PyCAMA report generated by tropl2-proc

tropl2-proc

2024-12-09 (02:16)

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]	0.606 ± 0.419	15033926	0.995	0.830	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.890 \pm 134.017) \times 10^{-2}$	15033926	0.235	0.419	9.408×10^{-3}	-99.2	396
sulfurdioxide total vertical column precision [DU]	0.563 ± 0.968	15033926	0.222	0.334	0.313	4.069×10^{-2}	79.0
sulfurdioxide slant column density corrected [DU]	$(1.724 \pm 34.730) \times 10^{-2}$	15033926	0.235	0.346	8.740×10^{-3}	-9.64	245
sulfurdioxide slant column density cobra [DU]	$(1.718 \pm 33.800) \times 10^{-2}$	15033926	0.235	0.346	8.740×10^{-3}	-9.64	22.4
sulfurdioxide slant column density cobra precision [DU]	0.276 ± 0.118	15033926	0.213	0.109	0.238	8.628×10^{-2}	14.0
sulfurdioxide slant column density window1 [DU]	$(7.152 \pm 64.829) \times 10^{-2}$	15033926	0.125	0.720	7.638×10^{-2}	-213	51.6
sulfurdioxide slant column density window1 precision [DU]	0.276 ± 0.118	15033926	0.213	0.109	0.238	8.628×10^{-2}	14.0
sulfurdioxide slant column density corrected win1 [DU]	$(2.195 \pm 63.068) \times 10^{-2}$	15033926	2.500×10^{-2}	0.692	9.490×10^{-3}	-213	51.6
background so2 slant column offset window1 [DU]	$(-4.957 \pm 15.049) \times 10^{-2}$	15033926	-0.140	0.185	-9.072×10^{-2}	-1.16	3.61
sulfurdioxide slant column density window2 [DU]	1.30 ± 8.64	15033926	0.750	10.9	1.19	-888	573
sulfurdioxide slant column density window2 precision [DU]	7.82 ± 2.22	15033926	6.97	2.61	7.46	2.05	529
sulfurdioxide slant column density corrected win2 [DU]	0.821 ± 8.463	15033926	0.750	10.7	0.804	-887	573
background so2 slant column offset window2 [DU]	-0.480 ± 1.987	15033926	0.750	2.48	-8.772×10^{-2}	-11.8	6.38
sulfurdioxide slant column density window3 [DU]	-5.15 ± 23.34	15033926	-6.16	28.7	-5.45	-1.922×10^{3}	1.547×10^{3}
sulfurdioxide slant column density window3 precision [DU]	27.1 ± 13.1	15033926	21.5	10.6	23.8	9.10	580
sulfurdioxide slant column density corrected win3 [DU]	-2.93 ± 22.61	15033926	-2.80	27.7	-2.87	-1.931×10^{3}	1.542×10^{3}
background so2 slant column offset window3 [DU]	2.21 ± 6.60	15033926	-0.560	9.59	2.12	-27.6	20.8
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	15033926	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(4.201 \pm 10.051) \times 10^{-2}$	15033926	1.664×10^{-2}	2.515×10^{-2}	2.111×10^{-2}	3.361×10^{-4}	2.50
fitted radiance shift [nm]	$(-4.650 \pm 25.244) \times 10^{-4}$	15033926	-5.000×10^{-4}	1.727×10^{-3}	-5.253×10^{-4}	-3.808×10^{-2}	6.046×10^{-2}
fitted radiance squeeze [1]	$(-5.261 \pm 18.372) \times 10^{-5}$	15033926	-3.000×10^{-5}	2.168×10^{-4}	-4.276×10^{-5}	-1.965×10^{-2}	1.275×10^{-2}
fitted root mean square [1]	$(1.217 \pm 0.487) \times 10^{-3}$	15033926	9.750×10^{-4}	4.685×10^{-4}	1.082×10^{-3}	3.186×10^{-4}	6.884×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.922 ± 0.597	15033926	0.620	0.640	0.764	5.000×10^{-2}	3.12
sulfurdioxide total air mass factor polluted precision [1]	0.144 ± 0.153	15033926	3.500×10^{-2}	0.171	8.419×10^{-2}	2.500×10^{-3}	1.71
sulfurdioxide clear air mass factor polluted [1]	0.771 ± 0.494	15033926	0.540	0.386	0.652	3.049×10^{-2}	3.14
number of spectral points in retrieval [1]	73.4 ± 0.5	15033926	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	2.000×10^{-2}	7.000×10^{-2}	0.170	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.89	−0.900	−0.524	−0.344	−0.196	0.223	0.383	0.585	1.02	3.40
sulfurdioxide total vertical column precision [DU]	8.277×10^{-2}	0.107	0.129	0.155	0.197	0.531	0.746	1.06	1.80	4.76
sulfurdioxide slant column density corrected [DU]	−0.800	−0.460	−0.336	−0.252	−0.163	0.183	0.277	0.368	0.510	0.950
sulfurdioxide slant column density cobra [DU]	−0.800	−0.460	−0.336	−0.252	−0.163	0.183	0.277	0.368	0.510	0.950
sulfurdioxide slant column density cobra precision [DU]	0.139	0.164	0.177	0.188	0.201	0.311	0.373	0.428	0.504	0.714
sulfurdioxide slant column density window1 [DU]	−1.62	−0.933	−0.665	−0.482	−0.289	0.432	0.616	0.791	1.05	1.78
sulfurdioxide slant column density window1 precision [DU]	0.139	0.164	0.177	0.188	0.201	0.311	0.373	0.428	0.504	0.714
sulfurdioxide slant column density corrected win1 [DU]	−1.55	−0.919	−0.677	−0.512	−0.334	0.358	0.544	0.723	0.999	1.78
background so2 slant column offset window1 [DU]	−0.312	−0.233	−0.200	−0.174	−0.149	3.626×10^{-2}	0.106	0.167	0.239	0.381
sulfurdioxide slant column density window2 [DU]	−19.2	−12.5	−9.28	−6.89	−4.21	6.65	9.43	12.0	15.5	23.3
sulfurdioxide slant column density window2 precision [DU]	4.19	4.96	5.43	5.83	6.32	8.92	9.82	10.7	11.9	14.5
sulfurdioxide slant column density corrected win2 [DU]	−19.8	−12.9	−9.59	−7.19	−4.52	6.14	8.82	11.2	14.6	21.7
background so2 slant column offset window2 [DU]	−6.62	−4.27	−3.11	−2.33	−1.55	0.931	1.22	1.46	1.86	3.23
sulfurdioxide slant column density window3 [DU]	−64.0	−42.7	−33.3	−26.7	−19.5	9.20	16.9	24.0	33.6	52.6
sulfurdioxide slant column density window3 precision [DU]	13.0	15.0	16.4	17.7	19.5	30.0	34.6	40.1	51.5	82.7
sulfurdioxide slant column density corrected win3 [DU]	−60.9	−40.0	−30.5	−23.8	−16.7	11.1	18.2	24.8	33.9	52.6
background so2 slant column offset window3 [DU]	−12.2	−8.73	−6.47	−4.68	−2.40	7.19	9.39	11.1	12.8	15.2
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]	1.403×10^{-3}	3.922×10^{-3}	6.294×10^{-3}	8.791×10^{-3}	1.203×10^{-2}	3.718×10^{-2}	5.083×10^{-2}	7.273×10^{-2}	0.132	0.417
fitted radiance shift [nm]	-8.061×10^{-3}	-4.088×10^{-3}	-2.710×10^{-3}	-1.973×10^{-3}	-1.381×10^{-3}	3.463×10^{-4}	1.043×10^{-3}	1.922×10^{-3}	3.459×10^{-3}	7.636×10^{-3}
fitted radiance squeeze [1]	-5.558×10^{-4}	-3.613×10^{-4}	-2.772×10^{-4}	-2.184×10^{-4}	-1.562×10^{-4}	6.054×10^{-5}	1.113×10^{-4}	1.577×10^{-4}	2.230×10^{-4}	3.777×10^{-4}
fitted root mean square [1]	5.787×10^{-4}	7.078×10^{-4}	7.830×10^{-4}	8.407×10^{-4}	9.099×10^{-4}	1.378×10^{-3}	1.619×10^{-3}	1.846×10^{-3}	2.157×10^{-3}	2.999×10^{-3}
sulfurdioxide total air mass factor polluted [1]	6.664×10^{-2}	0.200	0.312	0.409	0.516	1.16	1.51	1.89	2.27	2.60
sulfurdioxide total air mass factor polluted precision [1]	8.662×10^{-3}	1.646×10^{-2}	2.289×10^{-2}	2.843×10^{-2}	3.628×10^{-2}	0.207	0.277	0.345	0.445	0.706
sulfurdioxide clear air mass factor polluted [1]	0.162	0.281	0.356	0.417	0.486	0.872	1.02	1.21	2.04	2.69
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]	0.720 ± 0.387	5409302	0.650	1.000	0.0	1.000	0.350	1.000
sulfurdioxide total vertical column [DU]	$(7.412 \pm 192.950) \times 10^{-2}$	5409302	0.616	1.907×10^{-2}	-89.2	224	-0.281	0.336
sulfurdioxide total vertical column precision [DU]	0.877 ± 1.377	5409302	0.585	0.432	5.219×10^{-2}	37.3	0.276	0.861
sulfurdioxide slant column density corrected [DU]	$(2.783 \pm 40.973) \times 10^{-2}$	5409302	0.402	1.405×10^{-2}	-6.89	126	-0.185	0.217
sulfurdioxide slant column density cobra [DU]	$(2.775 \pm 40.365) \times 10^{-2}$	5409302	0.402	1.405×10^{-2}	-6.89	12.8	-0.185	0.217
sulfurdioxide slant column density cobra precision [DU]	0.322 ± 0.139	5409302	0.165	0.280	9.265×10^{-2}	7.14	0.224	0.389
sulfurdioxide slant column density window1 [DU]	0.148 ± 0.740	5409302	0.804	0.146	-12.4	33.1	-0.256	0.549
sulfurdioxide slant column density window1 precision [DU]	0.322 ± 0.139	5409302	0.165	0.280	9.265×10^{-2}	7.14	0.224	0.389
sulfurdioxide slant column density corrected win1 [DU]	$(5.112 \pm 73.781) \times 10^{-2}$	5409302	0.799	2.693×10^{-2}	-12.4	33.0	-0.365	0.434
background so2 slant column offset window1 [DU]	$(-9.736 \pm 12.364) \times 10^{-2}$	5409302	0.106	-0.110	-1.16	3.61	-0.164	-5.878×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.69 ± 9.82	5409302	12.4	1.38	-854	195	-4.69	7.74
sulfurdioxide slant column density window2 precision [DU]	8.85 ± 2.30	5409302	2.92	8.56	2.54	273	7.25	10.2
sulfurdioxide slant column density corrected win2 [DU]	0.858 ± 9.551	5409302	12.1	0.832	-856	196	-5.22	6.92
background so2 slant column offset window2 [DU]	-0.827 ± 2.396	5409302	2.93	2.577×10^{-2}	-11.8	6.38	-2.10	0.835
sulfurdioxide slant column density window3 [DU]	-6.72 ± 26.33	5409302	33.2	-6.10	-215	176	-22.9	10.2
sulfurdioxide slant column density window3 precision [DU]	30.4 ± 12.7	5409302	10.2	27.5	9.39	232	23.2	33.5
sulfurdioxide slant column density corrected win3 [DU]	-3.17 ± 25.85	5409302	32.6	-2.89	-206	182	-19.3	13.3
background so2 slant column offset window3 [DU]	3.54 ± 5.36	5409302	8.31	2.50	-24.1	20.5	-0.515	7.79
sulfurdioxide slant column cobra flag [1]	1.96 ± 0.26	5409302	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(7.654 \pm 15.785) \times 10^{-2}$	5409302	5.236×10^{-2}	3.193×10^{-2}	1.149×10^{-3}	2.50	1.768×10^{-2}	7.004×10^{-2}
fitted radiance shift [nm]	$(-2.626 \pm 25.433) \times 10^{-4}$	5409302	1.681×10^{-3}	-3.043×10^{-4}	-3.556×10^{-2}	3.434×10^{-2}	-1.131×10^{-3}	5.505×10^{-4}
fitted radiance squeeze [1]	$(-8.257 \pm 186.220) \times 10^{-6}$	5409302	2.166×10^{-4}	-7.024×10^{-6}	-4.927×10^{-3}	1.275×10^{-2}	-1.155×10^{-4}	1.010×10^{-4}
fitted root mean square [1]	$(1.397 \pm 0.576) \times 10^{-3}$	5409302	6.585×10^{-4}	1.232×10^{-3}	3.297×10^{-4}	2.714×10^{-2}	1.004×10^{-3}	1.662×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.688 ± 0.368	5409302	0.476	0.664	5.000×10^{-2}	2.68	0.417	0.893
sulfurdioxide total air mass factor polluted precision [1]	$(8.732 \pm 11.075) \times 10^{-2}$	5409302	7.667×10^{-2}	4.687×10^{-2}	2.500×10^{-3}	1.71	2.894×10^{-2}	0.106
sulfurdioxide clear air mass factor polluted [1]	0.628 ± 0.265	5409302	0.402	0.635	3.049×10^{-2}	1.82	0.418	0.819
number of spectral points in retrieval [1]	73.5 ± 0.5	5409302	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]	0.542 ± 0.423	9624624	0.890	0.460	0.0	1.000	0.110	1.000
sulfurdioxide total vertical column [DU]	$(1.911 \pm 84.379) \times 10^{-2}$	9624624	0.346	6.253×10^{-3}	-99.2	396	-0.165	0.181
sulfurdioxide total vertical column precision [DU]	0.386 ± 0.557	9624624	0.255	0.264	4.069×10^{-2}	79.0	0.165	0.420
sulfurdioxide slant column density corrected [DU]	$(1.129 \pm 30.652) \times 10^{-2}$	9624624	0.320	6.328×10^{-3}	-9.64	245	-0.153	0.168
sulfurdioxide slant column density cobra [DU]	$(1.125 \pm 29.460) \times 10^{-2}$	9624624	0.320	6.328×10^{-3}	-9.64	22.4	-0.153	0.168
sulfurdioxide slant column density cobra precision [DU]	0.249 ± 0.096	9624624	7.737×10^{-2}	0.224	8.628×10^{-2}	14.0	0.194	0.271
sulfurdioxide slant column density window1 [DU]	$(2.827 \pm 58.641) \times 10^{-2}$	9624624	0.677	4.311×10^{-2}	-213	51.6	-0.304	0.373
sulfurdioxide slant column density window1 precision [DU]	0.249 ± 0.096	9624624	7.737×10^{-2}	0.224	8.628×10^{-2}	14.0	0.194	0.271
sulfurdioxide slant column density corrected win1 [DU]	$(5.558 \pm 560.900) \times 10^{-3}$	9624624	0.642	1.529×10^{-3}	-213	51.6	-0.319	0.323
background so2 slant column offset window1 [DU]	$(-2.271 \pm 15.741) \times 10^{-2}$	9624624	0.226	-6.335×10^{-2}	-0.766	1.94	-0.142	8.379×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.09 ± 7.90	9624624	10.1	1.09	-888	573	-3.97	6.15
sulfurdioxide slant column density window2 precision [DU]	7.24 ± 1.95	9624624	2.13	6.98	2.05	529	6.00	8.13
sulfurdioxide slant column density corrected win2 [DU]	0.801 ± 7.784	9624624	9.94	0.791	-887	573	-4.18	5.76
background so2 slant column offset window2 [DU]	-0.286 ± 1.683	9624624	2.39	-0.153	-8.19	6.38	-1.39	0.999
sulfurdioxide slant column density window3 [DU]	-4.26 ± 21.42	9624624	26.7	-5.16	-1.922×10^3	1.547×10^3	-18.0	8.66
sulfurdioxide slant column density window3 precision [DU]	25.2 ± 13.0	9624624	8.55	21.8	9.10	580	18.2	26.8
sulfurdioxide slant column density corrected win3 [DU]	-2.80 ± 20.56	9624624	25.5	-2.86	-1.931×10^3	1.542×10^3	-15.5	9.96
background so2 slant column offset window3 [DU]	1.47 ± 7.09	9624624	11.2	1.81	-27.6	20.8	-4.31	6.86
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.18	9624624	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.261 \pm 2.701) \times 10^{-2}$	9624624	1.950×10^{-2}	1.716×10^{-2}	3.361×10^{-4}	1.61	9.653×10^{-3}	2.916×10^{-2}
fitted radiance shift [nm]	$(-5.788 \pm 25.066) \times 10^{-4}$	9624624	1.694×10^{-3}	-6.538×10^{-4}	-3.808×10^{-2}	6.046×10^{-2}	-1.486×10^{-3}	2.080×10^{-4}
fitted radiance squeeze [1]	$(-7.754 \pm 17.749) \times 10^{-5}$	9624624	2.156×10^{-4}	-6.241×10^{-5}	-1.965×10^{-2}	1.274×10^{-2}	-1.778×10^{-4}	3.780×10^{-5}
fitted root mean square [1]	$(1.115 \pm 0.395) \times 10^{-3}$	9624624	3.610×10^{-4}	1.022×10^{-3}	3.186×10^{-4}	6.884×10^{-2}	8.753×10^{-4}	1.236×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.05 ± 0.66	9624624	0.868	0.846	5.000×10^{-2}	3.12	0.566	1.43
sulfurdioxide total air mass factor polluted precision [1]	0.176 ± 0.164	9624624	0.213	0.130	4.529×10^{-3}	1.66	4.385×10^{-2}	0.257
sulfurdioxide clear air mass factor polluted [1]	0.851 ± 0.568	9624624	0.416	0.661	0.102	3.14	0.509	0.925
number of spectral points in retrieval [1]	73.4 ± 0.5	9624624	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]	0.649 ± 0.409	10520165	0.780	1.000	0.0	1.000	0.220	1.000
sulfurdioxide total vertical column [DU]	$(2.336 \pm 101.973) \times 10^{-2}$	10520165	0.430	9.061×10^{-3}	-99.2	396	-0.204	0.226
sulfurdioxide total vertical column precision [DU]	0.492 ± 0.721	10520165	0.288	0.318	4.803×10^{-2}	79.0	0.215	0.503
sulfurdioxide slant column density corrected [DU]	$(1.252 \pm 30.554) \times 10^{-2}$	10520165	0.327	7.531×10^{-3}	-6.89	245	-0.155	0.172
sulfurdioxide slant column density cobra [DU]	$(1.249 \pm 29.524) \times 10^{-2}$	10520165	0.327	7.531×10^{-3}	-6.89	15.8	-0.155	0.172
sulfurdioxide slant column density cobra precision [DU]	0.258 ± 0.103	10520165	8.387×10^{-2}	0.227	8.628×10^{-2}	14.0	0.196	0.280
sulfurdioxide slant column density window1 [DU]	$(9.301 \pm 58.219) \times 10^{-2}$	10520165	0.673	9.582×10^{-2}	-21.6	51.6	-0.243	0.430
sulfurdioxide slant column density window1 precision [DU]	0.258 ± 0.103	10520165	8.387×10^{-2}	0.227	8.628×10^{-2}	14.0	0.196	0.280
sulfurdioxide slant column density corrected win1 [DU]	$(2.067 \pm 57.199) \times 10^{-2}$	10520165	0.655	1.351×10^{-2}	-21.6	51.6	-0.313	0.342
background so2 slant column offset window1 [DU]	$(-7.234 \pm 12.346) \times 10^{-2}$	10520165	0.153	-9.770×10^{-2}	-1.16	3.61	-0.151	1.670×10^{-3}
sulfurdioxide slant column density window2 [DU]	0.921 ± 8.331	10520165	10.6	0.837	-888	573	-4.42	6.13
sulfurdioxide slant column density window2 precision [DU]	7.62 ± 2.05	10520165	2.43	7.31	2.22	529	6.23	8.65
sulfurdioxide slant column density corrected win2 [DU]	0.661 ± 8.215	10520165	10.4	0.652	-887	573	-4.57	5.87
background so2 slant column offset window2 [DU]	-0.260 ± 1.804	10520165	2.20	9.024×10^{-2}	-11.8	6.38	-1.22	0.975
sulfurdioxide slant column density window3 [DU]	-2.17 ± 22.76	10520165	28.5	-2.75	-236	158	-16.6	11.9
sulfurdioxide slant column density window3 precision [DU]	26.7 ± 12.5	10520165	9.72	23.6	9.10	223	19.7	29.4
sulfurdioxide slant column density corrected win3 [DU]	-0.977 ± 21.915	10520165	27.5	-1.35	-227	159	-14.8	12.6
background so2 slant column offset window3 [DU]	1.20 ± 5.88	10520165	8.22	1.29	-27.6	20.5	-2.73	5.49
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.13	10520165	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(3.035 \pm 4.326) \times 10^{-2}$	10520165	2.101×10^{-2}	2.098×10^{-2}	1.663×10^{-3}	2.50	1.289×10^{-2}	3.389×10^{-2}
fitted radiance shift [nm]	$(-3.952 \pm 24.826) \times 10^{-4}$	10520165	1.793×10^{-3}	-4.254×10^{-4}	-3.438×10^{-2}	6.046×10^{-2}	-1.322×10^{-3}	4.714×10^{-4}
fitted radiance squeeze [1]	$(-3.769 \pm 16.406) \times 10^{-5}$	10520165	1.958×10^{-4}	-3.129×10^{-5}	-1.867×10^{-2}	1.259×10^{-2}	-1.321×10^{-4}	6.378×10^{-5}
fitted root mean square [1]	$(1.138 \pm 0.428) \times 10^{-3}$	10520165	3.674×10^{-4}	1.030×10^{-3}	3.186×10^{-4}	3.911×10^{-2}	8.822×10^{-4}	1.250×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.819 ± 0.441	10520165	0.501	0.739	5.000×10^{-2}	2.76	0.524	1.02
sulfurdioxide total air mass factor polluted precision [1]	0.133 ± 0.136	10520165	0.154	7.364×10^{-2}	3.650×10^{-3}	1.66	3.726×10^{-2}	0.192
sulfurdioxide clear air mass factor polluted [1]	0.661 ± 0.236	10520165	0.314	0.630	5.569×10^{-2}	2.82	0.491	0.806
number of spectral points in retrieval [1]	73.4 ± 0.5	10520165	1.000	73.0	71.0	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]	0.494 ± 0.425	3981978	0.920	0.380	0.0	1.000	8.000×10^{-2}	1.000
sulfurdioxide total vertical column [DU]	$(6.936 \pm 172.321) \times 10^{-2}$	3981978	0.368	9.465×10^{-3}	-89.2	224	-0.168	0.200
sulfurdioxide total vertical column precision [DU]	0.657 ± 1.238	3981978	0.462	0.278	4.069×10^{-2}	37.3	0.140	0.602
sulfurdioxide slant column density corrected [DU]	$(2.777 \pm 42.768) \times 10^{-2}$	3981978	0.401	1.200×10^{-2}	-7.28	126	-0.186	0.215
sulfurdioxide slant column density cobra [DU]	$(2.768 \pm 41.997) \times 10^{-2}$	3981978	0.401	1.200×10^{-2}	-7.28	22.4	-0.186	0.215
sulfurdioxide slant column density cobra precision [DU]	0.317 ± 0.138	3981978	0.143	0.280	8.833×10^{-2}	9.17	0.226	0.369
sulfurdioxide slant column density window1 [DU]	$(7.305 \pm 779.683) \times 10^{-3}$	3981978	0.857	5.058×10^{-3}	-213	48.8	-0.430	0.427
sulfurdioxide slant column density window1 precision [DU]	0.317 ± 0.138	3981978	0.143	0.280	8.833×10^{-2}	9.17	0.226	0.369
sulfurdioxide slant column density corrected win1 [DU]	$(2.083 \pm 74.888) \times 10^{-2}$	3981978	0.797	-5.300×10^{-3}	-213	48.9	-0.396	0.400
background so2 slant column offset window1 [DU]	$(1.352 \pm 19.227) \times 10^{-2}$	3981978	0.315	-5.182×10^{-2}	-1.16	2.76	-0.139	0.176
sulfurdioxide slant column density window2 [DU]	2.25 ± 9.20	3981978	11.5	2.16	-854	507	-3.55	7.92
sulfurdioxide slant column density window2 precision [DU]	8.25 ± 2.48	3981978	2.98	7.83	2.42	374	6.54	9.52
sulfurdioxide slant column density corrected win2 [DU]	1.25 ± 8.95	3981978	11.1	1.24	-856	508	-4.31	6.80
background so2 slant column offset window2 [DU]	-1.00 ± 2.23	3981978	3.22	-0.715	-11.8	6.38	-2.44	0.777
sulfurdioxide slant column density window3 [DU]	-12.2 ± 23.0	3981978	27.4	-11.9	-1.922×10^{3}	1.547×10^{3}	-25.7	1.68
sulfurdioxide slant column density window3 precision [DU]	27.4 ± 14.4	3981978	12.2	23.9	9.39	580	18.7	30.9
sulfurdioxide slant column density corrected win3 [DU]	-7.40 ± 23.35	3981978	28.0	-6.35	-1.931×10^{3}	1.542×10^{3}	-20.8	7.15
background so2 slant column offset window3 [DU]	4.85 ± 7.57	3981978	12.4	6.75	-27.6	20.8	-1.22	11.2
sulfurdioxide slant column cobra flag [1]	1.94 ± 0.33	3981978	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(6.063 \pm 14.233) \times 10^{-2}$	3981978	4.381×10^{-2}	2.022×10^{-2}	3.361×10^{-4}	2.48	7.927×10^{-3}	5.173×10^{-2}
fitted radiance shift [nm]	$(-6.665 \pm 25.624) \times 10^{-4}$	3981978	1.449×10^{-3}	-7.821×10^{-4}	-3.808×10^{-2}	5.989×10^{-2}	-1.477×10^{-3}	-2.775×10^{-5}
fitted radiance squeeze [1]	$(-9.676 \pm 22.025) \times 10^{-5}$	3981978	2.755×10^{-4}	-9.049×10^{-5}	-1.965×10^{-2}	1.275×10^{-2}	-2.326×10^{-4}	4.294×10^{-5}
fitted root mean square [1]	$(1.402 \pm 0.553) \times 10^{-3}$	3981978	6.240×10^{-4}	1.272×10^{-3}	3.438×10^{-4}	6.884×10^{-2}	1.029×10^{-3}	1.653×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.22 ± 0.82	3981978	1.53	0.959	5.000×10^{-2}	3.12	0.518	2.04
sulfurdioxide total air mass factor polluted precision [1]	0.179 ± 0.190	3981978	0.215	0.126	2.500×10^{-3}	1.71	3.465×10^{-2}	0.249
sulfurdioxide clear air mass factor polluted [1]	1.09 ± 0.79	3981978	1.05	0.803	3.049×10^{-2}	3.14	0.487	1.54
number of spectral points in retrieval [1]	73.4 ± 0.5	3981978	1.000	73.0	52.0	74.0	73.0	74.0

3 Granule outlines

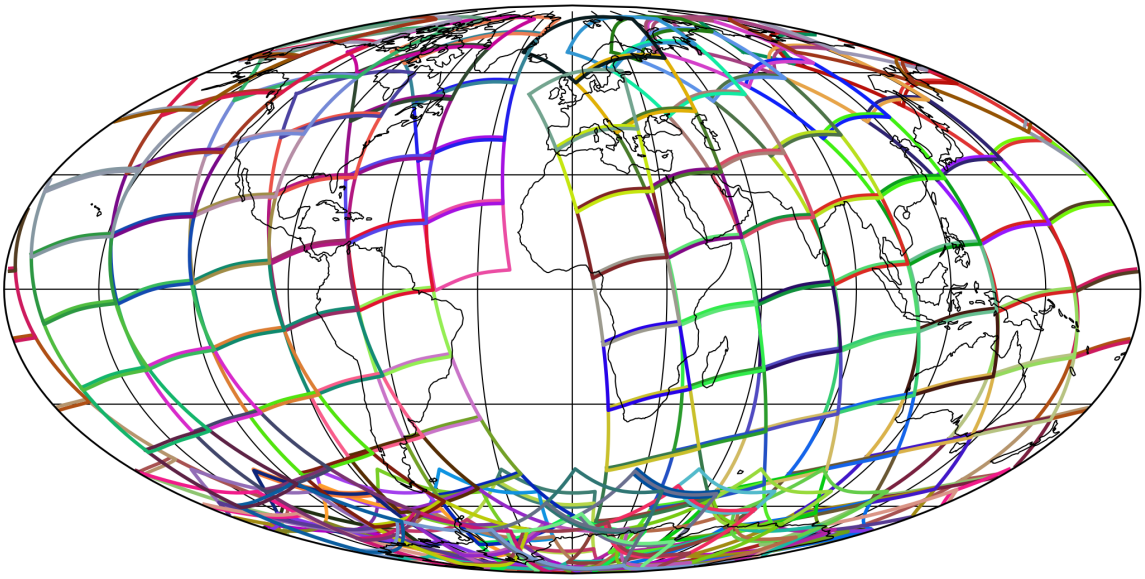

Figure 1: Outline of the granules.

