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]	0.623 ± 0.414	17289240	0.995	0.800	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(4.834 \pm 166.946) \times 10^{-2}$	17289240	0.223	0.413	9.141×10^{-3}	-138	619
sulfurdioxide total vertical column precision [DU]	0.605 ± 1.177	17289240	0.197	0.346	0.303	2.718×10^{-2}	132
sulfurdioxide slant column density corrected [DU]	$(1.654 \pm 34.479) \times 10^{-2}$	17289240	0.227	0.338	8.471×10^{-3}	-21.5	366
sulfurdioxide slant column density cobra [DU]	$(1.646 \pm 33.004) \times 10^{-2}$	17289240	0.227	0.338	8.471×10^{-3}	-21.5	43.1
sulfurdioxide slant column density cobra precision [DU]	0.271 ± 0.122	17289240	0.188	0.111	0.234	8.322×10^{-2}	19.8
sulfurdioxide slant column density window1 [DU]	0.143 ± 0.635	17289240	0.175	0.705	0.153	-67.0	64.9
sulfurdioxide slant column density window1 precision [DU]	0.271 ± 0.122	17289240	0.188	0.111	0.234	8.322×10^{-2}	19.8
sulfurdioxide slant column density corrected win1 [DU]	$(1.230 \pm 61.871) \times 10^{-2}$	17289240	-2.500×10^{-2}	0.675	-2.836×10^{-3}	-67.0	64.9
background so2 slant column offset window1 [DU]	-0.131 ± 0.179	17289240	-0.220	0.220	-0.189	-1.03	2.89
sulfurdioxide slant column density window2 [DU]	1.47 ± 8.61	17289240	0.750	10.8	1.35	-1.731×10^{3}	1.035×10^{3}
sulfurdioxide slant column density window2 precision [DU]	7.79 ± 2.18	17289240	6.97	2.46	7.45	2.21	564
sulfurdioxide slant column density corrected win2 [DU]	-2.26 ± 8.40	17289240	-2.25	10.6	-2.21	-1.733×10^{3}	1.029×10^{3}
background so2 slant column offset window2 [DU]	-3.73 ± 2.37	17289240	-2.25	2.59	-3.03	-32.2	4.57
sulfurdioxide slant column density window3 [DU]	-6.59 ± 23.51	17289240	-8.40	29.4	-6.97	-488	1.048×10^{3}
sulfurdioxide slant column density window3 precision [DU]	26.9 ± 12.8	17289240	21.5	9.80	23.6	9.07	1.738×10^{3}
sulfurdioxide slant column density corrected win3 [DU]	15.1 ± 22.7	17289240	14.0	28.3	15.0	-480	1.060×10^{3}
background so2 slant column offset window3 [DU]	21.7 ± 7.0	17289240	18.5	10.2	21.9	-21.5	72.2
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17289240	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(4.985 \pm 15.993) \times 10^{-2}$	17289240	1.664×10^{-2}	2.647×10^{-2}	2.262×10^{-2}	6.222×10^{-4}	4.43
fitted radiance shift [nm]	$(-4.751 \pm 25.170) \times 10^{-4}$	17289240	-5.000×10^{-4}	1.760×10^{-3}	-5.151×10^{-4}	-4.500×10^{-2}	4.889×10^{-2}
fitted radiance squeeze [1]	$(-5.299 \pm 17.804) \times 10^{-5}$	17289240	-3.000×10^{-5}	2.100×10^{-4}	-4.622×10^{-5}	-2.167×10^{-2}	2.292×10^{-2}
fitted root mean square [1]	$(1.207 \pm 0.497) \times 10^{-3}$	17289240	9.250×10^{-4}	4.769×10^{-4}	1.068×10^{-3}	3.310×10^{-4}	5.432×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.911 ± 0.606	17289240	0.620	0.651	0.766	5.000×10^{-2}	3.18
sulfurdioxide total air mass factor polluted precision [1]	0.140 ± 0.151	17289240	3.500×10^{-2}	0.161	8.357×10^{-2}	2.500×10^{-3}	1.82
sulfurdioxide clear air mass factor polluted [1]	0.805 ± 0.594	17289240	0.580	0.406	0.648	2.623×10^{-2}	3.20
number of spectral points in retrieval [1]	73.4 ± 0.5	17289240	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}	0.1000	0.200	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−3.19	−0.942	−0.530	−0.342	−0.194	0.220	0.381	0.592	1.08	3.86
sulfurdioxide total vertical column precision [DU]	7.959×10^{-2}	0.103	0.126	0.152	0.191	0.537	0.797	1.17	2.02	5.54
sulfurdioxide slant column density corrected [DU]	−0.790	−0.453	−0.329	−0.246	−0.159	0.179	0.271	0.361	0.501	0.934
sulfurdioxide slant column density cobra [DU]	−0.790	−0.453	−0.329	−0.246	−0.159	0.179	0.271	0.361	0.501	0.934
sulfurdioxide slant column density cobra precision [DU]	0.136	0.159	0.171	0.182	0.195	0.306	0.368	0.427	0.504	0.723
sulfurdioxide slant column density window1 [DU]	−1.55	−0.851	−0.580	−0.397	−0.205	0.499	0.677	0.846	1.10	1.81
sulfurdioxide slant column density window1 precision [DU]	0.136	0.159	0.171	0.182	0.195	0.306	0.368	0.427	0.504	0.723
sulfurdioxide slant column density corrected win1 [DU]	−1.53	−0.905	−0.669	−0.508	−0.337	0.339	0.522	0.699	0.975	1.77
background so2 slant column offset window1 [DU]	−0.416	−0.338	−0.303	−0.279	−0.252	-3.273×10^{-2}	6.114×10^{-2}	0.133	0.216	0.375
sulfurdioxide slant column density window2 [DU]	−18.9	−12.3	−9.04	−6.67	−4.01	6.80	9.57	12.1	15.6	23.2
sulfurdioxide slant column density window2 precision [DU]	4.21	5.01	5.50	5.89	6.37	8.82	9.68	10.5	11.7	14.3
sulfurdioxide slant column density corrected win2 [DU]	−22.9	−15.9	−12.6	−10.2	−7.54	3.07	5.70	8.06	11.3	18.0
background so2 slant column offset window2 [DU]	−11.5	−8.79	−6.97	−5.81	−4.72	−2.13	−1.85	−1.62	−1.28	-6.212×10^{-2}
sulfurdioxide slant column density window3 [DU]	−64.6	−44.4	−35.2	−28.6	−21.4	8.01	15.8	23.0	32.6	51.7
sulfurdioxide slant column density window3 precision [DU]	13.2	15.1	16.5	17.9	19.6	29.4	34.0	39.6	50.8	81.3
sulfurdioxide slant column density corrected win3 [DU]	−41.7	−21.9	−12.7	−6.14	0.980	29.3	36.7	43.3	52.3	70.6
background so2 slant column offset window3 [DU]	6.15	10.1	12.2	14.2	16.8	27.1	29.1	30.7	32.4	35.8
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]	3.239×10^{-3}	6.498×10^{-3}	8.819×10^{-3}	1.076×10^{-2}	1.357×10^{-2}	4.003×10^{-2}	5.111×10^{-2}	6.777×10^{-2}	0.126	0.575
fitted radiance shift [nm]	-8.053×10^{-3}	-4.148×10^{-3}	-2.769×10^{-3}	-2.005×10^{-3}	-1.397×10^{-3}	3.629×10^{-4}	1.067×10^{-3}	1.938×10^{-3}	3.421×10^{-3}	7.433×10^{-3}
fitted radiance squeeze [1]	-5.263×10^{-4}	-3.471×10^{-4}	-2.690×10^{-4}	-2.138×10^{-4}	-1.550×10^{-4}	5.501×10^{-5}	1.055×10^{-4}	1.519×10^{-4}	2.184×10^{-4}	3.798×10^{-4}
fitted root mean square [1]	5.769×10^{-4}	6.981×10^{-4}	7.699×10^{-4}	8.255×10^{-4}	8.930×10^{-4}	1.370×10^{-3}	1.596×10^{-3}	1.828×10^{-3}	2.175×10^{-3}	3.033×10^{-3}
sulfurdioxide total air mass factor polluted [1]	6.181×10^{-2}	0.187	0.289	0.383	0.496	1.15	1.45	1.80	2.32	2.74
sulfurdioxide total air mass factor polluted precision [1]	7.915×10^{-3}	1.526×10^{-2}	2.166×10^{-2}	2.728×10^{-2}	3.506×10^{-2}	0.196	0.266	0.338	0.446	0.683
sulfurdioxide clear air mass factor polluted [1]	0.144	0.253	0.335	0.405	0.478	0.884	1.01	1.24	2.51	2.96
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]	0.689 ± 0.400	6421278	0.750	1.000	0.0	1.000	0.250	1.000
sulfurdioxide total vertical column [DU]	0.102 ± 2.609	6421278	0.616	1.365×10^{-2}	-138	619	-0.284	0.332
sulfurdioxide total vertical column precision [DU]	1.00 ± 1.76	6421278	0.724	0.438	5.472×10^{-2}	47.3	0.260	0.984
sulfurdioxide slant column density corrected [DU]	$(2.485 \pm 41.023) \times 10^{-2}$	6421278	0.392	1.009×10^{-2}	-7.89	53.5	-0.183	0.209
sulfurdioxide slant column density cobra [DU]	$(2.473 \pm 40.531) \times 10^{-2}$	6421278	0.392	1.009×10^{-2}	-7.89	12.5	-0.183	0.209
sulfurdioxide slant column density cobra precision [DU]	0.320 ± 0.152	6421278	0.174	0.273	8.977×10^{-2}	19.8	0.216	0.391
sulfurdioxide slant column density window1 [DU]	0.211 ± 0.741	6421278	0.785	0.219	-12.6	13.1	-0.177	0.608
sulfurdioxide slant column density window1 precision [DU]	0.320 ± 0.152	6421278	0.174	0.273	8.977×10^{-2}	19.8	0.216	0.391
sulfurdioxide slant column density corrected win1 [DU]	$(3.728 \pm 74.026) \times 10^{-2}$	6421278	0.777	9.743×10^{-3}	-12.5	13.0	-0.370	0.406
background so2 slant column offset window1 [DU]	-0.174 ± 0.166	6421278	0.158	-0.204	-0.761	2.89	-0.275	-0.117
sulfurdioxide slant column density window2 [DU]	2.15 ± 9.59	6421278	12.2	1.85	-175	111	-4.09	8.07
sulfurdioxide slant column density window2 precision [DU]	8.57 ± 2.24	6421278	2.77	8.28	2.38	300	7.04	9.81
sulfurdioxide slant column density corrected win2 [DU]	-2.39 ± 9.24	6421278	11.8	-2.34	-176	101	-8.25	3.51
background so2 slant column offset window2 [DU]	-4.55 ± 3.04	6421278	4.21	-3.32	-32.2	4.57	-6.50	-2.28
sulfurdioxide slant column density window3 [DU]	-9.45 ± 25.18	6421278	31.9	-9.03	-201	163	-25.1	6.76
sulfurdioxide slant column density window3 precision [DU]	29.1 ± 12.3	6421278	9.58	26.3	9.35	215	22.3	31.9
sulfurdioxide slant column density corrected win3 [DU]	15.0 ± 24.7	6421278	31.3	15.2	-168	189	-0.447	30.9
background so2 slant column offset window3 [DU]	24.5 ± 6.1	6421278	9.45	24.1	-11.5	72.2	19.8	29.2
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.25	6421278	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(8.810 \pm 25.564) \times 10^{-2}$	6421278	4.576×10^{-2}	2.523×10^{-2}	6.222×10^{-4}	4.43	1.344×10^{-2}	5.920×10^{-2}
fitted radiance shift [nm]	$(-3.003 \pm 24.971) \times 10^{-4}$	6421278	1.742×10^{-3}	-3.419×10^{-4}	-4.010×10^{-2}	3.682×10^{-2}	-1.197×10^{-3}	5.449×10^{-4}
fitted radiance squeeze [1]	$(-2.462 \pm 185.653) \times 10^{-6}$	6421278	2.116×10^{-4}	-1.875×10^{-6}	-1.621×10^{-2}	1.778×10^{-3}	-1.076×10^{-4}	1.041×10^{-4}
fitted root mean square [1]	$(1.388 \pm 0.614) \times 10^{-3}$	6421278	6.917×10^{-4}	1.202×10^{-3}	3.436×10^{-4}	3.055×10^{-2}	9.723×10^{-4}	1.664×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.681 ± 0.408	6421278	0.542	0.635	5.000×10^{-2}	2.84	0.366	0.908
sulfurdioxide total air mass factor polluted precision [1]	$(9.818 \pm 13.453) \times 10^{-2}$	6421278	9.930×10^{-2}	4.779×10^{-2}	2.500×10^{-3}	1.82	2.484×10^{-2}	0.124
sulfurdioxide clear air mass factor polluted [1]	0.590 ± 0.277	6421278	0.455	0.591	2.623×10^{-2}	2.16	0.353	0.807
number of spectral points in retrieval [1]	73.5 ± 0.5	6421278	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]	0.584 ± 0.417	10867962	0.830	0.490	0.0	1.000	0.170	1.000
sulfurdioxide total vertical column [DU]	$(1.644 \pm 63.958) \times 10^{-2}$	10867962	0.337	7.573×10^{-3}	-99.8	213	-0.159	0.178
sulfurdioxide total vertical column precision [DU]	0.370 ± 0.463	10867962	0.253	0.253	2.718×10^{-2}	132	0.164	0.417
sulfurdioxide slant column density corrected [DU]	$(1.163 \pm 29.936) \times 10^{-2}$	10867962	0.312	7.682×10^{-3}	-21.5	366	-0.148	0.165
sulfurdioxide slant column density cobra [DU]	$(1.157 \pm 27.598) \times 10^{-2}$	10867962	0.312	7.682×10^{-3}	-21.5	43.1	-0.148	0.165
sulfurdioxide slant column density cobra precision [DU]	0.242 ± 0.089	10867962	8.041×10^{-2}	0.219	8.322×10^{-2}	14.1	0.188	0.268
sulfurdioxide slant column density window1 [DU]	0.103 ± 0.560	10867962	0.661	0.120	-67.0	64.9	-0.219	0.442
sulfurdioxide slant column density window1 precision [DU]	0.242 ± 0.089	10867962	8.041×10^{-2}	0.219	8.322×10^{-2}	14.1	0.188	0.268
sulfurdioxide slant column density corrected win1 [DU]	$(-2.456 \pm 533.499) \times 10^{-3}$	10867962	0.626	-8.945×10^{-3}	-67.0	64.9	-0.320	0.306
background so2 slant column offset window1 [DU]	-0.106 ± 0.182	10867962	0.265	-0.175	-1.03	2.66	-0.241	2.386×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.07 ± 7.95	10867962	10.1	1.10	-1.731×10^{3}	1.035×10^{3}	-3.97	6.16
sulfurdioxide slant column density window2 precision [DU]	7.33 ± 2.00	10867962	2.07	7.05	2.21	564	6.11	8.18
sulfurdioxide slant column density corrected win2 [DU]	-2.18 ± 7.87	10867962	10.0	-2.14	-1.733×10^{3}	1.029×10^{3}	-7.16	2.84
background so2 slant column offset window2 [DU]	-3.24 ± 1.68	10867962	2.20	-2.88	-15.7	4.00	-4.25	-2.04
sulfurdioxide slant column density window3 [DU]	-4.91 ± 22.30	10867962	28.1	-5.91	-488	1.048×10^{3}	-19.4	8.69
sulfurdioxide slant column density window3 precision [DU]	25.5 ± 12.9	10867962	8.73	22.1	9.07	1.738×10^{3}	18.5	27.2
sulfurdioxide slant column density corrected win3 [DU]	15.1 ± 21.4	10867962	26.8	14.9	-480	1.060×10^{3}	1.70	28.5
background so2 slant column offset window3 [DU]	20.1 ± 7.1	10867962	11.2	20.3	-21.5	39.5	14.4	25.7
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.18	10867962	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.725 \pm 2.653) \times 10^{-2}$	10867962	2.129×10^{-2}	2.187×10^{-2}	7.215×10^{-4}	1.67	1.364×10^{-2}	3.493×10^{-2}
fitted radiance shift [nm]	$(-5.784 \pm 25.230) \times 10^{-4}$	10867962	1.736×10^{-3}	-6.198×10^{-4}	-4.500×10^{-2}	4.889×10^{-2}	-1.494×10^{-3}	2.419×10^{-4}
fitted radiance squeeze [1]	$(-8.284 \pm 16.632) \times 10^{-5}$	10867962	2.044×10^{-4}	-7.107×10^{-5}	-2.167×10^{-2}	2.292×10^{-2}	-1.790×10^{-4}	2.532×10^{-5}
fitted root mean square [1]	$(1.100 \pm 0.374) \times 10^{-3}$	10867962	3.765×10^{-4}	1.011×10^{-3}	3.310×10^{-4}	5.432×10^{-2}	8.625×10^{-4}	1.239×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.05 ± 0.66	10867962	0.770	0.861	5.000×10^{-2}	3.18	0.573	1.34
sulfurdioxide total air mass factor polluted precision [1]	0.165 ± 0.155	10867962	0.194	0.119	4.533×10^{-3}	1.57	4.349×10^{-2}	0.238
sulfurdioxide clear air mass factor polluted [1]	0.932 ± 0.688	10867962	0.421	0.676	0.116	3.20	0.529	0.950
number of spectral points in retrieval [1]	73.4 ± 0.5	10867962	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]	0.667 ± 0.403	12289863	0.760	1.000	0.0	1.000	0.240	1.000
sulfurdioxide total vertical column [DU]	$(3.142 \pm 121.263) \times 10^{-2}$	12289863	0.420	8.738×10^{-3}	-99.8	402	-0.199	0.221
sulfurdioxide total vertical column precision [DU]	0.507 ± 0.844	12289863	0.289	0.304	4.923×10^{-2}	38.3	0.206	0.495
sulfurdioxide slant column density corrected [DU]	$(1.323 \pm 30.142) \times 10^{-2}$	12289863	0.322	7.256×10^{-3}	-21.5	48.5	-0.153	0.169
sulfurdioxide slant column density cobra [DU]	$(1.320 \pm 29.978) \times 10^{-2}$	12289863	0.322	7.256×10^{-3}	-21.5	43.1	-0.153	0.169
sulfurdioxide slant column density cobra precision [DU]	0.255 ± 0.107	12289863	9.135×10^{-2}	0.223	8.385×10^{-2}	19.8	0.190	0.282
sulfurdioxide slant column density window1 [DU]	0.163 ± 0.585	12289863	0.662	0.170	-58.6	51.0	-0.165	0.498
sulfurdioxide slant column density window1 precision [DU]	0.255 ± 0.107	12289863	9.135×10^{-2}	0.223	8.385×10^{-2}	19.8	0.190	0.282
sulfurdioxide slant column density corrected win1 [DU]	$(7.562 \pm 573.533) \times 10^{-3}$	12289863	0.644	-4.198×10^{-3}	-58.6	50.6	-0.323	0.321
background so2 slant column offset window1 [DU]	-0.156 ± 0.153	12289863	0.181	-0.198	-0.761	2.64	-0.256	-7.555×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.07 ± 8.31	12289863	10.5	0.988	-587	828	-4.24	6.27
sulfurdioxide slant column density window2 precision [DU]	7.60 ± 2.01	12289863	2.29	7.31	2.36	564	6.29	8.58
sulfurdioxide slant column density corrected win2 [DU]	-2.28 ± 8.17	12289863	10.4	-2.24	-589	826	-7.46	2.95
background so2 slant column offset window2 [DU]	-3.35 ± 2.05	12289863	2.05	-2.81	-32.2	4.57	-4.12	-2.06
sulfurdioxide slant column density window3 [DU]	-3.54 ± 23.11	12289863	29.2	-4.14	-239	332	-18.4	10.9
sulfurdioxide slant column density window3 precision [DU]	26.6 ± 12.1	12289863	9.10	23.5	9.07	215	19.9	29.0
sulfurdioxide slant column density corrected win3 [DU]	17.2 ± 22.1	12289863	28.1	16.8	-230	357	3.00	31.1
background so2 slant column offset window3 [DU]	20.7 ± 6.6	12289863	9.15	21.0	-21.5	72.2	16.3	25.5
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.13	12289863	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.290 \pm 5.493) \times 10^{-2}$	12289863	2.279×10^{-2}	2.294×10^{-2}	6.866×10^{-4}	2.48	1.463×10^{-2}	3.742×10^{-2}
fitted radiance shift [nm]	$(-3.951 \pm 24.377) \times 10^{-4}$	12289863	1.824×10^{-3}	-3.929×10^{-4}	-4.500×10^{-2}	3.682×10^{-2}	-1.334×10^{-3}	4.902×10^{-4}
fitted radiance squeeze [1]	$(-4.516 \pm 16.503) \times 10^{-5}$	12289863	1.948×10^{-4}	-3.912×10^{-5}	-2.167×10^{-2}	1.425×10^{-2}	-1.391×10^{-4}	5.562×10^{-5}
fitted root mean square [1]	$(1.136 \pm 0.446) \times 10^{-3}$	12289863	3.899×10^{-4}	1.018×10^{-3}	3.354×10^{-4}	5.432×10^{-2}	8.674×10^{-4}	1.257×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.816 ± 0.420	12289863	0.522	0.752	5.000×10^{-2}	2.60	0.519	1.04
sulfurdioxide total air mass factor polluted precision [1]	0.130 ± 0.131	12289863	0.145	7.706×10^{-2}	2.702×10^{-3}	1.80	3.675×10^{-2}	0.182
sulfurdioxide clear air mass factor polluted [1]	0.667 ± 0.246	12289863	0.323	0.633	3.196×10^{-2}	2.74	0.495	0.818
number of spectral points in retrieval [1]	73.4 ± 0.5	12289863	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]	0.512 ± 0.421	4356284	0.900	0.450	0.0	1.000	0.1000	1.000
sulfurdioxide total vertical column [DU]	$(7.125 \pm 217.245) \times 10^{-2}$	4356284	0.361	8.562×10^{-3}	-138	534	-0.165	0.196
sulfurdioxide total vertical column precision [DU]	0.749 ± 1.543	4356284	0.567	0.272	2.718×10^{-2}	44.3	0.128	0.695
sulfurdioxide slant column density corrected [DU]	$(2.179 \pm 39.104) \times 10^{-2}$	4356284	0.383	1.087×10^{-2}	-13.2	53.5	-0.178	0.204
sulfurdioxide slant column density cobra [DU]	$(2.168 \pm 38.504) \times 10^{-2}$	4356284	0.383	1.087×10^{-2}	-13.2	12.5	-0.178	0.204
sulfurdioxide slant column density cobra precision [DU]	0.307 ± 0.139	4356284	0.144	0.266	8.322×10^{-2}	9.85	0.216	0.360
sulfurdioxide slant column density window1 [DU]	$(8.091 \pm 72.977) \times 10^{-2}$	4356284	0.826	8.982×10^{-2}	-67.0	64.9	-0.334	0.492
sulfurdioxide slant column density window1 precision [DU]	0.307 ± 0.139	4356284	0.144	0.266	8.322×10^{-2}	9.85	0.216	0.360
sulfurdioxide slant column density corrected win1 [DU]	$(1.771 \pm 70.088) \times 10^{-2}$	4356284	0.760	-2.305×10^{-3}	-67.0	64.9	-0.377	0.383
background so2 slant column offset window1 [DU]	$(-6.320 \pm 22.117) \times 10^{-2}$	4356284	0.362	-0.140	-1.03	2.79	-0.239	0.123
sulfurdioxide slant column density window2 [DU]	2.37 ± 9.13	4356284	11.4	2.30	-1.731×10^{3}	1.035×10^{3}	-3.36	8.01
sulfurdioxide slant column density window2 precision [DU]	8.19 ± 2.45	4356284	2.79	7.77	2.21	490	6.57	9.36
sulfurdioxide slant column density corrected win2 [DU]	-2.21 ± 8.88	4356284	11.0	-2.16	-1.733×10^{3}	1.029×10^{3}	-7.69	3.34
background so2 slant column offset window2 [DU]	-4.59 ± 2.68	4356284	3.84	-4.17	-32.2	2.64	-6.20	-2.36
sulfurdioxide slant column density window3 [DU]	-14.2 ± 22.6	4356284	27.6	-13.9	-488	1.048×10^{3}	-27.8	-0.219
sulfurdioxide slant column density window3 precision [DU]	27.1 ± 14.3	4356284	11.5	23.8	9.56	1.738×10^{3}	18.5	30.0
sulfurdioxide slant column density corrected win3 [DU]	9.90 ± 23.08	4356284	28.2	10.6	-480	1.060×10^{3}	-3.83	24.4
background so2 slant column offset window3 [DU]	24.1 ± 7.5	4356284	11.5	25.9	-18.5	57.4	18.5	30.0
sulfurdioxide slant column cobra flag [1]	1.94 ± 0.33	4356284	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(8.090 \pm 25.959) \times 10^{-2}$	4356284	3.716×10^{-2}	1.904×10^{-2}	6.222×10^{-4}	4.43	1.055×10^{-2}	4.771×10^{-2}
fitted radiance shift [nm]	$(-7.022 \pm 26.415) \times 10^{-4}$	4356284	1.414×10^{-3}	-8.181×10^{-4}	-3.999×10^{-2}	4.889×10^{-2}	-1.482×10^{-3}	-6.762×10^{-5}
fitted radiance squeeze [1]	$(-8.001 \pm 20.380) \times 10^{-5}$	4356284	2.532×10^{-4}	-7.686×10^{-5}	-1.306×10^{-2}	1.272×10^{-2}	-2.069×10^{-4}	4.623×10^{-5}
fitted root mean square [1]	$(1.367 \pm 0.540) \times 10^{-3}$	4356284	5.867×10^{-4}	1.240×10^{-3}	3.310×10^{-4}	3.818×10^{-2}	1.007×10^{-3}	1.594×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.22 ± 0.89	4356284	1.70	0.901	5.000×10^{-2}	3.18	0.450	2.15
sulfurdioxide total air mass factor polluted precision [1]	0.174 ± 0.192	4356284	0.213	0.121	2.500×10^{-3}	1.82	3.050×10^{-2}	0.244
sulfurdioxide clear air mass factor polluted [1]	1.23 ± 0.98	4356284	1.93	0.796	3.041×10^{-2}	3.20	0.428	2.36
number of spectral points in retrieval [1]	73.4 ± 0.5	4356284	1.000	73.0	70.0	74.0	73.0	74.0

3 Granule outlines

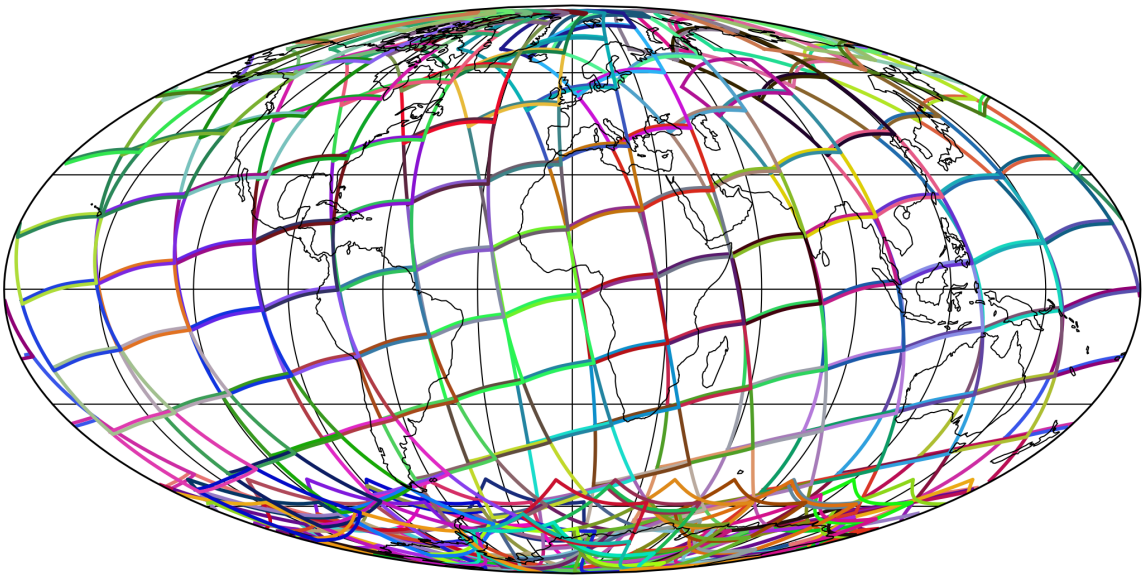


Figure 1: Outline of the granules.

