PyCAMA report generated by tropl2-proc

tropl2-proc

2023-12-26 (01:30)

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]	0.943 ± 0.145	24812466	0.995	0.0	1.000	0.350	1.000
cloud pressure crb [hPa]	754 ± 212	24812466	1.015×10^{3}	322	805	130	1.063×10^{3}
cloud pressure crb precision [hPa]	1.64 ± 7.85	24812466	0.750	0.725	0.319	8.545×10^{-4}	1.584×10^{3}
cloud fraction crb [1]	0.499 ± 0.384	24812466	0.996	0.851	0.449	0.0	1.000
cloud fraction crb precision [1]	$(1.221 \pm 5.027) \times 10^{-4}$	24812466	2.500×10^{-4}	6.492×10^{-5}	6.683×10^{-5}	3.353×10^{-10}	0.308
scene albedo [1]	0.476 ± 0.337	24812466	2.500×10^{-2}	0.629	0.453	-4.598×10^{-2}	4.39
scene albedo precision [1]	$(7.024 \pm 7.997) \times 10^{-5}$	24812466	2.500×10^{-4}	5.265×10^{-5}	4.550×10^{-5}	9.875×10^{-6}	1.400×10^{-2}
apparent scene pressure [hPa]	781 ± 195	24812466	1.008×10^{3}	300	835	130	1.065×10^{3}
apparent scene pressure precision [hPa]	0.680 ± 1.322	24812466	0.500	0.424	0.271	4.132×10^{-2}	59.3
chi square [1]	$(0.766 \pm 40.495) \times 10^{5}$	24812466	0.150	5.786×10^{4}	2.927×10^{4}	66.9	1.638×10^{9}
number of iterations [1]	3.85 ± 1.55	24812466	3.23	2.00	3.00	1.000	14.0
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.622 \pm 6.454) \times 10^{-9}$	24812466	7.500×10^{-10}	5.251×10^{-9}	1.320×10^{-9}	-1.821×10^{-6}	1.668×10^{-6}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.774 \pm 0.721) \times 10^{-9}$	24812466	8.500×10^{-10}	1.100×10^{-9}	1.706×10^{-9}	4.226×10^{-10}	5.685×10^{-9}
chi square fluorescence [1]	$(0.498 \pm 0.982) \times 10^{5}$	24812466	1.250×10^{3}	4.471×10^{4}	1.413×10^{4}	94.6	2.441×10^{6}
degrees of freedom fluorescence [1]	6.00 ± 0.00	24812466	5.95	0.0	6.00	6.00	6.00
number of spectral points in retrieval [1]	59.0 ± 0.1	24812466	58.5	0.0	59.0	56.0	59.0
wavelength calibration offset [nm]	$(-3.379 \pm 10.662) \times 10^{-3}$	24812466	2.000×10^{-3}	1.079×10^{-2}	-1.401×10^{-3}	-0.142	0.127

Table 2: Percentile ranges

Variable	1 %	5 %	10 %	15.9 %	25 %	75 %	84.1 %	90 %	95 %	99 %
qa value [1]	0.500	0.500	0.900	0.900	1.000	1.000	1.000	1.000	1.000	1.000
cloud pressure crb [hPa]	238	346	423	509	615	937	969	989	1.010×10^{3}	1.020×10^{3}
cloud pressure crb precision [hPa]	6.589×10^{-2}	9.320×10^{-2}	0.114	0.133	0.165	0.891	1.61	2.89	6.18	21.7
cloud fraction crb [1]	0.0	1.461×10^{-2}	3.196×10^{-2}	5.679×10^{-2}	0.112	0.963	1.000	1.000	1.000	1.000
cloud fraction crb precision [1]	1.761×10^{-5}	2.134×10^{-5}	2.396×10^{-5}	2.702×10^{-5}	3.507×10^{-5}	1.000×10^{-4}	1.176×10^{-4}	1.958×10^{-4}	3.717×10^{-4}	1.013×10^{-3}
scene albedo [1]	8.372×10^{-3}	2.313×10^{-2}	4.256×10^{-2}	7.472×10^{-2}	0.150	0.779	0.884	0.940	0.989	1.11
scene albedo precision [1]	1.293×10^{-5}	1.515×10^{-5}	1.778×10^{-5}	2.128×10^{-5}	2.781×10^{-5}	8.045×10^{-5}	1.066×10^{-4}	1.395×10^{-4}	2.101×10^{-4}	4.256×10^{-4}
apparent scene pressure [hPa]	294	394	480	565	647	948	974	993	1.010×10^{3}	1.021×10^{3}
apparent scene pressure precision [hPa]	6.616×10^{-2}	9.229×10^{-2}	0.112	0.131	0.160	0.584	0.918	1.49	2.74	6.76
chi square [1]	421	1.361×10^{3}	3.127×10^{3}	5.887×10^{3}	1.078×10^{4}	6.864×10^{4}	9.388×10^{4}	1.190×10^{5}	1.527×10^{5}	2.341×10^{5}
number of iterations [1]	2.00	2.00	2.00	3.00	3.00	5.00	5.00	5.00	6.00	10.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	-1.317×10^{-8}	-6.054×10^{-9}	-3.679×10^{-9}	-2.296×10^{-9}	-1.004×10^{-9}	4.247×10^{-9}	6.046×10^{-9}	7.783×10^{-9}	1.026×10^{-8}	1.562×10^{-8}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	7.054×10^{-10}	8.066×10^{-10}	8.845×10^{-10}	9.815×10^{-10}	1.164×10^{-9}	2.264×10^{-9}	2.542×10^{-9}	2.688×10^{-9}	3.034×10^{-9}	3.696×10^{-9}
chi square fluorescence [1]	423	998	1.539×10^{3}	2.217×10^{3}	3.739×10^{3}	4.845×10^{4}	8.244×10^{4}	1.312×10^{5}	2.333×10^{5}	4.993×10^{5}
degrees of freedom fluorescence [1]	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
number of spectral points in retrieval [1]	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0
wavelength calibration offset [nm]	-3.777×10^{-2}	-2.269×10^{-2}	-1.649×10^{-2}	-1.225×10^{-2}	-7.979×10^{-3}	2.812×10^{-3}	4.333×10^{-3}	5.691×10^{-3}	9.171×10^{-3}	2.201×10^{-2}

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]	0.992 ± 0.039	9310387	0.0	1.000	0.350	1.000	1.000	1.000
cloud pressure crb [hPa]	730 ± 231	9310387	392	801	130	1.063×10^{3}	538	930
cloud pressure crb precision [hPa]	2.53 ± 10.40	9310387	1.38	0.579	8.545×10^{-4}	1.584×10^{3}	0.242	1.62
cloud fraction crb [1]	0.376 ± 0.341	9310387	0.589	0.255	0.0	1.000	6.875×10^{-2}	0.657
cloud fraction crb precision [1]	$(1.162 \pm 2.111) \times 10^{-4}$	9310387	8.193×10^{-5}	7.413×10^{-5}	6.284×10^{-9}	0.198	3.822×10^{-5}	1.201×10^{-4}
scene albedo [1]	0.378 ± 0.288	9310387	0.469	0.335	-4.598×10^{-2}	4.39	0.117	0.586
scene albedo precision [1]	$(7.443 \pm 8.567) \times 10^{-5}$	9310387	5.425×10^{-5}	4.689×10^{-5}	9.875×10^{-6}	1.400×10^{-2}	3.005×10^{-5}	8.430×10^{-5}
apparent scene pressure [hPa]	767 ± 212	9310387	347	839	130	1.065×10^{3}	599	946
apparent scene pressure precision [hPa]	0.920 ± 1.653	9310387	0.631	0.393	4.132×10^{-2}	59.3	0.215	0.846
chi square [1]	$(0.541 \pm 30.094) \times 10^{5}$	9310387	3.015×10^{4}	1.726×10^{4}	66.9	7.851×10^{8}	6.790×10^{3}	3.694×10^{4}
number of iterations [1]	3.82 ± 1.72	9310387	1.000	3.00	1.000	14.0	3.00	4.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(7.088 \pm 45.148) \times 10^{-10}$	9310387	3.670×10^{-9}	8.088×10^{-10}	-1.098×10^{-6}	9.755×10^{-7}	-9.637×10^{-10}	2.706×10^{-9}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.493 \pm 0.619) \times 10^{-9}$	9310387	8.543×10^{-10}	1.386×10^{-9}	4.275×10^{-10}	5.539×10^{-9}	9.847×10^{-10}	1.839×10^{-9}
chi square fluorescence [1]	$(0.455 \pm 0.922) \times 10^{5}$	9310387	3.997×10^{4}	1.102×10^{4}	97.7	1.877×10^{6}	3.023×10^{3}	4.299×10^{4}
degrees of freedom fluorescence [1]	6.00 ± 0.00	9310387	0.0	6.00	6.00	6.00	6.00	6.00
number of spectral points in retrieval [1]	59.0 ± 0.1	9310387	0.0	59.0	57.0	59.0	59.0	59.0
wavelength calibration offset [nm]	$(-4.526 \pm 11.929) \times 10^{-3}$	9310387	1.215×10^{-2}	-2.722×10^{-3}	-0.136	8.556×10^{-2}	-9.993×10^{-3}	2.157×10^{-3}

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]	0.913 ± 0.174	15502079	0.1000	1.000	0.350	1.000	0.900	1.000
cloud pressure crb [hPa]	769 ± 199	15502079	300	808	130	1.034×10^3	640	940
cloud pressure crb precision [hPa]	1.10 ± 5.74	15502079	0.416	0.240	9.766×10^{-4}	879	0.149	0.565
cloud fraction crb [1]	0.573 ± 0.388	15502079	0.843	0.617	0.0	1.000	0.157	1.000
cloud fraction crb precision [1]	$(1.256 \pm 6.146) \times 10^{-4}$	15502079	6.675×10^{-5}	6.181×10^{-5}	3.353×10^{-10}	0.308	3.325×10^{-5}	1.000×10^{-4}
scene albedo [1]	0.535 ± 0.351	15502079	0.684	0.575	-2.875×10^{-2}	3.69	0.176	0.861
scene albedo precision [1]	$(6.773 \pm 7.623) \times 10^{-5}$	15502079	5.201×10^{-5}	4.470×10^{-5}	9.939×10^{-6}	4.140×10^{-3}	2.646×10^{-5}	7.847×10^{-5}
apparent scene pressure [hPa]	790 ± 184	15502079	288	832	130	1.034×10^3	660	949
apparent scene pressure precision [hPa]	0.536 ± 1.050	15502079	0.293	0.222	4.135×10^{-2}	32.7	0.146	0.439
chi square [1]	$(0.902 \pm 45.615) \times 10^5$	15502079	7.090×10^4	4.264×10^4	123	1.638×10^9	1.592×10^4	8.681×10^4
number of iterations [1]	3.86 ± 1.43	15502079	2.00	4.00	1.000	14.0	3.00	5.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(2.170 \pm 7.323) \times 10^{-9}$	15502079	6.406×10^{-9}	1.877×10^{-9}	-1.821×10^{-6}	1.668×10^{-6}	-1.034×10^{-9}	5.372×10^{-9}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.943 \pm 0.725) \times 10^{-9}$	15502079	1.135×10^{-9}	1.972×10^{-9}	4.226×10^{-10}	5.685×10^{-9}	1.333×10^{-9}	2.468×10^{-9}
chi square fluorescence [1]	$(0.524 \pm 1.016) \times 10^5$	15502079	4.718×10^4	1.608×10^4	94.6	2.441×10^6	4.344×10^3	5.153×10^4
degrees of freedom fluorescence [1]	6.00 ± 0.00	15502079	0.0	6.00	6.00	6.00	6.00	6.00
number of spectral points in retrieval [1]	59.0 ± 0.1	15502079	0.0	59.0	56.0	59.0	59.0	59.0
wavelength calibration offset [nm]	$(-2.691 \pm 9.758) \times 10^{-3}$	15502079	9.818×10^{-3}	-7.071×10^{-4}	-0.142	0.127	-6.742×10^{-3}	3.075×10^{-3}

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]	0.982 ± 0.043	16200657	0.0	1.000	0.350	1.000	1.000	1.000
cloud pressure crb [hPa]	777 ± 219	16200657	333	862	130	1.043×10^{3}	620	953
cloud pressure crb precision [hPa]	1.78 ± 8.34	16200657	0.819	0.354	2.319×10^{-3}	1.584×10^{3}	0.171	0.990
cloud fraction crb [1]	0.414 ± 0.350	16200657	0.647	0.322	0.0	1.000	8.482×10^{-2}	0.732
cloud fraction crb precision [1]	$(7.996 \pm 14.328) \times 10^{-5}$	16200657	5.543×10^{-5}	4.499×10^{-5}	4.566×10^{-9}	5.644×10^{-2}	2.738×10^{-5}	8.281×10^{-5}
scene albedo [1]	0.360 ± 0.301	16200657	0.542	0.285	-4.598×10^{-2}	4.06	7.862×10^{-2}	0.621
scene albedo precision [1]	$(5.494 \pm 7.107) \times 10^{-5}$	16200657	3.424×10^{-5}	3.683×10^{-5}	9.939×10^{-6}	1.400×10^{-2}	2.169×10^{-5}	5.593×10^{-5}
apparent scene pressure [hPa]	797 ± 208	16200657	304	878	130	1.064×10^{3}	659	963
apparent scene pressure precision [hPa]	0.886 ± 1.585	16200657	0.678	0.330	4.132×10^{-2}	58.5	0.167	0.845
chi square [1]	$(0.840 \pm 49.981) \times 10^{5}$	16200657	4.990×10^{4}	2.194×10^{4}	66.9	1.638×10^{9}	6.897×10^{3}	5.680×10^{4}
number of iterations [1]	3.32 ± 1.13	16200657	1.000	3.00	1.000	14.0	3.00	4.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(7.055 \pm 55.392) \times 10^{-10}$	16200657	4.551×10^{-9}	3.989×10^{-10}	-1.413×10^{-6}	1.139×10^{-6}	-1.625×10^{-9}	2.926×10^{-9}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.706 \pm 0.754) \times 10^{-9}$	16200657	1.196×10^{-9}	1.550×10^{-9}	4.226×10^{-10}	5.420×10^{-9}	1.048×10^{-9}	2.244×10^{-9}
chi square fluorescence [1]	$(0.503 \pm 0.940) \times 10^{5}$	16200657	4.771×10^{4}	1.801×10^{4}	94.6	2.285×10^{6}	5.307×10^{3}	5.301×10^{4}
degrees of freedom fluorescence [1]	6.00 ± 0.00	16200657	0.0	6.00	6.00	6.00	6.00	6.00
number of spectral points in retrieval [1]	59.0 ± 0.1	16200657	0.0	59.0	57.0	59.0	59.0	59.0
wavelength calibration offset [nm]	$(-4.655 \pm 11.623) \times 10^{-3}$	16200657	1.146×10^{-2}	-3.063×10^{-3}	-0.142	0.127	-9.895×10^{-3}	1.563×10^{-3}

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]	0.848 ± 0.231	7388797	0.500	1.000	0.350	1.000	0.500	1.000
cloud pressure crb [hPa]	715 ± 188	7388797	249	713	130	1.054×10^3	619	868
cloud pressure crb precision [hPa]	1.34 ± 6.63	7388797	0.498	0.254	8.545×10^{-4}	1.518×10^3	0.153	0.651
cloud fraction crb [1]	0.678 ± 0.395	7388797	0.767	1.000	0.0	1.000	0.233	1.000
cloud fraction crb precision [1]	$(2.008 \pm 8.774) \times 10^{-4}$	7388797	9.031×10^{-6}	1.000×10^{-4}	3.353×10^{-10}	0.308	1.000×10^{-4}	1.090×10^{-4}
scene albedo [1]	0.717 ± 0.286	7388797	0.502	0.827	-7.842×10^{-3}	4.31	0.446	0.948
scene albedo precision [1]	$(9.464 \pm 7.827) \times 10^{-5}$	7388797	6.070×10^{-5}	7.555×10^{-5}	9.875×10^{-6}	1.676×10^{-3}	4.825×10^{-5}	1.090×10^{-4}
apparent scene pressure [hPa]	754 ± 159	7388797	252	746	130	1.054×10^3	644	896
apparent scene pressure precision [hPa]	0.267 ± 0.196	7388797	0.169	0.216	4.135×10^{-2}	13.1	0.147	0.316
chi square [1]	$(0.656 \pm 0.790) \times 10^5$	7388797	6.908×10^4	4.977×10^4	171	3.222×10^7	2.355×10^4	9.262×10^4
number of iterations [1]	4.93 ± 1.72	7388797	1.000	5.00	1.000	14.0	4.00	5.00
fluorescence [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(3.555 \pm 7.699) \times 10^{-9}$	7388797	5.031×10^{-9}	3.353×10^{-9}	-1.821×10^{-6}	1.668×10^{-6}	1.105×10^{-9}	6.136×10^{-9}
fluorescence precision [mol s^{-1} m^{-2} nm^{-1} sr^{-1}]	$(1.955 \pm 0.616) \times 10^{-9}$	7388797	8.343×10^{-10}	1.950×10^{-9}	4.473×10^{-10}	5.685×10^{-9}	1.522×10^{-9}	2.357×10^{-9}
chi square fluorescence [1]	$(0.474 \pm 1.032) \times 10^5$	7388797	3.333×10^4	7.734×10^3	129	1.869×10^6	2.348×10^3	3.568×10^4
degrees of freedom fluorescence [1]	6.00 ± 0.00	7388797	0.0	6.00	6.00	6.00	6.00	6.00
number of spectral points in retrieval [1]	59.0 ± 0.1	7388797	0.0	59.0	57.0	59.0	59.0	59.0
wavelength calibration offset [nm]	$(-6.652 \pm 75.561) \times 10^{-4}$	7388797	7.025×10^{-3}	1.538×10^{-3}	-8.528×10^{-2}	7.237×10^{-2}	-3.097×10^{-3}	3.928×10^{-3}

Table 7: Correlation matrix

Viewing zenith angle	Solar zenith angle	Latitude	Cloud pressure	Cloud fraction	Scene albedo	Apparent scene pressure	χ^2	Number of iterations	Fluorescence	χ^2 of fluorescence retrieval	Number of points in the spectrum	Spectral offset (λ(true) − λ(nominal))
1.000	1.161×10^{-2}	1.829×10^{-3}	-8.582×10^{-2}	6.904×10^{-2}	7.833×10^{-2}	-9.510×10^{-2}	-3.351×10^{-4}	-3.200×10^{-2}	5.751×10^{-2}	1.517×10^{-2}	1.731×10^{-2}	-9.997×10^{-2}
1.161×10^{-2}	1.000	8.599×10^{-2}	−0.188	0.429	0.504	−0.195	-6.902×10^{-3}	0.248	0.193	−0.339	3.977×10^{-3}	0.294
1.829×10^{-3}	8.599×10^{-2}	1.000	-9.563×10^{-2}	−0.393	−0.395	-5.450×10^{-2}	-3.328×10^{-3}	−0.135	−0.192	4.542×10^{-2}	1.205×10^{-3}	−0.152
-8.582×10^{-2}	−0.188	-9.563×10^{-2}	1.000	−0.224	−0.252	0.932	8.406×10^{-3}	-9.316×10^{-2}	−0.141	0.152	-8.581×10^{-3}	−0.196
6.904×10^{-2}	0.429	−0.393	−0.224	1.000	0.948	−0.369	1.427×10^{-2}	4.013×10^{-2}	0.377	-4.660×10^{-3}	-1.754×10^{-4}	0.300
7.833×10^{-2}	0.504	−0.395	−0.252	0.948	1.000	−0.352	-1.672×10^{-3}	0.217	0.397	2.700×10^{-3}	6.378×10^{-4}	0.305
-9.510×10^{-2}	−0.195	-5.450×10^{-2}	0.932	−0.369	−0.352	1.000	1.660×10^{-3}	-4.957×10^{-3}	−0.174	0.180	-7.420×10^{-3}	−0.238
-3.351×10^{-4}	-6.902×10^{-3}	-3.328×10^{-3}	8.406×10^{-3}	1.427×10^{-2}	-1.672×10^{-3}	1.660×10^{-3}	1.000	1.721×10^{-2}	-7.630×10^{-4}	5.132×10^{-3}	8.669×10^{-5}	-2.441×10^{-3}
-3.200×10^{-2}	0.248	−0.135	-9.316×10^{-2}	4.013×10^{-2}	0.217	-4.957×10^{-3}	1.721×10^{-2}	1.000	0.142	-8.774×10^{-2}	1.343×10^{-3}	9.625×10^{-2}
5.751×10^{-2}	0.193	−0.192	−0.141	0.377	0.397	−0.174	-7.630×10^{-4}	0.142	1.000	−0.185	-1.464×10^{-4}	0.263
1.517×10^{-2}	−0.339	4.542×10^{-2}	0.152	-4.660×10^{-3}	2.700×10^{-3}	0.180	5.132×10^{-3}	-8.774×10^{-2}	−0.185	1.000	-3.151×10^{-3}	−0.381
1.731×10^{-2}	3.977×10^{-3}	1.205×10^{-3}	-8.581×10^{-3}	-1.754×10^{-4}	6.378×10^{-4}	-7.420×10^{-3}	8.669×10^{-5}	1.343×10^{-3}	-1.464×10^{-4}	-3.151×10^{-3}	1.000	-7.595×10^{-3}
-9.997×10^{-2}	0.294	−0.152	−0.196	0.300	0.305	−0.238	-2.441×10^{-3}	9.625×10^{-2}	0.263	−0.381	-7.595×10^{-3}	1.000

Table 8: Covariance matrix

Viewing zenith angle	Solar zenith angle	Latitude	Cloud pressure	Cloud fraction	Scene albedo	Apparent scene pressure	χ^2	Number of iterations	Fluorescence	χ^2 of fluorescence retrieval	Number of points in the spectrum	Spectral offset (λ(true) − λ(nominal))
383	4.43	1.63	−357	0.518	0.517	−364	-2.655×10^{4}	−0.969	7.264×10^{-9}	2.917×10^{4}	3.226×10^{-2}	-2.086×10^{-2}
4.43	380	76.4	−777	3.21	3.32	−741	-5.446×10^{5}	7.47	2.427×10^{-8}	-6.480×10^{5}	7.377×10^{-3}	6.110×10^{-2}
1.63	76.4	2.082×10^{3}	−927	−6.88	−6.08	−486	-6.149×10^{5}	−9.51	-5.657×10^{-8}	2.036×10^{5}	5.233×10^{-3}	-7.387×10^{-2}
−357	−777	−927	4.511×10^{4}	−18.3	−18.1	3.865×10^{4}	7.230×10^{6}	−30.6	-1.938×10^{-7}	3.180×10^{6}	−0.174	−0.444
0.518	3.21	−6.88	−18.3	0.147	0.123	−27.6	2.215×10^{4}	2.380×10^{-2}	9.324×10^{-10}	−176	-6.406×10^{-6}	1.226×10^{-3}
0.517	3.32	−6.08	−18.1	0.123	0.114	−23.2	-2.284×10^{3}	0.113	8.648×10^{-10}	89.5	2.049×10^{-5}	1.097×10^{-3}
−364	−741	−486	3.865×10^{4}	−27.6	−23.2	3.815×10^{4}	1.313×10^{6}	−1.50	-2.192×10^{-7}	3.447×10^{6}	−0.138	−0.496
-2.655×10^{4}	-5.446×10^{5}	-6.149×10^{5}	7.230×10^{6}	2.215×10^{4}	-2.284×10^{3}	1.313×10^{6}	1.640×10^{13}	1.078×10^{5}	-1.994×10^{-5}	2.042×10^{9}	33.4	−105
−0.969	7.47	−9.51	−30.6	2.380×10^{-2}	0.113	−1.50	1.078×10^{5}	2.39	1.418×10^{-9}	-1.333×10^{4}	1.978×10^{-4}	1.587×10^{-3}
7.264×10^{-9}	2.427×10^{-8}	-5.657×10^{-8}	-1.938×10^{-7}	9.324×10^{-10}	8.648×10^{-10}	-2.192×10^{-7}	-1.994×10^{-5}	1.418×10^{-9}	4.165×10^{-17}	-1.175×10^{-4}	-8.998×10^{-14}	1.812×10^{-11}
2.917×10^{4}	-6.480×10^{5}	2.036×10^{5}	3.180×10^{6}	−176	89.5	3.447×10^{6}	2.042×10^{9}	-1.333×10^{4}	-1.175×10^{-4}	9.652×10^{9}	−29.5	−399
3.226×10^{-2}	7.377×10^{-3}	5.233×10^{-3}	−0.174	-6.406×10^{-6}	2.049×10^{-5}	−0.138	33.4	1.978×10^{-4}	-8.998×10^{-14}	−29.5	9.066×10^{-3}	-7.710×10^{-6}
-2.086×10^{-2}	6.110×10^{-2}	-7.387×10^{-2}	−0.444	1.226×10^{-3}	1.097×10^{-3}	−0.496	−105	1.587×10^{-3}	1.812×10^{-11}	−399	-7.710×10^{-6}	1.137×10^{-4}

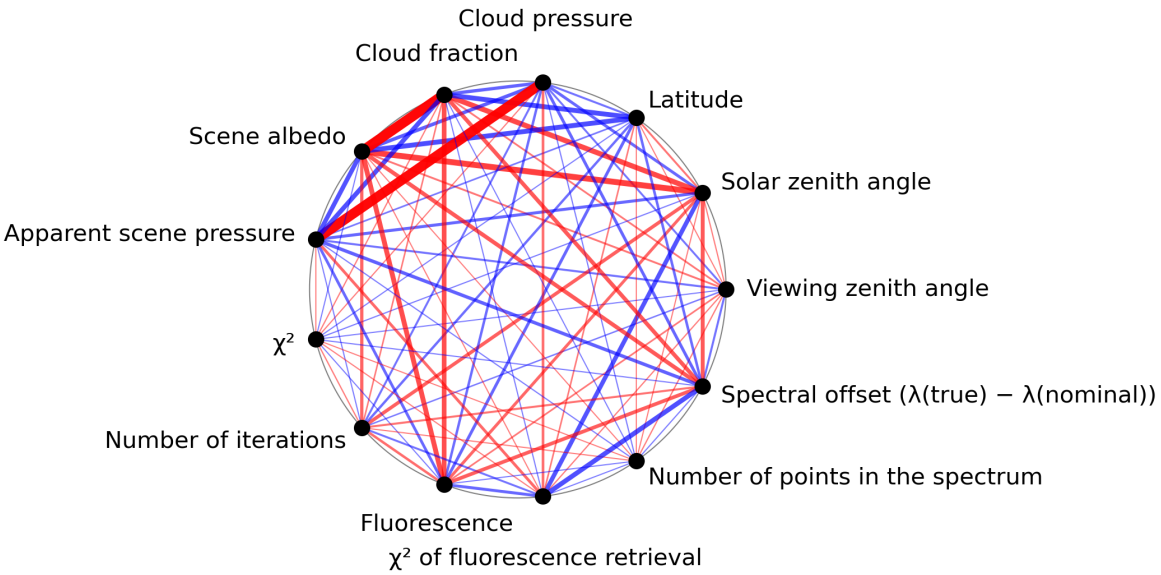


Figure 1: Map of correlation graph for 2023-12-10 to 2023-12-12.

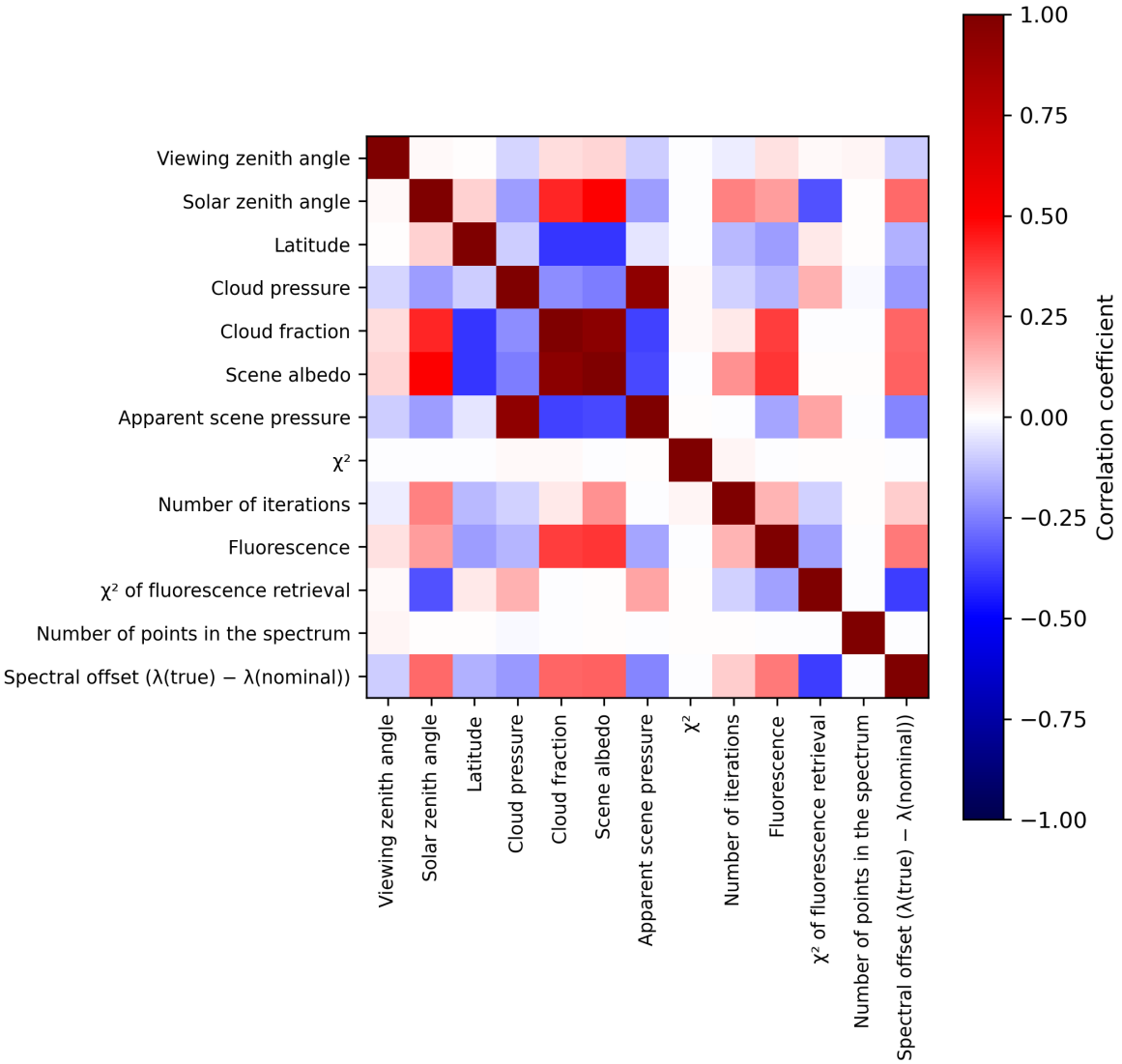


Figure 2: Map of correlation matrix for 2023-12-10 to 2023-12-12.

3 Granule outlines

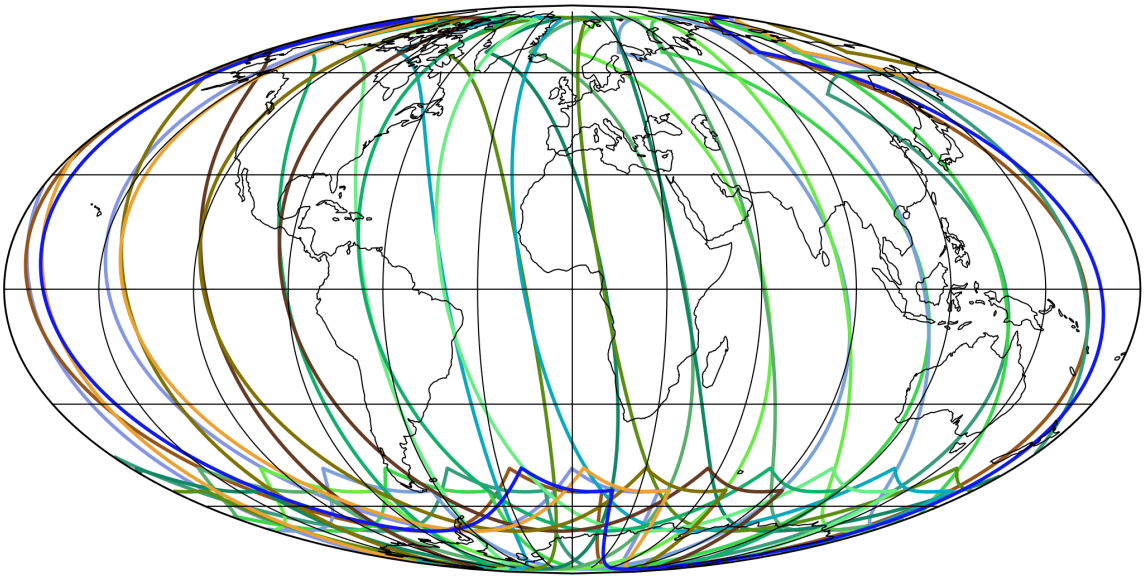


Figure 3: Outline of the granules.

4 Input data monitoring

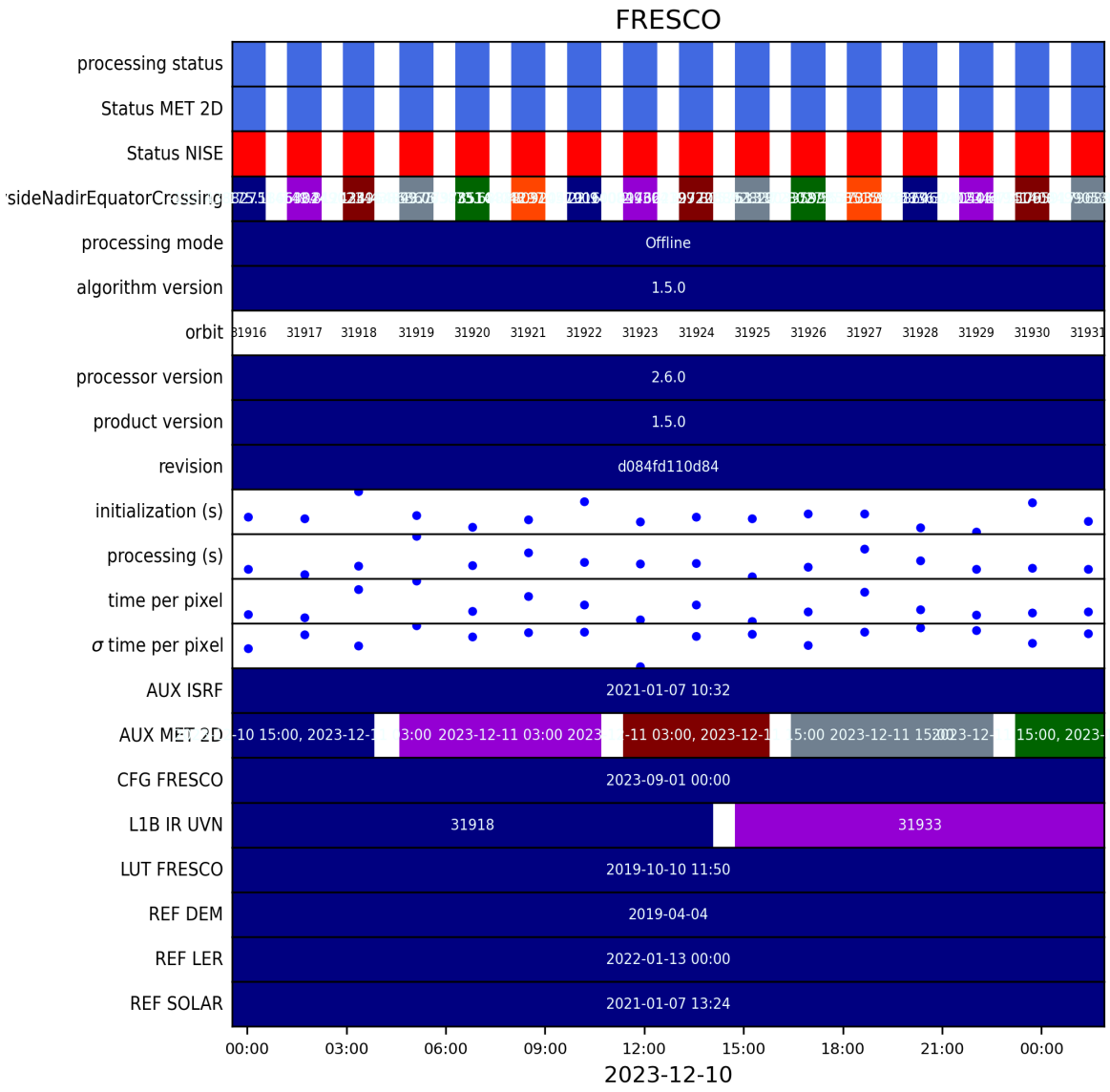


Figure 4: Input data per granule

5 Warnings and errors

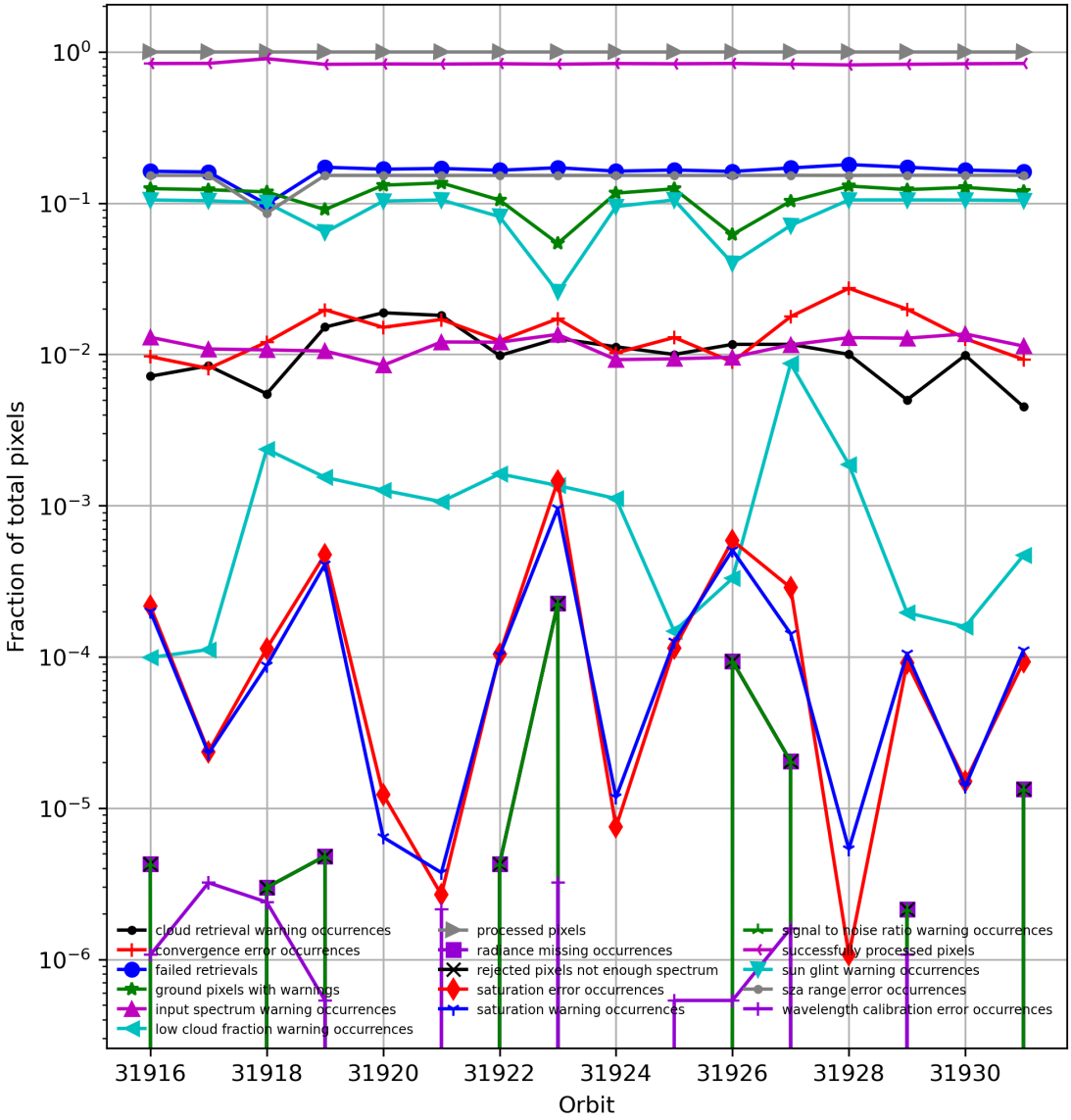


Figure 5: Fraction of pixels with specific warnings and errors during processing

6 World maps

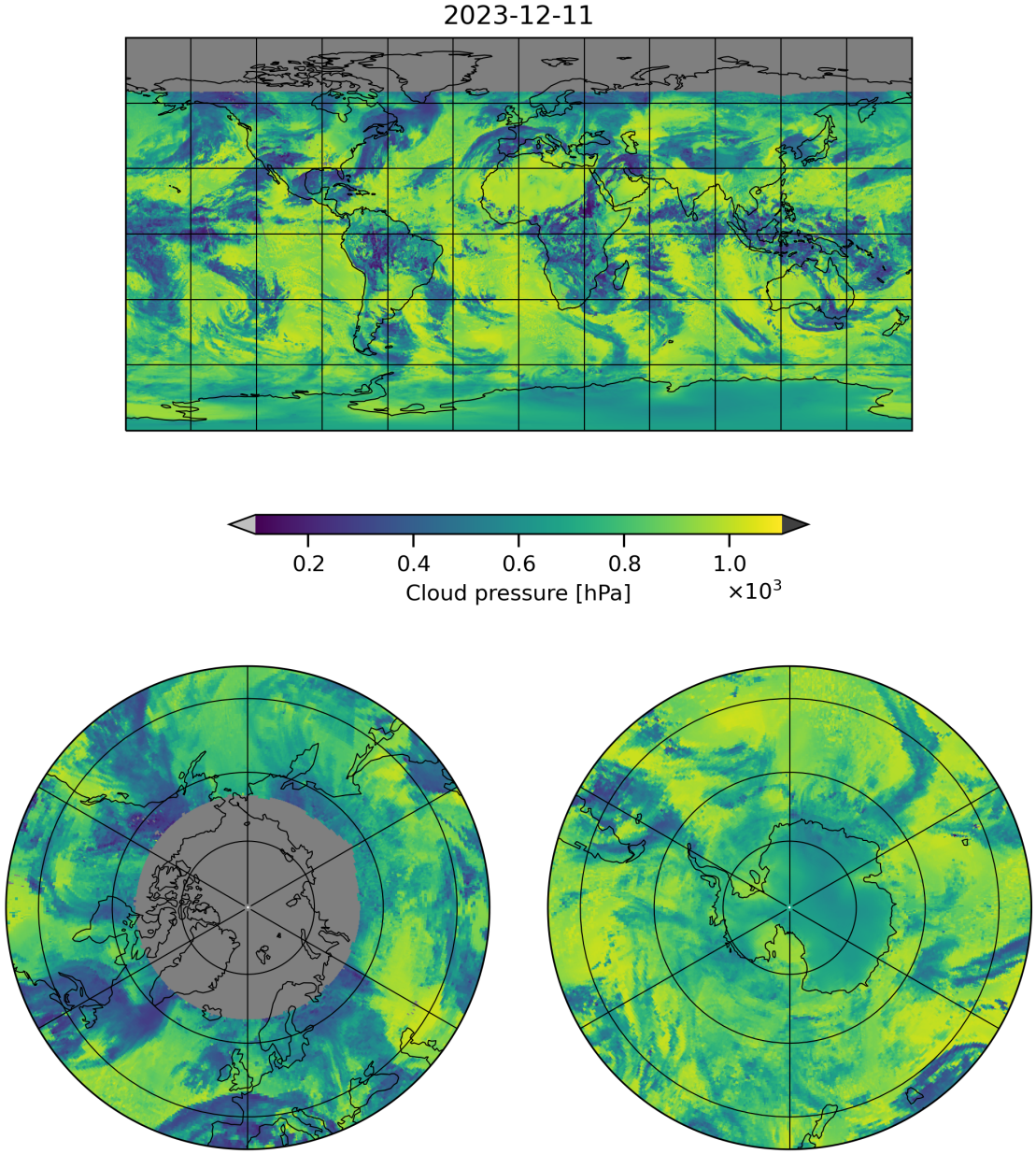


Figure 6: Map of “Cloud pressure” for 2023-12-10 to 2023-12-12

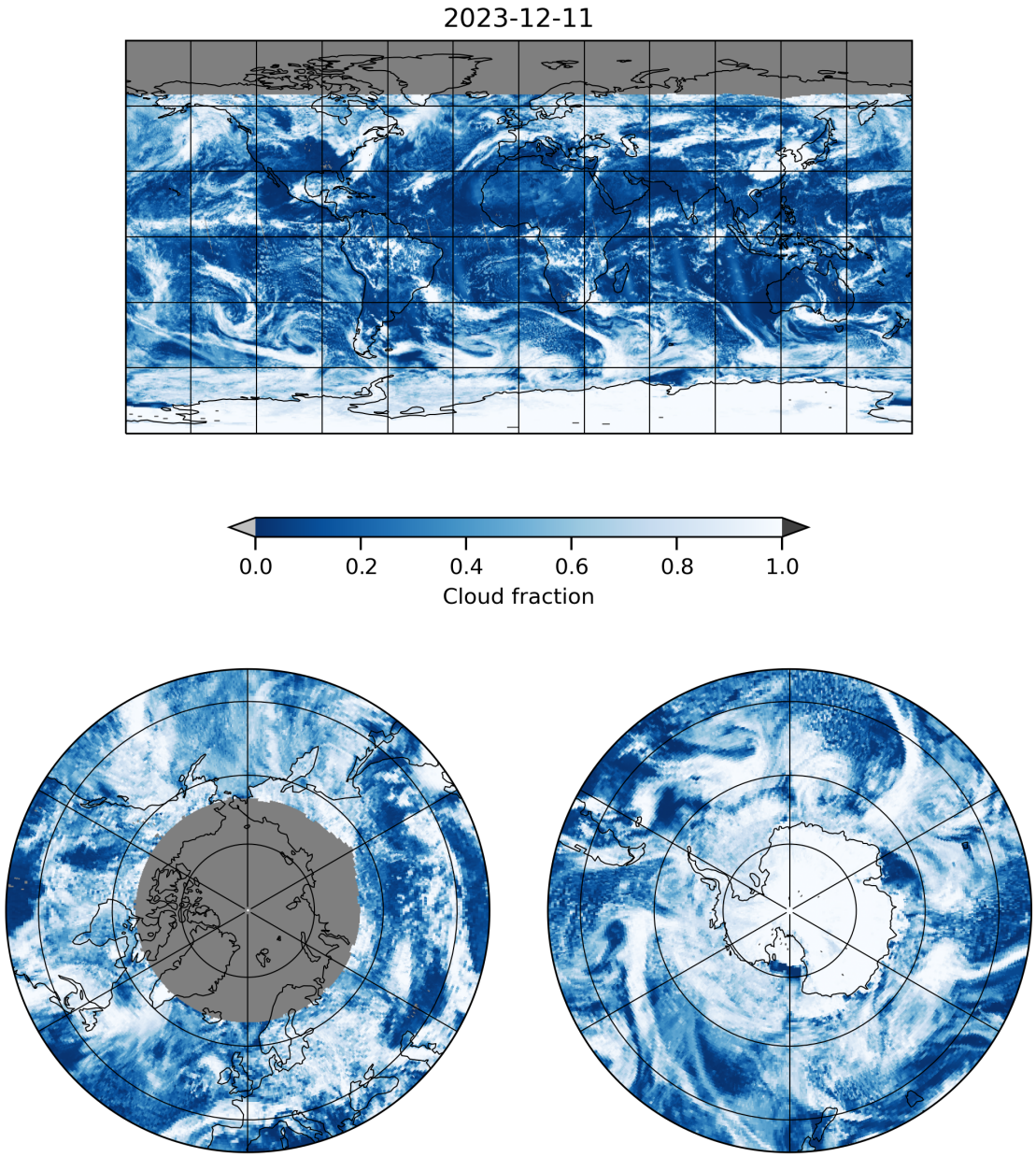


Figure 7: Map of “Cloud fraction” for 2023-12-10 to 2023-12-12

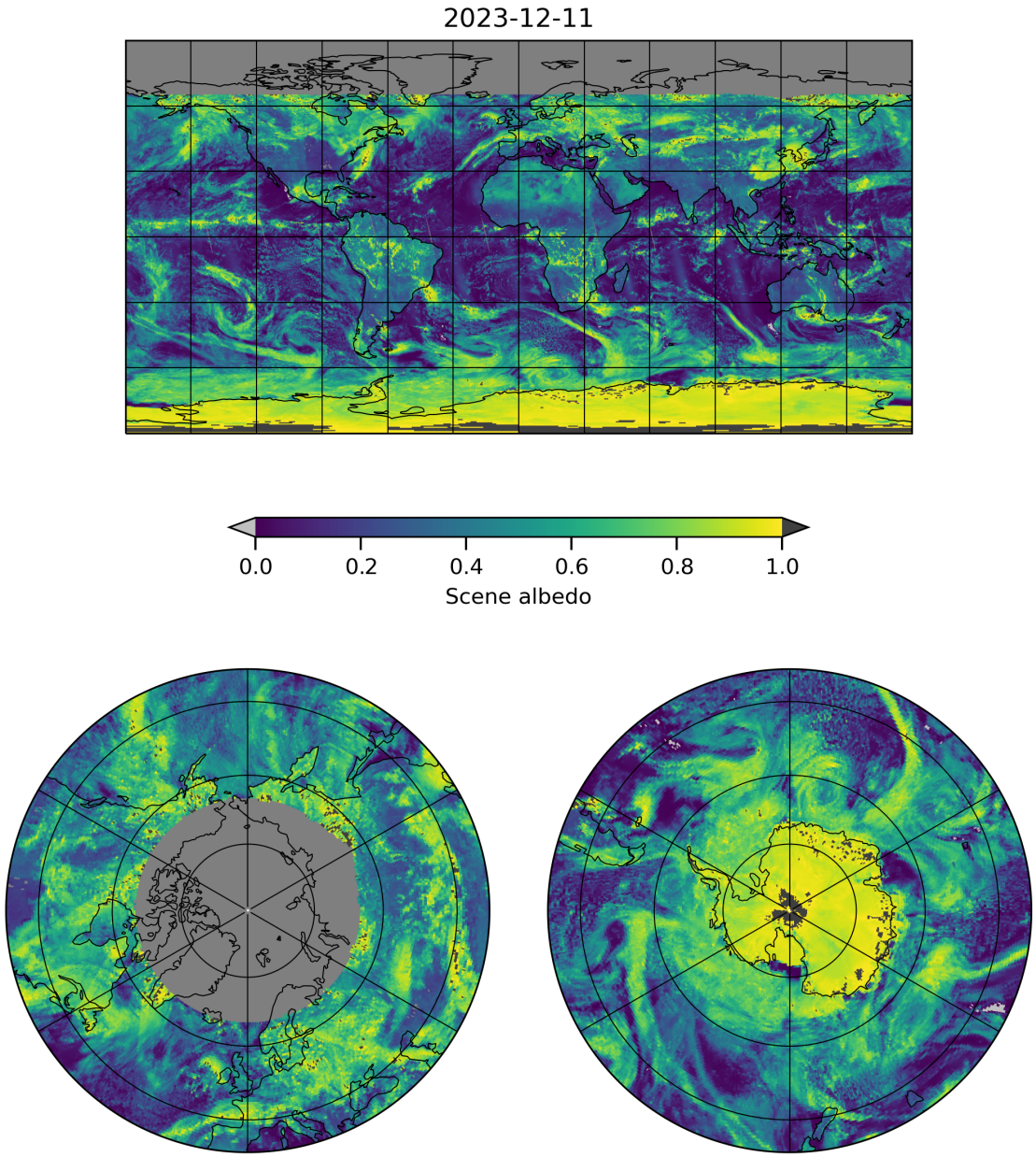


Figure 8: Map of “Scene albedo” for 2023-12-10 to 2023-12-12

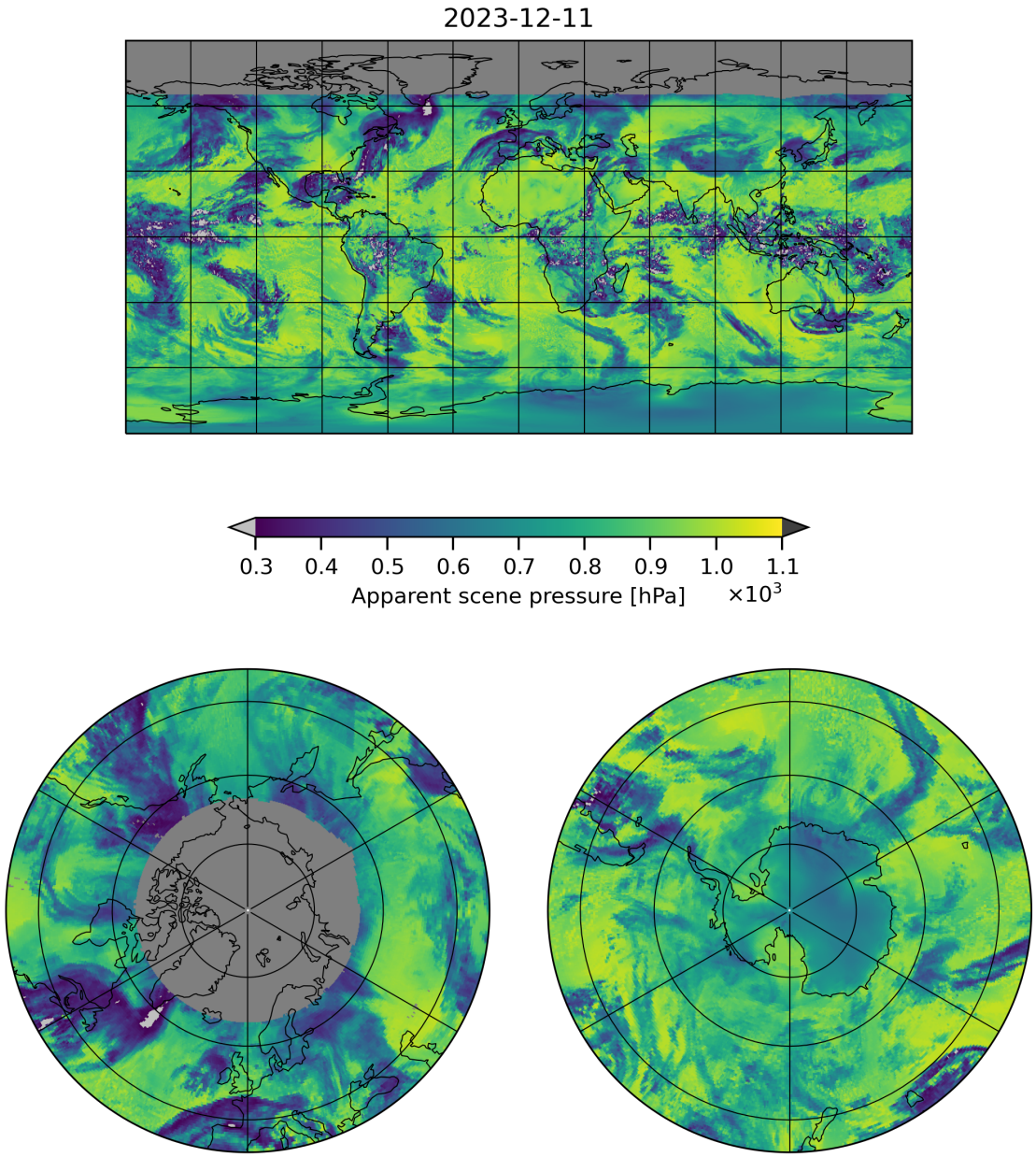


Figure 9: Map of “Apparent scene pressure” for 2023-12-10 to 2023-12-12

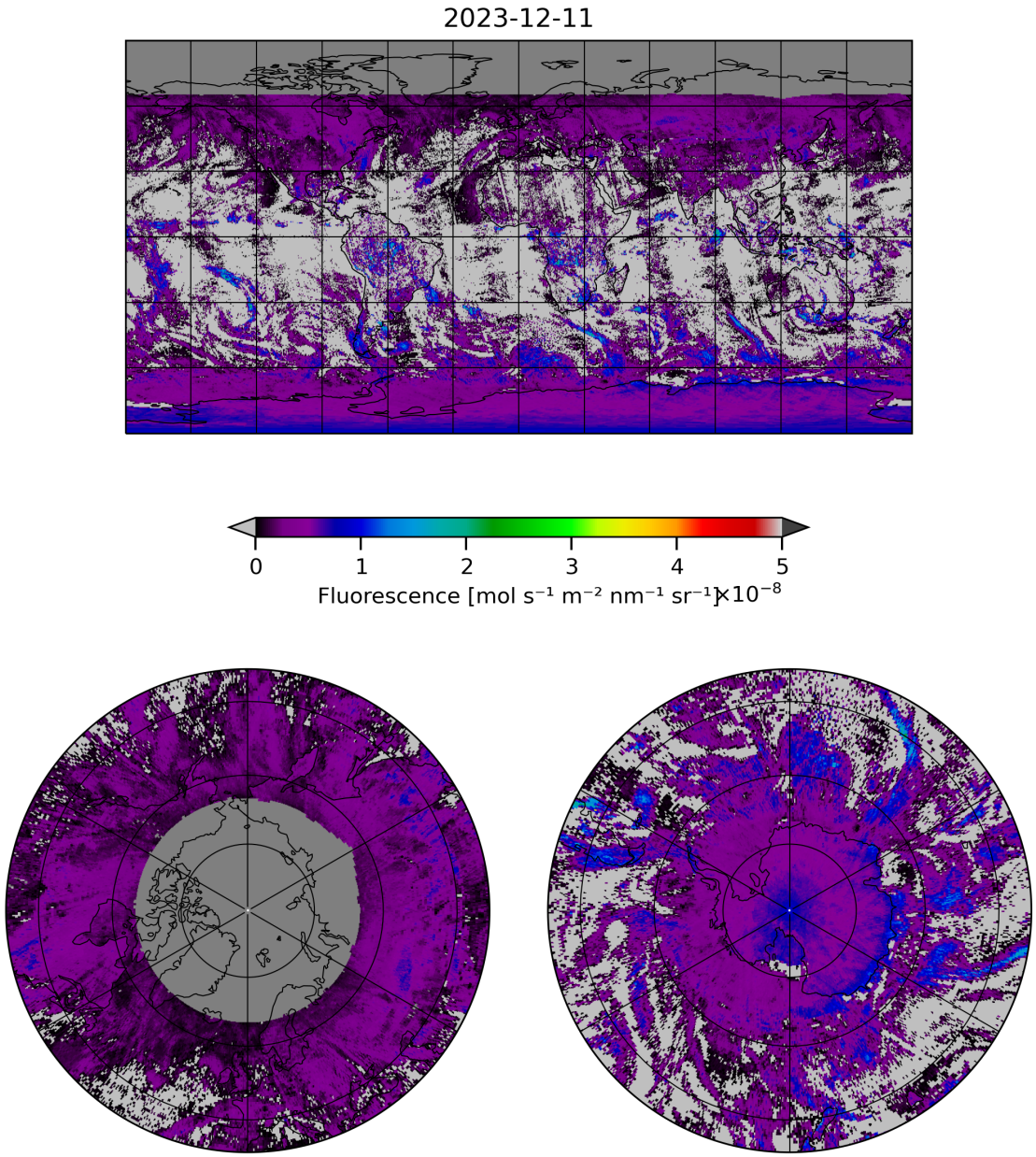


Figure 10: Map of “Fluorescence” for 2023-12-10 to 2023-12-12

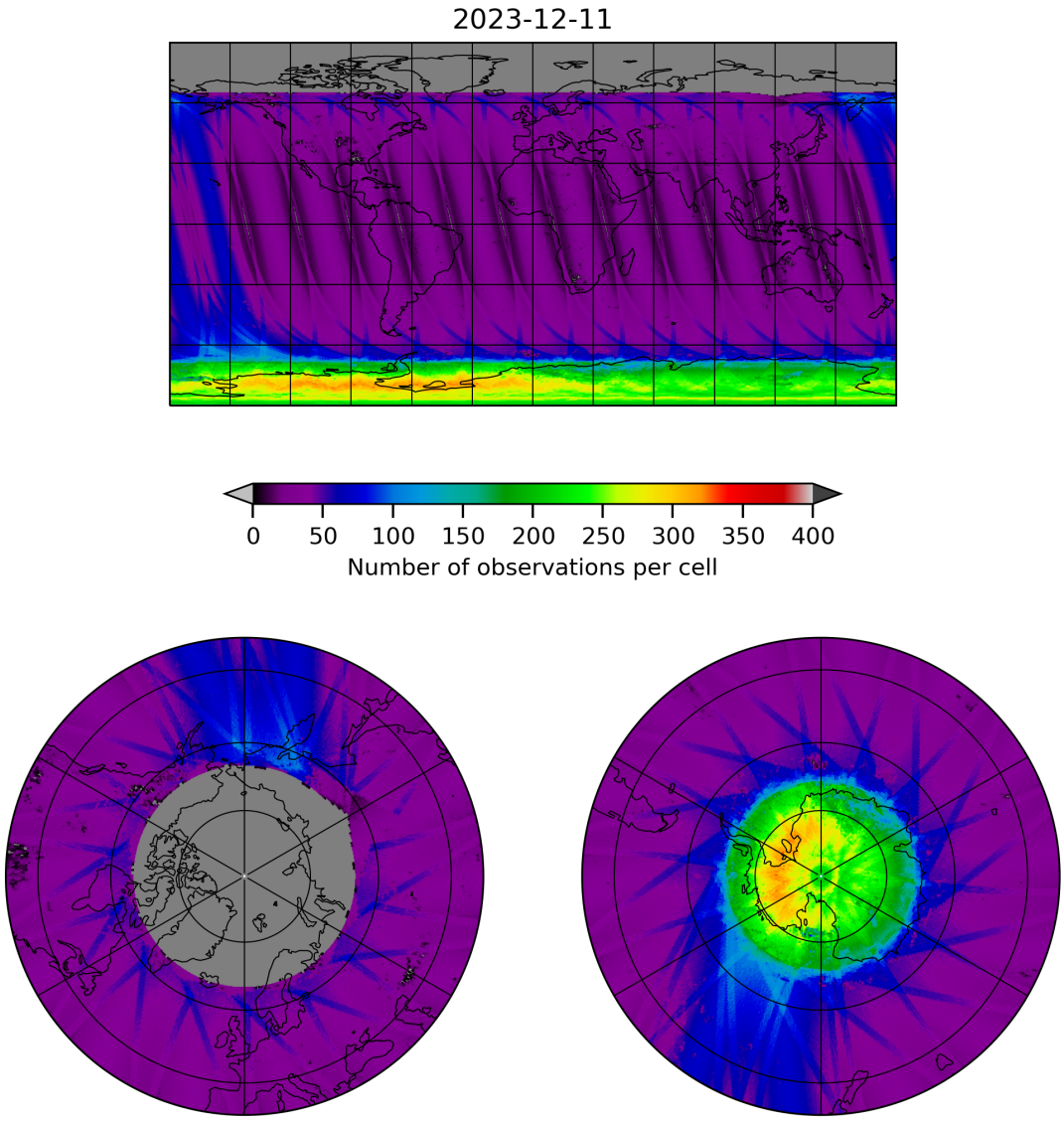


Figure 11: Map of the number of observations for 2023-12-10 to 2023-12-12

7 Zonal average

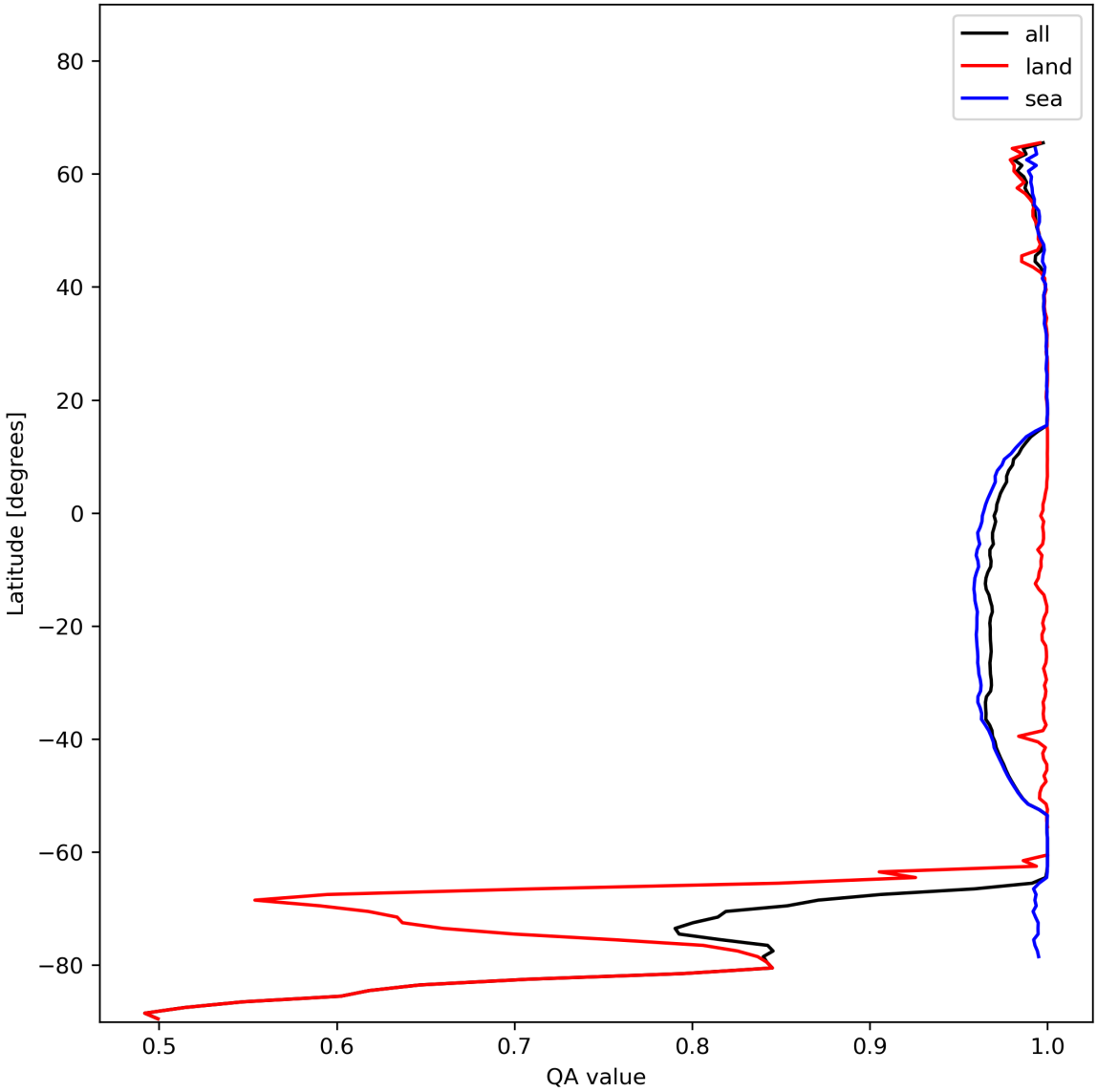


Figure 12: Zonal average of “QA value” for 2023-12-10 to 2023-12-12.

