1.1_CANDELS-3D-HST

March 8, 2018

1 COSMOS master catalogue

1.1 Preparation of HST CANDELS-3D data

The catalogue comes from `dmu0_CANDELS-3D-HST`.

In the catalogue, we keep:

- The identifier (it's unique in the catalogue);
- The position;
- The stellarity;
- The kron magnitude, there doesn't appear to be aperture magnitudes. This may mean the survey is unusable.

```
This notebook was run with herschelhelp_internal version:
33f5ec7 (Wed Dec 6 16:56:17 2017 +0000)
```

1.2 I - Column selection

```
WARNING: UnitsWarning: '0.3631uJy' did not parse as fits unit: Numeric factor not supported by F
WARNING: UnitsWarning: '[Msun]' did not parse as fits unit: Invalid character at col 0 [astropy.
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:76: RuntimeWarning: divide by zero enc
  magnitudes = 2.5 * (23 - np.log10(fluxes)) - 48.6
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:80: RuntimeWarning: divide by zero enc
  errors = 2.5 / np.log(10) * errors_on_fluxes / fluxes
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:80: RuntimeWarning: invalid value enco
  errors = 2.5 / np.log(10) * errors_on_fluxes / fluxes
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:76: RuntimeWarning: invalid value enco
  magnitudes = 2.5 * (23 - np.log10(fluxes)) - 48.6
```

```
Out[7]: <IPython.core.display.HTML object>
```

1.3 II - Removal of duplicated sources

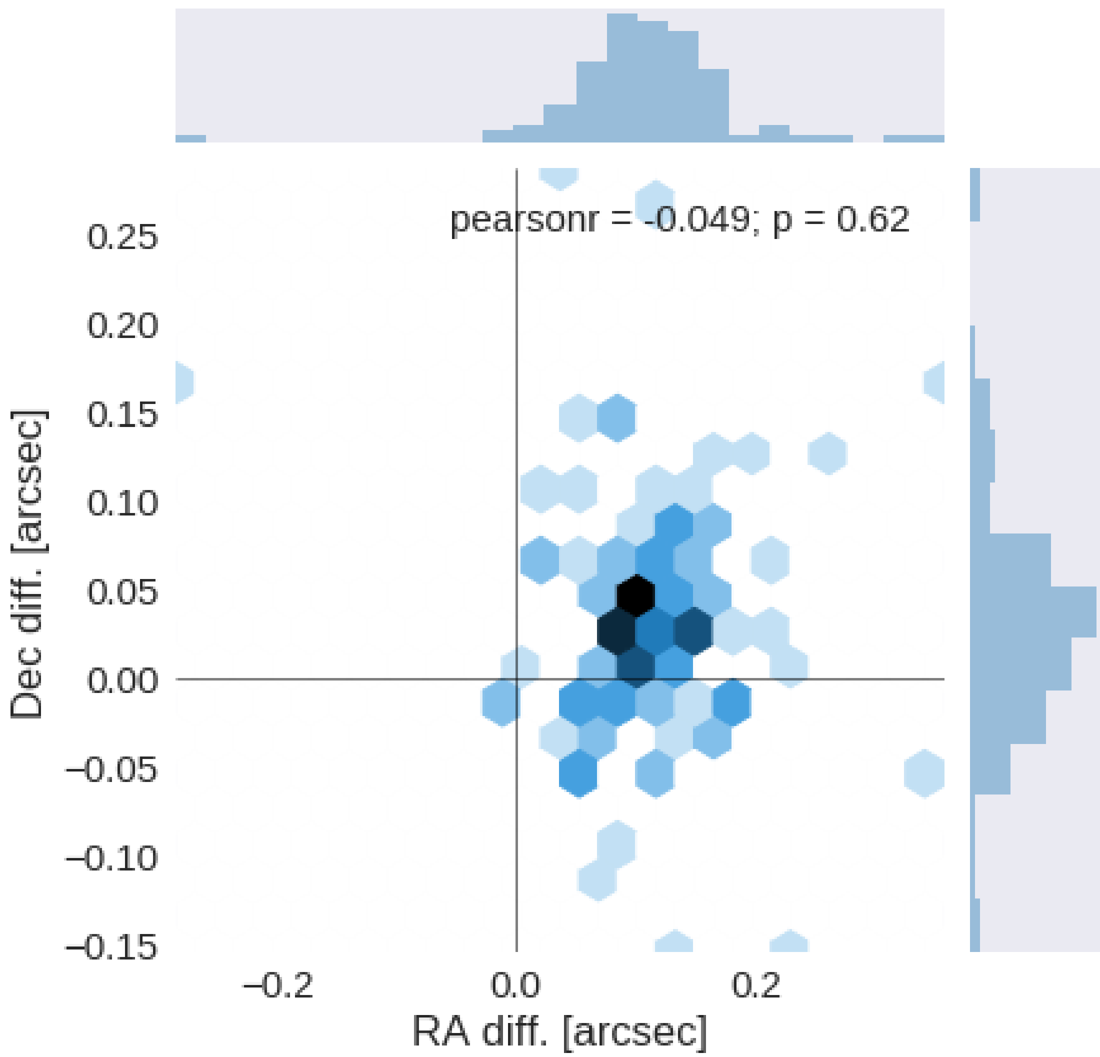
We remove duplicated objects from the input catalogues.

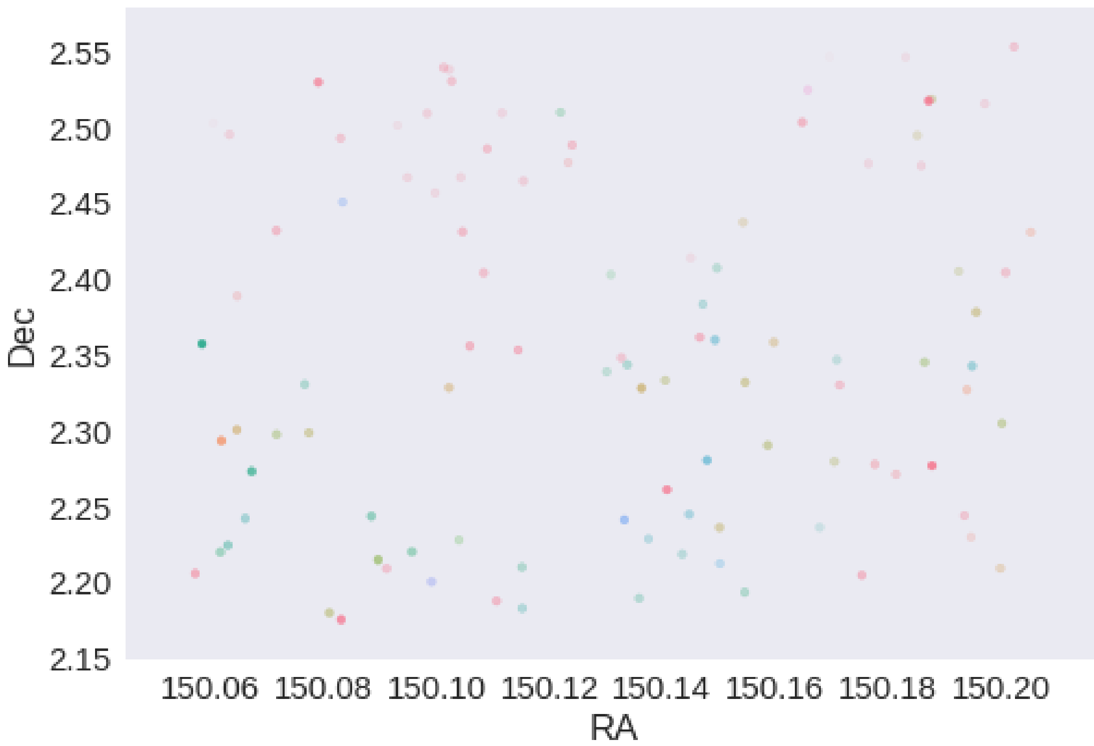
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
The initial catalogue had 33879 sources.
The cleaned catalogue has 33869 sources (10 removed).
The cleaned catalogue has 10 sources flagged as having been cleaned
```

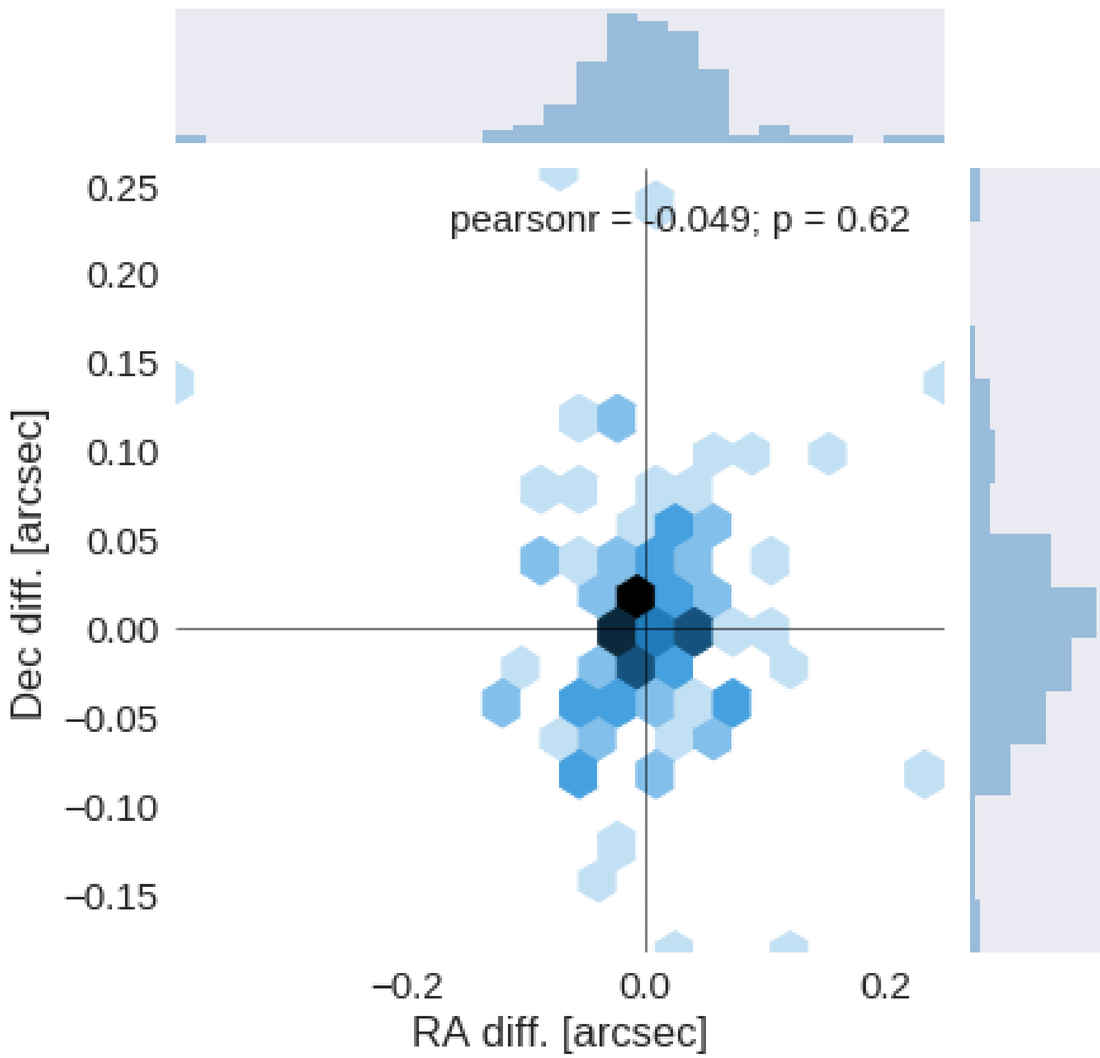
1.4 III - Astrometry correction

We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.

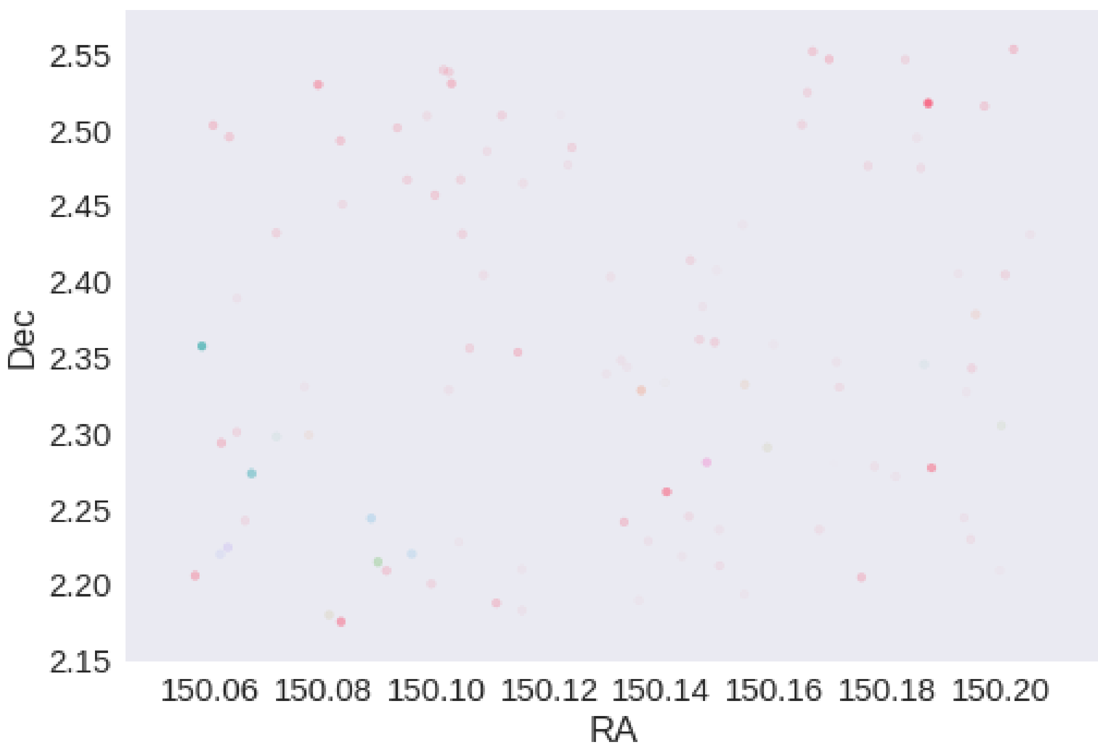





```
RA correction: -0.10791846540882943 arcsec
Dec correction: -0.028431532331651965 arcsec
```



pearsonr = -0.049; p = 0.62
0.25
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
Dec diff. [arcsec]
−0.2
0.0
0.2
RA diff. [arcsec]



1.5 IV - Flagging Gaia objects

```
110 sources flagged.
```

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.2_CFHTLS

March 8, 2018

1 COSMOS master catalogue

1.1 Preparation of Canada France Hawaii Telescope Legacy Survey (CFHTLS) data

The catalogue is in `dmu0_CFHTLS`.

In the catalogue, we keep:

- The position;
- The stellarity (g band stellarity);
- The aperture magnitude (3 arcsec).
- The total magnitude (Kron like aperture magnitude).

We use the 2007 release, which we take as the date.

```
This notebook was run with herschelhelp_internal version:
33f5ec7 (Wed Dec 6 16:56:17 2017 +0000)
```

1.2 I - Column selection

```
Out[6]: <IPython.core.display.HTML object>
```

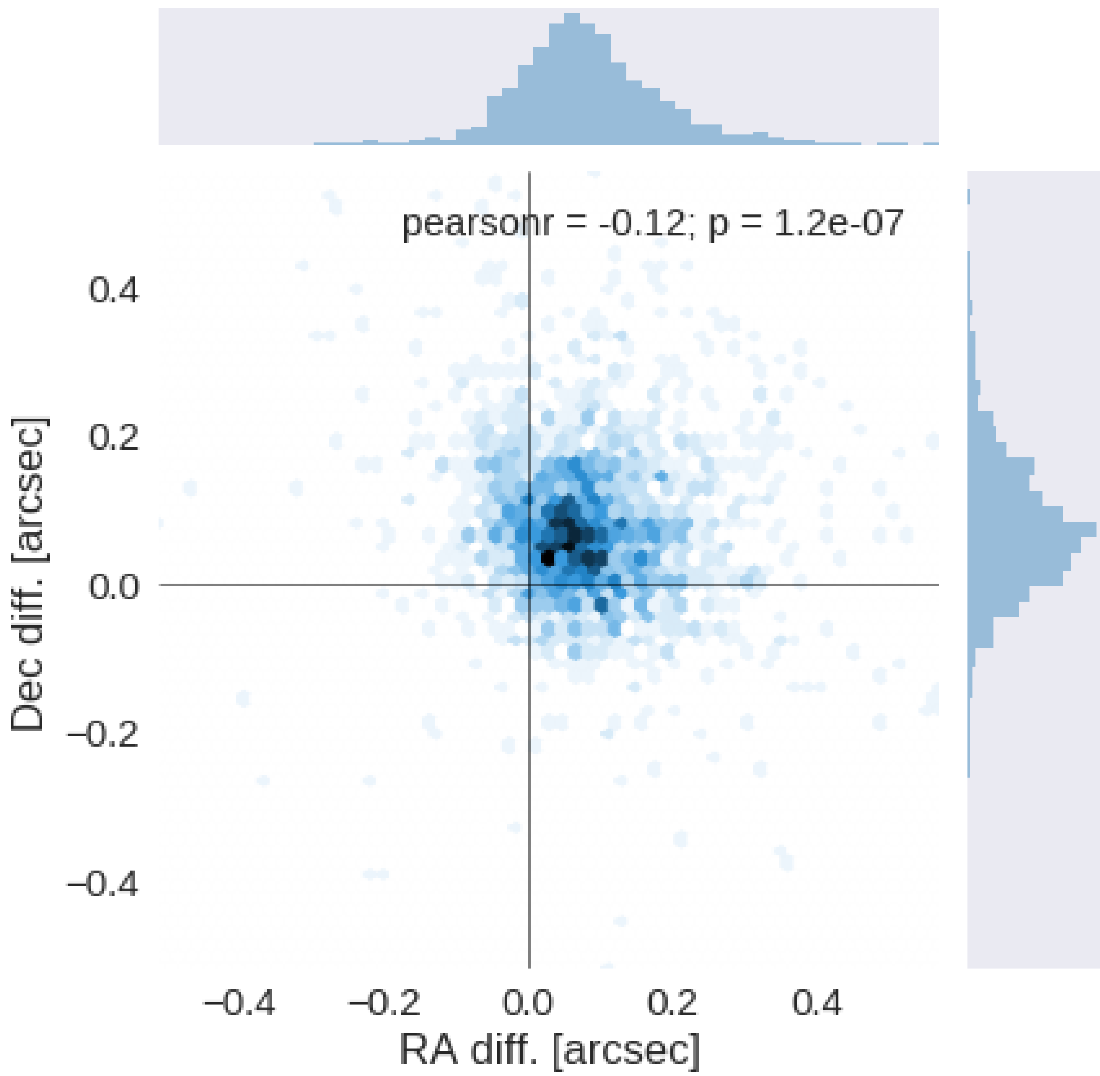
1.3 II - Removal of duplicated sources

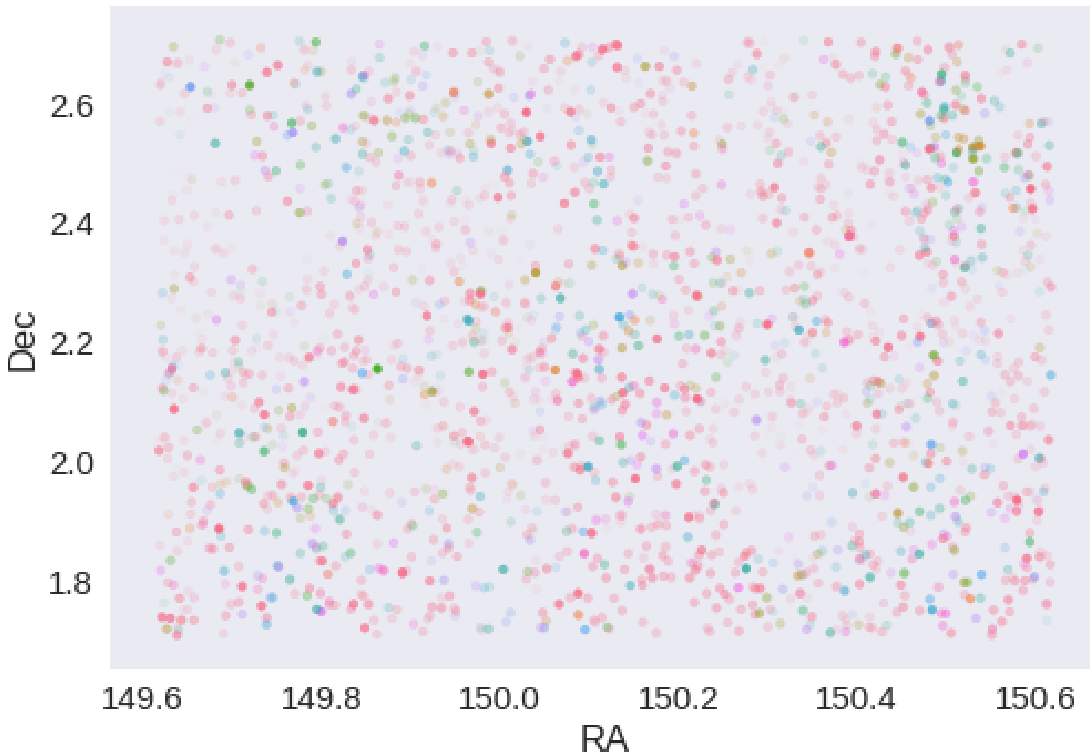
We remove duplicated objects from the input catalogues.

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)


The initial catalogue had 554830 sources.
The cleaned catalogue has 554830 sources (0 removed).
The cleaned catalogue has 0 sources flagged as having been cleaned
```

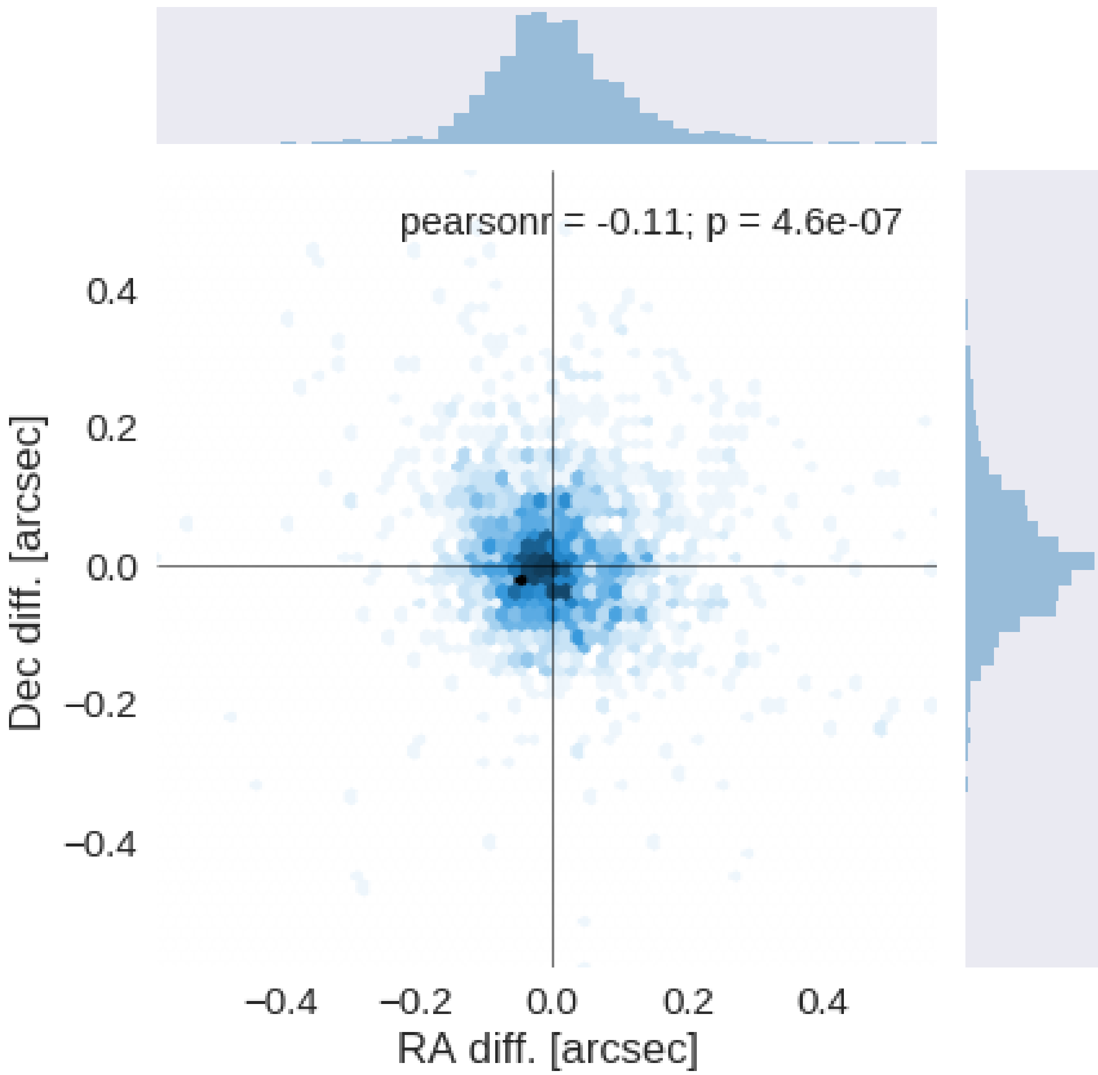
1.4 III - Astrometry correction

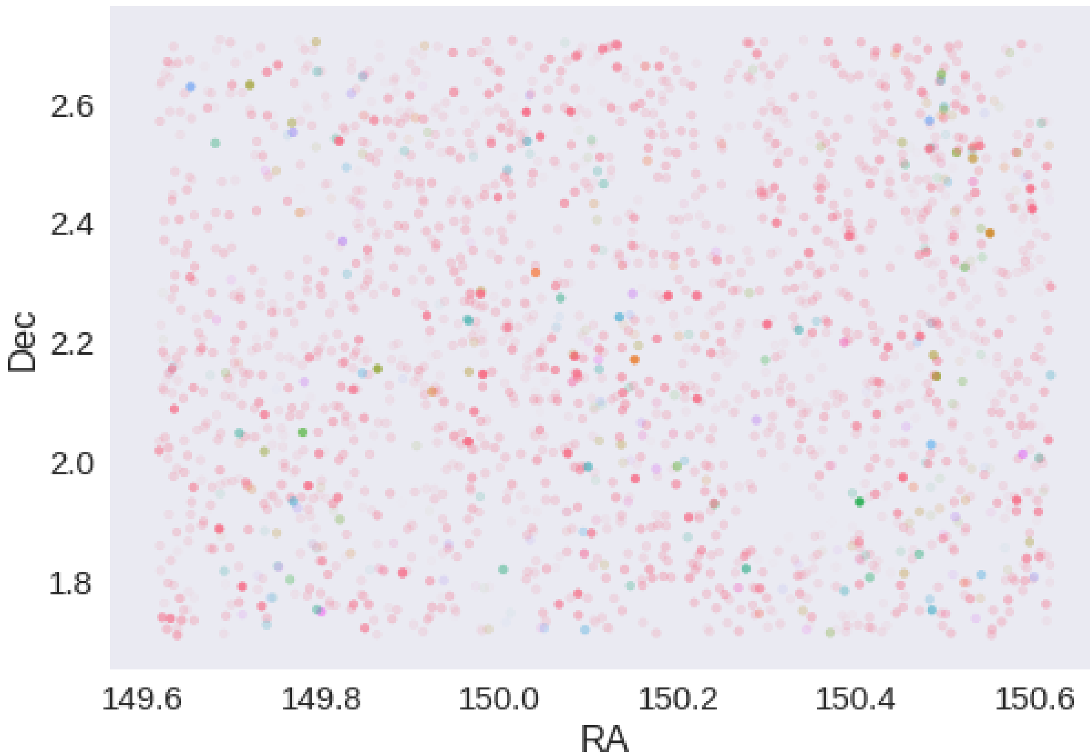
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.






```
RA correction: -0.07301163240072128 arcsec
Dec correction: -0.06591029994105213 arcsec
```


pearsonr = -0.11; p = 4.6e-07
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.4
−0.2
0.0
0.2
0.4
RA diff. [arcsec]



1.5 IV - Flagging Gaia objects

```
2052 sources flagged.
```

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.3_DECaLS

March 8, 2018

1 COSMOS master catalogue

1.1 Preparation of DECam Legacy Survey data

This catalogue comes from `dmu0_DECaLS`.

In the catalogue, we keep:

- The `object_id` as unique object identifier;
- The position;
- The u, g, r, i, z, Y aperture magnitude (2");
- The u, g, r, i, z, Y kron fluxes and magnitudes.

We check for all ugrizY then only take bands for which there are measurements

```
This notebook was run with herschelhelp_internal version:
0246c5d (Thu Jan 25 17:01:47 2018 +0000) [with local modifications]
```

```
WARNING: UnitsWarning: '1/deg^2' did not parse as fits unit: Numeric factor not supported by FIT
WARNING: UnitsWarning: 'nanomaggy' did not parse as fits unit: At col 0, Unit 'nanomaggy' not su
WARNING: UnitsWarning: '1/nanomaggy^2' did not parse as fits unit: Numeric factor not supported
WARNING: UnitsWarning: '1/arcsec^2' did not parse as fits unit: Numeric factor not supported by
```

1.2 I - Aperture correction

To compute aperture correction we need to dertermine two parametres: the target aperture and the range of magnitudes for the stars that will be used to compute the correction.

Target aperture: To determine the target aperture, we simulate a curve of growth using the provided apertures and draw two figures:

- The evolution of the magnitudes of the objects by plotting on the same plot aperture number vs the mean magnitude.
- The mean gain (loss when negative) of magnitude is each aperture compared to the previous (except for the first of course).

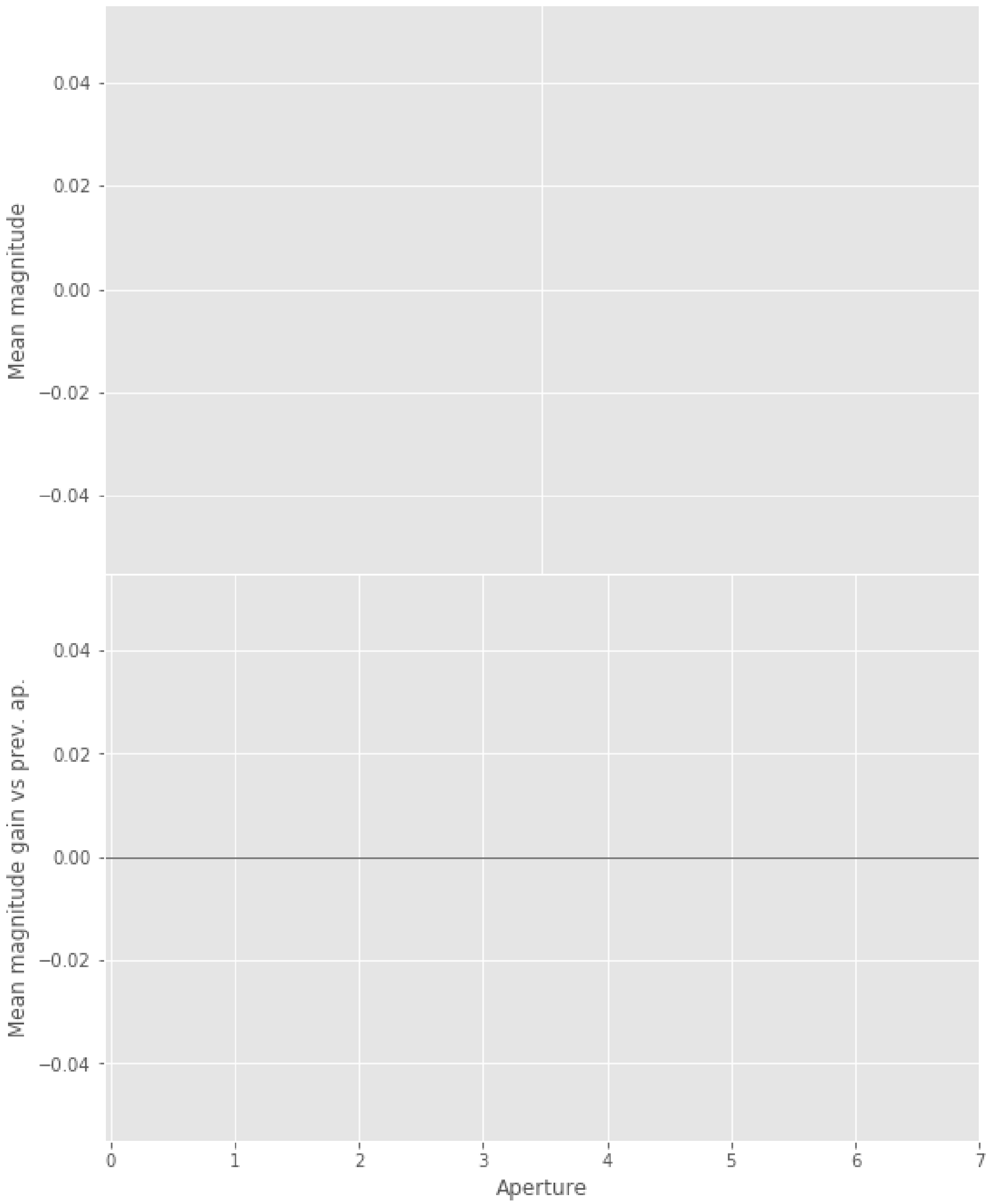
As target aperture, we should use the smallest (i.e. less noisy) aperture for which most of the flux is captures.

Magnitude range: To know what limits in aperture to use when doing the aperture correction, we plot for each magnitude bin the correction that is computed and its RMS. We should then use the wide limits (to use more stars) where the correction is stable and with few dispersion.

