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]	0.595 ± 0.423	17133603	0.995	0.850	1.000	0.0	1.000
sulfurdioxide total vertical column [DU]	$(3.504 \pm 134.148) \times 10^{-2}$	17133603	0.223	0.380	7.324×10^{-3}	-117	531
sulfurdioxide total vertical column precision [DU]	0.546 ± 0.967	17133603	0.222	0.345	0.284	2.694×10^{-2}	37.5
sulfurdioxide slant column density corrected [DU]	$(1.377 \pm 32.441) \times 10^{-2}$	17133603	0.235	0.332	7.515×10^{-3}	-36.7	259
sulfurdioxide slant column density cobra [DU]	$(1.373 \pm 31.665) \times 10^{-2}$	17133603	0.235	0.332	7.515×10^{-3}	-36.7	107
sulfurdioxide slant column density cobra precision [DU]	0.264 ± 0.114	17133603	0.213	9.268×10^{-2}	0.227	6.970×10^{-2}	28.7
sulfurdioxide slant column density window1 [DU]	$(8.829 \pm 61.677) \times 10^{-2}$	17133603	0.125	0.705	8.926×10^{-2}	-84.3	101
sulfurdioxide slant column density window1 precision [DU]	0.264 ± 0.114	17133603	0.213	9.268×10^{-2}	0.227	6.970×10^{-2}	28.7
sulfurdioxide slant column density corrected win1 [DU]	$(1.975 \pm 59.902) \times 10^{-2}$	17133603	2.500×10^{-2}	0.671	8.726×10^{-3}	-84.3	101
background so2 slant column offset window1 [DU]	$(-6.854 \pm 15.506) \times 10^{-2}$	17133603	-0.180	0.222	-0.114	-1.30	2.71
sulfurdioxide slant column density window2 [DU]	0.590 ± 8.628	17133603	0.250	10.6	0.564	-957	976
sulfurdioxide slant column density window2 precision [DU]	7.70 ± 2.26	17133603	6.97	2.60	7.31	2.09	595
sulfurdioxide slant column density corrected win2 [DU]	-0.218 ± 8.478	17133603	0.250	10.4	-0.171	-955	978
background so2 slant column offset window2 [DU]	-0.808 ± 1.978	17133603	0.750	2.50	-0.396	-13.8	15.9
sulfurdioxide slant column density window3 [DU]	-4.49 ± 23.05	17133603	-7.28	28.3	-4.82	-3.923×10^{3}	379
sulfurdioxide slant column density window3 precision [DU]	26.5 ± 12.8	17133603	21.5	10.4	23.3	9.28	893
sulfurdioxide slant column density corrected win3 [DU]	-0.336 ± 22.342	17133603	-1.68	27.3	-0.322	-3.928×10^{3}	381
background so2 slant column offset window3 [DU]	4.16 ± 6.42	17133603	2.80	9.63	4.04	-29.8	24.9
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.21	17133603	1.67	0.0	2.00	0.0	2.00
integrated so2 profile apriori [DU]	$(3.841 \pm 11.755) \times 10^{-2}$	17133603	1.423×10^{-2}	2.352×10^{-2}	1.786×10^{-2}	2.478×10^{-4}	5.14
fitted radiance shift [nm]	$(-3.486 \pm 24.260) \times 10^{-4}$	17133603	-5.000×10^{-4}	1.573×10^{-3}	-4.071×10^{-4}	-6.601×10^{-2}	4.237×10^{-2}
fitted radiance squeeze [1]	$(-4.254 \pm 17.099) \times 10^{-5}$	17133603	-3.000×10^{-5}	2.064×10^{-4}	-3.862×10^{-5}	-1.526×10^{-2}	1.683×10^{-2}
fitted root mean square [1]	$(1.170 \pm 0.459) \times 10^{-3}$	17133603	9.750×10^{-4}	4.047×10^{-4}	1.045×10^{-3}	3.326×10^{-4}	8.740×10^{-2}
sulfurdioxide total air mass factor polluted [1]	0.988 ± 0.674	17133603	0.700	0.729	0.814	5.000×10^{-2}	3.31
sulfurdioxide total air mass factor polluted precision [1]	0.151 ± 0.159	17133603	3.500×10^{-2}	0.176	8.877×10^{-2}	2.500×10^{-3}	1.72
sulfurdioxide clear air mass factor polluted [1]	0.831 ± 0.583	17133603	0.540	0.409	0.687	3.607×10^{-2}	3.37
number of spectral points in retrieval [1]	73.4 ± 0.5	17133603	73.0	1.000	73.0	70.0	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}	6.000×10^{-2}	0.150	1.000	1.000	1.000	1.000	1.000
sulfurdioxide total vertical column [DU]	−2.91	−0.890	−0.502	−0.322	−0.179	0.201	0.356	0.557	1.00	3.38
sulfurdioxide total vertical column precision [DU]	6.758×10^{-2}	8.392×10^{-2}	0.105	0.133	0.175	0.519	0.745	1.09	1.86	4.56
sulfurdioxide slant column density corrected [DU]	−0.769	−0.441	−0.322	−0.242	−0.157	0.175	0.263	0.349	0.481	0.877
sulfurdioxide slant column density cobra [DU]	−0.769	−0.441	−0.322	−0.242	−0.157	0.175	0.263	0.349	0.481	0.877
sulfurdioxide slant column density cobra precision [DU]	0.137	0.161	0.174	0.184	0.196	0.289	0.359	0.416	0.484	0.684
sulfurdioxide slant column density window1 [DU]	−1.48	−0.866	−0.623	−0.452	−0.267	0.438	0.617	0.787	1.04	1.74
sulfurdioxide slant column density window1 precision [DU]	0.137	0.161	0.174	0.184	0.196	0.289	0.359	0.416	0.484	0.684
sulfurdioxide slant column density corrected win1 [DU]	−1.47	−0.881	−0.653	−0.495	−0.325	0.347	0.525	0.695	0.953	1.68
background so2 slant column offset window1 [DU]	−0.365	−0.266	−0.222	−0.198	−0.175	4.744×10^{-2}	0.116	0.157	0.205	0.296
sulfurdioxide slant column density window2 [DU]	−20.2	−13.0	−9.74	−7.36	−4.71	5.86	8.55	11.0	14.4	22.1
sulfurdioxide slant column density window2 precision [DU]	4.13	4.87	5.32	5.70	6.18	8.78	9.70	10.6	11.9	14.6
sulfurdioxide slant column density corrected win2 [DU]	−21.3	−13.7	−10.4	−8.04	−5.40	5.04	7.66	10.0	13.3	20.3
background so2 slant column offset window2 [DU]	−7.00	−4.59	−3.36	−2.62	−1.89	0.606	0.873	1.10	1.46	3.07
sulfurdioxide slant column density window3 [DU]	−62.6	−41.5	−32.2	−25.7	−18.7	9.62	17.2	24.3	33.8	52.7
sulfurdioxide slant column density window3 precision [DU]	13.2	15.0	16.3	17.5	19.1	29.4	34.0	39.2	50.2	80.7
sulfurdioxide slant column density corrected win3 [DU]	−57.5	−36.8	−27.4	−20.9	−13.9	13.4	20.5	27.1	36.1	54.7
background so2 slant column offset window3 [DU]	−8.43	−5.77	−4.34	−2.86	−0.691	8.94	11.2	12.9	14.6	17.2
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]	1.445×10^{-3}	3.455×10^{-3}	5.600×10^{-3}	7.715×10^{-3}	1.047×10^{-2}	3.399×10^{-2}	4.513×10^{-2}	6.094×10^{-2}	0.107	0.398
fitted radiance shift [nm]	-7.736×10^{-3}	-3.859×10^{-3}	-2.494×10^{-3}	-1.748×10^{-3}	-1.173×10^{-3}	4.003×10^{-4}	1.064×10^{-3}	1.919×10^{-3}	3.413×10^{-3}	7.440×10^{-3}
fitted radiance squeeze [1]	-4.829×10^{-4}	-3.187×10^{-4}	-2.489×10^{-4}	-1.990×10^{-4}	-1.442×10^{-4}	6.218×10^{-5}	1.122×10^{-4}	1.579×10^{-4}	2.224×10^{-4}	3.751×10^{-4}
fitted root mean square [1]	5.781×10^{-4}	6.979×10^{-4}	7.702×10^{-4}	8.257×10^{-4}	8.906×10^{-4}	1.295×10^{-3}	1.522×10^{-3}	1.767×10^{-3}	2.089×10^{-3}	2.847×10^{-3}
sulfurdioxide total air mass factor polluted [1]	6.799×10^{-2}	0.187	0.295	0.402	0.523	1.25	1.62	2.05	2.56	2.89
sulfurdioxide total air mass factor polluted precision [1]	8.594×10^{-3}	1.555×10^{-2}	2.270×10^{-2}	2.841×10^{-2}	3.751×10^{-2}	0.214	0.293	0.369	0.477	0.716
sulfurdioxide clear air mass factor polluted [1]	0.158	0.278	0.368	0.433	0.506	0.915	1.07	1.34	2.54	3.03
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]	0.736 ± 0.377	5783675	0.610	1.000	0.0	1.000	0.390	1.000
sulfurdioxide total vertical column [DU]	$(7.386 \pm 205.506) \times 10^{-2}$	5783675	0.595	1.429×10^{-2}	-117	531	-0.275	0.320
sulfurdioxide total vertical column precision [DU]	0.864 ± 1.387	5783675	0.624	0.428	4.835×10^{-2}	37.5	0.259	0.883
sulfurdioxide slant column density corrected [DU]	$(2.227 \pm 39.597) \times 10^{-2}$	5783675	0.399	1.089×10^{-2}	-6.84	39.3	-0.186	0.213
sulfurdioxide slant column density cobra [DU]	$(2.222 \pm 39.357) \times 10^{-2}$	5783675	0.399	1.089×10^{-2}	-6.84	8.19	-0.186	0.213
sulfurdioxide slant column density cobra precision [DU]	0.322 ± 0.142	5783675	0.167	0.279	9.143×10^{-2}	4.55	0.223	0.390
sulfurdioxide slant column density window1 [DU]	0.165 ± 0.728	5783675	0.799	0.170	-9.09	8.69	-0.232	0.567
sulfurdioxide slant column density window1 precision [DU]	0.322 ± 0.142	5783675	0.167	0.279	9.143×10^{-2}	4.55	0.223	0.390
sulfurdioxide slant column density corrected win1 [DU]	$(4.773 \pm 72.633) \times 10^{-2}$	5783675	0.793	3.024×10^{-2}	-8.79	8.64	-0.362	0.431
background so2 slant column offset window1 [DU]	-0.118 ± 0.124	5783675	0.105	-0.128	-1.17	2.71	-0.182	-7.693×10^{-2}
sulfurdioxide slant column density window2 [DU]	1.07 ± 9.93	5783675	12.4	0.850	-254	74.8	-5.25	7.18
sulfurdioxide slant column density window2 precision [DU]	8.89 ± 2.33	5783675	2.93	8.56	2.26	156	7.26	10.2
sulfurdioxide slant column density corrected win2 [DU]	-0.159 ± 9.677	5783675	12.2	-0.110	-254	68.6	-6.21	5.97
background so2 slant column offset window2 [DU]	-1.23 ± 2.43	5783675	3.05	-0.363	-13.8	15.9	-2.57	0.484
sulfurdioxide slant column density window3 [DU]	-6.40 ± 26.30	5783675	33.2	-5.77	-315	202	-22.7	10.6
sulfurdioxide slant column density window3 precision [DU]	30.6 ± 13.0	5783675	10.4	27.5	9.74	228	23.3	33.7
sulfurdioxide slant column density corrected win3 [DU]	-0.749 ± 25.859	5783675	32.7	-0.503	-311	205	-16.9	15.8
background so2 slant column offset window3 [DU]	5.65 ± 5.36	5783675	8.05	4.57	-22.0	24.9	1.59	9.64
sulfurdioxide slant column cobra flag [1]	1.97 ± 0.26	5783675	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(7.521 \pm 19.424) \times 10^{-2}$	5783675	4.367×10^{-2}	3.004×10^{-2}	1.312×10^{-3}	5.14	1.699×10^{-2}	6.066×10^{-2}
fitted radiance shift [nm]	$(-1.943 \pm 25.918) \times 10^{-4}$	5783675	1.699×10^{-3}	-2.210×10^{-4}	-3.234×10^{-2}	3.352×10^{-2}	-1.064×10^{-3}	6.351×10^{-4}
fitted radiance squeeze [1]	$(-3.237 \pm 187.288) \times 10^{-6}$	5783675	2.166×10^{-4}	-4.496×10^{-7}	-1.121×10^{-2}	2.311×10^{-3}	-1.097×10^{-4}	1.069×10^{-4}
fitted root mean square [1]	$(1.396 \pm 0.571) \times 10^{-3}$	5783675	6.675×10^{-4}	1.227×10^{-3}	3.575×10^{-4}	2.078×10^{-2}	1.001×10^{-3}	1.669×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.705 ± 0.391	5783675	0.520	0.670	5.000×10^{-2}	2.67	0.409	0.929
sulfurdioxide total air mass factor polluted precision [1]	$(8.581 \pm 10.748) \times 10^{-2}$	5783675	7.897×10^{-2}	4.963×10^{-2}	2.500×10^{-3}	1.72	2.833×10^{-2}	0.107
sulfurdioxide clear air mass factor polluted [1]	0.644 ± 0.287	5783675	0.444	0.649	3.607×10^{-2}	1.97	0.414	0.858
number of spectral points in retrieval [1]	73.5 ± 0.5	5783675	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]	0.523 ± 0.426	11349928	0.900	0.410	0.0	1.000	0.1000	1.000
sulfurdioxide total vertical column [DU]	$(1.527 \pm 75.056) \times 10^{-2}$	11349928	0.308	5.467×10^{-3}	-40.7	214	-0.147	0.161
sulfurdioxide total vertical column precision [DU]	0.384 ± 0.594	11349928	0.263	0.237	2.694×10^{-2}	27.1	0.142	0.406
sulfurdioxide slant column density corrected [DU]	$(9.439 \pm 280.919) \times 10^{-3}$	11349928	0.305	6.166×10^{-3}	-36.7	259	-0.146	0.159
sulfurdioxide slant column density cobra [DU]	$(9.404 \pm 269.025) \times 10^{-3}$	11349928	0.305	6.166×10^{-3}	-36.7	107	-0.146	0.159
sulfurdioxide slant column density cobra precision [DU]	0.234 ± 0.082	11349928	6.046×10^{-2}	0.214	6.970×10^{-2}	28.7	0.189	0.249
sulfurdioxide slant column density window1 [DU]	$(4.903 \pm 54.739) \times 10^{-2}$	11349928	0.660	5.509×10^{-2}	-84.3	101	-0.281	0.379
sulfurdioxide slant column density window1 precision [DU]	0.234 ± 0.082	11349928	6.046×10^{-2}	0.214	6.970×10^{-2}	28.7	0.189	0.249
sulfurdioxide slant column density corrected win1 [DU]	$(5.498 \pm 521.765) \times 10^{-3}$	11349928	0.621	5.833×10^{-5}	-84.3	101	-0.309	0.311
background so2 slant column offset window1 [DU]	$(-4.353 \pm 16.292) \times 10^{-2}$	11349928	0.271	-8.506×10^{-2}	-1.30	0.833	-0.172	9.909×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.343 ± 7.874	11349928	9.81	0.448	-957	976	-4.49	5.32
sulfurdioxide slant column density window2 precision [DU]	7.10 ± 1.96	11349928	2.09	6.82	2.09	595	5.86	7.95
sulfurdioxide slant column density corrected win2 [DU]	-0.248 ± 7.796	11349928	9.71	-0.195	-955	978	-5.06	4.65
background so2 slant column offset window2 [DU]	-0.592 ± 1.663	11349928	2.40	-0.417	-9.48	6.21	-1.73	0.678
sulfurdioxide slant column density window3 [DU]	-3.52 ± 21.13	11349928	26.3	-4.44	-3.923×10^3	379	-17.1	9.18
sulfurdioxide slant column density window3 precision [DU]	24.5 ± 12.2	11349928	8.10	21.2	9.28	893	17.9	26.0
sulfurdioxide slant column density corrected win3 [DU]	-0.126 ± 20.313	11349928	25.0	-0.251	-3.928×10^3	381	-12.7	12.4
background so2 slant column offset window3 [DU]	3.40 ± 6.78	11349928	11.1	3.67	-29.8	22.6	-2.49	8.59
sulfurdioxide slant column cobra flag [1]	1.98 ± 0.18	11349928	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(1.966 \pm 2.433) \times 10^{-2}$	11349928	1.663×10^{-2}	1.422×10^{-2}	2.478×10^{-4}	1.56	8.419×10^{-3}	2.505×10^{-2}
fitted radiance shift [nm]	$(-4.273 \pm 23.330) \times 10^{-4}$	11349928	1.482×10^{-3}	-4.913×10^{-4}	-6.601×10^{-2}	4.237×10^{-2}	-1.214×10^{-3}	2.684×10^{-4}
fitted radiance squeeze [1]	$(-6.256 \pm 15.836) \times 10^{-5}$	11349928	1.979×10^{-4}	-5.631×10^{-5}	-1.526×10^{-2}	1.683×10^{-2}	-1.585×10^{-4}	3.942×10^{-5}
fitted root mean square [1]	$(1.055 \pm 0.336) \times 10^{-3}$	11349928	3.020×10^{-4}	9.879×10^{-4}	3.326×10^{-4}	8.740×10^{-2}	8.565×10^{-4}	1.159×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.13 ± 0.74	11349928	0.927	0.917	5.000×10^{-2}	3.31	0.589	1.52
sulfurdioxide total air mass factor polluted precision [1]	0.184 ± 0.170	11349928	0.227	0.134	3.985×10^{-3}	1.64	4.506×10^{-2}	0.272
sulfurdioxide clear air mass factor polluted [1]	0.926 ± 0.667	11349928	0.431	0.701	9.008×10^{-2}	3.37	0.534	0.965
number of spectral points in retrieval [1]	73.4 ± 0.5	11349928	1.000	73.0	70.0	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]	0.638 ± 0.415	12066081	0.800	1.000	0.0	1.000	0.200	1.000
sulfurdioxide total vertical column [DU]	$(2.518 \pm 108.475) \times 10^{-2}$	12066081	0.401	7.916×10^{-3}	-89.4	531	-0.191	0.211
sulfurdioxide total vertical column precision [DU]	0.496 ± 0.776	12066081	0.300	0.289	4.587×10^{-2}	37.5	0.197	0.497
sulfurdioxide slant column density corrected [DU]	$(1.188 \pm 29.377) \times 10^{-2}$	12066081	0.321	7.006×10^{-3}	-10.1	107	-0.153	0.169
sulfurdioxide slant column density cobra [DU]	$(1.187 \pm 29.291) \times 10^{-2}$	12066081	0.321	7.006×10^{-3}	-10.1	107	-0.153	0.169
sulfurdioxide slant column density cobra precision [DU]	0.253 ± 0.104	12066081	7.826×10^{-2}	0.222	8.196×10^{-2}	25.9	0.193	0.271
sulfurdioxide slant column density window1 [DU]	0.123 ± 0.575	12066081	0.661	0.122	-81.9	101	-0.210	0.452
sulfurdioxide slant column density window1 precision [DU]	0.253 ± 0.104	12066081	7.826×10^{-2}	0.222	8.196×10^{-2}	25.9	0.193	0.271
sulfurdioxide slant column density corrected win1 [DU]	$(4.031 \pm 56.575) \times 10^{-2}$	12066081	0.645	3.069×10^{-2}	-81.9	101	-0.289	0.356
background so2 slant column offset window1 [DU]	$(-8.283 \pm 14.667) \times 10^{-2}$	12066081	0.192	-0.122	-1.17	2.61	-0.178	1.443×10^{-2}
sulfurdioxide slant column density window2 [DU]	0.411 ± 8.396	12066081	10.4	0.395	-651	846	-4.79	5.60
sulfurdioxide slant column density window2 precision [DU]	7.54 ± 2.11	12066081	2.43	7.20	2.12	595	6.12	8.56
sulfurdioxide slant column density corrected win2 [DU]	-0.152 ± 8.273	12066081	10.3	-0.103	-650	847	-5.26	5.03
background so2 slant column offset window2 [DU]	-0.564 ± 1.806	12066081	2.20	-0.181	-13.8	15.9	-1.54	0.657
sulfurdioxide slant column density window3 [DU]	-1.57 ± 22.53	12066081	28.1	-2.13	-368	379	-15.8	12.3
sulfurdioxide slant column density window3 precision [DU]	26.3 ± 12.4	12066081	9.68	23.1	9.28	210	19.3	29.0
sulfurdioxide slant column density corrected win3 [DU]	1.48 ± 21.74	12066081	27.1	1.08	-366	381	-12.2	14.9
background so2 slant column offset window3 [DU]	3.05 ± 5.73	12066081	8.39	3.09	-29.8	24.9	-1.16	7.23
sulfurdioxide slant column cobra flag [1]	1.99 ± 0.13	12066081	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(2.771 \pm 4.146) \times 10^{-2}$	12066081	2.018×10^{-2}	1.871×10^{-2}	1.130×10^{-3}	2.28	1.213×10^{-2}	3.231×10^{-2}
fitted radiance shift [nm]	$(-3.153 \pm 24.001) \times 10^{-4}$	12066081	1.719×10^{-3}	-3.492×10^{-4}	-3.648×10^{-2}	3.508×10^{-2}	-1.204×10^{-3}	5.153×10^{-4}
fitted radiance squeeze [1]	$(-2.944 \pm 16.011) \times 10^{-5}$	12066081	1.916×10^{-4}	-2.616×10^{-5}	-1.524×10^{-2}	1.683×10^{-2}	-1.235×10^{-4}	6.808×10^{-5}
fitted root mean square [1]	$(1.119 \pm 0.425) \times 10^{-3}$	12066081	3.511×10^{-4}	1.009×10^{-3}	3.326×10^{-4}	8.740×10^{-2}	8.674×10^{-4}	1.218×10^{-3}
sulfurdioxide total air mass factor polluted [1]	0.863 ± 0.472	12066081	0.567	0.792	5.000×10^{-2}	2.80	0.533	1.10
sulfurdioxide total air mass factor polluted precision [1]	0.130 ± 0.126	12066081	0.149	7.699×10^{-2}	3.133×10^{-3}	1.23	3.855×10^{-2}	0.187
sulfurdioxide clear air mass factor polluted [1]	0.686 ± 0.245	12066081	0.325	0.663	4.773×10^{-2}	2.87	0.510	0.835
number of spectral points in retrieval [1]	73.5 ± 0.5	12066081	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]	0.479 ± 0.422	4532265	0.920	0.310	0.0	1.000	8.000×10^{-2}	1.000
sulfurdioxide total vertical column [DU]	$(5.080 \pm 163.840) \times 10^{-2}$	4532265	0.298	5.678×10^{-3}	-117	126	-0.138	0.160
sulfurdioxide total vertical column precision [DU]	0.613 ± 1.205	4532265	0.462	0.236	2.694×10^{-2}	32.2	9.873×10^{-2}	0.561
sulfurdioxide slant column density corrected [DU]	$(1.689 \pm 36.457) \times 10^{-2}$	4532265	0.359	8.331×10^{-3}	-10.5	60.8	-0.169	0.189
sulfurdioxide slant column density cobra [DU]	$(1.683 \pm 36.132) \times 10^{-2}$	4532265	0.359	8.331×10^{-3}	-10.5	30.6	-0.169	0.189
sulfurdioxide slant column density cobra precision [DU]	0.287 ± 0.129	4532265	0.134	0.242	6.970×10^{-2}	15.3	0.205	0.339
sulfurdioxide slant column density window1 [DU]	$(-1.130 \pm 69.286) \times 10^{-2}$	4532265	0.806	-2.683×10^{-2}	-24.0	55.9	-0.428	0.378
sulfurdioxide slant column density window1 precision [DU]	0.287 ± 0.129	4532265	0.134	0.242	6.970×10^{-2}	15.3	0.205	0.339
sulfurdioxide slant column density corrected win1 [DU]	$(-3.769 \pm 66.099) \times 10^{-2}$	4532265	0.730	-5.862×10^{-2}	-24.0	55.9	-0.419	0.311
background so2 slant column offset window1 [DU]	$(-2.639 \pm 16.940) \times 10^{-2}$	4532265	0.284	-6.336×10^{-2}	-1.30	2.37	-0.163	0.122
sulfurdioxide slant column density window2 [DU]	1.02 ± 9.07	4532265	10.9	1.01	-957	976	-4.45	6.47
sulfurdioxide slant column density window2 precision [DU]	8.02 ± 2.51	4532265	2.97	7.55	2.09	537	6.28	9.25
sulfurdioxide slant column density corrected win2 [DU]	-0.392 ± 8.875	4532265	10.7	-0.359	-955	978	-5.73	5.01
background so2 slant column offset window2 [DU]	-1.41 ± 2.19	4532265	3.20	-1.20	-13.8	6.21	-2.80	0.392
sulfurdioxide slant column density window3 [DU]	-11.6 ± 22.4	4532265	26.7	-11.3	-240	202	-24.8	1.93
sulfurdioxide slant column density window3 precision [DU]	26.6 ± 13.4	4532265	11.5	23.1	9.93	294	18.3	29.8
sulfurdioxide slant column density corrected win3 [DU]	-4.57 ± 22.82	4532265	27.3	-3.59	-240	205	-17.7	9.62
background so2 slant column offset window3 [DU]	7.06 ± 7.17	4532265	11.9	8.90	-29.8	24.9	1.14	13.0
sulfurdioxide slant column cobra flag [1]	1.94 ± 0.33	4532265	0.0	2.00	0.0	2.00	2.00	2.00
integrated so2 profile apriori [DU]	$(5.619 \pm 18.687) \times 10^{-2}$	4532265	3.542×10^{-2}	1.329×10^{-2}	2.478×10^{-4}	5.14	4.925×10^{-3}	4.034×10^{-2}
fitted radiance shift [nm]	$(-4.513 \pm 24.090) \times 10^{-4}$	4532265	1.206×10^{-3}	-5.339×10^{-4}	-4.596×10^{-2}	4.237×10^{-2}	-1.116×10^{-3}	9.016×10^{-5}
fitted radiance squeeze [1]	$(-8.070 \pm 18.963) \times 10^{-5}$	4532265	2.359×10^{-4}	-8.393×10^{-5}	-1.526×10^{-2}	1.186×10^{-2}	-2.000×10^{-4}	3.594×10^{-5}
fitted root mean square [1]	$(1.286 \pm 0.500) \times 10^{-3}$	4532265	4.872×10^{-4}	1.150×10^{-3}	3.405×10^{-4}	4.131×10^{-2}	9.681×10^{-4}	1.455×10^{-3}
sulfurdioxide total air mass factor polluted [1]	1.35 ± 0.95	4532265	1.85	1.04	5.000×10^{-2}	3.31	0.516	2.36
sulfurdioxide total air mass factor polluted precision [1]	0.210 ± 0.214	4532265	0.282	0.143	2.500×10^{-3}	1.72	3.550×10^{-2}	0.317
sulfurdioxide clear air mass factor polluted [1]	1.24 ± 0.94	4532265	1.30	0.886	3.607×10^{-2}	3.37	0.515	1.82
number of spectral points in retrieval [1]	73.4 ± 0.5	4532265	1.000	73.0	70.0	74.0	73.0	74.0

3 Granule outlines

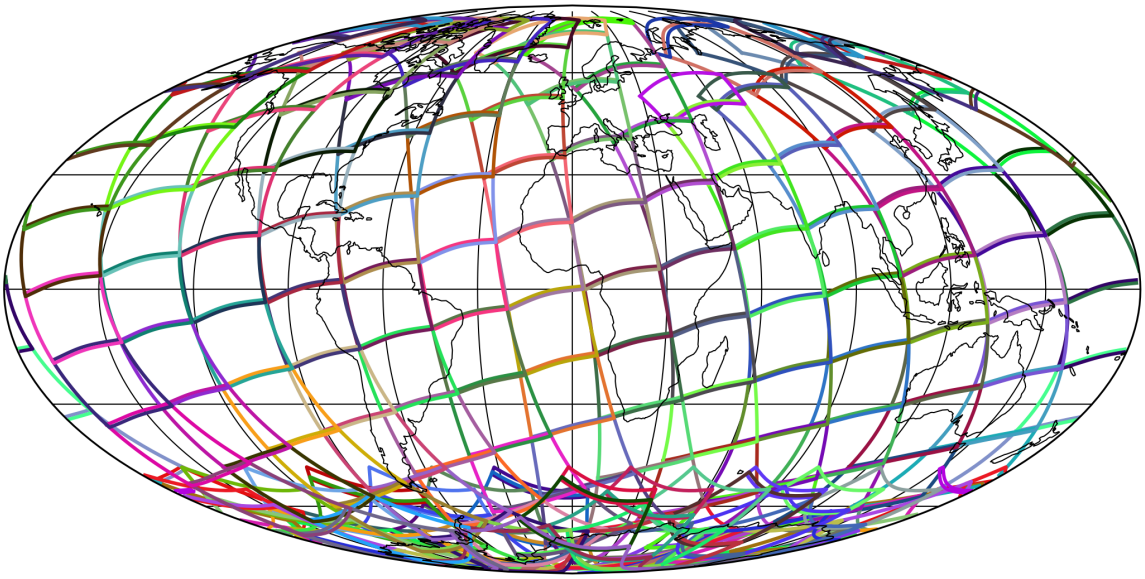

Figure 1: Outline of the granules.

4 Input data monitoring

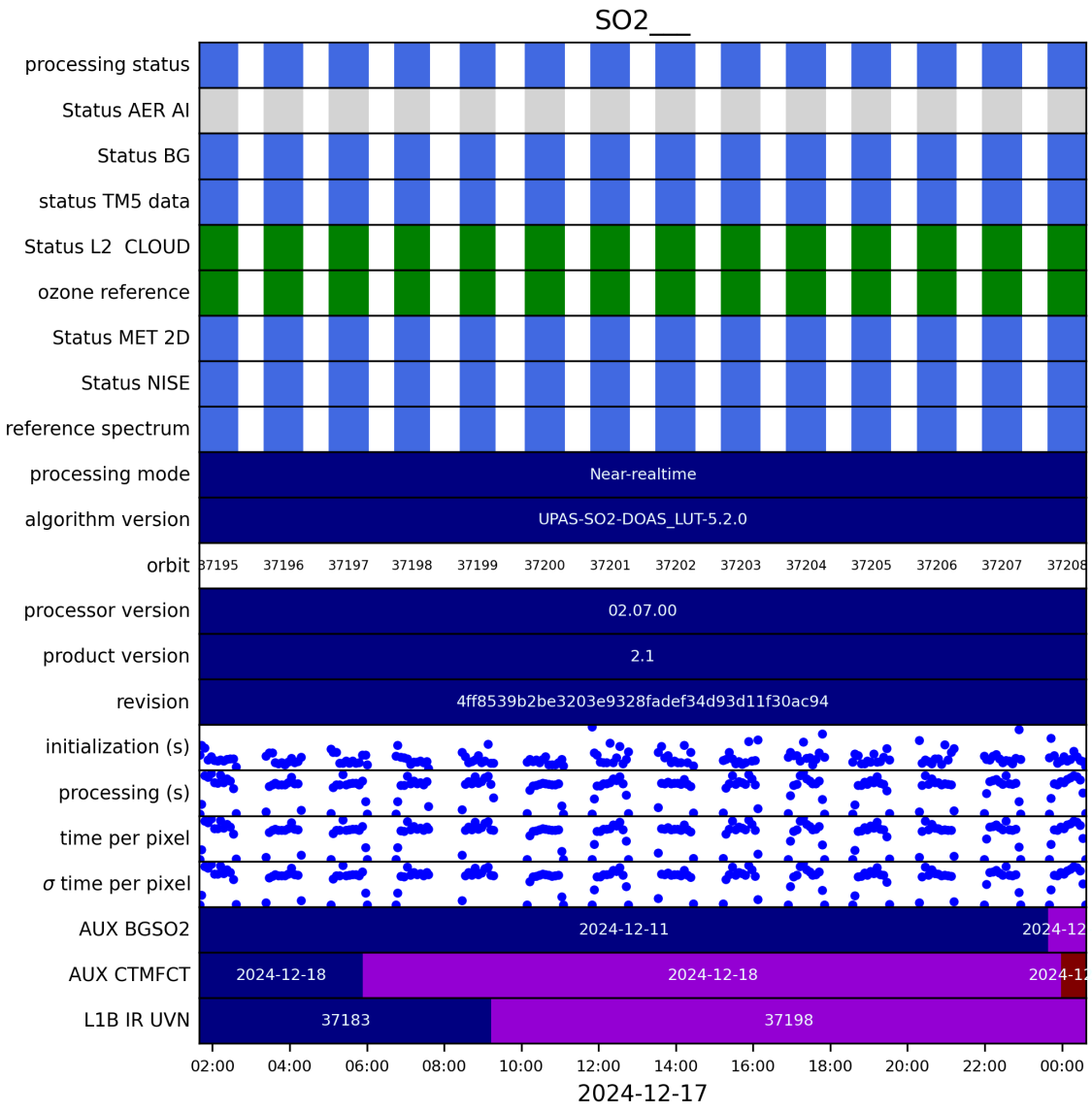

Figure 2: Input data per granule

5 Warnings and errors

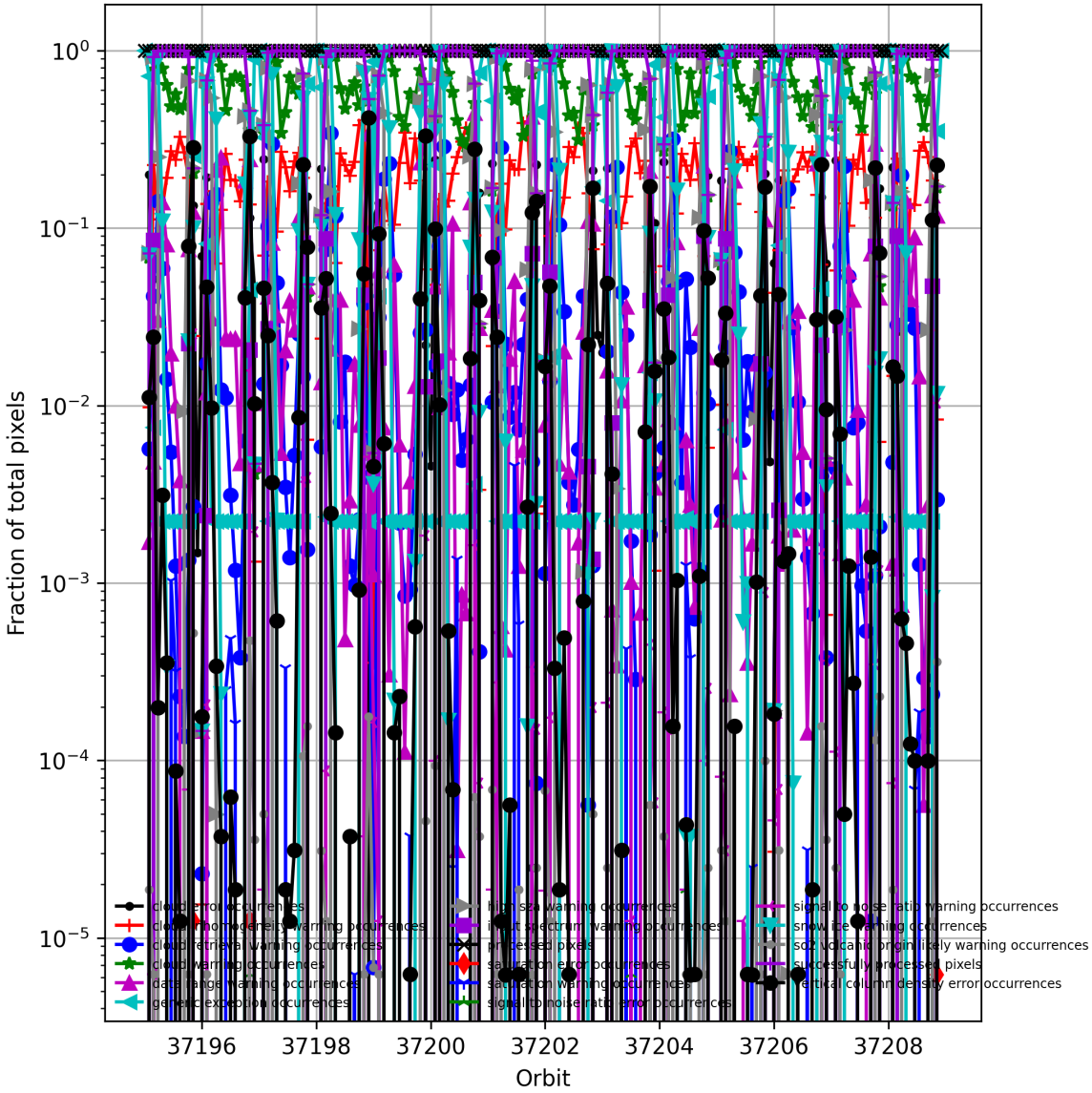

Figure 3: Fraction of pixels with specific warnings and errors during processing

6 World maps

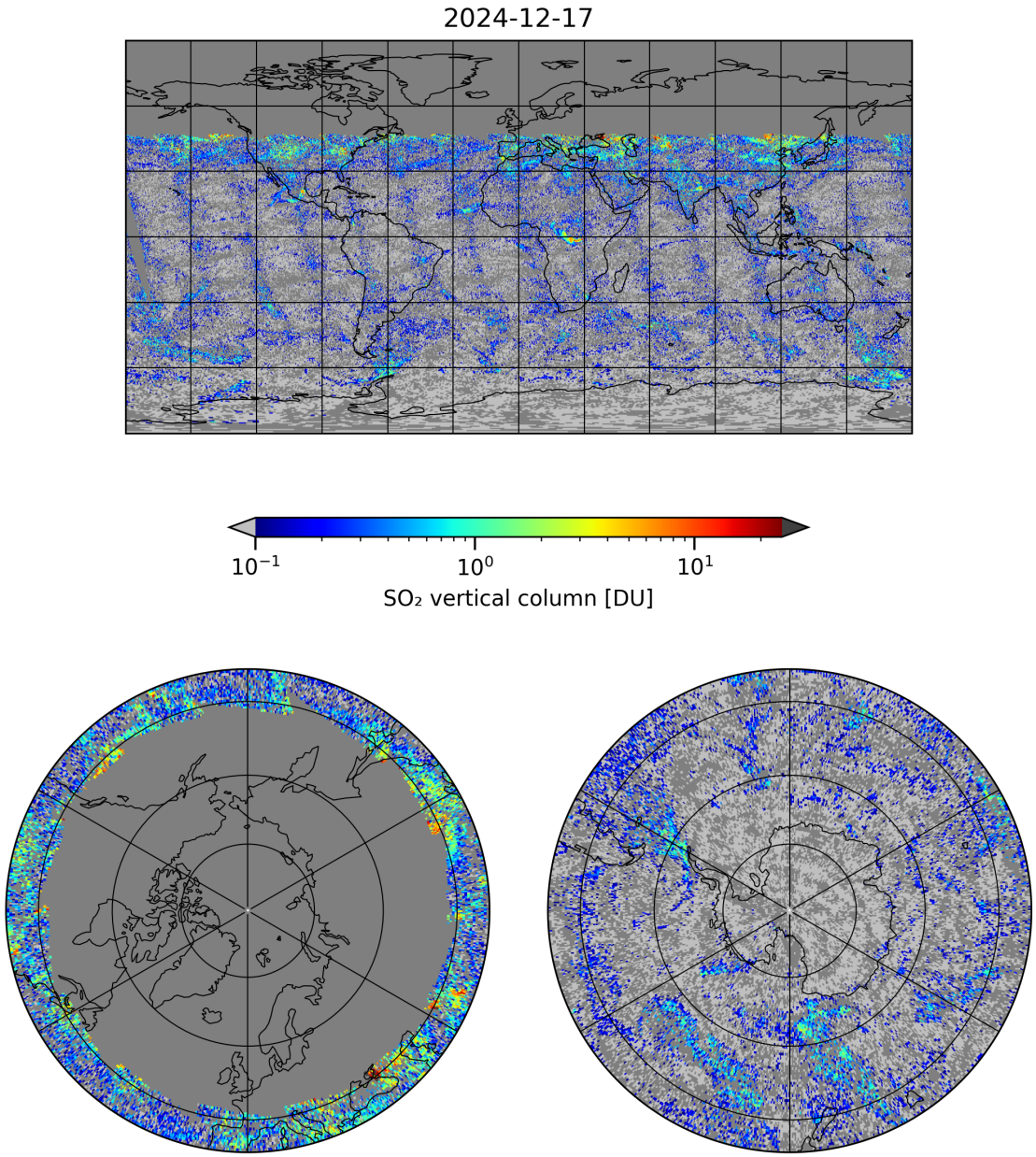

Figure 4: Map of "SO_2 vertical column" for 2024-12-17 to 2024-12-18

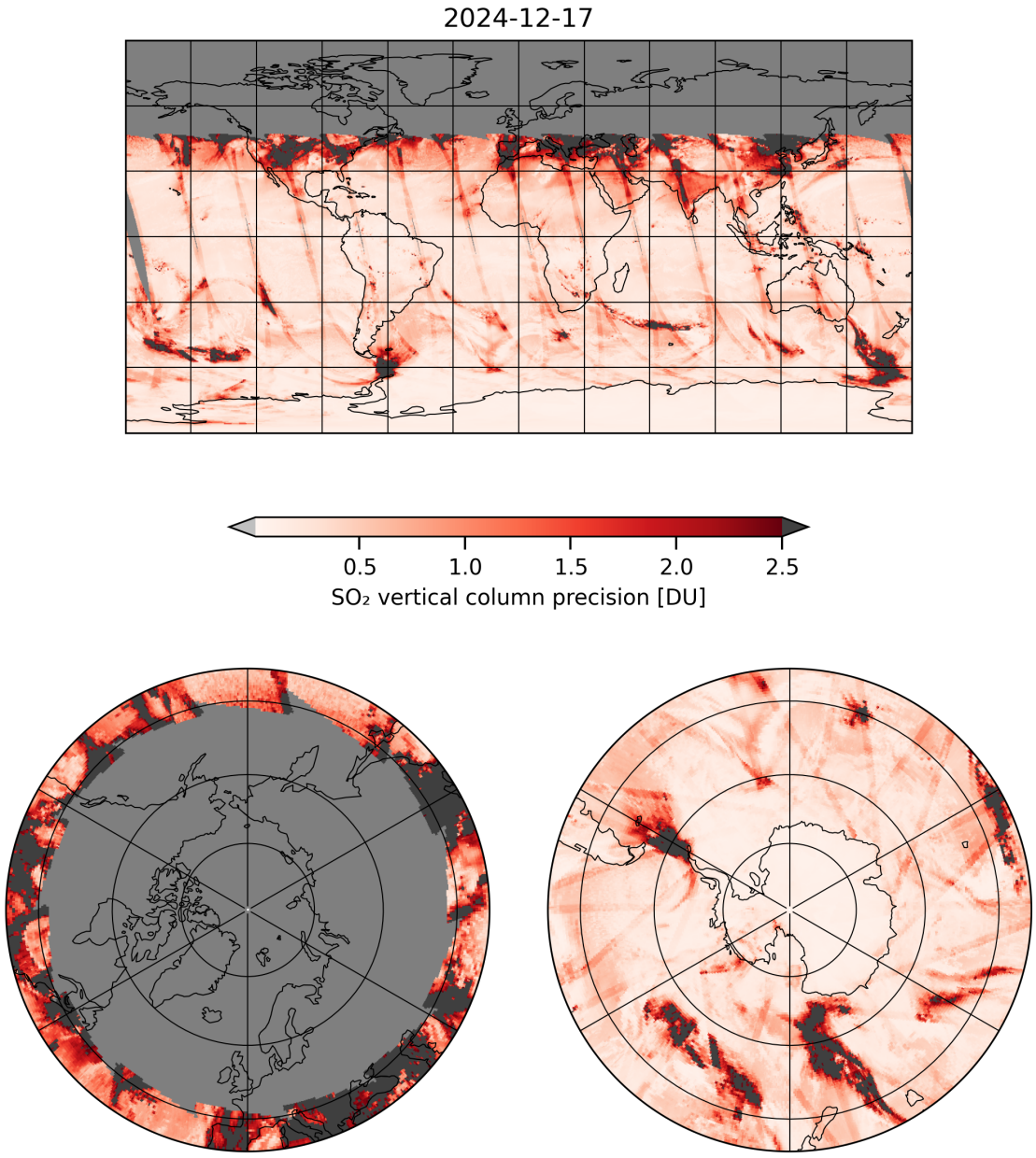

Figure 5: Map of "SO_2 vertical column precision" for 2024-12-17 to 2024-12-18

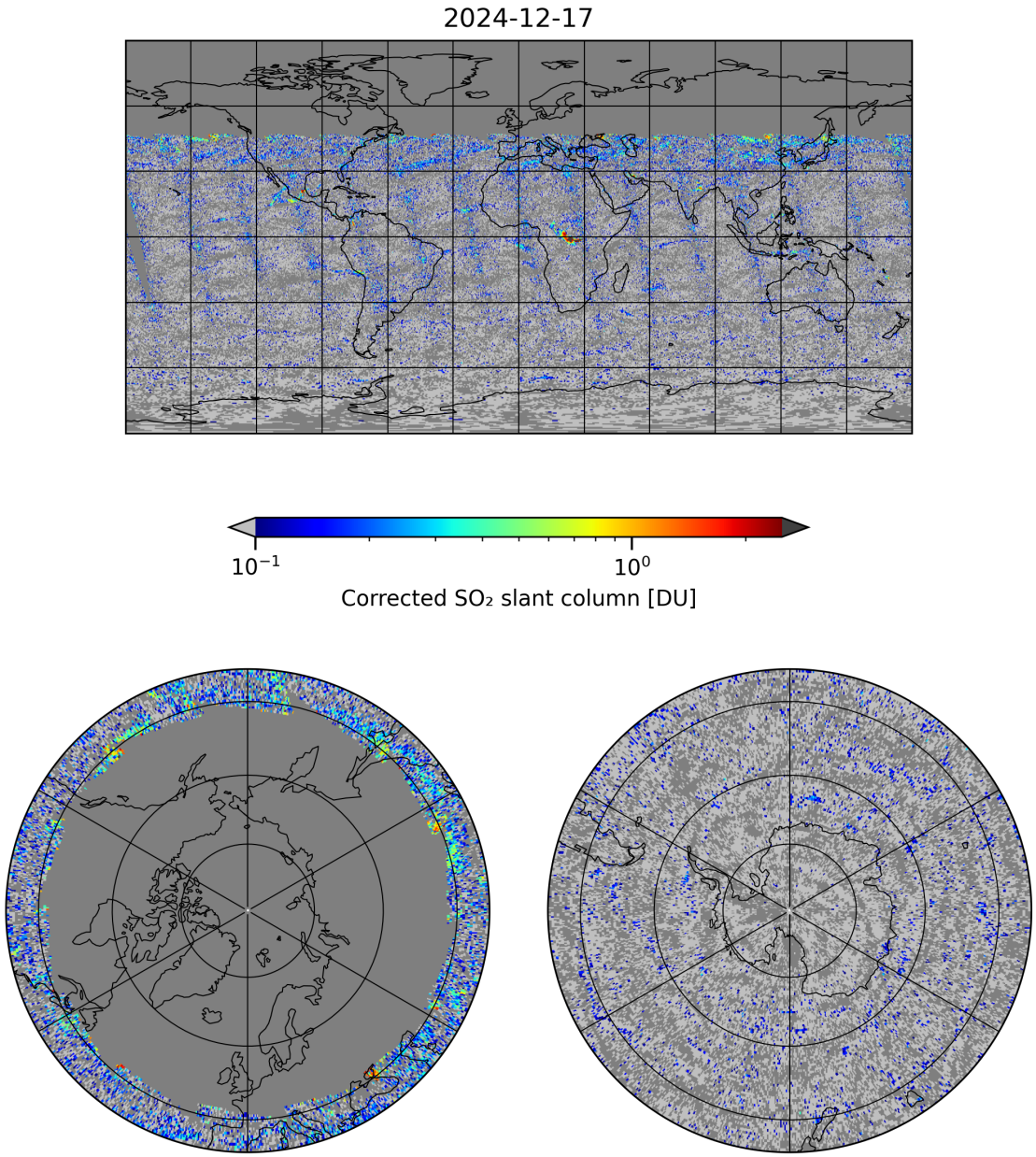

Figure 6: Map of "Corrected SO_2 slant column" for 2024-12-17 to 2024-12-18

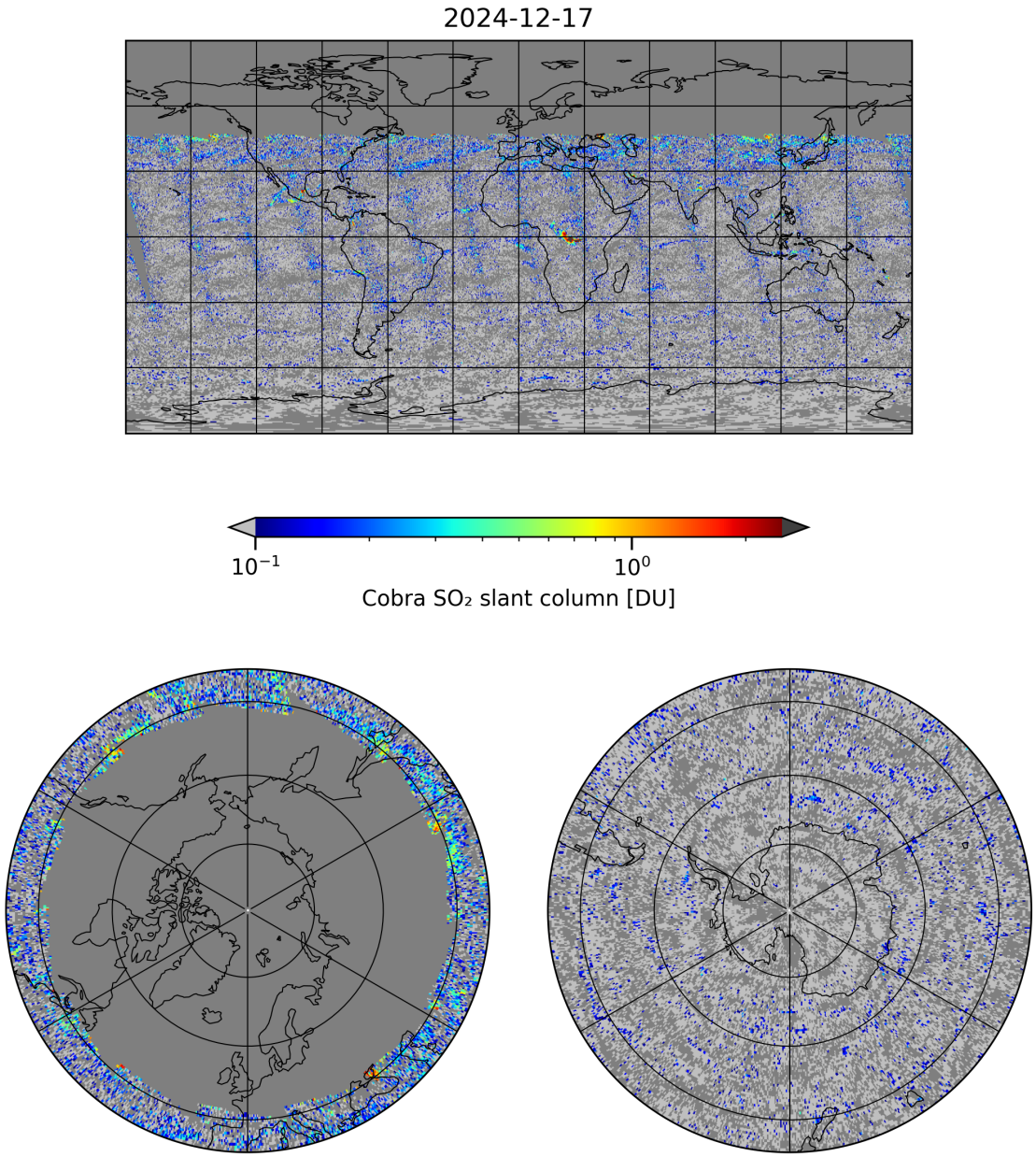

Figure 7: Map of "Cobra SO_2 slant column" for 2024-12-17 to 2024-12-18

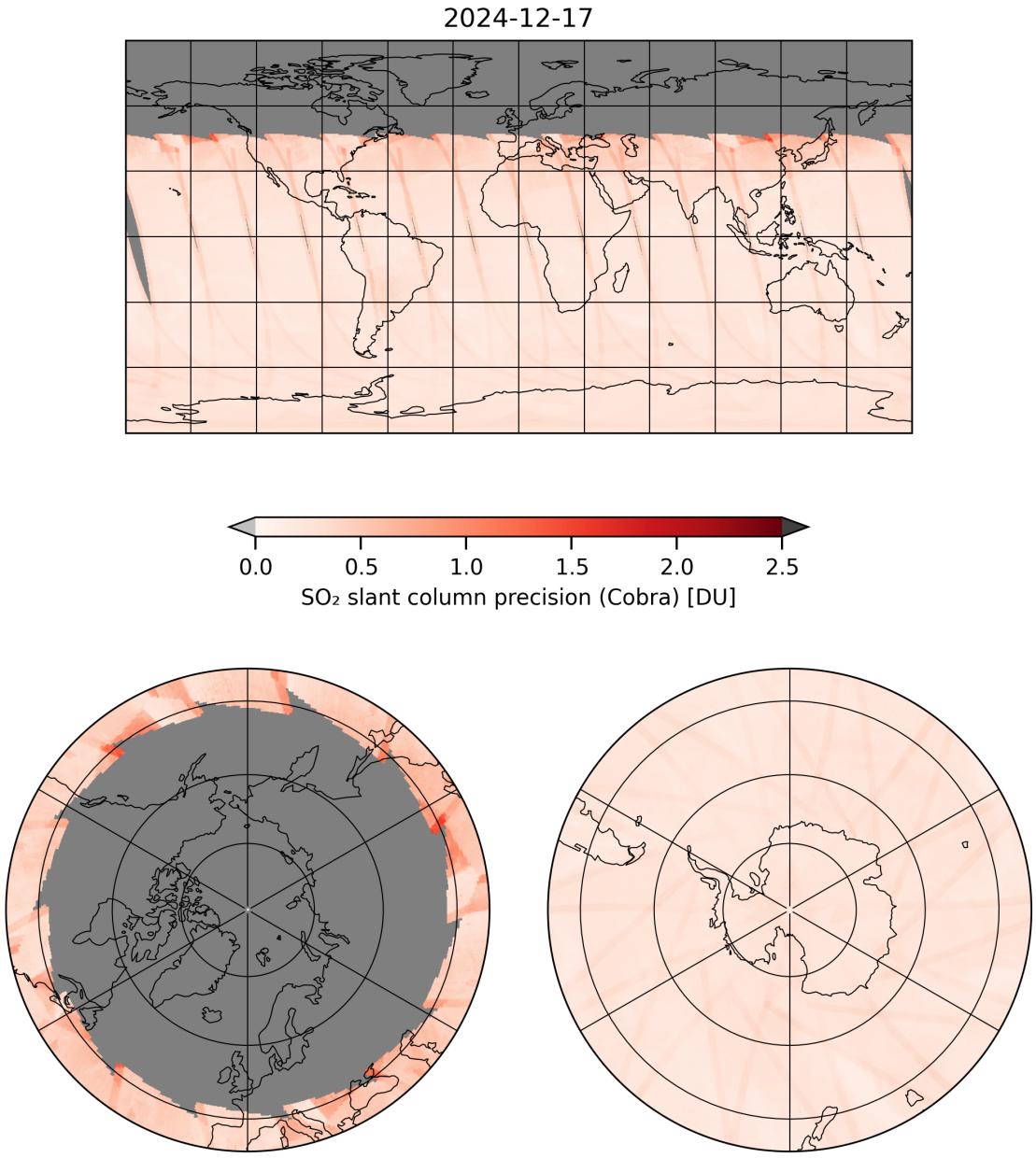

Figure 8: Map of "SO_2 slant column precision (Cobra)" for 2024-12-17 to 2024-12-18