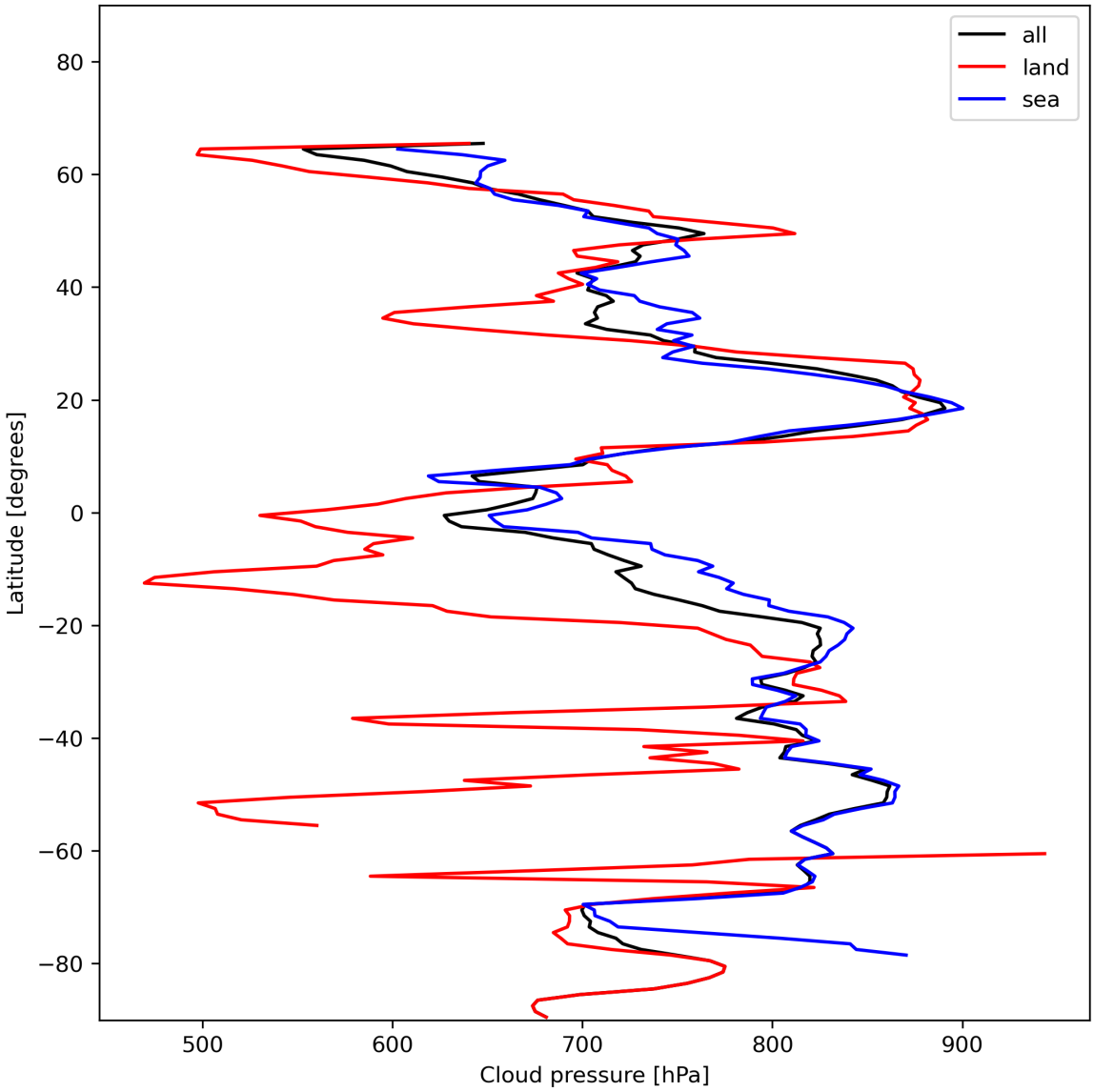


Figure 13: Zonal average of “Cloud pressure” for 2023-12-10 to 2023-12-12.

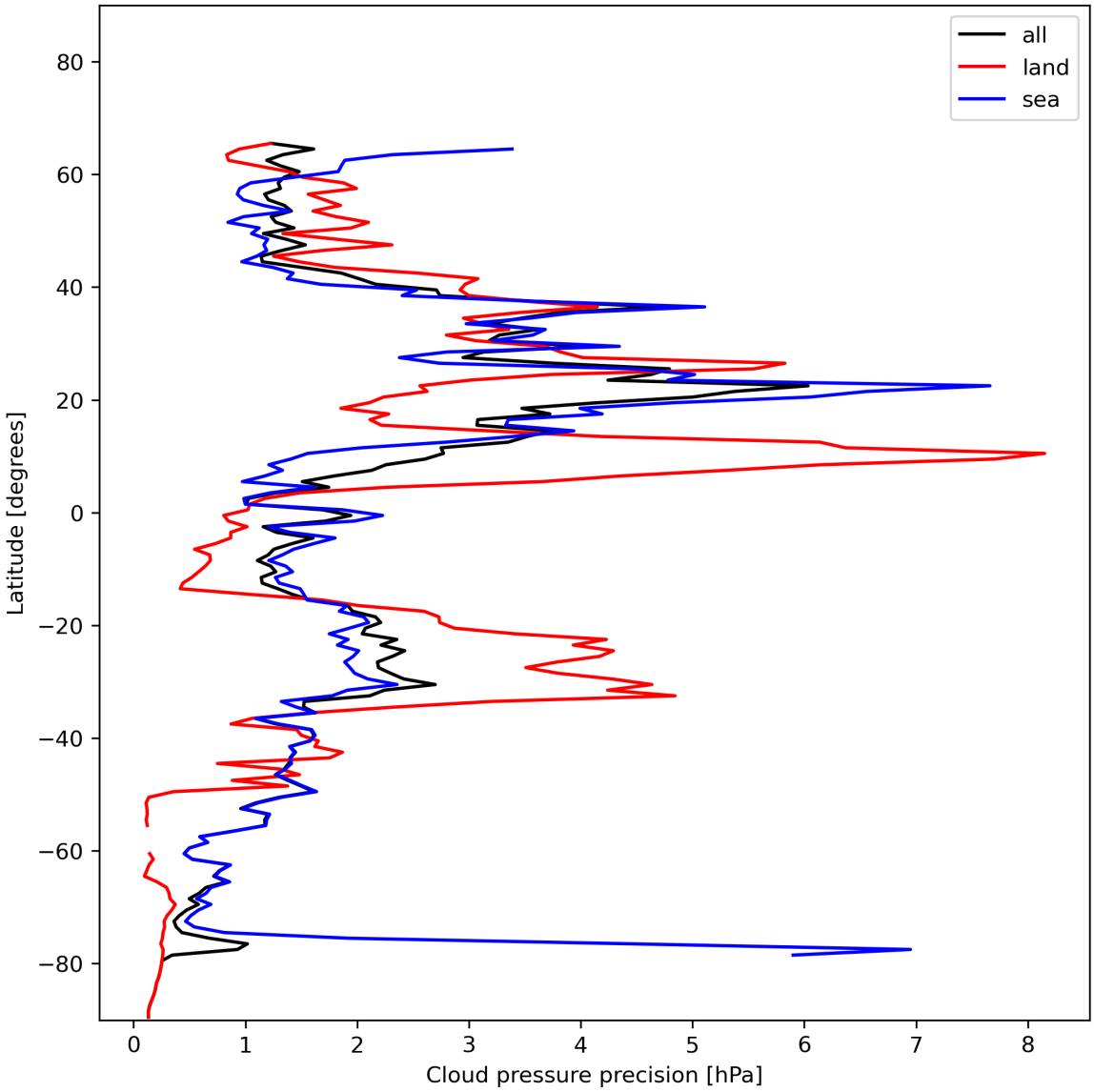


Figure 14: Zonal average of “Cloud pressure precision” for 2023-12-10 to 2023-12-12.

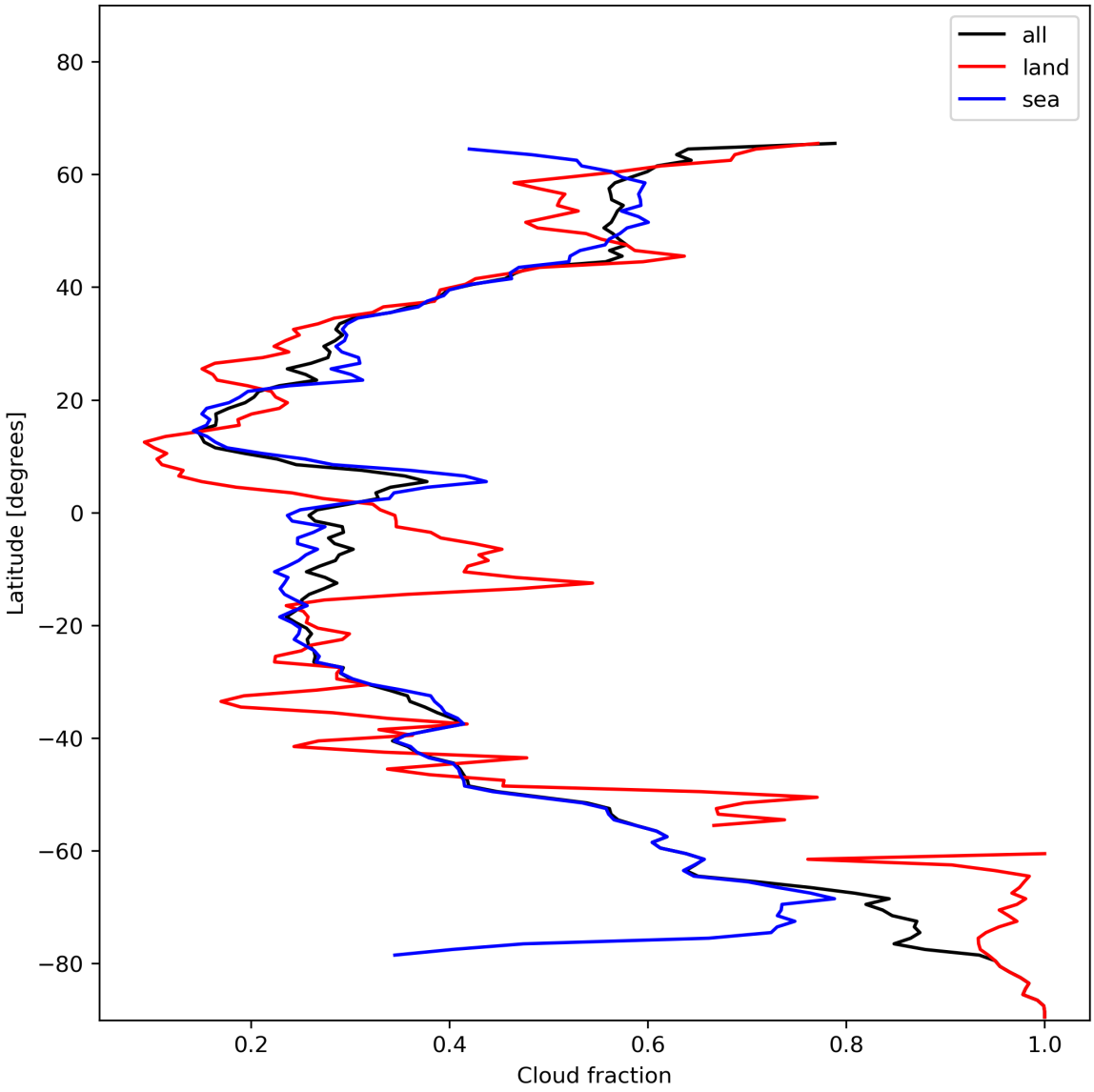


Figure 15: Zonal average of “Cloud fraction” for 2023-12-10 to 2023-12-12.

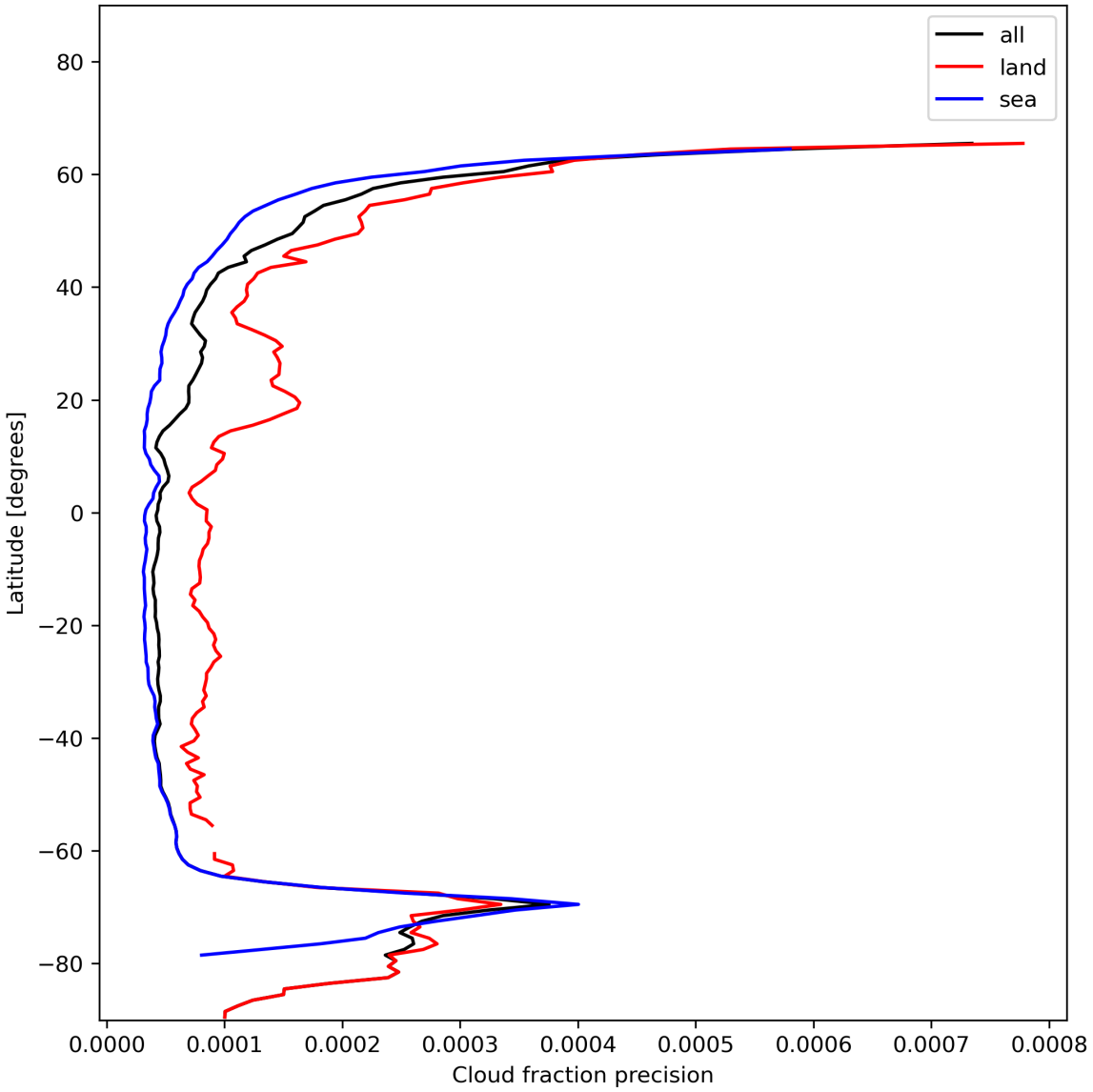


Figure 16: Zonal average of “Cloud fraction precision” for 2023-12-10 to 2023-12-12.

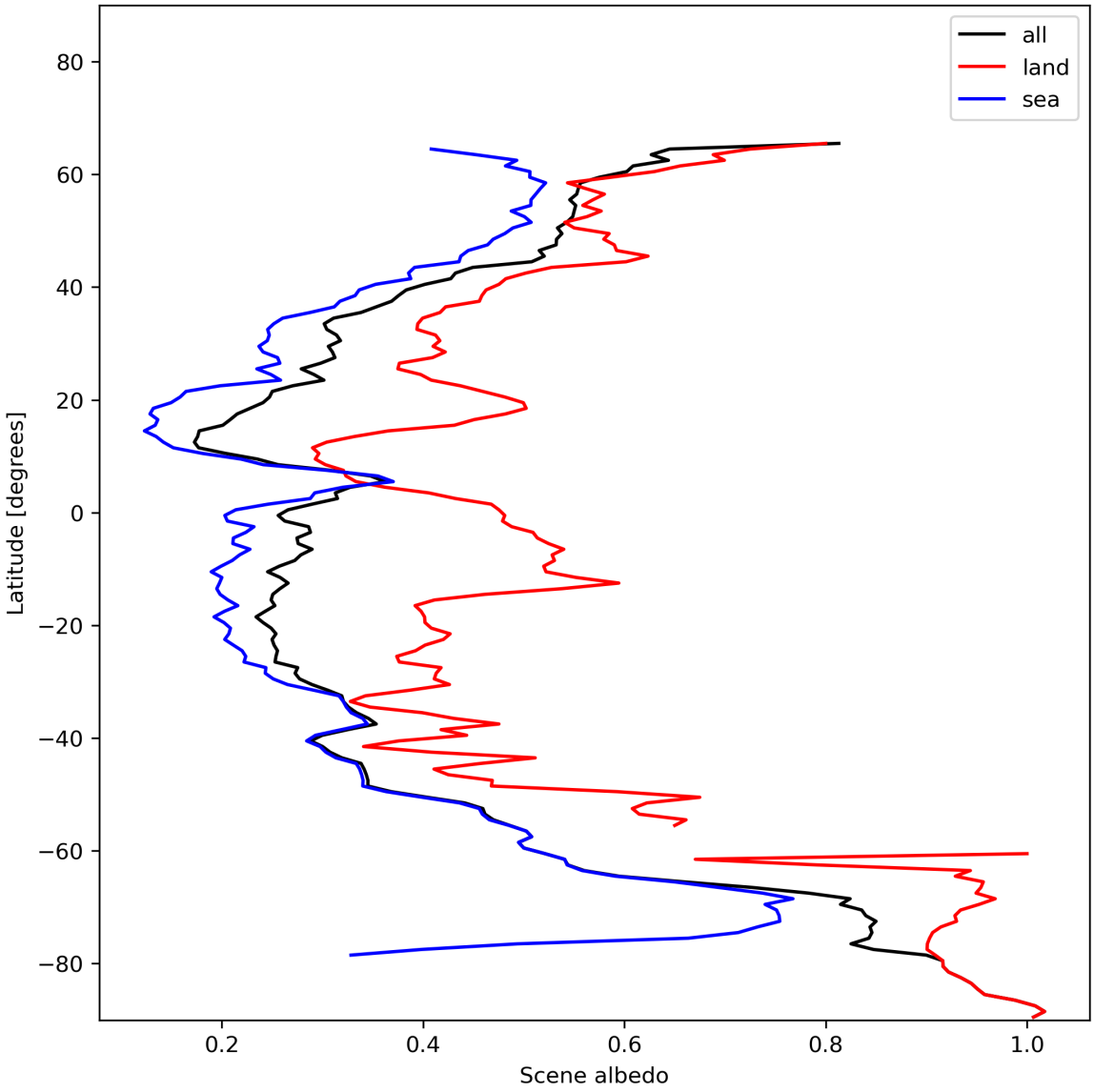


Figure 17: Zonal average of “Scene albedo” for 2023-12-10 to 2023-12-12.

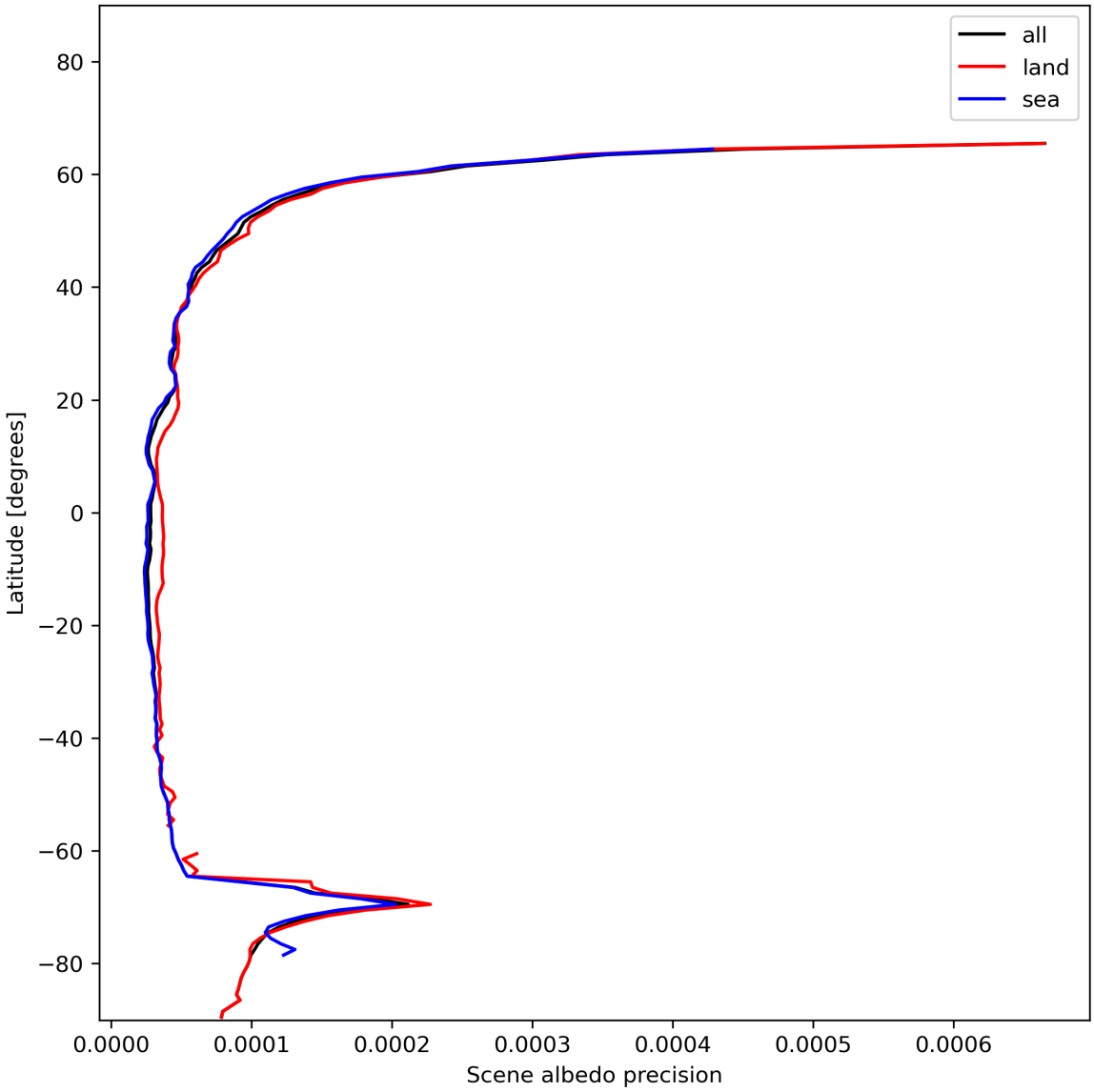


Figure 18: Zonal average of “Scene albedo precision” for 2023-12-10 to 2023-12-12.

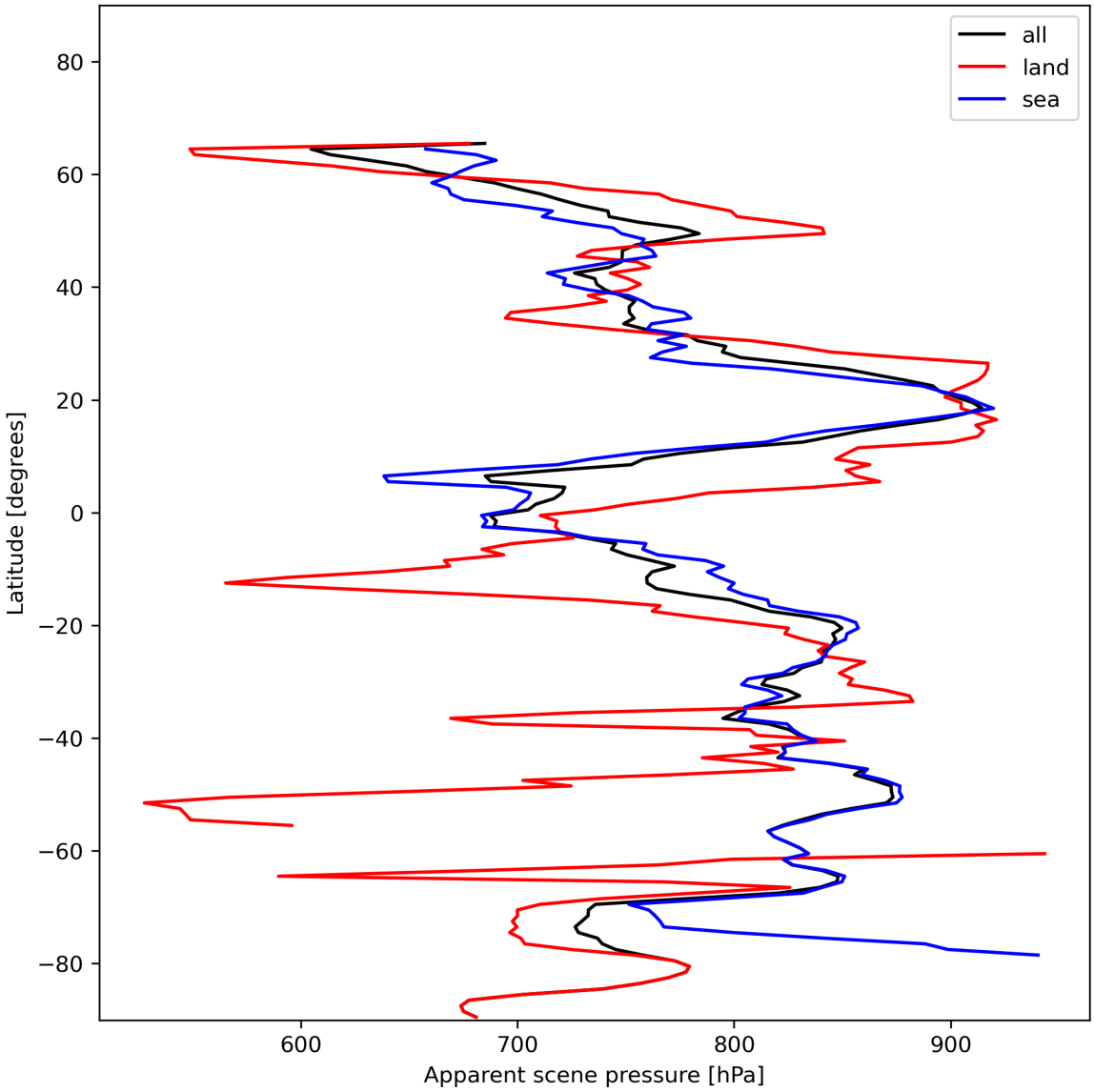


Figure 19: Zonal average of “Apparent scene pressure” for 2023-12-10 to 2023-12-12.

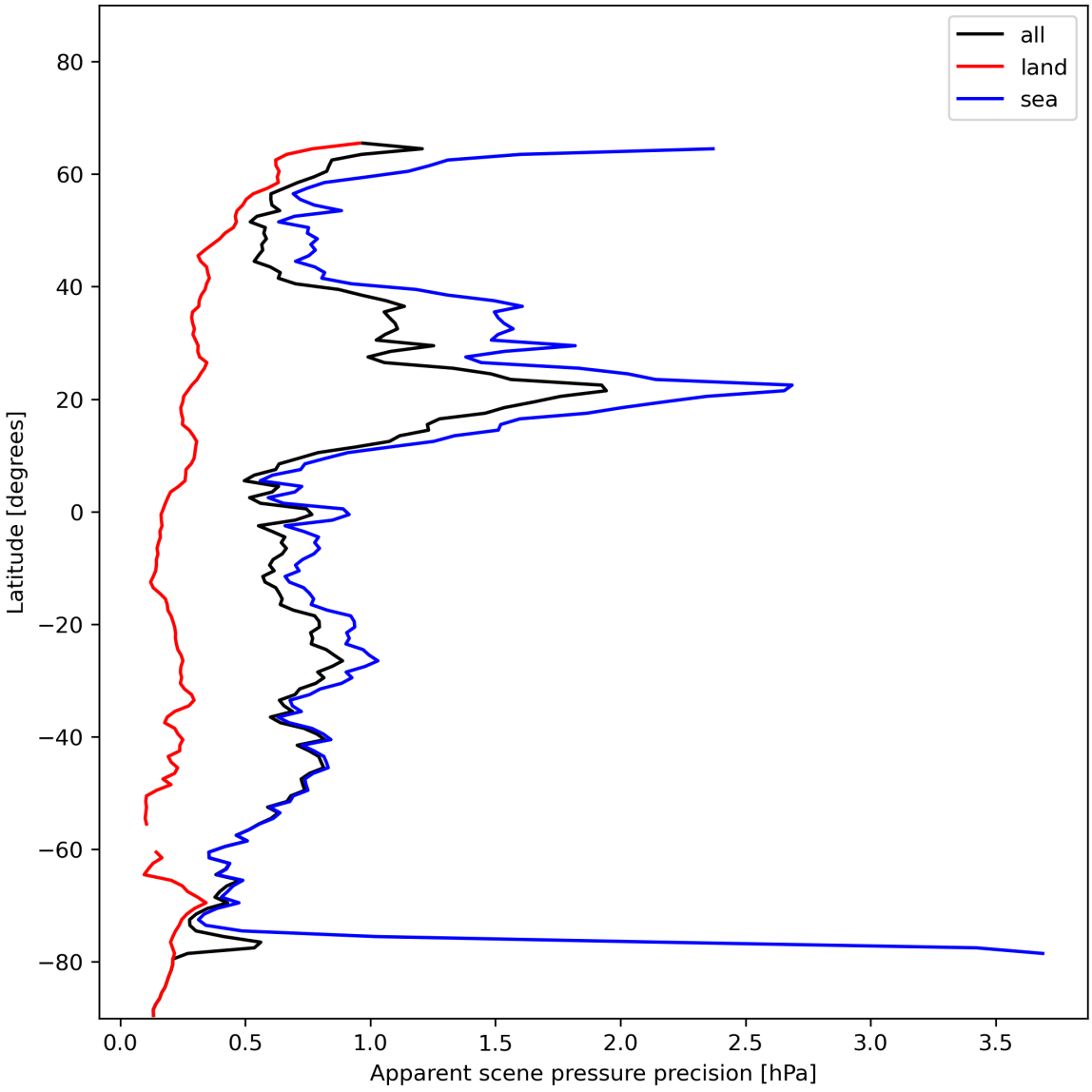


Figure 20: Zonal average of “Apparent scene pressure precision” for 2023-12-10 to 2023-12-12.

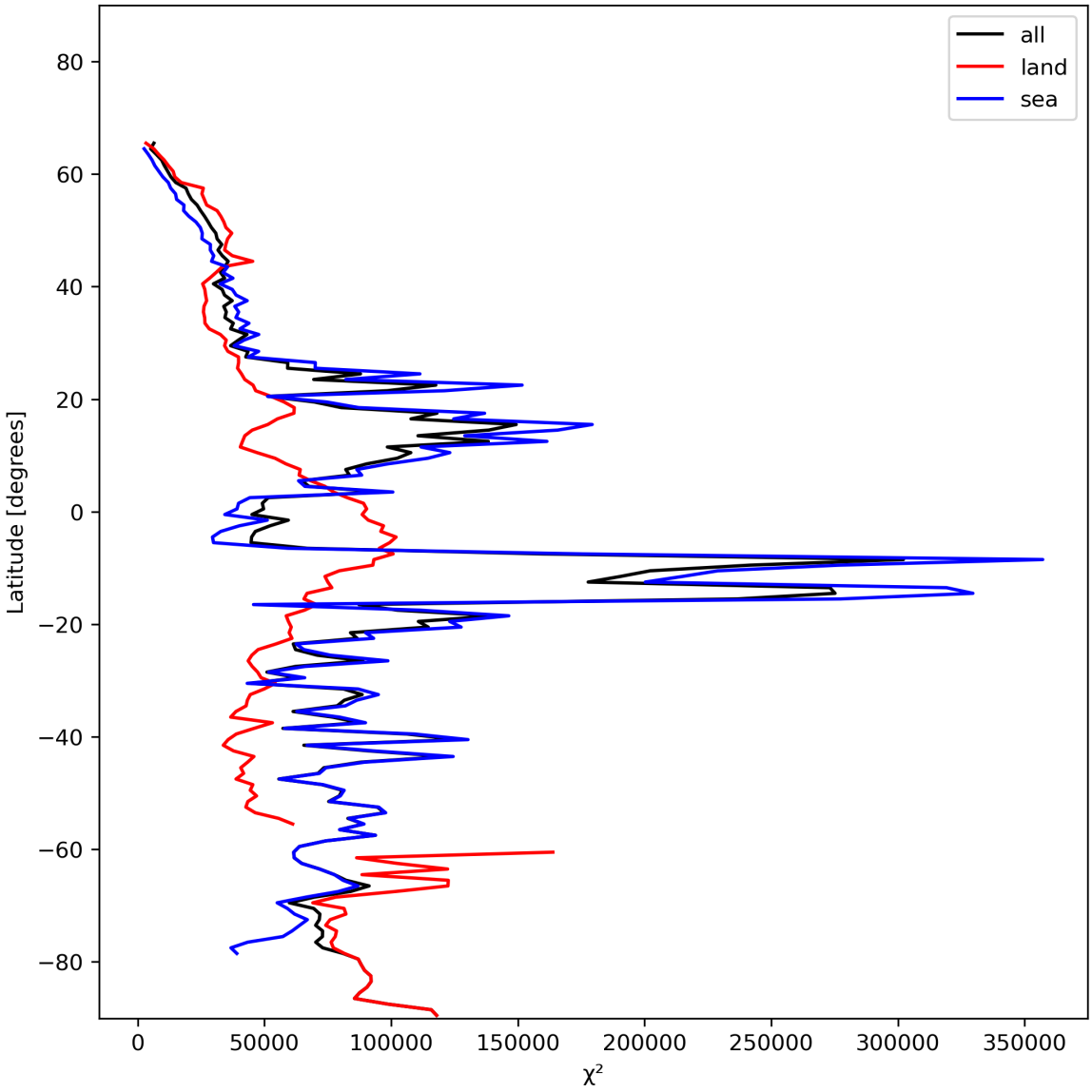


Figure 21: Zonal average of "χ^2" for 2023-12-10 to 2023-12-12.

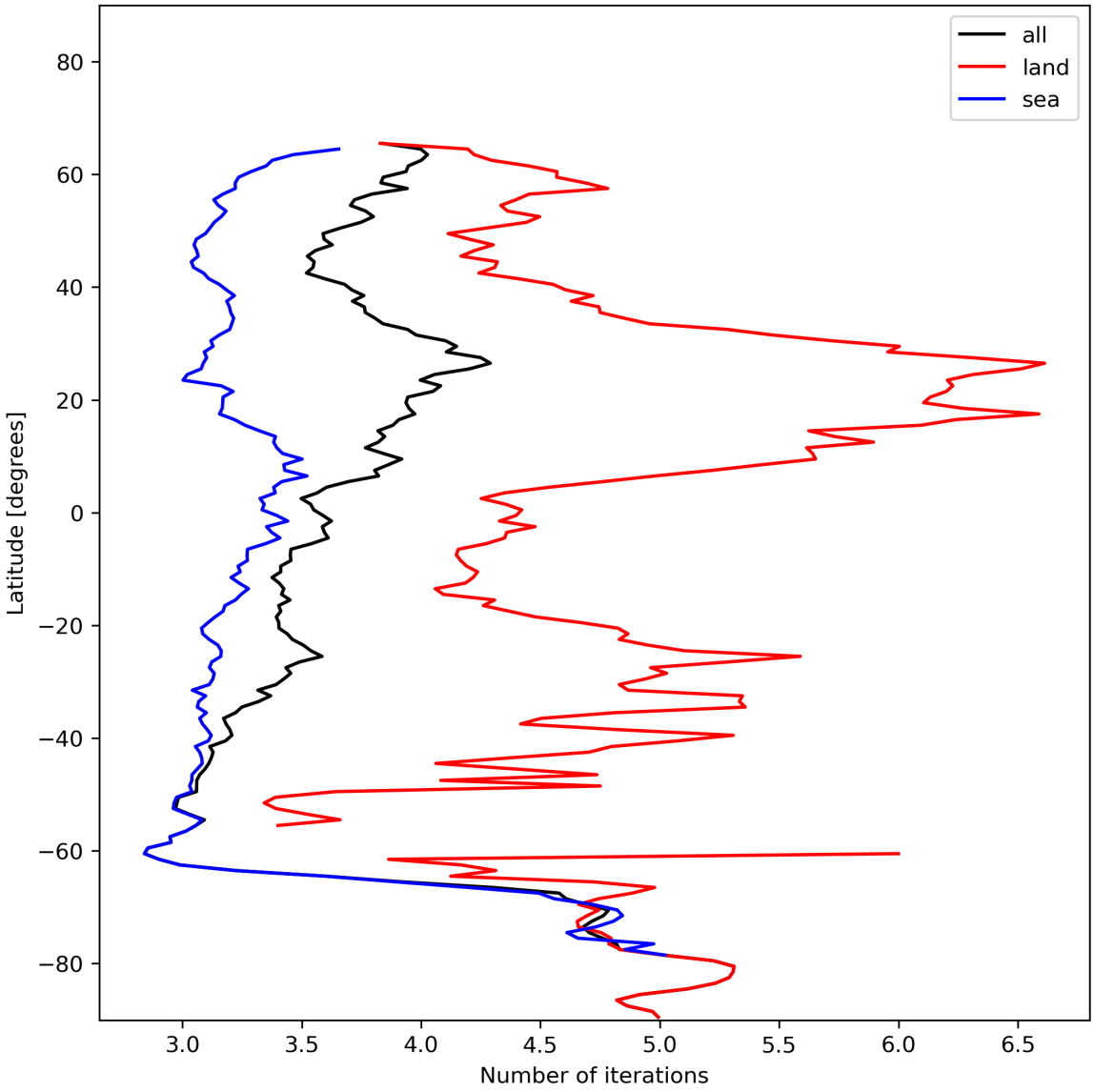


Figure 22: Zonal average of “Number of iterations” for 2023-12-10 to 2023-12-12.

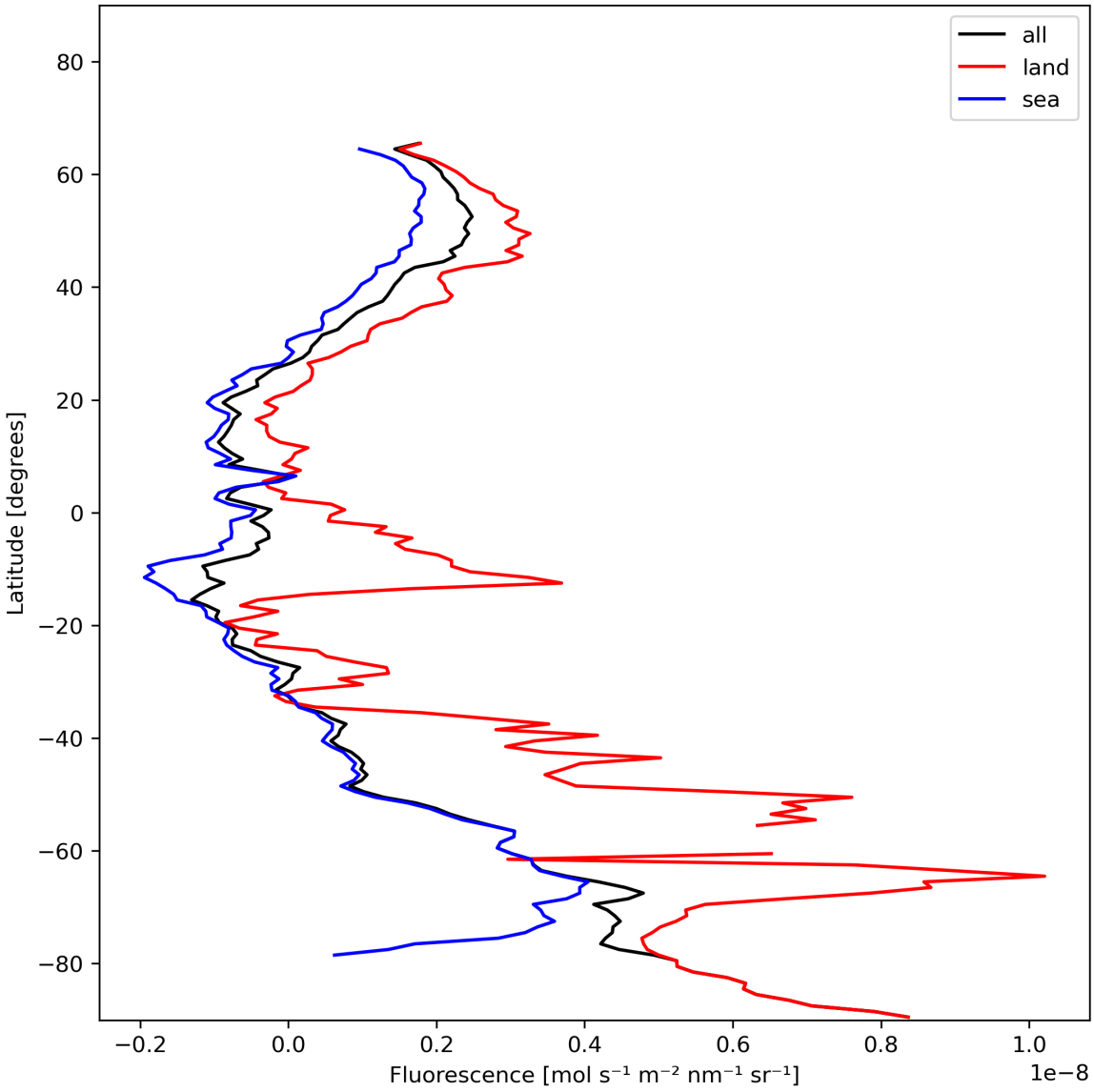


Figure 23: Zonal average of “Fluorescence” for 2023-12-10 to 2023-12-12.

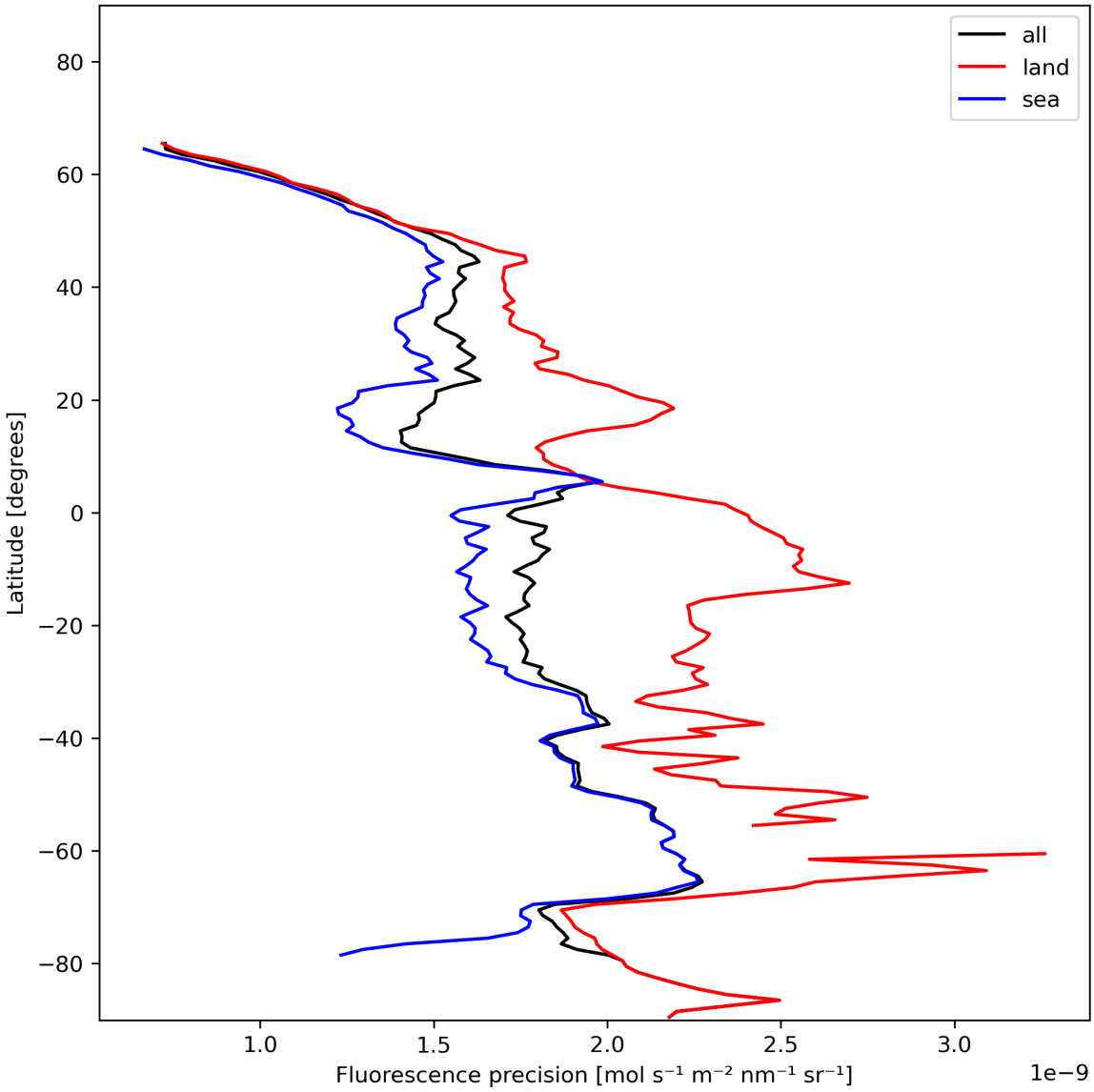


Figure 24: Zonal average of “Fluorescence precision” for 2023-12-10 to 2023-12-12.

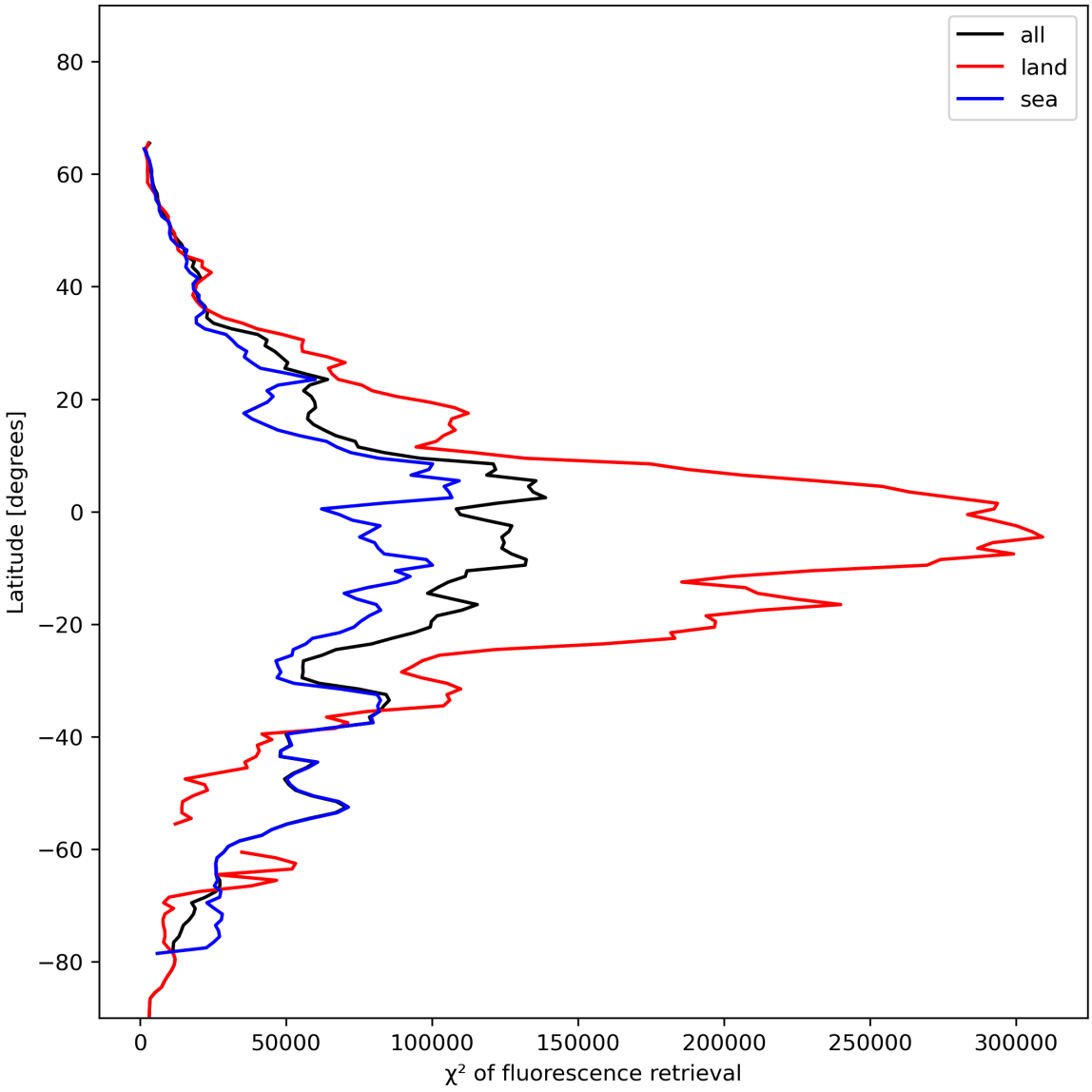


Figure 25: Zonal average of "χ^2 of fluorescence retrieval" for 2023-12-10 to 2023-12-12.

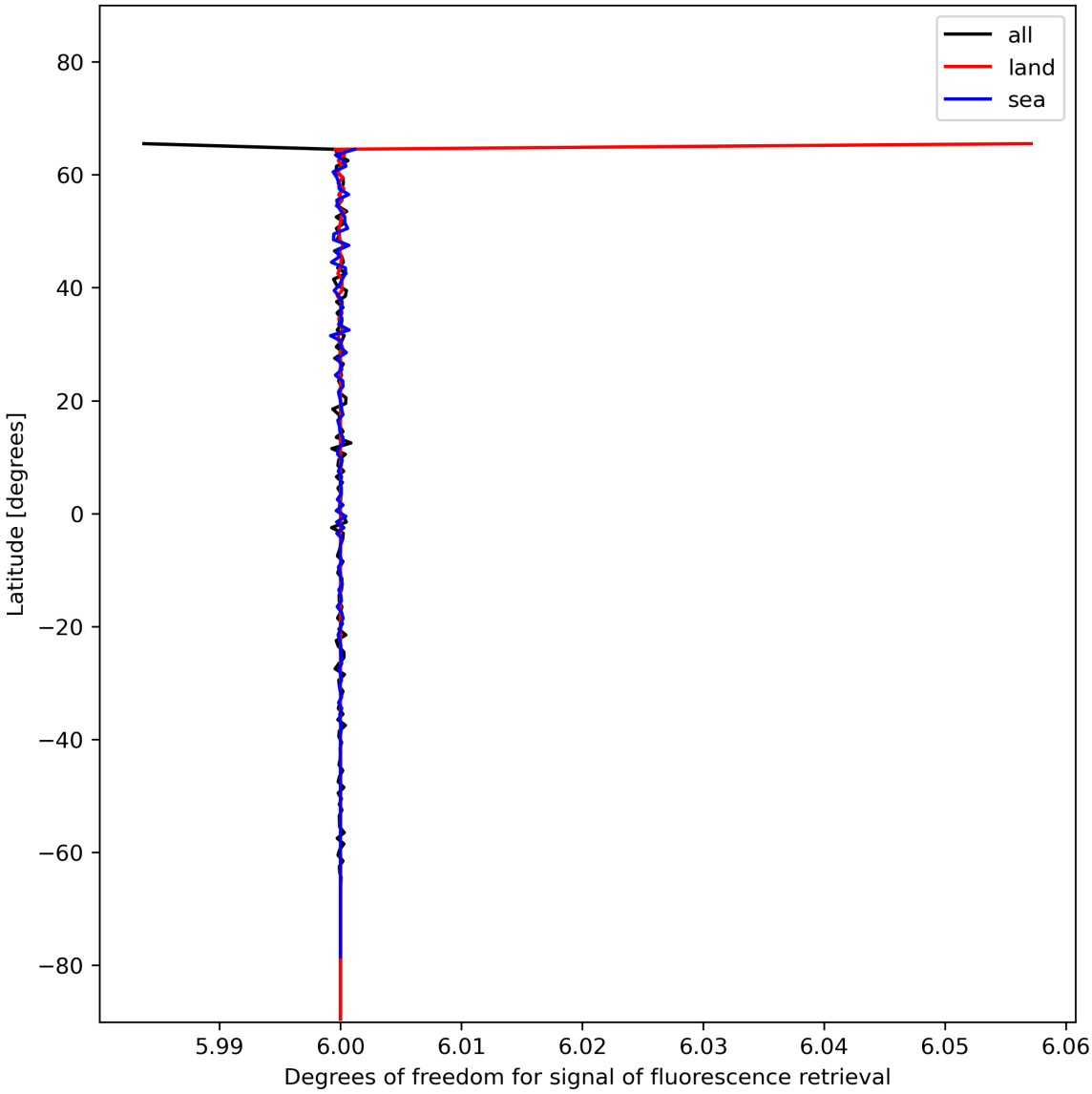


Figure 26: Zonal average of “Degrees of freedom for signal of fluorescence retrieval” for 2023-12-10 to 2023-12-12.

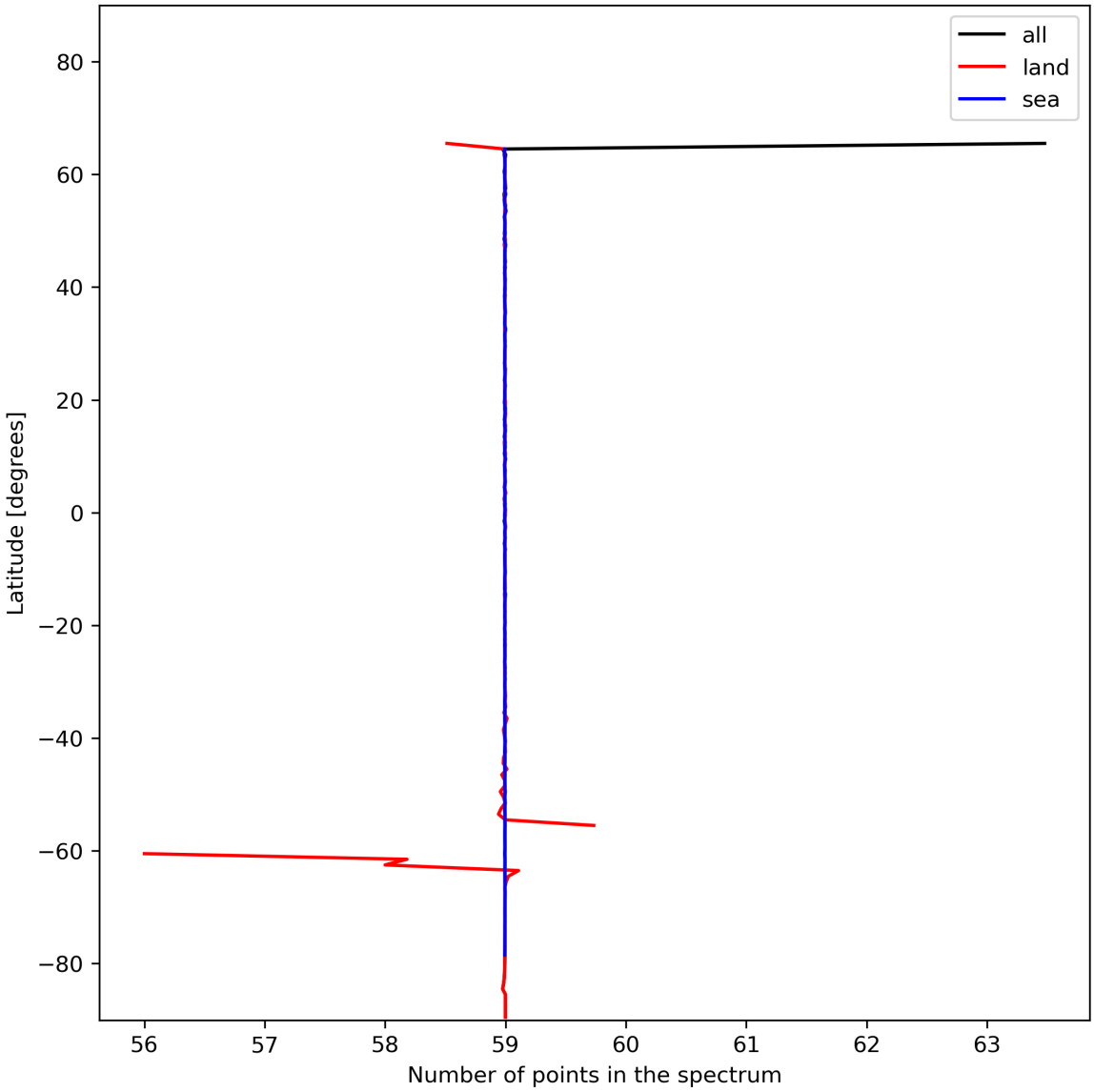


Figure 27: Zonal average of “Number of points in the spectrum” for 2023-12-10 to 2023-12-12.

