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]	0.644 ± 0.412	17306366	0.995	0.790	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.899 \pm 130.142) \times 10^{-2}$	17306366	0.235	0.413	9.344×10^{-3}	-120	561
sulfurdioxide total vertical column precision [DU]	0.536 ± 0.899	17306366	0.222	0.323	0.301	3.731×10^{-2}	45.7
sulfurdioxide slant column density corrected [DU]	$(1.723 \pm 34.519) \times 10^{-2}$	17306366	0.242	0.344	8.606×10^{-3}	-21.3	47.5
sulfurdioxide slant column density cobra [DU]	$(1.714 \pm 34.051) \times 10^{-2}$	17306366	0.242	0.344	8.606×10^{-3}	-21.3	39.9
sulfurdioxide slant column density cobra precision [DU]	0.277 ± 0.129	17306366	0.213	0.122	0.238	7.597×10^{-2}	17.0
sulfurdioxide slant column density window1 [DU]	0.163 ± 0.653	17306366	0.175	0.713	0.173	-180	83.3
sulfurdioxide slant column density window1 precision [DU]	0.277 ± 0.129	17306366	0.213	0.122	0.238	7.597×10^{-2}	17.0
sulfurdioxide slant column density corrected win1 [DU]	$(7.483 \pm 63.764) \times 10^{-2}$	17306366	2.500×10^{-2}	0.687	5.957×10^{-2}	-180	83.0
background so2 slant column offset window1 [DU]	$(-8.860 \pm 17.029) \times 10^{-2}$	17306366	-0.180	0.194	-0.138	-1.46	3.09
sulfurdioxide slant column density window2 [DU]	3.27 ± 8.75	17306366	2.75	11.0	3.07	-794	865
sulfurdioxide slant column density window2 precision [DU]	7.83 ± 2.15	17306366	6.97	2.47	7.50	2.23	621
sulfurdioxide slant column density corrected win2 [DU]	1.30 ± 8.43	17306366	1.25	10.7	1.31	-794	865
background so2 slant column offset window2 [DU]	-1.97 ± 2.46	17306366	-0.250	2.75	-1.19	-19.7	4.69
sulfurdioxide slant column density window3 [DU]	-19.8 ± 23.7	17306366	-20.7	29.7	-20.1	-1.490×10^3	334
sulfurdioxide slant column density window3 precision [DU]	27.2 ± 12.4	17306366	22.5	9.20	24.2	9.69	445
sulfurdioxide slant column density corrected win3 [DU]	-10.1 ± 23.0	17306366	-11.8	28.8	-10.3	-1.483×10^3	333
background so2 slant column offset window3 [DU]	9.73 ± 7.02	17306366	12.9	10.8	9.85	-18.6	36.8
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17306366	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(4.102 \pm 9.533) \times 10^{-2}$	17306366	2.104×10^{-2}	2.413×10^{-2}	2.057×10^{-2}	5.051×10^{-4}	2.98
fitted radiance shift [nm]	$(-4.208 \pm 24.137) \times 10^{-4}$	17306366	-5.000×10^{-4}	1.701×10^{-3}	-4.452×10^{-4}	-6.544×10^{-2}	5.301×10^{-2}
fitted radiance squeeze [1]	$(-4.375 \pm 17.809) \times 10^{-5}$	17306366	-3.000×10^{-5}	2.065×10^{-4}	-3.785×10^{-5}	-1.980×10^{-2}	2.290×10^{-2}
fitted root mean square [1]	$(1.231 \pm 0.521) \times 10^{-3}$	17306366	9.250×10^{-4}	5.013×10^{-4}	1.085×10^{-3}	3.007×10^{-4}	7.676×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.905 ± 0.546	17306366	0.660	0.602	0.788	5.000×10^{-2}	3.10
sulfurdioxide total air mass factor polluted precision [1]	0.130 ± 0.136	17306366	3.500×10^{-2}	0.145	7.695×10^{-2}	2.500×10^{-3}	2.02
sulfurdioxide clear air mass factor polluted [1]	0.795 ± 0.522	17306366	0.660	0.380	0.684	2.452×10^{-2}	3.13
number of spectral points in retrieval [1]	73.4 ± 0.5	17306366	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	5.000×10^{-2}	0.1000	0.210	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.60	−0.866	−0.508	−0.335	−0.194	0.220	0.373	0.567	0.984	3.12
sulfurdioxide total vertical column precision [DU]	8.529×10^{-2}	0.110	0.134	0.161	0.197	0.520	0.739	1.05	1.64	4.25
sulfurdioxide slant column density corrected [DU]	−0.807	−0.463	−0.336	−0.251	−0.162	0.182	0.276	0.368	0.514	0.968
sulfurdioxide slant column density cobra [DU]	−0.807	−0.463	−0.336	−0.251	−0.162	0.182	0.276	0.368	0.514	0.968
sulfurdioxide slant column density cobra precision [DU]	0.132	0.159	0.173	0.184	0.198	0.320	0.374	0.427	0.512	0.762
sulfurdioxide slant column density window1 [DU]	−1.58	−0.849	−0.570	−0.384	−0.190	0.524	0.706	0.879	1.14	1.88
sulfurdioxide slant column density window1 precision [DU]	0.132	0.159	0.173	0.184	0.198	0.320	0.374	0.427	0.512	0.762
sulfurdioxide slant column density corrected win1 [DU]	−1.52	−0.865	−0.621	−0.456	−0.280	0.407	0.595	0.778	1.06	1.88
background so2 slant column offset window1 [DU]	−0.354	−0.285	−0.254	−0.230	−0.200	-6.031×10^{-3}	8.170×10^{-2}	0.156	0.251	0.414
sulfurdioxide slant column density window2 [DU]	−17.0	−10.6	−7.41	−5.04	−2.37	8.66	11.5	14.1	17.8	25.6
sulfurdioxide slant column density window2 precision [DU]	4.16	5.02	5.53	5.94	6.42	8.88	9.74	10.6	11.8	14.3
sulfurdioxide slant column density corrected win2 [DU]	−19.2	−12.4	−9.13	−6.72	−4.04	6.64	9.30	11.7	14.9	21.8
background so2 slant column offset window2 [DU]	−10.0	−7.34	−5.45	−4.17	−2.99	−0.245	1.012×10^{-2}	0.206	0.501	1.68
sulfurdioxide slant column density window3 [DU]	−78.3	−58.3	−48.9	−42.1	−34.8	−5.02	2.82	9.96	19.5	38.4
sulfurdioxide slant column density window3 precision [DU]	13.7	15.7	17.2	18.6	20.4	29.6	33.9	39.2	50.1	80.3
sulfurdioxide slant column density corrected win3 [DU]	−67.2	−47.4	−38.3	−31.7	−24.5	4.31	11.8	18.6	27.8	46.2
background so2 slant column offset window3 [DU]	−4.15	−1.63	0.161	2.03	4.34	15.1	17.2	18.9	20.9	24.4
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]	2.617×10^{-3}	4.893×10^{-3}	7.433×10^{-3}	9.840×10^{-3}	1.250×10^{-2}	3.663×10^{-2}	5.044×10^{-2}	7.210×10^{-2}	0.128	0.399
fitted radiance shift [nm]	-7.694×10^{-3}	-3.925×10^{-3}	-2.624×10^{-3}	-1.909×10^{-3}	-1.316×10^{-3}	3.850×10^{-4}	1.038×10^{-3}	1.861×10^{-3}	3.290×10^{-3}	7.224×10^{-3}
fitted radiance squeeze [1]	-5.205×10^{-4}	-3.349×10^{-4}	-2.561×10^{-4}	-2.016×10^{-4}	-1.442×10^{-4}	6.234×10^{-5}	1.129×10^{-4}	1.597×10^{-4}	2.271×10^{-4}	3.931×10^{-4}
fitted root mean square [1]	5.659×10^{-4}	7.058×10^{-4}	7.810×10^{-4}	8.372×10^{-4}	9.052×10^{-4}	1.406×10^{-3}	1.635×10^{-3}	1.865×10^{-3}	2.234×10^{-3}	3.149×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.100	0.235	0.334	0.421	0.528	1.13	1.39	1.67	2.10	2.62
sulfurdioxide total air mass factor polluted precision [1]	9.716×10^{-3}	1.749×10^{-2}	2.360×10^{-2}	2.908×10^{-2}	3.690×10^{-2}	0.182	0.245	0.307	0.396	0.607
sulfurdioxide clear air mass factor polluted [1]	0.158	0.275	0.354	0.428	0.508	0.888	1.00	1.16	2.21	2.86
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]	0.715 ± 0.389	6827954	0.680	1.000	0.0	1.000	0.320	1.000
sulfurdioxide total vertical column [DU]	$(7.600 \pm 196.383) \times 10^{-2}$	6827954	0.606	1.581×10^{-2}	-120	561	-0.278	0.328
sulfurdioxide total vertical column precision [DU]	0.837 ± 1.303	6827954	0.613	0.429	4.794×10^{-2}	45.7	0.269	0.882
sulfurdioxide slant column density corrected [DU]	$(2.648 \pm 42.228) \times 10^{-2}$	6827954	0.395	1.169×10^{-2}	-9.62	47.5	-0.183	0.212
sulfurdioxide slant column density cobra [DU]	$(2.627 \pm 41.349) \times 10^{-2}$	6827954	0.395	1.169×10^{-2}	-9.62	10.8	-0.183	0.212
sulfurdioxide slant column density cobra precision [DU]	0.323 ± 0.157	6827954	0.169	0.281	8.075×10^{-2}	7.98	0.216	0.385
sulfurdioxide slant column density window1 [DU]	0.229 ± 0.753	6827954	0.796	0.234	-10.9	34.0	-0.165	0.631
sulfurdioxide slant column density window1 precision [DU]	0.323 ± 0.157	6827954	0.169	0.281	8.075×10^{-2}	7.98	0.216	0.385
sulfurdioxide slant column density corrected win1 [DU]	$(9.889 \pm 75.077) \times 10^{-2}$	6827954	0.788	7.148×10^{-2}	-9.93	34.0	-0.313	0.475
background so2 slant column offset window1 [DU]	-0.130 ± 0.158	6827954	0.157	-0.157	-0.684	3.09	-0.228	-7.175×10^{-2}
sulfurdioxide slant column density window2 [DU]	4.07 ± 9.64	6827954	12.3	3.71	-146	256	-2.28	10.0
sulfurdioxide slant column density window2 precision [DU]	8.53 ± 2.18	6827954	2.70	8.20	2.24	184	7.02	9.72
sulfurdioxide slant column density corrected win2 [DU]	1.23 ± 9.13	6827954	11.7	1.23	-152	249	-4.61	7.07
background so2 slant column offset window2 [DU]	-2.83 ± 3.15	6827954	4.54	-1.57	-19.7	4.49	-4.94	-0.396
sulfurdioxide slant column density window3 [DU]	-22.6 ± 25.1	6827954	32.0	-22.3	-210	174	-38.4	-6.39
sulfurdioxide slant column density window3 precision [DU]	29.2 ± 12.2	6827954	9.22	26.2	9.92	211	22.5	31.7
sulfurdioxide slant column density corrected win3 [DU]	-10.0 ± 24.6	6827954	31.3	-9.90	-205	190	-25.6	5.76
background so2 slant column offset window3 [DU]	12.6 ± 6.0	6827954	9.54	12.4	-12.5	36.8	7.63	17.2
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.24	6827954	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.481 \pm 14.503) \times 10^{-2}$	6827954	4.426×10^{-2}	2.246×10^{-2}	5.051×10^{-4}	2.98	1.256×10^{-2}	5.681×10^{-2}
fitted radiance shift [nm]	$(-2.616 \pm 23.947) \times 10^{-4}$	6827954	1.638×10^{-3}	-2.787×10^{-4}	-3.139×10^{-2}	5.301×10^{-2}	-1.101×10^{-3}	5.367×10^{-4}
fitted radiance squeeze [1]	$(-1.863 \pm 189.562) \times 10^{-6}$	6827954	2.146×10^{-4}	-1.151×10^{-6}	-9.345×10^{-3}	1.517×10^{-2}	-1.081×10^{-4}	1.064×10^{-4}
fitted root mean square [1]	$(1.404 \pm 0.632) \times 10^{-3}$	6827954	6.821×10^{-4}	1.206×10^{-3}	3.492×10^{-4}	7.676×10^{-2}	9.796×10^{-4}	1.662×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.691 ± 0.381	6827954	0.492	0.641	5.000×10^{-2}	2.86	0.407	0.898
sulfurdioxide total air mass factor polluted precision [1]	$(9.770 \pm 13.689) \times 10^{-2}$	6827954	8.927×10^{-2}	4.751×10^{-2}	2.500×10^{-3}	2.02	2.748×10^{-2}	0.117
sulfurdioxide clear air mass factor polluted [1]	0.591 ± 0.264	6827954	0.418	0.571	2.452×10^{-2}	2.15	0.376	0.794
number of spectral points in retrieval [1]	73.5 ± 0.5	6827954	1.000	73.0	71.0	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]	0.598 ± 0.419	10478412	0.830	1.000	0.0	1.000	0.170	1.000
sulfurdioxide total vertical column [DU]	$(1.488 \pm 53.182) \times 10^{-2}$	10478412	0.334	6.880×10^{-3}	-35.0	48.1	-0.159	0.175
sulfurdioxide total vertical column precision [DU]	0.340 ± 0.361	10478412	0.223	0.247	3.731×10^{-2}	19.7	0.168	0.391
sulfurdioxide slant column density corrected [DU]	$(1.121 \pm 28.373) \times 10^{-2}$	10478412	0.317	6.966×10^{-3}	-21.3	39.9	-0.150	0.166
sulfurdioxide slant column density cobra [DU]	$(1.119 \pm 28.285) \times 10^{-2}$	10478412	0.317	6.966×10^{-3}	-21.3	39.9	-0.150	0.166
sulfurdioxide slant column density cobra precision [DU]	0.248 ± 0.095	10478412	8.789×10^{-2}	0.222	7.597×10^{-2}	17.0	0.189	0.277
sulfurdioxide slant column density window1 [DU]	0.121 ± 0.574	10478412	0.665	0.139	-180	83.3	-0.203	0.462
sulfurdioxide slant column density window1 precision [DU]	0.248 ± 0.095	10478412	8.789×10^{-2}	0.222	7.597×10^{-2}	17.0	0.189	0.277
sulfurdioxide slant column density corrected win1 [DU]	$(5.915 \pm 55.102) \times 10^{-2}$	10478412	0.633	5.328×10^{-2}	-180	83.0	-0.262	0.371
background so2 slant column offset window1 [DU]	$(-6.152 \pm 17.260) \times 10^{-2}$	10478412	0.233	-0.122	-1.46	1.73	-0.185	4.843×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.74 ± 8.08	10478412	10.3	2.72	-794	865	-2.41	7.88
sulfurdioxide slant column density window2 precision [DU]	7.38 ± 2.01	10478412	2.15	7.10	2.23	621	6.13	8.28
sulfurdioxide slant column density corrected win2 [DU]	1.34 ± 7.95	10478412	10.1	1.36	-794	865	-3.70	6.39
background so2 slant column offset window2 [DU]	-1.40 ± 1.66	10478412	2.26	-0.997	-14.4	4.69	-2.43	-0.169
sulfurdioxide slant column density window3 [DU]	-18.1 ± 22.6	10478412	28.4	-18.9	-1.490×10^{3}	334	-32.6	-4.19
sulfurdioxide slant column density window3 precision [DU]	25.9 ± 12.4	10478412	8.60	22.8	9.69	445	19.1	27.7
sulfurdioxide slant column density corrected win3 [DU]	-10.2 ± 21.9	10478412	27.4	-10.5	-1.483×10^{3}	333	-23.9	3.41
background so2 slant column offset window3 [DU]	7.89 ± 7.03	10478412	11.4	7.82	-18.6	36.7	2.01	13.4
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.18	10478412	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.551 \pm 2.637) \times 10^{-2}$	10478412	1.862×10^{-2}	1.978×10^{-2}	8.918×10^{-4}	1.42	1.246×10^{-2}	3.107×10^{-2}
fitted radiance shift [nm]	$(-5.246 \pm 24.203) \times 10^{-4}$	10478412	1.700×10^{-3}	-5.612×10^{-4}	-6.544×10^{-2}	4.619×10^{-2}	-1.429×10^{-3}	2.710×10^{-4}
fitted radiance squeeze [1]	$(-7.104 \pm 16.455) \times 10^{-5}$	10478412	1.988×10^{-4}	-5.974×10^{-5}	-1.980×10^{-2}	2.290×10^{-2}	-1.645×10^{-4}	3.426×10^{-5}
fitted root mean square [1]	$(1.119 \pm 0.395) \times 10^{-3}$	10478412	4.022×10^{-4}	1.025×10^{-3}	3.007×10^{-4}	6.911×10^{-2}	8.691×10^{-4}	1.271×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.04 ± 0.59	10478412	0.692	0.893	5.000×10^{-2}	3.10	0.628	1.32
sulfurdioxide total air mass factor polluted precision [1]	0.151 ± 0.131	10478412	0.175	0.110	4.721×10^{-3}	1.40	4.556×10^{-2}	0.221
sulfurdioxide clear air mass factor polluted [1]	0.927 ± 0.601	10478412	0.378	0.737	0.137	3.13	0.584	0.962
number of spectral points in retrieval [1]	73.4 ± 0.5	10478412	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]	0.685 ± 0.399	12407289	0.740	1.000	0.0	1.000	0.260	1.000
sulfurdioxide total vertical column [DU]	$(2.512 \pm 84.057) \times 10^{-2}$	12407289	0.403	8.987×10^{-3}	-80.2	86.6	-0.191	0.213
sulfurdioxide total vertical column precision [DU]	0.442 ± 0.584	12407289	0.260	0.290	4.914×10^{-2}	31.2	0.204	0.464
sulfurdioxide slant column density corrected [DU]	$(1.406 \pm 31.448) \times 10^{-2}$	12407289	0.329	7.803×10^{-3}	-21.3	40.6	-0.155	0.173
sulfurdioxide slant column density cobra [DU]	$(1.402 \pm 31.212) \times 10^{-2}$	12407289	0.329	7.803×10^{-3}	-21.3	28.1	-0.155	0.173
sulfurdioxide slant column density cobra precision [DU]	0.263 ± 0.118	12407289	0.102	0.227	7.597×10^{-2}	14.3	0.193	0.295
sulfurdioxide slant column density window1 [DU]	0.170 ± 0.605	12407289	0.675	0.178	-160	32.4	-0.163	0.512
sulfurdioxide slant column density window1 precision [DU]	0.263 ± 0.118	12407289	0.102	0.227	7.597×10^{-2}	14.3	0.193	0.295
sulfurdioxide slant column density corrected win1 [DU]	$(6.436 \pm 59.434) \times 10^{-2}$	12407289	0.656	5.303×10^{-2}	-160	32.6	-0.272	0.384
background so2 slant column offset window1 [DU]	-0.106 ± 0.148	12407289	0.174	-0.143	-1.46	3.09	-0.202	-2.860×10^{-2}
sulfurdioxide slant column density window2 [DU]	2.84 ± 8.44	12407289	10.7	2.69	-794	865	-2.60	8.08
sulfurdioxide slant column density window2 precision [DU]	7.65 ± 2.02	12407289	2.32	7.35	2.23	429	6.31	8.63
sulfurdioxide slant column density corrected win2 [DU]	1.23 ± 8.22	12407289	10.5	1.24	-794	865	-4.00	6.47
background so2 slant column offset window2 [DU]	-1.60 ± 2.12	12407289	2.21	-1.01	-19.7	4.69	-2.42	-0.209
sulfurdioxide slant column density window3 [DU]	-16.9 ± 23.3	12407289	29.5	-17.4	-245	334	-31.8	-2.25
sulfurdioxide slant column density window3 precision [DU]	26.9 ± 11.8	12407289	8.56	24.0	9.69	225	20.5	29.1
sulfurdioxide slant column density corrected win3 [DU]	-7.97 ± 22.46	12407289	28.6	-8.44	-245	333	-22.4	6.17
background so2 slant column offset window3 [DU]	8.93 ± 6.61	12407289	9.65	8.98	-18.6	36.8	4.01	13.7
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.14	12407289	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.011 \pm 4.094) \times 10^{-2}$	12407289	1.932×10^{-2}	2.024×10^{-2}	5.846×10^{-4}	2.08	1.338×10^{-2}	3.270×10^{-2}
fitted radiance shift [nm]	$(-3.796 \pm 23.189) \times 10^{-4}$	12407289	1.712×10^{-3}	-3.723×10^{-4}	-5.085×10^{-2}	5.301×10^{-2}	-1.263×10^{-3}	4.496×10^{-4}
fitted radiance squeeze [1]	$(-4.239 \pm 16.519) \times 10^{-5}$	12407289	1.938×10^{-4}	-3.590×10^{-5}	-1.202×10^{-2}	2.088×10^{-2}	-1.354×10^{-4}	5.836×10^{-5}
fitted root mean square [1]	$(1.165 \pm 0.478) \times 10^{-3}$	12407289	4.093×10^{-4}	1.033×10^{-3}	3.007×10^{-4}	7.676×10^{-2}	8.814×10^{-4}	1.291×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.856 ± 0.403	12407289	0.492	0.800	5.000×10^{-2}	2.74	0.573	1.06
sulfurdioxide total air mass factor polluted precision [1]	0.121 ± 0.115	12407289	0.130	7.507×10^{-2}	2.722×10^{-3}	1.45	3.991×10^{-2}	0.170
sulfurdioxide clear air mass factor polluted [1]	0.710 ± 0.250	12407289	0.317	0.692	2.495×10^{-2}	2.76	0.541	0.857
number of spectral points in retrieval [1]	73.4 ± 0.5	12407289	1.000	73.0	70.0	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]	0.546 ± 0.424	4161907	0.890	0.490	0.0	1.000	0.110	1.000
sulfurdioxide total vertical column [DU]	$(6.245 \pm 186.482) \times 10^{-2}$	4161907	0.414	9.138×10^{-3}	-120	561	-0.190	0.224
sulfurdioxide total vertical column precision [DU]	0.690 ± 1.236	4161907	0.582	0.329	3.731×10^{-2}	45.7	0.148	0.729
sulfurdioxide slant column density corrected [DU]	$(2.293 \pm 39.789) \times 10^{-2}$	4161907	0.385	1.038×10^{-2}	-9.62	47.5	-0.180	0.205
sulfurdioxide slant column density cobra [DU]	$(2.277 \pm 39.003) \times 10^{-2}$	4161907	0.385	1.038×10^{-2}	-9.62	19.9	-0.180	0.205
sulfurdioxide slant column density cobra precision [DU]	0.308 ± 0.140	4161907	0.145	0.273	8.619×10^{-2}	11.3	0.218	0.362
sulfurdioxide slant column density window1 [DU]	0.135 ± 0.737	4161907	0.825	0.147	-54.9	46.4	-0.277	0.548
sulfurdioxide slant column density window1 precision [DU]	0.308 ± 0.140	4161907	0.145	0.273	8.619×10^{-2}	11.3	0.218	0.362
sulfurdioxide slant column density corrected win1 [DU]	$(9.634 \pm 70.937) \times 10^{-2}$	4161907	0.771	7.695×10^{-2}	-54.9	46.3	-0.303	0.468
background so2 slant column offset window1 [DU]	$(-3.886 \pm 21.357) \times 10^{-2}$	4161907	0.322	-0.123	-0.902	1.73	-0.194	0.127
sulfurdioxide slant column density window2 [DU]	4.20 ± 9.28	4161907	11.7	4.07	-728	753	-1.73	9.98
sulfurdioxide slant column density window2 precision [DU]	8.25 ± 2.37	4161907	2.73	7.88	2.28	621	6.69	9.42
sulfurdioxide slant column density corrected win2 [DU]	1.47 ± 8.89	4161907	11.2	1.51	-728	754	-4.10	7.08
background so2 slant column offset window2 [DU]	-2.73 ± 2.81	4161907	4.14	-2.17	-17.4	4.07	-4.50	-0.358
sulfurdioxide slant column density window3 [DU]	-27.4 ± 23.0	4161907	28.3	-27.1	-1.490×10^{3}	166	-41.4	-13.1
sulfurdioxide slant column density window3 precision [DU]	27.7 ± 13.7	4161907	10.8	24.5	9.92	445	19.6	30.4
sulfurdioxide slant column density corrected win3 [DU]	-15.7 ± 23.3	4161907	28.7	-15.1	-1.483×10^{3}	173	-29.8	-1.04
background so2 slant column offset window3 [DU]	11.7 ± 7.6	4161907	12.3	13.4	-18.6	36.7	5.42	17.7
sulfurdioxide slant column cobra flag [1]	1.95 ± 0.32	4161907	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.103 \pm 14.492) \times 10^{-2}$	4161907	4.521×10^{-2}	2.058×10^{-2}	5.051×10^{-4}	2.98	7.367×10^{-3}	5.258×10^{-2}
fitted radiance shift [nm]	$(-5.655 \pm 26.034) \times 10^{-4}$	4161907	1.538×10^{-3}	-6.786×10^{-4}	-4.017×10^{-2}	4.619×10^{-2}	-1.418×10^{-3}	1.196×10^{-4}
fitted radiance squeeze [1]	$(-5.354 \pm 20.533) \times 10^{-5}$	4161907	2.466×10^{-4}	-5.005×10^{-5}	-1.298×10^{-2}	1.517×10^{-2}	-1.773×10^{-4}	6.931×10^{-5}
fitted root mean square [1]	$(1.381 \pm 0.552) \times 10^{-3}$	4161907	5.918×10^{-4}	1.262×10^{-3}	3.211×10^{-4}	3.552×10^{-2}	1.017×10^{-3}	1.609×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.09 ± 0.81	4161907	1.33	0.762	5.000×10^{-2}	3.10	0.434	1.76
sulfurdioxide total air mass factor polluted precision [1]	0.158 ± 0.179	4161907	0.197	9.672×10^{-2}	2.500×10^{-3}	2.02	2.782×10^{-2}	0.225
sulfurdioxide clear air mass factor polluted [1]	1.09 ± 0.90	4161907	1.32	0.684	2.609×10^{-2}	3.13	0.409	1.73
number of spectral points in retrieval [1]	73.4 ± 0.5	4161907	1.000	73.0	71.0	74.0	73.0	74.0

3 Granule outlines

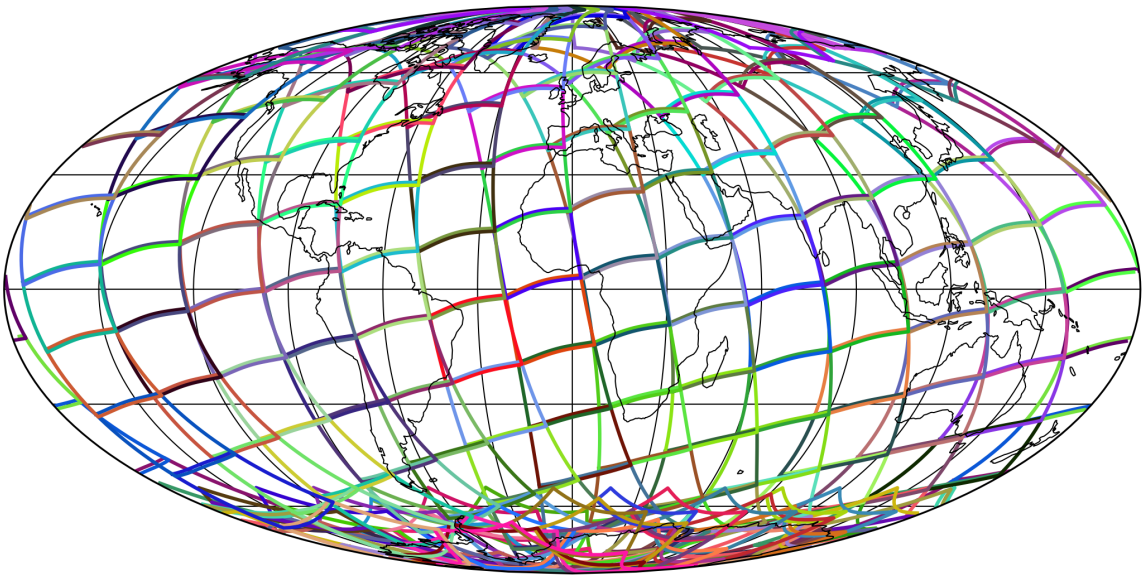


Figure 1: Outline of the granules.

