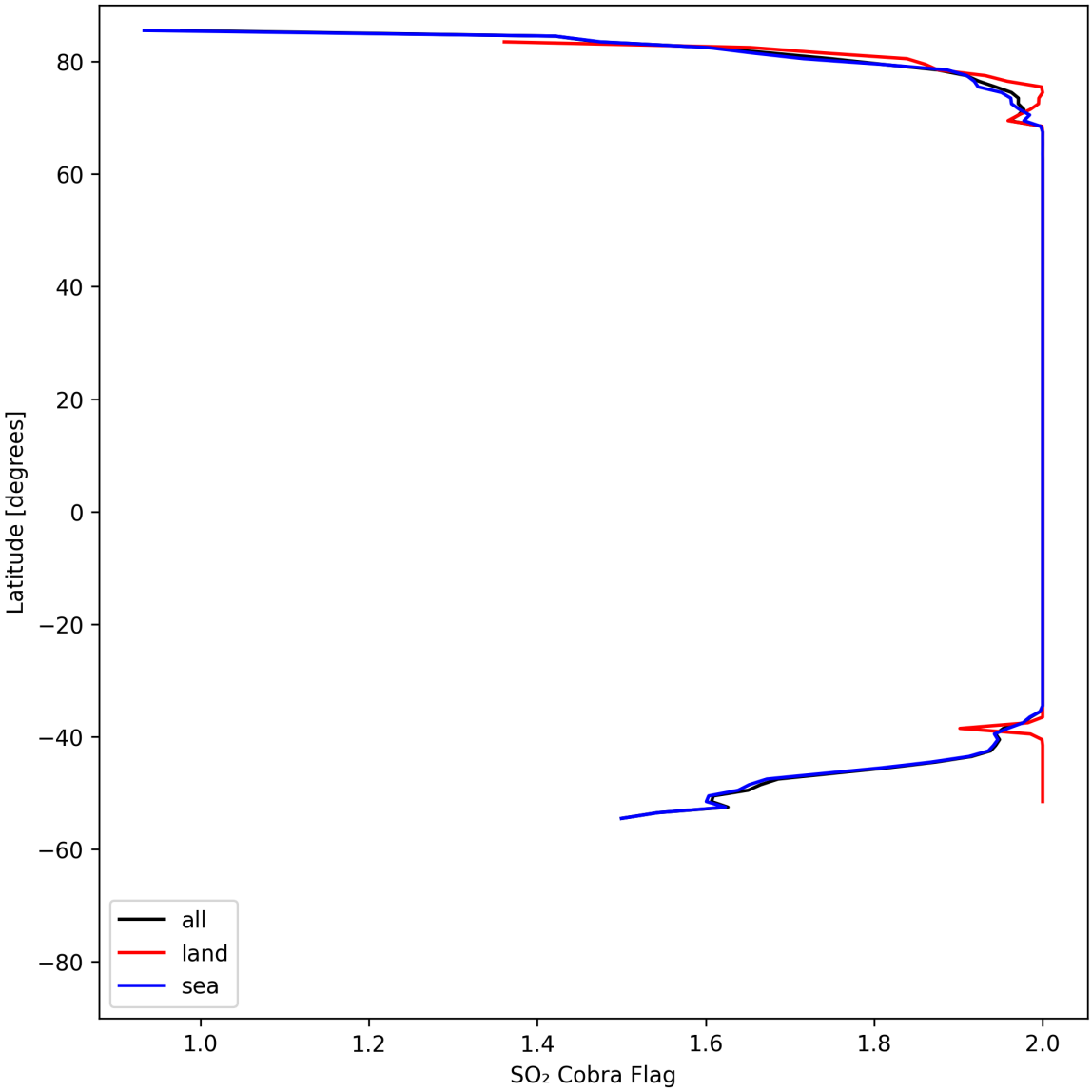

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-04-30 to 2025-05-01.

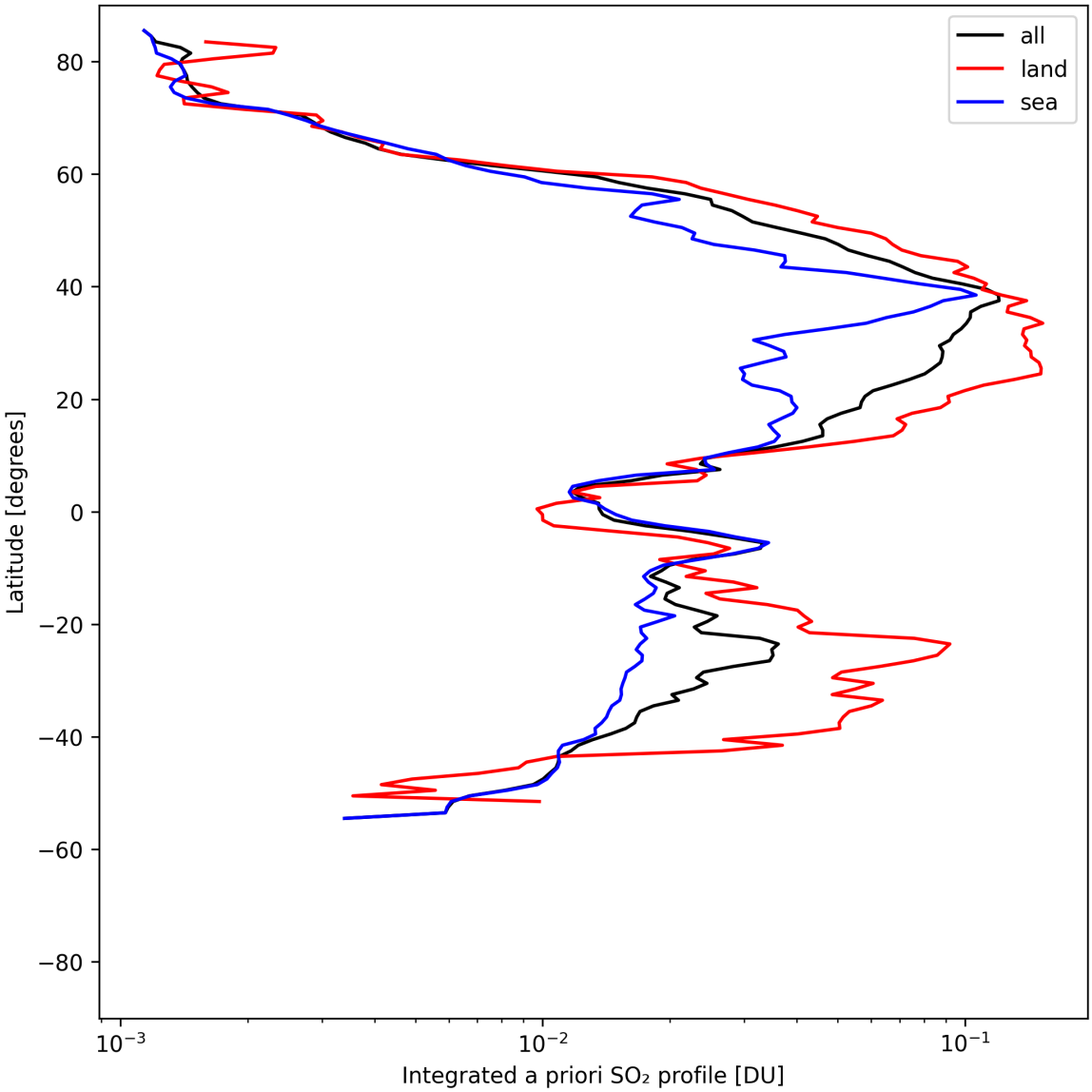

Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-04-30 to 2025-05-01.

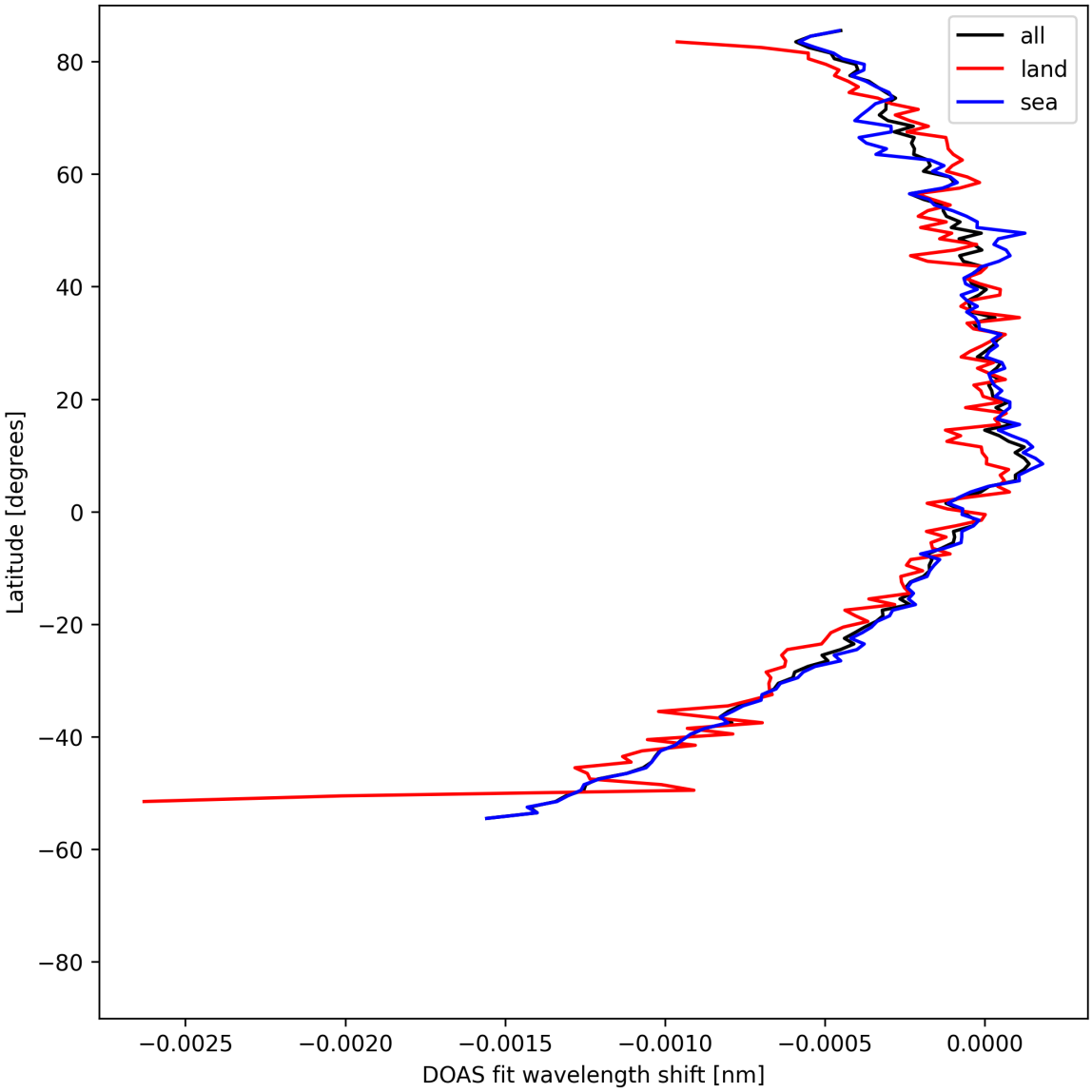

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-04-30 to 2025-05-01.

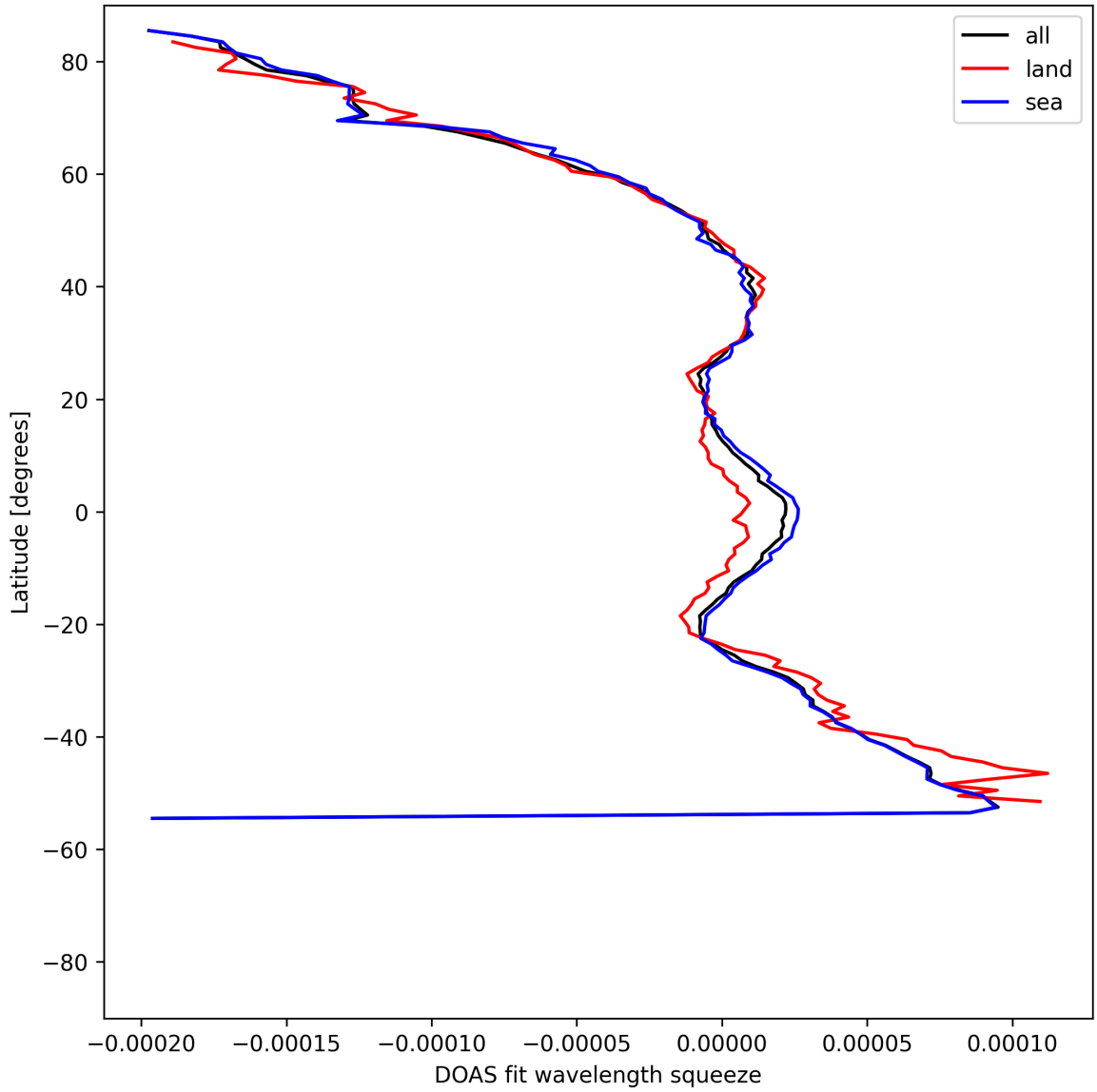

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-04-30 to 2025-05-01.

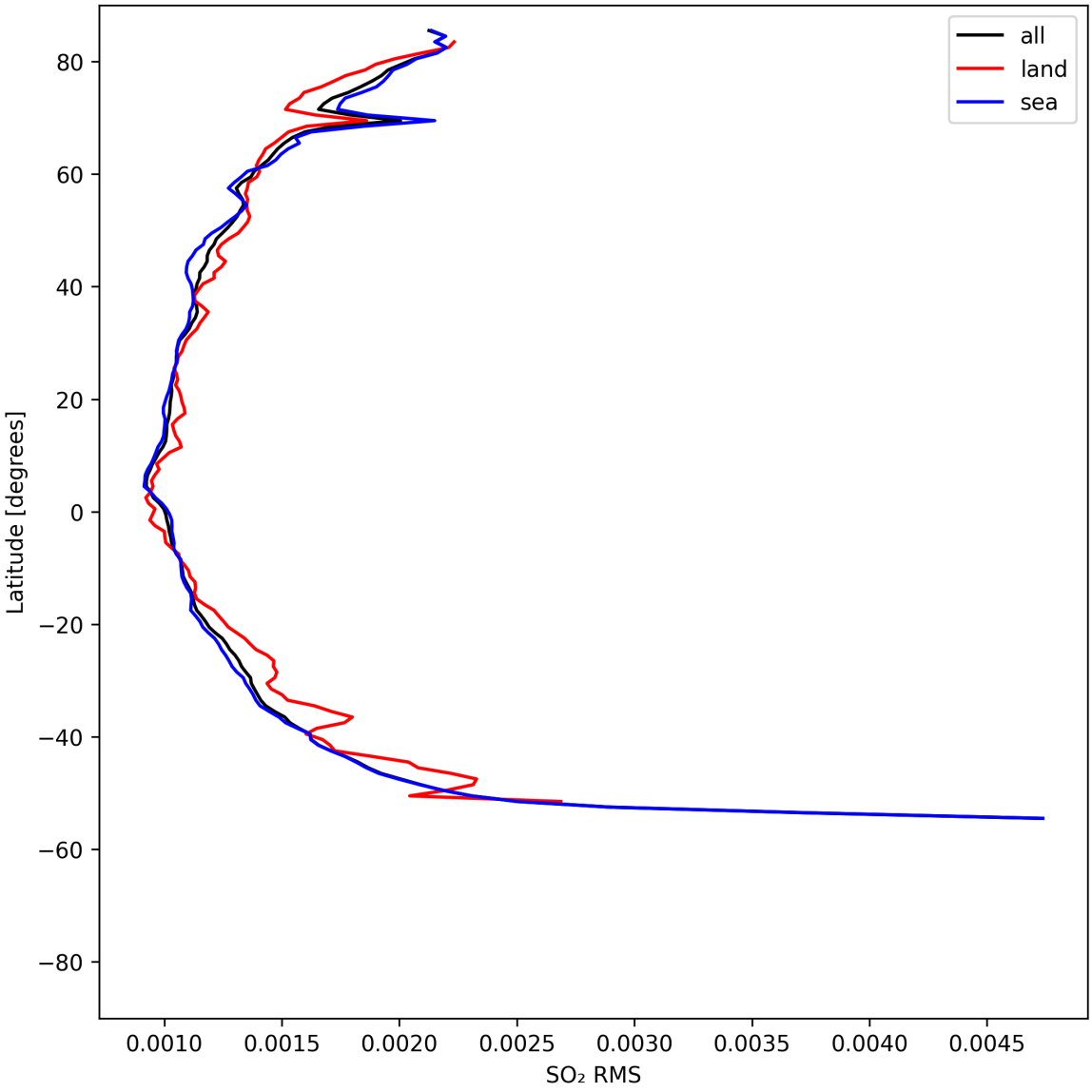

Figure 52: Zonal average of "SO_2 RMS" for 2025-04-30 to 2025-05-01.

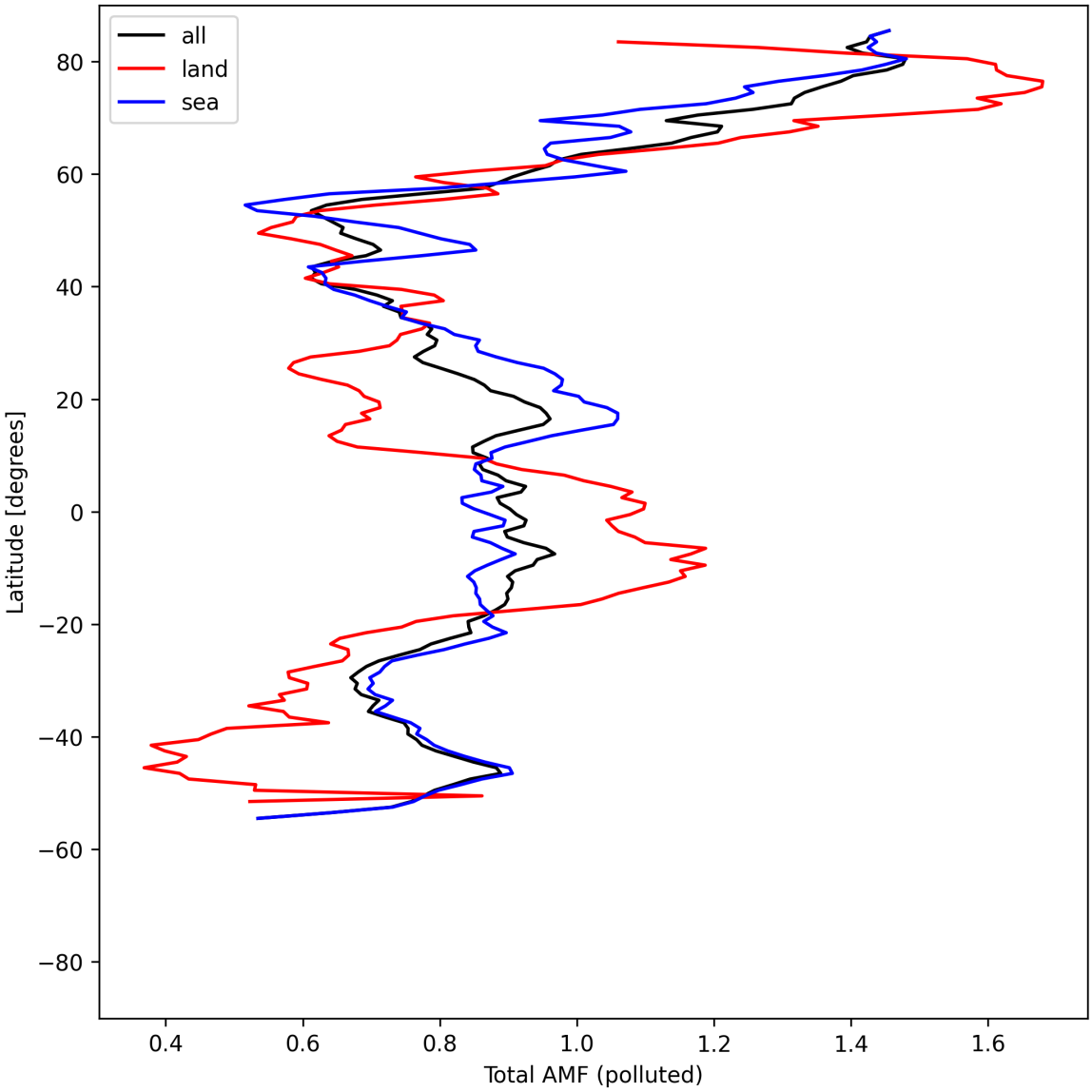

Figure 53: Zonal average of “Total AMF (polluted)” for 2025-04-30 to 2025-05-01.

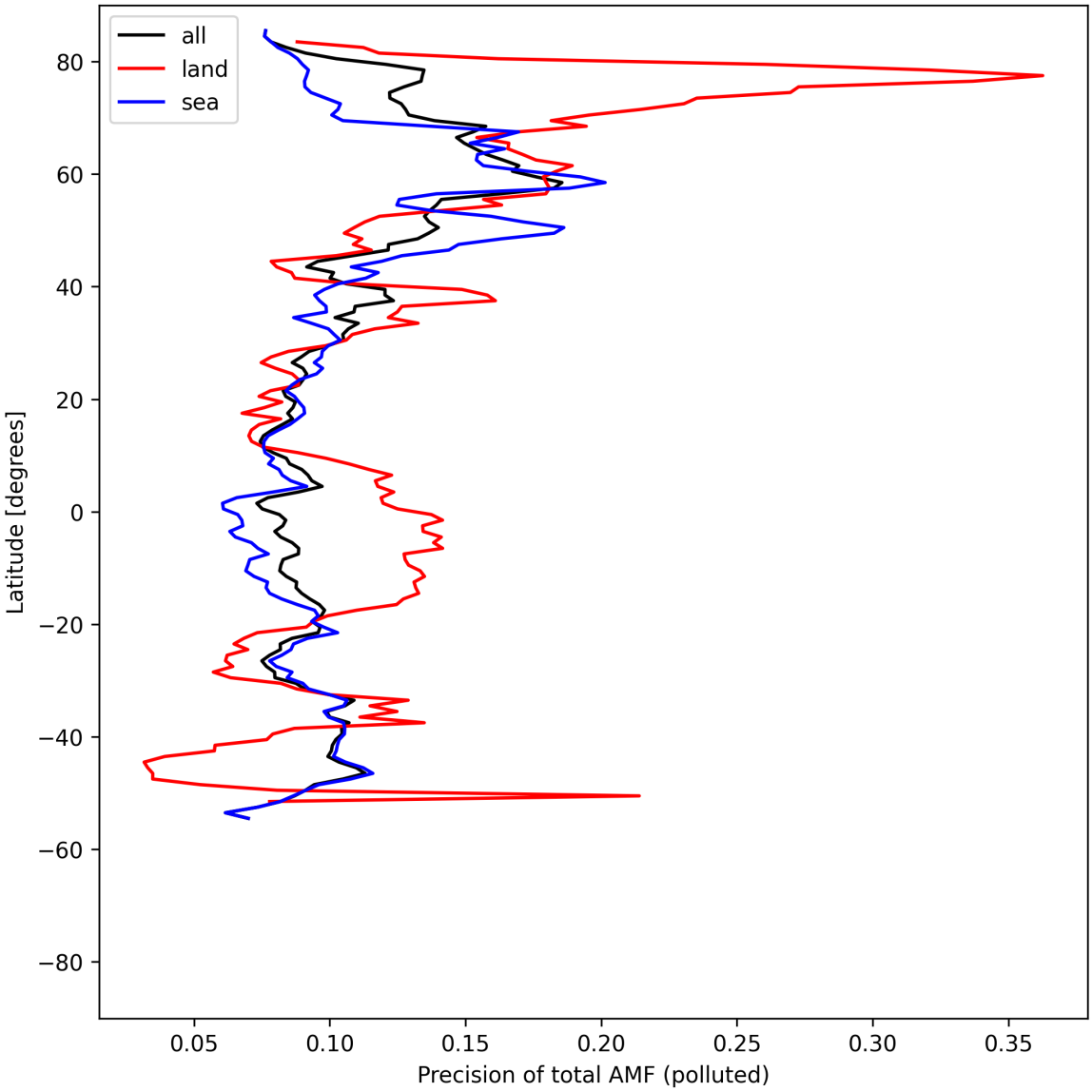

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-04-30 to 2025-05-01.

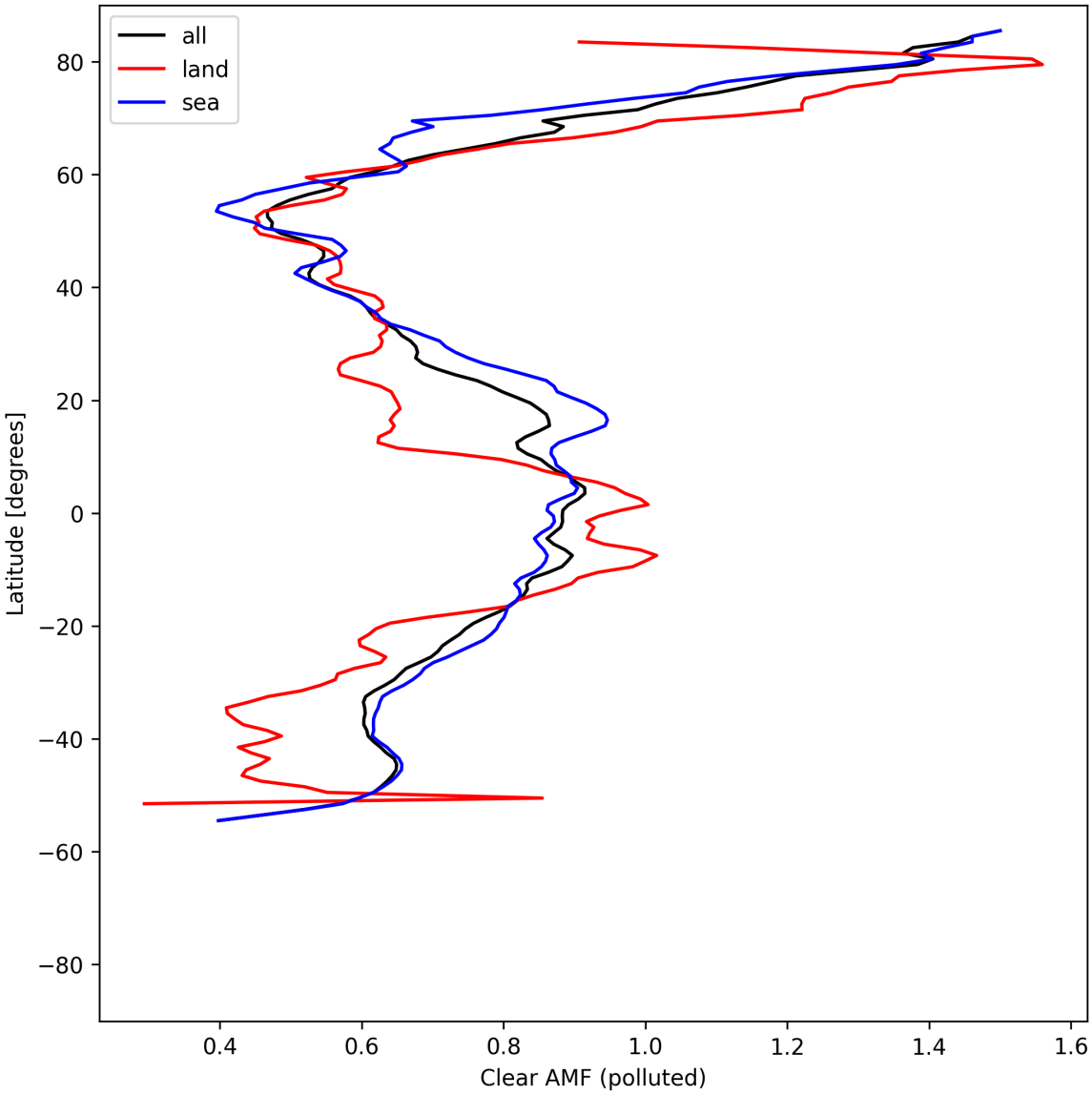

Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-04-30 to 2025-05-01.