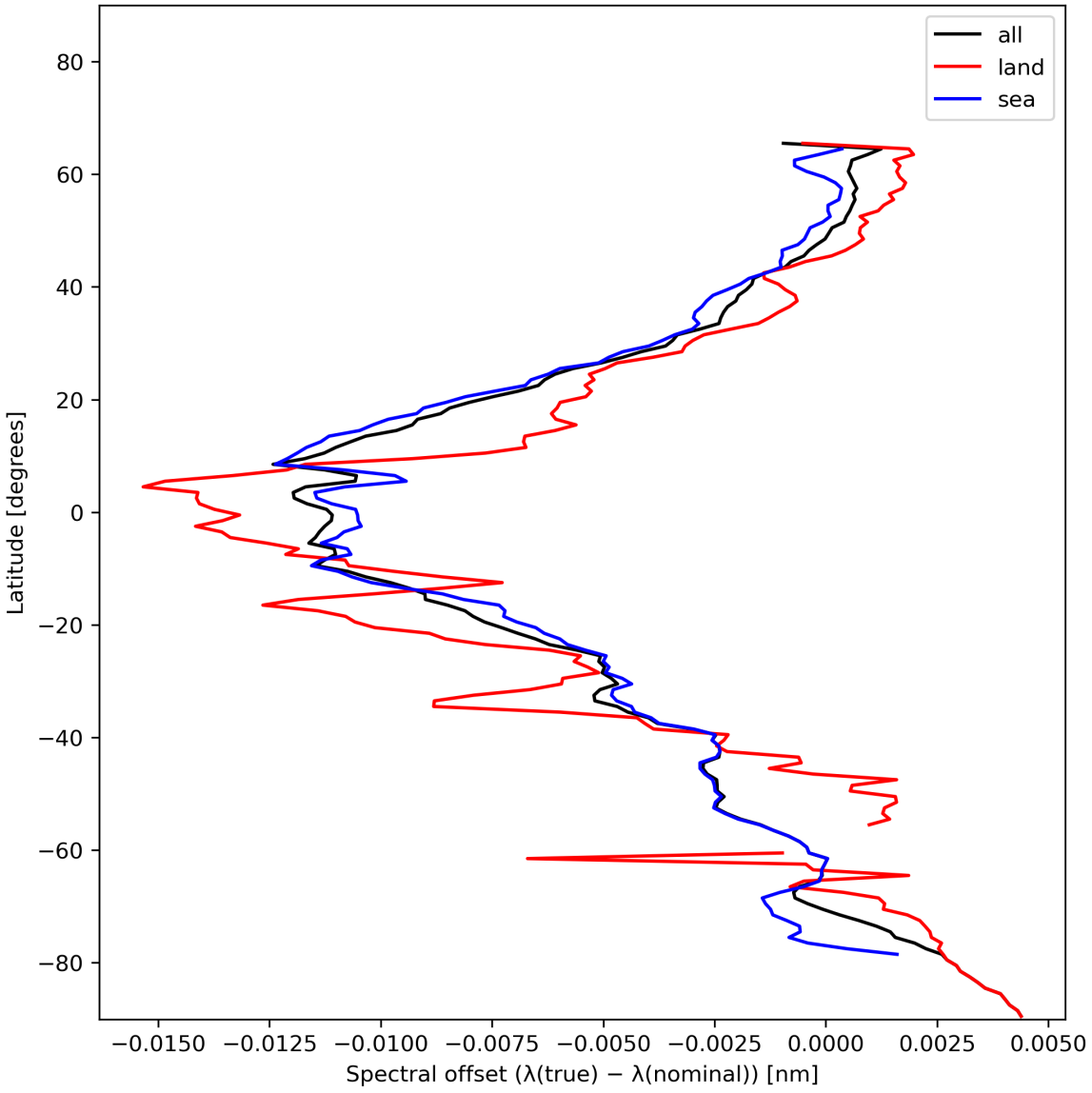


Figure 28: Zonal average of "Spectral offset (λ(true) − λ(nominal))" for 2023-12-10 to 2023-12-12.

8 Histograms

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

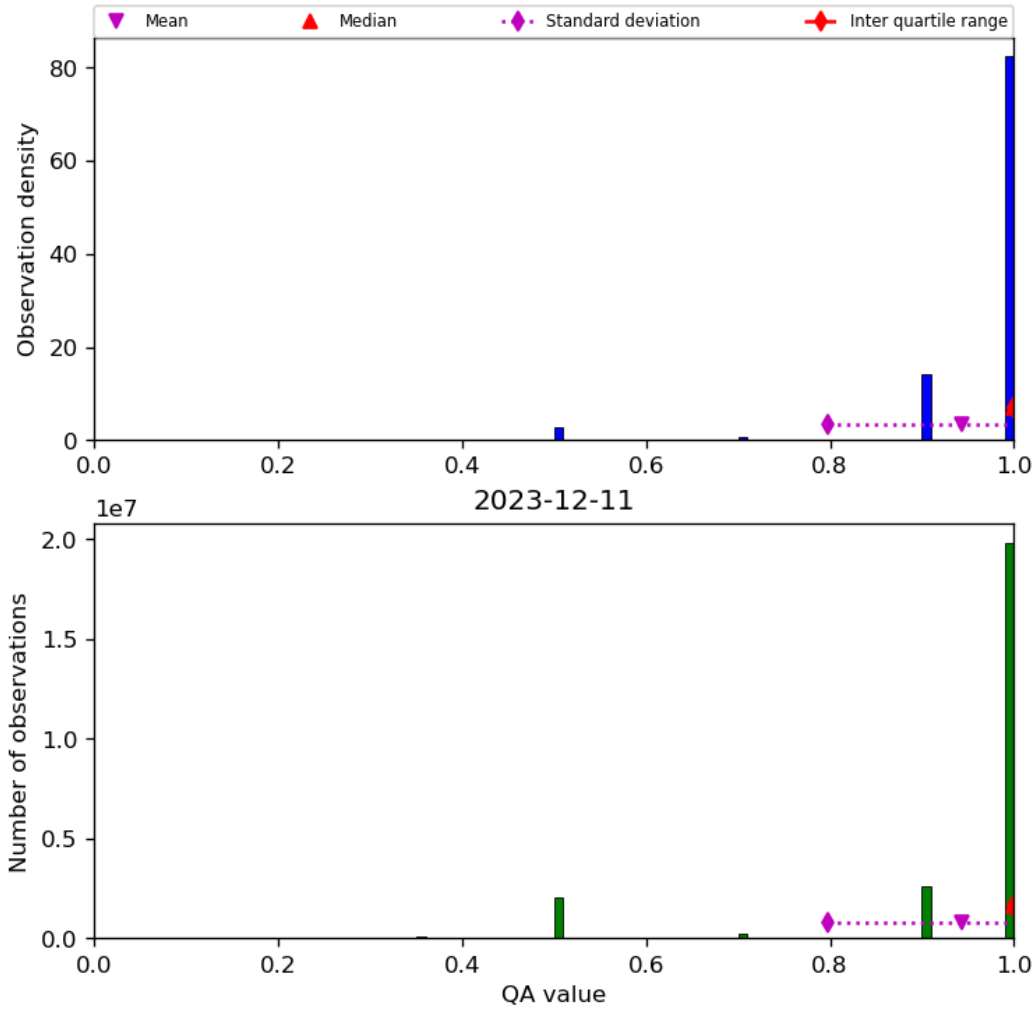


Figure 29: Histogram of “QA value” for 2023-12-10 to 2023-12-12

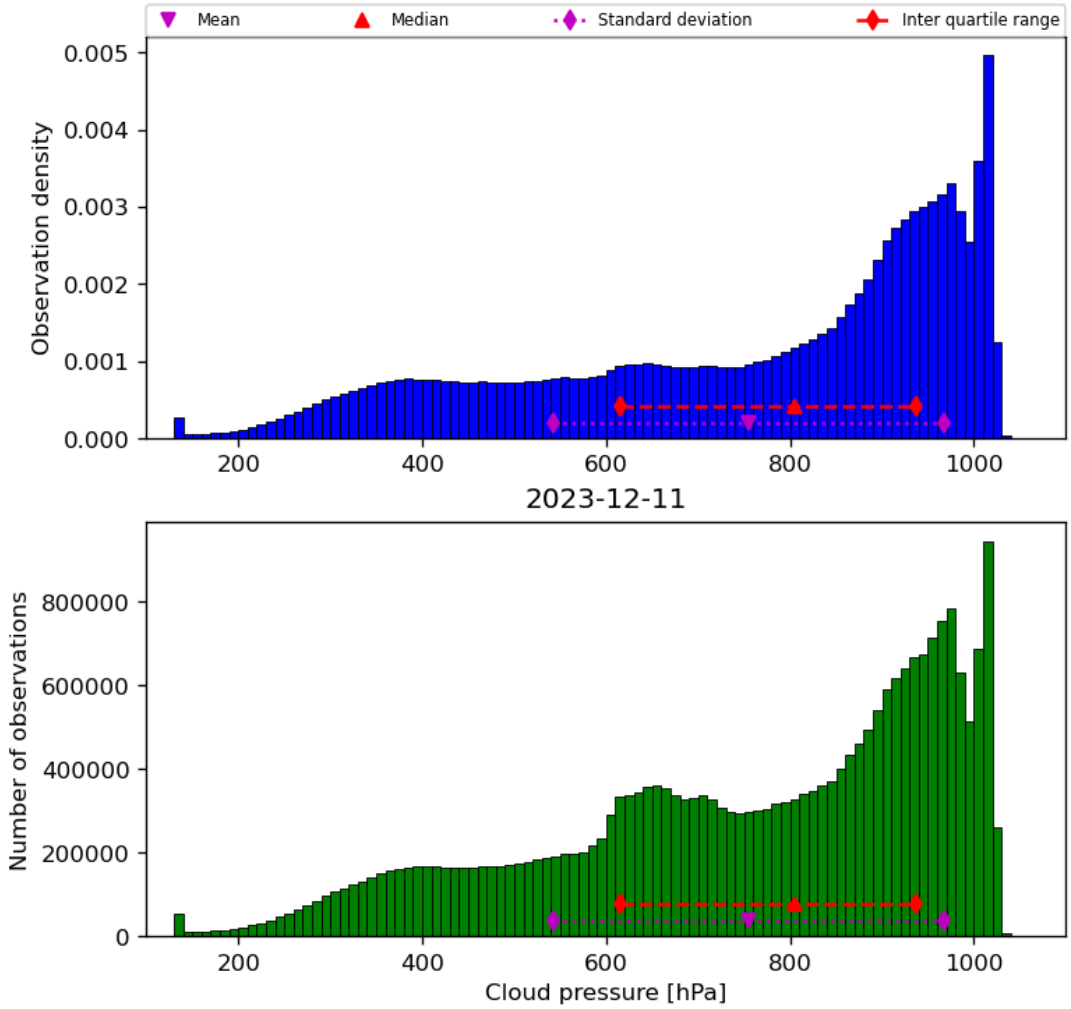


Figure 30: Histogram of “Cloud pressure” for 2023-12-10 to 2023-12-12

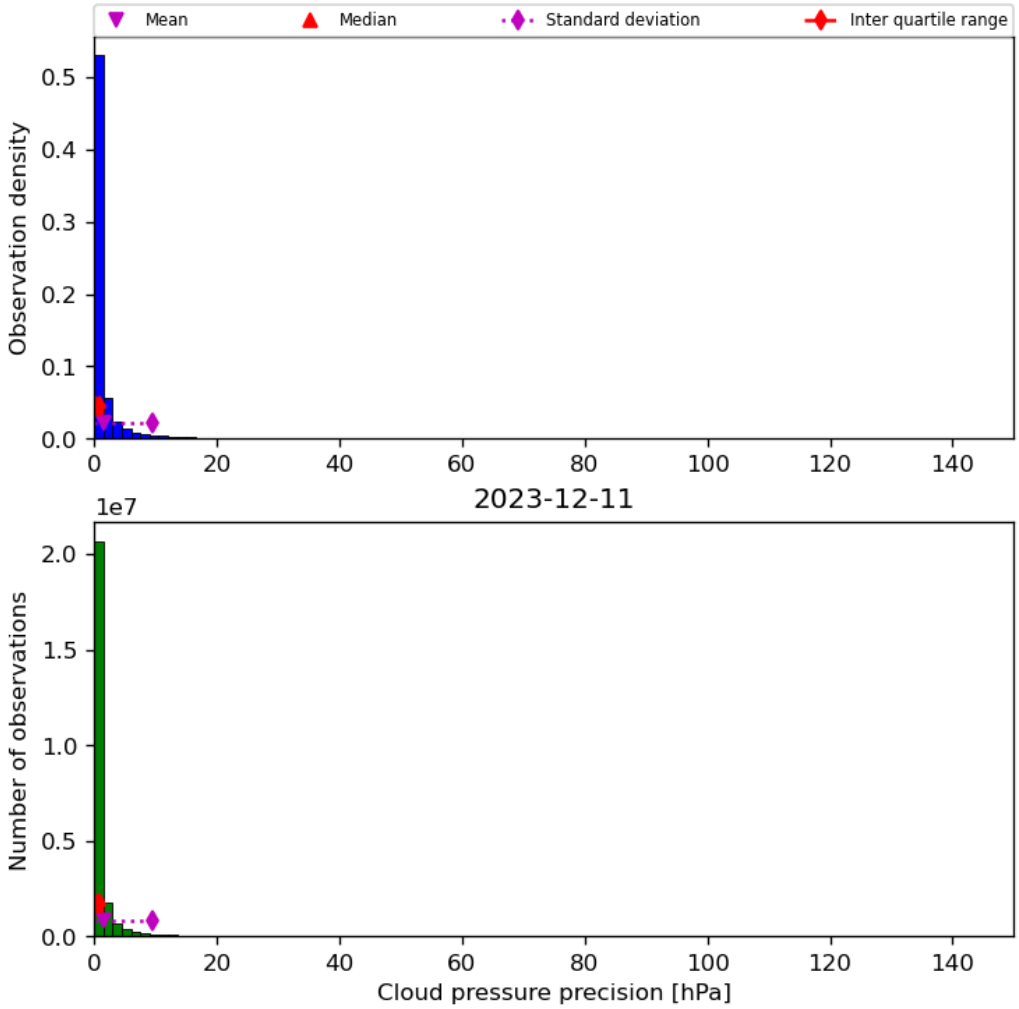


Figure 31: Histogram of “Cloud pressure precision” for 2023-12-10 to 2023-12-12

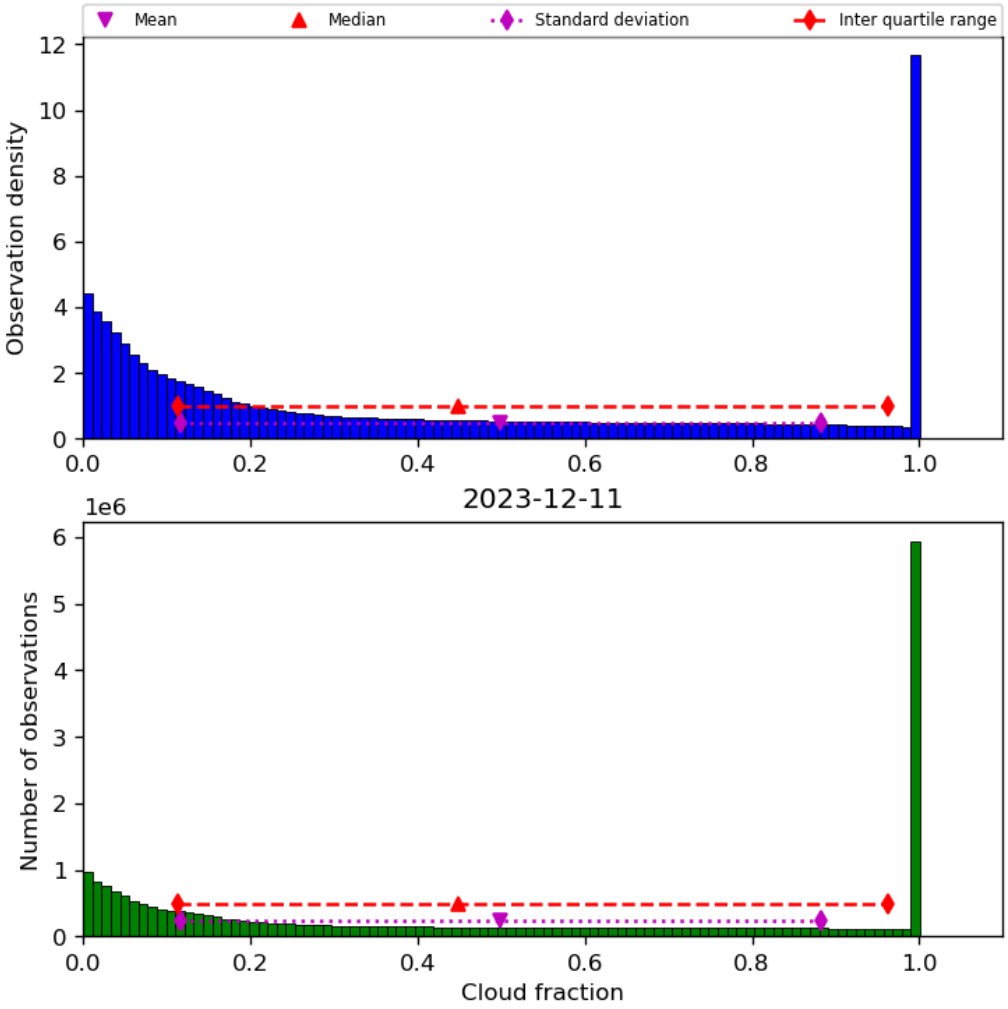


Figure 32: Histogram of “Cloud fraction” for 2023-12-10 to 2023-12-12

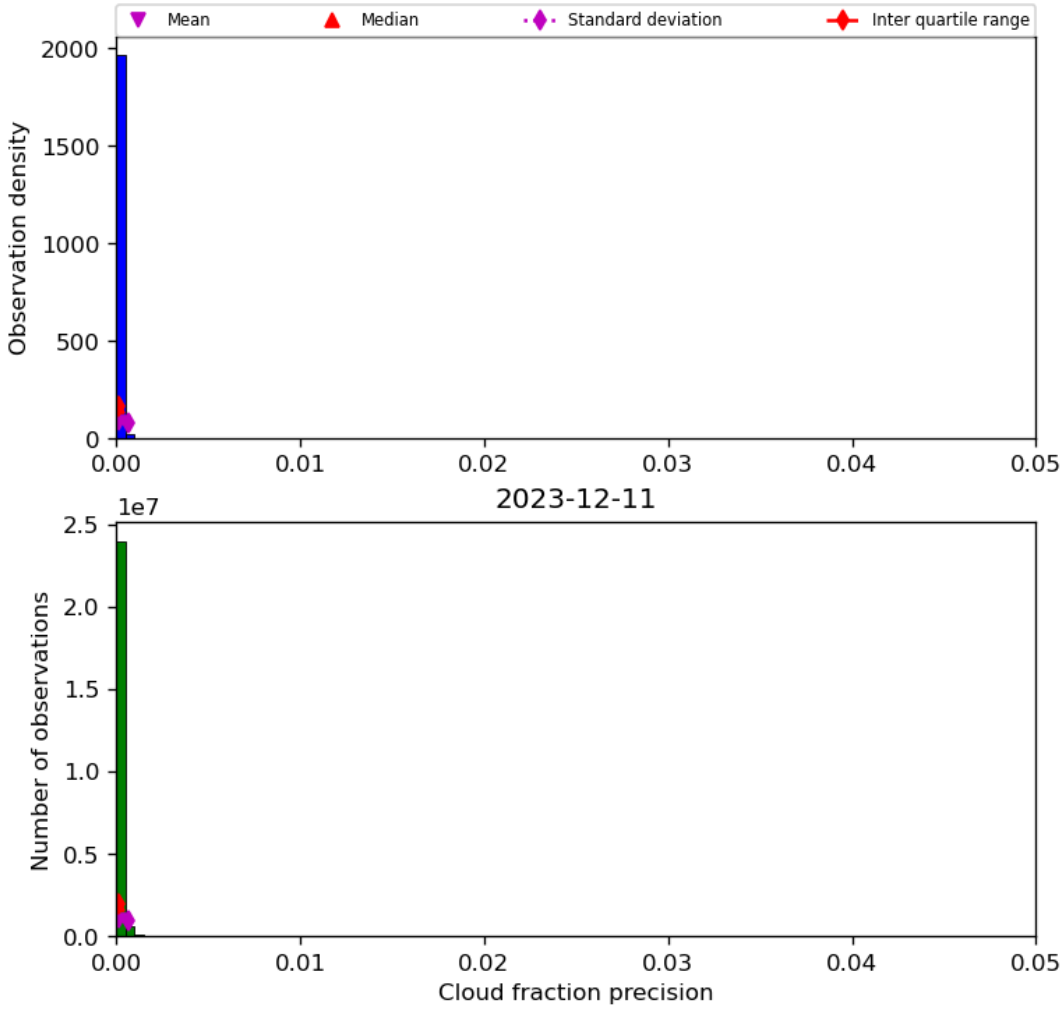


Figure 33: Histogram of “Cloud fraction precision” for 2023-12-10 to 2023-12-12

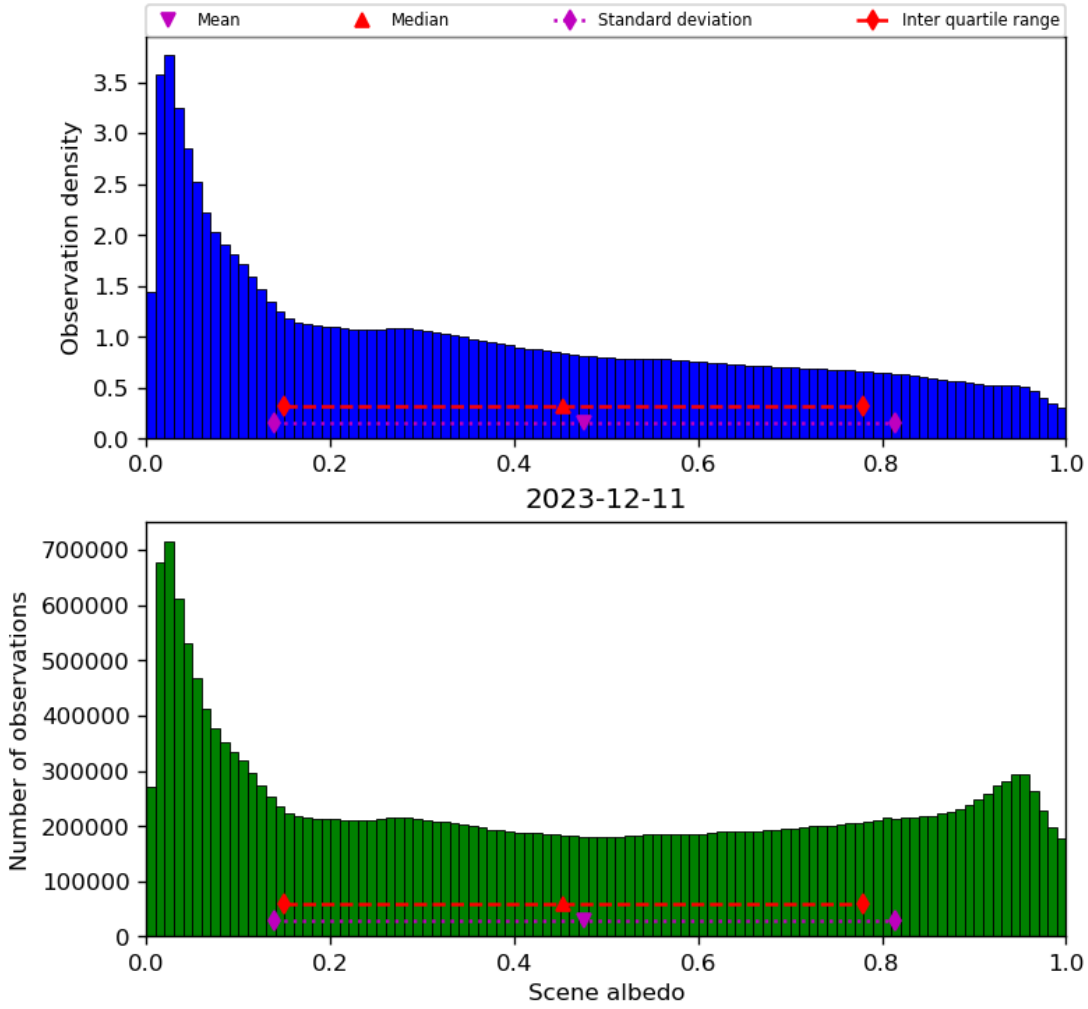


Figure 34: Histogram of “Scene albedo” for 2023-12-10 to 2023-12-12

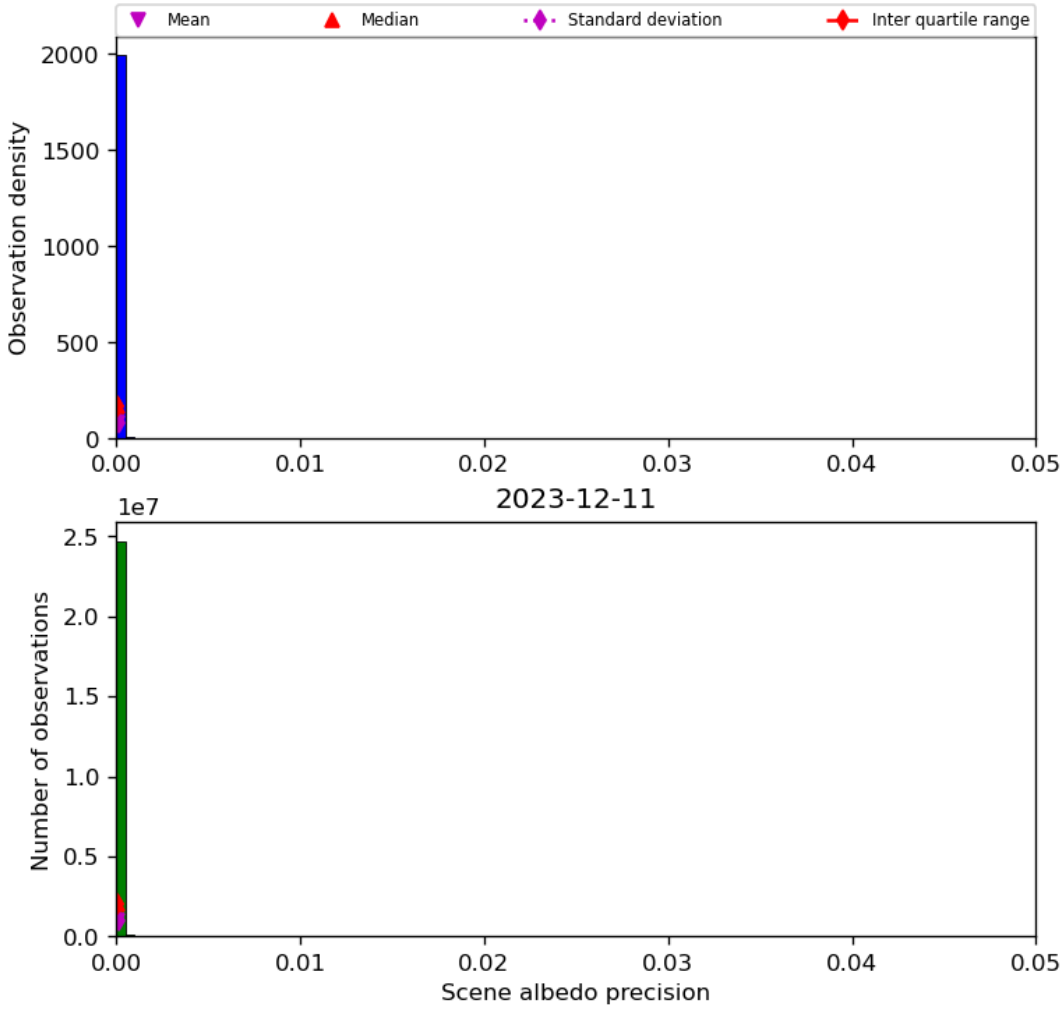


Figure 35: Histogram of “Scene albedo precision” for 2023-12-10 to 2023-12-12

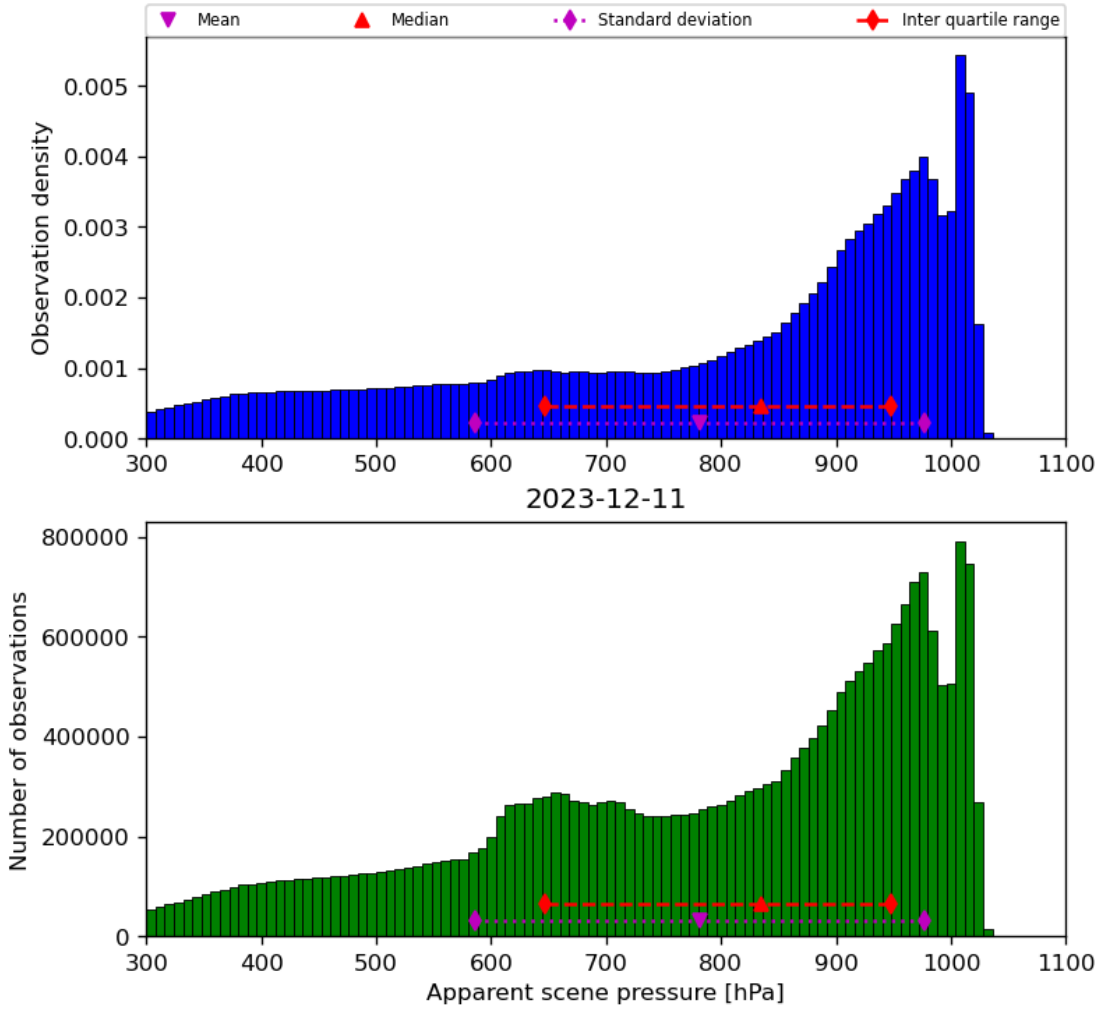


Figure 36: Histogram of “Apparent scene pressure” for 2023-12-10 to 2023-12-12

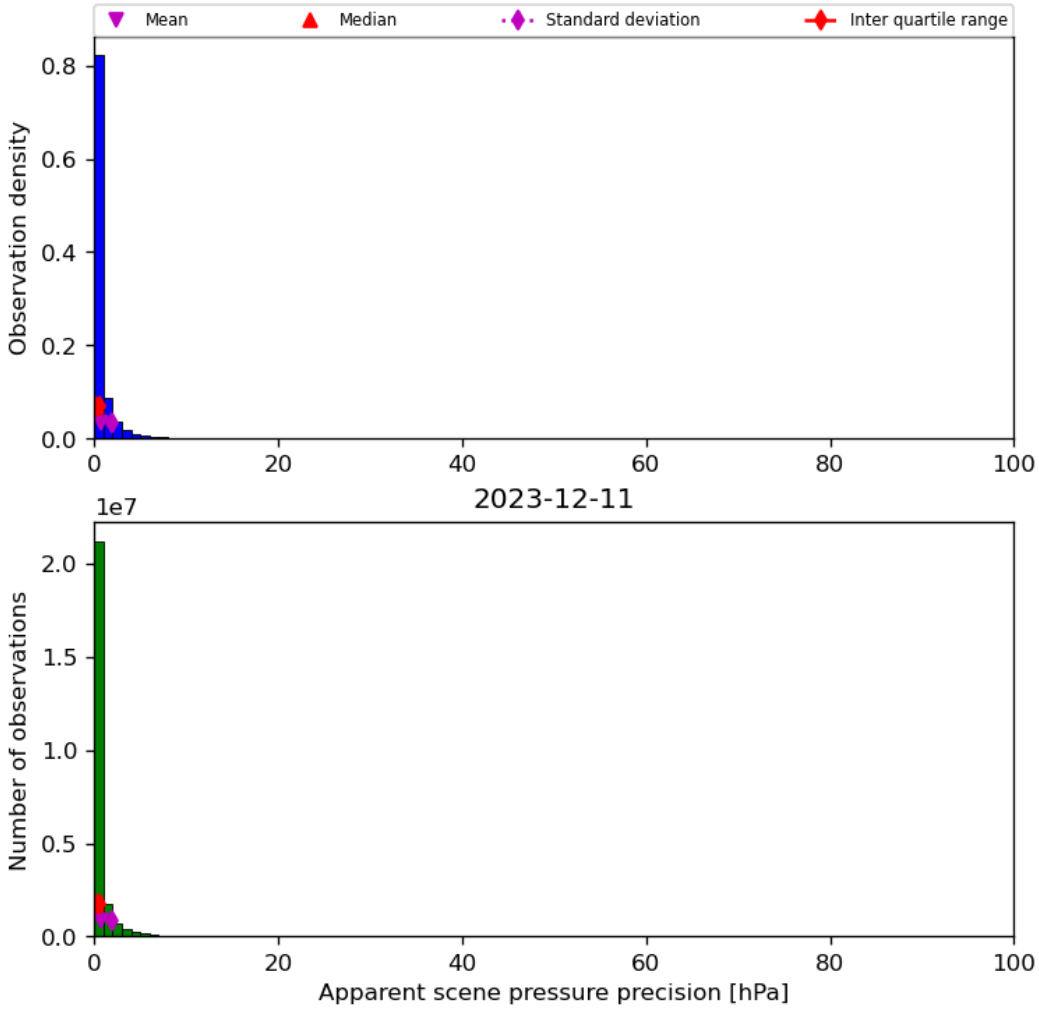


Figure 37: Histogram of “Apparent scene pressure precision” for 2023-12-10 to 2023-12-12

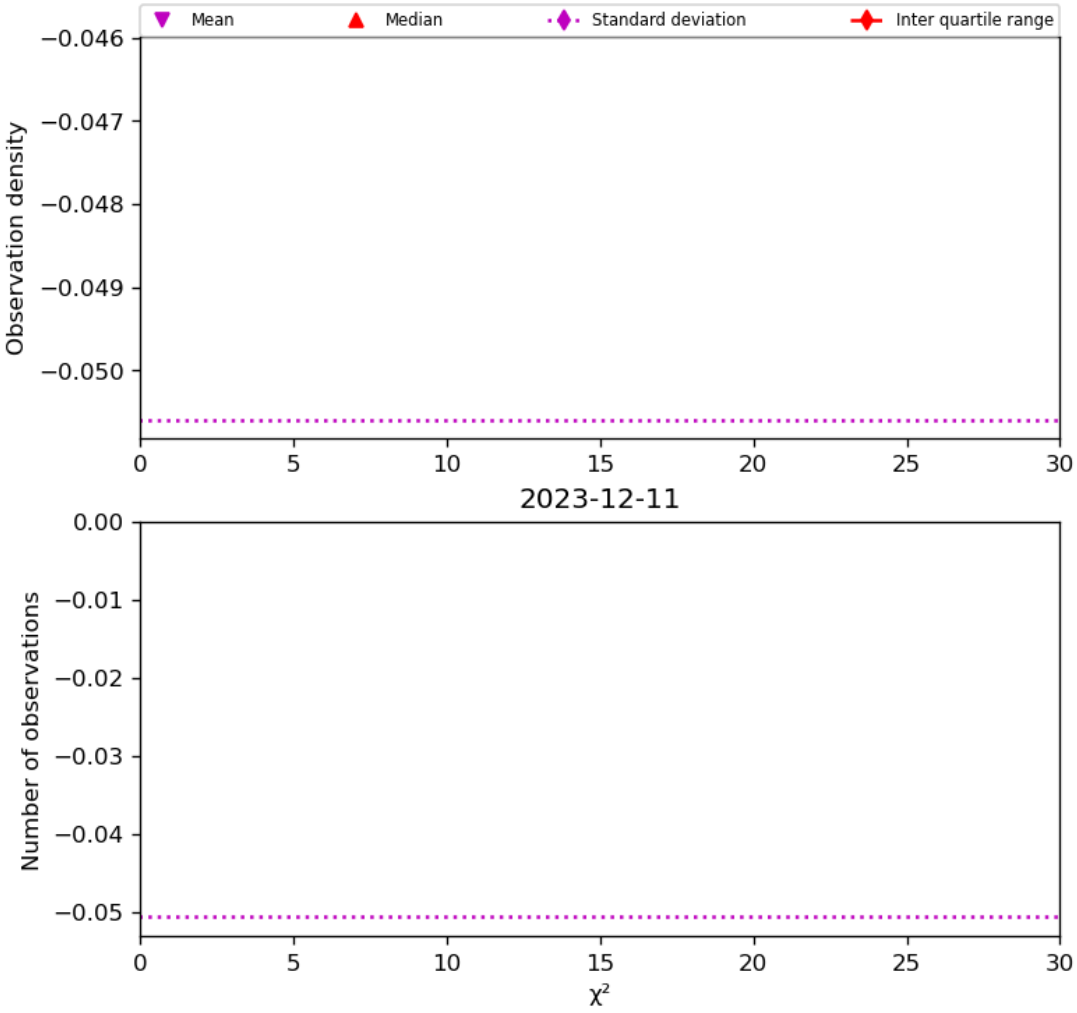


Figure 38: Histogram of "χ^2" for 2023-12-10 to 2023-12-12

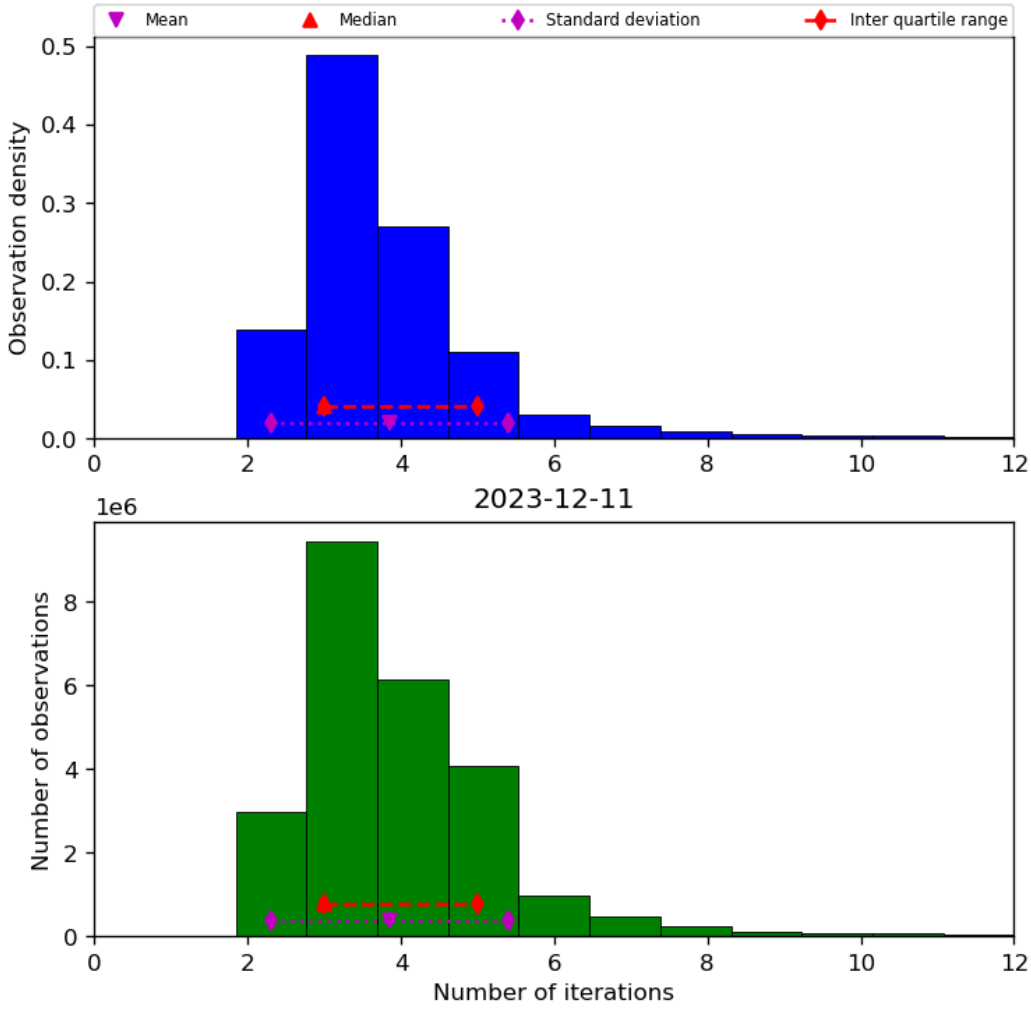


Figure 39: Histogram of “Number of iterations” for 2023-12-10 to 2023-12-12

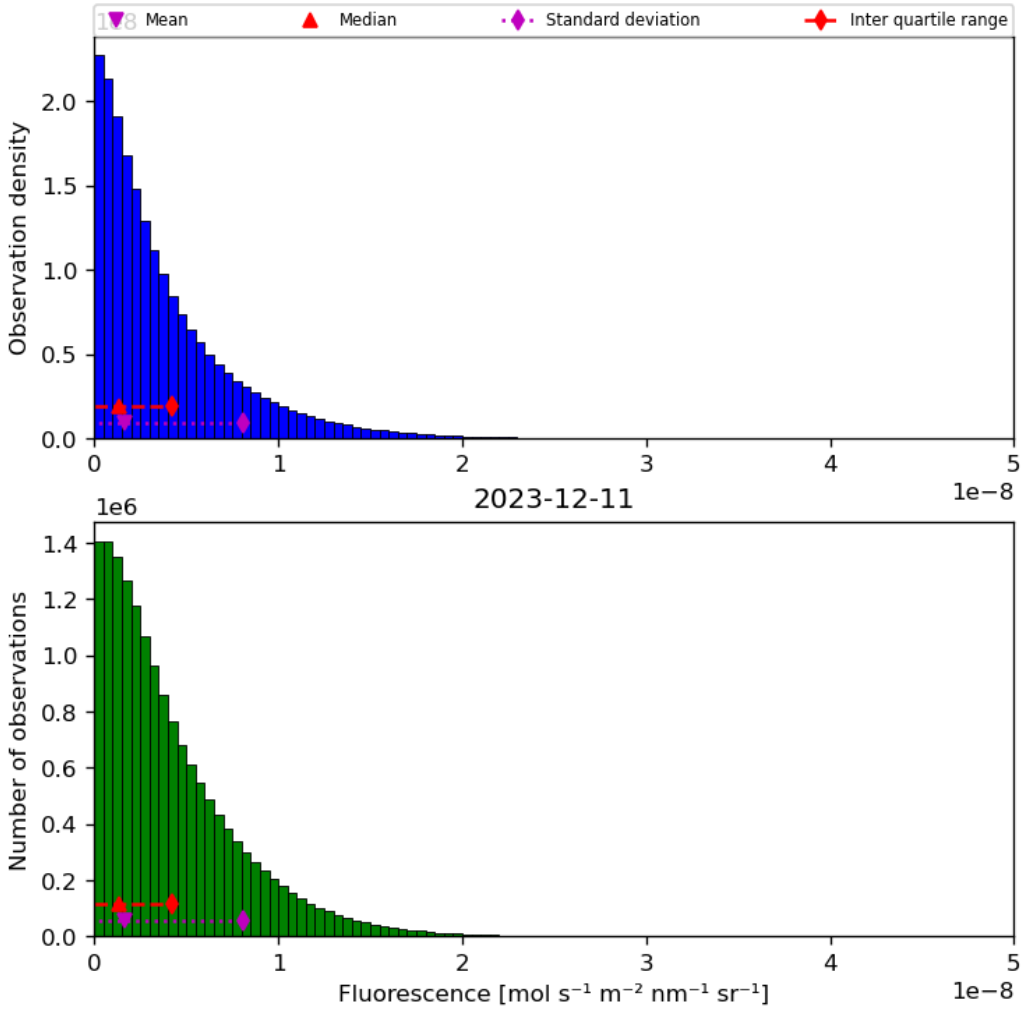


Figure 40: Histogram of “Fluorescence” for 2023-12-10 to 2023-12-12

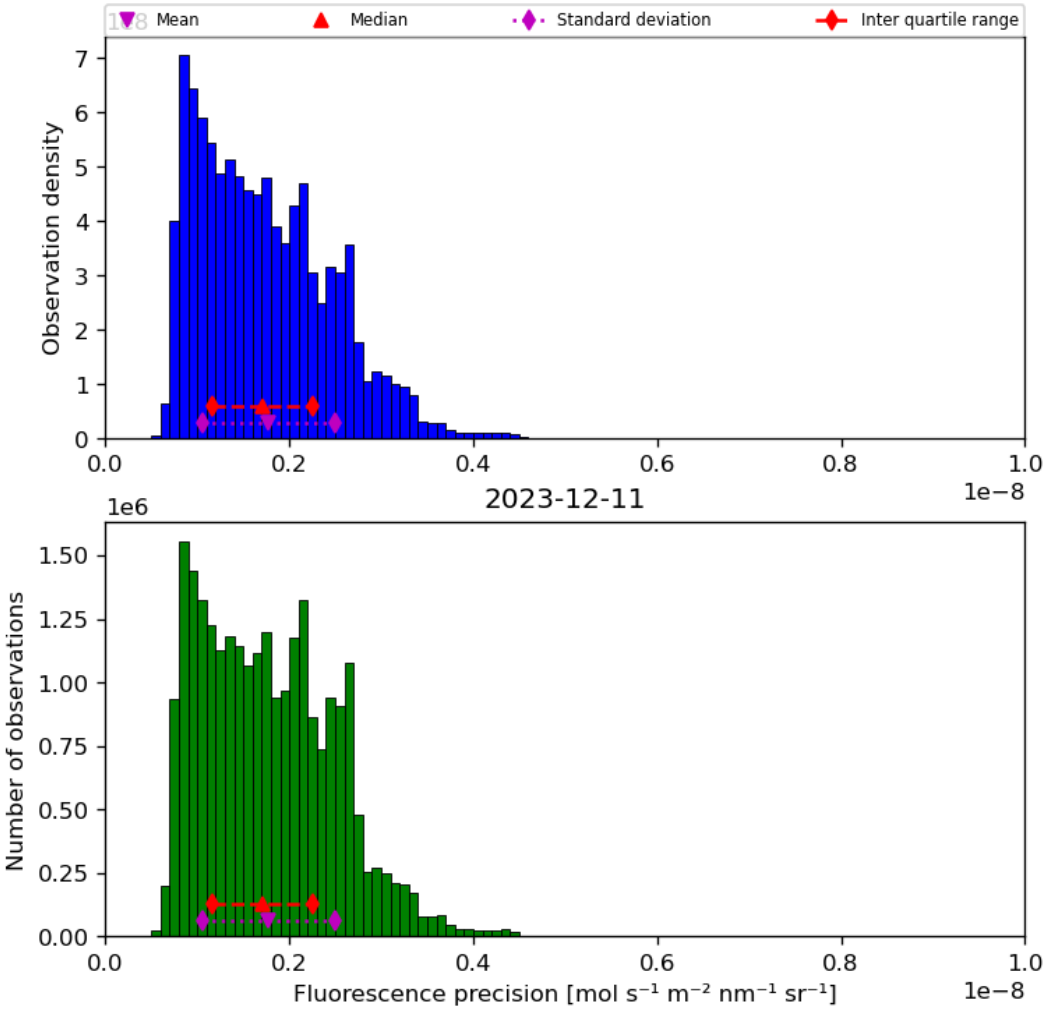


Figure 41: Histogram of “Fluorescence precision” for 2023-12-10 to 2023-12-12

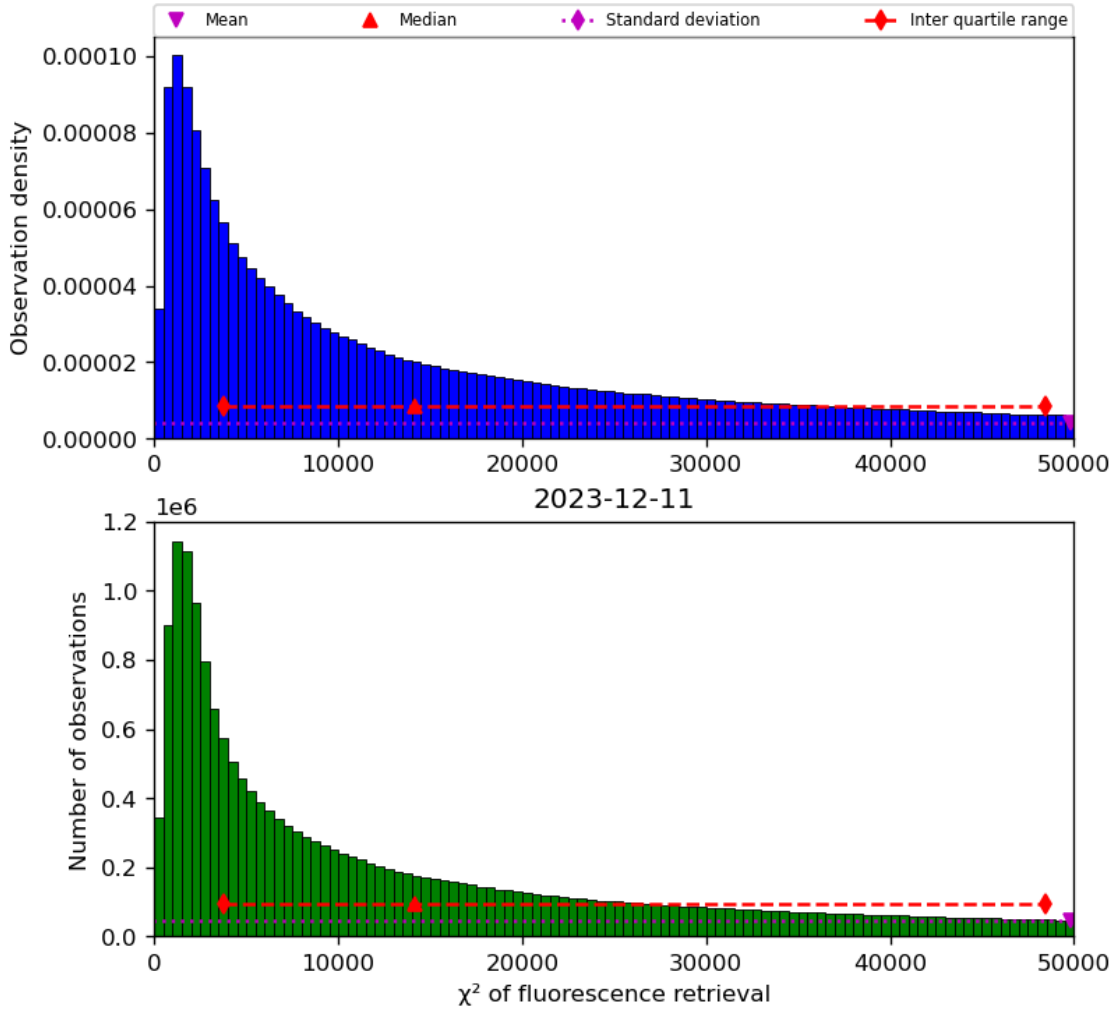


Figure 42: Histogram of "χ^2 of fluorescence retrieval" for 2023-12-10 to 2023-12-12

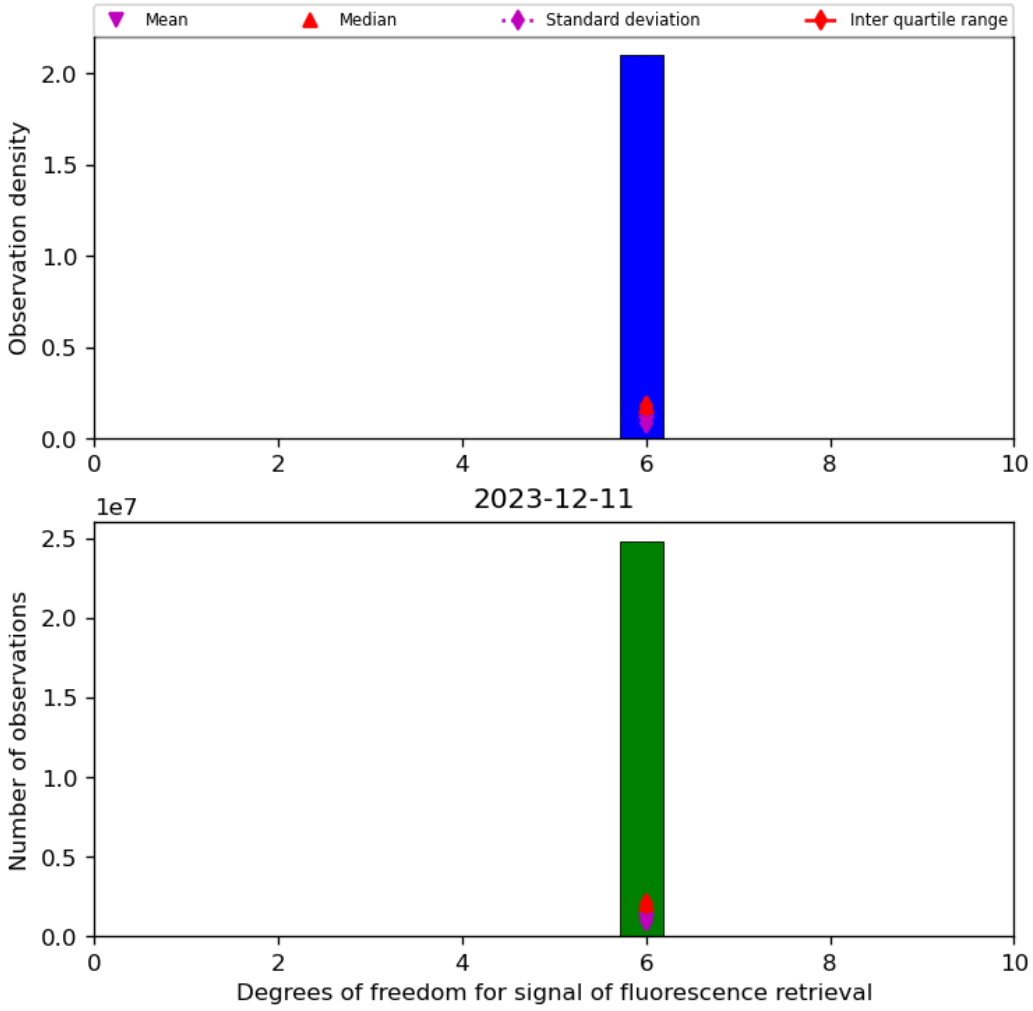


Figure 43: Histogram of “Degrees of freedom for signal of fluorescence retrieval” for 2023-12-10 to 2023-12-12

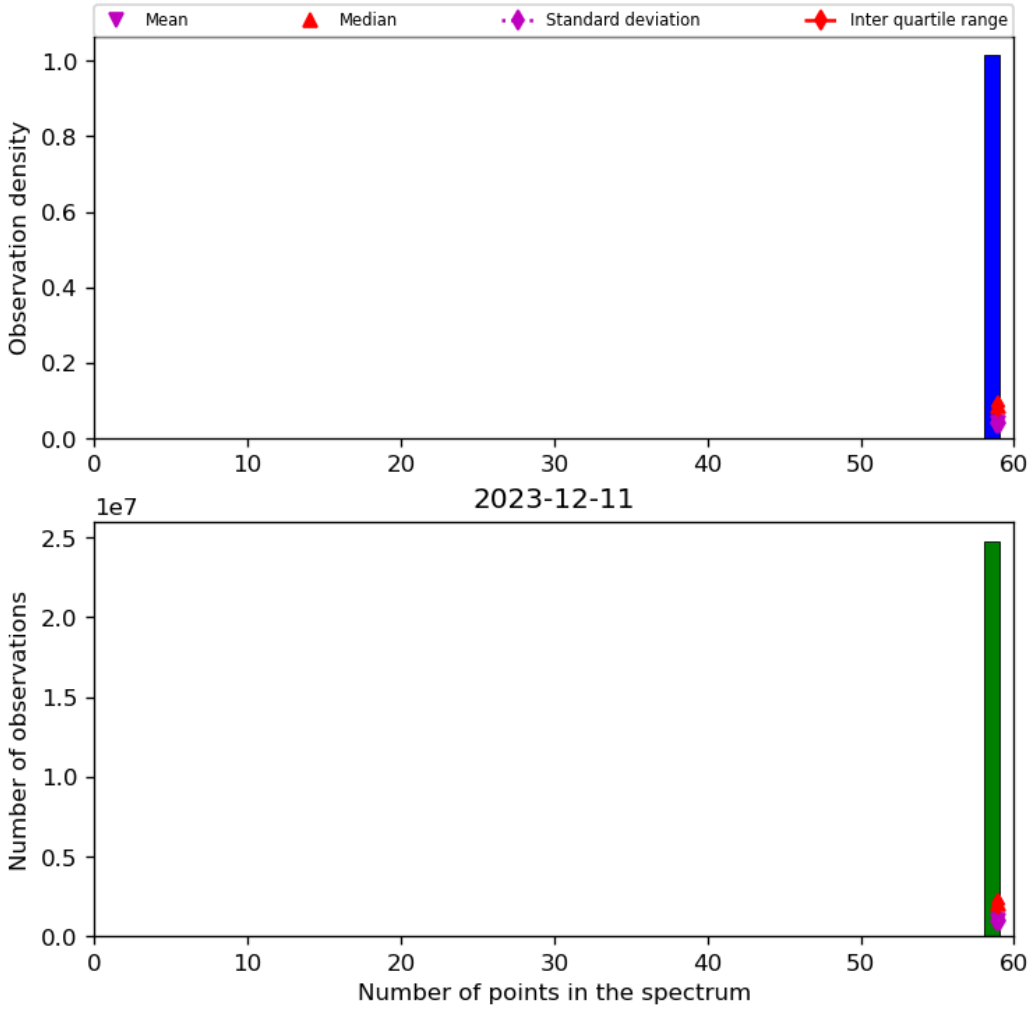


Figure 44: Histogram of “Number of points in the spectrum” for 2023-12-10 to 2023-12-12

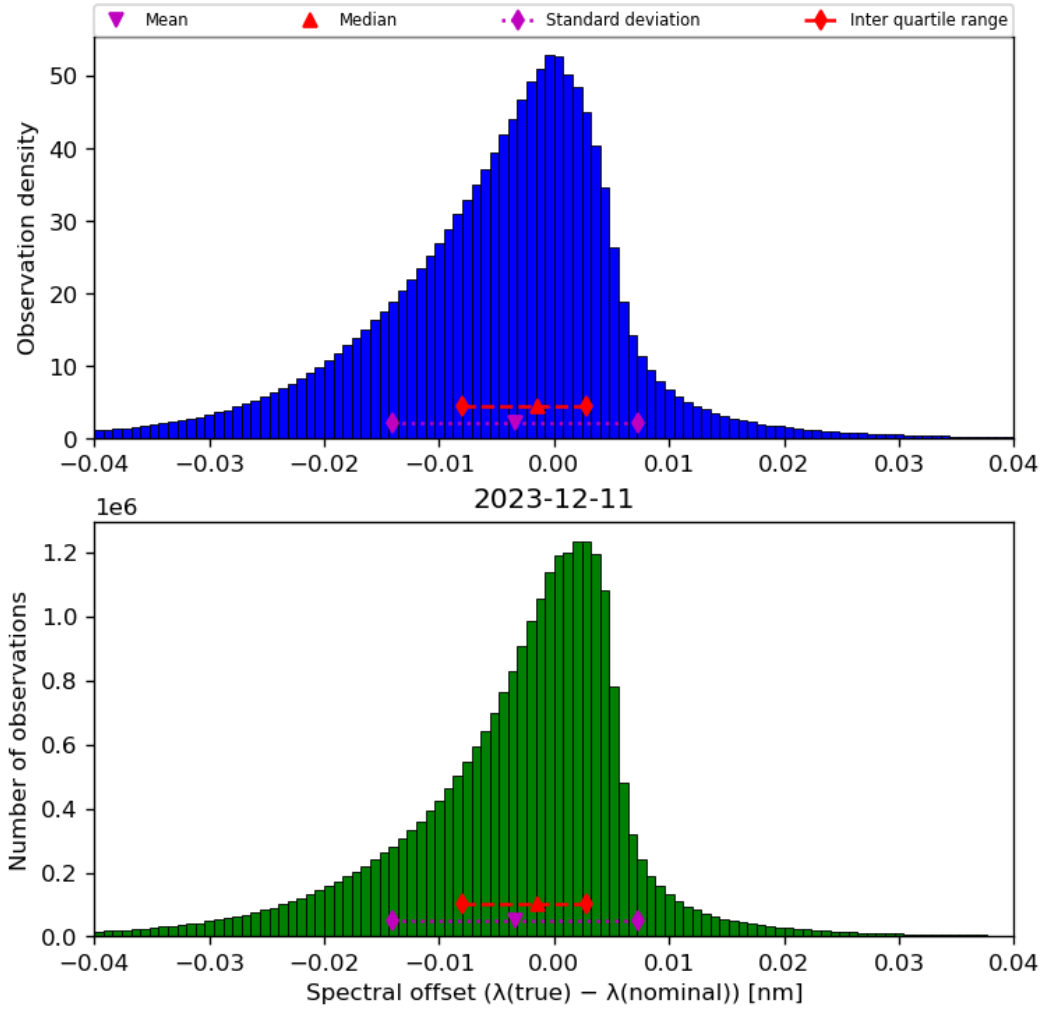


Figure 45: Histogram of "Spectral offset (λ(true) − λ(nominal))" for 2023-12-10 to 2023-12-12

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.

