PyCAMA report generated by tropl2-proc

tropl2-proc

2023-12-24 (01:45)

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]	0.779 ± 0.234	25091582	0.735	0.260	0.740	0.0	1.000
nitrogendioxide tropospheric column [mol m^{-2}]	$(9.866 \pm 64.437) \times 10^{-6}$	25091582	9.253×10^{-6}	1.021×10^{-5}	2.764×10^{-6}	-1.617×10^{-3}	9.181×10^{-3}
nitrogendioxide tropospheric column precision [mol m^{-2}]	$(1.229 \pm 5.027) \times 10^{-5}$	25091582	6.763×10^{-6}	4.977×10^{-6}	6.582×10^{-6}	2.966×10^{-6}	4.918×10^{-2}
air mass factor troposphere [1]	2.41 ± 1.35	25091582	1.86	1.50	2.07	3.761×10^{-3}	8.57
air mass factor total [1]	3.33 ± 1.81	25091582	2.10	1.24	2.73	0.360	14.3
number of spectral points in retrieval [1]	304 ± 1	25091582	304	1.000	304	234	305
number of iterations [1]	3.86 ± 1.17	25091582	4.22	1.000	4.00	3.00	9.00
wavelength calibration offset [nm]	$(-2.149 \pm 5.773) \times 10^{-3}$	25091582	-8.000×10^{-4}	4.635×10^{-3}	-1.896×10^{-3}	-6.598×10^{-2}	5.380×10^{-2}
nitrogendioxide stratospheric column [mol/m^2]	$(5.076 \pm 2.142) \times 10^{-5}$	25091582	3.250×10^{-5}	3.300×10^{-5}	4.753×10^{-5}	1.030×10^{-5}	1.390×10^{-4}
nitrogendioxide stratospheric column precision [mol/m^2]	$(3.321 \pm 0.000) \times 10^{-6}$	25091582	3.350×10^{-6}	0.0	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}
nitrogendioxide total column [mol/m^2]	$(5.859 \pm 2.417) \times 10^{-5}$	25091582	6.153×10^{-5}	2.706×10^{-5}	5.792×10^{-5}	2.629×10^{-6}	1.006×10^{-3}
nitrogendioxide total column precision [mol/m^2]	$(1.232 \pm 0.612) \times 10^{-5}$	25091582	1.289×10^{-5}	5.066×10^{-6}	1.199×10^{-5}	1.484×10^{-6}	7.862×10^{-4}
nitrogendioxide summed total column [mol/m^2]	$(6.063 \pm 6.407) \times 10^{-5}$	25091582	6.443×10^{-5}	2.816×10^{-5}	5.819×10^{-5}	-1.605×10^{-3}	9.193×10^{-3}
nitrogendioxide summed total column precision [mol/m^2]	$(1.310 \pm 5.018) \times 10^{-5}$	25091582	4.679×10^{-6}	4.453×10^{-6}	7.372×10^{-6}	4.452×10^{-6}	4.918×10^{-2}
chi square [1]	537 ± 610	25091582	312	190	405	154	3.416×10^4
root mean square error of fit [1]	$(3.961 \pm 2.503) \times 10^{-4}$	25091582	5.130×10^{-4}	3.041×10^{-4}	3.418×10^{-4}	8.658×10^{-5}	4.207×10^{-3}
air mass factor stratosphere [1]	3.69 ± 2.05	25091582	2.22	1.55	2.98	2.08	15.7

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	7.000×10^{-2}	0.200	0.660	0.730	0.740	1.000	1.000	1.000	1.000	1.000
nitrogendioxide tropospheric column [mol m^{-2}]	-2.897×10^{-5}	-8.788×10^{-6}	-4.570×10^{-6}	-2.540×10^{-6}	-8.450×10^{-7}	9.364×10^{-6}	1.354×10^{-5}	1.878×10^{-5}	3.179×10^{-5}	1.583×10^{-4}
nitrogendioxide tropospheric column precision [mol m^{-2}]	3.176×10^{-6}	3.351×10^{-6}	3.568×10^{-6}	3.861×10^{-6}	4.529×10^{-6}	9.505×10^{-6}	1.267×10^{-5}	1.725×10^{-5}	2.952×10^{-5}	1.036×10^{-4}
air mass factor troposphere [1]	0.269	0.665	0.981	1.25	1.54	3.03	3.82	4.43	5.22	6.39
air mass factor total [1]	1.38	2.02	2.09	2.17	2.29	3.53	4.27	5.39	7.39	11.0
number of spectral points in retrieval [1]	303	304	304	304	304	305	305	305	305	305
number of iterations [1]	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	8.00	8.00
wavelength calibration offset [nm]	-2.002×10^{-2}	-1.071×10^{-2}	-7.732×10^{-3}	-6.209×10^{-3}	-4.571×10^{-3}	6.387×10^{-5}	1.349×10^{-3}	3.120×10^{-3}	6.428×10^{-3}	1.581×10^{-2}
nitrogendioxide stratospheric column [mol/m^2]	1.408×10^{-5}	2.331×10^{-5}	2.887×10^{-5}	3.110×10^{-5}	3.287×10^{-5}	6.587×10^{-5}	7.379×10^{-5}	8.030×10^{-5}	8.916×10^{-5}	1.054×10^{-4}
nitrogendioxide stratospheric column precision [mol/m^2]	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}
nitrogendioxide total column [mol/m^2]	1.976×10^{-5}	3.089×10^{-5}	3.468×10^{-5}	3.780×10^{-5}	4.221×10^{-5}	6.927×10^{-5}	7.660×10^{-5}	8.364×10^{-5}	9.343×10^{-5}	1.207×10^{-4}
nitrogendioxide total column precision [mol/m^2]	4.390×10^{-6}	6.820×10^{-6}	7.635×10^{-6}	8.266×10^{-6}	9.123×10^{-6}	1.419×10^{-5}	1.563×10^{-5}	1.704×10^{-5}	1.905×10^{-5}	2.793×10^{-5}
nitrogendioxide summed total column [mol/m^2]	-1.795×10^{-7}	2.632×10^{-5}	3.266×10^{-5}	3.659×10^{-5}	4.157×10^{-5}	6.973×10^{-5}	7.698×10^{-5}	8.421×10^{-5}	9.452×10^{-5}	1.811×10^{-4}
nitrogendioxide summed total column precision [mol/m^2]	4.596×10^{-6}	4.718×10^{-6}	4.874×10^{-6}	5.092×10^{-6}	5.616×10^{-6}	1.007×10^{-5}	1.310×10^{-5}	1.756×10^{-5}	2.971×10^{-5}	1.036×10^{-4}
chi square [1]	233	262	283	301	327	517	611	768	1.190×10^3	3.101×10^3
root mean square error of fit [1]	1.199×10^{-4}	1.385×10^{-4}	1.544×10^{-4}	1.723×10^{-4}	2.054×10^{-4}	5.096×10^{-4}	5.871×10^{-4}	6.770×10^{-4}	8.577×10^{-4}	1.321×10^{-3}
air mass factor stratosphere [1]	2.10	2.14	2.20	2.28	2.42	3.97	4.97	6.27	8.44	12.1

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]	0.771 ± 0.273	9387378	0.260	0.740	0.0	1.000	0.740	1.000
nitrogendioxide tropospheric column [mol m^{-2}]	$(2.317 \pm 10.349) \times 10^{-5}$	9387378	1.602×10^{-5}	8.578×10^{-6}	-1.617×10^{-3}	9.181×10^{-3}	1.952×10^{-6}	1.797×10^{-5}
nitrogendioxide tropospheric column precision [mol m^{-2}]	$(2.256 \pm 8.094) \times 10^{-5}$	9387378	9.161×10^{-6}	9.609×10^{-6}	3.237×10^{-6}	4.918×10^{-2}	7.302×10^{-6}	1.646×10^{-5}
air mass factor troposphere [1]	1.67 ± 0.81	9387378	0.966	1.66	3.761×10^{-3}	7.05	1.13	2.10
air mass factor total [1]	3.19 ± 1.62	9387378	1.17	2.71	0.360	13.7	2.30	3.46
number of spectral points in retrieval [1]	304 ± 1	9387378	1.000	304	235	305	304	305
number of iterations [1]	3.77 ± 1.09	9387378	1.000	4.00	3.00	8.00	3.00	4.00
wavelength calibration offset [nm]	$(-1.806 \pm 6.290) \times 10^{-3}$	9387378	5.111×10^{-3}	-1.550×10^{-3}	-6.318×10^{-2}	5.371×10^{-2}	-4.415×10^{-3}	6.965×10^{-4}
nitrogendioxide stratospheric column [mol/m^2]	$(3.121 \pm 0.683) \times 10^{-5}$	9387378	7.080×10^{-6}	3.222×10^{-5}	1.030×10^{-5}	4.801×10^{-5}	2.859×10^{-5}	3.567×10^{-5}
nitrogendioxide stratospheric column precision [mol/m^2]	$(3.321 \pm 0.000) \times 10^{-6}$	9387378	0.0	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}
nitrogendioxide total column [mol/m^2]	$(4.856 \pm 3.081) \times 10^{-5}$	9387378	1.383×10^{-5}	4.282×10^{-5}	2.629×10^{-6}	1.006×10^{-3}	3.627×10^{-5}	5.010×10^{-5}
nitrogendioxide total column precision [mol/m^2]	$(1.076 \pm 0.895) \times 10^{-5}$	9387378	2.766×10^{-6}	9.205×10^{-6}	1.484×10^{-6}	7.862×10^{-4}	7.942×10^{-6}	1.071×10^{-5}
nitrogendioxide summed total column [mol/m^2]	$(5.438 \pm 10.217) \times 10^{-5}$	9387378	1.699×10^{-5}	4.193×10^{-5}	-1.605×10^{-3}	9.193×10^{-3}	3.420×10^{-5}	5.119×10^{-5}
nitrogendioxide summed total column precision [mol/m^2]	$(2.309 \pm 8.086) \times 10^{-5}$	9387378	8.773×10^{-6}	1.017×10^{-5}	4.637×10^{-6}	4.918×10^{-2}	8.022×10^{-6}	1.679×10^{-5}
chi square [1]	490 ± 555	9387378	162	350	154	3.032×10^4	296	458
root mean square error of fit [1]	$(3.838 \pm 2.539) \times 10^{-4}$	9387378	2.865×10^{-4}	3.177×10^{-4}	9.236×10^{-5}	4.207×10^{-3}	1.971×10^{-4}	4.836×10^{-4}
air mass factor stratosphere [1]	4.10 ± 2.20	9387378	1.93	3.33	2.12	15.7	2.66	4.60

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]	0.784 ± 0.207	15704204	0.200	0.740	0.0	1.000	0.730	0.930
nitrogendioxide tropospheric column [mol m^{-2}]	$(1.911 \pm 7.937) \times 10^{-6}$	15704204	6.528×10^{-6}	1.099×10^{-6}	-3.802×10^{-4}	8.390×10^{-4}	-1.359×10^{-6}	5.168×10^{-6}
nitrogendioxide tropospheric column precision [mol m^{-2}]	$(6.153 \pm 4.682) \times 10^{-6}$	15704204	3.054×10^{-6}	5.243×10^{-6}	2.966×10^{-6}	6.598×10^{-4}	3.849×10^{-6}	6.904×10^{-6}
air mass factor troposphere [1]	2.86 ± 1.41	15704204	1.96	2.48	2.155×10^{-2}	8.57	1.81	3.77
air mass factor total [1]	3.41 ± 1.91	15704204	1.29	2.75	0.685	14.3	2.28	3.57
number of spectral points in retrieval [1]	304 ± 1	15704204	1.000	304	234	305	304	305
number of iterations [1]	3.92 ± 1.22	15704204	1.000	4.00	3.00	9.00	3.00	4.00
wavelength calibration offset [nm]	$(-2.354 \pm 5.429) \times 10^{-3}$	15704204	4.384×10^{-3}	-2.077×10^{-3}	-6.598×10^{-2}	5.380×10^{-2}	-4.650×10^{-3}	-2.663×10^{-4}
nitrogendioxide stratospheric column [mol/m^2]	$(6.245 \pm 1.843) \times 10^{-5}$	15704204	2.209×10^{-5}	6.188×10^{-5}	2.485×10^{-5}	1.390×10^{-4}	5.192×10^{-5}	7.402×10^{-5}
nitrogendioxide stratospheric column precision [mol/m^2]	$(3.321 \pm 0.000) \times 10^{-6}$	15704204	0.0	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}
nitrogendioxide total column [mol/m^2]	$(6.459 \pm 1.644) \times 10^{-5}$	15704204	1.774×10^{-5}	6.406×10^{-5}	1.210×10^{-5}	5.039×10^{-4}	5.634×10^{-5}	7.408×10^{-5}
nitrogendioxide total column precision [mol/m^2]	$(1.325 \pm 0.310) \times 10^{-5}$	15704204	3.389×10^{-6}	1.309×10^{-5}	4.650×10^{-6}	1.010×10^{-4}	1.163×10^{-5}	1.502×10^{-5}
nitrogendioxide summed total column [mol/m^2]	$(6.437 \pm 1.678) \times 10^{-5}$	15704204	1.792×10^{-5}	6.425×10^{-5}	-3.360×10^{-4}	8.896×10^{-4}	5.616×10^{-5}	7.408×10^{-5}
nitrogendioxide summed total column precision [mol/m^2]	$(7.122 \pm 4.482) \times 10^{-6}$	15704204	2.577×10^{-6}	6.206×10^{-6}	4.452×10^{-6}	6.598×10^{-4}	5.084×10^{-6}	7.661×10^{-6}
chi square [1]	564 ± 640	15704204	181	433	163	3.416×10^4	357	538
root mean square error of fit [1]	$(4.034 \pm 2.478) \times 10^{-4}$	15704204	3.067×10^{-4}	3.555×10^{-4}	8.658×10^{-5}	4.133×10^{-3}	2.138×10^{-4}	5.205×10^{-4}
air mass factor stratosphere [1]	3.44 ± 1.91	15704204	1.26	2.78	2.08	14.5	2.32	3.58

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]	0.797 ± 0.206	16294703	0.260	0.740	0.0	1.000	0.740	1.000
nitrogendioxide tropospheric column [mol m^{-2}]	$(5.325 \pm 21.519) \times 10^{-6}$	16294703	9.519×10^{-6}	3.604×10^{-6}	-8.520×10^{-4}	9.181×10^{-3}	-6.150×10^{-7}	8.904×10^{-6}
nitrogendioxide tropospheric column precision [mol m^{-2}]	$(8.690 \pm 11.912) \times 10^{-6}$	16294703	3.596×10^{-6}	6.601×10^{-6}	3.091×10^{-6}	3.738×10^{-3}	5.128×10^{-6}	8.724×10^{-6}
air mass factor troposphere [1]	2.13 ± 0.98	16294703	0.950	1.99	3.147×10^{-2}	8.56	1.58	2.53
air mass factor total [1]	3.04 ± 1.59	16294703	0.848	2.57	0.405	14.3	2.26	3.11
number of spectral points in retrieval [1]	304 ± 1	16294703	1.000	304	235	305	304	305
number of iterations [1]	4.01 ± 1.24	16294703	1.000	4.00	3.00	9.00	3.00	4.00
wavelength calibration offset [nm]	$(-2.037 \pm 6.021) \times 10^{-3}$	16294703	4.899×10^{-3}	-1.824×10^{-3}	-6.598×10^{-2}	5.225×10^{-2}	-4.557×10^{-3}	3.423×10^{-4}
nitrogendioxide stratospheric column [mol/m^2]	$(4.854 \pm 1.826) \times 10^{-5}$	16294703	2.948×10^{-5}	4.468×10^{-5}	1.030×10^{-5}	1.390×10^{-4}	3.285×10^{-5}	6.233×10^{-5}
nitrogendioxide stratospheric column precision [mol/m^2]	$(3.321 \pm 0.000) \times 10^{-6}$	16294703	0.0	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}
nitrogendioxide total column [mol/m^2]	$(5.420 \pm 1.764) \times 10^{-5}$	16294703	2.481×10^{-5}	5.445×10^{-5}	2.629×10^{-6}	8.500×10^{-4}	4.051×10^{-5}	6.531×10^{-5}
nitrogendioxide total column precision [mol/m^2]	$(1.135 \pm 0.366) \times 10^{-5}$	16294703	4.577×10^{-6}	1.139×10^{-5}	1.548×10^{-6}	4.048×10^{-4}	8.800×10^{-6}	1.338×10^{-5}
nitrogendioxide summed total column [mol/m^2]	$(5.387 \pm 2.458) \times 10^{-5}$	16294703	2.557×10^{-5}	5.508×10^{-5}	-8.401×10^{-4}	9.193×10^{-3}	4.010×10^{-5}	6.567×10^{-5}
nitrogendioxide summed total column precision [mol/m^2]	$(9.480 \pm 11.772) \times 10^{-6}$	16294703	3.225×10^{-6}	7.389×10^{-6}	4.537×10^{-6}	3.738×10^{-3}	6.110×10^{-6}	9.335×10^{-6}
chi square [1]	557 ± 604	16294703	206	416	154	3.273×10^4	336	542
root mean square error of fit [1]	$(3.416 \pm 2.252) \times 10^{-4}$	16294703	2.190×10^{-4}	2.911×10^{-4}	9.336×10^{-5}	4.133×10^{-3}	1.890×10^{-4}	4.080×10^{-4}
air mass factor stratosphere [1]	3.29 ± 1.81	16294703	1.01	2.69	2.08	15.7	2.33	3.35

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]	0.773 ± 0.254	7556904	0.150	0.880	0.0	1.000	0.730	0.880
nitrogendioxide tropospheric column [mol m^{-2}]	$(1.348 \pm 7.948) \times 10^{-5}$	7556904	1.037×10^{-5}	1.095×10^{-6}	-9.685×10^{-4}	7.447×10^{-3}	-1.018×10^{-6}	9.352×10^{-6}
nitrogendioxide tropospheric column precision [mol m^{-2}]	$(1.372 \pm 5.754) \times 10^{-5}$	7556904	6.618×10^{-6}	5.476×10^{-6}	2.966×10^{-6}	4.918×10^{-2}	3.507×10^{-6}	1.013×10^{-5}
air mass factor troposphere [1]	3.13 ± 1.72	7556904	2.89	3.43	3.761×10^{-3}	8.57	1.54	4.44
air mass factor total [1]	3.89 ± 1.98	7556904	1.99	3.37	0.360	14.2	2.55	4.54
number of spectral points in retrieval [1]	304 ± 1	7556904	1.000	304	234	305	304	305
number of iterations [1]	3.59 ± 0.98	7556904	1.000	3.00	3.00	9.00	3.00	4.00
wavelength calibration offset [nm]	$(-2.417 \pm 5.154) \times 10^{-3}$	7556904	4.162×10^{-3}	-2.044×10^{-3}	-6.553×10^{-2}	5.371×10^{-2}	-4.607×10^{-3}	-4.443×10^{-4}
nitrogendioxide stratospheric column [mol/m^2]	$(5.853 \pm 2.522) \times 10^{-5}$	7556904	4.497×10^{-5}	5.936×10^{-5}	1.066×10^{-5}	1.328×10^{-4}	3.475×10^{-5}	7.971×10^{-5}
nitrogendioxide stratospheric column precision [mol/m^2]	$(3.321 \pm 0.000) \times 10^{-6}$	7556904	0.0	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}	3.321×10^{-6}
nitrogendioxide total column [mol/m^2]	$(6.763 \pm 2.748) \times 10^{-5}$	7556904	3.293×10^{-5}	6.495×10^{-5}	3.086×10^{-6}	1.006×10^{-3}	4.947×10^{-5}	8.239×10^{-5}
nitrogendioxide total column precision [mol/m^2]	$(1.418 \pm 0.760) \times 10^{-5}$	7556904	6.070×10^{-6}	1.334×10^{-5}	1.484×10^{-6}	7.862×10^{-4}	1.066×10^{-5}	1.673×10^{-5}
nitrogendioxide summed total column [mol/m^2]	$(7.201 \pm 7.756) \times 10^{-5}$	7556904	3.386×10^{-5}	6.555×10^{-5}	-9.565×10^{-4}	7.479×10^{-3}	4.956×10^{-5}	8.343×10^{-5}
nitrogendioxide summed total column precision [mol/m^2]	$(1.462 \pm 5.742) \times 10^{-5}$	7556904	5.826×10^{-6}	6.404×10^{-6}	4.452×10^{-6}	4.918×10^{-2}	4.830×10^{-6}	1.066×10^{-5}
chi square [1]	502 ± 613	7556904	163	395	166	3.416×10^4	320	483
root mean square error of fit [1]	$(4.903 \pm 2.486) \times 10^{-4}$	7556904	2.878×10^{-4}	4.970×10^{-4}	8.658×10^{-5}	4.207×10^{-3}	3.093×10^{-4}	5.972×10^{-4}
air mass factor stratosphere [1]	4.28 ± 2.06	7556904	1.98	3.65	2.08	15.6	2.94	4.92

Table 7: Correlation matrix

Viewing zenith angle	Solar zenith angle	Latitude	NO_2 tropospheric vertical column	NO_2 tropospheric vertical column precision	Tropospheric airmass factor	Total airmass factor	Wavelength calibration offset	Stratospheric vertical NO_2 column	Total vertical NO_2 column	Total vertical NO_2 column precision	Summed vertical NO_2 column	Summed vertical NO_2 column precision	χ^2	RMS	Stratospheric airmass factor
1.000	5.579×10^{-3}	-1.362×10^{-4}	-8.386×10^{-3}	9.557×10^{-3}	8.227×10^{-2}	0.174	−0.288	8.800×10^{-3}	1.441×10^{-2}	-7.246×10^{-4}	-5.493×10^{-3}	9.251×10^{-3}	2.202×10^{-2}	0.189	0.174
5.579×10^{-3}	1.000	6.998×10^{-2}	8.610×10^{-2}	0.134	0.494	0.678	-1.728×10^{-2}	0.173	0.263	0.201	0.144	0.134	−0.203	0.680	0.774
-1.362×10^{-4}	6.998×10^{-2}	1.000	0.190	0.195	−0.637	−0.157	6.269×10^{-2}	−0.876	−0.431	−0.275	−0.102	0.190	-1.729×10^{-2}	−0.136	0.104
-8.386×10^{-3}	8.610×10^{-2}	0.190	1.000	0.717	−0.188	−0.131	4.479×10^{-2}	−0.183	0.474	0.447	0.944	0.717	-2.135×10^{-2}	1.407×10^{-2}	8.685×10^{-2}
9.557×10^{-3}	0.134	0.195	0.717	1.000	−0.178	-4.277×10^{-2}	7.004×10^{-3}	−0.170	0.328	0.377	0.664	1.000	-2.029×10^{-2}	0.119	0.193
8.227×10^{-2}	0.494	−0.637	−0.188	−0.178	1.000	0.686	−0.101	0.712	0.314	0.193	4.904×10^{-2}	−0.174	-6.904×10^{-2}	0.534	0.451
0.174	0.678	−0.157	−0.131	-4.277×10^{-2}	0.686	1.000	−0.105	0.359	0.107	3.787×10^{-2}	-1.214×10^{-2}	-4.302×10^{-2}	−0.147	0.782	0.881
−0.288	-1.728×10^{-2}	6.269×10^{-2}	4.479×10^{-2}	7.004×10^{-3}	−0.101	−0.105	1.000	-6.346×10^{-2}	1.994×10^{-2}	1.895×10^{-2}	2.383×10^{-2}	6.668×10^{-3}	0.101	-6.226×10^{-2}	-8.975×10^{-2}
8.800×10^{-3}	0.173	−0.876	−0.183	−0.170	0.712	0.359	-6.346×10^{-2}	1.000	0.573	0.392	0.150	−0.166	-4.319×10^{-2}	0.283	0.113
1.441×10^{-2}	0.263	−0.431	0.474	0.328	0.314	0.107	1.994×10^{-2}	0.573	1.000	0.885	0.668	0.329	-6.570×10^{-2}	0.238	0.188
-7.246×10^{-4}	0.201	−0.275	0.447	0.377	0.193	3.787×10^{-2}	1.895×10^{-2}	0.392	0.885	1.000	0.580	0.378	-7.430×10^{-4}	0.179	0.137
-5.493×10^{-3}	0.144	−0.102	0.944	0.664	4.904×10^{-2}	-1.214×10^{-2}	2.383×10^{-2}	0.150	0.668	0.580	1.000	0.665	-3.591×10^{-2}	0.109	0.125
9.251×10^{-3}	0.134	0.190	0.717	1.000	−0.174	-4.302×10^{-2}	6.668×10^{-3}	−0.166	0.329	0.378	0.665	1.000	-2.073×10^{-2}	0.119	0.192
2.202×10^{-2}	−0.203	-1.729×10^{-2}	-2.135×10^{-2}	-2.029×10^{-2}	-6.904×10^{-2}	−0.147	0.101	-4.319×10^{-2}	-6.570×10^{-2}	-7.430×10^{-4}	-3.591×10^{-2}	-2.073×10^{-2}	1.000	0.181	−0.173
0.189	0.680	−0.136	1.407×10^{-2}	0.119	0.534	0.782	-6.226×10^{-2}	0.283	0.238	0.179	0.109	0.119	0.181	1.000	0.820
0.174	0.774	0.104	8.685×10^{-2}	0.193	0.451	0.881	-8.975×10^{-2}	0.113	0.188	0.137	0.125	0.192	−0.173	0.820	1.000

Table 8: Covariance matrix

Viewing zenith angle	Solar zenith angle	Latitude	NO_2 tropospheric vertical column	NO_2 tropospheric vertical column precision	Tropospheric airmass factor	Total airmass factor	Wavelength calibration offset	Stratospheric vertical NO_2 column	Total vertical NO_2 column	Total vertical NO_2 column precision	Summed vertical NO_2 column	Summed vertical NO_2 column precision	χ^2	RMS	Stratospheric airmass factor
383	2.12	−0.122	-1.058×10^{-5}	9.403×10^{-6}	2.18	6.17	-3.251×10^{-2}	3.688×10^{-6}	6.819×10^{-6}	-8.676×10^{-8}	-6.887×10^{-6}	9.086×10^{-6}	263	9.261×10^{-4}	6.98
2.12	376	61.9	1.077×10^{-4}	1.306×10^{-4}	13.0	23.8	-1.936×10^{-3}	7.187×10^{-5}	1.234×10^{-4}	2.386×10^{-5}	1.795×10^{-4}	1.302×10^{-4}	-2.409×10^{3}	3.302×10^{-3}	30.8
−0.122	61.9	2.078×10^{3}	5.571×10^{-4}	4.475×10^{-4}	−39.2	−13.0	1.649×10^{-2}	-8.553×10^{-4}	-4.746×10^{-4}	-7.679×10^{-5}	-2.982×10^{-4}	4.351×10^{-4}	−481	-1.556×10^{-3}	9.68
-1.058×10^{-5}	1.077×10^{-4}	5.571×10^{-4}	4.152×10^{-9}	2.322×10^{-9}	-1.637×10^{-5}	-1.534×10^{-5}	1.666×10^{-8}	-2.532×10^{-10}	7.385×10^{-10}	1.760×10^{-10}	3.899×10^{-9}	2.317×10^{-9}	-8.396×10^{-4}	2.268×10^{-10}	1.147×10^{-5}
9.403×10^{-6}	1.306×10^{-4}	4.475×10^{-4}	2.322×10^{-9}	2.527×10^{-9}	-1.209×10^{-5}	-3.896×10^{-6}	2.033×10^{-9}	-1.827×10^{-10}	3.981×10^{-10}	1.160×10^{-10}	2.139×10^{-9}	2.523×10^{-9}	-6.226×10^{-4}	1.498×10^{-9}	1.990×10^{-5}
2.18	13.0	−39.2	-1.637×10^{-5}	-1.209×10^{-5}	1.83	1.68	-7.895×10^{-4}	2.062×10^{-5}	1.027×10^{-5}	1.595×10^{-6}	4.245×10^{-6}	-1.179×10^{-5}	−56.9	1.804×10^{-4}	1.25
6.17	23.8	−13.0	-1.534×10^{-5}	-3.896×10^{-6}	1.68	3.28	-1.103×10^{-3}	1.393×10^{-5}	4.678×10^{-6}	4.199×10^{-7}	-1.409×10^{-6}	-3.911×10^{-6}	−163	3.548×10^{-4}	3.27
-3.251×10^{-2}	-1.936×10^{-3}	1.649×10^{-2}	1.666×10^{-8}	2.033×10^{-9}	-7.895×10^{-4}	-1.103×10^{-3}	3.332×10^{-5}	-7.845×10^{-9}	2.782×10^{-9}	6.693×10^{-10}	8.814×10^{-9}	1.932×10^{-9}	0.355	-8.995×10^{-8}	-1.062×10^{-3}
3.688×10^{-6}	7.187×10^{-5}	-8.553×10^{-4}	-2.532×10^{-10}	-1.827×10^{-10}	2.062×10^{-5}	1.393×10^{-5}	-7.845×10^{-9}	4.587×10^{-10}	2.967×10^{-10}	5.131×10^{-11}	2.055×10^{-10}	-1.779×10^{-10}	-5.647×10^{-4}	1.517×10^{-9}	4.951×10^{-6}
6.819×10^{-6}	1.234×10^{-4}	-4.746×10^{-4}	7.385×10^{-10}	3.981×10^{-10}	1.027×10^{-5}	4.678×10^{-6}	2.782×10^{-9}	2.967×10^{-10}	5.844×10^{-10}	1.308×10^{-10}	1.035×10^{-9}	3.996×10^{-10}	-9.696×10^{-4}	1.442×10^{-9}	9.295×10^{-6}
-8.676×10^{-8}	2.386×10^{-5}	-7.679×10^{-5}	1.760×10^{-10}	1.160×10^{-10}	1.595×10^{-6}	4.199×10^{-7}	6.693×10^{-10}	5.131×10^{-11}	1.308×10^{-10}	3.743×10^{-11}	2.274×10^{-10}	1.162×10^{-10}	-2.775×10^{-6}	2.741×10^{-10}	1.723×10^{-6}
-6.887×10^{-6}	1.795×10^{-4}	-2.982×10^{-4}	3.899×10^{-9}	2.139×10^{-9}	4.245×10^{-6}	-1.409×10^{-6}	8.814×10^{-9}	2.055×10^{-10}	1.035×10^{-9}	2.274×10^{-10}	4.104×10^{-9}	2.139×10^{-9}	-1.404×10^{-3}	1.744×10^{-9}	1.642×10^{-5}
9.086×10^{-6}	1.302×10^{-4}	4.351×10^{-4}	2.317×10^{-9}	2.523×10^{-9}	-1.179×10^{-5}	-3.911×10^{-6}	1.932×10^{-9}	-1.779×10^{-10}	3.996×10^{-10}	1.162×10^{-10}	2.139×10^{-9}	2.518×10^{-9}	-6.350×10^{-4}	1.492×10^{-9}	1.970×10^{-5}
263	-2.409×10^{3}	−481	-8.396×10^{-4}	-6.226×10^{-4}	−56.9	−163	0.355	-5.647×10^{-4}	-9.696×10^{-4}	-2.775×10^{-6}	-1.404×10^{-3}	-6.350×10^{-4}	3.727×10^{5}	2.763×10^{-2}	−217
9.261×10^{-4}	3.302×10^{-3}	-1.556×10^{-3}	2.268×10^{-10}	1.498×10^{-9}	1.804×10^{-4}	3.548×10^{-4}	-8.995×10^{-8}	1.517×10^{-9}	1.442×10^{-9}	2.741×10^{-10}	1.744×10^{-9}	1.492×10^{-9}	2.763×10^{-2}	6.264×10^{-8}	4.207×10^{-4}
6.98	30.8	9.68	1.147×10^{-5}	1.990×10^{-5}	1.25	3.27	-1.062×10^{-3}	4.951×10^{-6}	9.295×10^{-6}	1.723×10^{-6}	1.642×10^{-5}	1.970×10^{-5}	−217	4.207×10^{-4}	4.20

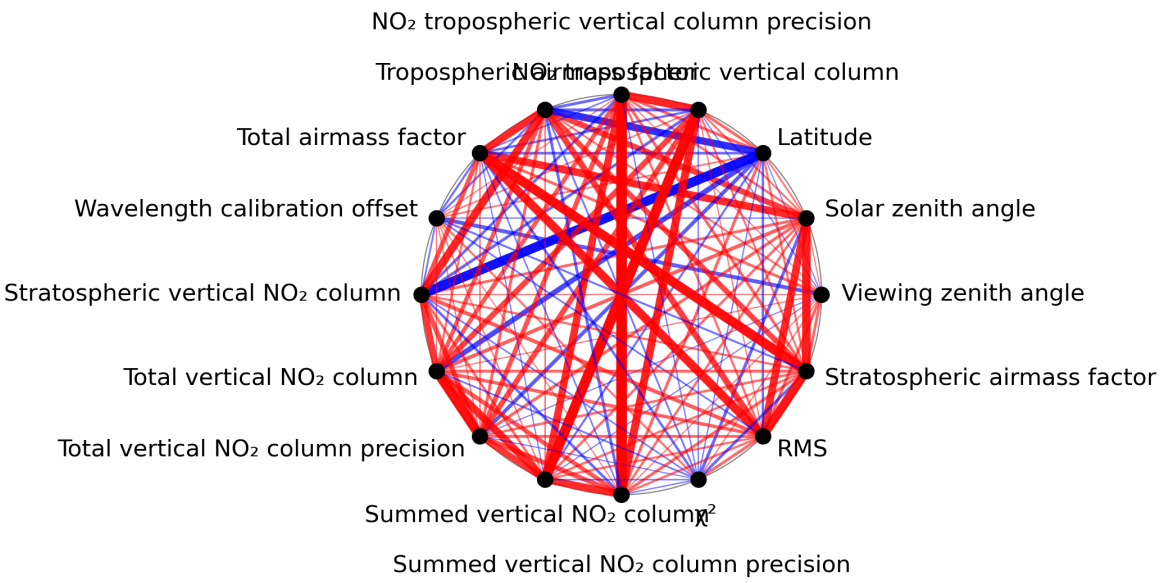


Figure 1: Map of correlation graph for 2023-12-09 to 2023-12-10.

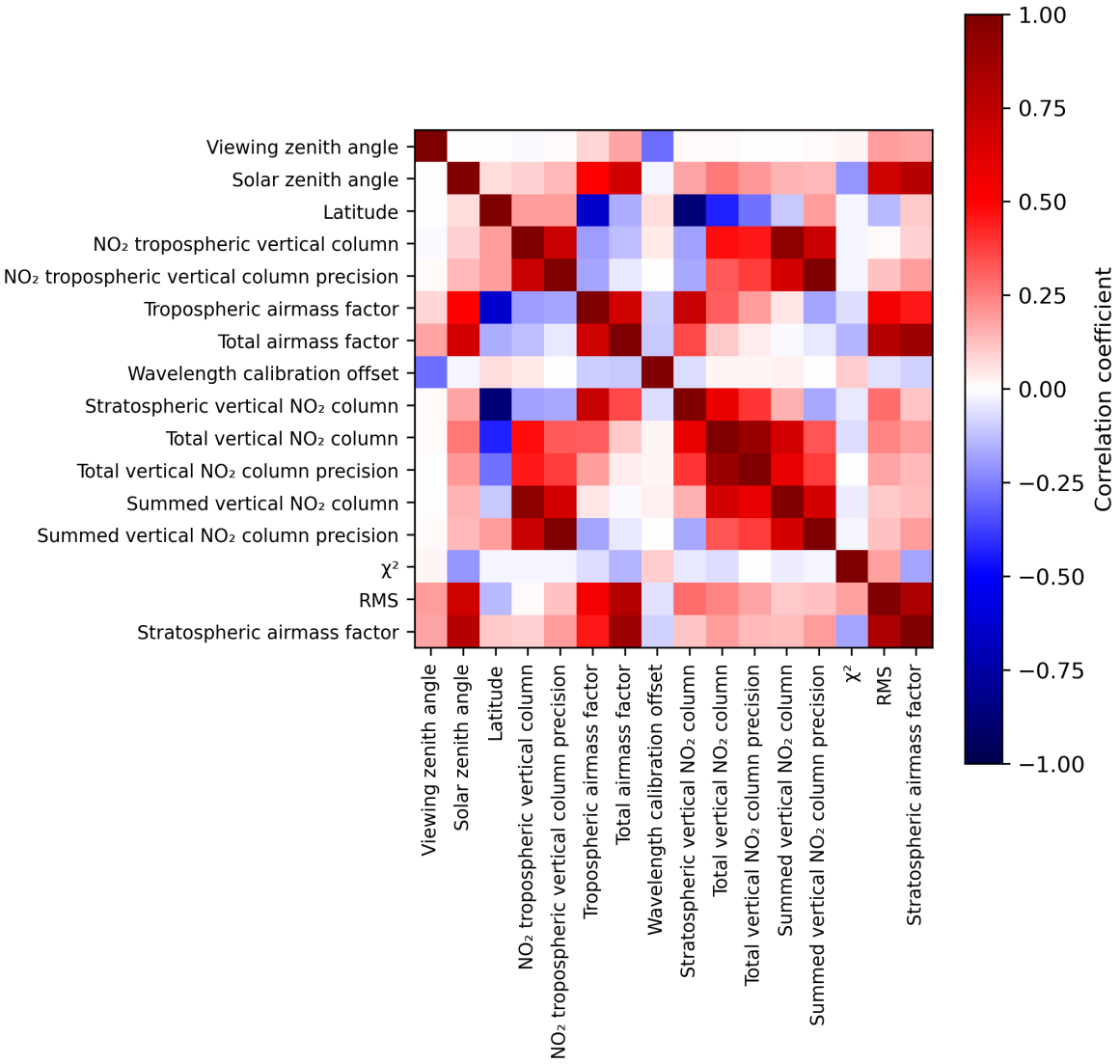


Figure 2: Map of correlation matrix for 2023-12-09 to 2023-12-10.

3 Granule outlines

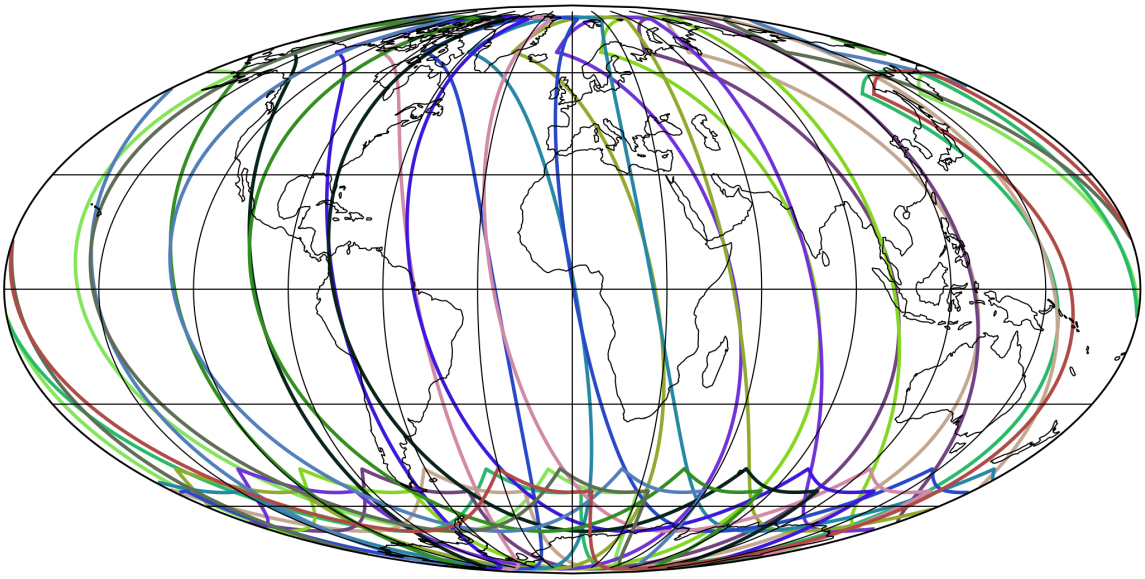


Figure 3: Outline of the granules.

4 Input data monitoring

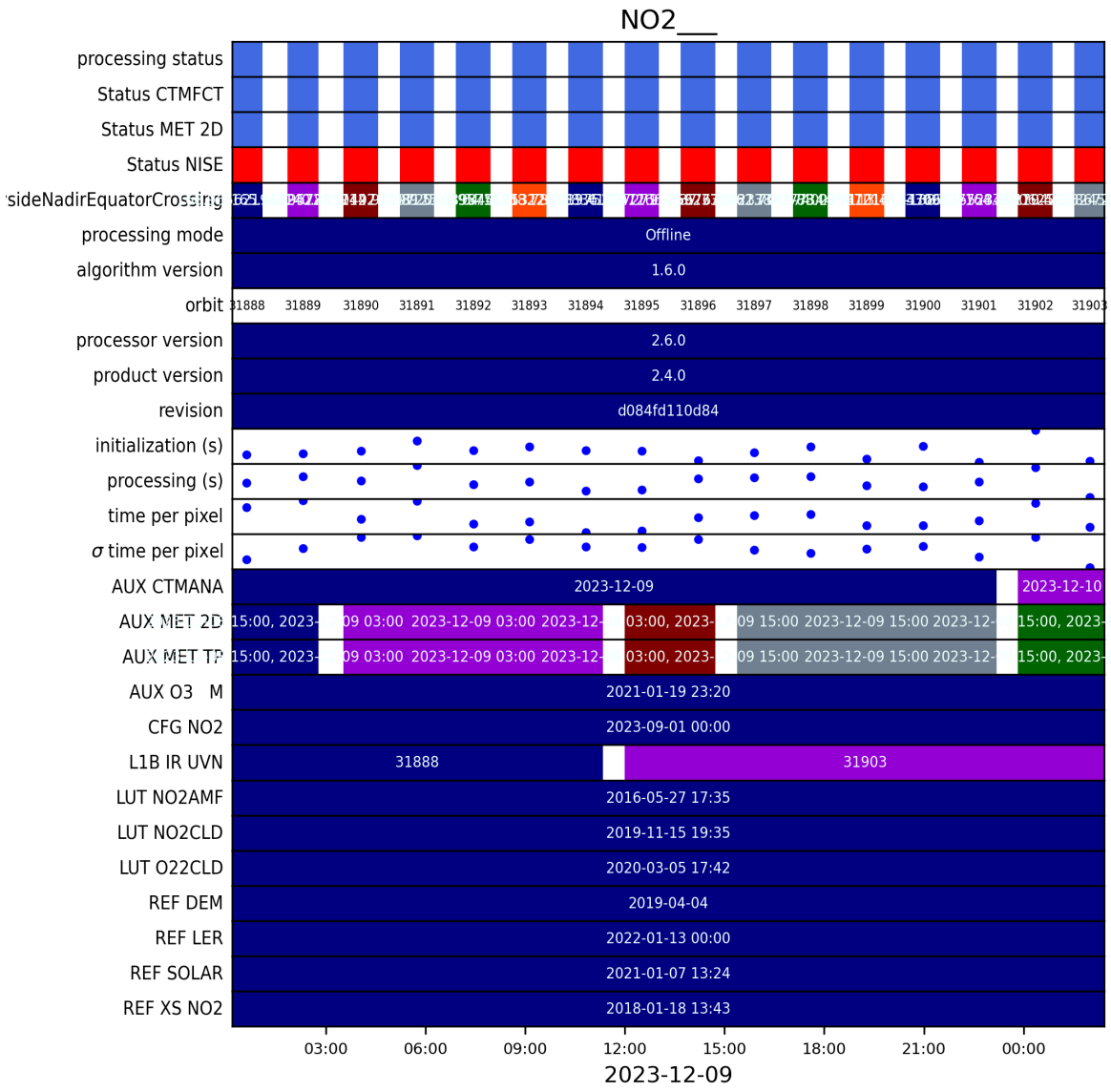


Figure 4: Input data per granule

5 Warnings and errors

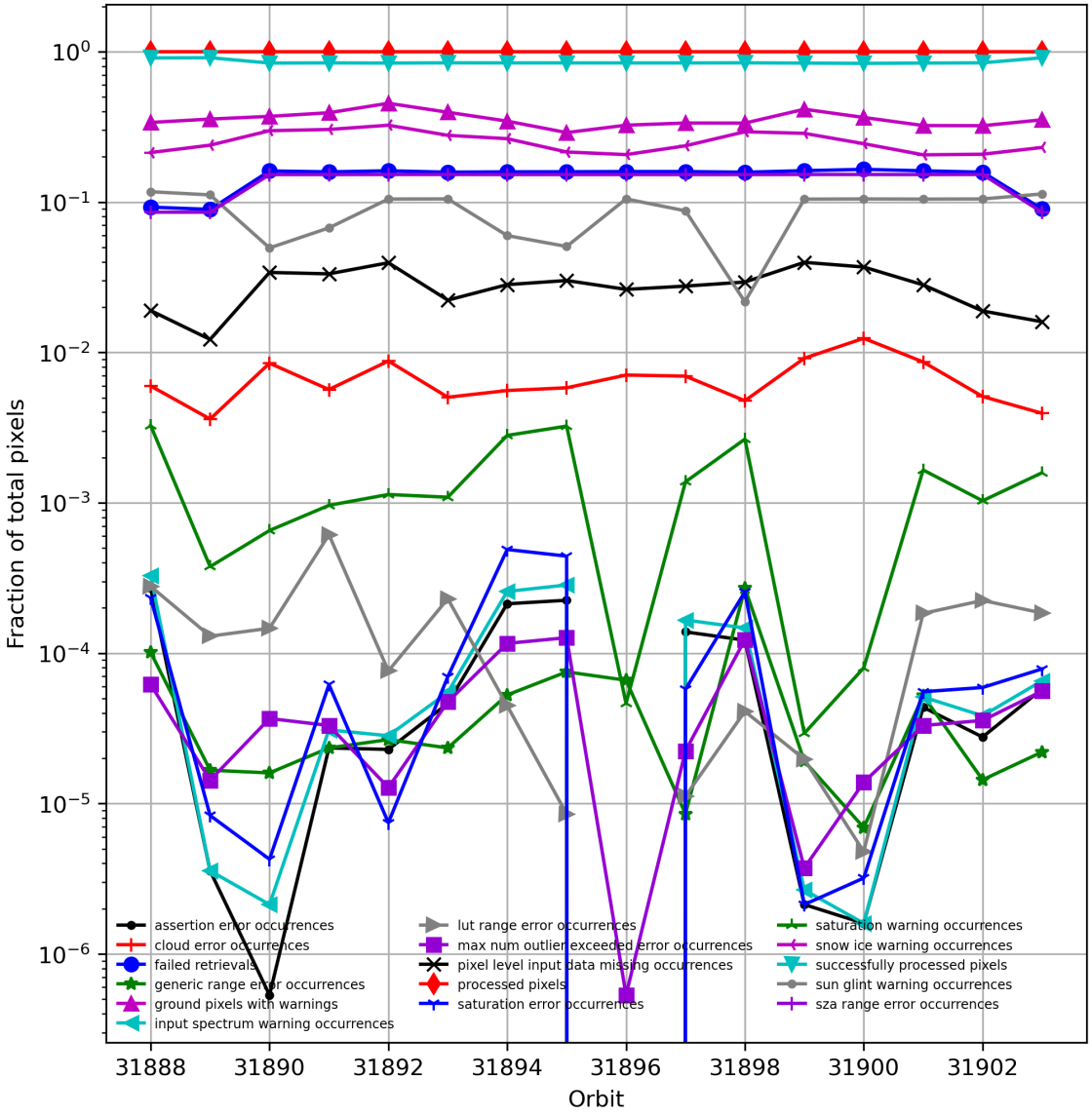


Figure 5: Fraction of pixels with specific warnings and errors during processing

6 World maps

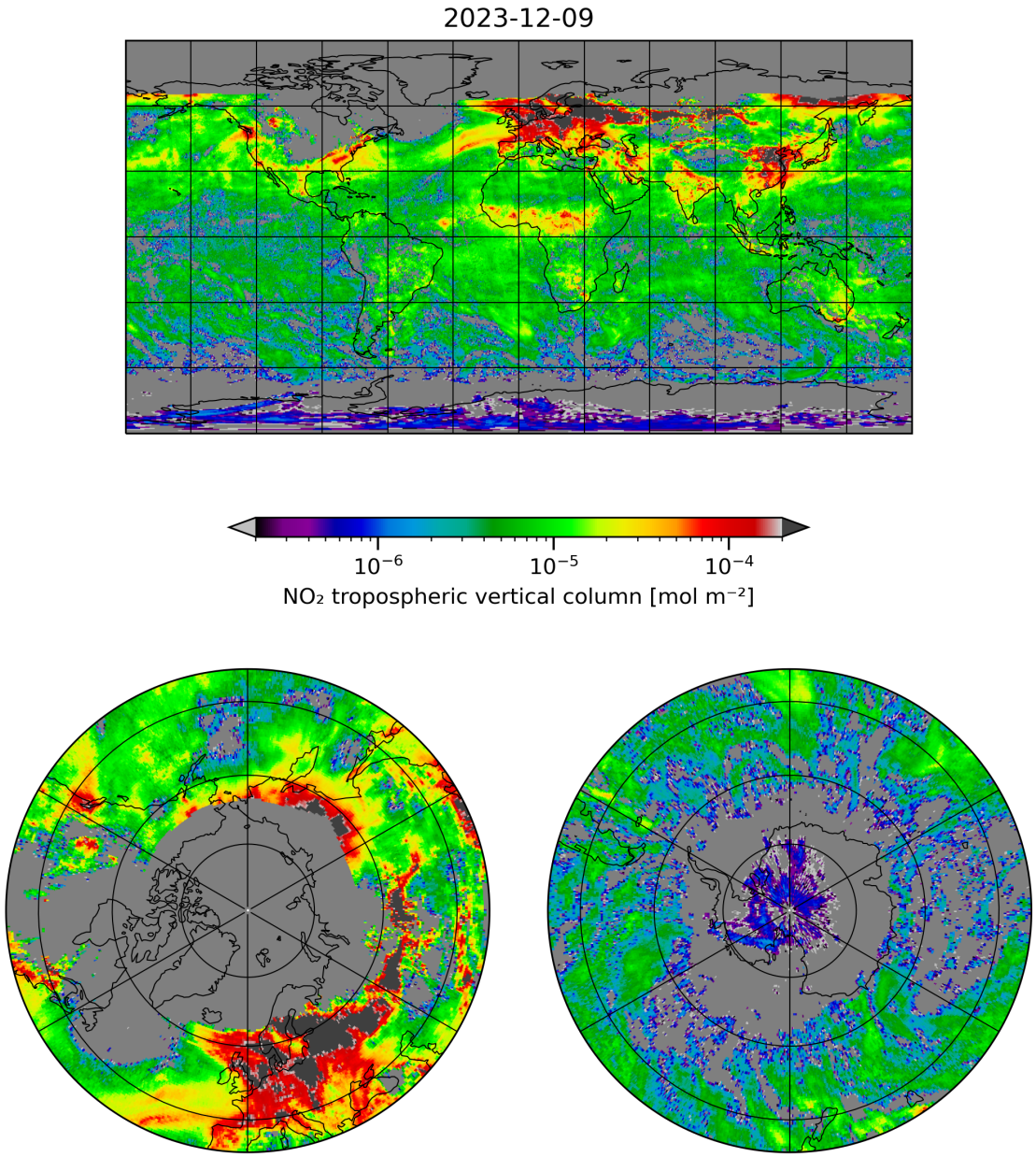


Figure 6: Map of "NO_2 tropospheric vertical column" for 2023-12-09 to 2023-12-10

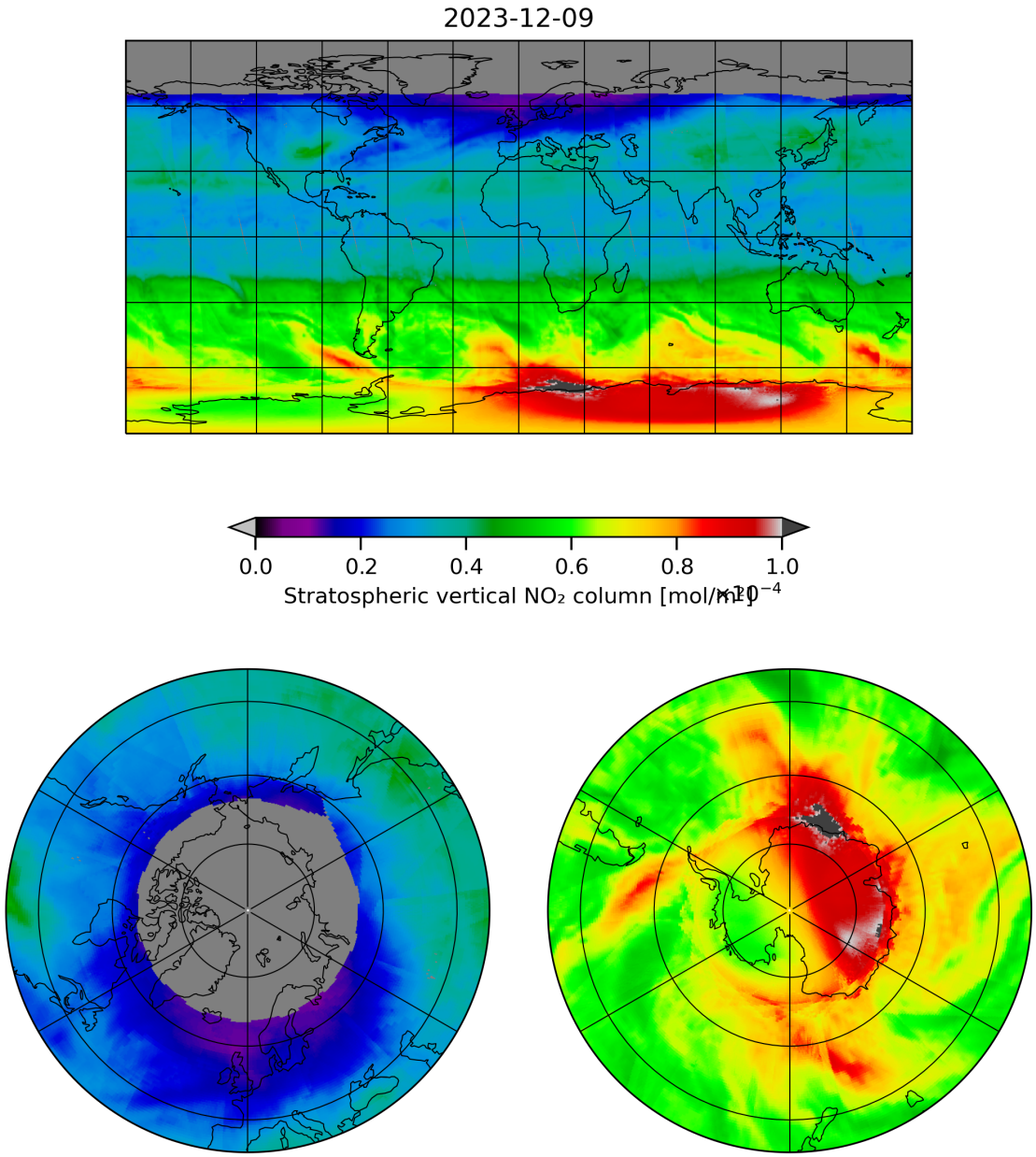


Figure 7: Map of “Stratospheric vertical NO_2 column” for 2023-12-09 to 2023-12-10

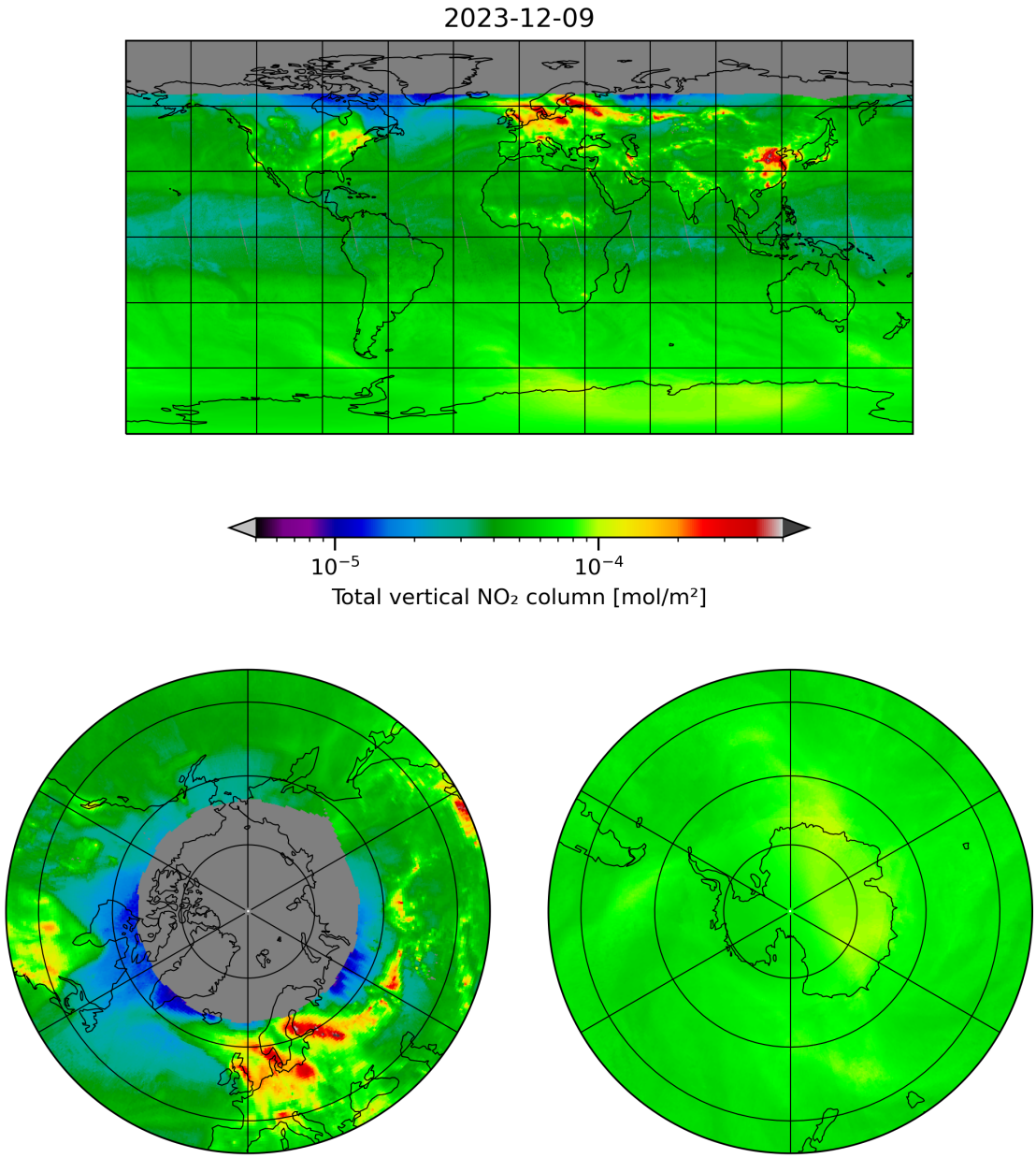


Figure 8: Map of "Total vertical NO_2 column" for 2023-12-09 to 2023-12-10

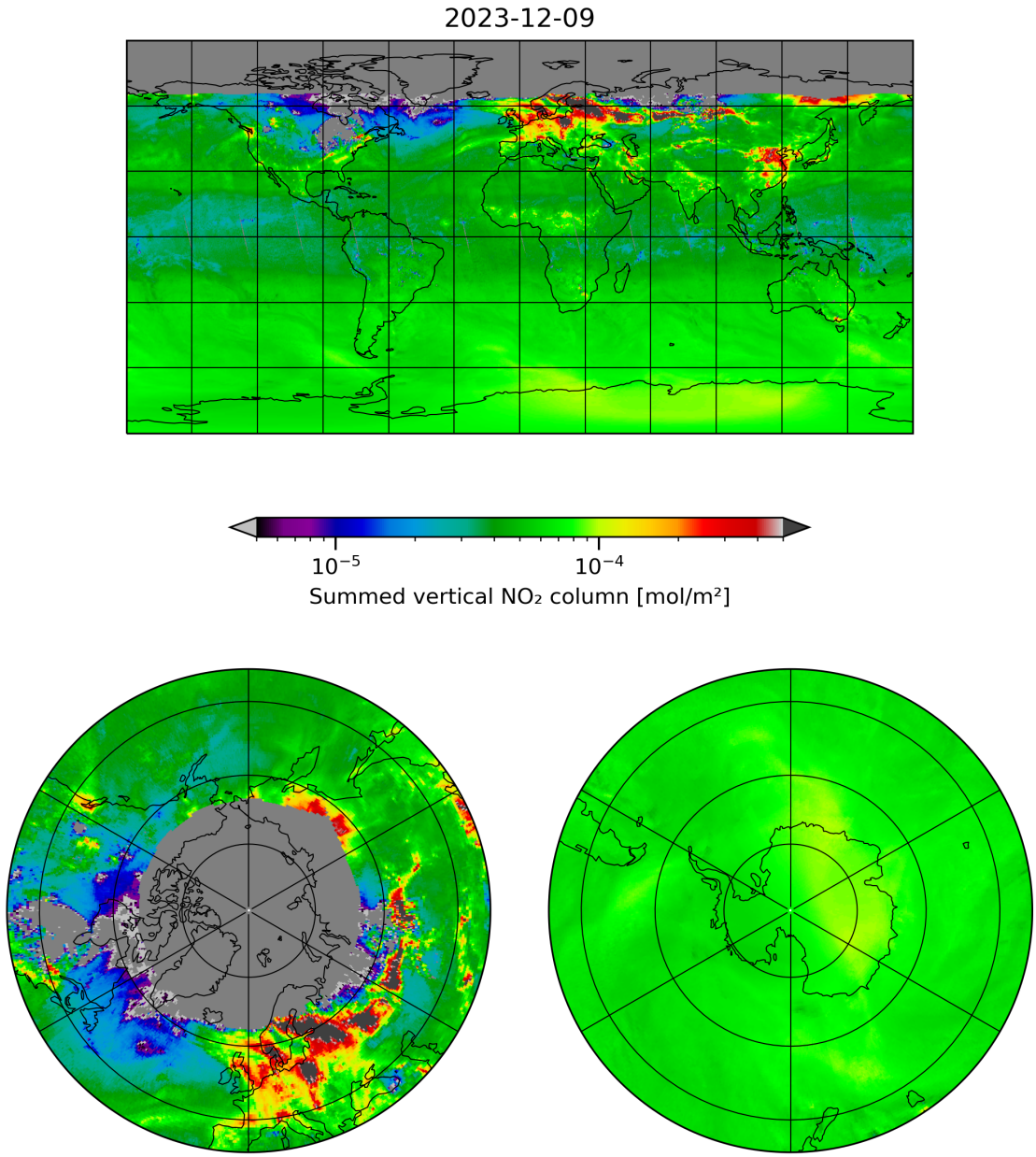


Figure 9: Map of “Summed vertical NO_2 column” for 2023-12-09 to 2023-12-10

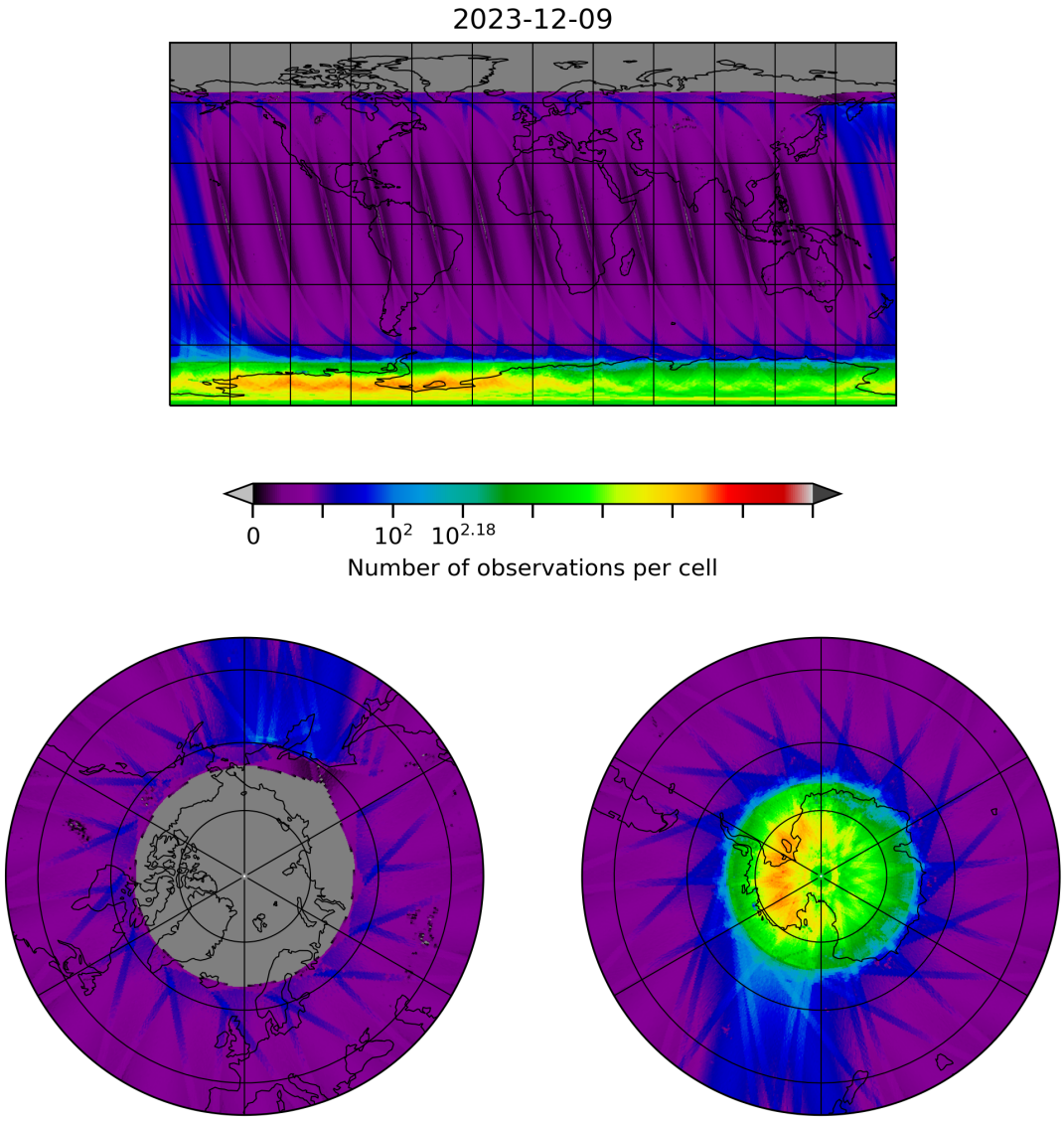


Figure 10: Map of the number of observations for 2023-12-09 to 2023-12-10

7 Zonal average

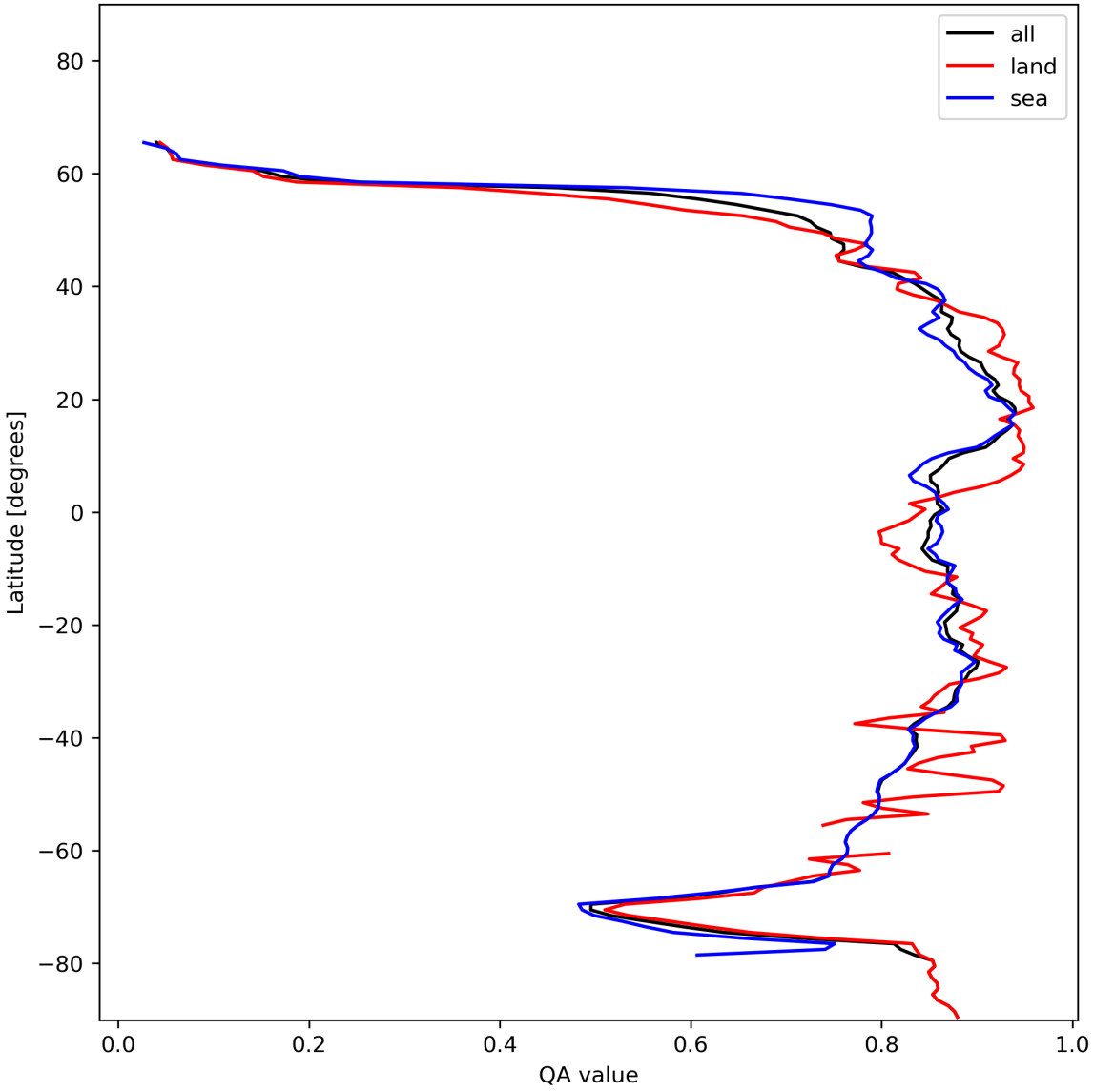


Figure 11: Zonal average of “QA value” for 2023-12-09 to 2023-12-10.

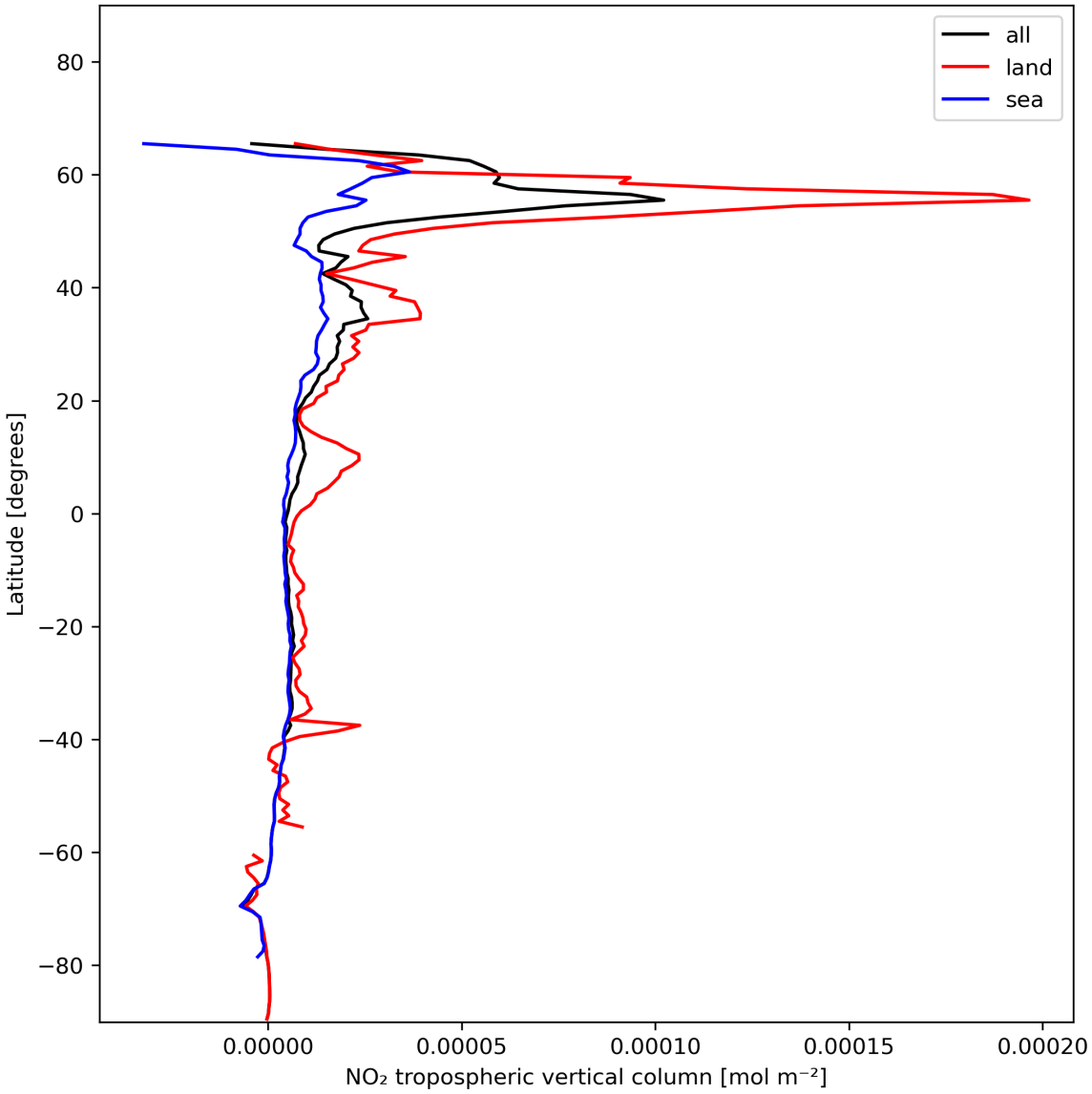


Figure 12: Zonal average of "NO_2 tropospheric vertical column" for 2023-12-09 to 2023-12-10.

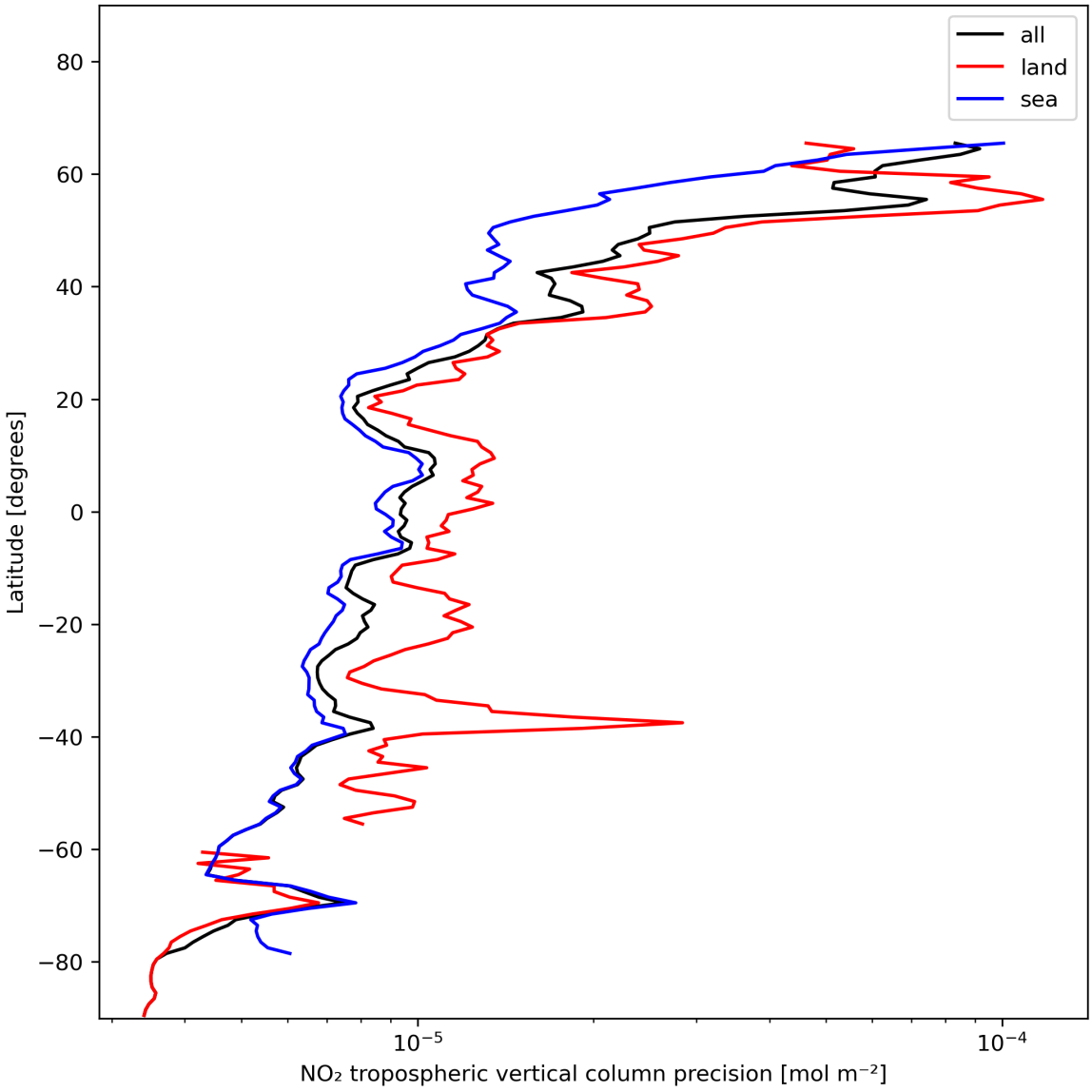


Figure 13: Zonal average of "NO_2 tropospheric vertical column precision" for 2023-12-09 to 2023-12-10.

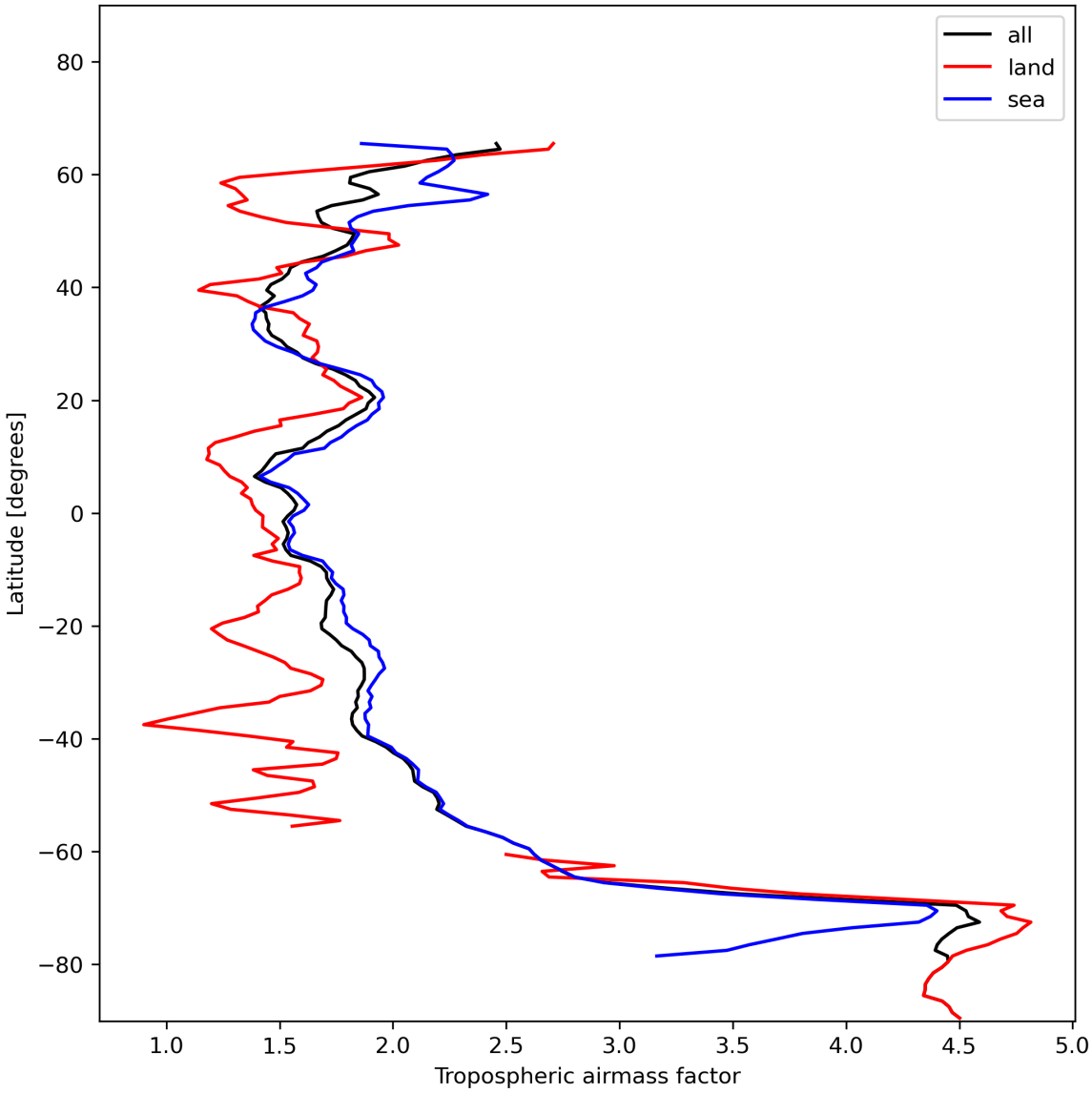


Figure 14: Zonal average of “Tropospheric airmass factor” for 2023-12-09 to 2023-12-10.

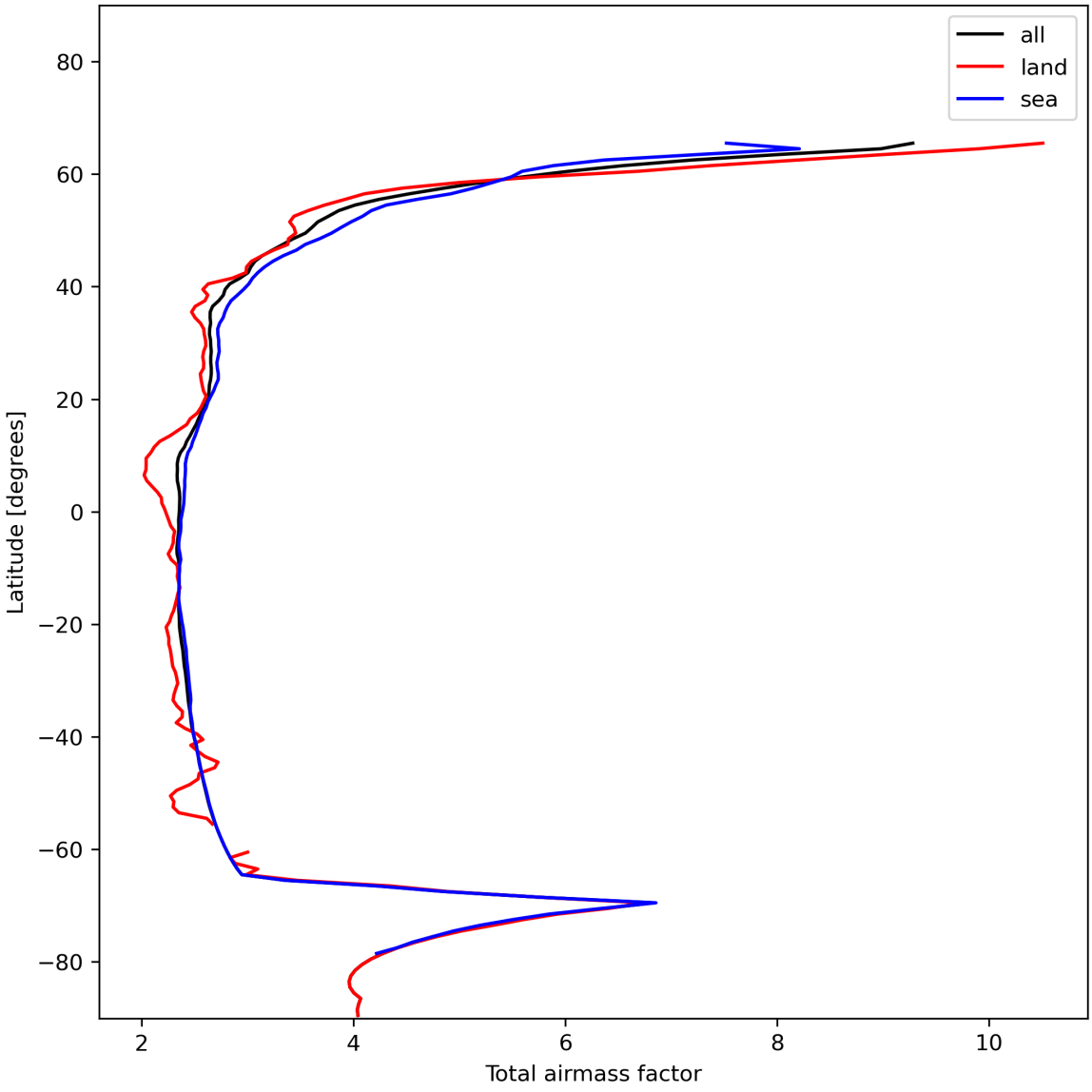


Figure 15: Zonal average of “Total airmass factor” for 2023-12-09 to 2023-12-10.

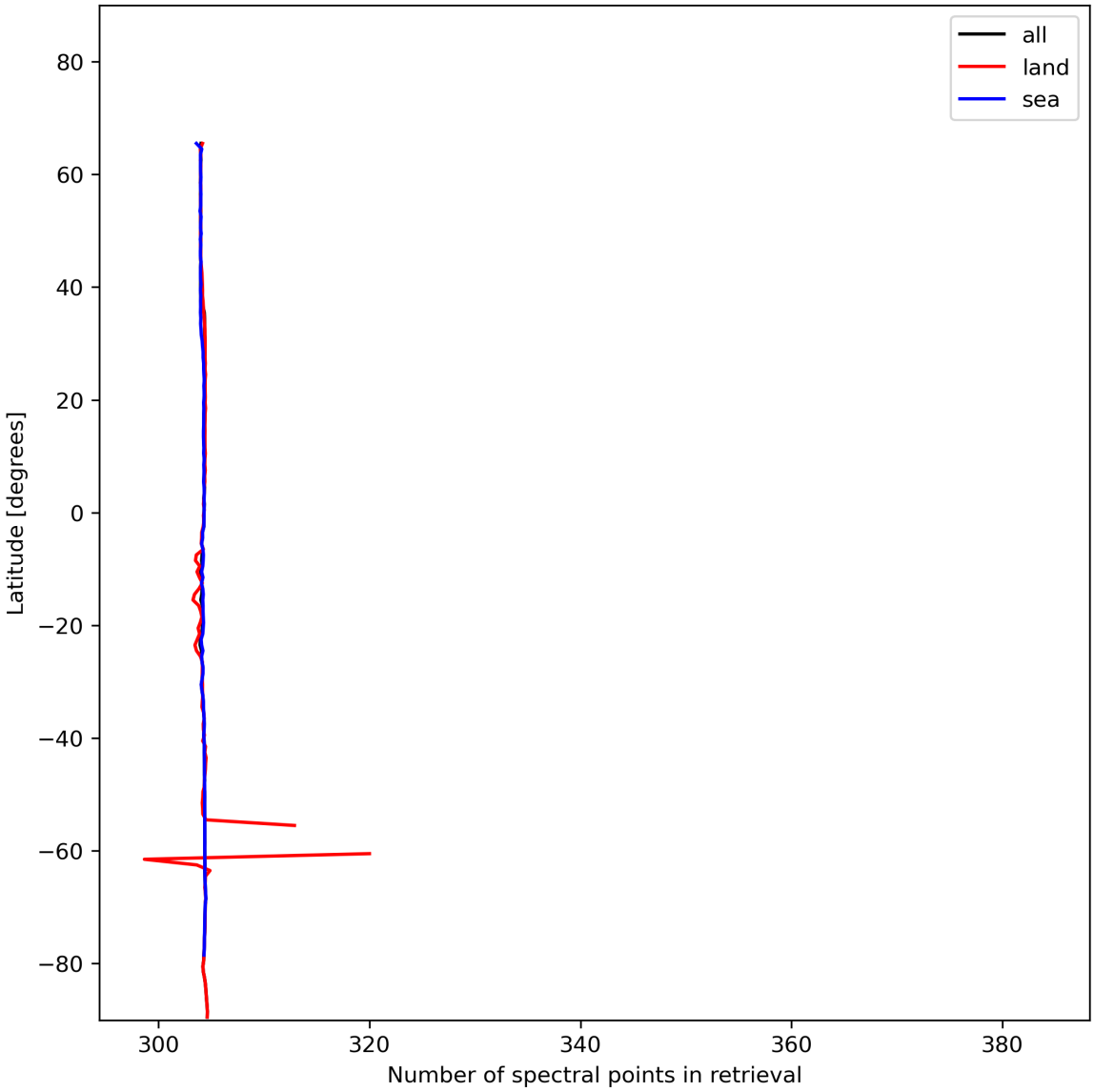


Figure 16: Zonal average of “Number of spectral points in retrieval” for 2023-12-09 to 2023-12-10.