4 Input data monitoring

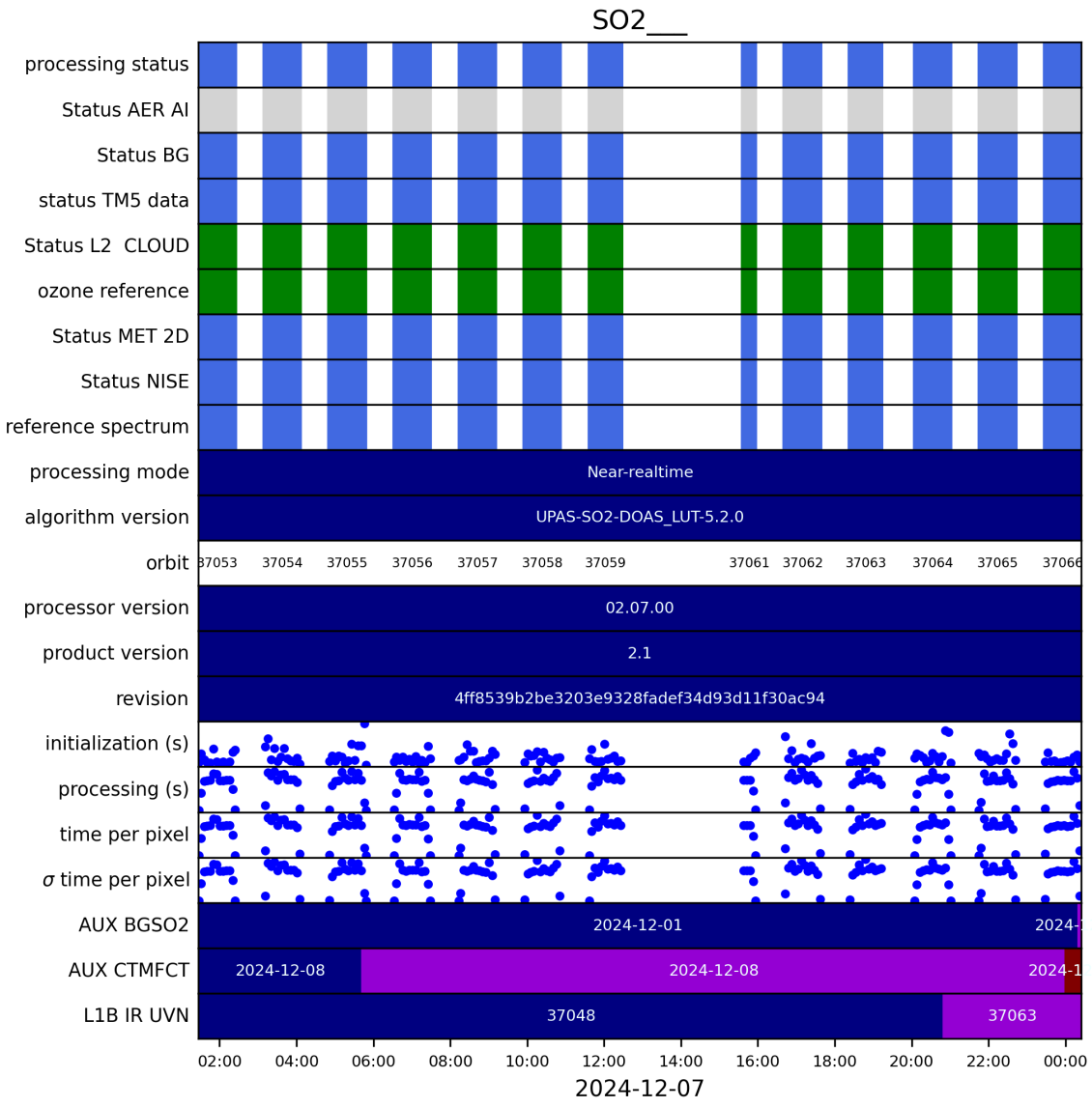

Figure 2: Input data per granule

5 Warnings and errors

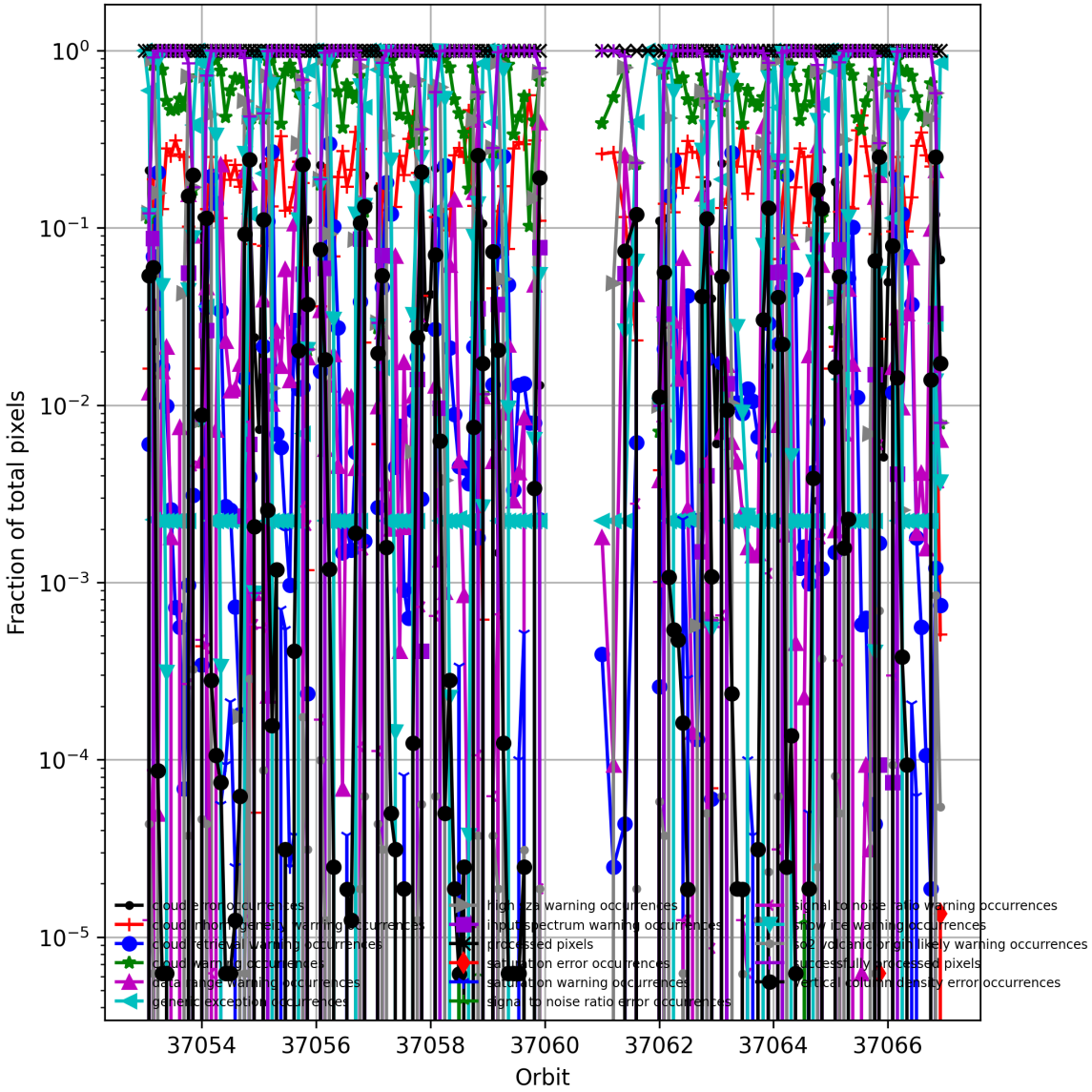

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

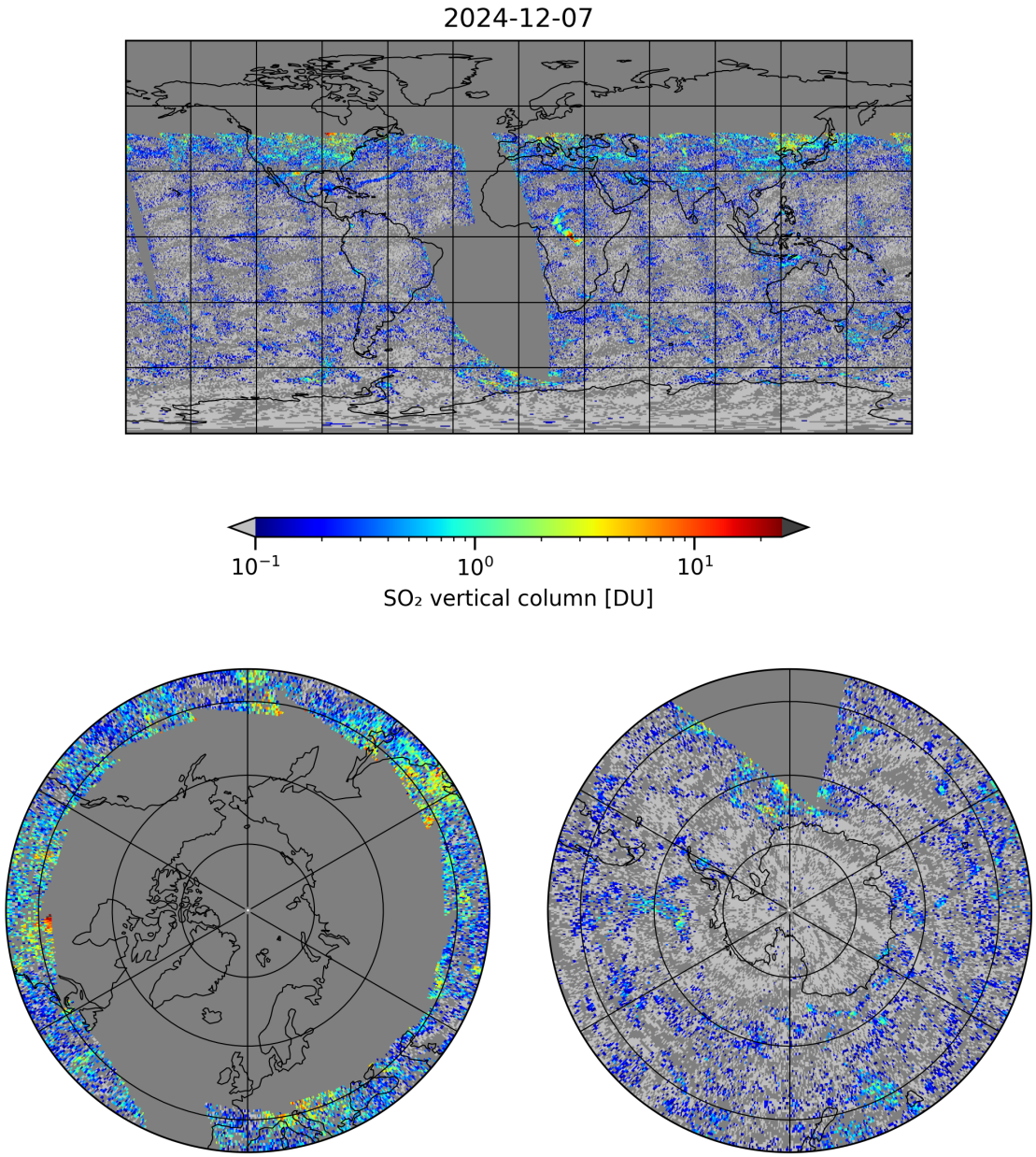

Figure 4: Map of "SO_2 vertical column" for 2024-12-07 to 2024-12-08

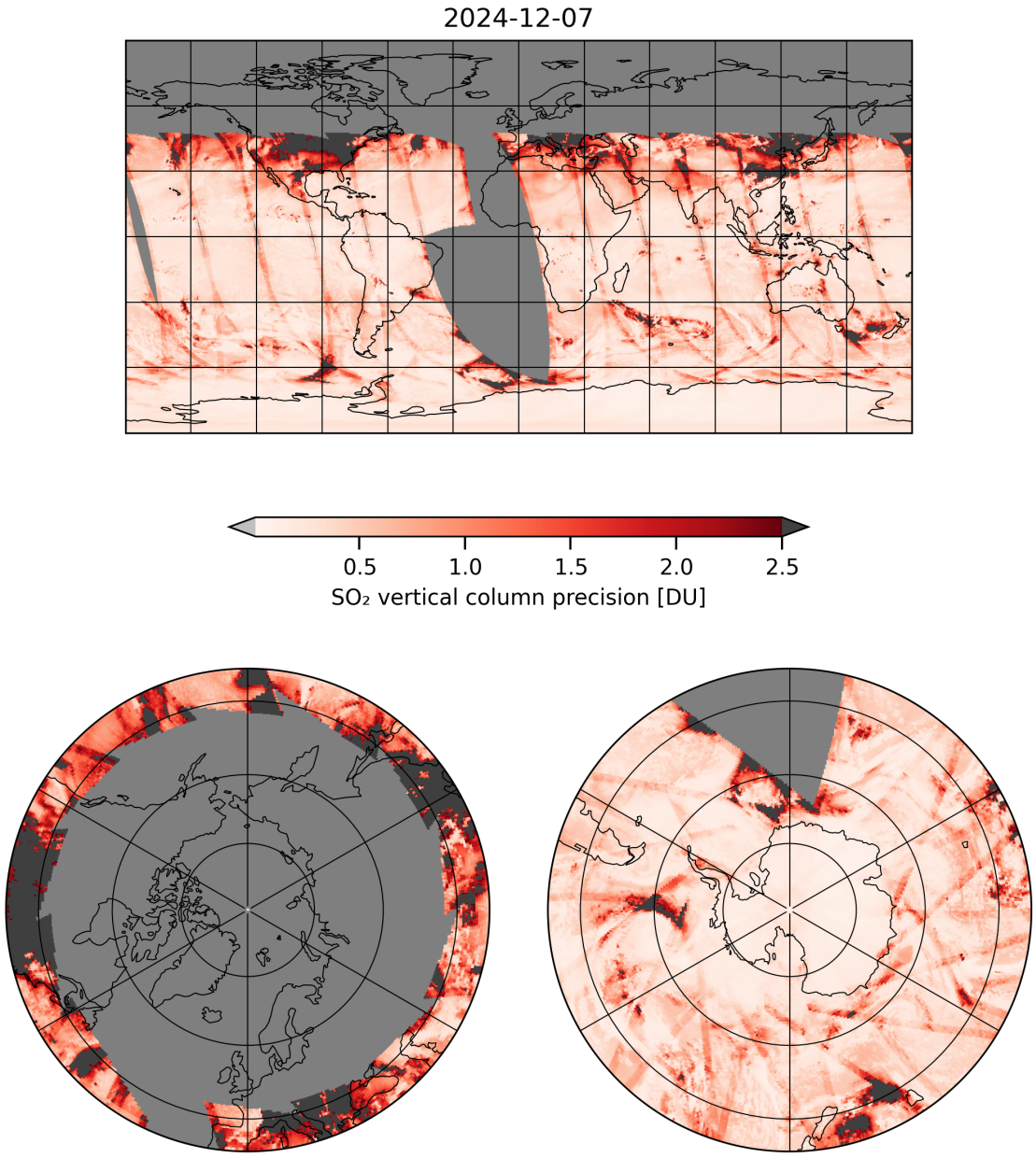

Figure 5: Map of "SO_2 vertical column precision" for 2024-12-07 to 2024-12-08

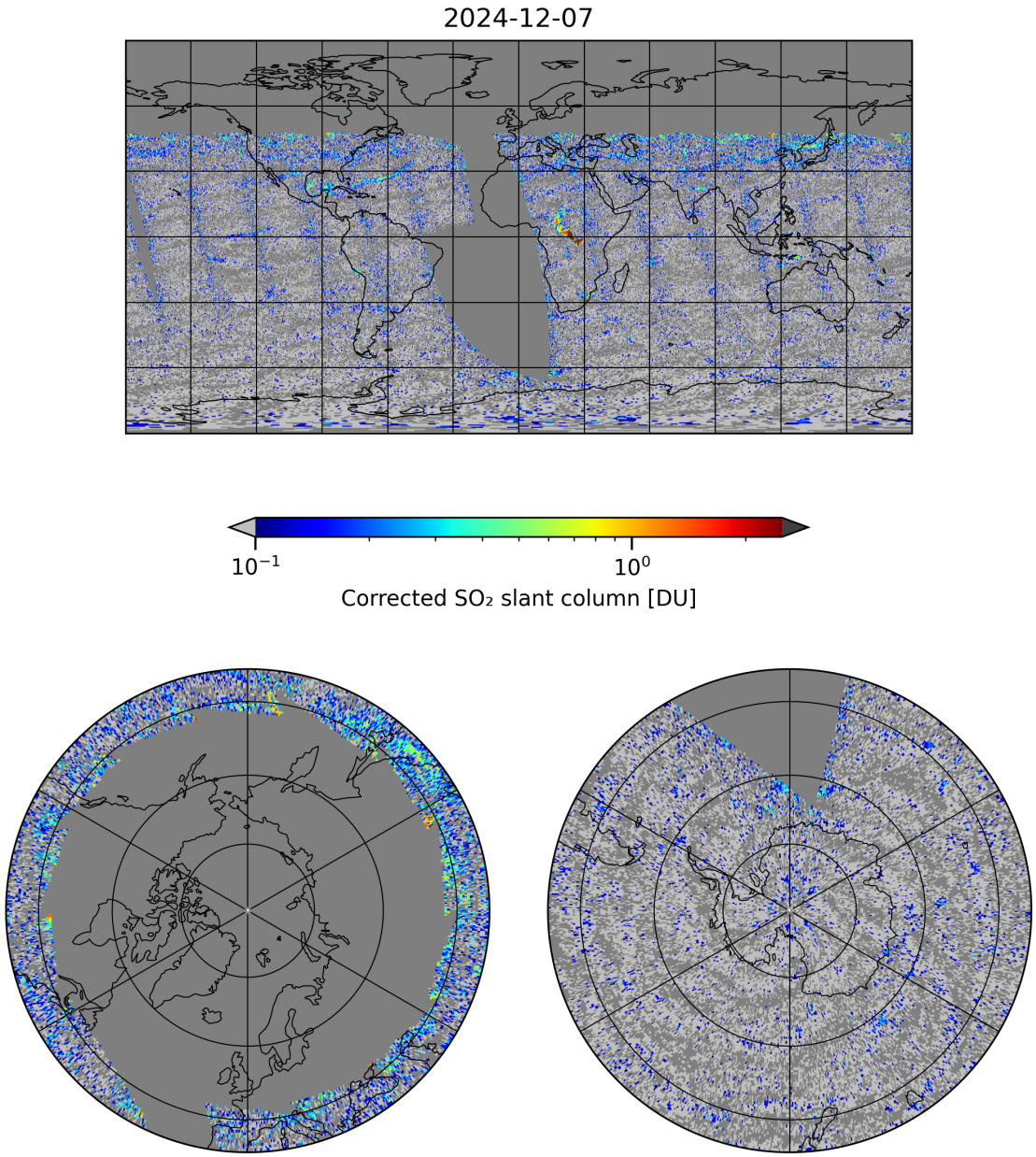

Figure 6: Map of "Corrected SO_2 slant column" for 2024-12-07 to 2024-12-08

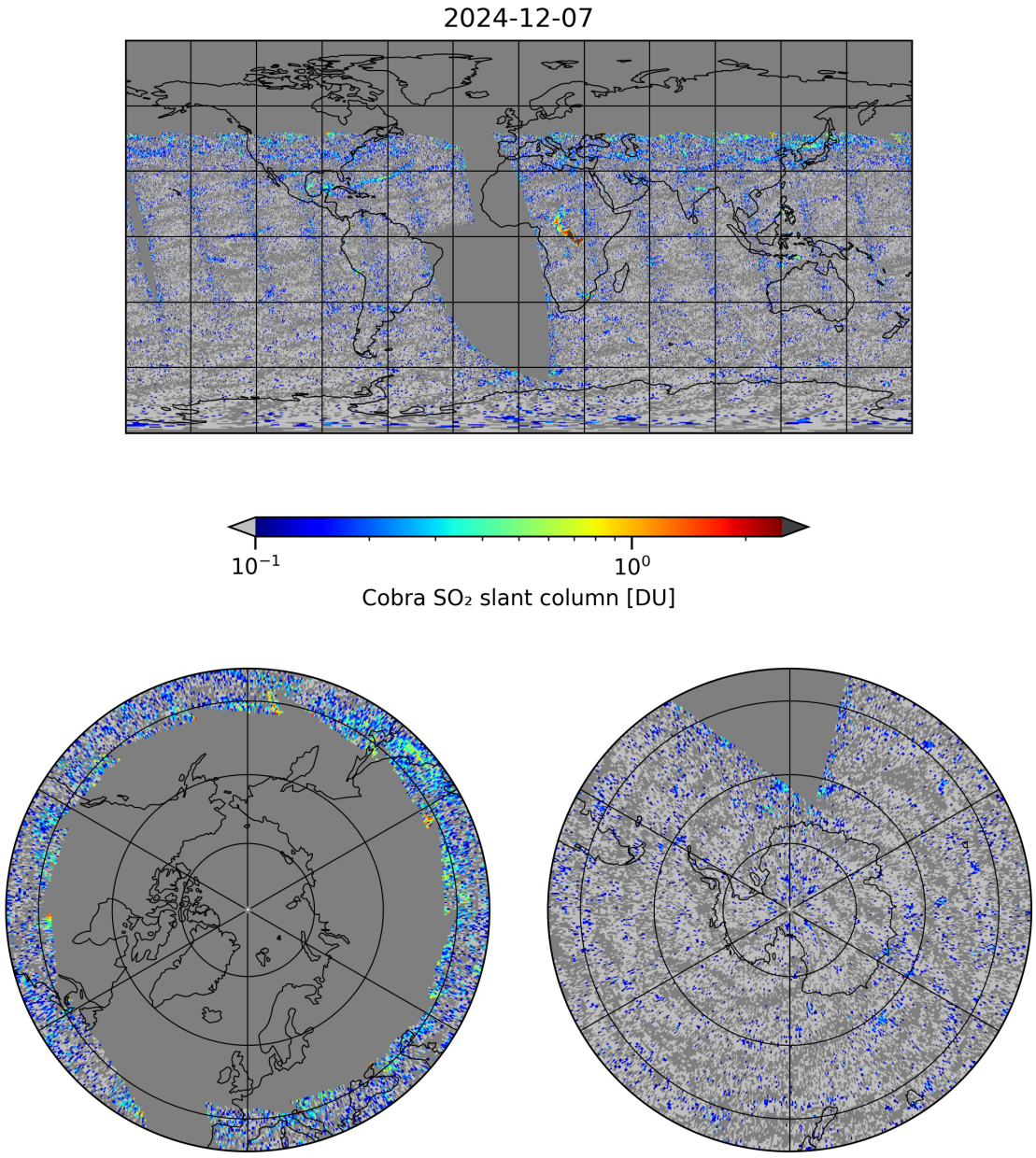

Figure 7: Map of "Cobra SO_2 slant column" for 2024-12-07 to 2024-12-08

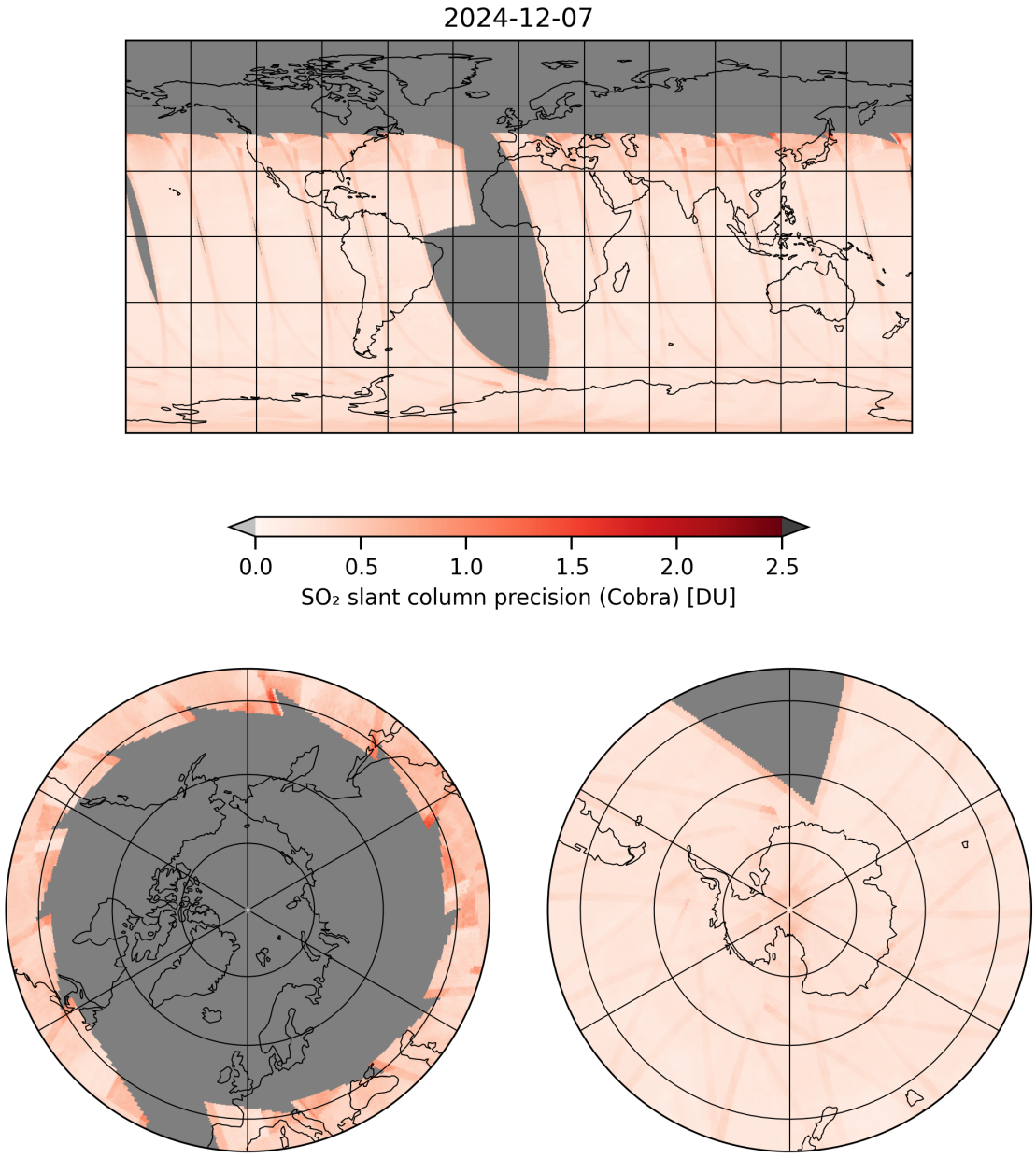

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2024-12-07 to 2024-12-08

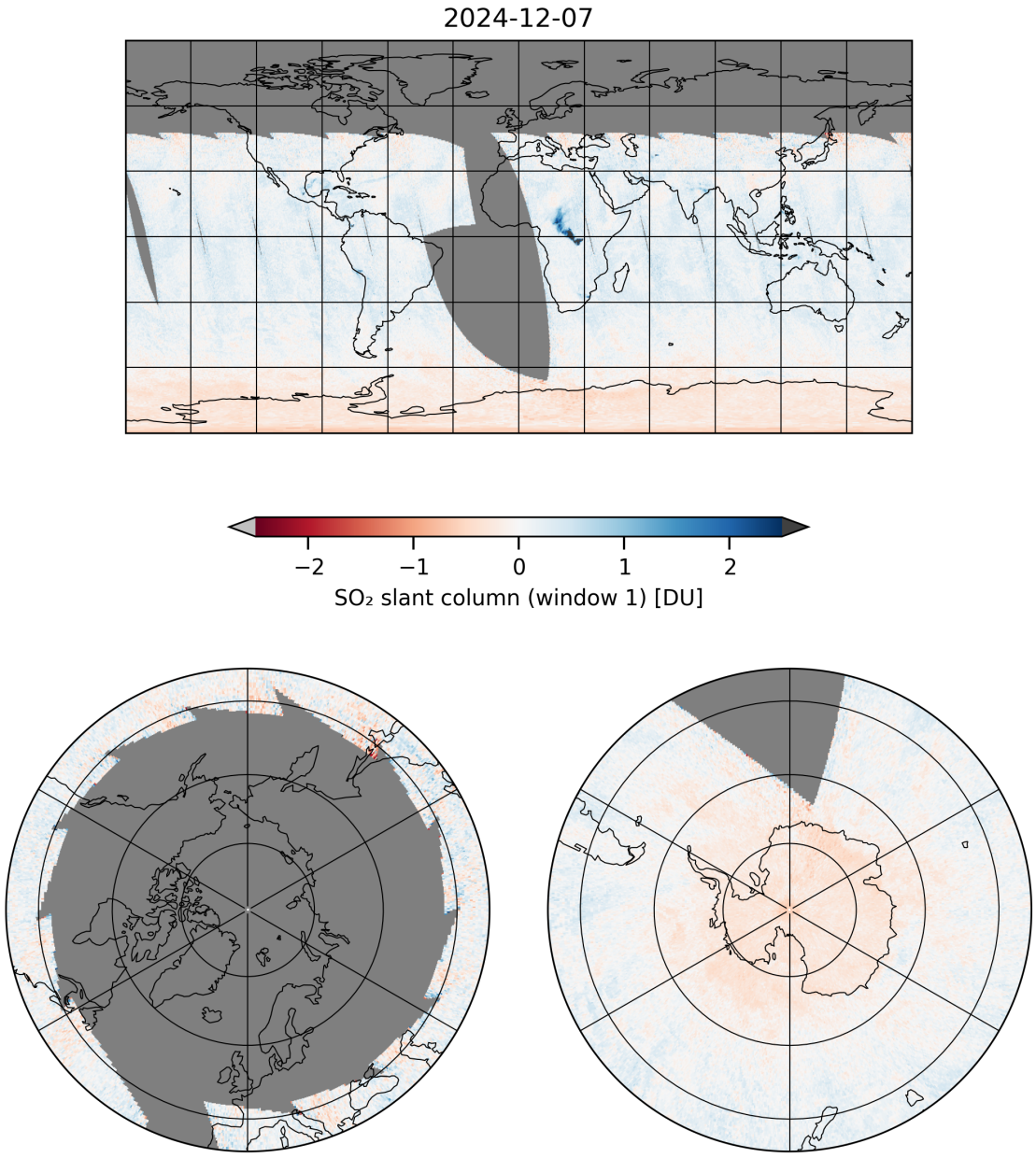

Figure 9: Map of "SO_2 slant column (window 1)" for 2024-12-07 to 2024-12-08

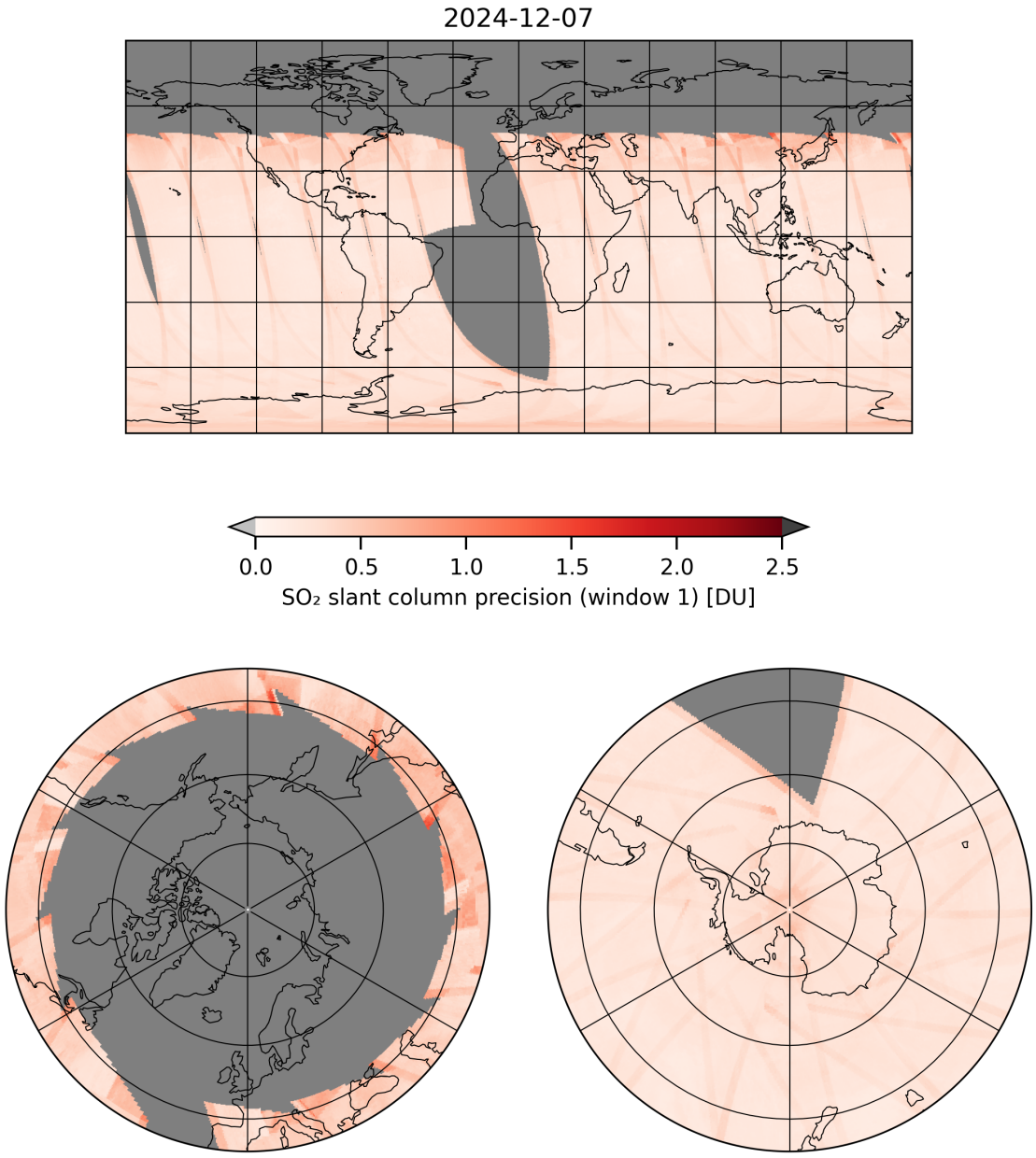

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2024-12-07 to 2024-12-08

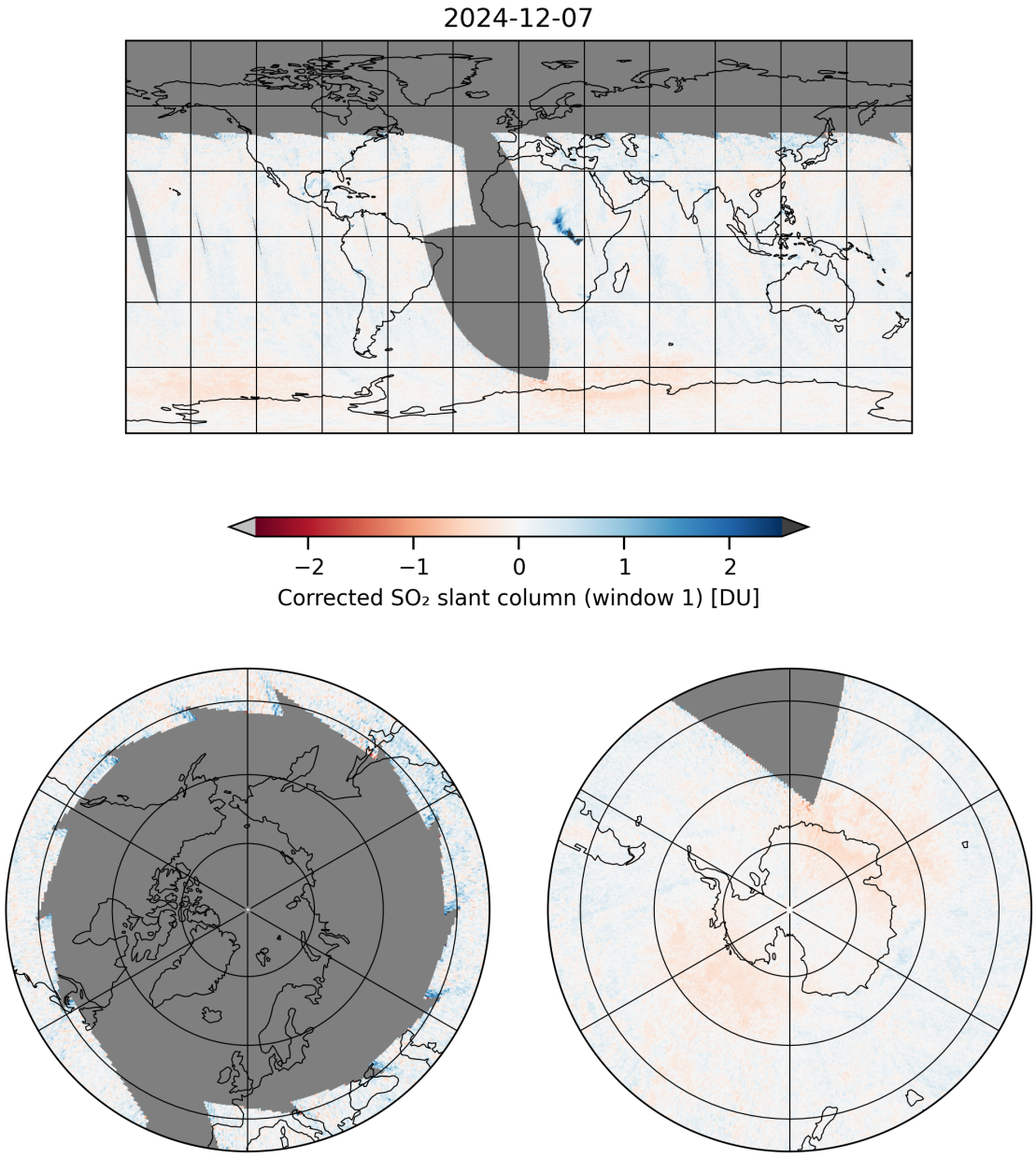

Figure 11: Map of "Corrected SO_2 slant column (window 1)" for 2024-12-07 to 2024-12-08

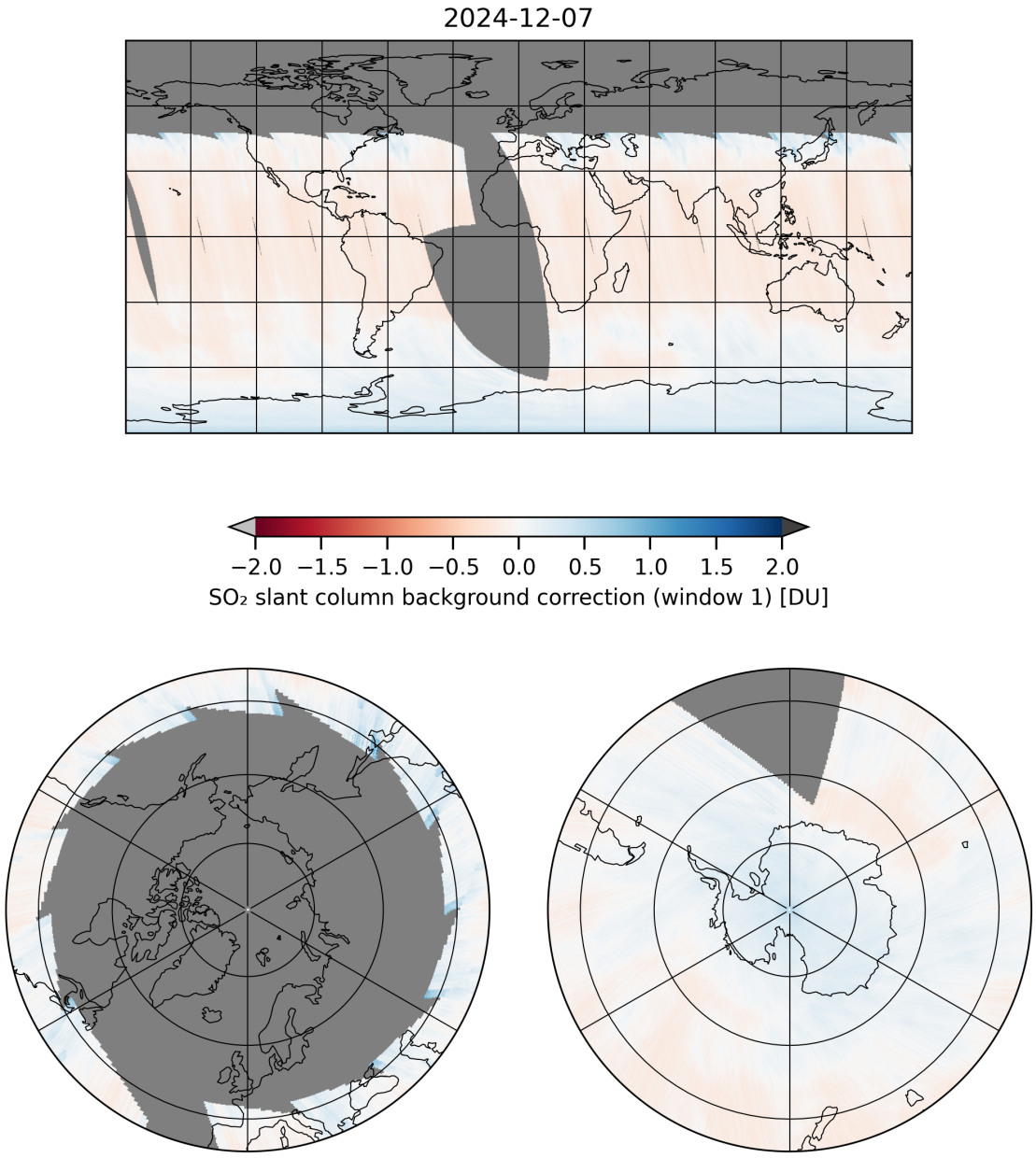

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2024-12-07 to 2024-12-08

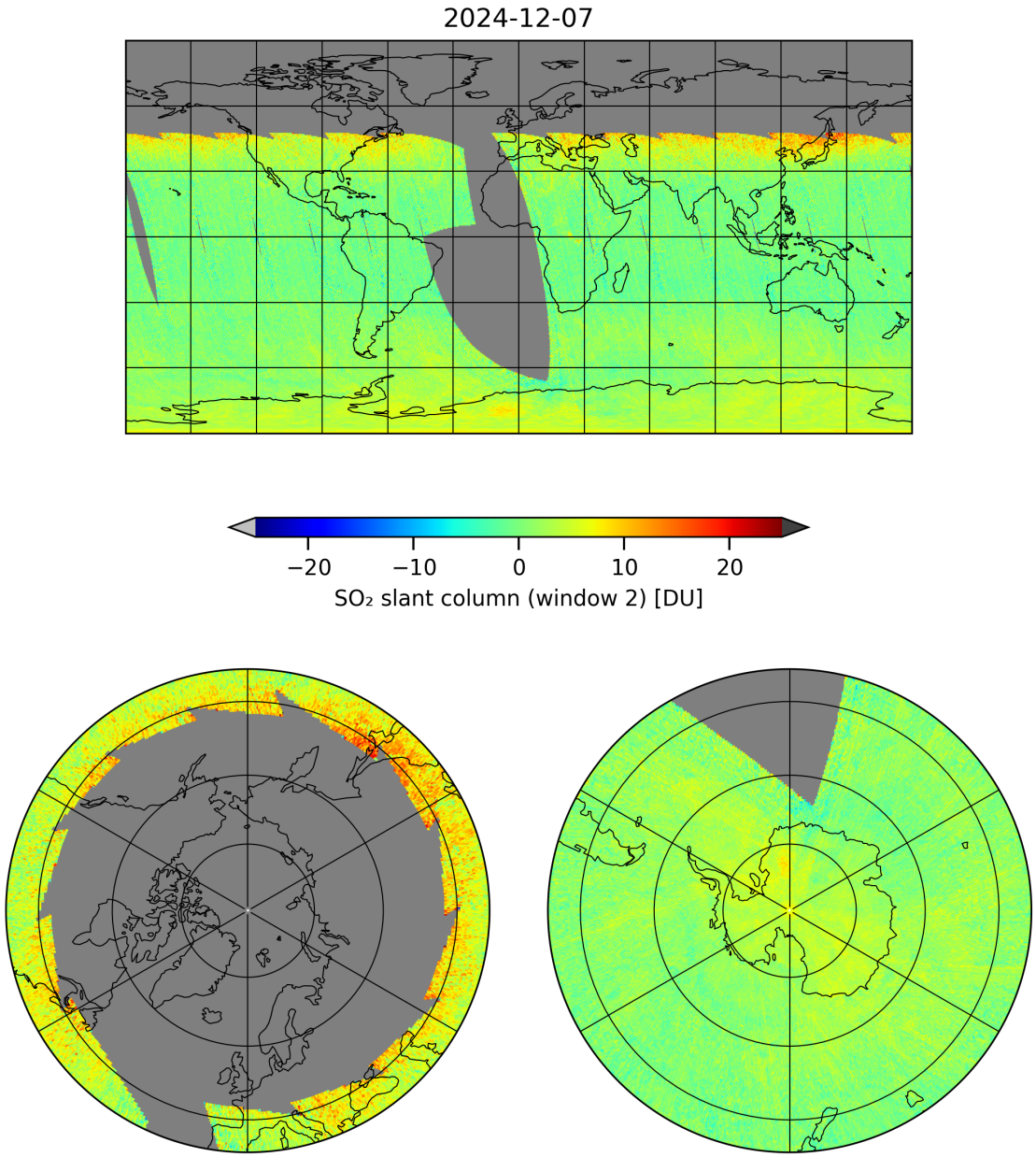

Figure 13: Map of "SO_2 slant column (window 2)" for 2024-12-07 to 2024-12-08

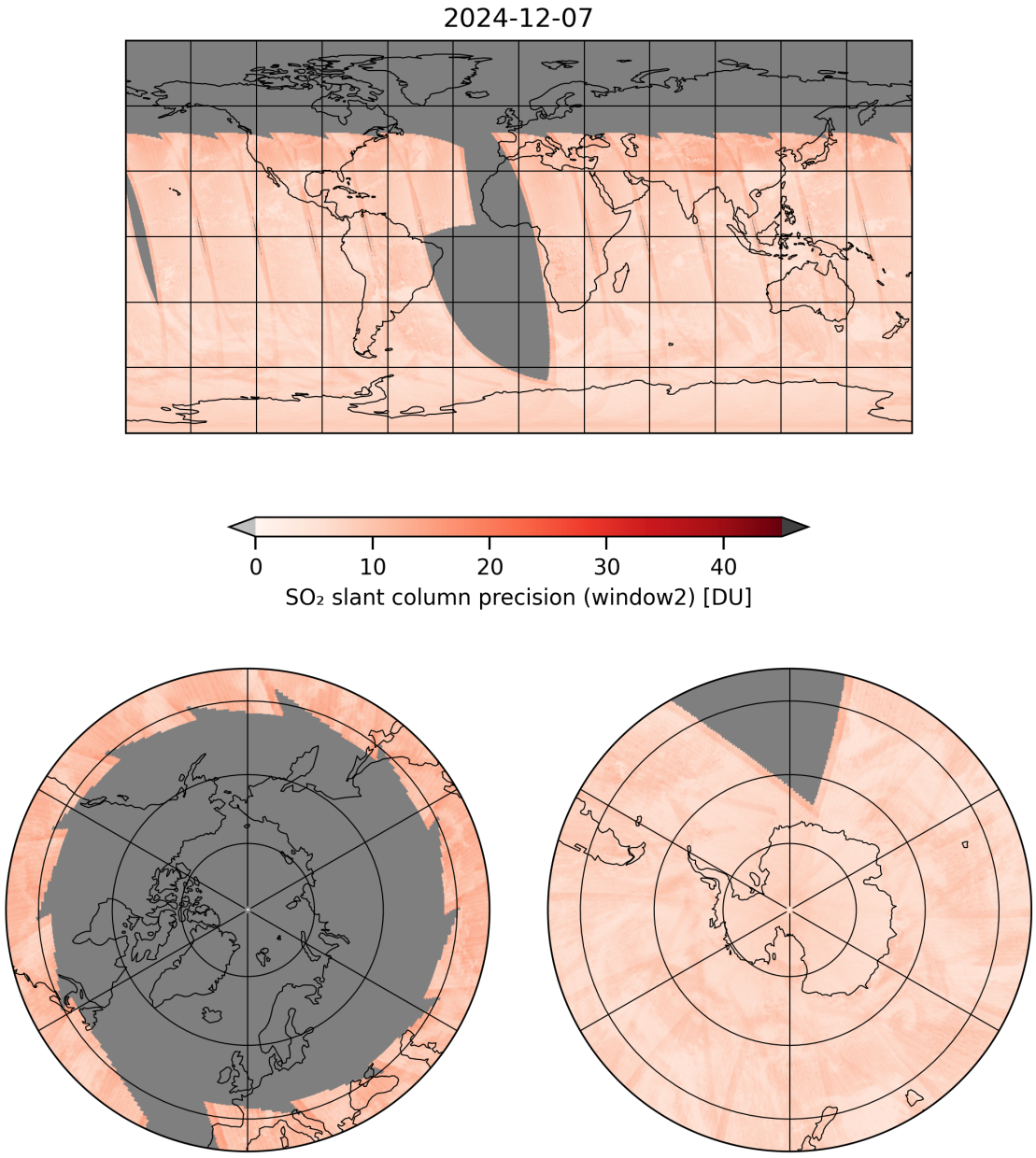

Figure 14: Map of "SO_2 slant column precision (window2)" for 2024-12-07 to 2024-12-08

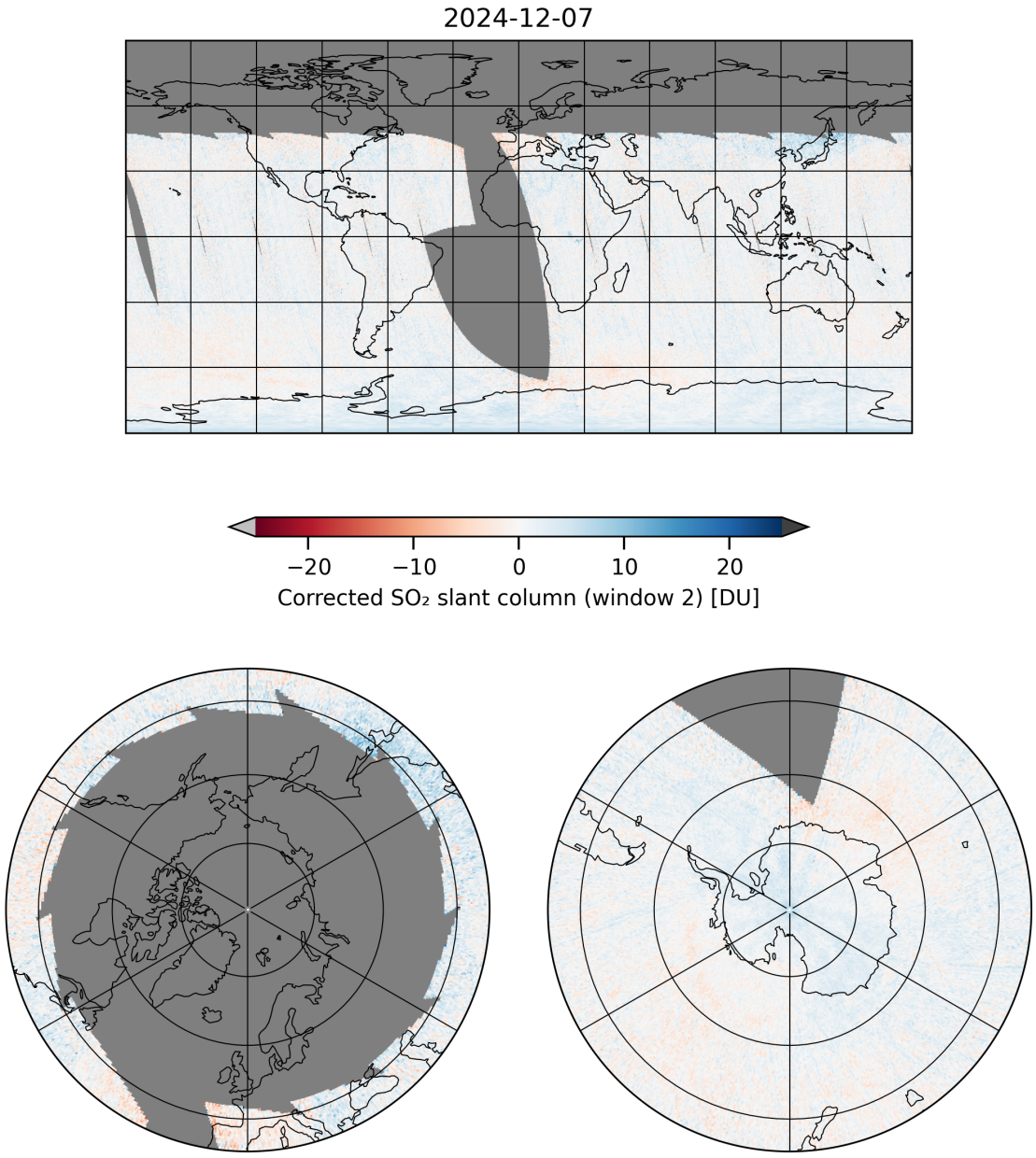

Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2024-12-07 to 2024-12-08

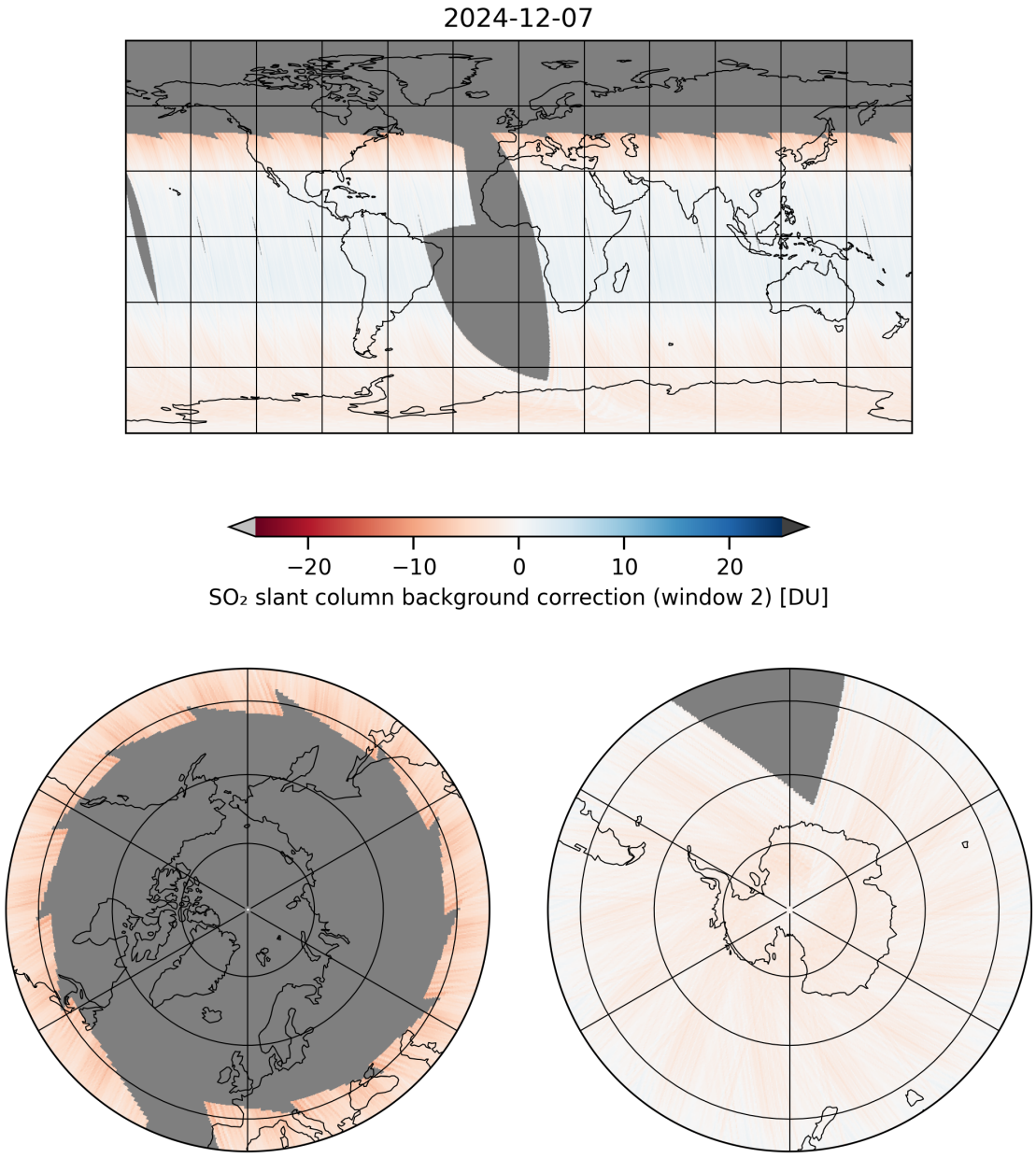

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2024-12-07 to 2024-12-08

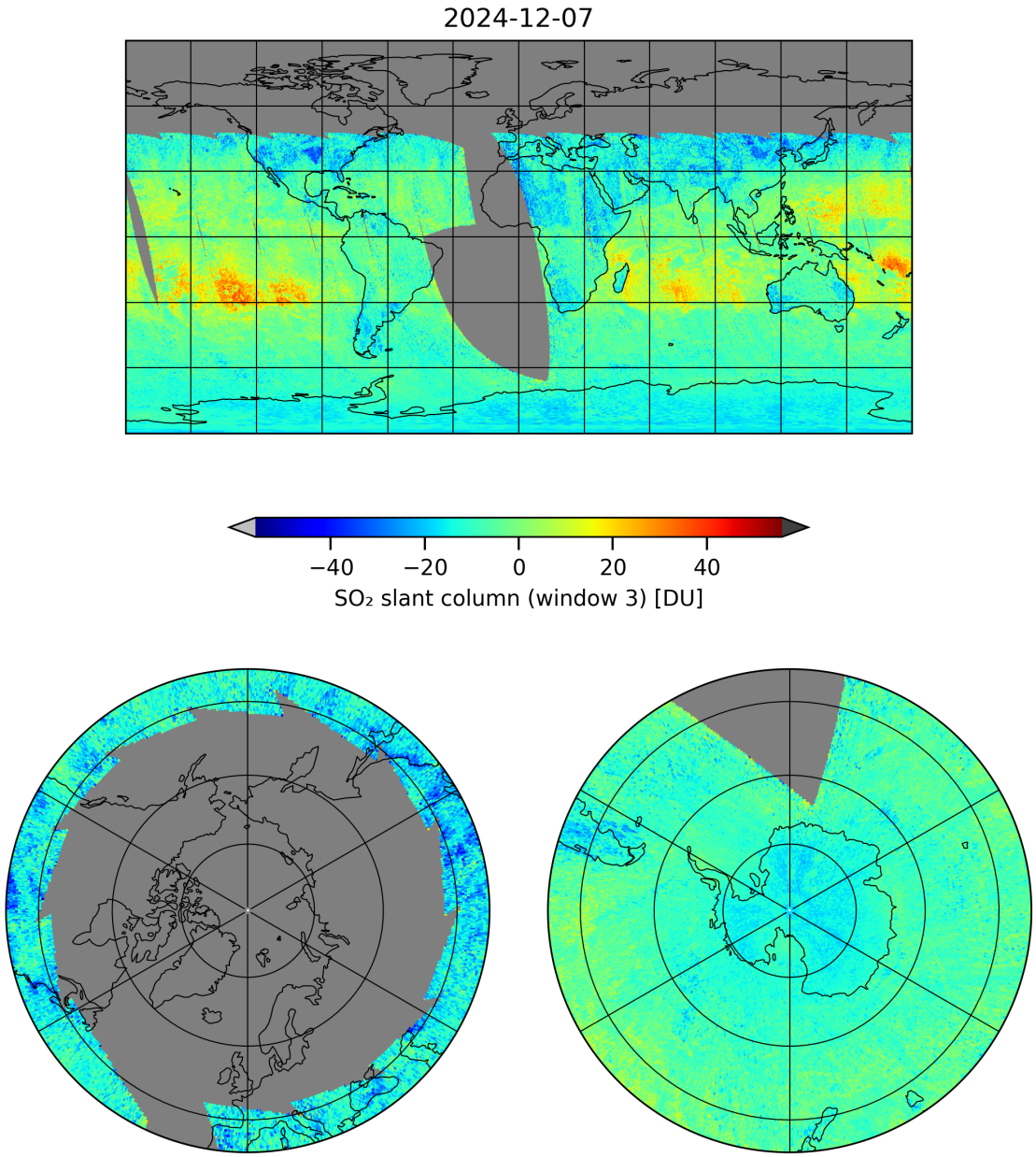

Figure 17: Map of "SO_2 slant column (window 3)" for 2024-12-07 to 2024-12-08

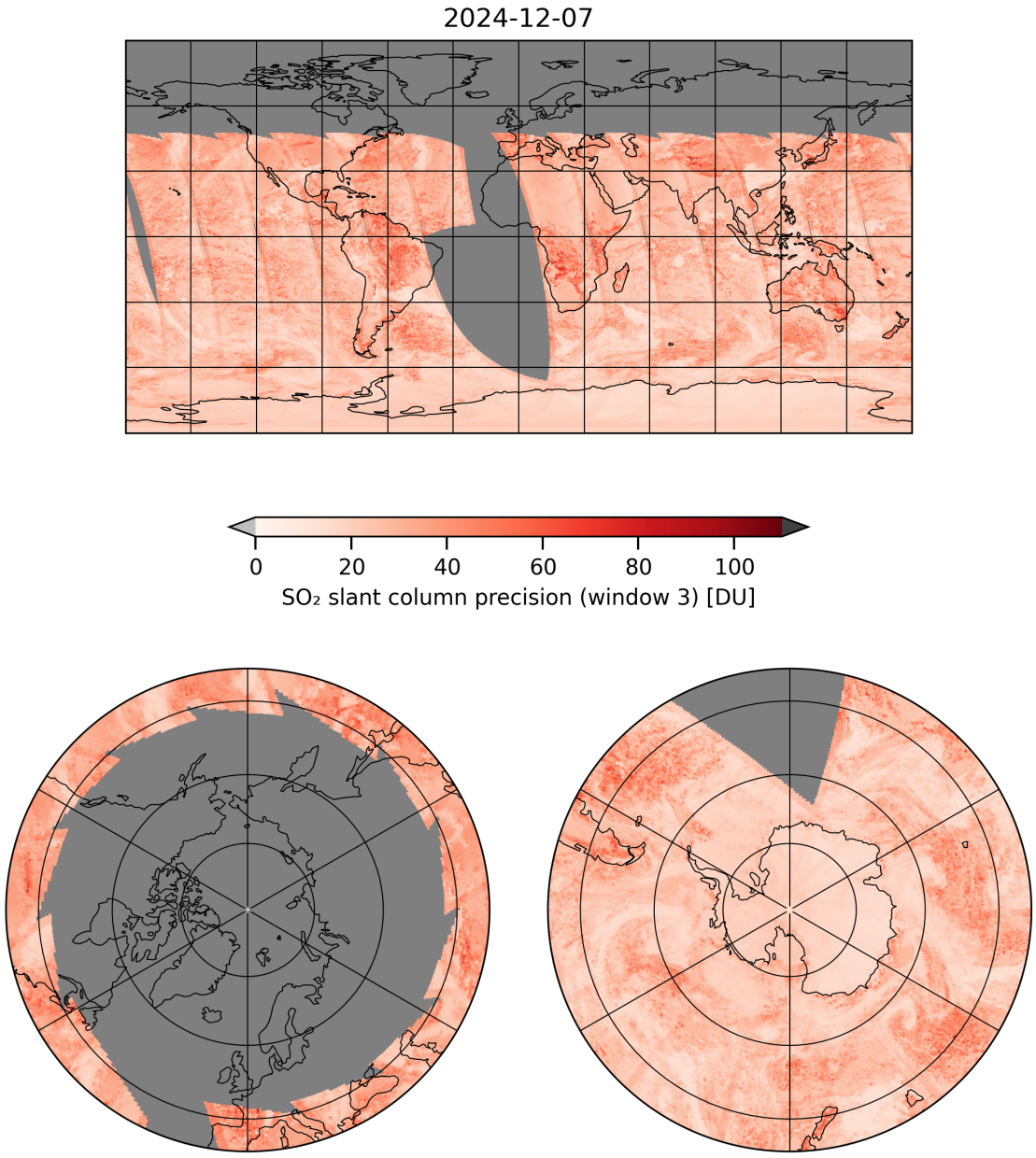

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2024-12-07 to 2024-12-08

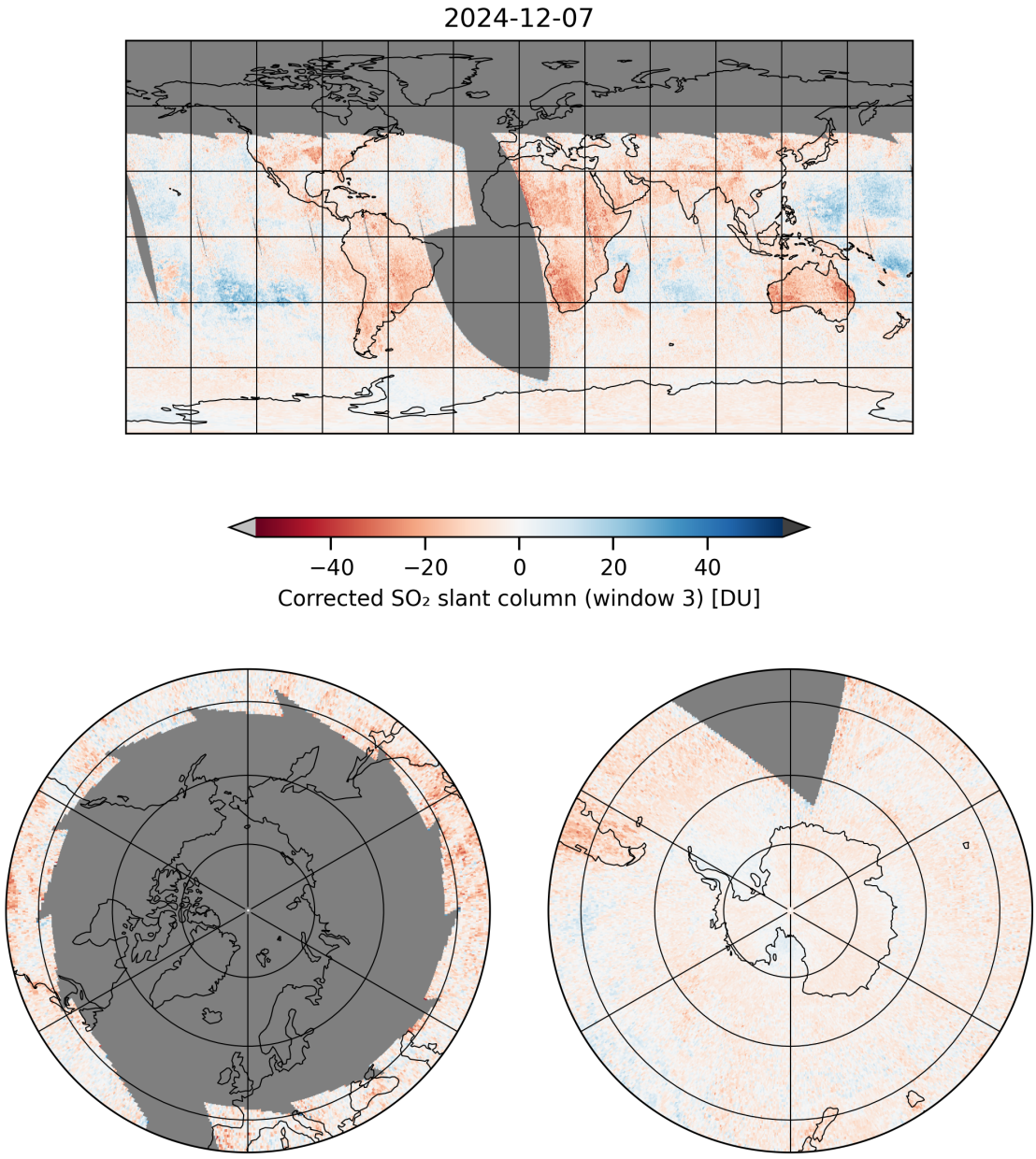

Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2024-12-07 to 2024-12-08

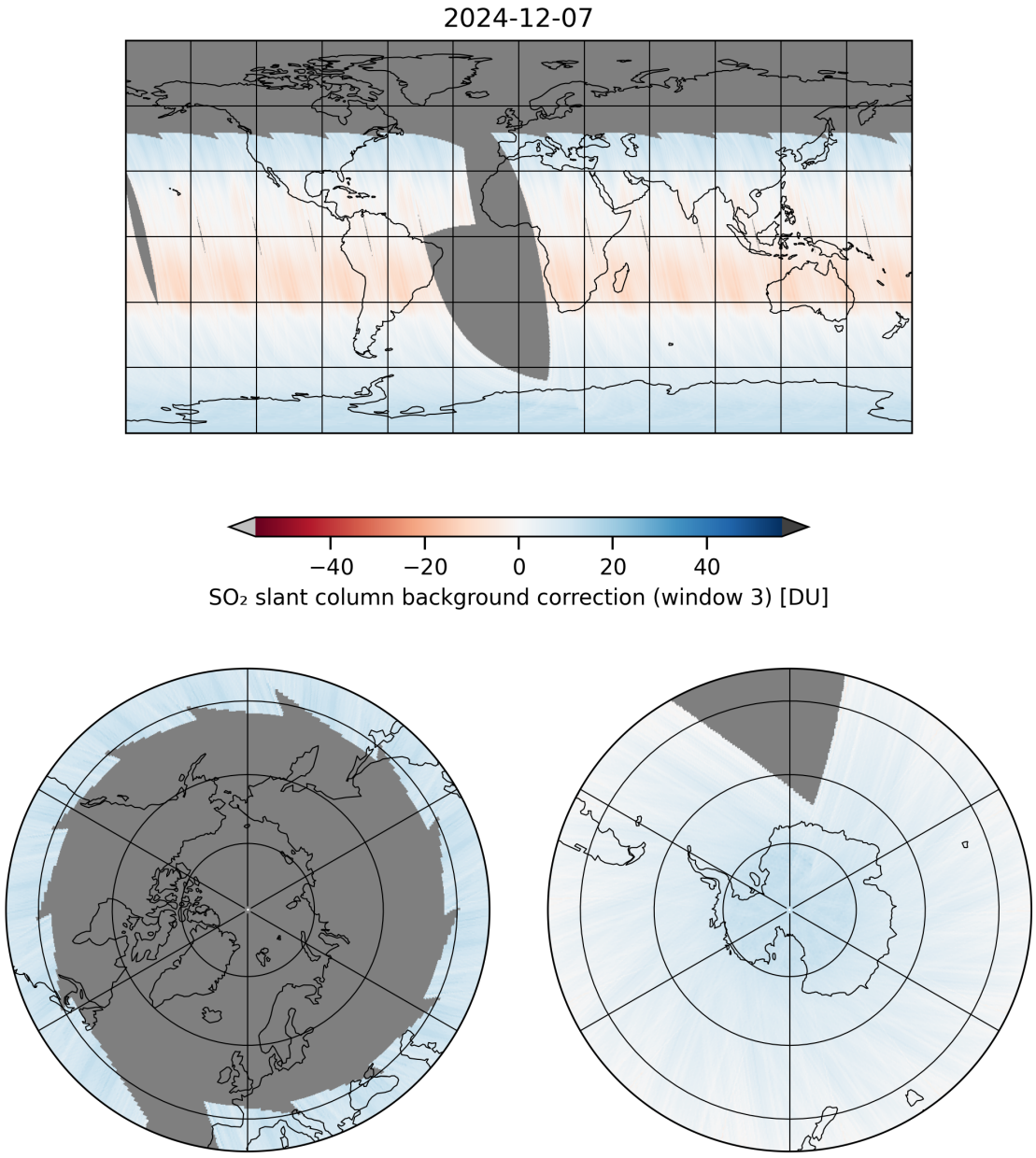

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2024-12-07 to 2024-12-08

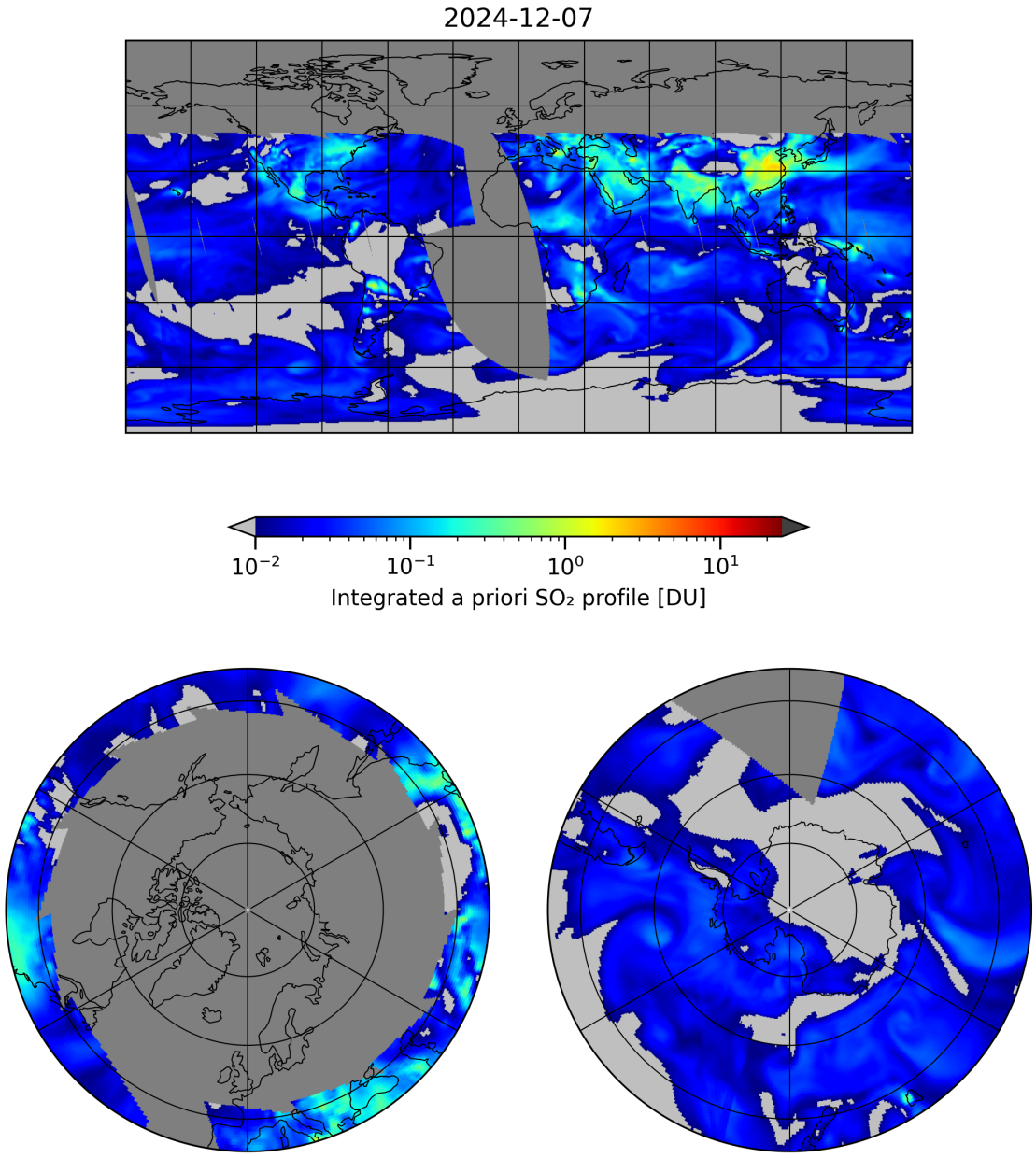

Figure 21: Map of “Integrated a priori SO_2 profile” for 2024-12-07 to 2024-12-08