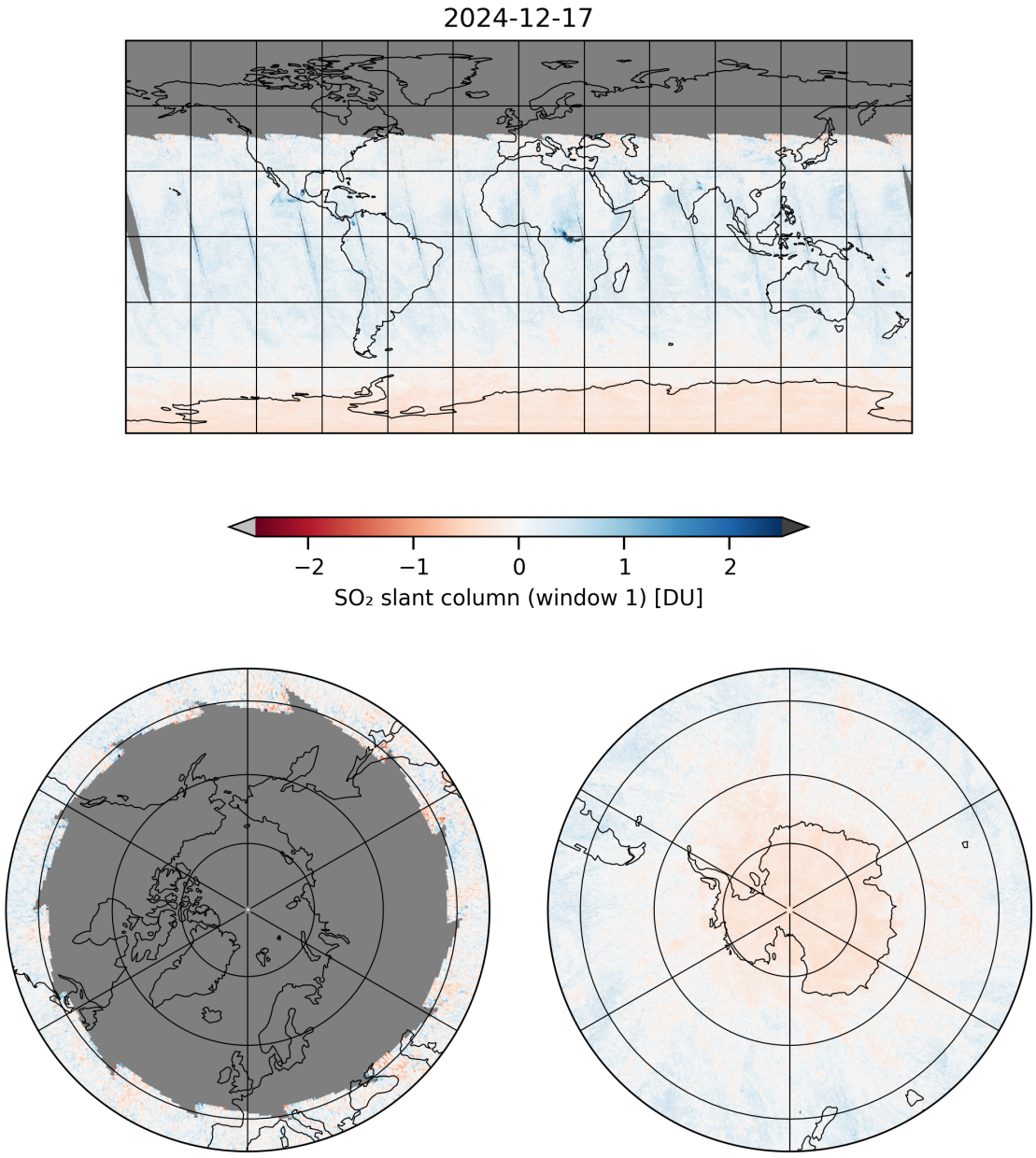

Figure 9: Map of "SO_2 slant column (window 1)" for 2024-12-17 to 2024-12-18

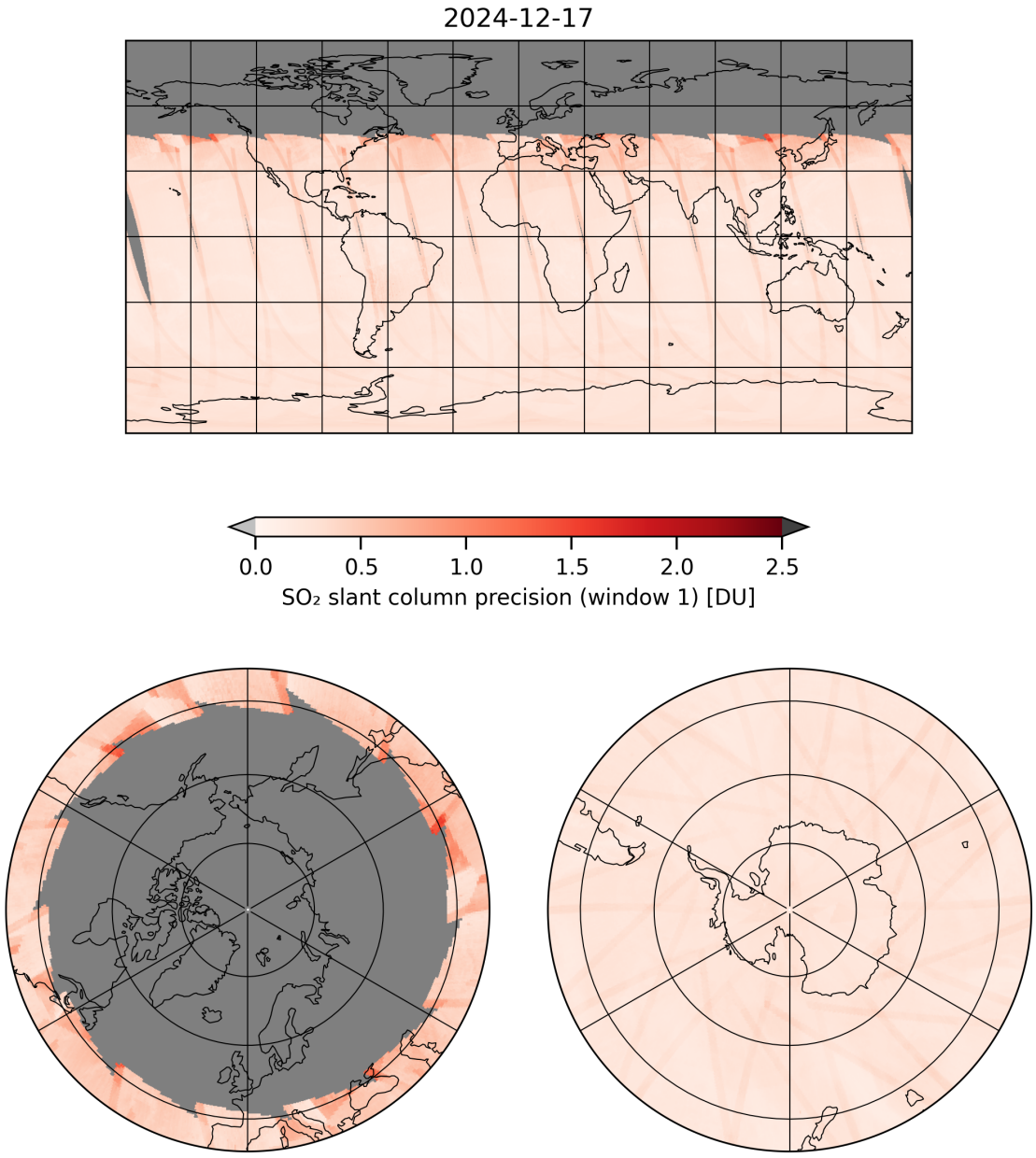

Figure 10: Map of "SO_2 slant column precision (window 1)" for 2024-12-17 to 2024-12-18

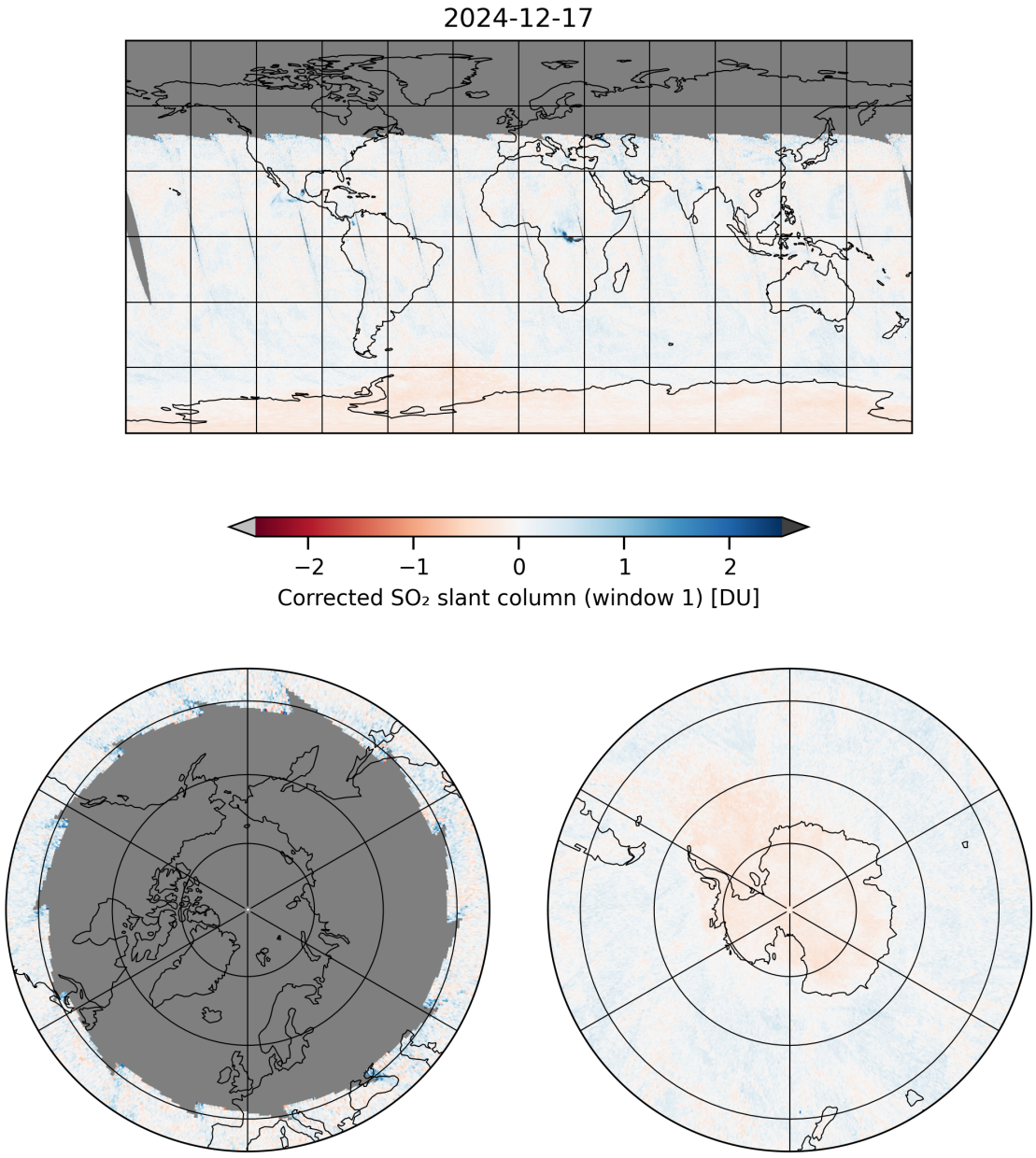

Figure 11: Map of "Corrected SO_2 slant column (window 1)" for 2024-12-17 to 2024-12-18

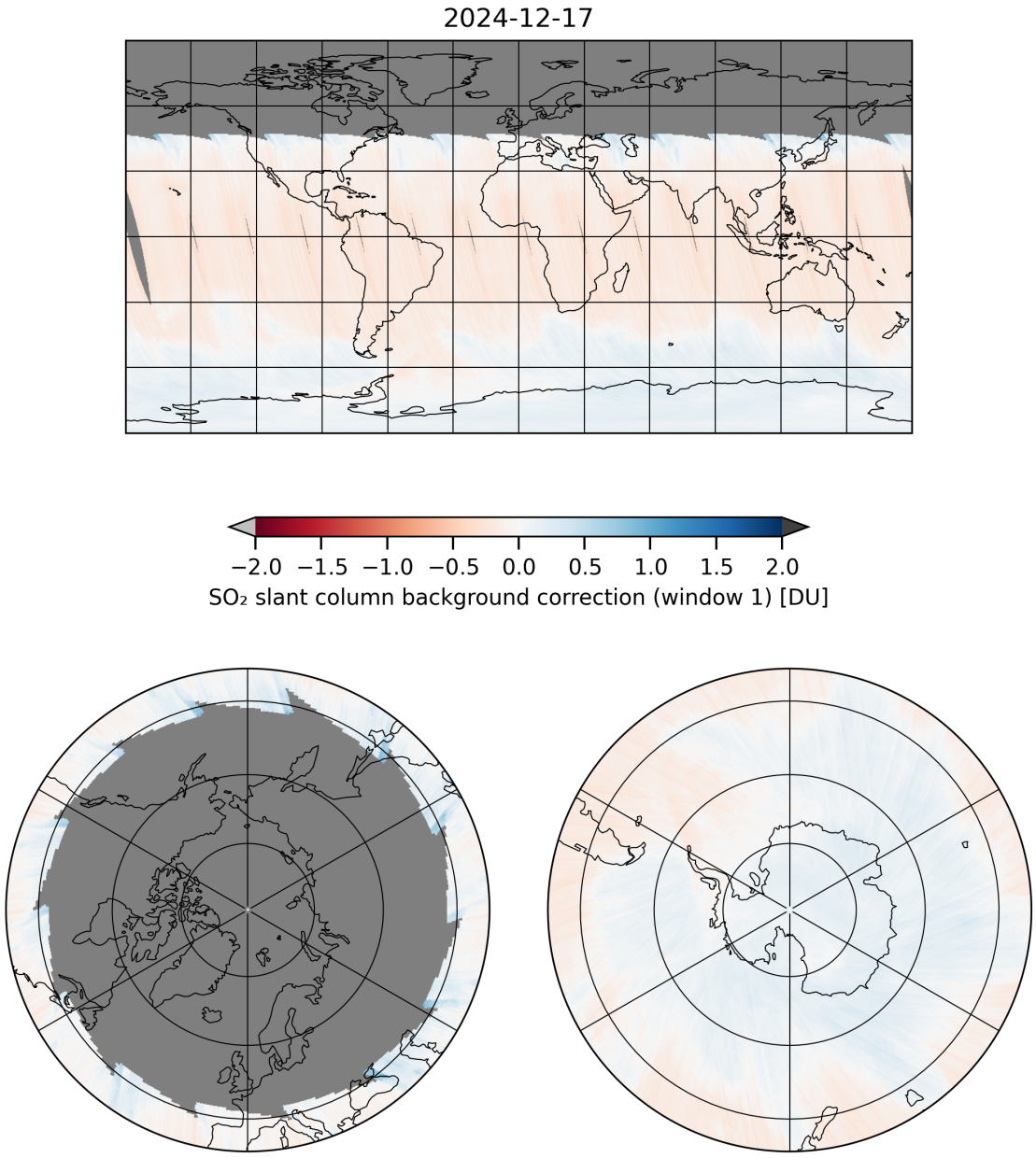

Figure 12: Map of "SO_2 slant column background correction (window 1)" for 2024-12-17 to 2024-12-18

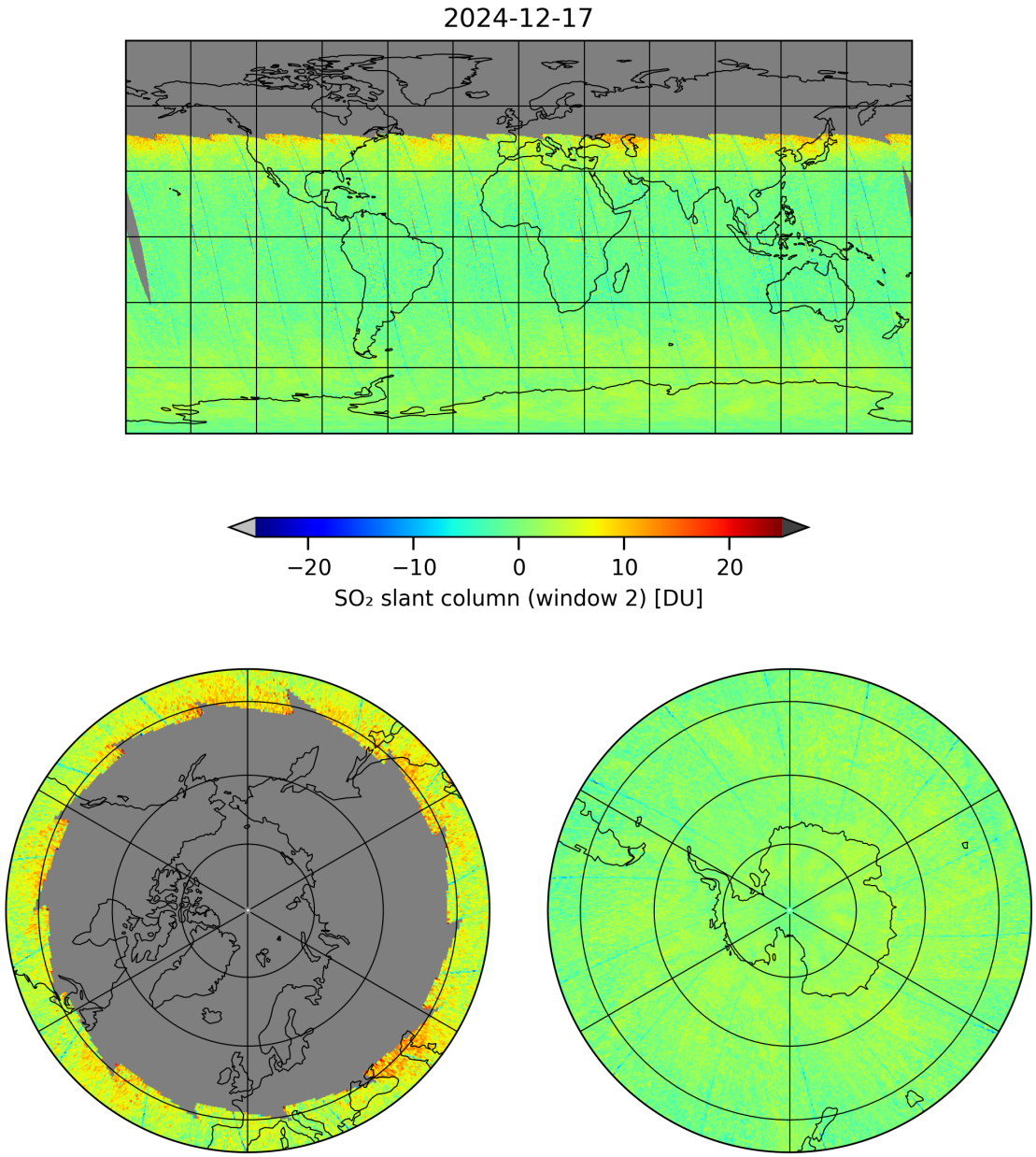

Figure 13: Map of "SO_2 slant column (window 2)" for 2024-12-17 to 2024-12-18

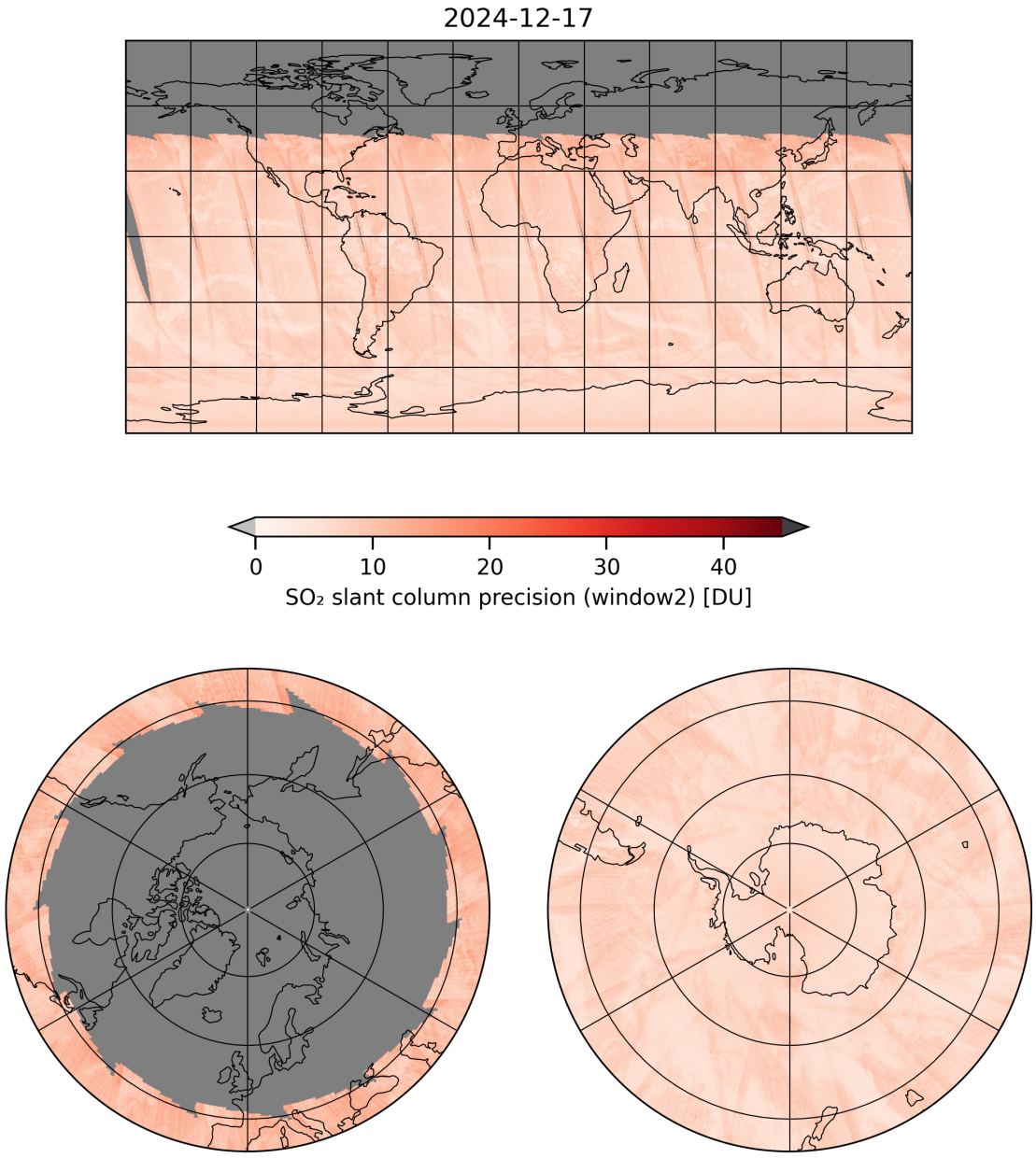

Figure 14: Map of "SO_2 slant column precision (window2)" for 2024-12-17 to 2024-12-18

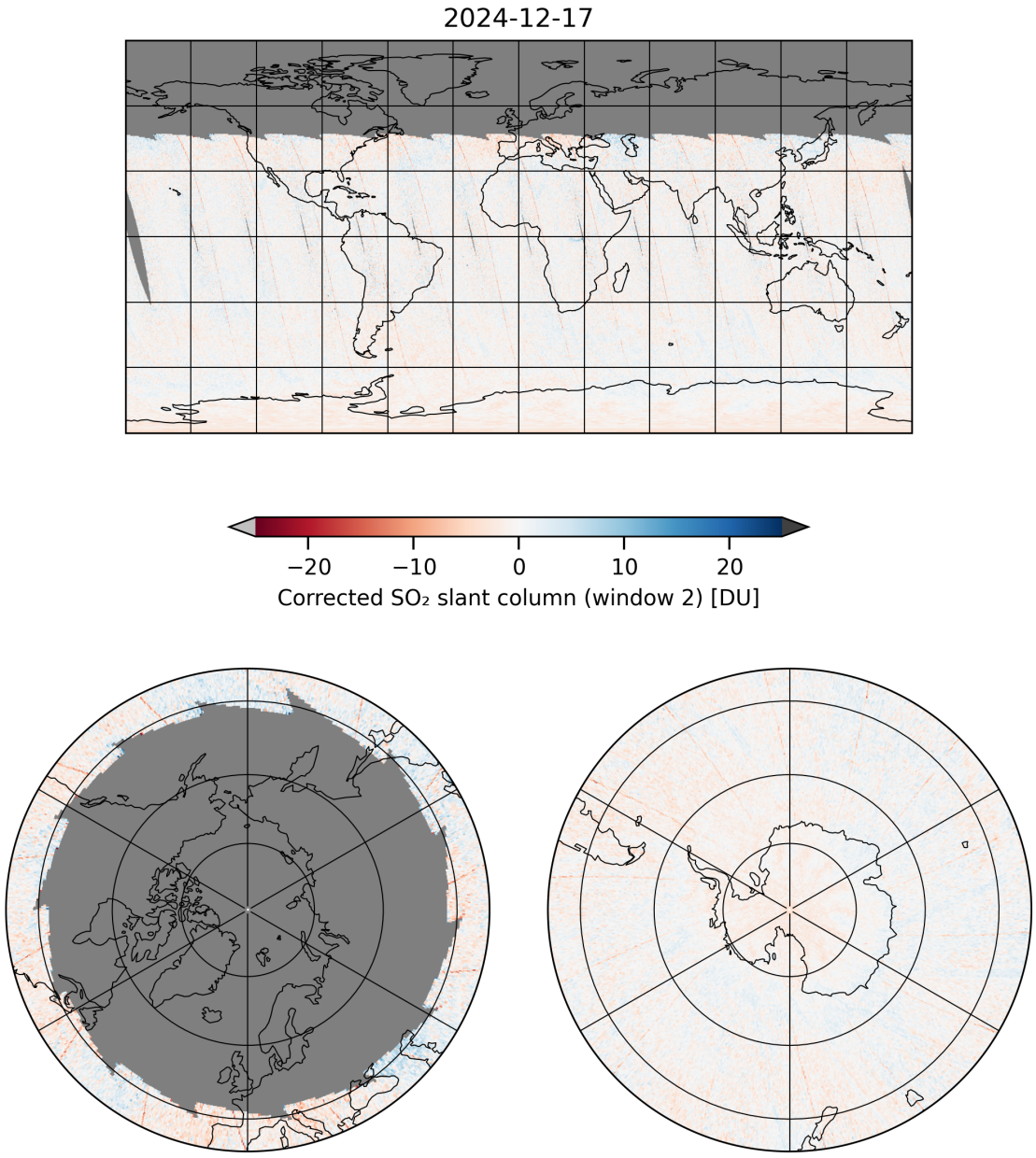

Figure 15: Map of "Corrected SO_2 slant column (window 2)" for 2024-12-17 to 2024-12-18

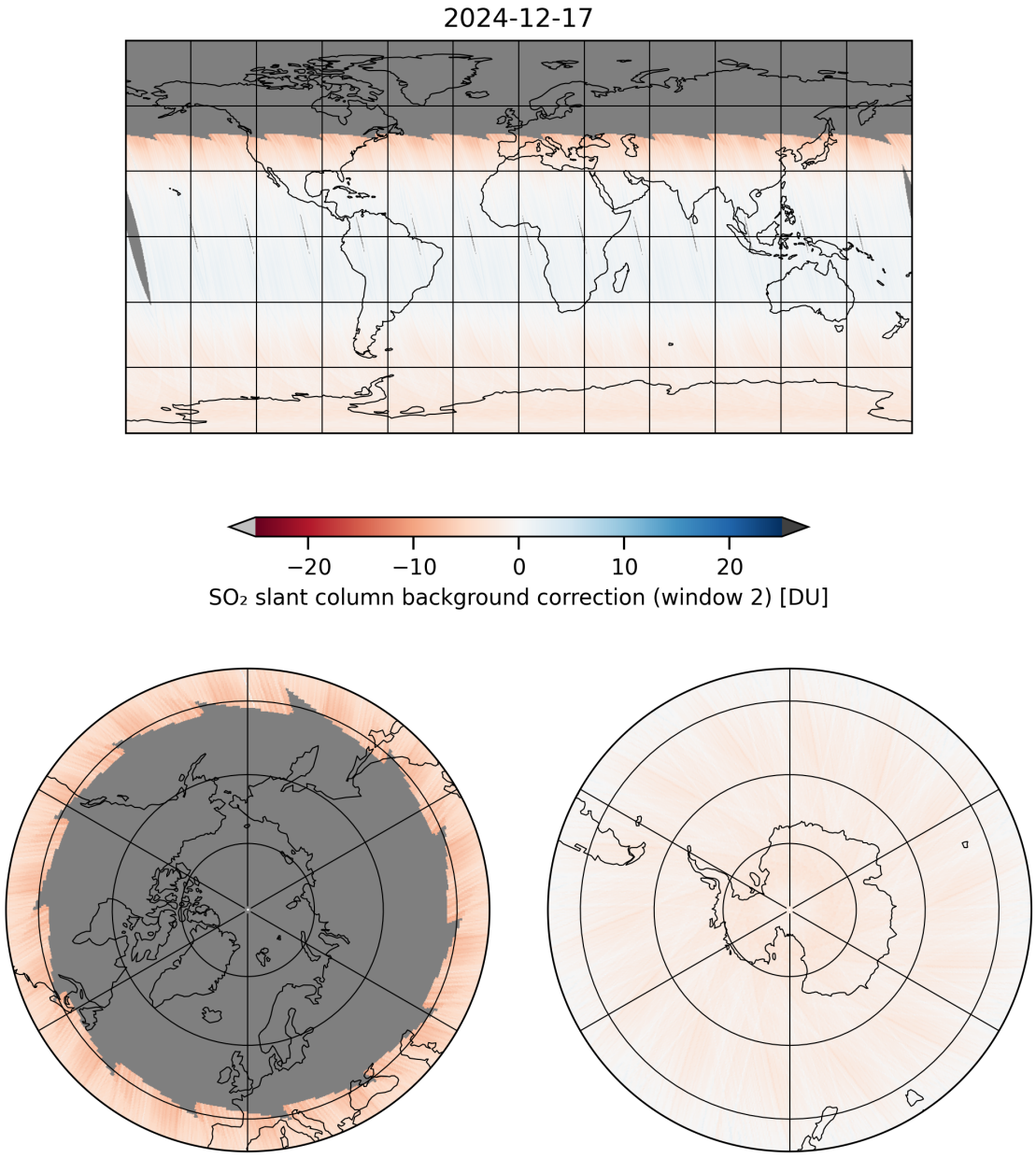

Figure 16: Map of "SO_2 slant column background correction (window 2)" for 2024-12-17 to 2024-12-18

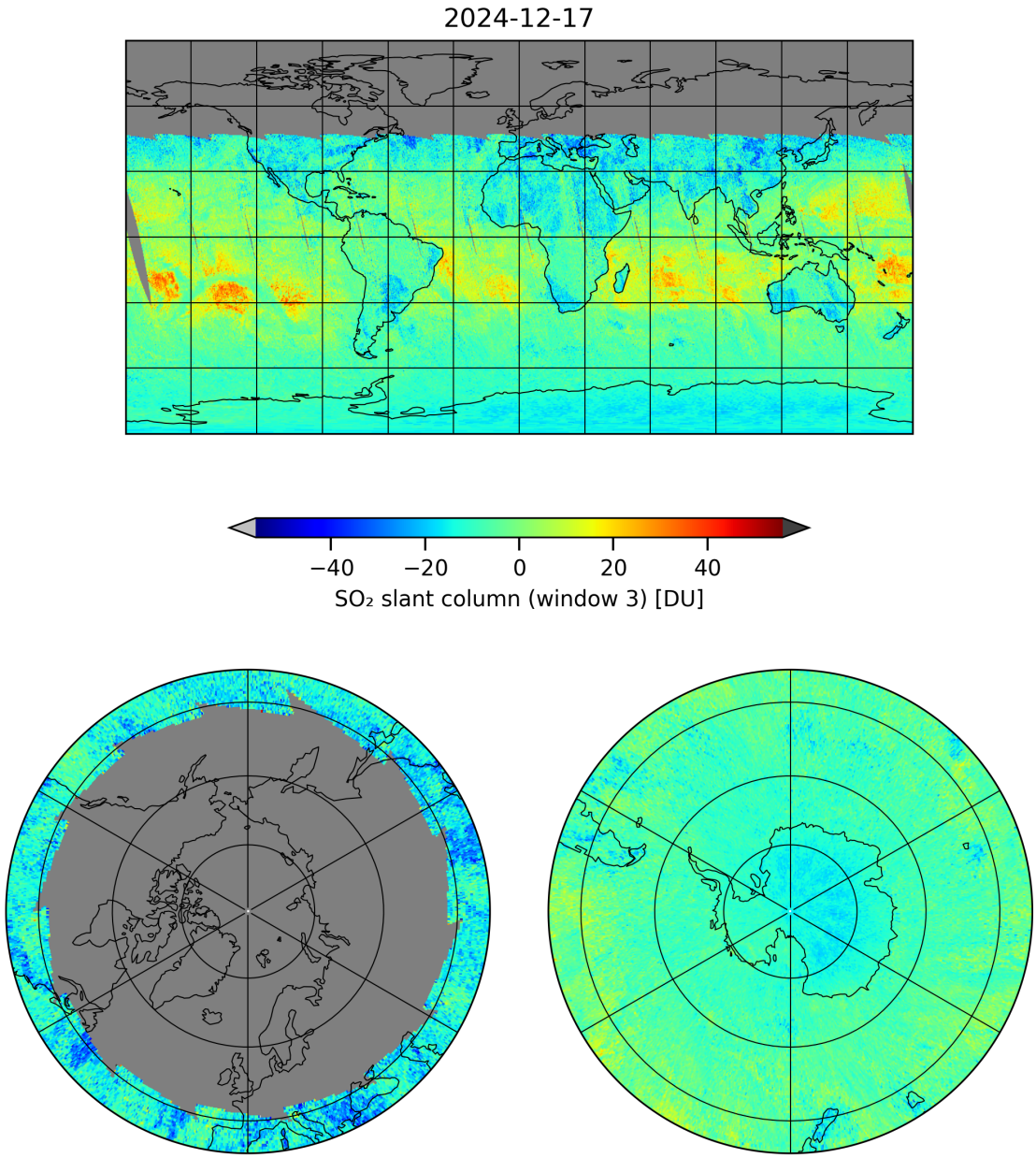

Figure 17: Map of "SO_2 slant column (window 3)" for 2024-12-17 to 2024-12-18

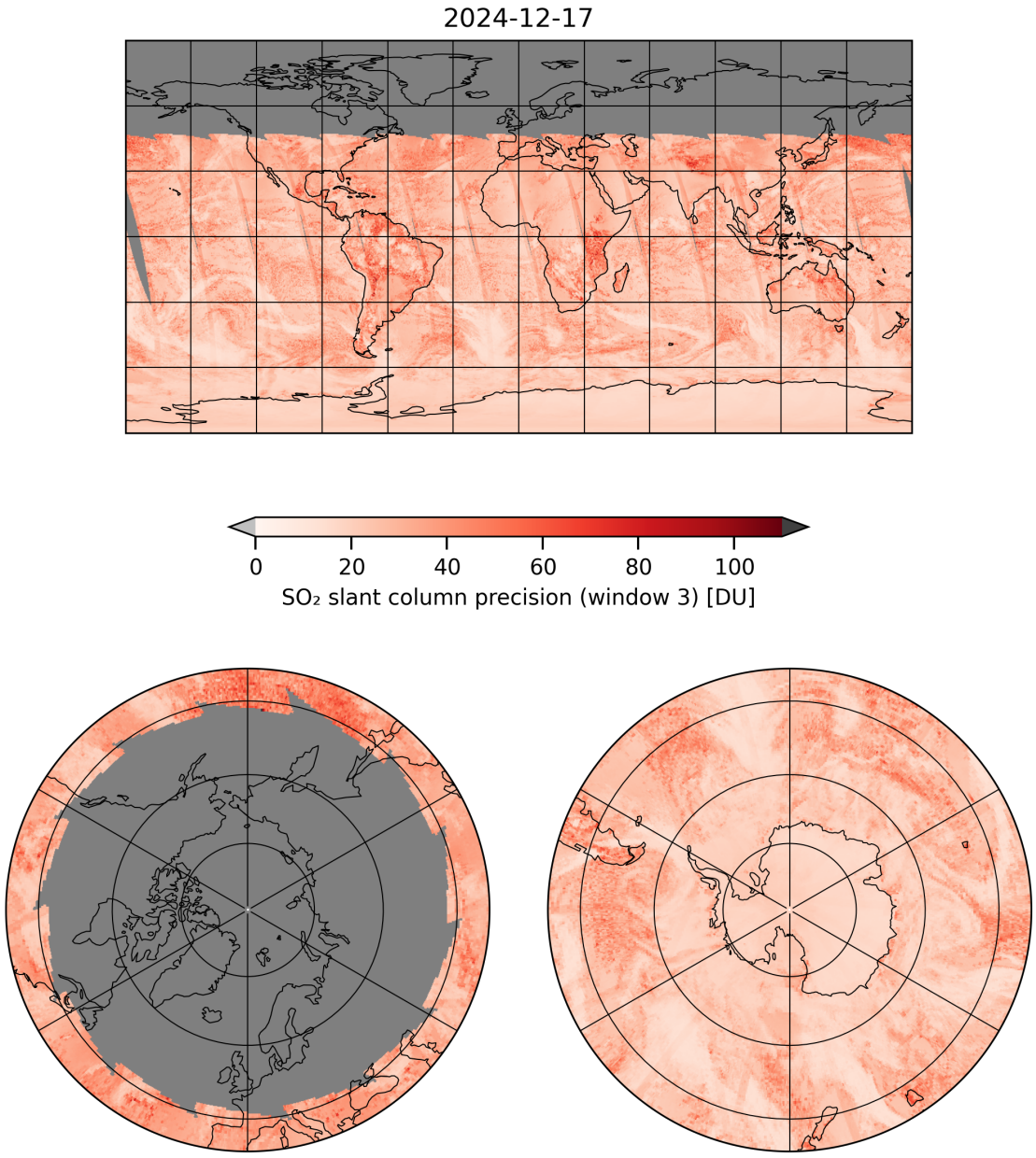

Figure 18: Map of "SO_2 slant column precision (window 3)" for 2024-12-17 to 2024-12-18

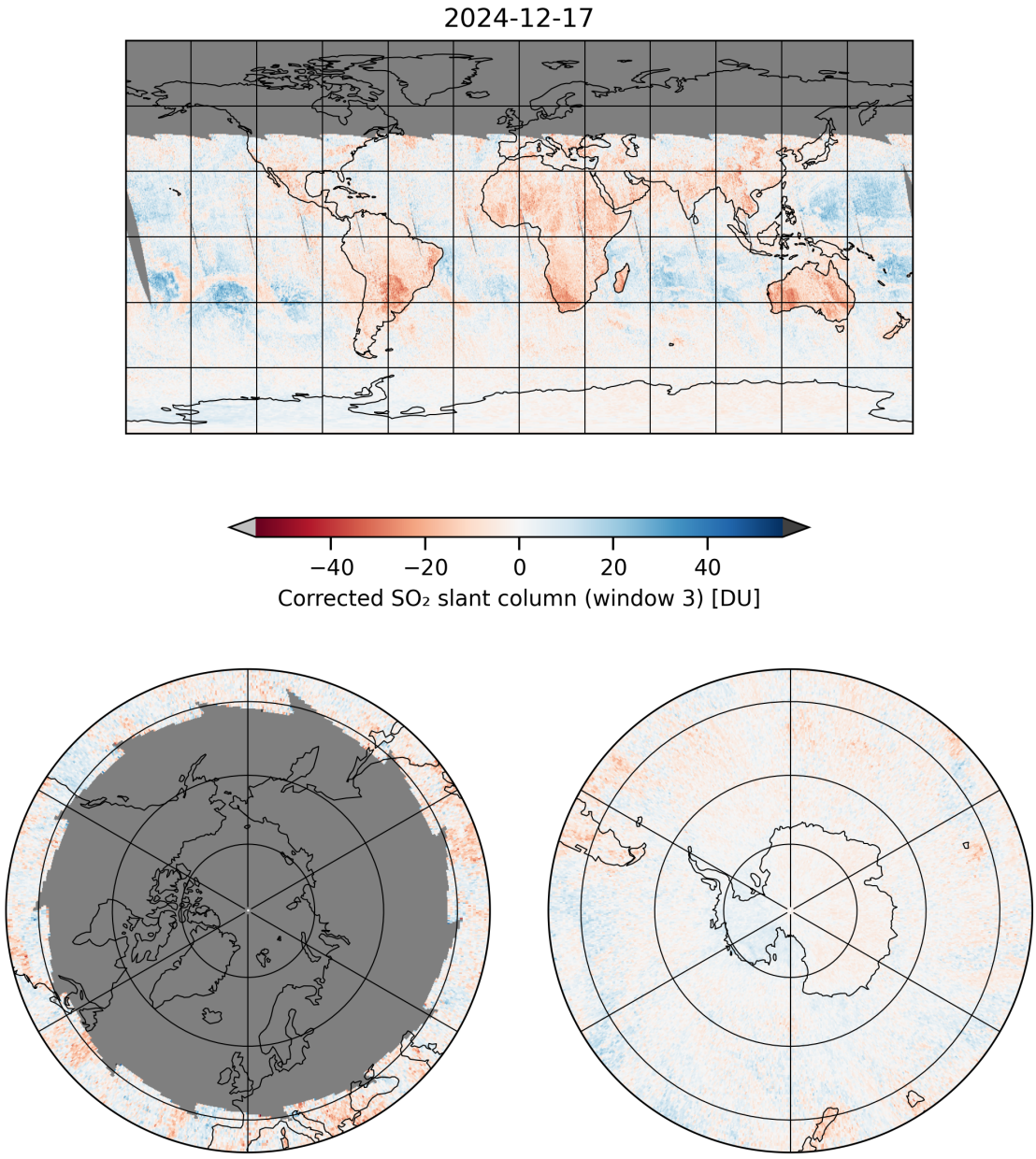

Figure 19: Map of "Corrected SO_2 slant column (window 3)" for 2024-12-17 to 2024-12-18

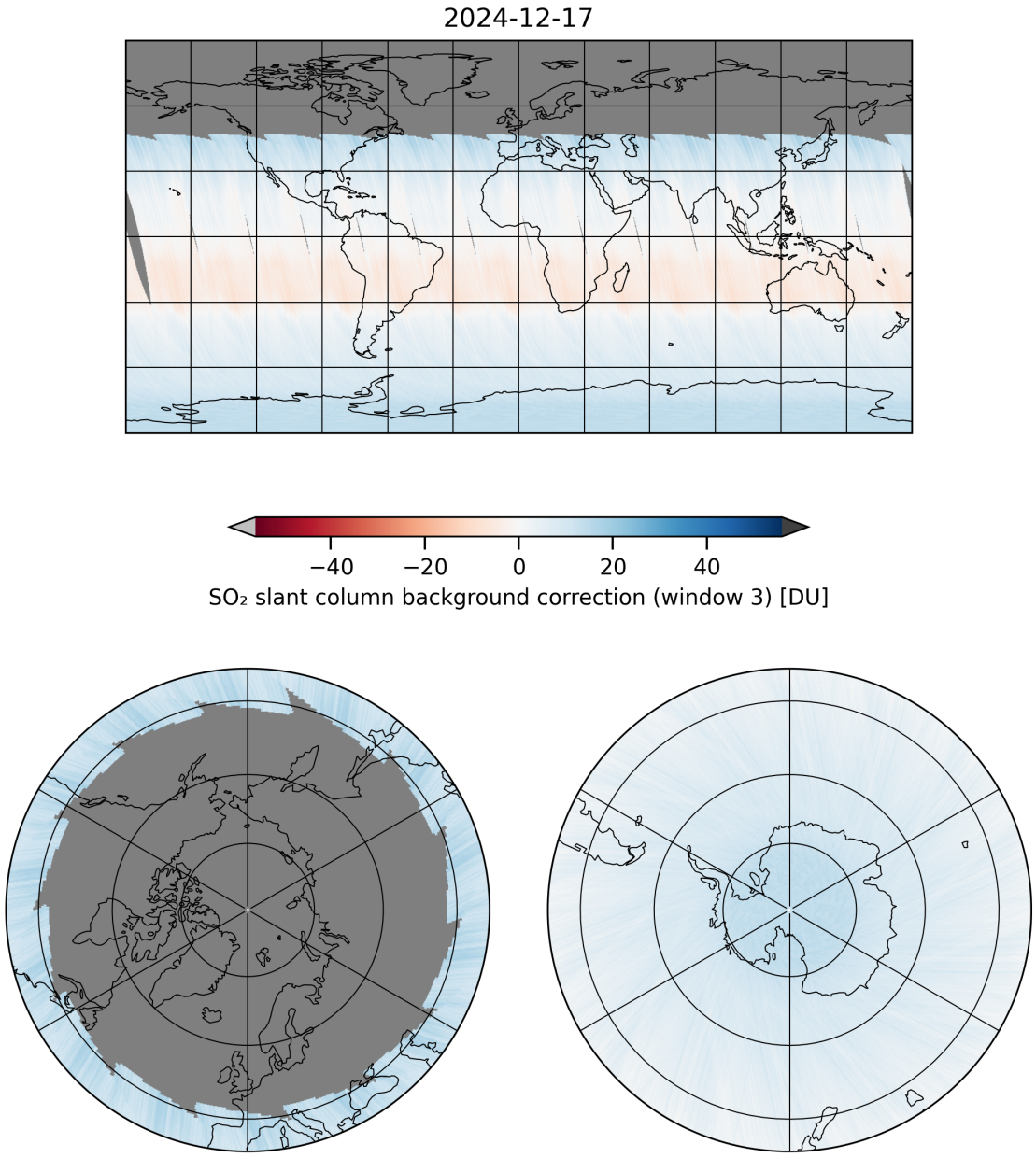

Figure 20: Map of "SO_2 slant column background correction (window 3)" for 2024-12-17 to 2024-12-18

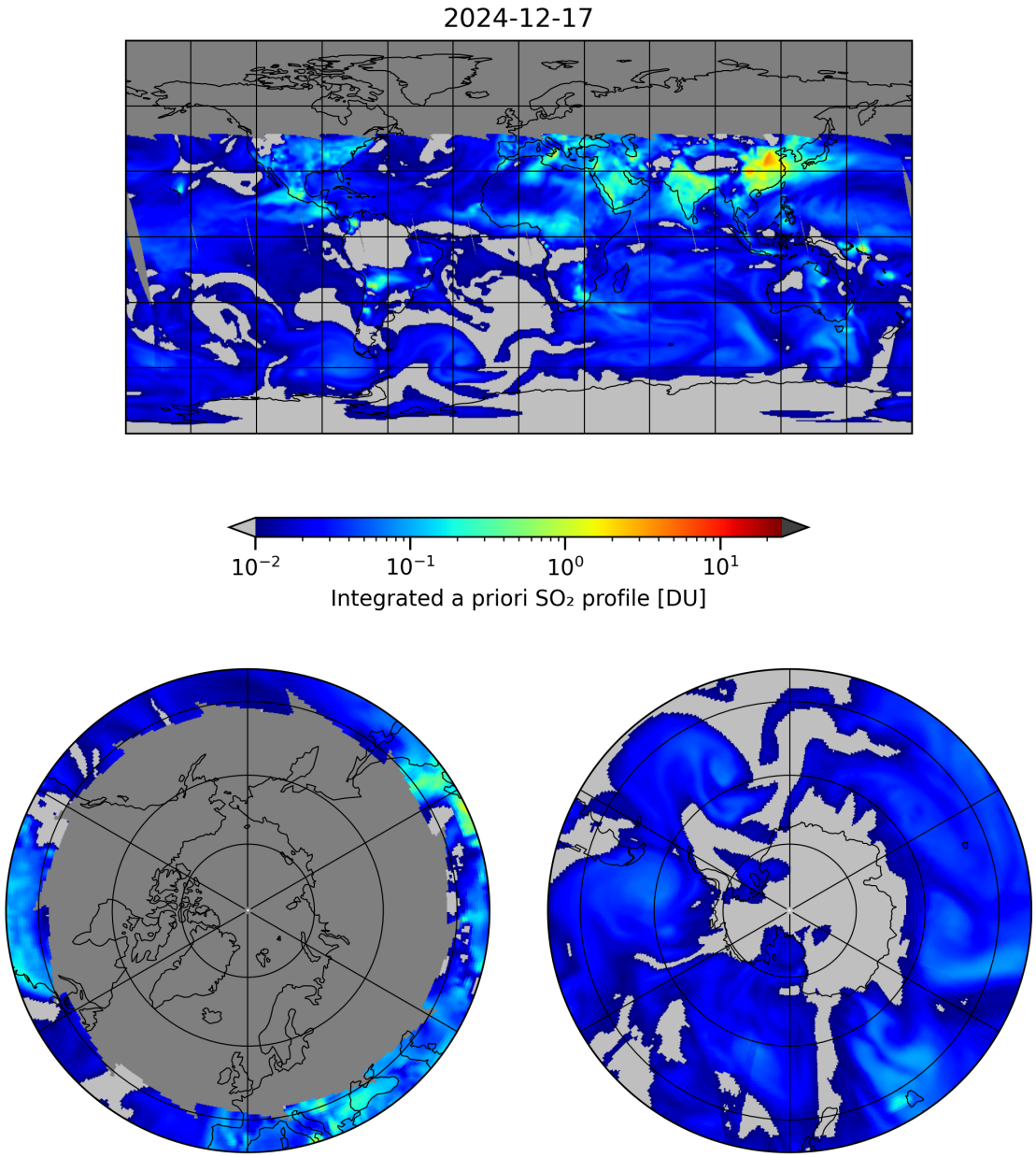

Figure 21: Map of “Integrated a priori SO_2 profile” for 2024-12-17 to 2024-12-18