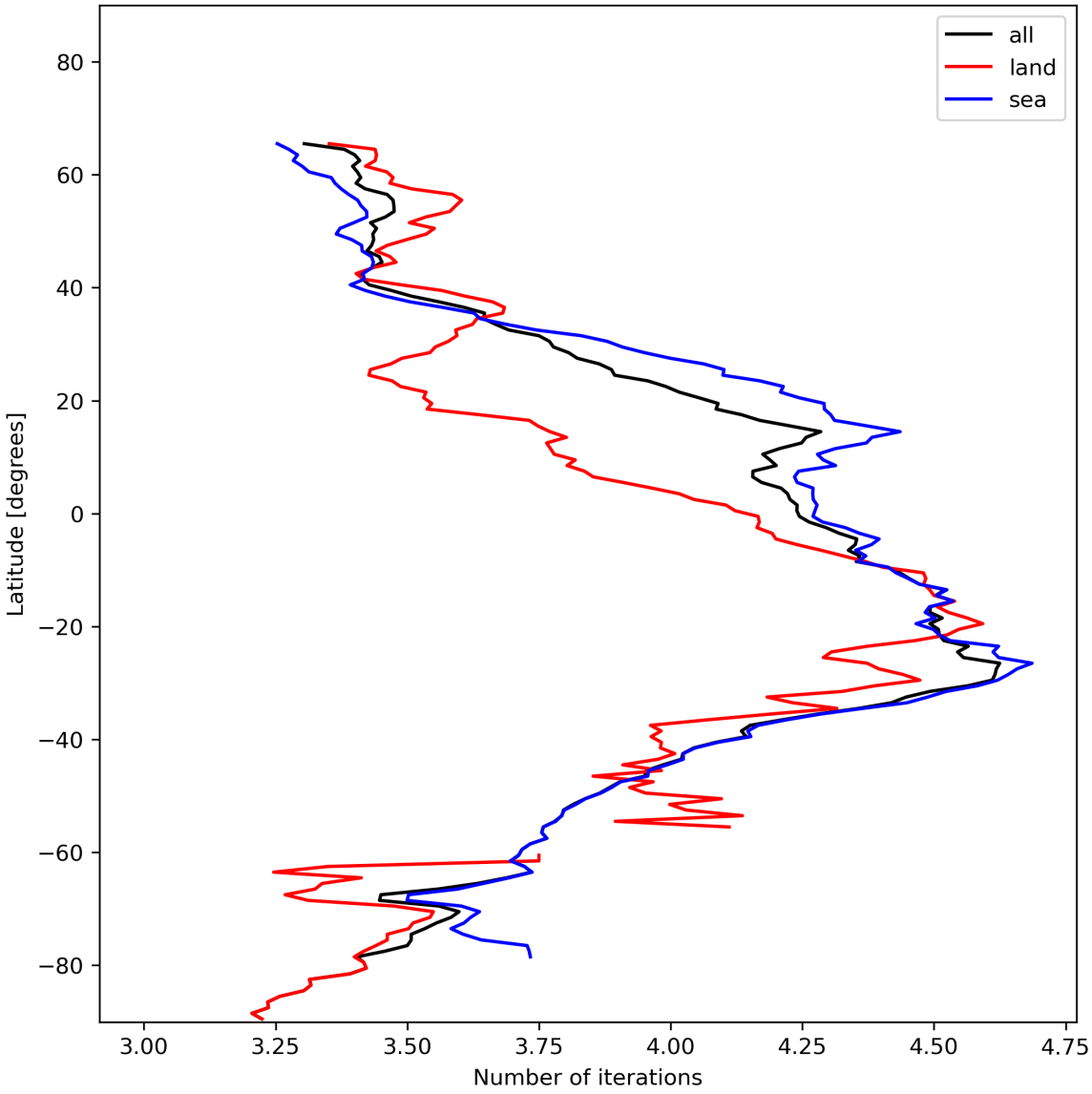


Figure 17: Zonal average of “Number of iterations” for 2023-12-09 to 2023-12-10.

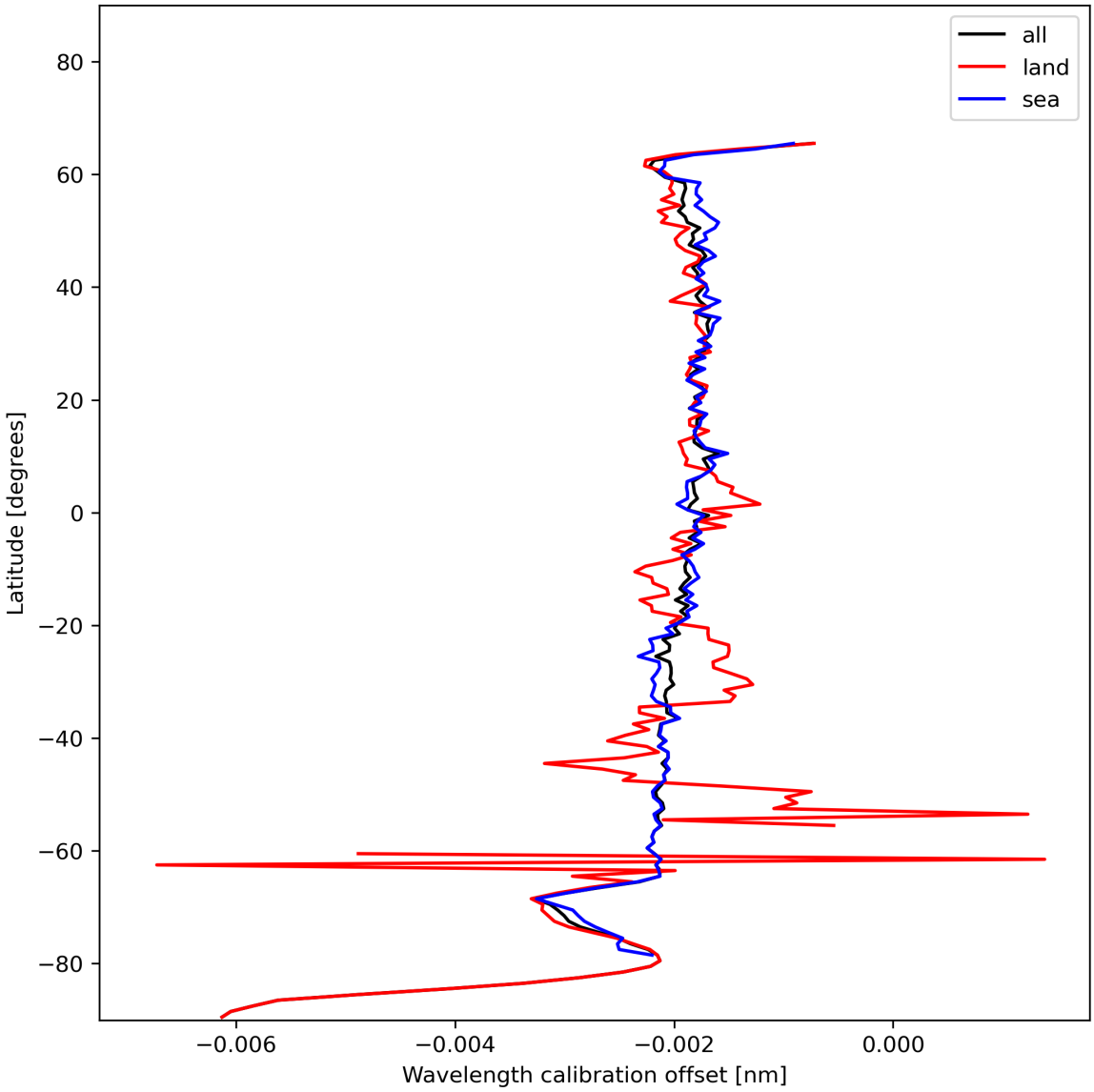


Figure 18: Zonal average of “Wavelength calibration offset” for 2023-12-09 to 2023-12-10.

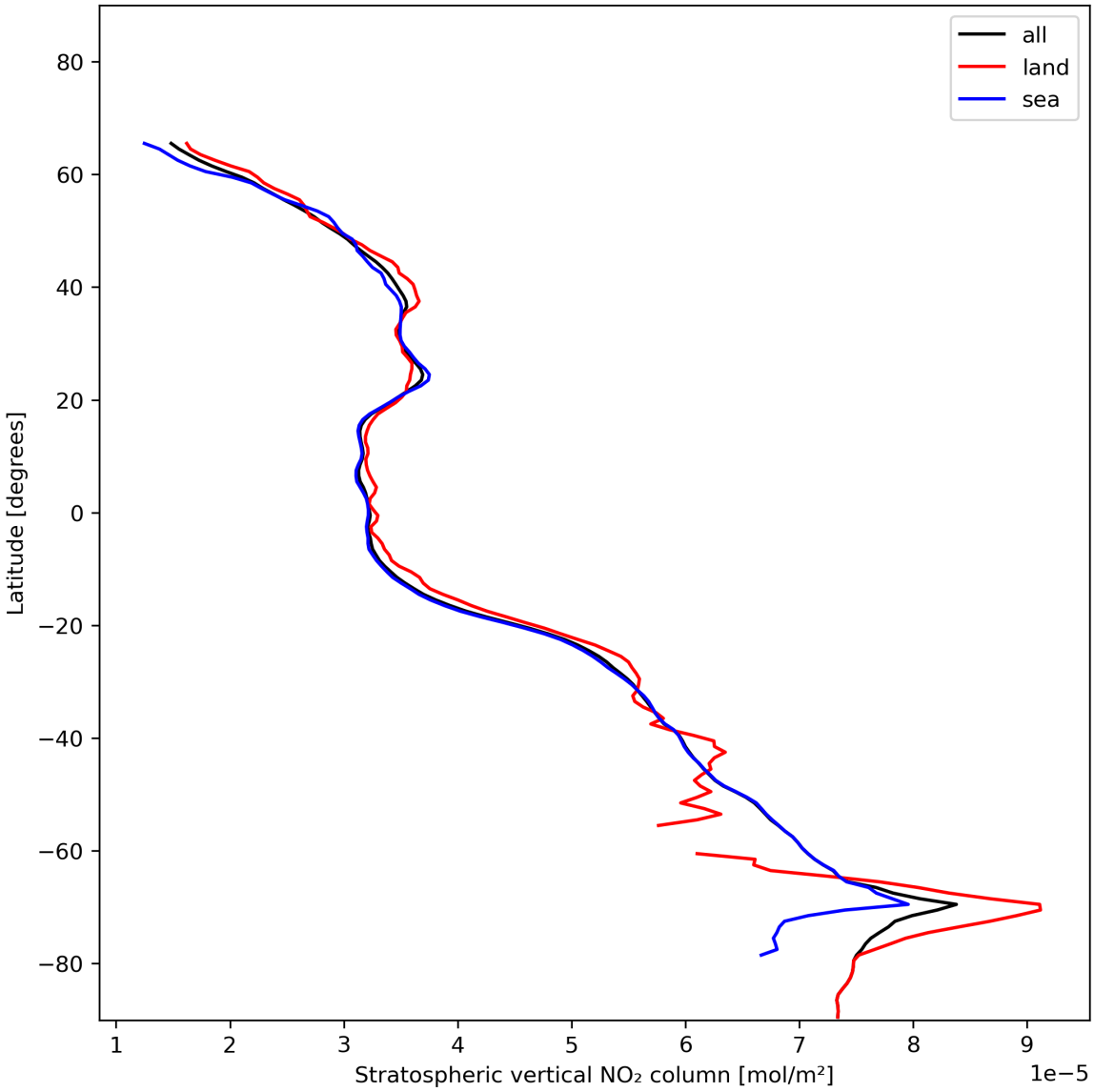


Figure 19: Zonal average of “Stratospheric vertical NO_2 column” for 2023-12-09 to 2023-12-10.

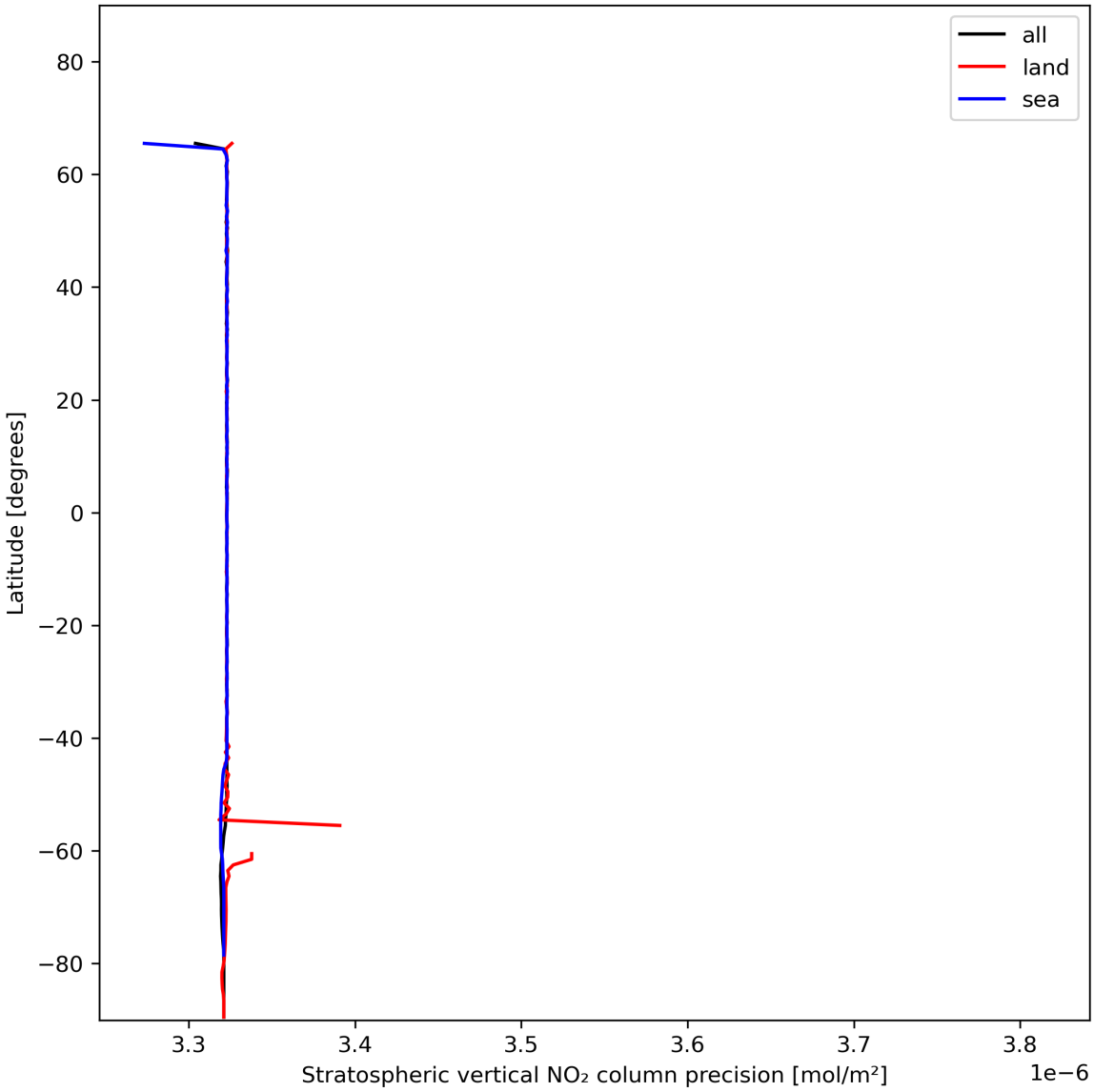


Figure 20: Zonal average of "Stratospheric vertical NO_2 column precision" for 2023-12-09 to 2023-12-10.

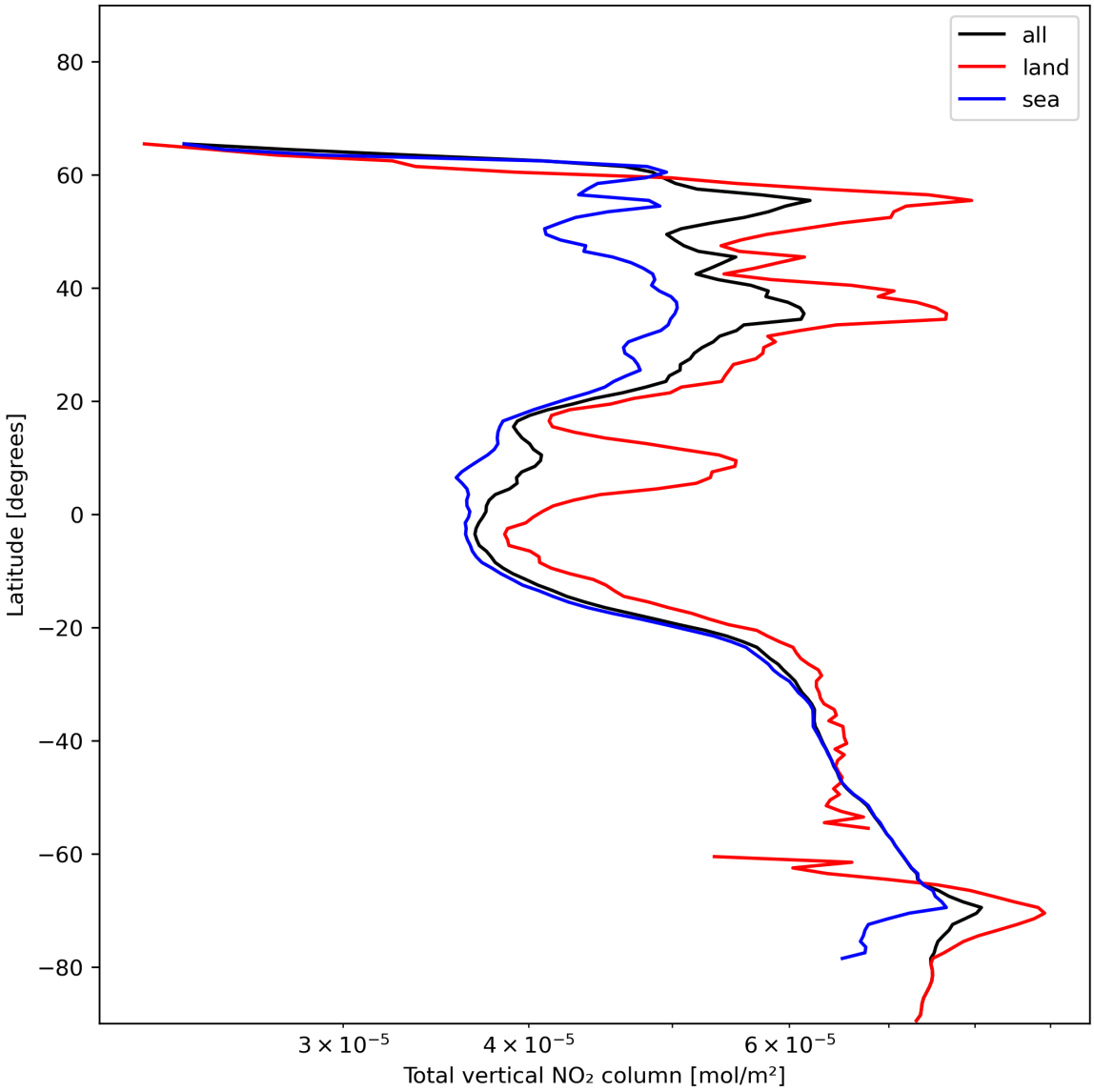


Figure 21: Zonal average of "Total vertical NO_2 column" for 2023-12-09 to 2023-12-10.

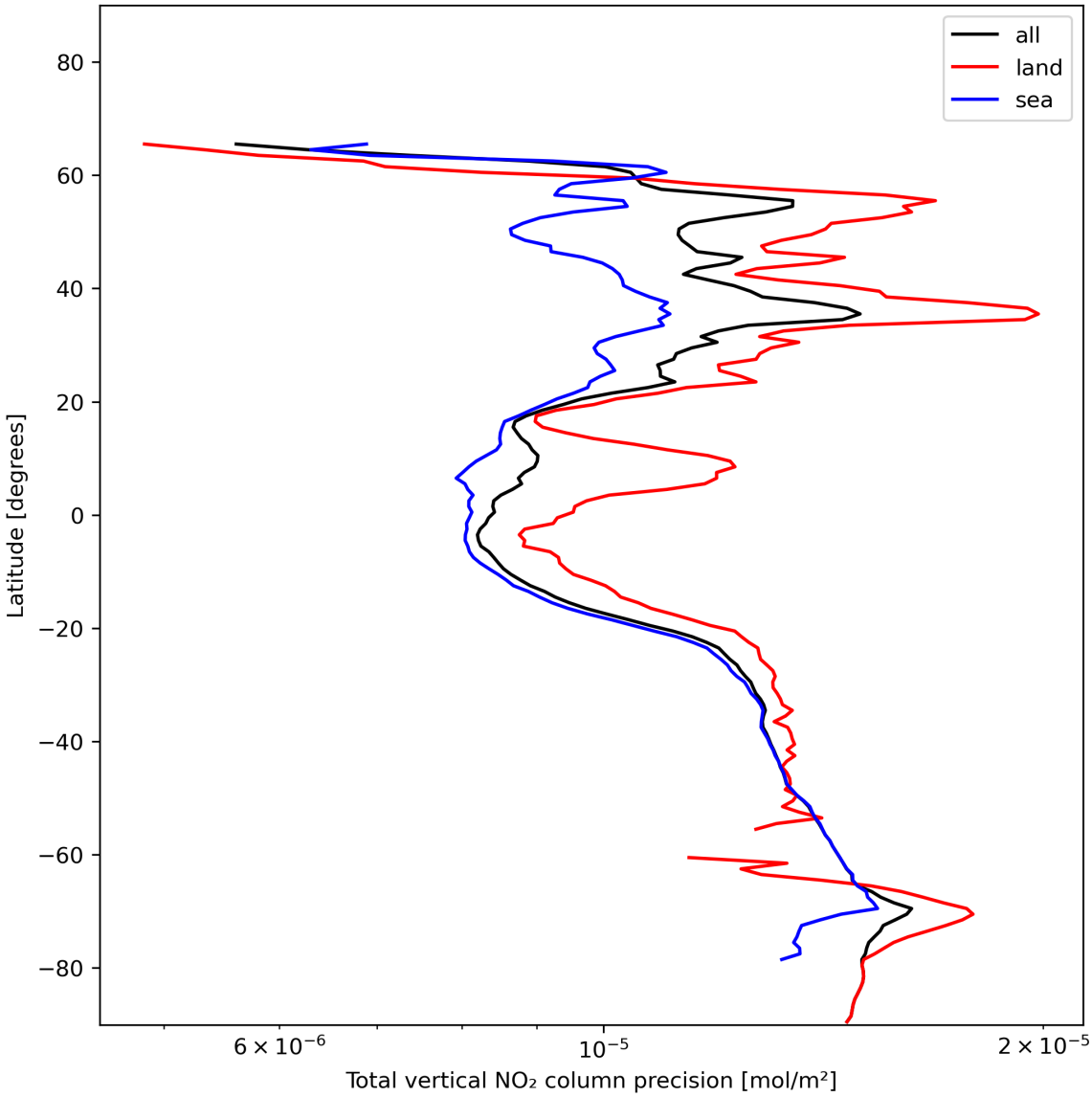


Figure 22: Zonal average of "Total vertical NO_2 column precision" for 2023-12-09 to 2023-12-10.

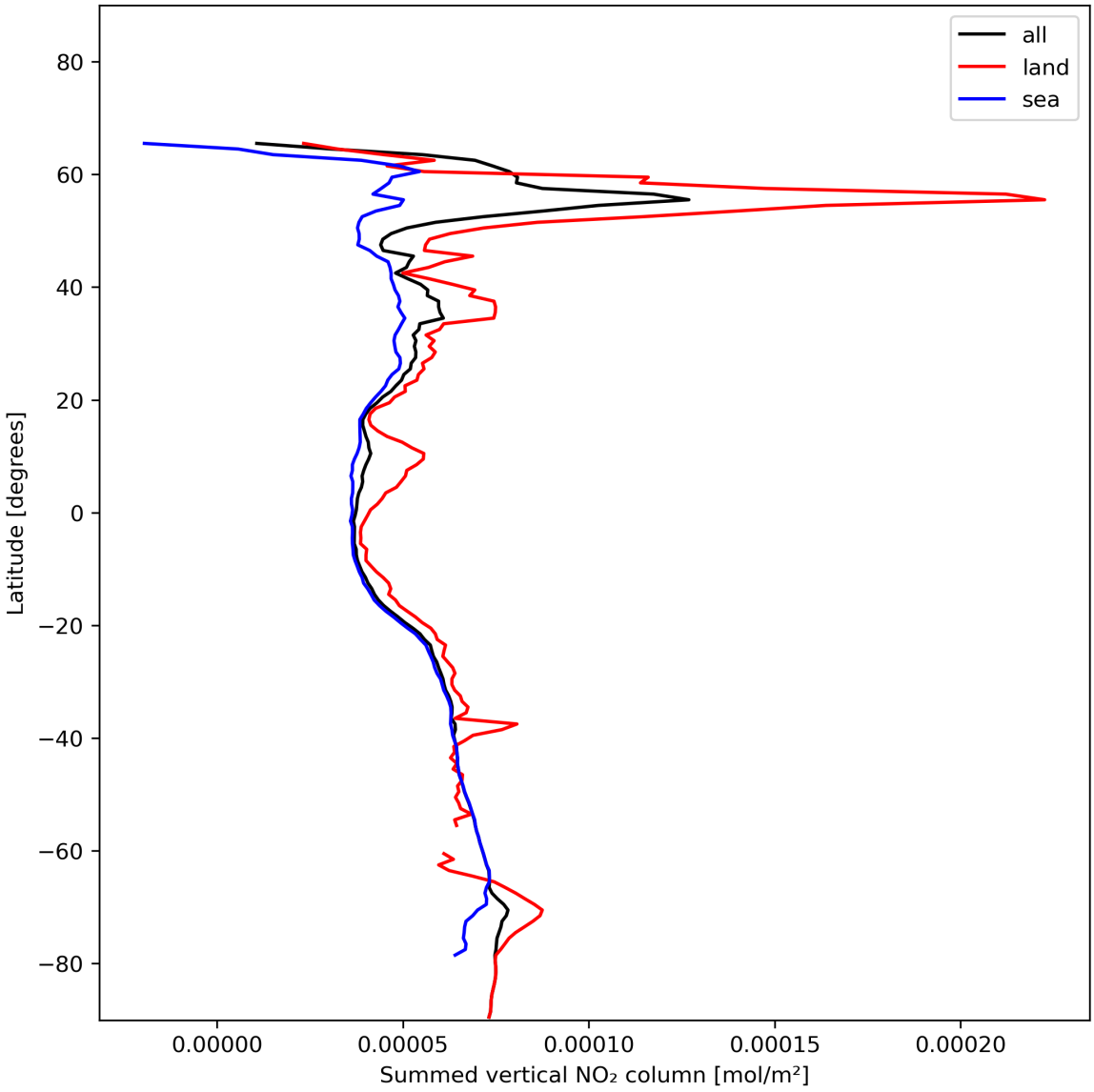


Figure 23: Zonal average of "Summed vertical NO_2 column" for 2023-12-09 to 2023-12-10.

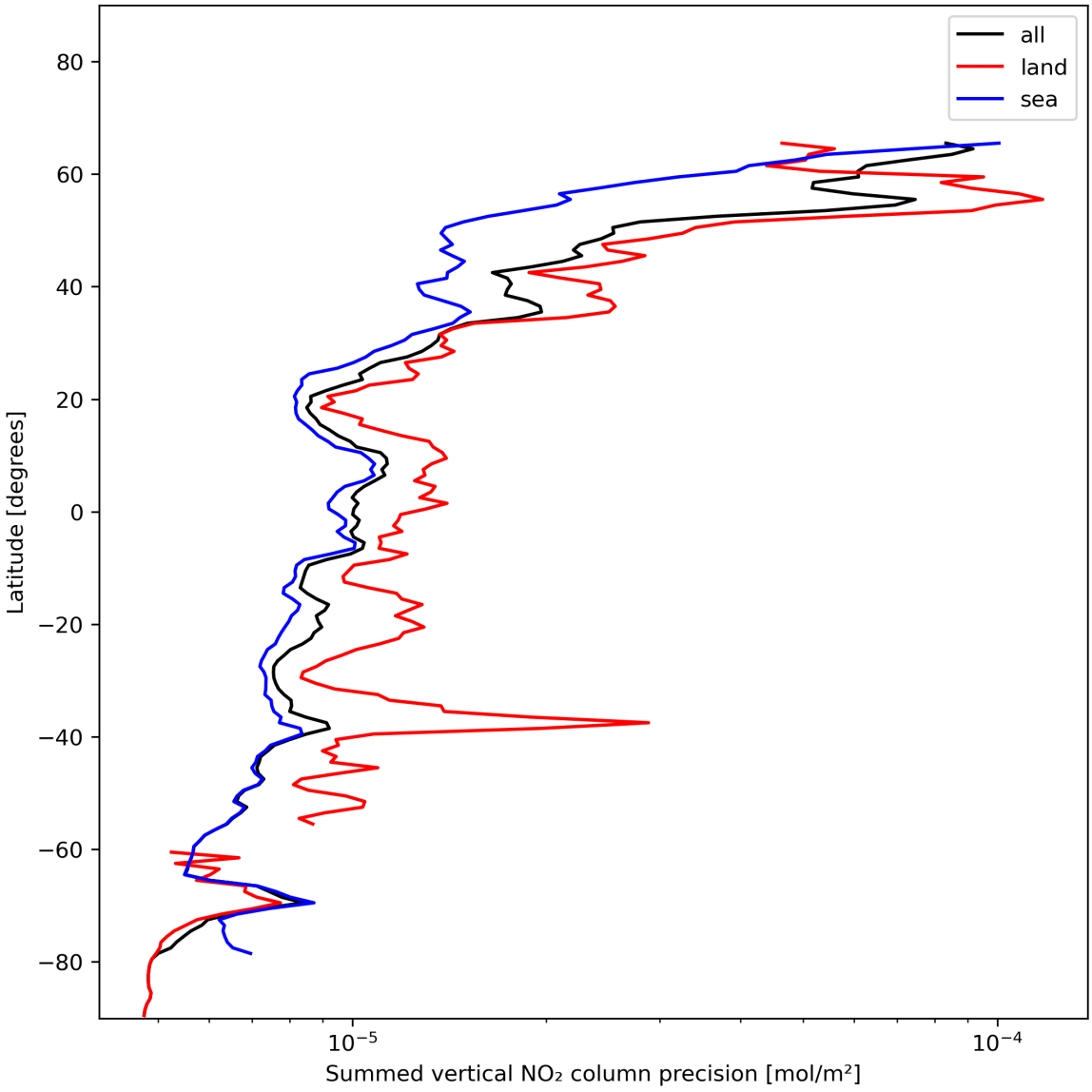


Figure 24: Zonal average of "Summed vertical NO_2 column precision" for 2023-12-09 to 2023-12-10.

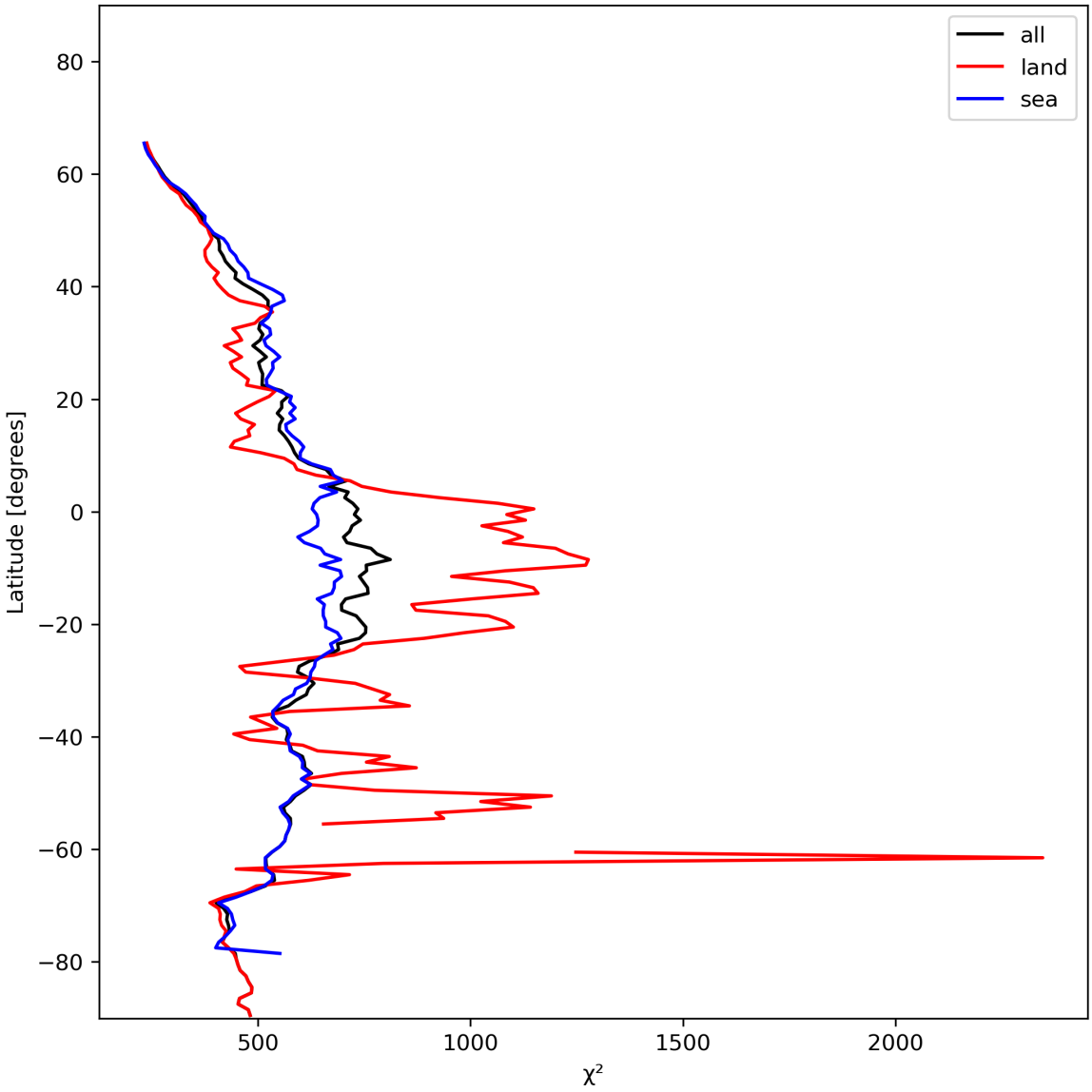


Figure 25: Zonal average of "χ^2" for 2023-12-09 to 2023-12-10.

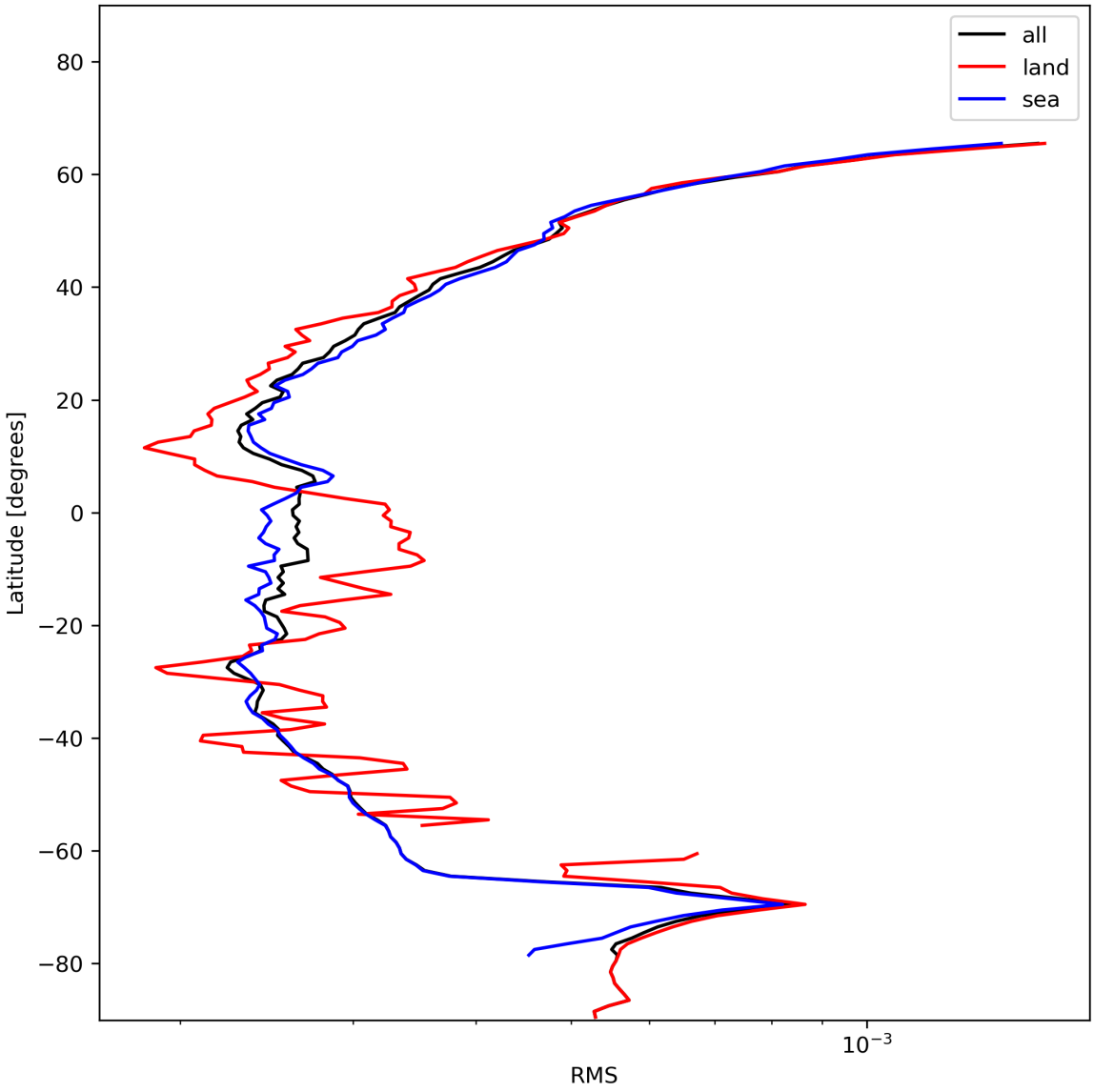


Figure 26: Zonal average of “RMS” for 2023-12-09 to 2023-12-10.

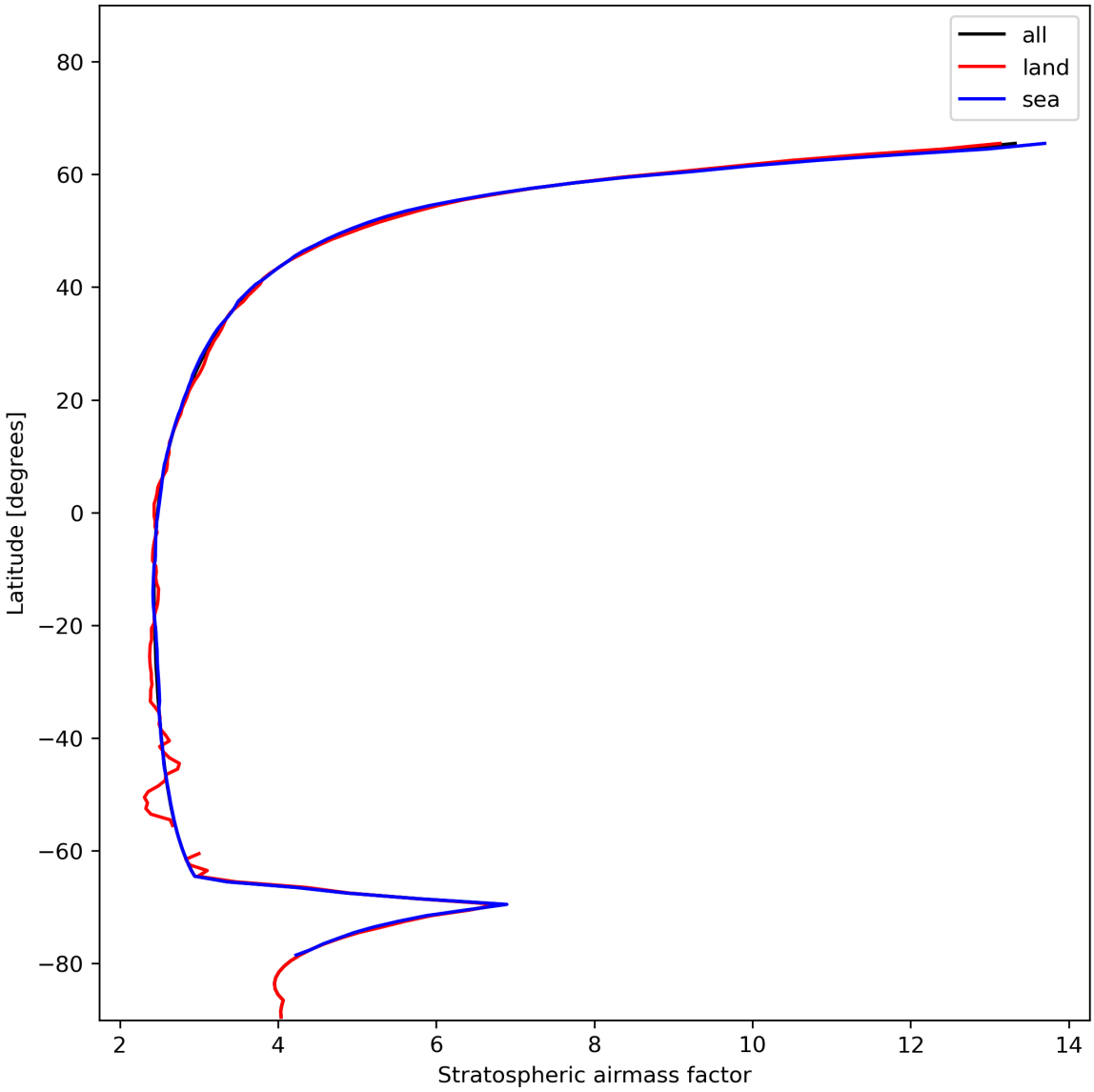


Figure 27: Zonal average of “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10.

8 Histograms

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

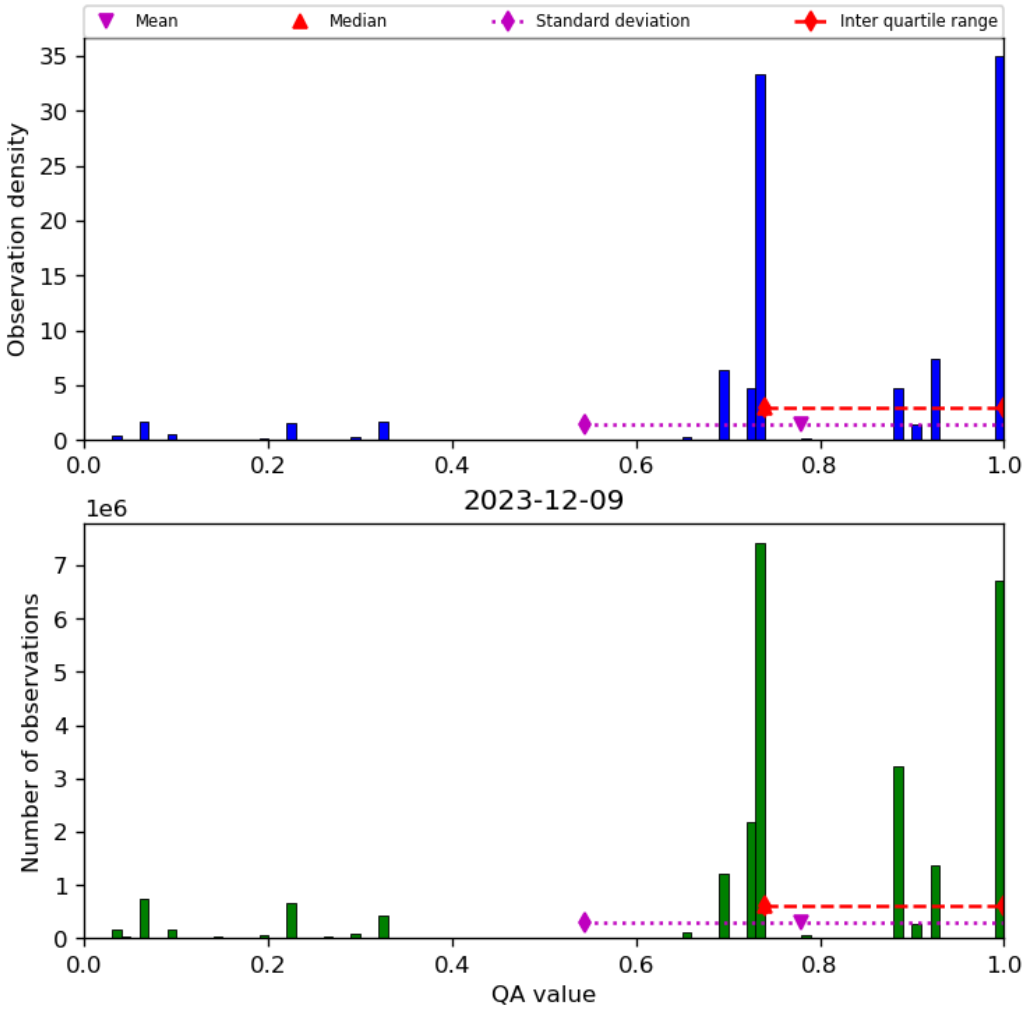


Figure 28: Histogram of “QA value” for 2023-12-09 to 2023-12-10

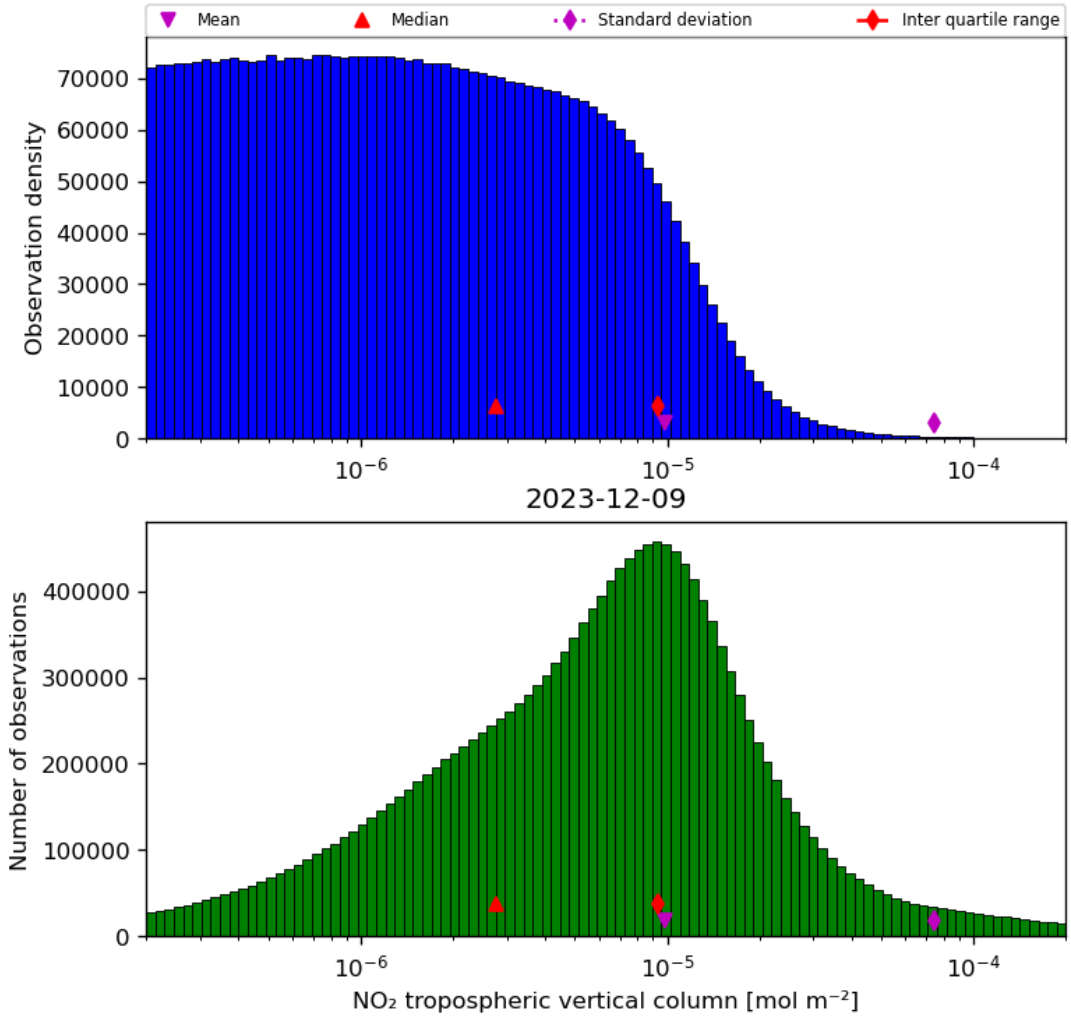


Figure 29: Histogram of "NO_2 tropospheric vertical column" for 2023-12-09 to 2023-12-10

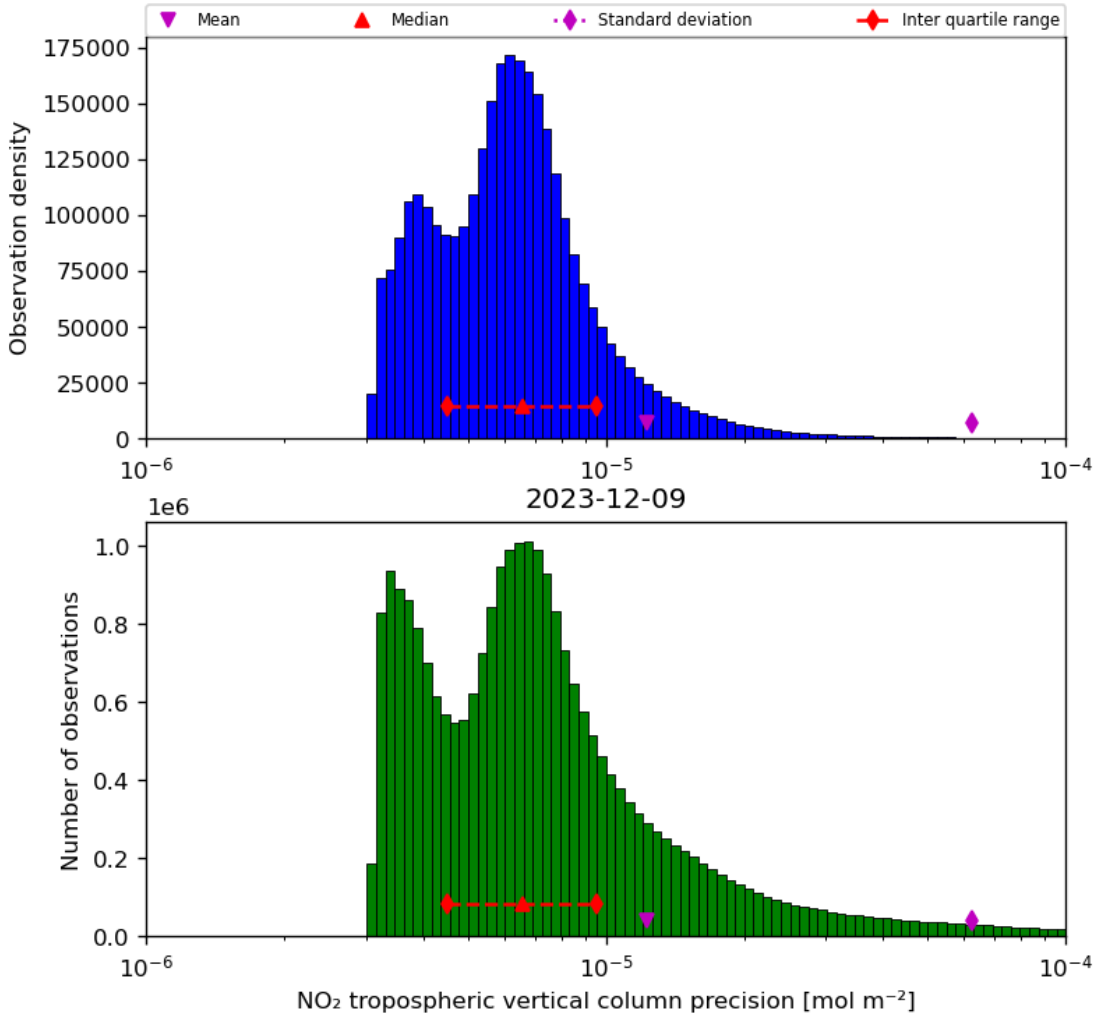


Figure 30: Histogram of "NO_2 tropospheric vertical column precision" for 2023-12-09 to 2023-12-10

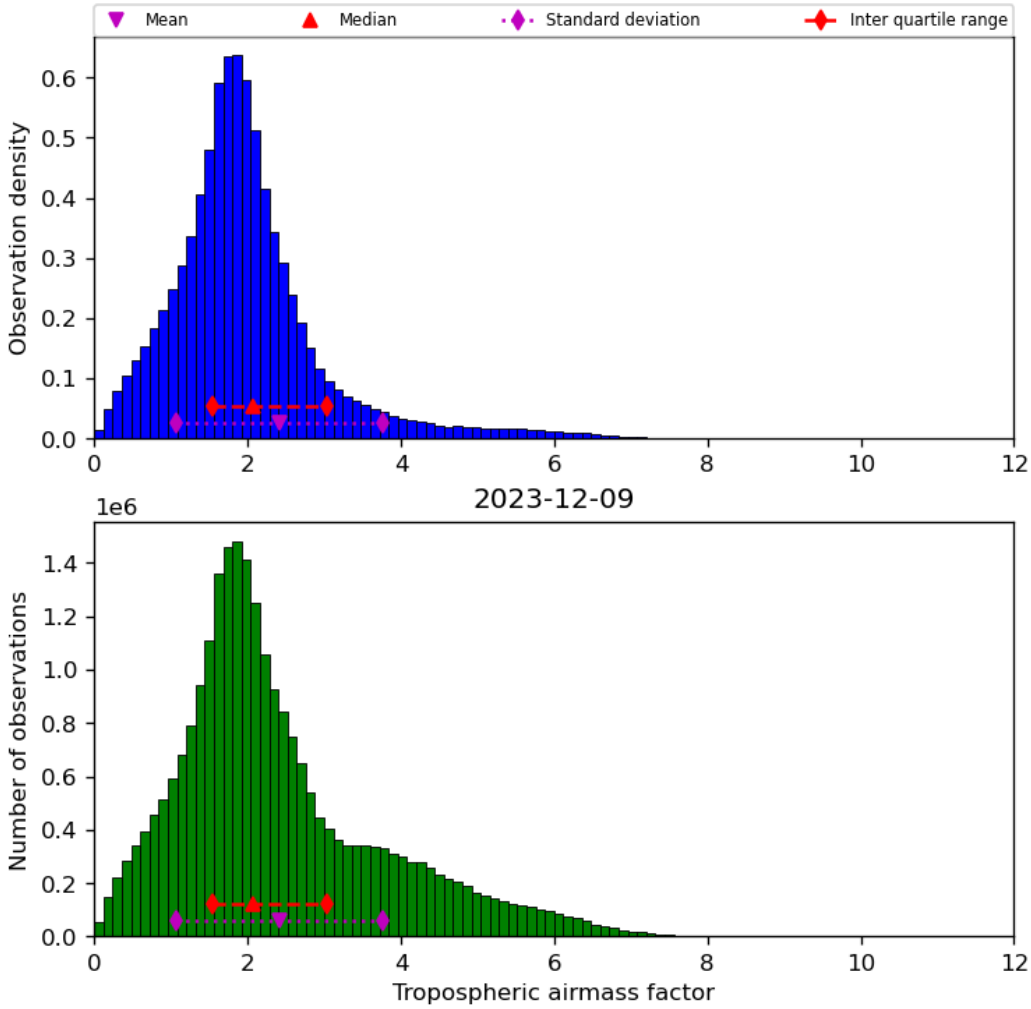


Figure 31: Histogram of “Tropospheric airmass factor” for 2023-12-09 to 2023-12-10

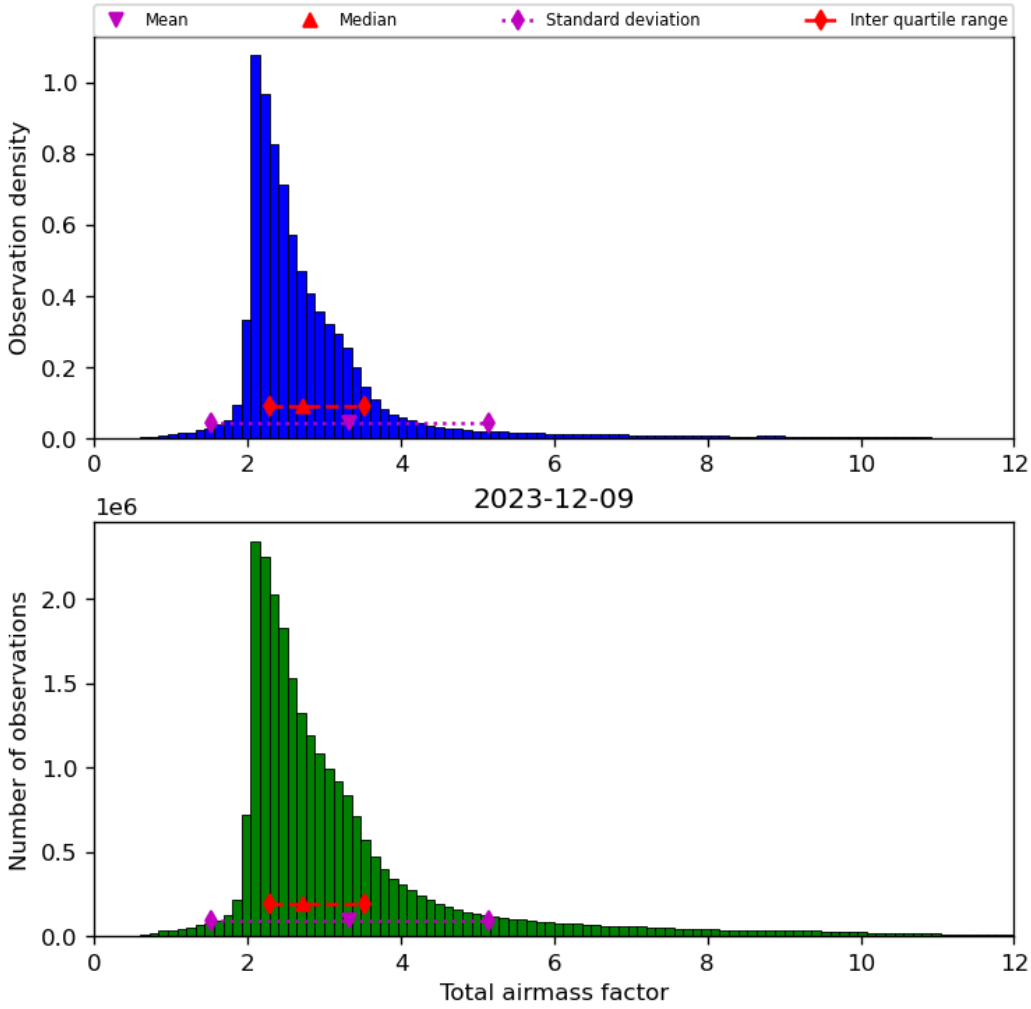


Figure 32: Histogram of “Total airmass factor” for 2023-12-09 to 2023-12-10

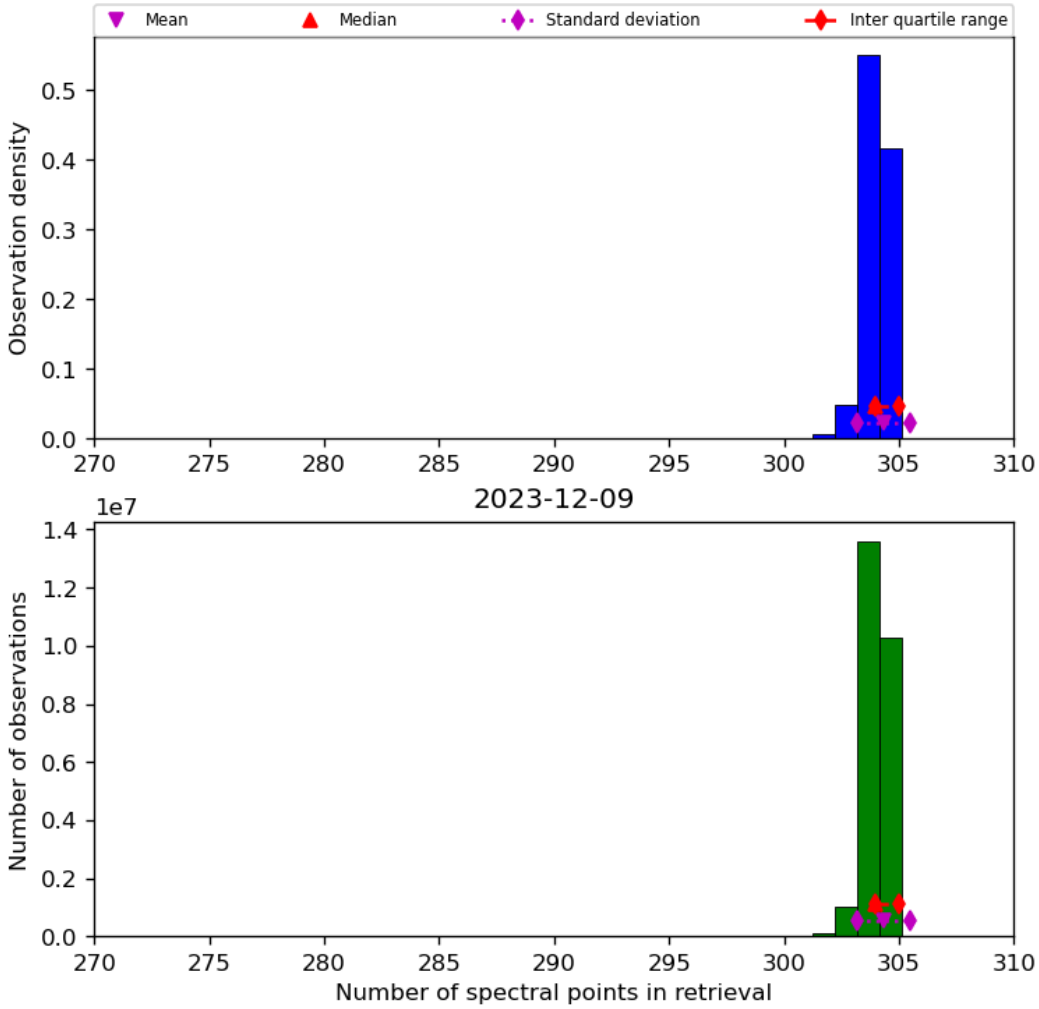


Figure 33: Histogram of “Number of spectral points in retrieval” for 2023-12-09 to 2023-12-10

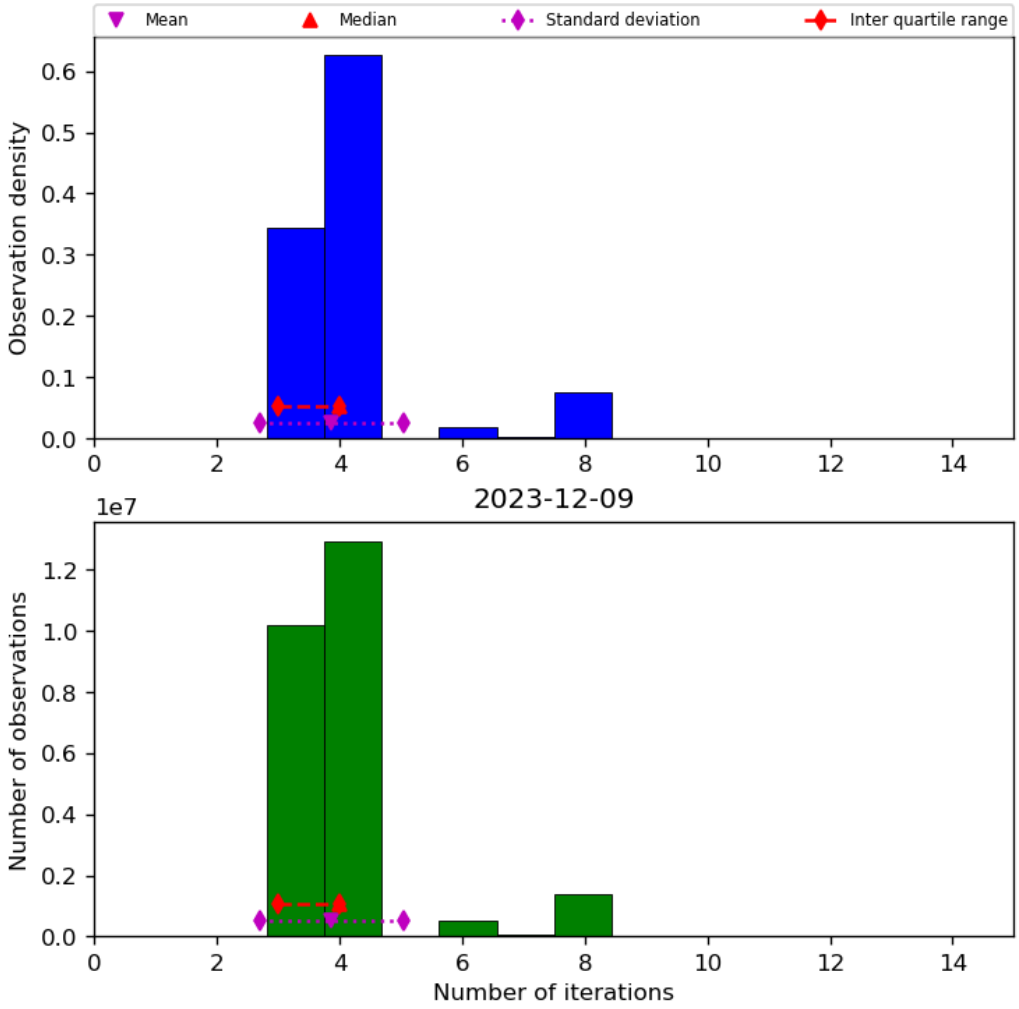


Figure 34: Histogram of “Number of iterations” for 2023-12-09 to 2023-12-10

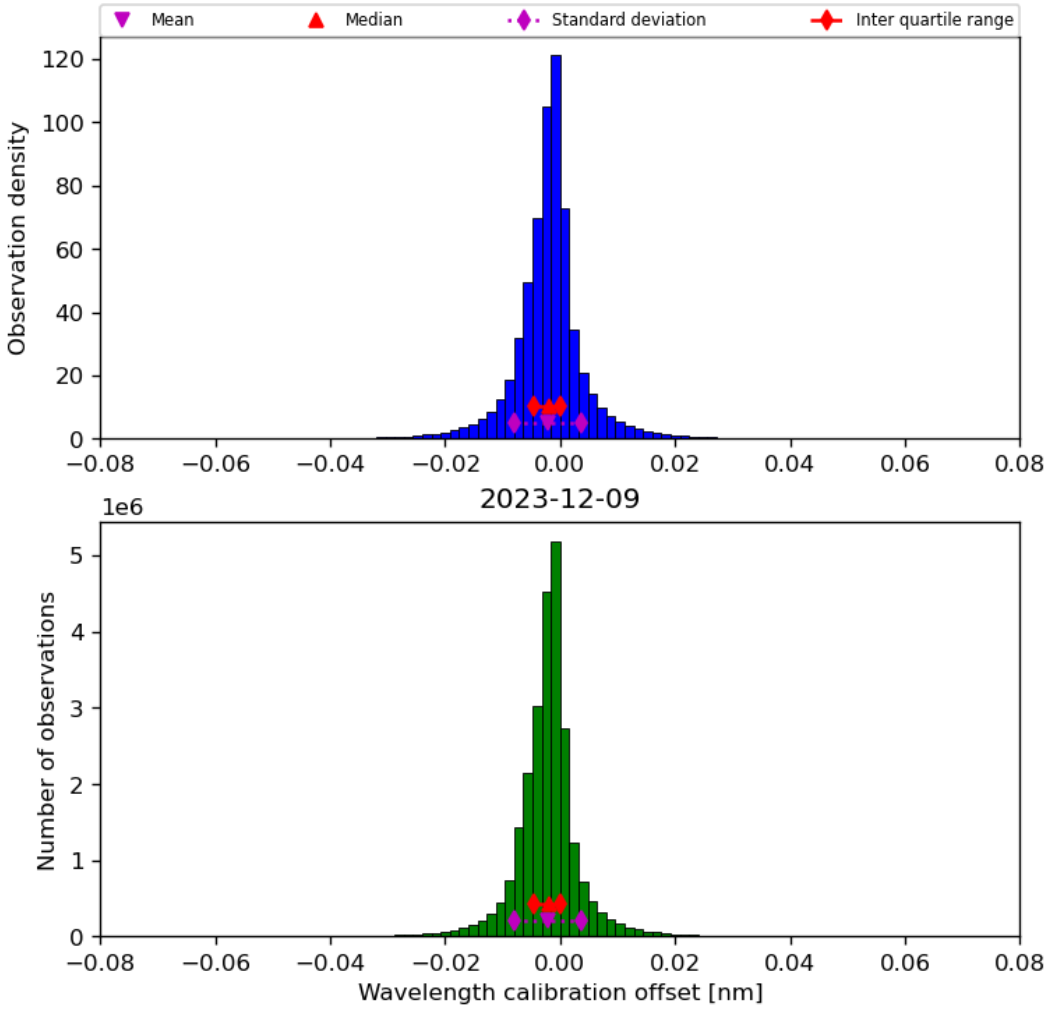


Figure 35: Histogram of “Wavelength calibration offset” for 2023-12-09 to 2023-12-10

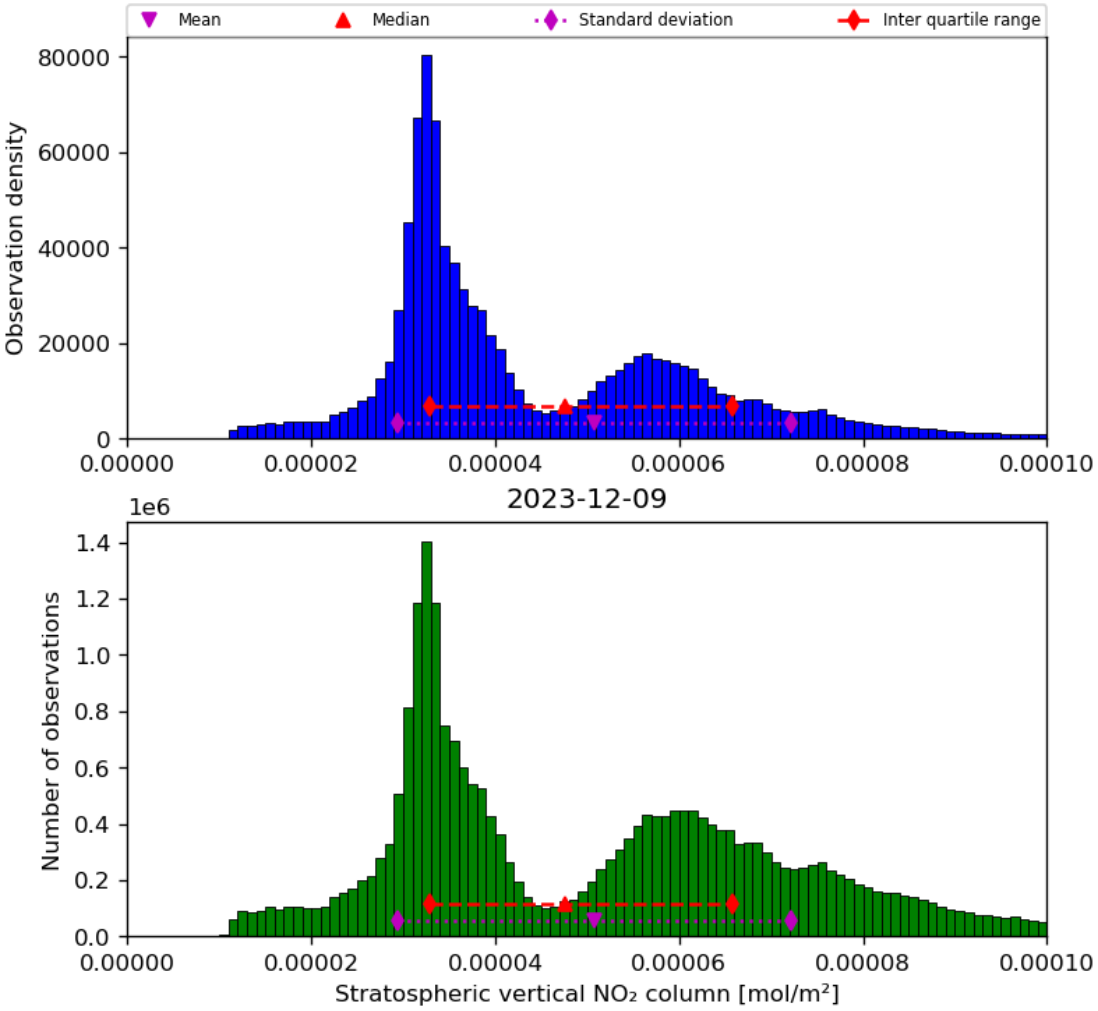


Figure 36: Histogram of "Stratospheric vertical NO_2 column" for 2023-12-09 to 2023-12-10

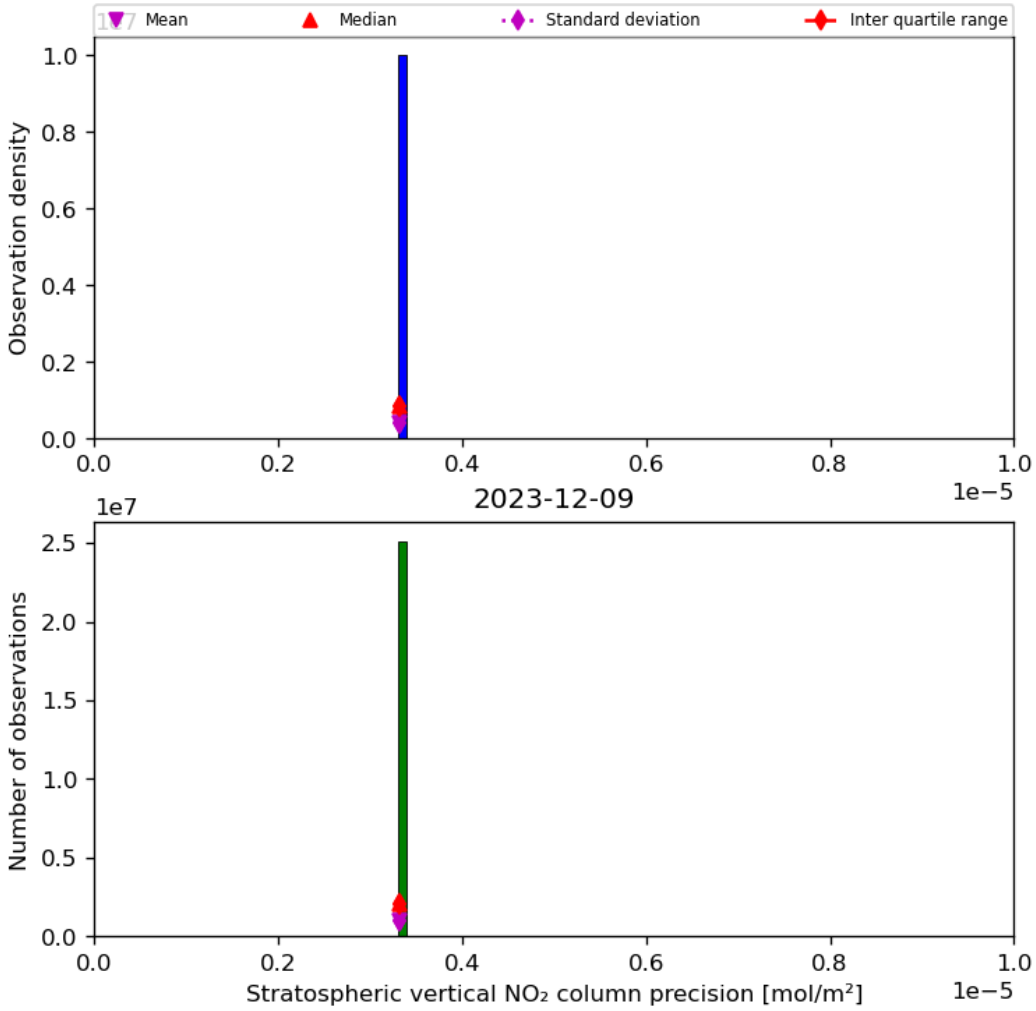


Figure 37: Histogram of “Stratospheric vertical NO_2 column precision” for 2023-12-09 to 2023-12-10

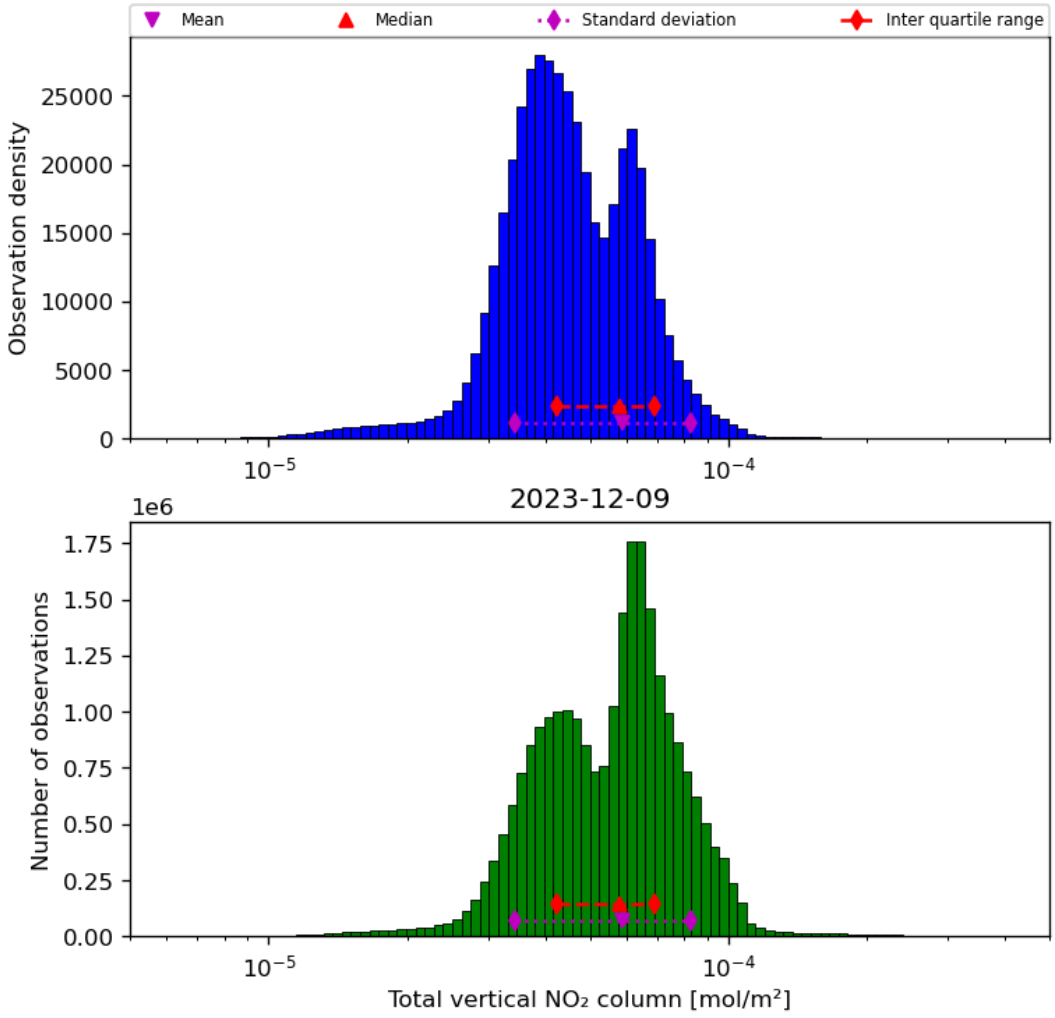


Figure 38: Histogram of "Total vertical NO_2 column" for 2023-12-09 to 2023-12-10

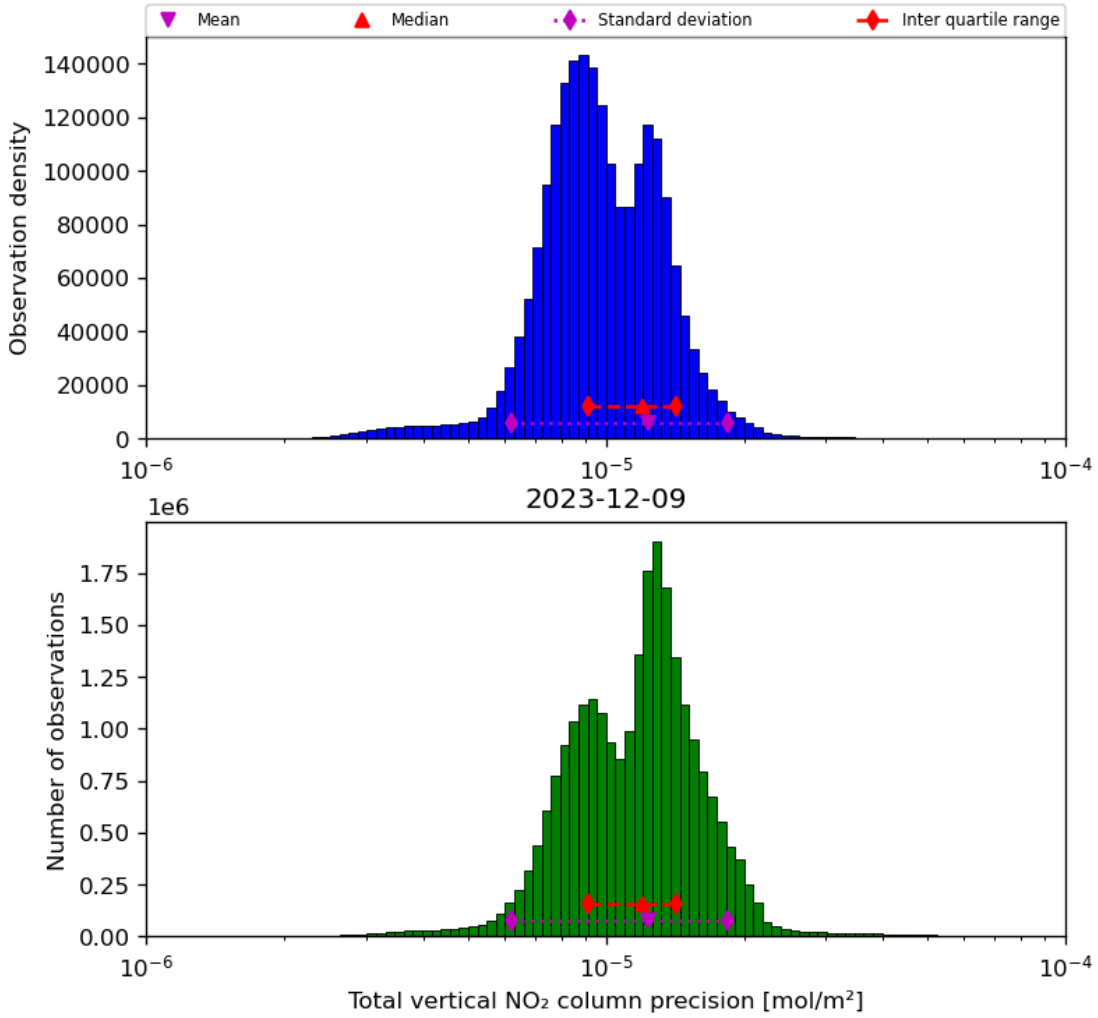


Figure 39: Histogram of "Total vertical NO_2 column precision" for 2023-12-09 to 2023-12-10

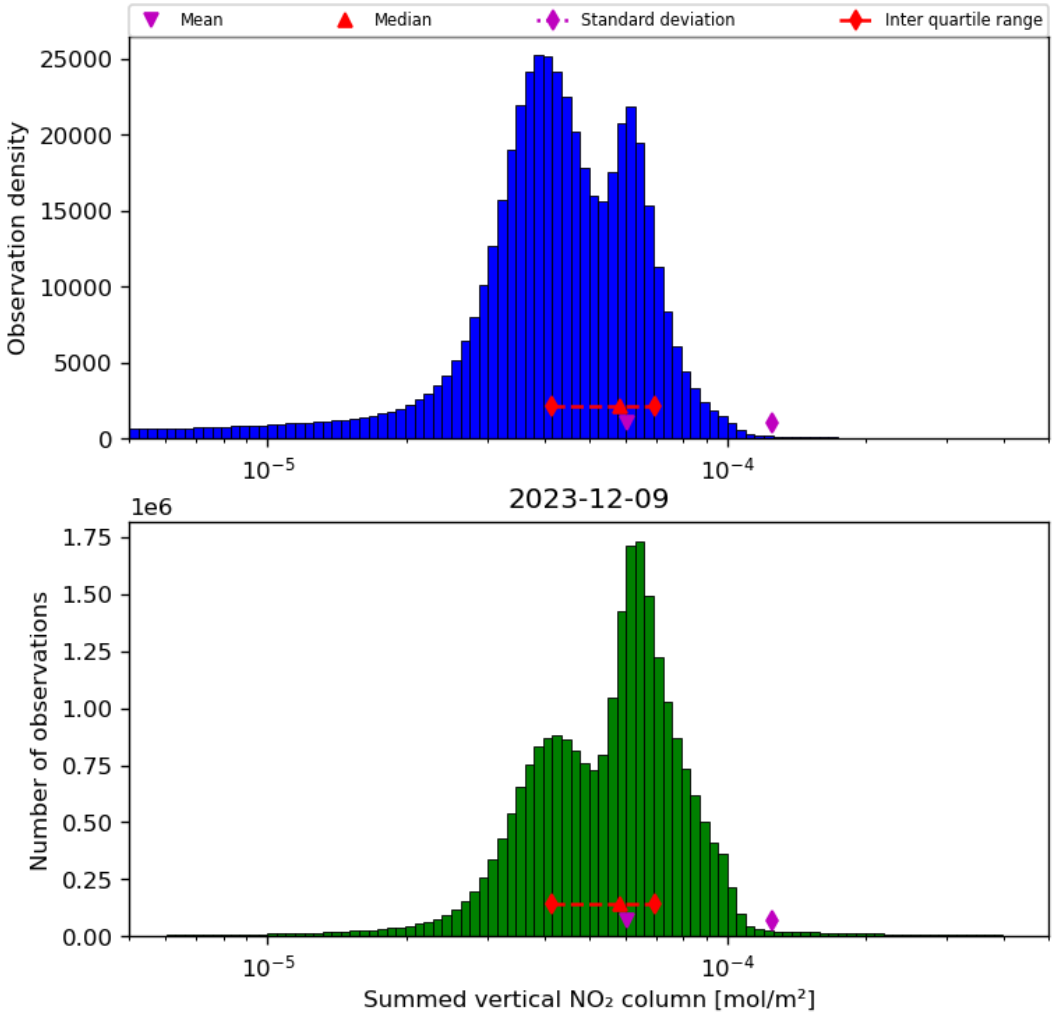


Figure 40: Histogram of "Summed vertical NO_2 column" for 2023-12-09 to 2023-12-10

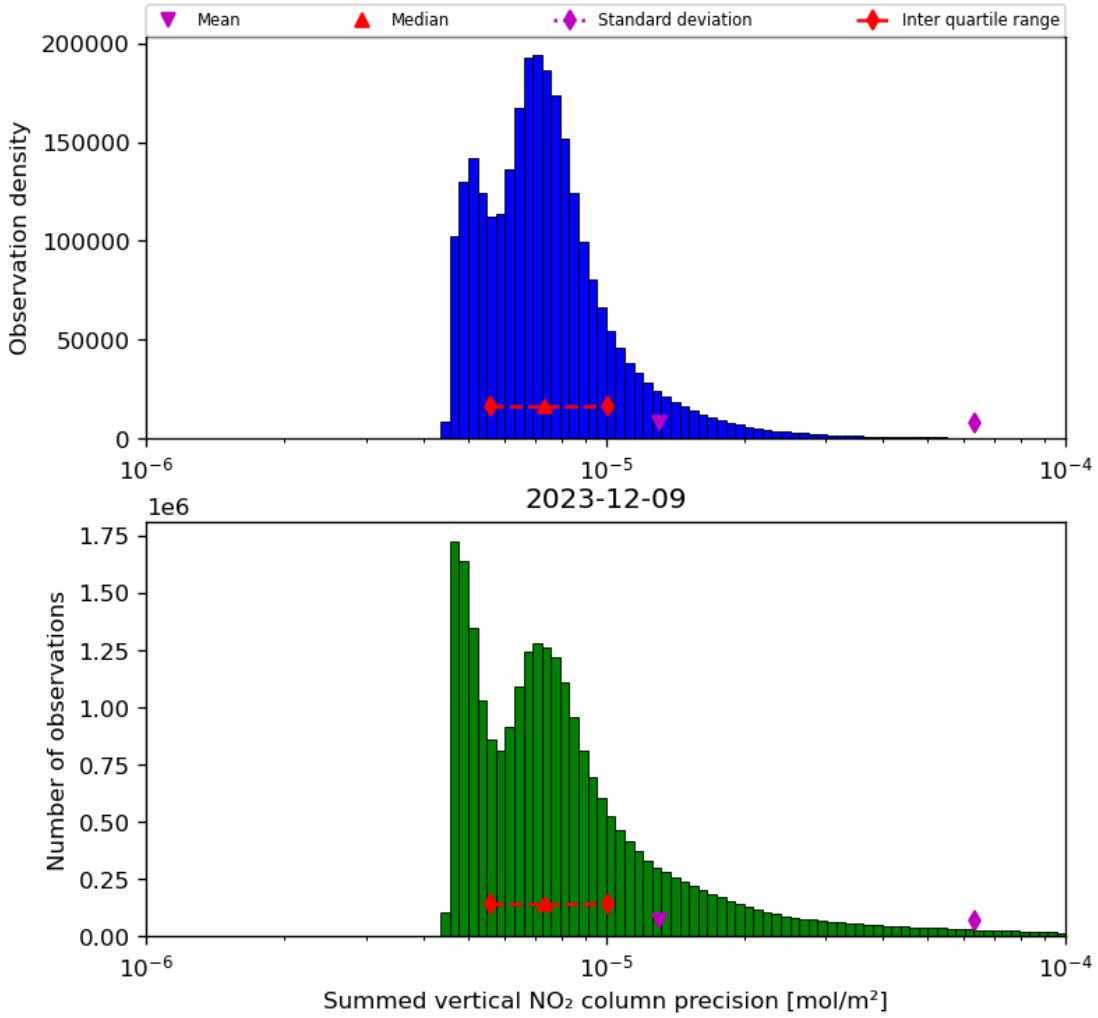


Figure 41: Histogram of "Summed vertical NO_2 column precision" for 2023-12-09 to 2023-12-10

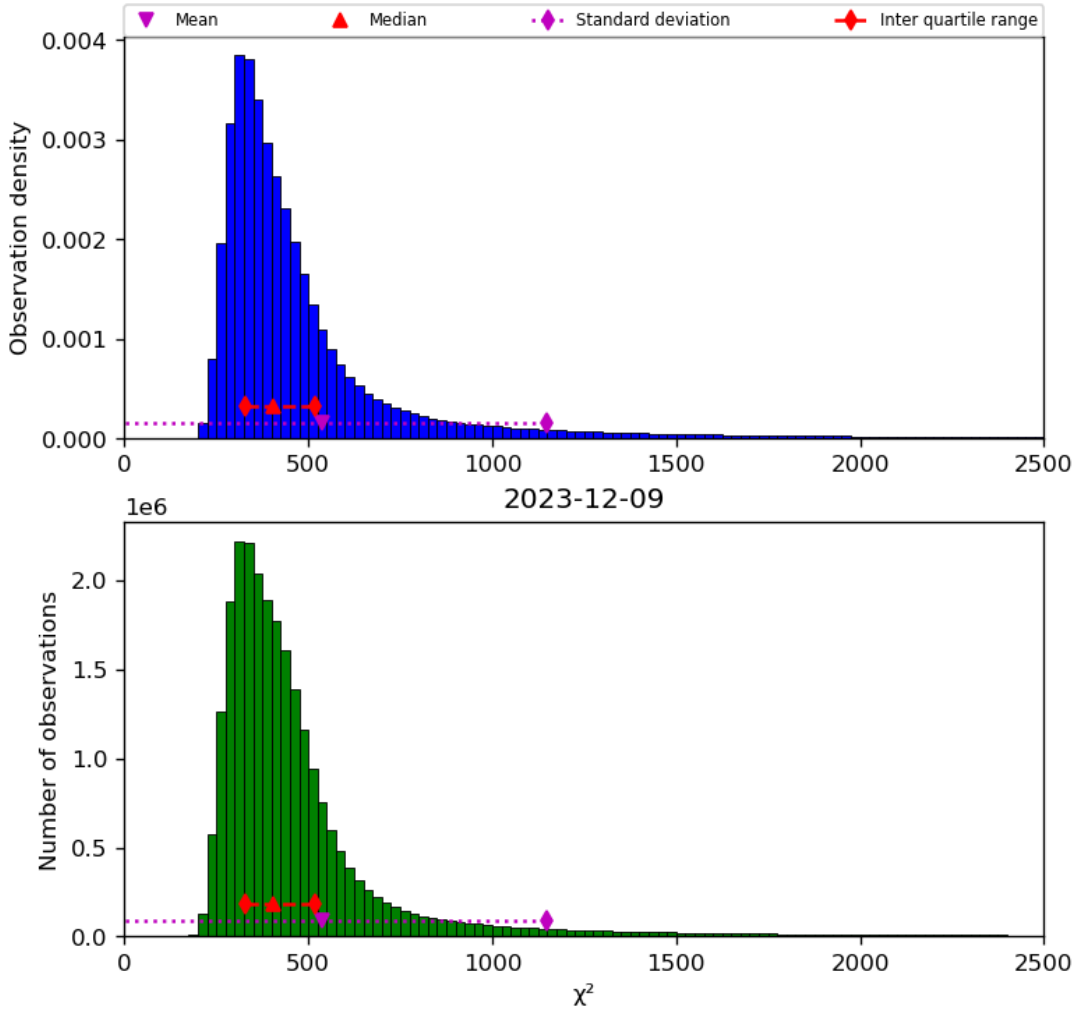


Figure 42: Histogram of "χ^2" for 2023-12-09 to 2023-12-10

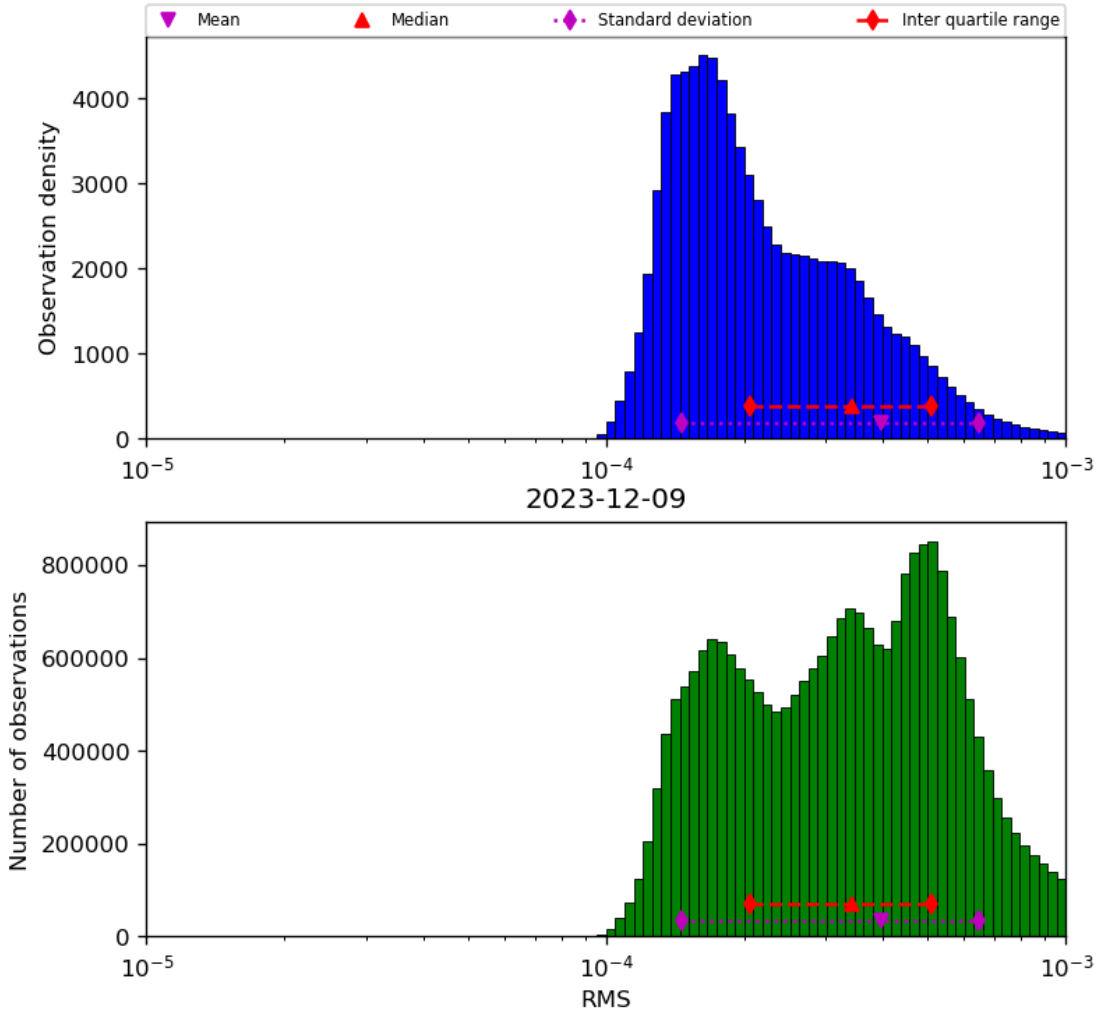


Figure 43: Histogram of “RMS” for 2023-12-09 to 2023-12-10

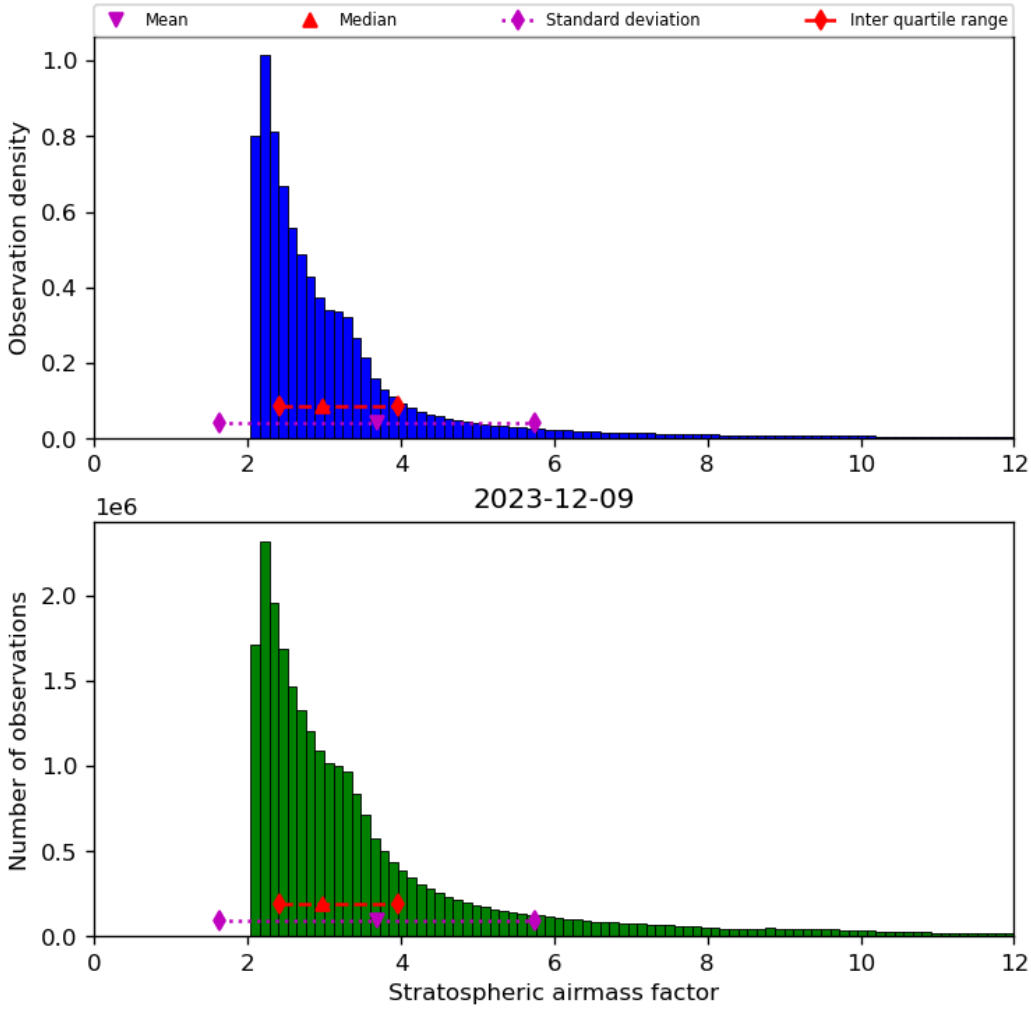


Figure 44: Histogram of “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10

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.