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:76: RuntimeWarning: divide by zero enc
  magnitudes = 2.5 * (23 - np.log10(fluxes)) - 48.6
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:80: RuntimeWarning: invalid value enco
  errors = 2.5 / np.log(10) * errors_on_fluxes / fluxes
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:76: RuntimeWarning: invalid value enco
  magnitudes = 2.5 * (23 - np.log10(fluxes)) - 48.6
```

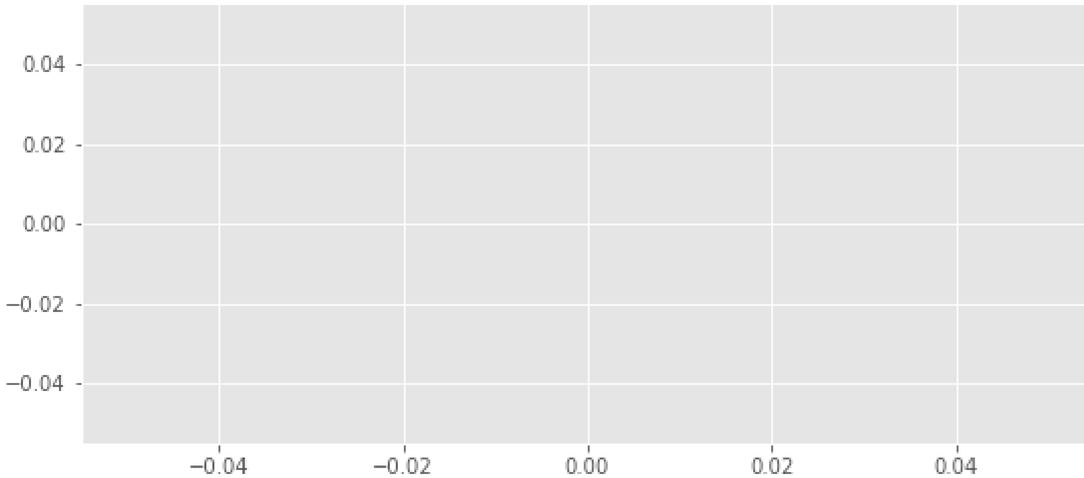
1.2.1 1.a u band

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:
  warnings.warn("Mean of empty slice", RuntimeWarning)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:
  warnings.warn("Mean of empty slice", RuntimeWarning)
```

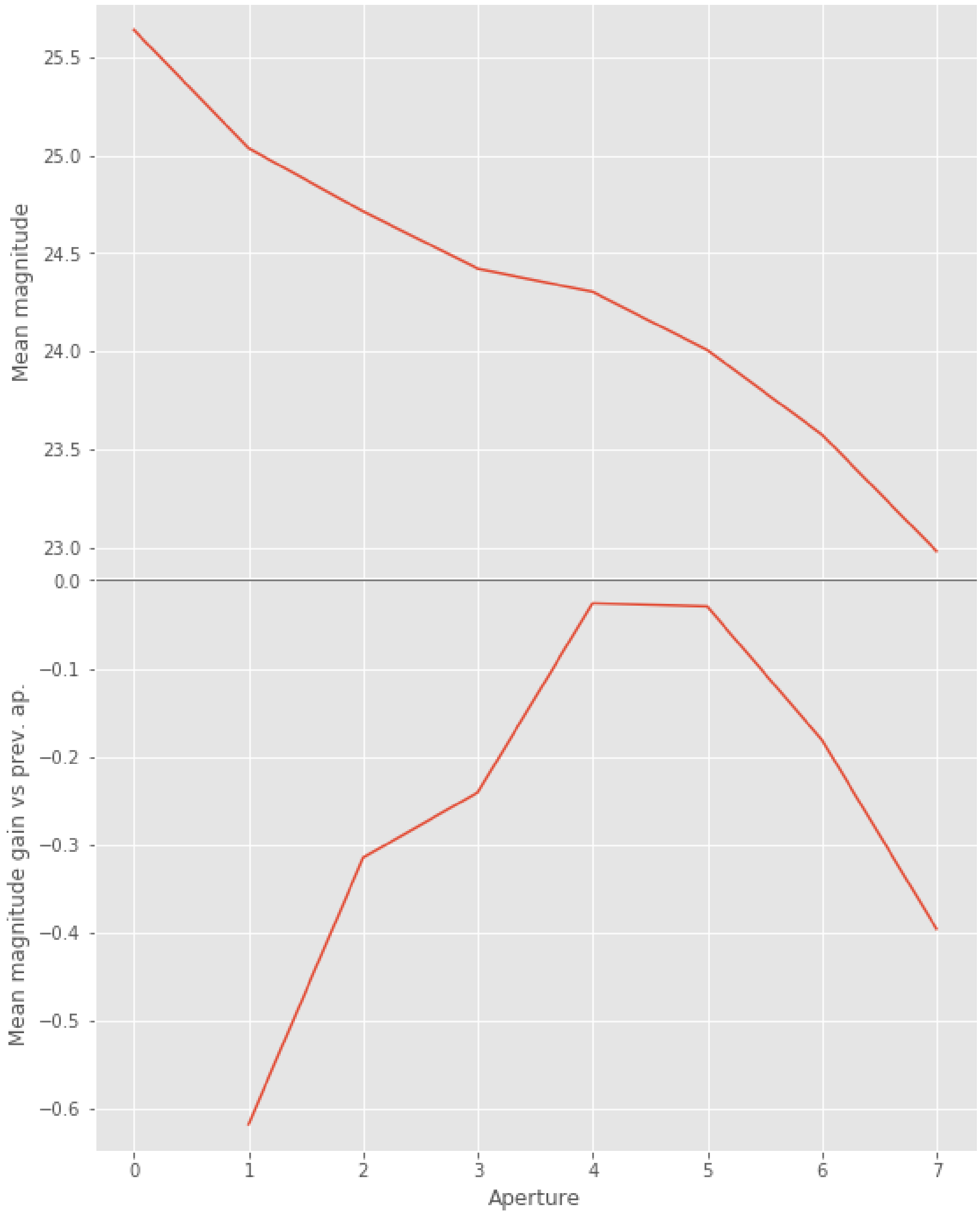


u band is all nan

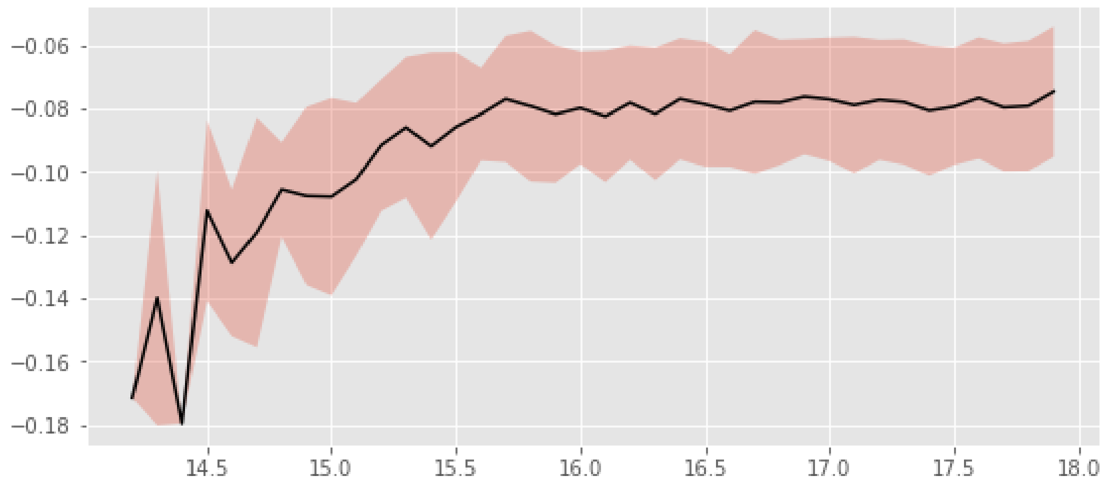
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:
  warnings.warn("All-NaN slice encountered", RuntimeWarning)
```


0.04
0.02
0.00
−0.02
−0.04
−0.04
−0.02
0.00
0.02
0.04

1.2.2 I.a - g band



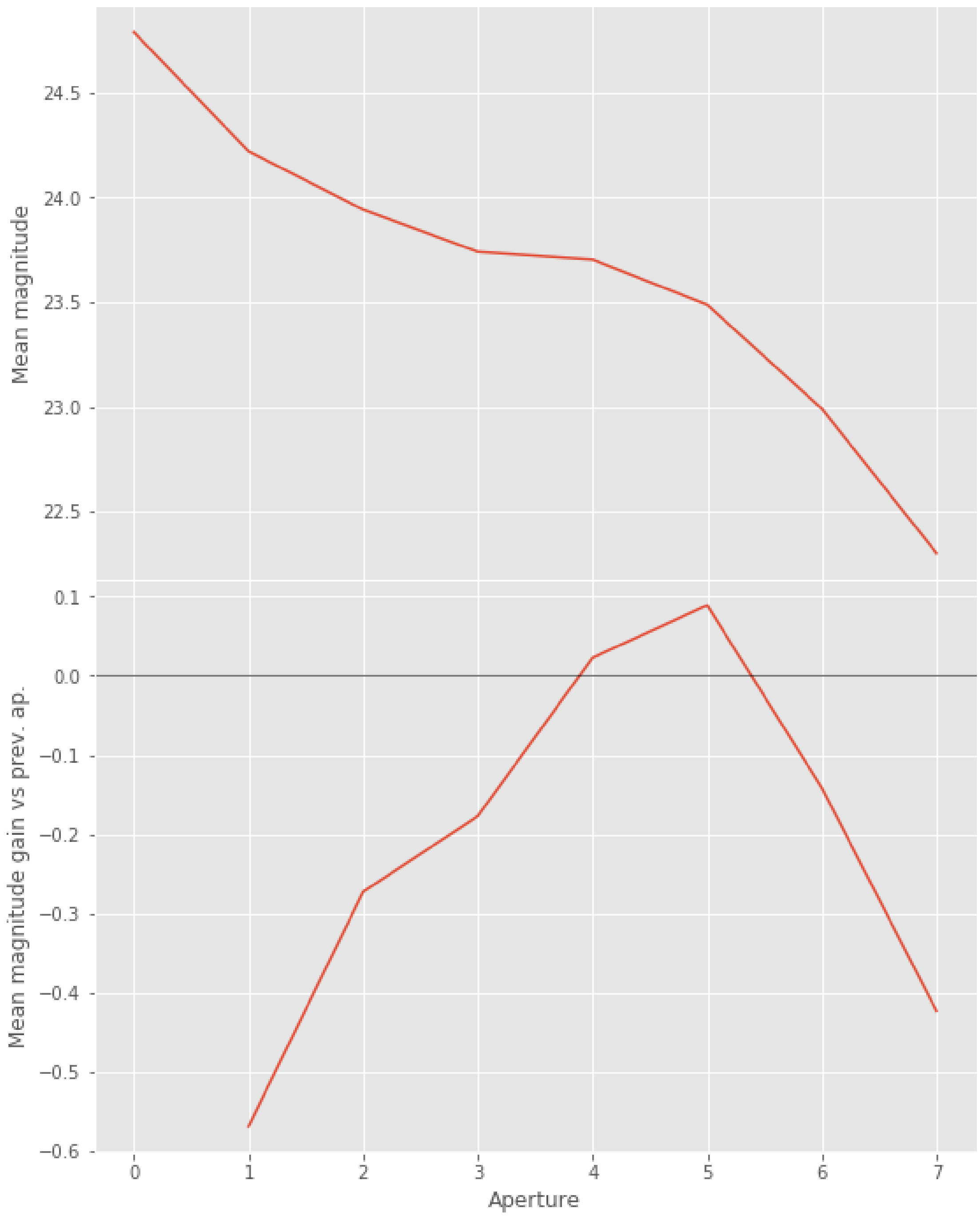
We will use aperture 5 as target.



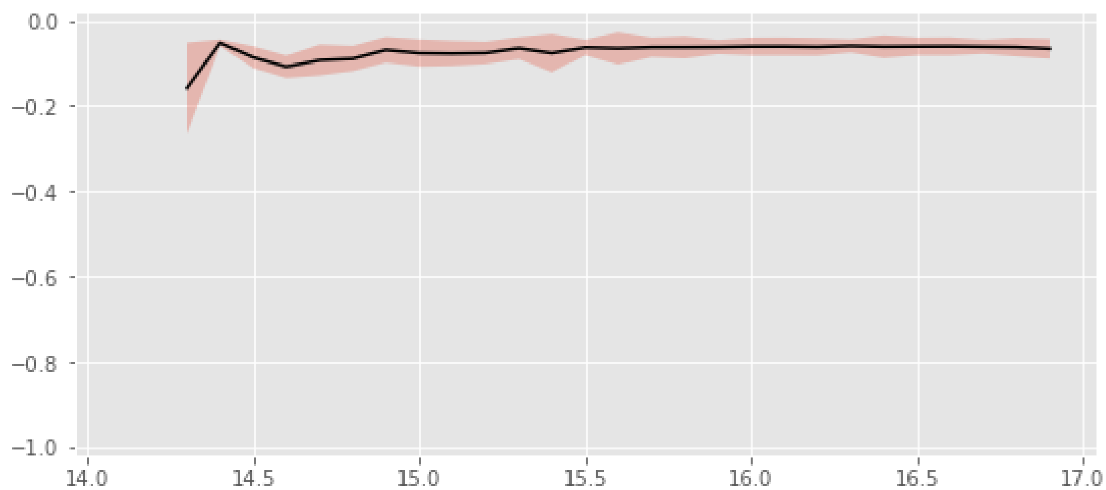
We will use magnitudes between 16.0 and 19.0

```
Aperture correction for g band:
Correction: -0.07828878191013189
Number of source used: 3747
RMS: 0.02005037338010651
```

1.2.3 I.b - r band



We will use aperture 5 as target.

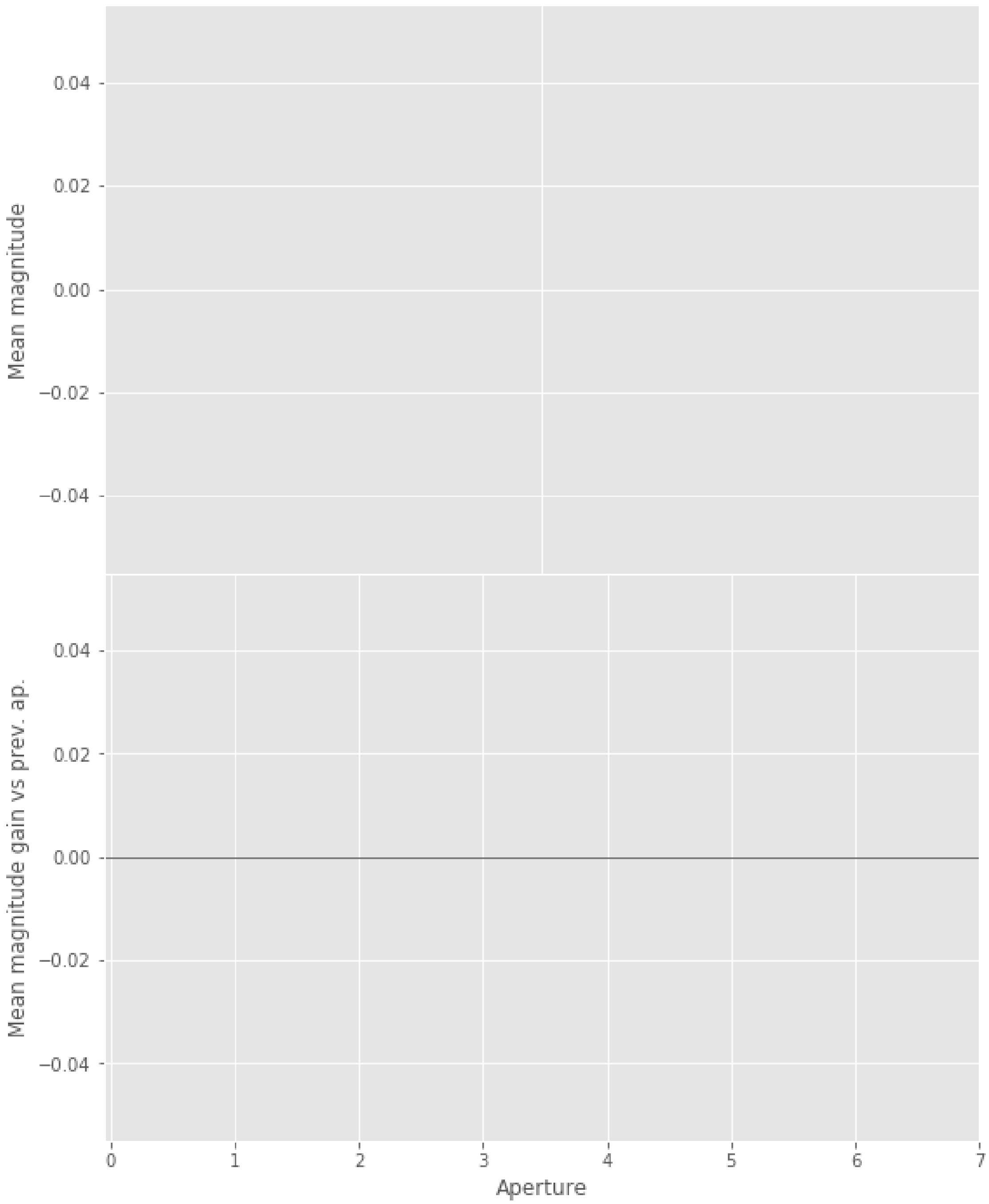


We use magnitudes between 16.0 and 18.0.

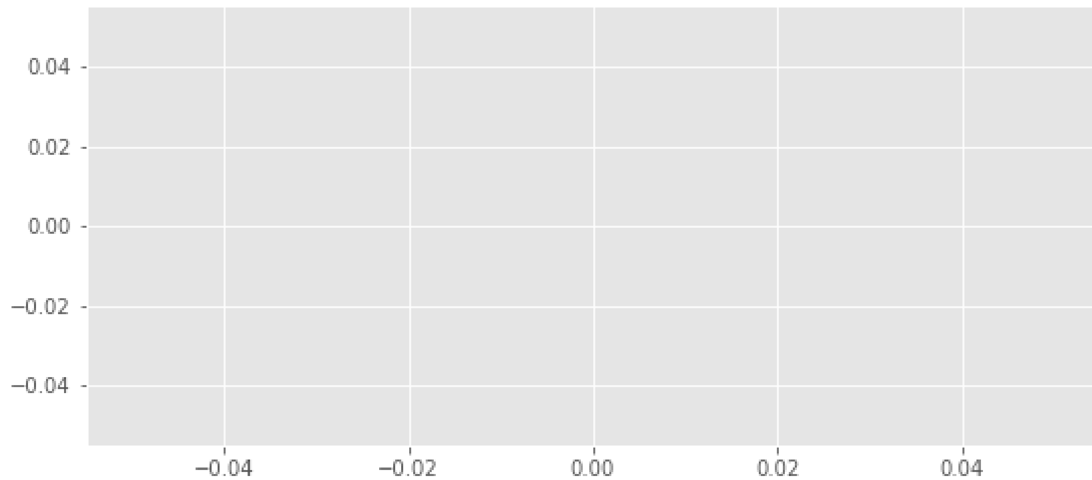
```
Aperture correction for r band:
Correction: -0.0609926935865559
Number of source used: 2998
RMS: 0.02000000736251746
```

1.2.4 I.d - i band

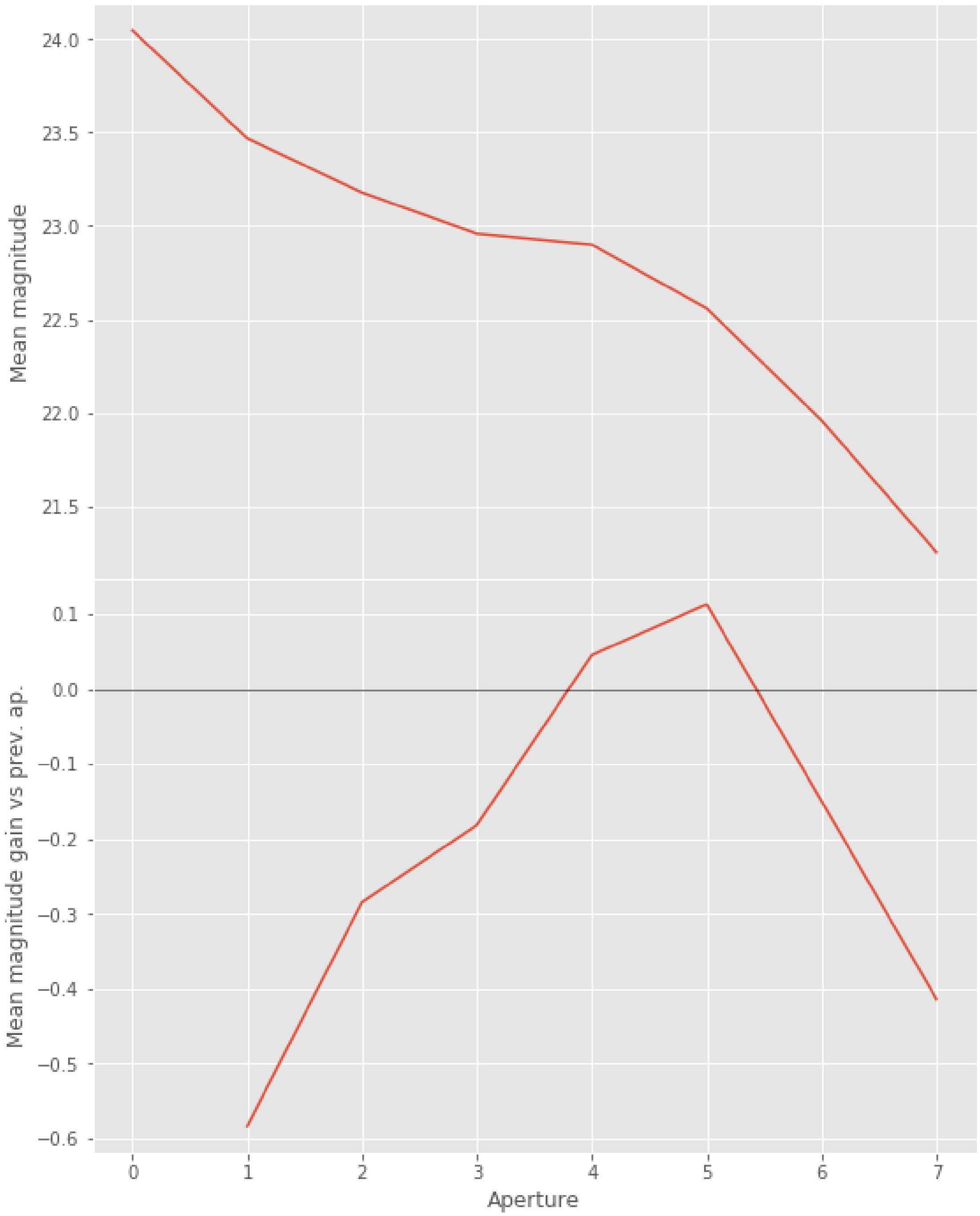
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:
  warnings.warn("Mean of empty slice", RuntimeWarning)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:
  warnings.warn("Mean of empty slice", RuntimeWarning)
```



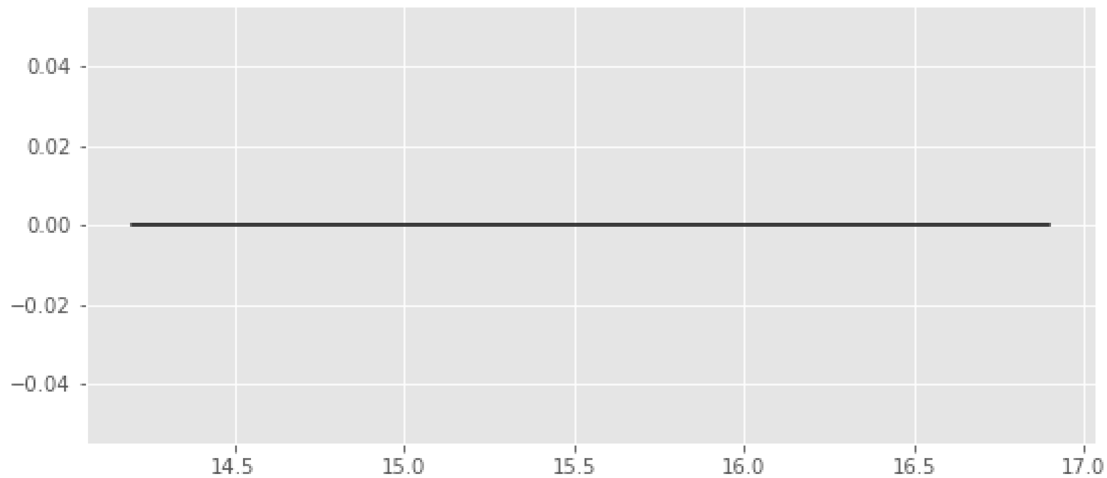

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:
  warnings.warn("All-NaN slice encountered", RuntimeWarning)
```


0.04
0.02
0.00
−0.02
−0.04
−0.04
−0.02
0.00
0.02
0.04

1.2.5 I.e - z band



We will use aperture 4 as target.

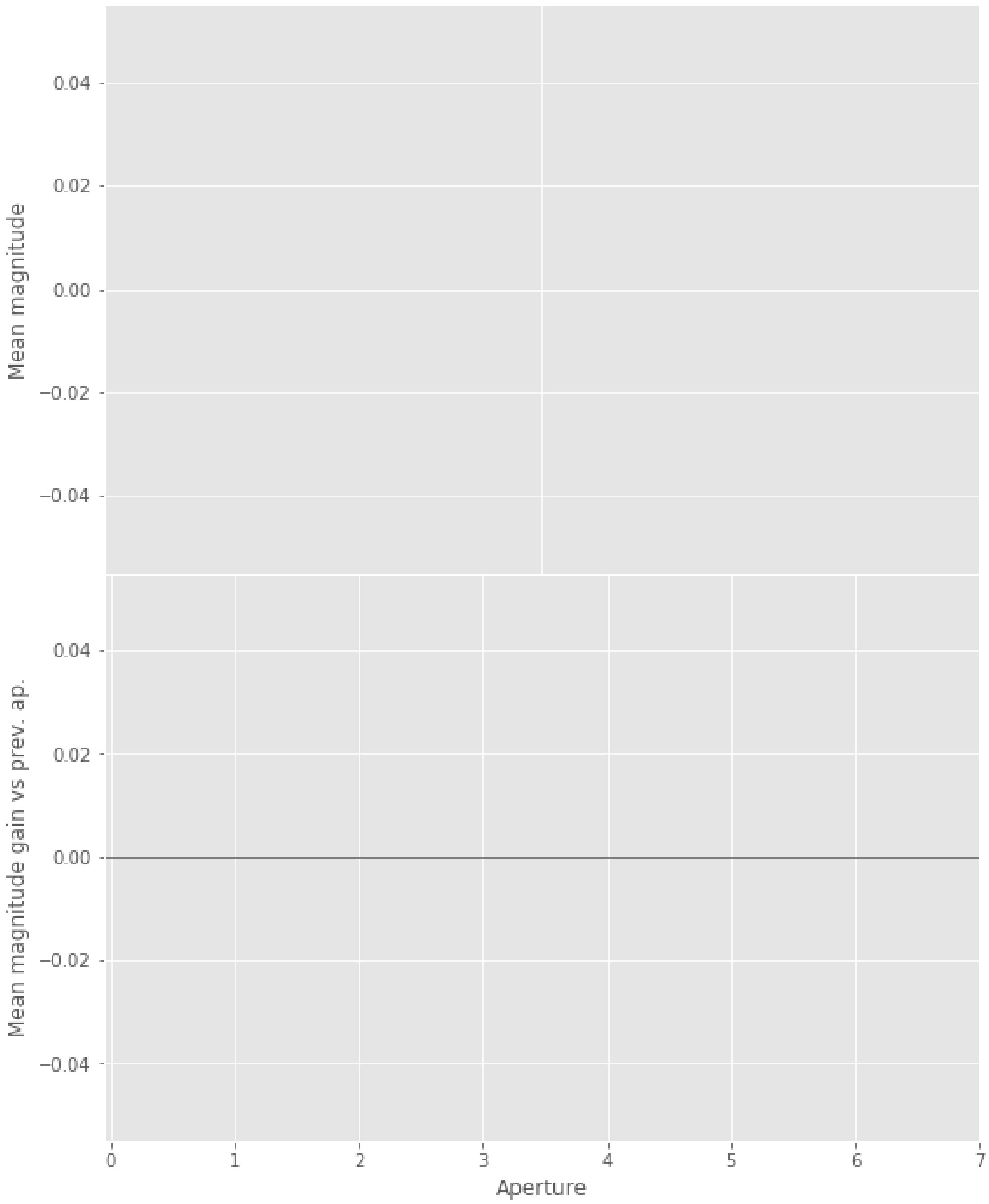


We use magnitudes between 16.0 and 17.5.

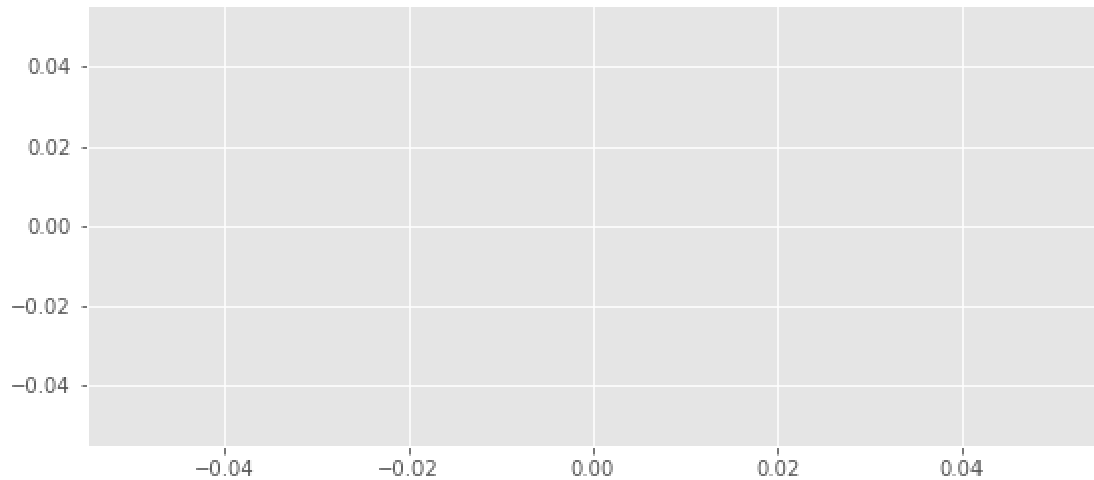
```
Aperture correction for z band:
Correction: -0.08840349726085606
Number of source used: 3336
RMS: 0.022340888963949663
```

1.2.6 I.f - Y band

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:
  warnings.warn("Mean of empty slice", RuntimeWarning)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:
  warnings.warn("Mean of empty slice", RuntimeWarning)
```




```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:
  warnings.warn("All-NaN slice encountered", RuntimeWarning)
```



1.3 II - Stellarity

Legacy Survey does not provide a 0 to 1 stellarity so we replace items flagged as PSF accpording to the following table:

$$P(star) = \frac{\prod_i P(star)_i}{\prod_i P(star)_i + \prod_i P(galaxy)_i}$$

where i is the band, and with using the same probabilities as UKDISS:

HSC flag	UKIDSS flag	Meaning	P(star)	P(galaxy)	P(noise)	P(saturated)
	-9	Saturated	0.0	0.0	5.0	95.0
	-3	Probable galaxy	25.0	70.0	5.0	0.0
	-2	Probable star	70.0	25.0	5.0	0.0
0	-1	Star	90.0	5.0	5.0	0.0
	0	Noise	5.0	5.0	90.0	0.0
1	+1	Galaxy	5.0	90.0	5.0	0.0

1.4 II - Column selection

```
WARNING: UnitsWarning: '1/deg^2' did not parse as fits unit: Numeric factor not supported by FIT
WARNING: UnitsWarning: 'nanomaggy' did not parse as fits unit: At col 0, Unit 'nanomaggy' not su
WARNING: UnitsWarning: '1/nanomaggy^2' did not parse as fits unit: Numeric factor not supported
WARNING: UnitsWarning: '1/arcsec^2' did not parse as fits unit: Numeric factor not supported by

/opt/herschelhelp_internal/herschelhelp_internal/utils.py:76: RuntimeWarning: invalid value enco
  magnitudes = 2.5 * (23 - np.log10(fluxes)) - 48.6
```

```
Out[27]: <IPython.core.display.HTML object>
```

1.5 III - Removal of duplicated sources

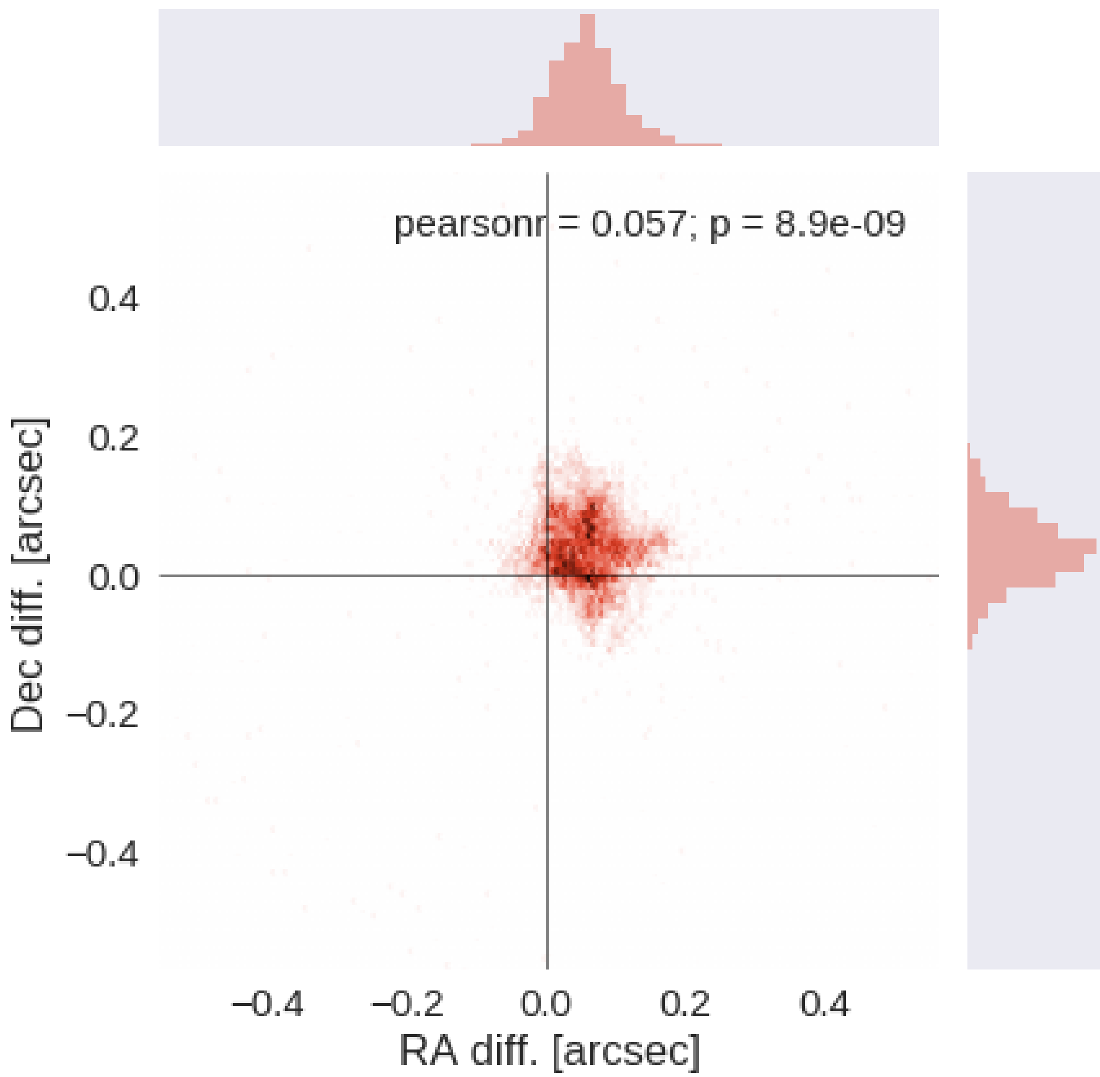
We remove duplicated objects from the input catalogues.

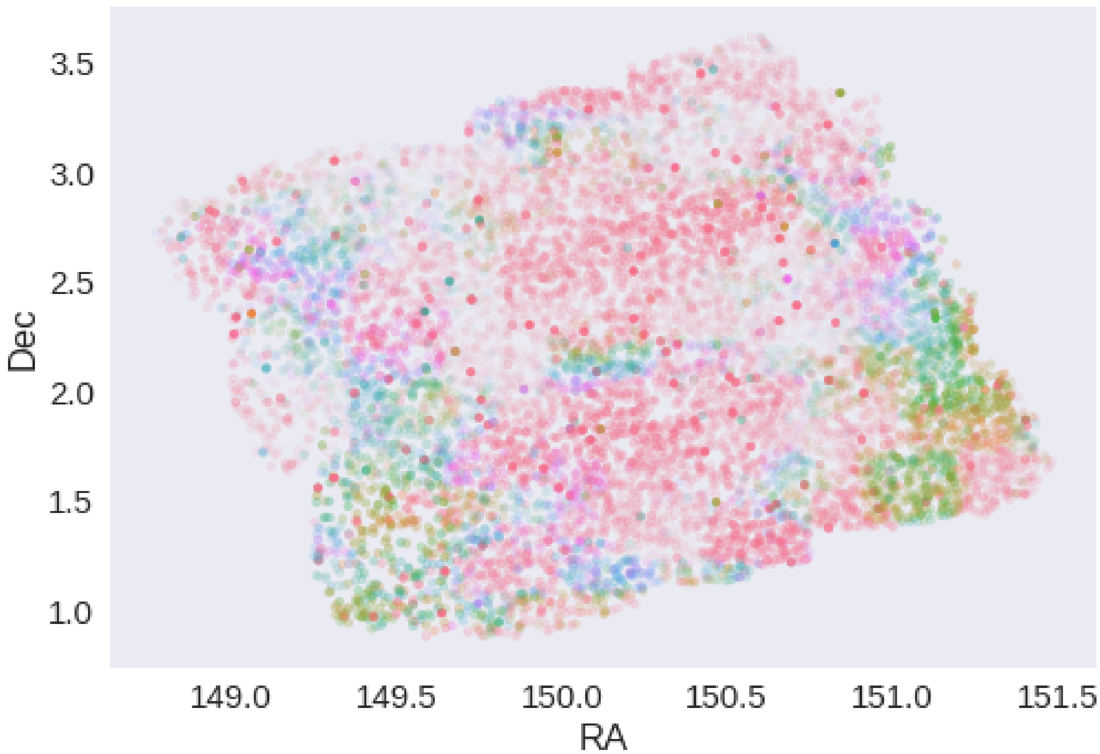
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
The initial catalogue had 376709 sources.
The cleaned catalogue has 376653 sources (56 removed).
The cleaned catalogue has 56 sources flagged as having been cleaned
```

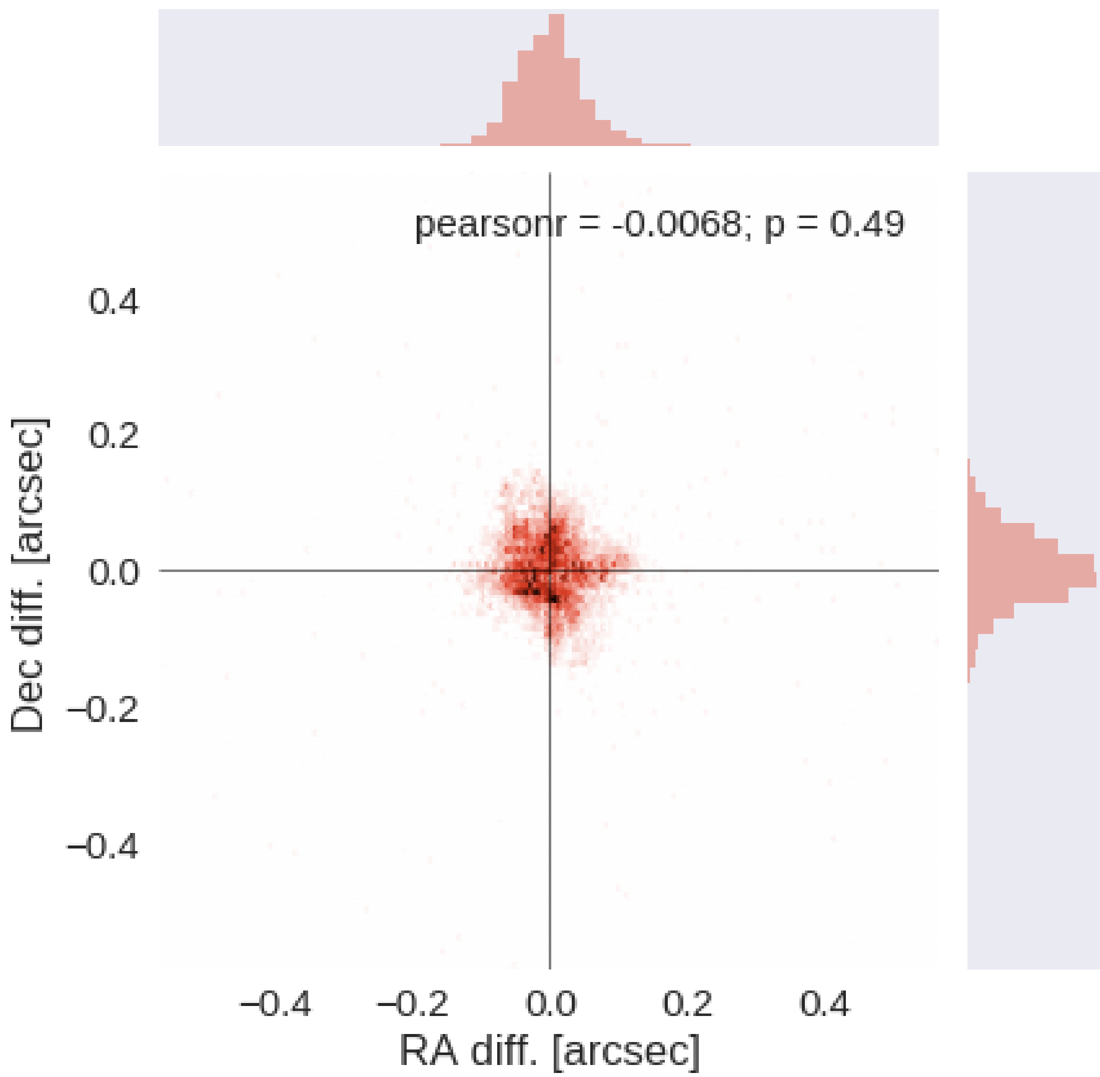
1.6 III - Astrometry correction

We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.


pearsonr = 0.057; p = 8.9e-09
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.4
−0.2
0.0
0.2
0.4
RA diff. [arcsec]




```
RA correction: -0.0579814082698249 arcsec
Dec correction: -0.03379117265440712 arcsec
```


pearsonr = -0.0068; p = 0.49
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.4
−0.2
0.0
0.2
0.4
RA diff. [arcsec]

1.7 IV - Flagging Gaia objects

```
10677 sources flagged.
```

2 V - Saving to disk

1.4.1_HSC-DEEP

March 8, 2018

1 COSMOS master catalogue

1.1 Preparation of Hyper Suprime-Cam Subaru Strategic Program Catalogues (HSC-SSP) data

This catalogue comes from `dmu0_HSC`.

In the catalogue, we keep:

- The `object_id` as unique object identifier;
- The position;
- The g, r, i, z, y (no N921) aperture magnitude in 2" that we aperture correct;
- The g, r, i, z, y (no N921) kron fluxes and magnitudes.
- The extended flag that we convert to a stellariy.

Note: On ELAIS-N1 the HSC-SSP catalogue does not contain any N816 magnitudes.

We use 2016 as the epoch.