4 Input data monitoring

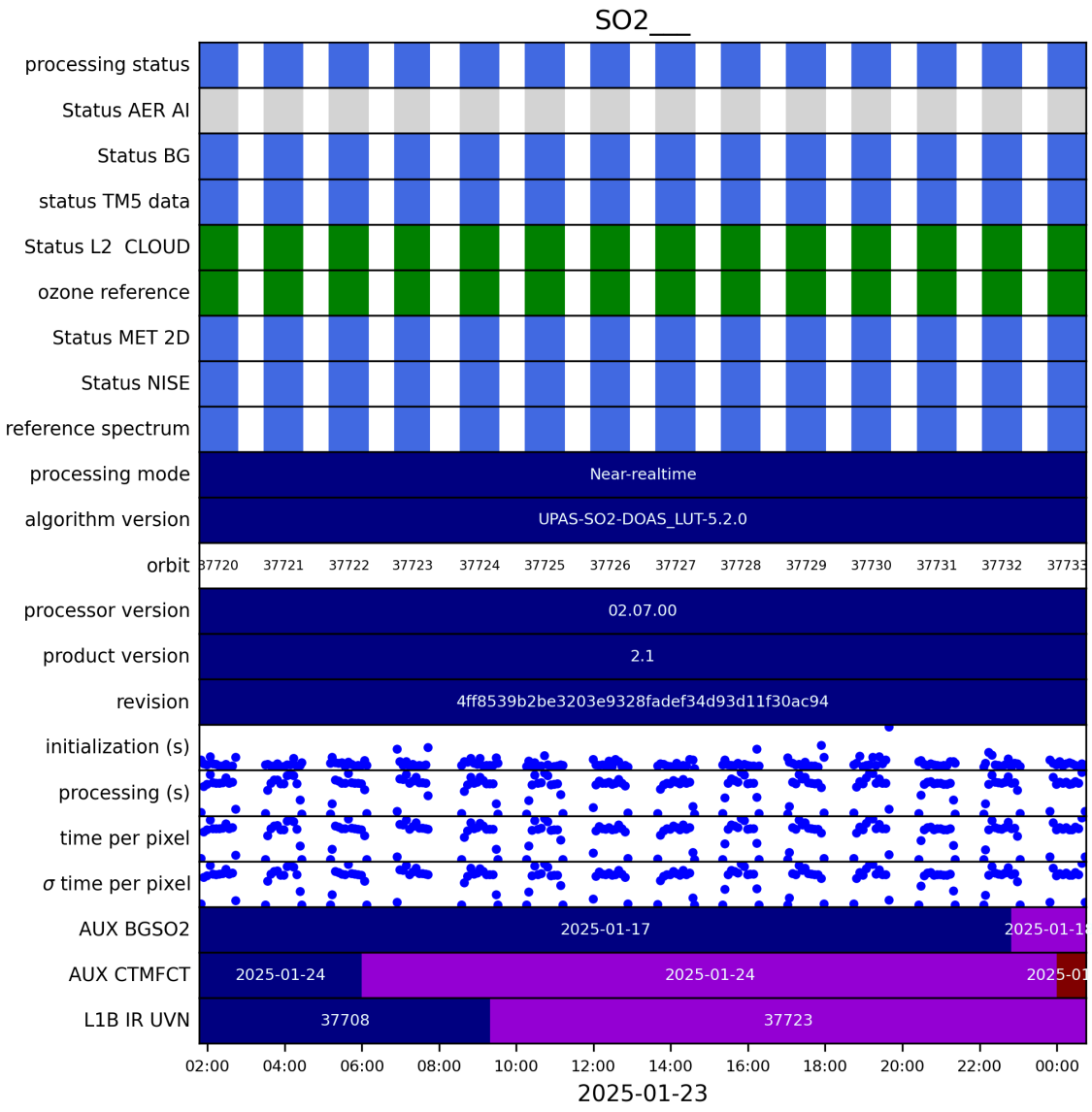


Figure 2: Input data per granule

5 Warnings and errors

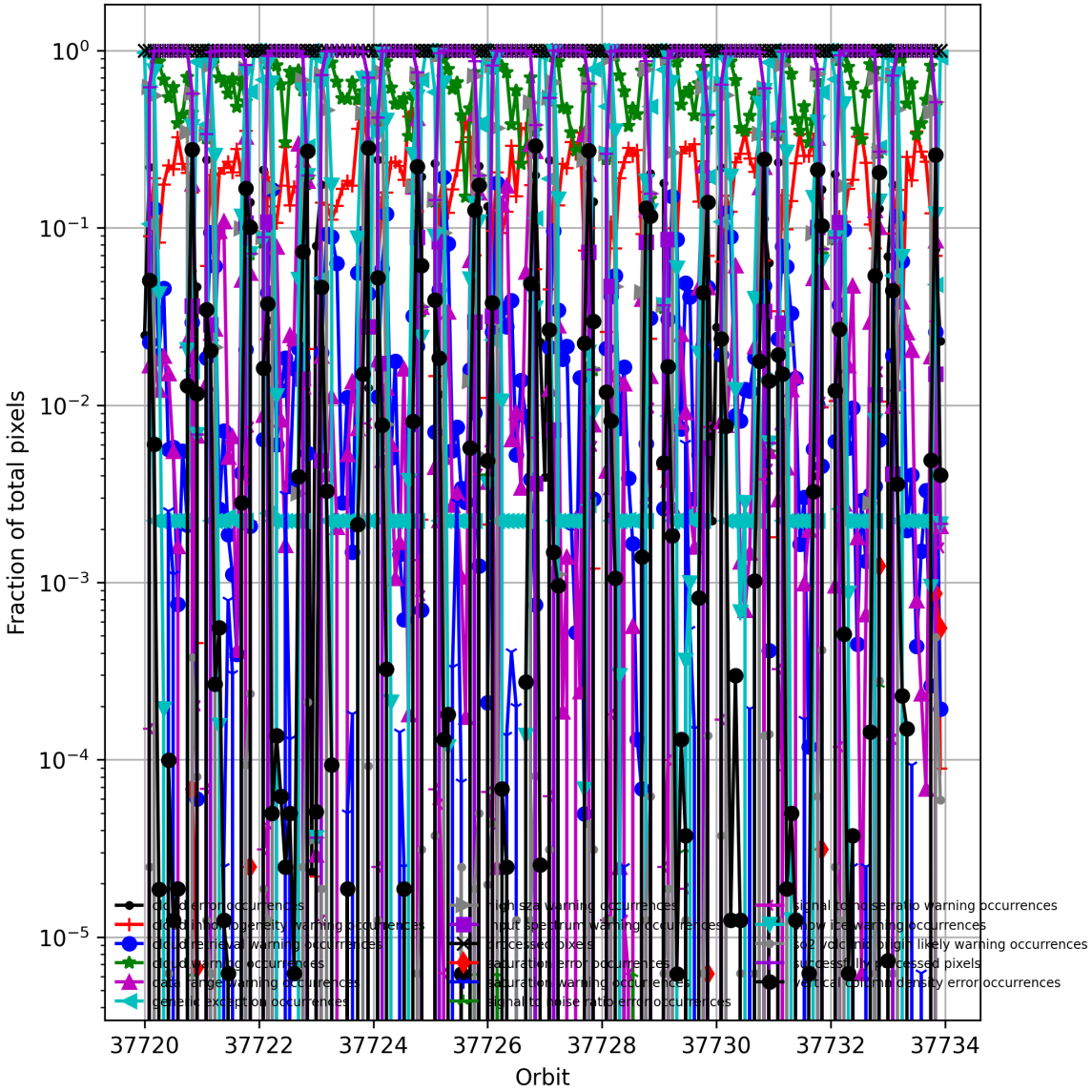


Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

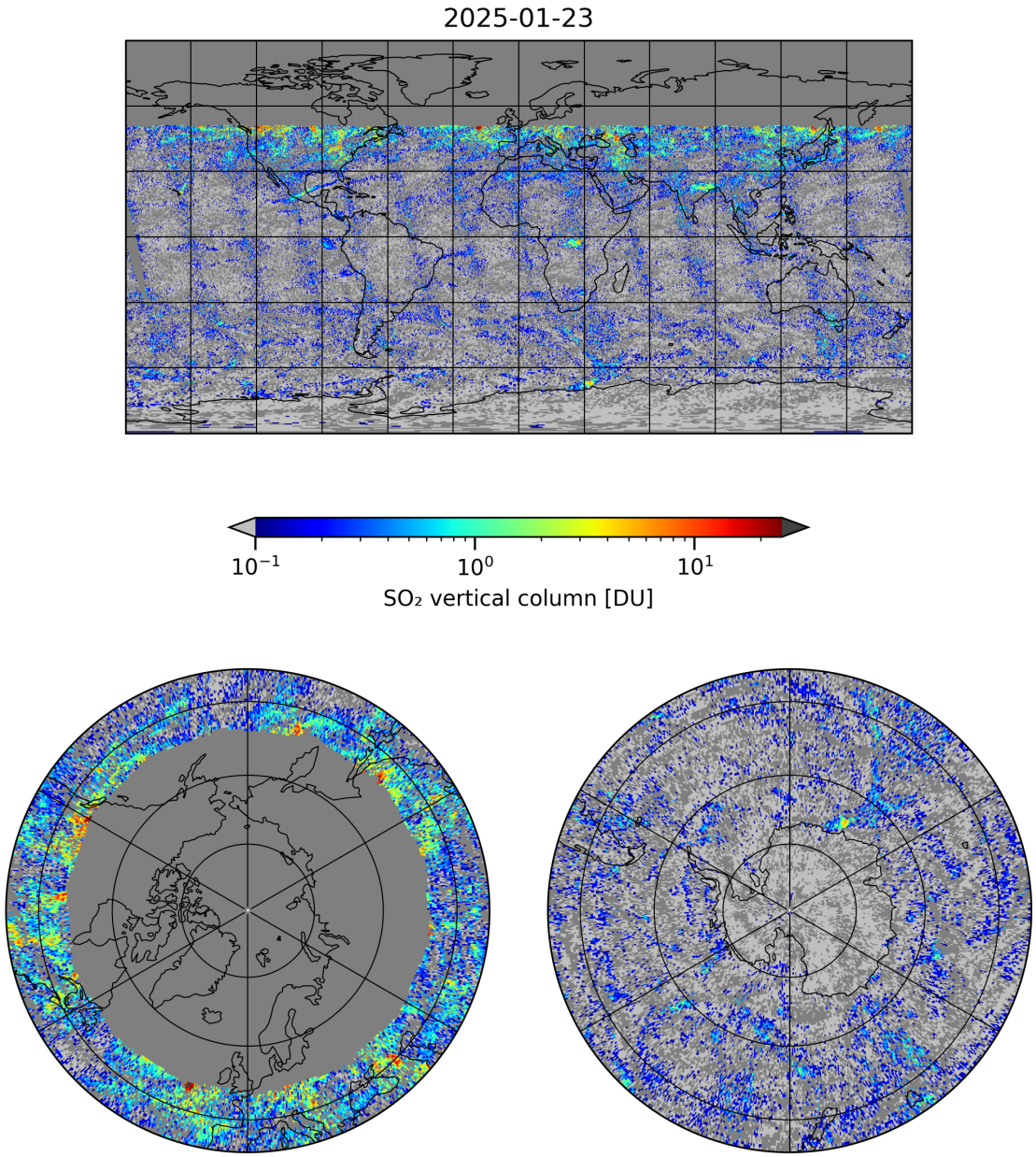


Figure 4: Map of "SO_2 vertical column" for 2025-01-23 to 2025-01-24

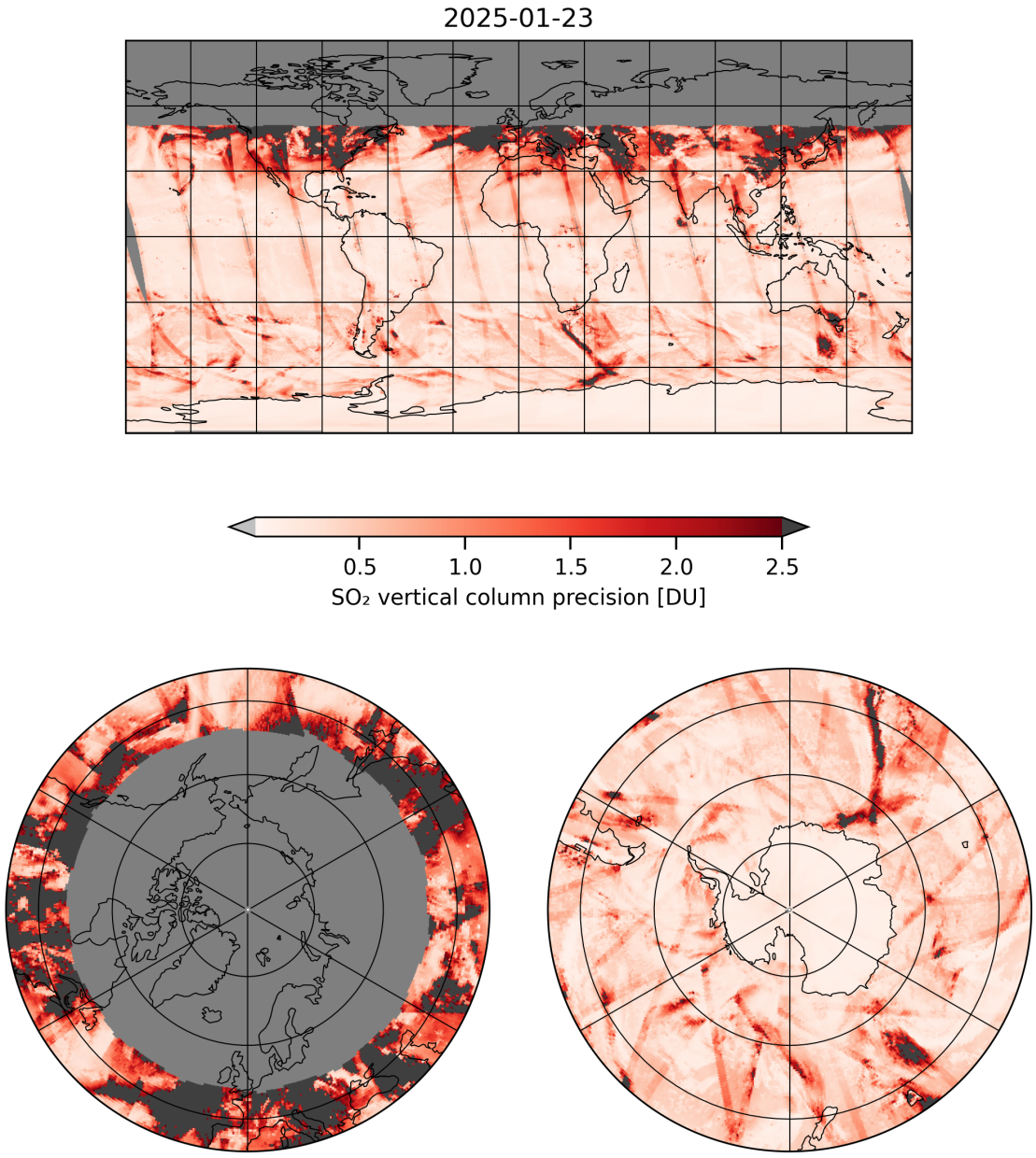


Figure 5: Map of "SO_2 vertical column precision" for 2025-01-23 to 2025-01-24

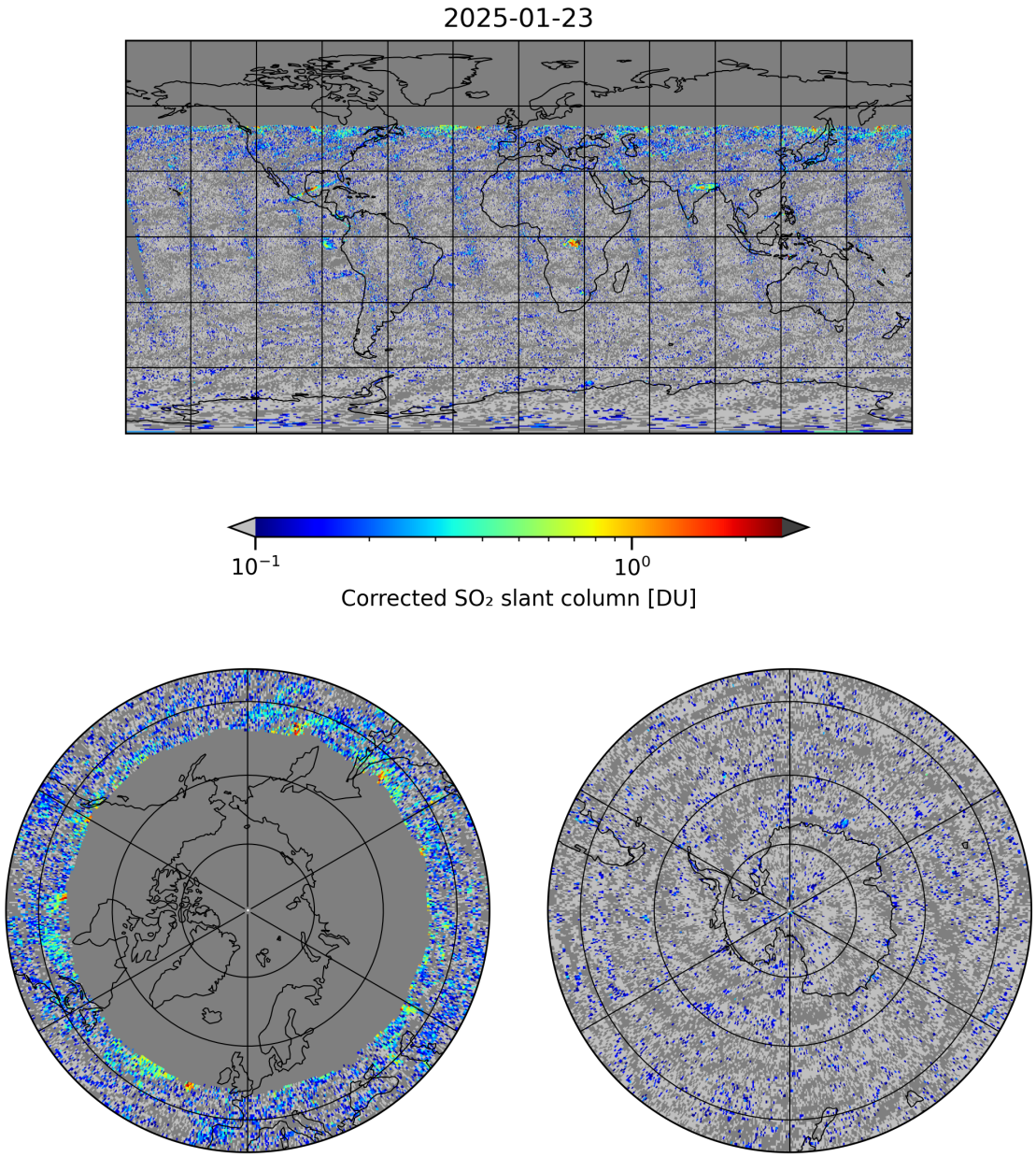


Figure 6: Map of “Corrected SO_2 slant column” for 2025-01-23 to 2025-01-24

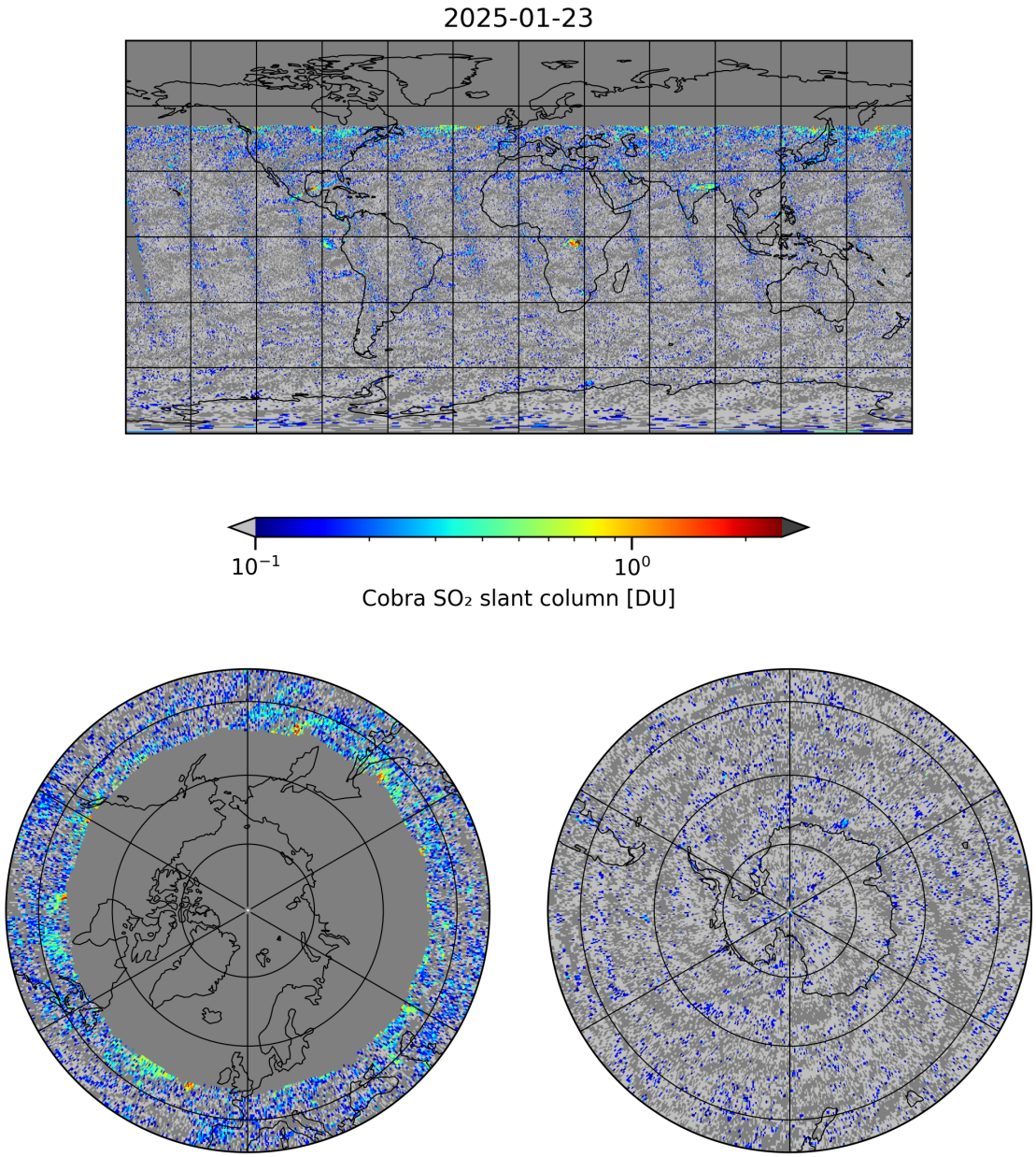


Figure 7: Map of "Cobra SO_2 slant column" for 2025-01-23 to 2025-01-24

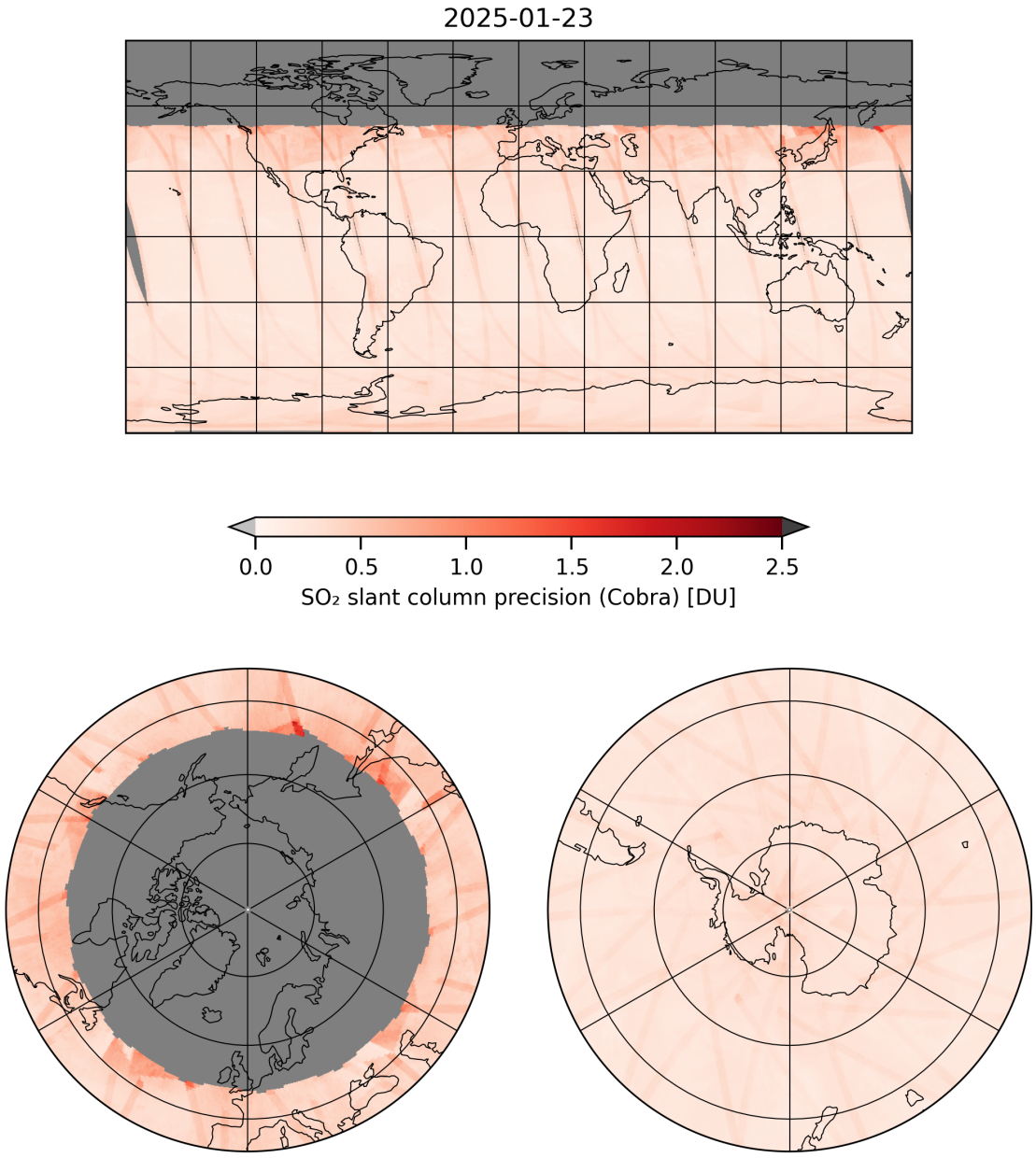


Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2025-01-23 to 2025-01-24

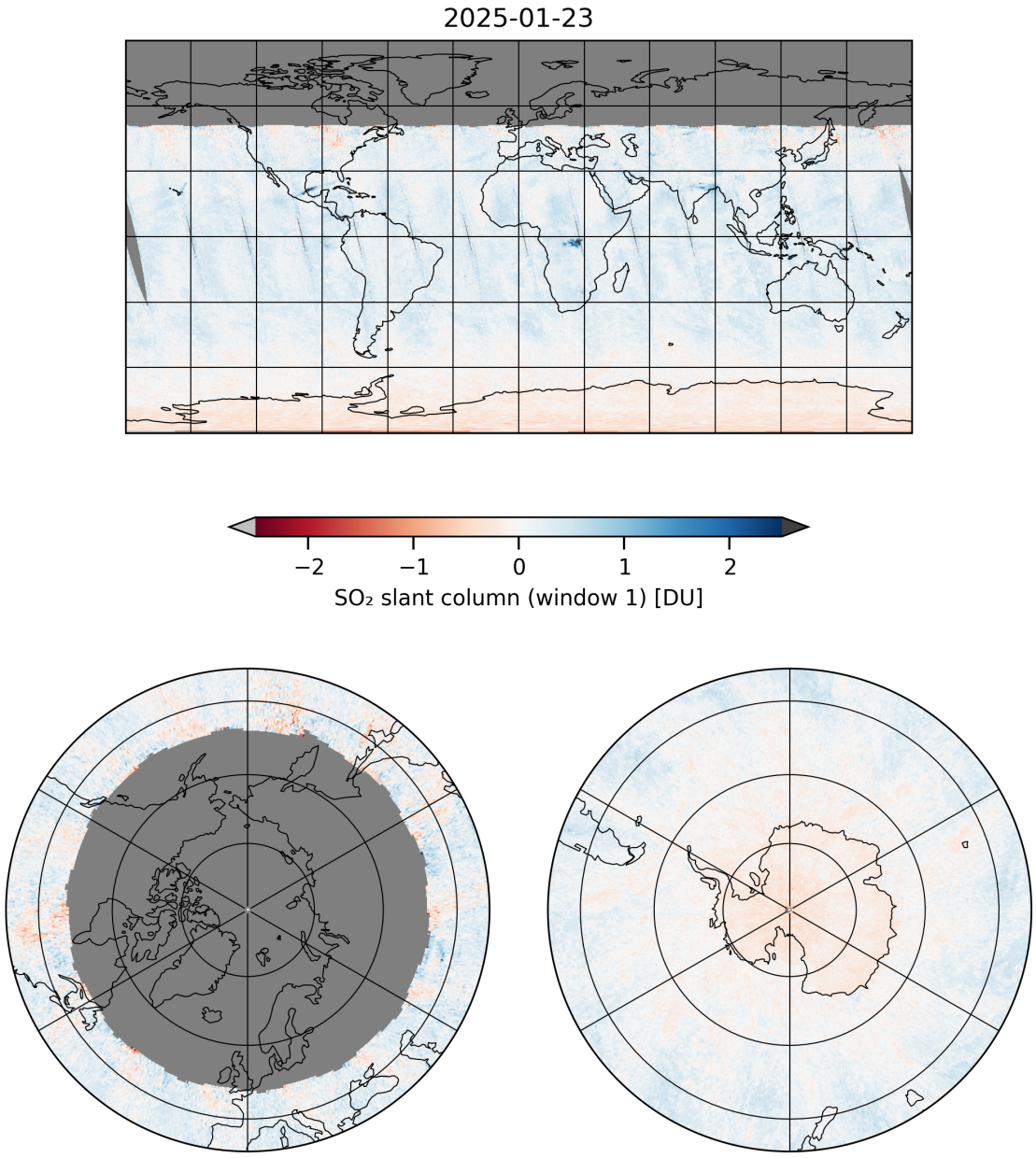


Figure 9: Map of "SO_2 slant column (window 1)" for 2025-01-23 to 2025-01-24

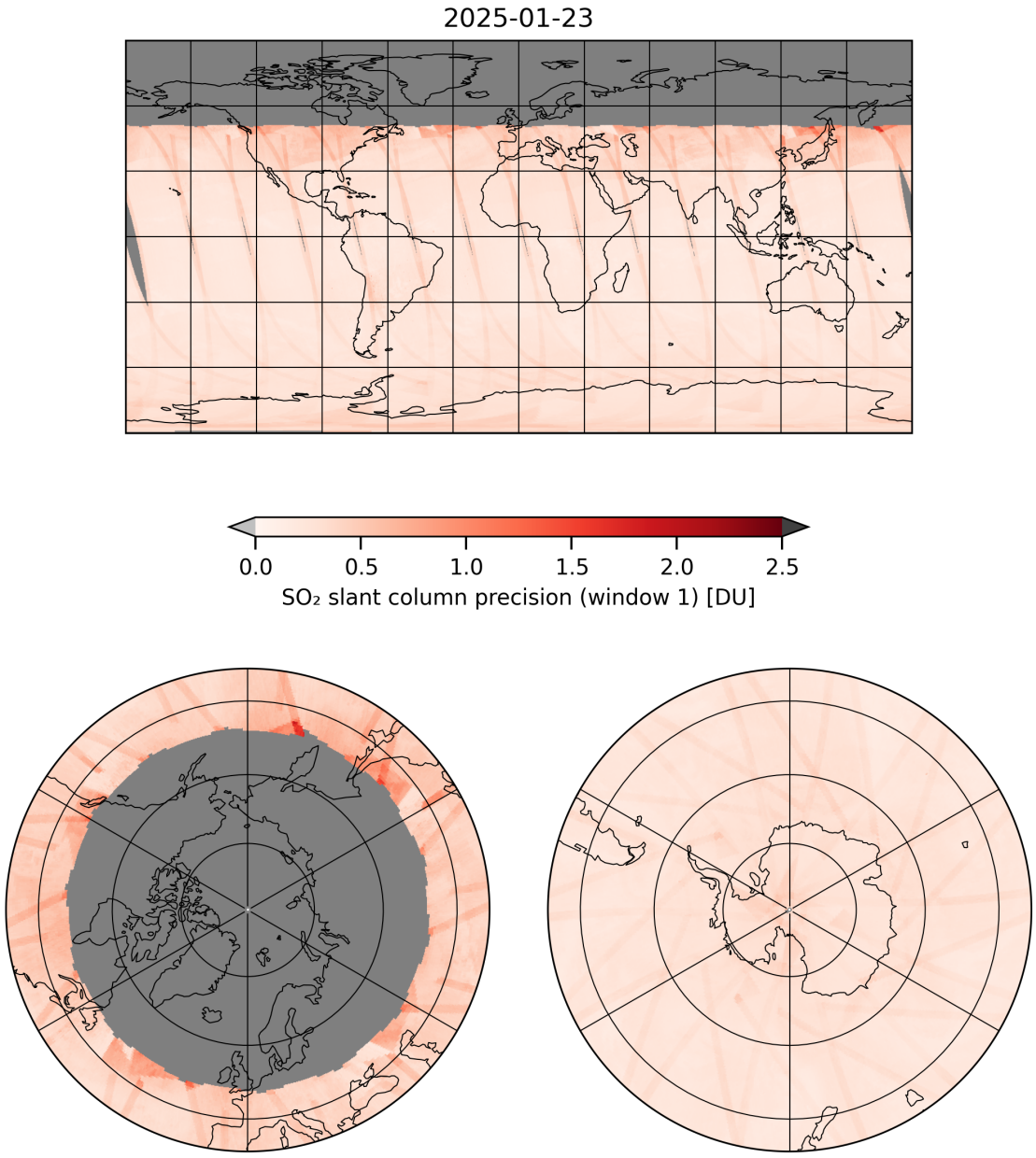


Figure 10: Map of "SO_2 slant column precision (window 1)" for 2025-01-23 to 2025-01-24

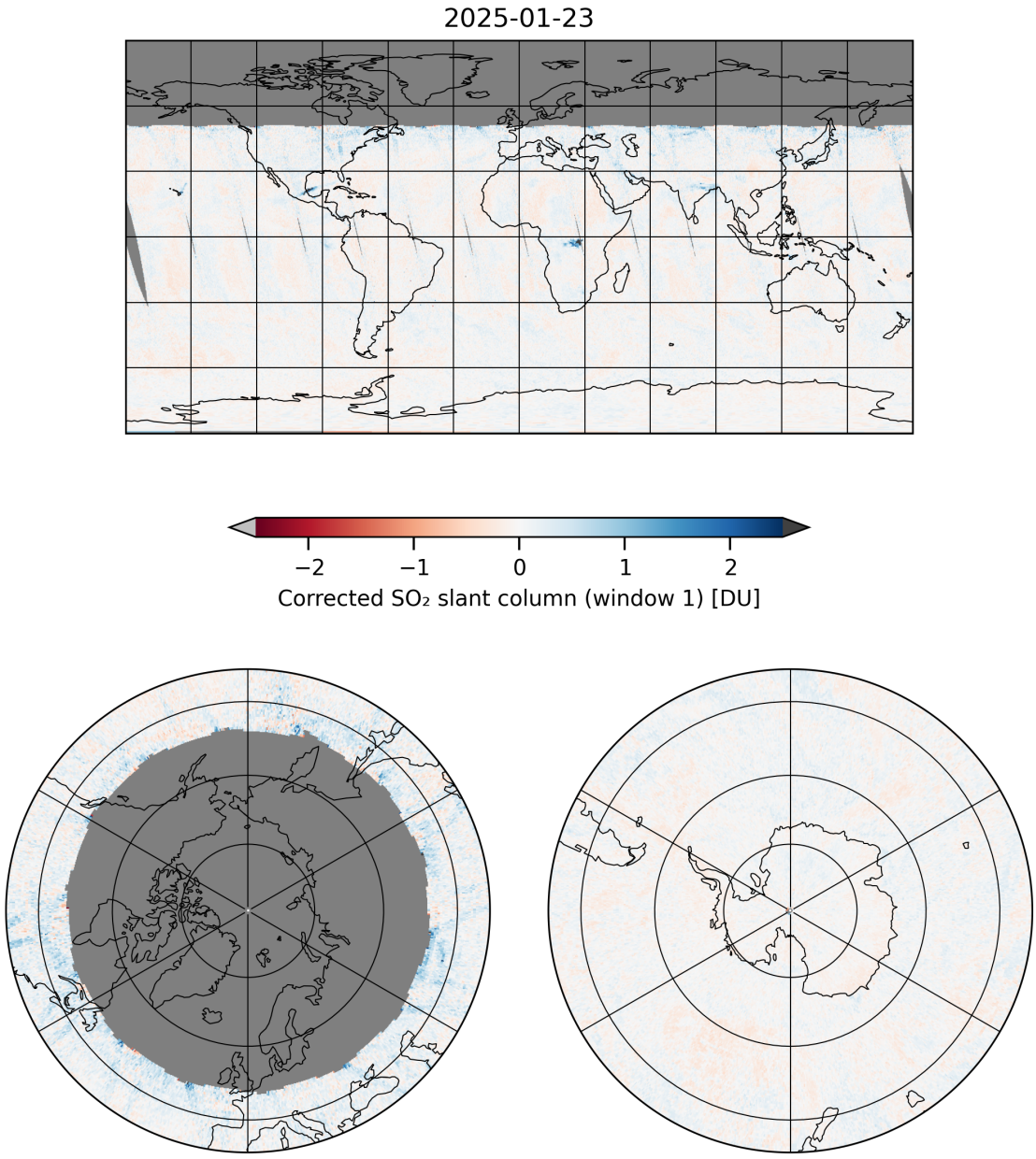


Figure 11: Map of "Corrected SO_2 slant column (window 1)" for 2025-01-23 to 2025-01-24

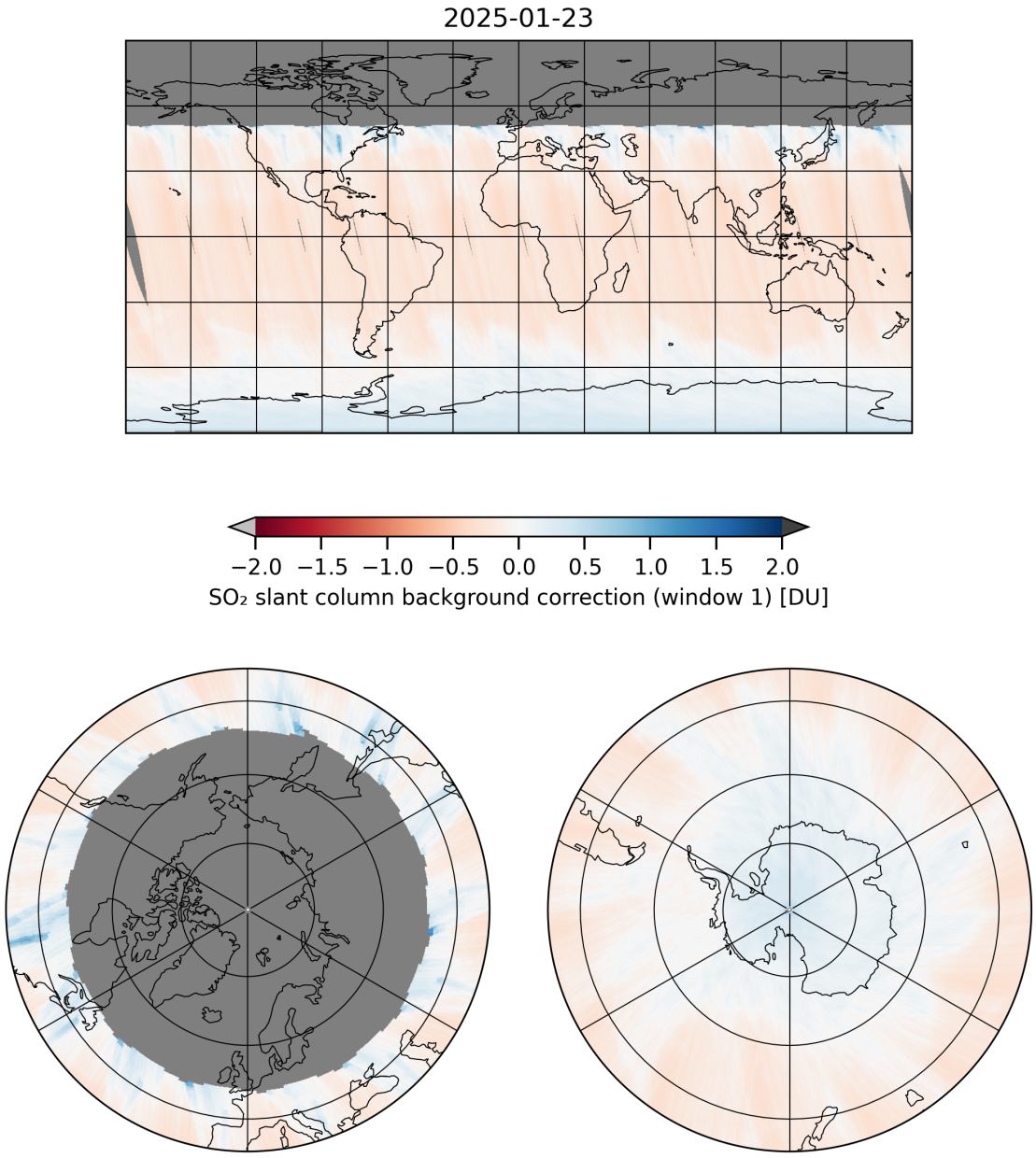


Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2025-01-23 to 2025-01-24

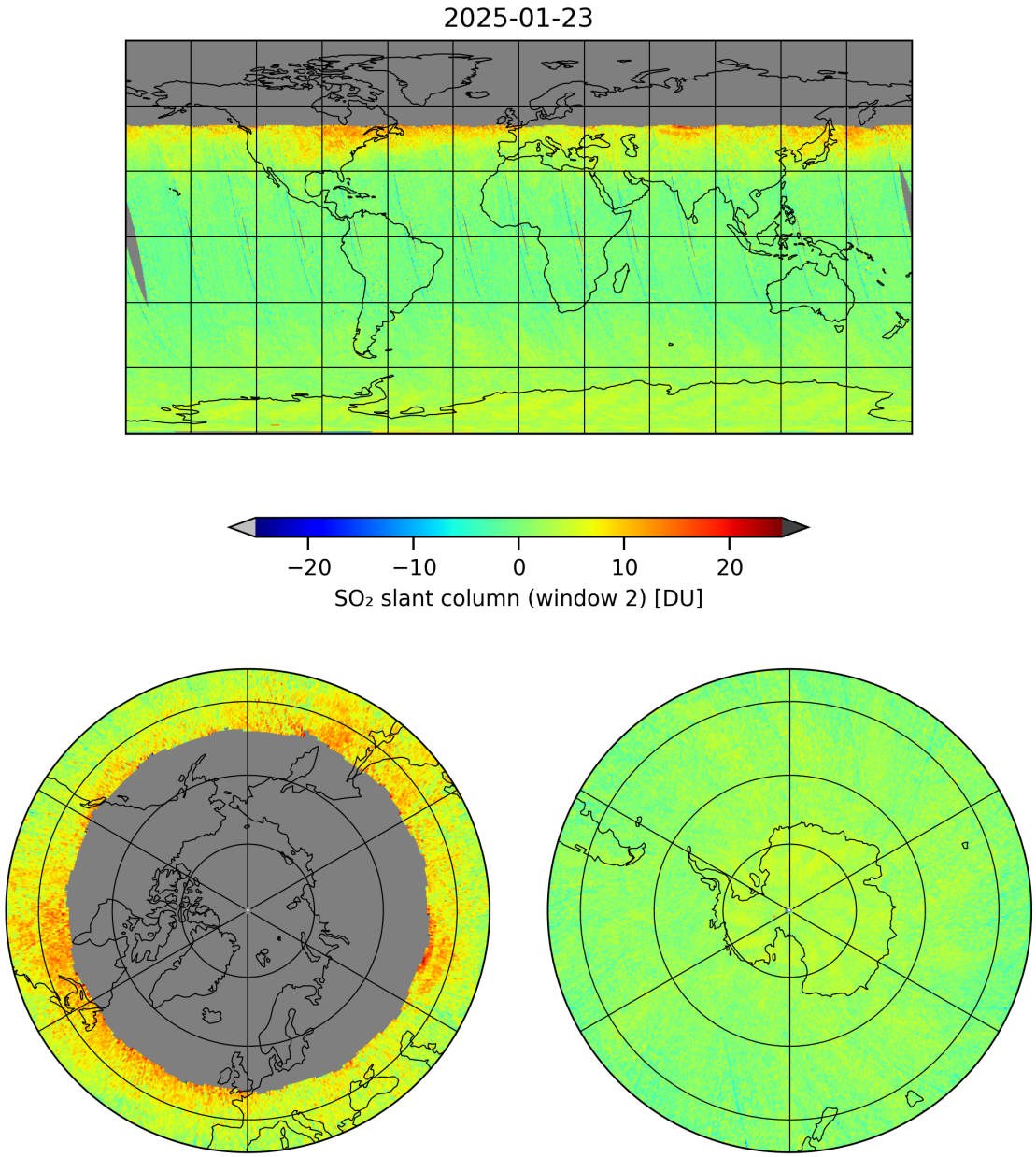


Figure 13: Map of "SO_2 slant column (window 2)" for 2025-01-23 to 2025-01-24

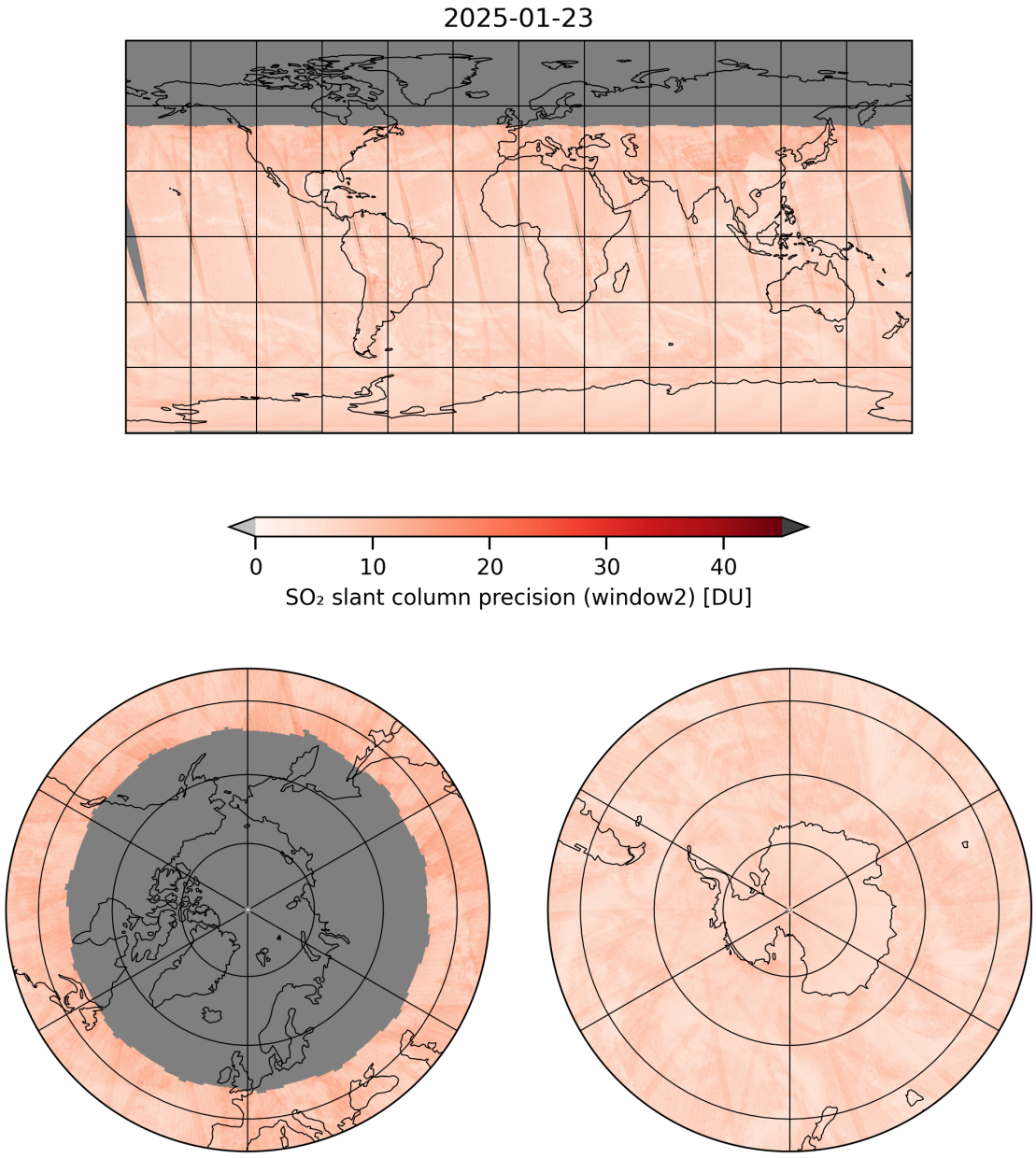


Figure 14: Map of "SO_2 slant column precision (window2)" for 2025-01-23 to 2025-01-24

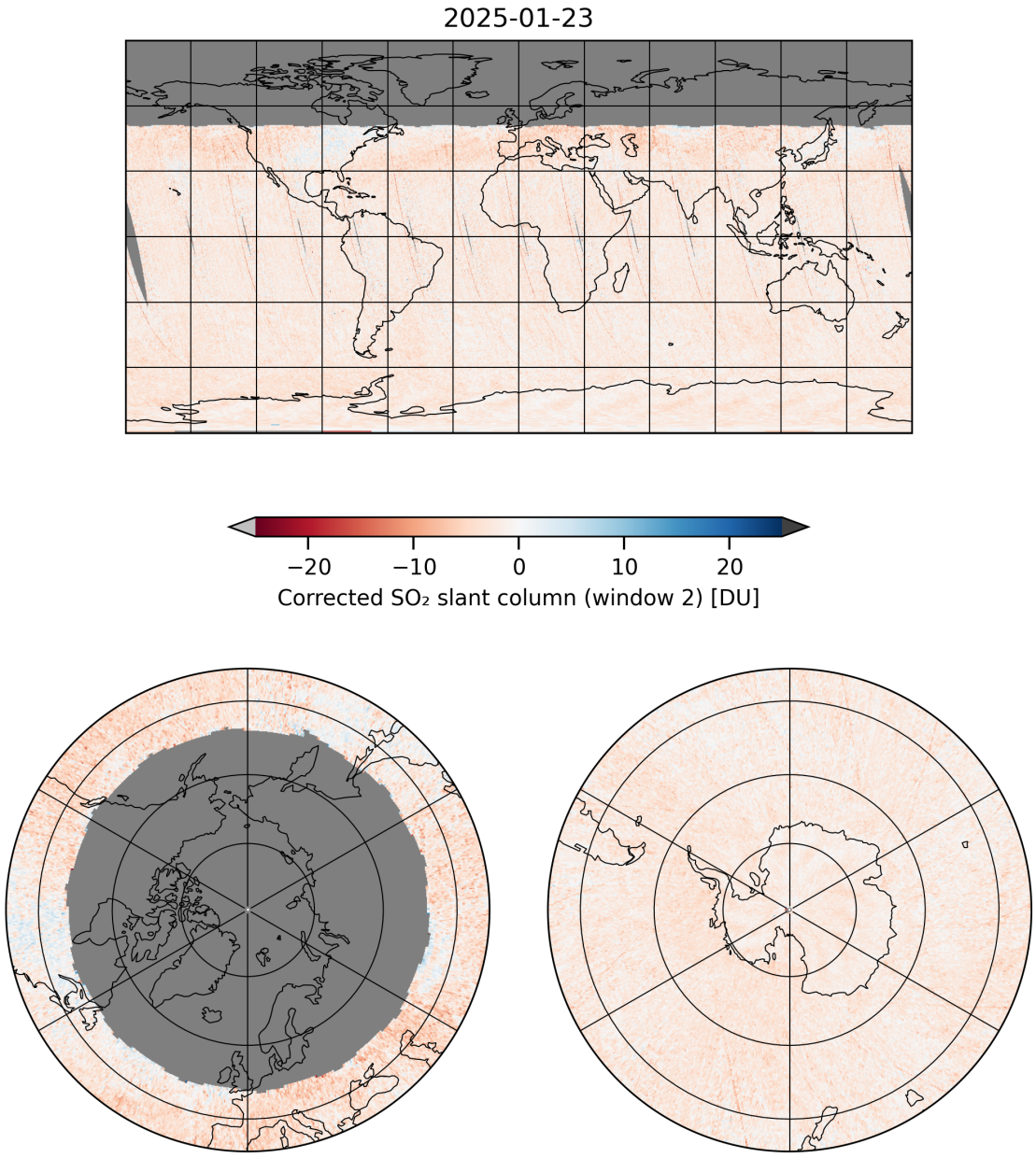


Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2025-01-23 to 2025-01-24

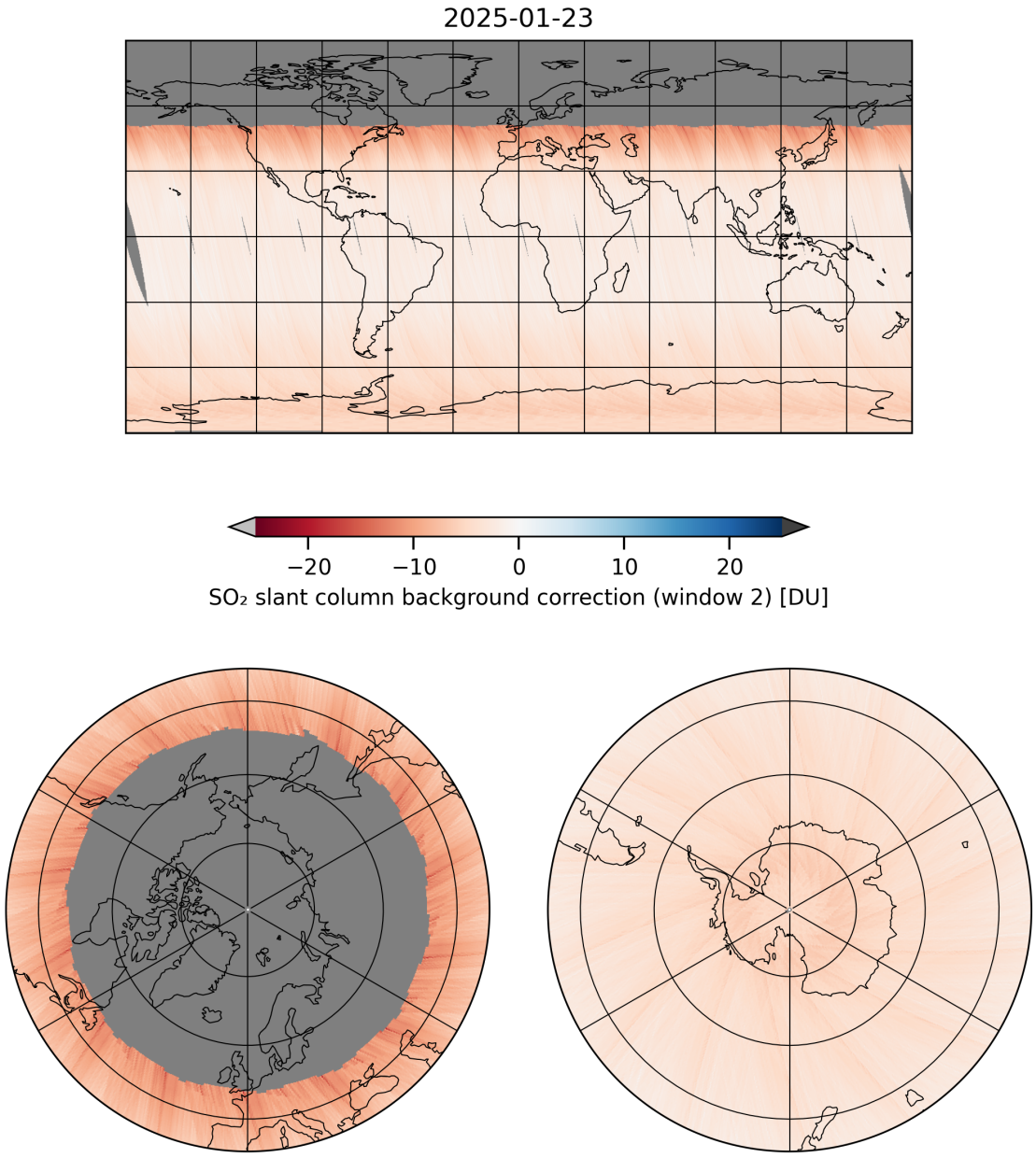


Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2025-01-23 to 2025-01-24

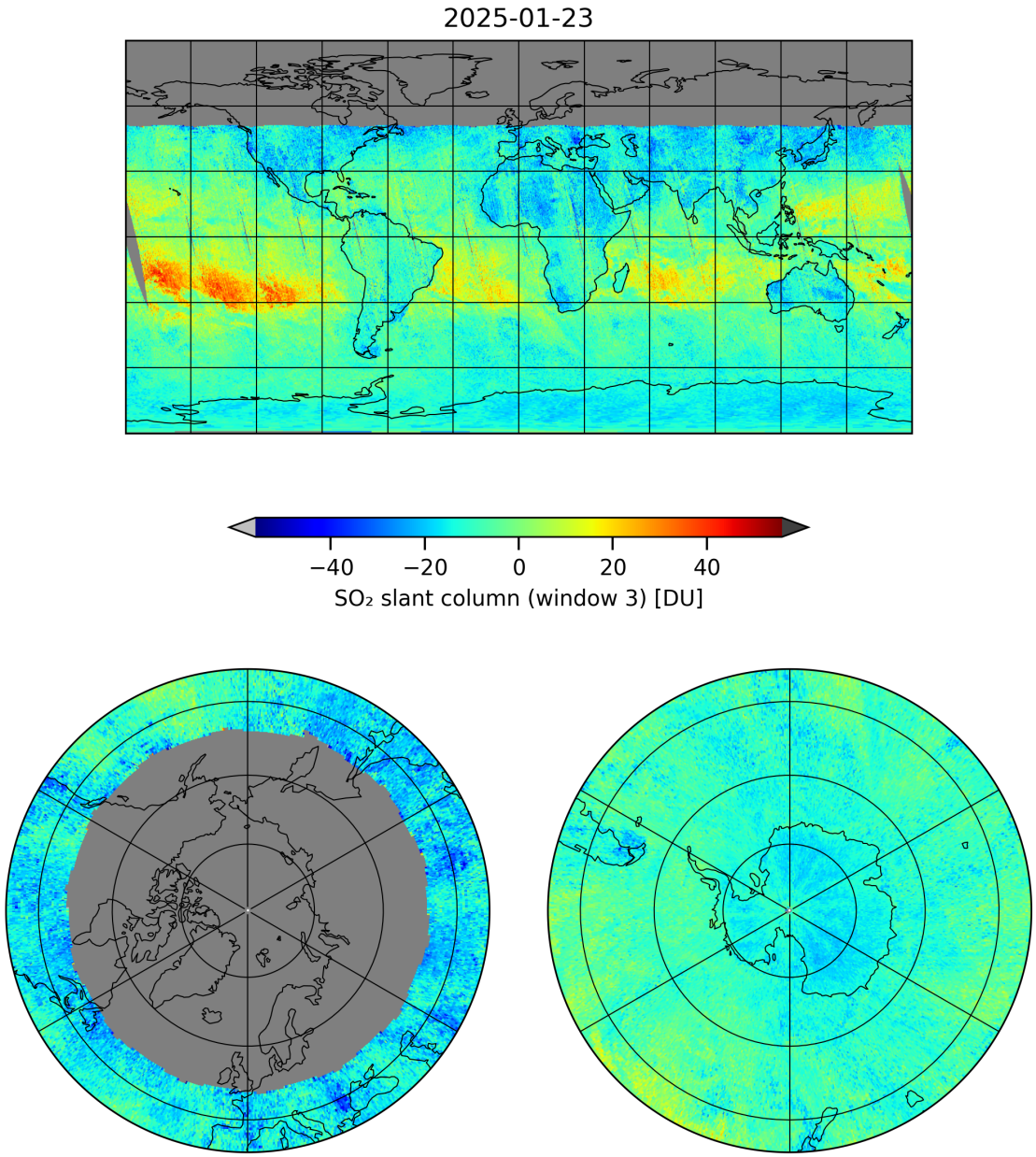


Figure 17: Map of "SO_2 slant column (window 3)" for 2025-01-23 to 2025-01-24

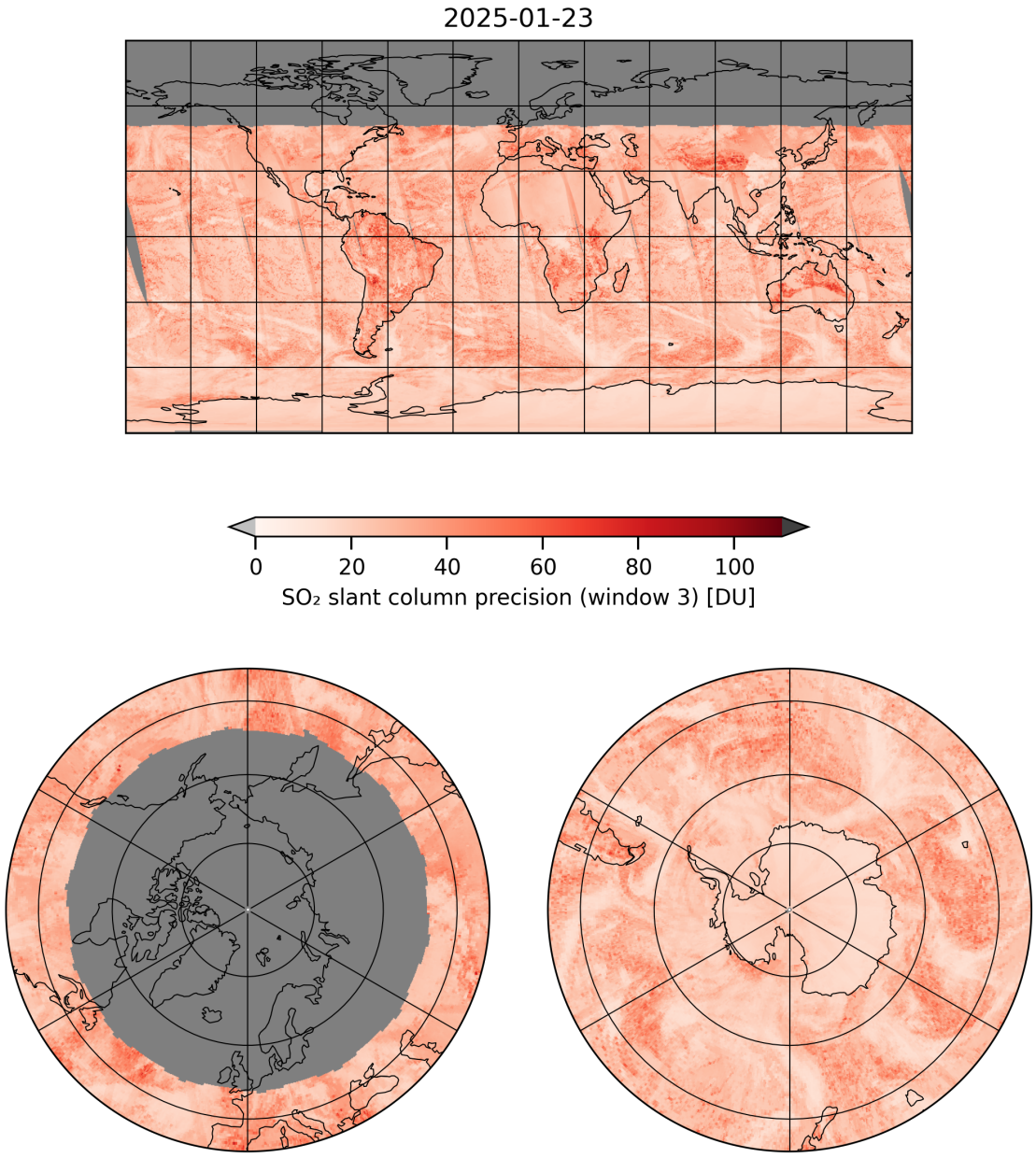


Figure 18: Map of "SO_2 slant column precision (window 3)" for 2025-01-23 to 2025-01-24

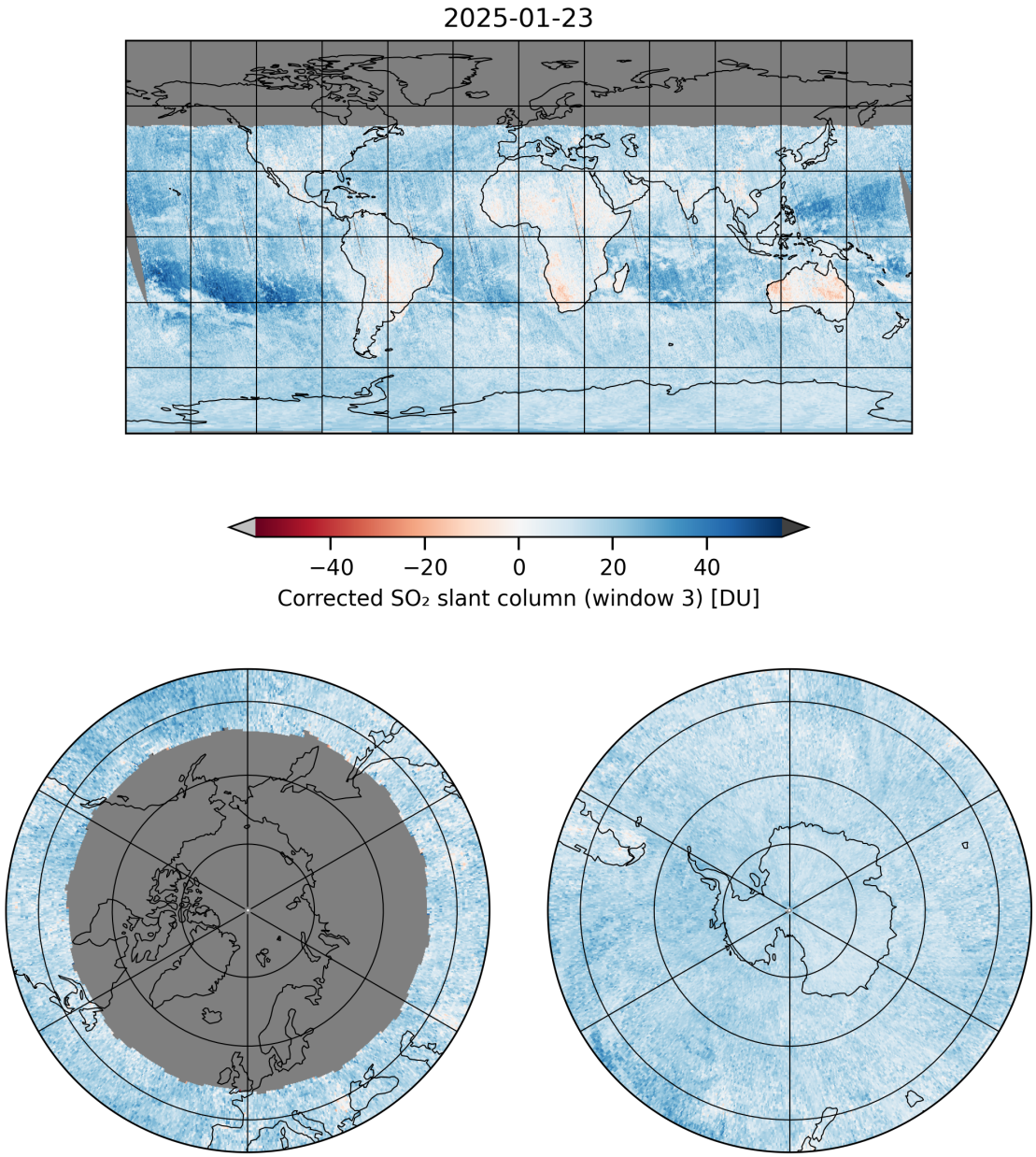


Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2025-01-23 to 2025-01-24

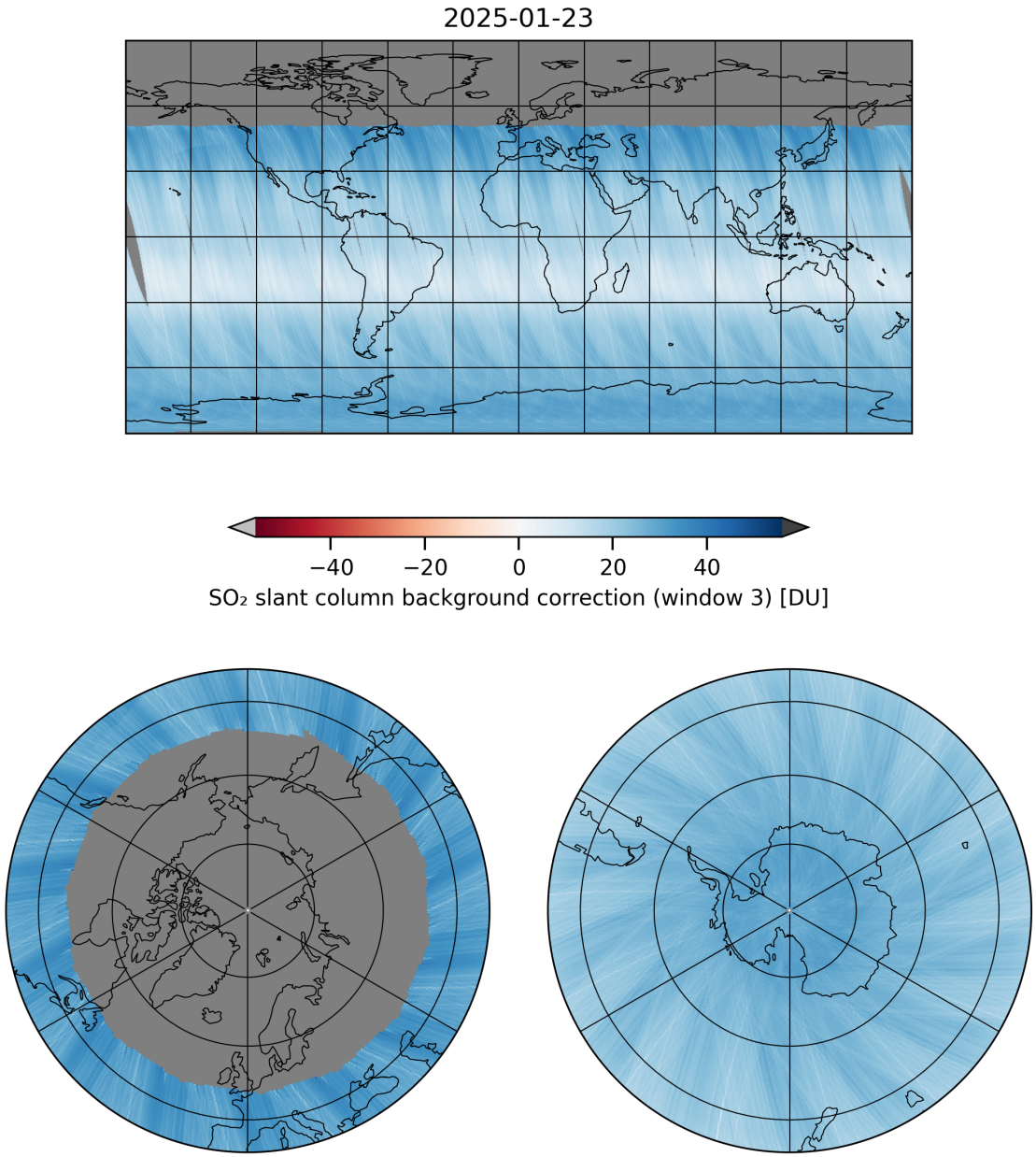


Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2025-01-23 to 2025-01-24

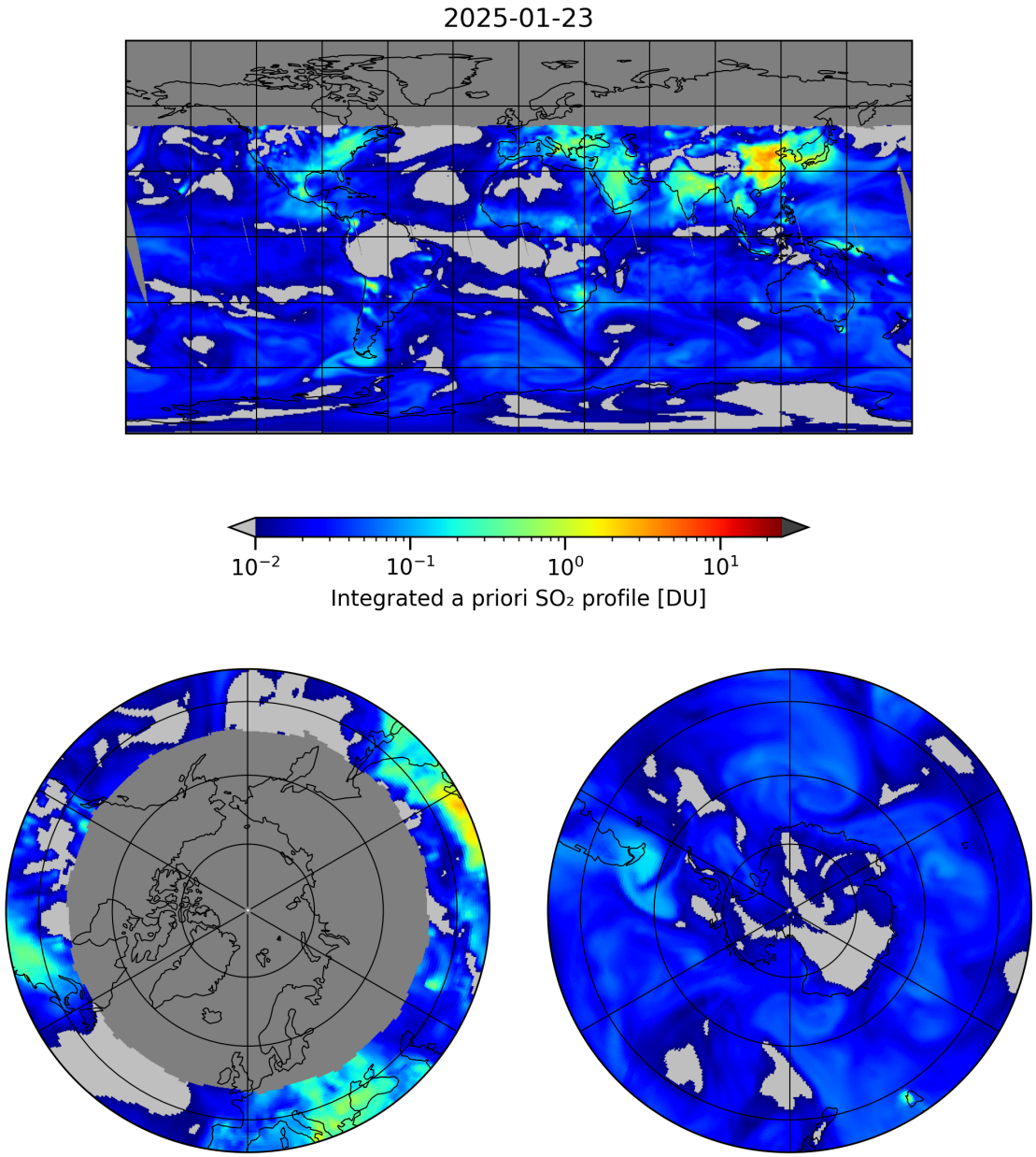


Figure 21: Map of “Integrated a priori SO_2 profile” for 2025-01-23 to 2025-01-24