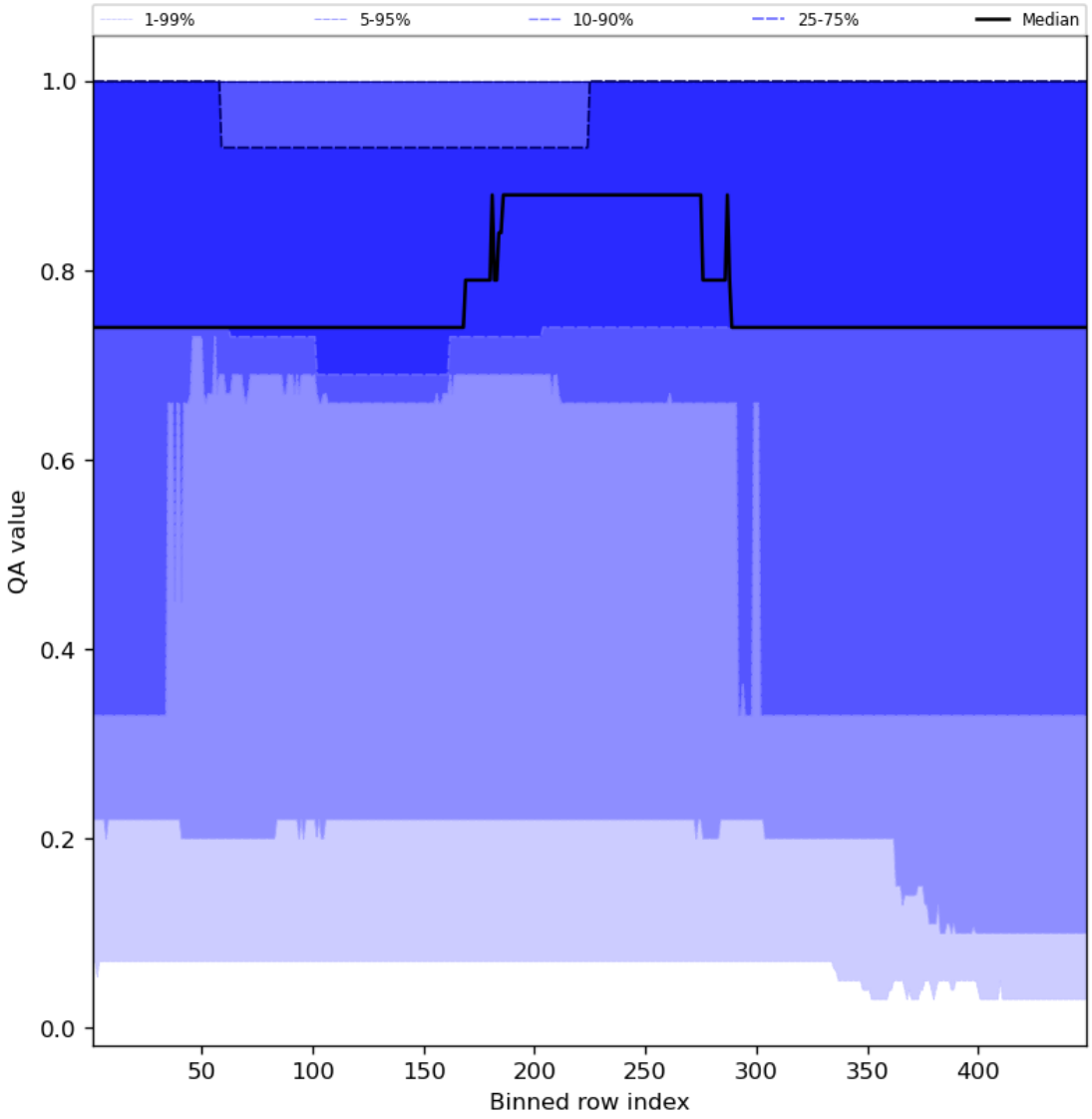


Figure 45: Along track statistics of “QA value” for 2023-12-09 to 2023-12-10

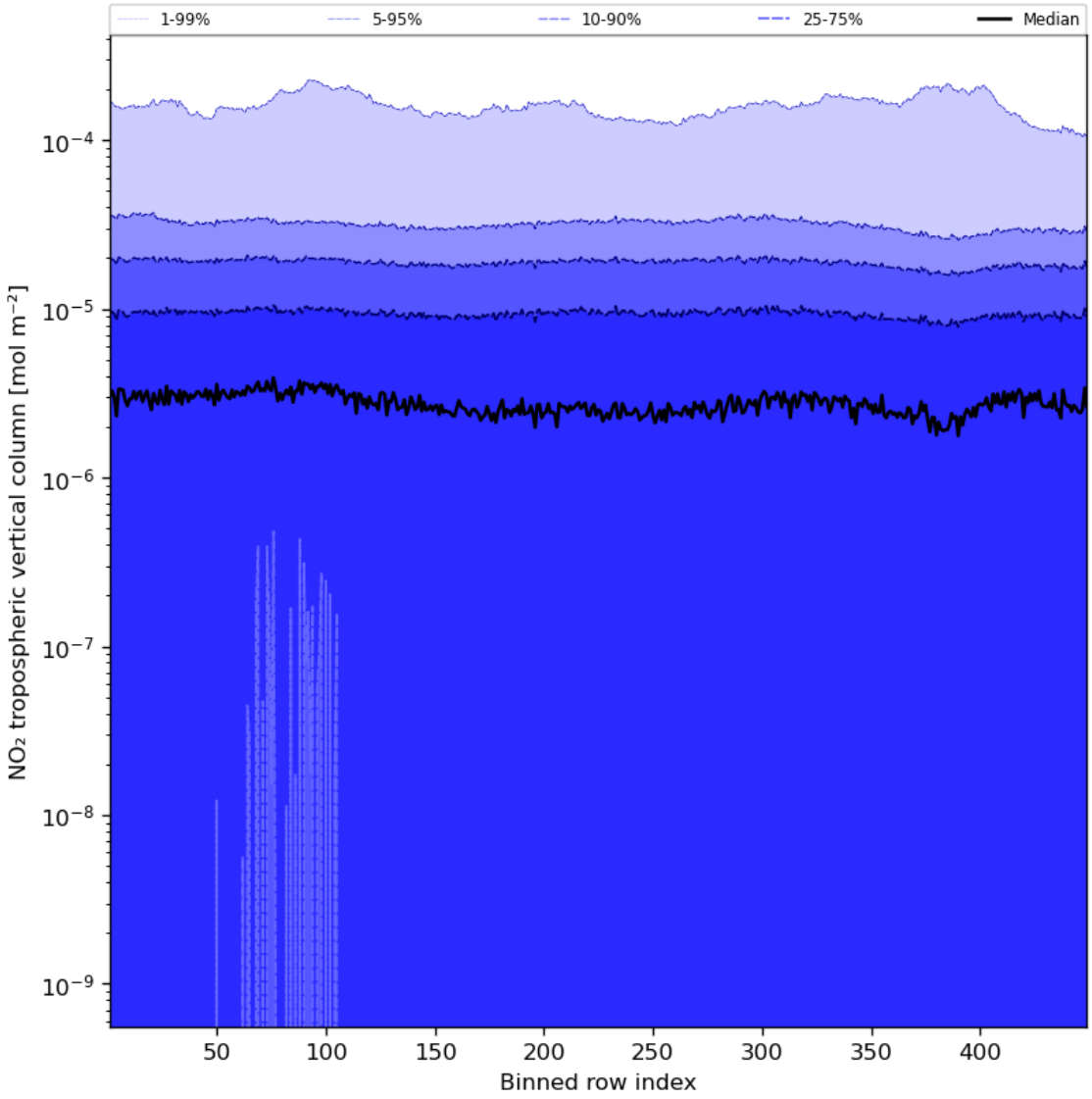


Figure 46: Along track statistics of "NO_2 tropospheric vertical column" for 2023-12-09 to 2023-12-10

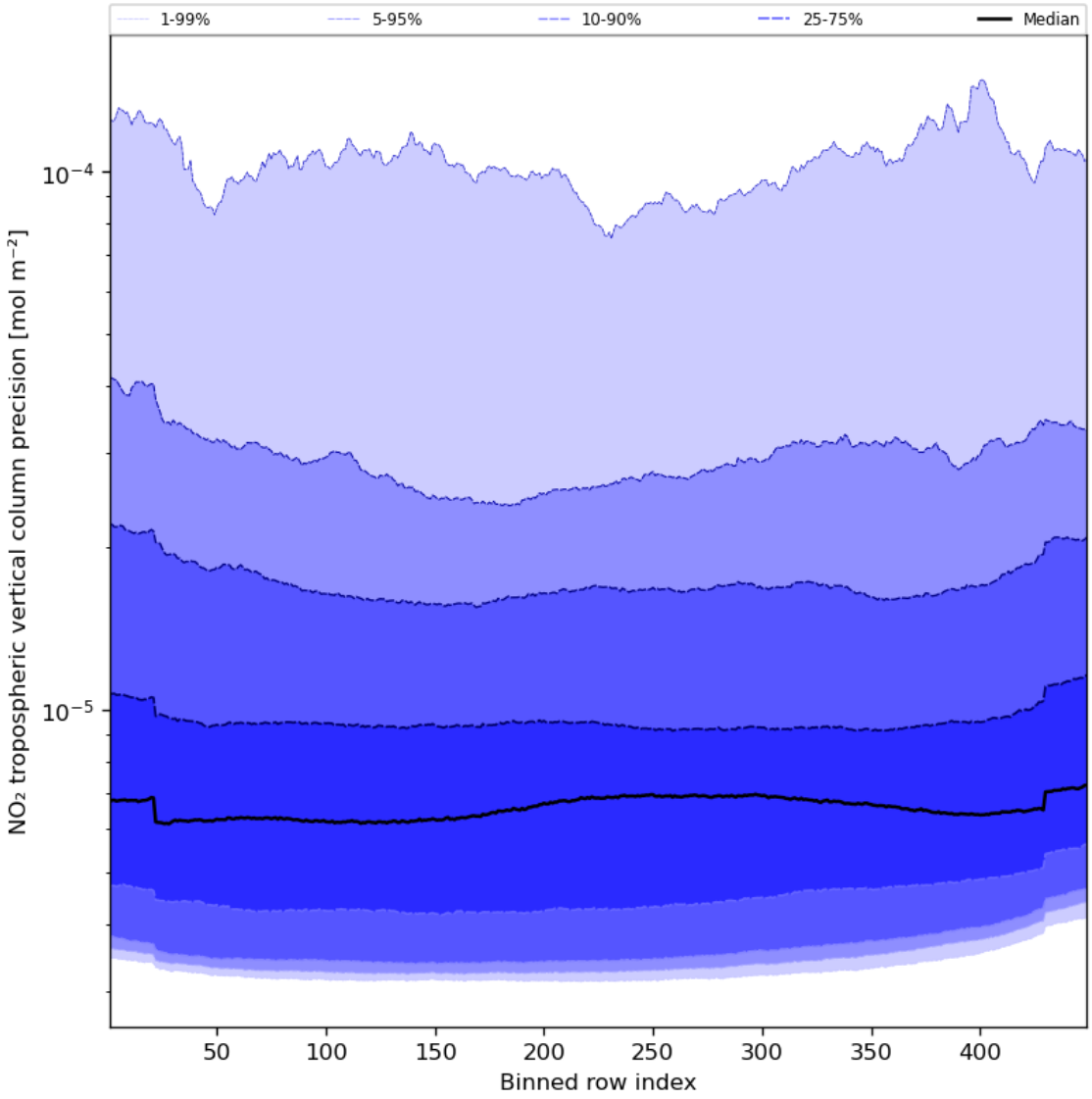


Figure 47: Along track statistics of "NO_2 tropospheric vertical column precision" for 2023-12-09 to 2023-12-10

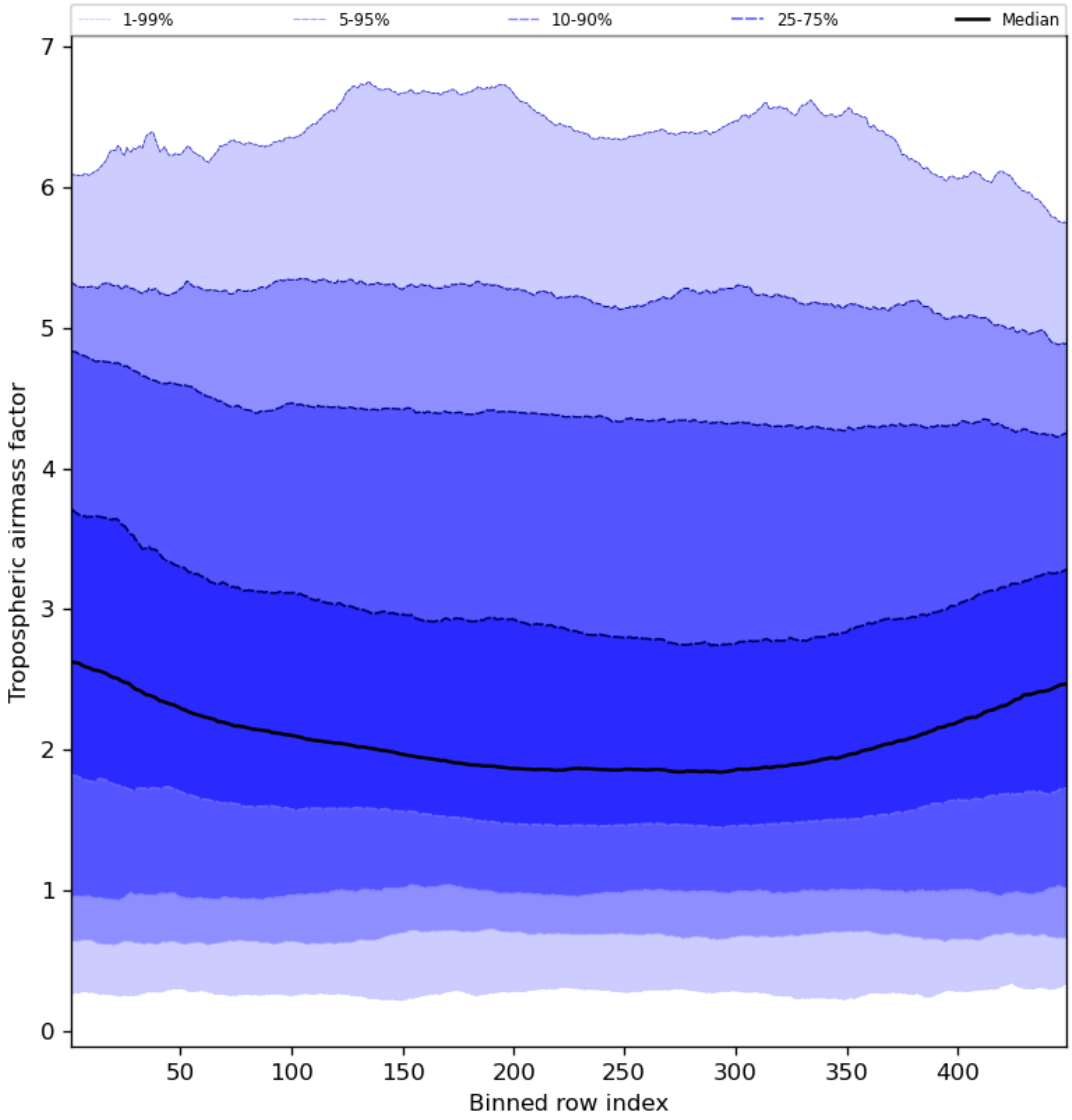


Figure 48: Along track statistics of “Tropospheric airmass factor” for 2023-12-09 to 2023-12-10

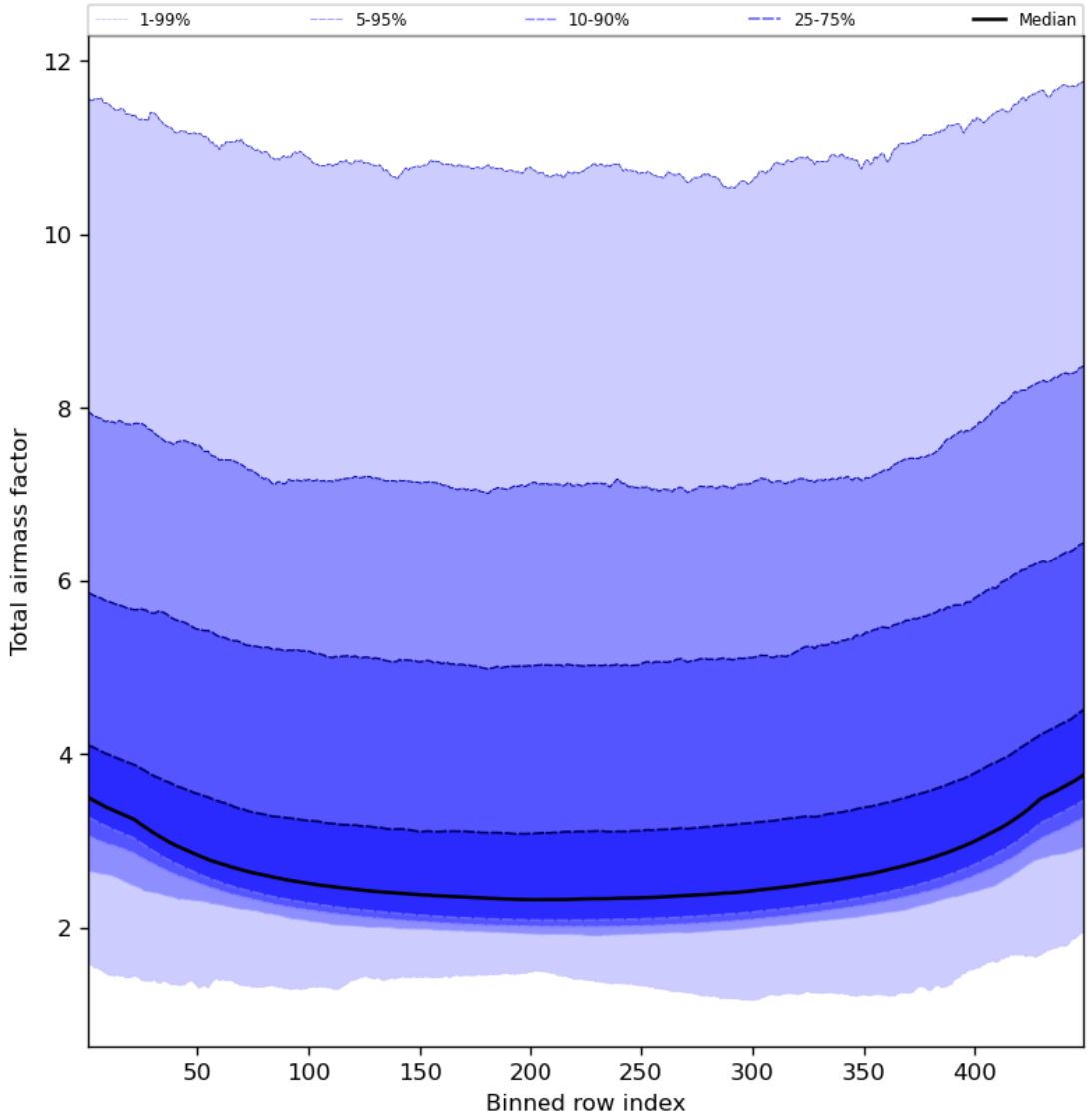


Figure 49: Along track statistics of “Total airmass factor” for 2023-12-09 to 2023-12-10

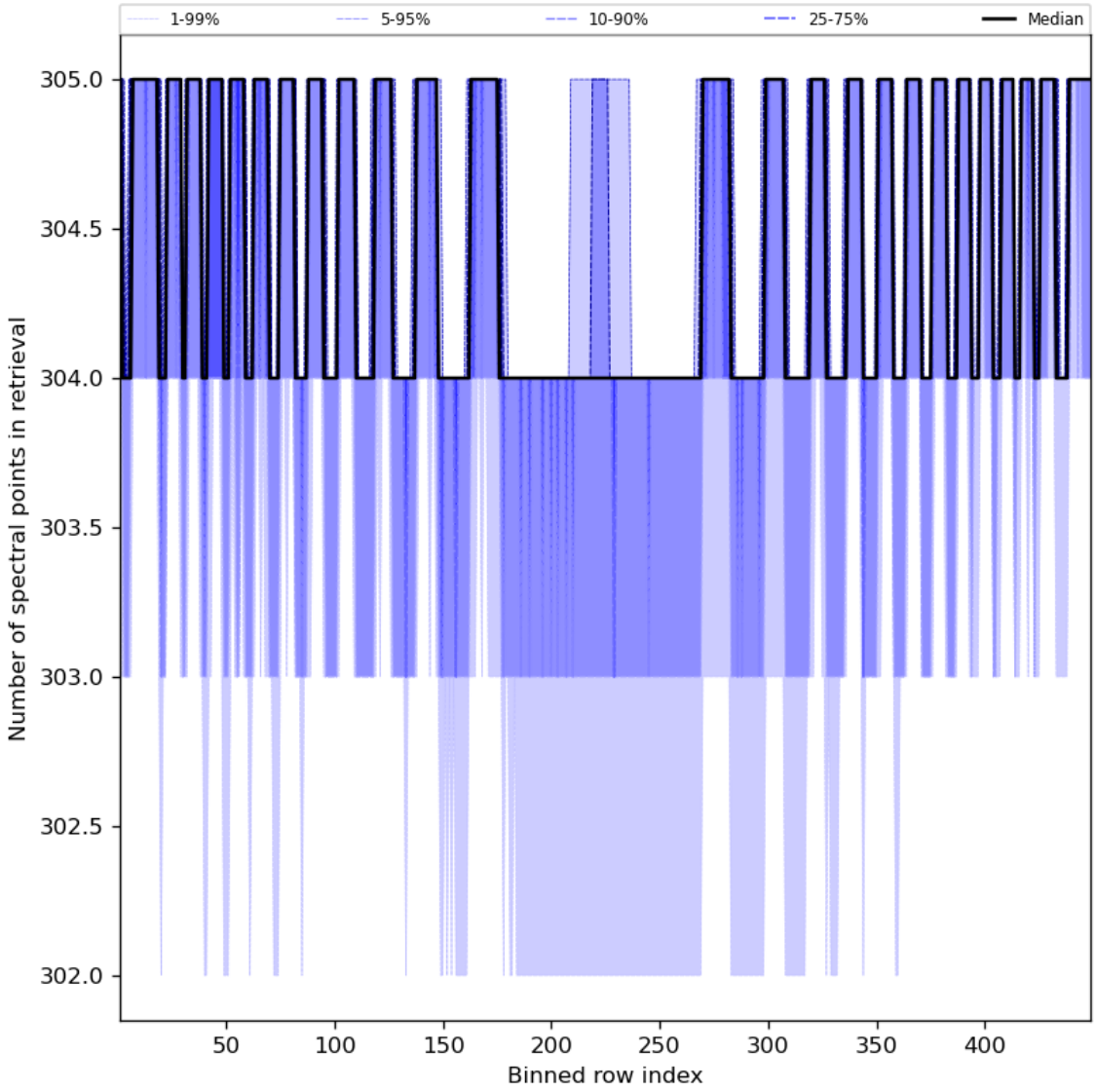


Figure 50: Along track statistics of “Number of spectral points in retrieval” for 2023-12-09 to 2023-12-10

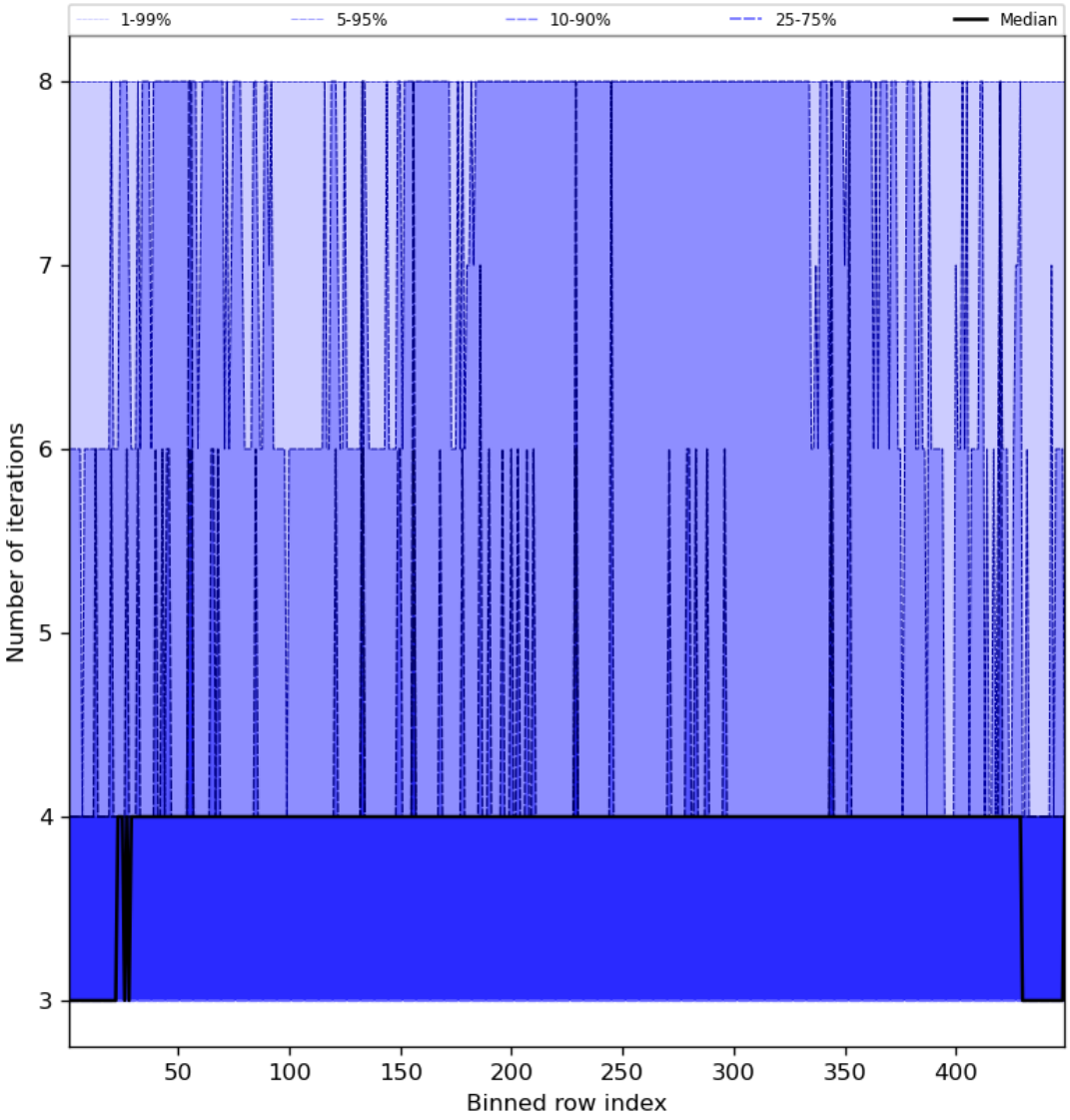


Figure 51: Along track statistics of “Number of iterations” for 2023-12-09 to 2023-12-10

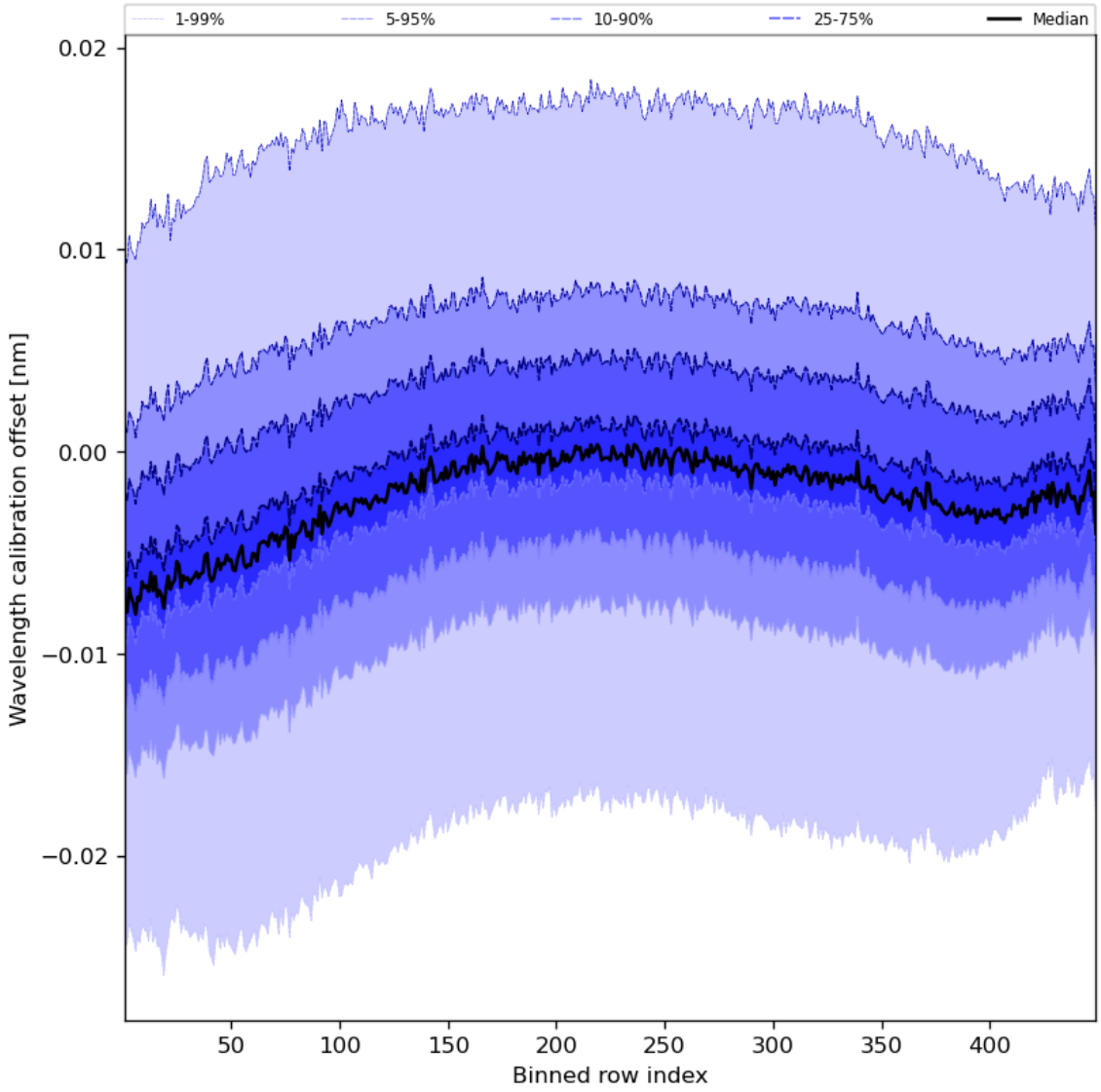


Figure 52: Along track statistics of “Wavelength calibration offset” for 2023-12-09 to 2023-12-10

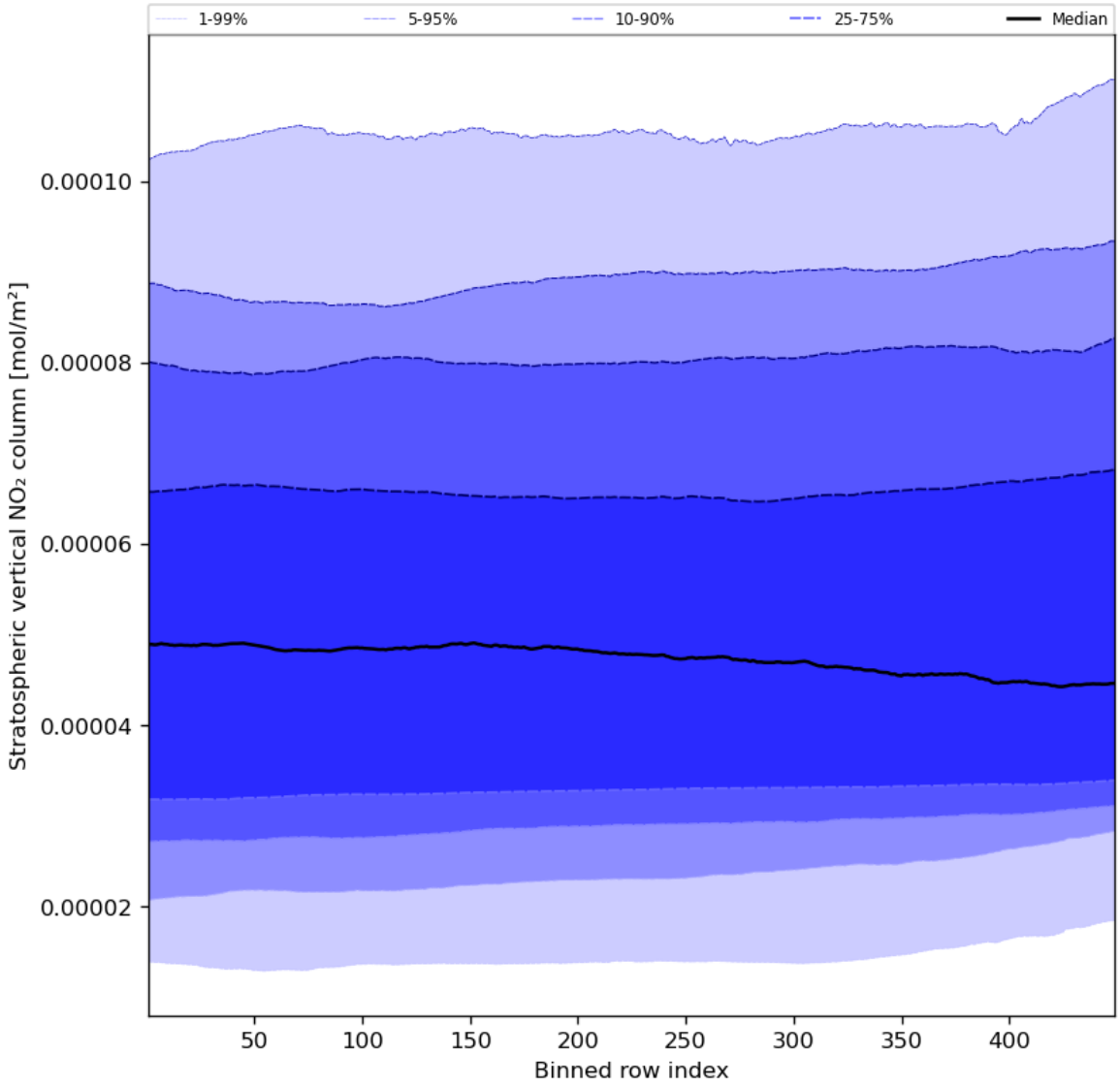


Figure 53: Along track statistics of “Stratospheric vertical NO_2 column” for 2023-12-09 to 2023-12-10

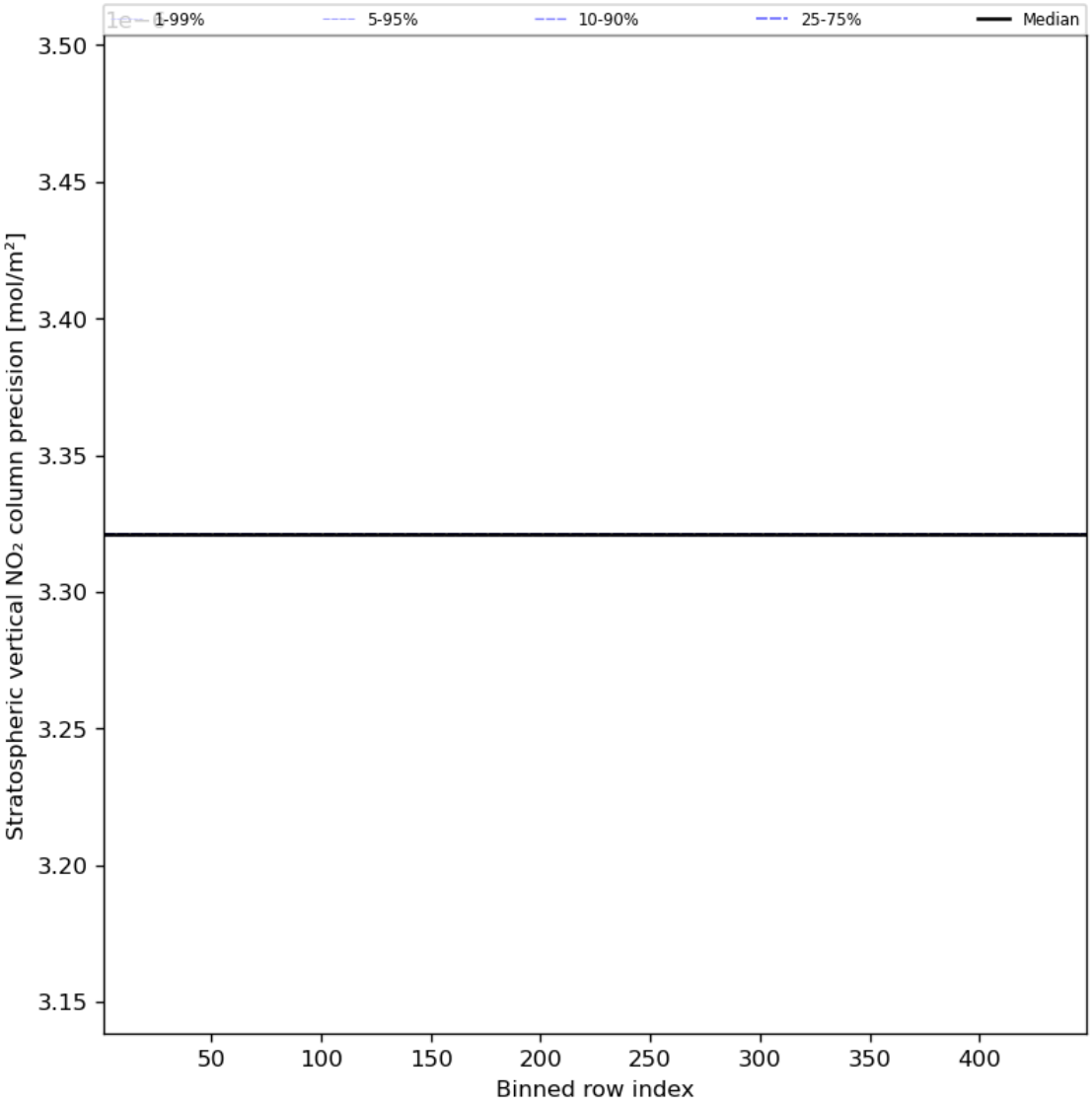


Figure 54: Along track statistics of “Stratospheric vertical NO_2 column precision” for 2023-12-09 to 2023-12-10

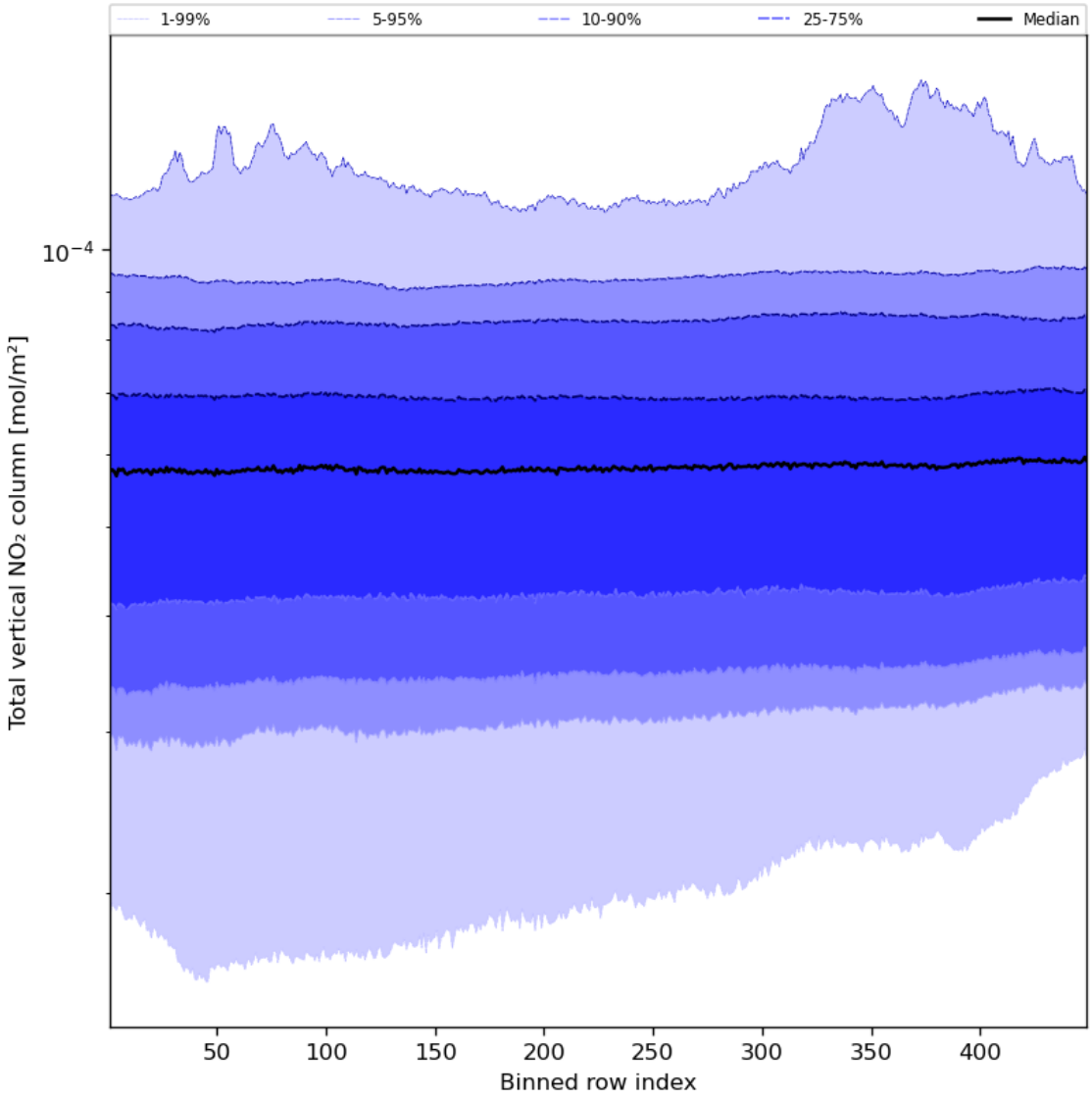


Figure 55: Along track statistics of "Total vertical NO_2 column" for 2023-12-09 to 2023-12-10

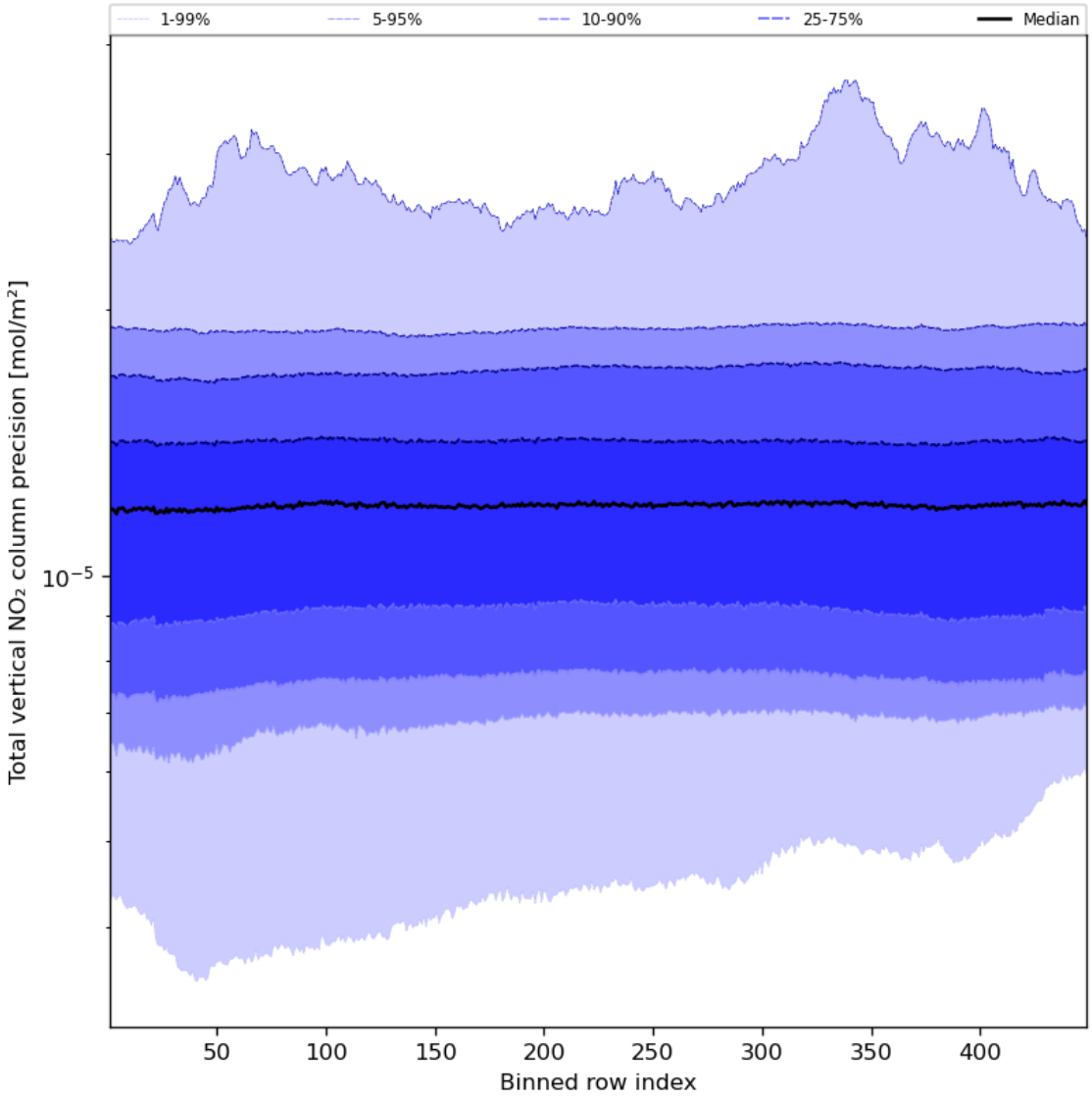


Figure 56: Along track statistics of “Total vertical NO_2 column precision” for 2023-12-09 to 2023-12-10

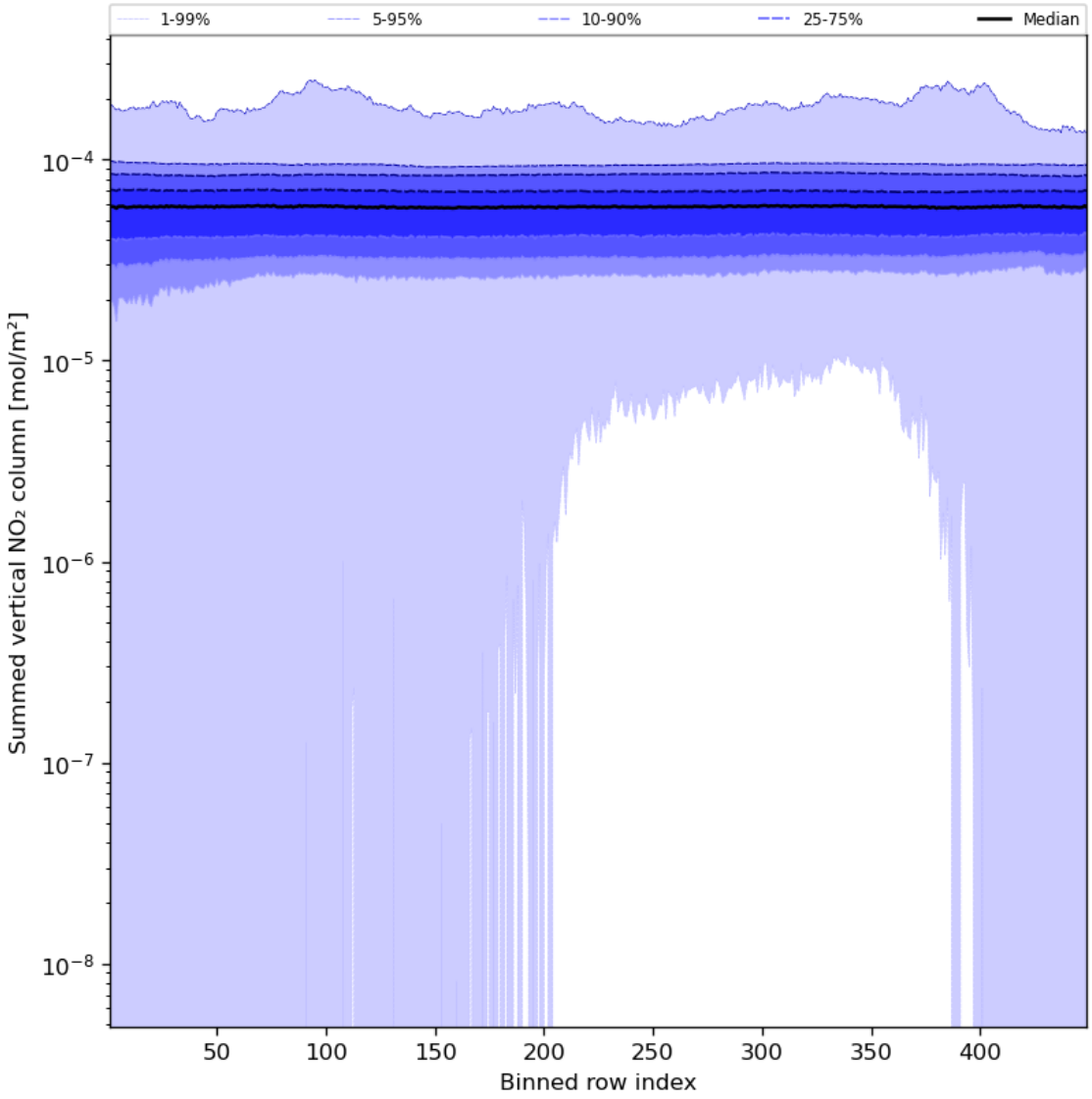


Figure 57: Along track statistics of “Summed vertical NO_2 column” for 2023-12-09 to 2023-12-10

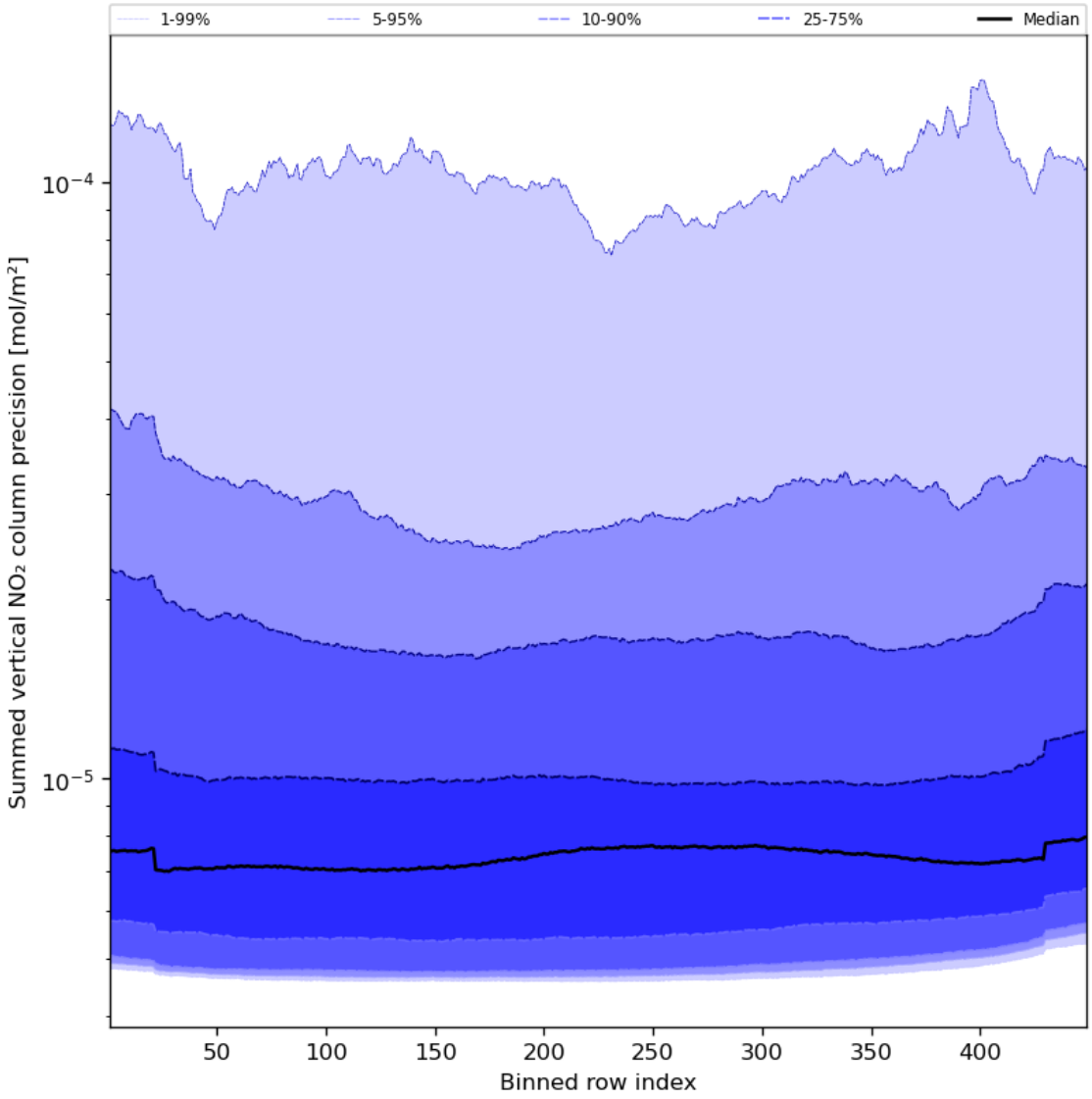


Figure 58: Along track statistics of “Summed vertical NO_2 column precision” for 2023-12-09 to 2023-12-10

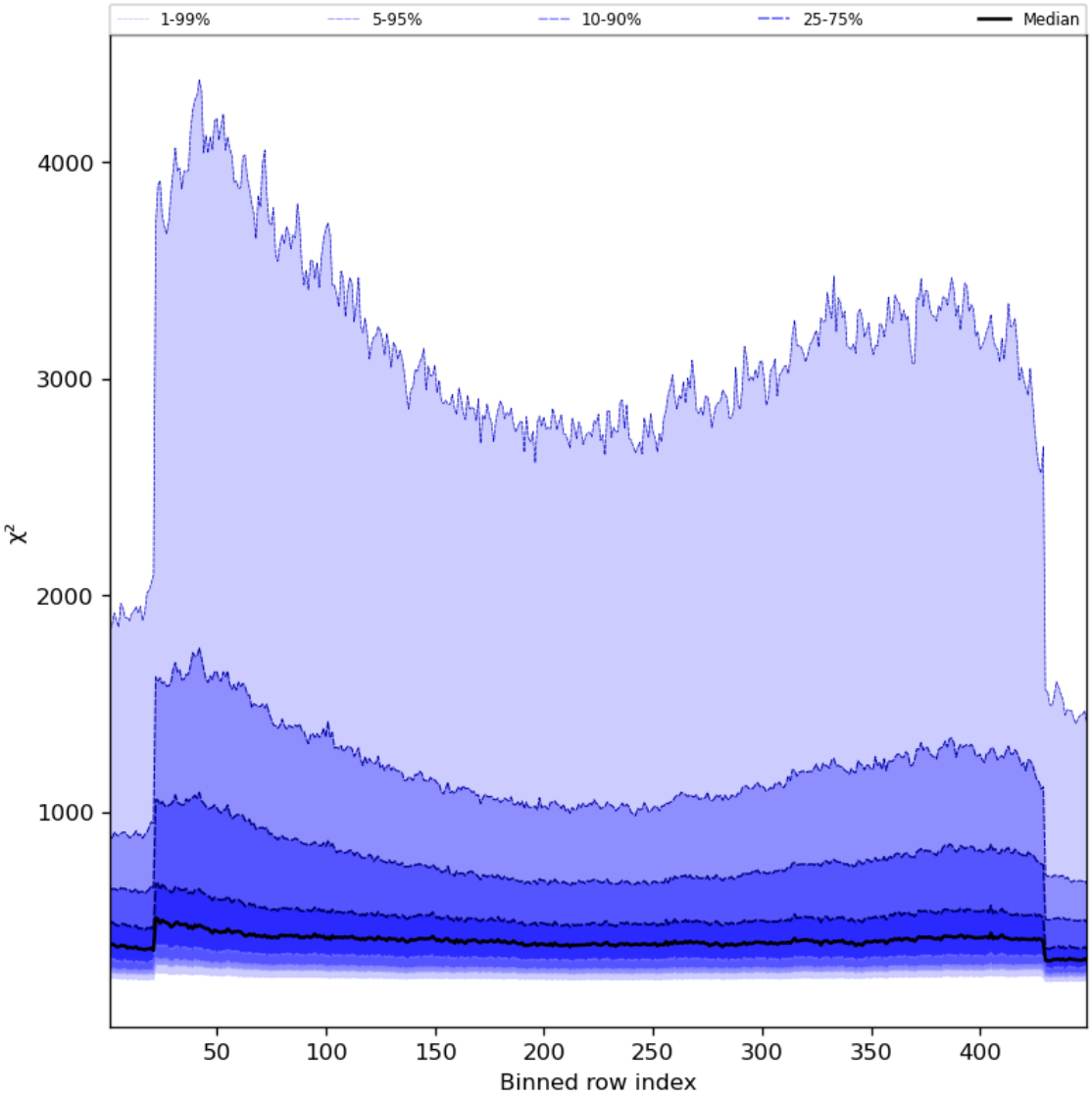


Figure 59: Along track statistics of "χ^2" for 2023-12-09 to 2023-12-10

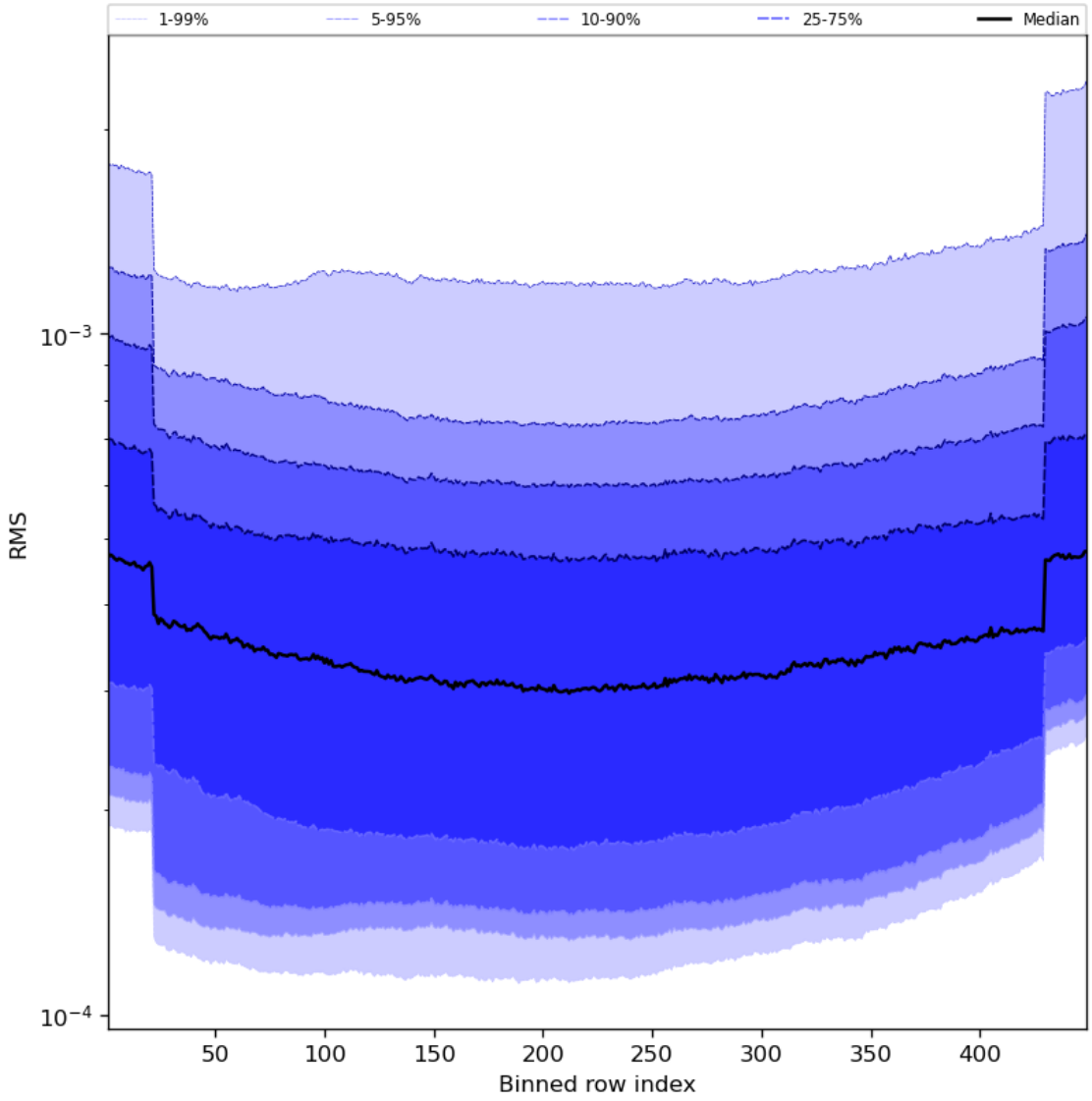


Figure 60: Along track statistics of “RMS” for 2023-12-09 to 2023-12-10

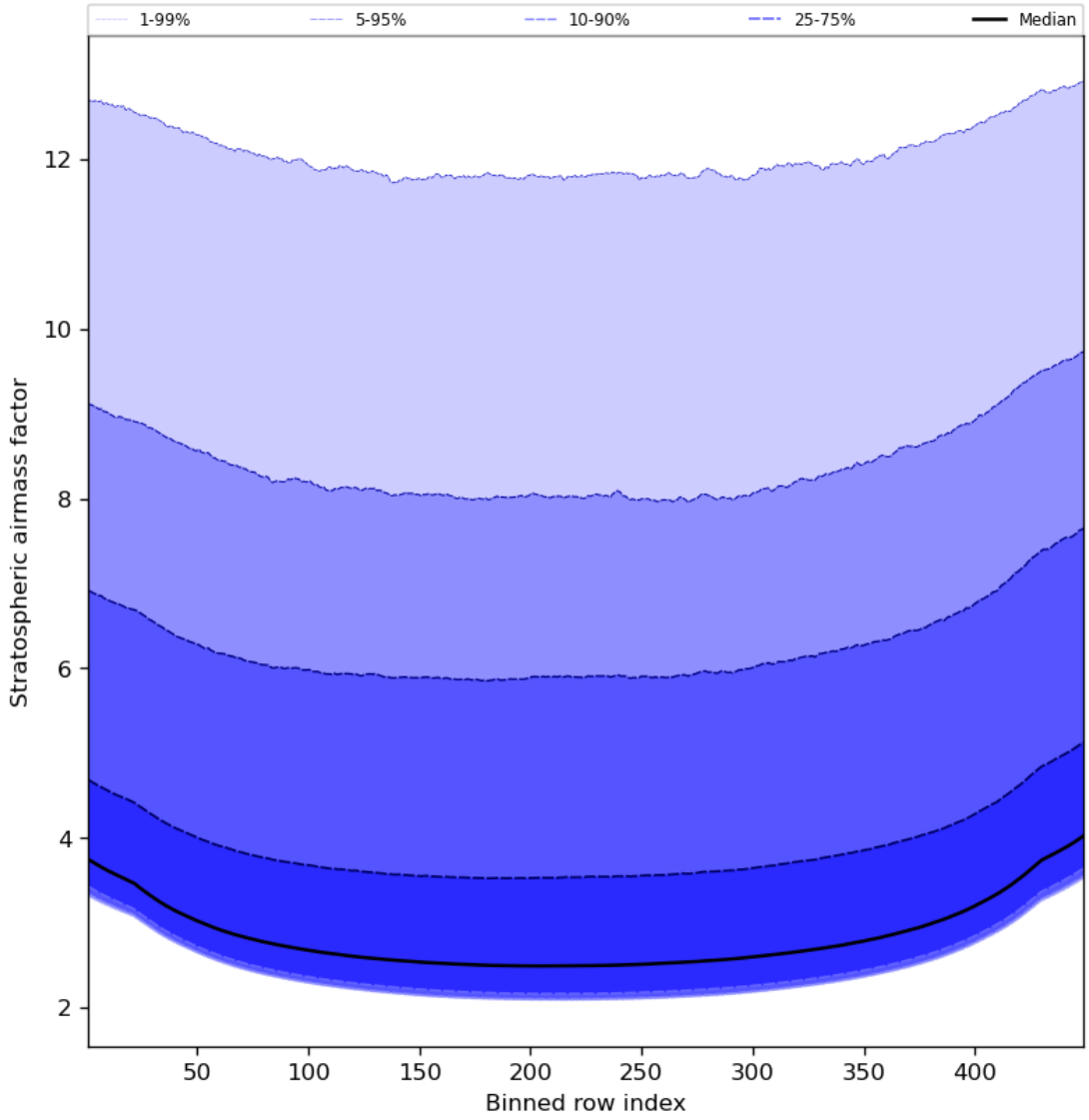


Figure 61: Along track statistics of “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10

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.

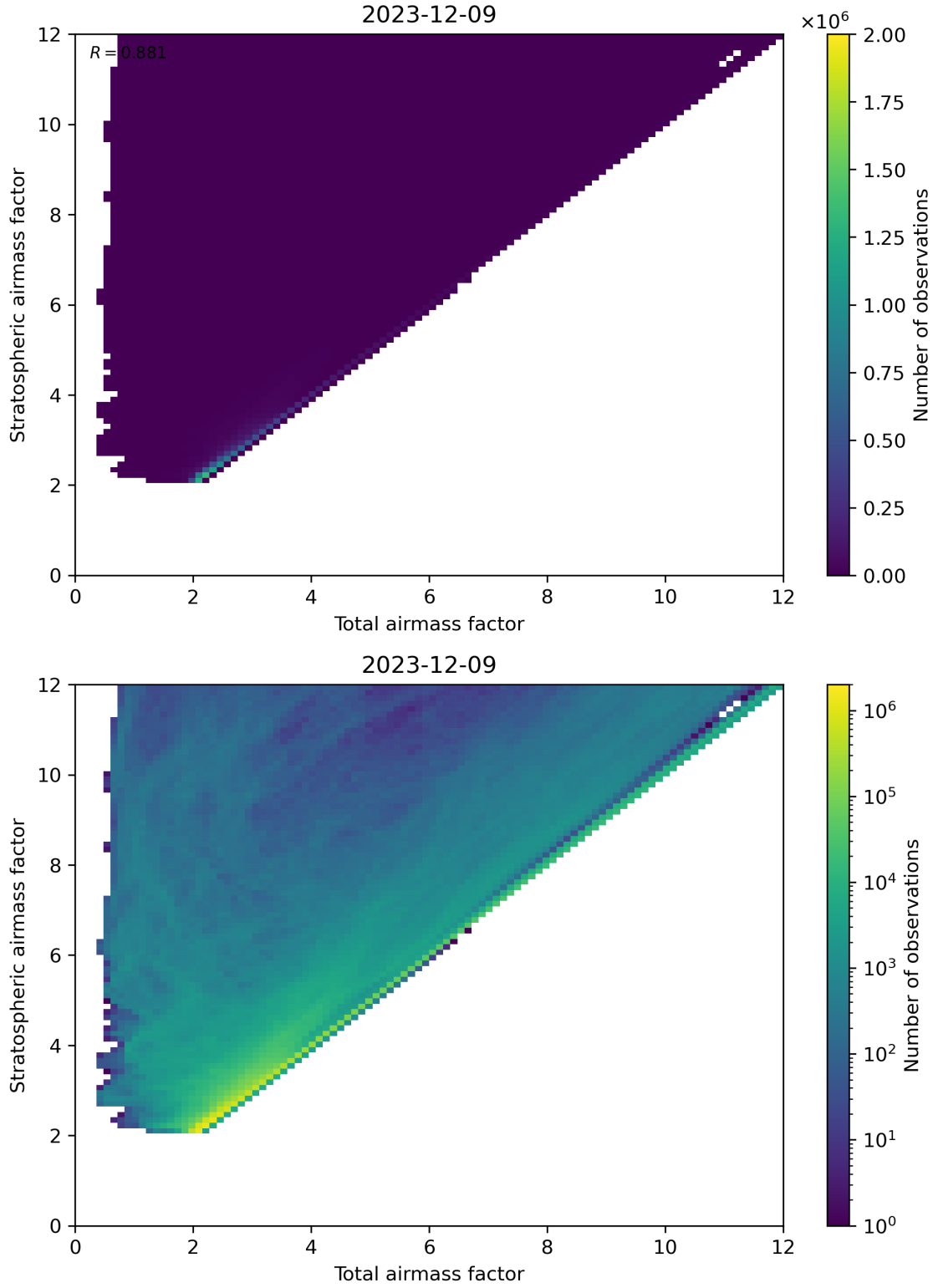


Figure 62: Scatter density plot of “Total airmass factor” against “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10.

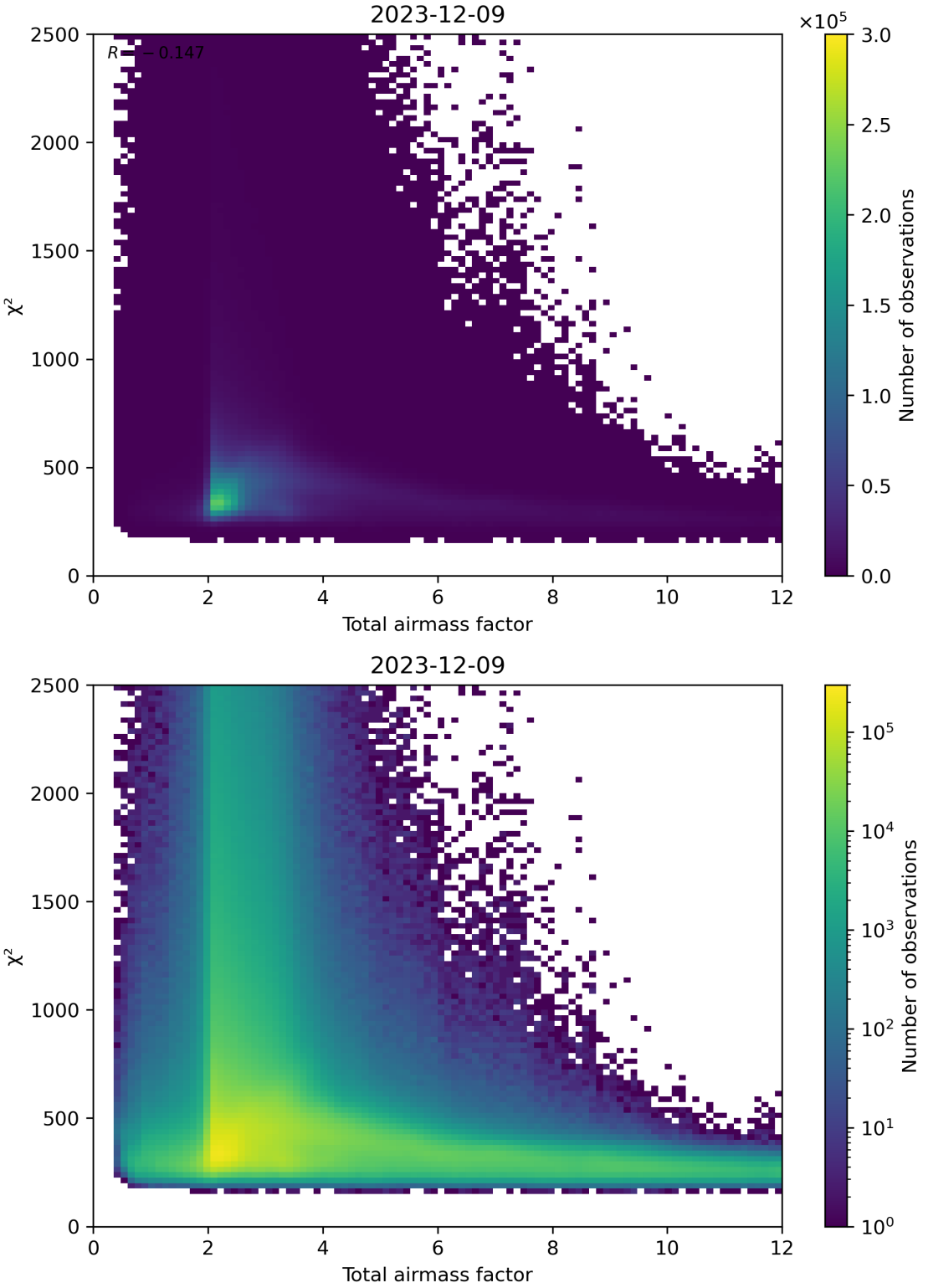


Figure 63: Scatter density plot of "Total airmass factor" against "χ^2" for 2023-12-09 to 2023-12-10.

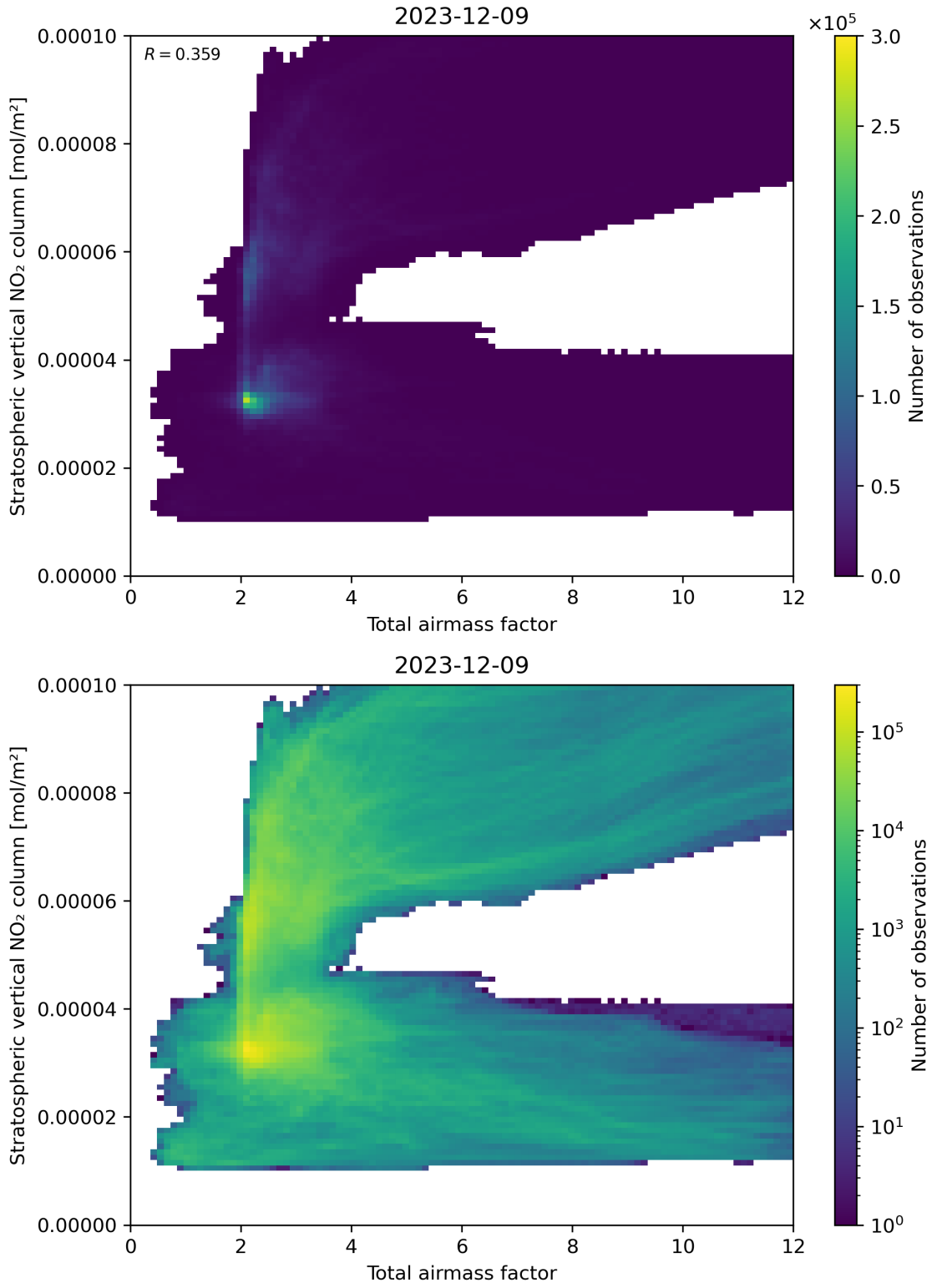


Figure 64: Scatter density plot of "Total airmass factor" against "Stratospheric vertical NO_2 column" for 2023-12-09 to 2023-12-10.

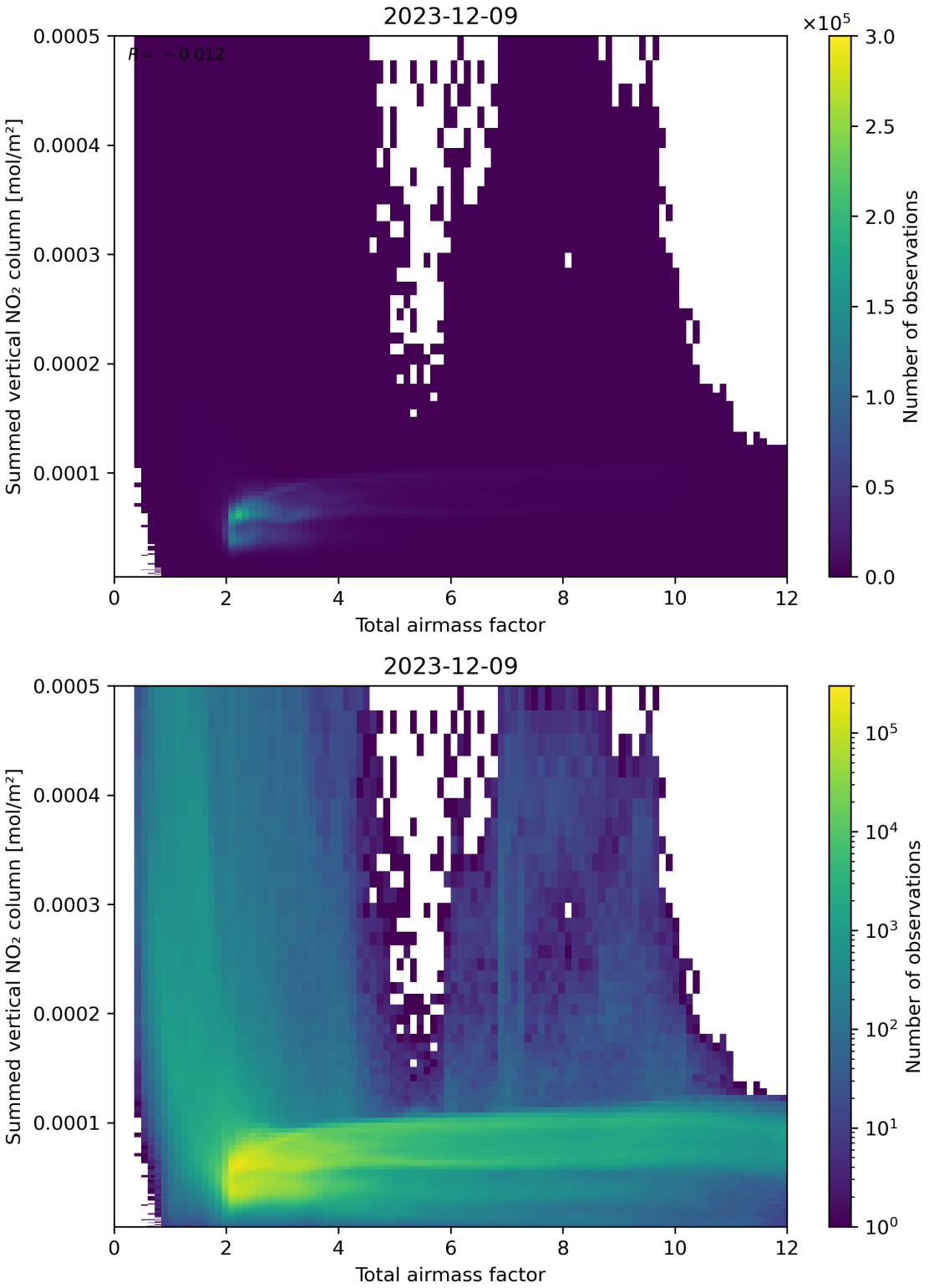


Figure 65: Scatter density plot of “Total airmass factor” against “Summed vertical NO_2 column” for 2023-12-09 to 2023-12-10.