```
This notebook was run with herschelhelp_internal version:
33f5ec7 (Wed Dec 6 16:56:17 2017 +0000)
```

1.2 I - Aperture correction

To compute aperture correction we need to dertermine two parametres: the target aperture and the range of magnitudes for the stars that will be used to compute the correction.

Target aperture: To determine the target aperture, we simulate a curve of growth using the provided apertures and draw two figures:

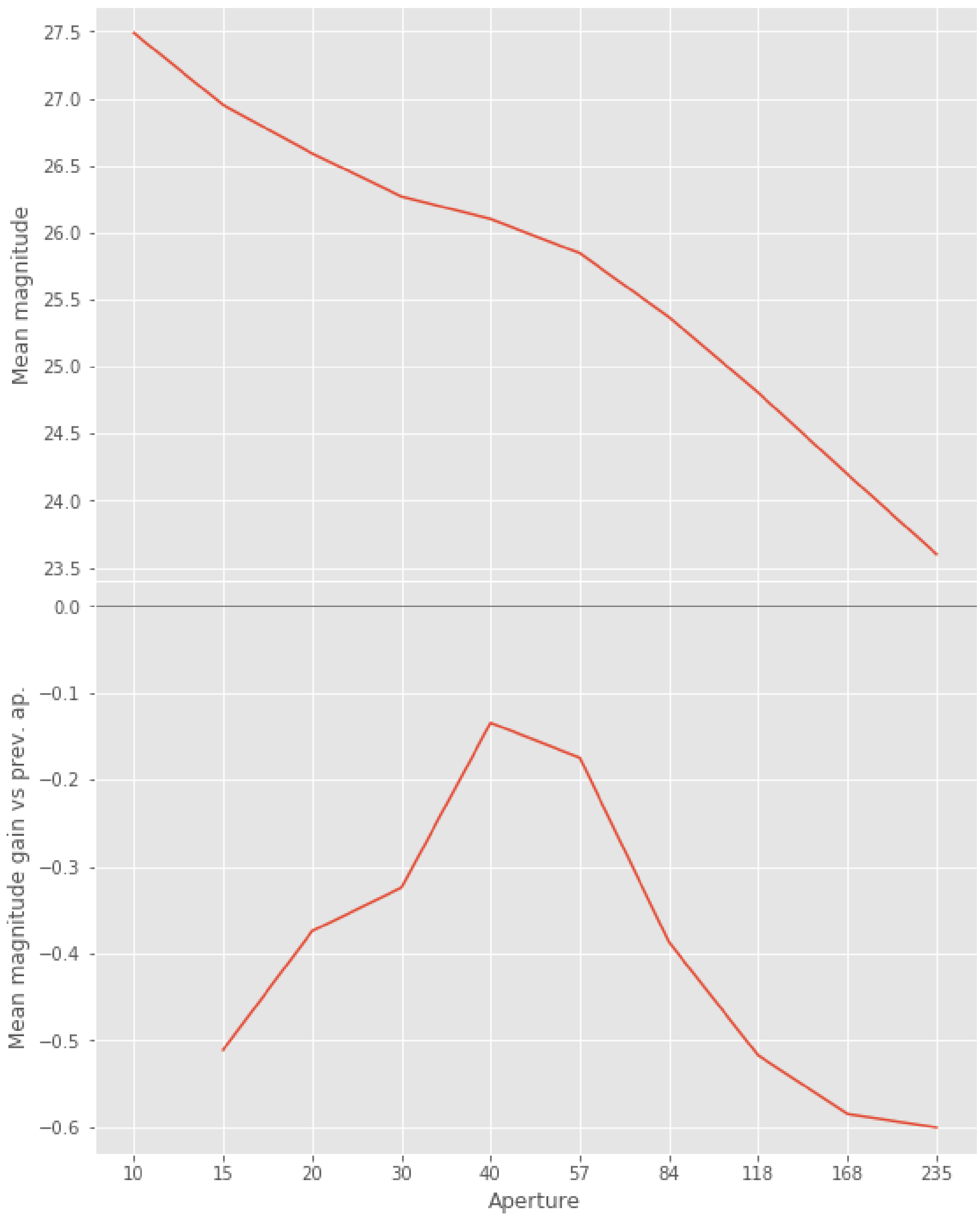
- The evolution of the magnitudes of the objects by plotting on the same plot aperture number vs the mean magnitude.
- The mean gain (loss when negative) of magnitude is each aperture compared to the previous (except for the first of course).

As target aperture, we should use the smallest (i.e. less noisy) aperture for which most of the flux is captures.

Magnitude range: To know what limits in aperture to use when doing the aperture correction, we plot for each magnitude bin the correction that is computed and its RMS. We should then use the wide limits (to use more stars) where the correction is stable and with few dispersion.

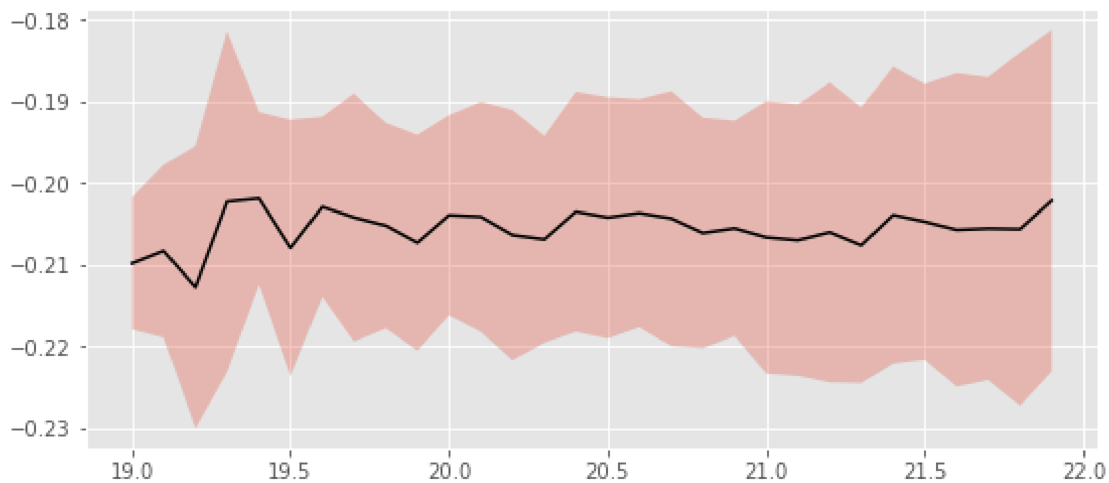
1.2.1 I.a - g band

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```



We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



We will use magnitudes between 18.5 and 20.8

```
Aperture correction for g band:
Correction: -0.20549774169921875
Number of source used: 3768
RMS: 0.017911572957685837
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

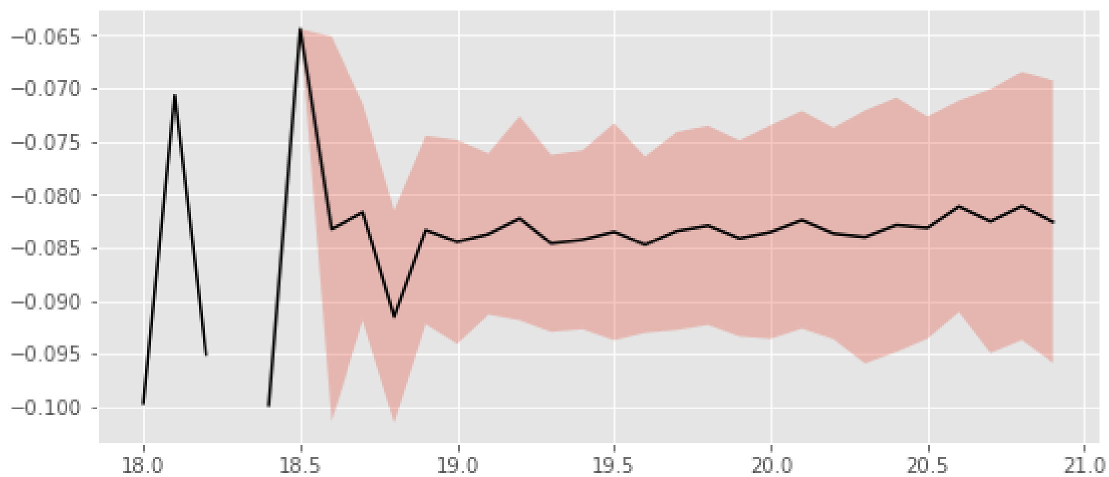
1.2.2 I.b - r band

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```

We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
```

```
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



We use magnitudes between 17.6 and 19.7.

```
Aperture correction for r band:
Correction: -0.08256912231445312
Number of source used: 3891
RMS: 0.011581382492618938
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

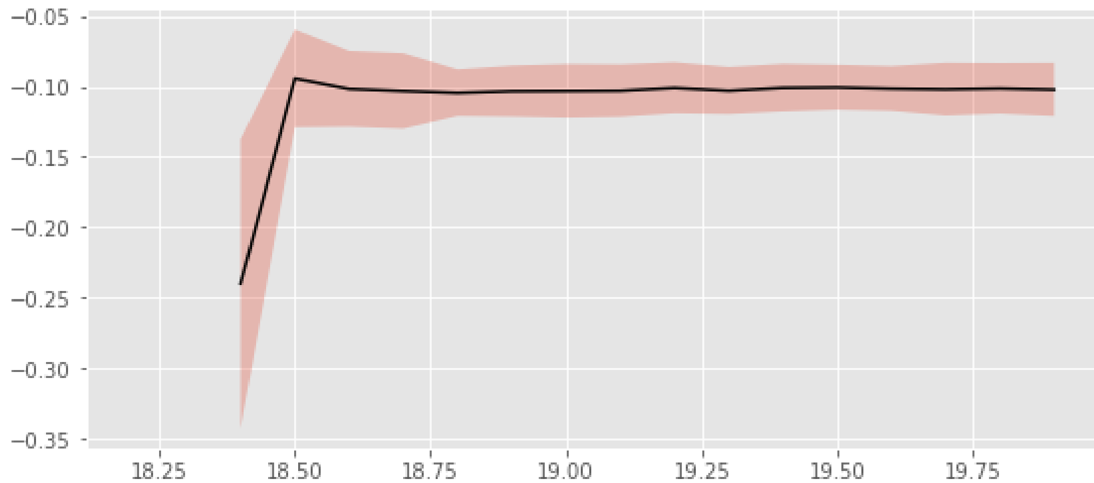
1.2.3 I.c - i band

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```

We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



We use magnitudes between 18.5 and 19.8.

```
Aperture correction for i band:
Correction: -0.10167789459228516
Number of source used: 3474
RMS: 0.017594865067775622
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

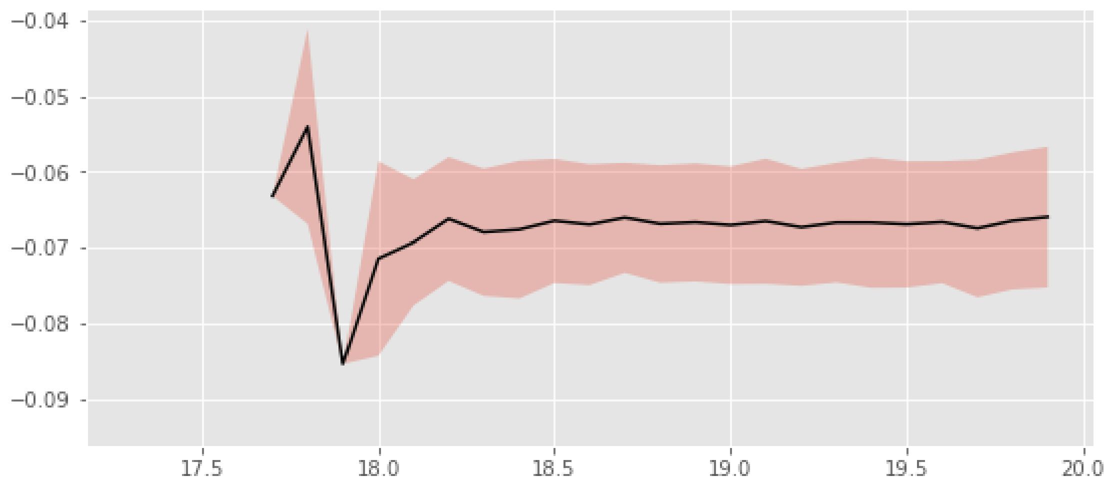
1.2.4 I.d - z band

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```

We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



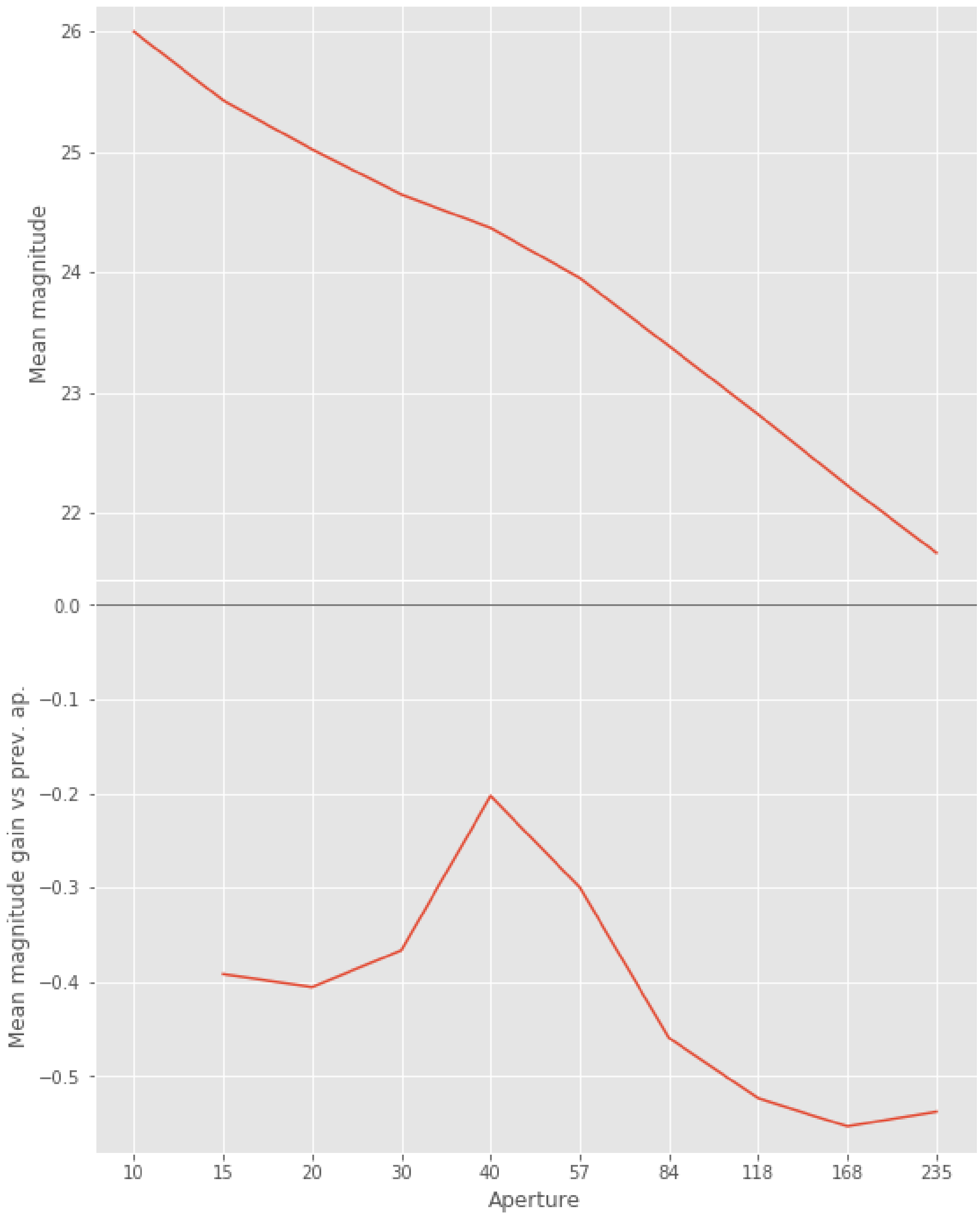
We use magnitudes between 17.5 and 19.8.

```
Aperture correction for z band:
Correction: -0.06690597534179688
Number of source used: 5966
RMS: 0.008133258602144438
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

1.2.5 I.e - y band

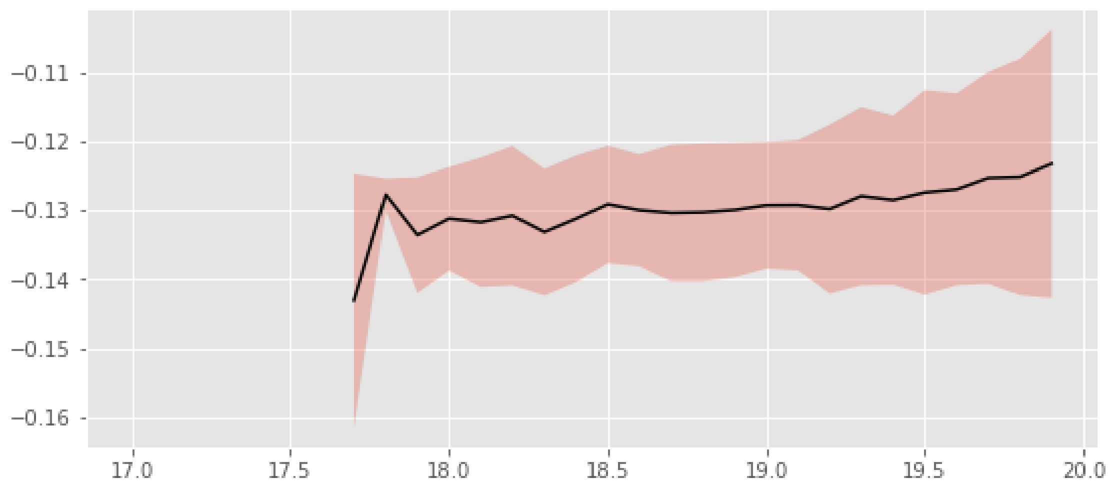
```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```



We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



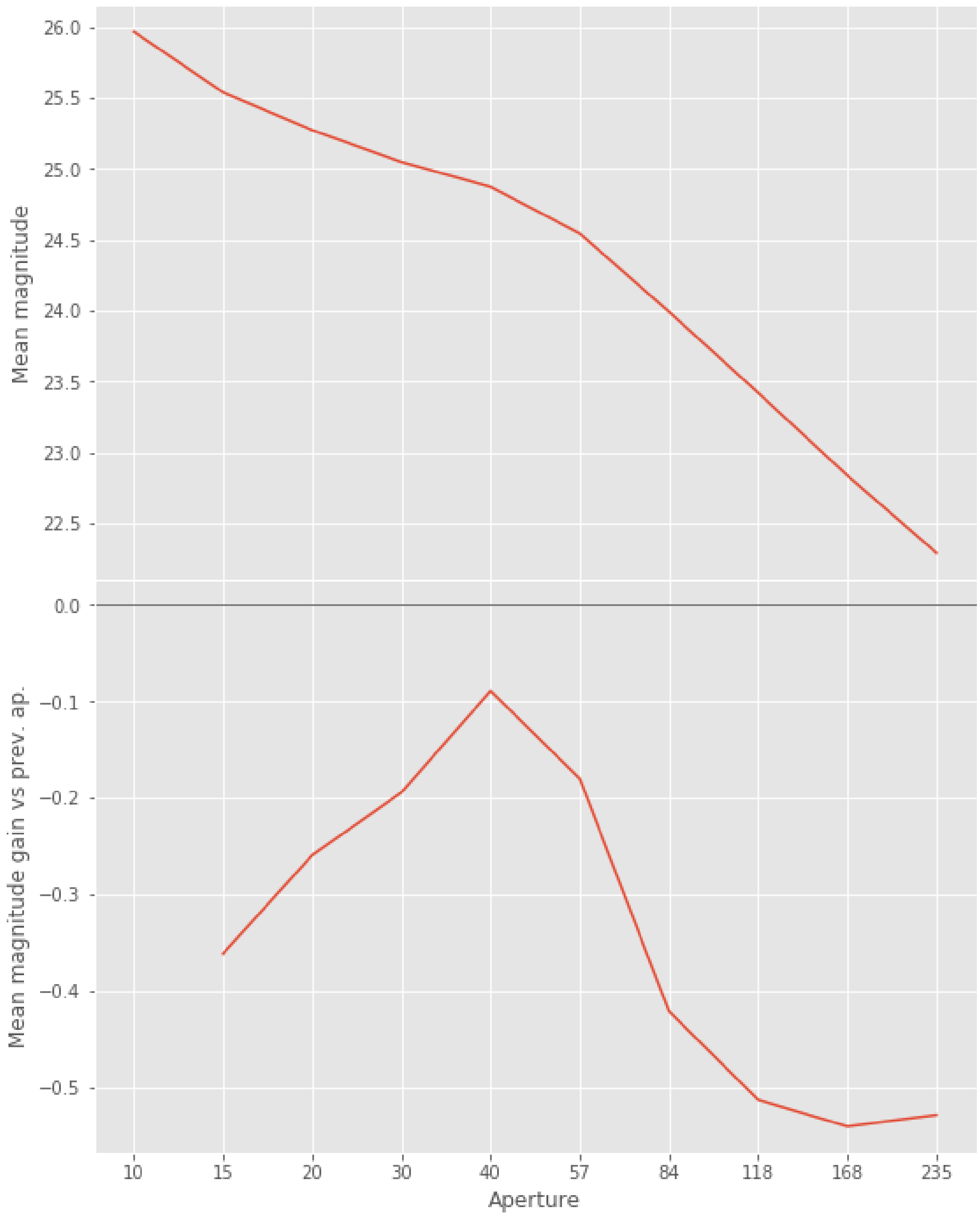
We use magnitudes between 17 and 18.7.

```
Aperture correction for y band:
Correction: -0.13036632537841797
Number of source used: 1008
RMS: 0.008730060428994603
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

1.2.6 I.f - n921 band

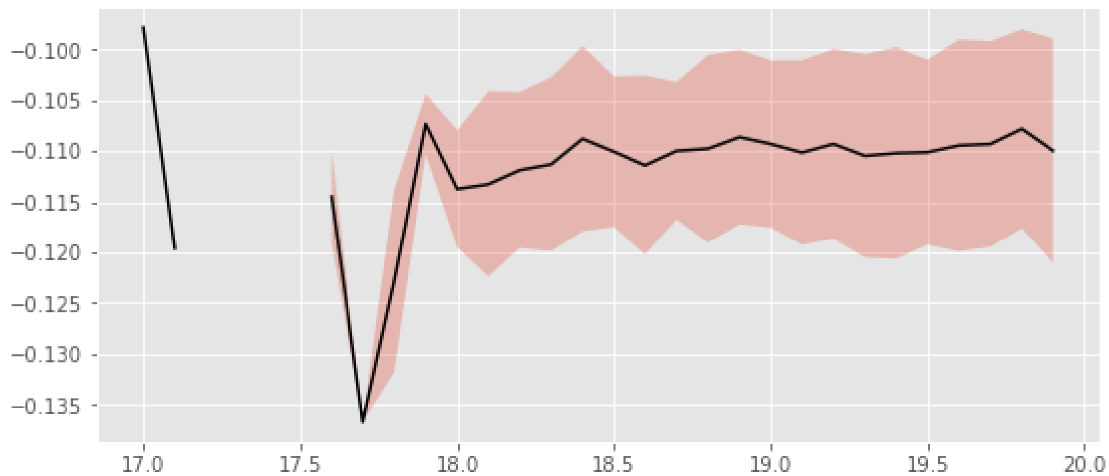
```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```



We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



We use magnitudes between 17 and 18.7.

```
Aperture correction for n921 band:
Correction: -0.11112499237060547
Number of source used: 419
RMS: 0.0083674661823173
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

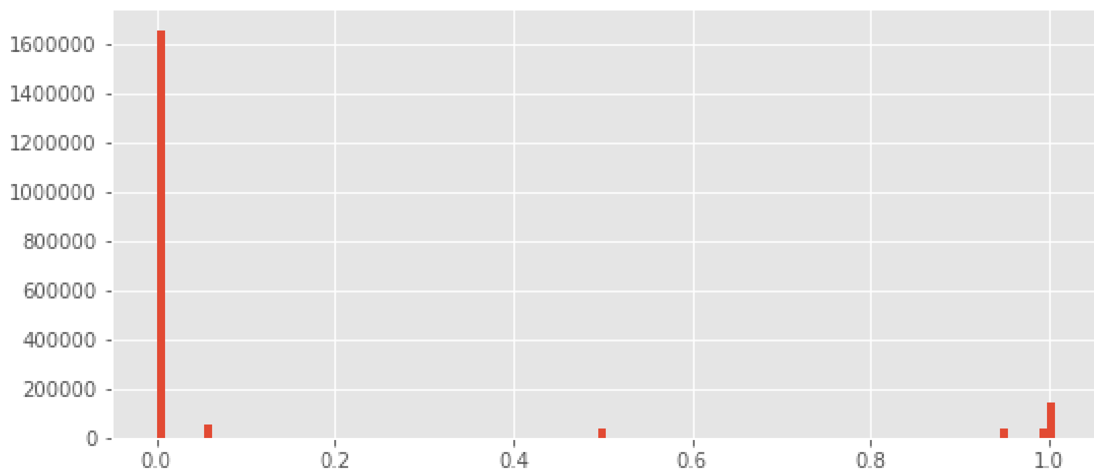
1.3 II - Stellarity

HSC does not provide a 0 to 1 stellarity value but a 0/1 extended flag in each band. We are using the same method as UKIDSS (cf this page) to compute a stellarity based on the class in each band:

$$P(star) = \frac{\prod_i P(star)_i}{\prod_i P(star)_i + \prod_i P(galaxy)_i}$$

where i is the band, and with using the same probabilities as UKDISS:

HSC flag	UKIDSS flag	Meaning	P(star)	P(galaxy)	P(noise)	P(saturated)
	-9	Saturated	0.0	0.0	5.0	95.0
	-3	Probable galaxy	25.0	70.0	5.0	0.0
	-2	Probable star	70.0	25.0	5.0	0.0
0	-1	Star	90.0	5.0	5.0	0.0
	0	Noise	5.0	5.0	90.0	0.0
1	+1	Galaxy	5.0	90.0	5.0	0.0



1.4 II - Column selection

Out[32]: <IPython.core.display.HTML object>

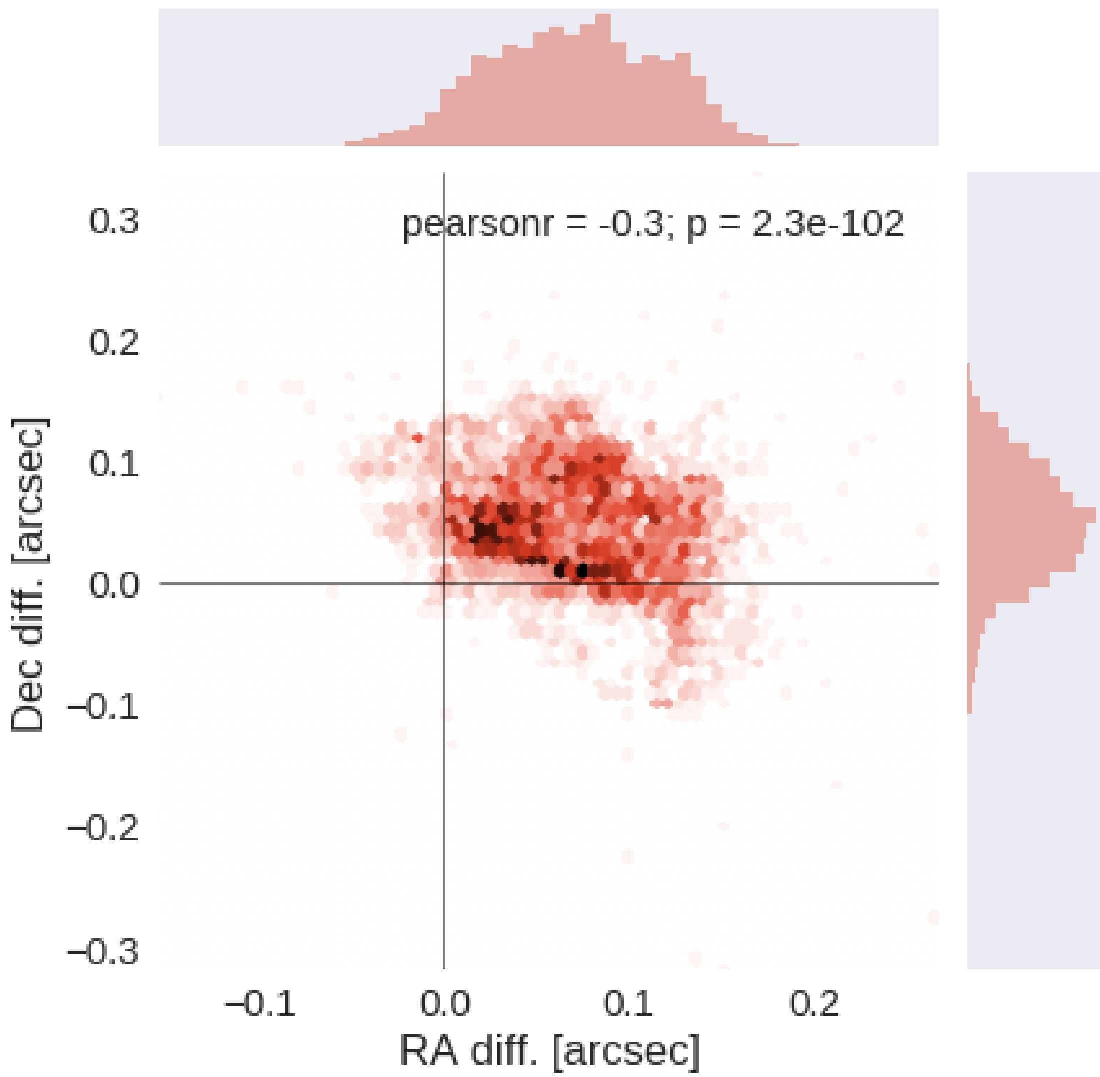
1.5 III - Removal of duplicated sources

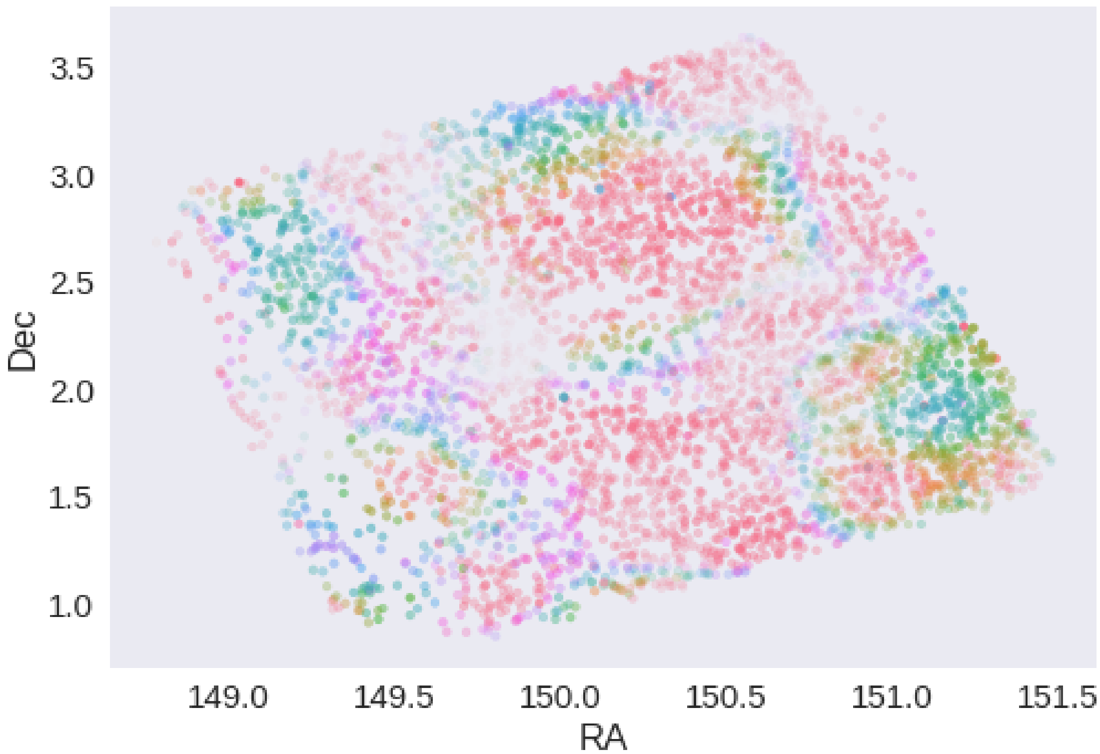
We remove duplicated objects from the input catalogues.

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)


The initial catalogue had 1966391 sources.
The cleaned catalogue has 1966275 sources (116 removed).
The cleaned catalogue has 99 sources flagged as having been cleaned
```

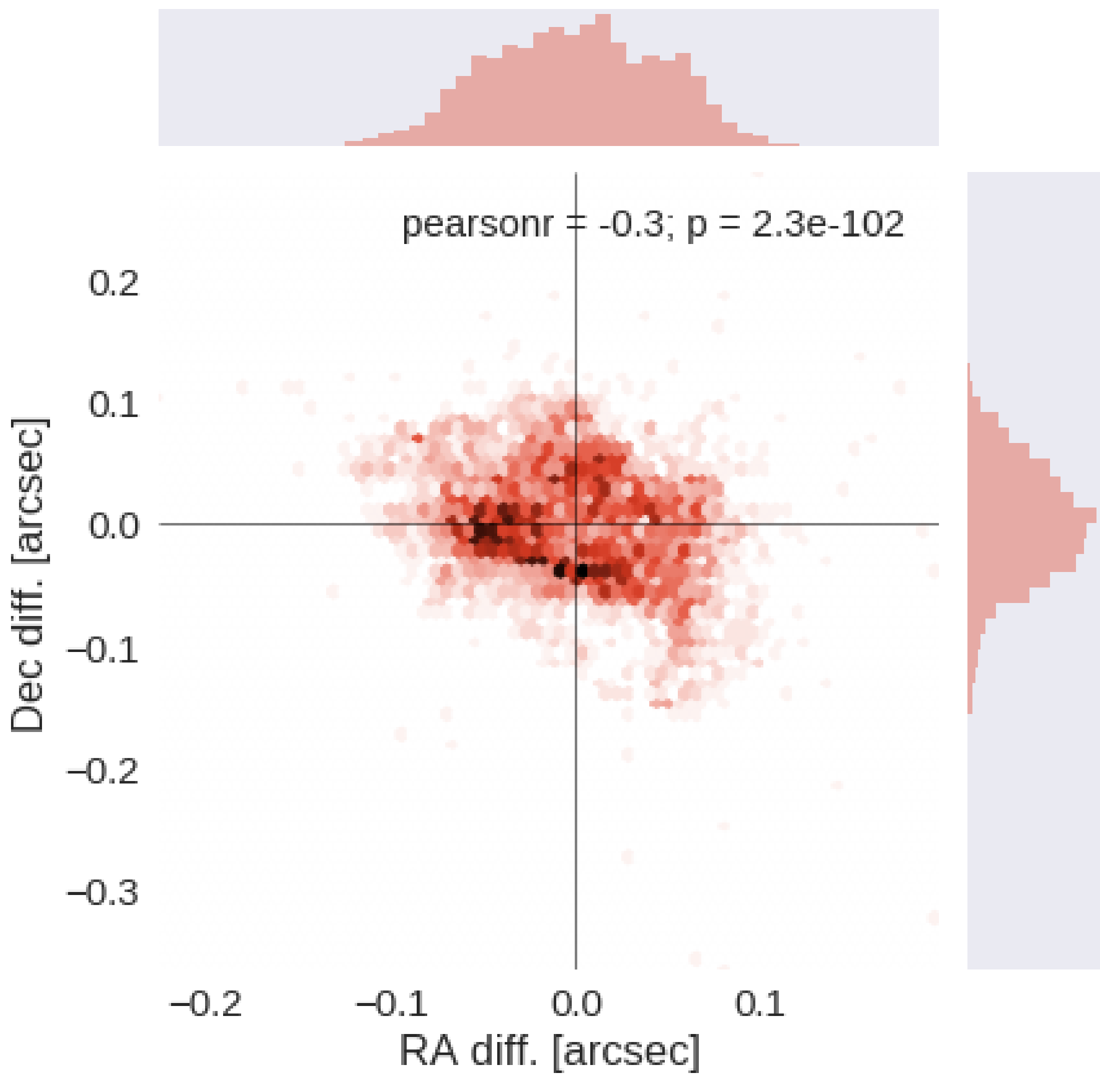
1.6 III - Astrometry correction

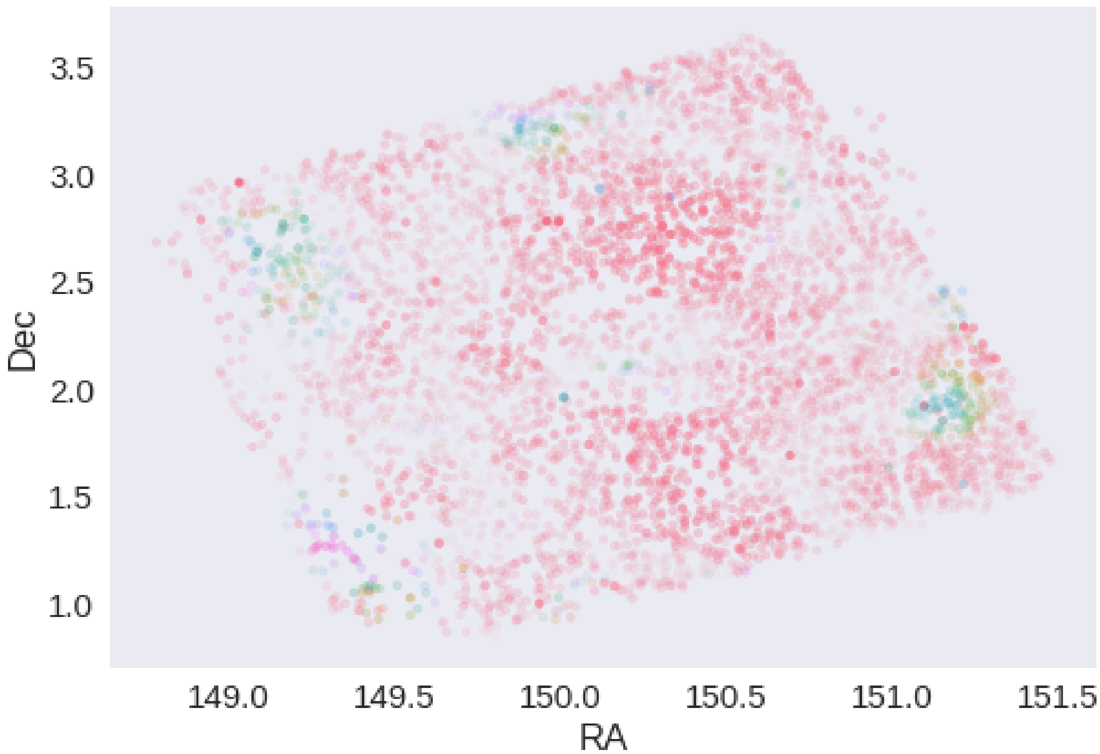
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.


pearsonr = -0.3; p = 2.3e-102
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
Dec diff. [arcsec]
−0.1
0.0
0.1
0.2
RA diff. [arcsec]




```
RA correction: -0.071356699493208 arcsec
Dec correction: -0.048603063064600605 arcsec
```


pearsonr = -0.3; p = 2.3e-102
0.2
0.1
0.0
−0.1
−0.2
−0.3
Dec diff. [arcsec]
−0.2
−0.1
0.0
0.1
RA diff. [arcsec]



1.7 IV - Flagging Gaia objects

```
5103 sources flagged.
```

1.8 V - Flagging objects near bright stars

2 VI - Saving to disk

1.4.2_HSC-UDEEP

March 8, 2018

1 COSMOS master catalogue

1.1 Preparation of Hyper Suprime-Cam Subaru Strategic Program Catalogues (HSC-SSP) data

This catalogue comes from `dmu0_HSC`.