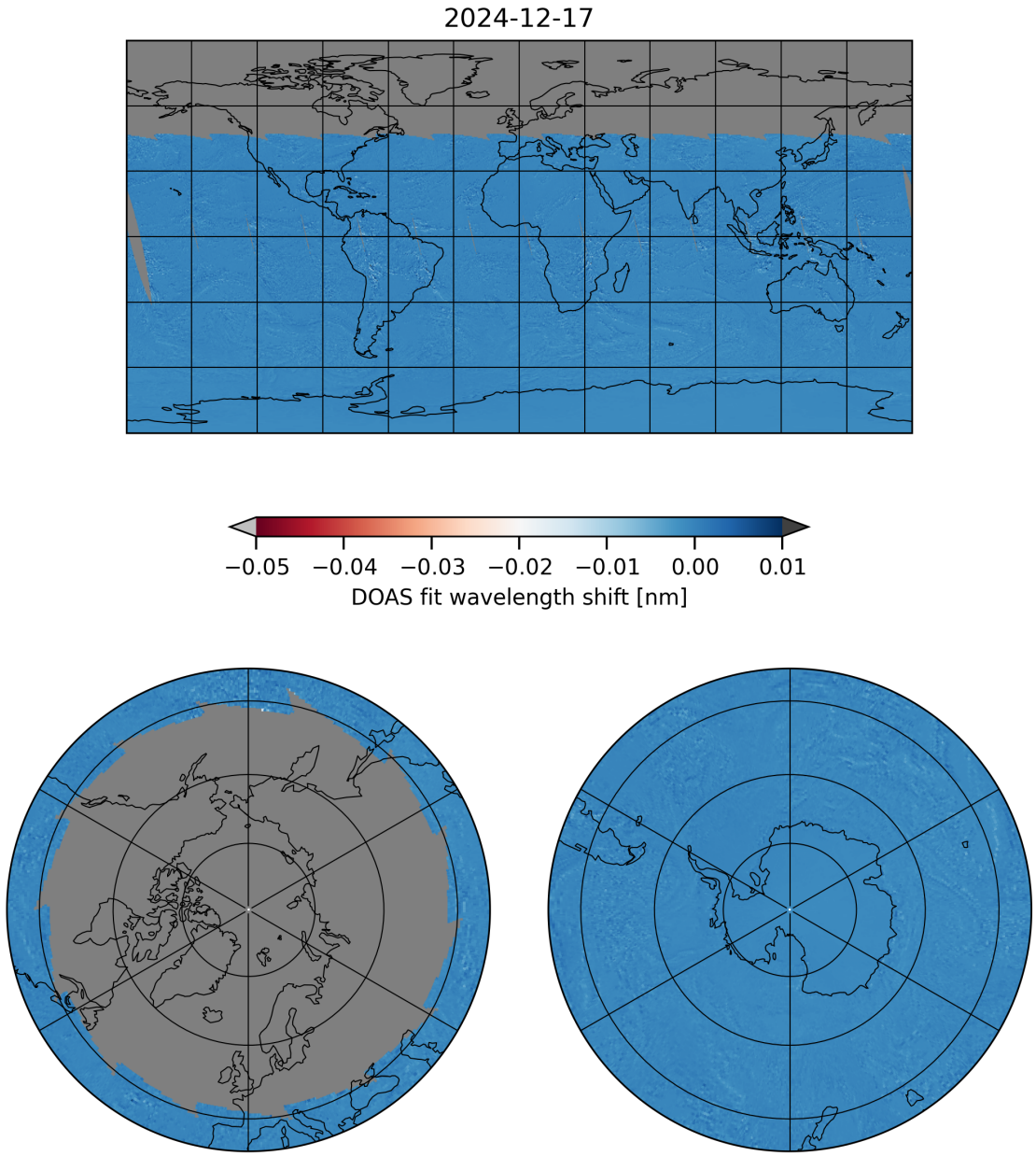

Figure 22: Map of “DOAS fit wavelength shift” for 2024-12-17 to 2024-12-18

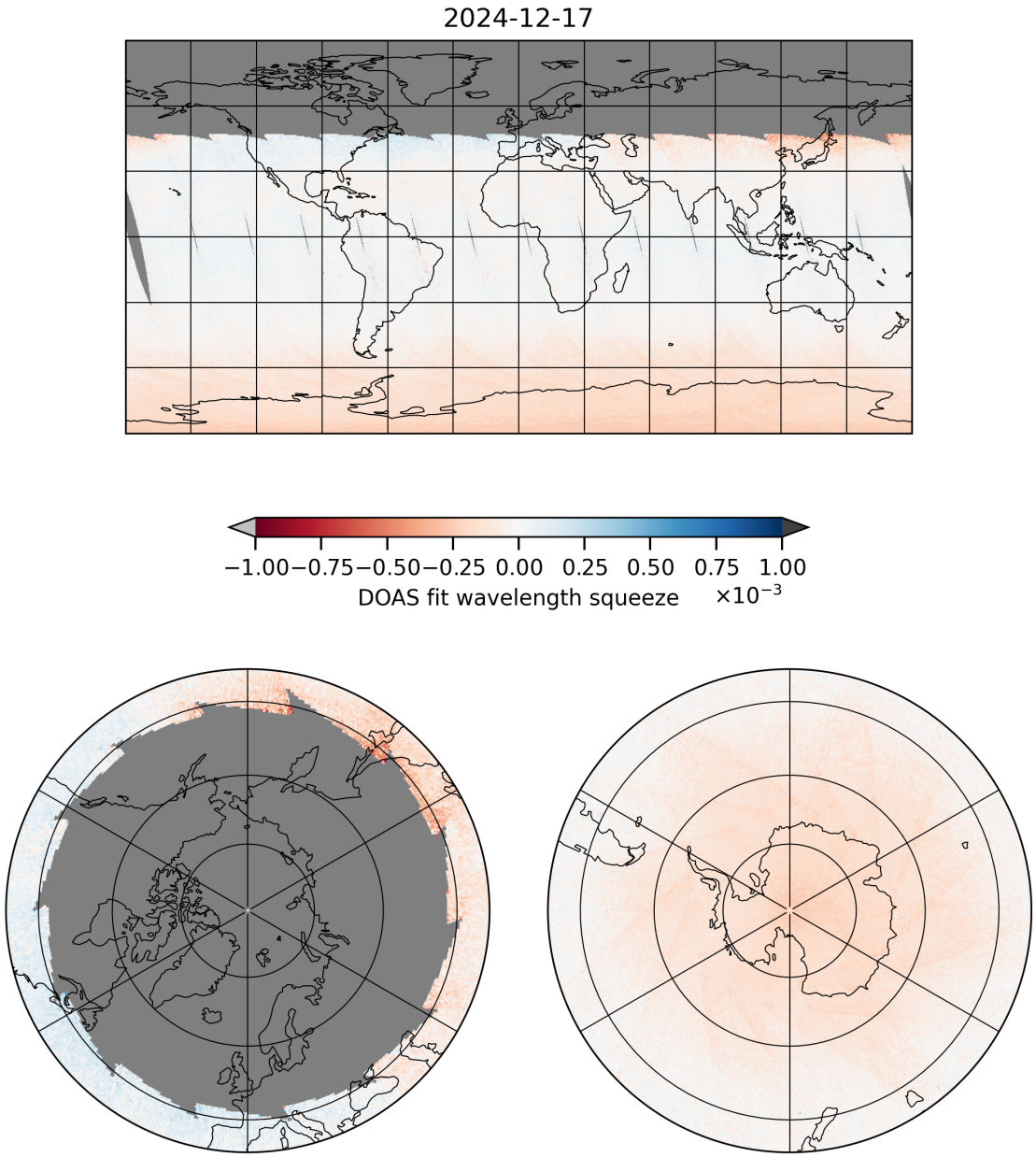

Figure 23: Map of “DOAS fit wavelength squeeze” for 2024-12-17 to 2024-12-18

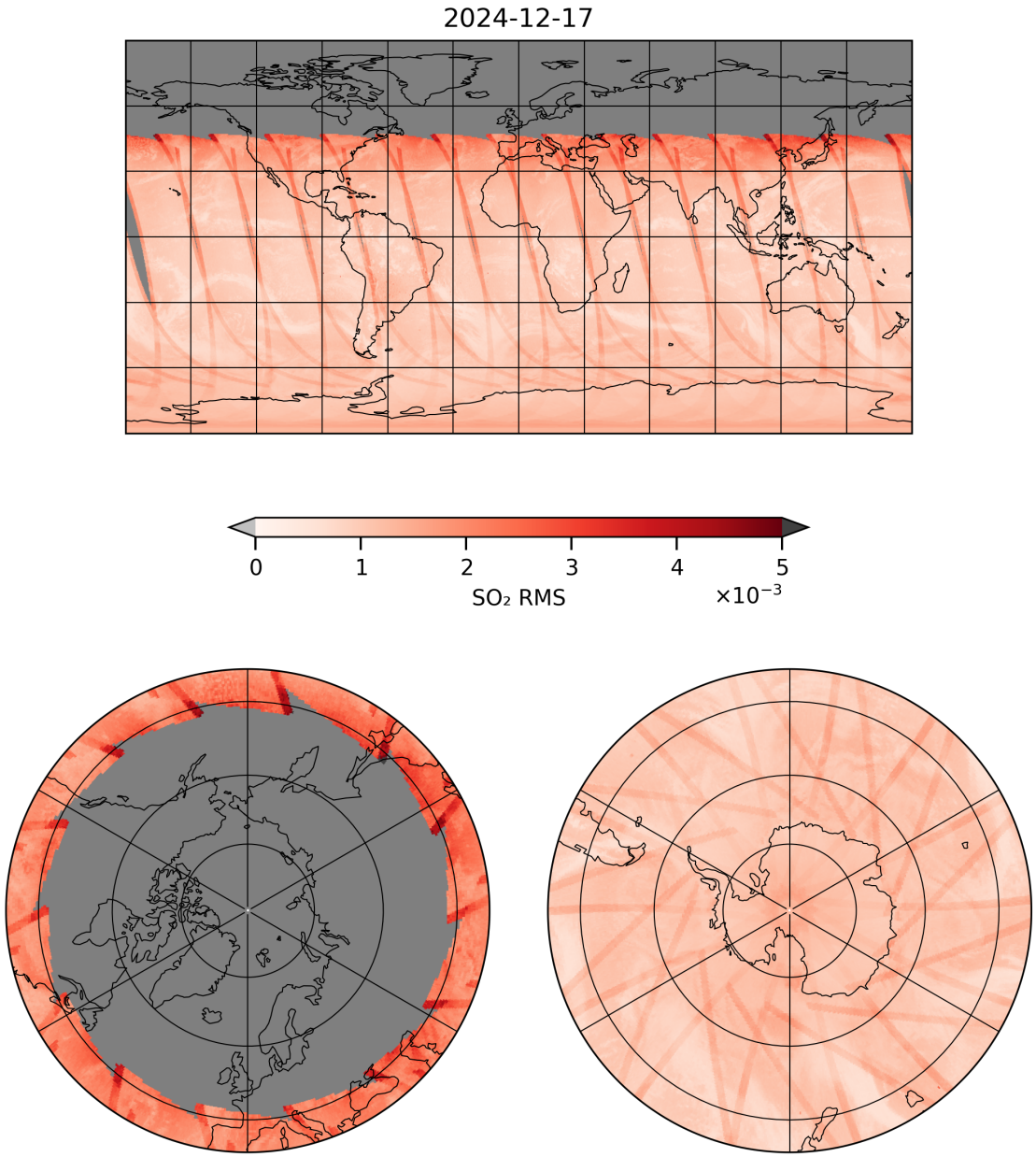

Figure 24: Map of "SO_2 RMS" for 2024-12-17 to 2024-12-18

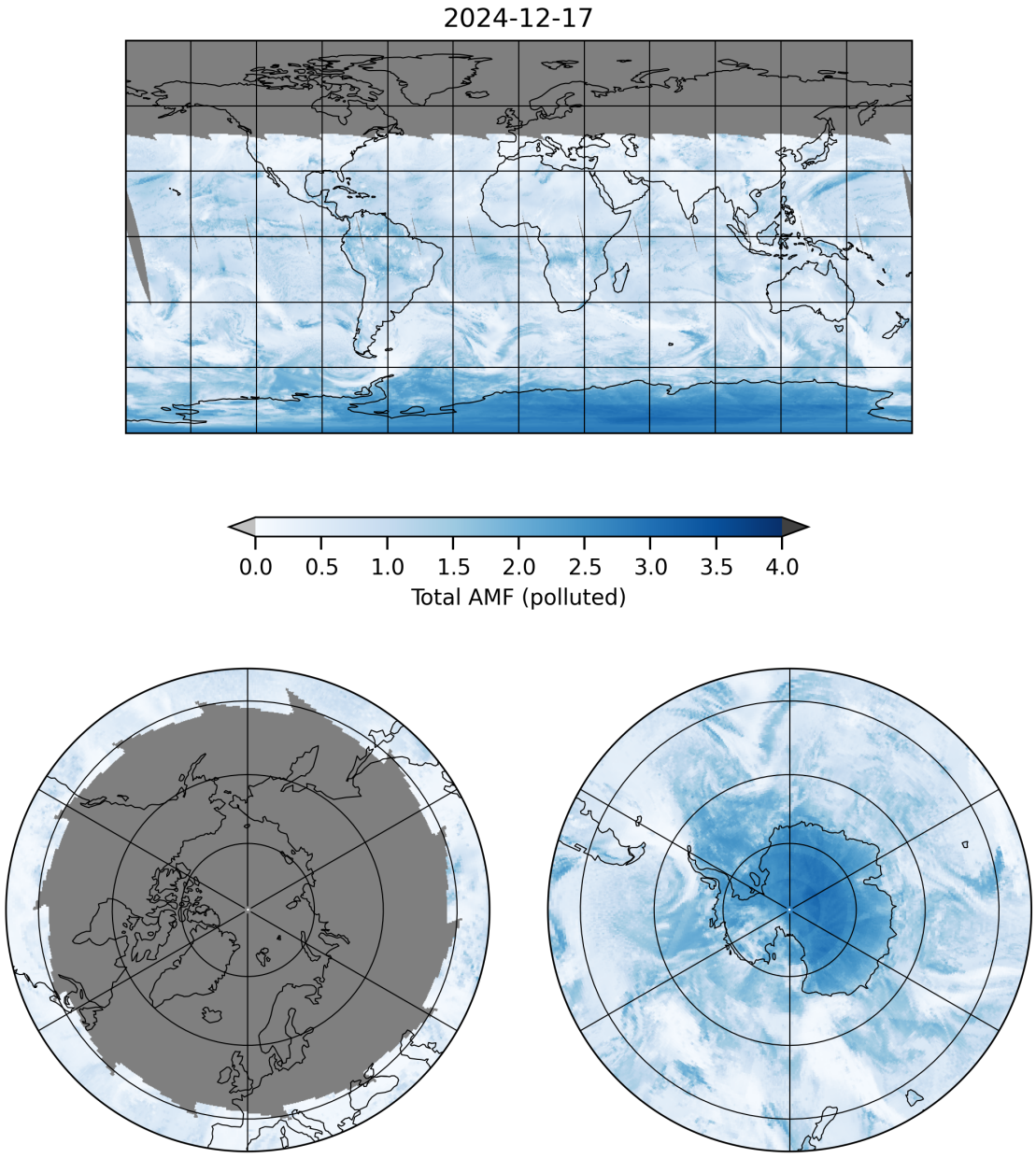

Figure 25: Map of “Total AMF (polluted)” for 2024-12-17 to 2024-12-18

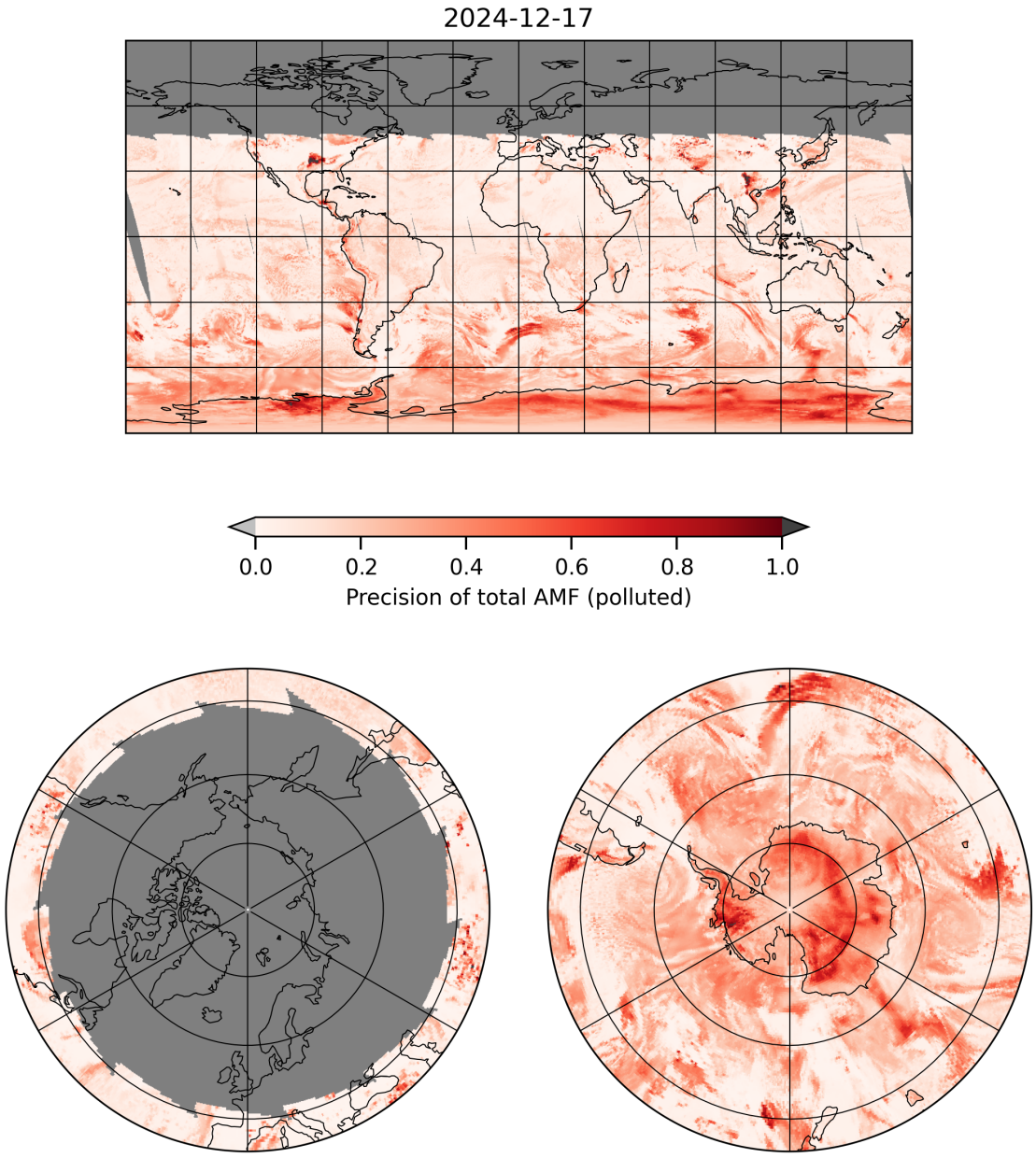

Figure 26: Map of “Precision of total AMF (polluted)” for 2024-12-17 to 2024-12-18

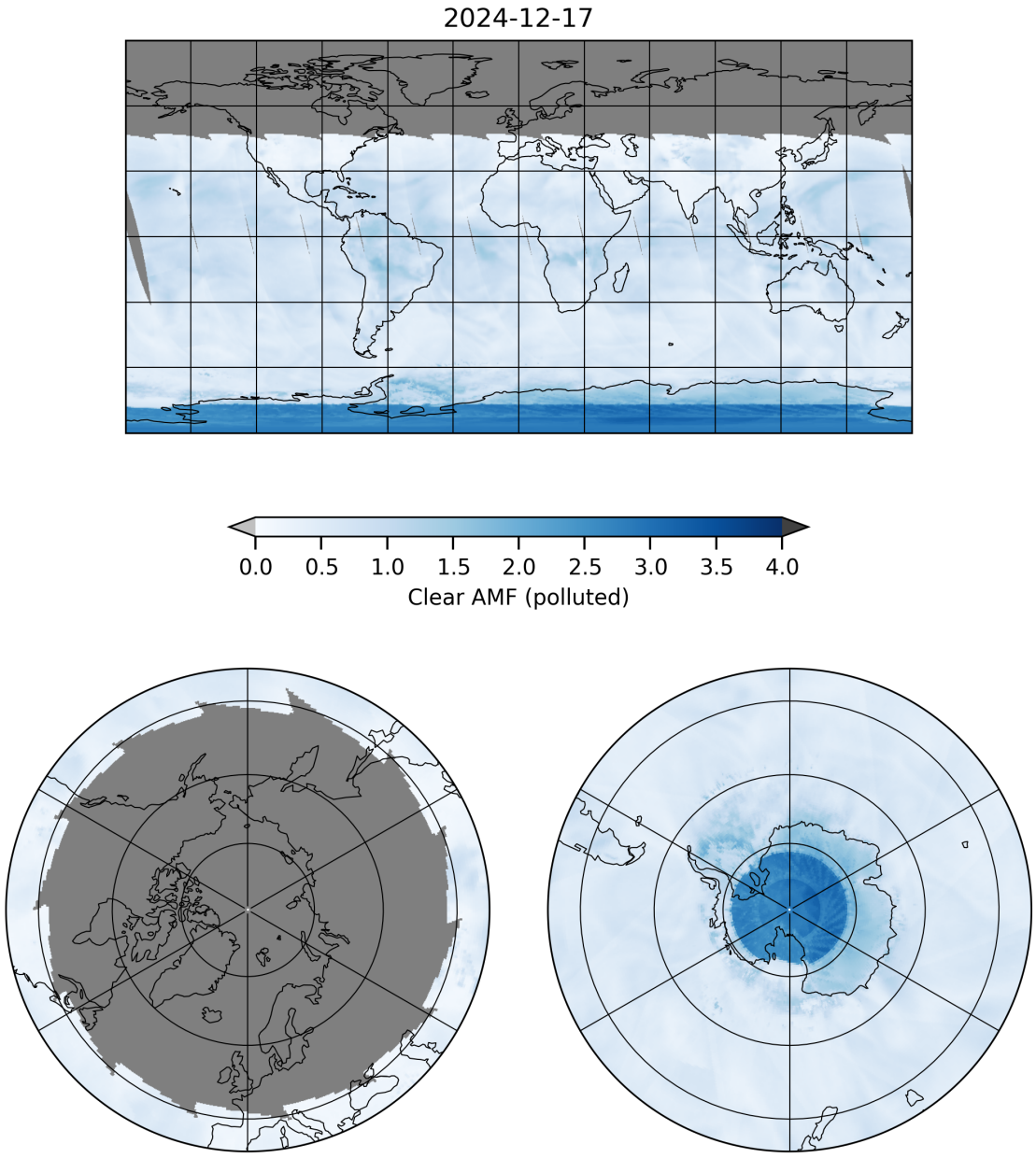

Figure 27: Map of “Clear AMF (polluted)” for 2024-12-17 to 2024-12-18

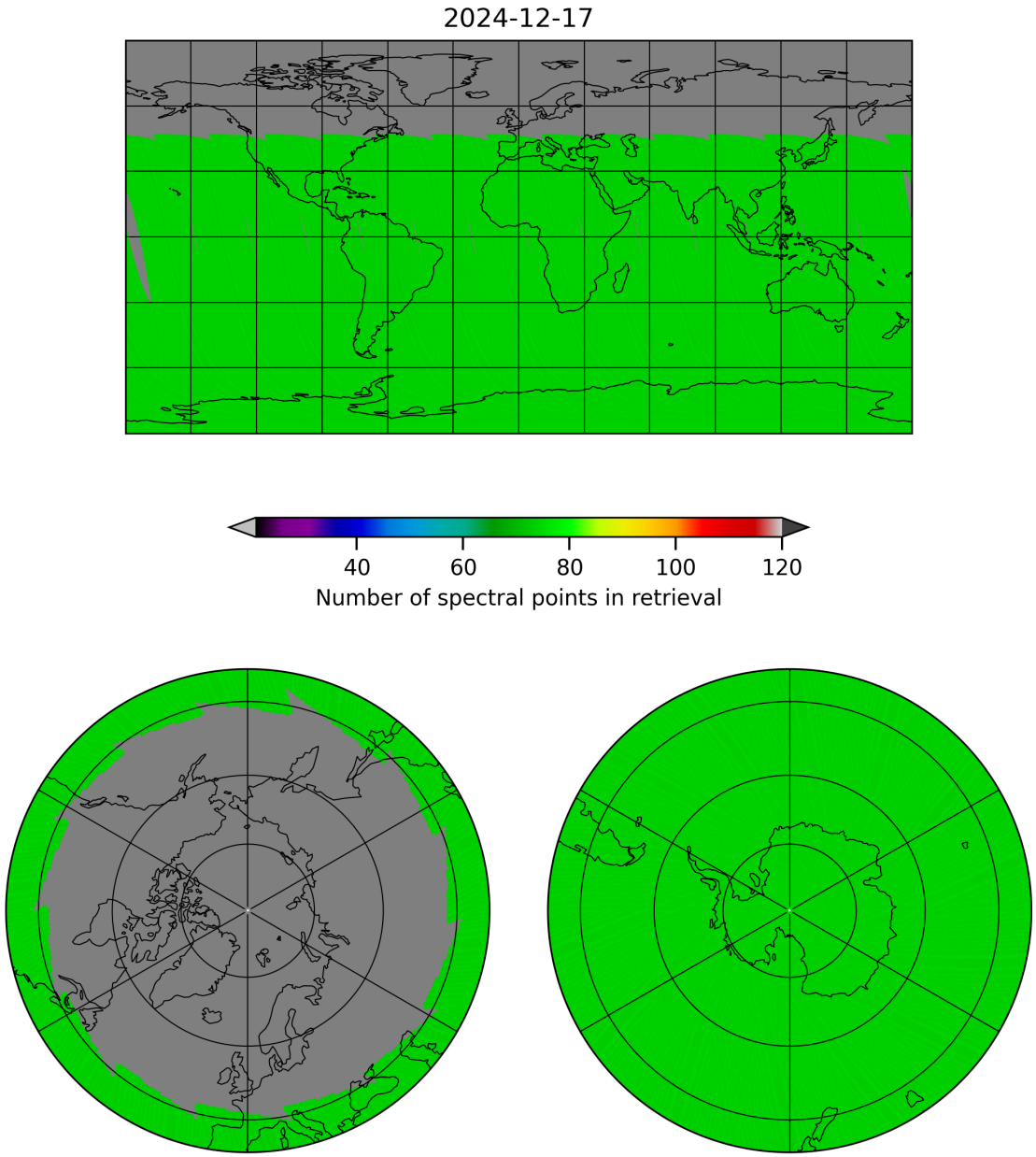

Figure 28: Map of “Number of spectral points in retrieval” for 2024-12-17 to 2024-12-18

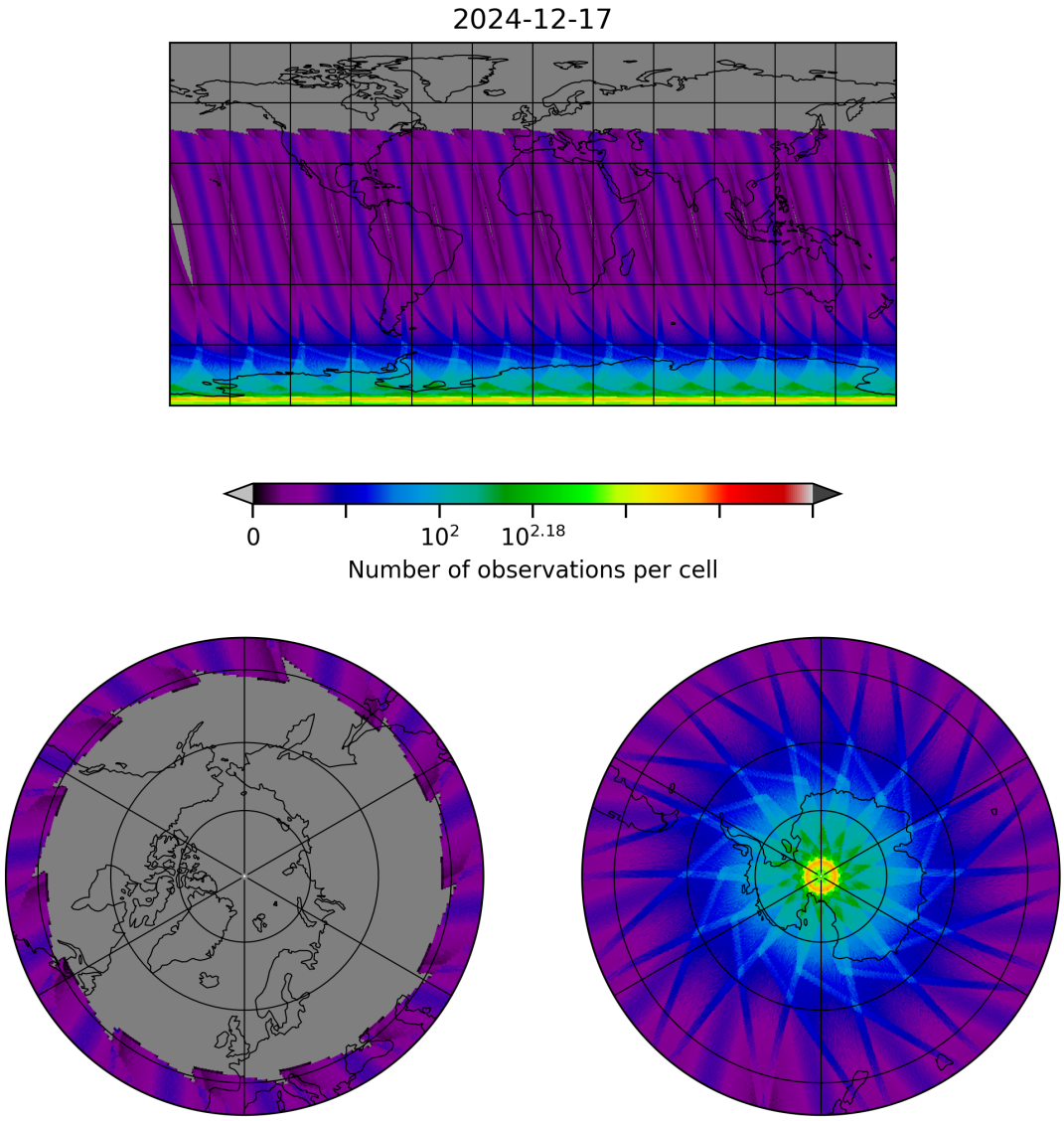

Figure 29: Map of the number of observations for 2024-12-17 to 2024-12-18

7 Zonal average

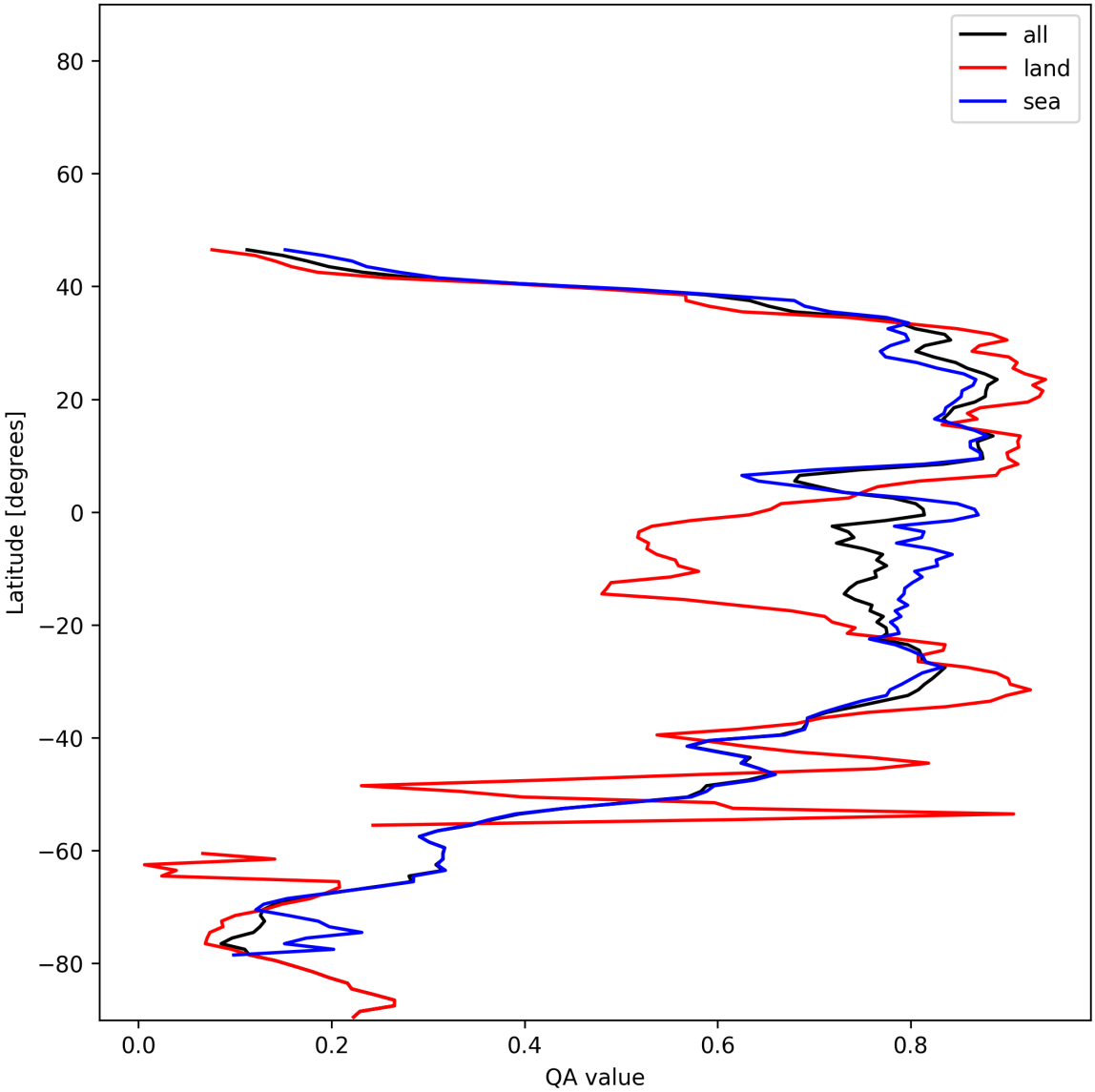

Figure 30: Zonal average of “QA value” for 2024-12-17 to 2024-12-18.

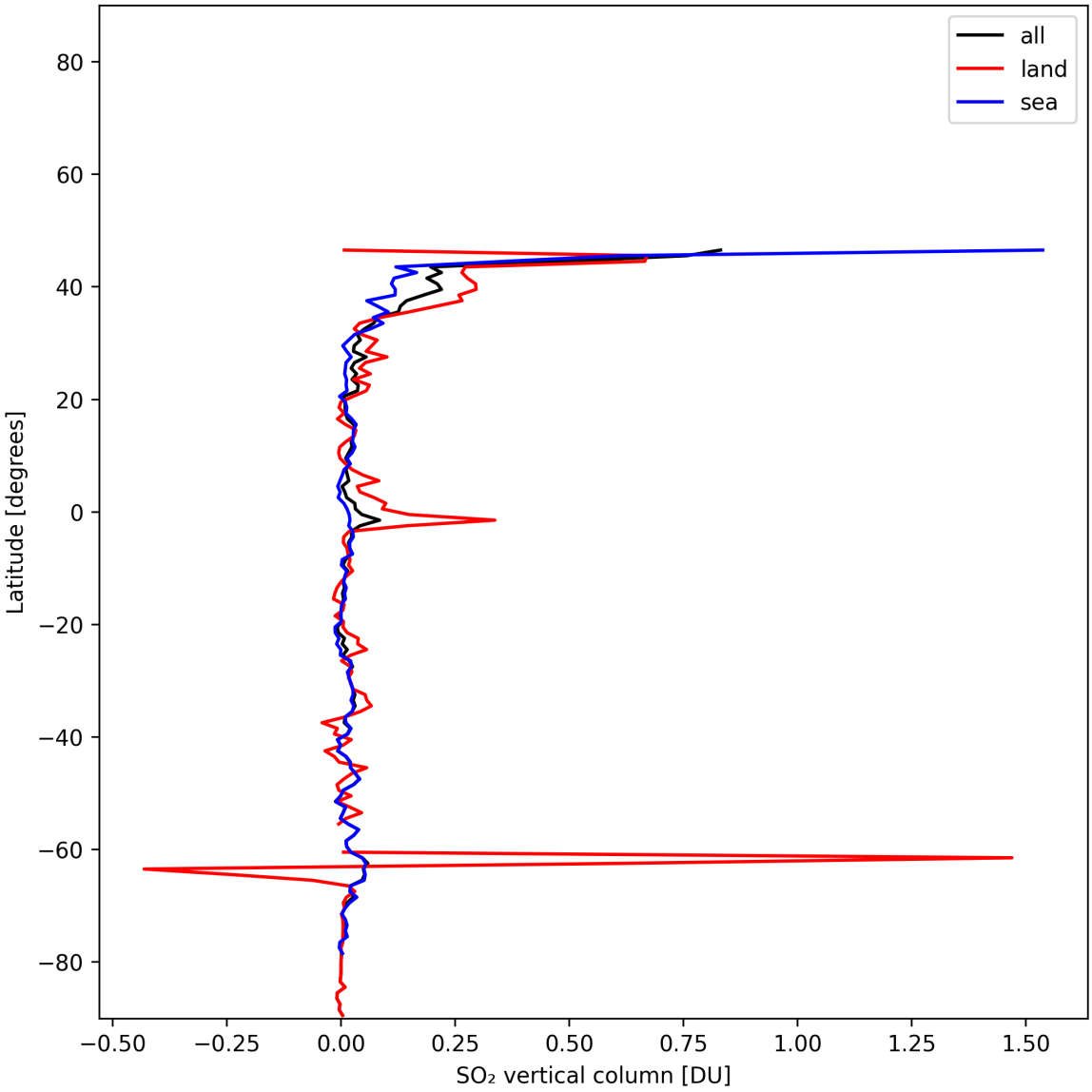

Figure 31: Zonal average of "SO_2 vertical column" for 2024-12-17 to 2024-12-18.

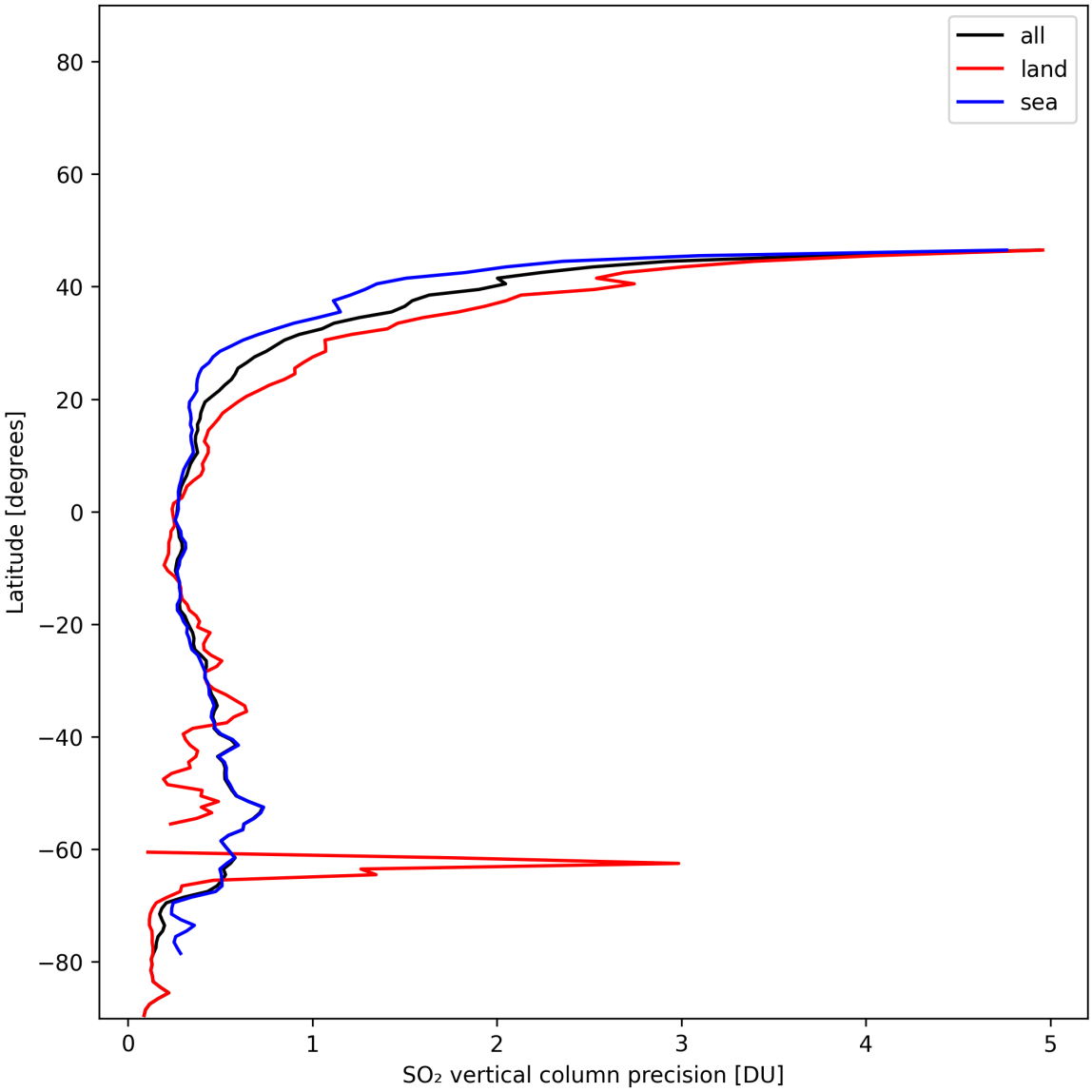

Figure 32: Zonal average of "SO_2 vertical column precision" for 2024-12-17 to 2024-12-18.

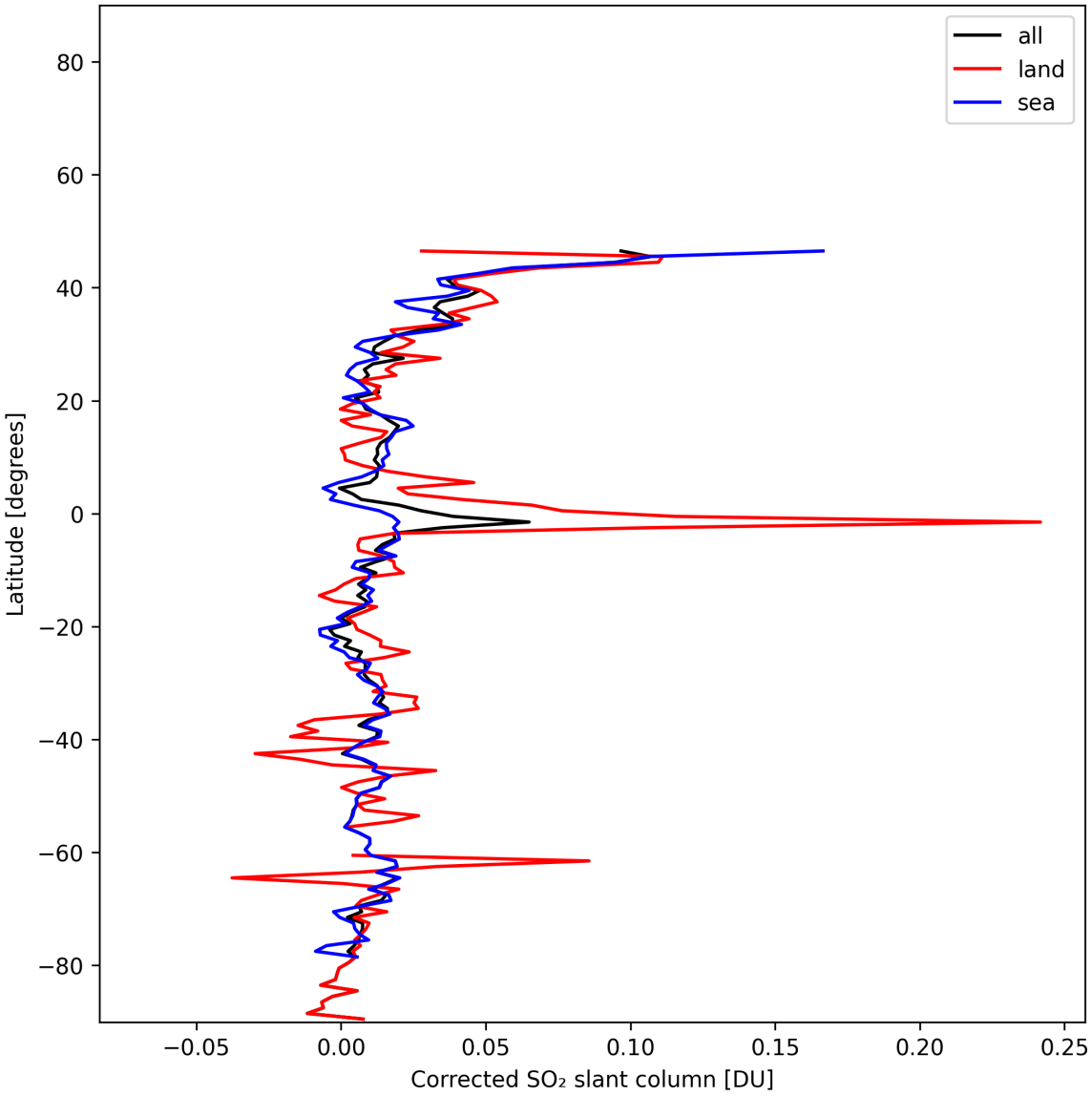

Figure 33: Zonal average of "Corrected SO_2 slant column" for 2024-12-17 to 2024-12-18.

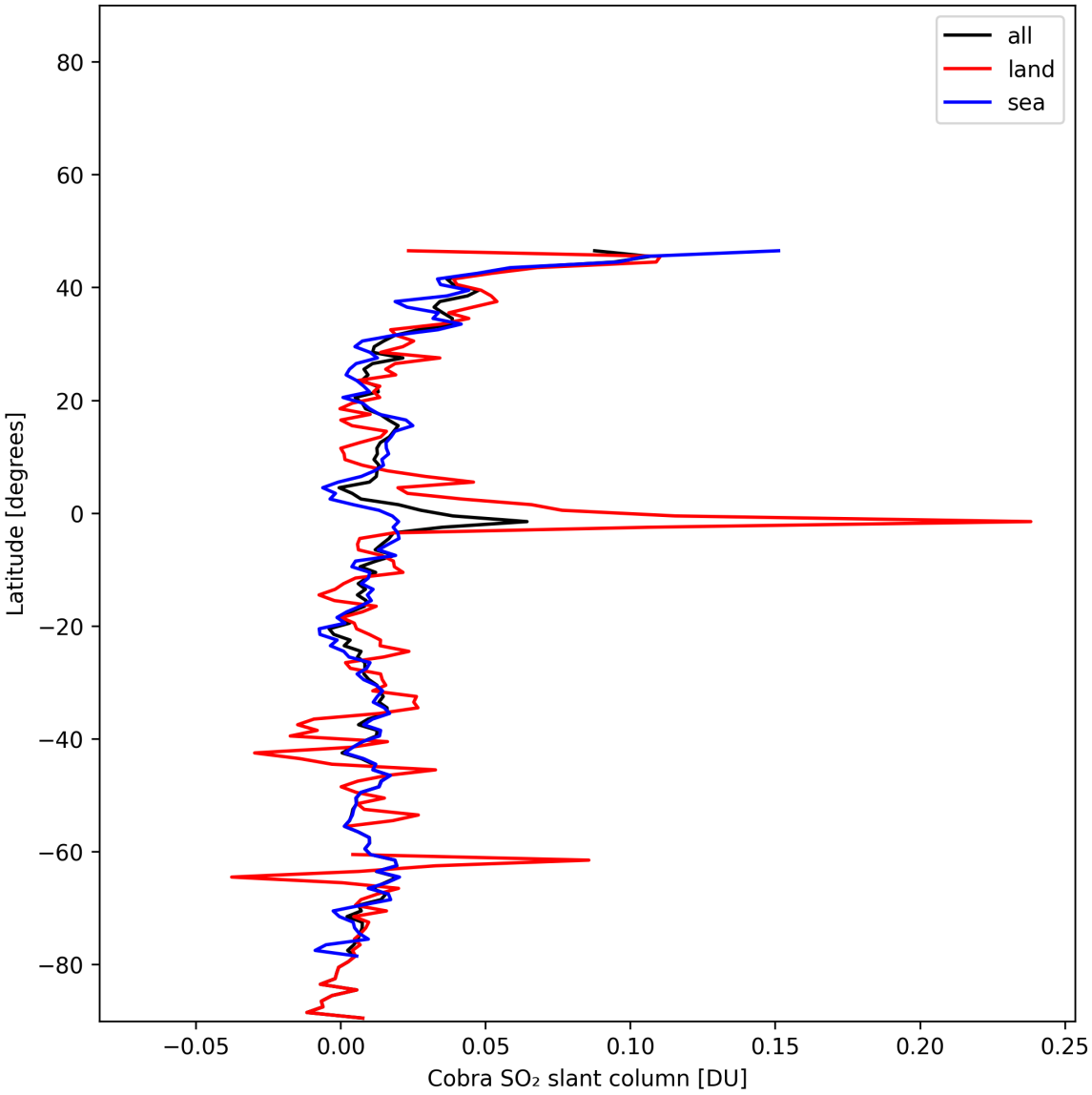

Figure 34: Zonal average of "Cobra SO_2 slant column" for 2024-12-17 to 2024-12-18.

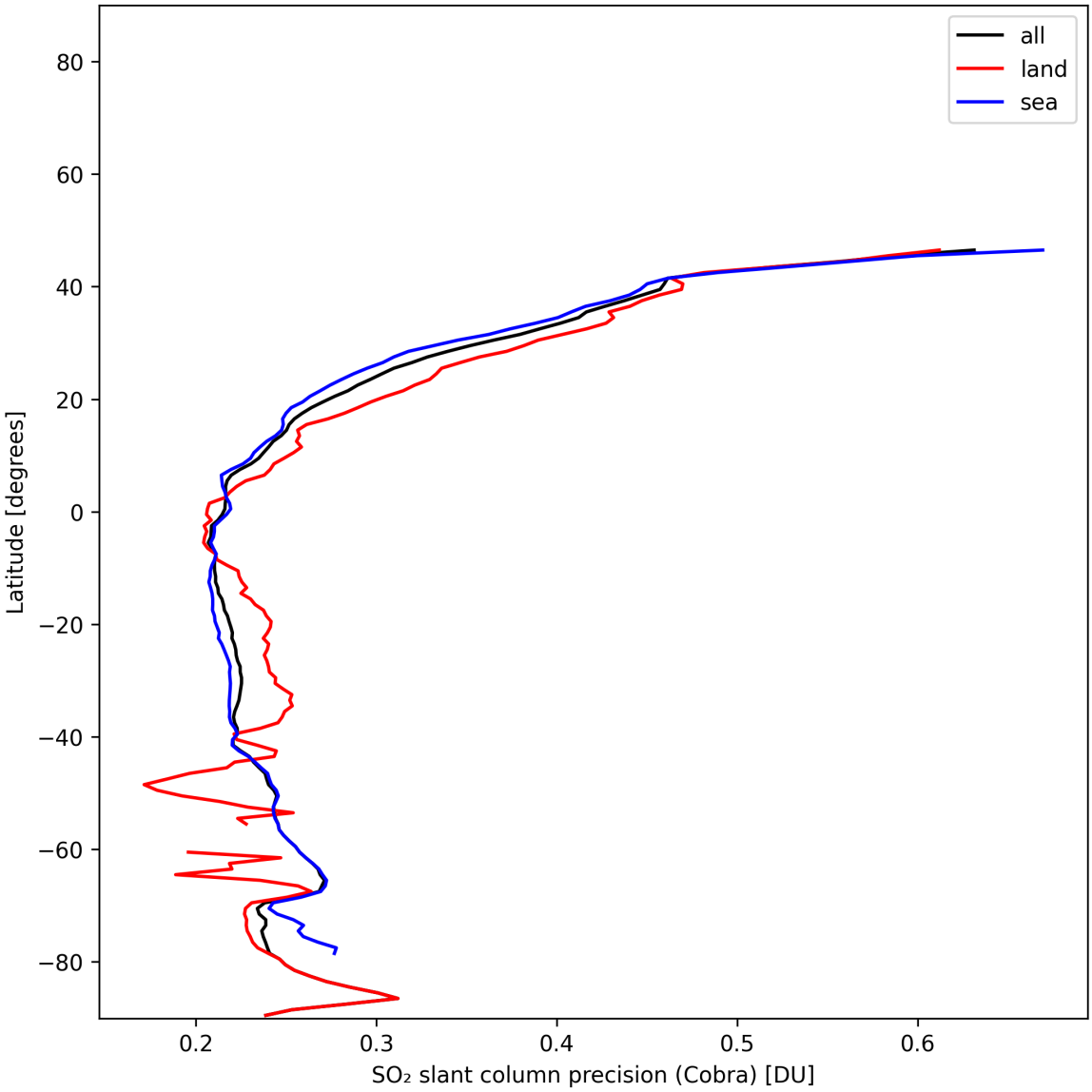

Figure 35: Zonal average of "SO_2 slant column precision (Cobra)" for 2024-12-17 to 2024-12-18.

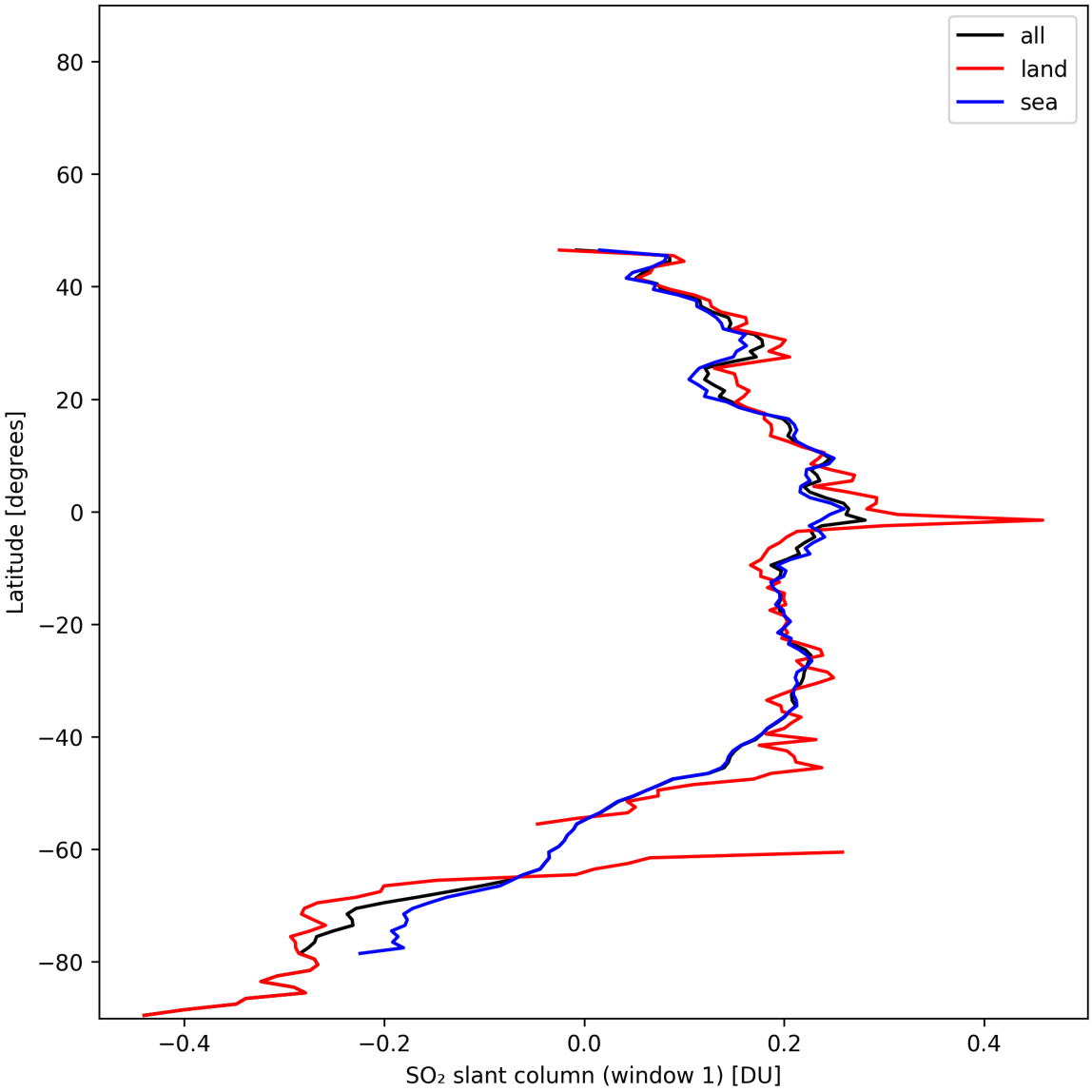

Figure 36: Zonal average of "SO_2 slant column (window 1)" for 2024-12-17 to 2024-12-18.