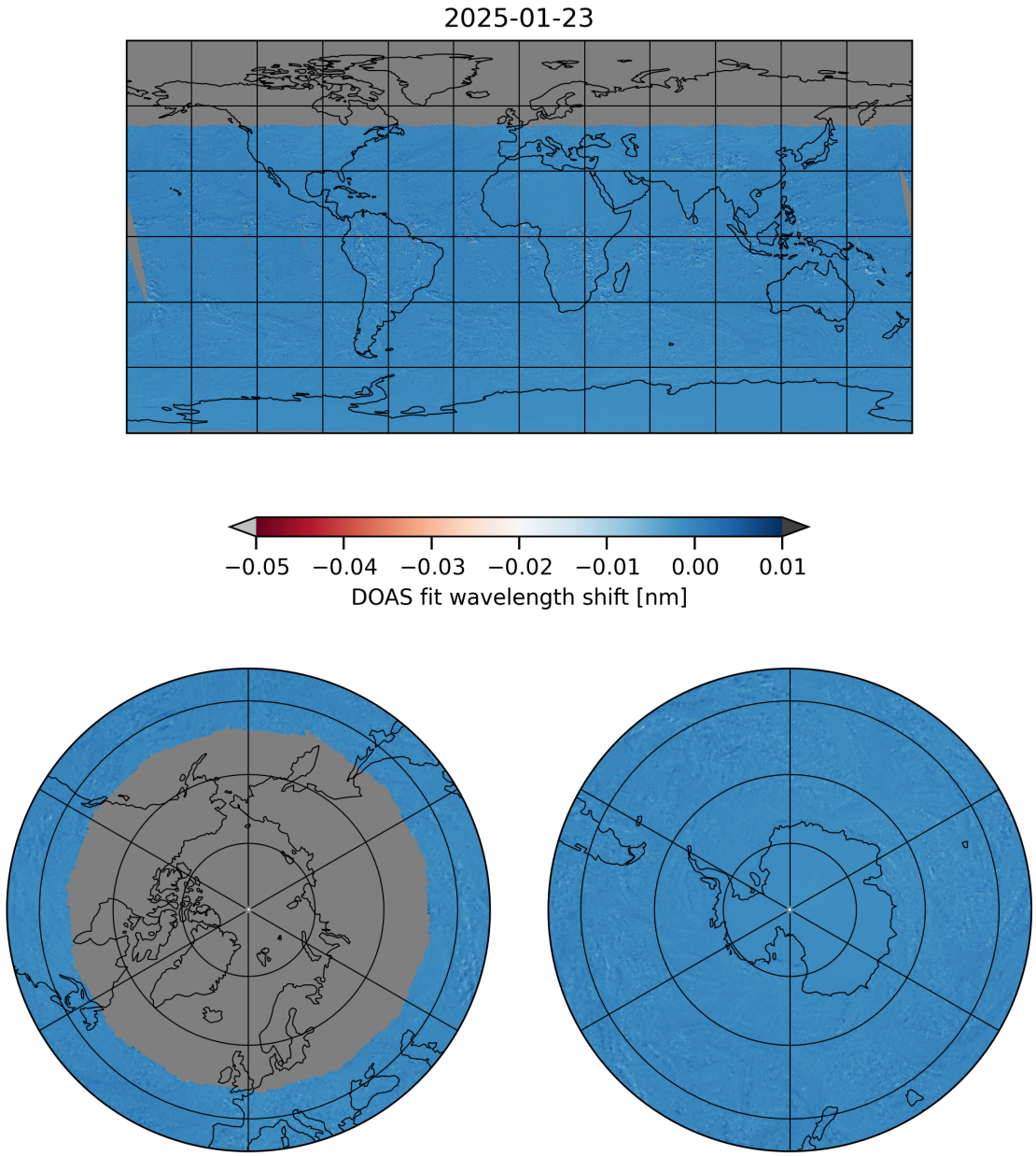


Figure 22: Map of “DOAS fit wavelength shift” for 2025-01-23 to 2025-01-24

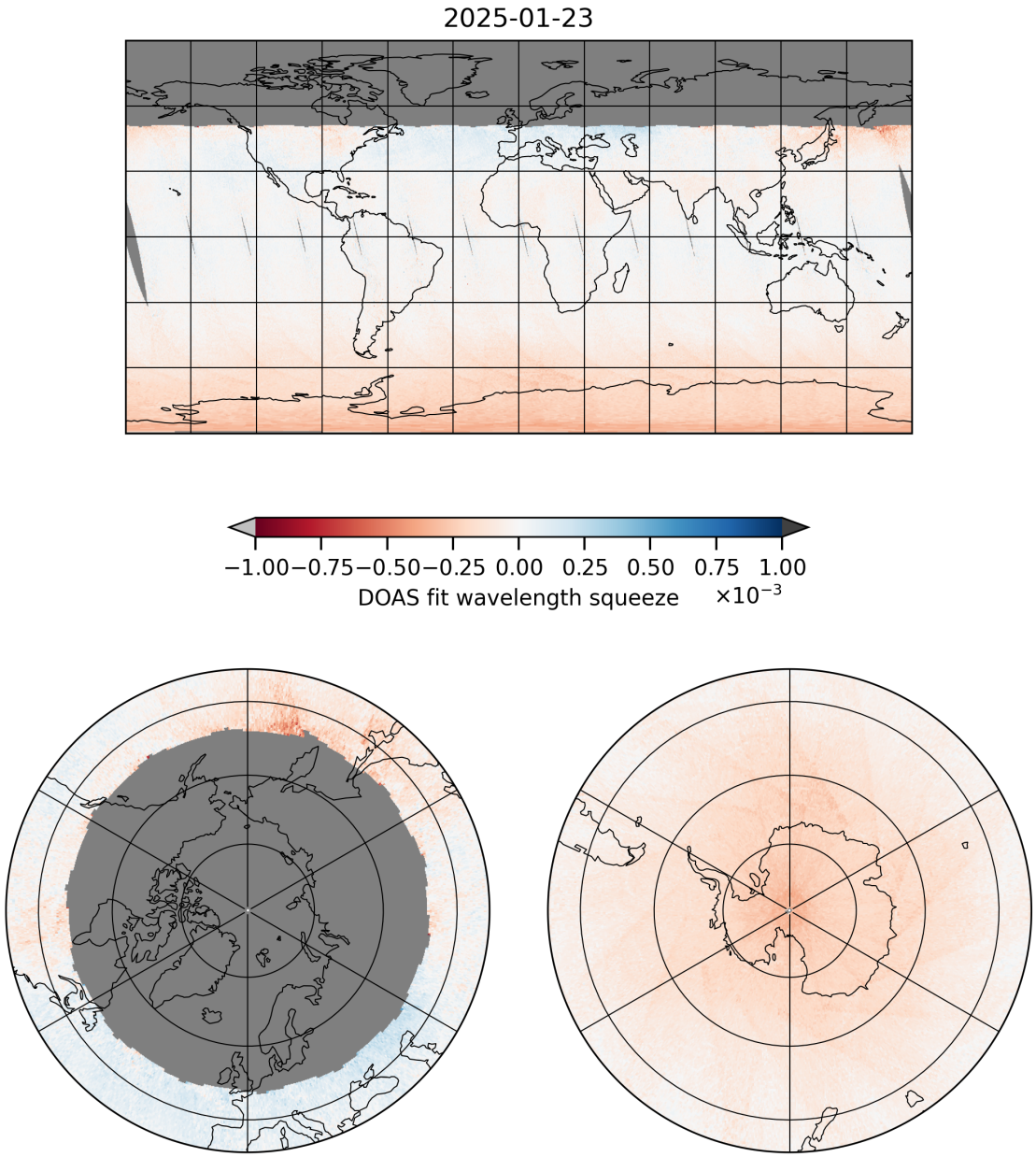


Figure 23: Map of “DOAS fit wavelength squeeze” for 2025-01-23 to 2025-01-24

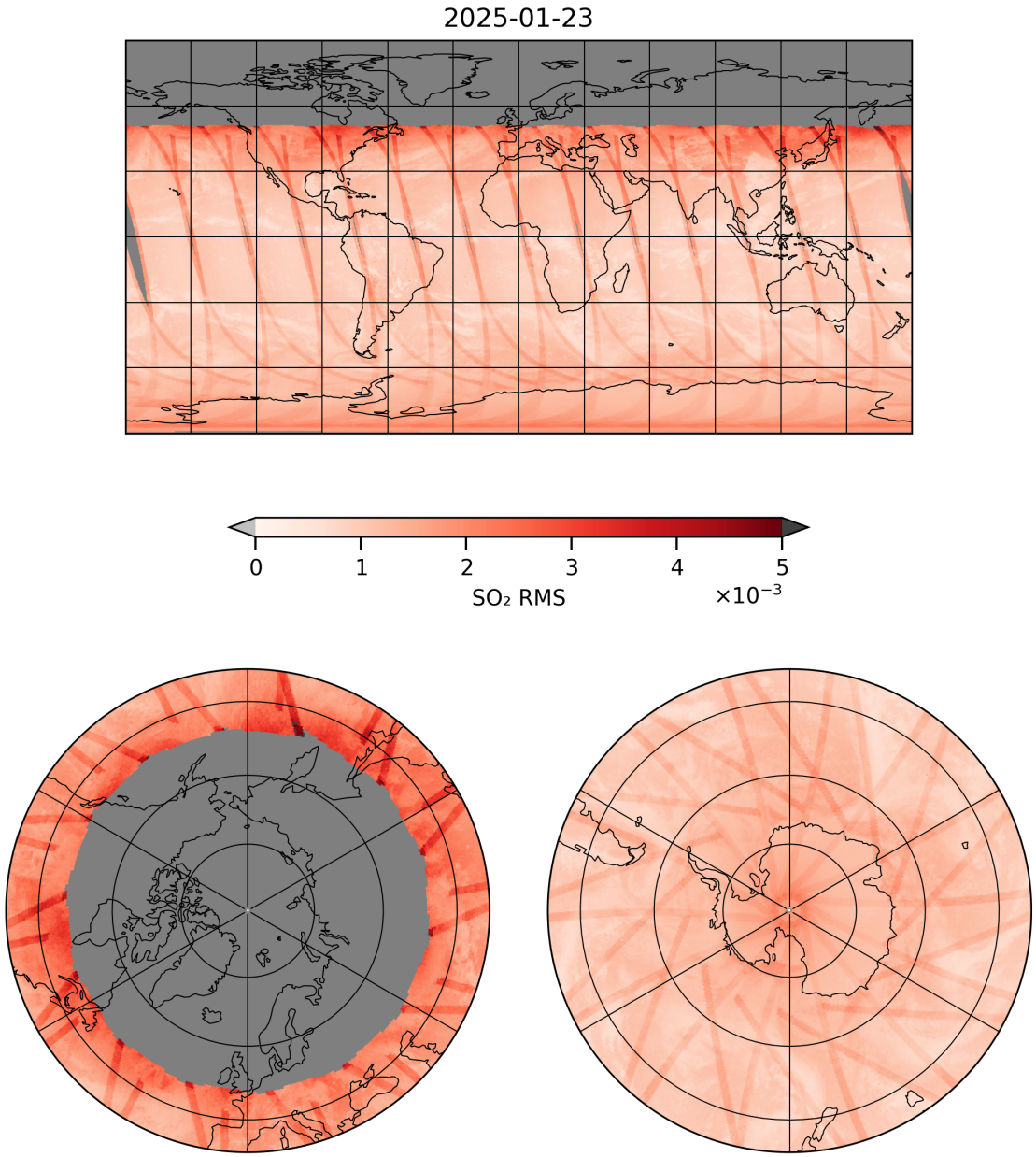


Figure 24: Map of "SO_2 RMS" for 2025-01-23 to 2025-01-24

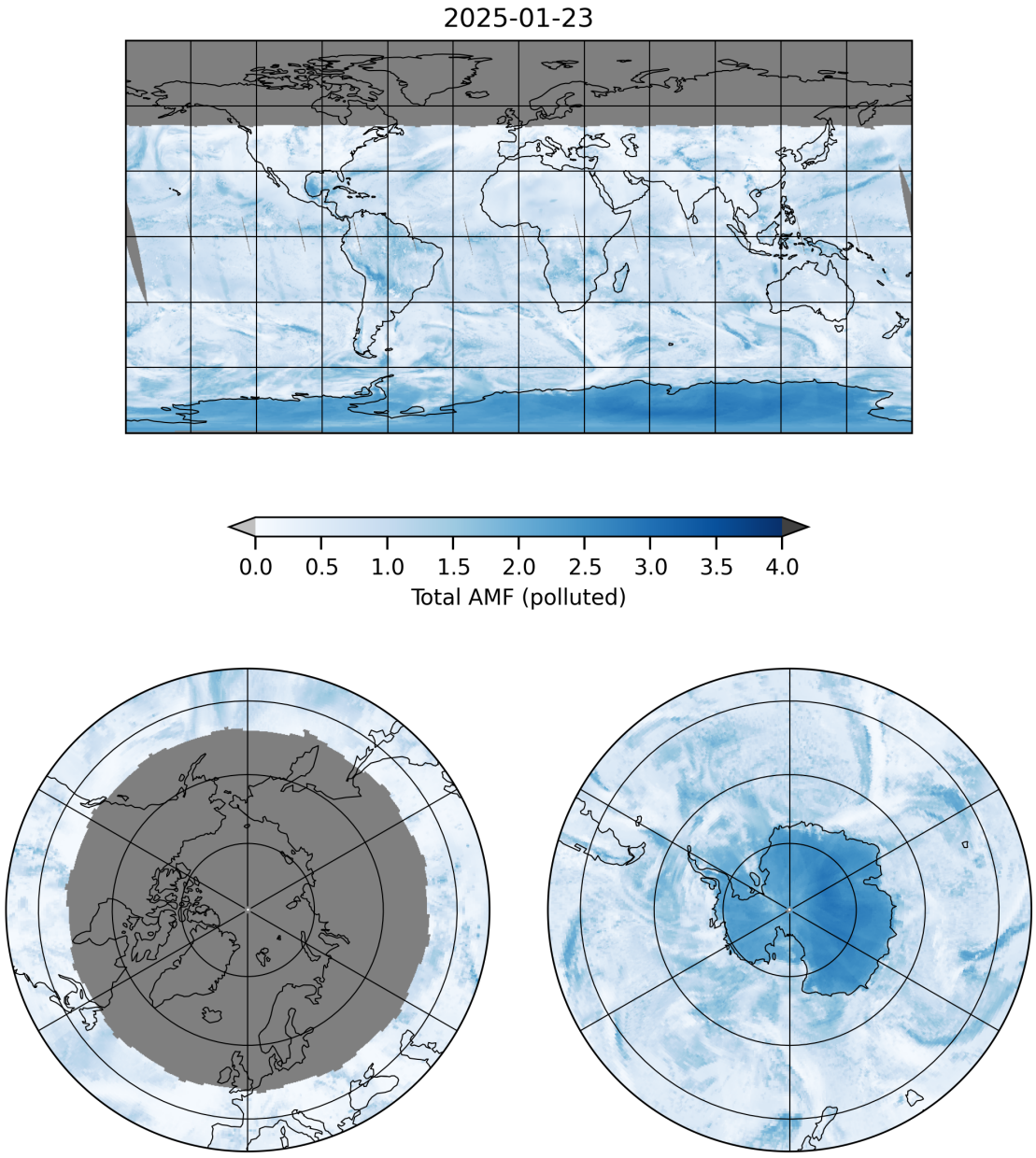


Figure 25: Map of “Total AMF (polluted)” for 2025-01-23 to 2025-01-24

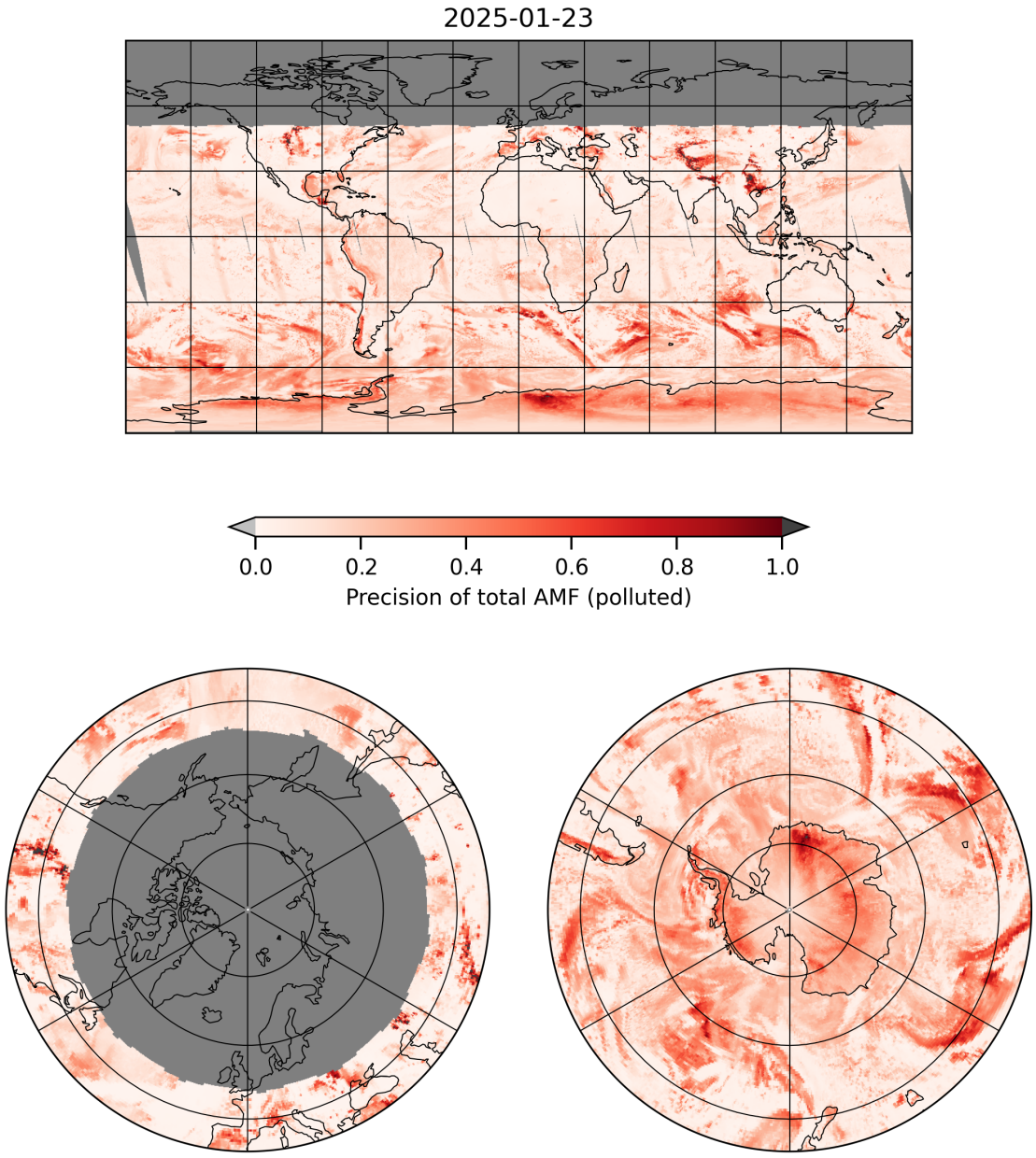


Figure 26: Map of “Precision of total AMF (polluted)” for 2025-01-23 to 2025-01-24

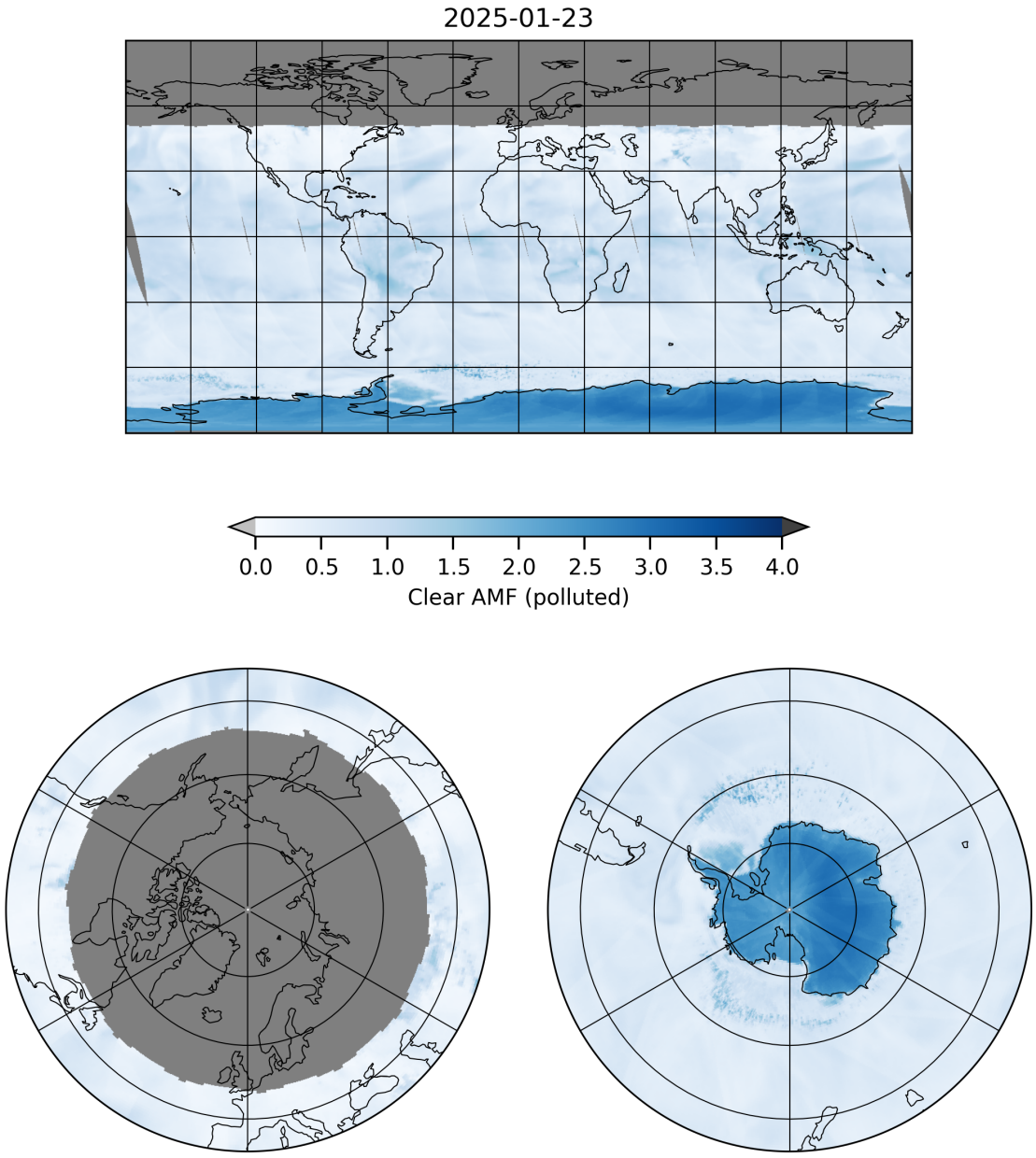


Figure 27: Map of “Clear AMF (polluted)” for 2025-01-23 to 2025-01-24

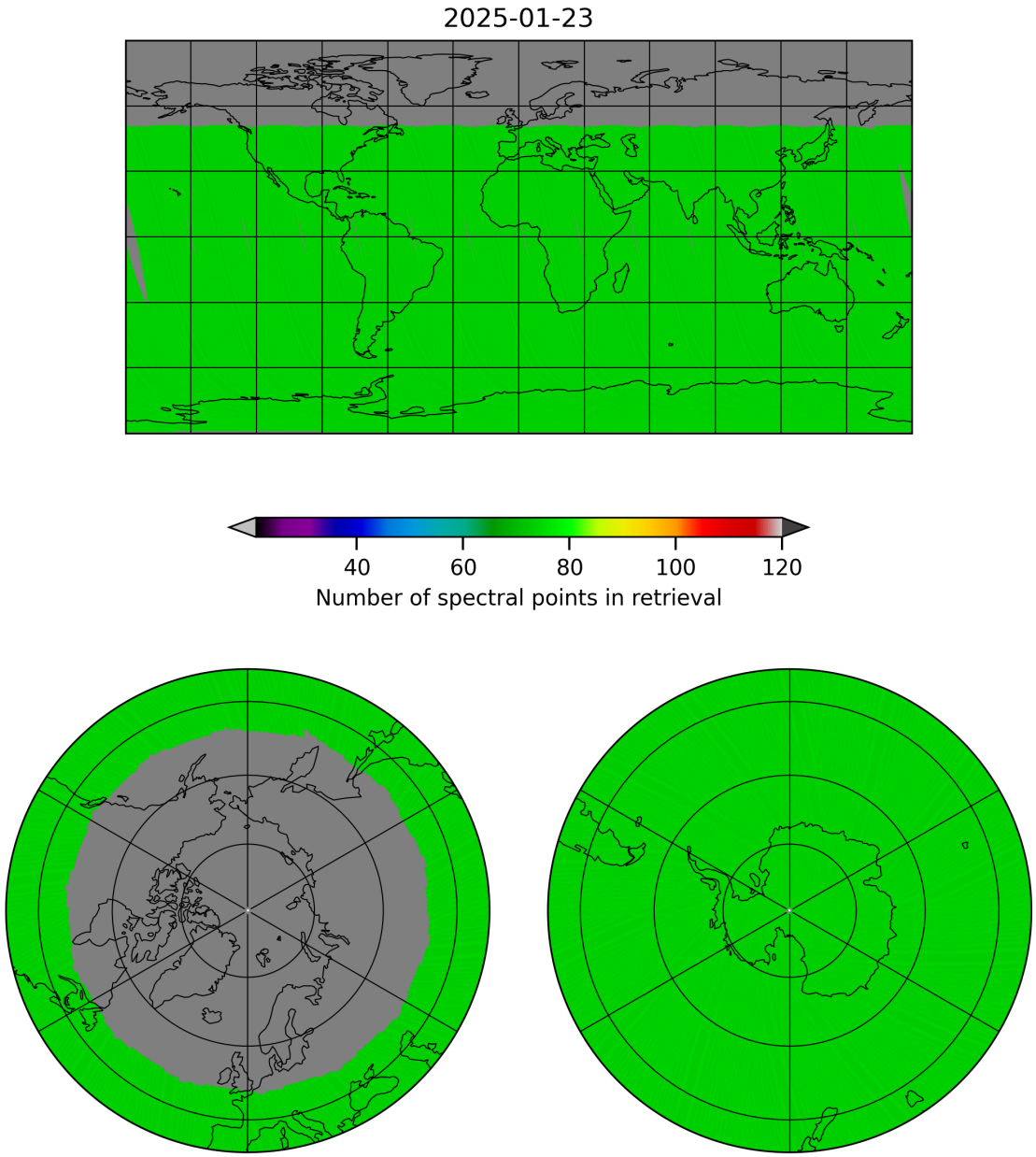


Figure 28: Map of “Number of spectral points in retrieval” for 2025-01-23 to 2025-01-24

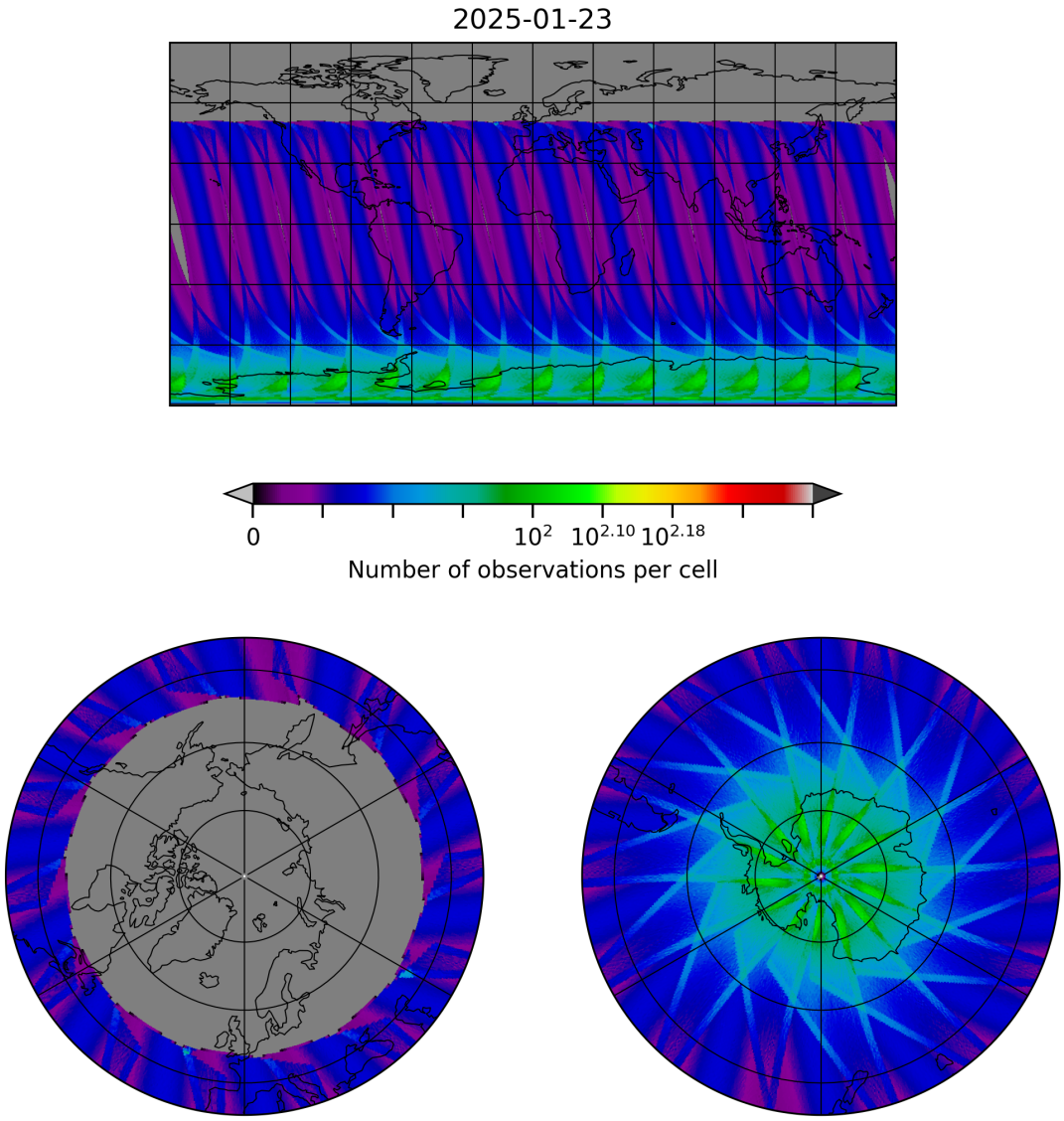


Figure 29: Map of the number of observations for 2025-01-23 to 2025-01-24

7 Zonal average

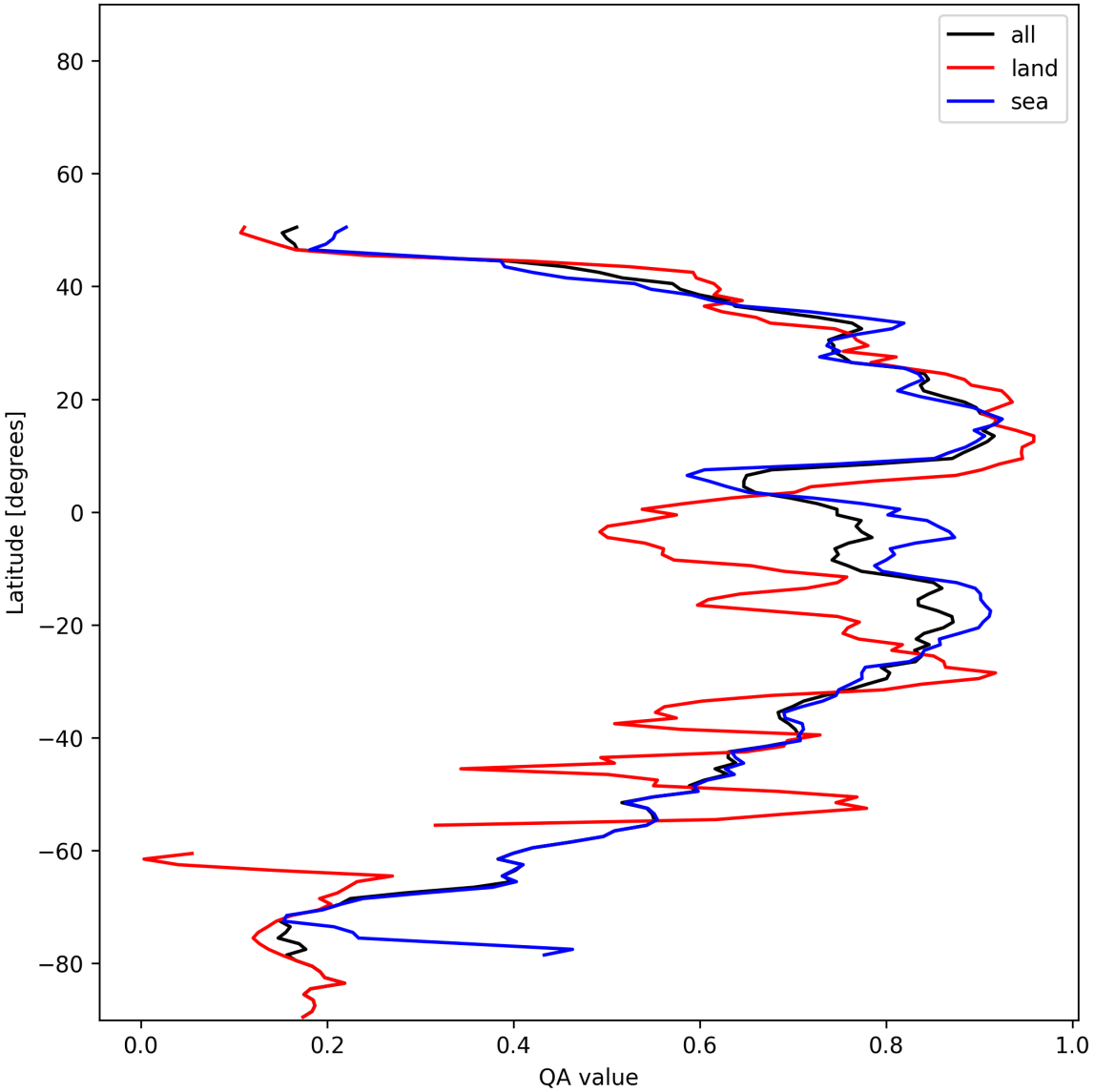


Figure 30: Zonal average of “QA value” for 2025-01-23 to 2025-01-24.

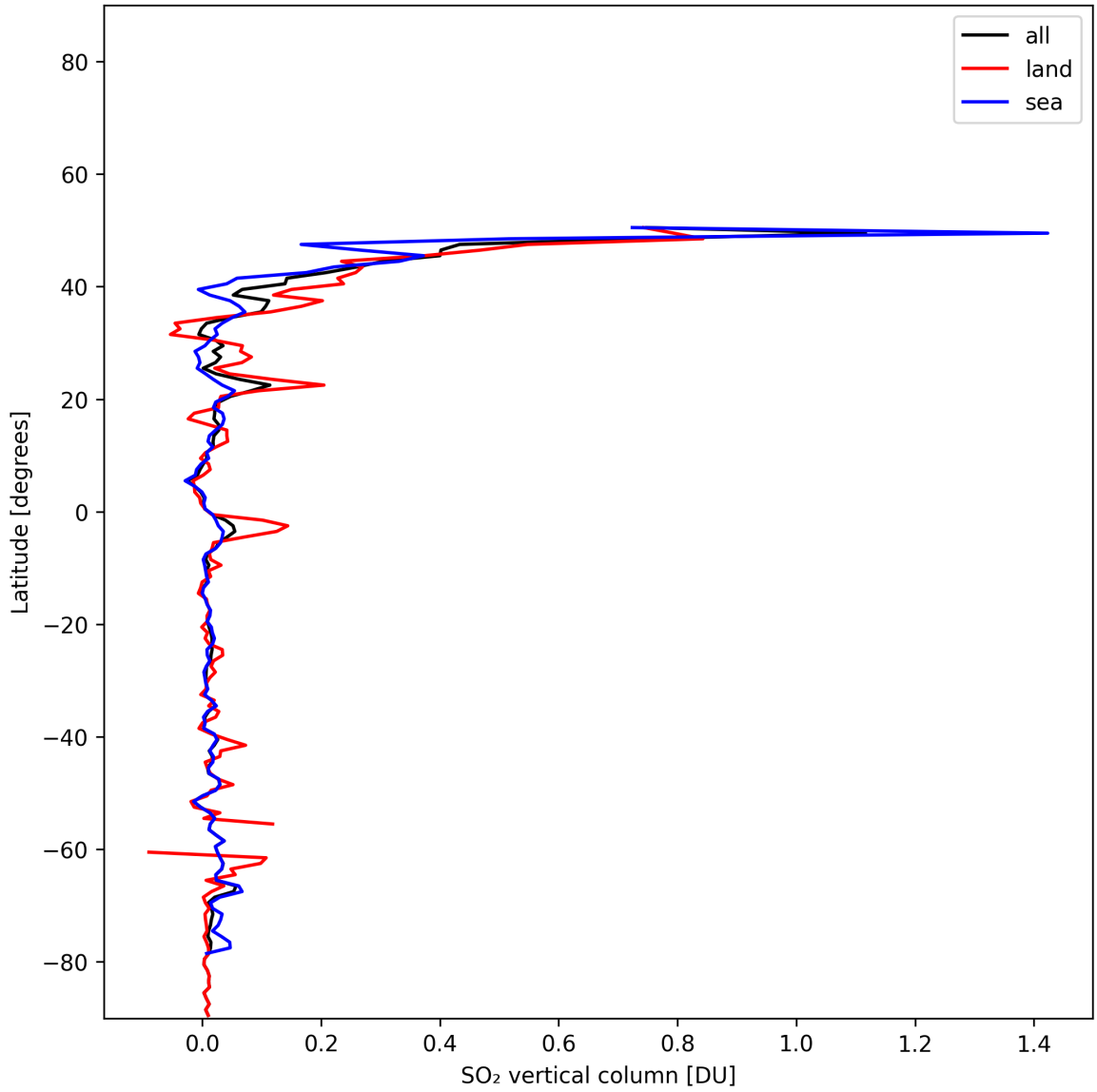


Figure 31: Zonal average of "SO_2 vertical column" for 2025-01-23 to 2025-01-24.

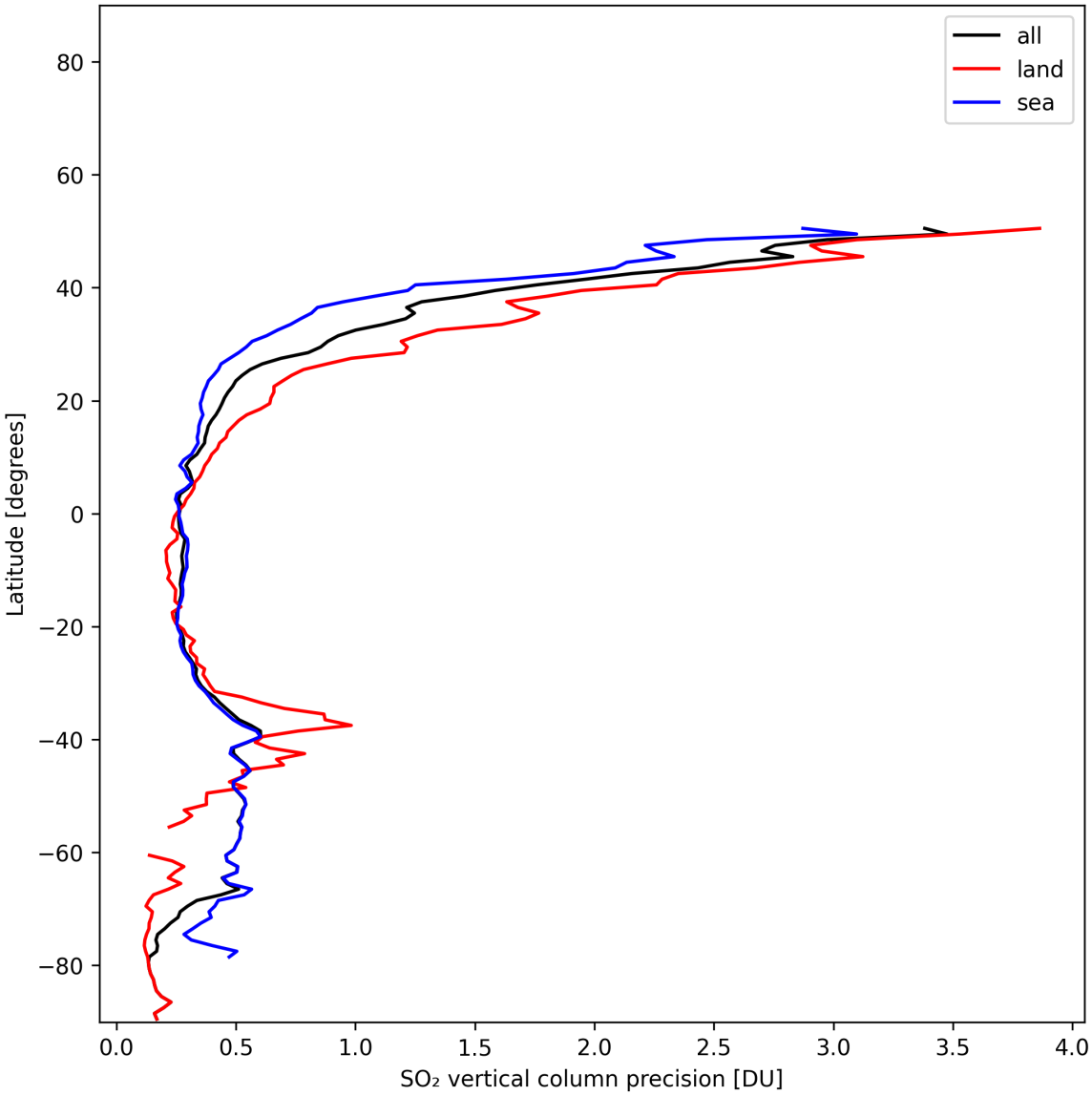


Figure 32: Zonal average of "SO_2 vertical column precision" for 2025-01-23 to 2025-01-24.

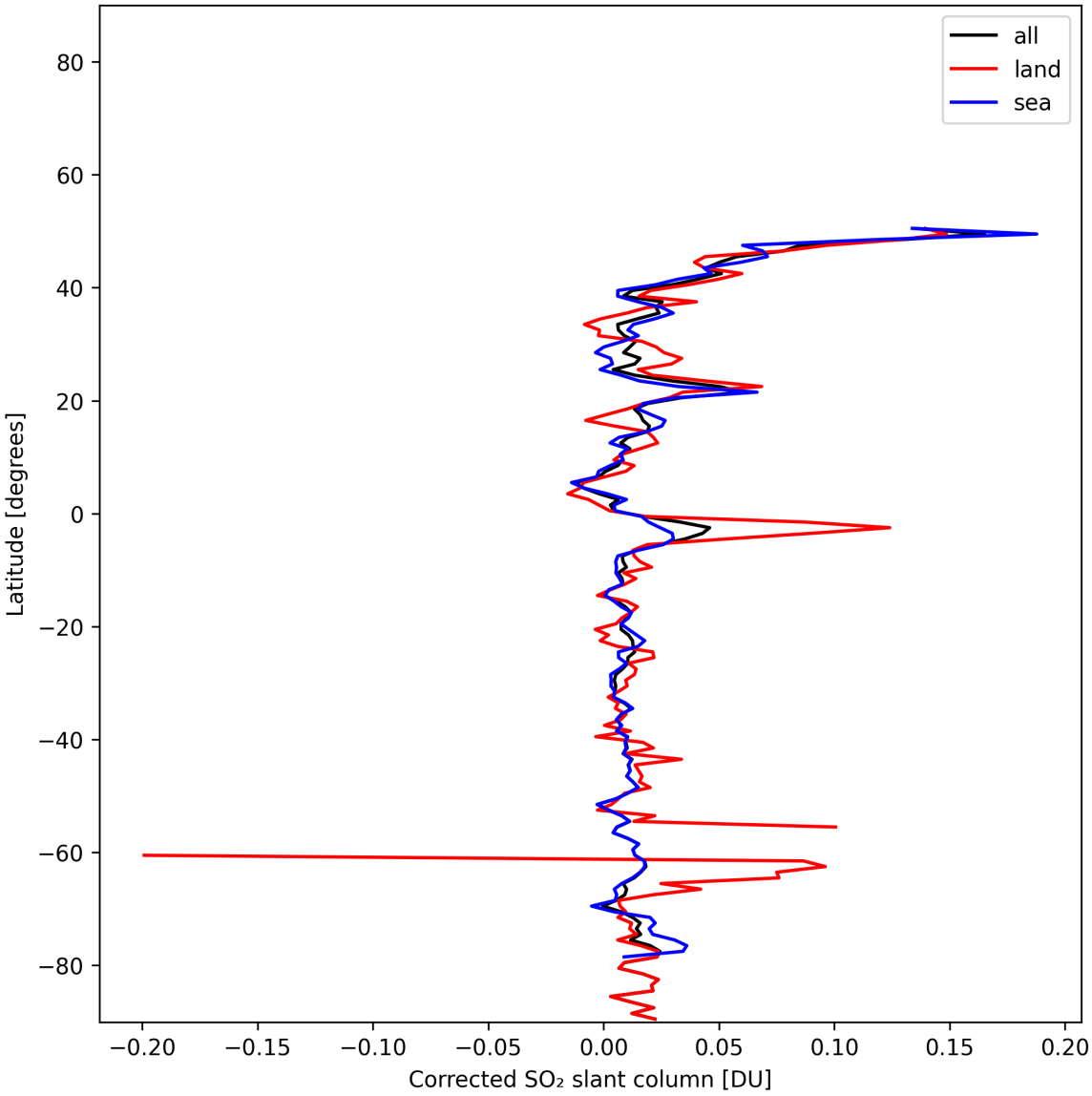


Figure 33: Zonal average of “Corrected SO_2 slant column” for 2025-01-23 to 2025-01-24.

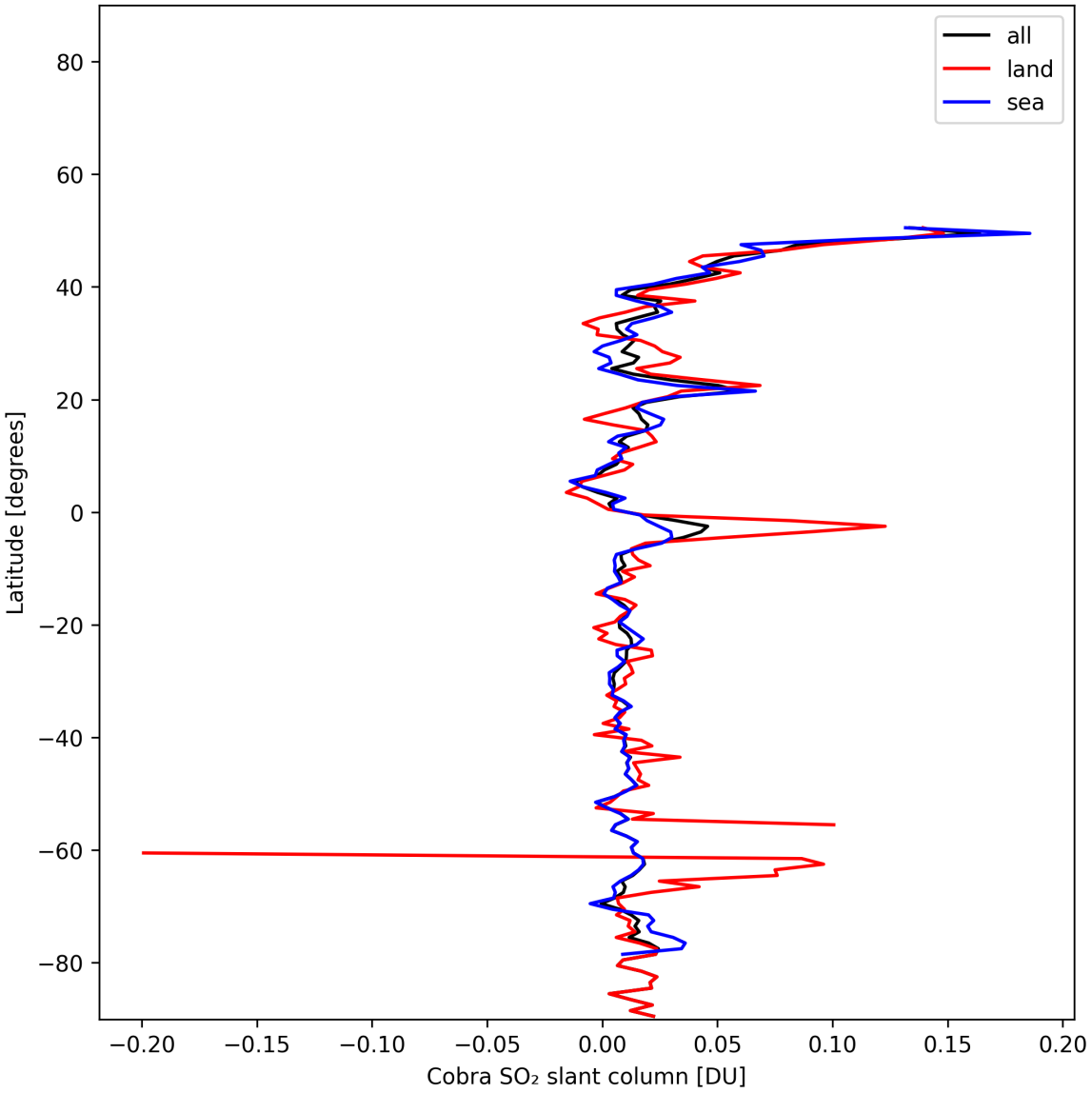


Figure 34: Zonal average of “Cobra SO_2 slant column” for 2025-01-23 to 2025-01-24.

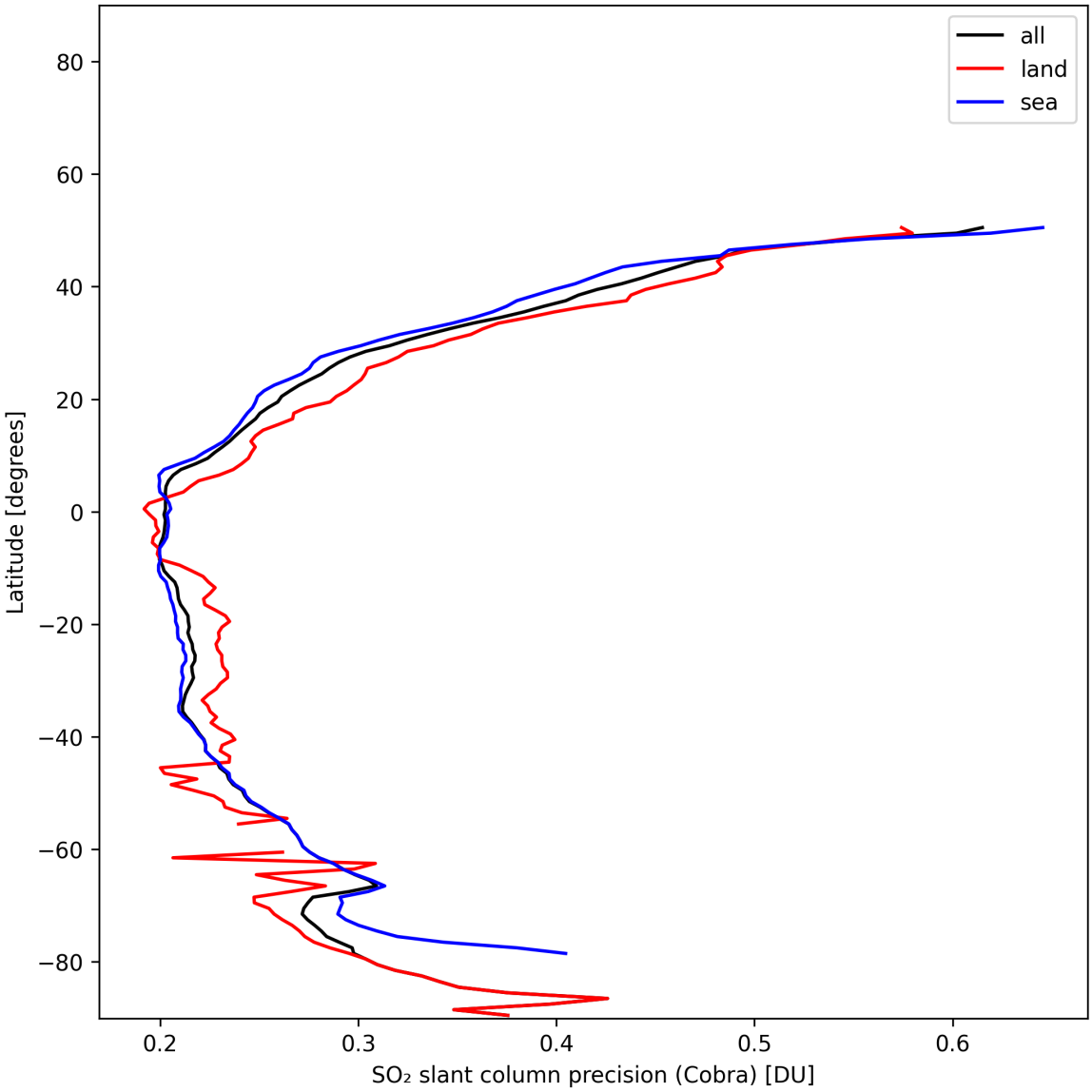


Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2025-01-23 to 2025-01-24.

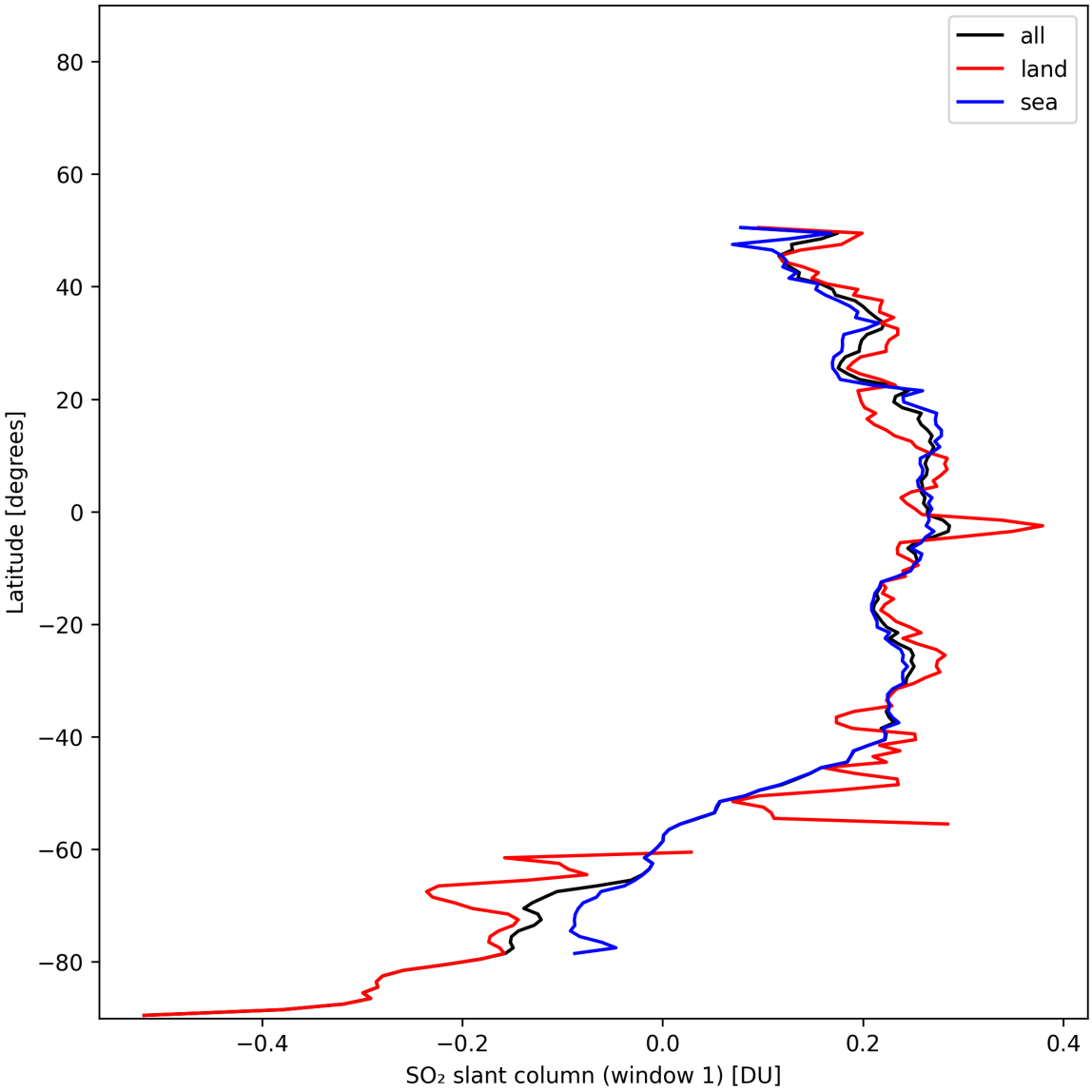


Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2025-01-23 to 2025-01-24.