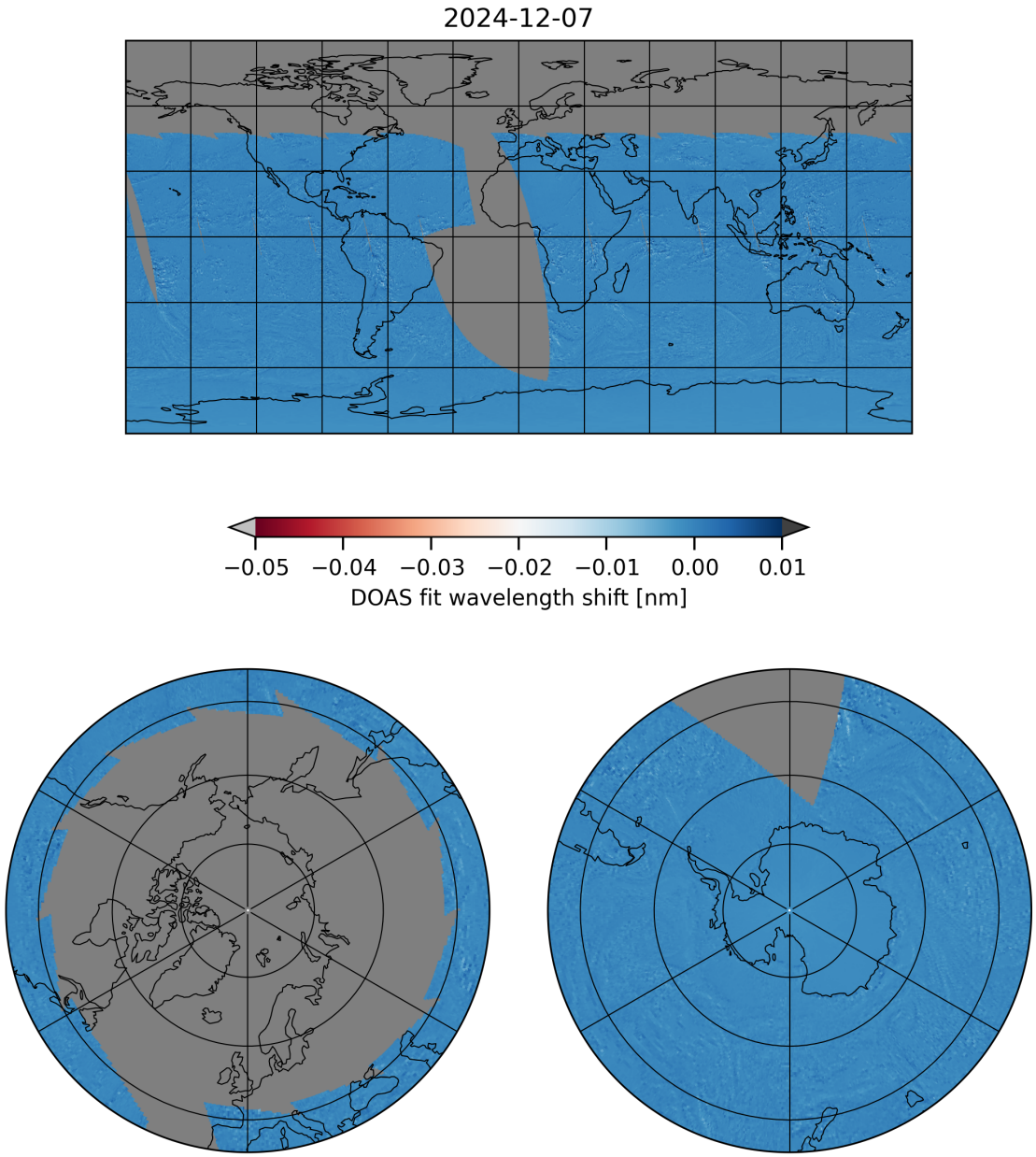

Figure 22: Map of “DOAS fit wavelength shift” for 2024-12-07 to 2024-12-08

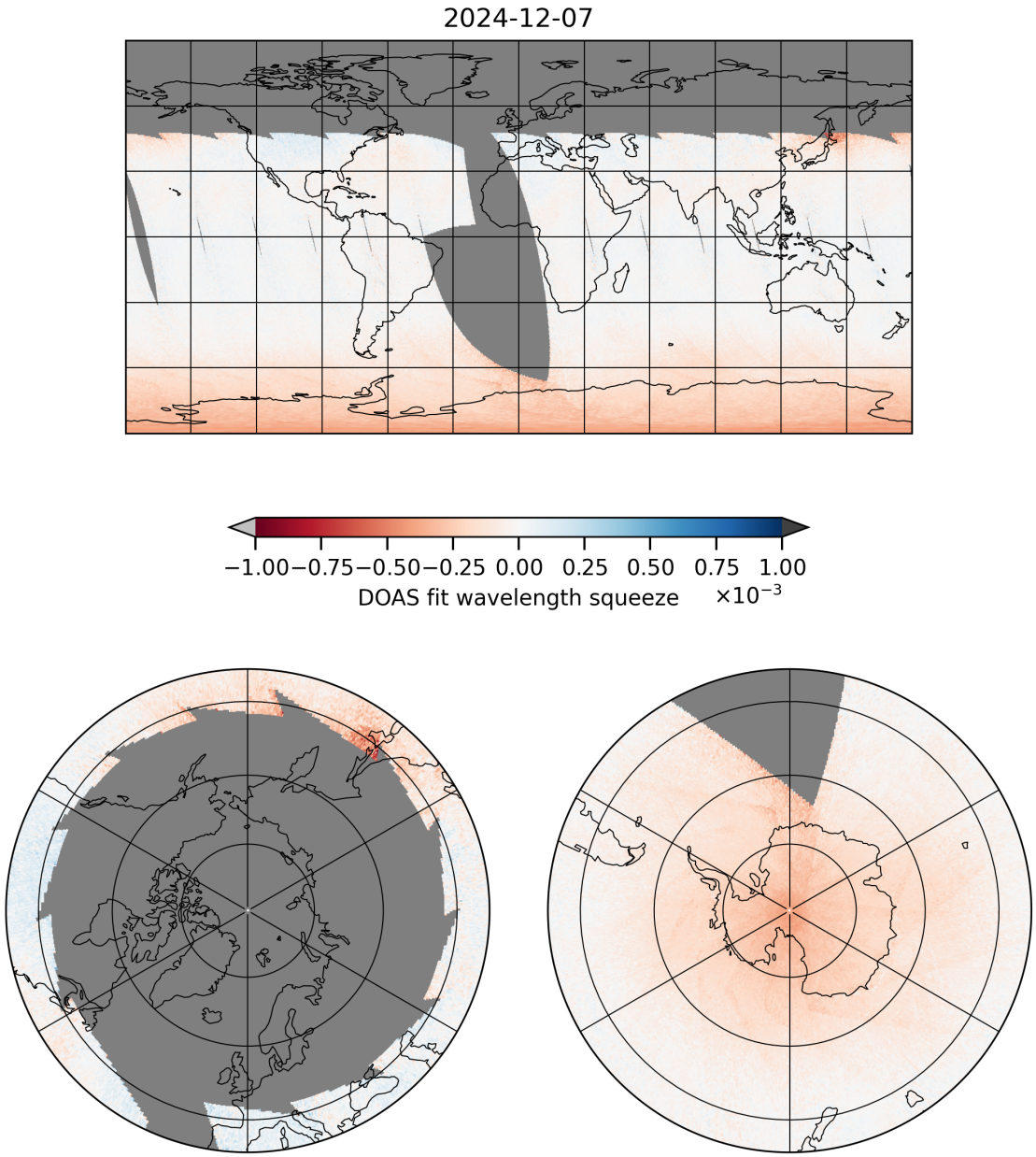

Figure 23: Map of “DOAS fit wavelength squeeze” for 2024-12-07 to 2024-12-08

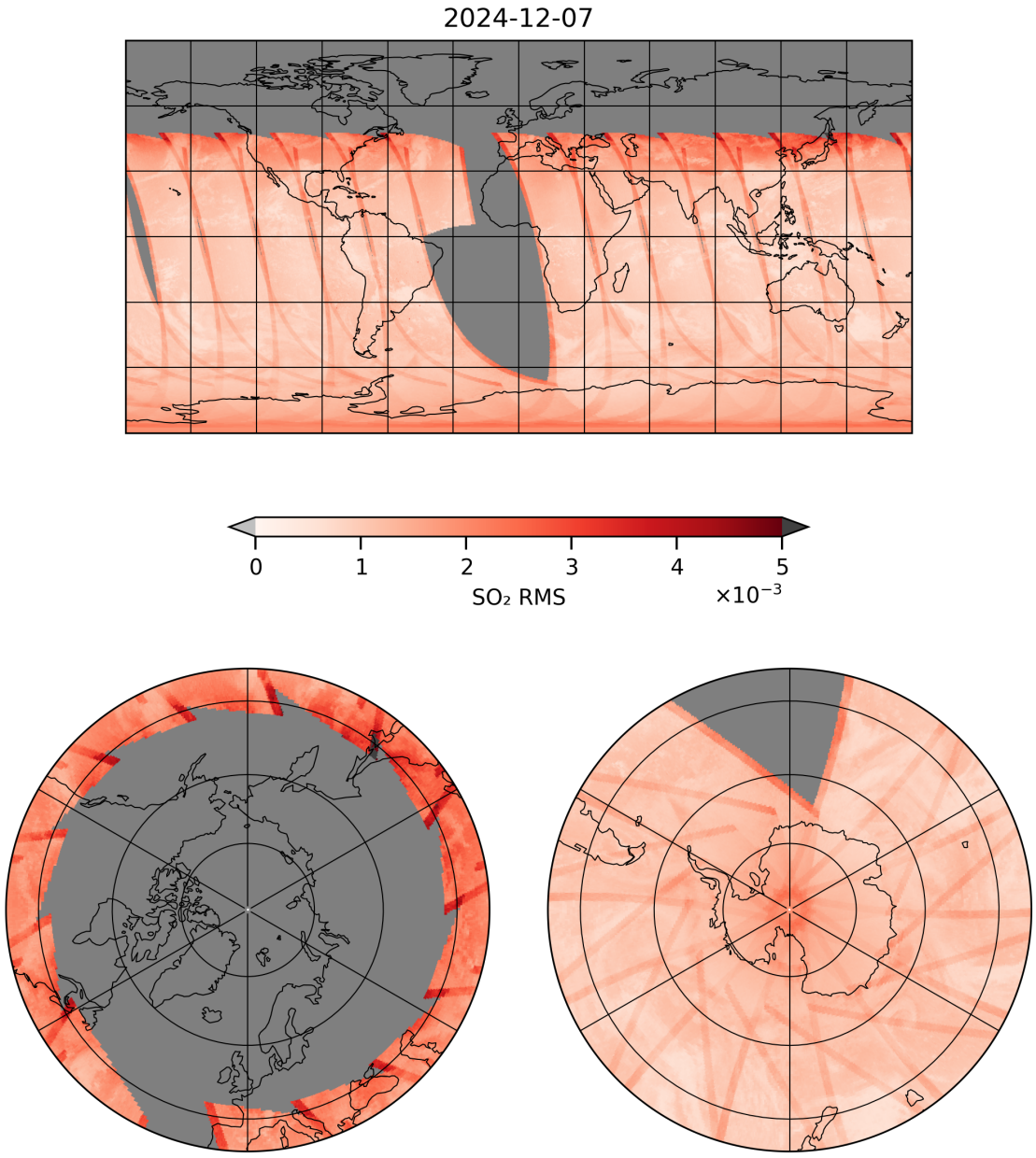

Figure 24: Map of "SO_2 RMS" for 2024-12-07 to 2024-12-08

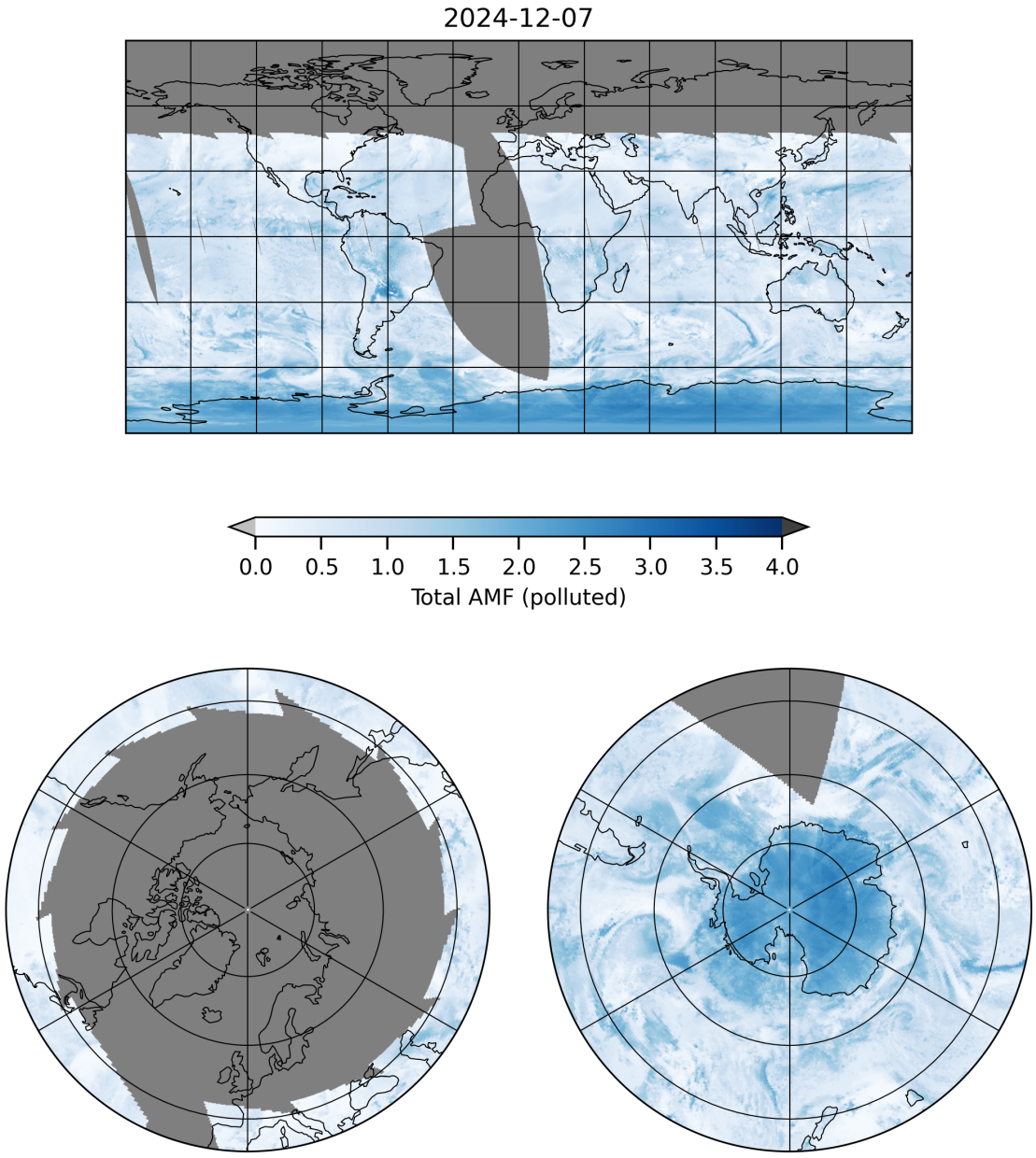

Figure 25: Map of “Total AMF (polluted)” for 2024-12-07 to 2024-12-08

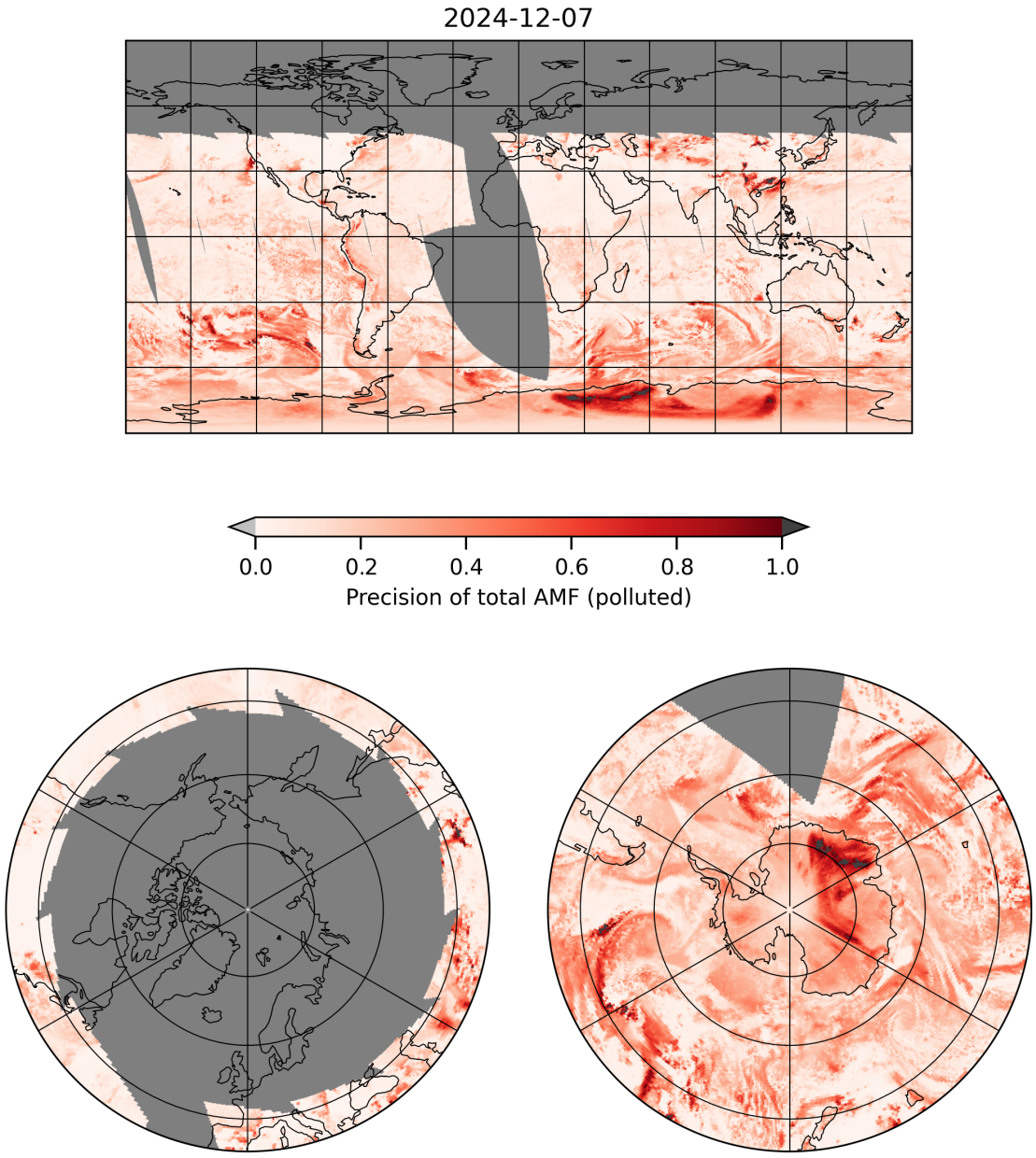

Figure 26: Map of “Precision of total AMF (polluted)” for 2024-12-07 to 2024-12-08

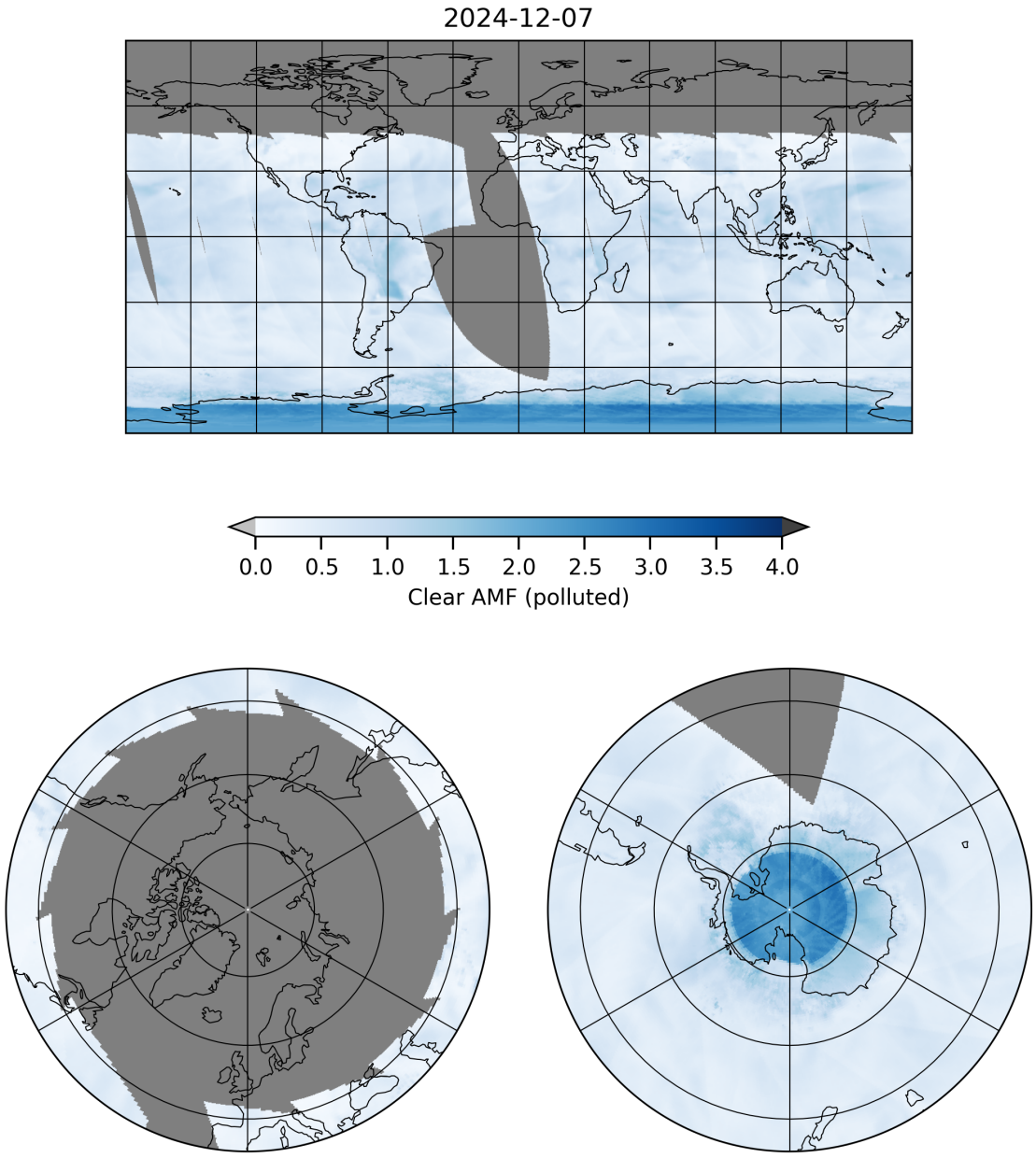

Figure 27: Map of “Clear AMF (polluted)” for 2024-12-07 to 2024-12-08

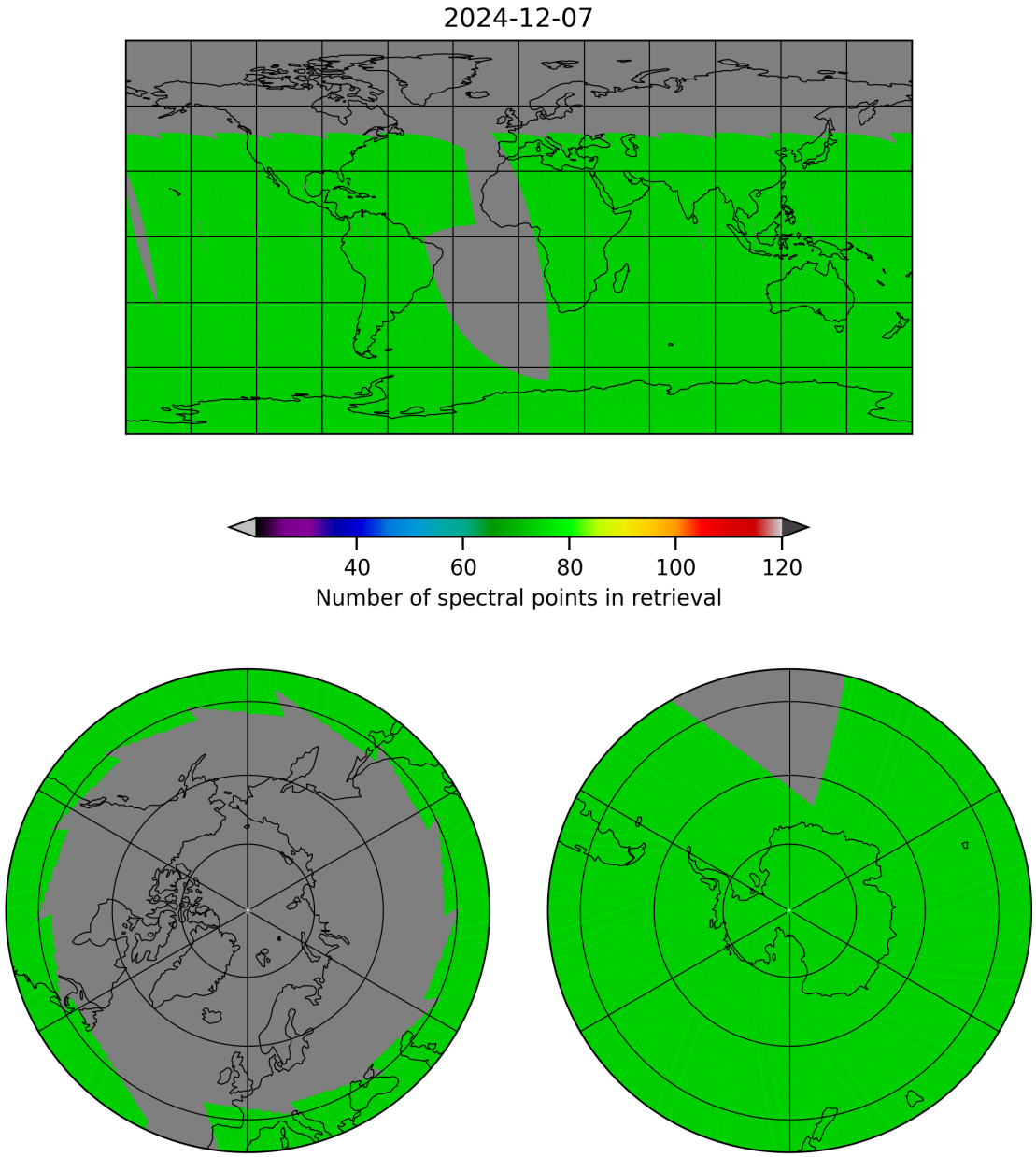

Figure 28: Map of “Number of spectral points in retrieval” for 2024-12-07 to 2024-12-08

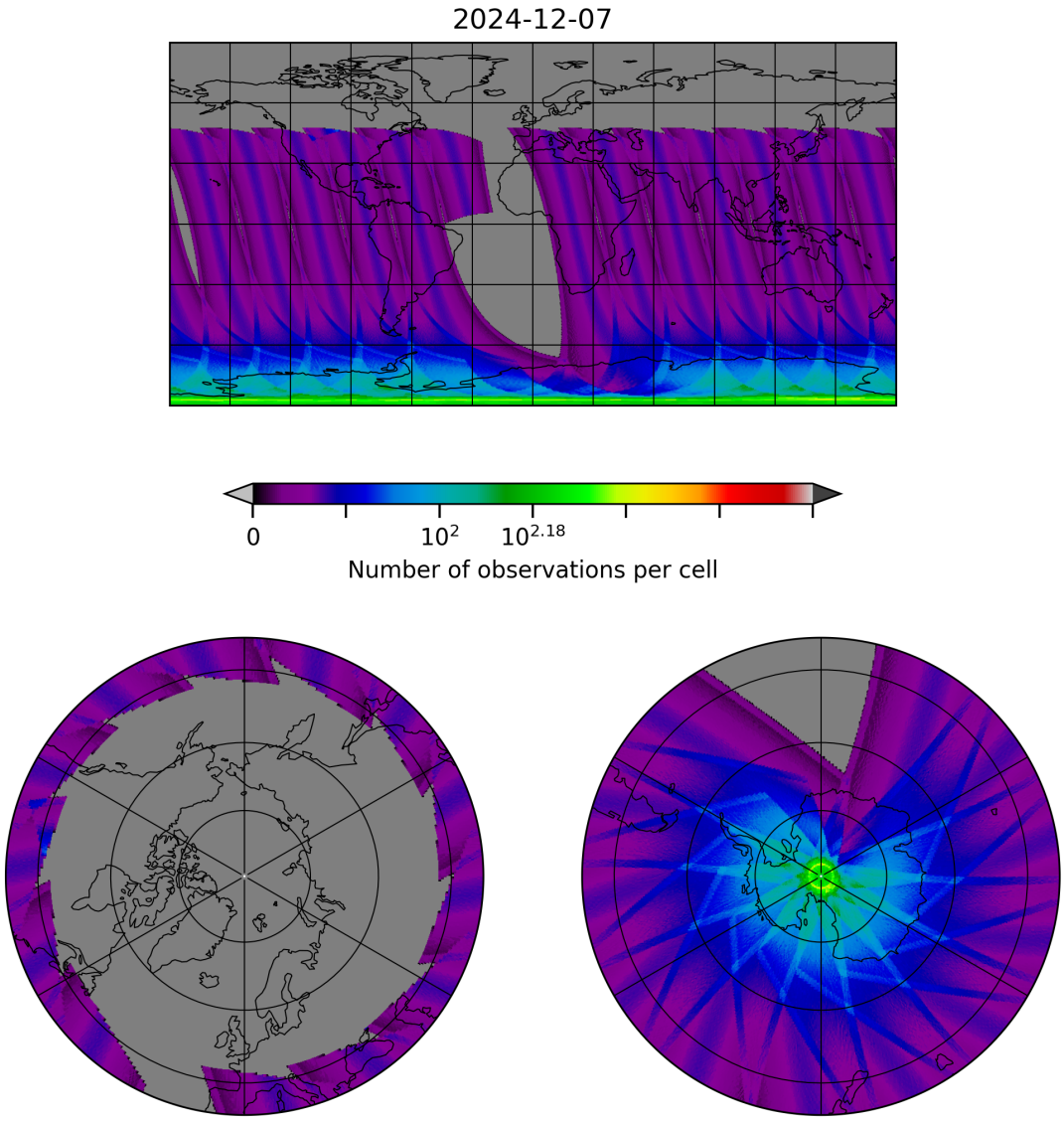

Figure 29: Map of the number of observations for 2024-12-07 to 2024-12-08

7 Zonal average

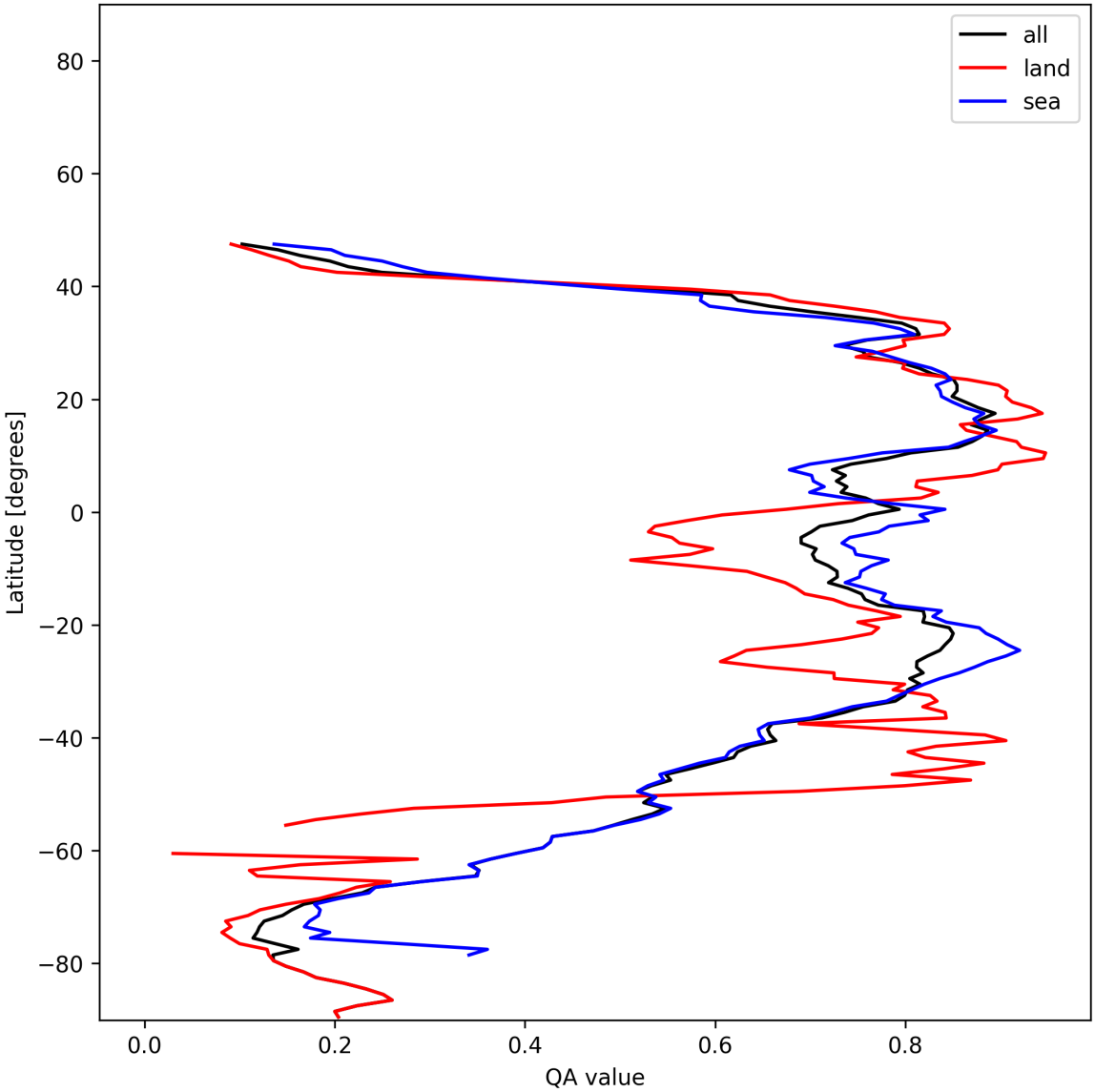

Figure 30: Zonal average of “QA value” for 2024-12-07 to 2024-12-08.

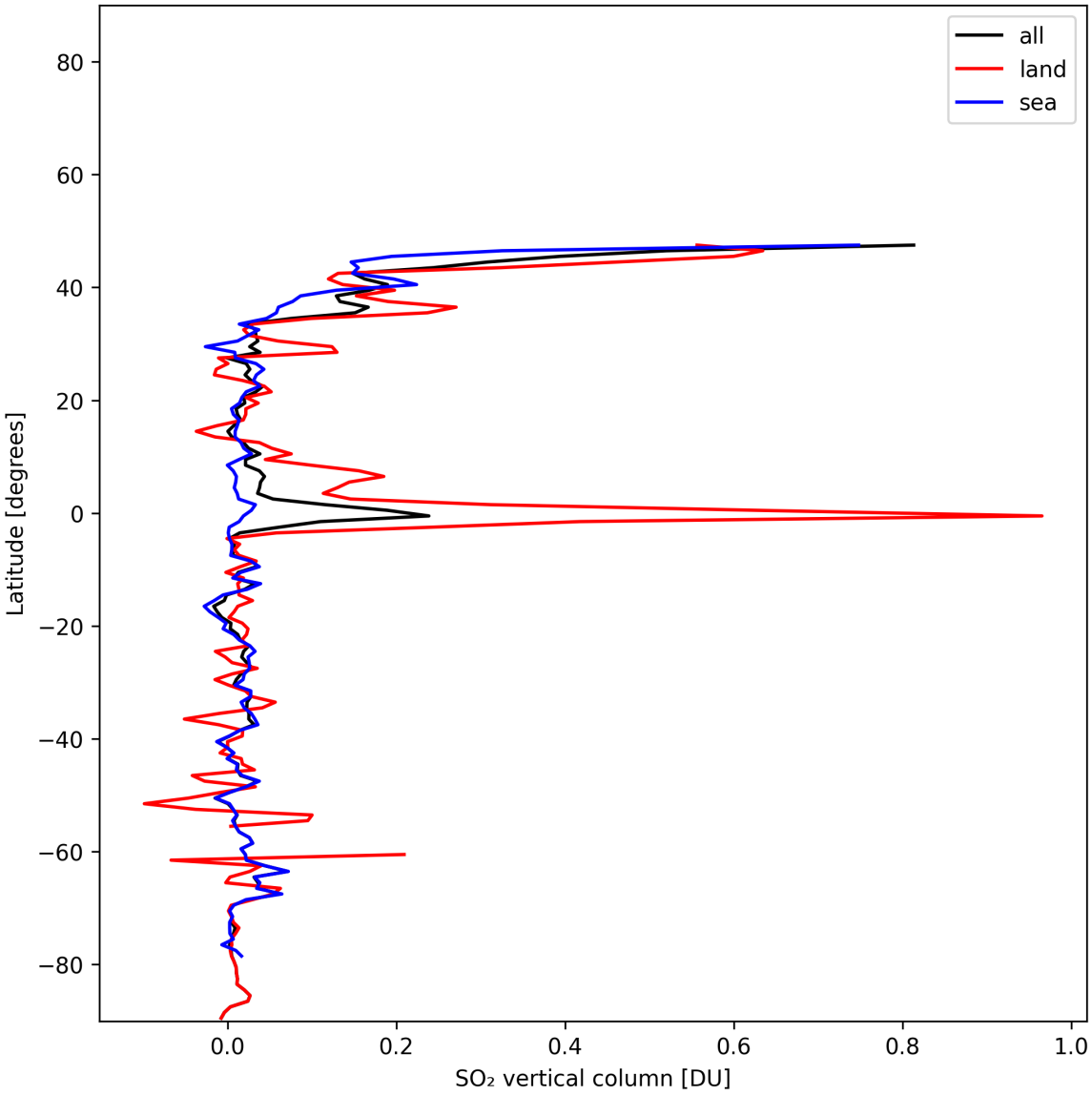

Figure 31: Zonal average of "SO_2 vertical column" for 2024-12-07 to 2024-12-08.

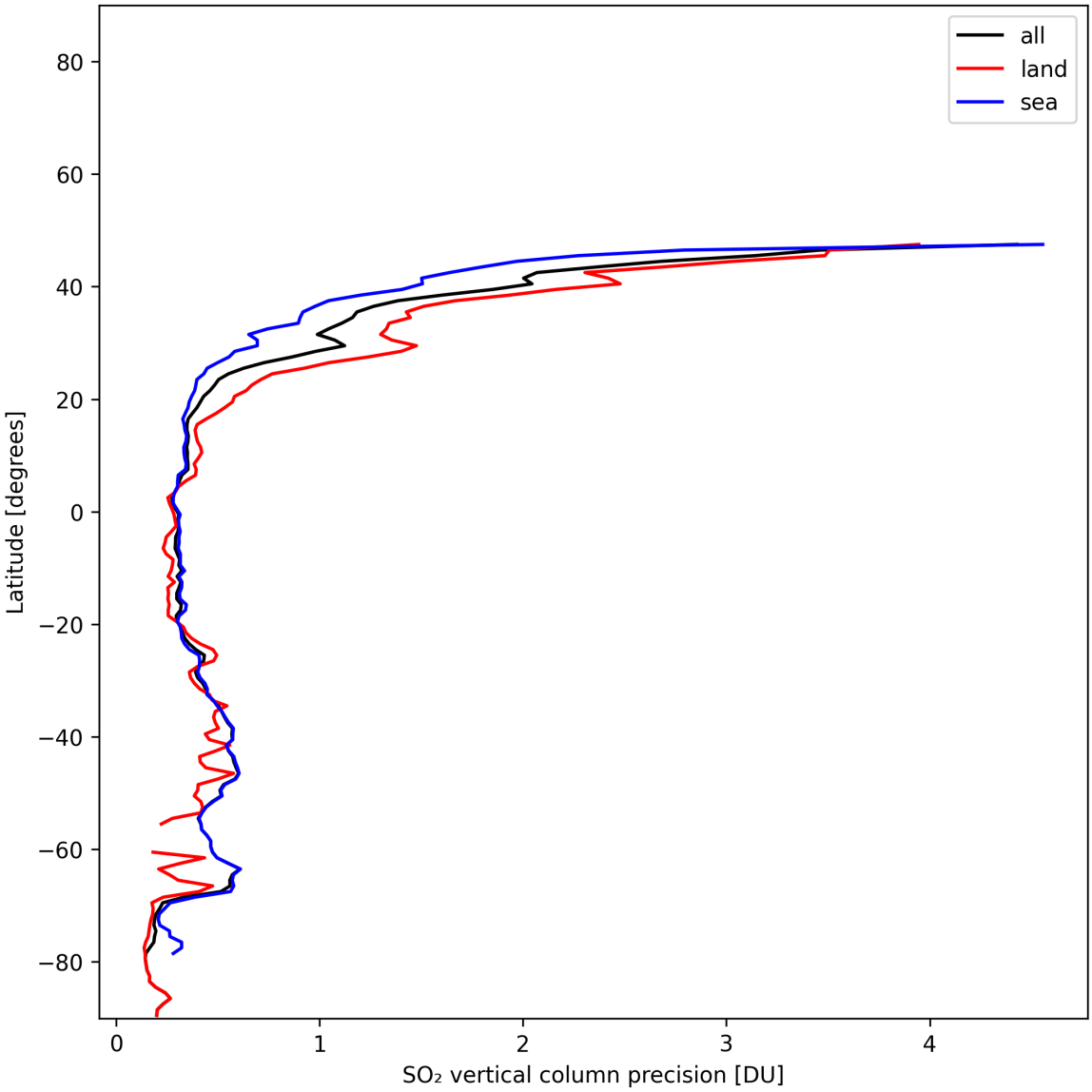

Figure 32: Zonal average of "SO_2 vertical column precision" for 2024-12-07 to 2024-12-08.

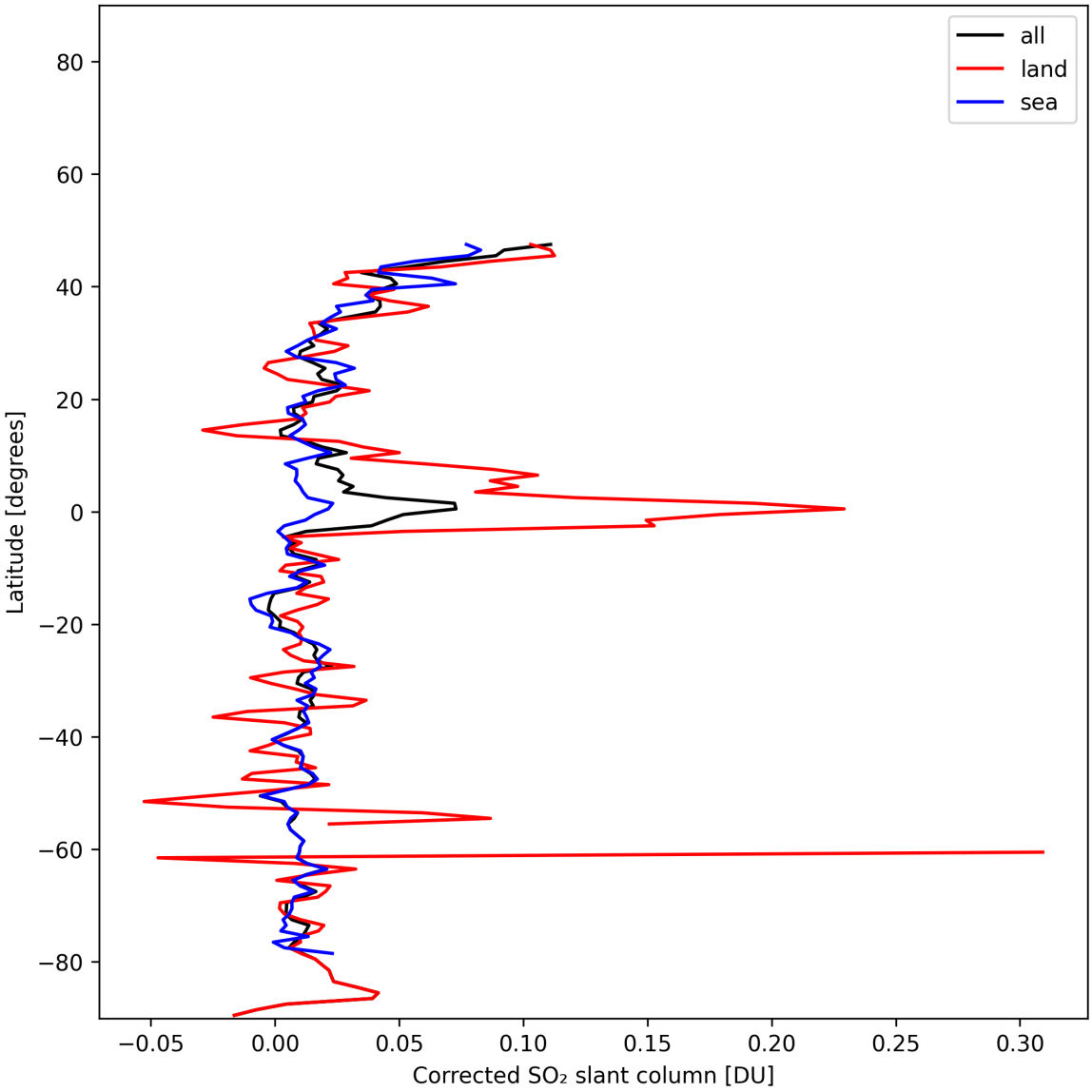

Figure 33: Zonal average of "Corrected SO_2 slant column" for 2024-12-07 to 2024-12-08.

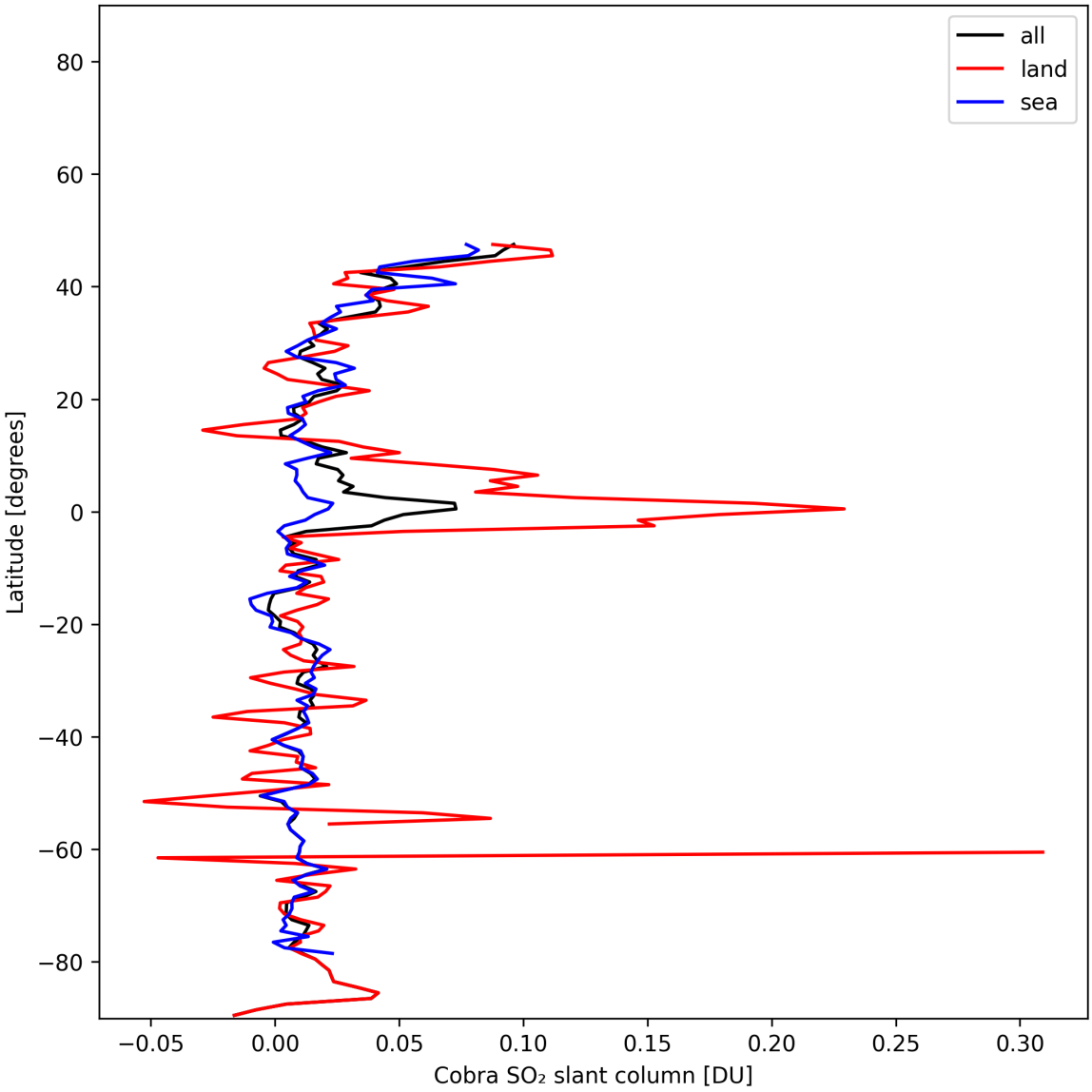

Figure 34: Zonal average of "Cobra SO_2 slant column" for 2024-12-07 to 2024-12-08.

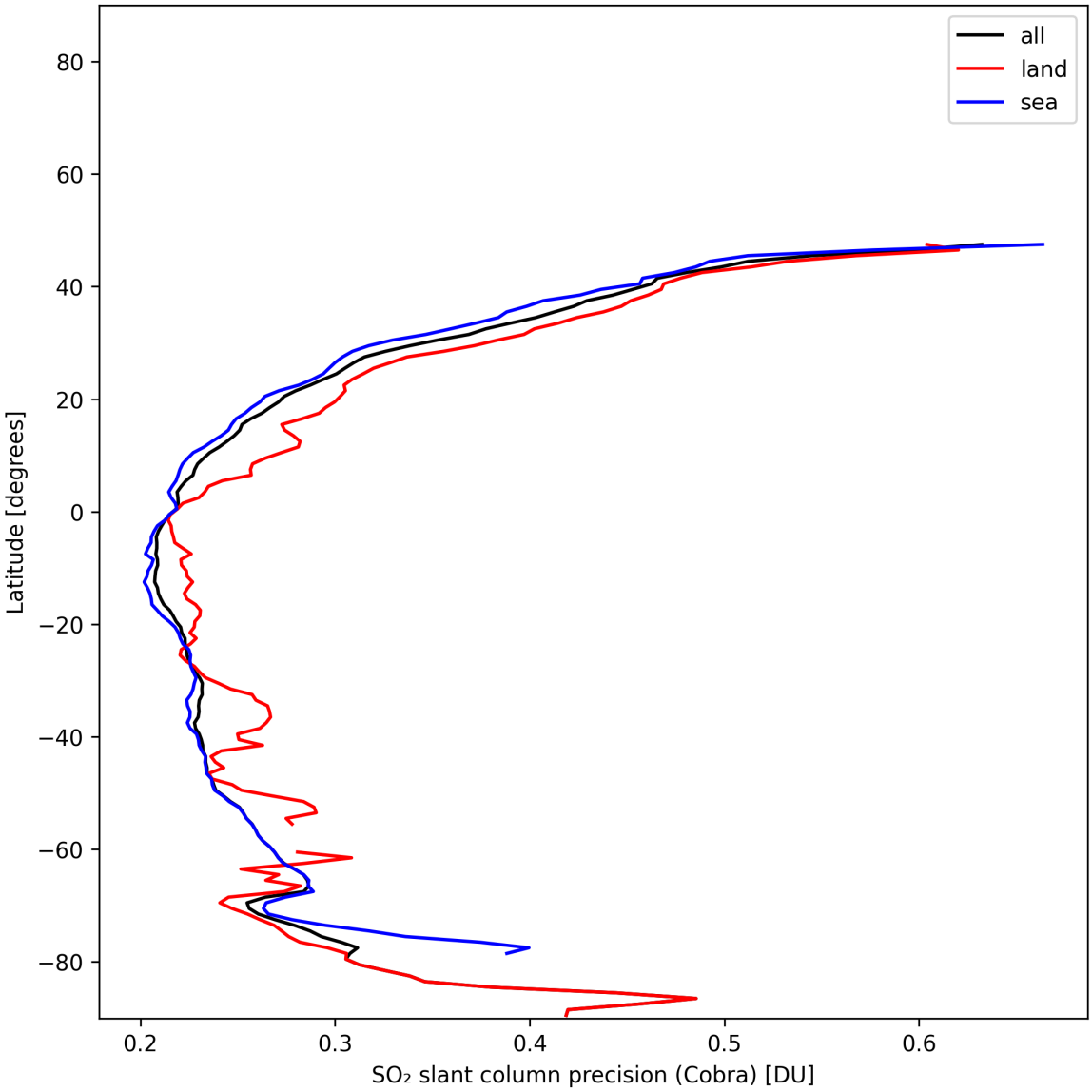

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2024-12-07 to 2024-12-08.

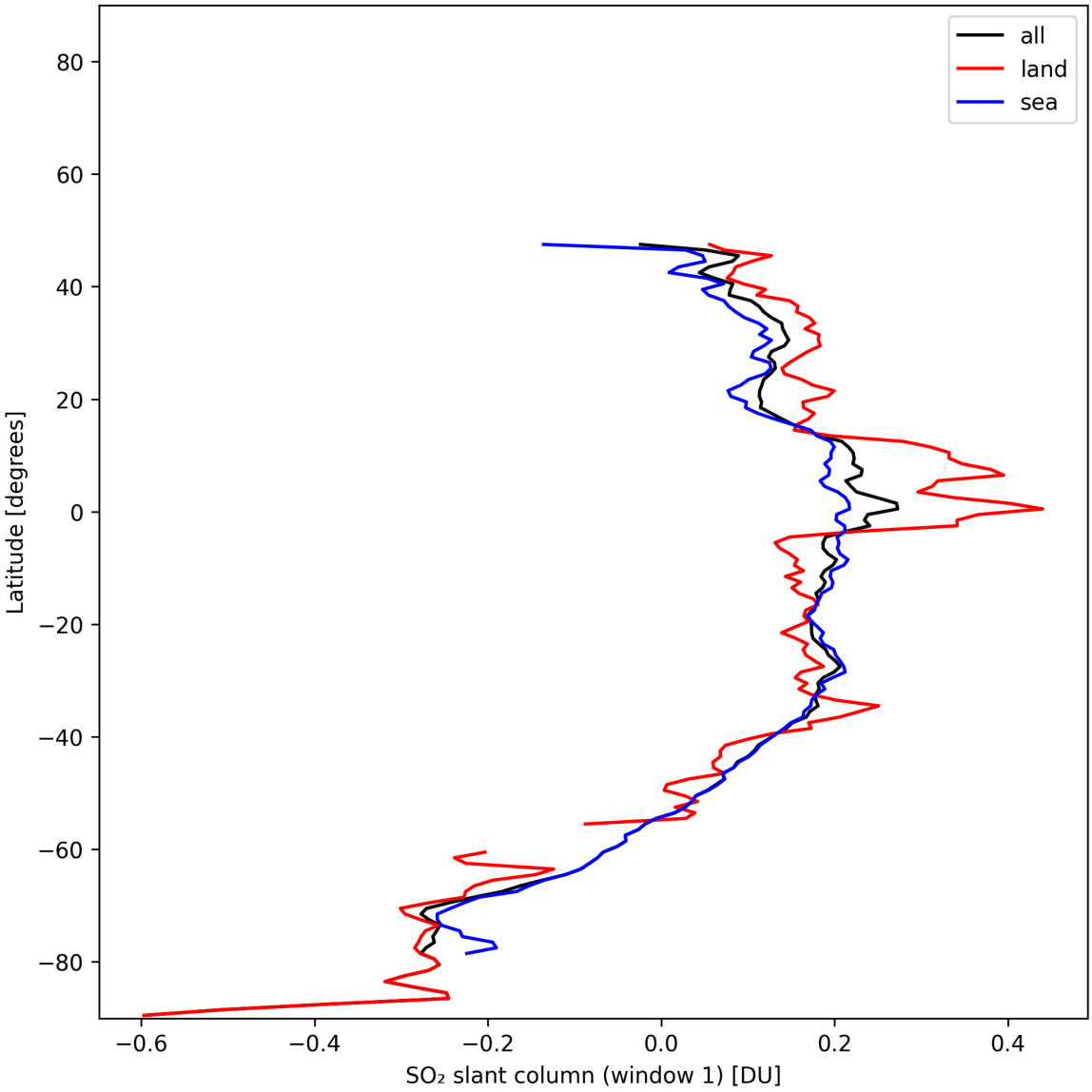

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2024-12-07 to 2024-12-08.