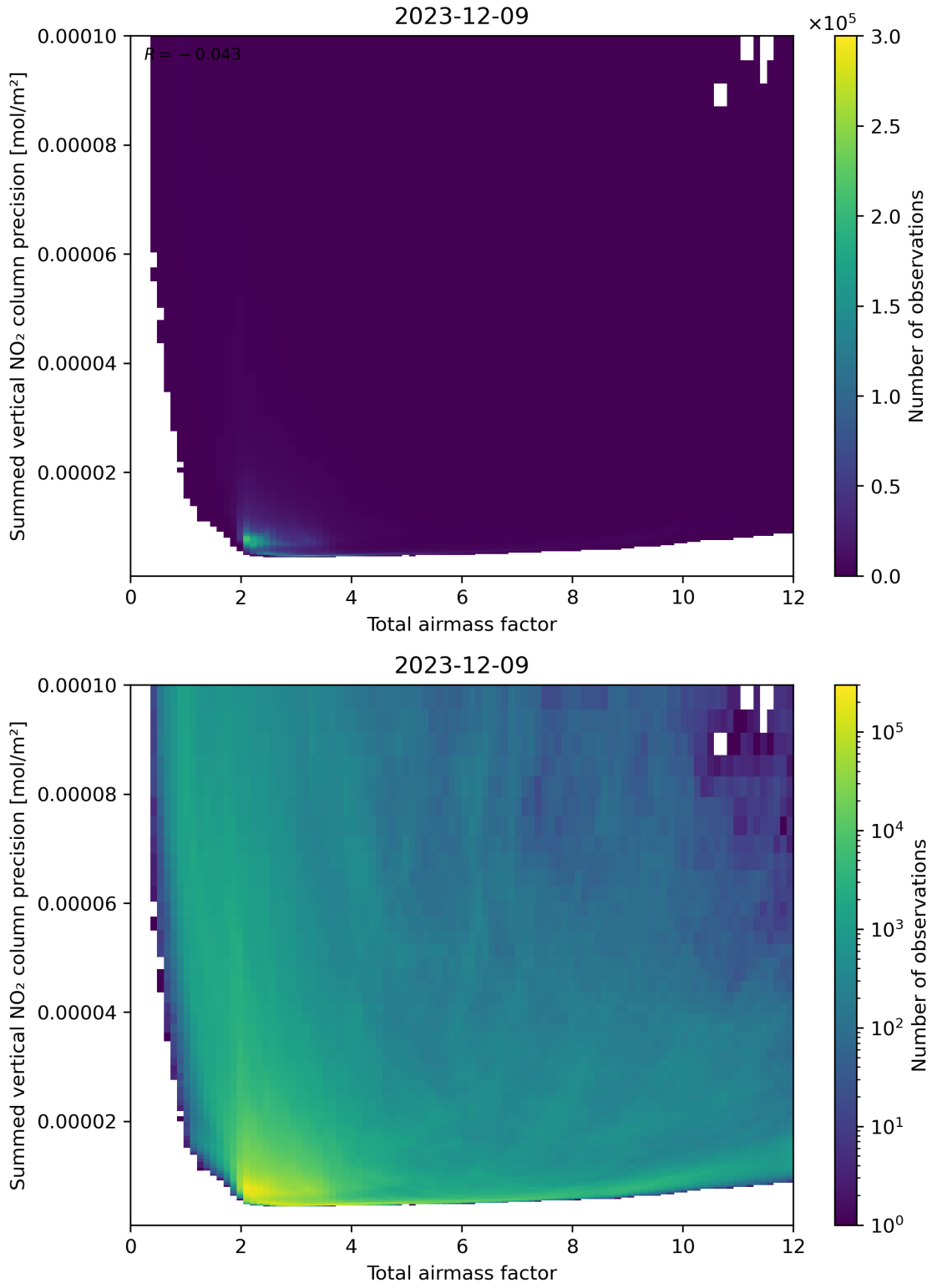


Figure 66: Scatter density plot of “Total airmass factor” against “Summed vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

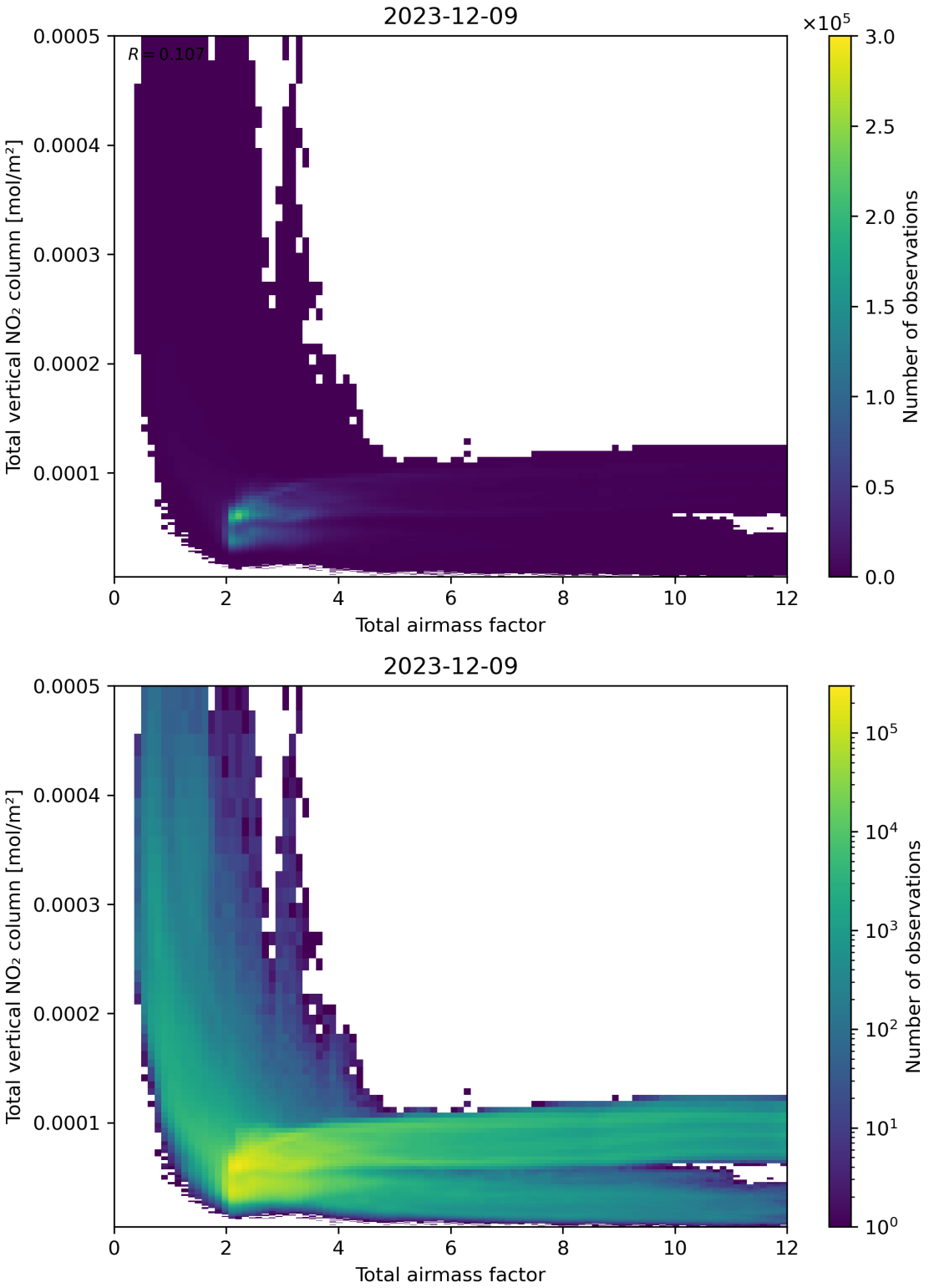


Figure 67: Scatter density plot of “Total airmass factor” against “Total vertical NO_2 column” for 2023-12-09 to 2023-12-10.

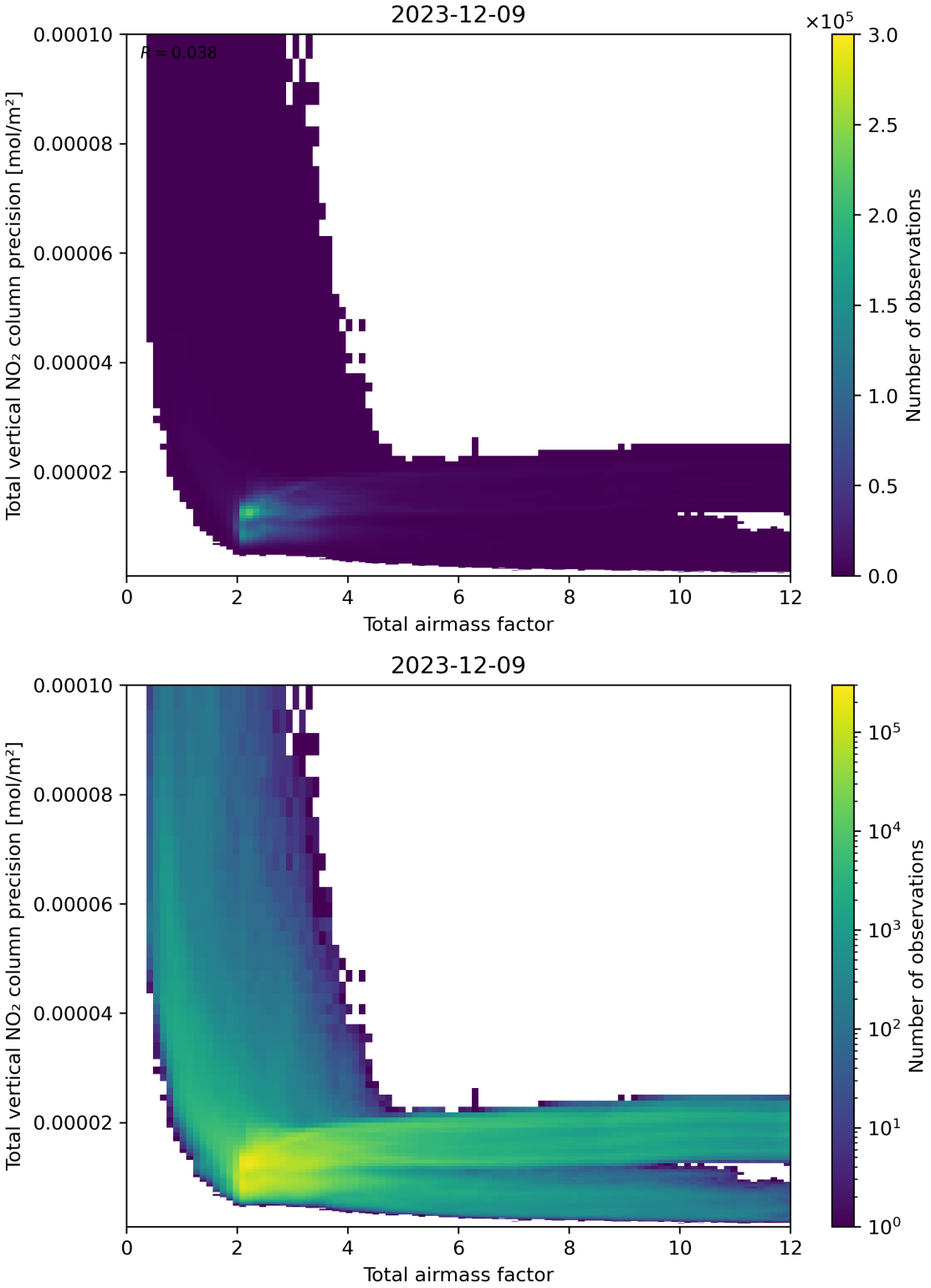


Figure 68: Scatter density plot of “Total airmass factor” against “Total vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

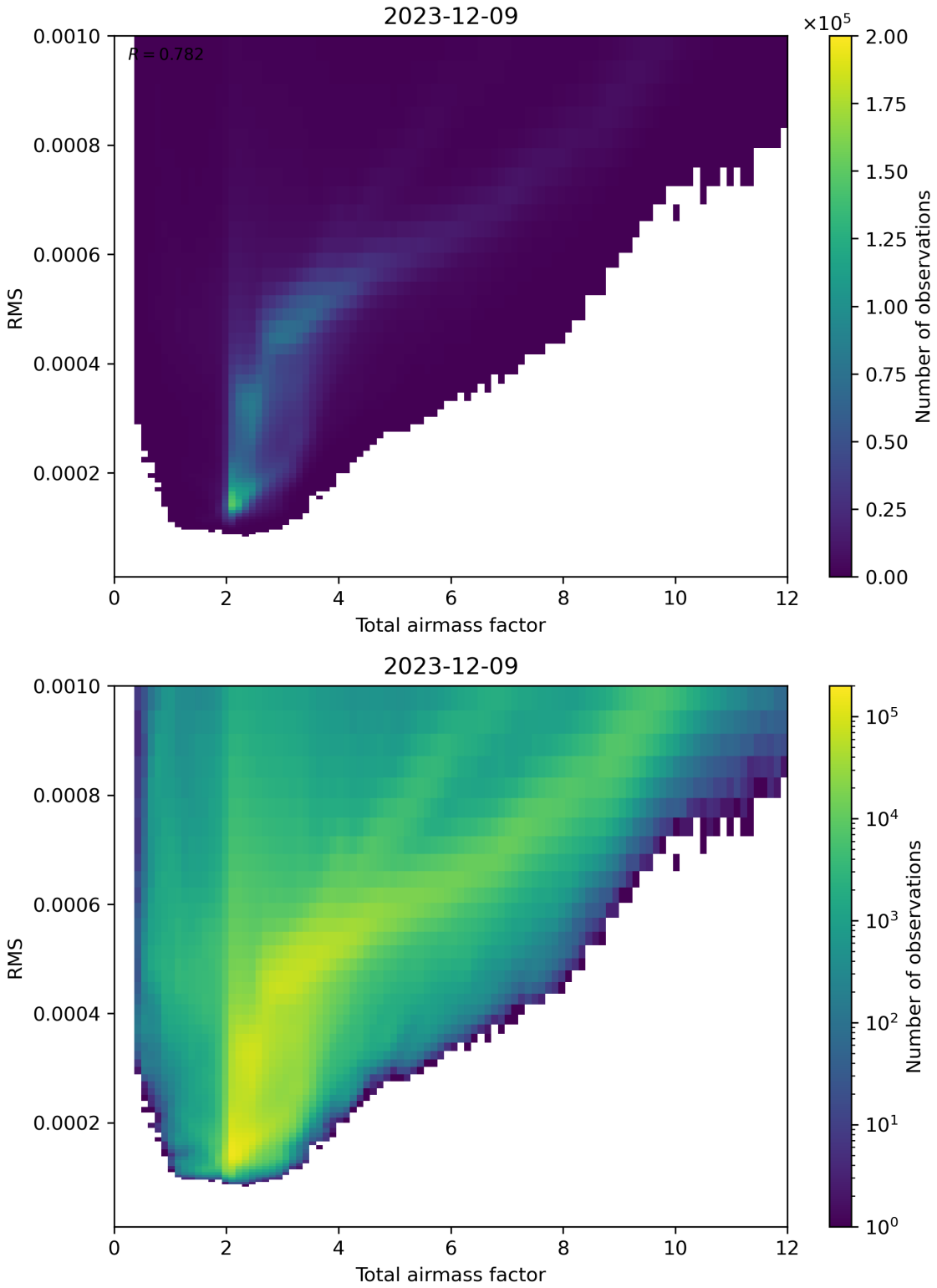


Figure 69: Scatter density plot of “Total airmass factor” against “RMS” for 2023-12-09 to 2023-12-10.

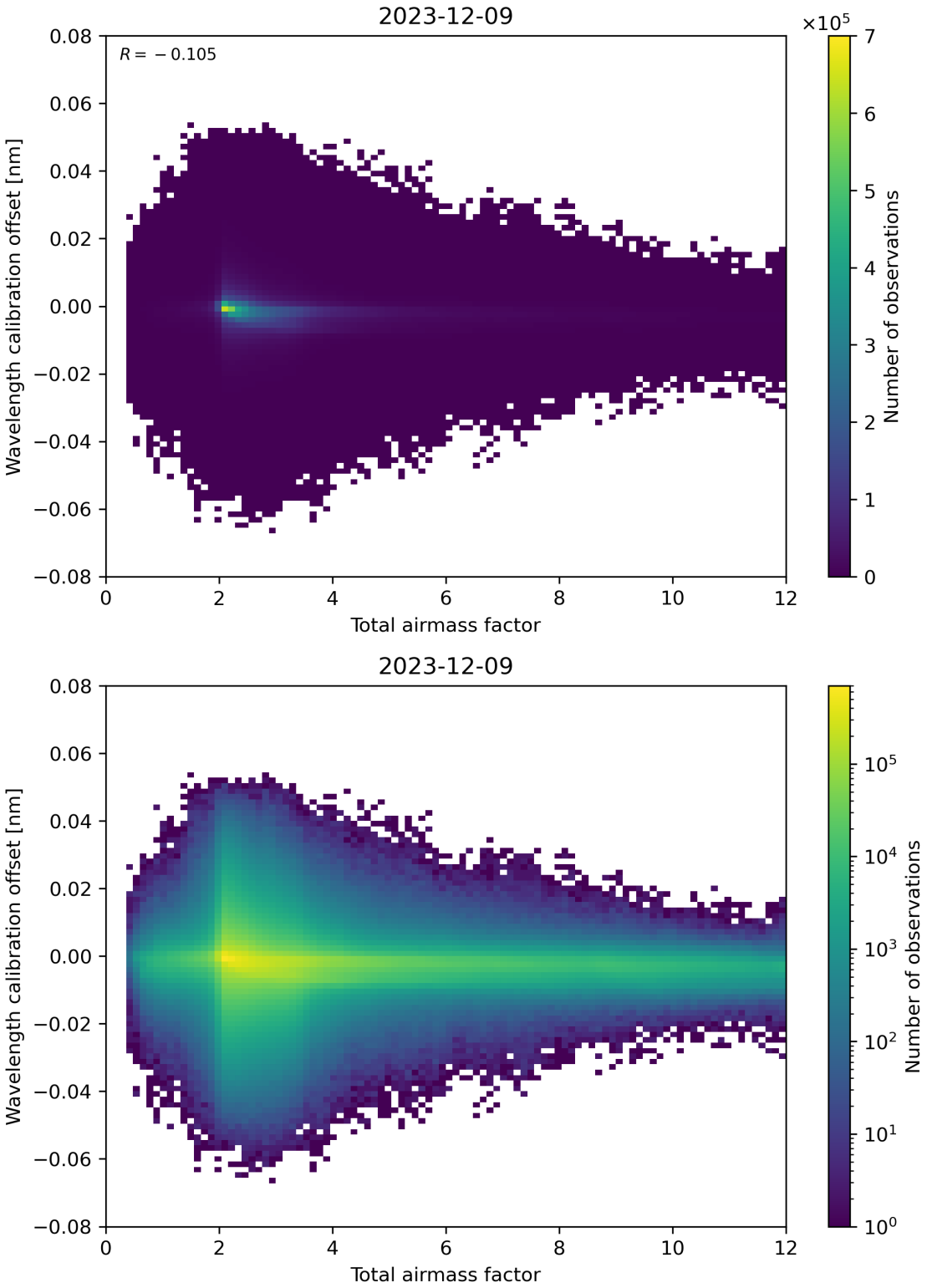


Figure 70: Scatter density plot of “Total airmass factor” against “Wavelength calibration offset” for 2023-12-09 to 2023-12-10.

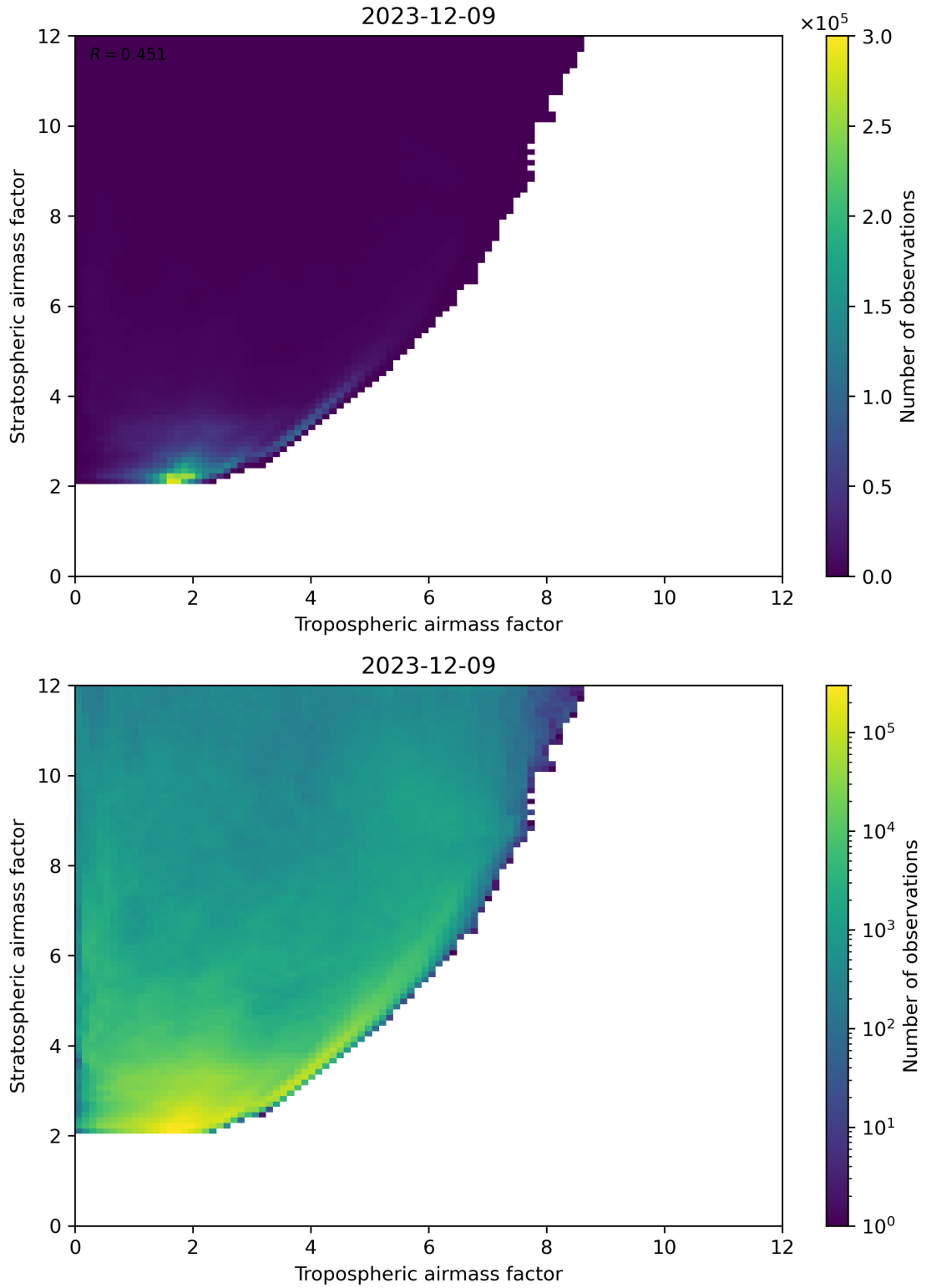


Figure 71: Scatter density plot of “Tropospheric airmass factor” against “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10.

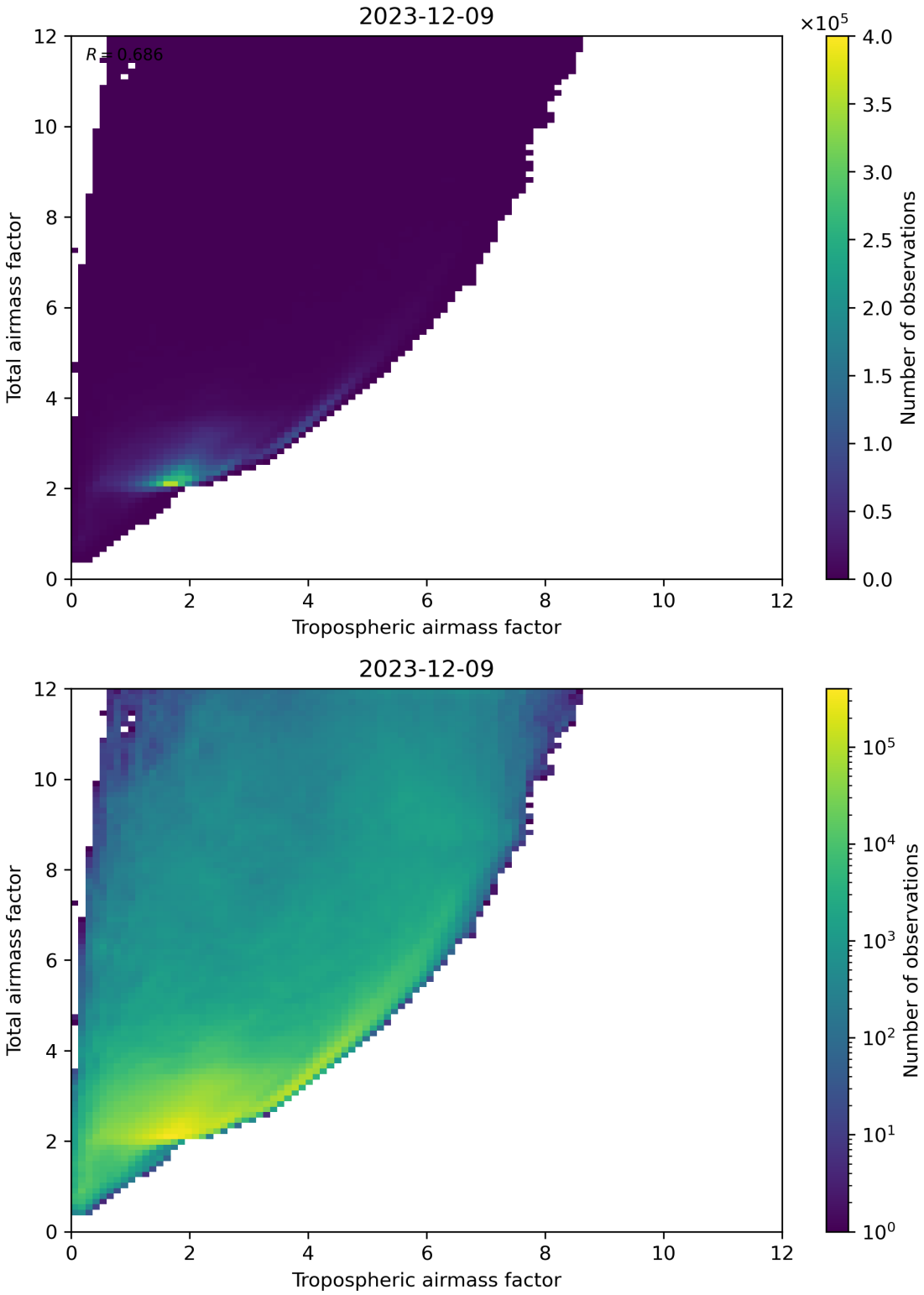


Figure 72: Scatter density plot of “Tropospheric airmass factor” against “Total airmass factor” for 2023-12-09 to 2023-12-10.

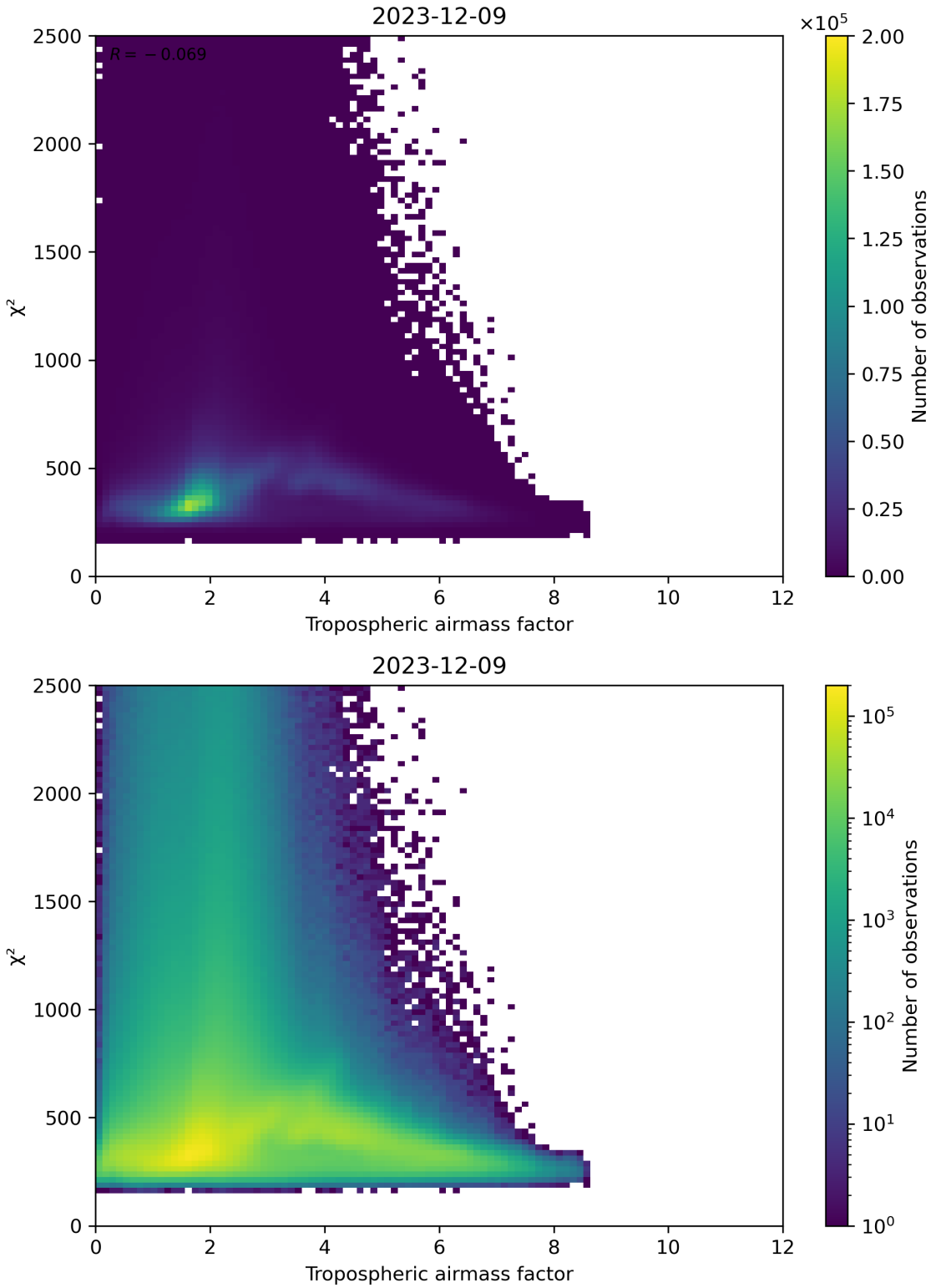


Figure 73: Scatter density plot of "Tropospheric airmass factor" against "χ^2" for 2023-12-09 to 2023-12-10.

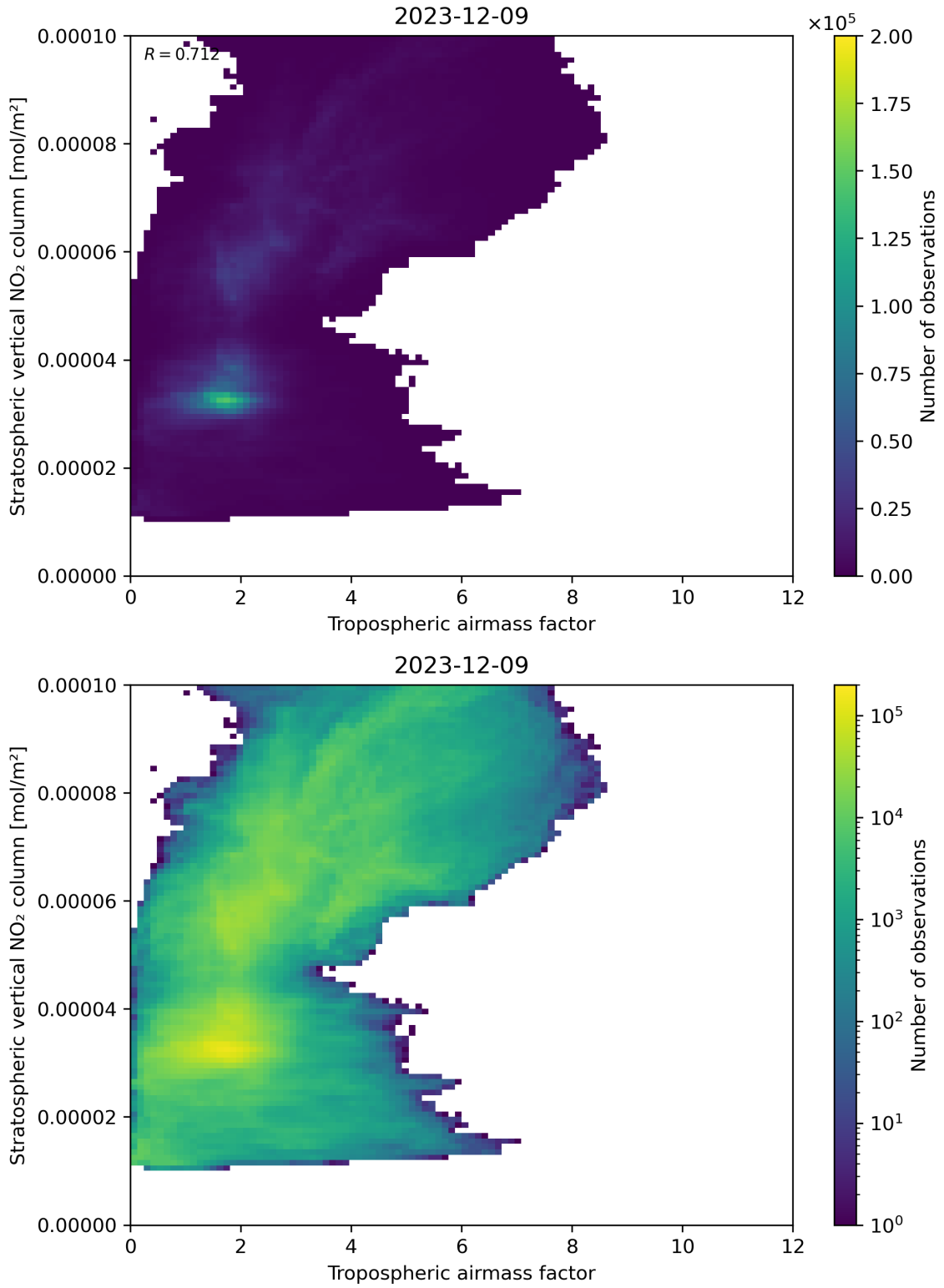


Figure 74: Scatter density plot of “Tropospheric airmass factor” against “Stratospheric vertical NO_2 column” for 2023-12-09 to 2023-12-10.

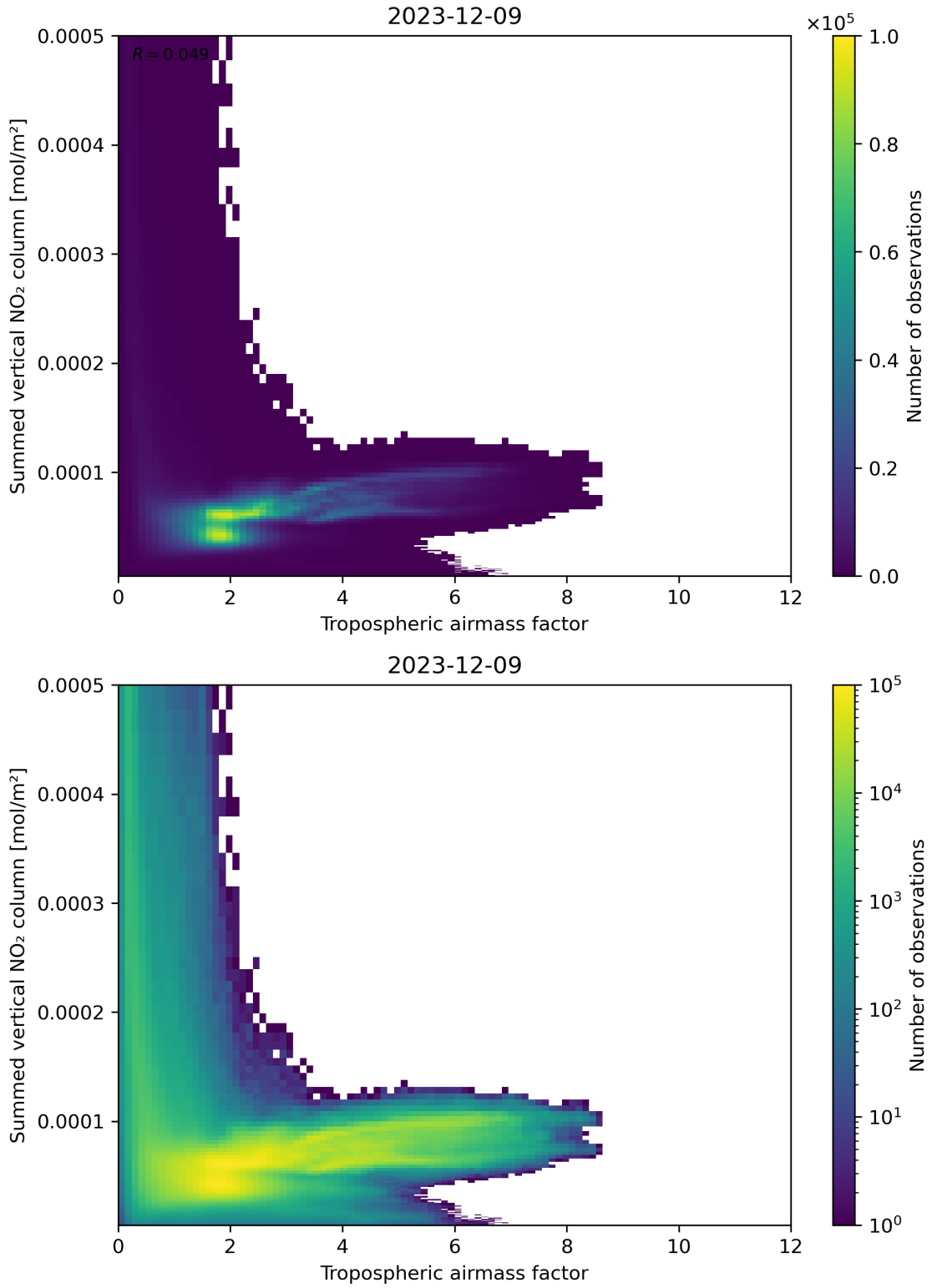


Figure 75: Scatter density plot of “Tropospheric airmass factor” against “Summed vertical NO_2 column” for 2023-12-09 to 2023-12-10.

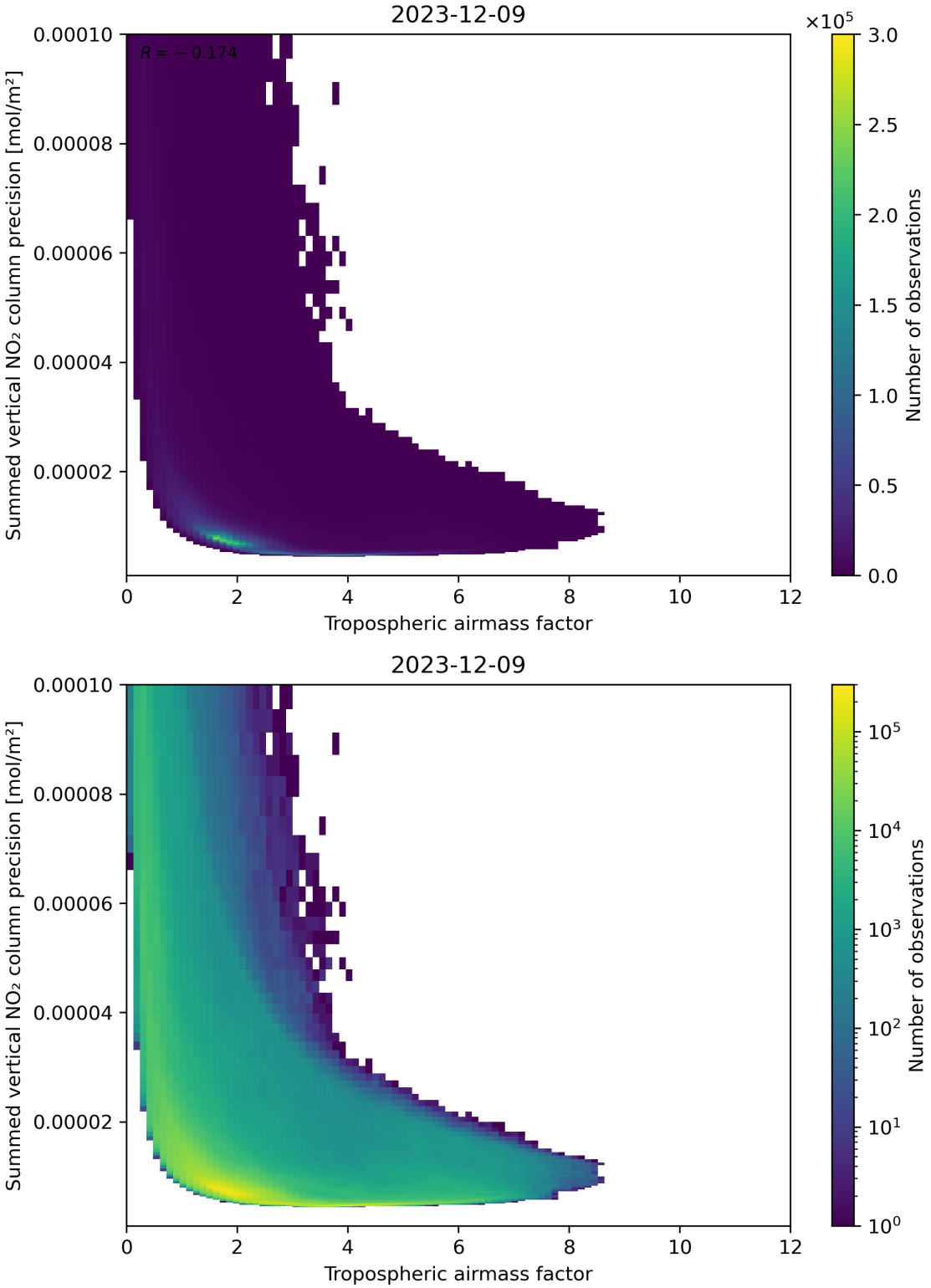


Figure 76: Scatter density plot of “Tropospheric airmass factor” against “Summed vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

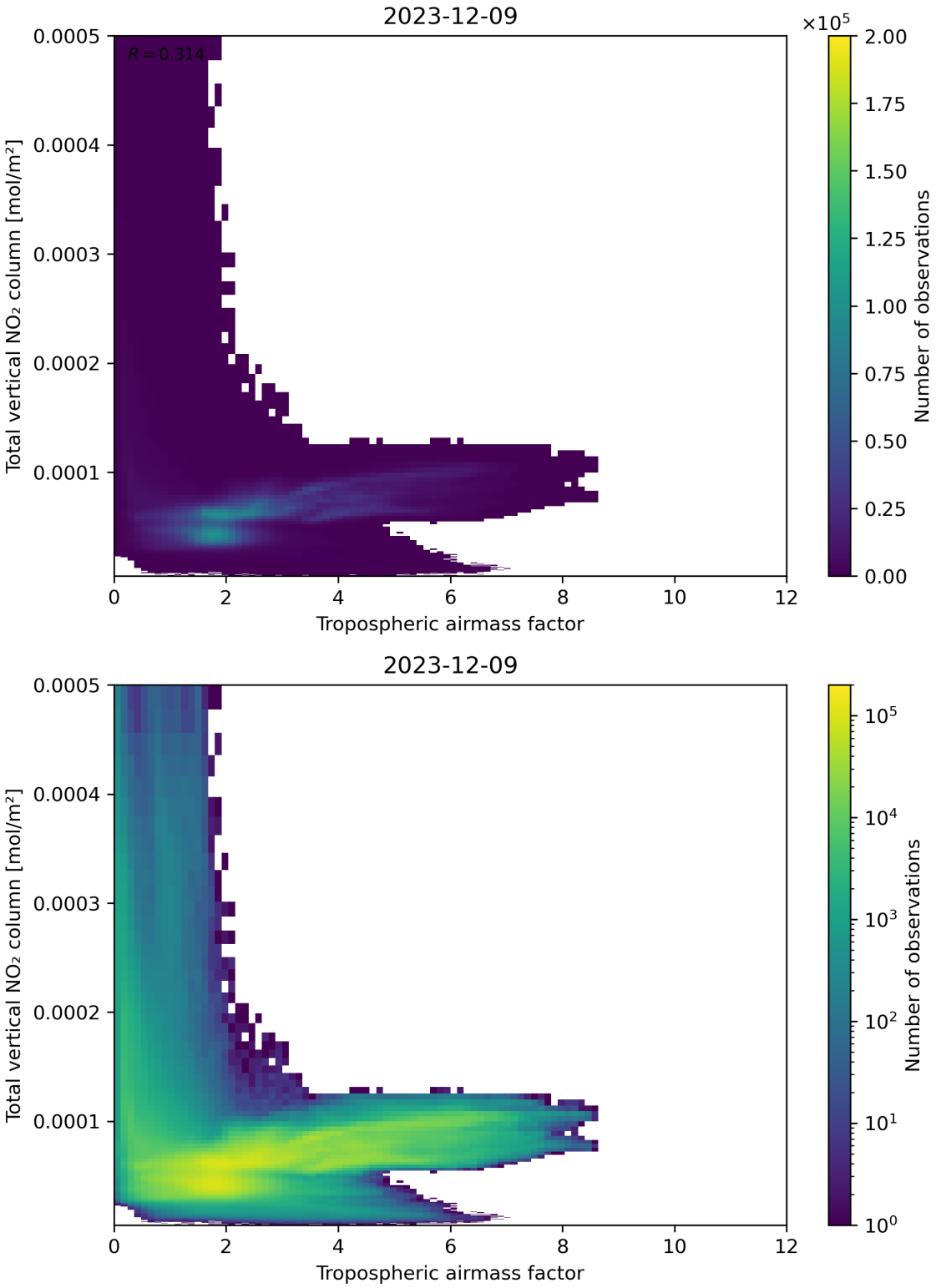


Figure 77: Scatter density plot of "Tropospheric airmass factor" against "Total vertical NO_2 column" for 2023-12-09 to 2023-12-10.

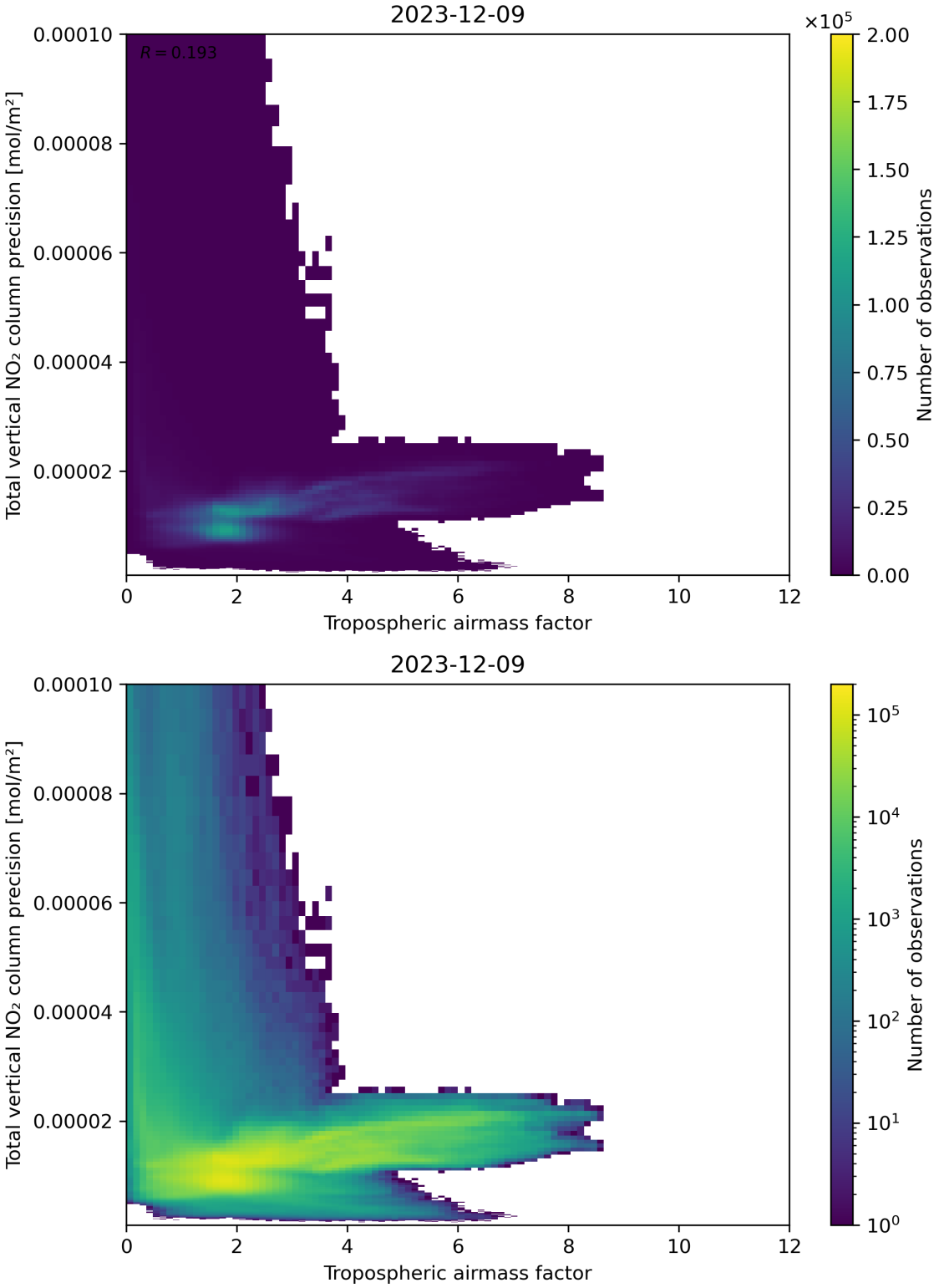


Figure 78: Scatter density plot of “Tropospheric airmass factor” against “Total vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

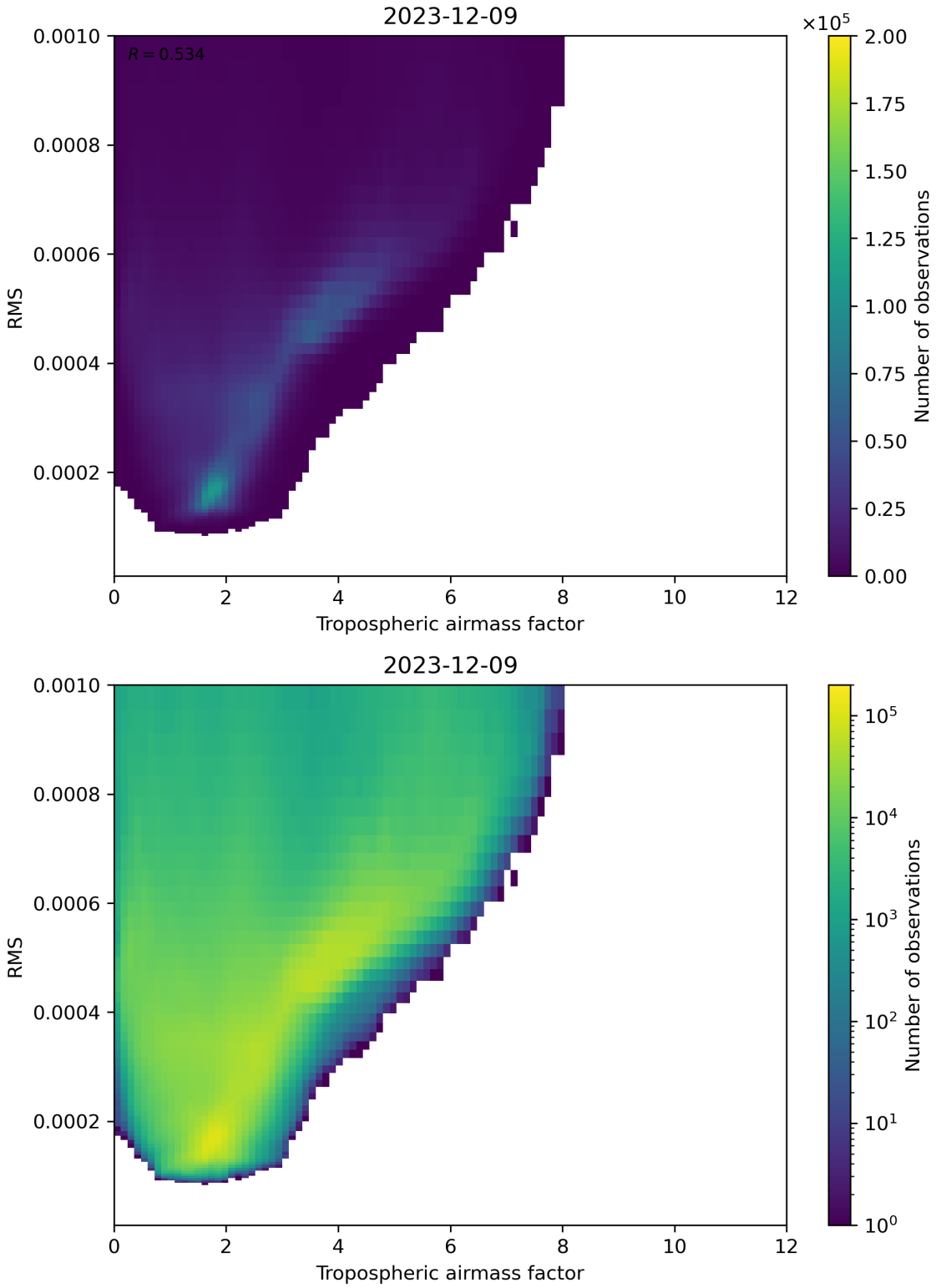


Figure 79: Scatter density plot of “Tropospheric airmass factor” against “RMS” for 2023-12-09 to 2023-12-10.

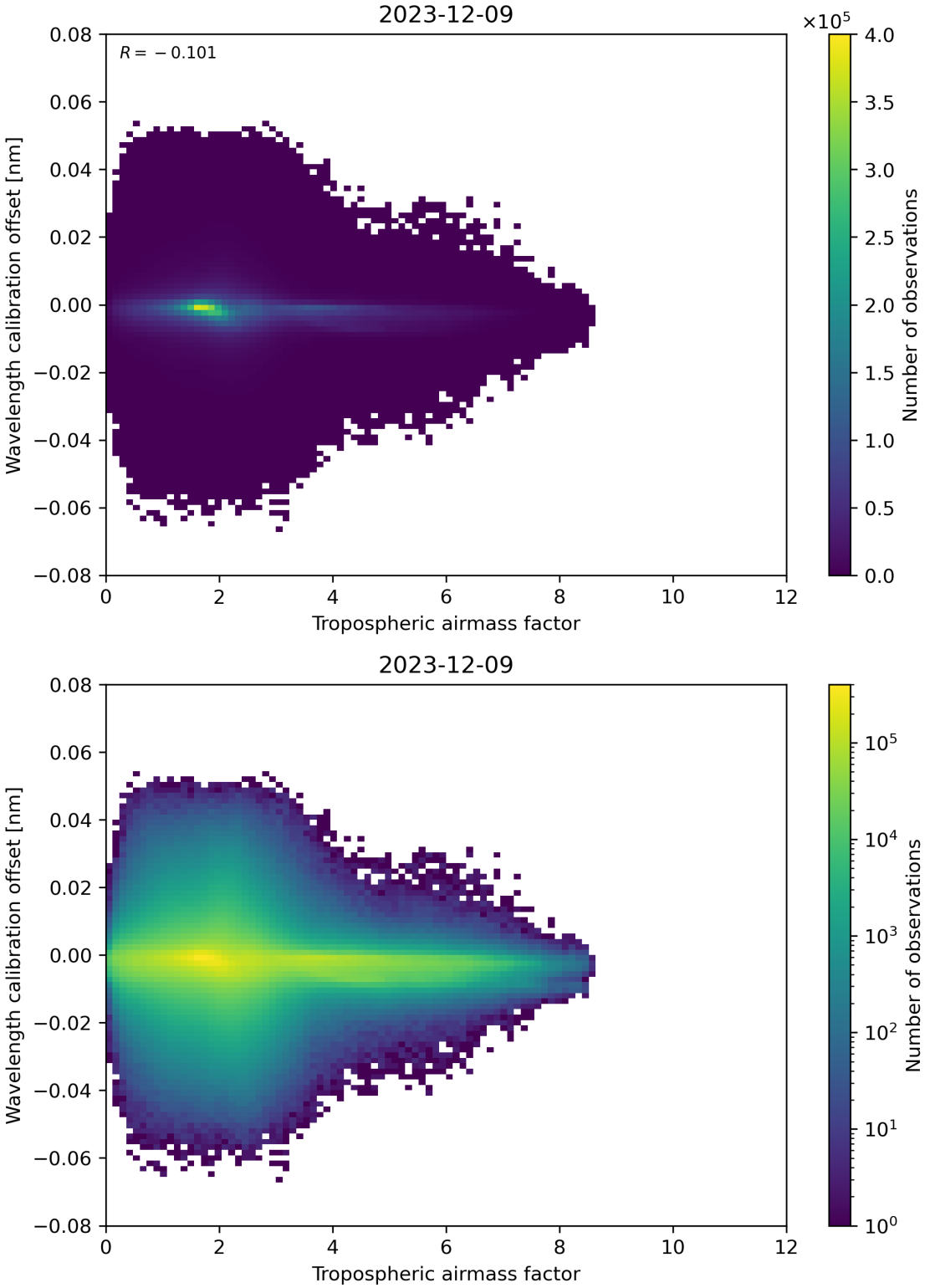


Figure 80: Scatter density plot of “Tropospheric airmass factor” against “Wavelength calibration offset” for 2023-12-09 to 2023-12-10.

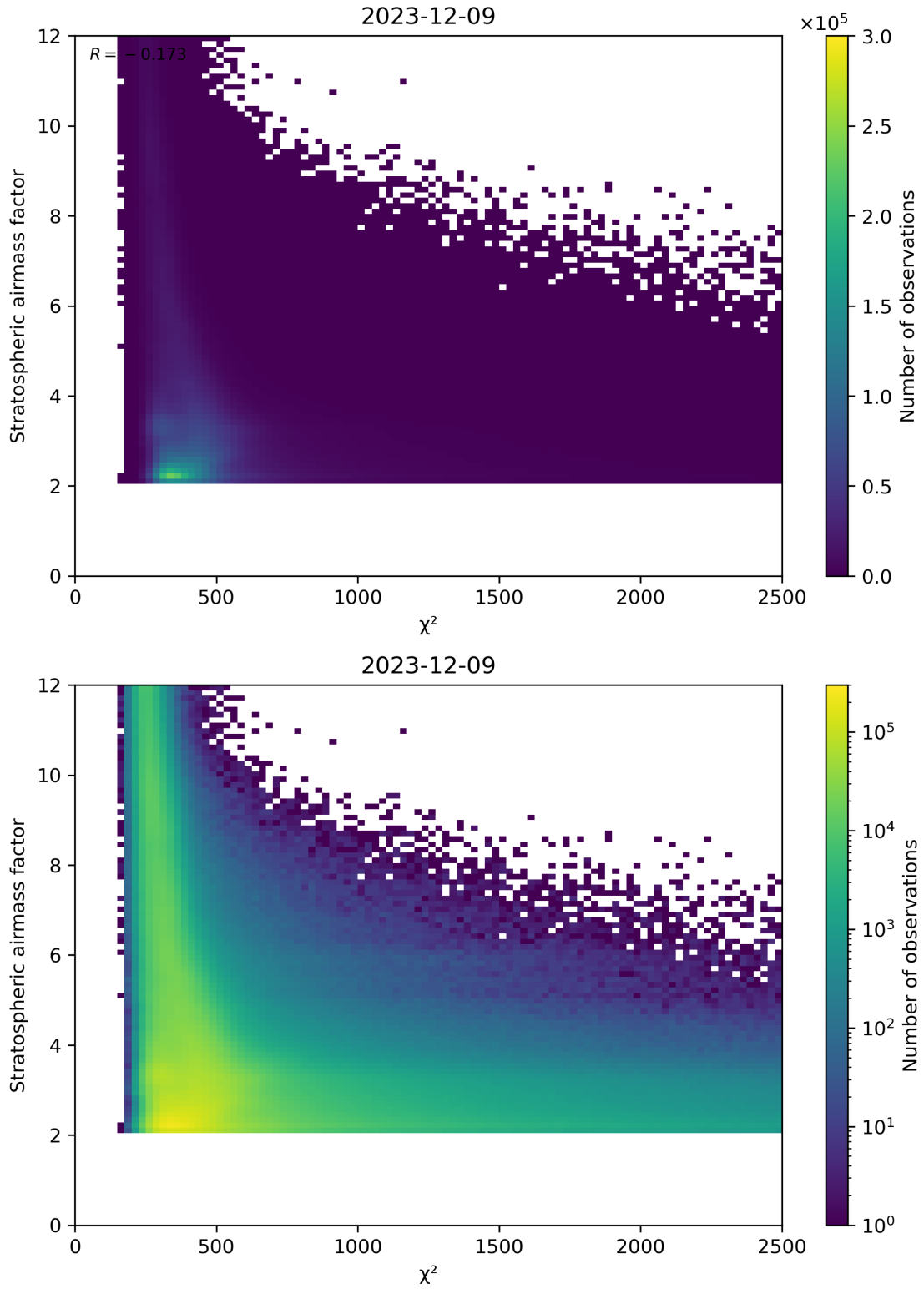


Figure 81: Scatter density plot of "χ^2" against "Stratospheric airmass factor" for 2023-12-09 to 2023-12-10.

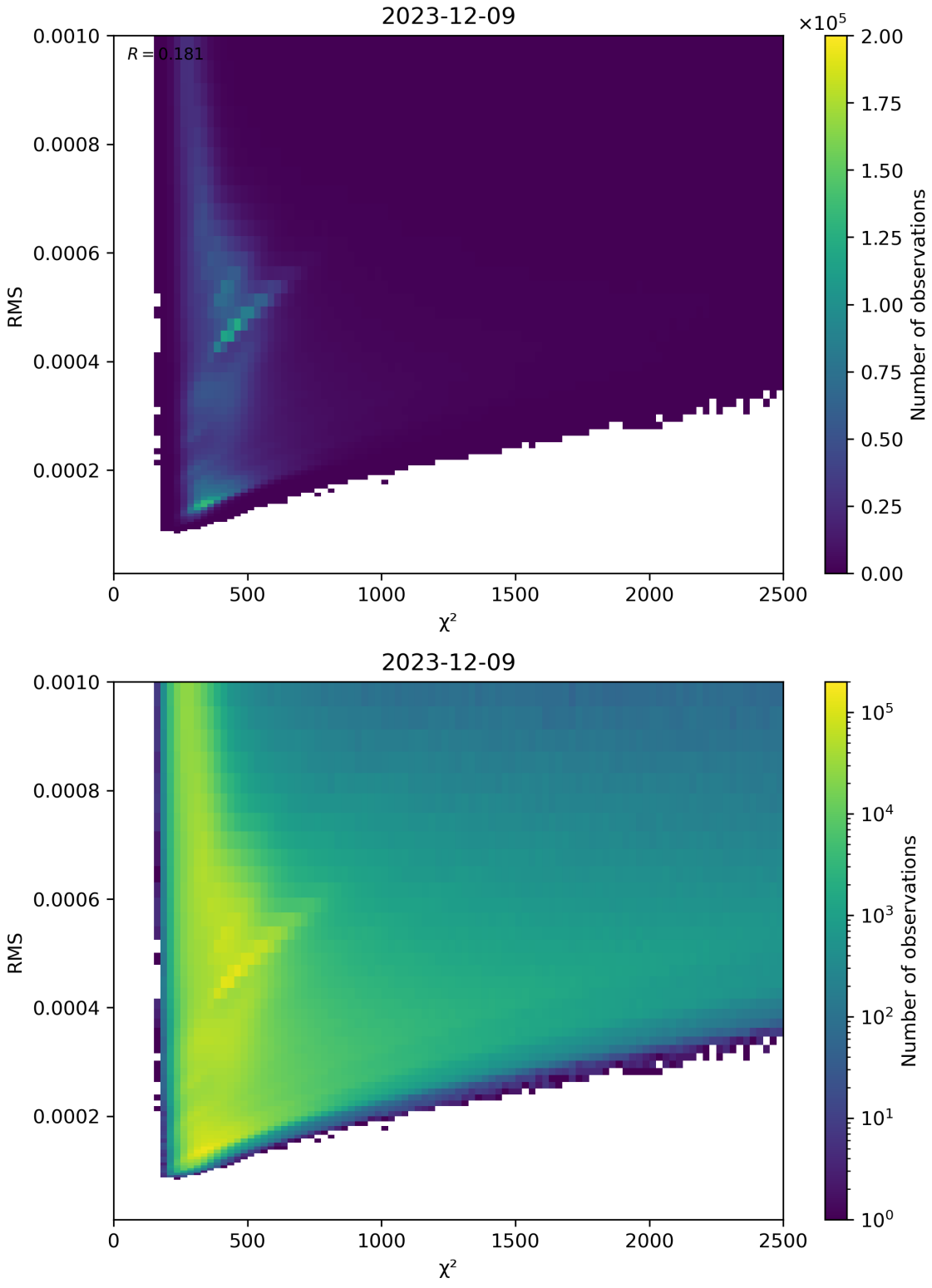


Figure 82: Scatter density plot of "χ^2" against "RMS" for 2023-12-09 to 2023-12-10.

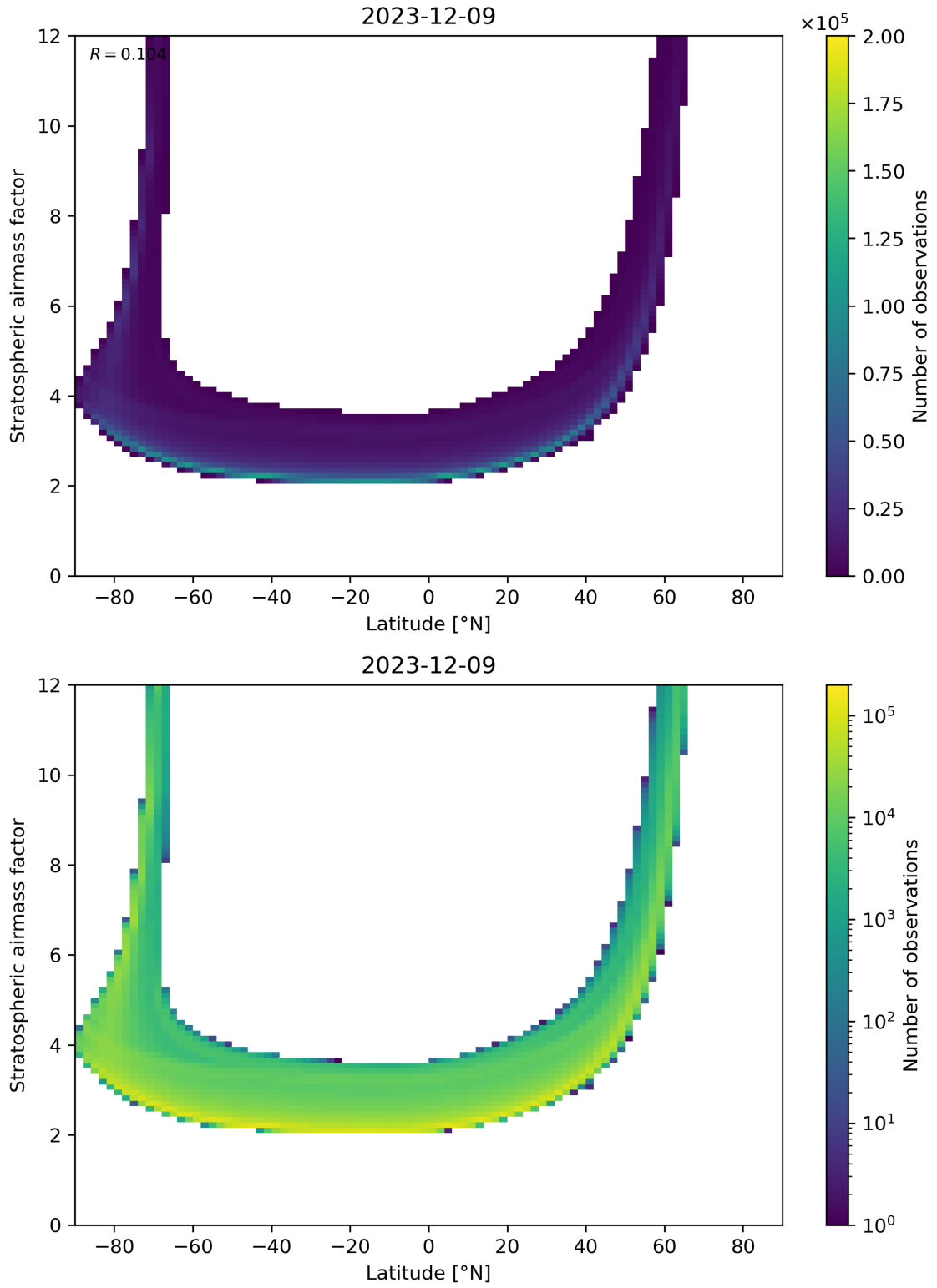


Figure 83: Scatter density plot of “Latitude” against “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10.

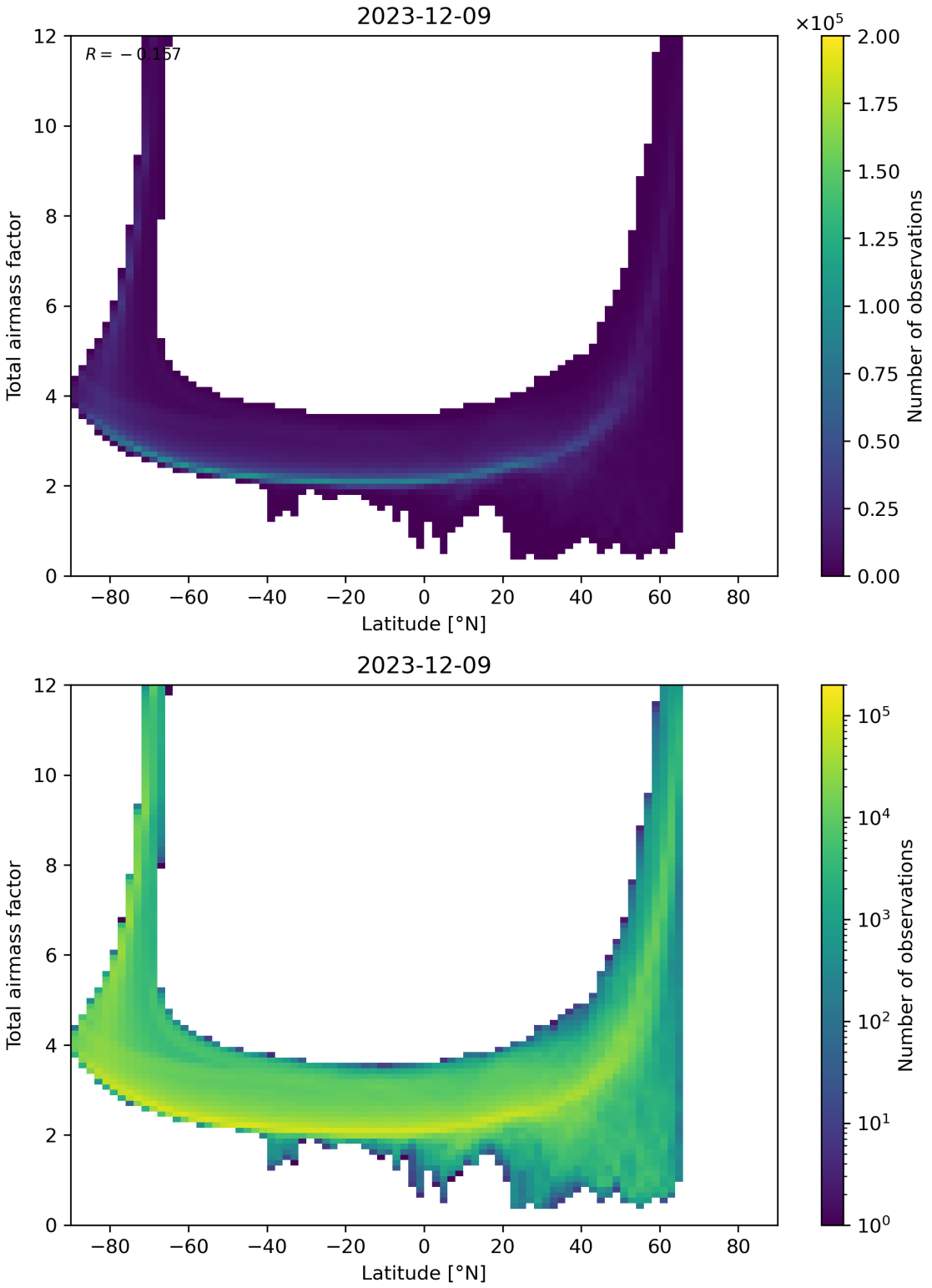


Figure 84: Scatter density plot of “Latitude” against “Total airmass factor” for 2023-12-09 to 2023-12-10.

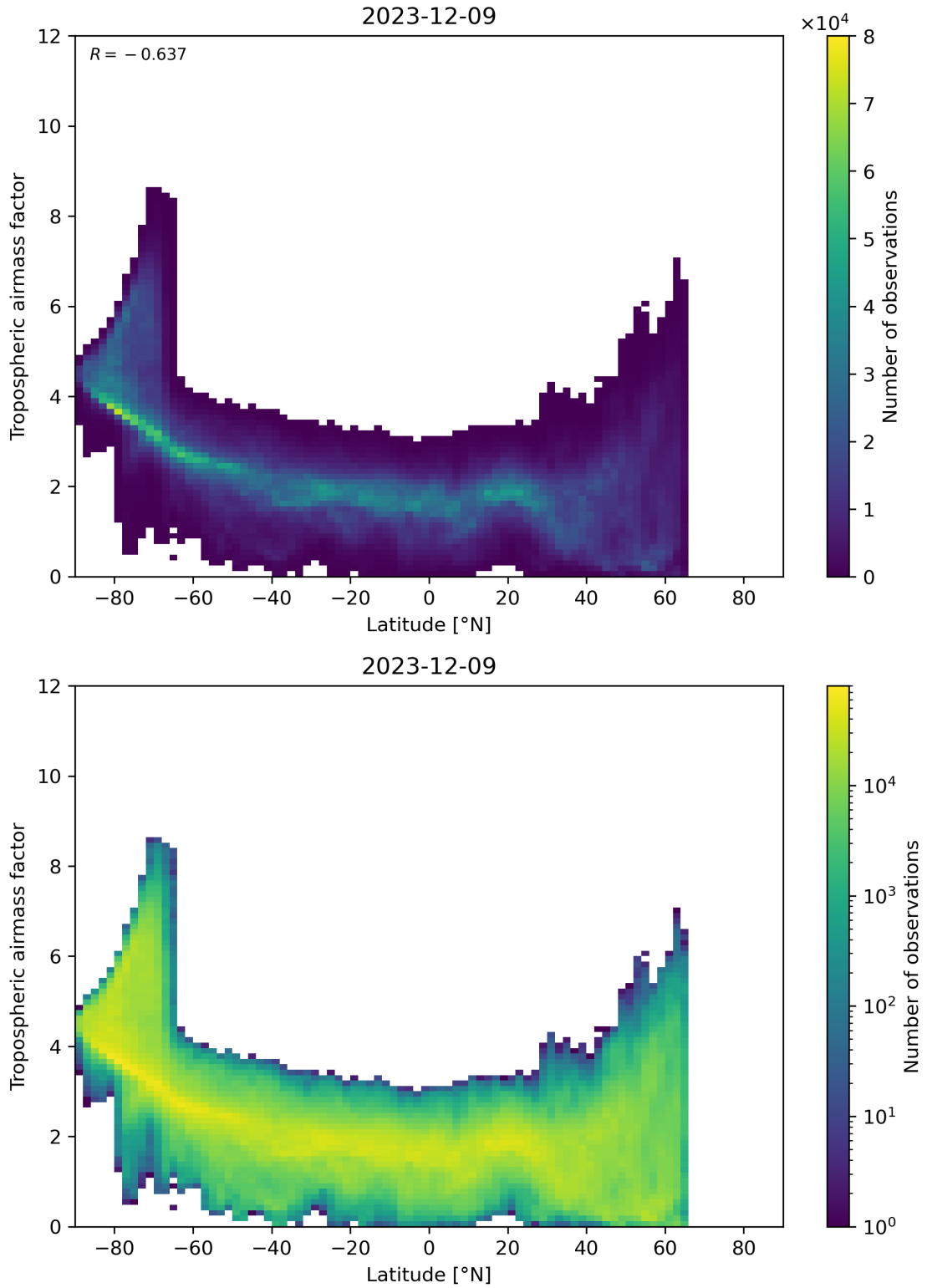


Figure 85: Scatter density plot of “Latitude” against “Tropospheric airmass factor” for 2023-12-09 to 2023-12-10.

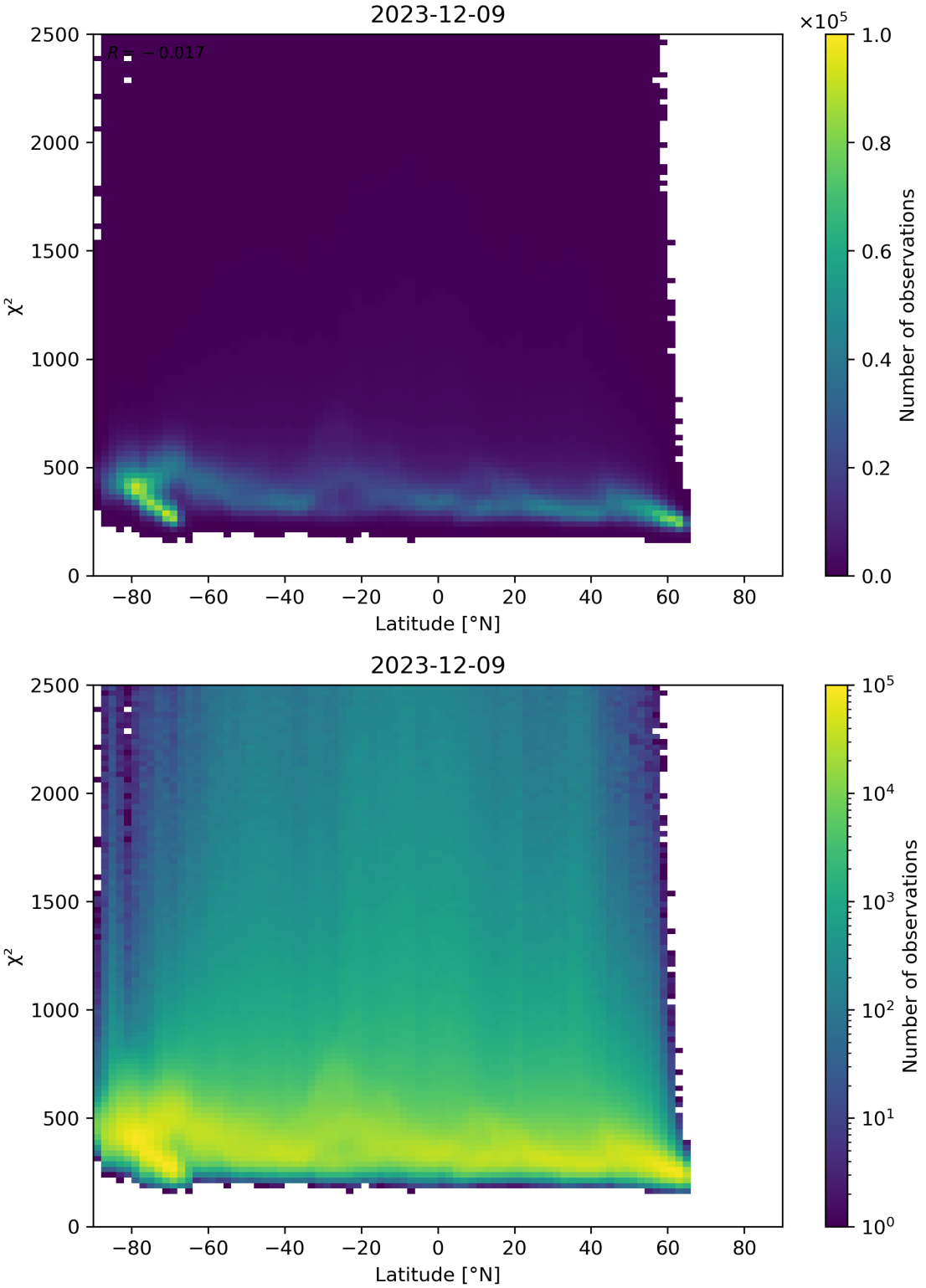


Figure 86: Scatter density plot of "Latitude" against "χ^2" for 2023-12-09 to 2023-12-10.

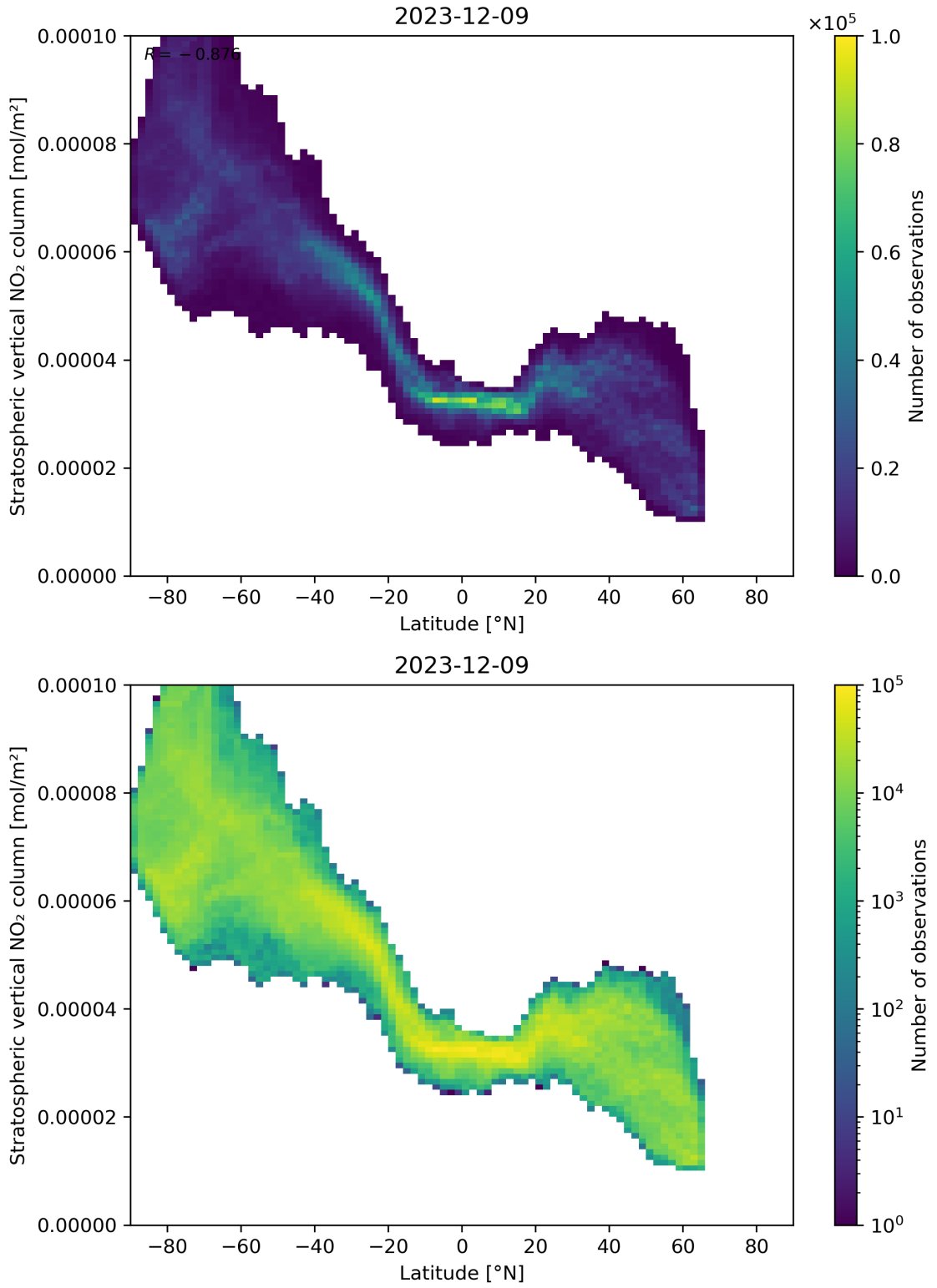


Figure 87: Scatter density plot of “Latitude” against “Stratospheric vertical NO_2 column” for 2023-12-09 to 2023-12-10.

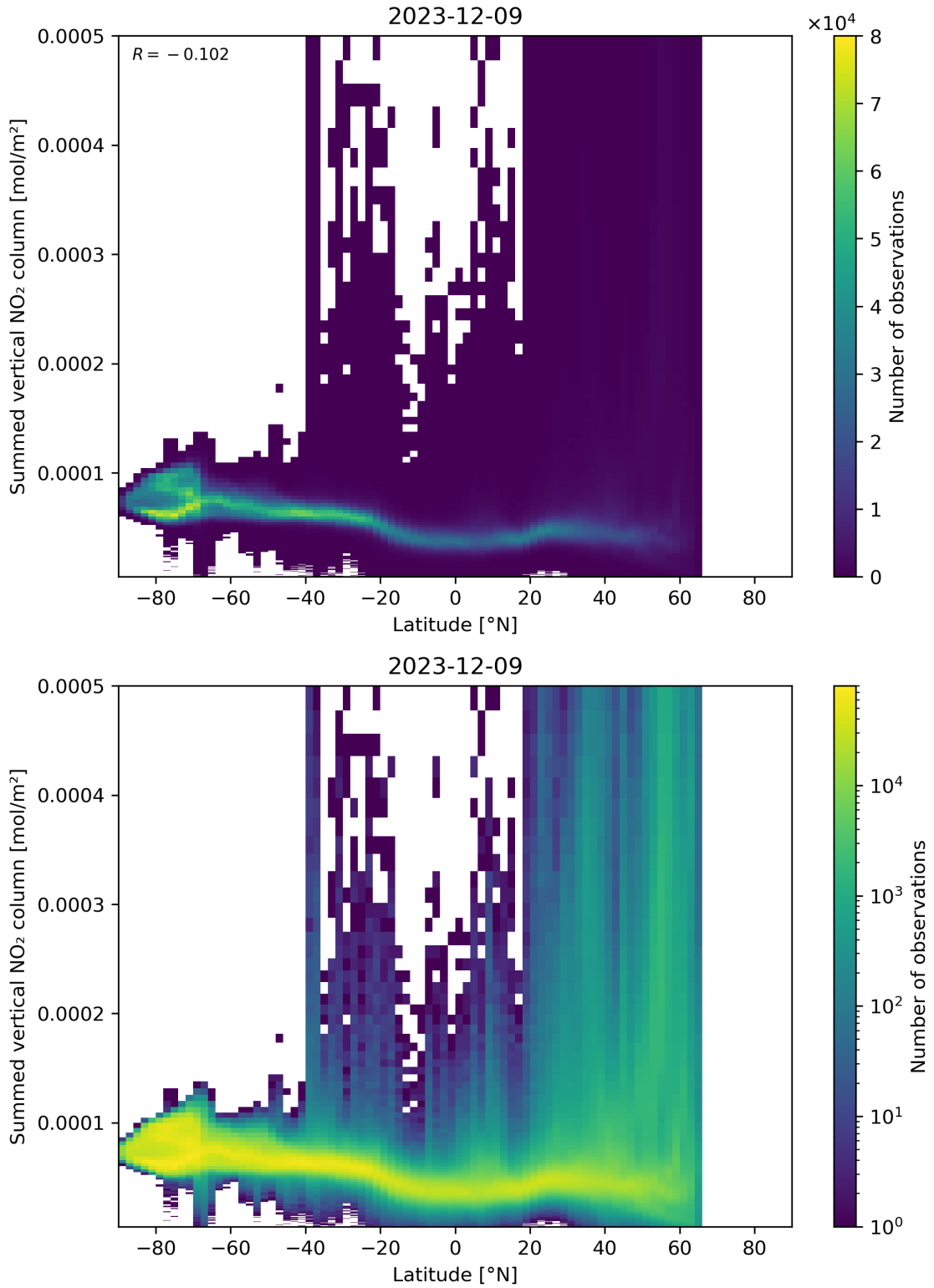


Figure 88: Scatter density plot of “Latitude” against “Summed vertical NO_2 column” for 2023-12-09 to 2023-12-10.