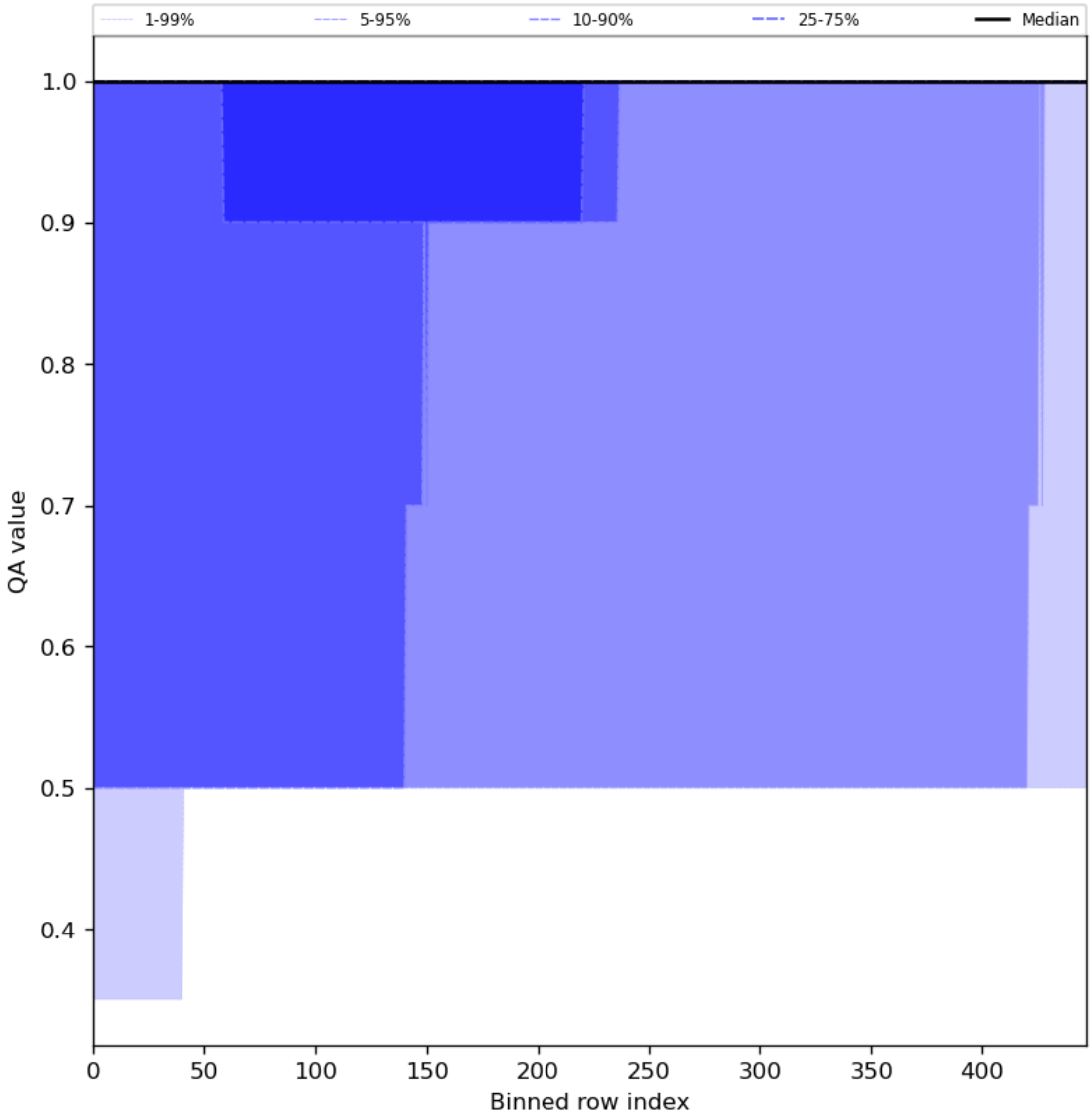


Figure 46: Along track statistics of “QA value” for 2023-12-10 to 2023-12-12

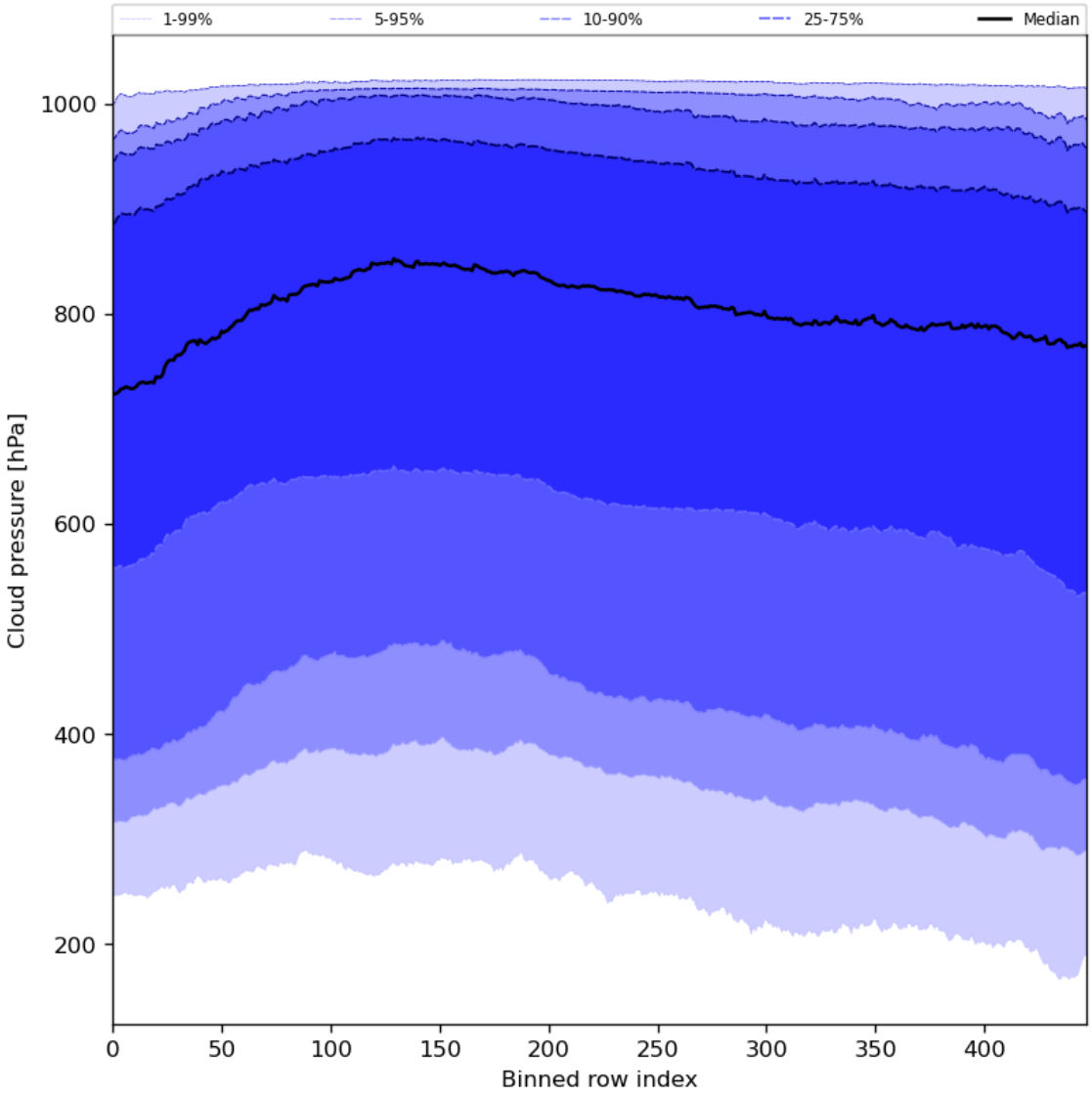


Figure 47: Along track statistics of “Cloud pressure” for 2023-12-10 to 2023-12-12

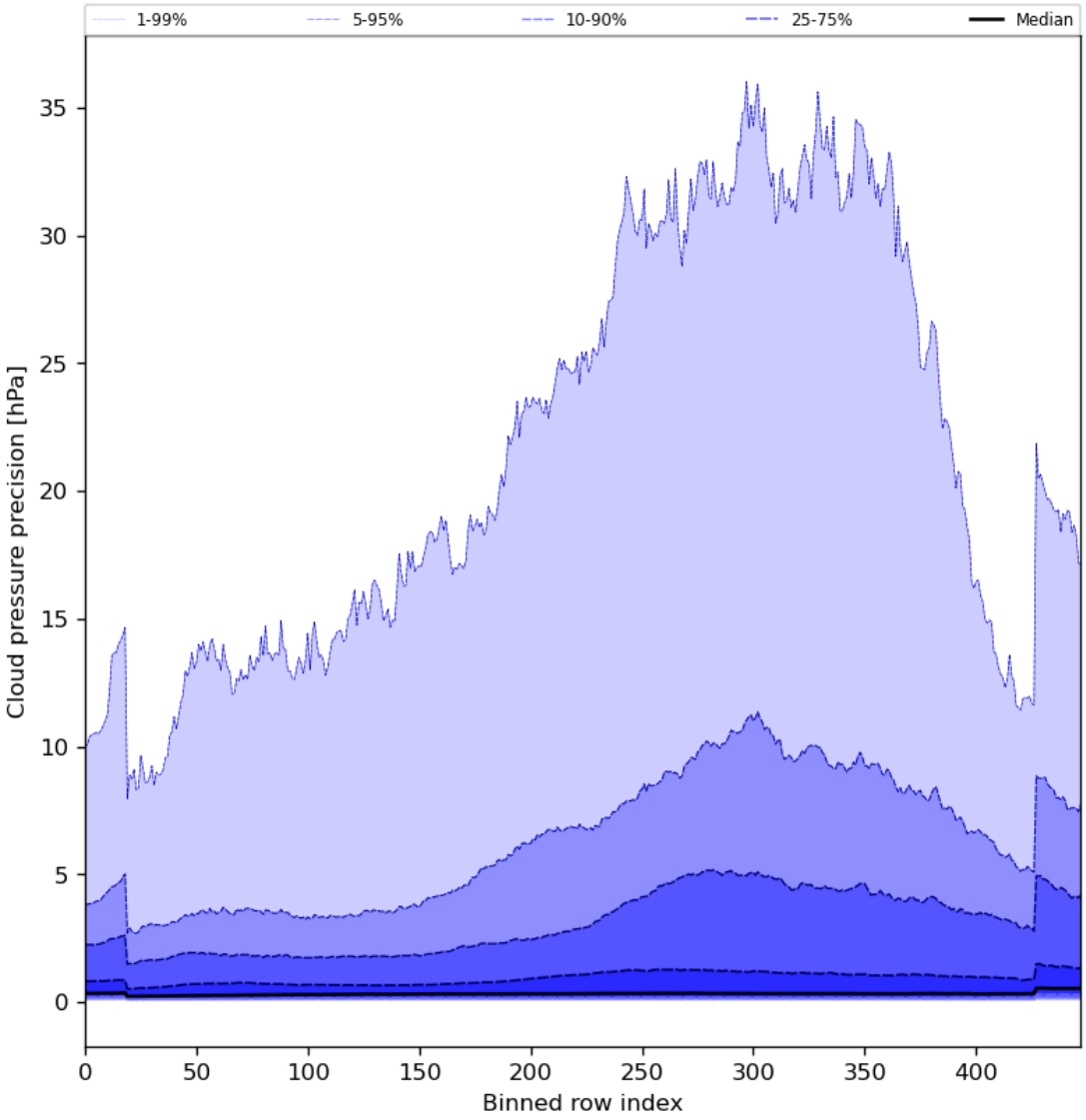


Figure 48: Along track statistics of “Cloud pressure precision” for 2023-12-10 to 2023-12-12

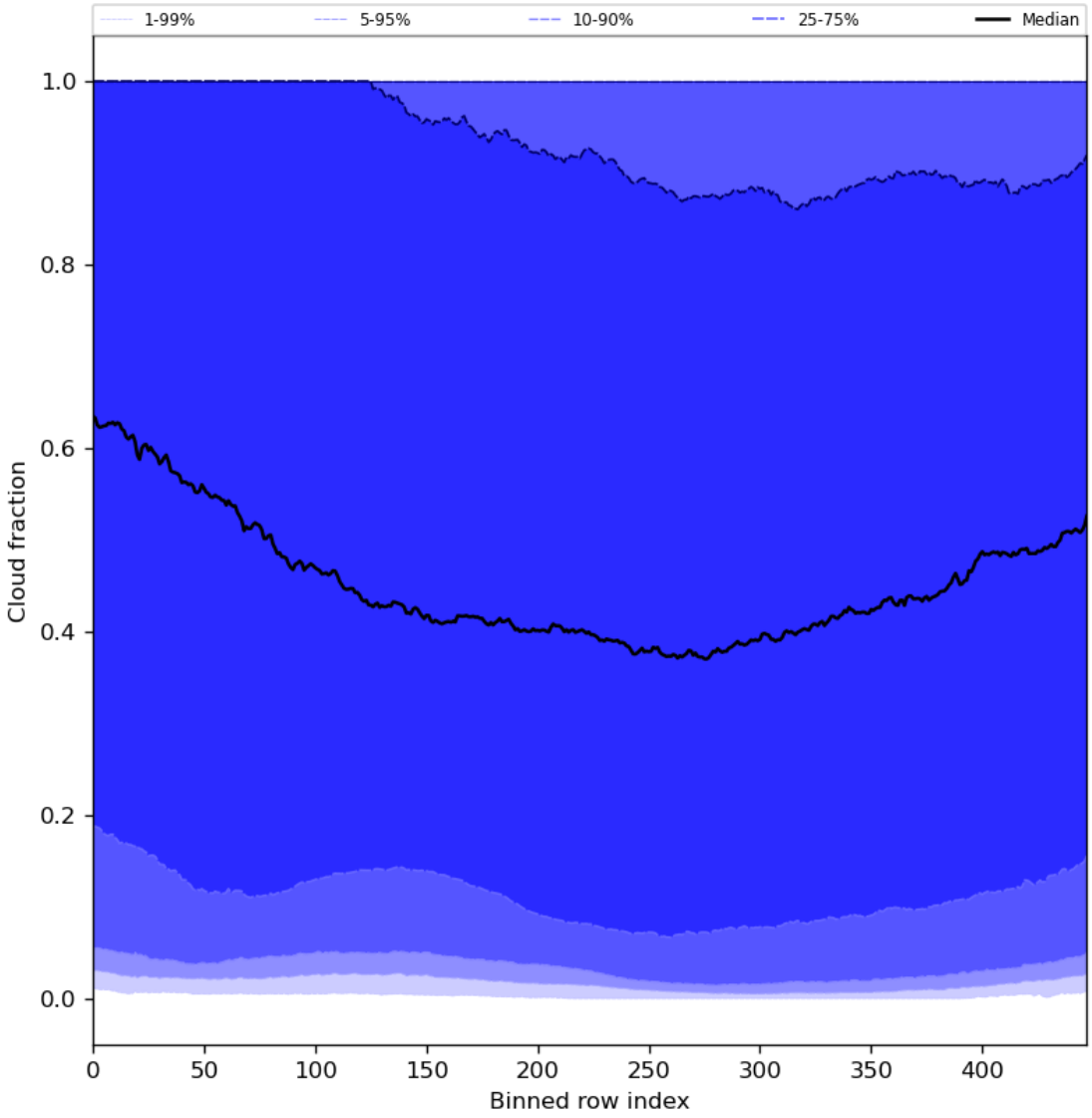


Figure 49: Along track statistics of “Cloud fraction” for 2023-12-10 to 2023-12-12

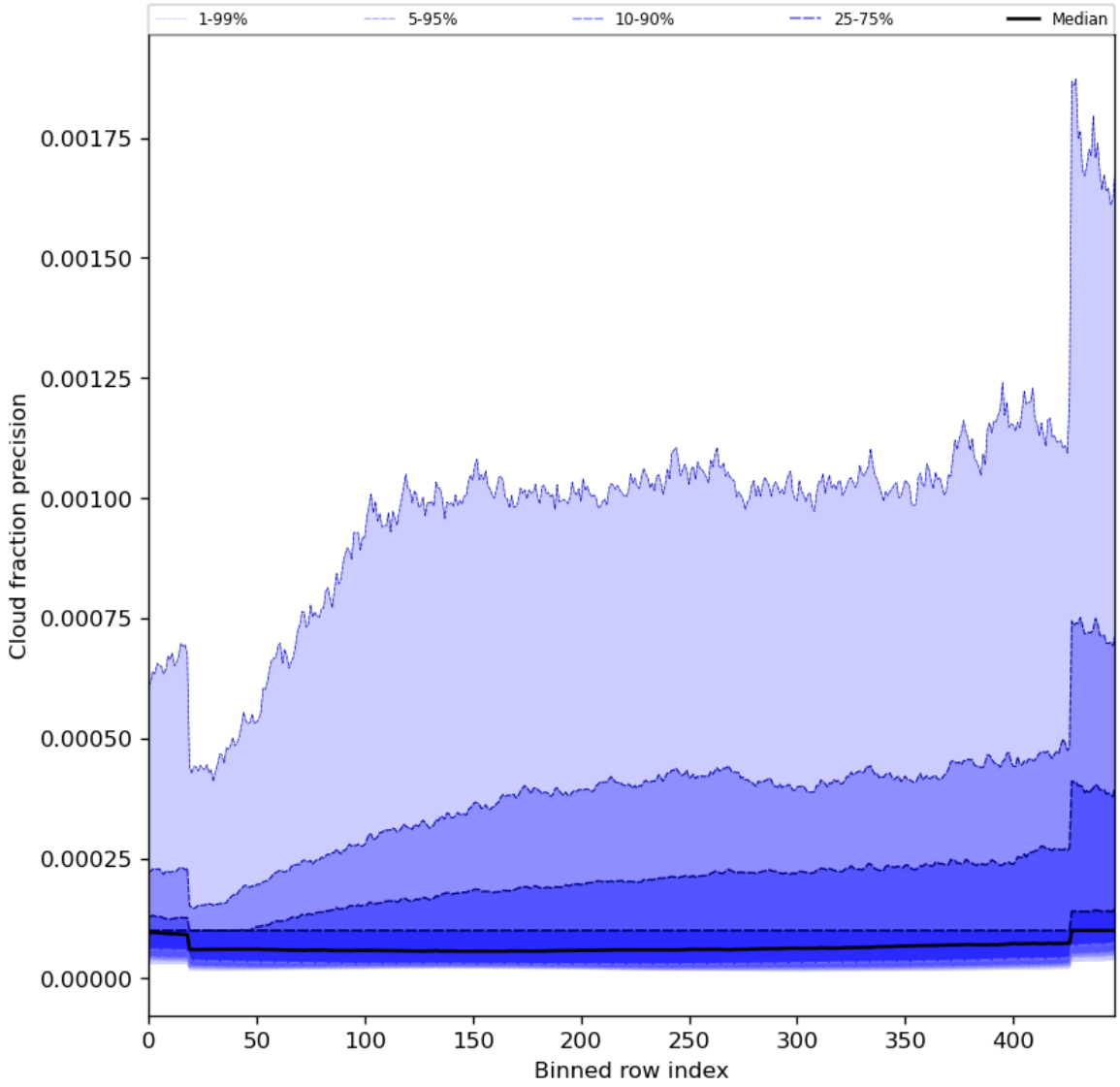


Figure 50: Along track statistics of “Cloud fraction precision” for 2023-12-10 to 2023-12-12

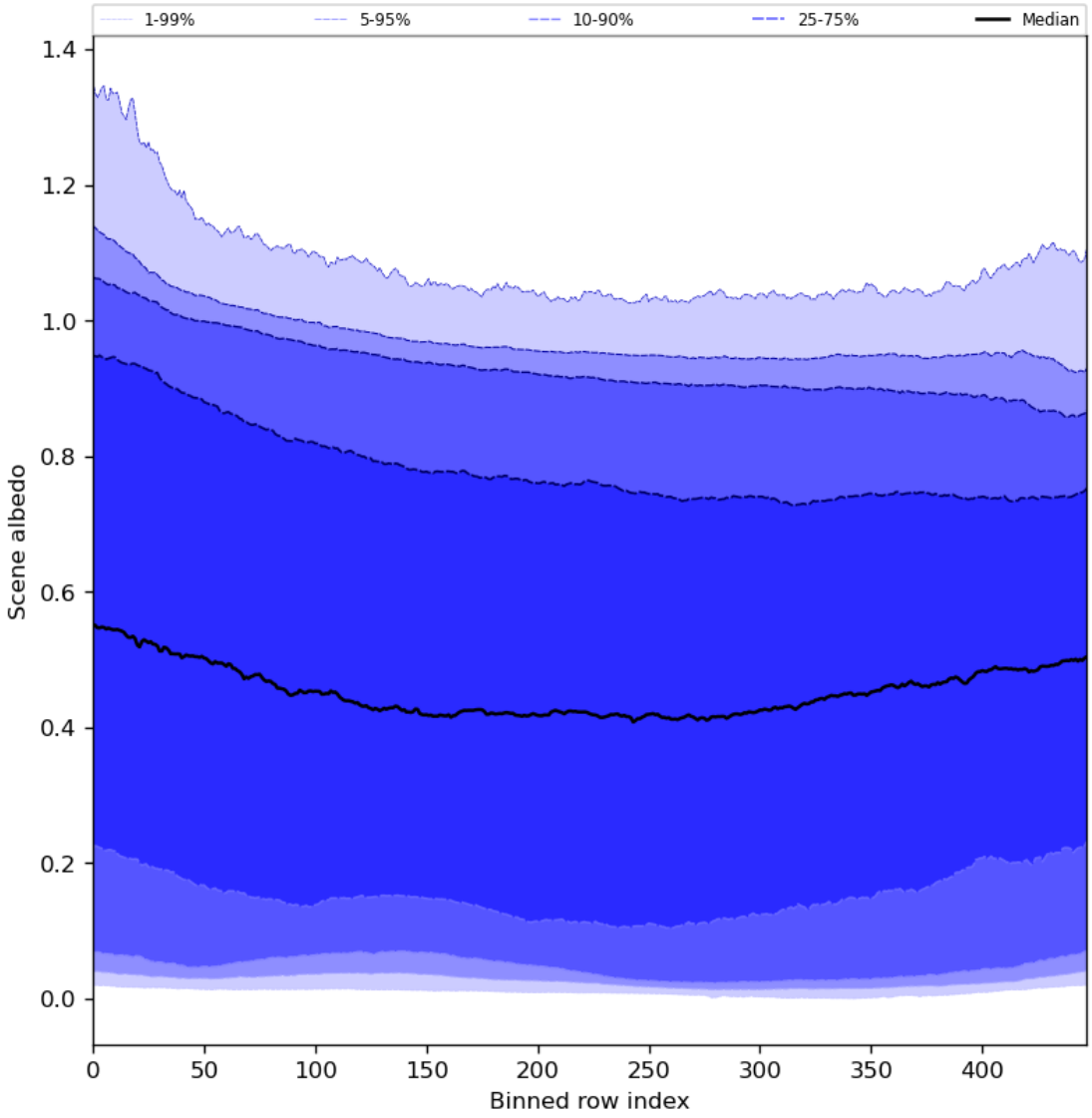


Figure 51: Along track statistics of “Scene albedo” for 2023-12-10 to 2023-12-12

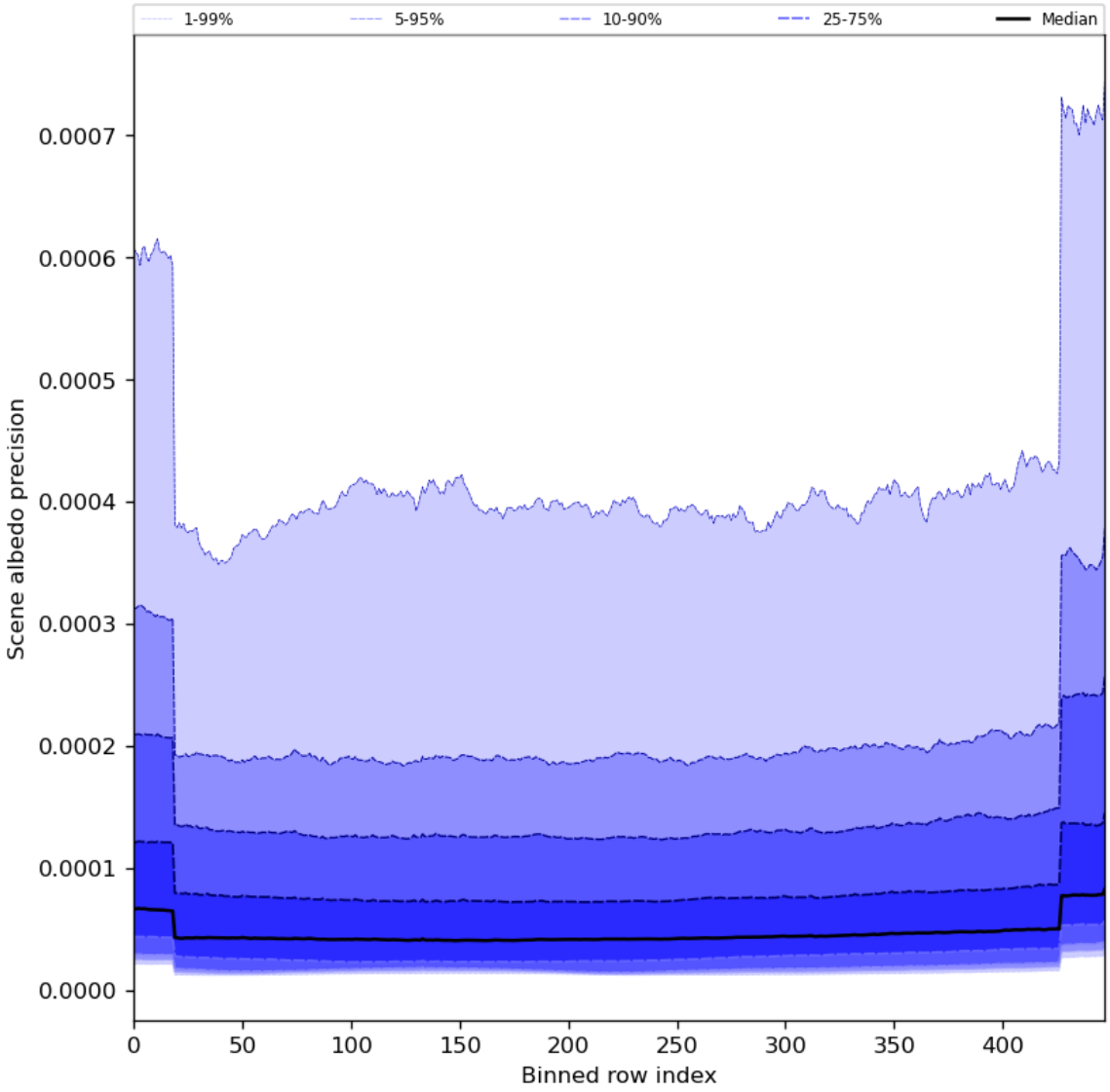


Figure 52: Along track statistics of “Scene albedo precision” for 2023-12-10 to 2023-12-12

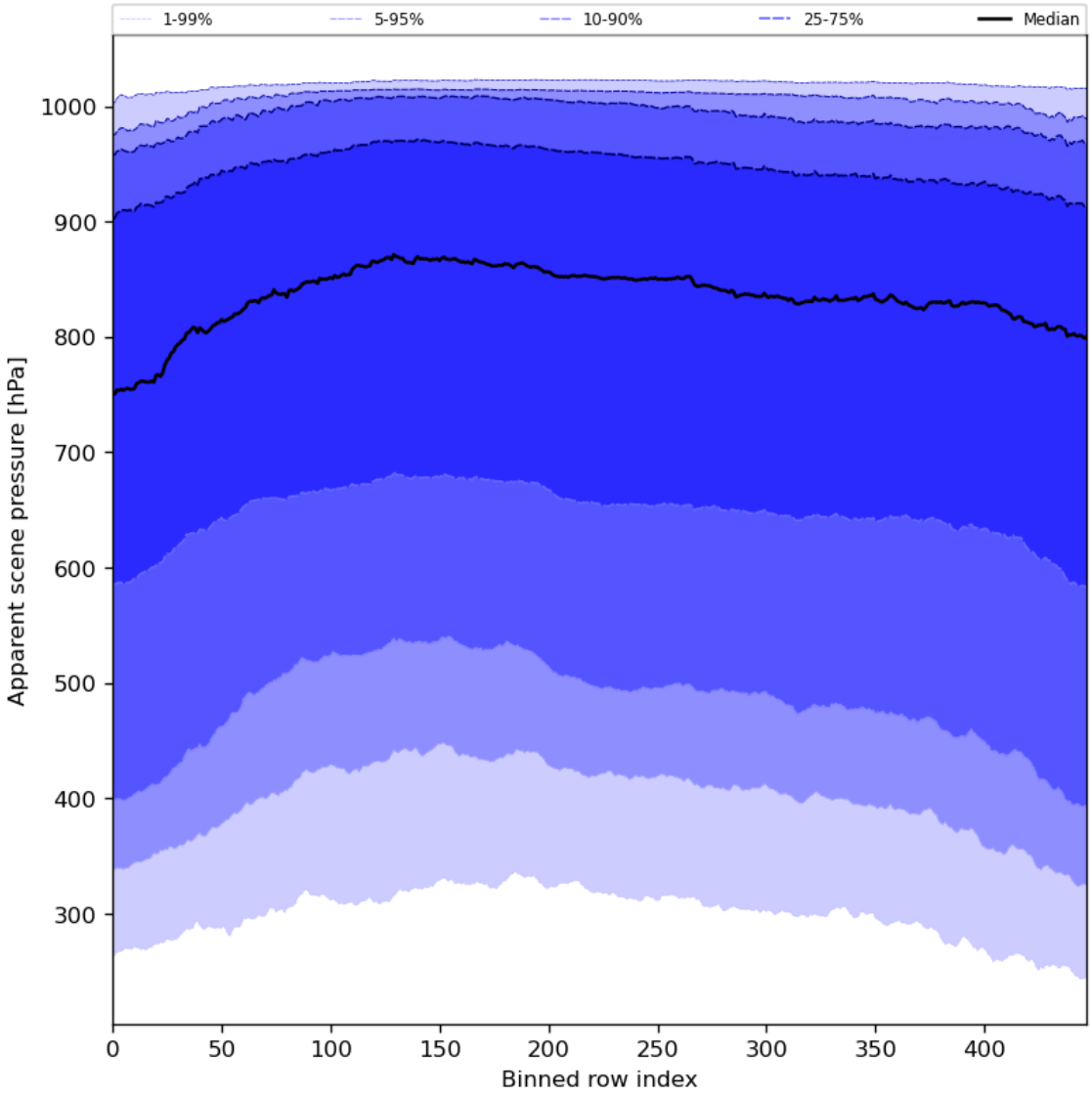


Figure 53: Along track statistics of “Apparent scene pressure” for 2023-12-10 to 2023-12-12

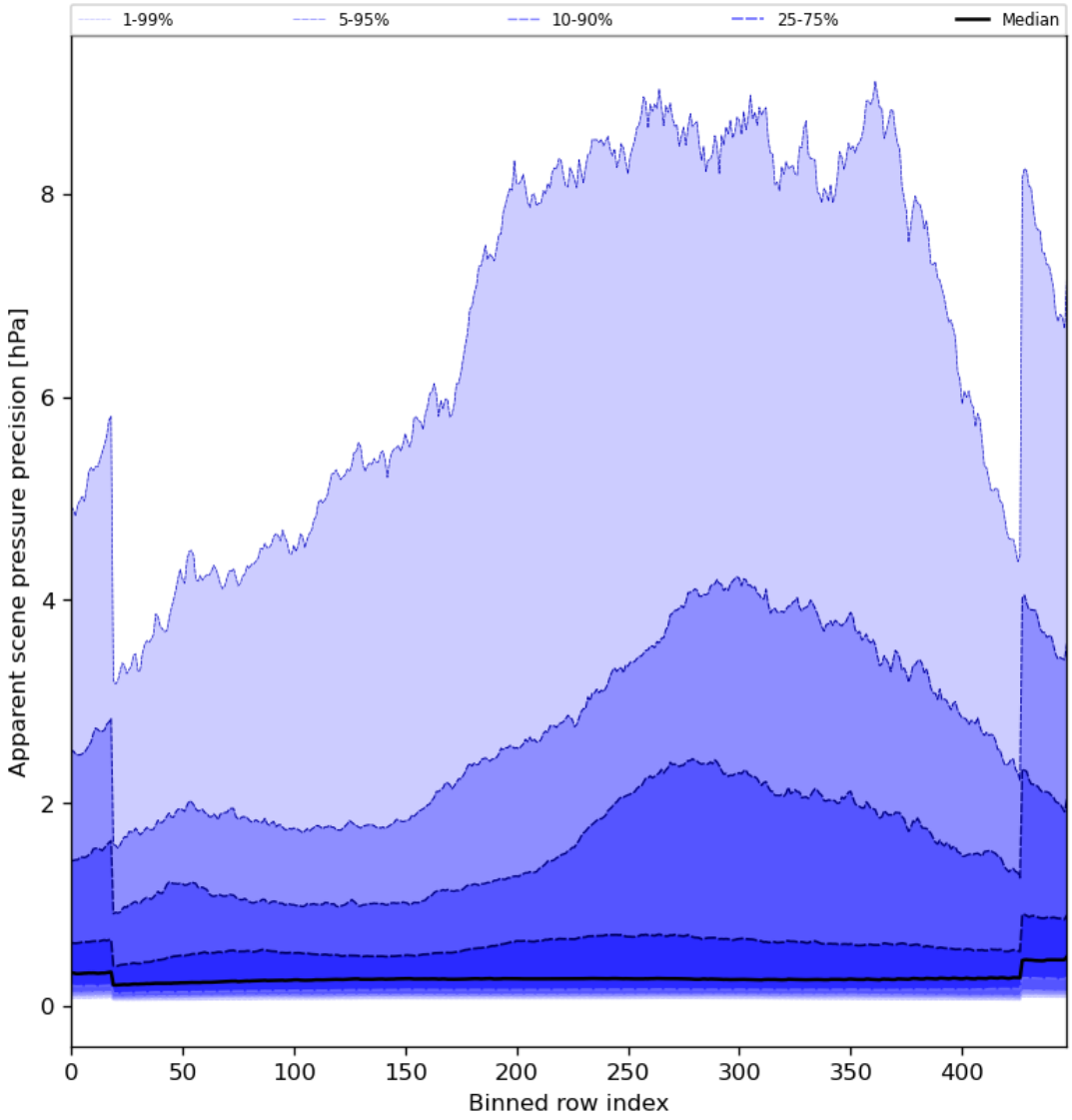


Figure 54: Along track statistics of “Apparent scene pressure precision” for 2023-12-10 to 2023-12-12

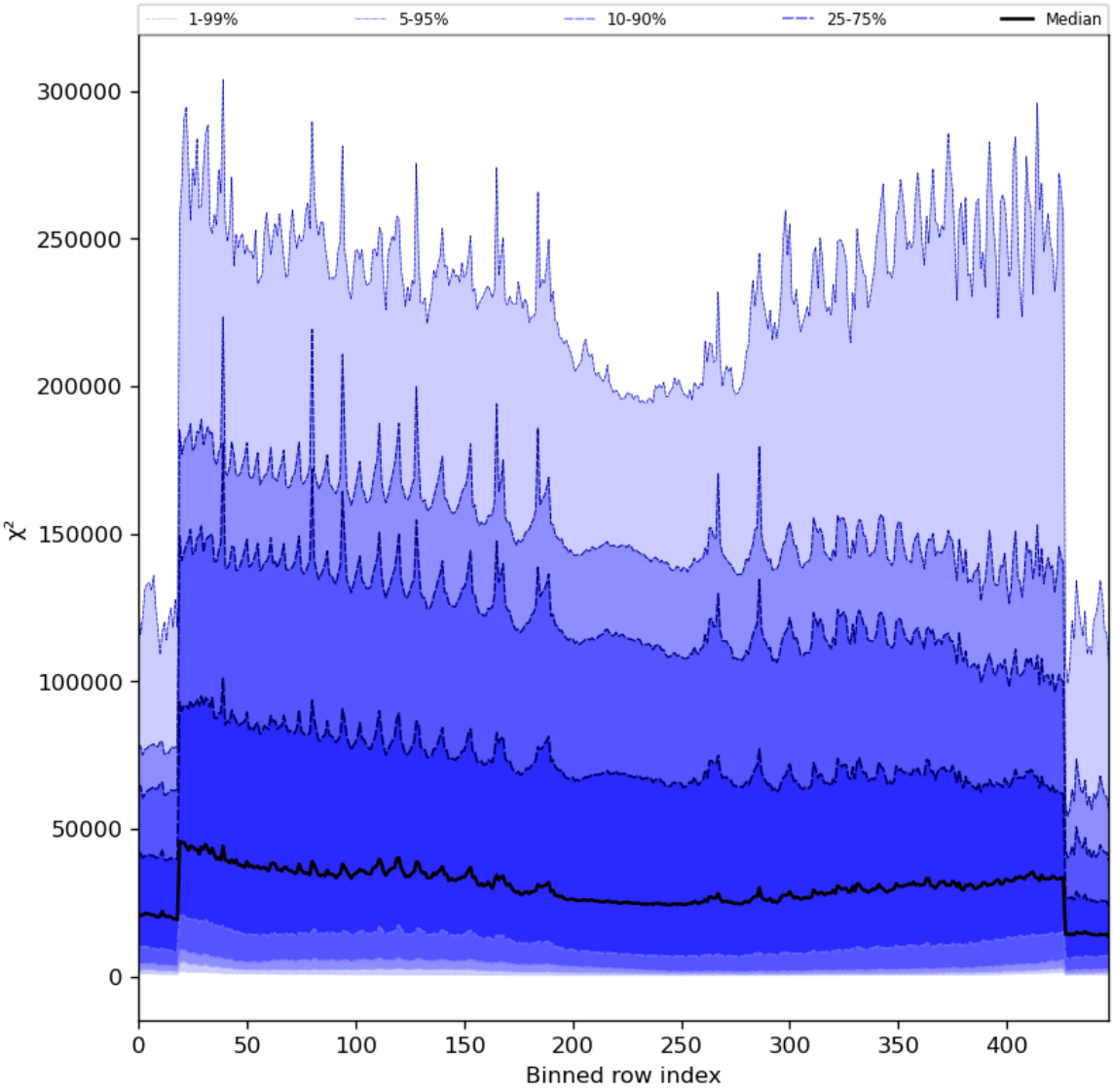


Figure 55: Along track statistics of "χ^2" for 2023-12-10 to 2023-12-12

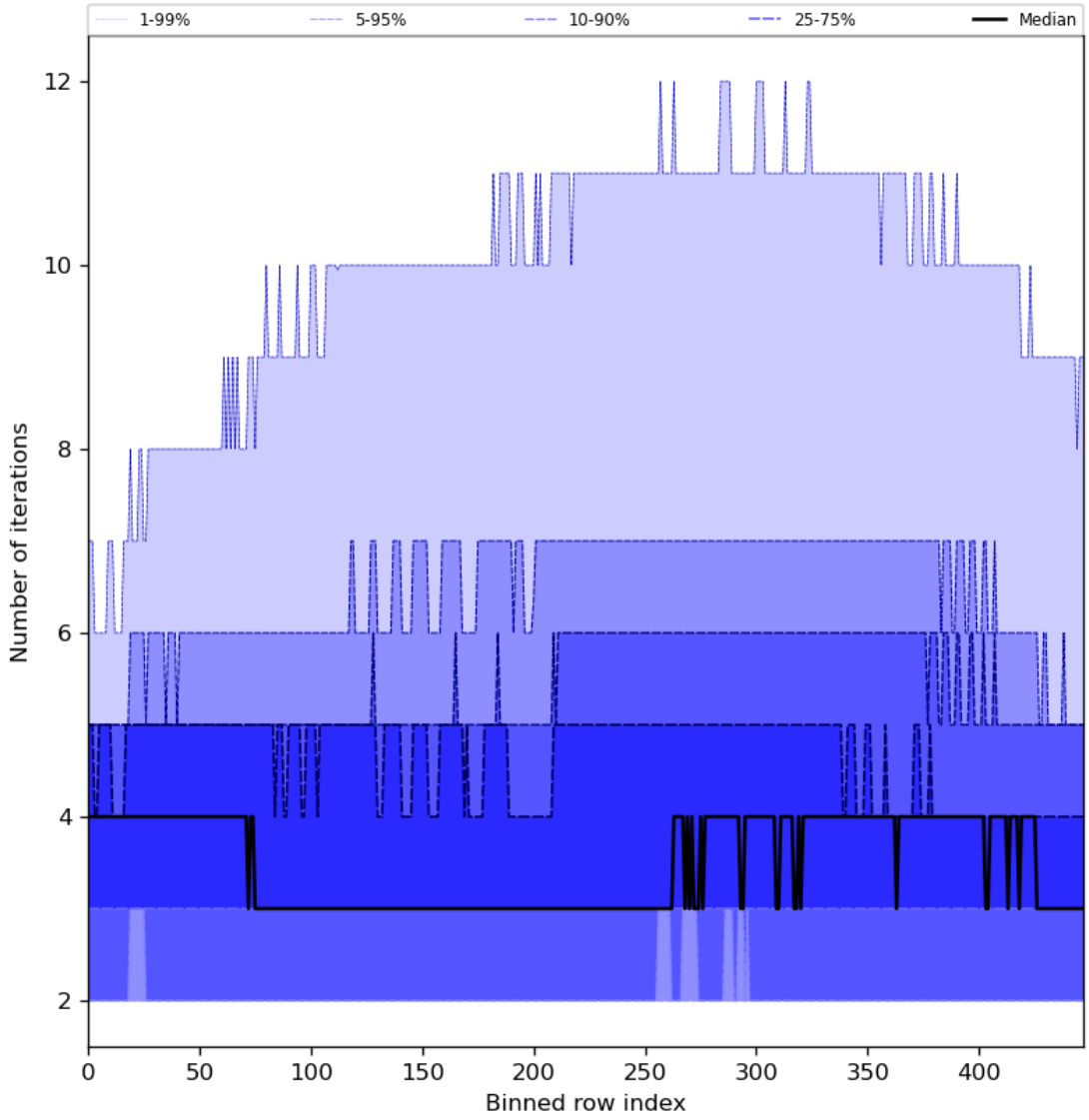


Figure 56: Along track statistics of “Number of iterations” for 2023-12-10 to 2023-12-12

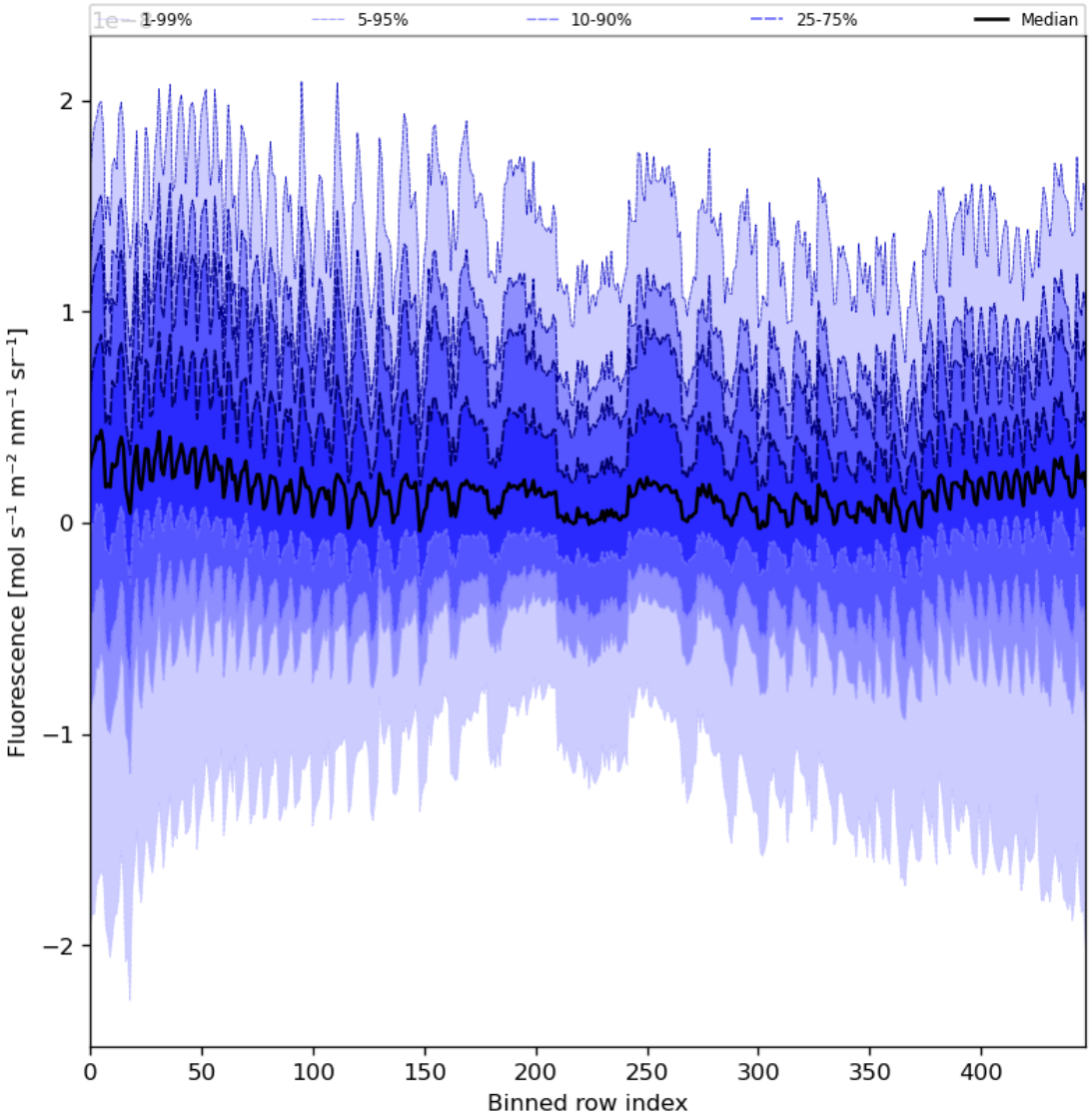


Figure 57: Along track statistics of “Fluorescence” for 2023-12-10 to 2023-12-12

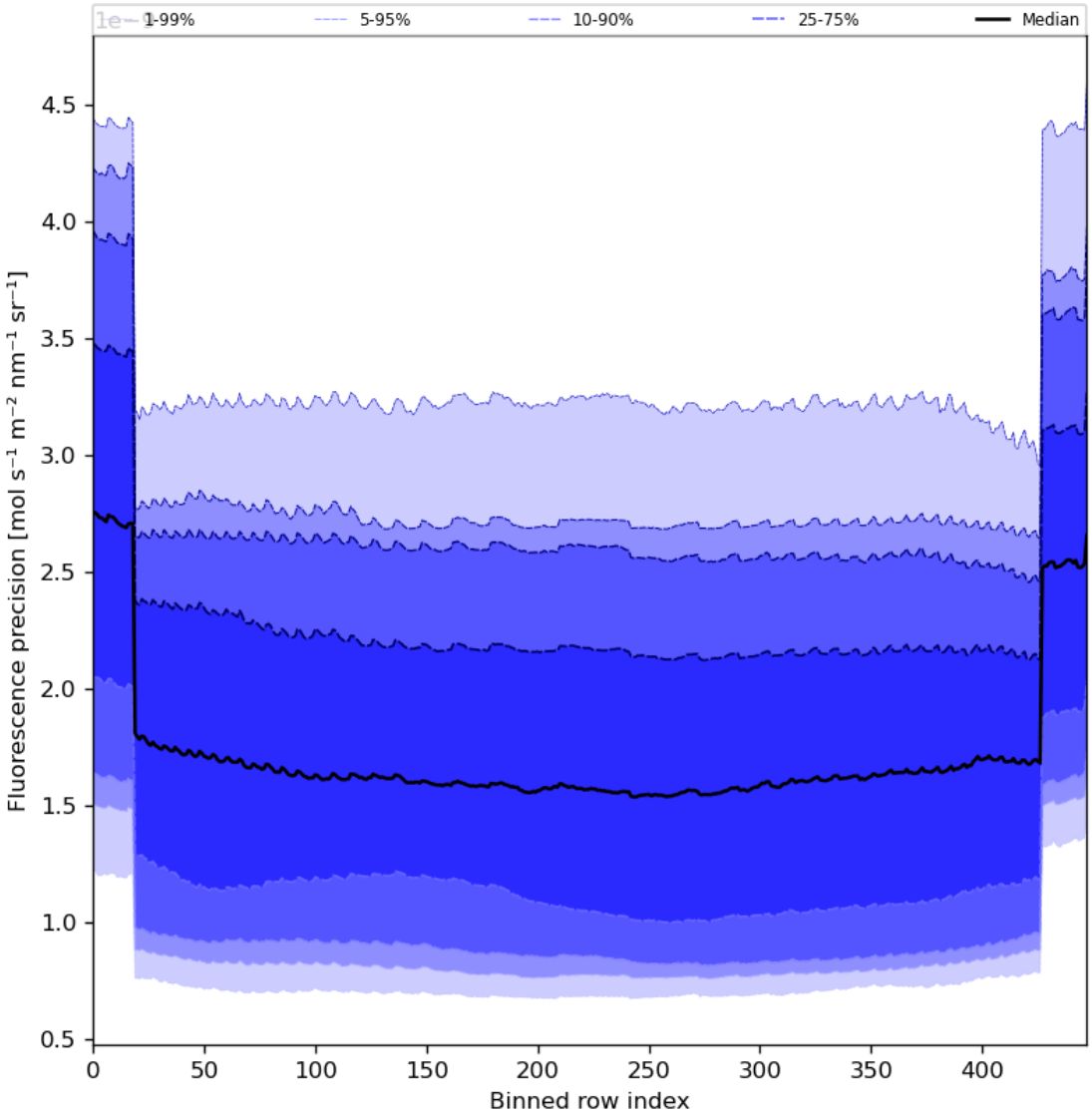


Figure 58: Along track statistics of “Fluorescence precision” for 2023-12-10 to 2023-12-12

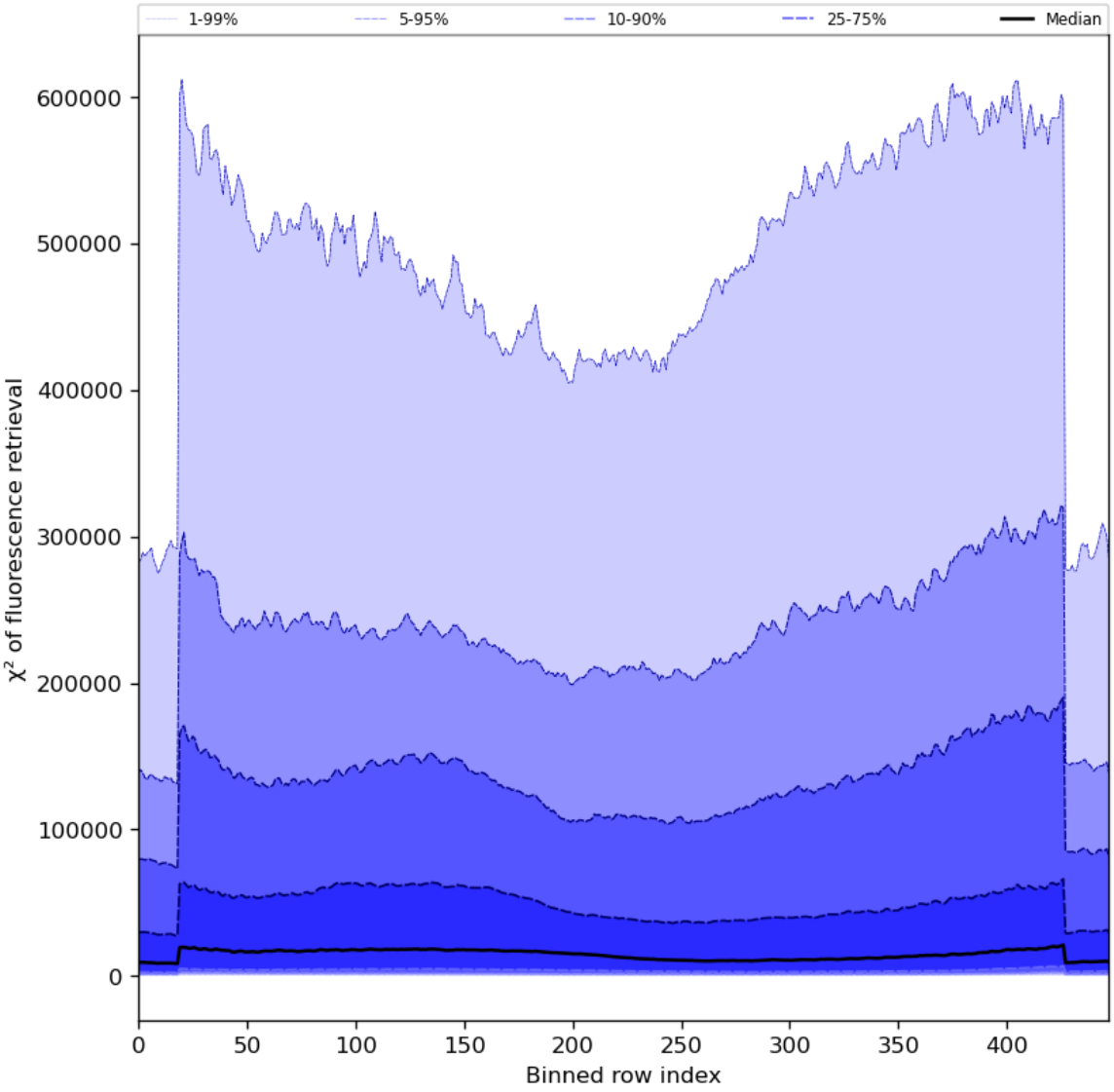


Figure 59: Along track statistics of "χ^2 of fluorescence retrieval" for 2023-12-10 to 2023-12-12

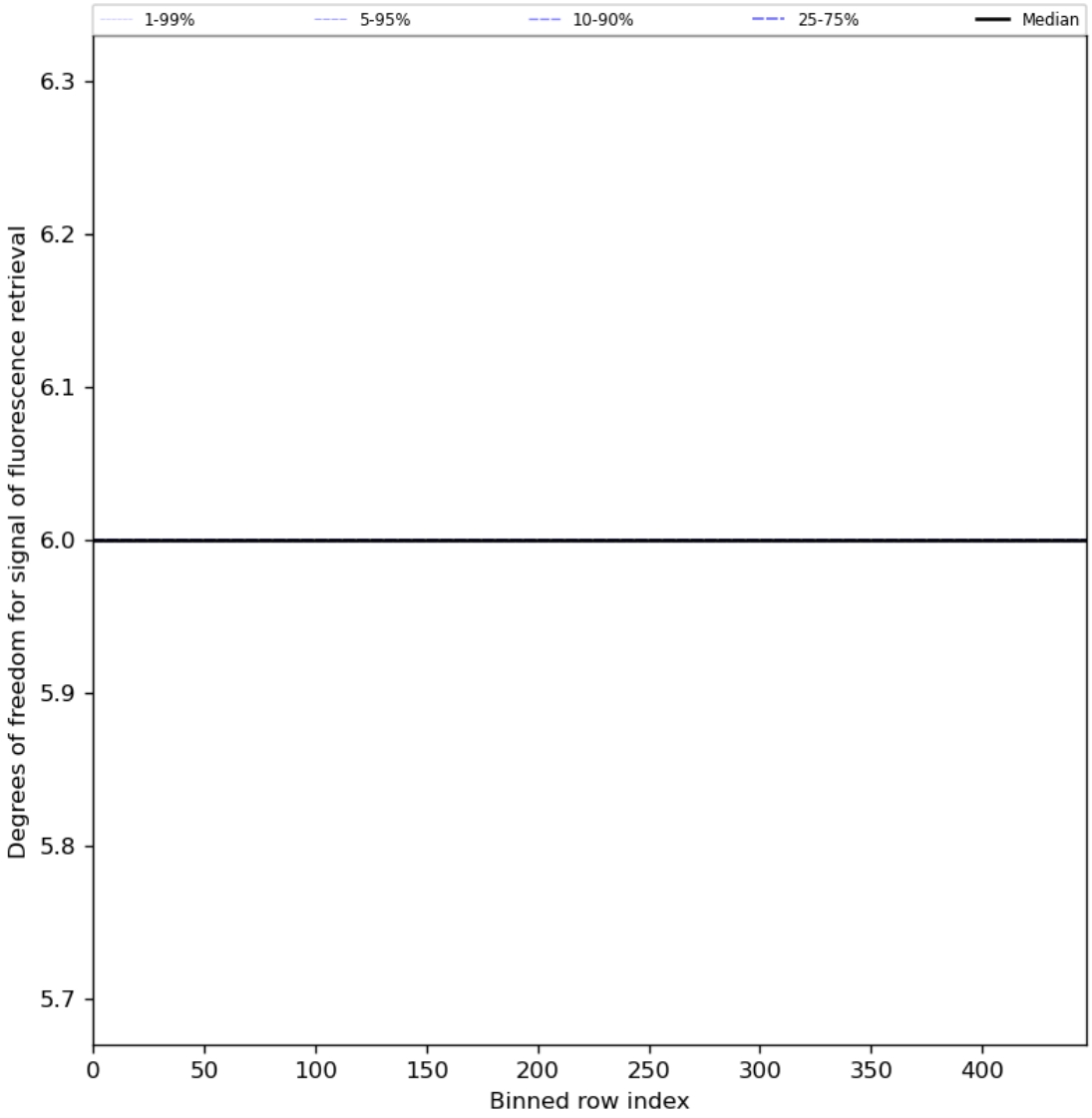


Figure 60: Along track statistics of “Degrees of freedom for signal of fluorescence retrieval” for 2023-12-10 to 2023-12-12

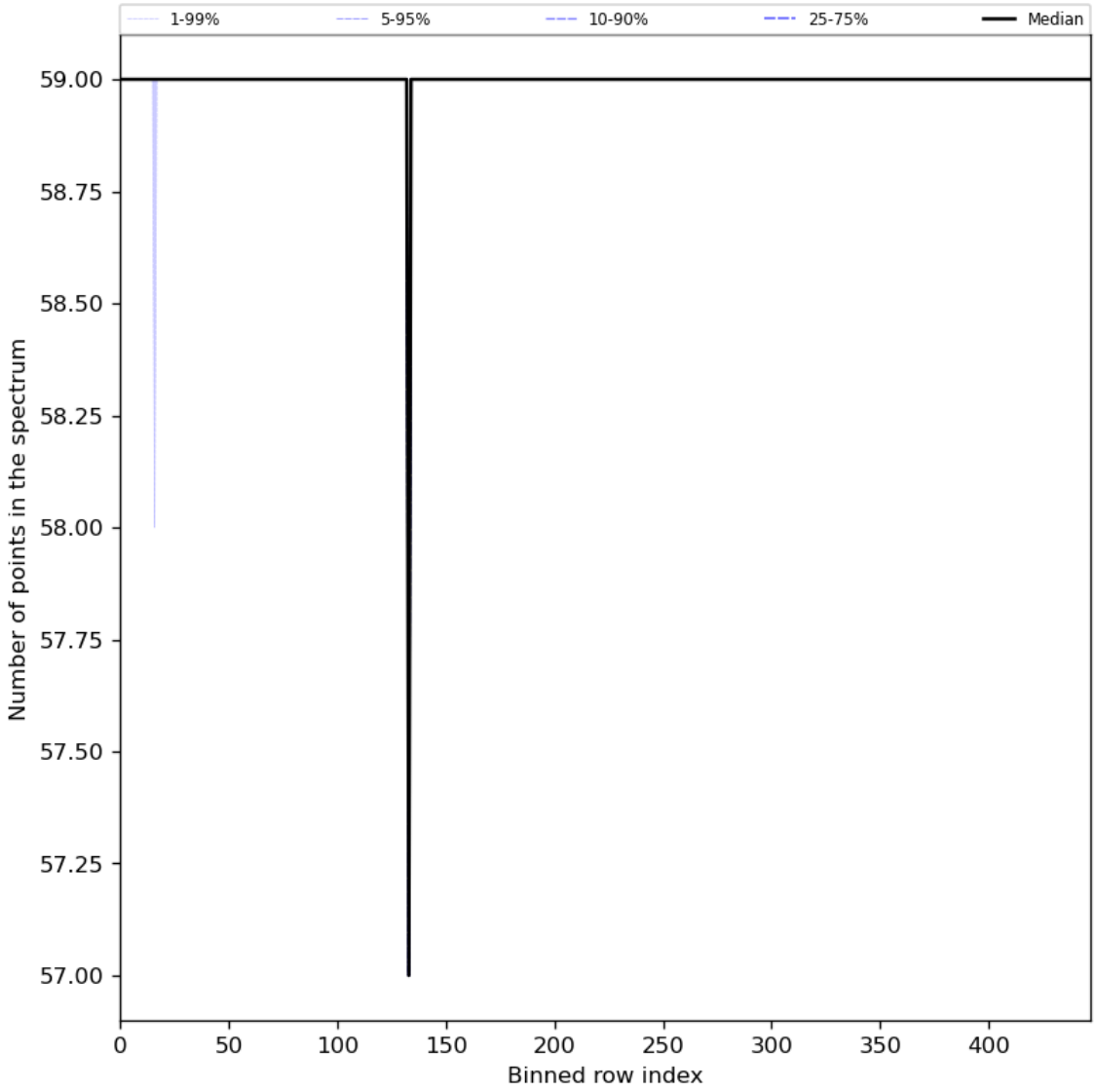


Figure 61: Along track statistics of “Number of points in the spectrum” for 2023-12-10 to 2023-12-12

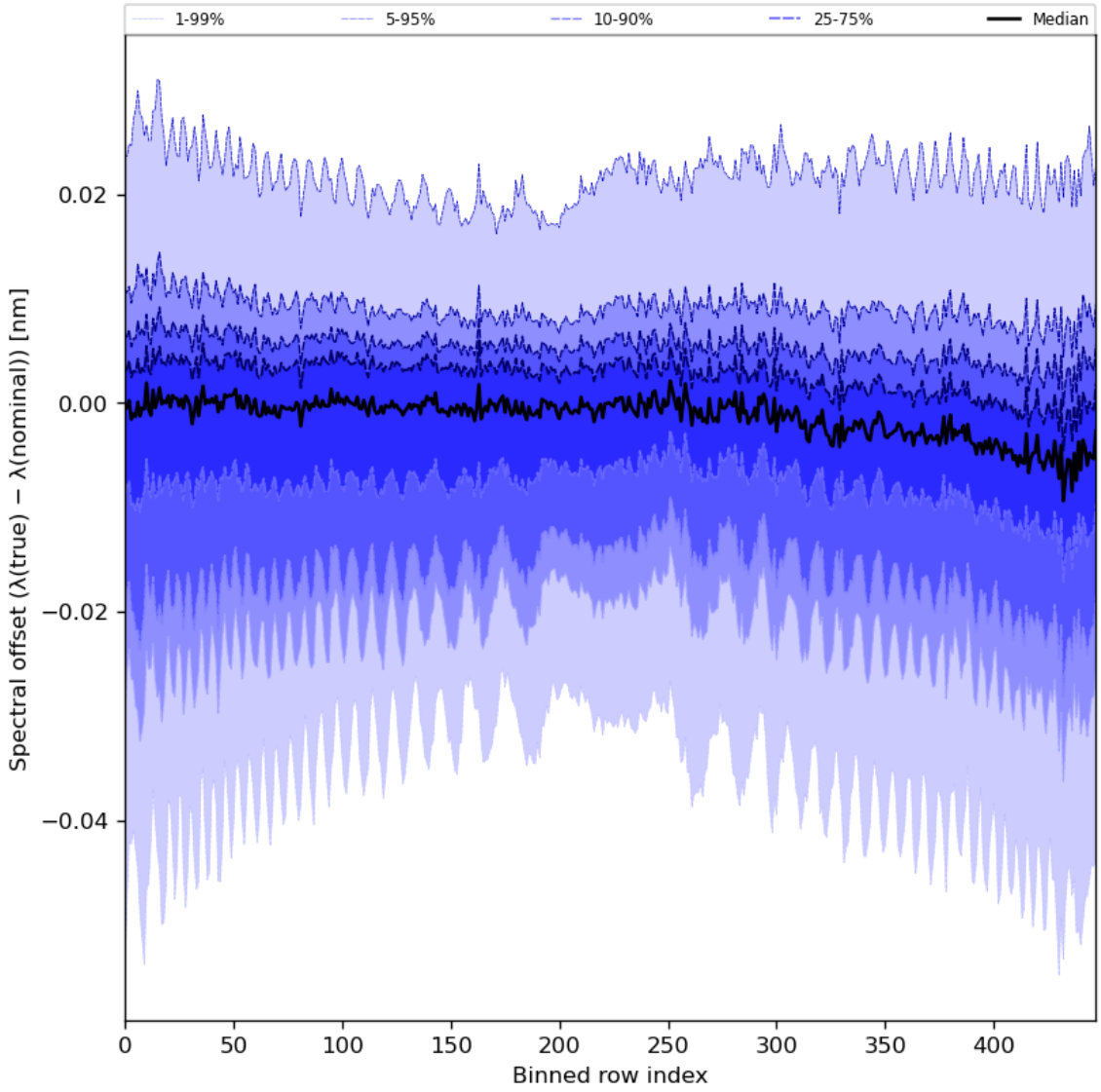


Figure 62: Along track statistics of "Spectral offset (λ(true) − λ(nominal))" for 2023-12-10 to 2023-12-12

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.