4 Input data monitoring

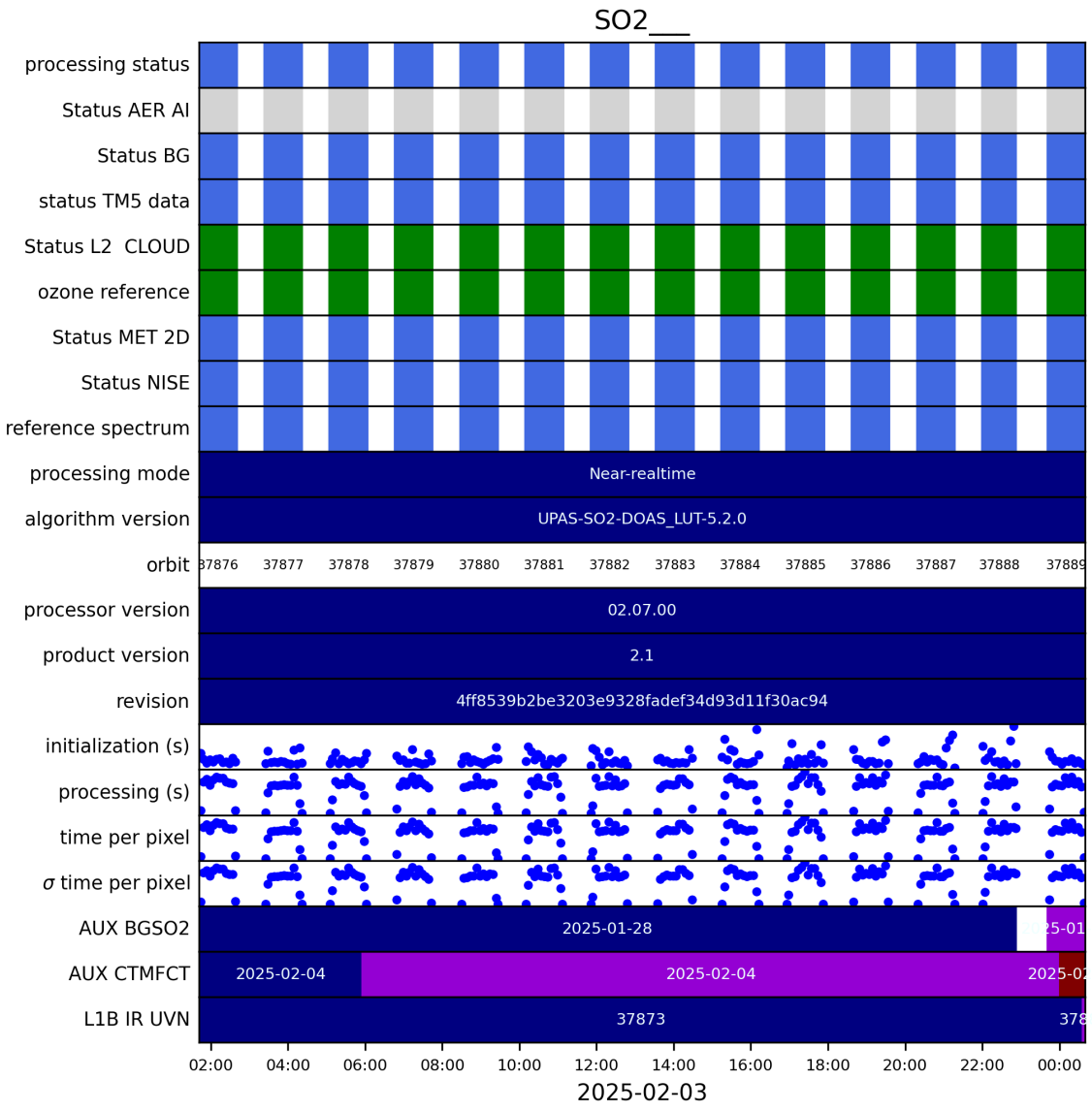


Figure 2: Input data per granule

5 Warnings and errors

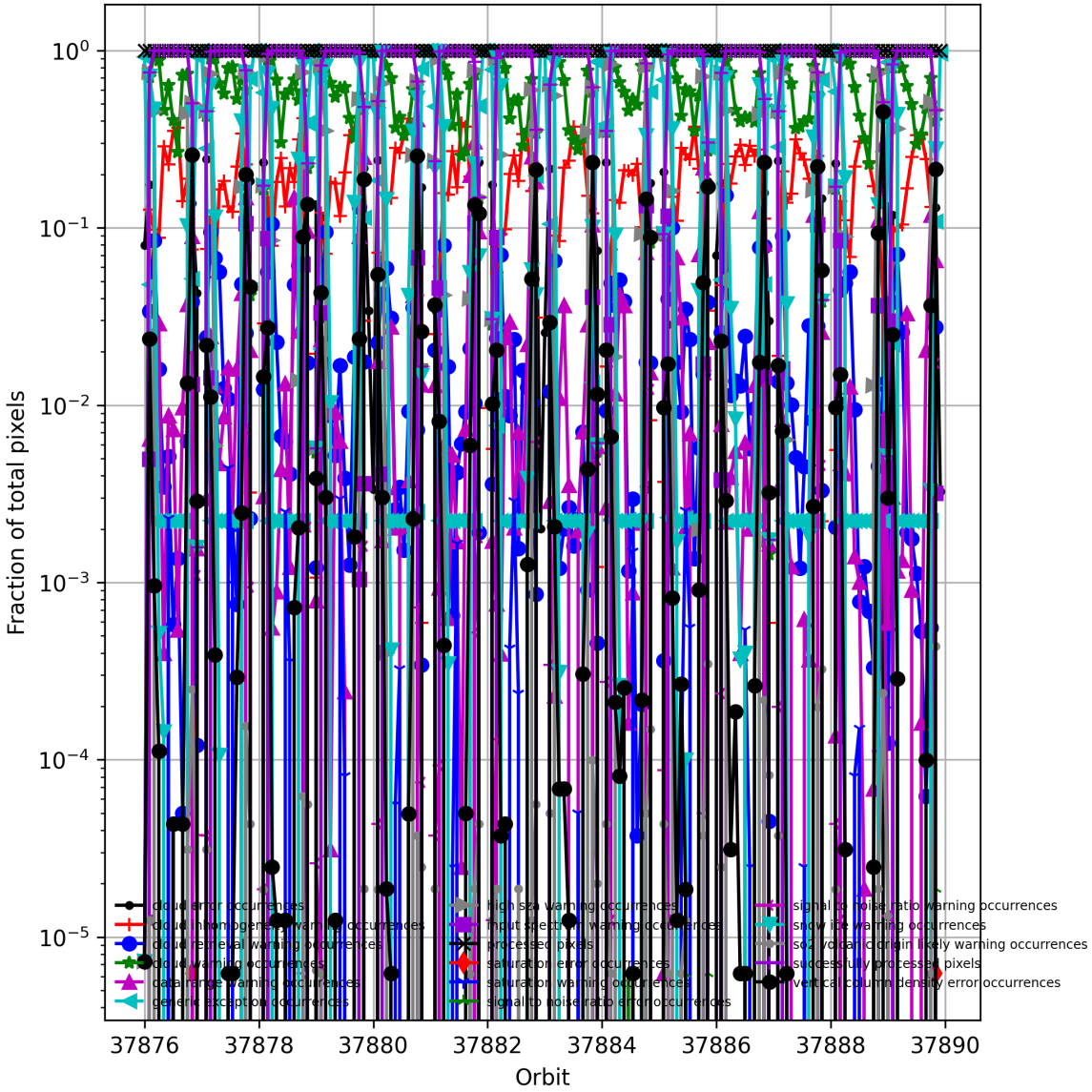


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

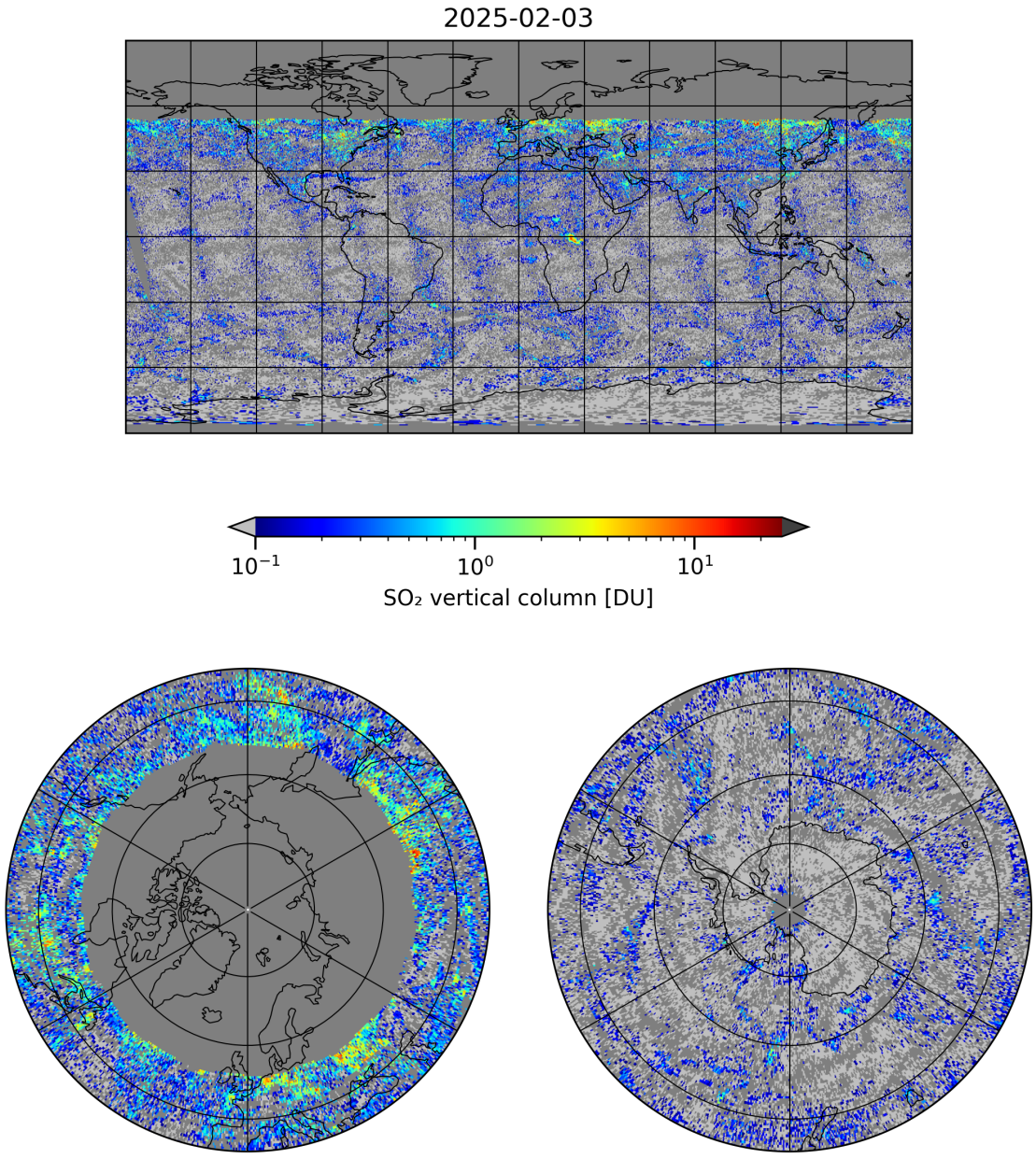


Figure 4: Map of "SO_2 vertical column" for 2025-02-03 to 2025-02-04

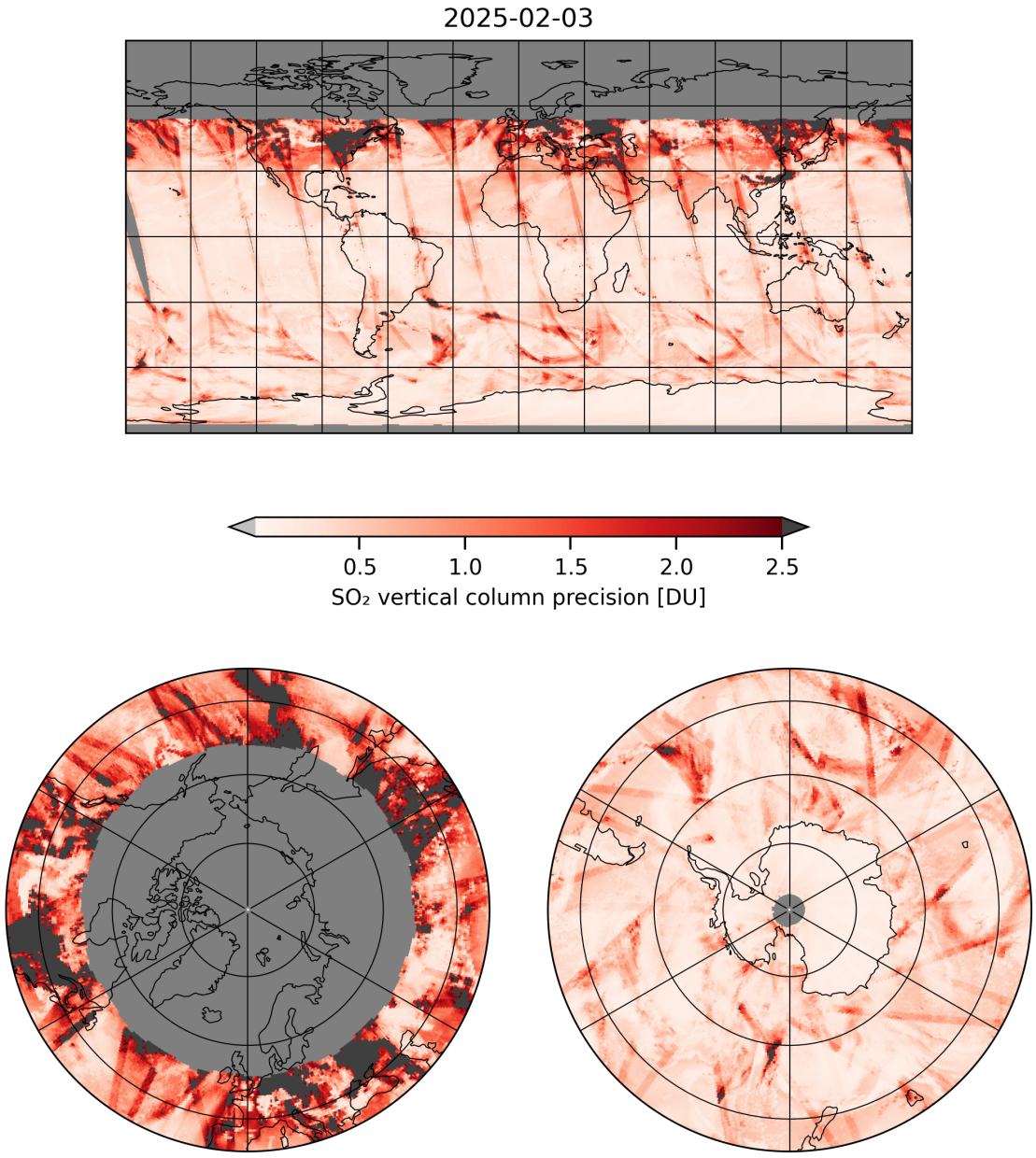


Figure 5: Map of "SO_2 vertical column precision" for 2025-02-03 to 2025-02-04

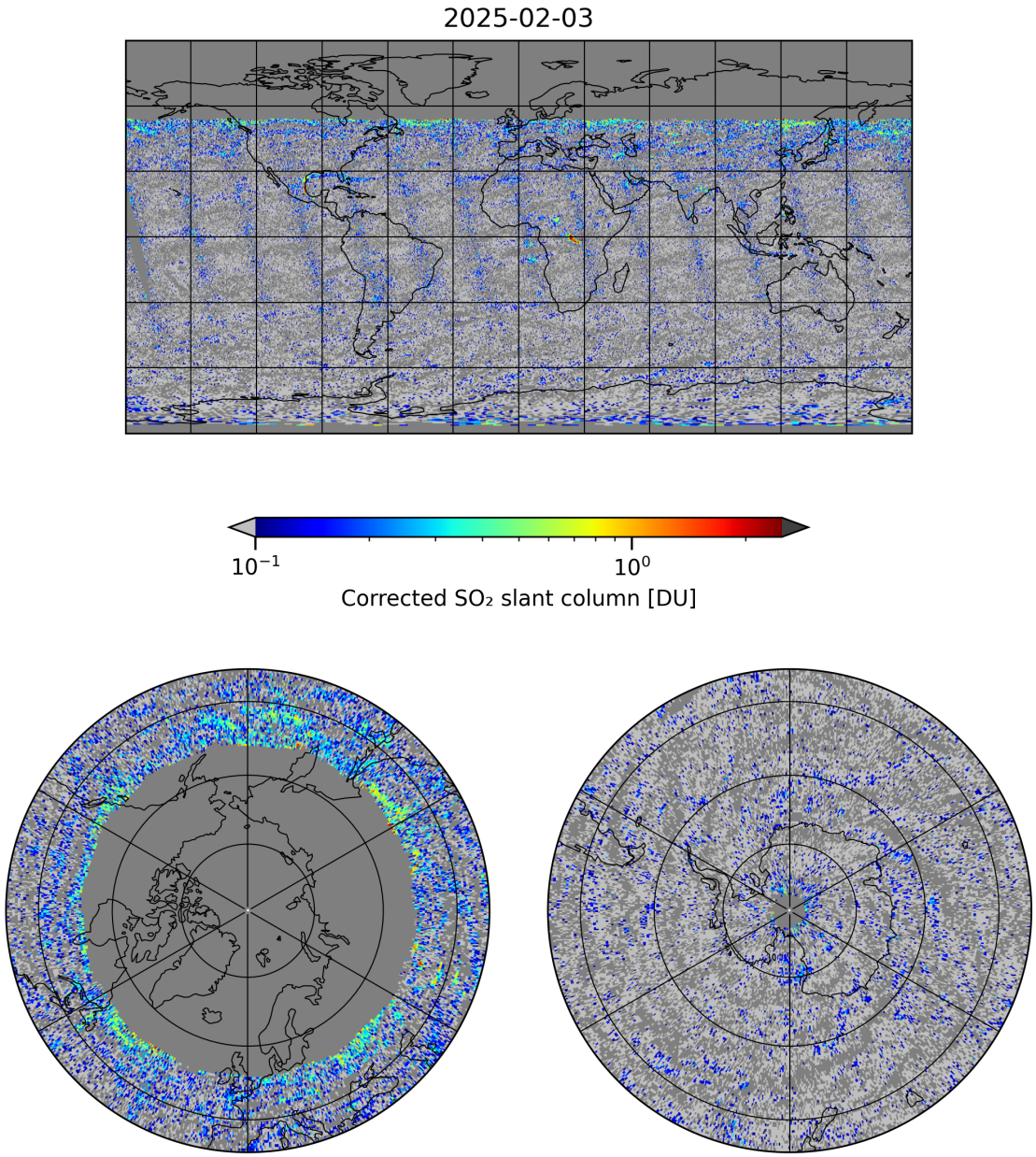


Figure 6: Map of "Corrected SO_2 slant column" for 2025-02-03 to 2025-02-04

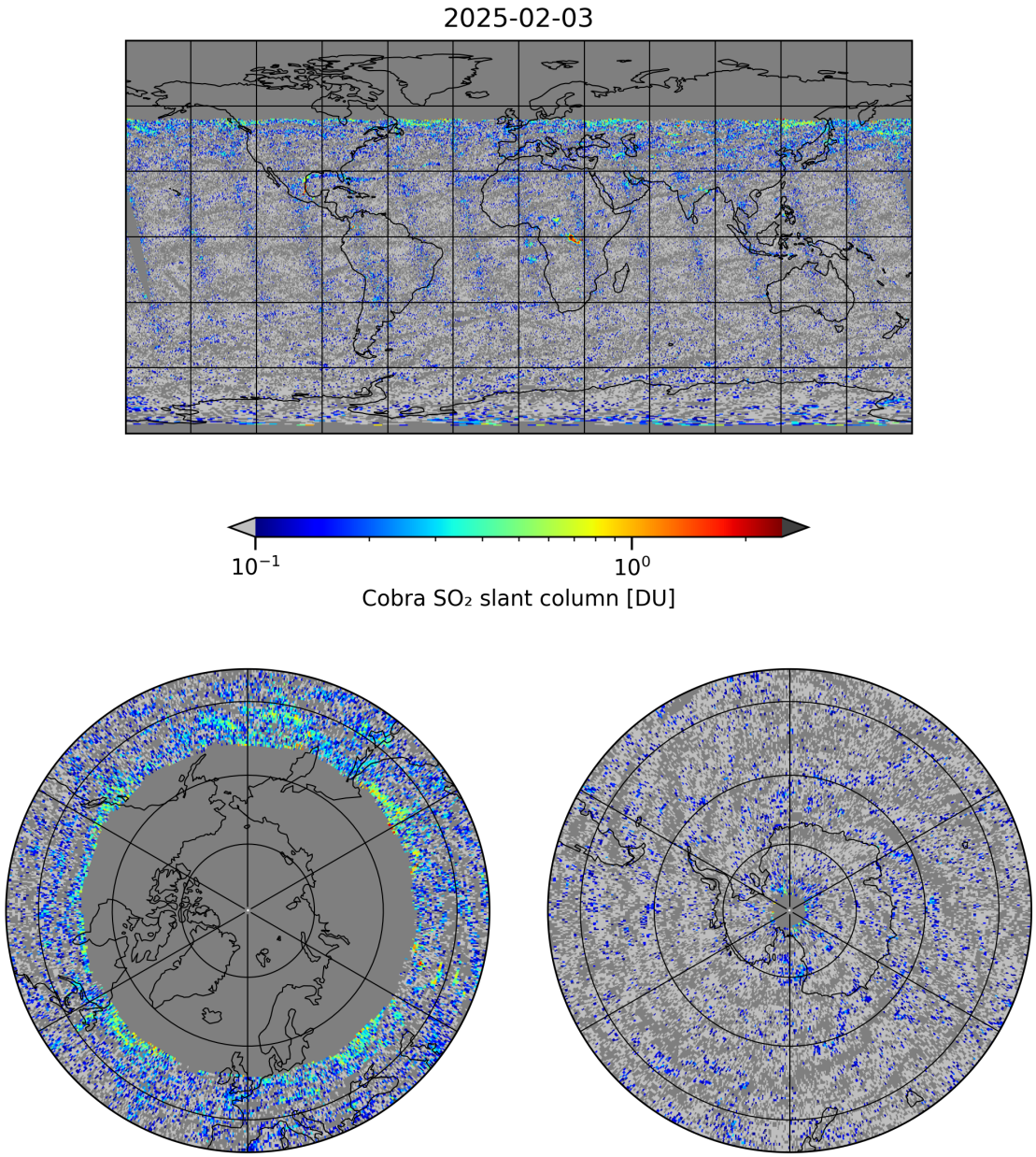


Figure 7: Map of "Cobra SO_2 slant column" for 2025-02-03 to 2025-02-04

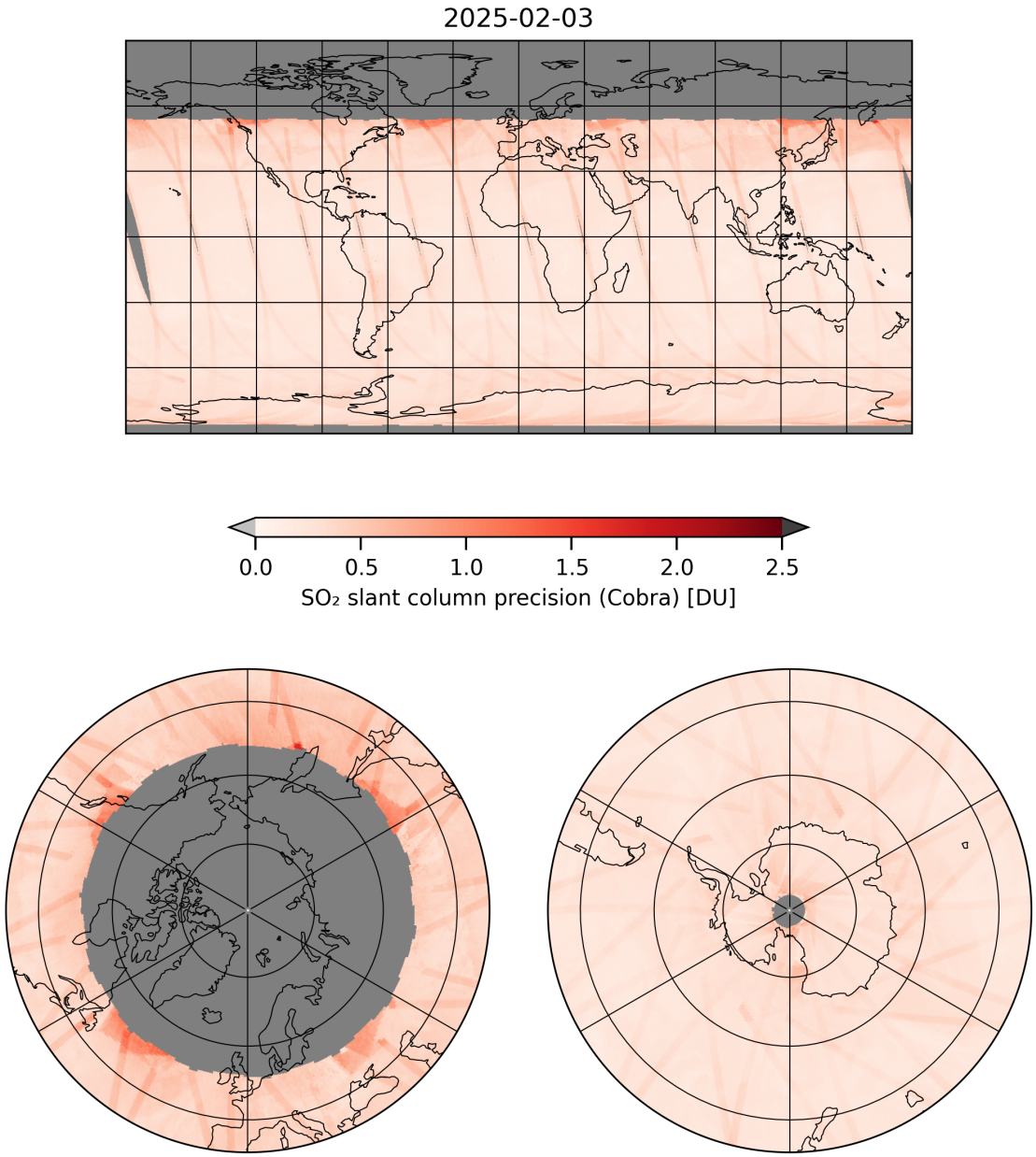


Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-02-03 to 2025-02-04

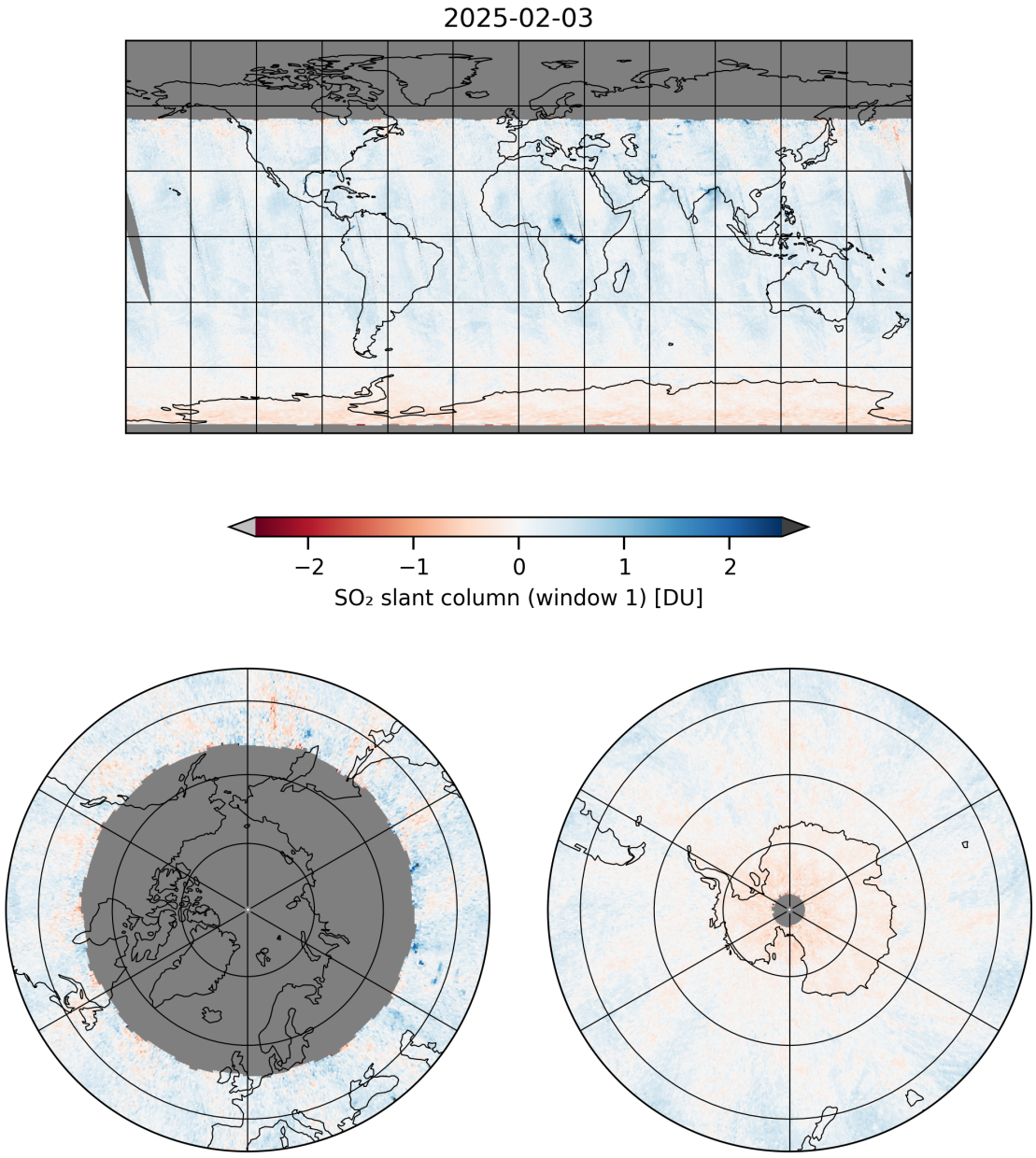


Figure 9: Map of "SO_2 slant column (window 1)" for 2025-02-03 to 2025-02-04

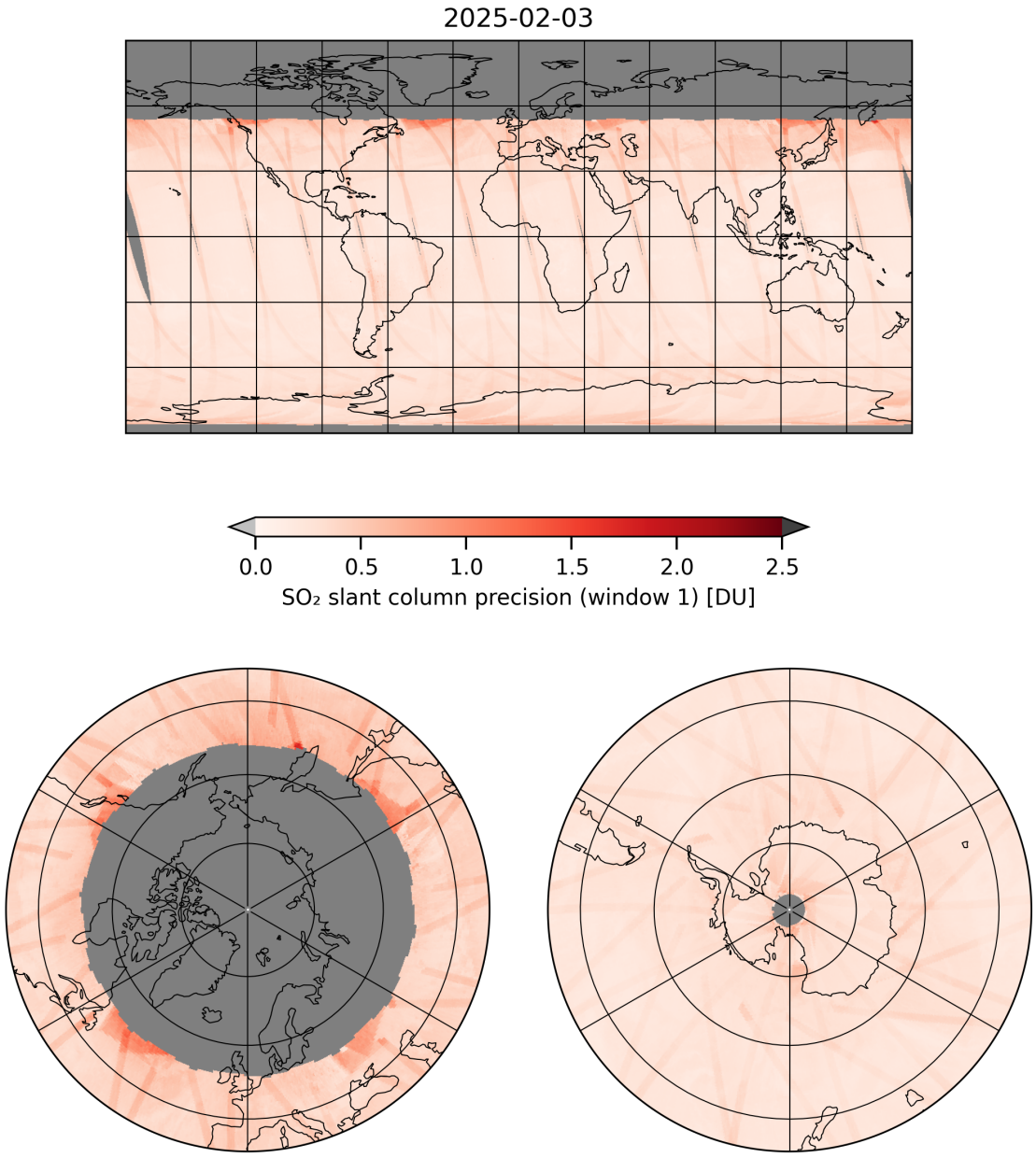


Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-02-03 to 2025-02-04

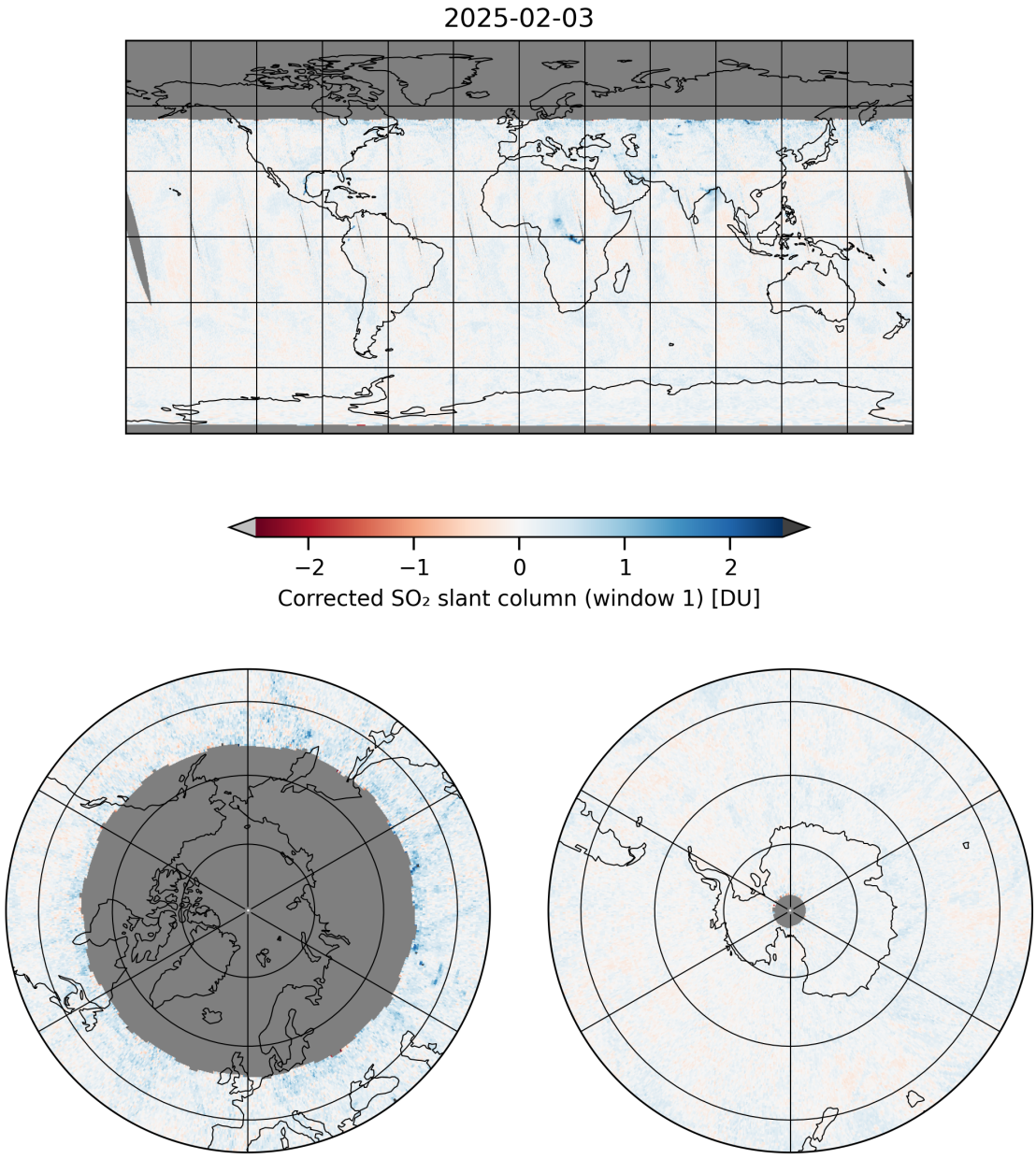


Figure 11: Map of "Corrected SO_2 slant column (window 1)" for 2025-02-03 to 2025-02-04