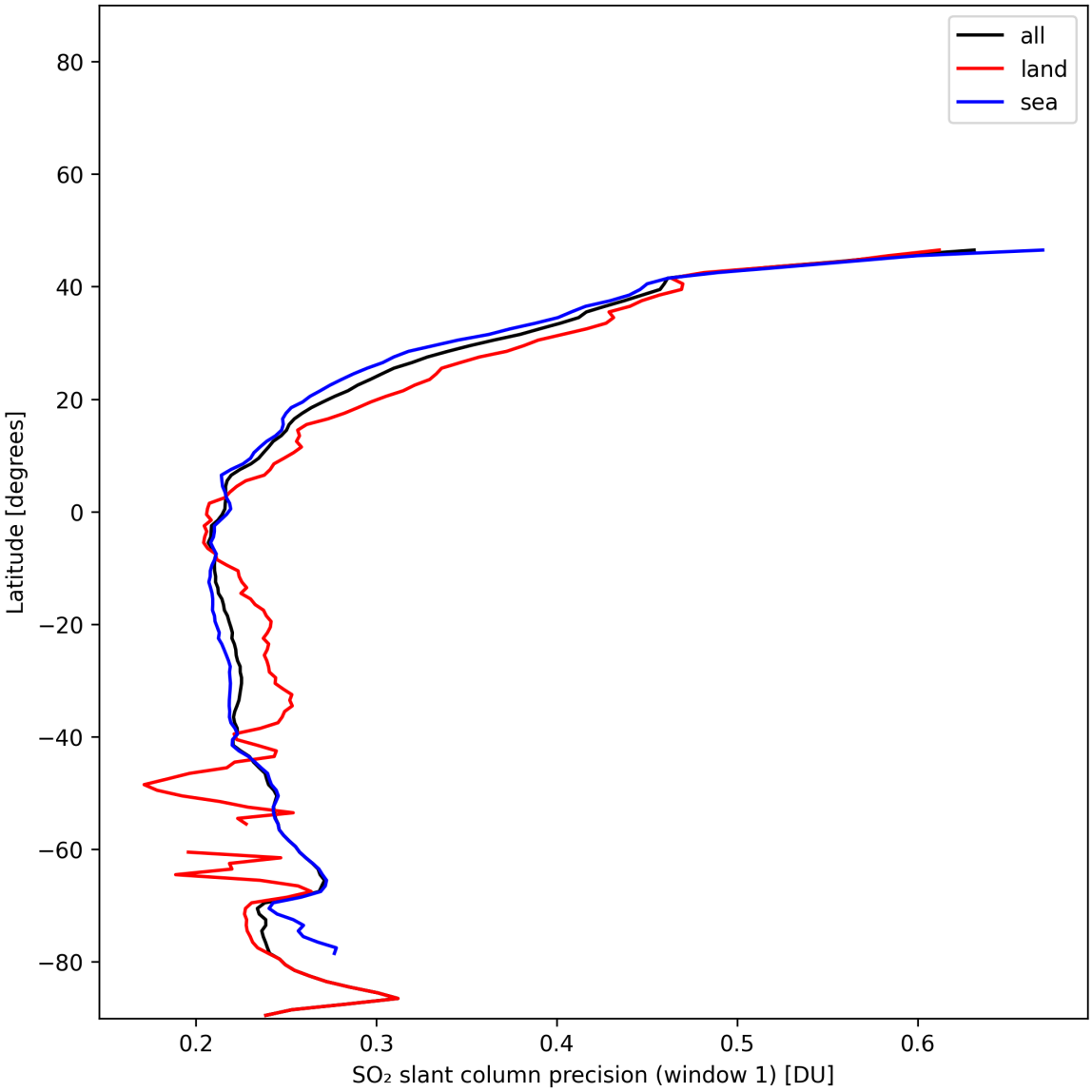

Figure 37: Zonal average of "SO_2 slant column precision (window 1)" for 2024-12-17 to 2024-12-18.

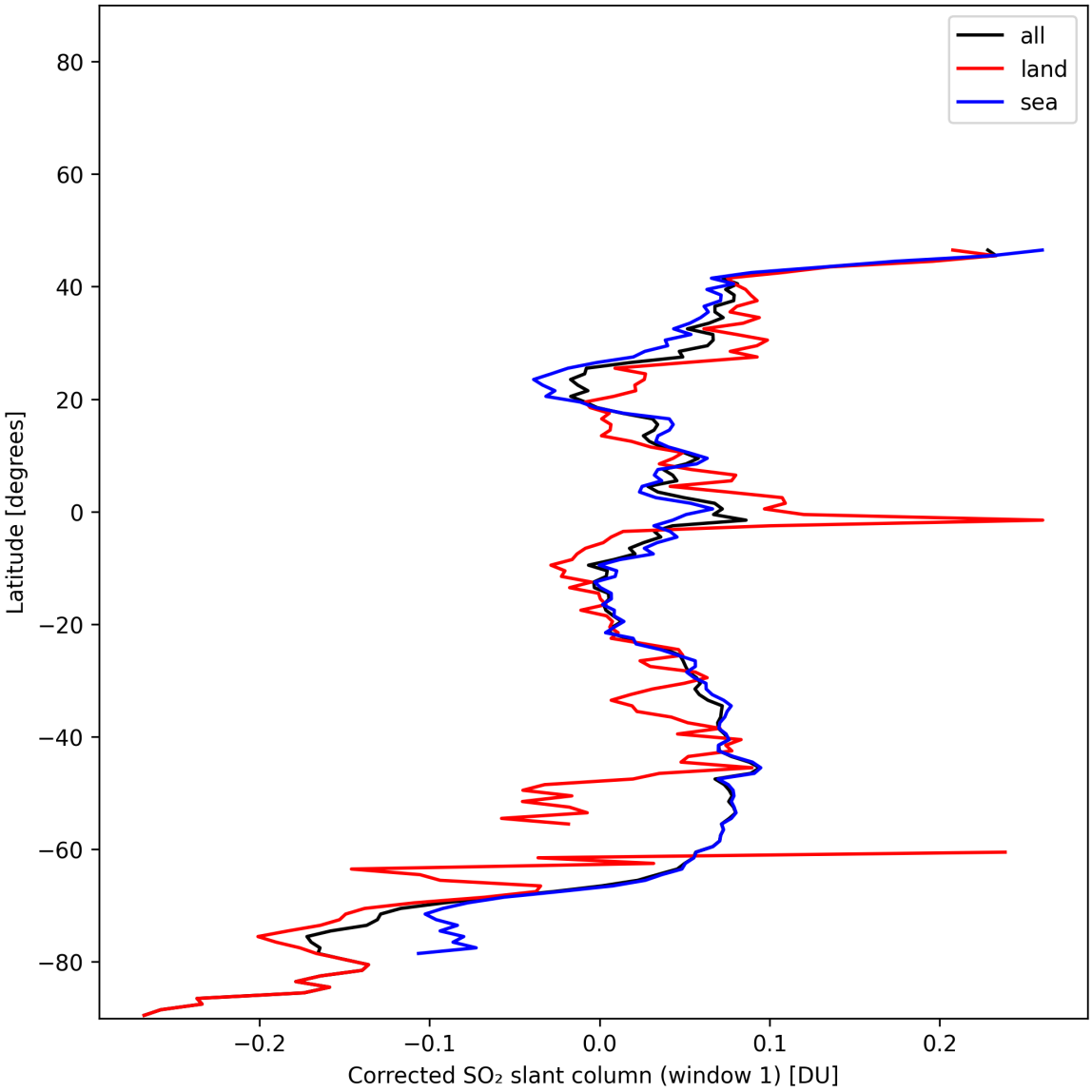

Figure 38: Zonal average of "Corrected SO_2 slant column (window 1)" for 2024-12-17 to 2024-12-18.

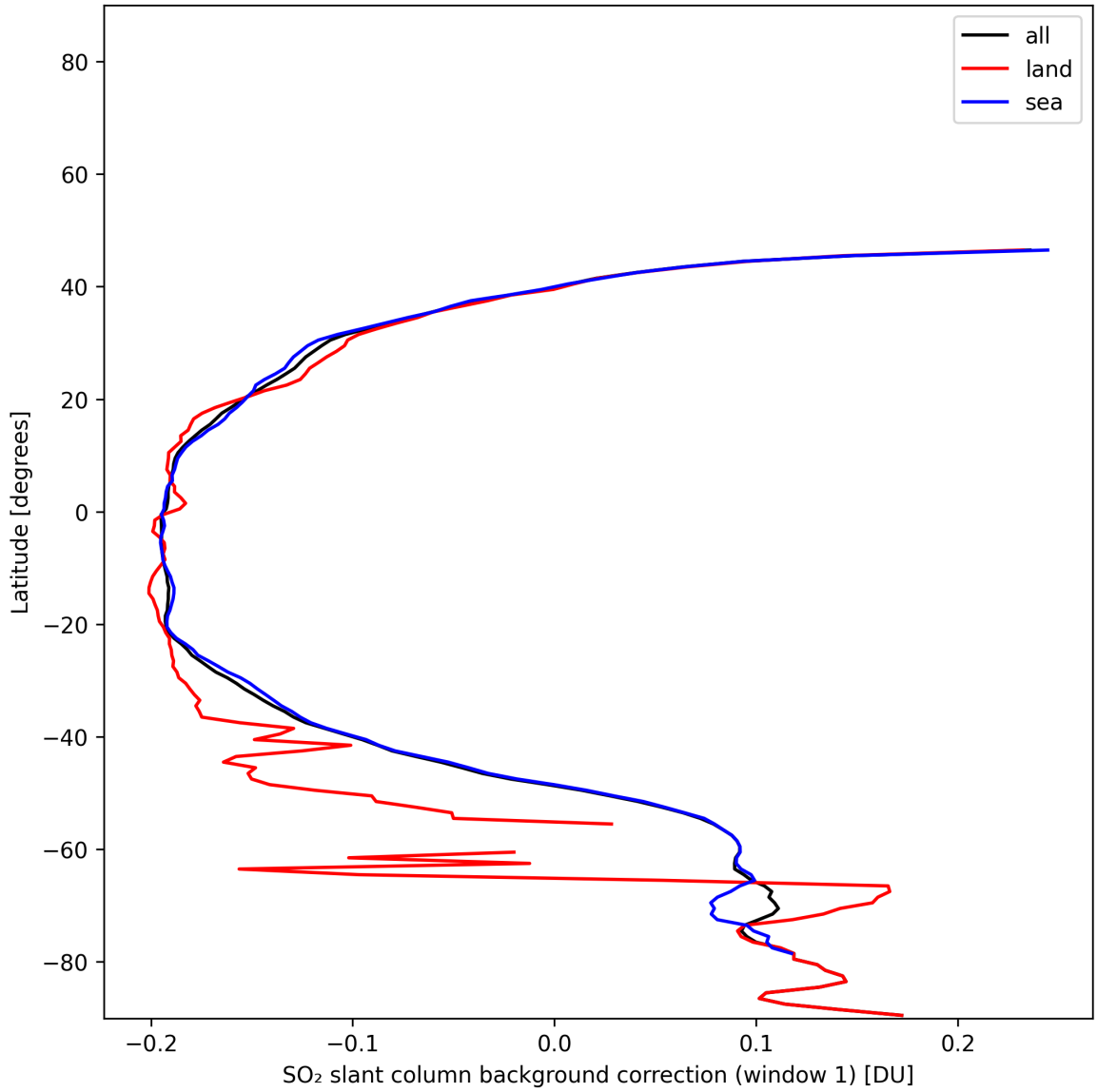

Figure 39: Zonal average of "SO_2 slant column background correction (window 1)" for 2024-12-17 to 2024-12-18.

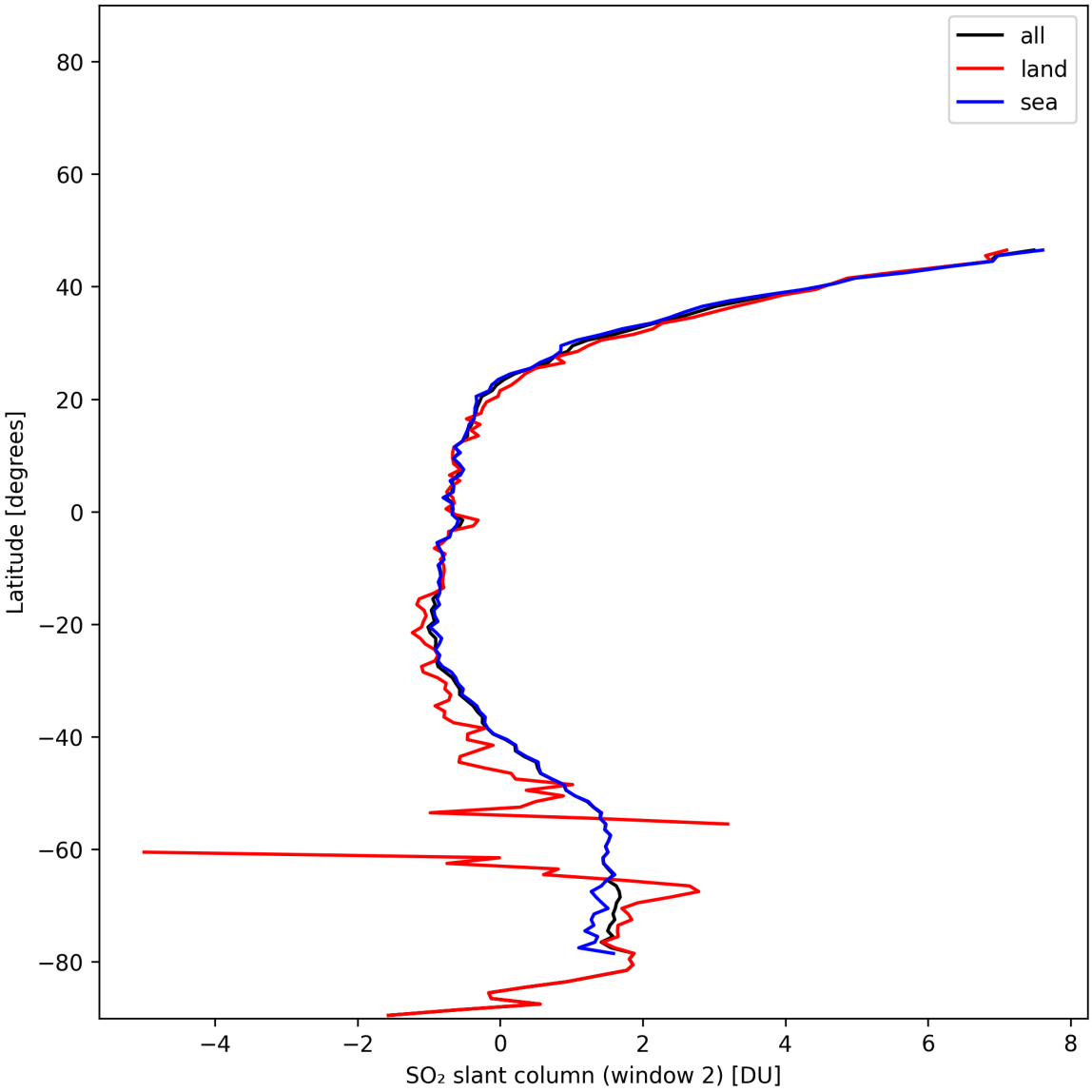

Figure 40: Zonal average of "SO_2 slant column (window 2)" for 2024-12-17 to 2024-12-18.

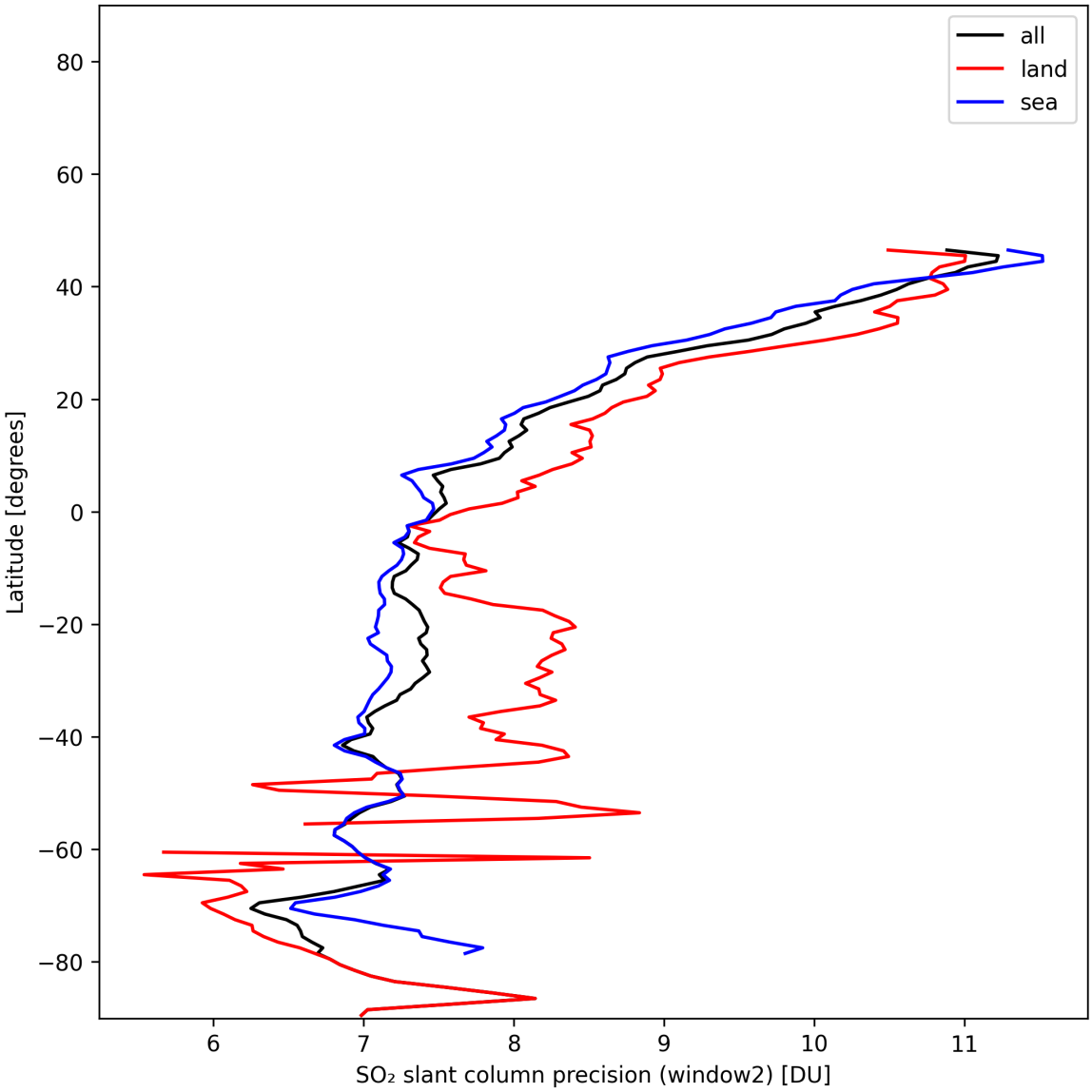

Figure 41: Zonal average of "SO_2 slant column precision (window2)" for 2024-12-17 to 2024-12-18.

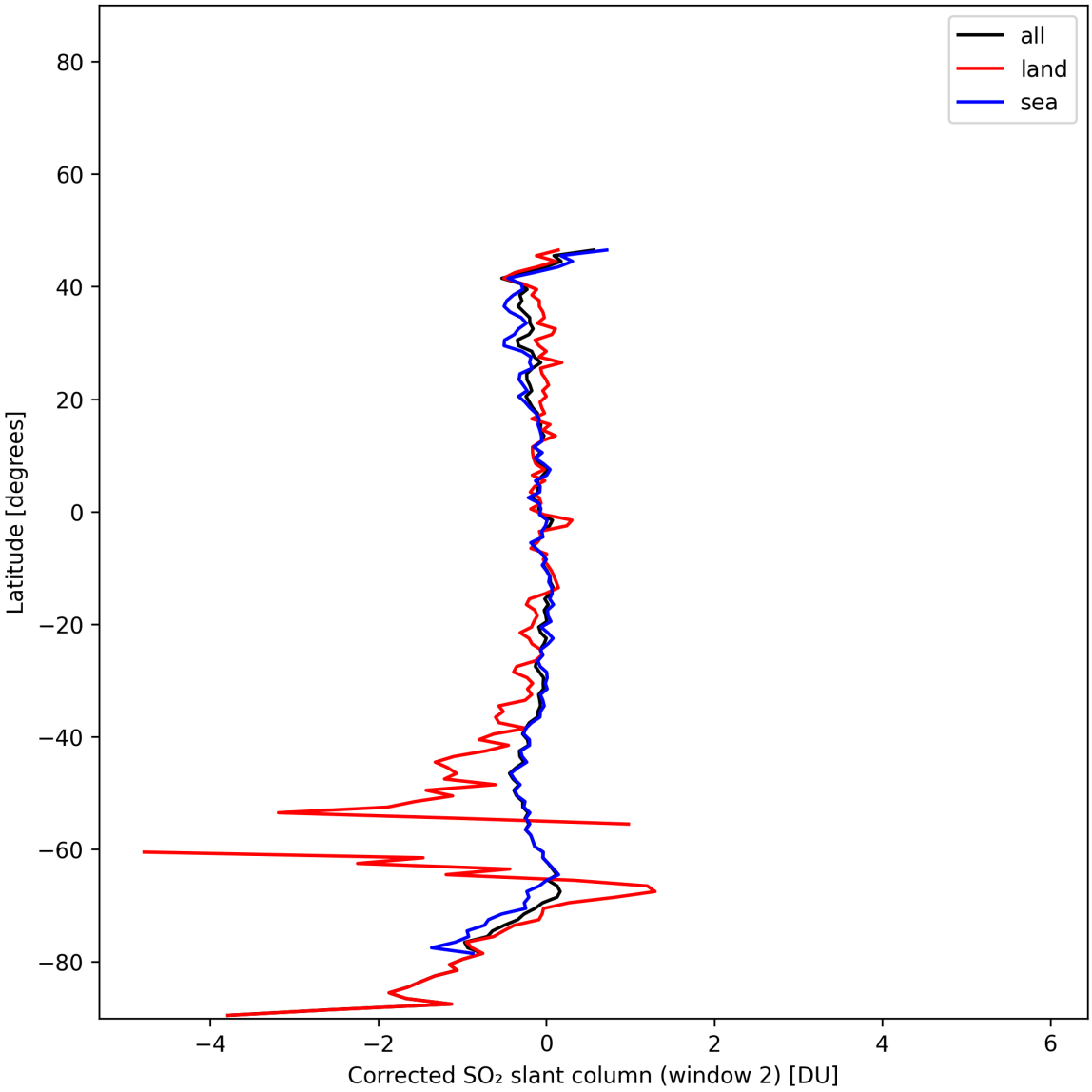

Figure 42: Zonal average of "Corrected SO_2 slant column (window 2)" for 2024-12-17 to 2024-12-18.

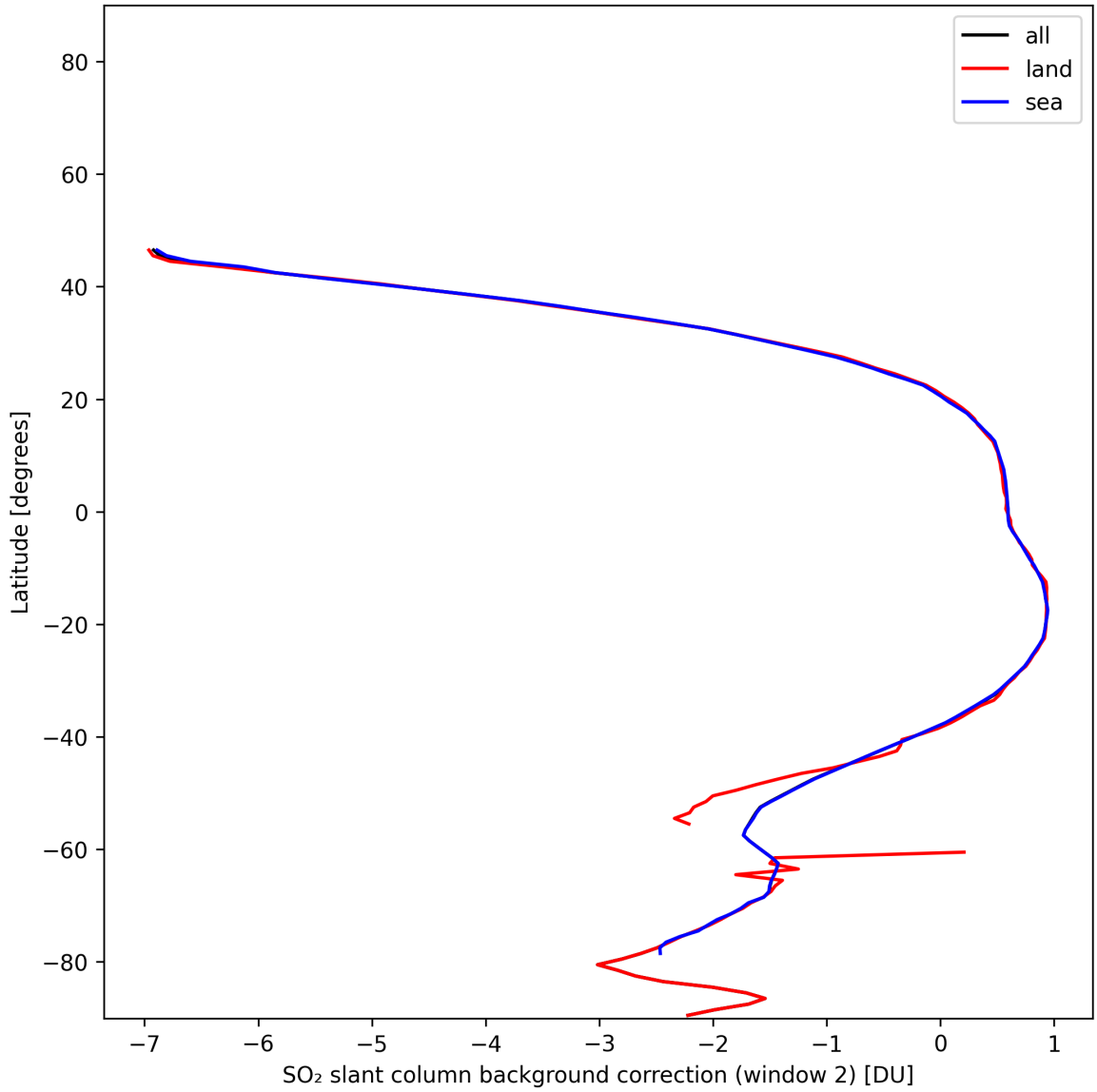

Figure 43: Zonal average of "SO_2 slant column background correction (window 2)" for 2024-12-17 to 2024-12-18.

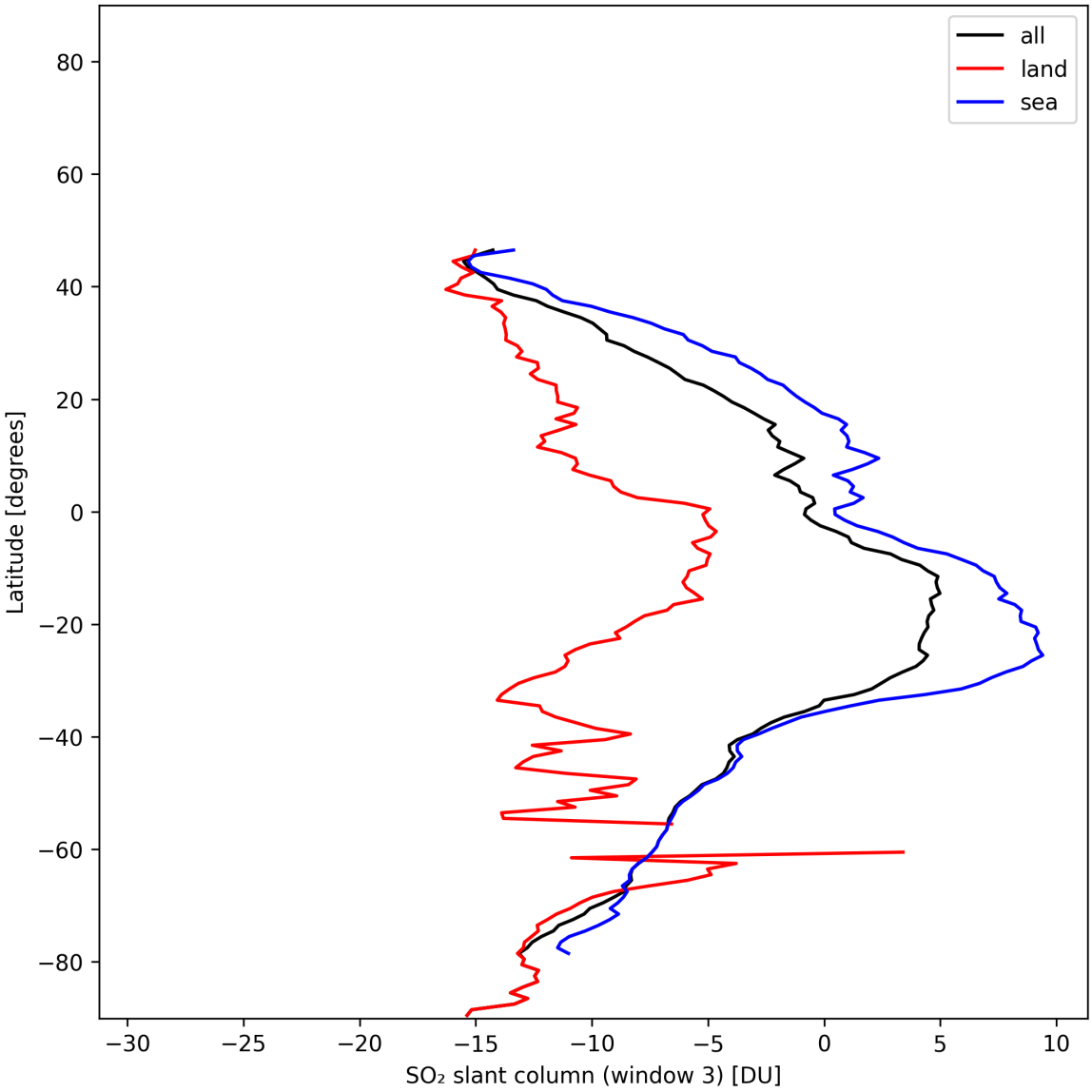

Figure 44: Zonal average of "SO_2 slant column (window 3)" for 2024-12-17 to 2024-12-18.

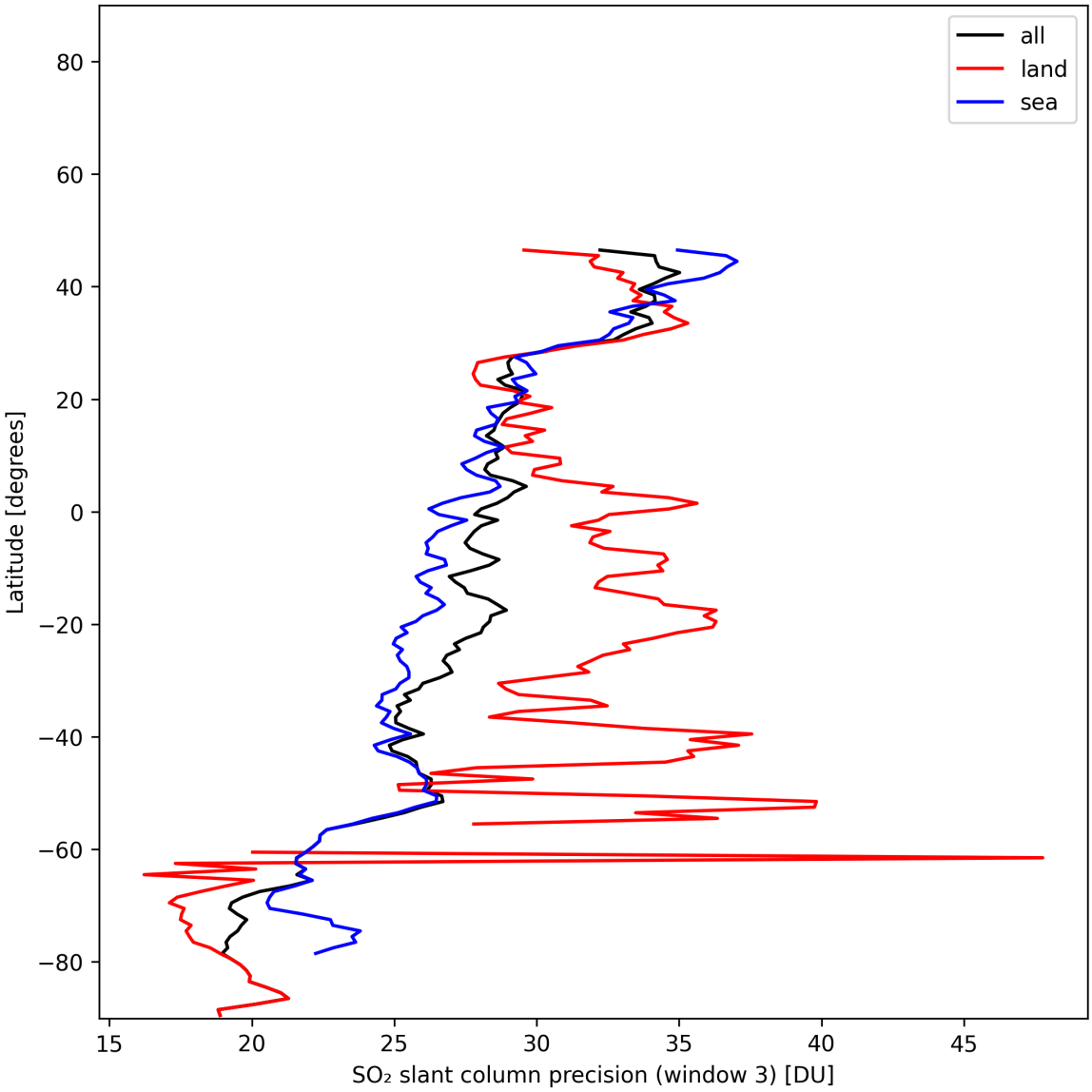

Figure 45: Zonal average of "SO_2 slant column precision (window 3)" for 2024-12-17 to 2024-12-18.

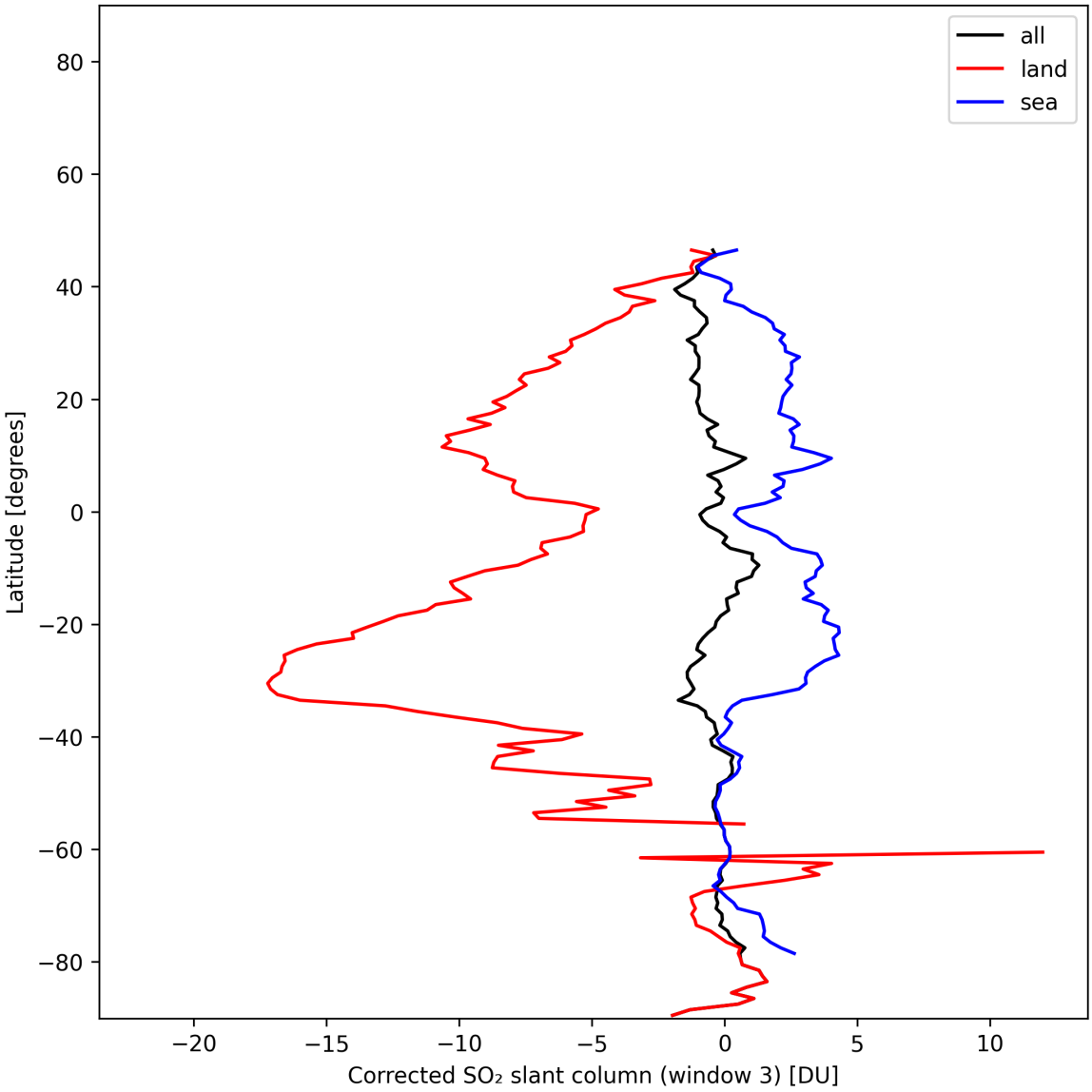

Figure 46: Zonal average of "Corrected SO_2 slant column (window 3)" for 2024-12-17 to 2024-12-18.

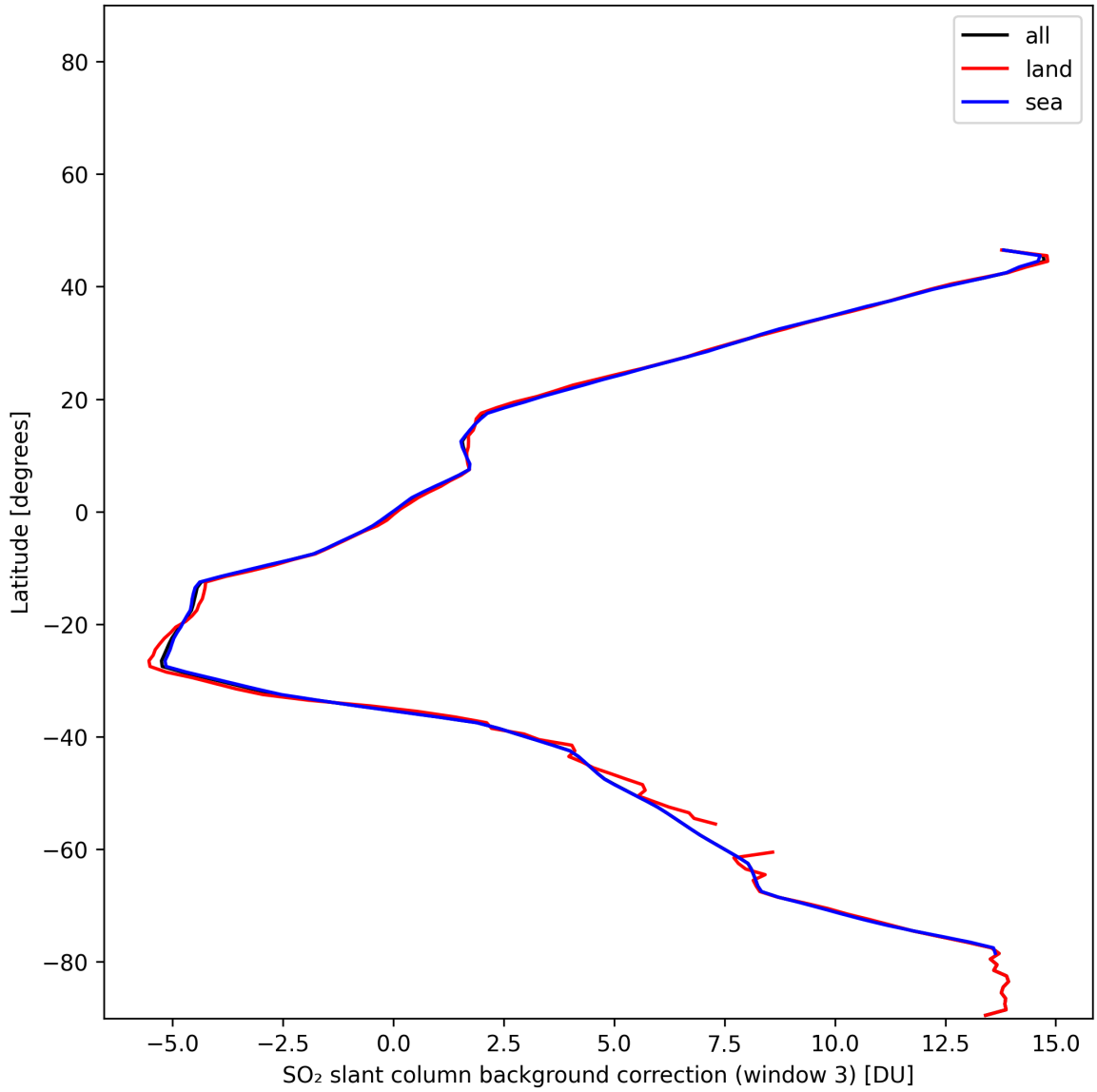

Figure 47: Zonal average of "SO_2 slant column background correction (window 3)" for 2024-12-17 to 2024-12-18.

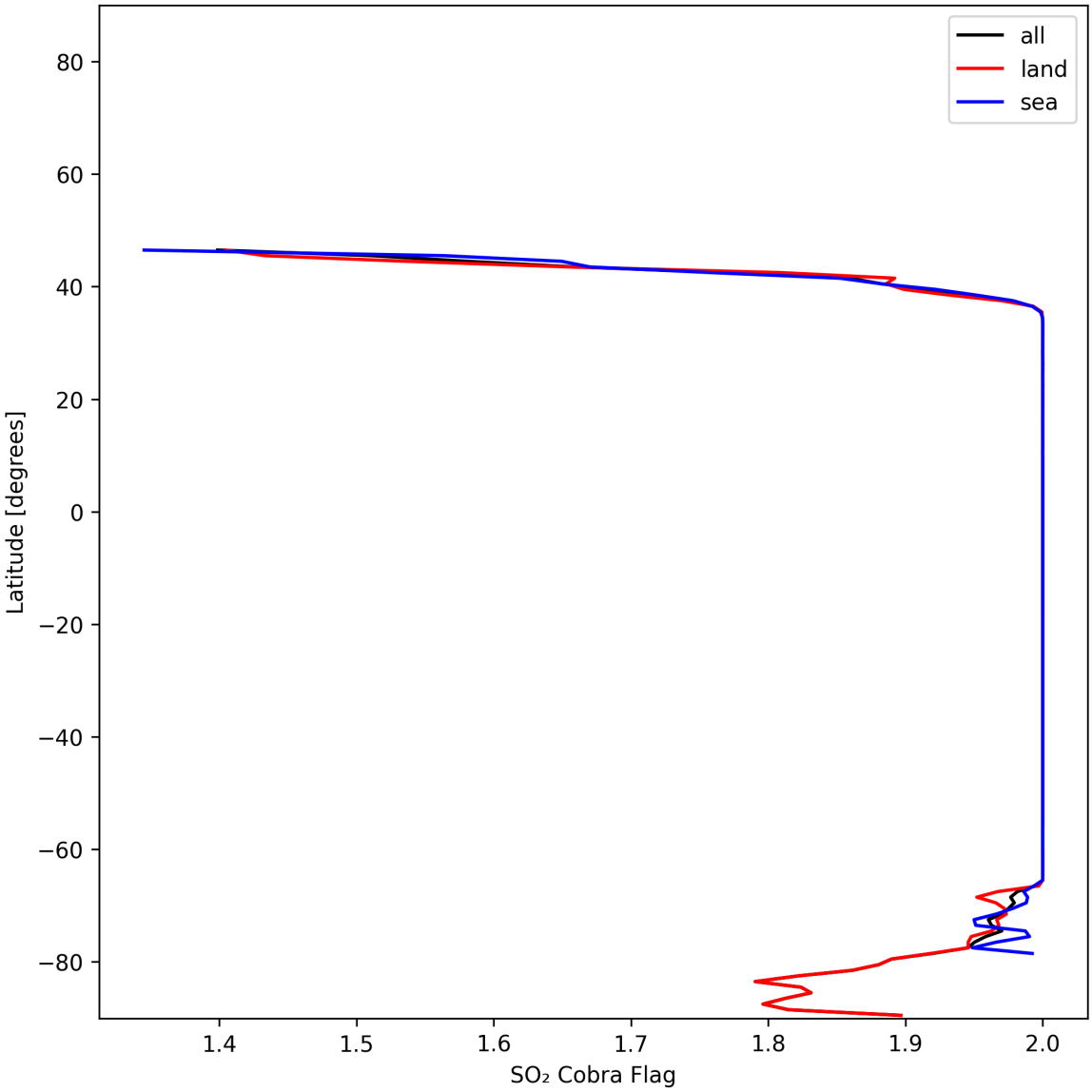

Figure 48: Zonal average of "SO_2 Cobra Flag" for 2024-12-17 to 2024-12-18.

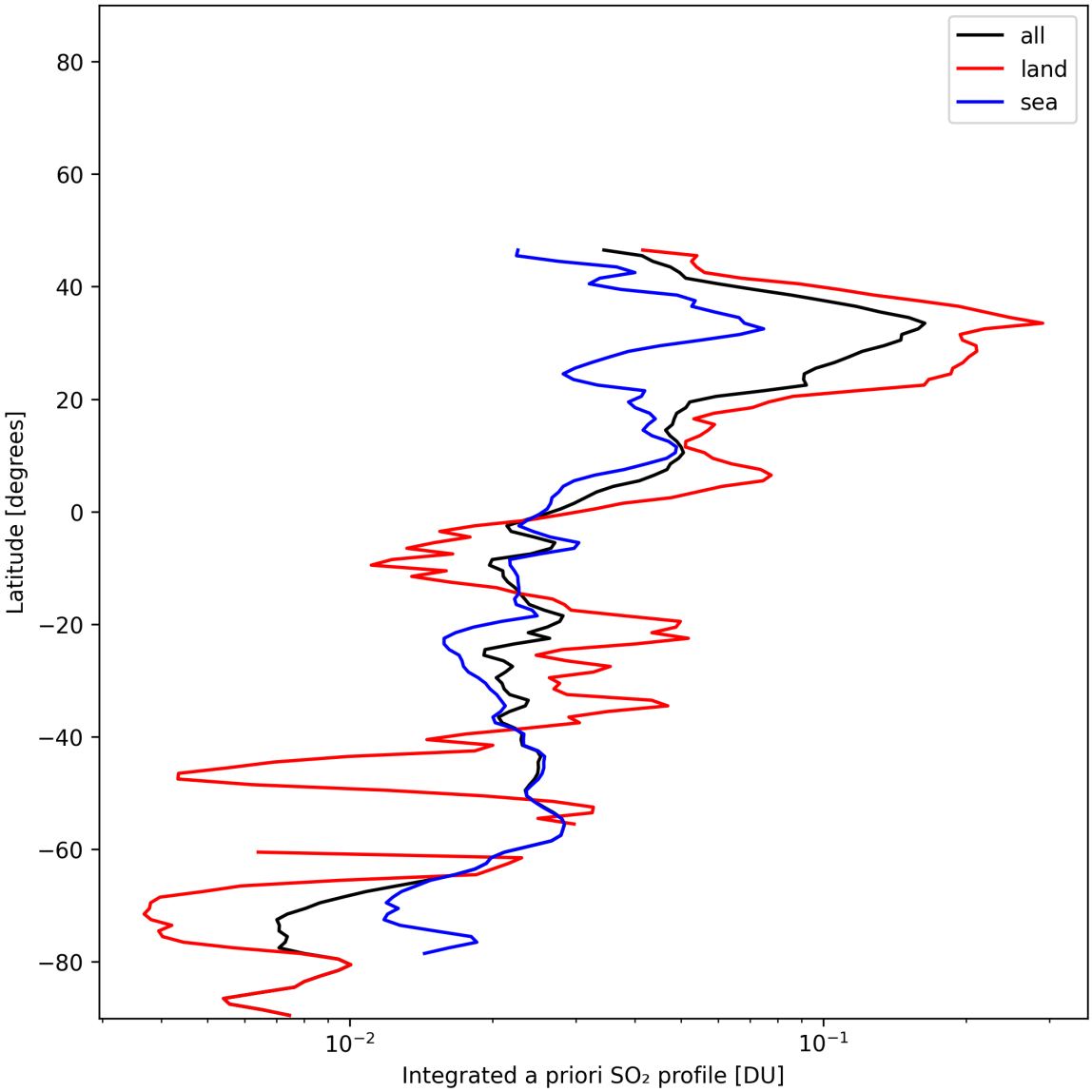

Figure 49: Zonal average of "Integrated a priori SO_2 profile" for 2024-12-17 to 2024-12-18.

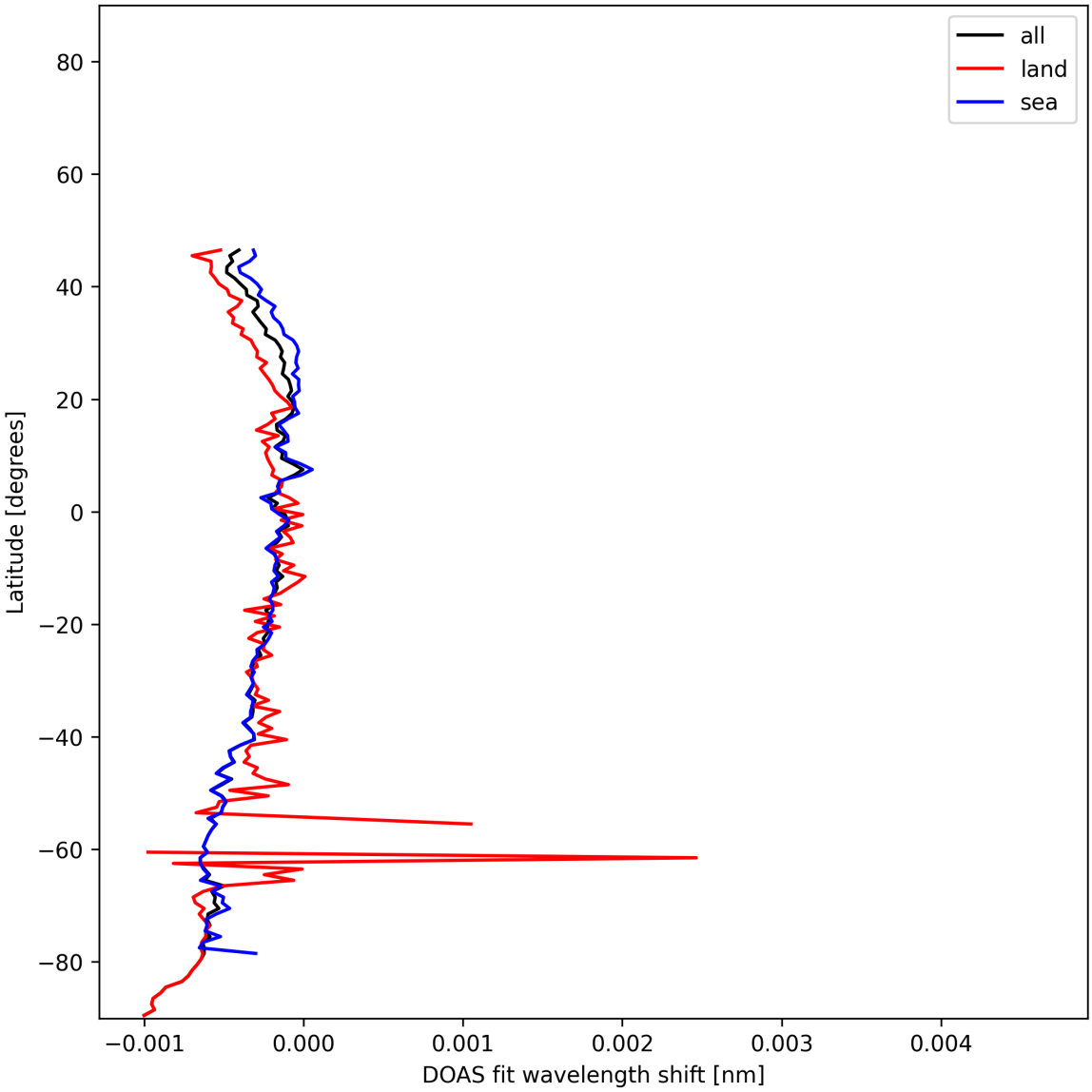

Figure 50: Zonal average of “DOAS fit wavelength shift” for 2024-12-17 to 2024-12-18.

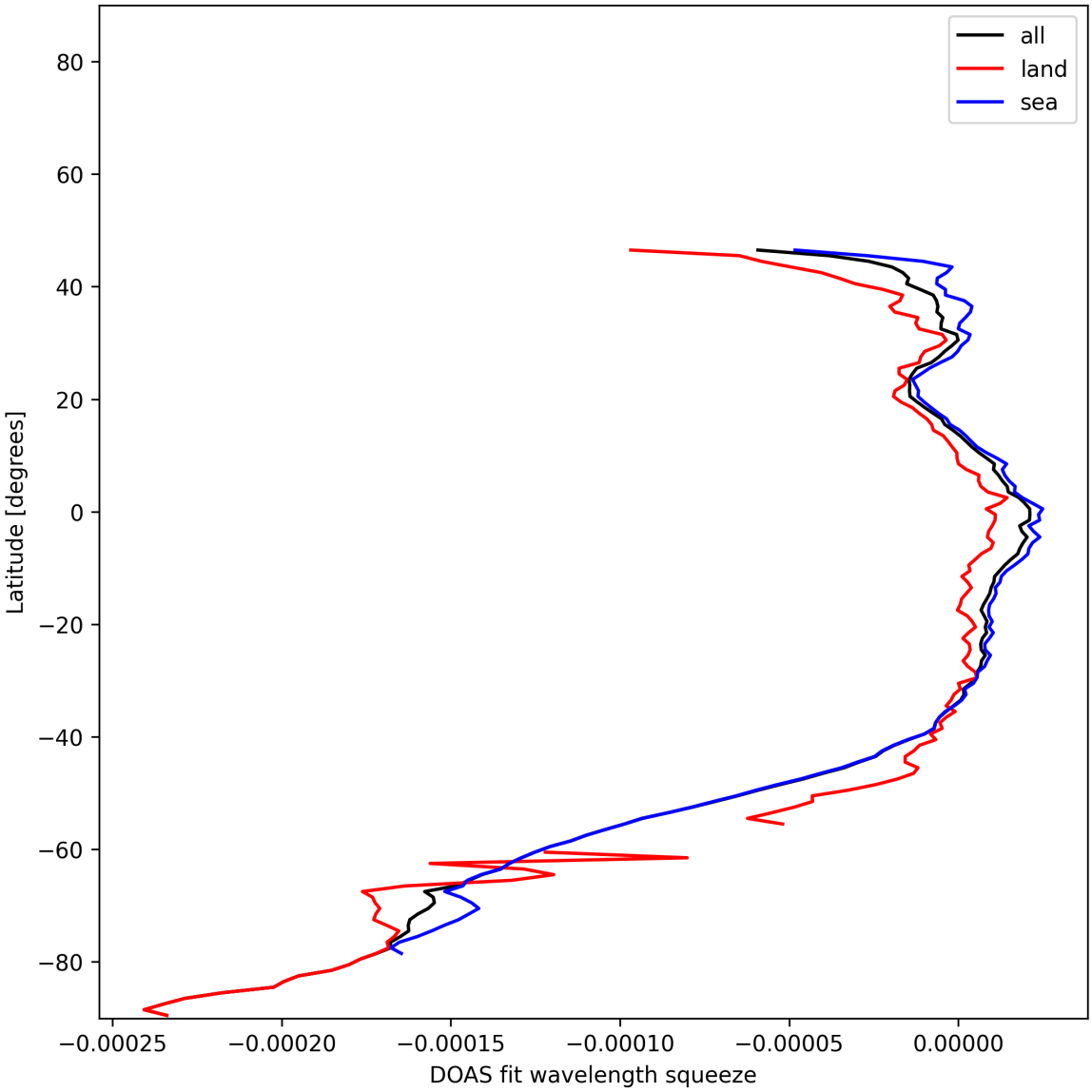

Figure 51: Zonal average of “DOAS fit wavelength squeeze” for 2024-12-17 to 2024-12-18.