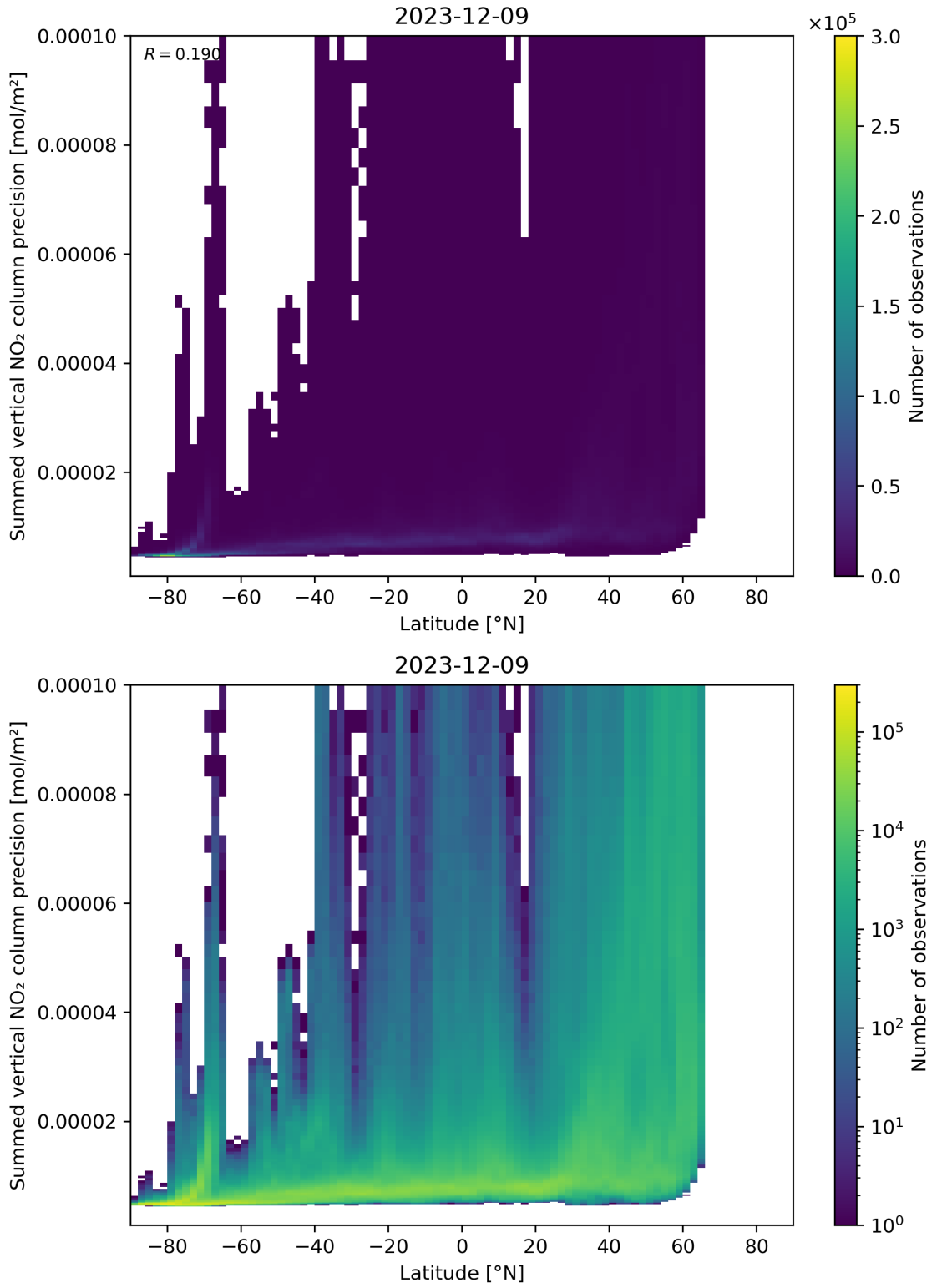


Figure 89: Scatter density plot of “Latitude” against “Summed vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

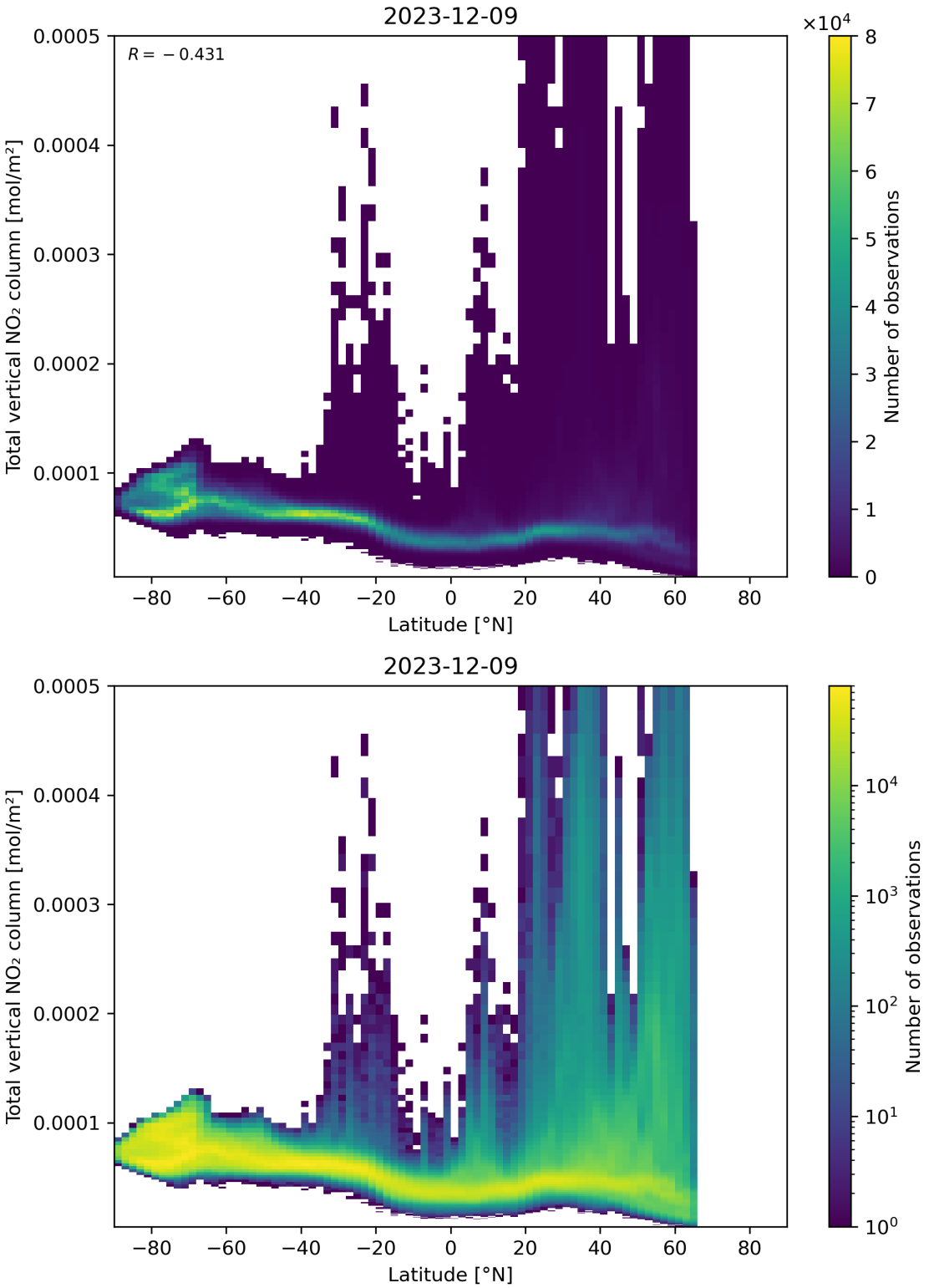


Figure 90: Scatter density plot of “Latitude” against “Total vertical NO_2 column” for 2023-12-09 to 2023-12-10.

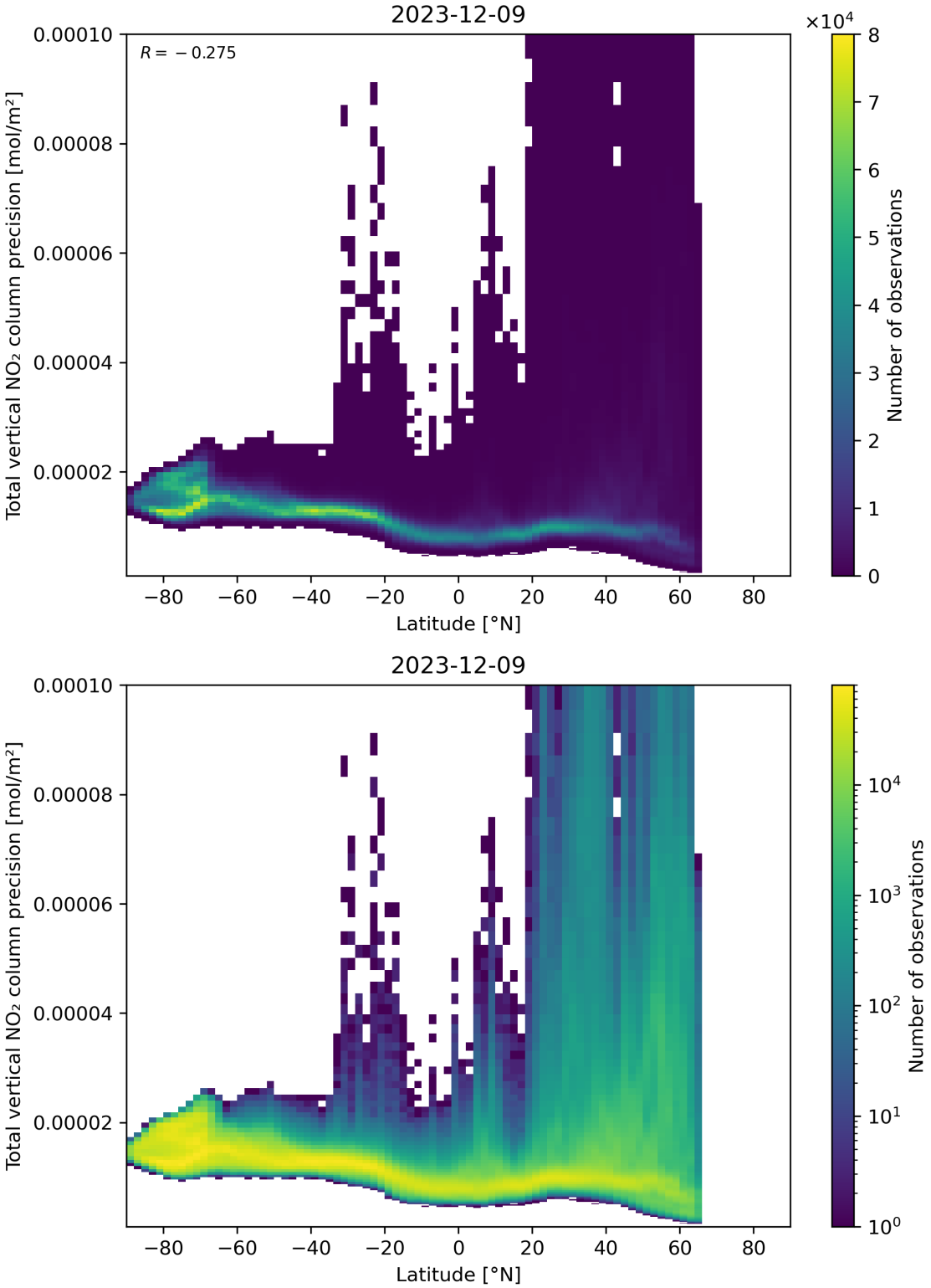


Figure 91: Scatter density plot of “Latitude” against “Total vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

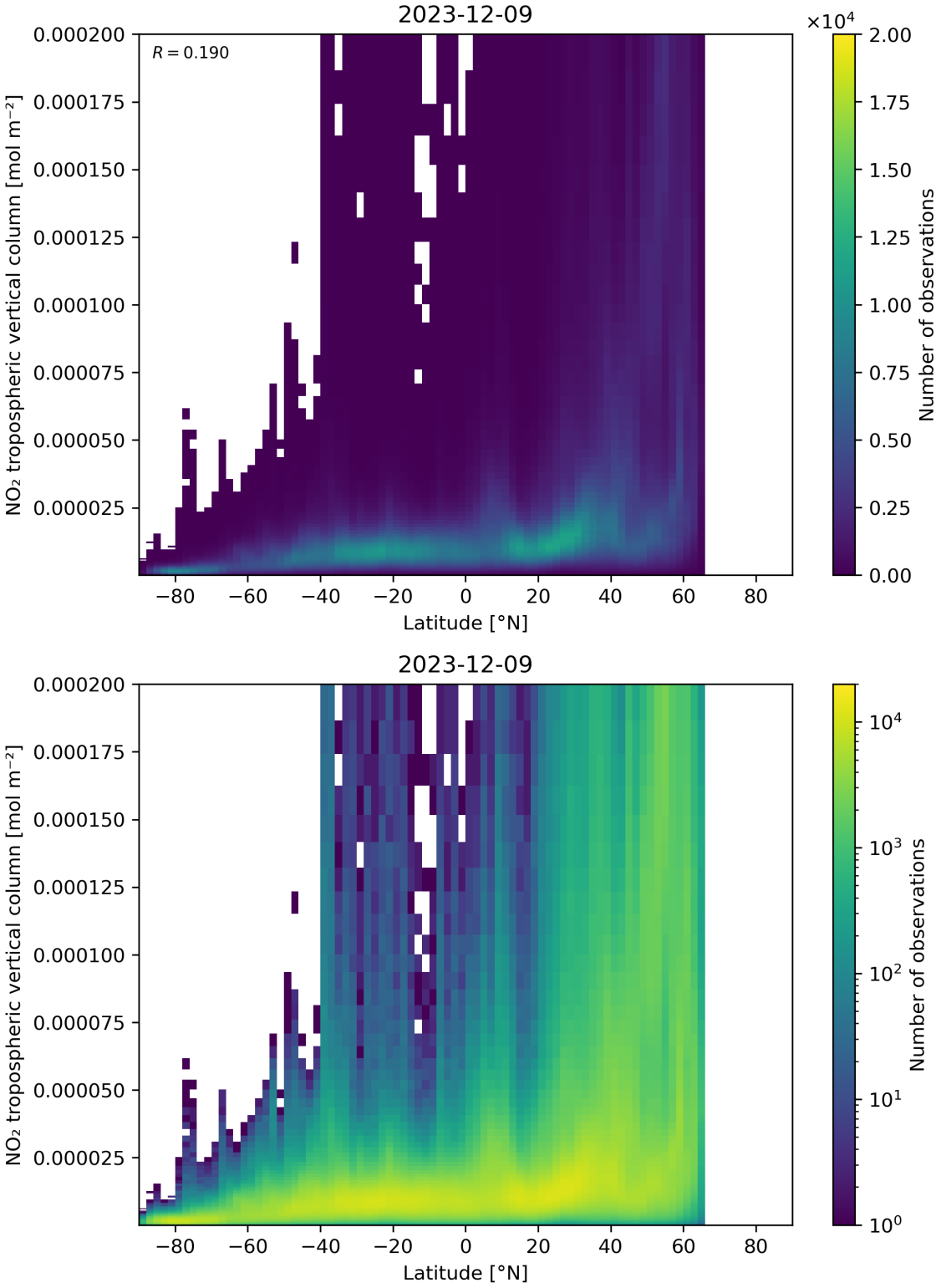


Figure 92: Scatter density plot of “Latitude” against “NO_2 tropospheric vertical column” for 2023-12-09 to 2023-12-10.

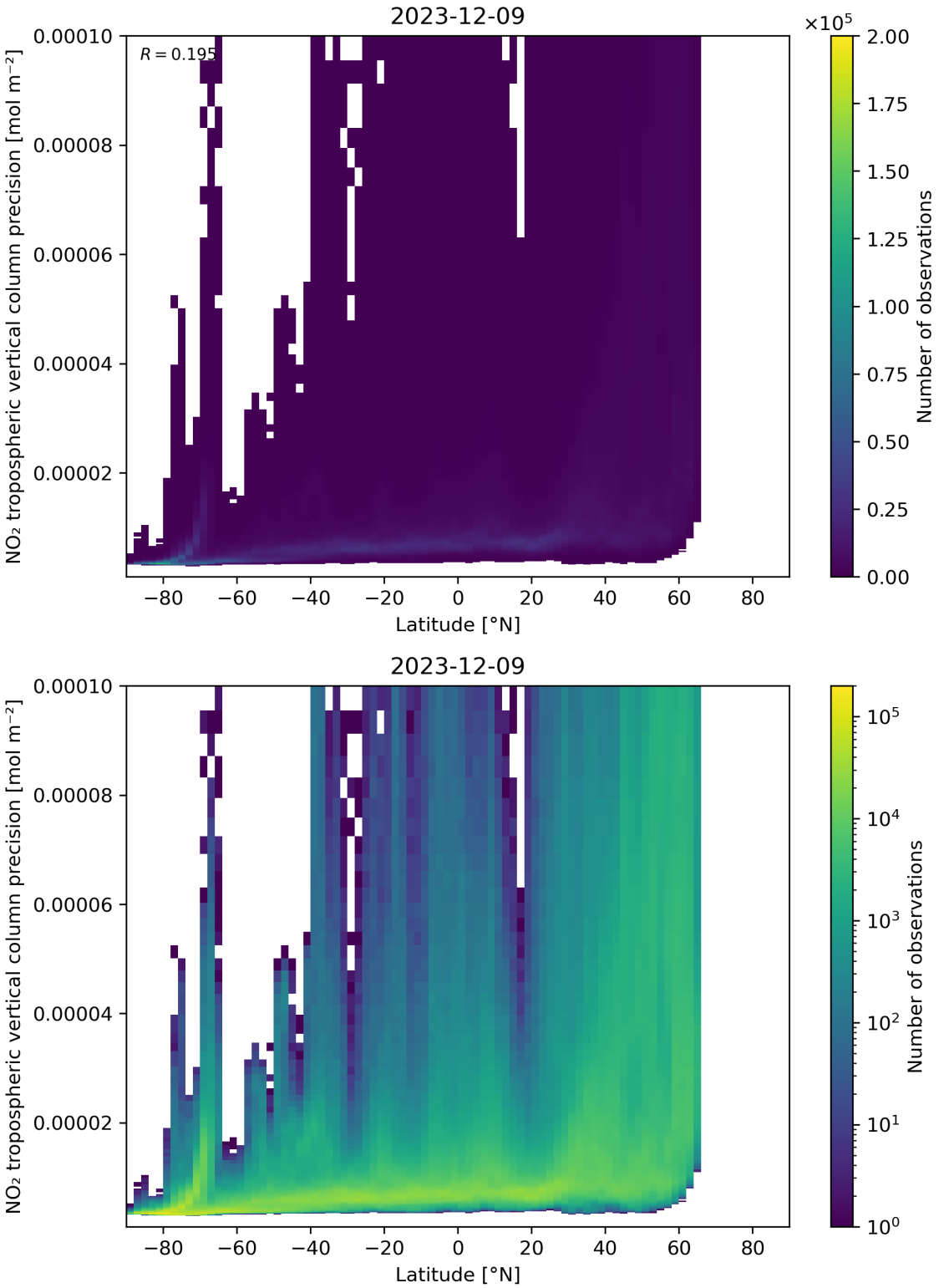


Figure 93: Scatter density plot of “Latitude” against “NO_2 tropospheric vertical column precision” for 2023-12-09 to 2023-12-10.

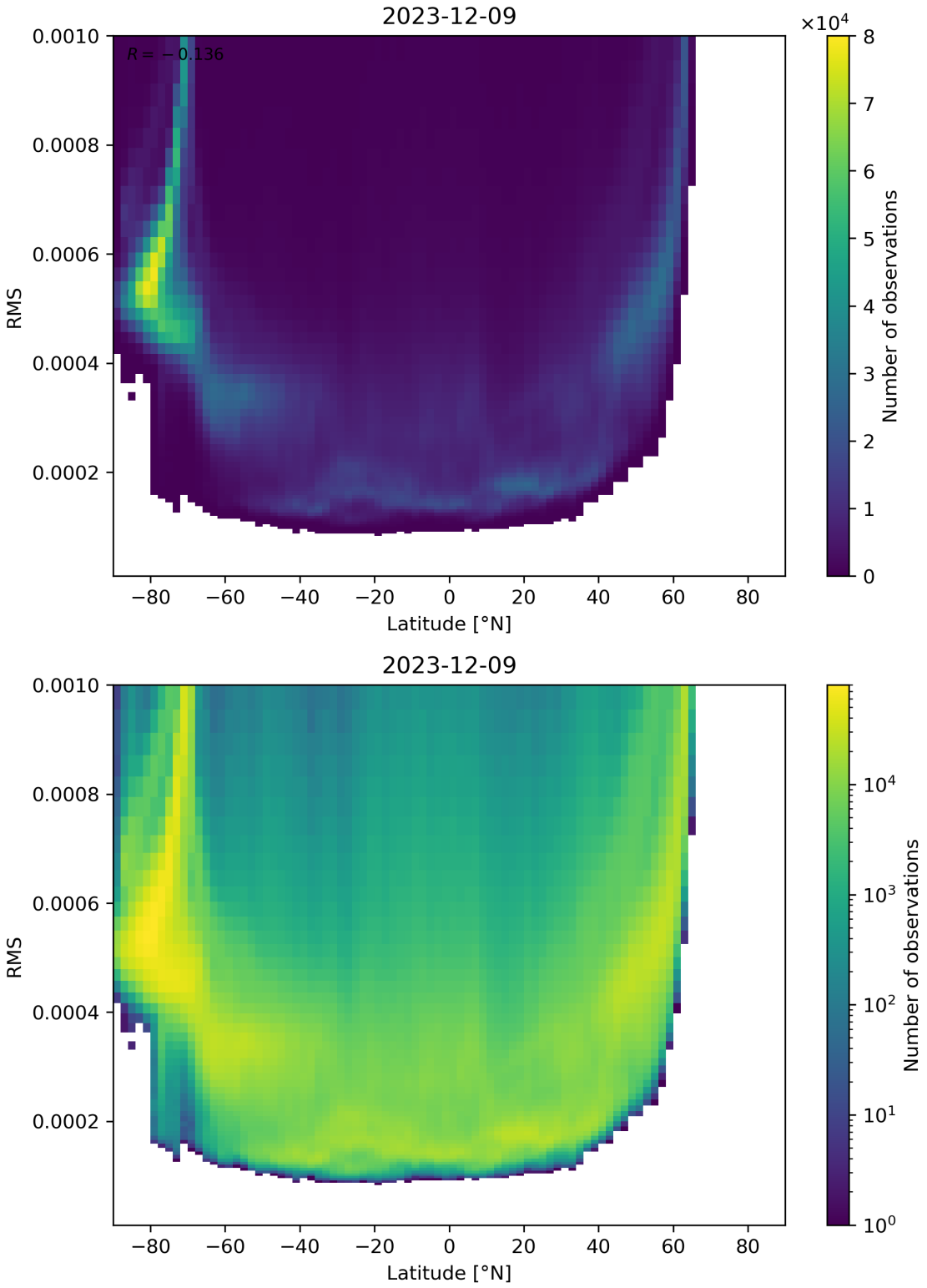


Figure 94: Scatter density plot of “Latitude” against “RMS” for 2023-12-09 to 2023-12-10.

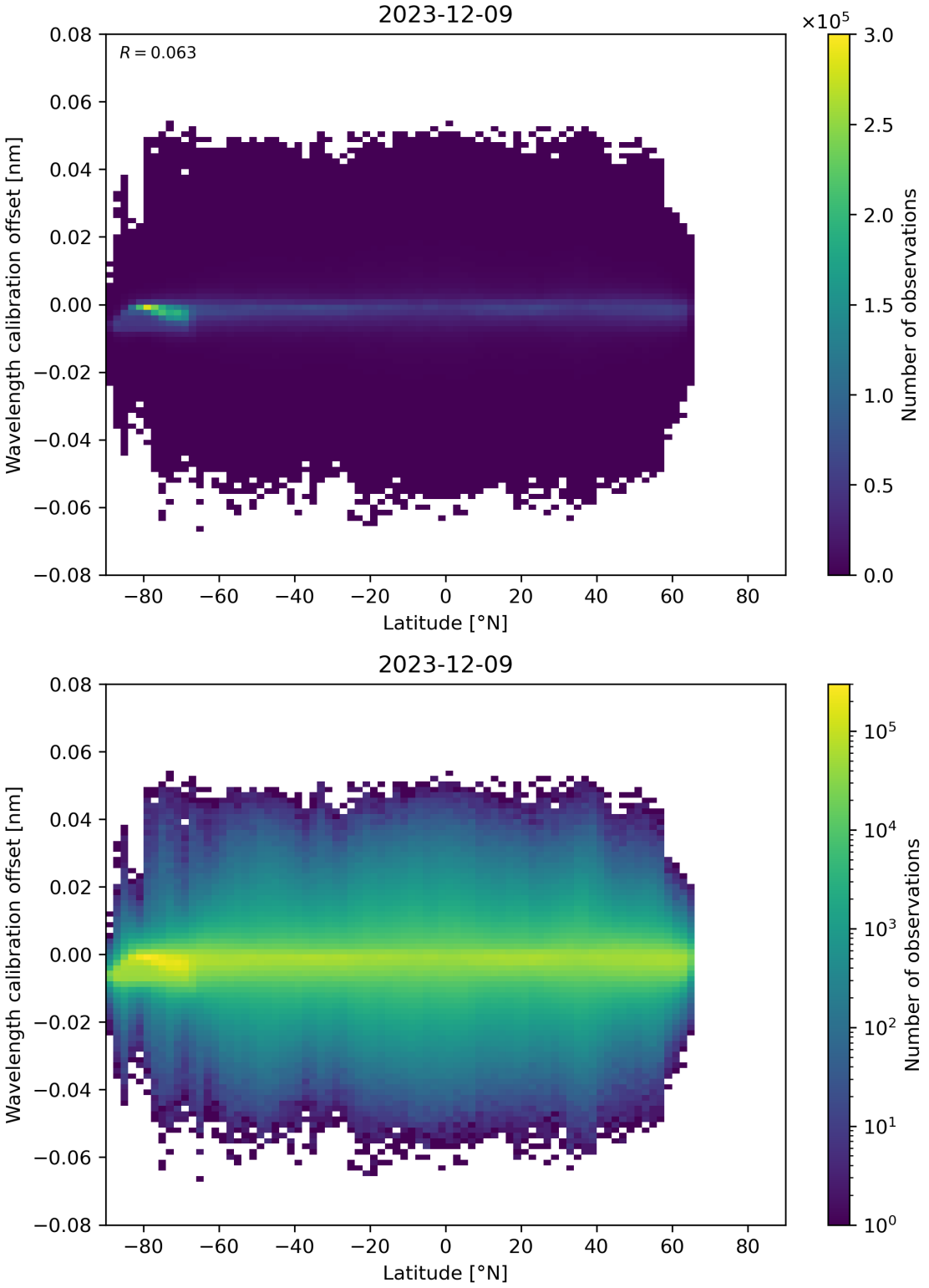


Figure 95: Scatter density plot of “Latitude” against “Wavelength calibration offset” for 2023-12-09 to 2023-12-10.

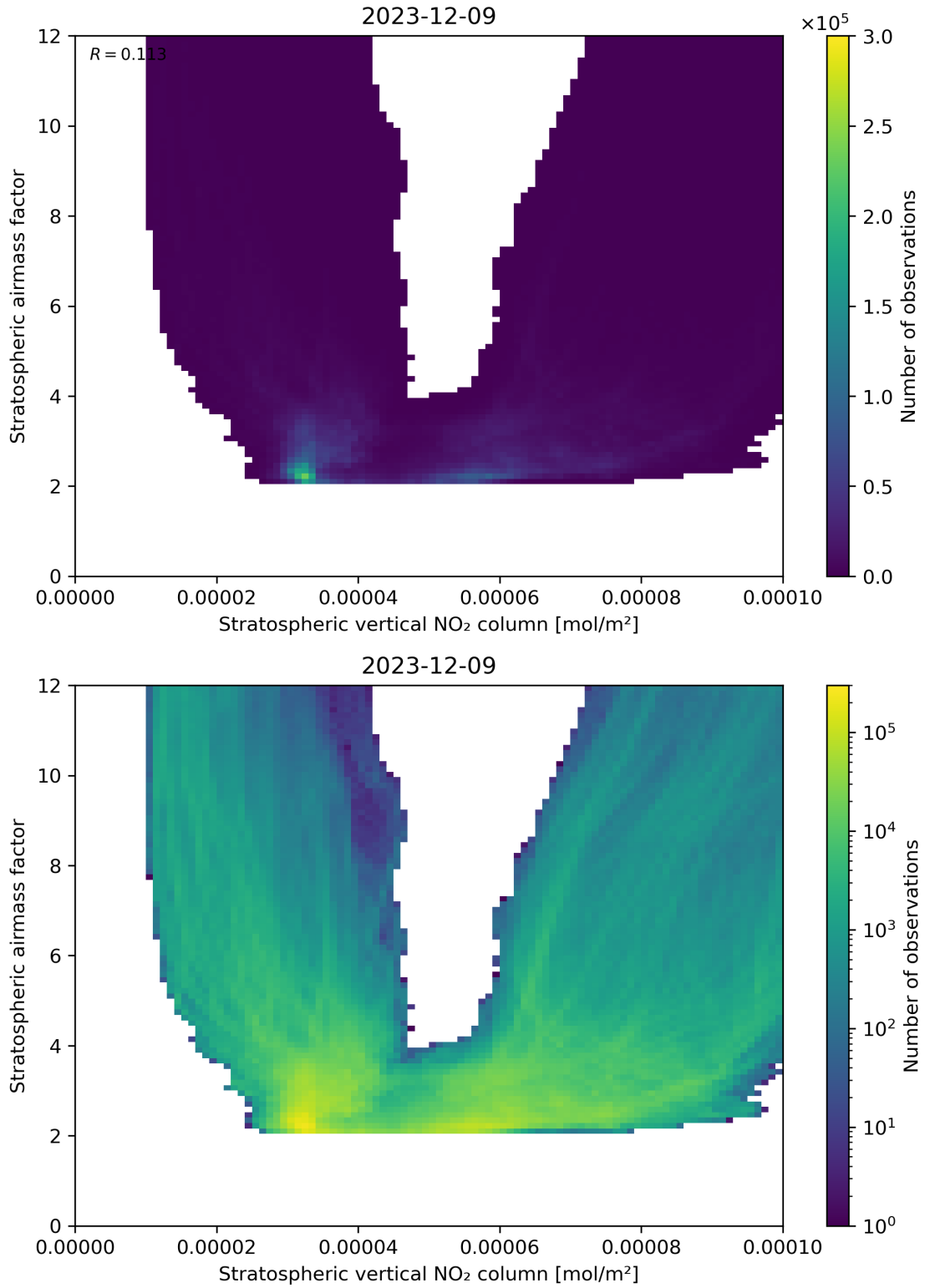


Figure 96: Scatter density plot of "Stratospheric vertical NO_2 column" against "Stratospheric airmass factor" for 2023-12-09 to 2023-12-10.

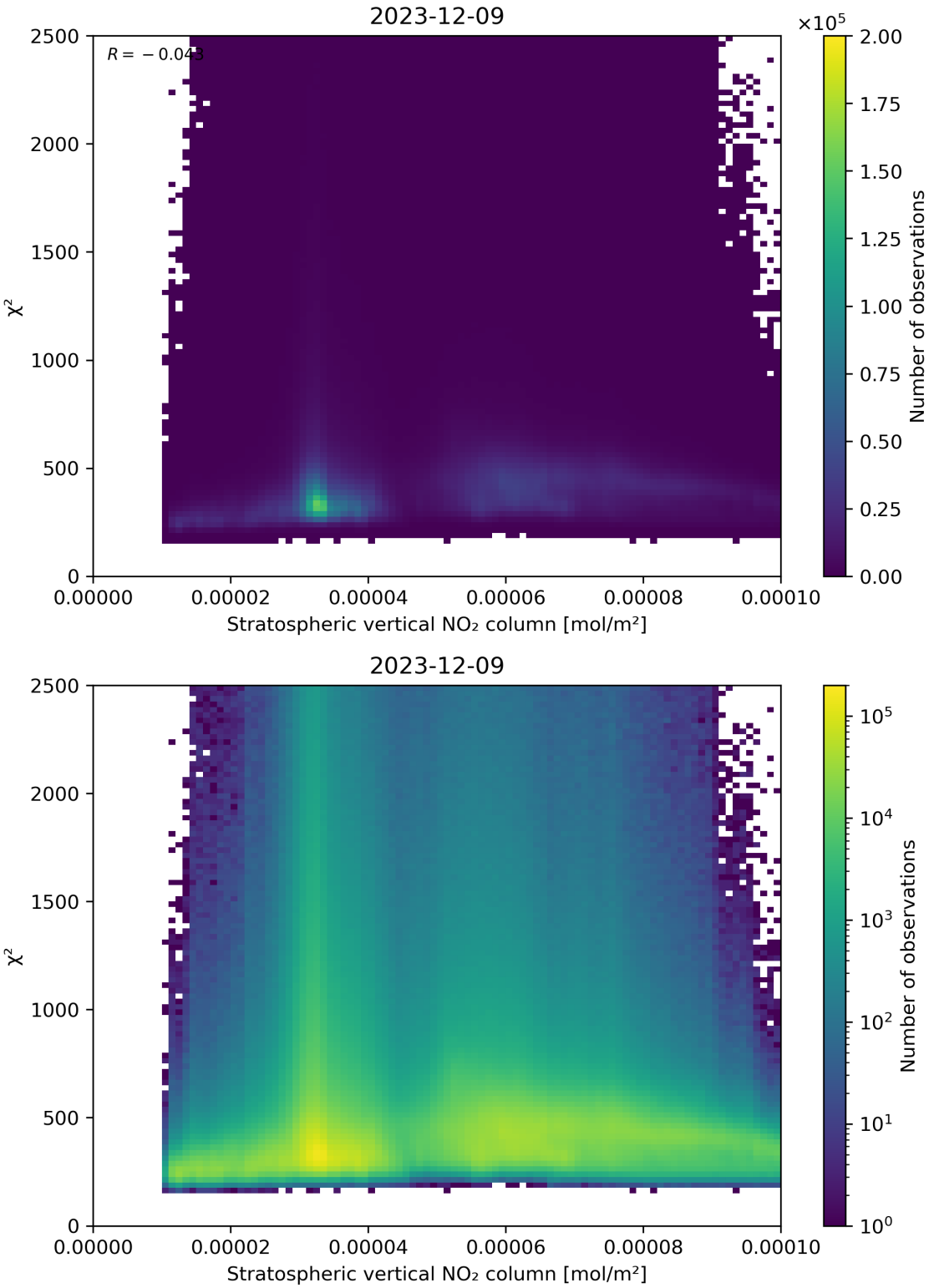


Figure 97: Scatter density plot of "Stratospheric vertical NO_2 column" against "χ^2" for 2023-12-09 to 2023-12-10.

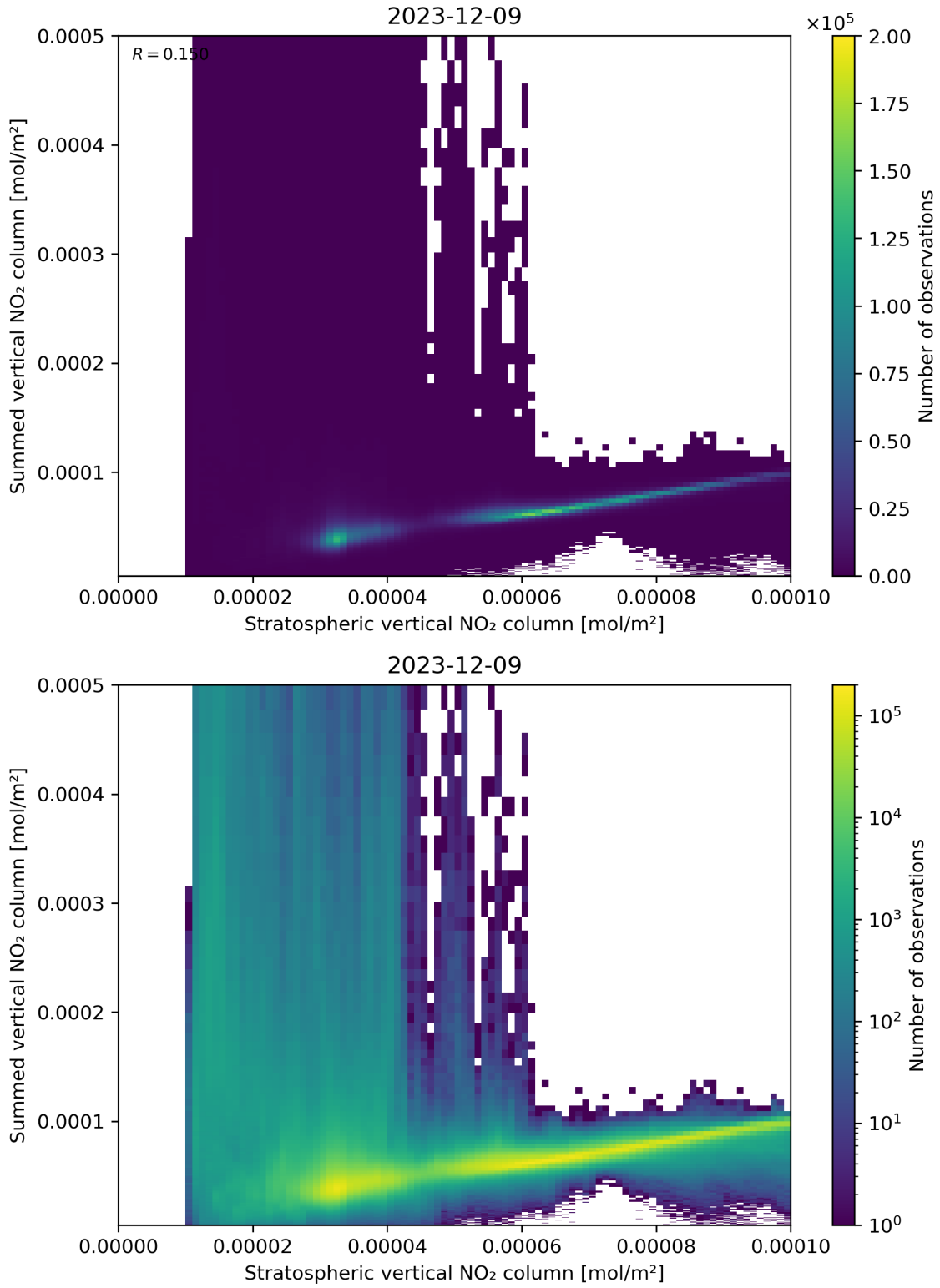


Figure 98: Scatter density plot of "Stratospheric vertical NO_2 column" against "Summed vertical NO_2 column" for 2023-12-09 to 2023-12-10.

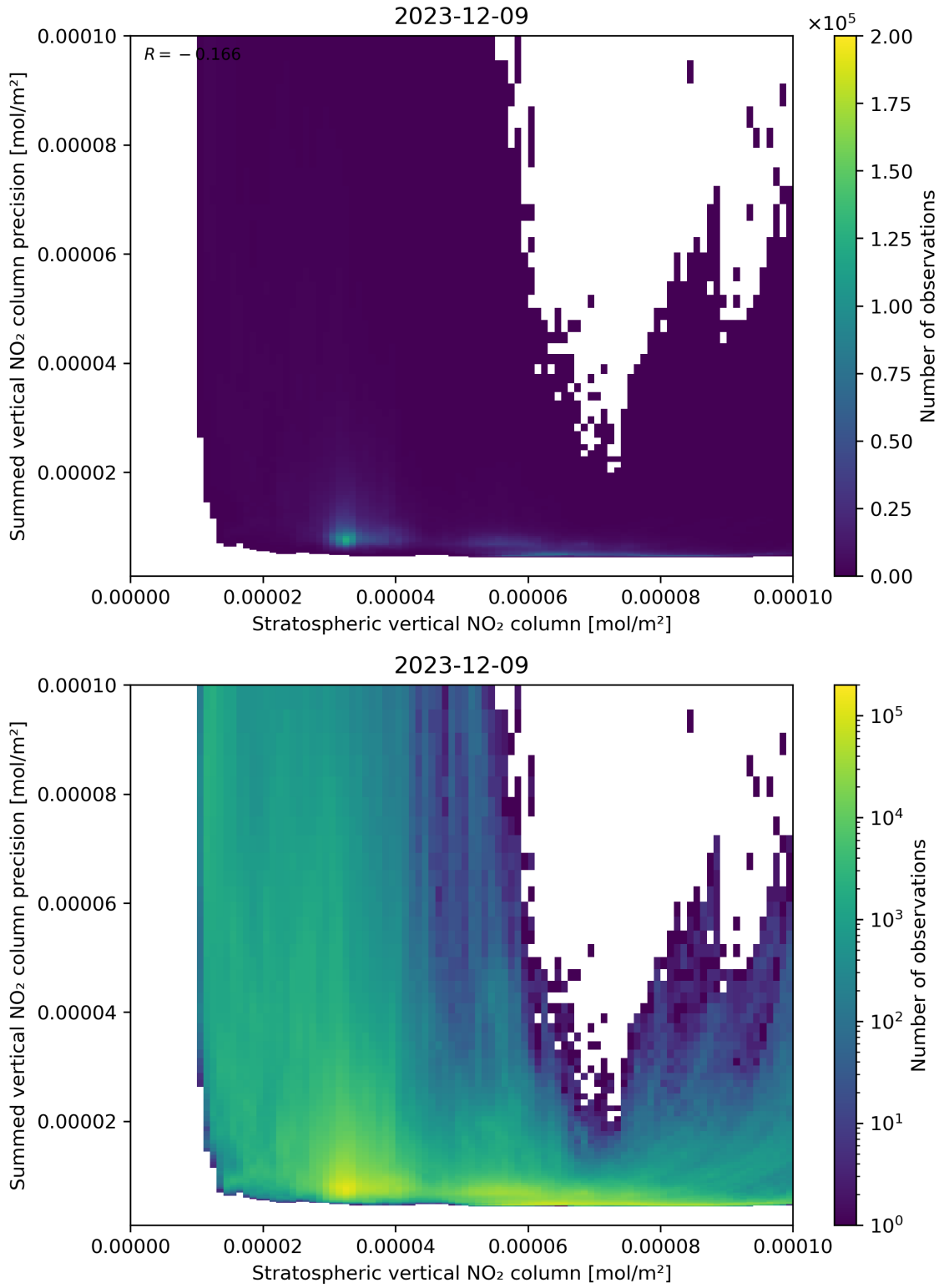


Figure 99: Scatter density plot of “Stratospheric vertical NO_2 column” against “Summed vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

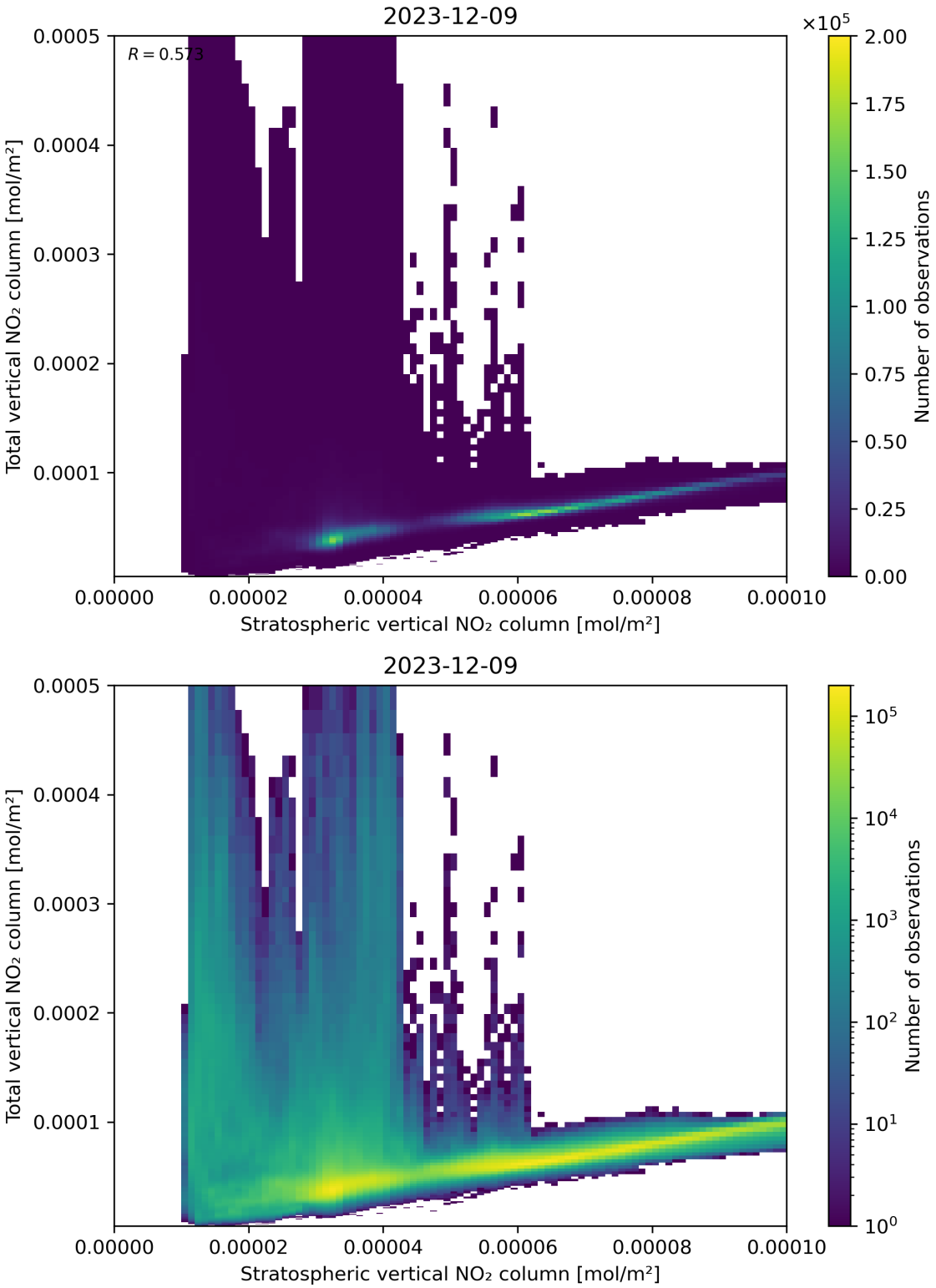


Figure 100: Scatter density plot of "Stratospheric vertical NO_2 column" against "Total vertical NO_2 column" for 2023-12-09 to 2023-12-10.

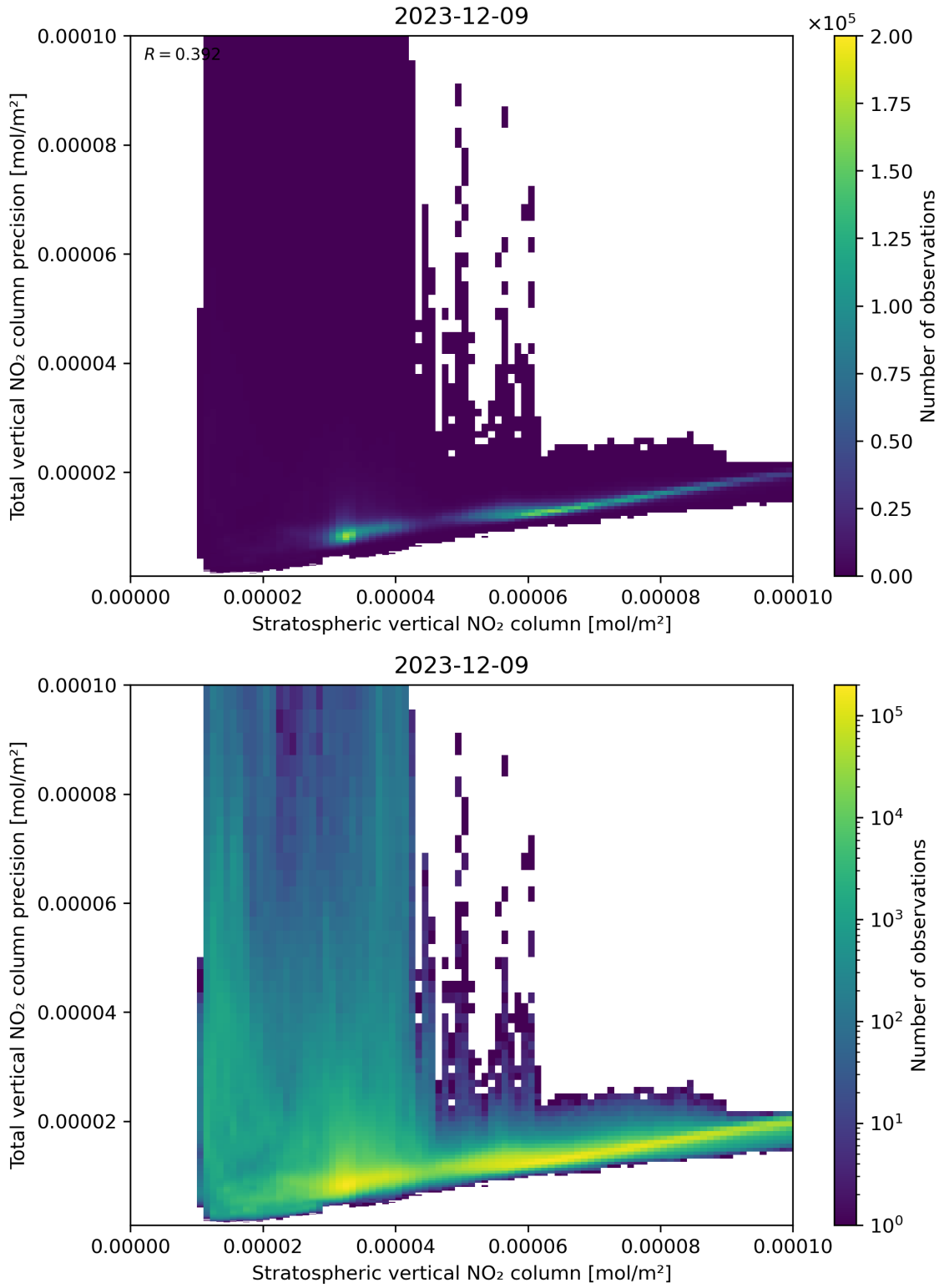


Figure 101: Scatter density plot of "Stratospheric vertical NO_2 column" against "Total vertical NO_2 column precision" for 2023-12-09 to 2023-12-10.

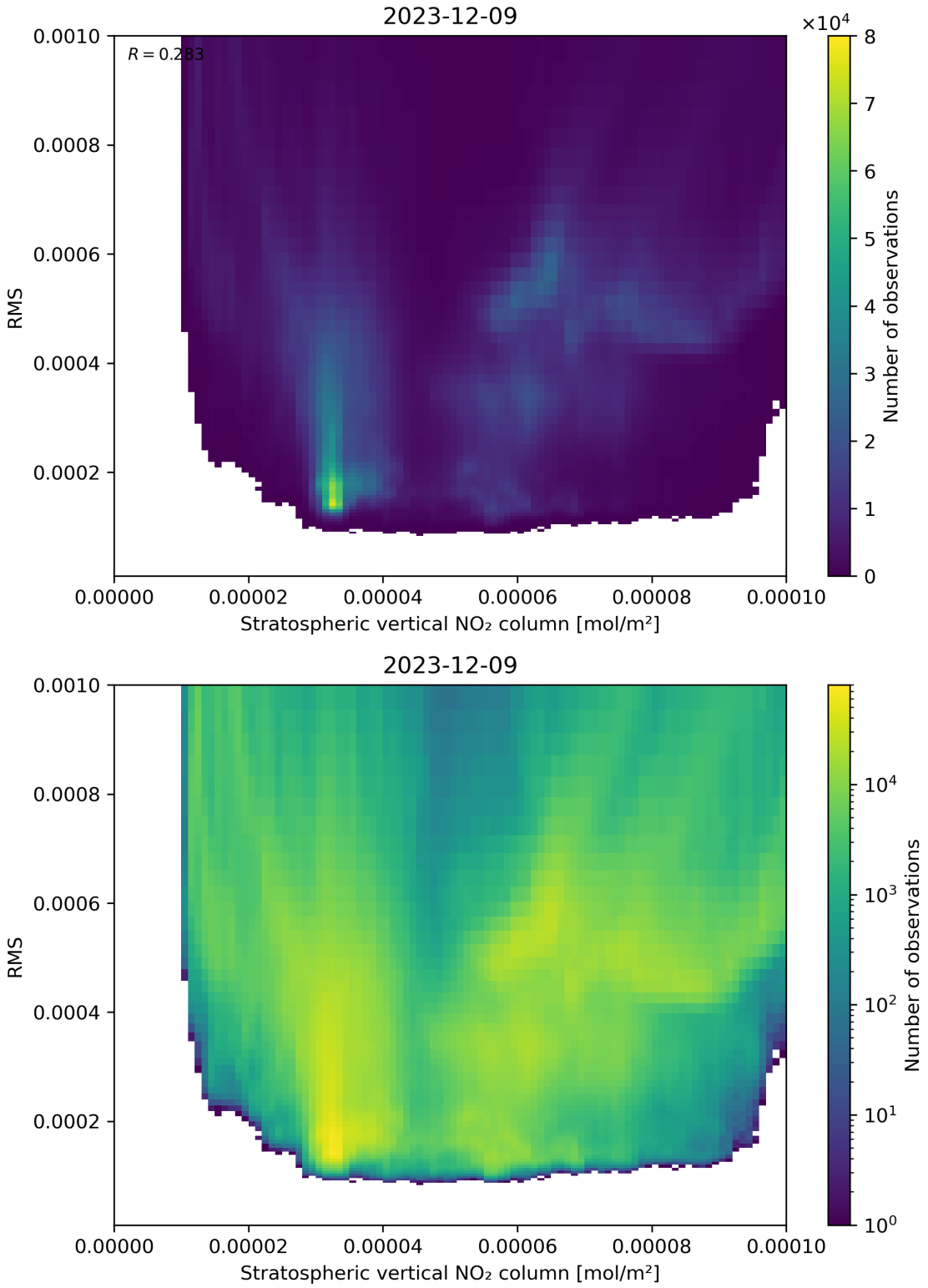


Figure 102: Scatter density plot of “Stratospheric vertical NO_2 column” against “RMS” for 2023-12-09 to 2023-12-10.

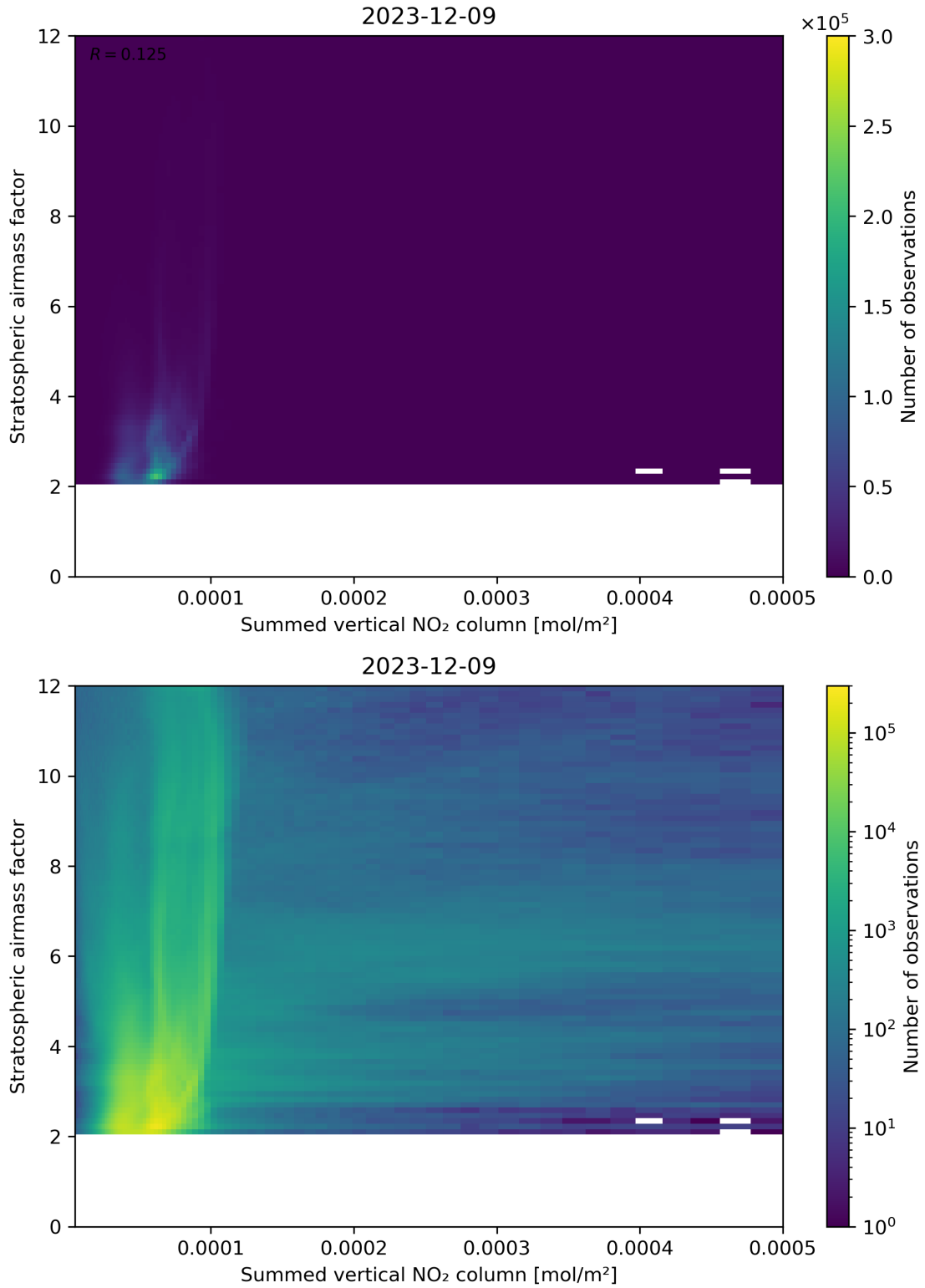


Figure 103: Scatter density plot of “Summed vertical NO_2 column” against “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10.

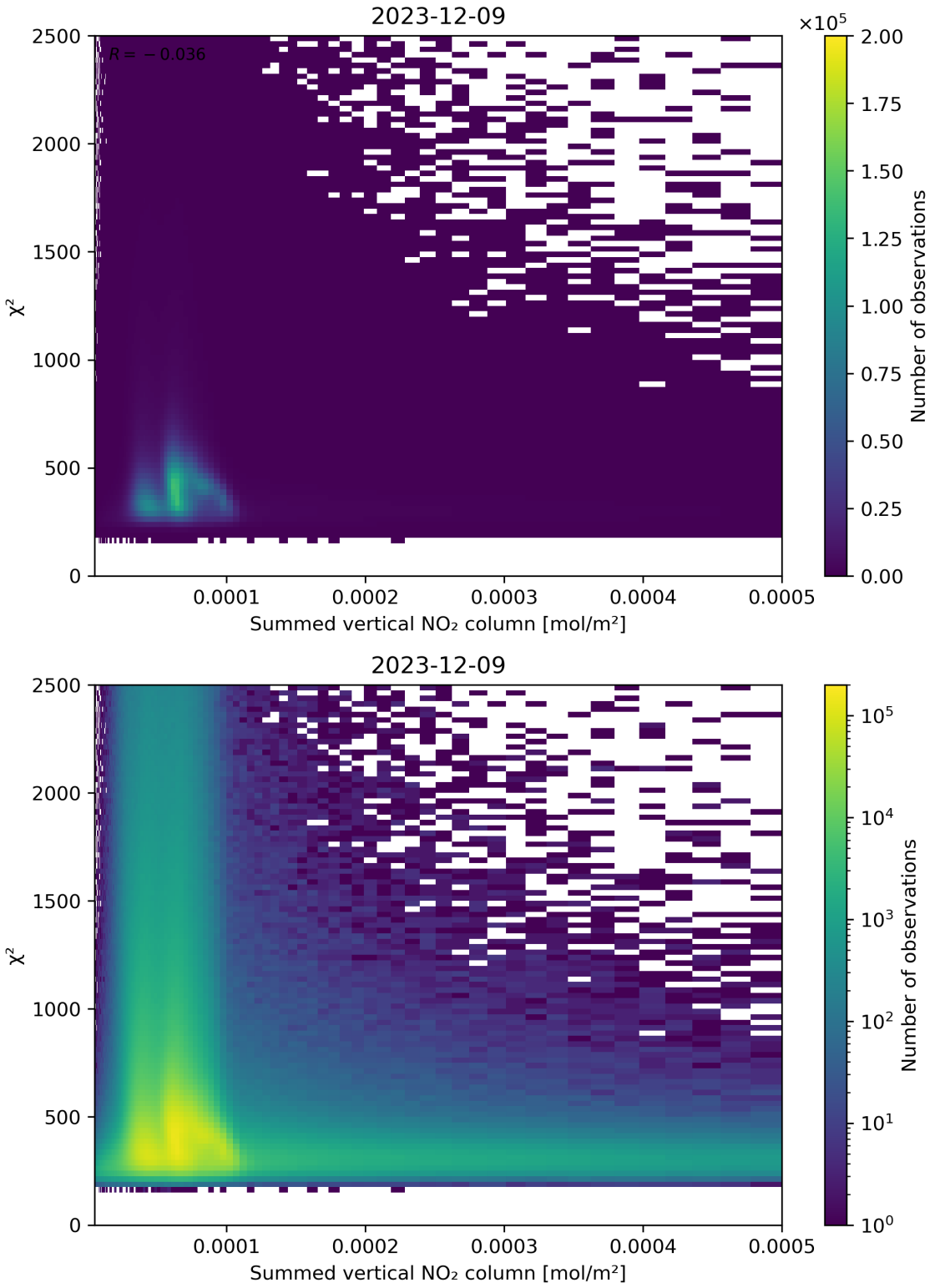


Figure 104: Scatter density plot of "Summed vertical NO_2 column" against "χ^2" for 2023-12-09 to 2023-12-10.

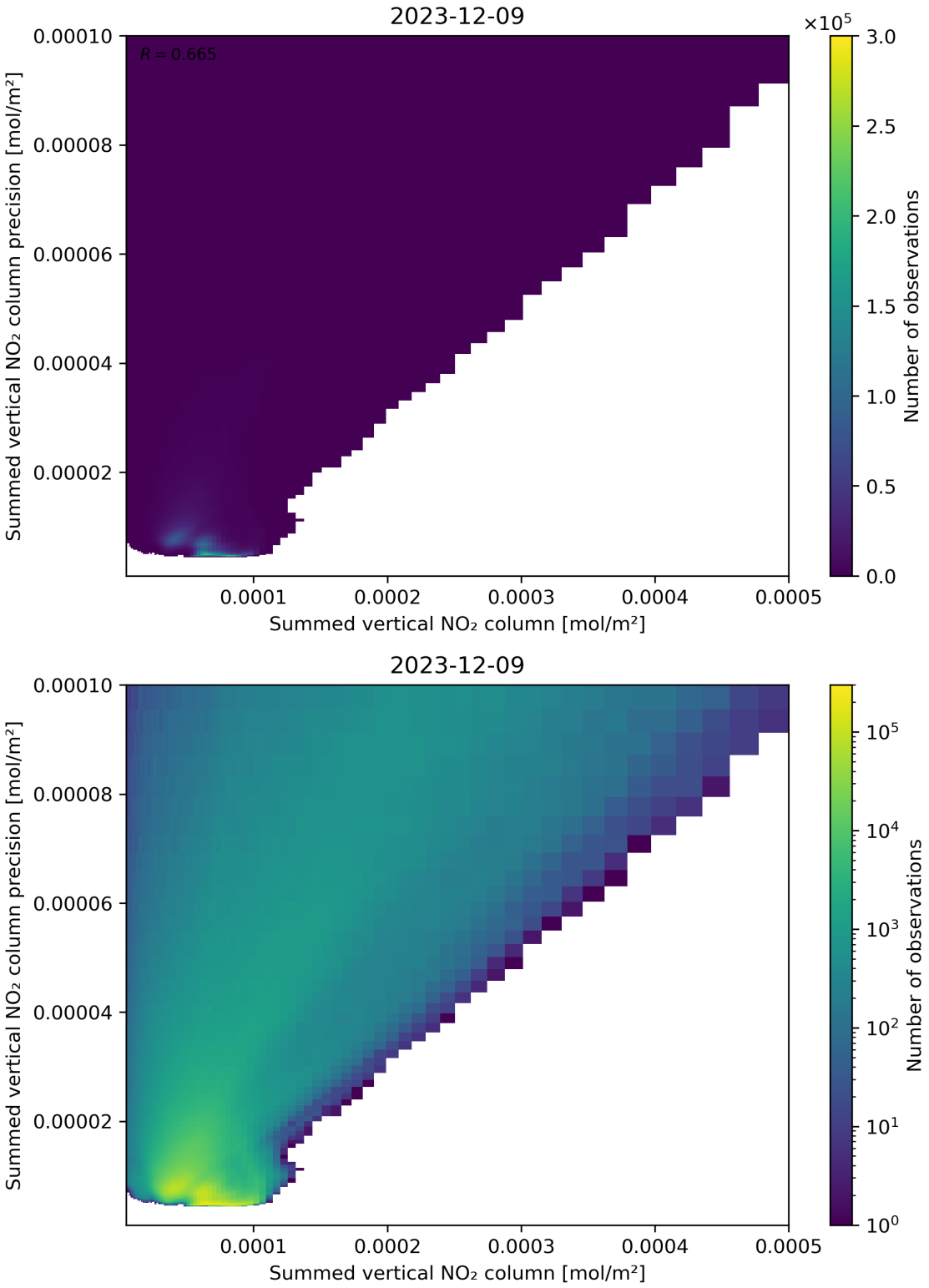


Figure 105: Scatter density plot of “Summed vertical NO_2 column” against “Summed vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

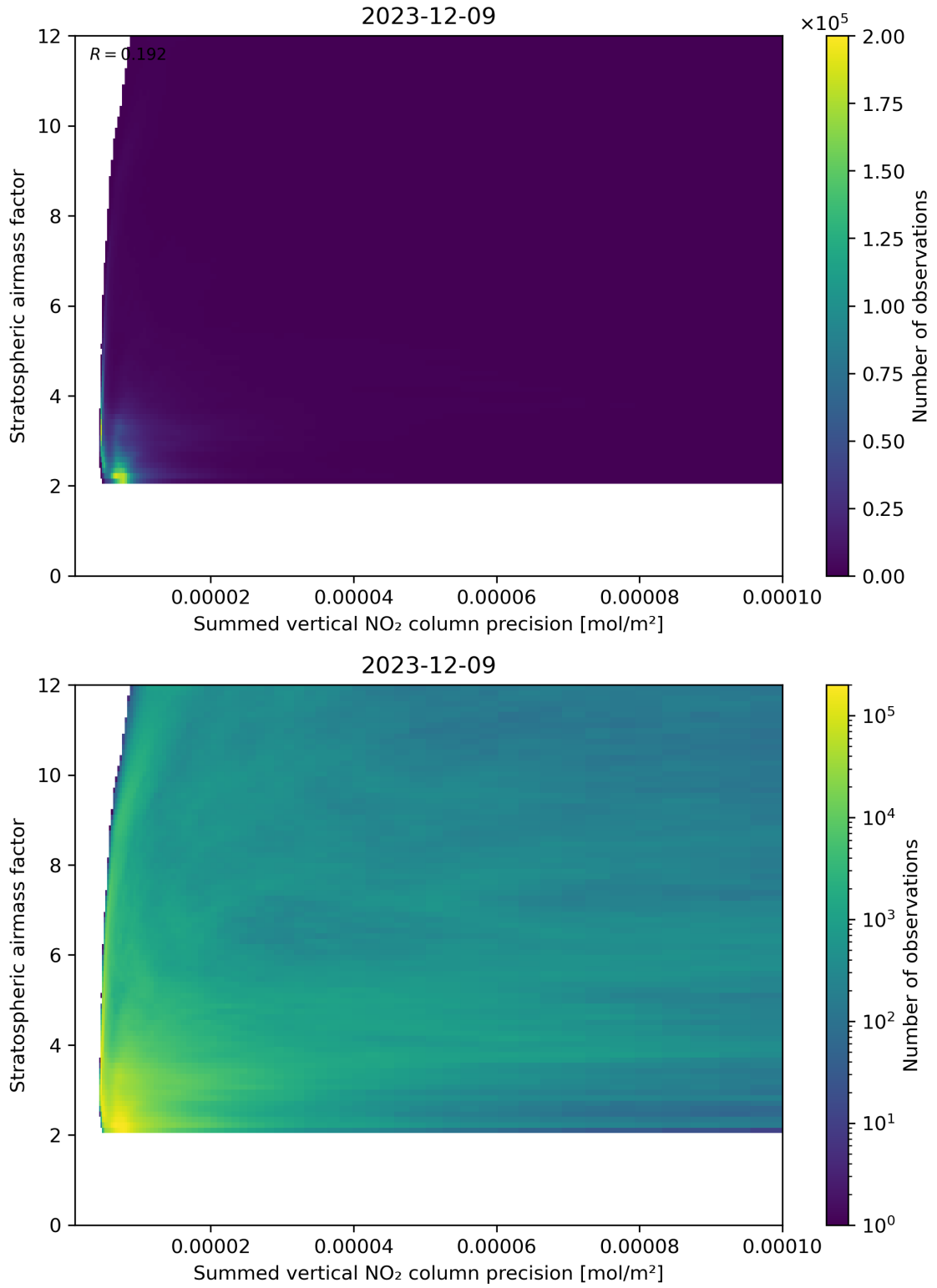


Figure 106: Scatter density plot of “Summed vertical NO_2 column precision” against “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10.

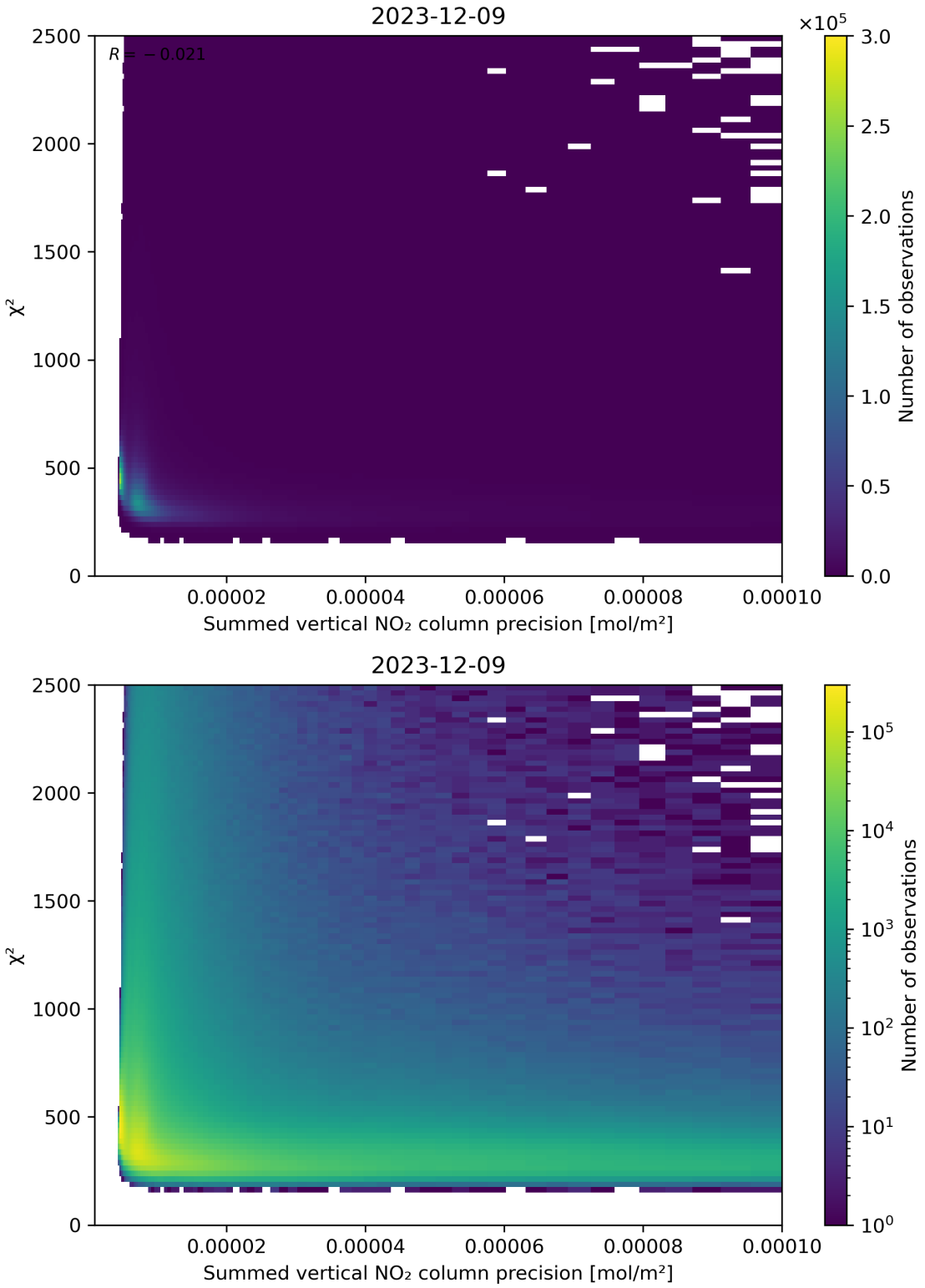


Figure 107: Scatter density plot of "Summed vertical NO_2 column precision" against "χ^2" for 2023-12-09 to 2023-12-10.

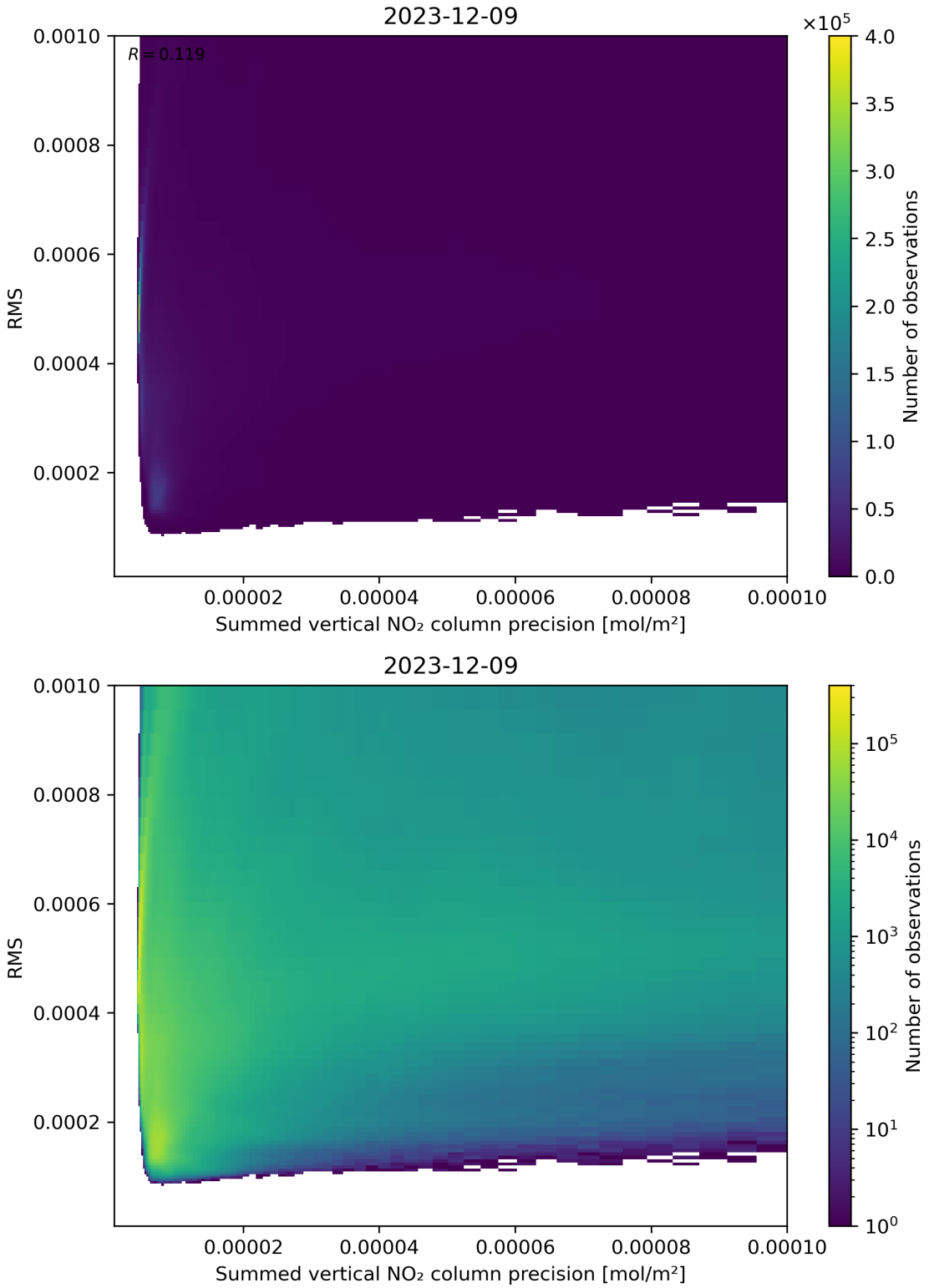


Figure 108: Scatter density plot of “Summed vertical NO_2 column precision” against “RMS” for 2023-12-09 to 2023-12-10.

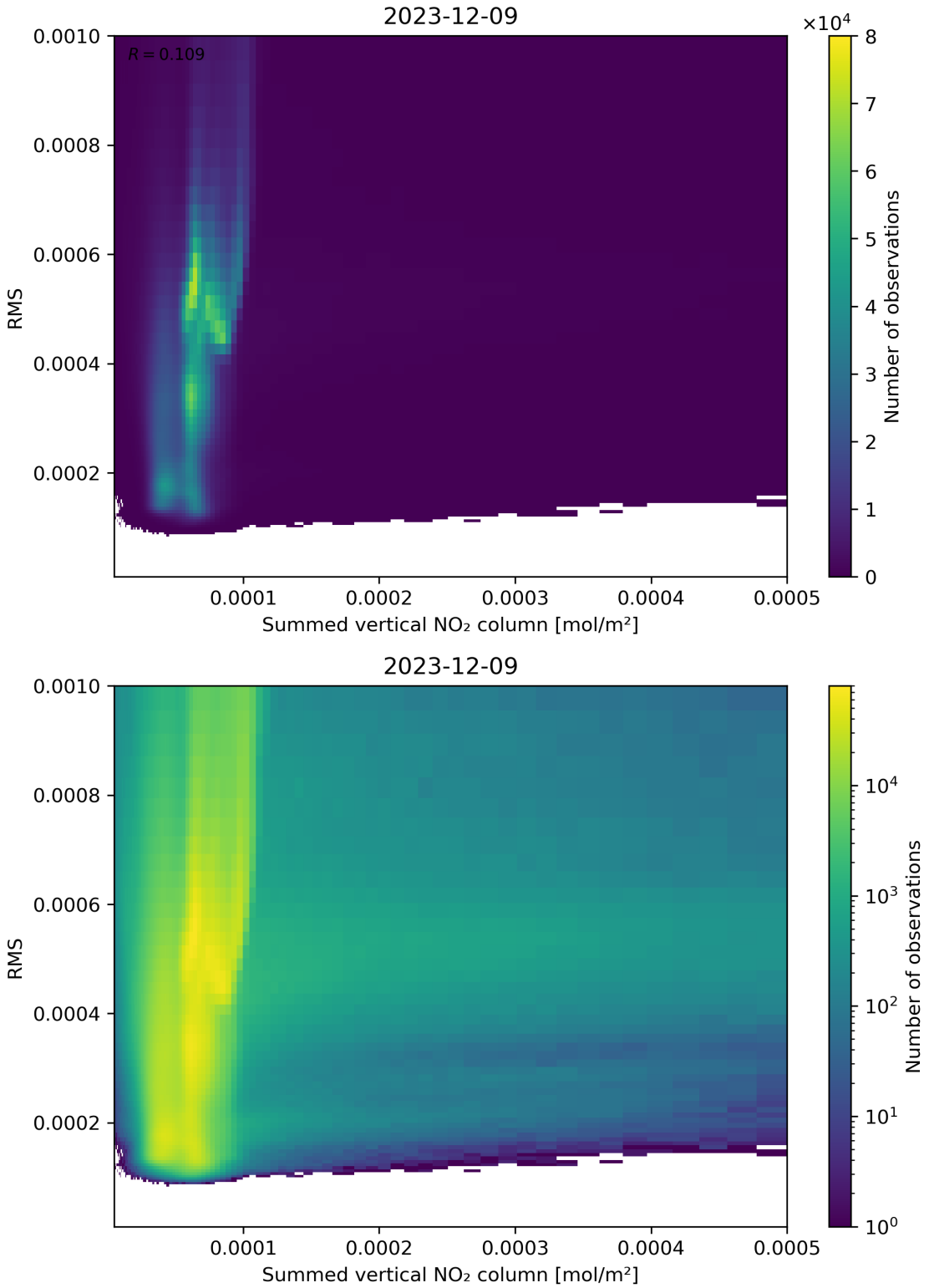


Figure 109: Scatter density plot of “Summed vertical NO_2 column” against “RMS” for 2023-12-09 to 2023-12-10.

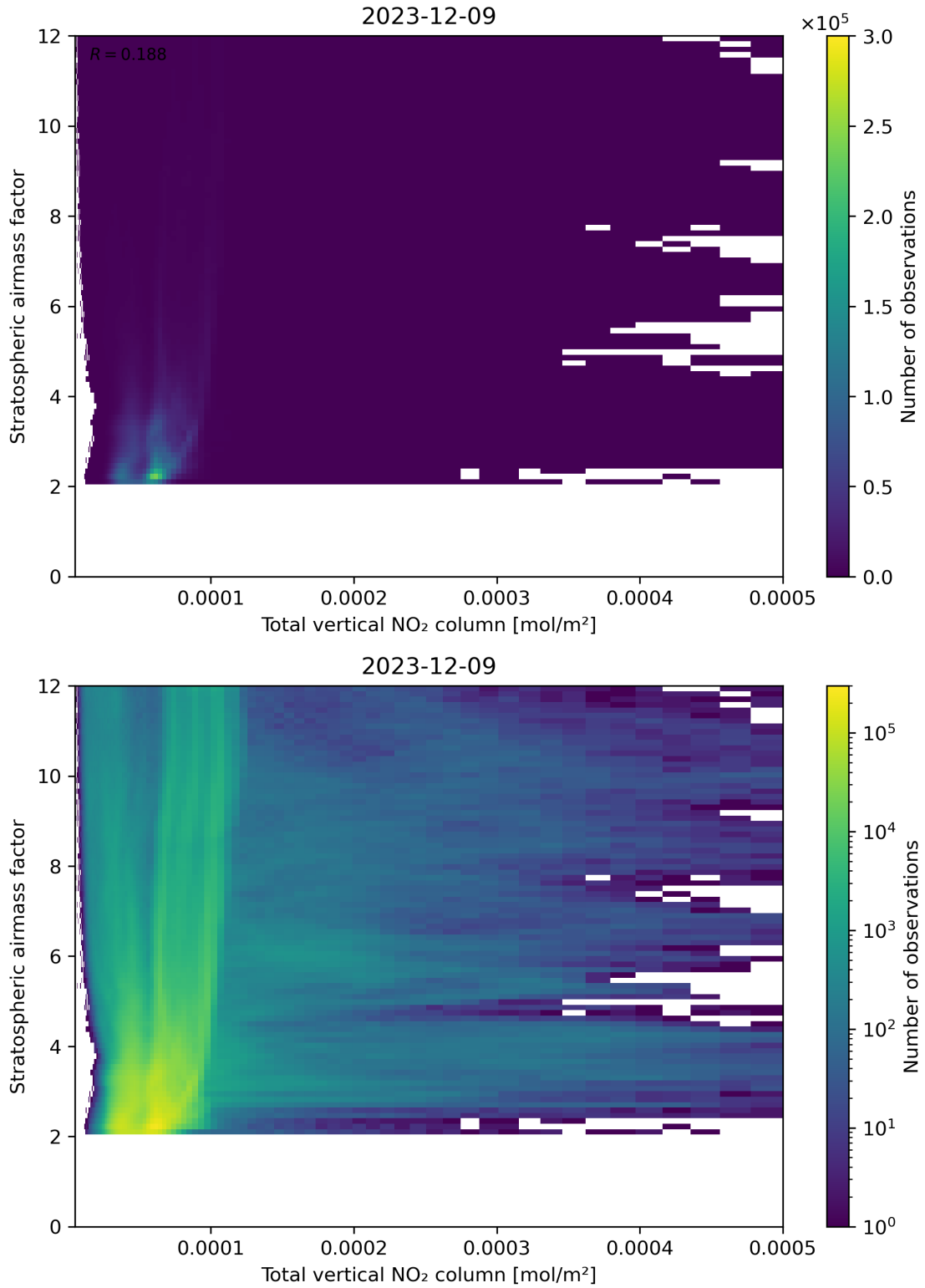


Figure 110: Scatter density plot of "Total vertical NO_2 column" against "Stratospheric airmass factor" for 2023-12-09 to 2023-12-10.

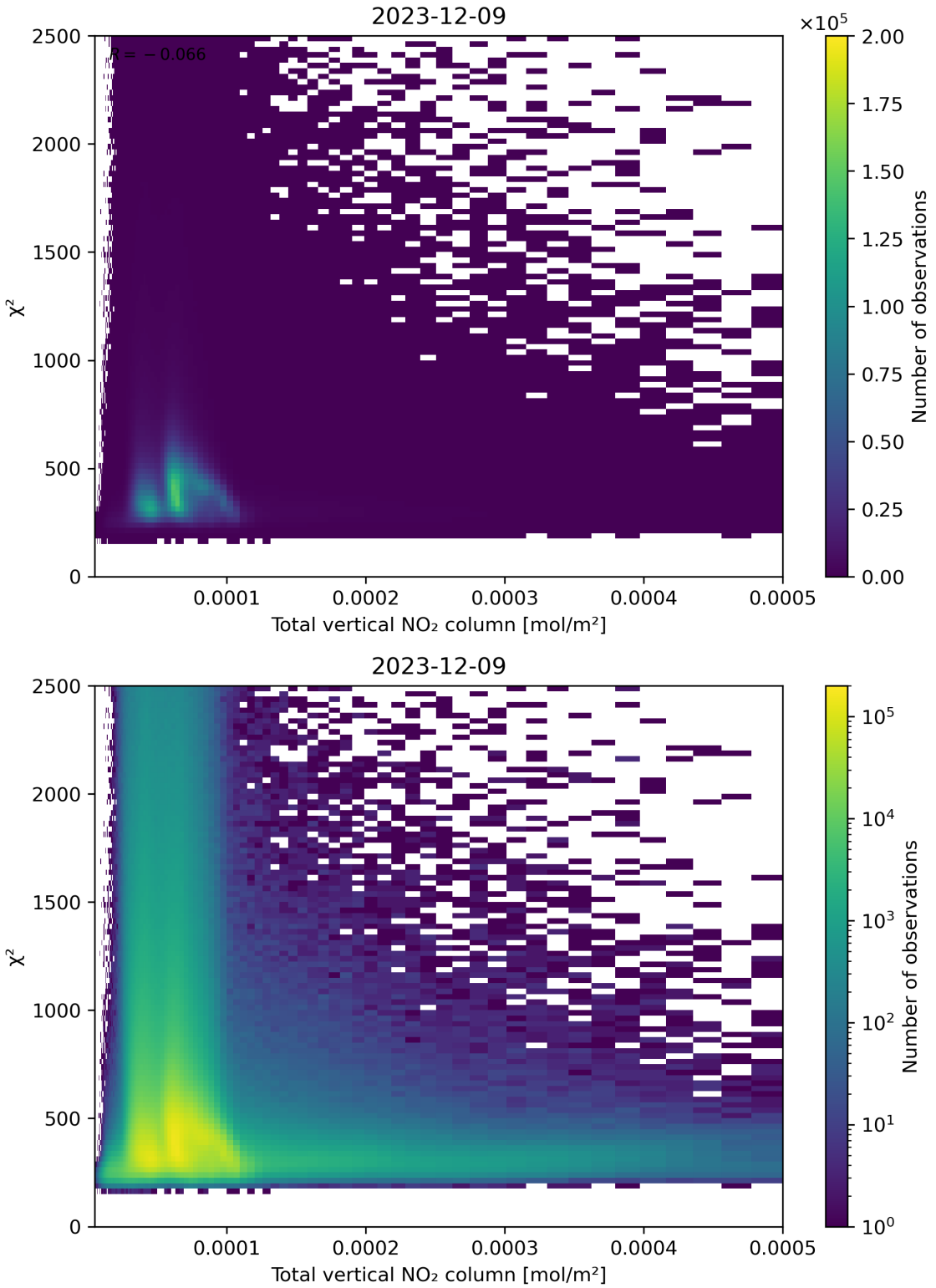


Figure 111: Scatter density plot of "Total vertical NO_2 column" against "χ^2" for 2023-12-09 to 2023-12-10.