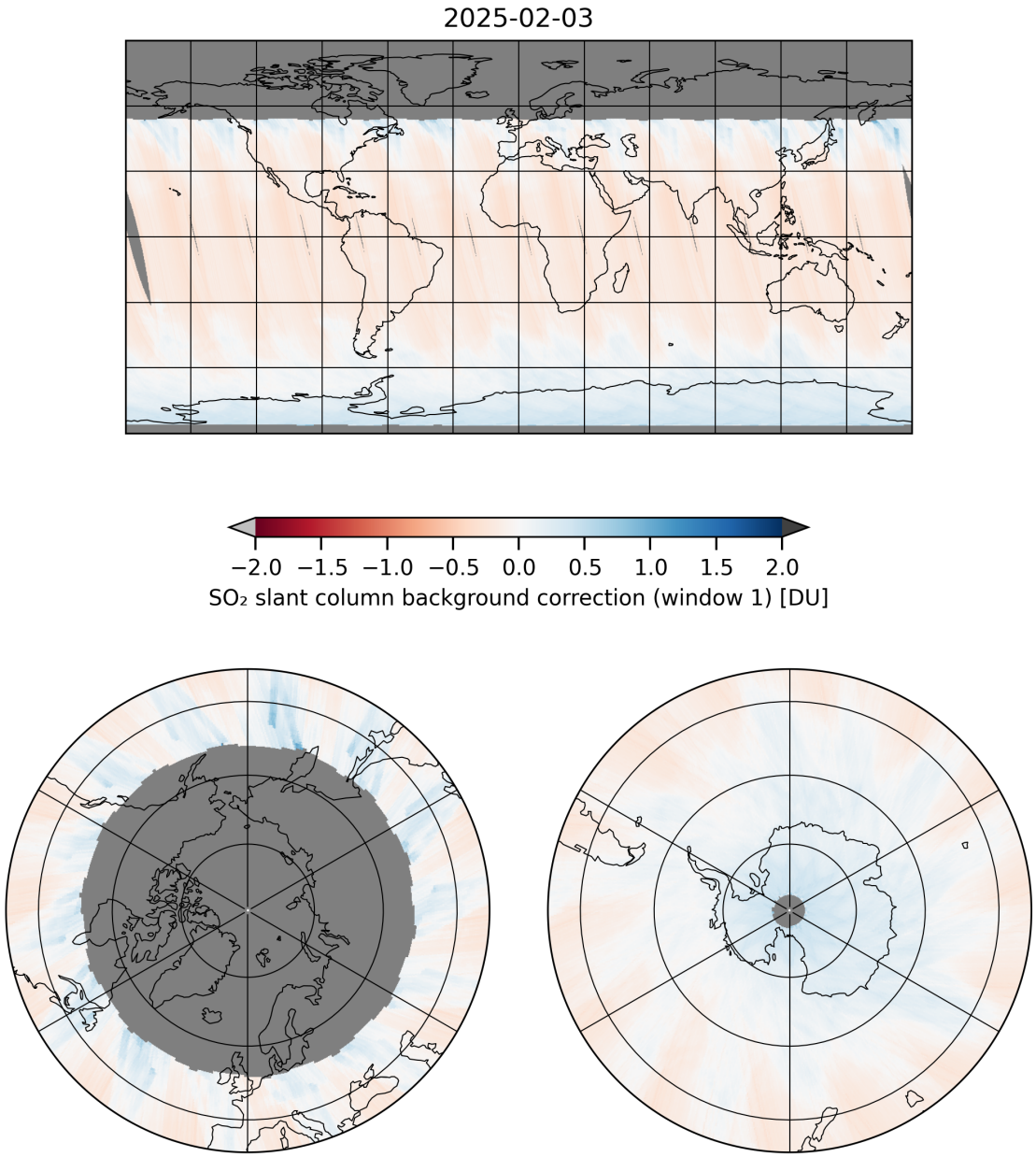


Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-02-03 to 2025-02-04

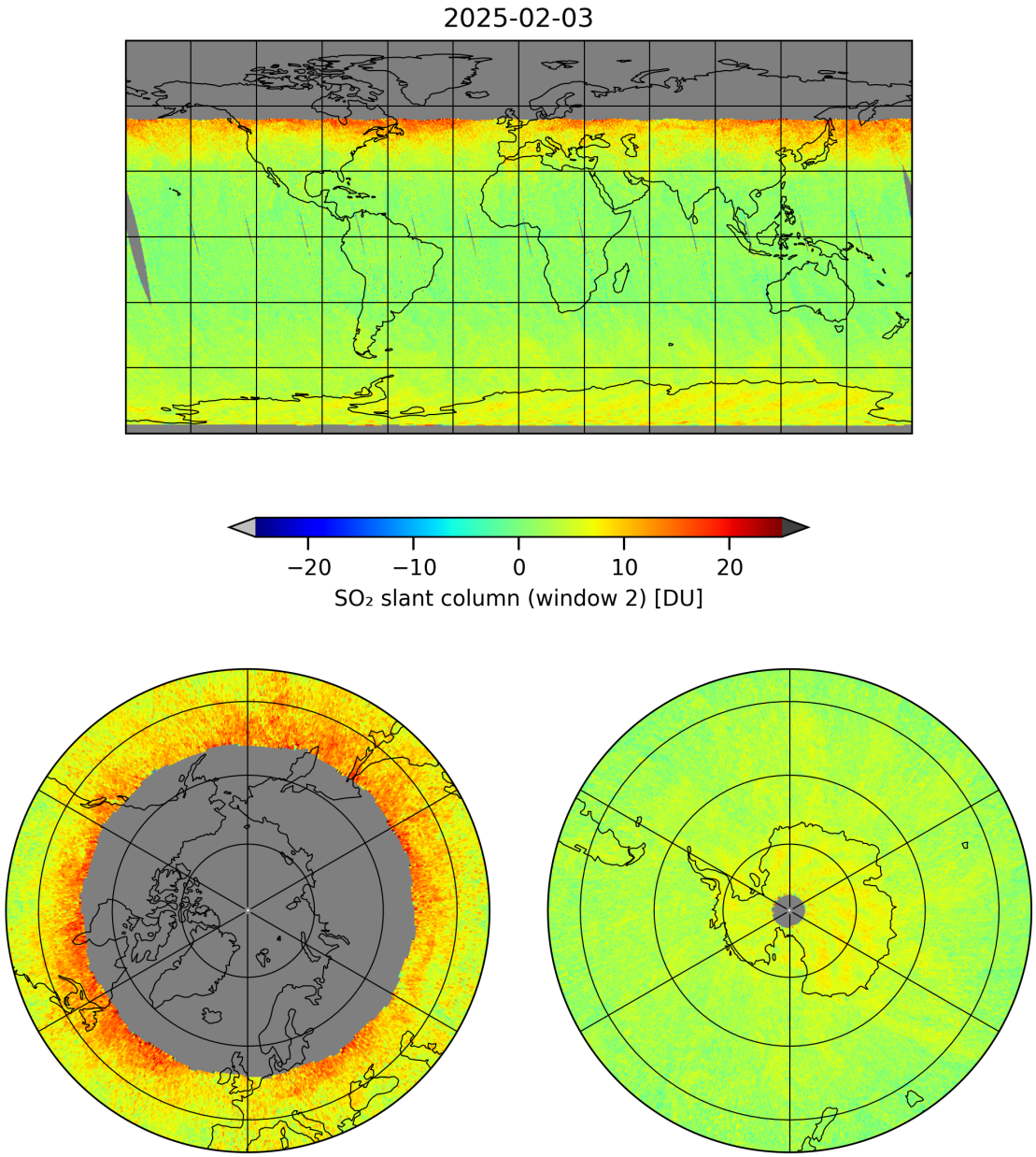


Figure 13: Map of "SO_2 slant column (window 2)" for 2025-02-03 to 2025-02-04

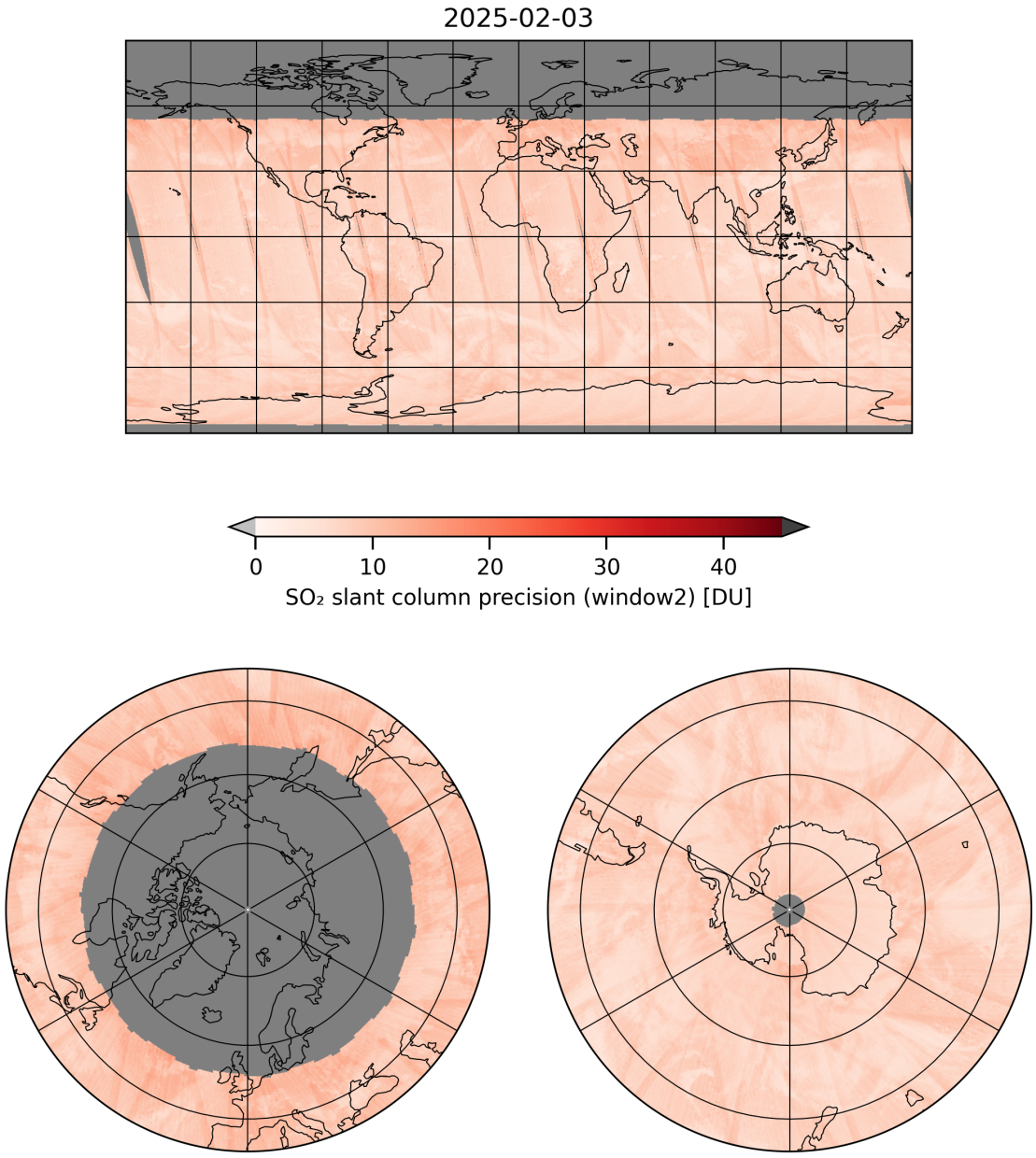


Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-02-03 to 2025-02-04

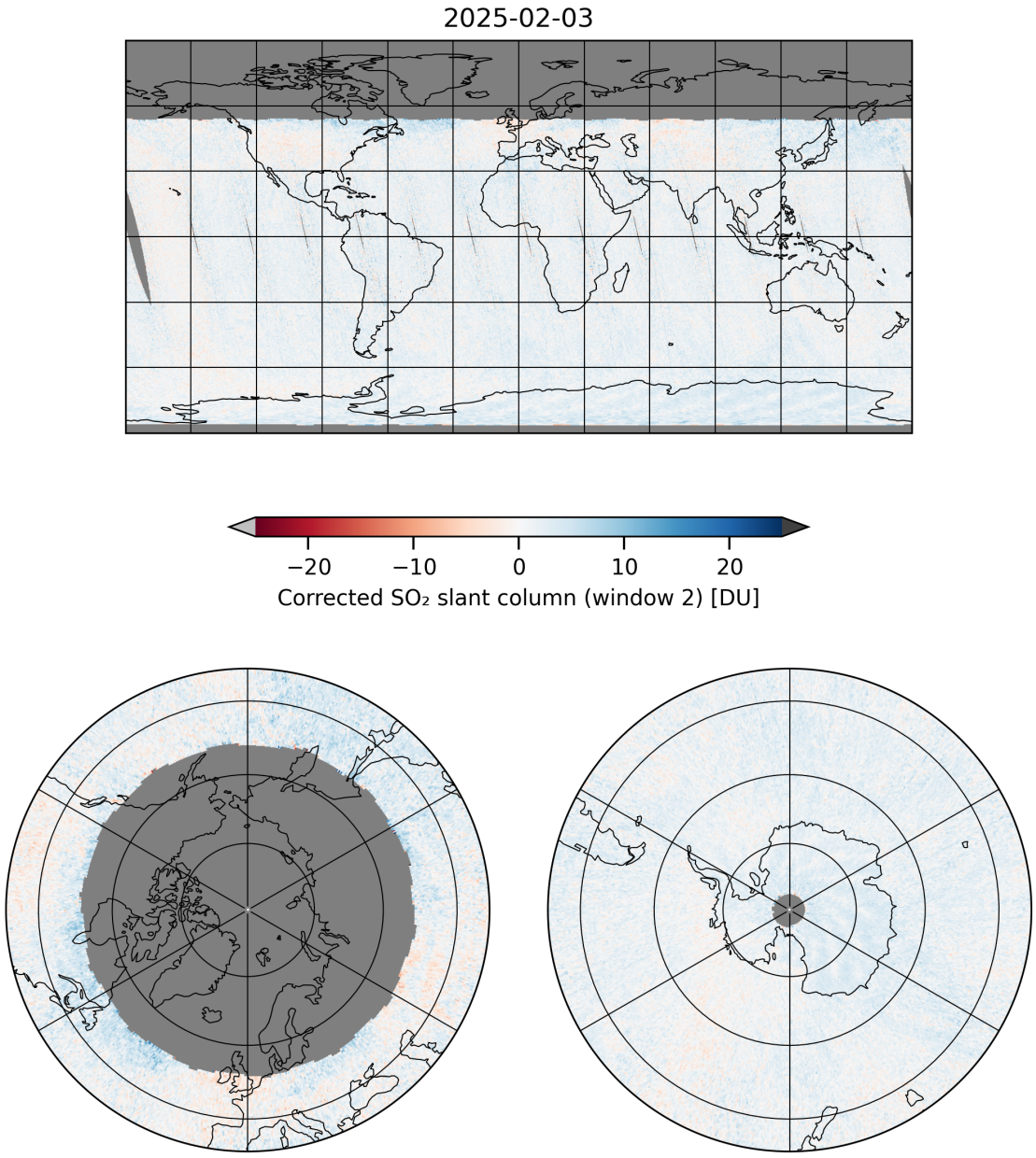


Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2025-02-03 to 2025-02-04

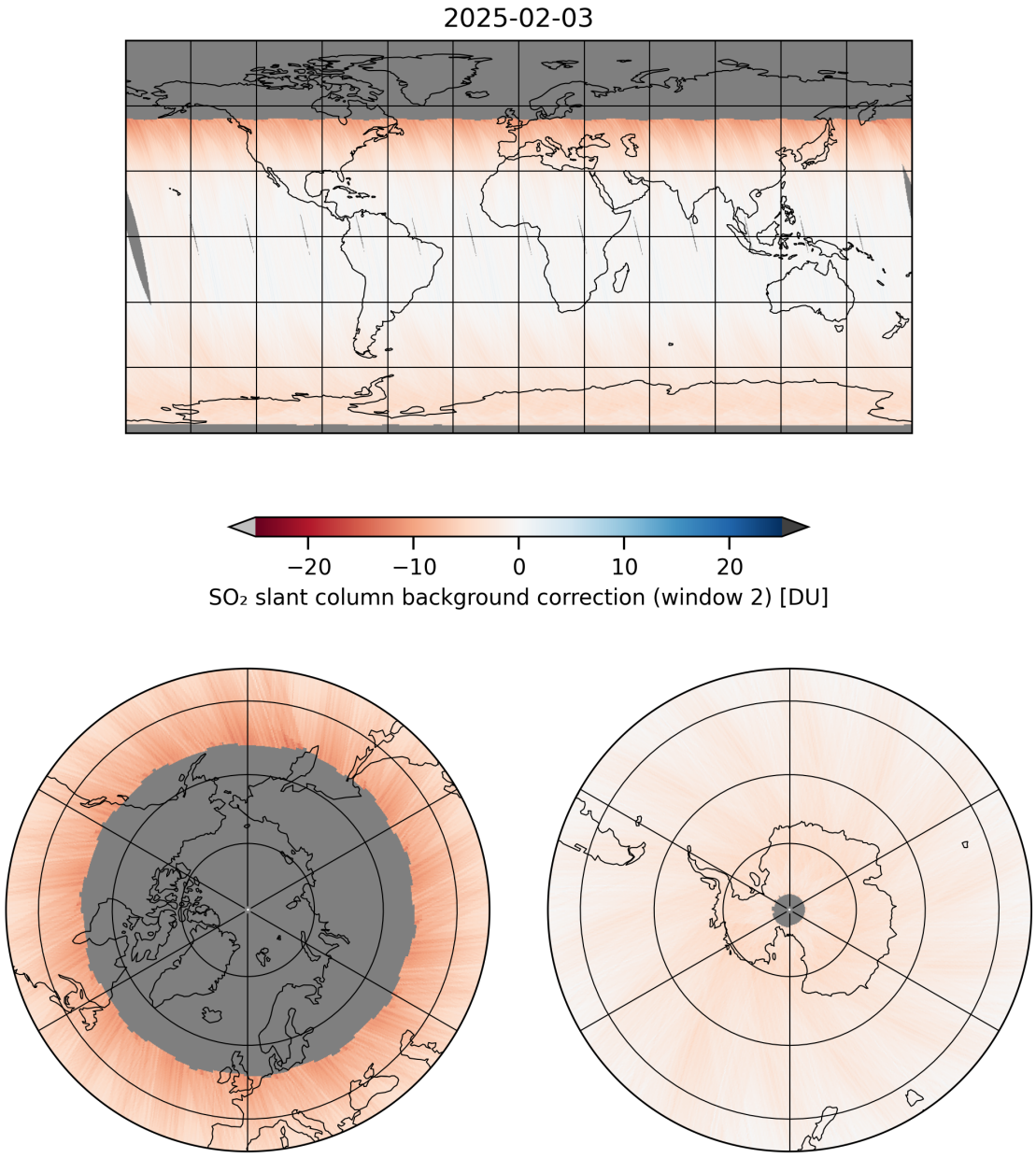


Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-02-03 to 2025-02-04

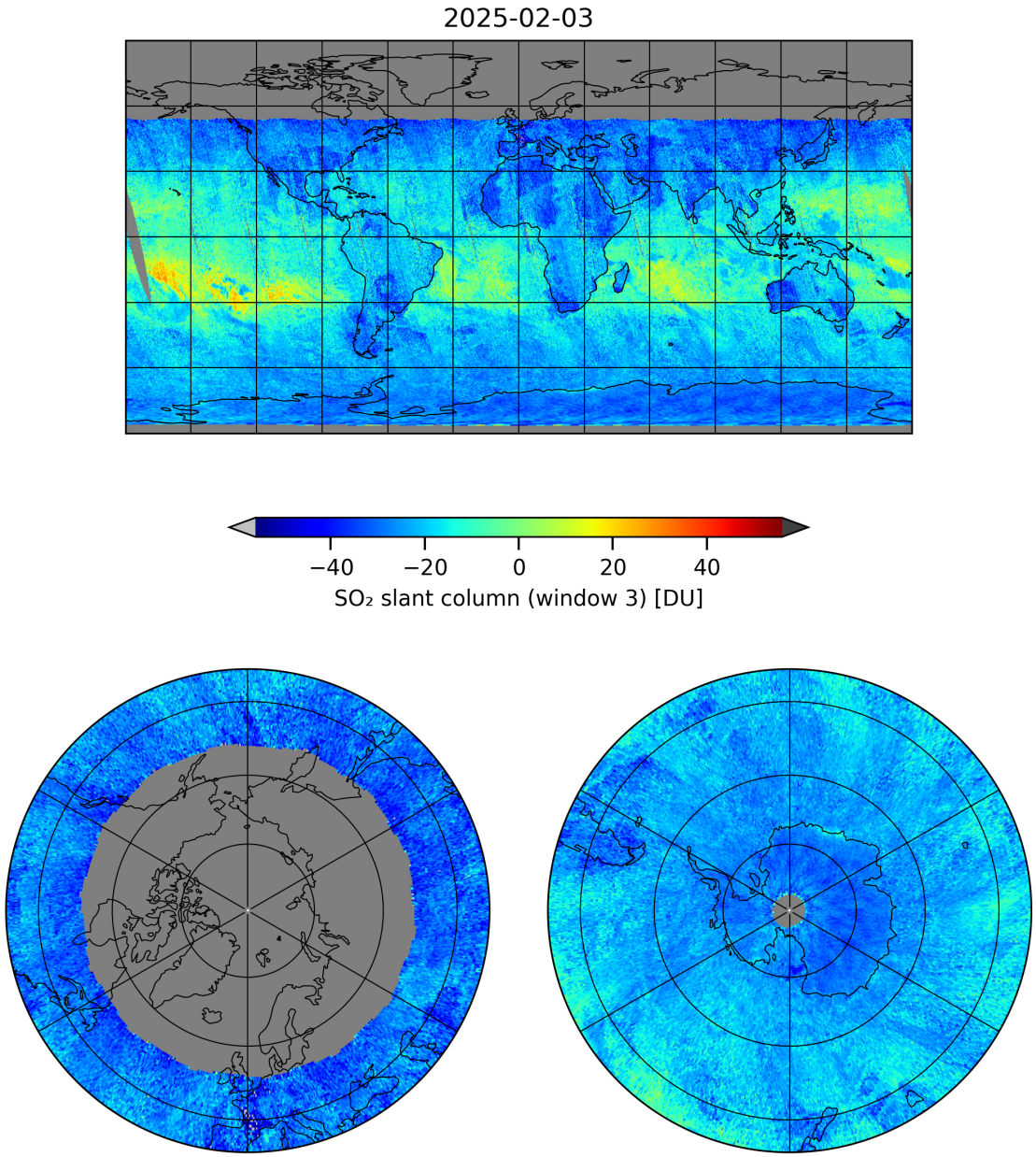


Figure 17: Map of "SO_2 slant column (window 3)" for 2025-02-03 to 2025-02-04

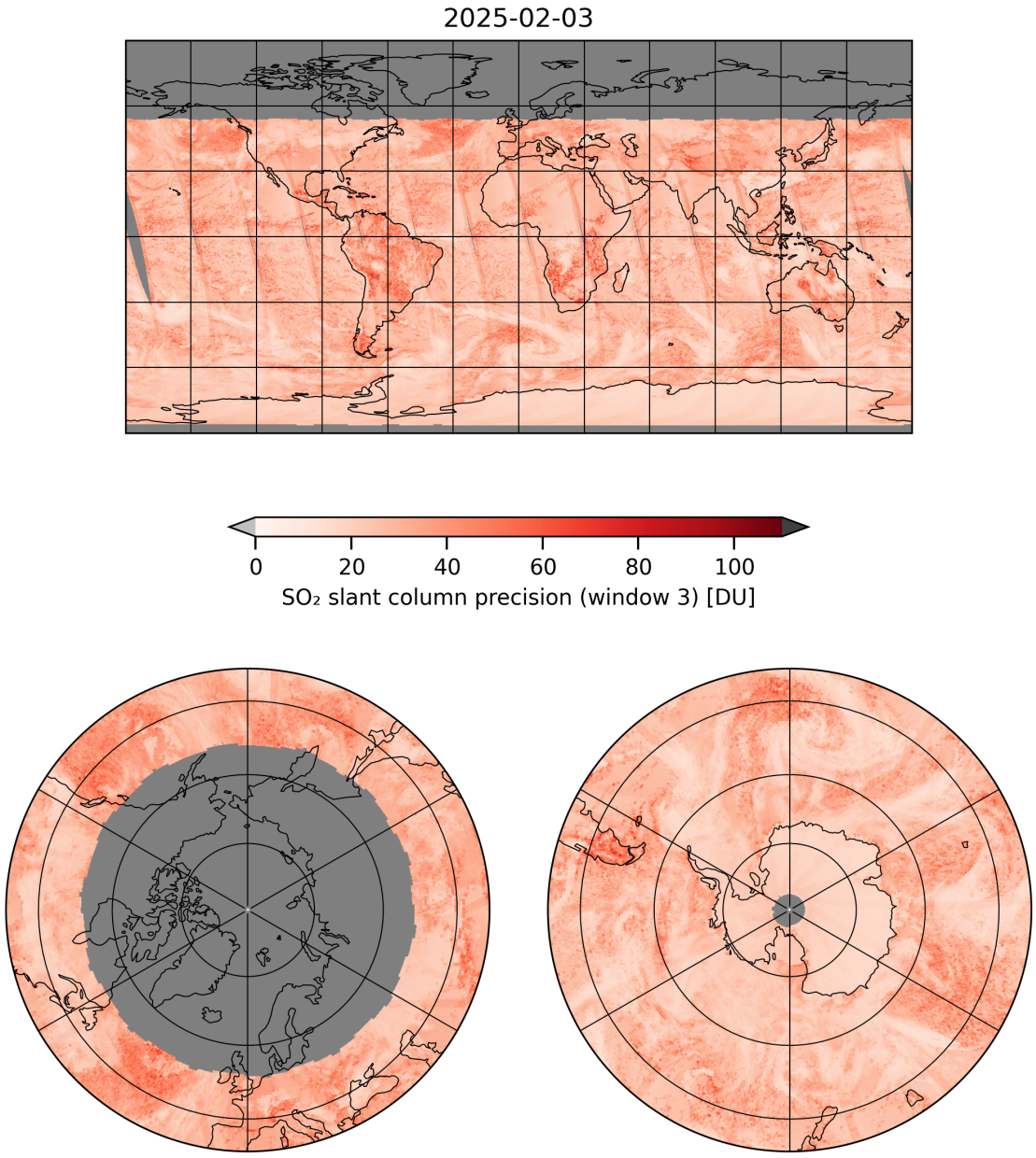


Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-02-03 to 2025-02-04

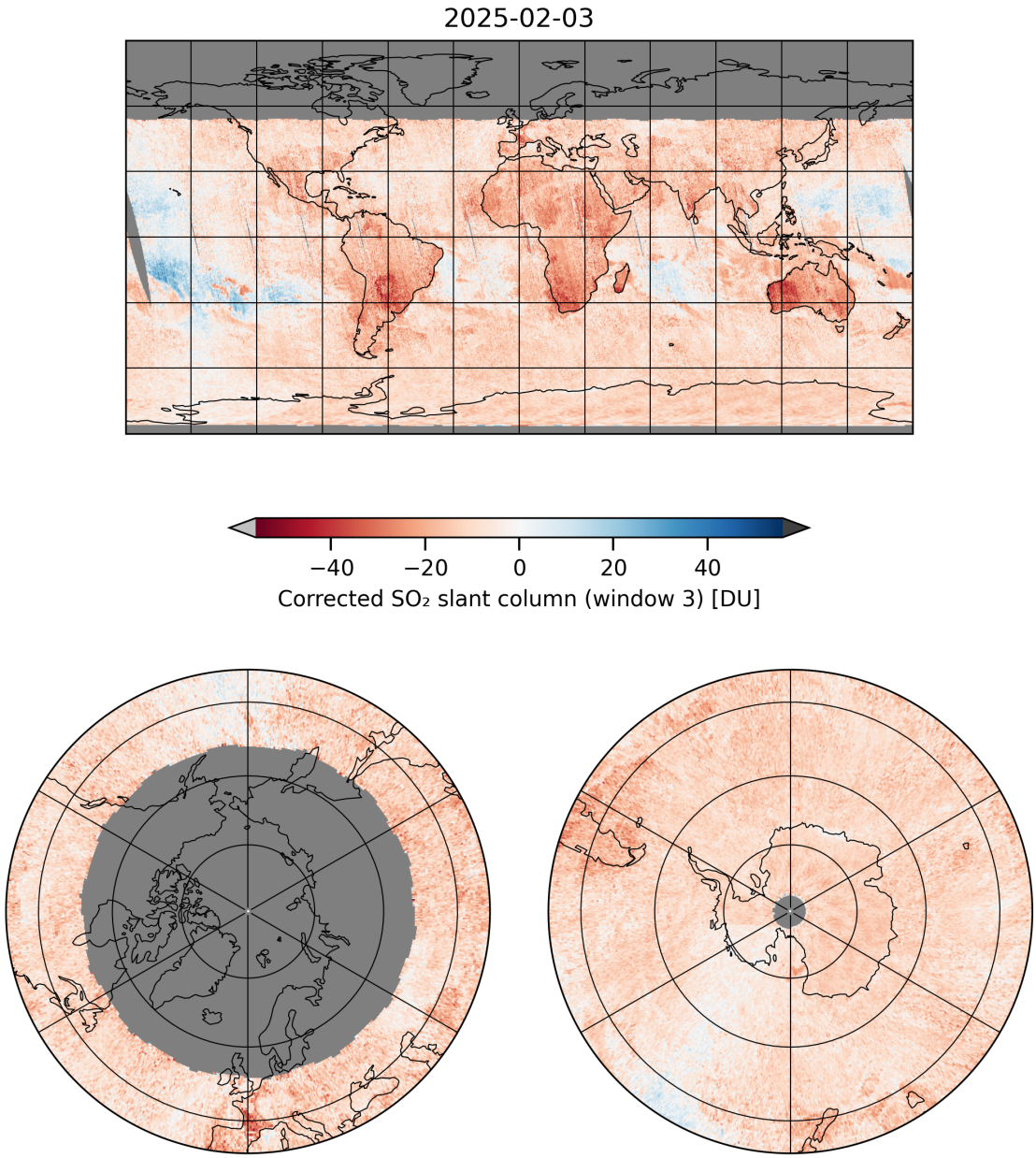


Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-02-03 to 2025-02-04

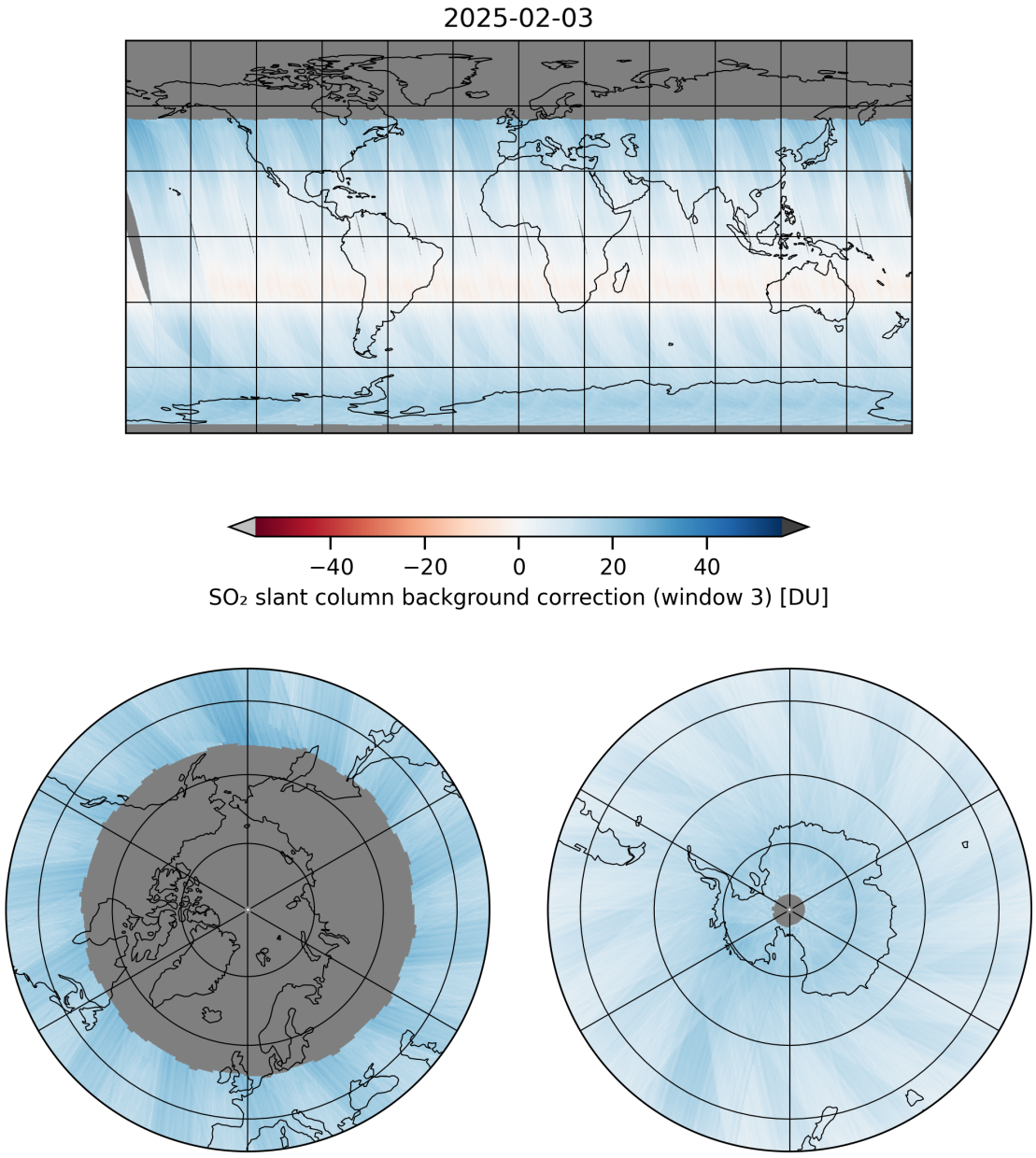


Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-02-03 to 2025-02-04

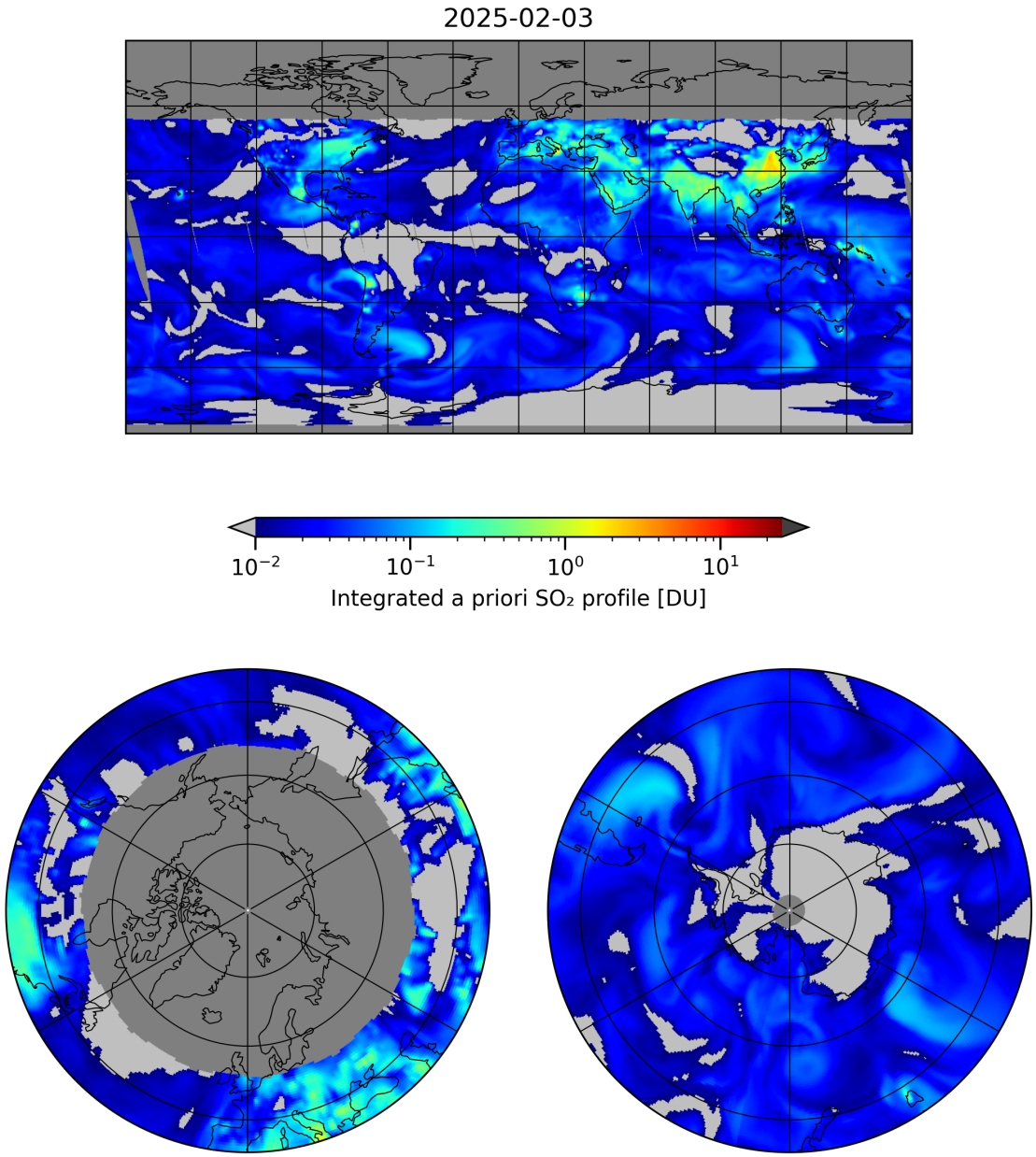


Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-02-03 to 2025-02-04

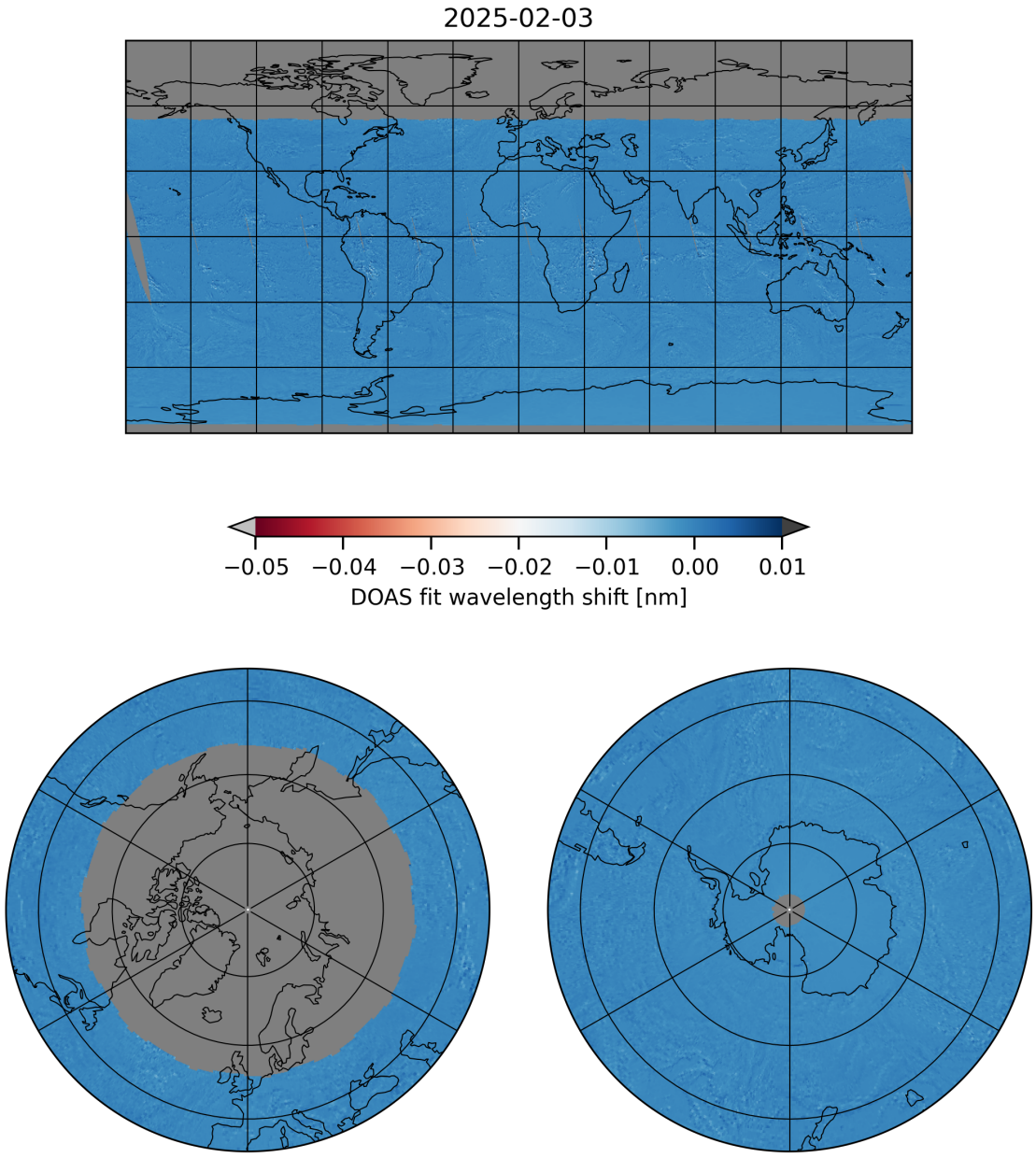


Figure 22: Map of “DOAS fit wavelength shift” for 2025-02-03 to 2025-02-04

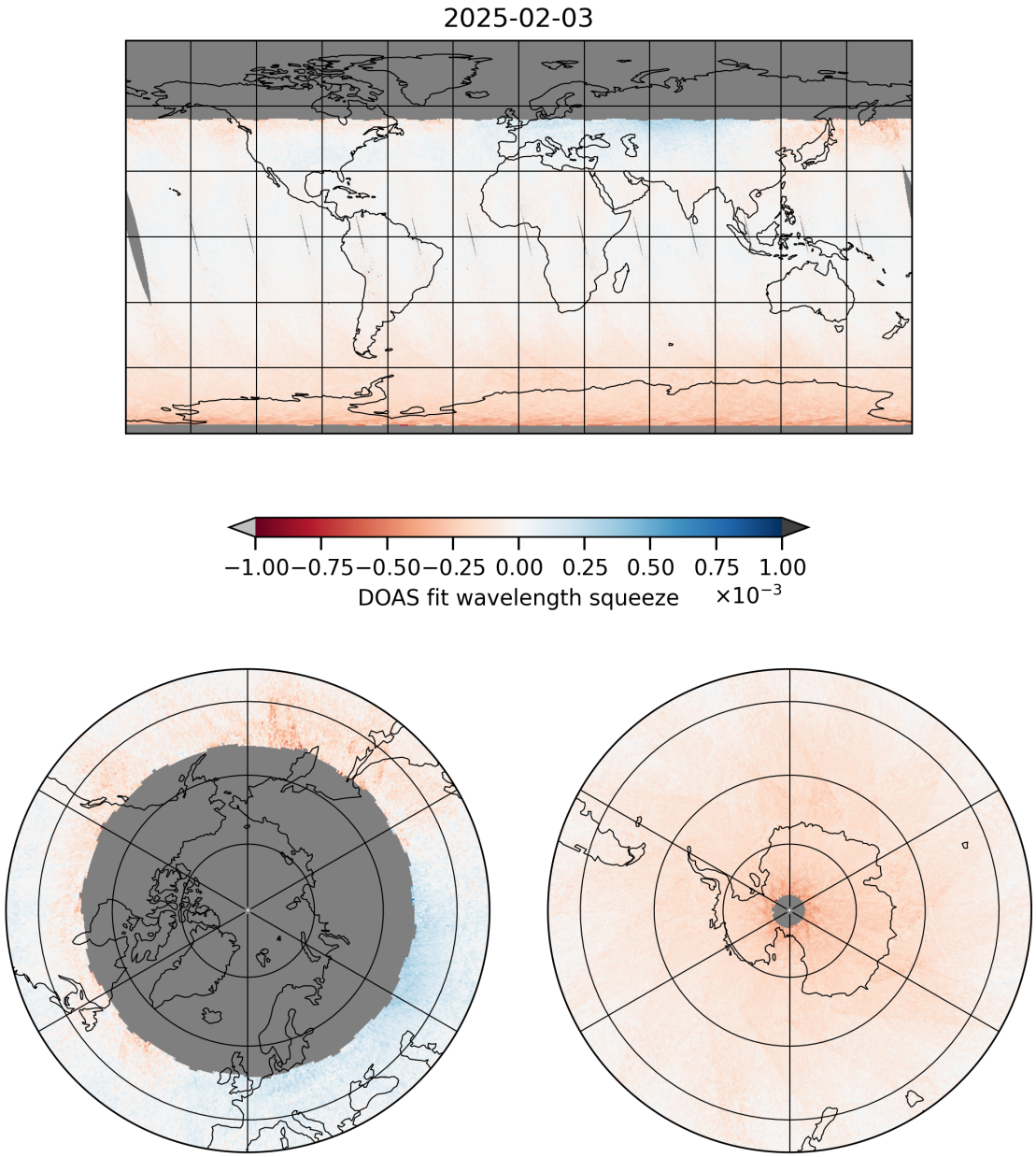


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-02-03 to 2025-02-04

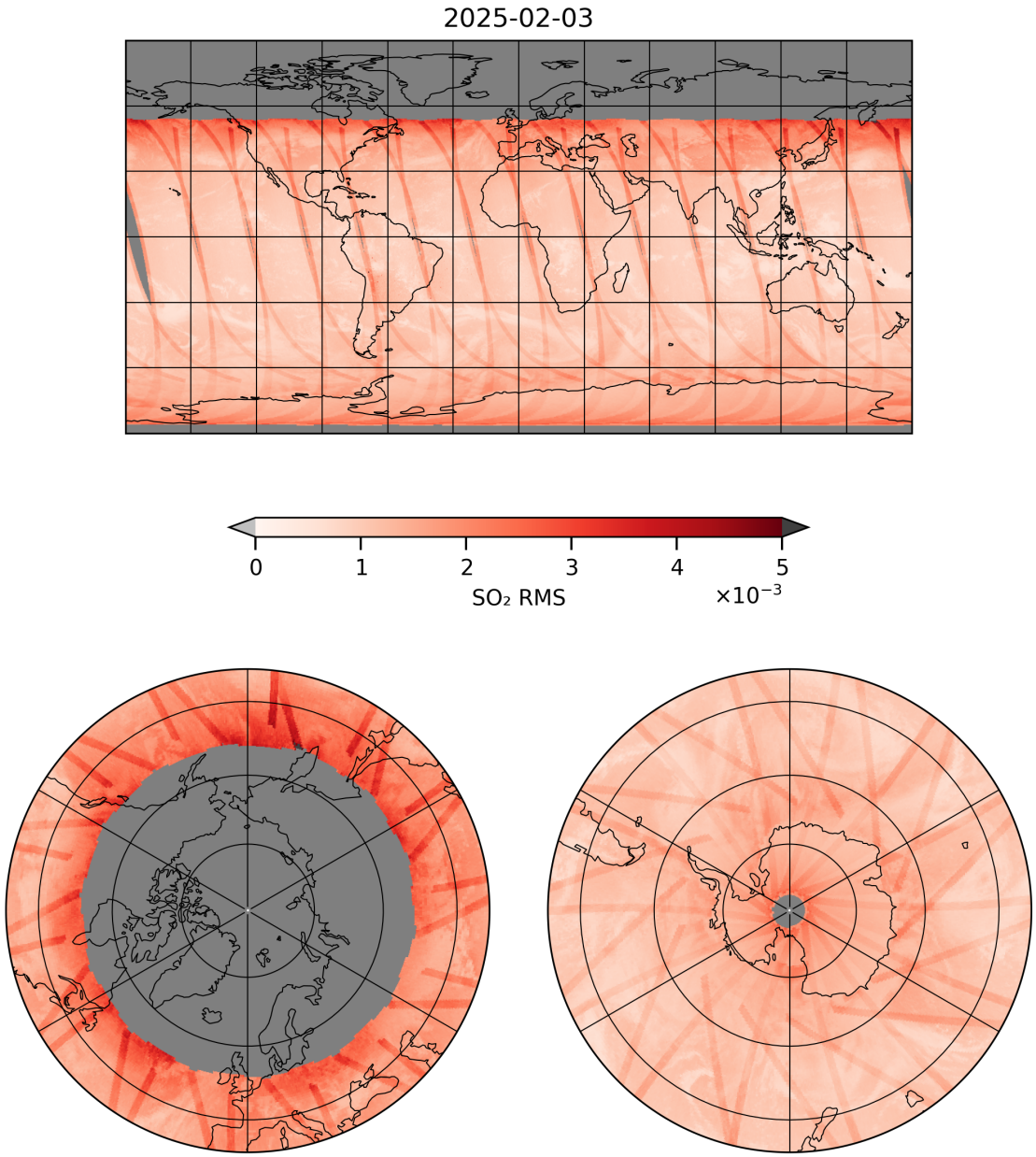


Figure 24: Map of "SO_2 RMS" for 2025-02-03 to 2025-02-04

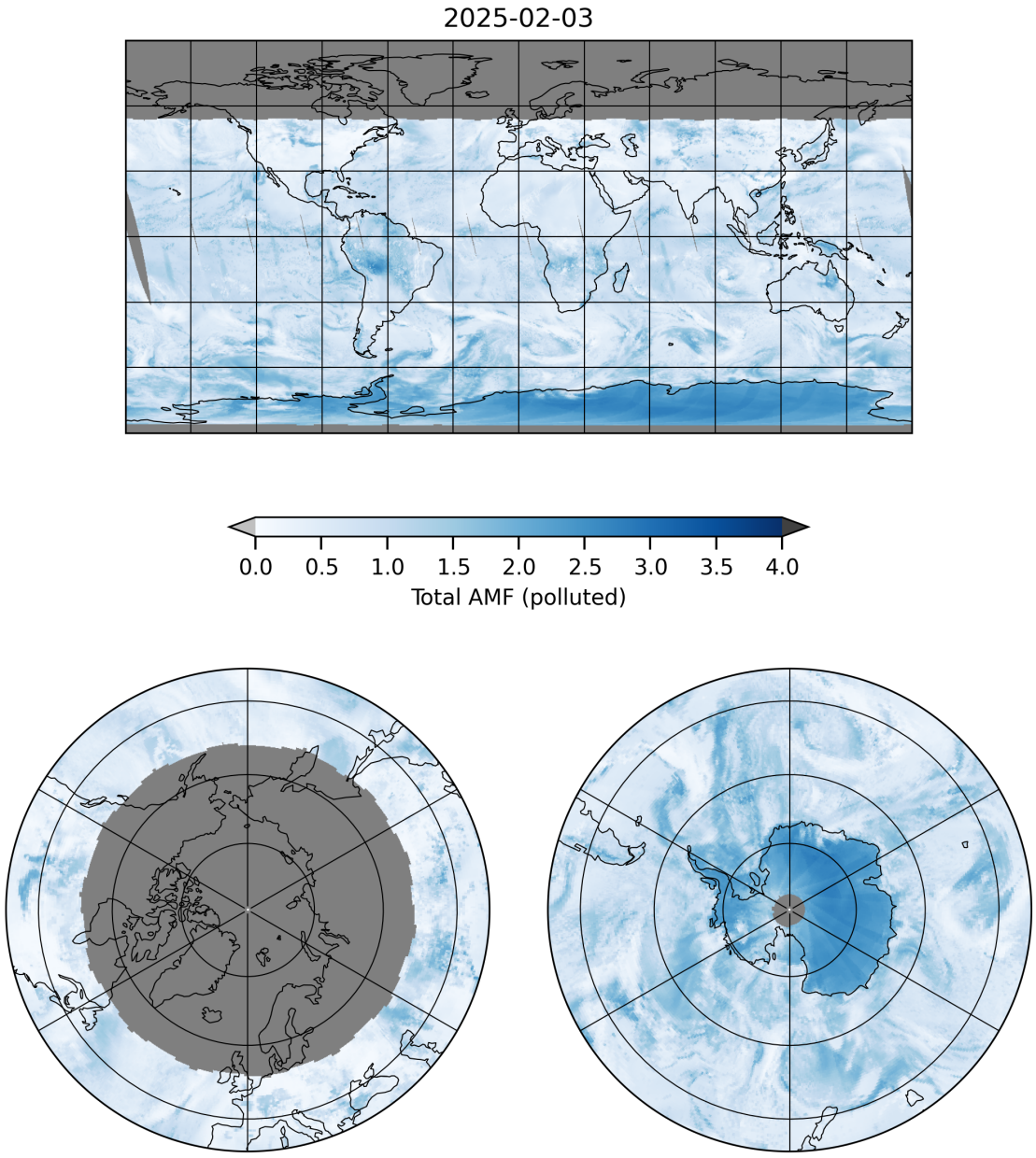


Figure 25: Map of “Total AMF (polluted)” for 2025-02-03 to 2025-02-04

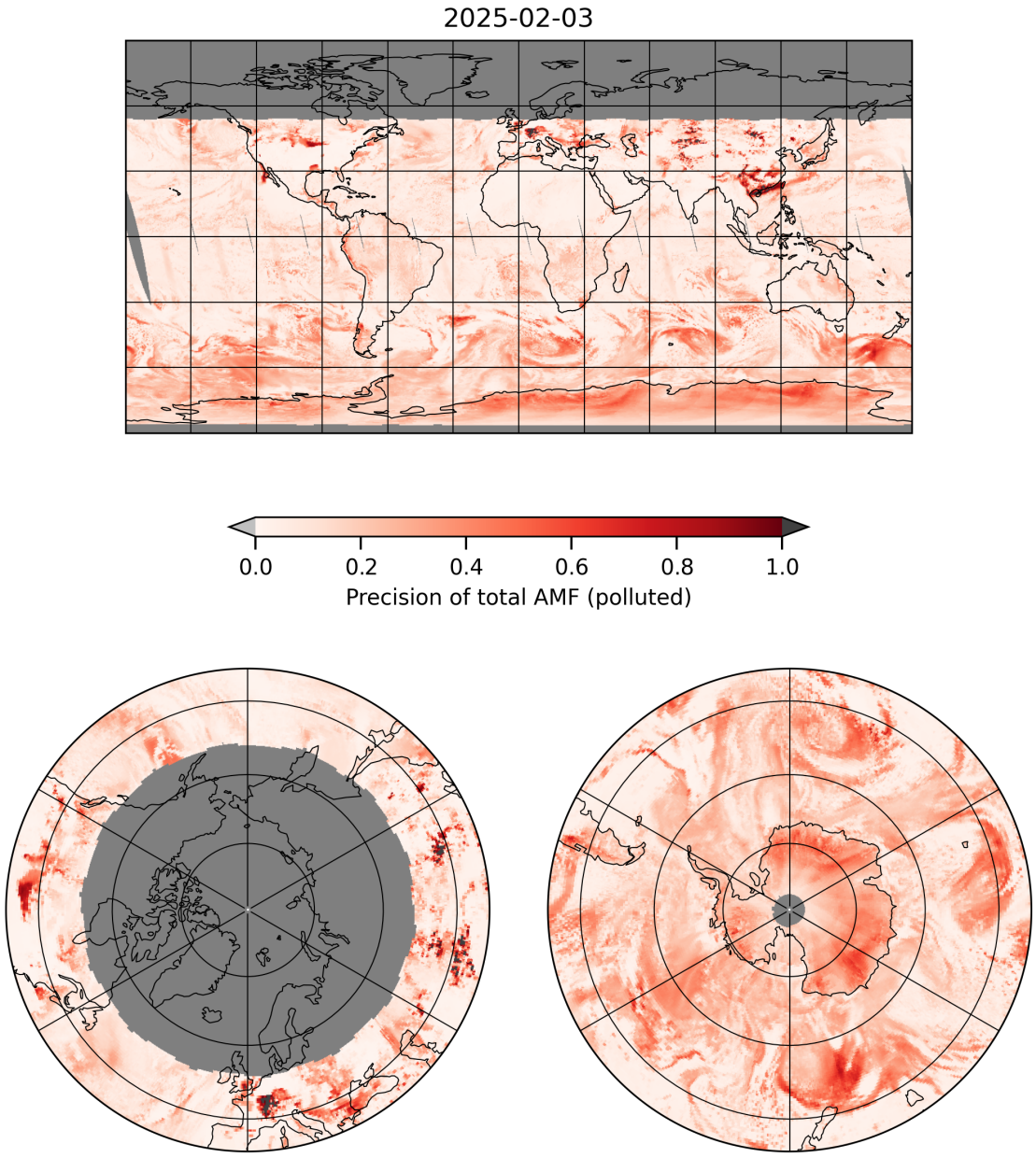


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-02-03 to 2025-02-04

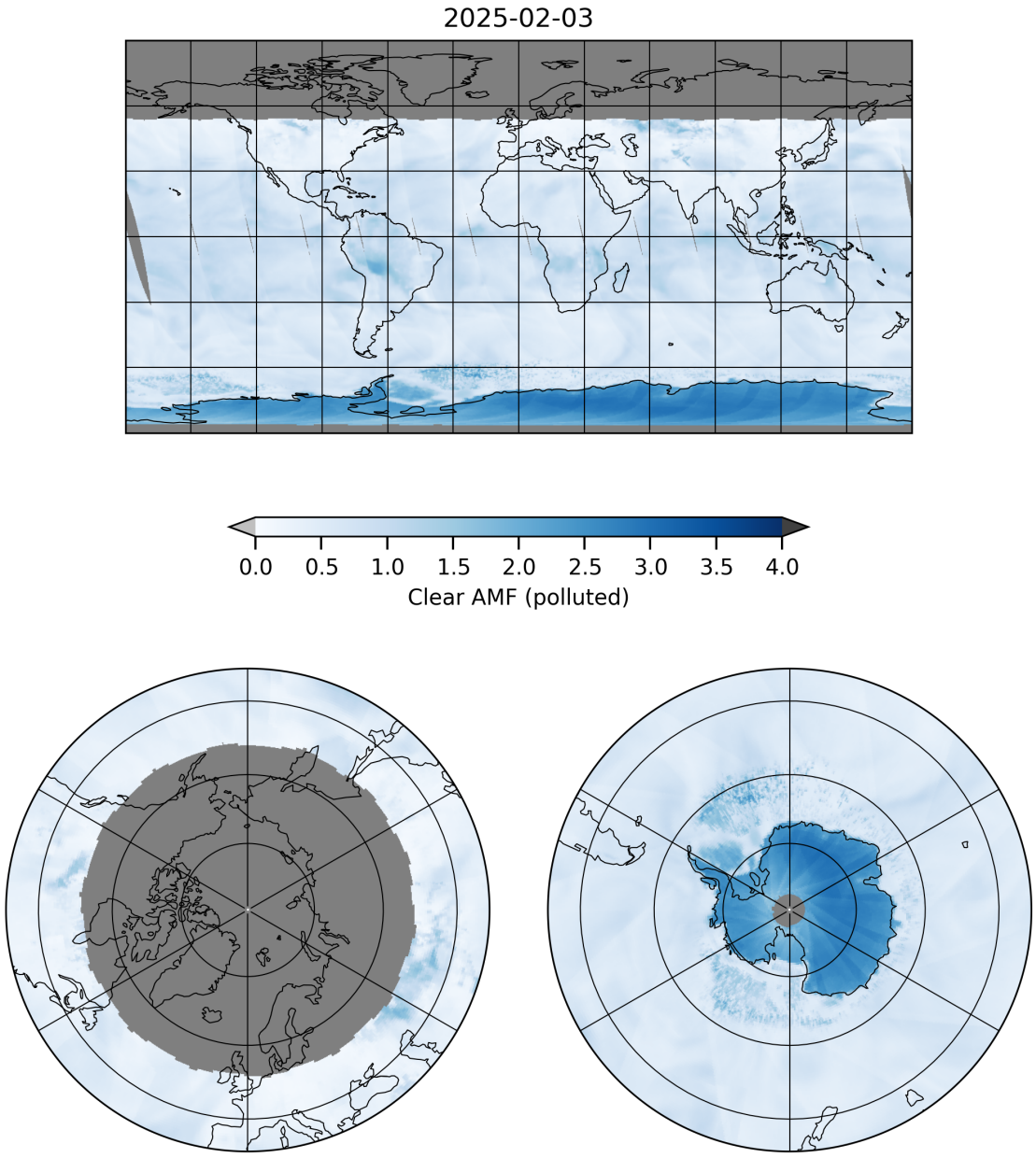


Figure 27: Map of “Clear AMF (polluted)” for 2025-02-03 to 2025-02-04

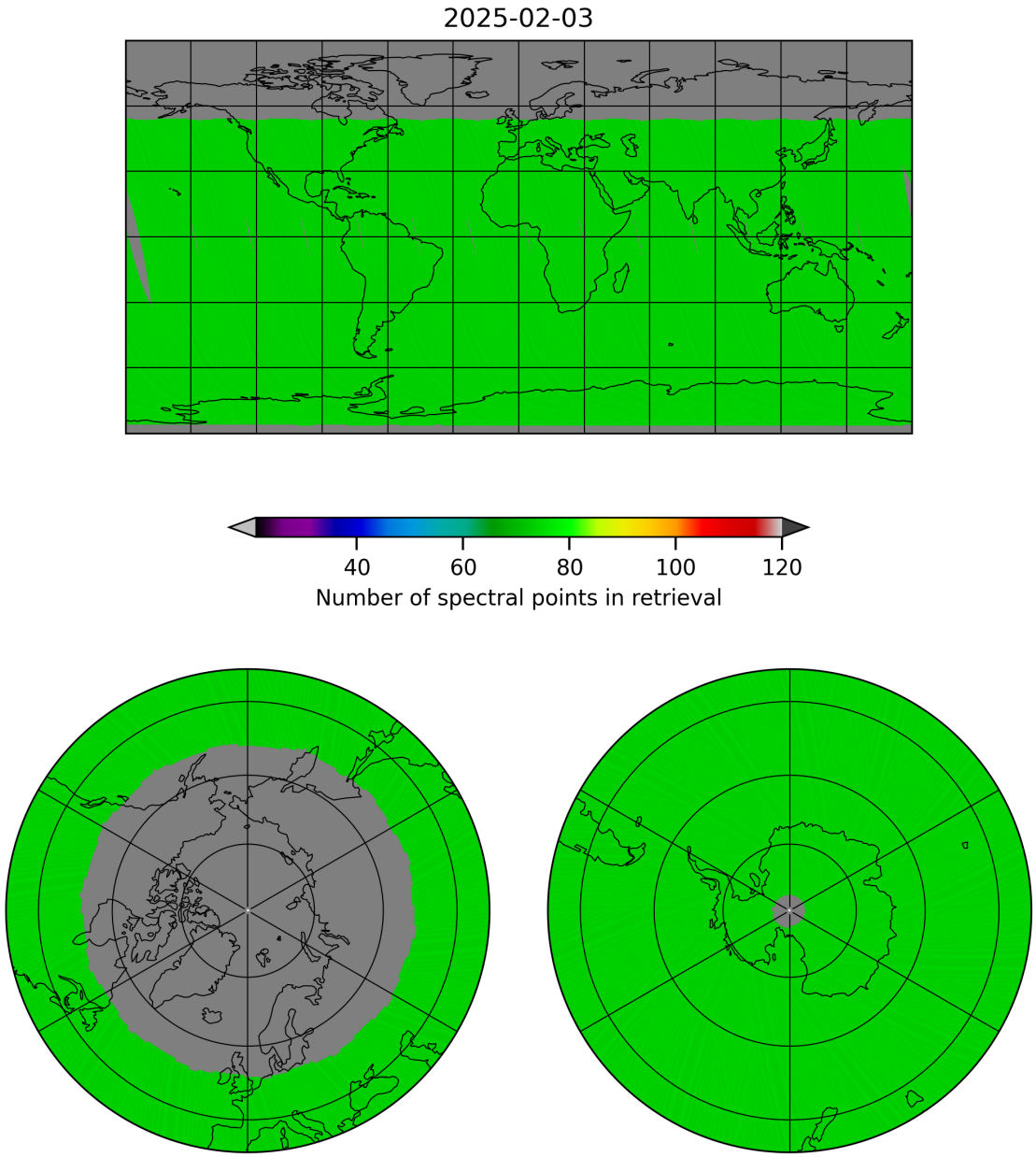


Figure 28: Map of “Number of spectral points in retrieval” for 2025-02-03 to 2025-02-04

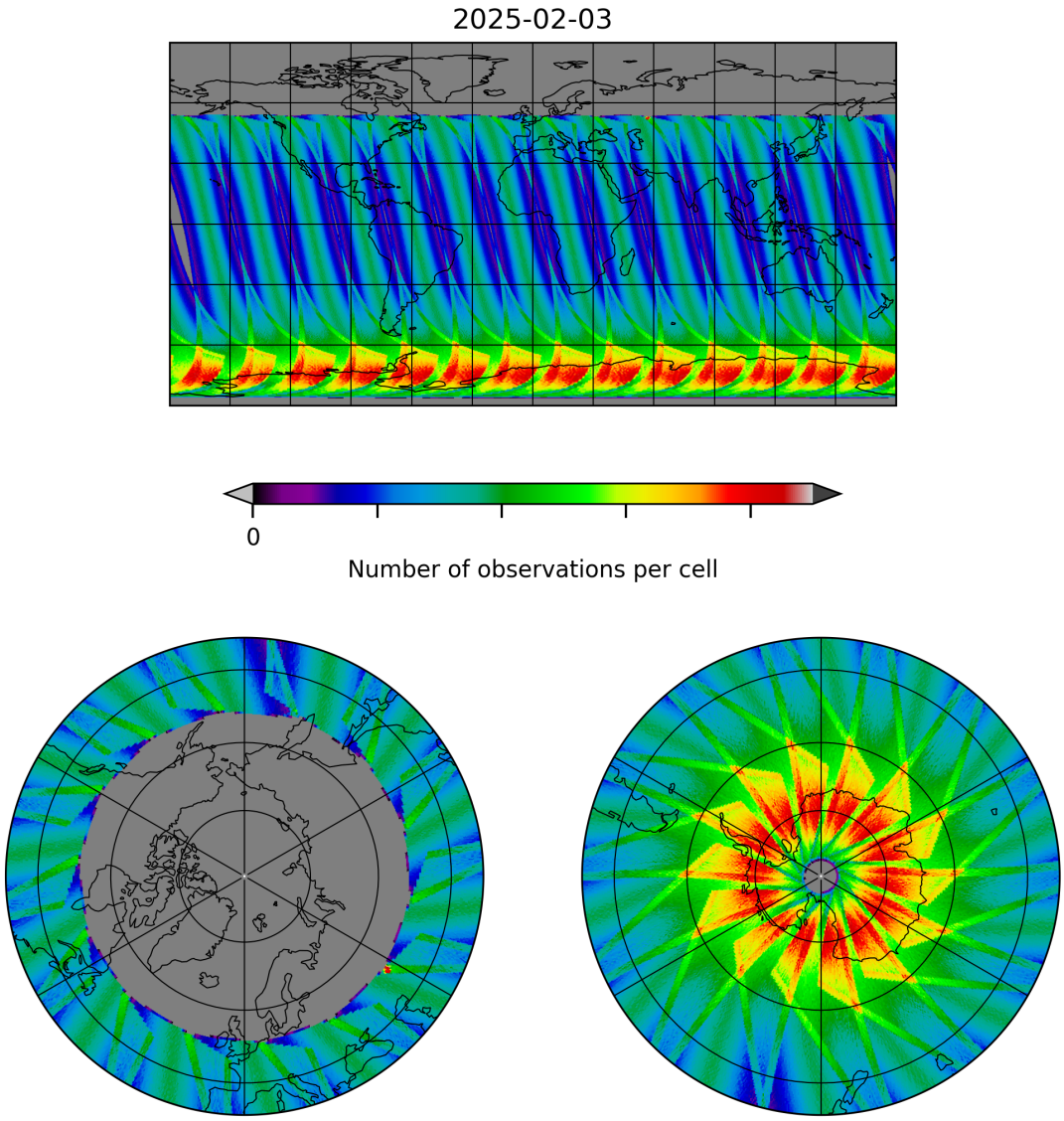


Figure 29: Map of the number of observations for 2025-02-03 to 2025-02-04

7 Zonal average

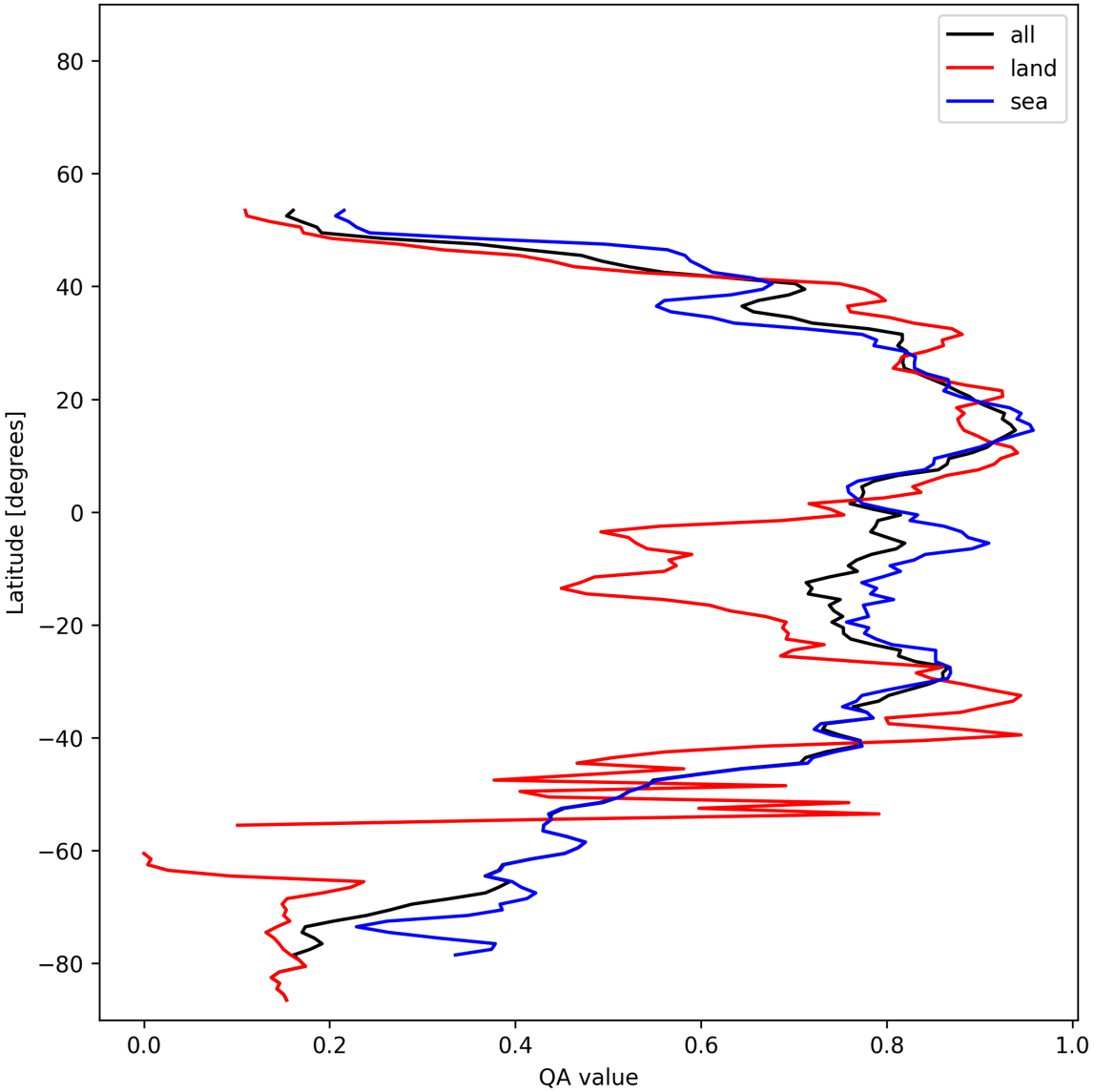


Figure 30: Zonal average of “QA value” for 2025-02-03 to 2025-02-04.

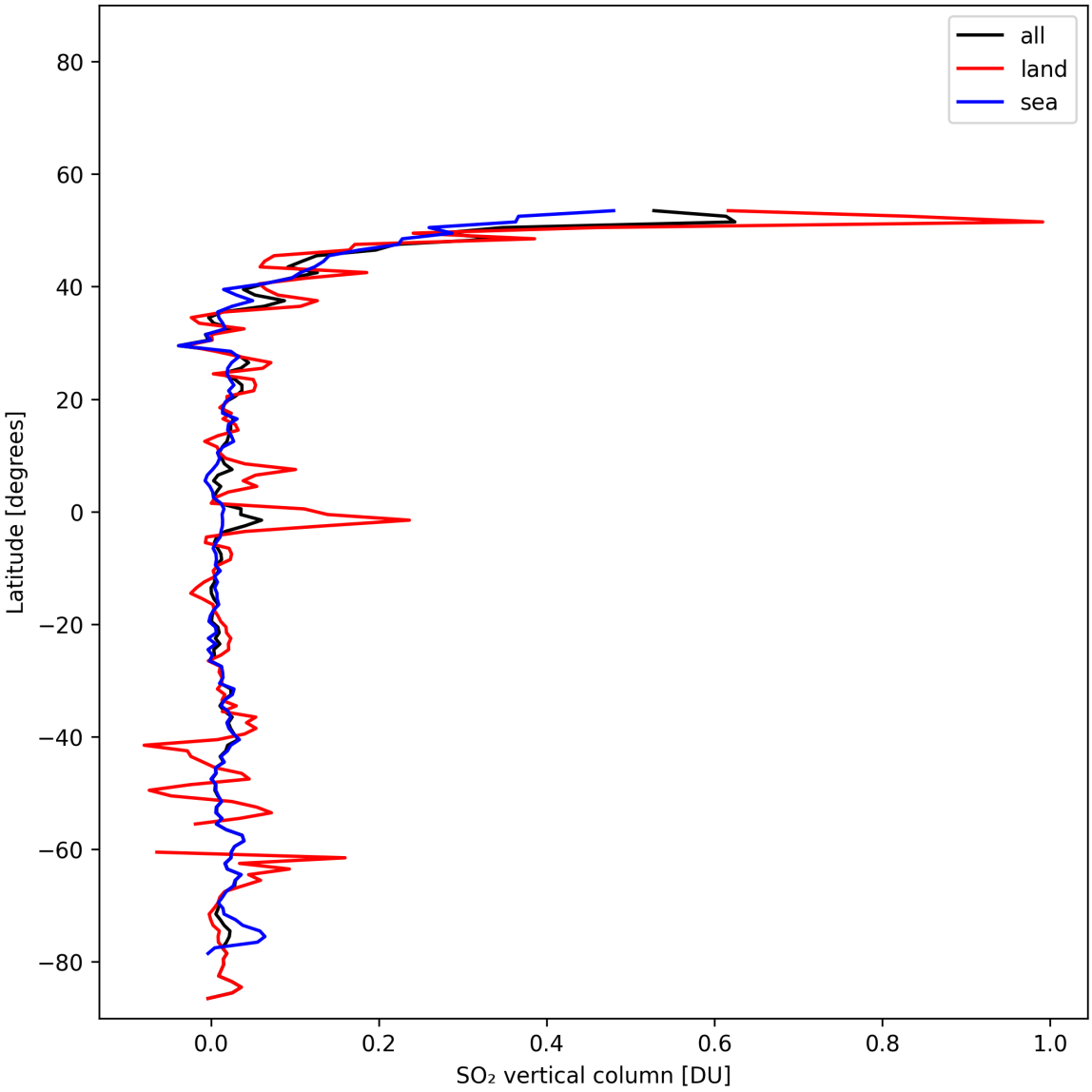


Figure 31: Zonal average of "SO_2 vertical column" for 2025-02-03 to 2025-02-04.

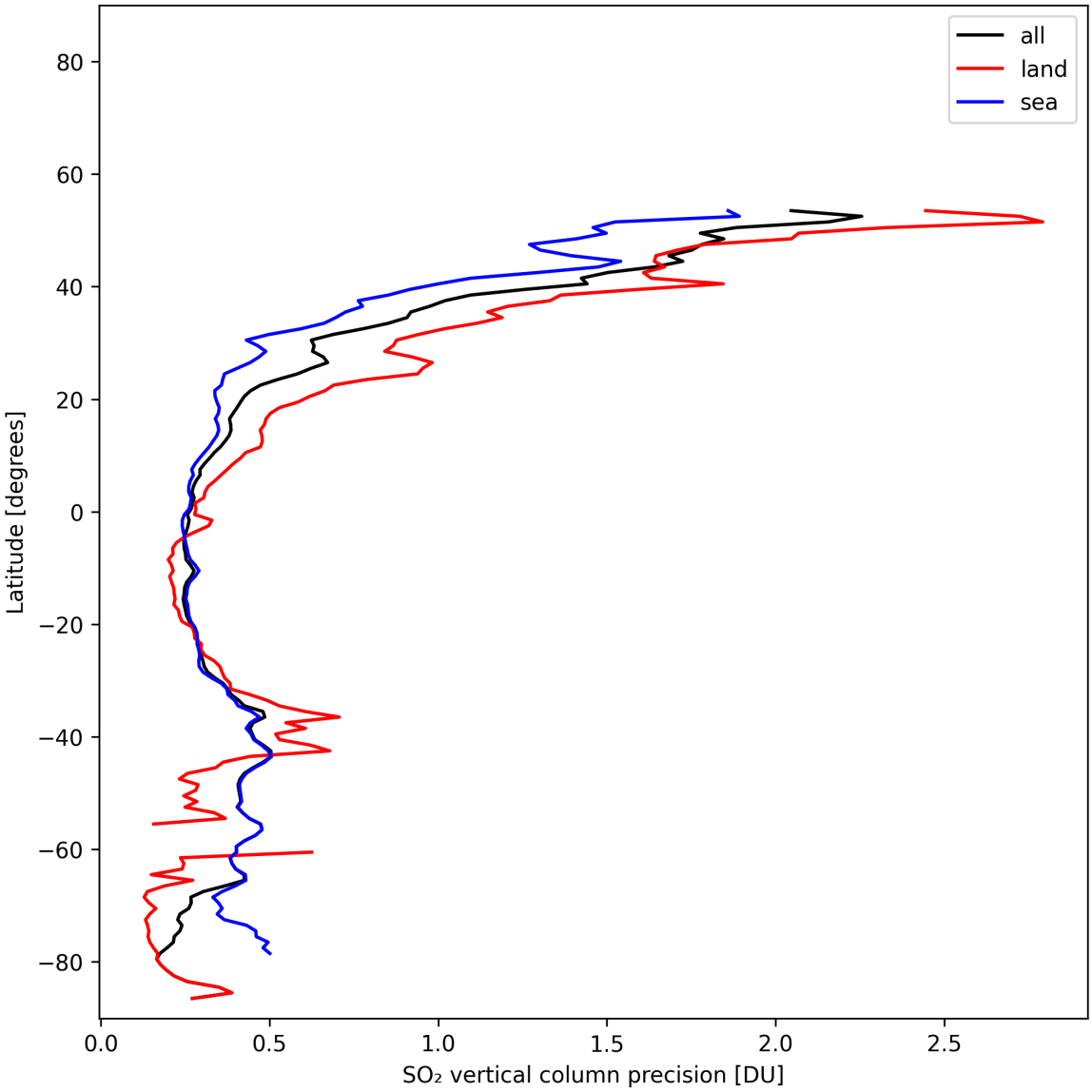


Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-02-03 to 2025-02-04.

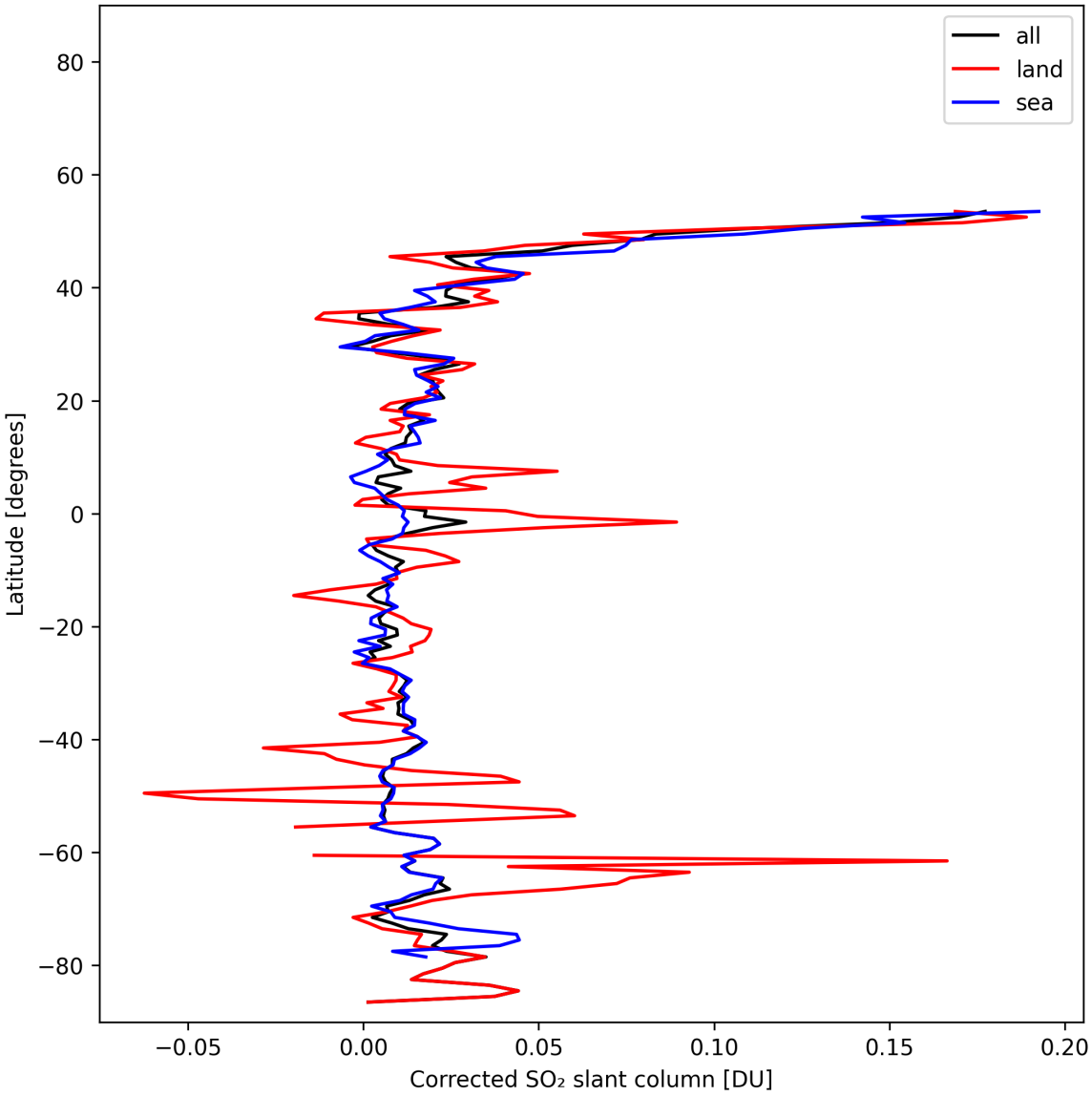


Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-02-03 to 2025-02-04.

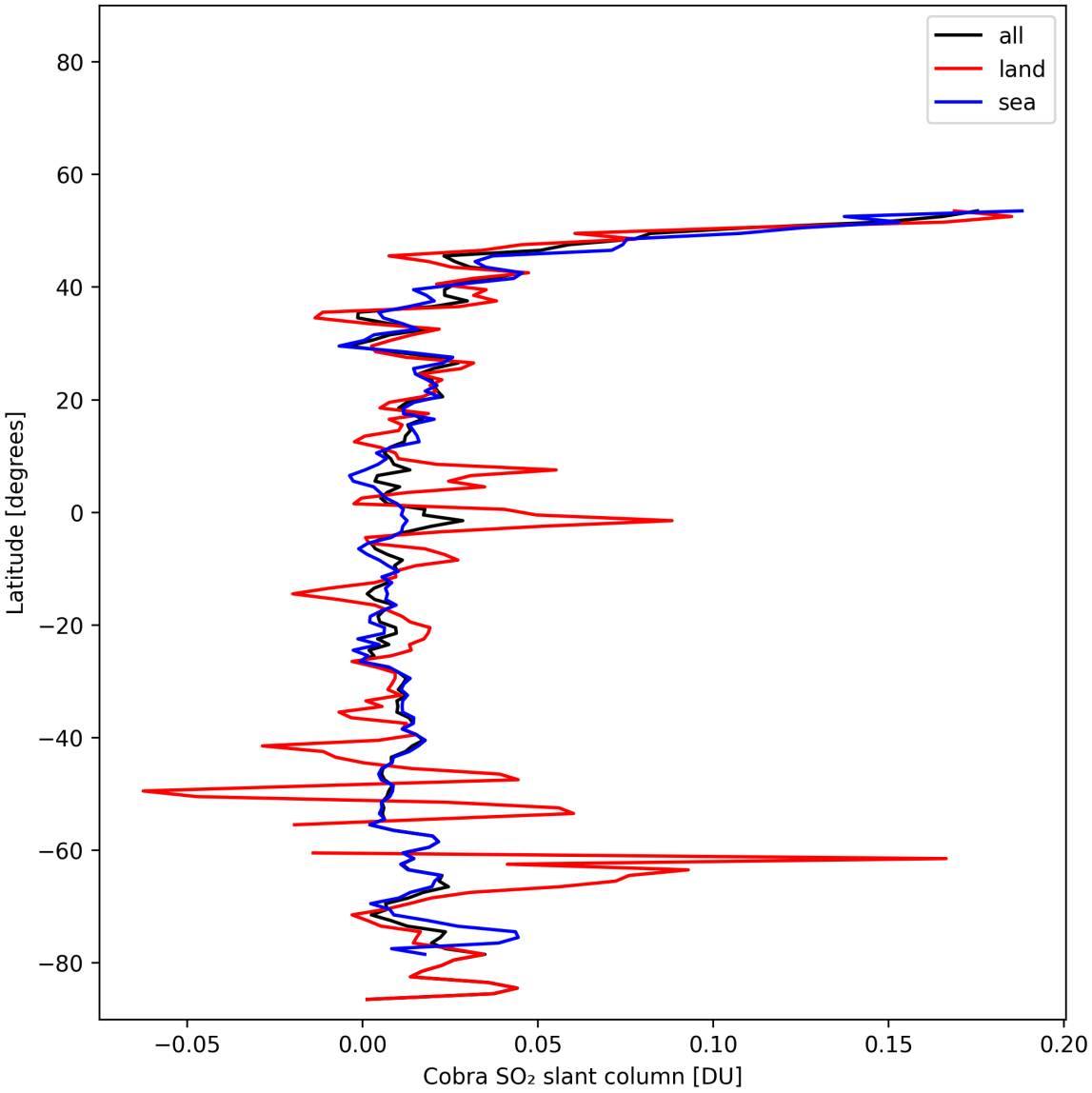


Figure 34: Zonal average of “Cobra SO_2 slant column” for 2025-02-03 to 2025-02-04.

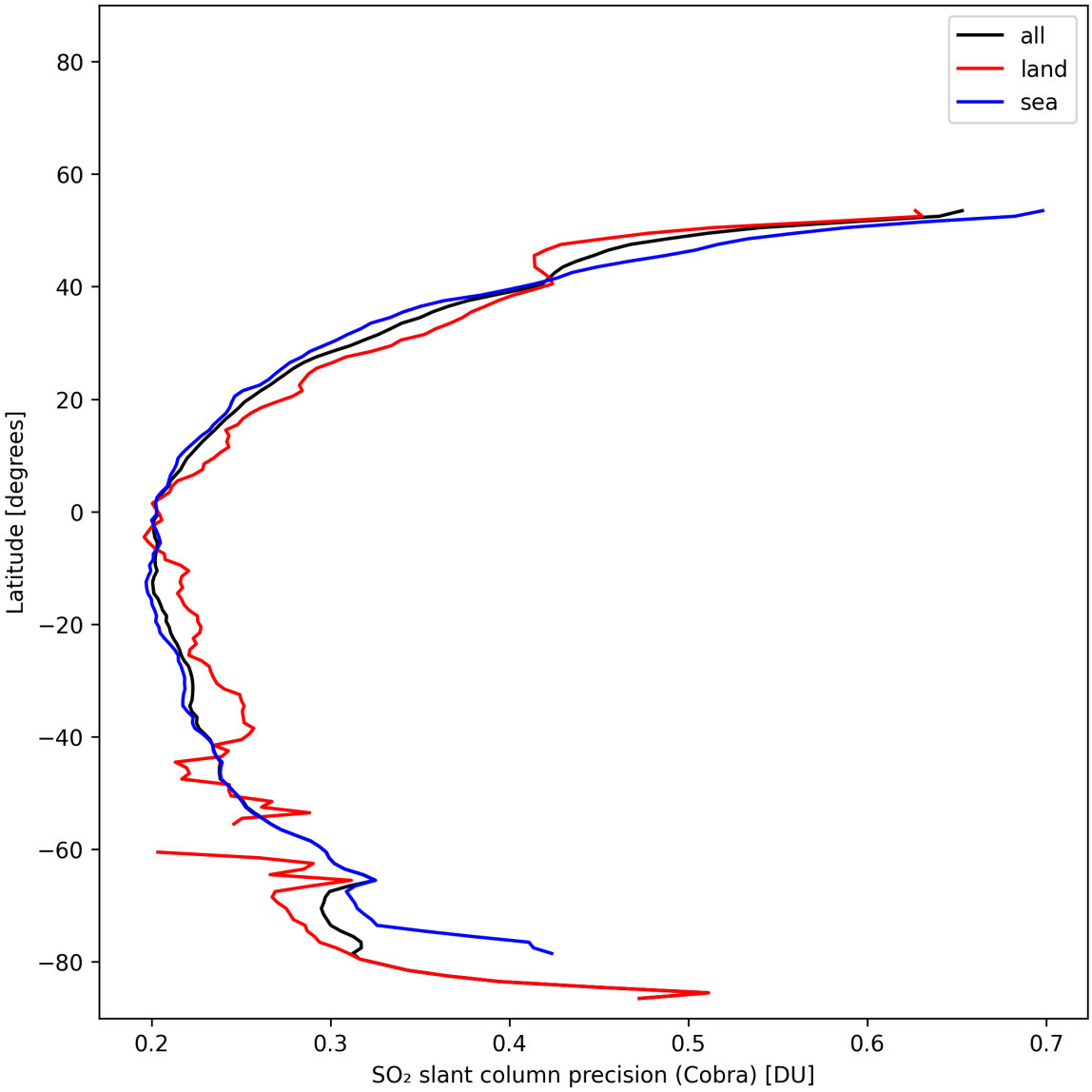


Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-02-03 to 2025-02-04.

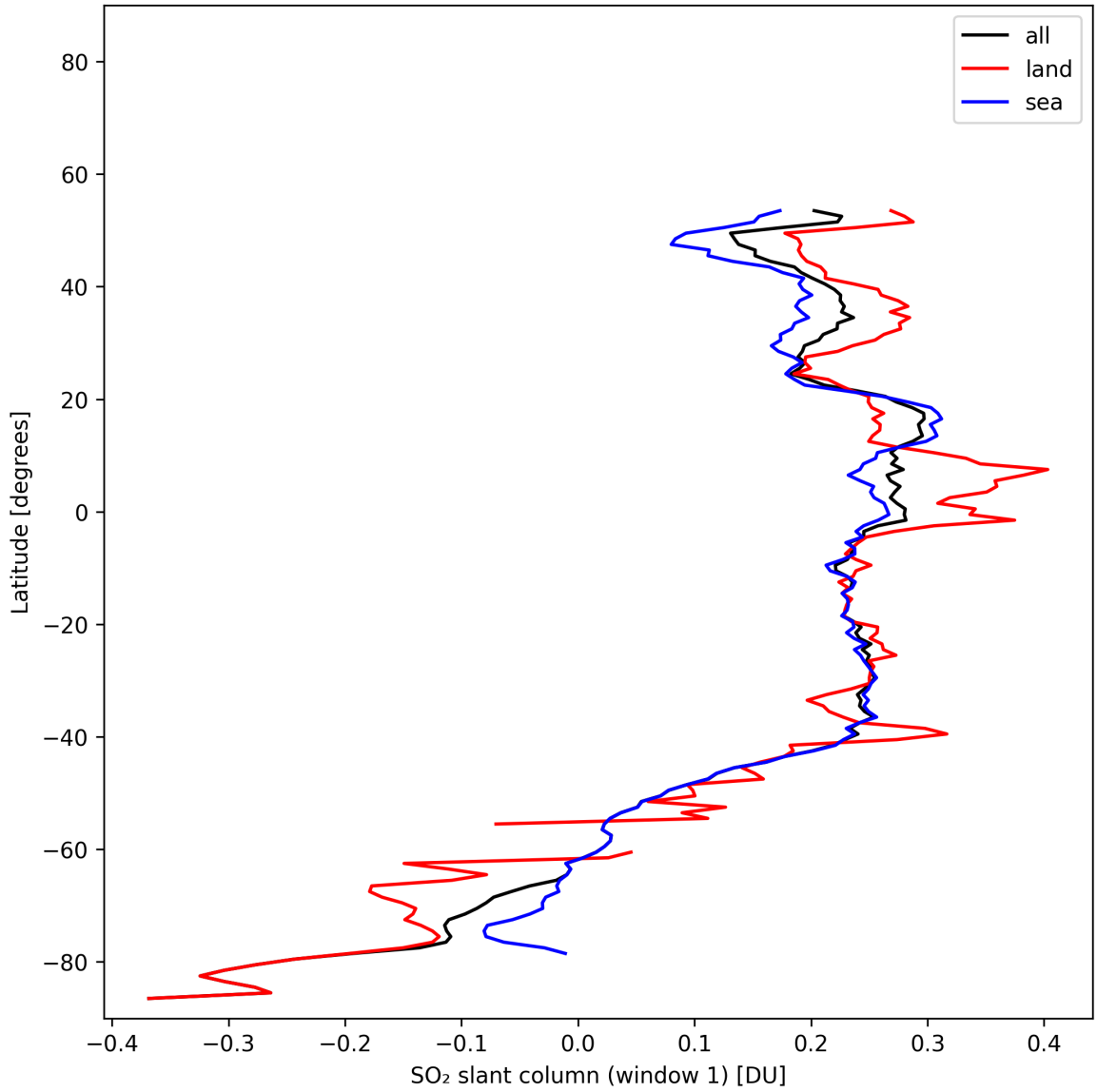


Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-02-03 to 2025-02-04.