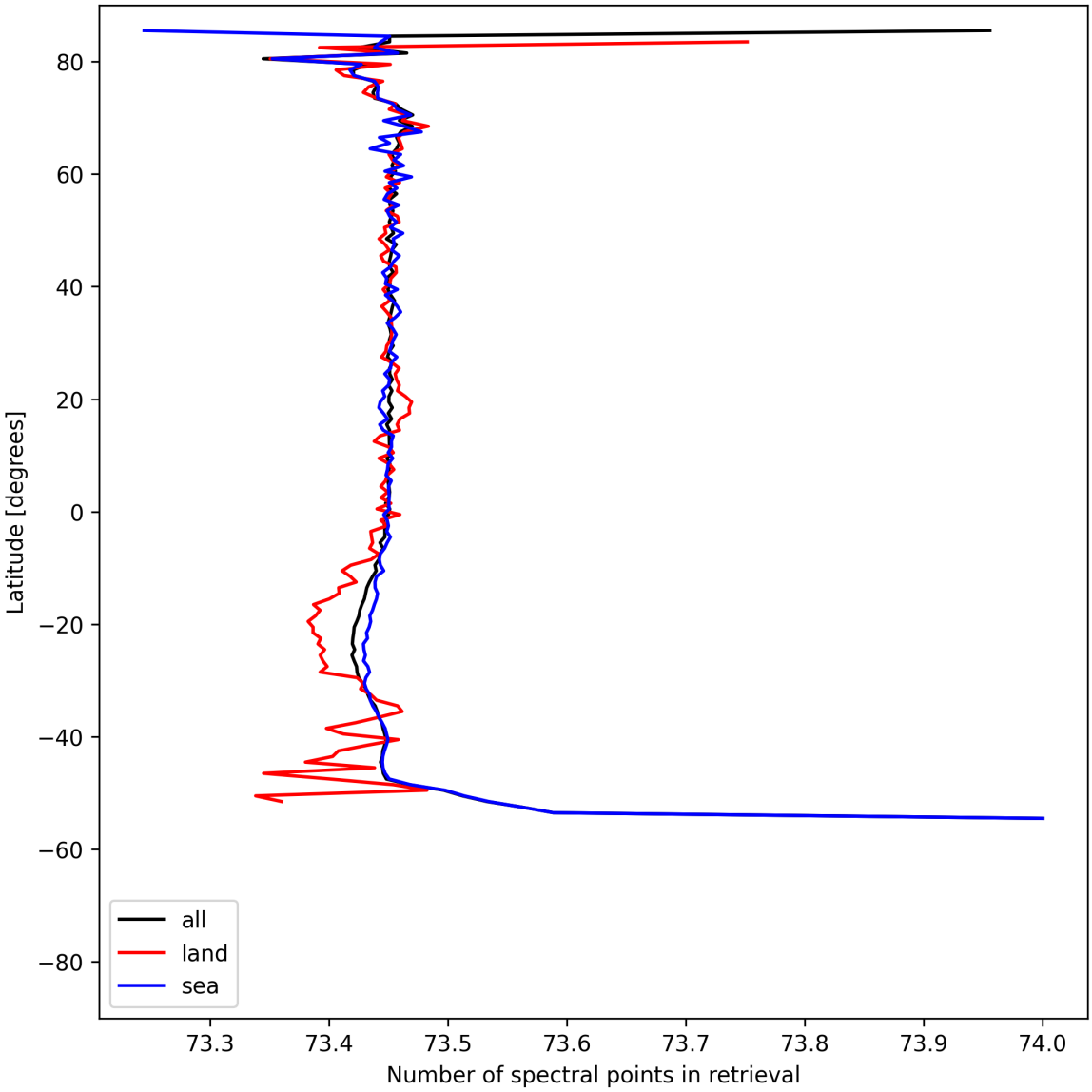

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-04-30 to 2025-05-01.

8 Histograms

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

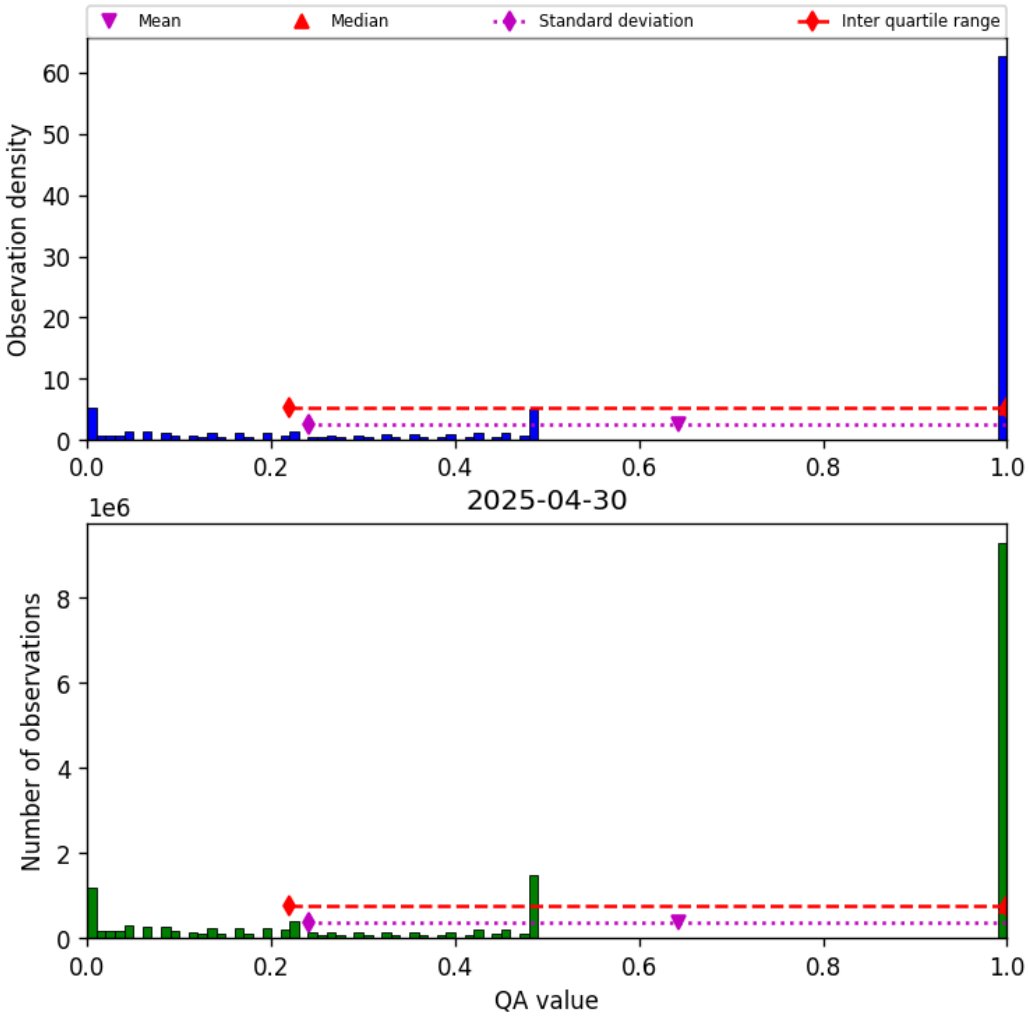

Figure 57: Histogram of “QA value” for 2025-04-30 to 2025-05-01

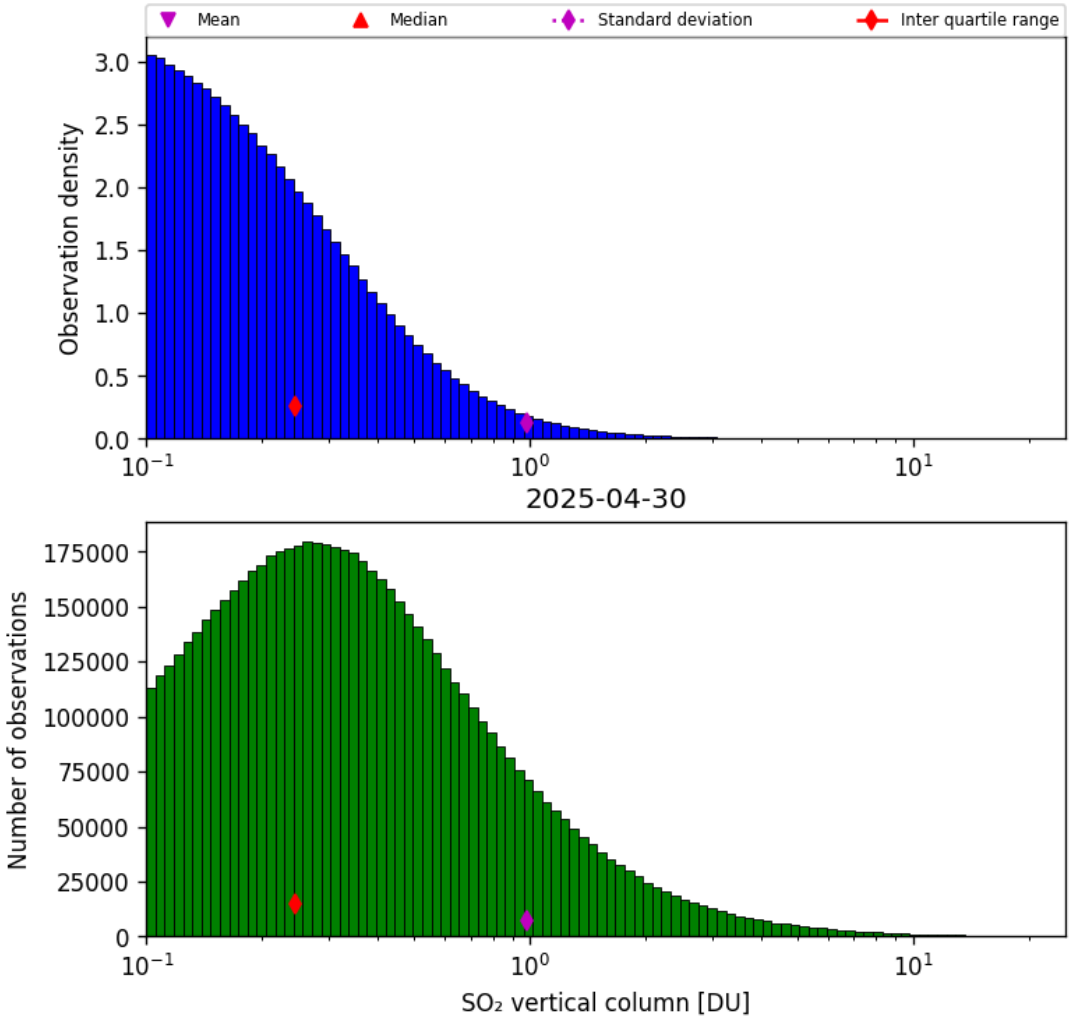

Figure 58: Histogram of "SO_2 vertical column" for 2025-04-30 to 2025-05-01

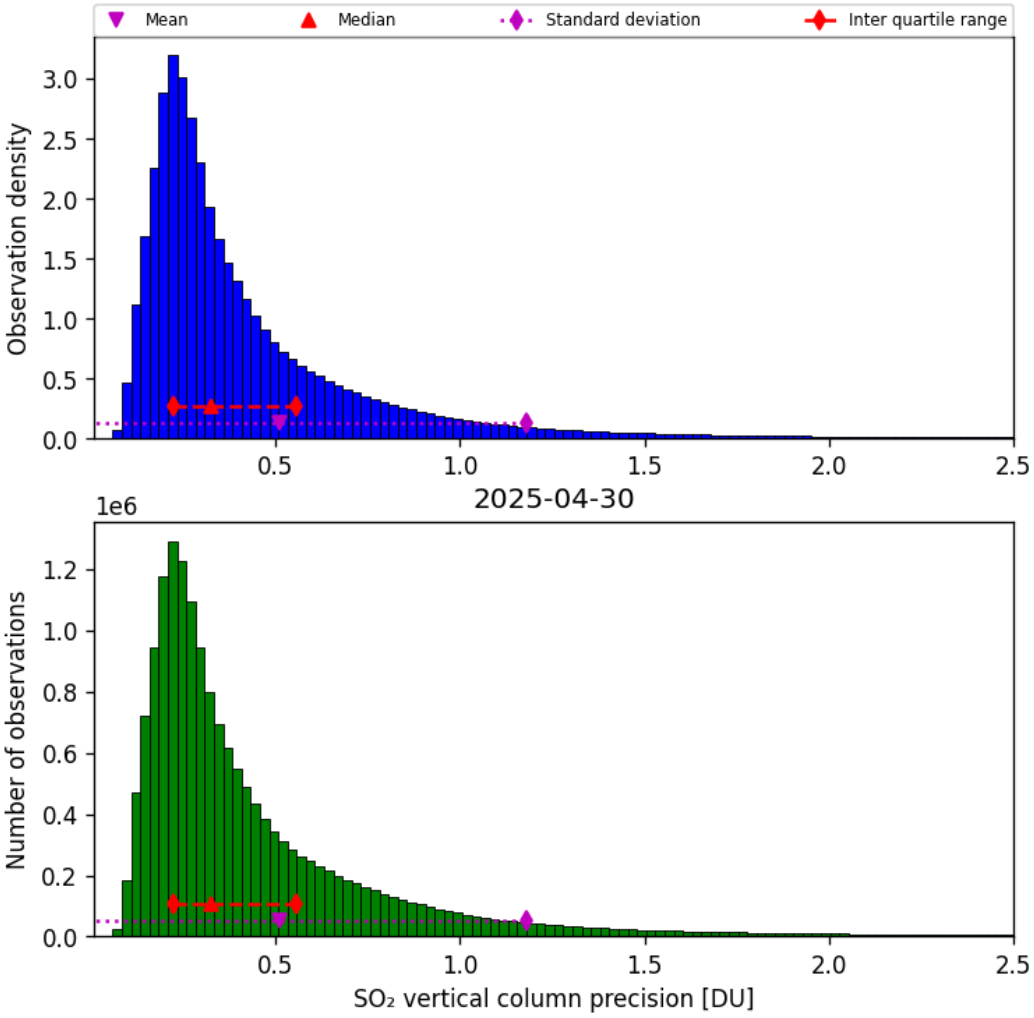

Figure 59: Histogram of "SO_2 vertical column precision" for 2025-04-30 to 2025-05-01