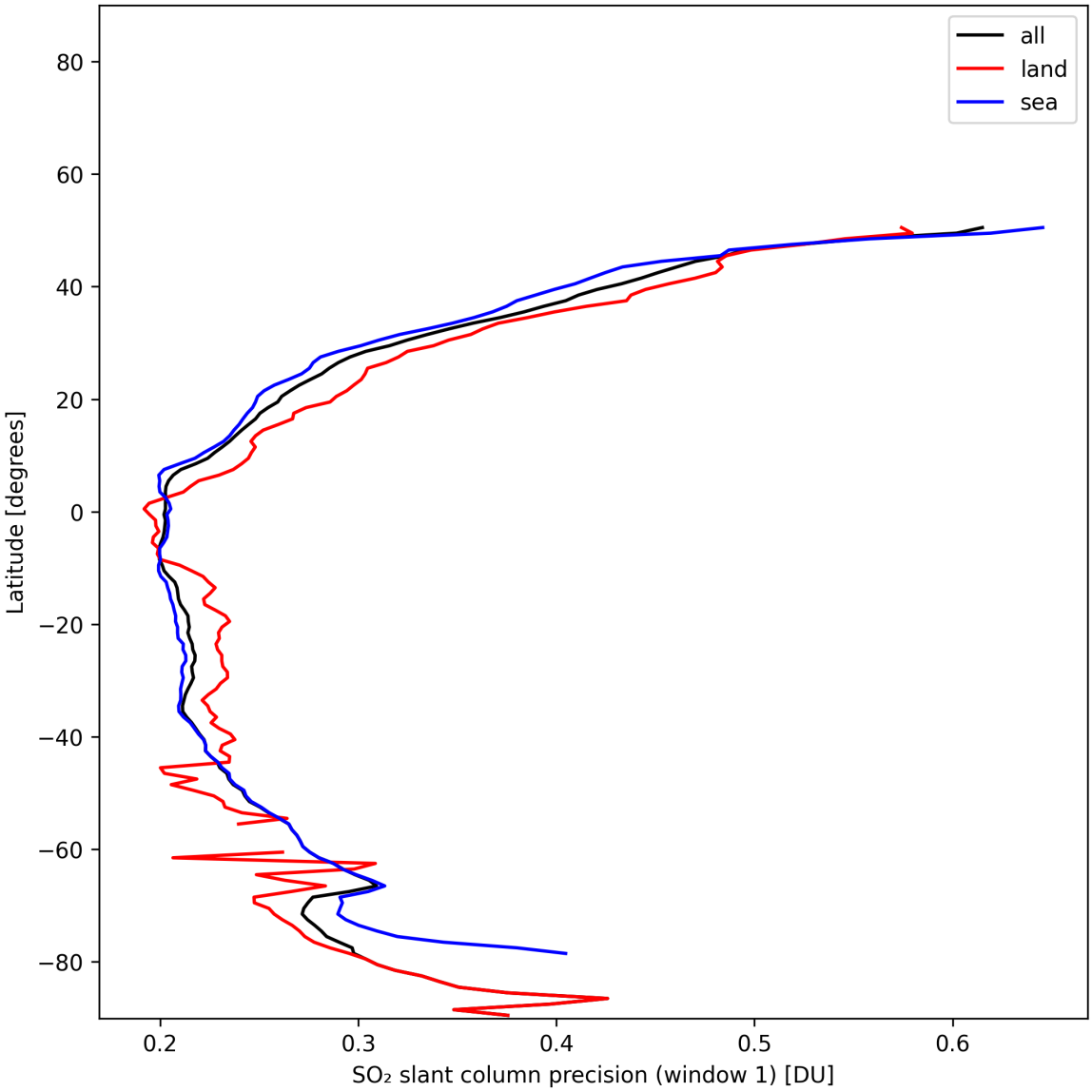


Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2025-01-23 to 2025-01-24.

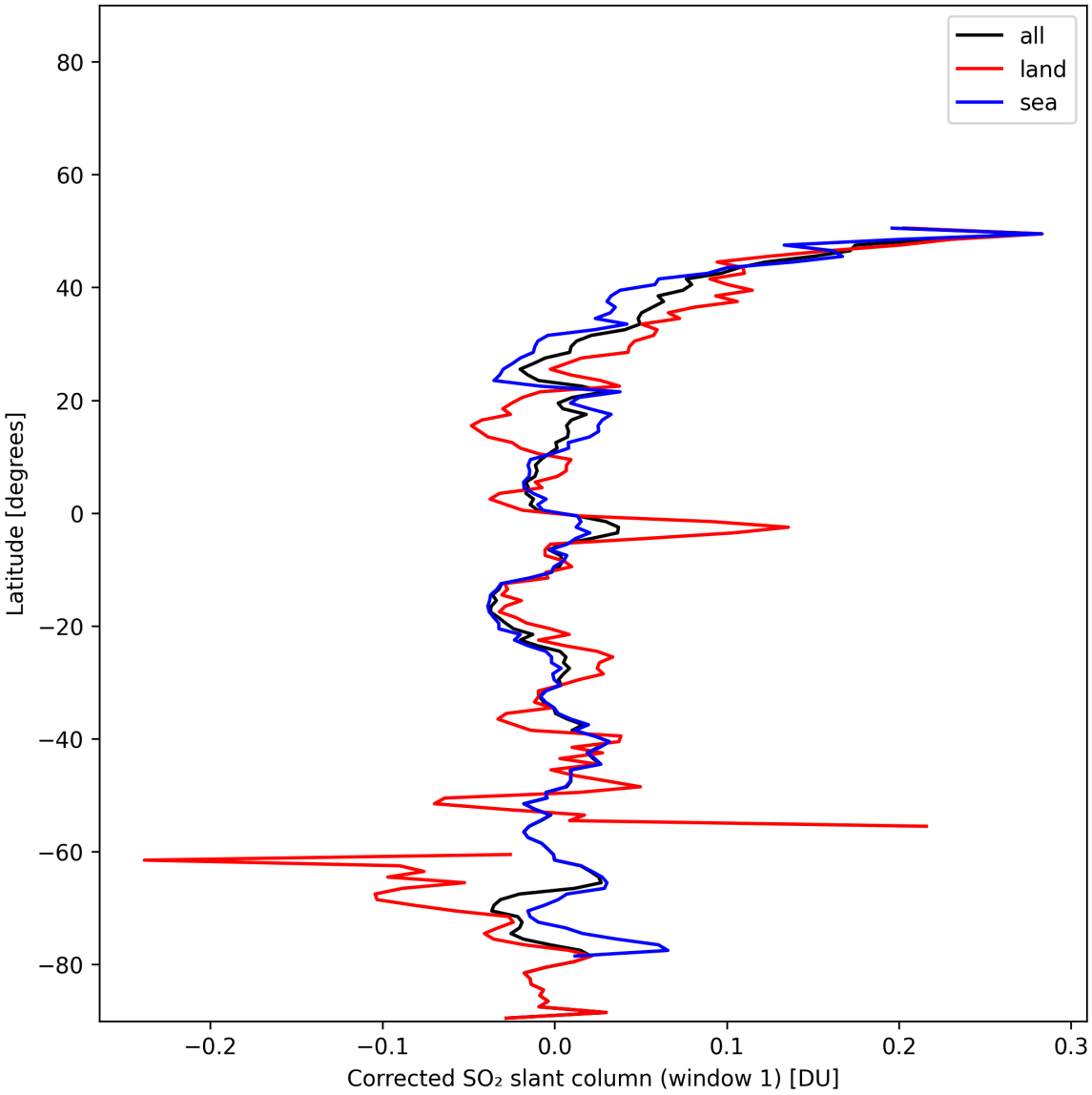


Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2025-01-23 to 2025-01-24.

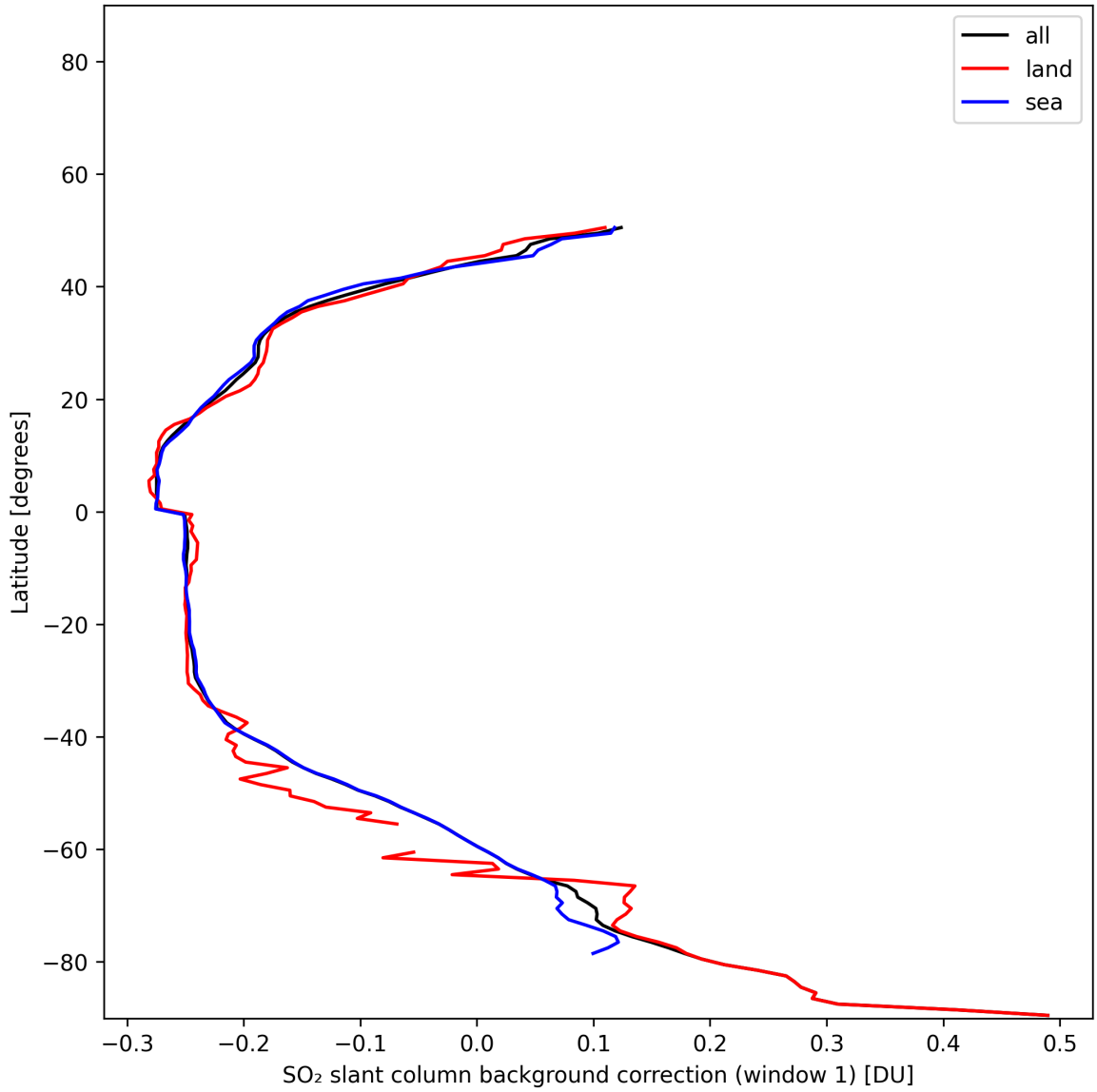


Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2025-01-23 to 2025-01-24.

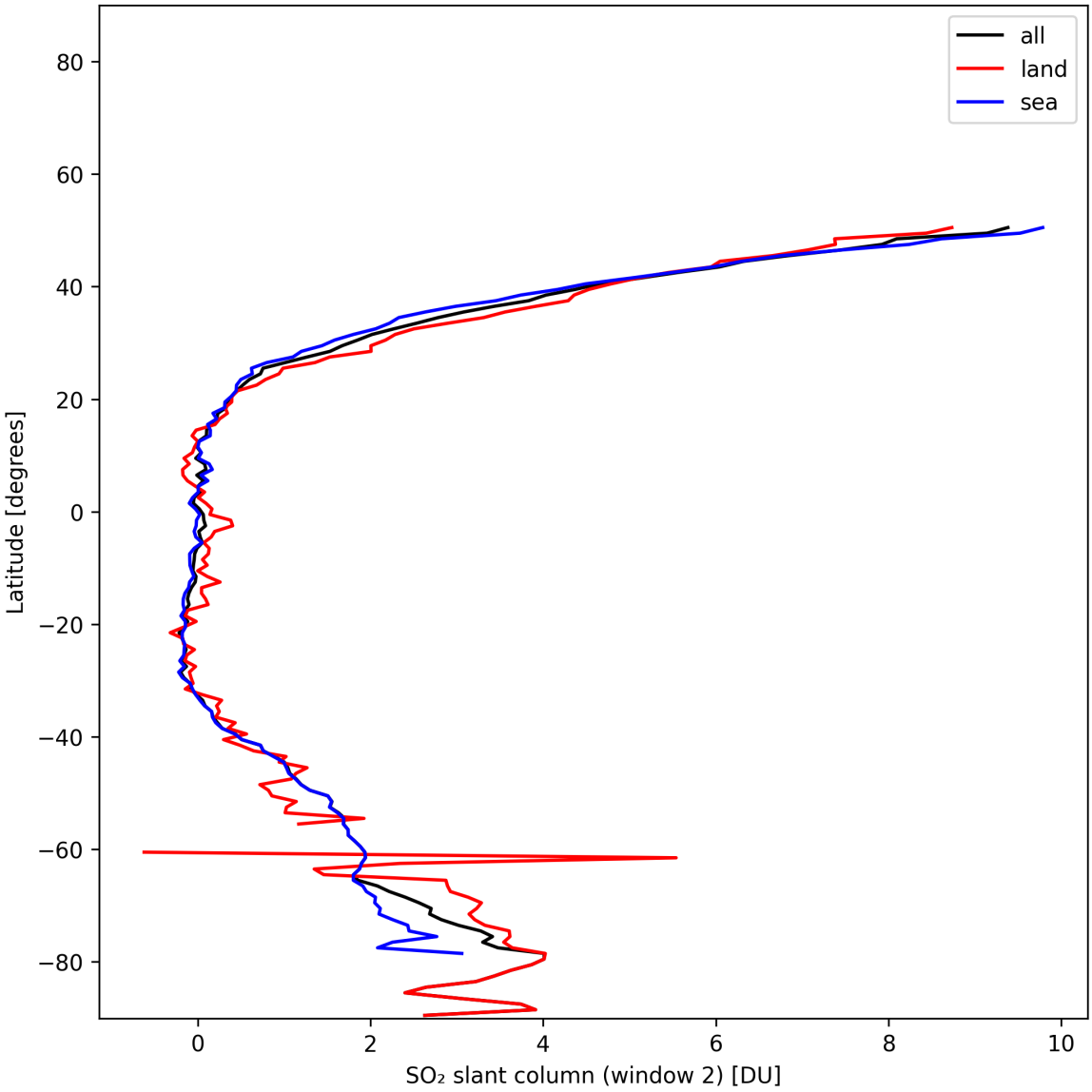


Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2025-01-23 to 2025-01-24.

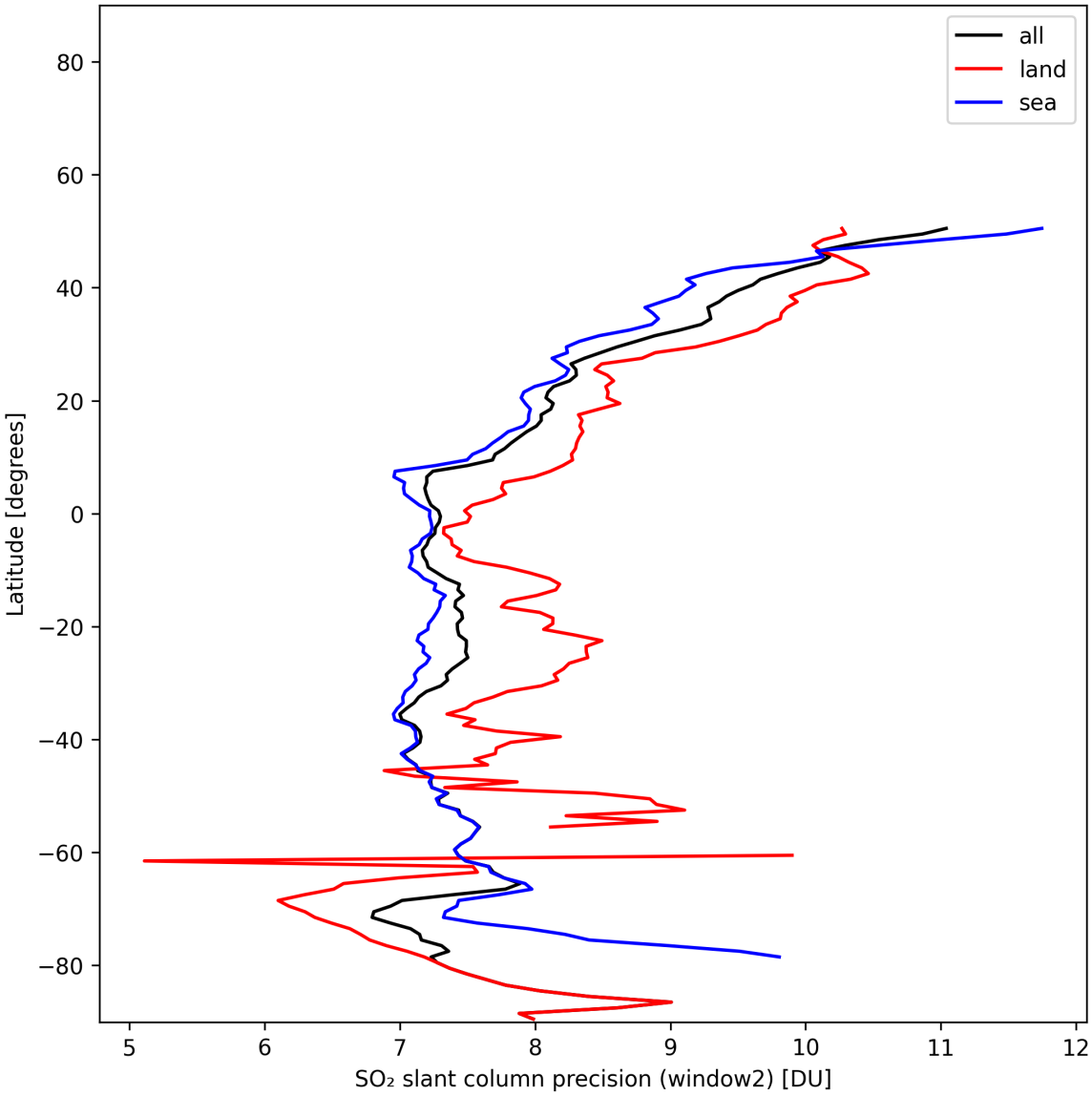


Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2025-01-23 to 2025-01-24.

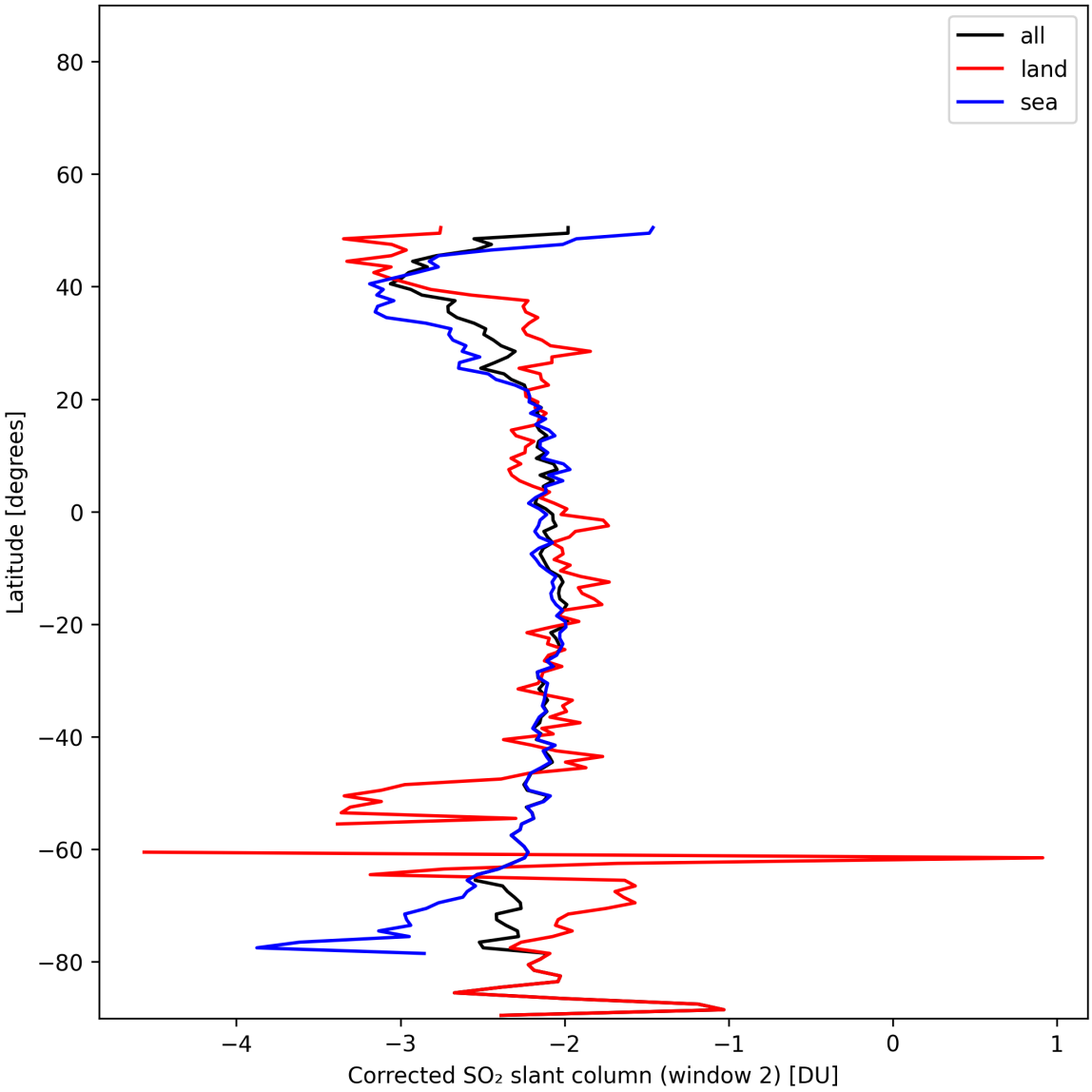


Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2025-01-23 to 2025-01-24.

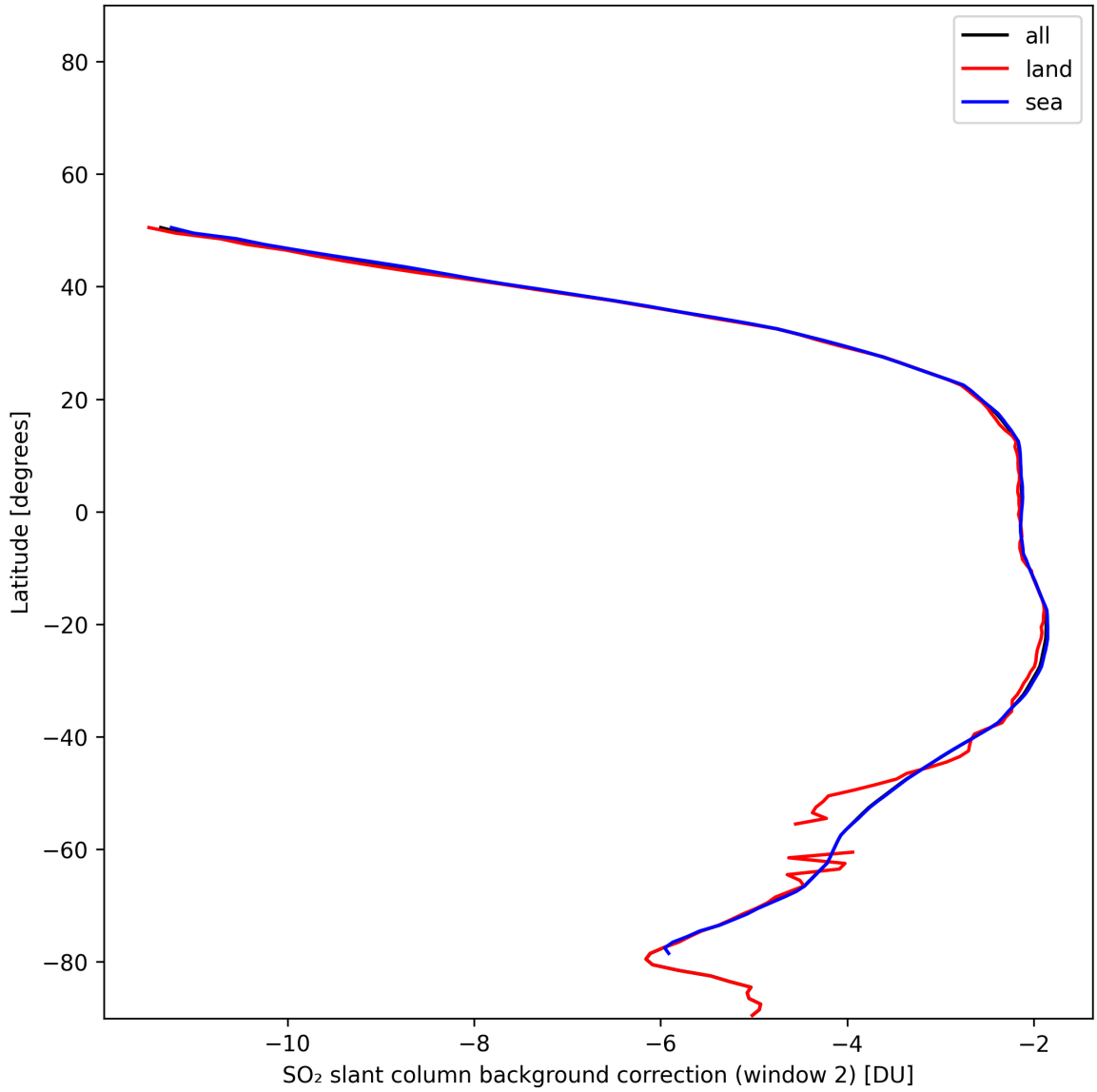


Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2025-01-23 to 2025-01-24.

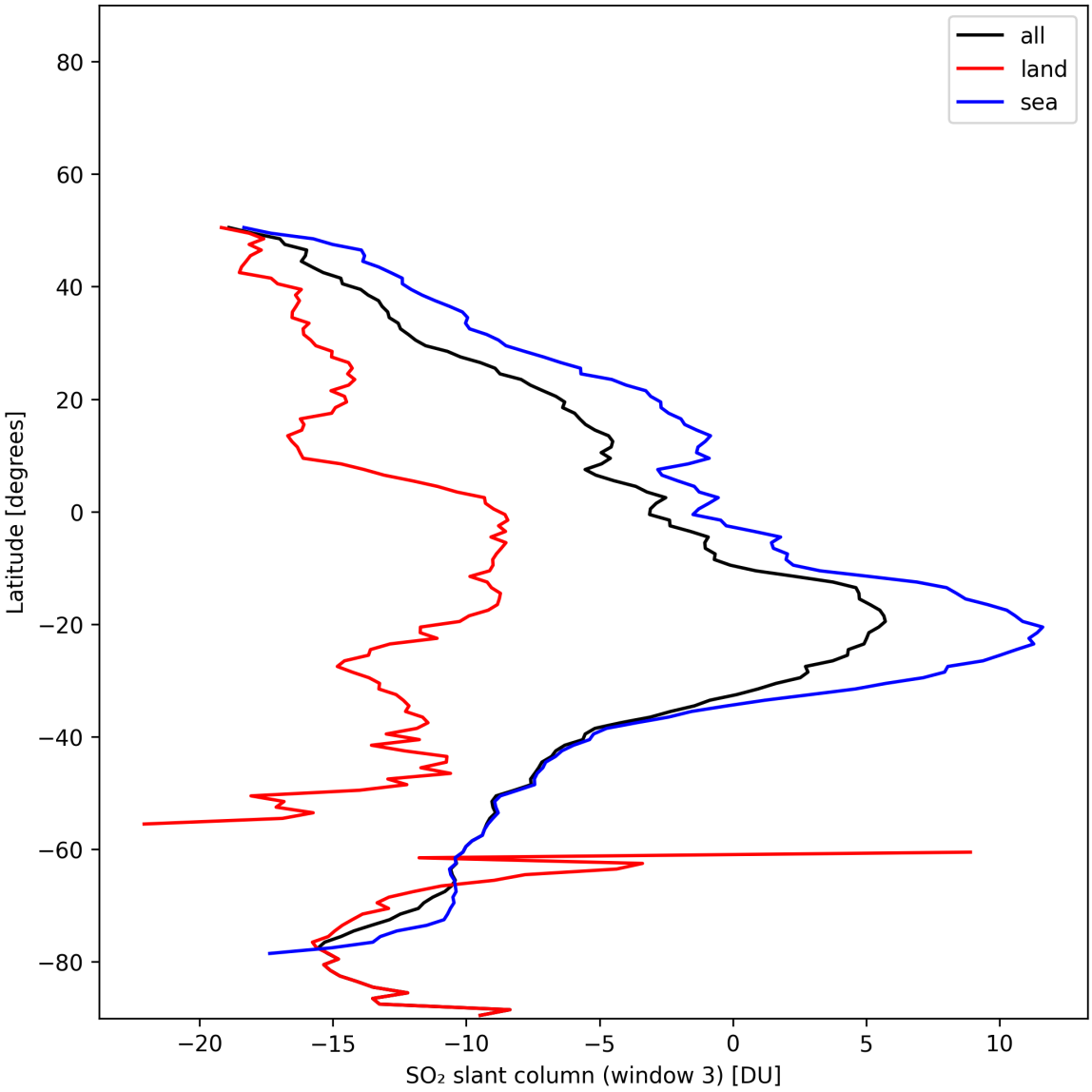


Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2025-01-23 to 2025-01-24.

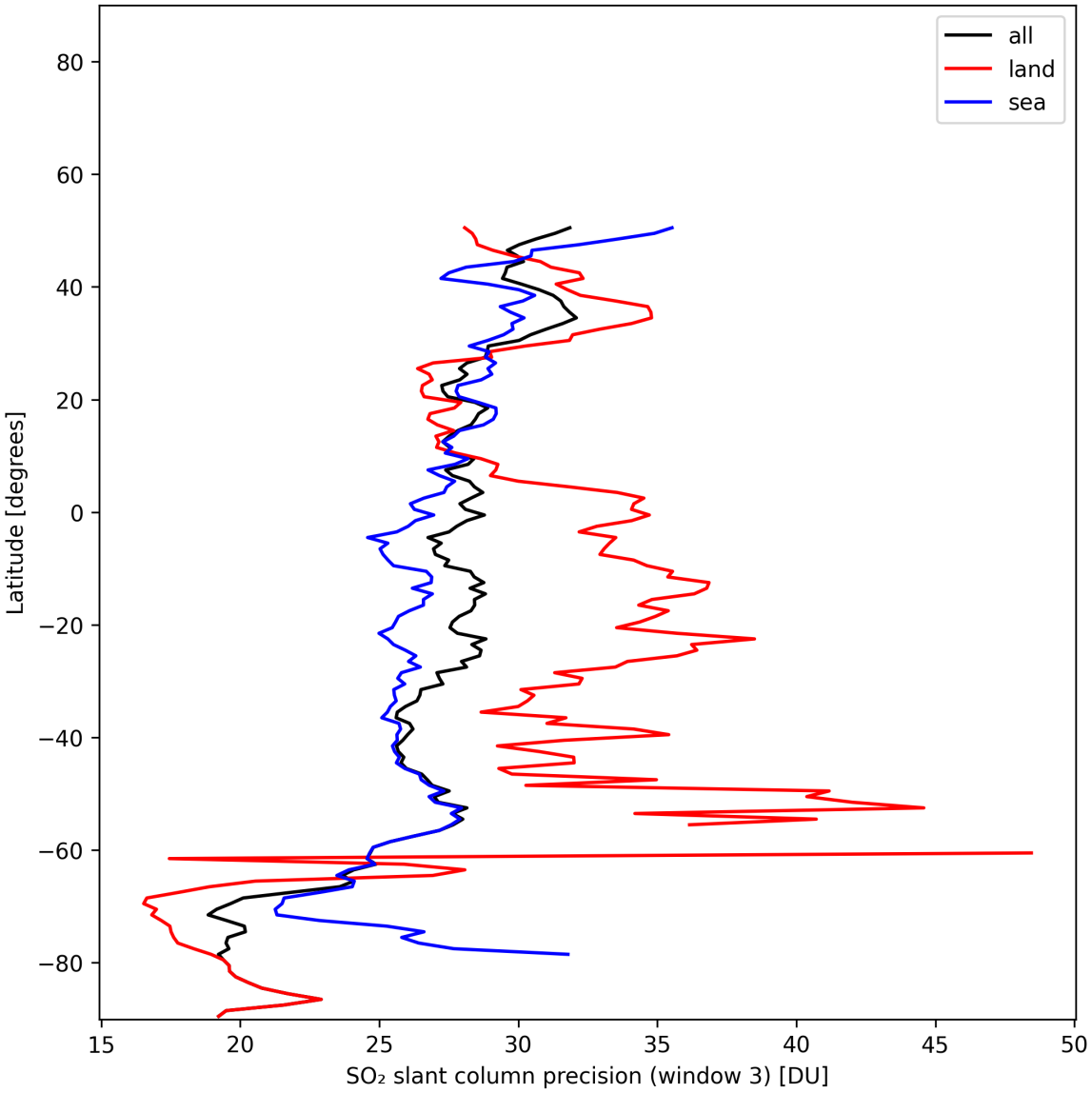


Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2025-01-23 to 2025-01-24.

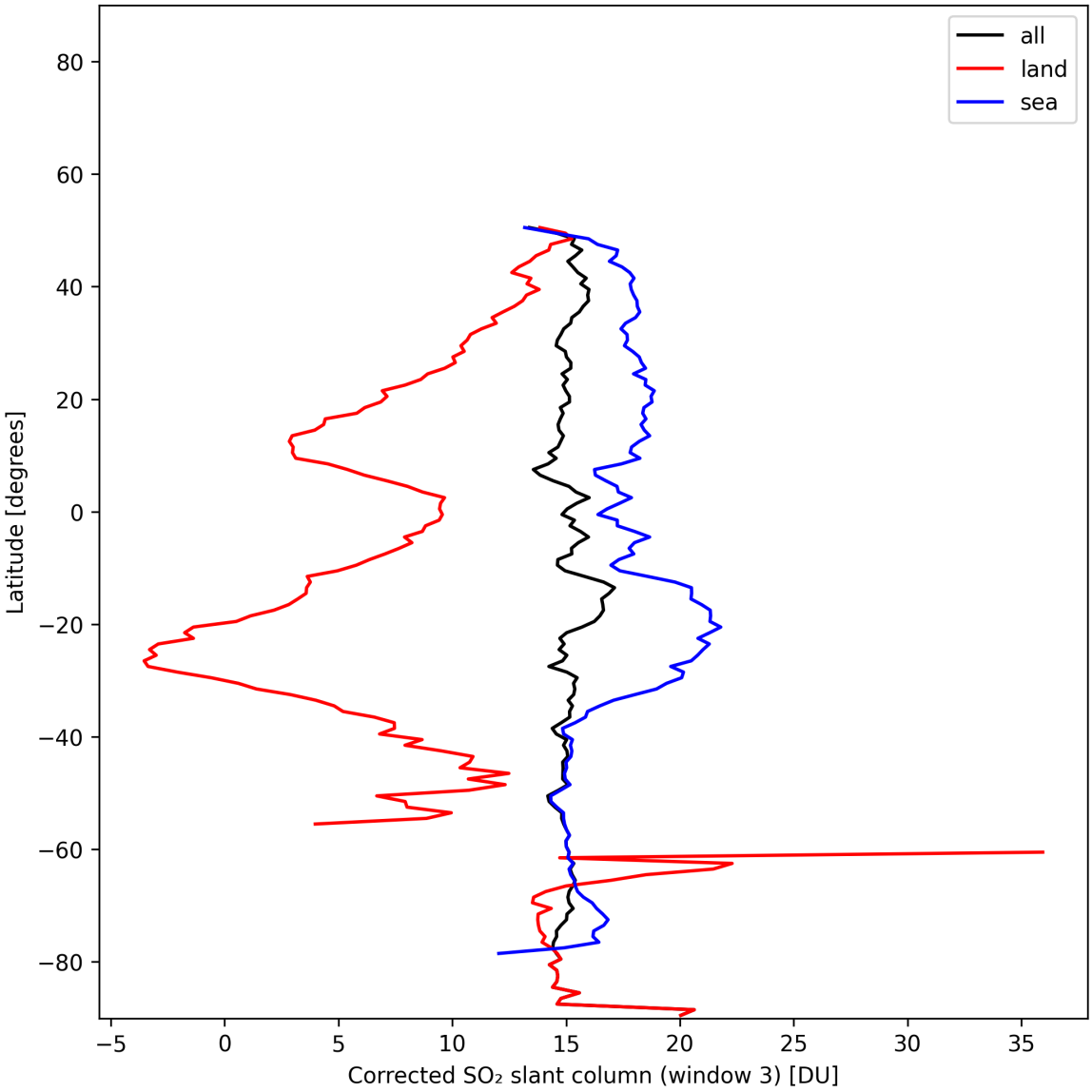


Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2025-01-23 to 2025-01-24.

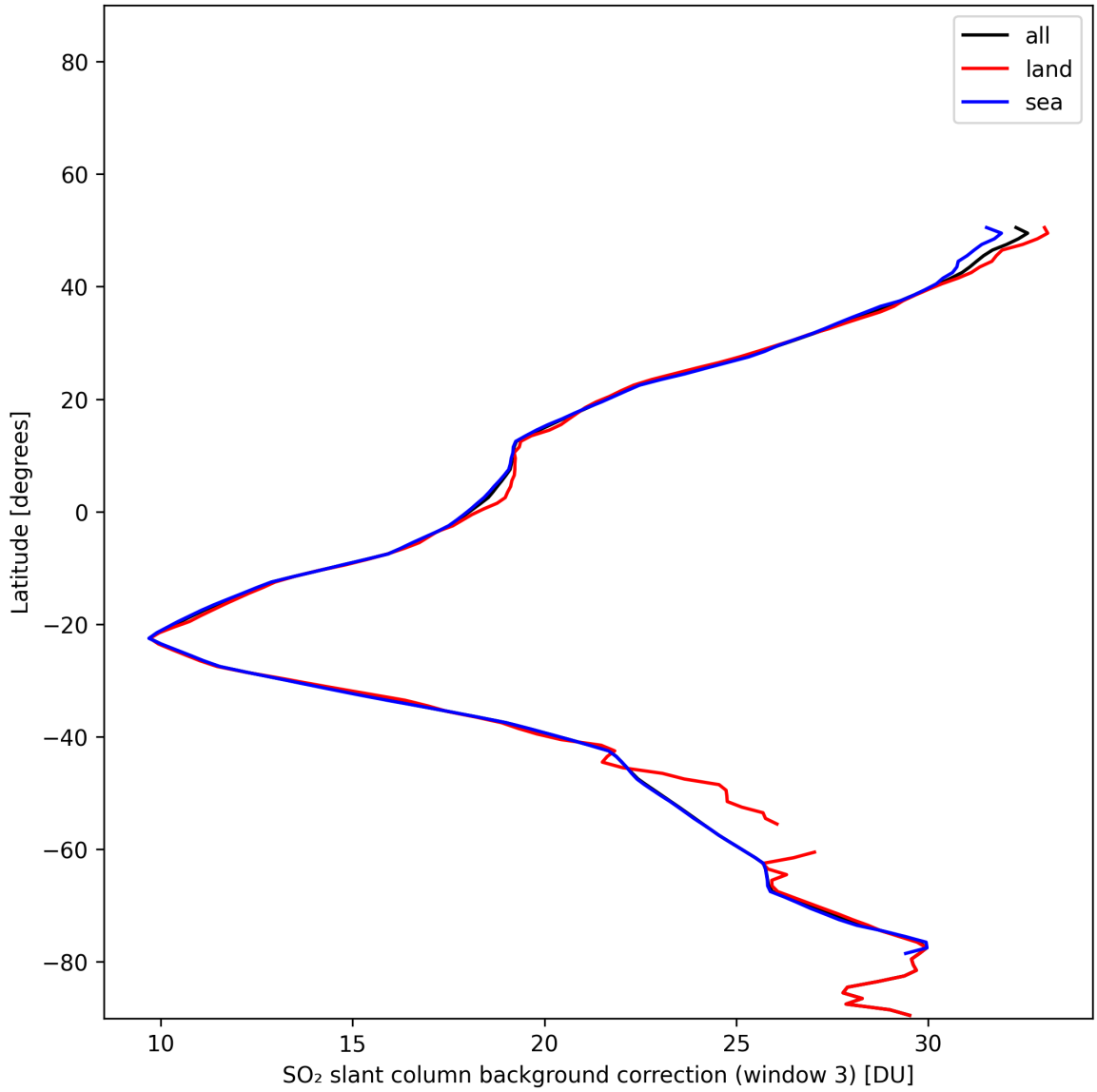


Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2025-01-23 to 2025-01-24.

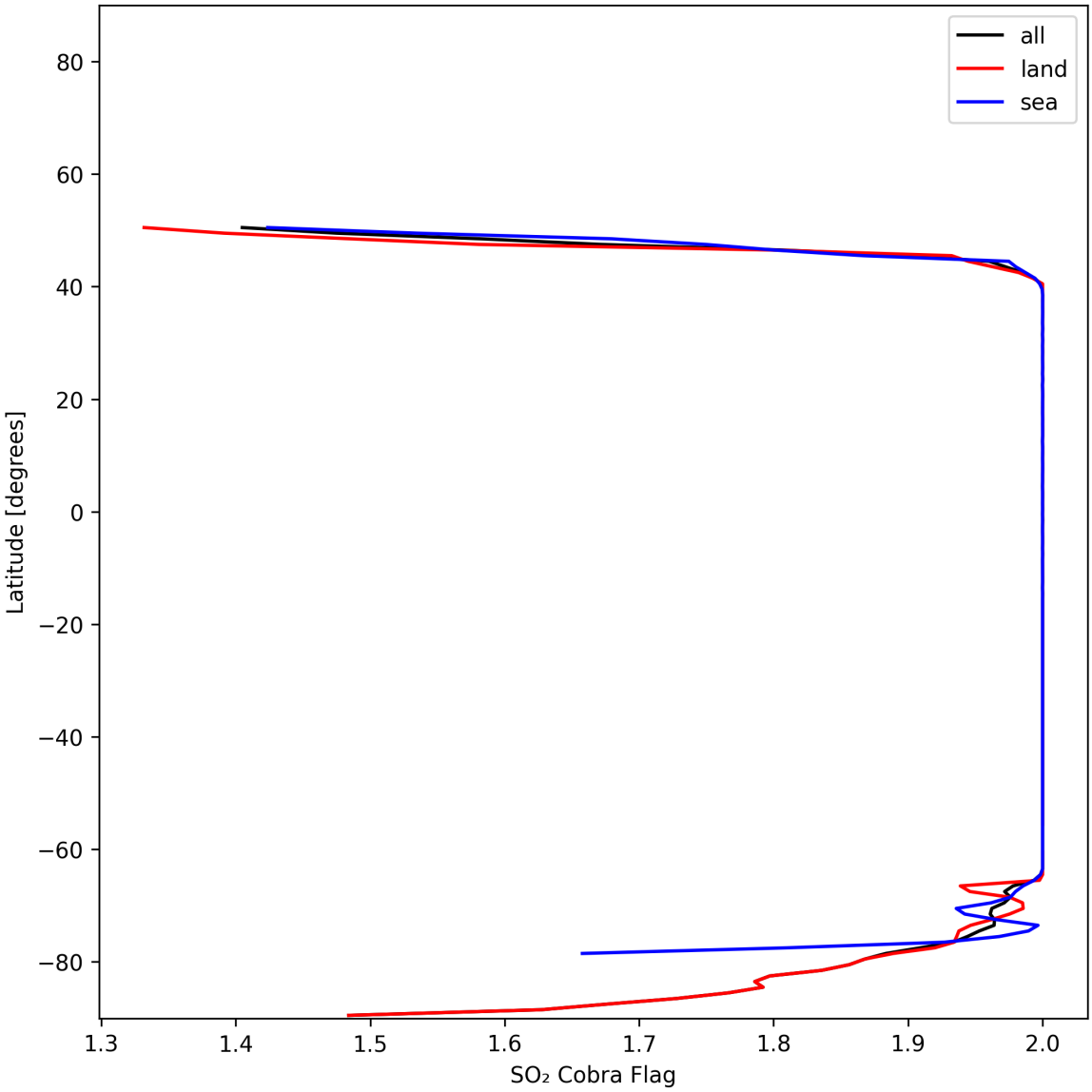


Figure 48: Zonal average of "SO_2 Cobra Flag" for 2025-01-23 to 2025-01-24.

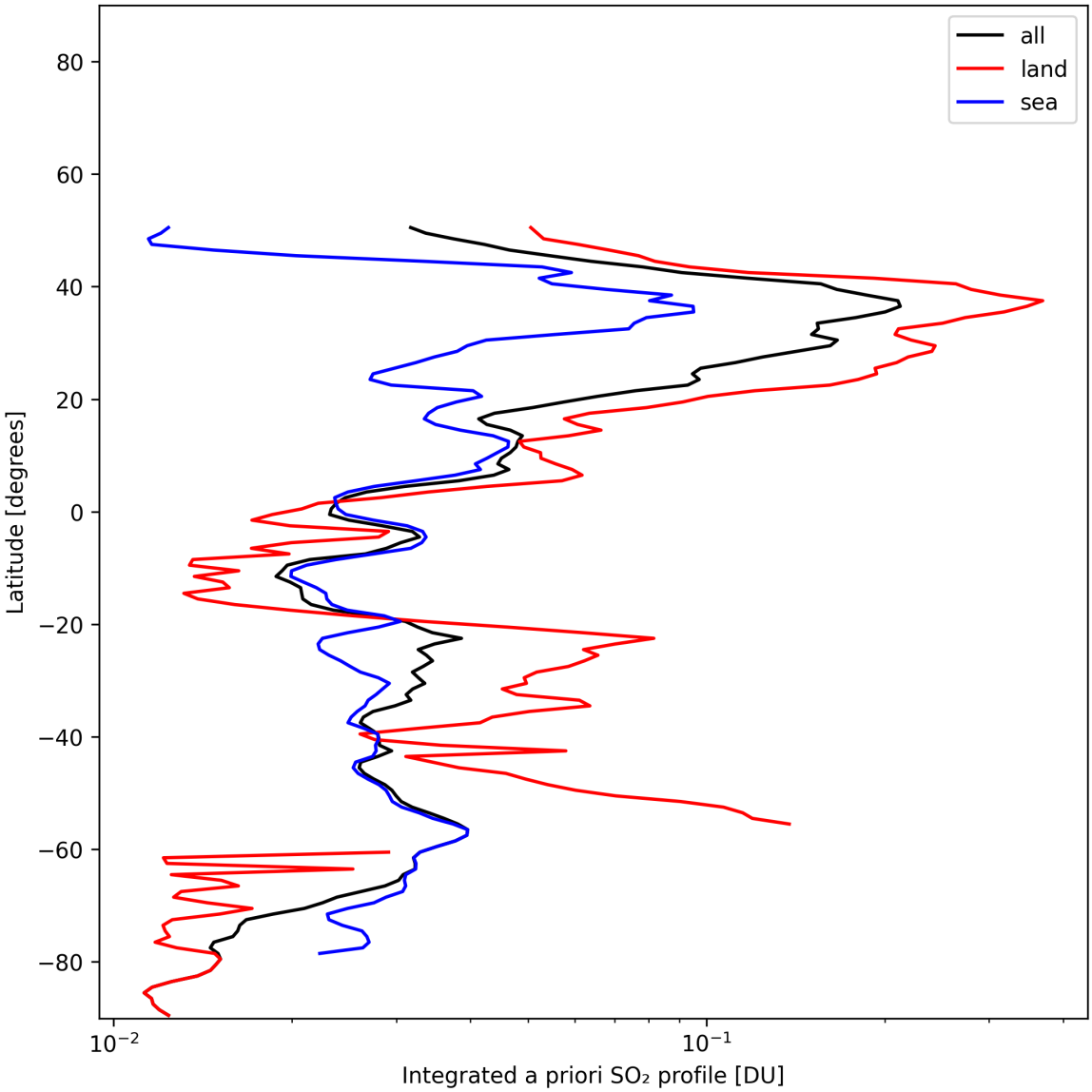


Figure 49: Zonal average of “Integrated a priori SO_2 profile” for 2025-01-23 to 2025-01-24.

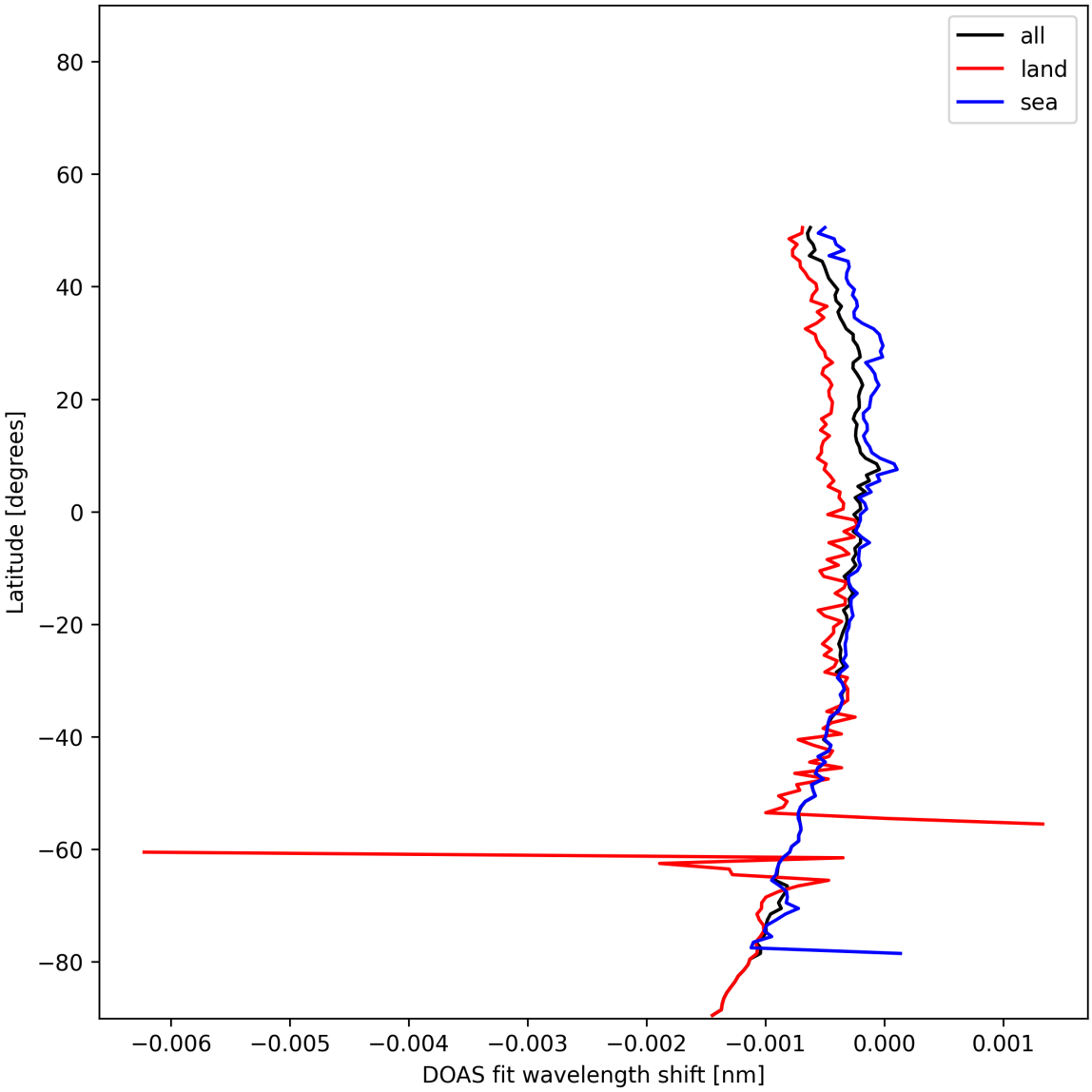


Figure 50: Zonal average of “DOAS fit wavelength shift” for 2025-01-23 to 2025-01-24.

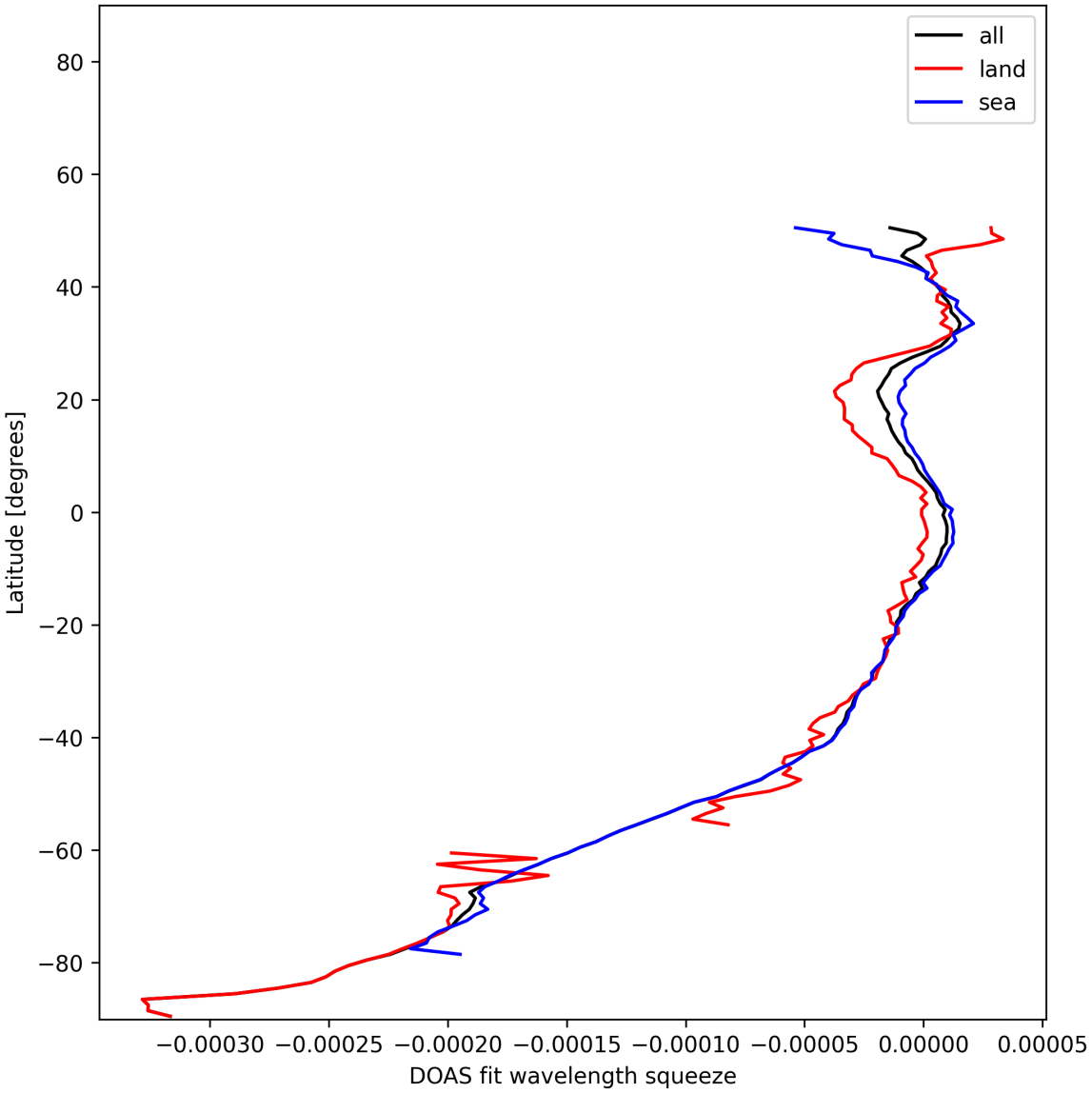


Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2025-01-23 to 2025-01-24.