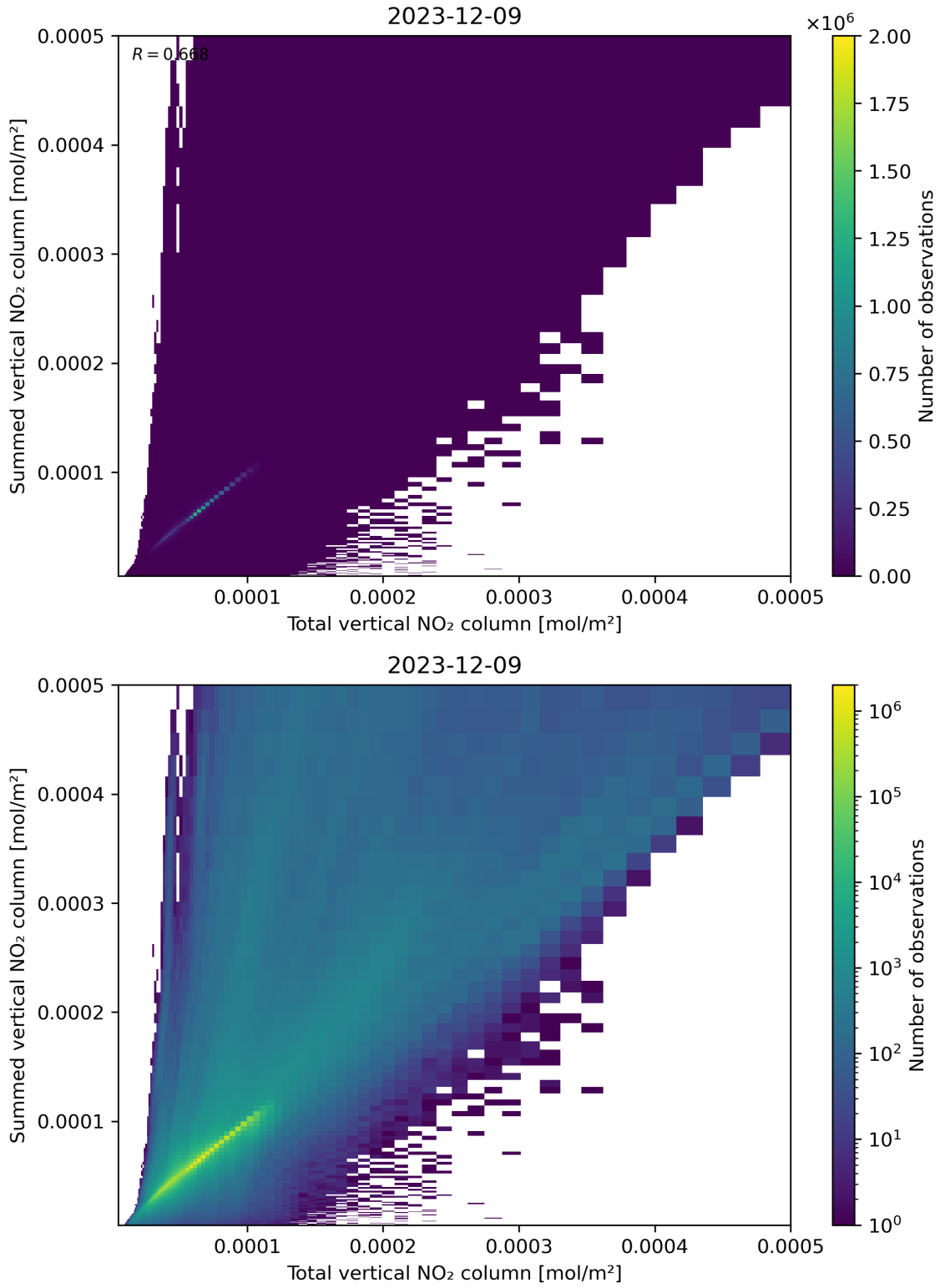


Figure 112: Scatter density plot of "Total vertical NO_2 column" against "Summed vertical NO_2 column" for 2023-12-09 to 2023-12-10.

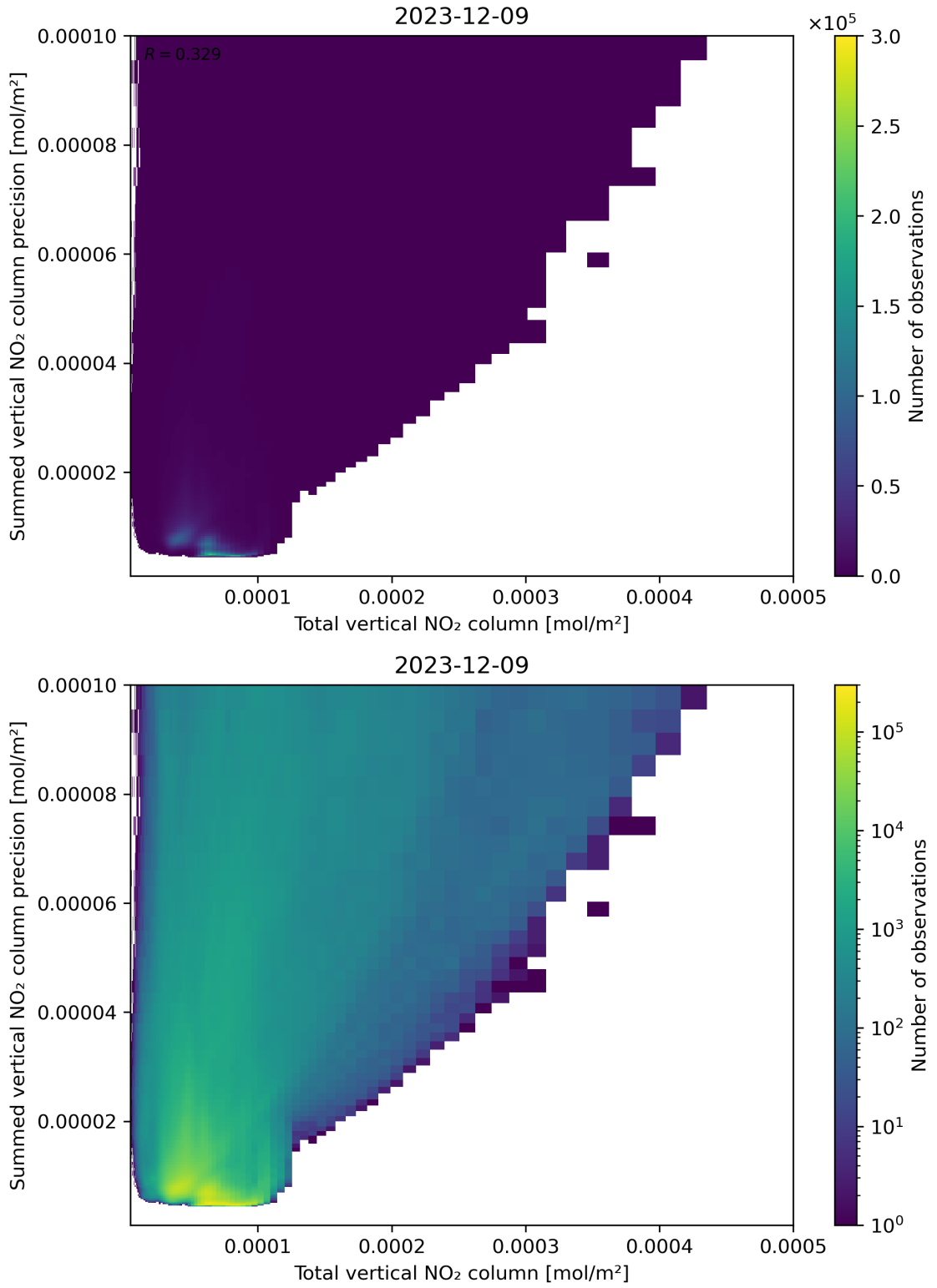


Figure 113: Scatter density plot of "Total vertical NO_2 column" against "Summed vertical NO_2 column precision" for 2023-12-09 to 2023-12-10.

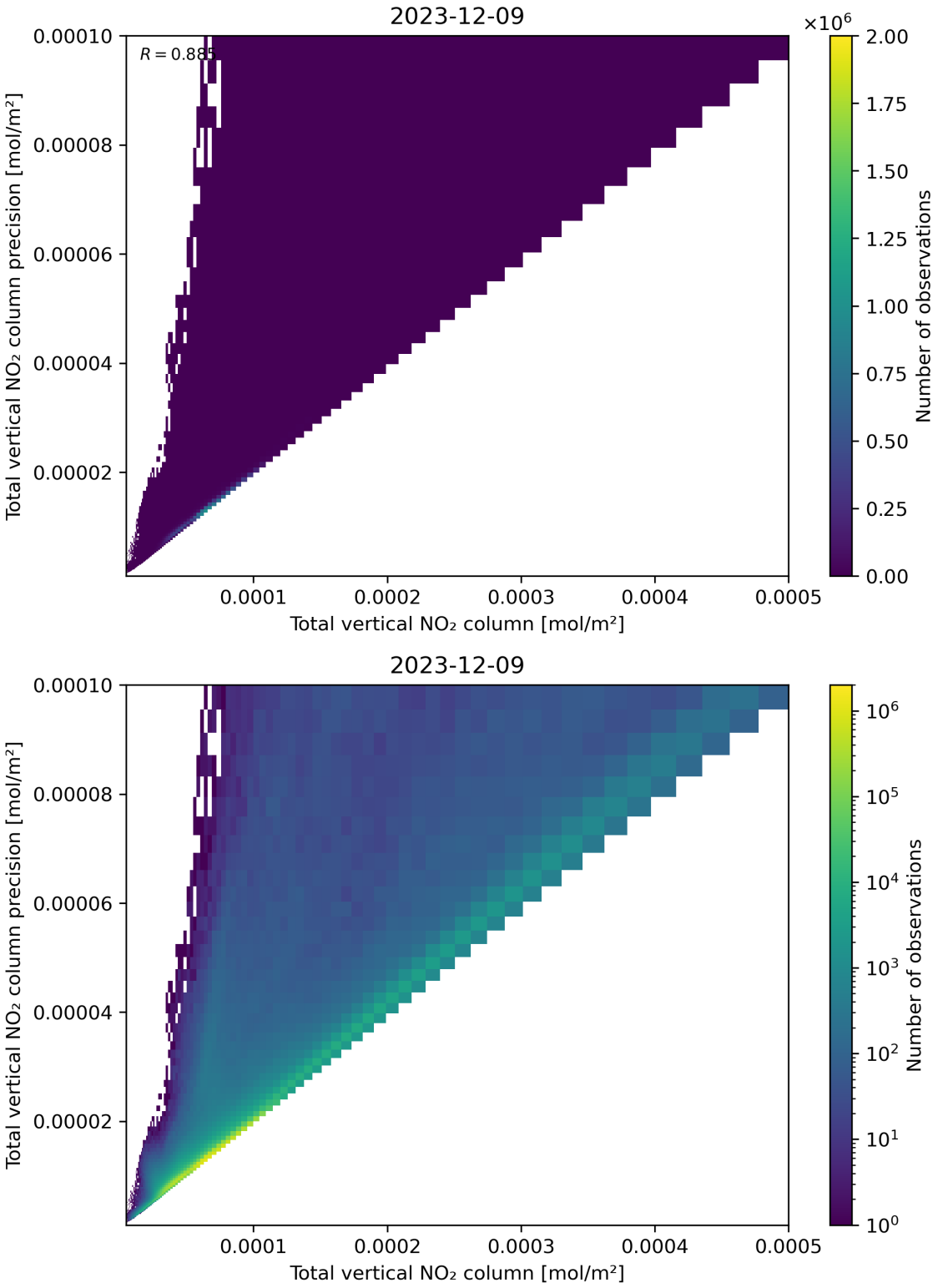


Figure 114: Scatter density plot of “Total vertical NO_2 column” against “Total vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

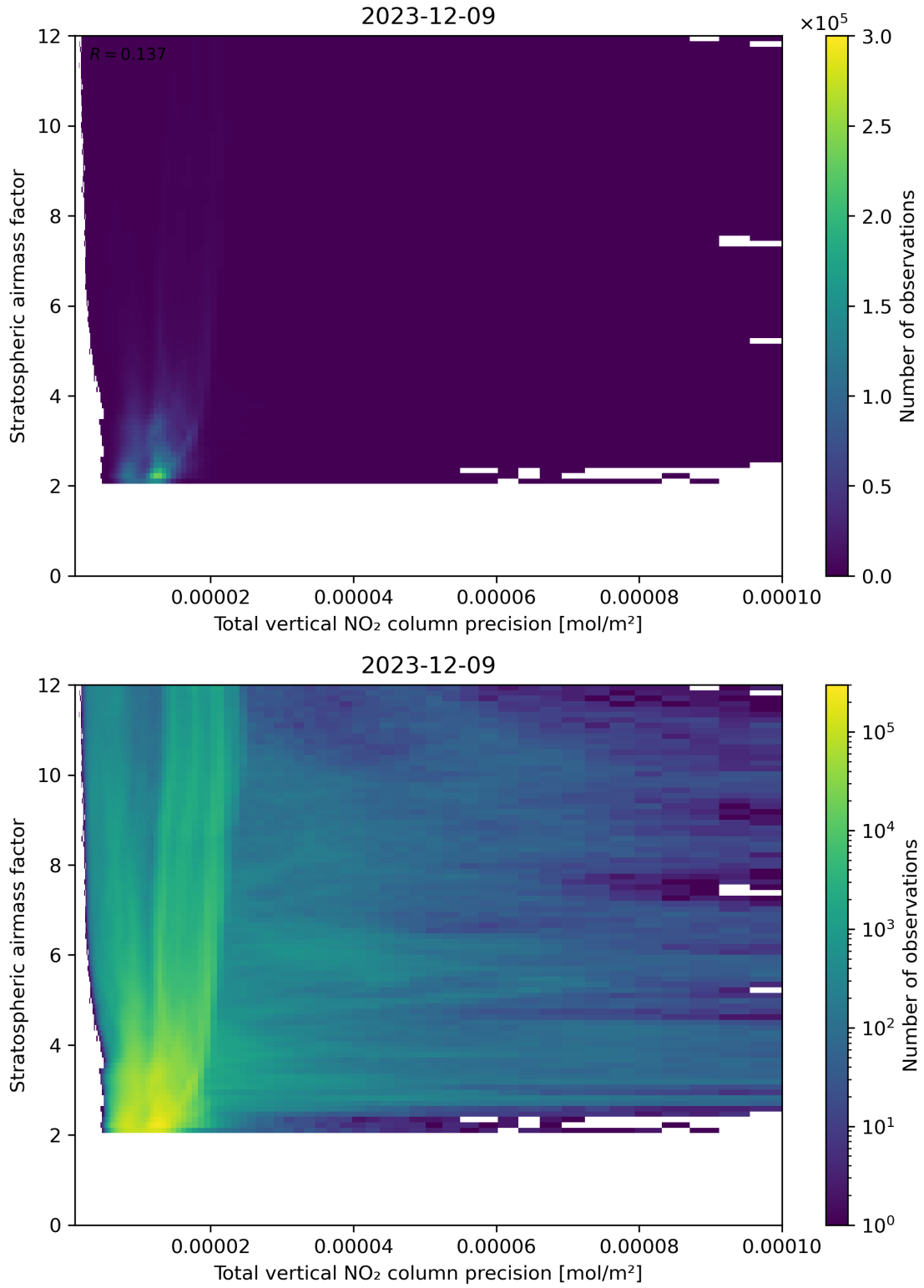


Figure 115: Scatter density plot of "Total vertical NO_2 column precision" against "Stratospheric airmass factor" for 2023-12-09 to 2023-12-10.

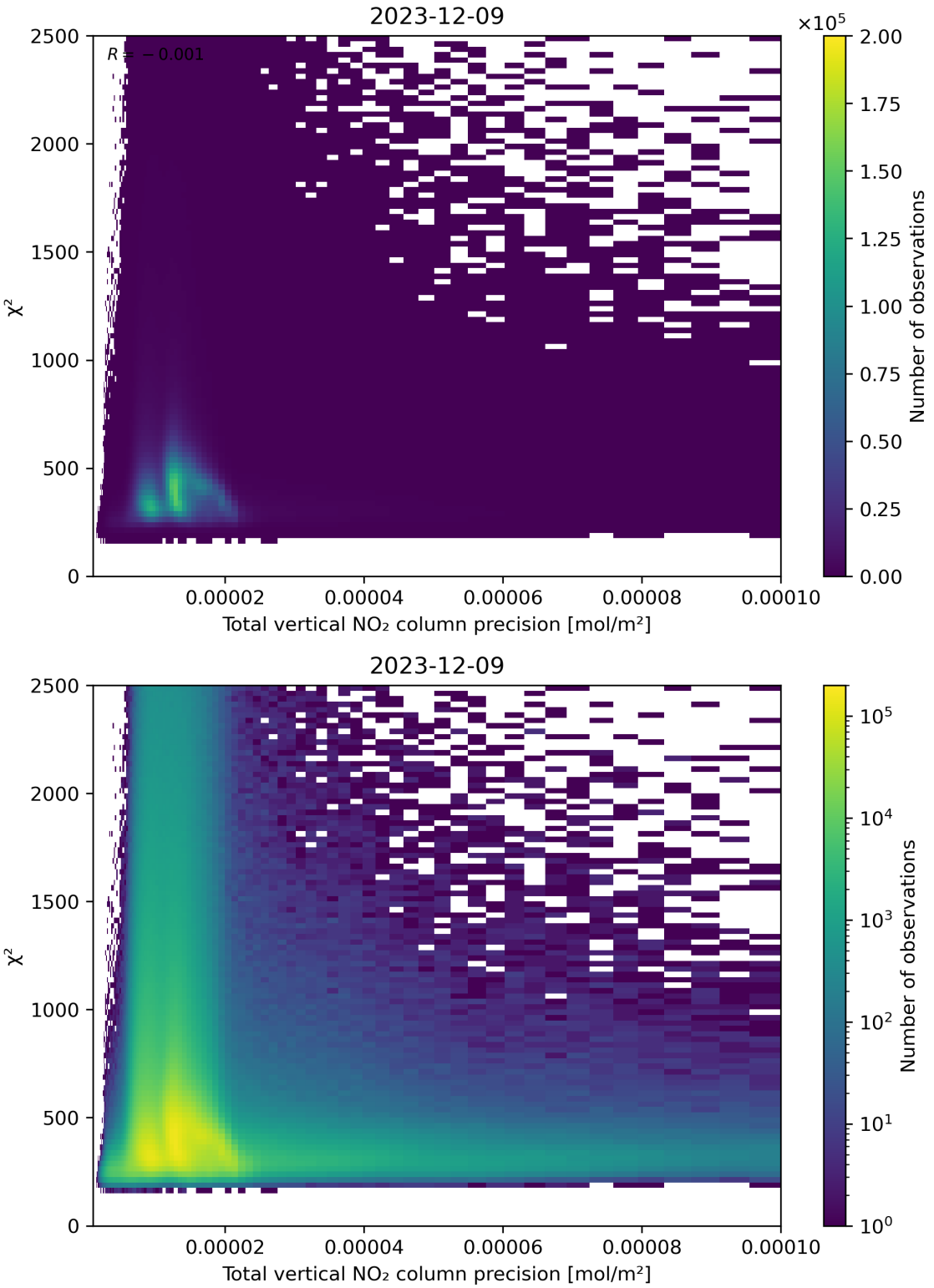


Figure 116: Scatter density plot of "Total vertical NO_2 column precision" against "χ^2" for 2023-12-09 to 2023-12-10.

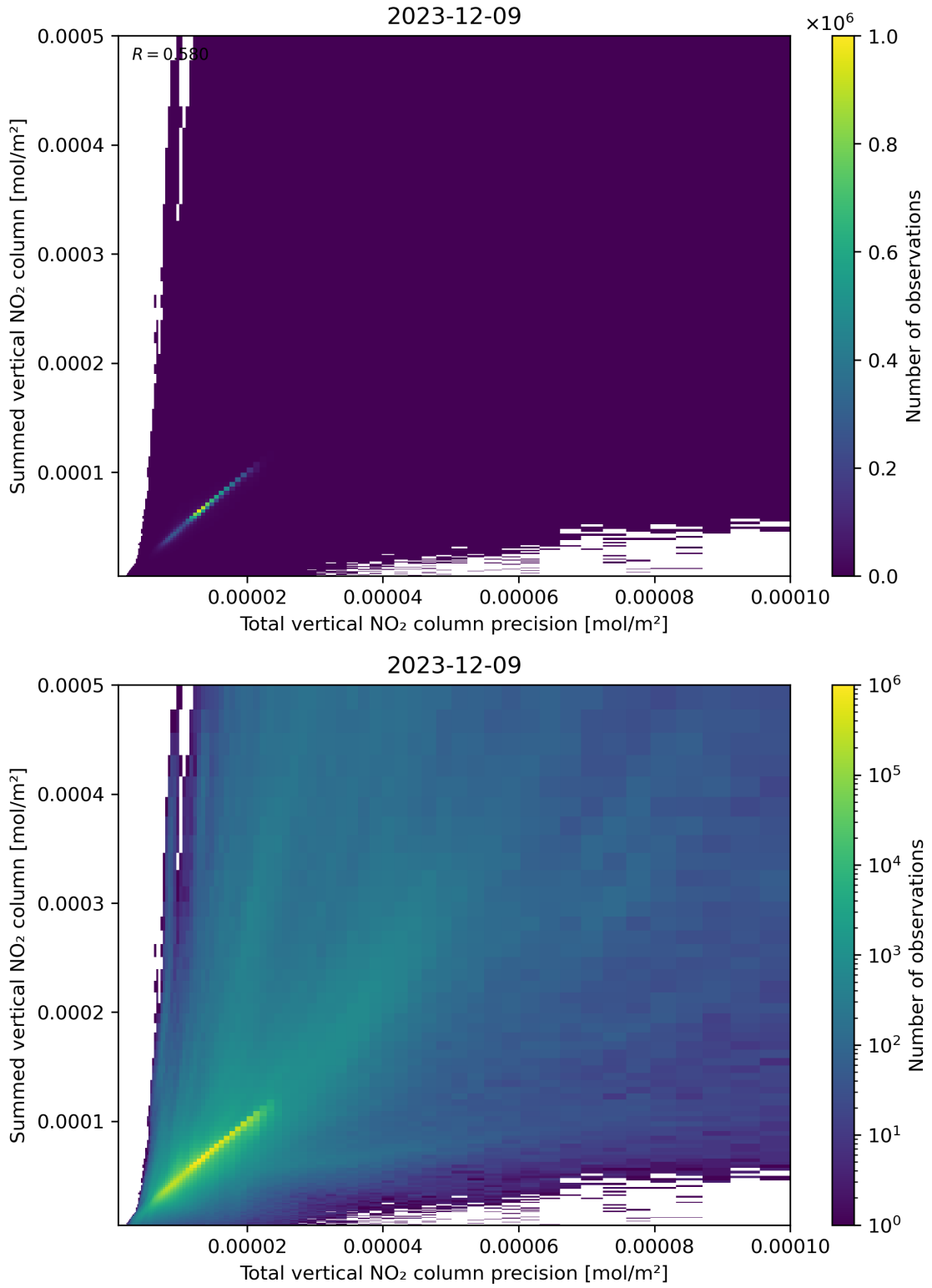


Figure 117: Scatter density plot of "Total vertical NO_2 column precision" against "Summed vertical NO_2 column" for 2023-12-09 to 2023-12-10.

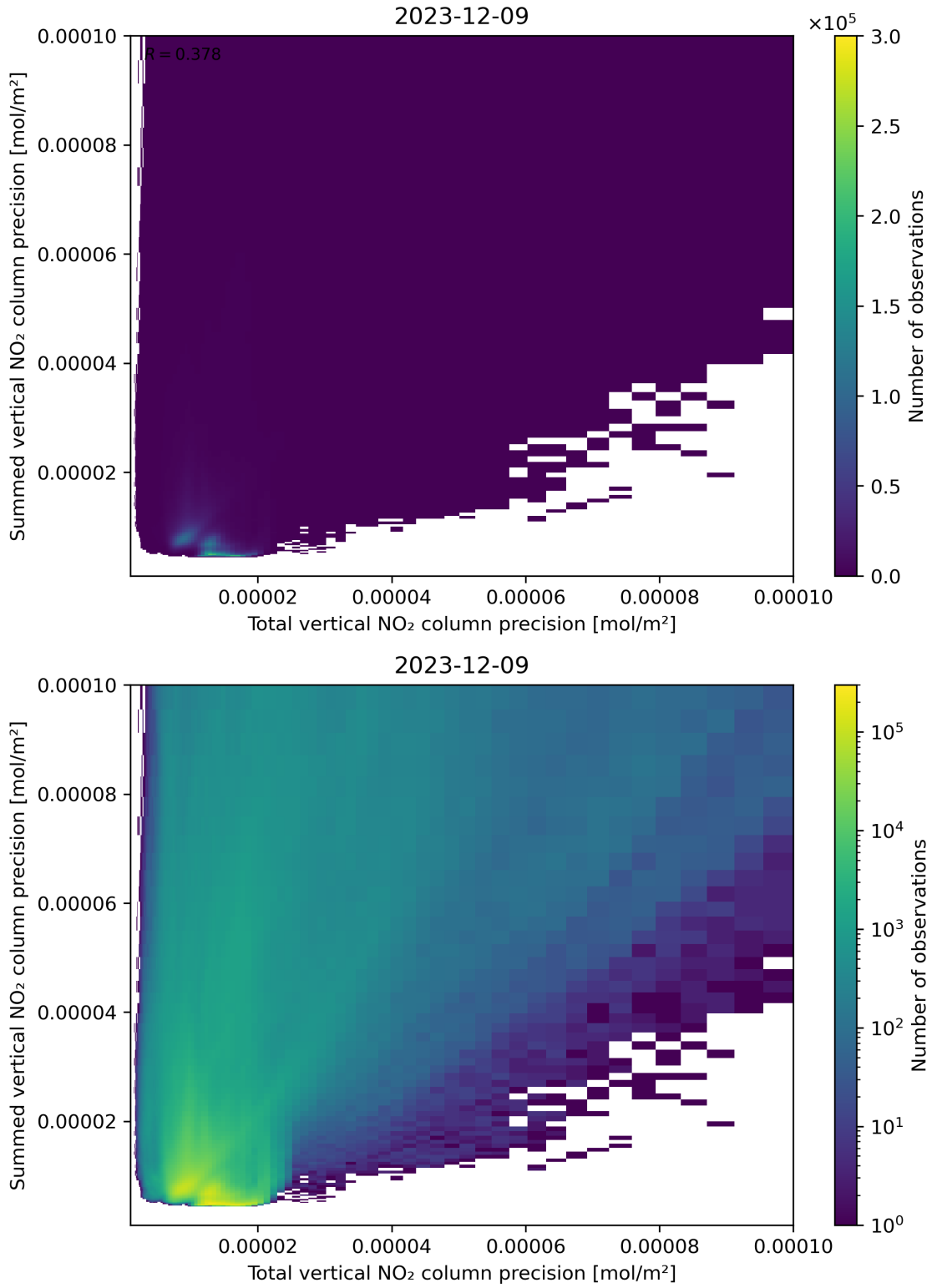


Figure 118: Scatter density plot of "Total vertical NO_2 column precision" against "Summed vertical NO_2 column precision" for 2023-12-09 to 2023-12-10.

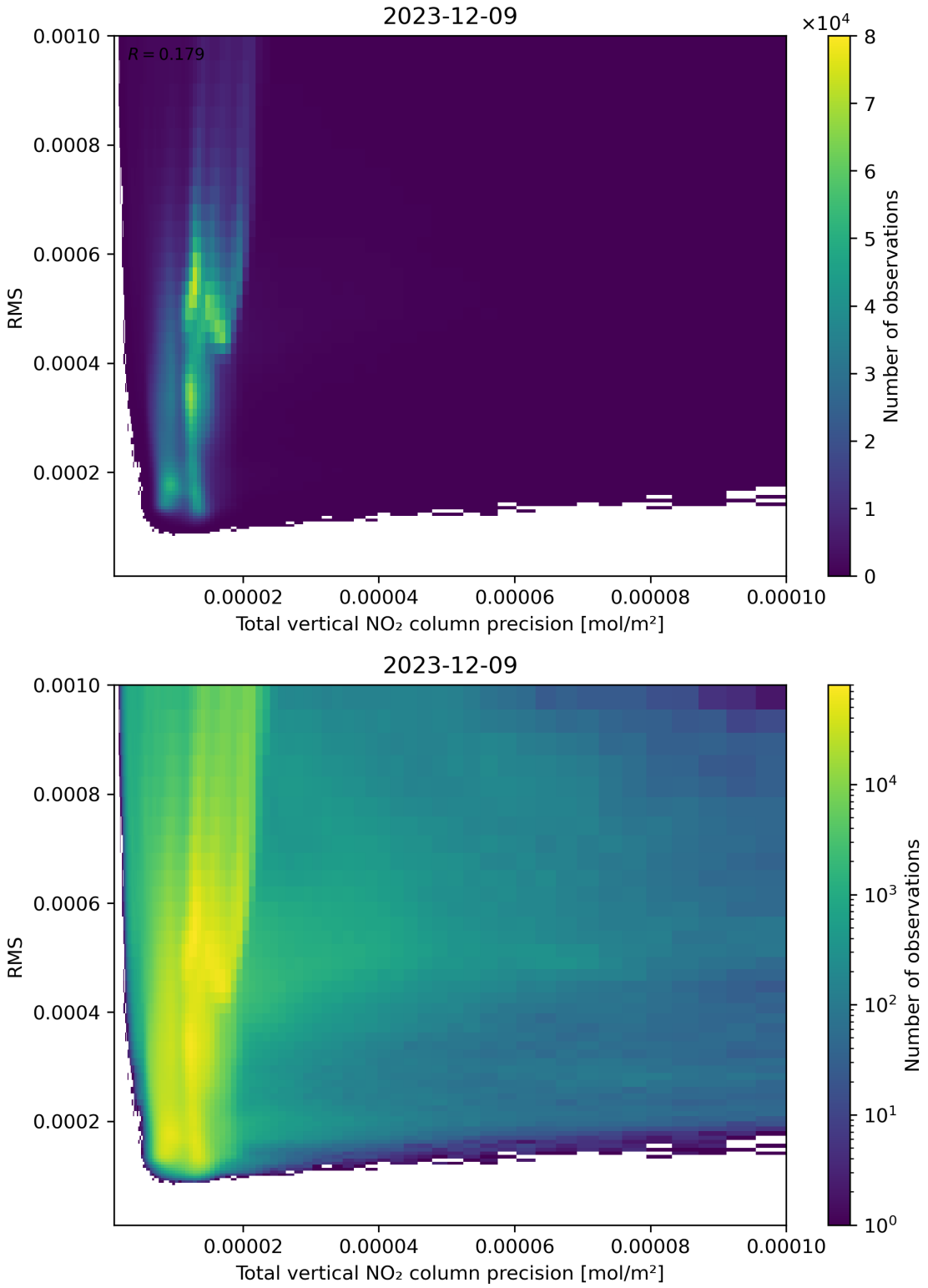


Figure 119: Scatter density plot of "Total vertical NO_2 column precision" against "RMS" for 2023-12-09 to 2023-12-10.

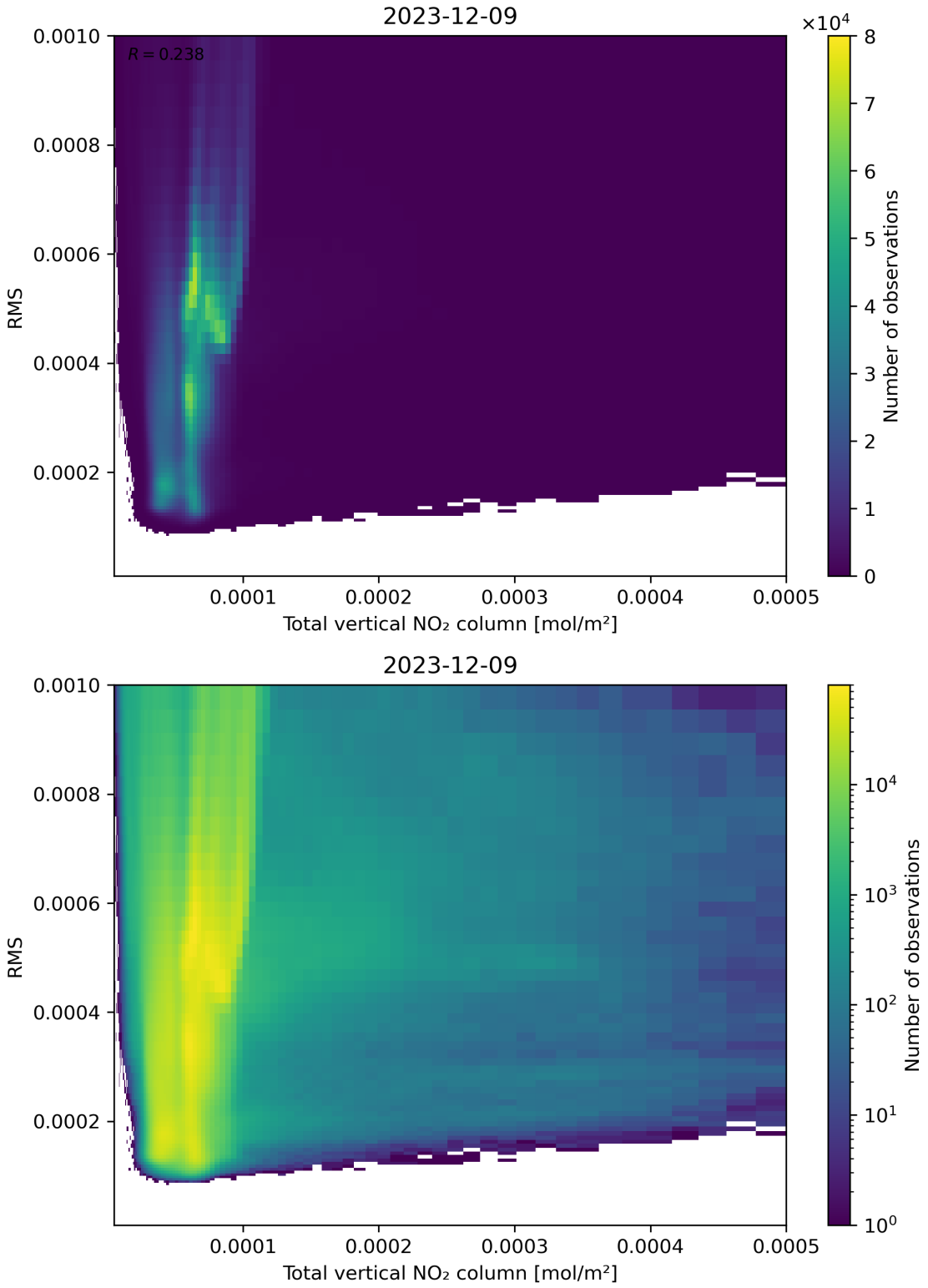


Figure 120: Scatter density plot of "Total vertical NO_2 column" against "RMS" for 2023-12-09 to 2023-12-10.

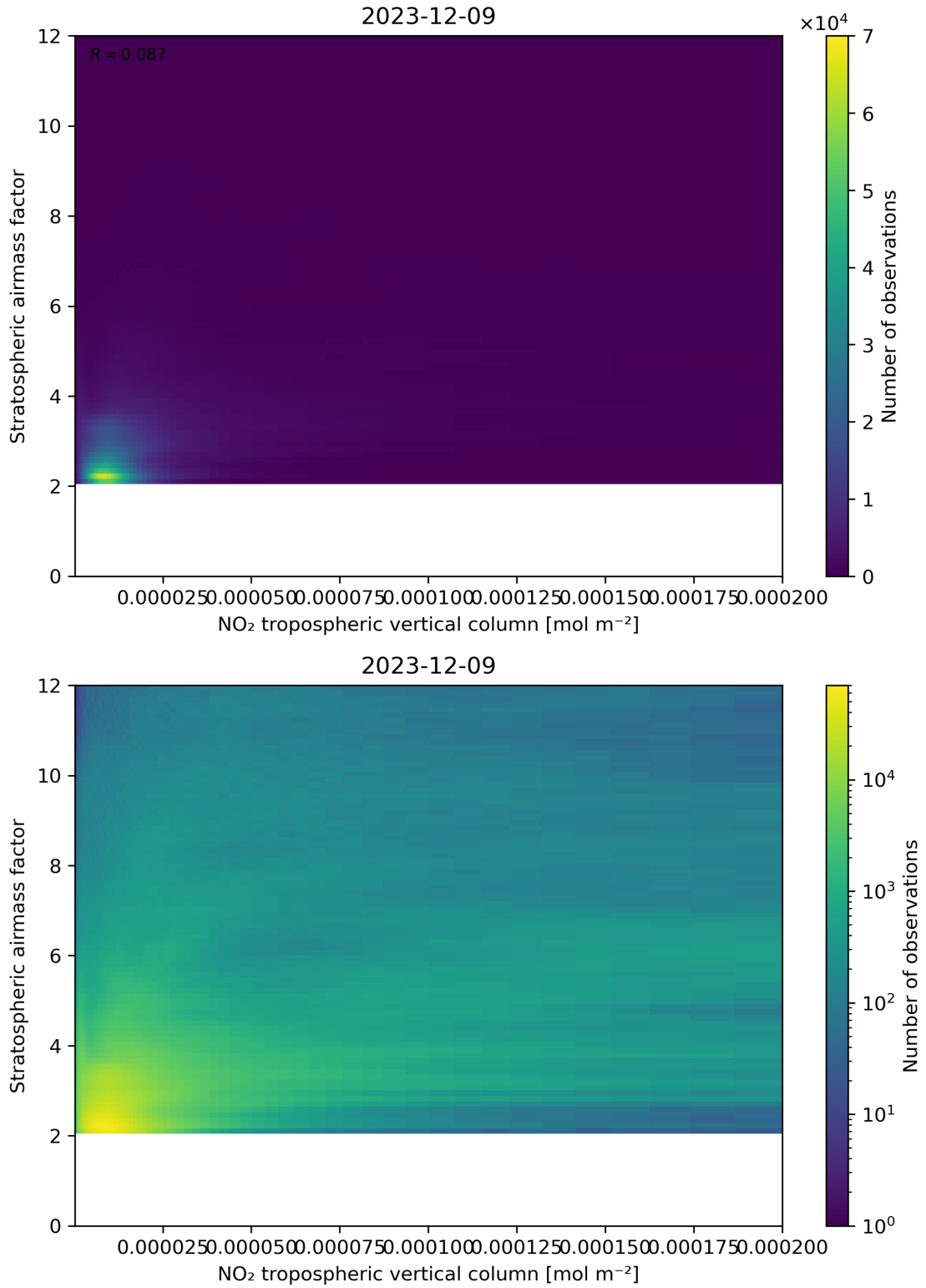


Figure 121: Scatter density plot of "NO_2 tropospheric vertical column" against "Stratospheric airmass factor" for 2023-12-09 to 2023-12-10.

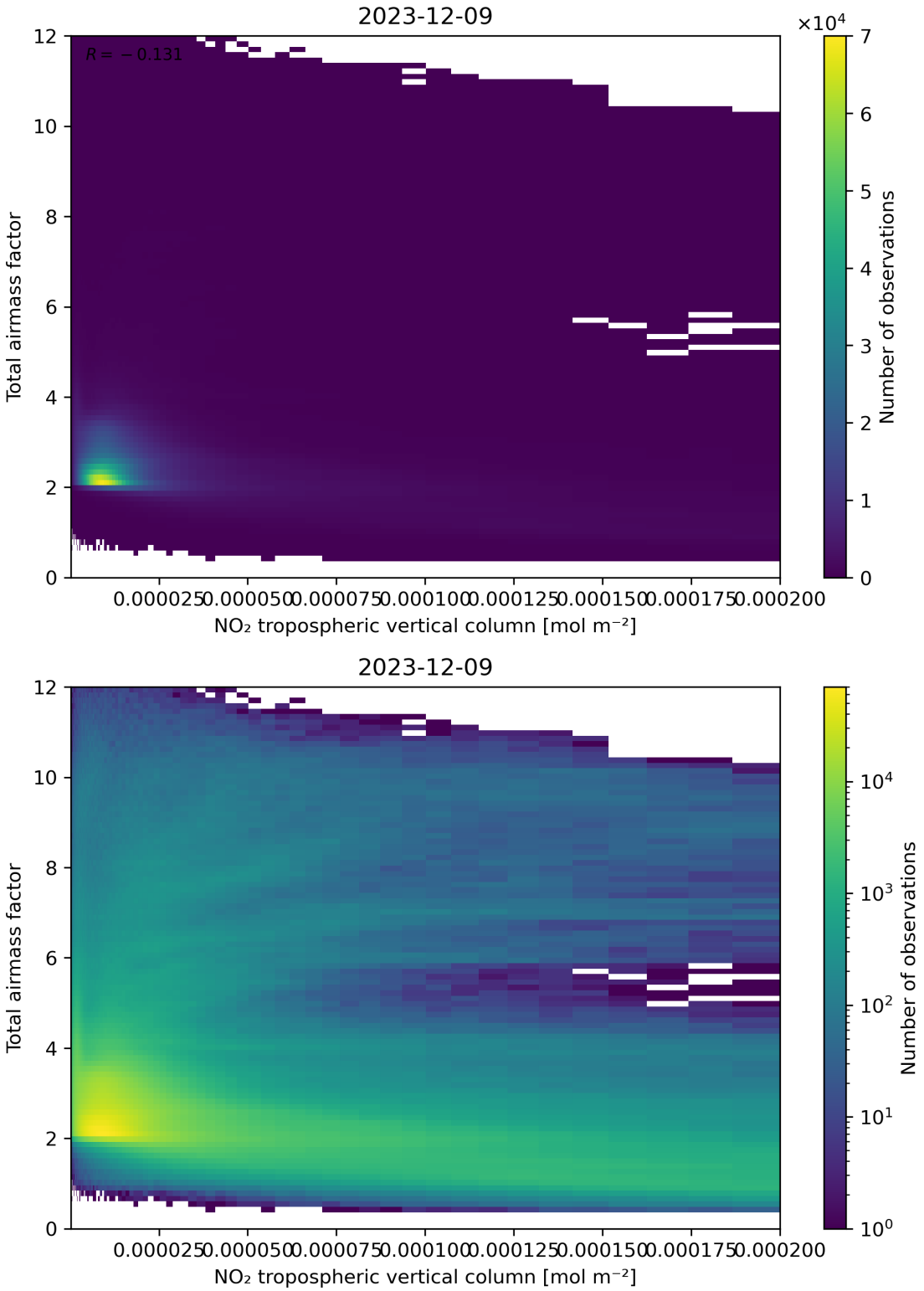


Figure 122: Scatter density plot of "NO_2 tropospheric vertical column" against "Total airmass factor" for 2023-12-09 to 2023-12-10.

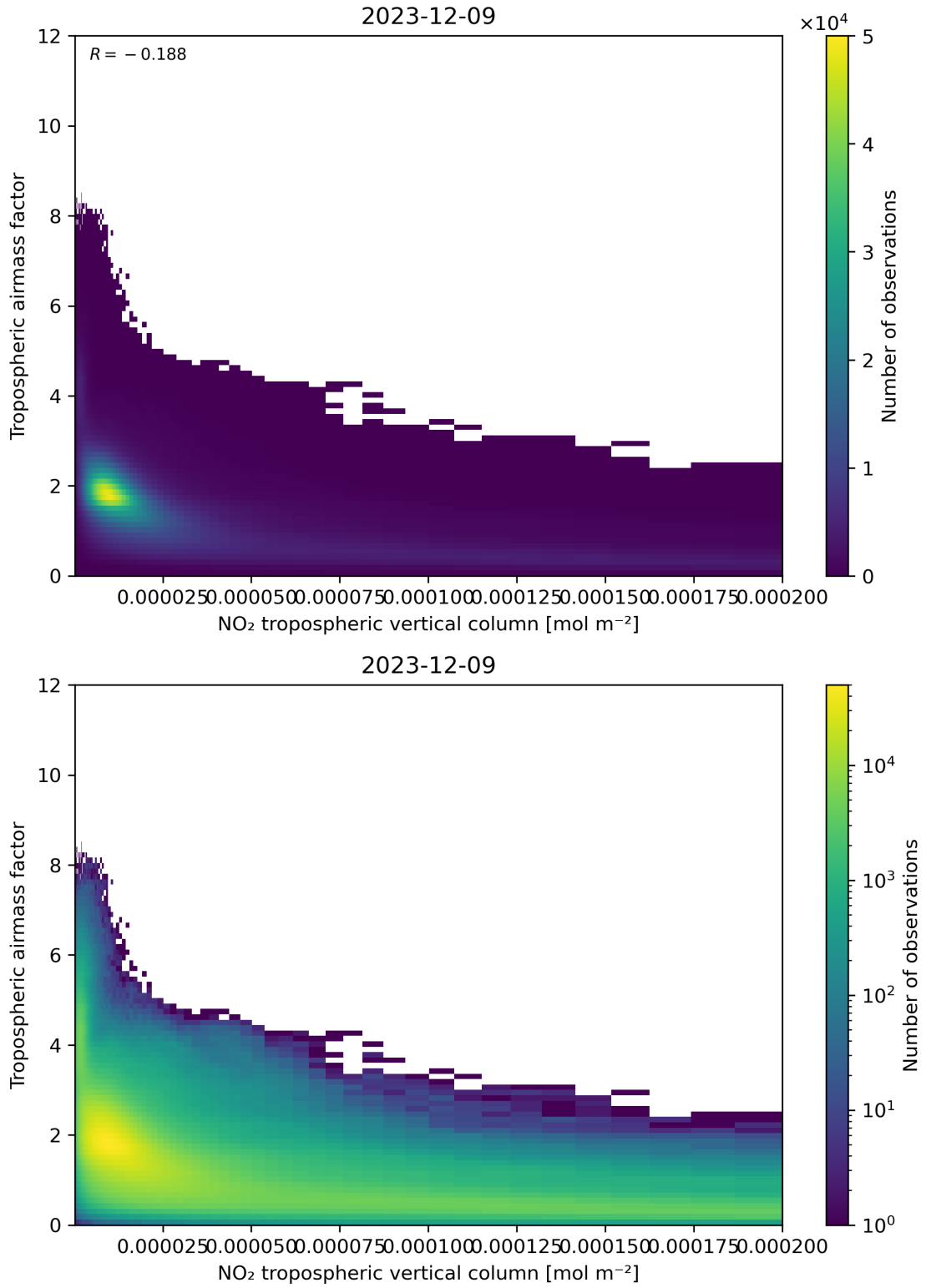


Figure 123: Scatter density plot of "NO_2 tropospheric vertical column" against "Tropospheric airmass factor" for 2023-12-09 to 2023-12-10.

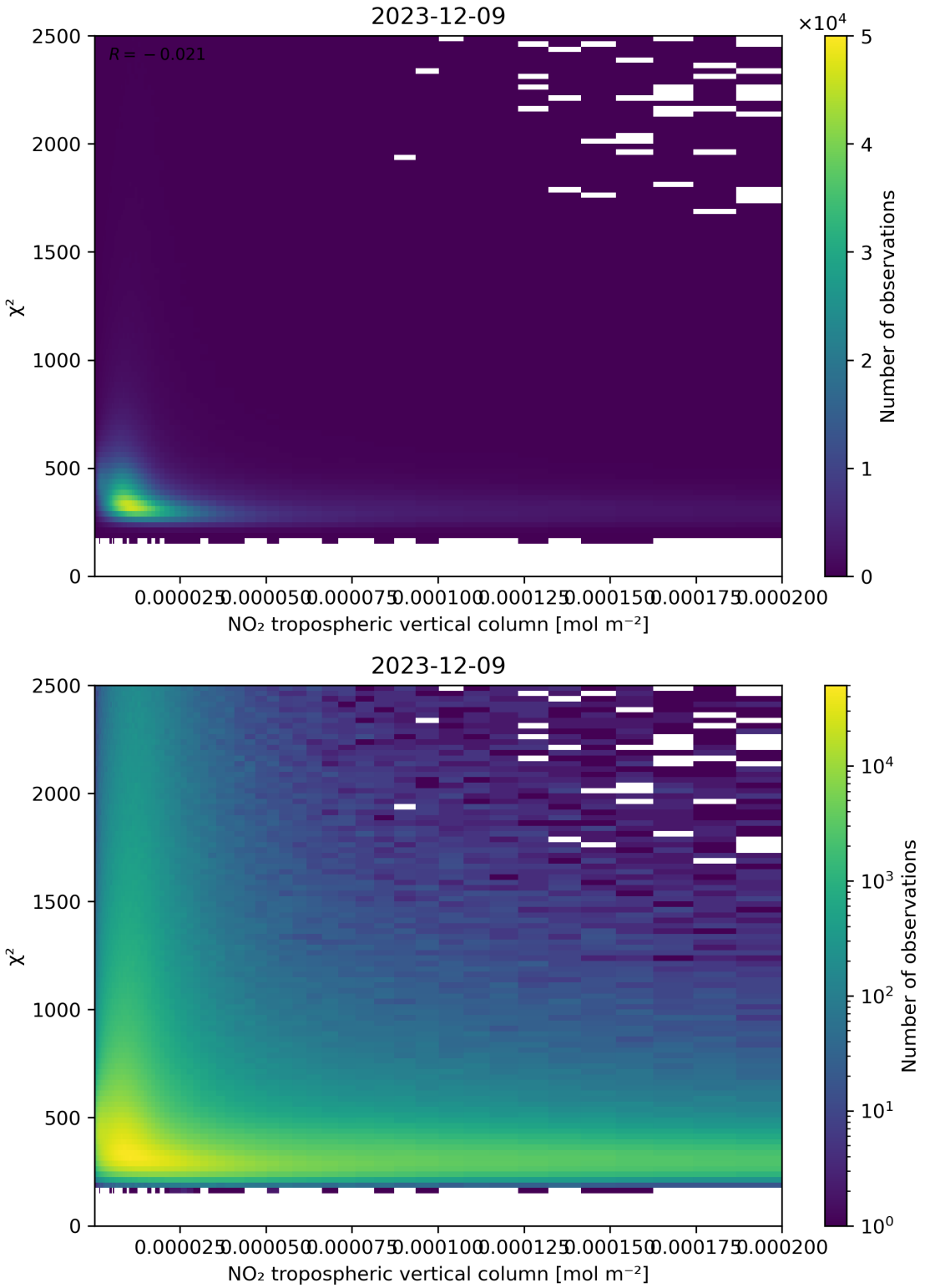


Figure 124: Scatter density plot of "NO_2 tropospheric vertical column" against "χ^2" for 2023-12-09 to 2023-12-10.

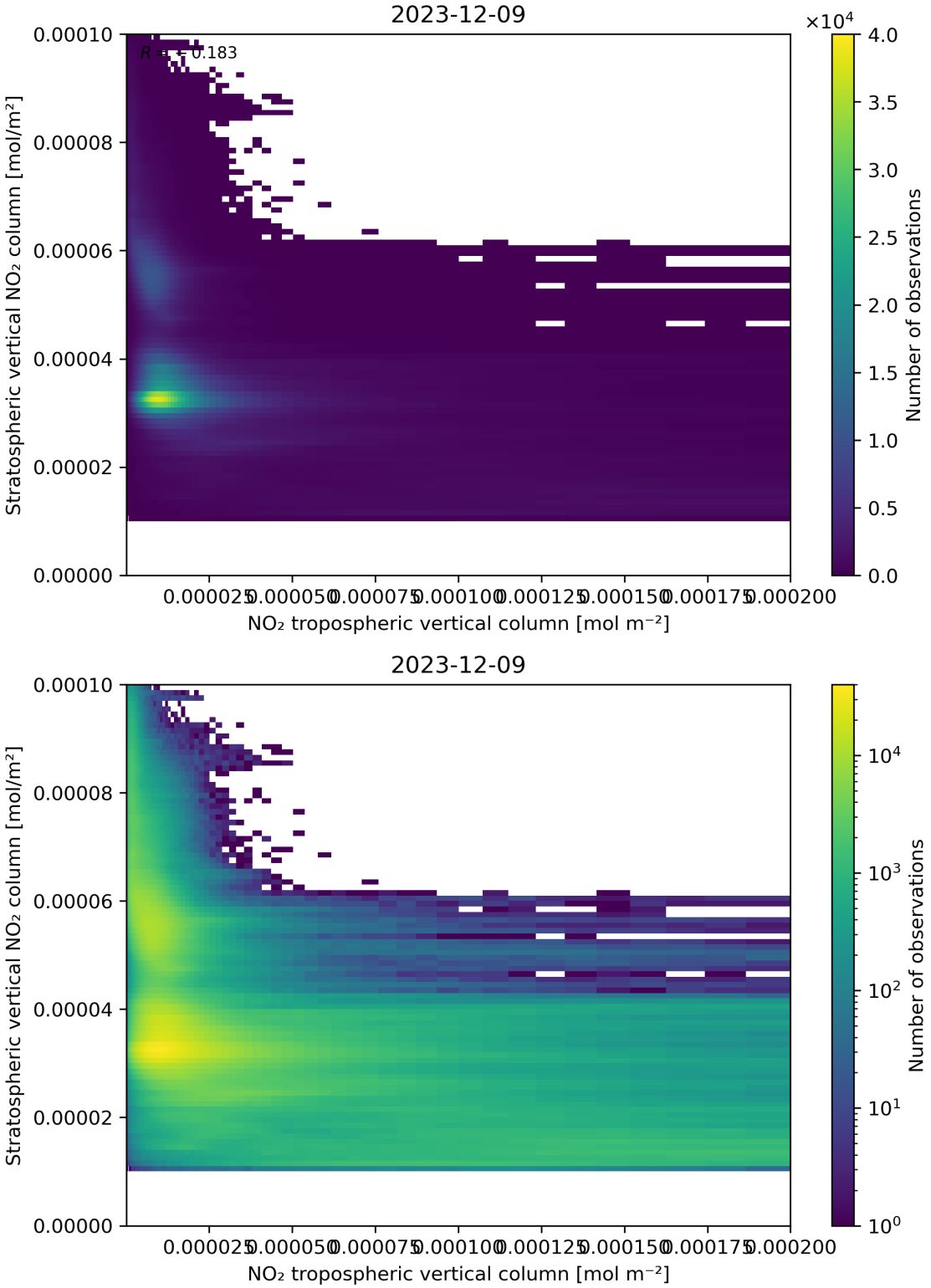


Figure 125: Scatter density plot of "NO_2 tropospheric vertical column" against "Stratospheric vertical NO_2 column" for 2023-12-09 to 2023-12-10.

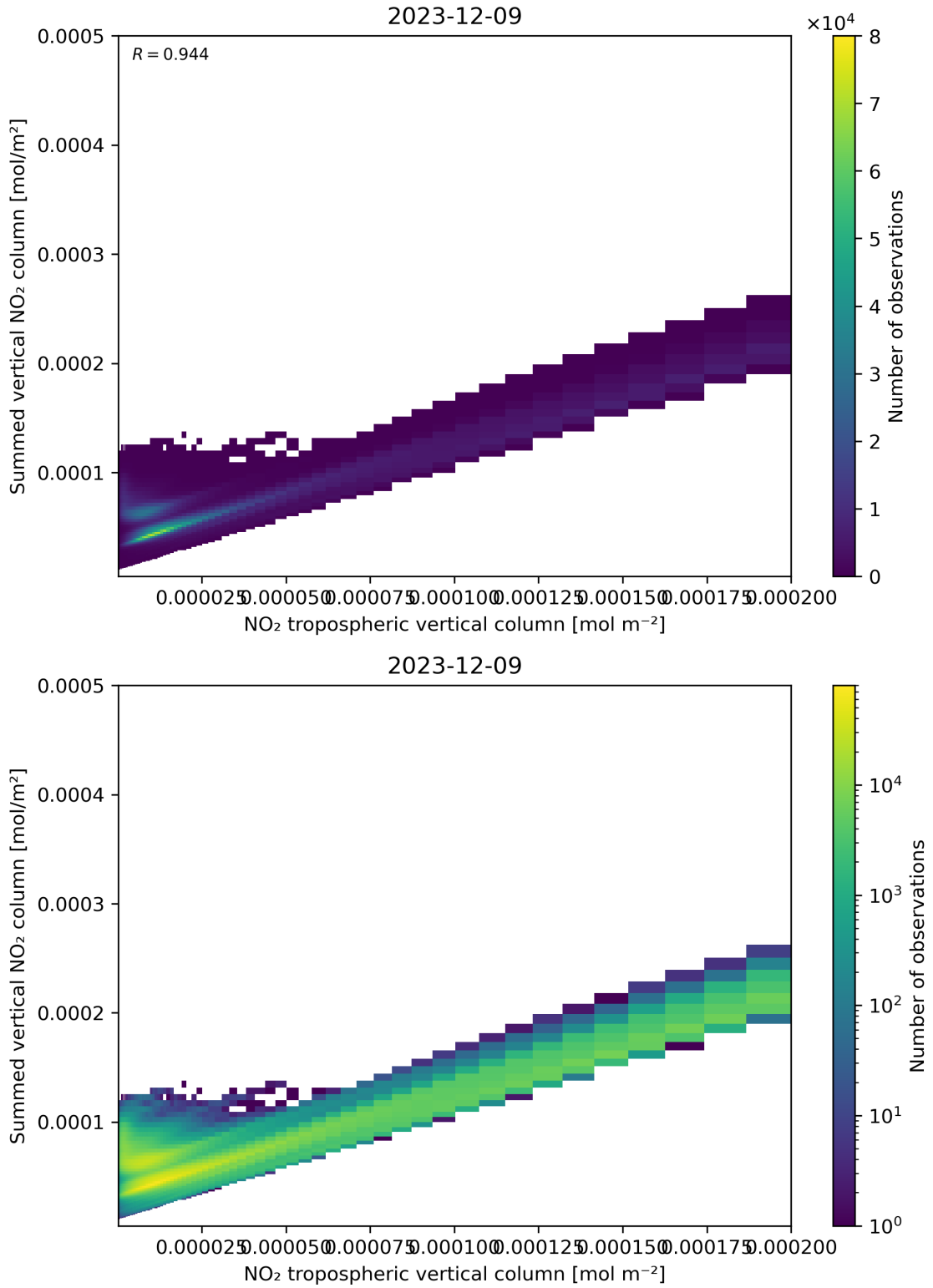


Figure 126: Scatter density plot of "NO_2 tropospheric vertical column" against "Summed vertical NO_2 column" for 2023-12-09 to 2023-12-10.

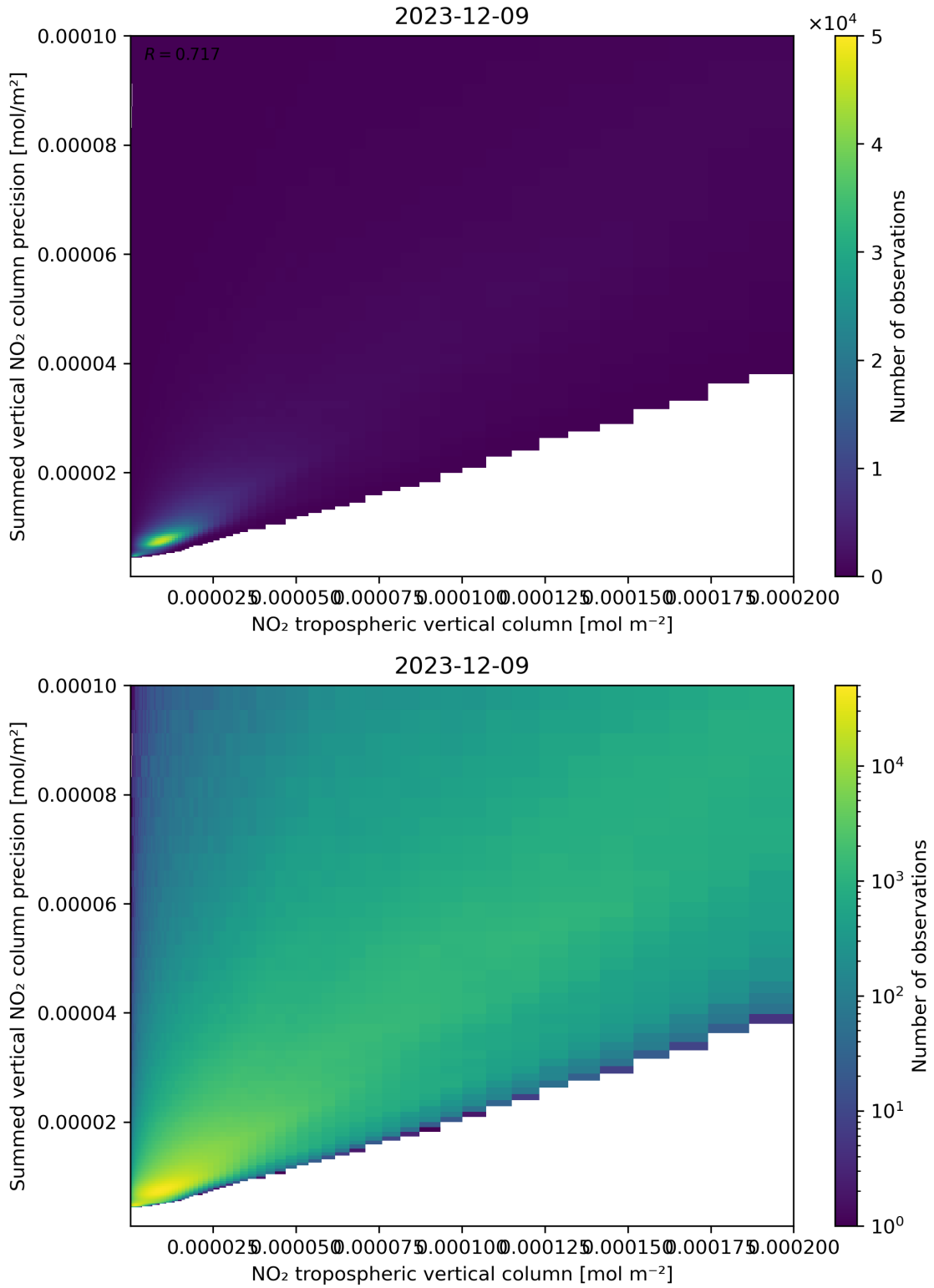


Figure 127: Scatter density plot of "NO_2 tropospheric vertical column" against "Summed vertical NO_2 column precision" for 2023-12-09 to 2023-12-10.

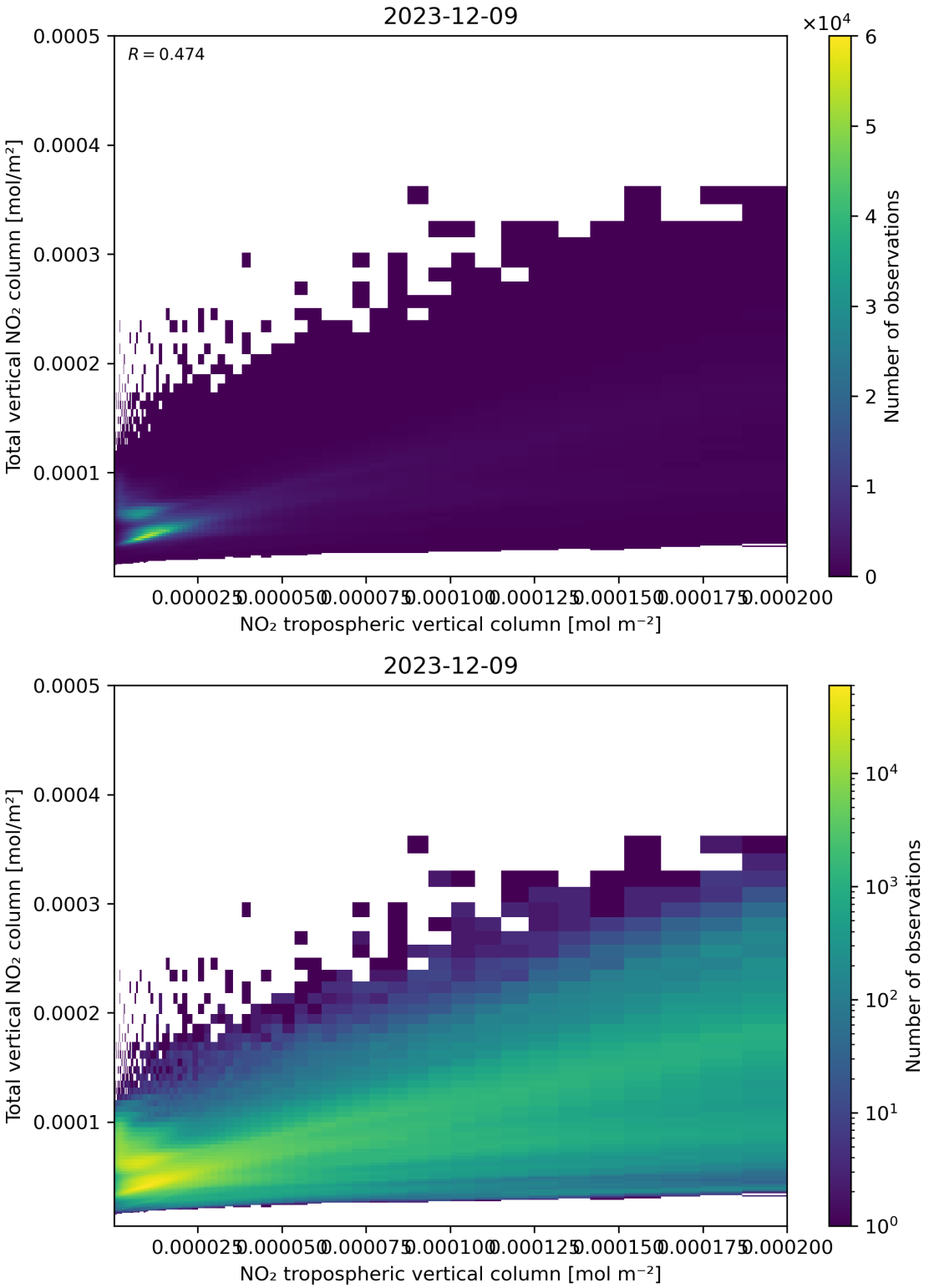


Figure 128: Scatter density plot of "NO_2 tropospheric vertical column" against "Total vertical NO_2 column" for 2023-12-09 to 2023-12-10.

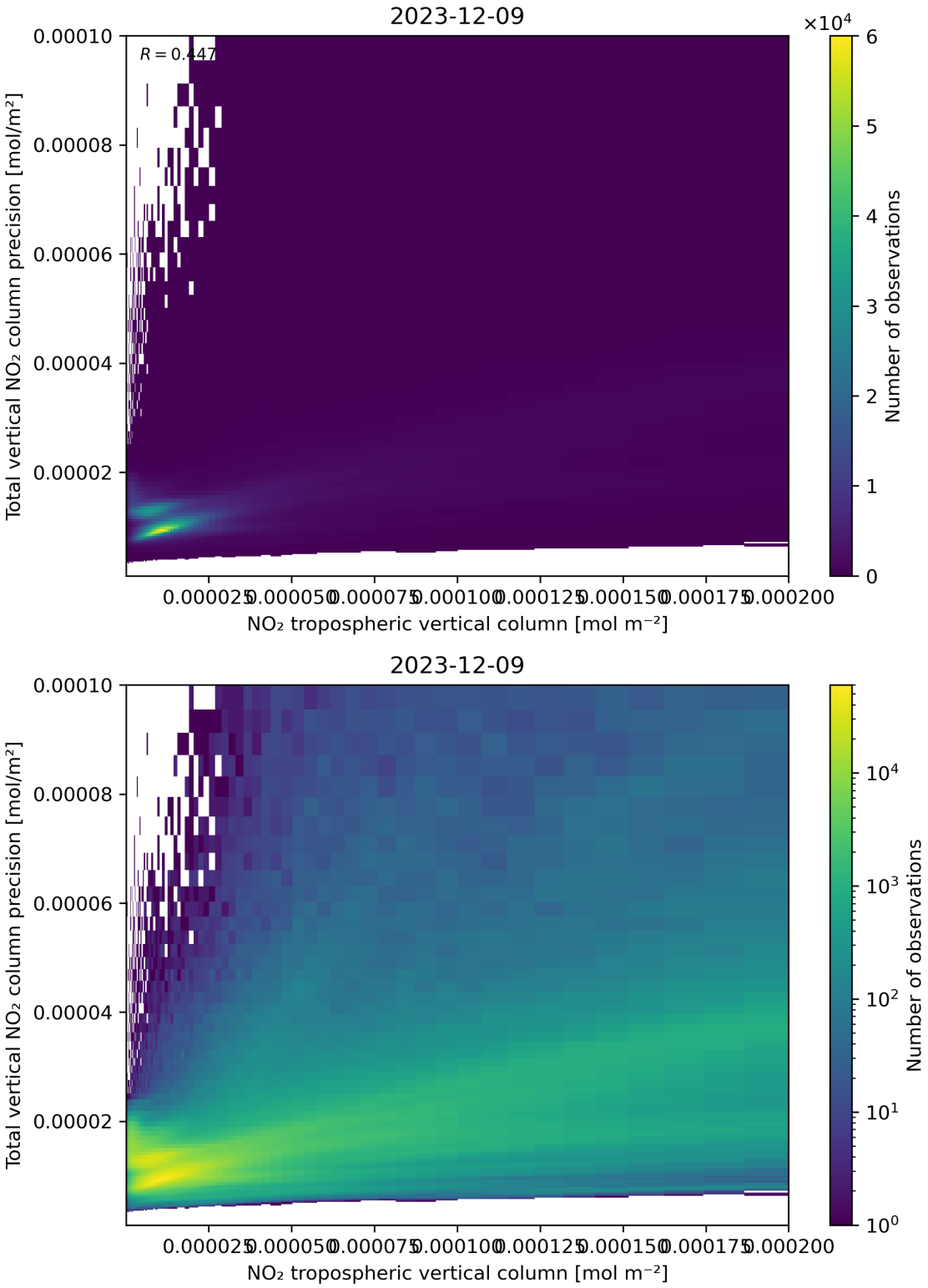


Figure 129: Scatter density plot of "NO_2 tropospheric vertical column" against "Total vertical NO_2 column precision" for 2023-12-09 to 2023-12-10.

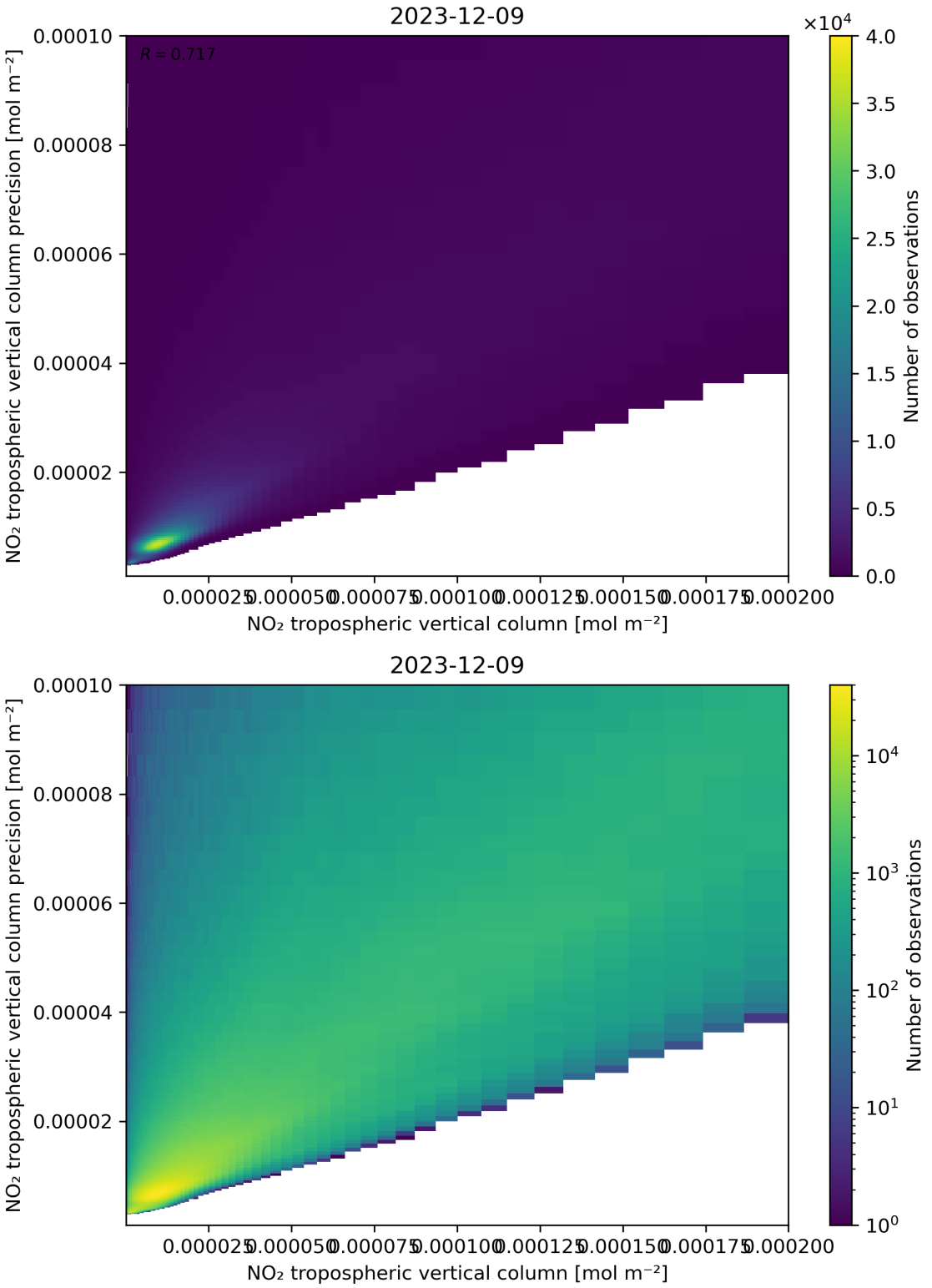


Figure 130: Scatter density plot of "NO_2 tropospheric vertical column" against "NO_2 tropospheric vertical column precision" for 2023-12-09 to 2023-12-10.

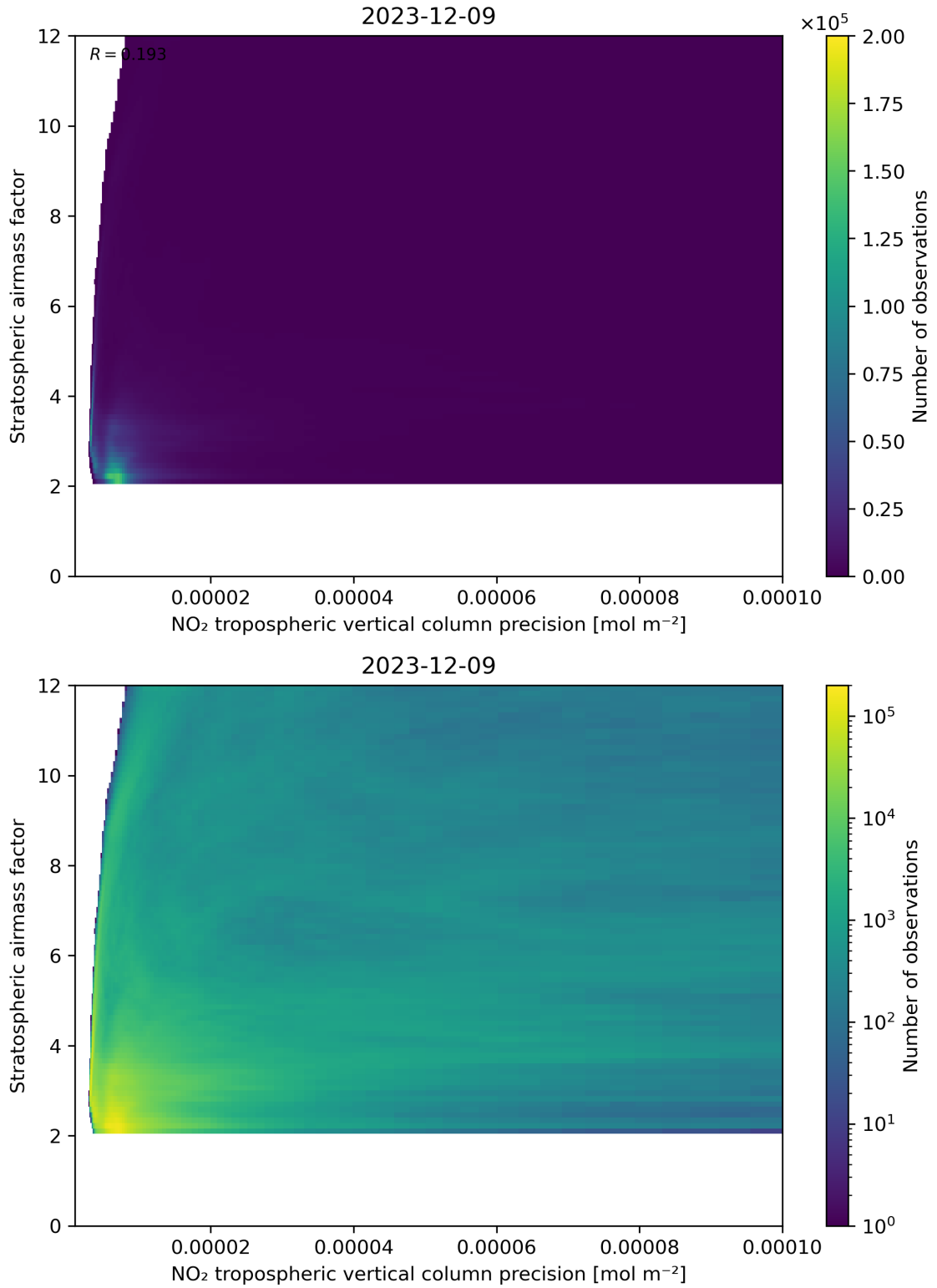


Figure 131: Scatter density plot of "NO_2 tropospheric vertical column precision" against "Stratospheric airmass factor" for 2023-12-09 to 2023-12-10.

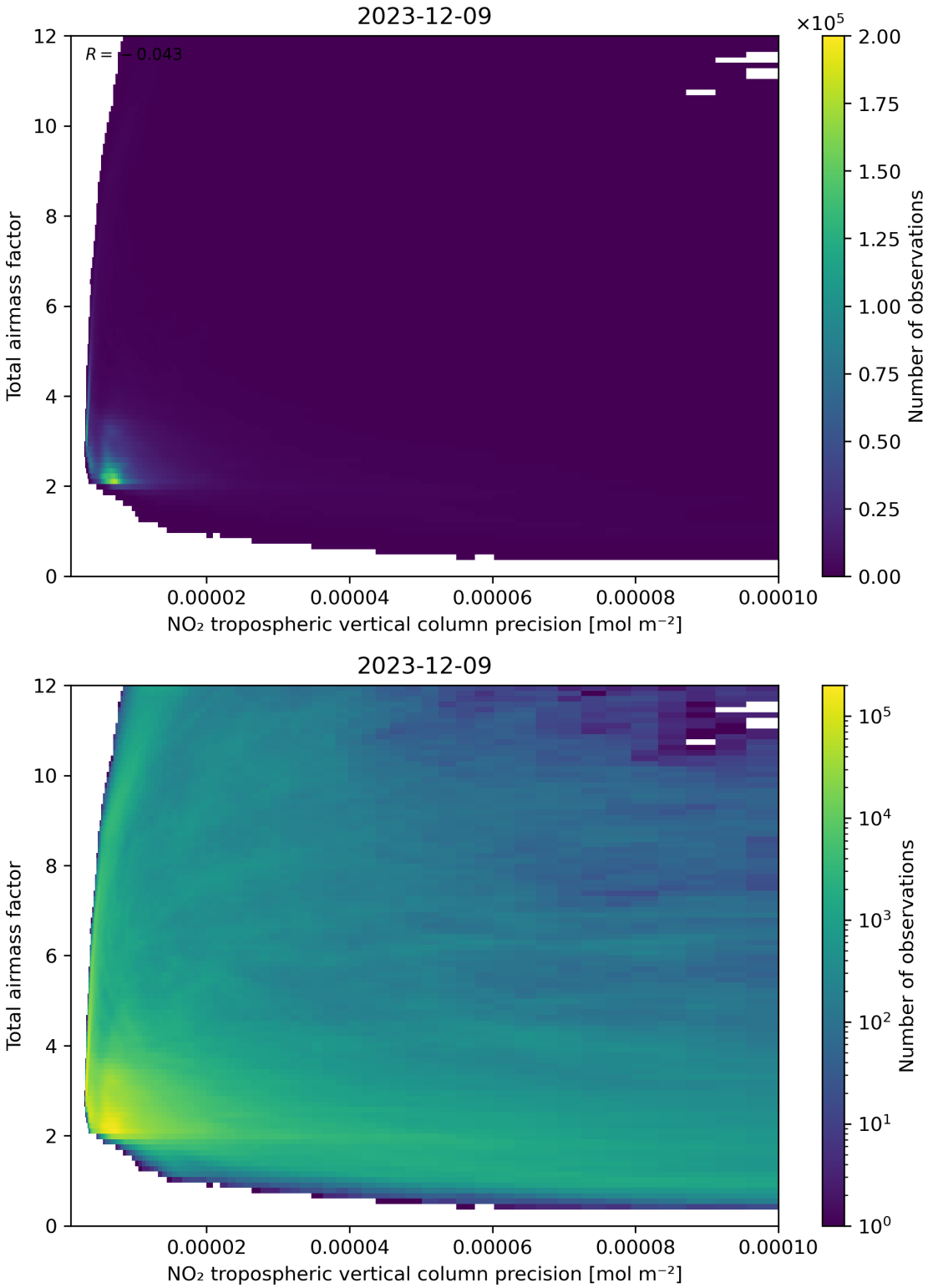


Figure 132: Scatter density plot of "NO_2 tropospheric vertical column precision" against "Total airmass factor" for 2023-12-09 to 2023-12-10.

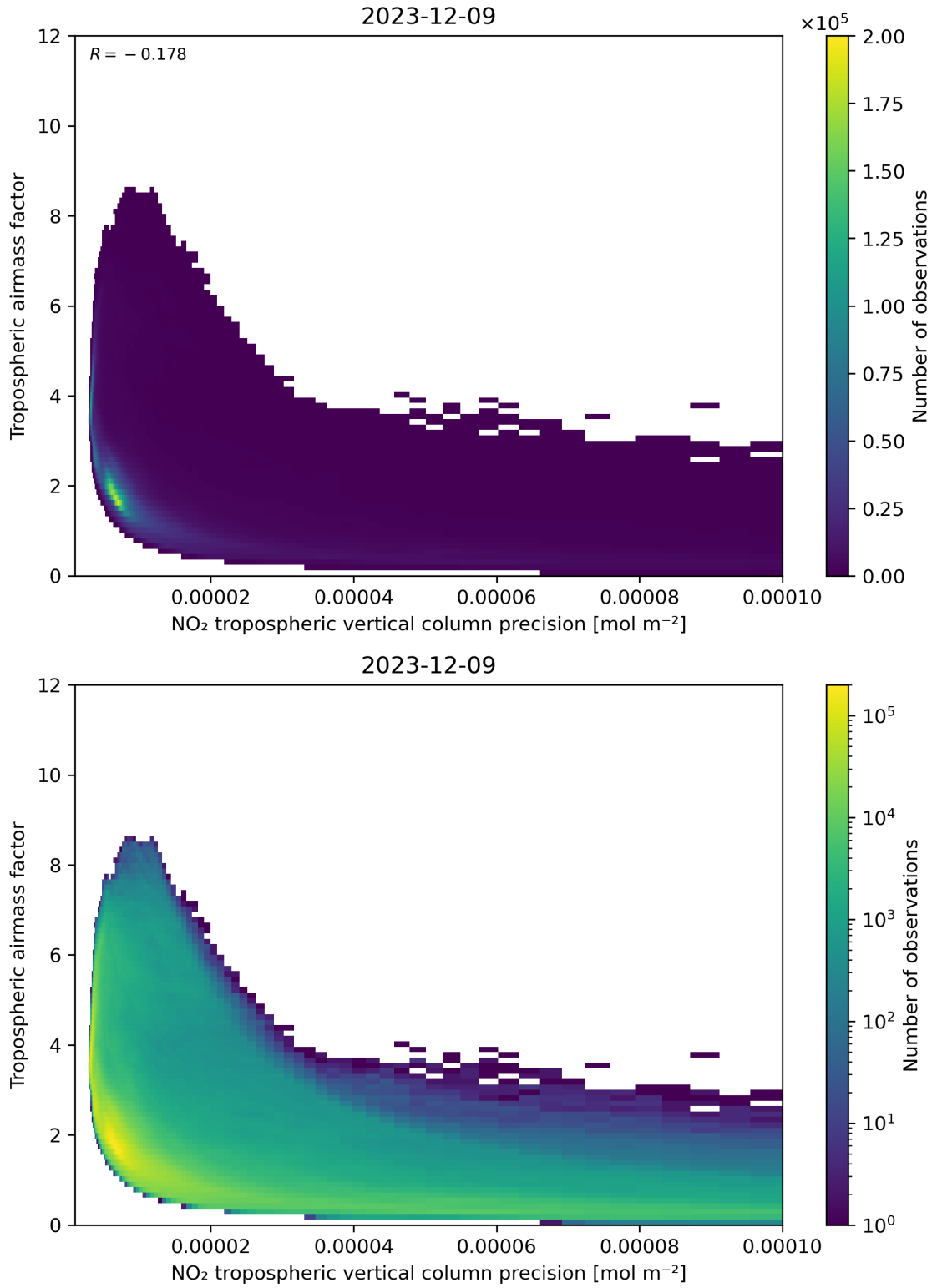


Figure 133: Scatter density plot of "NO_2 tropospheric vertical column precision" against "Tropospheric airmass factor" for 2023-12-09 to 2023-12-10.

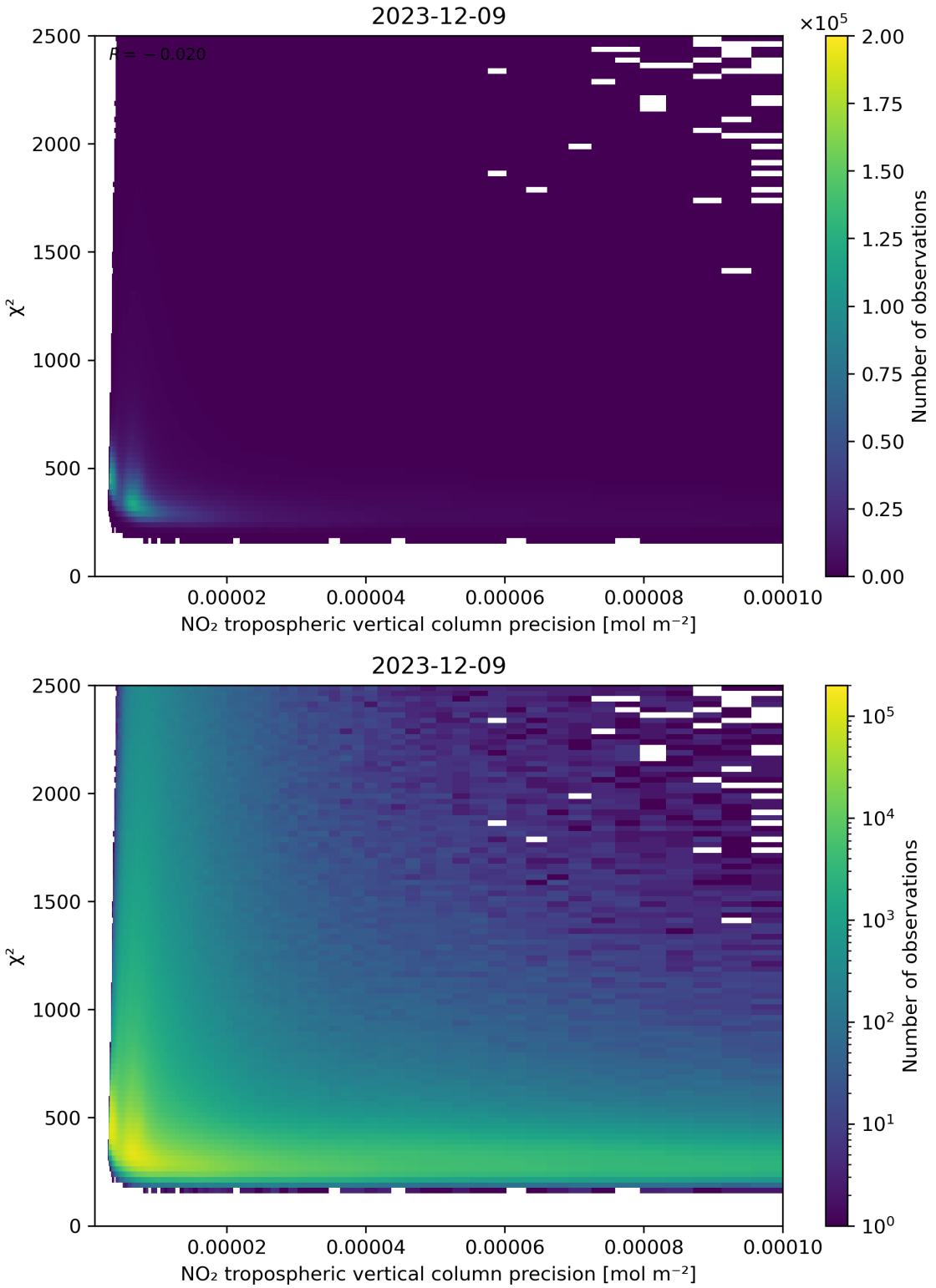


Figure 134: Scatter density plot of "NO_2 tropospheric vertical column precision" against "χ^2" for 2023-12-09 to 2023-12-10.