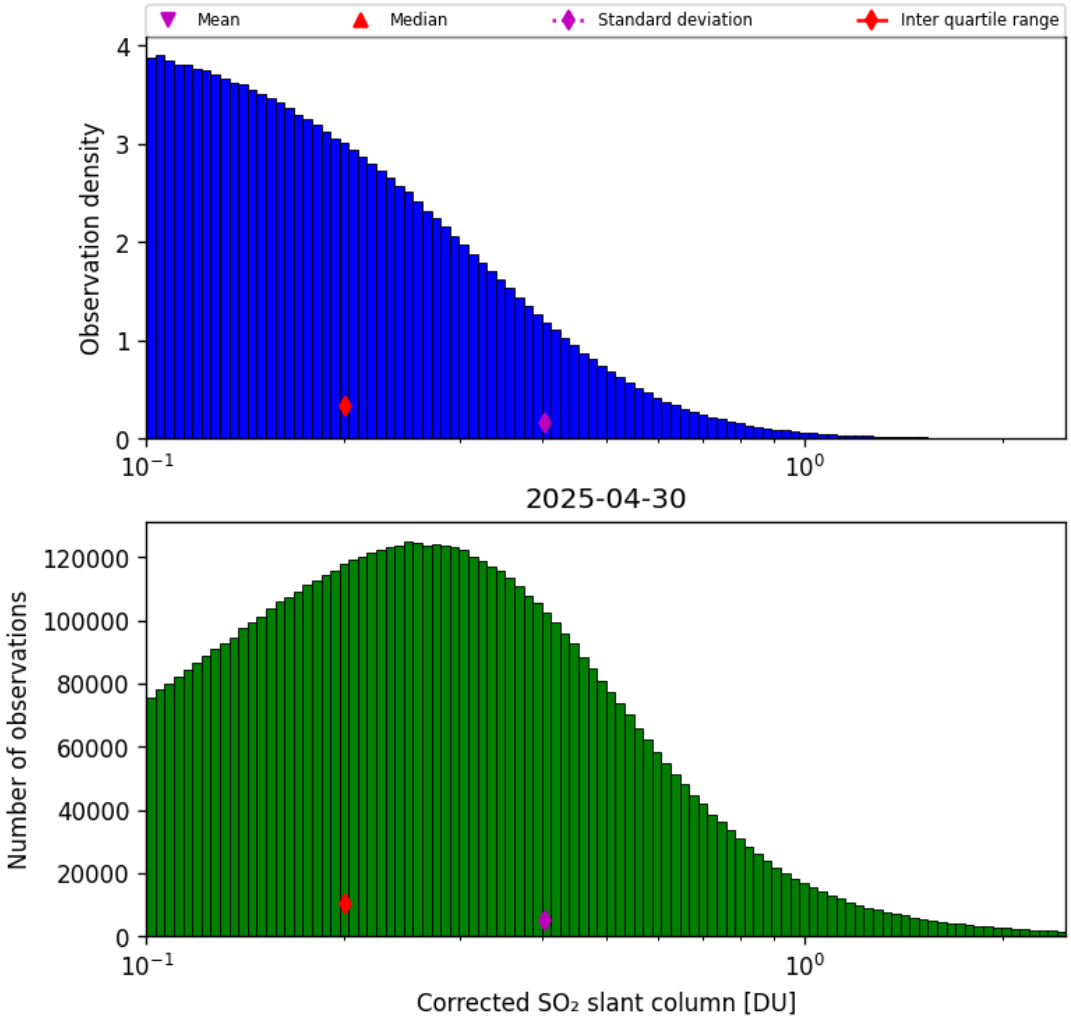

Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-04-30 to 2025-05-01

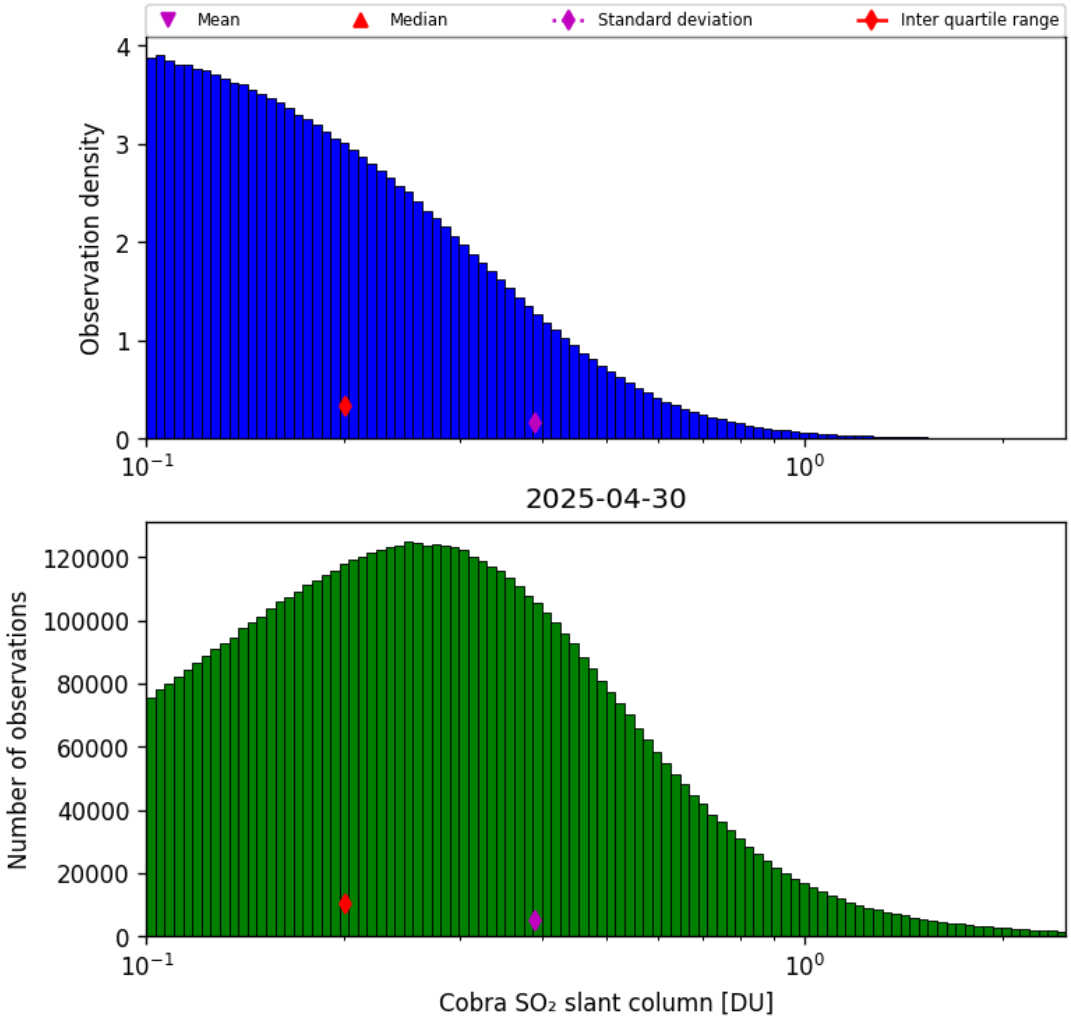

Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-04-30 to 2025-05-01

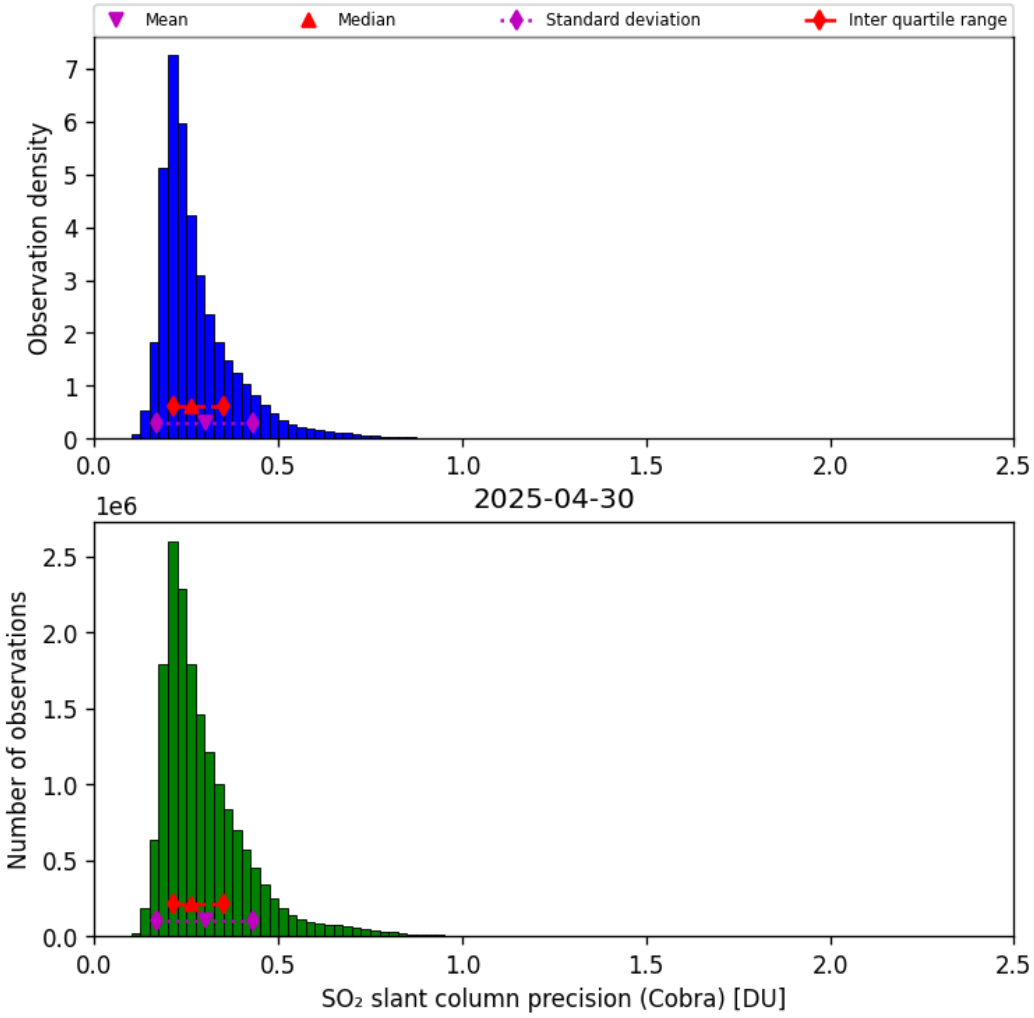

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-04-30 to 2025-05-01

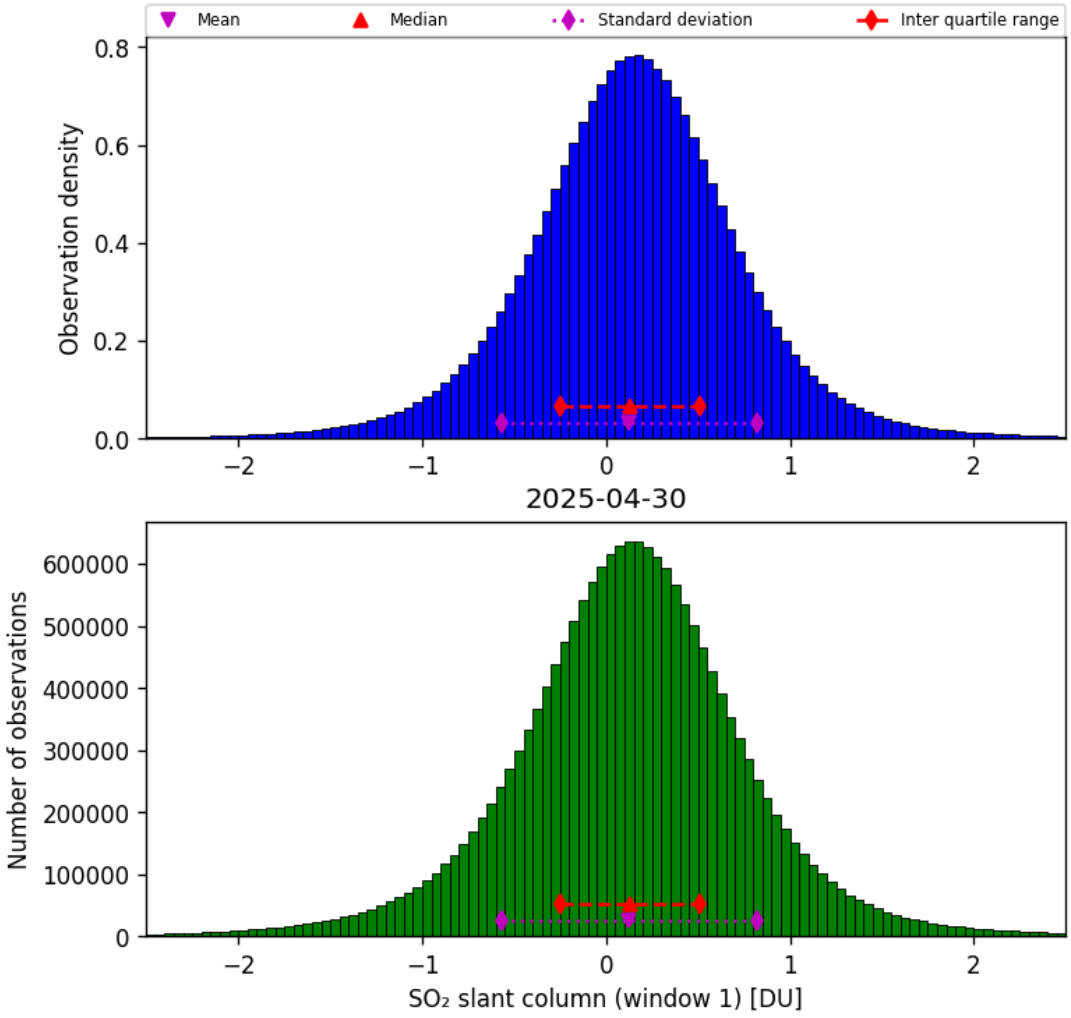

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-04-30 to 2025-05-01

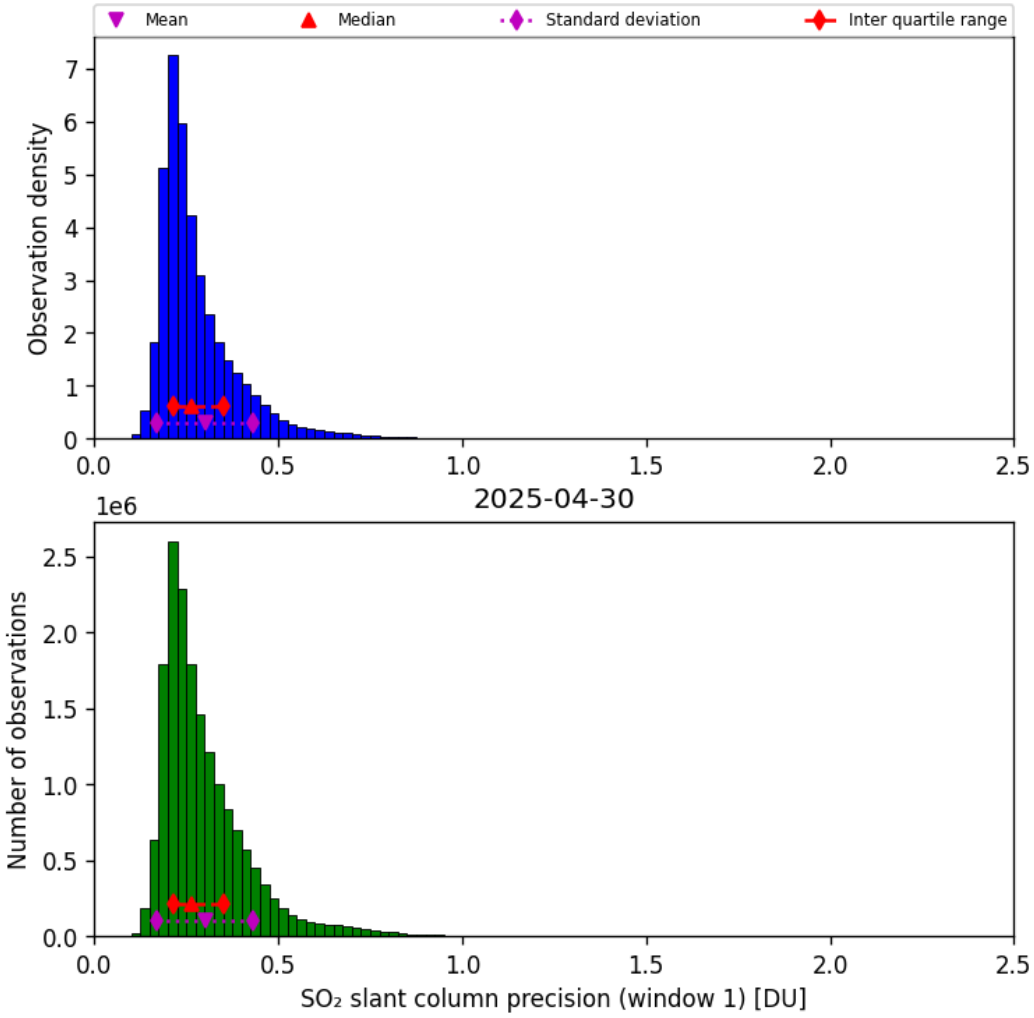

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-04-30 to 2025-05-01

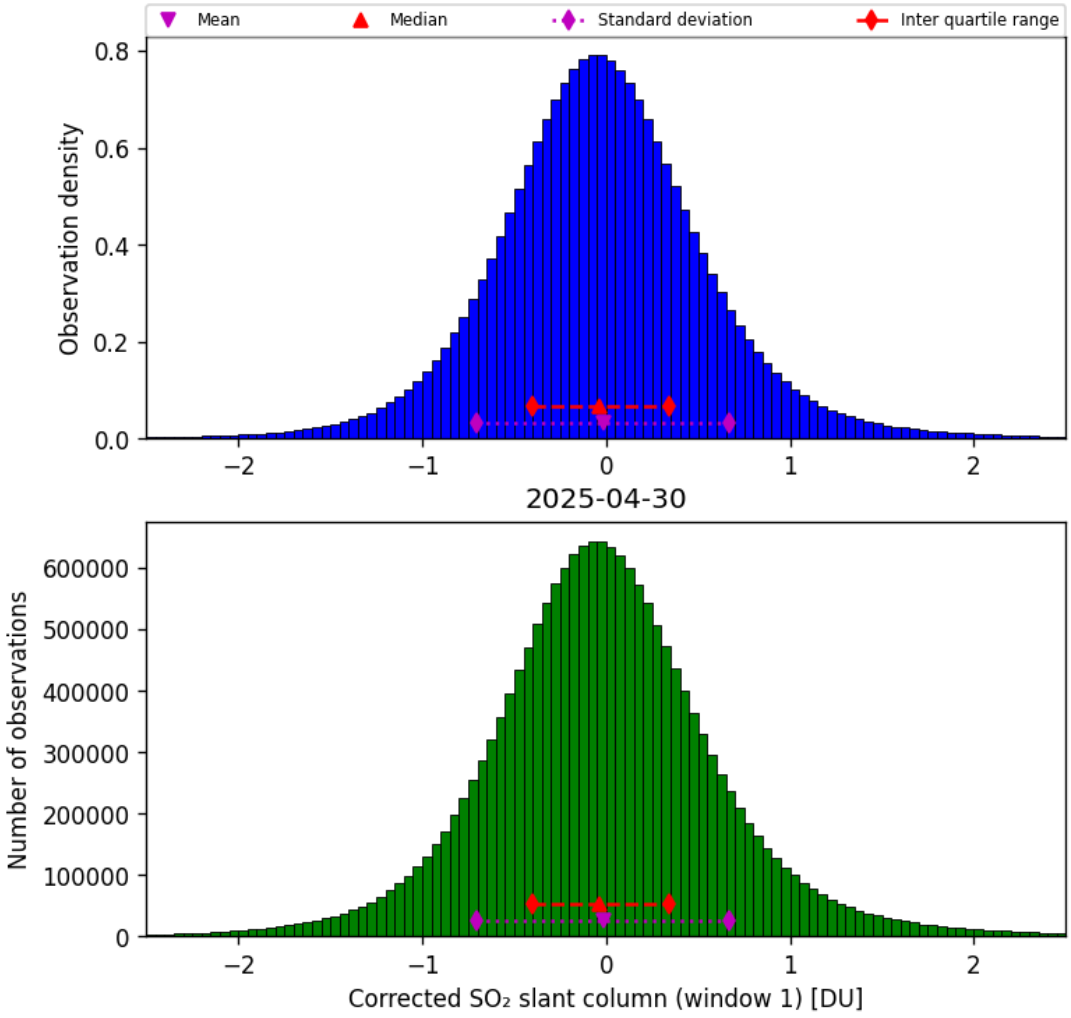

Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-04-30 to 2025-05-01

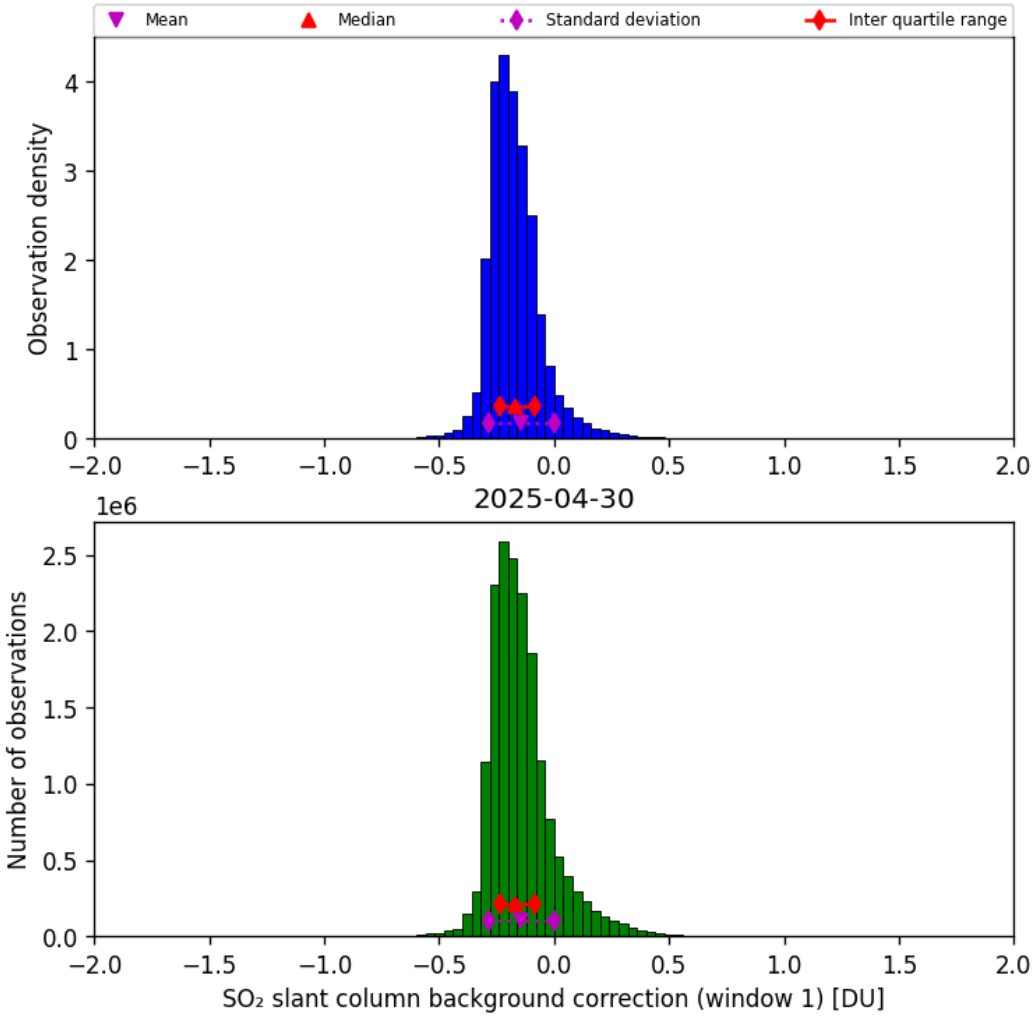

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-04-30 to 2025-05-01

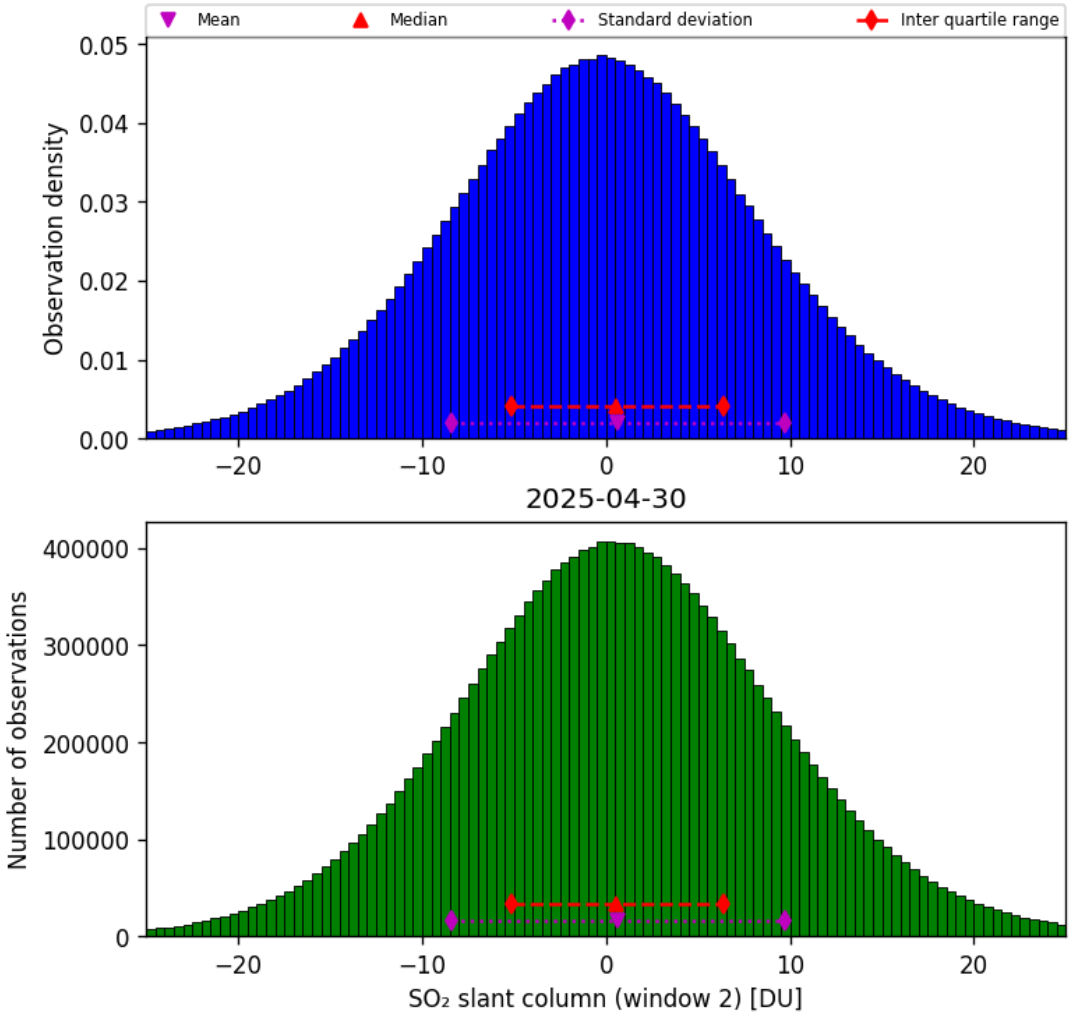

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-04-30 to 2025-05-01

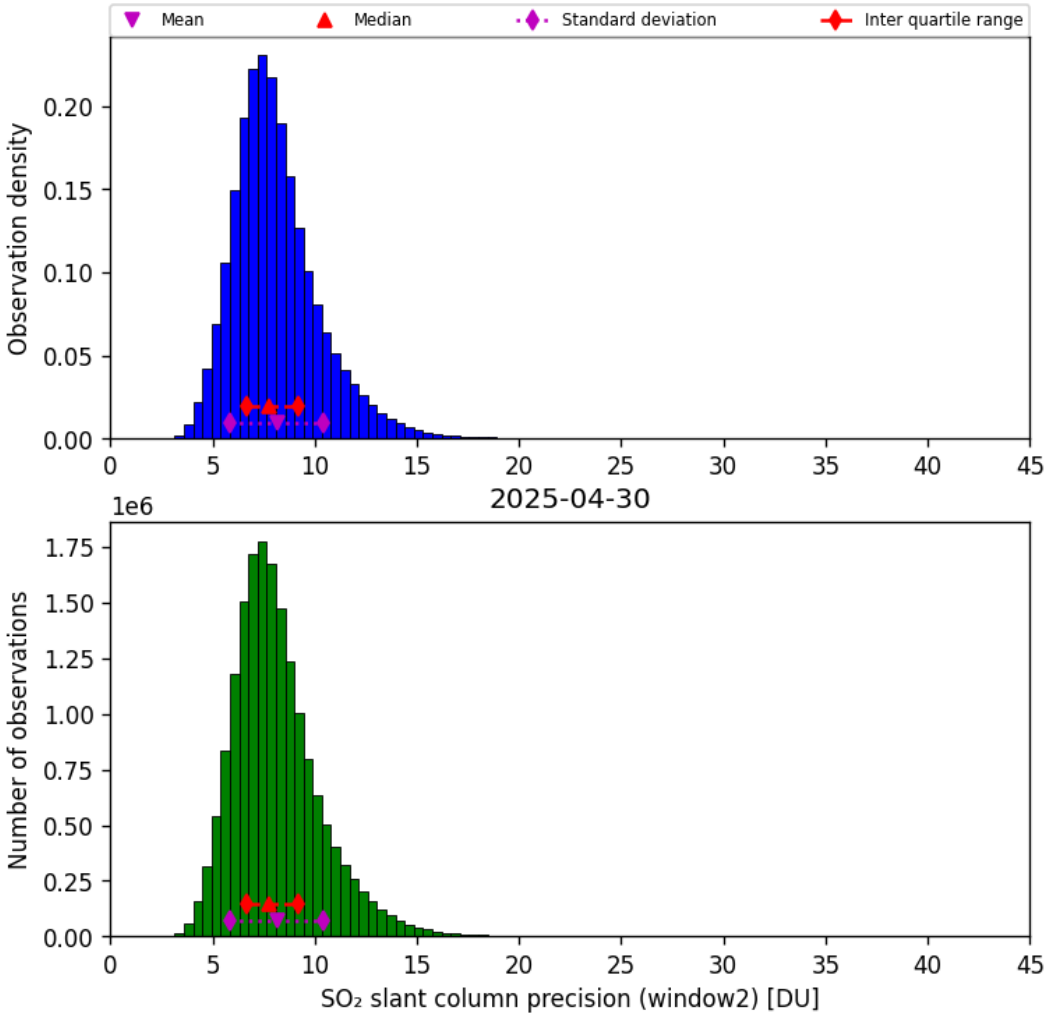