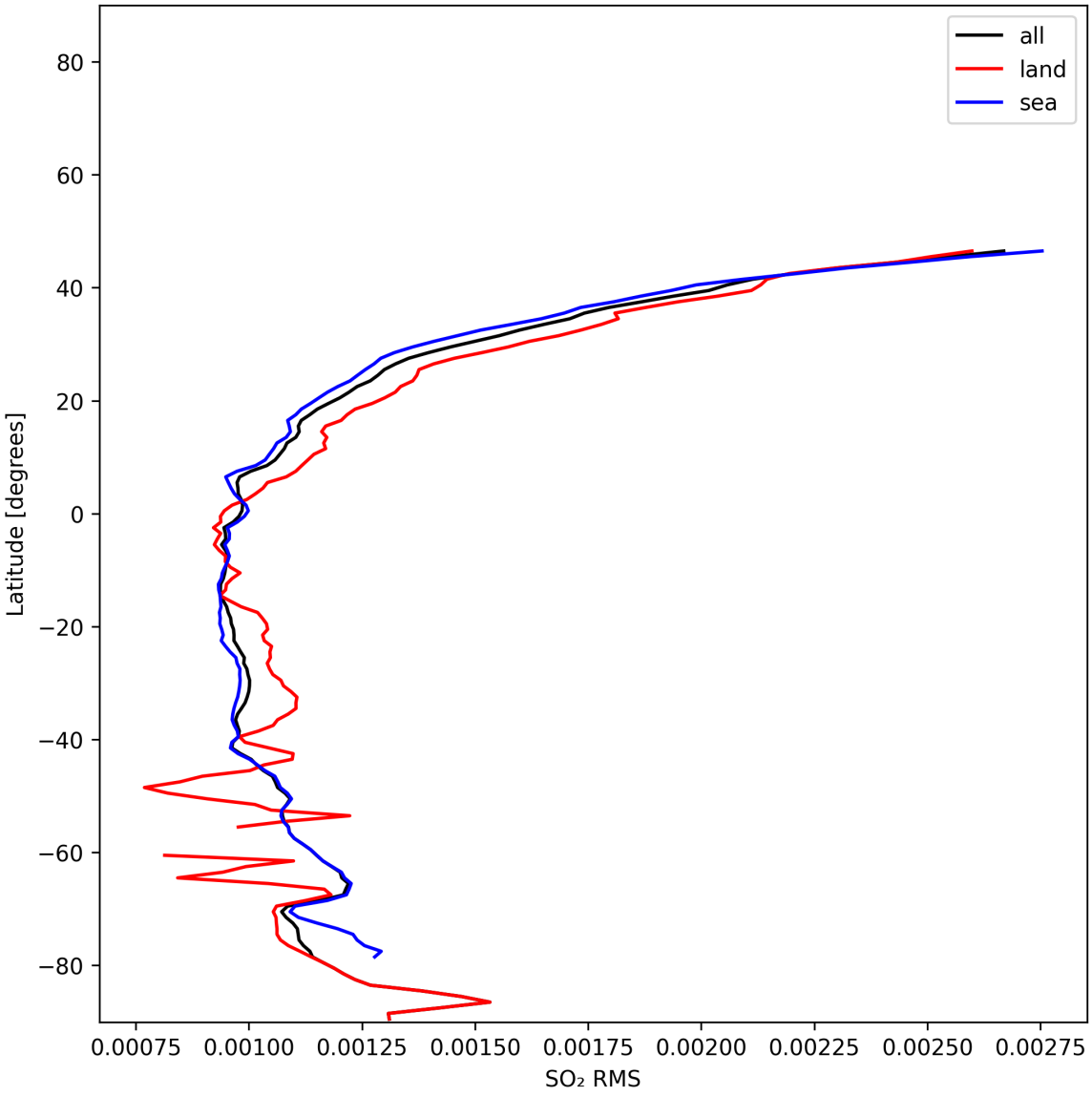

Figure 52: Zonal average of "SO_2 RMS" for 2024-12-17 to 2024-12-18.

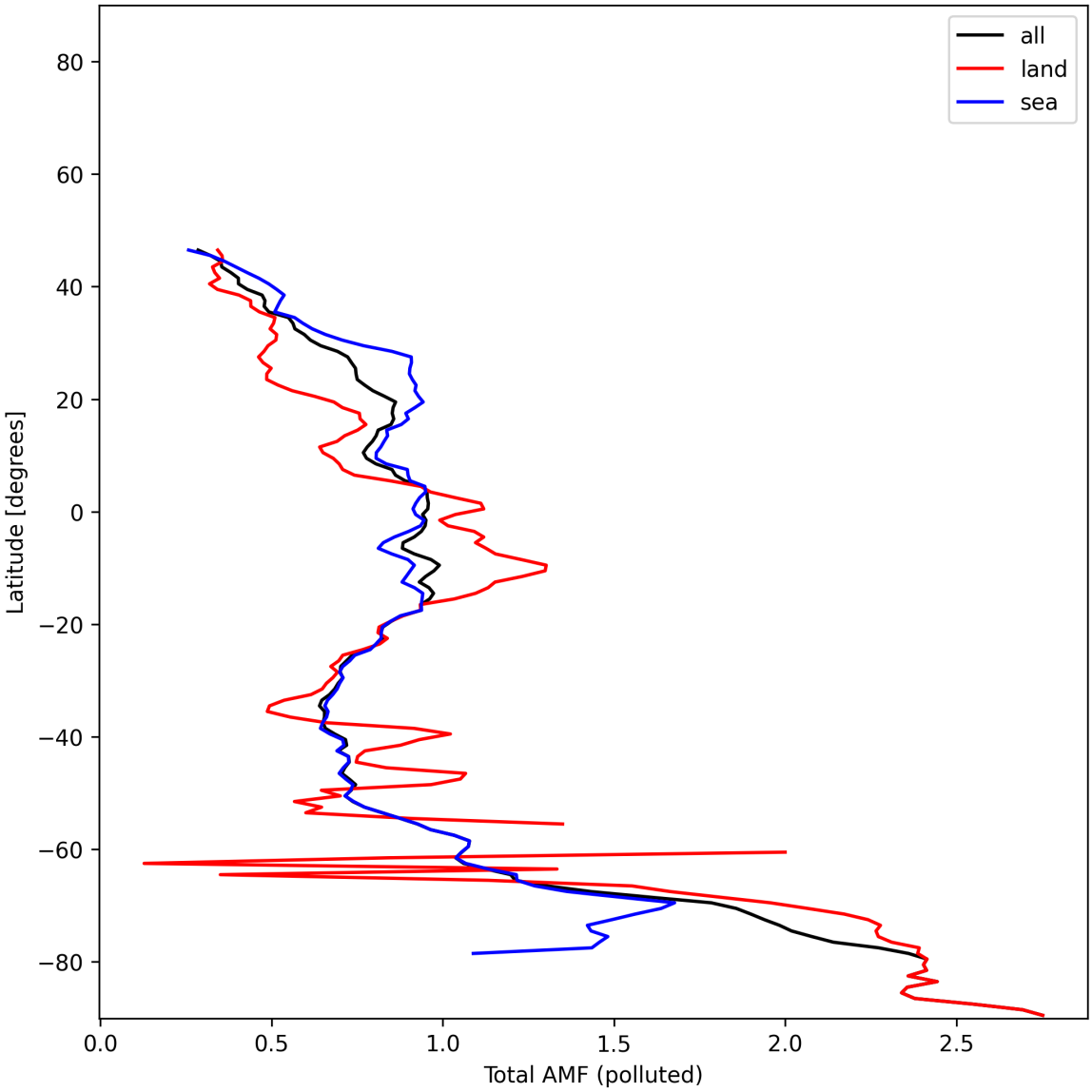

Figure 53: Zonal average of “Total AMF (polluted)” for 2024-12-17 to 2024-12-18.

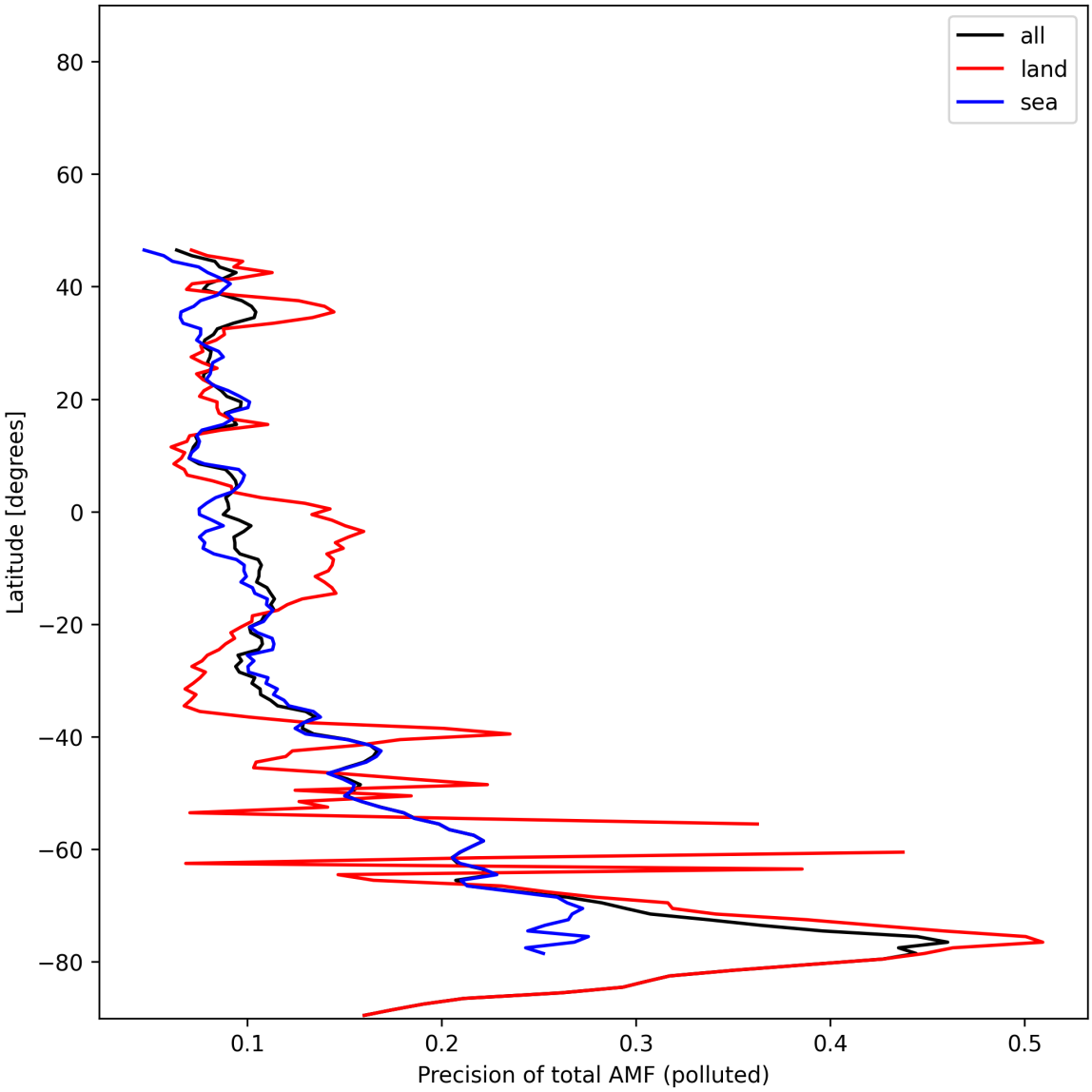

Figure 54: Zonal average of “Precision of total AMF (polluted)” for 2024-12-17 to 2024-12-18.

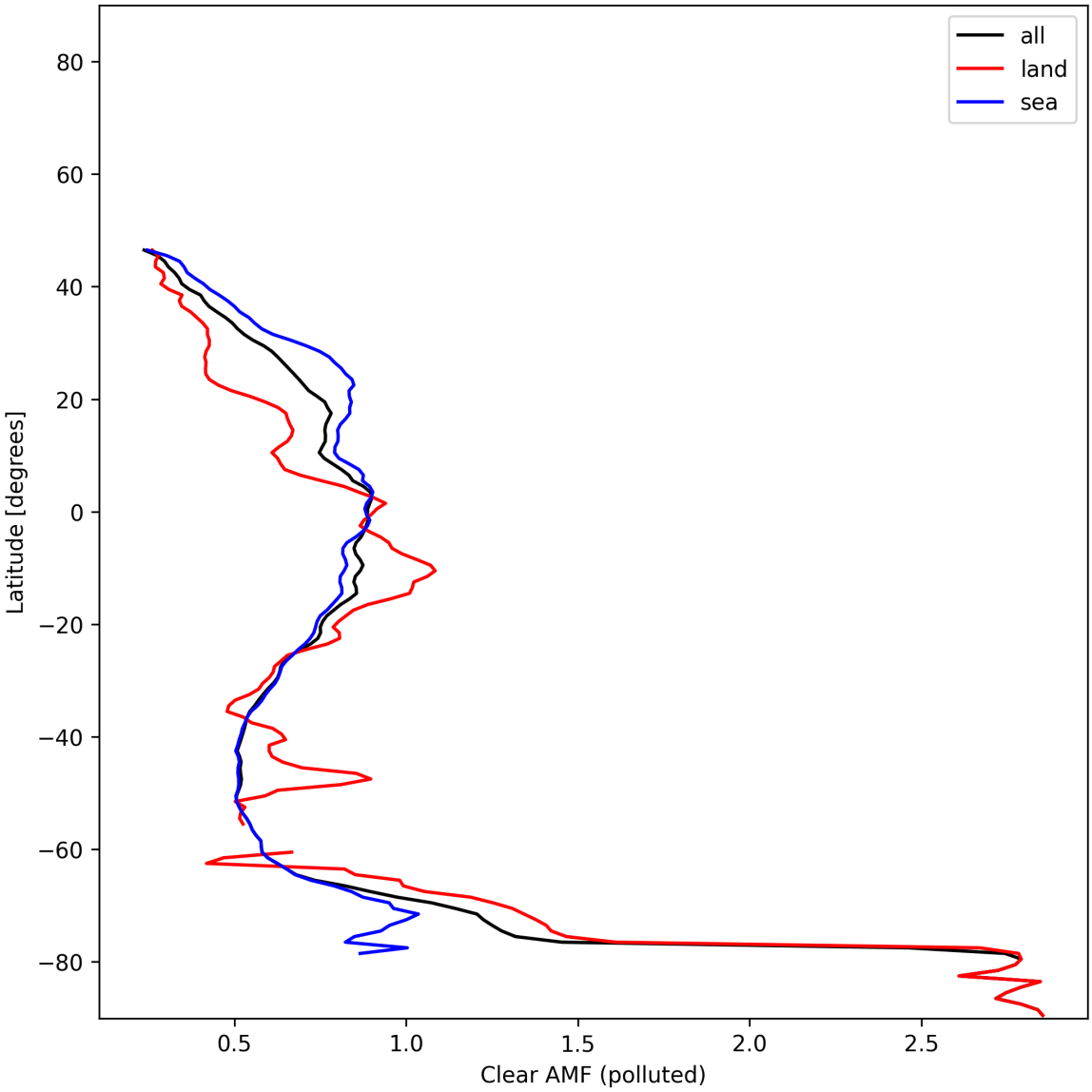

Figure 55: Zonal average of “Clear AMF (polluted)” for 2024-12-17 to 2024-12-18.

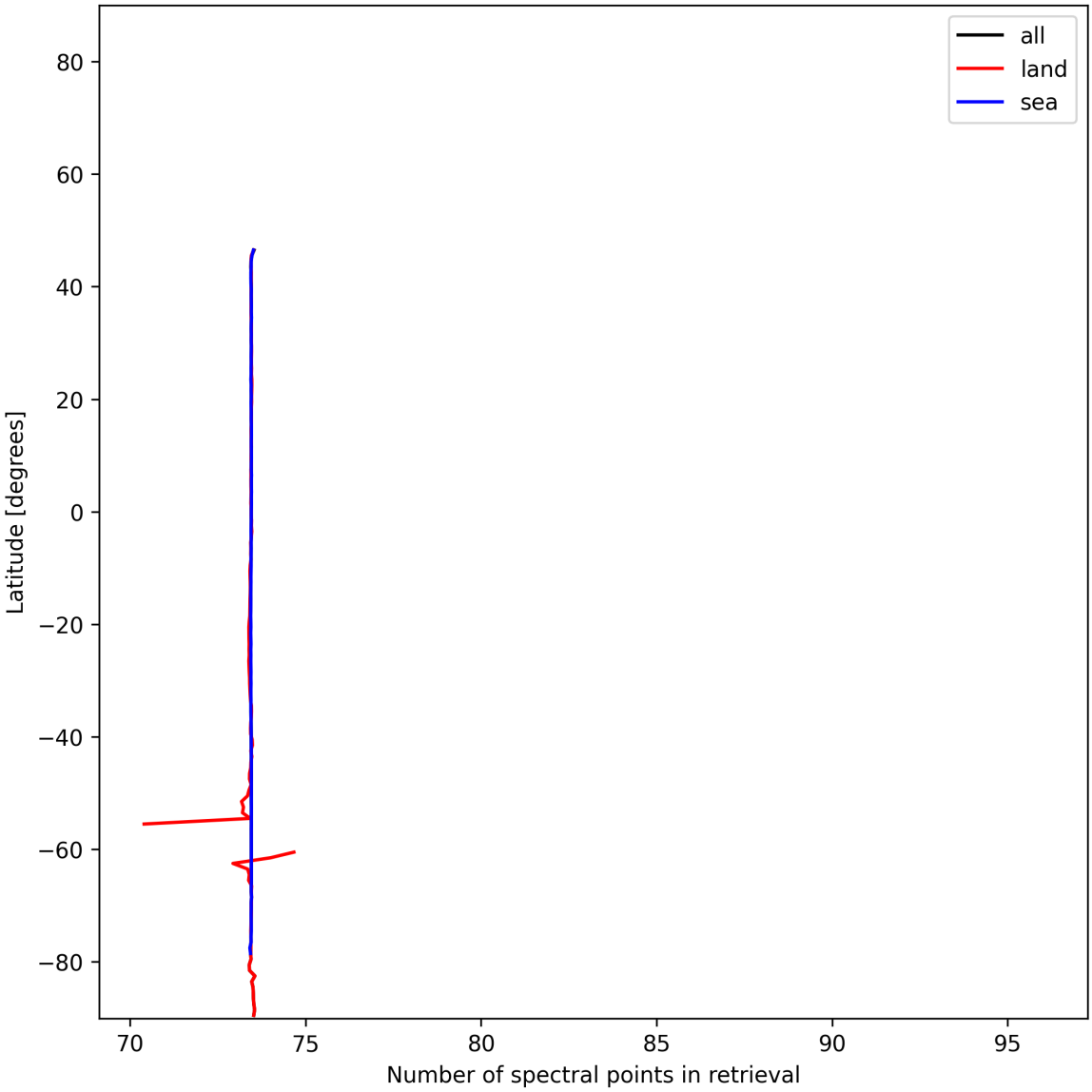

Figure 56: Zonal average of “Number of spectral points in retrieval” for 2024-12-17 to 2024-12-18.

8 Histograms

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

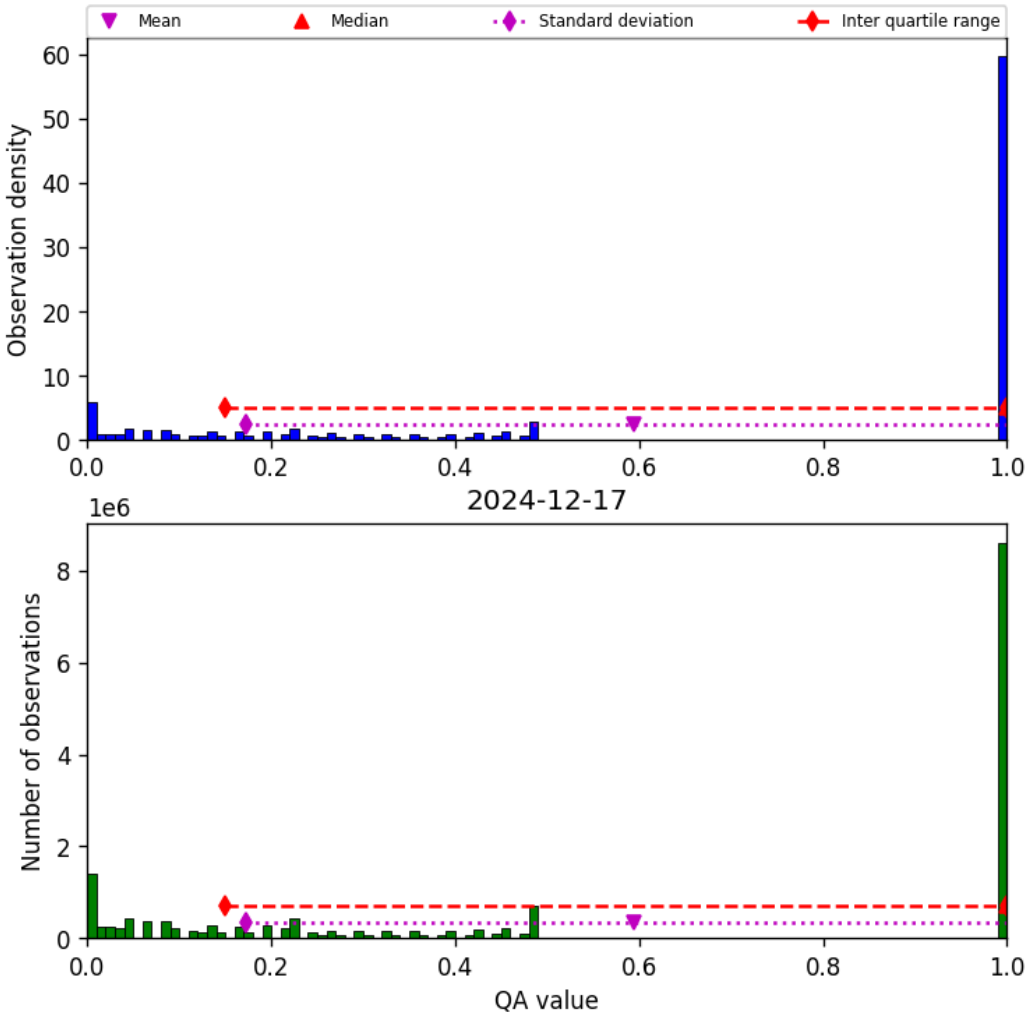

Figure 57: Histogram of “QA value” for 2024-12-17 to 2024-12-18

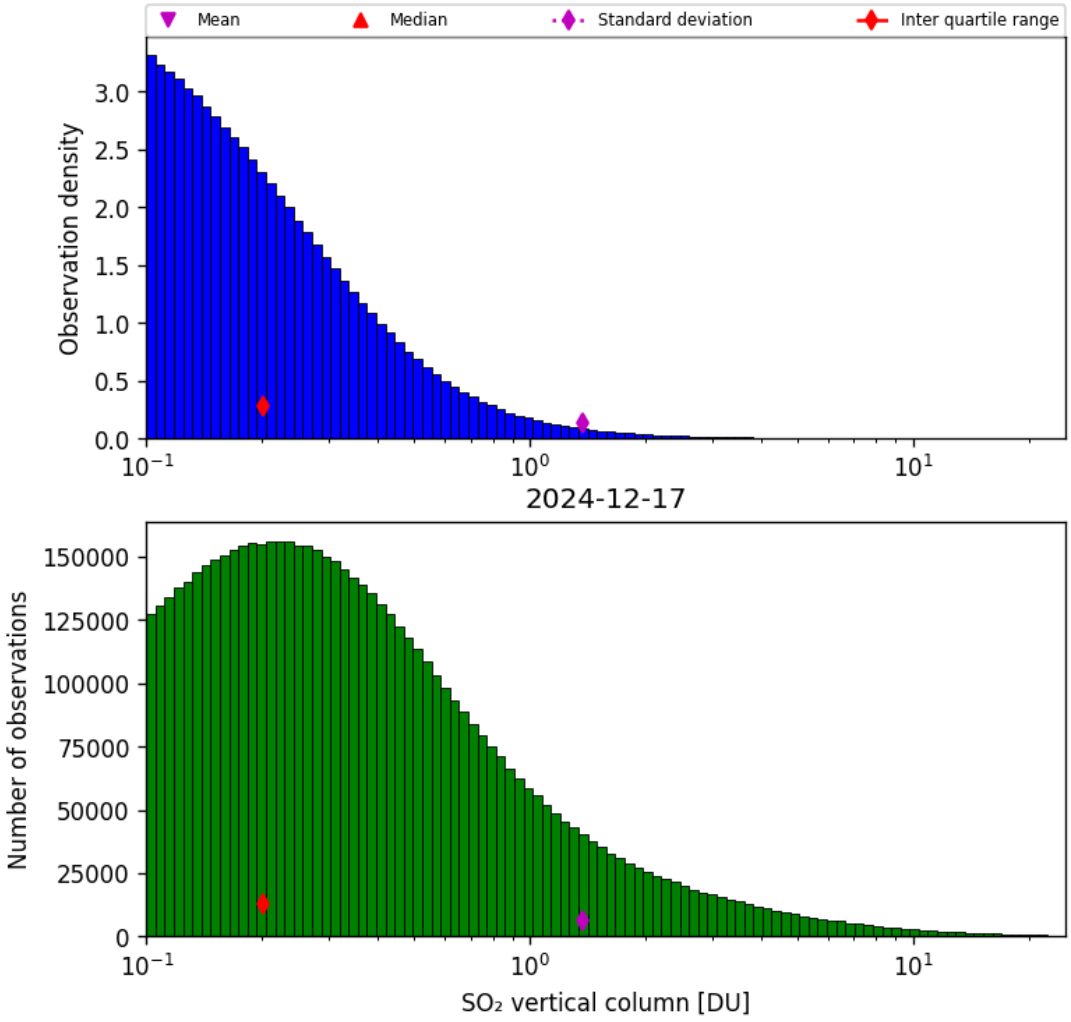

Figure 58: Histogram of "SO_2 vertical column" for 2024-12-17 to 2024-12-18

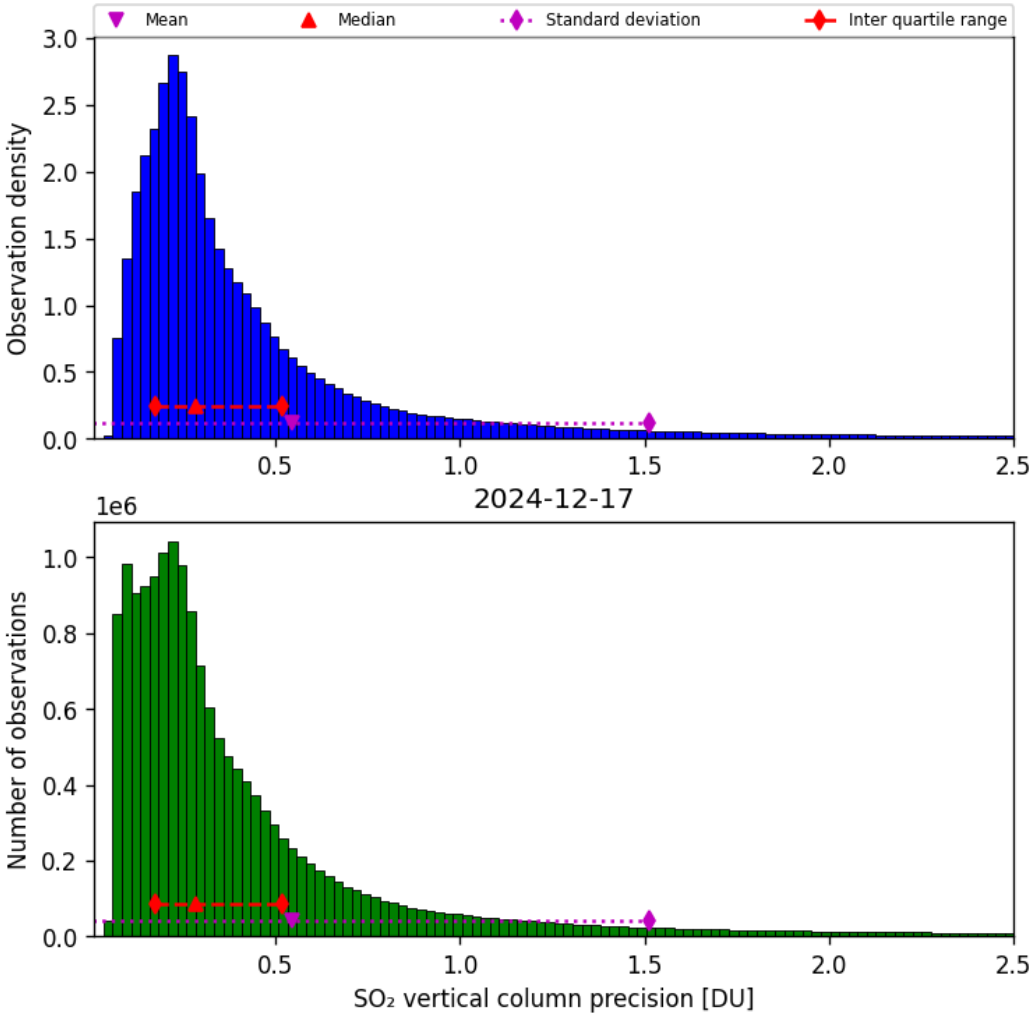

Figure 59: Histogram of "SO_2 vertical column precision" for 2024-12-17 to 2024-12-18

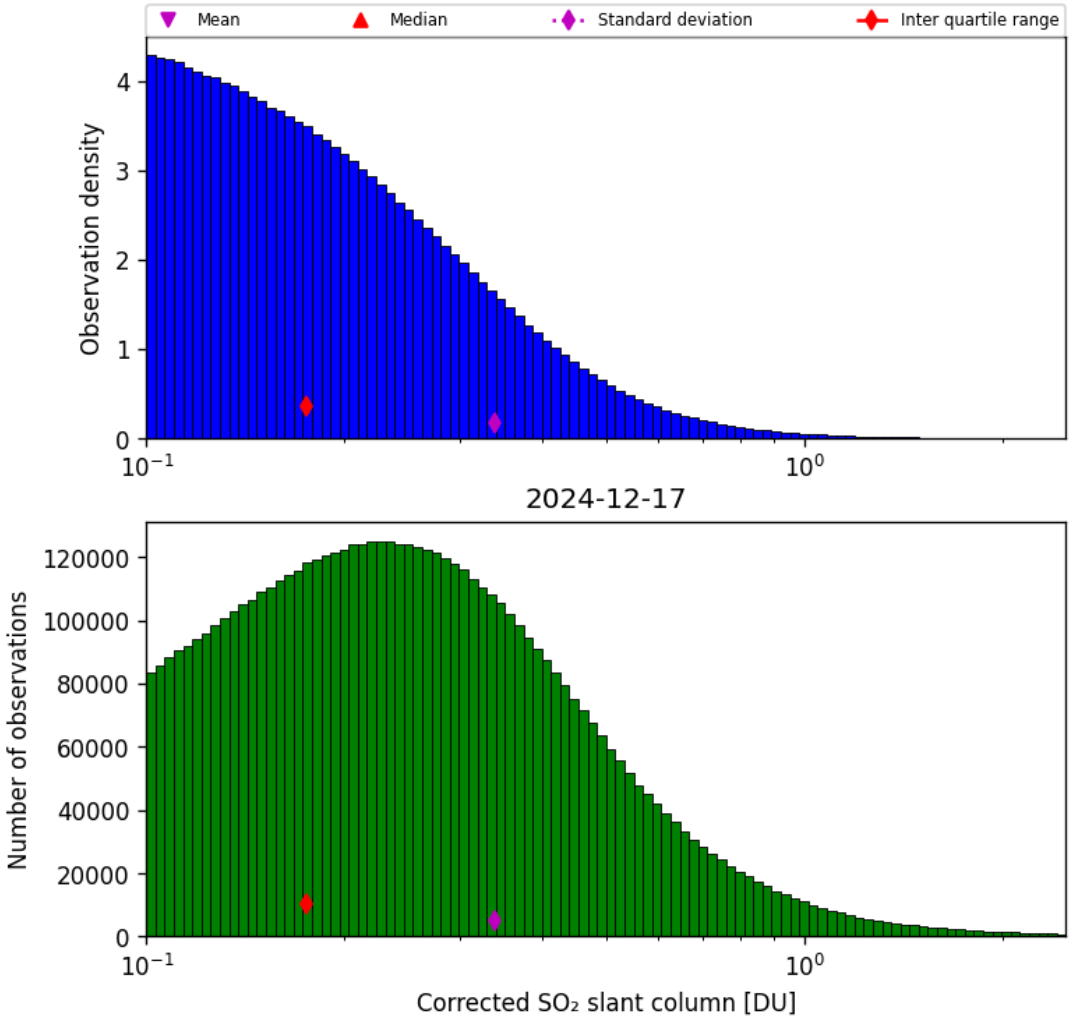

Figure 60: Histogram of “Corrected SO_2 slant column” for 2024-12-17 to 2024-12-18

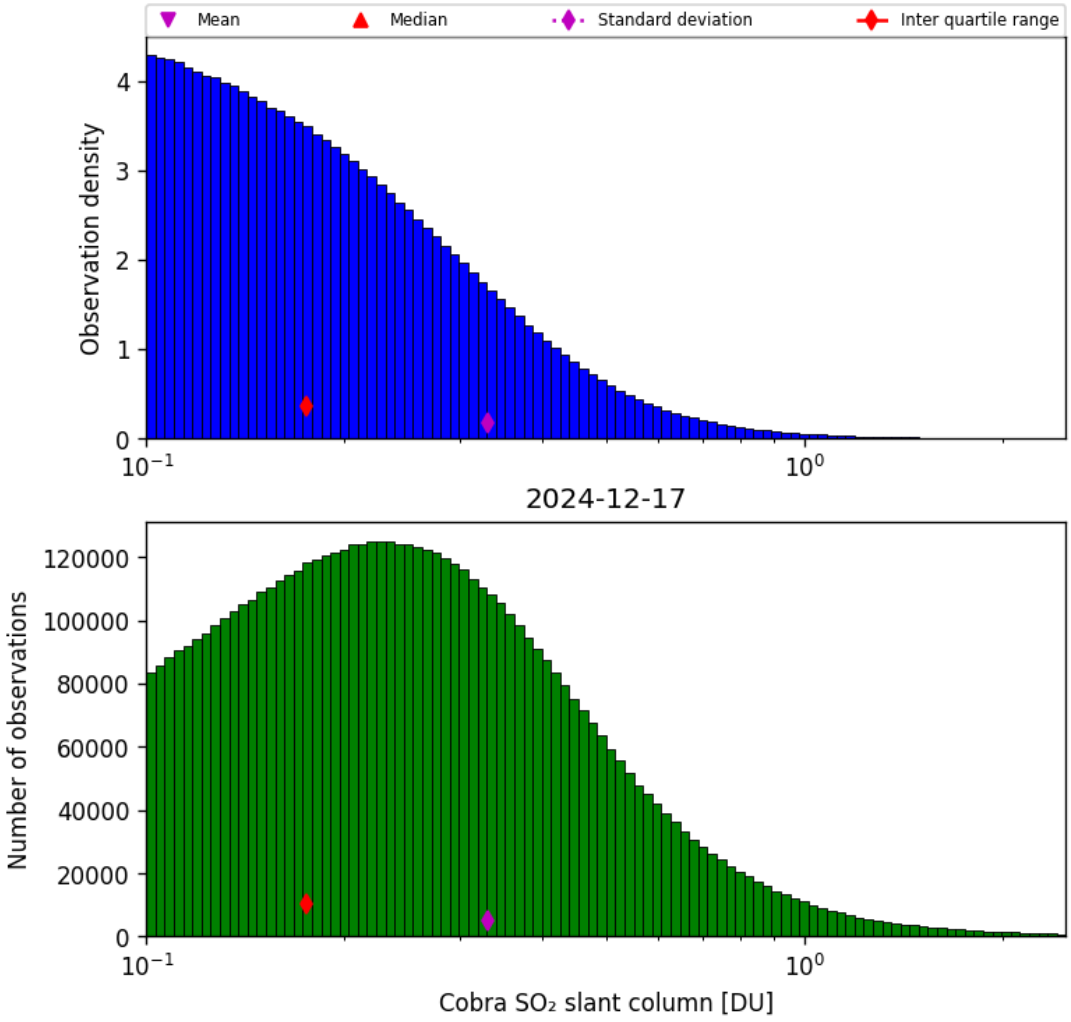

Figure 61: Histogram of "Cobra SO_2 slant column" for 2024-12-17 to 2024-12-18

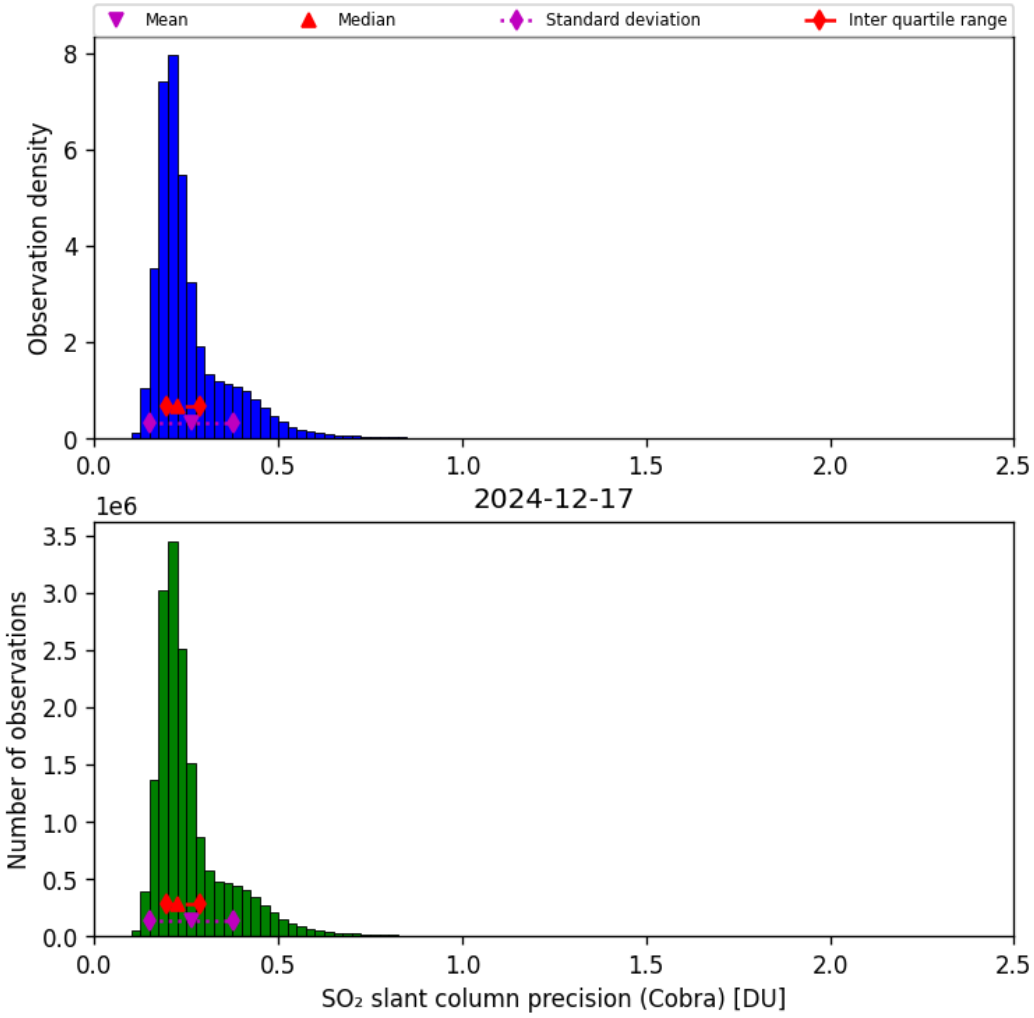

Figure 62: Histogram of "SO_2 slant column precision (Cobra)" for 2024-12-17 to 2024-12-18

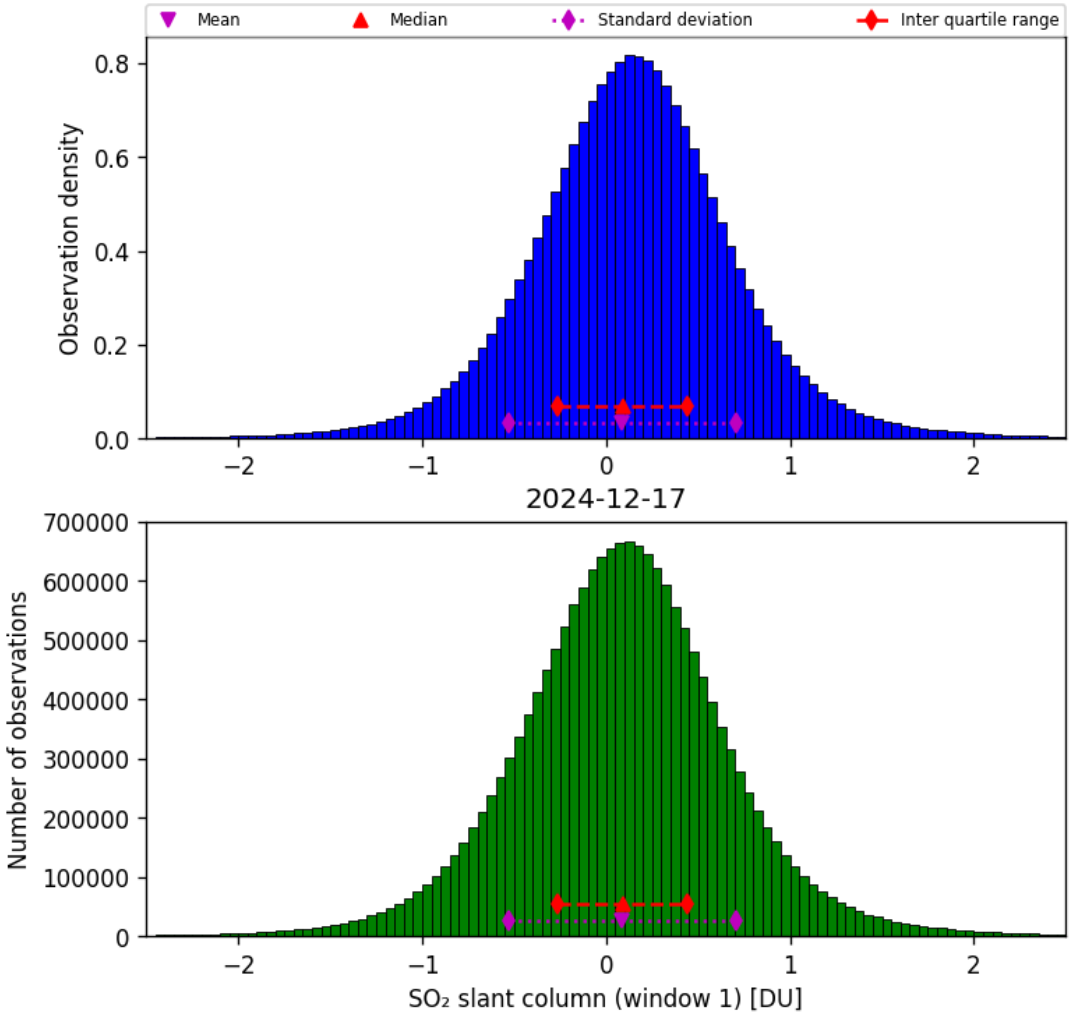

Figure 63: Histogram of "SO_2 slant column (window 1)" for 2024-12-17 to 2024-12-18

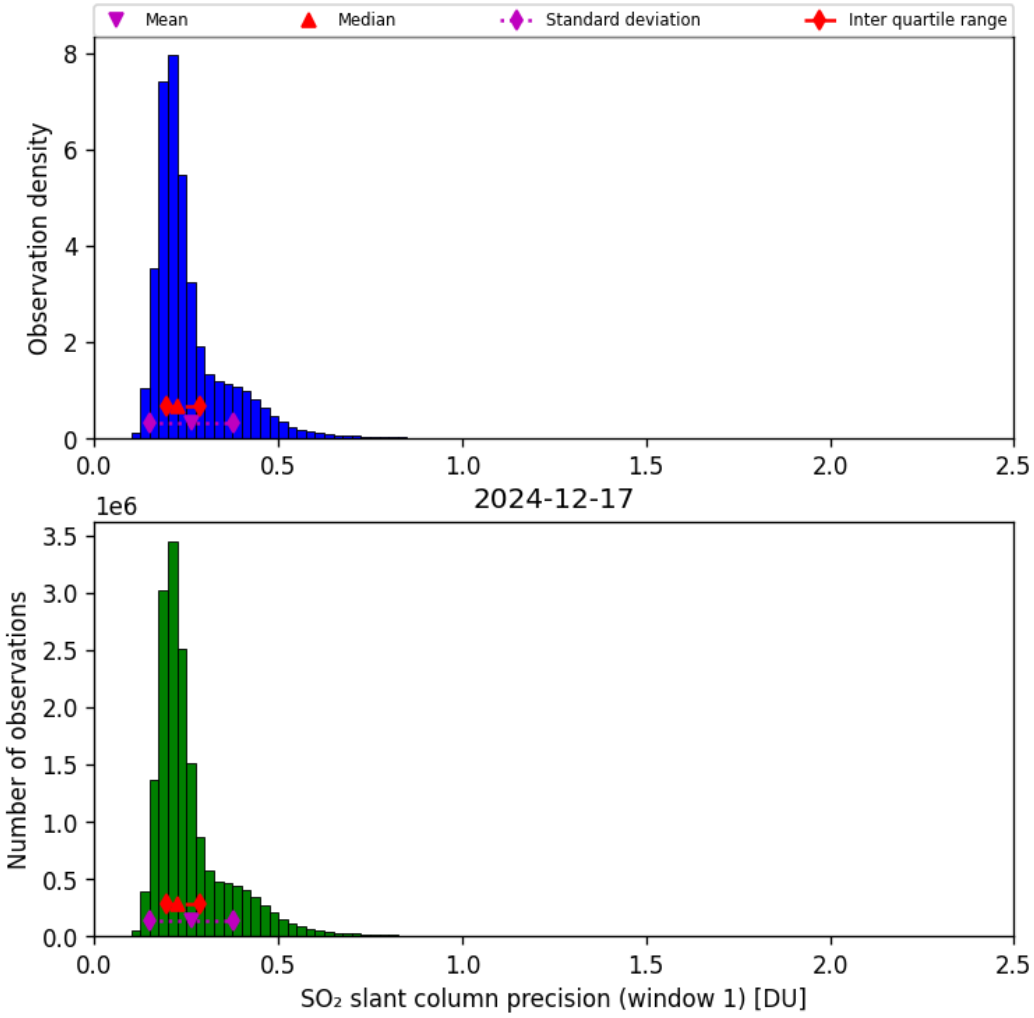

Figure 64: Histogram of "SO_2 slant column precision (window 1)" for 2024-12-17 to 2024-12-18

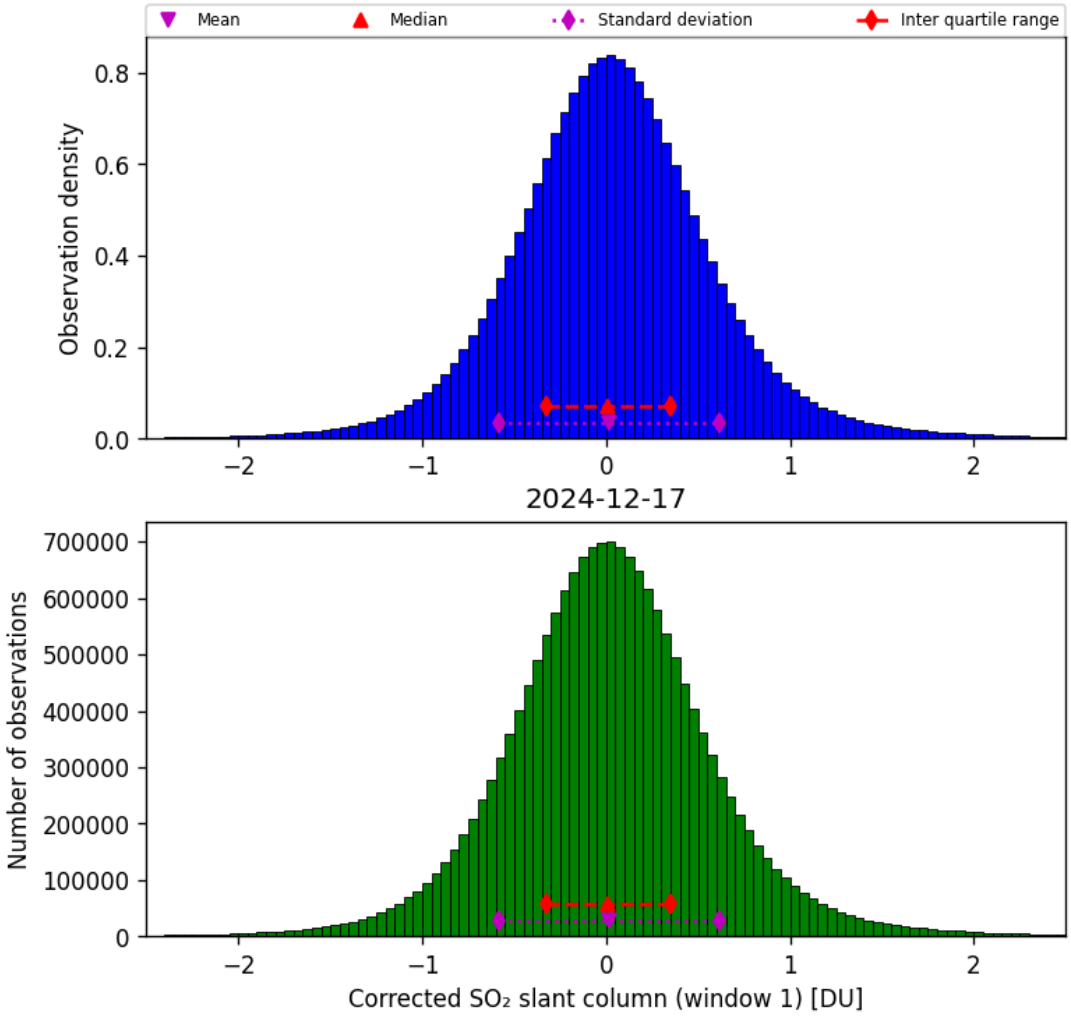

Figure 65: Histogram of "Corrected SO_2 slant column (window 1)" for 2024-12-17 to 2024-12-18

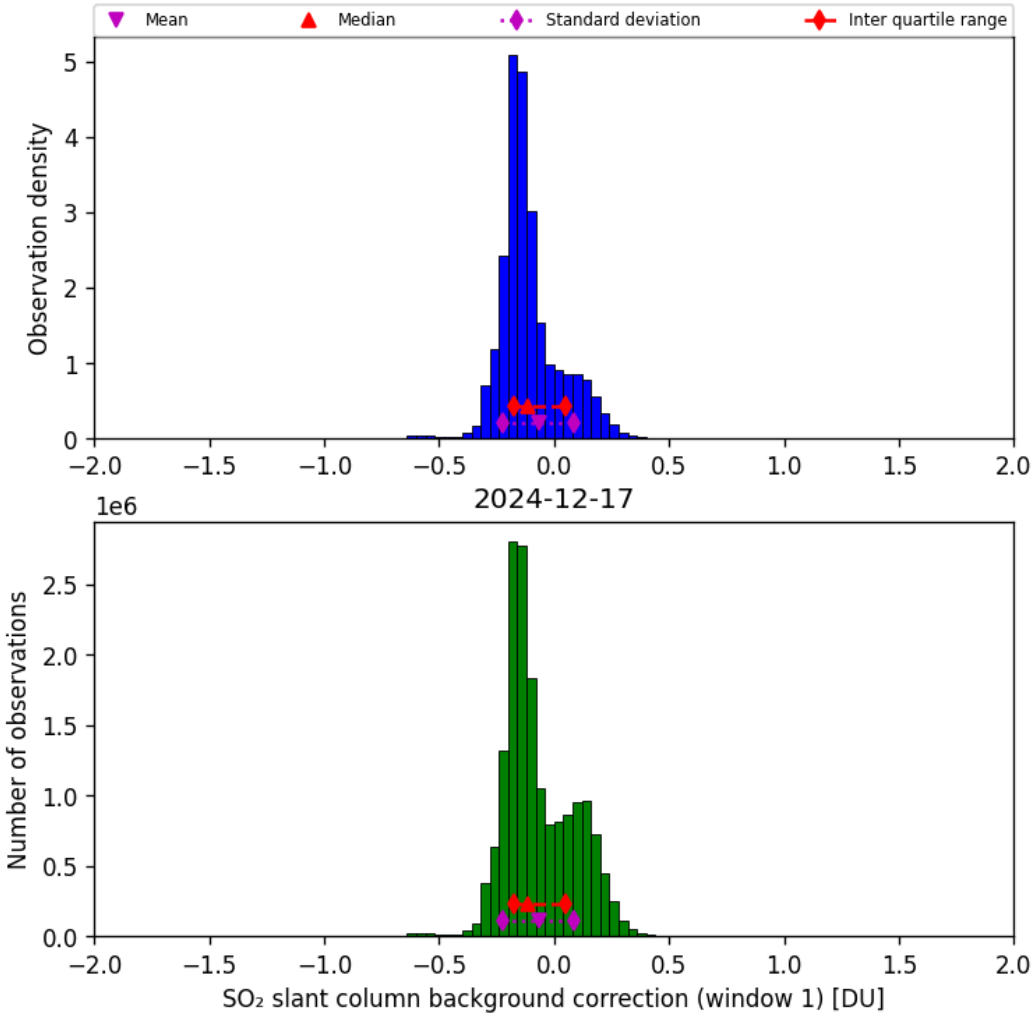

Figure 66: Histogram of "SO_2 slant column background correction (window 1)" for 2024-12-17 to 2024-12-18