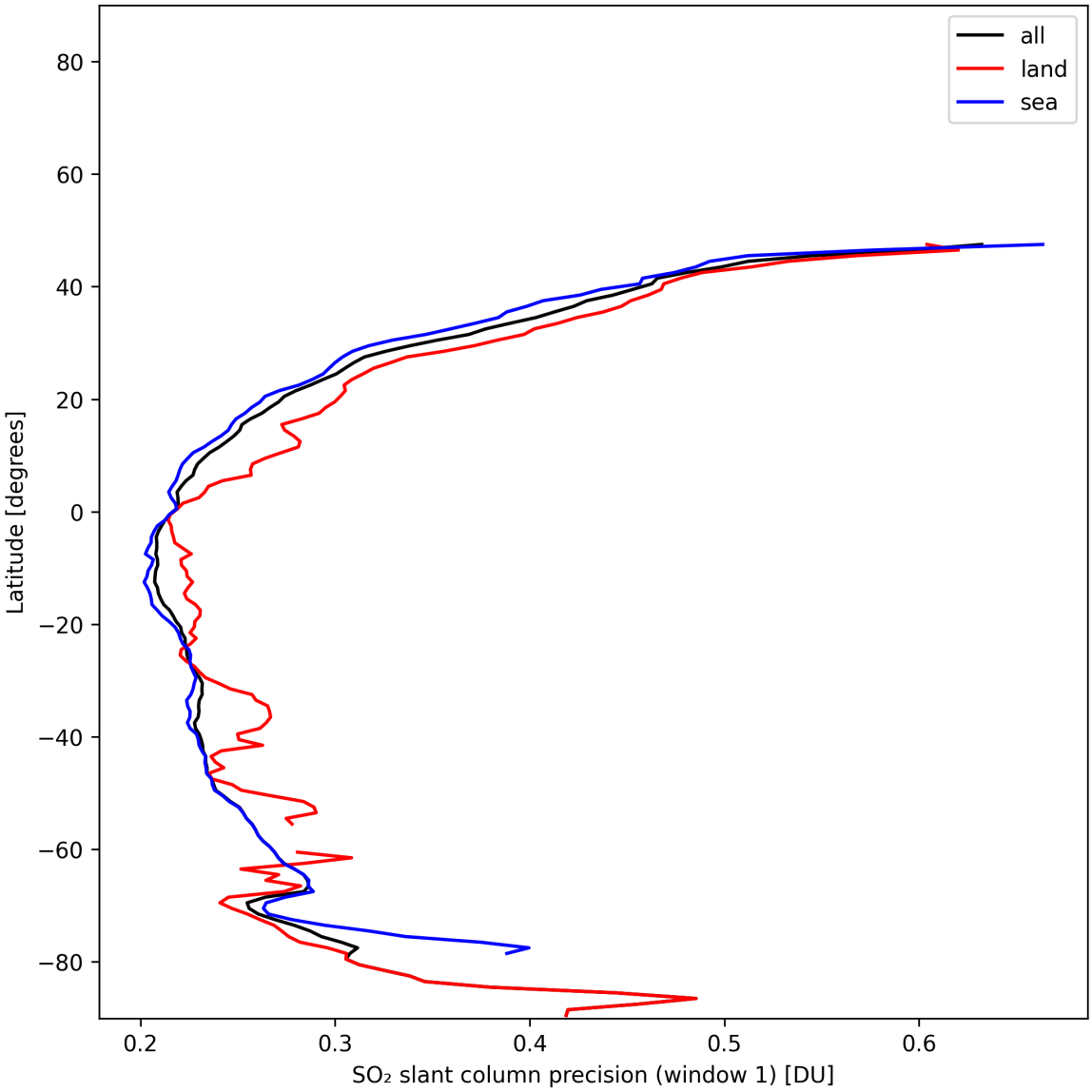

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2024-12-07 to 2024-12-08.

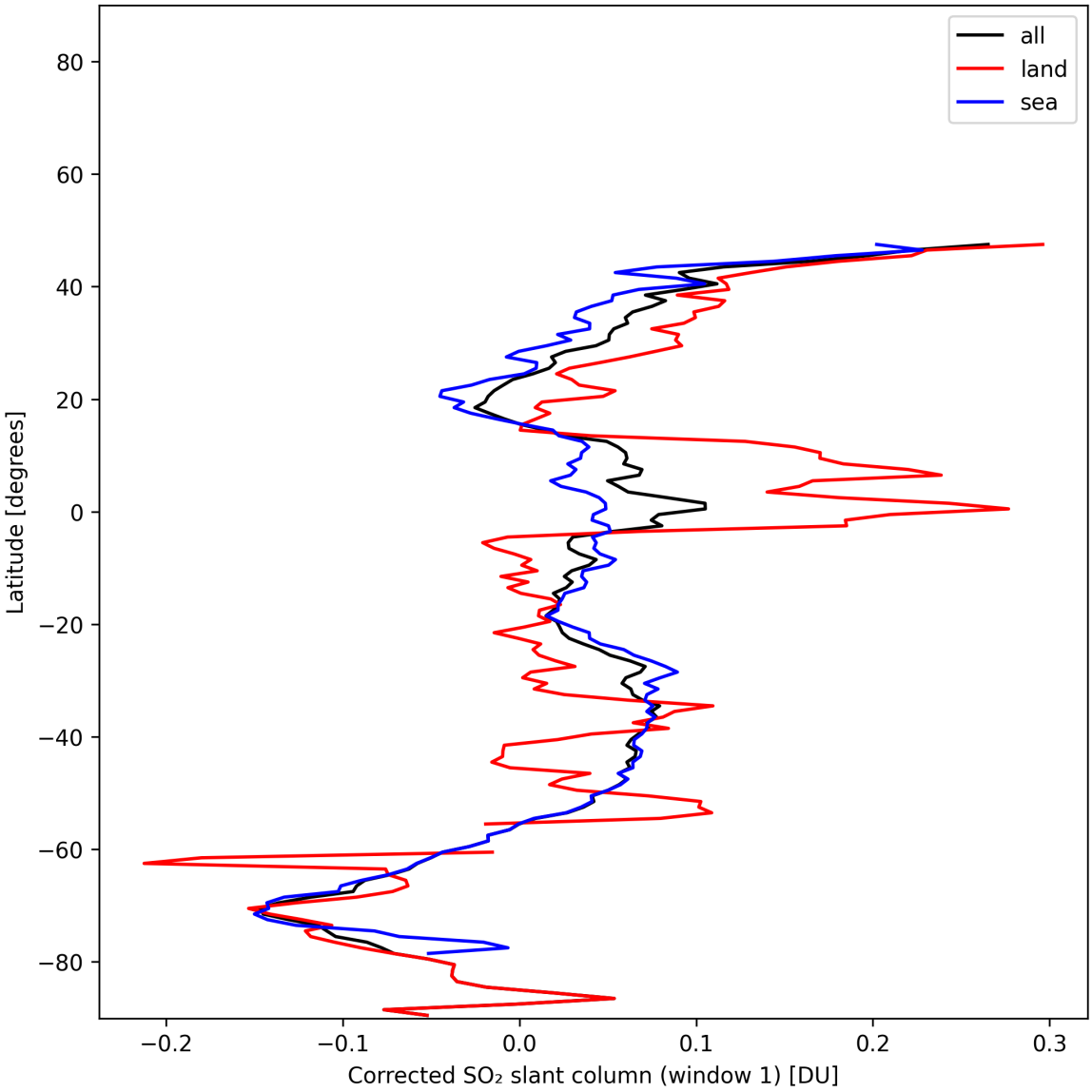

Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2024-12-07 to 2024-12-08.

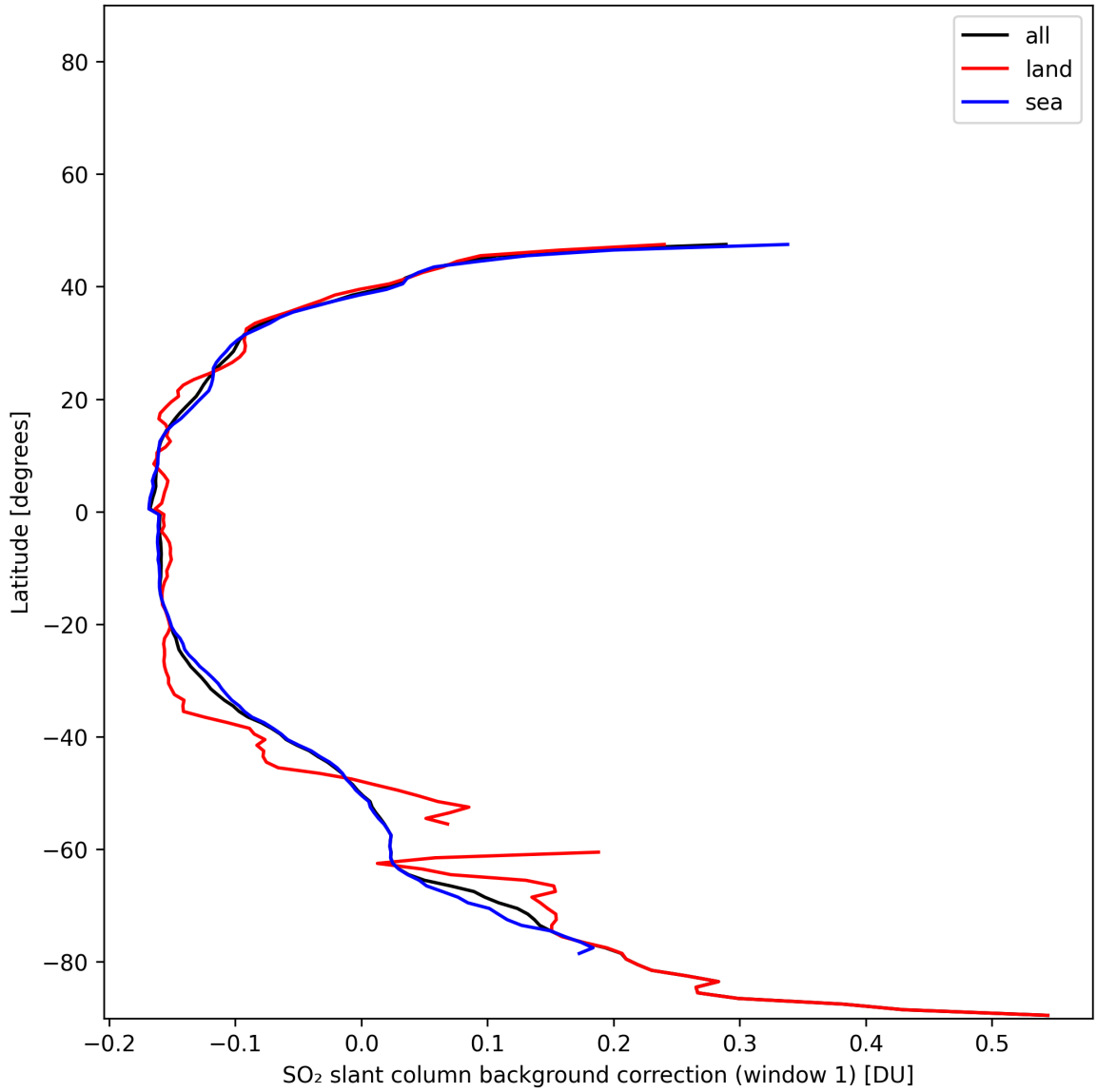

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2024-12-07 to 2024-12-08.

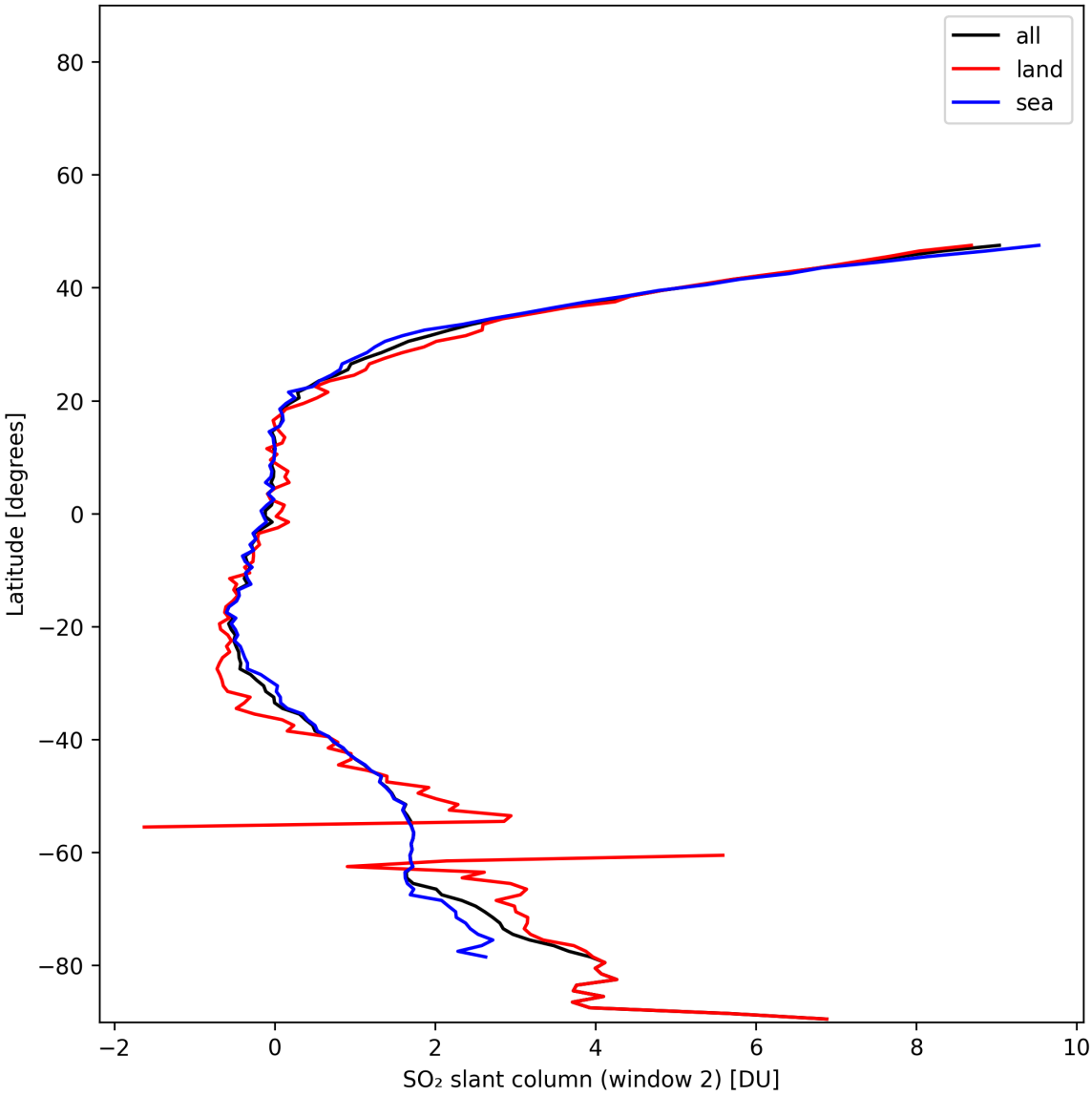

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2024-12-07 to 2024-12-08.

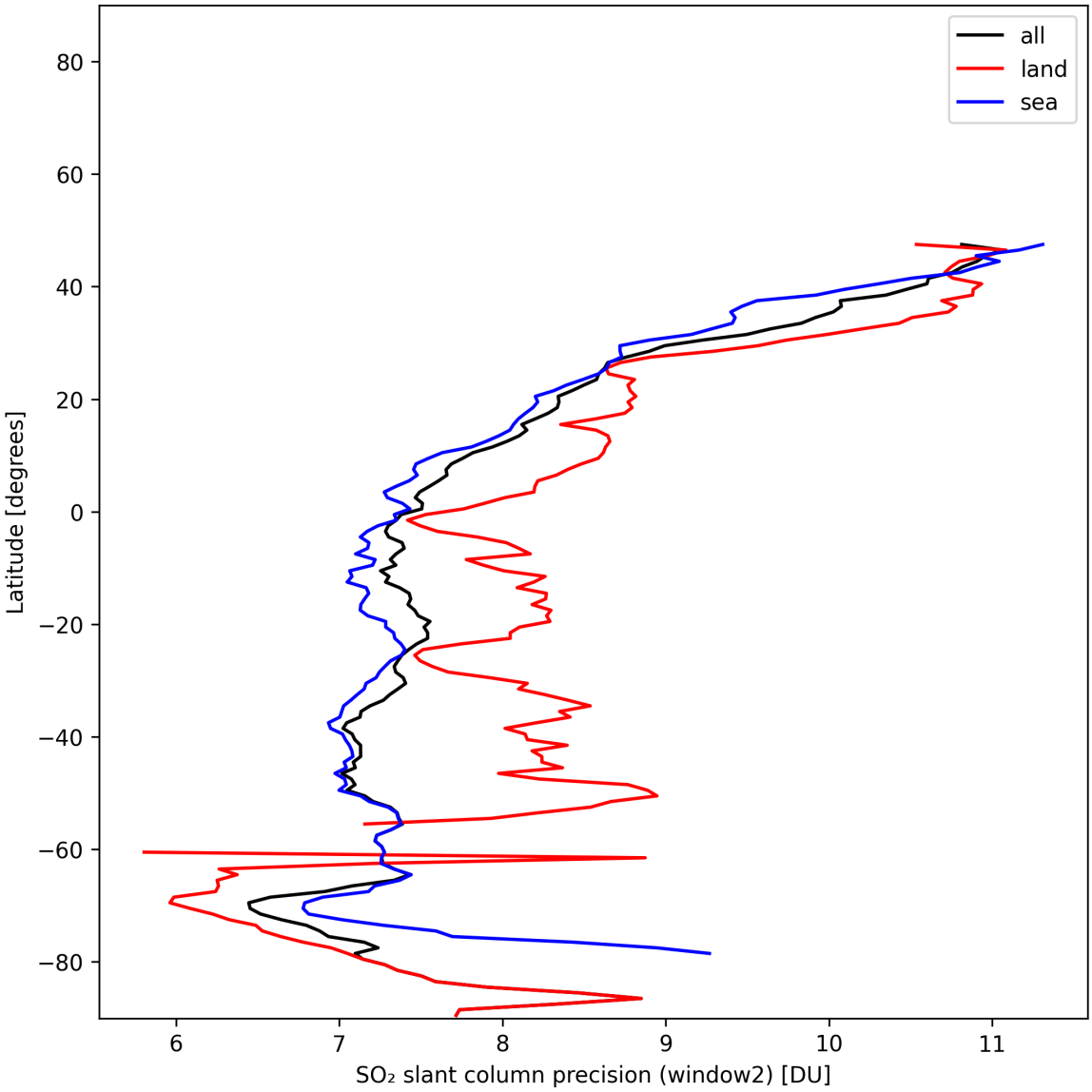

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2024-12-07 to 2024-12-08.

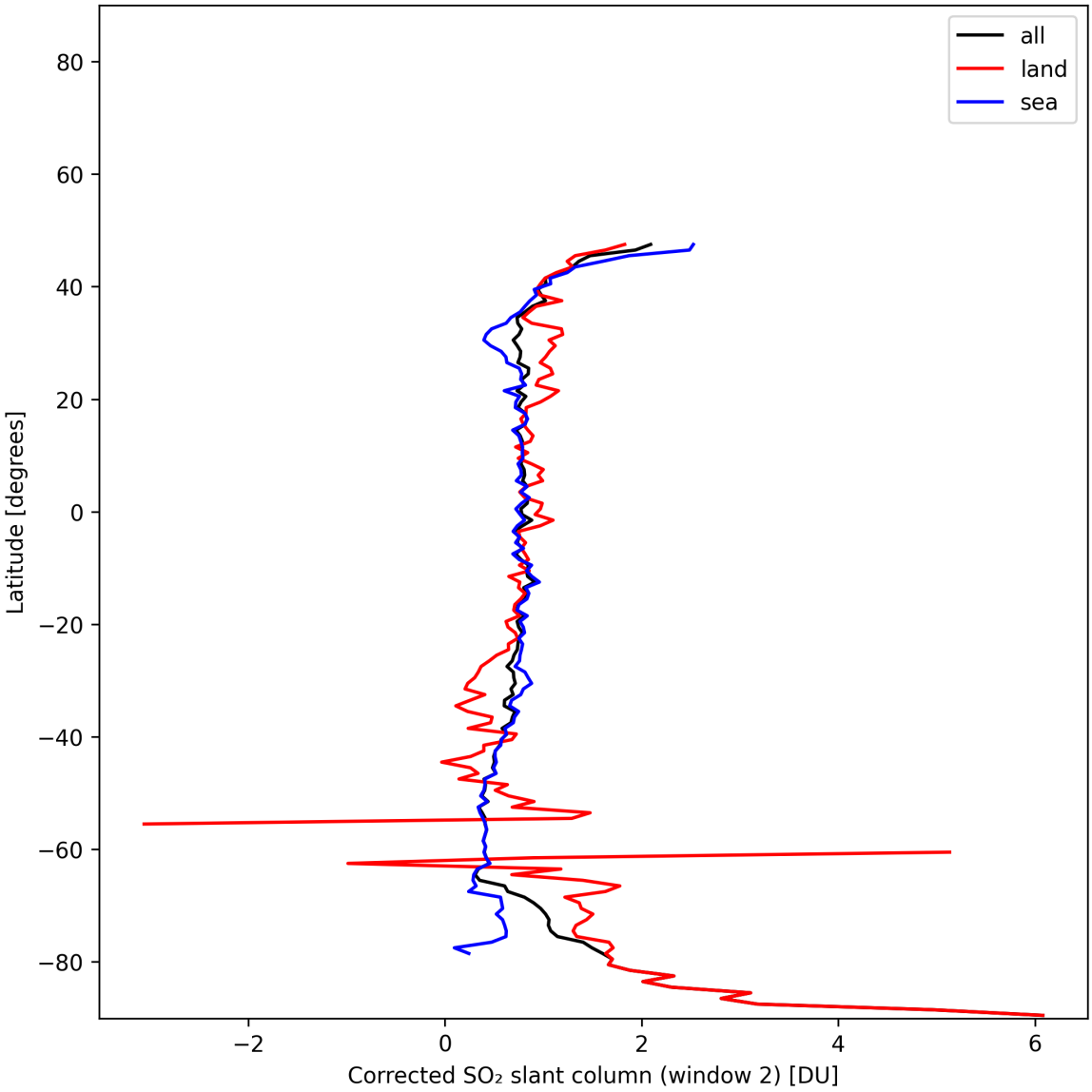

Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2024-12-07 to 2024-12-08.

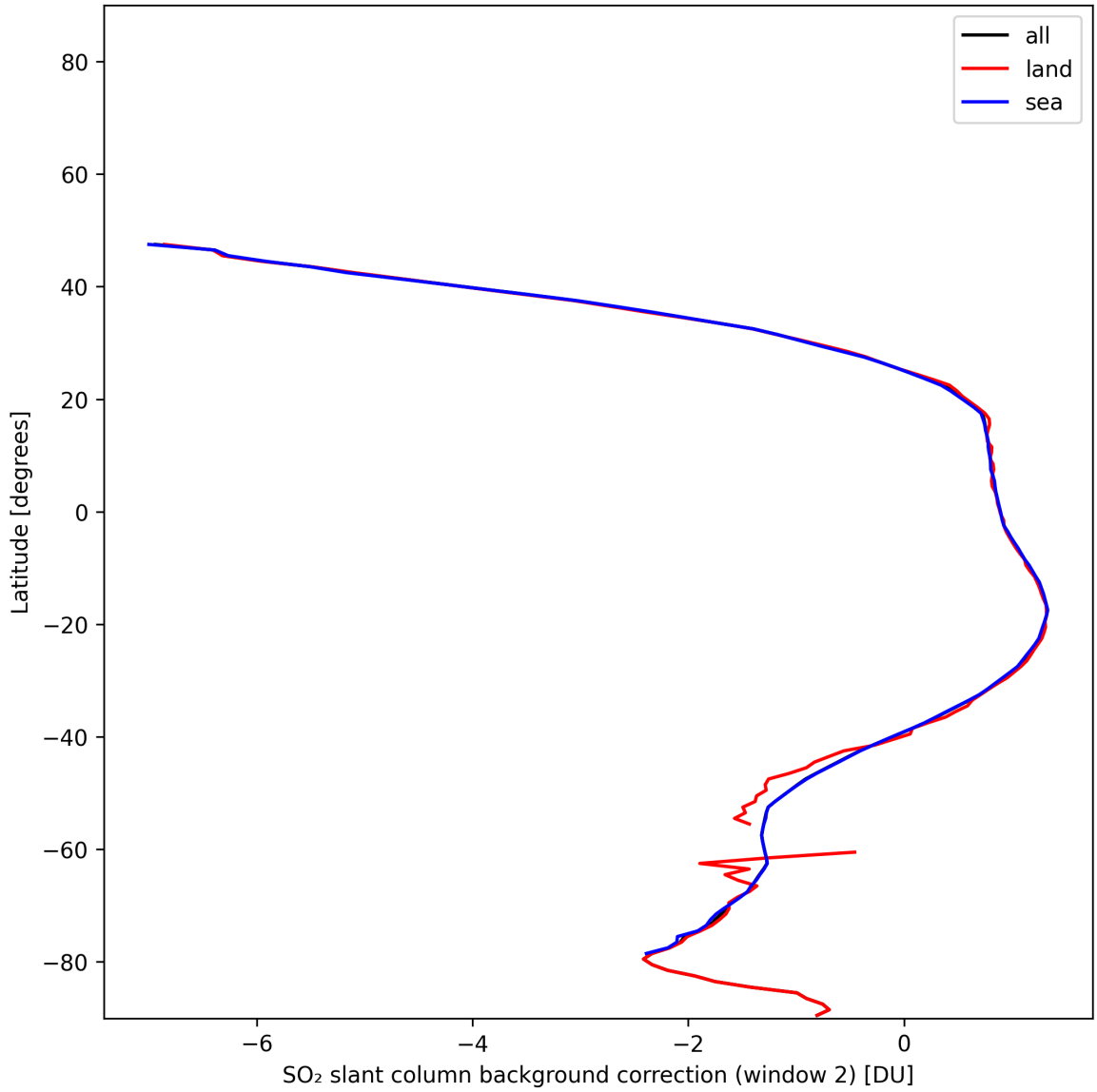

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2024-12-07 to 2024-12-08.

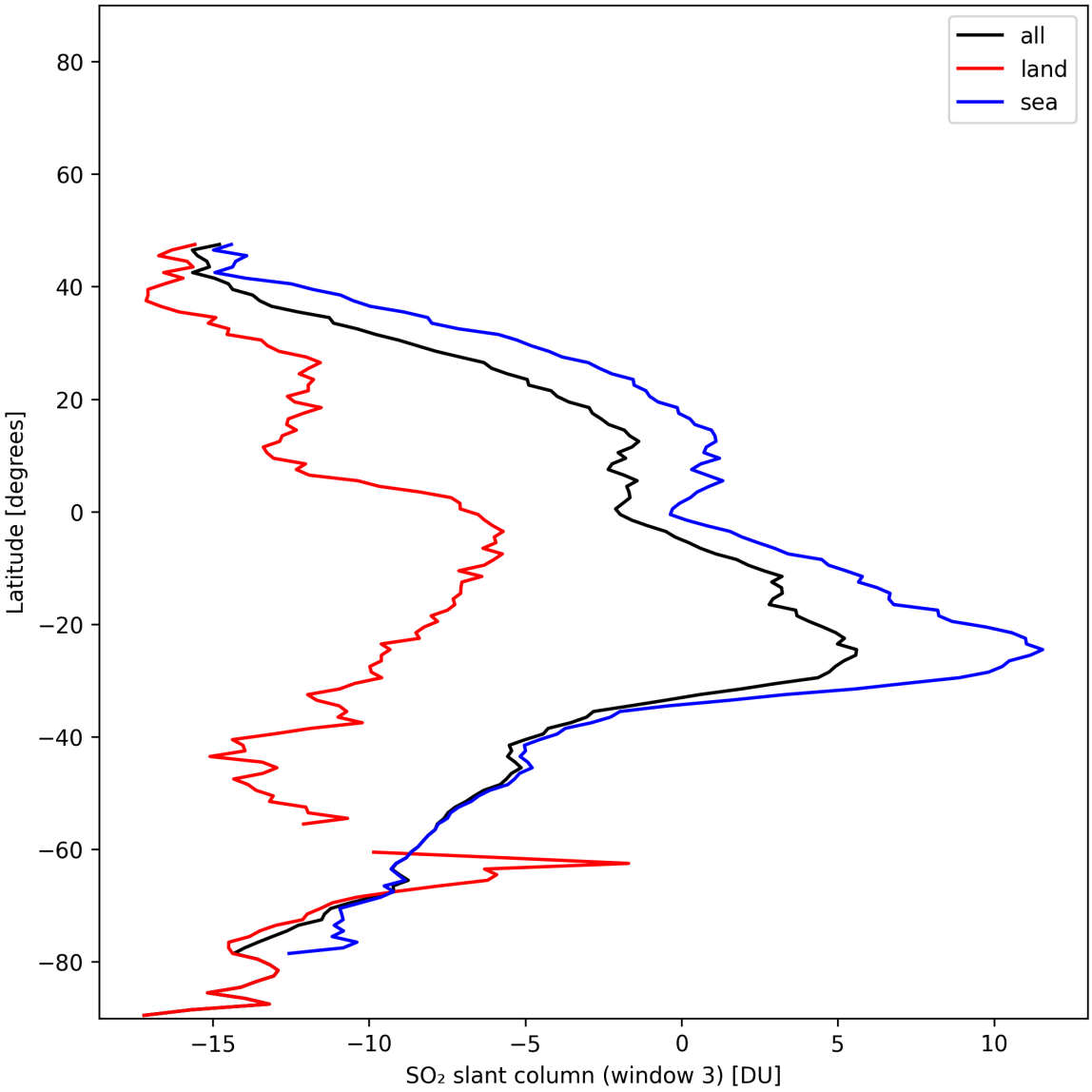

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2024-12-07 to 2024-12-08.

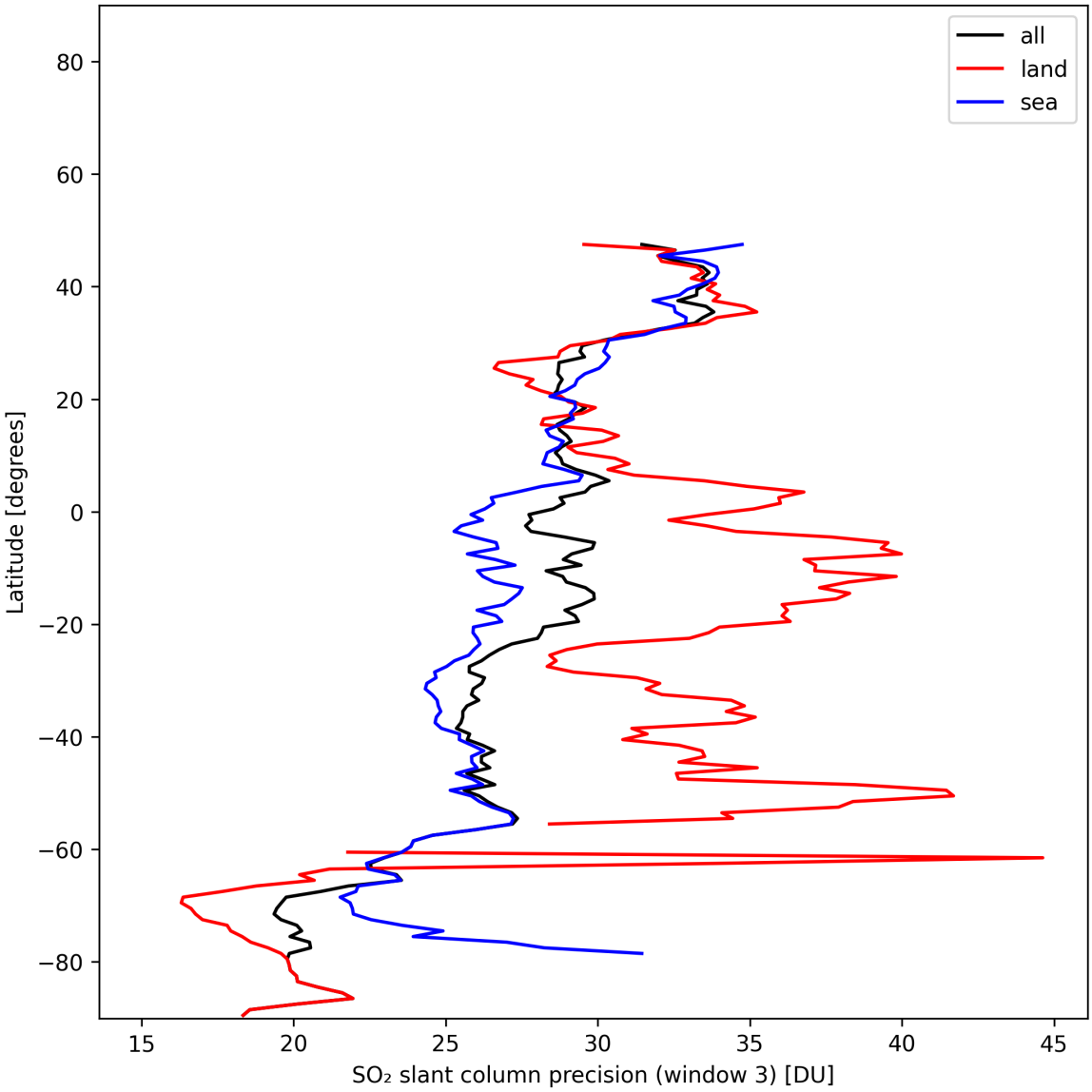

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2024-12-07 to 2024-12-08.

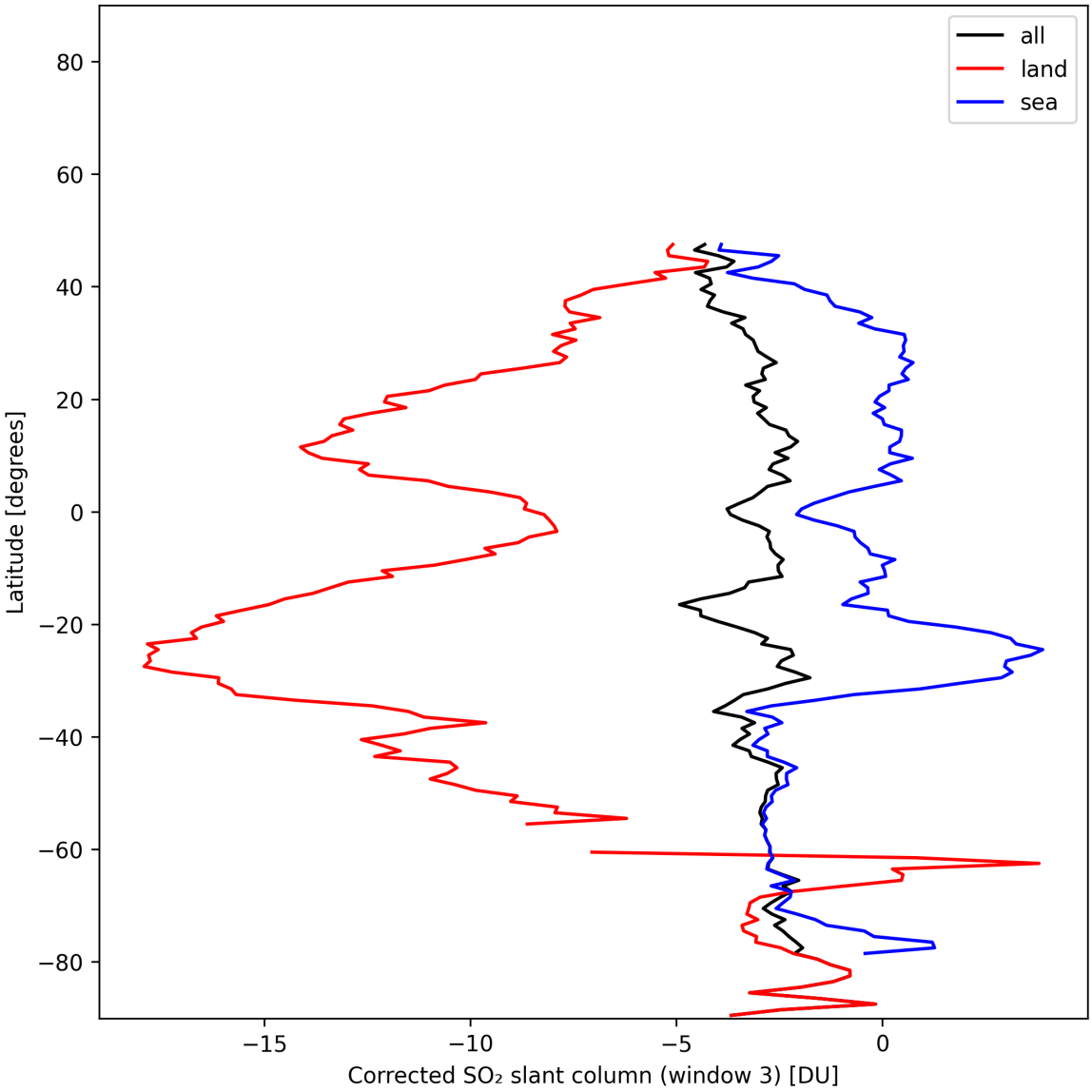

Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2024-12-07 to 2024-12-08.

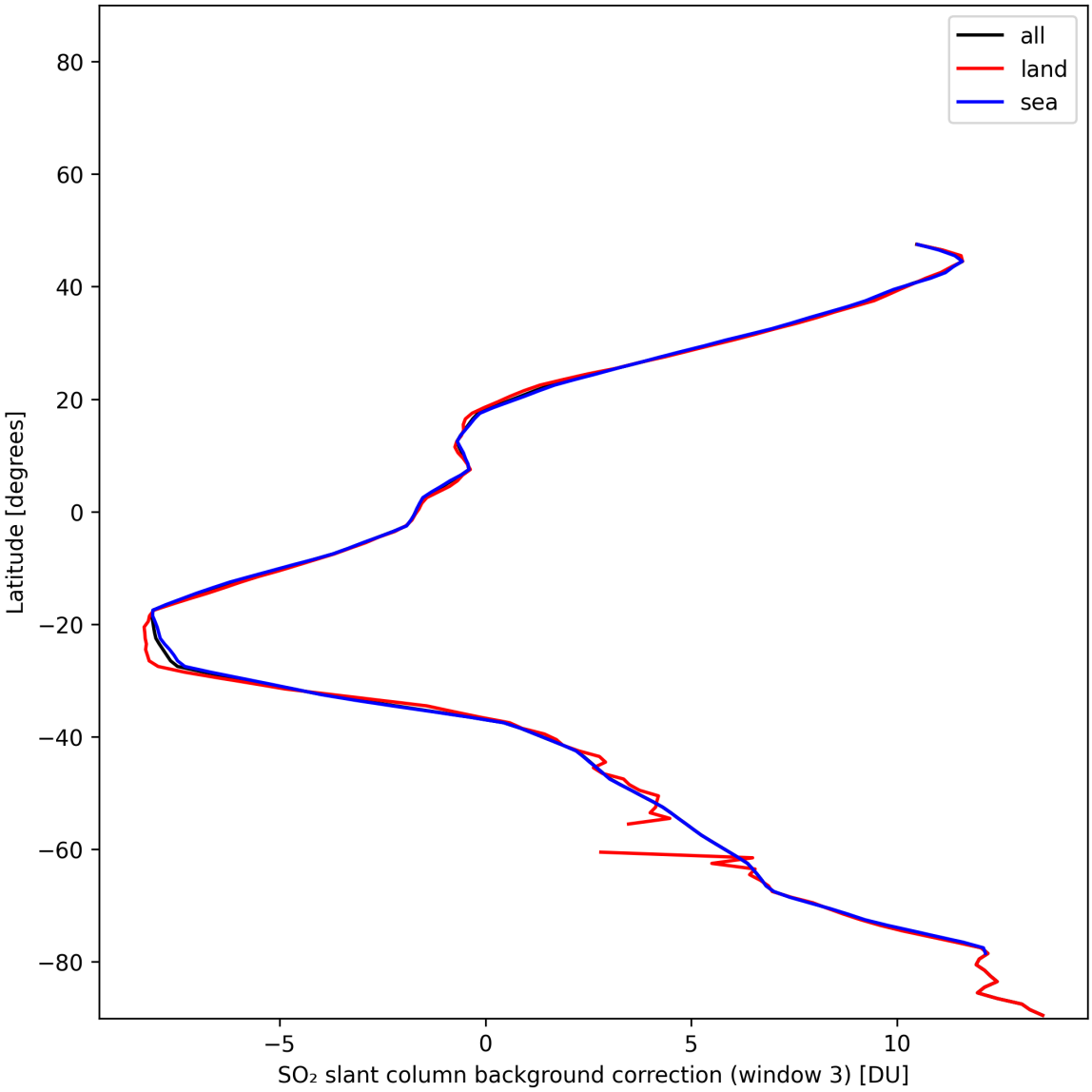

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2024-12-07 to 2024-12-08.

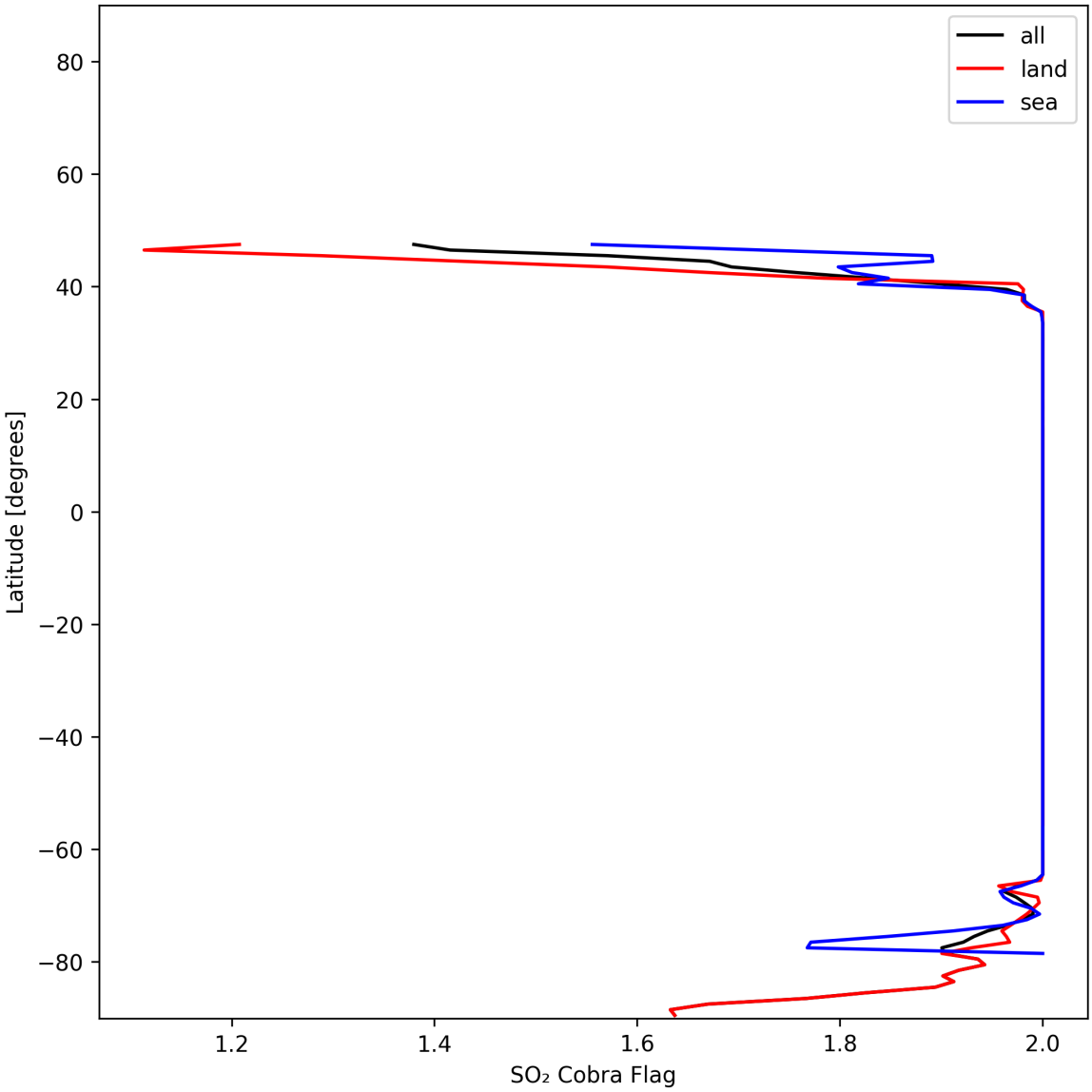

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2024-12-07 to 2024-12-08.

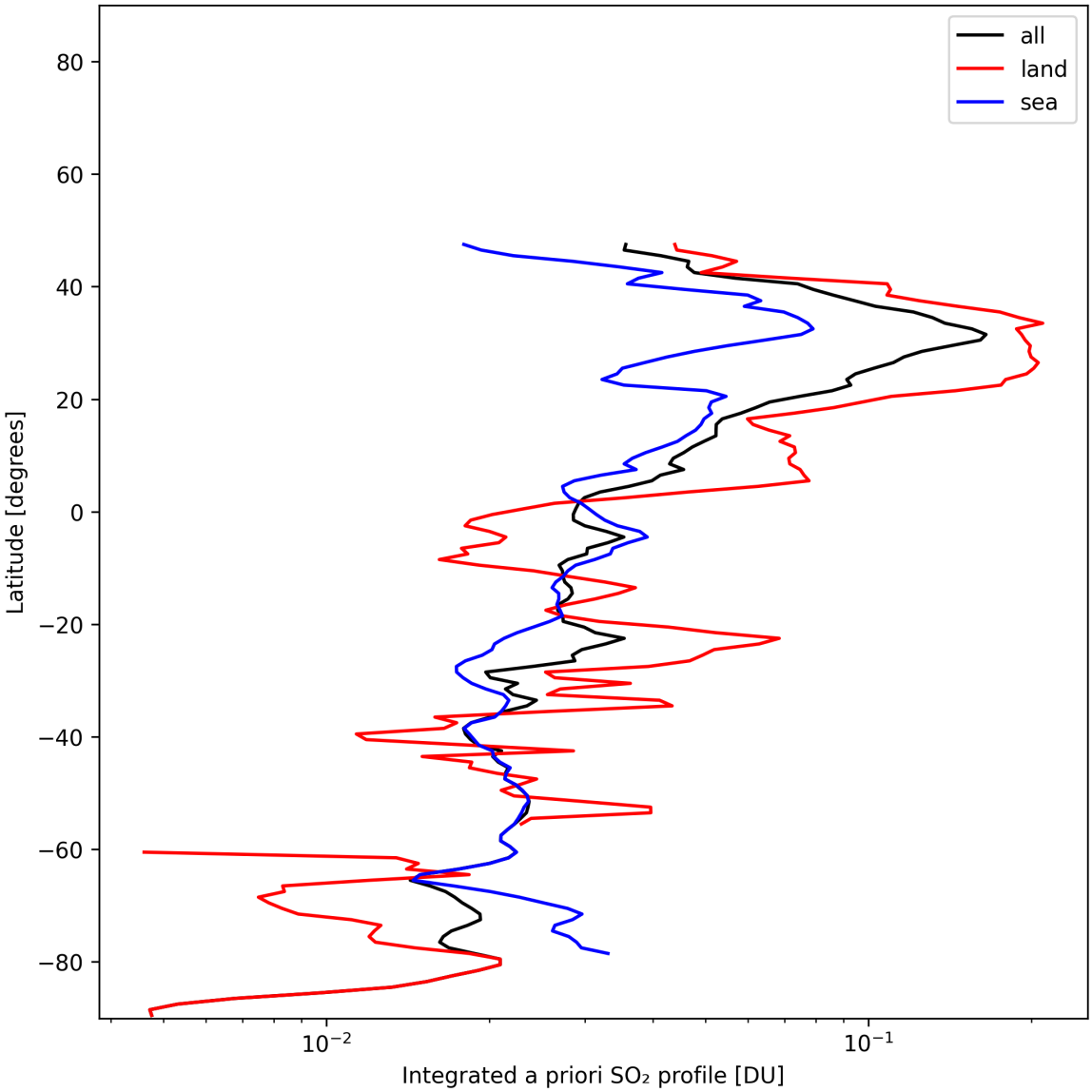

Figure 49: Zonal average of "Integrated a priori SO_2 profile" for 2024-12-07 to 2024-12-08.

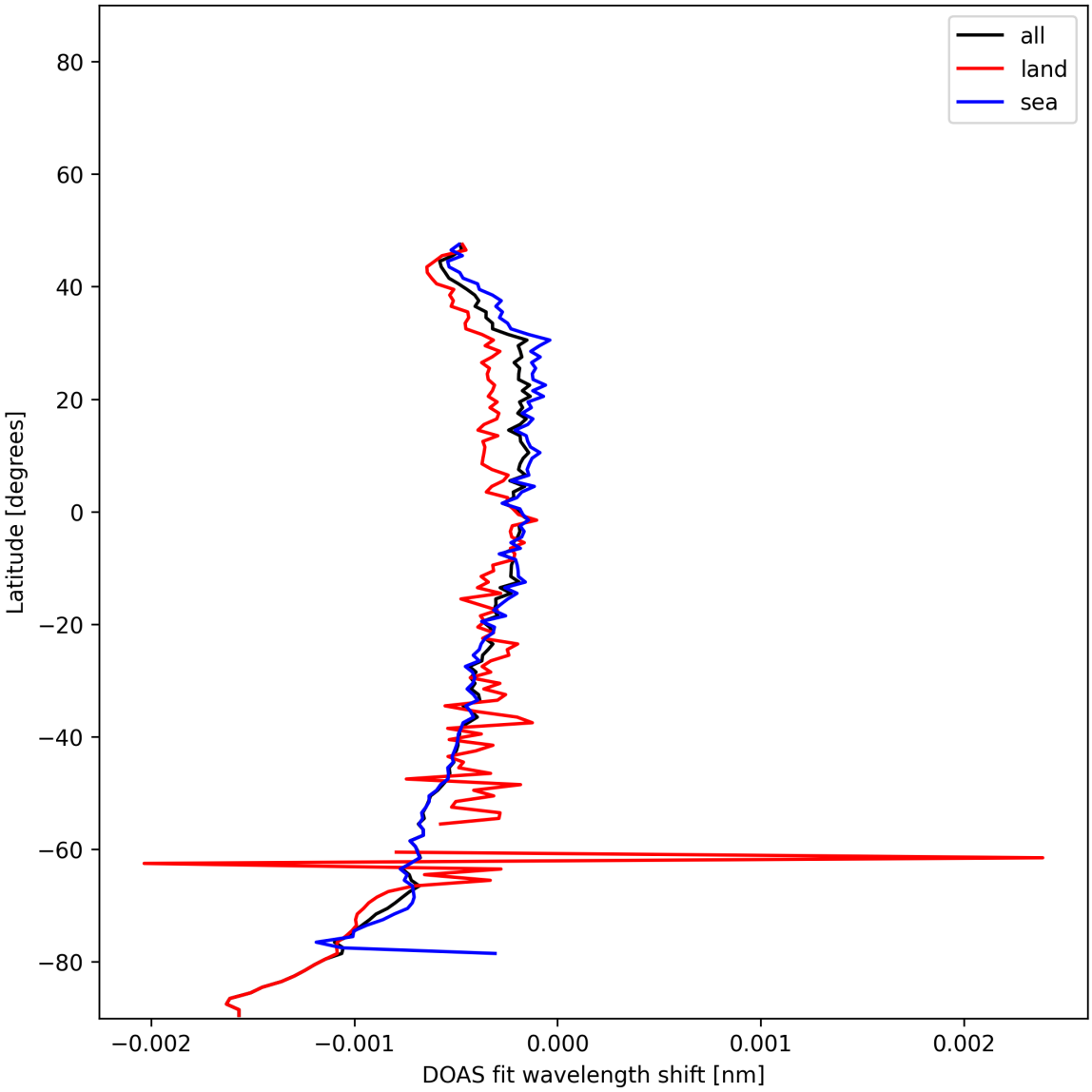

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2024-12-07 to 2024-12-08.

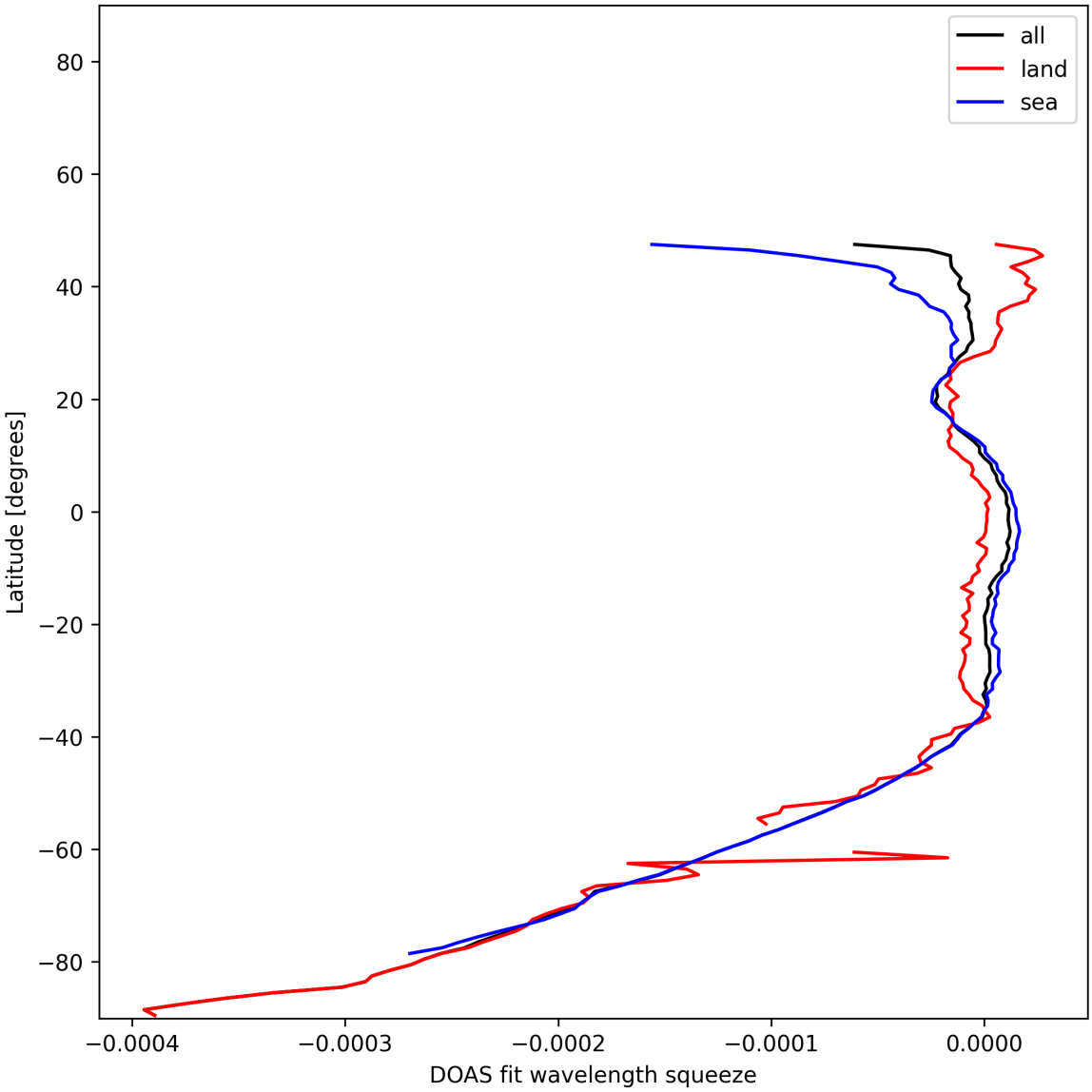

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2024-12-07 to 2024-12-08.