In the catalogue, we keep:

- The `object_id` as unique object identifier;
- The position;
- The g, r, i, z, y (no N921) aperture magnitude in 2" that we aperture correct;
- The g, r, i, z, y (no N921) kron fluxes and magnitudes.
- The extended flag that we convert to a stellariy.

Note: On ELAIS-N1 the HSC-SSP catalogue does not contain any N816 magnitudes.

We use 2016 as the epoch.

```
This notebook was run with herschelhelp_internal version:
33f5ec7 (Wed Dec 6 16:56:17 2017 +0000)
```

1.2 I - Aperture correction

To compute aperture correction we need to dertermine two parametres: the target aperture and the range of magnitudes for the stars that will be used to compute the correction.

Target aperture: To determine the target aperture, we simulate a curve of growth using the provided apertures and draw two figures:

- The evolution of the magnitudes of the objects by plotting on the same plot aperture number vs the mean magnitude.
- The mean gain (loss when negative) of magnitude is each aperture compared to the previous (except for the first of course).

As target aperture, we should use the smallest (i.e. less noisy) aperture for which most of the flux is captures.

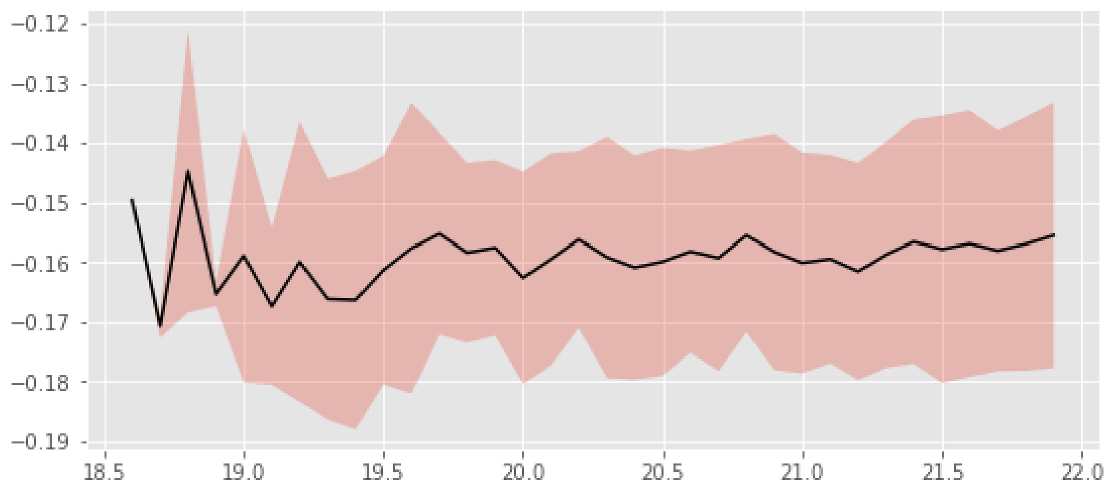
Magnitude range: To know what limits in aperture to use when doing the aperture correction, we plot for each magnitude bin the correction that is computed and its RMS. We should then use the wide limits (to use more stars) where the correction is stable and with few dispersion.

1.2.1 I.a - g band

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```

We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



We will use magnitudes between 18.5 and 20.8

```
Aperture correction for g band:
Correction: -0.15904808044433594
Number of source used: 969
RMS: 0.018600222036784176
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

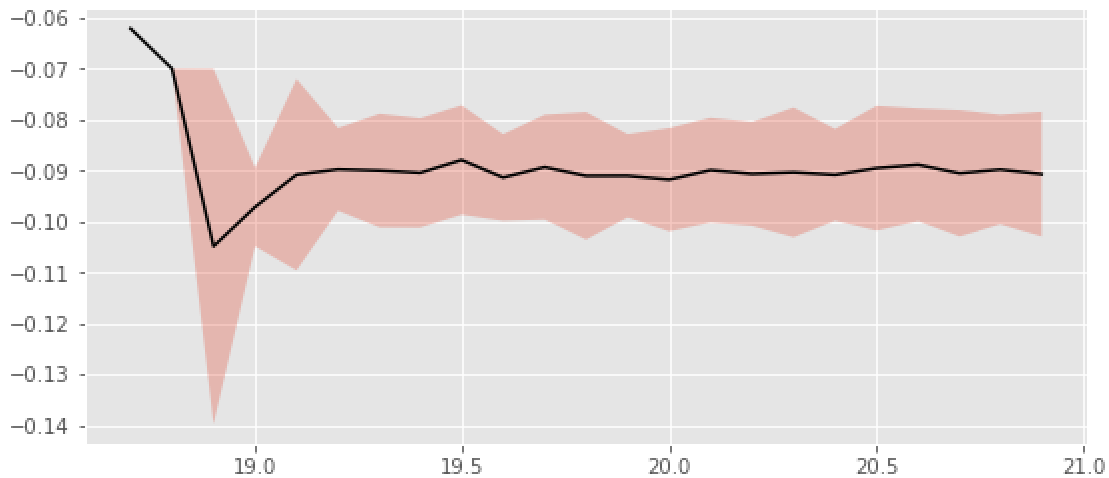
1.2.2 I.b - r band

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```

We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
```

```
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



We use magnitudes between 17.6 and 19.7.

```
Aperture correction for r band:
Correction: -0.09056663513183594
Number of source used: 349
RMS: 0.00958719667442224
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

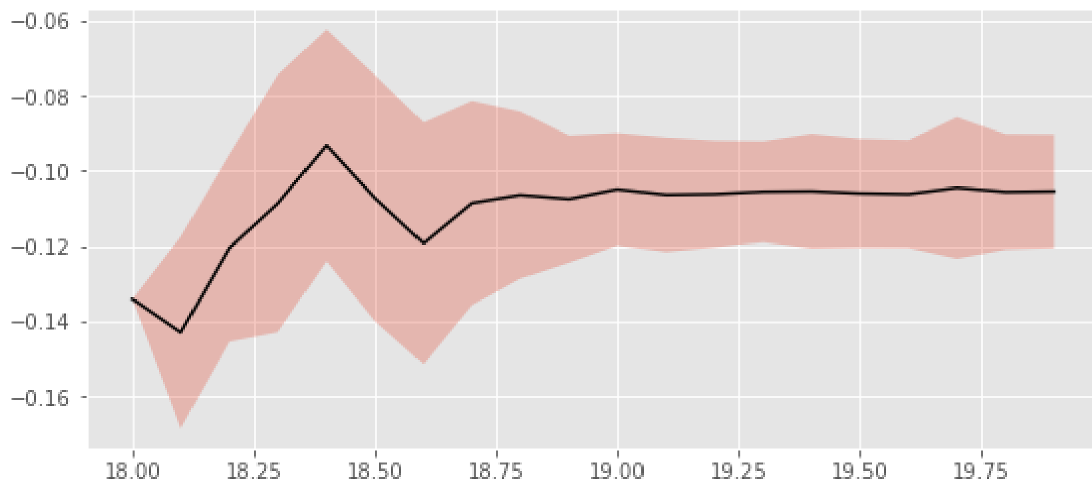
1.2.3 I.c - i band

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```

We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



We use magnitudes between 18.5 and 19.8.

```
Aperture correction for i band:
Correction: -0.10589122772216797
Number of source used: 2146
RMS: 0.016738303023859657
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

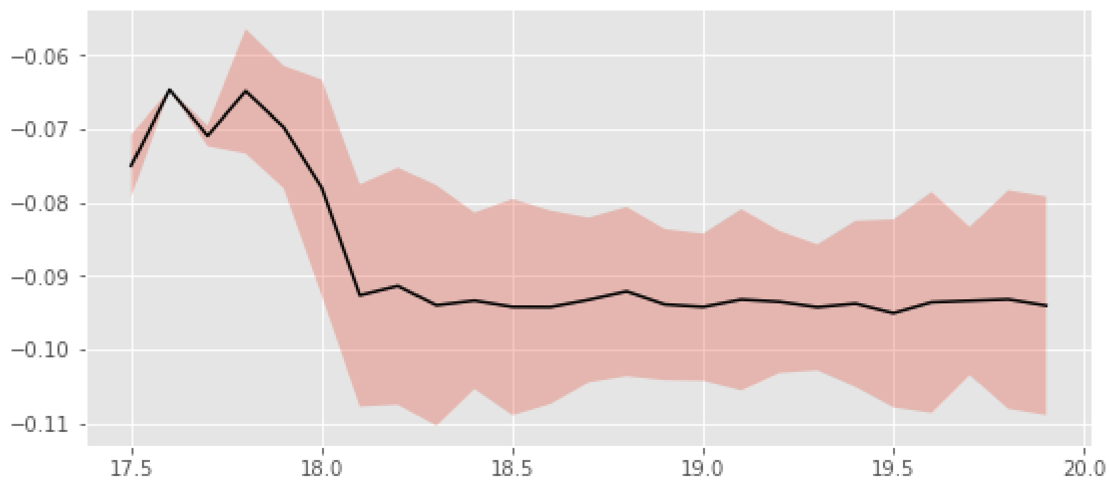
1.2.4 I.d - z band

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```

We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



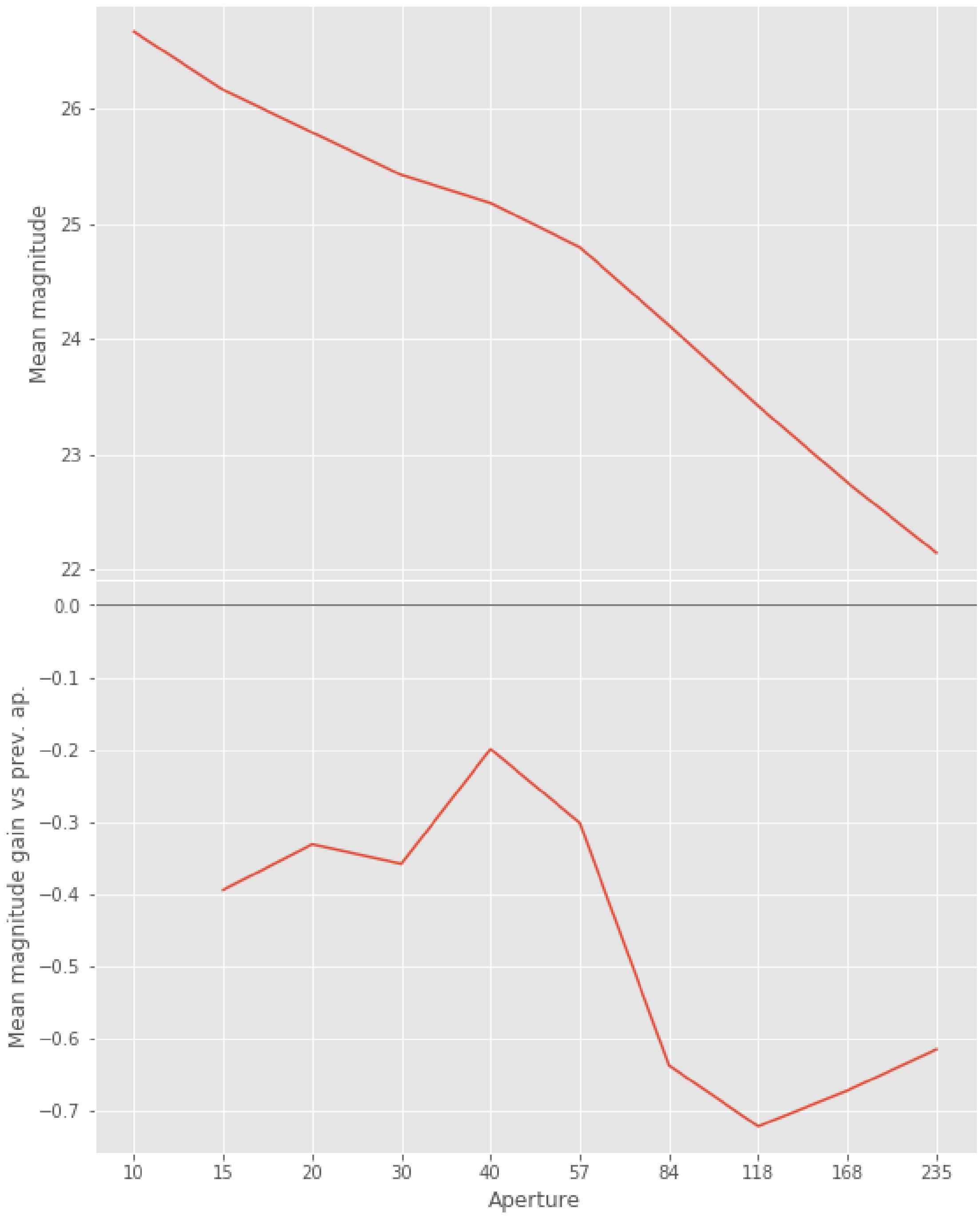
We use magnitudes between 17.5 and 19.8.

```
Aperture correction for z band:
Correction: -0.09363174438476562
Number of source used: 3208
RMS: 0.011914830630386885
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

1.2.5 I.e - y band

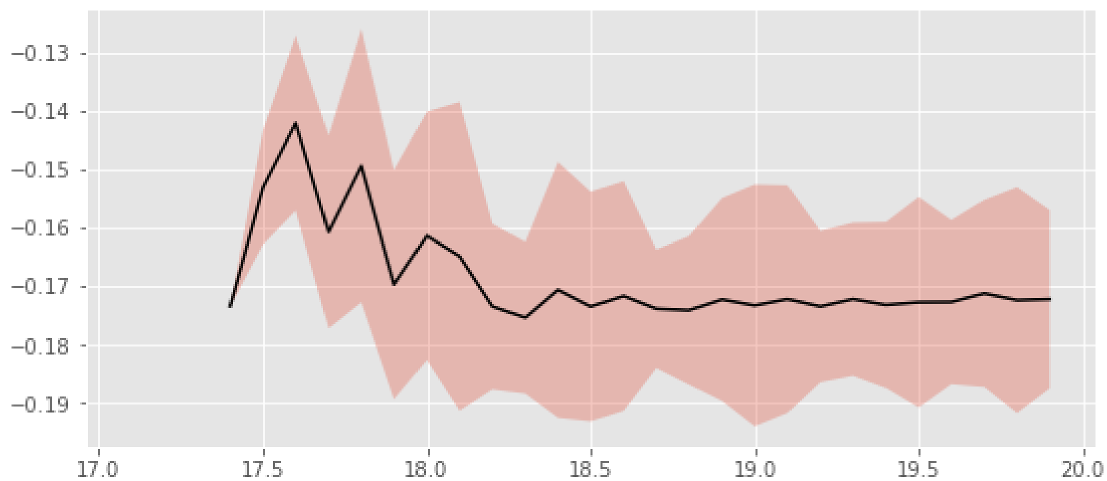
```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```



We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



We use magnitudes between 17 and 18.7.

```
Aperture correction for y band:
Correction: -0.17114639282226562
Number of source used: 764
RMS: 0.020499810124057233
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

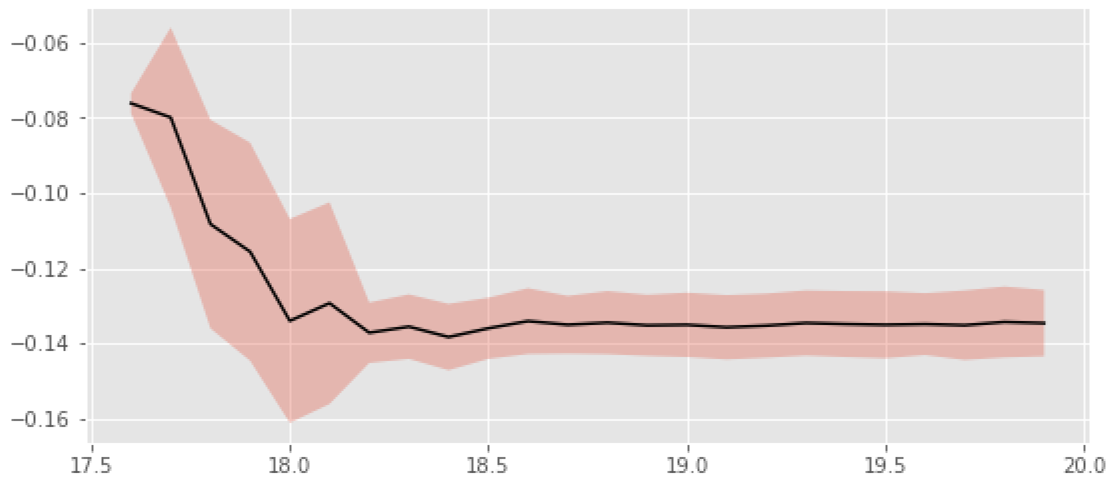
1.2.6 I.f - n921 band

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```

We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



We use magnitudes between 17 and 18.7.

```
Aperture correction for n921 band:
Correction: -0.1354379653930664
Number of source used: 533
RMS: 0.008487969070401766
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value enc
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```

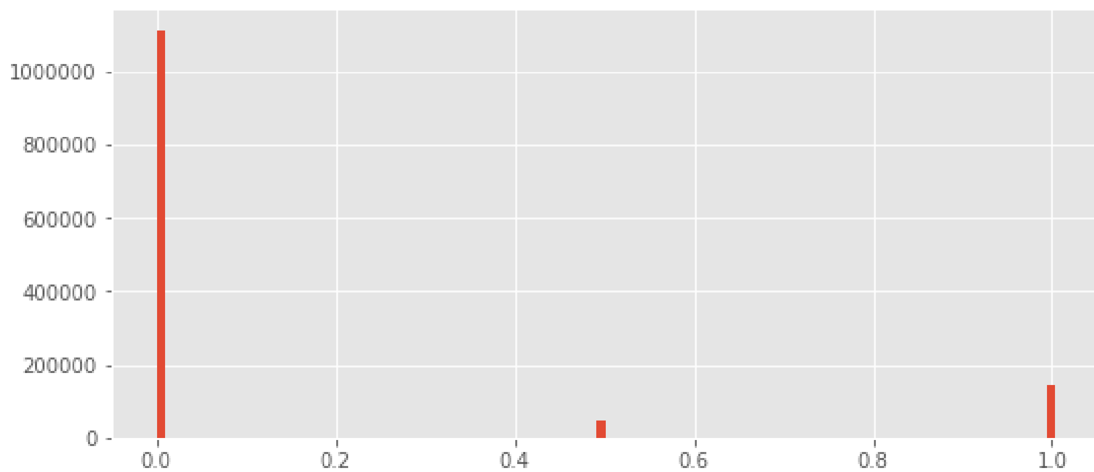
1.3 II - Stellarity

HSC does not provide a 0 to 1 stellarity value but a 0/1 extended flag in each band. We are using the same method as UKIDSS (cf this page) to compute a stellarity based on the class in each band:

$$P(star) = \frac{\prod_i P(star)_i}{\prod_i P(star)_i + \prod_i P(galaxy)_i}$$

where i is the band, and with using the same probabilities as UKDISS:

HSC flag	UKIDSS flag	Meaning	P(star)	P(galaxy)	P(noise)	P(saturated)
	-9	Saturated	0.0	0.0	5.0	95.0
	-3	Probable galaxy	25.0	70.0	5.0	0.0
	-2	Probable star	70.0	25.0	5.0	0.0
0	-1	Star	90.0	5.0	5.0	0.0
	0	Noise	5.0	5.0	90.0	0.0
1	+1	Galaxy	5.0	90.0	5.0	0.0



1.4 II - Column selection

Out[32]: <IPython.core.display.HTML object>

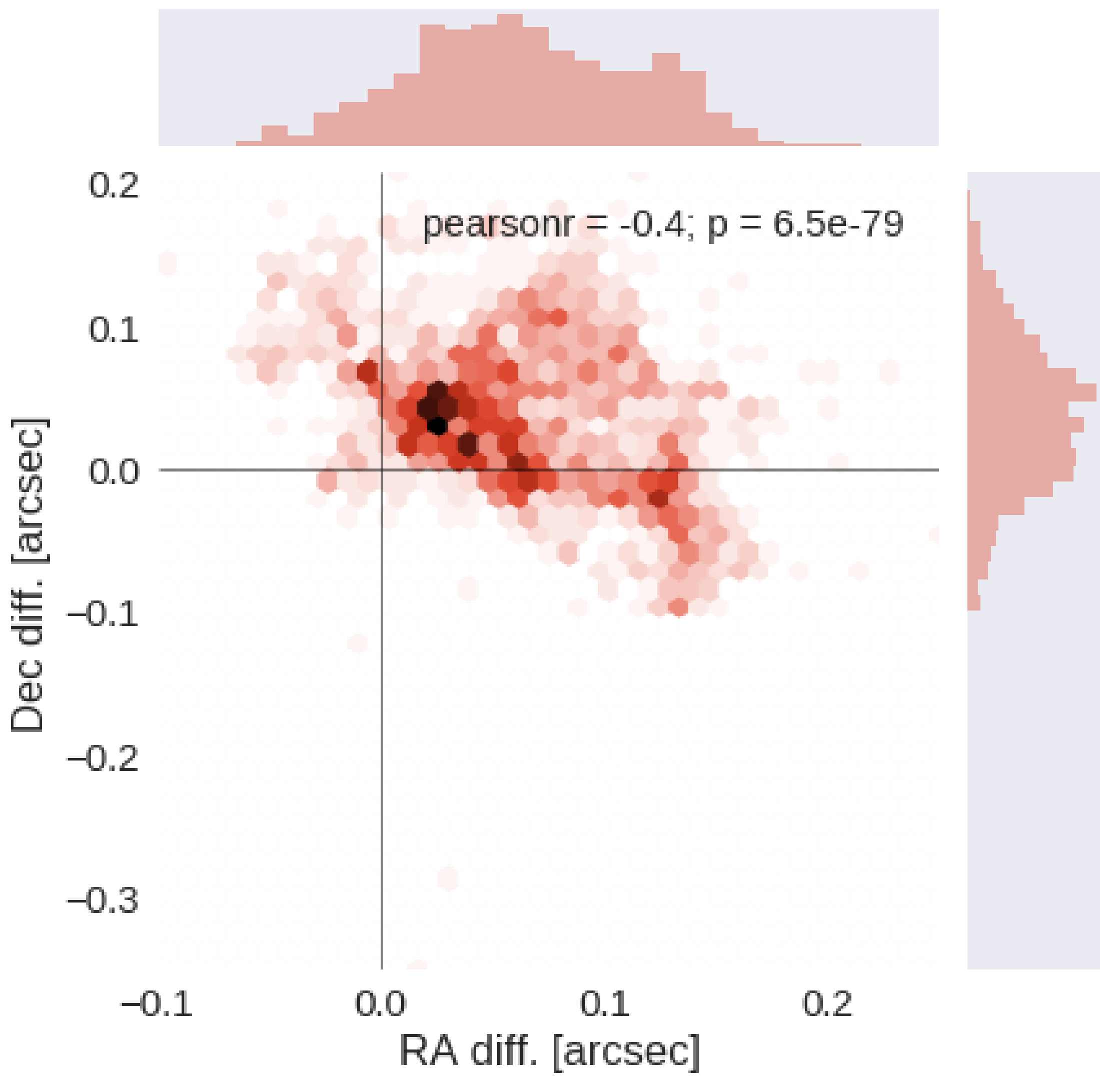
1.5 III - Removal of duplicated sources

We remove duplicated objects from the input catalogues.

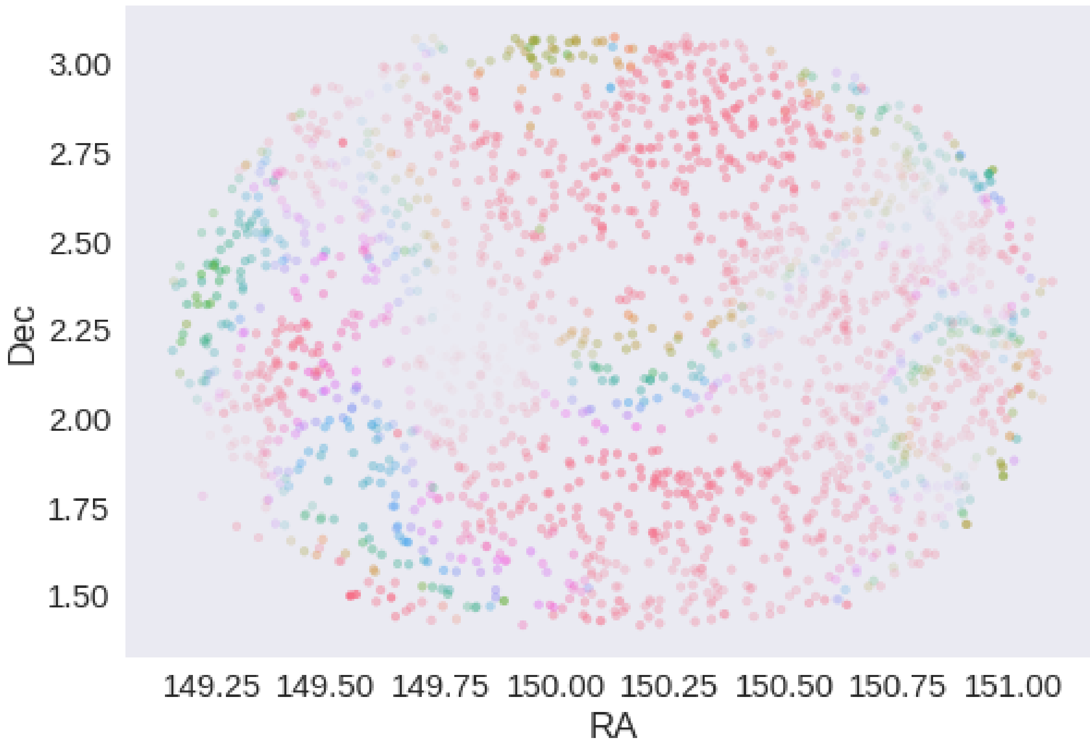
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)


The initial catalogue had 1307594 sources.
The cleaned catalogue has 1307525 sources (69 removed).
The cleaned catalogue has 67 sources flagged as having been cleaned
```

1.6 III - Astrometry correction

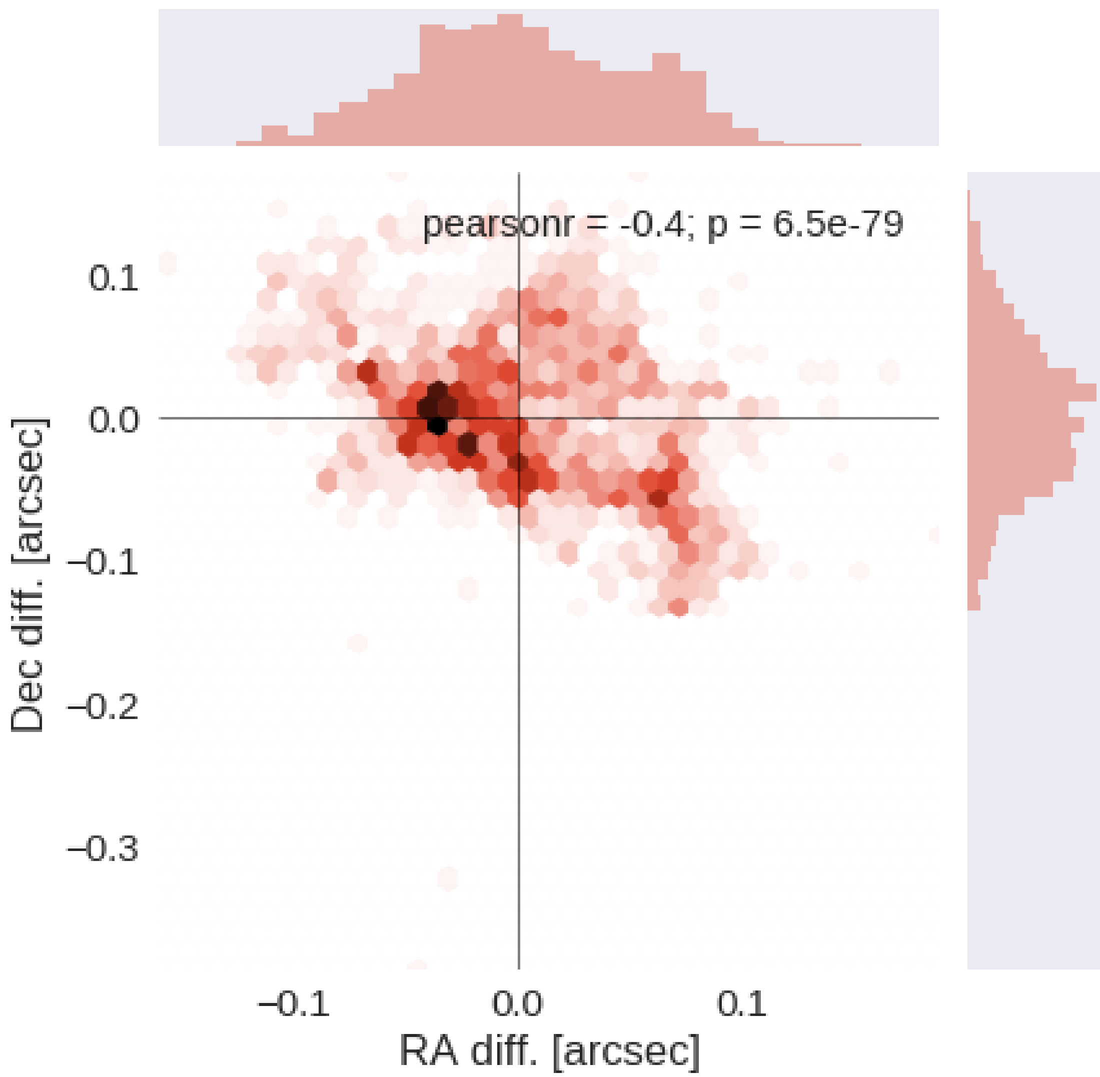
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.

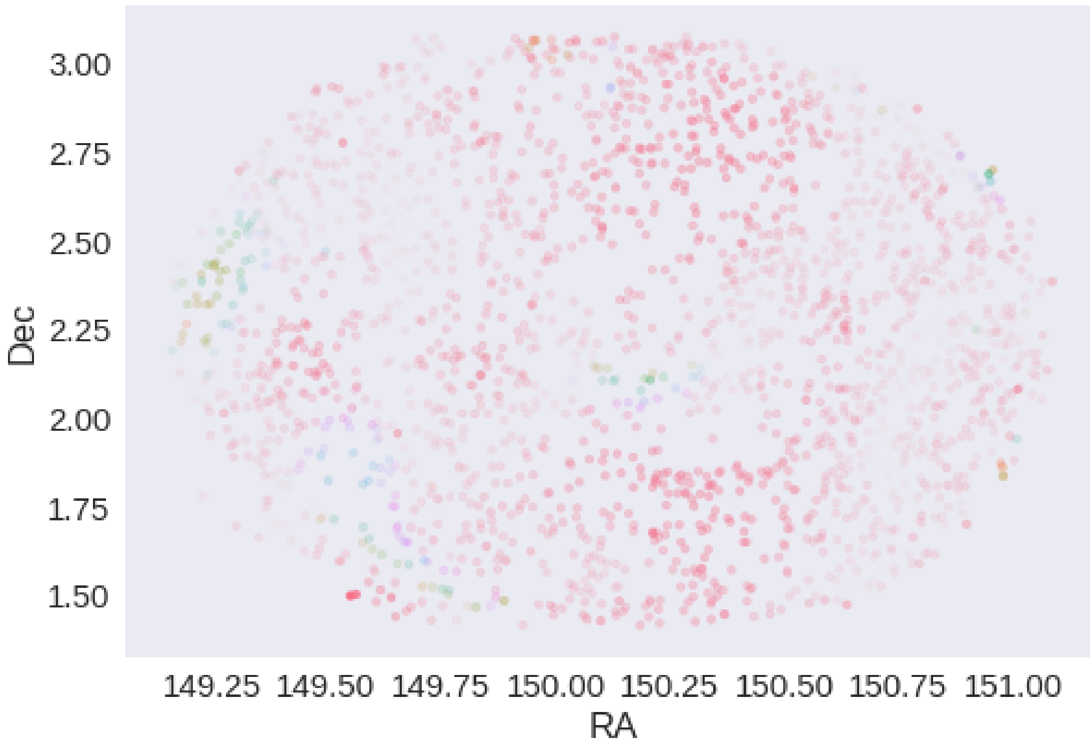


pearsonr = -0.4; p = 6.5e-79
0.2
0.1
0.0
−0.1
−0.2
−0.3
Dec diff. [arcsec]
−0.1
0.0
0.1
0.2
RA diff. [arcsec]




```
RA correction: -0.061218833292286945 arcsec
Dec correction: -0.03624856686692546 arcsec
```


pearsonr = -0.4; p = 6.5e-79
0.1
0.0
−0.1
−0.2
−0.3
Dec diff. [arcsec]
−0.1
0.0
0.1
RA diff. [arcsec]



1.7 IV - Flagging Gaia objects

```
2142 sources flagged.
```

1.8 V - Flagging objects near bright stars

2 VI - Saving to disk

1.5_KIDS

March 8, 2018

1 COSMOS master catalogue

1.1 Preparation of KIDS/VST data

Kilo Degree Survey/VLT Survey Telescope catalogue: the catalogue comes from `dmu0_KIDS`.

In the catalogue, we keep:

- The identifier (it's unique in the catalogue);
- The position;
- The stellarity;
- The aperture corrected aperture magnitude in each band (10 pixels = 2")
- The Petrosian magnitude to be used as total magnitude (no "auto" magnitude is provided).