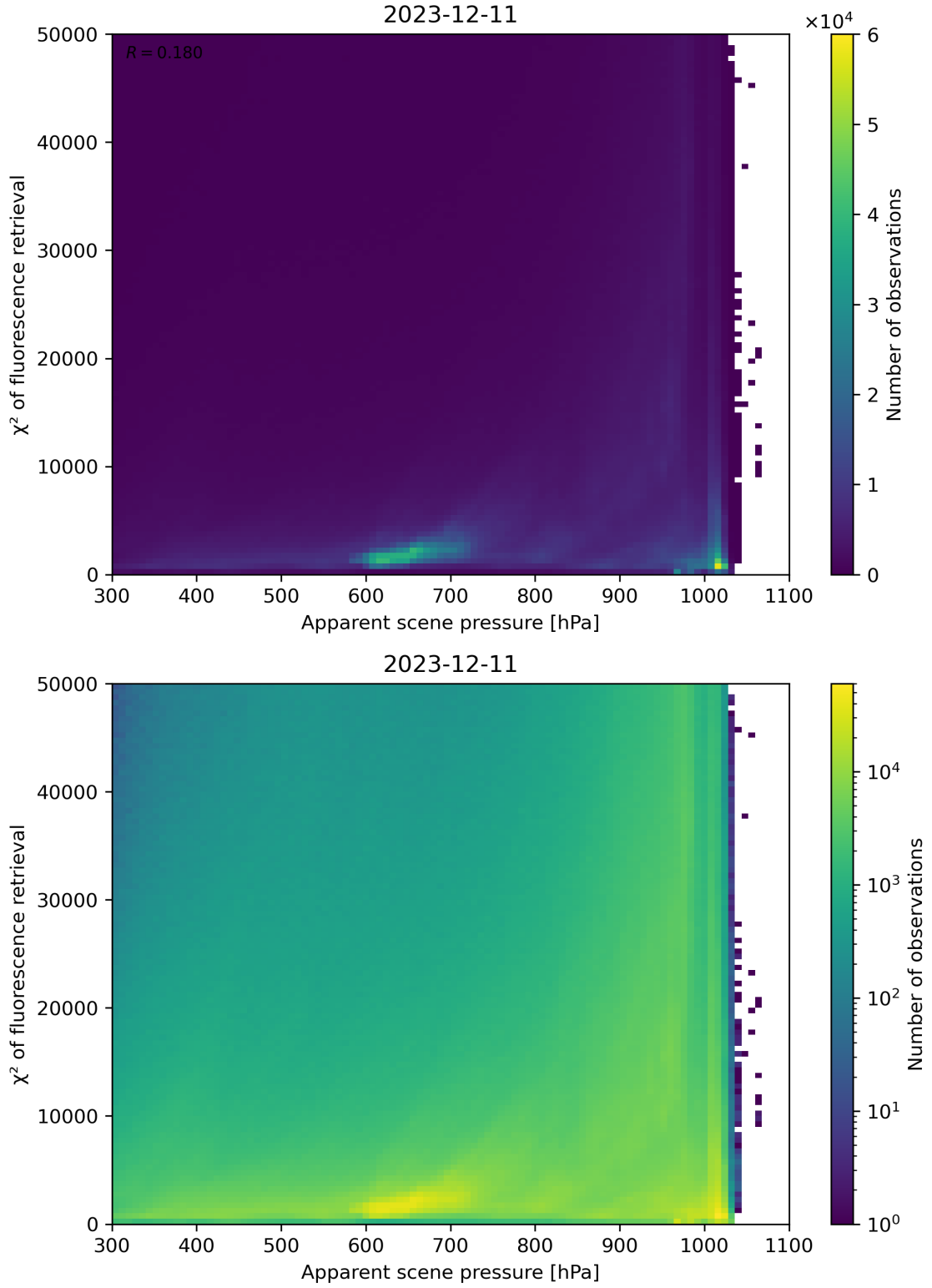


Figure 63: Scatter density plot of "Apparent scene pressure" against "χ^2 of fluorescence retrieval" for 2023-12-10 to 2023-12-12.

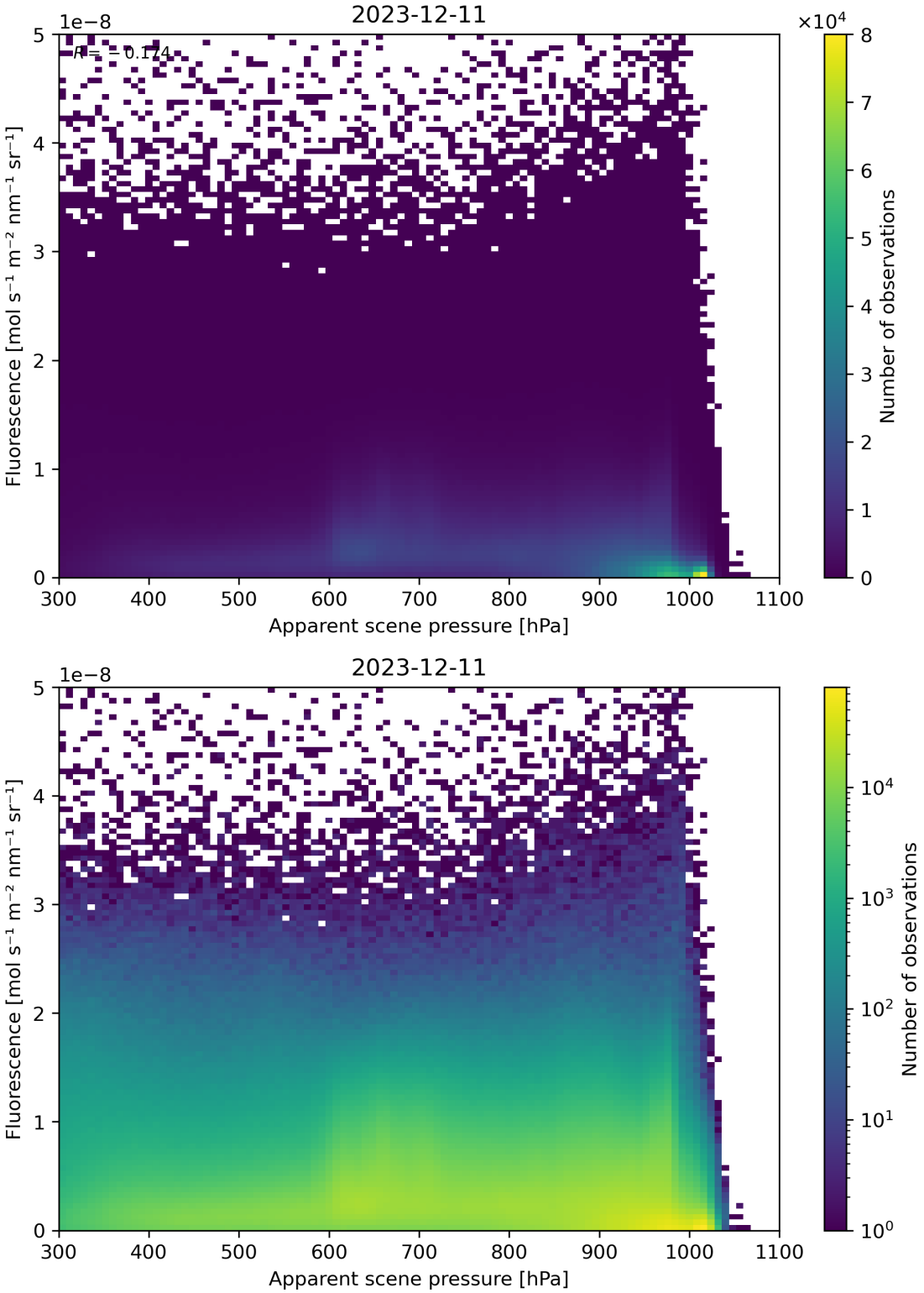


Figure 64: Scatter density plot of “Apparent scene pressure” against “Fluorescence” for 2023-12-10 to 2023-12-12.

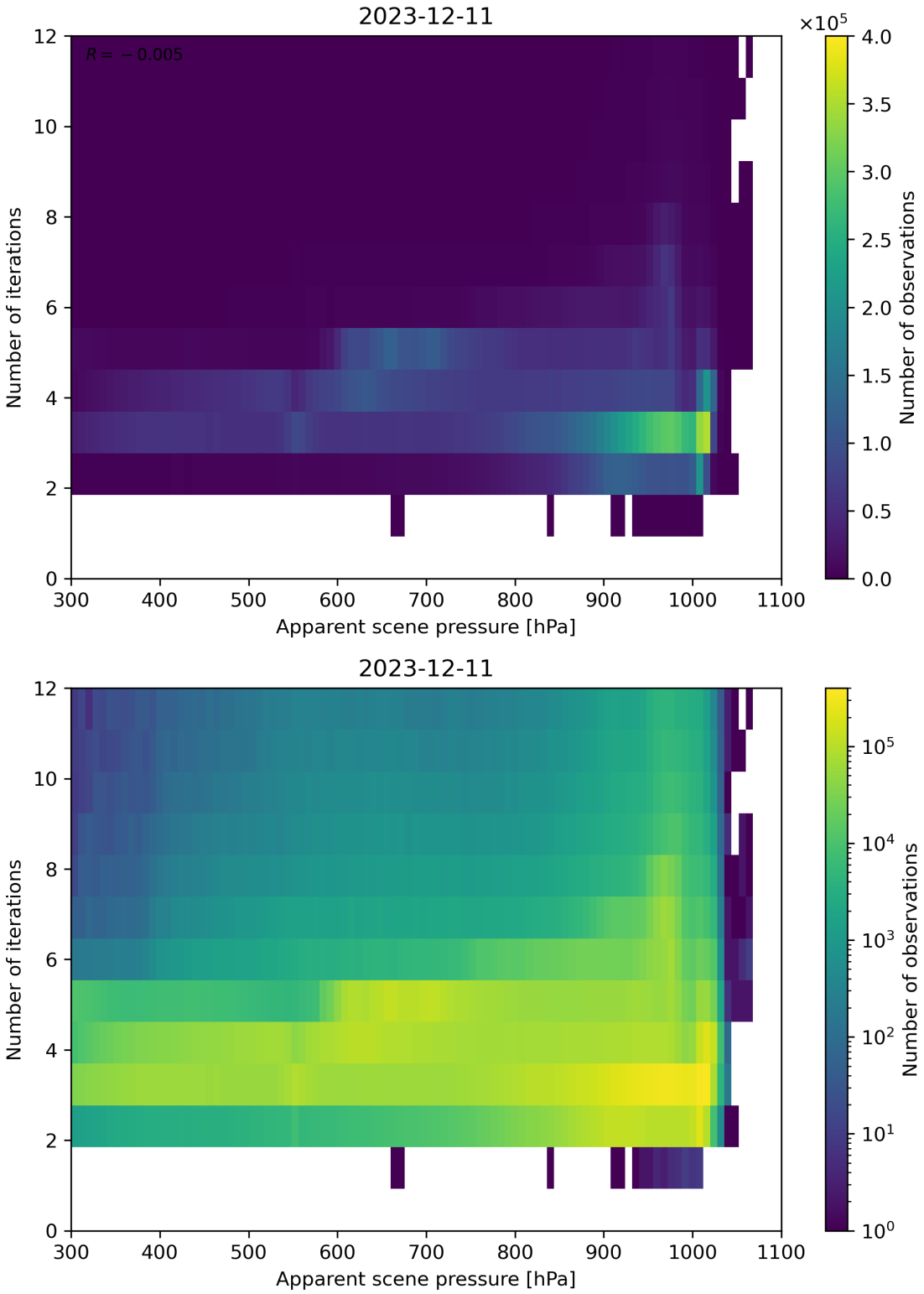


Figure 65: Scatter density plot of “Apparent scene pressure” against “Number of iterations” for 2023-12-10 to 2023-12-12.

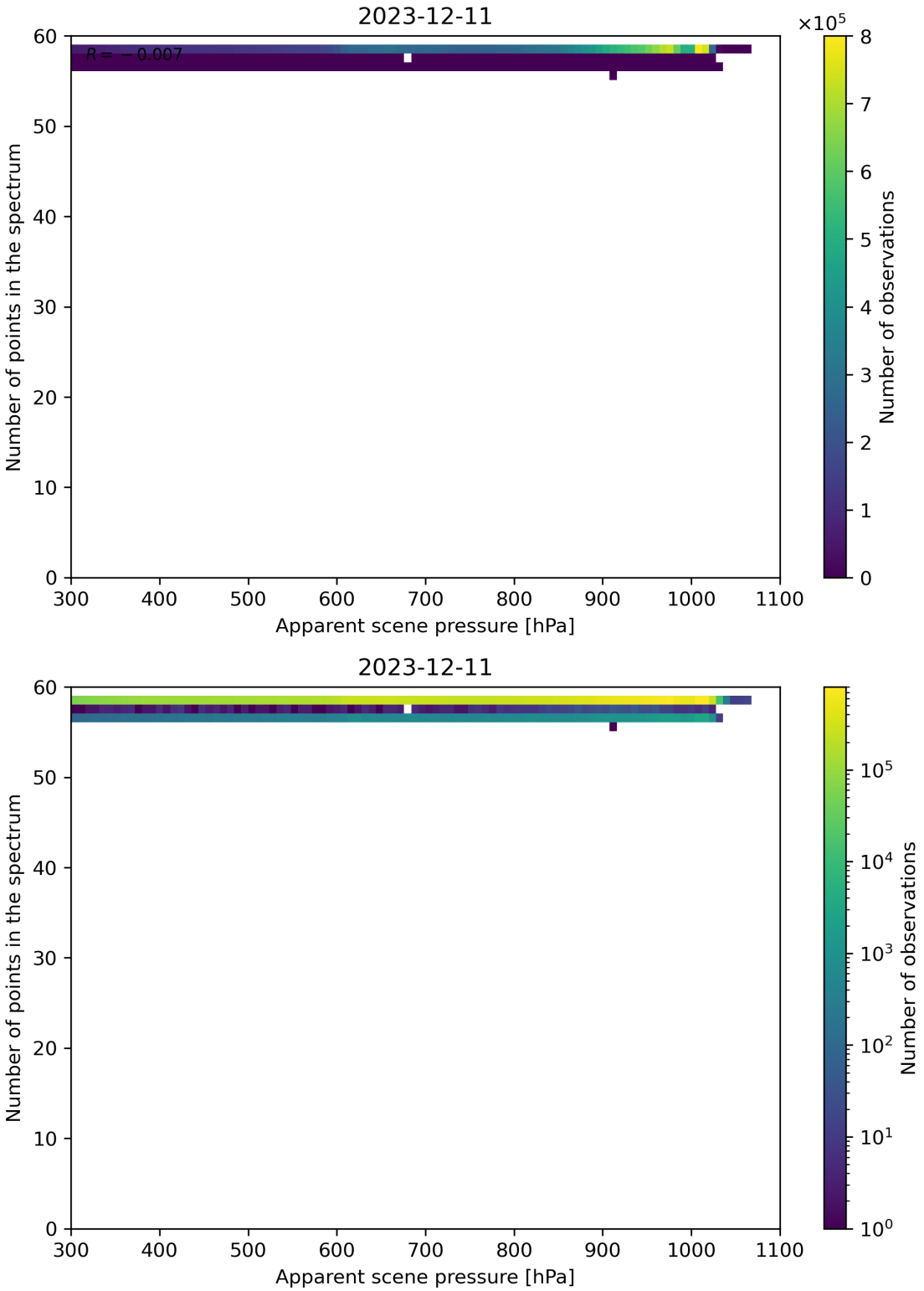


Figure 66: Scatter density plot of “Apparent scene pressure” against “Number of points in the spectrum” for 2023-12-10 to 2023-12-12.

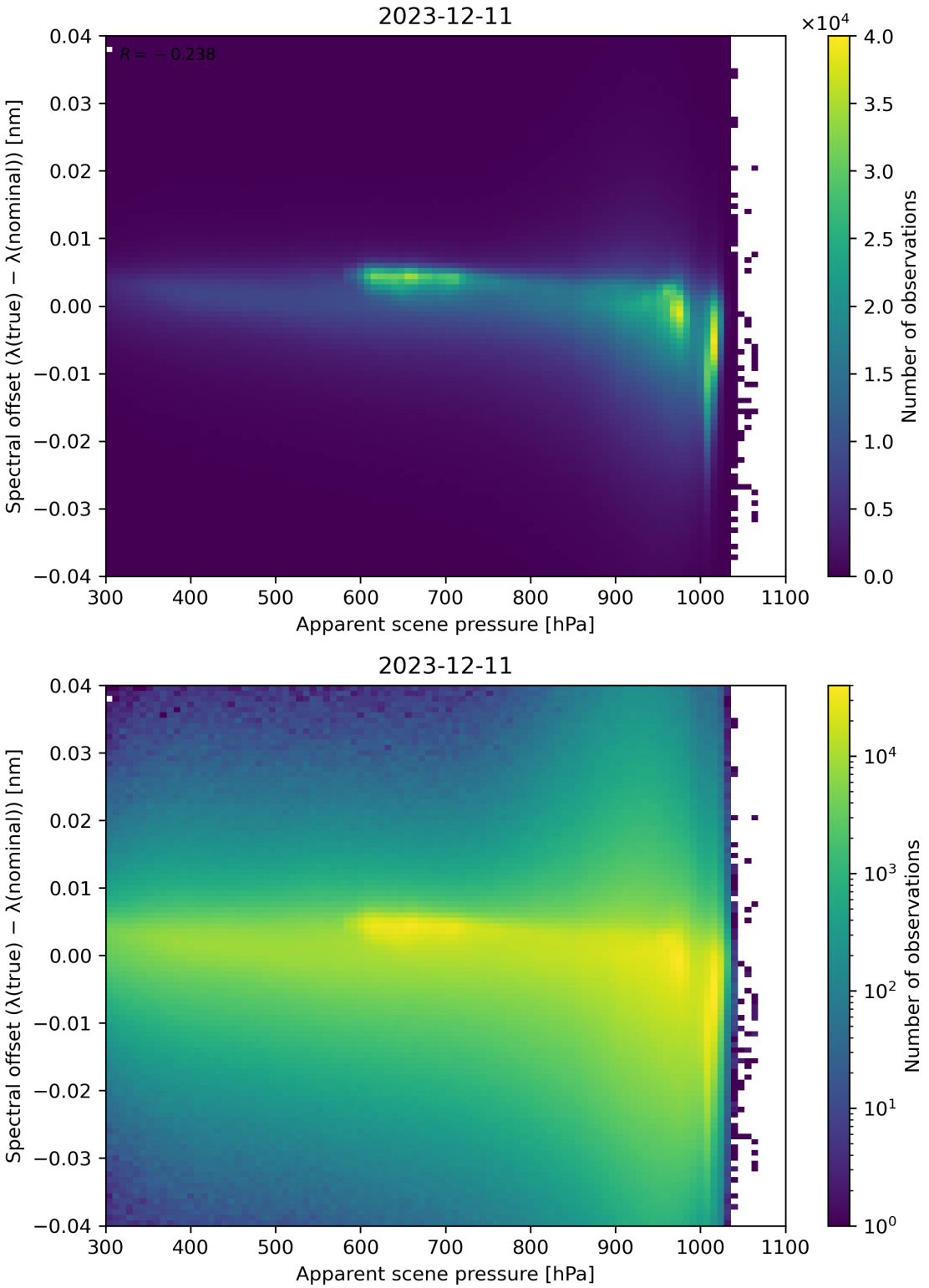


Figure 67: Scatter density plot of “Apparent scene pressure” against “Spectral offset (λ(true) − λ(nominal))” for 2023-12-10 to 2023-12-12.

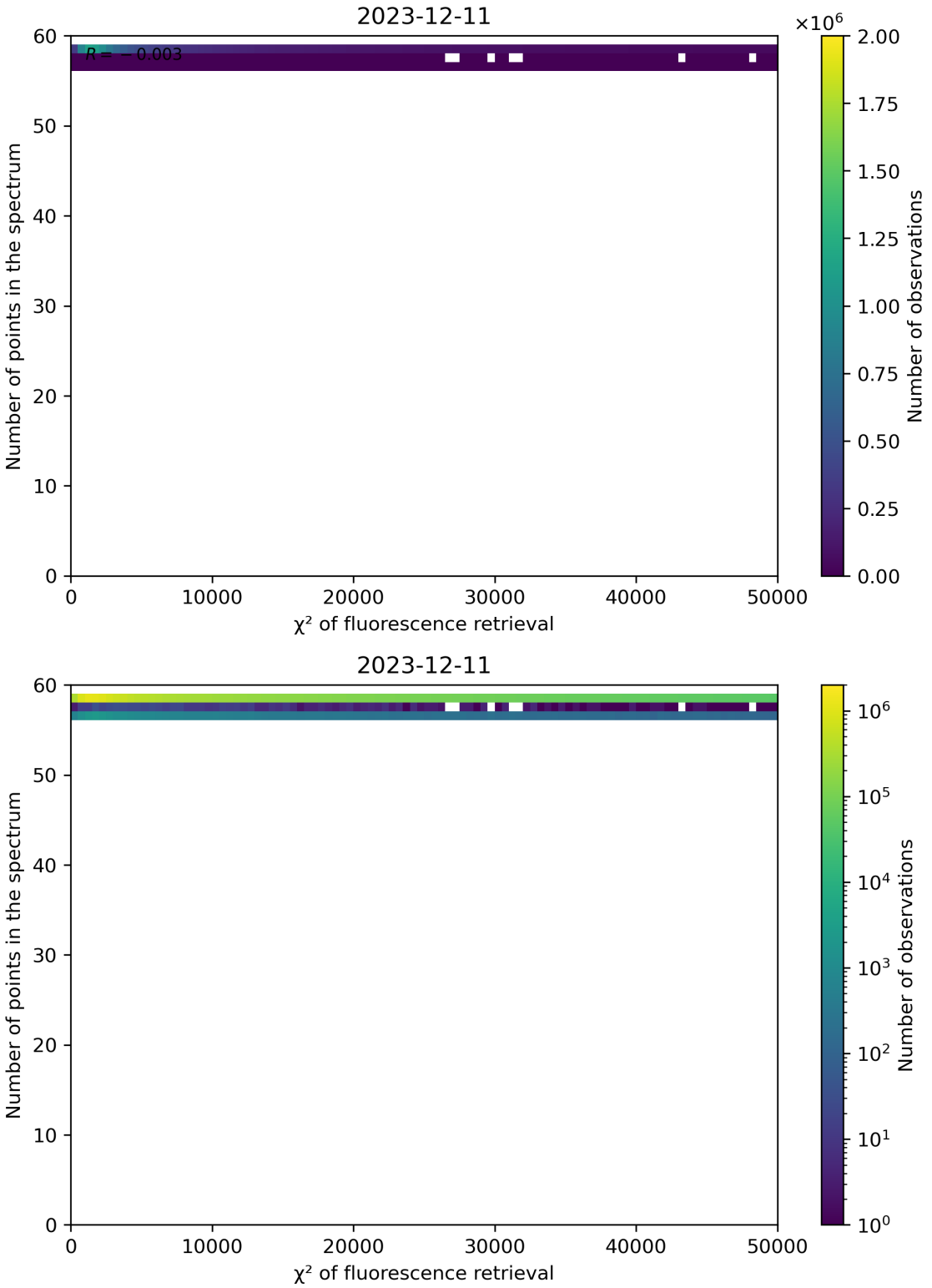


Figure 68: Scatter density plot of "χ^2 of fluorescence retrieval" against "Number of points in the spectrum" for 2023-12-10 to 2023-12-12.

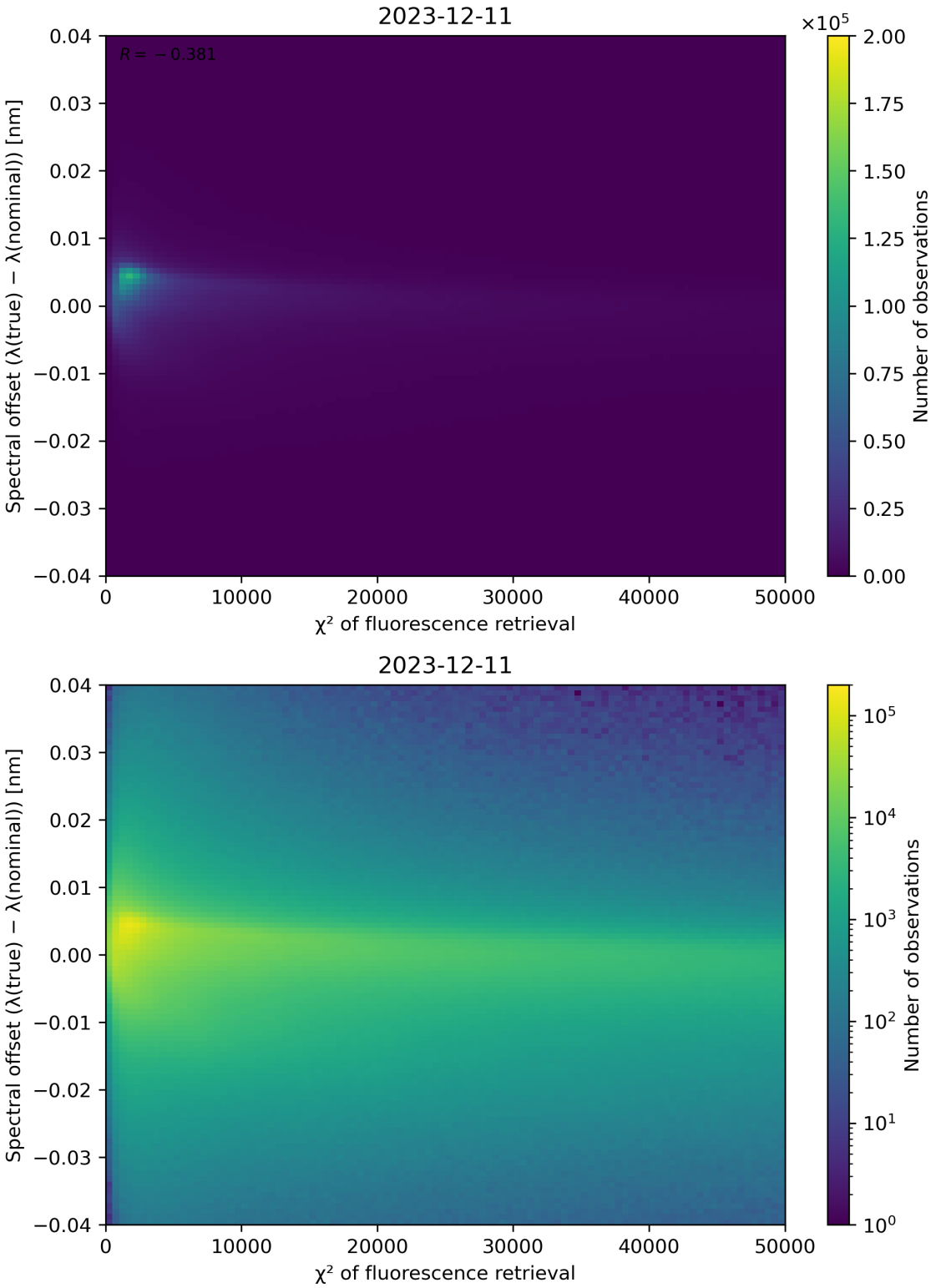


Figure 69: Scatter density plot of "χ^2 of fluorescence retrieval" against "Spectral offset (λ(true) − λ(nominal))" for 2023-12-10 to 2023-12-12.

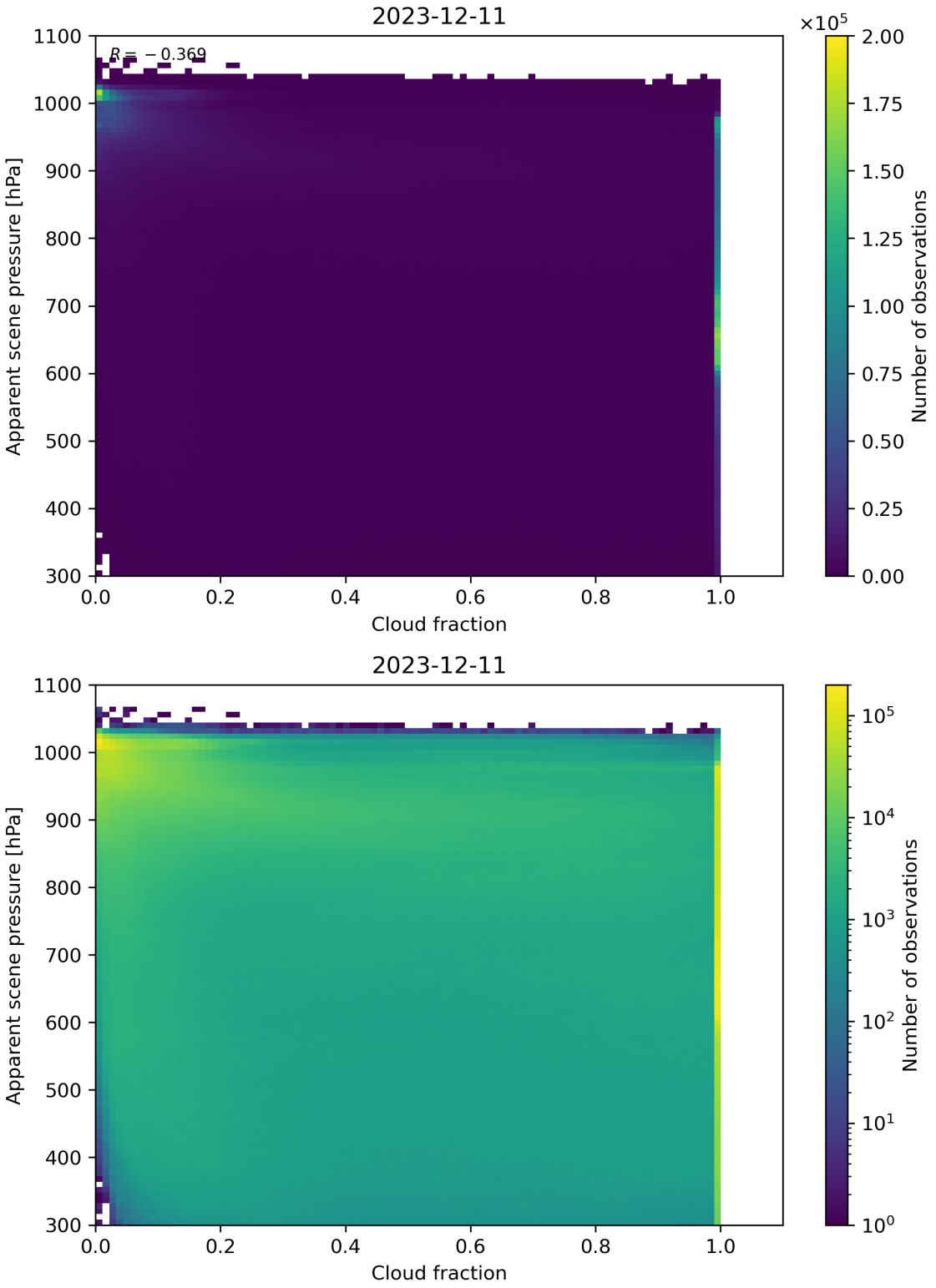


Figure 70: Scatter density plot of “Cloud fraction” against “Apparent scene pressure” for 2023-12-10 to 2023-12-12.

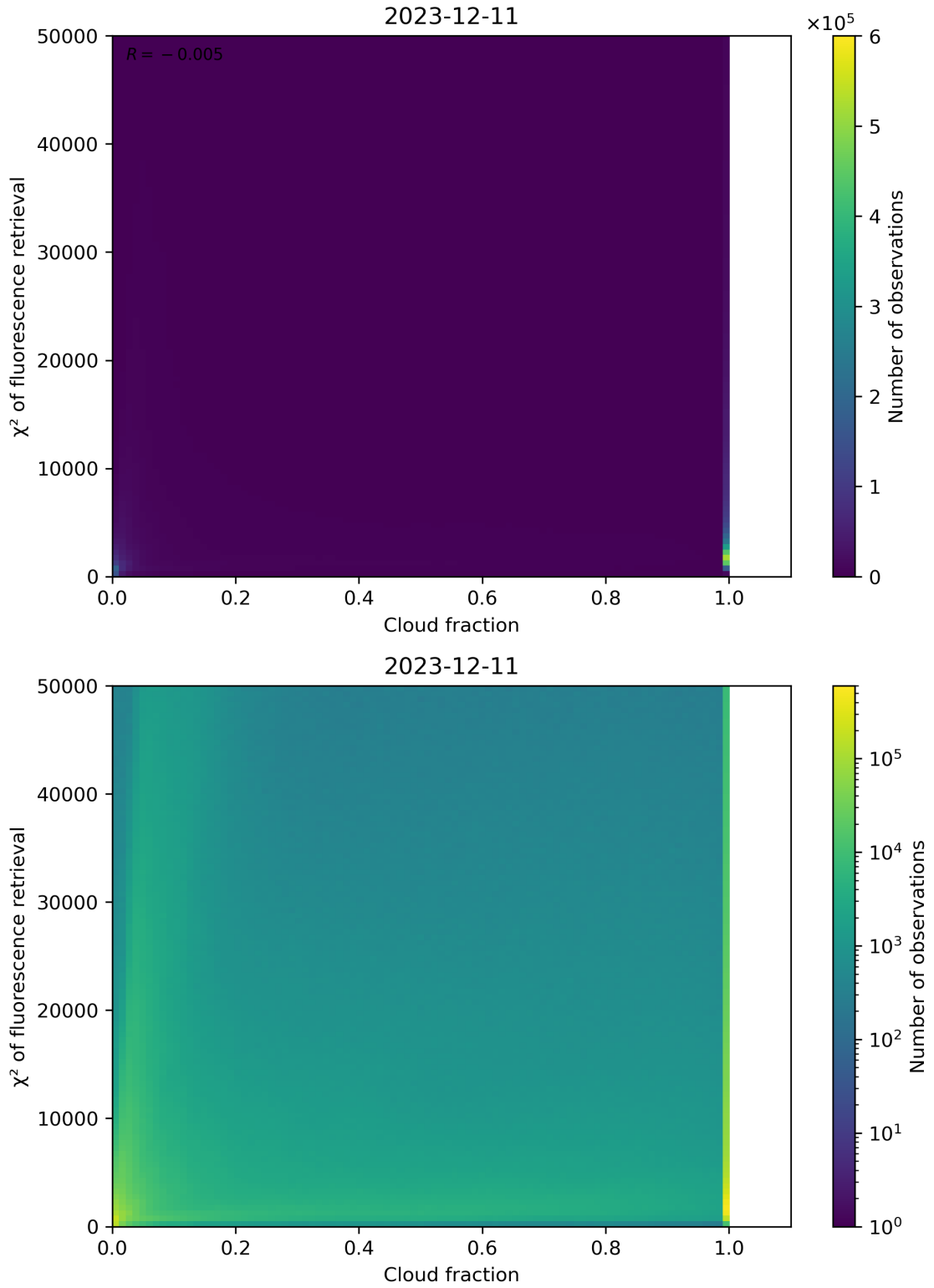


Figure 71: Scatter density plot of "Cloud fraction" against "χ^2 of fluorescence retrieval" for 2023-12-10 to 2023-12-12.

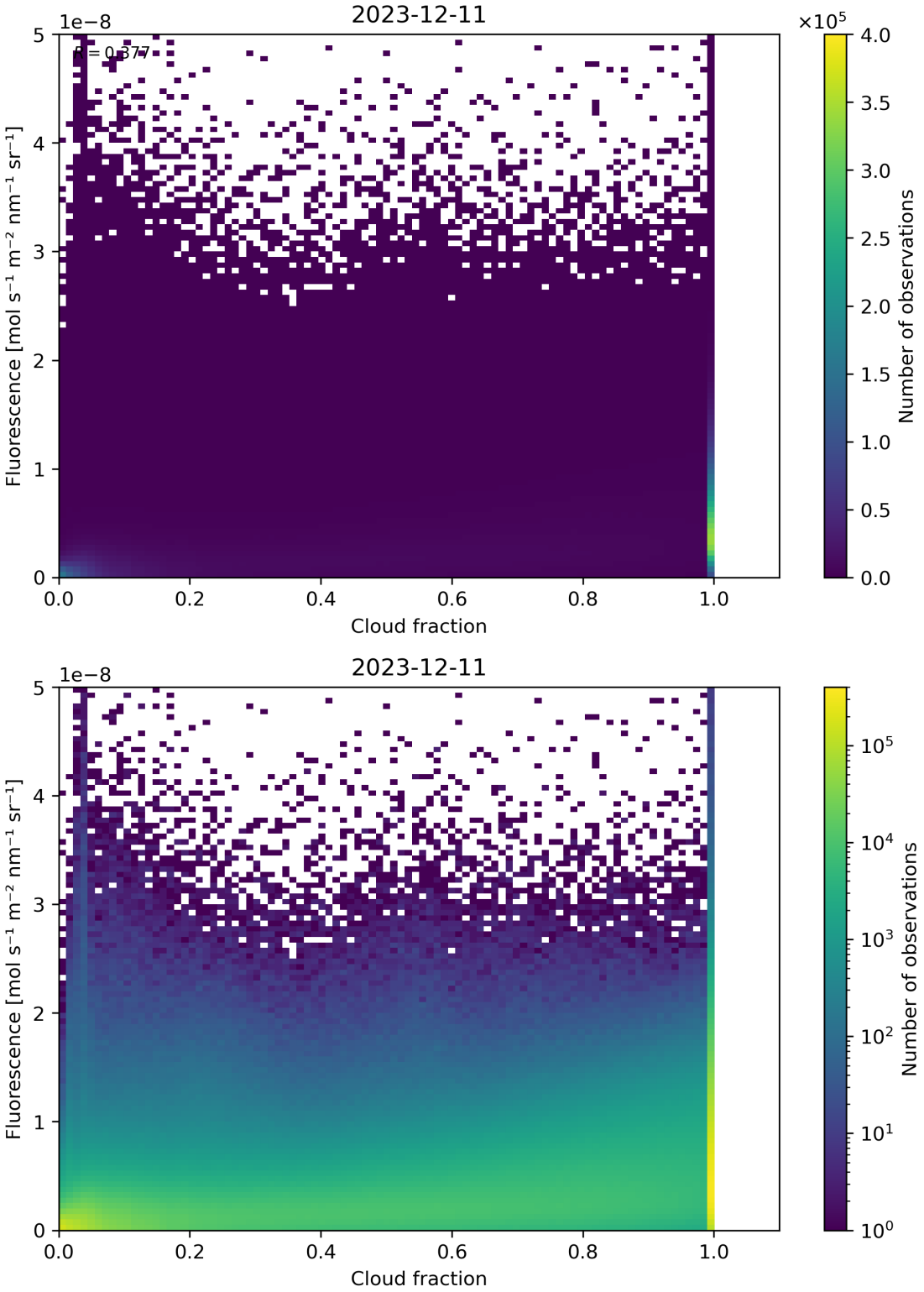


Figure 72: Scatter density plot of “Cloud fraction” against “Fluorescence” for 2023-12-10 to 2023-12-12.

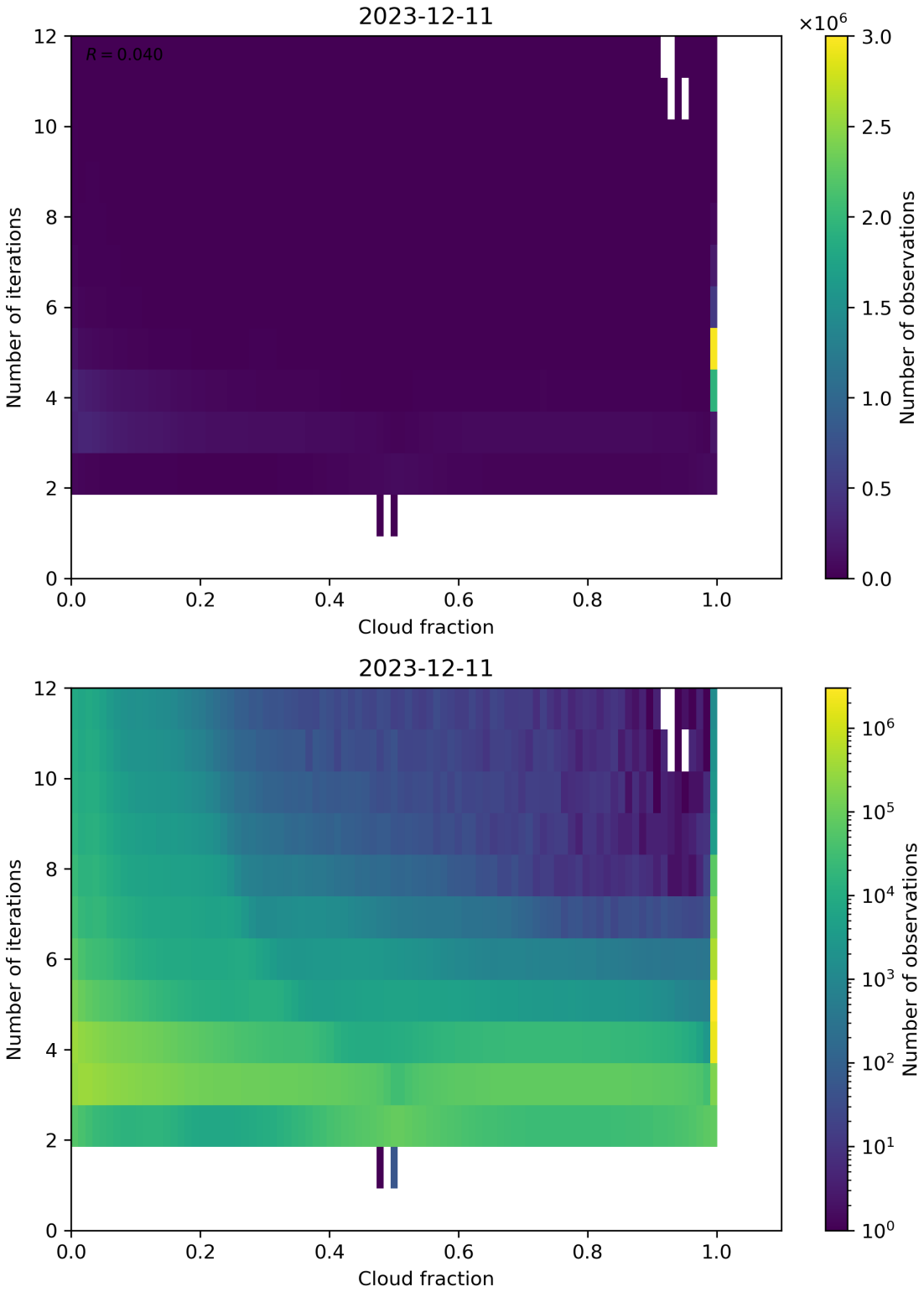


Figure 73: Scatter density plot of “Cloud fraction” against “Number of iterations” for 2023-12-10 to 2023-12-12.

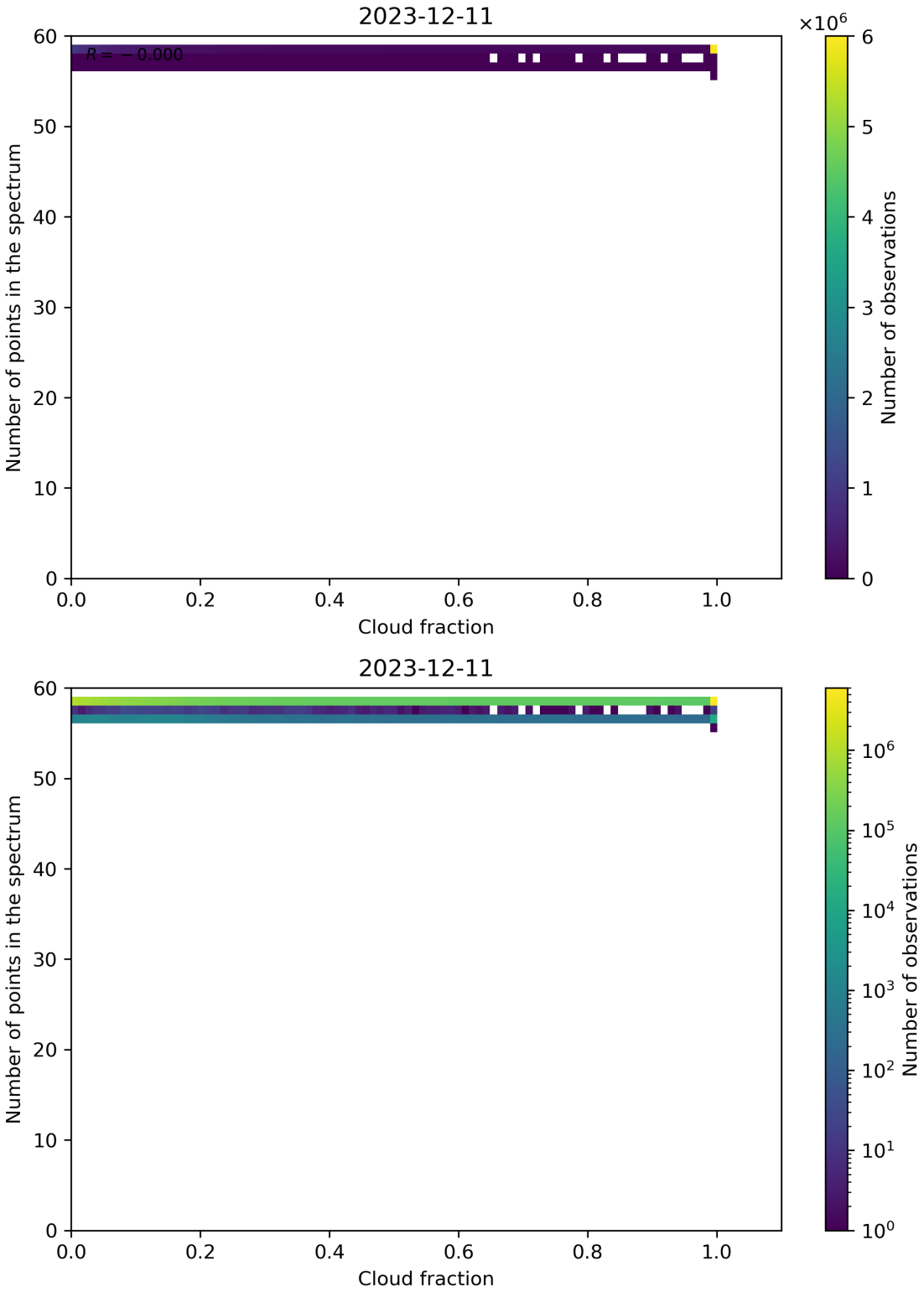


Figure 74: Scatter density plot of “Cloud fraction” against “Number of points in the spectrum” for 2023-12-10 to 2023-12-12.

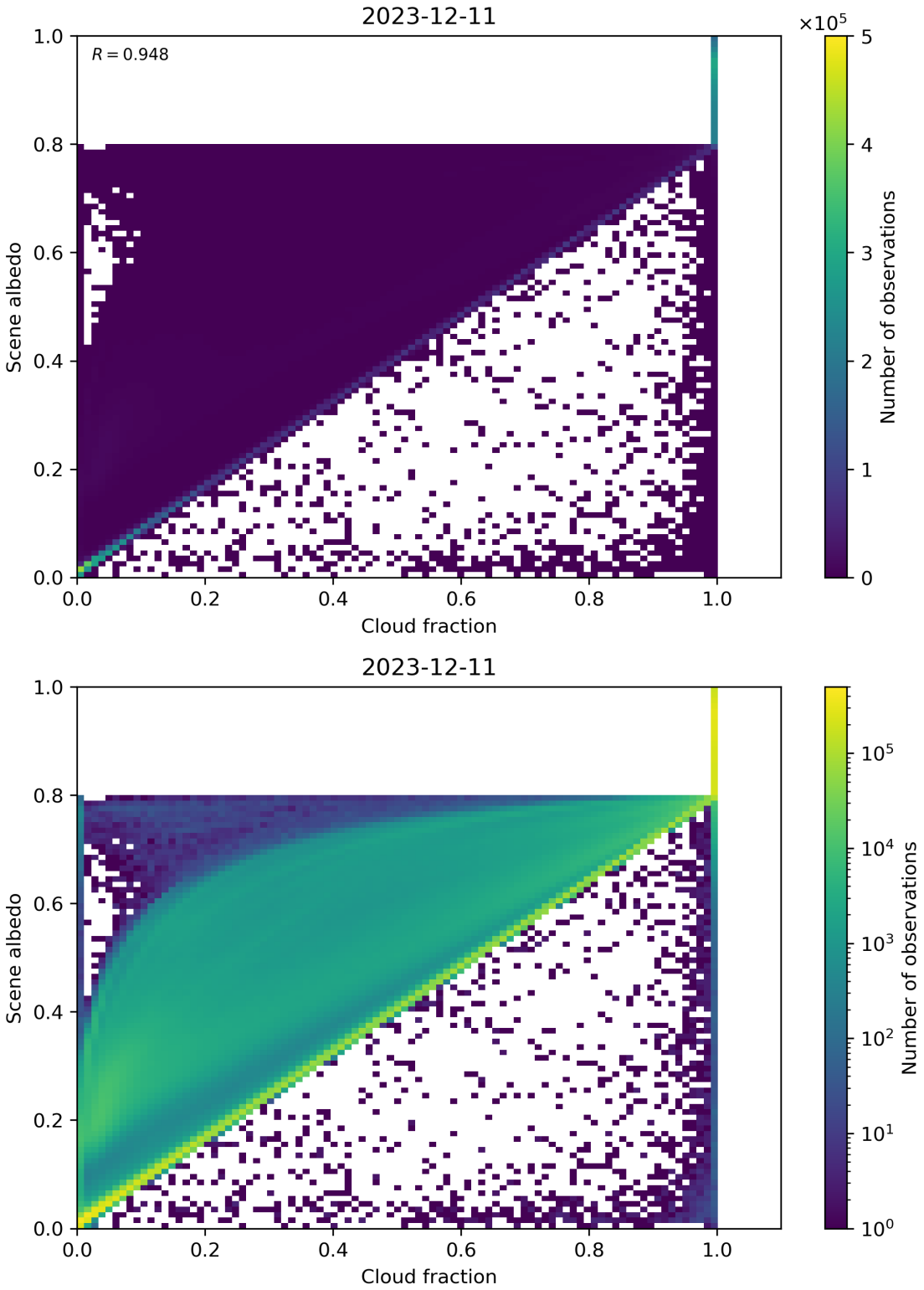


Figure 75: Scatter density plot of “Cloud fraction” against “Scene albedo” for 2023-12-10 to 2023-12-12.

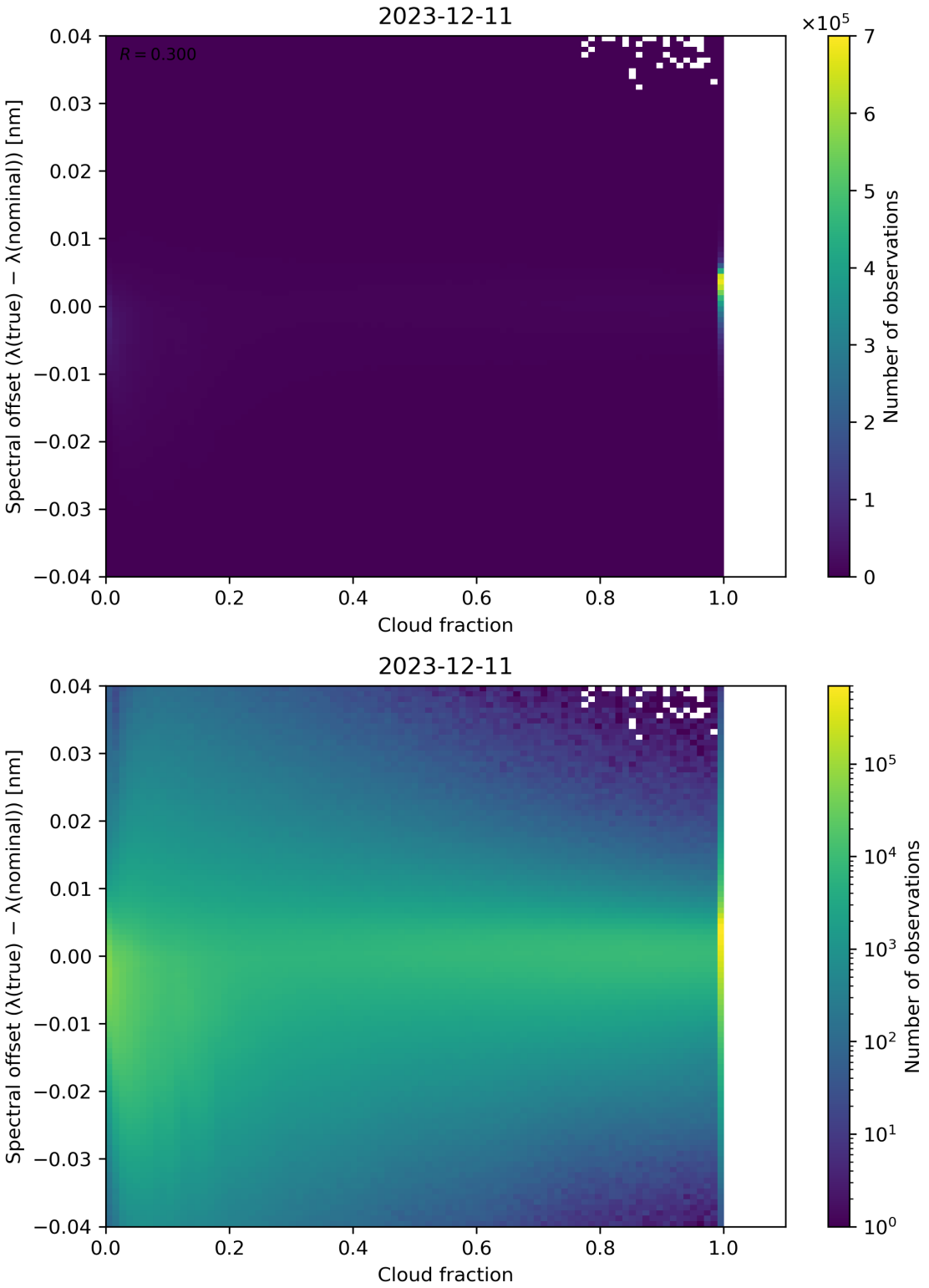


Figure 76: Scatter density plot of “Cloud fraction” against “Spectral offset (λ(true) − λ(nominal))” for 2023-12-10 to 2023-12-12.

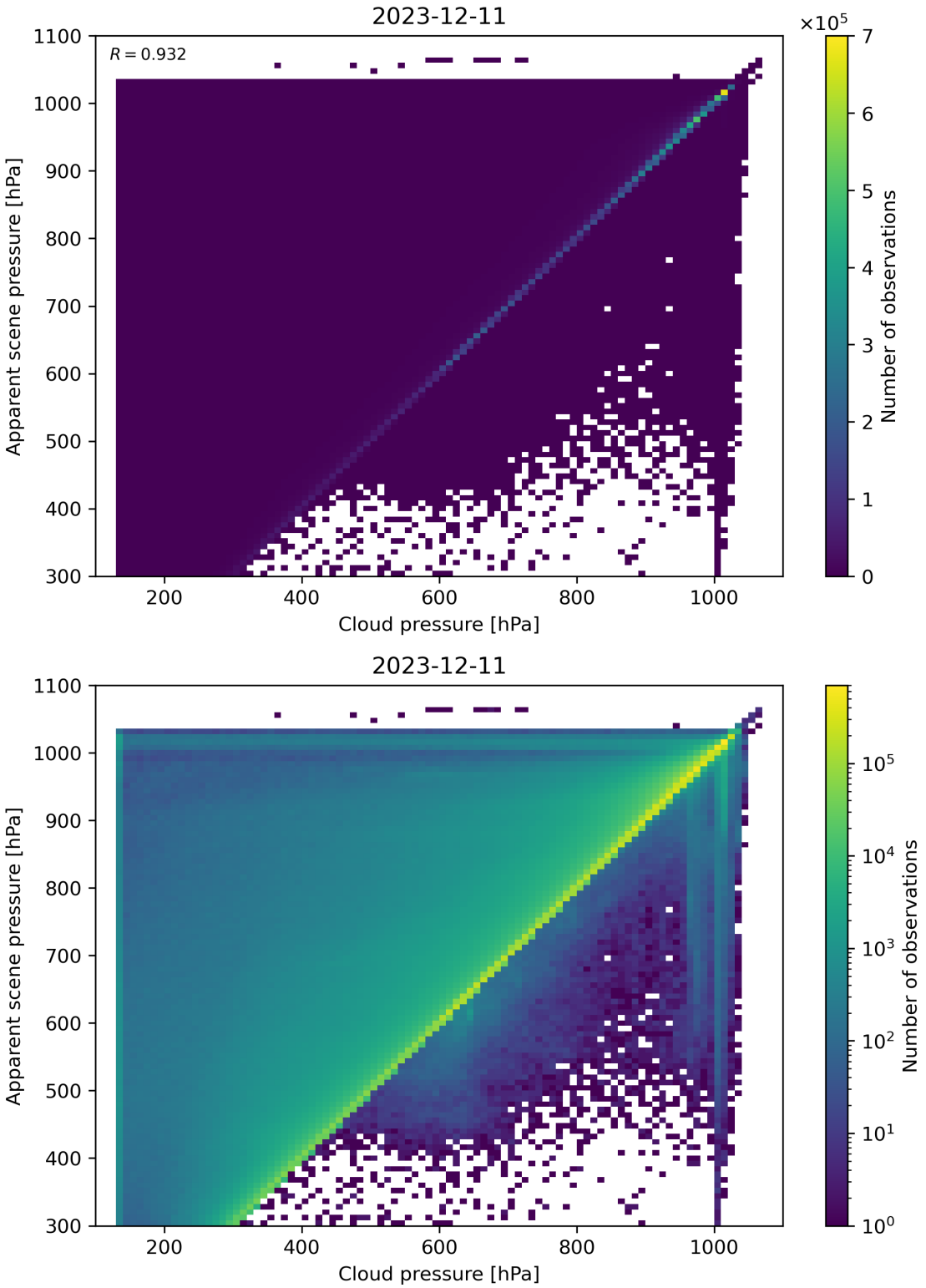


Figure 77: Scatter density plot of “Cloud pressure” against “Apparent scene pressure” for 2023-12-10 to 2023-12-12.

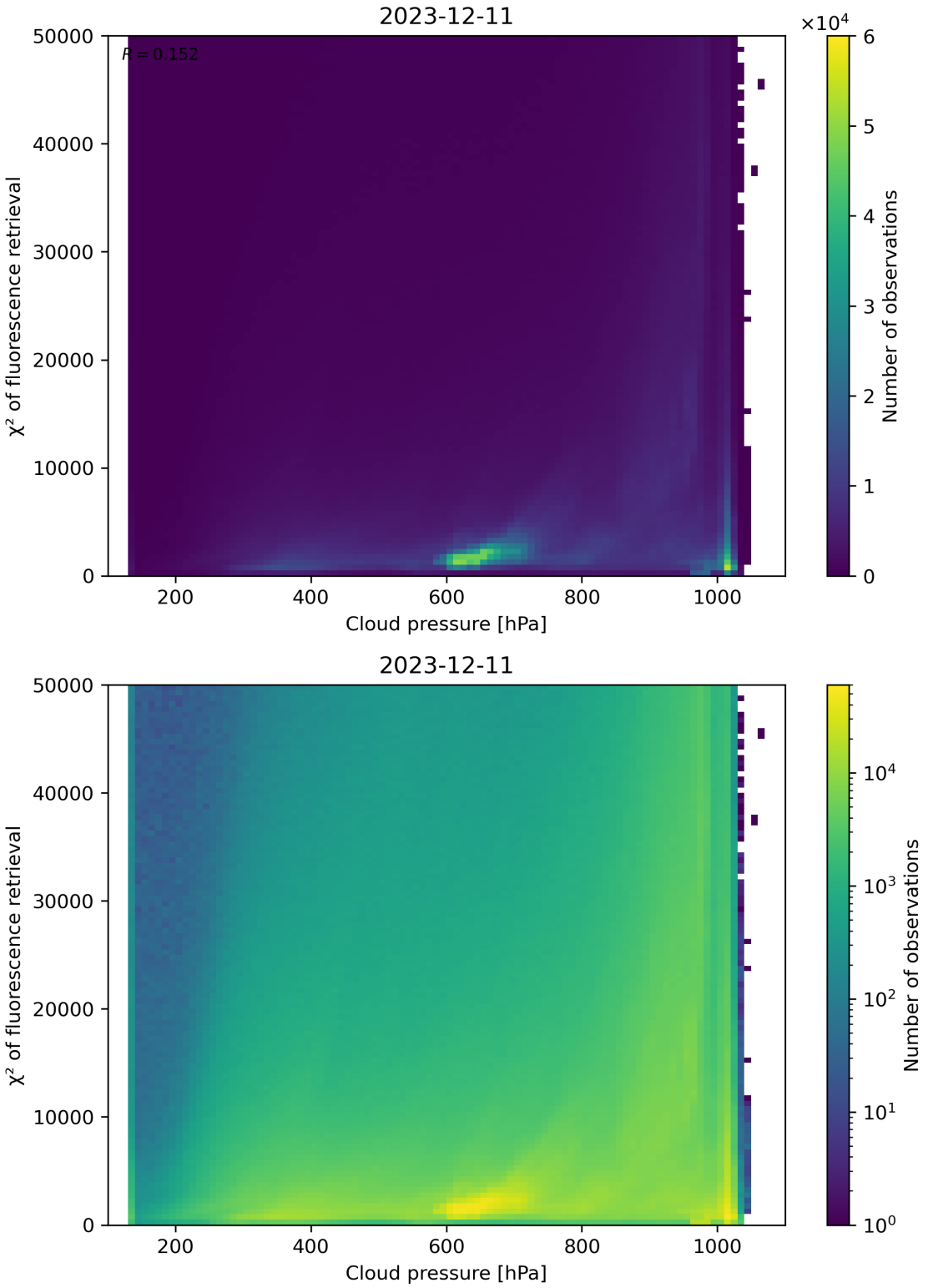


Figure 78: Scatter density plot of "Cloud pressure" against "χ^2 of fluorescence retrieval" for 2023-12-10 to 2023-12-12.