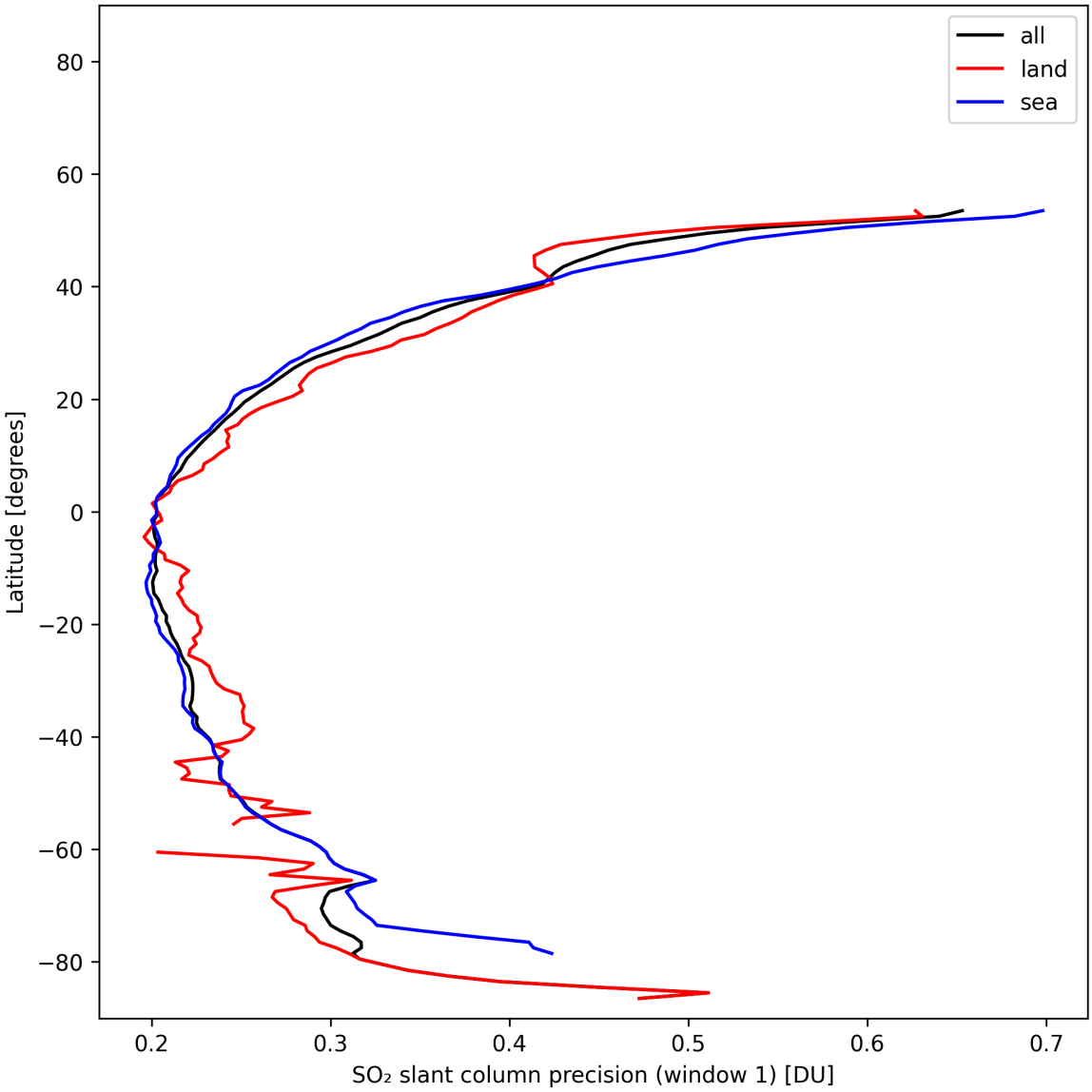


Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-02-03 to 2025-02-04.

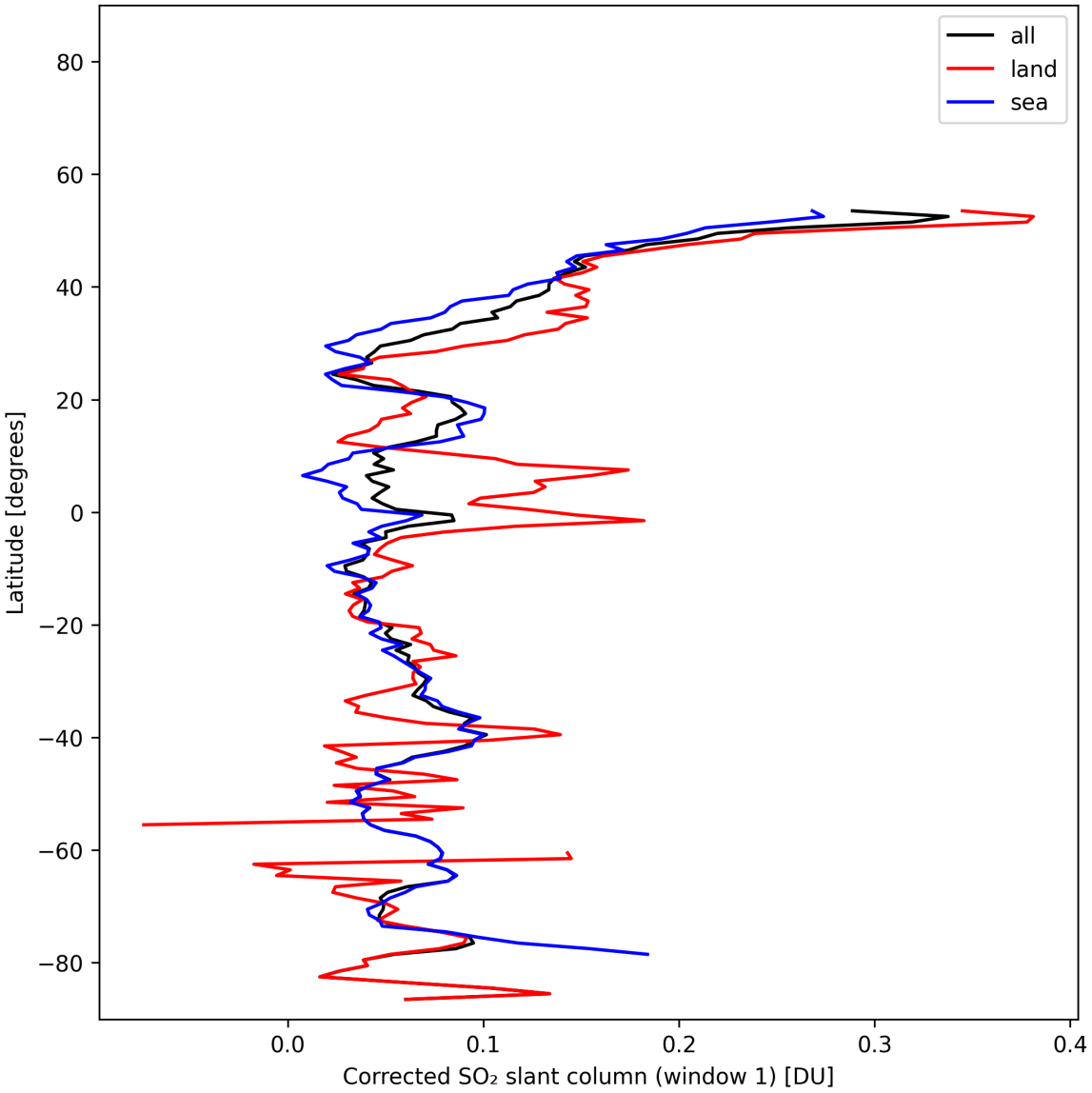


Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-02-03 to 2025-02-04.

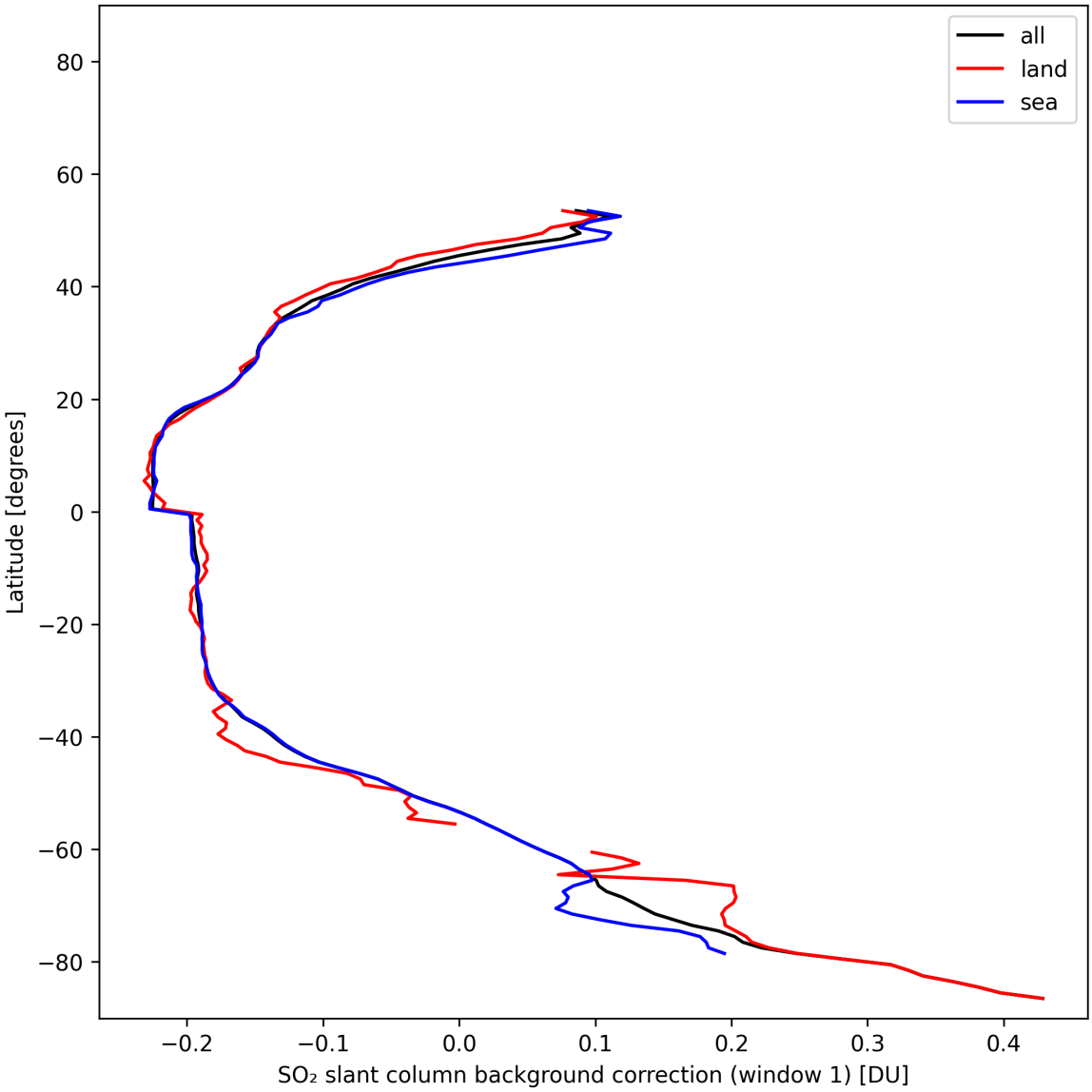


Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-02-03 to 2025-02-04.

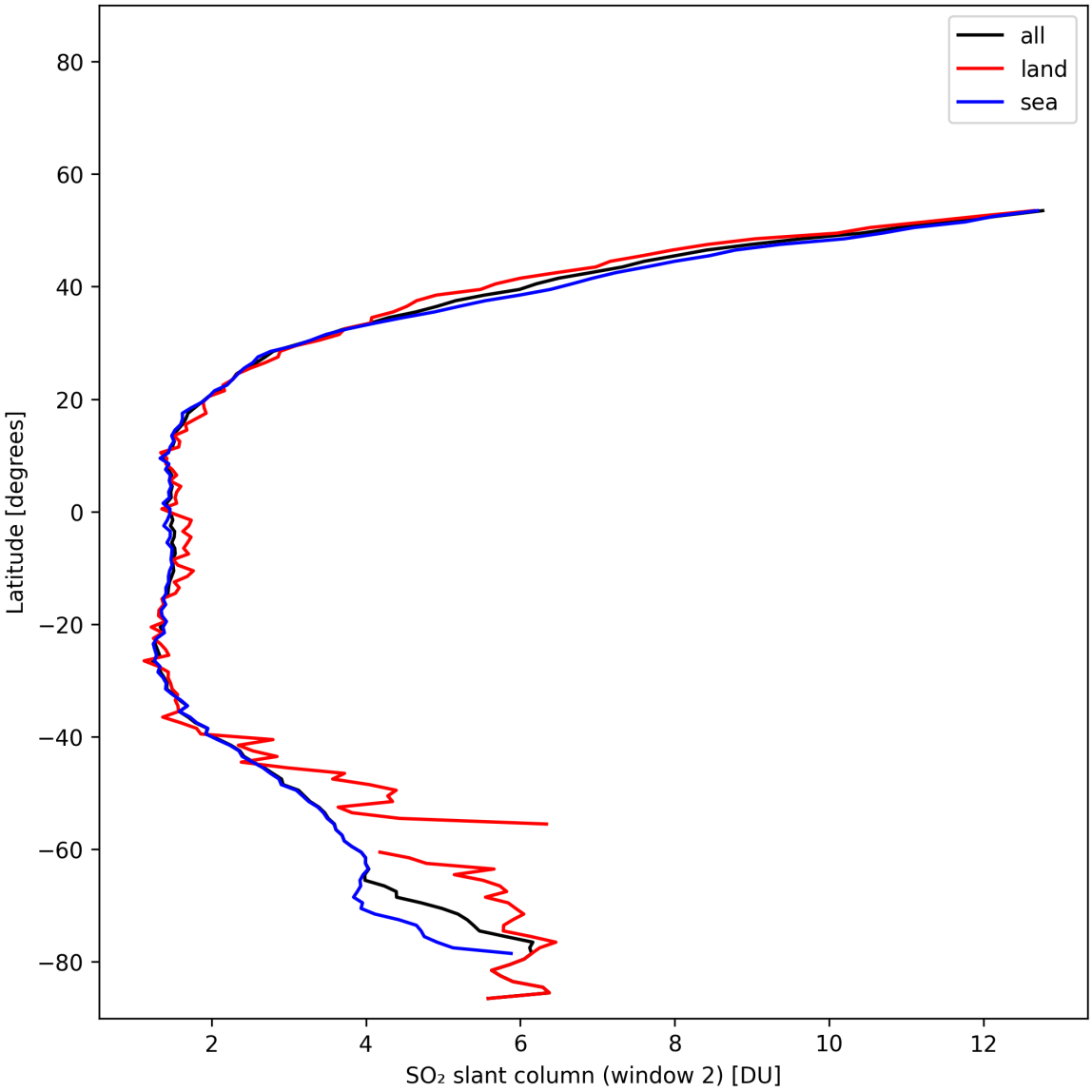


Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-02-03 to 2025-02-04.

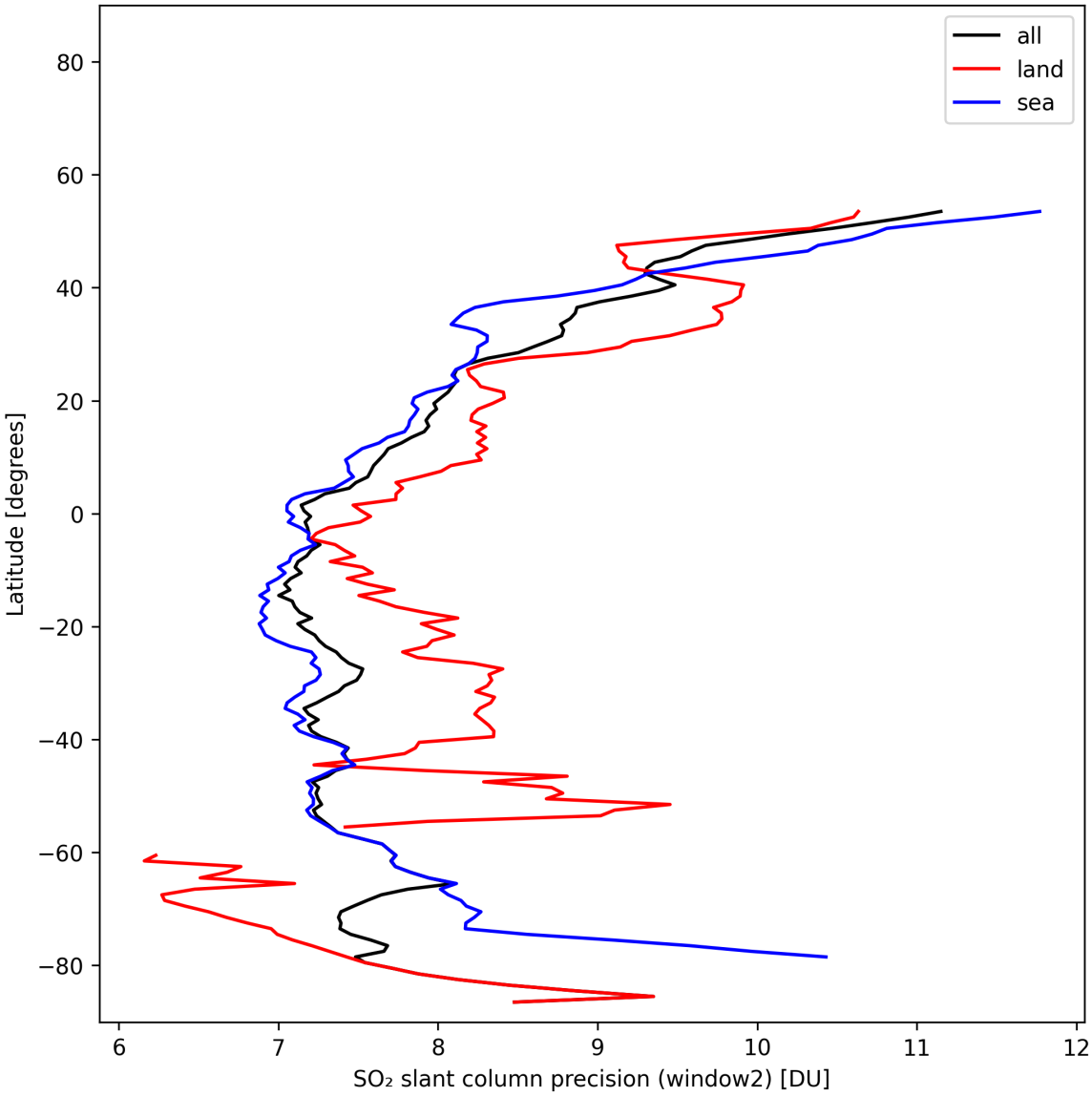


Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-02-03 to 2025-02-04.

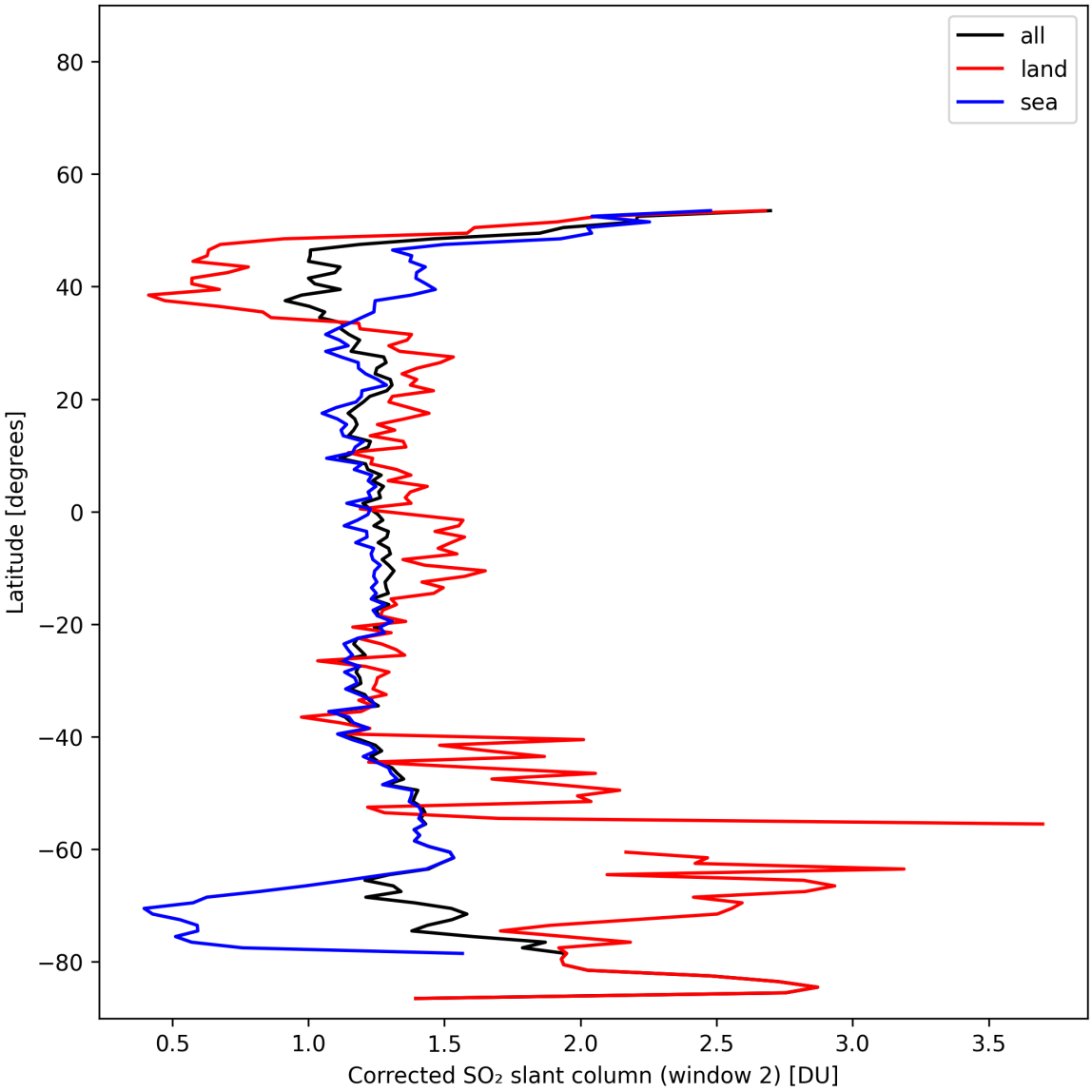


Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-02-03 to 2025-02-04.

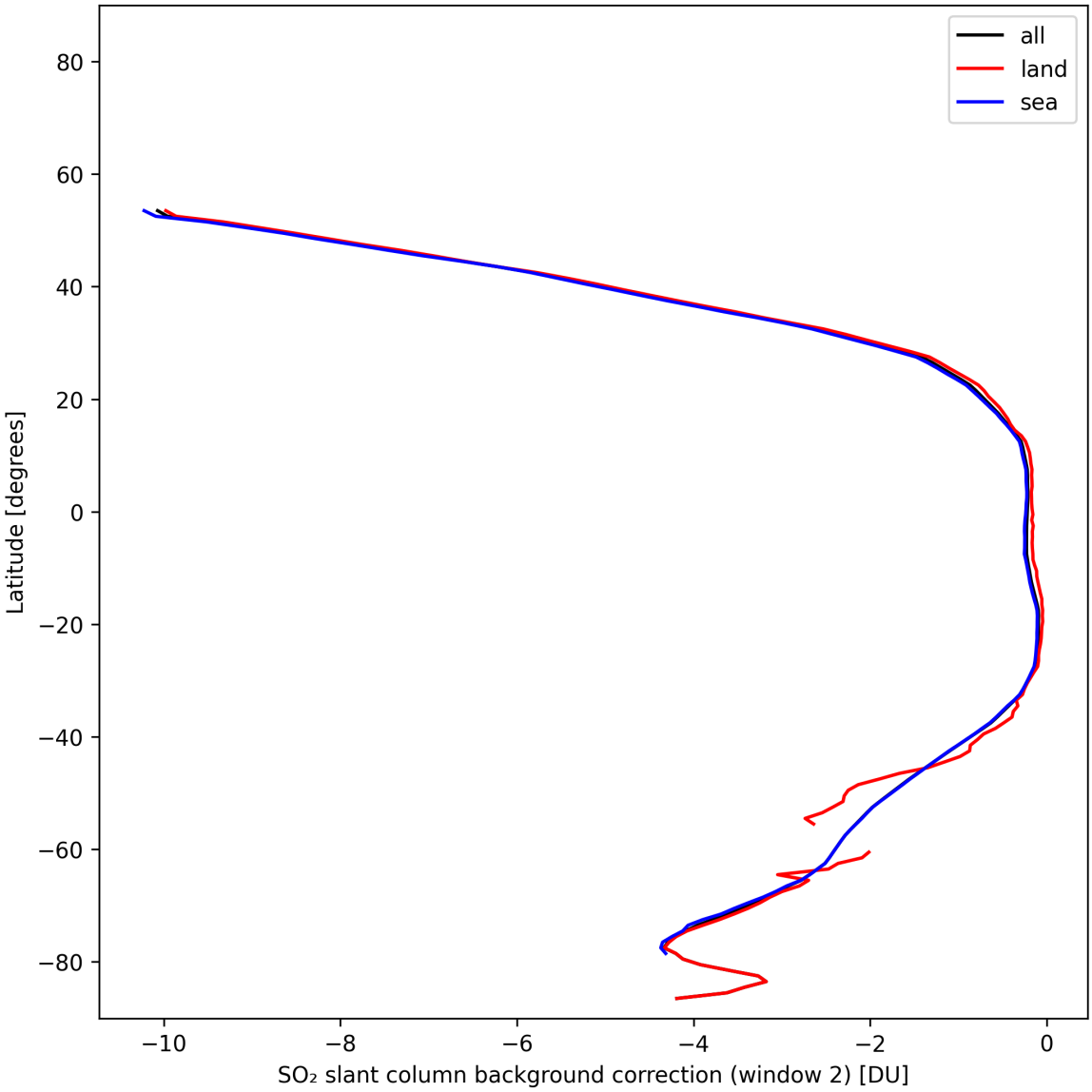


Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-02-03 to 2025-02-04.

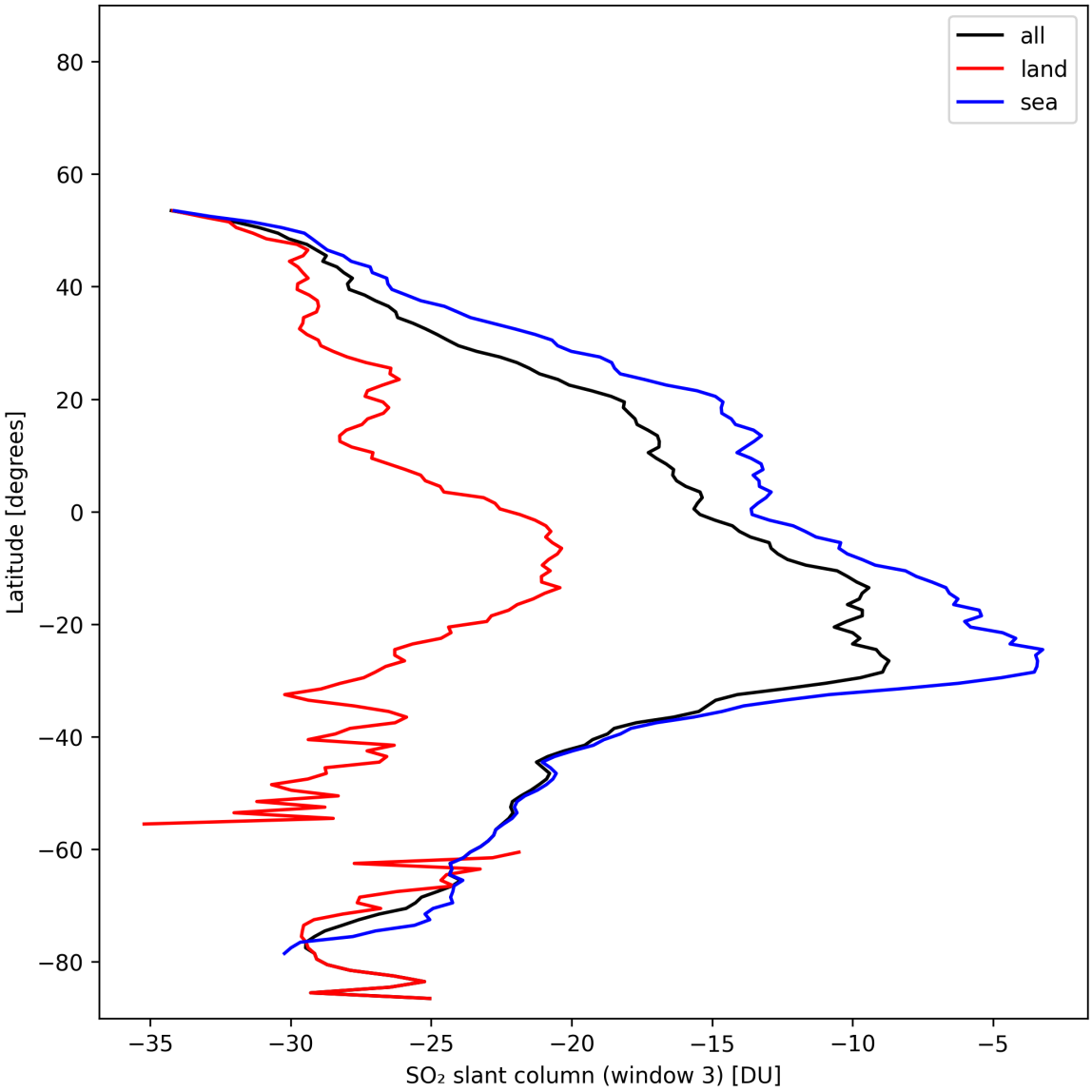


Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-02-03 to 2025-02-04.

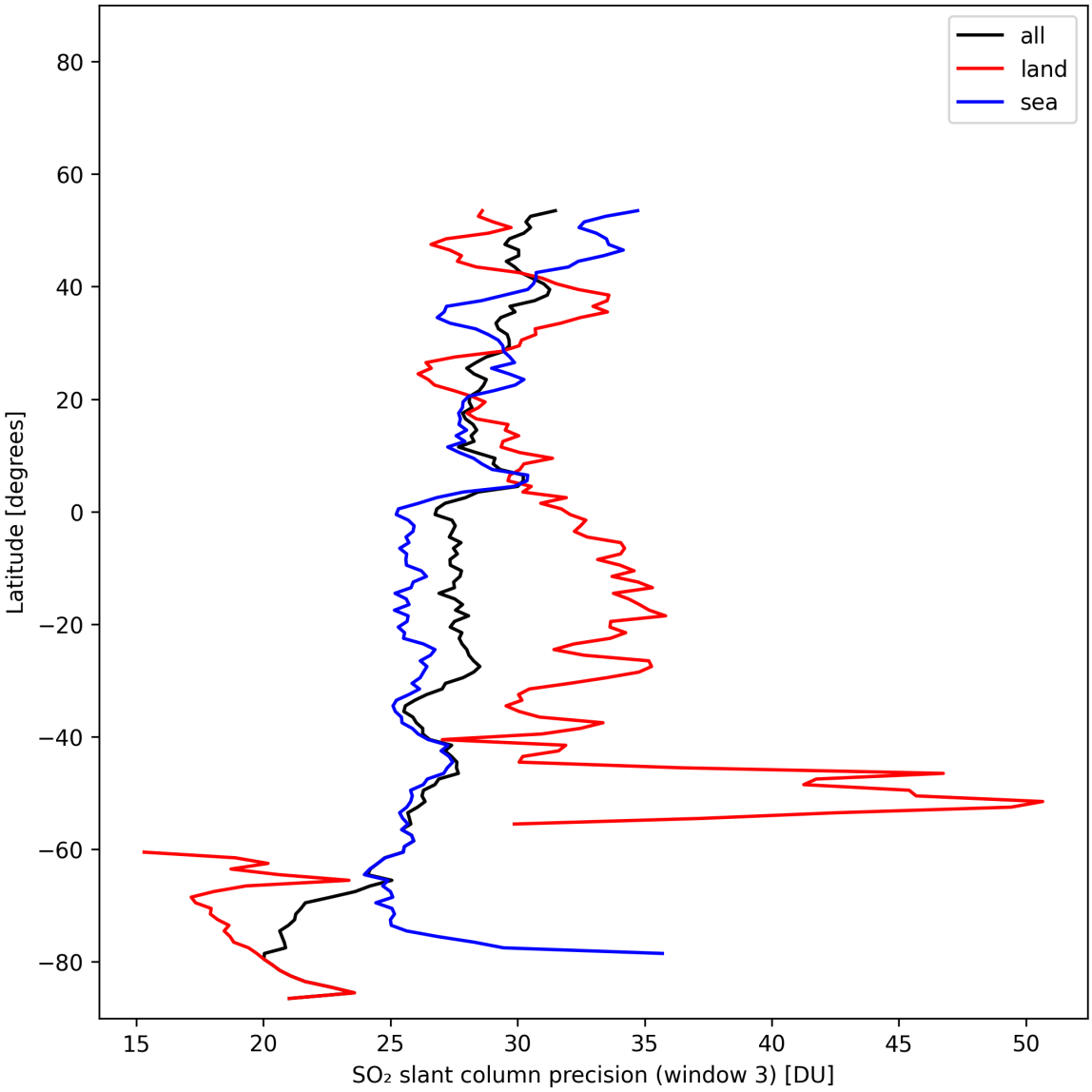


Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-02-03 to 2025-02-04.

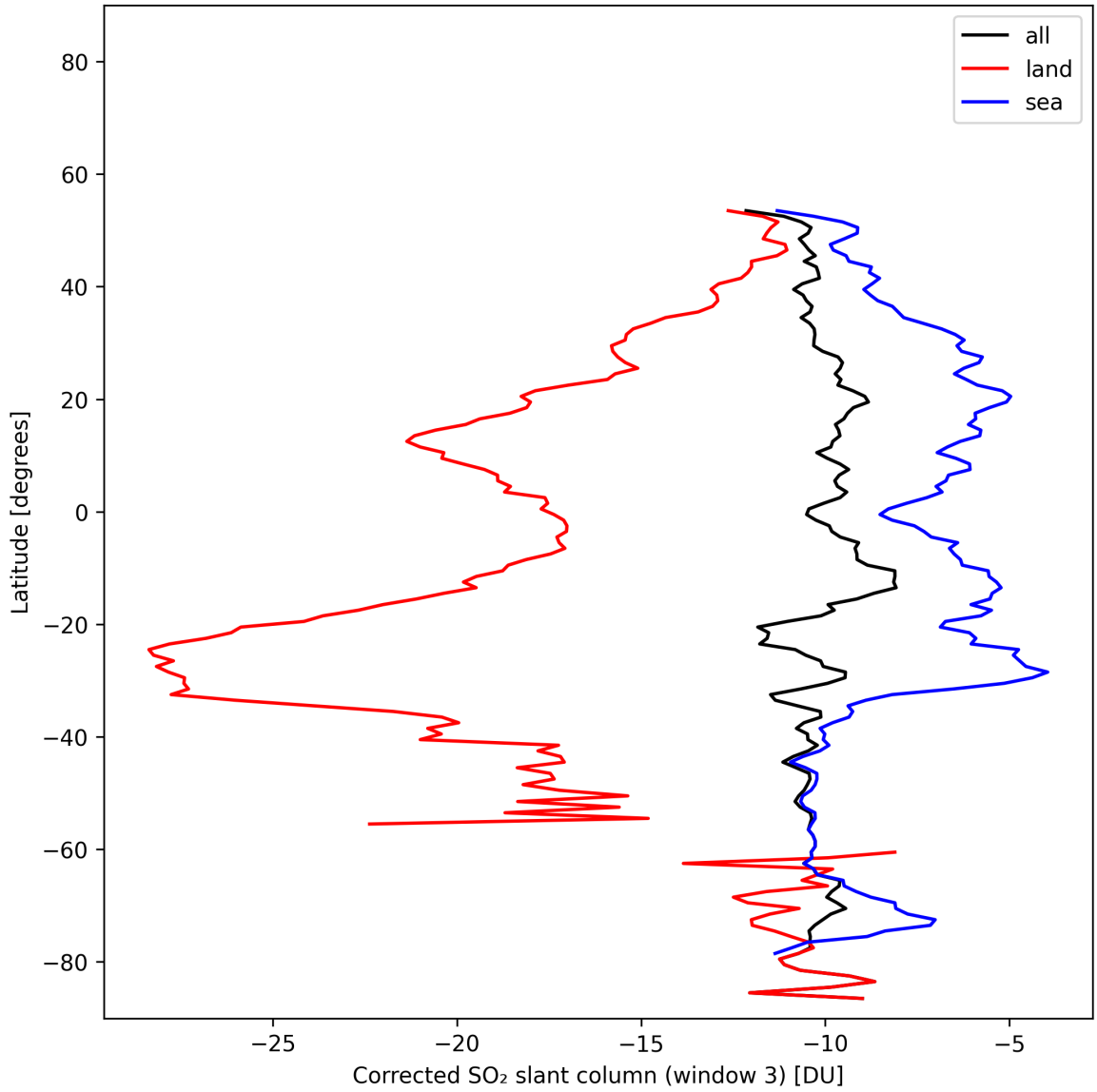


Figure 46: Zonal average of “Corrected SO_2 slant column (window 3)” for 2025-02-03 to 2025-02-04.

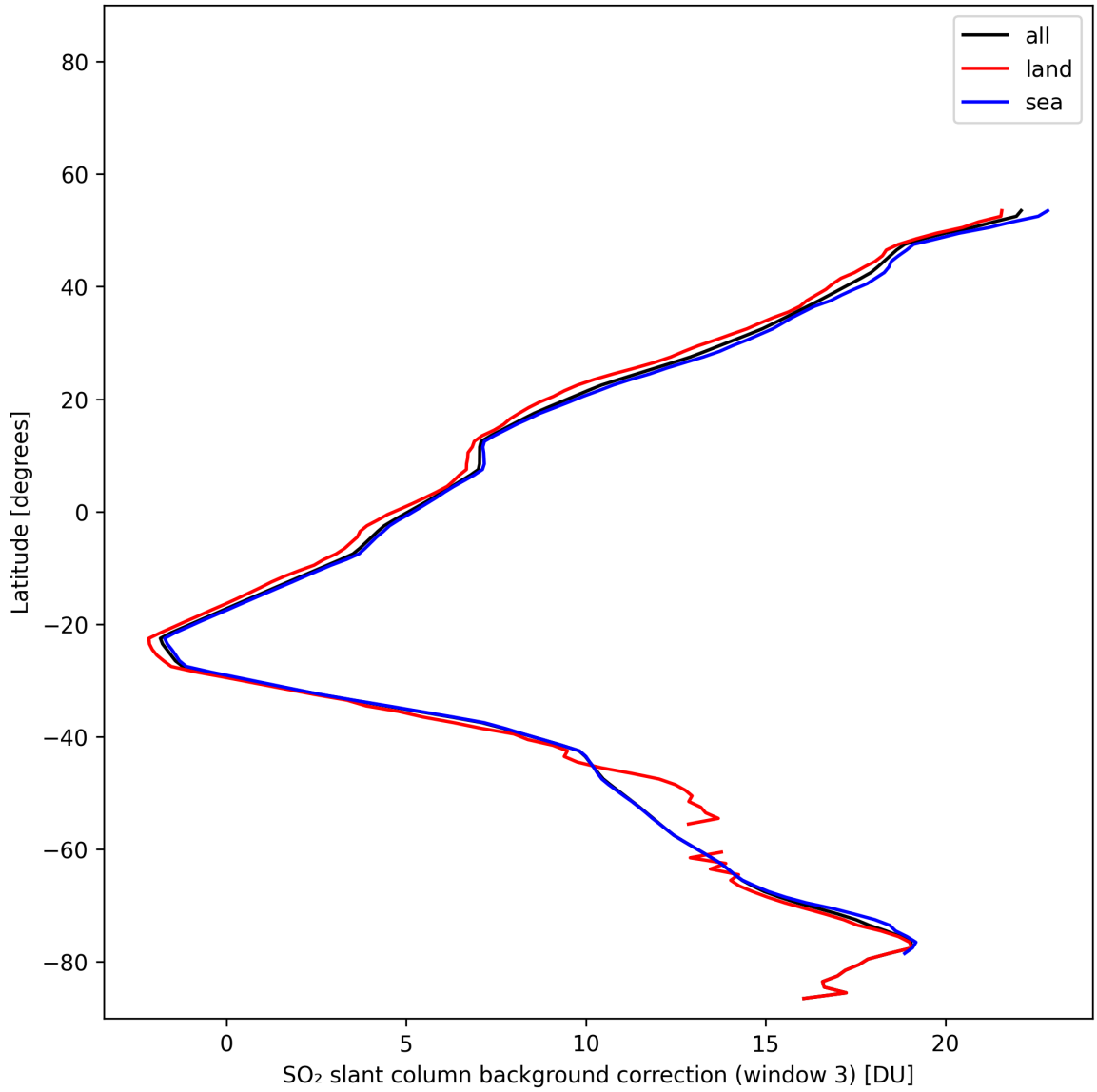


Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-02-03 to 2025-02-04.

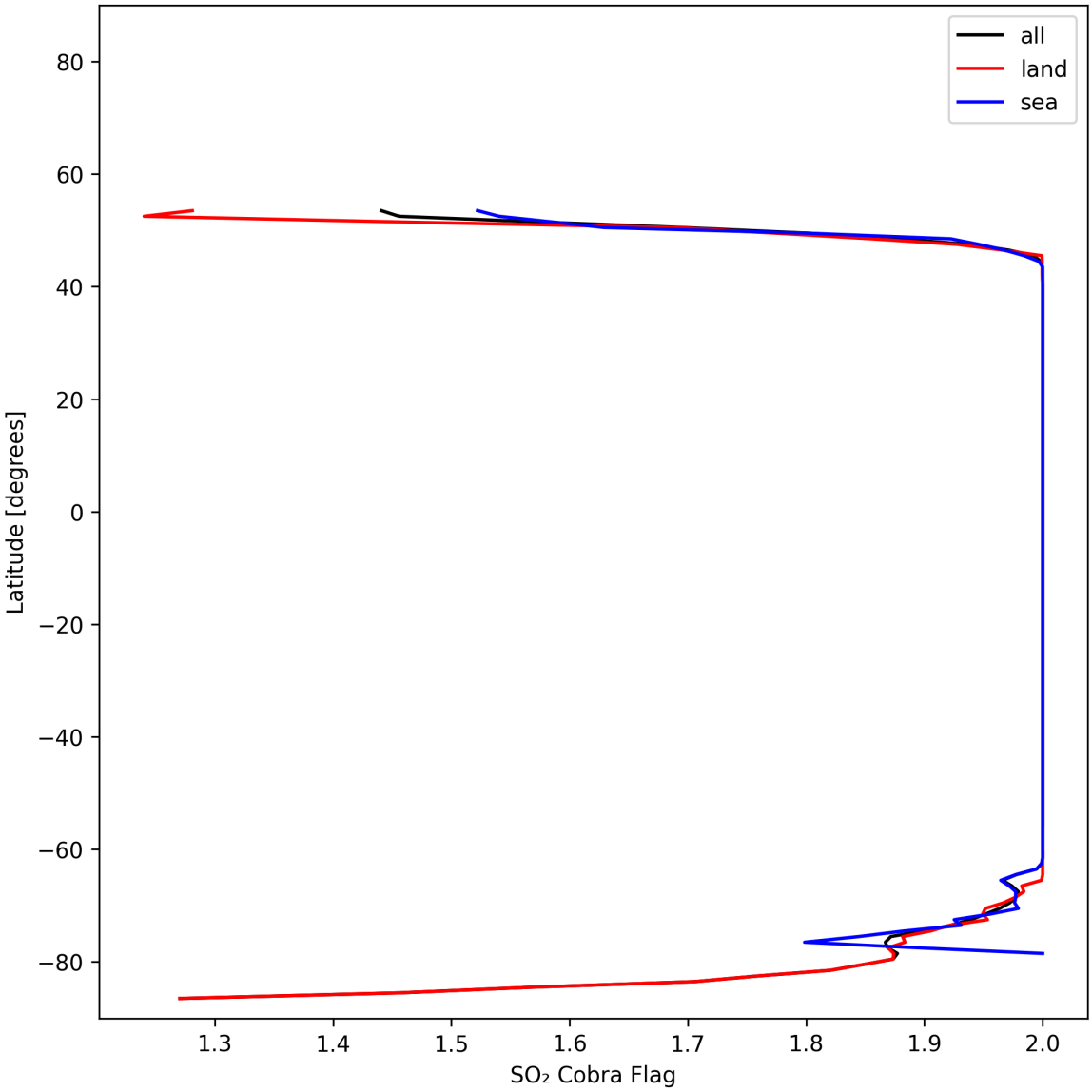


Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-02-03 to 2025-02-04.

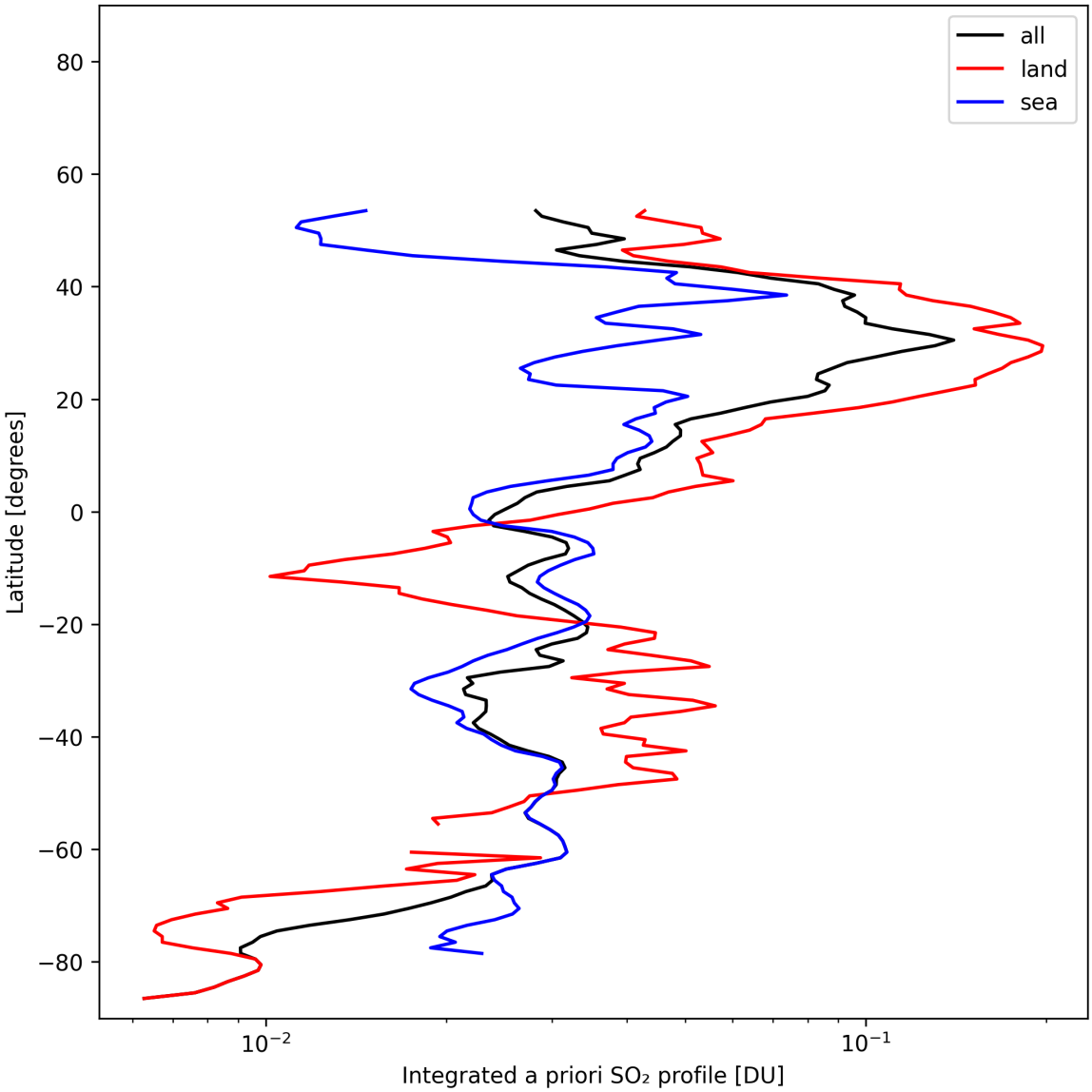


Figure 49: Zonal average of "Integrated a priori SO_2 profile" for 2025-02-03 to 2025-02-04.

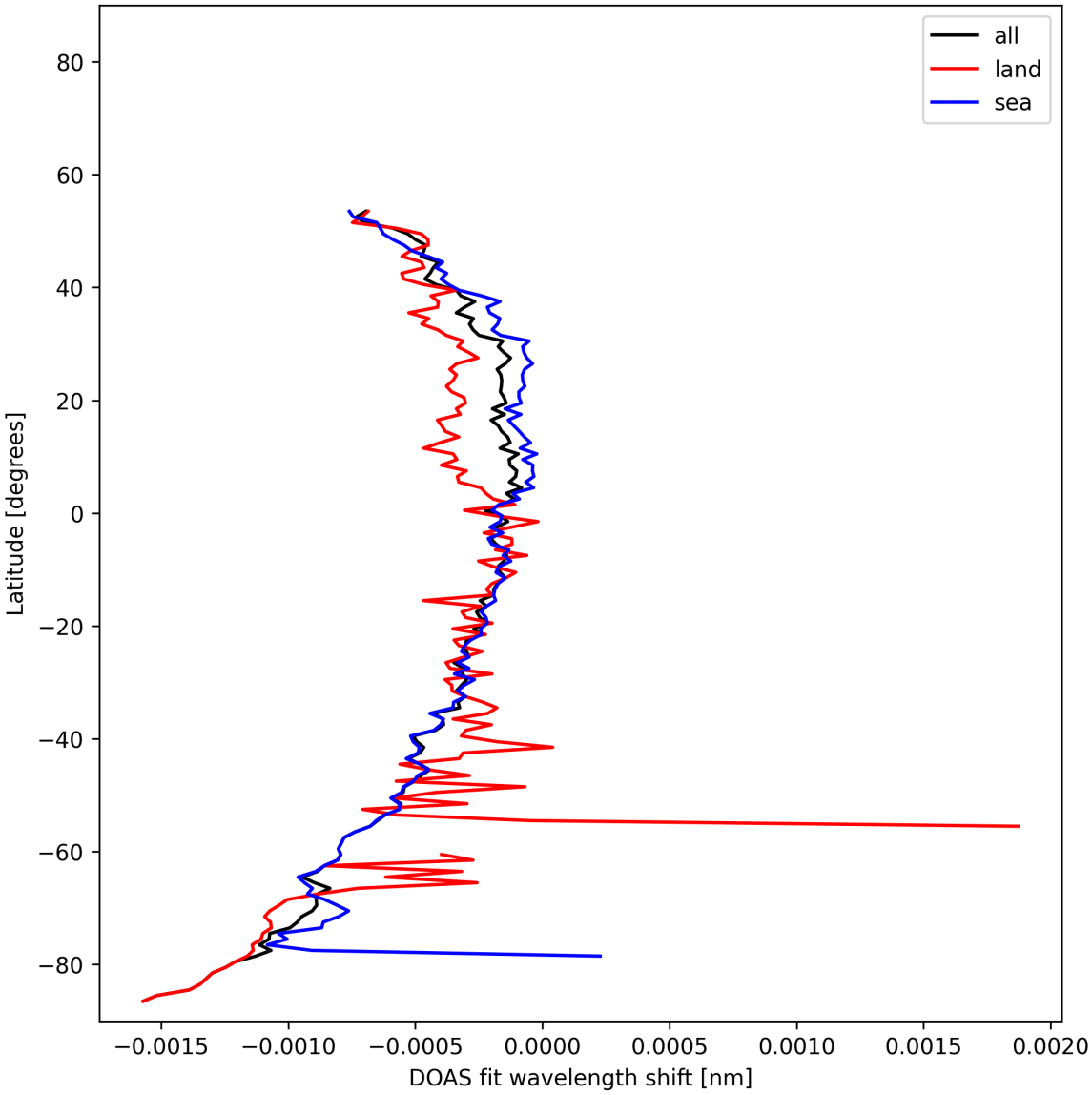


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-02-03 to 2025-02-04.

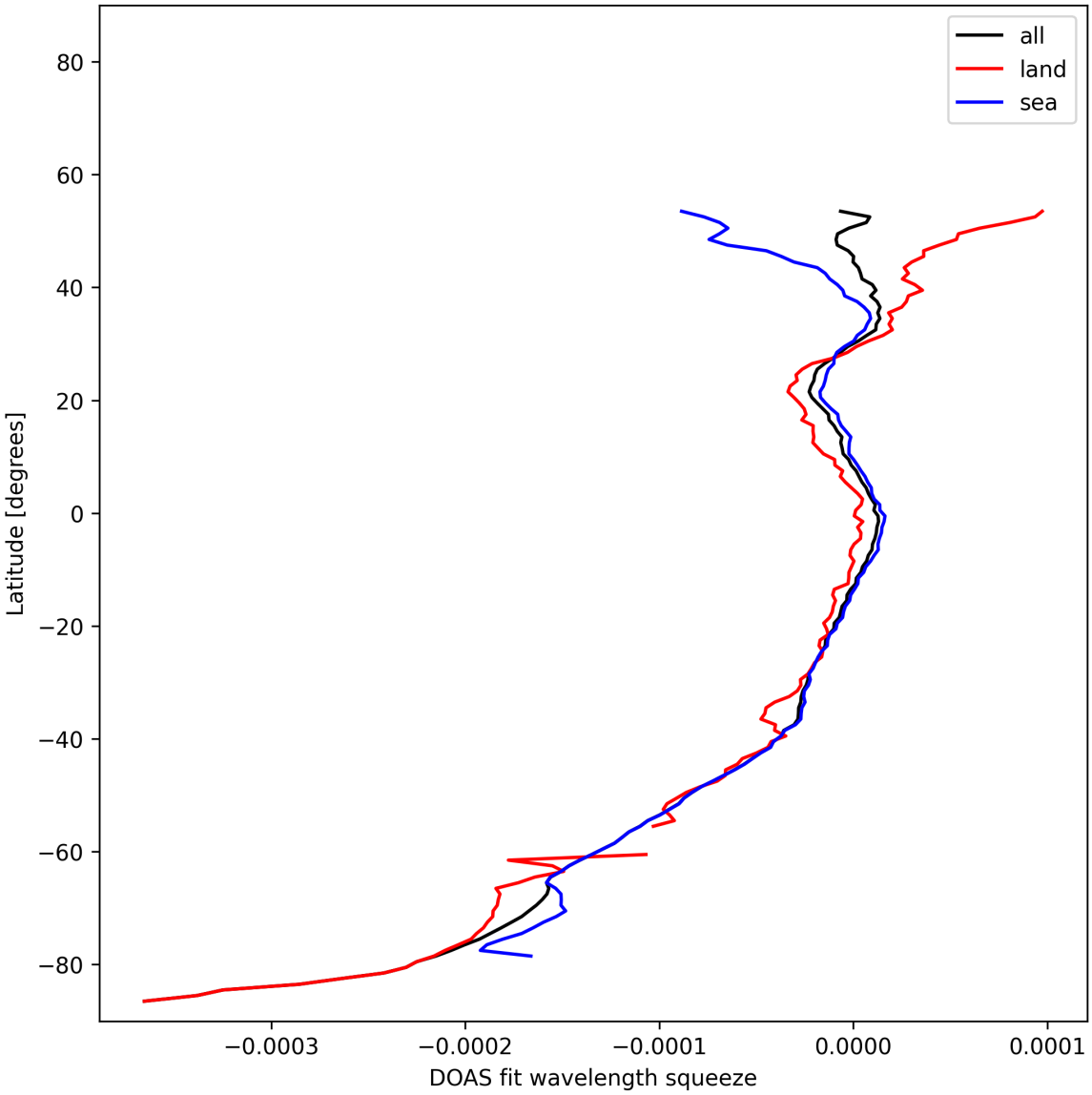


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-02-03 to 2025-02-04.