We take 2014 as the observation year from a typical image header.

```
This notebook was run with herschelhelp_internal version:
33f5ec7 (Wed Dec 6 16:56:17 2017 +0000)
```

1.2 I - Column selection

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:76: RuntimeWarning: invalid value enco
  magnitudes = 2.5 * (23 - np.log10(fluxes)) - 48.6
```

```
Out[6]: <IPython.core.display.HTML object>
```

1.3 II - Removal of duplicated sources

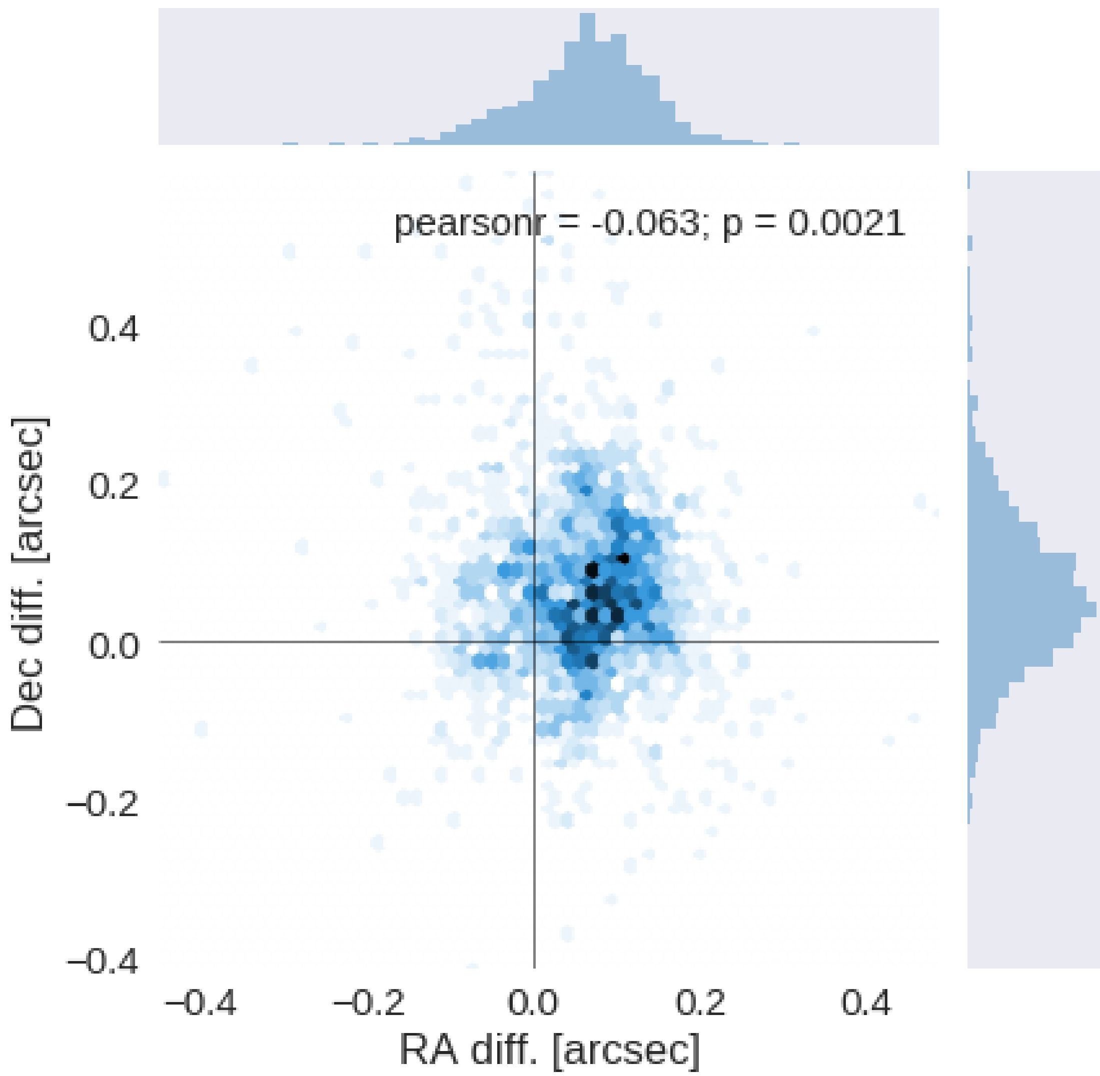
We remove duplicated objects from the input catalogues.

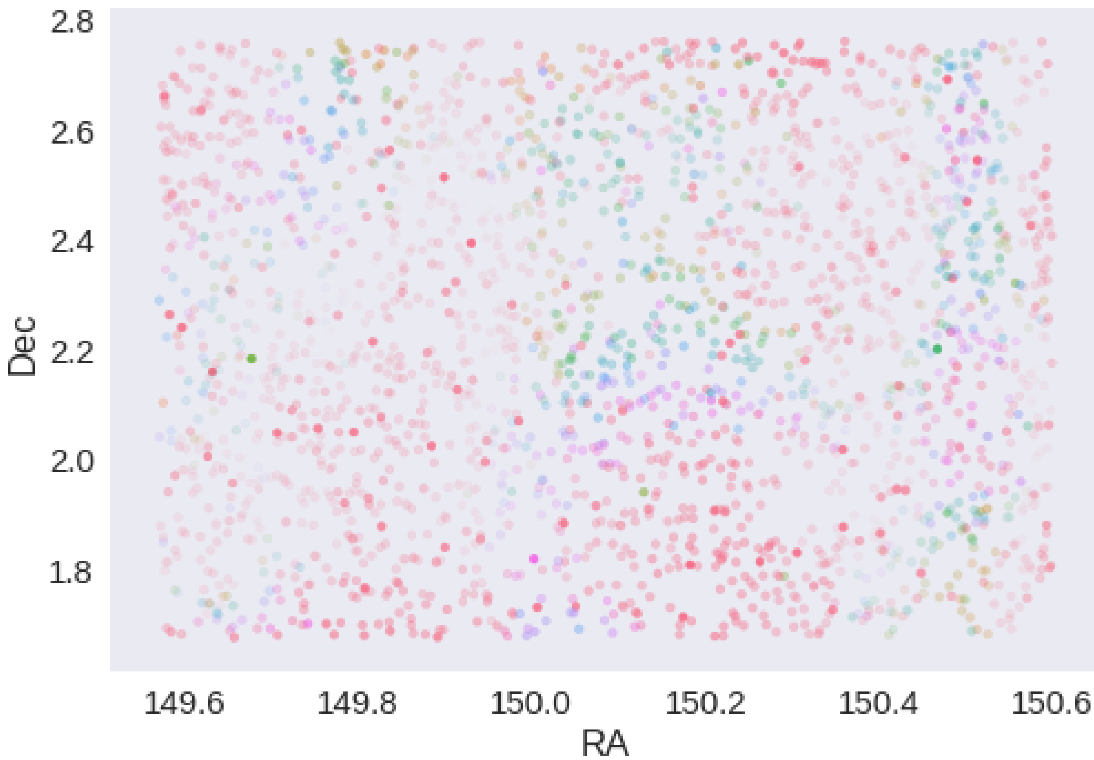
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
The initial catalogue had 152946 sources.
The cleaned catalogue has 152946 sources (0 removed).
The cleaned catalogue has 0 sources flagged as having been cleaned
```

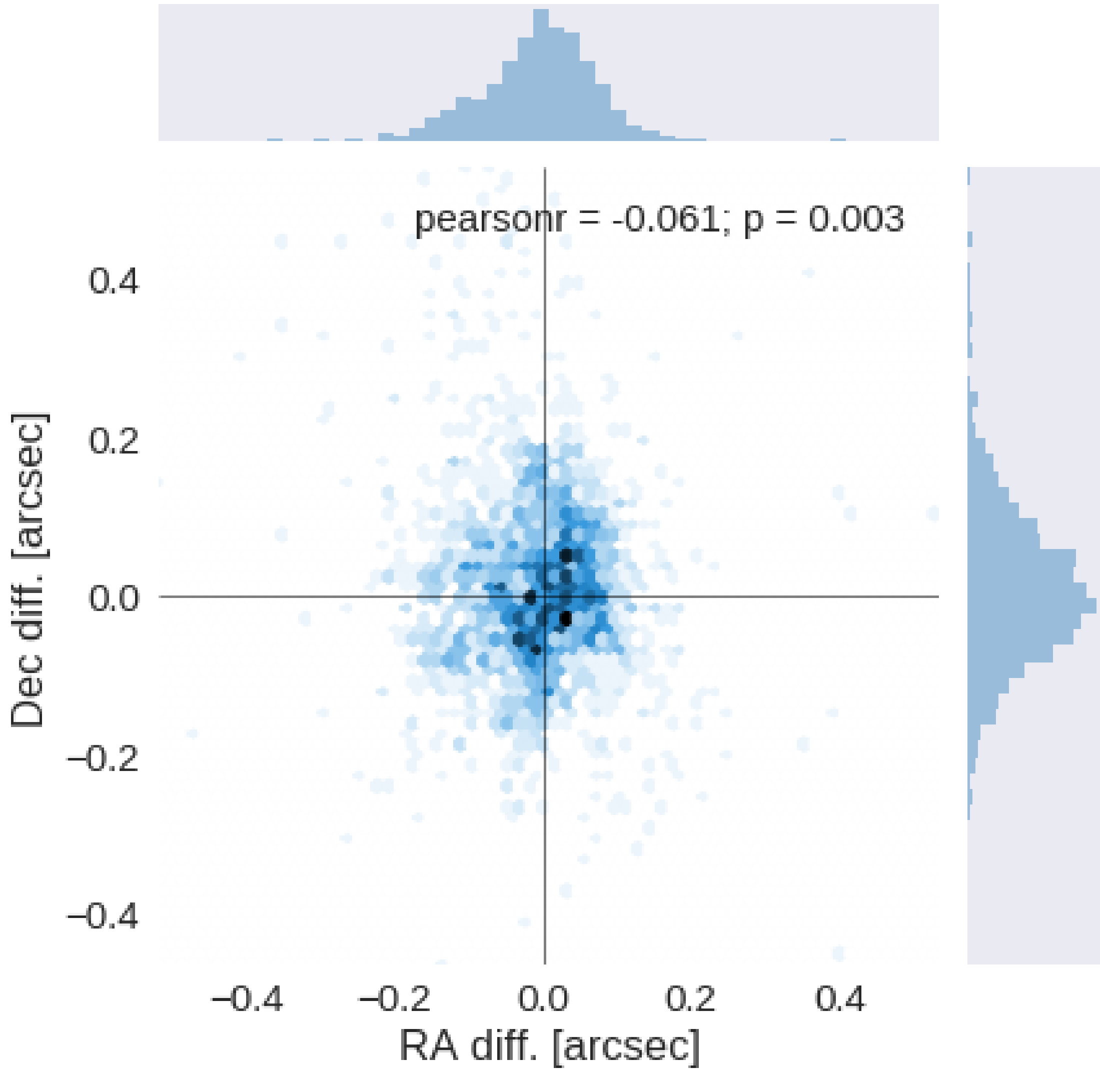
1.4 III - Astrometry correction

We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.

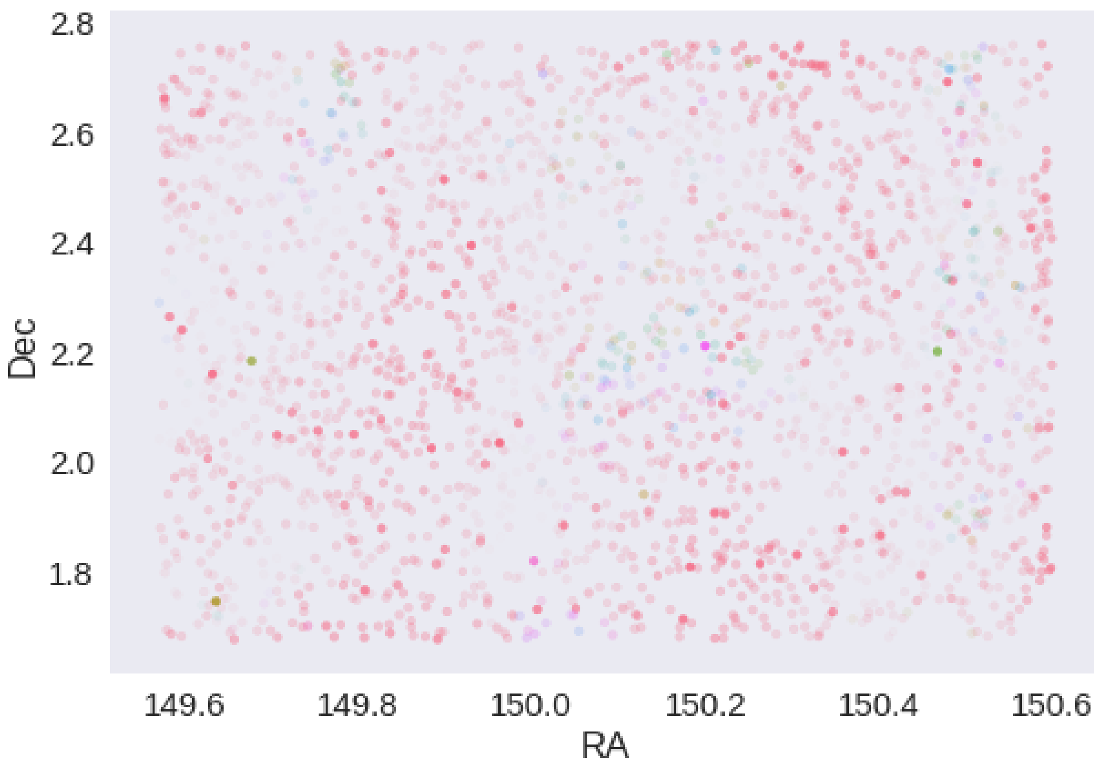





```
RA correction: -0.06793673346123796 arcsec
Dec correction: -0.05321466159404764 arcsec
```



pearsonr = -0.061; p = 0.003
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.4
−0.2
0.0
0.2
0.4
RA diff. [arcsec]



1.5 IV - Flagging Gaia objects

```
2633 sources flagged.
```

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.6_PanSTARRS-3SS

March 8, 2018

1 COSMOS master catalogue

1.1 Preparation of Pan-STARRS1 - 3pi Steradian Survey (3SS) data

This catalogue comes from `dmu0_PanSTARRS1-3SS`.

In the catalogue, we keep:

- The `uniquePspsSTid` as unique object identifier;
- The r-band position which is given for all the sources;
- The grizy `<band>ApMag` aperture magnitude (see below);
- The grizy `<band>KronMag` as total magnitude.

The Pan-STARRS1-3SS catalogue provides for each band an aperture magnitude defined as "In PS1, an 'optimal' aperture radius is determined based on the local PSF. The wings of the same analytic PSF are then used to extrapolate the flux measured inside this aperture to a 'total' flux."

The observations used for the catalogue where done between 2010 and 2015 (ref).

```
This notebook was run with herschelhelp_internal version:
33f5ec7 (Wed Dec 6 16:56:17 2017 +0000)
```

1.2 I - Column selection

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
Out[6]: <IPython.core.display.HTML object>
```

1.3 II - Removal of duplicated sources

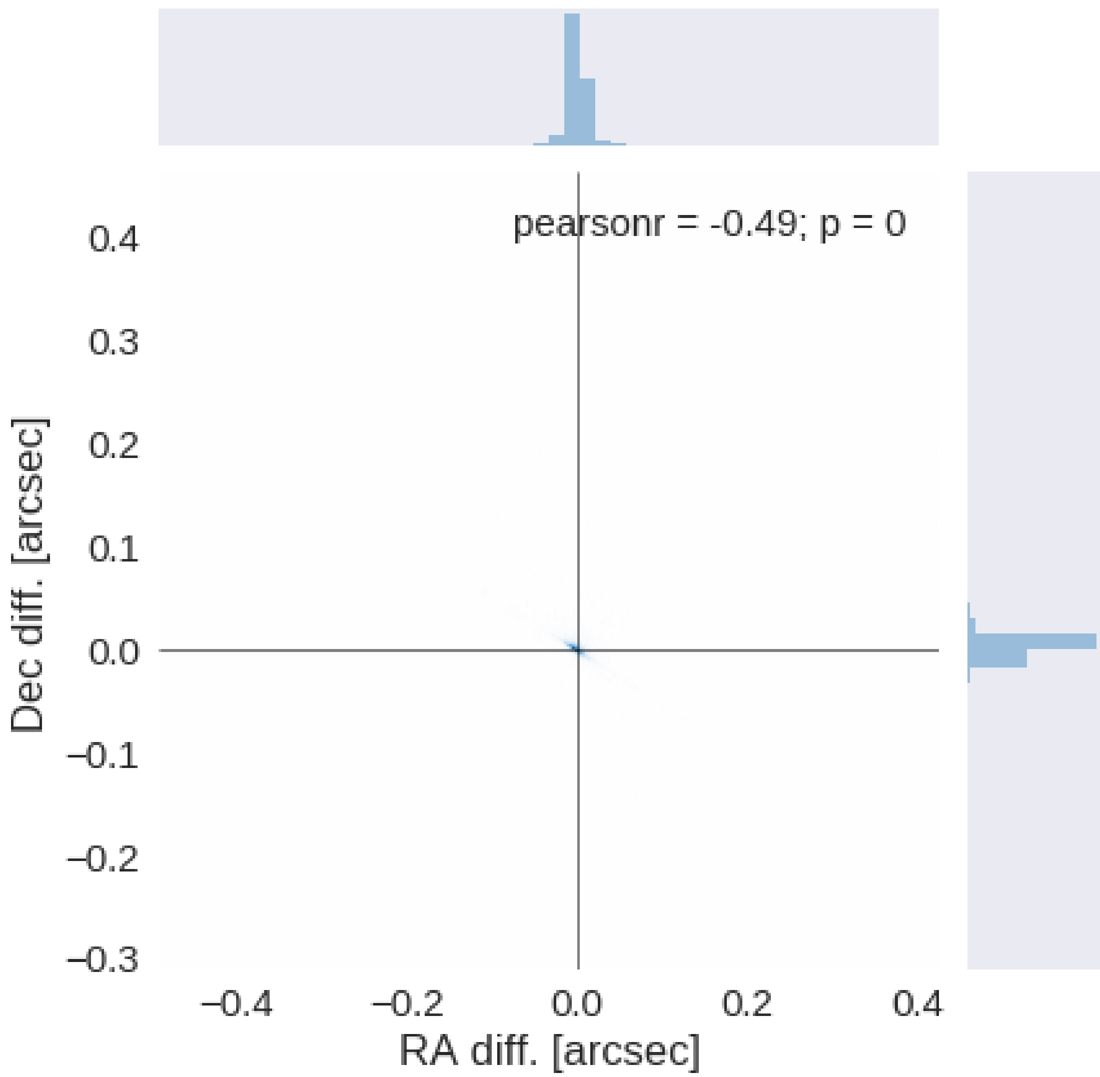
We remove duplicated objects from the input catalogues.

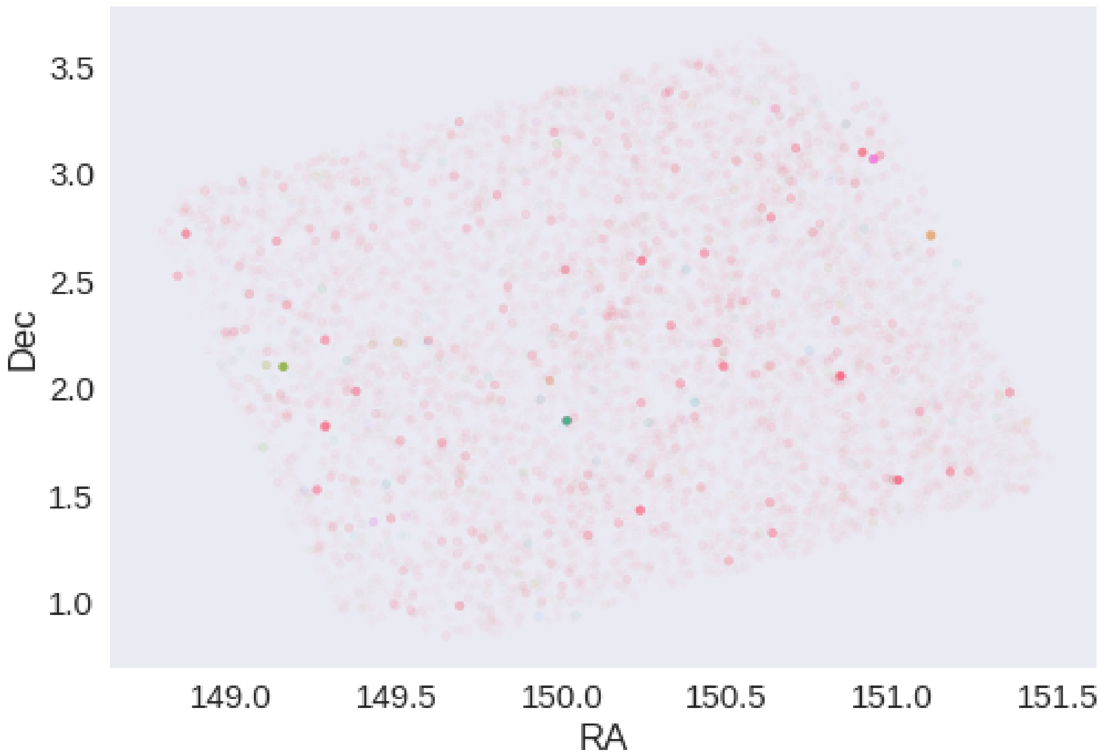
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
The initial catalogue had 134257 sources.
The cleaned catalogue has 134209 sources (48 removed).
The cleaned catalogue has 48 sources flagged as having been cleaned
```

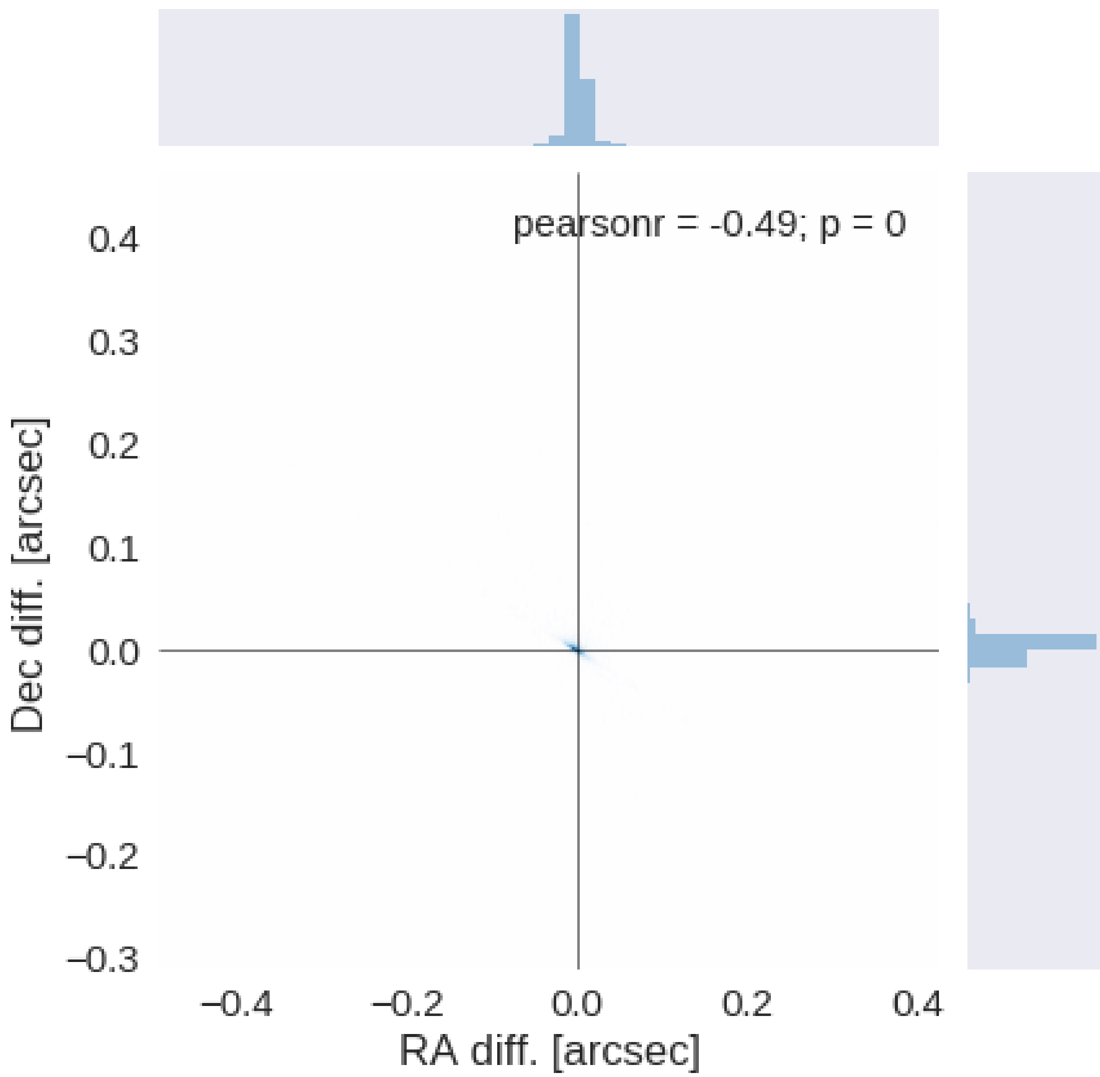
1.4 III - Astrometry correction

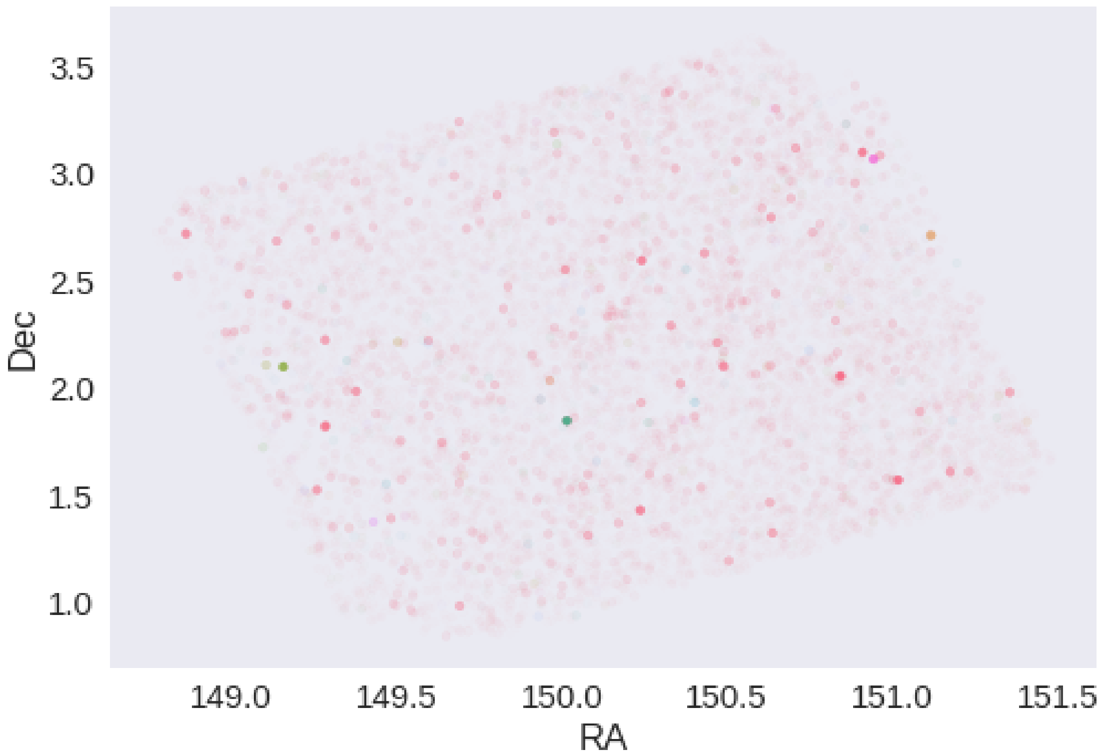
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.






```
RA correction: -0.001830837663874263 arcsec
Dec correction: -0.00030203157574959505 arcsec
```


pearsonr = -0.49; p = 0
0.4
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
Dec diff. [arcsec]
−0.4
−0.2
0.0
0.2
0.4
RA diff. [arcsec]



1.5 IV - Flagging Gaia objects

```
10748 sources flagged.
```

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.7_UKIDSS-LAS

March 8, 2018

1 COSMOS master catalogue

1.1 Preparation of UKIRT Infrared Deep Sky Survey / Large Area Survey (UKIDSS/LAS)

Information about UKIDSS can be found at http://www.ukidss.org/surveys/surveys.html

The catalogue comes from `dmu0_UKIDSS-LAS`.

In the catalogue, we keep:

- The identifier (it's unique in the catalogue);
- The position;
- The stellarity;
- The magnitude for each band in aperture 3 (2 arcsec).
- The hall magnitude is described as the total magnitude.

J band magnitudes are available in two eopchs. We take the first arbitrarily.

The magnitudes are "*Vega like*". The AB offsets are given by Hewett *et al.* (2016):

Band	AB offset
Y	0.634
J	0.938
H	1.379
K	1.900

Each source is associated with an epoch. These range between 2005 and 2007. We take 2006 for the epoch.

```
This notebook was run with herschelhelp_internal version:
33f5ec7 (Wed Dec 6 16:56:17 2017 +0000)
```

1.2 I - Column selection

```
WARNING: UnitsWarning: 'RADIANS' did not parse as fits unit: At col 0, Unit 'RADIANS' not suppor
```

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
```

```
  ma.MaskedArray.__setitem__(self, index, value)
```

Out[6]: <IPython.core.display.HTML object>

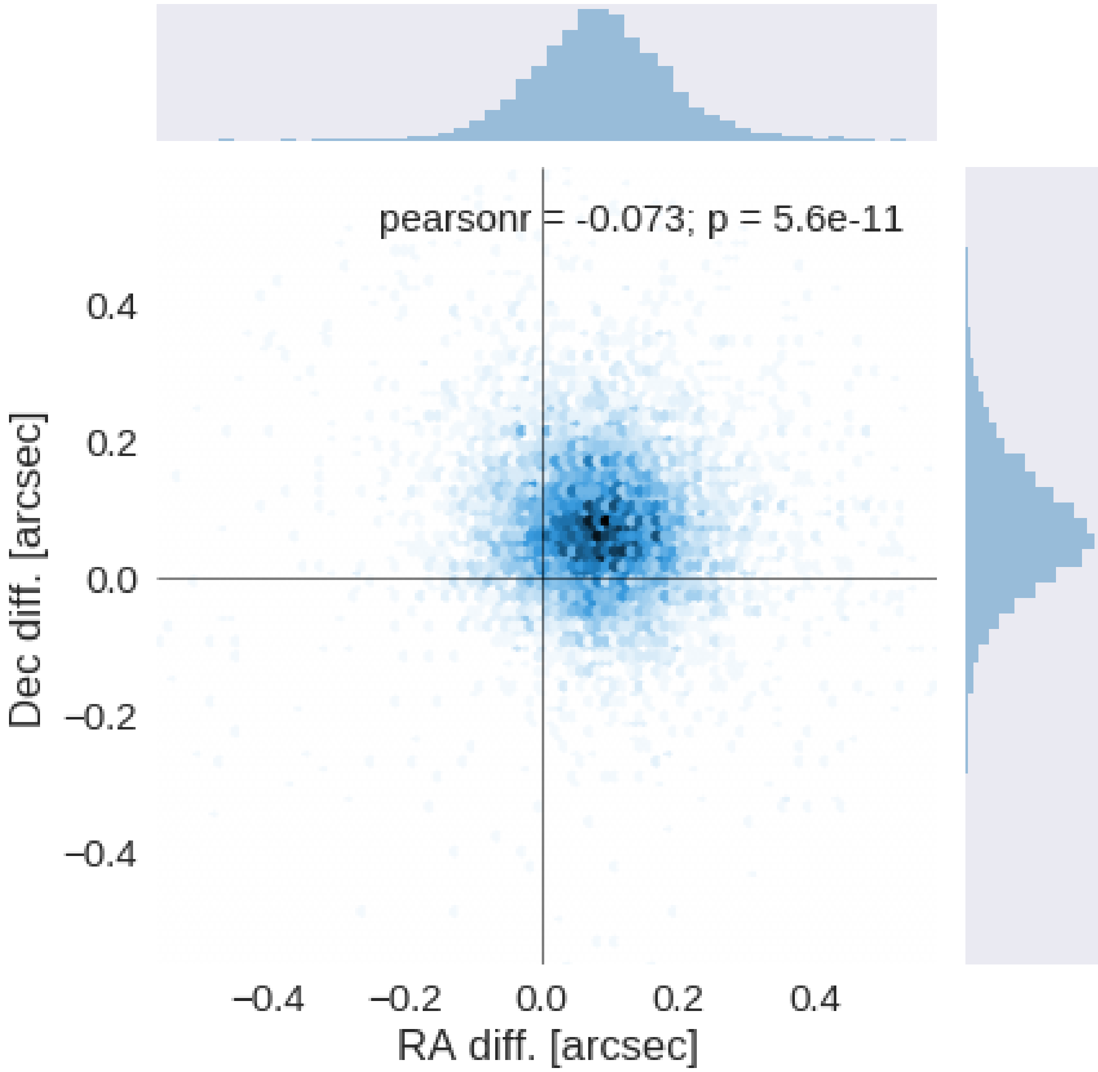
1.3 II - Removal of duplicated sources

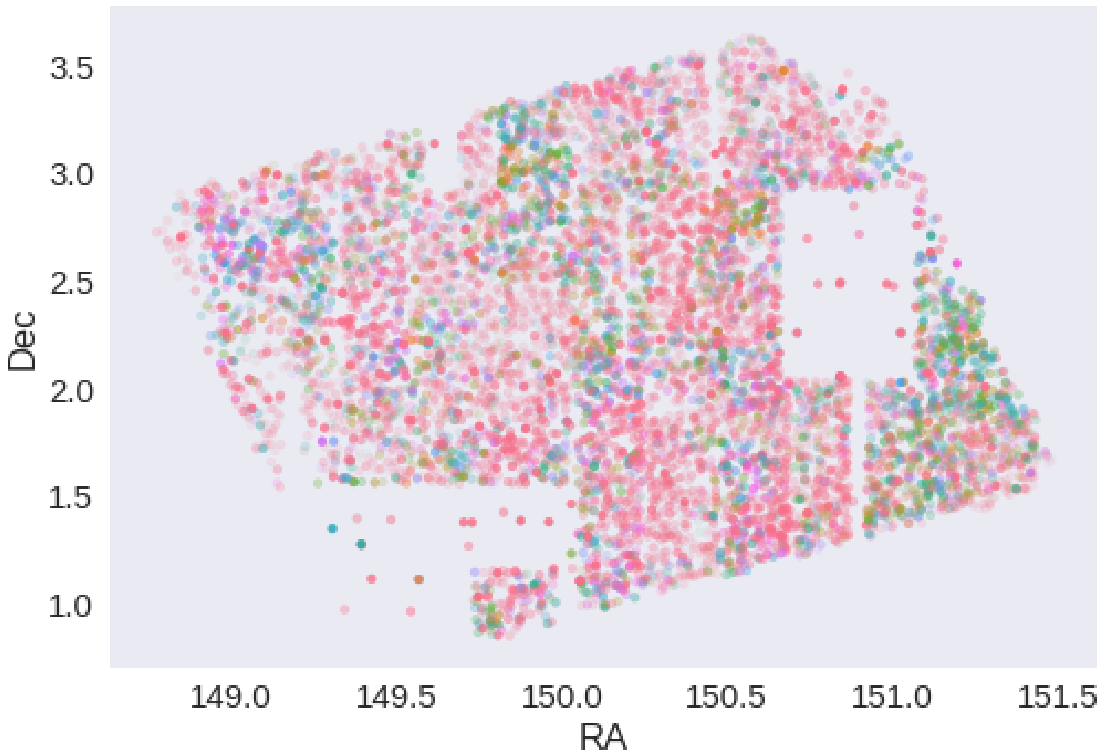
We remove duplicated objects from the input catalogues.

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)


The initial catalogue had 78235 sources.
The cleaned catalogue has 78114 sources (121 removed).
The cleaned catalogue has 118 sources flagged as having been cleaned
```

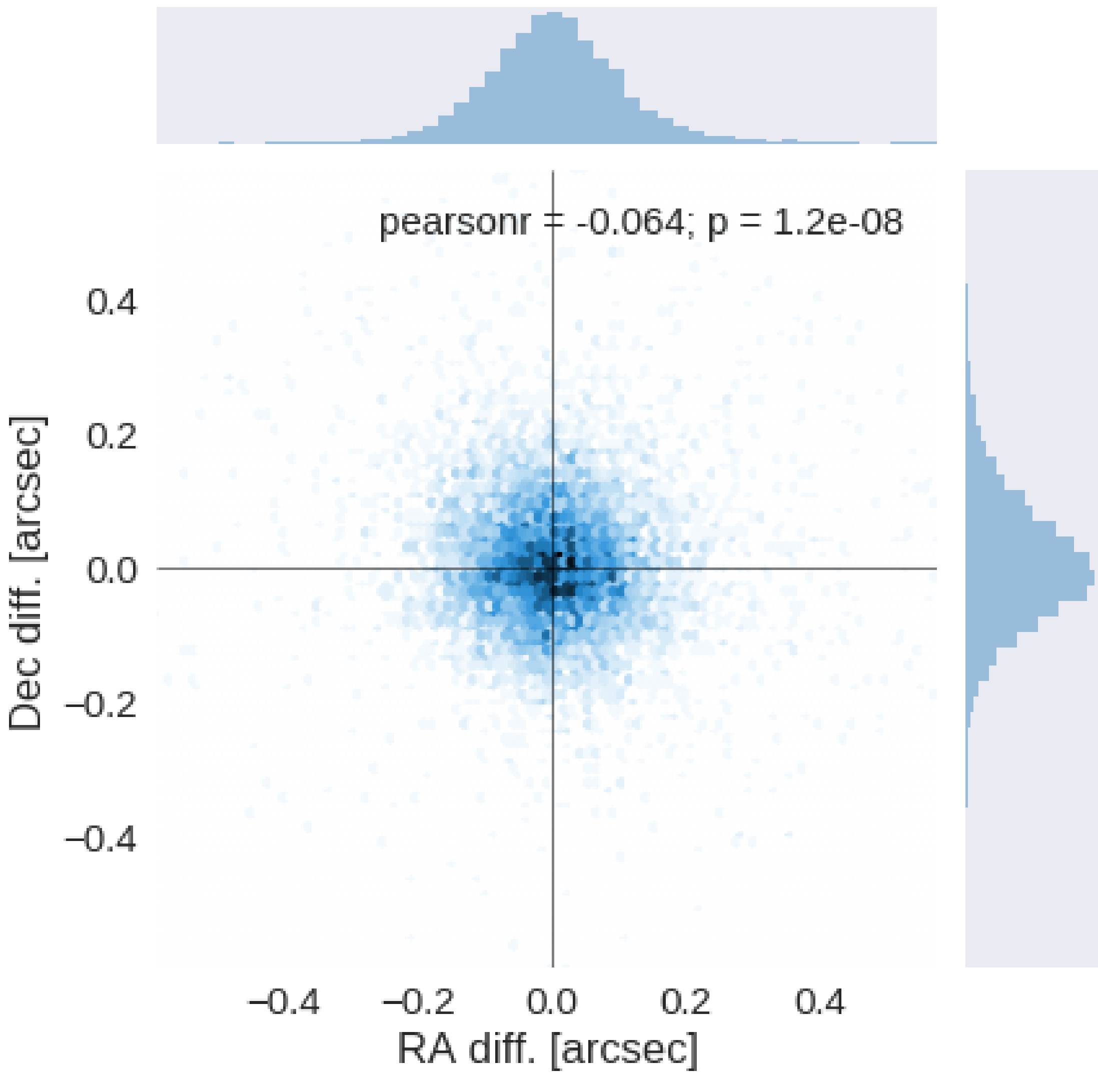
1.4 III - Astrometry correction

We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.


pearsonr = -0.073; p = 5.6e-11
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.4
−0.2
0.0
0.2
0.4
RA diff. [arcsec]




```
RA correction: -0.084222478335505 arcsec
Dec correction: -0.06767946427048699 arcsec
```



pearsonr = -0.064; p = 1.2e-08
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.4
−0.2
0.0
0.2
0.4
RA diff. [arcsec]

1.5 IV - Flagging Gaia objects

```
8625 sources flagged.
```

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.8_CFHT-WIRDS

March 8, 2018

1 XMM-LSS master catalogue

1.1 Preparation of Canada France Hawaii Telescope WIRDS Survey (CFHT-WIRDS) data

The catalogue is in `dmu0_CFHT-WIRDS`.