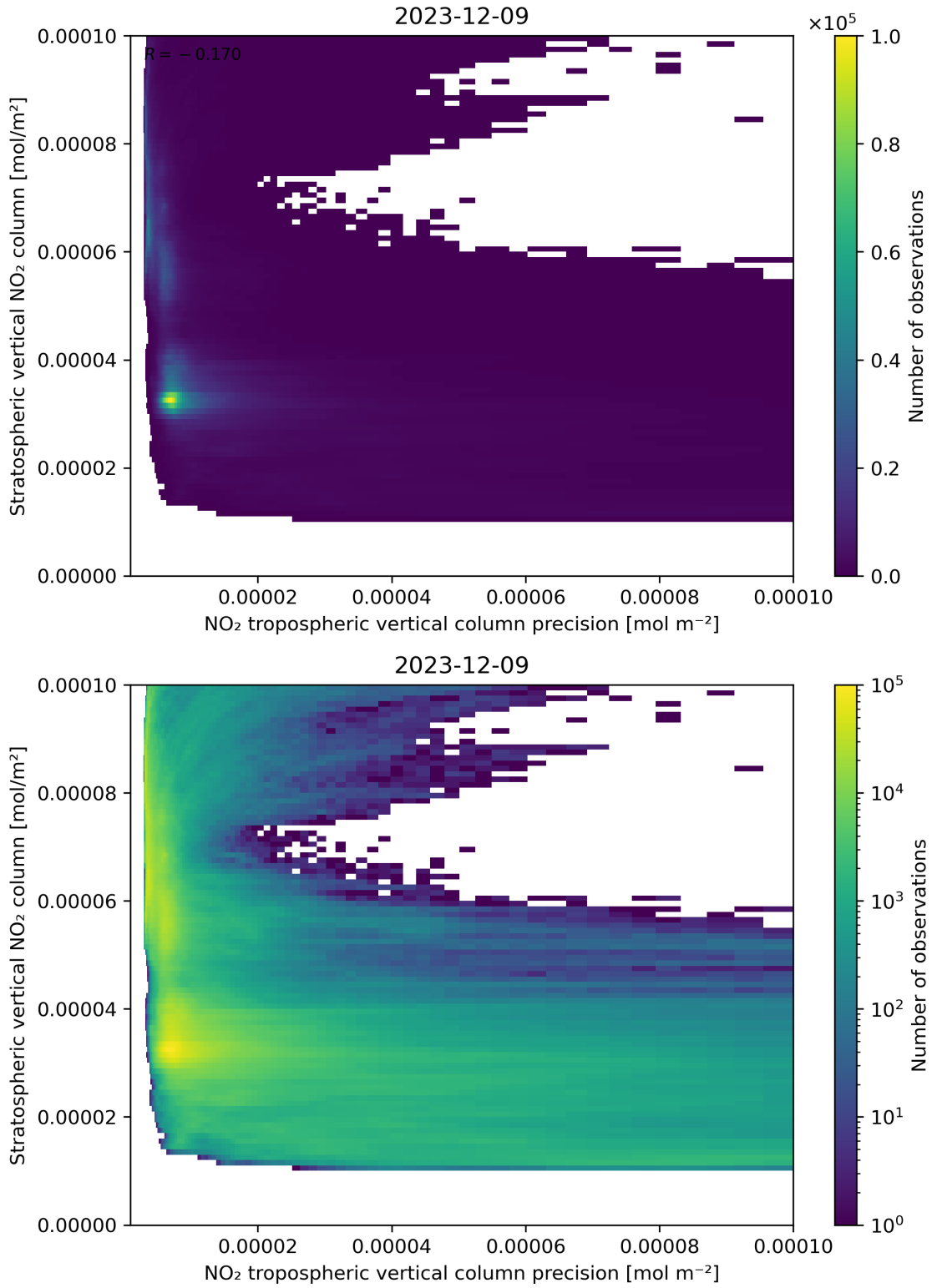


Figure 135: Scatter density plot of "NO_2 tropospheric vertical column precision" against "Stratospheric vertical NO_2 column" for 2023-12-09 to 2023-12-10.

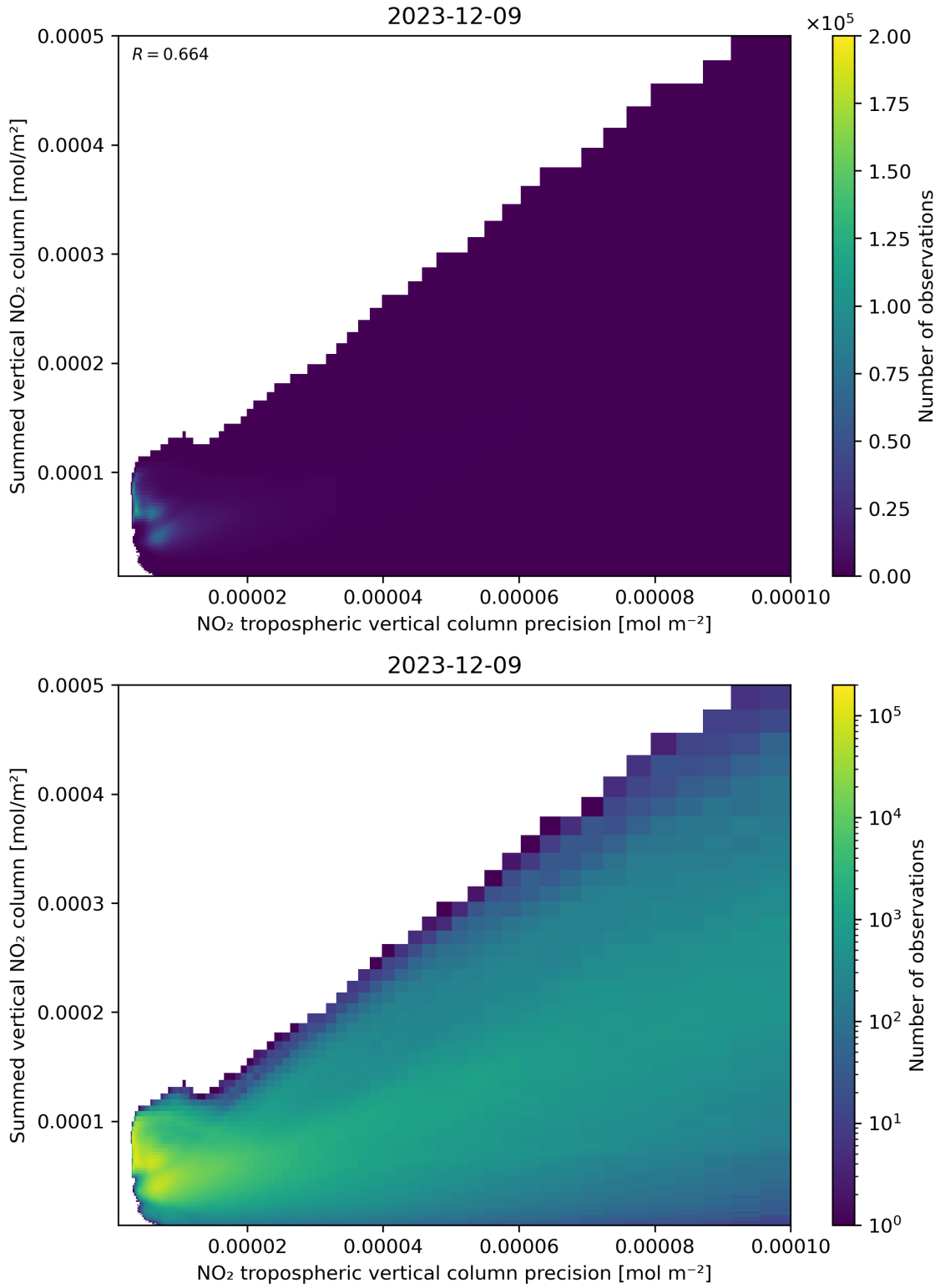


Figure 136: Scatter density plot of "NO_2 tropospheric vertical column precision" against "Summed vertical NO_2 column" for 2023-12-09 to 2023-12-10.

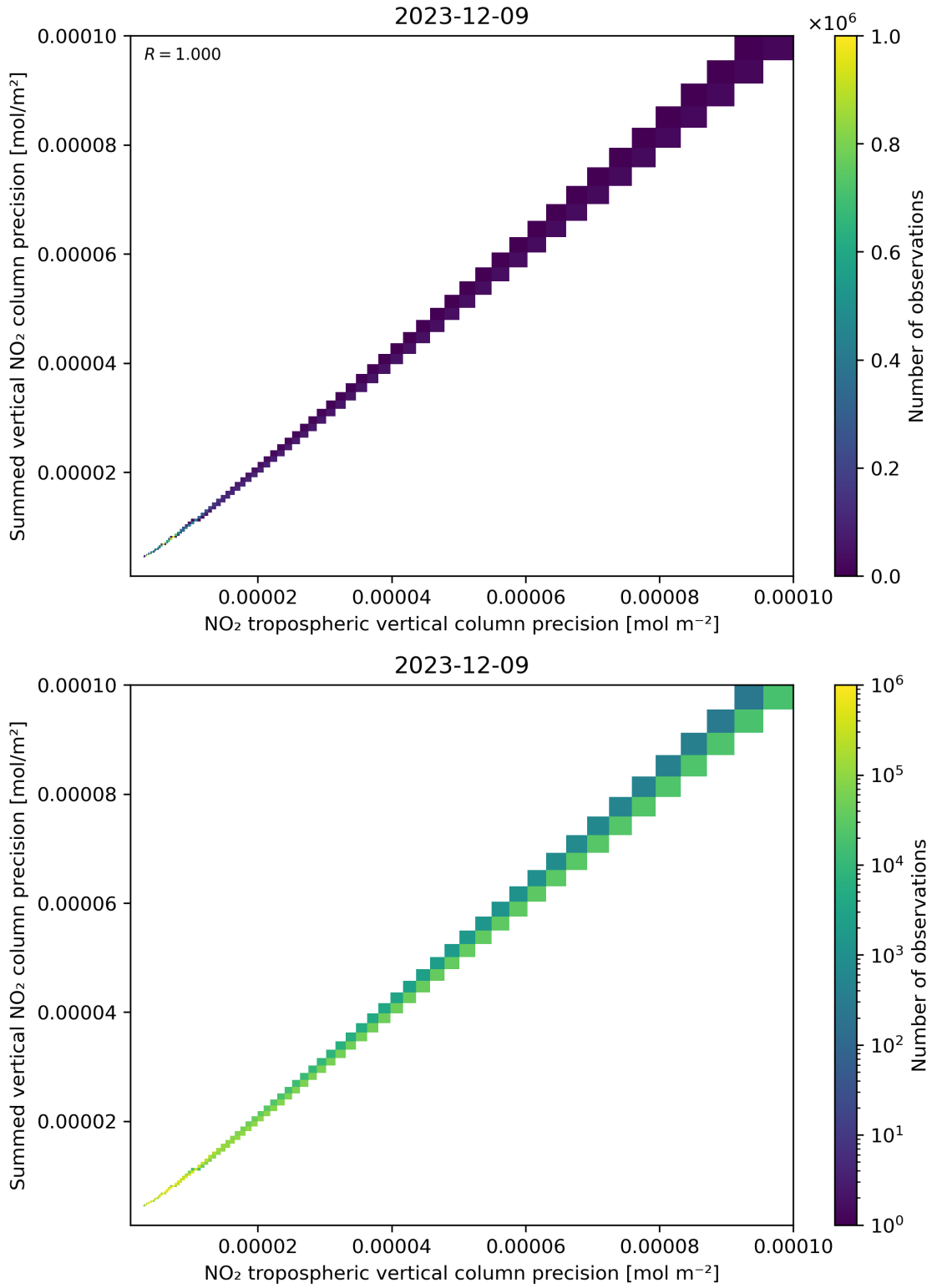


Figure 137: Scatter density plot of "NO_2 tropospheric vertical column precision" against "Summed vertical NO_2 column precision" for 2023-12-09 to 2023-12-10.

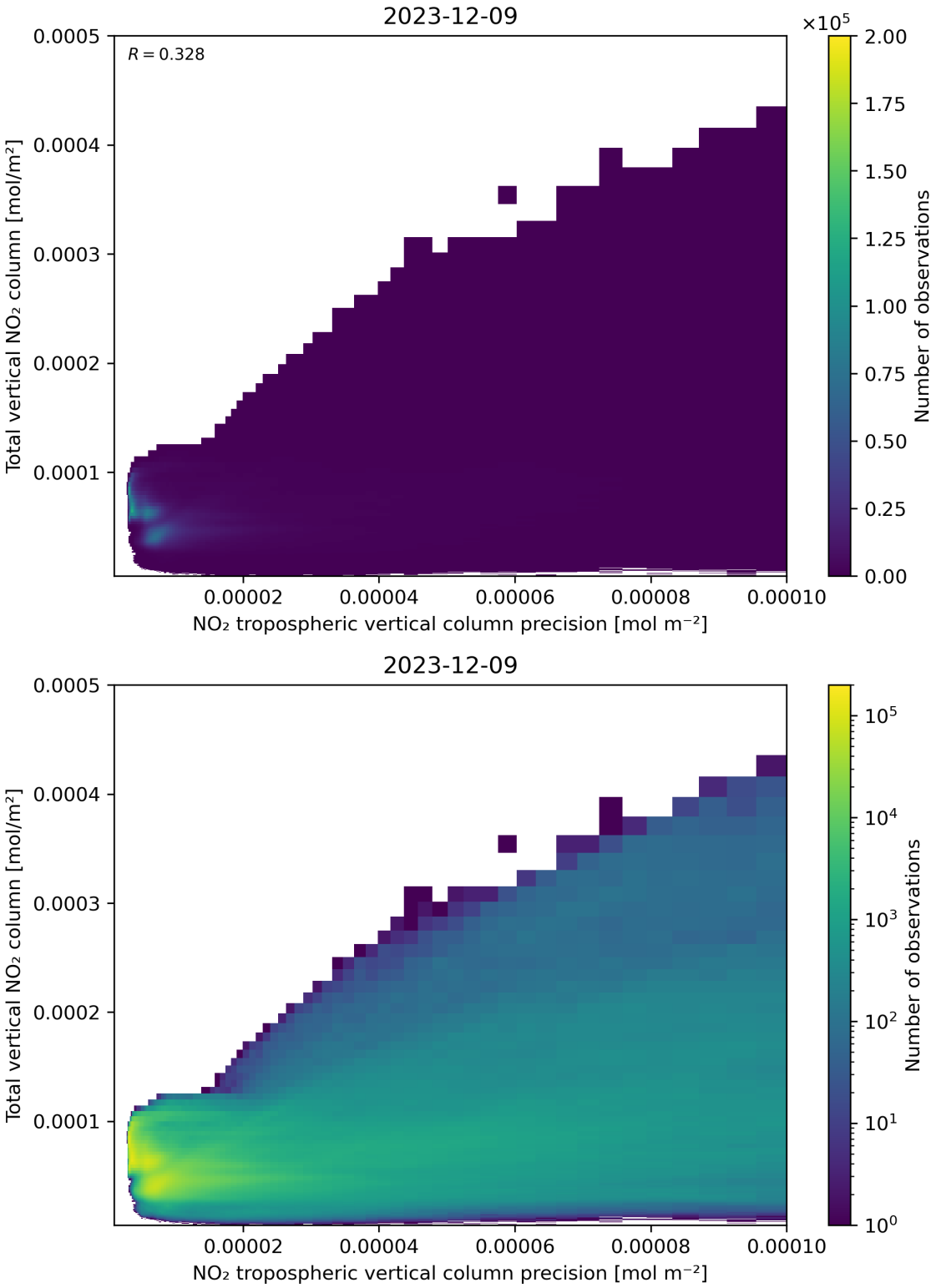


Figure 138: Scatter density plot of "NO_2 tropospheric vertical column precision" against "Total vertical NO_2 column" for 2023-12-09 to 2023-12-10.

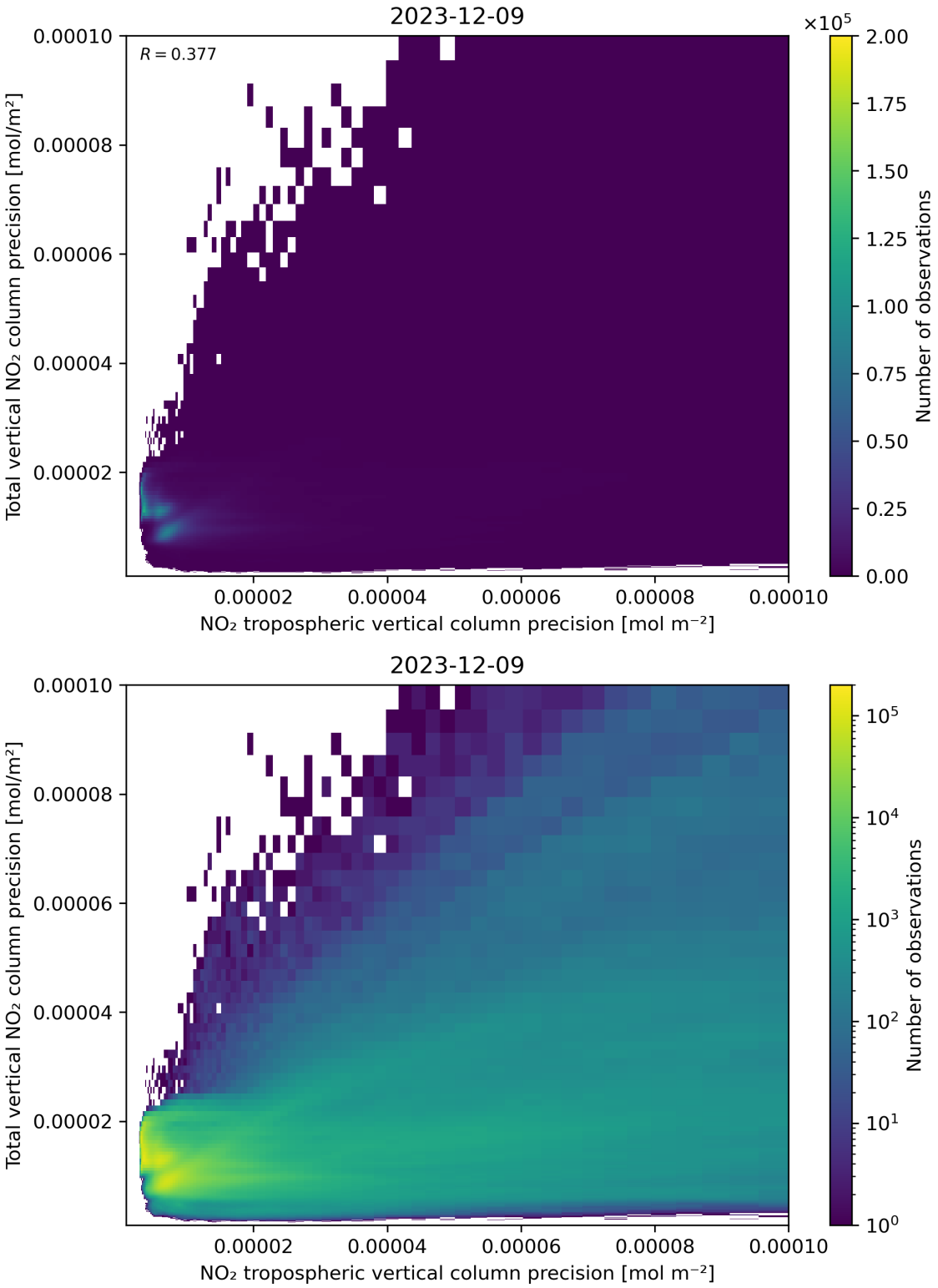


Figure 139: Scatter density plot of "NO_2 tropospheric vertical column precision" against "Total vertical NO_2 column precision" for 2023-12-09 to 2023-12-10.

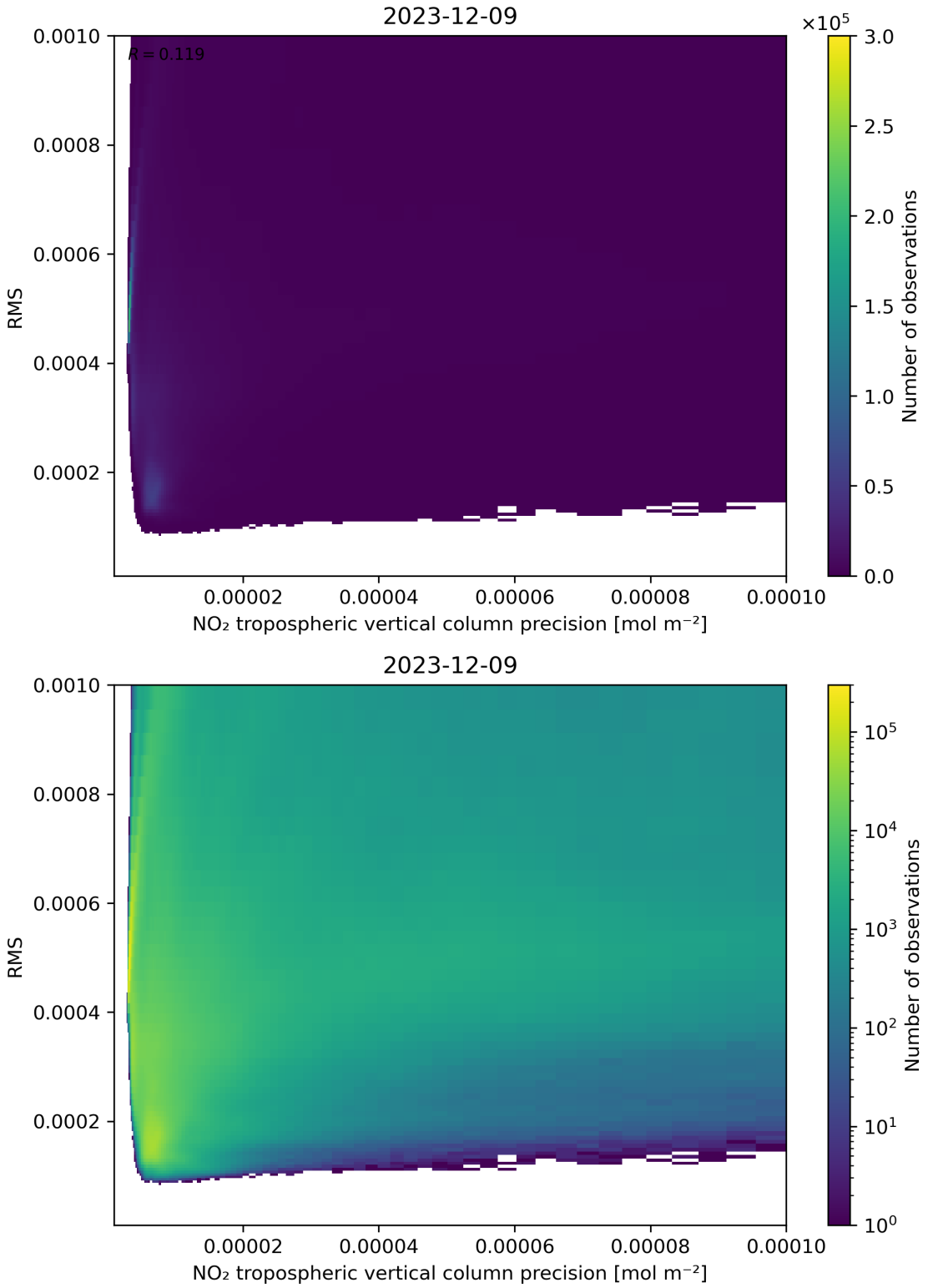


Figure 140: Scatter density plot of "NO_2 tropospheric vertical column precision" against "RMS" for 2023-12-09 to 2023-12-10.

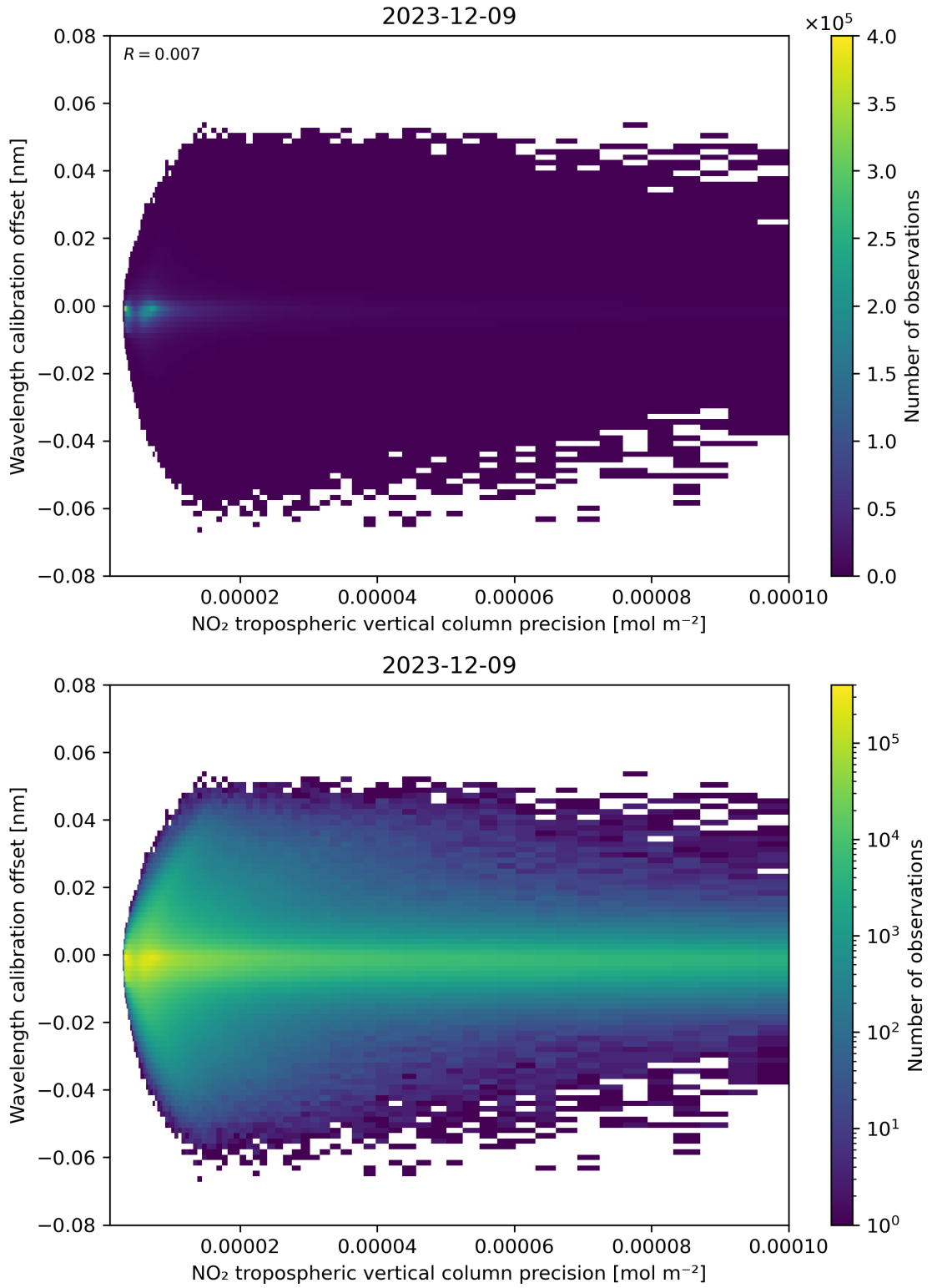


Figure 141: Scatter density plot of "NO_2 tropospheric vertical column precision" against "Wavelength calibration offset" for 2023-12-09 to 2023-12-10.

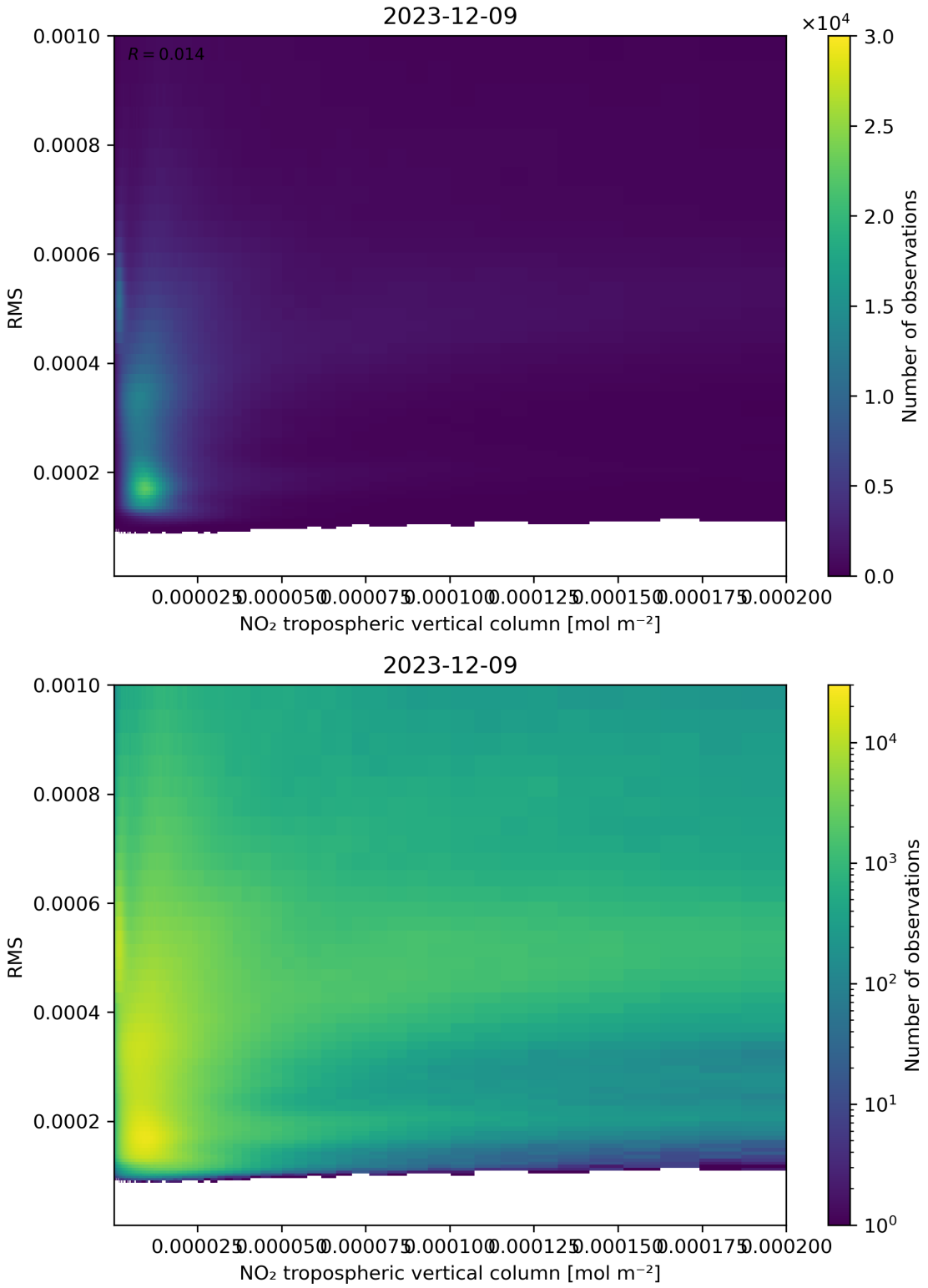


Figure 142: Scatter density plot of "NO_2 tropospheric vertical column" against "RMS" for 2023-12-09 to 2023-12-10.

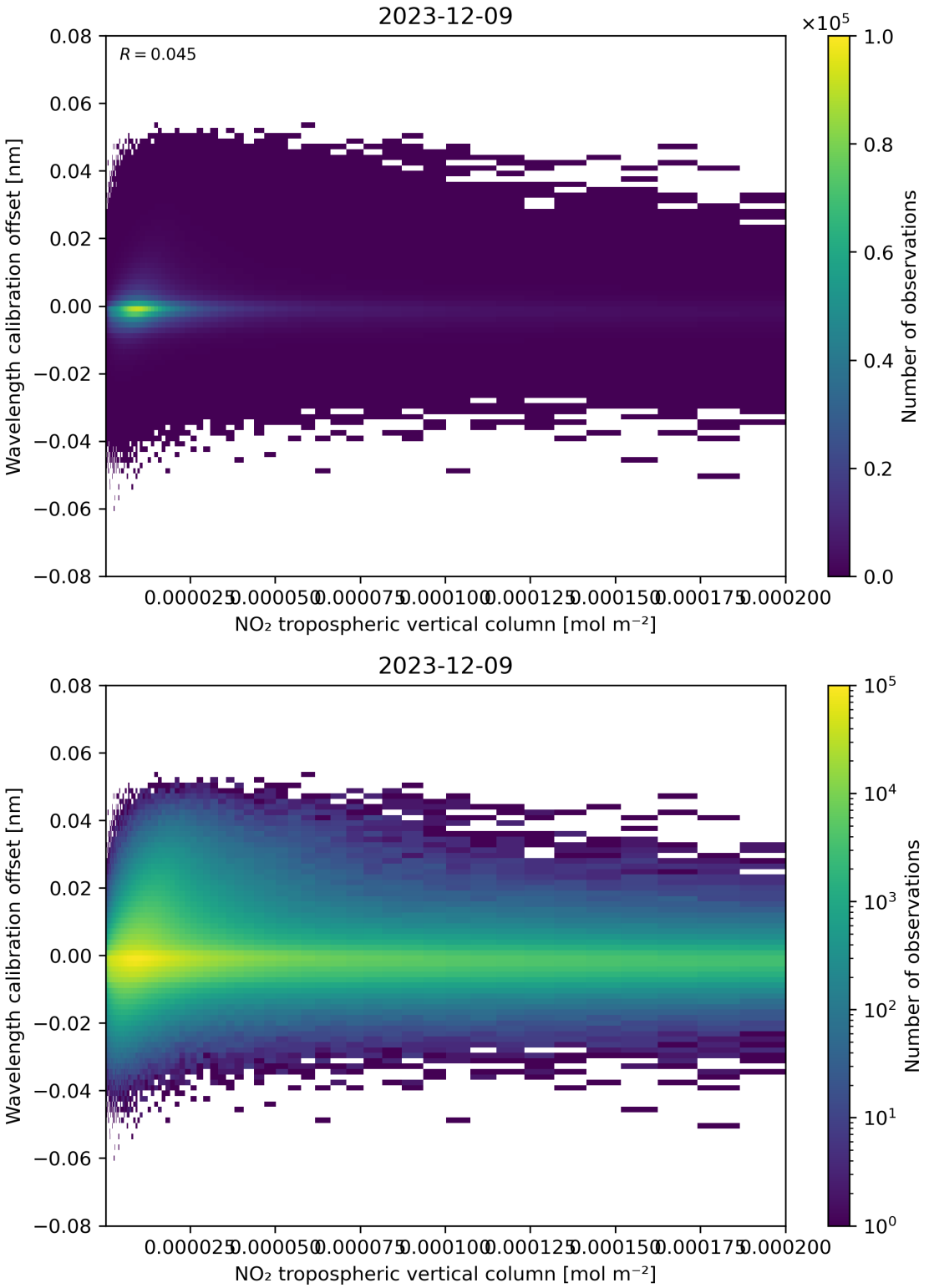


Figure 143: Scatter density plot of "NO_2 tropospheric vertical column" against "Wavelength calibration offset" for 2023-12-09 to 2023-12-10.

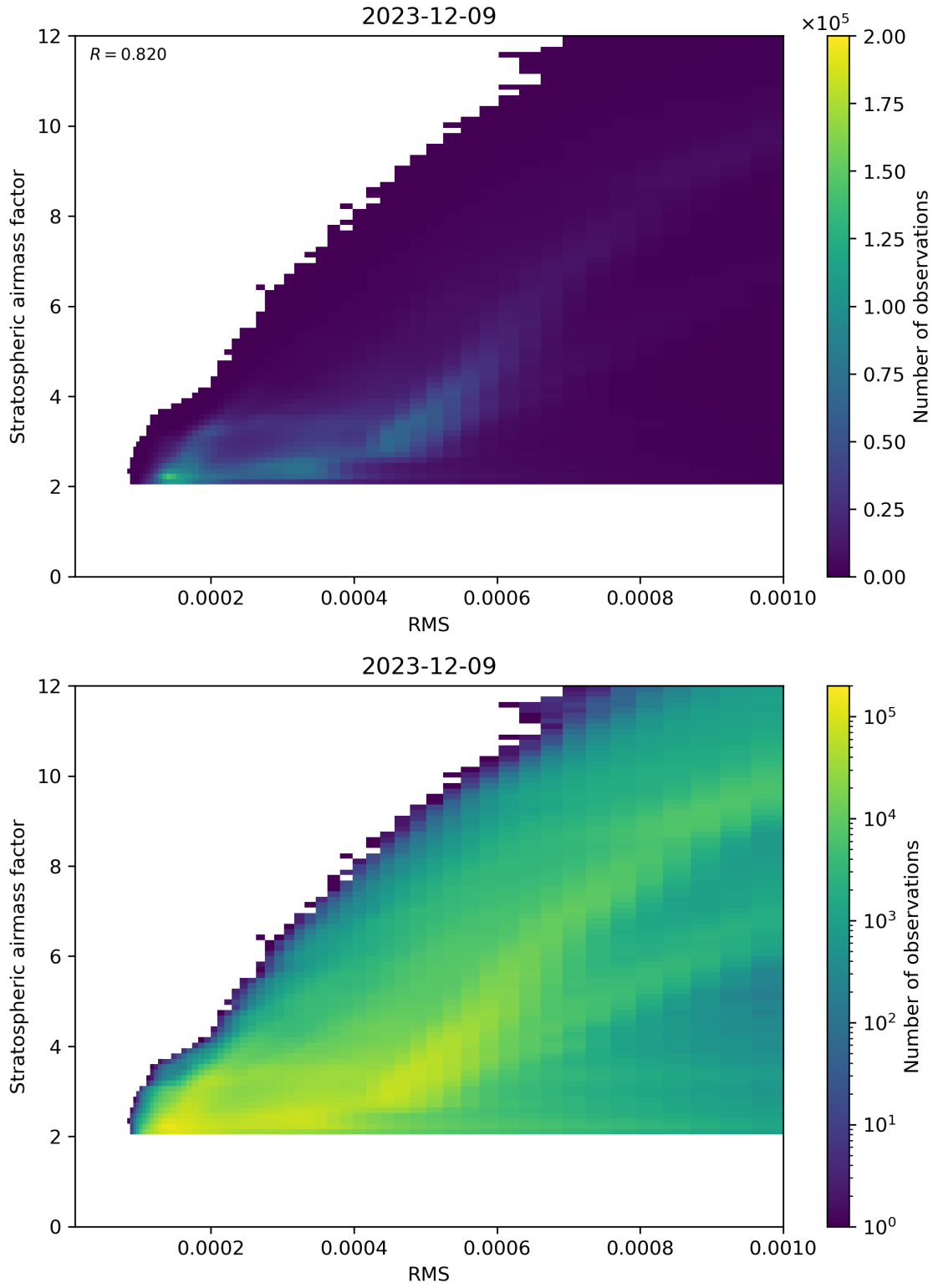


Figure 144: Scatter density plot of “RMS” against “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10.

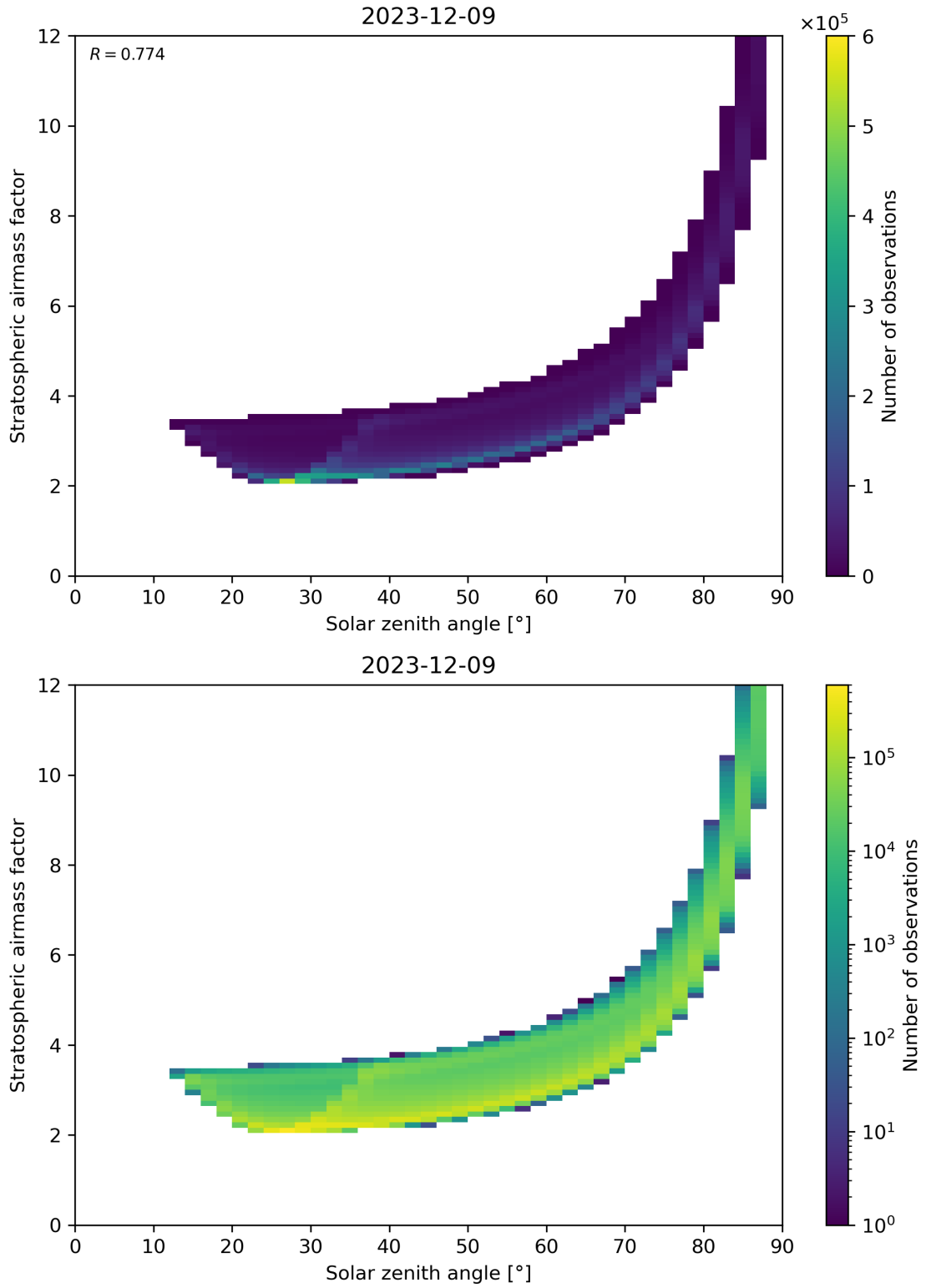


Figure 145: Scatter density plot of “Solar zenith angle” against “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10.

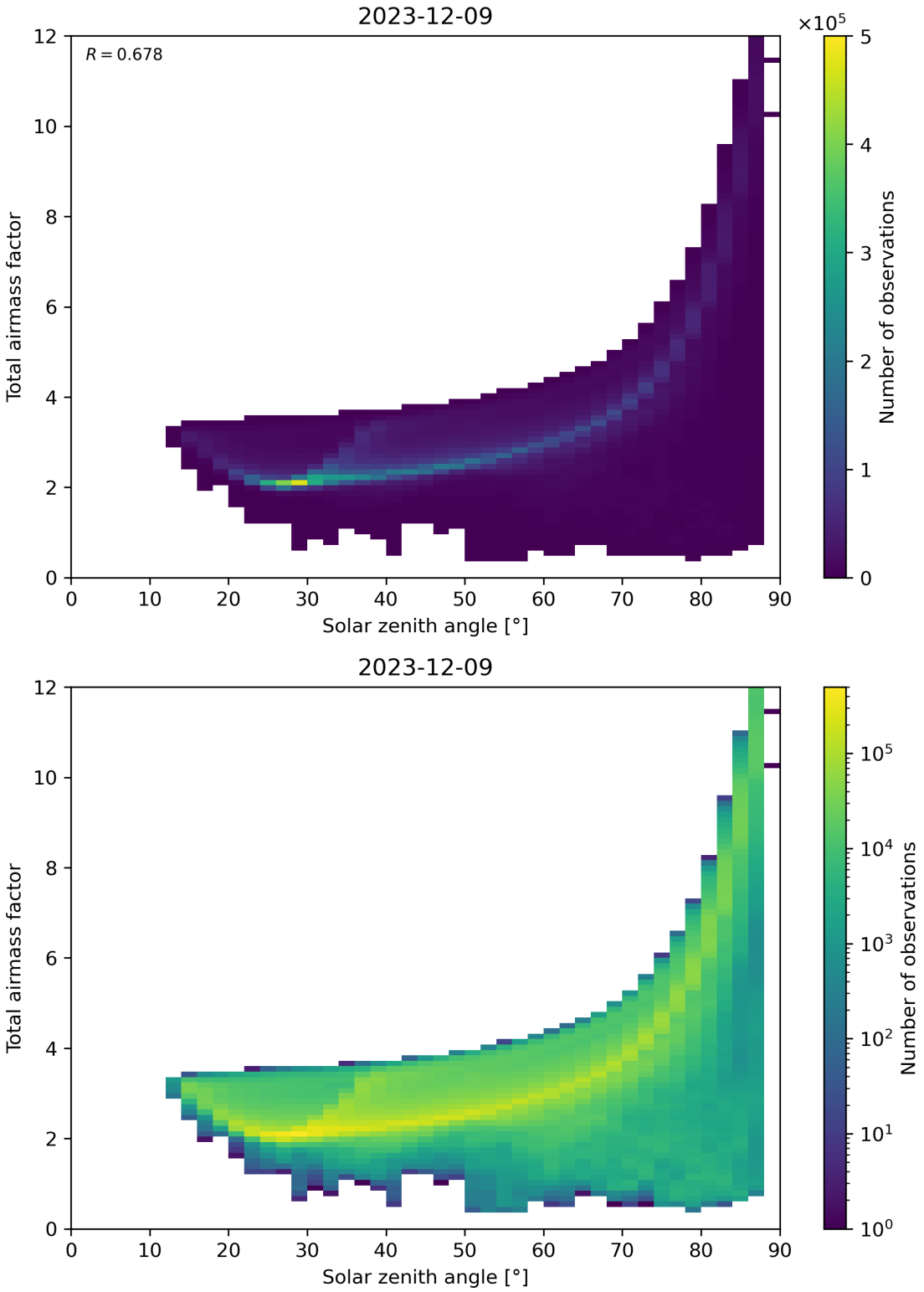


Figure 146: Scatter density plot of “Solar zenith angle” against “Total airmass factor” for 2023-12-09 to 2023-12-10.

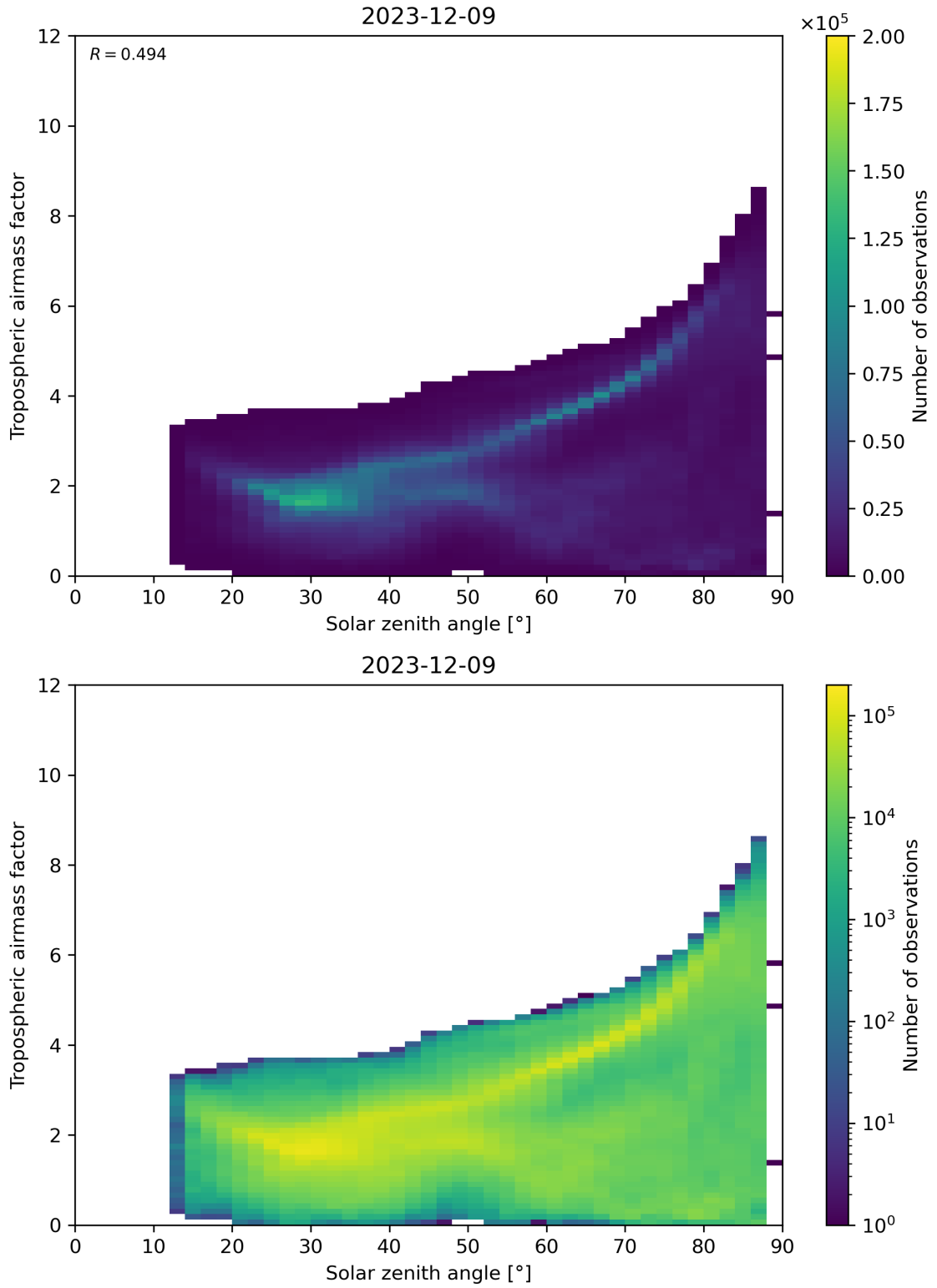


Figure 147: Scatter density plot of “Solar zenith angle” against “Tropospheric airmass factor” for 2023-12-09 to 2023-12-10.

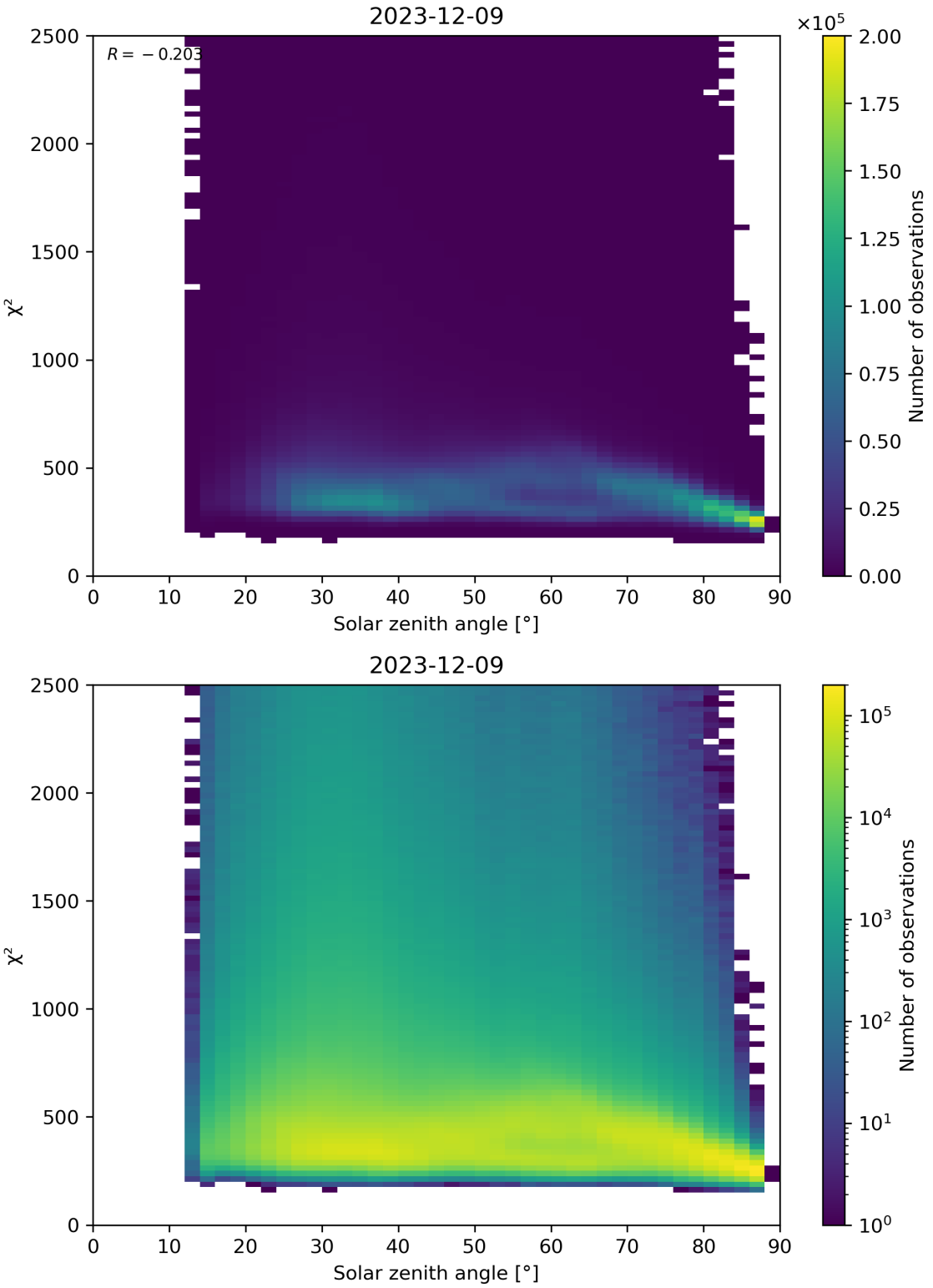


Figure 148: Scatter density plot of "Solar zenith angle" against "χ^2" for 2023-12-09 to 2023-12-10.

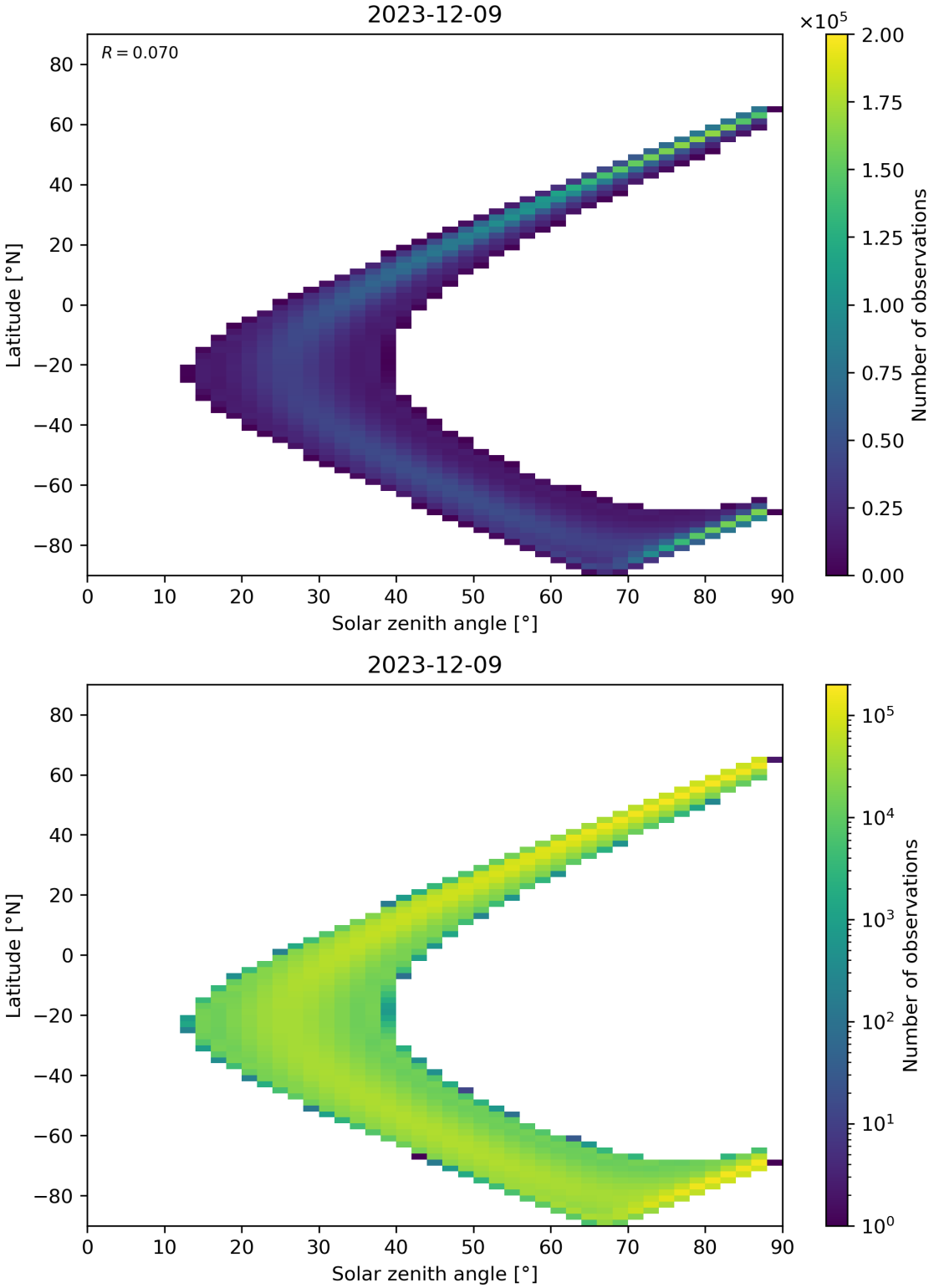


Figure 149: Scatter density plot of “Solar zenith angle” against “Latitude” for 2023-12-09 to 2023-12-10.

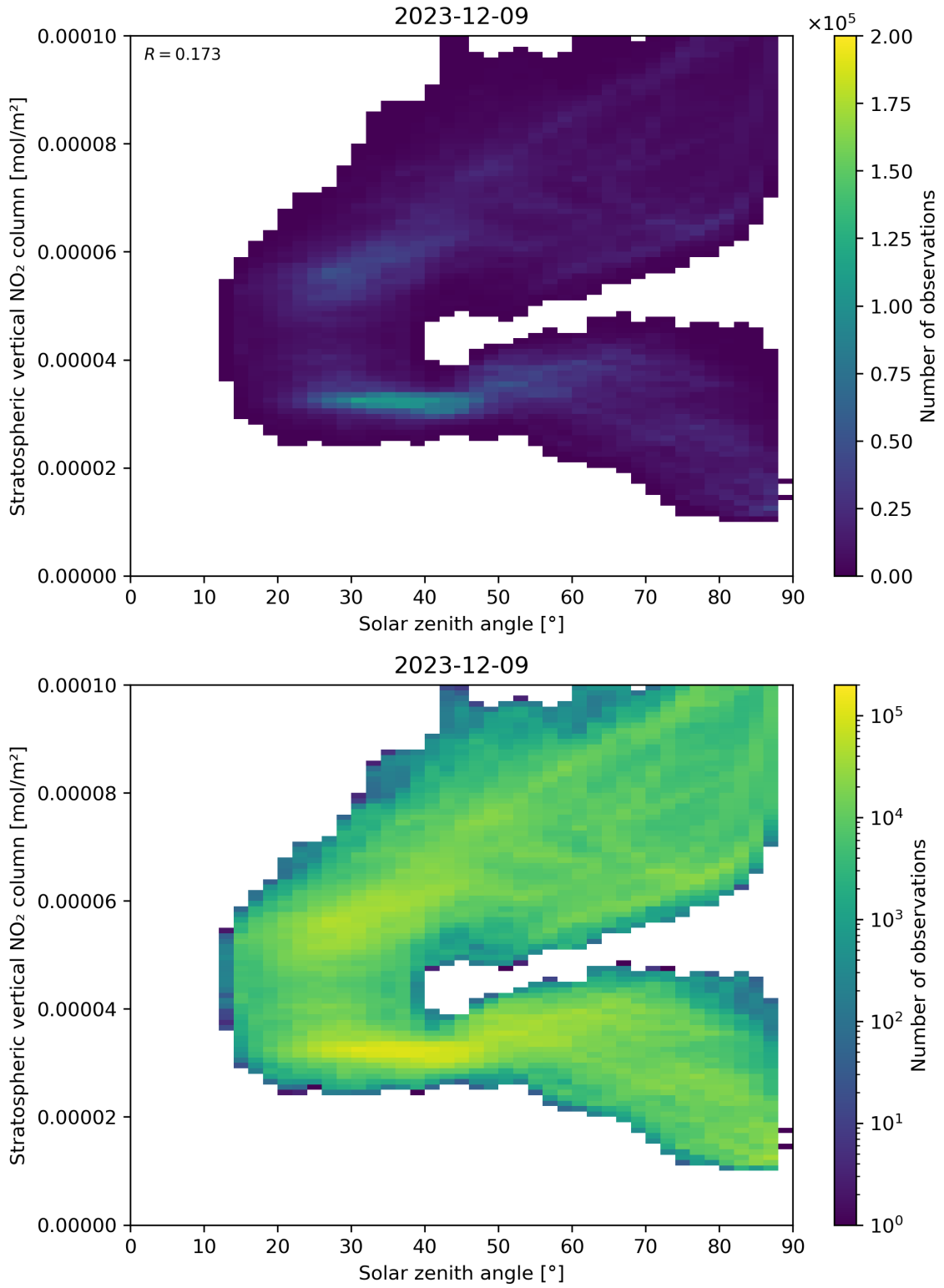


Figure 150: Scatter density plot of “Solar zenith angle” against “Stratospheric vertical NO_2 column” for 2023-12-09 to 2023-12-10.

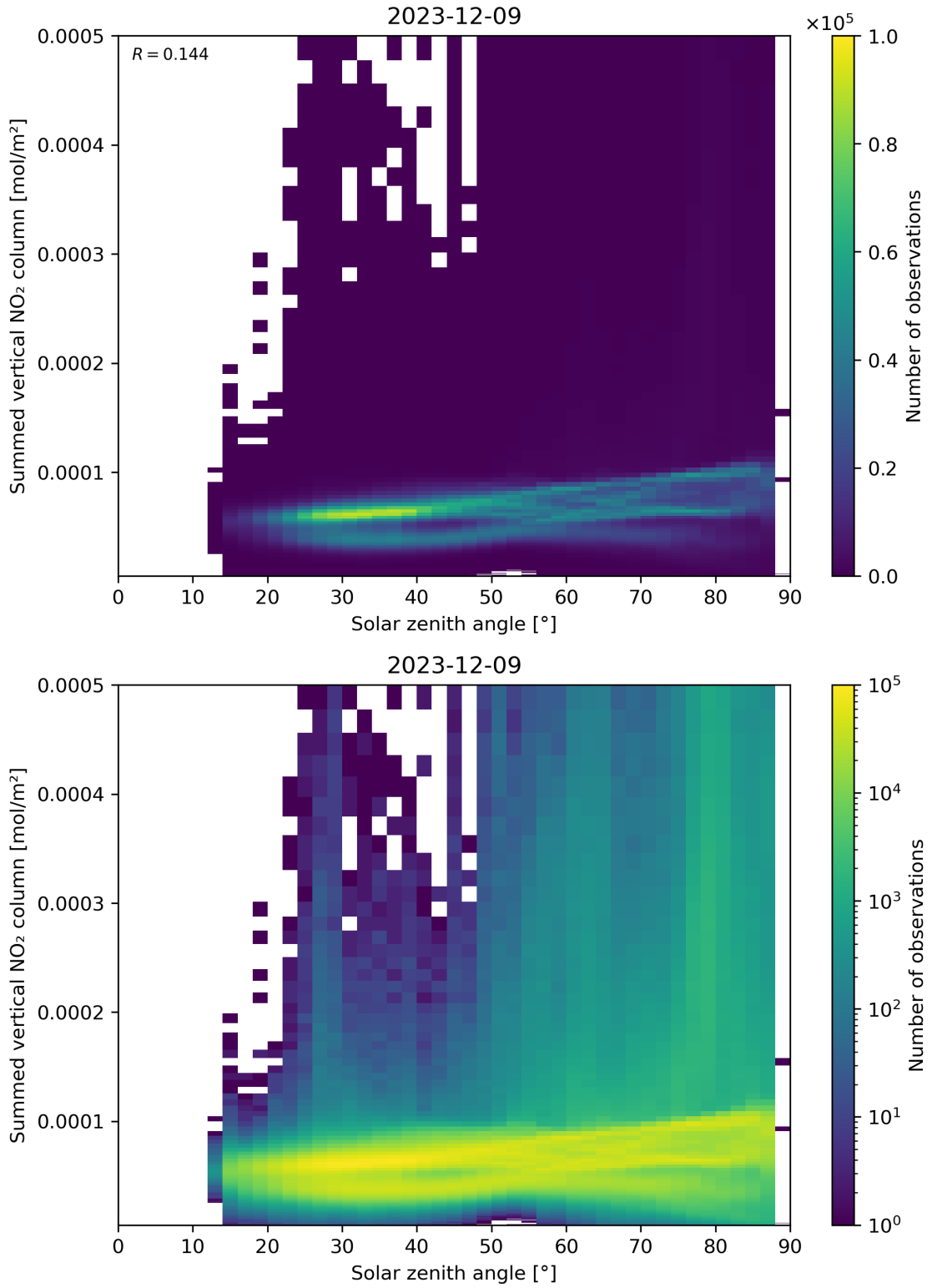


Figure 151: Scatter density plot of “Solar zenith angle” against “Summed vertical NO_2 column” for 2023-12-09 to 2023-12-10.

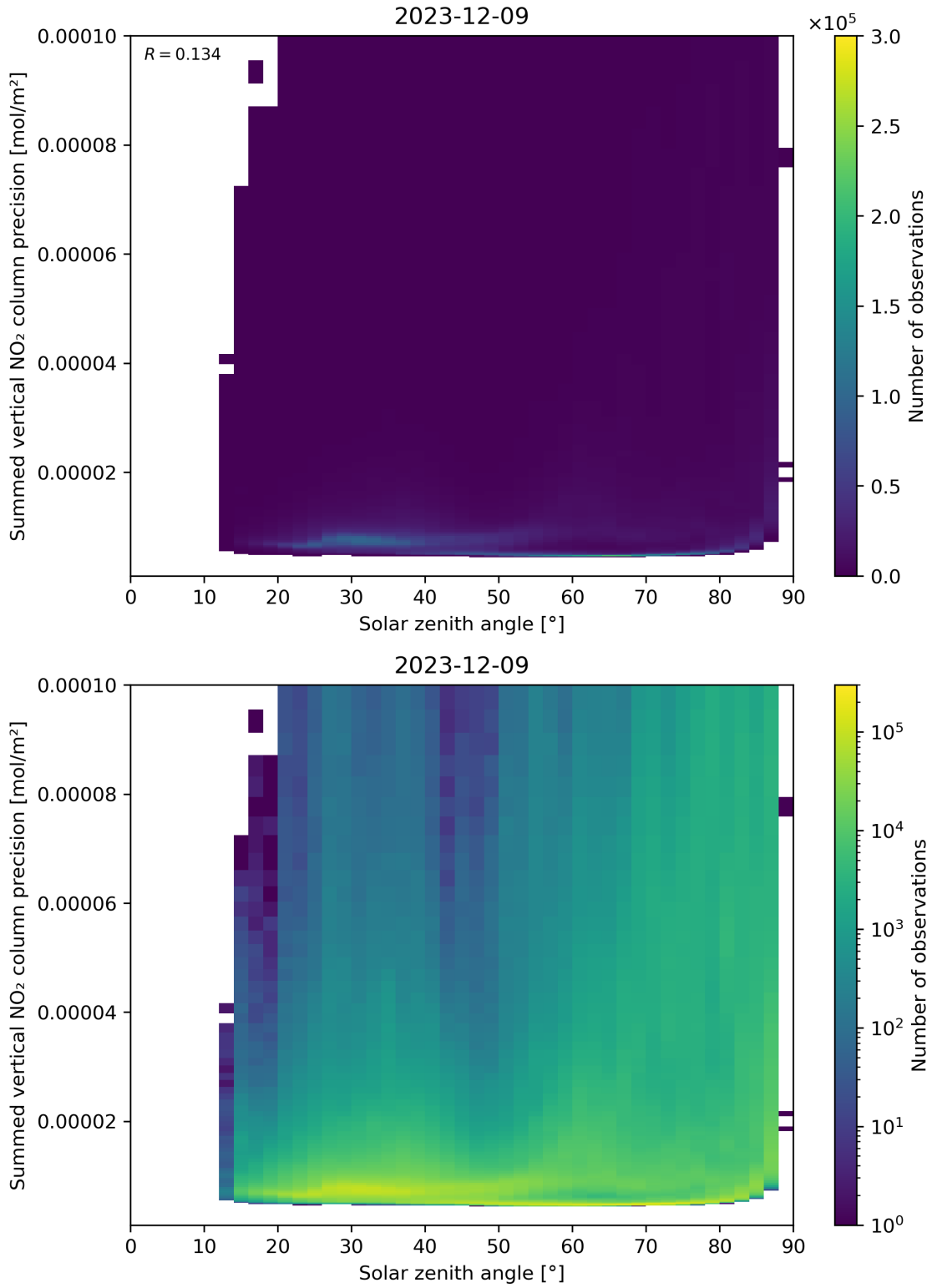


Figure 152: Scatter density plot of “Solar zenith angle” against “Summed vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

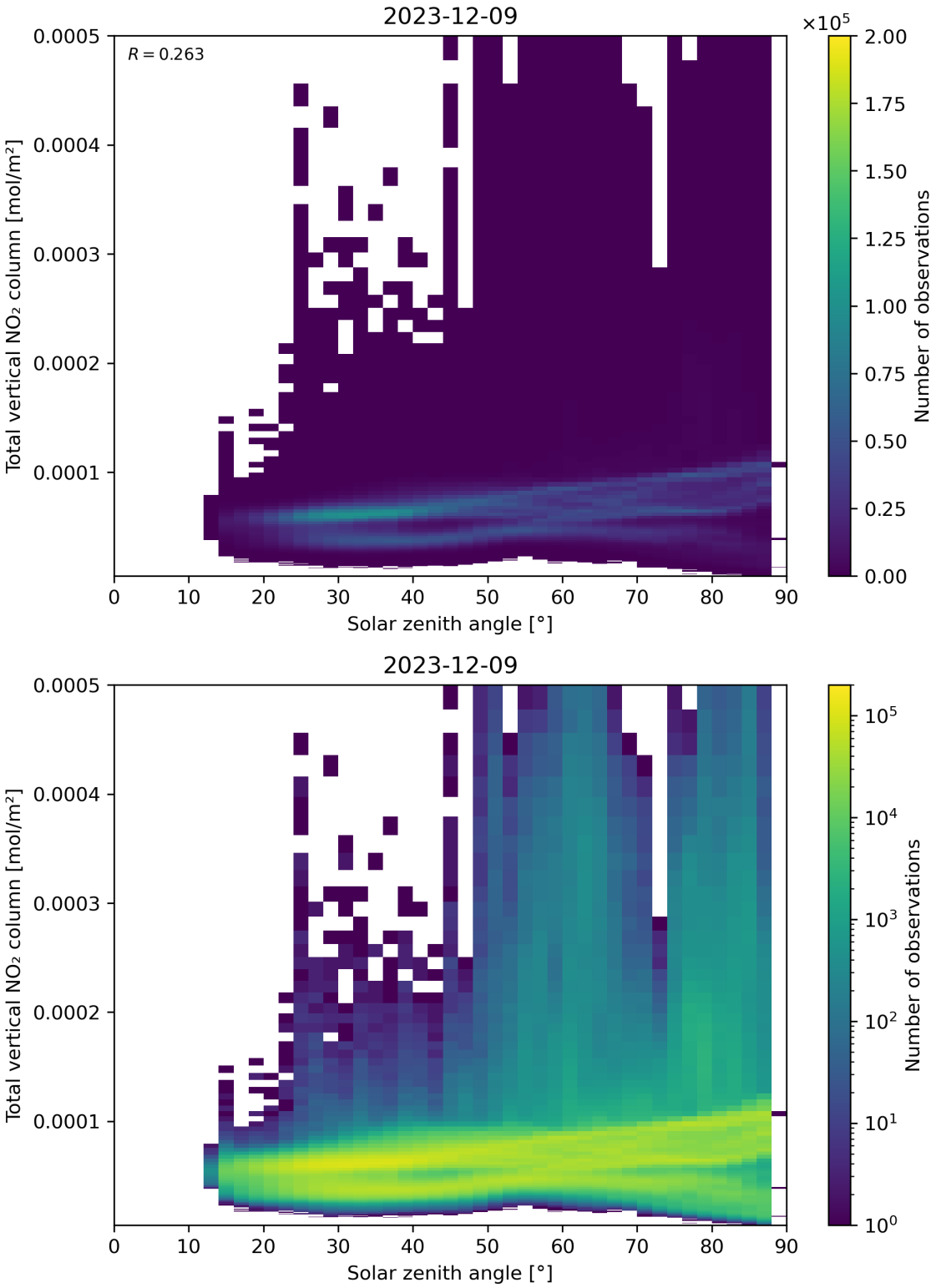


Figure 153: Scatter density plot of “Solar zenith angle” against “Total vertical NO_2 column” for 2023-12-09 to 2023-12-10.

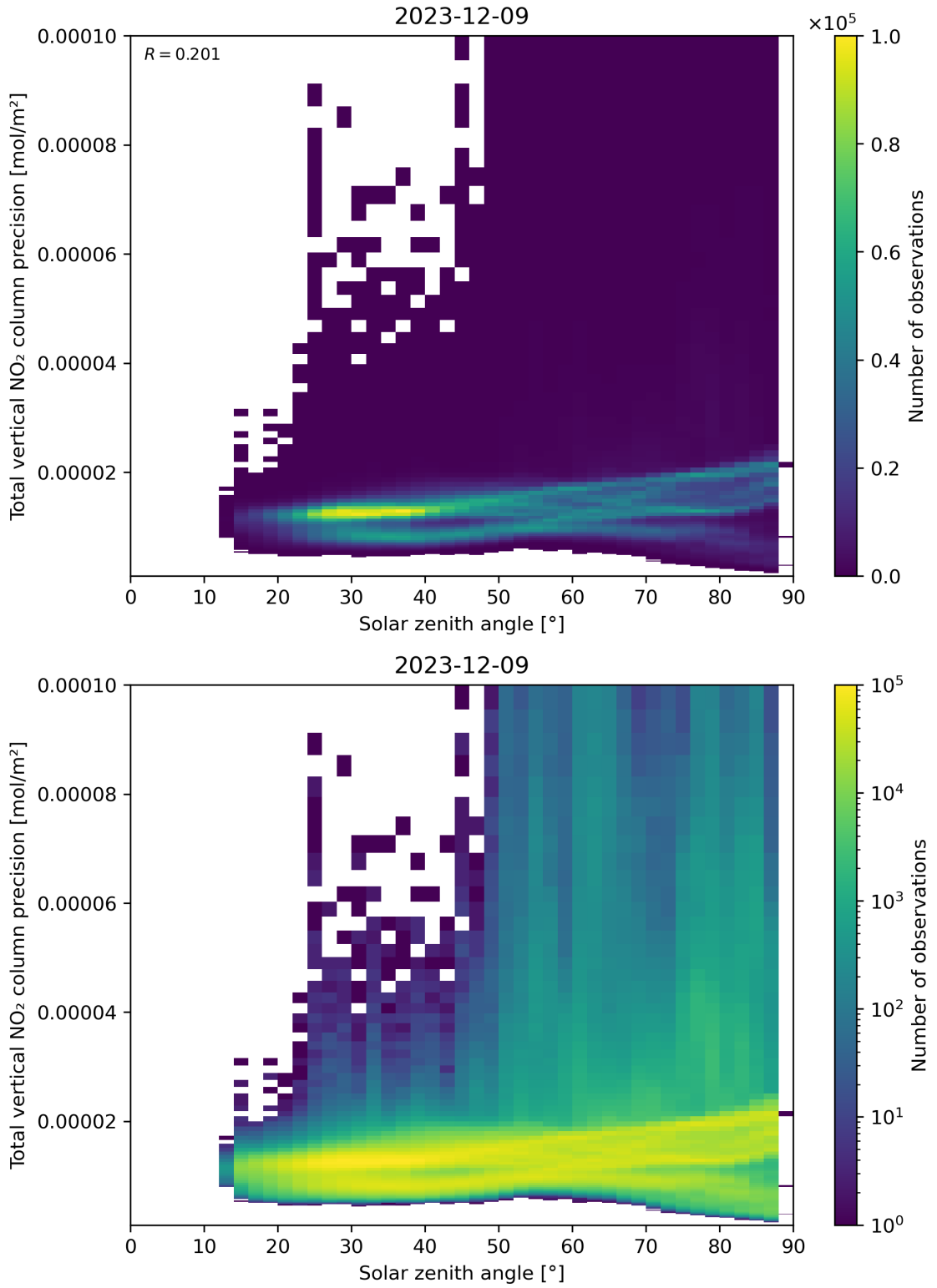


Figure 154: Scatter density plot of “Solar zenith angle” against “Total vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

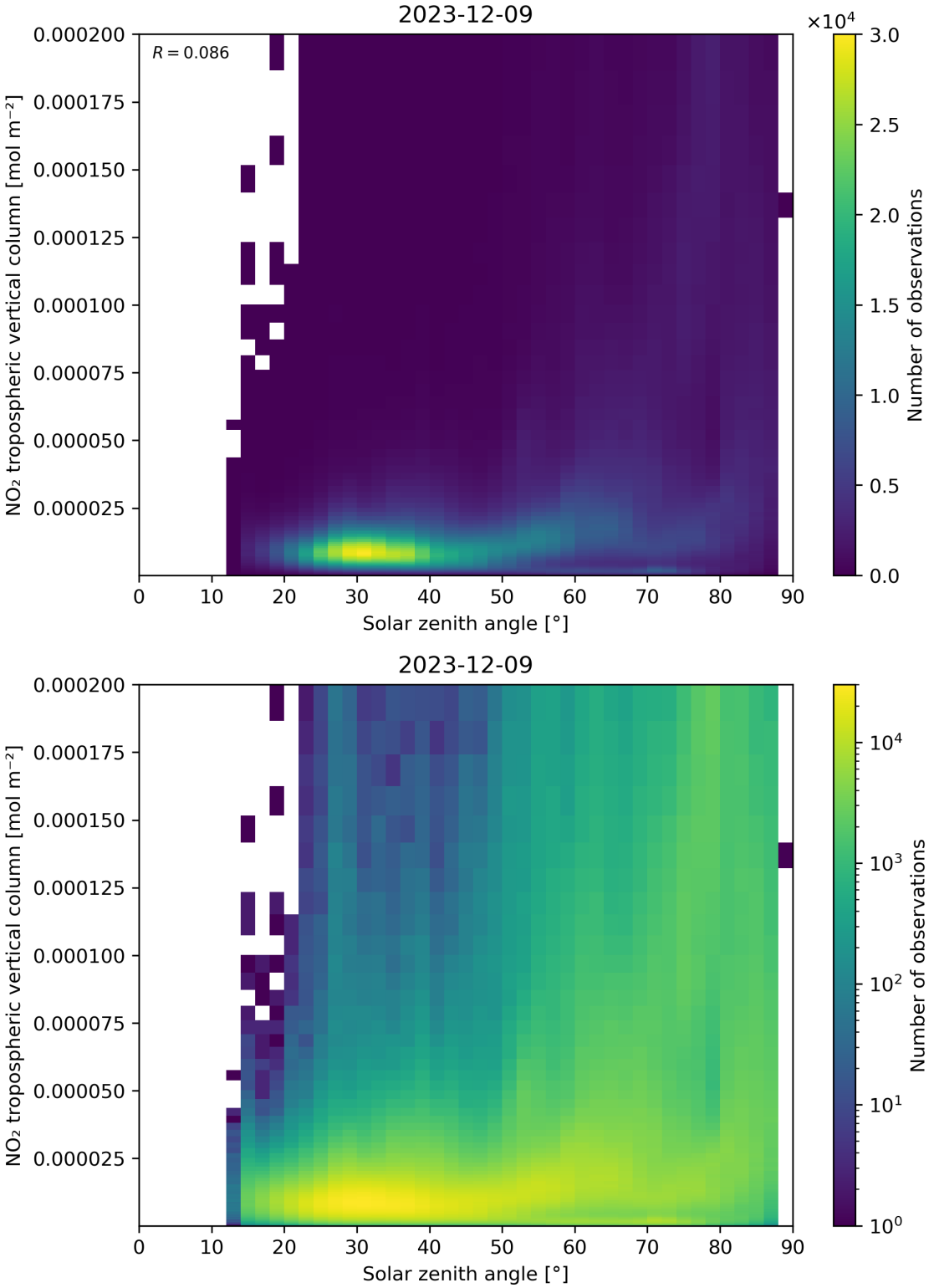


Figure 155: Scatter density plot of "Solar zenith angle" against "NO_2 tropospheric vertical column" for 2023-12-09 to 2023-12-10.

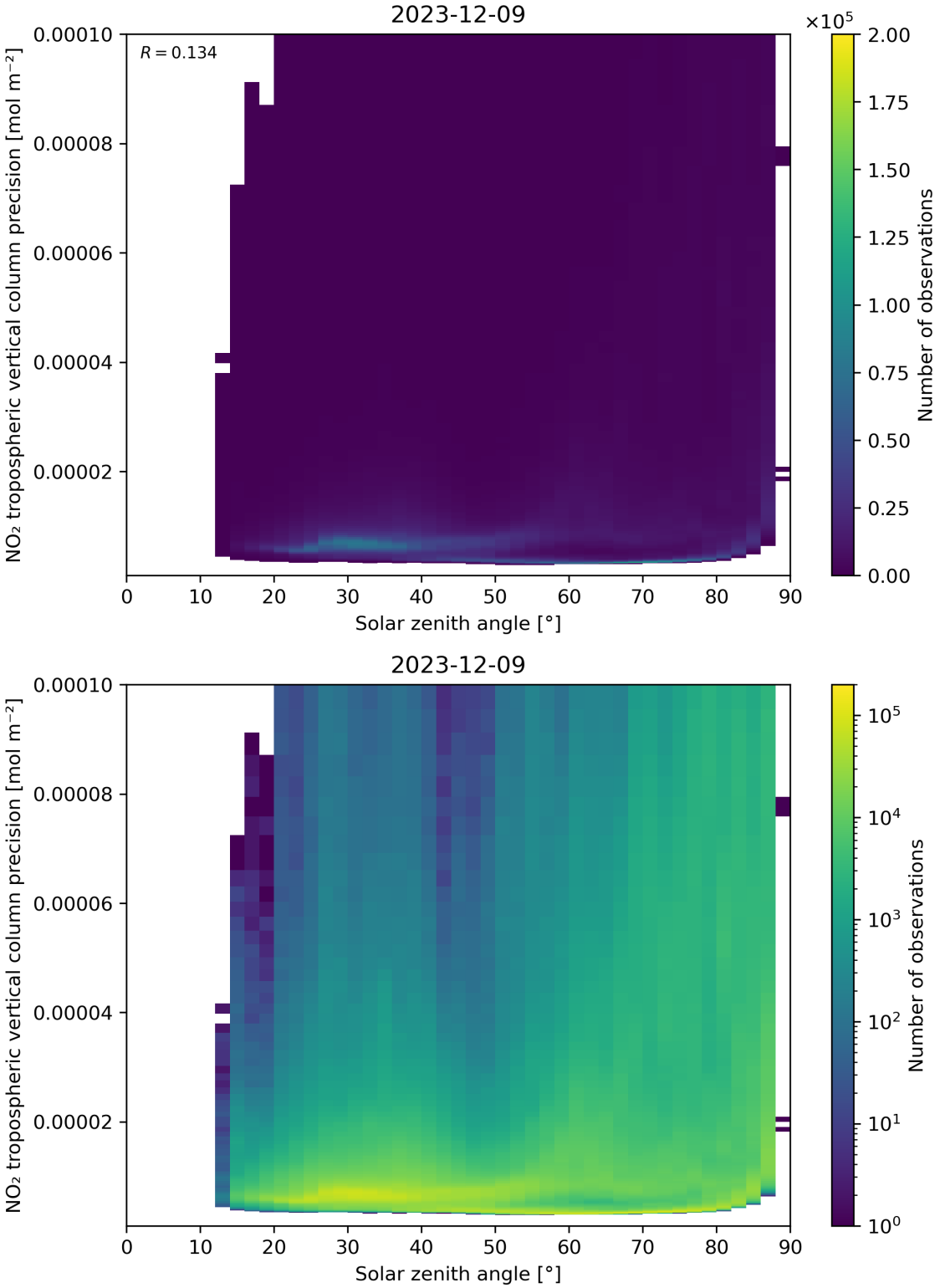


Figure 156: Scatter density plot of “Solar zenith angle” against “NO_2 tropospheric vertical column precision” for 2023-12-09 to 2023-12-10.

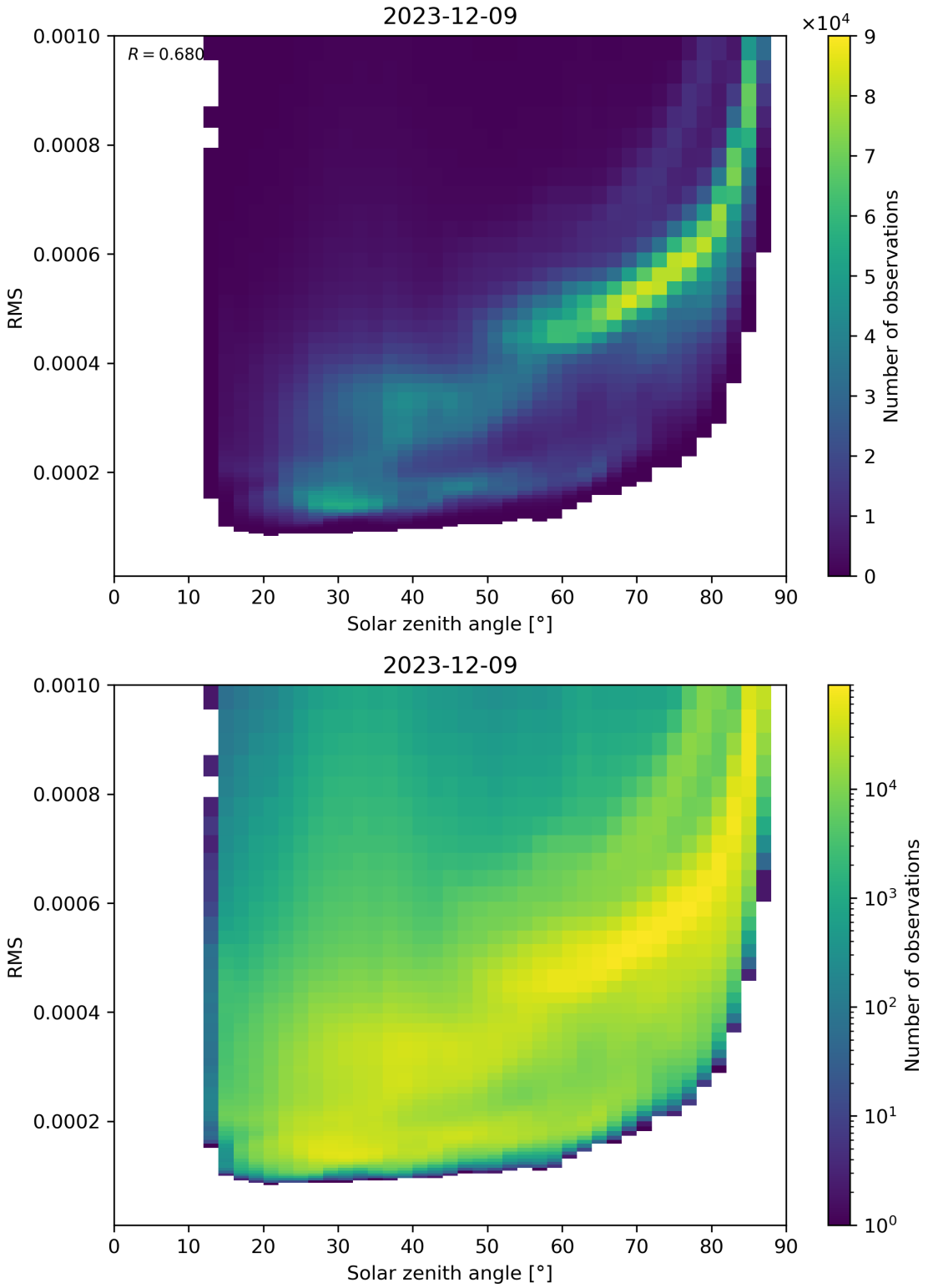


Figure 157: Scatter density plot of “Solar zenith angle” against “RMS” for 2023-12-09 to 2023-12-10.

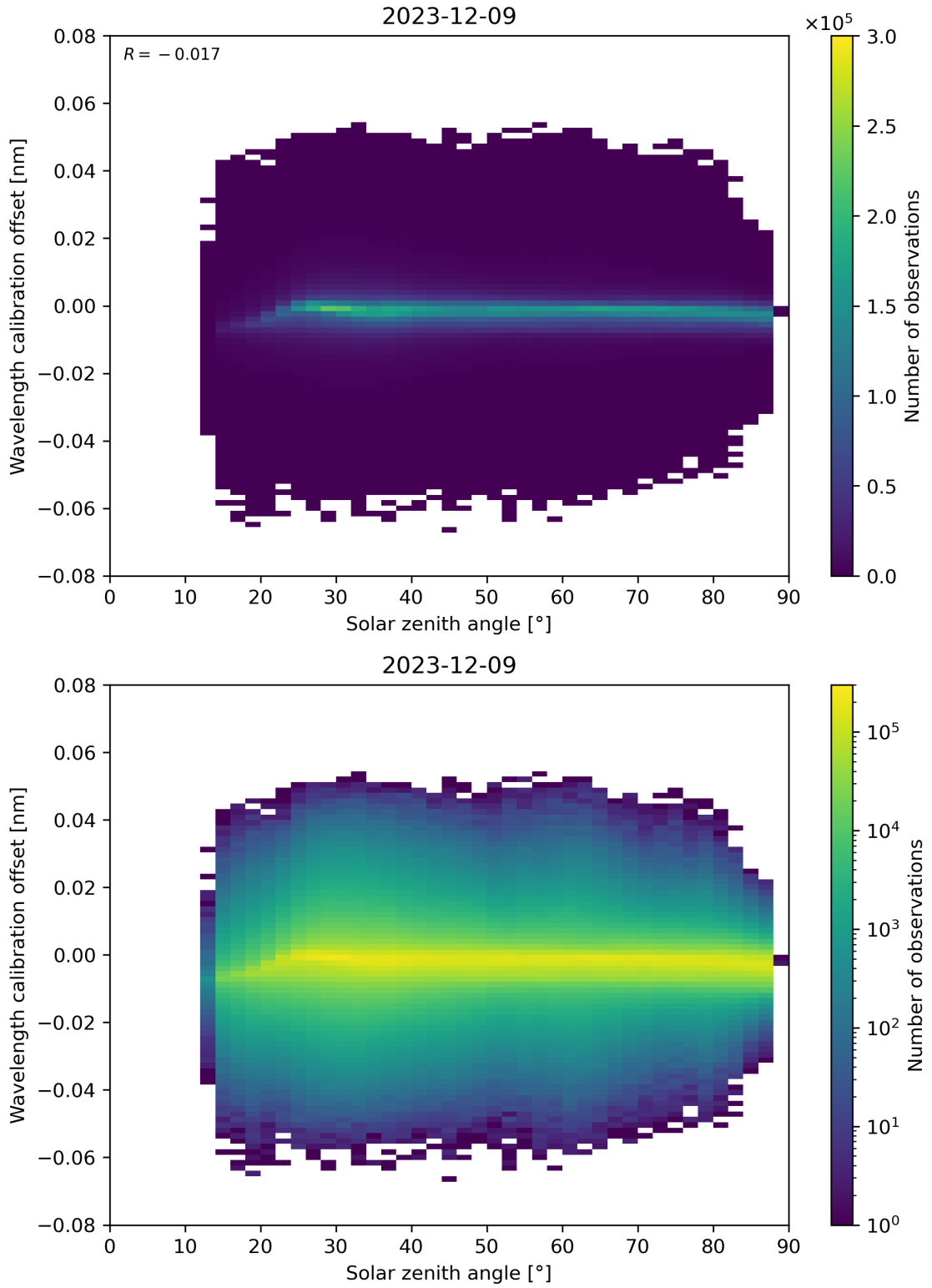


Figure 158: Scatter density plot of “Solar zenith angle” against “Wavelength calibration offset” for 2023-12-09 to 2023-12-10.