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-04-30 to 2025-05-01

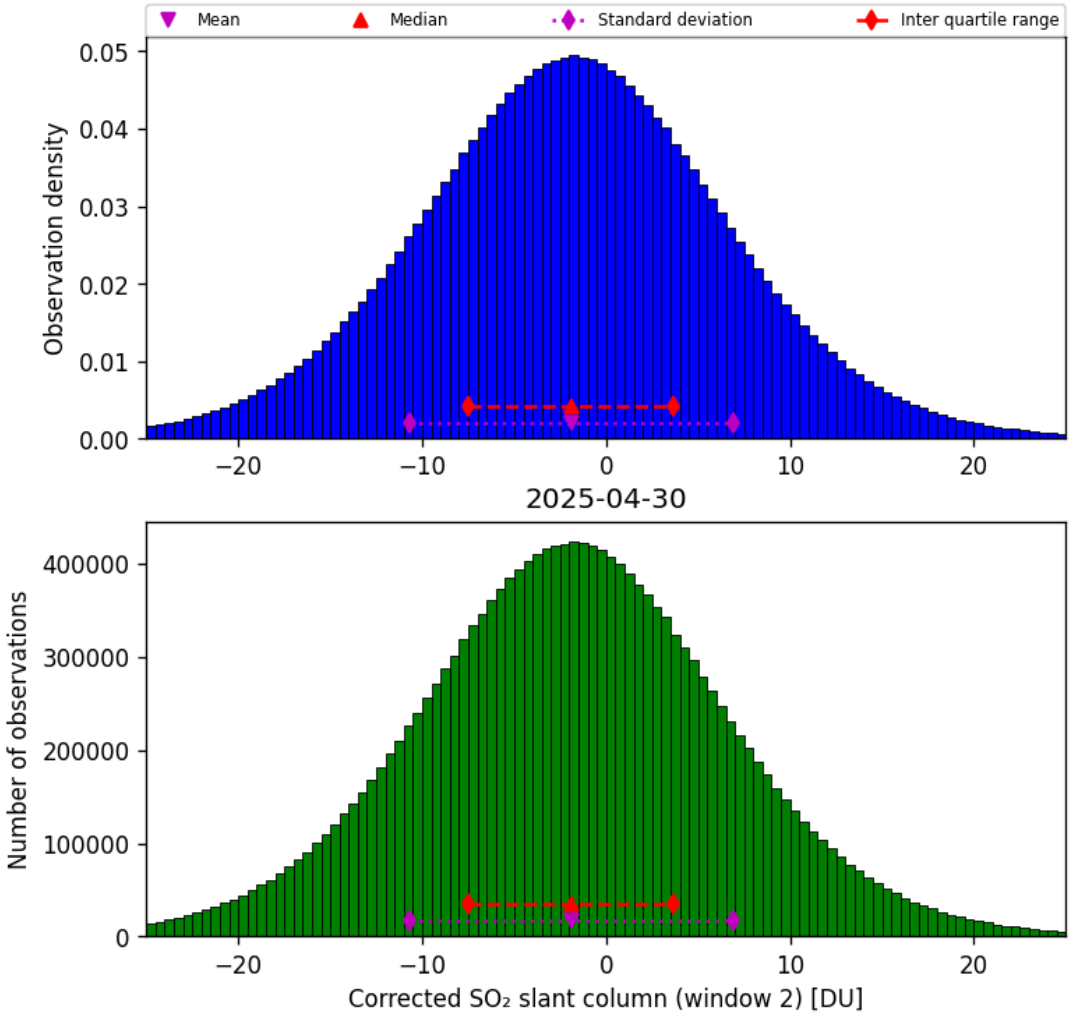

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-04-30 to 2025-05-01

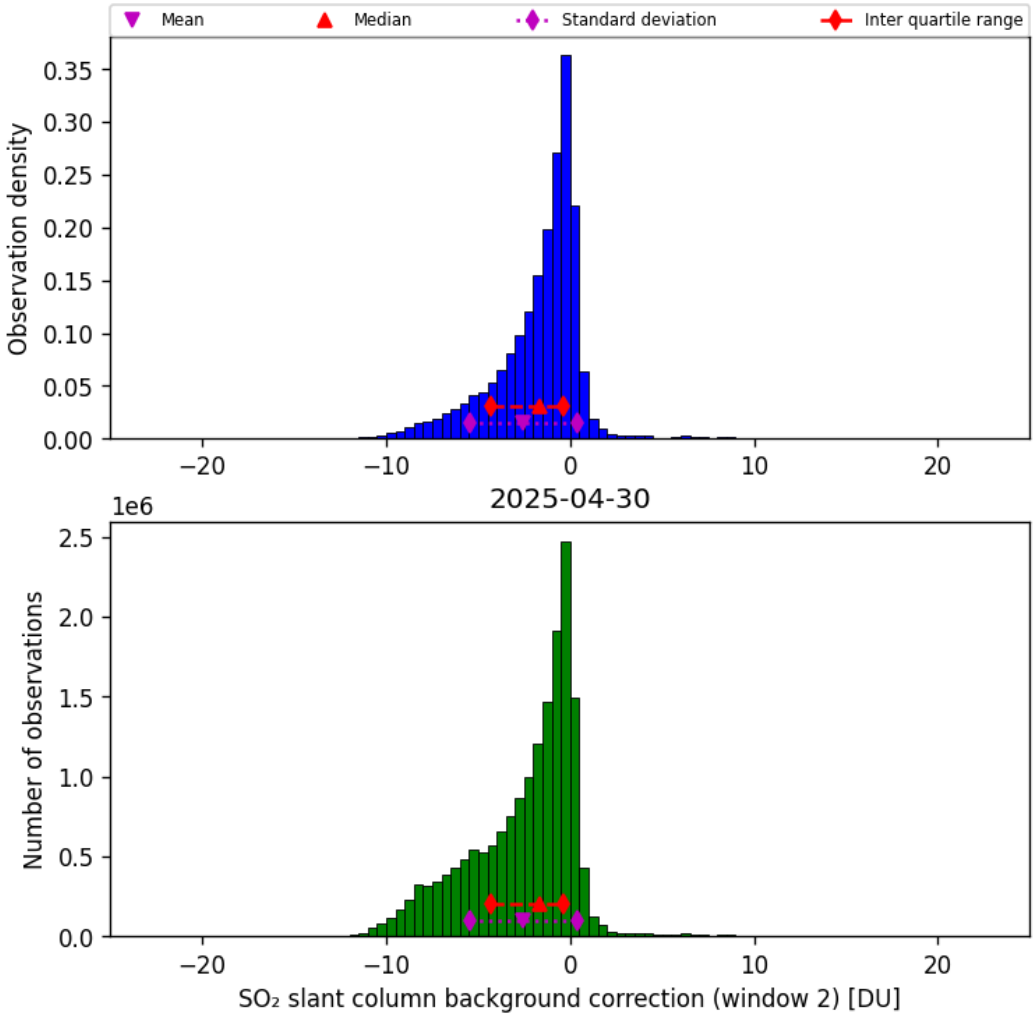

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-04-30 to 2025-05-01

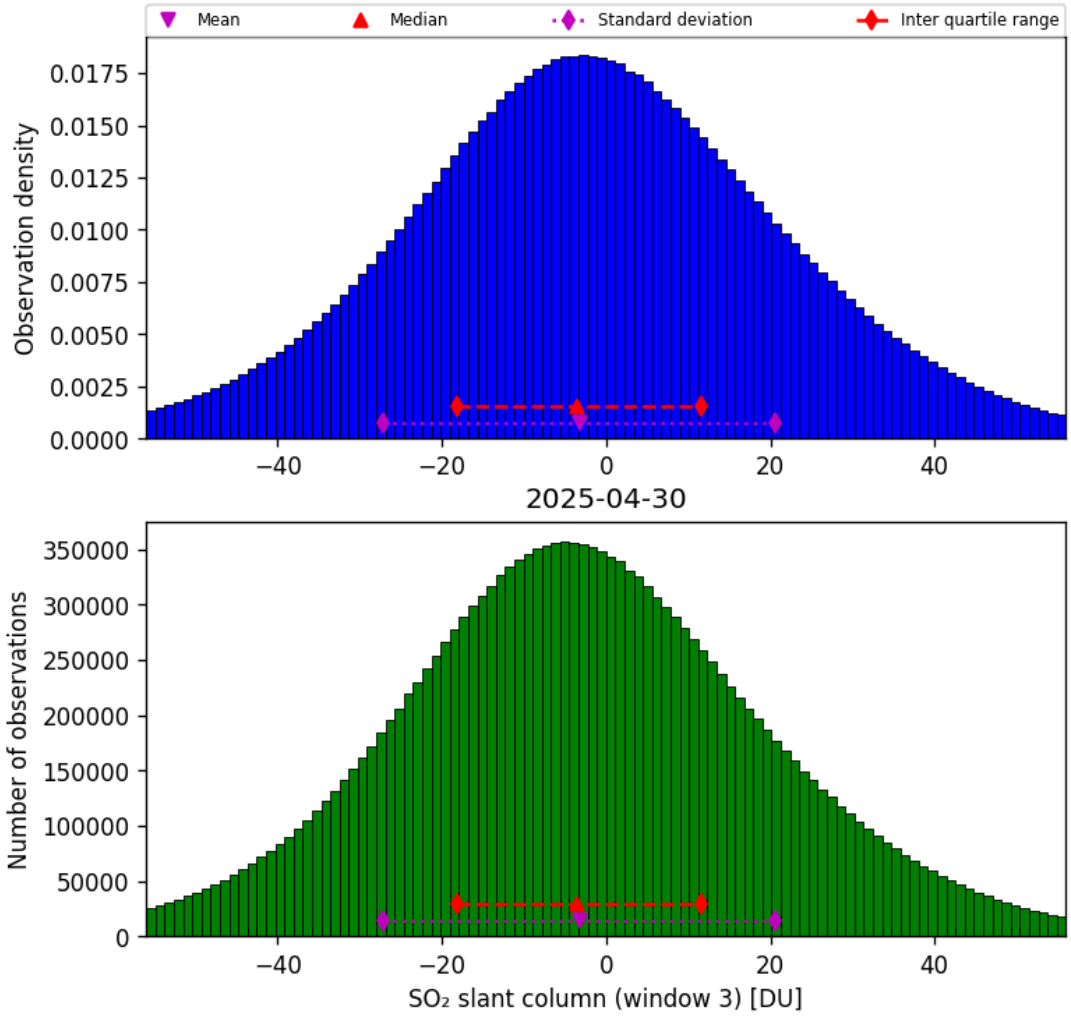

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-04-30 to 2025-05-01

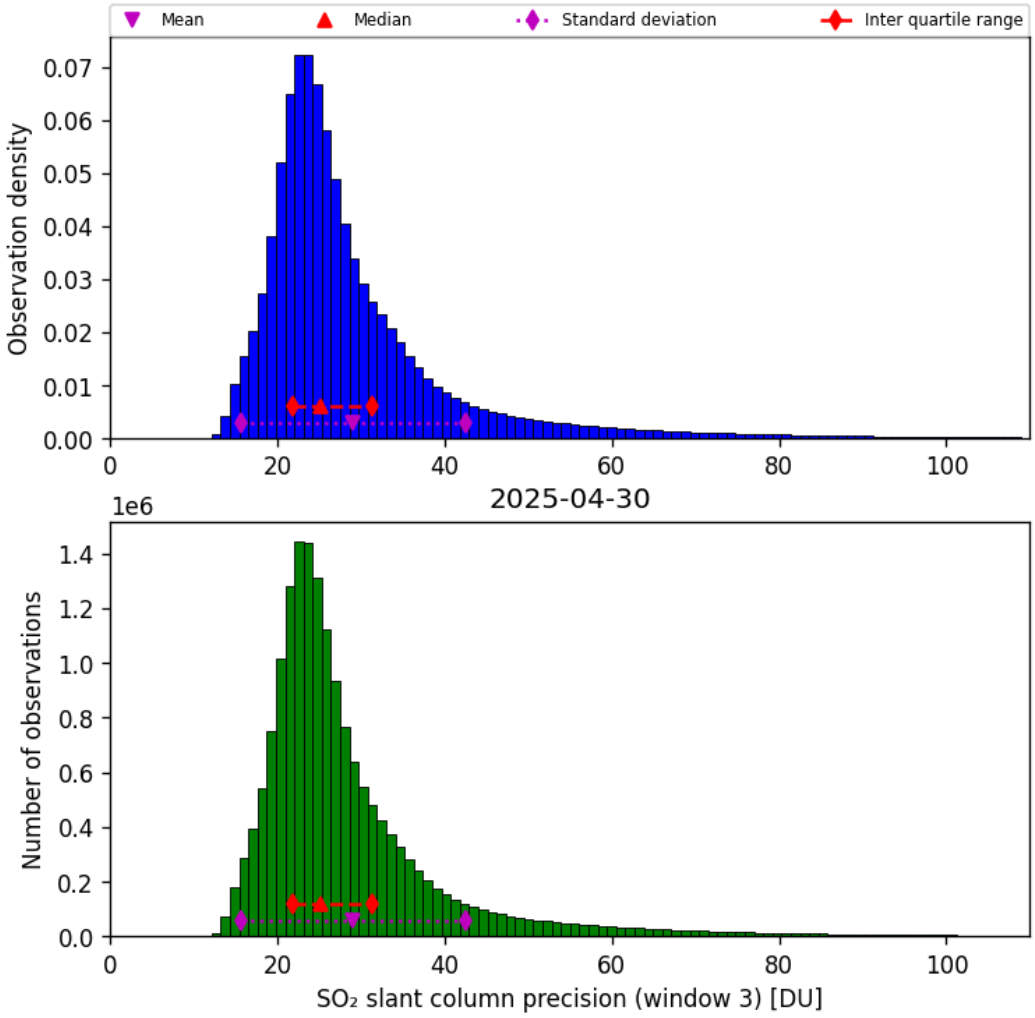

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-04-30 to 2025-05-01

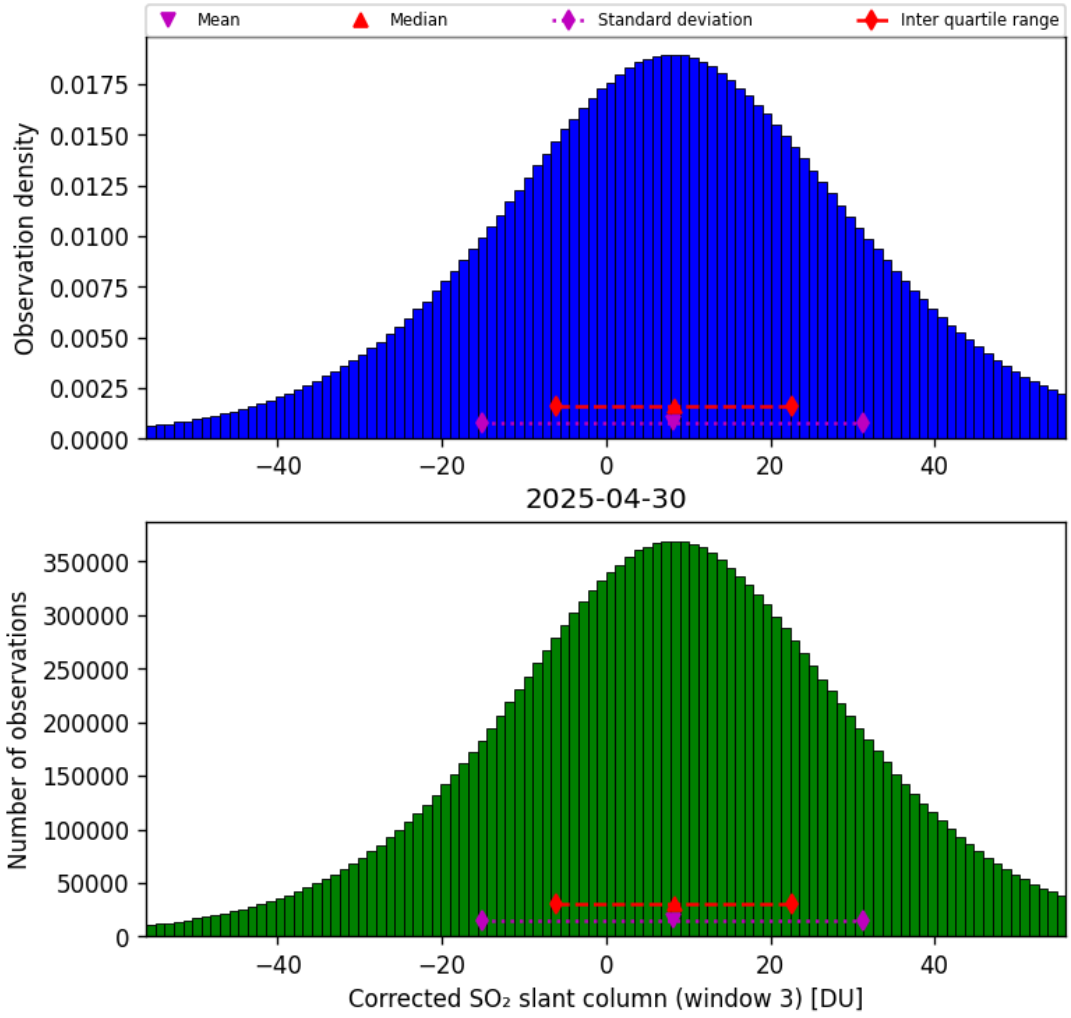

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-04-30 to 2025-05-01

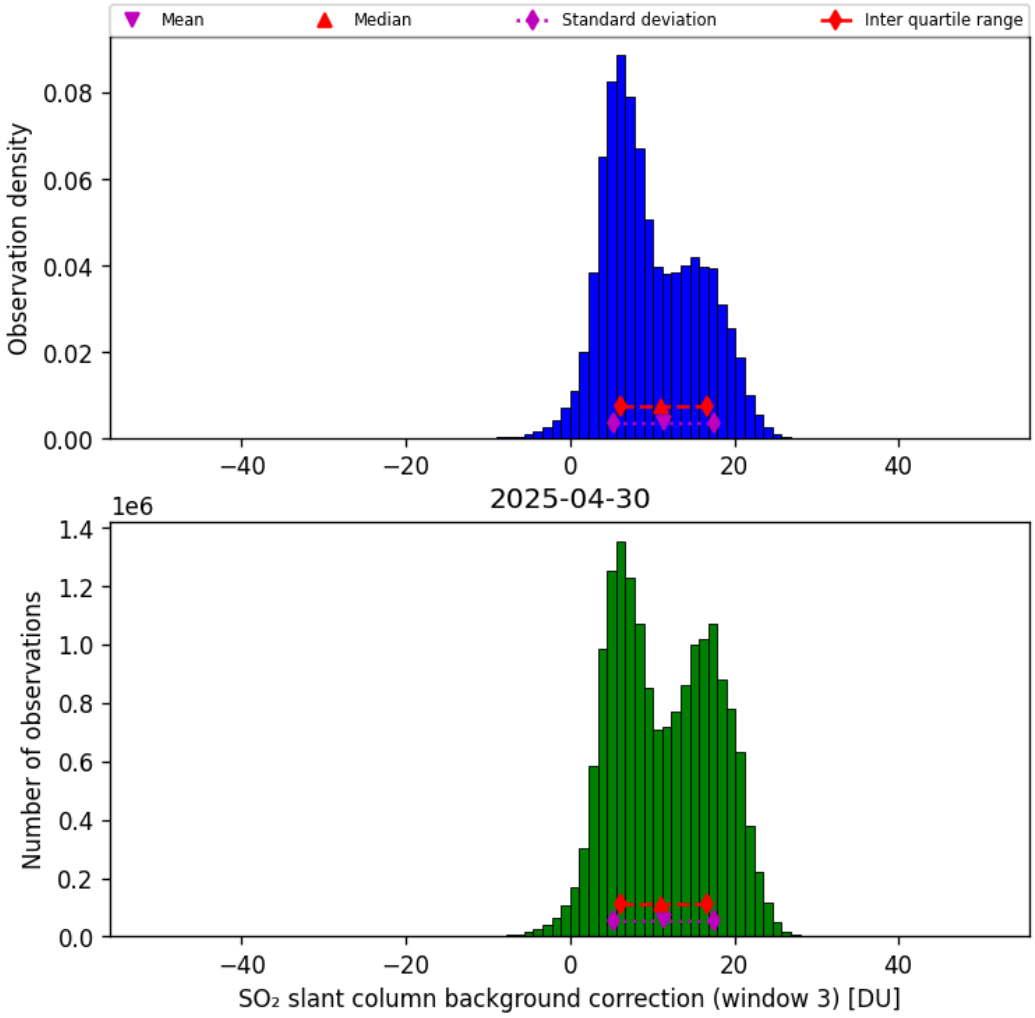

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-04-30 to 2025-05-01

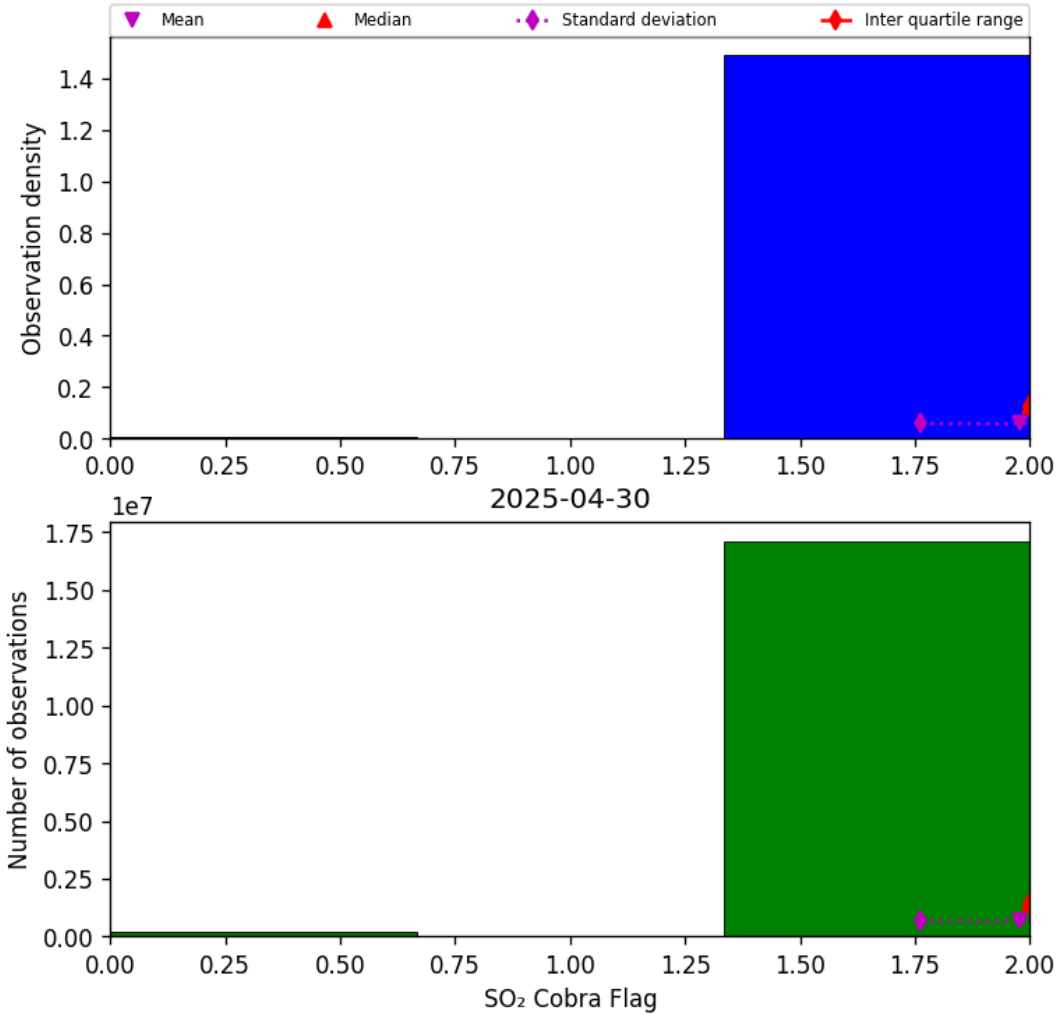

Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-04-30 to 2025-05-01

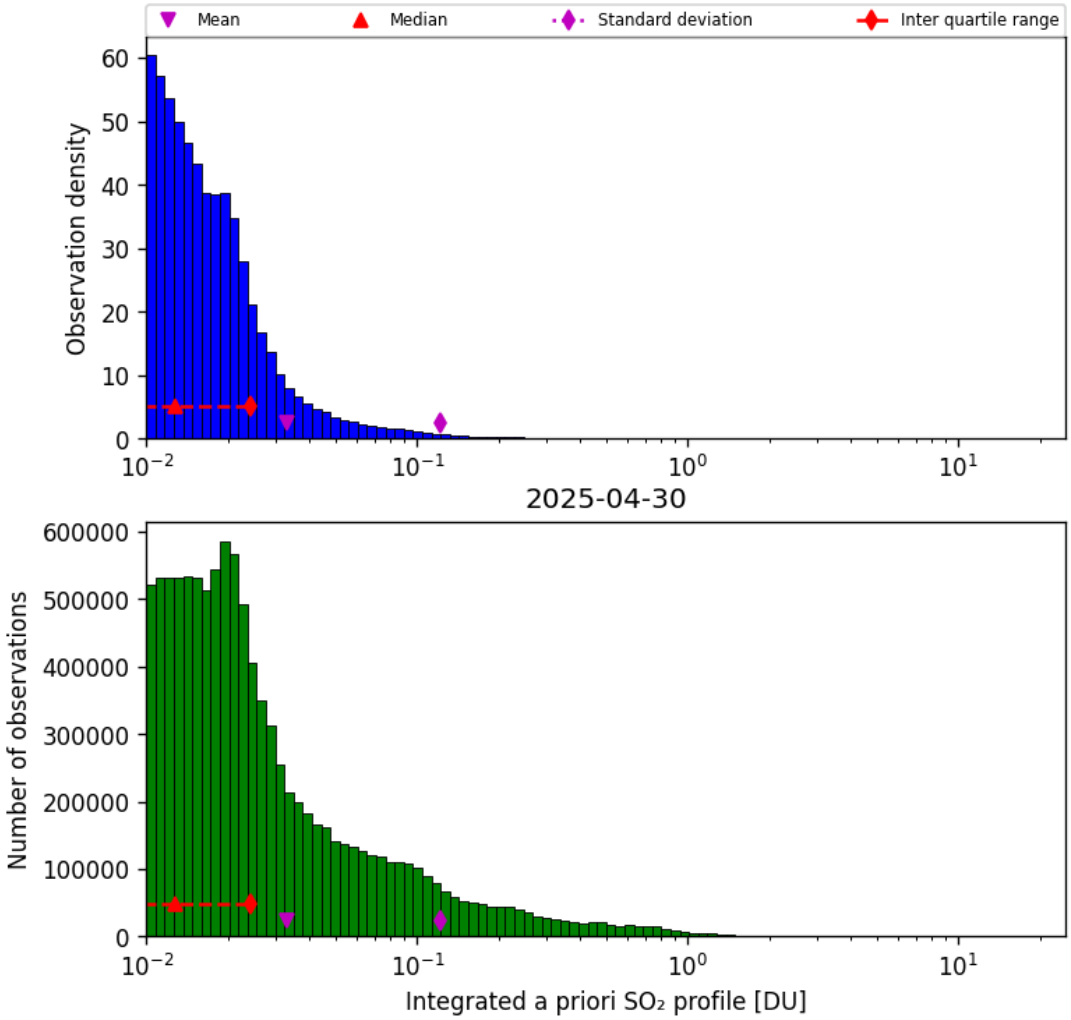

Figure 76: Histogram of “Integrated a priori SO_2 profile” for 2025-04-30 to 2025-05-01