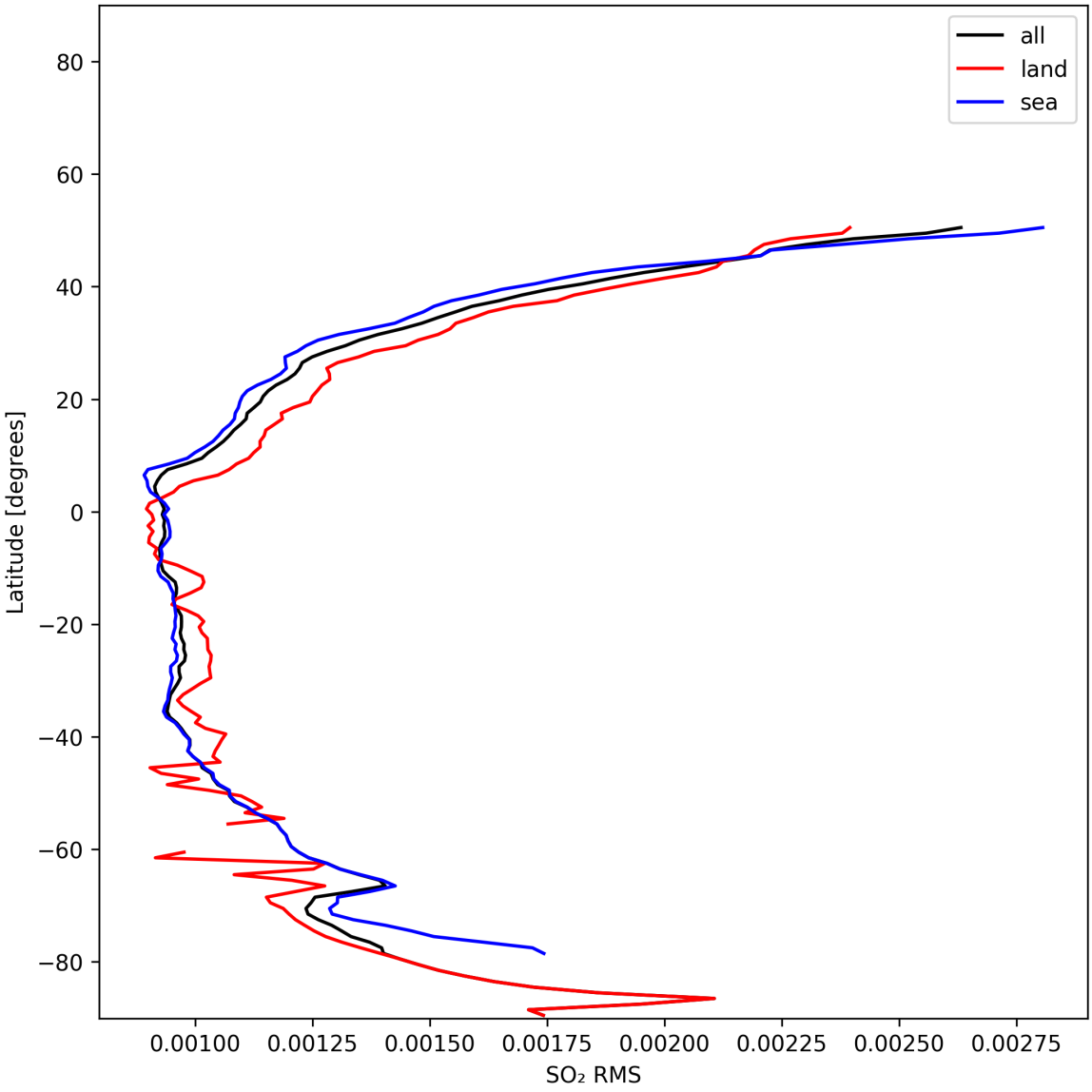


Figure 52: Zonal average of "SO_2 RMS" for 2025-01-23 to 2025-01-24.

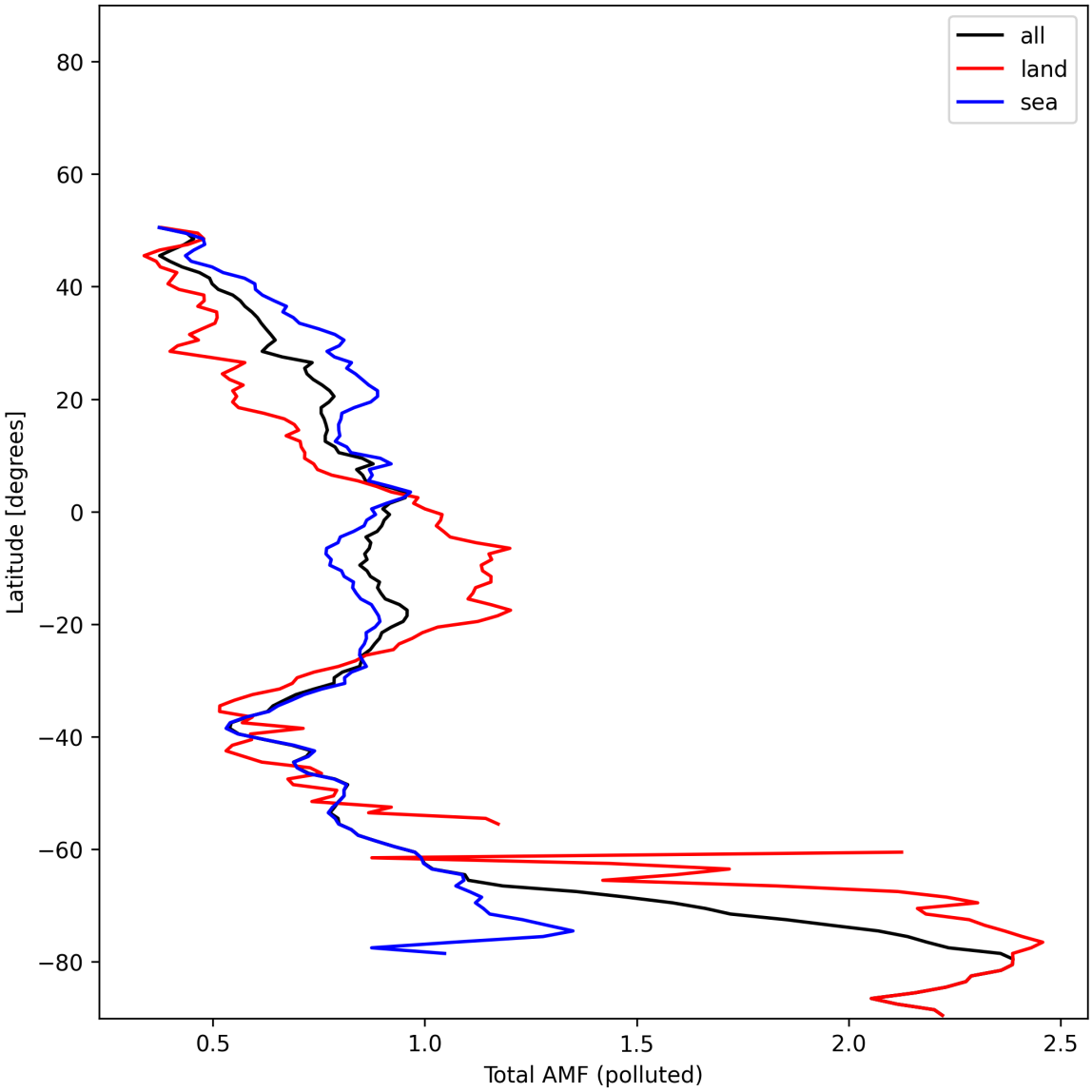


Figure 53: Zonal average of “Total AMF (polluted)” for 2025-01-23 to 2025-01-24.

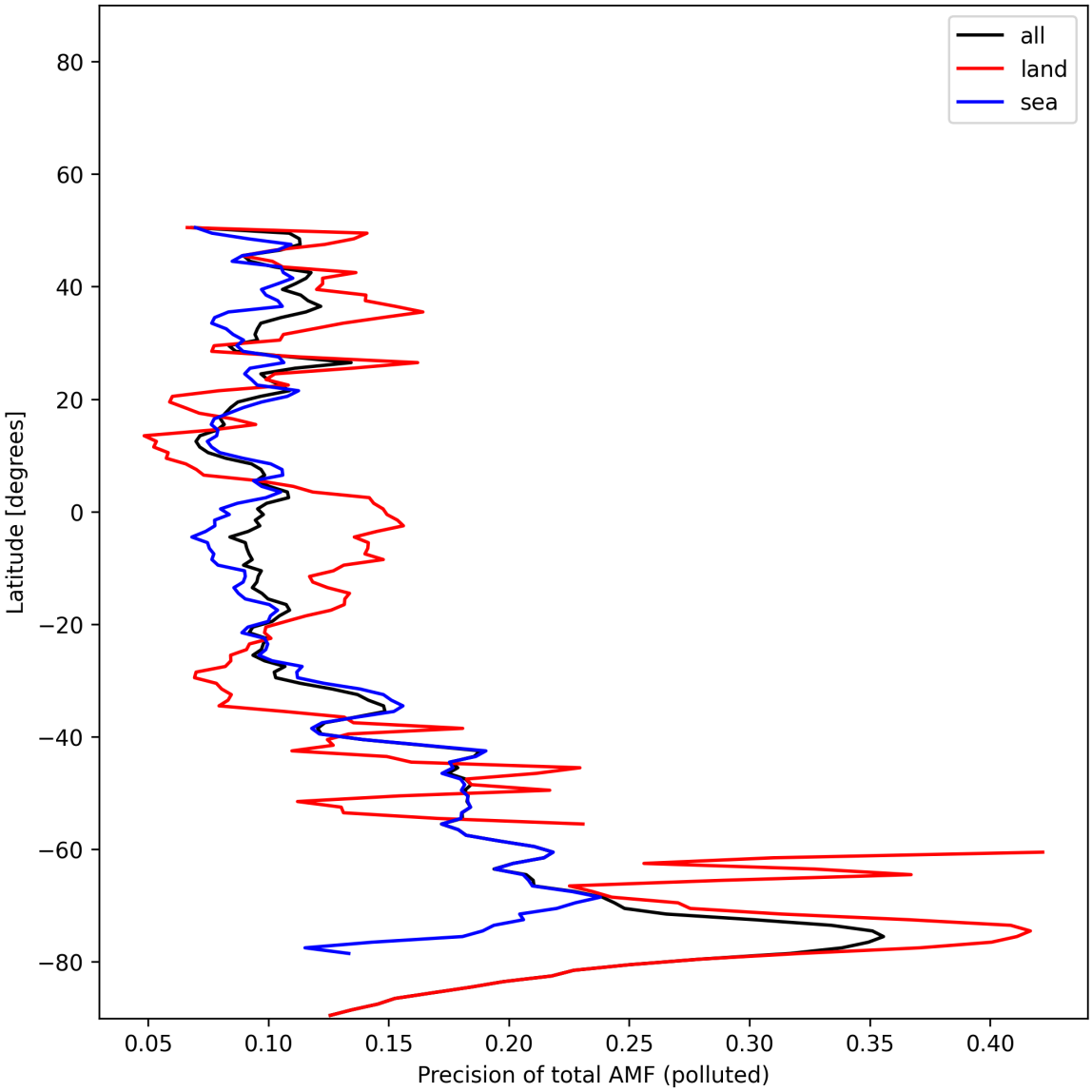


Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2025-01-23 to 2025-01-24.

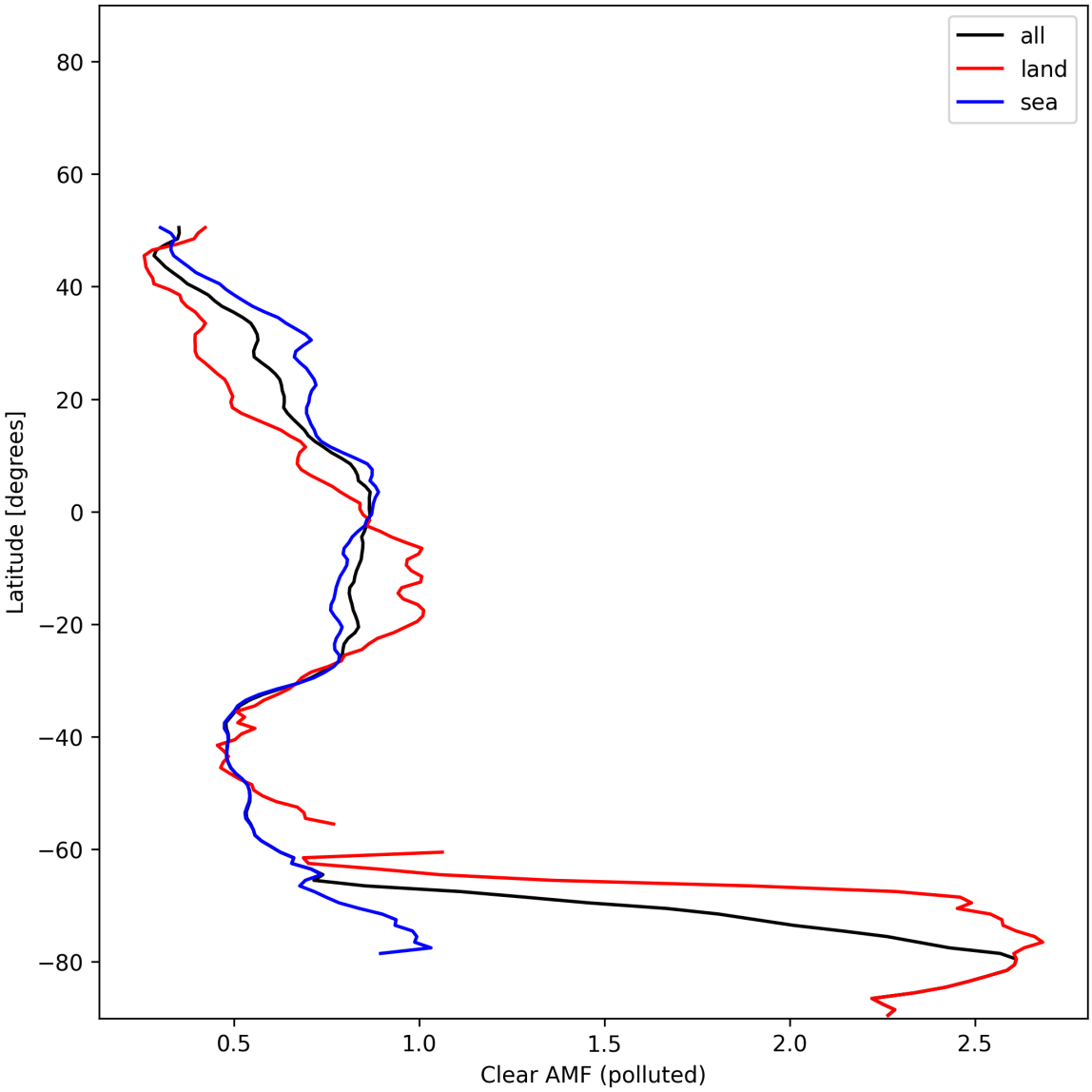


Figure 55: Zonal average of “Clear AMF (polluted)” for 2025-01-23 to 2025-01-24.

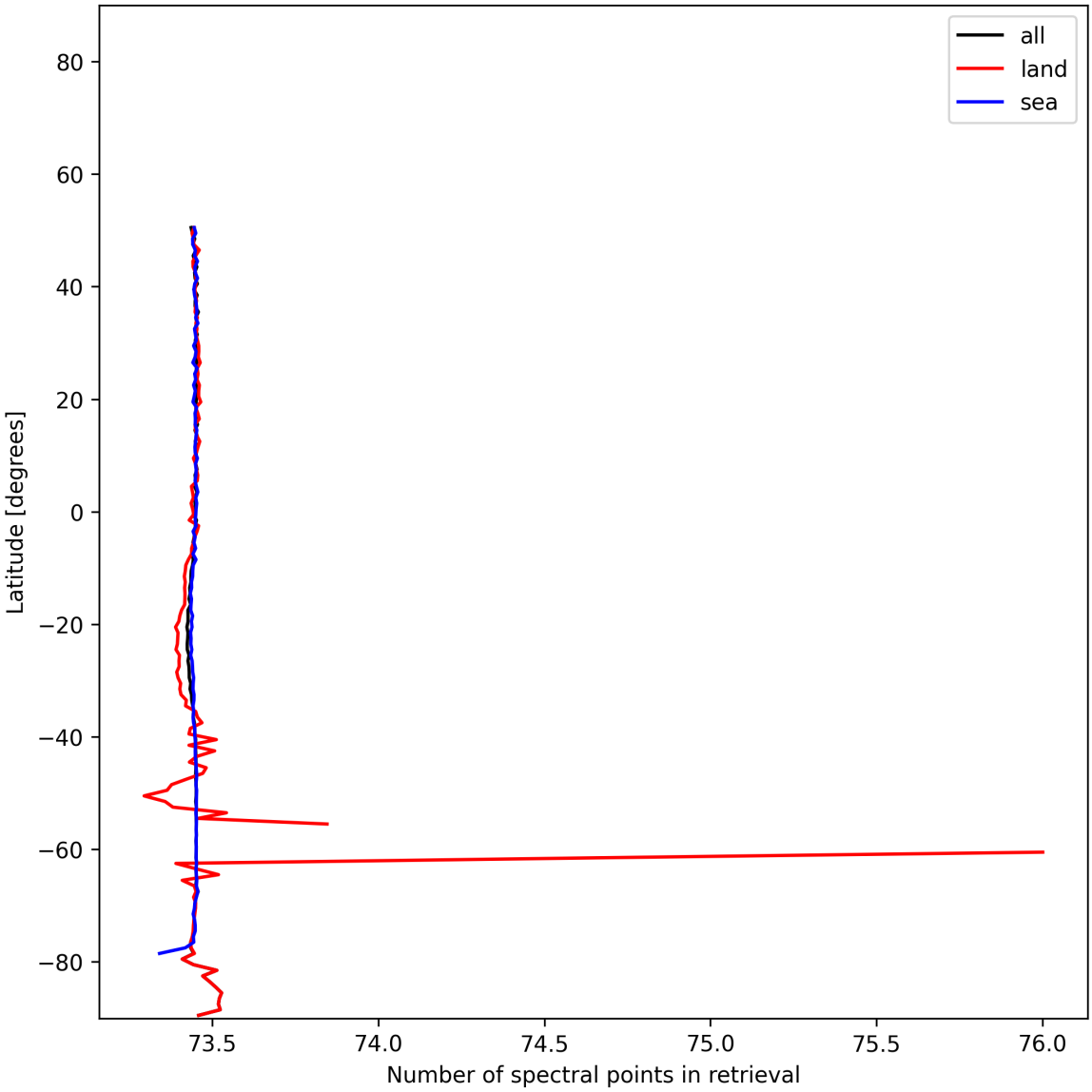


Figure 56: Zonal average of “Number of spectral points in retrieval” for 2025-01-23 to 2025-01-24.

8 Histograms

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

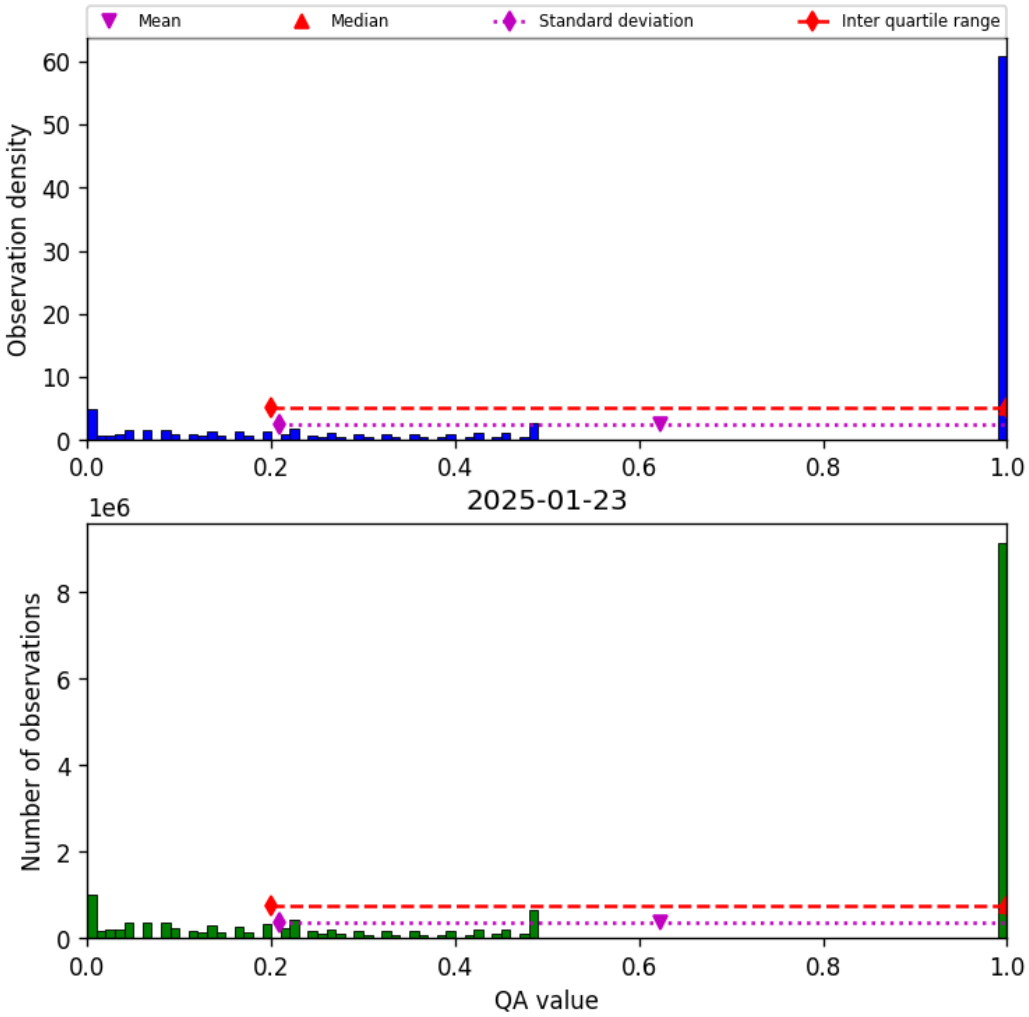


Figure 57: Histogram of “QA value” for 2025-01-23 to 2025-01-24

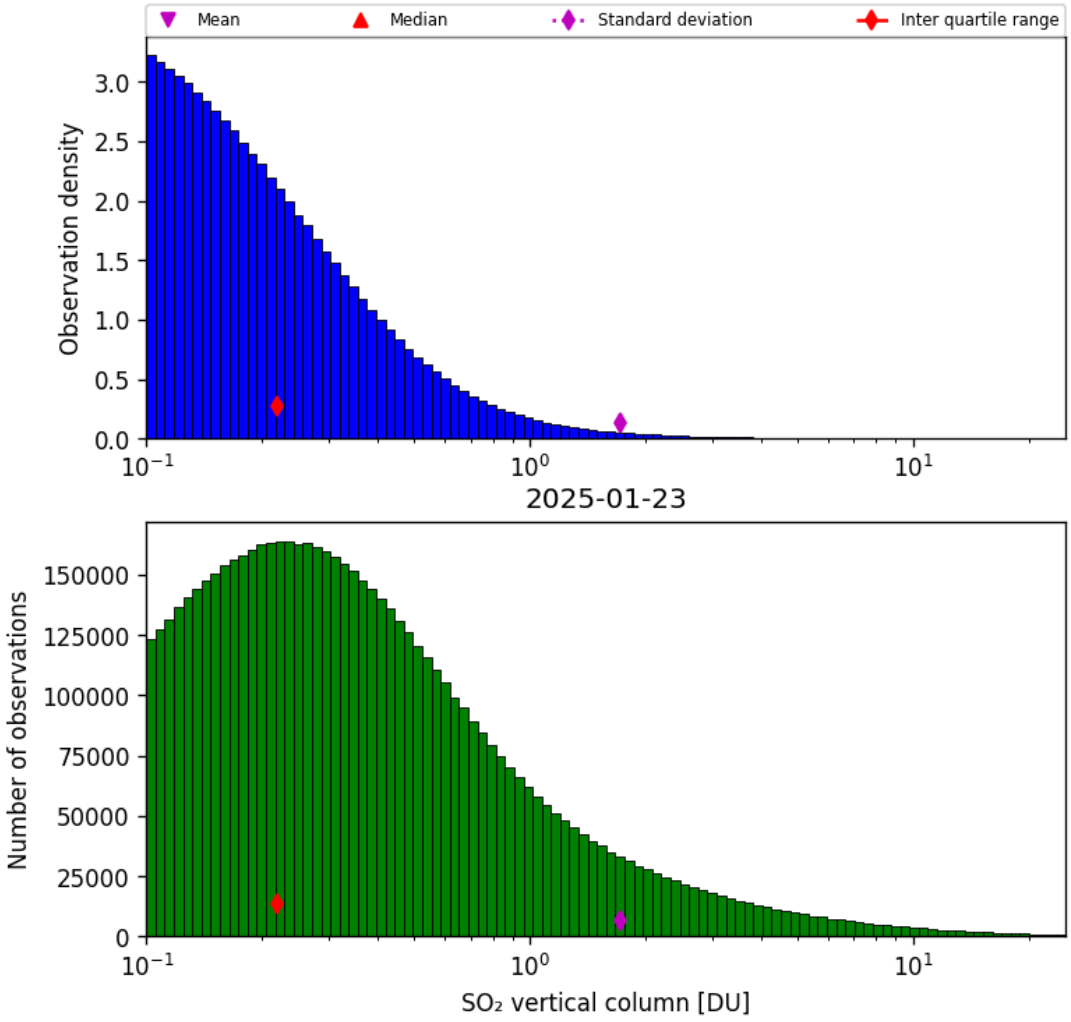


Figure 58: Histogram of "SO_2 vertical column" for 2025-01-23 to 2025-01-24

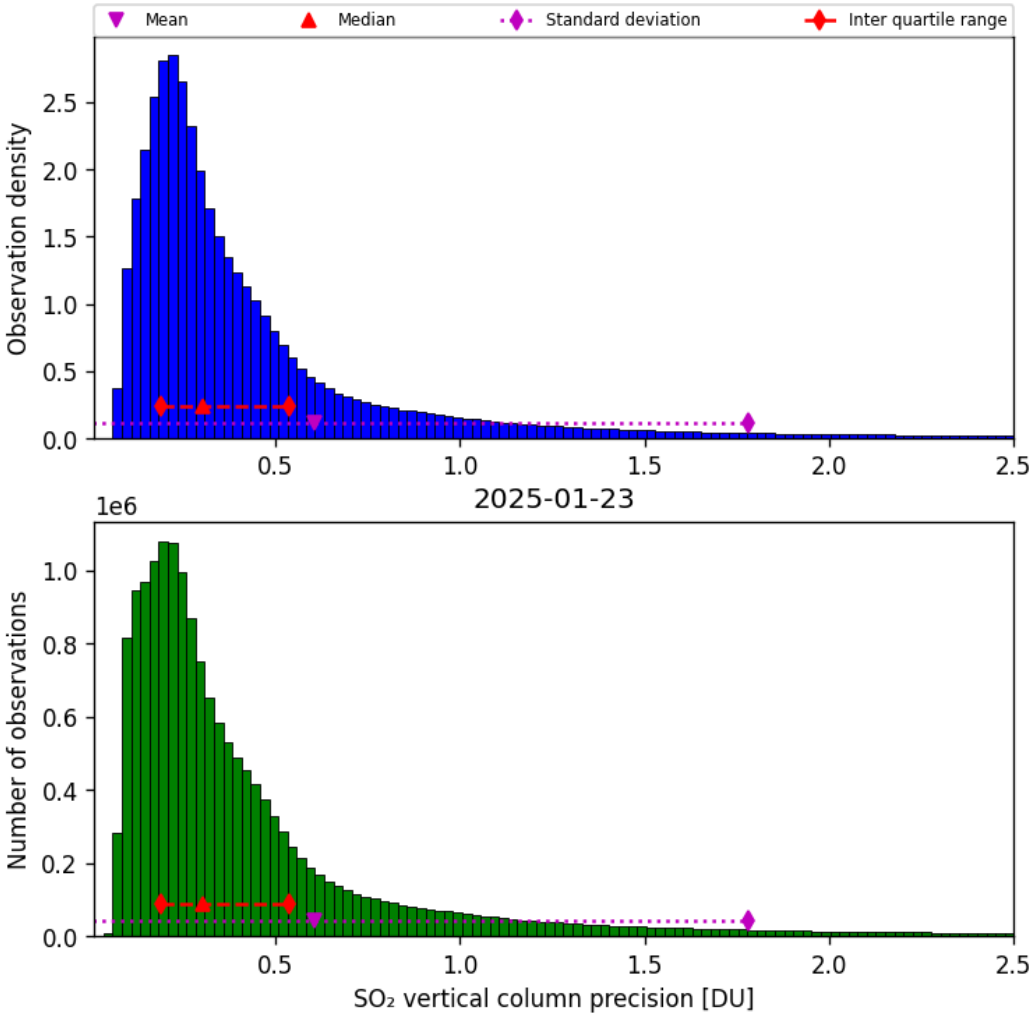


Figure 59: Histogram of "SO_2 vertical column precision" for 2025-01-23 to 2025-01-24

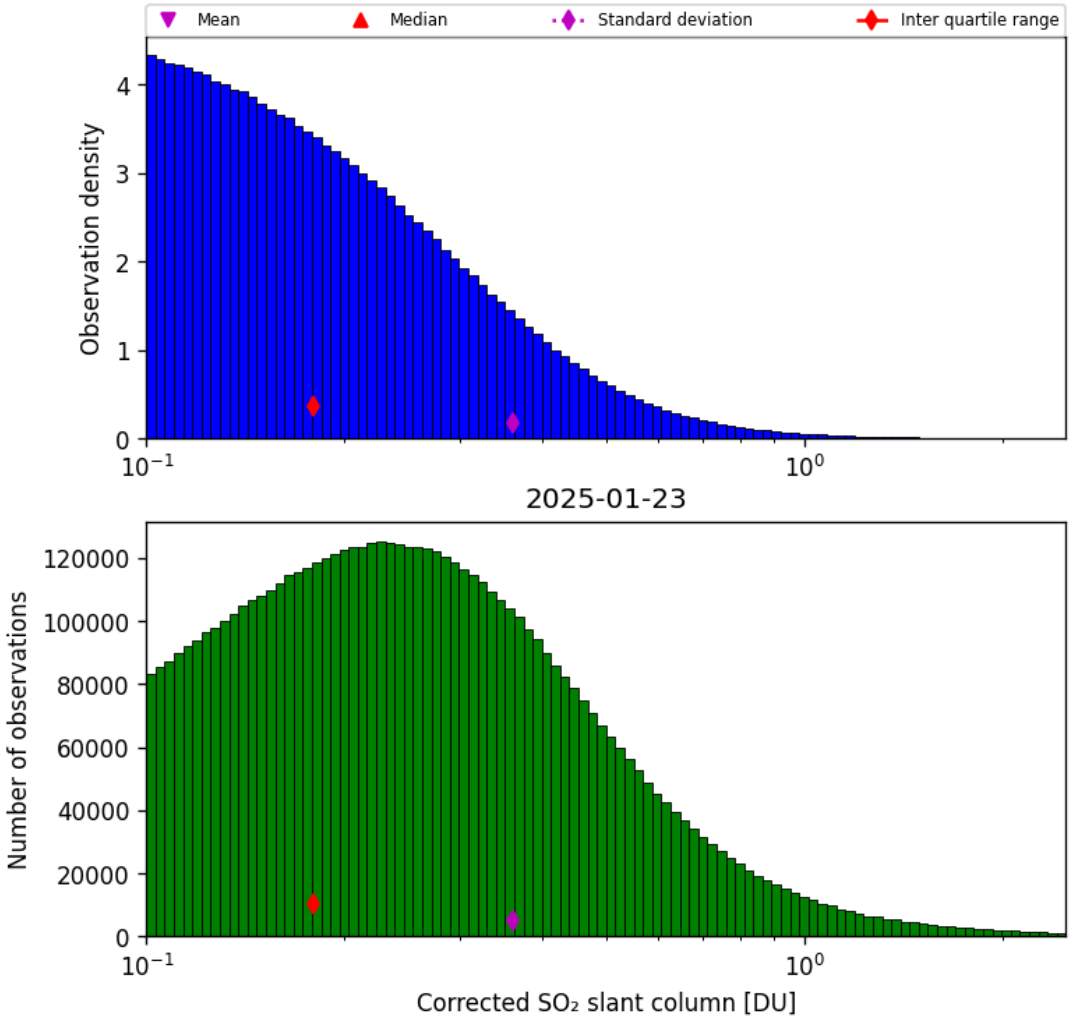


Figure 60: Histogram of "Corrected SO_2 slant column" for 2025-01-23 to 2025-01-24

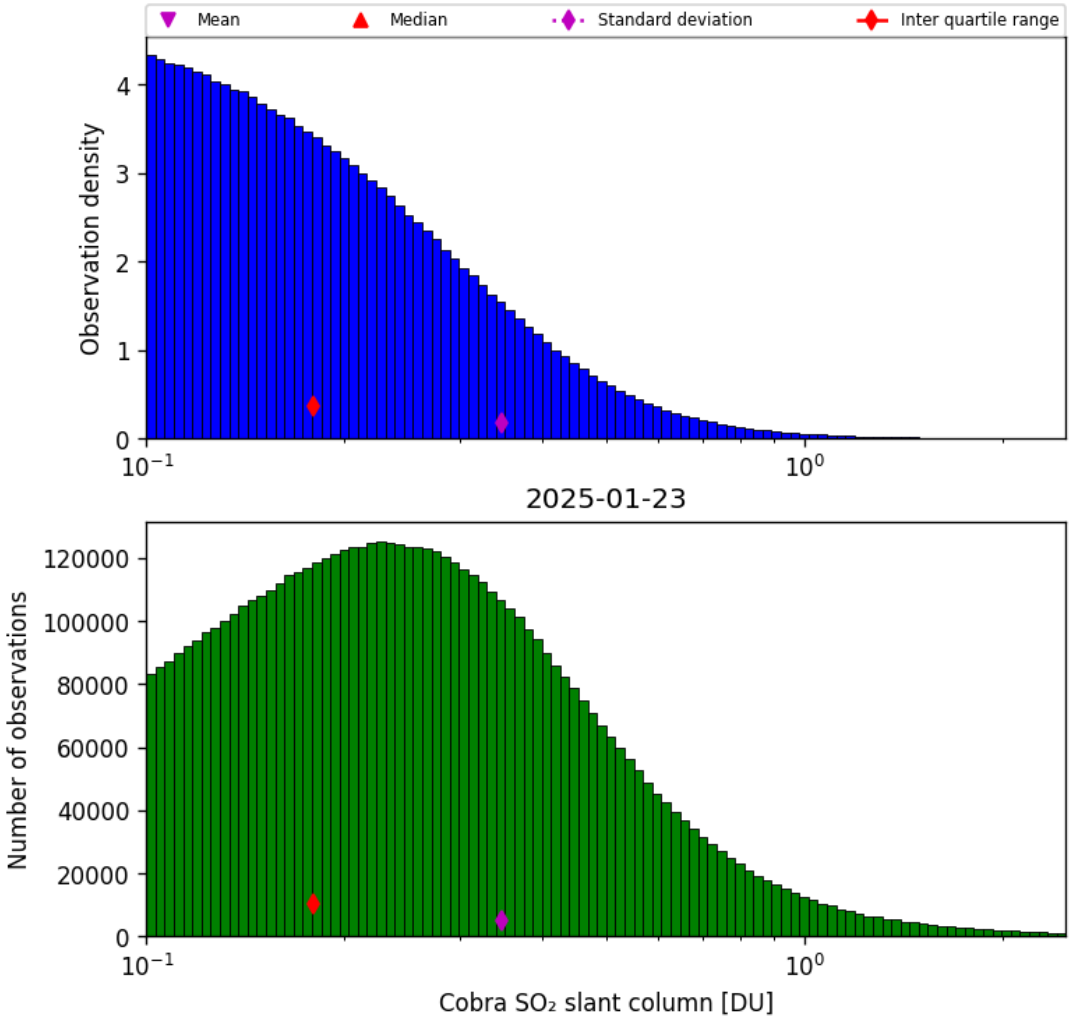


Figure 61: Histogram of "Cobra SO_2 slant column" for 2025-01-23 to 2025-01-24

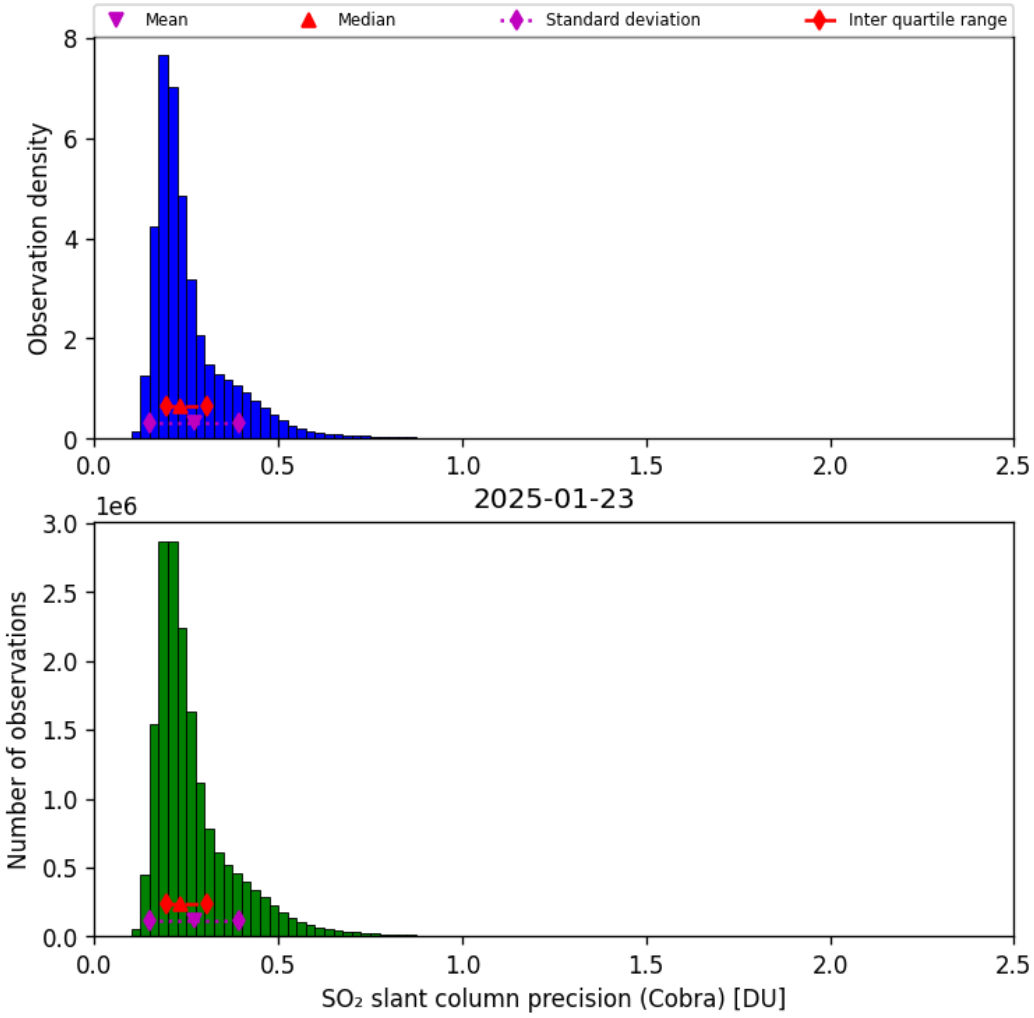


Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2025-01-23 to 2025-01-24

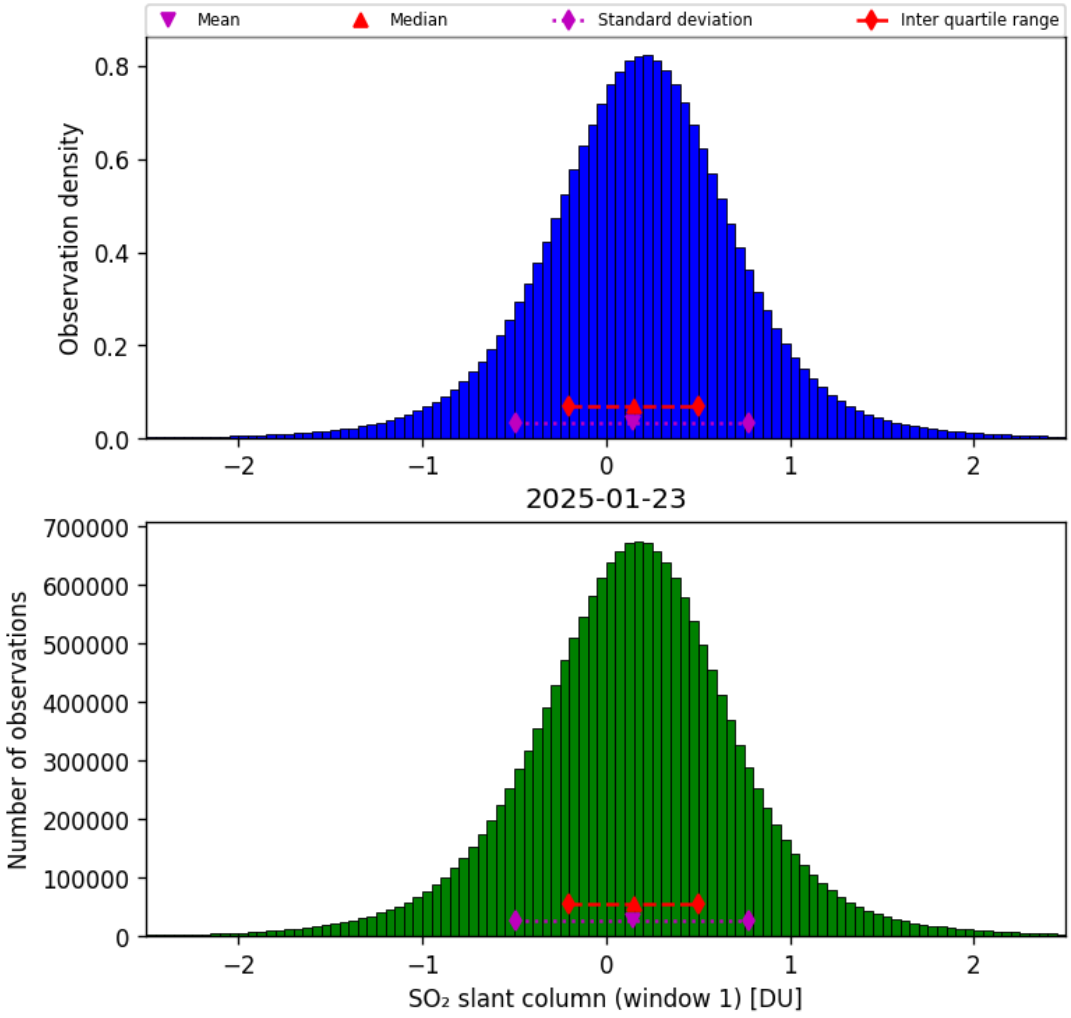


Figure 63: Histogram of "SO_2 slant column (window 1)" for 2025-01-23 to 2025-01-24

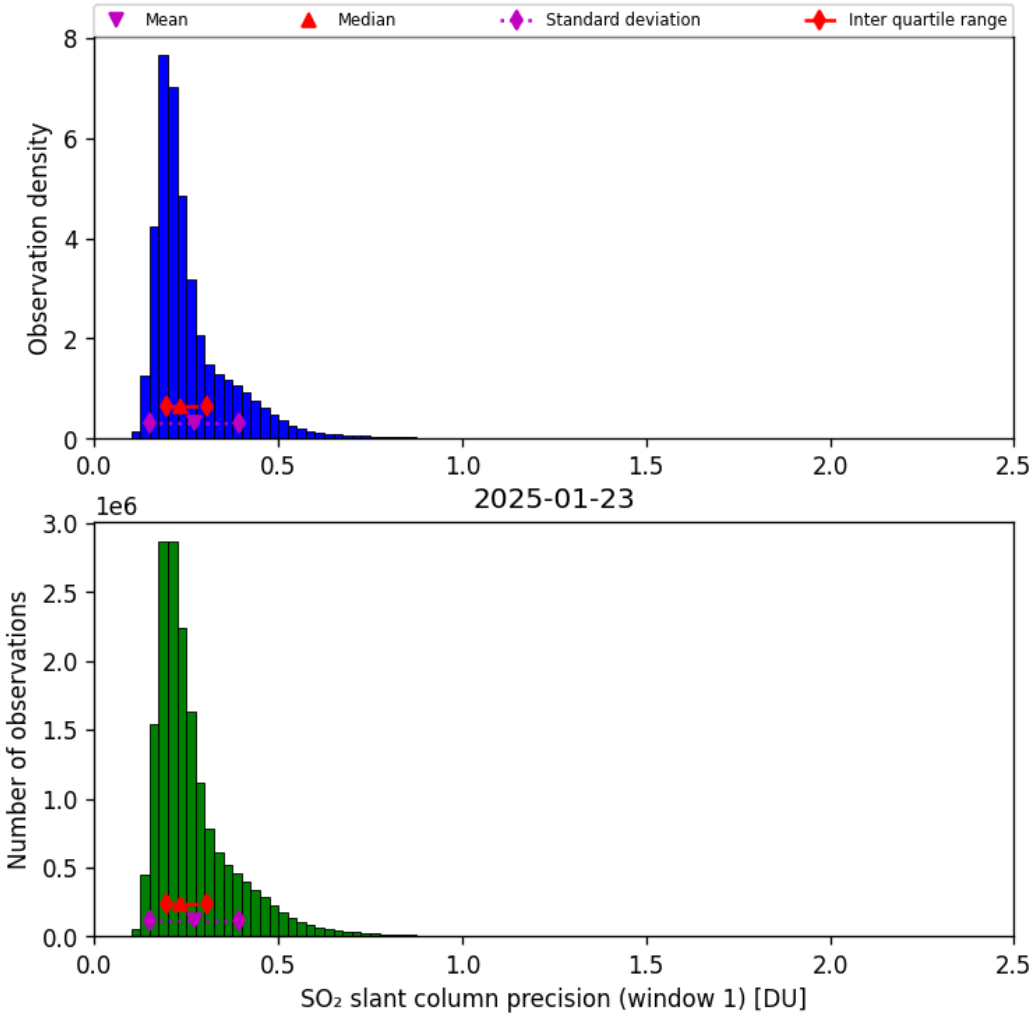


Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2025-01-23 to 2025-01-24

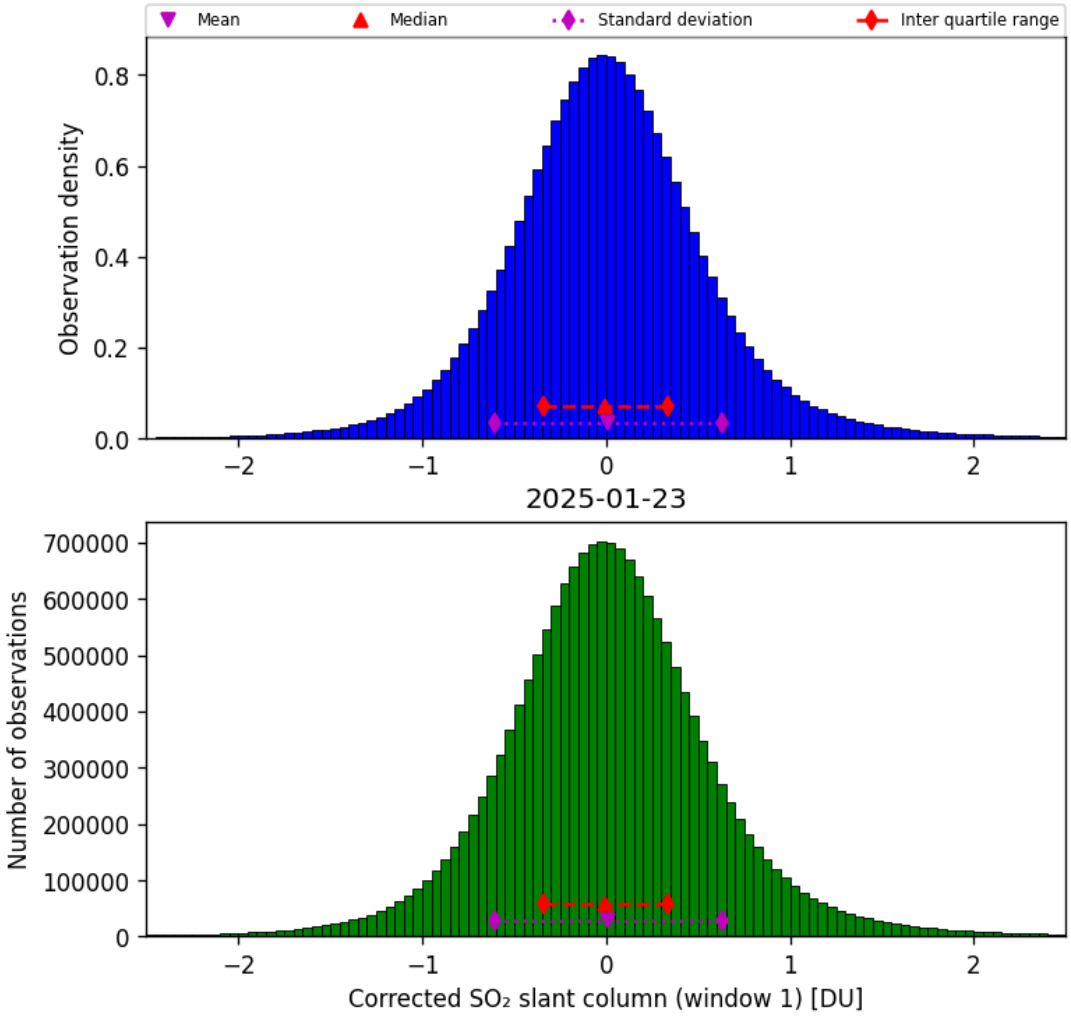


Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2025-01-23 to 2025-01-24

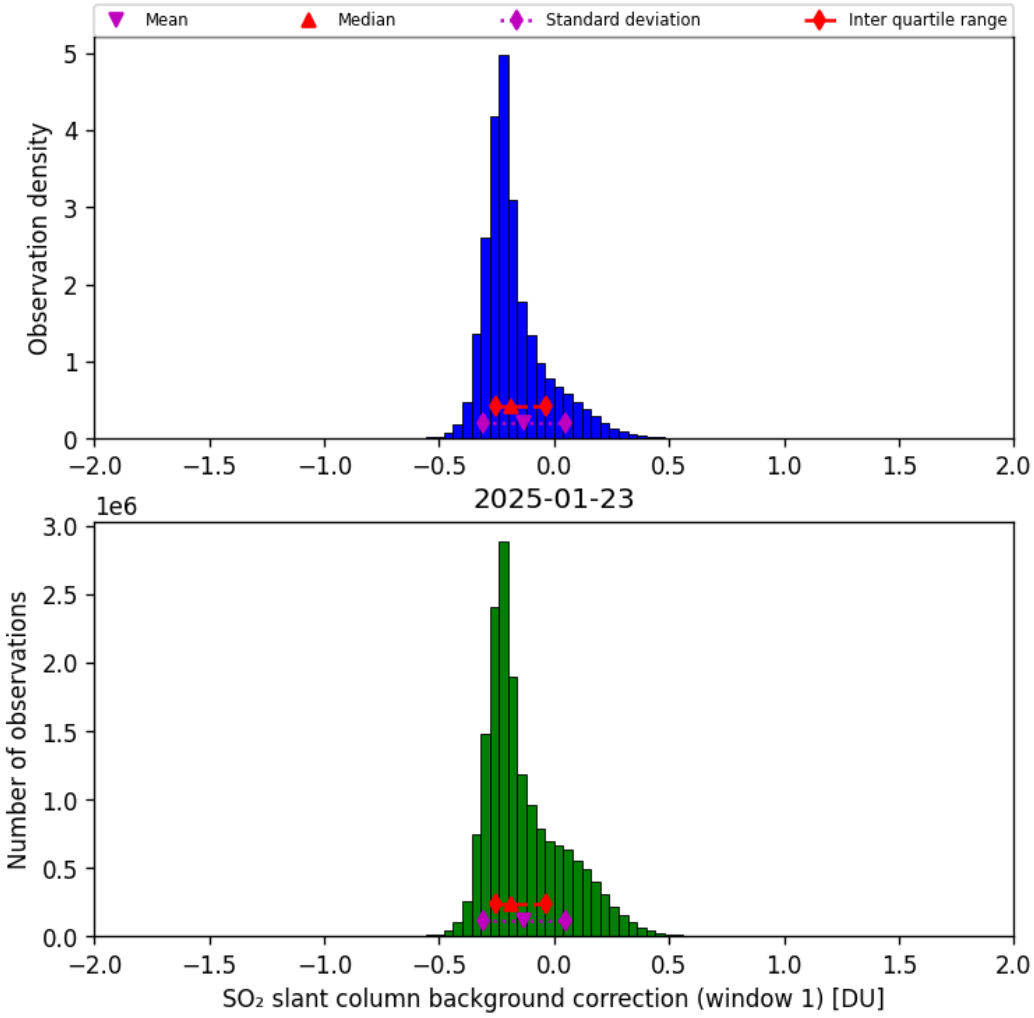


Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2025-01-23 to 2025-01-24

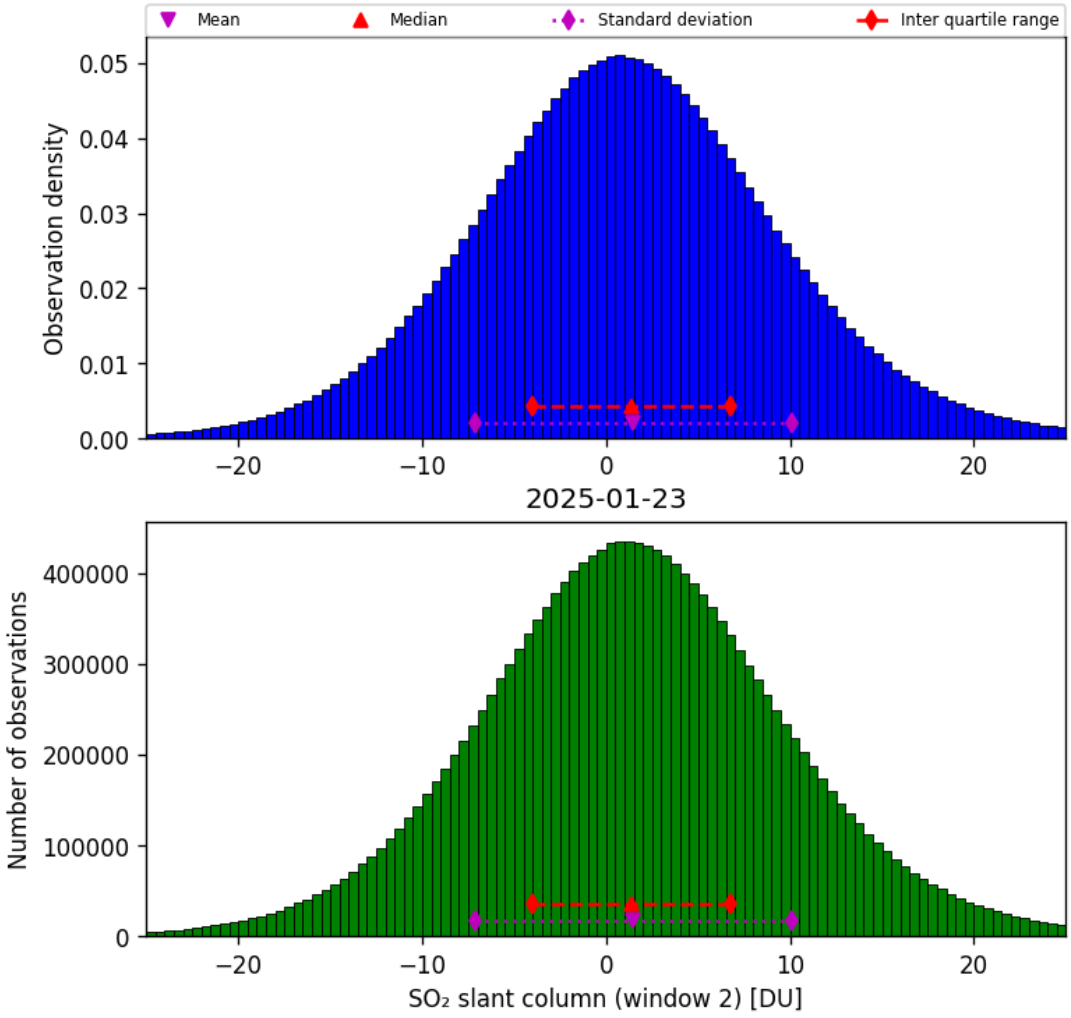


Figure 67: Histogram of "SO_2 slant column (window 2)" for 2025-01-23 to 2025-01-24