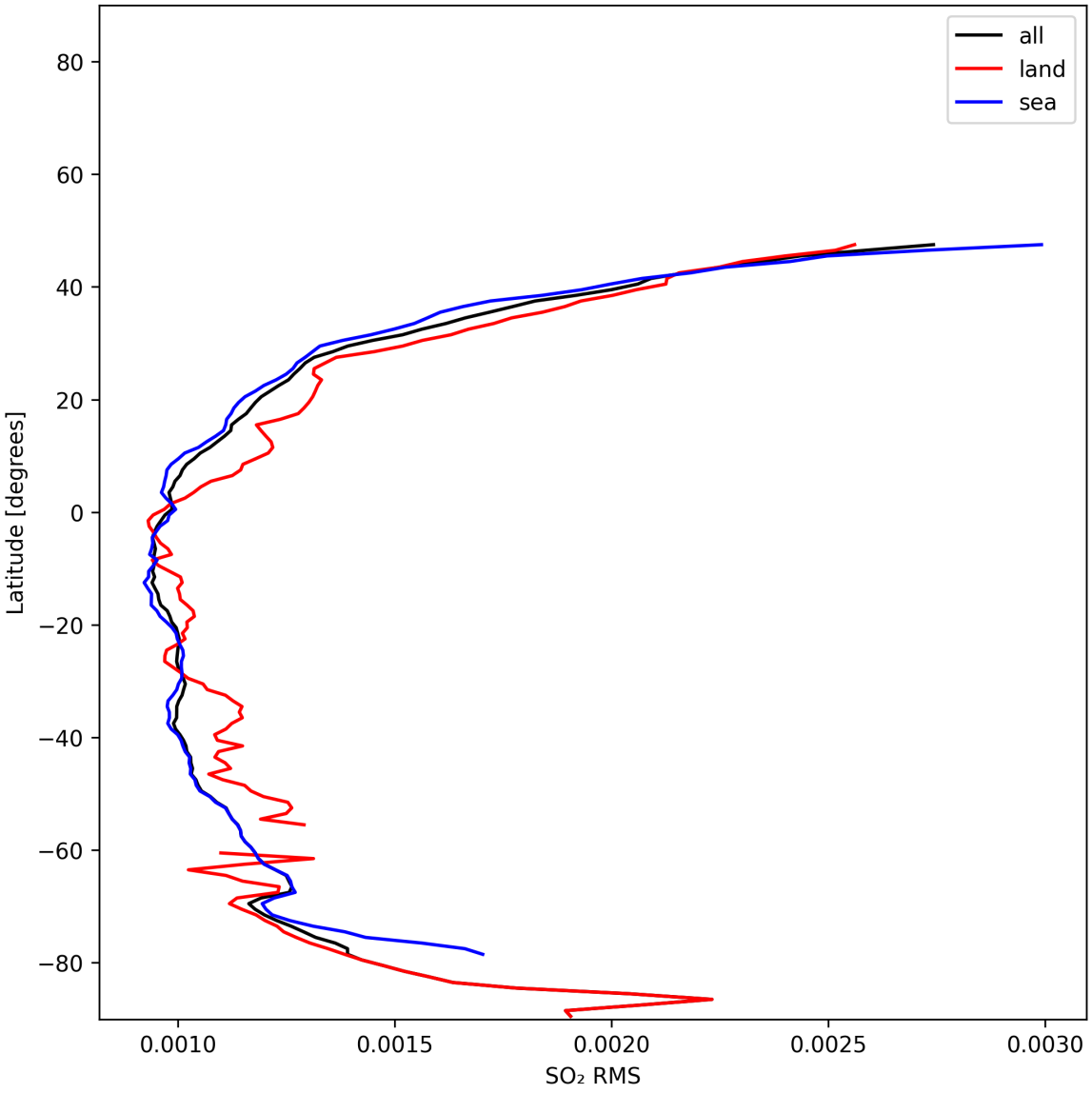

Figure 52: Zonal average of "SO_2 RMS" for 2024-12-07 to 2024-12-08.

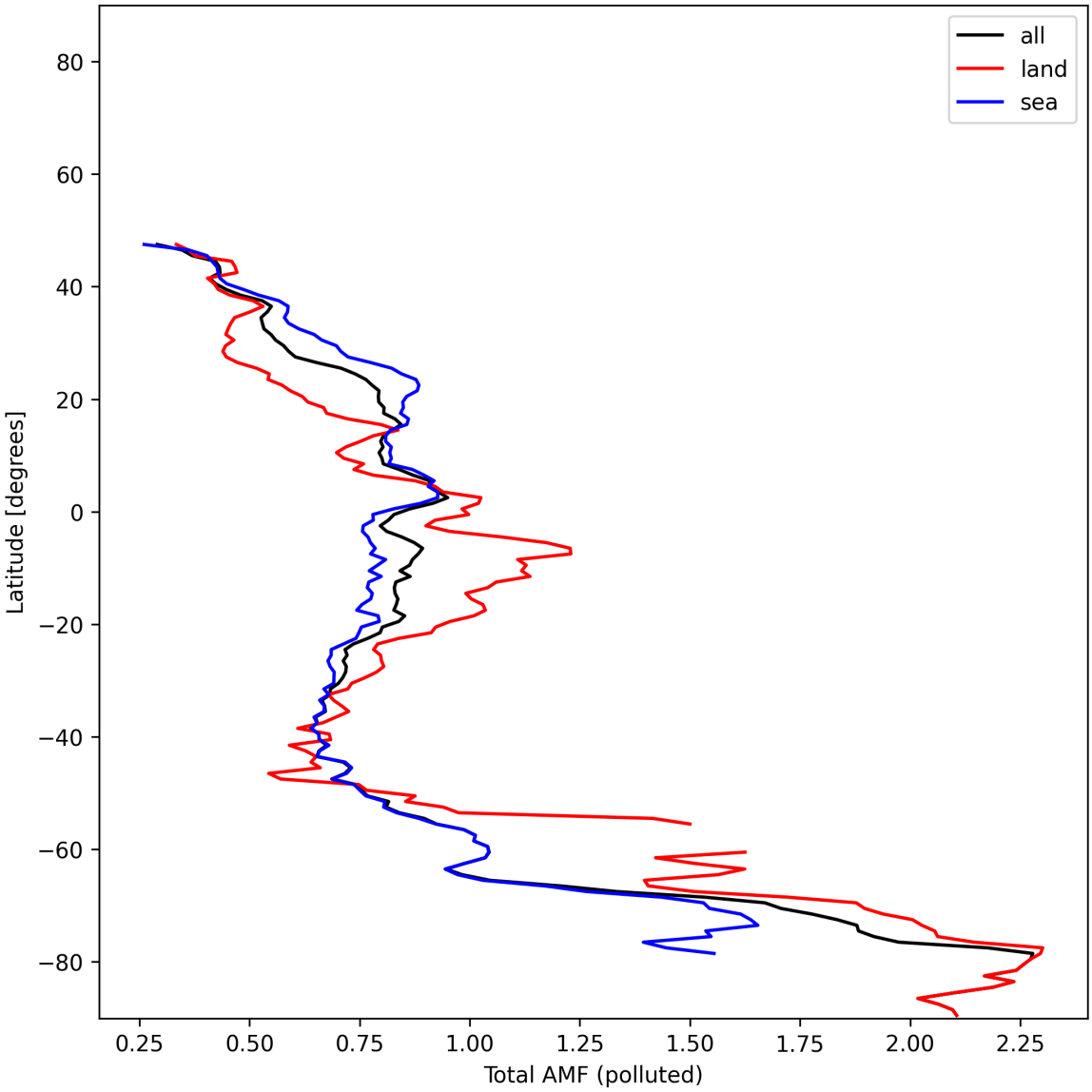

Figure 53: Zonal average of “Total AMF (polluted)” for 2024-12-07 to 2024-12-08.

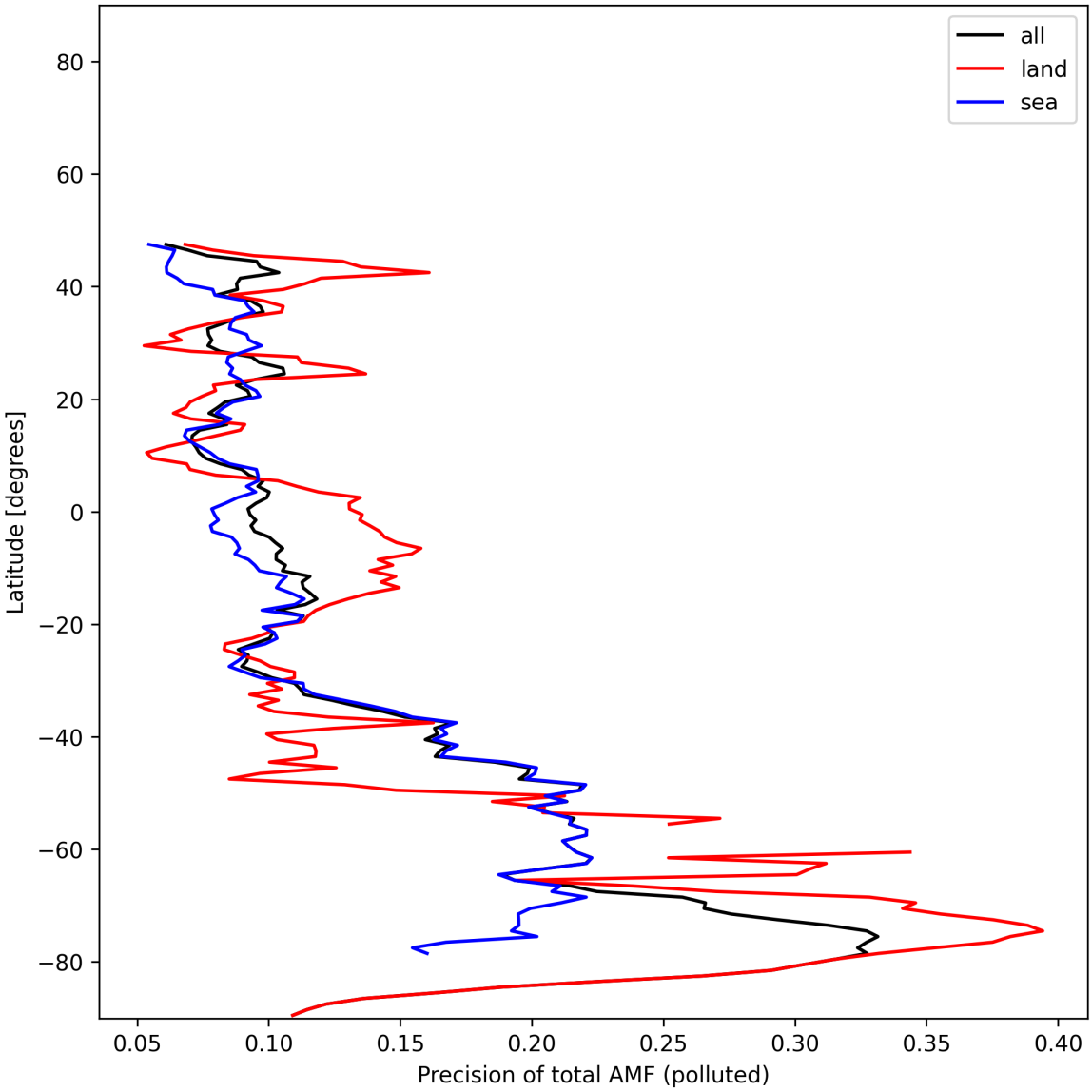

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2024-12-07 to 2024-12-08.

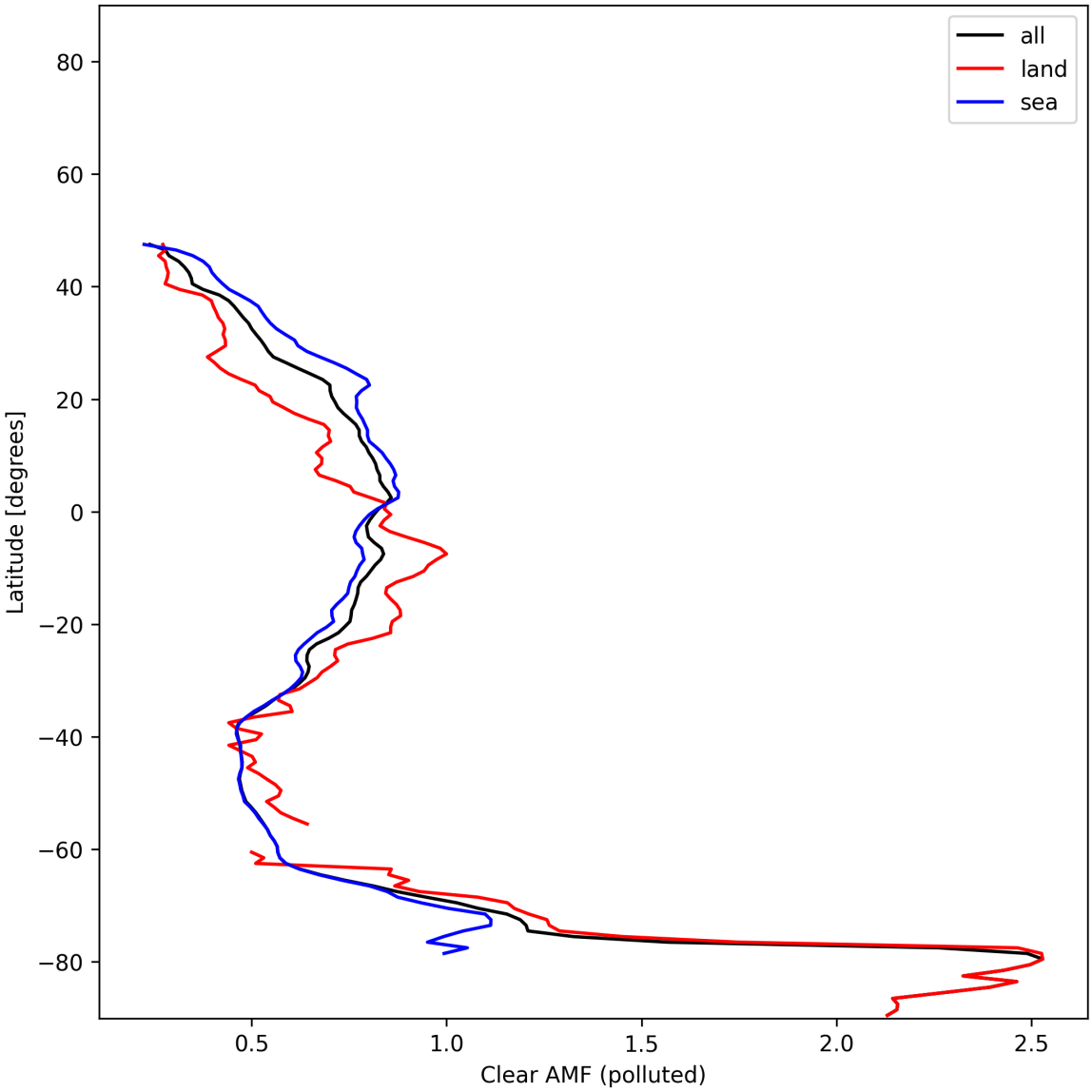

Figure 55: Zonal average of “Clear AMF (polluted)” for 2024-12-07 to 2024-12-08.

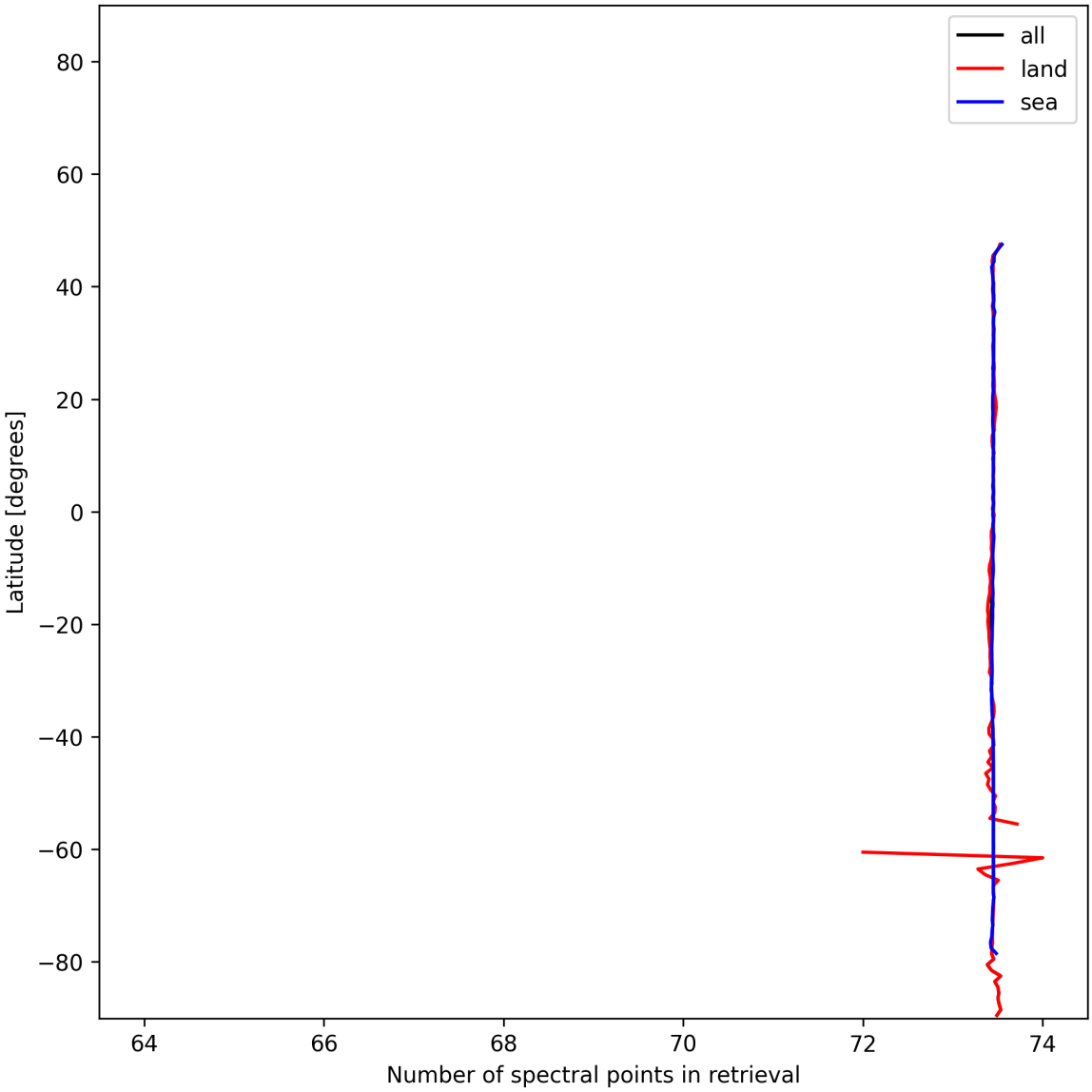

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2024-12-07 to 2024-12-08.

8 Histograms

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

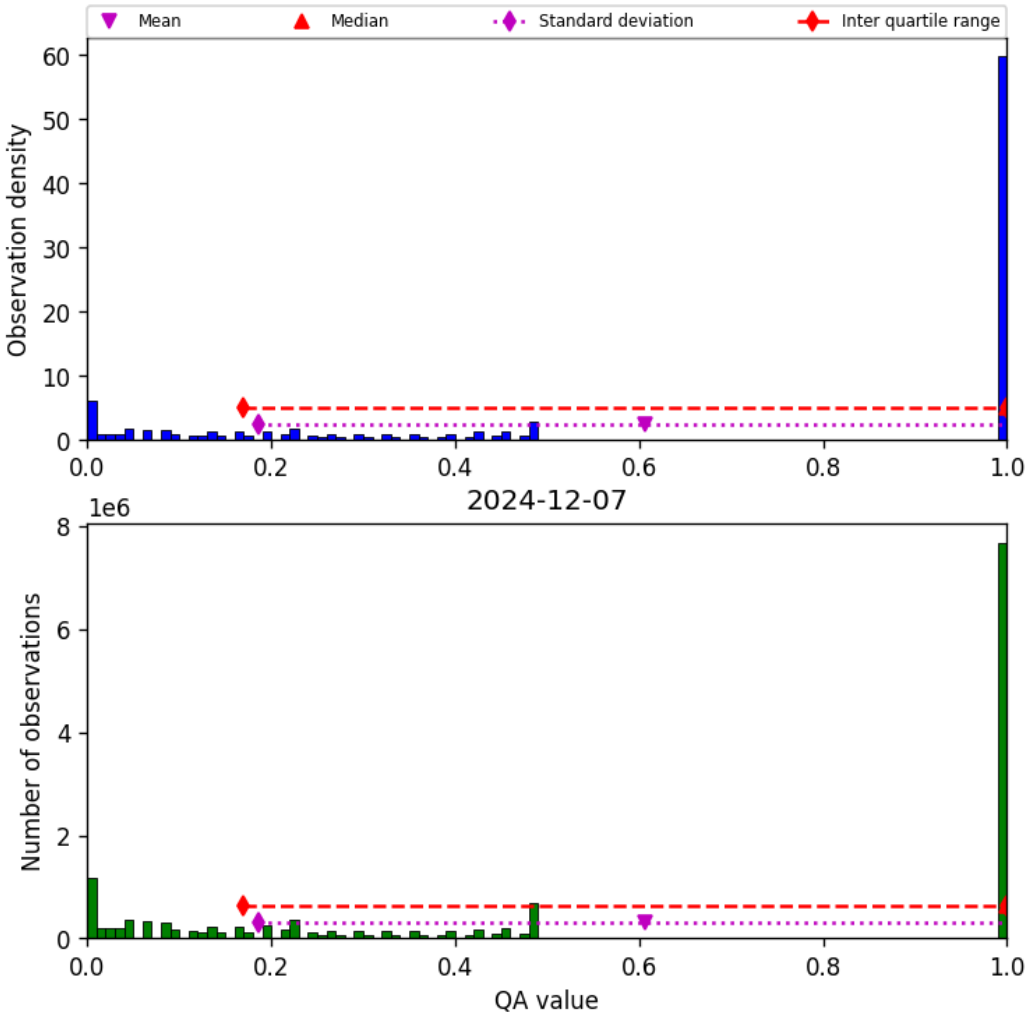

Figure 57: Histogram of “QA value” for 2024-12-07 to 2024-12-08

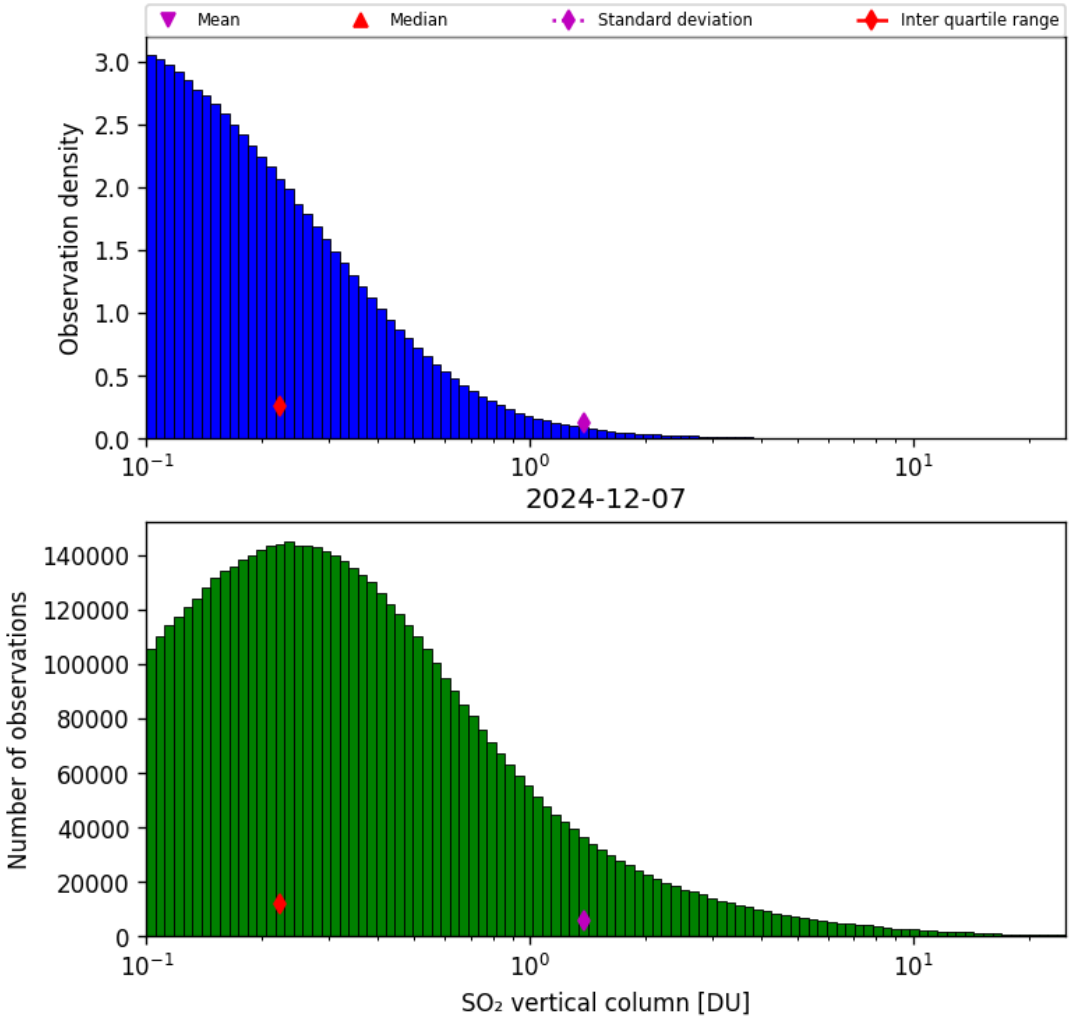

Figure 58: Histogram of "SO_2 vertical column" for 2024-12-07 to 2024-12-08

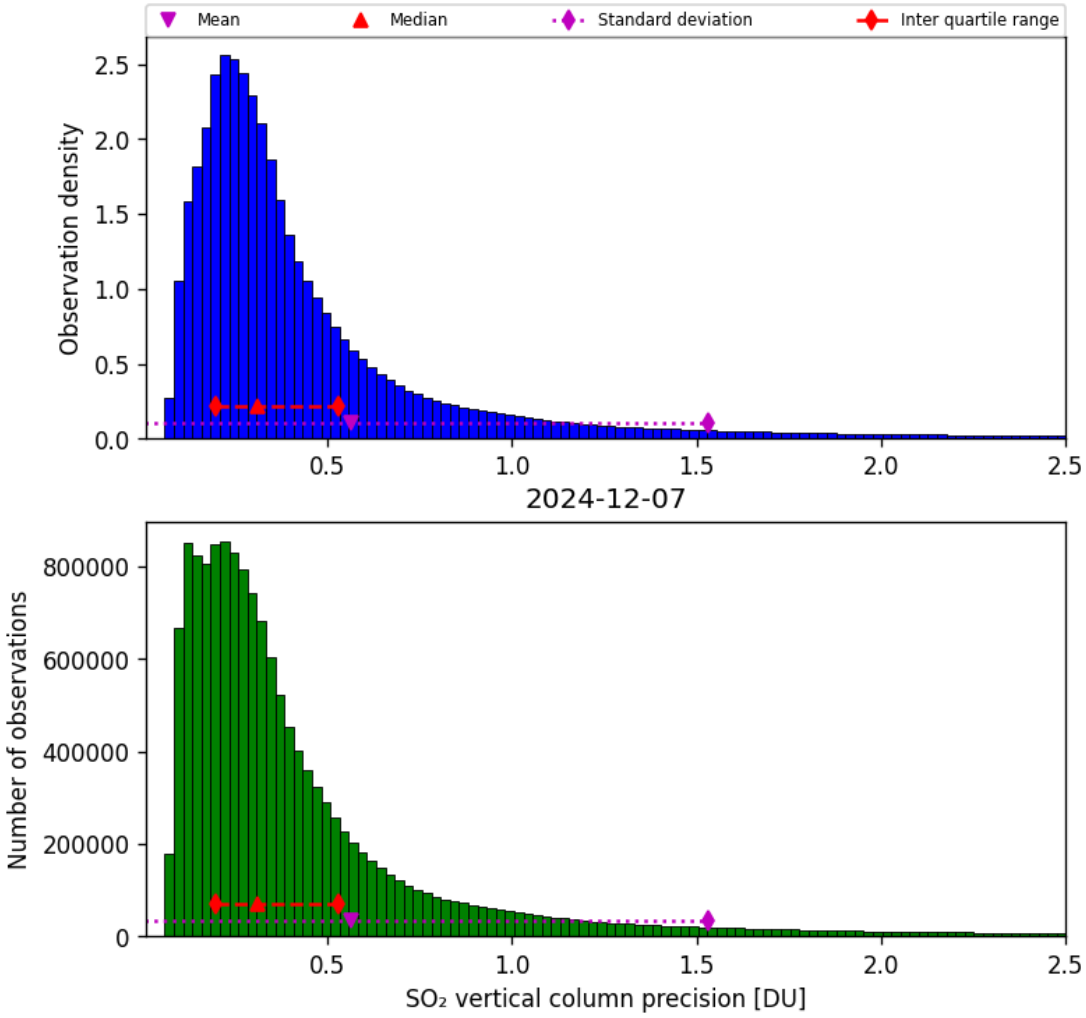

Figure 59: Histogram of "SO_2 vertical column precision" for 2024-12-07 to 2024-12-08

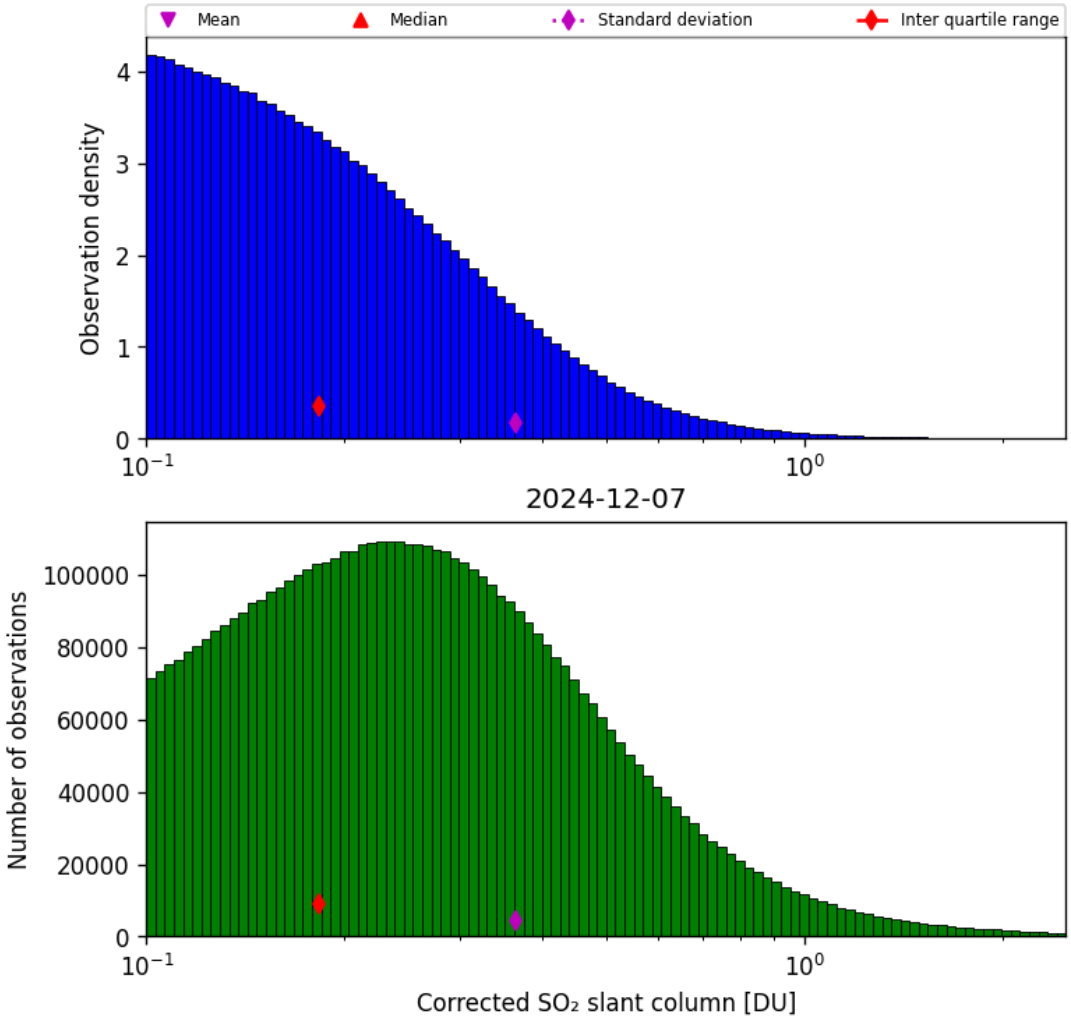

Figure 60: Histogram of "Corrected SO_2 slant column" for 2024-12-07 to 2024-12-08