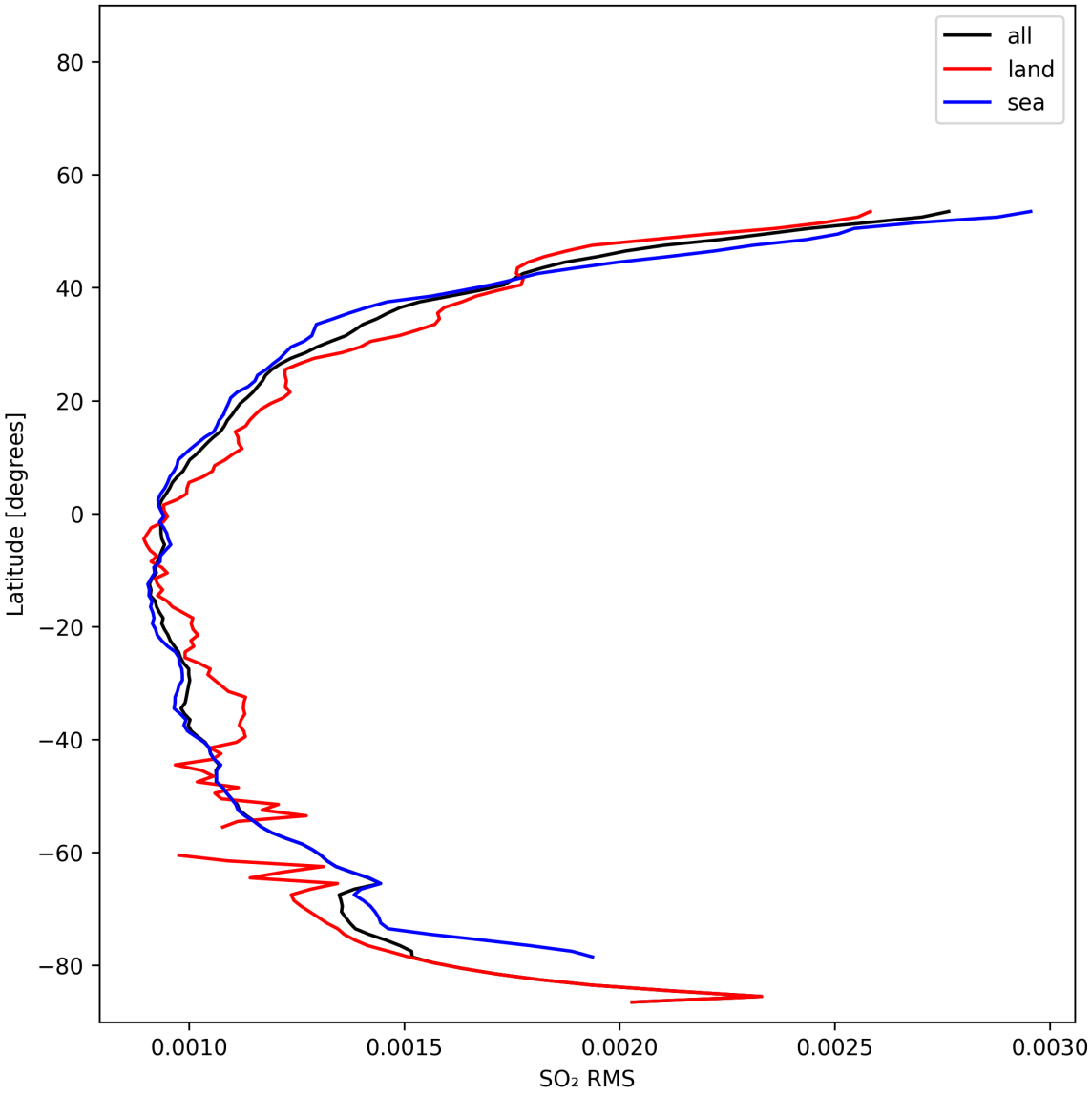


Figure 52: Zonal average of "SO_2 RMS" for 2025-02-03 to 2025-02-04.

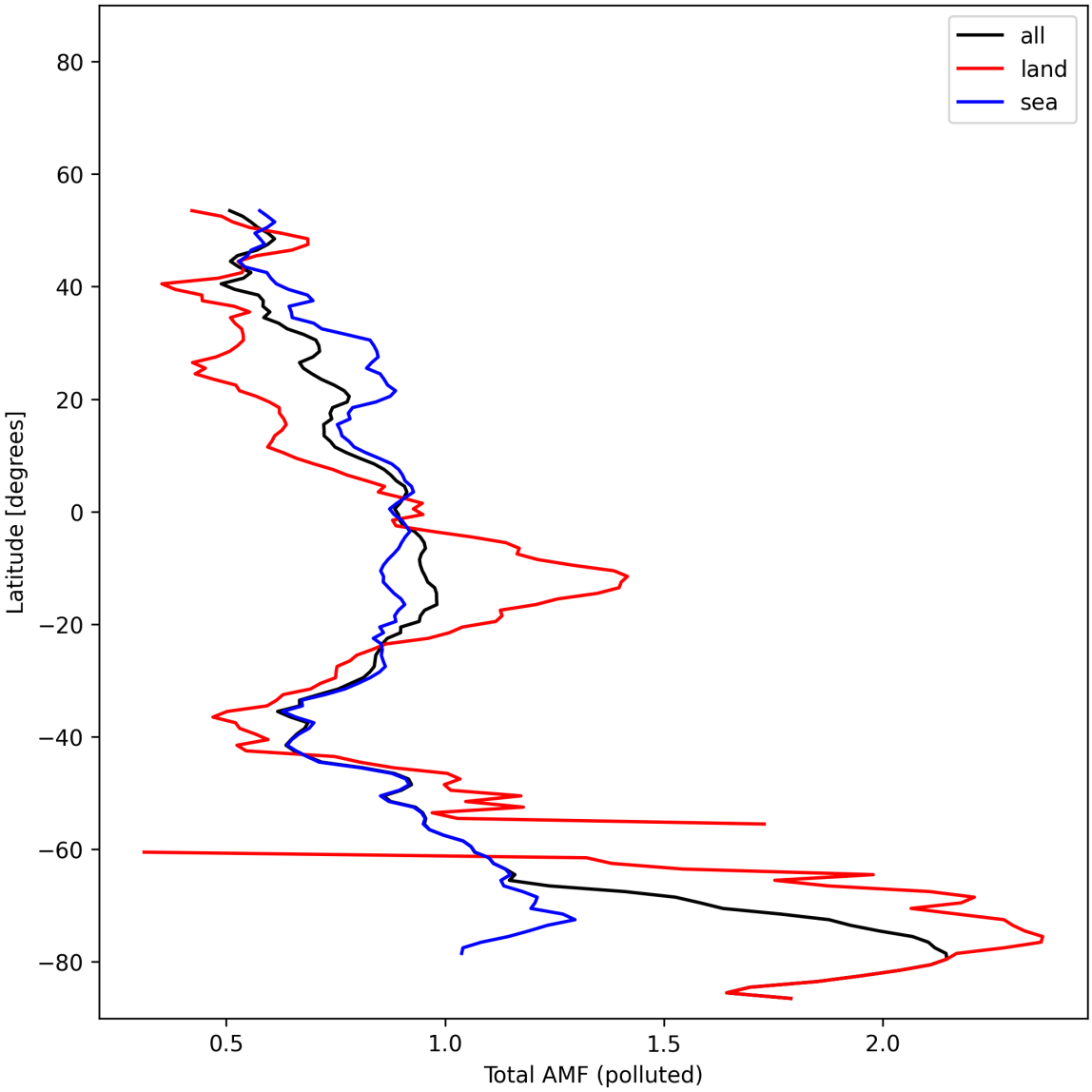


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-02-03 to 2025-02-04.

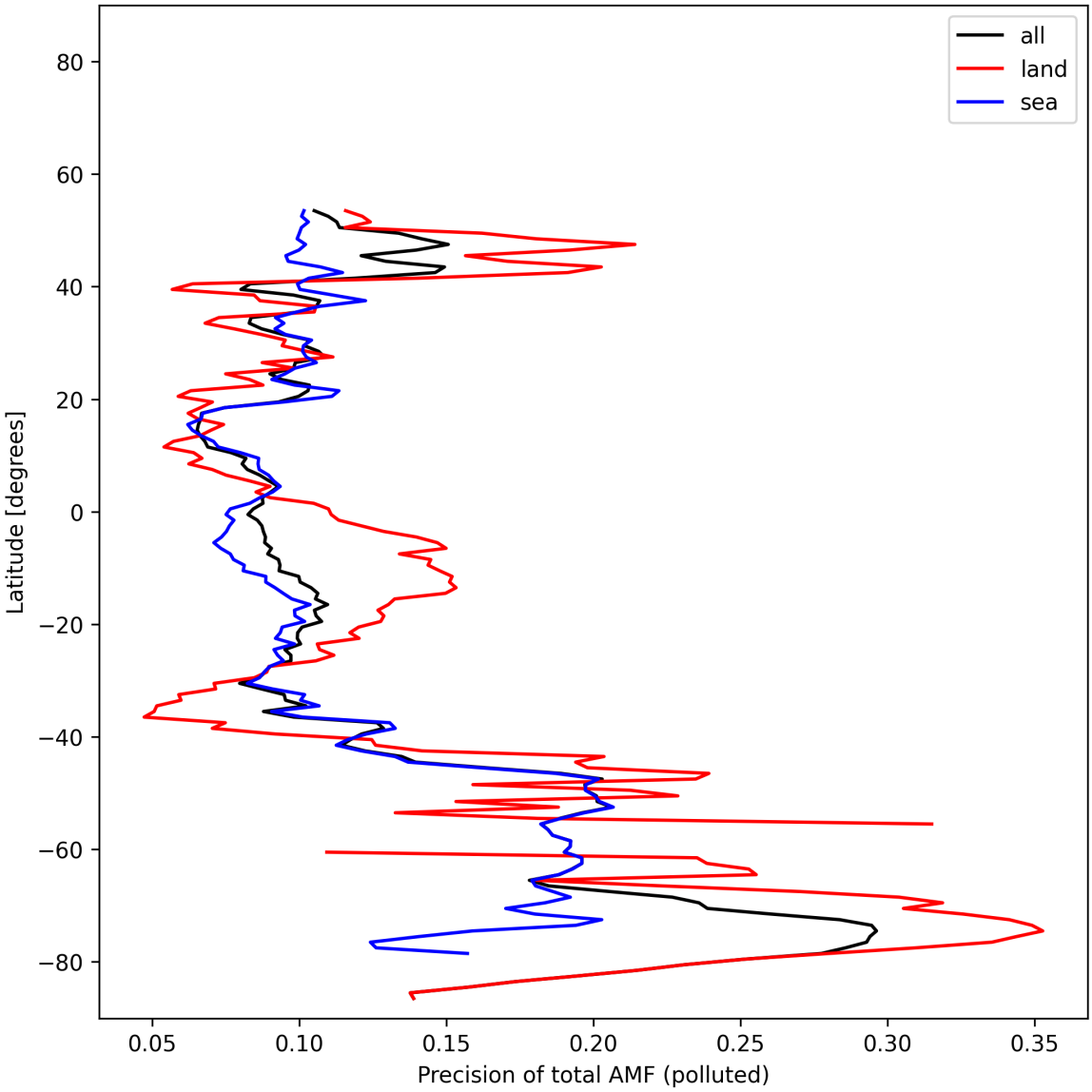


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-02-03 to 2025-02-04.

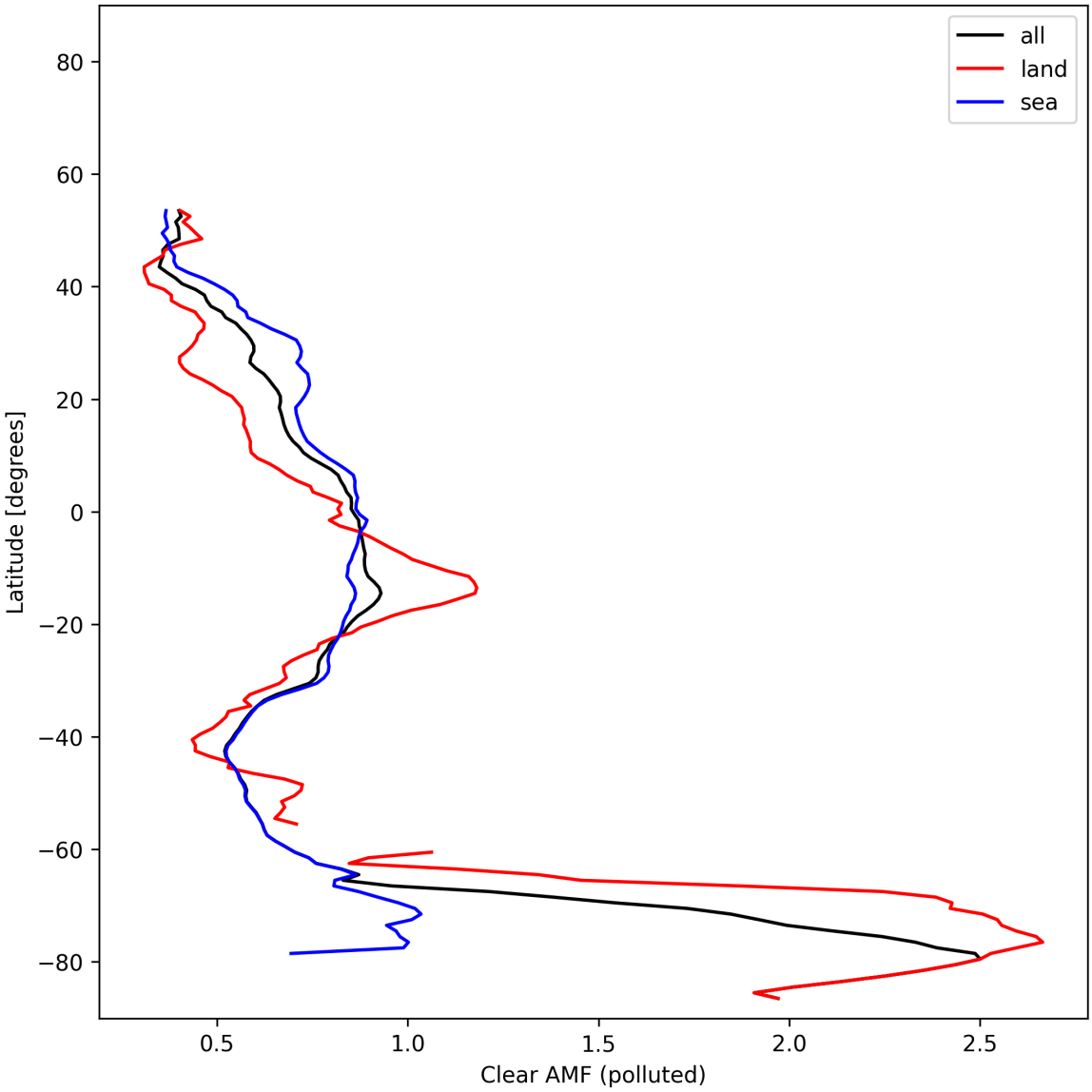


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-02-03 to 2025-02-04.

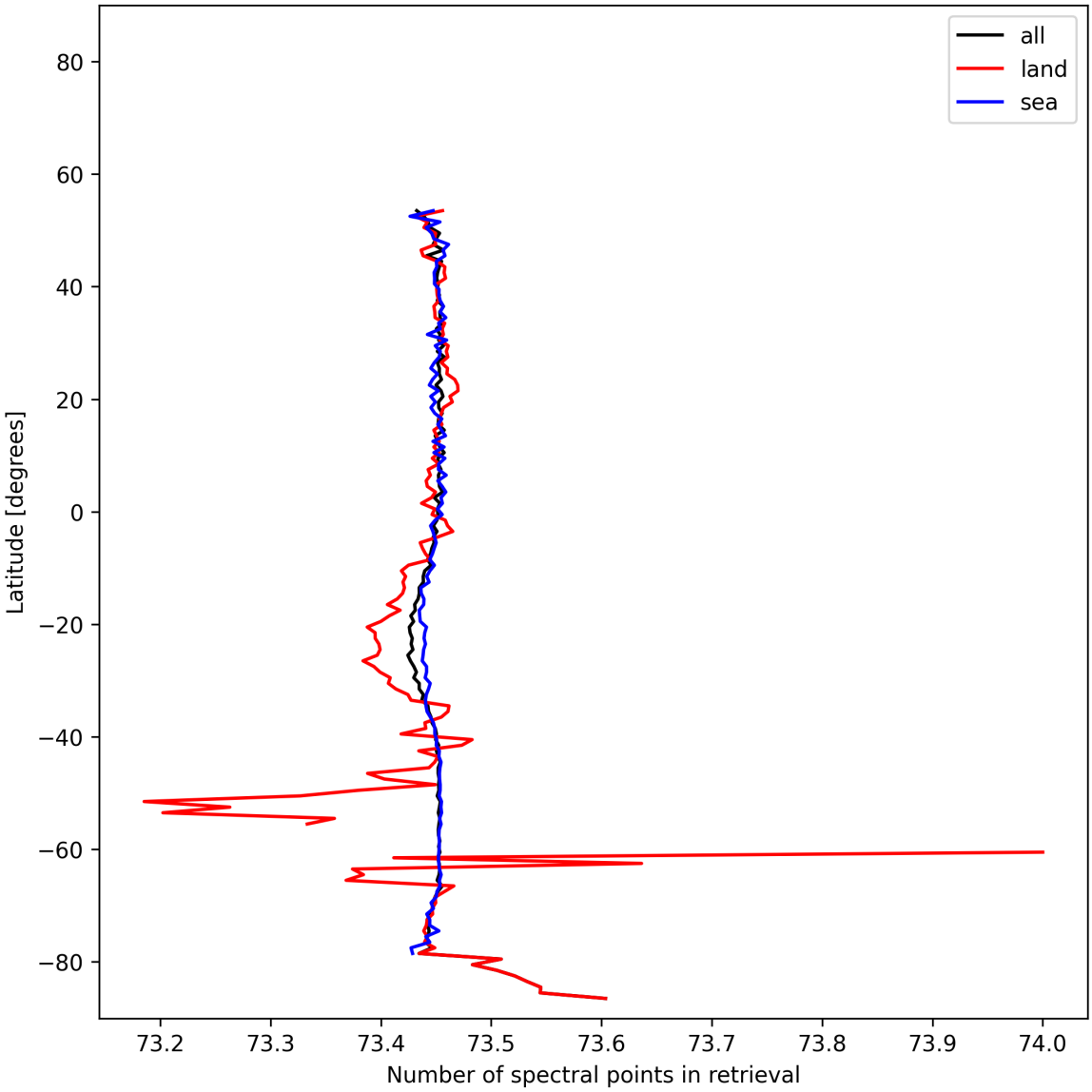


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-02-03 to 2025-02-04.

8 Histograms

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

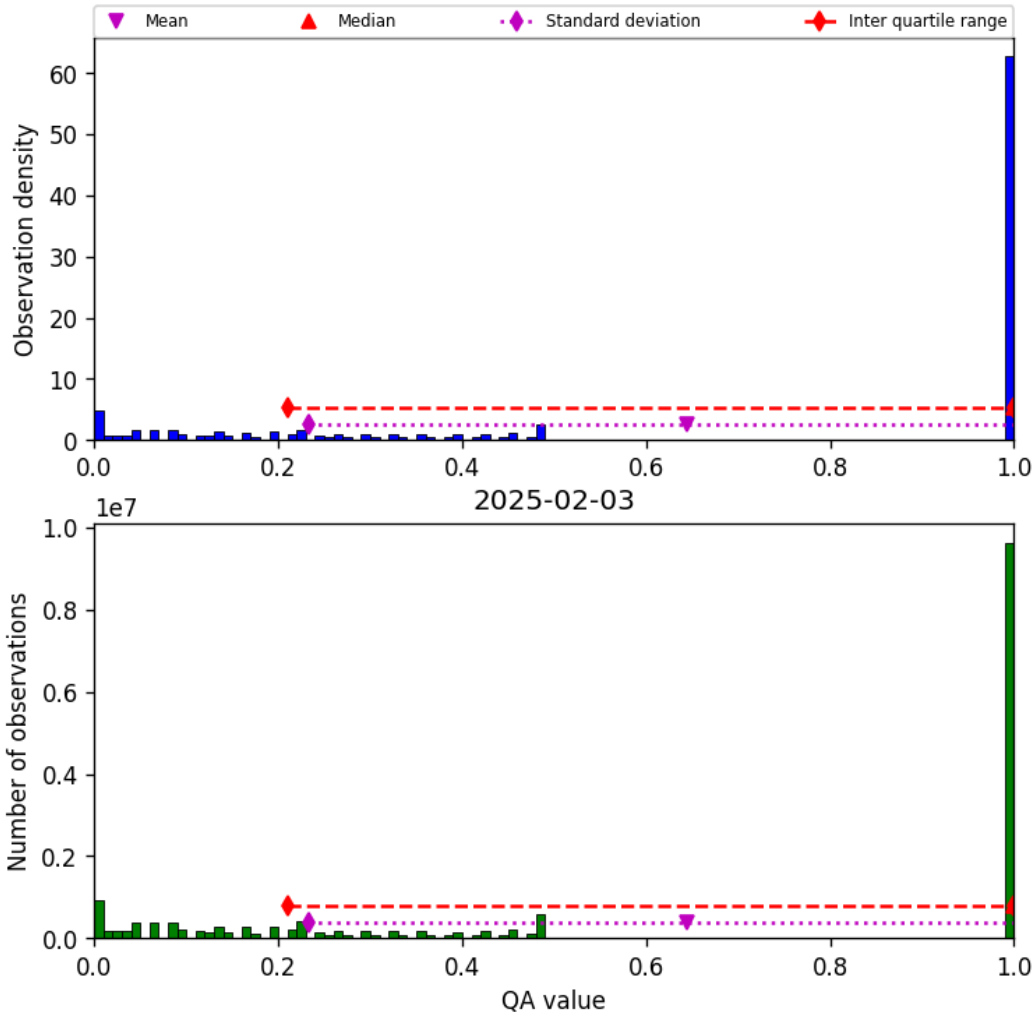


Figure 57: Histogram of “QA value” for 2025-02-03 to 2025-02-04

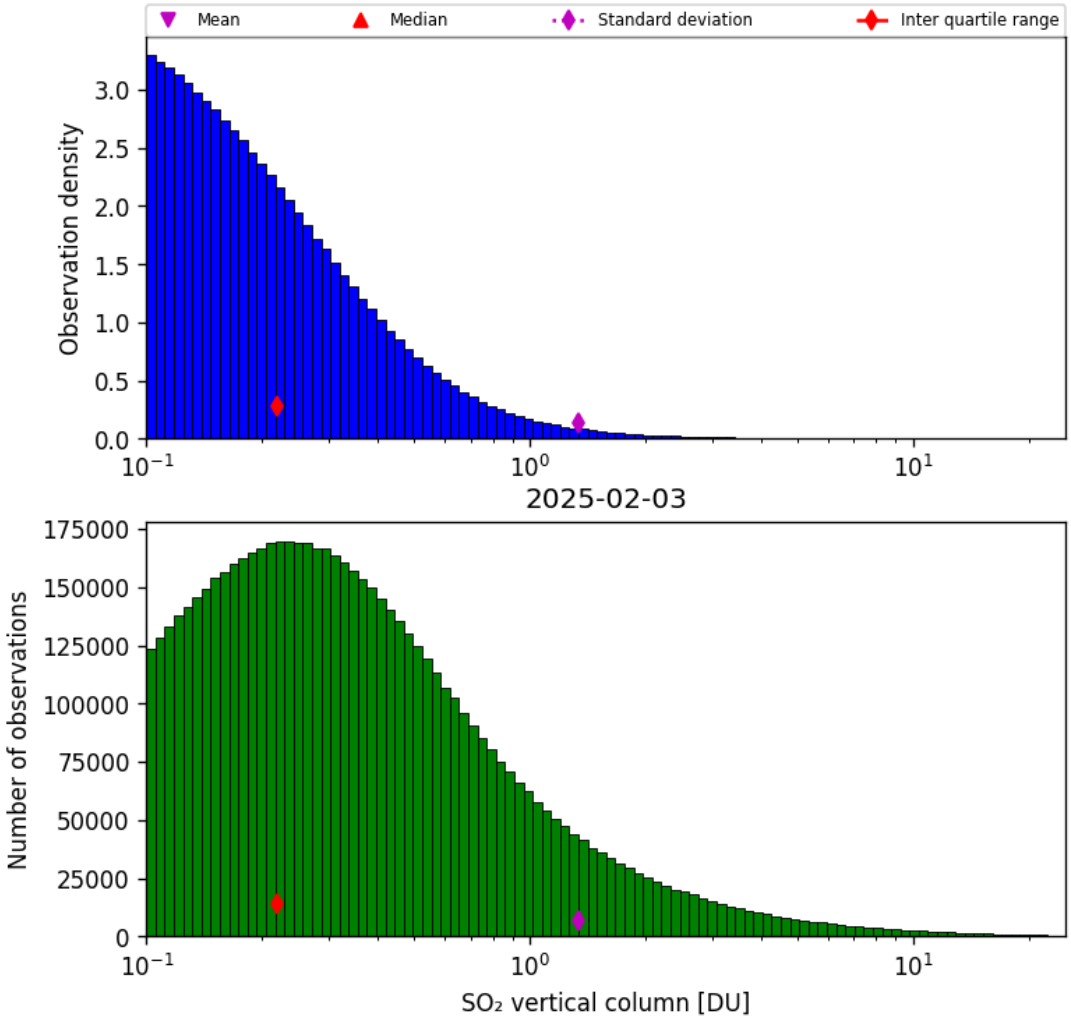


Figure 58: Histogram of "SO_2 vertical column" for 2025-02-03 to 2025-02-04

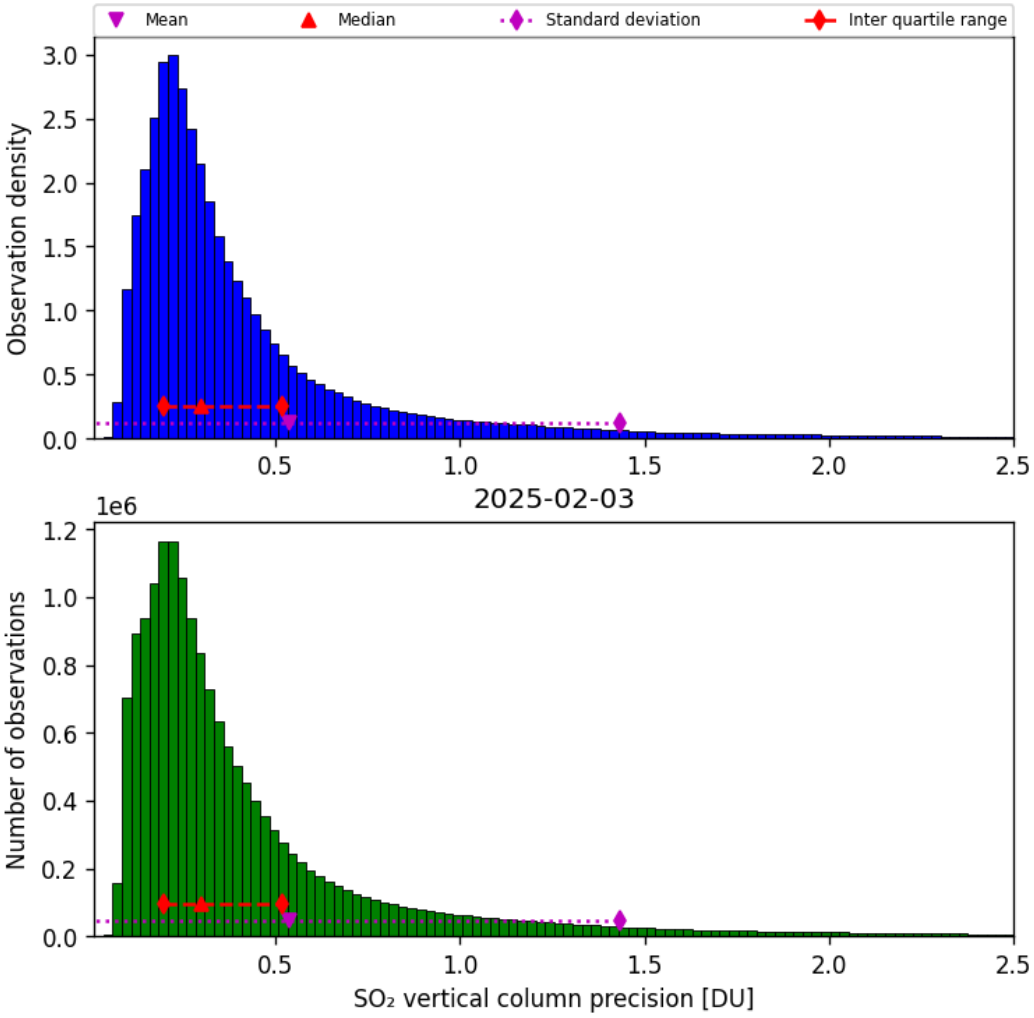


Figure 59: Histogram of "SO_2 vertical column precision" for 2025-02-03 to 2025-02-04