In the catalogue, we keep:

- The position;
- The stellarity;
- The aperture magnitude (3 arcsec).
- The total magnitude (Kron like aperture magnitude).

```
This notebook was run with herschelhelp_internal version:
0246c5d (Thu Jan 25 17:01:47 2018 +0000) [with local modifications]
```

1.2 I - Column selection

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/ipykernel/__main__.py:63:
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/ipykernel/__main__.py:64:
```

```
Out[5]: <IPython.core.display.HTML object>
```

1.3 II - Removal of duplicated sources

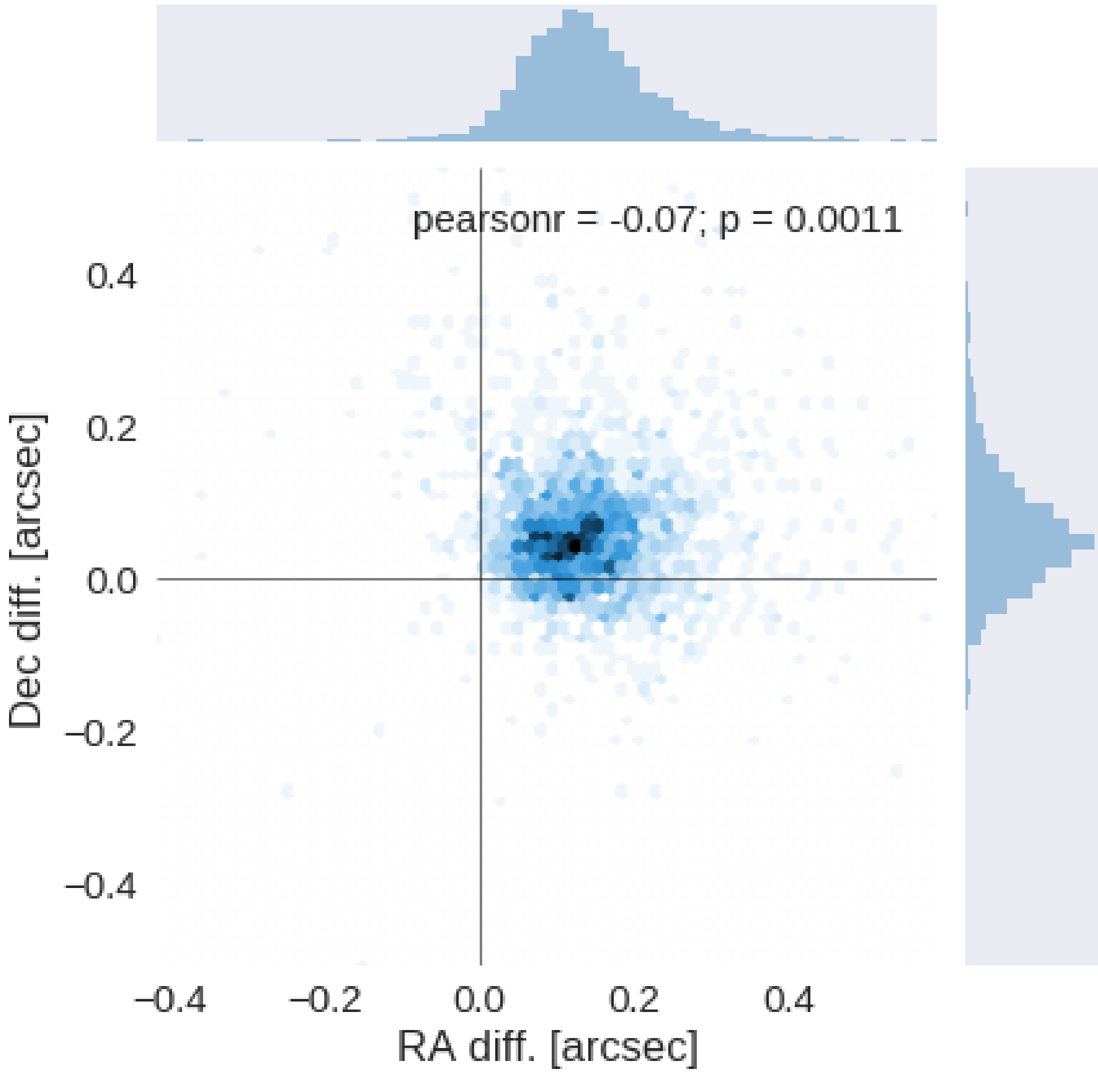
We remove duplicated objects from the input catalogues.

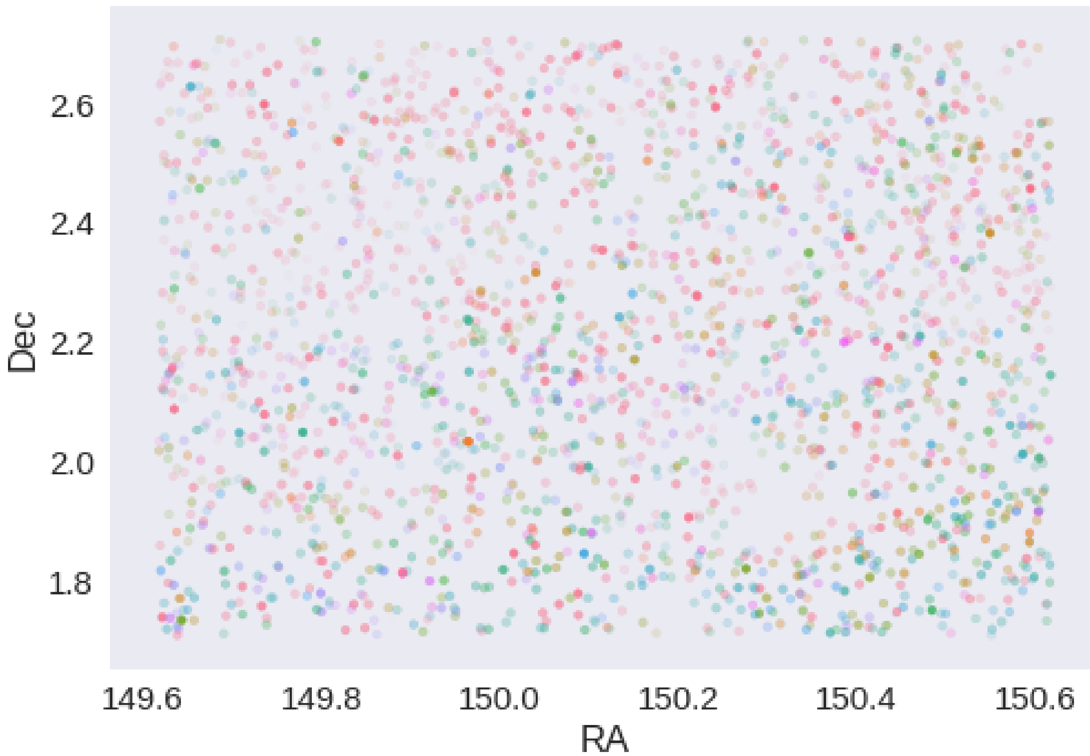
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
The initial catalogue had 170915 sources.
The cleaned catalogue has 170915 sources (0 removed).
The cleaned catalogue has 0 sources flagged as having been cleaned
```

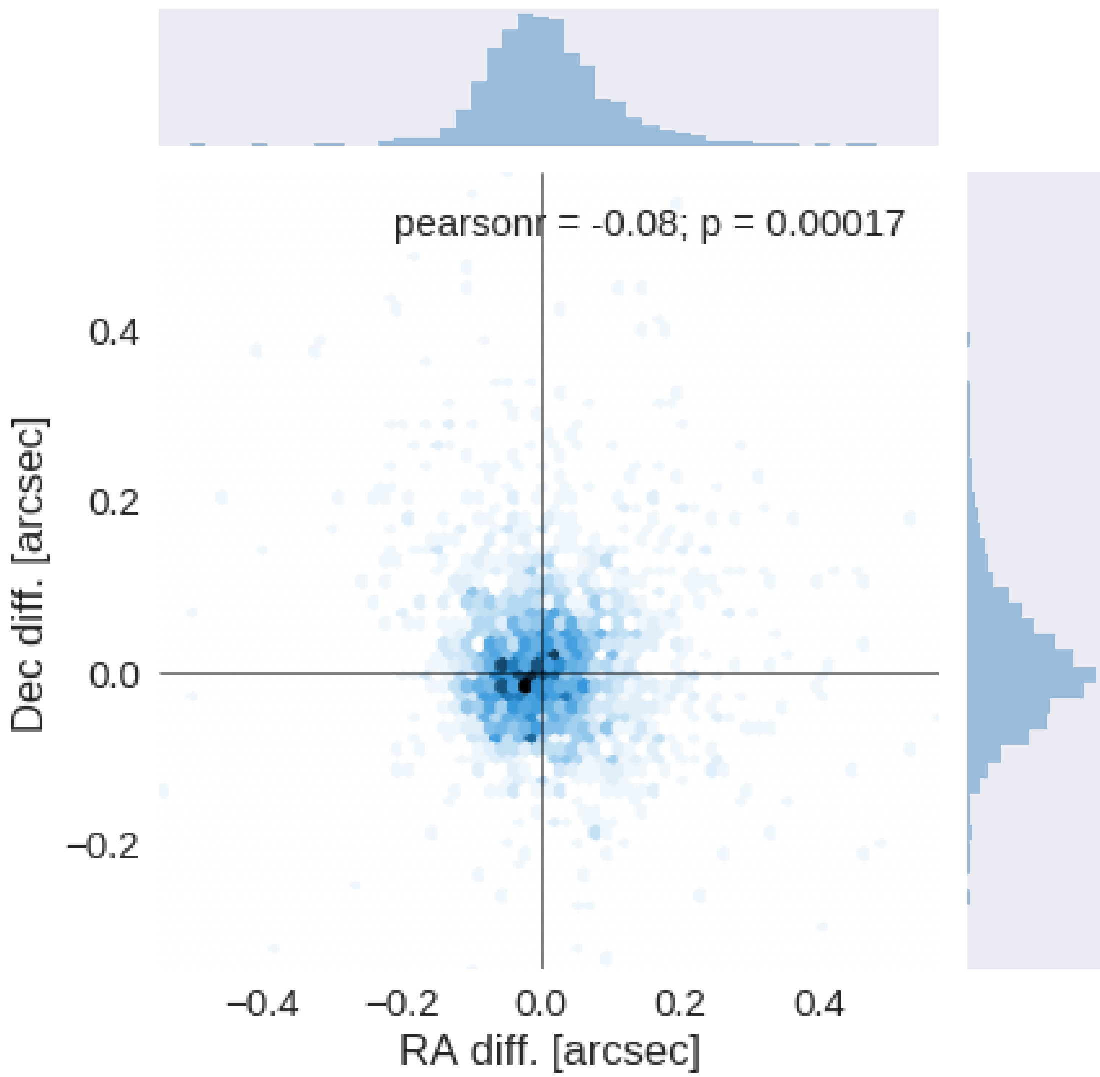
1.4 III - Astrometry correction

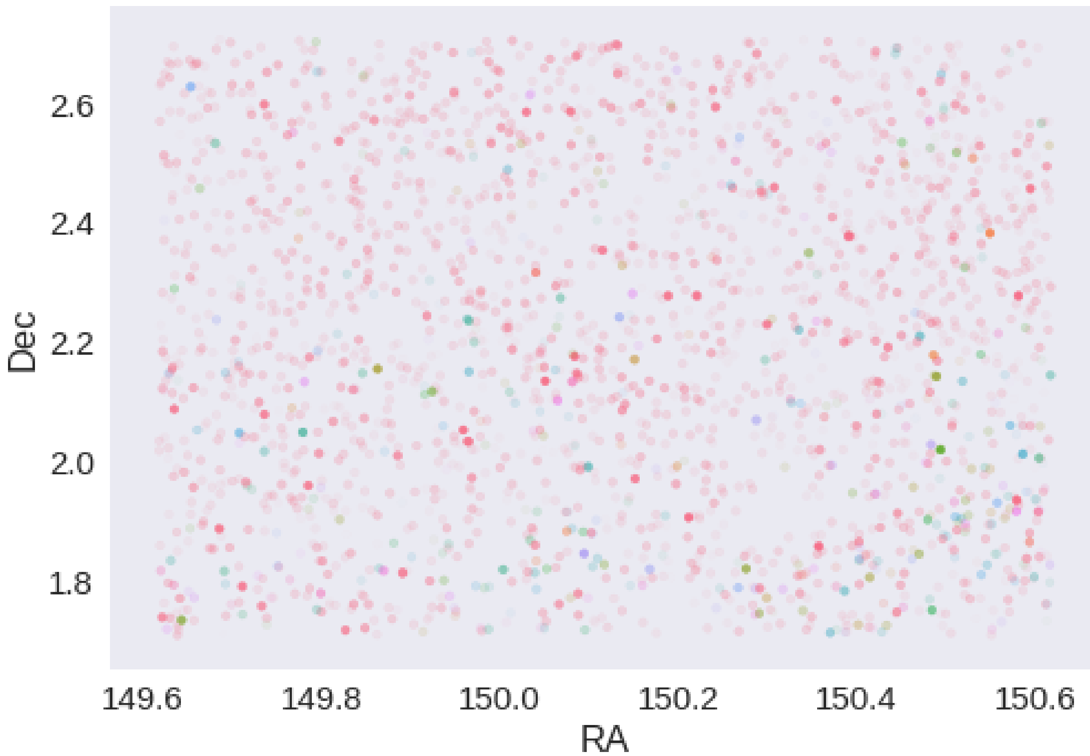
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.






```
RA correction: -0.13171006982020117 arcsec
Dec correction: -0.05162759665218175 arcsec
```


pearsonr = -0.08; p = 0.00017
0.4
0.2
0.0
−0.2
Dec diff. [arcsec]
−0.4
−0.2
0.0
0.2
0.4
RA diff. [arcsec]



1.5 IV - Flagging Gaia objects

```
2237 sources flagged.
```

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.9_COSMOS2015

March 8, 2018

1 COSMOS master catalogue

1.1 Convert COSMOS2016 to help format for comparison and homogeniety

This catalogue comes from `dmu1_COSMOS2015`. At present we will only cross match the ids into the HELP masterlist. to go into the cross id table. This will allow comparisons for our internal testing as well as allow users of the COSMOS catalogue to get other fluxes and HELP products.

```
This notebook was run with herschelhelp_internal version:
0246c5d (Thu Jan 25 17:01:47 2018 +0000) [with local modifications]
This notebook was executed on:
2018-02-16 17:22:05.499160
```

1.2 I - Column selection

```
WARNING: UnitsWarning: The unit 'erg' has been deprecated in the FITS standard. Suggested: cm2 g
WARNING: UnitsWarning: 'log(Msun)' did not parse as fits unit: At col 4, Unit 'Msun' not support
WARNING: UnitsWarning: 'log(Msun/yr)' did not parse as fits unit: At col 4, Unit 'Msun' not supp
WARNING: UnitsWarning: 'log(yr**-1)' did not parse as fits unit: 'log' is not a recognized funct
WARNING: UnitsWarning: 'log(erg.s**-1.Hz**-1)' did not parse as fits unit: 'log' is not a recogn
```

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:39: RuntimeWarning: overflow encounter
  fluxes = 10 ** ((8.9 - magnitudes)/2.5)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:76: RuntimeWarning: invalid value enco
  magnitudes = 2.5 * (23 - np.log10(fluxes)) - 48.6
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:76: RuntimeWarning: divide by zero enc
  magnitudes = 2.5 * (23 - np.log10(fluxes)) - 48.6
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:80: RuntimeWarning: invalid value enco
  errors = 2.5 / np.log(10) * errors_on_fluxes / fluxes
```

```
Out[8]: <IPython.core.display.HTML object>
```

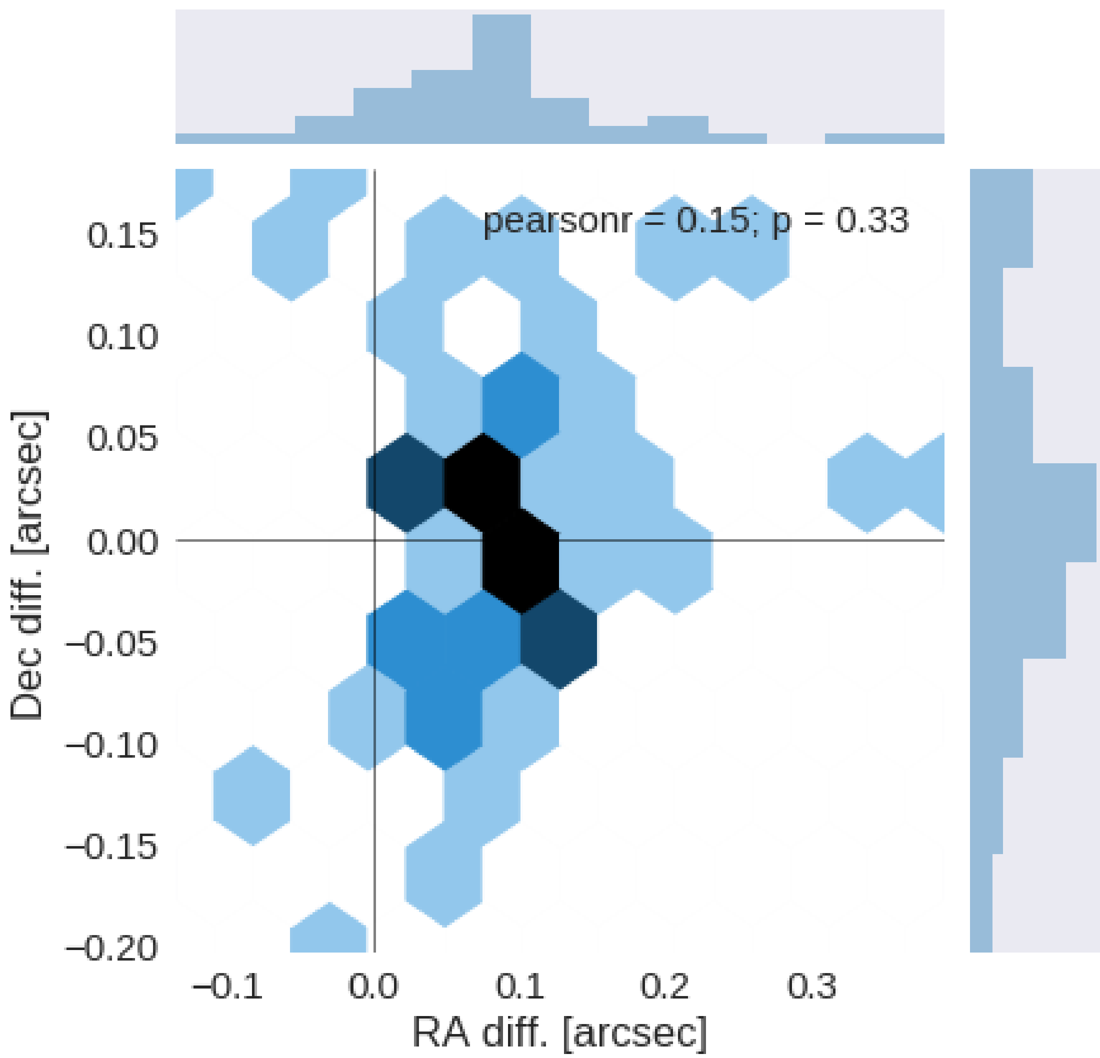
1.3 II - Removal of duplicated sources

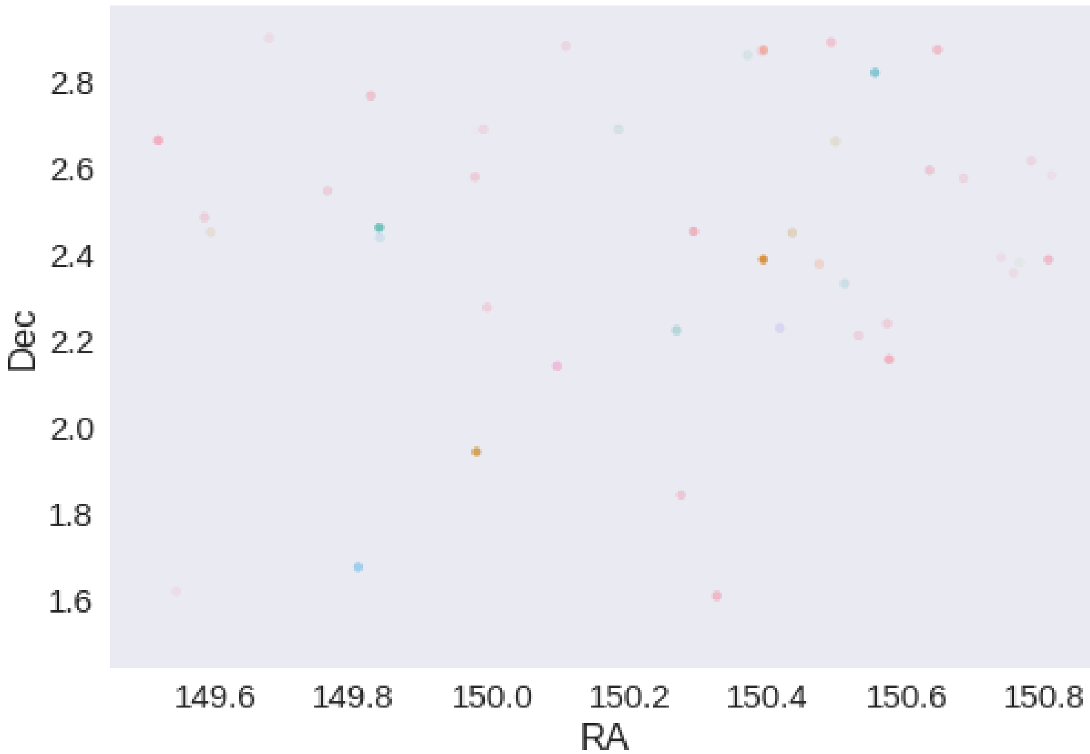
We remove duplicated objects from the input catalogues.

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)


The initial catalogue had 694478 sources.
The cleaned catalogue has 694478 sources (0 removed).
The cleaned catalogue has 0 sources flagged as having been cleaned
```

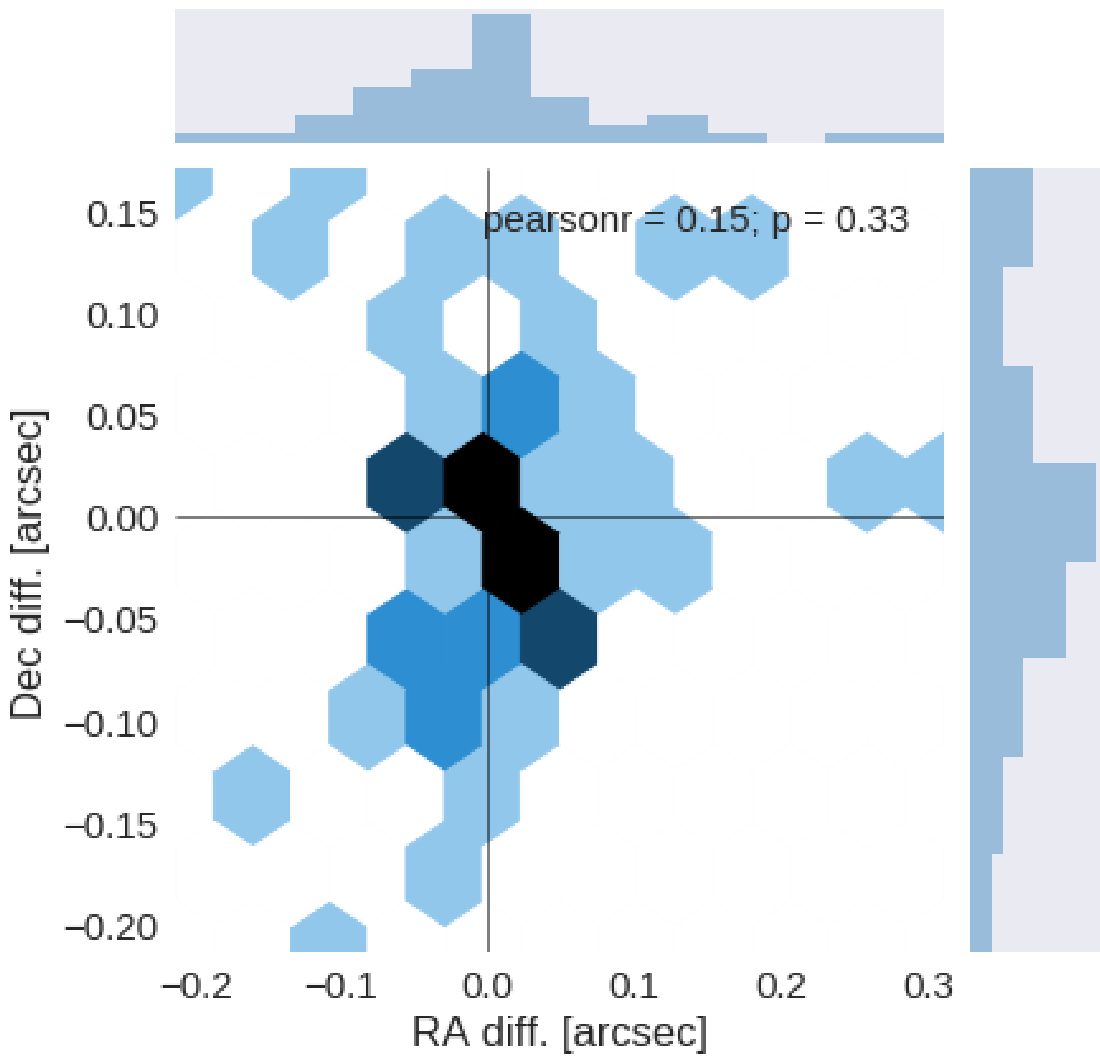
1.4 III - Astrometry correction

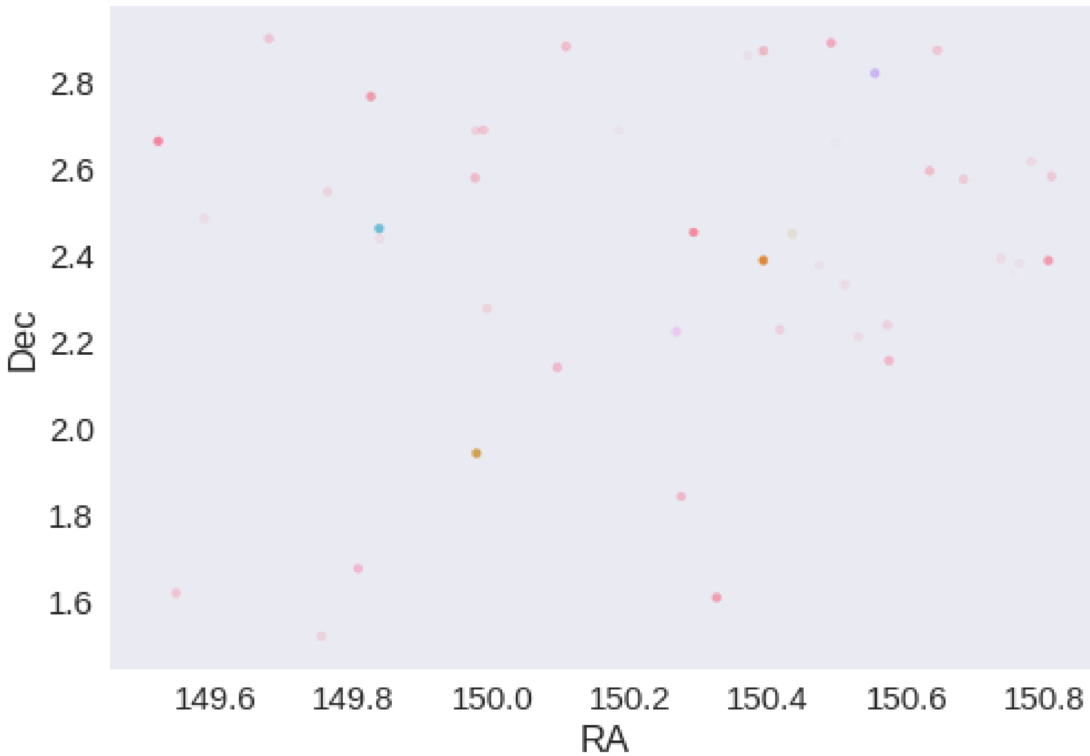
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.






```
RA correction: -0.07898549040419311 arcsec
Dec correction: -0.010563906203397977 arcsec
```


pearsonr = 0.15; p = 0.33
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
−0.20
Dec diff. [arcsec]
−0.2
−0.1
0.0
0.1
0.2
0.3
RA diff. [arcsec]



1.5 IV - Flagging Gaia objects

```
46 sources flagged.
```

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

2_Merging

March 8, 2018

1 COSMOS master catalogue

This notebook presents the merge of the various pristine catalogues to produce HELP mater catalogue on COSMOS.

```
This notebook was run with herschelhelp_internal version:
0246c5d (Thu Jan 25 17:01:47 2018 +0000) [with local modifications]
This notebook was executed on:
2018-02-17 01:07:25.965214
```

1.1 I - Reading the prepared pristine catalogues

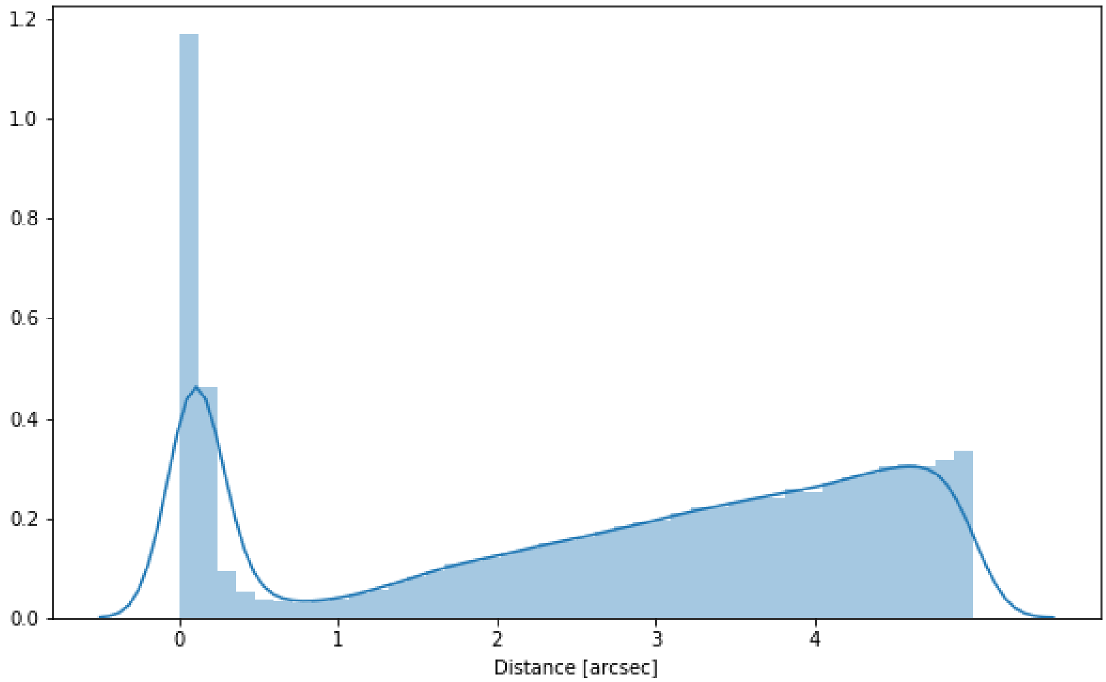
1.2 II - Merging tables

We first merge the optical catalogues and then add the infrared ones: CANDELS, CFHTLS, DECaLS, HSC, KIDS, PanSTARRS, UKIDSS-LAS, and CFHT-WIRDS.

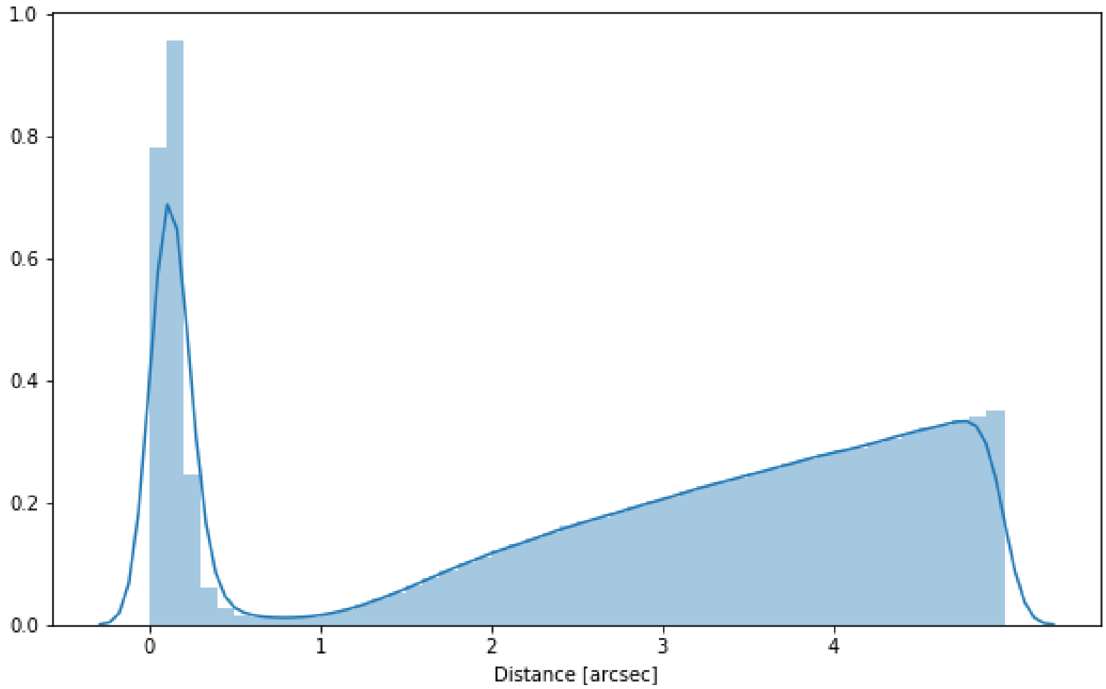
At every step, we look at the distribution of the distances to the nearest source in the merged catalogue to determine the best crossmatching radius.