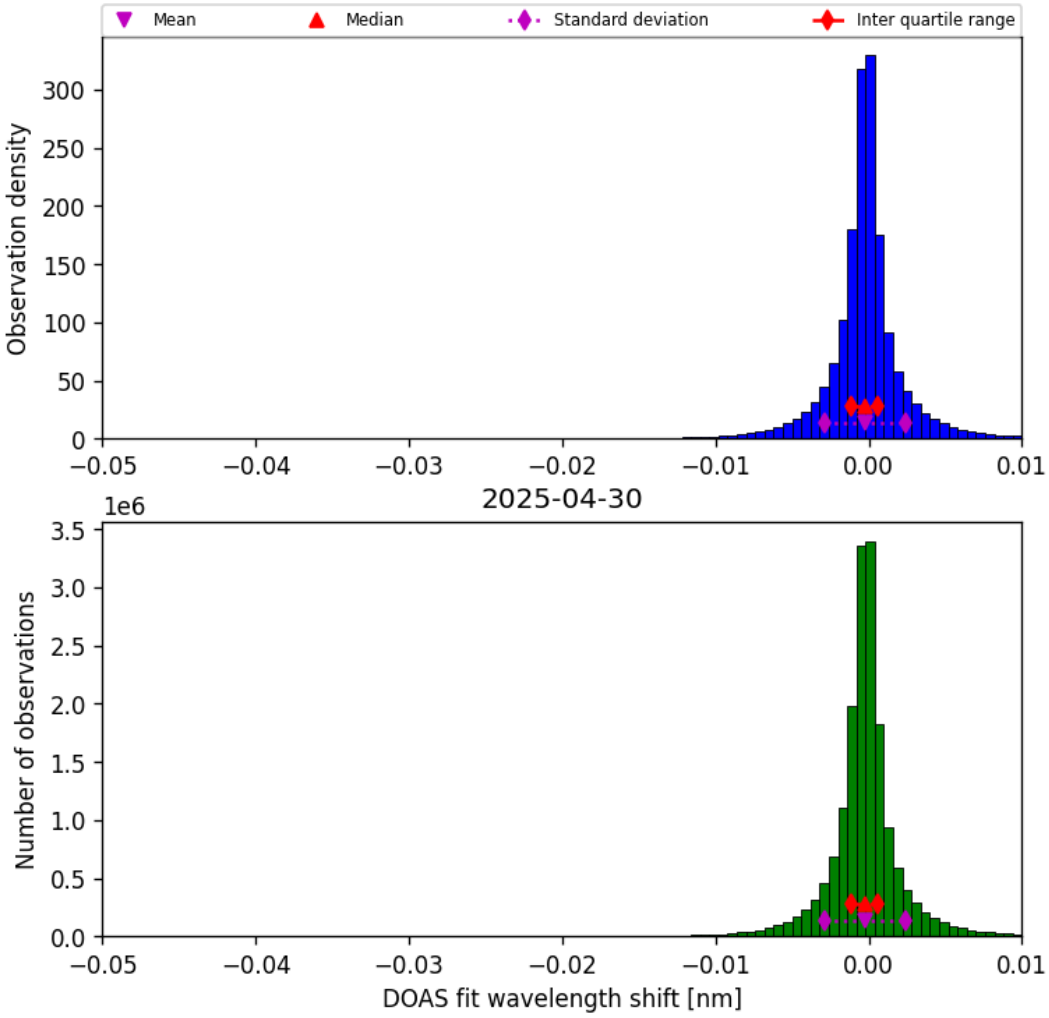

Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-04-30 to 2025-05-01

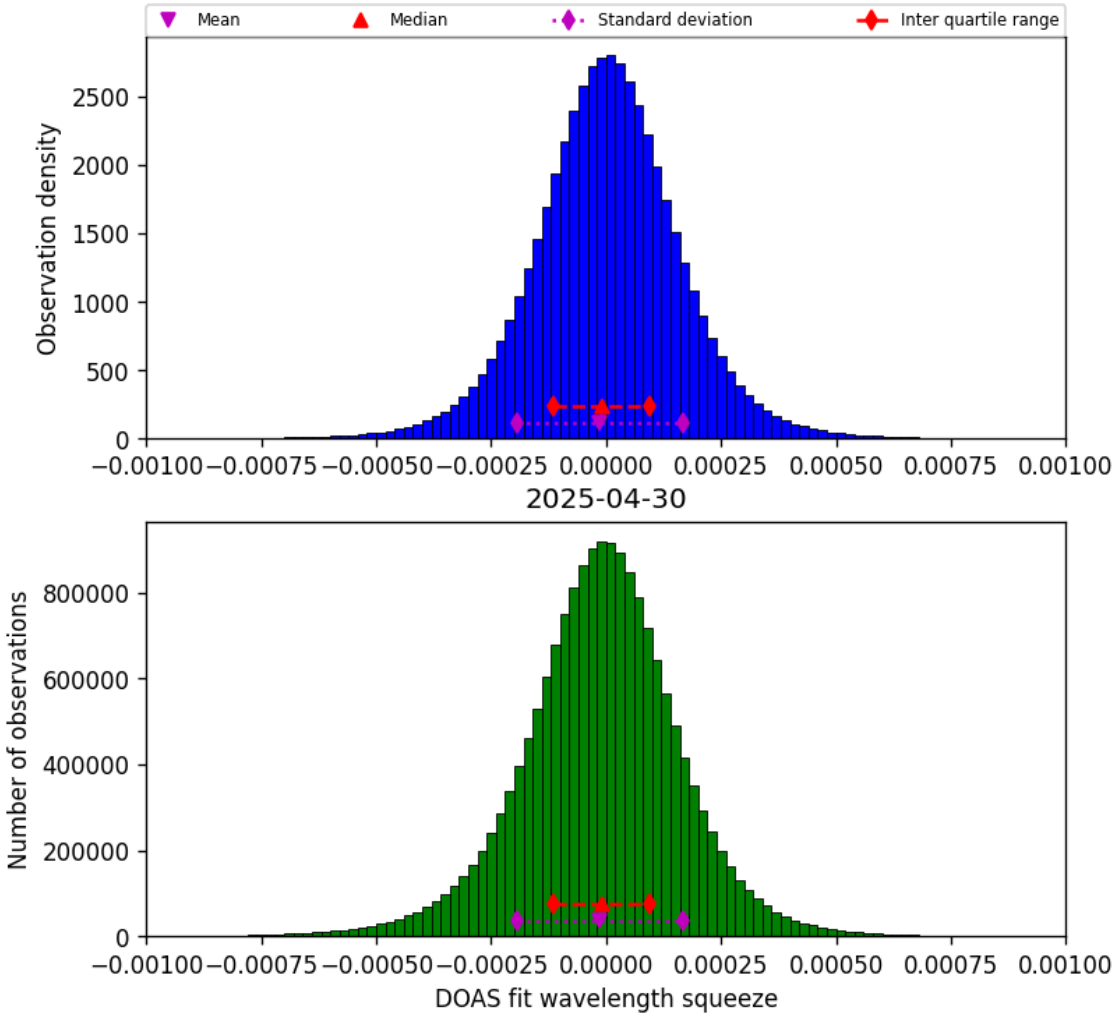

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-04-30 to 2025-05-01

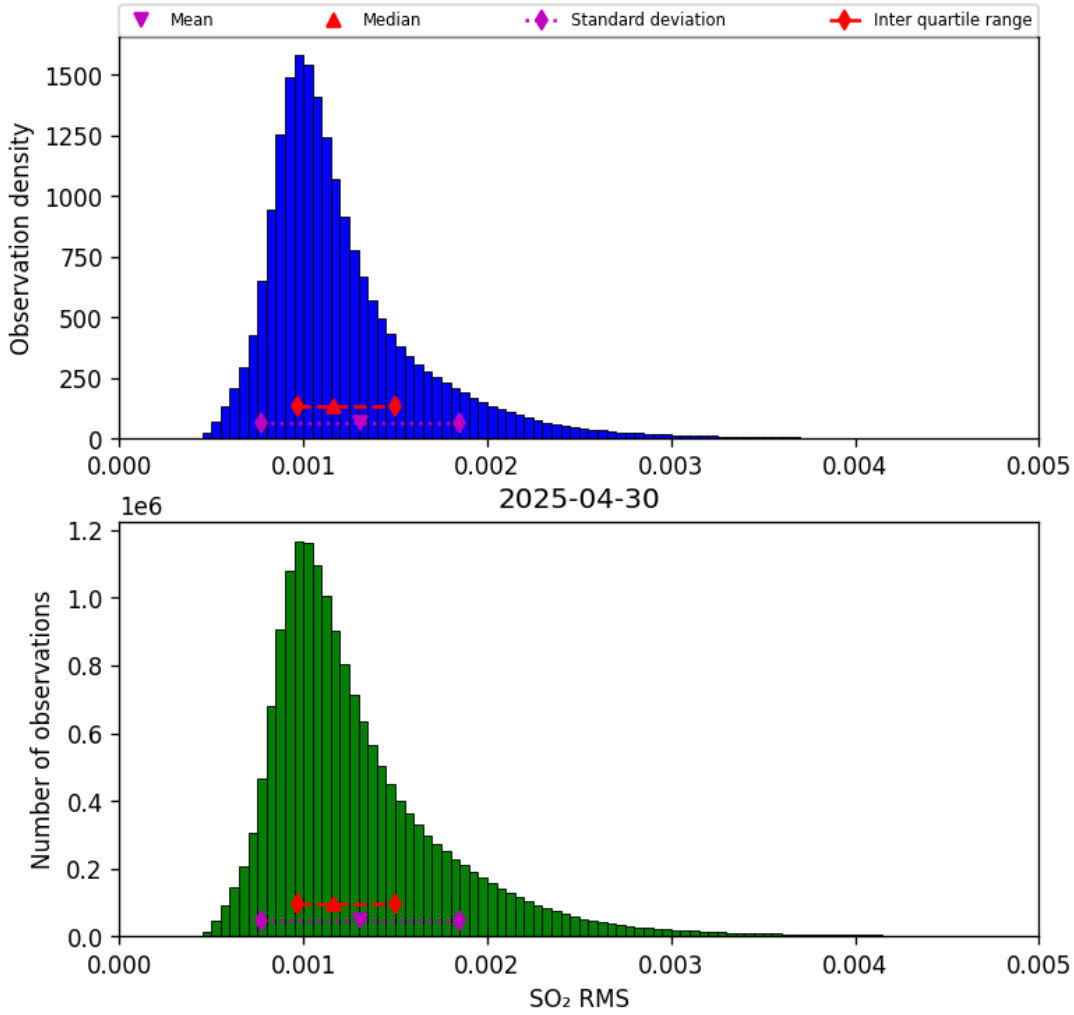

Figure 79: Histogram of "SO_2 RMS" for 2025-04-30 to 2025-05-01

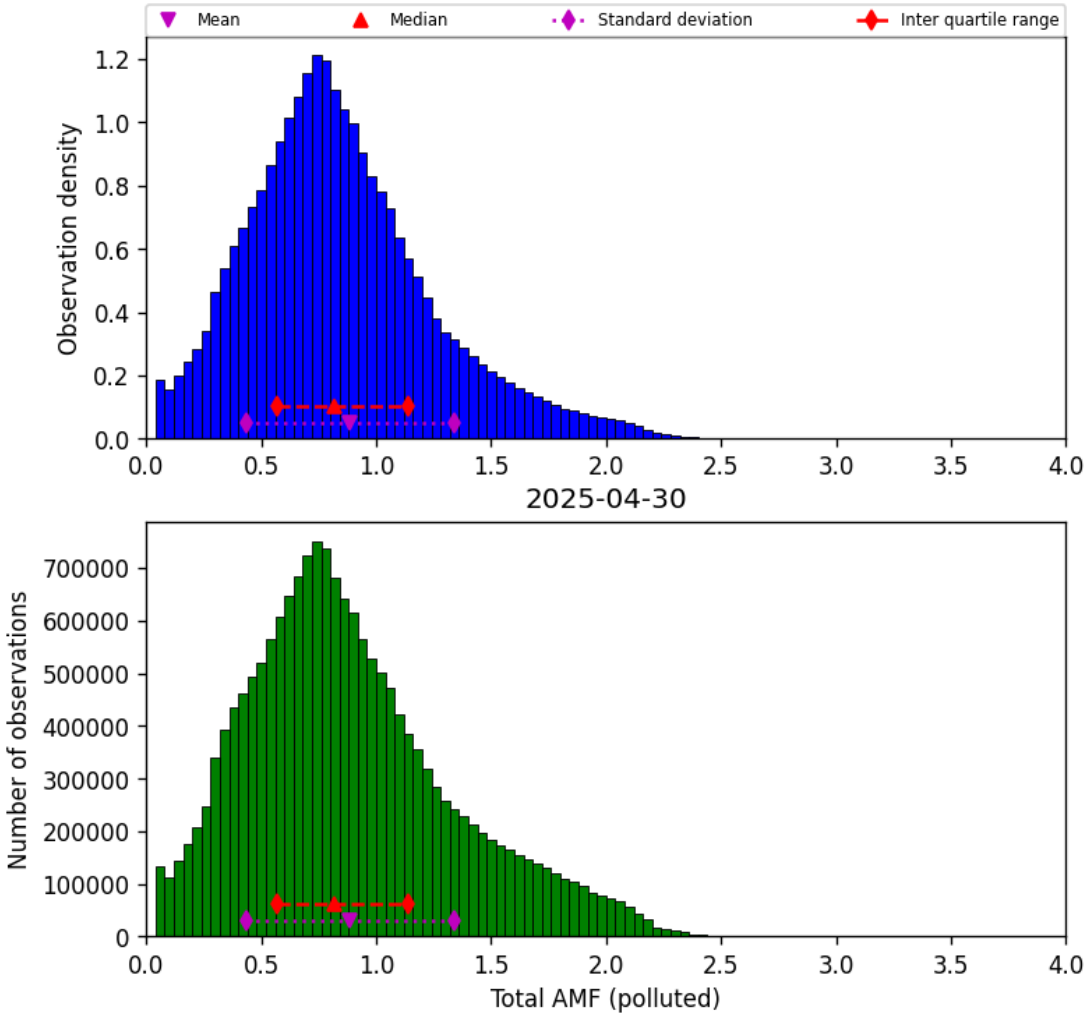

Figure 80: Histogram of “Total AMF (polluted)” for 2025-04-30 to 2025-05-01

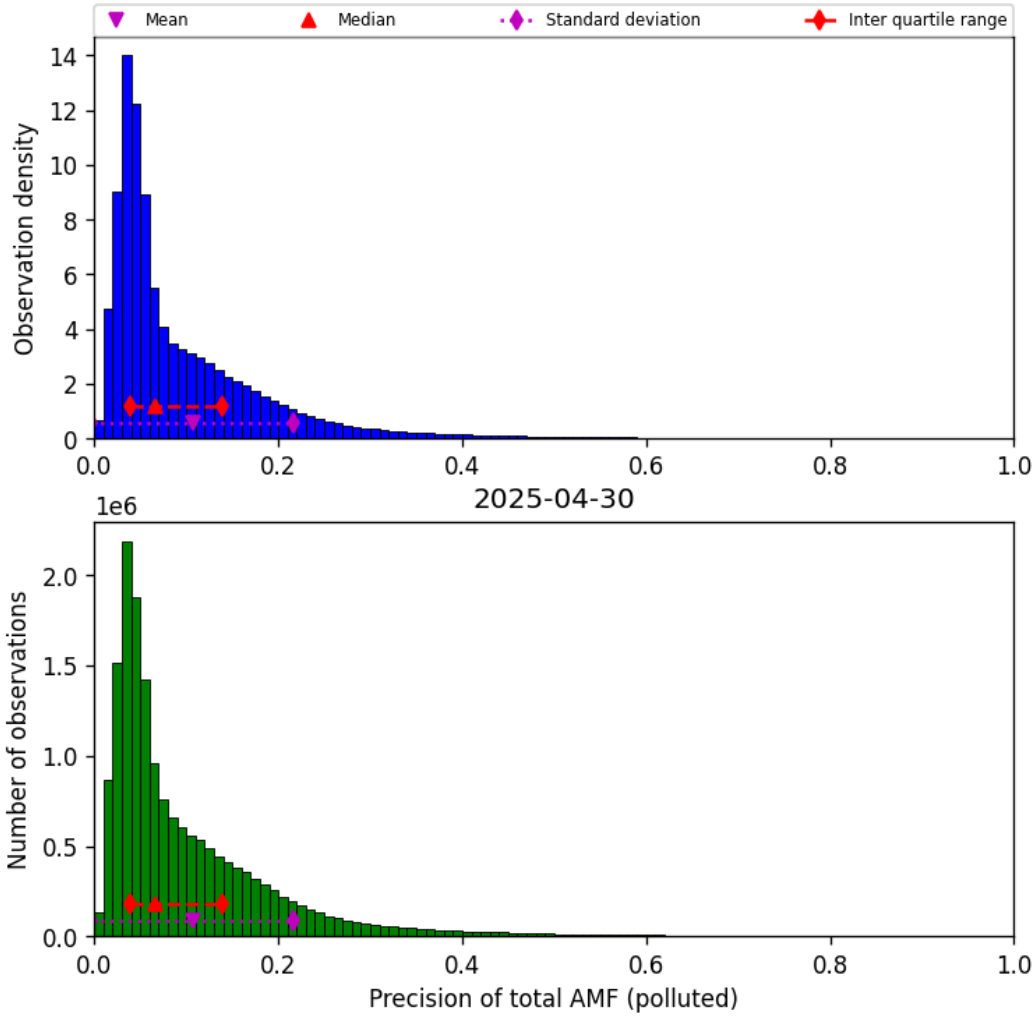

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-04-30 to 2025-05-01

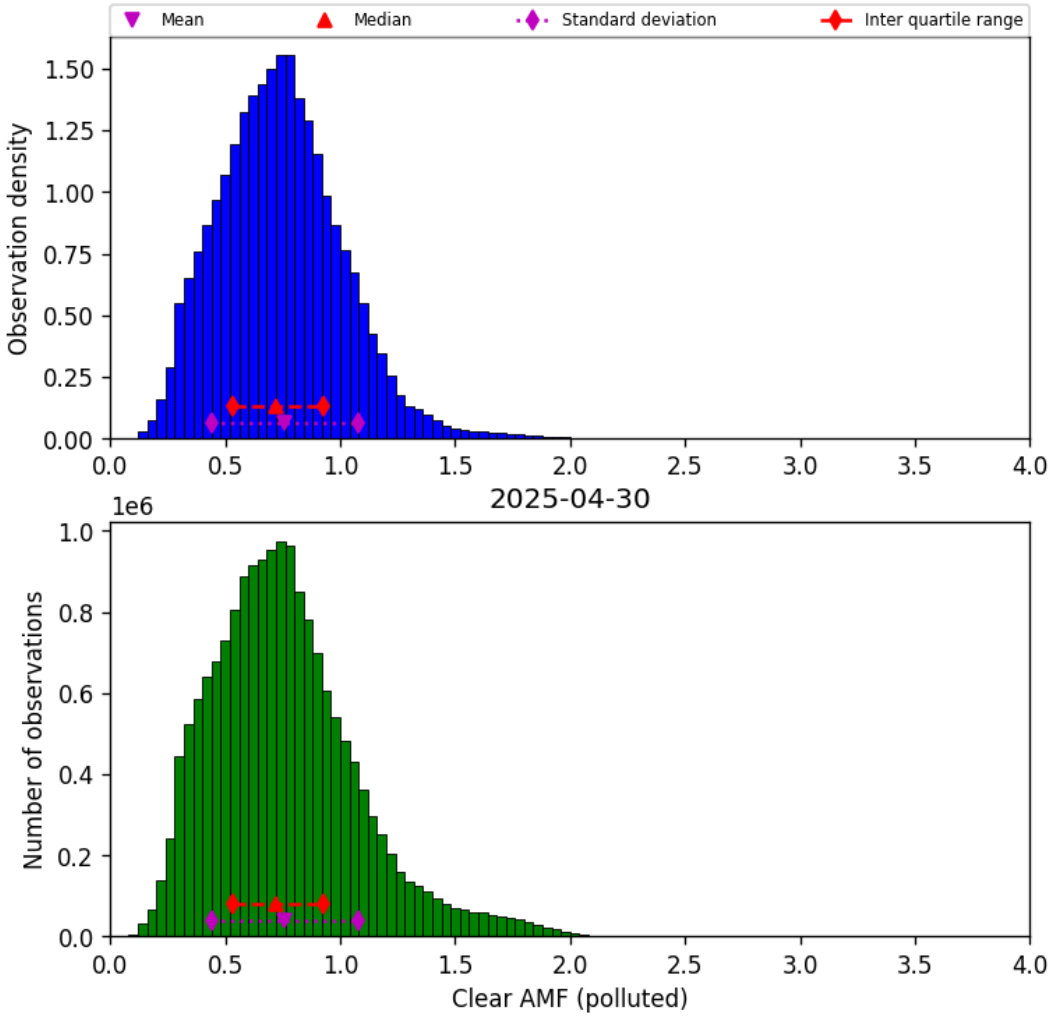

Figure 82: Histogram of “Clear AMF (polluted)” for 2025-04-30 to 2025-05-01

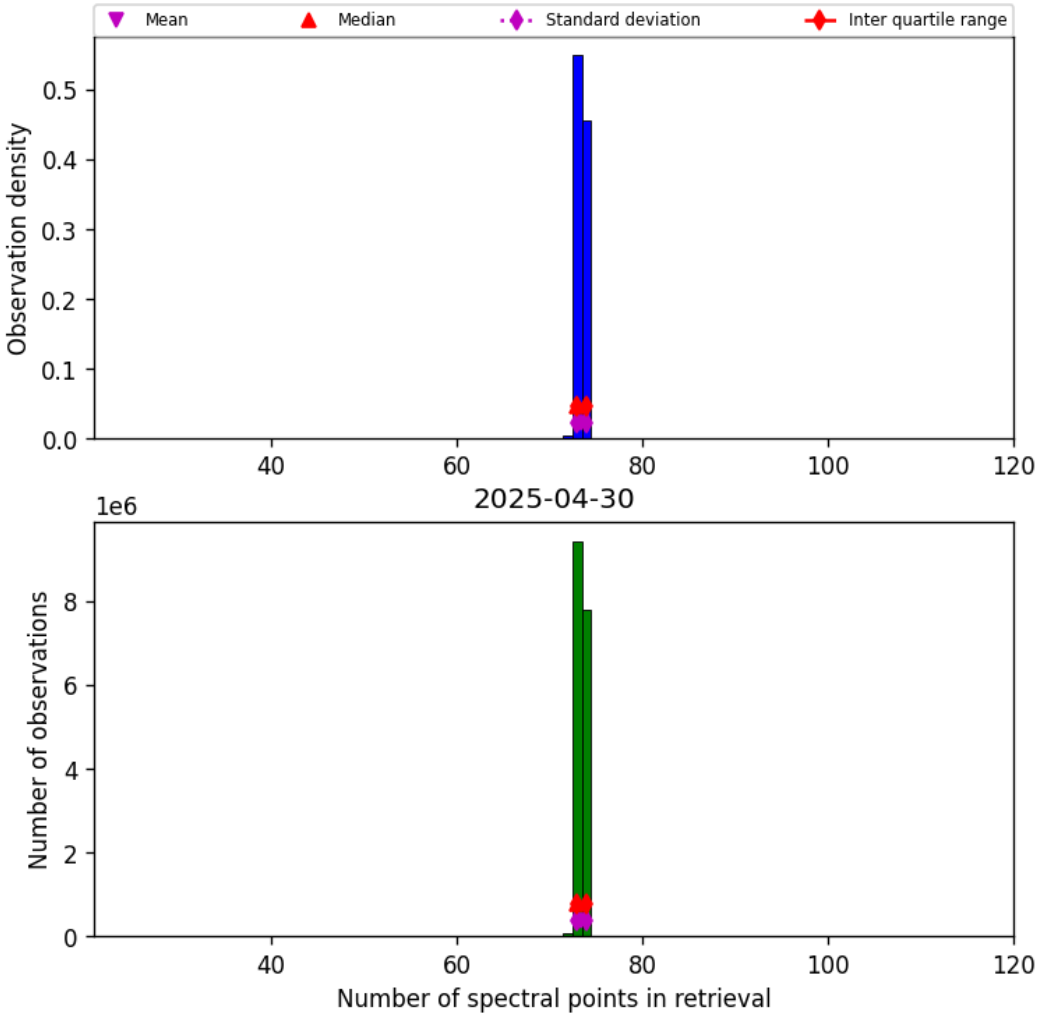

Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-04-30 to 2025-05-01

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.

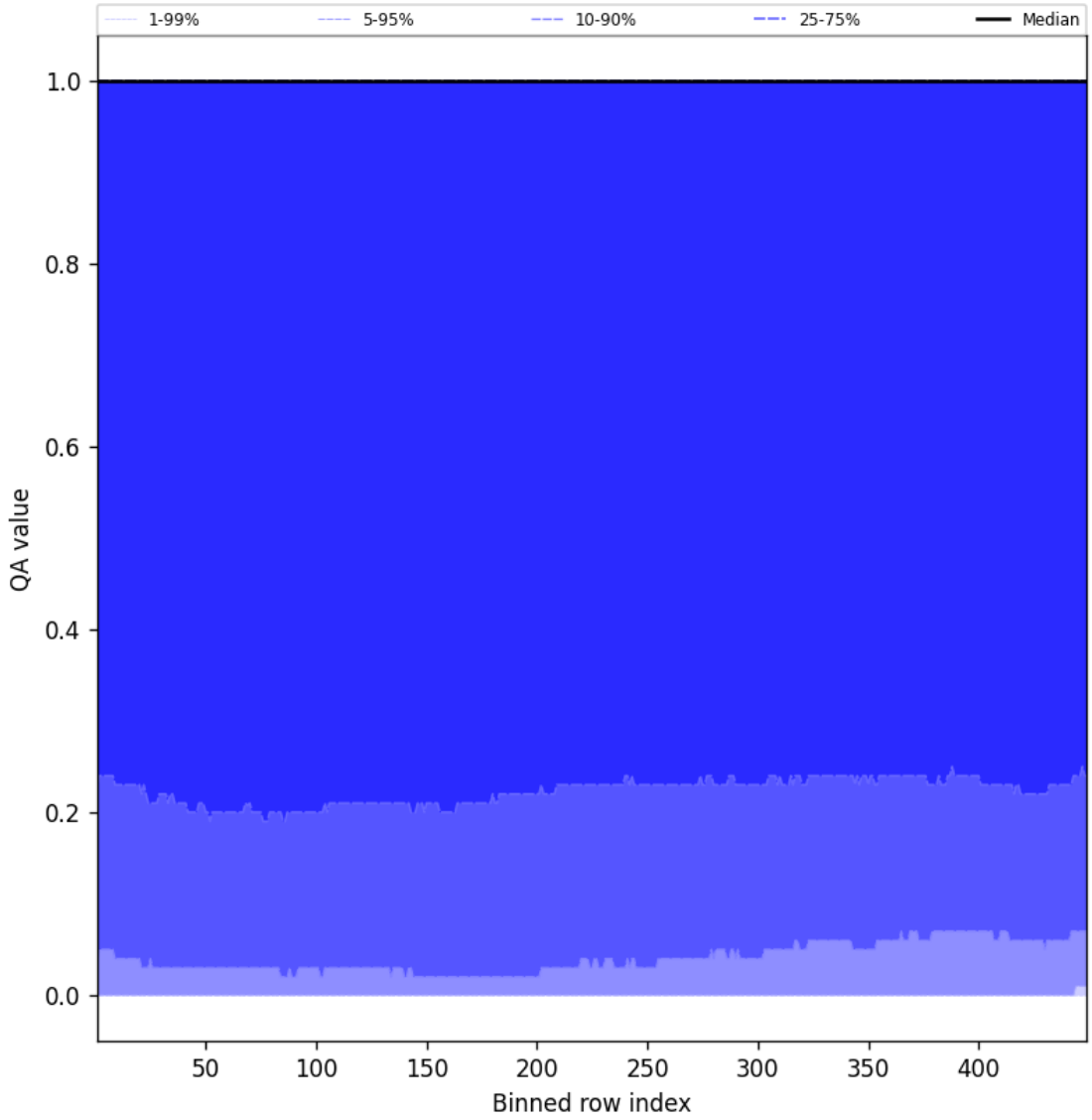

Figure 84: Along track statistics of “QA value” for 2025-04-30 to 2025-05-01

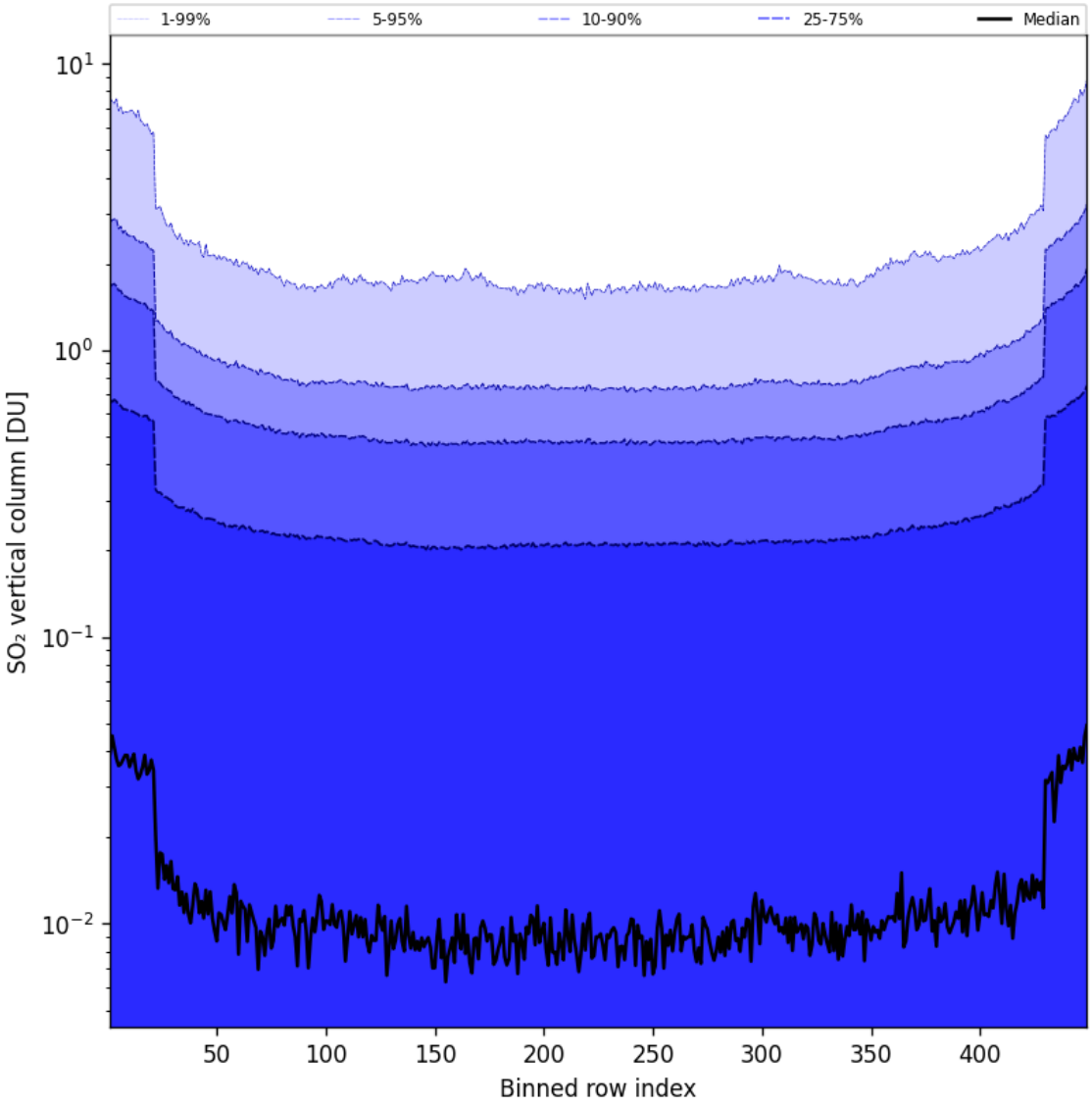

Figure 85: Along track statistics of "SO_2 vertical column" for 2025-04-30 to 2025-05-01

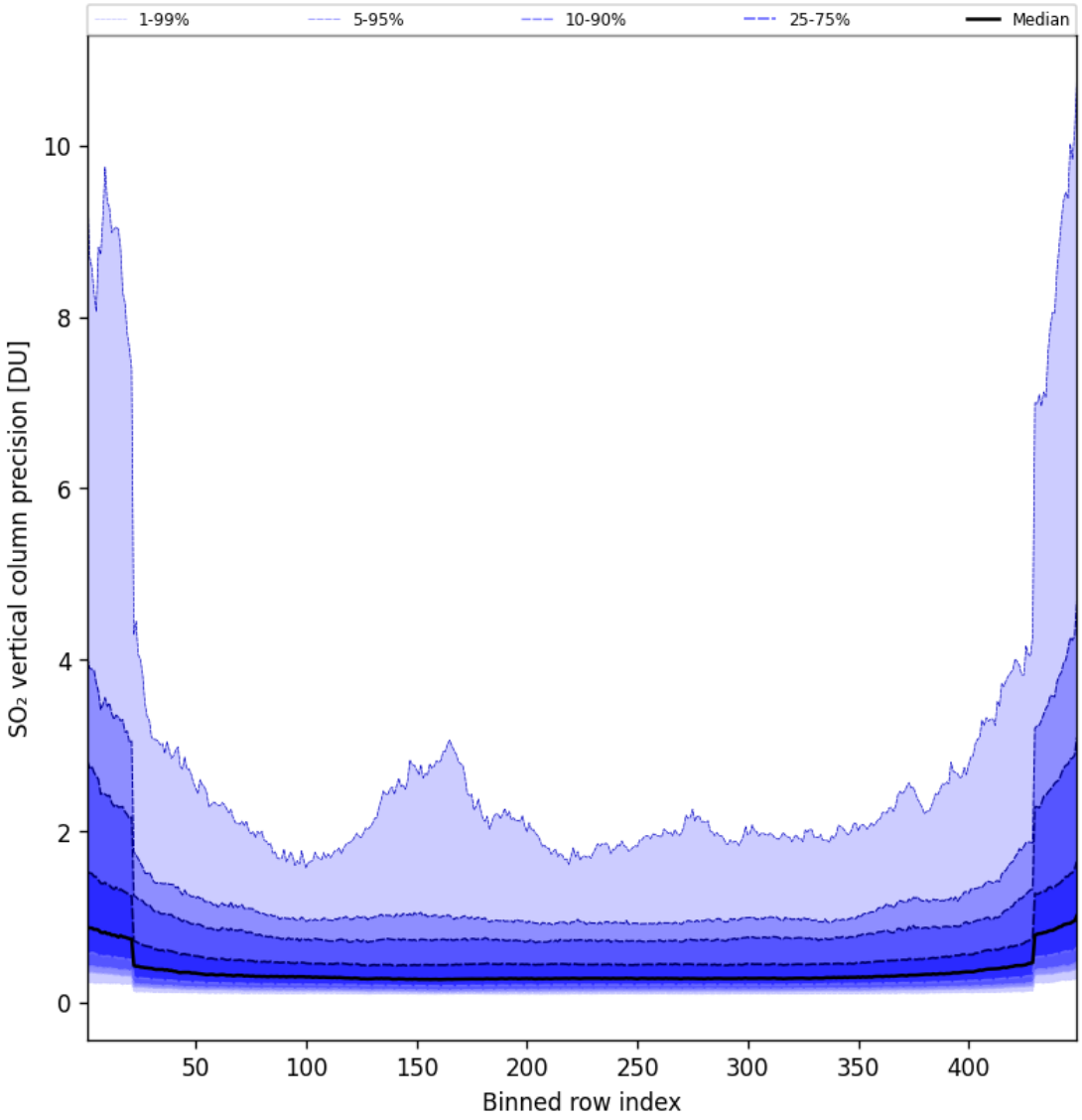

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-04-30 to 2025-05-01

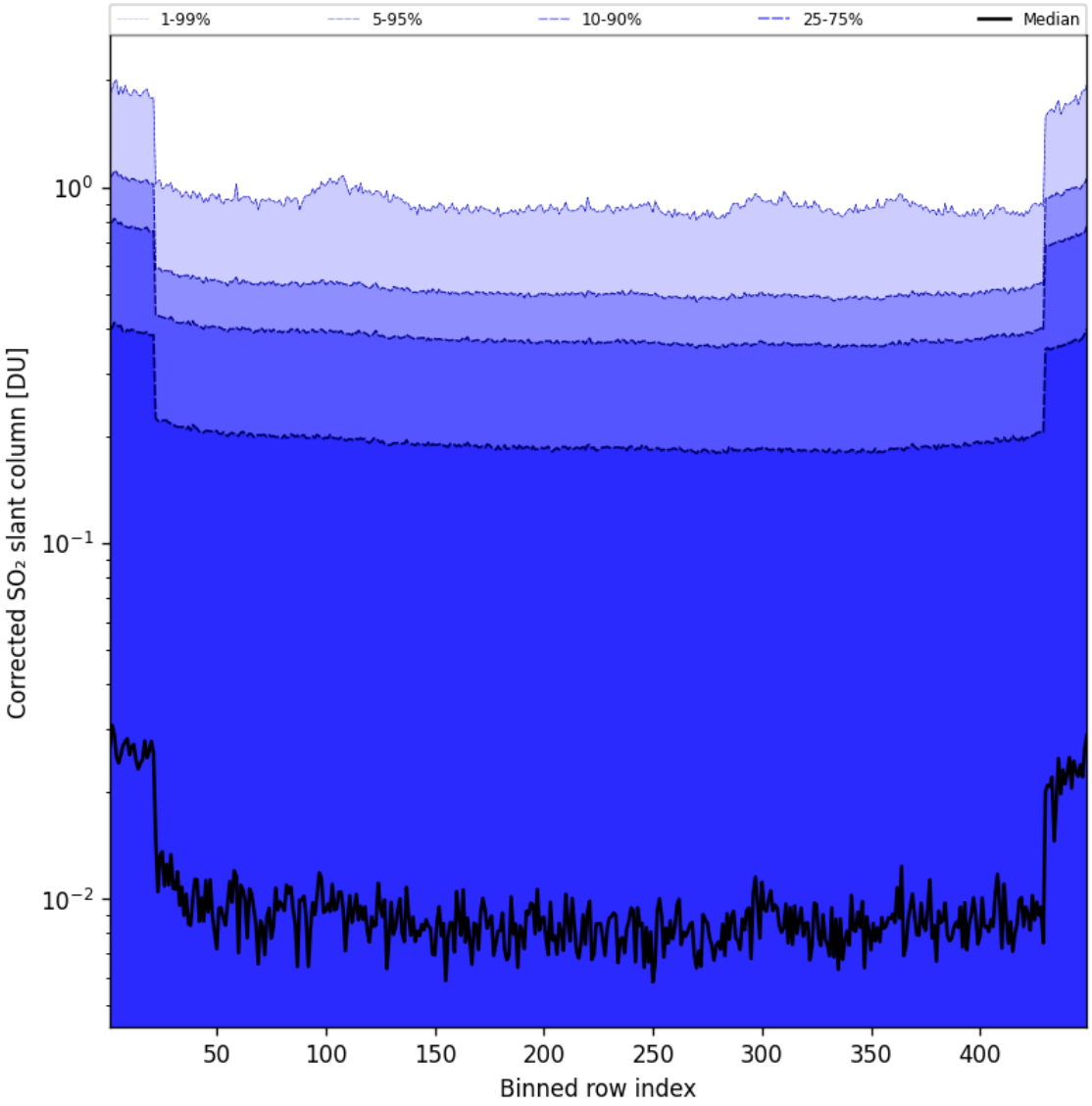

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-04-30 to 2025-05-01

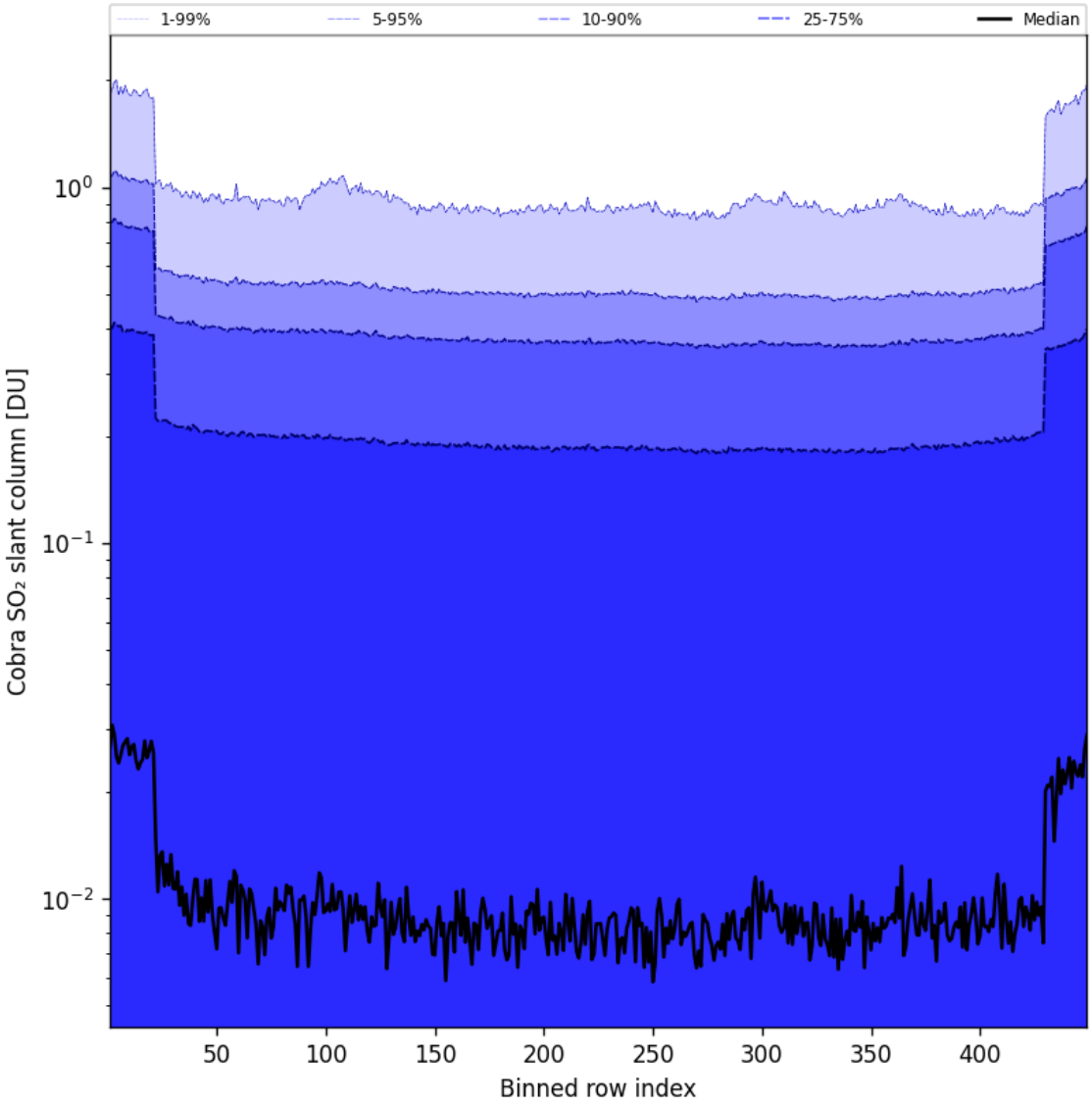

Figure 88: Along track statistics of "Cobra SO_2 slant column" for 2025-04-30 to 2025-05-01