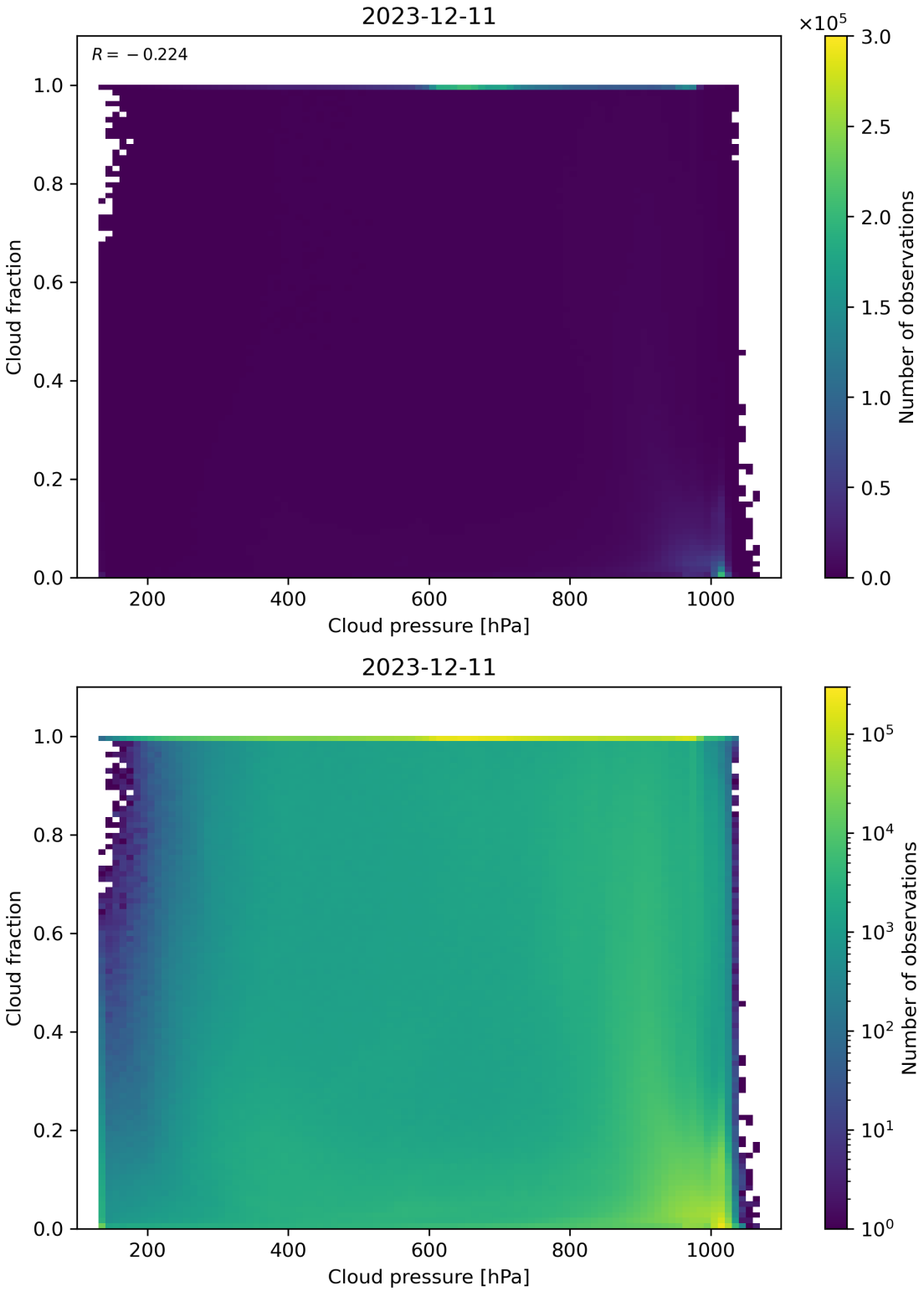


Figure 79: Scatter density plot of “Cloud pressure” against “Cloud fraction” for 2023-12-10 to 2023-12-12.

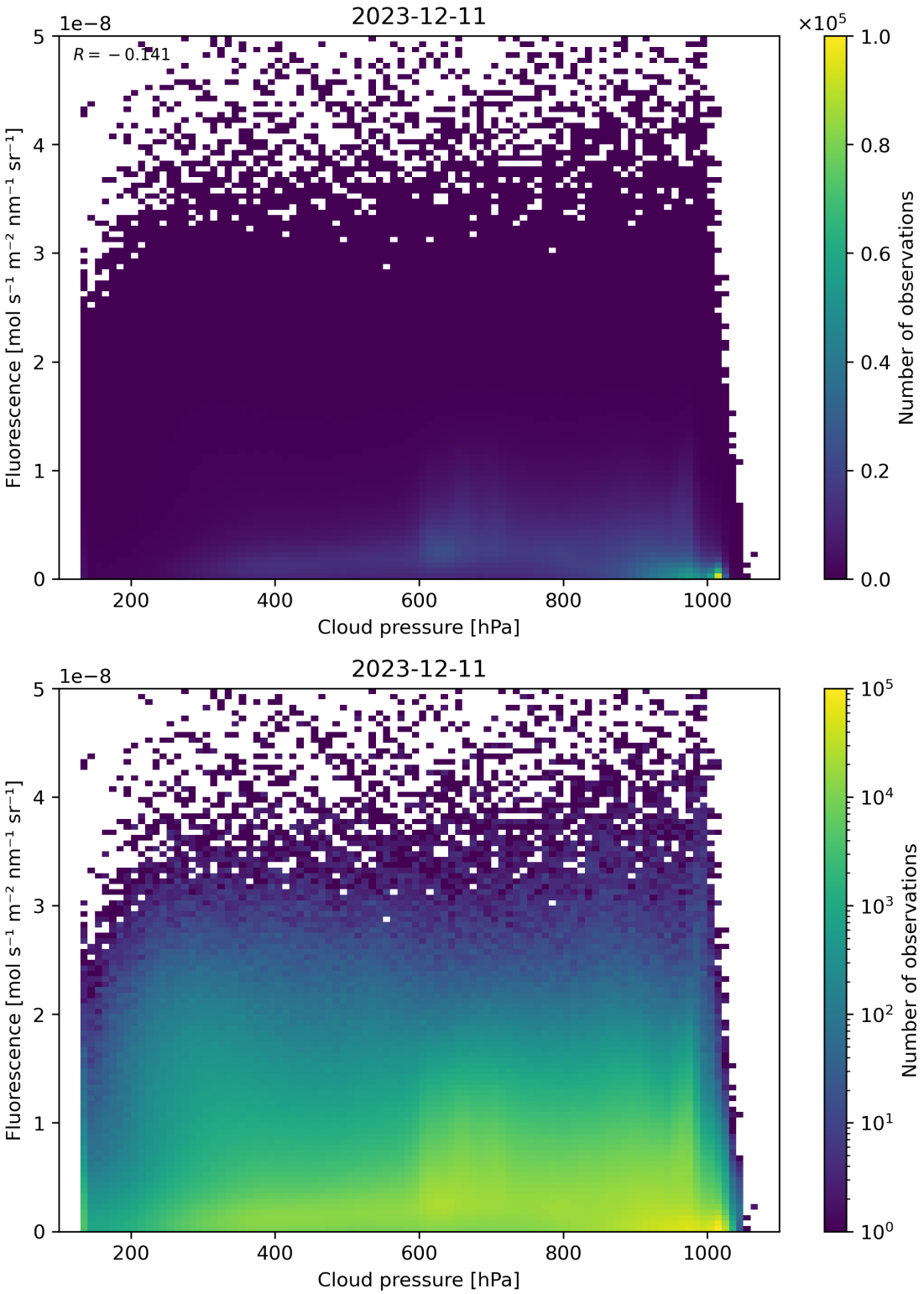


Figure 80: Scatter density plot of “Cloud pressure” against “Fluorescence” for 2023-12-10 to 2023-12-12.

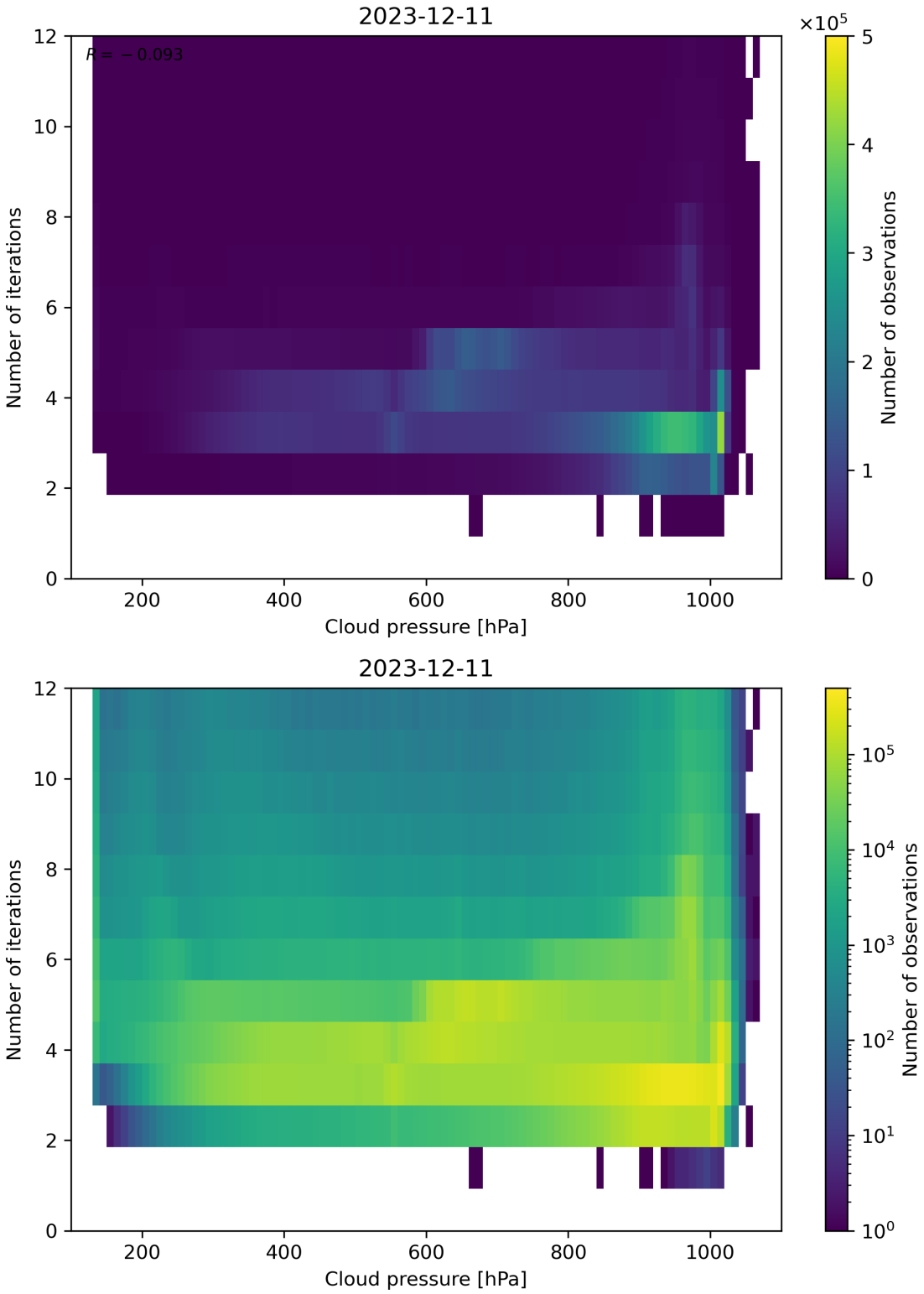


Figure 81: Scatter density plot of “Cloud pressure” against “Number of iterations” for 2023-12-10 to 2023-12-12.

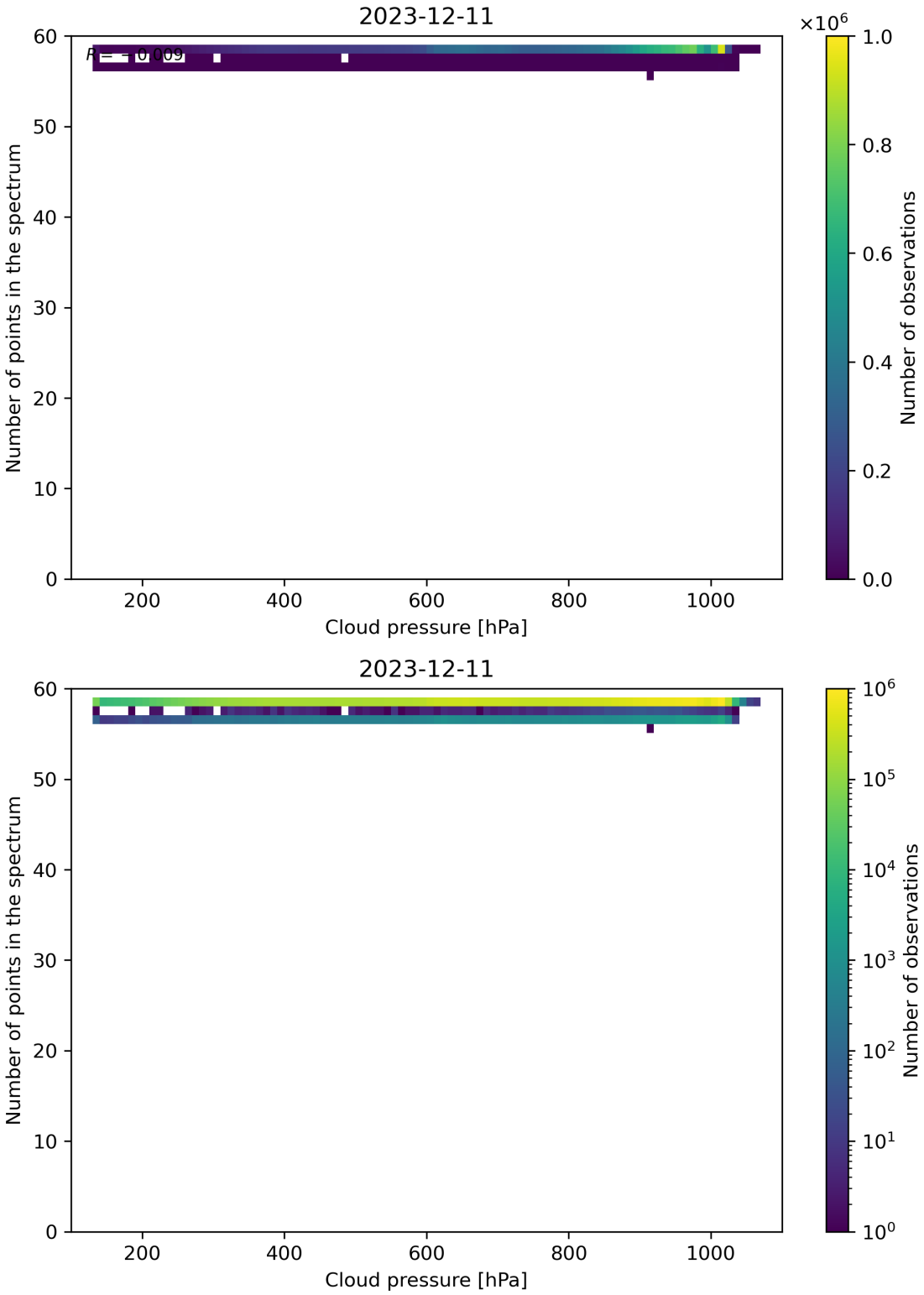


Figure 82: Scatter density plot of “Cloud pressure” against “Number of points in the spectrum” for 2023-12-10 to 2023-12-12.

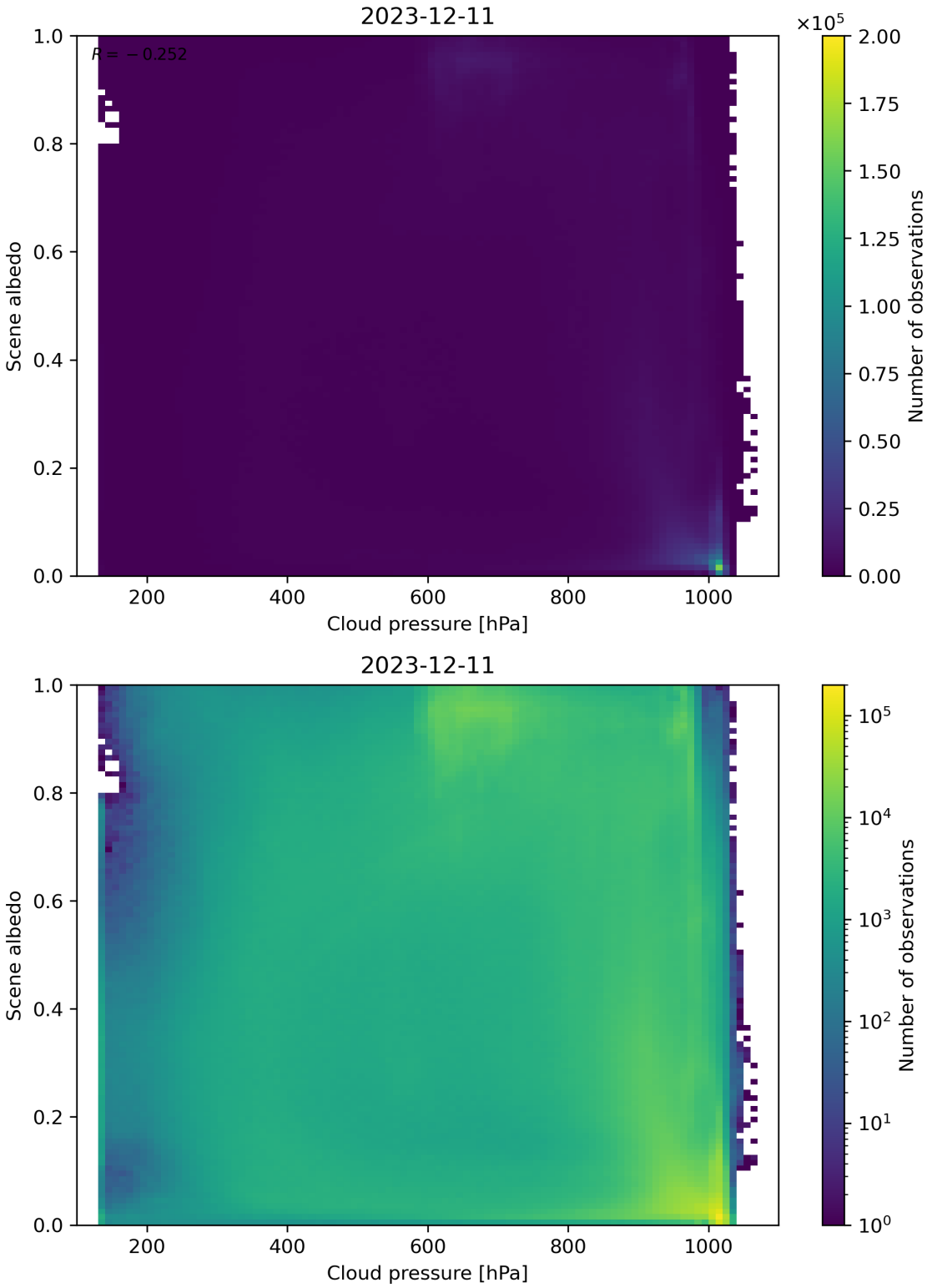


Figure 83: Scatter density plot of “Cloud pressure” against “Scene albedo” for 2023-12-10 to 2023-12-12.

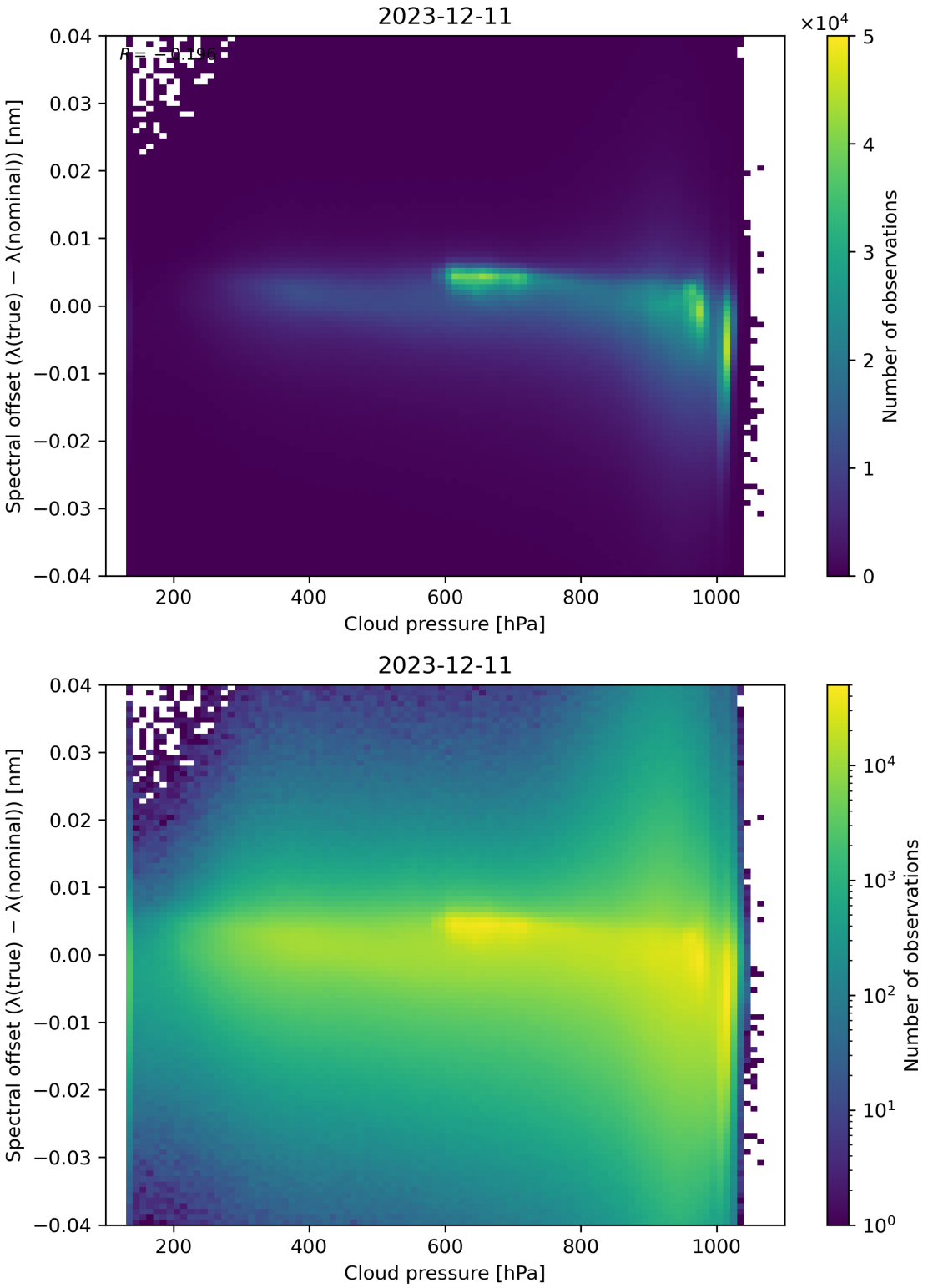


Figure 84: Scatter density plot of “Cloud pressure” against “Spectral offset (λ(true) − λ(nominal))” for 2023-12-10 to 2023-12-12.

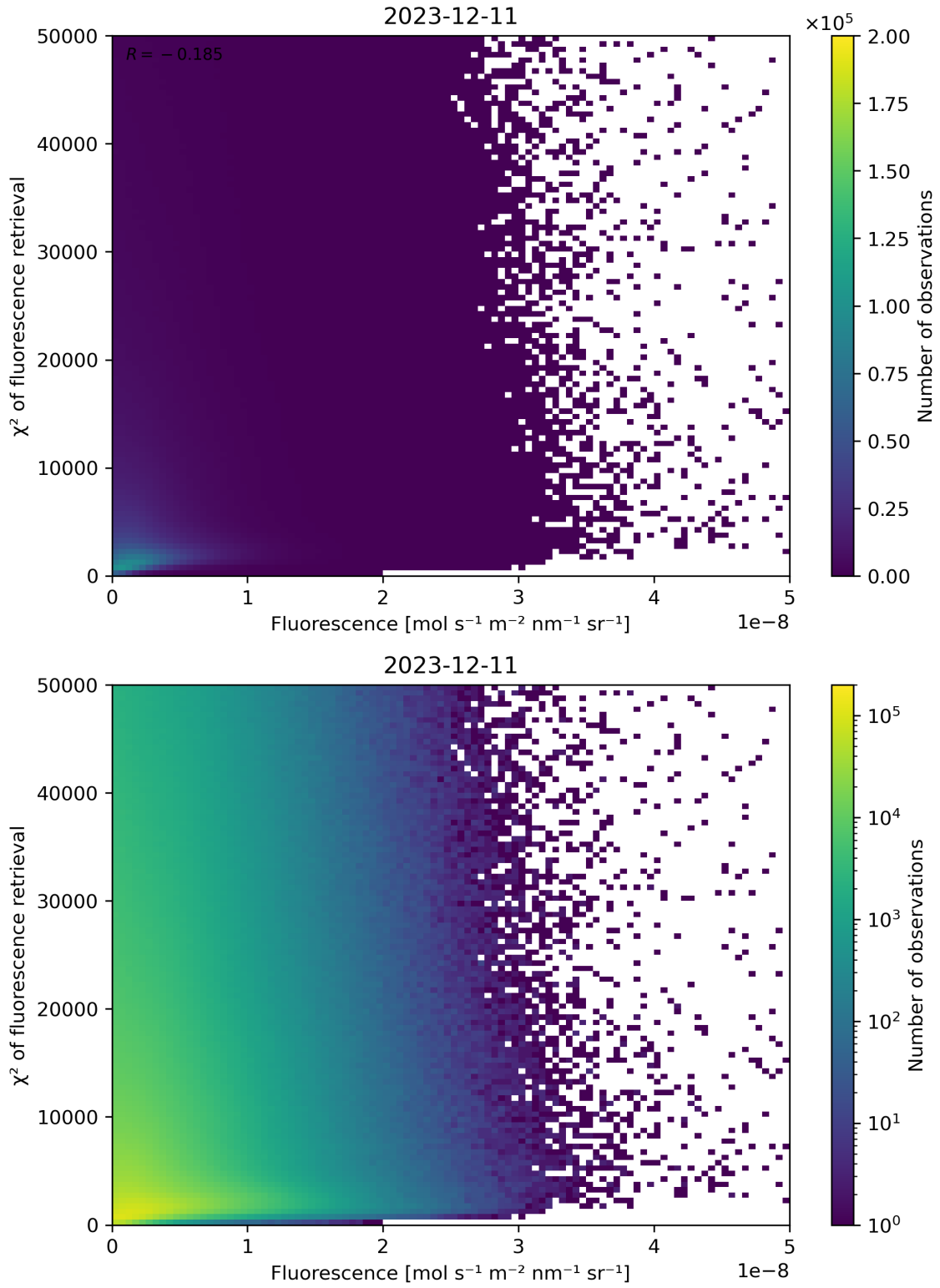


Figure 85: Scatter density plot of "Fluorescence" against "χ^2 of fluorescence retrieval" for 2023-12-10 to 2023-12-12.

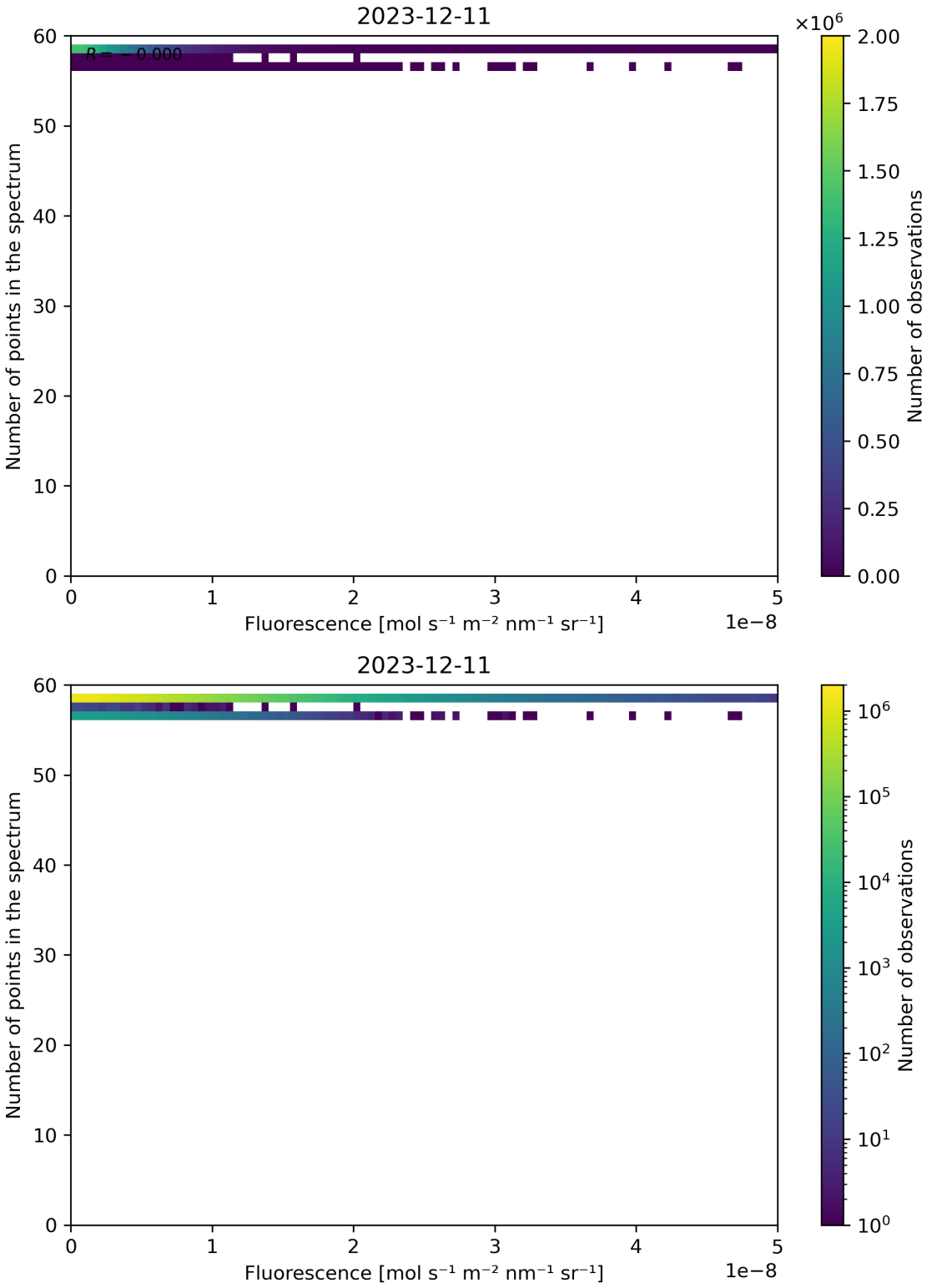
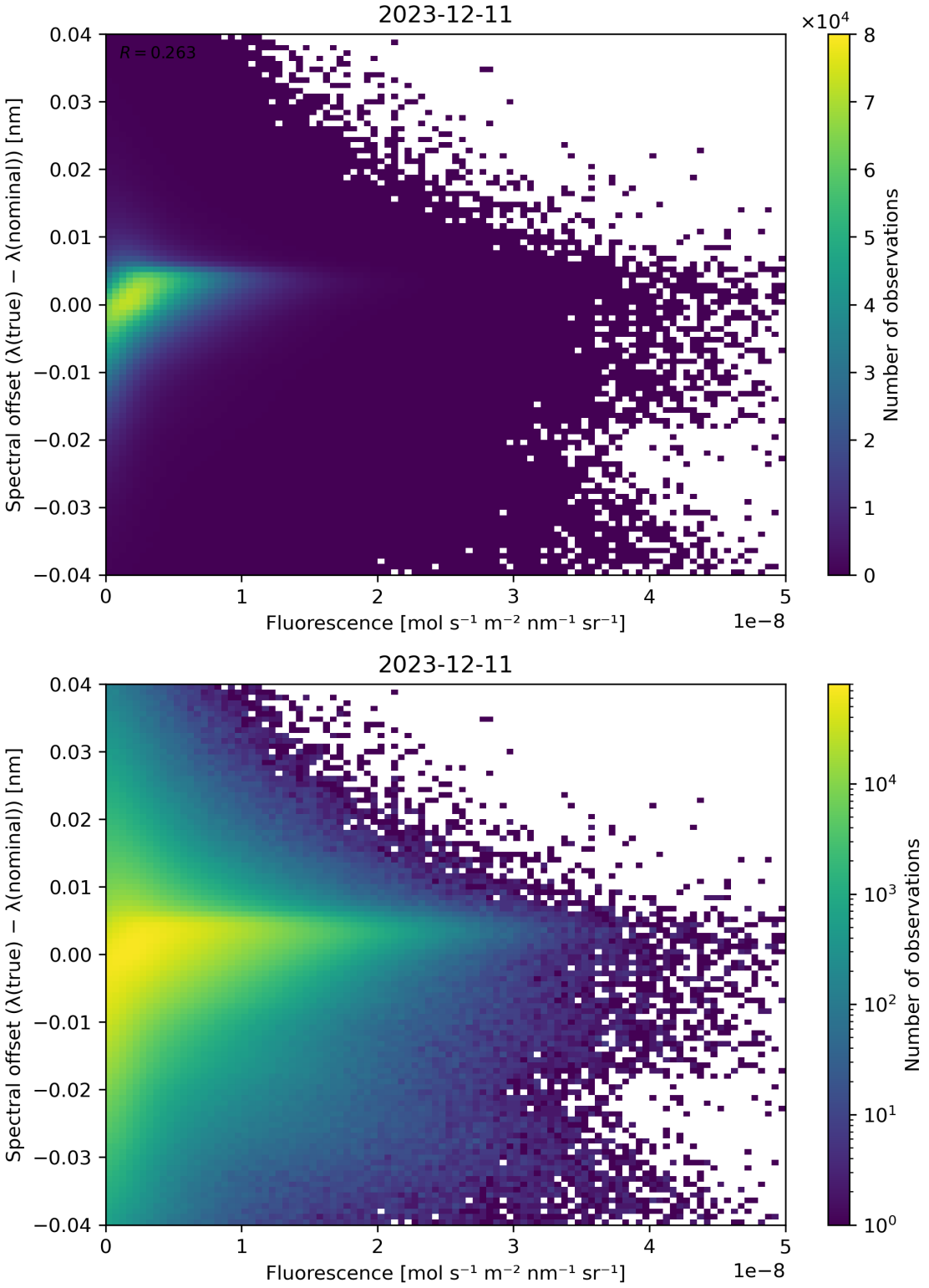


Figure 86: Scatter density plot of “Fluorescence” against “Number of points in the spectrum” for 2023-12-10 to 2023-12-12.



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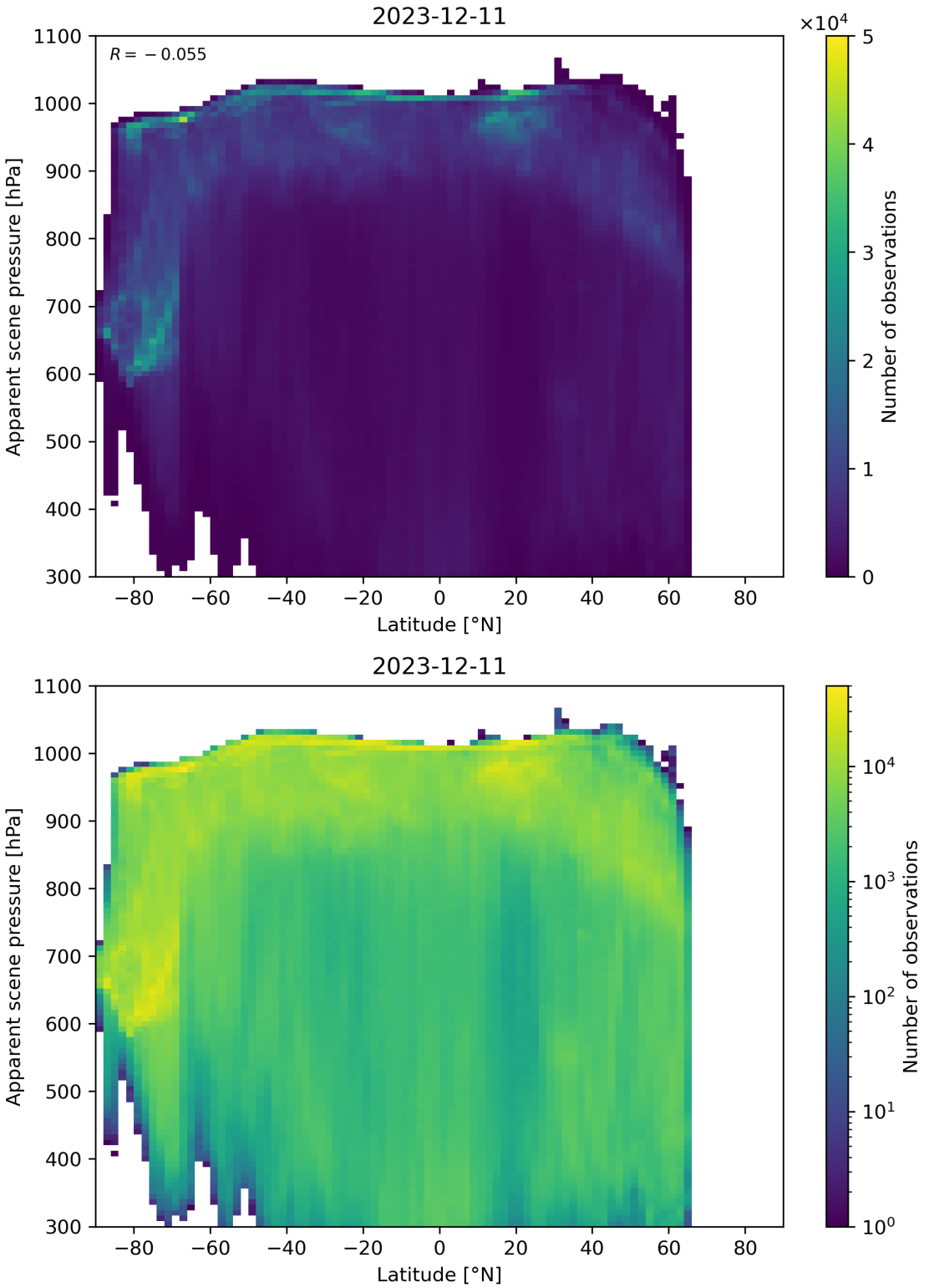

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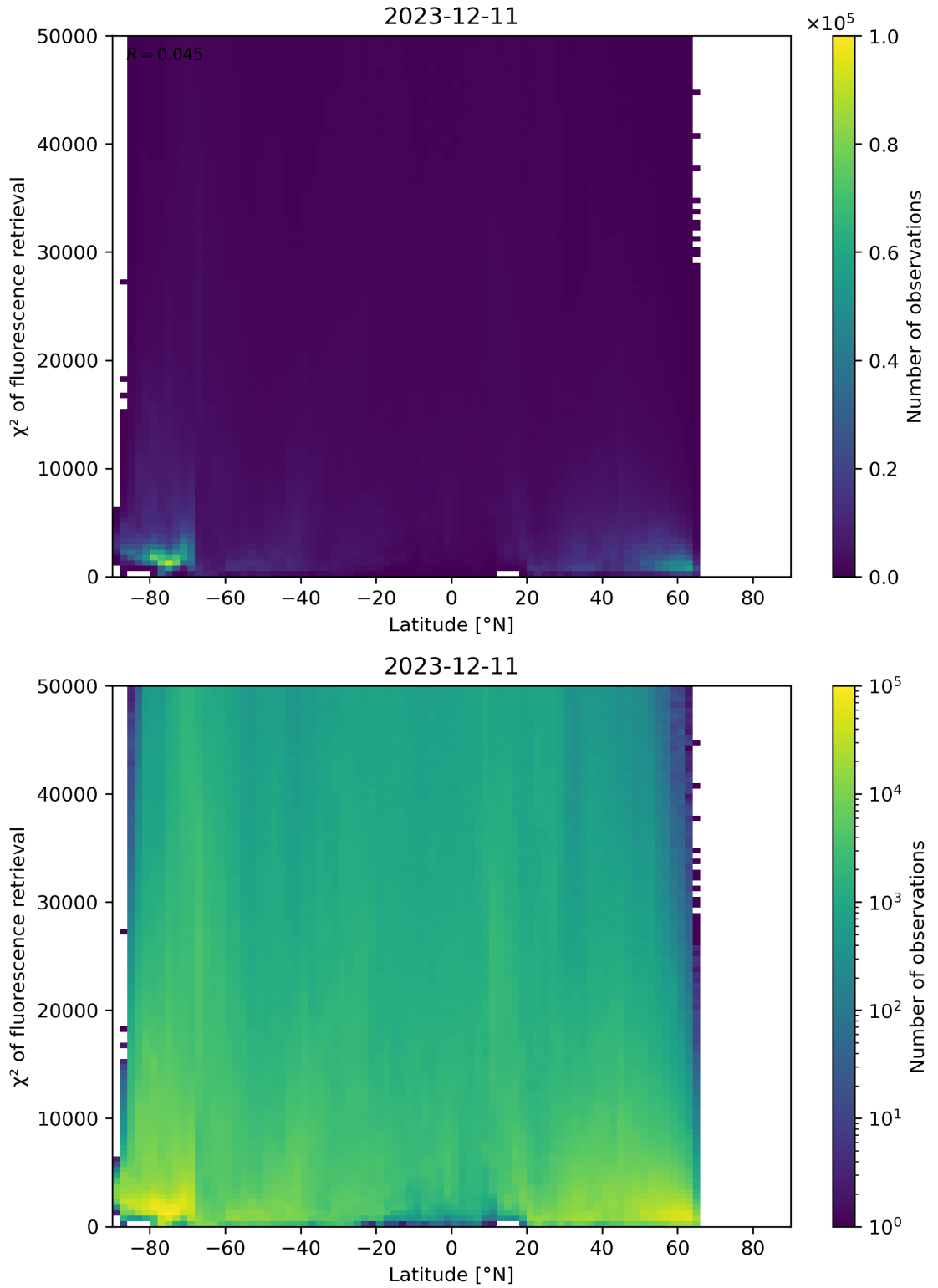

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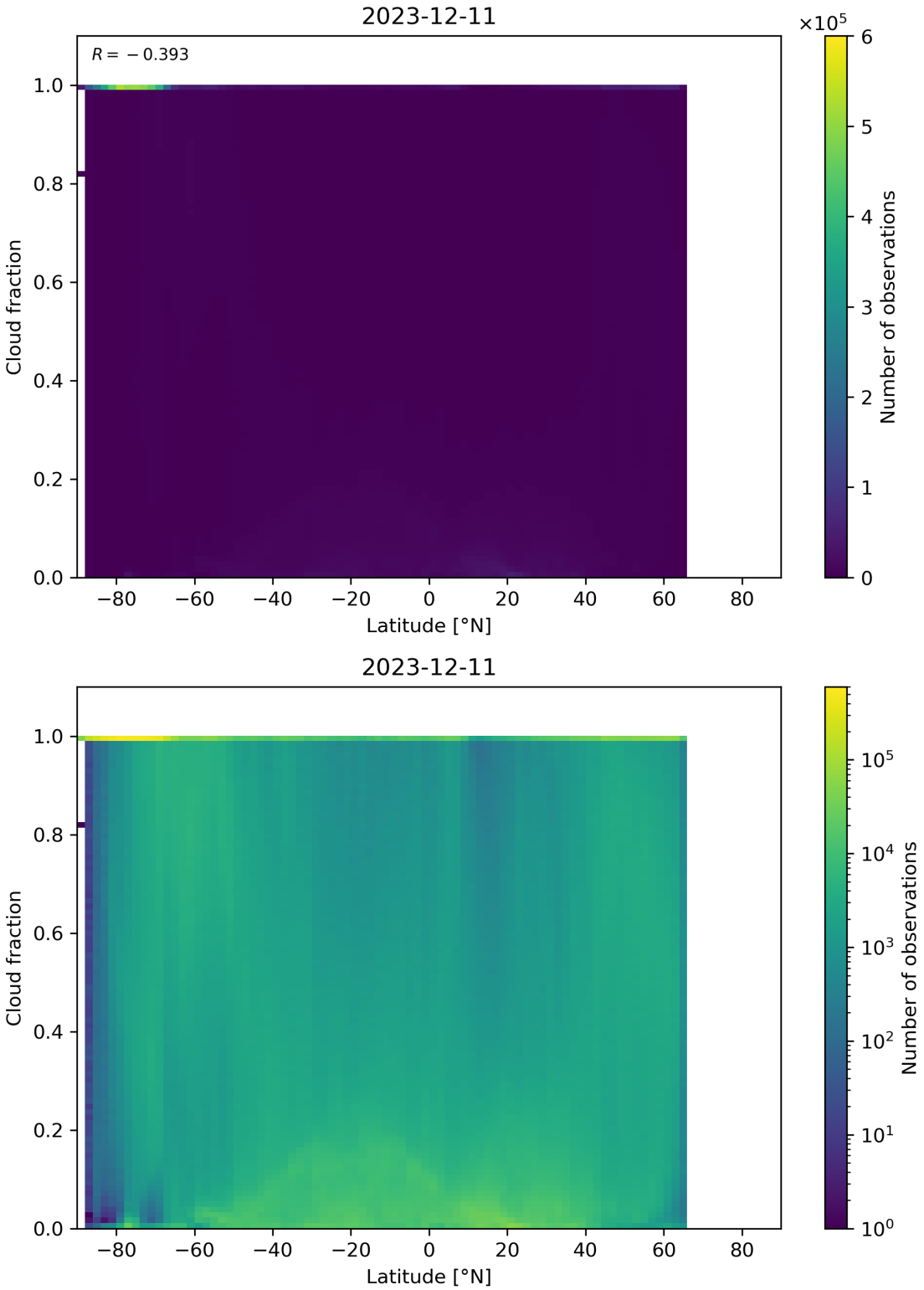

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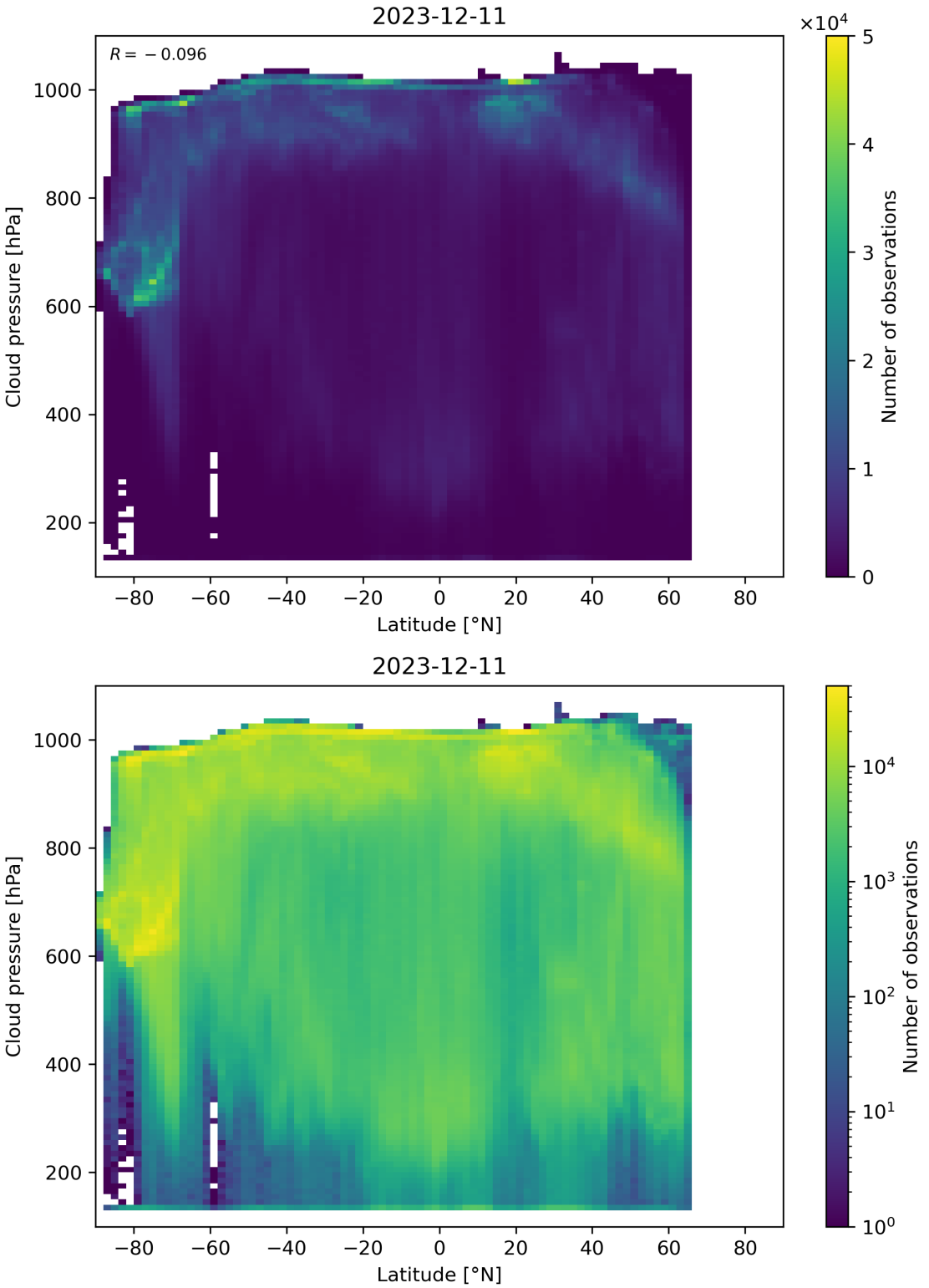

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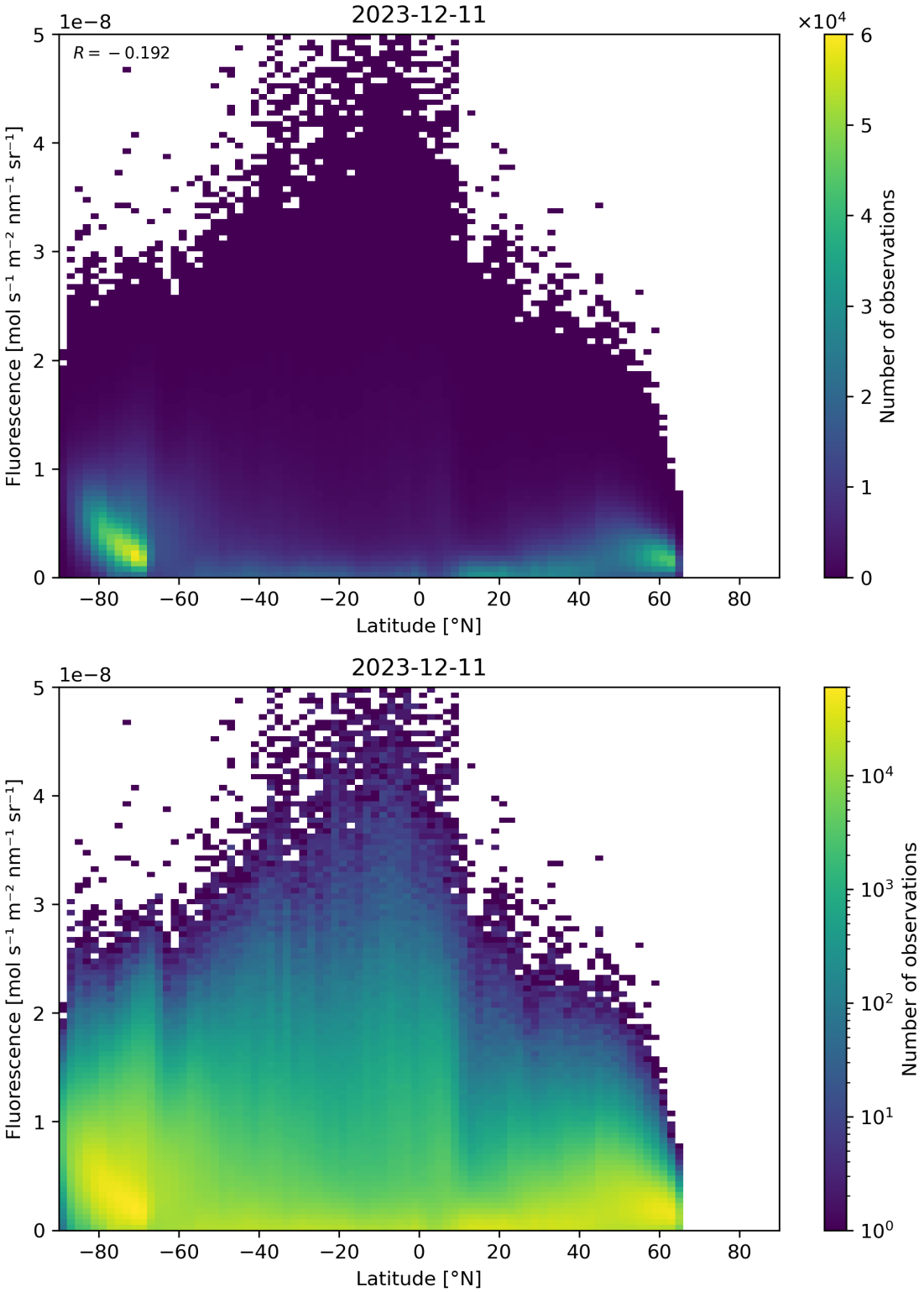

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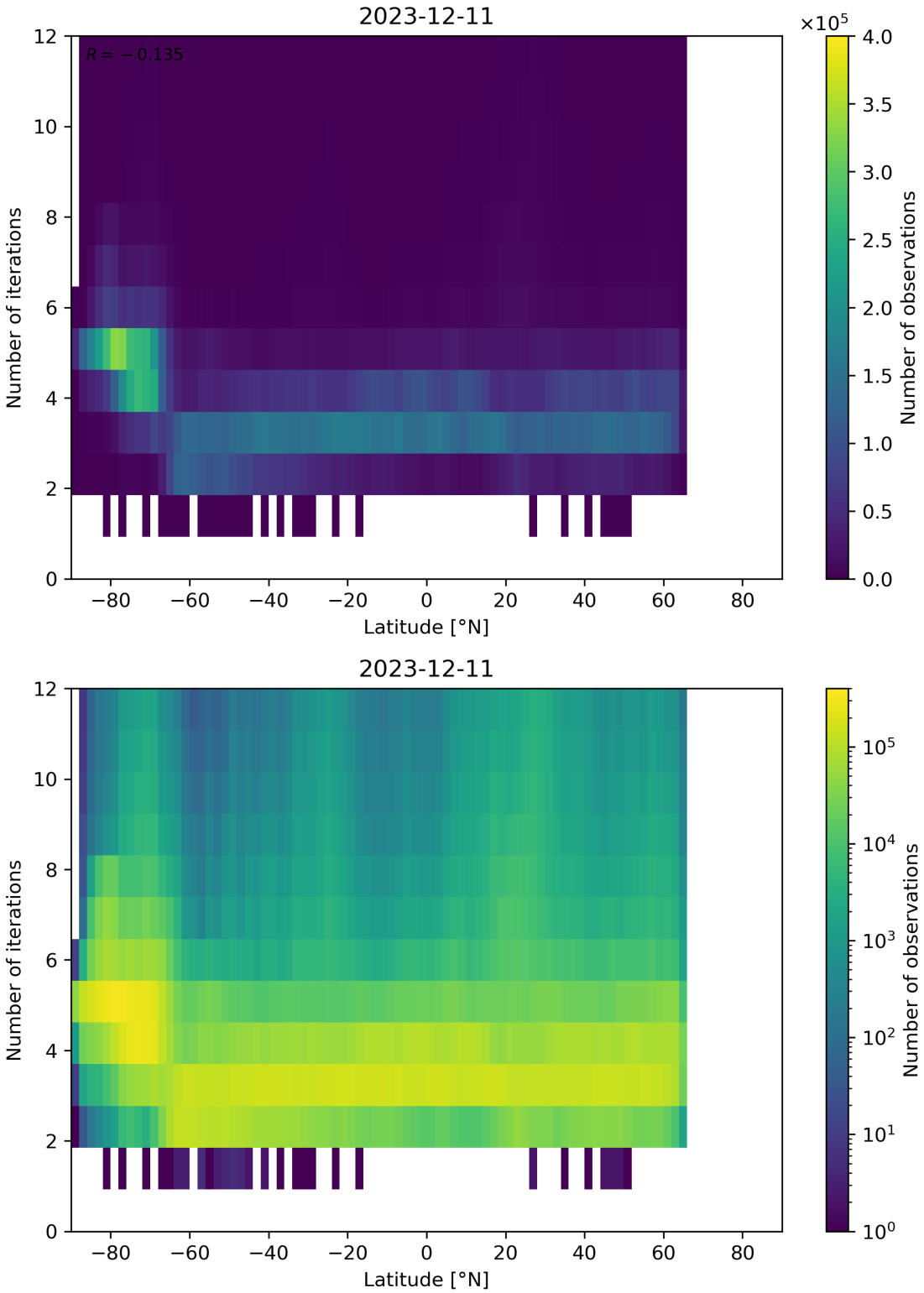

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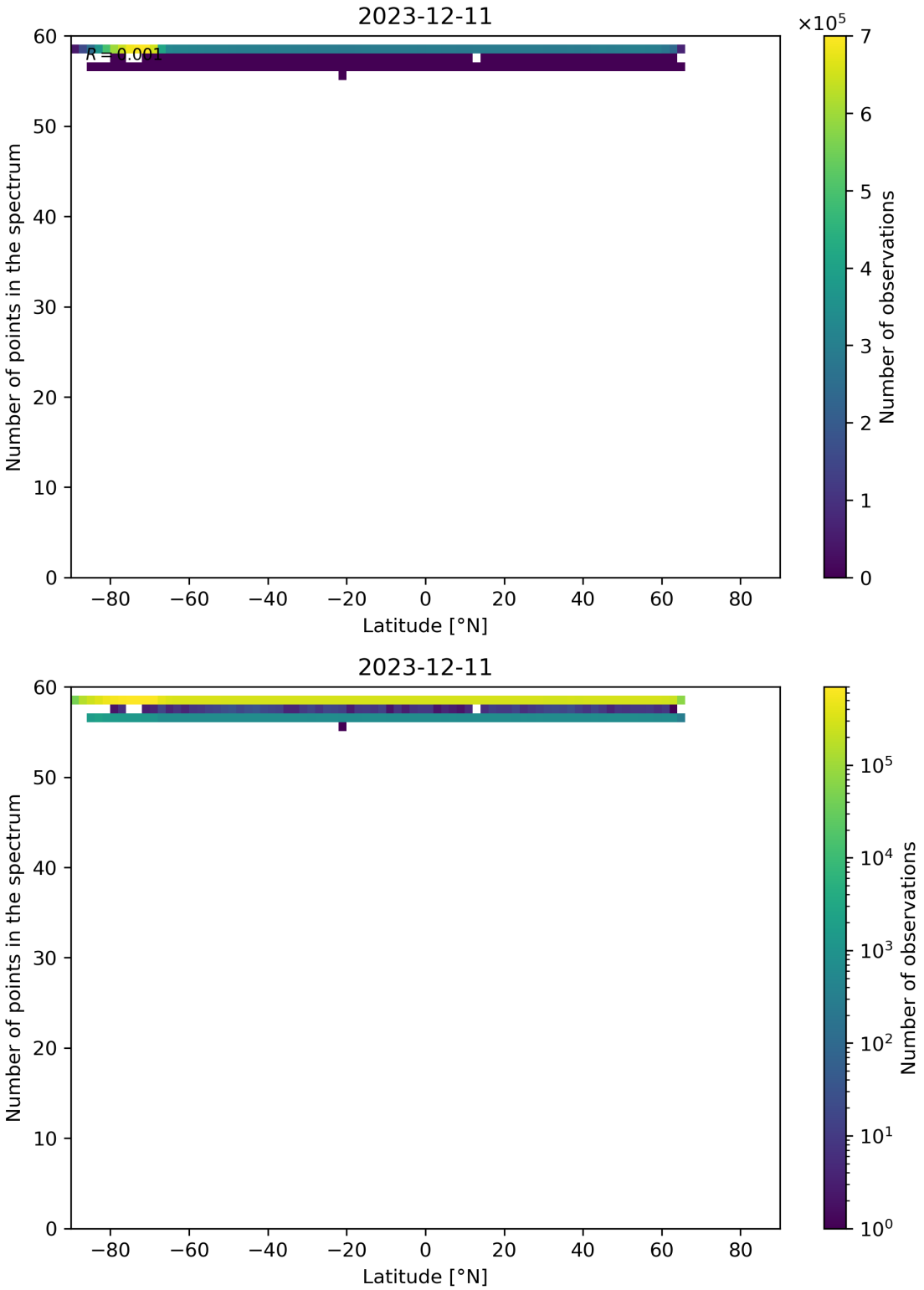