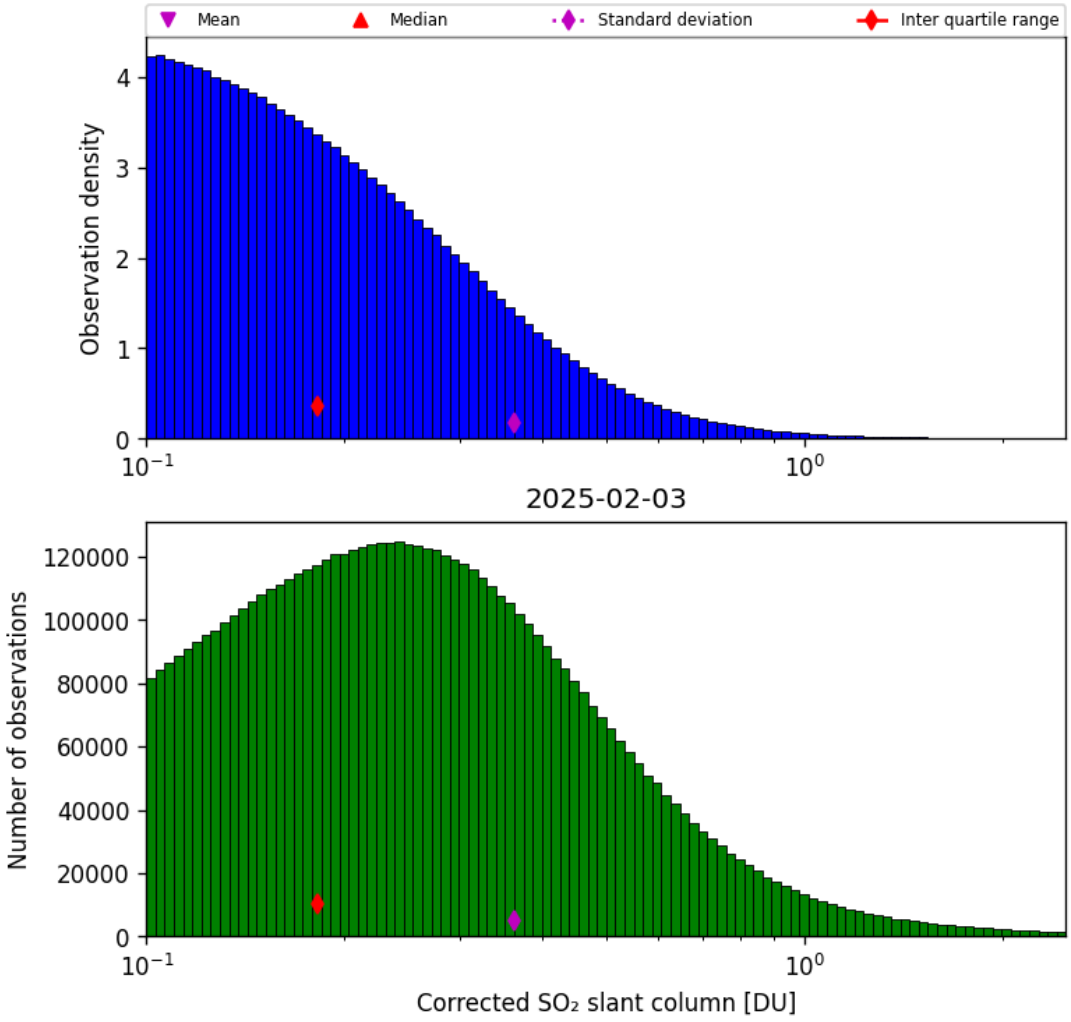


Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-02-03 to 2025-02-04

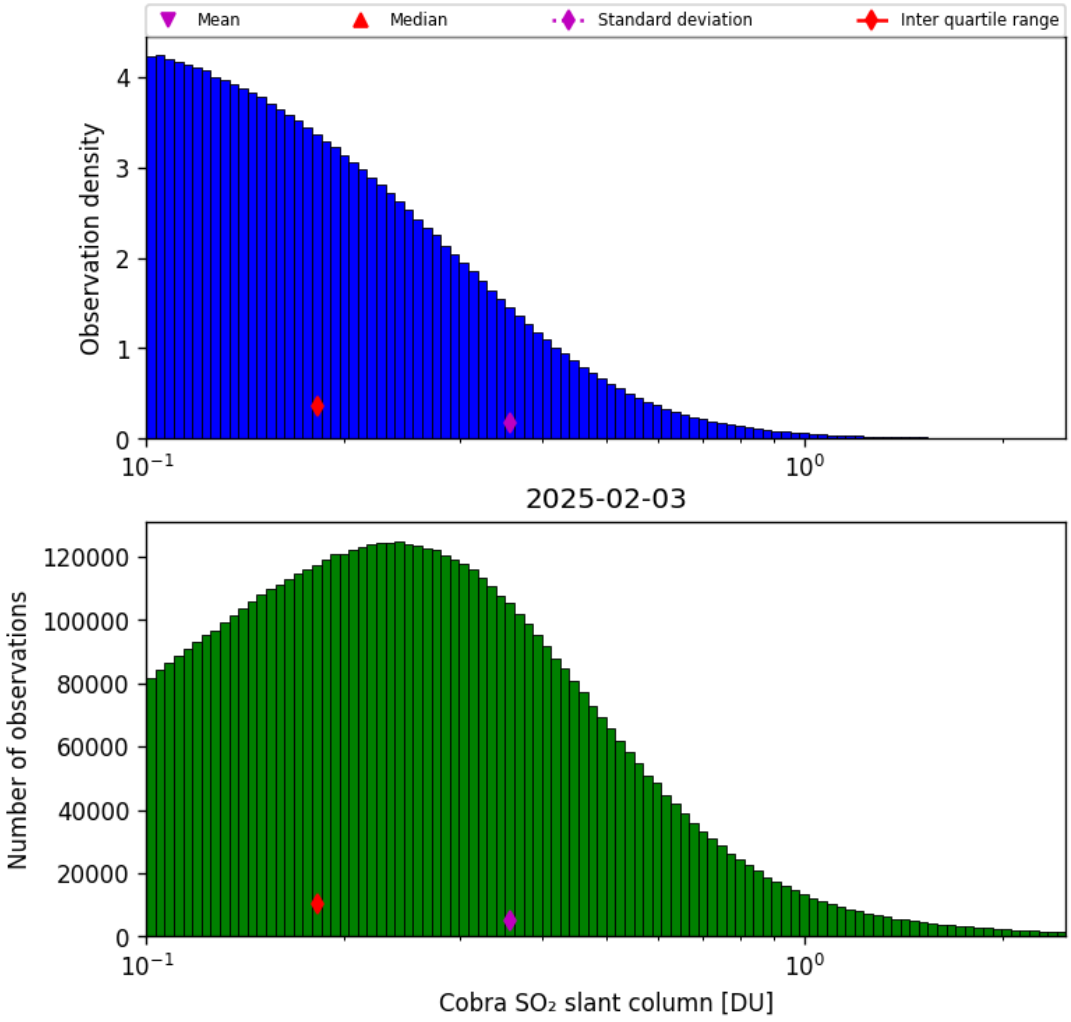


Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-02-03 to 2025-02-04

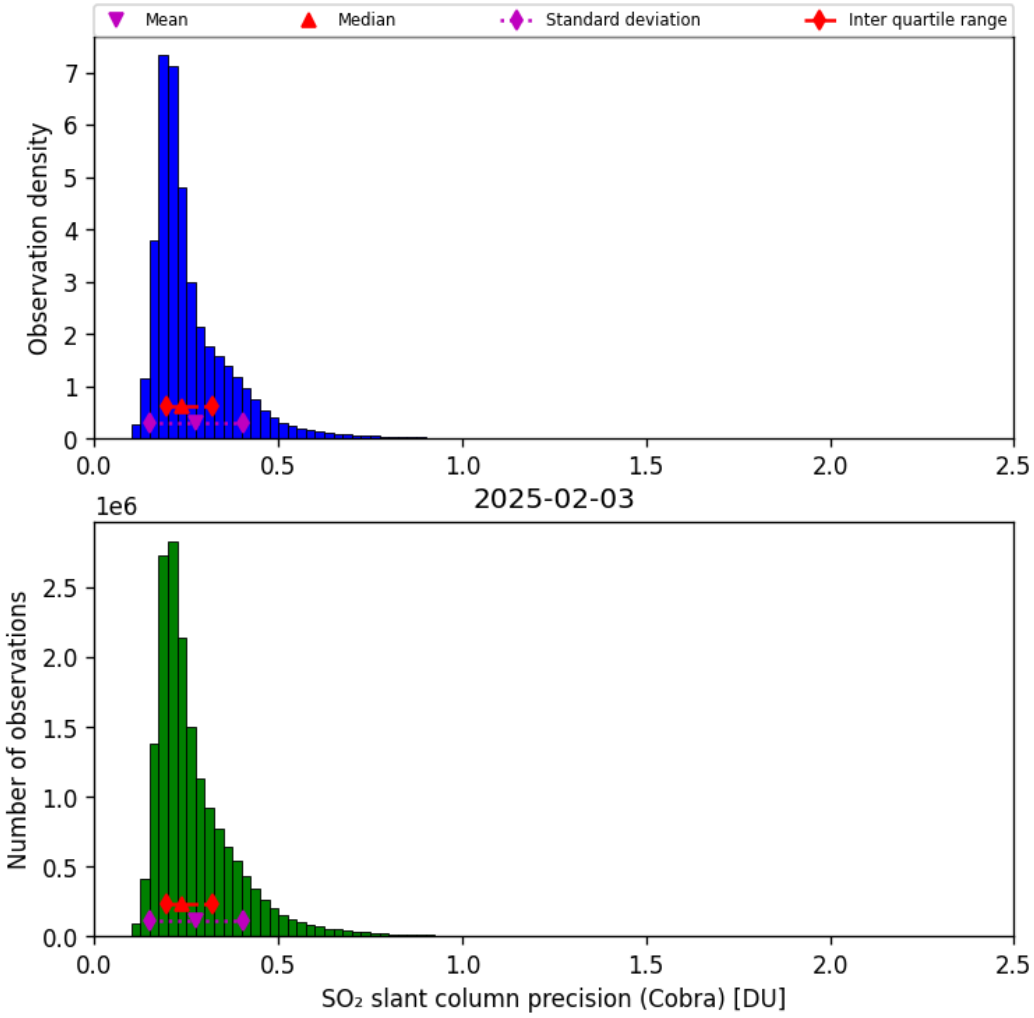


Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-02-03 to 2025-02-04

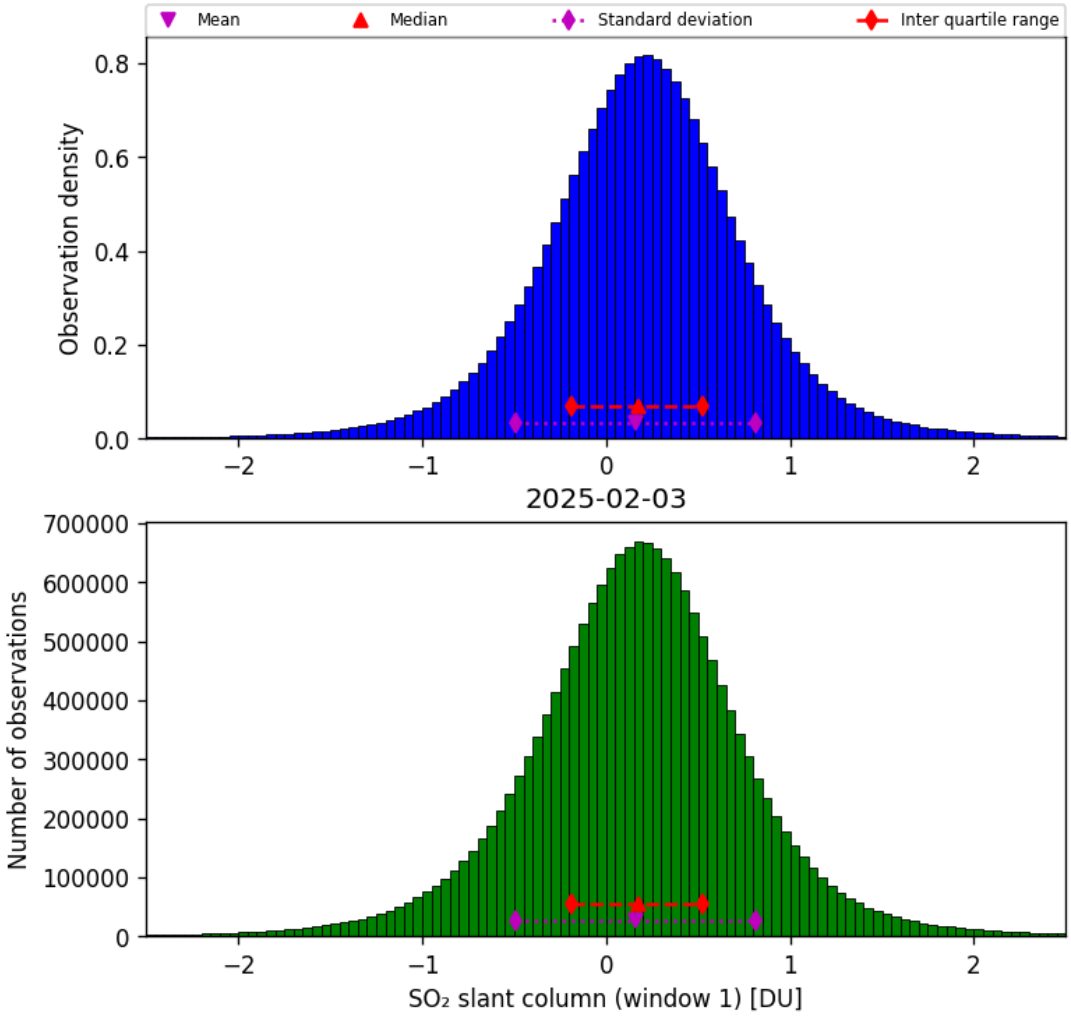


Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-02-03 to 2025-02-04

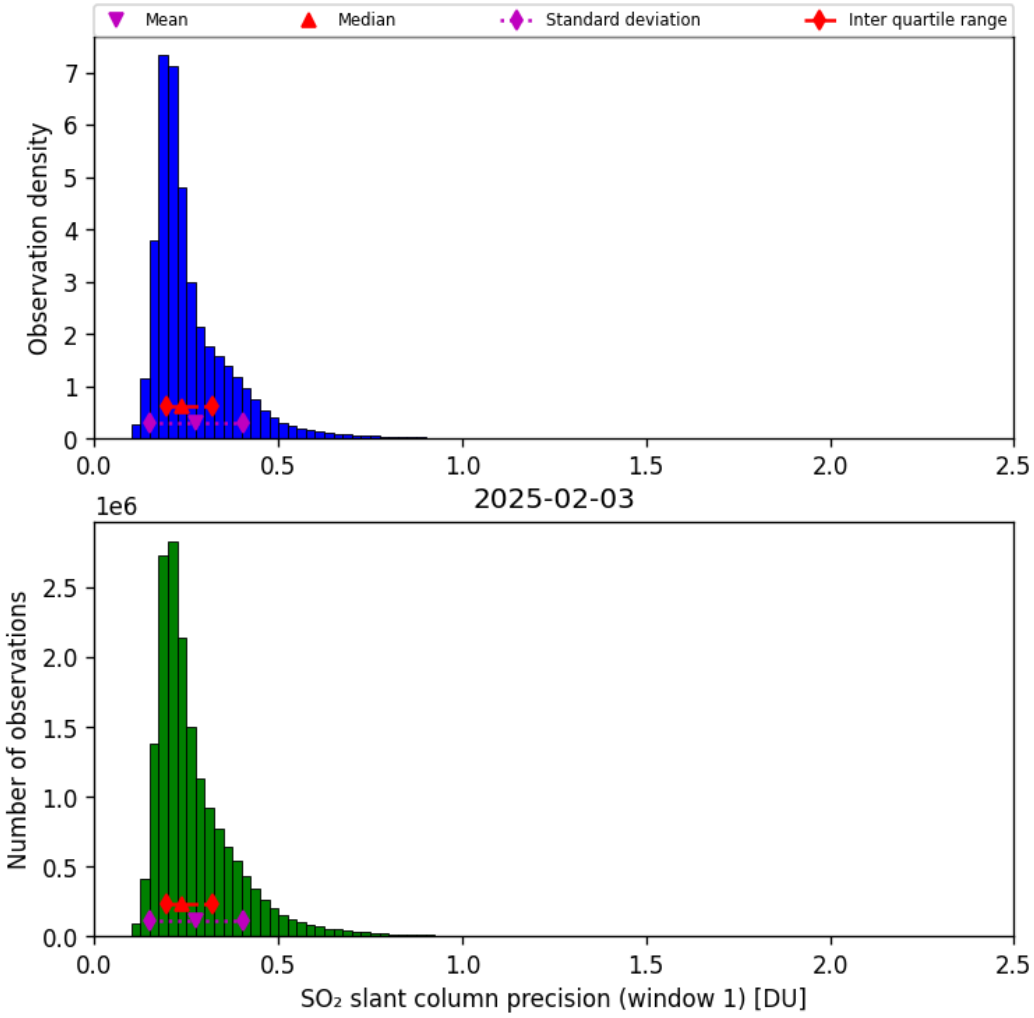


Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-02-03 to 2025-02-04

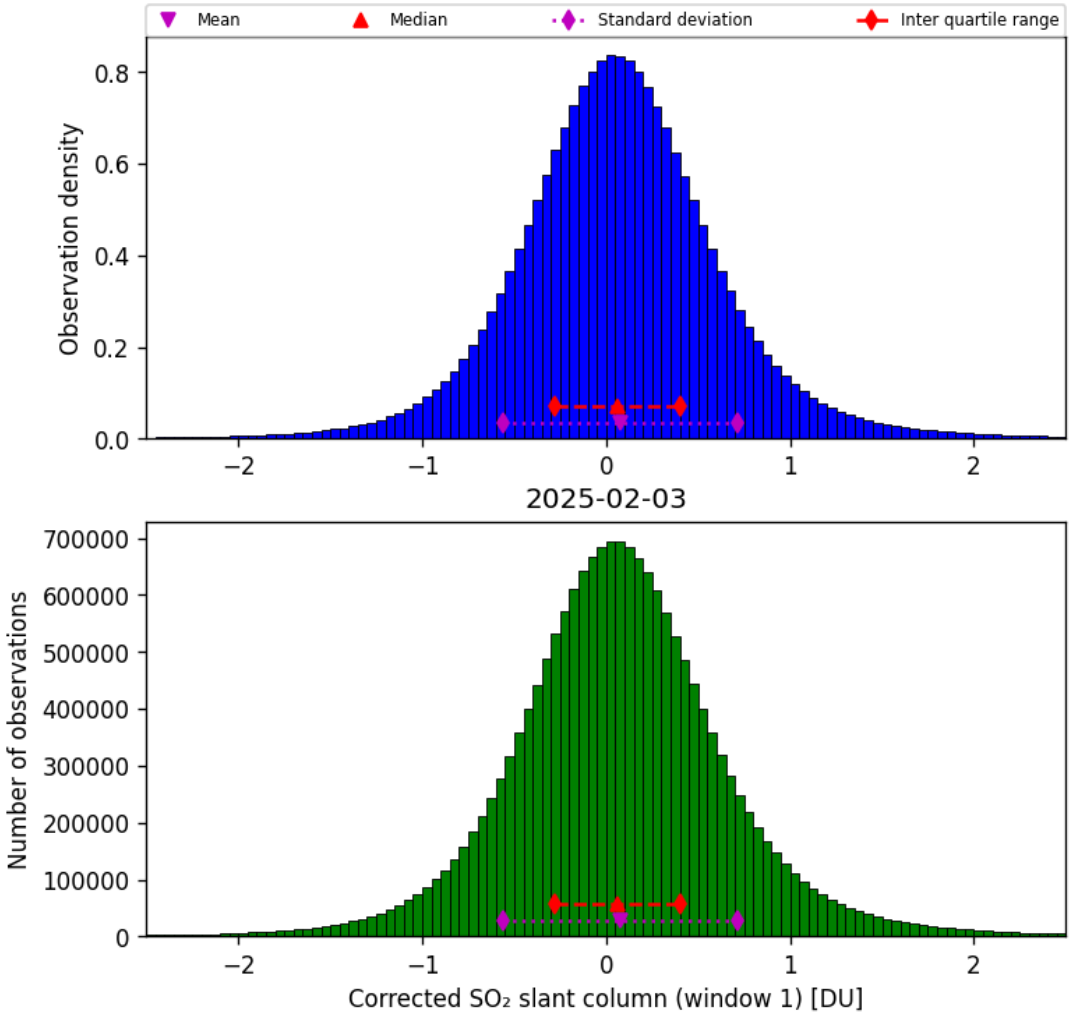


Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-02-03 to 2025-02-04

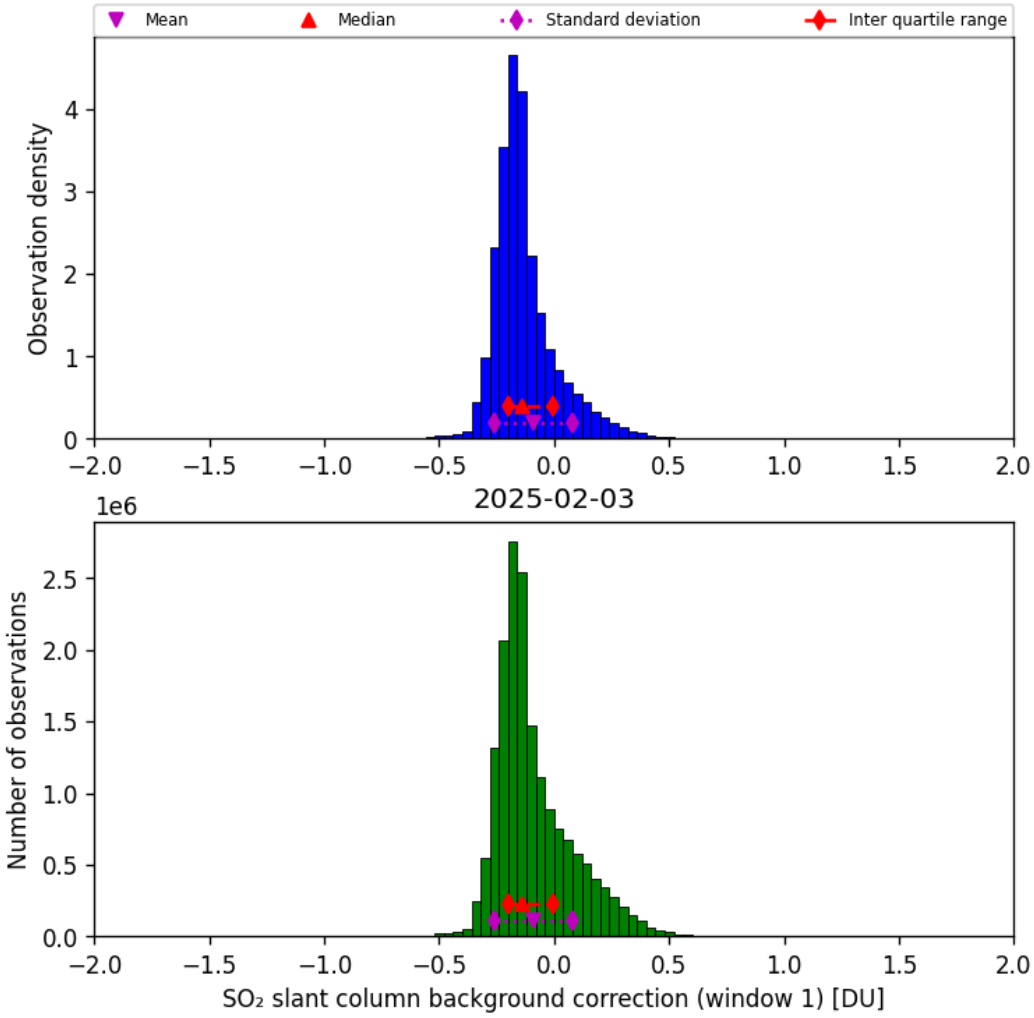


Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-02-03 to 2025-02-04

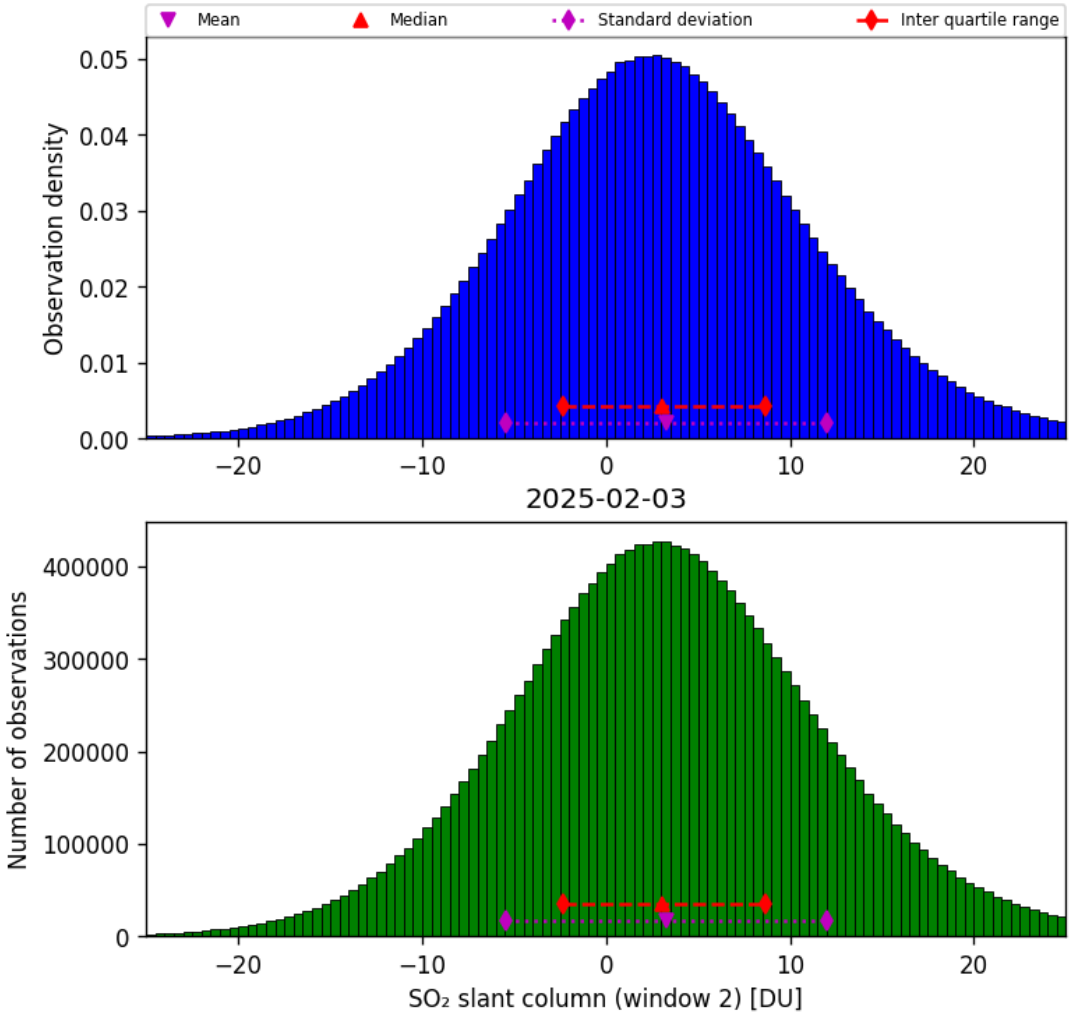


Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-02-03 to 2025-02-04

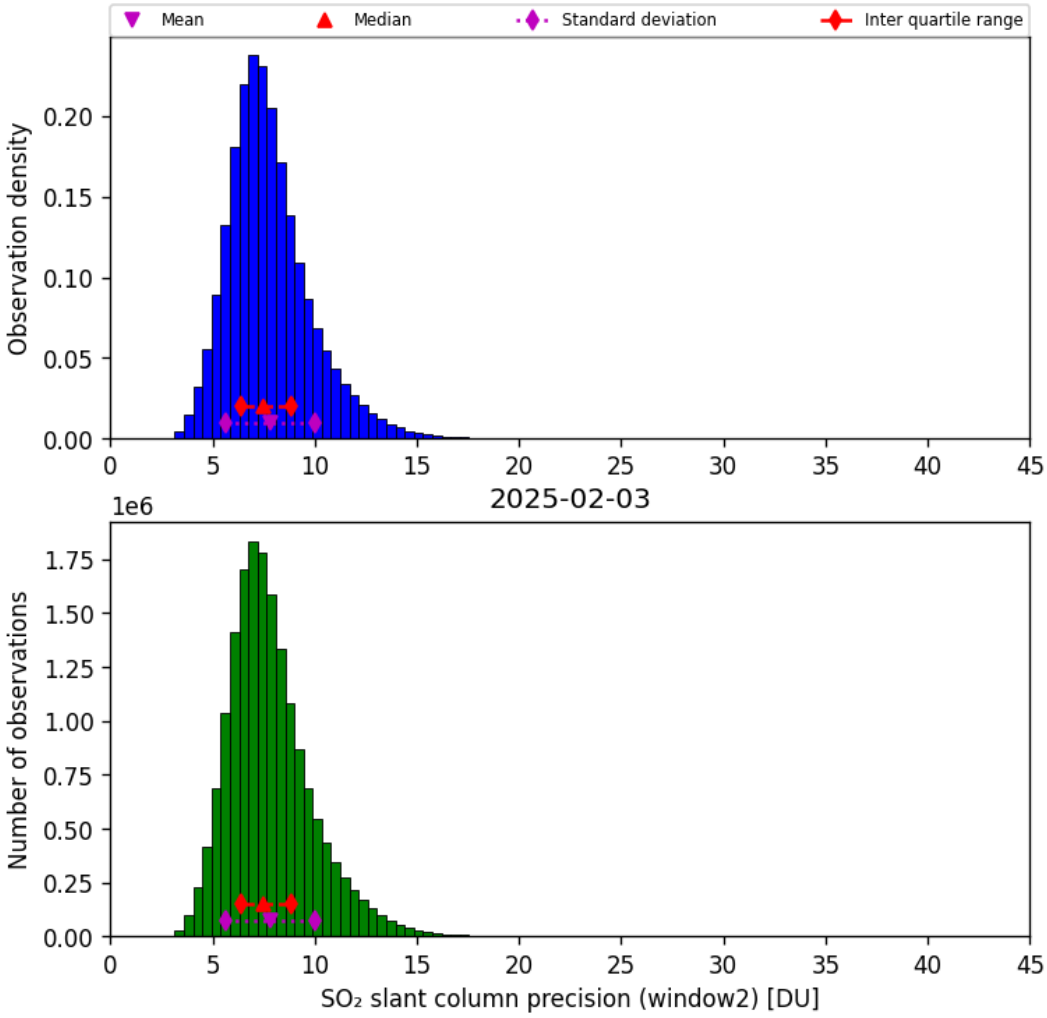


Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-02-03 to 2025-02-04

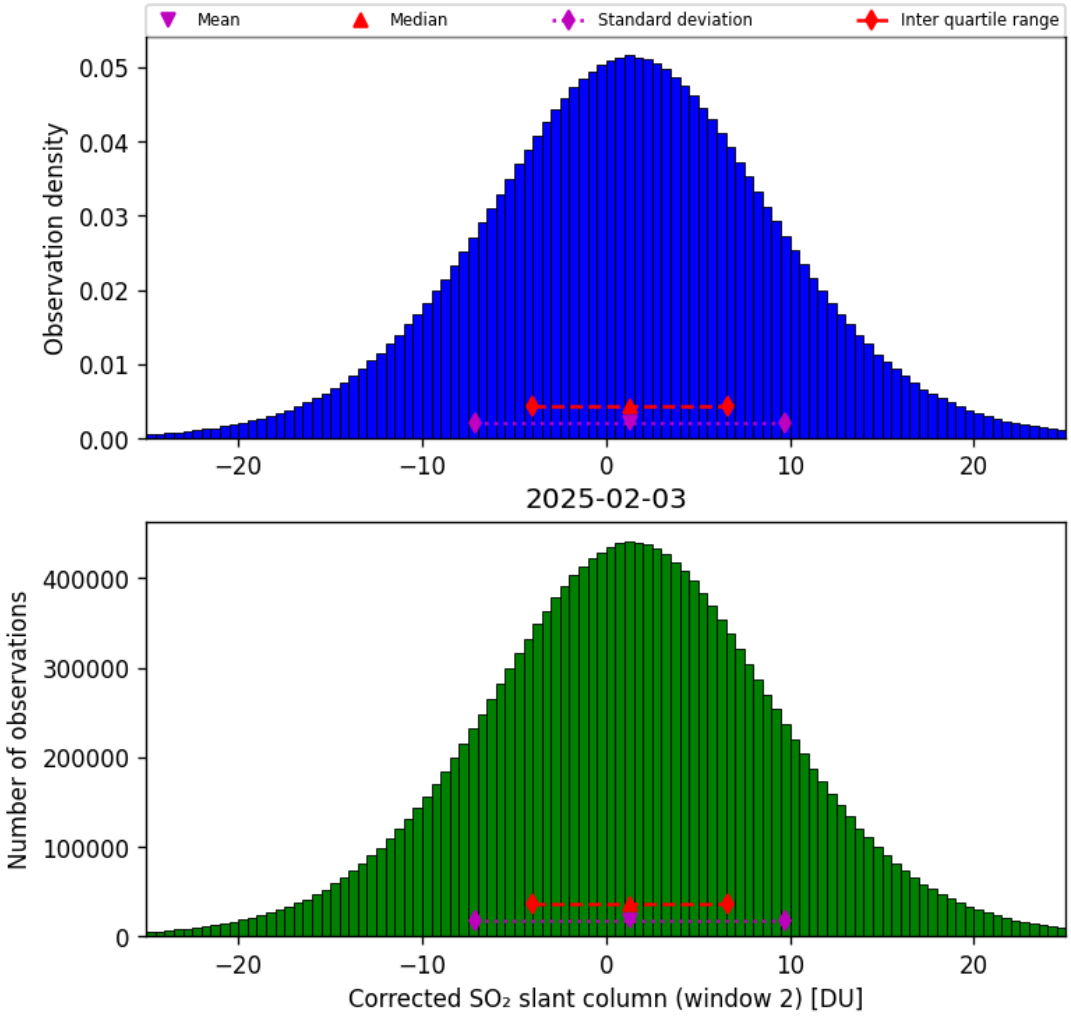


Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-02-03 to 2025-02-04

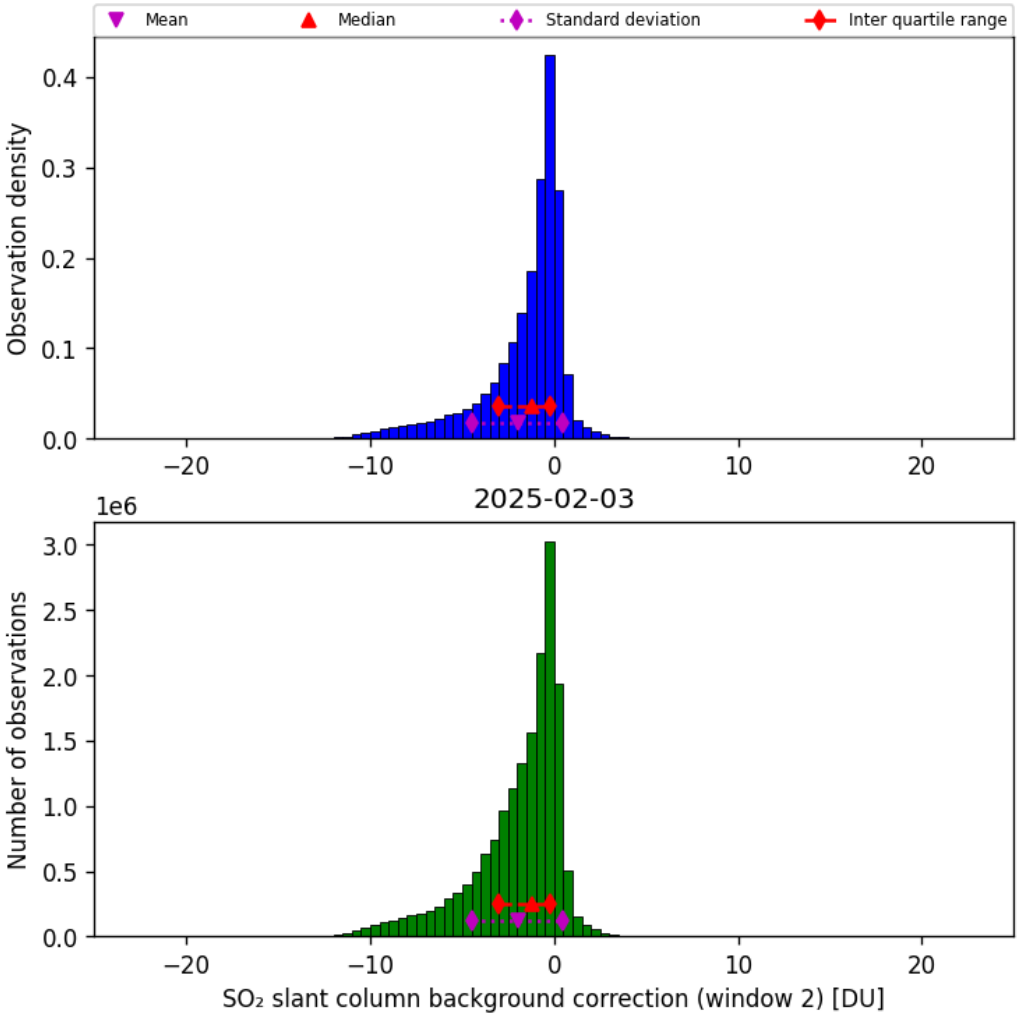


Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-02-03 to 2025-02-04

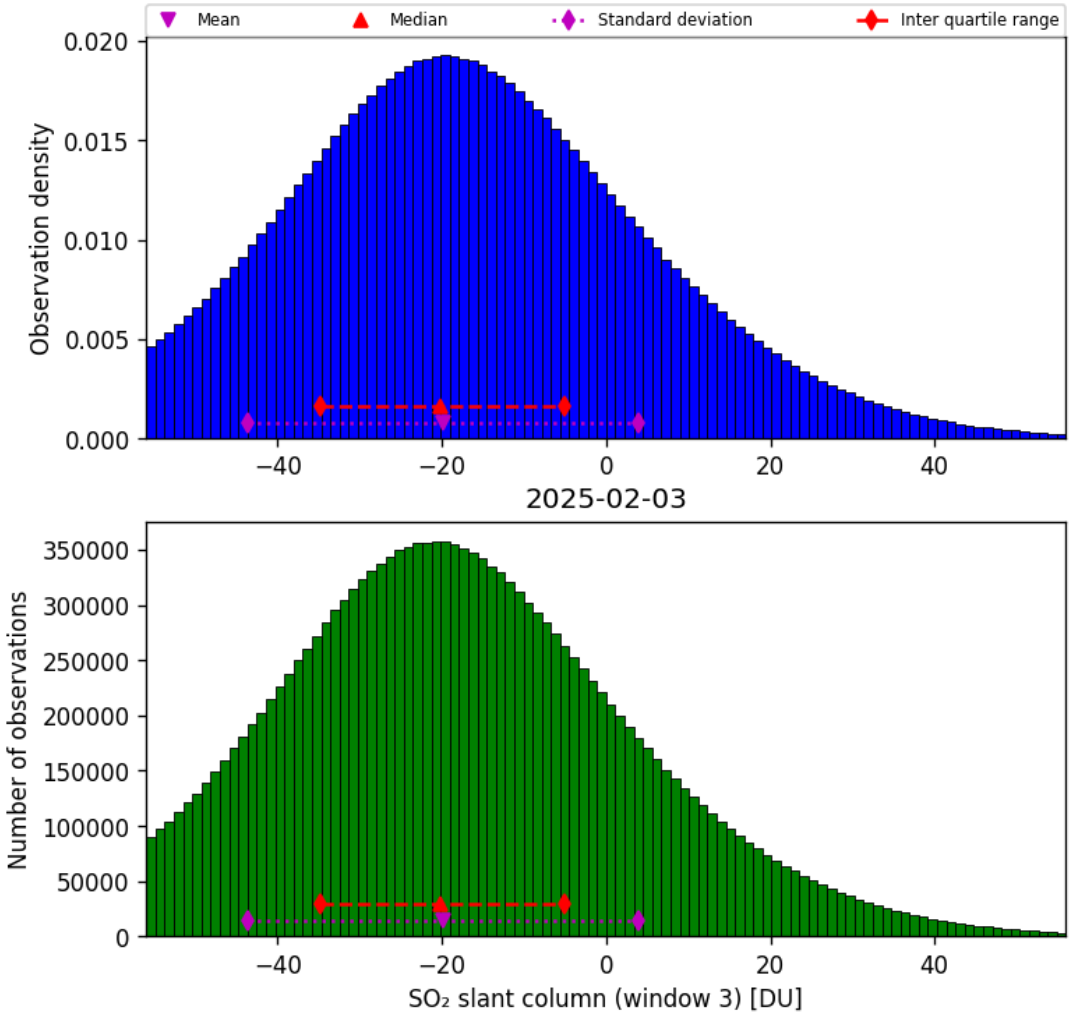


Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-02-03 to 2025-02-04

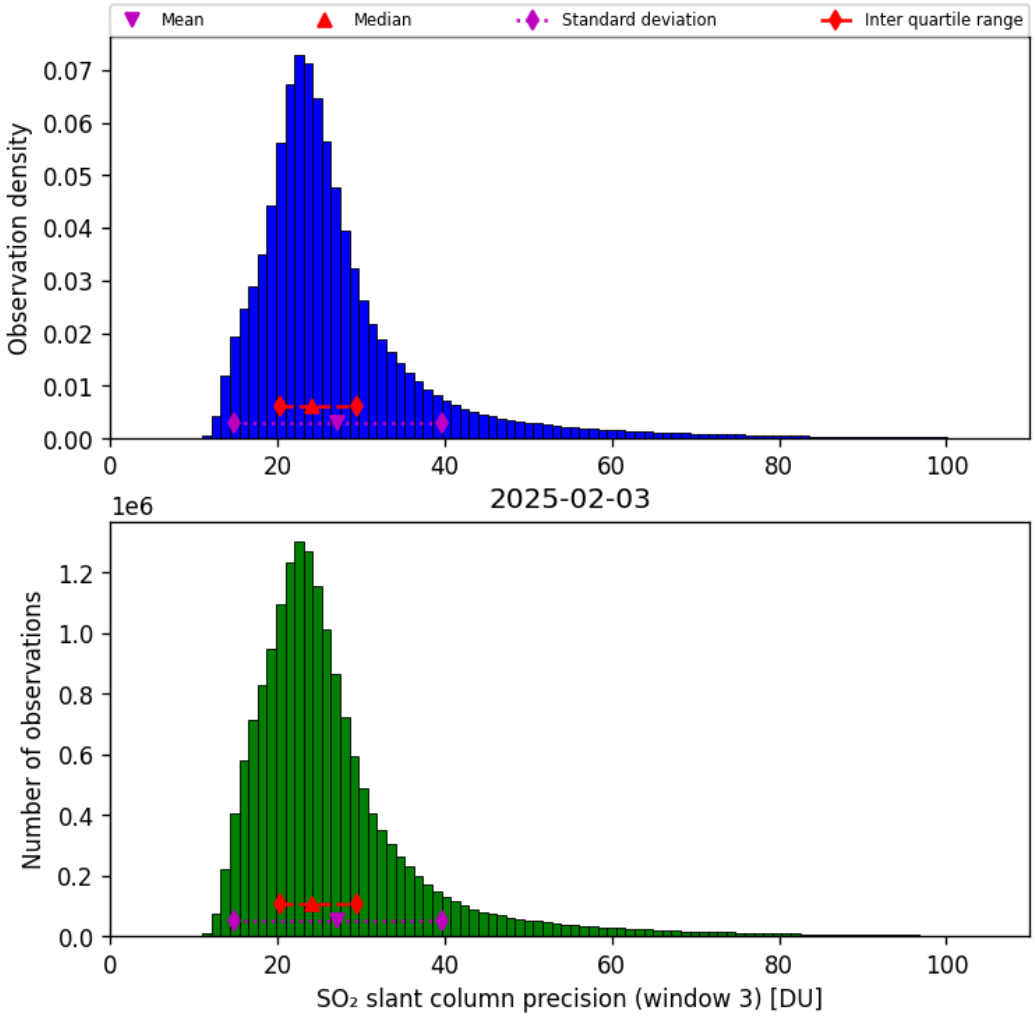


Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-02-03 to 2025-02-04

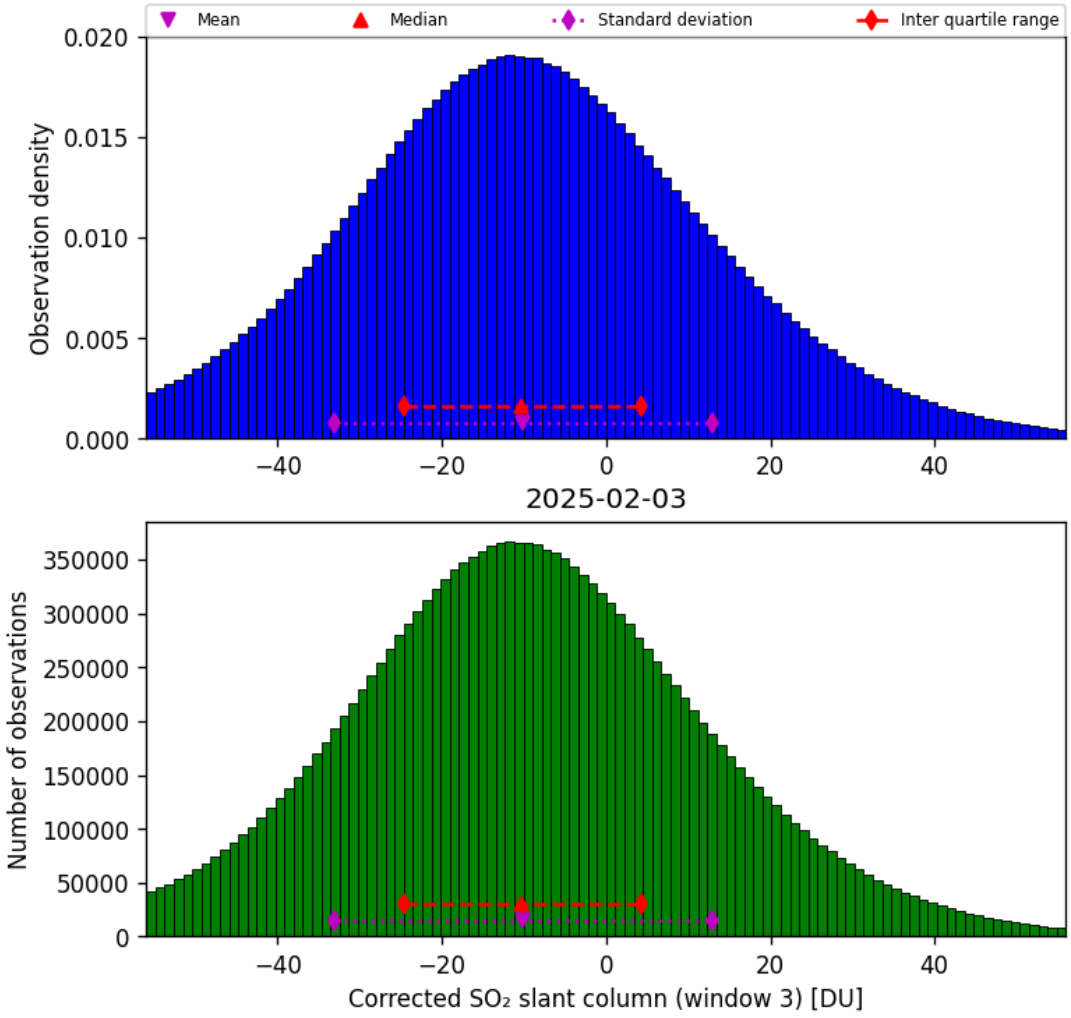


Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-02-03 to 2025-02-04

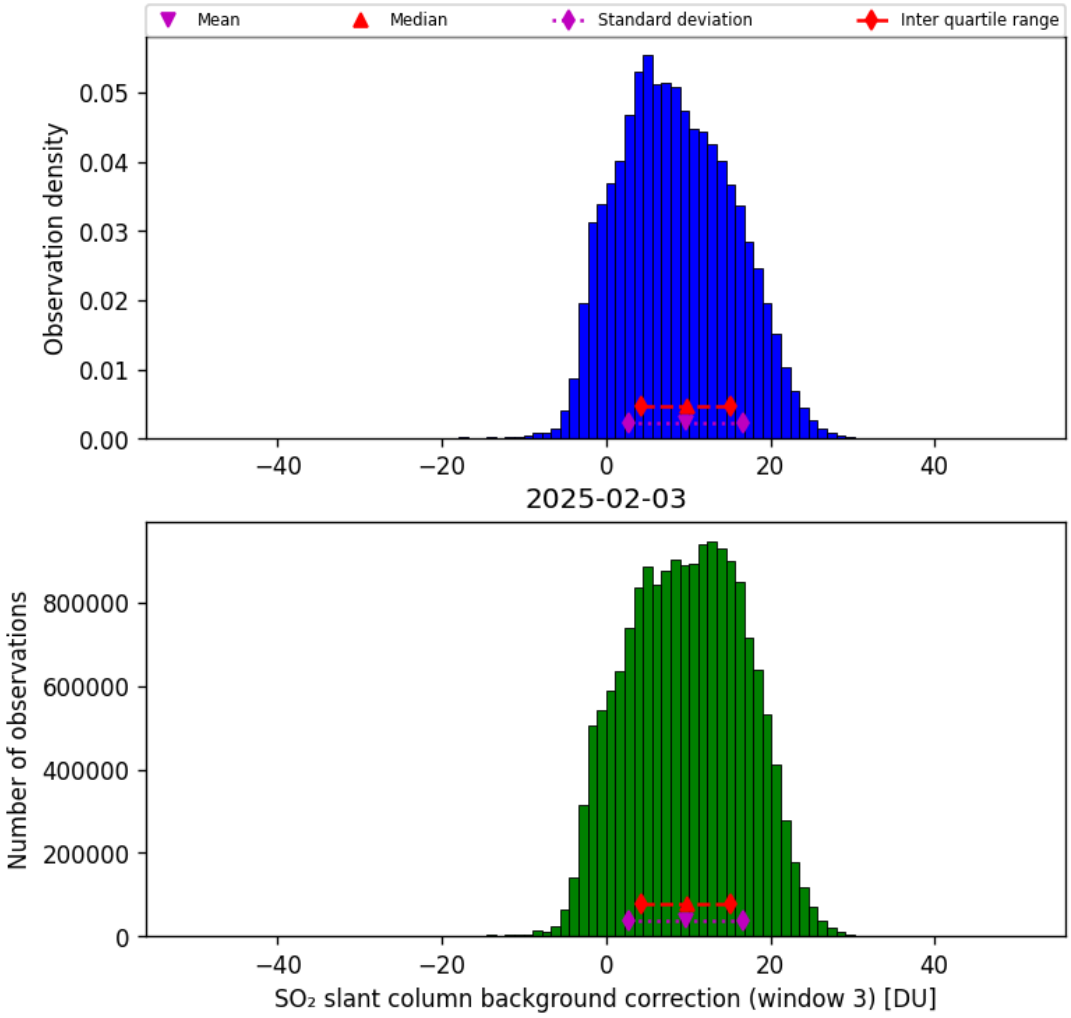


Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-02-03 to 2025-02-04

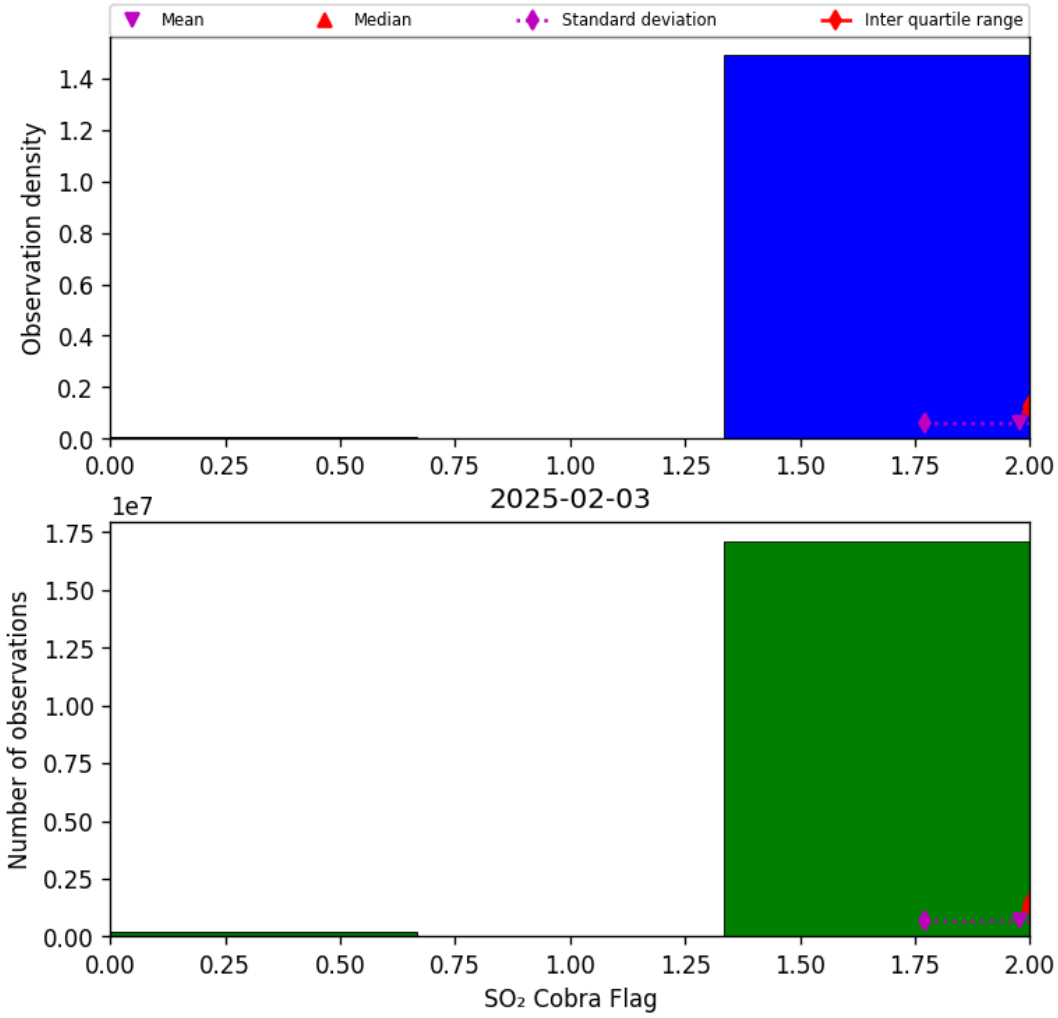


Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-02-03 to 2025-02-04

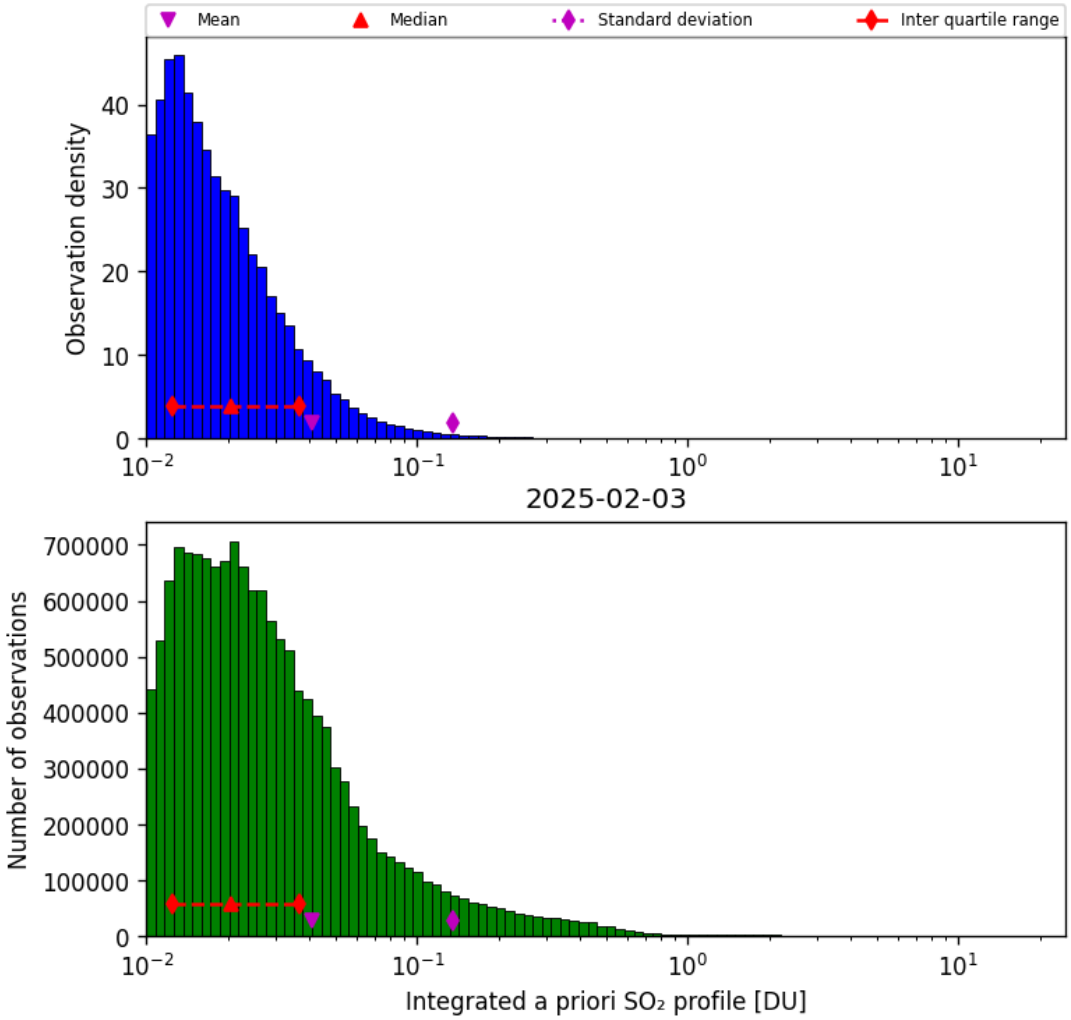


Figure 76: Histogram of "Integrated a priori SO_2 profile" for 2025-02-03 to 2025-02-04