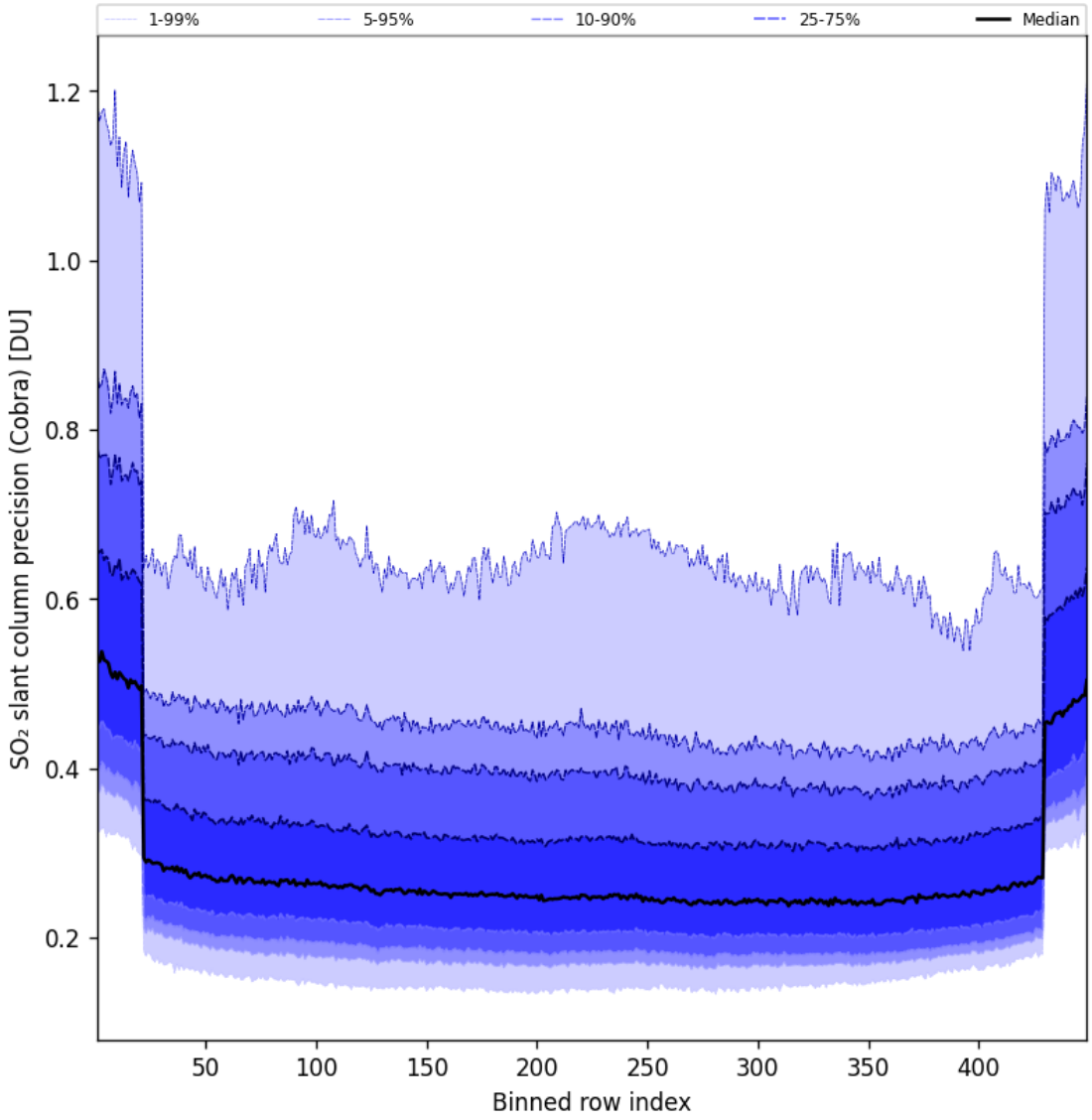

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-04-30 to 2025-05-01

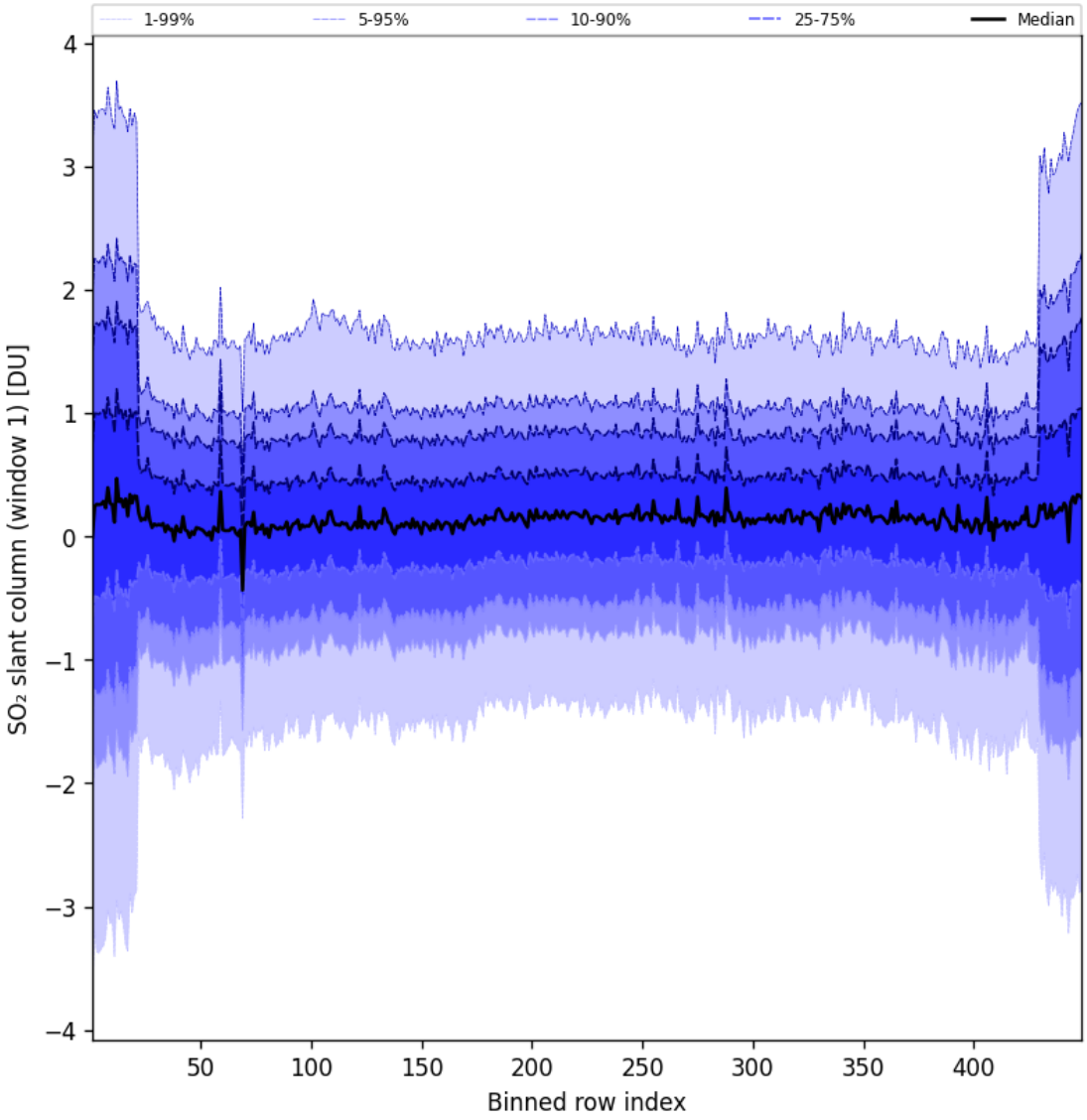

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-04-30 to 2025-05-01

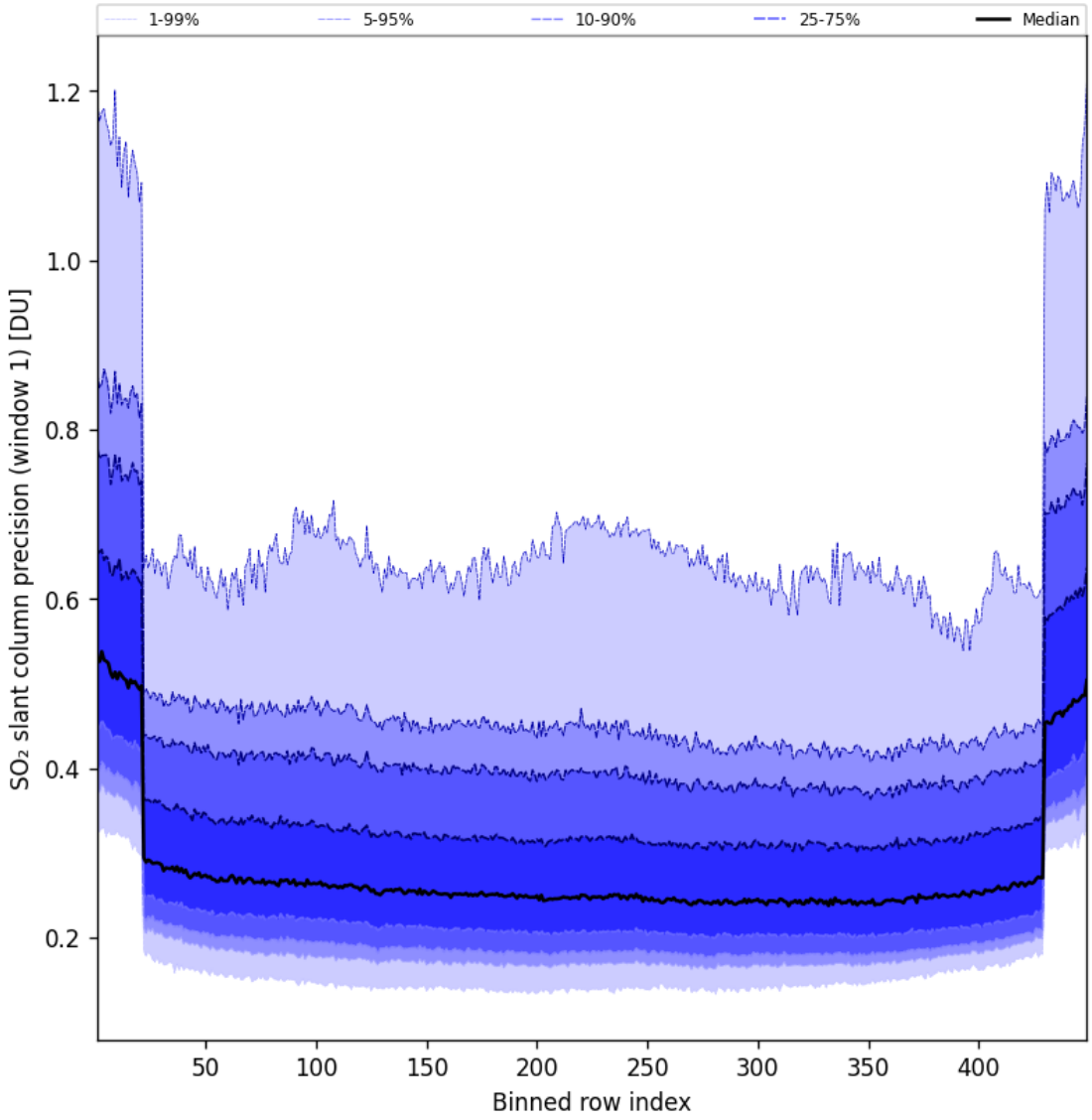

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-04-30 to 2025-05-01

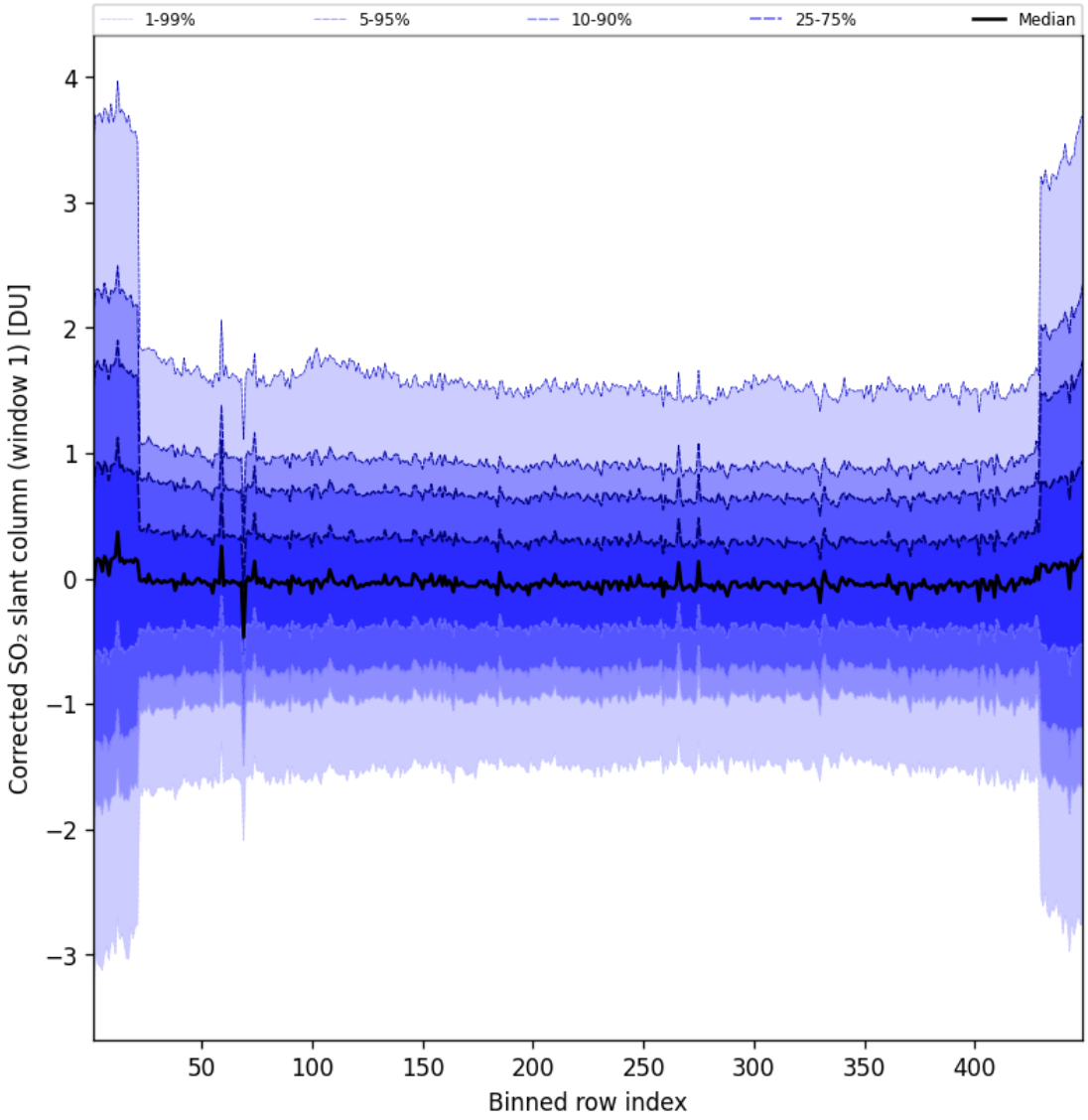

Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-04-30 to 2025-05-01

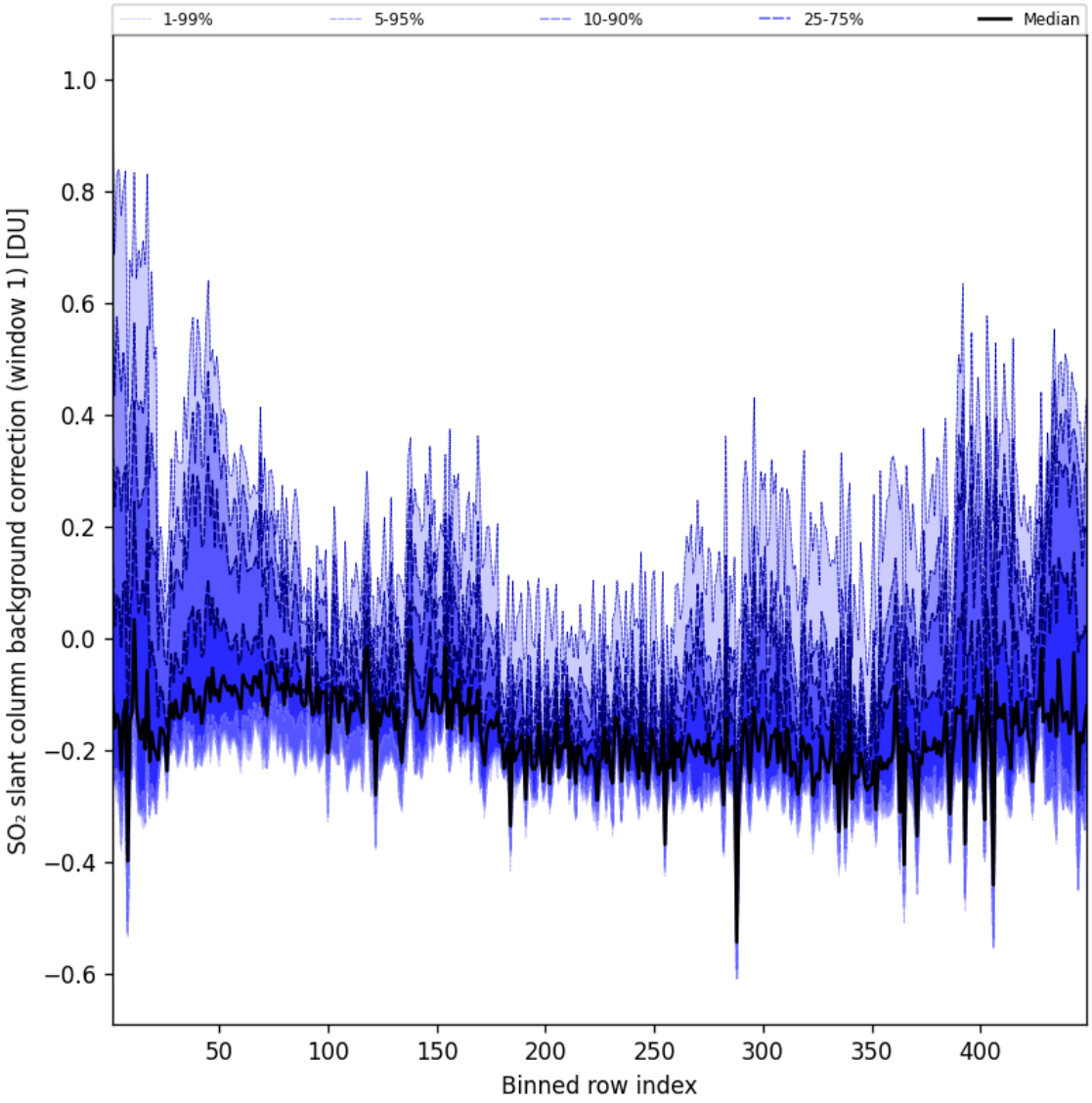

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-04-30 to 2025-05-01

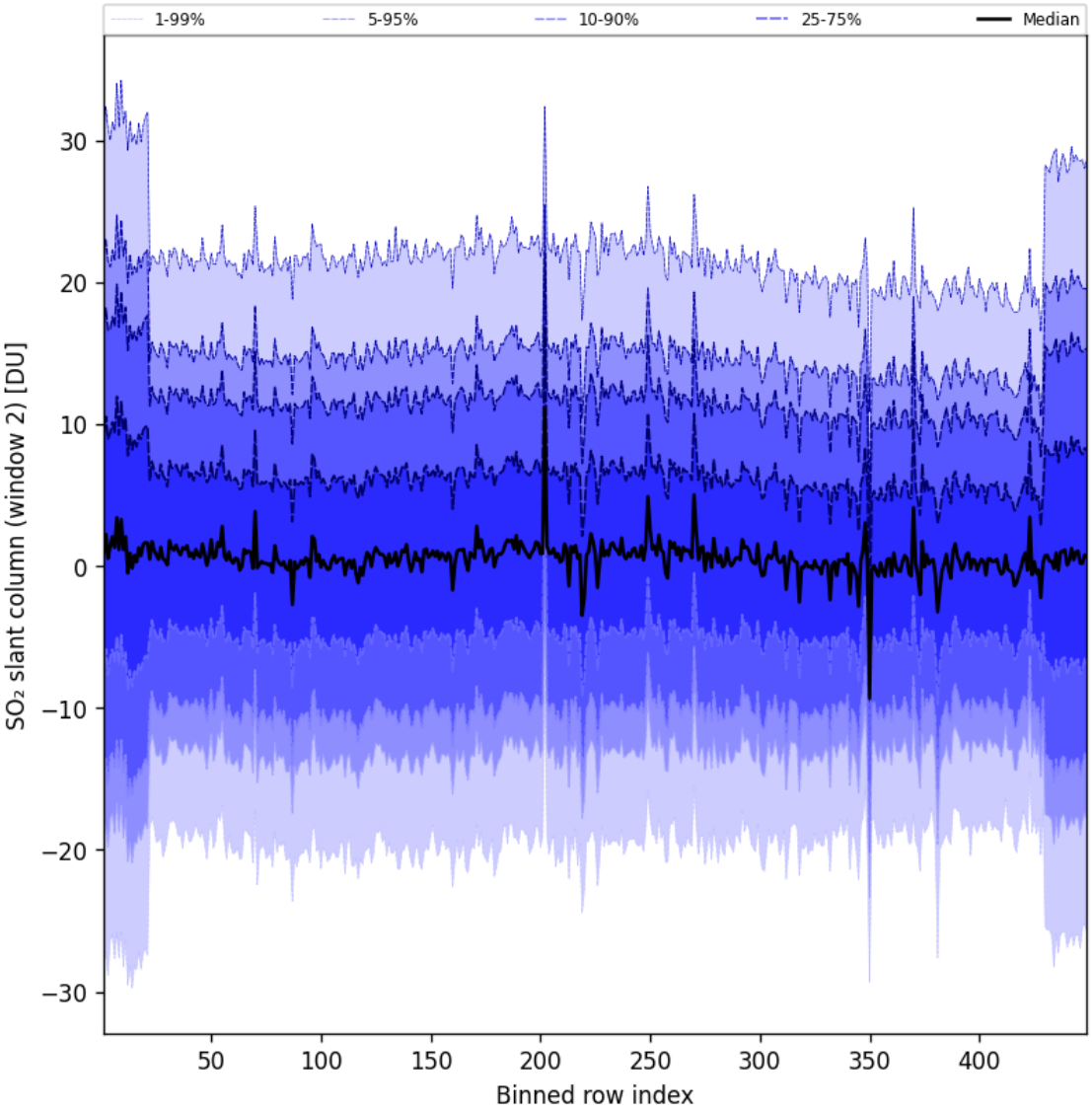

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-04-30 to 2025-05-01

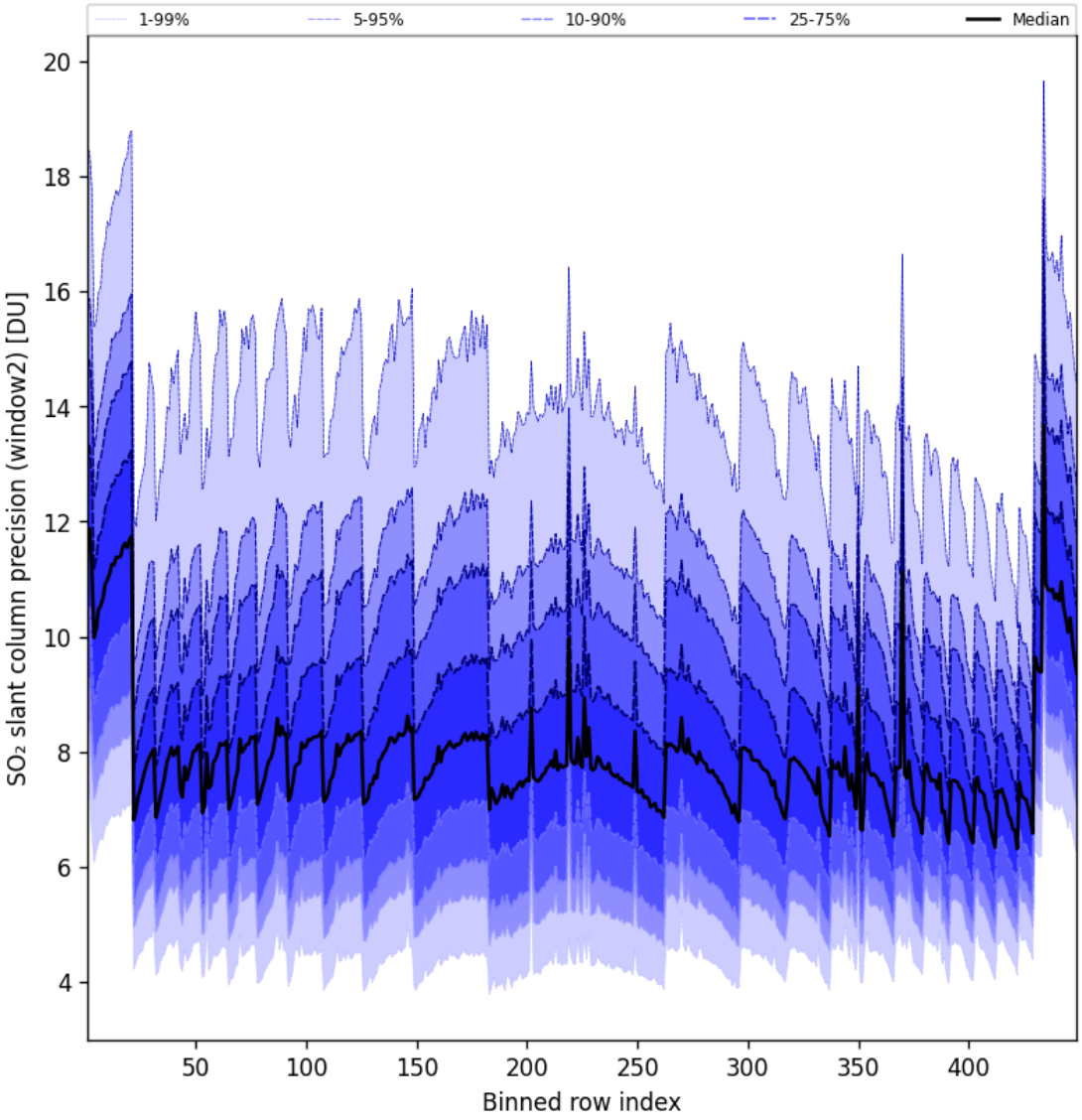

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-04-30 to 2025-05-01

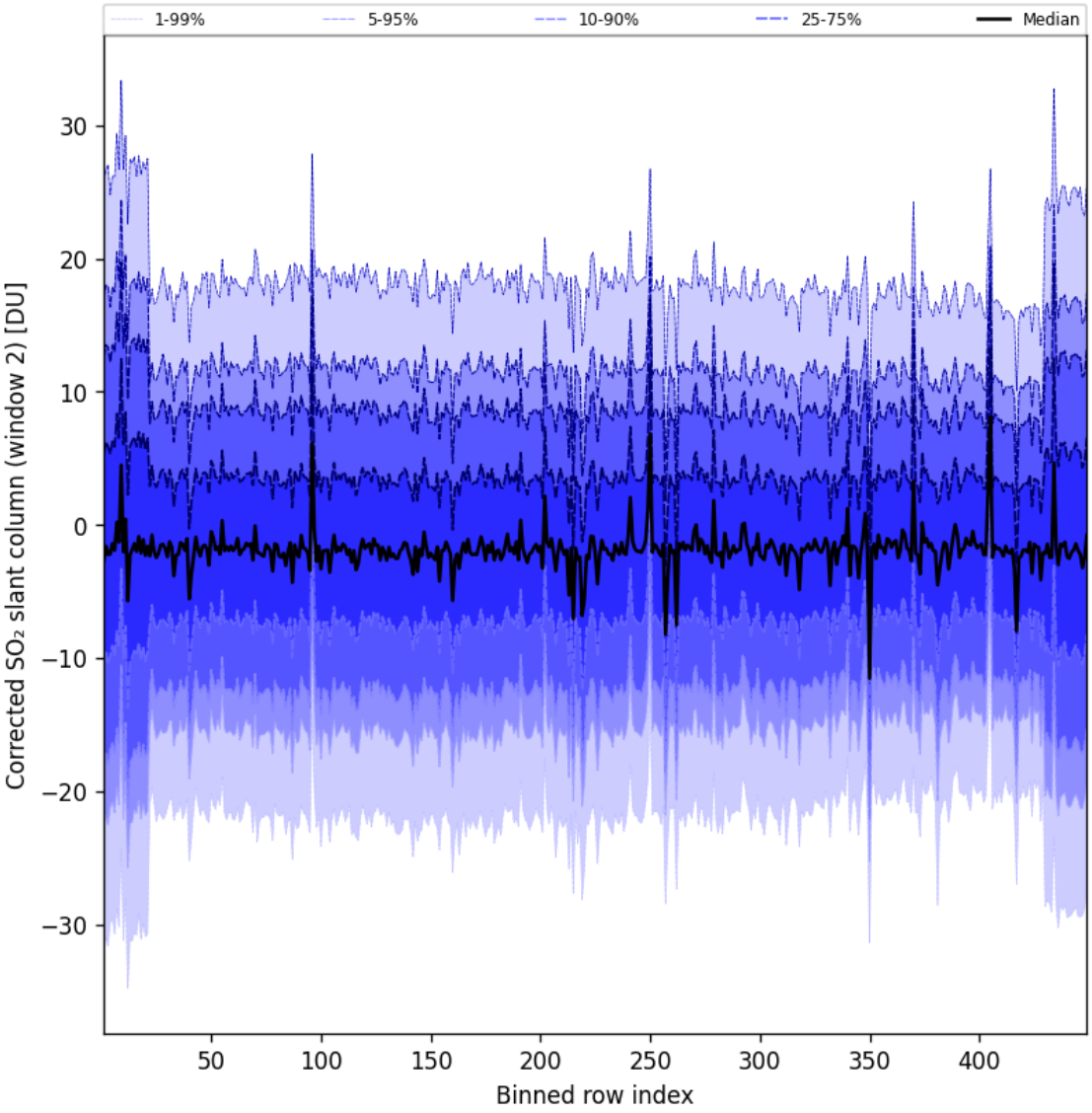

Figure 96: Along track statistics of "Corrected SO_2 slant column (window 2)" for 2025-04-30 to 2025-05-01