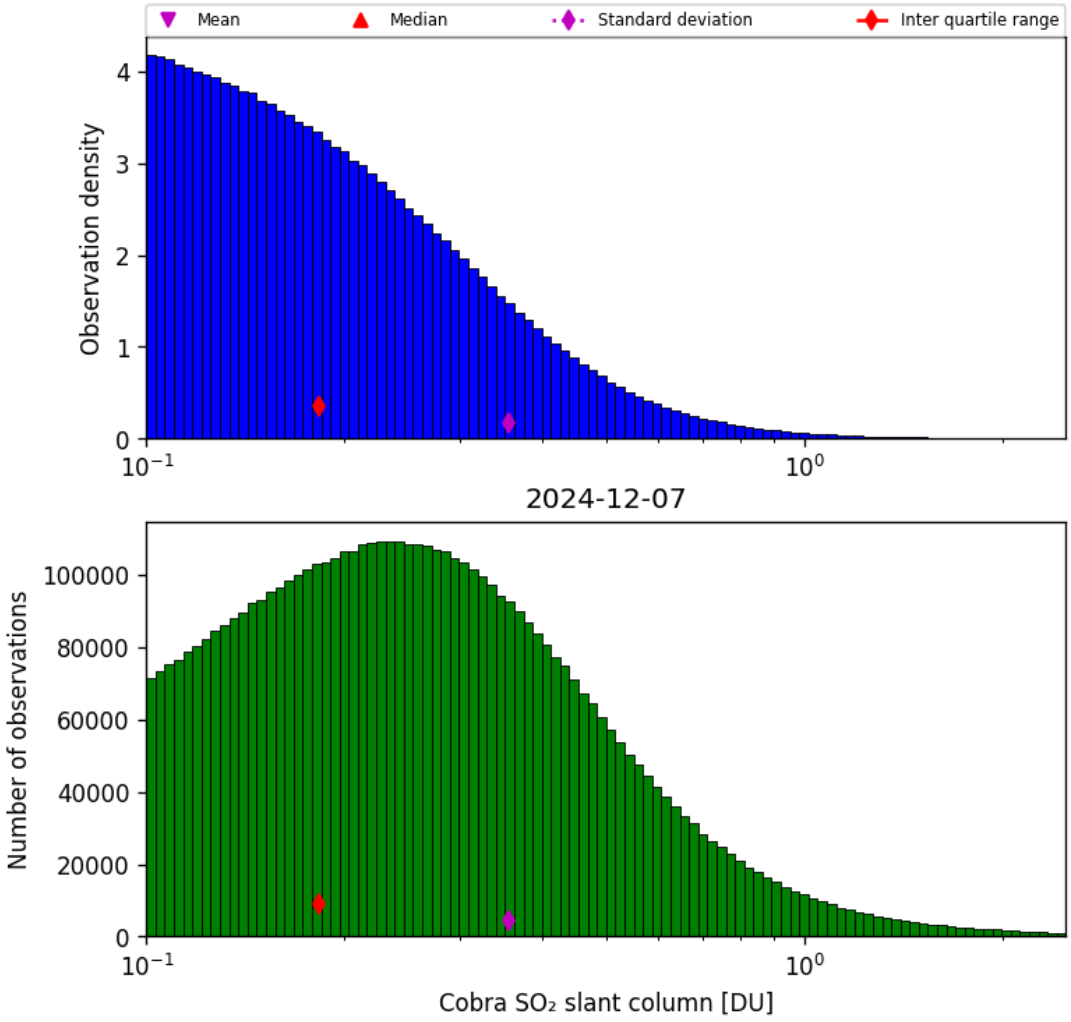

Figure 61: Histogram of "Cobra SO_2 slant column" for 2024-12-07 to 2024-12-08

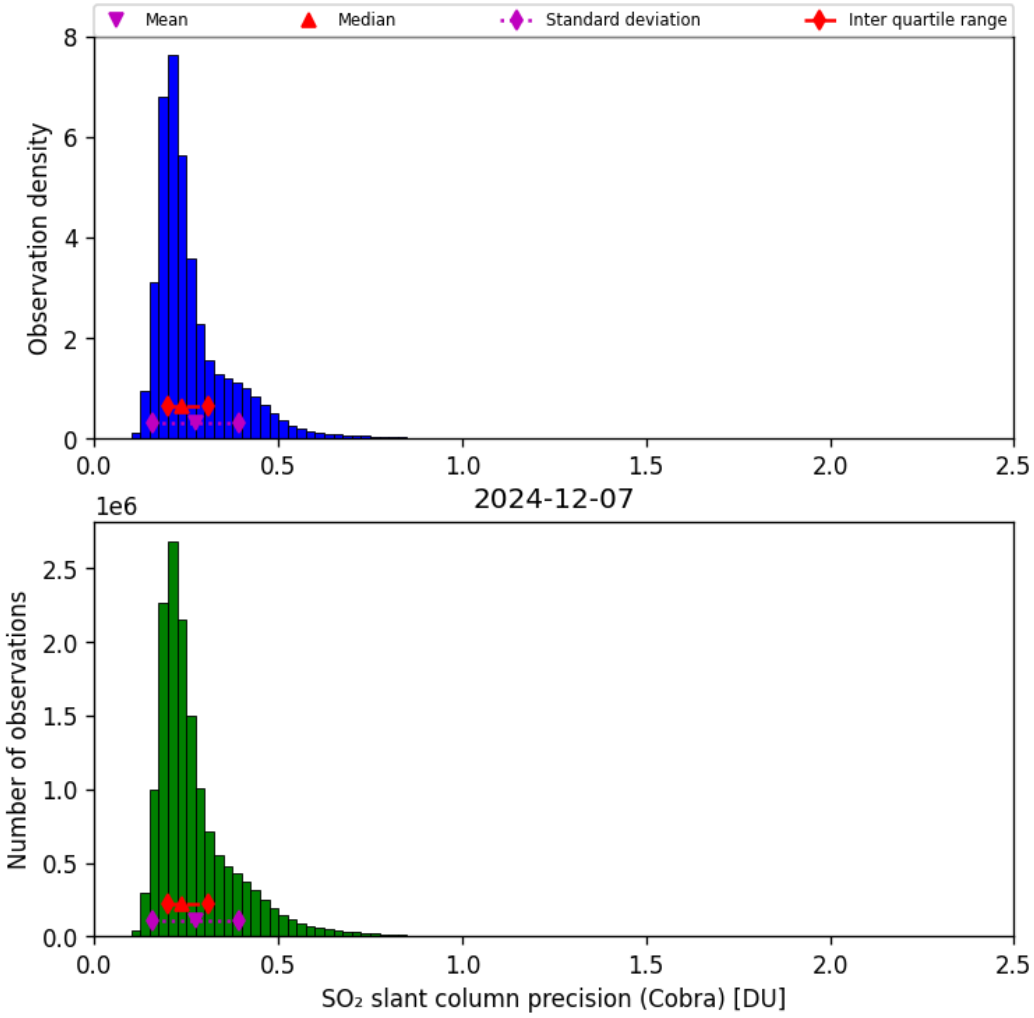

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2024-12-07 to 2024-12-08

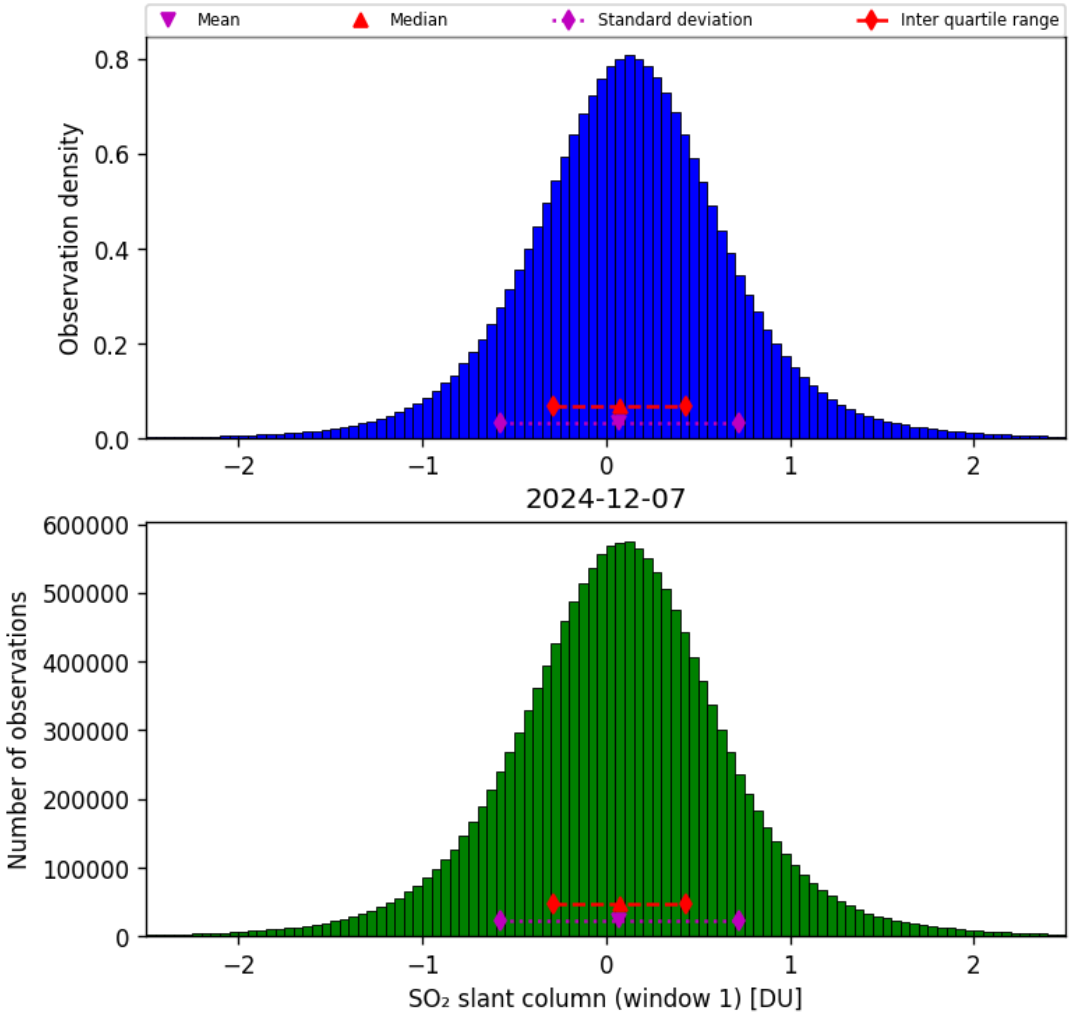

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2024-12-07 to 2024-12-08

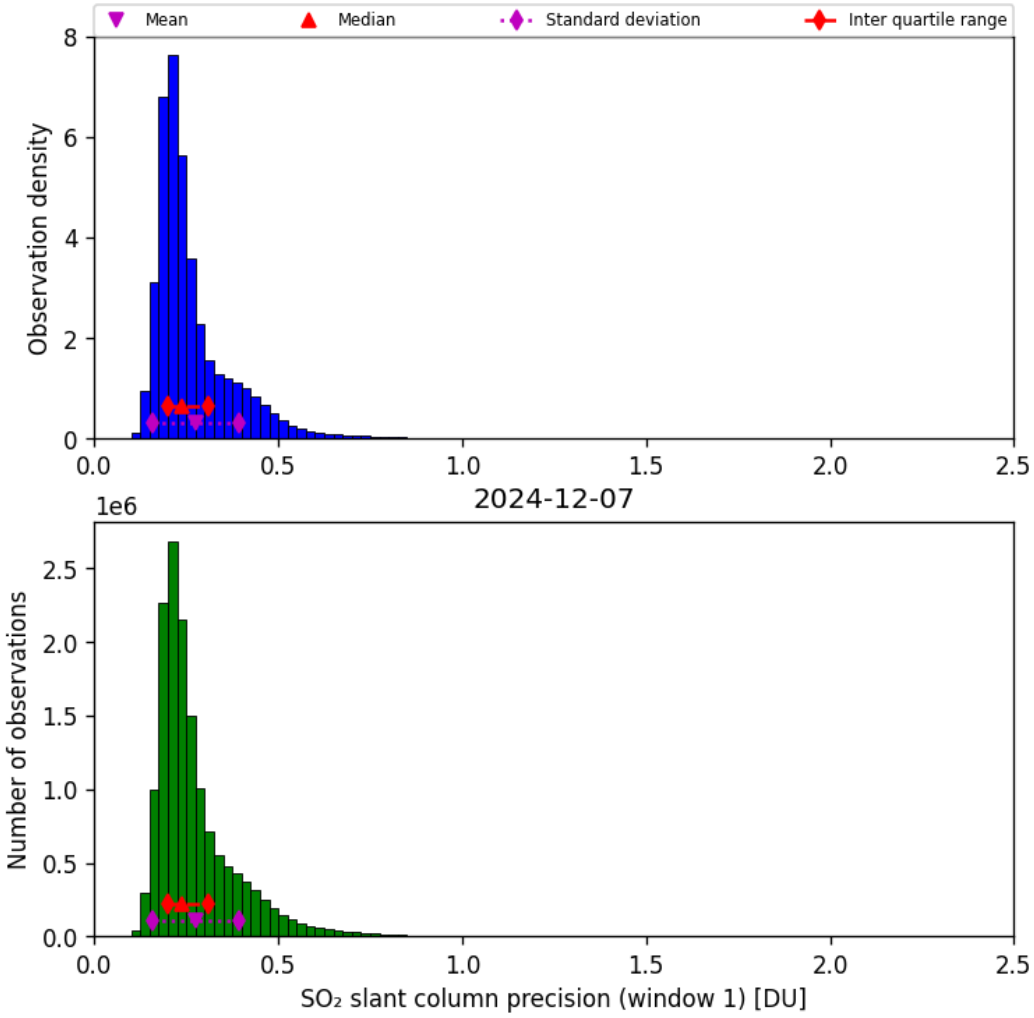

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2024-12-07 to 2024-12-08

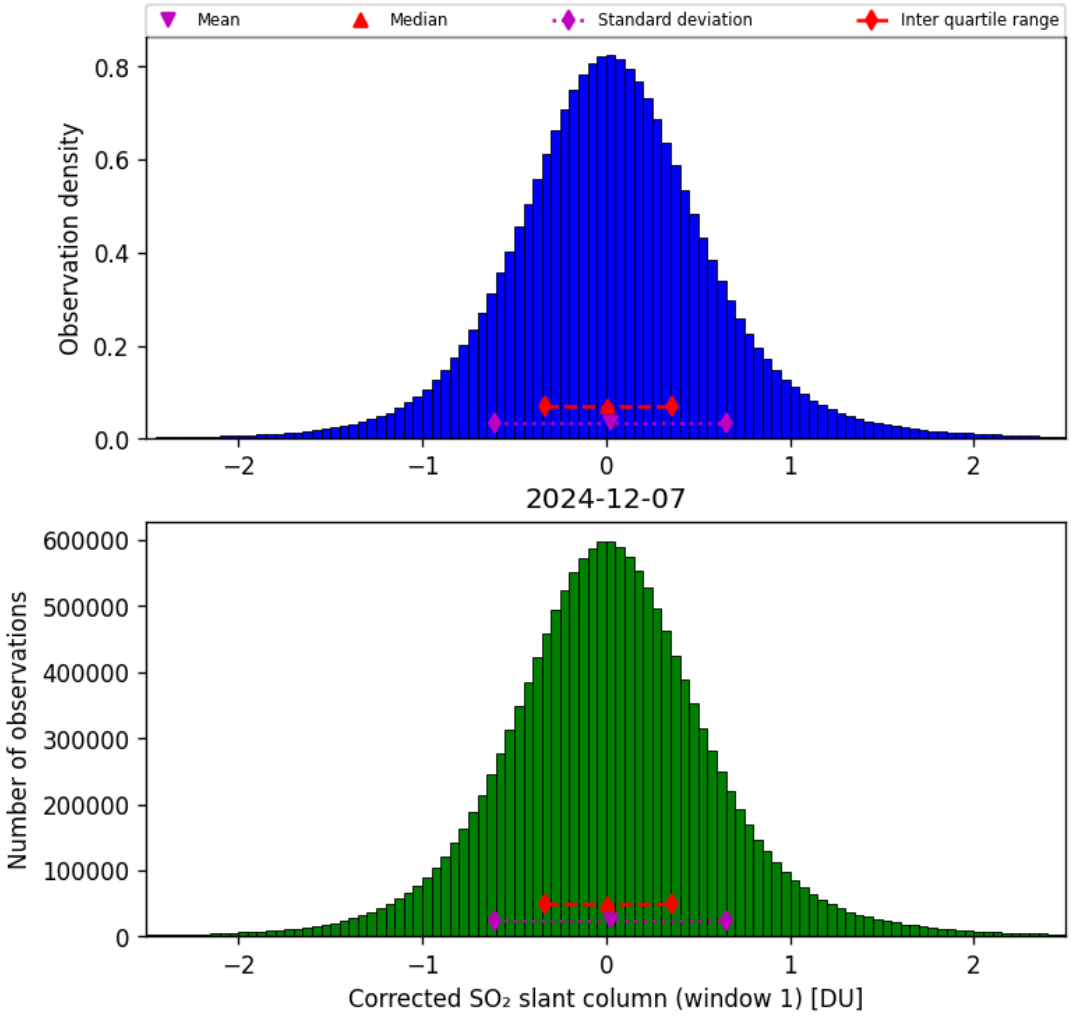

Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2024-12-07 to 2024-12-08

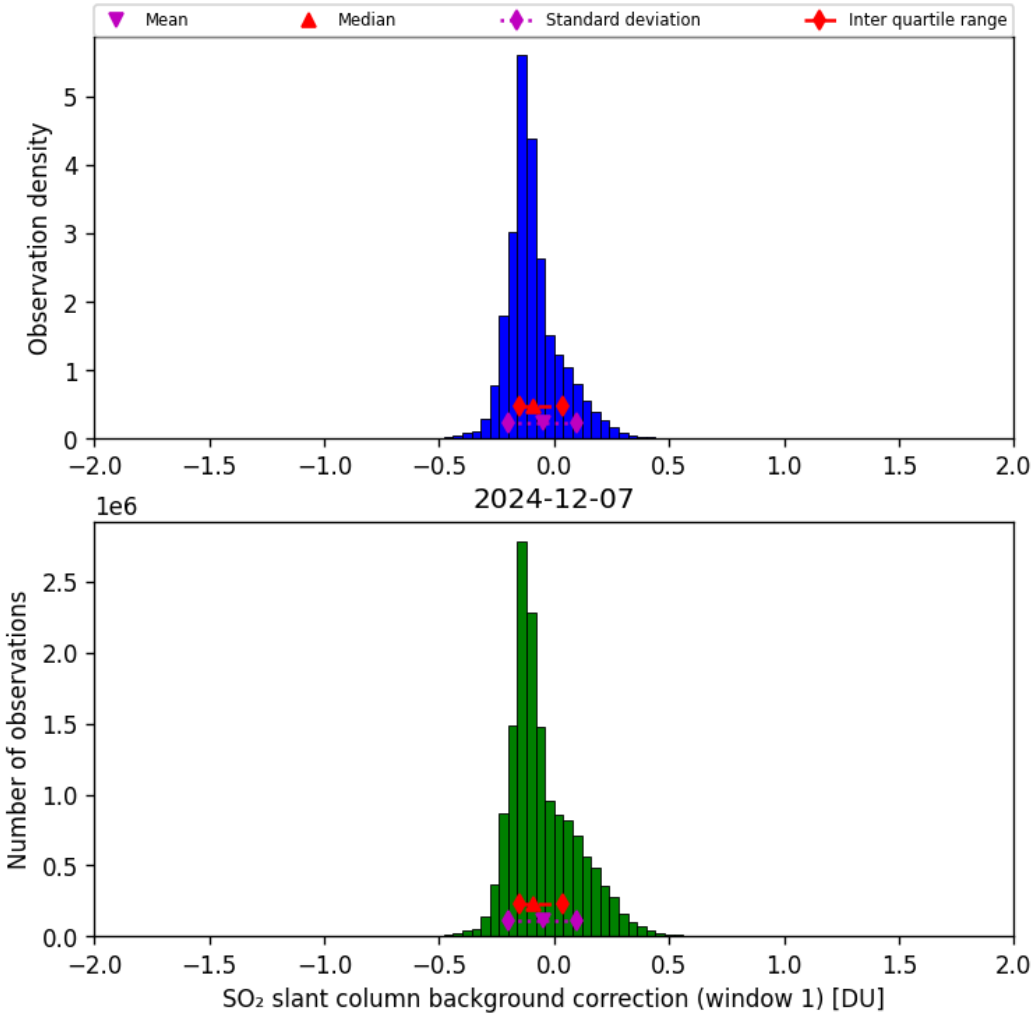

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2024-12-07 to 2024-12-08

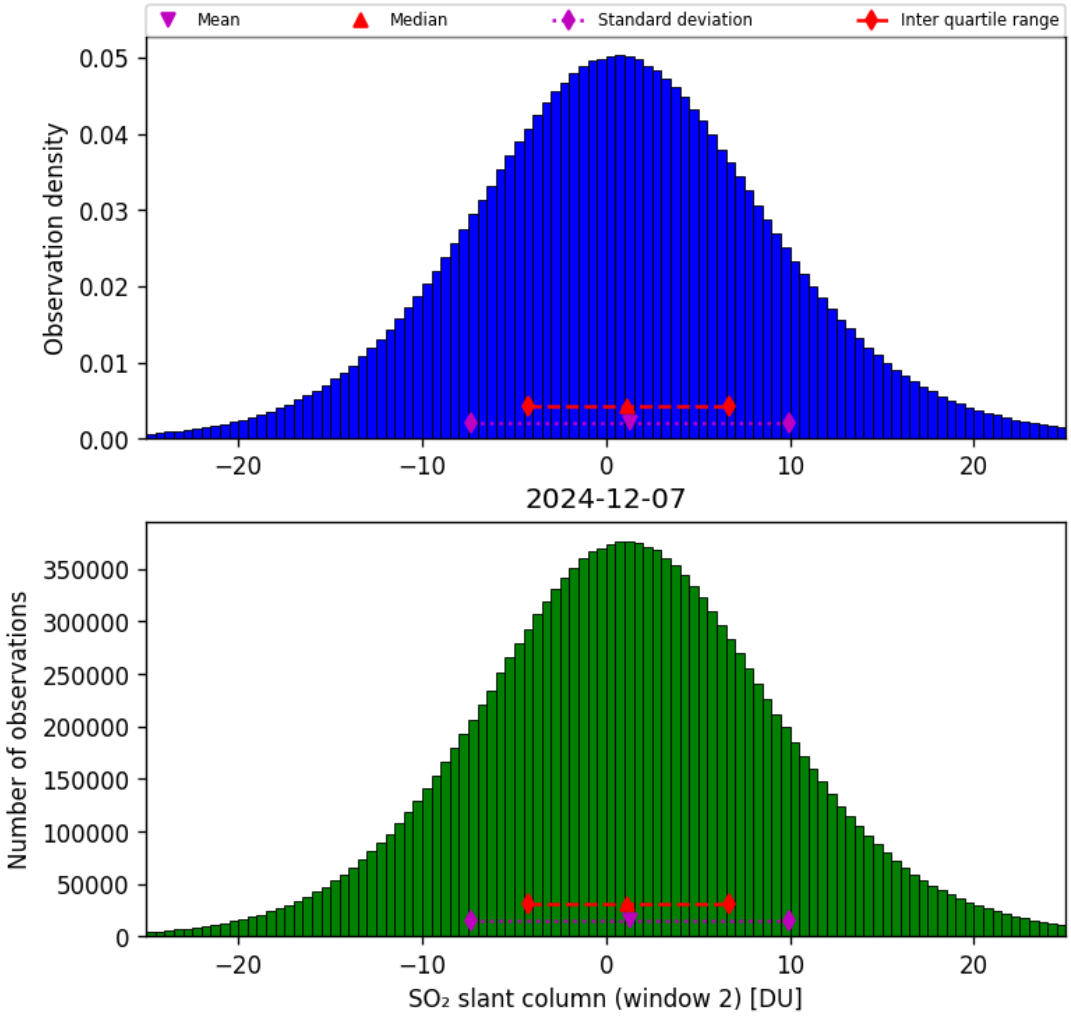

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2024-12-07 to 2024-12-08

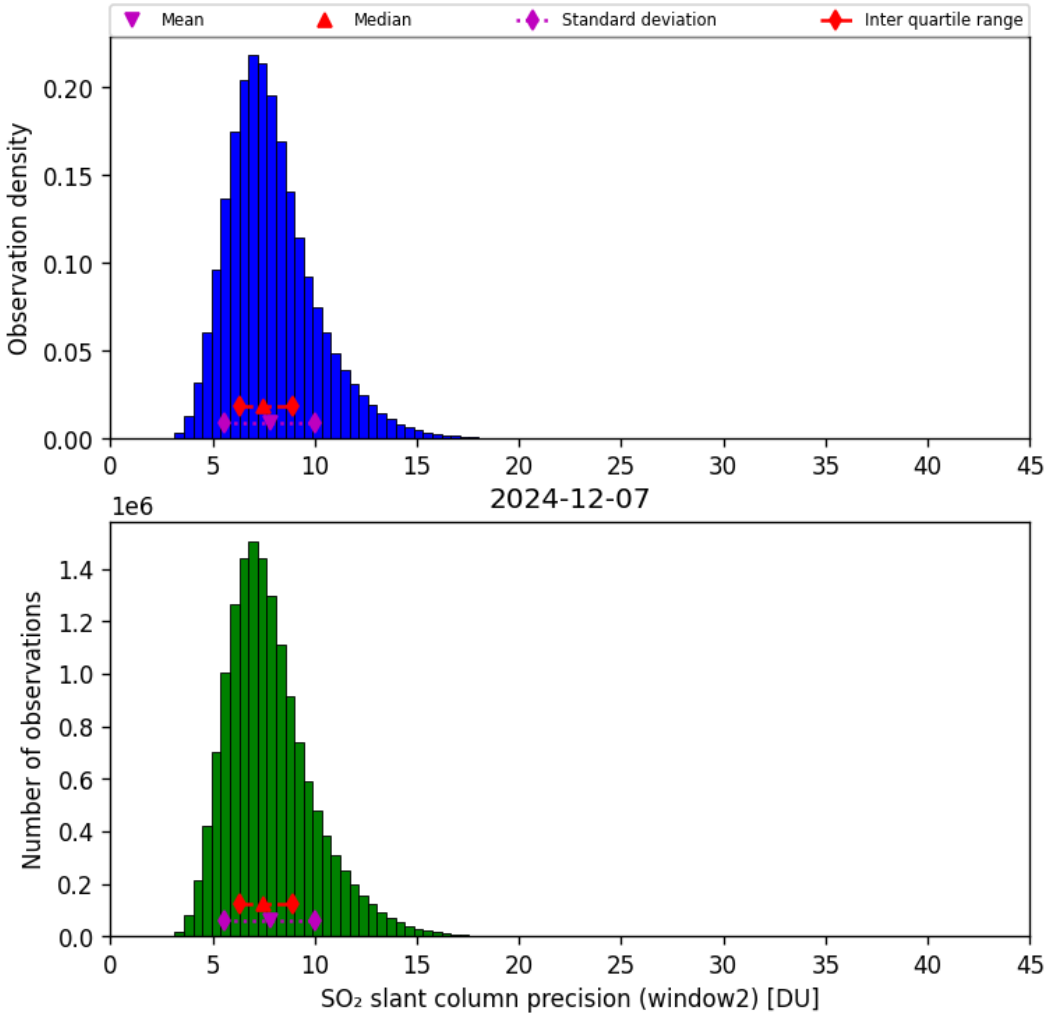

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2024-12-07 to 2024-12-08

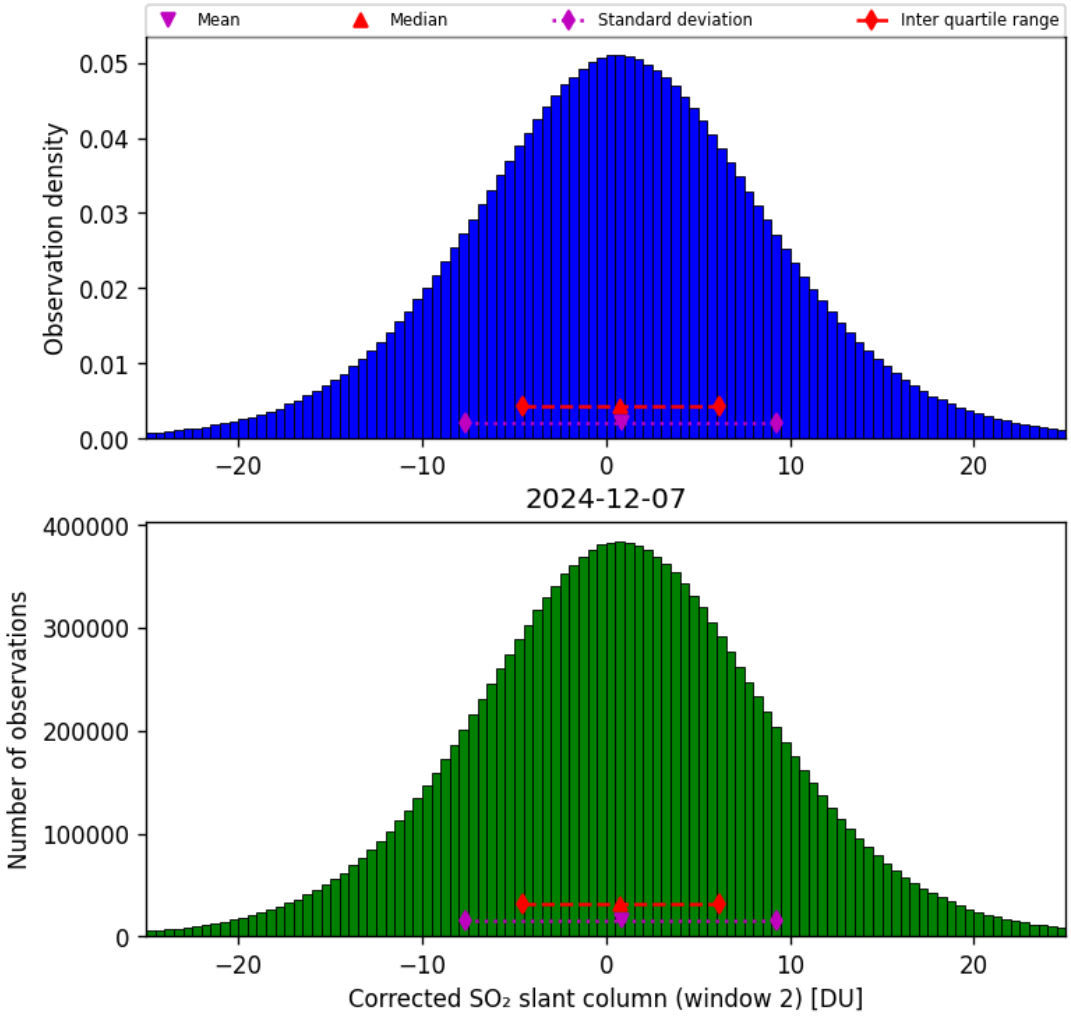

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2024-12-07 to 2024-12-08

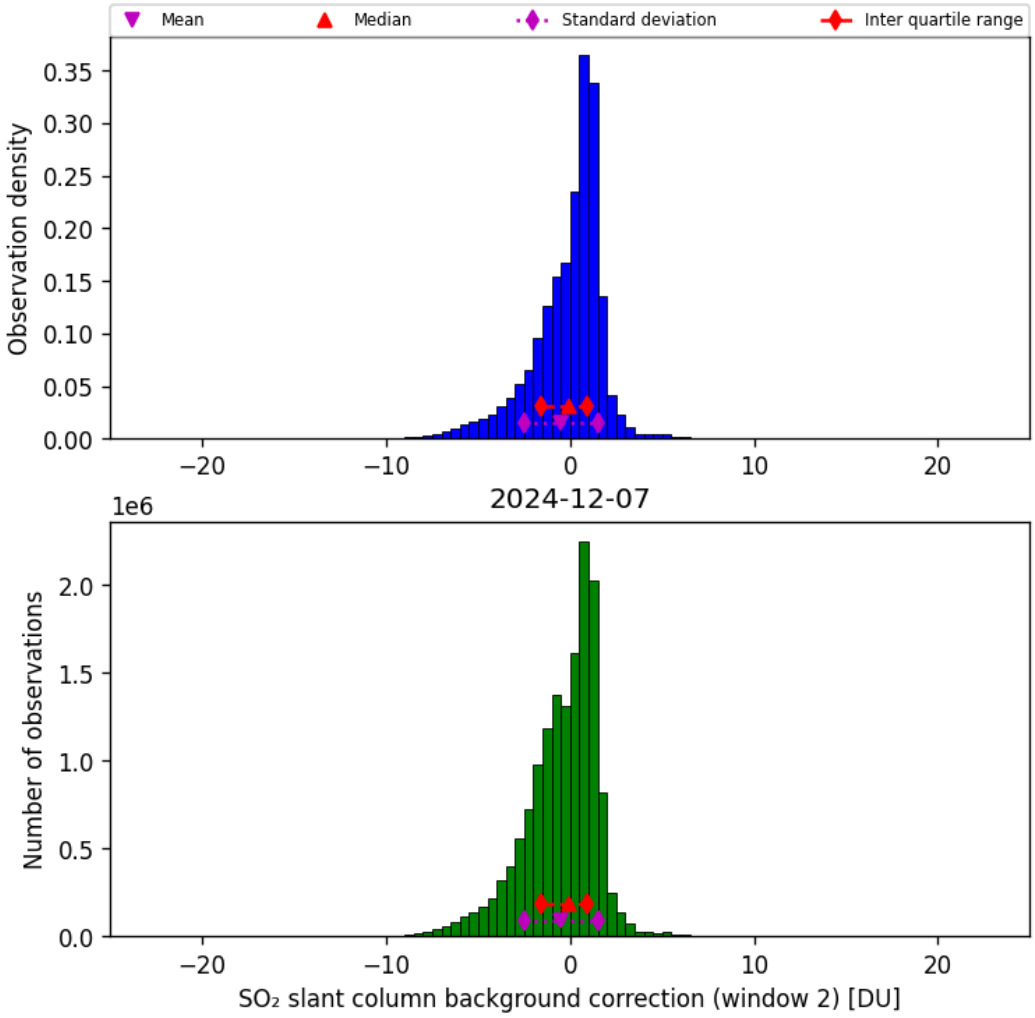

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2024-12-07 to 2024-12-08

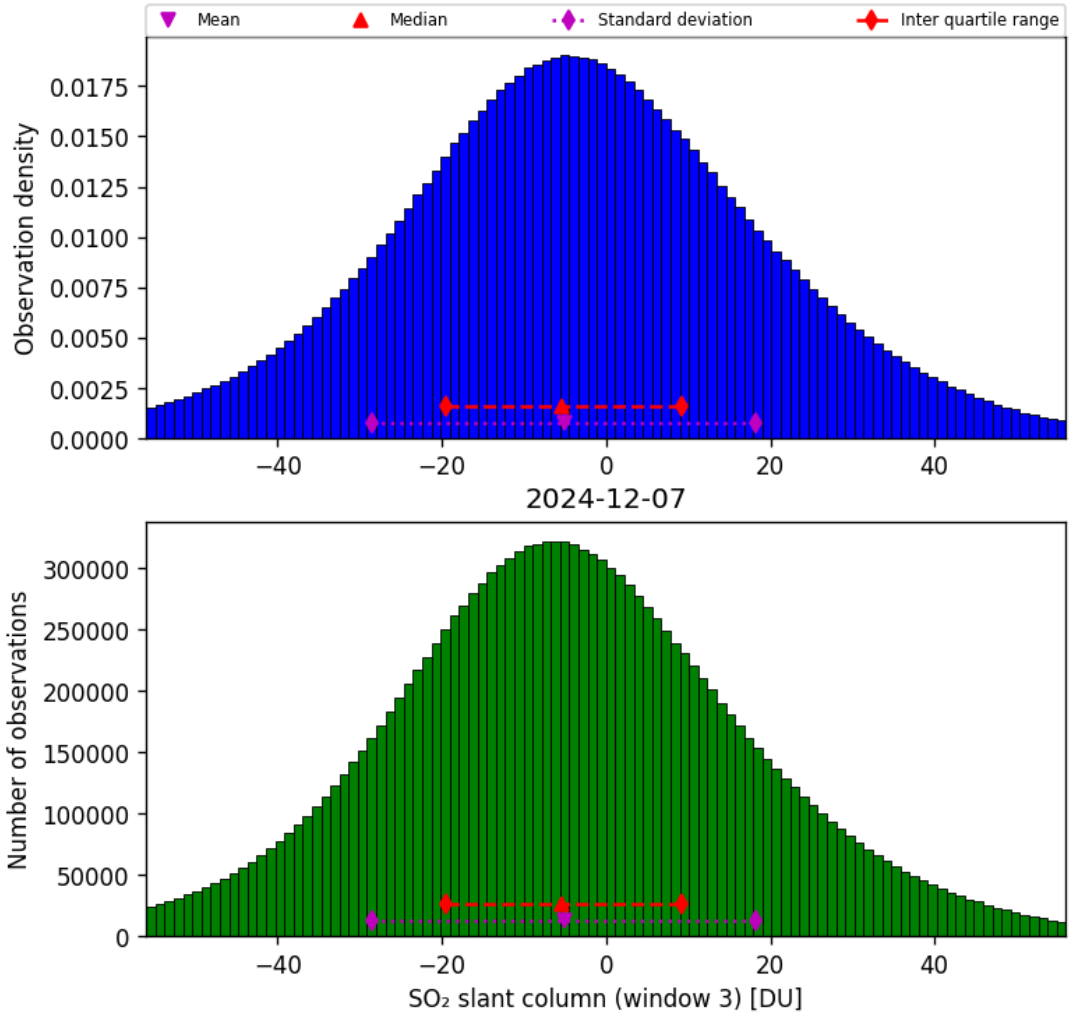

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2024-12-07 to 2024-12-08

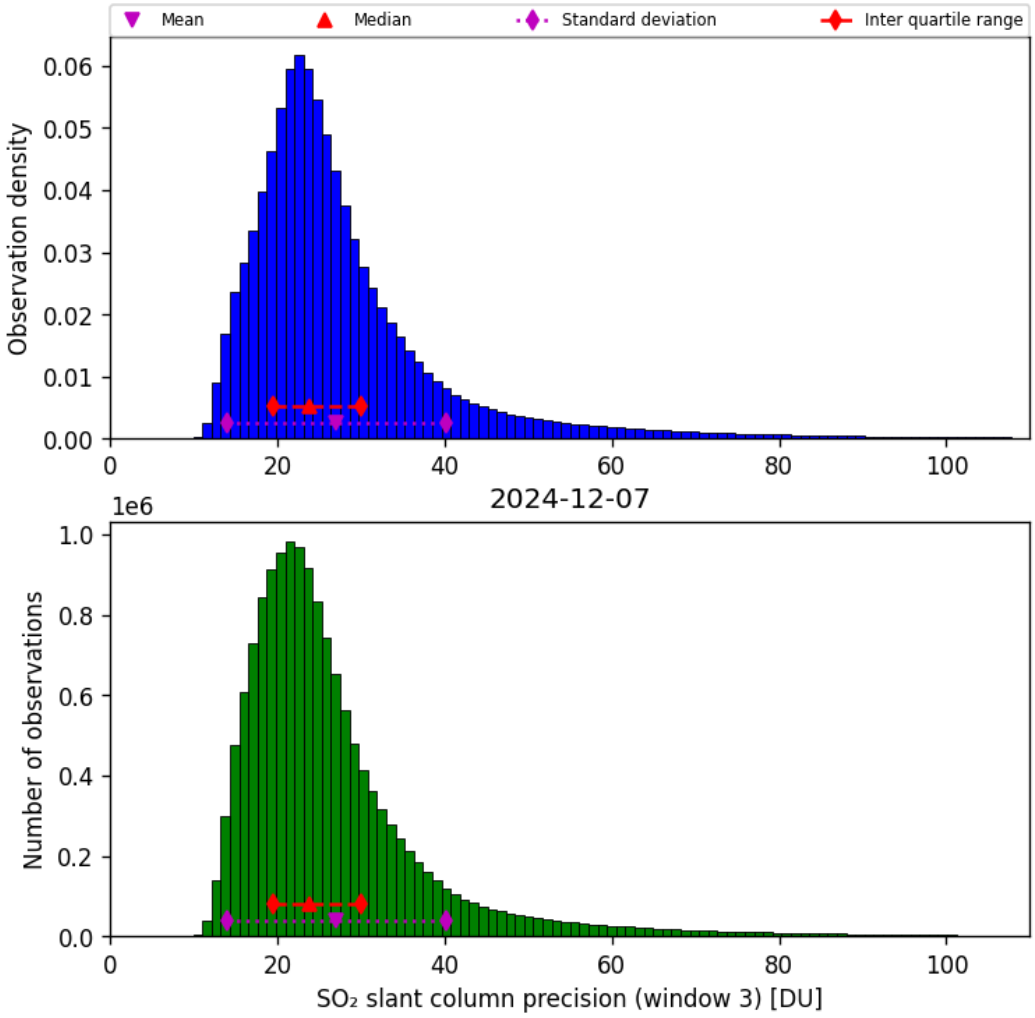

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2024-12-07 to 2024-12-08

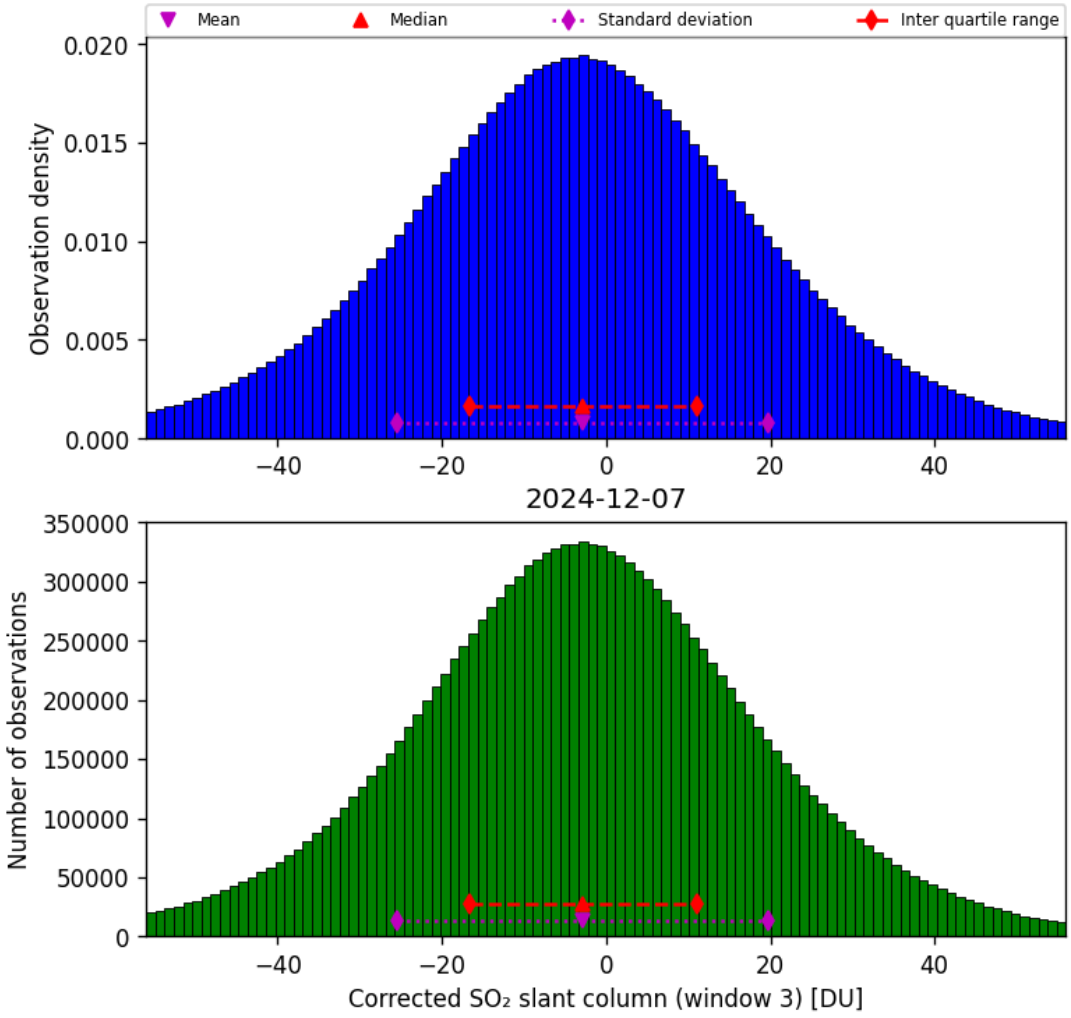

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2024-12-07 to 2024-12-08

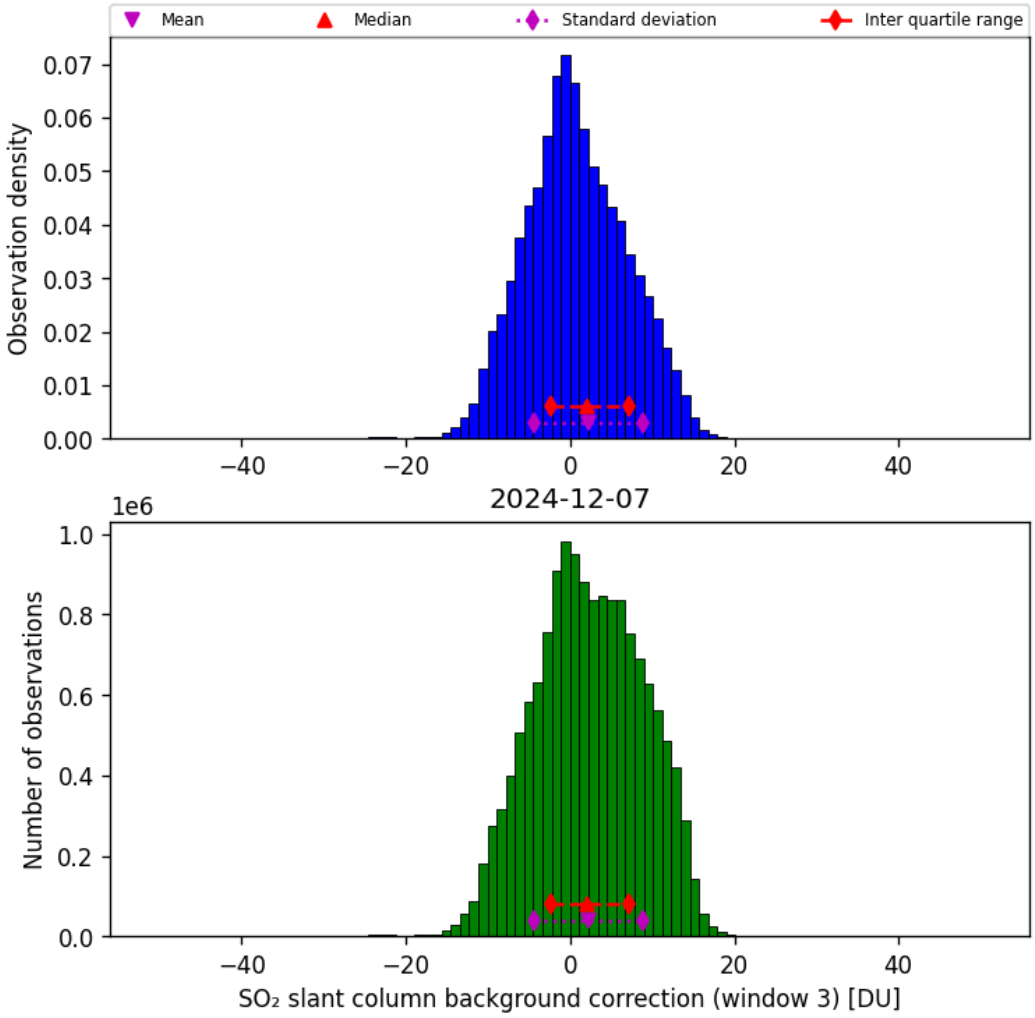

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2024-12-07 to 2024-12-08

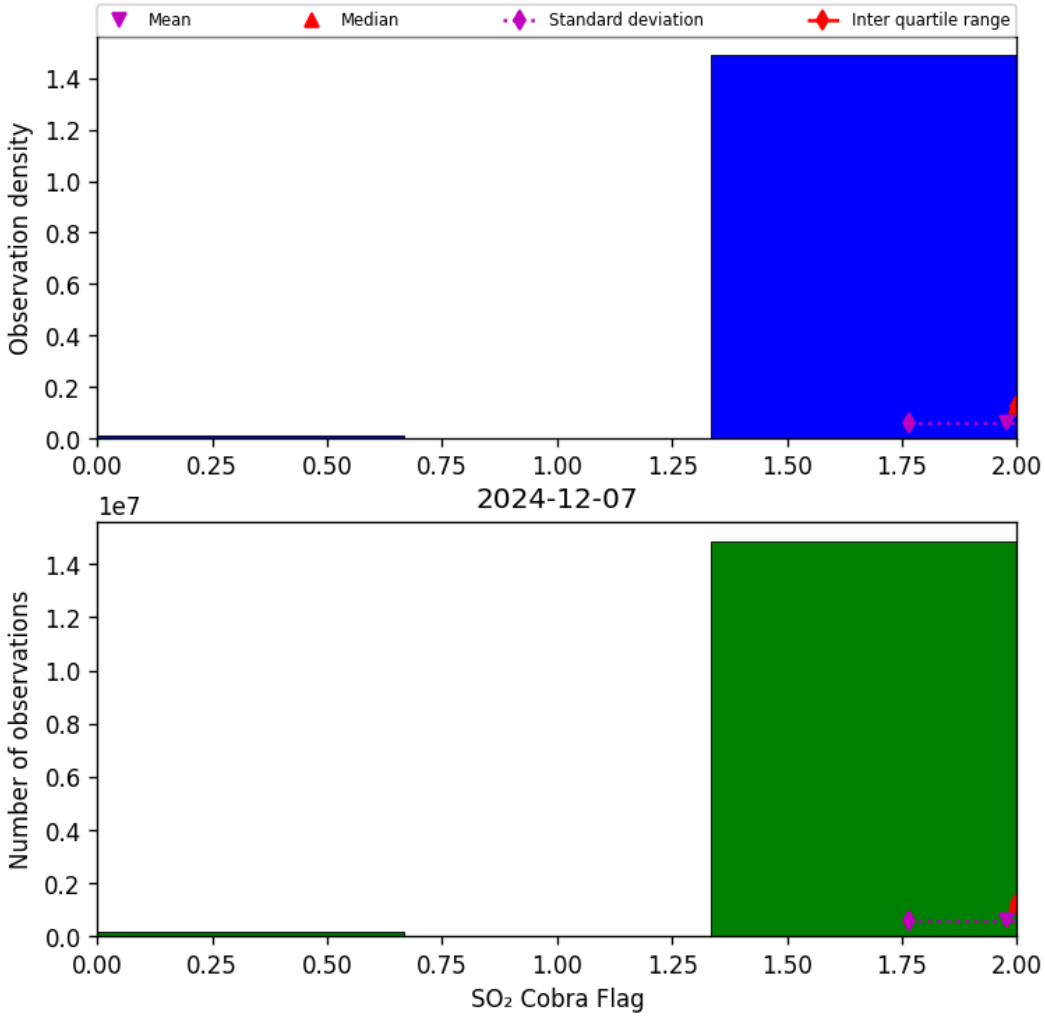

Figure 75: Histogram of "SO_2 Cobra Flag" for 2024-12-07 to 2024-12-08

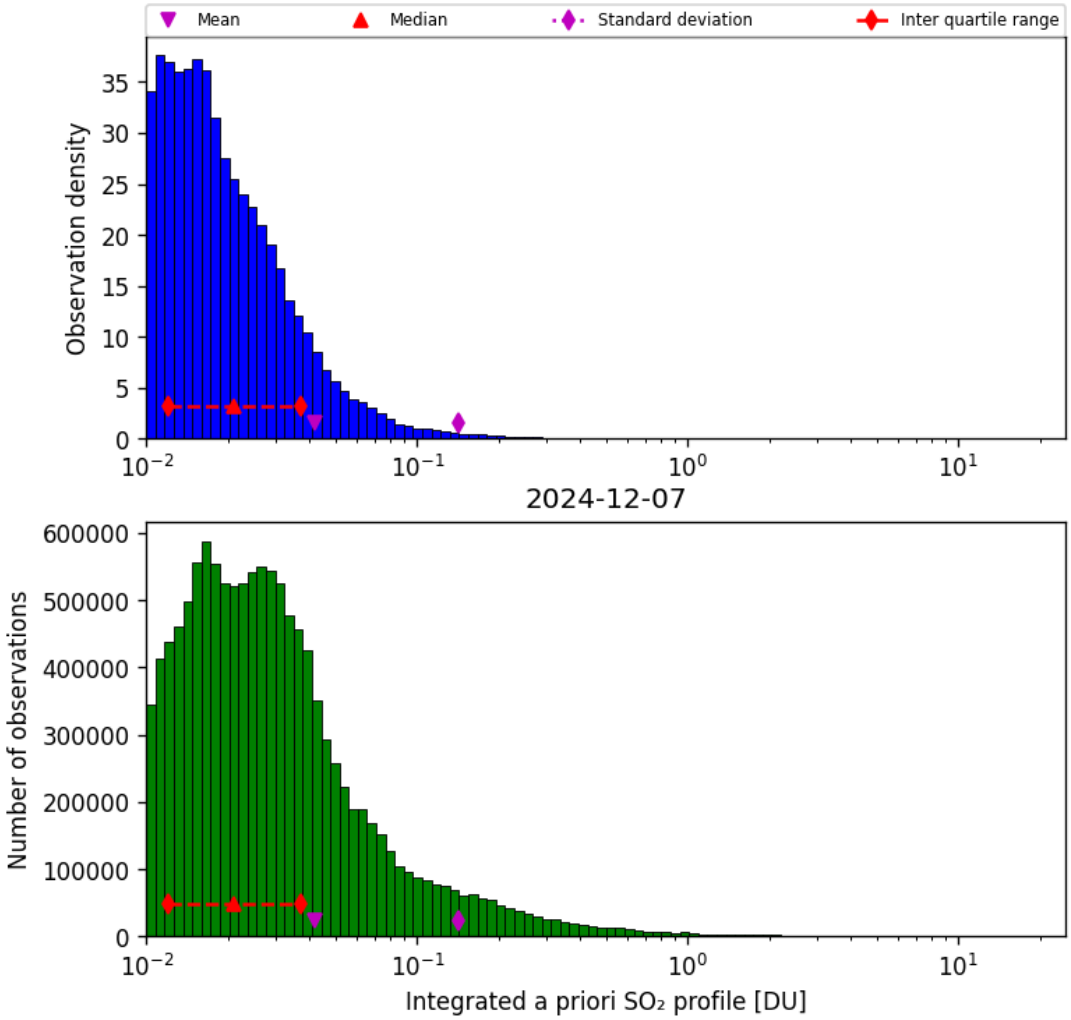

Figure 76: Histogram of “Integrated a priori SO_2 profile” for 2024-12-07 to 2024-12-08

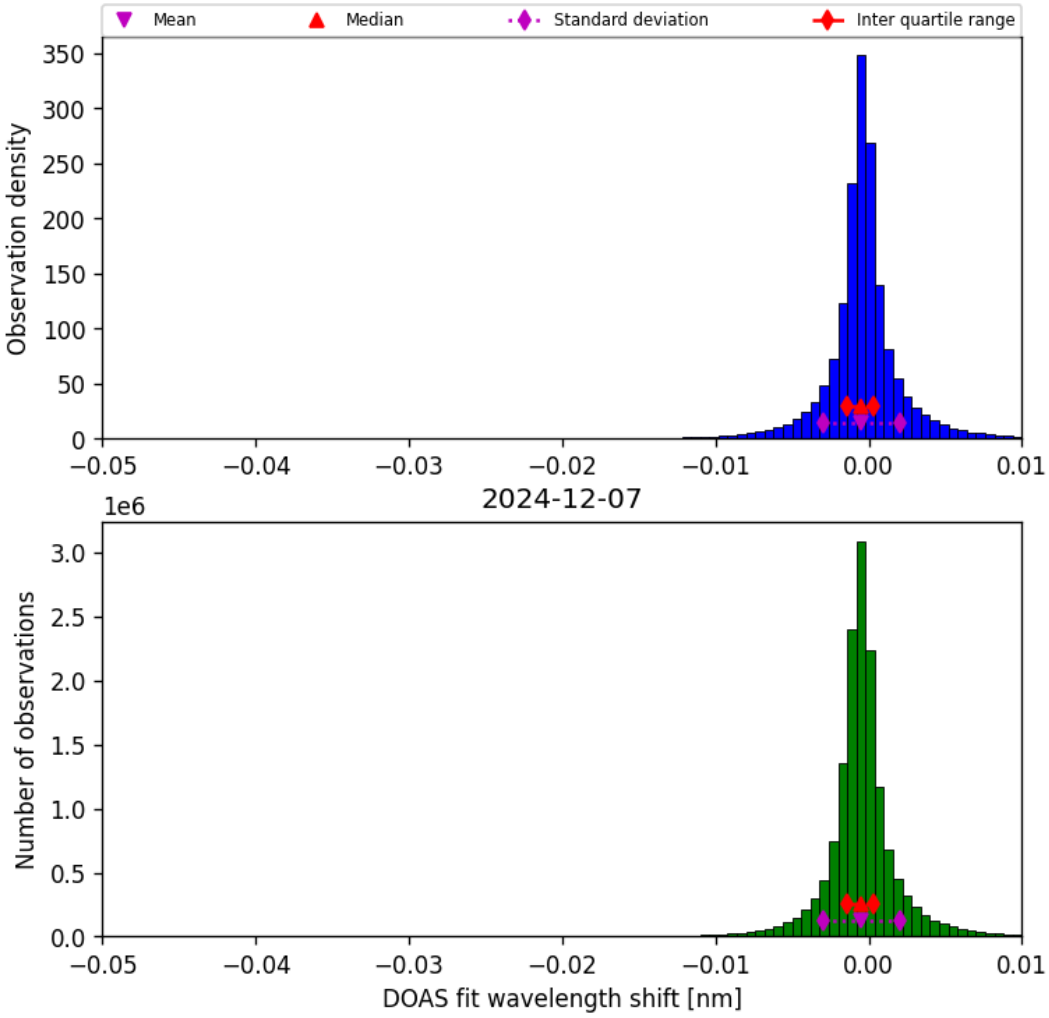

Figure 77: Histogram of “DOAS fit wavelength shift” for 2024-12-07 to 2024-12-08

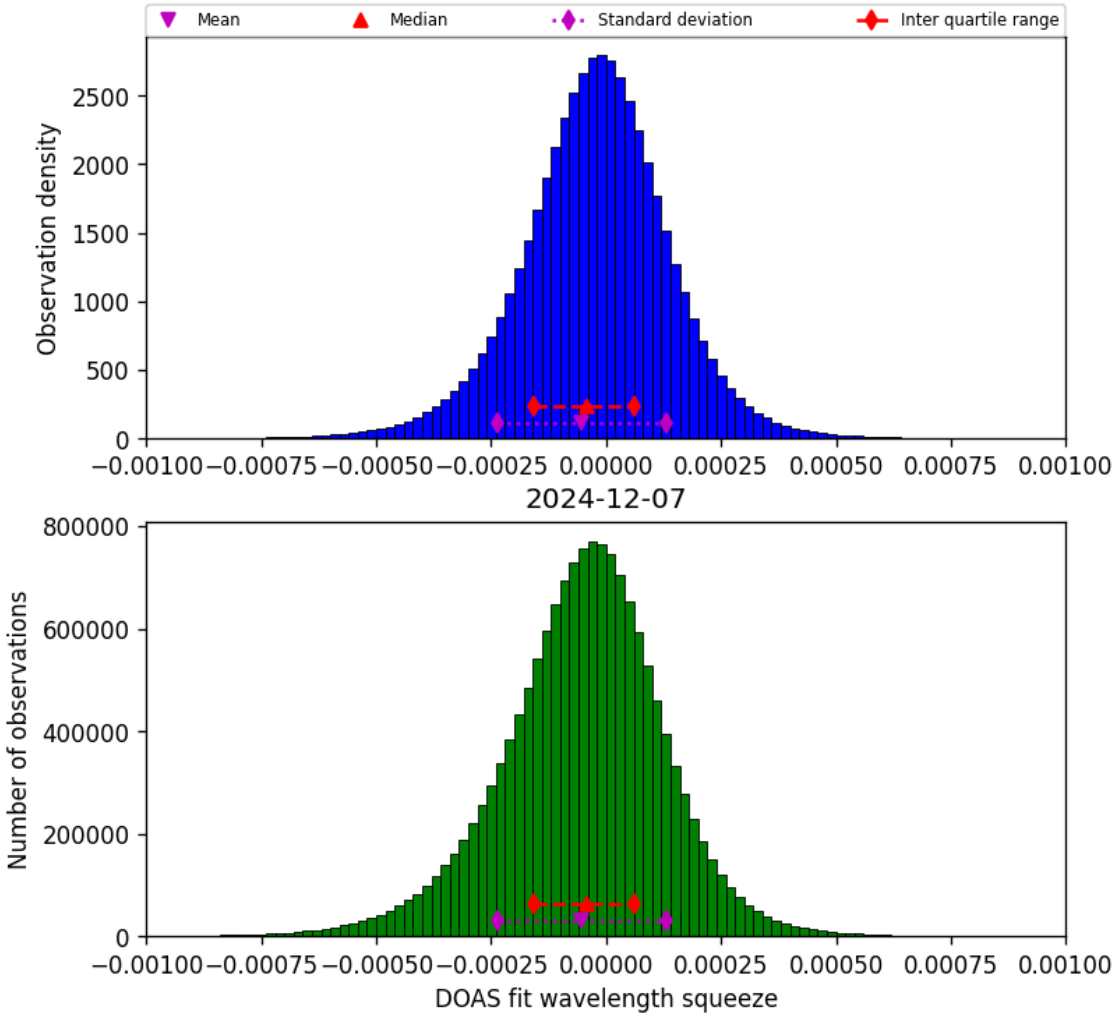

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2024-12-07 to 2024-12-08

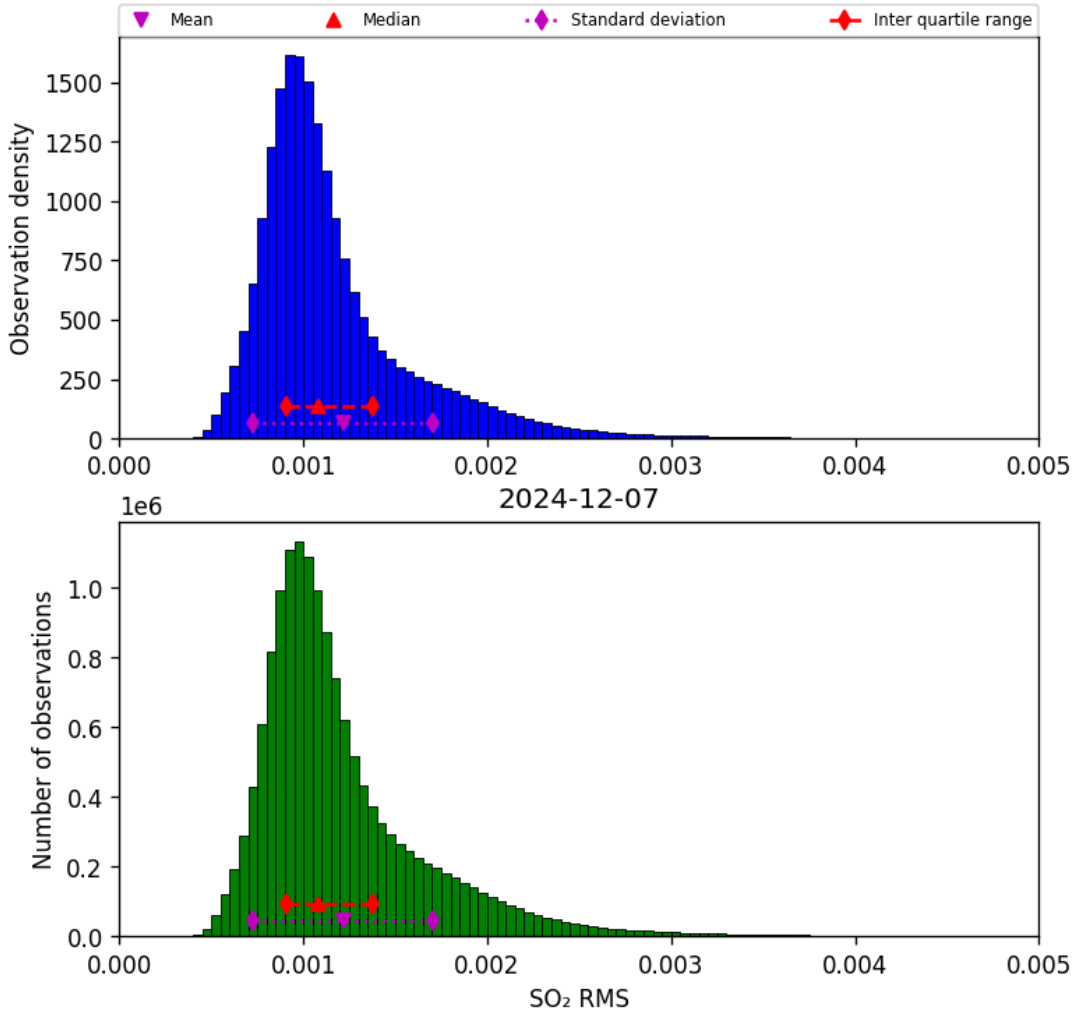

Figure 79: Histogram of "SO_2 RMS" for 2024-12-07 to 2024-12-08

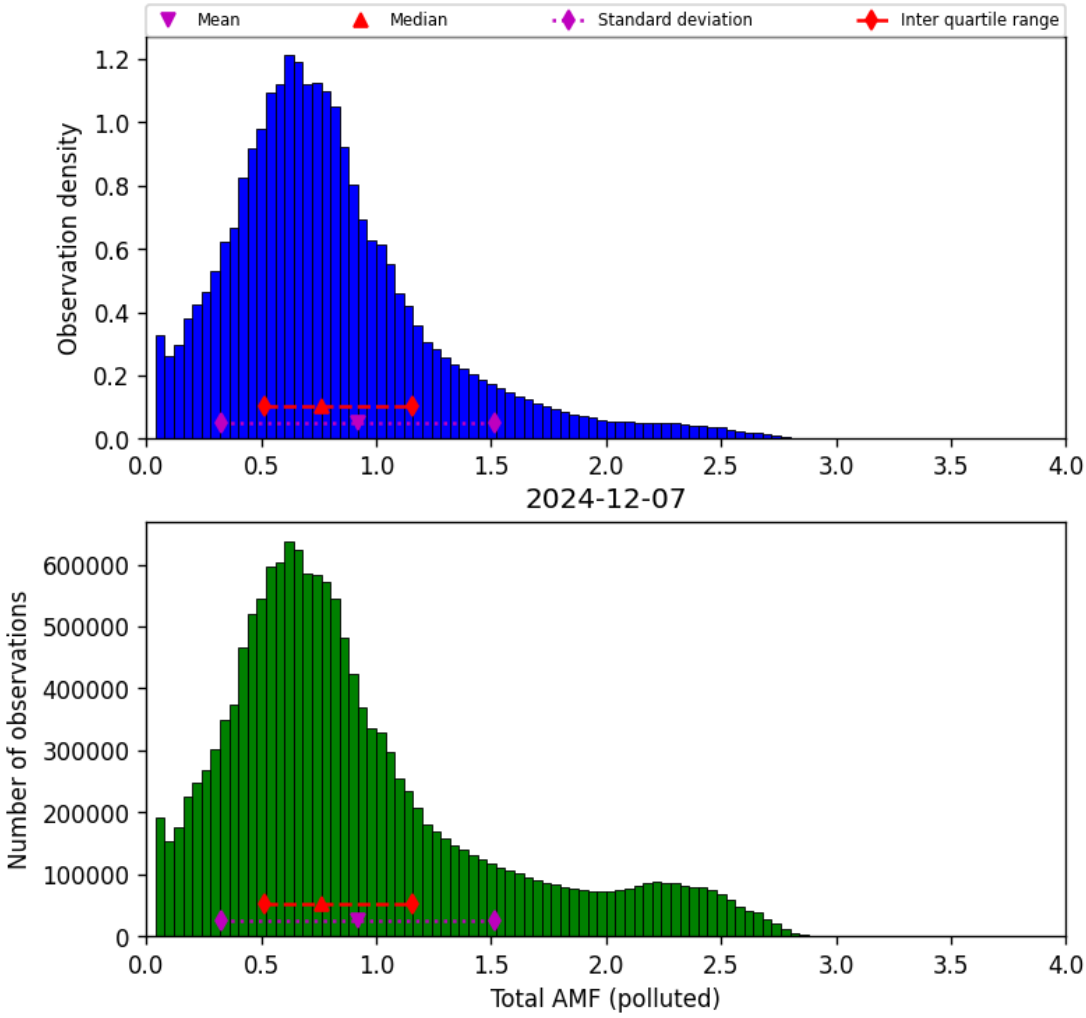

Figure 80: Histogram of “Total AMF (polluted)” for 2024-12-07 to 2024-12-08

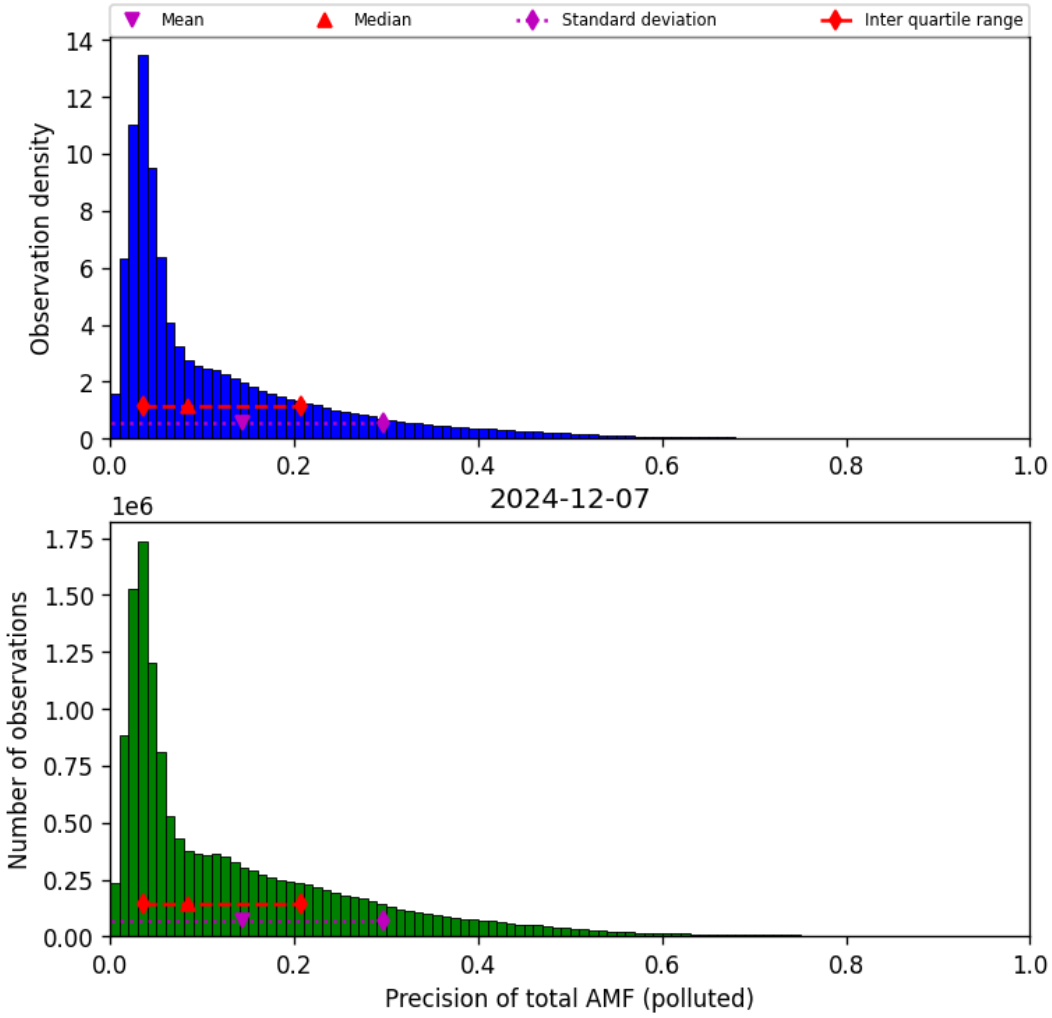

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2024-12-07 to 2024-12-08

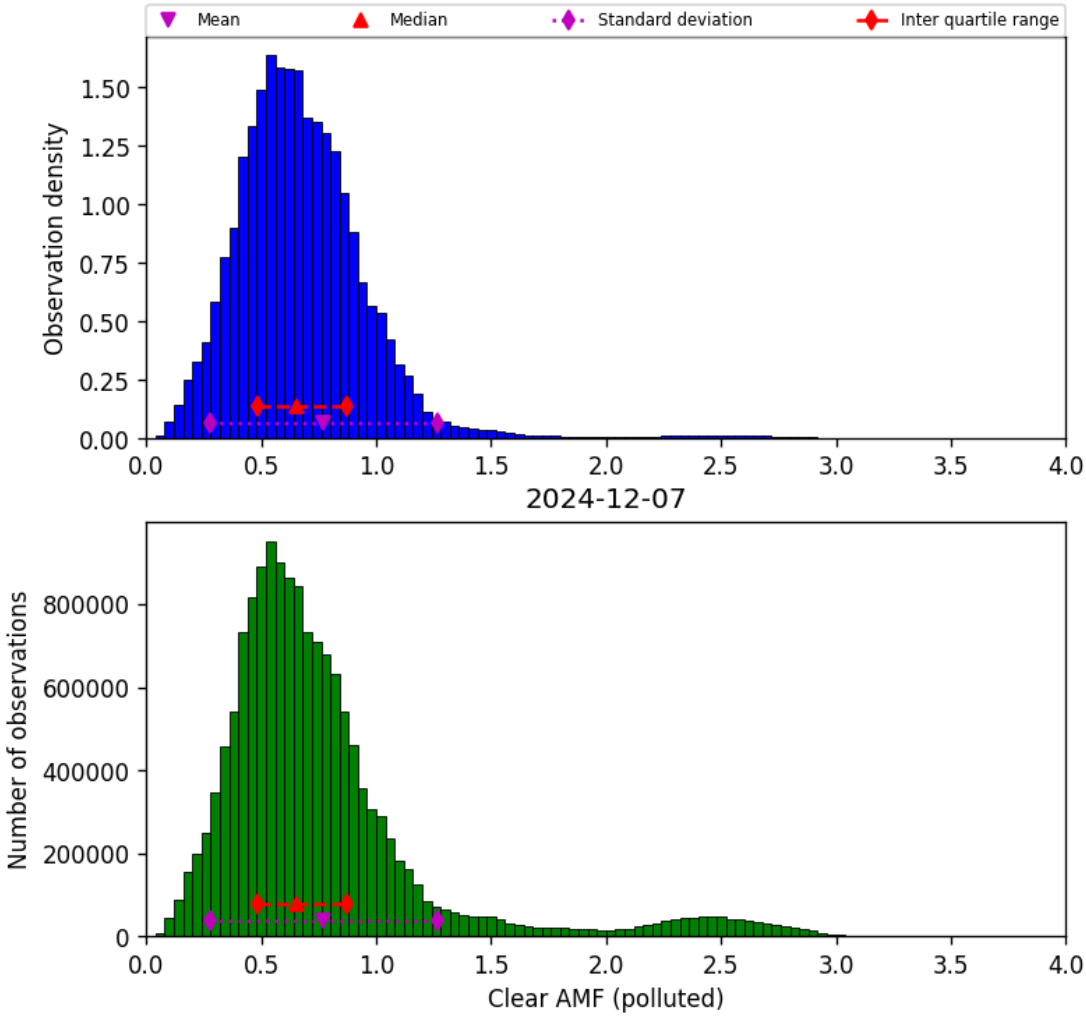

Figure 82: Histogram of “Clear AMF (polluted)” for 2024-12-07 to 2024-12-08

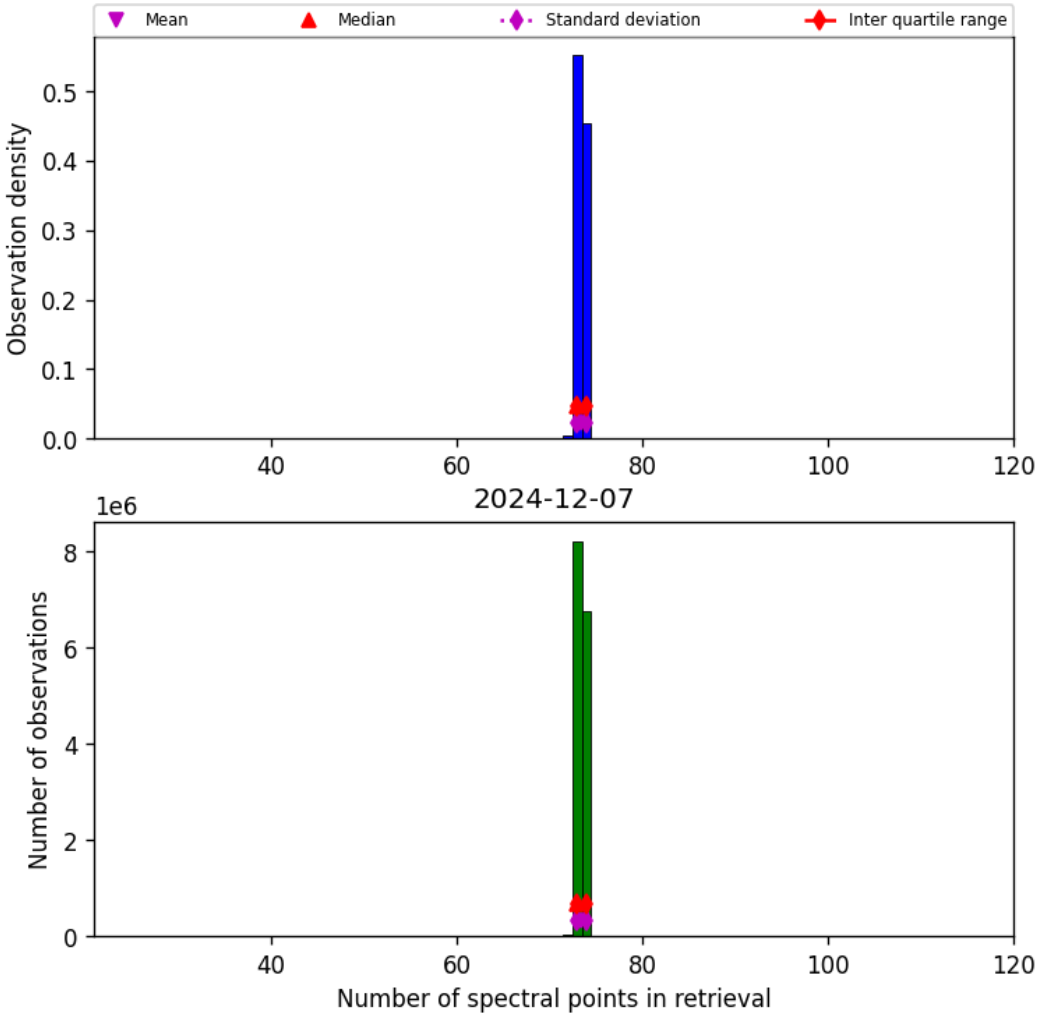

Figure 83: Histogram of “Number of spectral points in retrieval” for 2024-12-07 to 2024-12-08

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.