1.2.1 COSMOS 2015

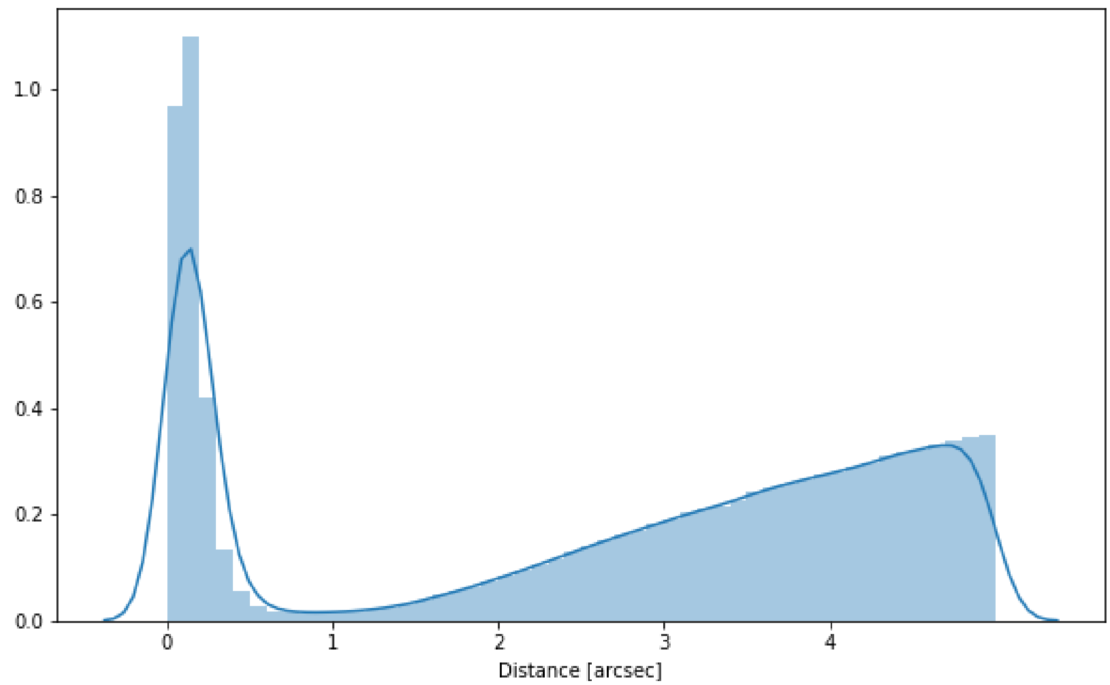
1.2.2 Add CANDELS



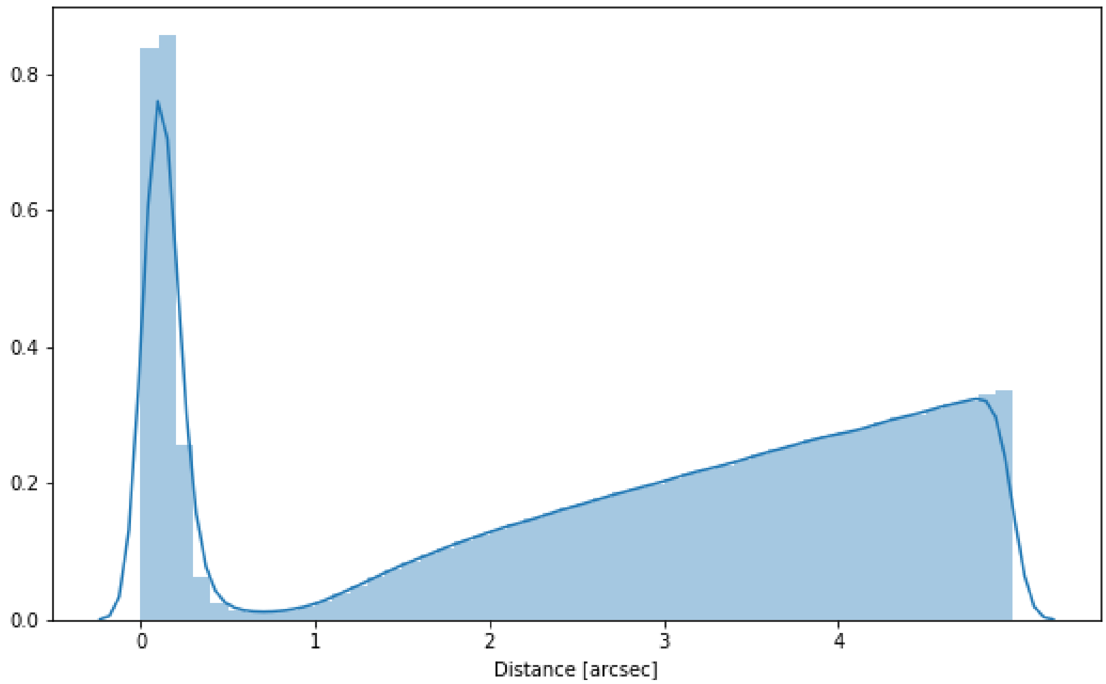
1.2.3 Add CFHTLS



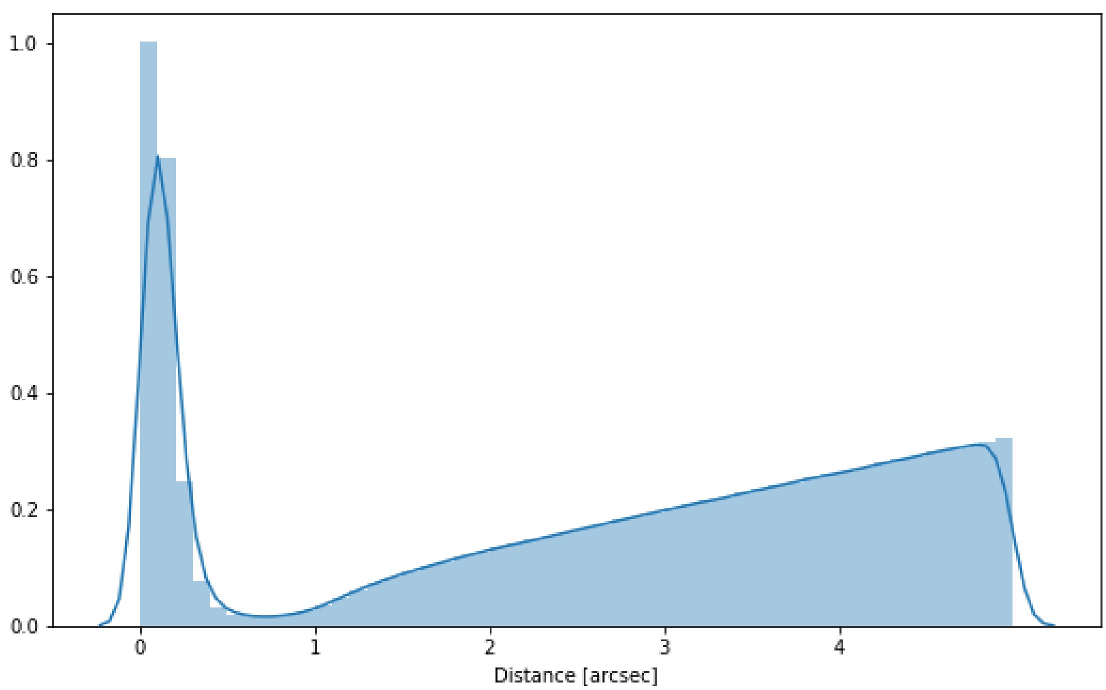
1.2.4 Add DECaLS



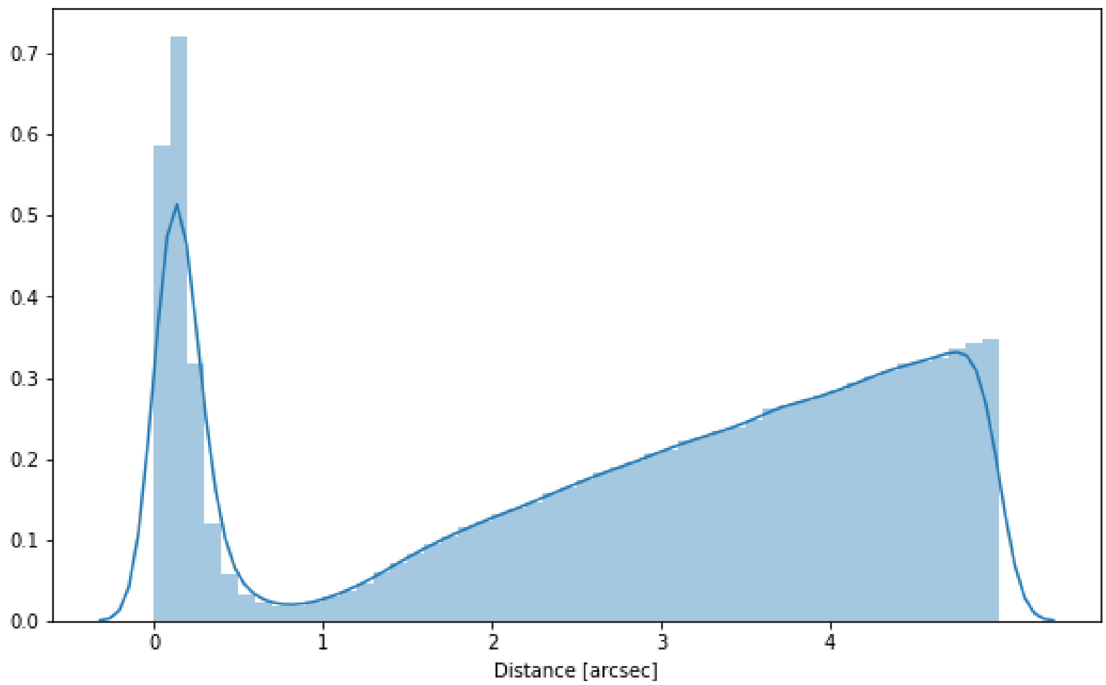
1.2.5 Add HSC-UDEEP



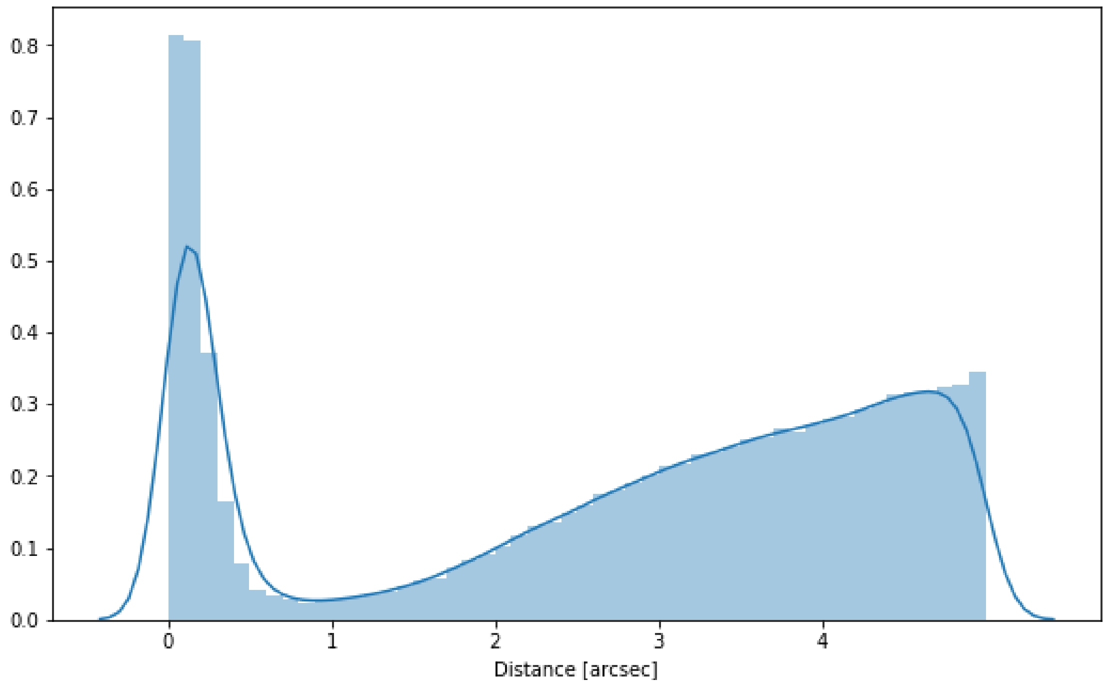
1.2.6 Add HSC-DEEP



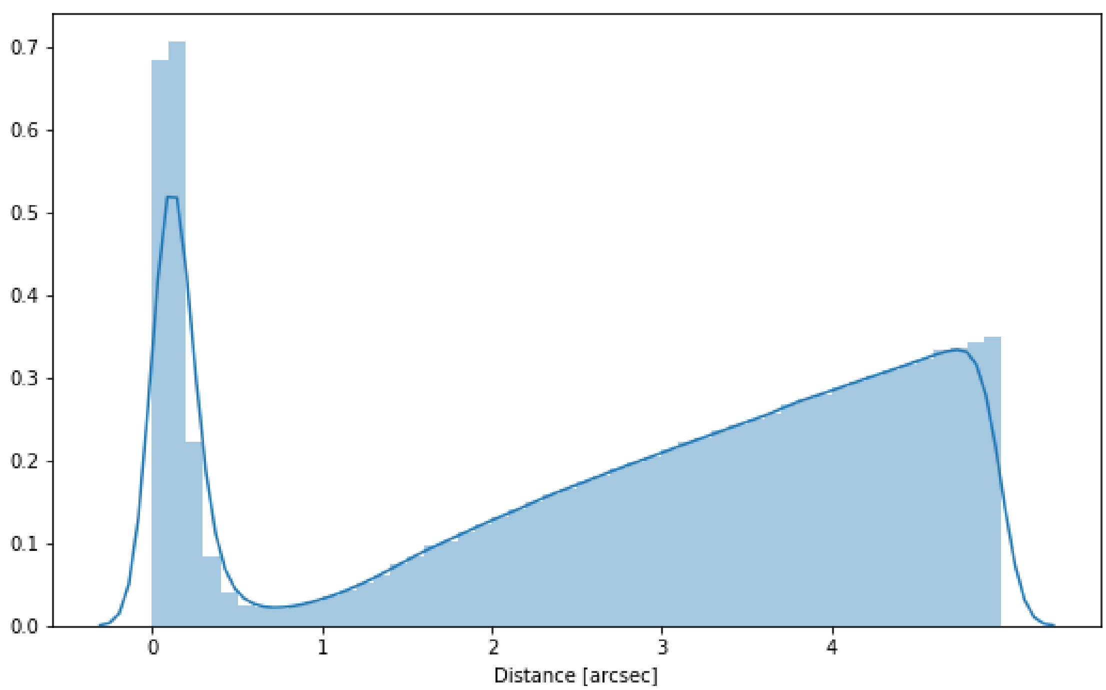
1.2.7 Add KIDS



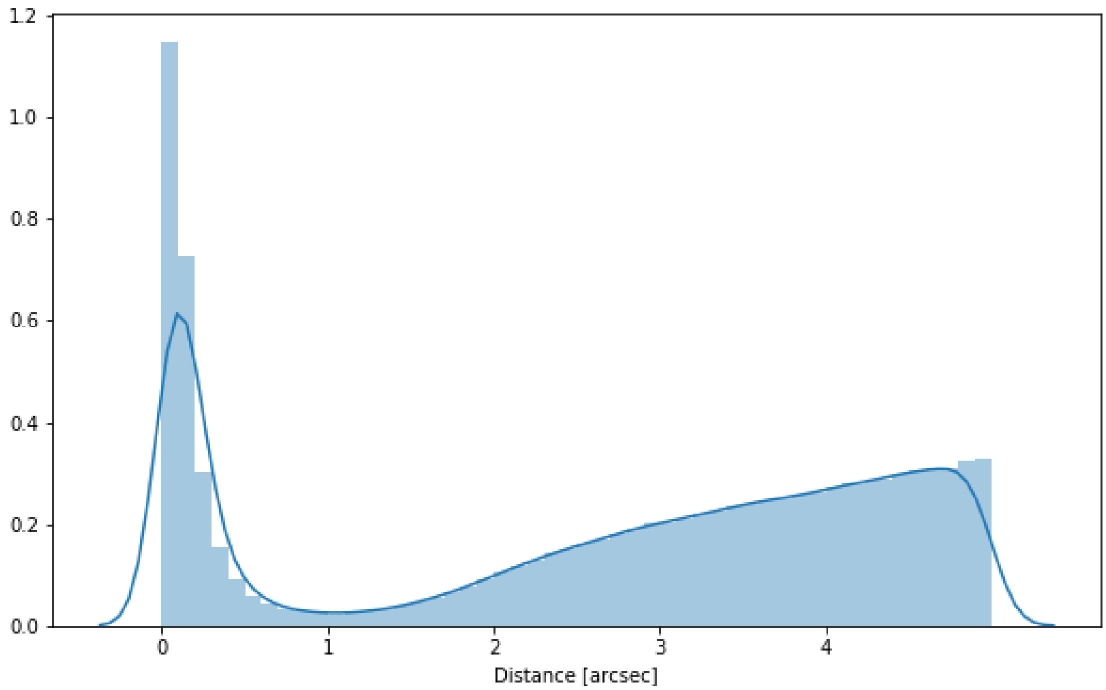
1.2.8 Add UKIDSS LAS



1.2.9 Add CFHT-WIRDS



1.3 Add PanSTARRS



1.3.1 Cleaning

When we merge the catalogues, astropy masks the non-existent values (e.g. when a row comes only from a catalogue and has no counterparts in the other, the columns from the latest are masked for that row). We indicate to use NaN for masked values for floats columns, False for flag columns and -1 for ID columns.

```
Out[26]: <IPython.core.display.HTML object>
```

1.4 III - Merging flags and stellarity

Each pristine catalogue contains a flag indicating if the source was associated to a another nearby source that was removed during the cleaning process. We merge these flags in a single one.

Wirds was created with a merge so contains a flag to be merged with the merg flag produced here

Each pristine catalogue contains a flag indicating the probability of a source being a Gaia object (0: not a Gaia object, 1: possibly, 2: probably, 3: definitely). We merge these flags taking the highest value.

Each prisitine catalogue may contain one or several stellarity columns indicating the probability (0 to 1) of each source being a star. We merge these columns taking the highest value.

```
cosmos_stellarity, candels_stellarity, cfhtls_stellarity, decals_stellarity, hsc-udeep_stellarit
```

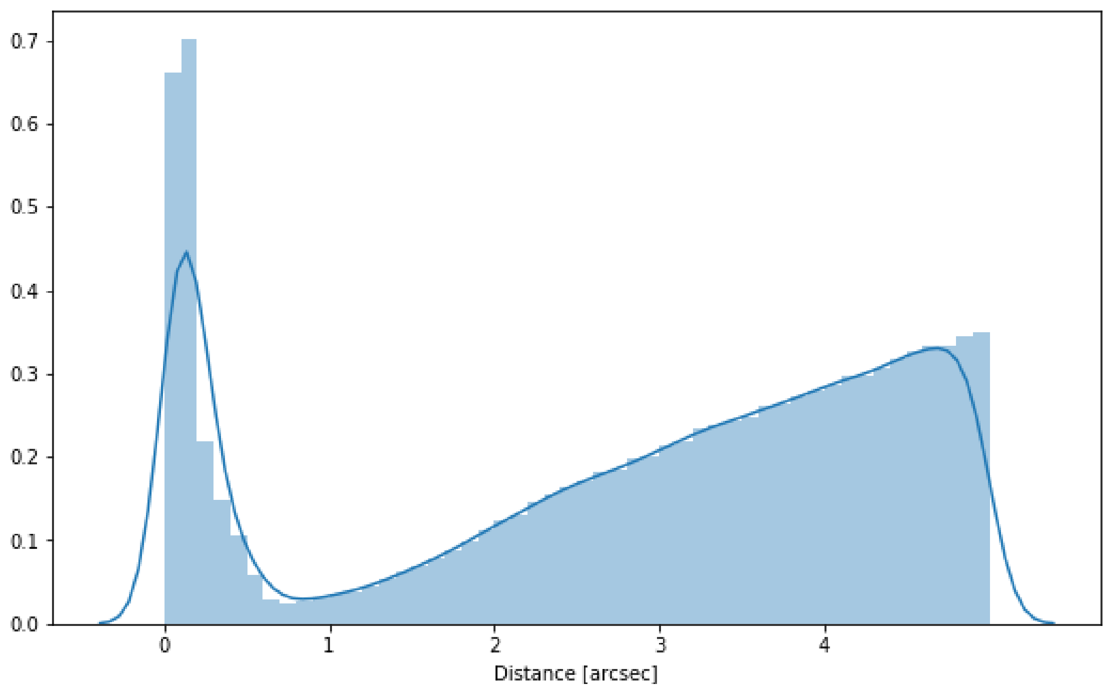
1.5 IV - Adding E(B-V) column

1.6 V a - Adding HELP unique identifiers and field columns

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:26
  return self.data.__eq__(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/ipykernel/__main__.py:4: V
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:78
  self.data[index] = value
```

```
The HELP IDs are not unique!!!
```

1.7 V b - Adding spec-z



1.8 VI - Choosing between multiple values for the same filter

1.8.1 VI.a HSC-DEEP and HSC-UDEEP and COSMOS

On COSMOS2015 we have early HSC y band photometry. To ensure values are the same as for the original run, we take fluxes in this order: COSMOS, HSC-DEEP, HSC-UDEEP.

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/core/numeric.py:301:
  format(shape, fill_value, array(fill_value).dtype), FutureWarning)
```

```
Out[41]: <IPython.core.display.HTML object>
```

1.9 VII.b Megacam

1.9.1 COSMOS vs CFHT-WIRDS vs CFHTLS

We take COSMOS over CFHTLS over CFHT-WIRDS

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/core/numeric.py:301:
  format(shape, fill_value, array(fill_value).dtype), FutureWarning)
```

```
Out[46]: <IPython.core.display.HTML object>
```

1.10 WIRcam

1.10.1 COSMOS vs WIRDS

We take COSMOS over WIRDS to ensure values are the same as for the original run

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/core/numeric.py:301:
  format(shape, fill_value, array(fill_value).dtype), FutureWarning)
```

```
Out[51]: <IPython.core.display.HTML object>
```

1.11 Final renaming

We rename some columns in line with HELP filter naming standards

1.12 VII.a Wavelength domain coverage

We add a binary `flag_optnir_obs` indicating that a source was observed in a given wavelength domain:

- 1 for observation in optical;
- 2 for observation in near-infrared;
- 4 for observation in mid-infrared (IRAC).

It's an integer binary flag, so a source observed both in optical and near-infrared by not in mid-infrared would have this flag at 1 + 2 = 3.

Note 1: The observation flag is based on the creation of multi-order coverage maps from the catalogues, this may not be accurate, especially on the edges of the coverage.

Note 2: Being on the observation coverage does not mean having fluxes in that wavelength domain. For sources observed in one domain but having no flux in it, one must take into consideration de different depths in the catalogue we are using.

1.13 VII.b Wavelength domain detection

We add a binary `flag_optnir_det` indicating that a source was detected in a given wavelength domain:

- 1 for detection in optical;
- 2 for detection in near-infrared;
- 4 for detection in mid-infrared (IRAC).

It's an integer binary flag, so a source detected both in optical and near-infrared by not in mid-infrared would have this flag at 1 + 2 = 3.

Note 1: We use the total flux columns to know if the source has flux, in some catalogues, we may have aperture flux and no total flux.

To get rid of artefacts (chip edges, star flares, etc.) we consider that a source is detected in one wavelength domain when it has a flux value in **at least two bands**. That means that good sources will be excluded from this flag when they are on the coverage of only one band.

1.14 VIII - Cross-identification table

We are producing a table associating to each HELP identifier, the identifiers of the sources in the pristine catalogue. This can be used to easily get additional information from them.

```
64 master list rows had multiple associations.
```

```
['help_id', 'cosmos_id', 'candels_id', 'cfhtls_id', 'decals_id', 'hsc-udeep_id', 'hsc-deep_id',
```

1.15 IX - Adding HEALPix index

We are adding a column with a HEALPix index at order 13 associated with each source.

1.16 IX - Saving the catalogue

```
Missing columns: set()
```

3_Checks_and_diagnostics

March 8, 2018

1 COSMOS master catalogue

1.1 Checks and diagnostics

```
This notebook was run with herschelhelp_internal version:
0246c5d (Thu Jan 25 17:01:47 2018 +0000) [with local modifications]
This notebook was executed on:
2018-02-16 20:08:24.630697
```

1.2 0 - Quick checks

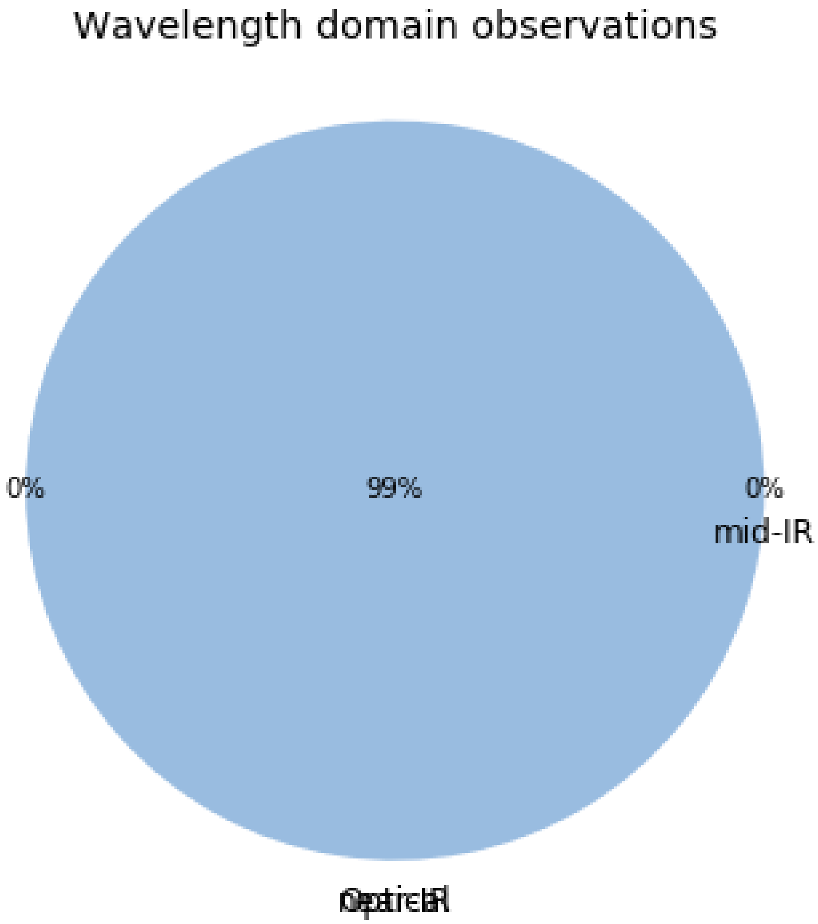
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/core/numeric.py:301:
  format(shape, fill_value, array(fill_value).dtype), FutureWarning)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/core/numeric.py:301:
  format(shape, fill_value, array(fill_value).dtype), FutureWarning)
```

```
Table shows only problematic columns.
```

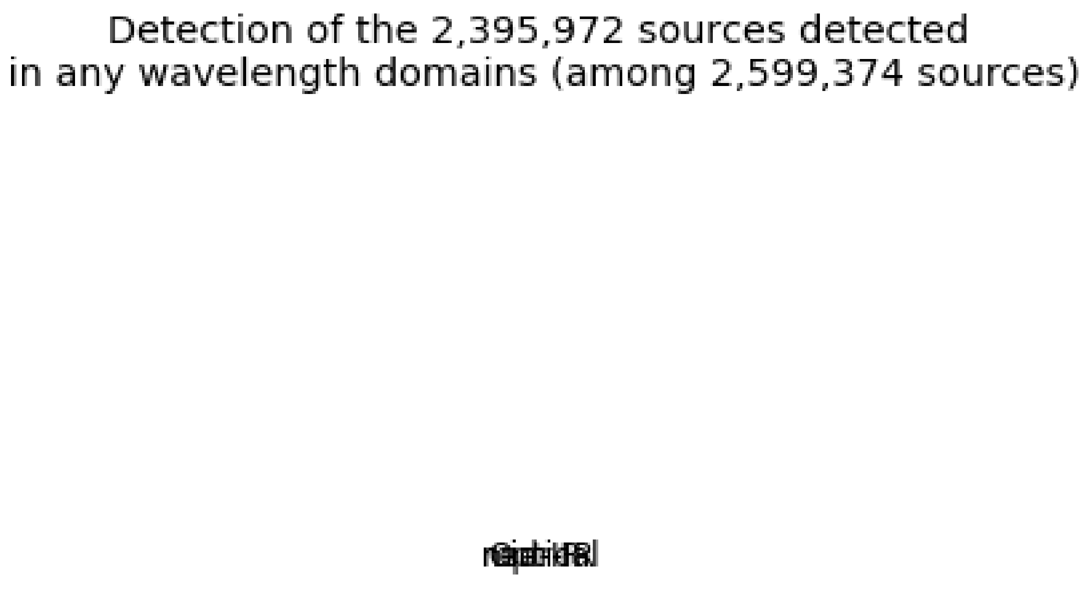
```
Out[4]: <IPython.core.display.HTML object>
```

1.3 I - Summary of wavelength domains

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/matplotlib_venn/_venn3.py:
  warnings.warn("Circle A has zero area")
```




```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/matplotlib_venn/_venn3.py:
  warnings.warn("All circles have zero area")
```

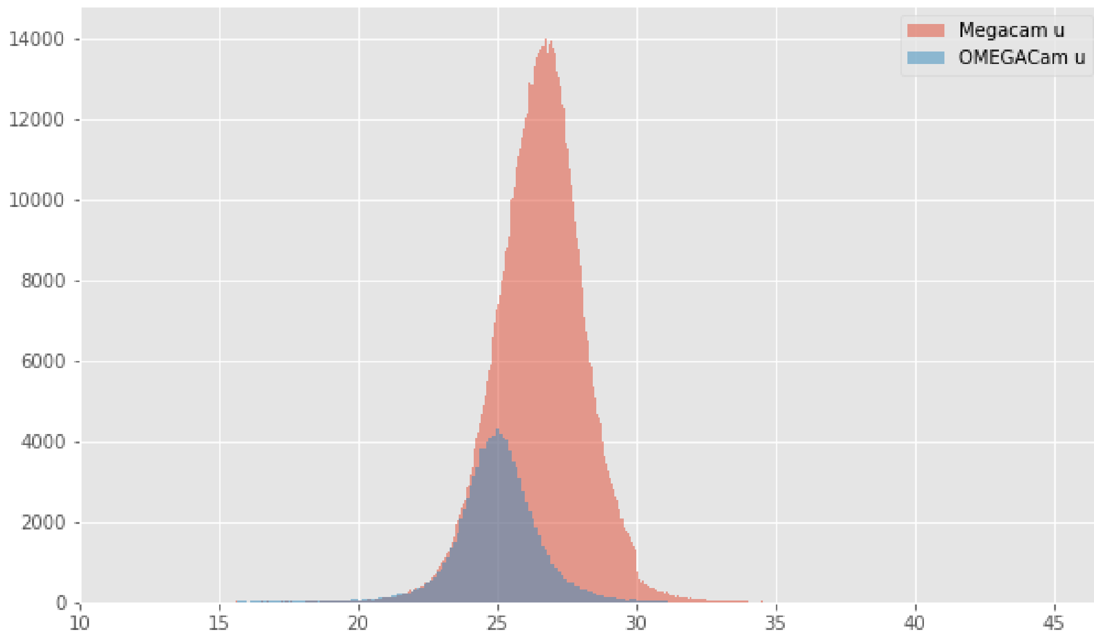


1.4 II - Comparing magnitudes in similar filters

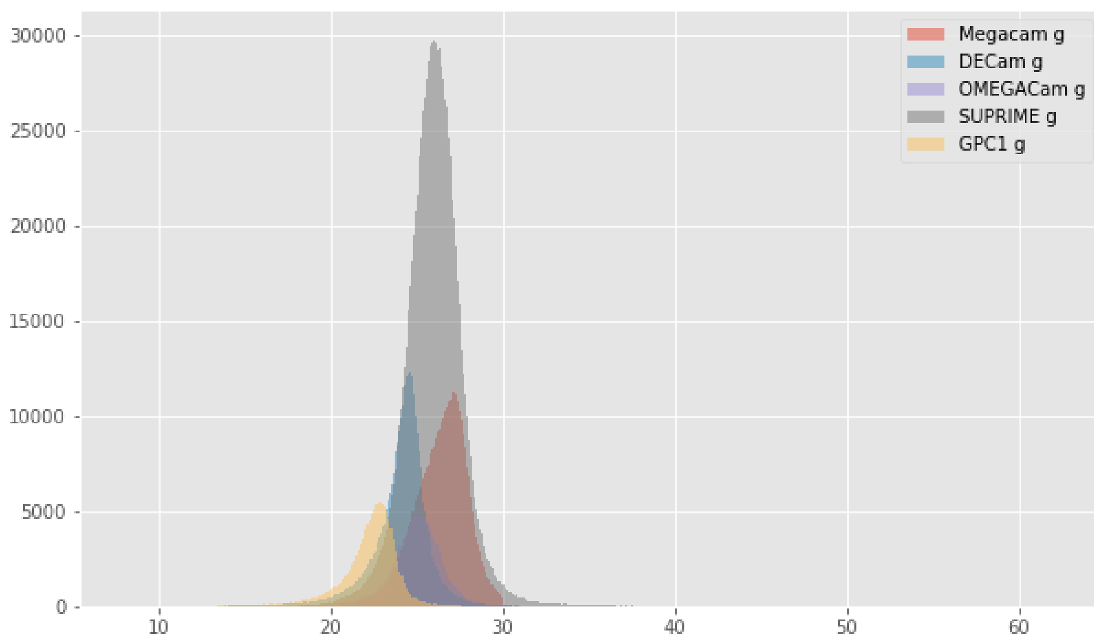
The master list if composed of several catalogues containing magnitudes in similar filters on different instruments. We are comparing the magnitudes in these corresponding filters.

1.4.1 II.a - Comparing depths

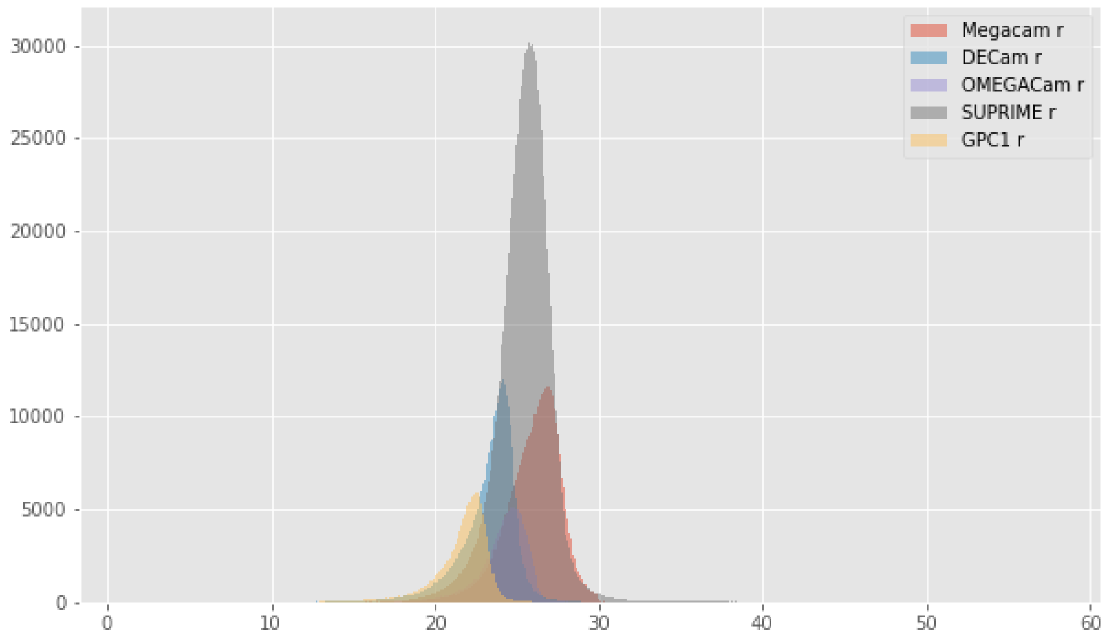
We compare the histograms of the total aperture magnitudes of similar bands.

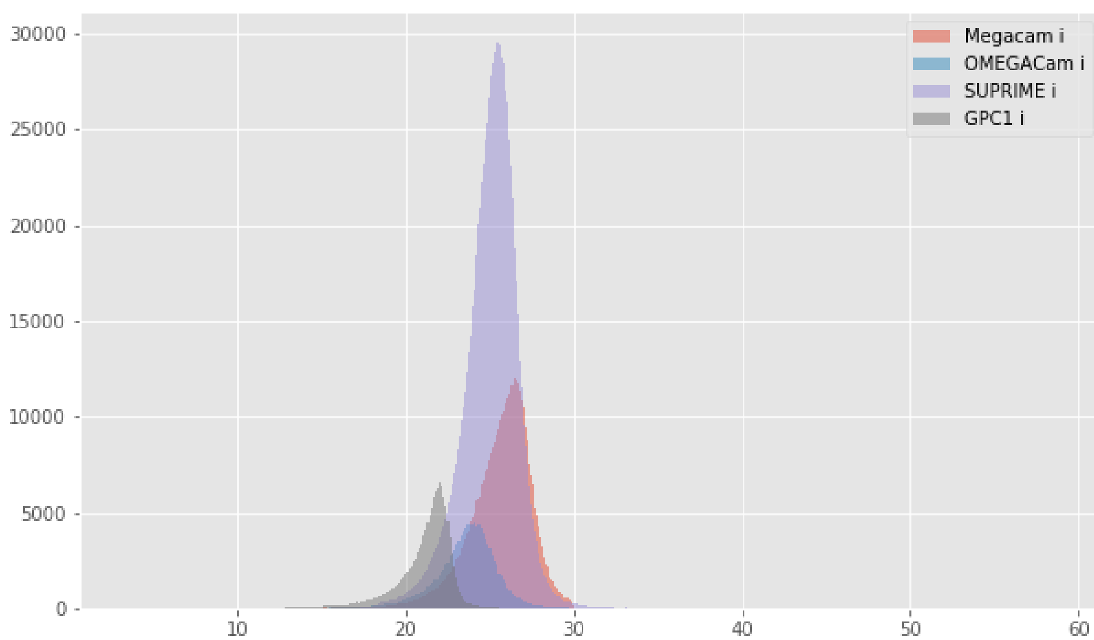


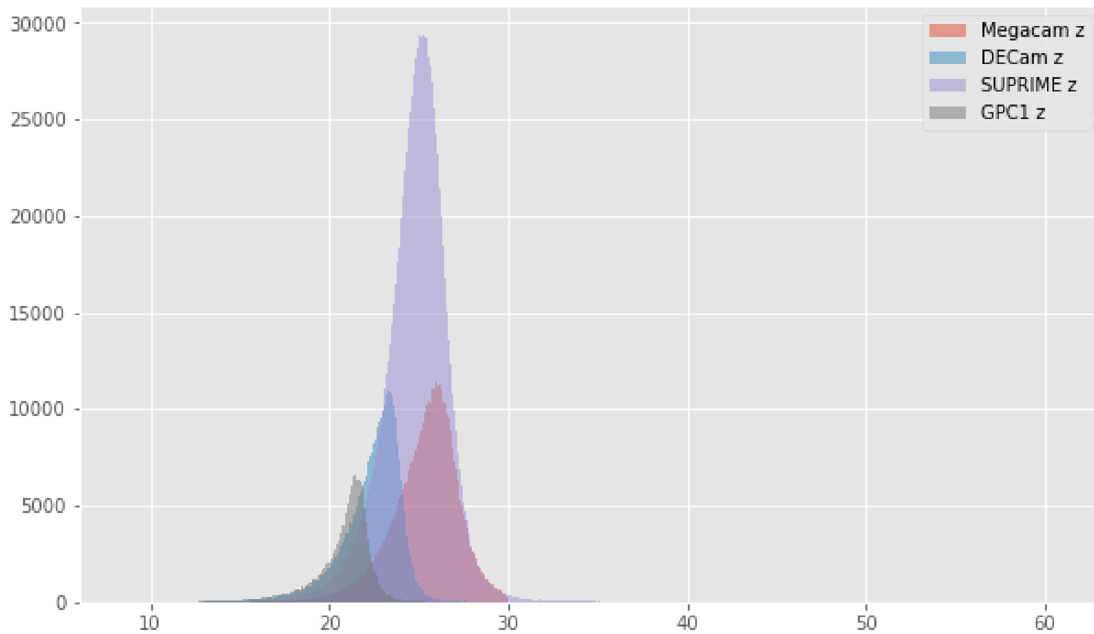
Megacam u
OMEGACam u
14000
12000
10000
8000
6000
4000
2000
0
10
15
20
25
30
35
40
45

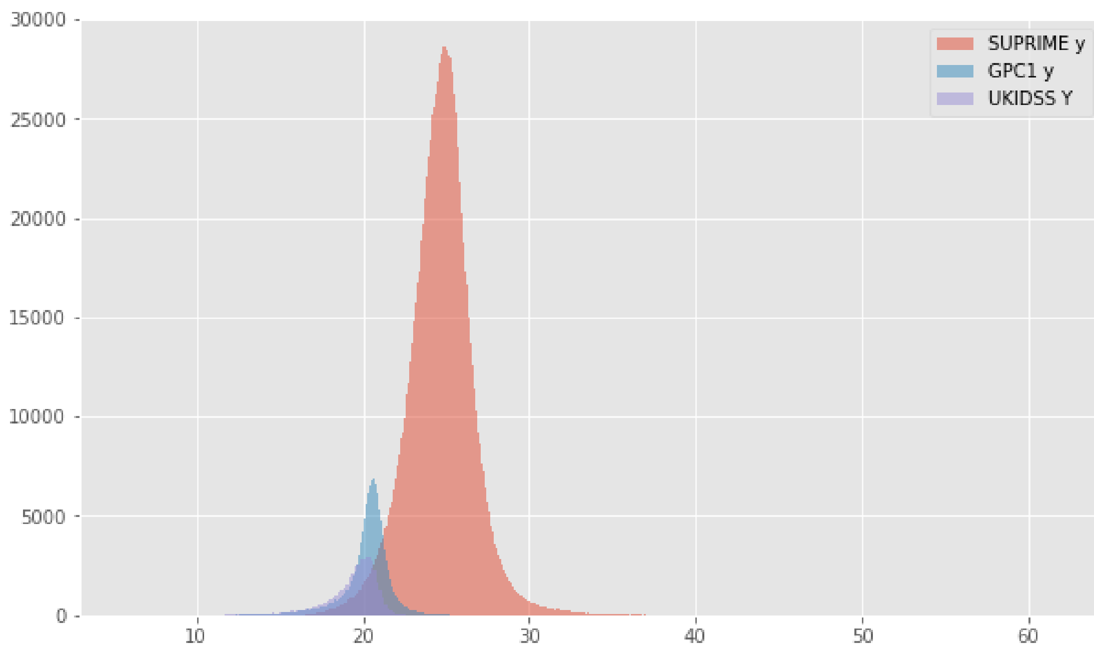


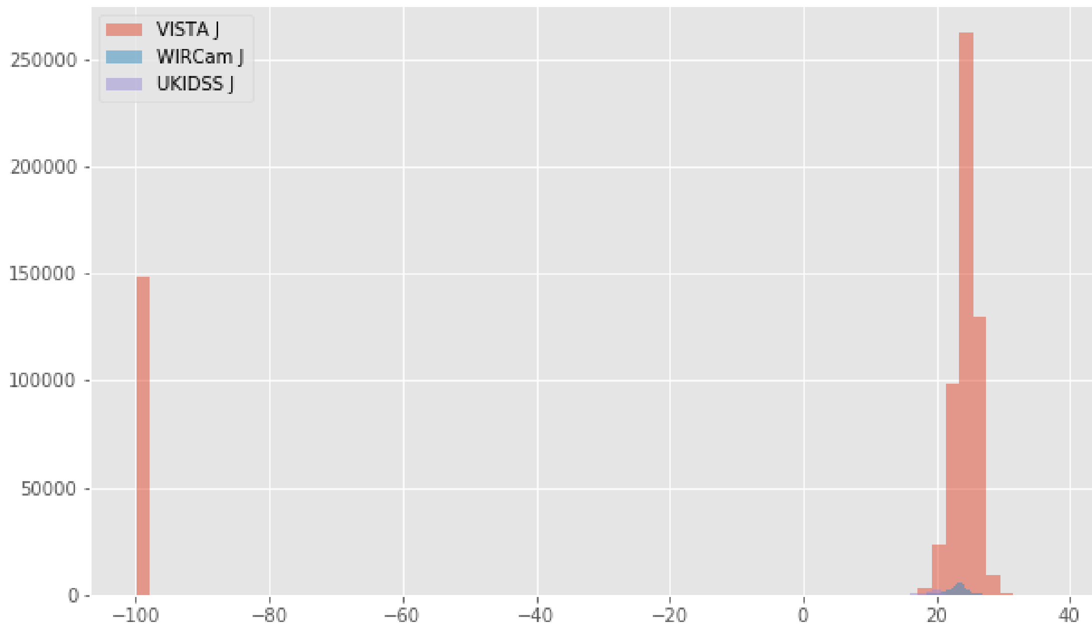
Megacam g
DECam g
OMEGACam g
SUPRIME g
GPC1 g
30000
25000
20000
15000
10000
5000
0
10
20
30
40
50
60

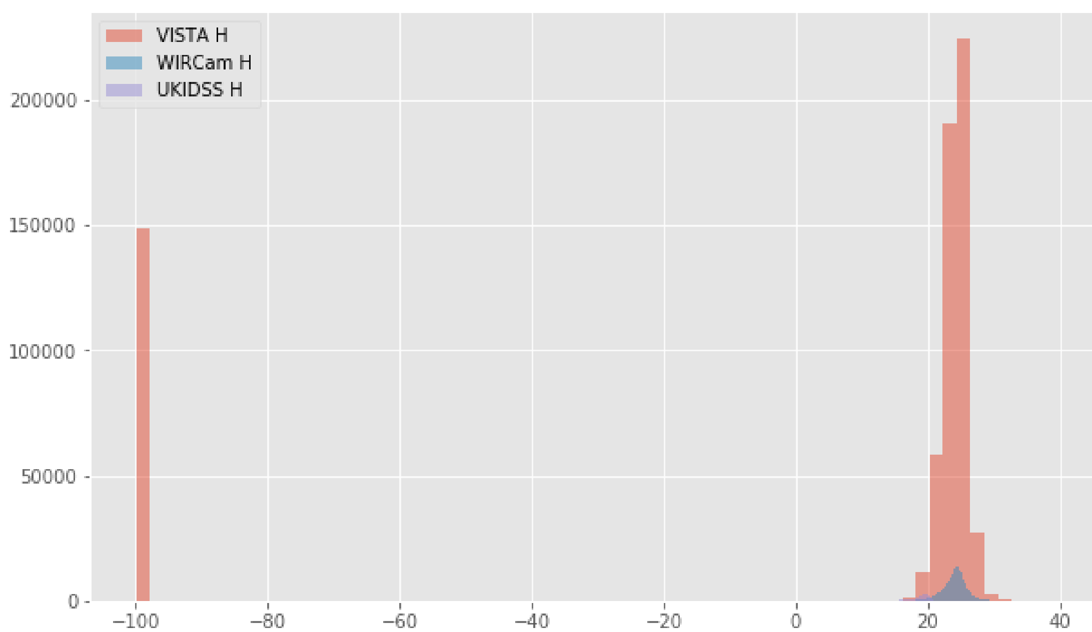

Megacam r
DECam r
OMEGACam r
SUPRIME r
GPC1 r
30000
25000
20000
15000
10000
5000
0
0
10
20
30
40
50
60