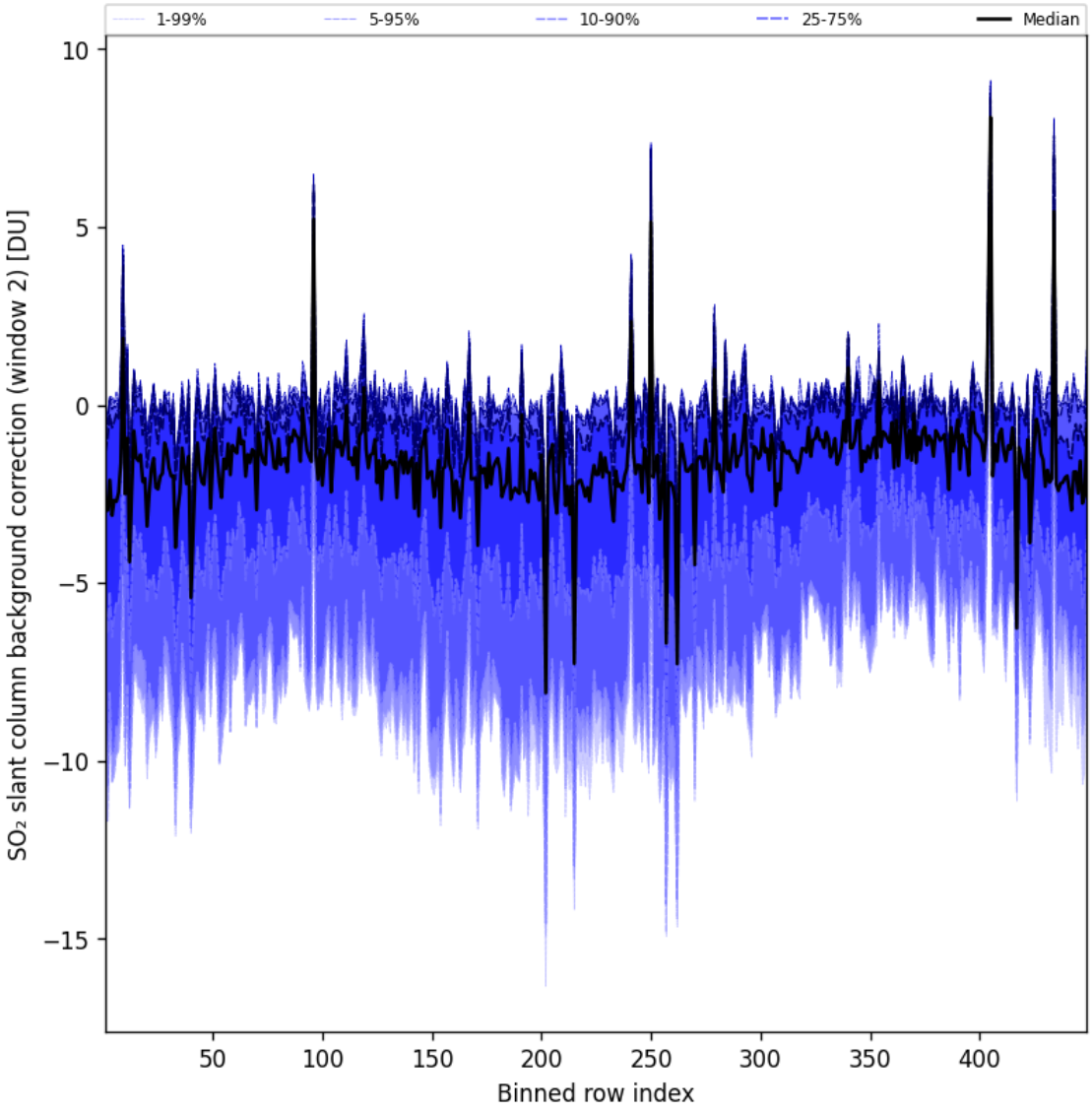

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-04-30 to 2025-05-01

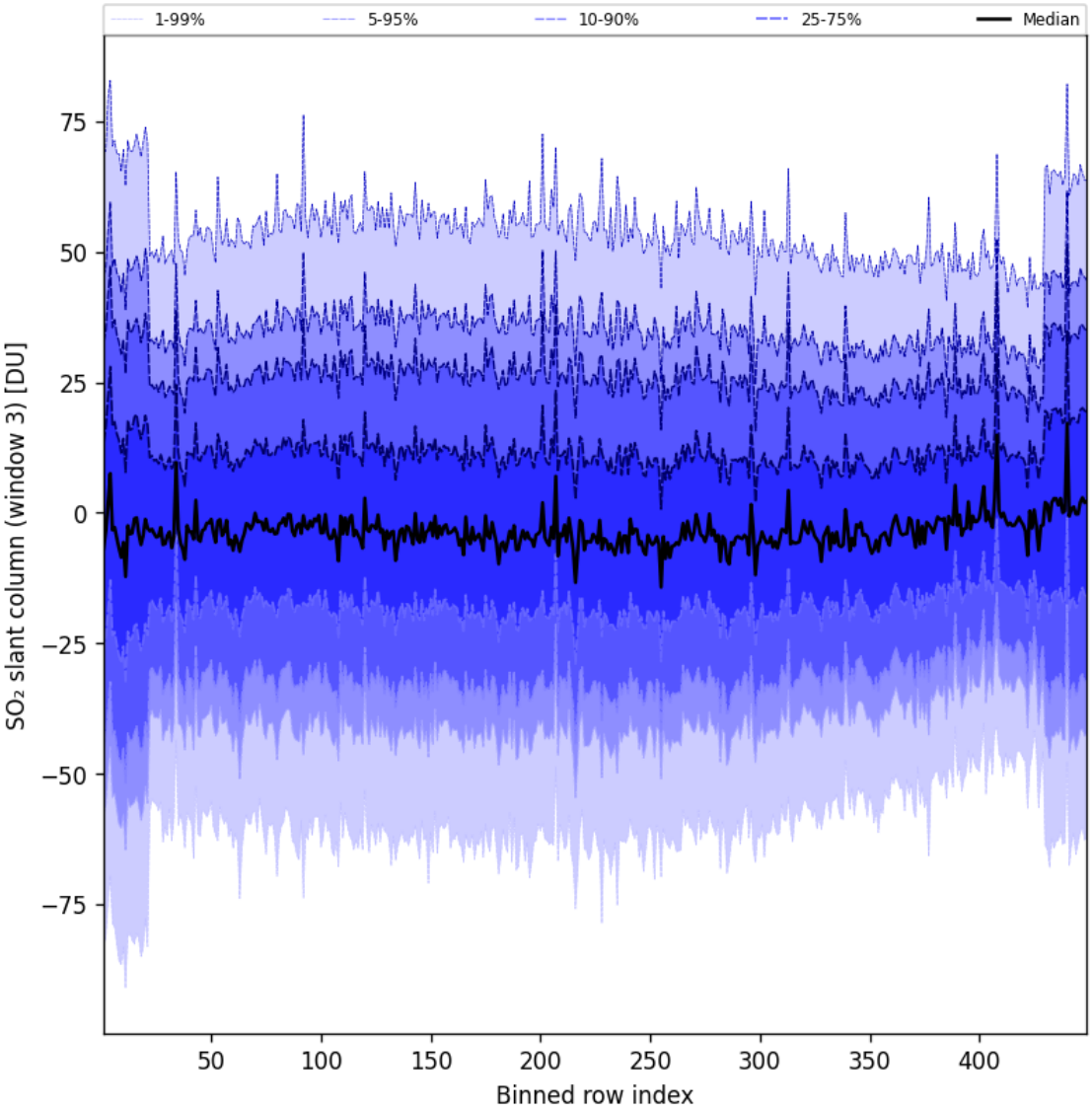

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-04-30 to 2025-05-01

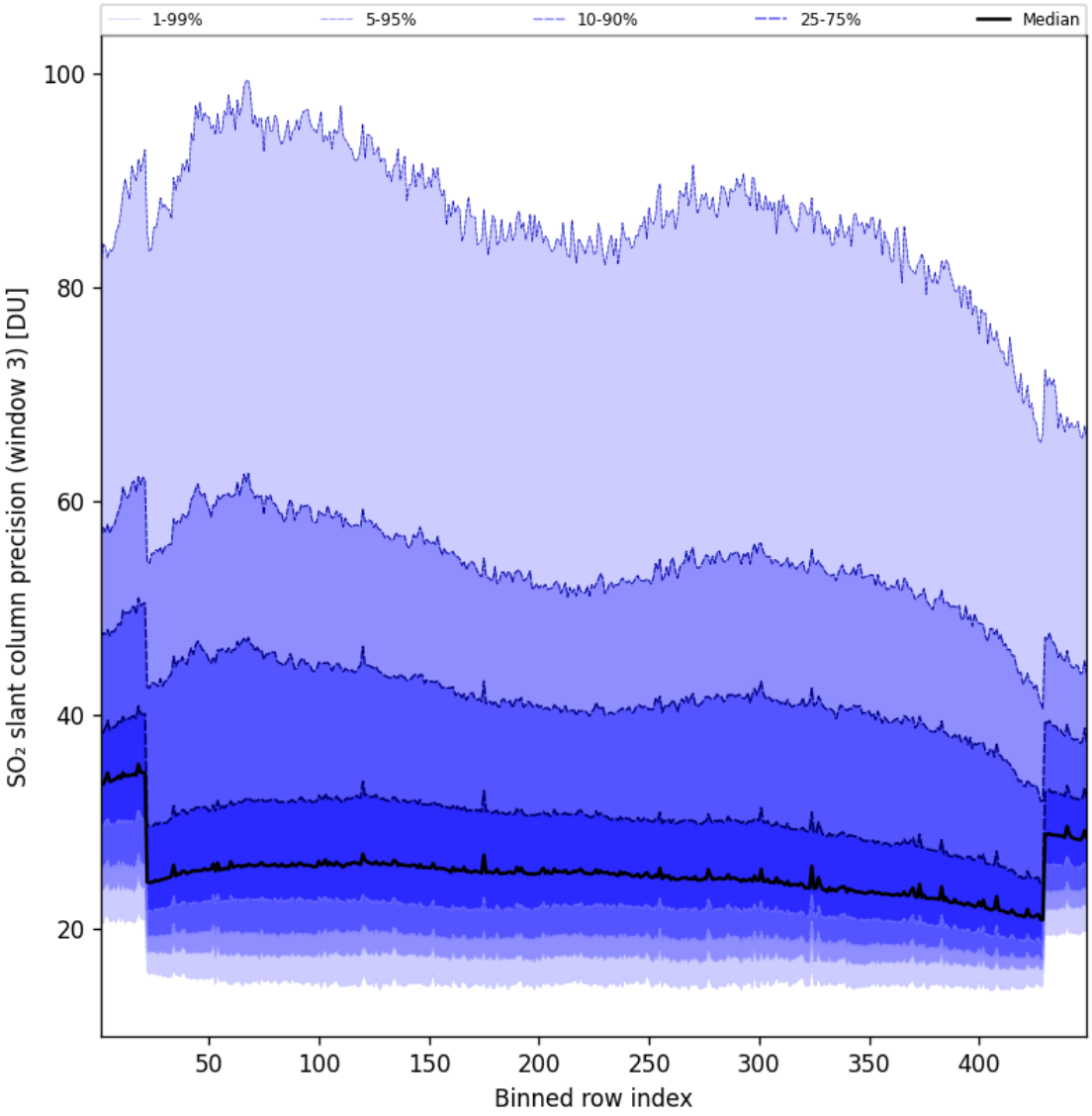

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-04-30 to 2025-05-01

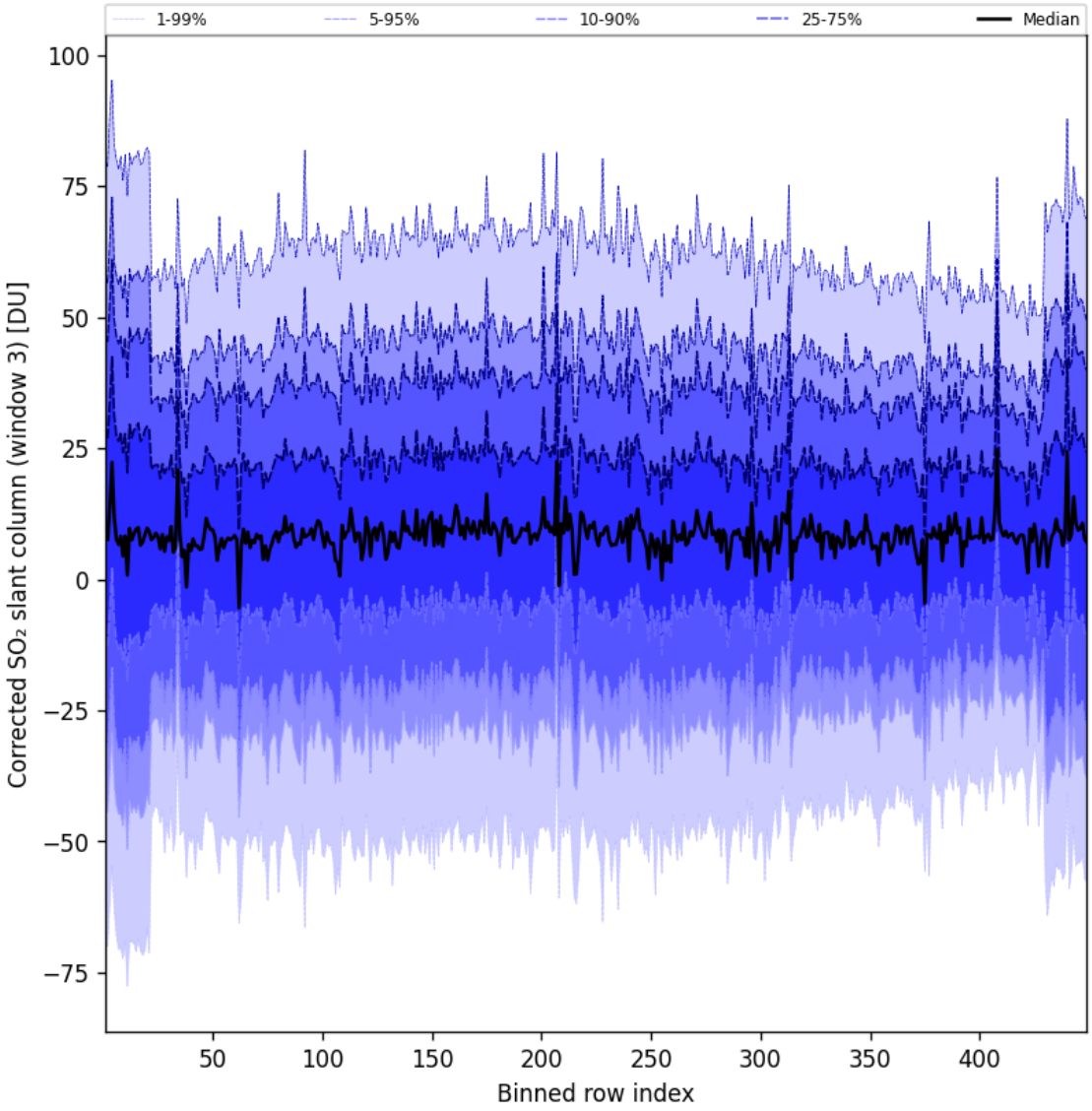

Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-04-30 to 2025-05-01

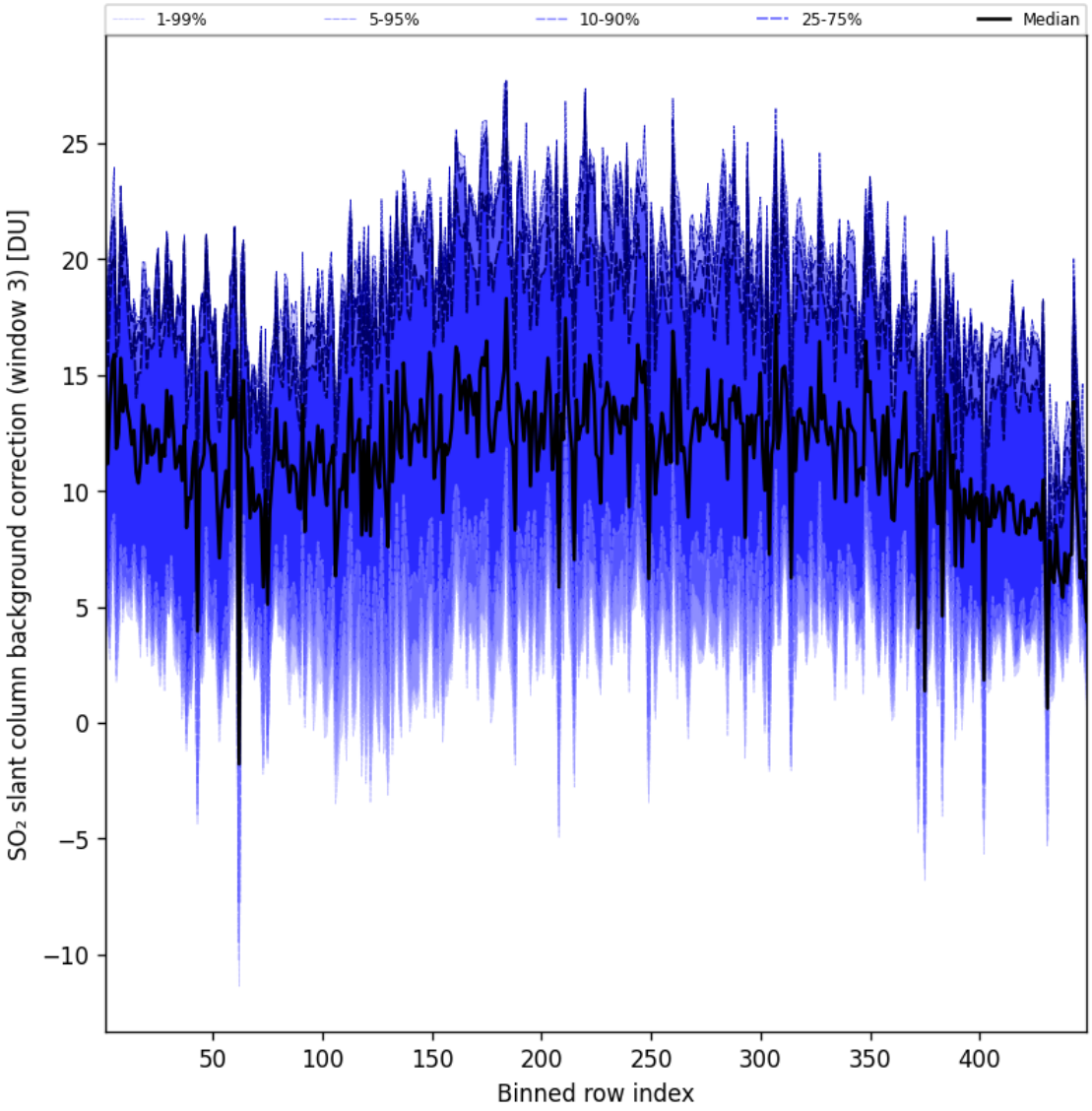

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-04-30 to 2025-05-01

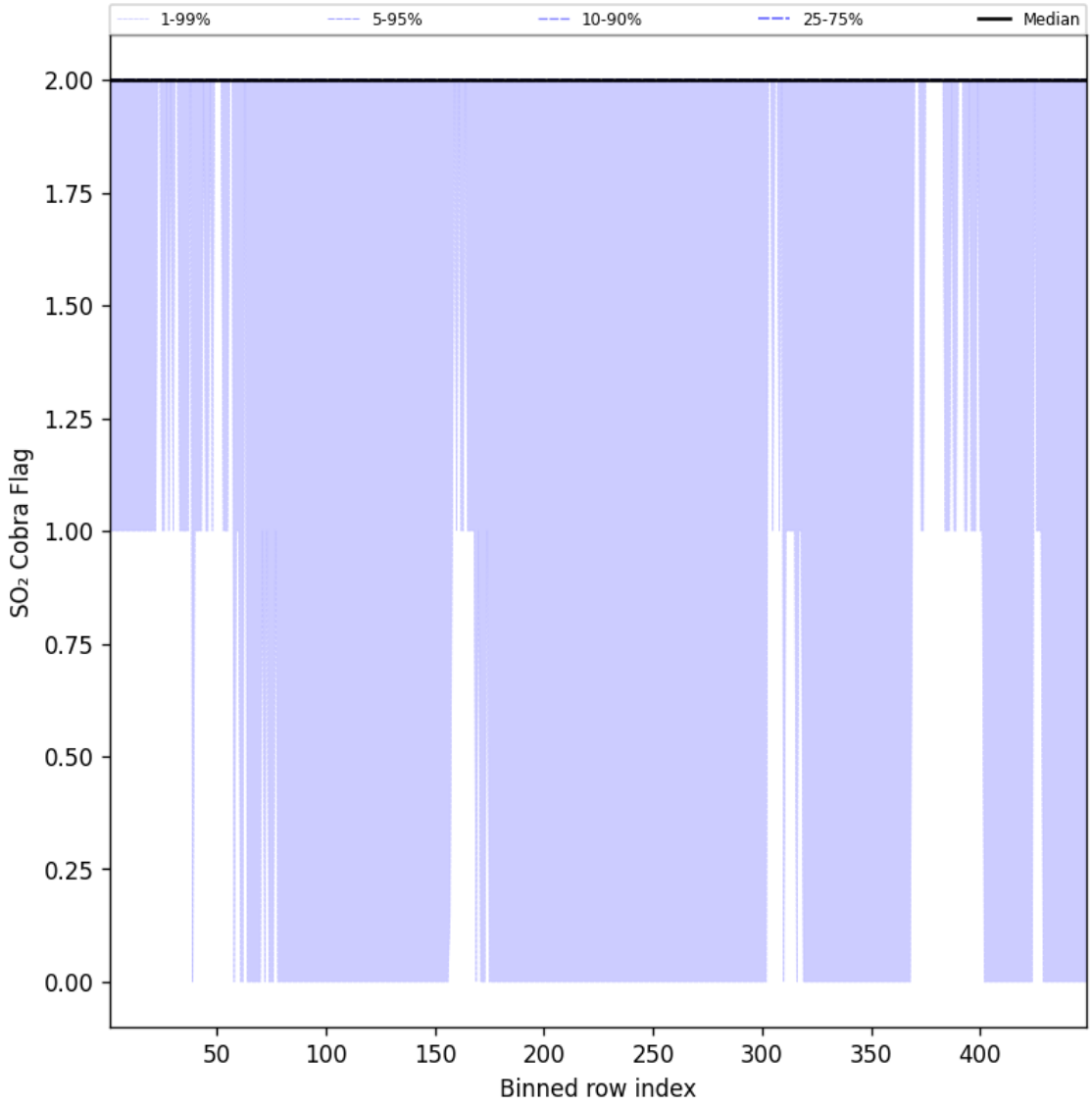

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-04-30 to 2025-05-01

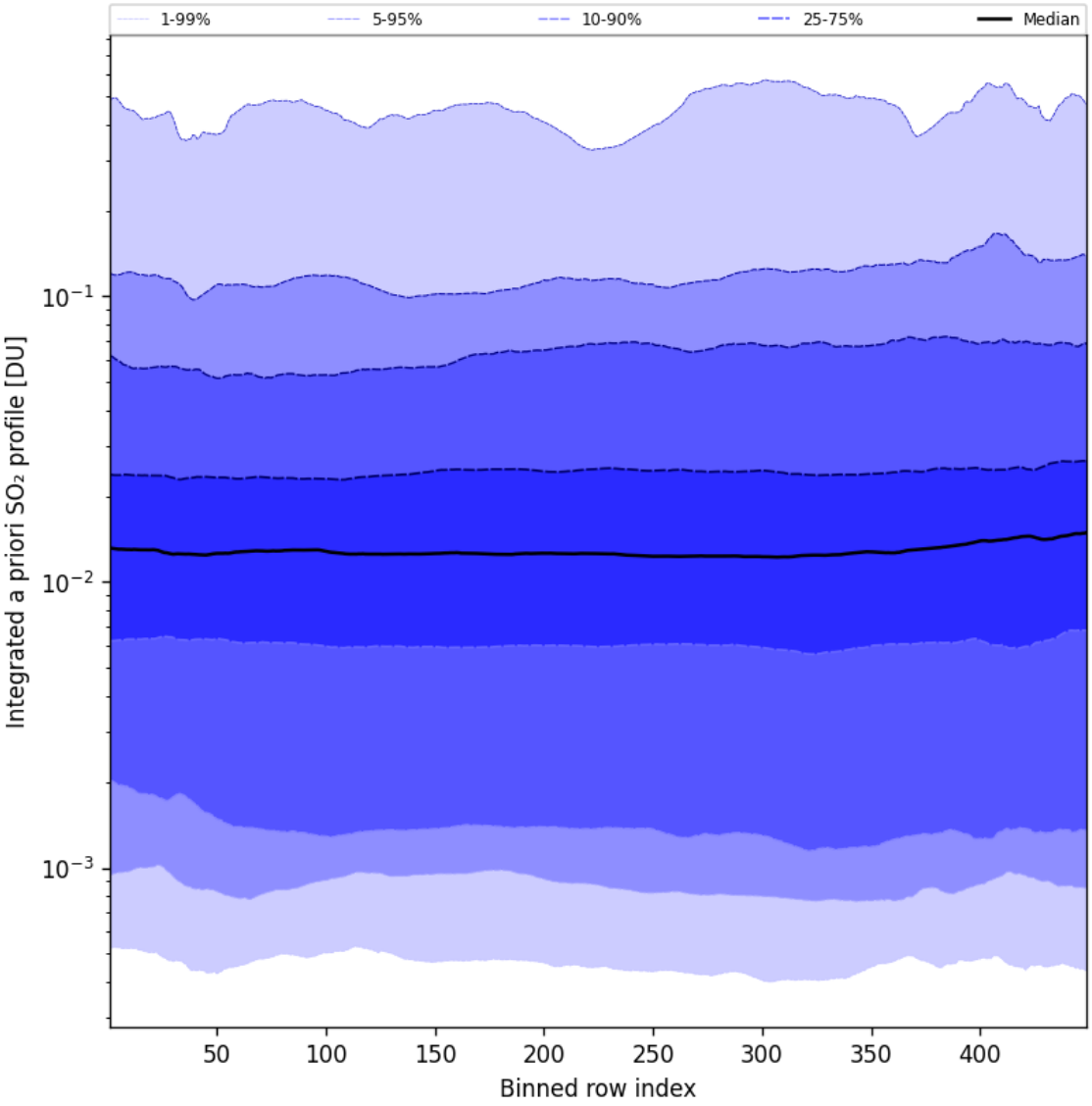

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-04-30 to 2025-05-01

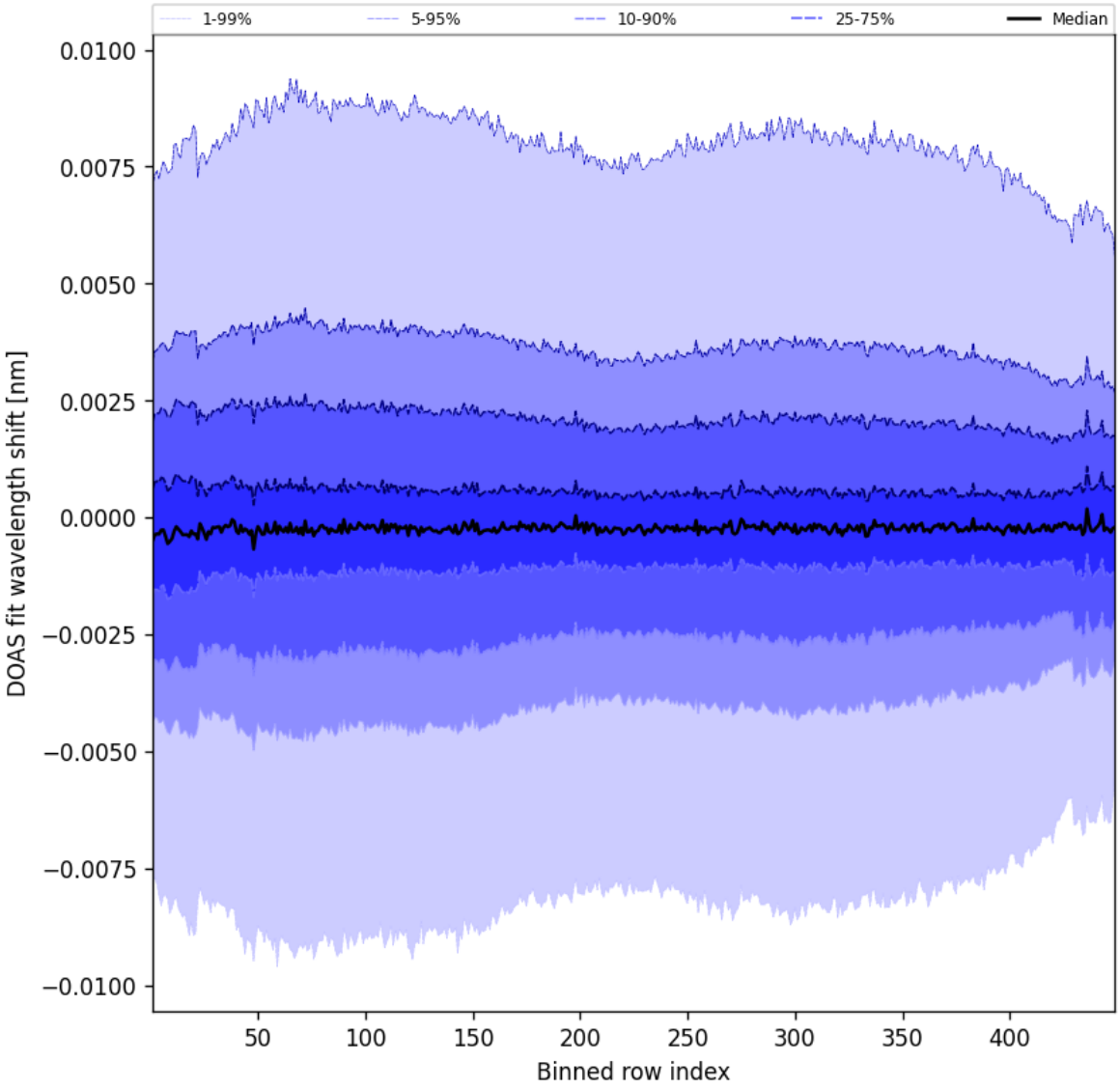