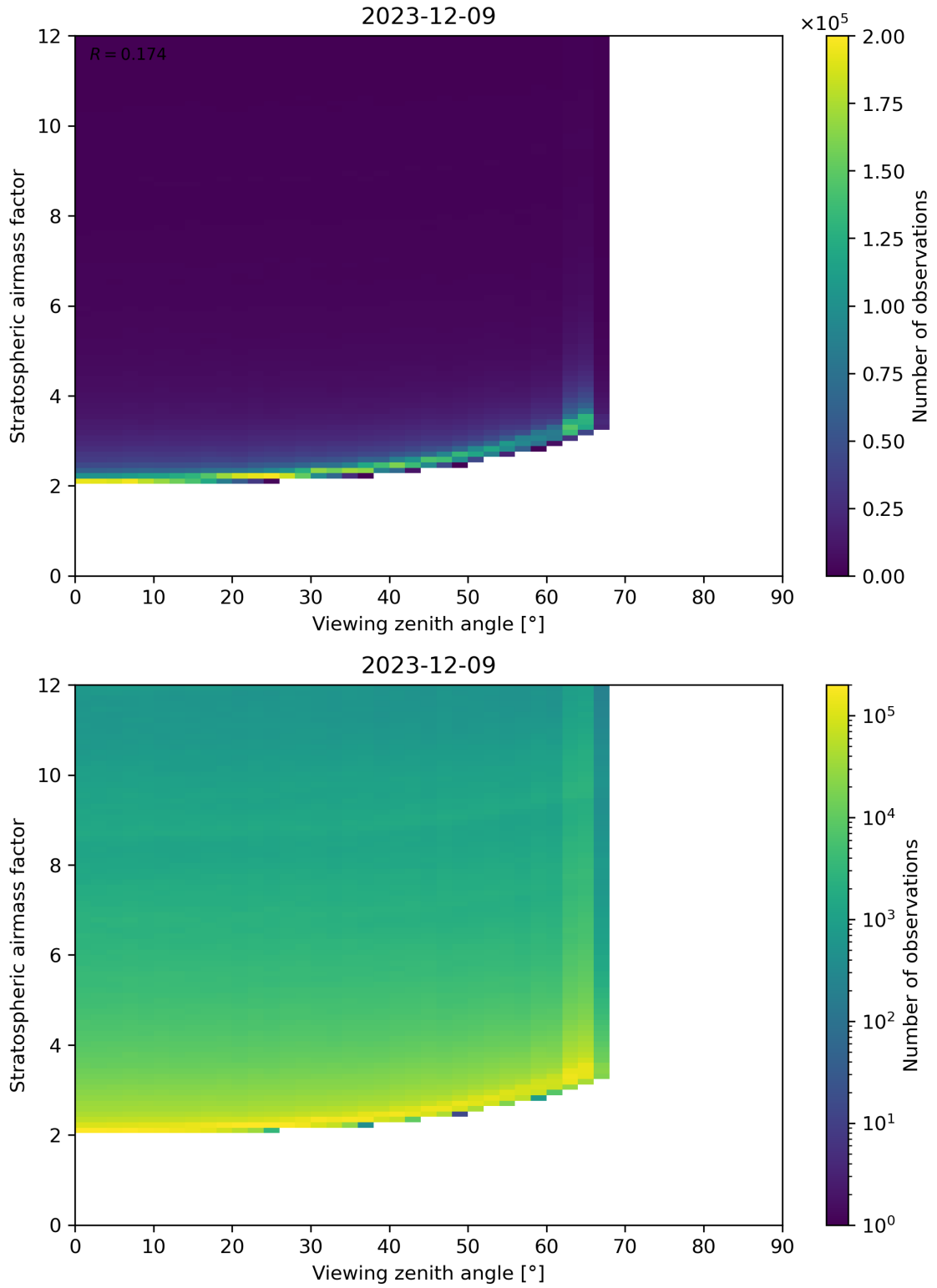


Figure 159: Scatter density plot of “Viewing zenith angle” against “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10.

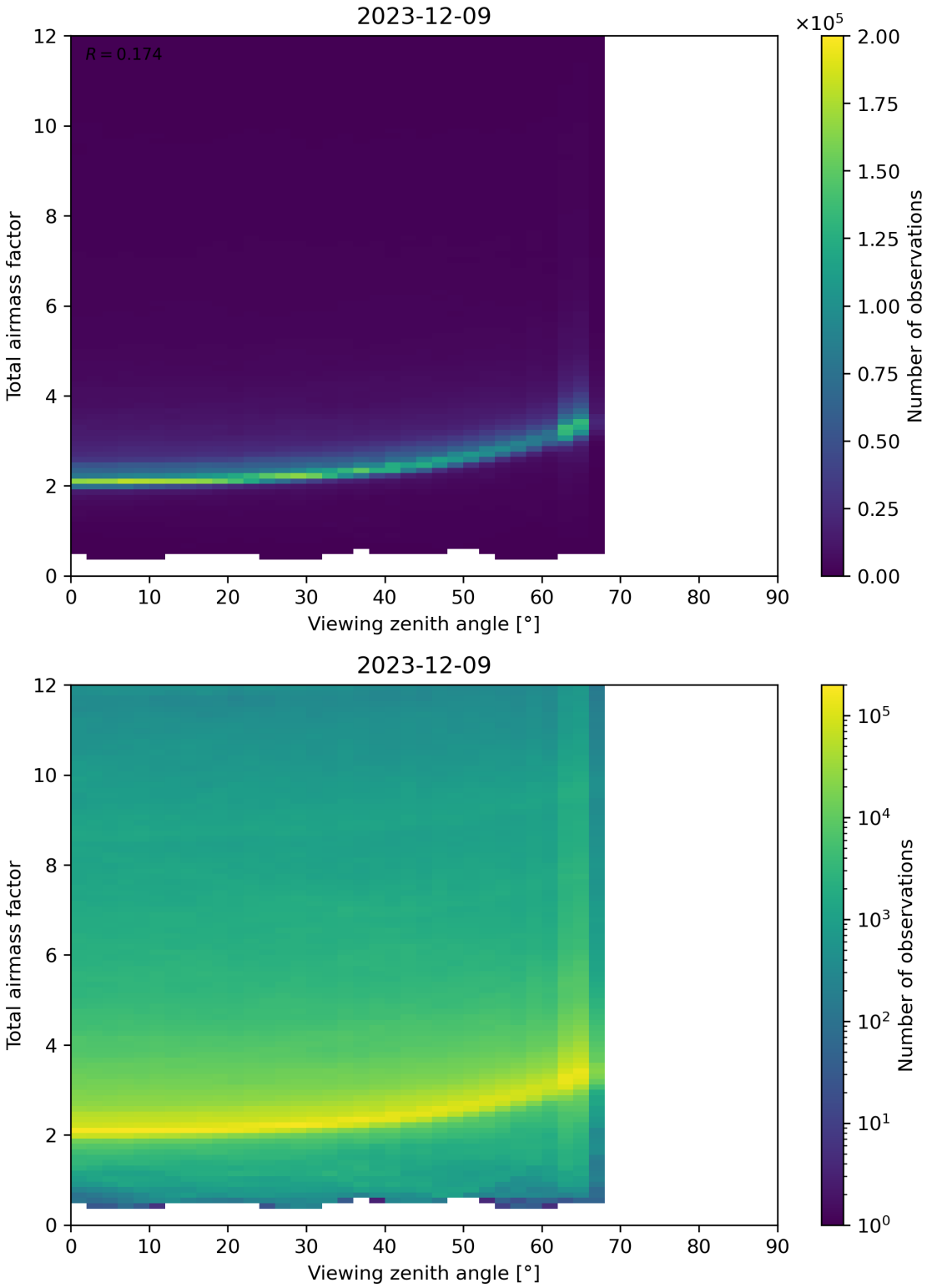


Figure 160: Scatter density plot of “Viewing zenith angle” against “Total airmass factor” for 2023-12-09 to 2023-12-10.

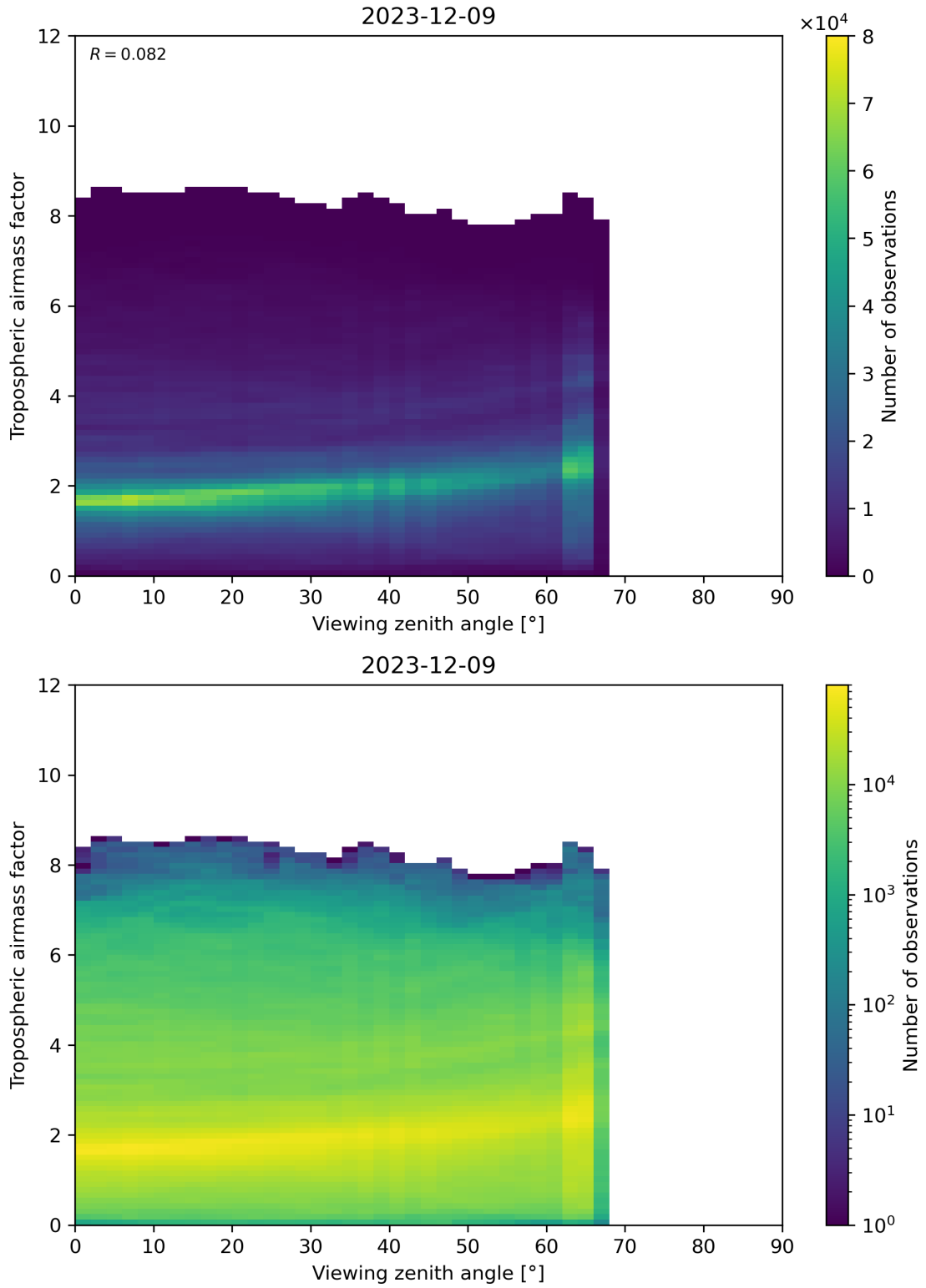


Figure 161: Scatter density plot of “Viewing zenith angle” against “Tropospheric airmass factor” for 2023-12-09 to 2023-12-10.

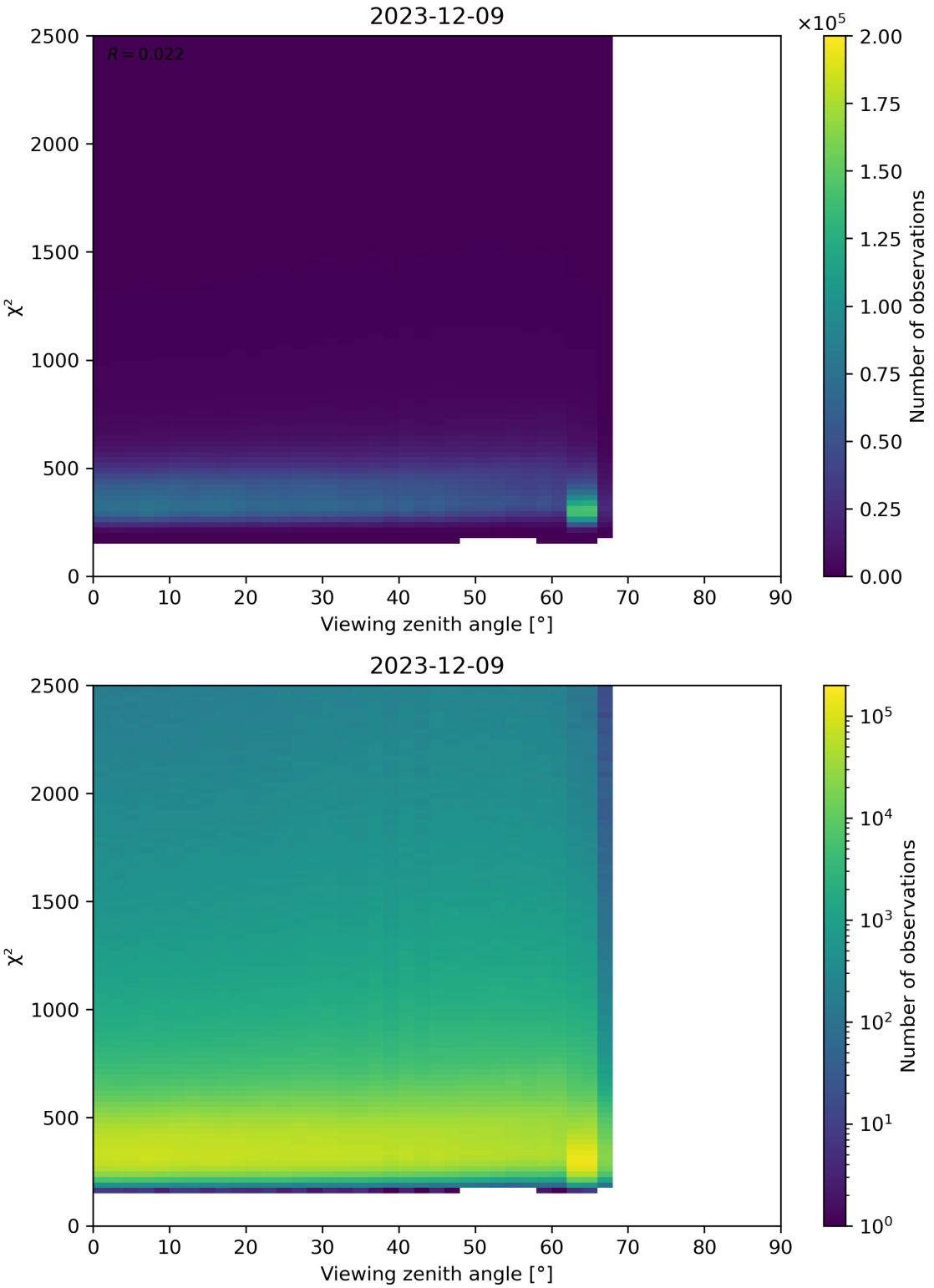


Figure 162: Scatter density plot of "Viewing zenith angle" against "χ^2" for 2023-12-09 to 2023-12-10.

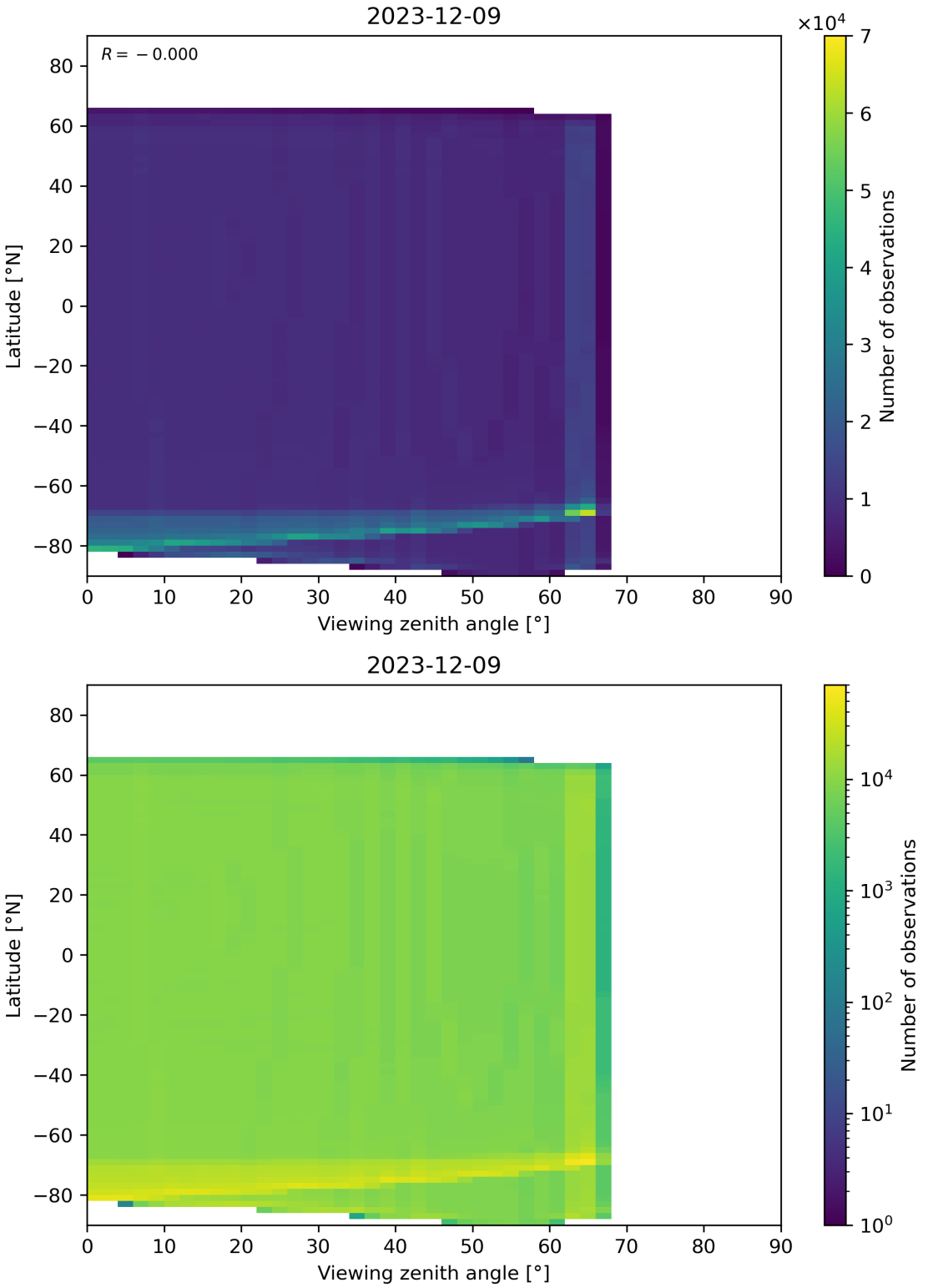


Figure 163: Scatter density plot of “Viewing zenith angle” against “Latitude” for 2023-12-09 to 2023-12-10.

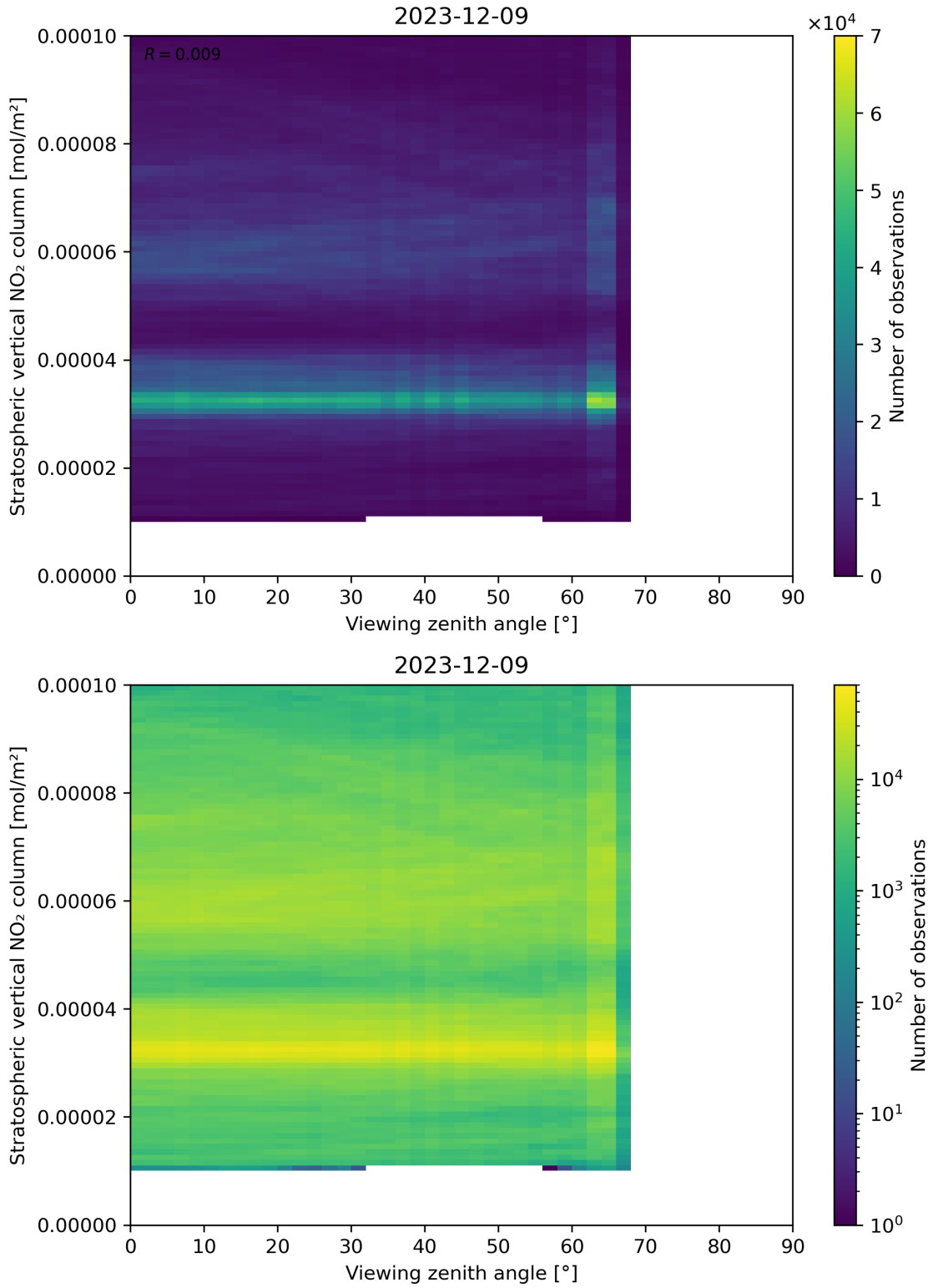


Figure 164: Scatter density plot of “Viewing zenith angle” against “Stratospheric vertical NO_2 column” for 2023-12-09 to 2023-12-10.

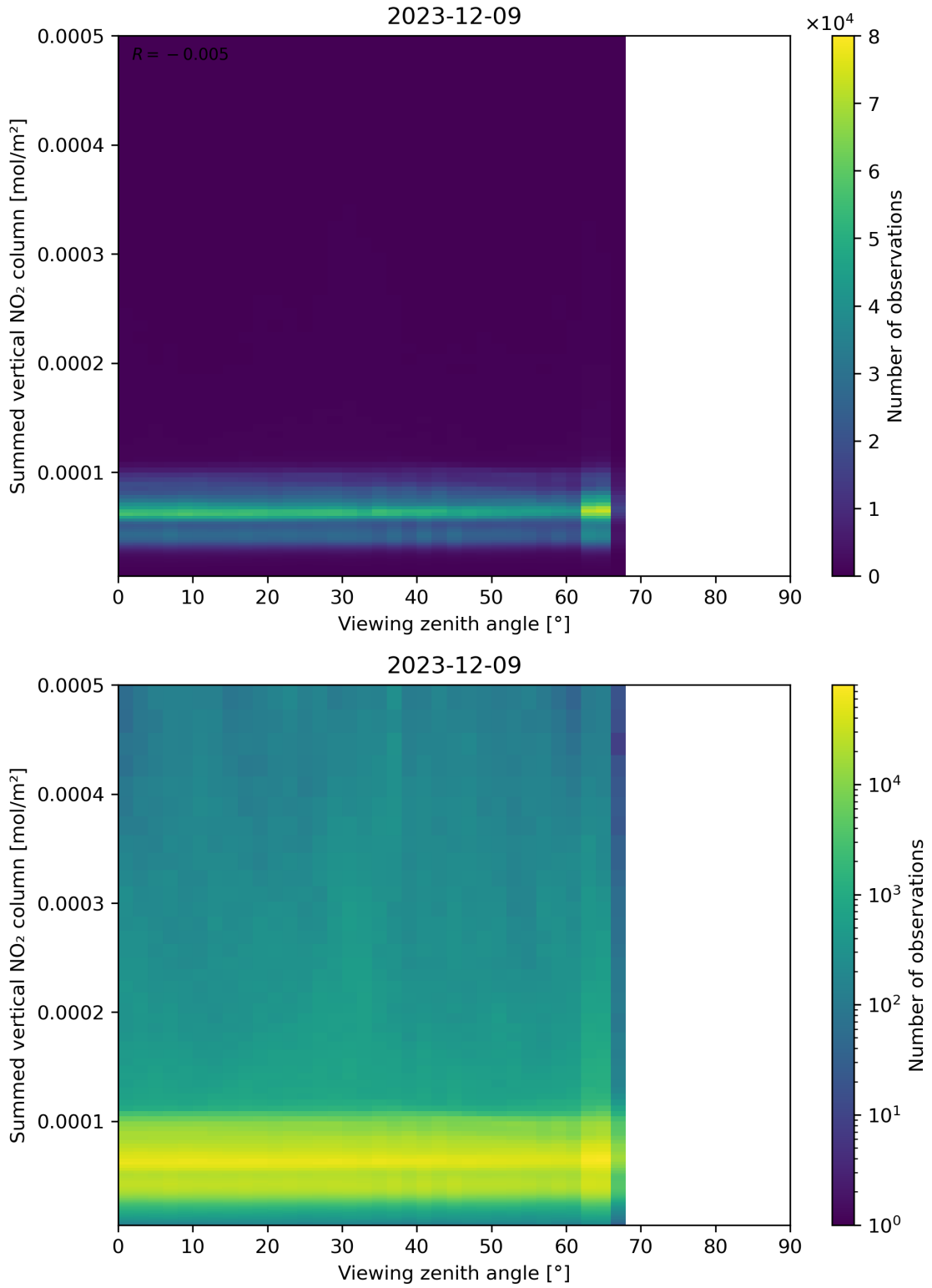


Figure 165: Scatter density plot of “Viewing zenith angle” against “Summed vertical NO_2 column” for 2023-12-09 to 2023-12-10.

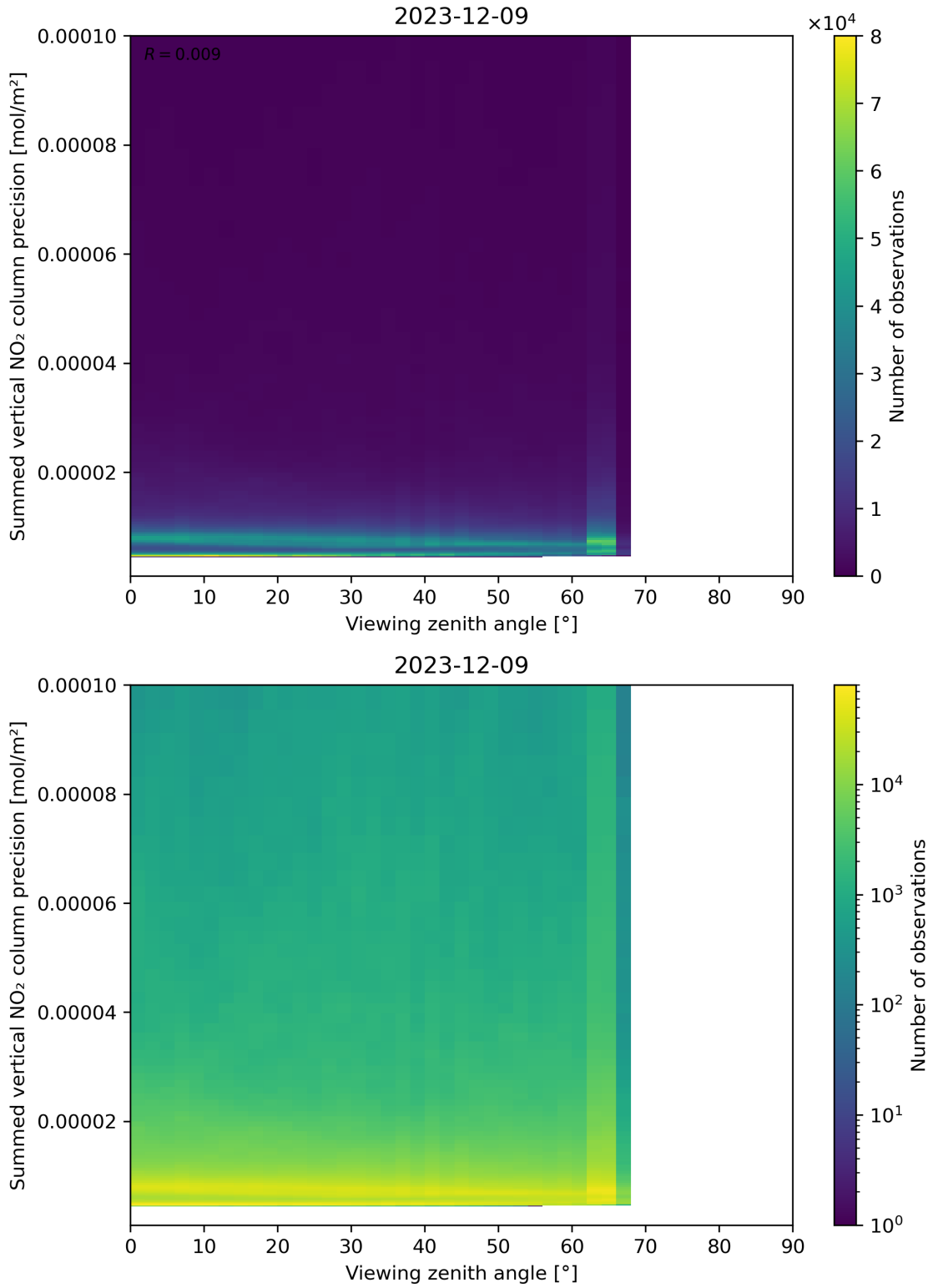


Figure 166: Scatter density plot of “Viewing zenith angle” against “Summed vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

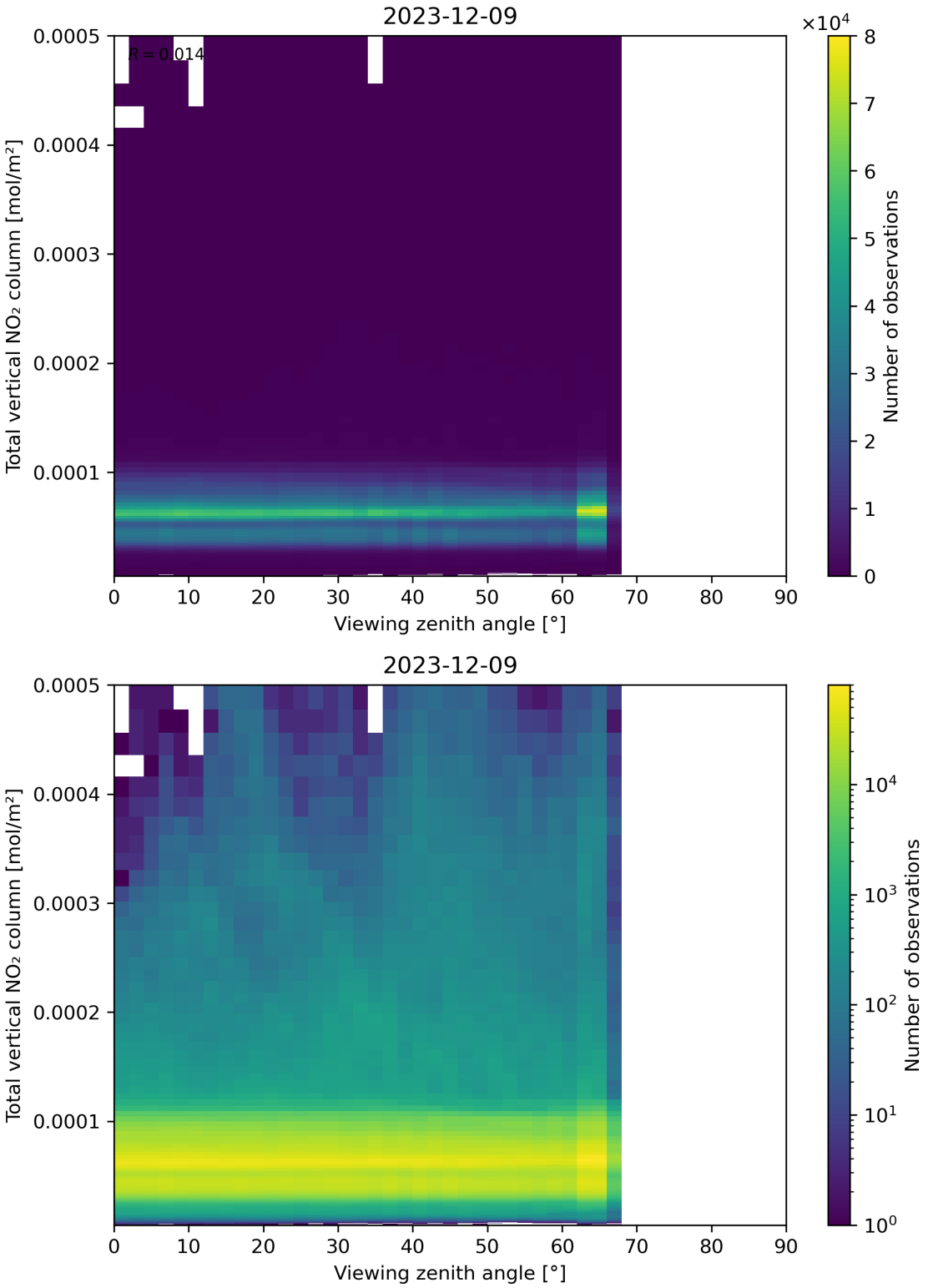


Figure 167: Scatter density plot of “Viewing zenith angle” against “Total vertical NO_2 column” for 2023-12-09 to 2023-12-10.

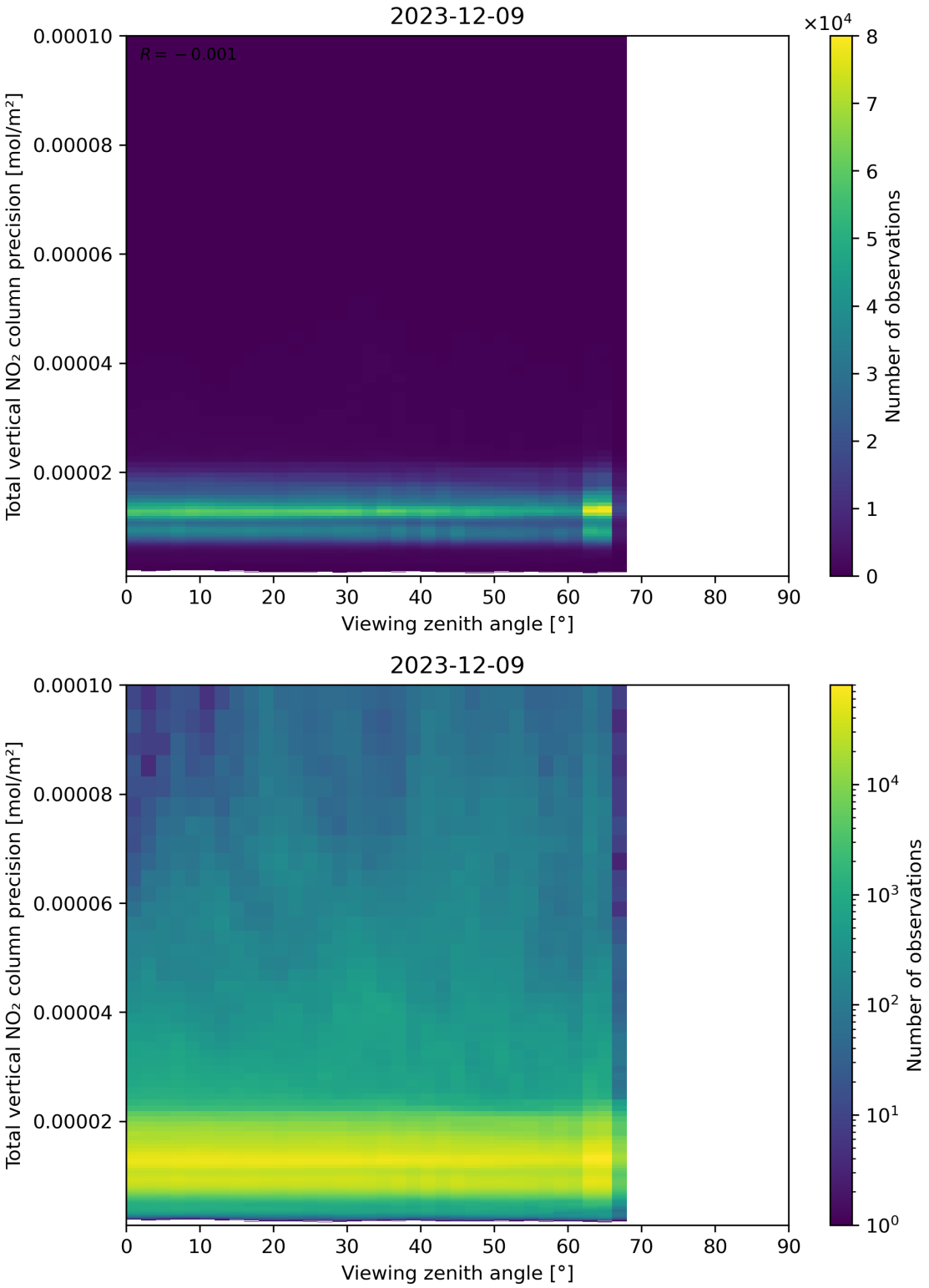


Figure 168: Scatter density plot of “Viewing zenith angle” against “Total vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.

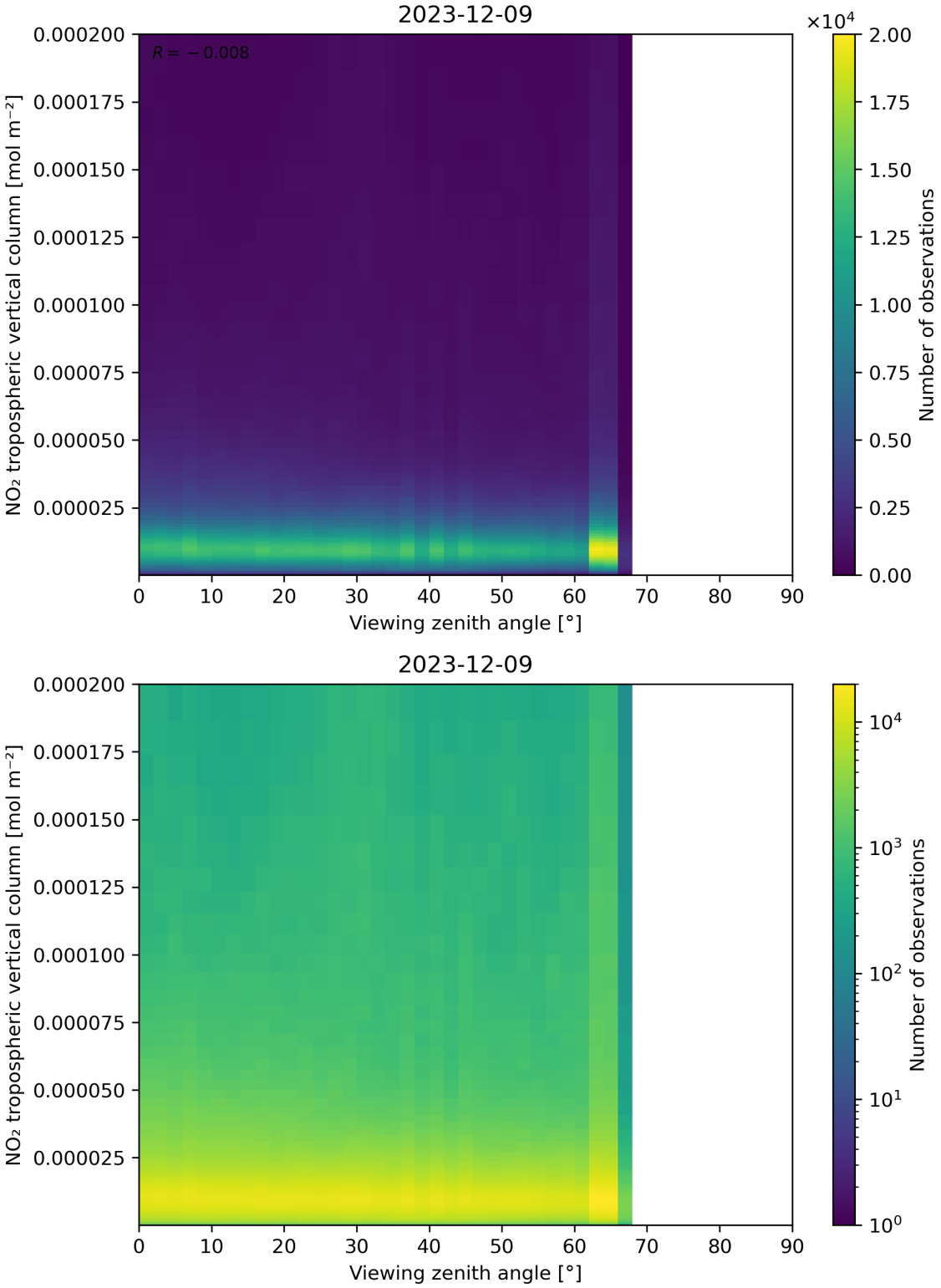


Figure 169: Scatter density plot of "Viewing zenith angle" against "NO_2 tropospheric vertical column" for 2023-12-09 to 2023-12-10.

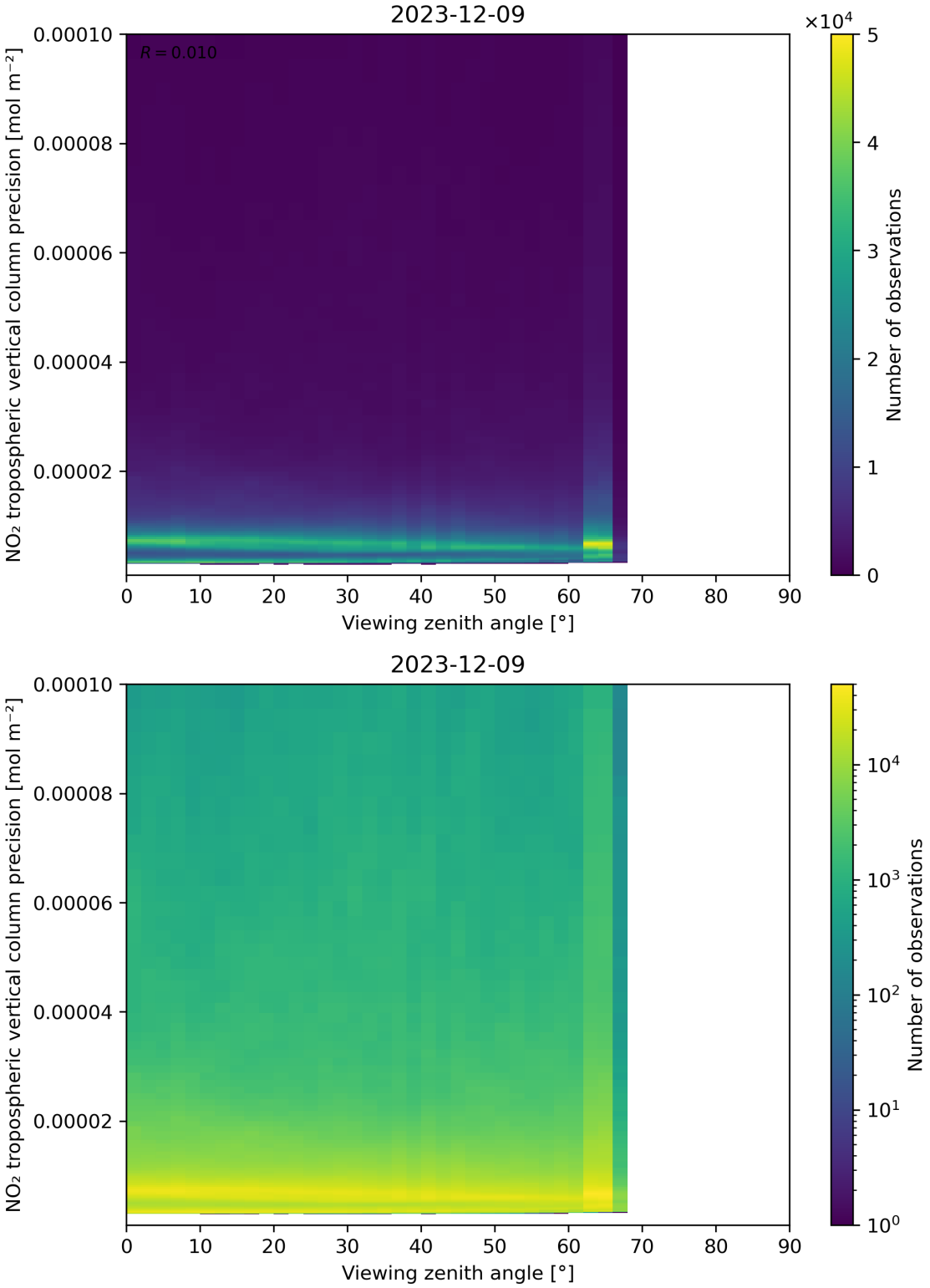


Figure 170: Scatter density plot of "Viewing zenith angle" against "NO_2 tropospheric vertical column precision" for 2023-12-09 to 2023-12-10.

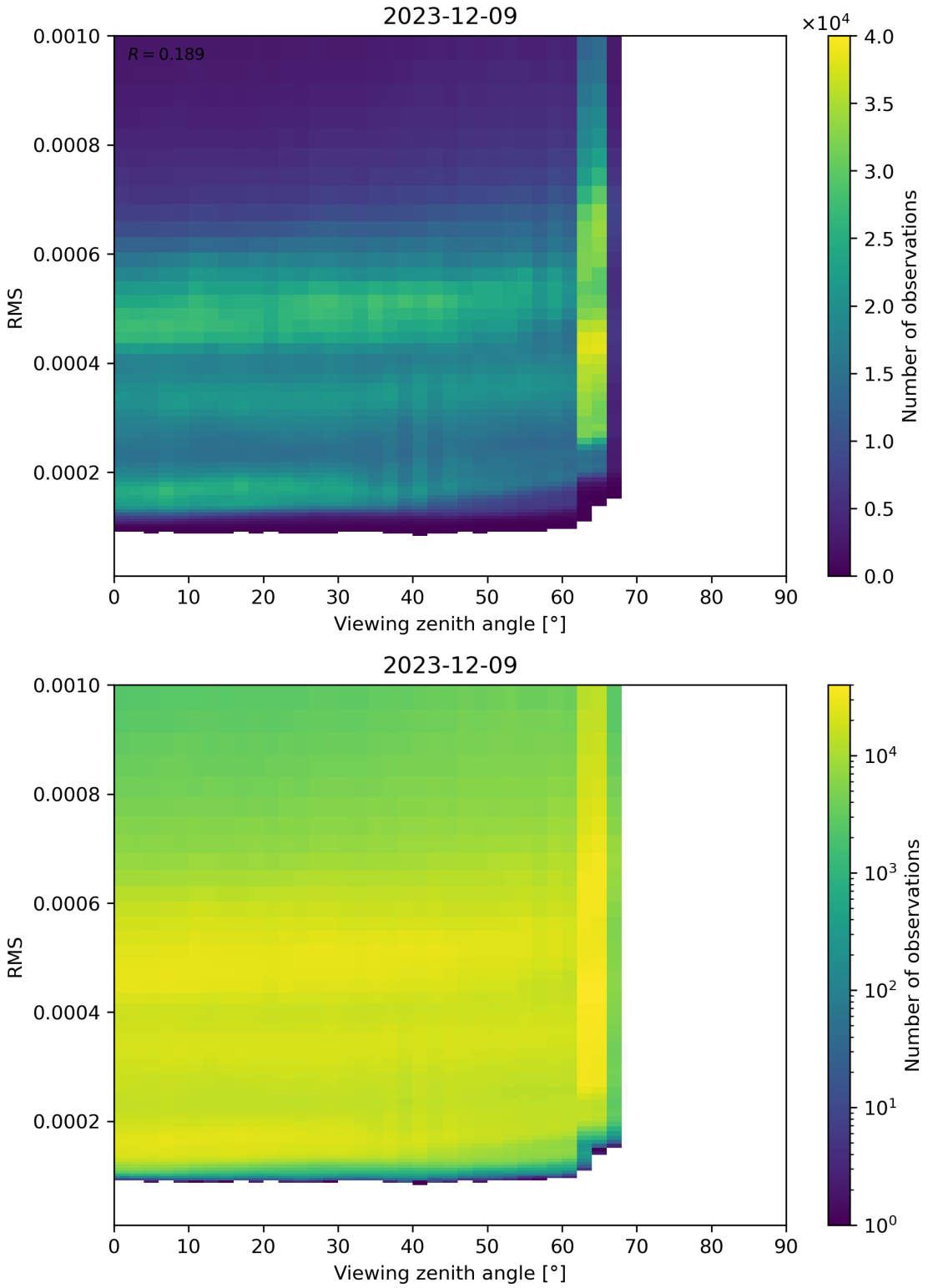


Figure 171: Scatter density plot of “Viewing zenith angle” against “RMS” for 2023-12-09 to 2023-12-10.

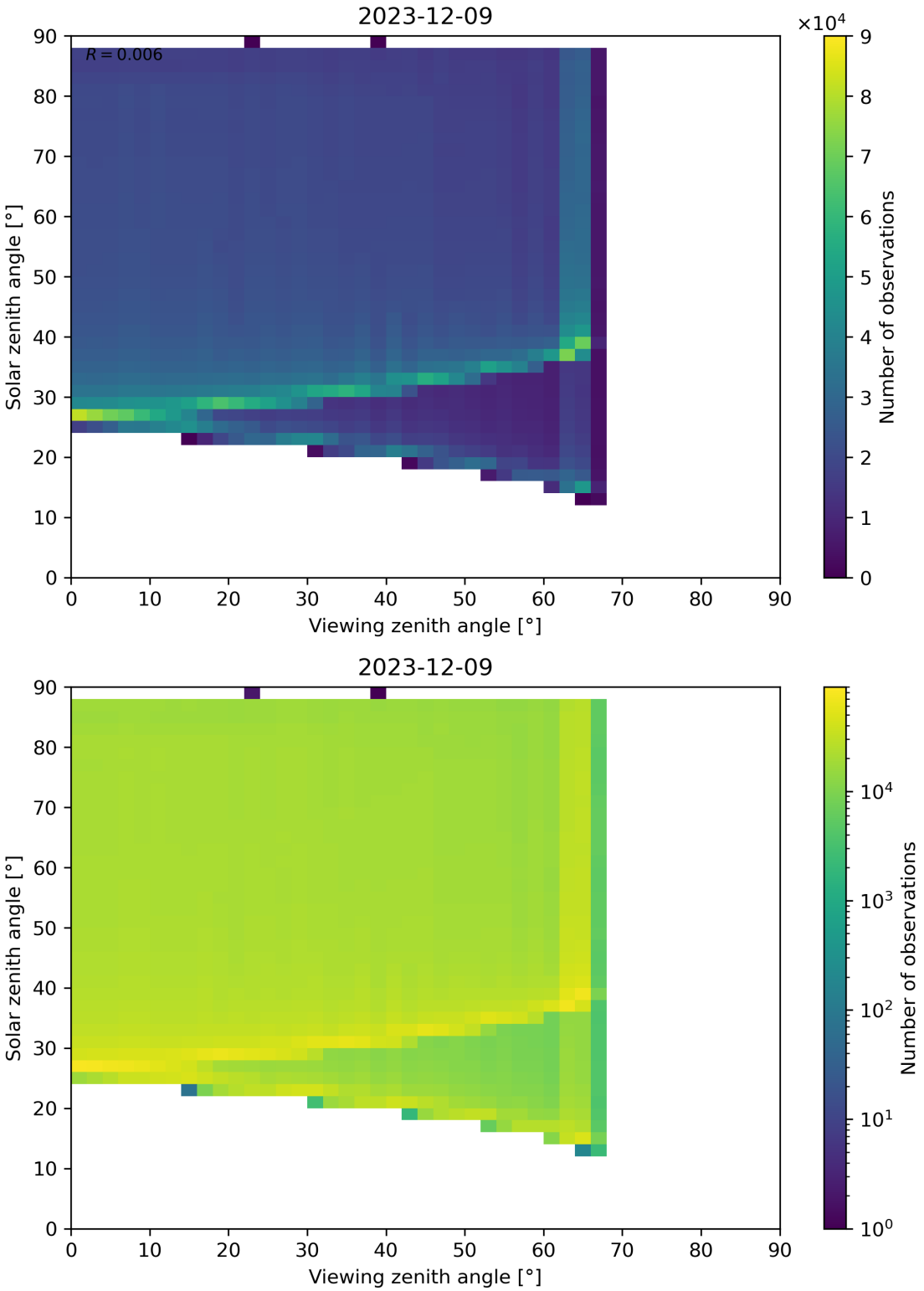


Figure 172: Scatter density plot of “Viewing zenith angle” against “Solar zenith angle” for 2023-12-09 to 2023-12-10.

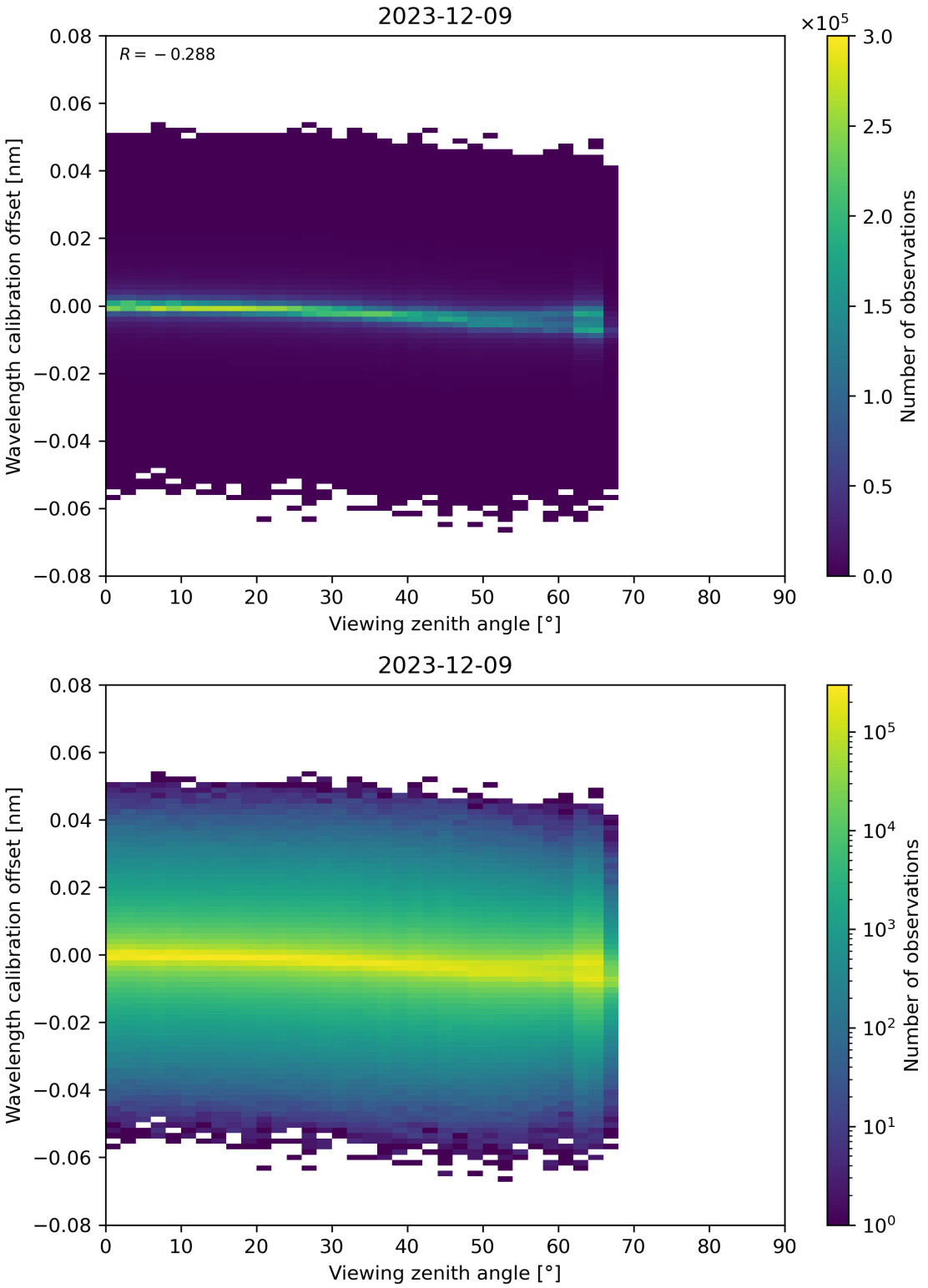


Figure 173: Scatter density plot of “Viewing zenith angle” against “Wavelength calibration offset” for 2023-12-09 to 2023-12-10.

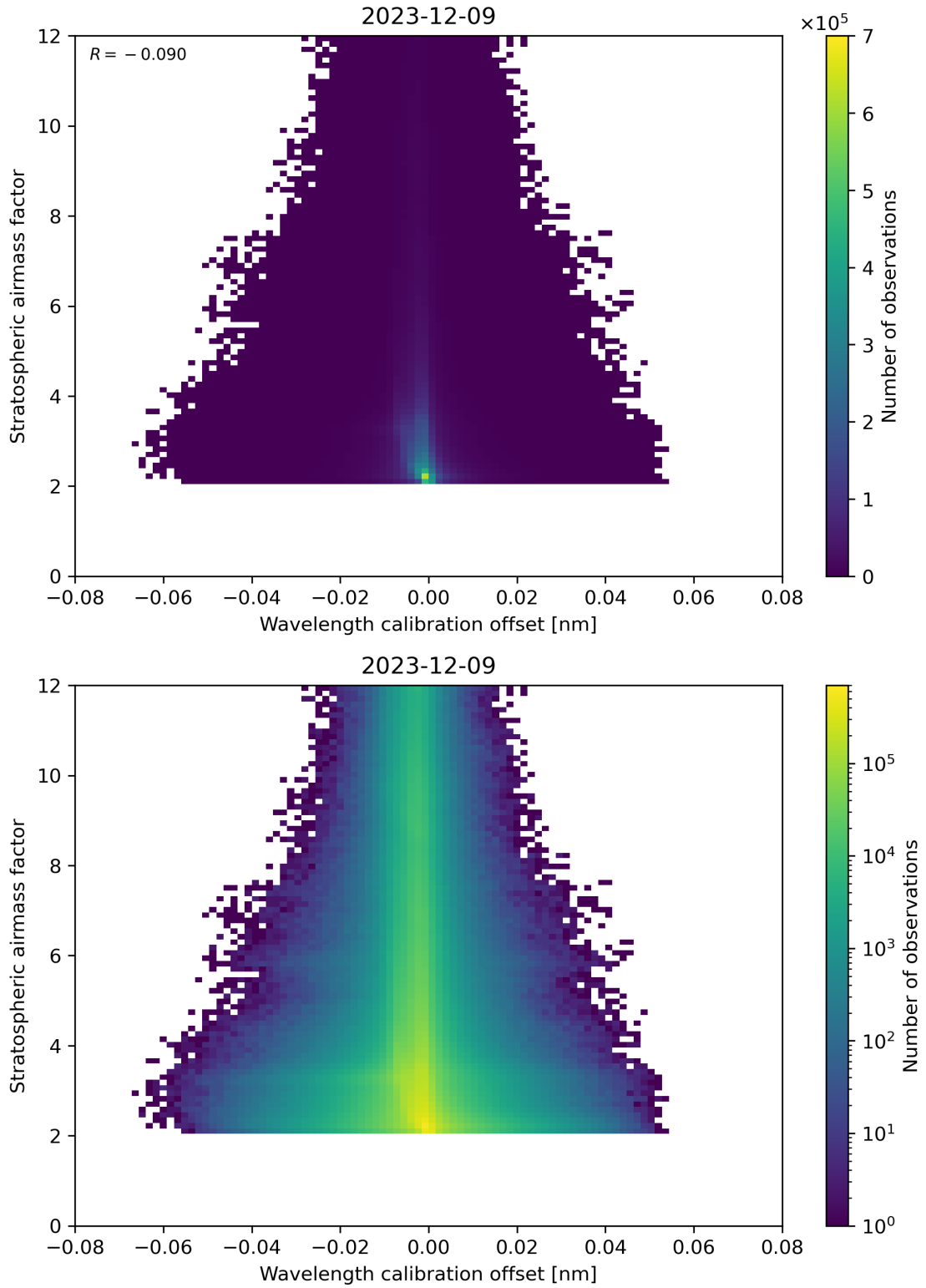


Figure 174: Scatter density plot of “Wavelength calibration offset” against “Stratospheric airmass factor” for 2023-12-09 to 2023-12-10.

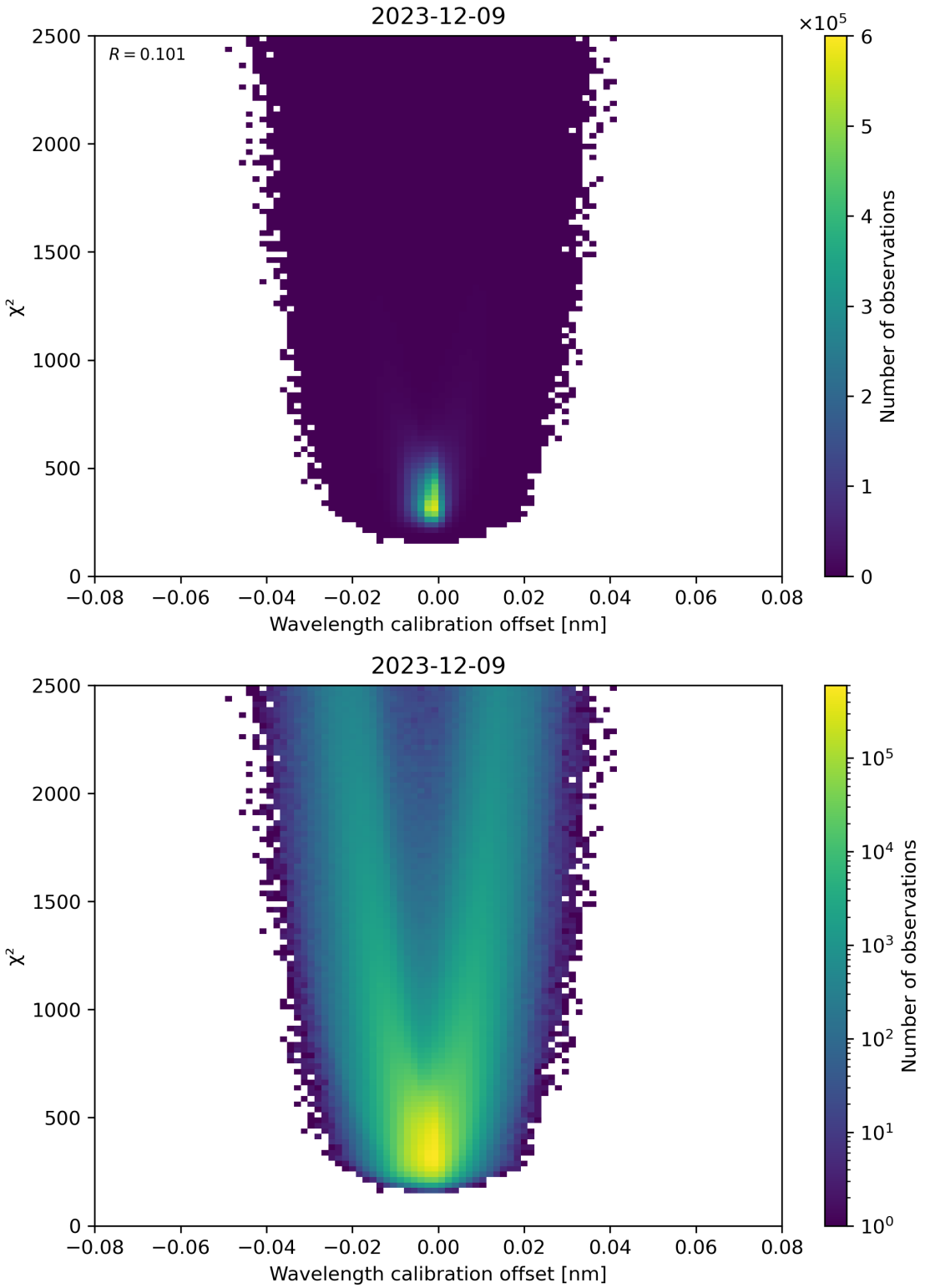


Figure 175: Scatter density plot of "Wavelength calibration offset" against "χ^2" for 2023-12-09 to 2023-12-10.

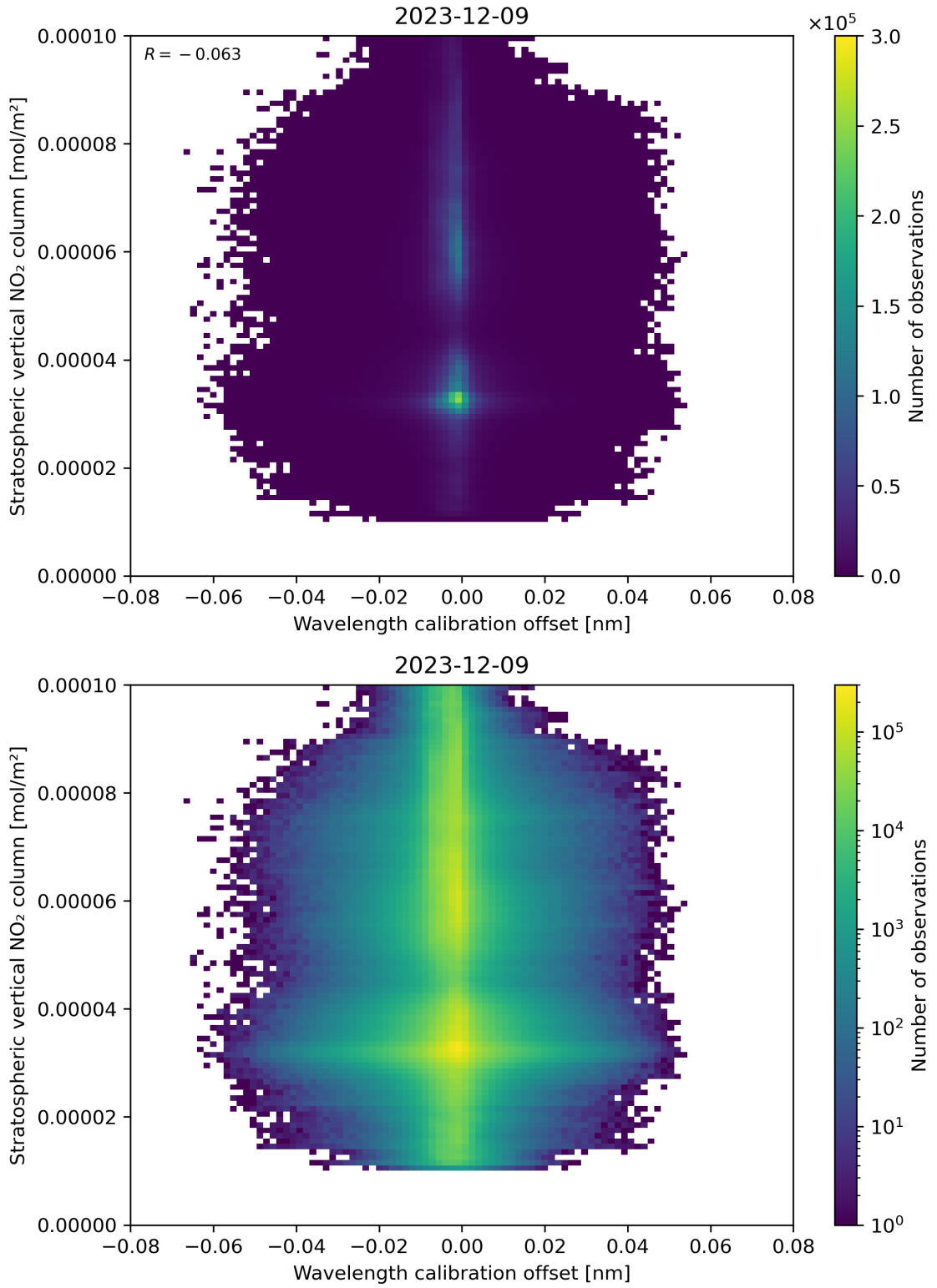


Figure 176: Scatter density plot of “Wavelength calibration offset” against “Stratospheric vertical NO_2 column” for 2023-12-09 to 2023-12-10.

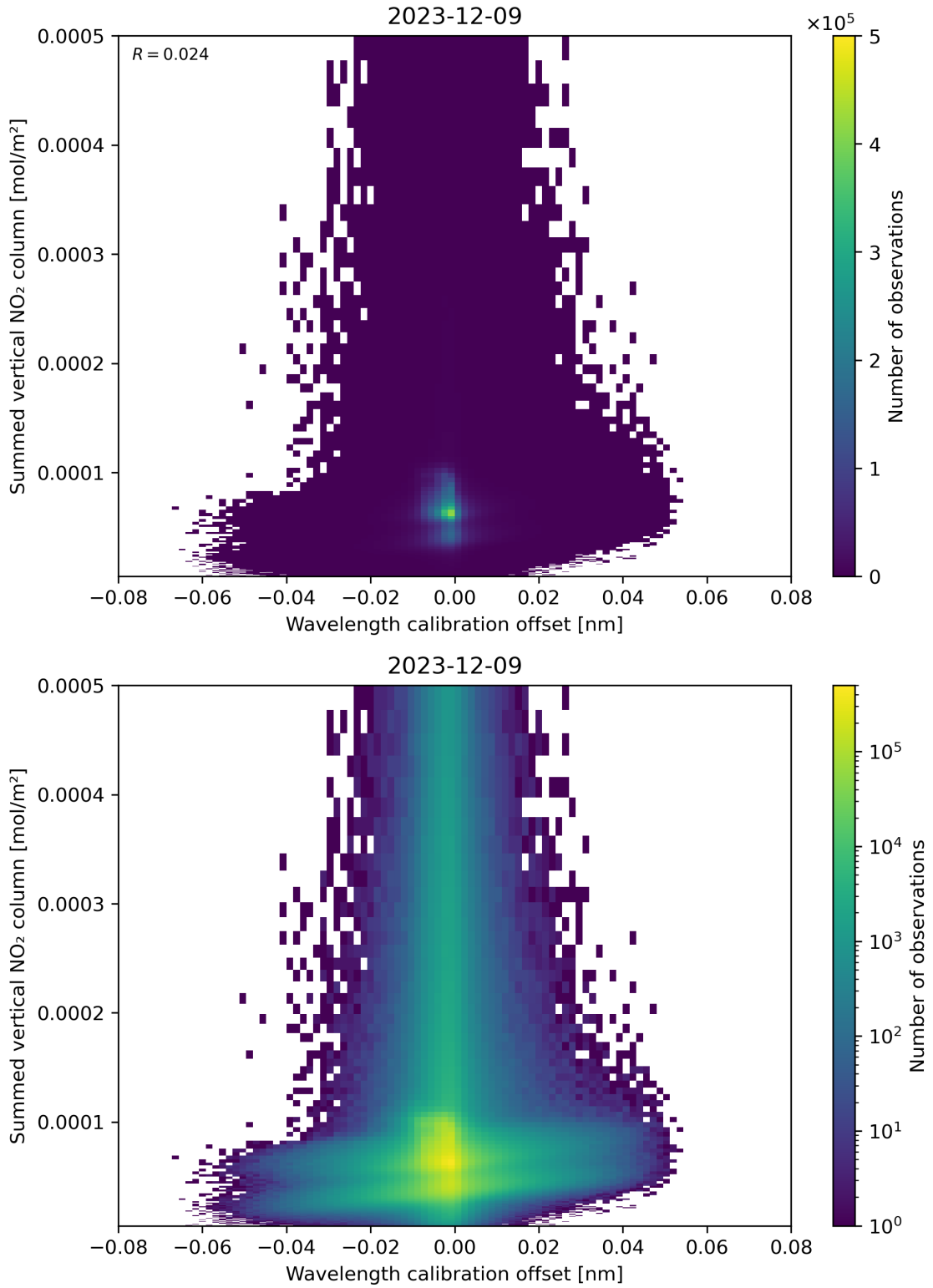


Figure 177: Scatter density plot of “Wavelength calibration offset” against “Summed vertical NO_2 column” for 2023-12-09 to 2023-12-10.

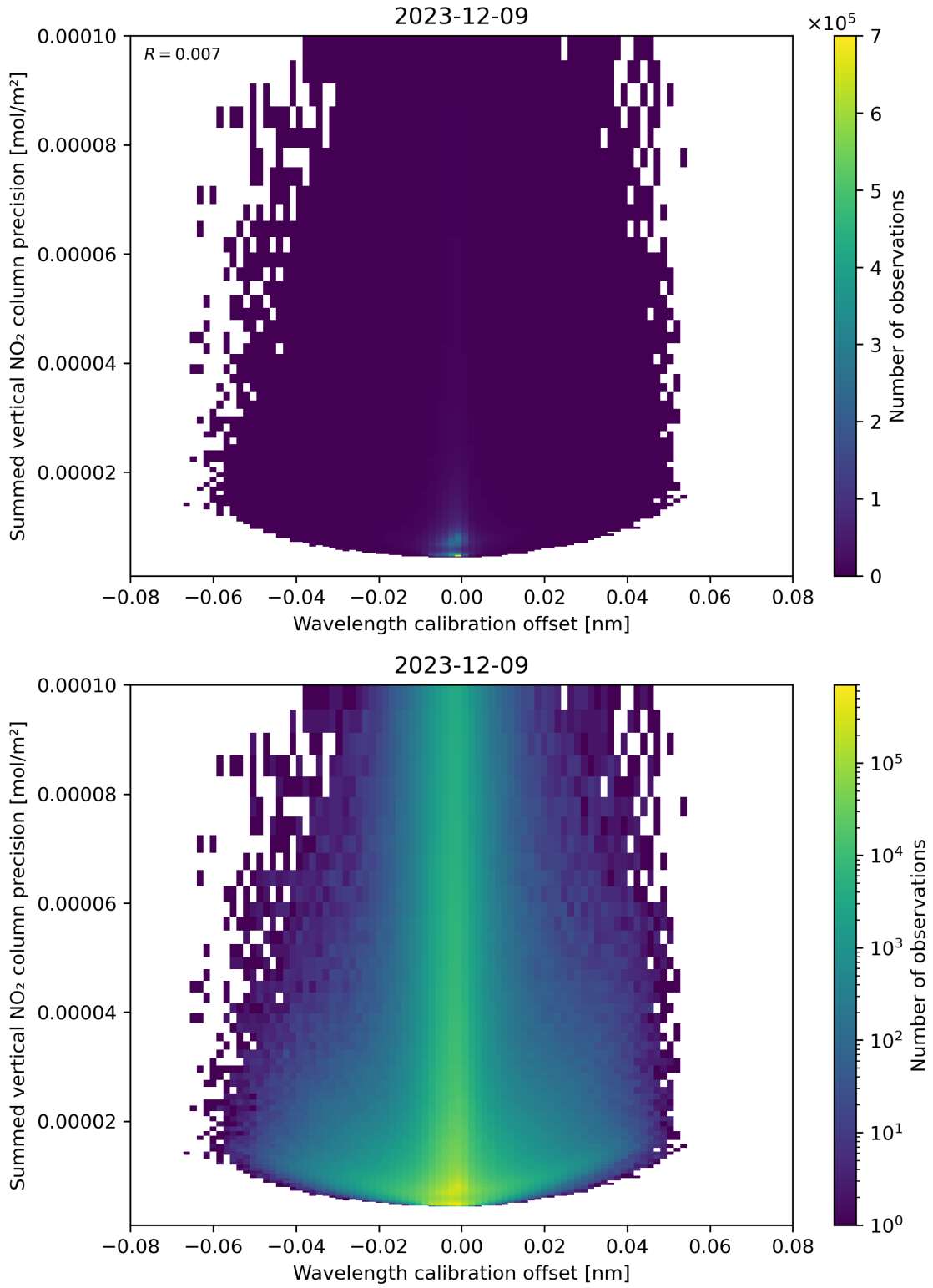
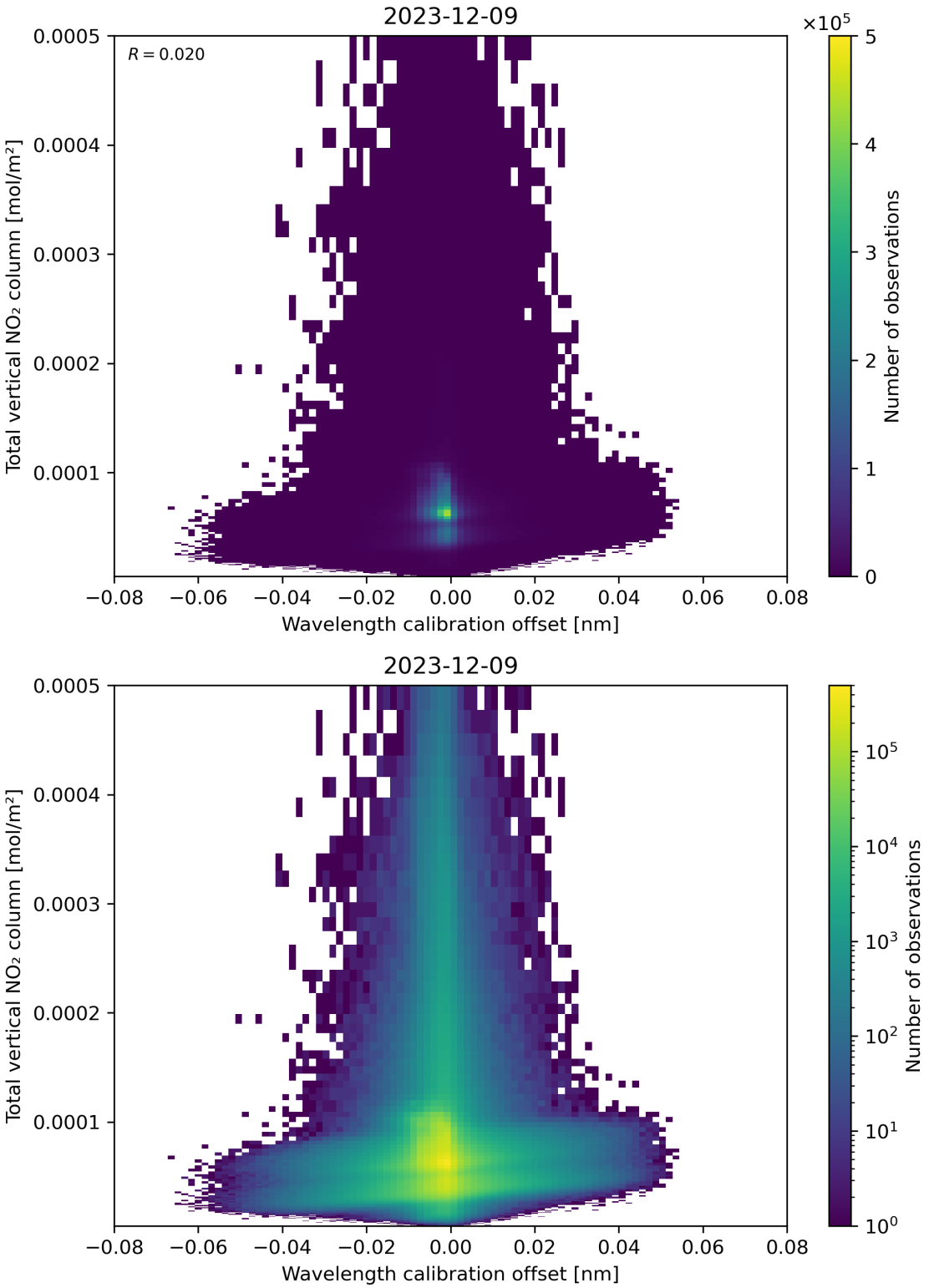


Figure 178: Scatter density plot of “Wavelength calibration offset” against “Summed vertical NO_2 column precision” for 2023-12-09 to 2023-12-10.



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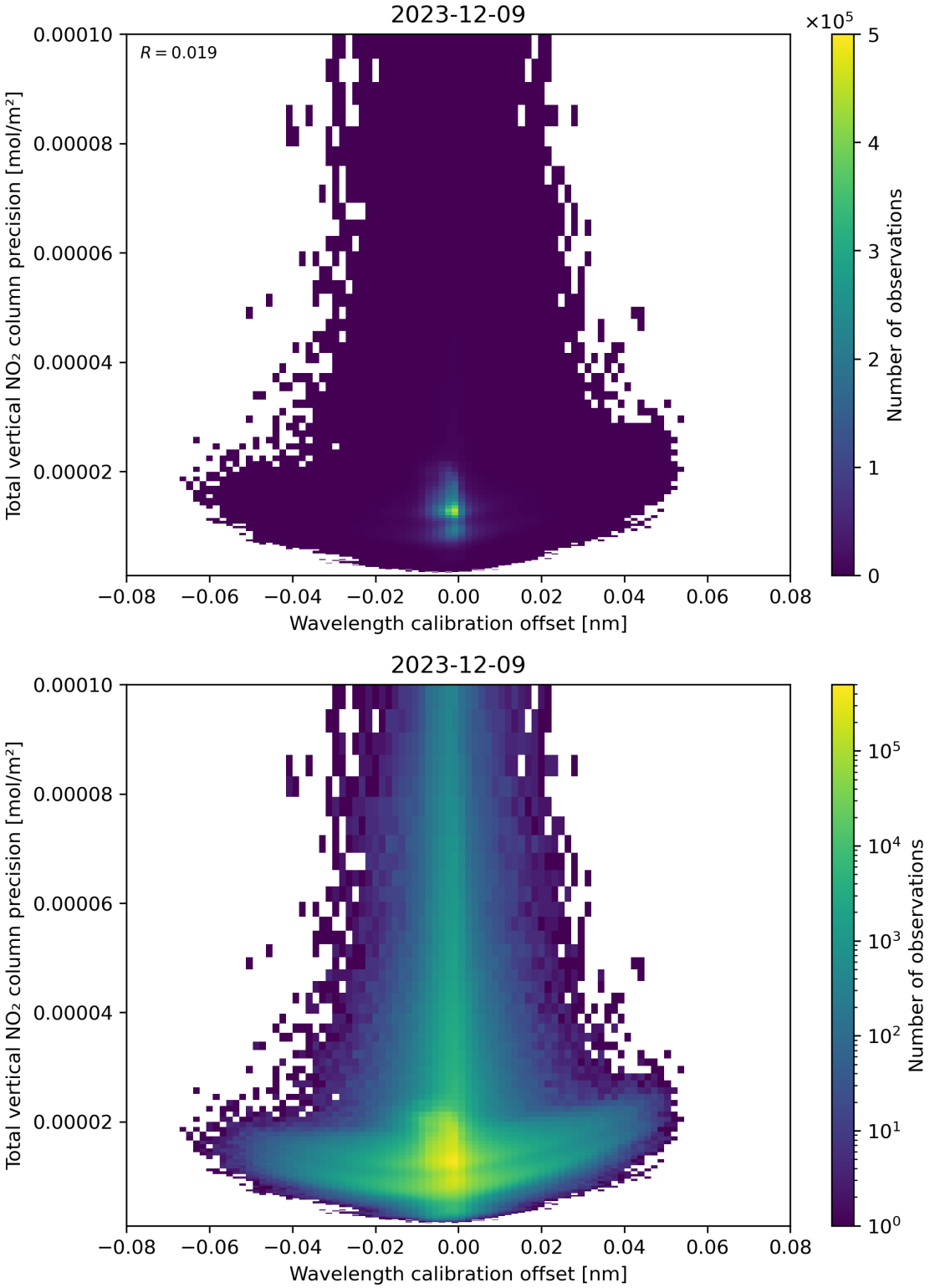
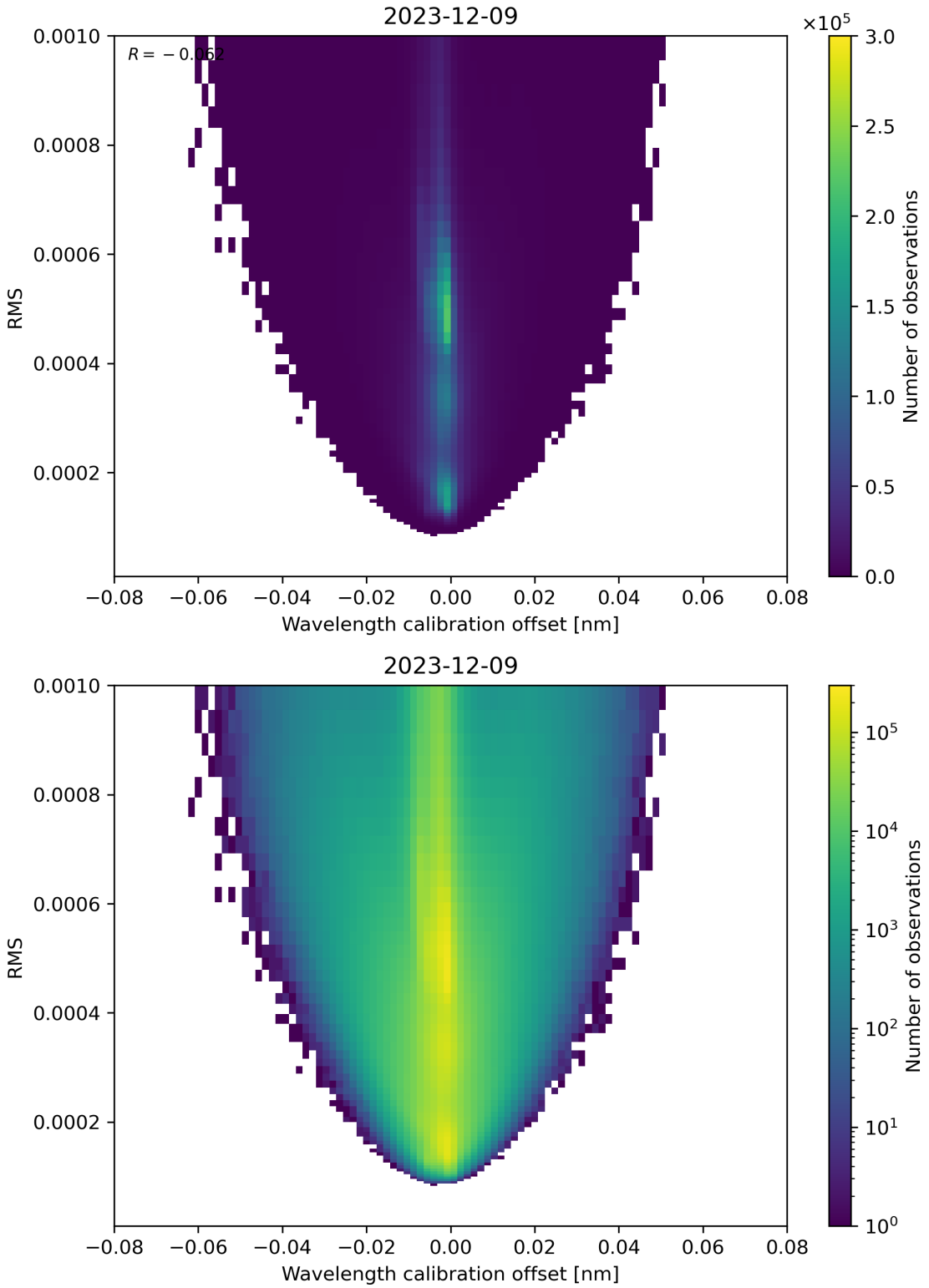


Figure 180: Scatter density plot of "Wavelength calibration offset" against "Total vertical NO_2 column precision" for 2023-12-09 to 2023-12-10.



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