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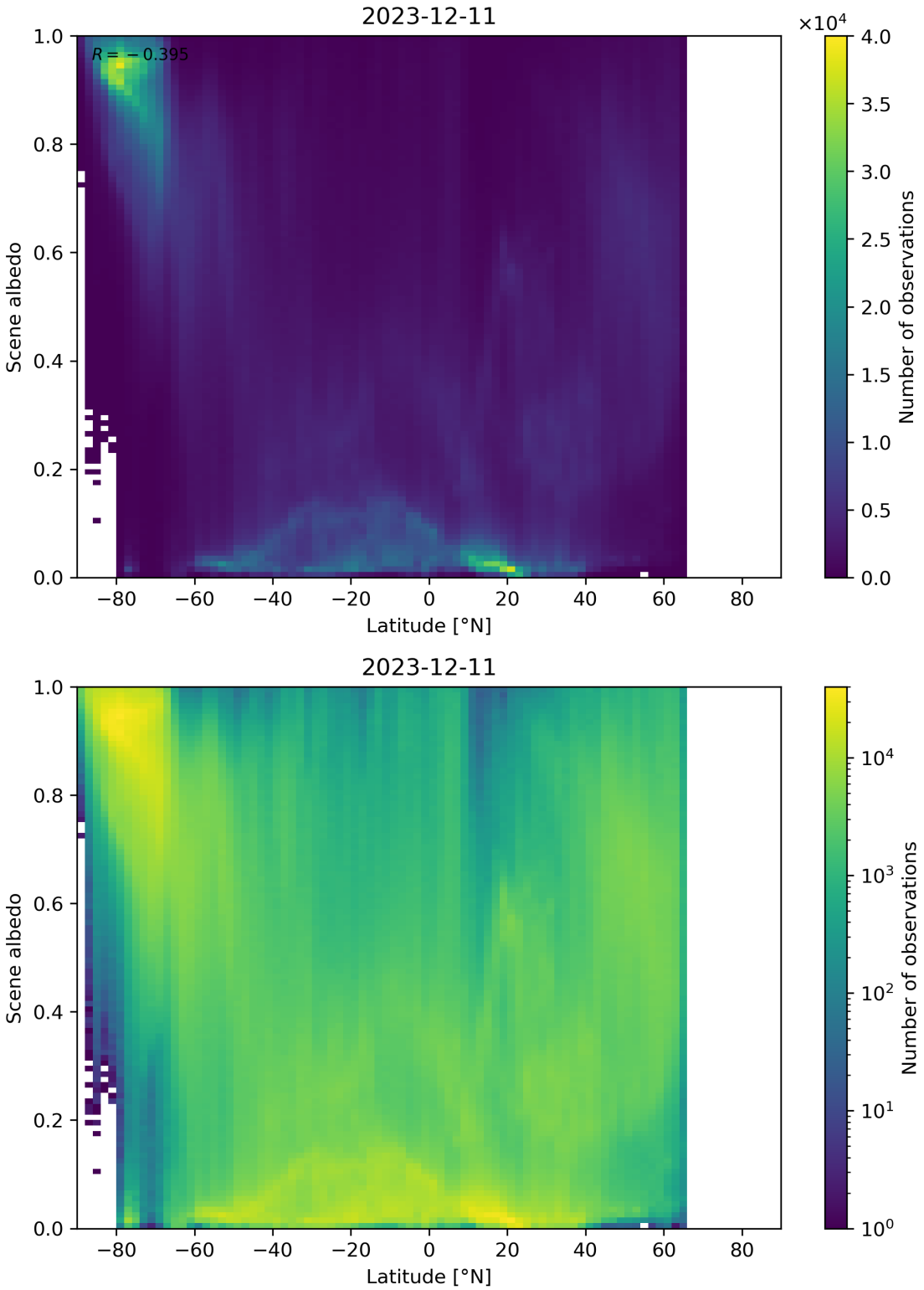

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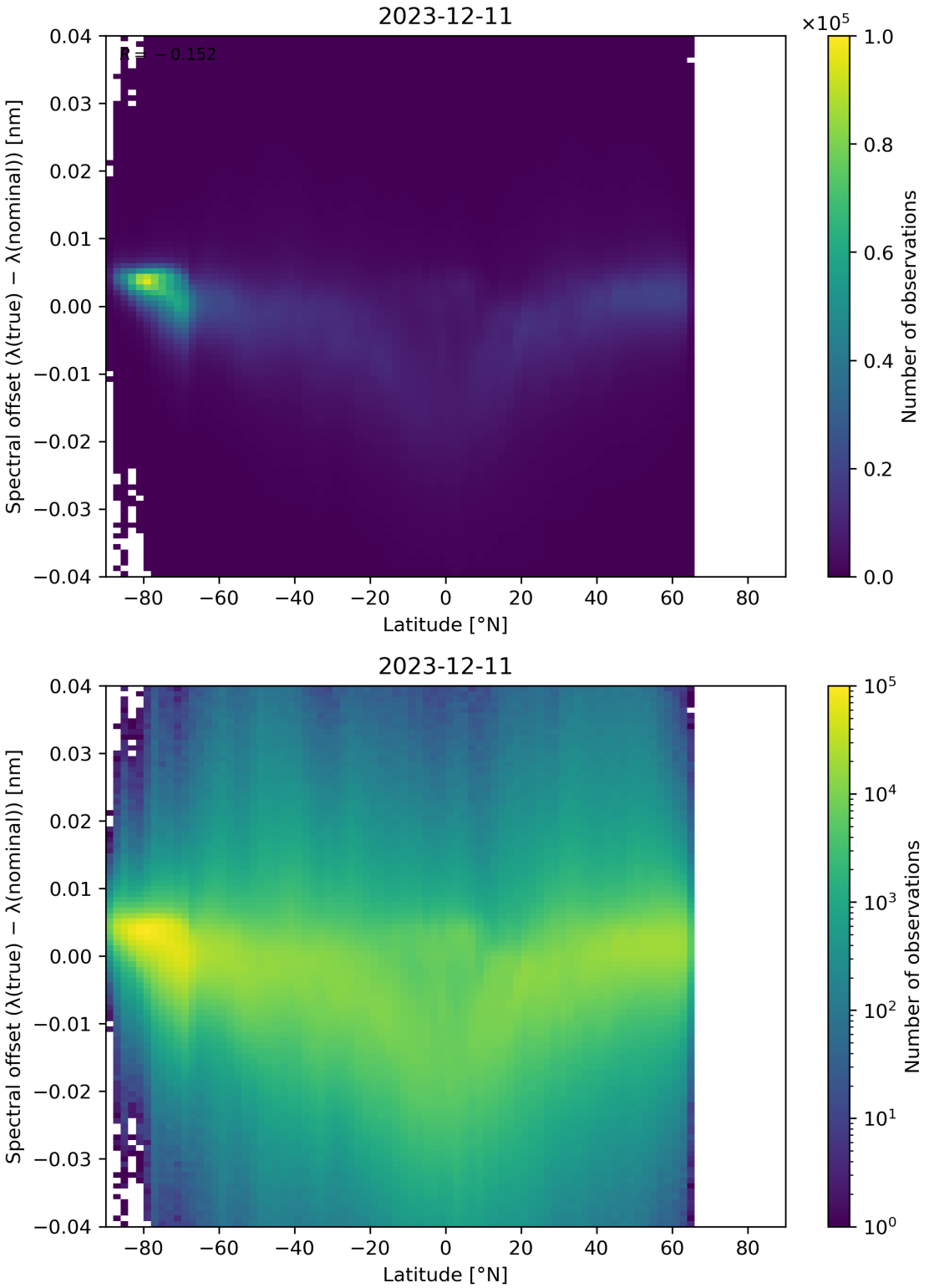

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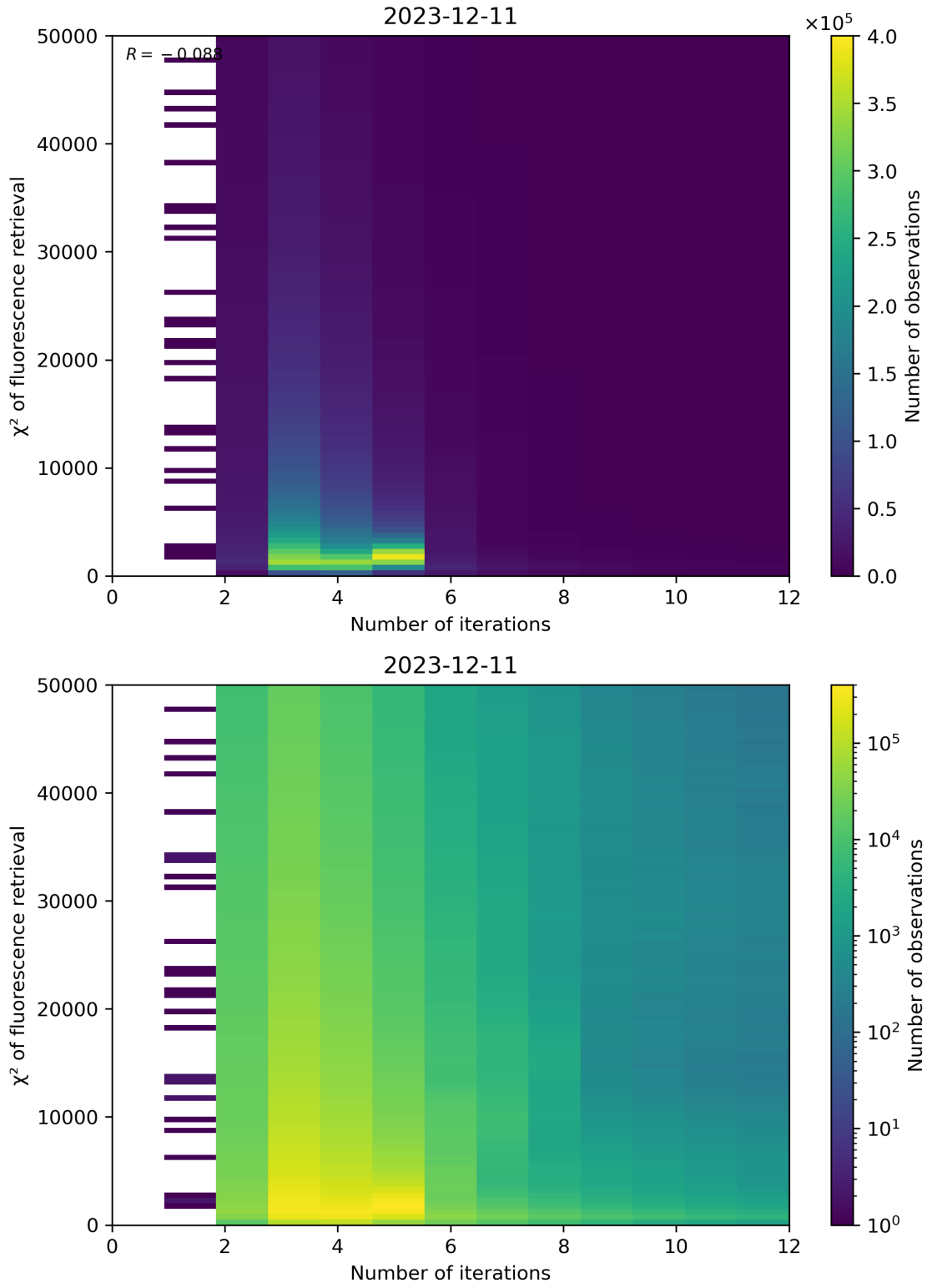

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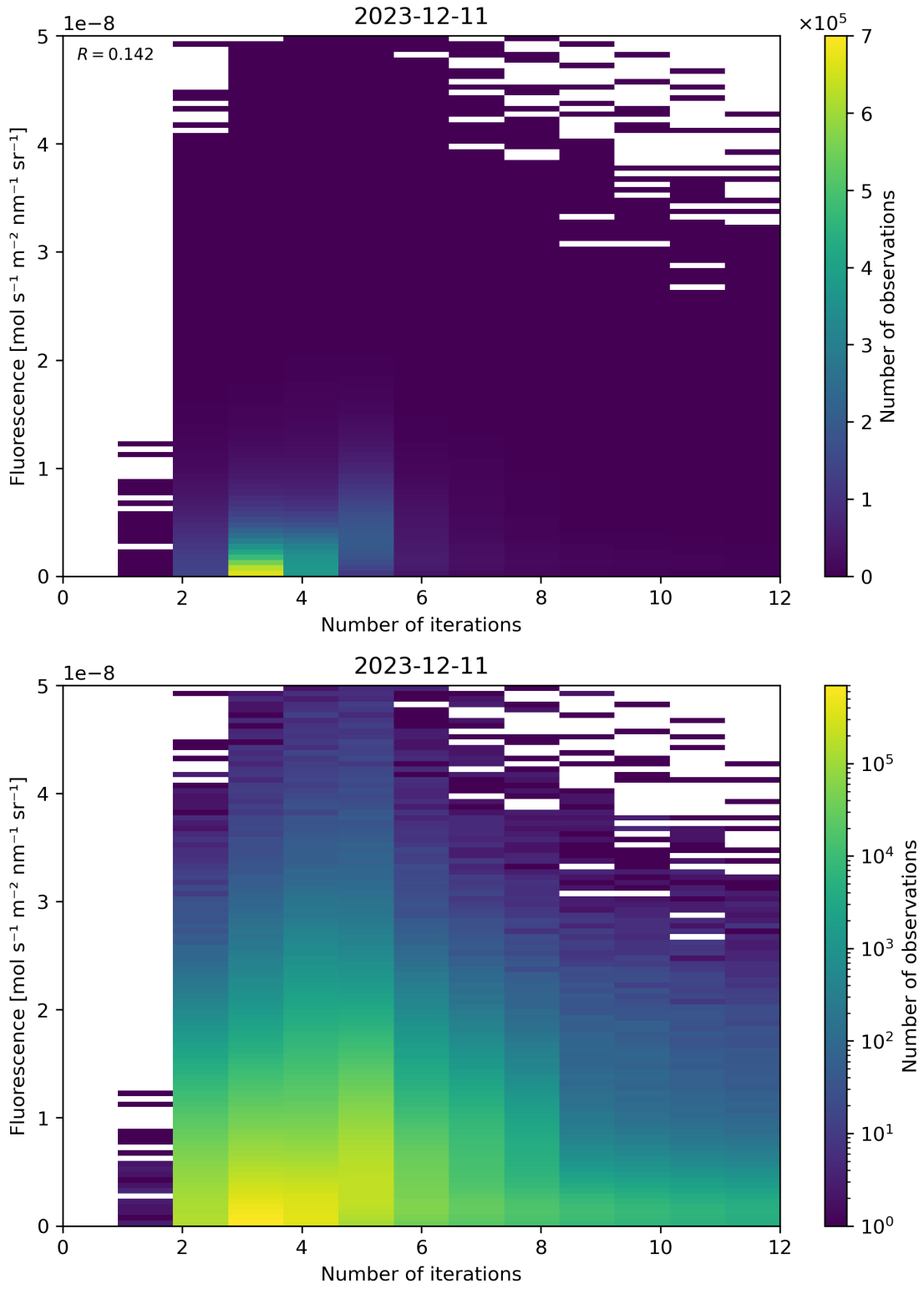

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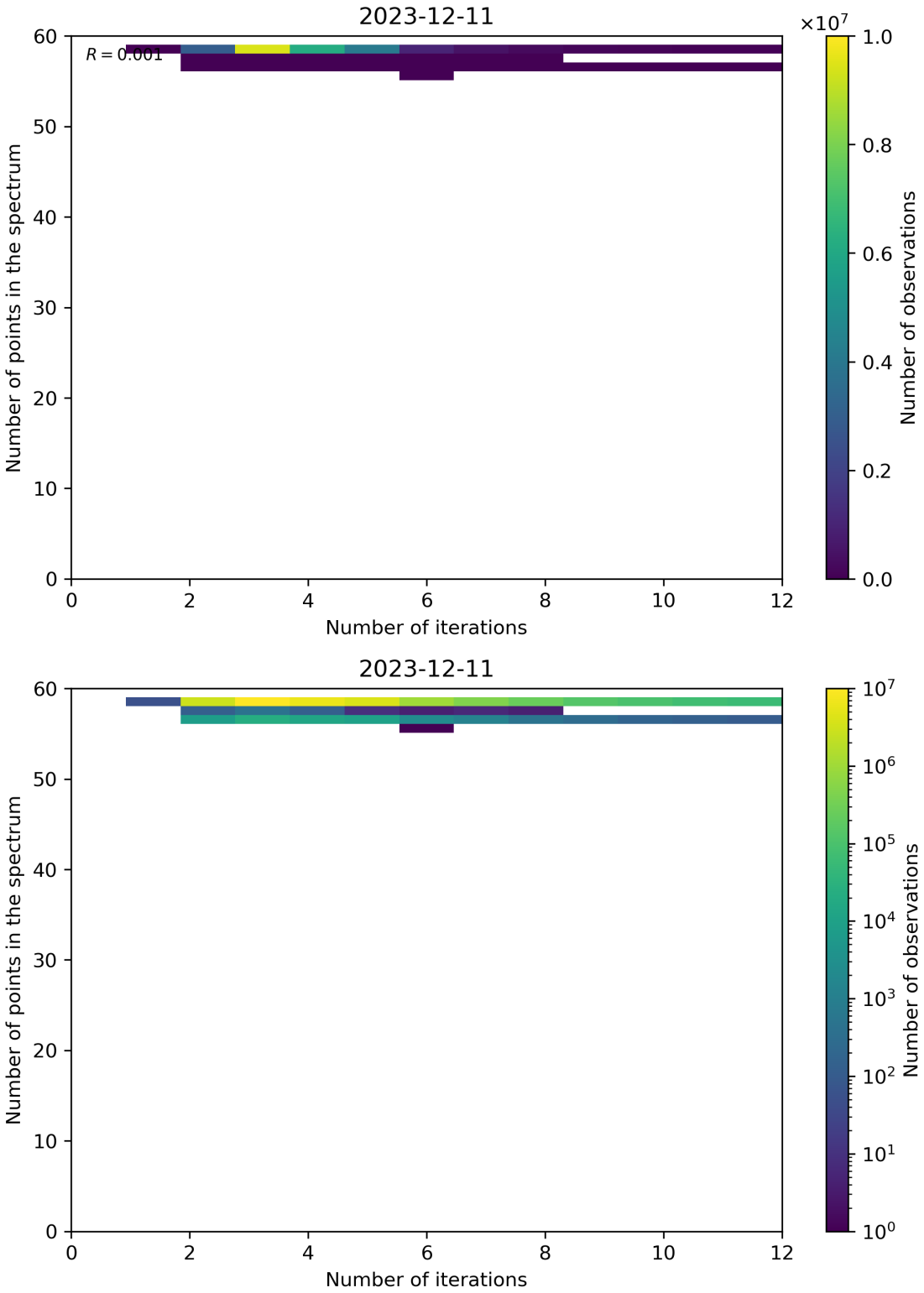

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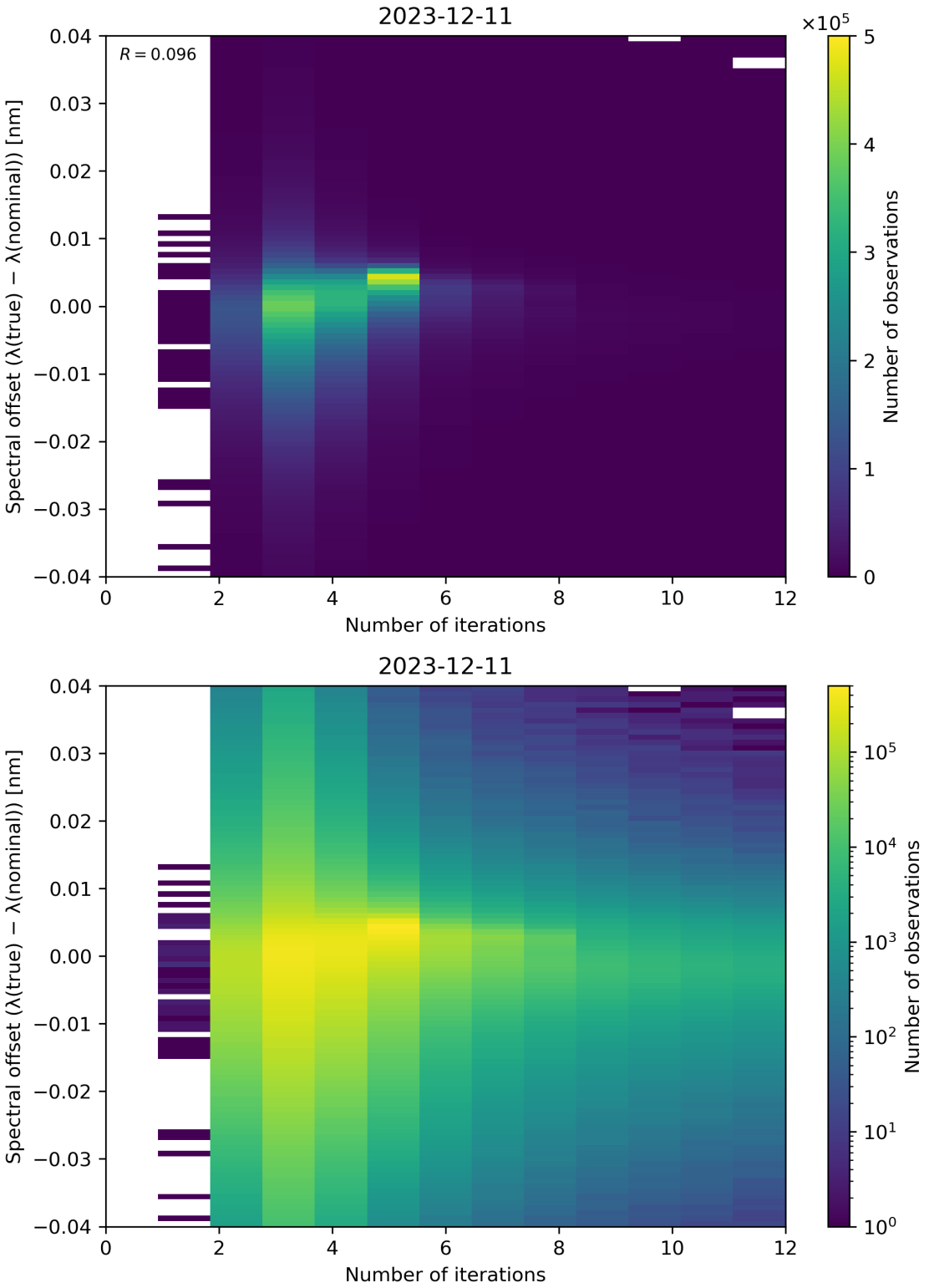

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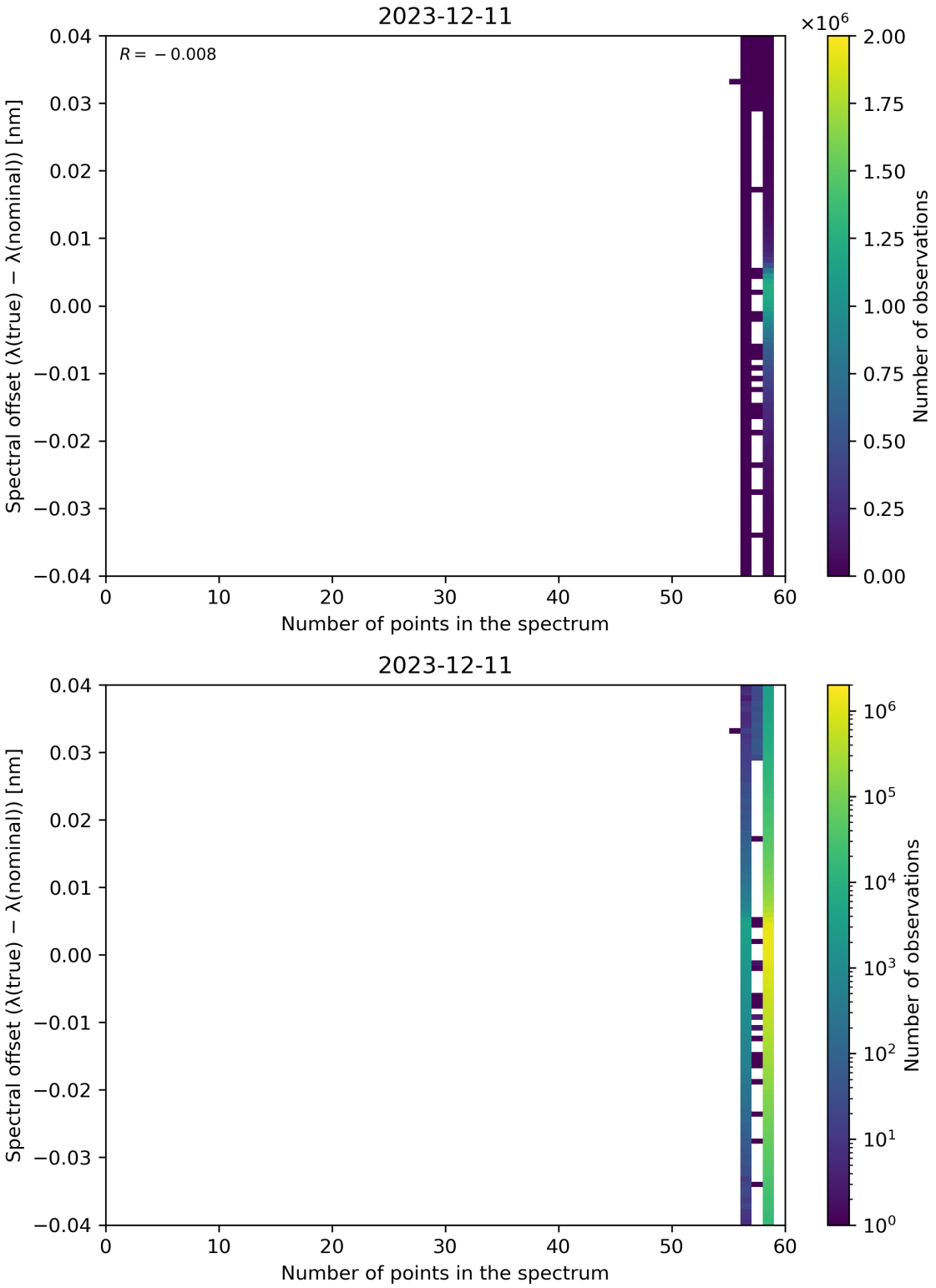

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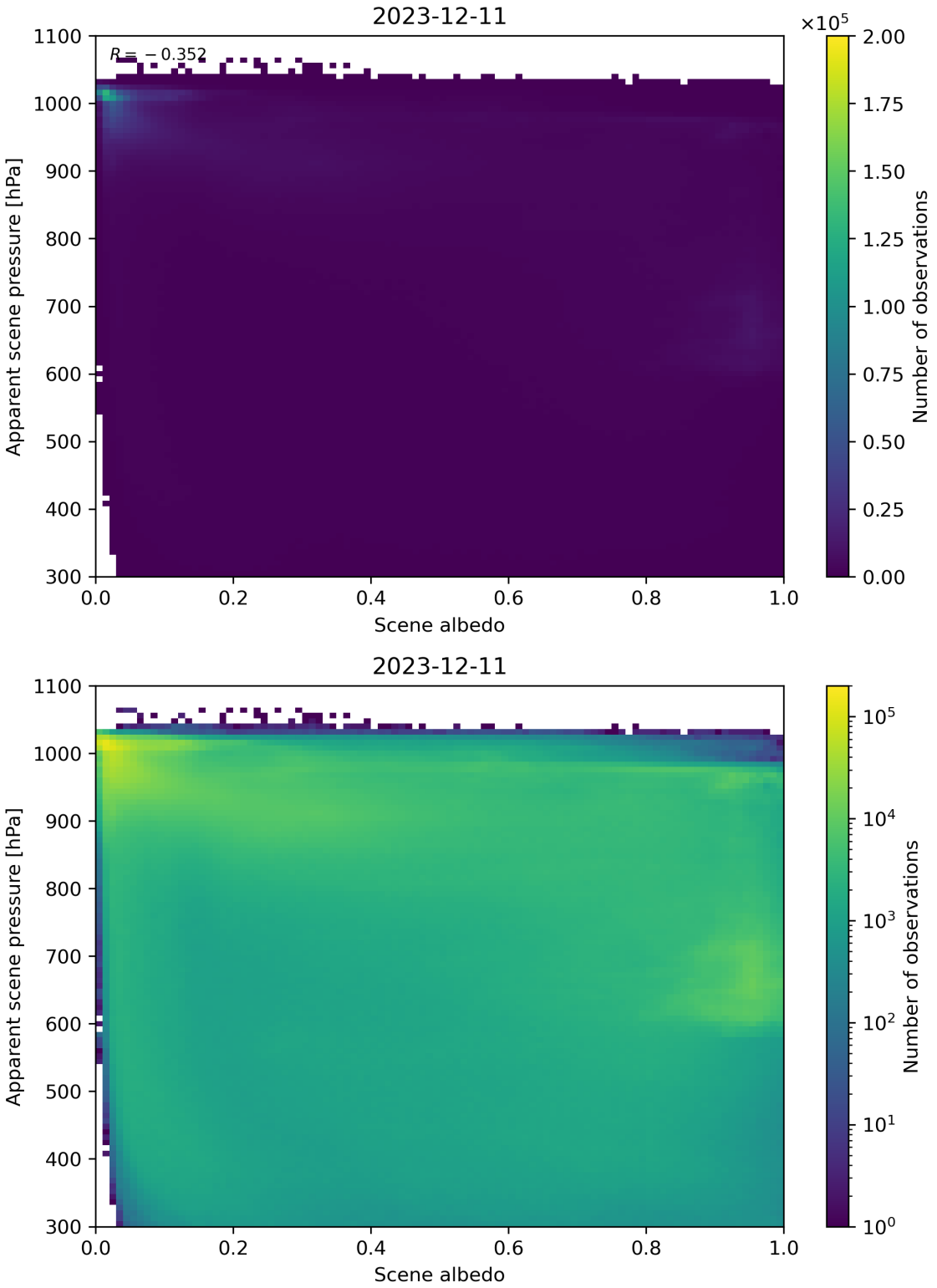

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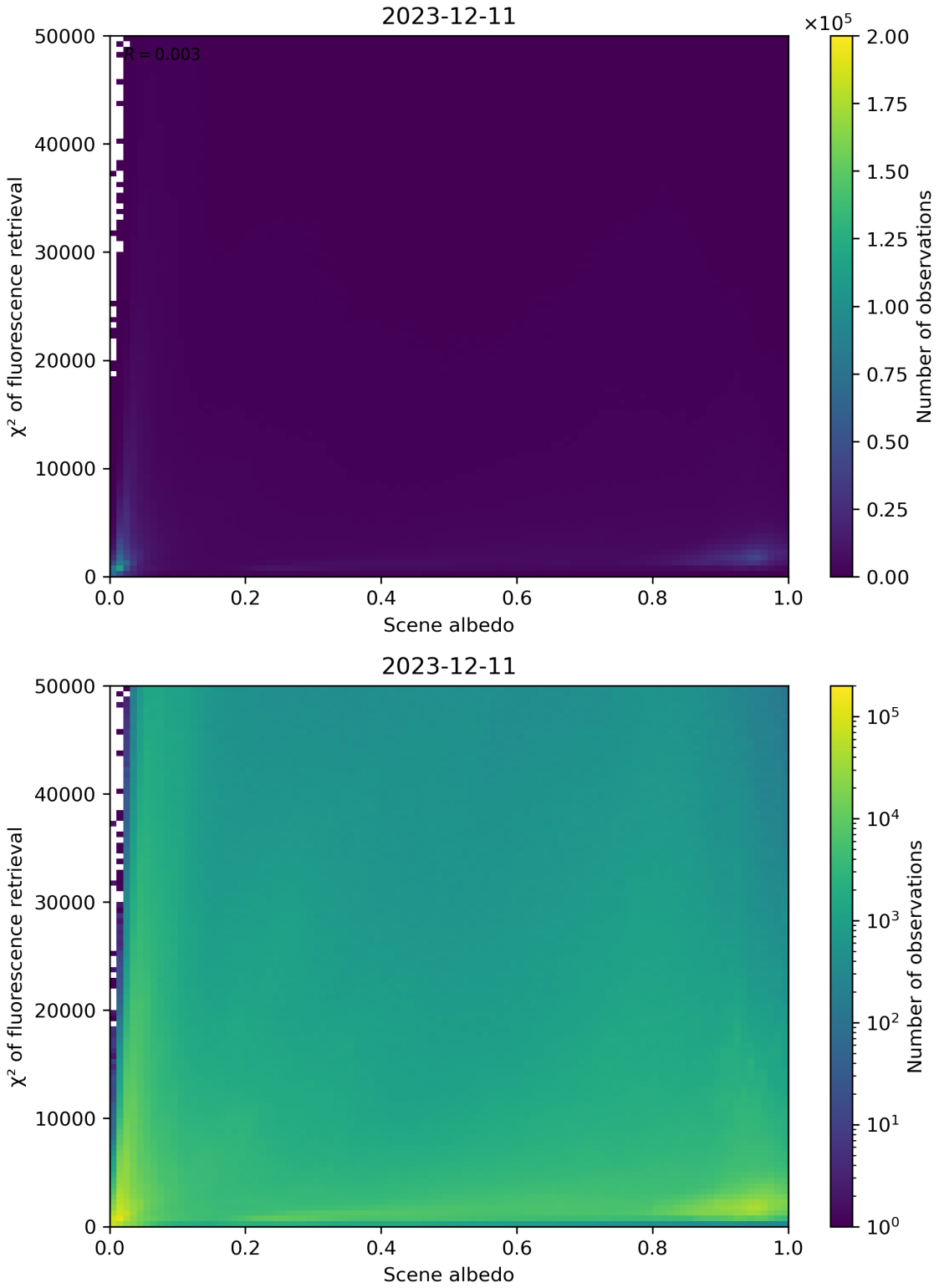

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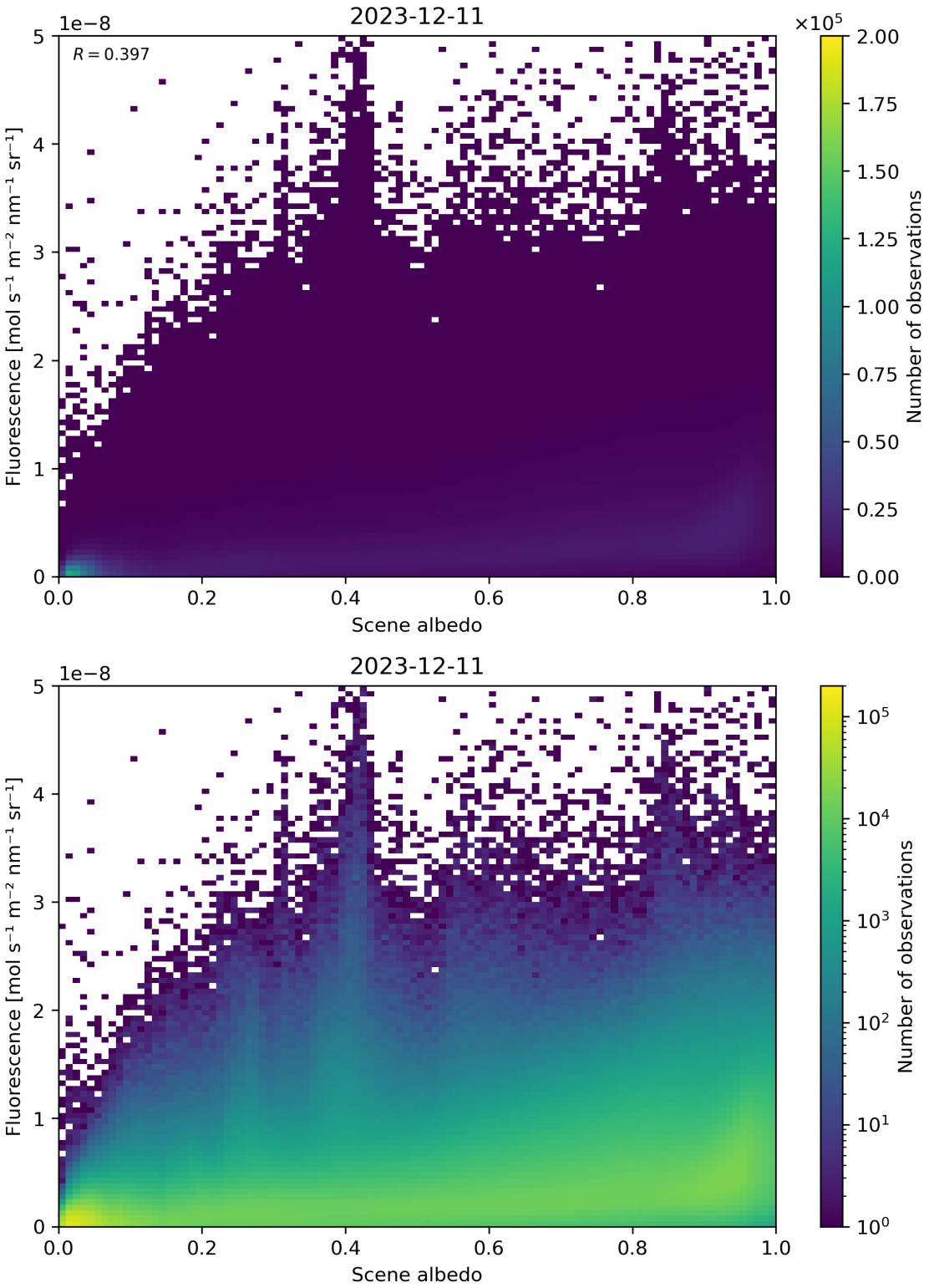

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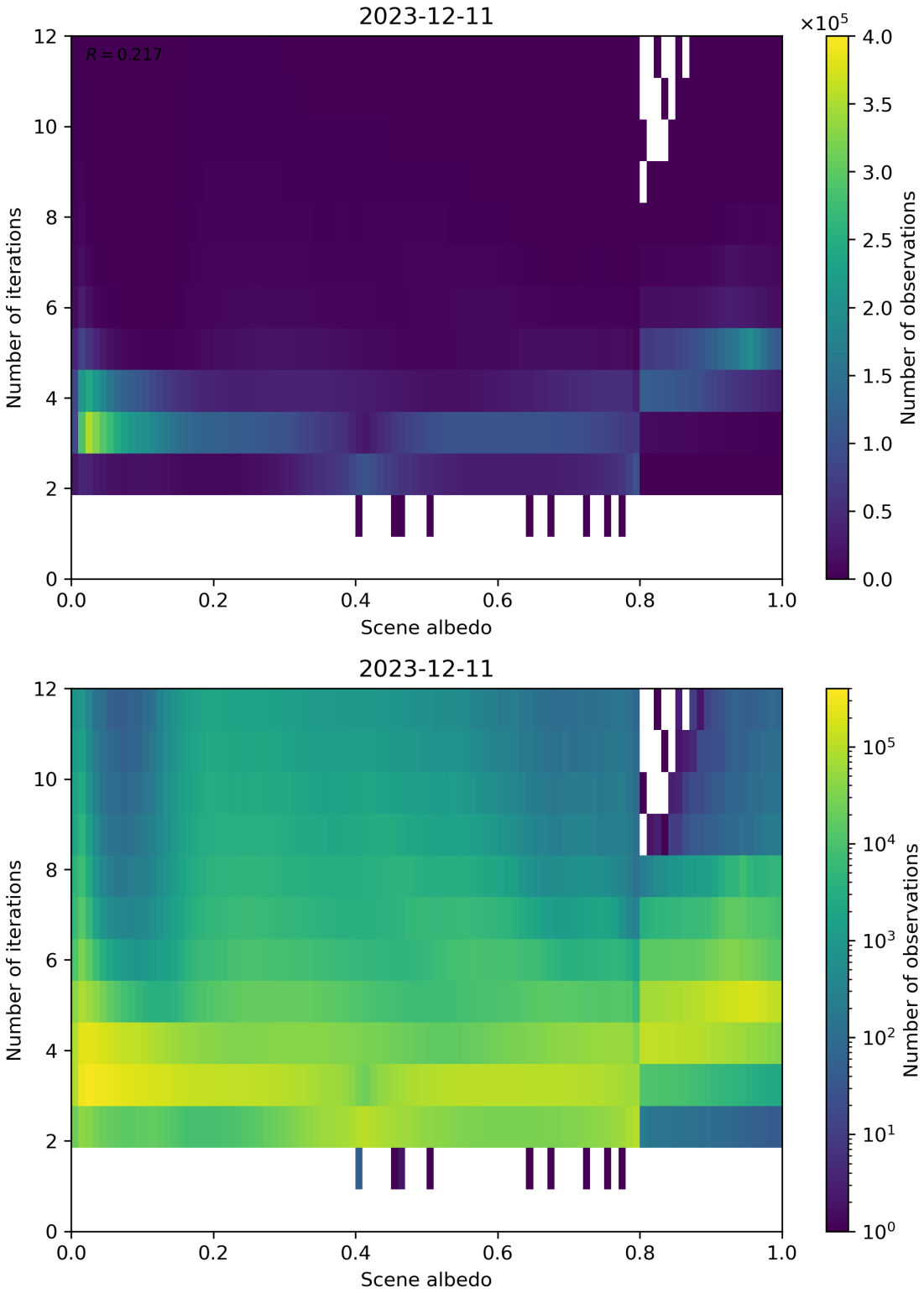

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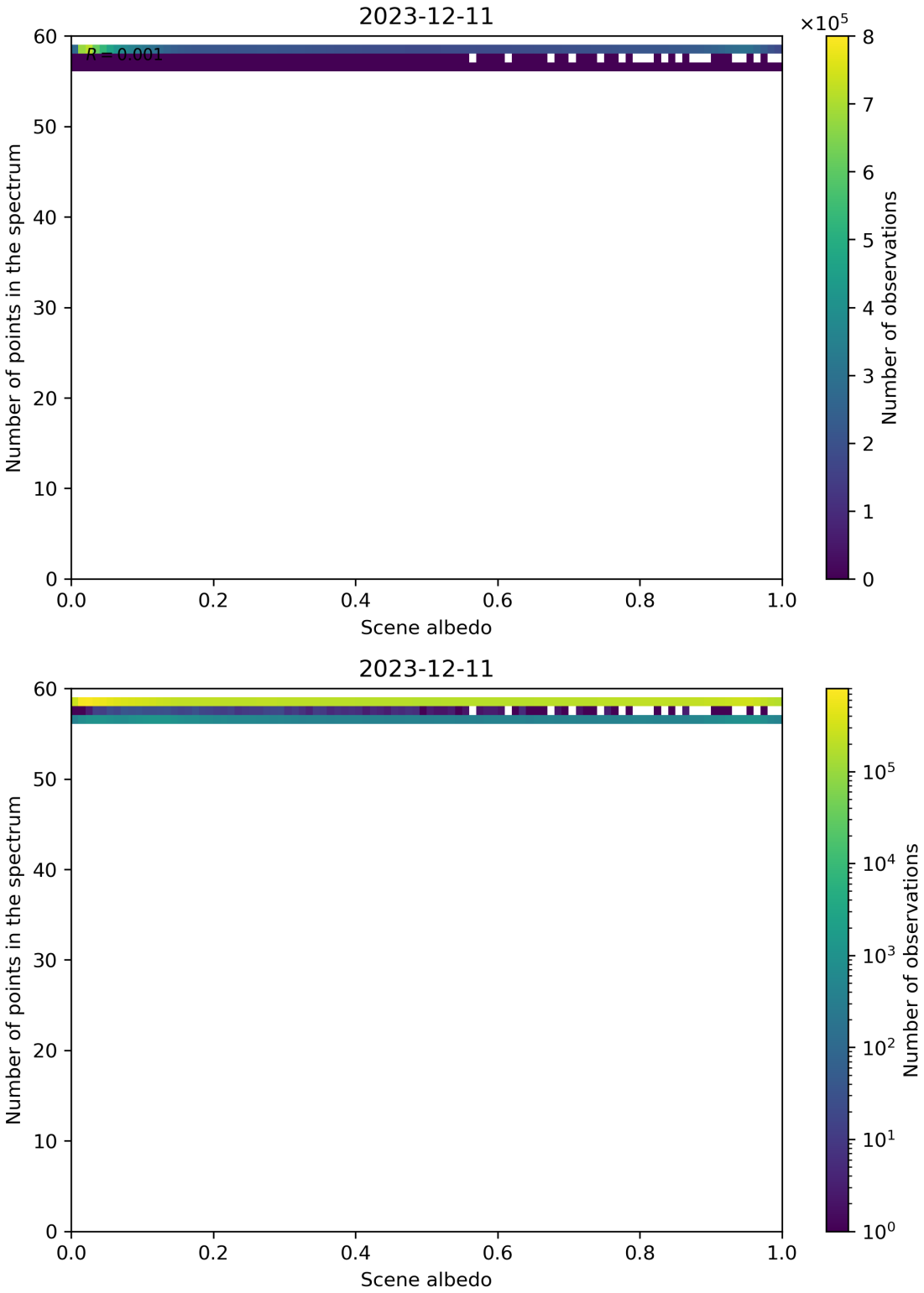

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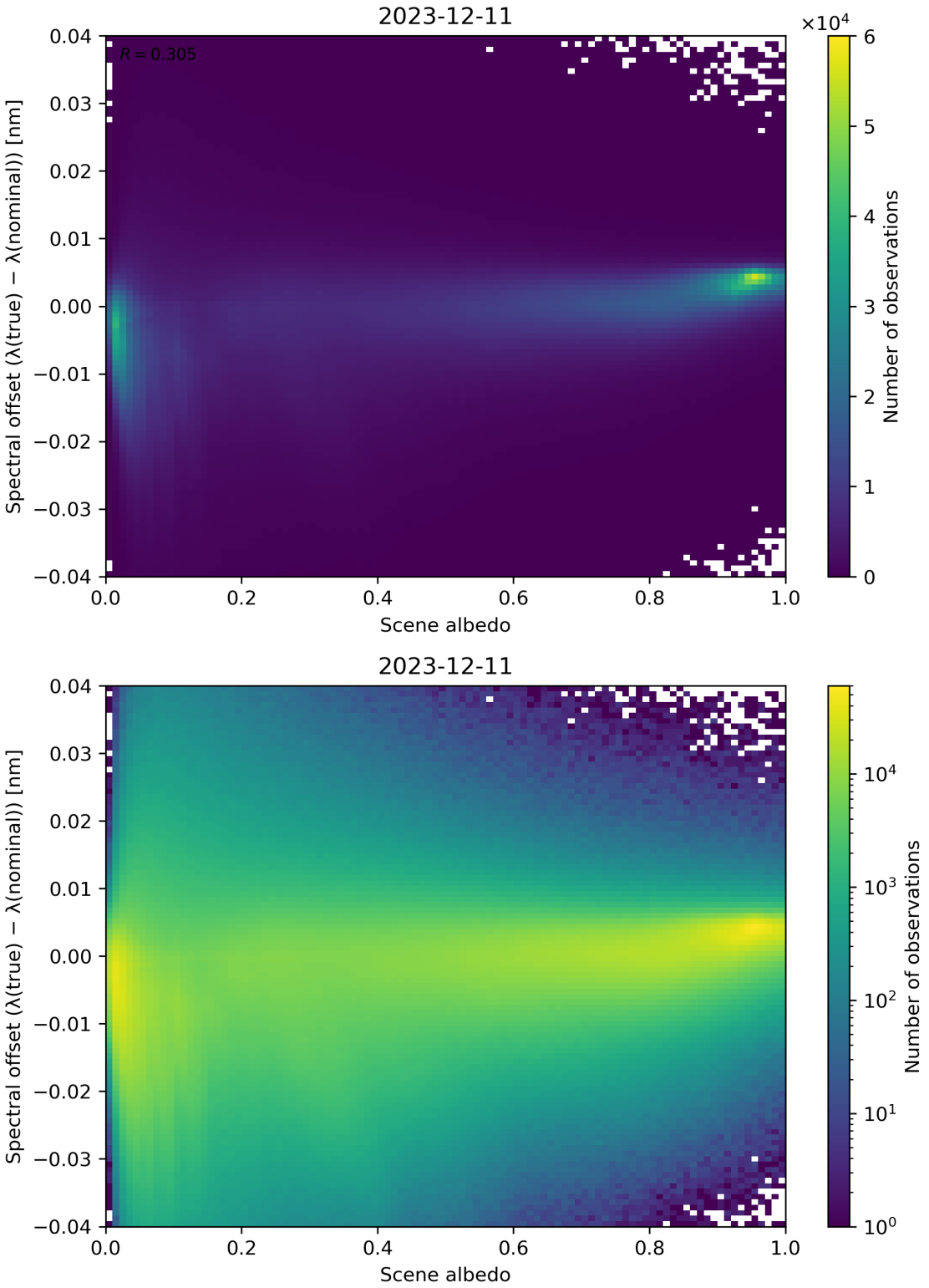

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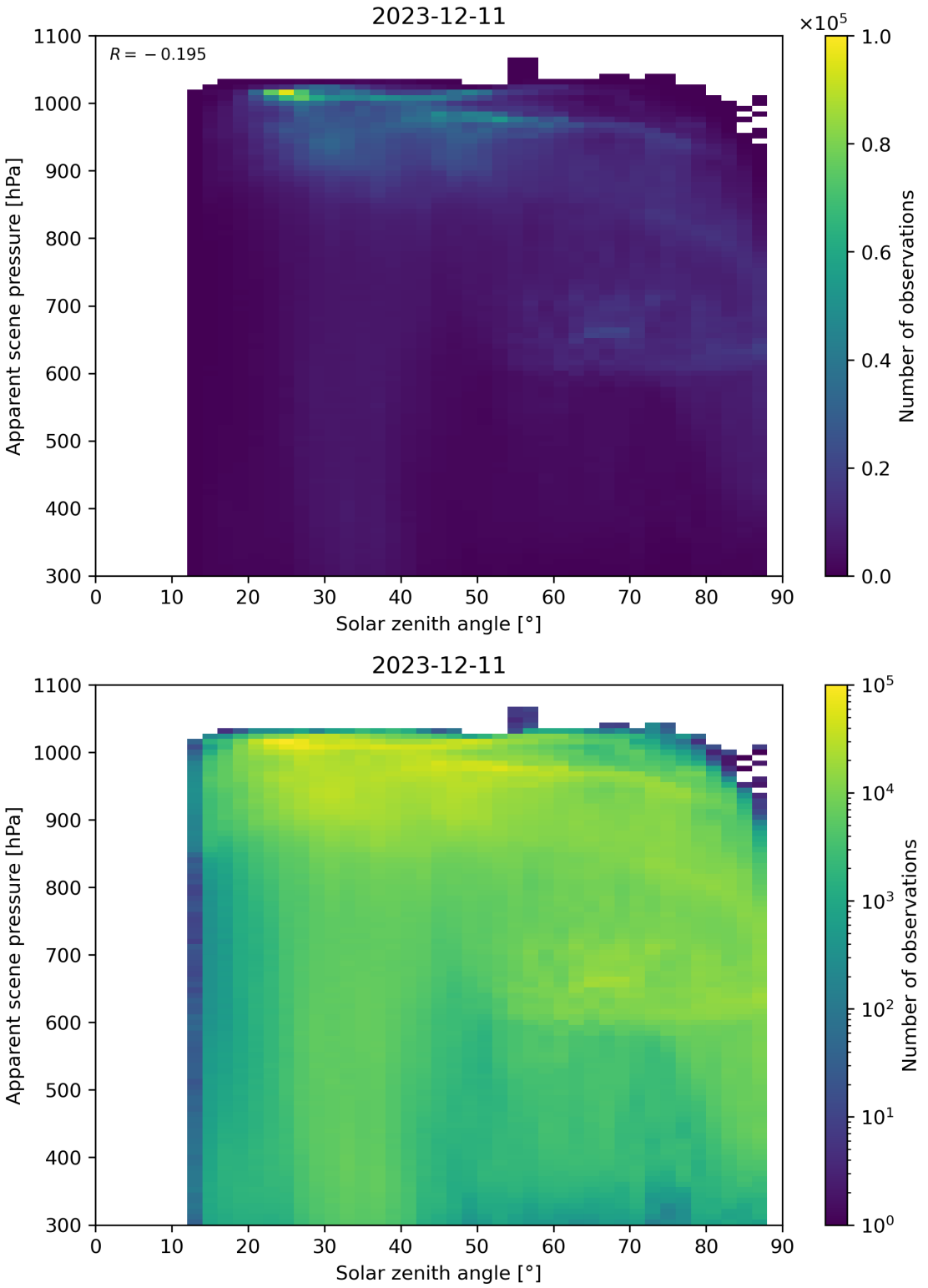

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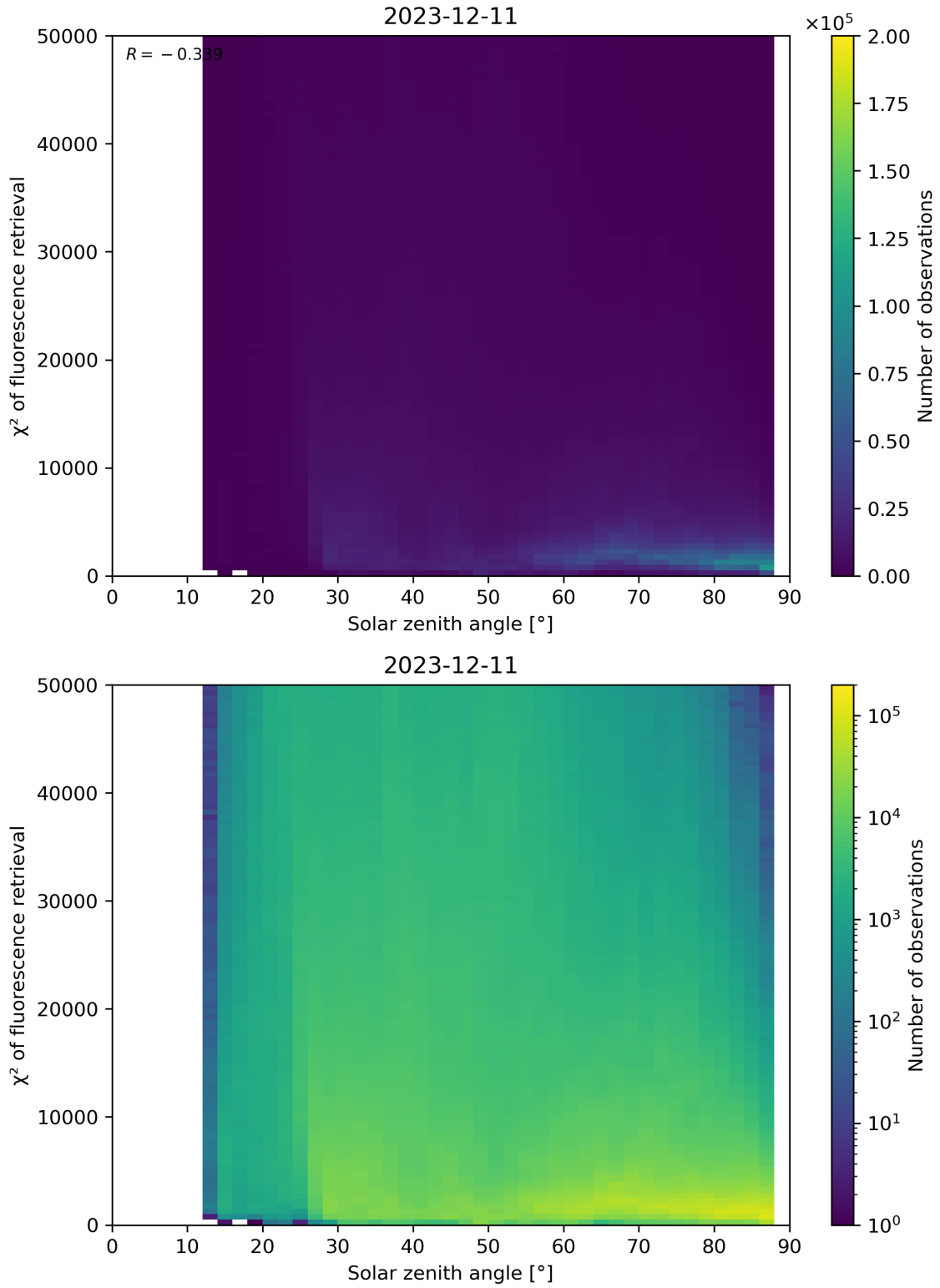

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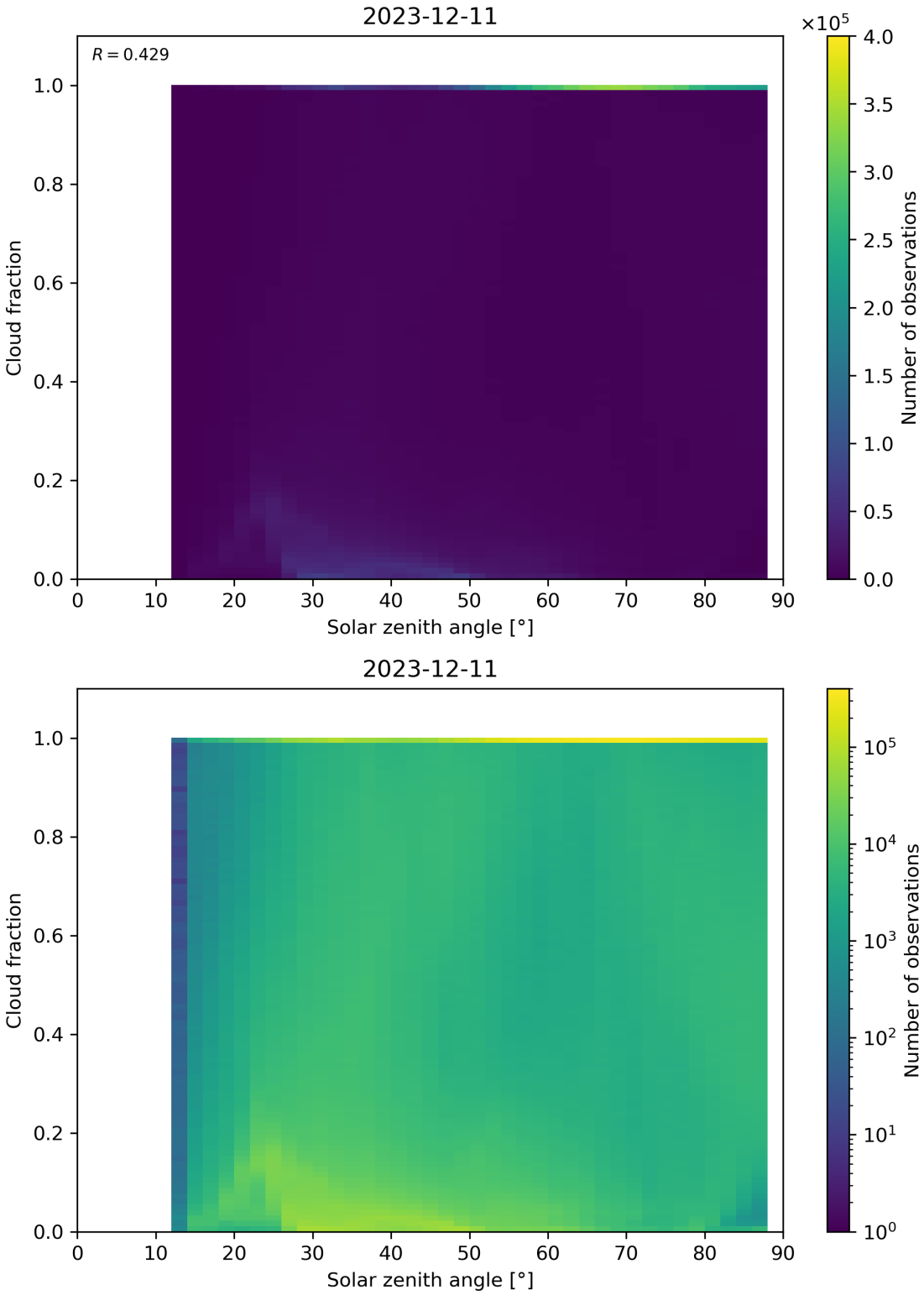

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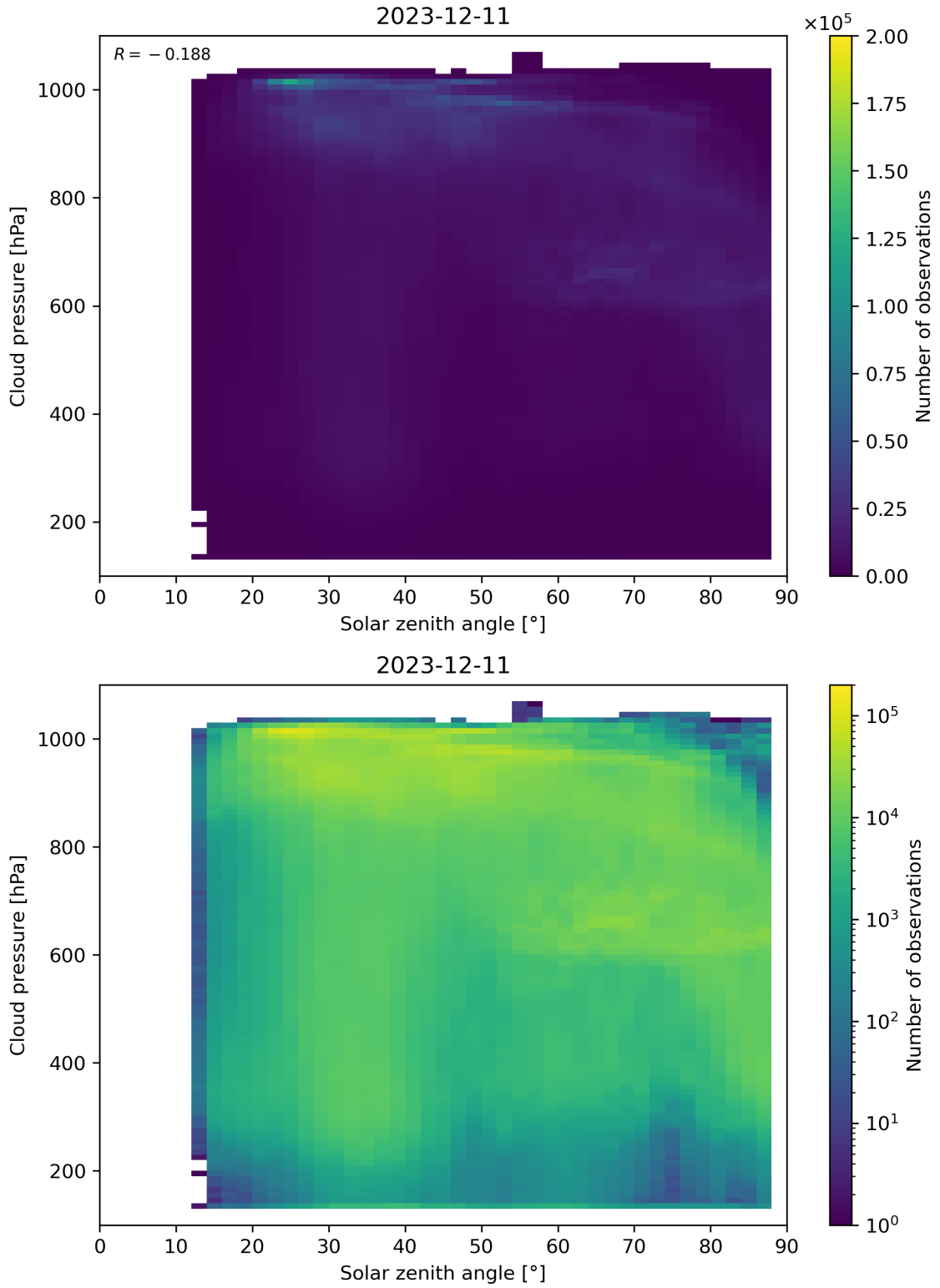