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-04-30 to 2025-05-01

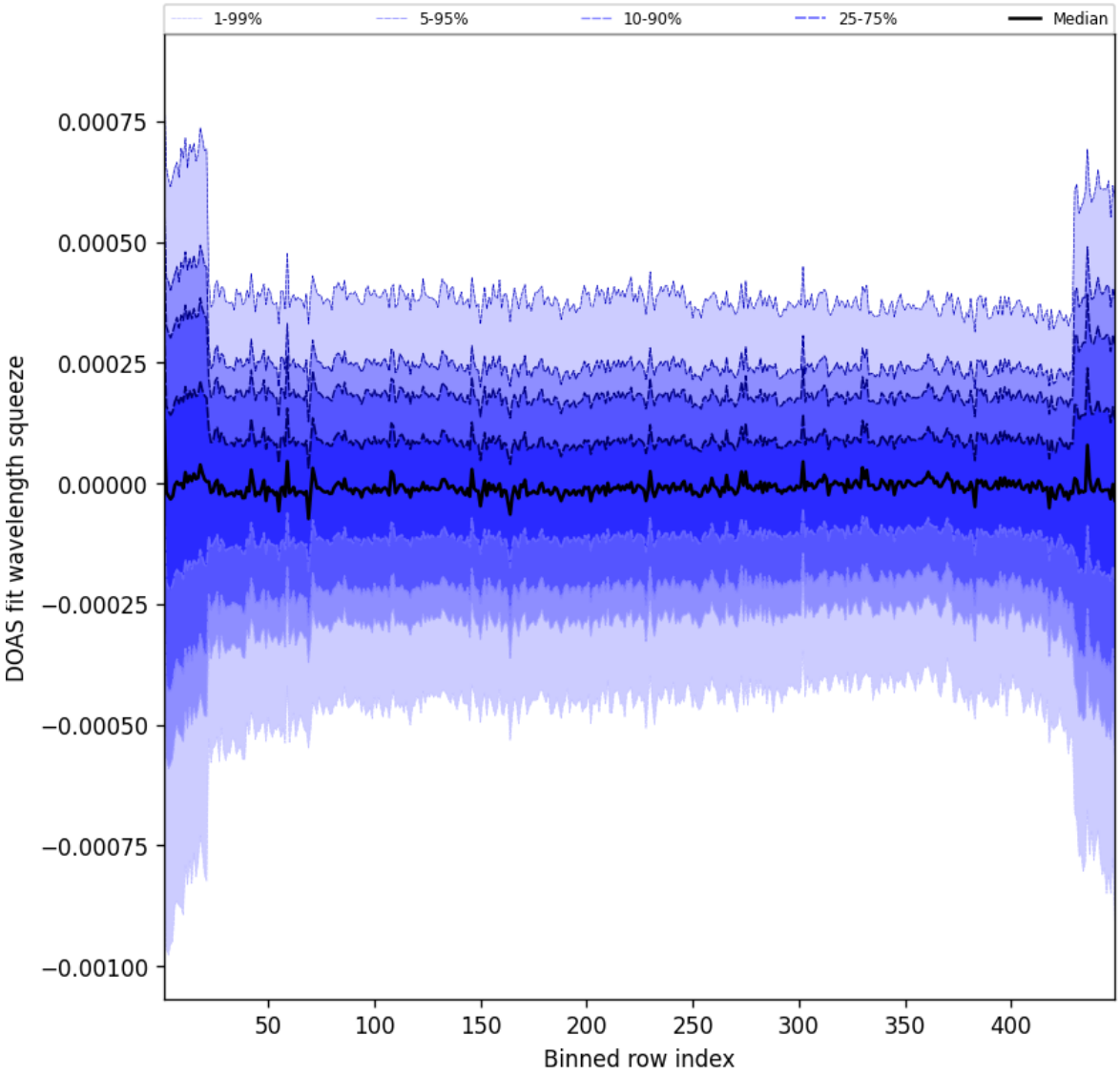

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-04-30 to 2025-05-01

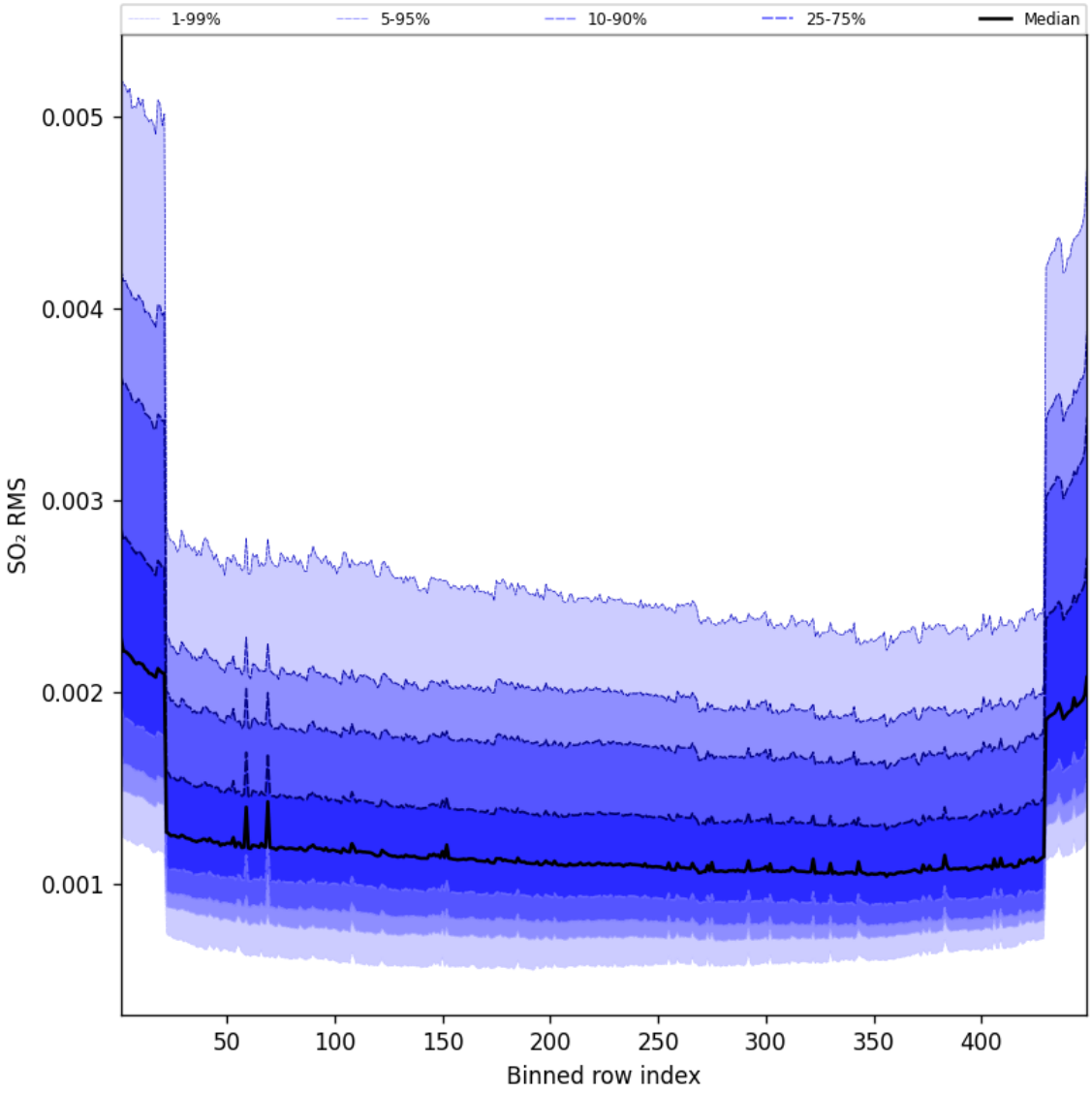

Figure 106: Along track statistics of "SO_2 RMS" for 2025-04-30 to 2025-05-01

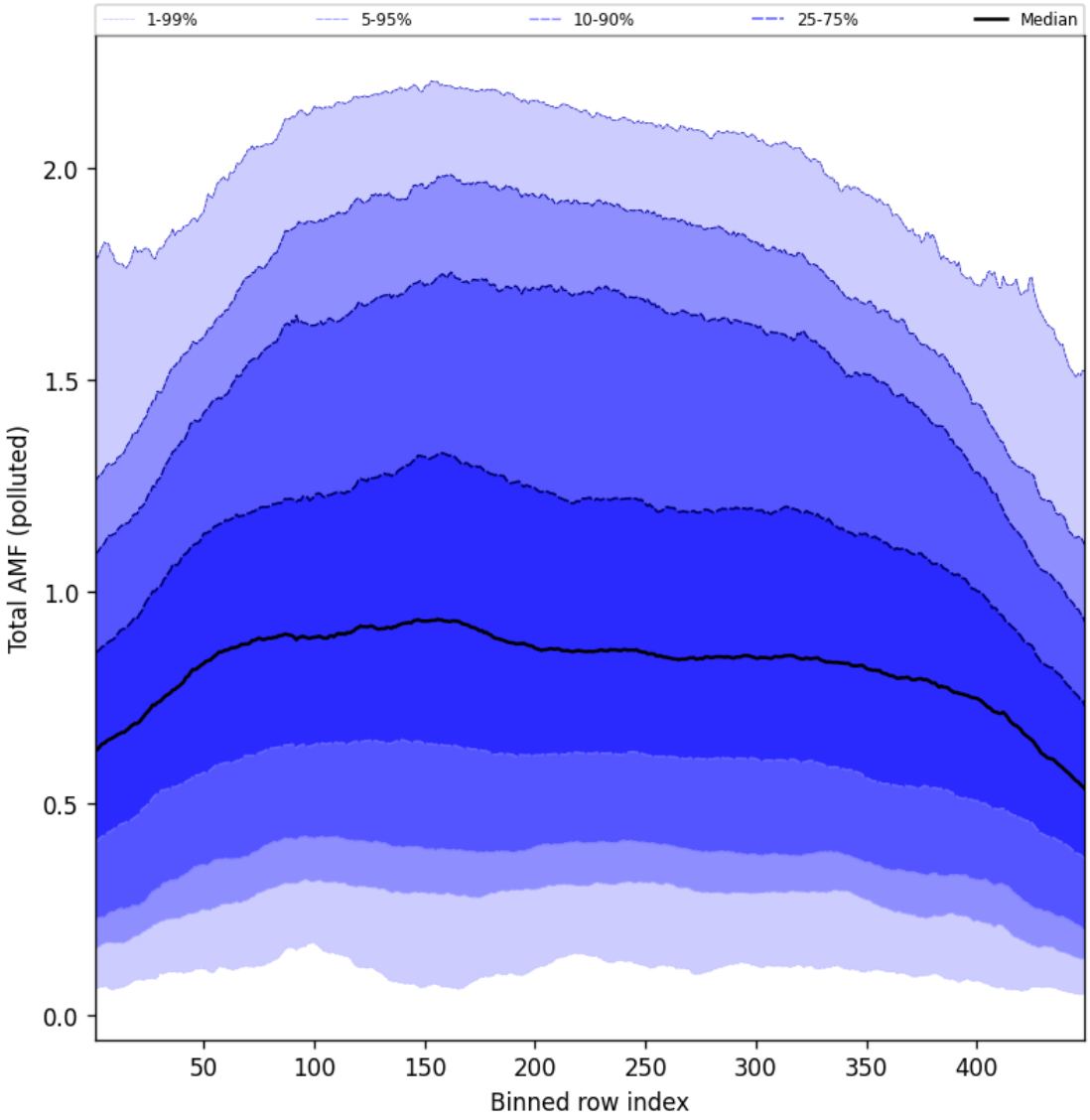

Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-04-30 to 2025-05-01

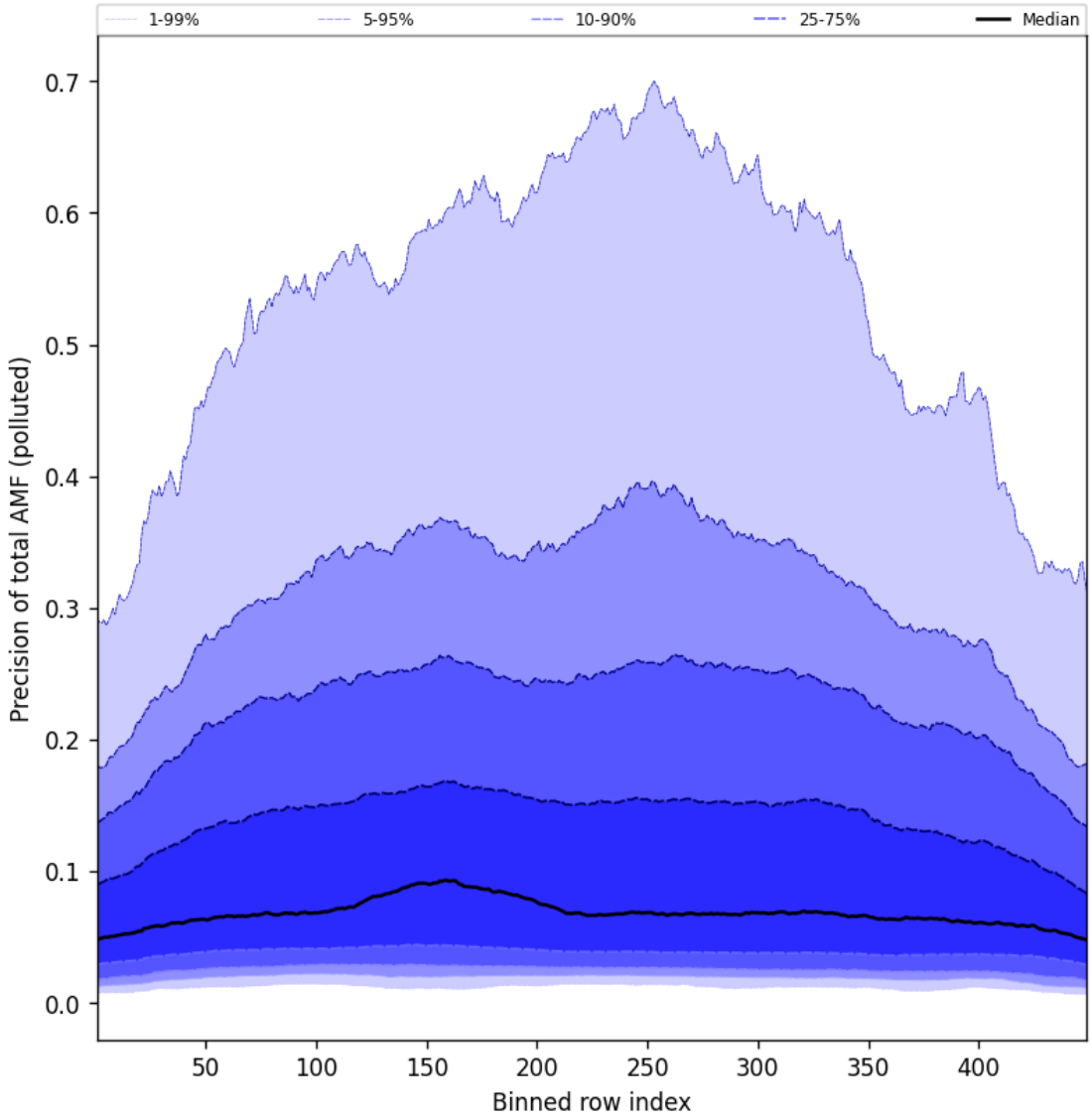

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2025-04-30 to 2025-05-01

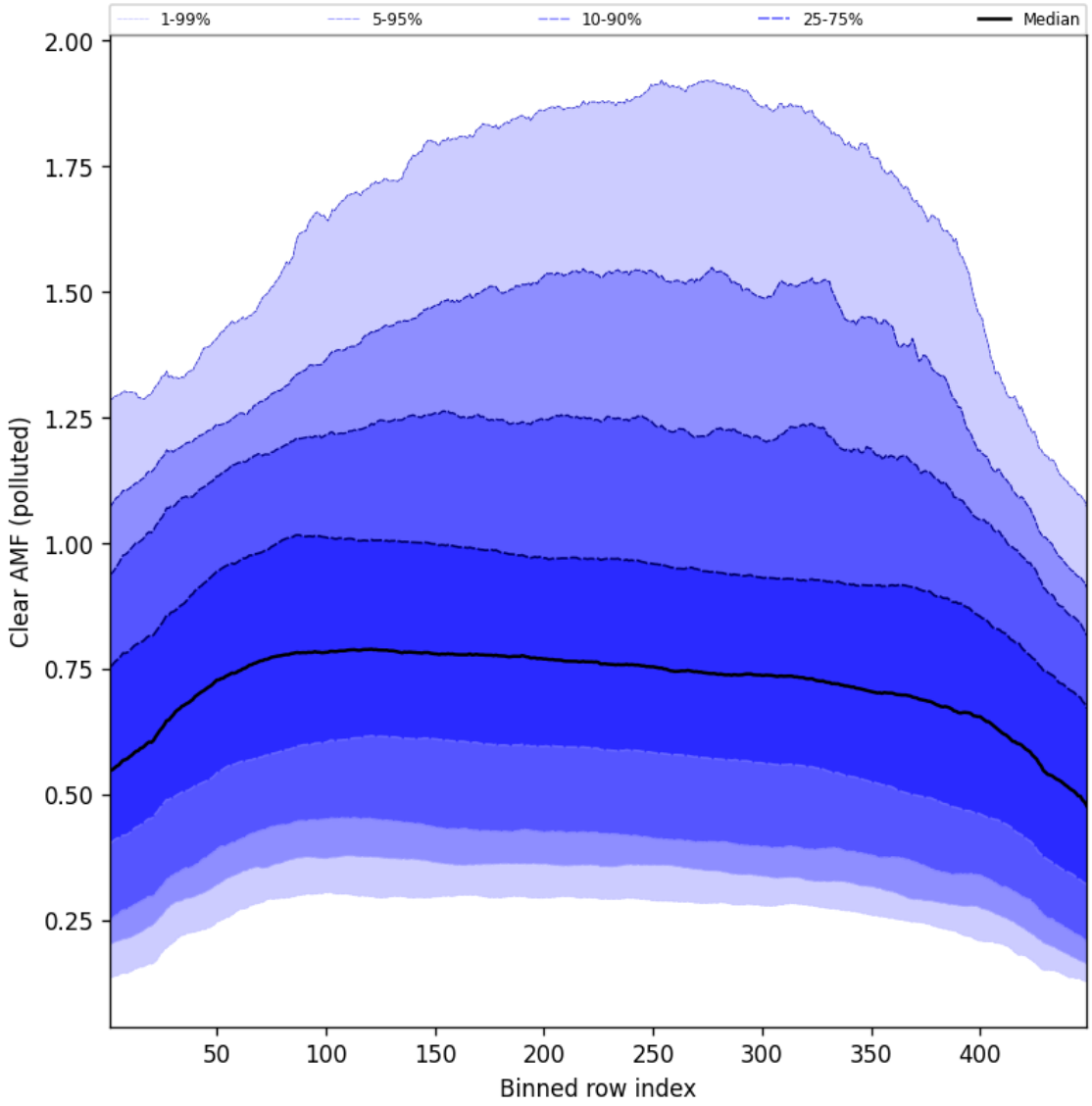

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2025-04-30 to 2025-05-01

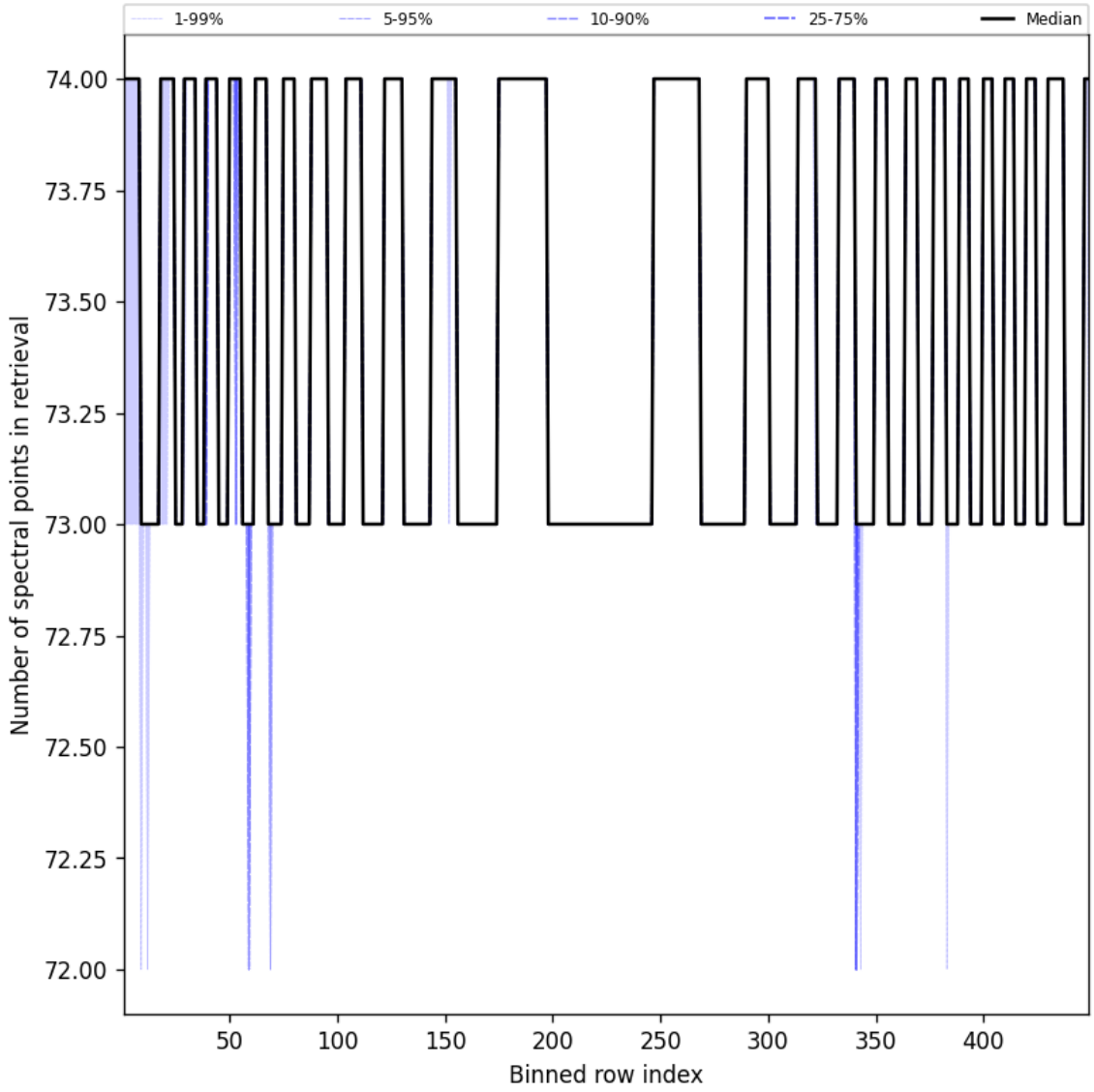

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-04-30 to 2025-05-01

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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