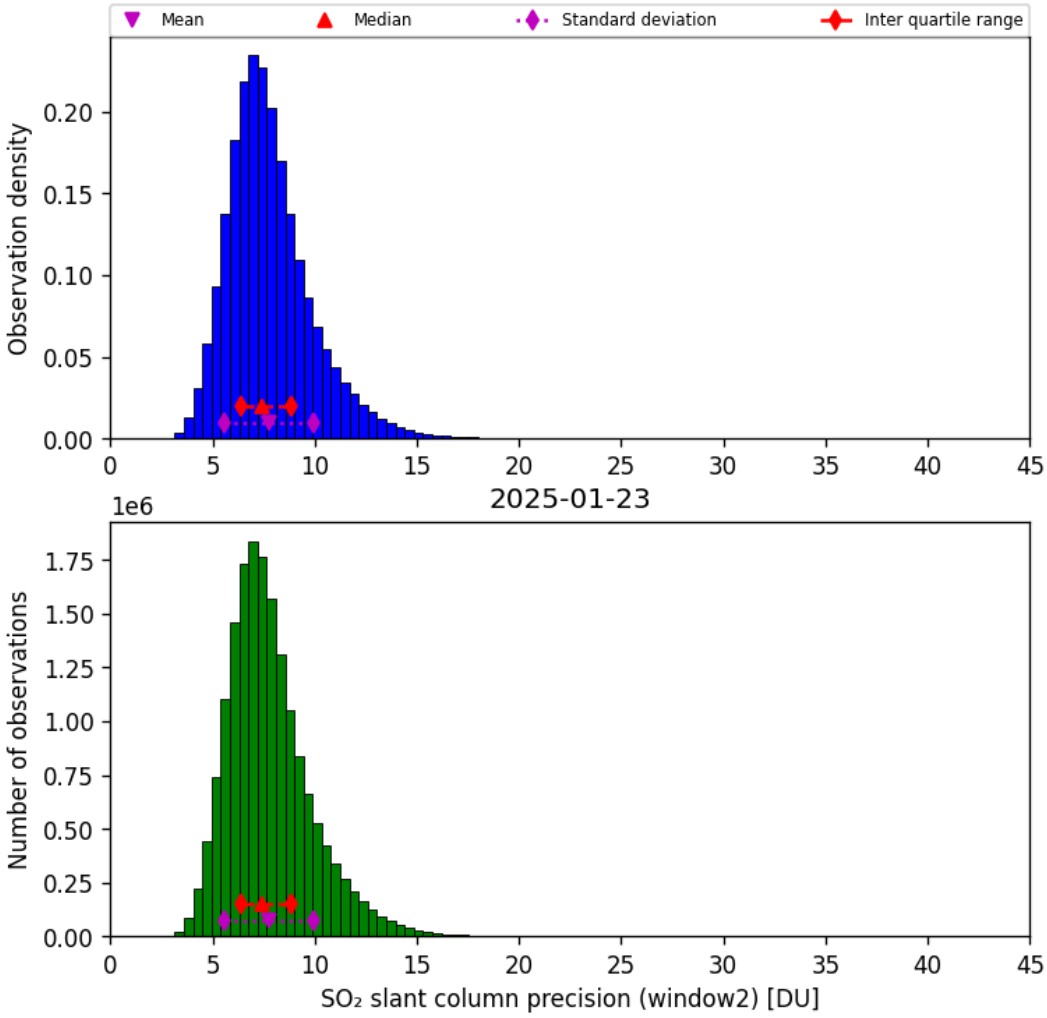


Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2025-01-23 to 2025-01-24

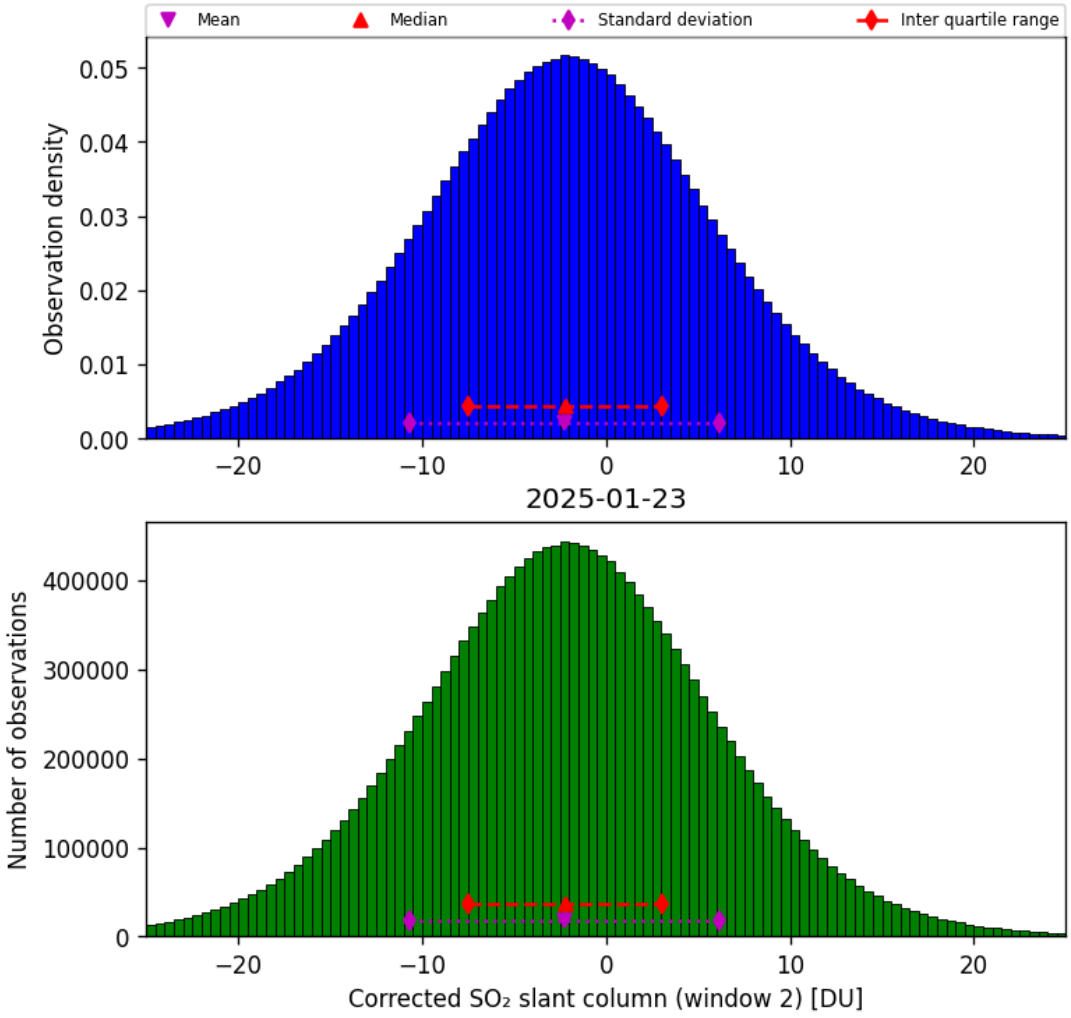


Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2025-01-23 to 2025-01-24

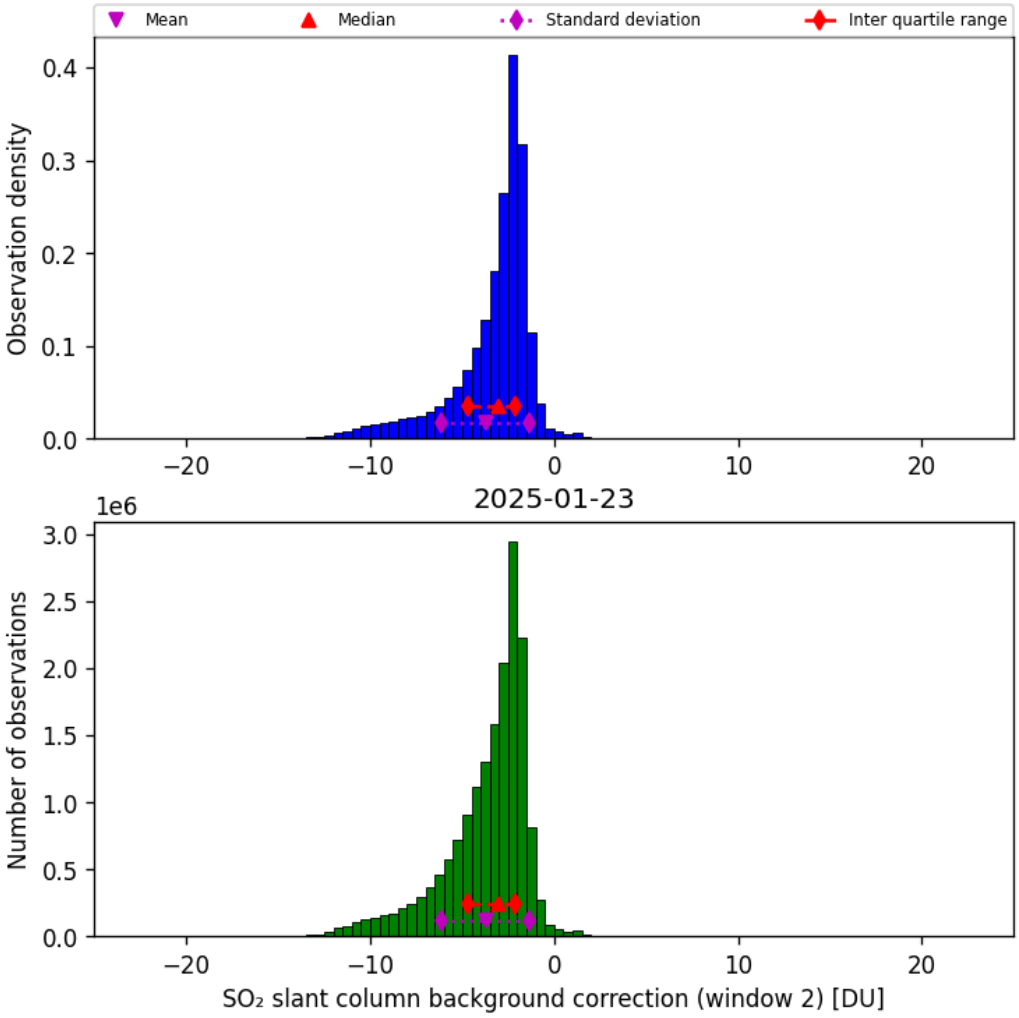


Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2025-01-23 to 2025-01-24

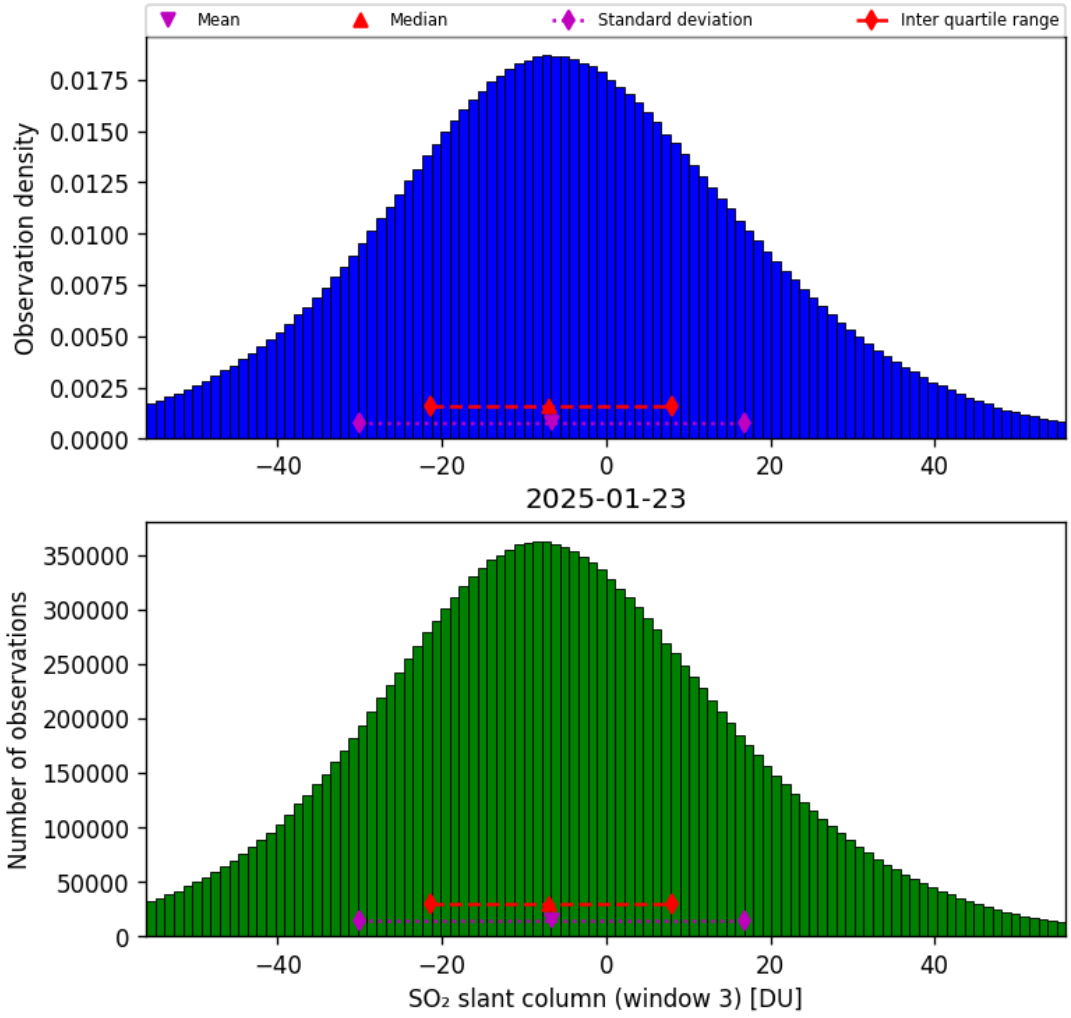


Figure 71: Histogram of "SO_2 slant column (window 3)" for 2025-01-23 to 2025-01-24

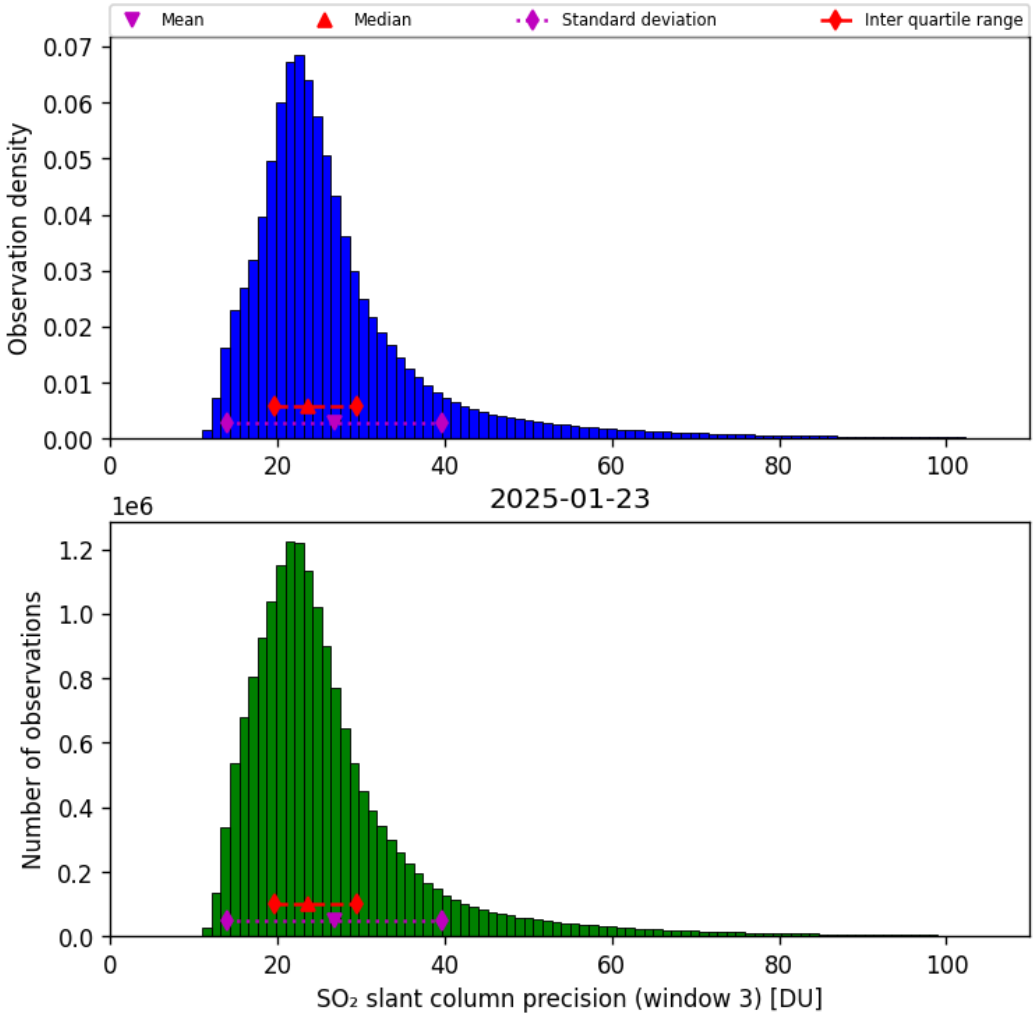


Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2025-01-23 to 2025-01-24

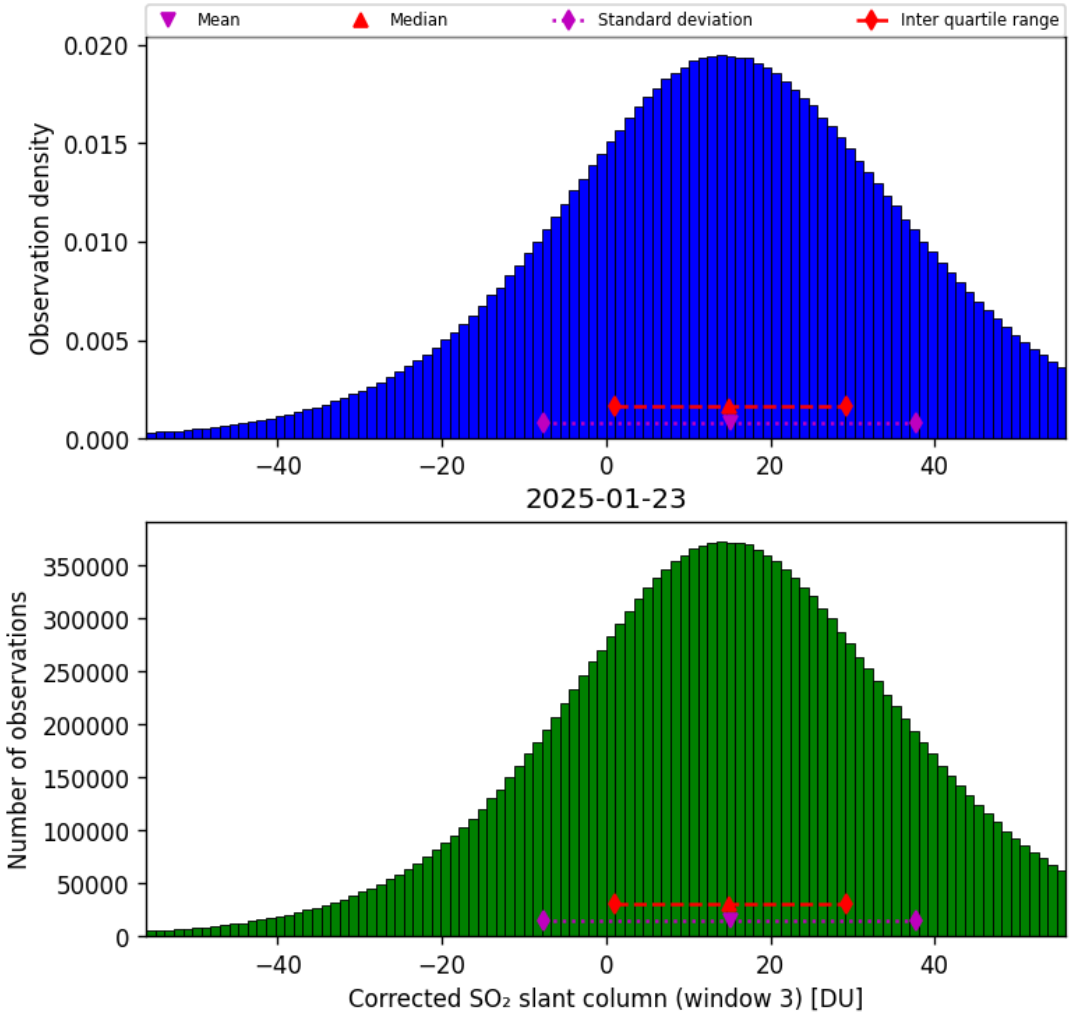


Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2025-01-23 to 2025-01-24

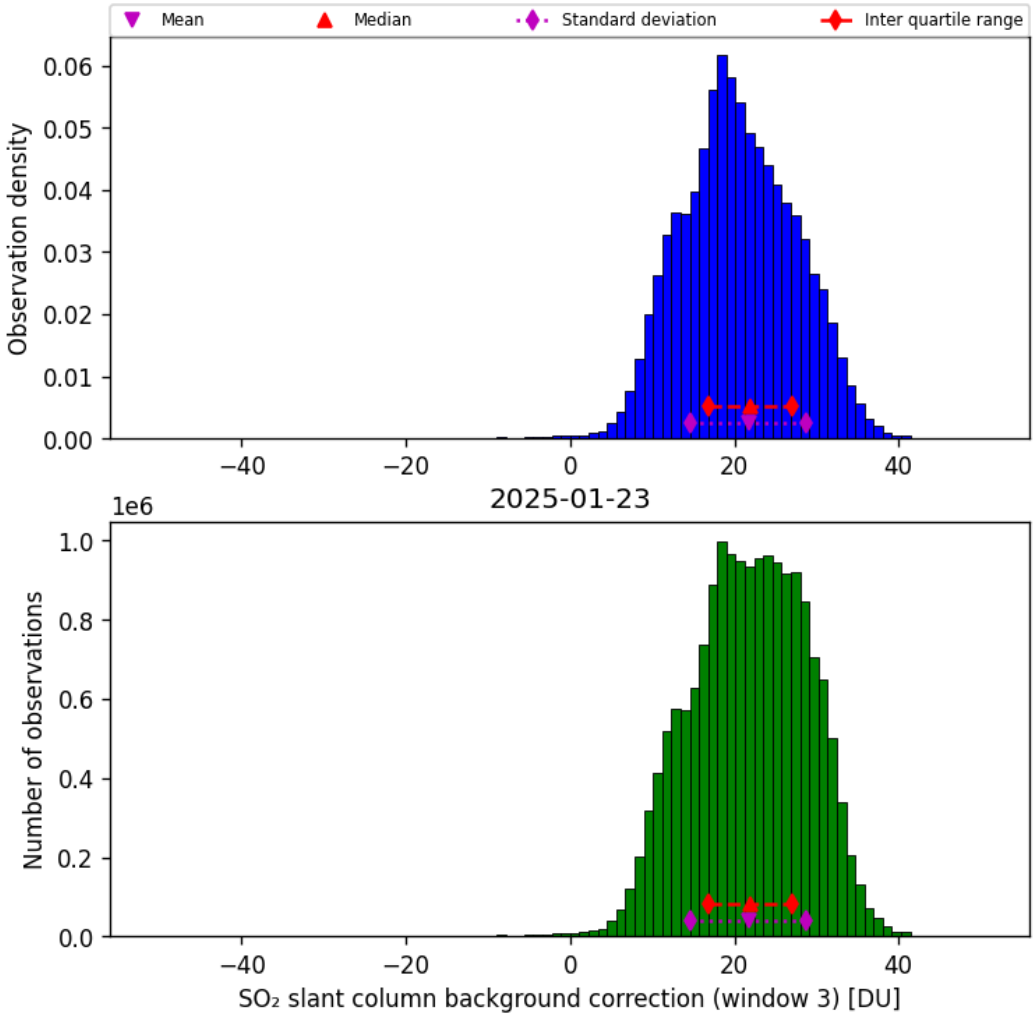


Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2025-01-23 to 2025-01-24

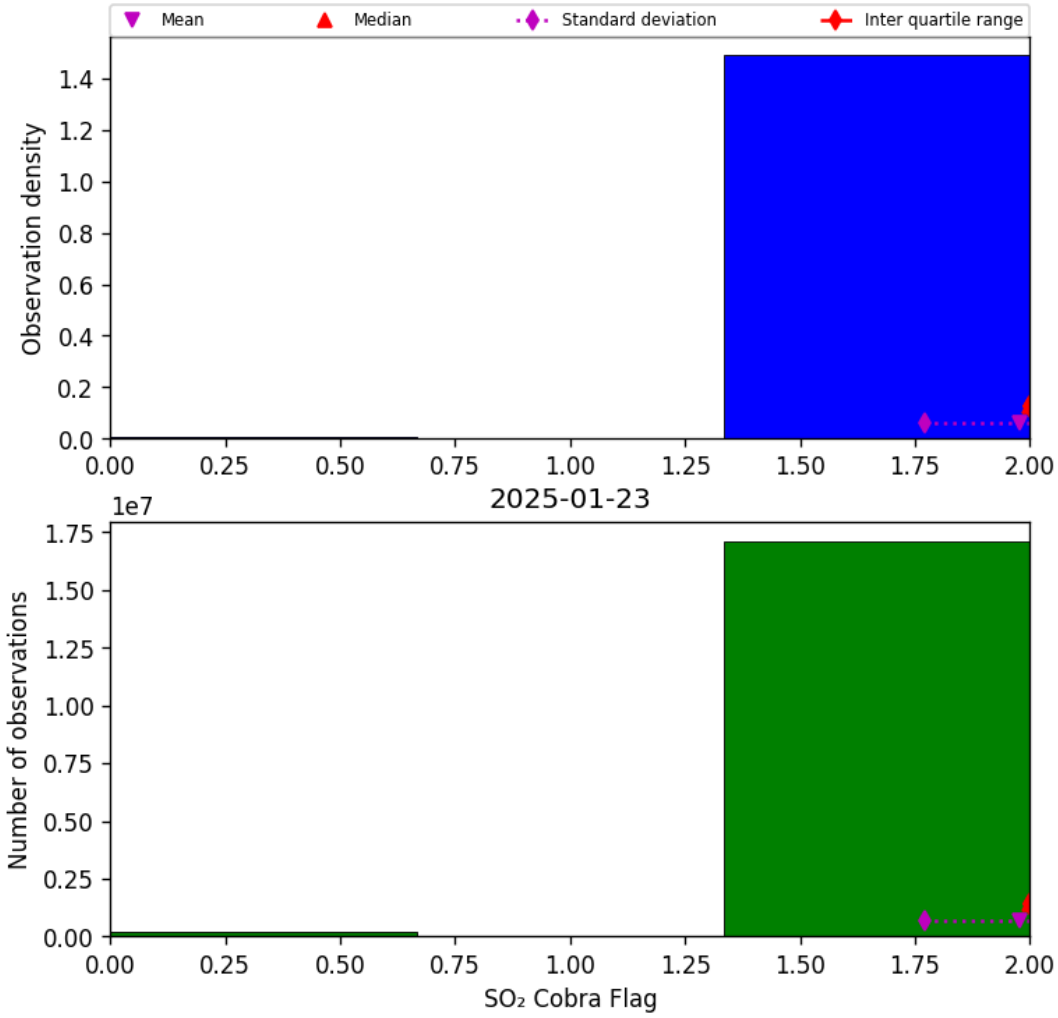


Figure 75: Histogram of "SO_2 Cobra Flag" for 2025-01-23 to 2025-01-24

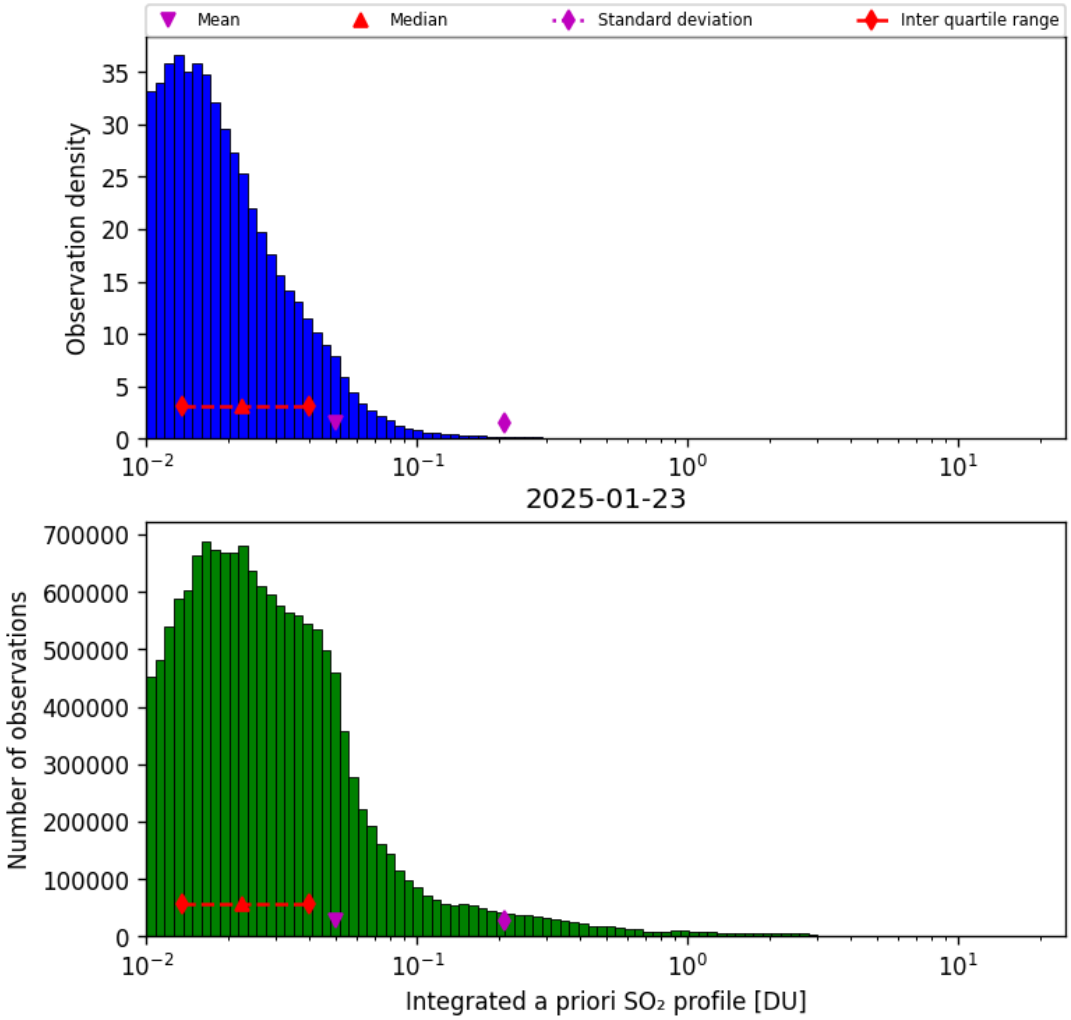


Figure 76: Histogram of “Integrated a priori SO_2 profile” for 2025-01-23 to 2025-01-24

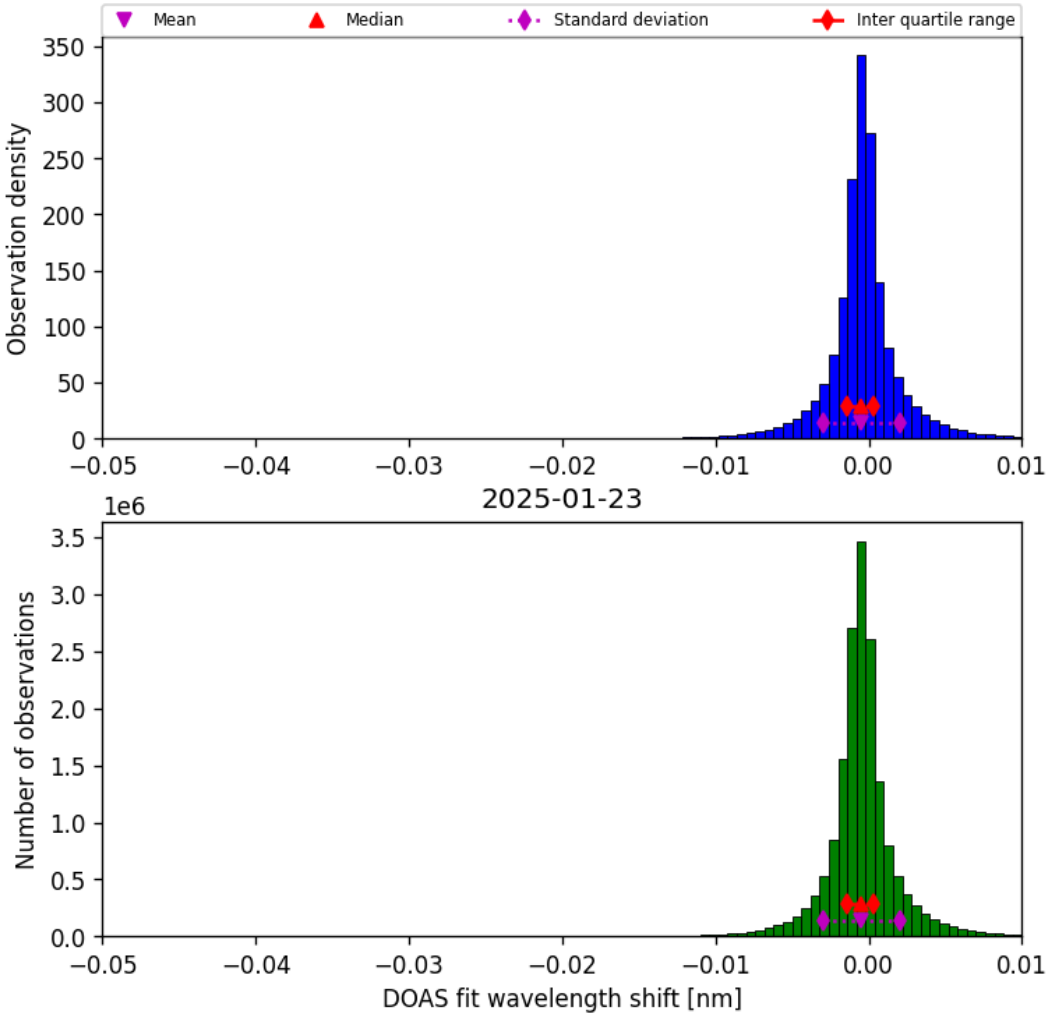


Figure 77: Histogram of “DOAS fit wavelength shift” for 2025-01-23 to 2025-01-24

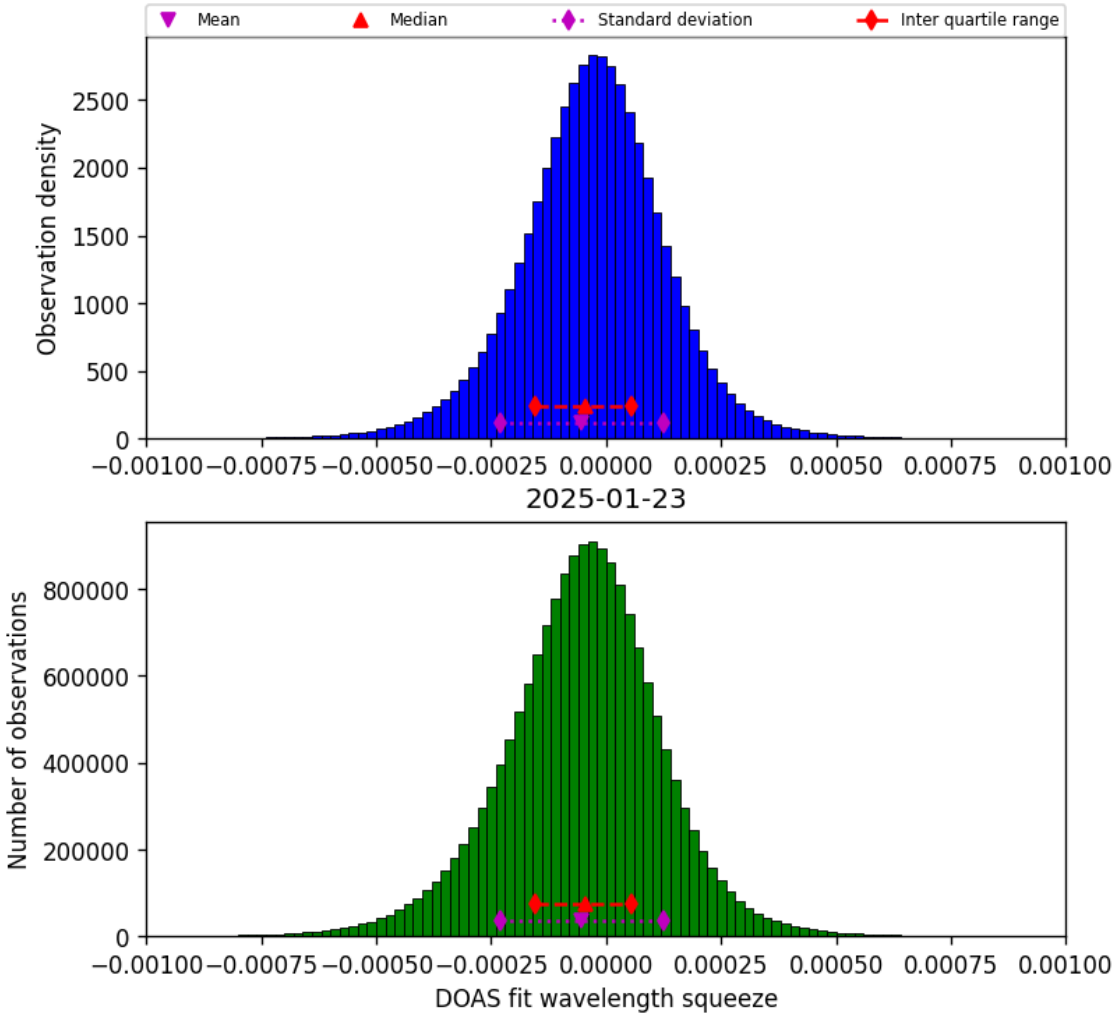


Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2025-01-23 to 2025-01-24

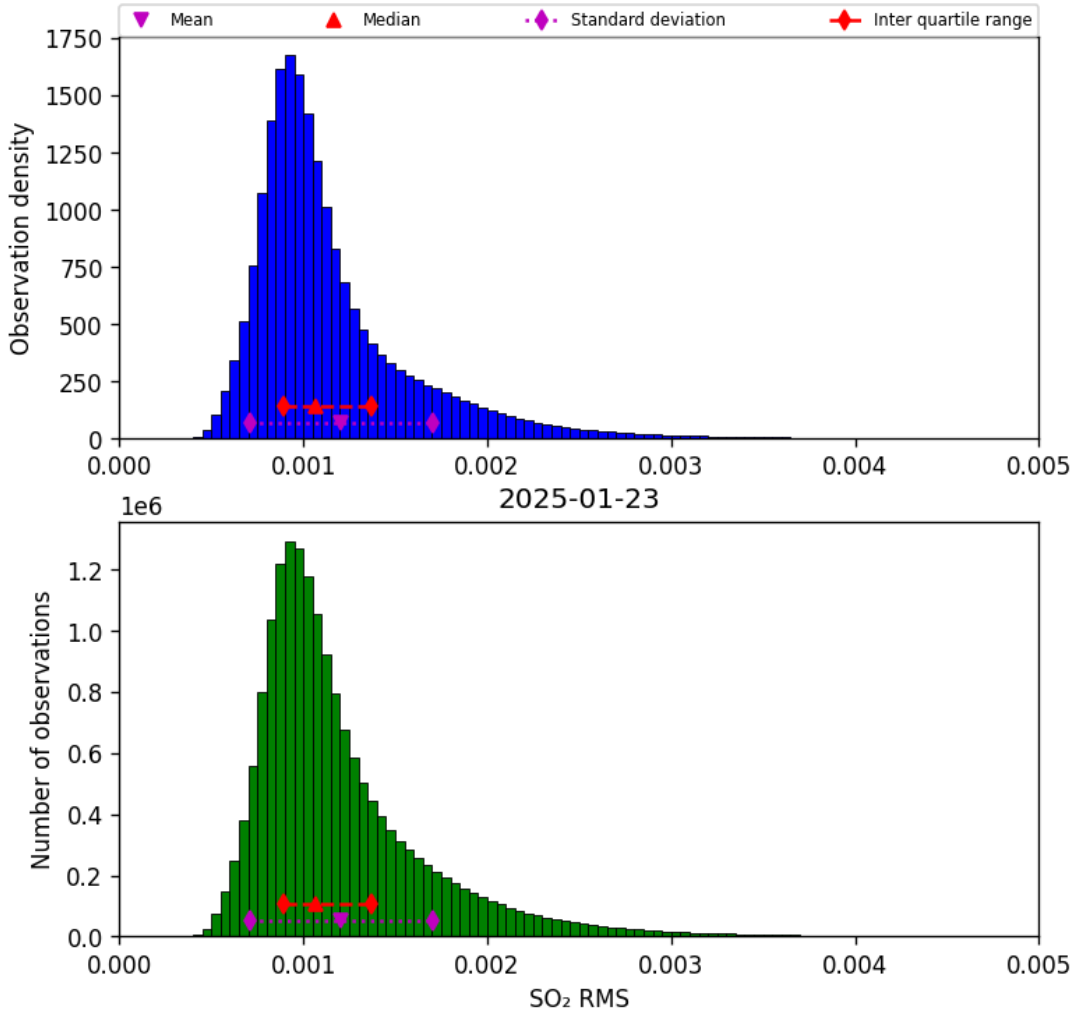


Figure 79: Histogram of "SO_2 RMS" for 2025-01-23 to 2025-01-24

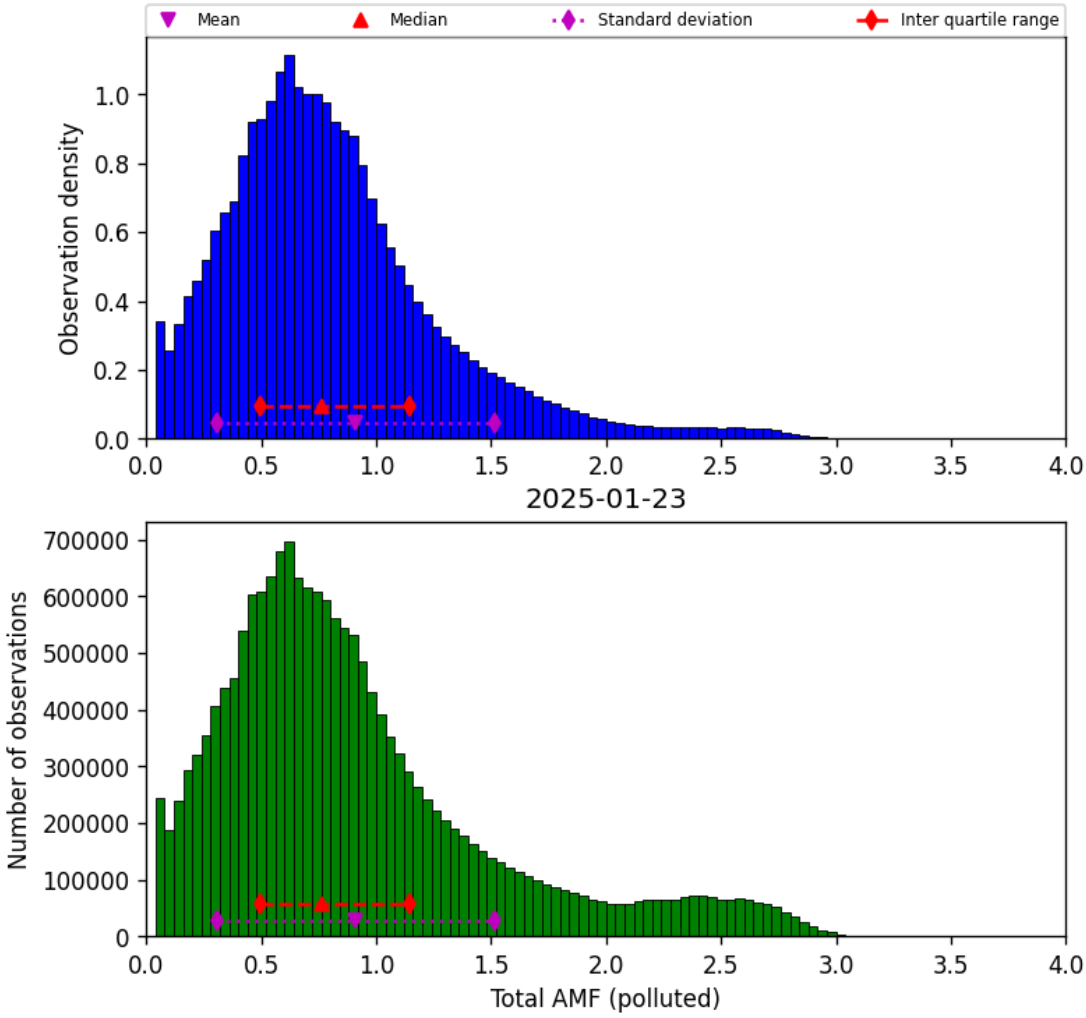


Figure 80: Histogram of “Total AMF (polluted)” for 2025-01-23 to 2025-01-24

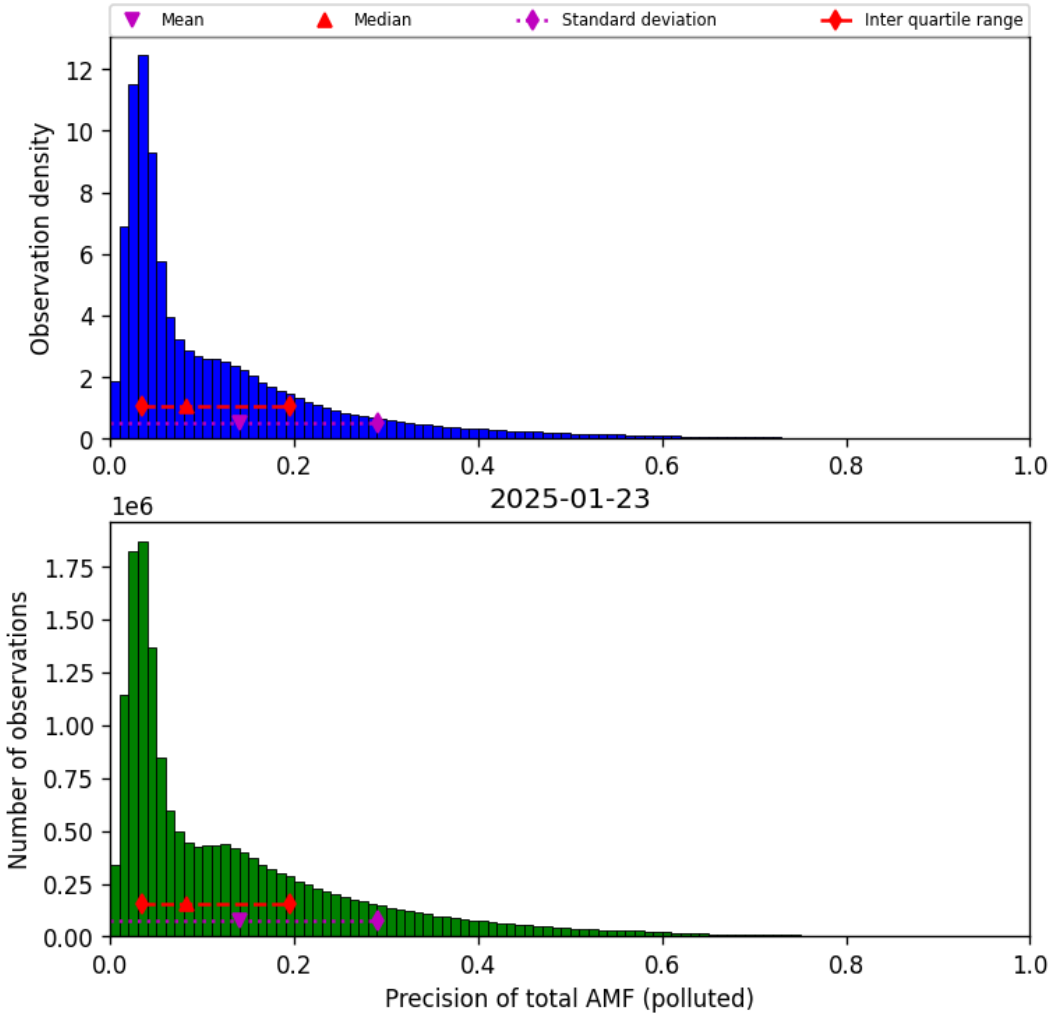


Figure 81: Histogram of “Precision of total AMF (polluted)” for 2025-01-23 to 2025-01-24

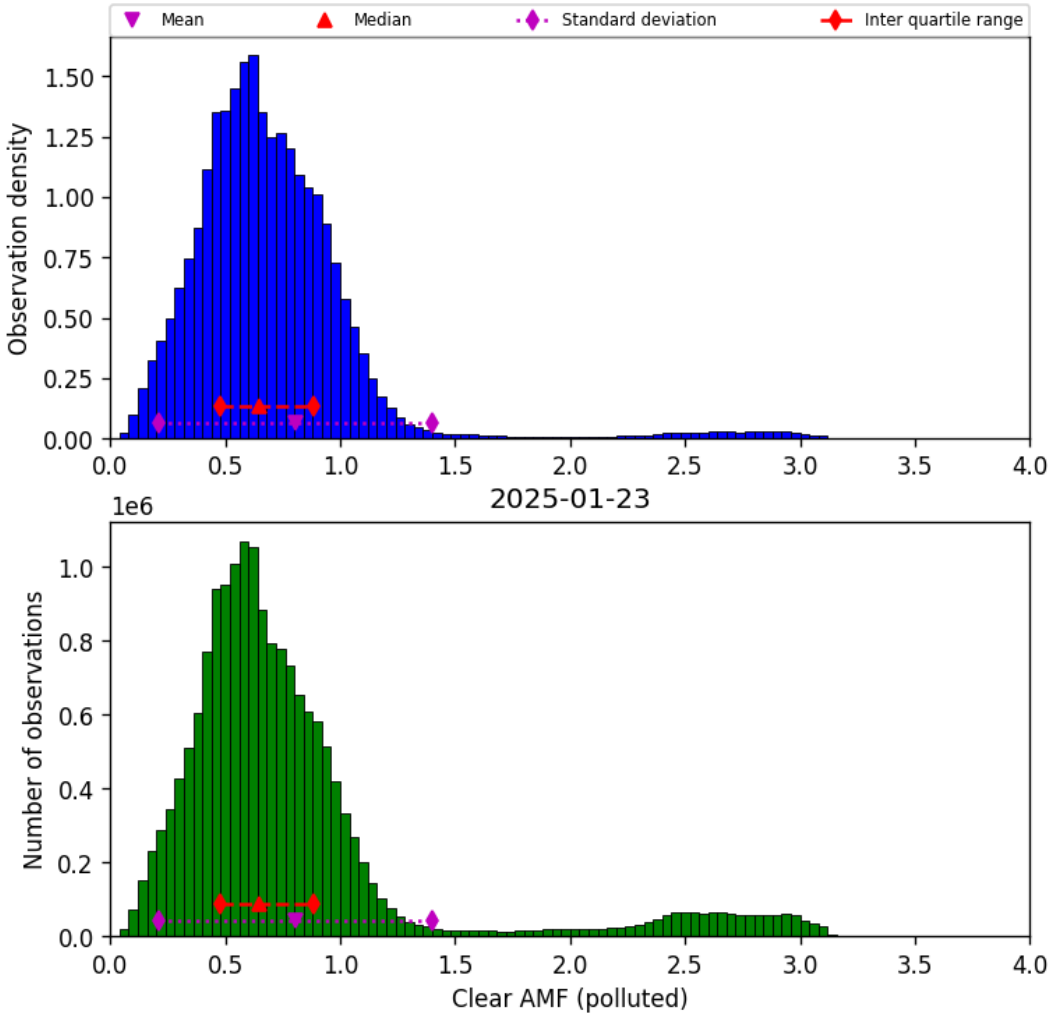


Figure 82: Histogram of “Clear AMF (polluted)” for 2025-01-23 to 2025-01-24

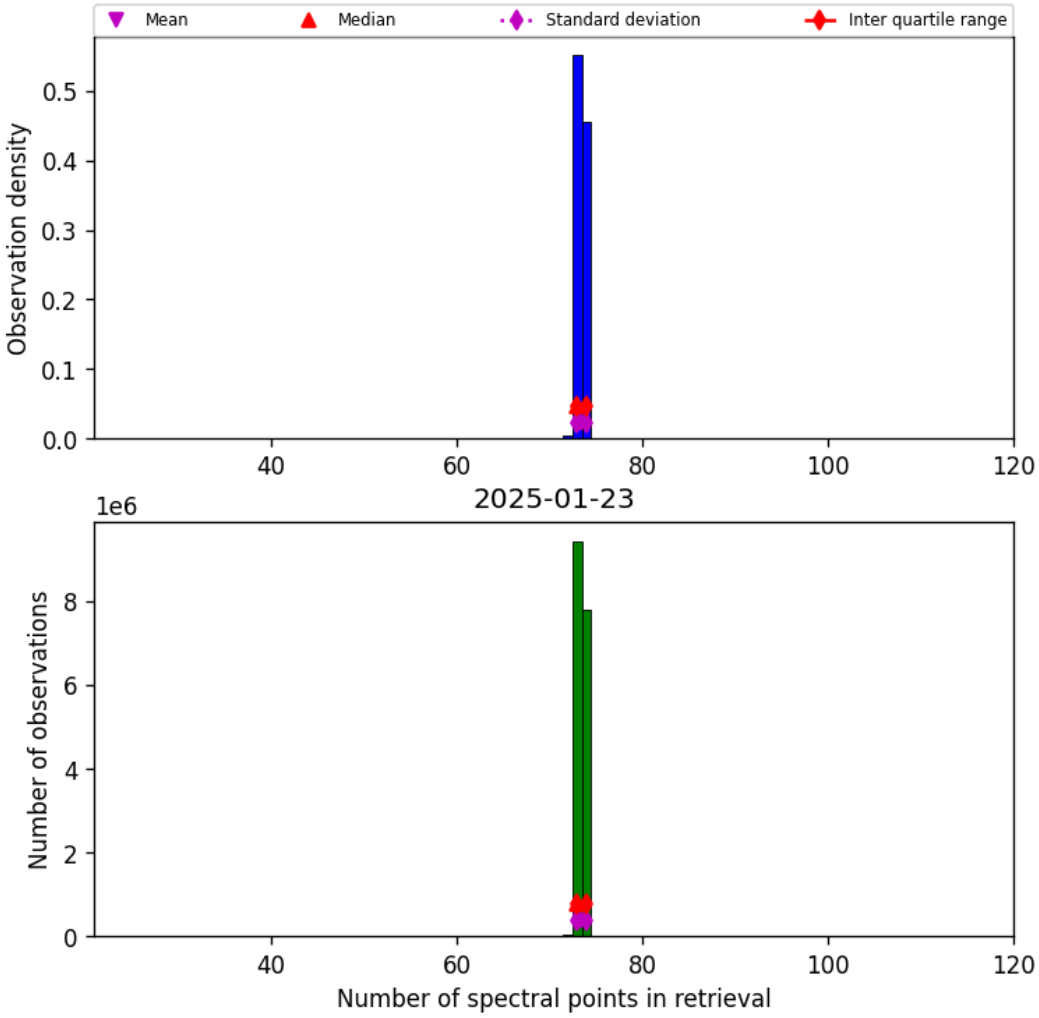


Figure 83: Histogram of “Number of spectral points in retrieval” for 2025-01-23 to 2025-01-24

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.