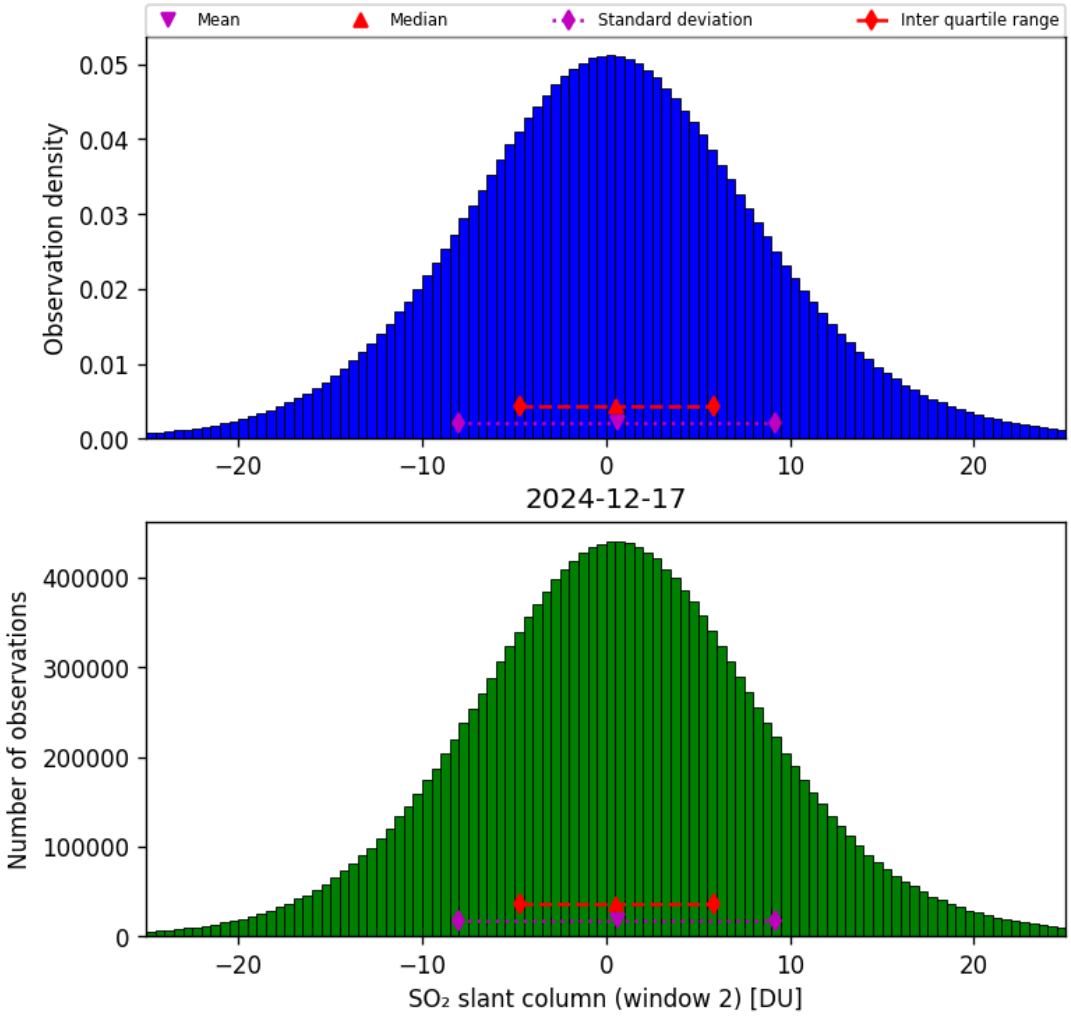

Figure 67: Histogram of "SO_2 slant column (window 2)" for 2024-12-17 to 2024-12-18

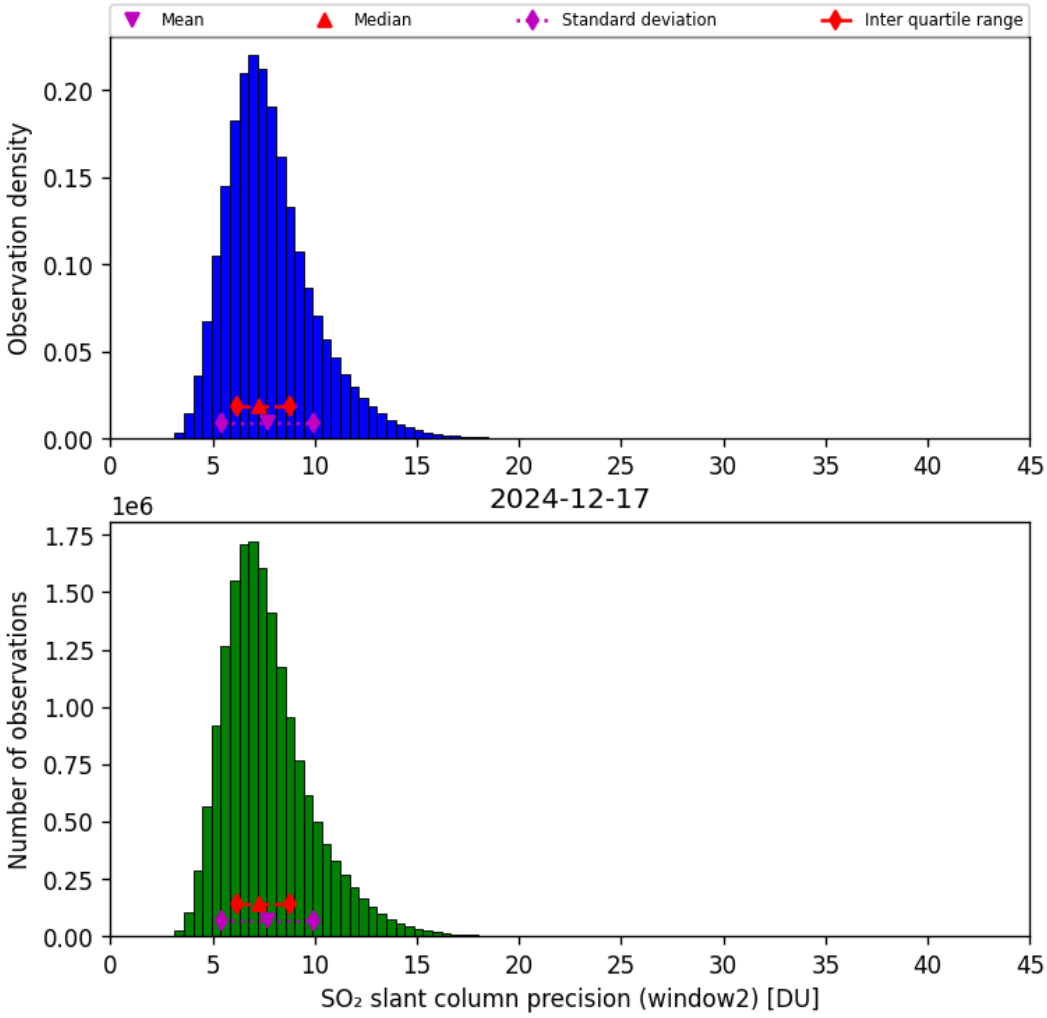

Figure 68: Histogram of "SO_2 slant column precision (window2)" for 2024-12-17 to 2024-12-18

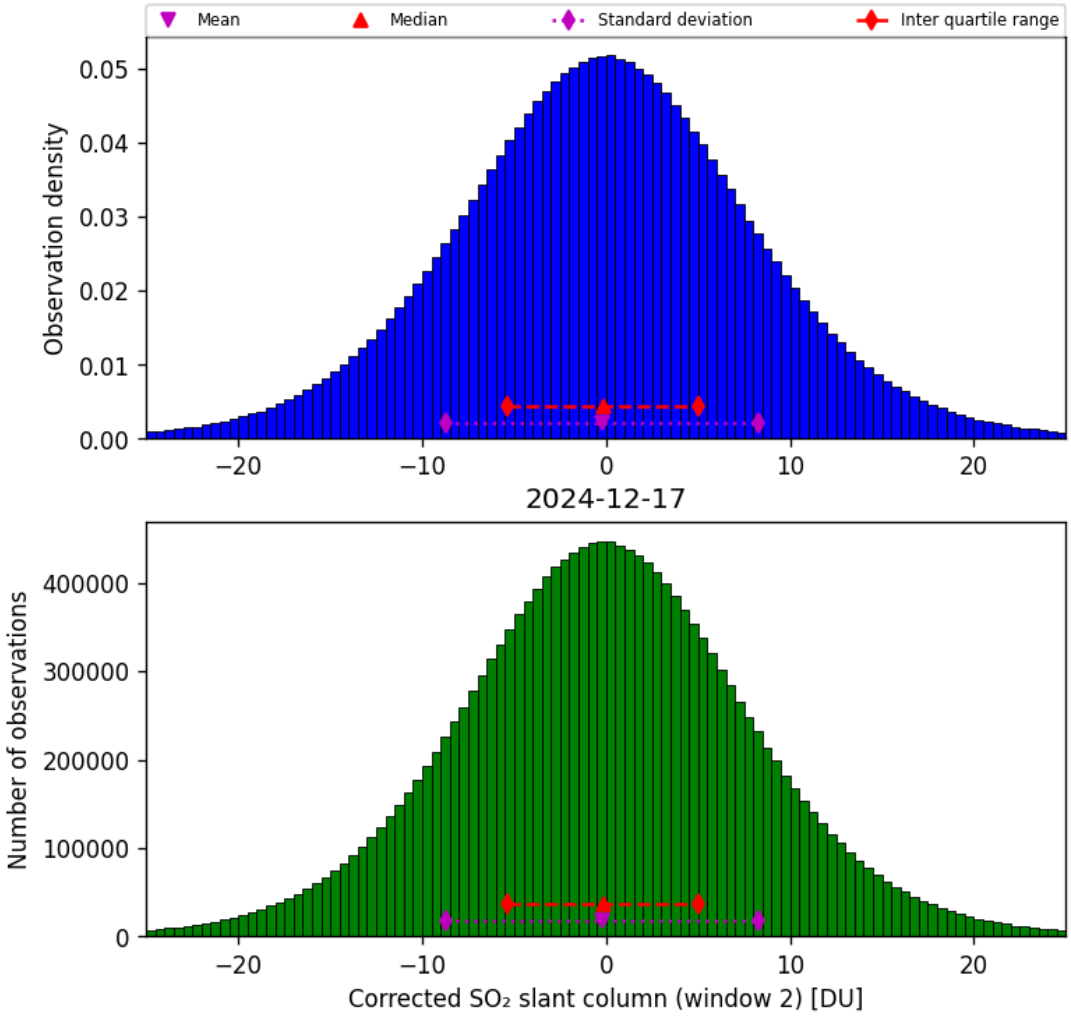

Figure 69: Histogram of "Corrected SO_2 slant column (window 2)" for 2024-12-17 to 2024-12-18

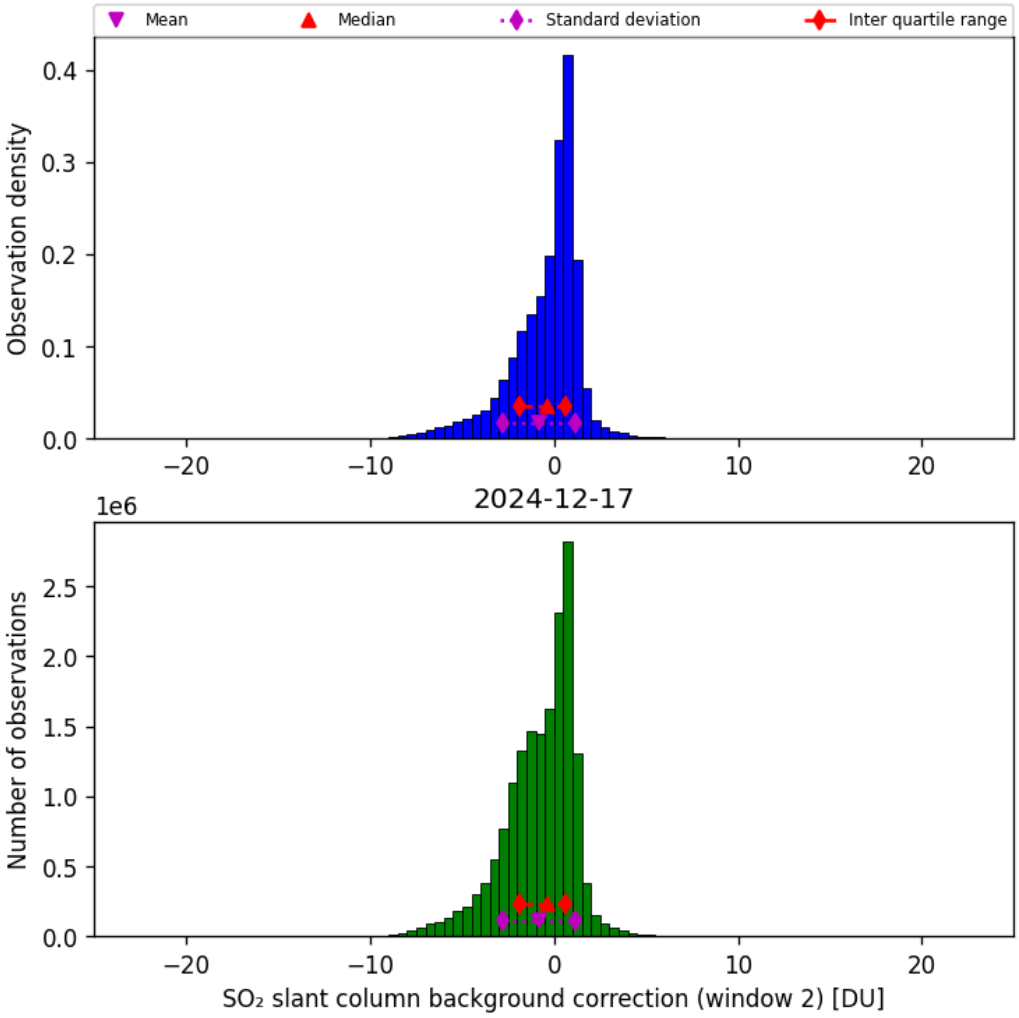

Figure 70: Histogram of "SO_2 slant column background correction (window 2)" for 2024-12-17 to 2024-12-18

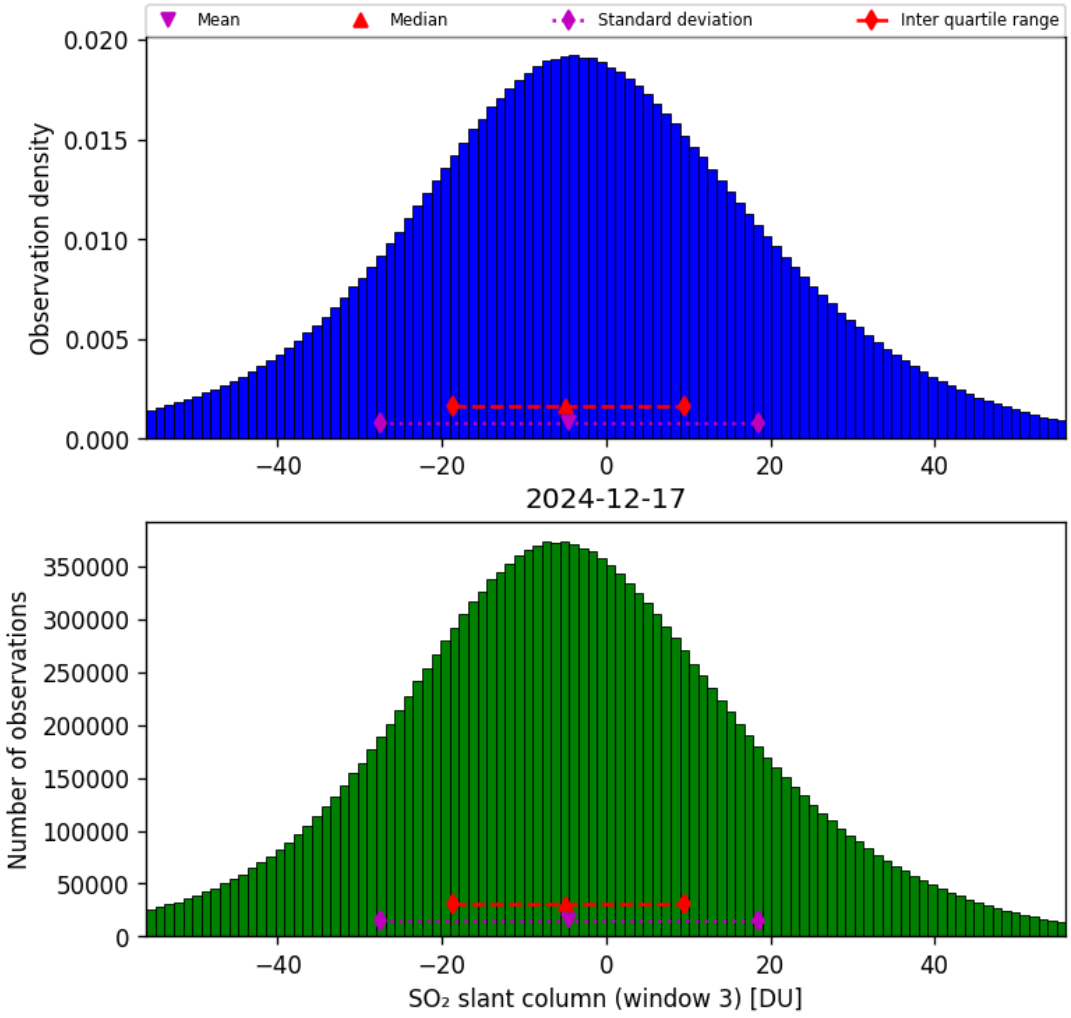

Figure 71: Histogram of "SO_2 slant column (window 3)" for 2024-12-17 to 2024-12-18

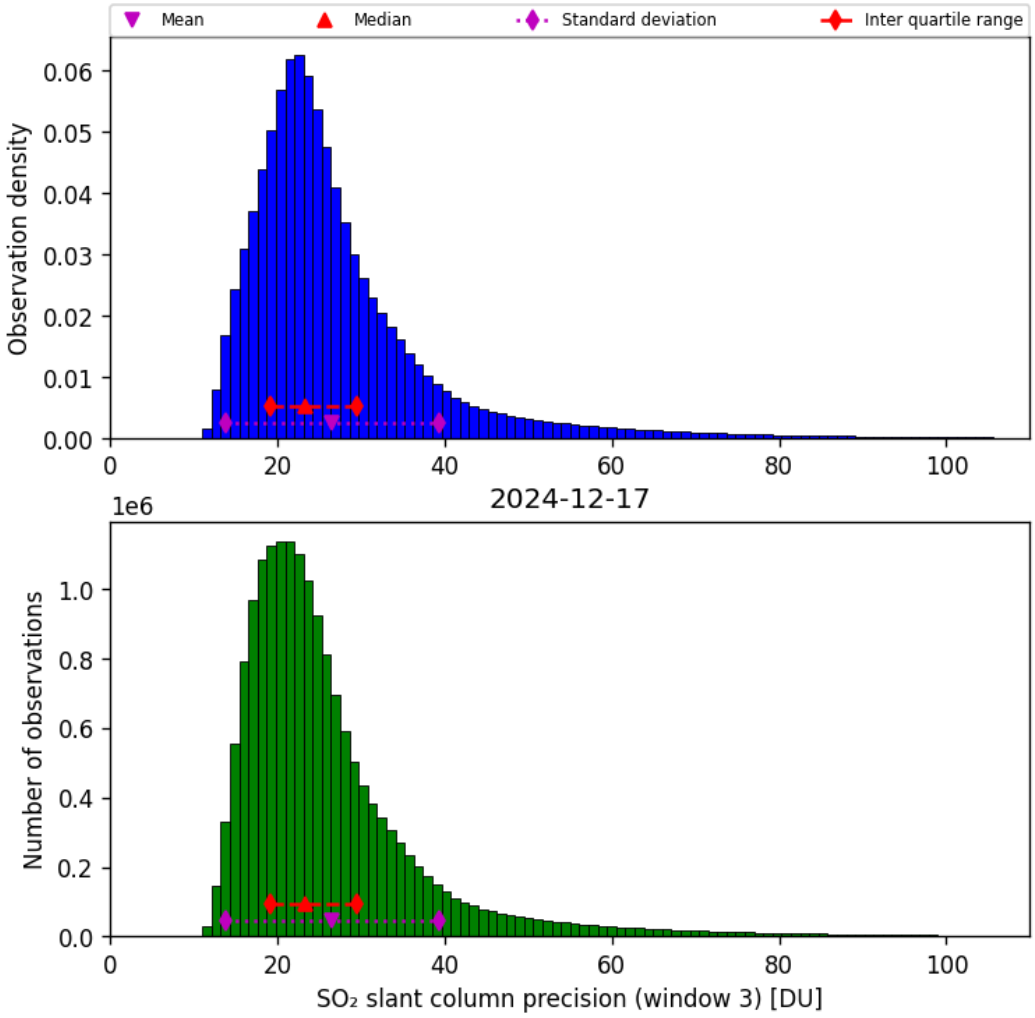

Figure 72: Histogram of "SO_2 slant column precision (window 3)" for 2024-12-17 to 2024-12-18

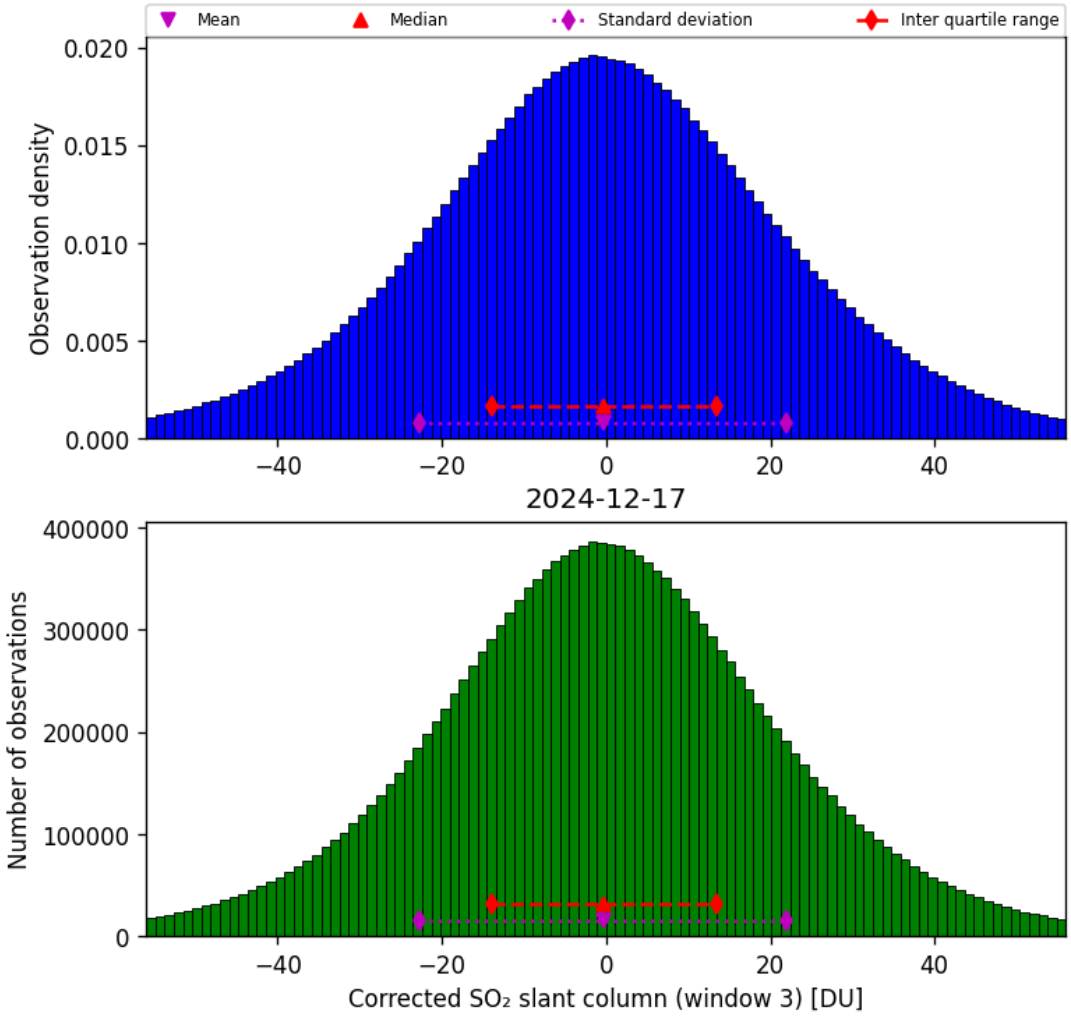

Figure 73: Histogram of "Corrected SO_2 slant column (window 3)" for 2024-12-17 to 2024-12-18

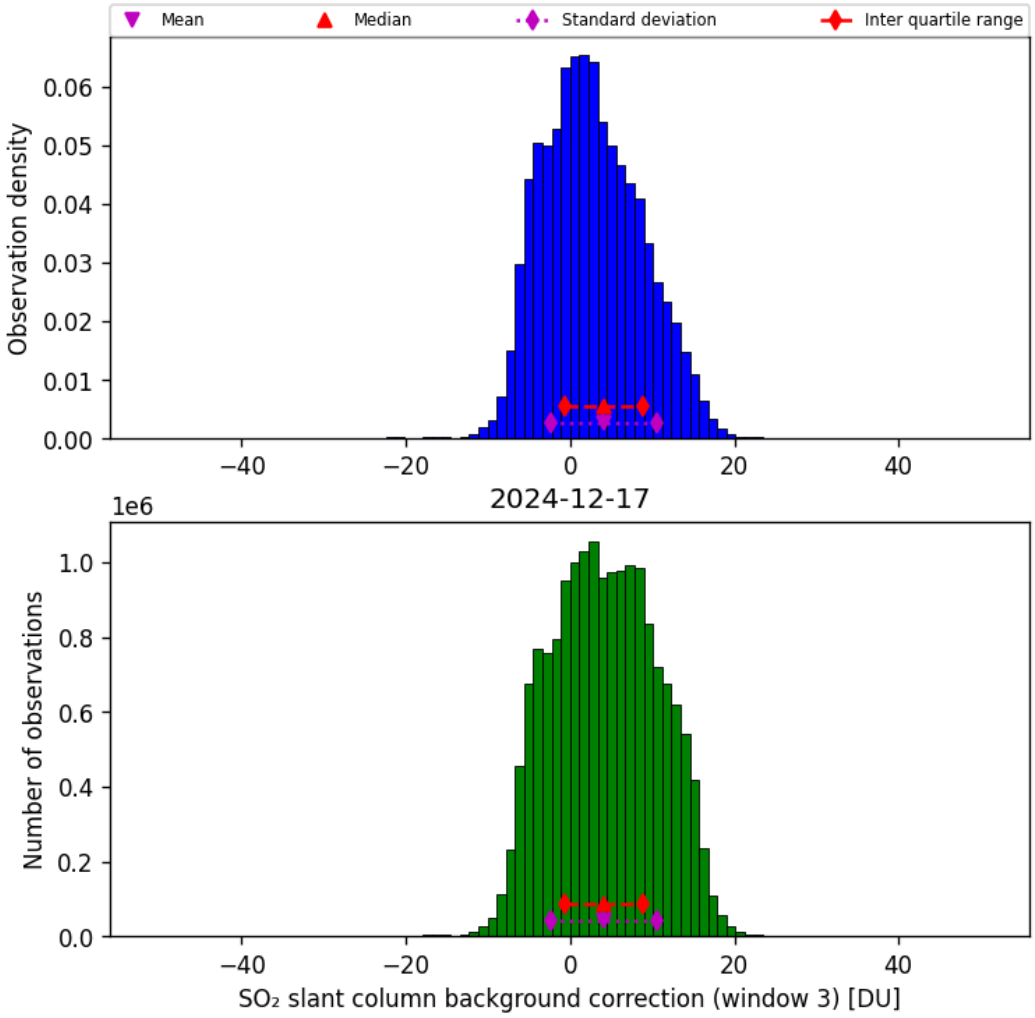

Figure 74: Histogram of "SO_2 slant column background correction (window 3)" for 2024-12-17 to 2024-12-18

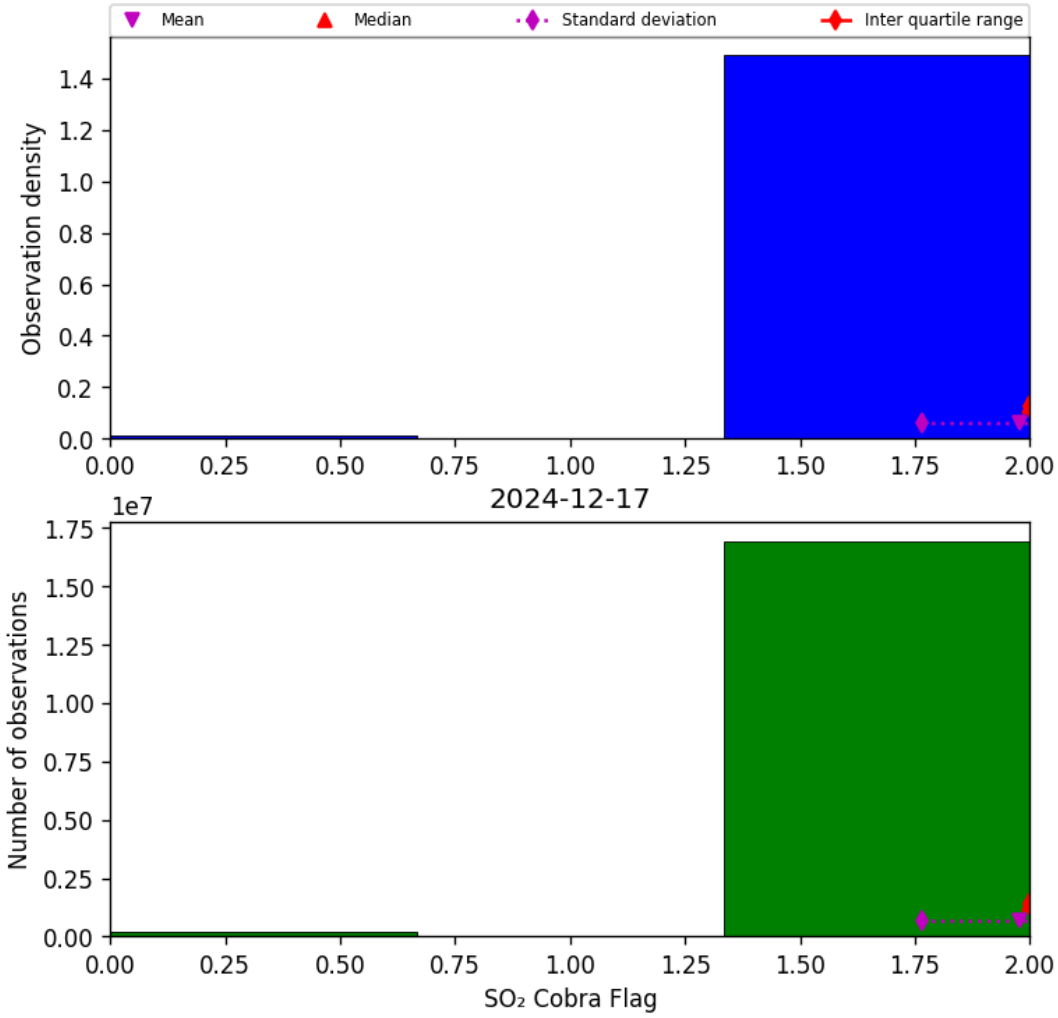

Figure 75: Histogram of "SO_2 Cobra Flag" for 2024-12-17 to 2024-12-18

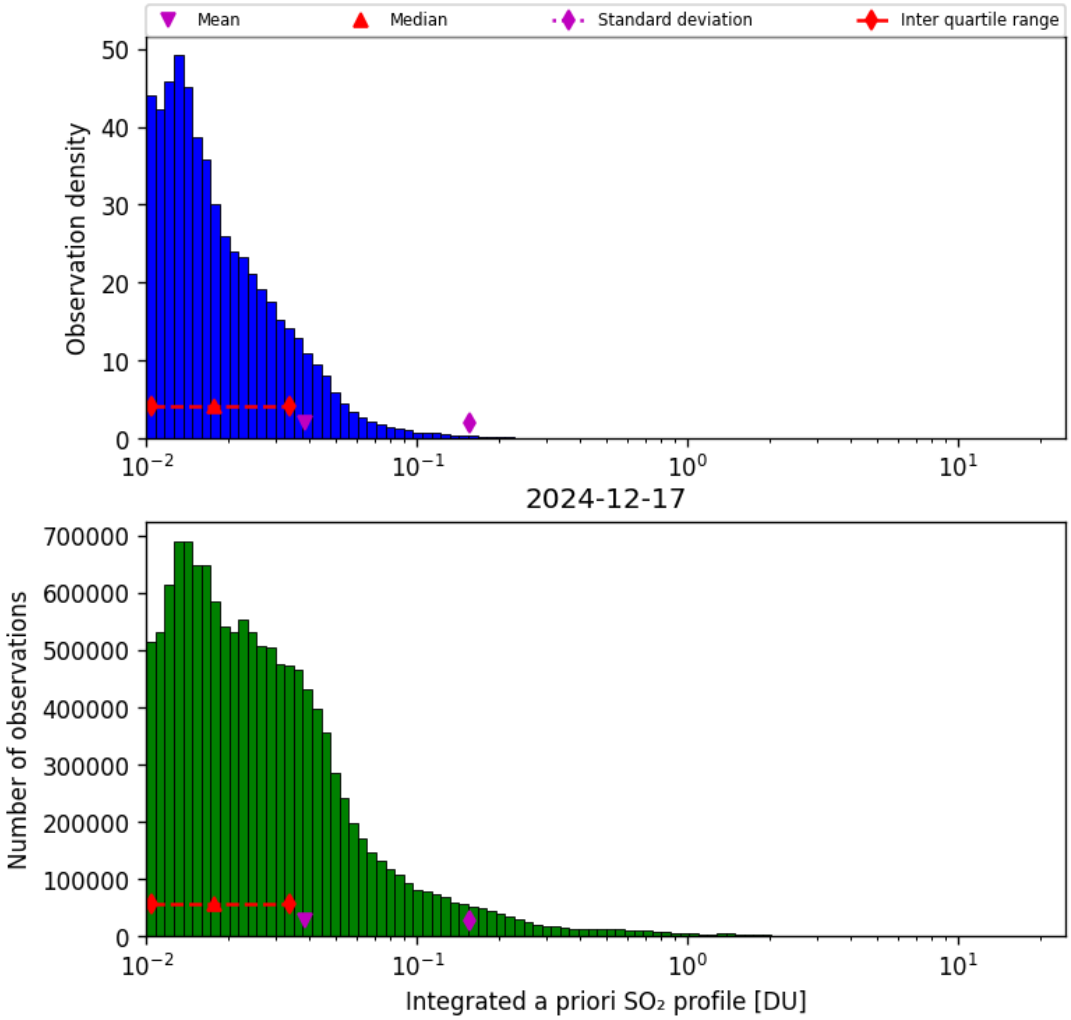

Figure 76: Histogram of "Integrated a priori SO_2 profile" for 2024-12-17 to 2024-12-18

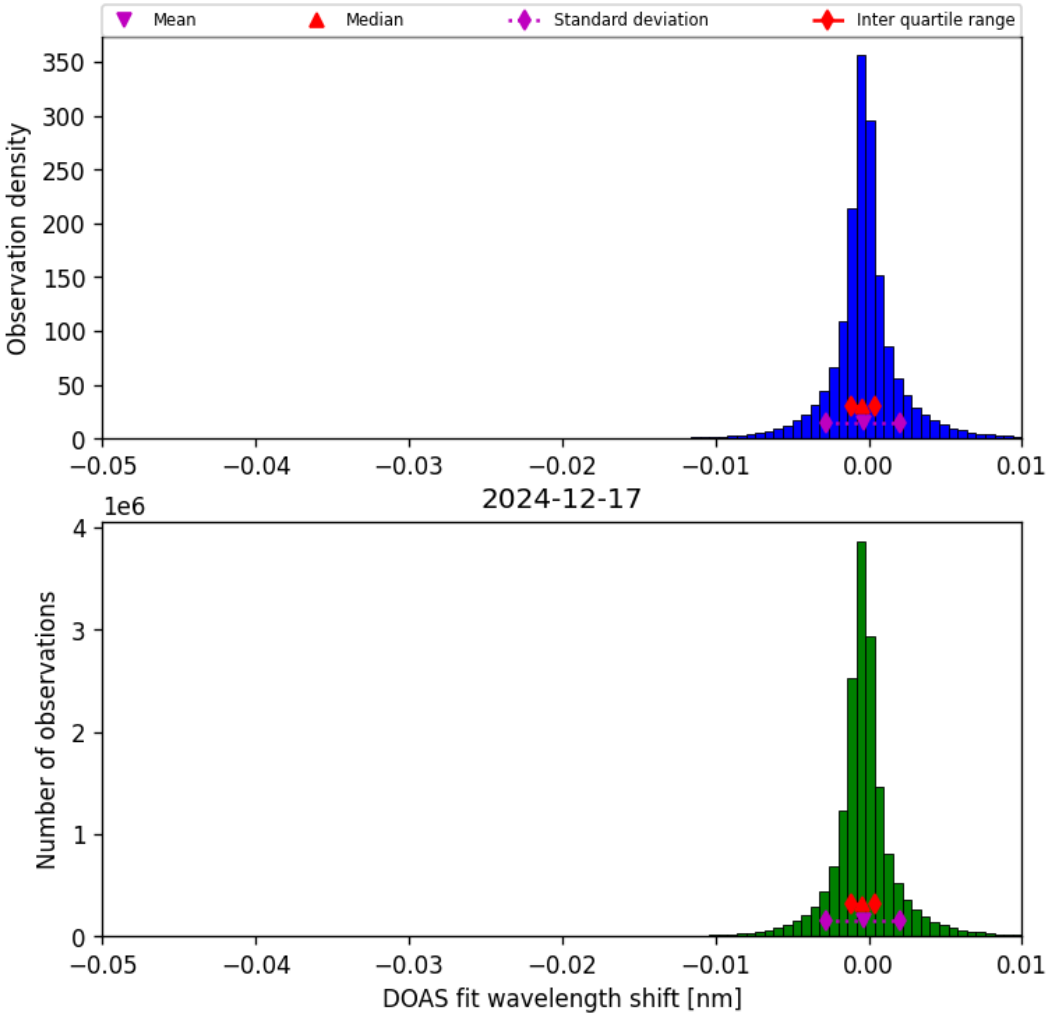

Figure 77: Histogram of “DOAS fit wavelength shift” for 2024-12-17 to 2024-12-18

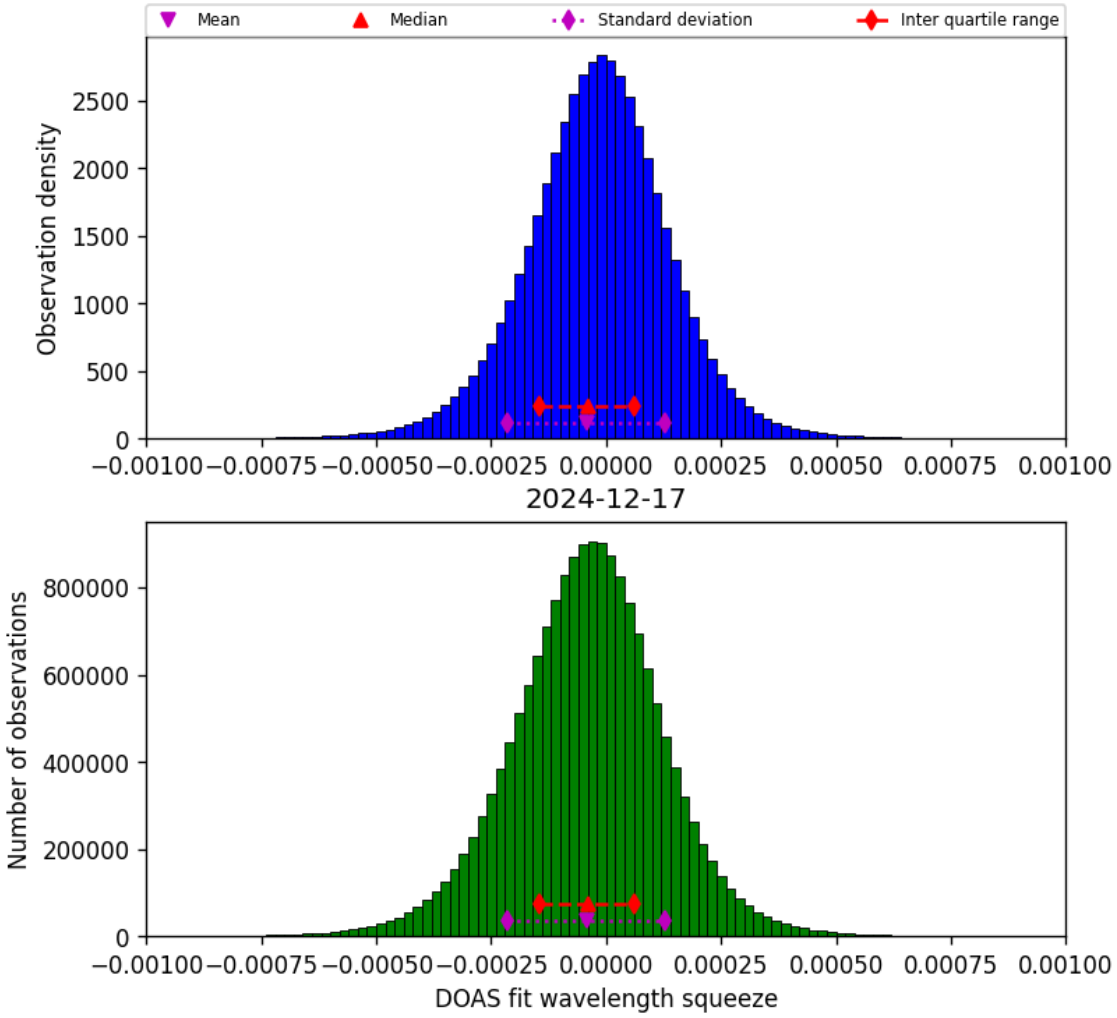

Figure 78: Histogram of “DOAS fit wavelength squeeze” for 2024-12-17 to 2024-12-18

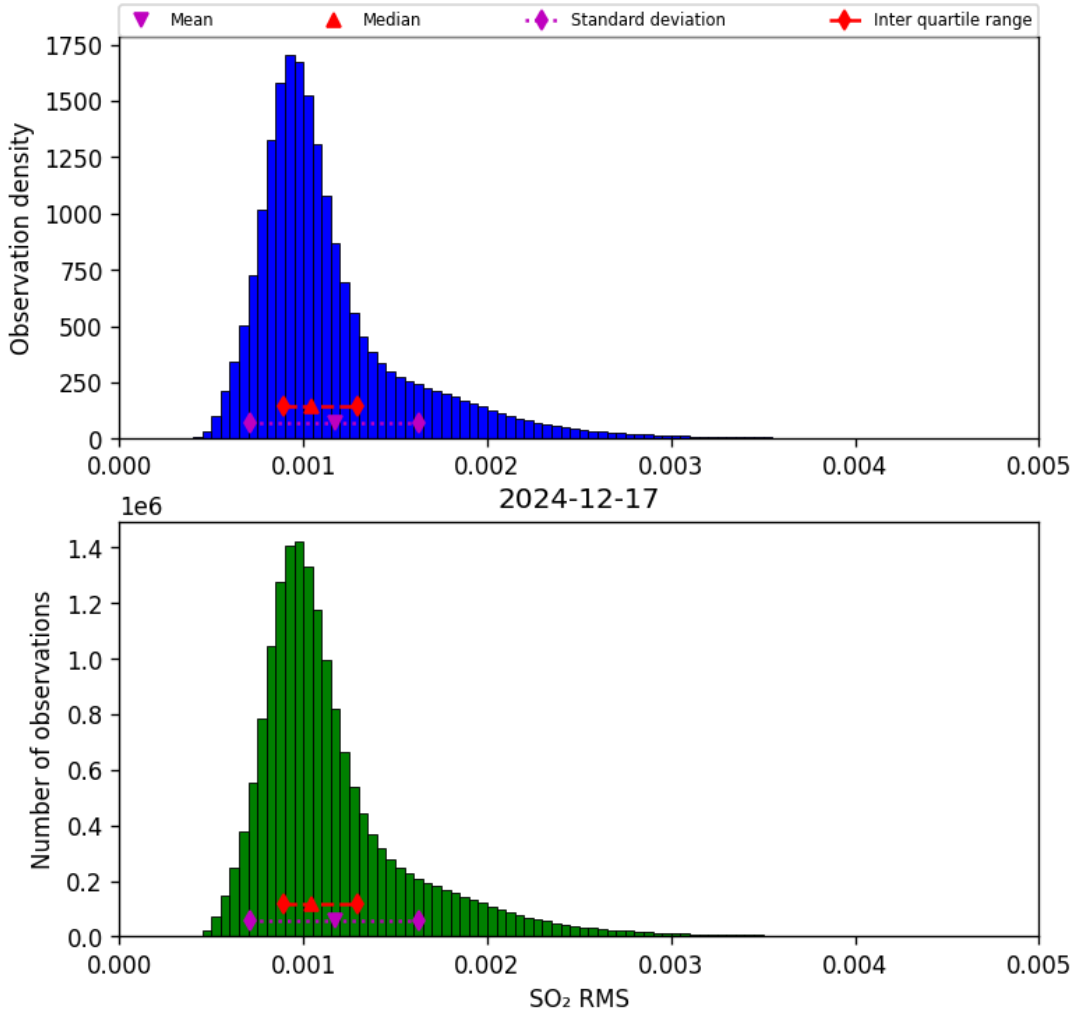

Figure 79: Histogram of "SO_2 RMS" for 2024-12-17 to 2024-12-18

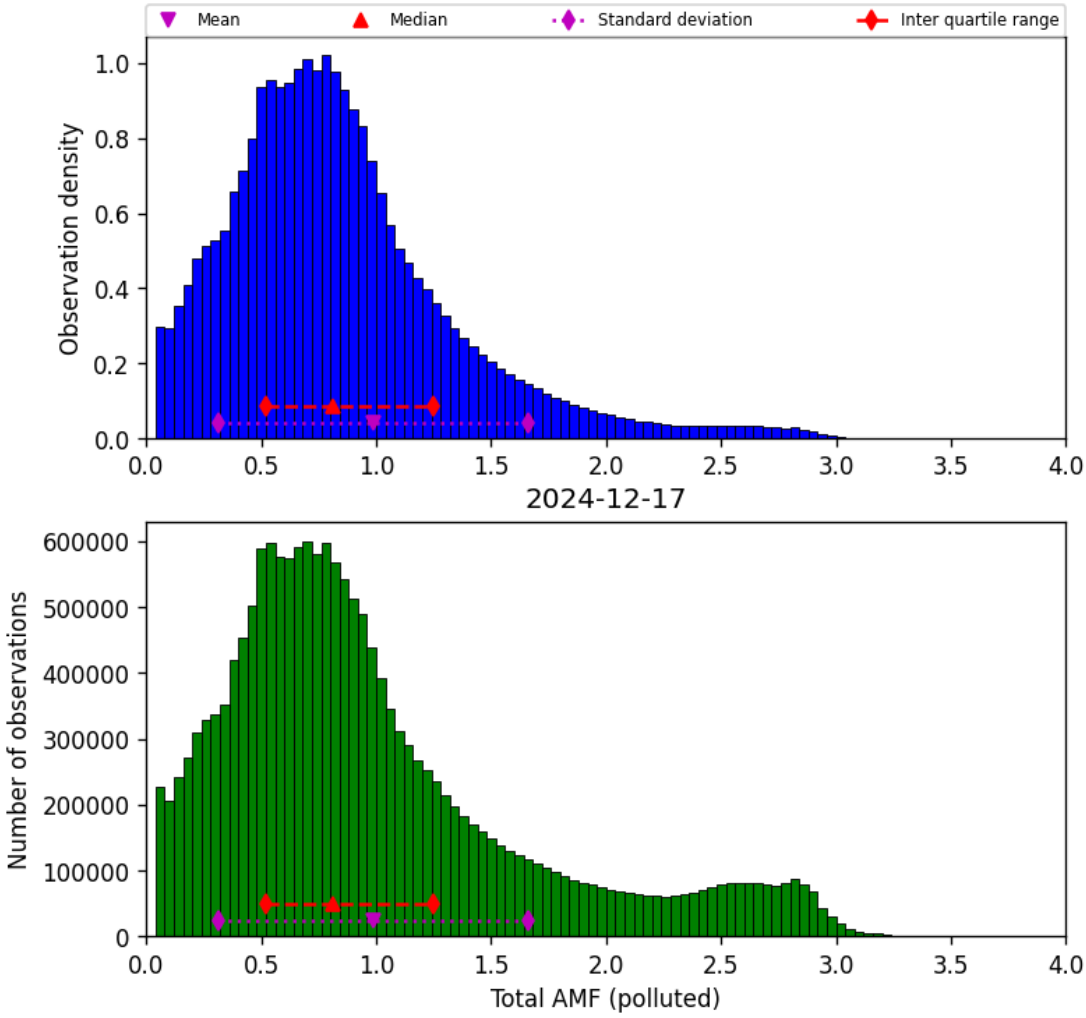

Figure 80: Histogram of “Total AMF (polluted)” for 2024-12-17 to 2024-12-18

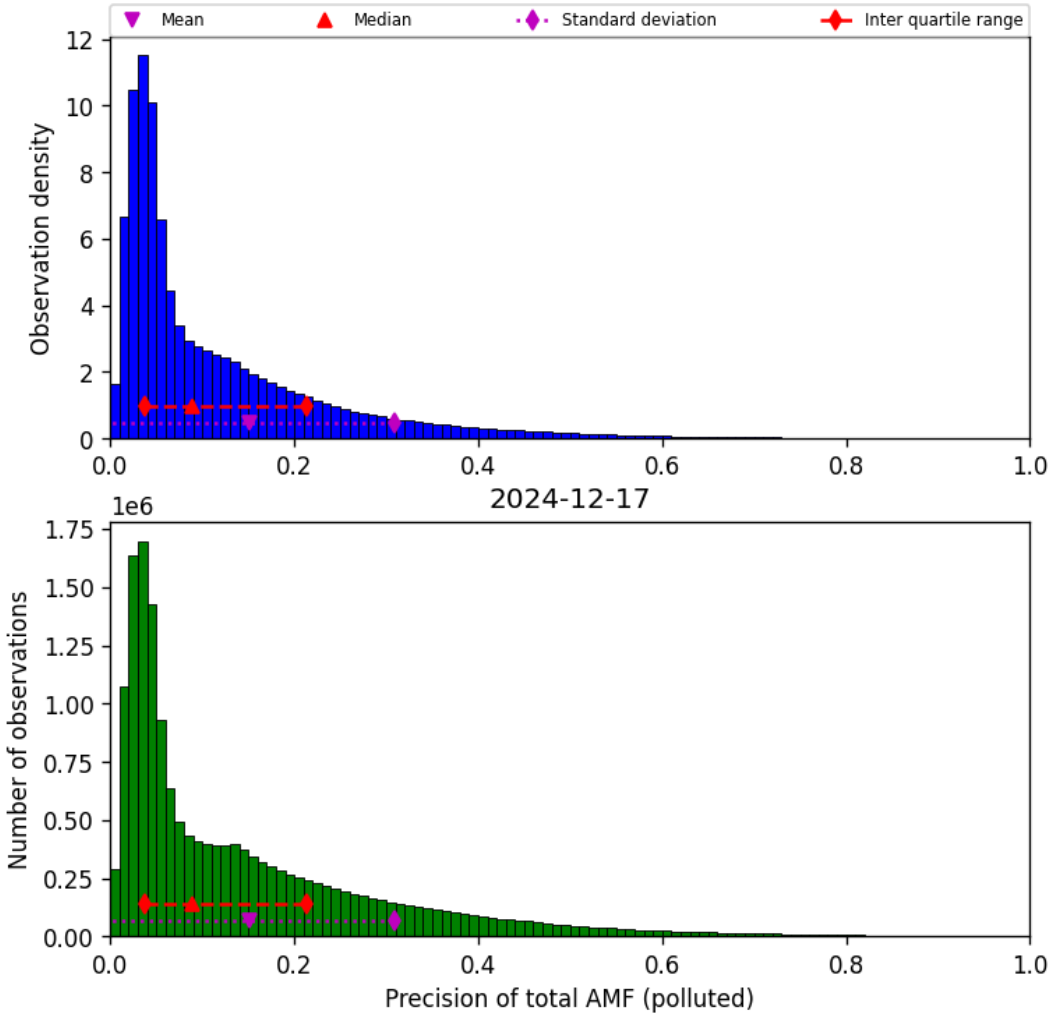

Figure 81: Histogram of “Precision of total AMF (polluted)” for 2024-12-17 to 2024-12-18

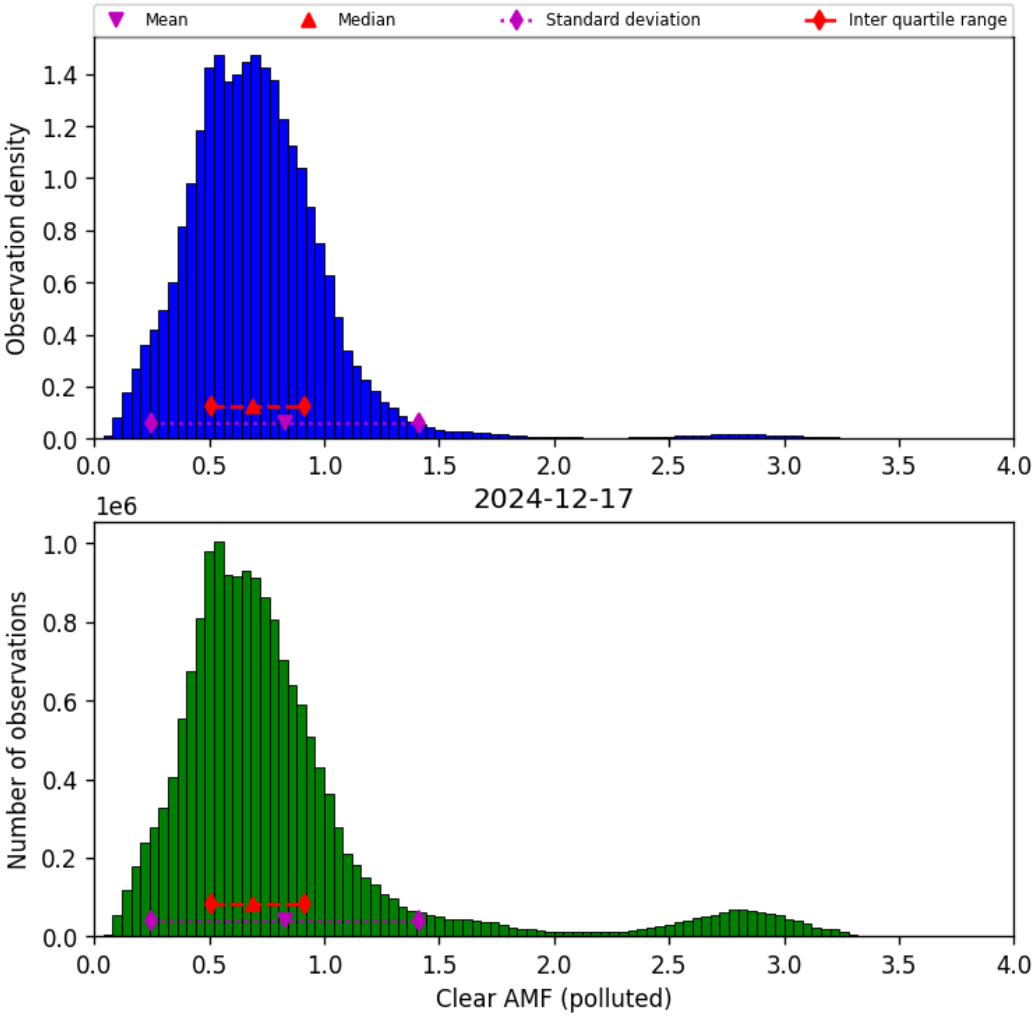

Figure 82: Histogram of “Clear AMF (polluted)” for 2024-12-17 to 2024-12-18

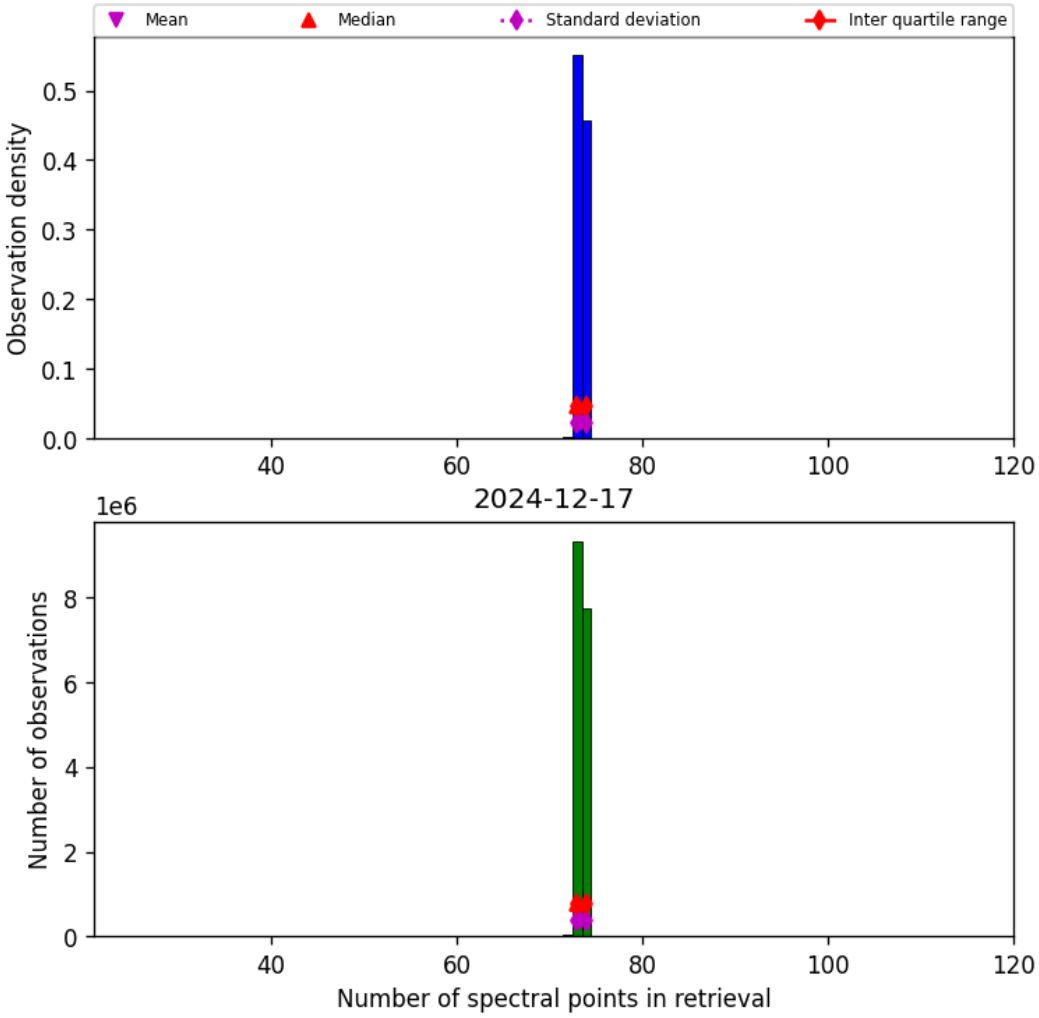

Figure 83: Histogram of “Number of spectral points in retrieval” for 2024-12-17 to 2024-12-18

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.