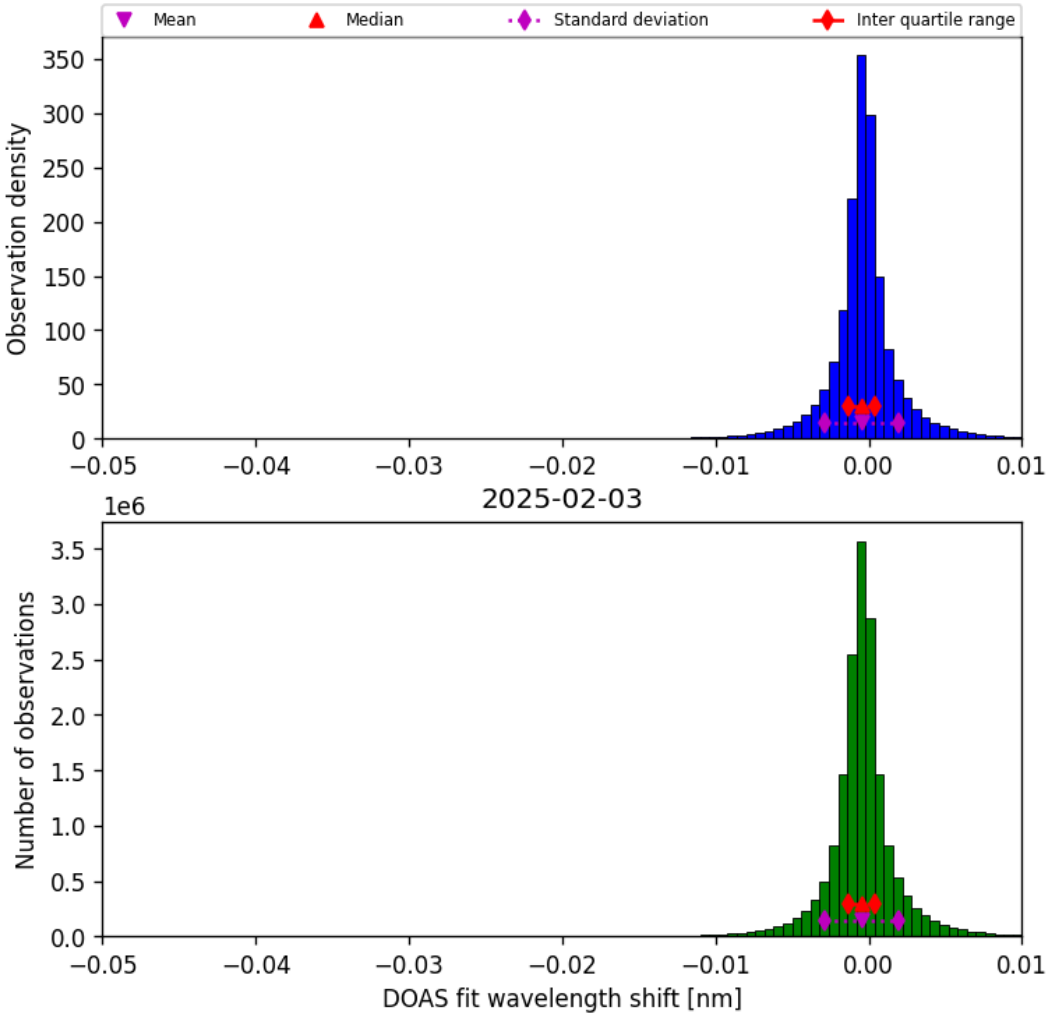


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-02-03 to 2025-02-04

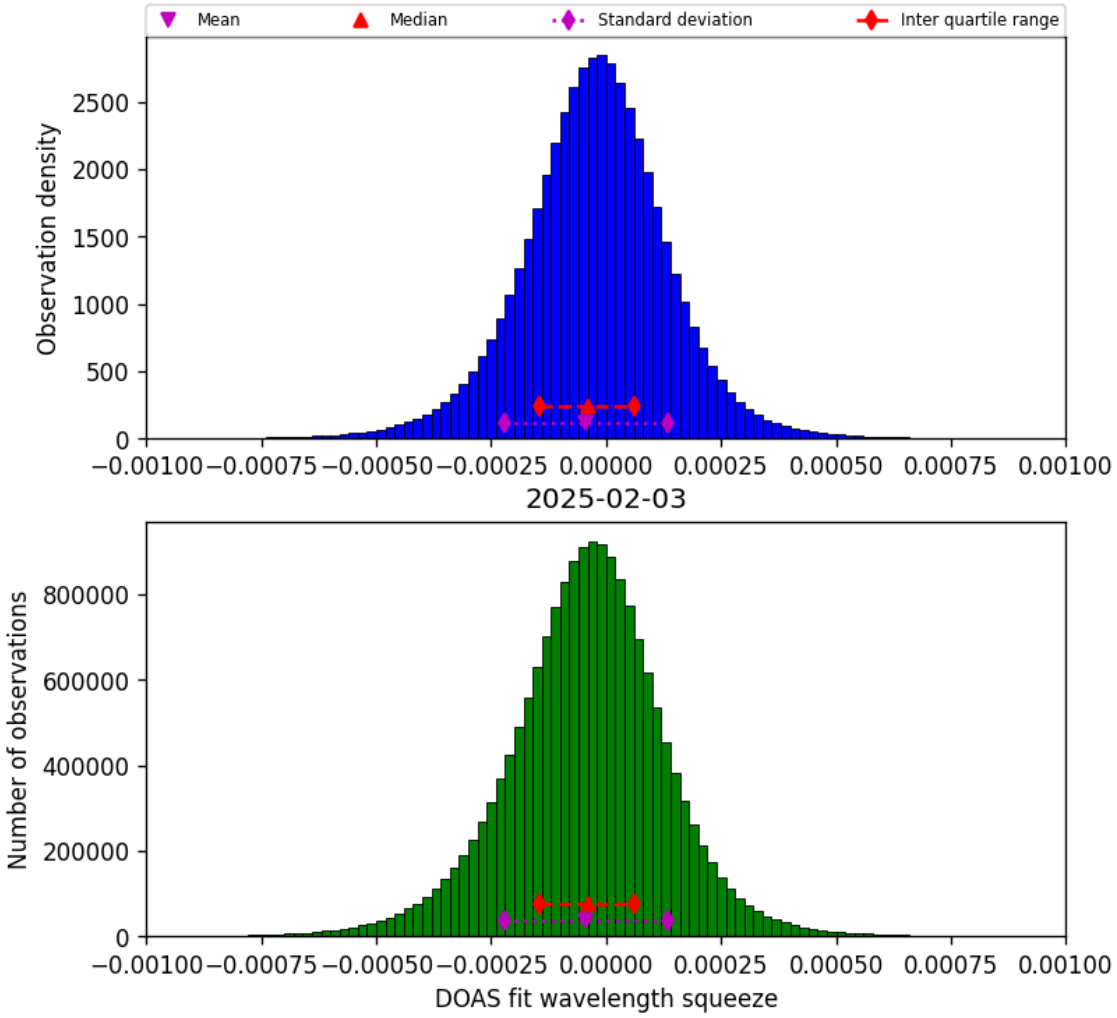


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-02-03 to 2025-02-04

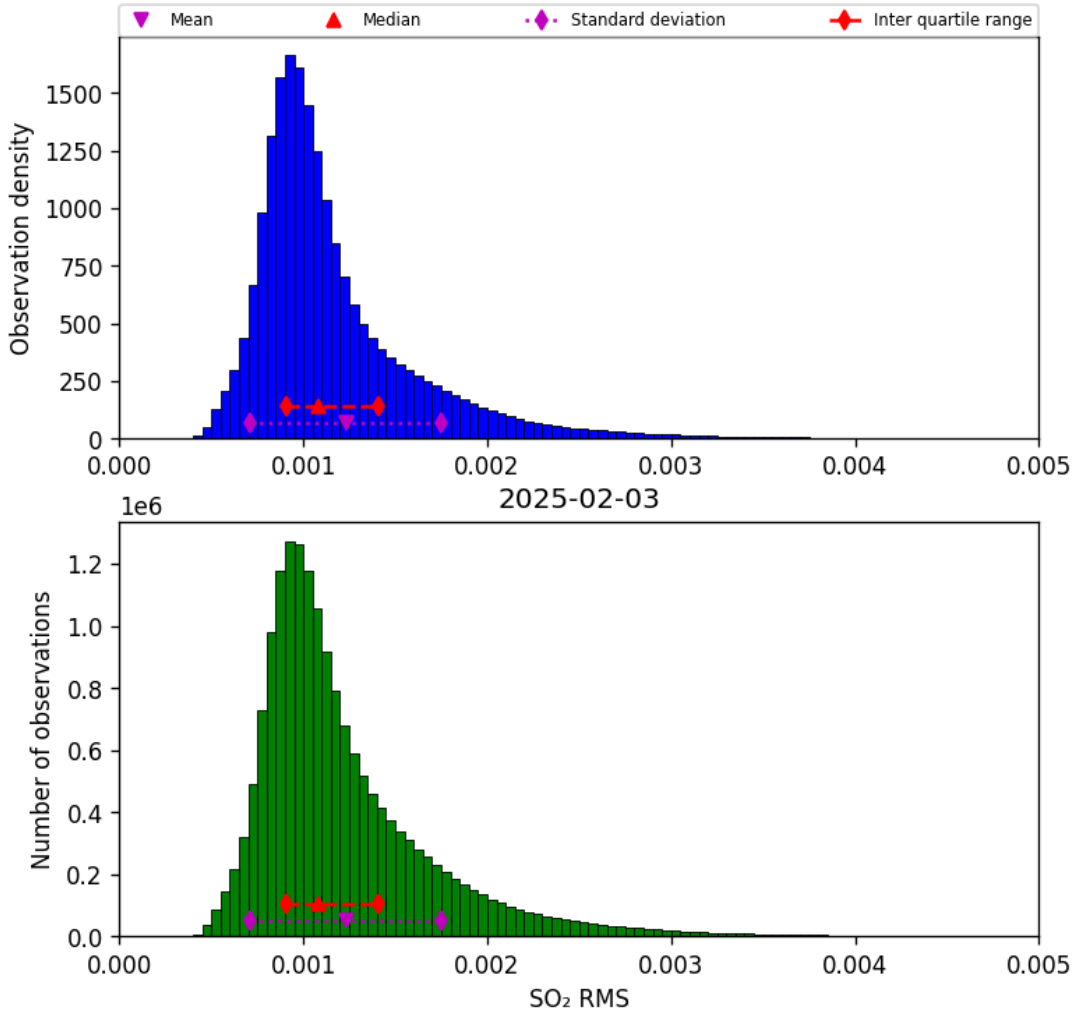


Figure 79: Histogram of "SO_2 RMS" for 2025-02-03 to 2025-02-04

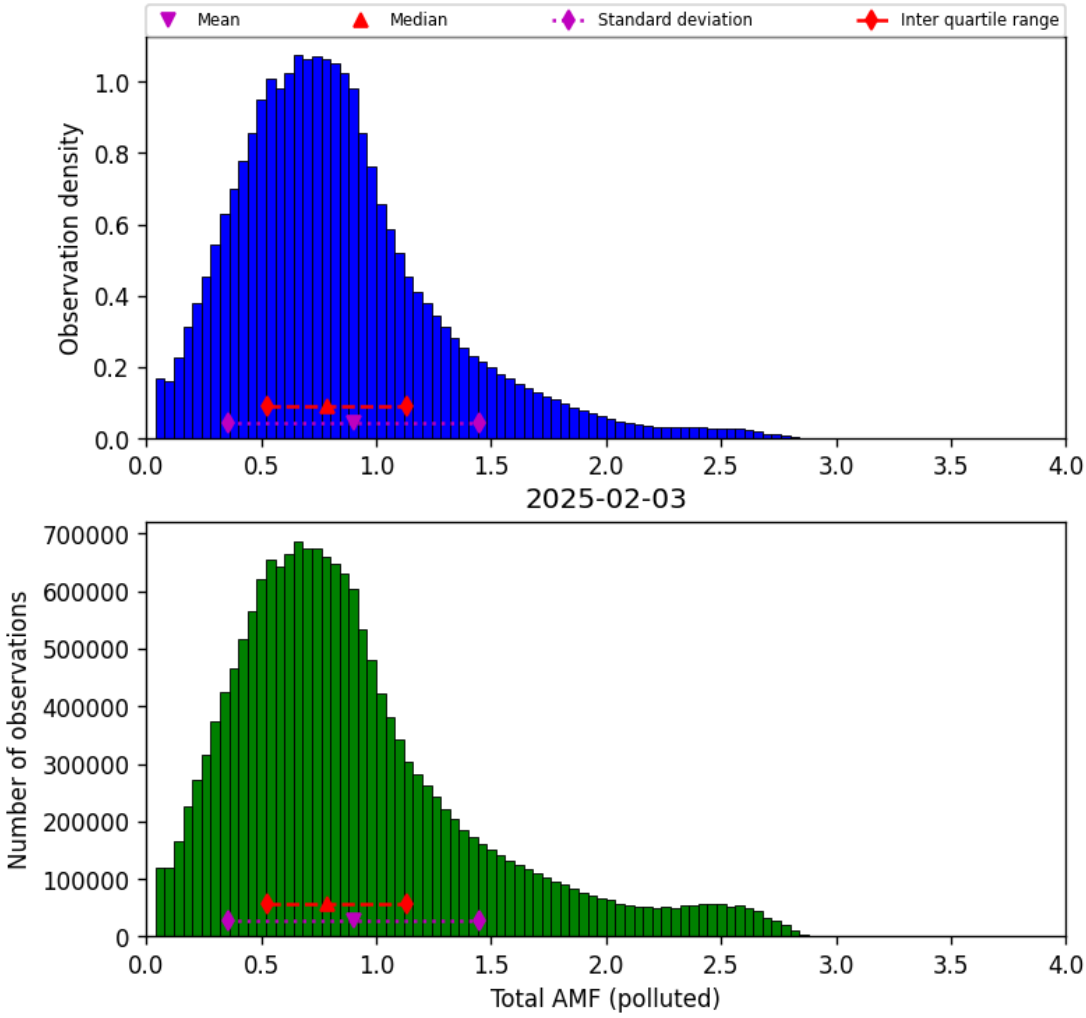


Figure 80: Histogram of “Total AMF (polluted)” for 2025-02-03 to 2025-02-04

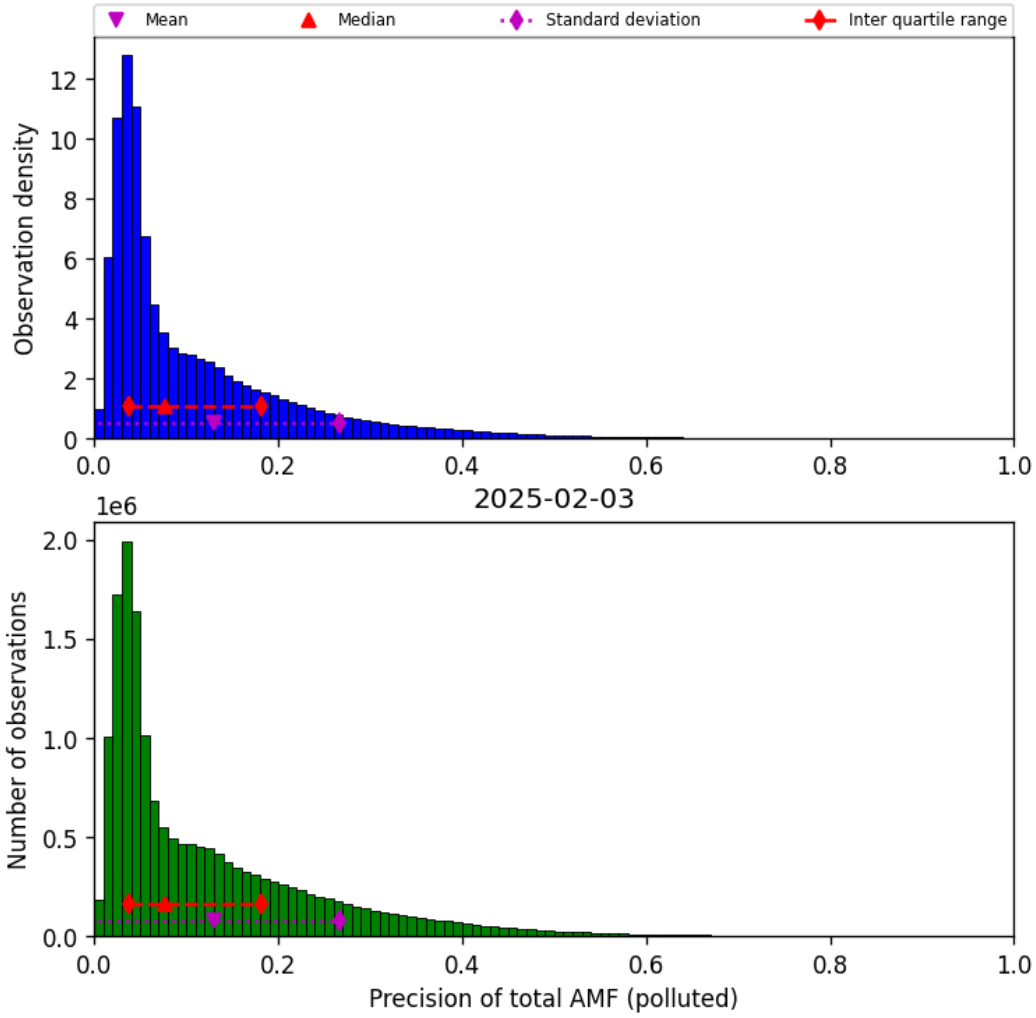


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-02-03 to 2025-02-04

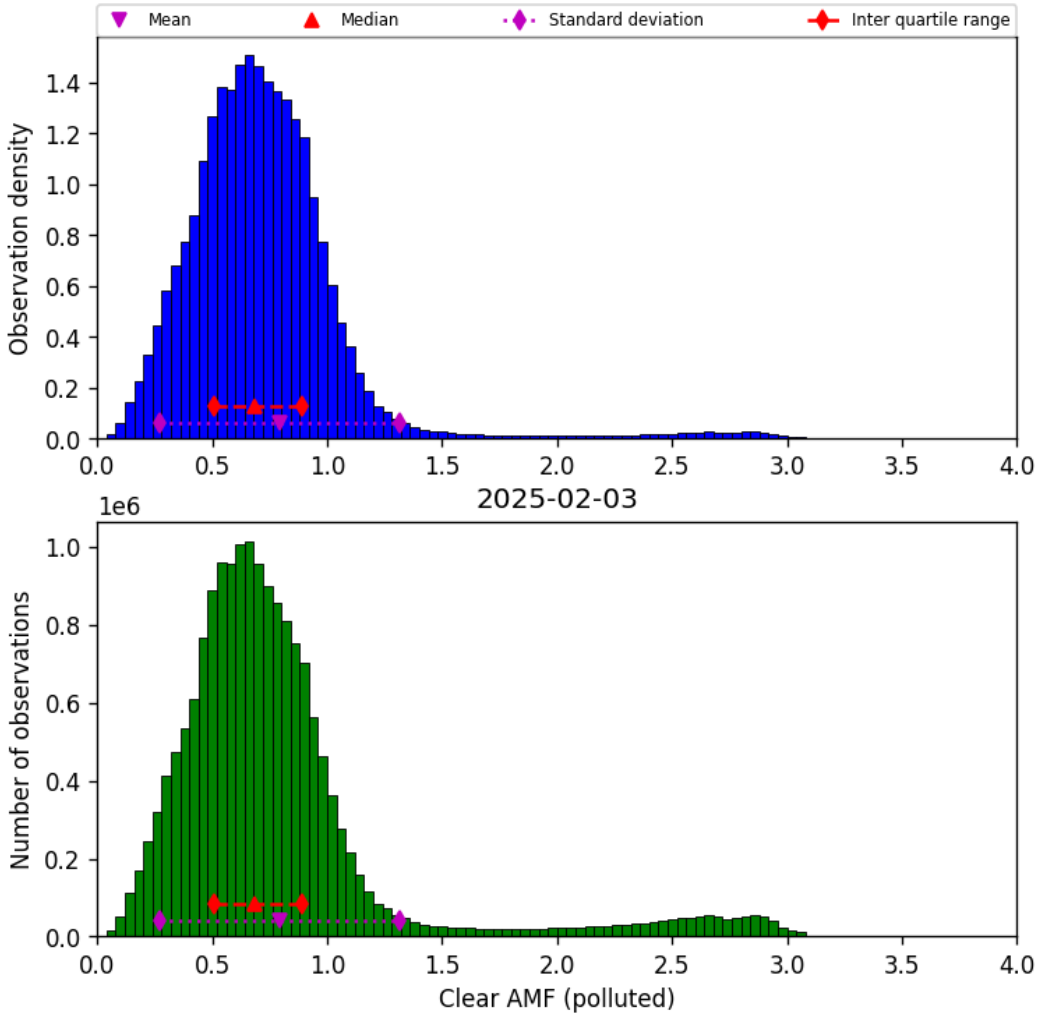


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-02-03 to 2025-02-04

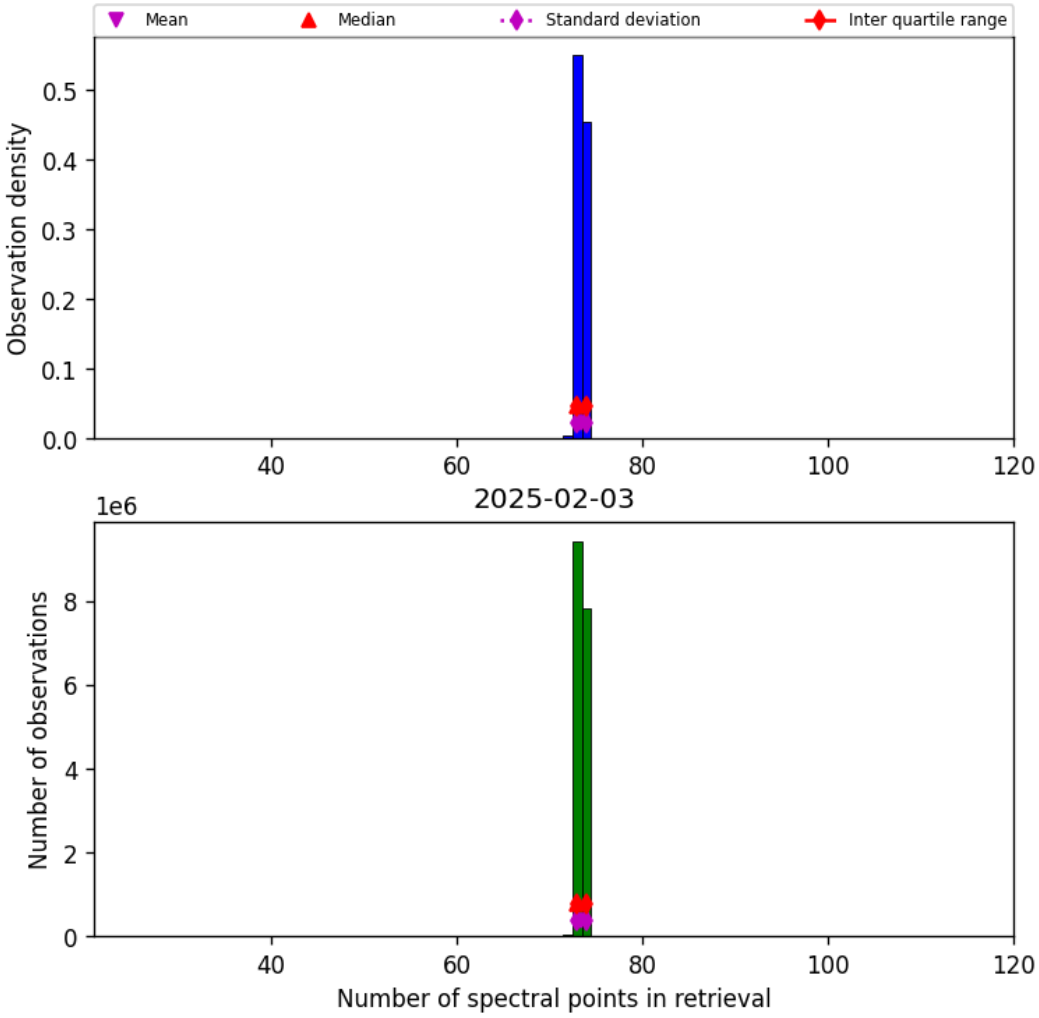


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-02-03 to 2025-02-04

9 Along track statistics

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

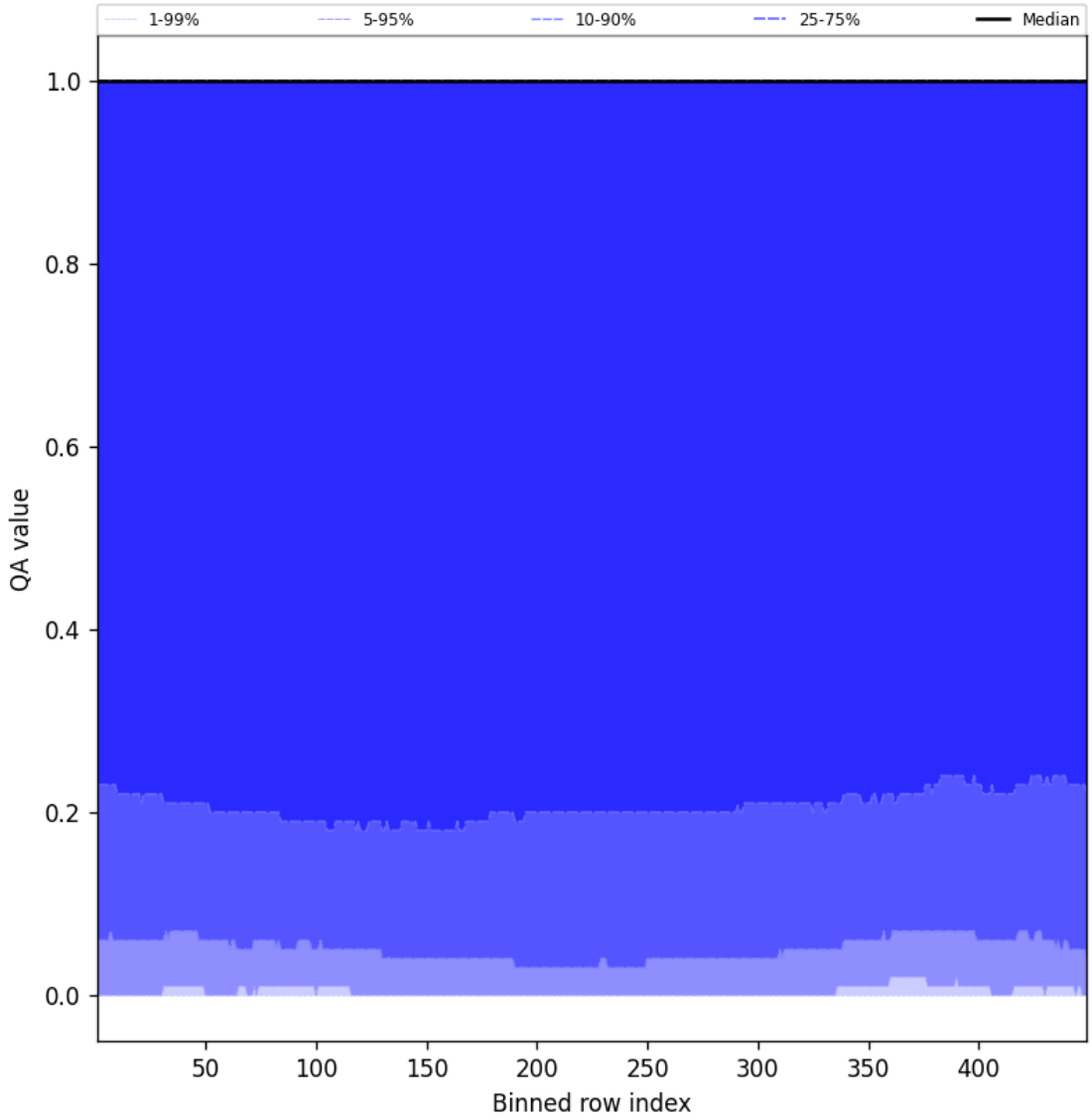


Figure 84: Along track statistics of “QA value” for 2025-02-03 to 2025-02-04

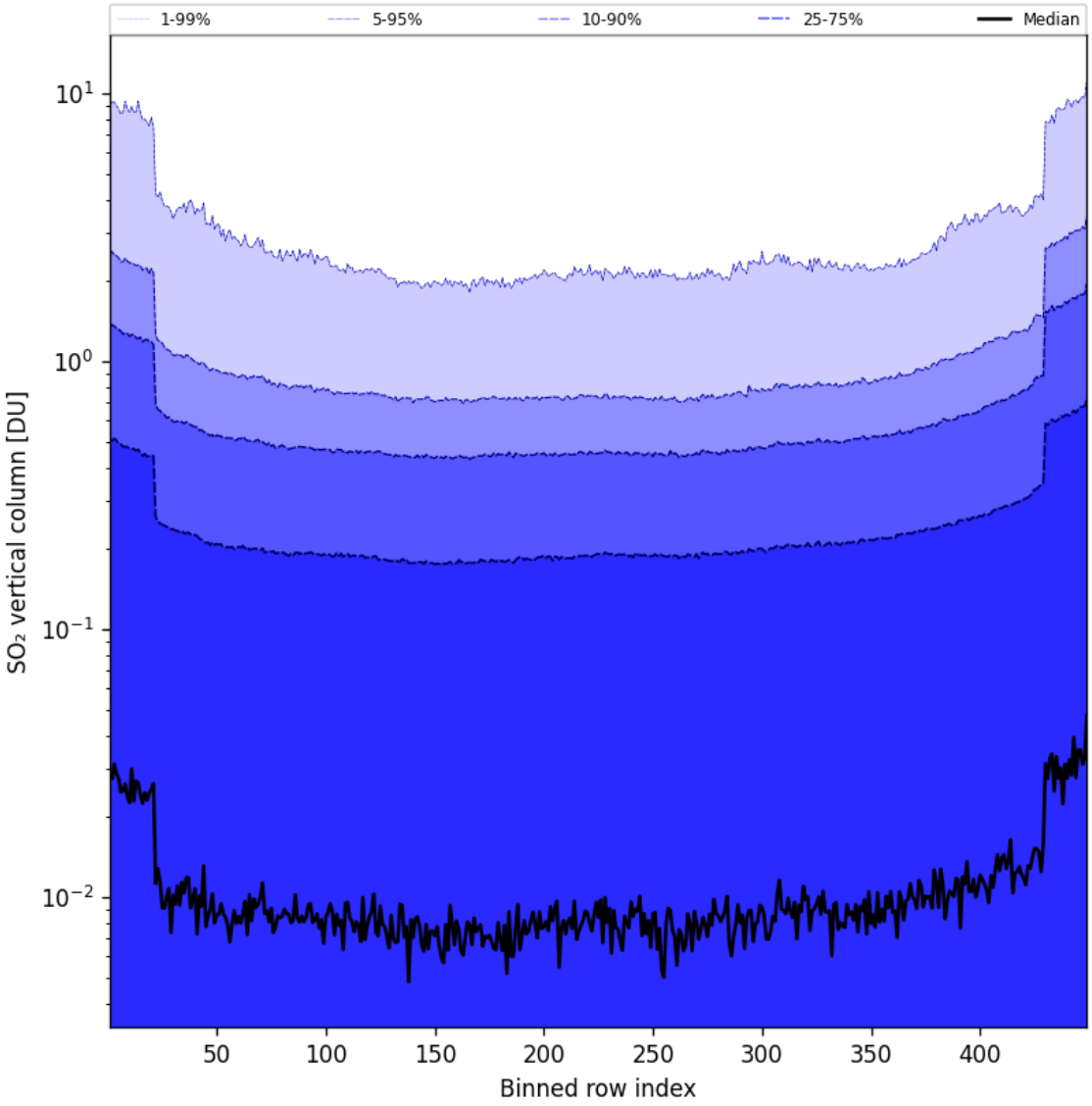


Figure 85: Along track statistics of "SO_2 vertical column" for 2025-02-03 to 2025-02-04

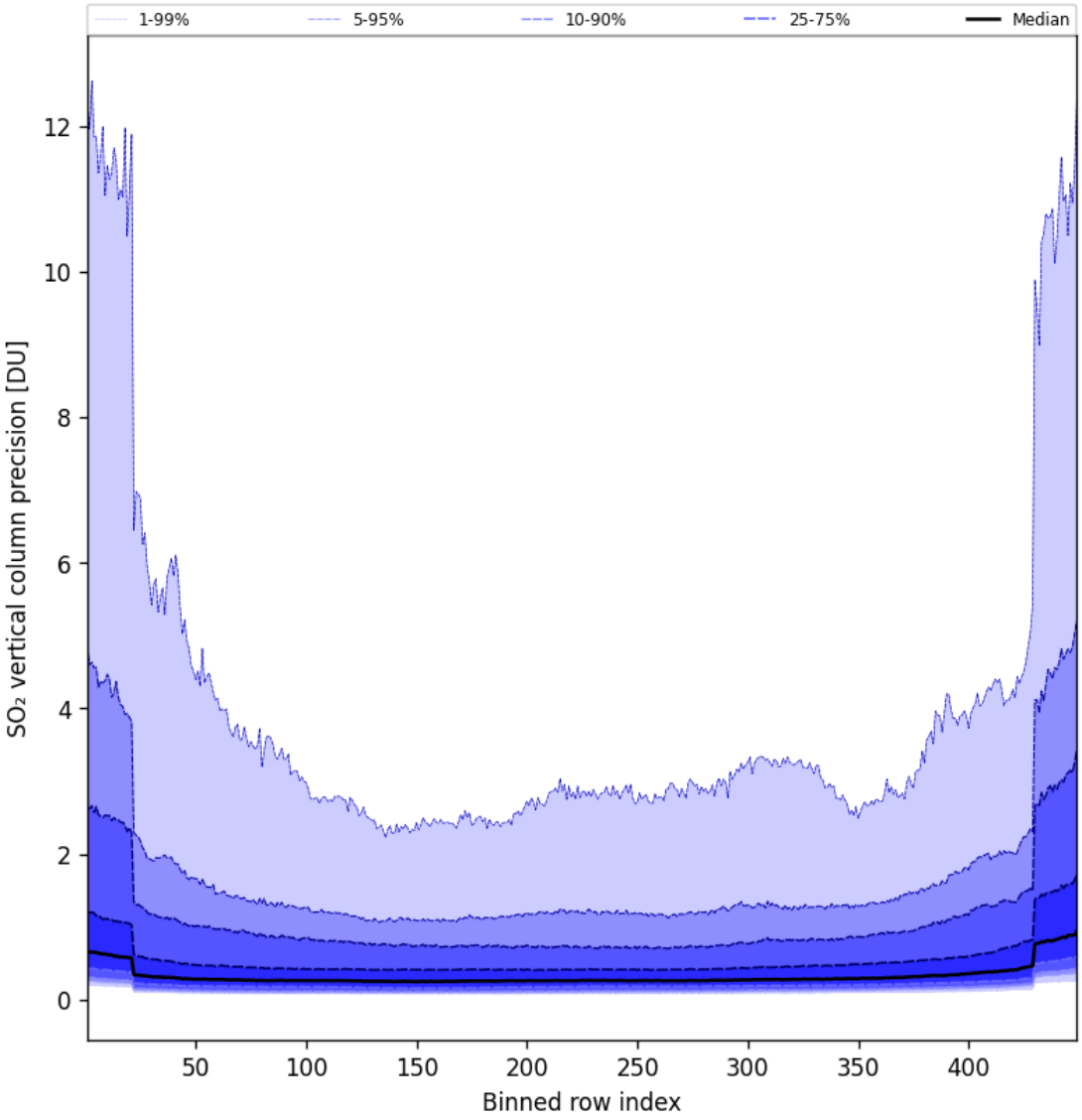


Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-02-03 to 2025-02-04

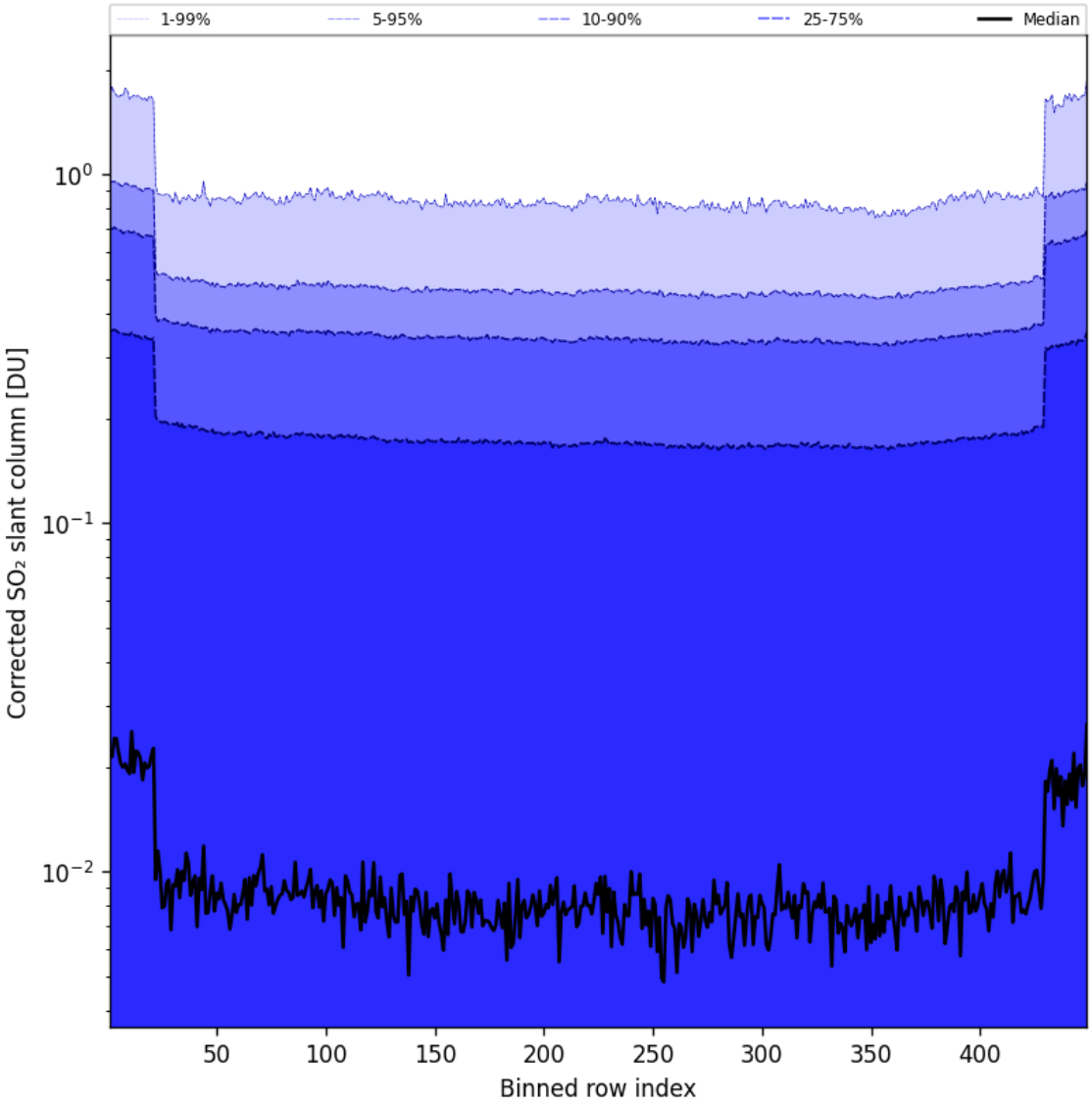


Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-02-03 to 2025-02-04

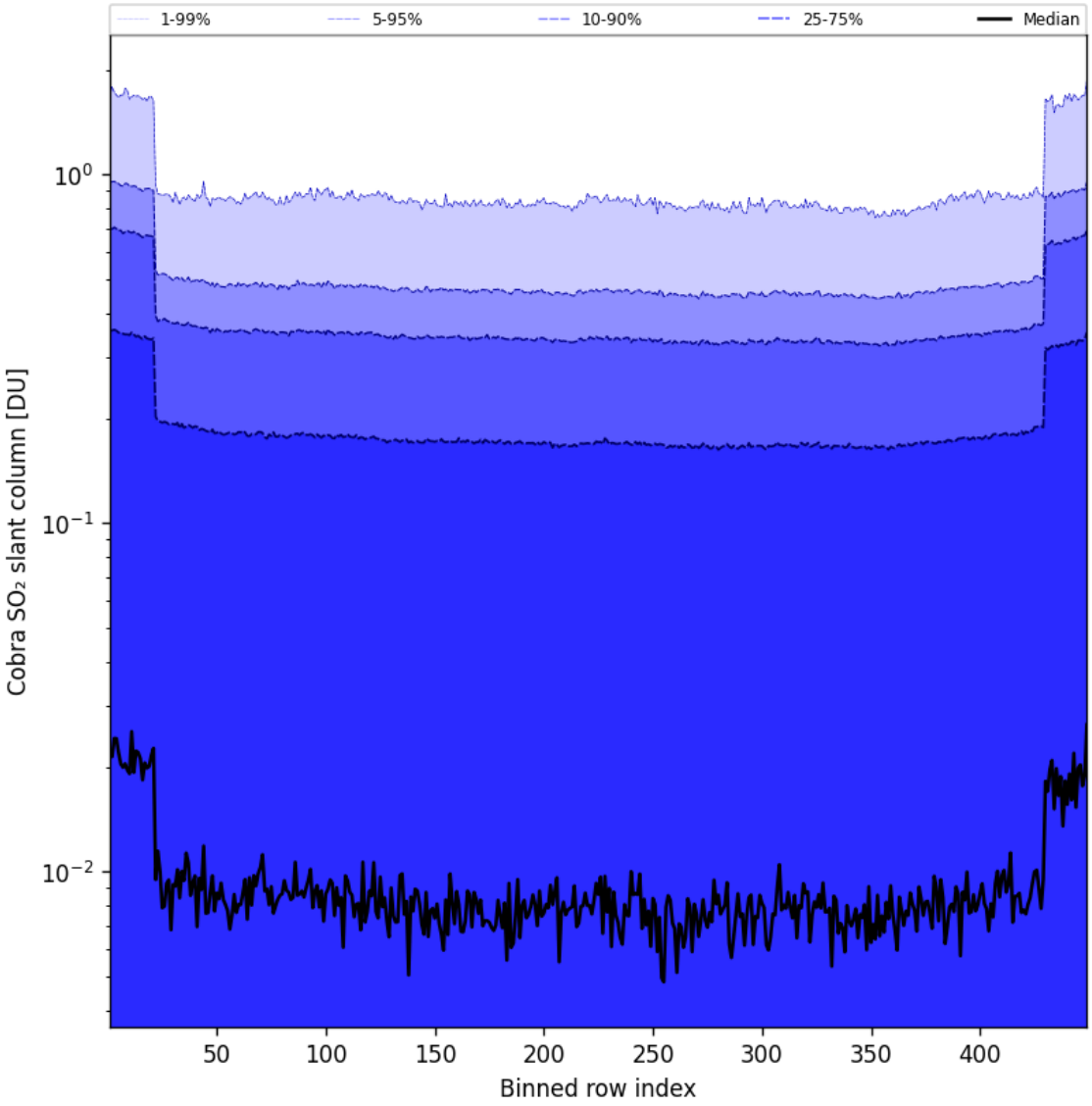


Figure 88: Along track statistics of "Cobra SO_2 slant column" for 2025-02-03 to 2025-02-04

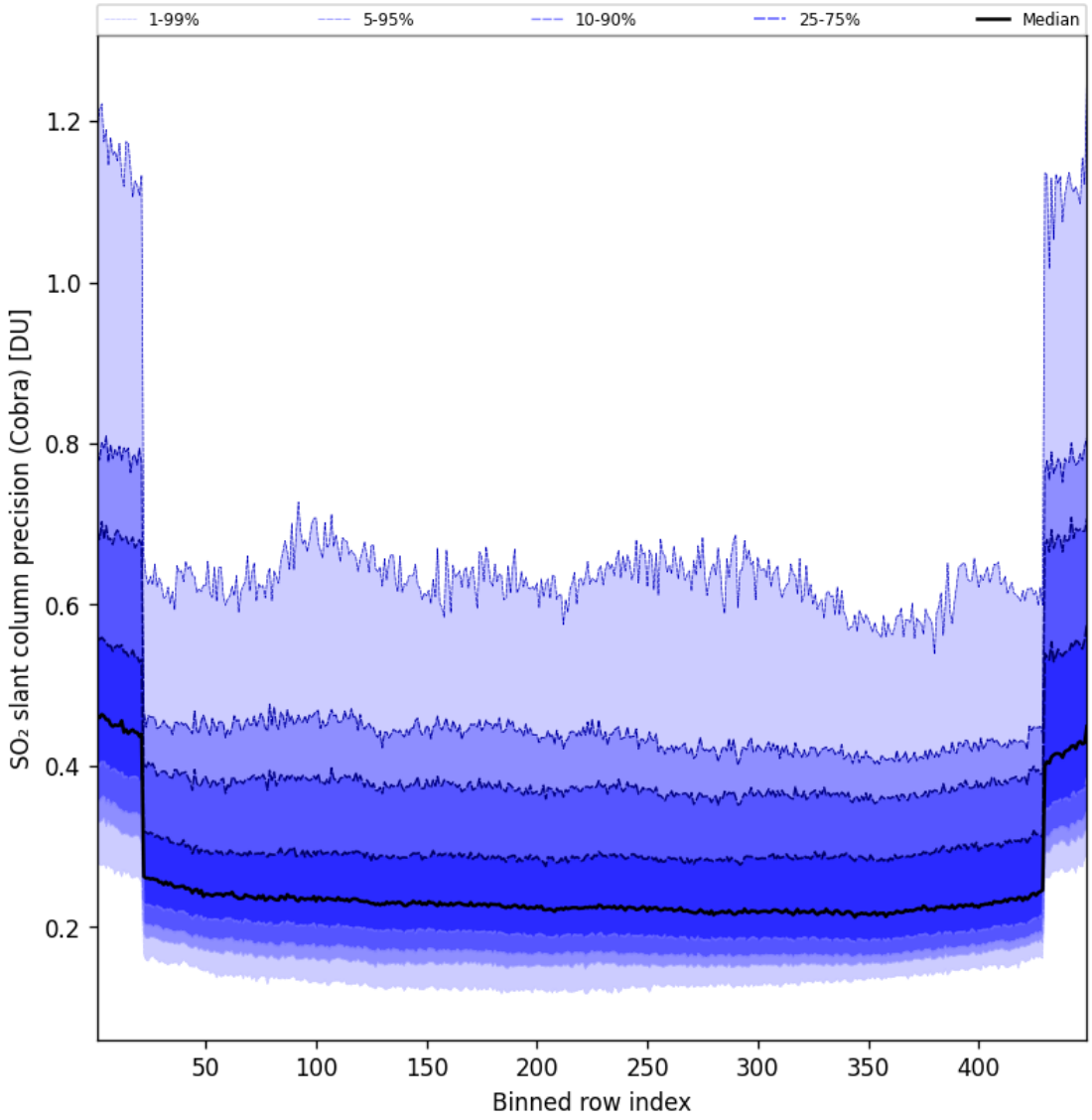


Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-02-03 to 2025-02-04

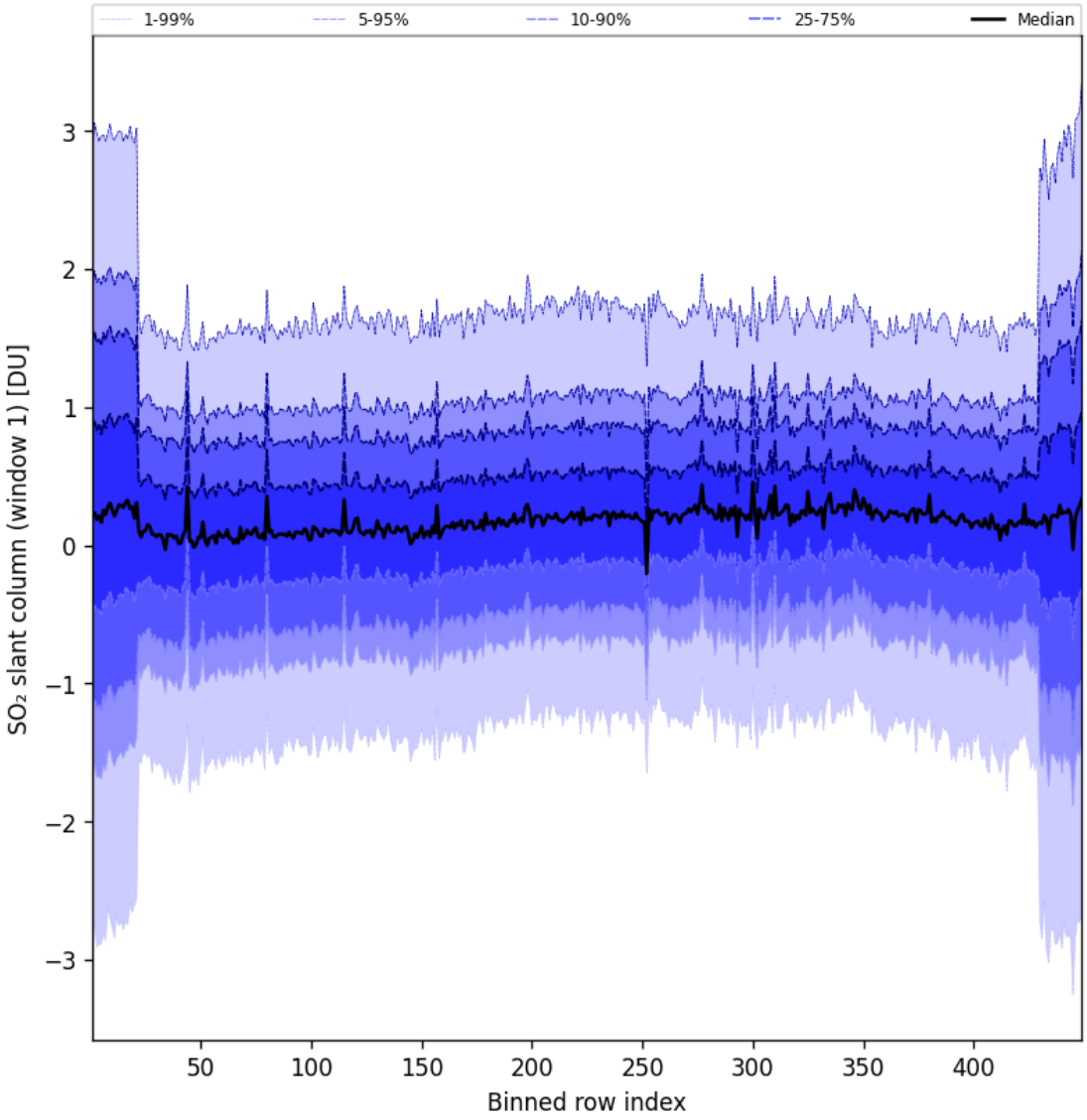


Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-02-03 to 2025-02-04

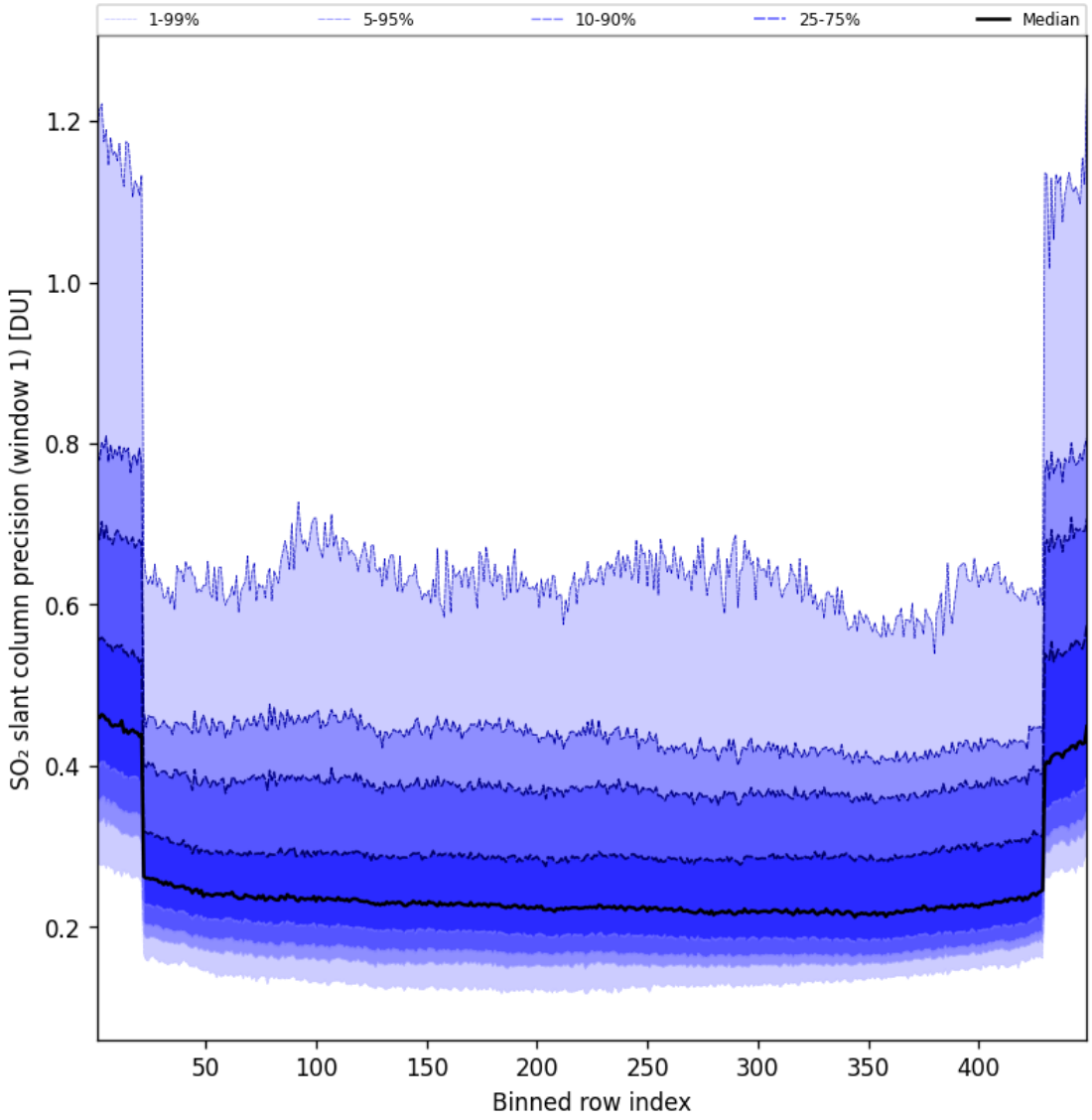


Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-02-03 to 2025-02-04

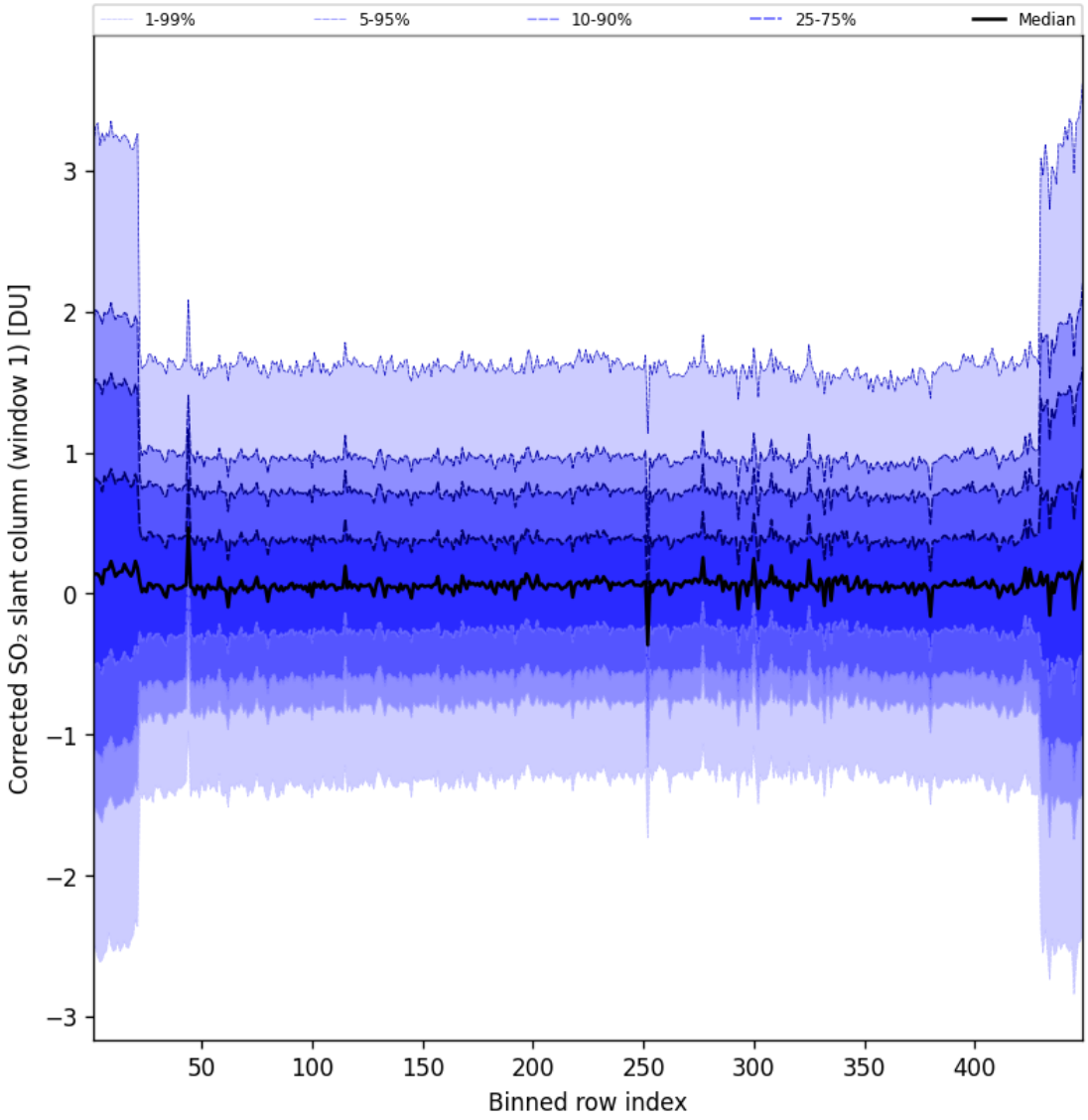


Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-02-03 to 2025-02-04

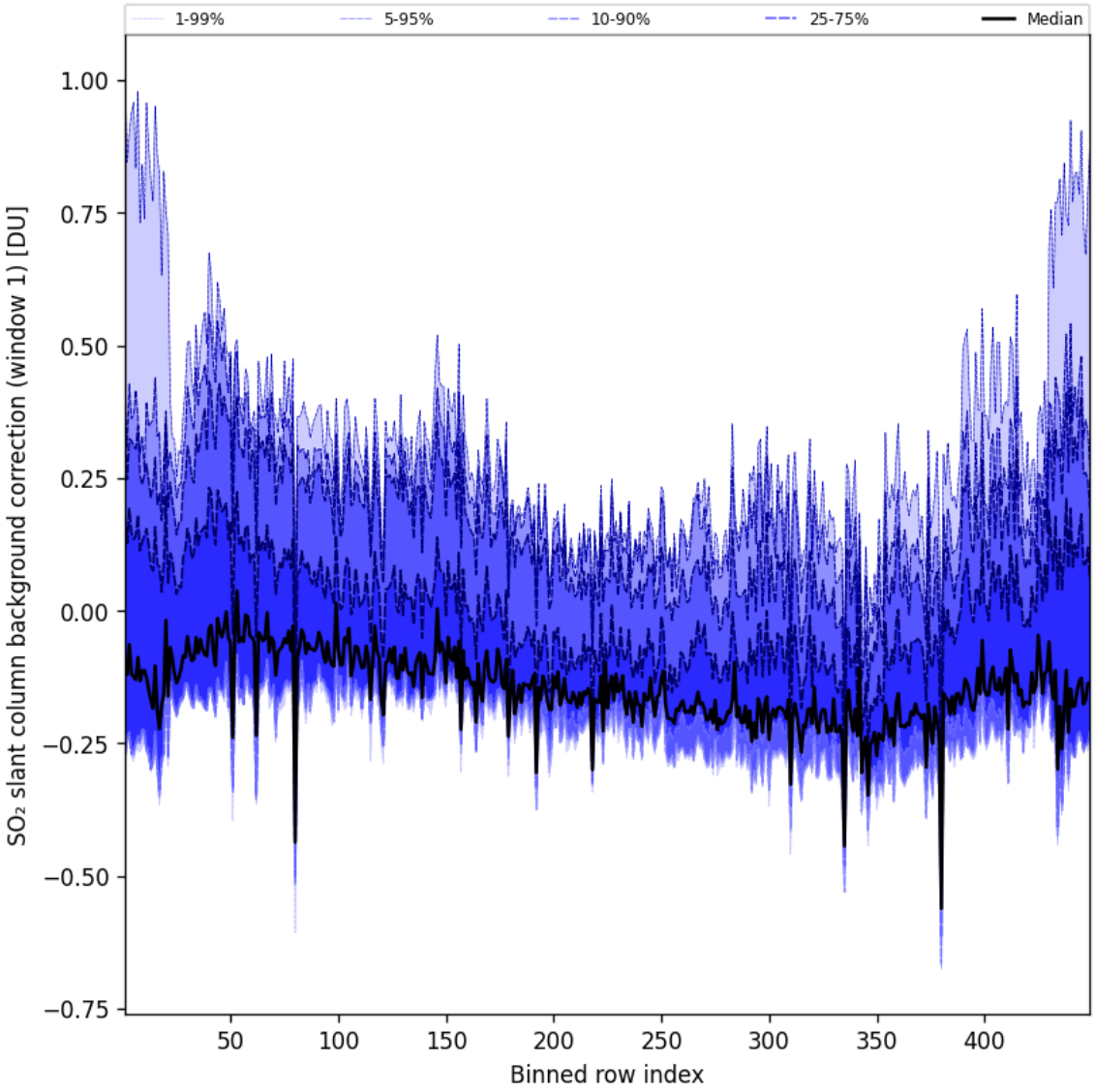


Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-02-03 to 2025-02-04

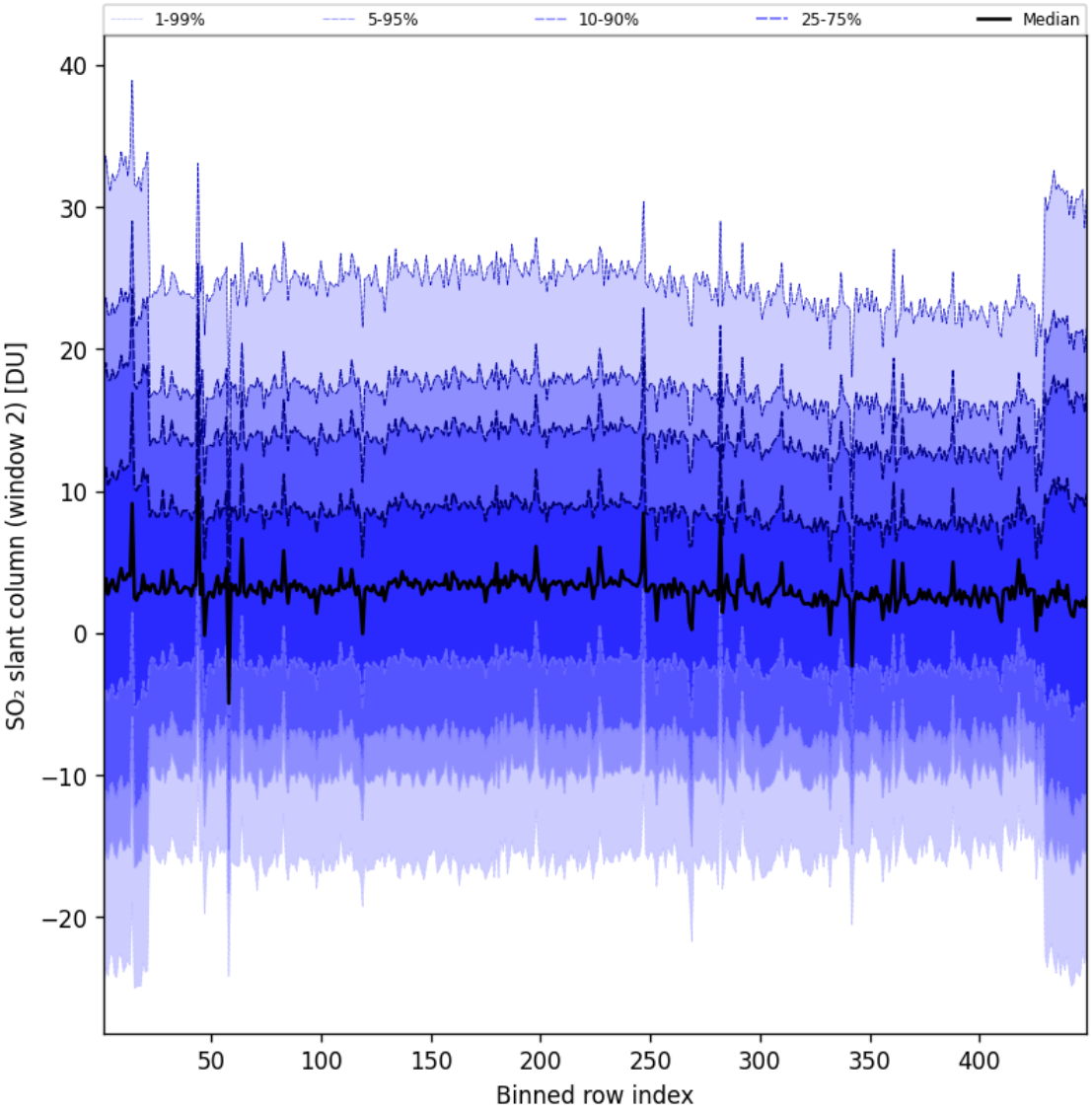


Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-02-03 to 2025-02-04

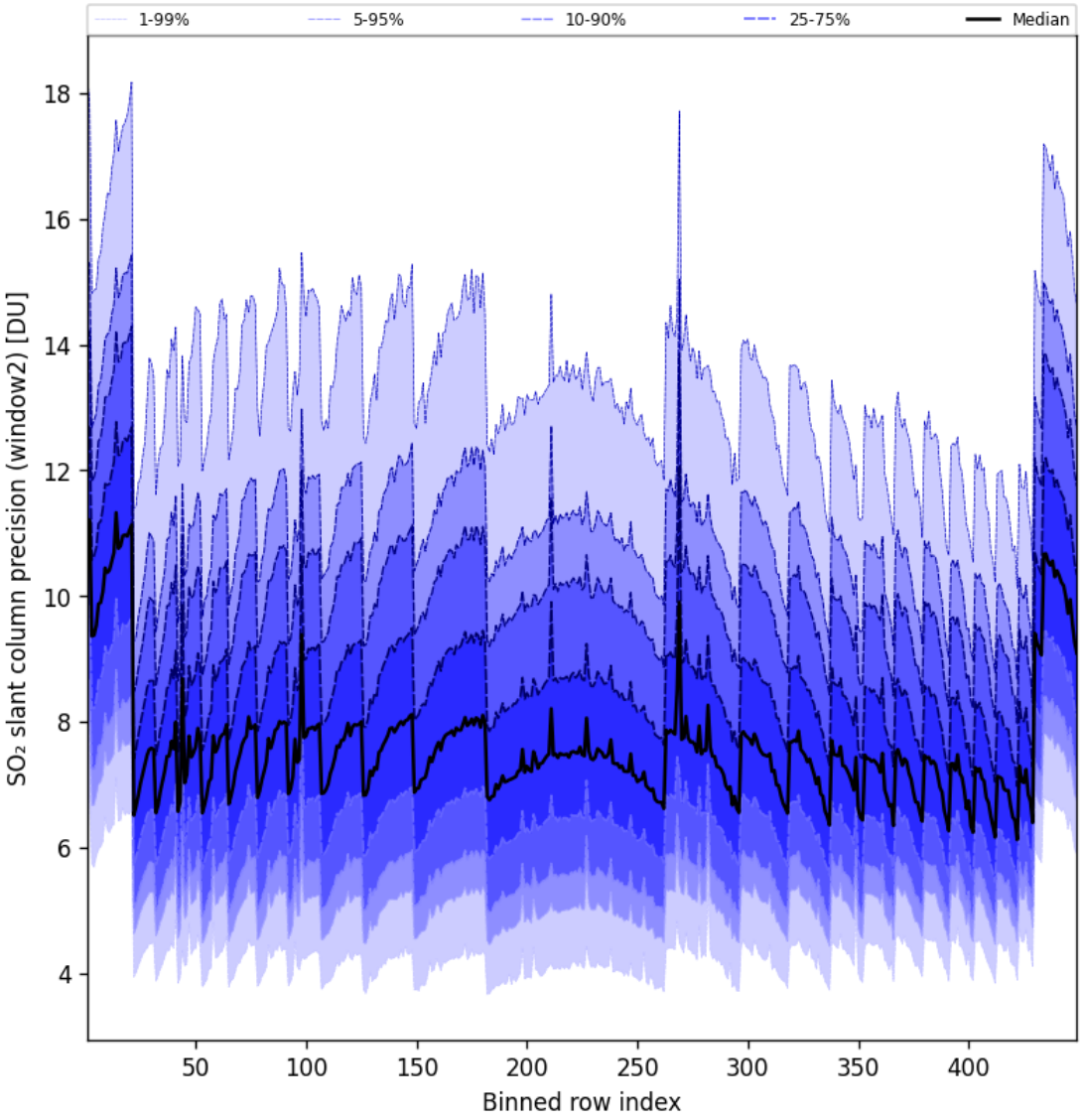


Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-02-03 to 2025-02-04

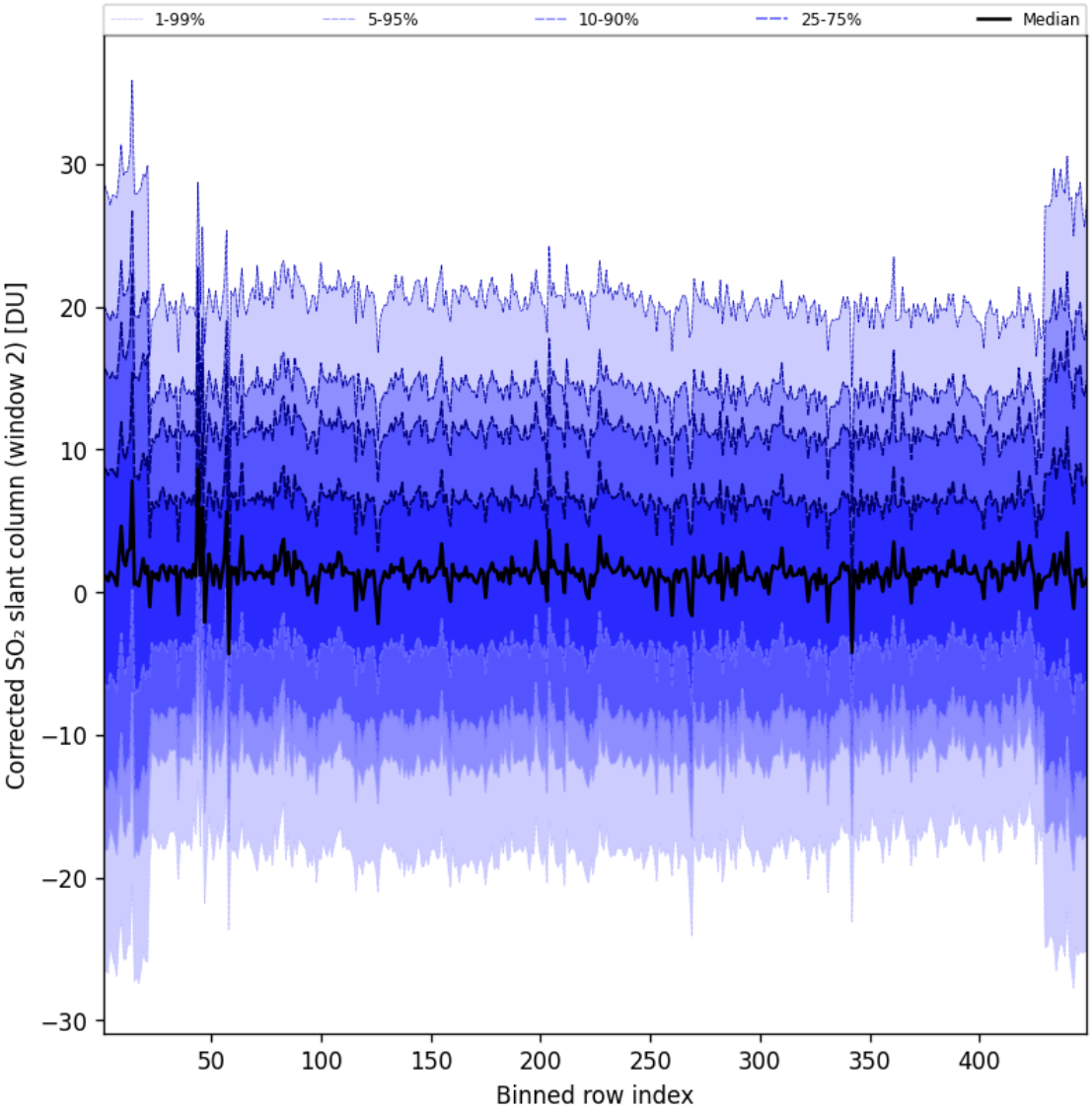


Figure 96: Along track statistics of “Corrected SO_2 slant column (window 2)” for 2025-02-03 to 2025-02-04