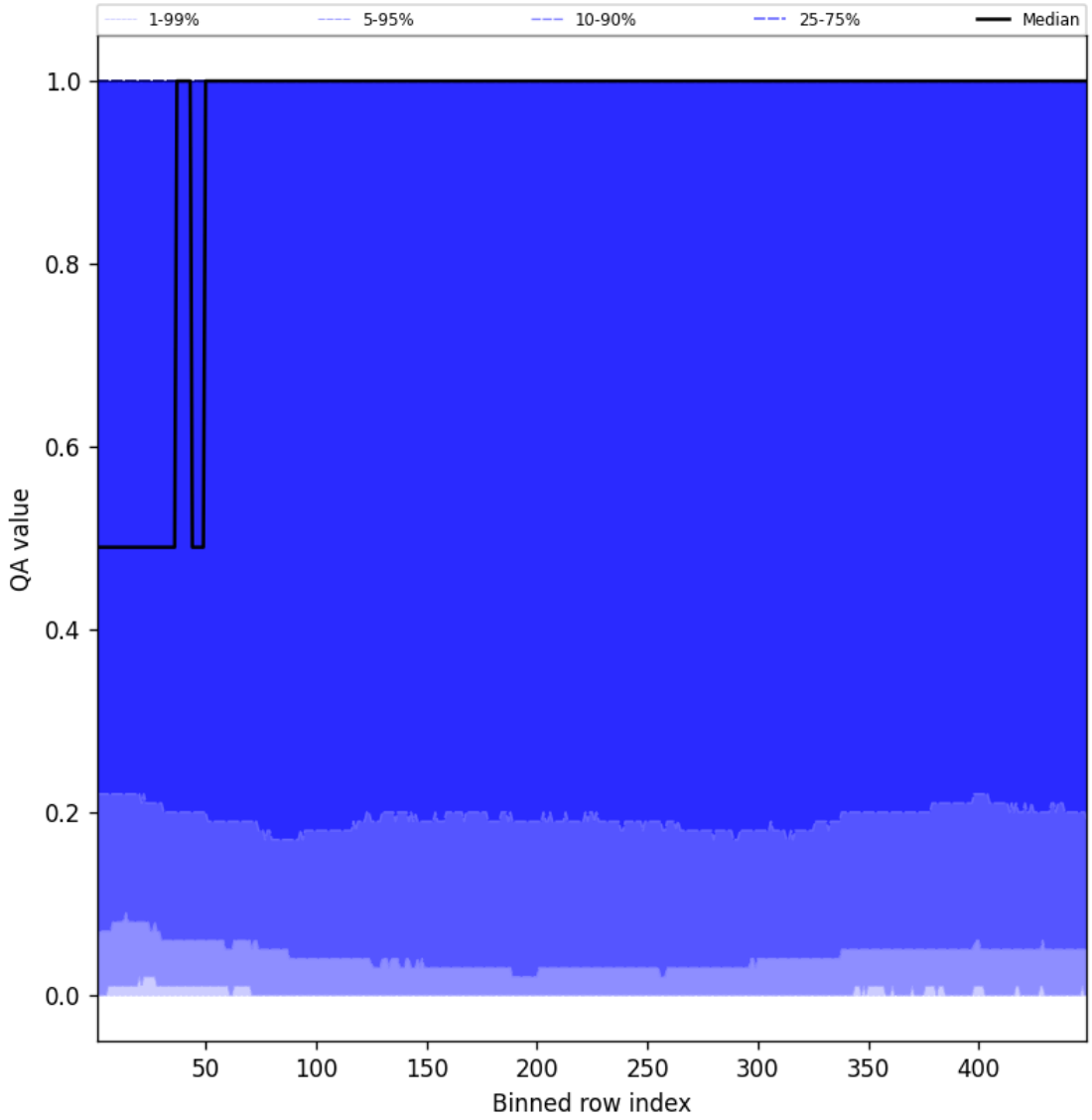


Figure 84: Along track statistics of “QA value” for 2025-01-23 to 2025-01-24

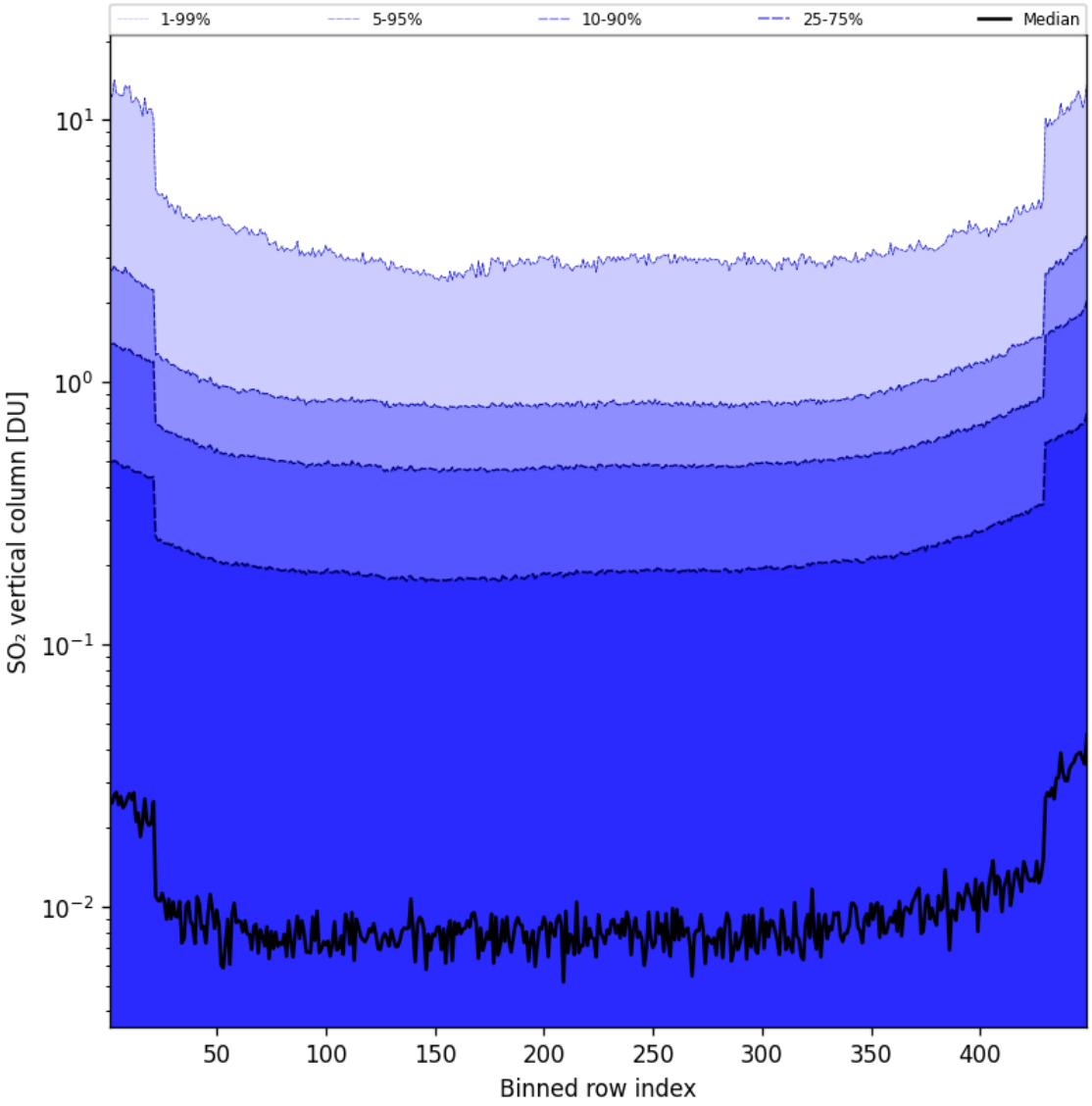


Figure 85: Along track statistics of "SO_2 vertical column" for 2025-01-23 to 2025-01-24

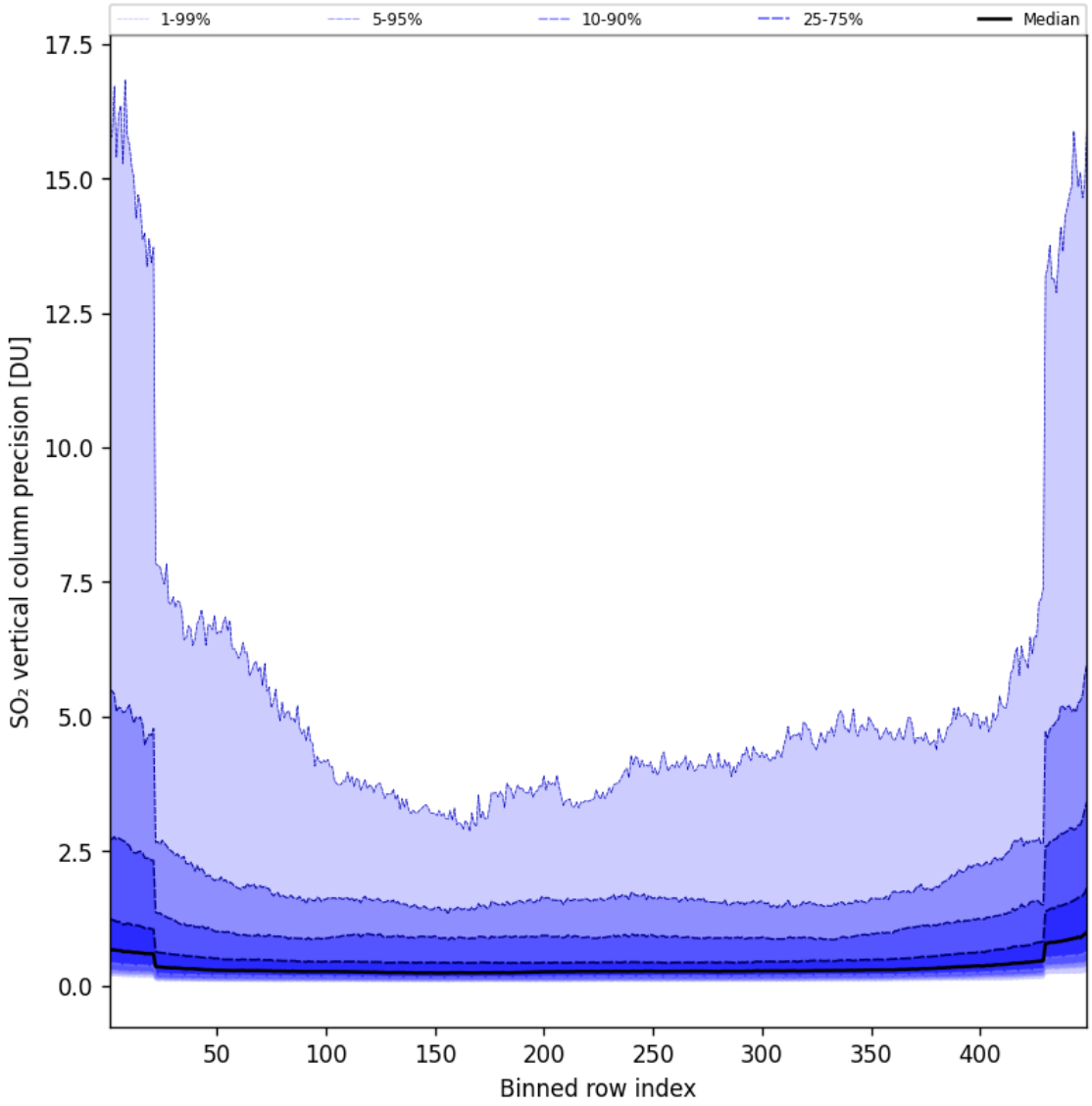


Figure 86: Along track statistics of "SO_2 vertical column precision" for 2025-01-23 to 2025-01-24

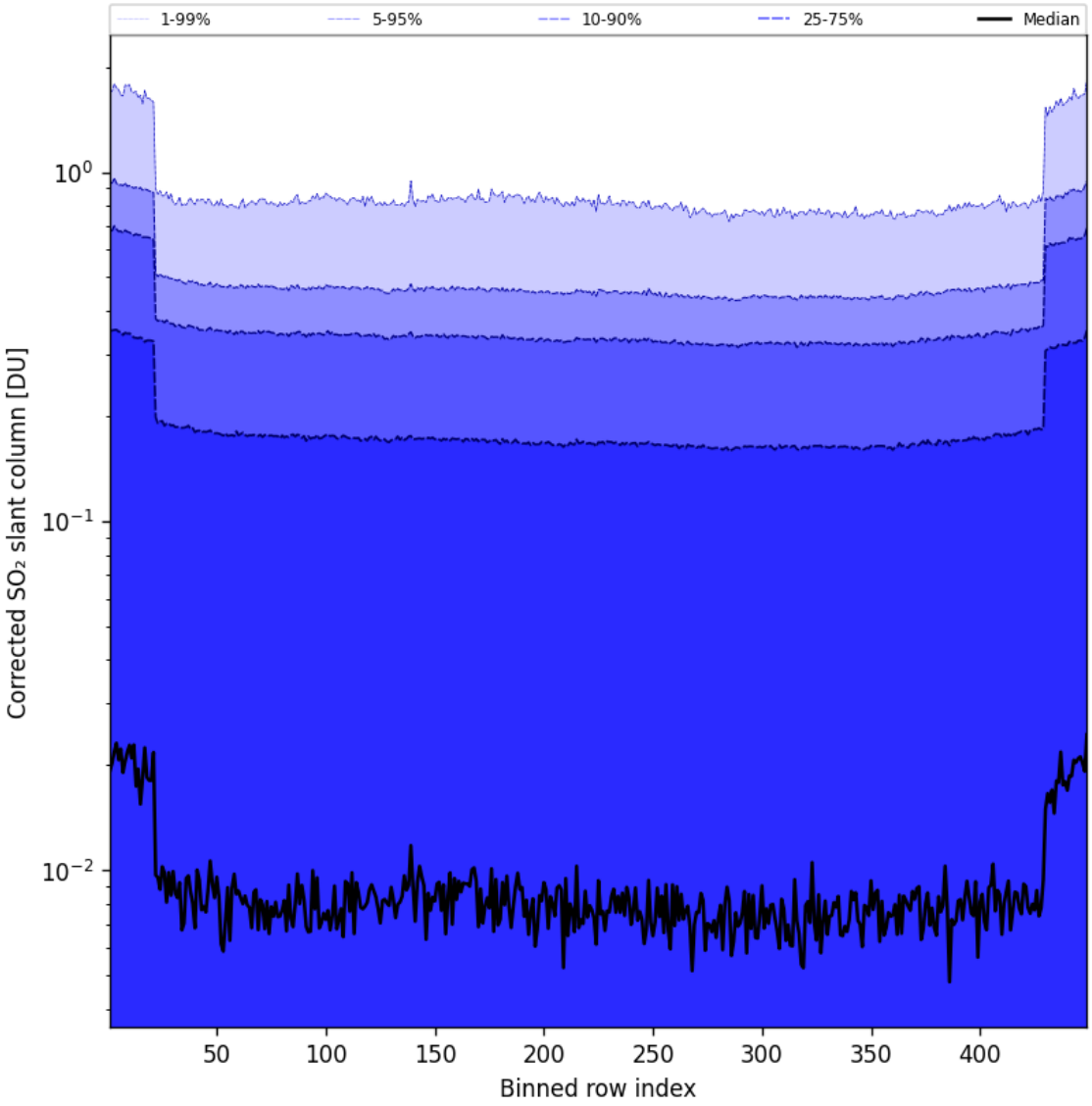


Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2025-01-23 to 2025-01-24

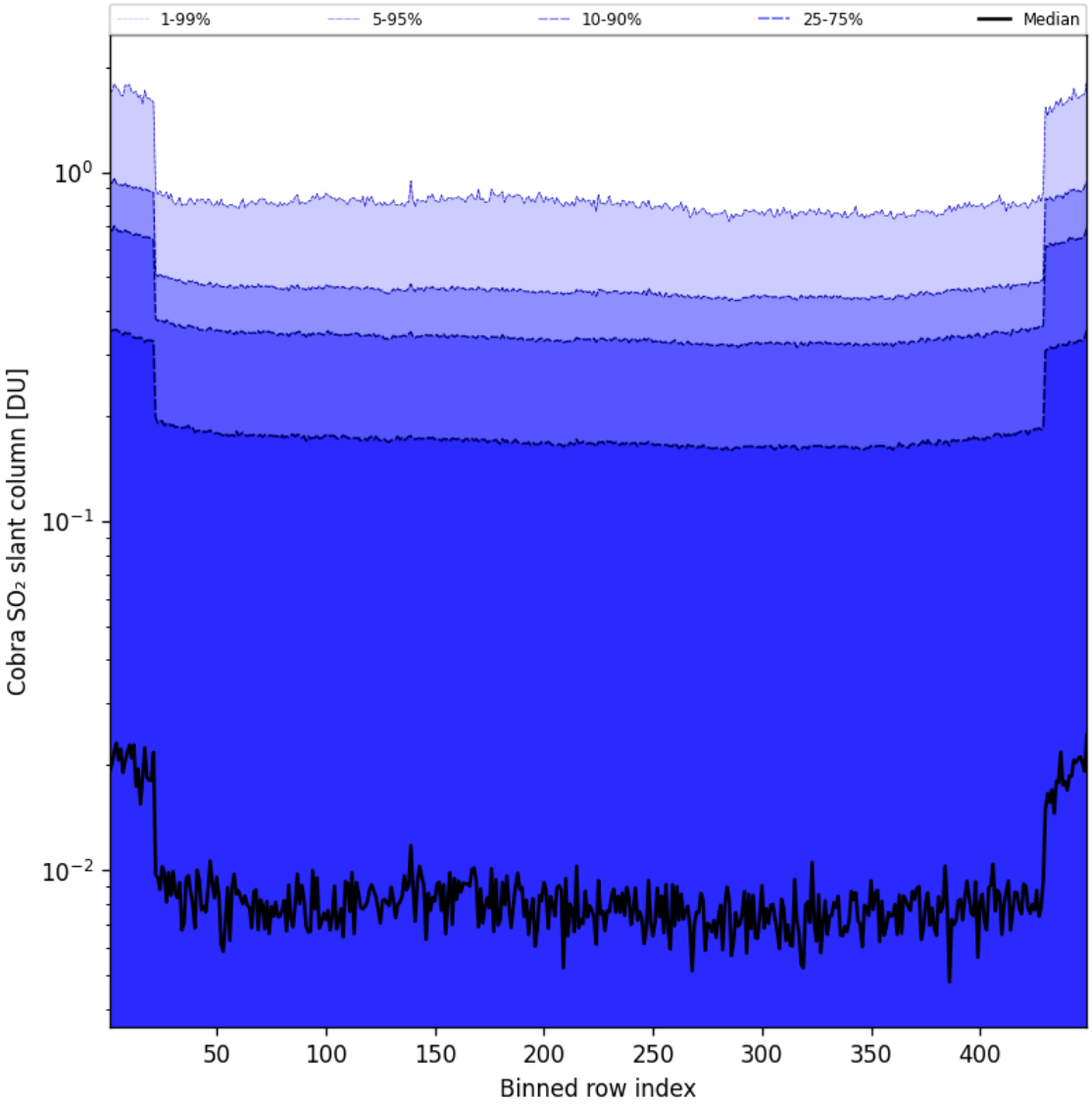


Figure 88: Along track statistics of “Cobra SO_2 slant column” for 2025-01-23 to 2025-01-24

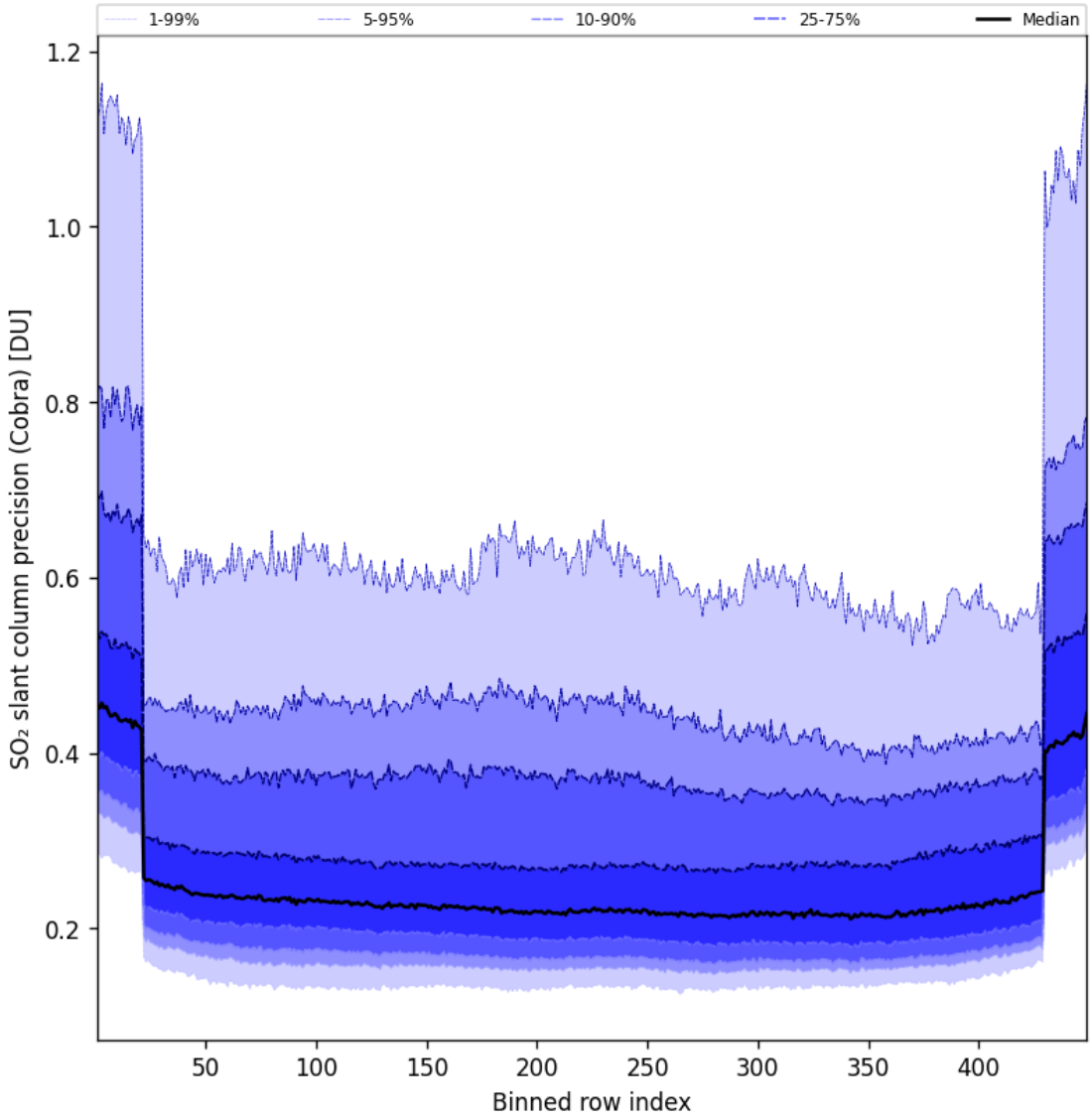


Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2025-01-23 to 2025-01-24

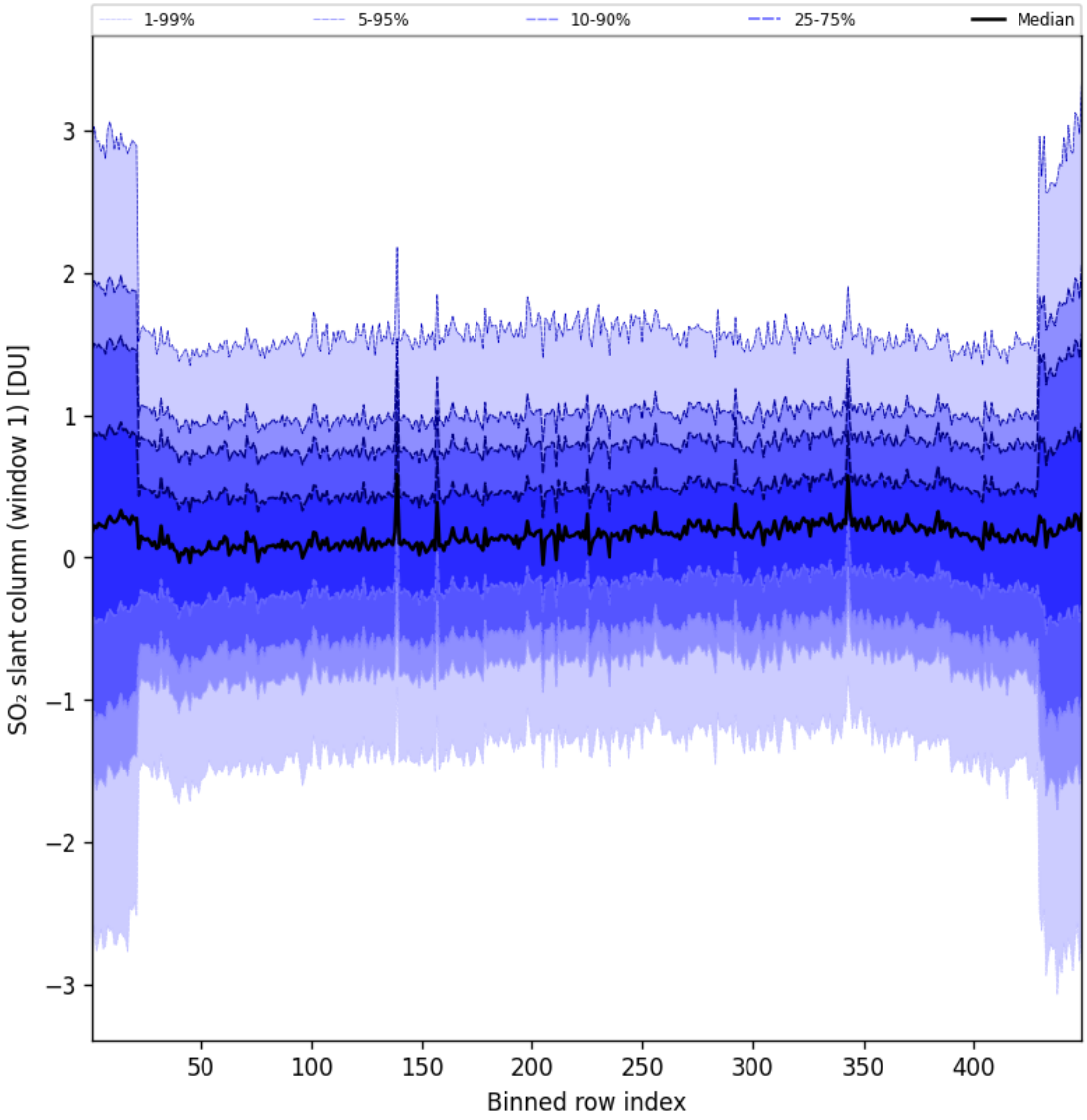


Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2025-01-23 to 2025-01-24

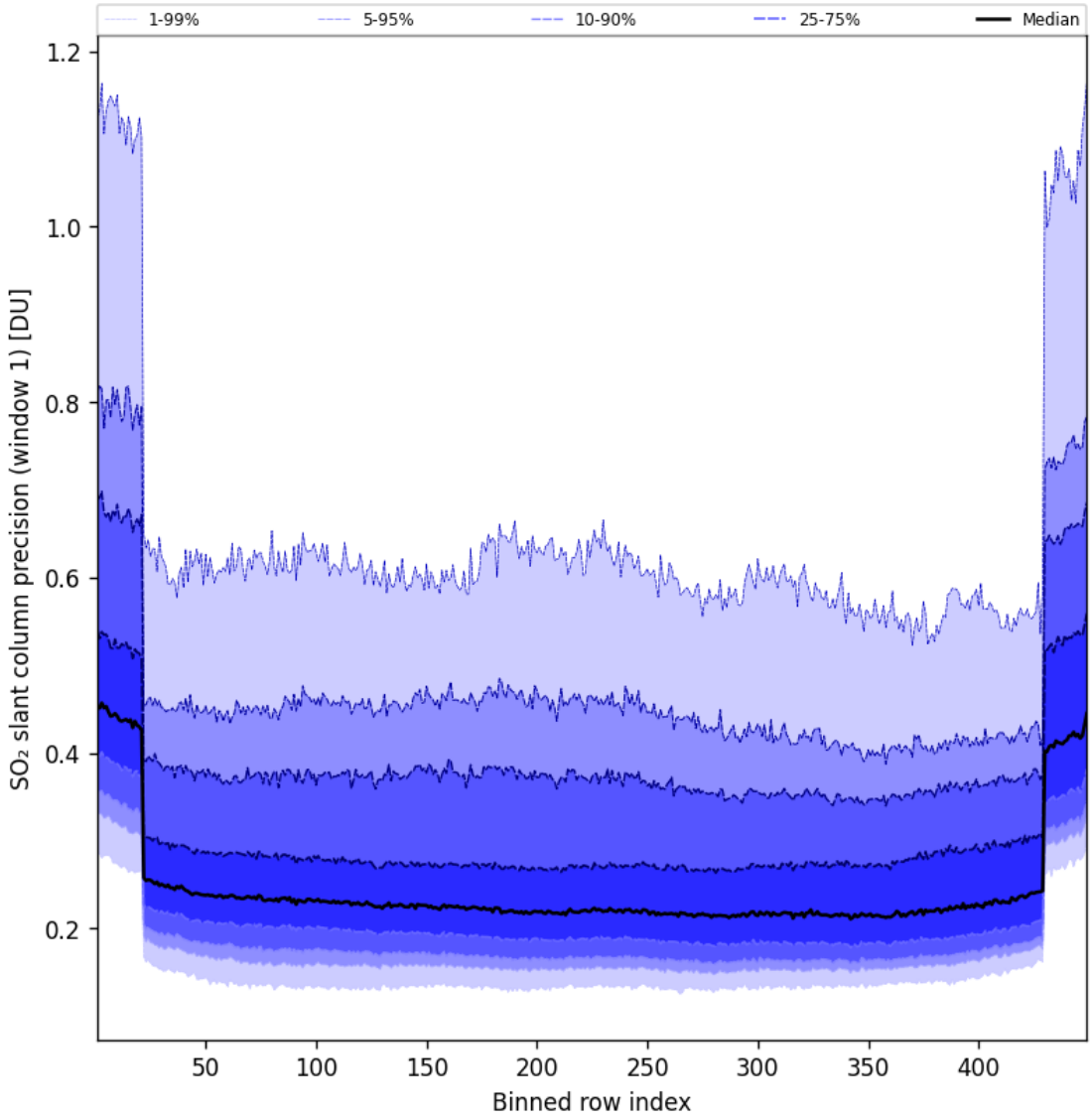


Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2025-01-23 to 2025-01-24

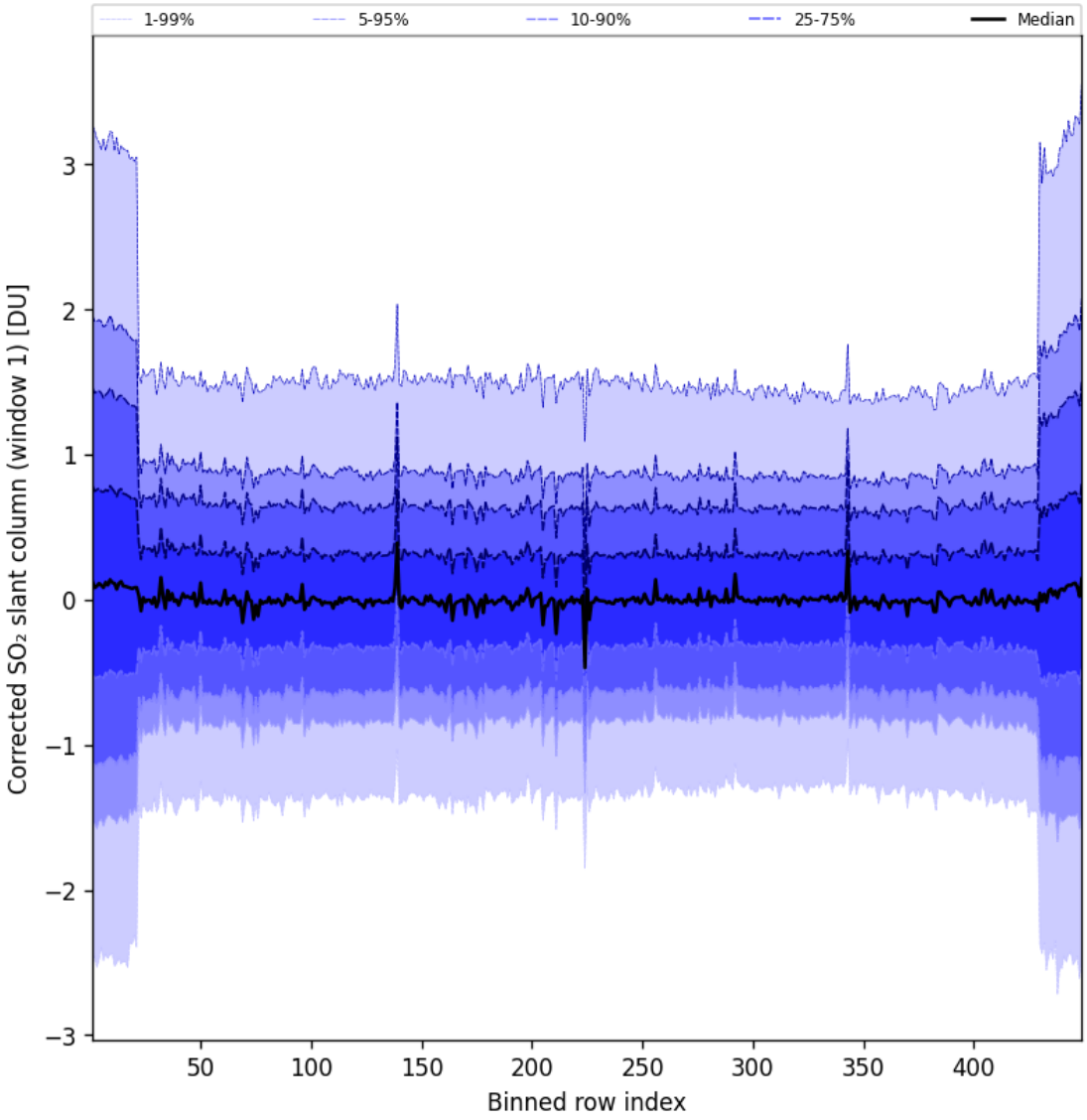


Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2025-01-23 to 2025-01-24

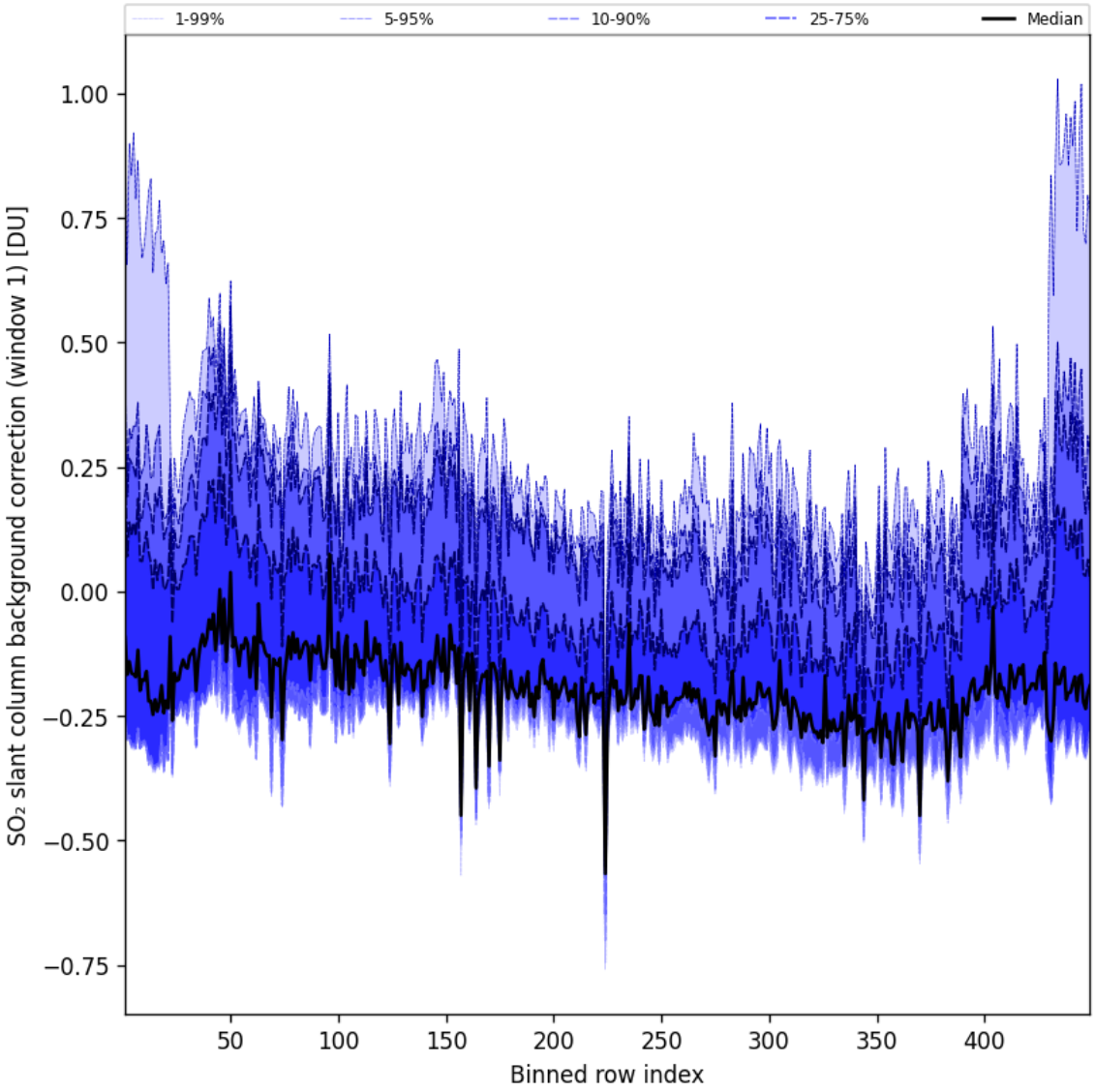


Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2025-01-23 to 2025-01-24

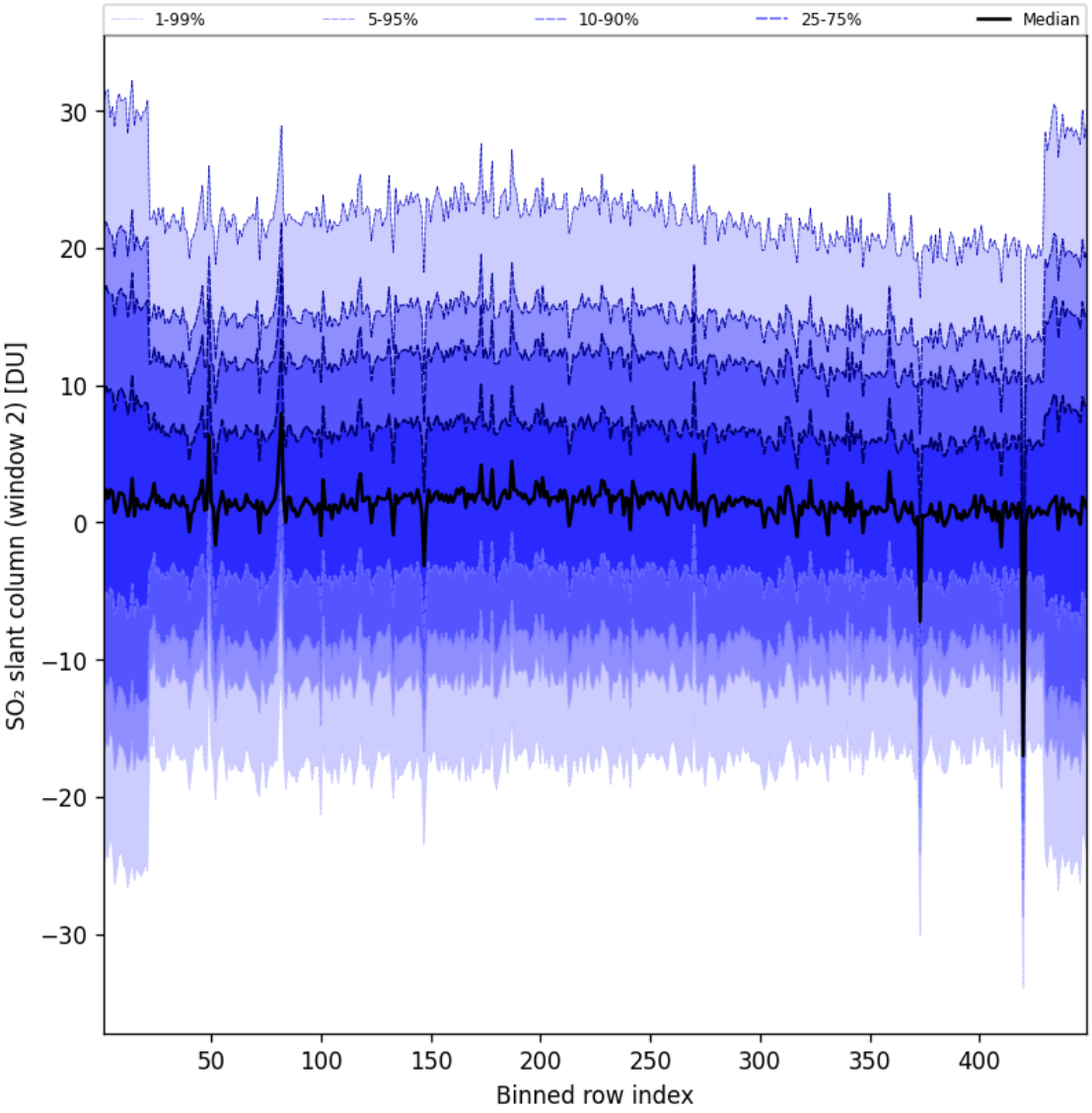


Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2025-01-23 to 2025-01-24

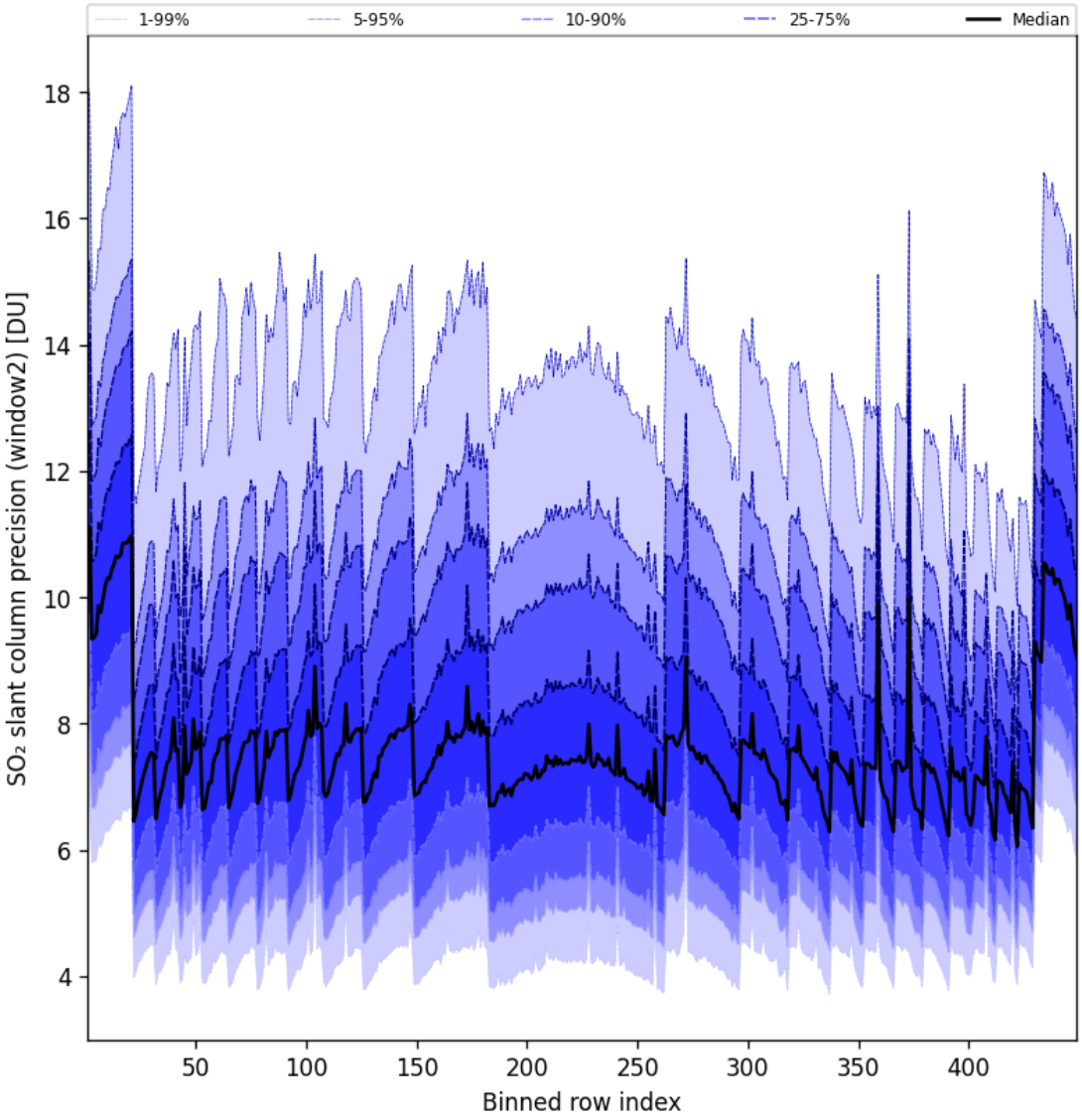


Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2025-01-23 to 2025-01-24

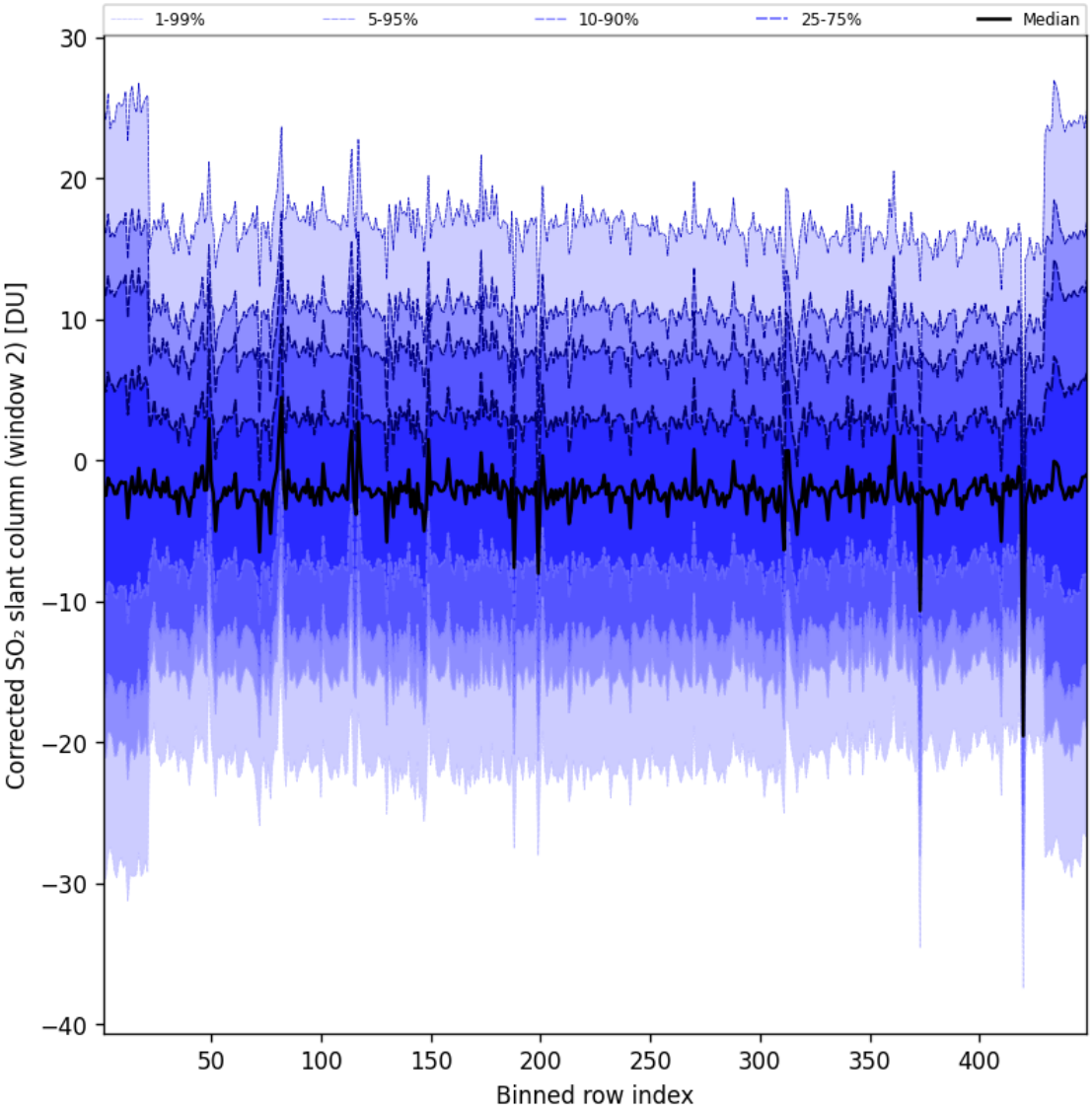


Figure 96: Along track statistics of “Corrected SO_2 slant column (window 2)” for 2025-01-23 to 2025-01-24