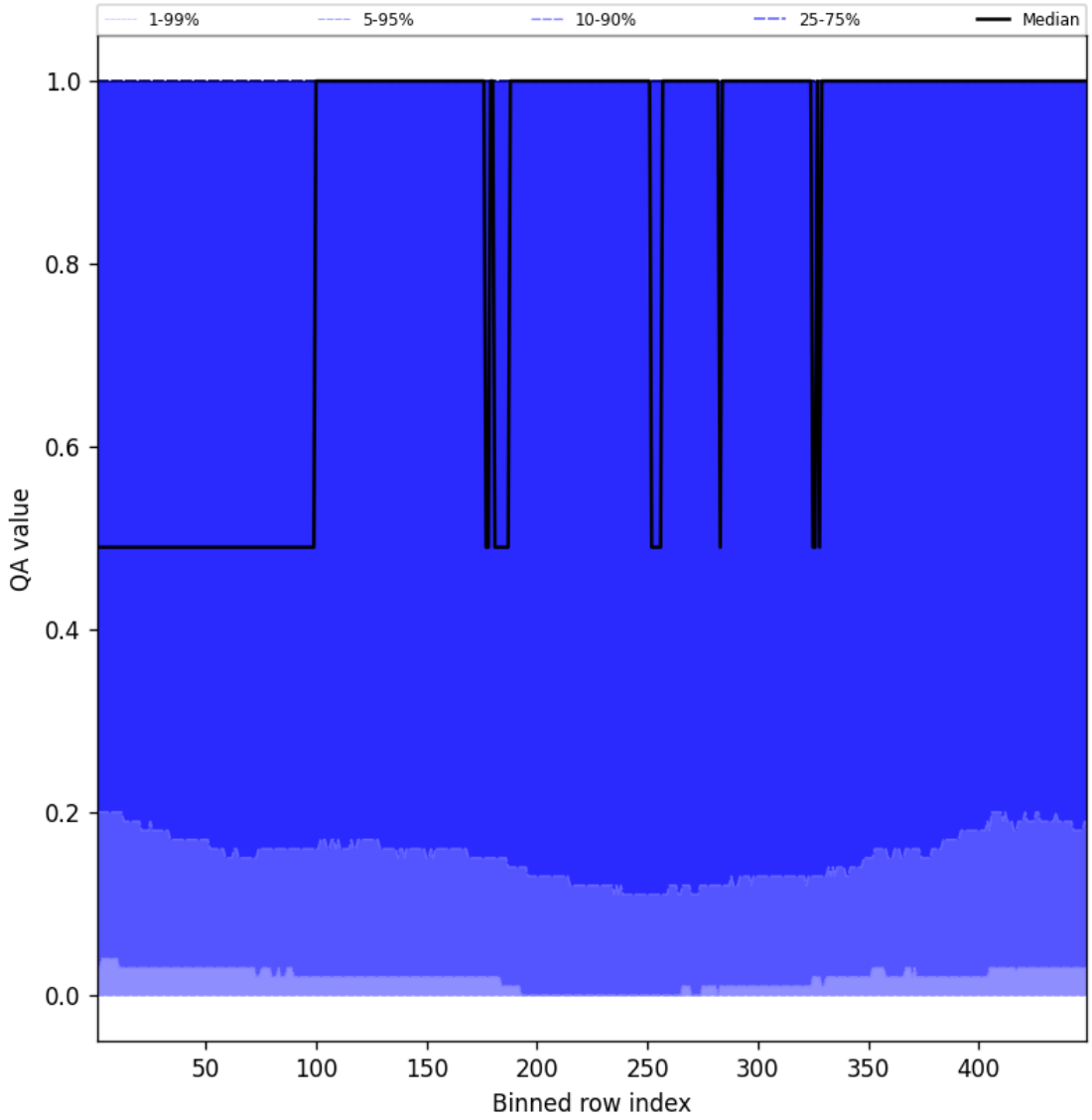

Figure 84: Along track statistics of “QA value” for 2024-12-17 to 2024-12-18

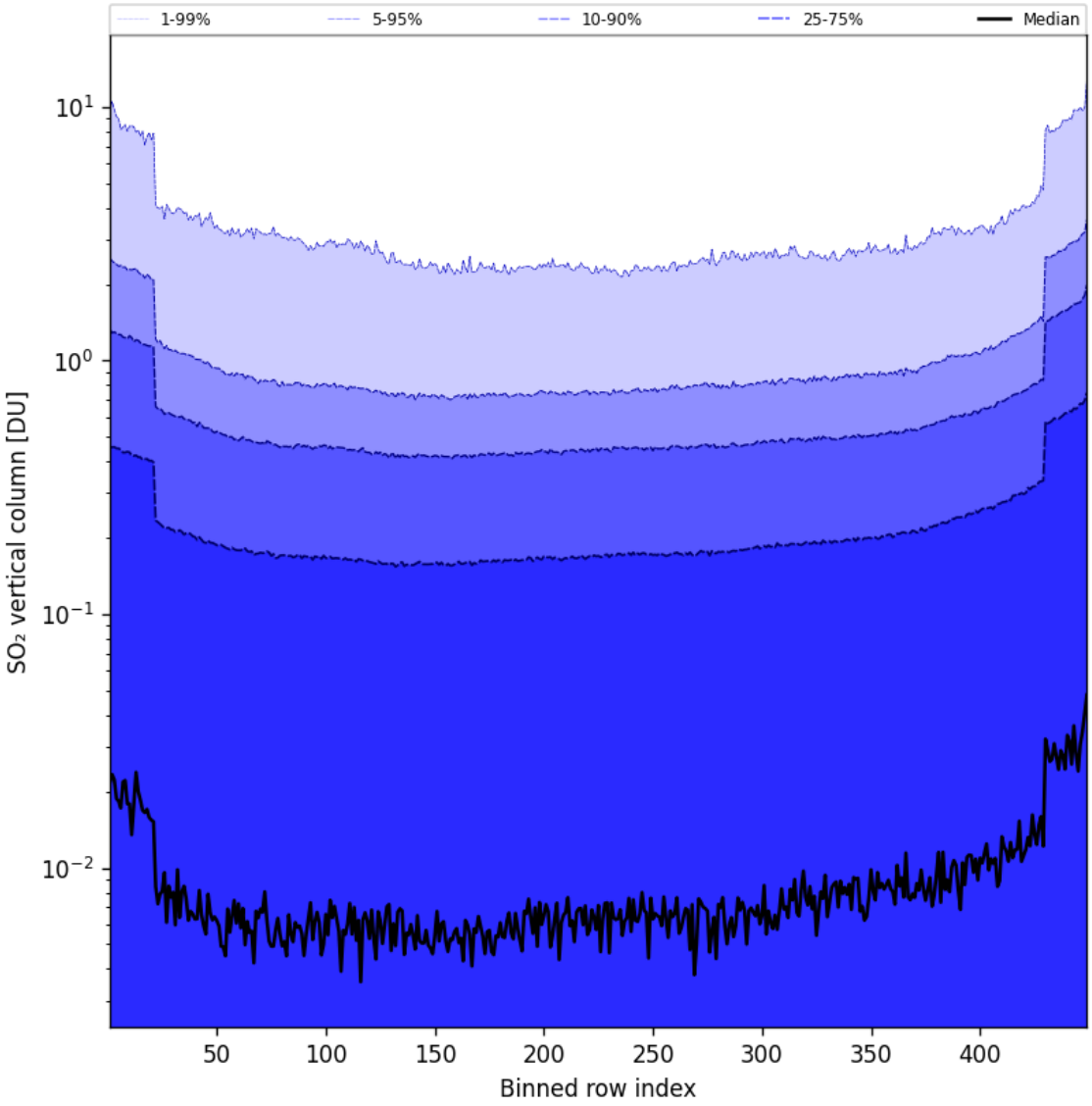

Figure 85: Along track statistics of "SO_2 vertical column" for 2024-12-17 to 2024-12-18

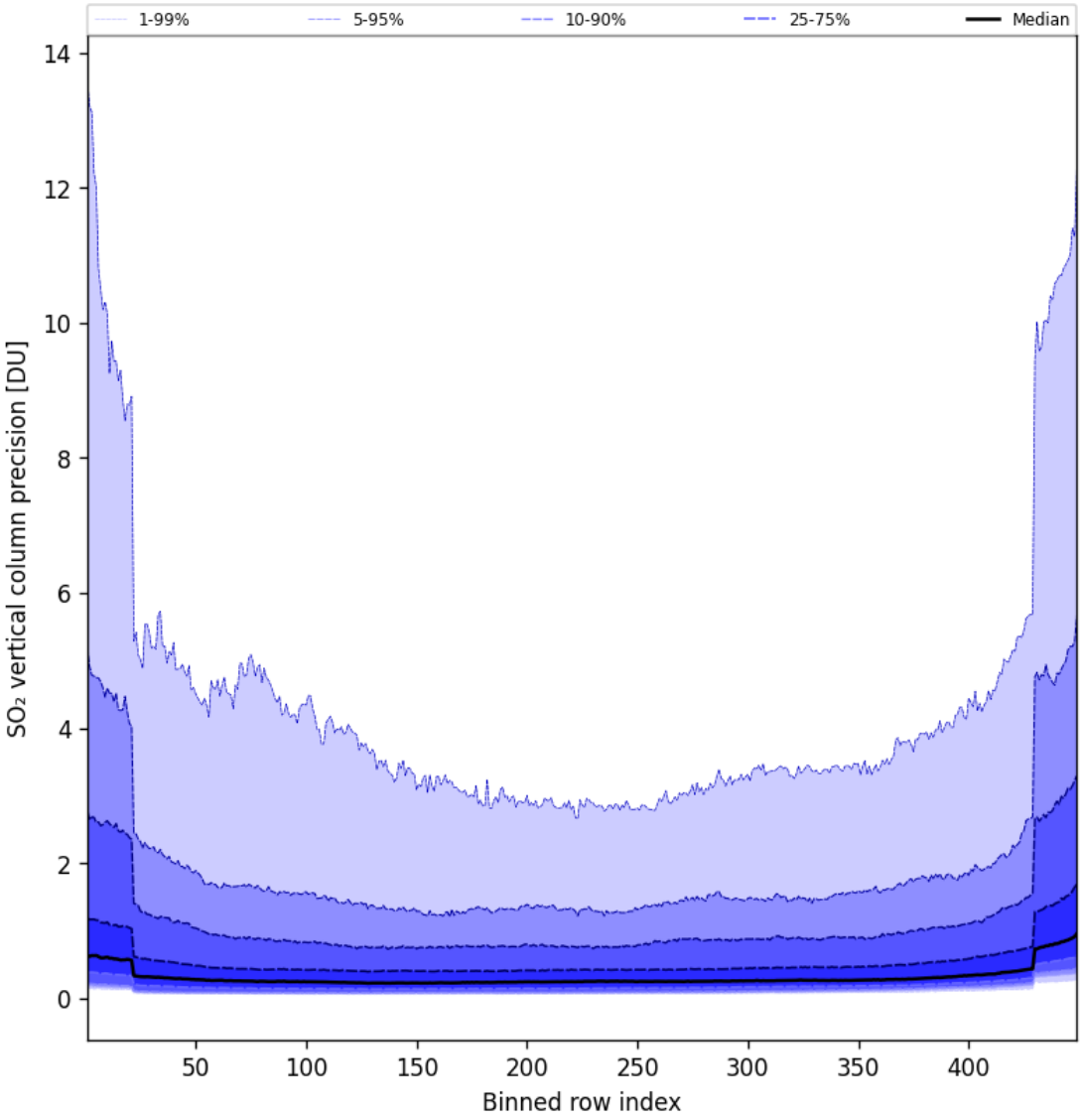

Figure 86: Along track statistics of "SO_2 vertical column precision" for 2024-12-17 to 2024-12-18

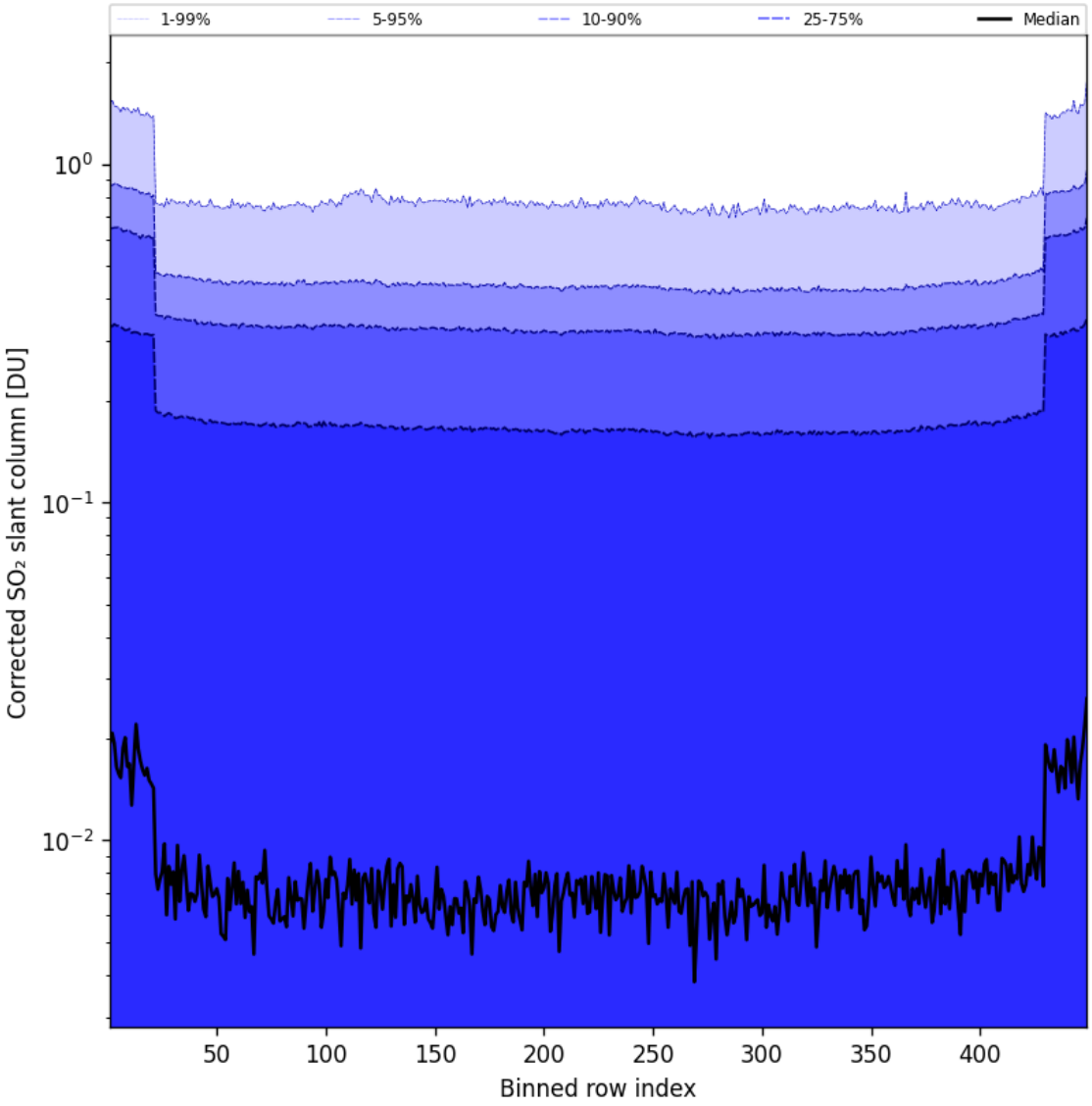

Figure 87: Along track statistics of "Corrected SO_2 slant column" for 2024-12-17 to 2024-12-18

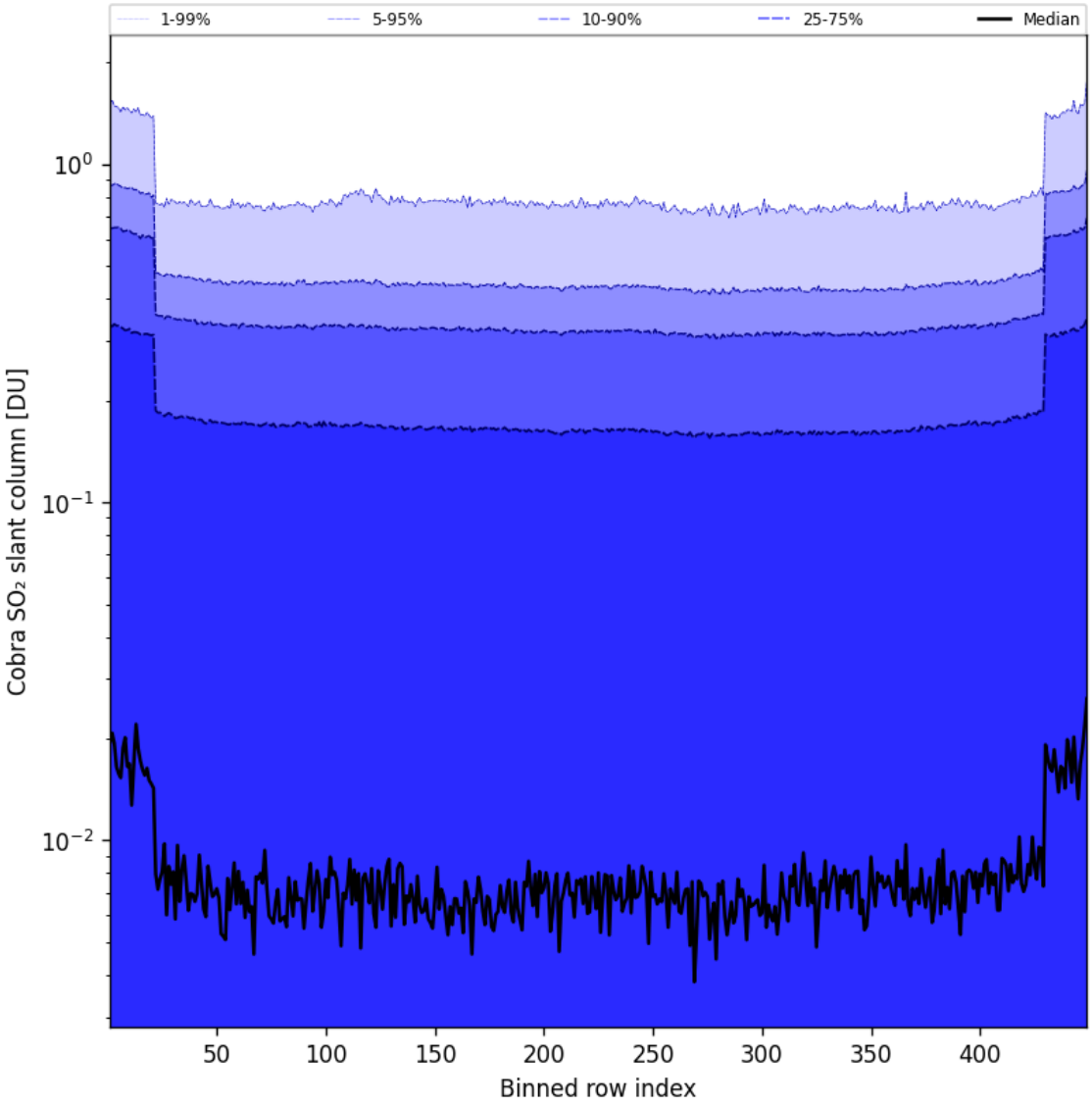

Figure 88: Along track statistics of "Cobra SO_2 slant column" for 2024-12-17 to 2024-12-18

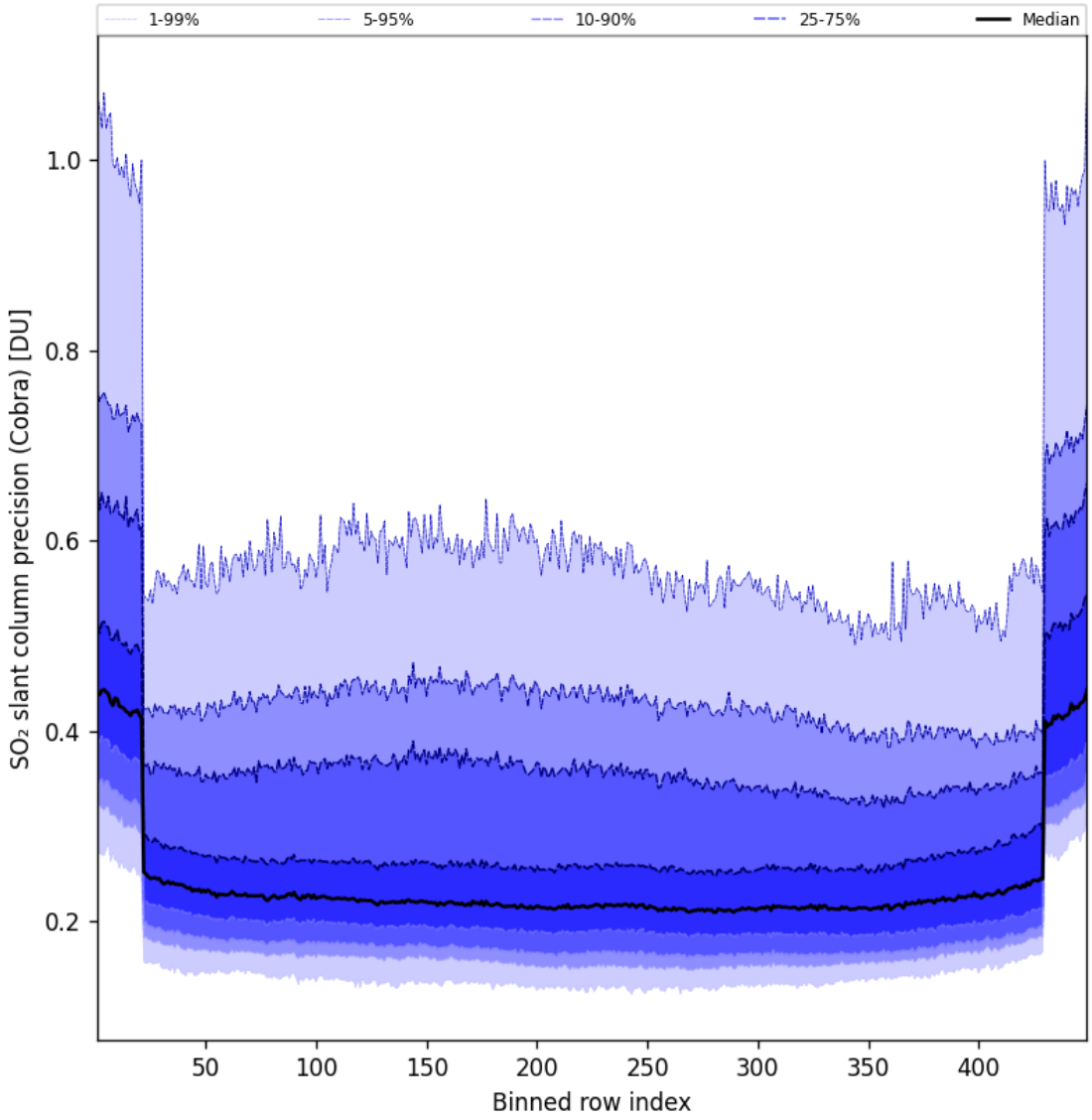

Figure 89: Along track statistics of "SO_2 slant column precision (Cobra)" for 2024-12-17 to 2024-12-18

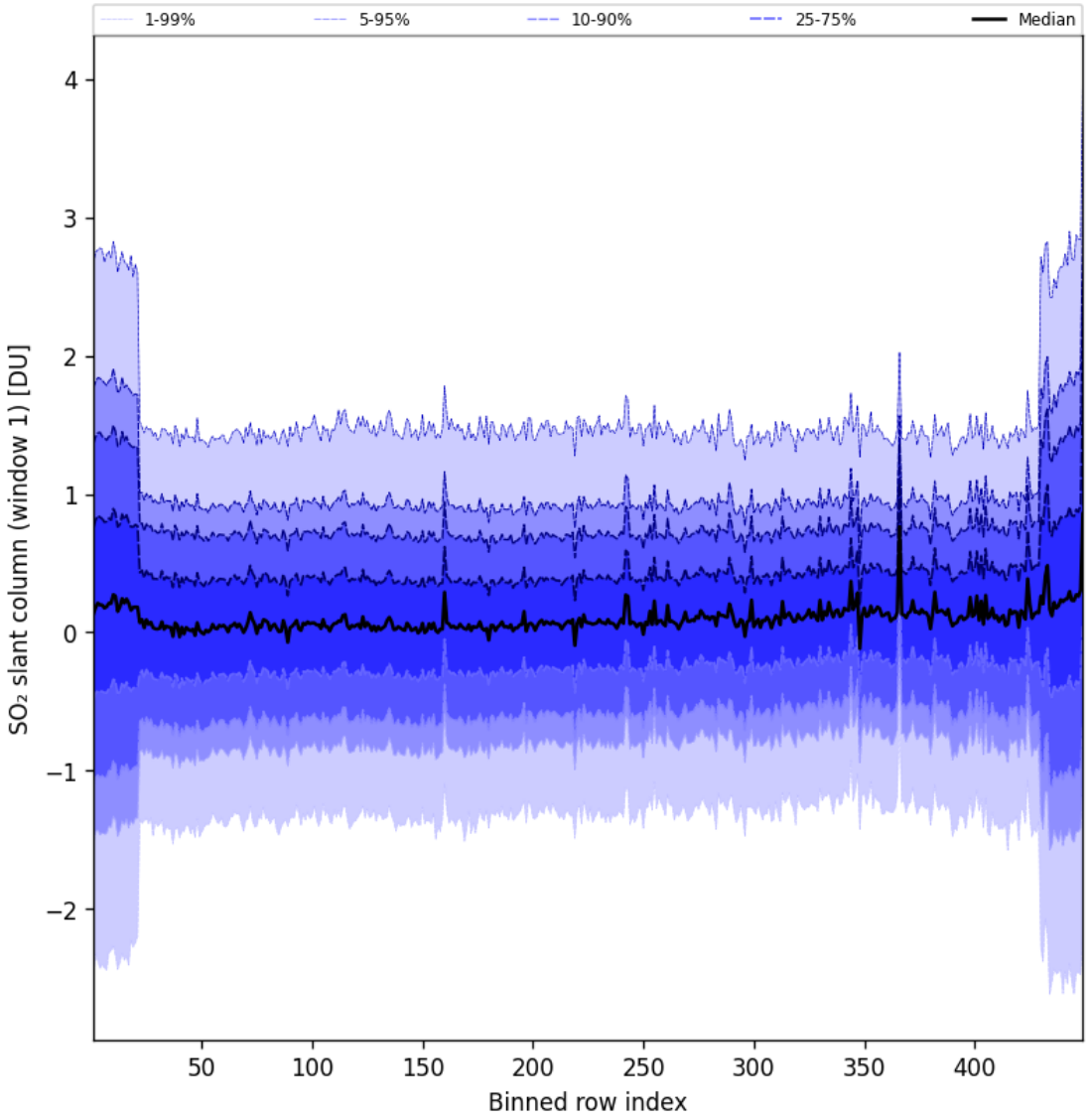

Figure 90: Along track statistics of "SO_2 slant column (window 1)" for 2024-12-17 to 2024-12-18

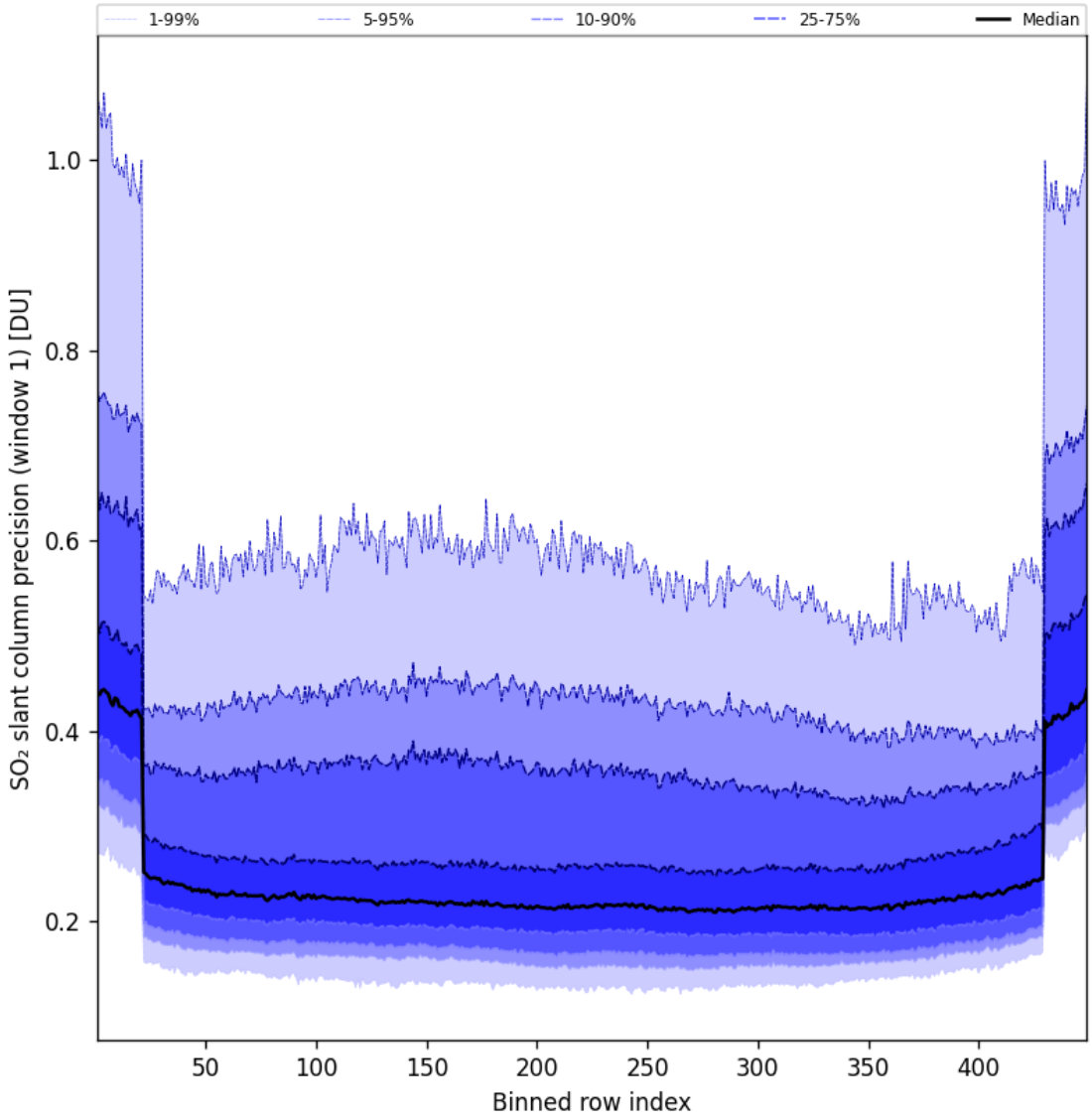

Figure 91: Along track statistics of "SO_2 slant column precision (window 1)" for 2024-12-17 to 2024-12-18

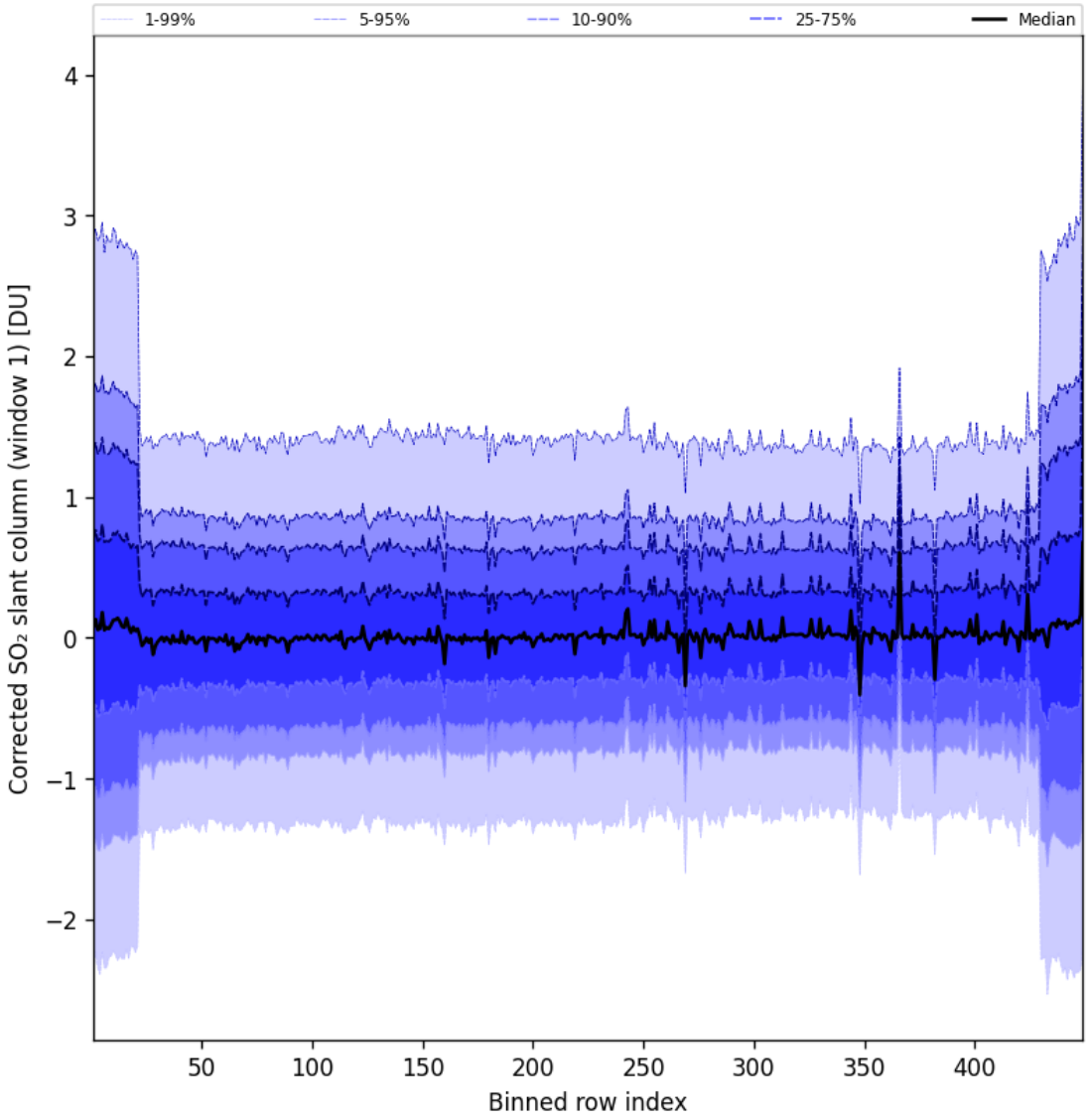

Figure 92: Along track statistics of “Corrected SO_2 slant column (window 1)” for 2024-12-17 to 2024-12-18

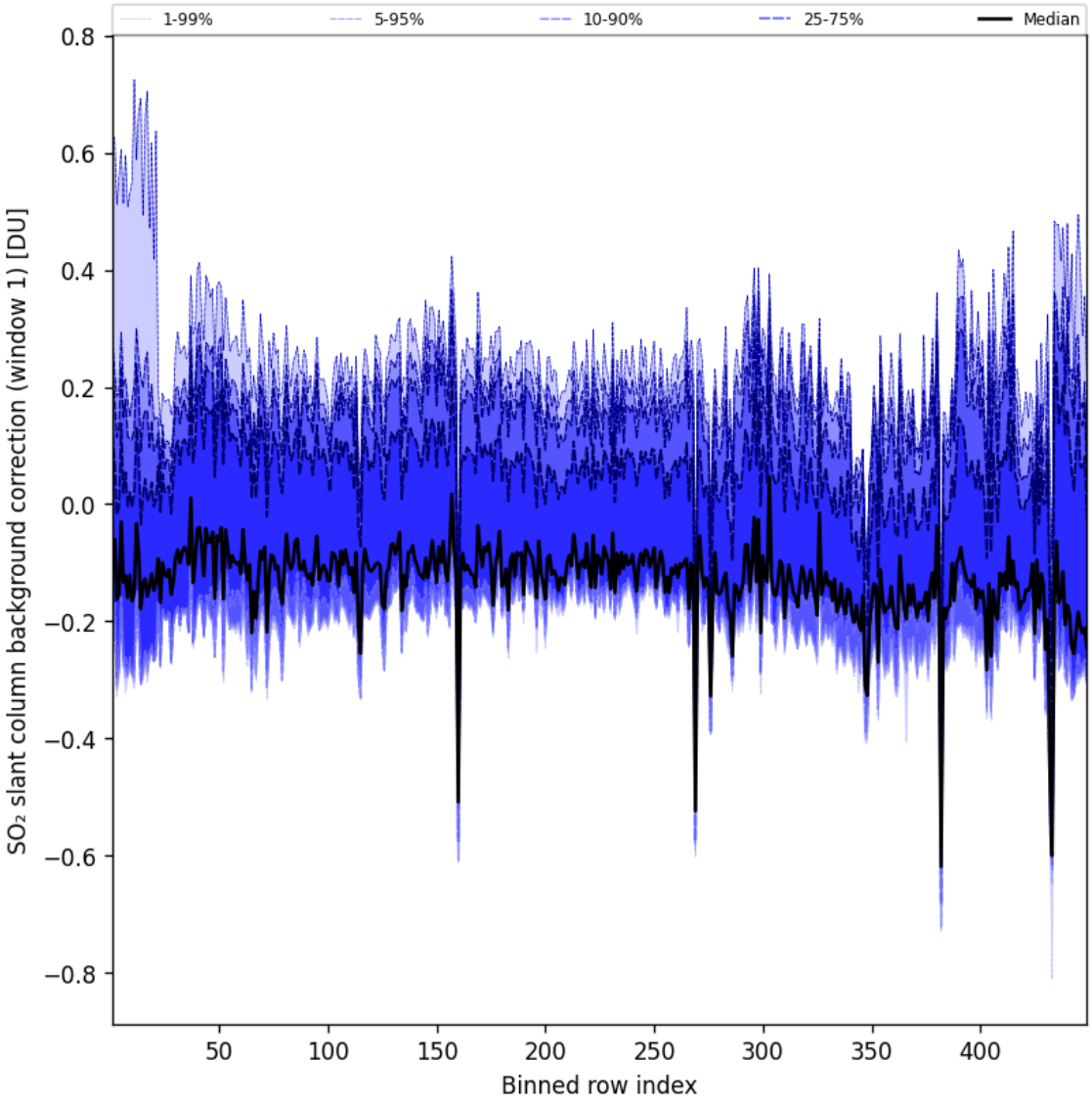

Figure 93: Along track statistics of "SO_2 slant column background correction (window 1)" for 2024-12-17 to 2024-12-18

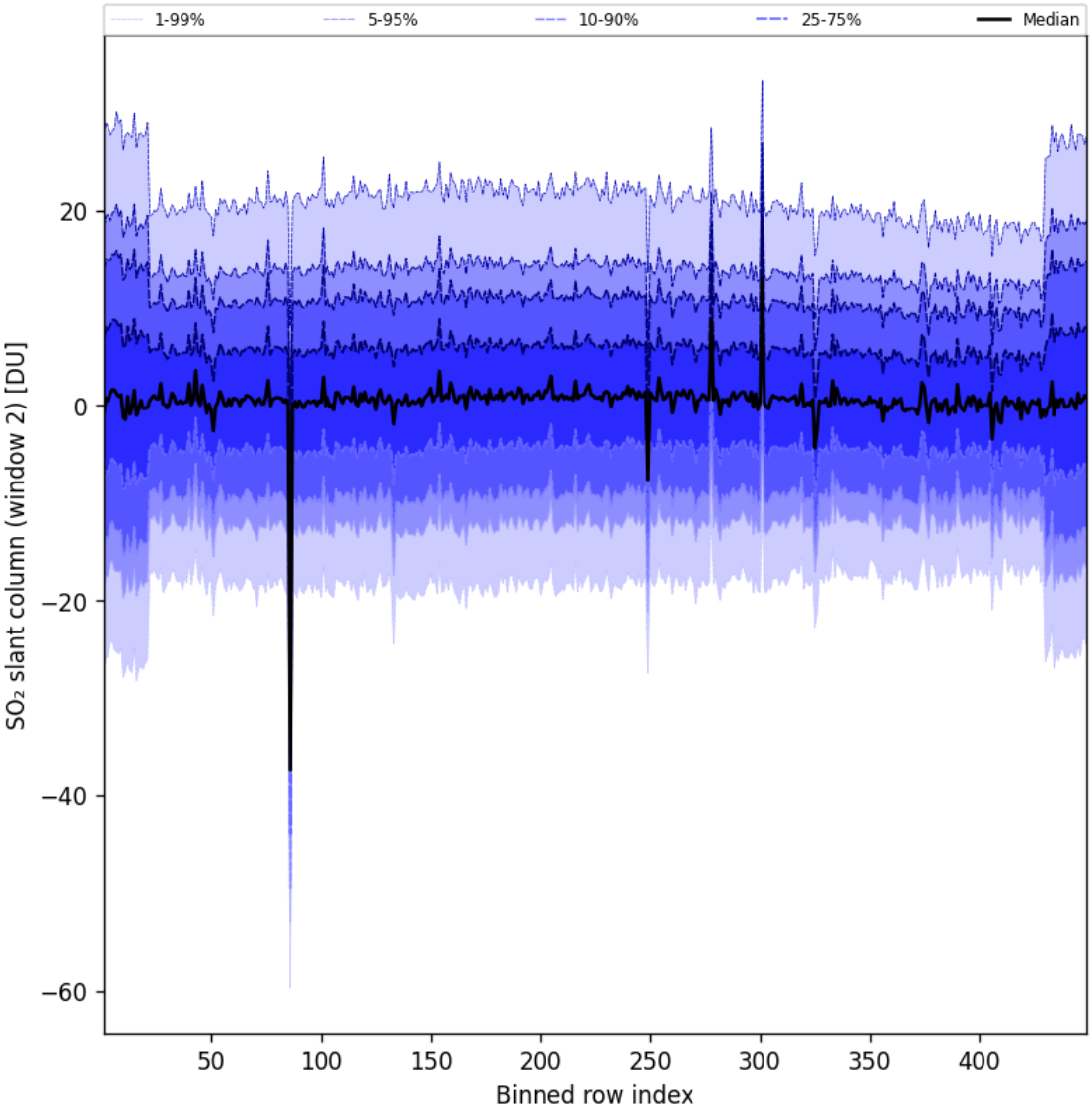

Figure 94: Along track statistics of "SO_2 slant column (window 2)" for 2024-12-17 to 2024-12-18

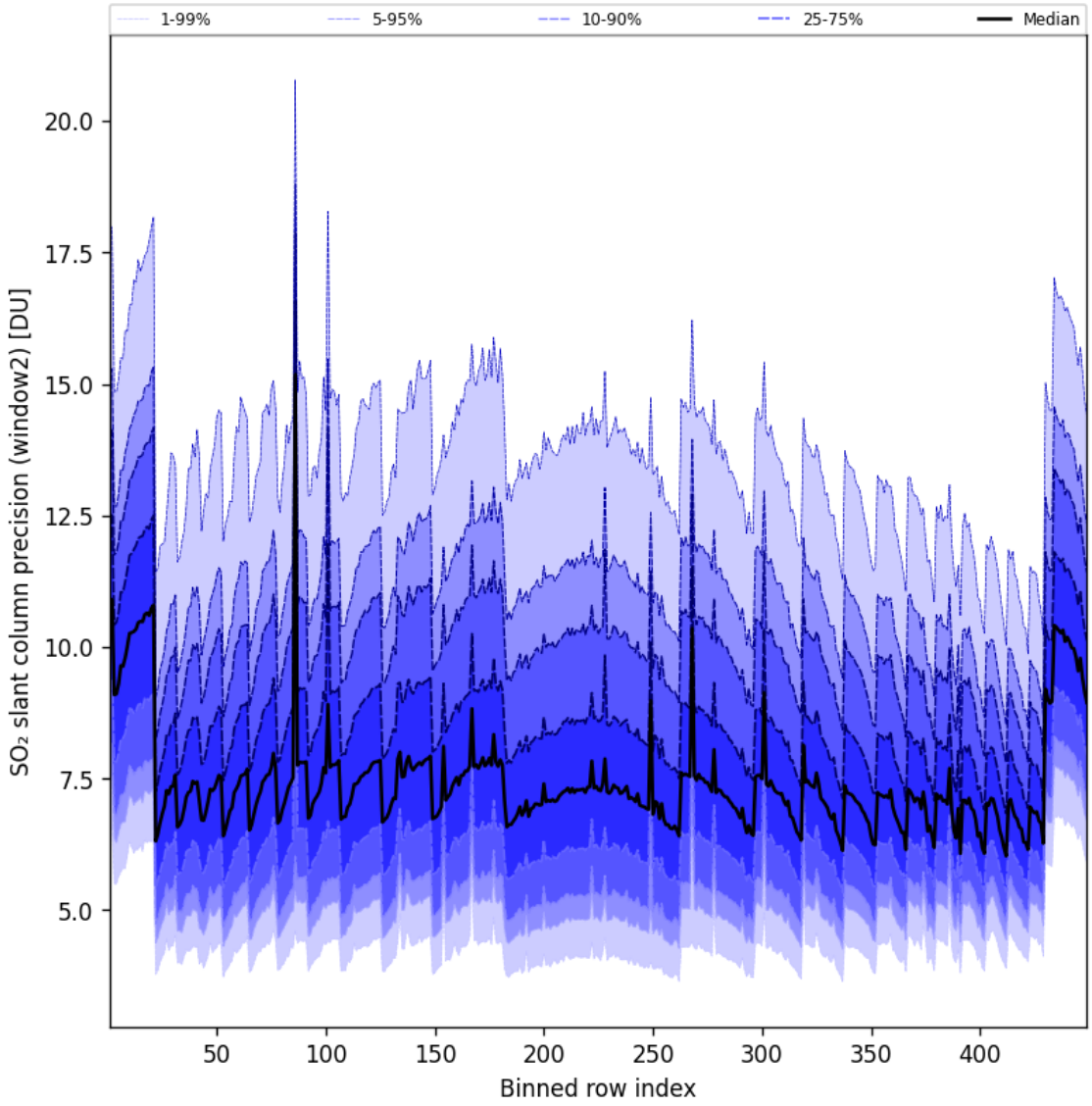

Figure 95: Along track statistics of "SO_2 slant column precision (window2)" for 2024-12-17 to 2024-12-18

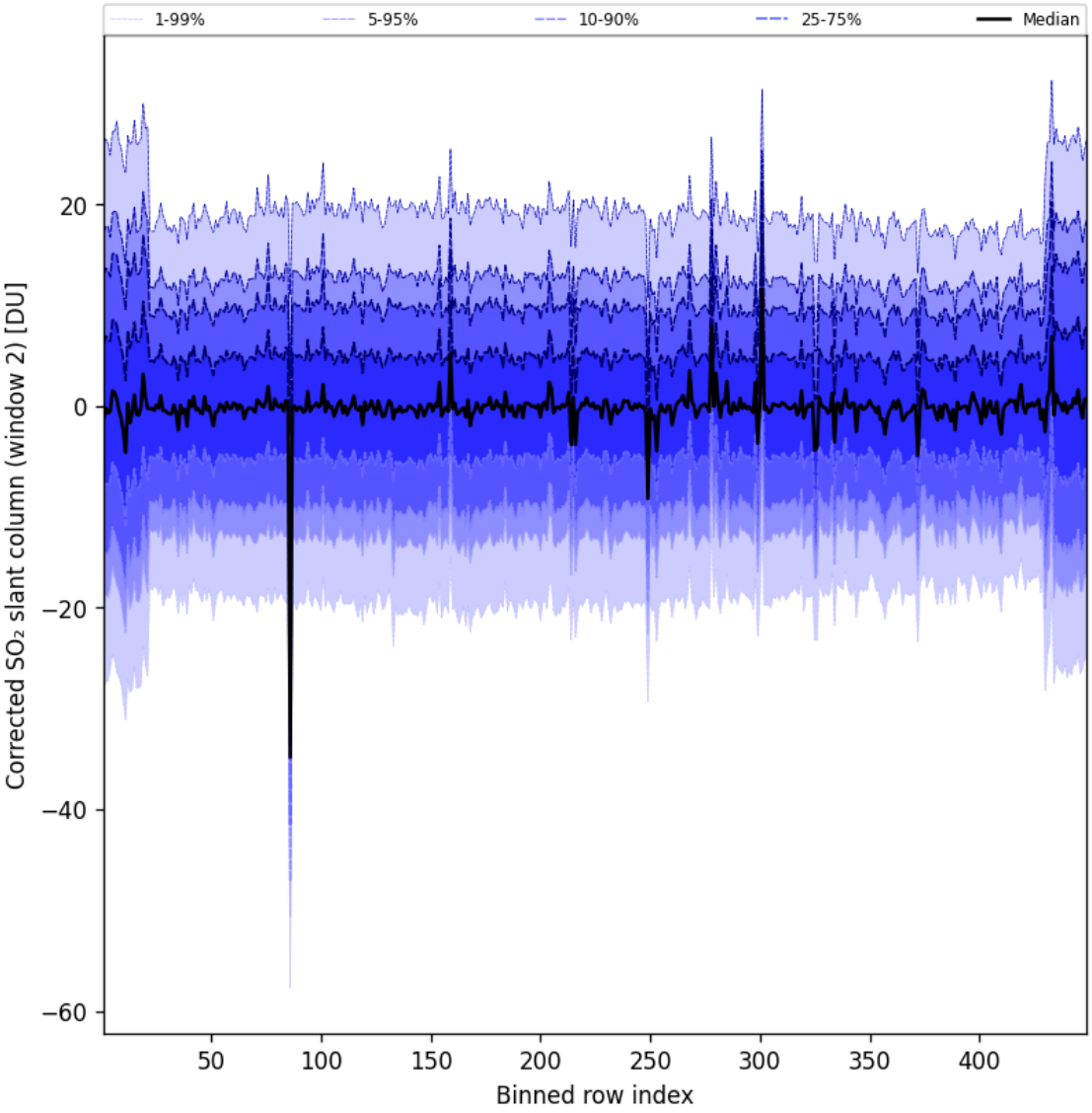

Figure 96: Along track statistics of "Corrected SO_2 slant column (window 2)" for 2024-12-17 to 2024-12-18