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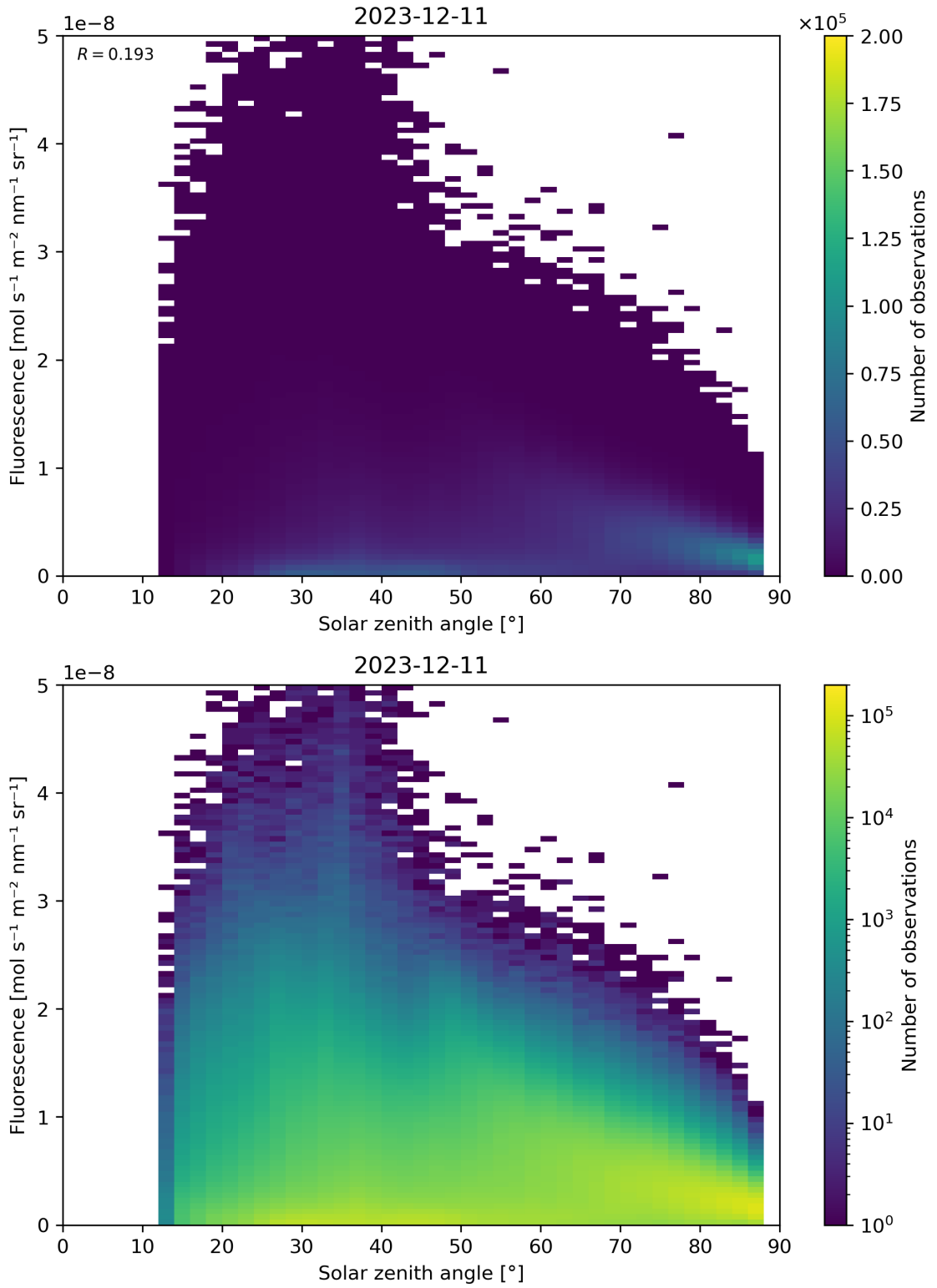

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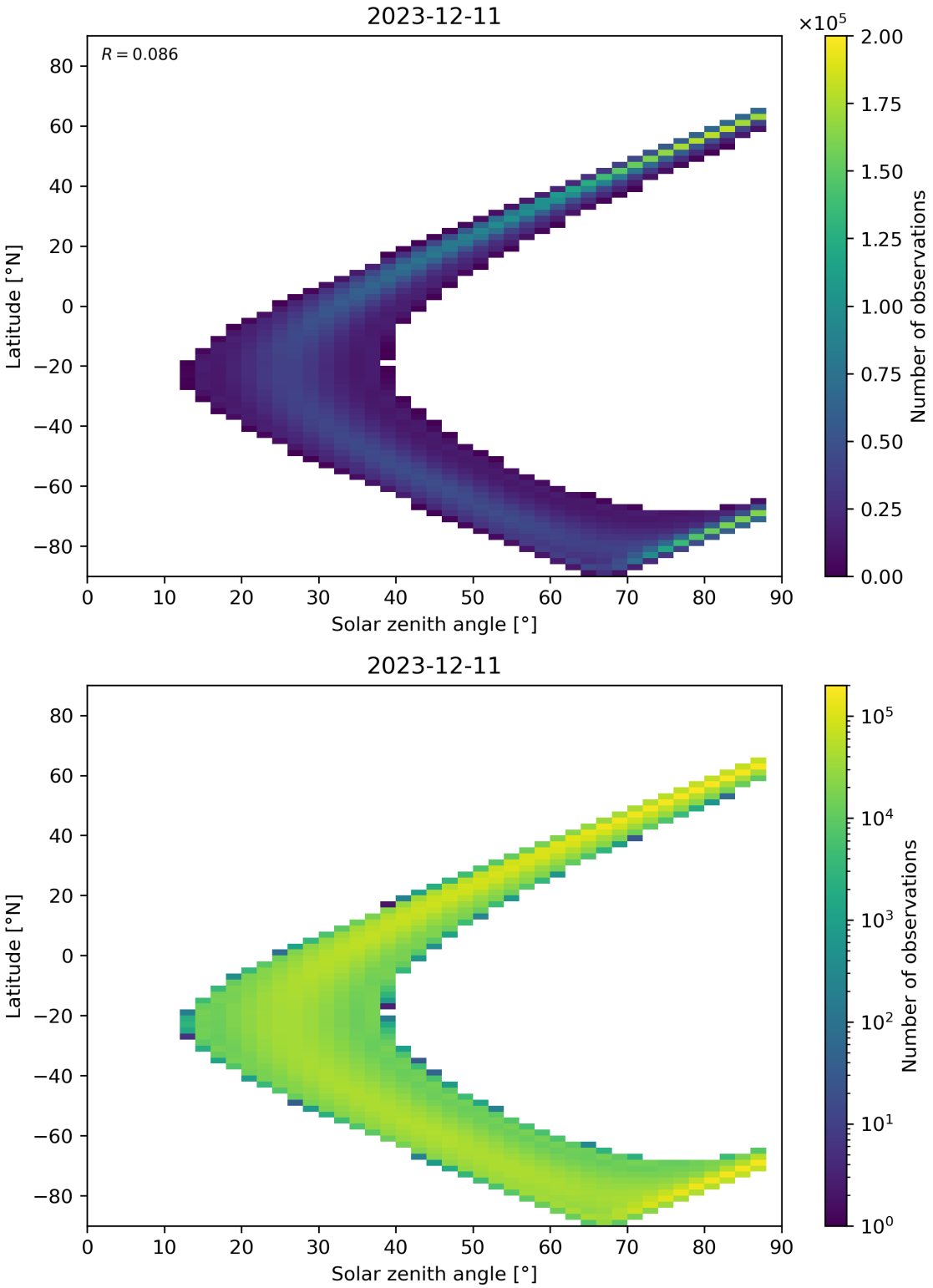

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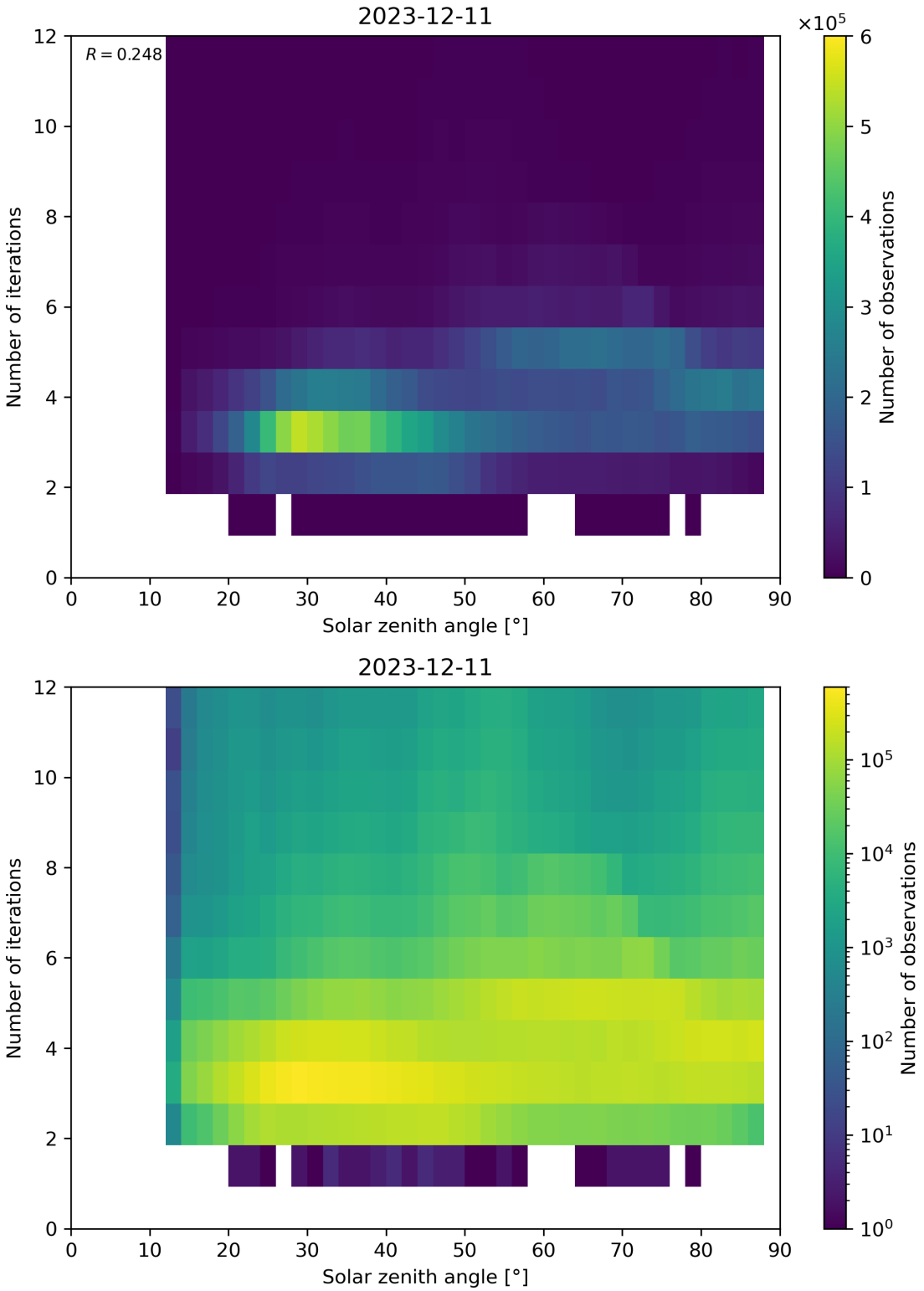

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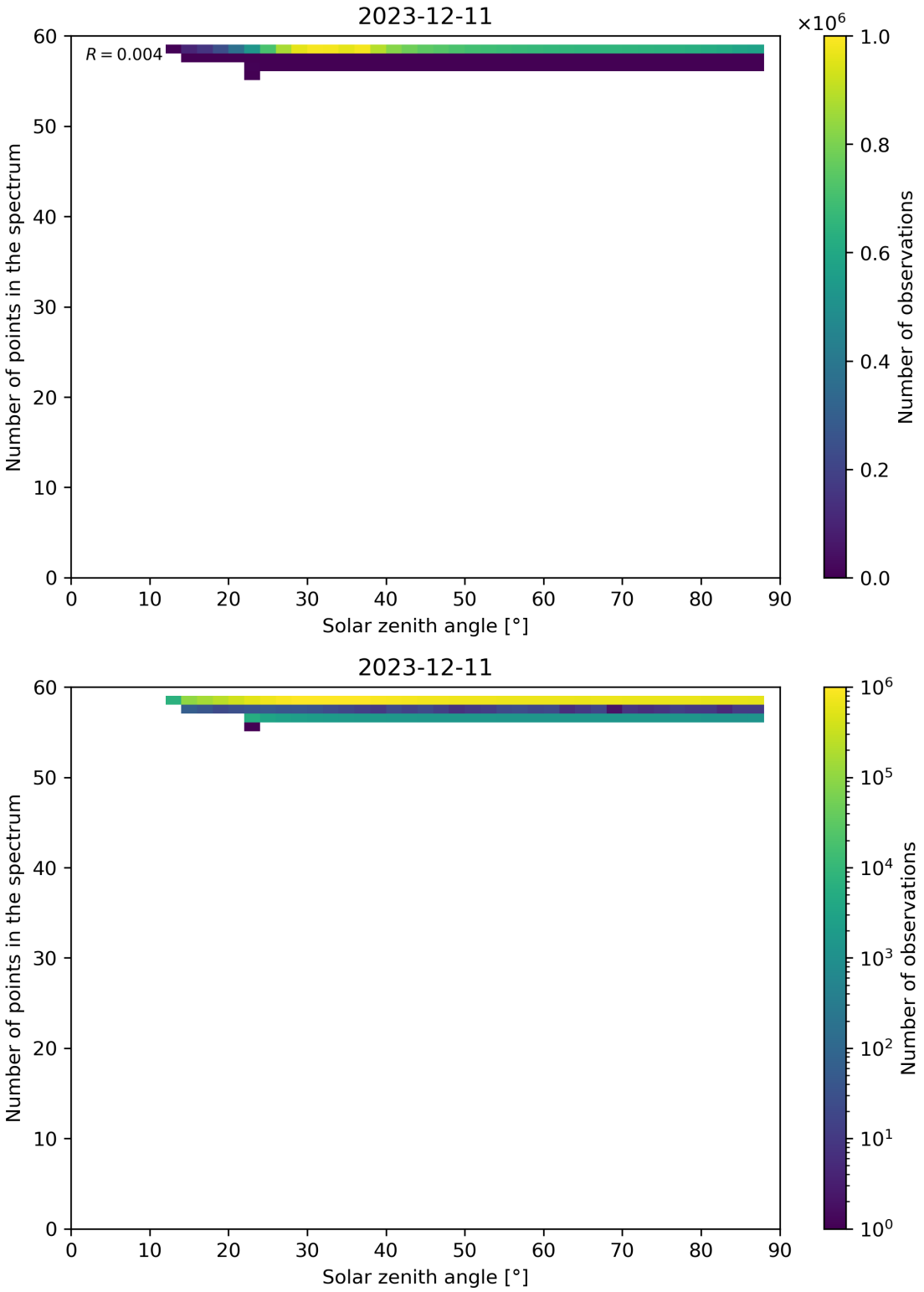

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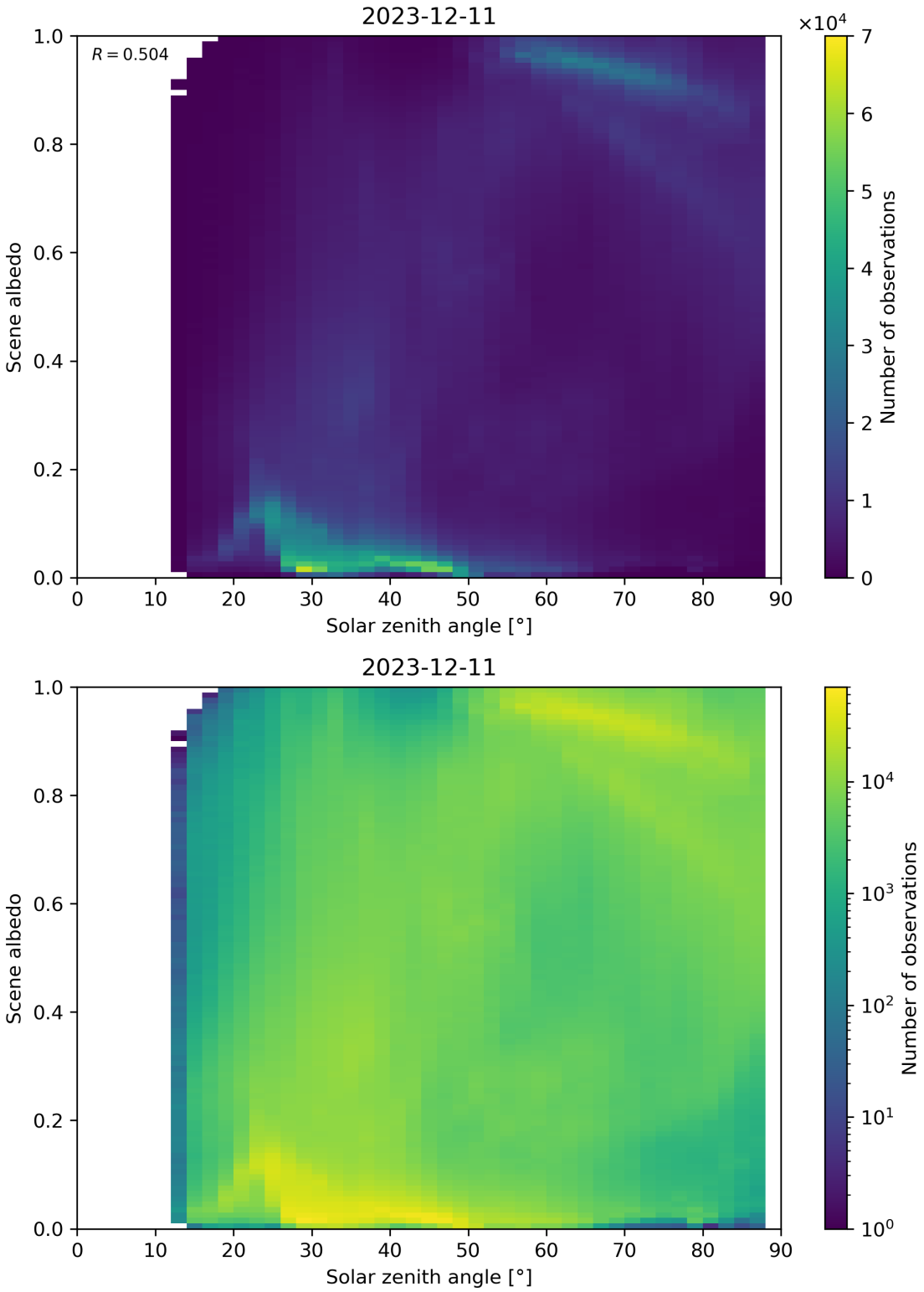

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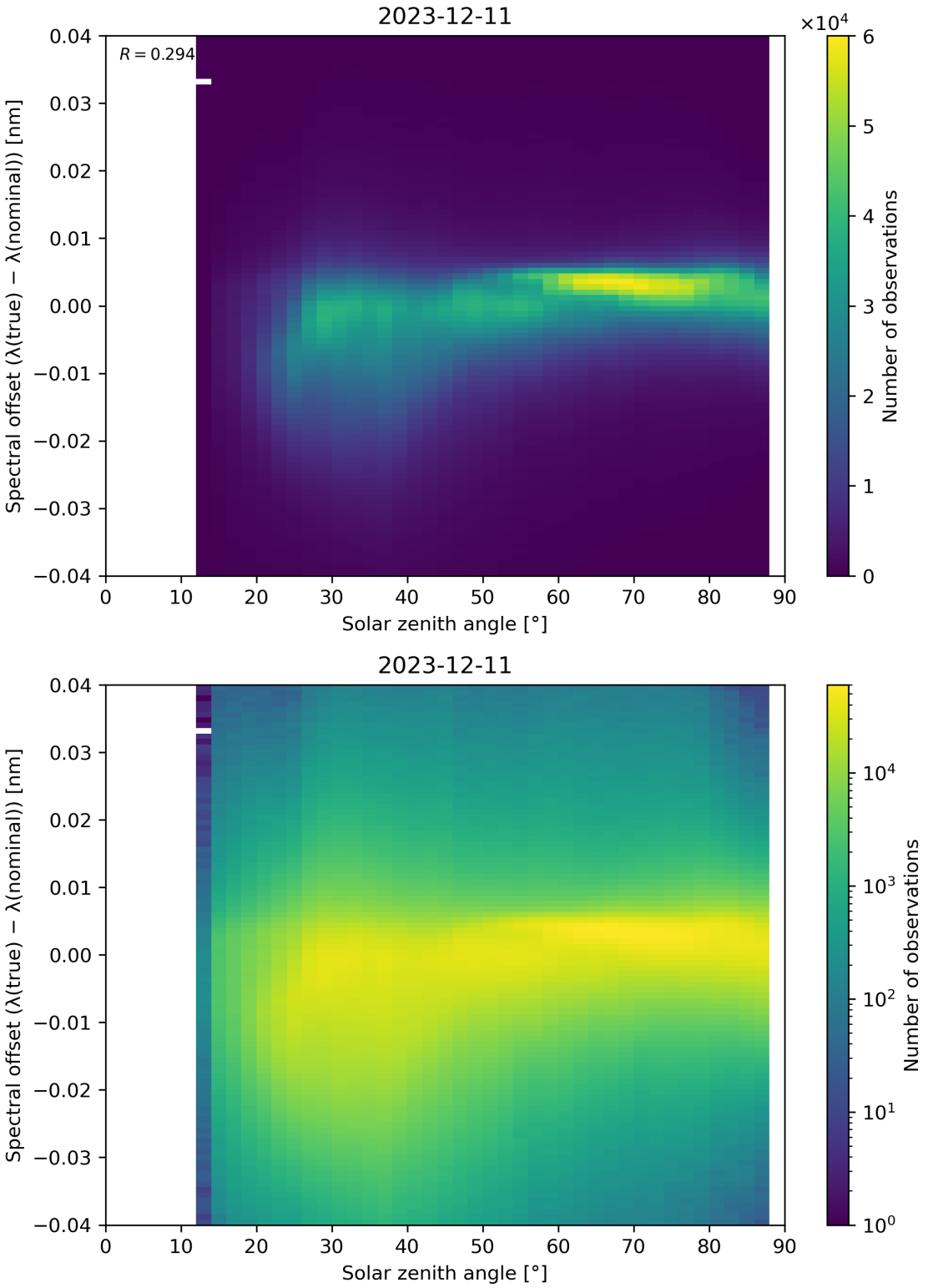

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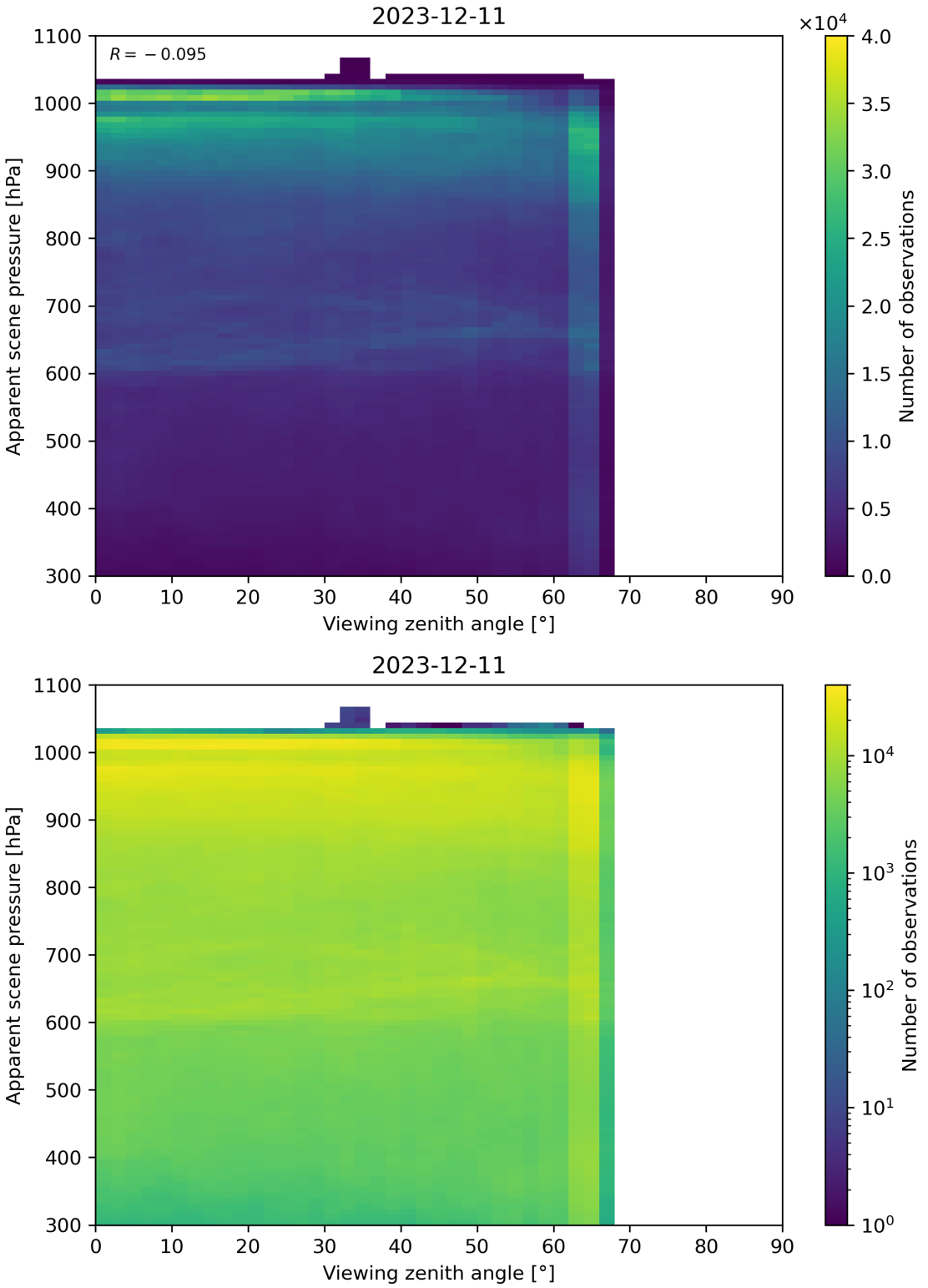

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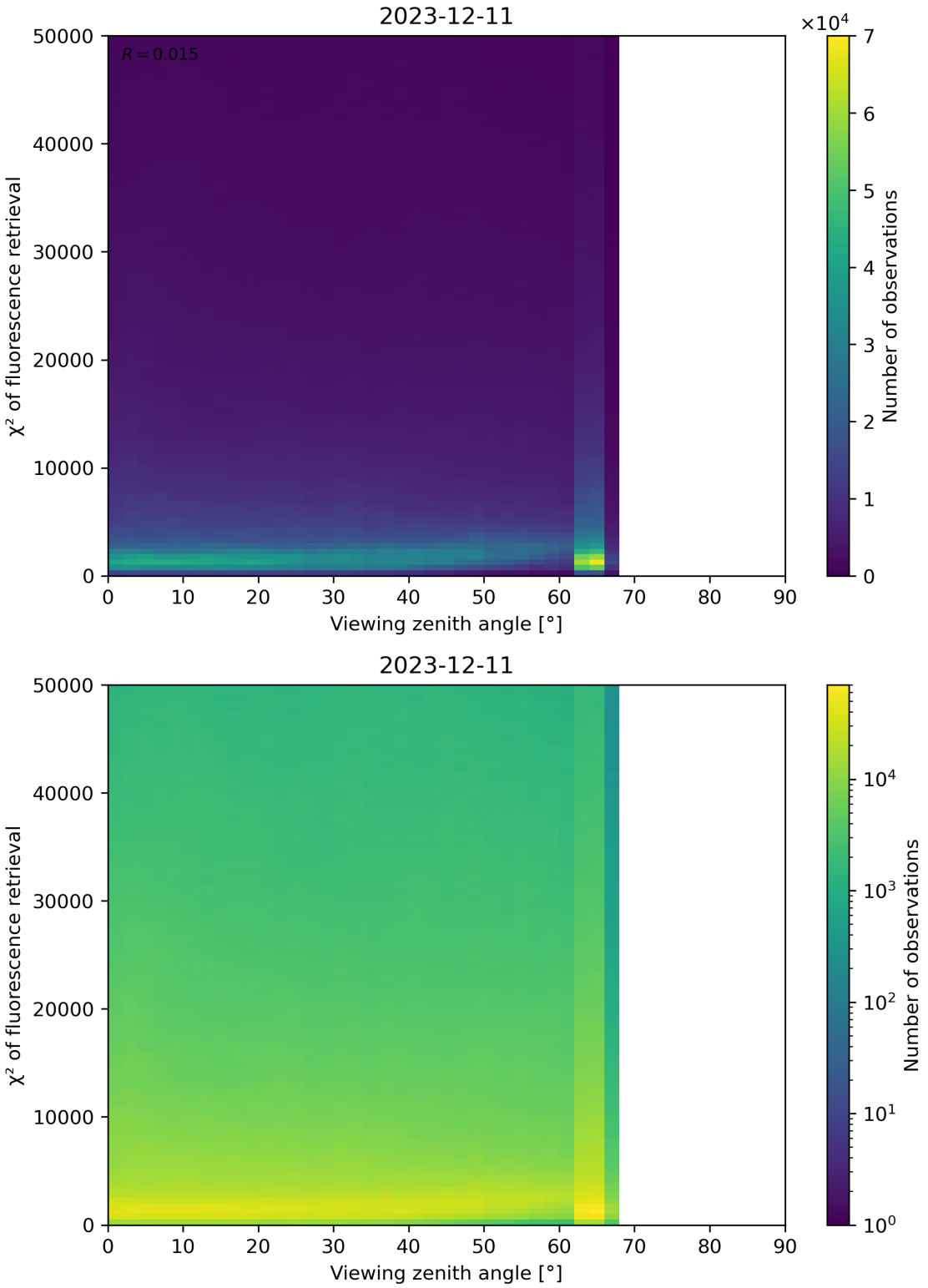

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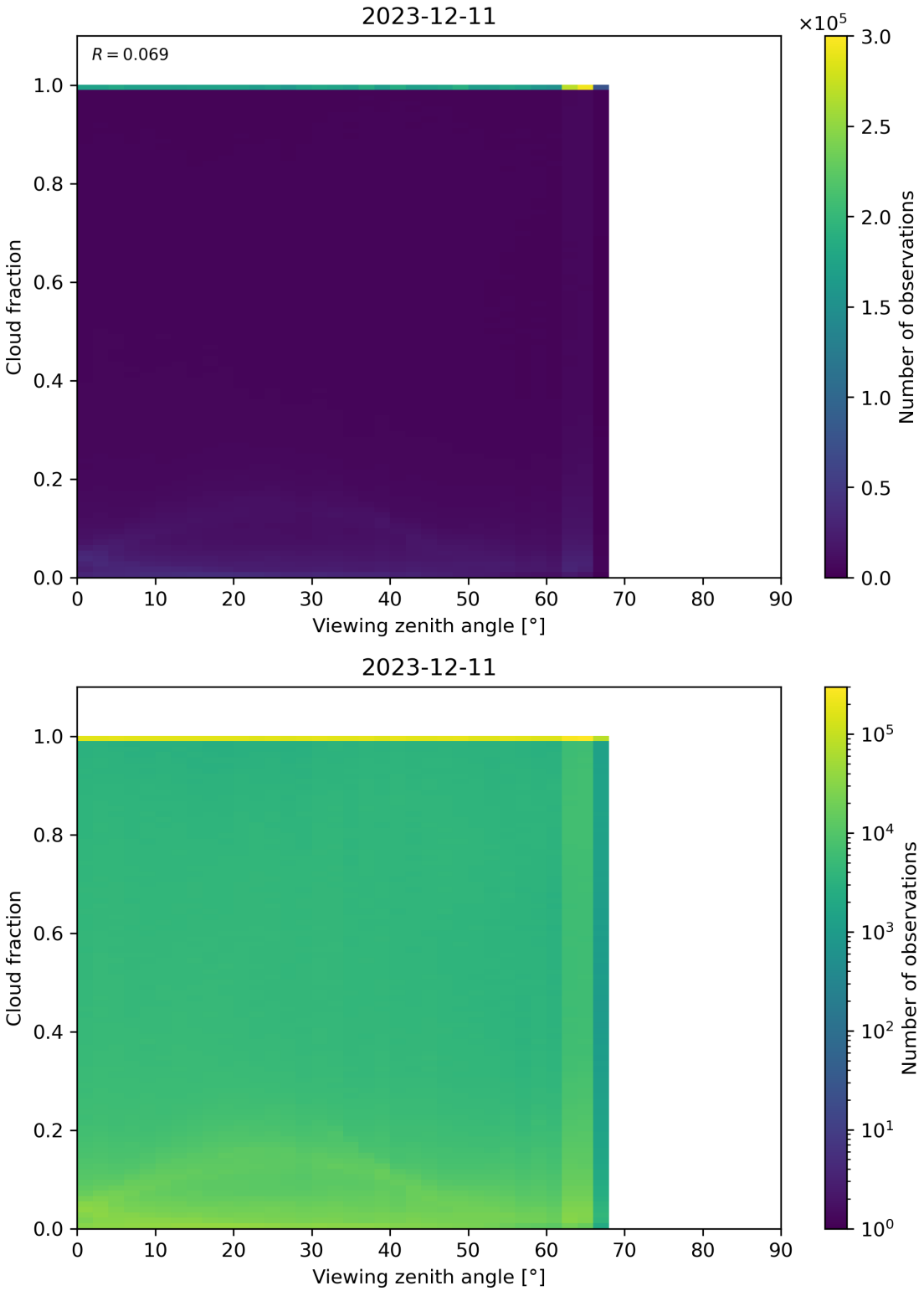

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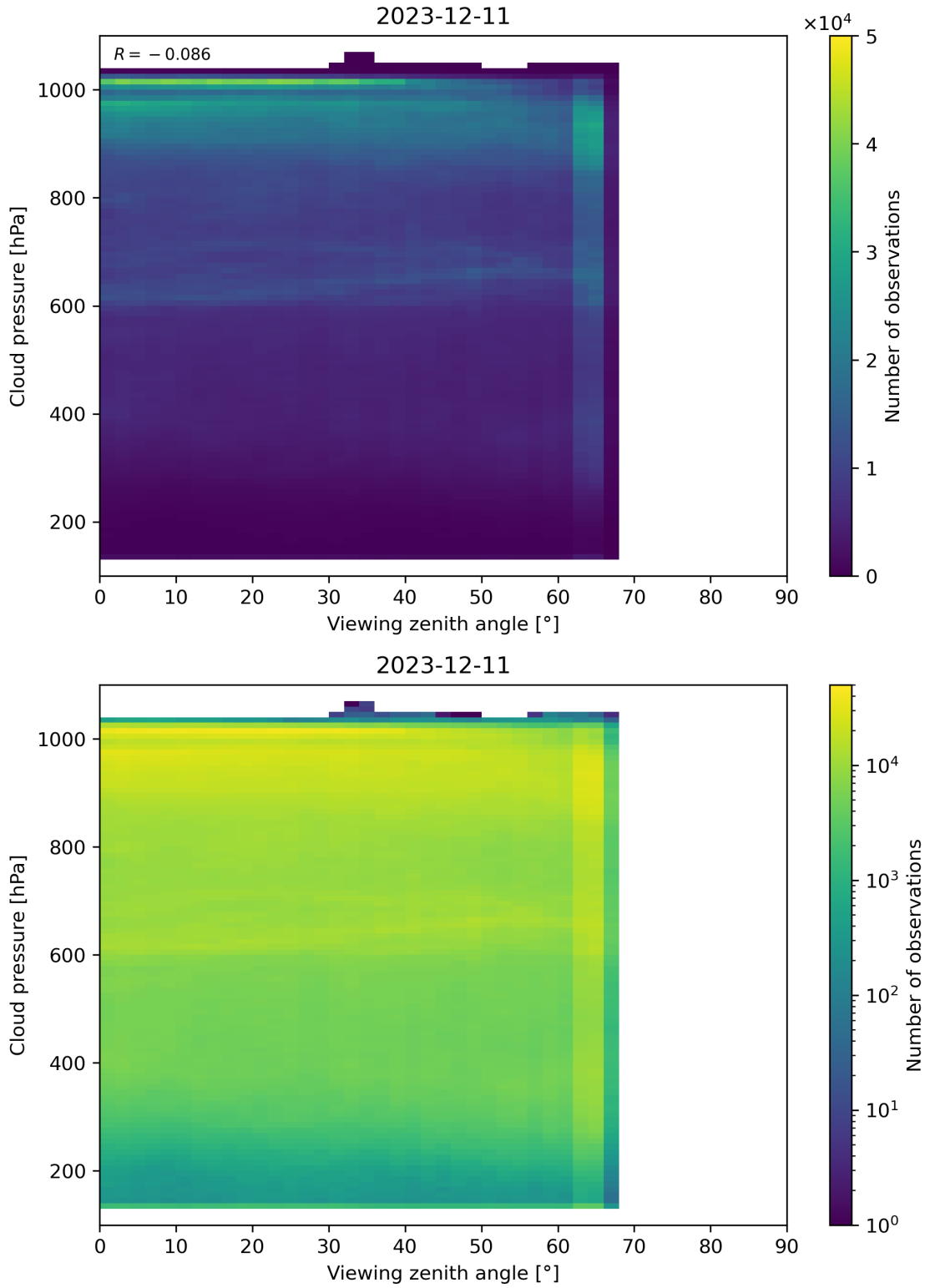

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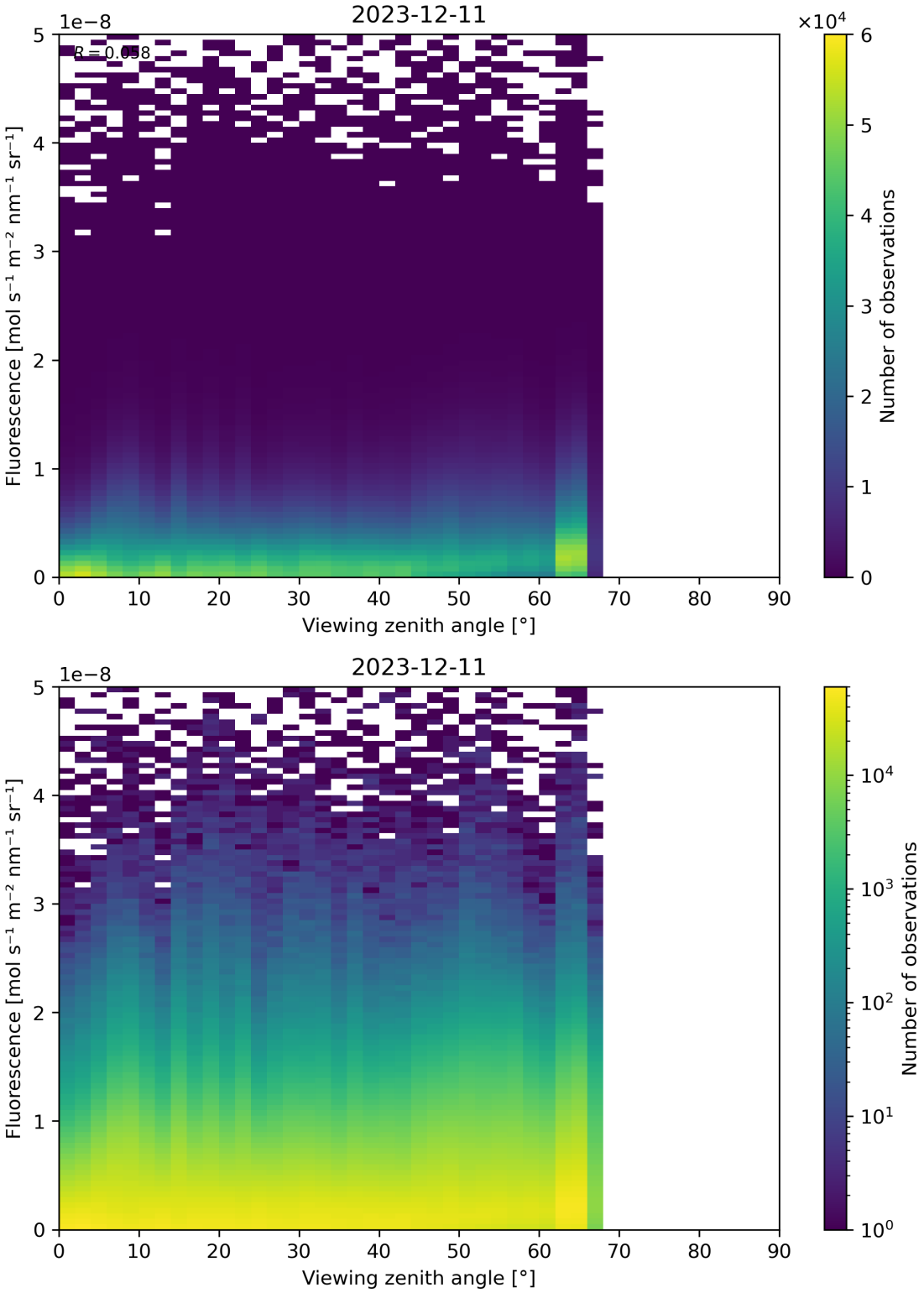

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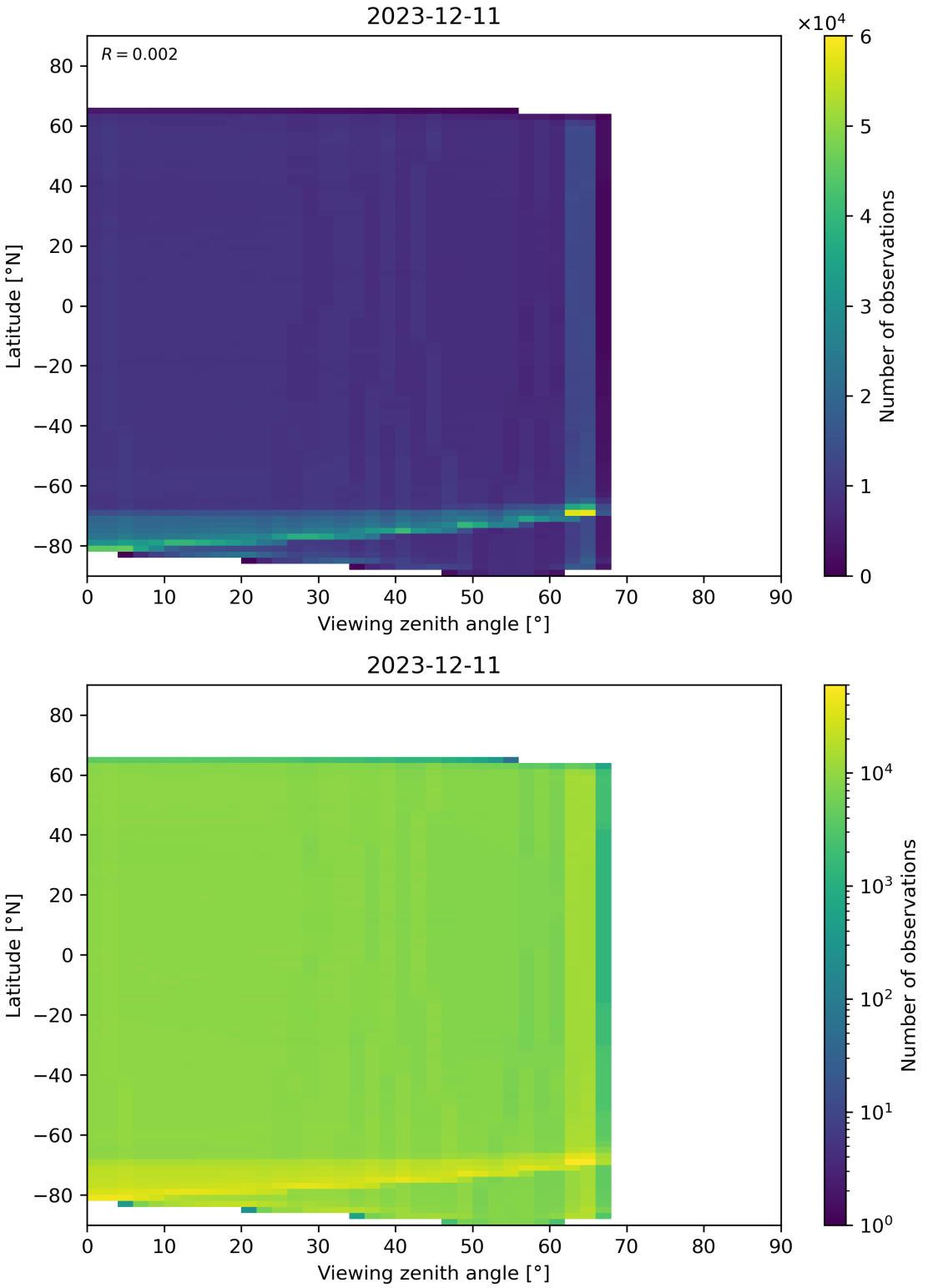

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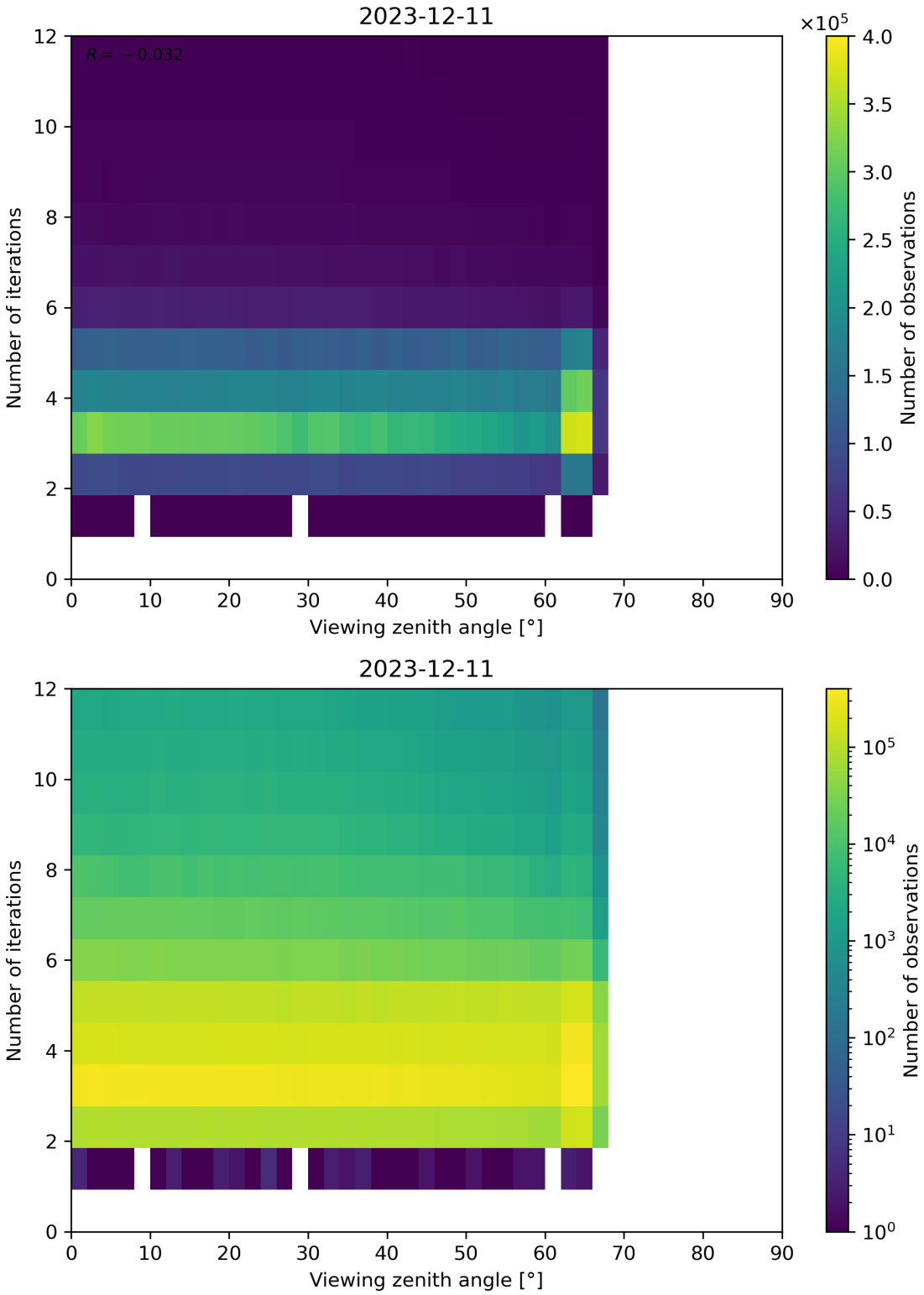

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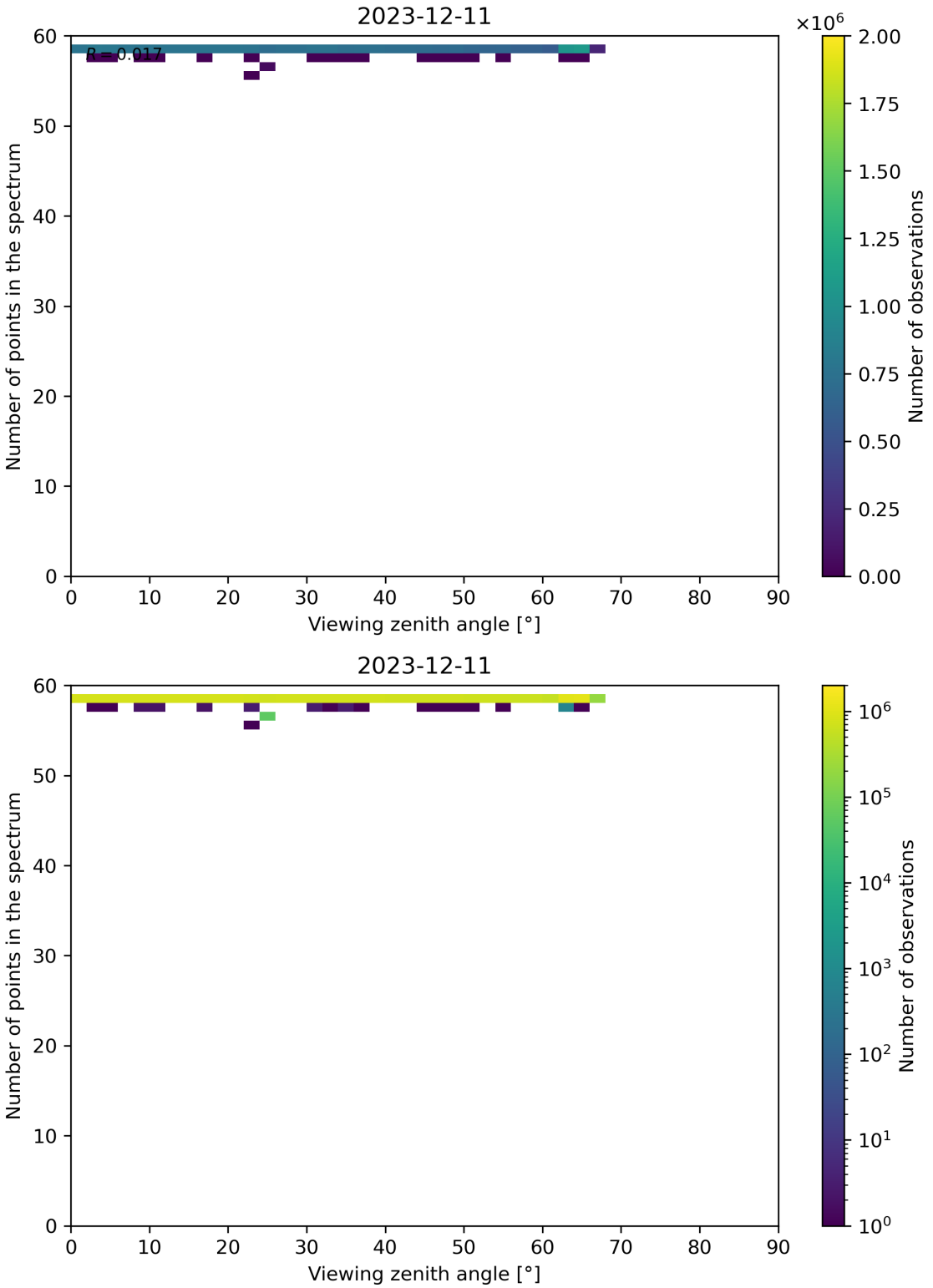

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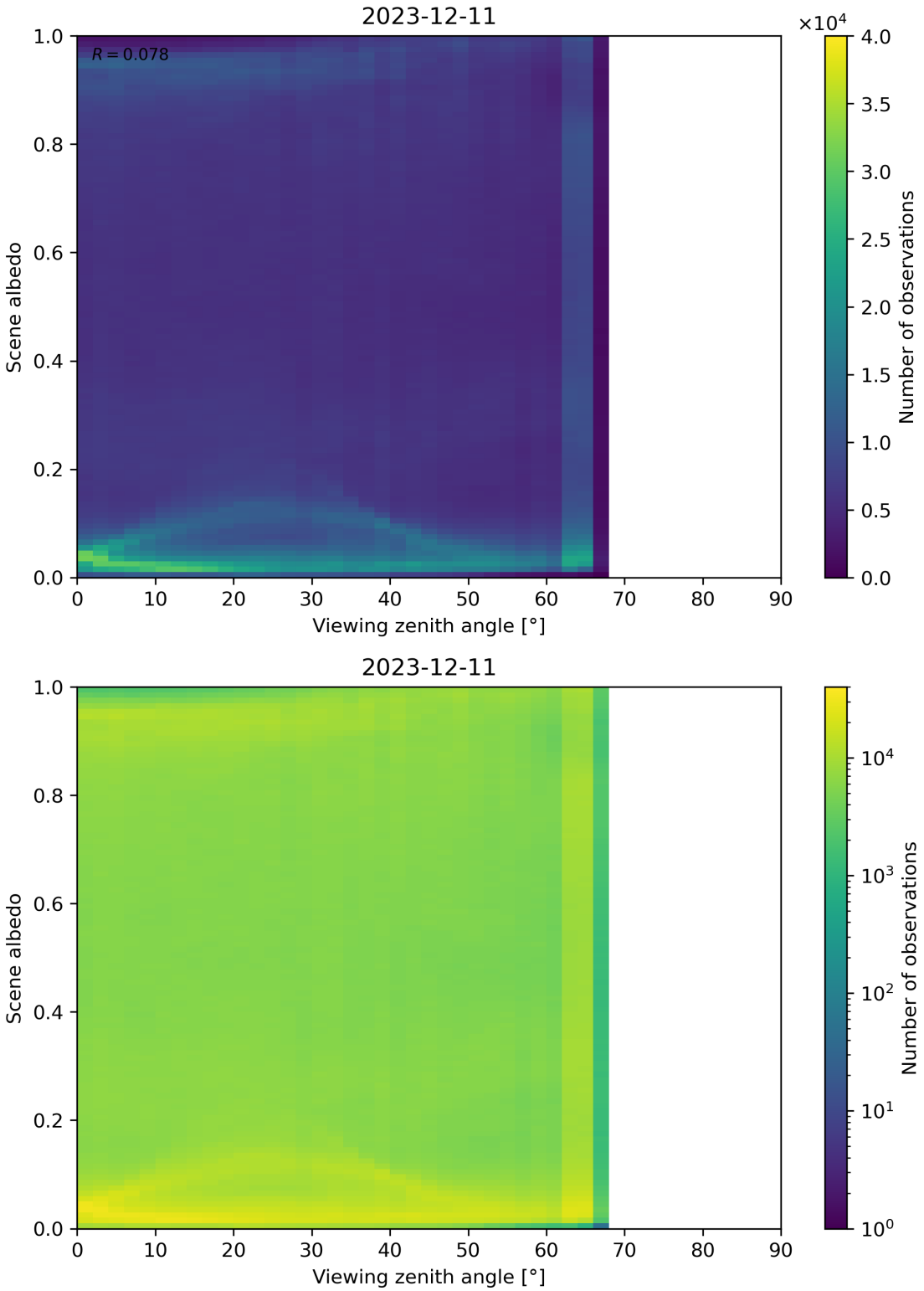

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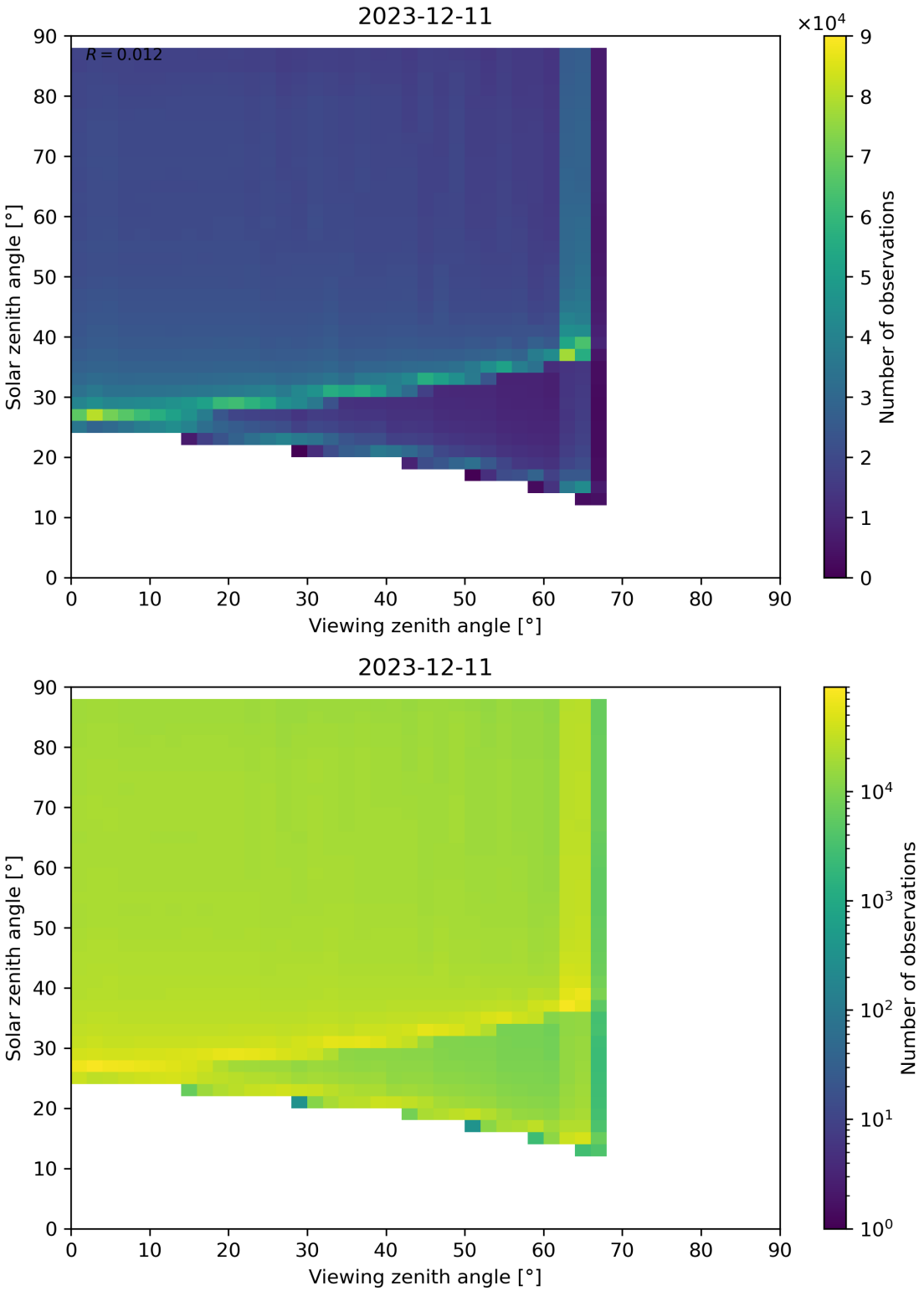

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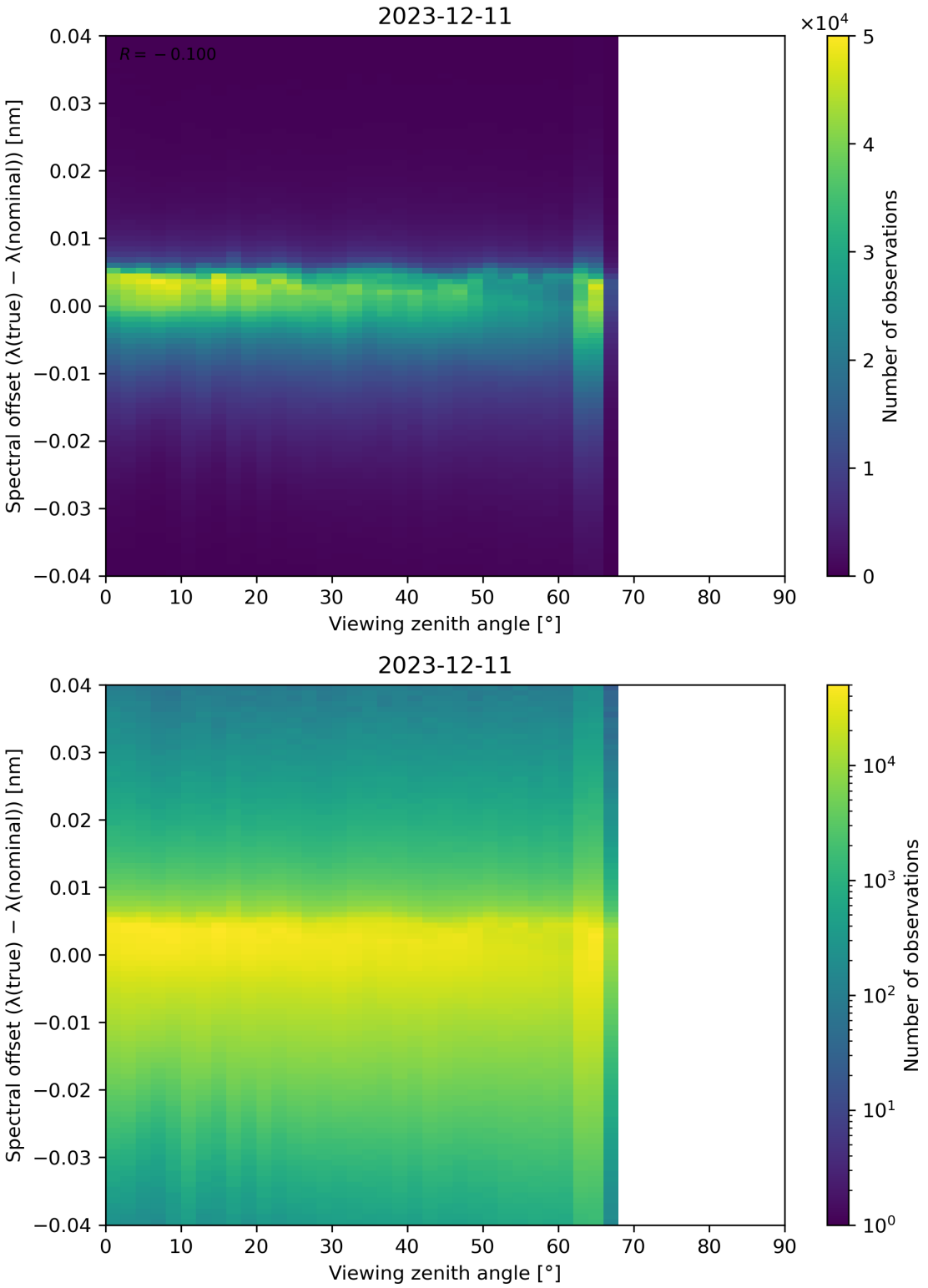

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