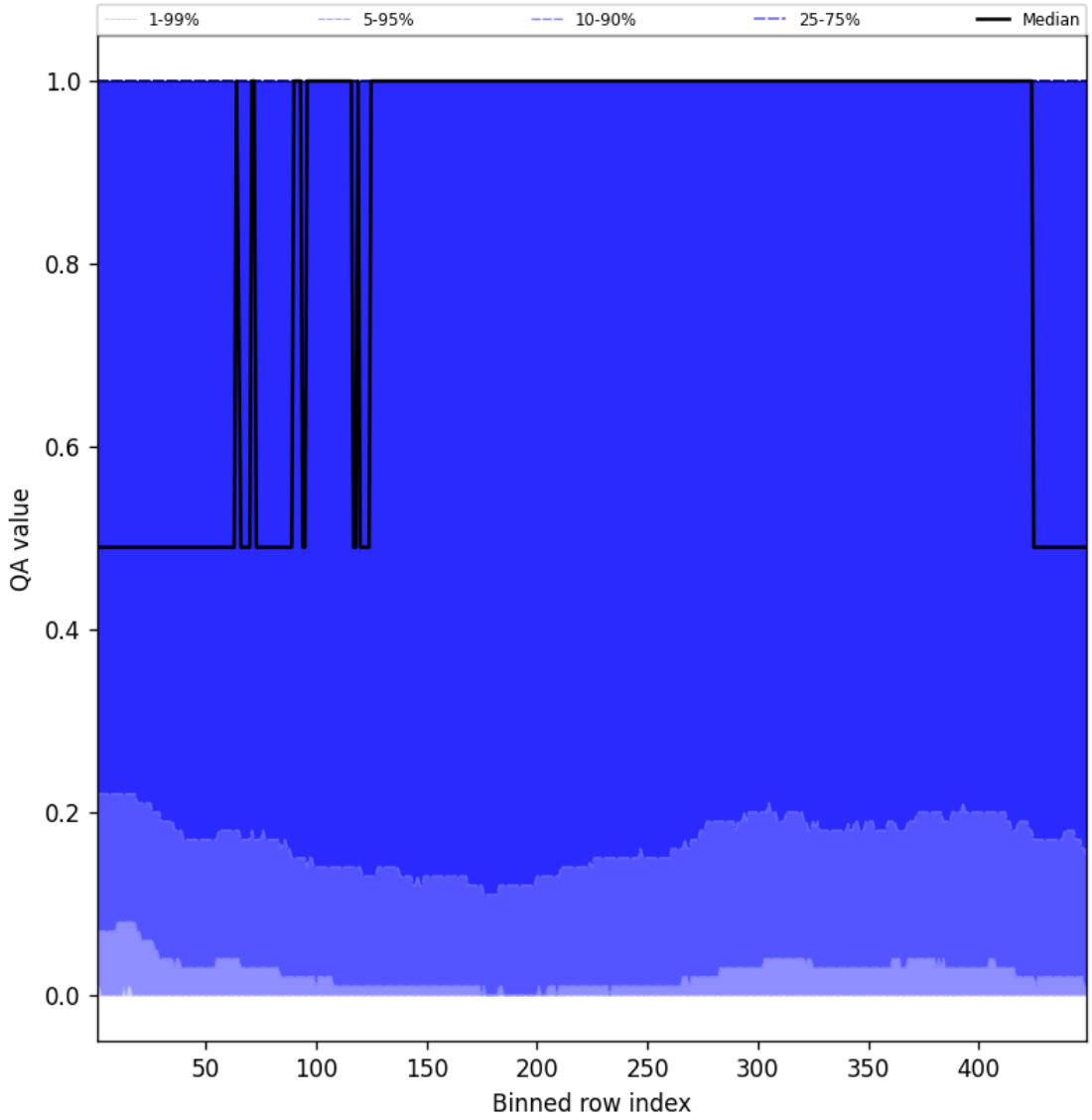

Figure 84: Along track statistics of “QA value” for 2024-12-07 to 2024-12-08

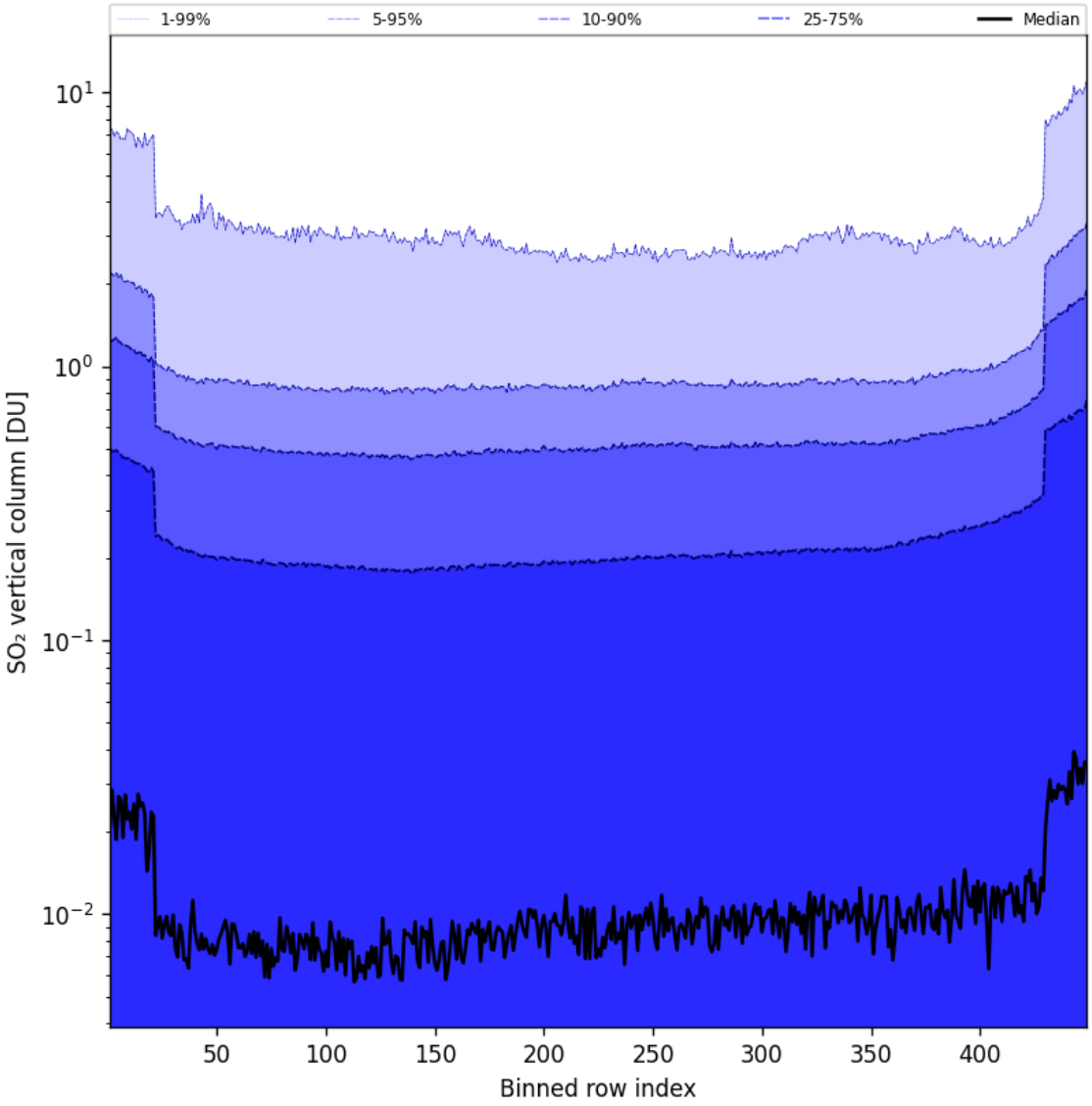

Figure 85: Along track statistics of "SO_2 vertical column" for 2024-12-07 to 2024-12-08

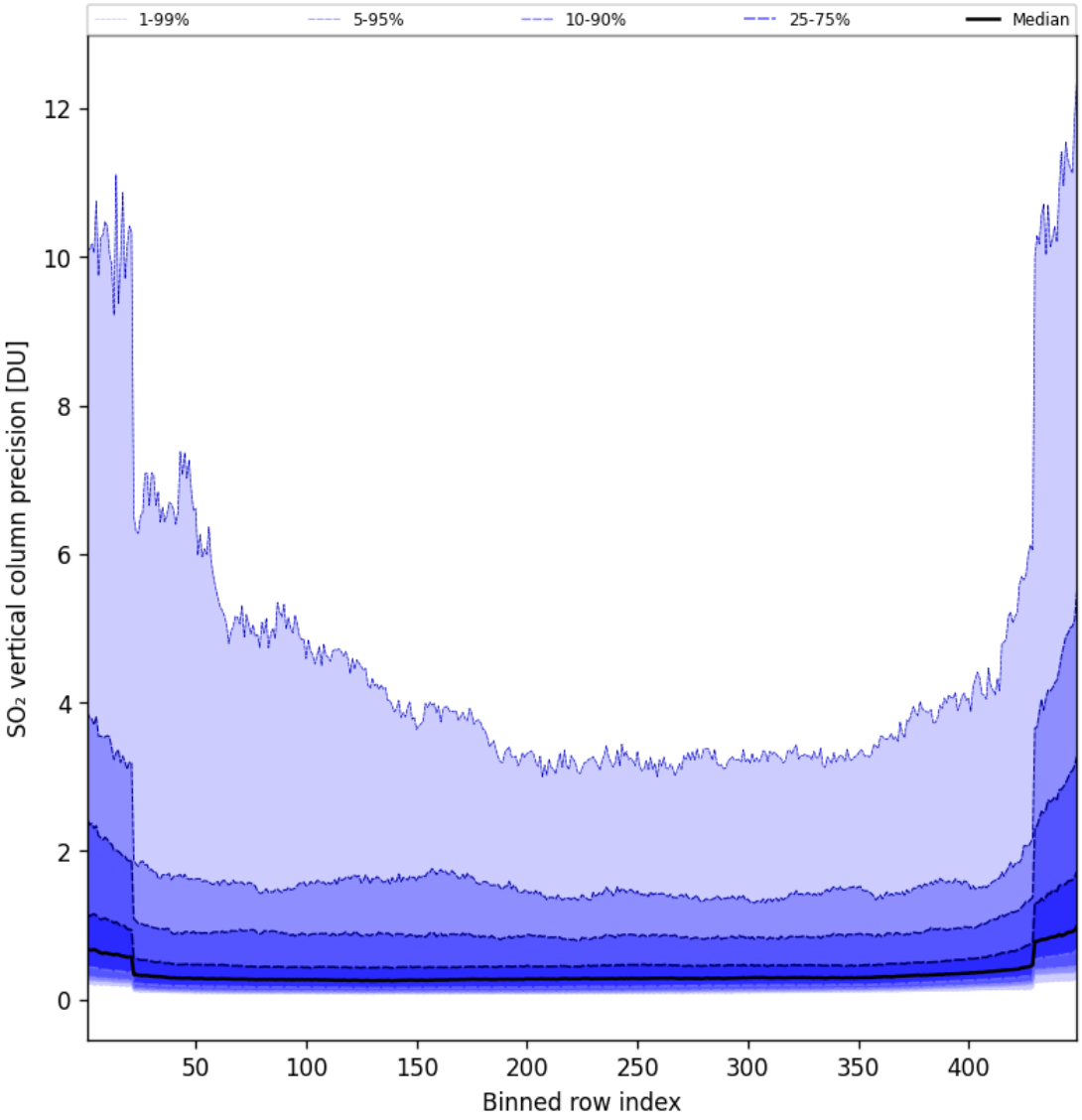

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2024-12-07 to 2024-12-08

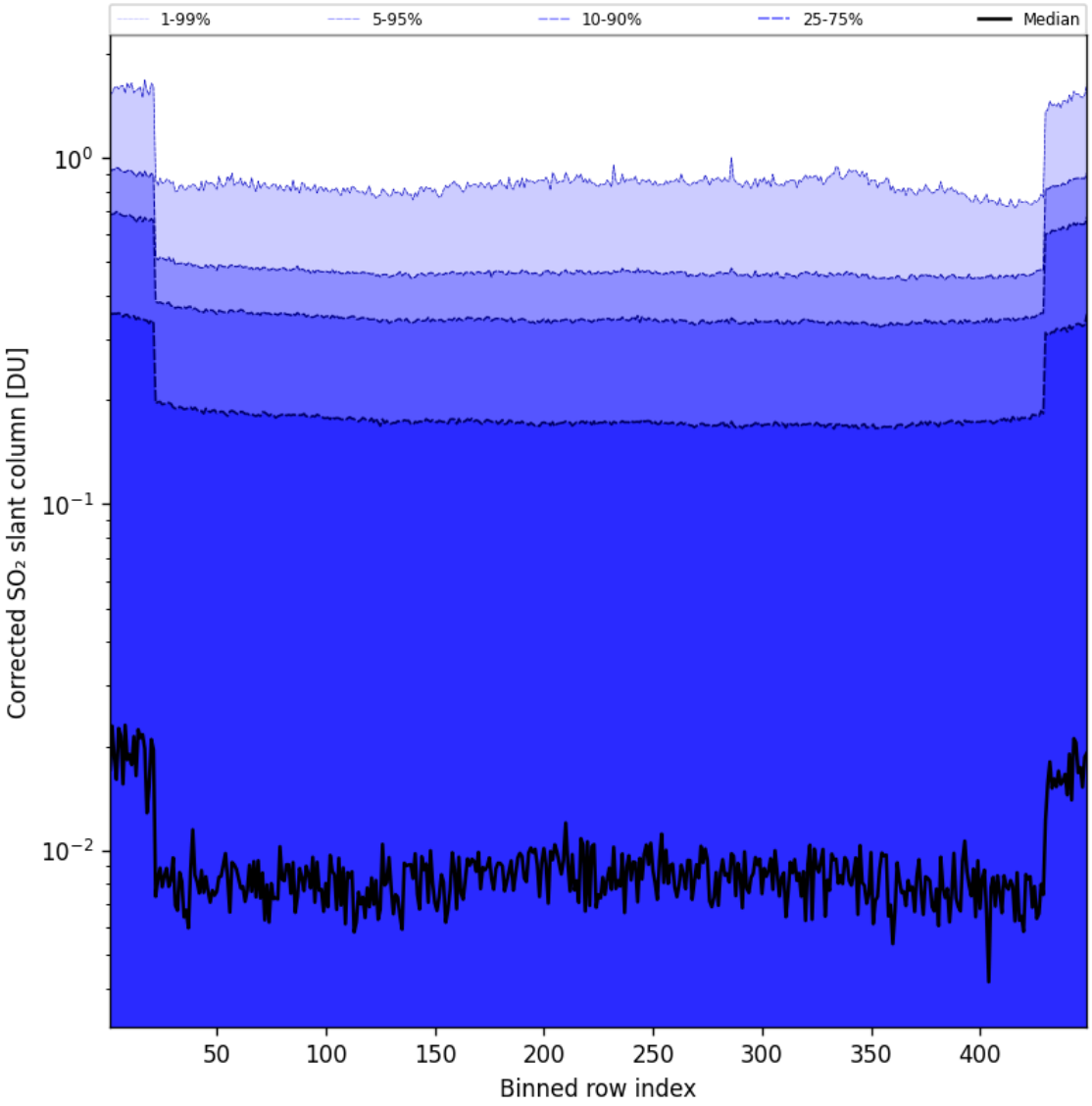

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2024-12-07 to 2024-12-08

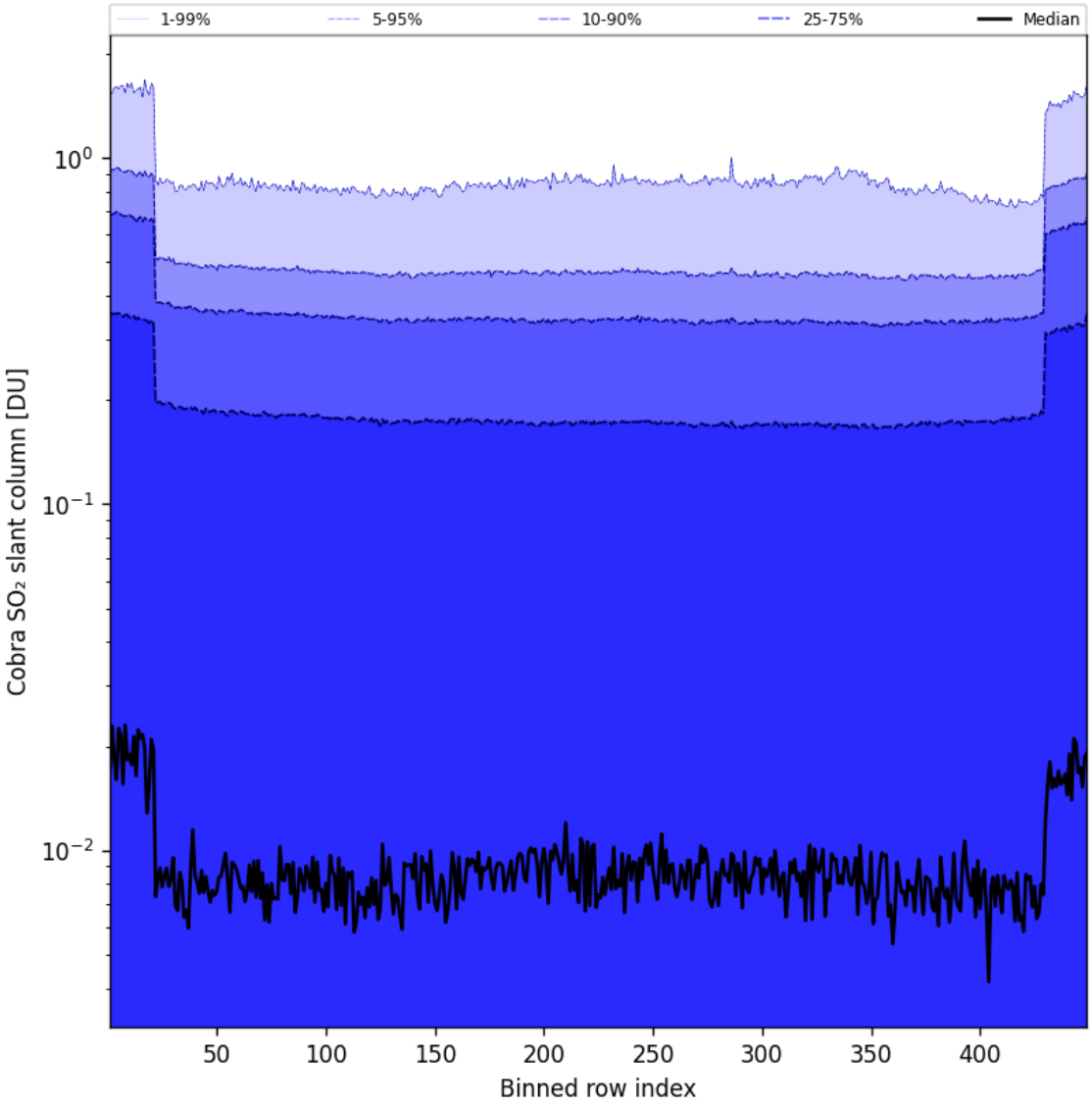

Figure 88: Along track statistics of "Cobra SO_2 slant column" for 2024-12-07 to 2024-12-08

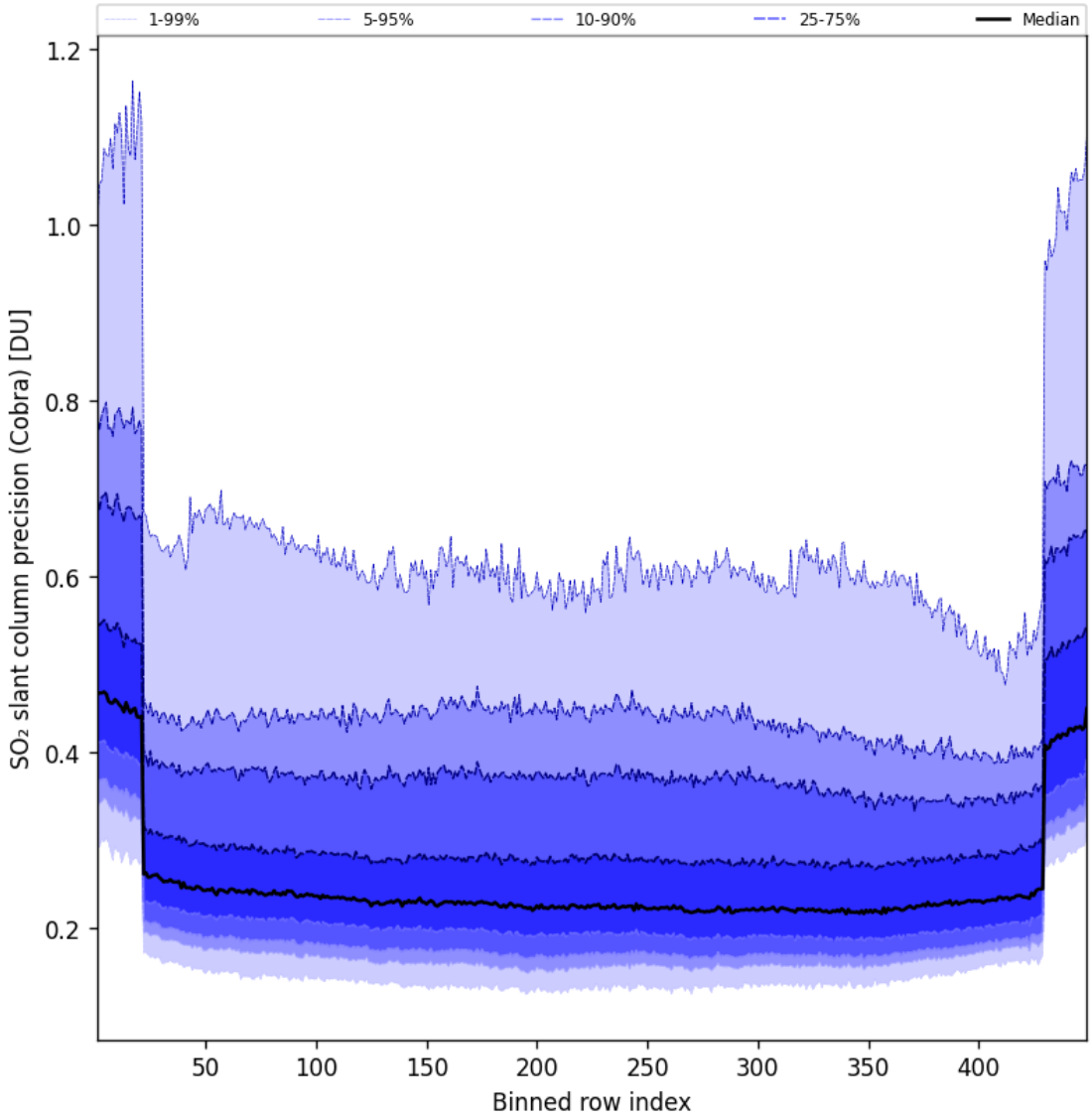

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2024-12-07 to 2024-12-08

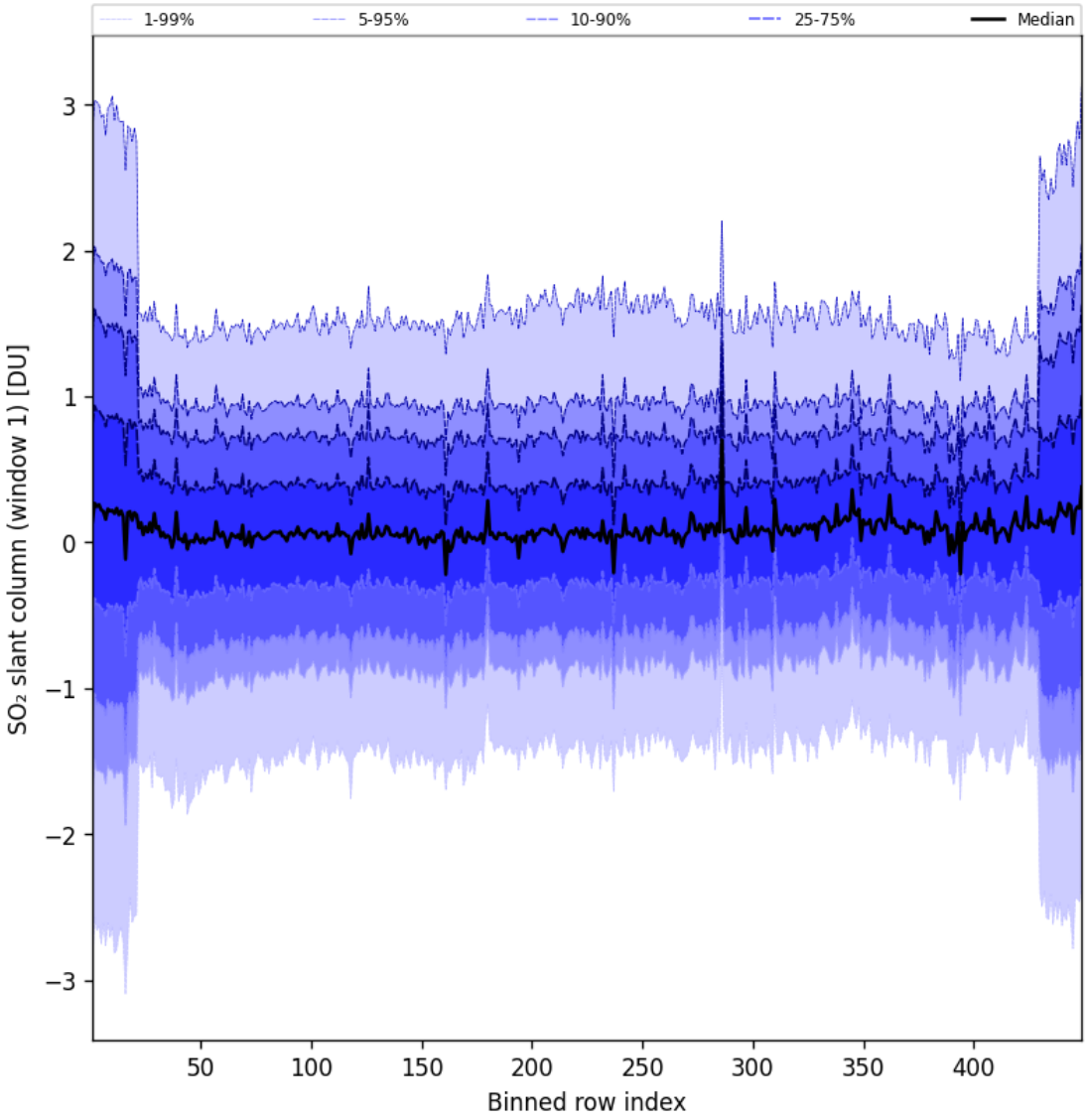

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2024-12-07 to 2024-12-08

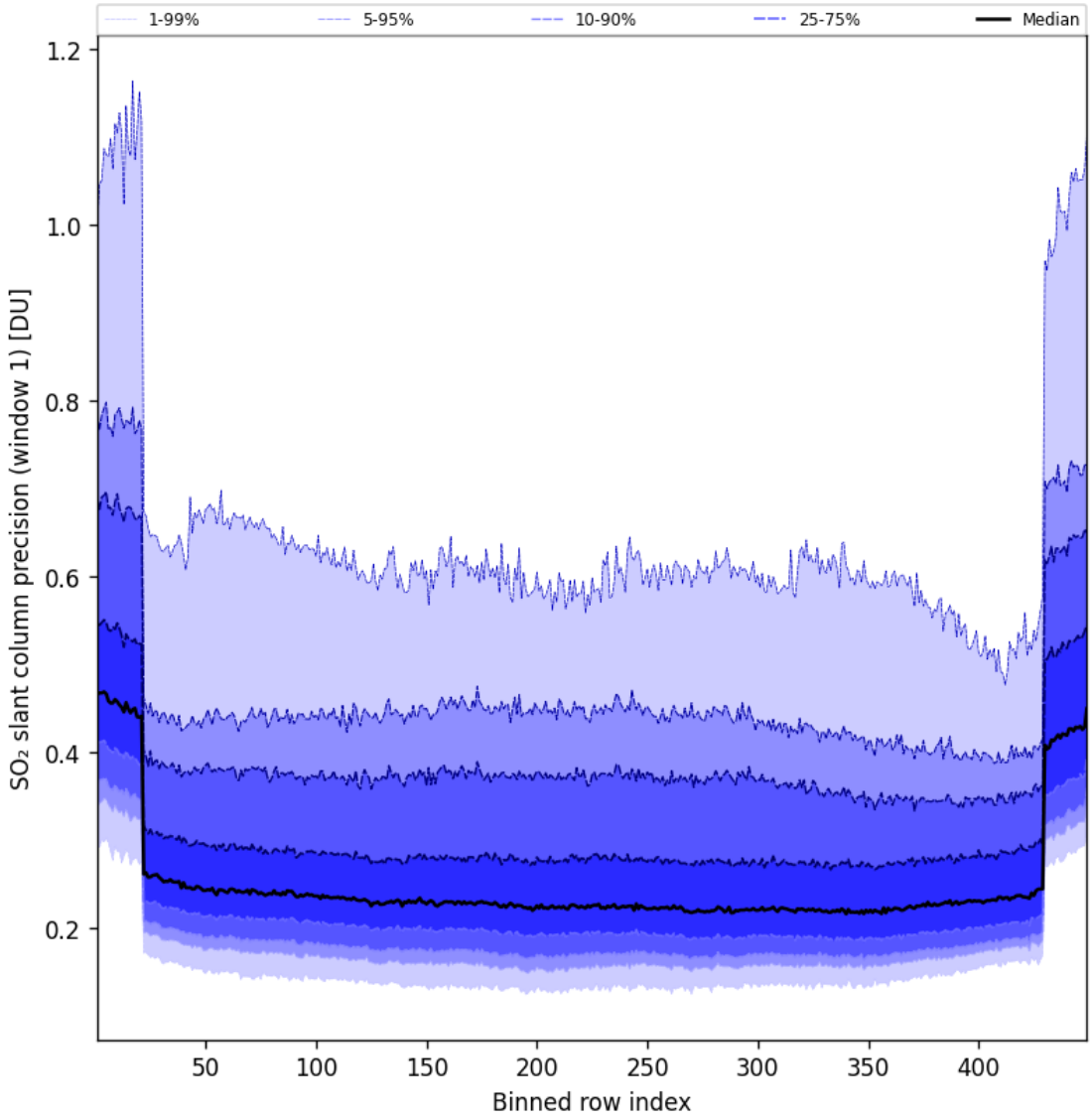

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2024-12-07 to 2024-12-08

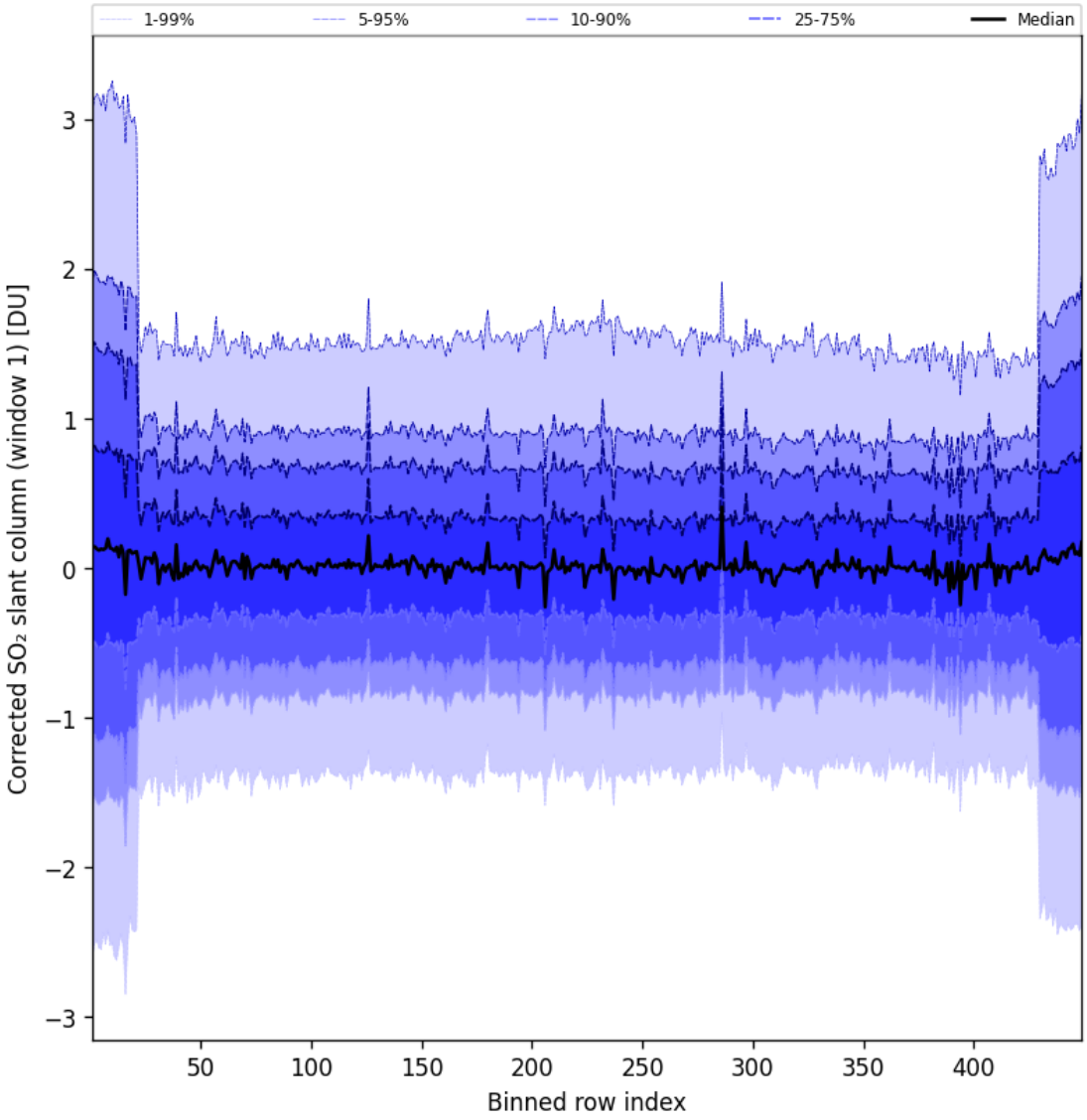

Figure 92: Along track statistics of "Corrected SO_2 slant column (window 1)" for 2024-12-07 to 2024-12-08

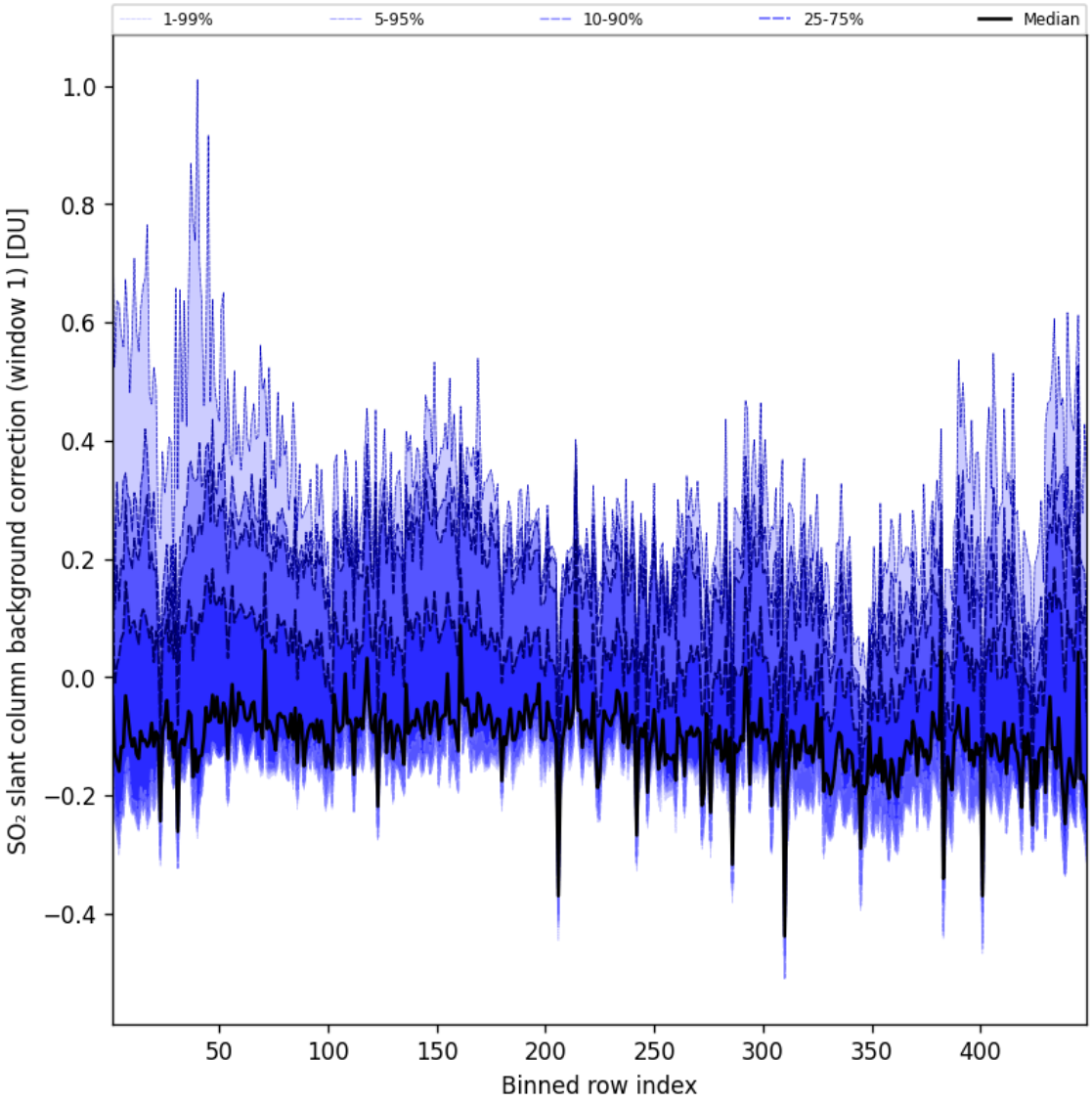

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2024-12-07 to 2024-12-08

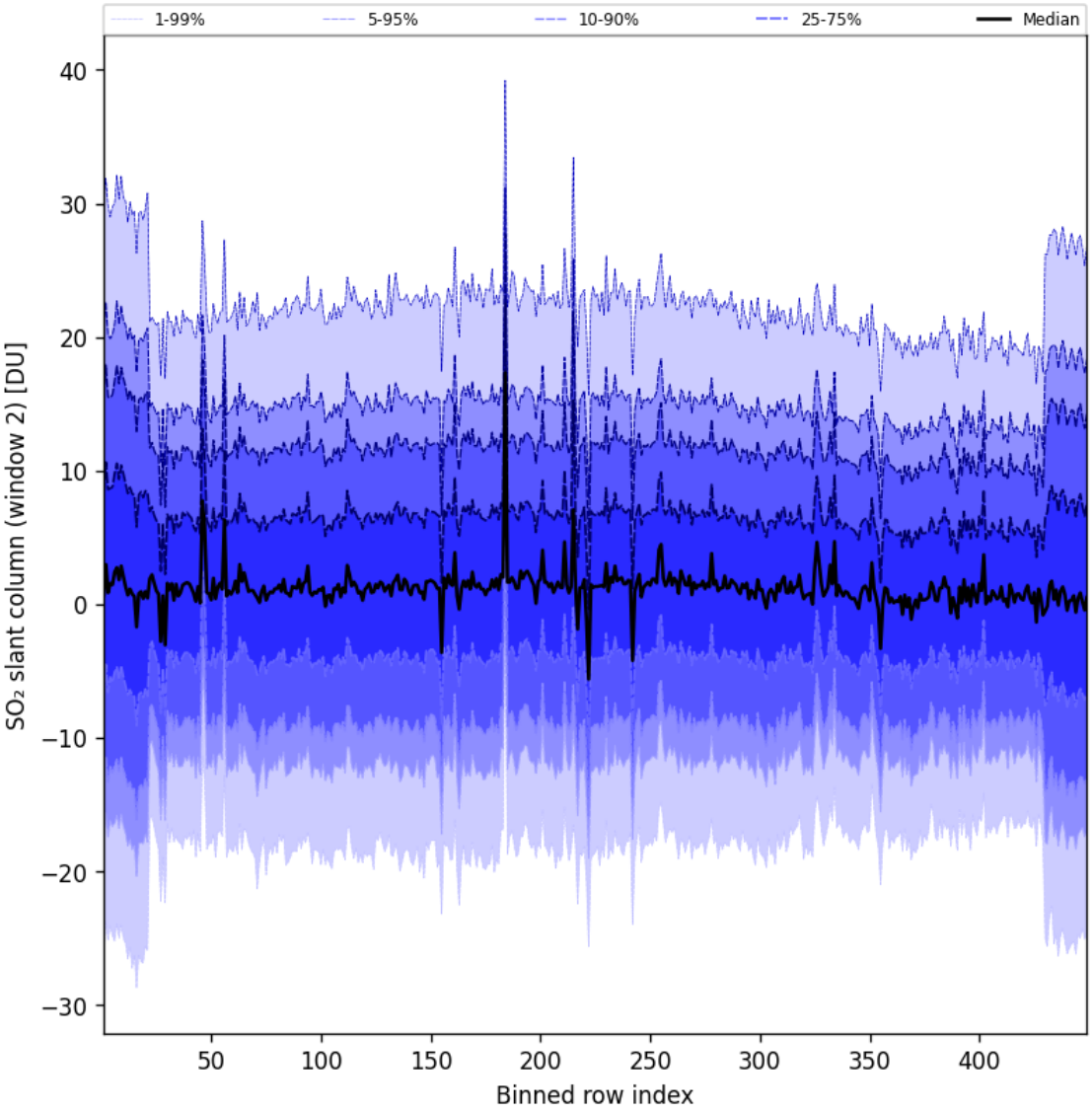

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2024-12-07 to 2024-12-08

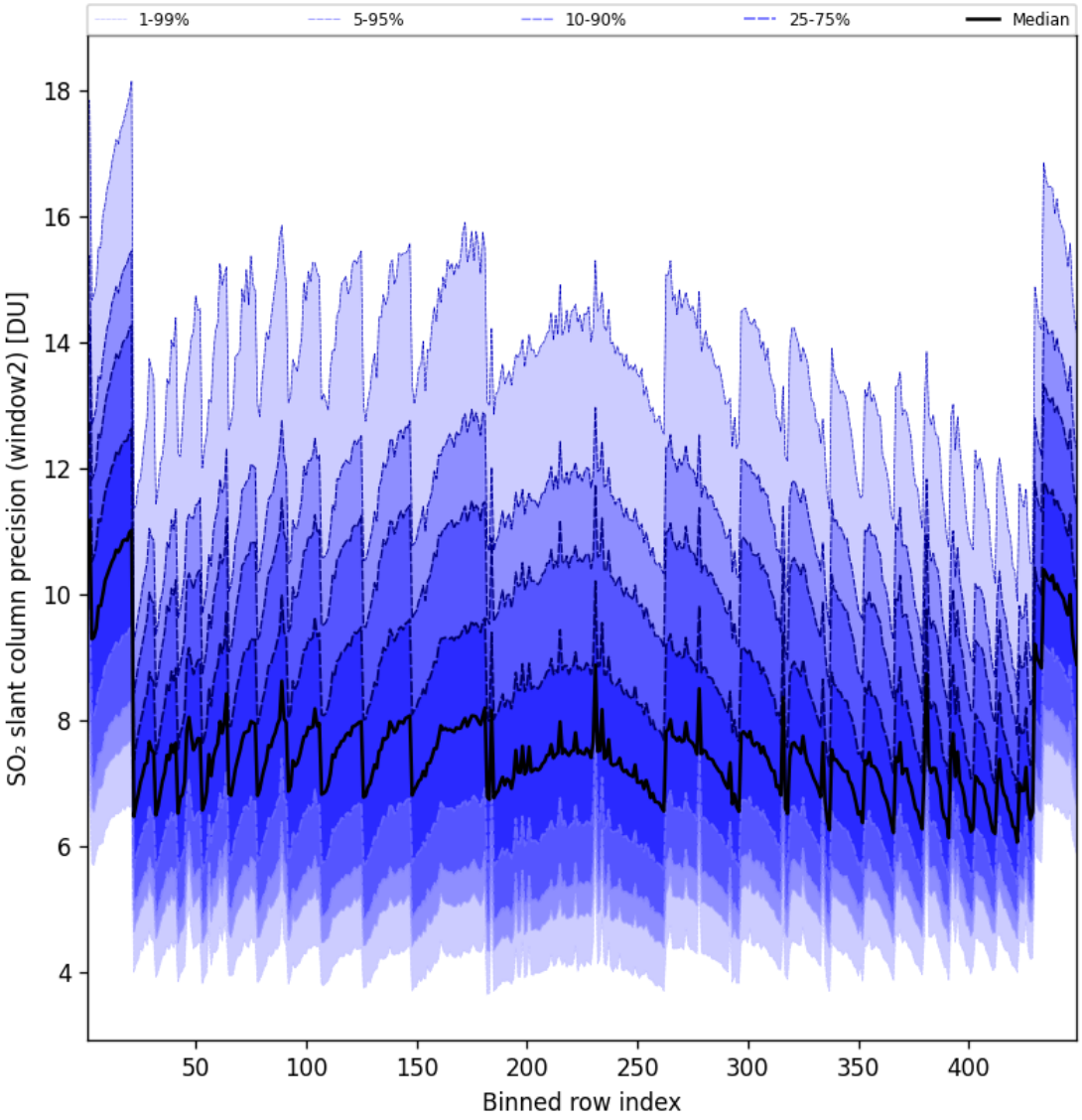

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2024-12-07 to 2024-12-08

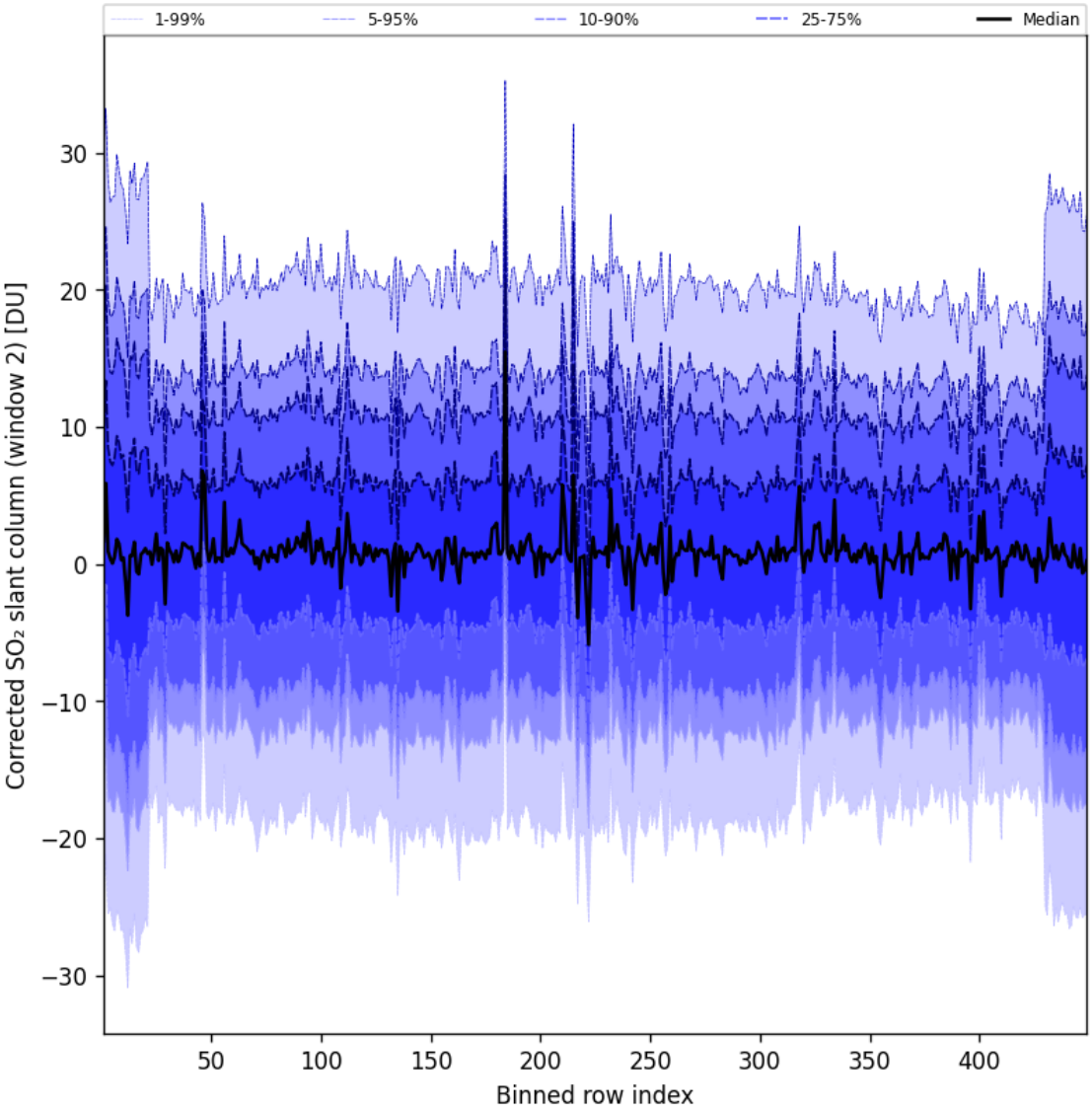

Figure 96: Along track statistics of "Corrected SO_2 slant column (window 2)" for 2024-12-07 to 2024-12-08