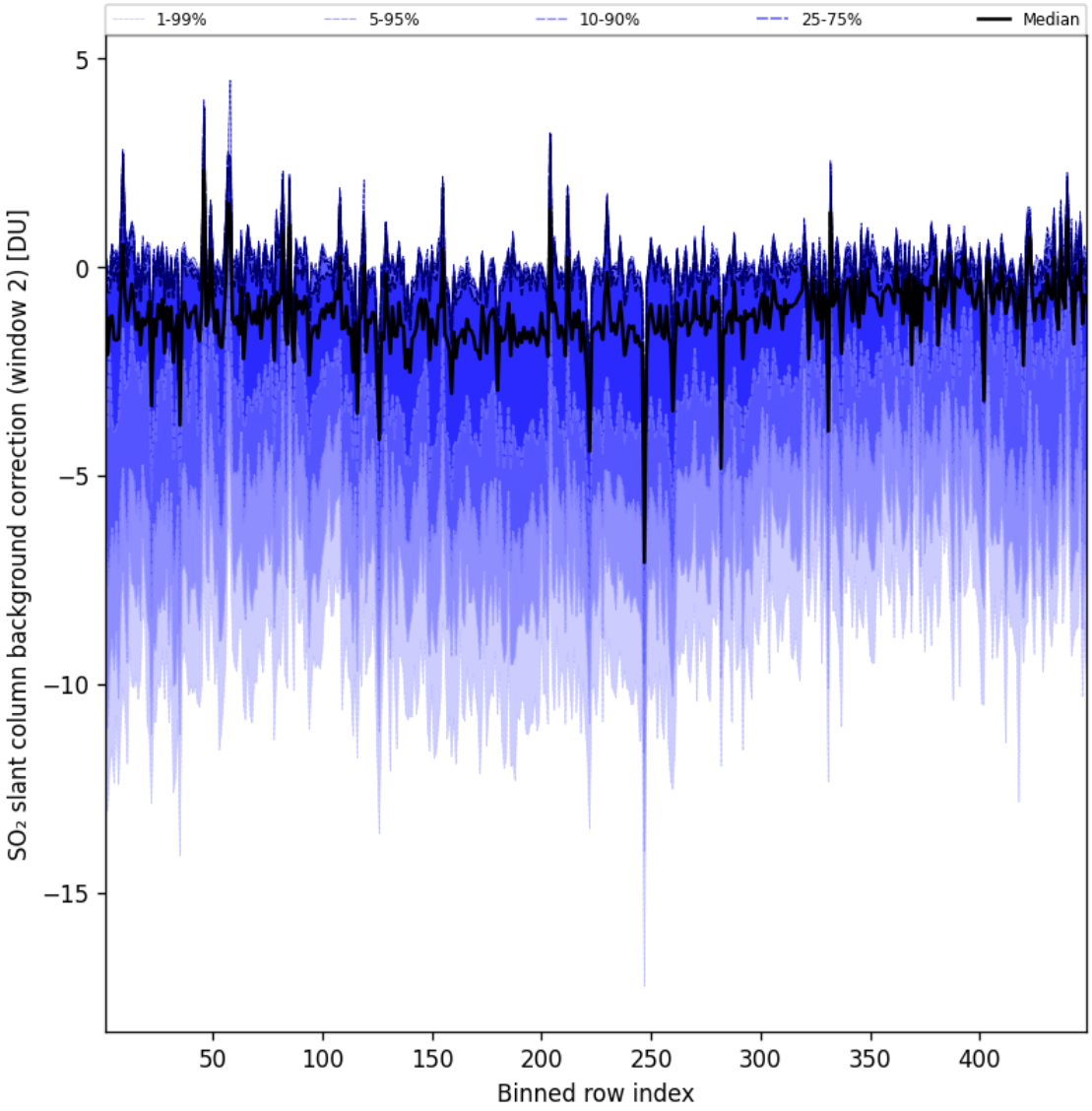


Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-02-03 to 2025-02-04

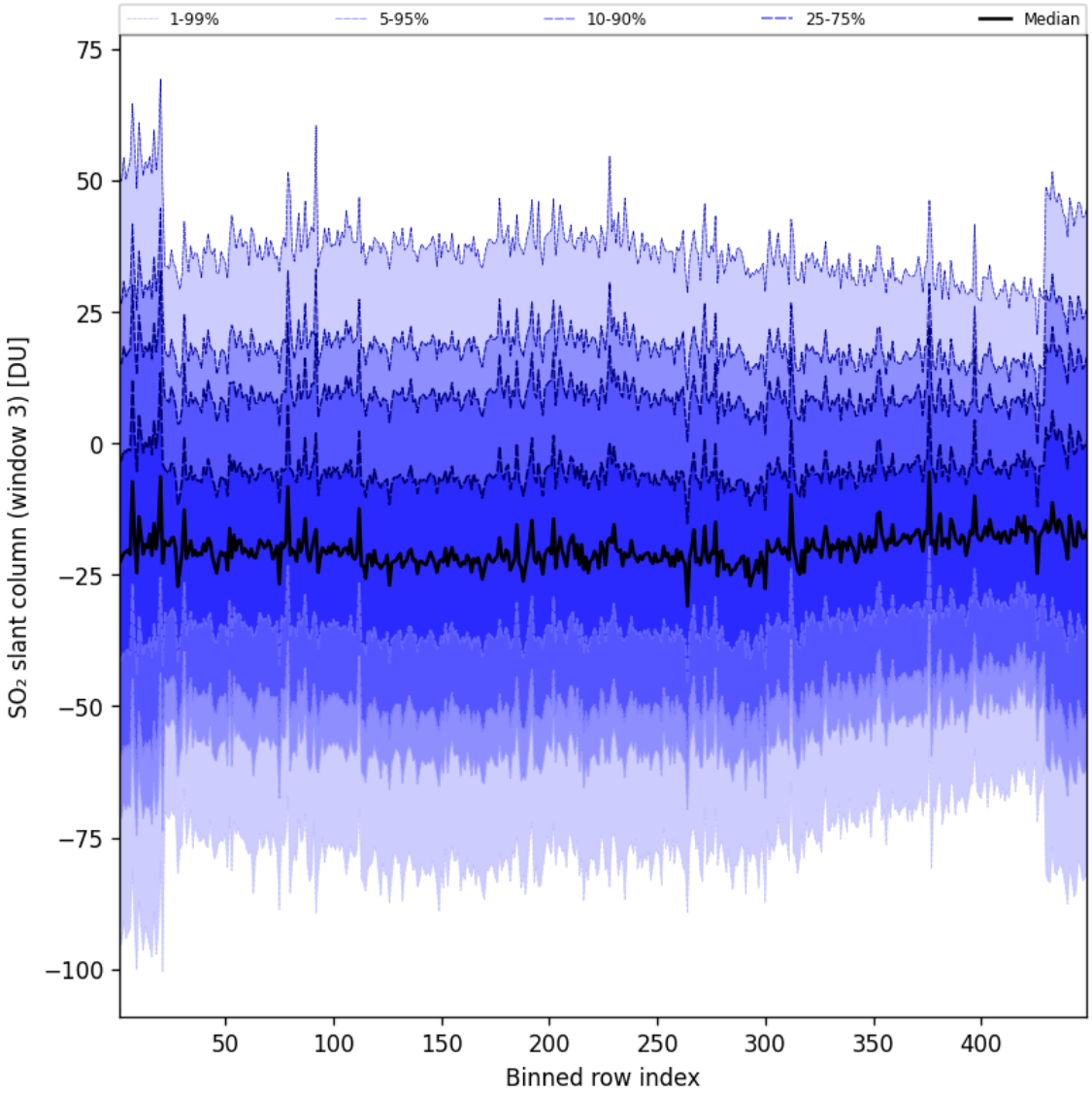


Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-02-03 to 2025-02-04

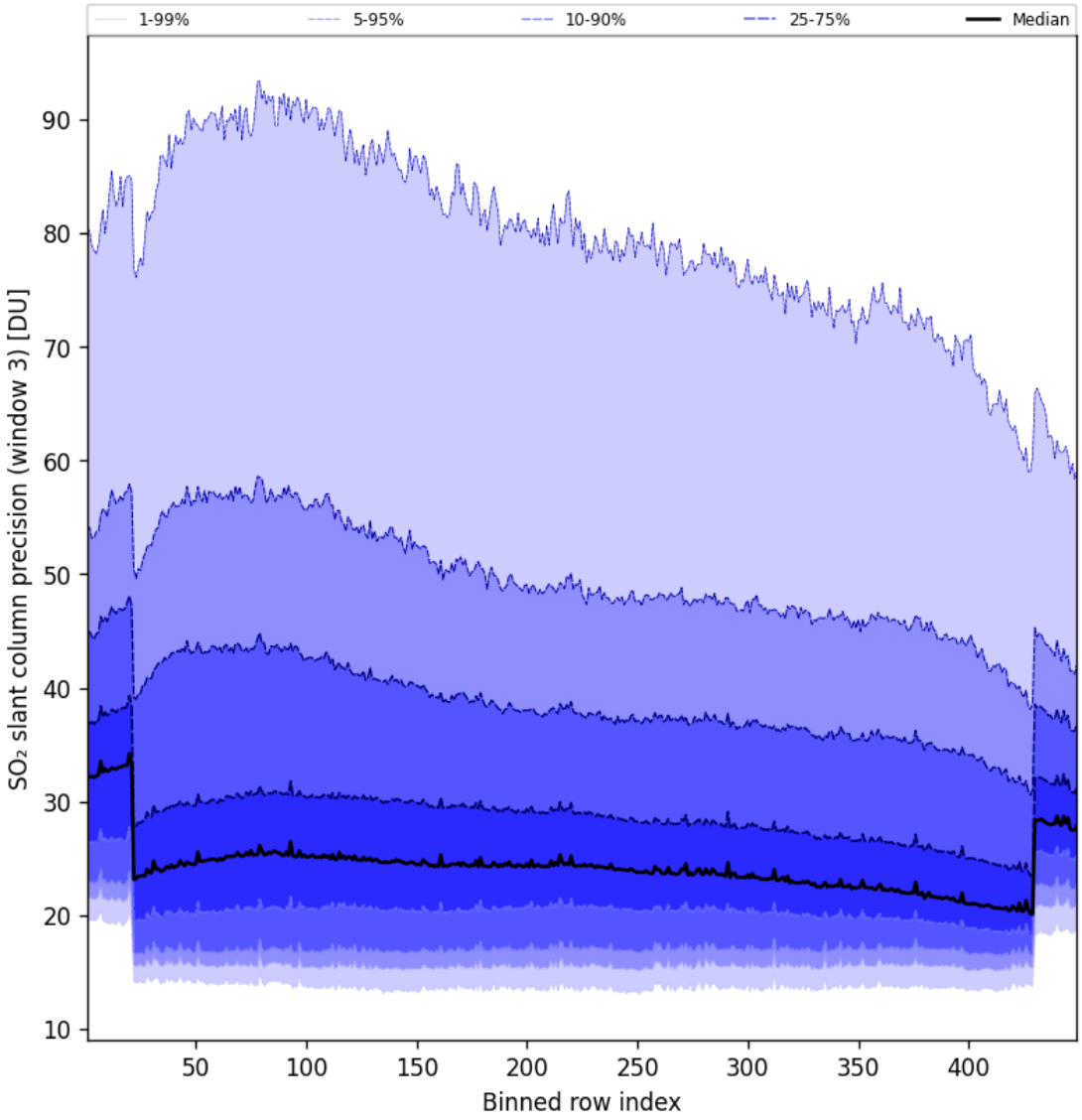
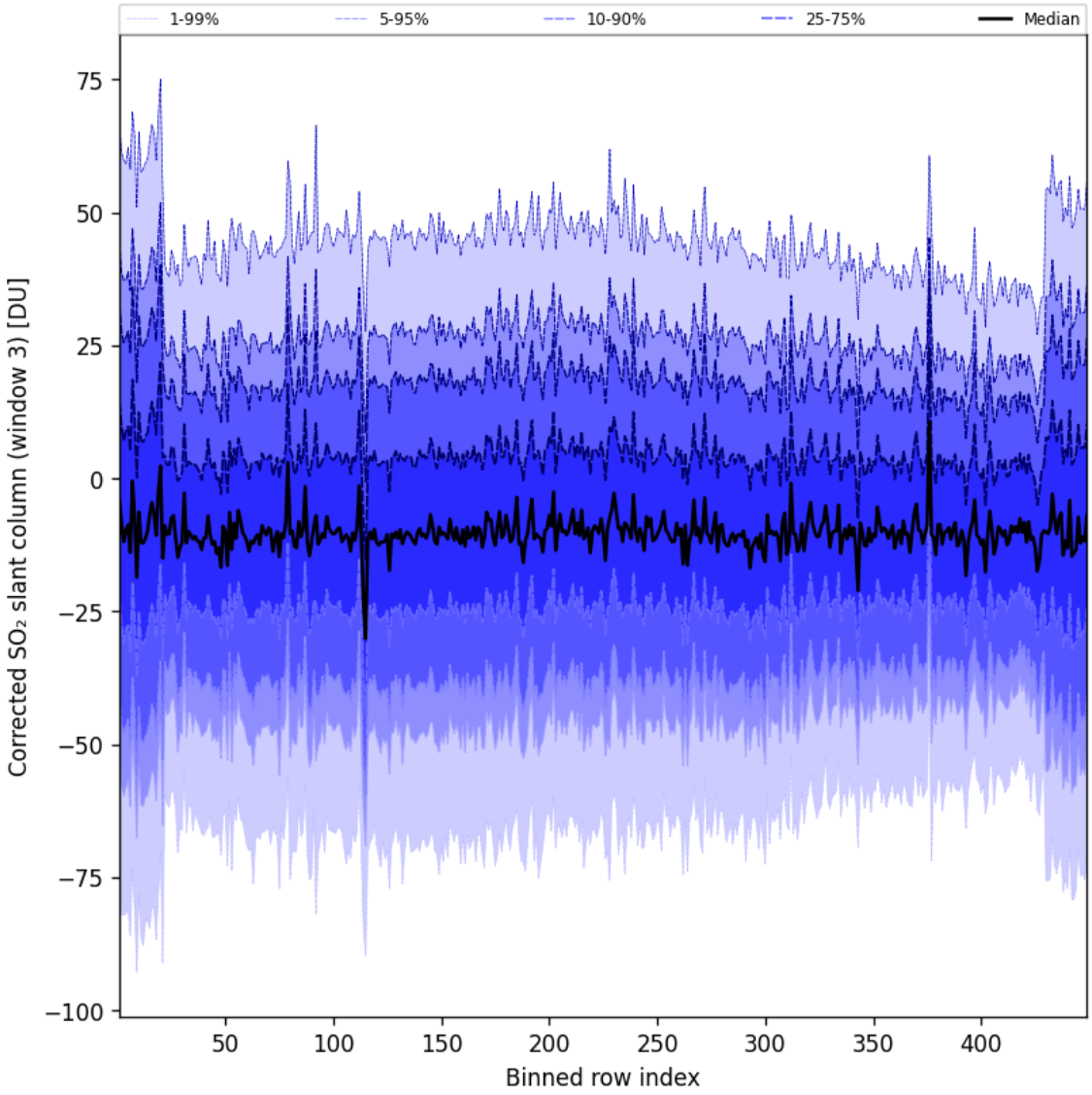


Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-02-03 to 2025-02-04



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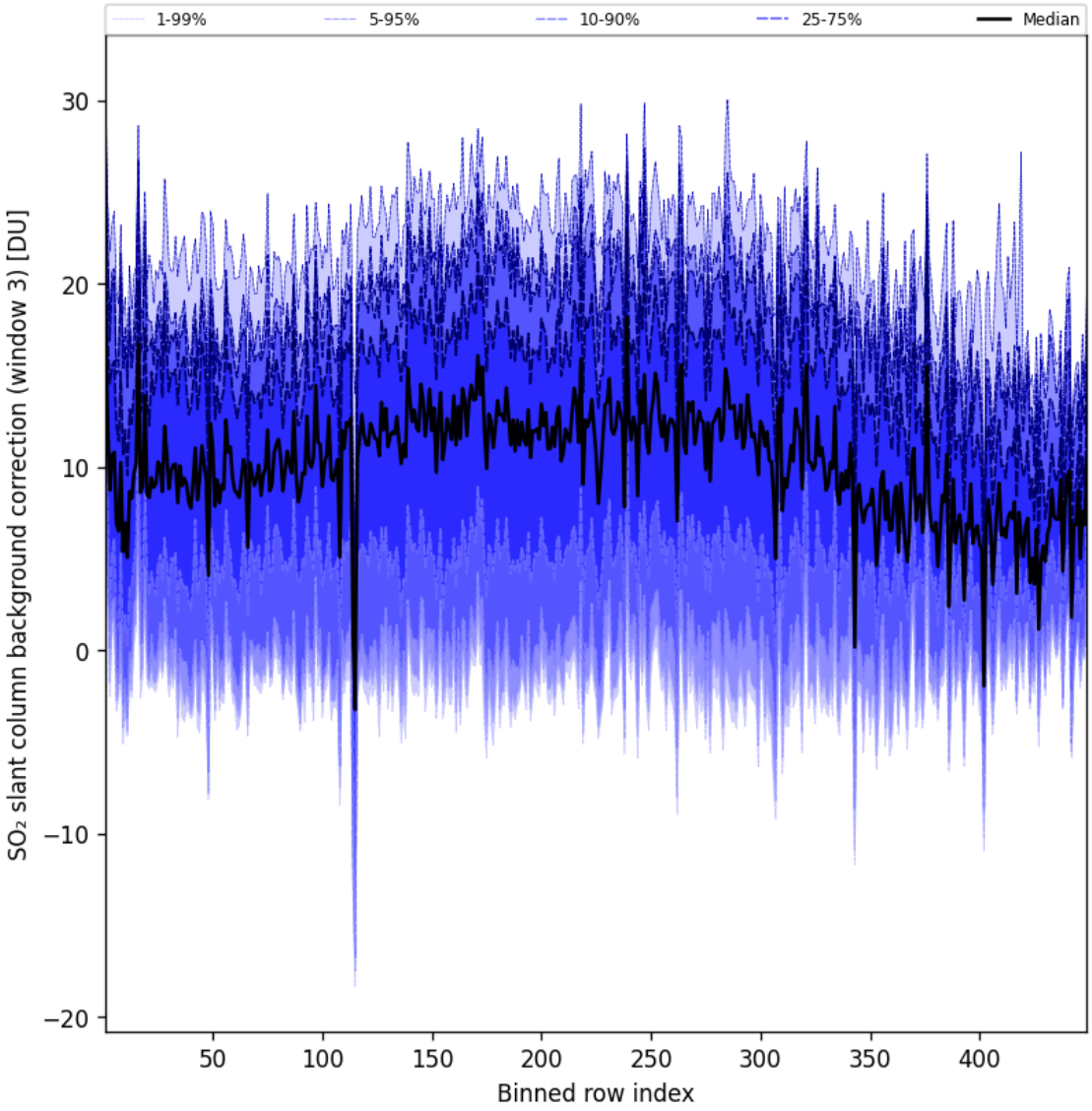

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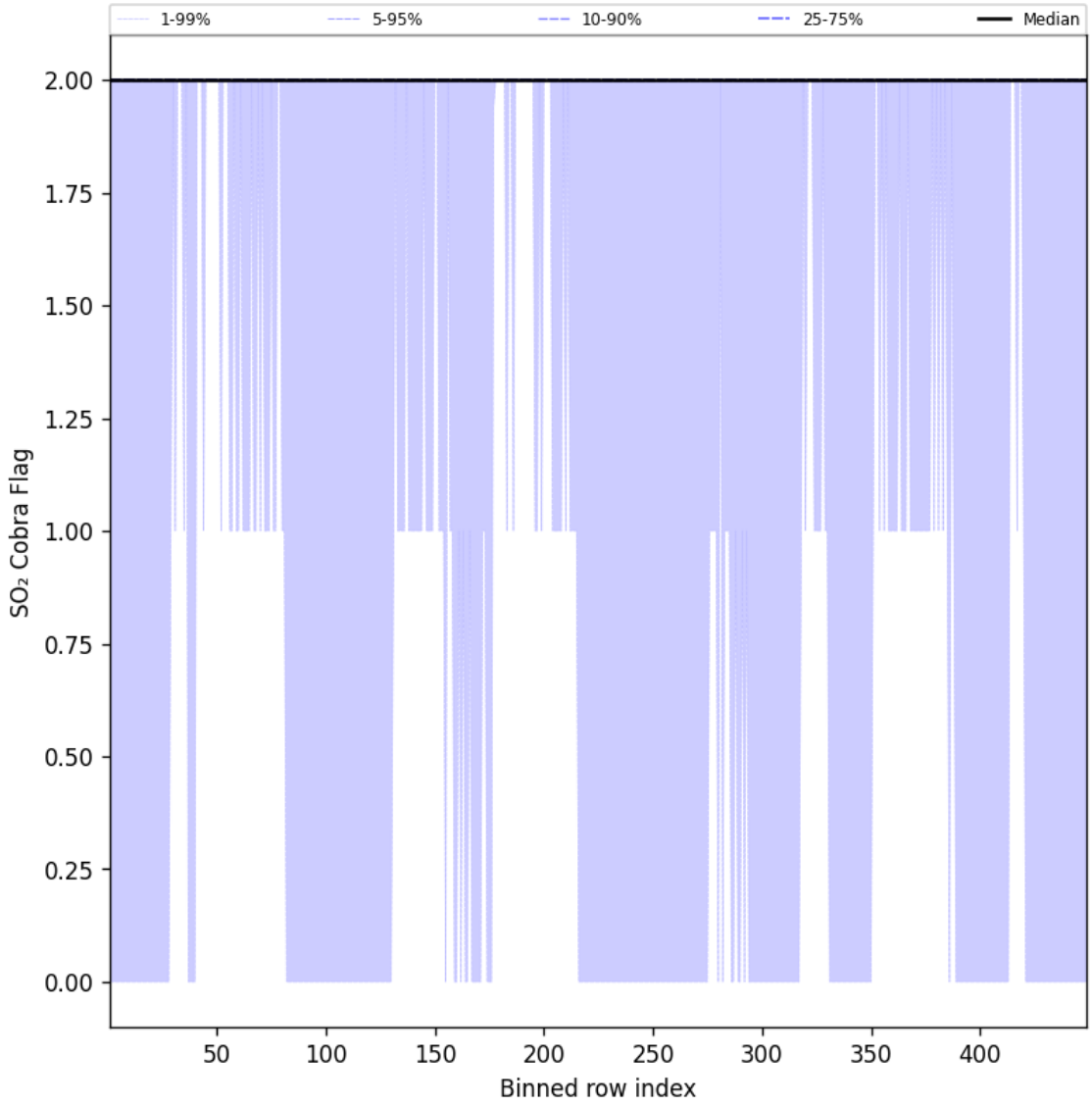

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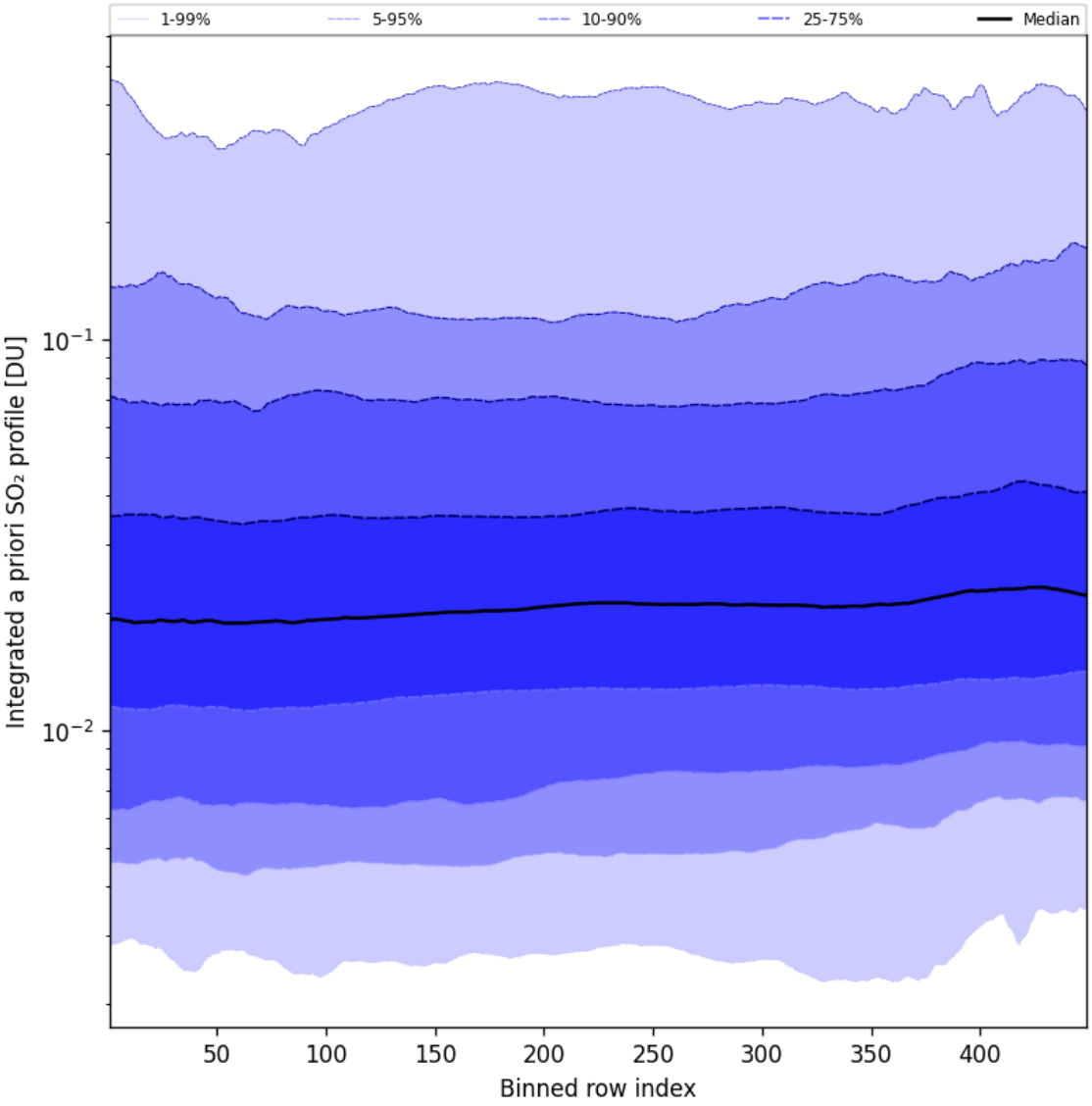

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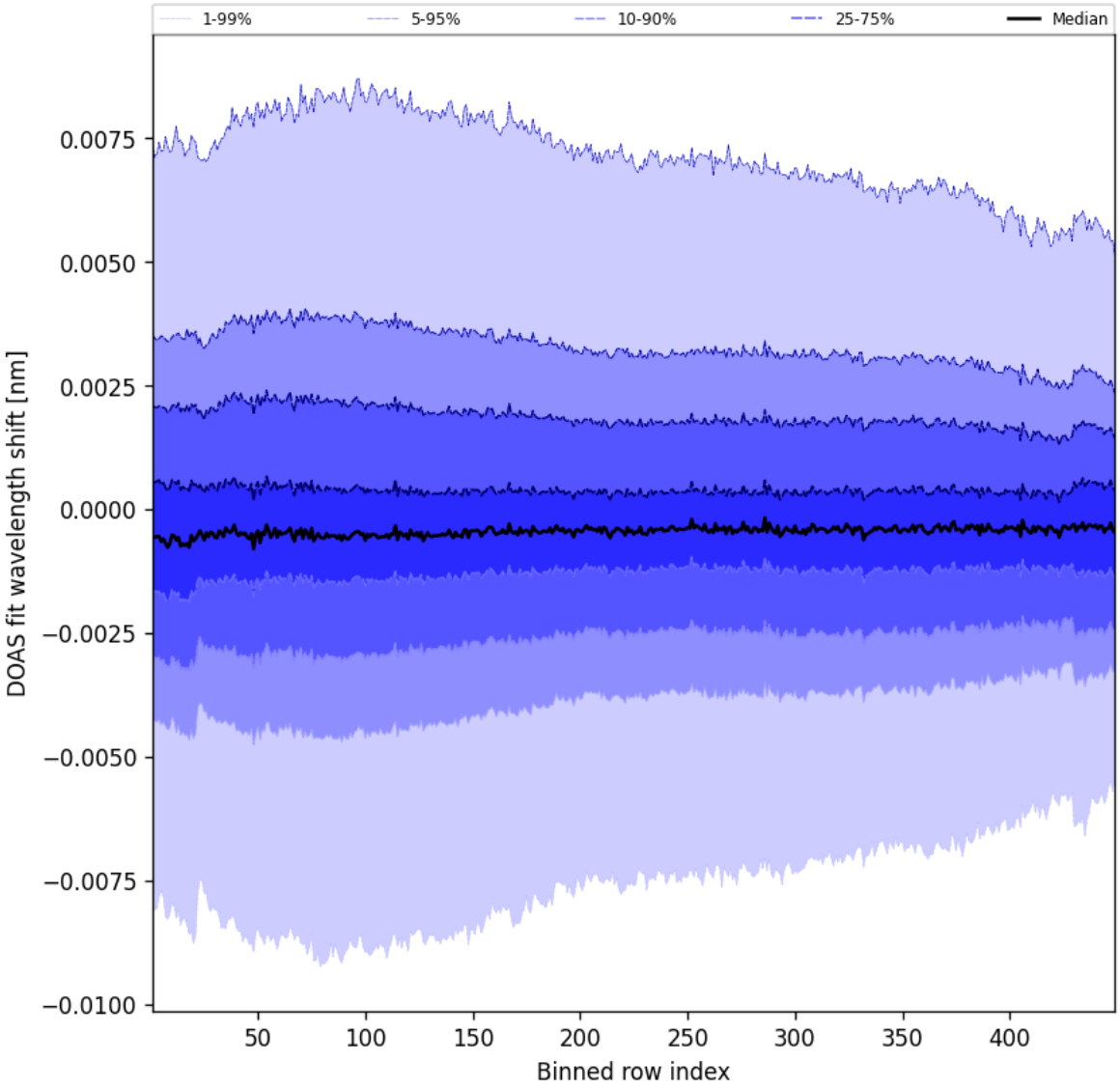

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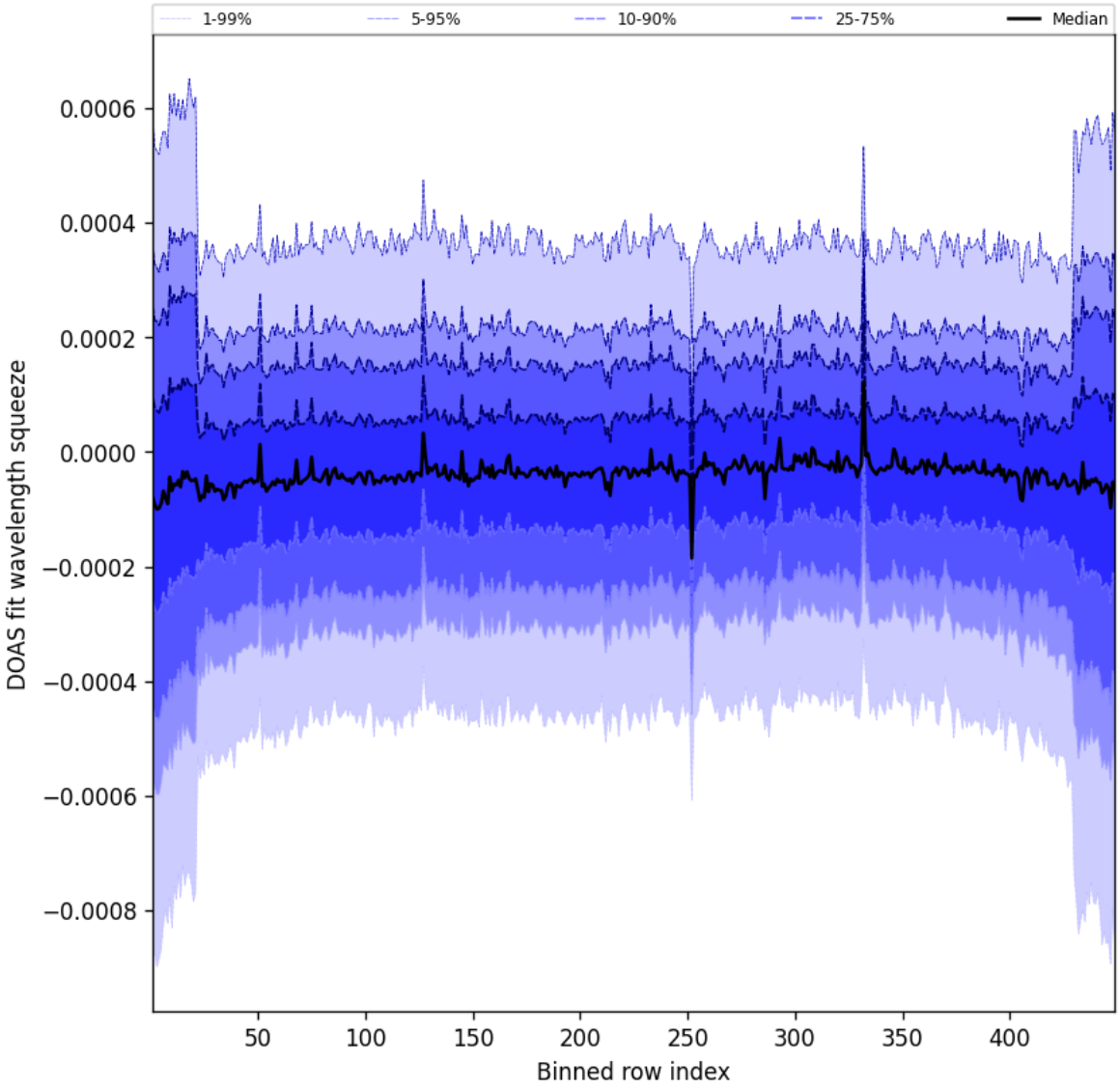

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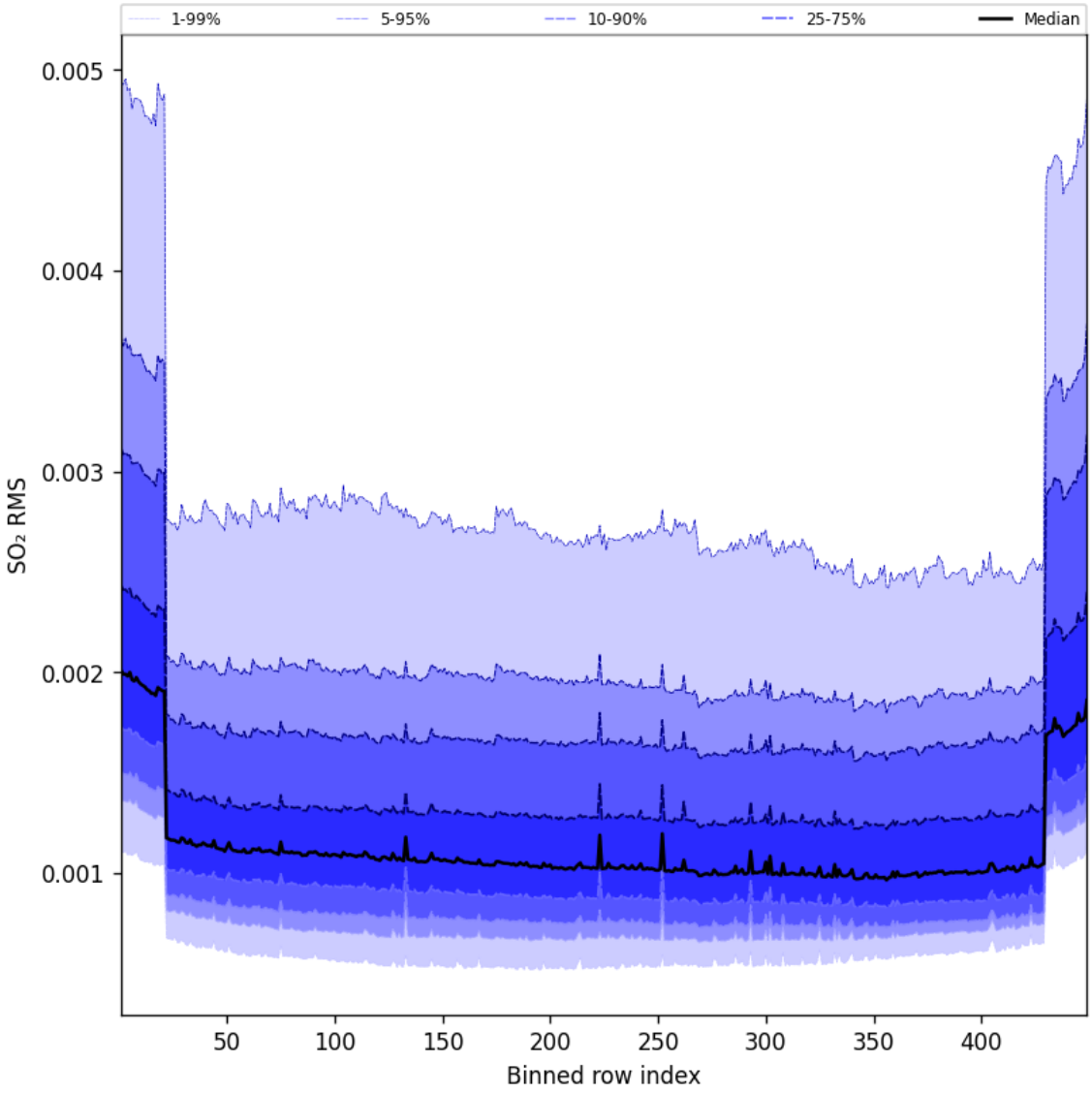

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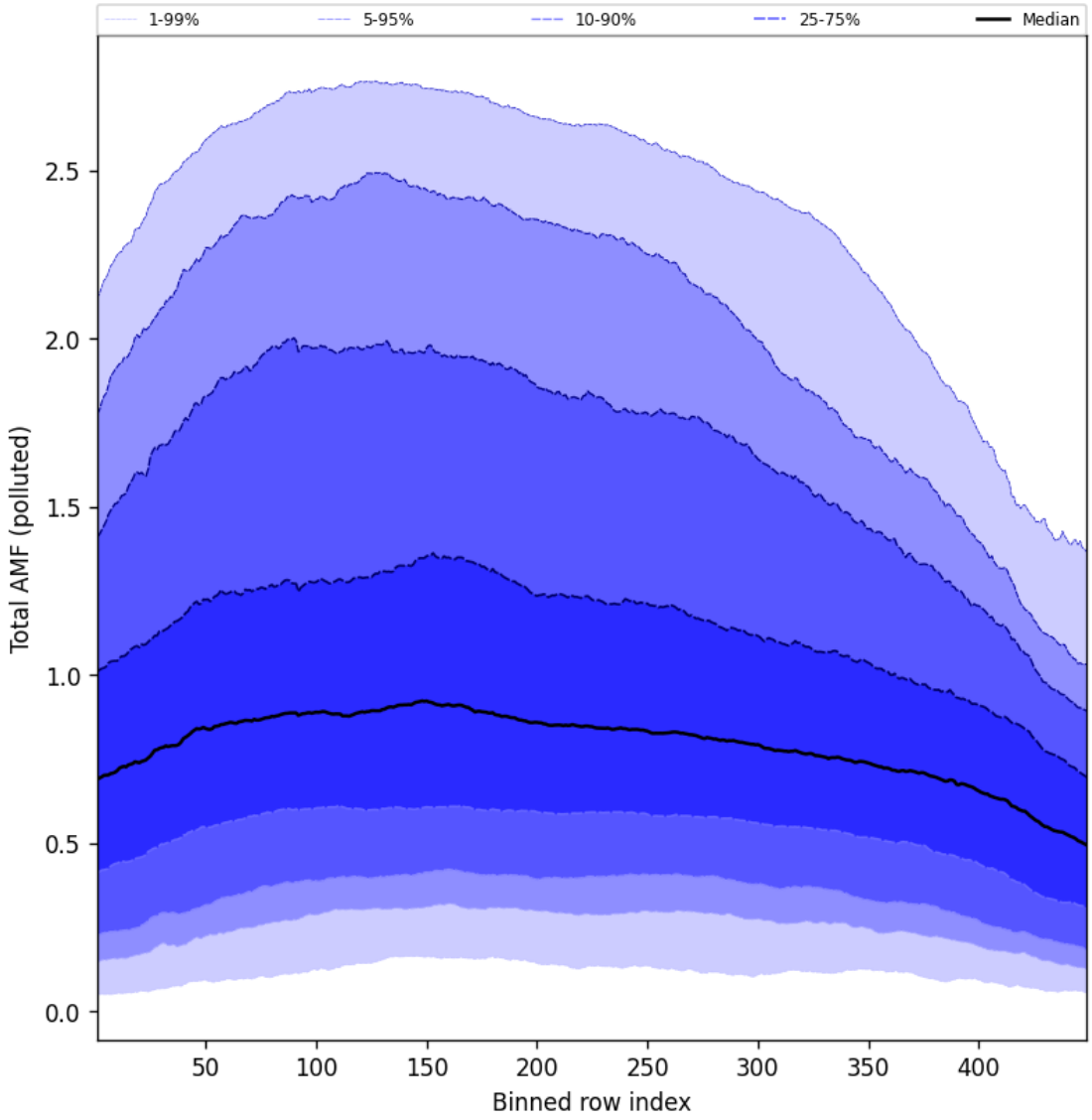

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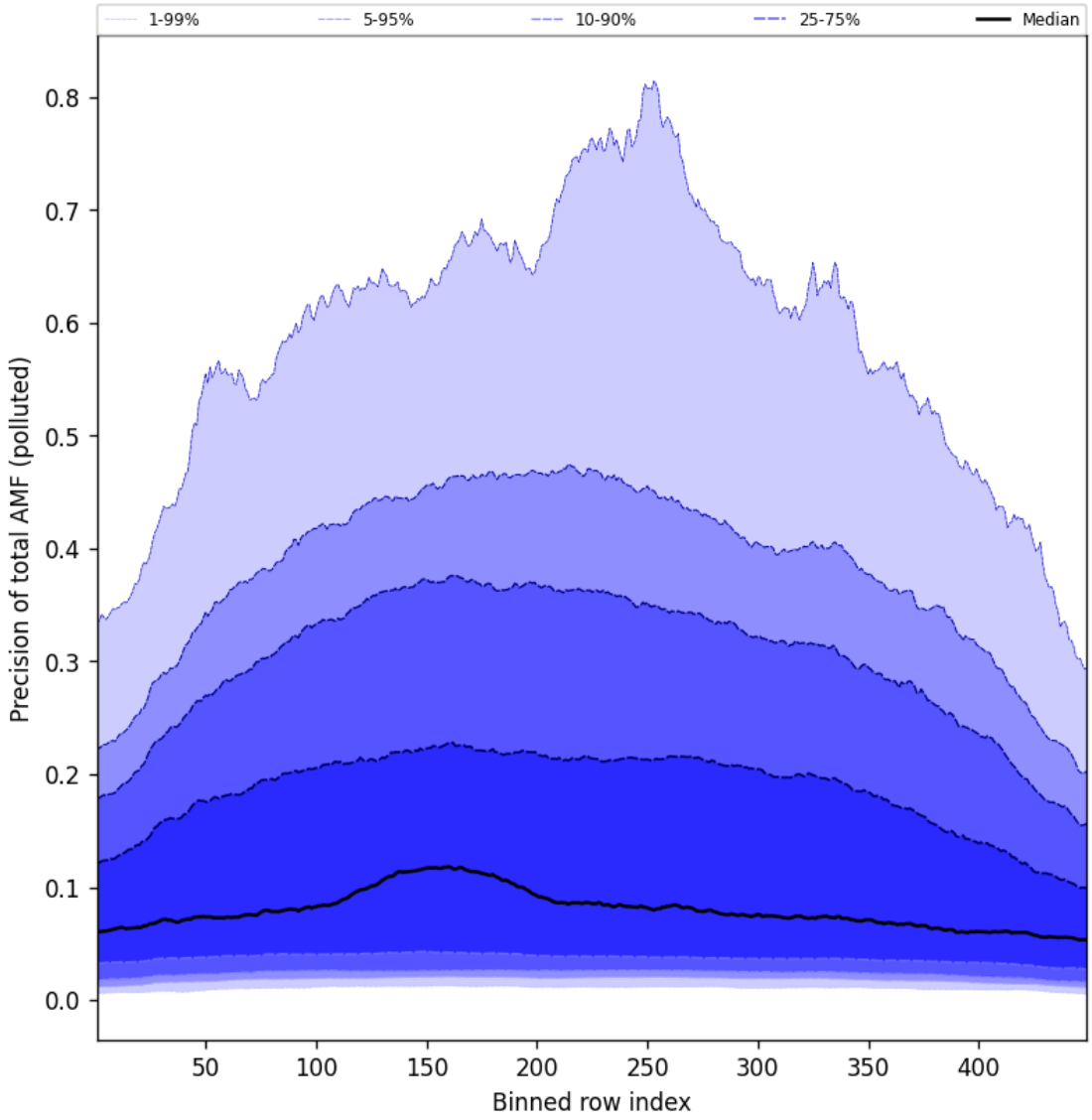

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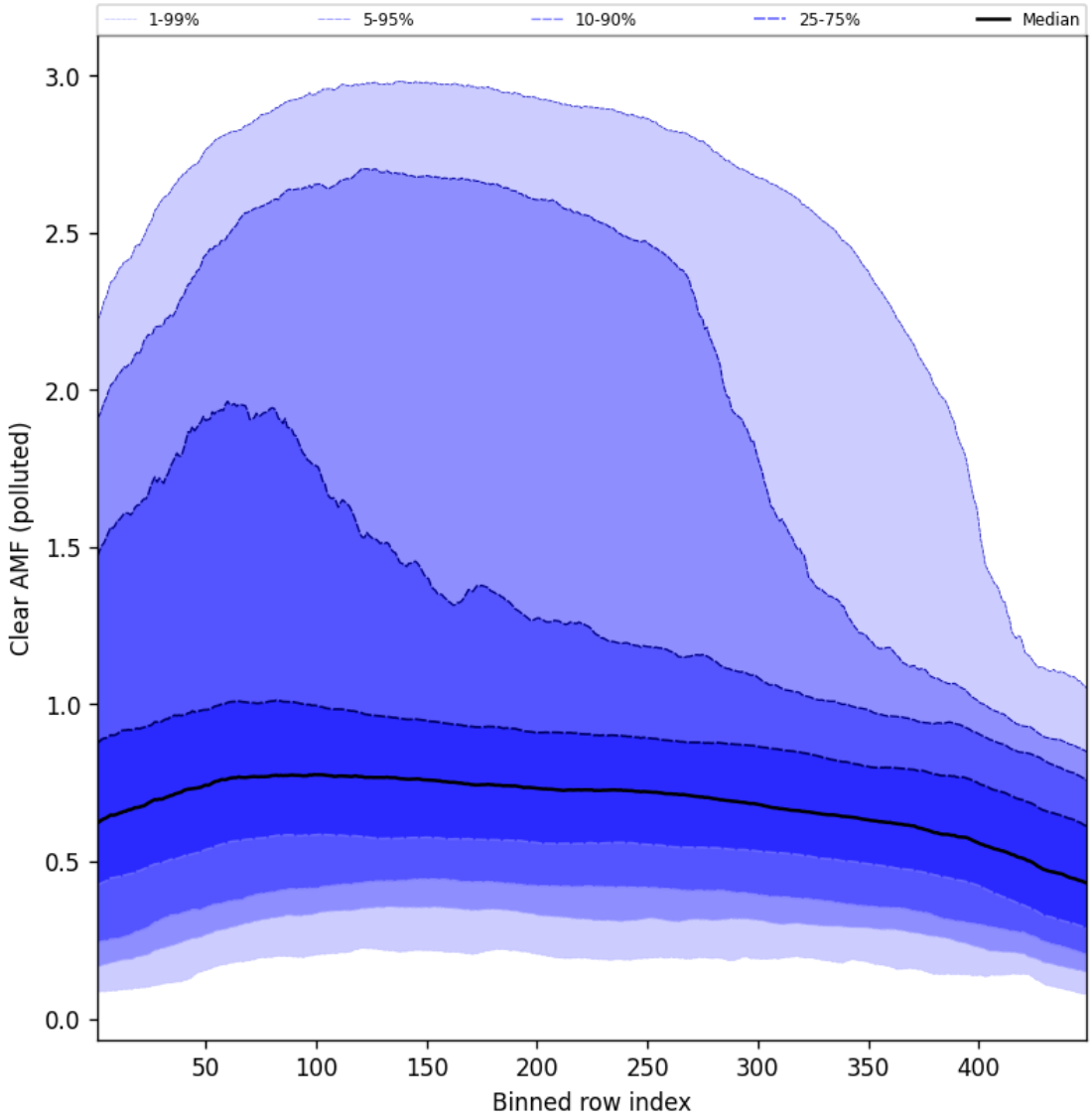

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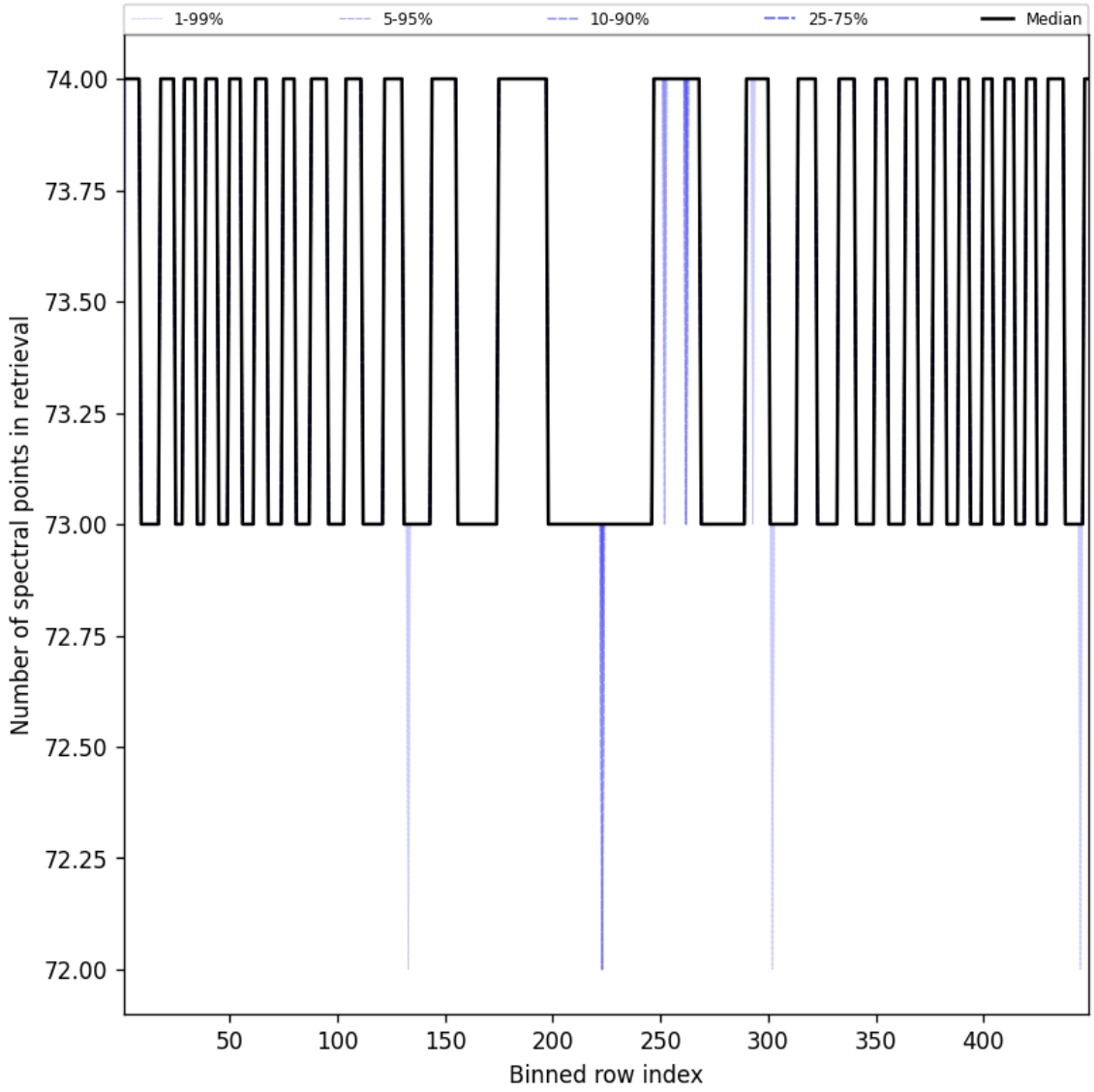

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-02-03 to 2025-02-04

10 Coincidence density

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

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