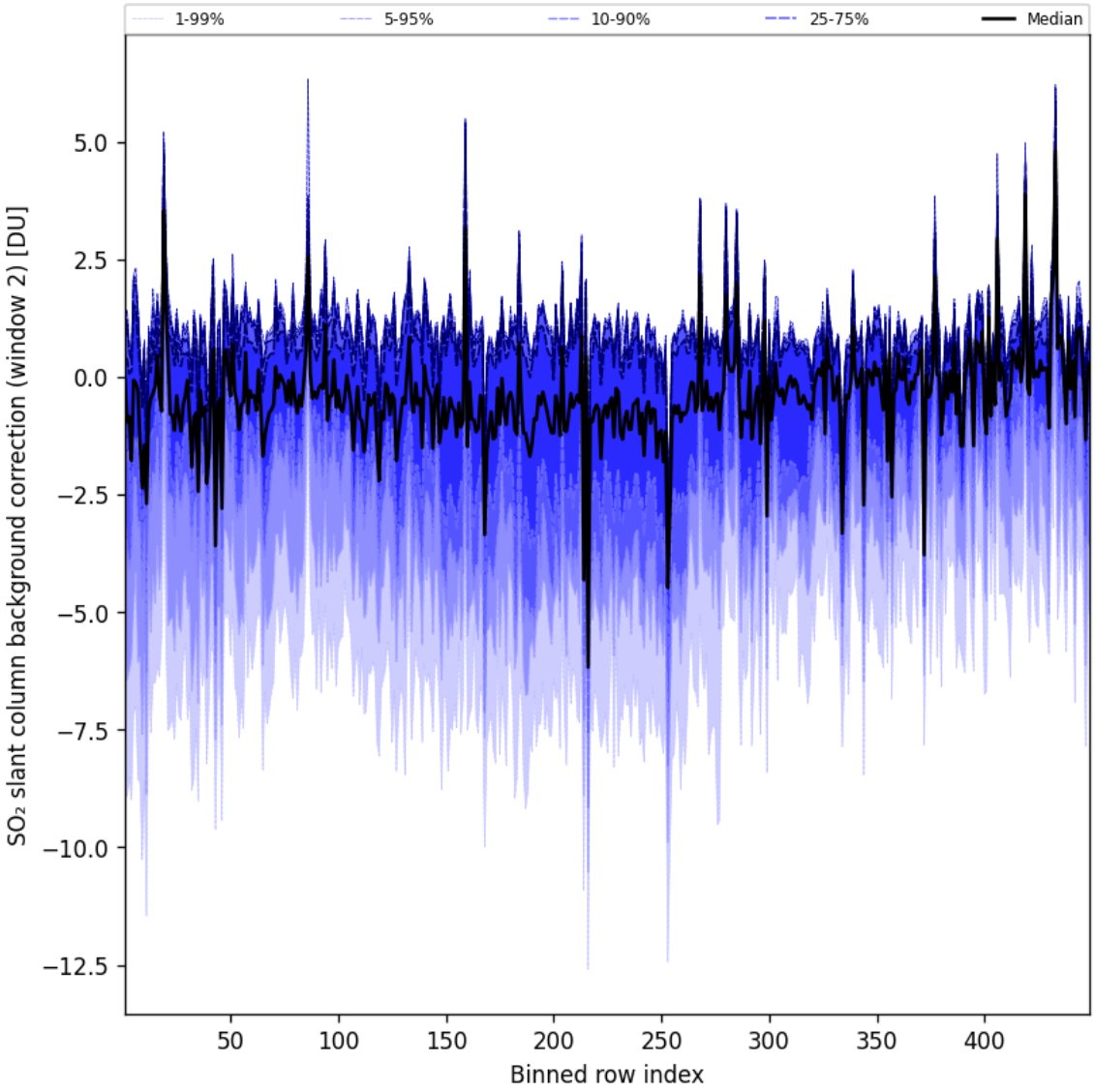

Figure 97: Along track statistics of "SO_2 slant column background correction (window 2)" for 2024-12-17 to 2024-12-18

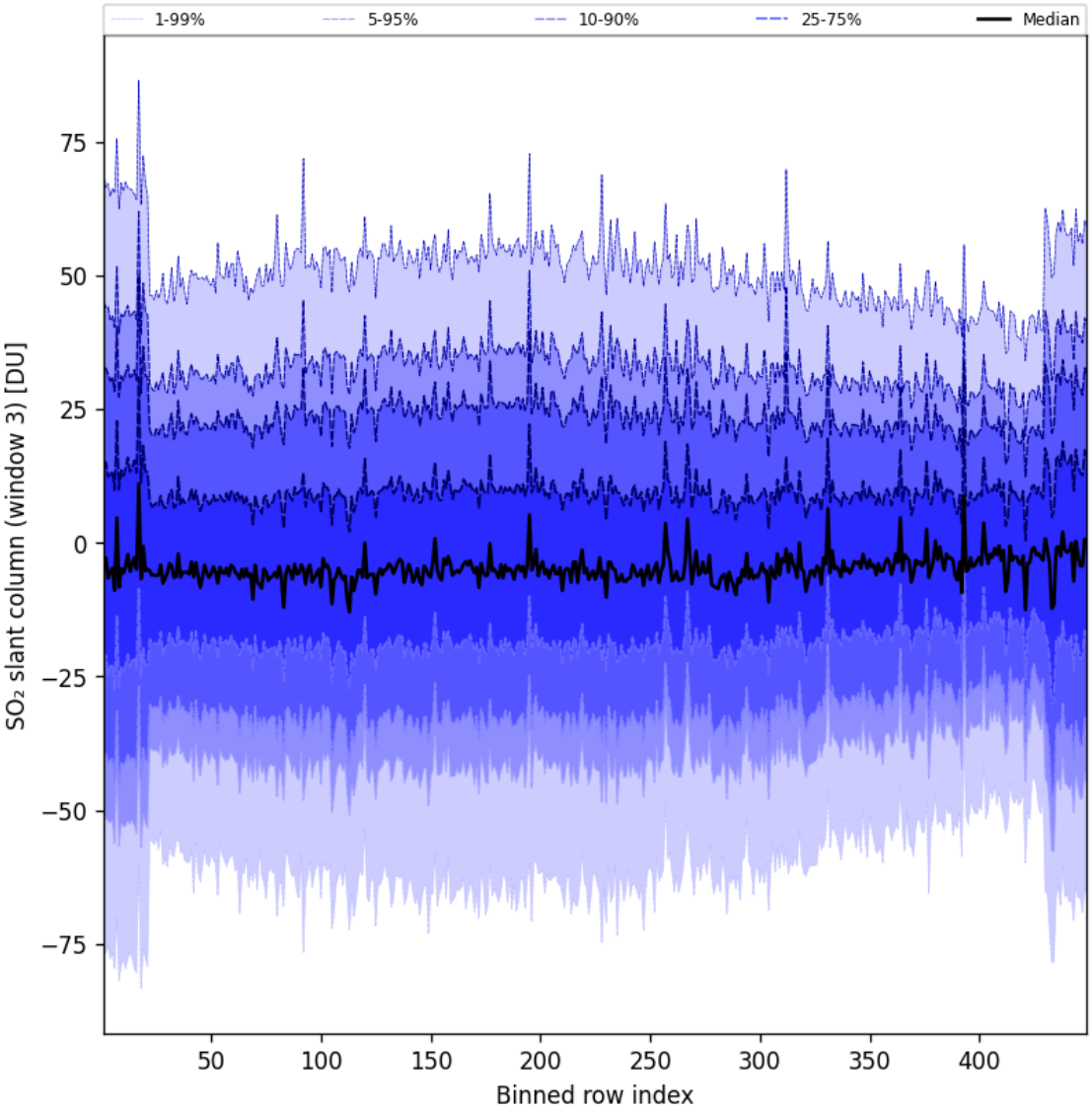

Figure 98: Along track statistics of "SO_2 slant column (window 3)" for 2024-12-17 to 2024-12-18

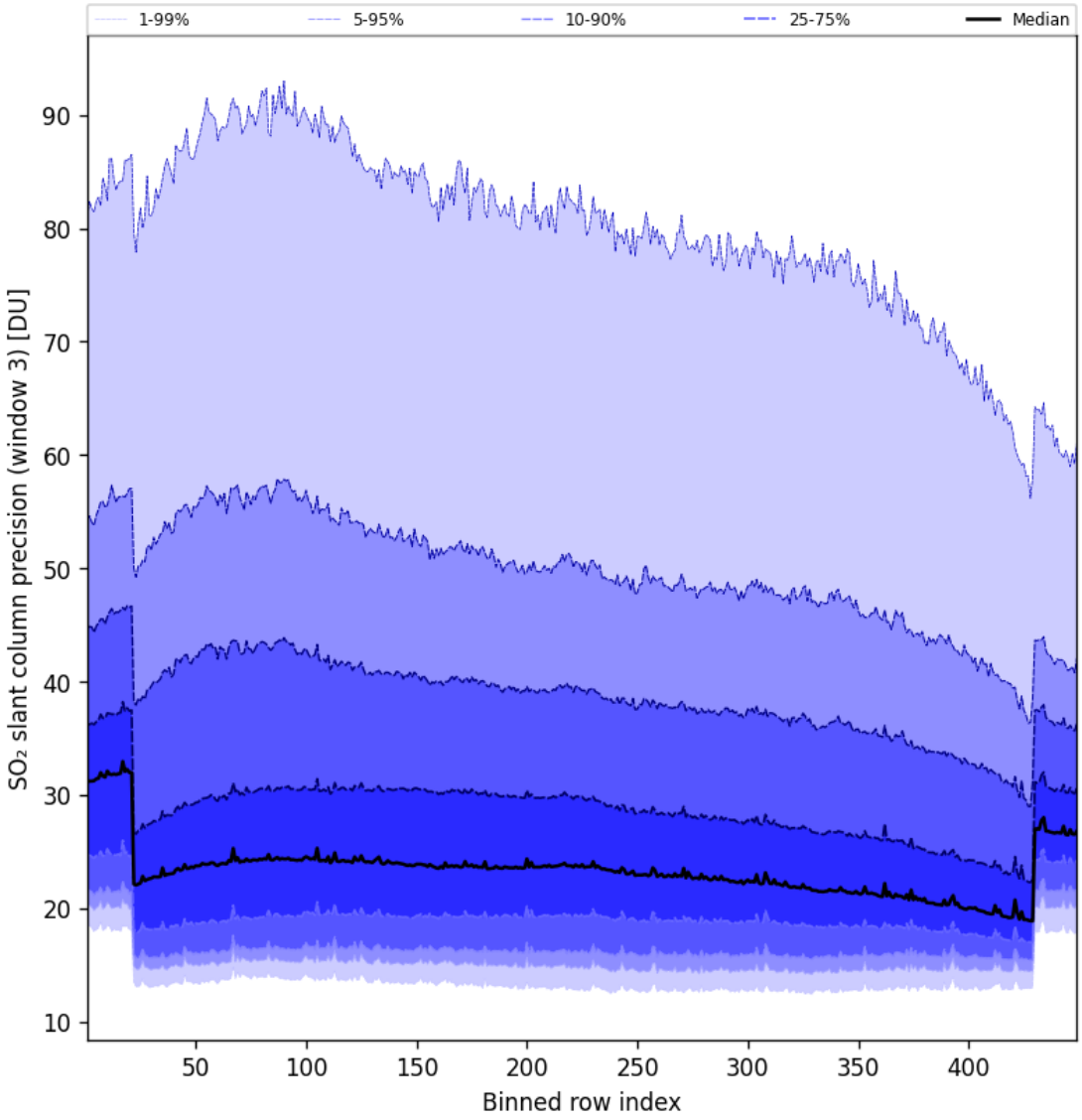

Figure 99: Along track statistics of "SO_2 slant column precision (window 3)" for 2024-12-17 to 2024-12-18

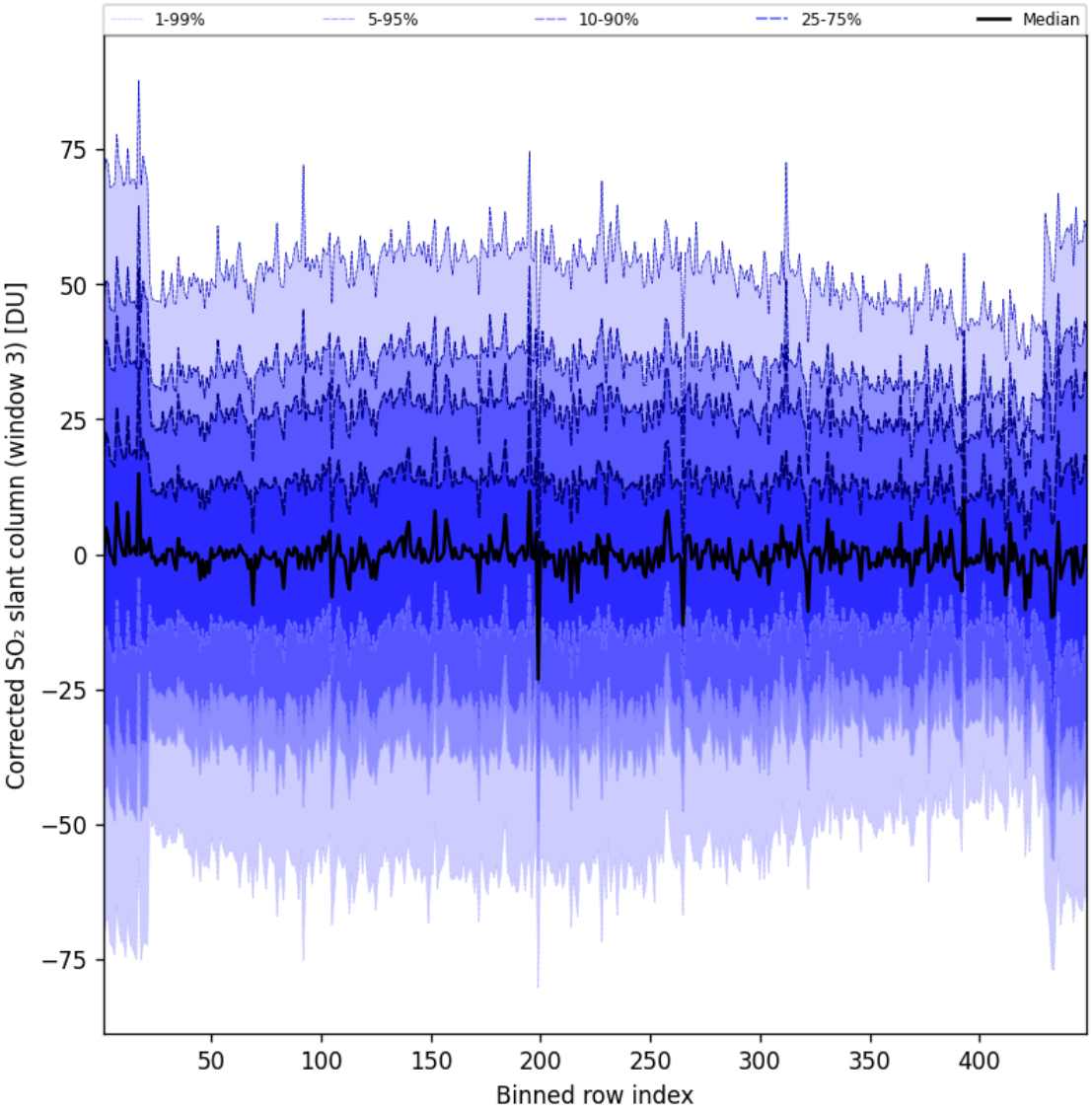

Figure 100: Along track statistics of “Corrected SO_2 slant column (window 3)” for 2024-12-17 to 2024-12-18

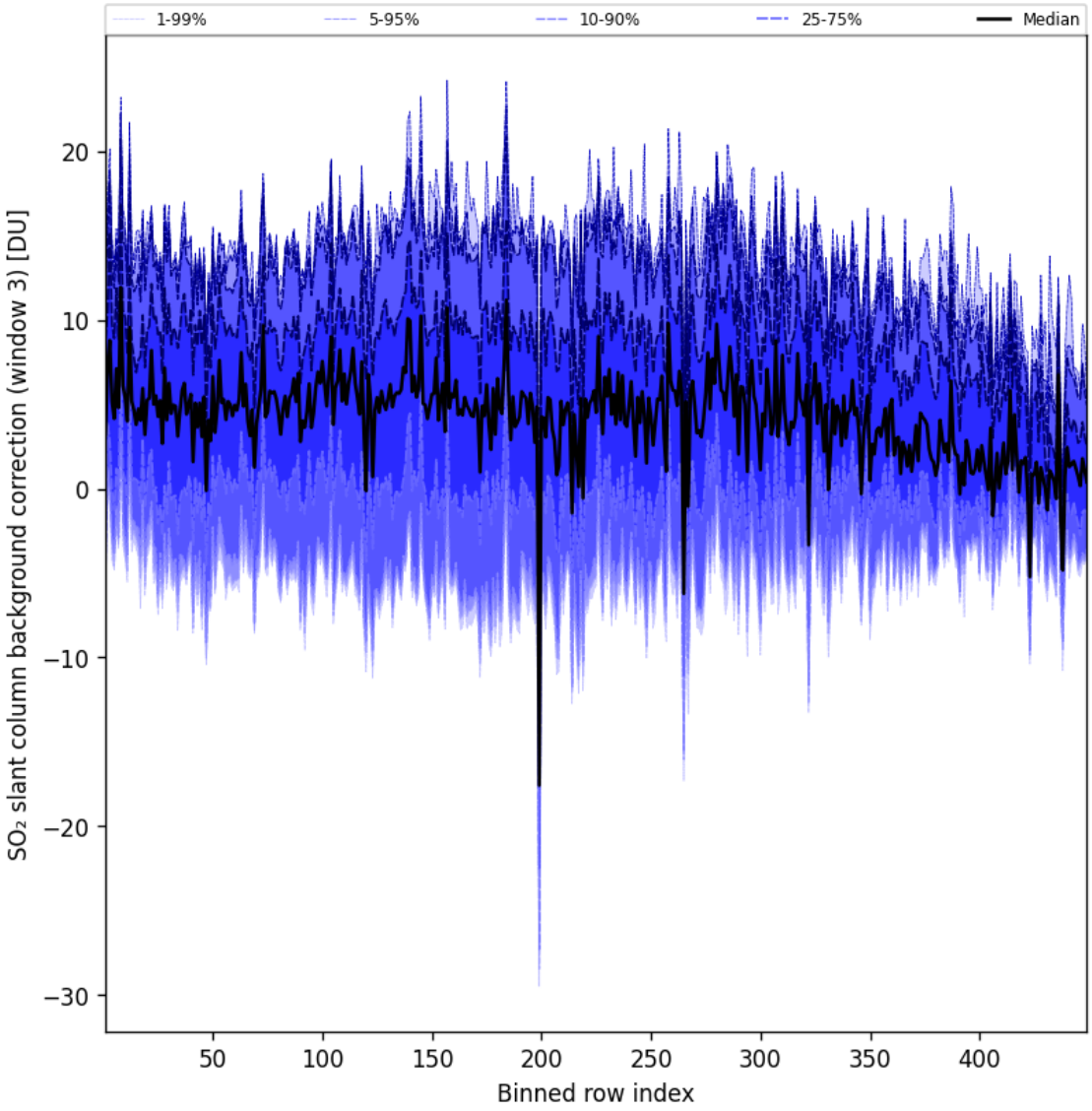

Figure 101: Along track statistics of "SO_2 slant column background correction (window 3)" for 2024-12-17 to 2024-12-18

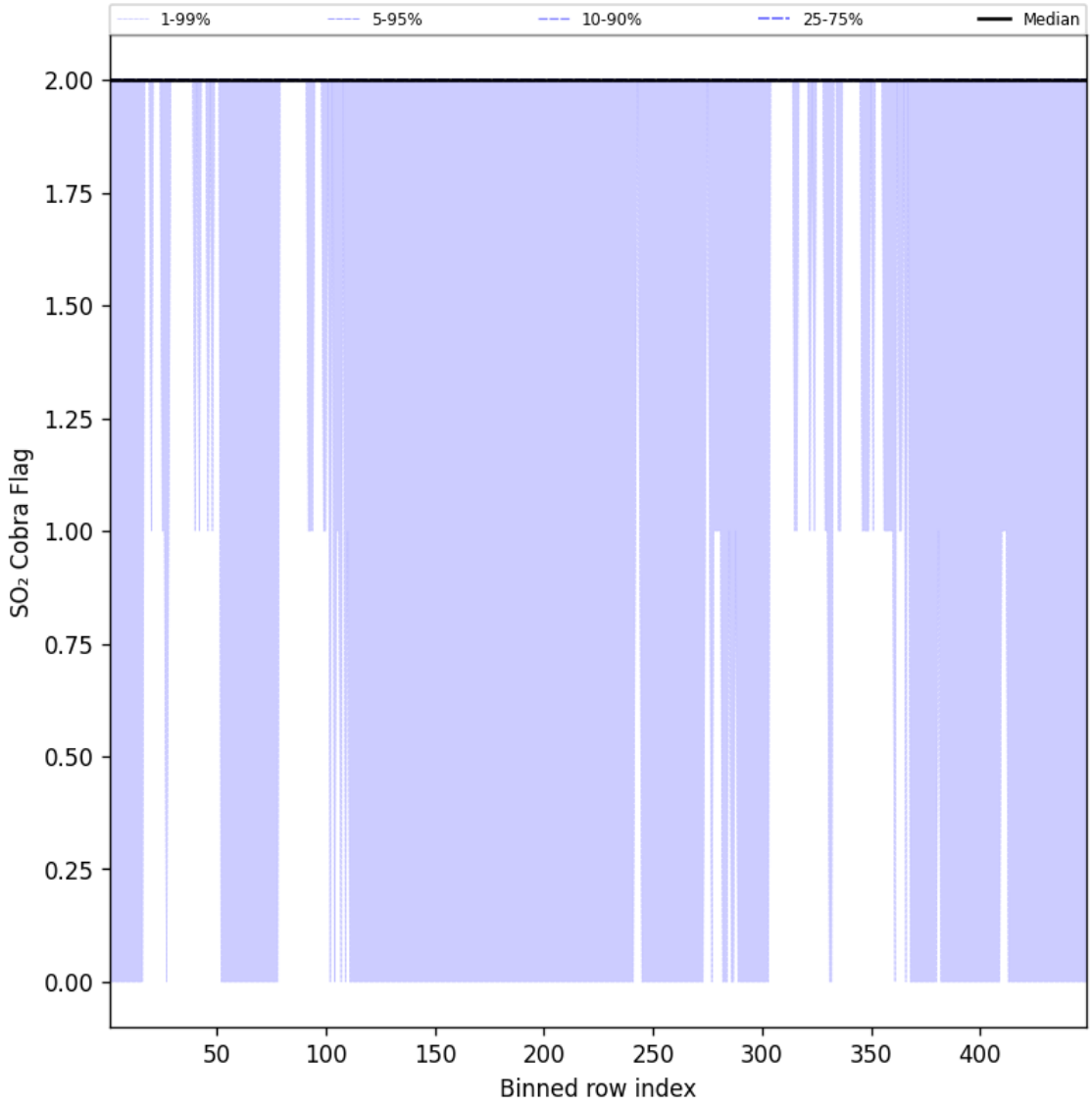

Figure 102: Along track statistics of "SO_2 Cobra Flag" for 2024-12-17 to 2024-12-18

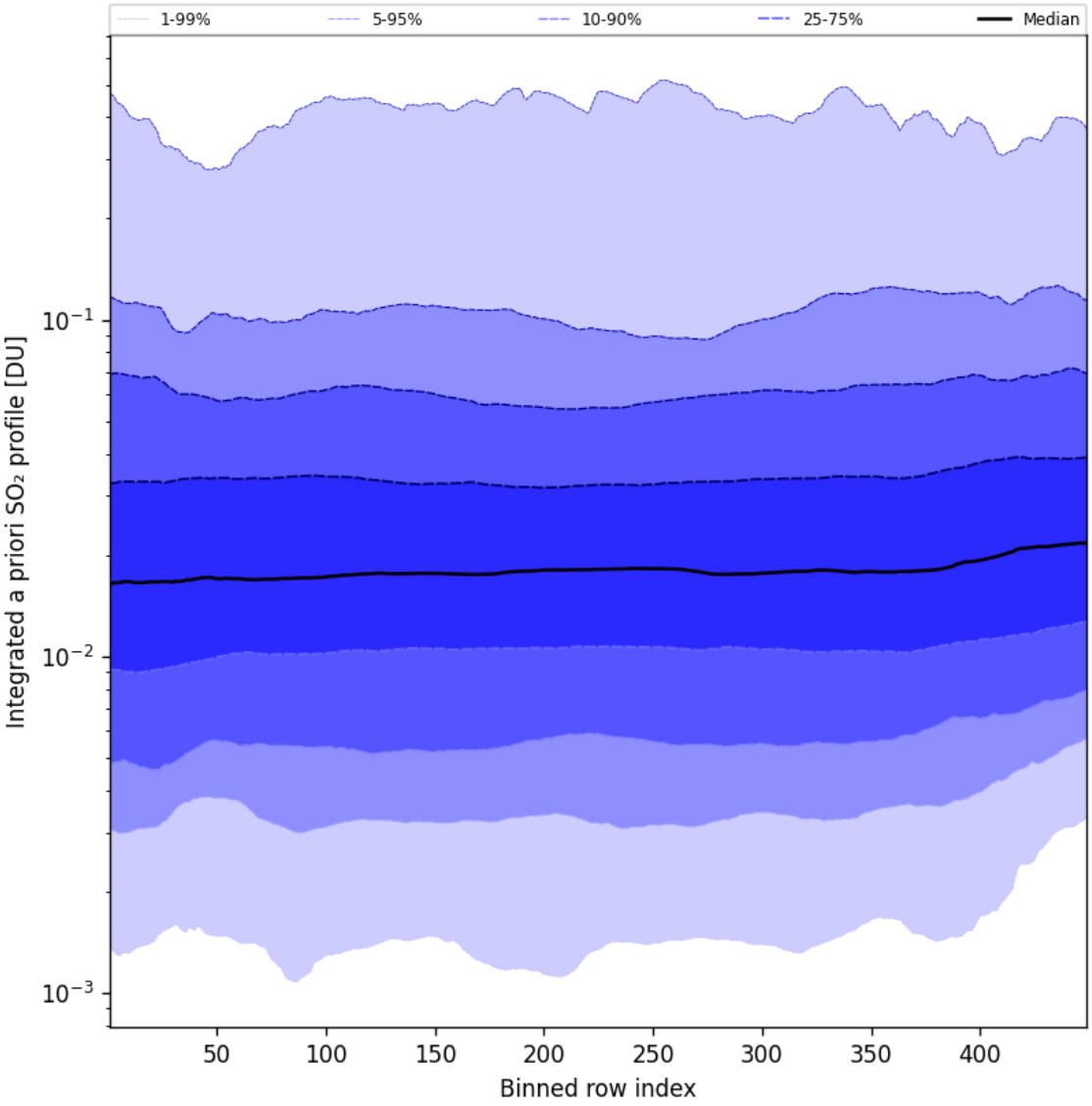

Figure 103: Along track statistics of “Integrated a priori SO_2 profile” for 2024-12-17 to 2024-12-18

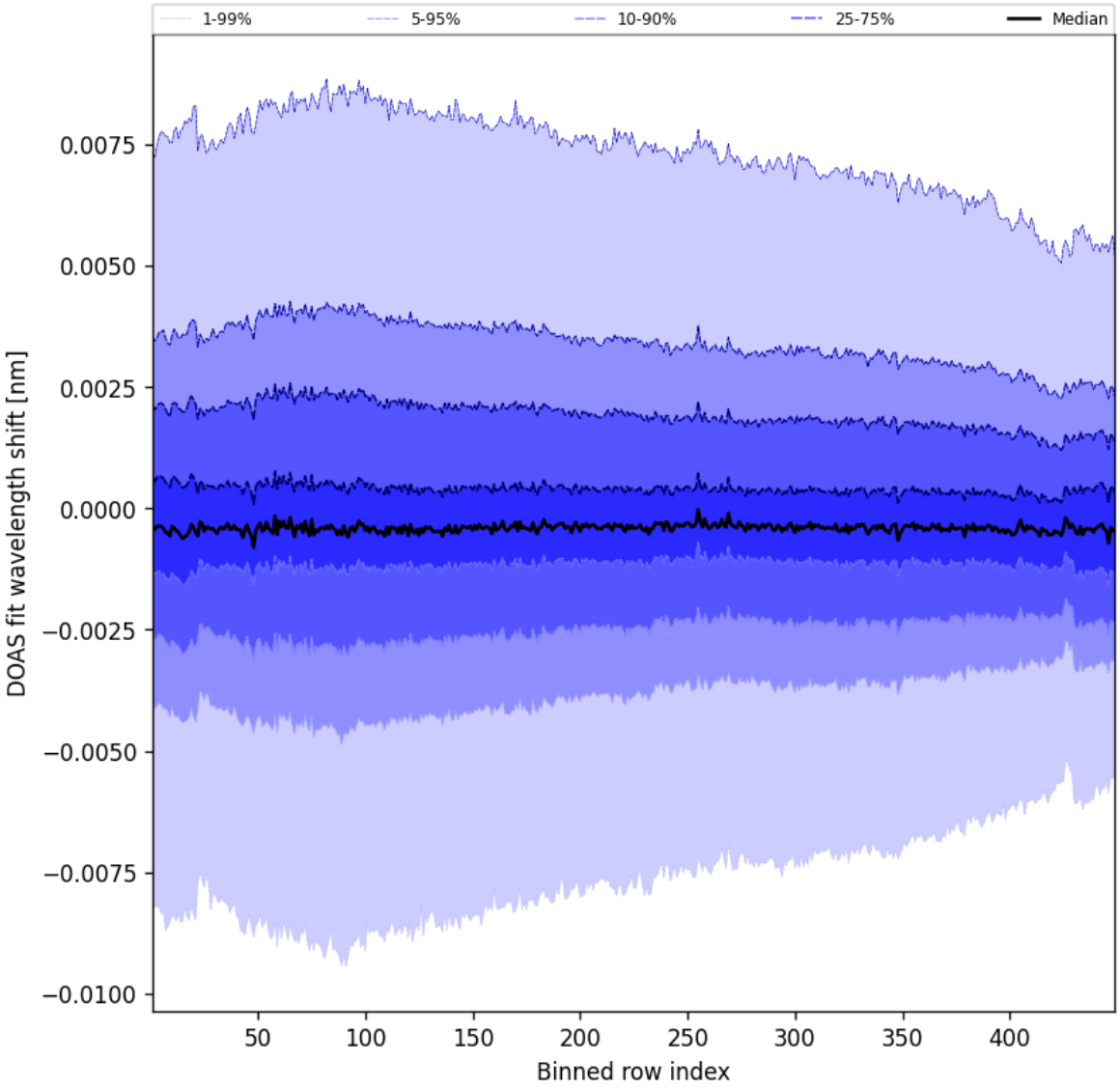

Figure 104: Along track statistics of “DOAS fit wavelength shift” for 2024-12-17 to 2024-12-18

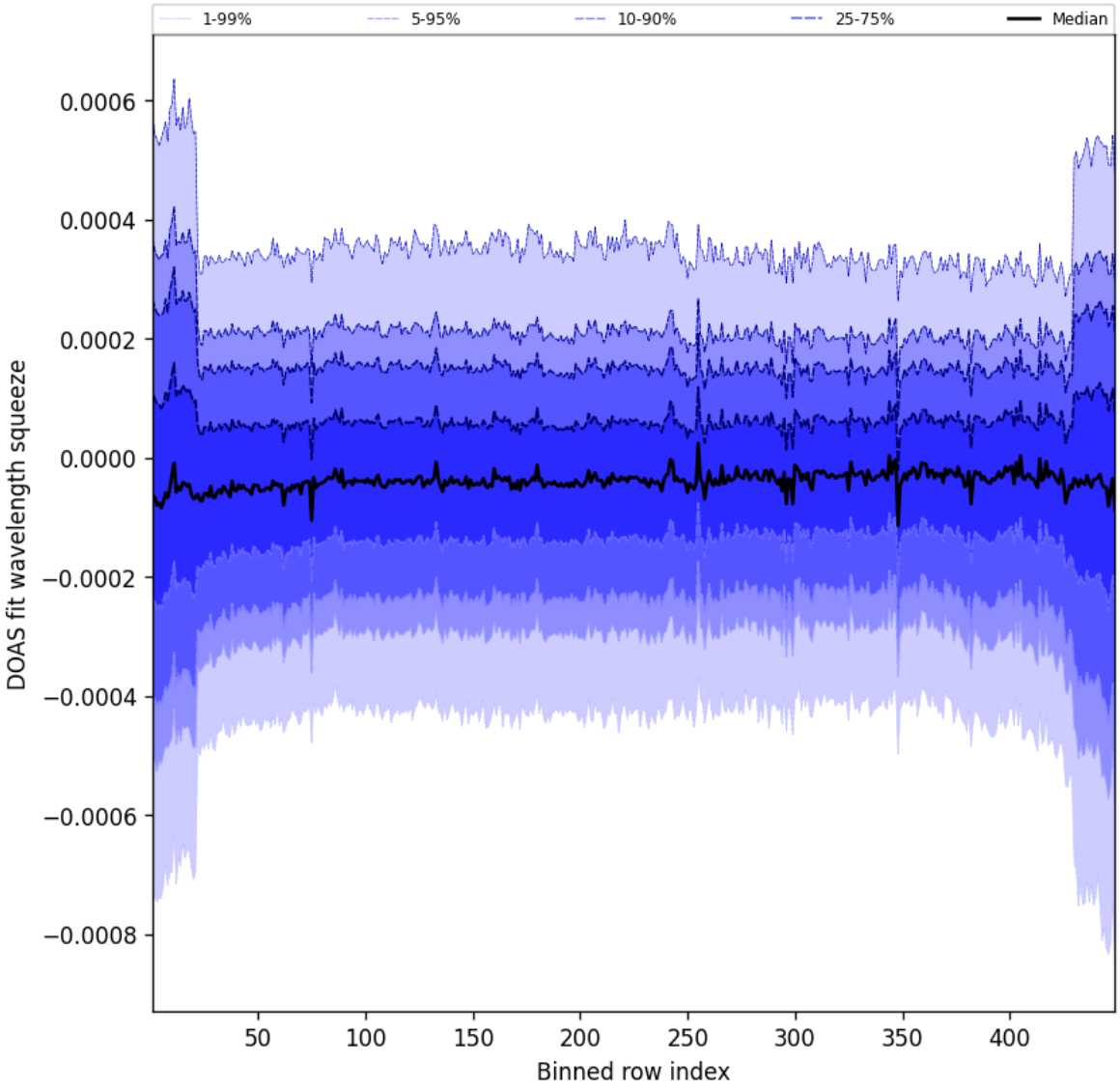

Figure 105: Along track statistics of “DOAS fit wavelength squeeze” for 2024-12-17 to 2024-12-18

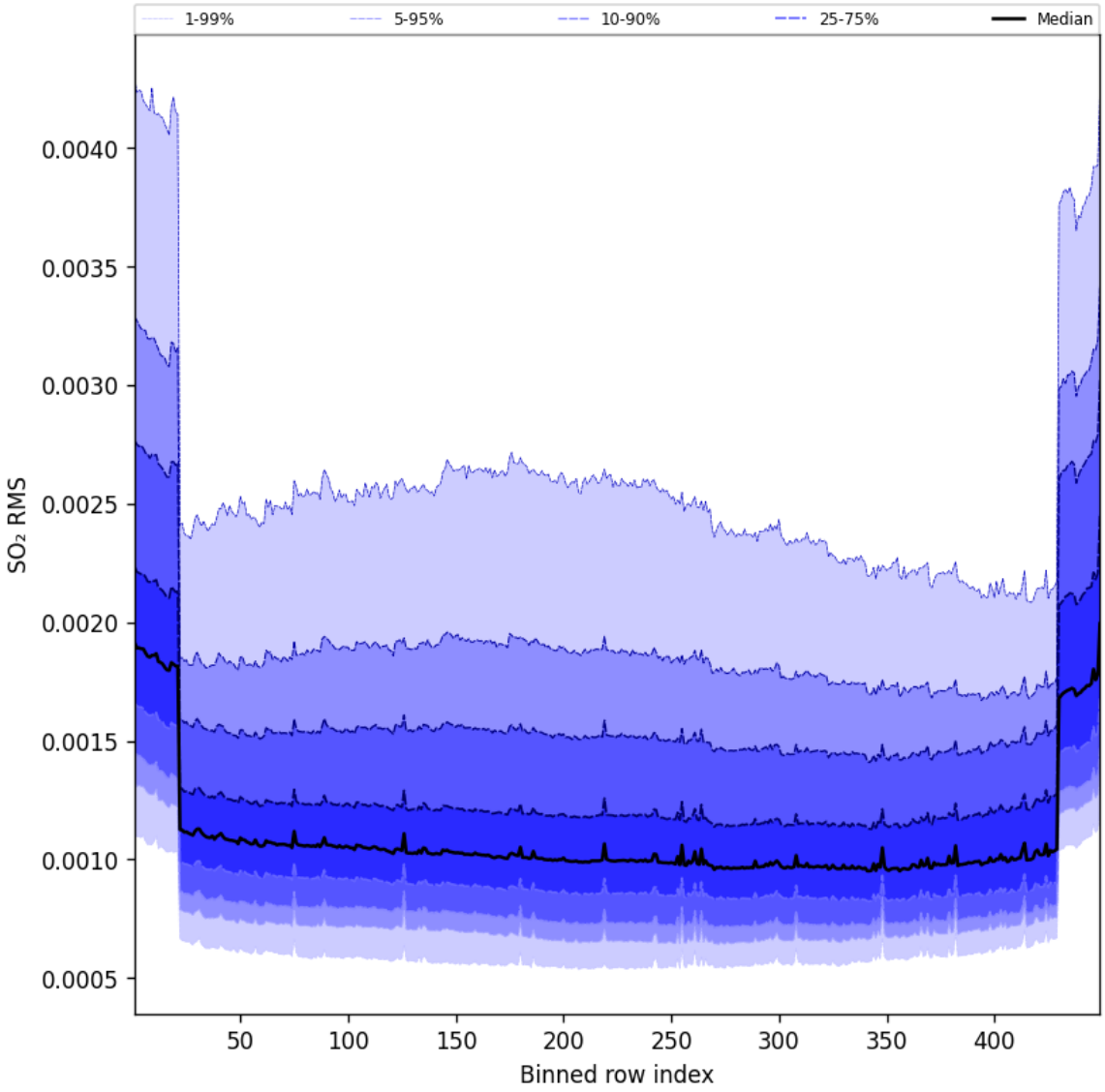

Figure 106: Along track statistics of "SO_2 RMS" for 2024-12-17 to 2024-12-18

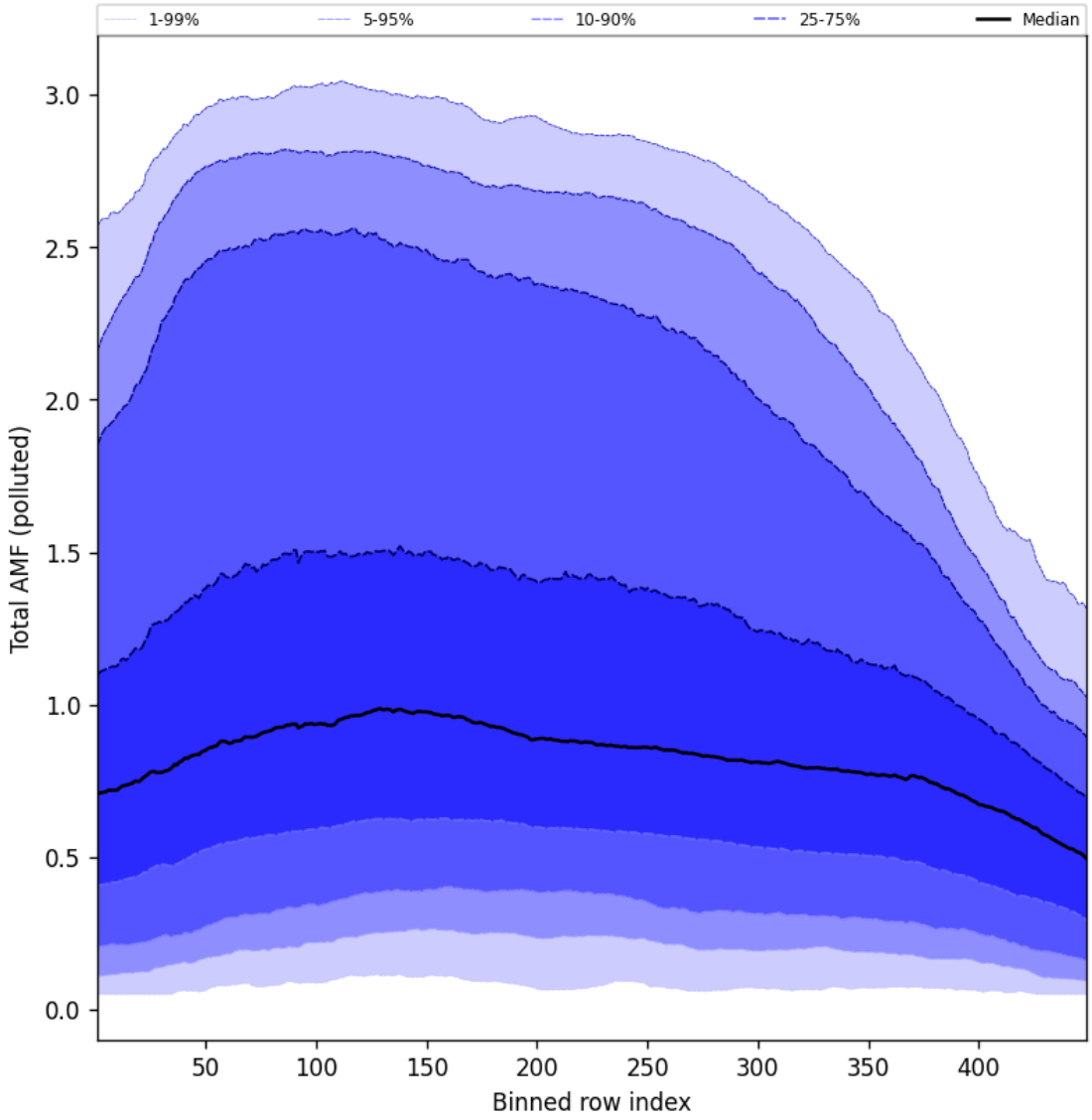

Figure 107: Along track statistics of “Total AMF (polluted)” for 2024-12-17 to 2024-12-18

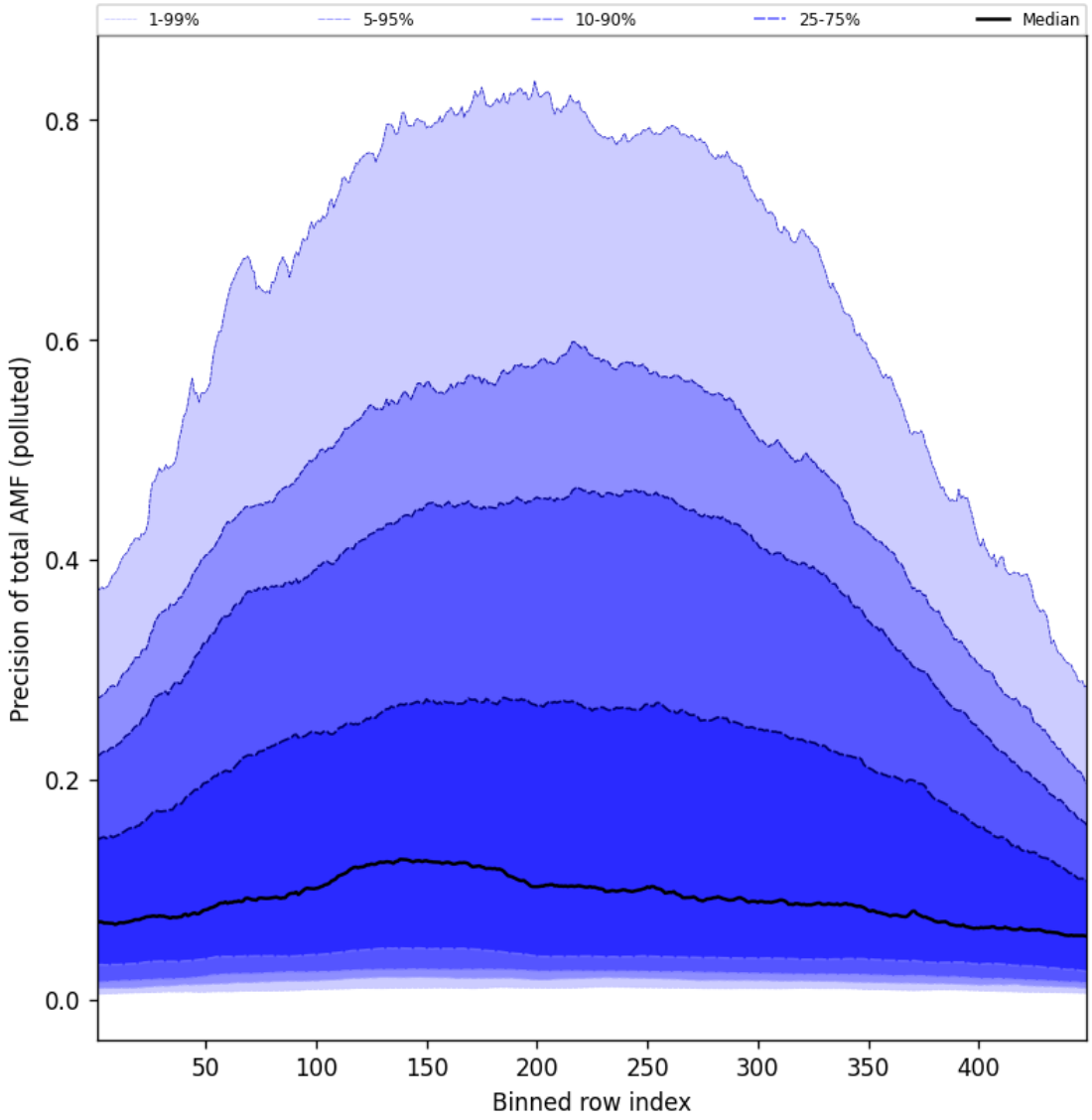

Figure 108: Along track statistics of “Precision of total AMF (polluted)” for 2024-12-17 to 2024-12-18

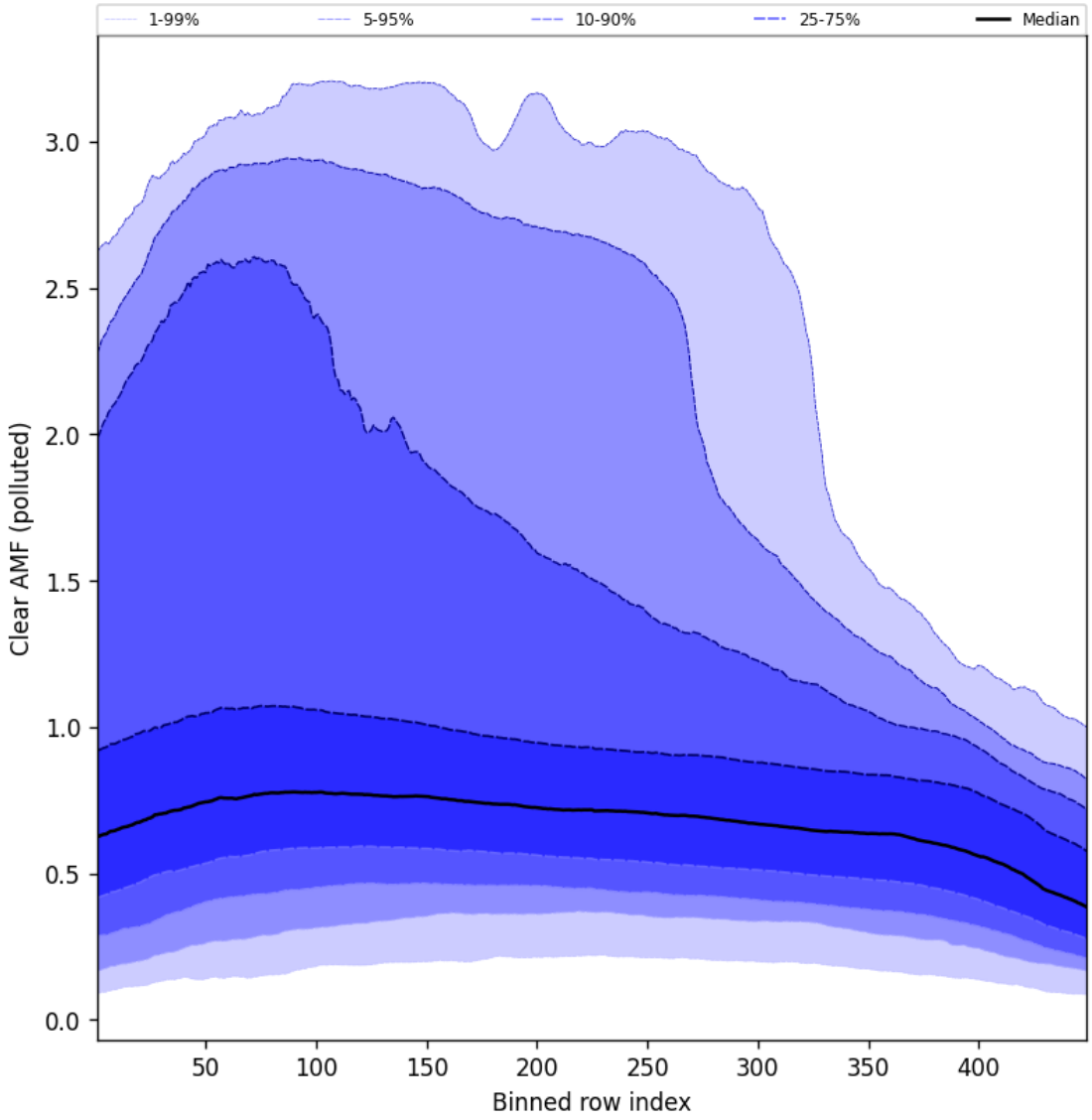

Figure 109: Along track statistics of “Clear AMF (polluted)” for 2024-12-17 to 2024-12-18

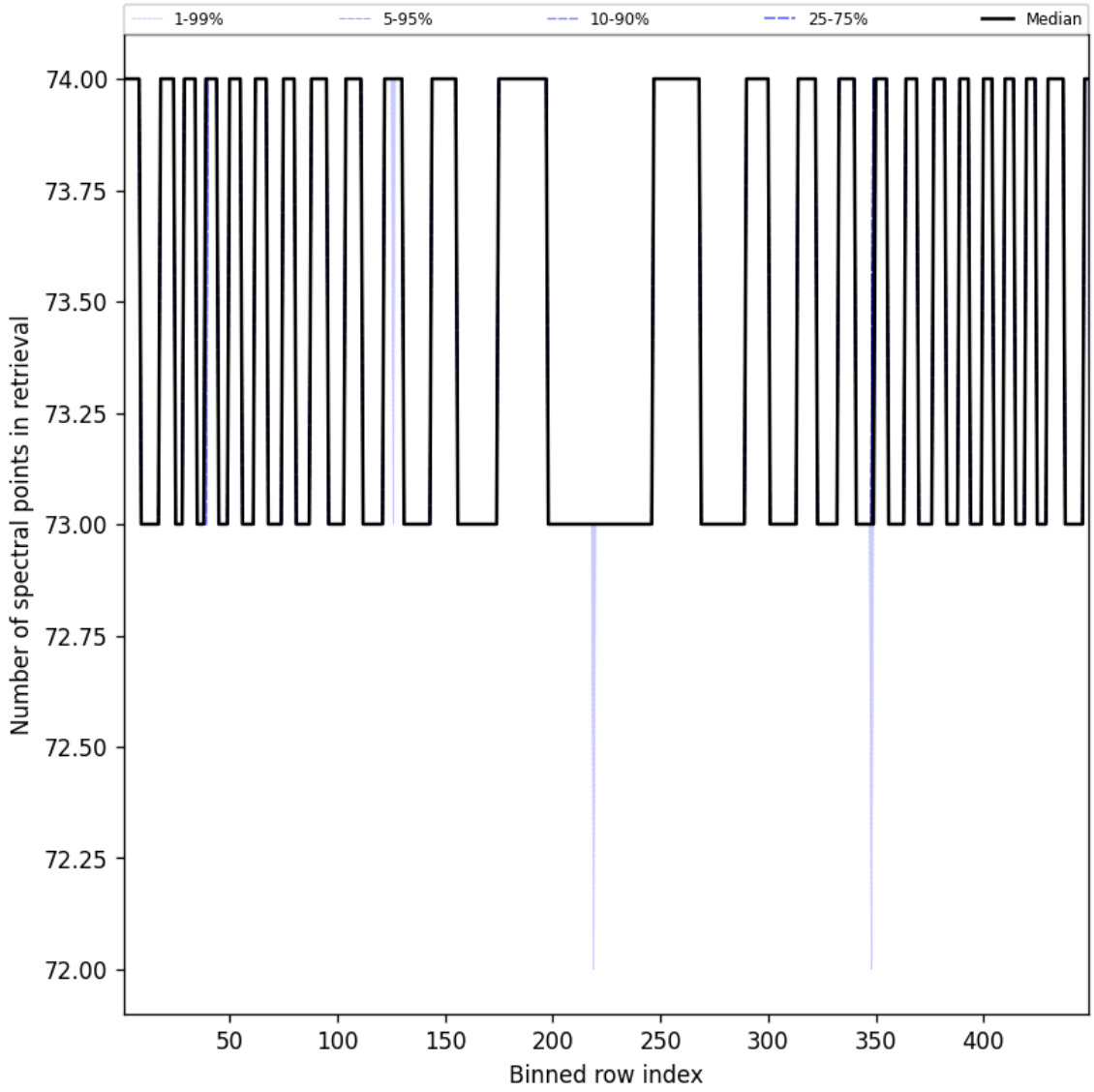

Figure 110: Along track statistics of “Number of spectral points in retrieval” for 2024-12-17 to 2024-12-18

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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11 Copyright information of 'PyCAMA'

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