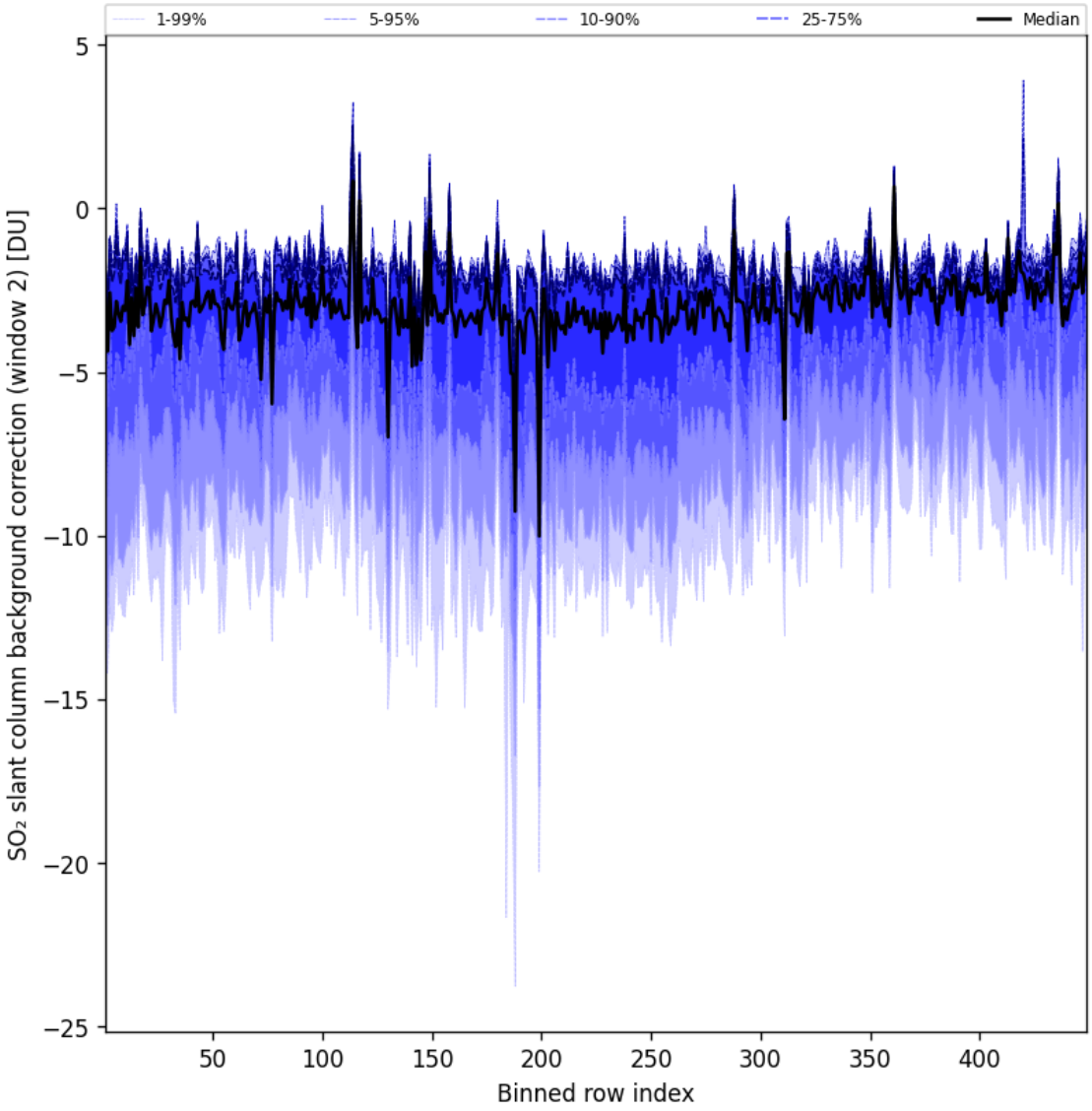


Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2025-01-23 to 2025-01-24

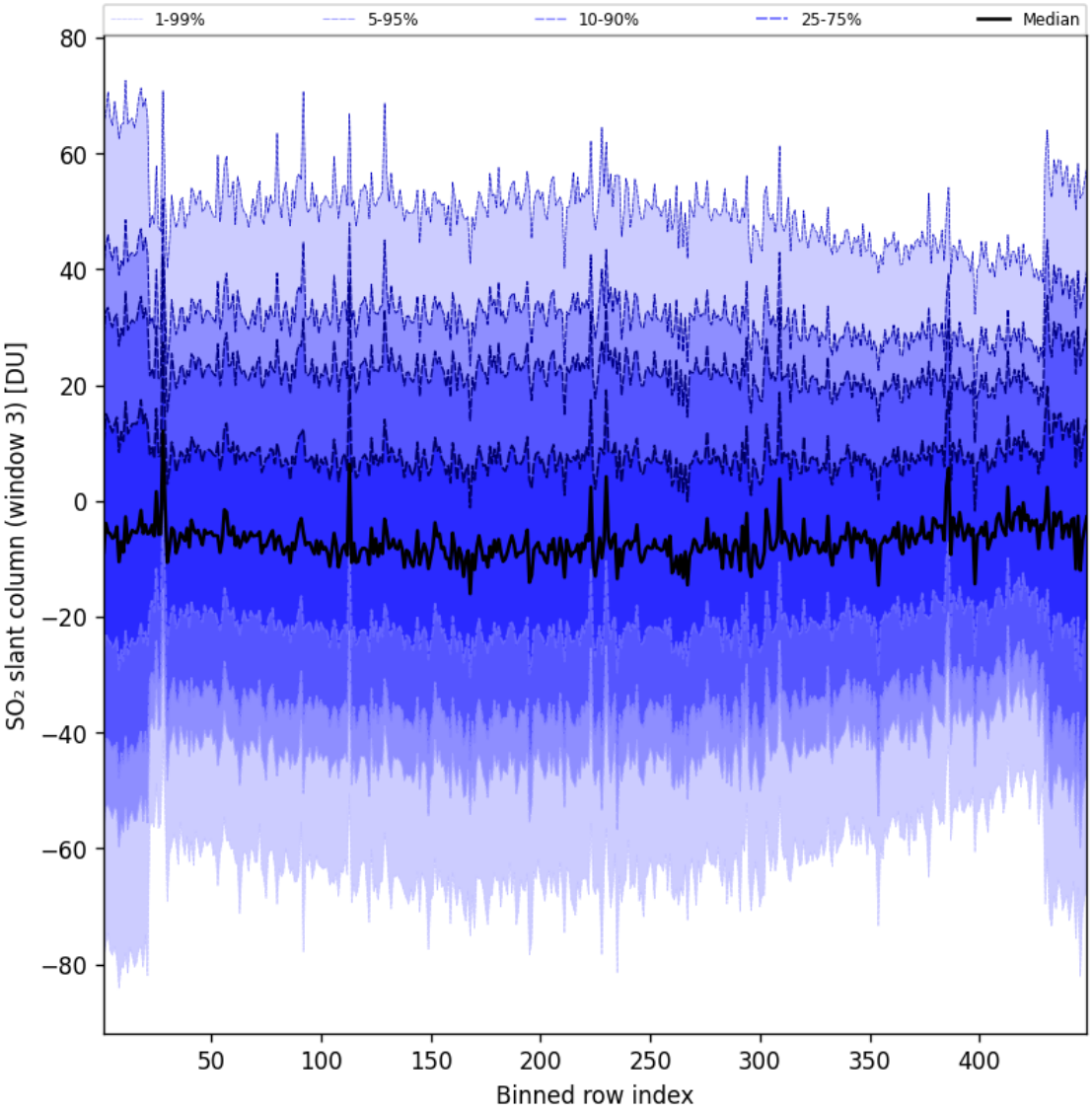


Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2025-01-23 to 2025-01-24

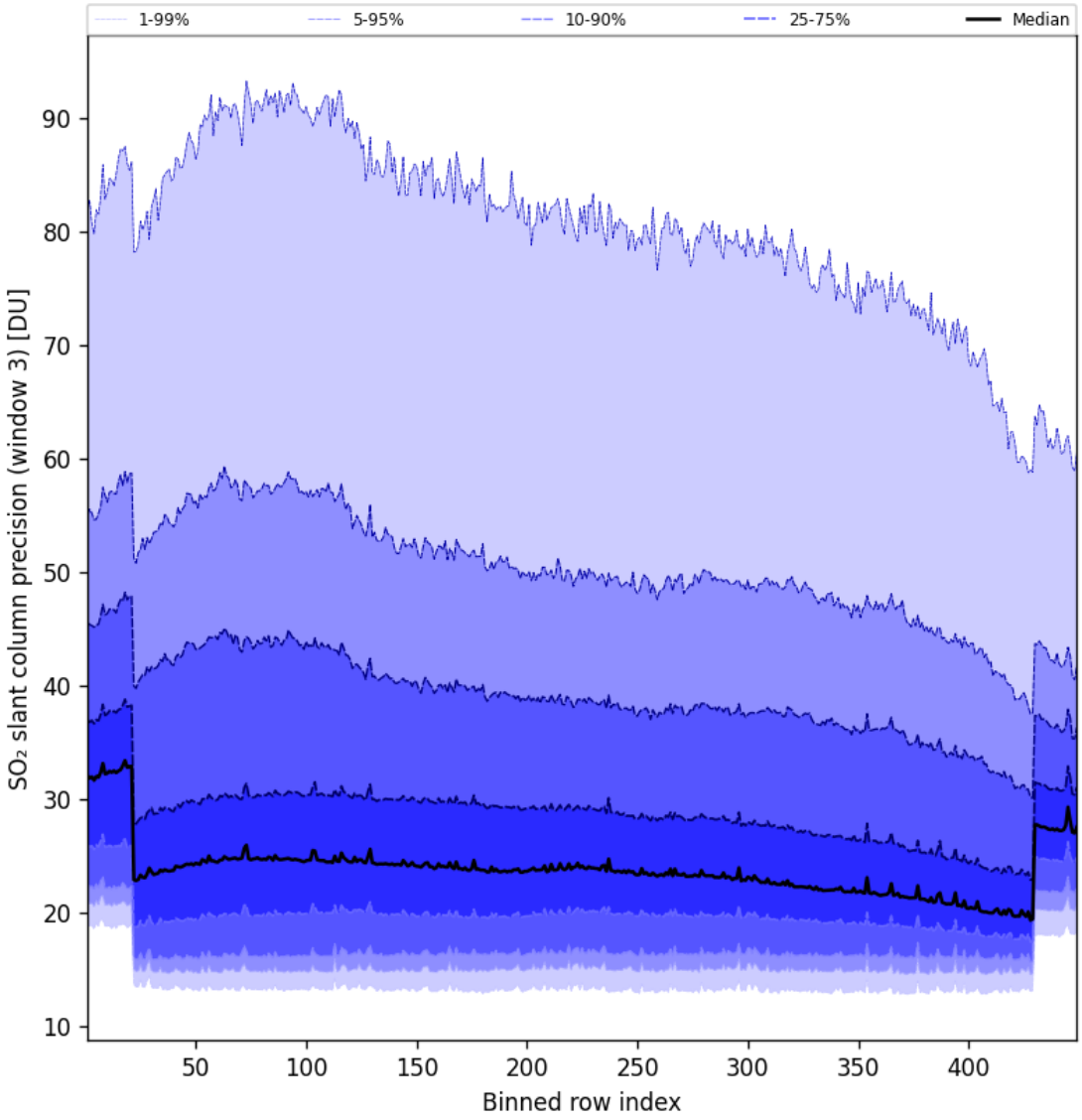


Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2025-01-23 to 2025-01-24

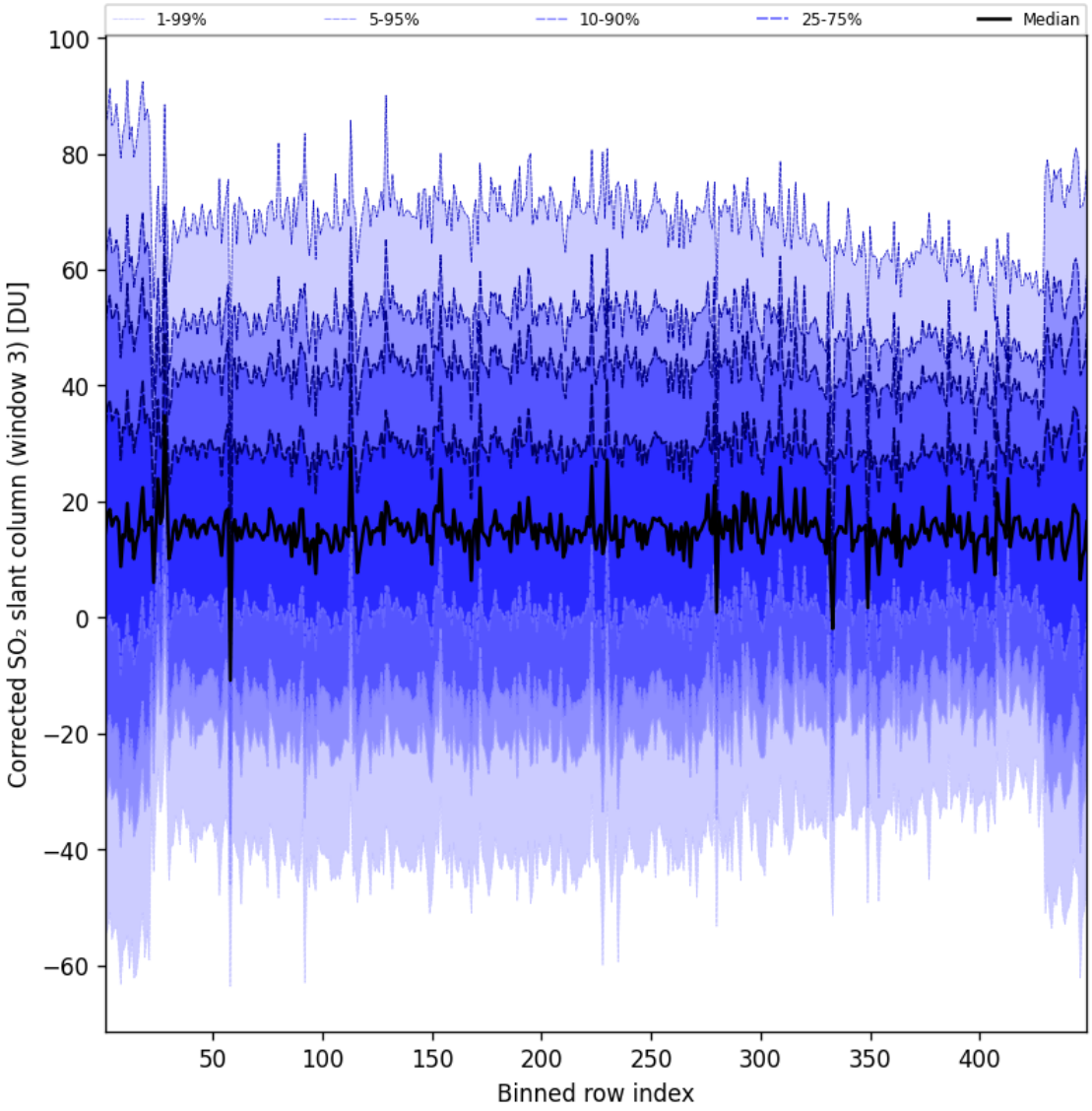


Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2025-01-23 to 2025-01-24

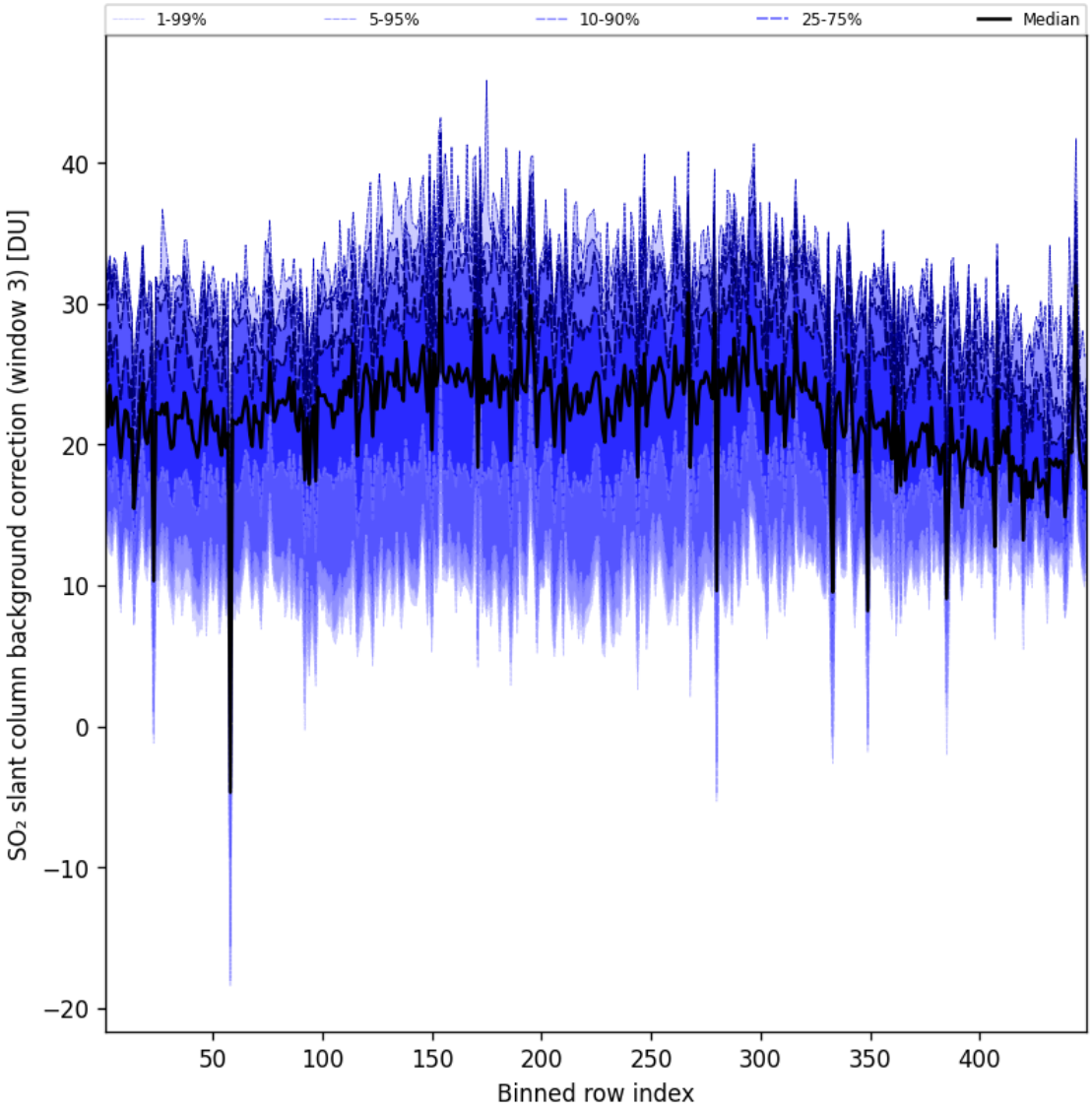


Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2025-01-23 to 2025-01-24

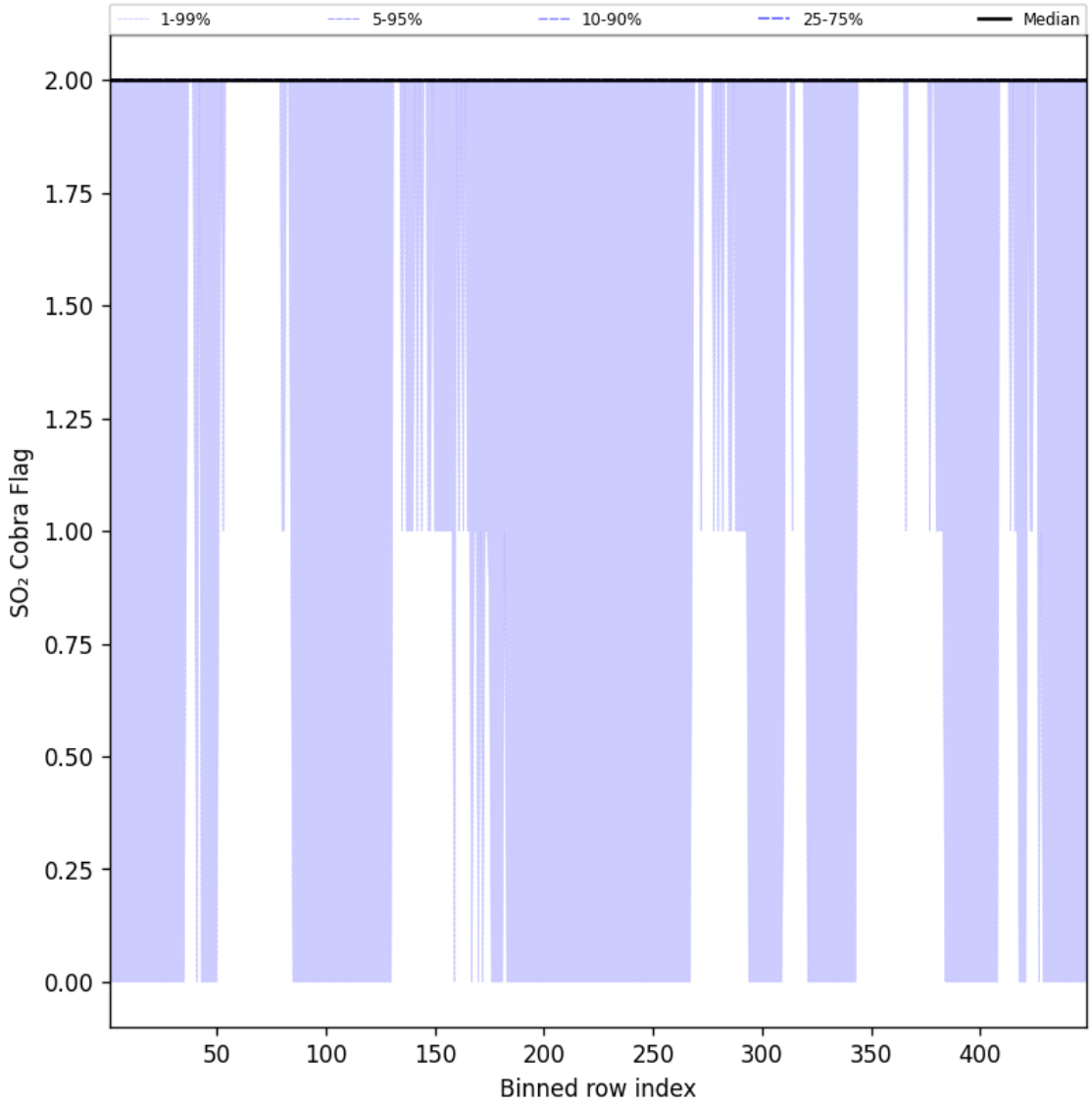


Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2025-01-23 to 2025-01-24

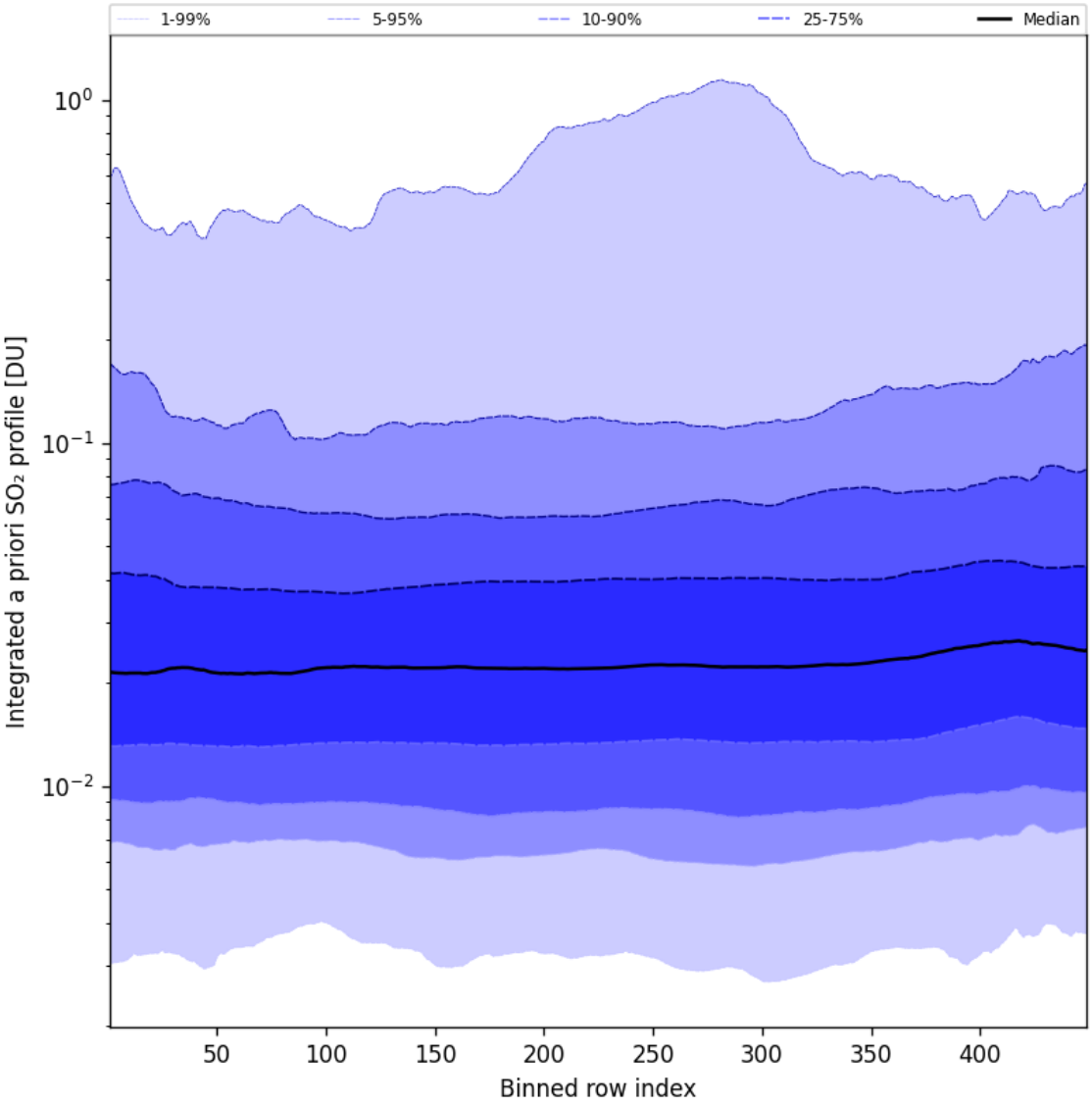


Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2025-01-23 to 2025-01-24

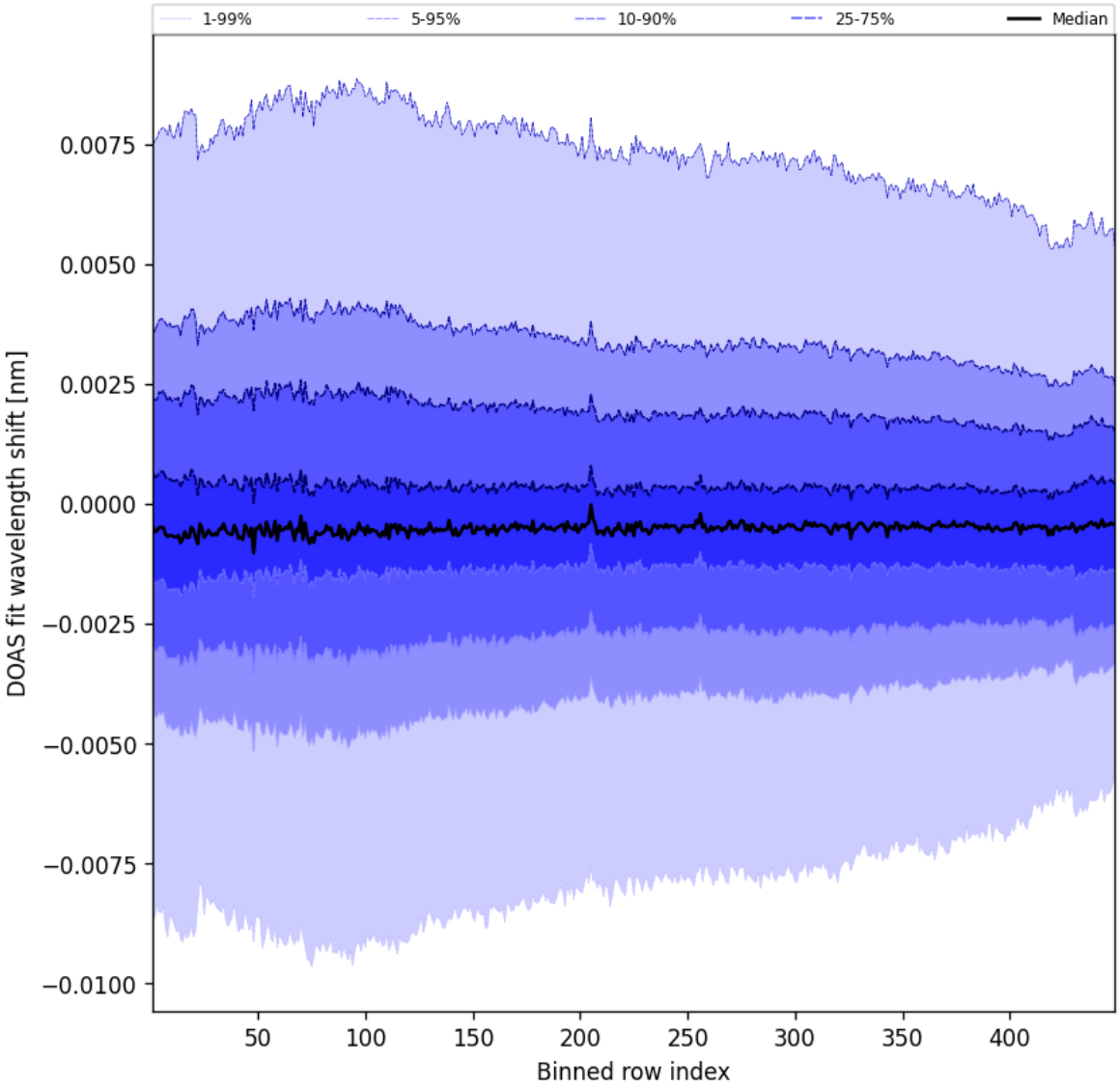


Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2025-01-23 to 2025-01-24

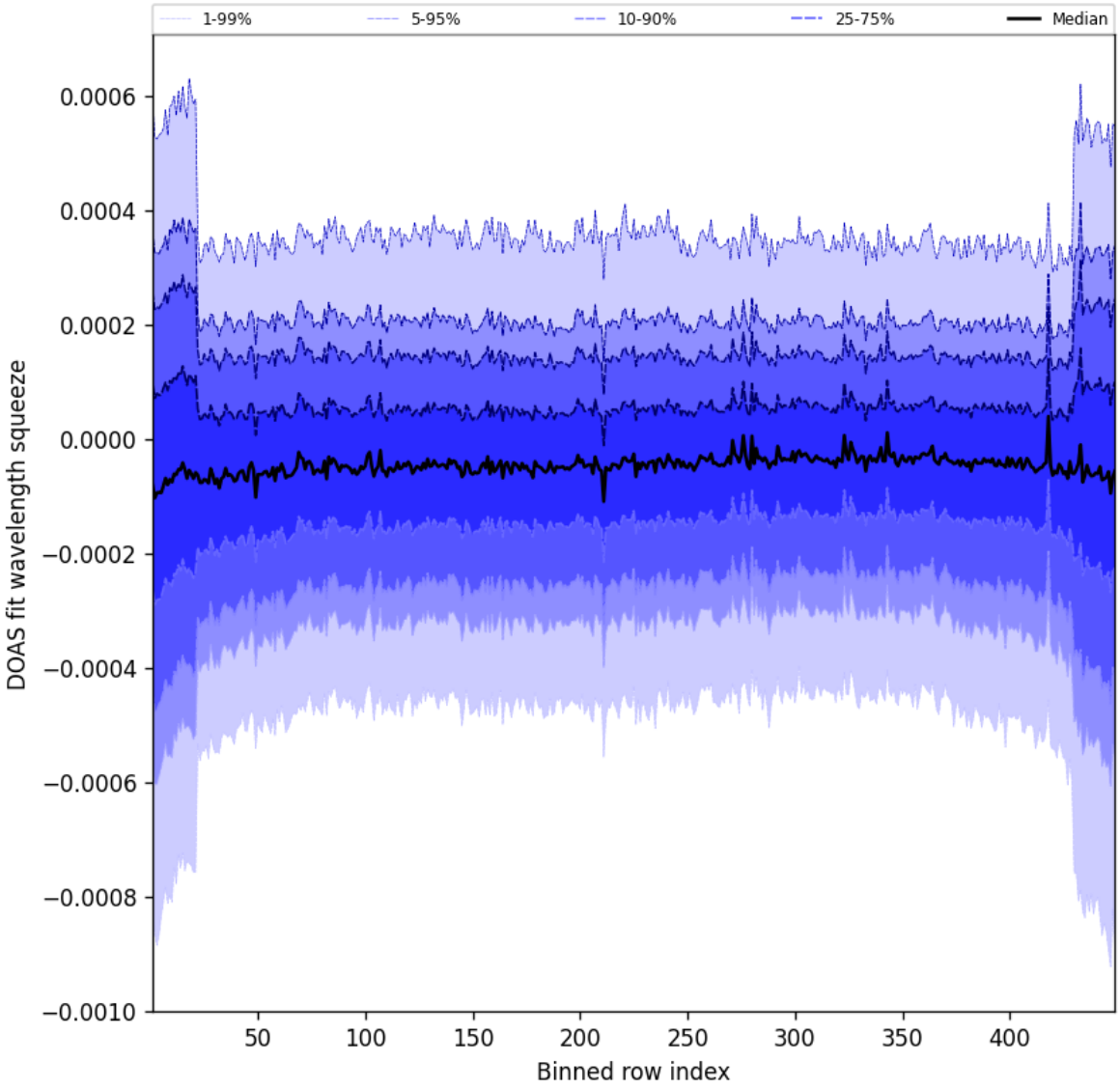


Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2025-01-23 to 2025-01-24

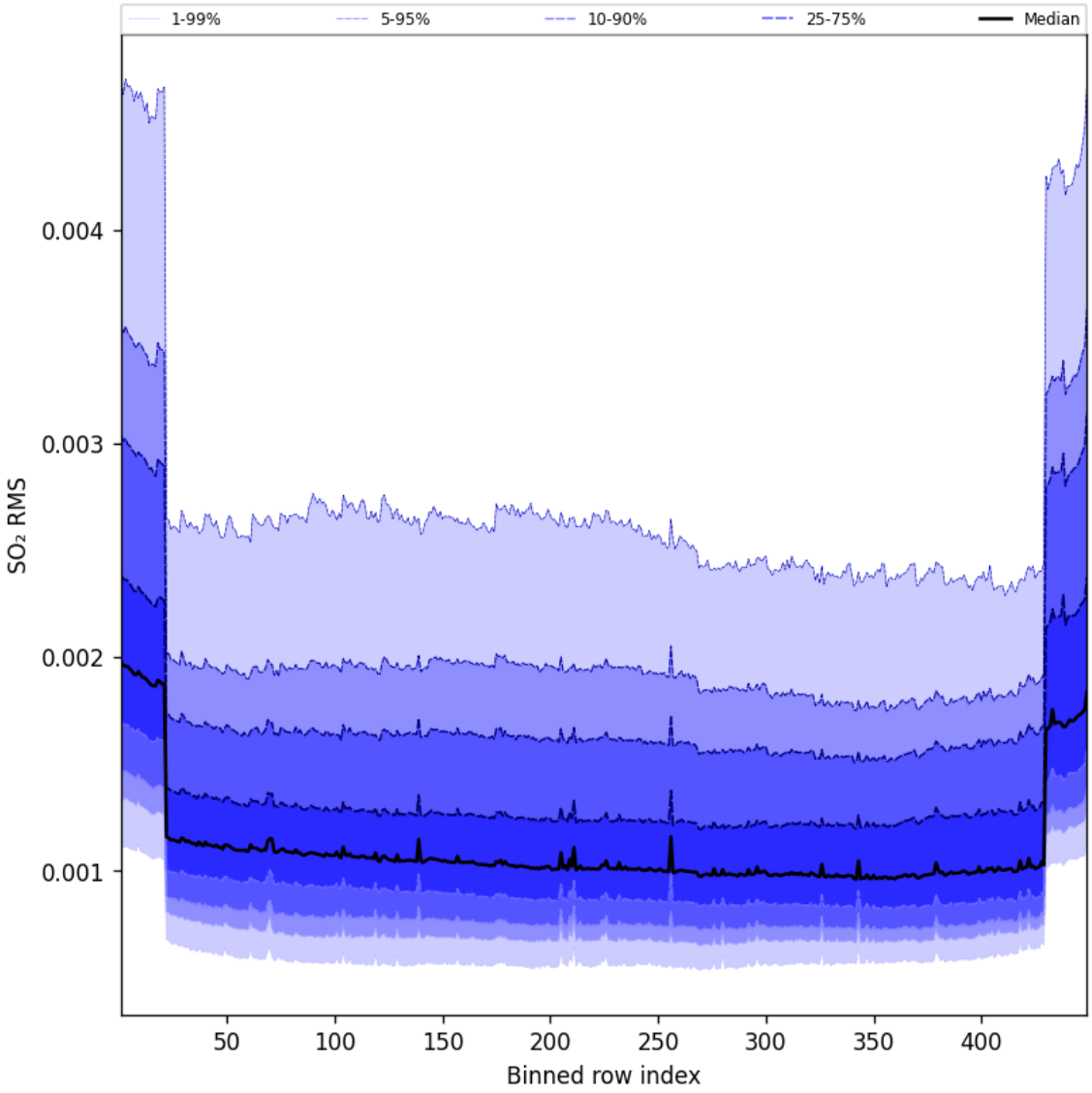


Figure 106: Along track statistics of "SO_2 RMS" for 2025-01-23 to 2025-01-24

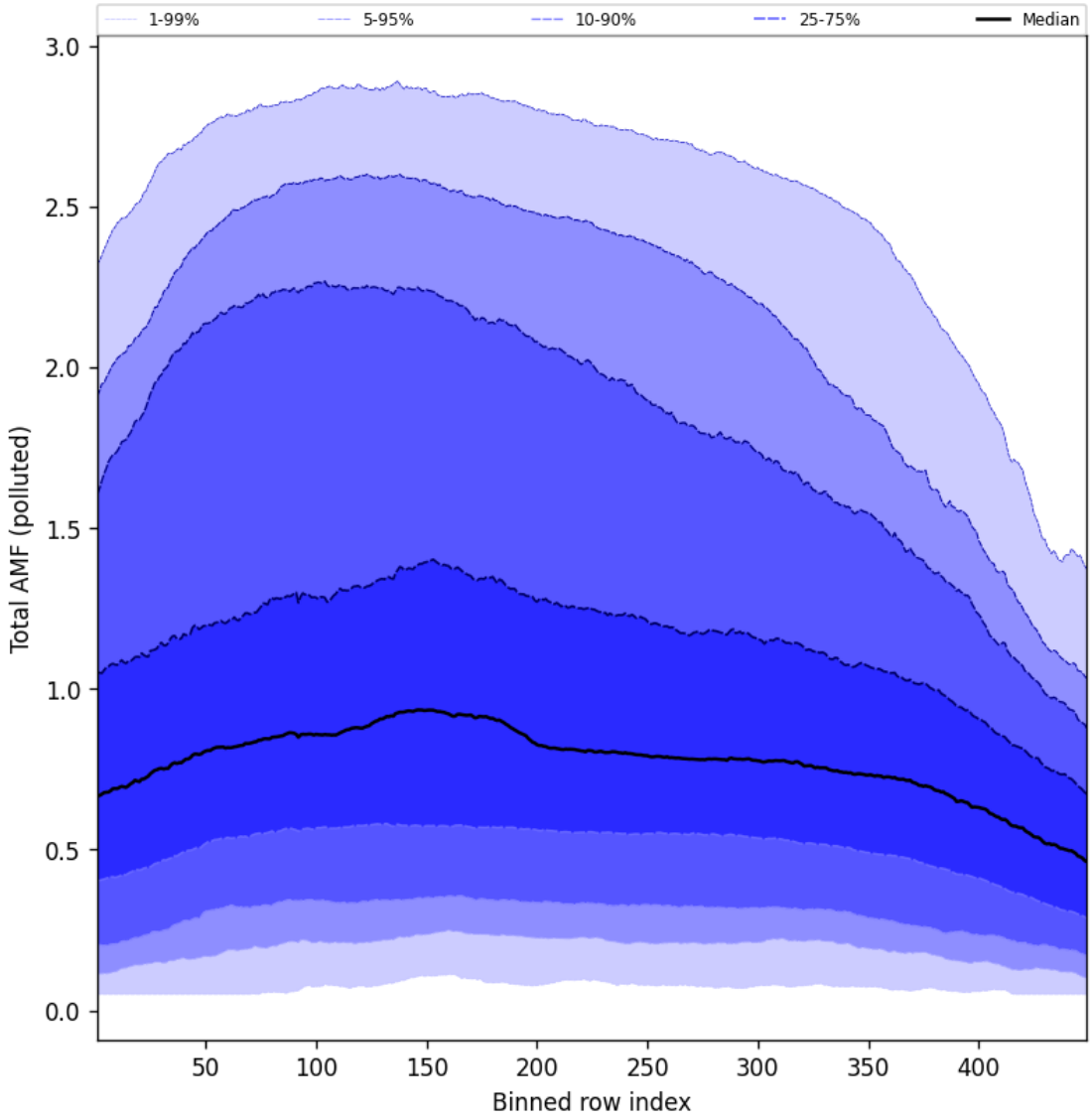
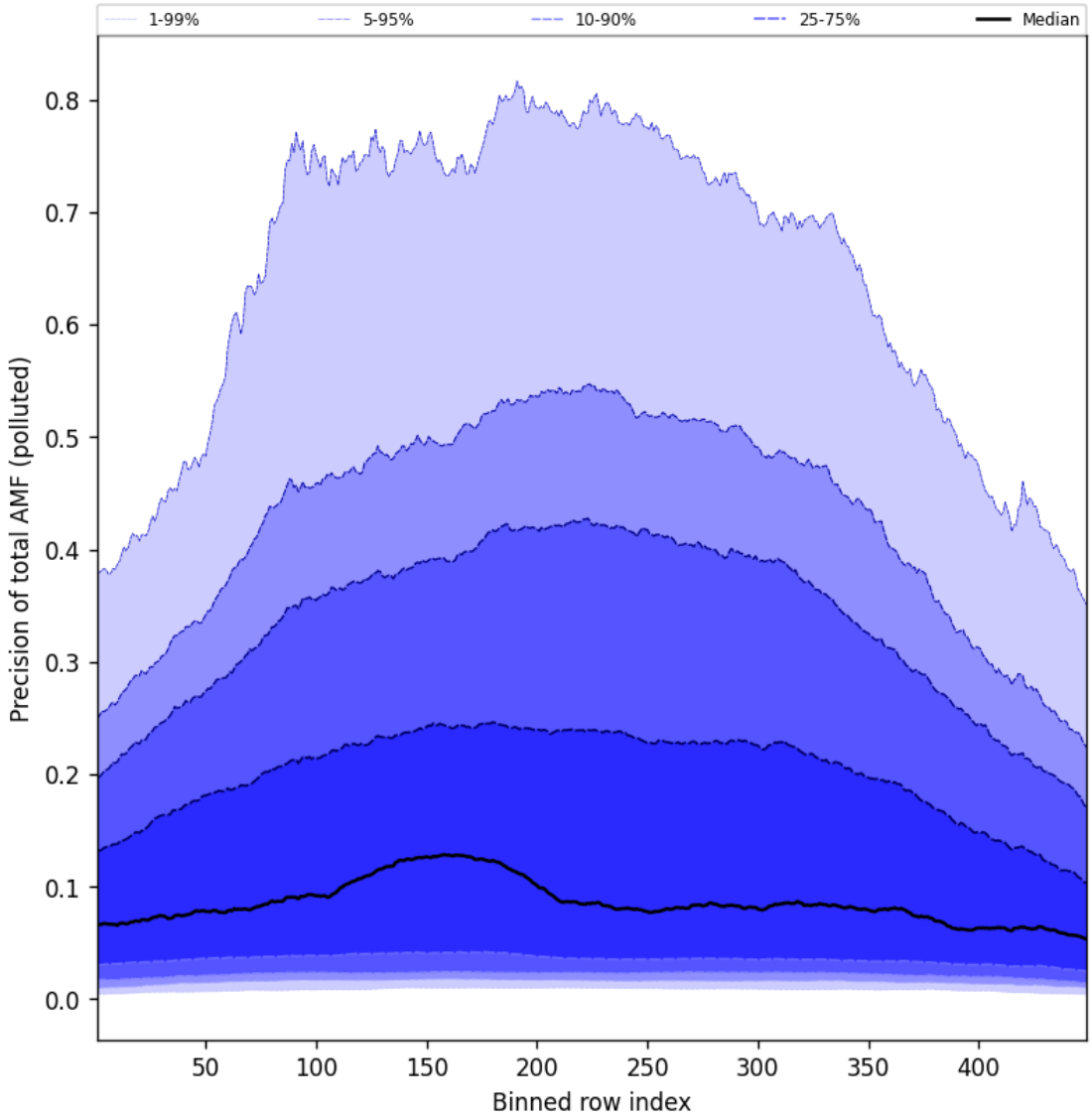


Figure 107: Along track statistics of “Total AMF (polluted)” for 2025-01-23 to 2025-01-24



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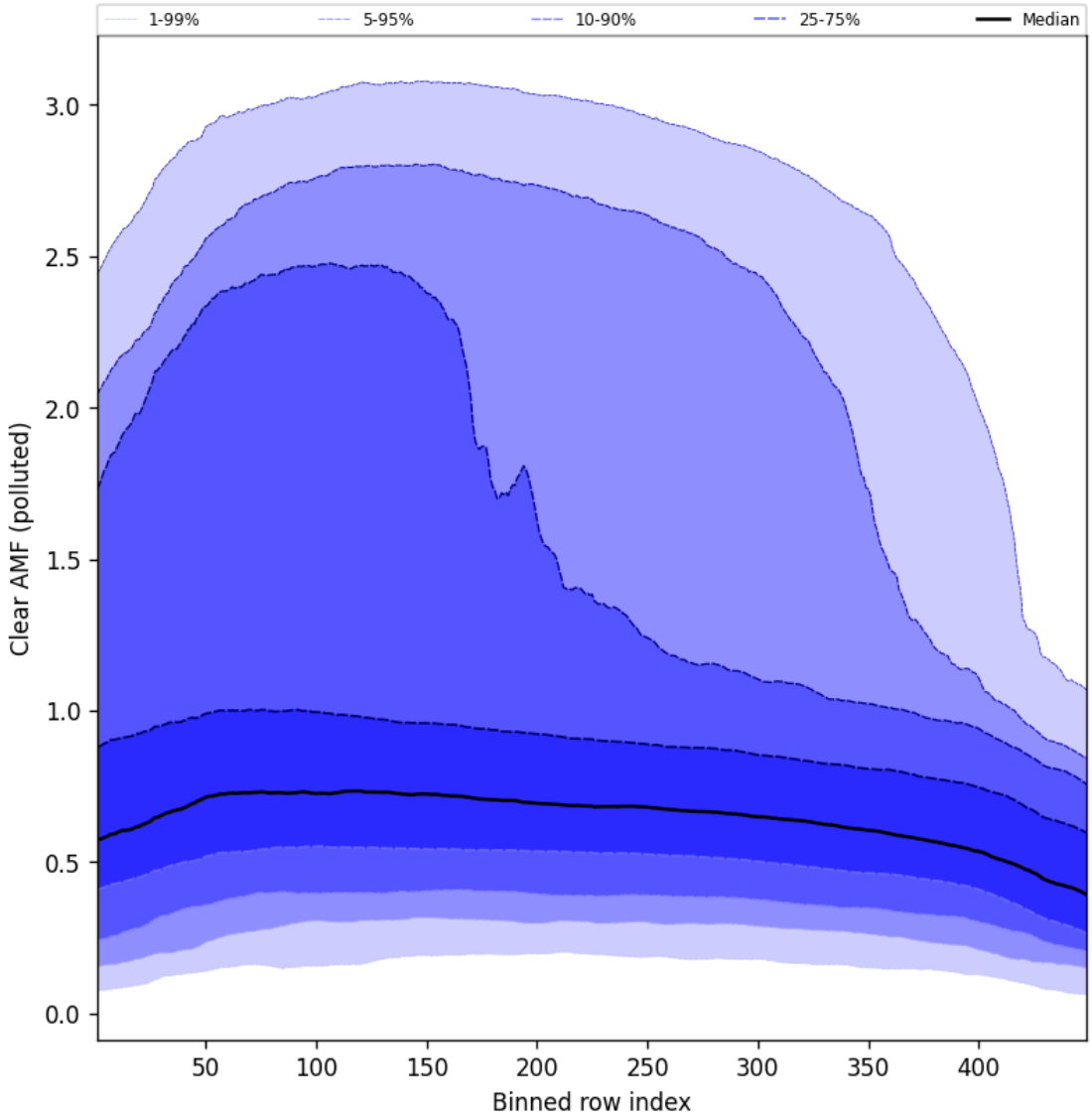

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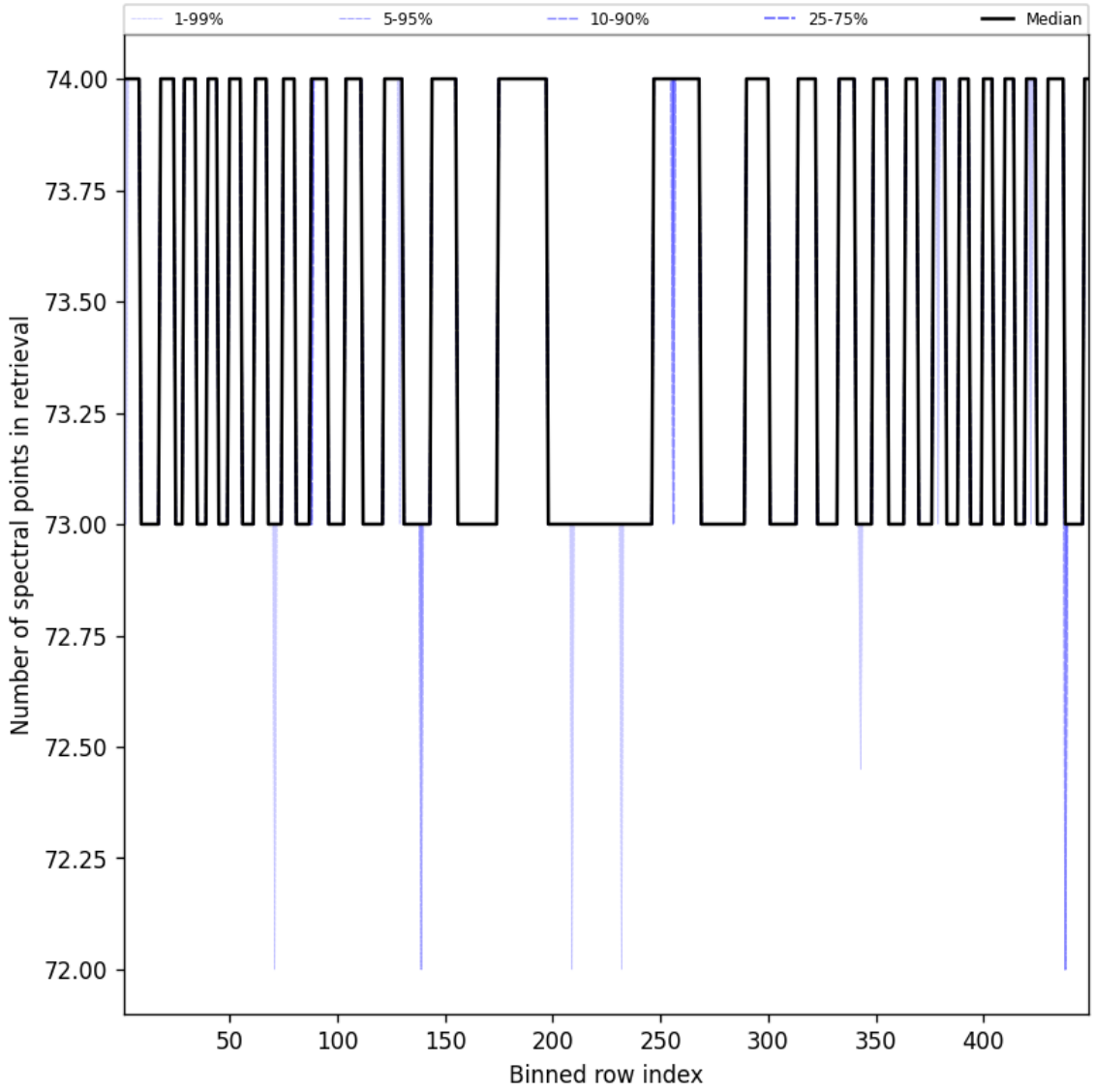

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2025-01-23 to 2025-01-24

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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