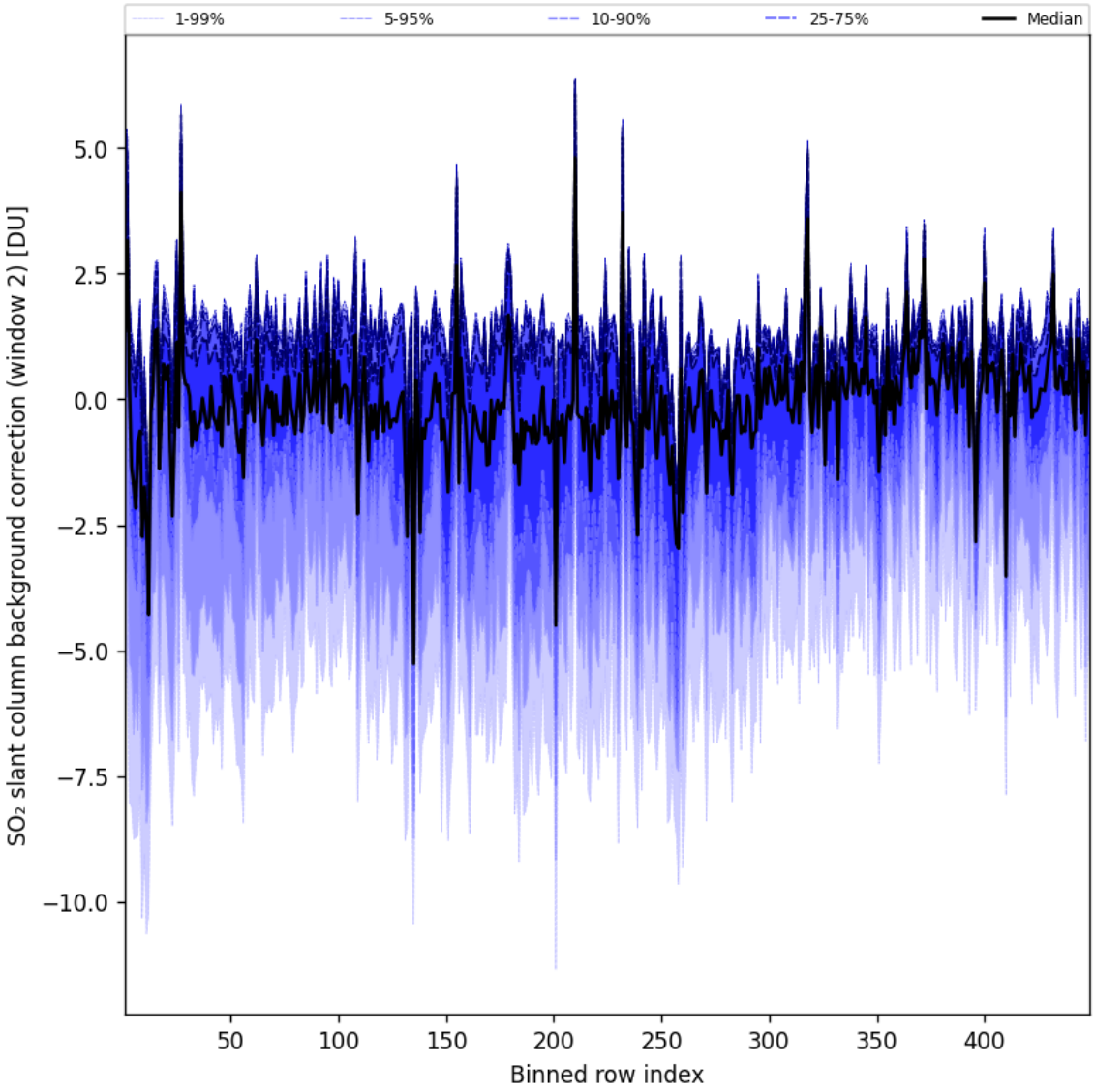

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2024-12-07 to 2024-12-08

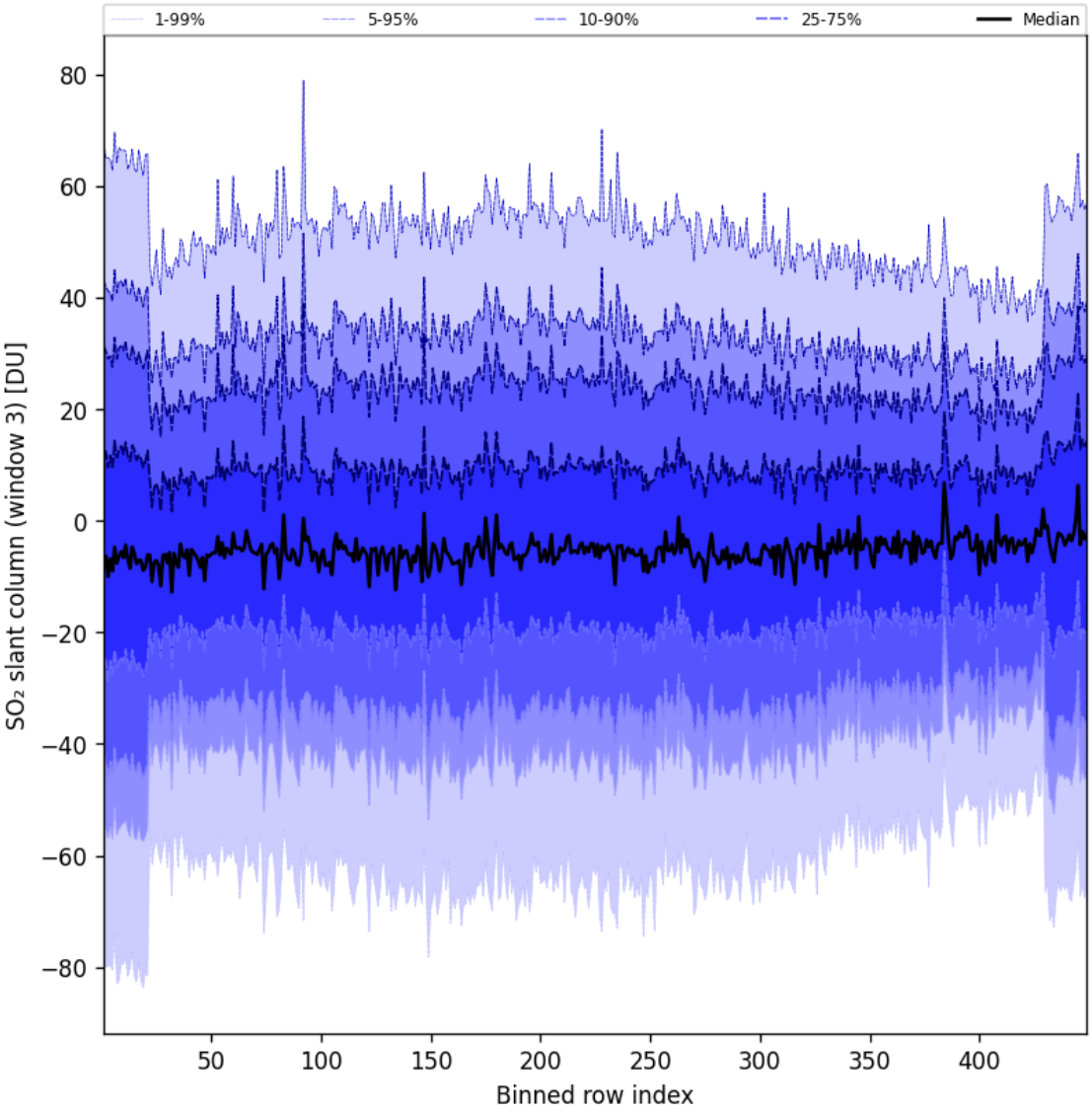

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2024-12-07 to 2024-12-08

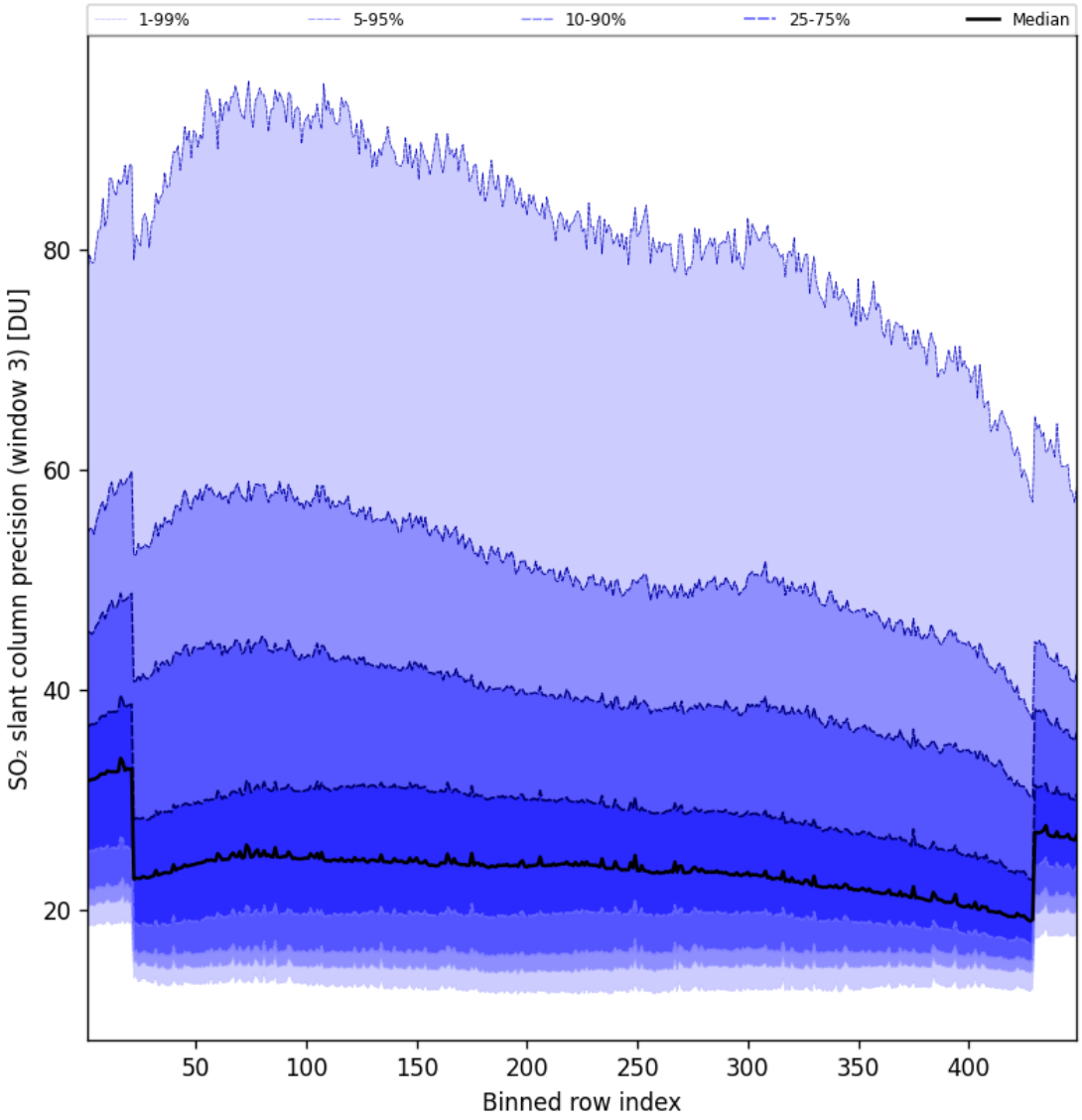

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2024-12-07 to 2024-12-08

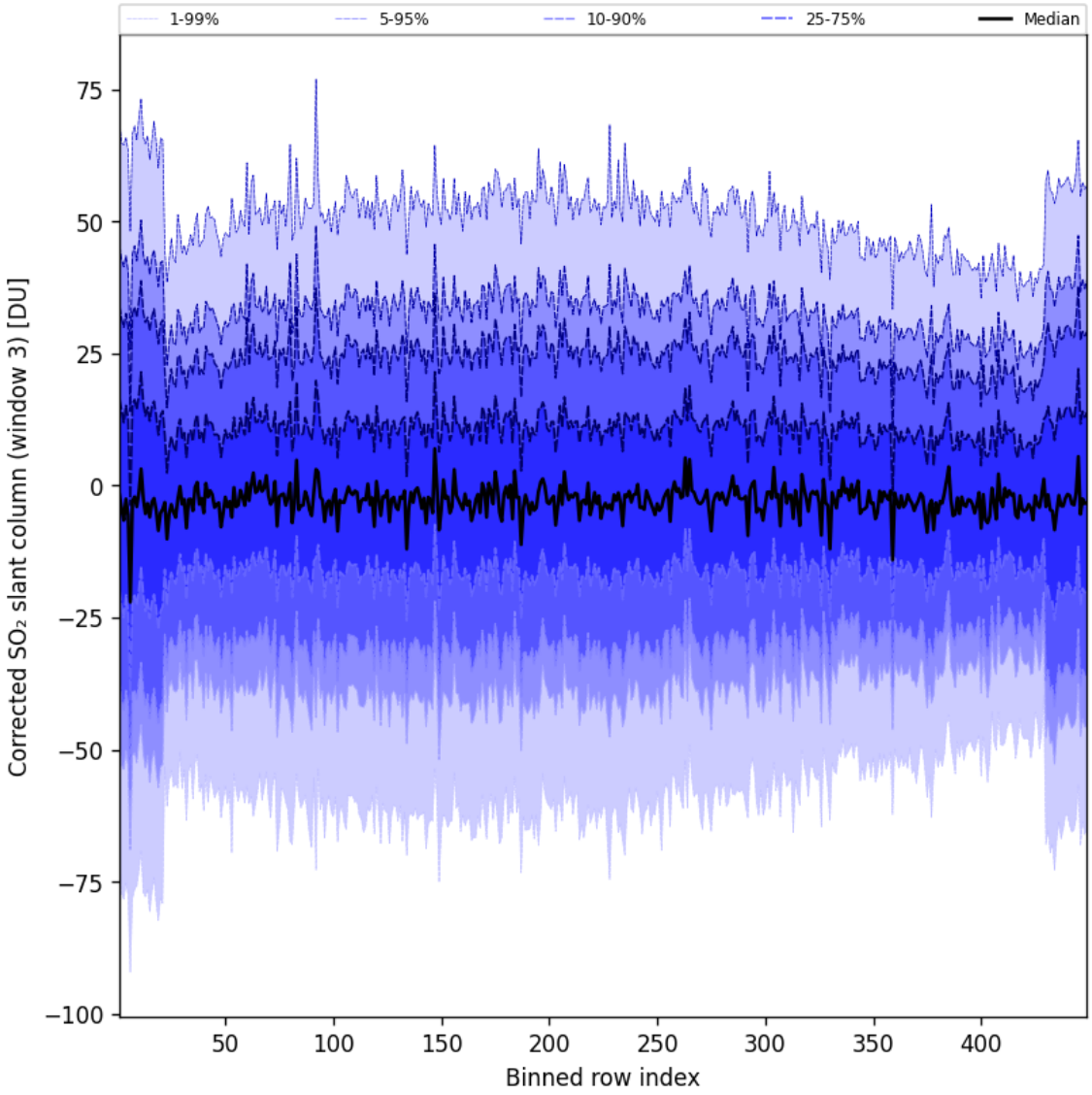

Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2024-12-07 to 2024-12-08

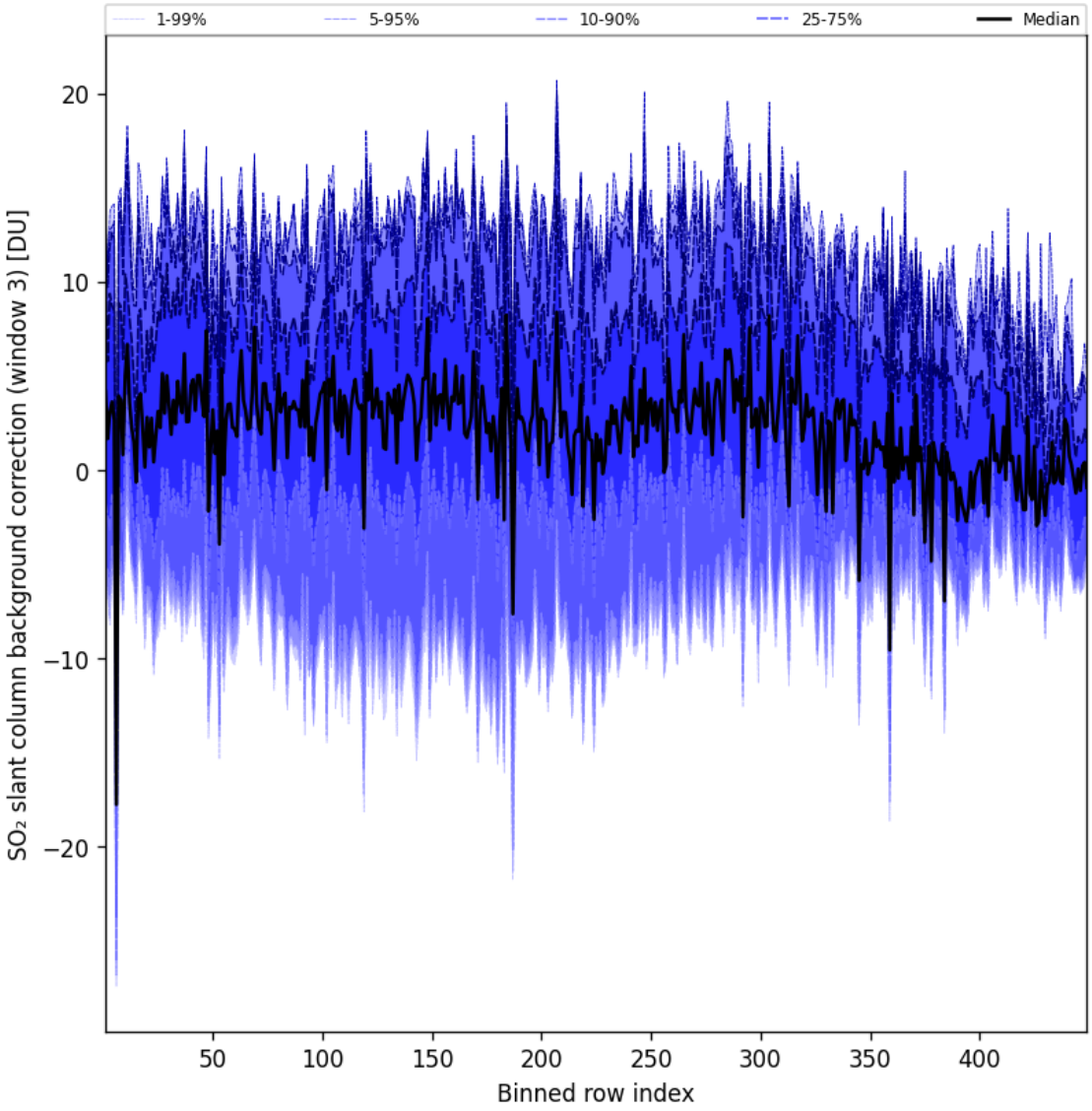

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2024-12-07 to 2024-12-08

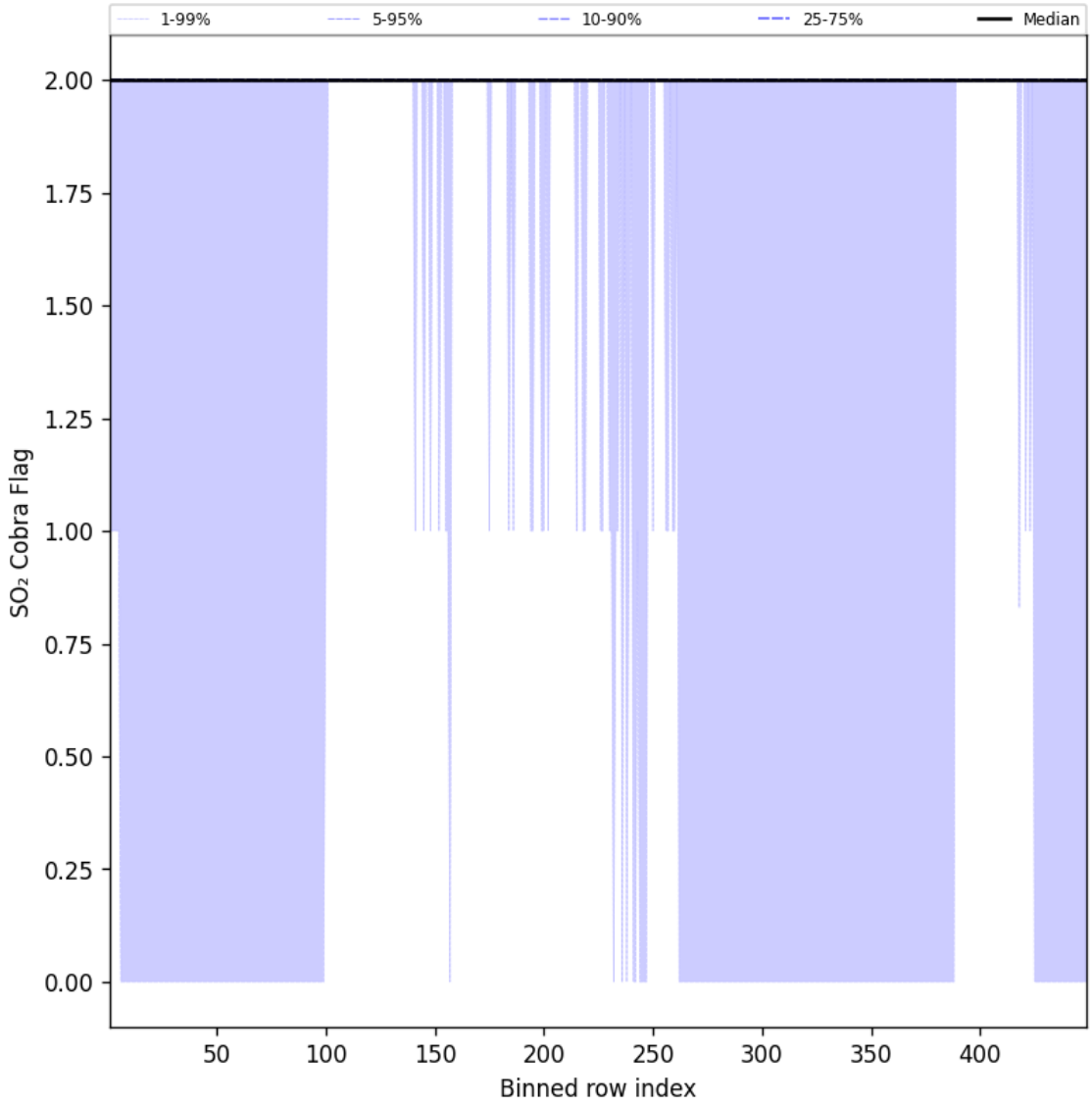

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2024-12-07 to 2024-12-08

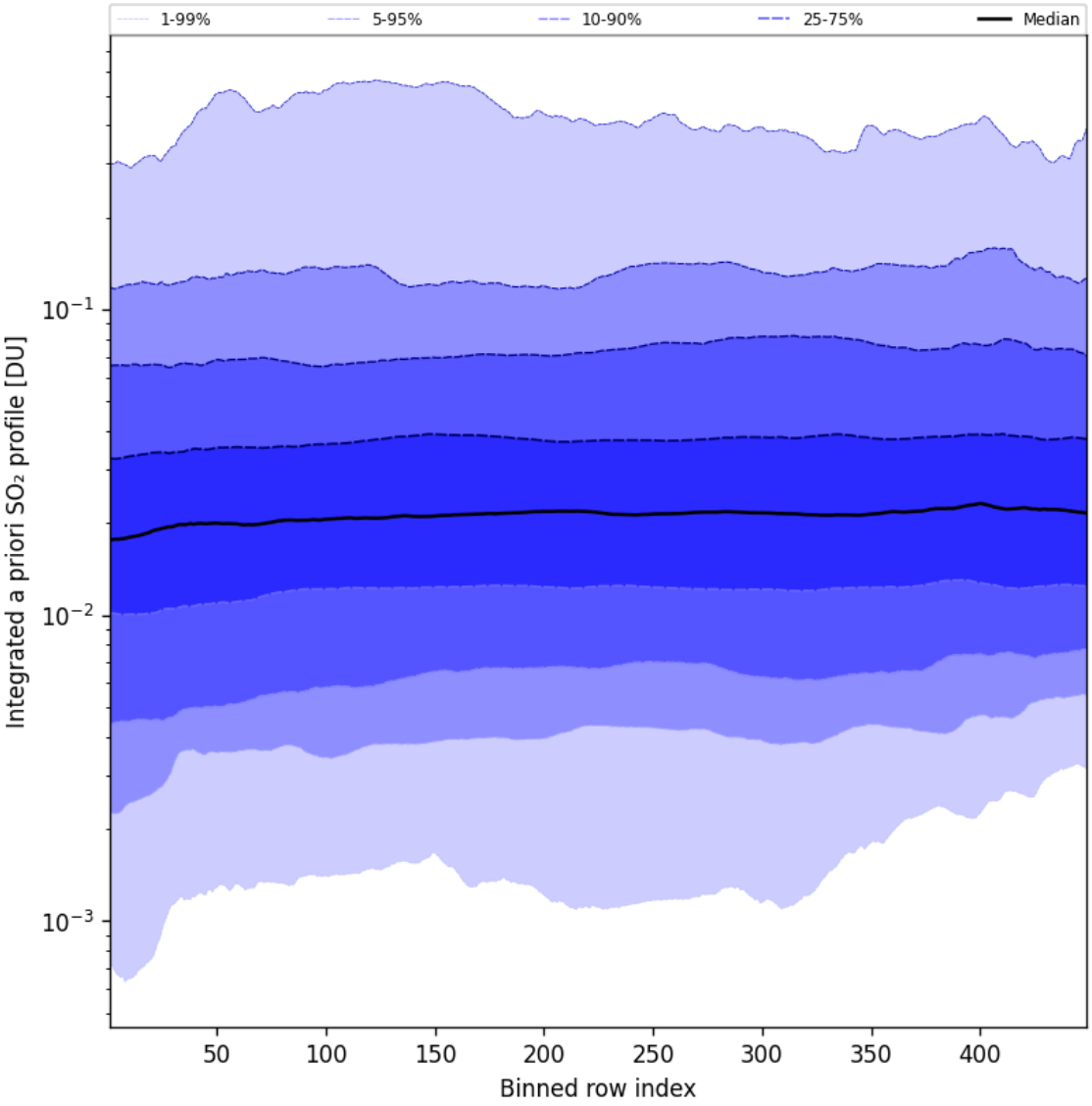

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2024-12-07 to 2024-12-08

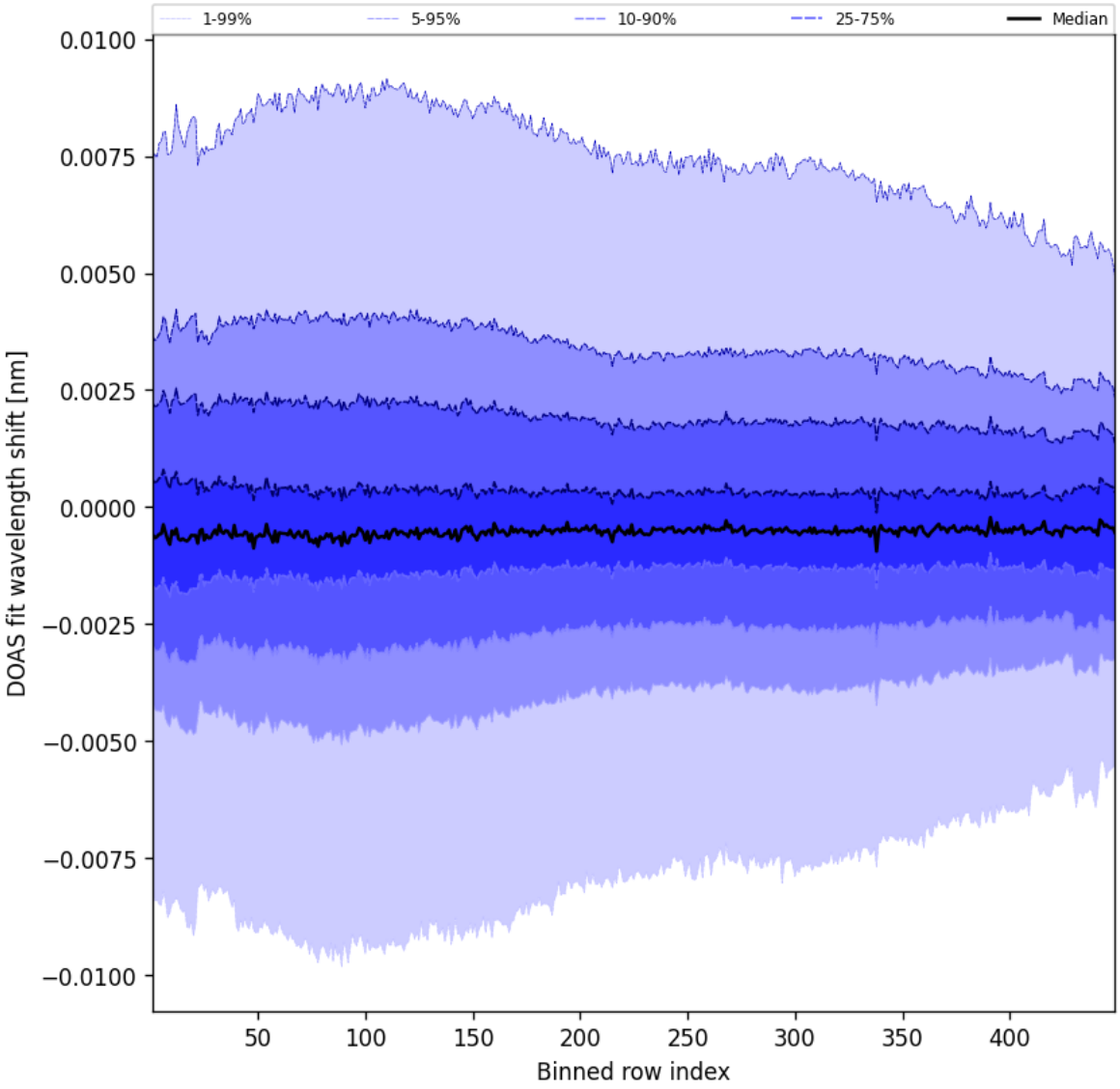

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2024-12-07 to 2024-12-08

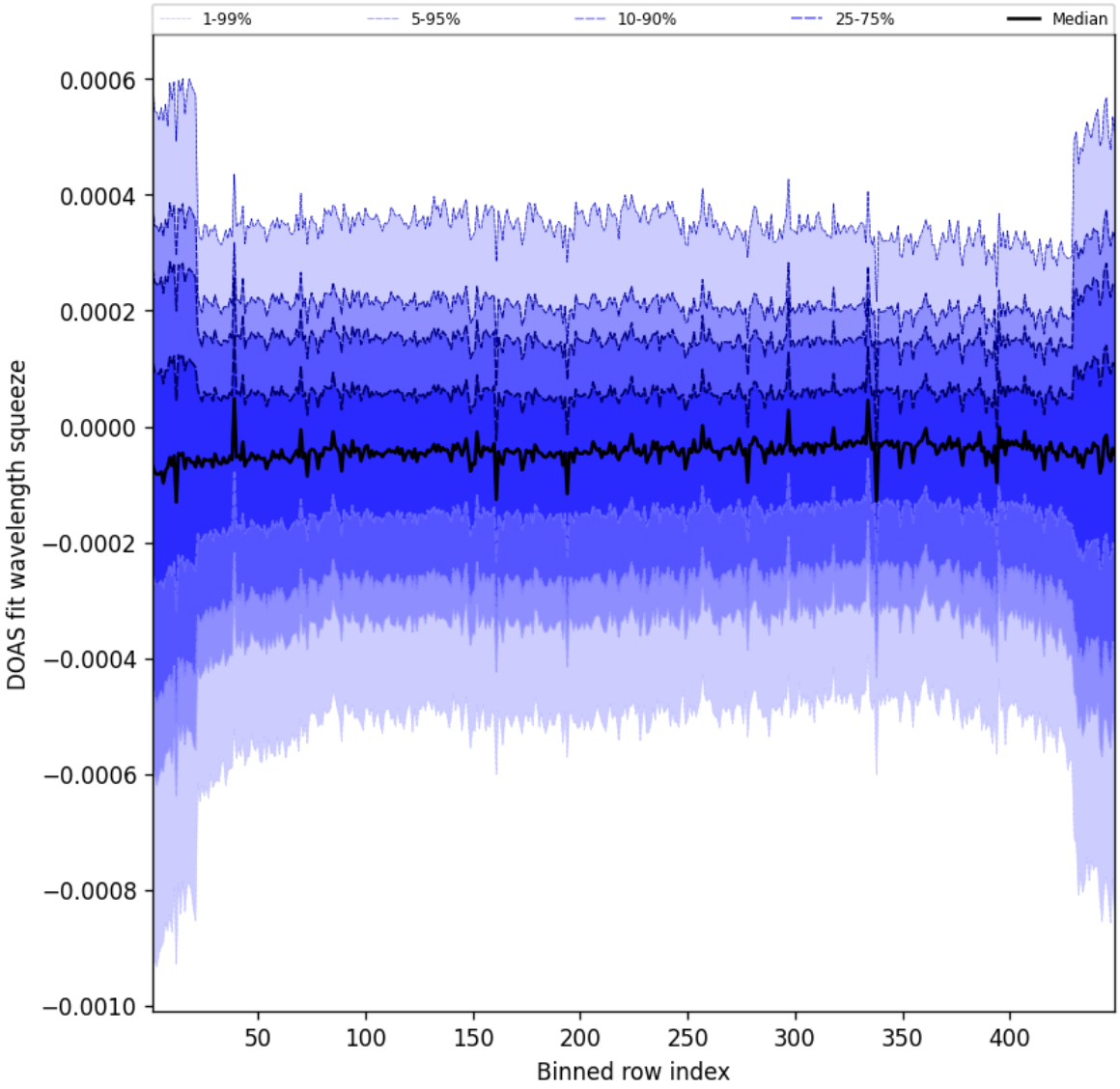

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2024-12-07 to 2024-12-08

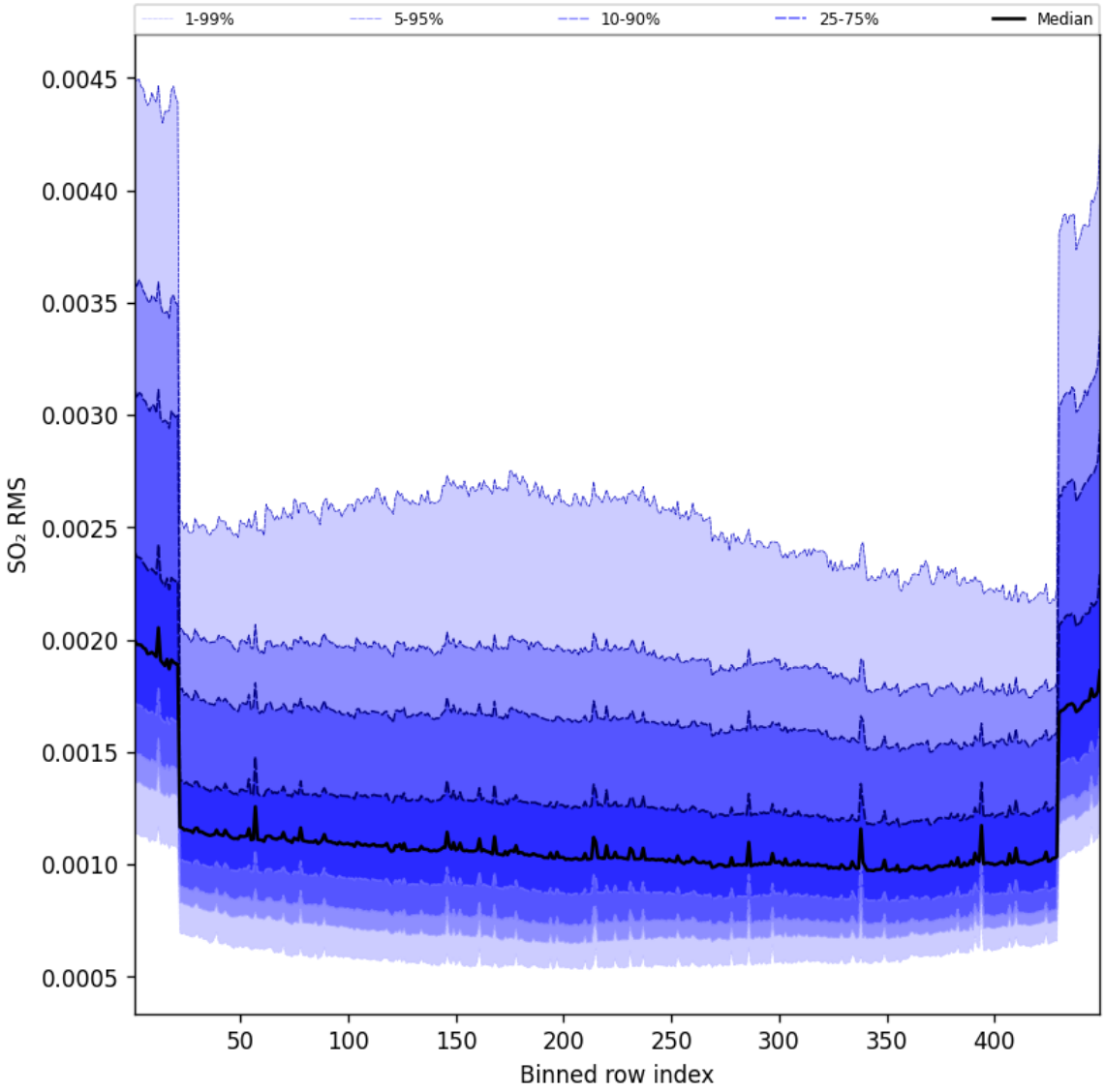

Figure 106: Along track statistics of "SO_2 RMS" for 2024-12-07 to 2024-12-08

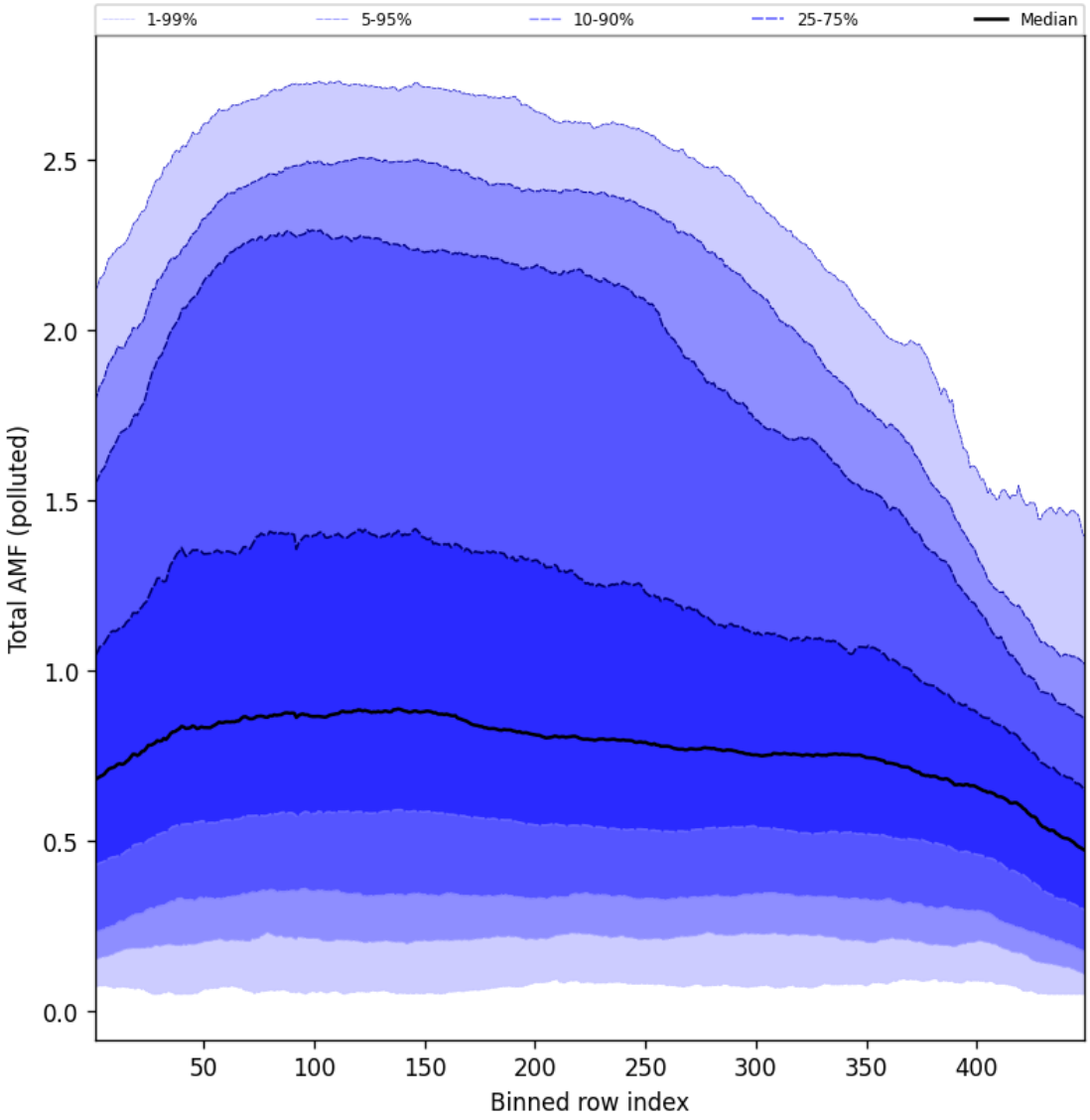

Figure 107: Along track statistics of “Total AMF (polluted)” for 2024-12-07 to 2024-12-08

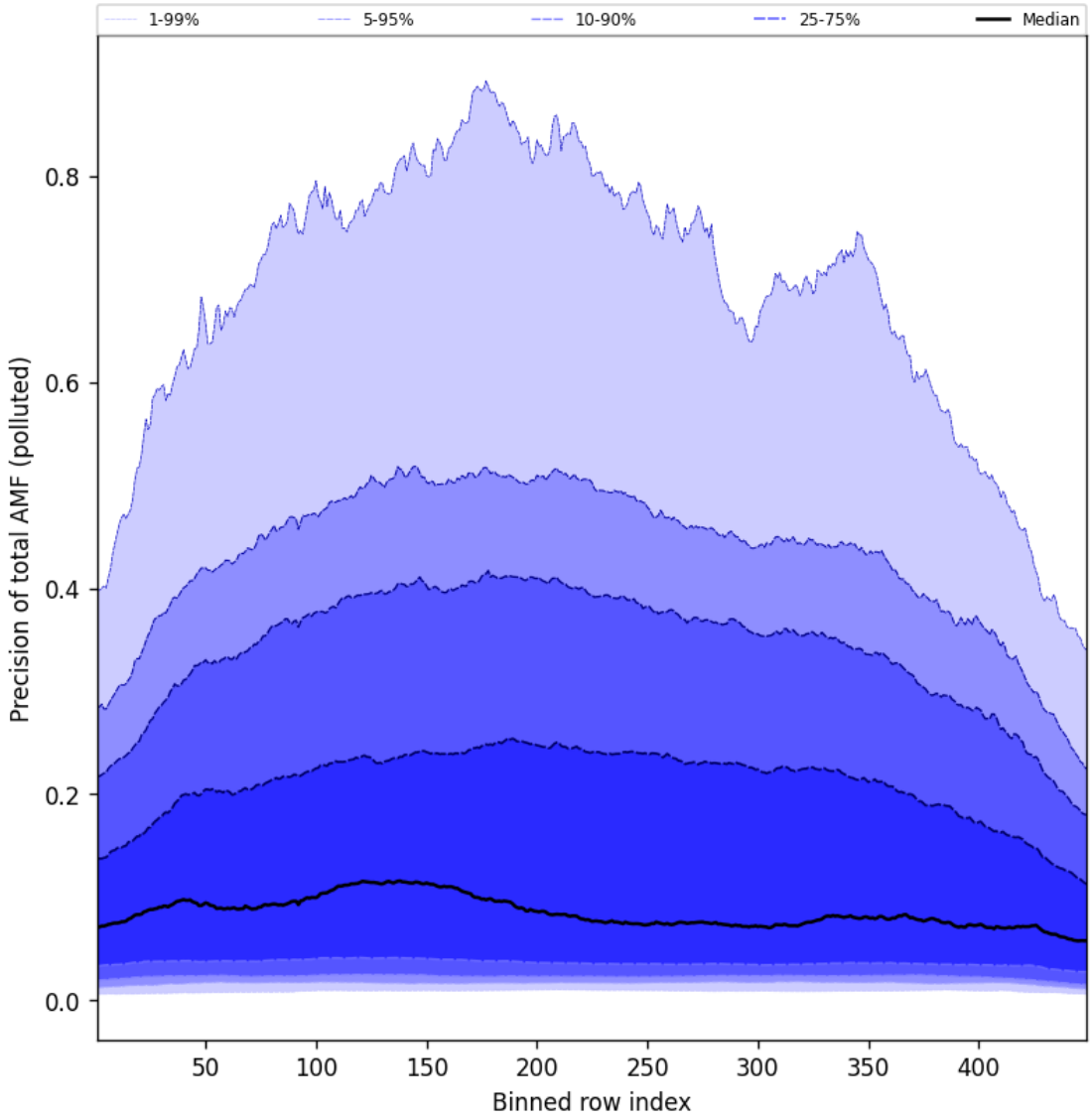

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2024-12-07 to 2024-12-08

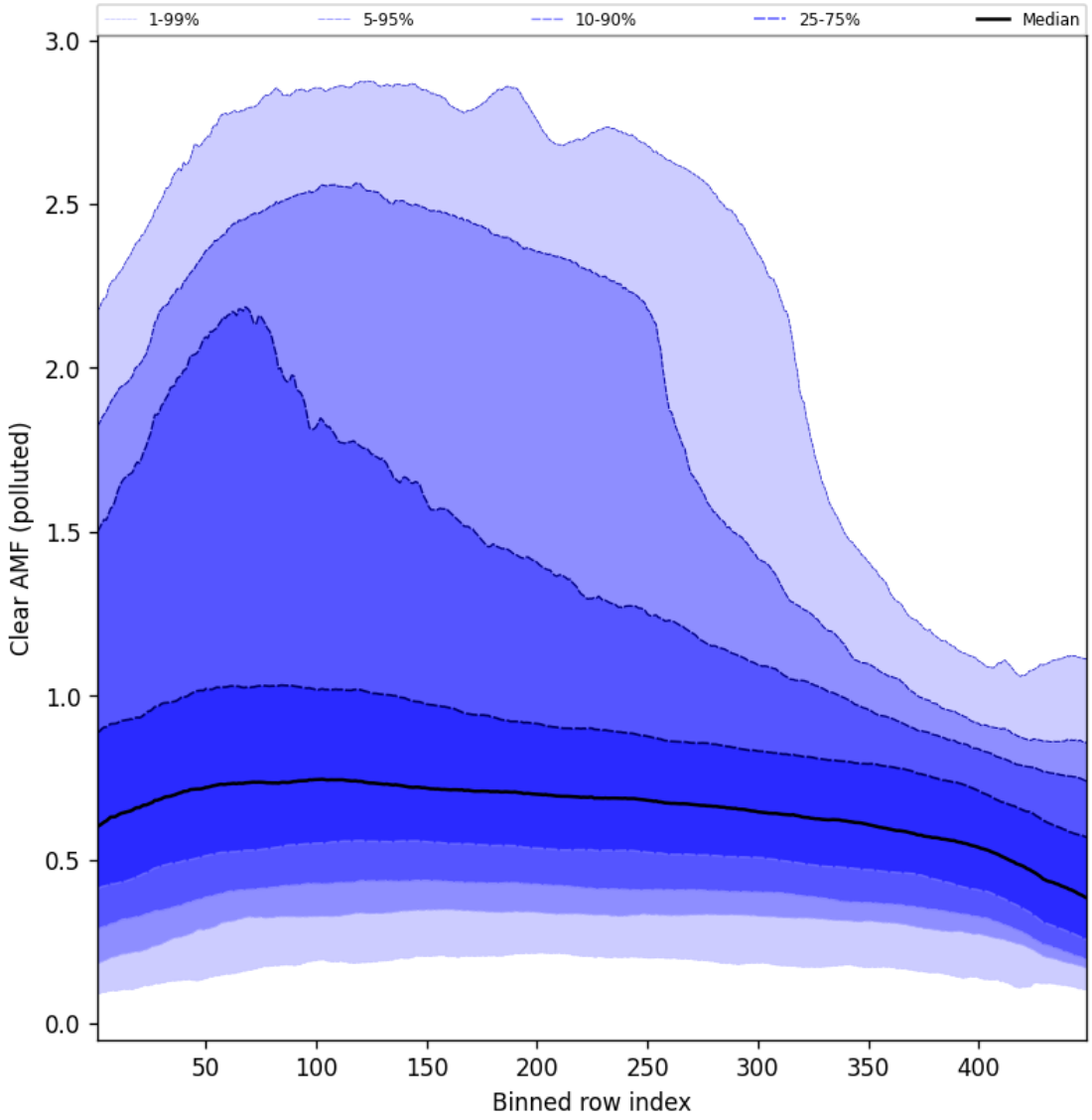

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2024-12-07 to 2024-12-08

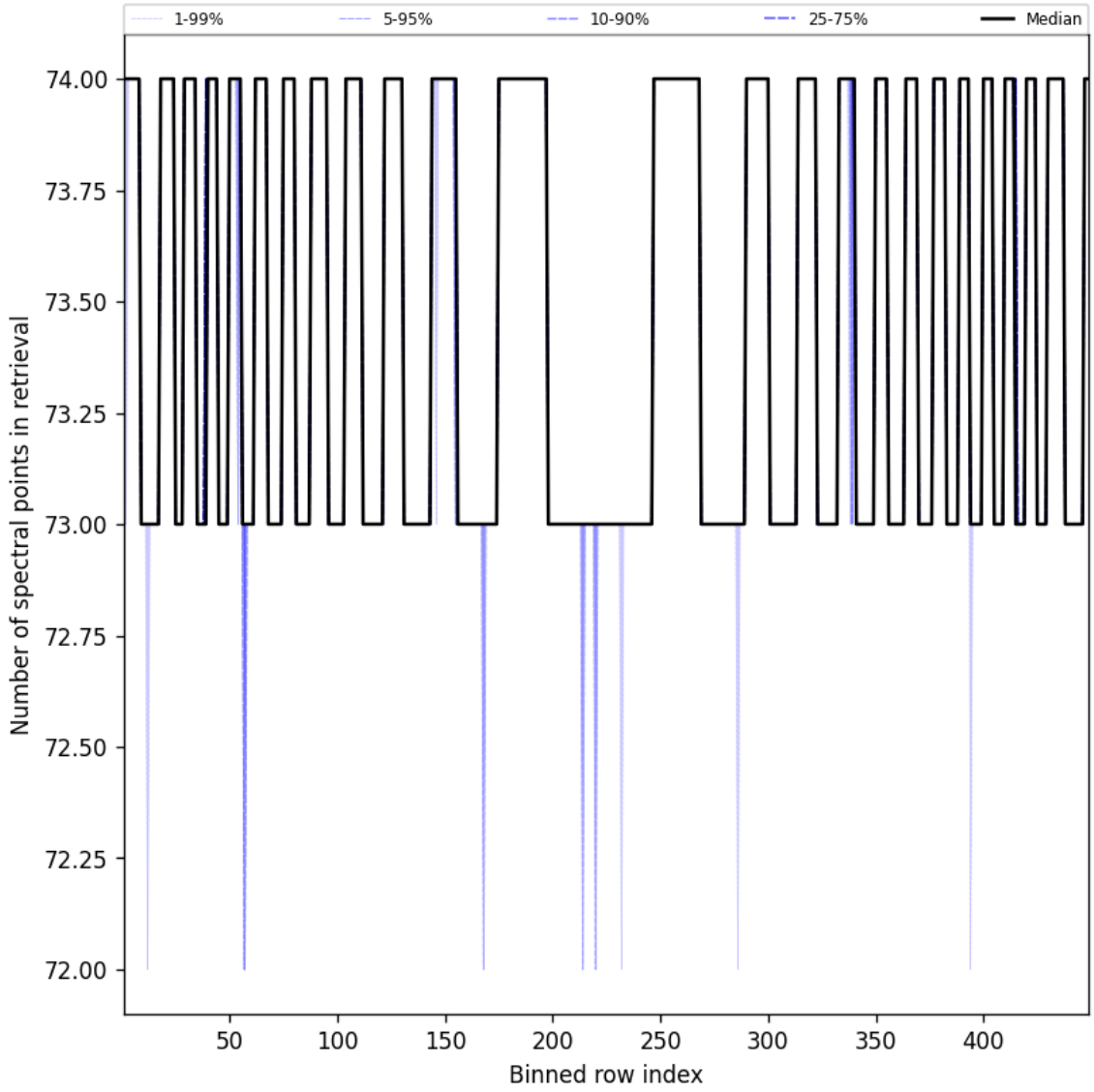

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2024-12-07 to 2024-12-08

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.

Contents

List of Figures

List of Tables

11 Copyright information of 'PyCAMA'

Maarten Sneep (maarten.sneep@knmi.nl).