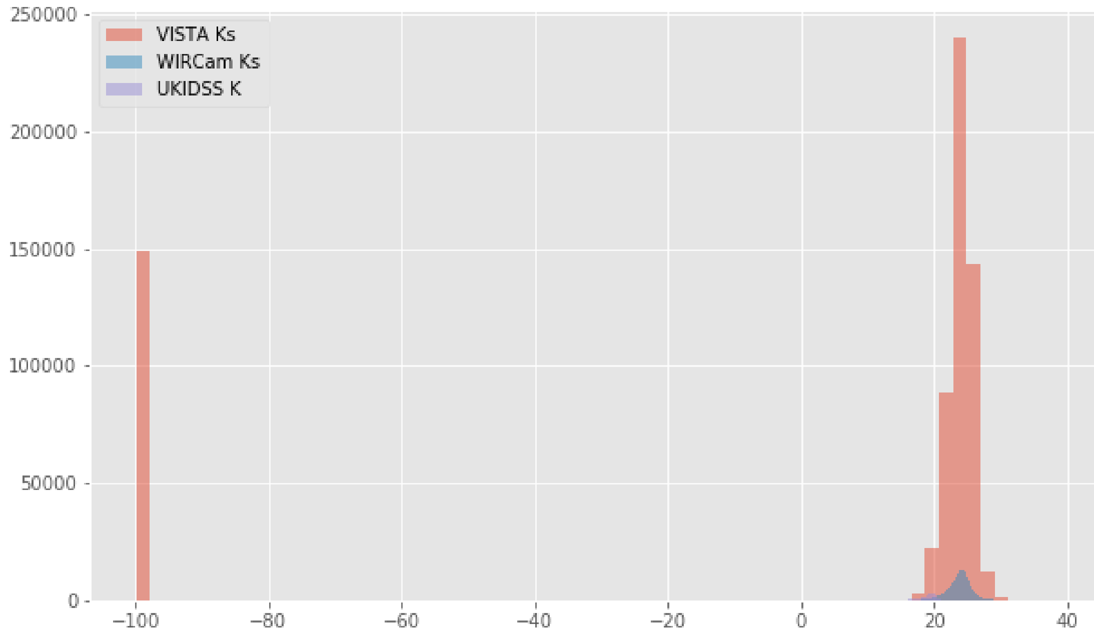

Megacam i
OMEGACam i
SUPRIME i
GPC1 i
30000
25000
20000
15000
10000
5000
0
10
20
30
40
50
60


Megacam z
DECam z
SUPRIME z
GPC1 z
30000
25000
20000
15000
10000
5000
0
10
20
30
40
50
60


SUPRIME y
GPC1 y
UKIDSS Y
30000
25000
20000
15000
10000
5000
0
10
20
30
40
50
60


VISTA J
WIRCam J
UKIDSS J
250000
200000
150000
100000
50000
0
−100
−80
−60
−40
−20
0
20
40

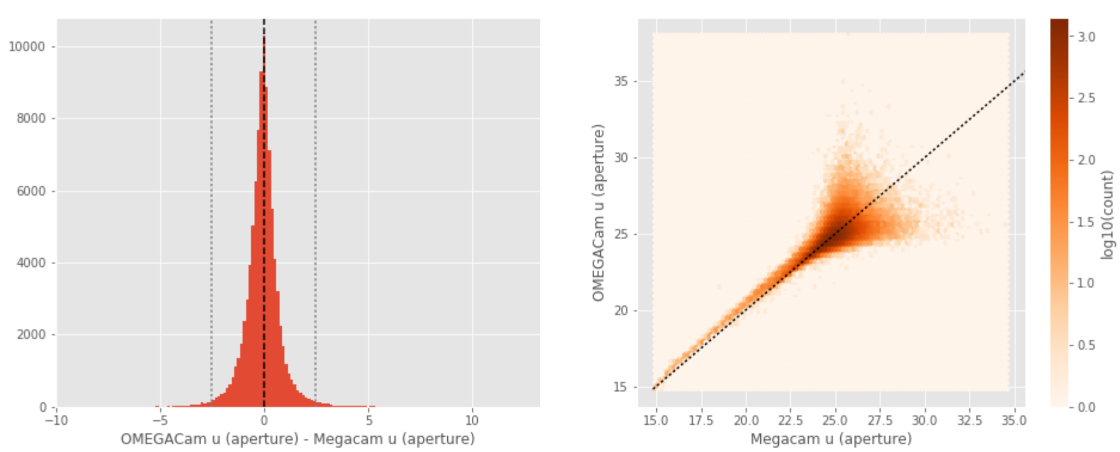

VISTA H
WIRCam H
UKIDSS H
200000
150000
100000
50000
0
−100
−80
−60
−40
−20
0
20
40



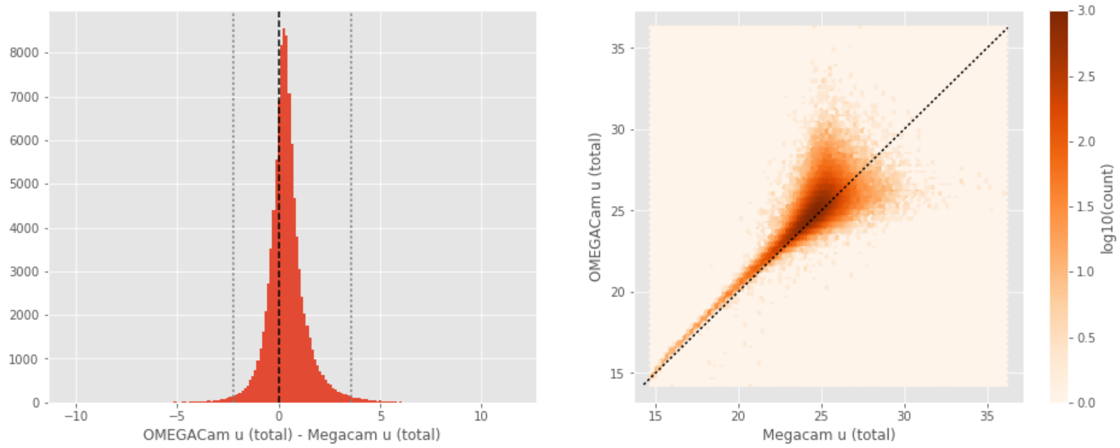
1.4.2 II.b - Comparing magnitudes

We compare one to one each magnitude in similar bands.

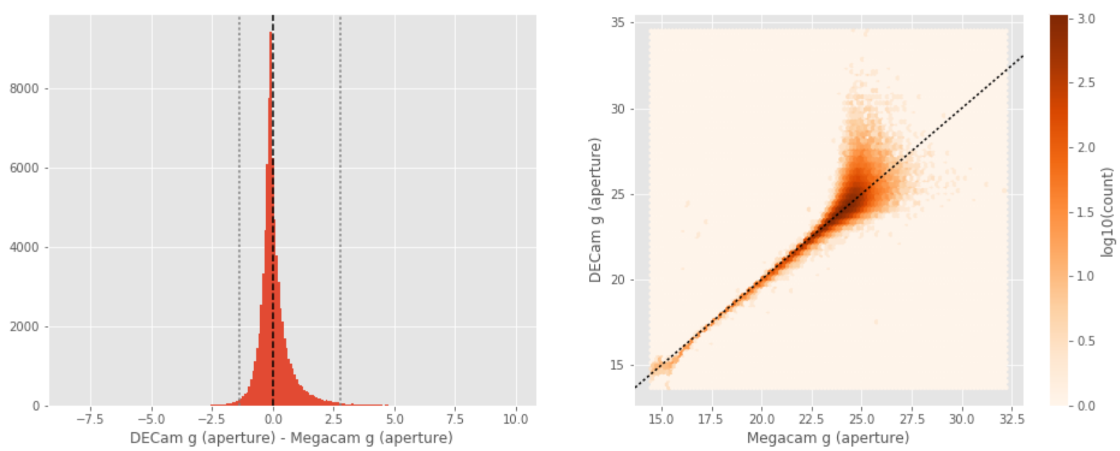
```
OMEGACam u (aperture) - Megacam u (aperture):
- Median: -0.06
- Median Absolute Deviation: 0.38
- 1% percentile: -2.5484440612792967
- 99% percentile: 2.4943000793457046
```



```
OMEGACam u (total) - Megacam u (total):
- Median: 0.31
- Median Absolute Deviation: 0.44
- 1% percentile: -2.2579750061035155
- 99% percentile: 3.58618278503418
```

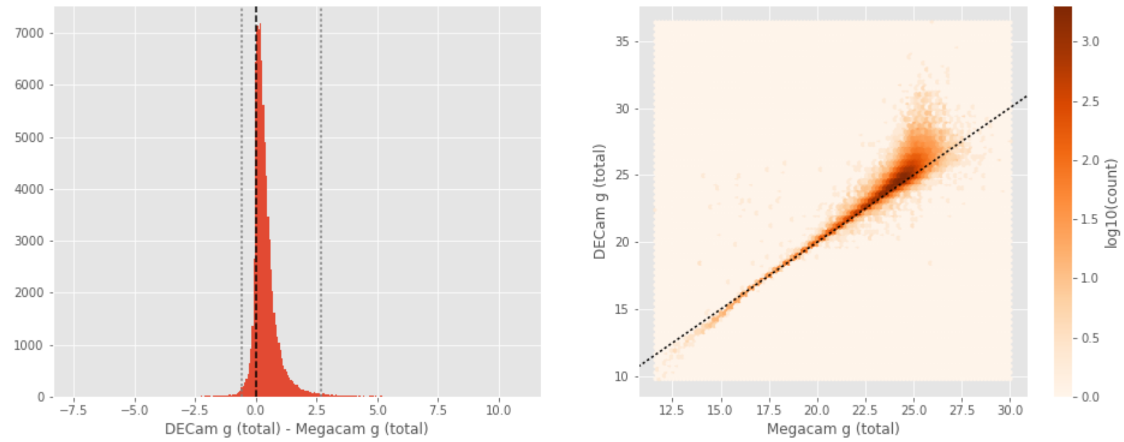



```
DECam g (aperture) - Megacam g (aperture):
- Median: -0.06
- Median Absolute Deviation: 0.25
- 1% percentile: -1.378798179626465
- 99% percentile: 2.7700712203979494
```

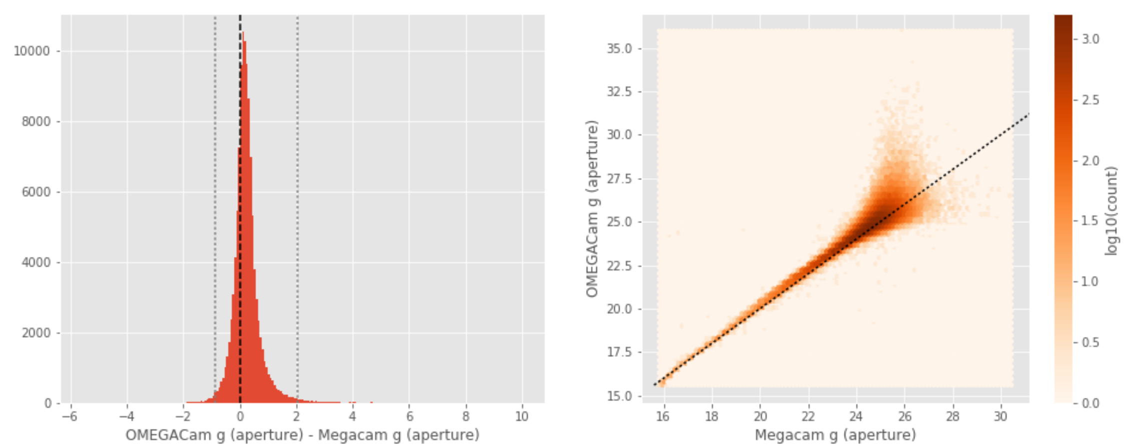



```
DECam g (total) - Megacam g (total):
- Median: 0.26
```

- Median Absolute Deviation: 0.21
- 1% percentile: -0.5860340881347655
- 99% percentile: 2.703821029663081

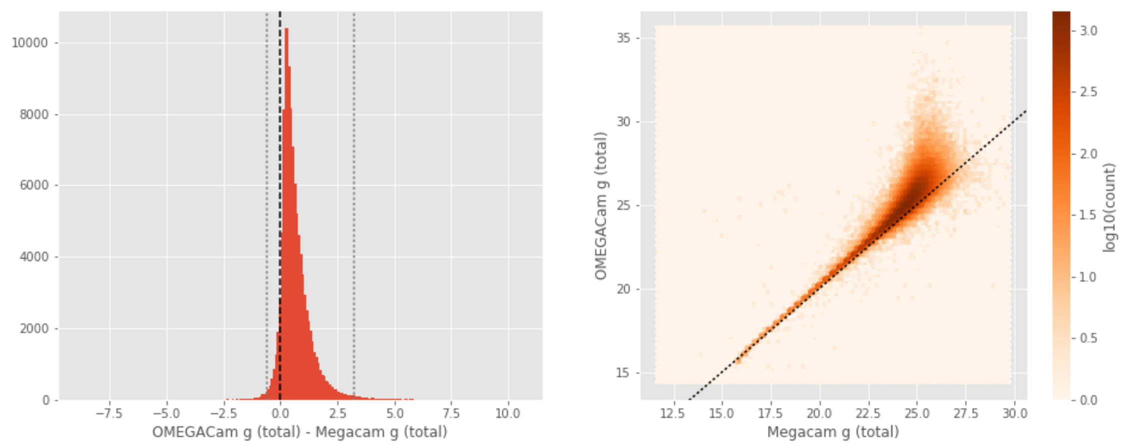


OMEGACam g (aperture) - Megacam g (aperture):
- Median: 0.19
- Median Absolute Deviation: 0.21
- 1% percentile: -0.8715366554260253
- 99% percentile: 2.0539600372314544

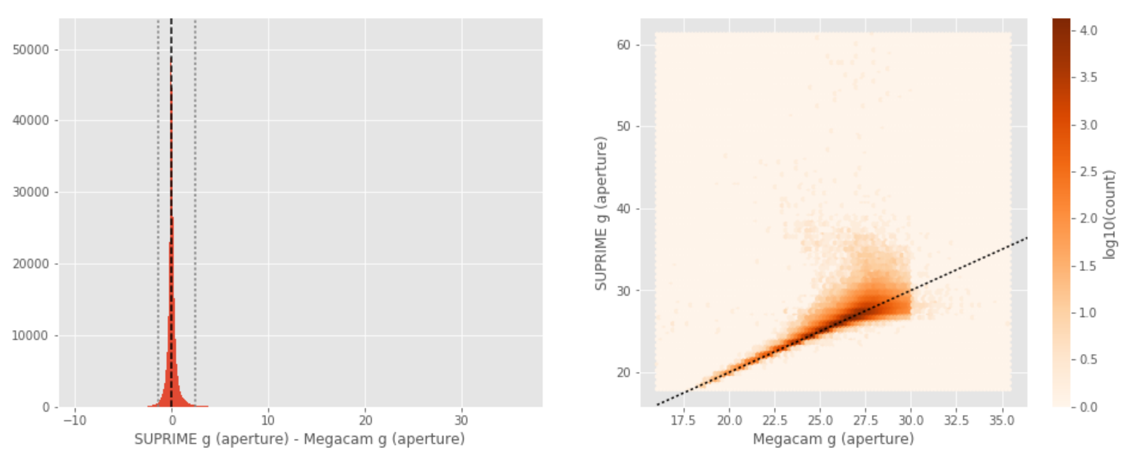


OMEGACam g (total) - Megacam g (total):
- Median: 0.49
- Median Absolute Deviation: 0.30
- 1% percentile: -0.5656244659423828

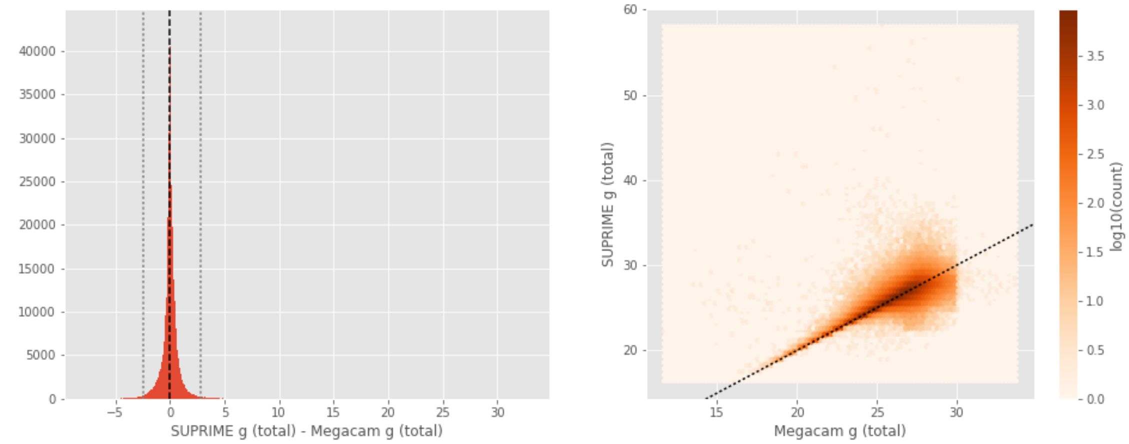
- 99% percentile: 3.228246269226068



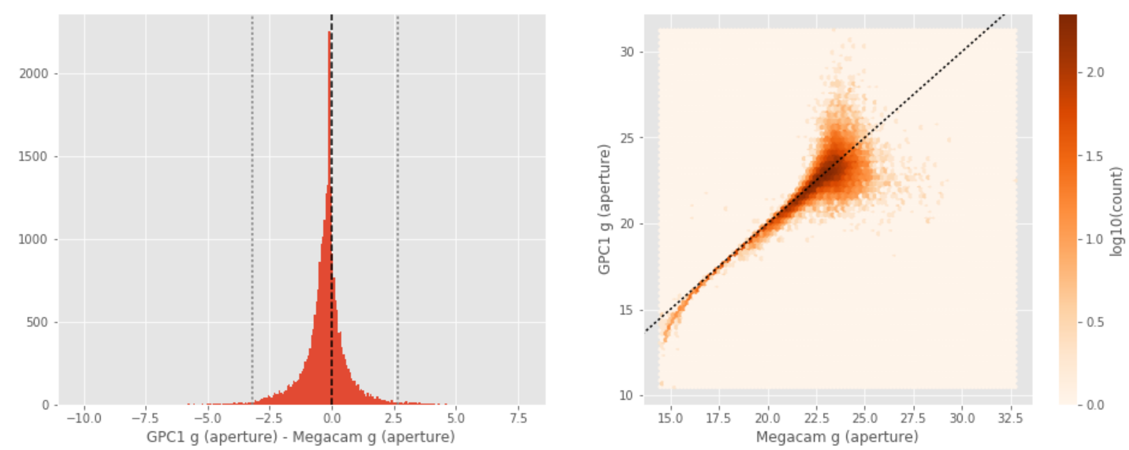
SUPRIME g (aperture) - Megacam g (aperture):
- Median: -0.00
- Median Absolute Deviation: 0.18
- 1% percentile: -1.3837828254699707
- 99% percentile: 2.458099346160887



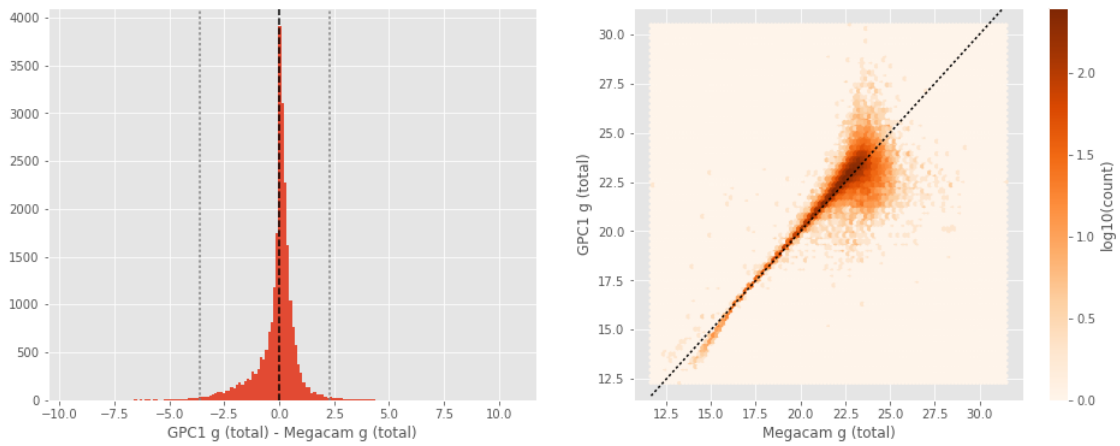
SUPRIME g (total) - Megacam g (total):
- Median: -0.00
- Median Absolute Deviation: 0.25
- 1% percentile: -2.494533824920654
- 99% percentile: 2.7505279541015635



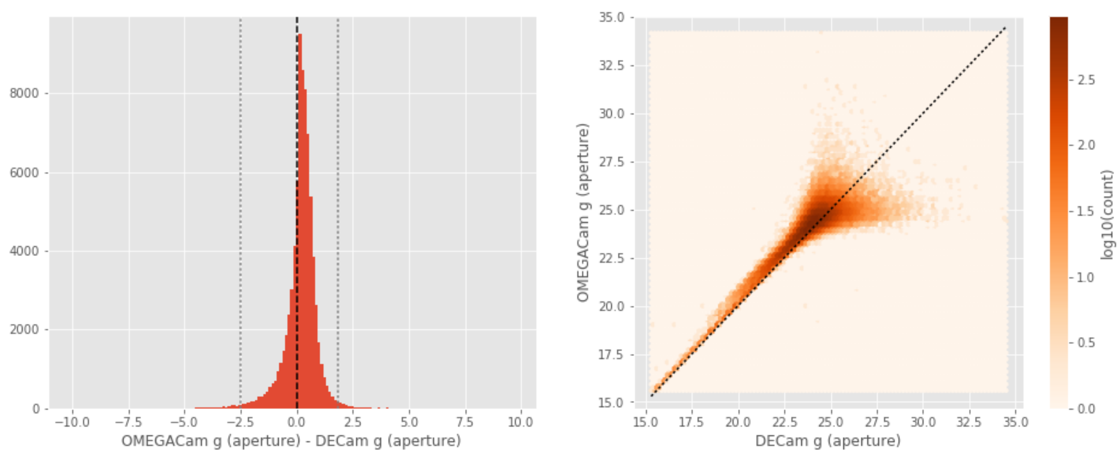
GPC1 g (aperture) - Megacam g (aperture):
- Median: -0.19
- Median Absolute Deviation: 0.34
- 1% percentile: -3.214349765777588
- 99% percentile: 2.656094722747805



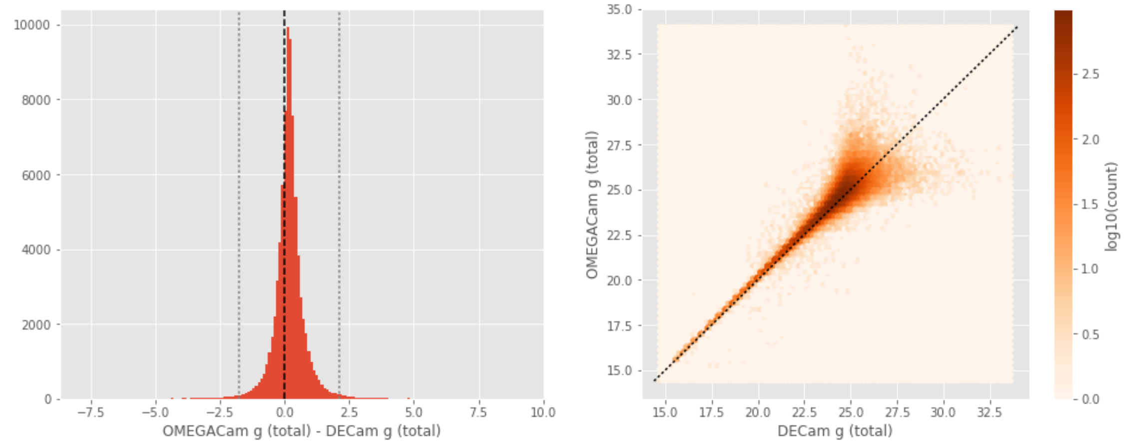
GPC1 g (total) - Megacam g (total):
- Median: 0.06
- Median Absolute Deviation: 0.29
- 1% percentile: -3.6342729187011718
- 99% percentile: 2.2842879486083993



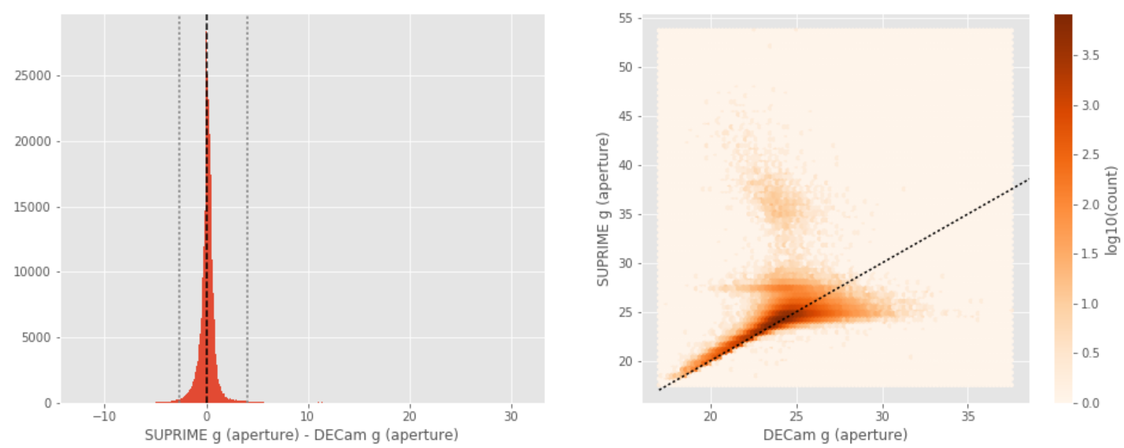
OMEGACam g (aperture) - DECam g (aperture):
- Median: 0.25
- Median Absolute Deviation: 0.30
- 1% percentile: -2.502462615966797
- 99% percentile: 1.8329804992675784



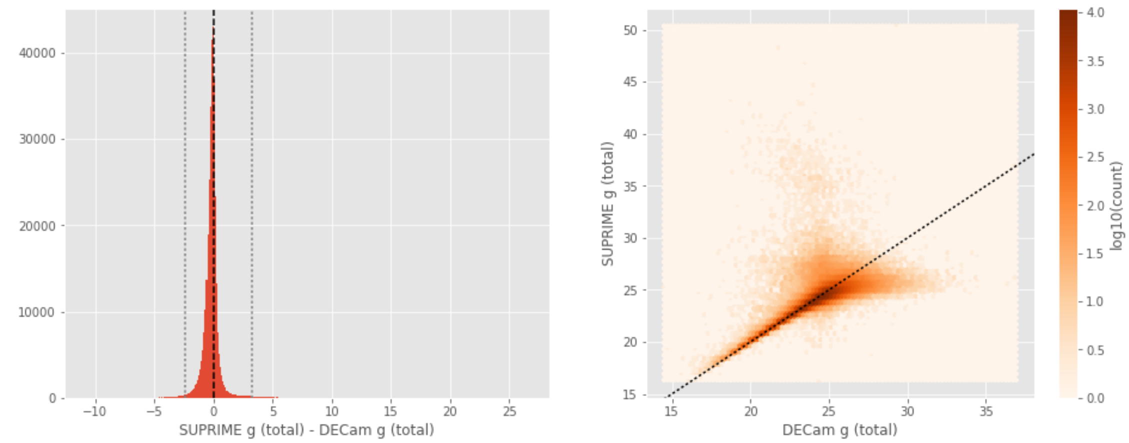
OMEGACam g (total) - DECam g (total):
- Median: 0.17
- Median Absolute Deviation: 0.25
- 1% percentile: -1.753932876586914
- 99% percentile: 2.1225991439819314



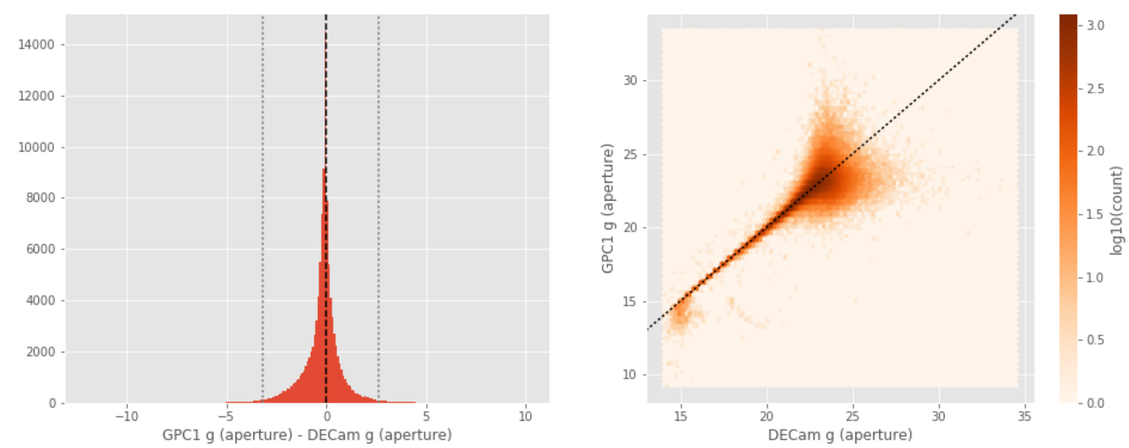
SUPRIME g (aperture) - DECam g (aperture):
- Median: 0.12
- Median Absolute Deviation: 0.31
- 1% percentile: -2.6937606811523436
- 99% percentile: 3.992506446838397



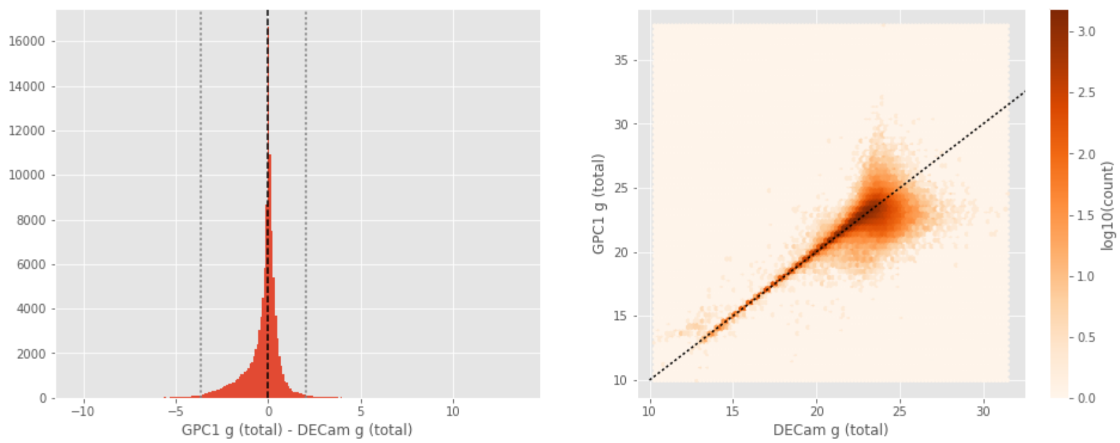
SUPRIME g (total) - DECam g (total):
- Median: -0.16
- Median Absolute Deviation: 0.23
- 1% percentile: -2.4316715240478515
- 99% percentile: 3.1994380950927463



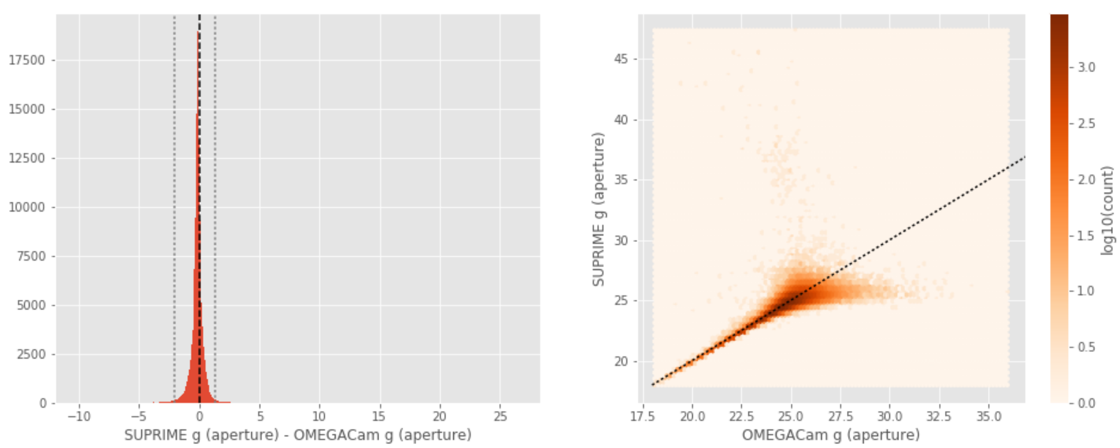
GPC1 g (aperture) - DECam g (aperture):
- Median: -0.07
- Median Absolute Deviation: 0.31
- 1% percentile: -3.197637596130371
- 99% percentile: 2.644296550750723



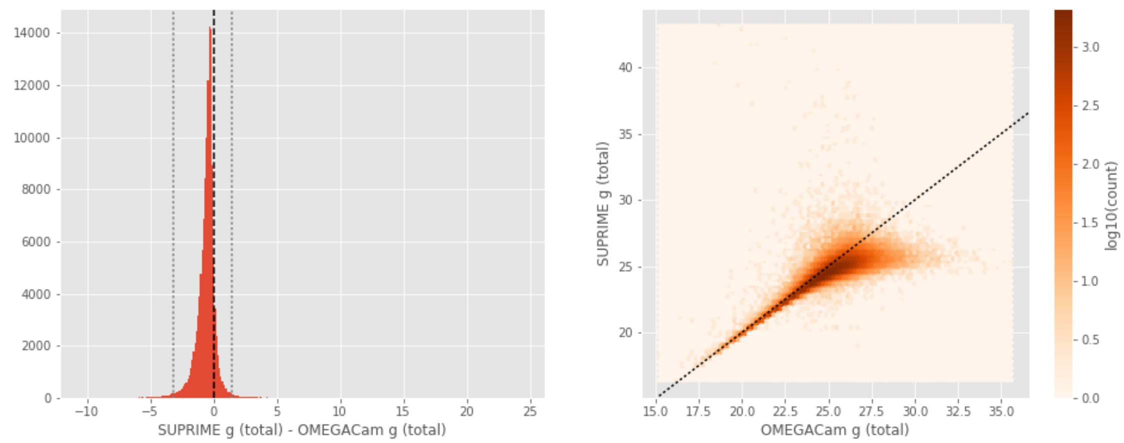
GPC1 g (total) - DECam g (total):
- Median: -0.00
- Median Absolute Deviation: 0.29
- 1% percentile: -3.656358833312988
- 99% percentile: 2.045563468933105



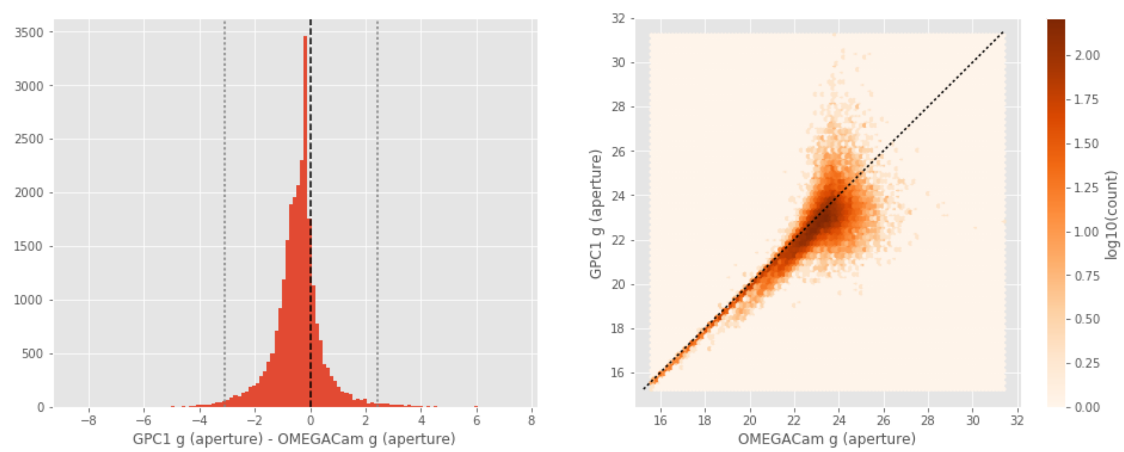
SUPRIME g (aperture) - OMEGACam g (aperture):
- Median: -0.13
- Median Absolute Deviation: 0.20
- 1% percentile: -2.0122363662719724
- 99% percentile: 1.309205894470203



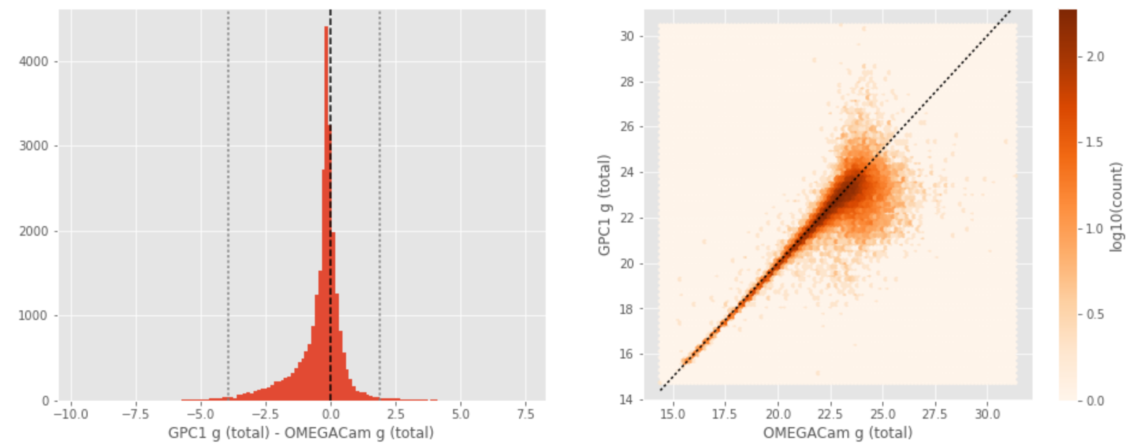
SUPRIME g (total) - OMEGACam g (total):
- Median: -0.44
- Median Absolute Deviation: 0.31
- 1% percentile: -3.19238166809082
- 99% percentile: 1.4302340698242428



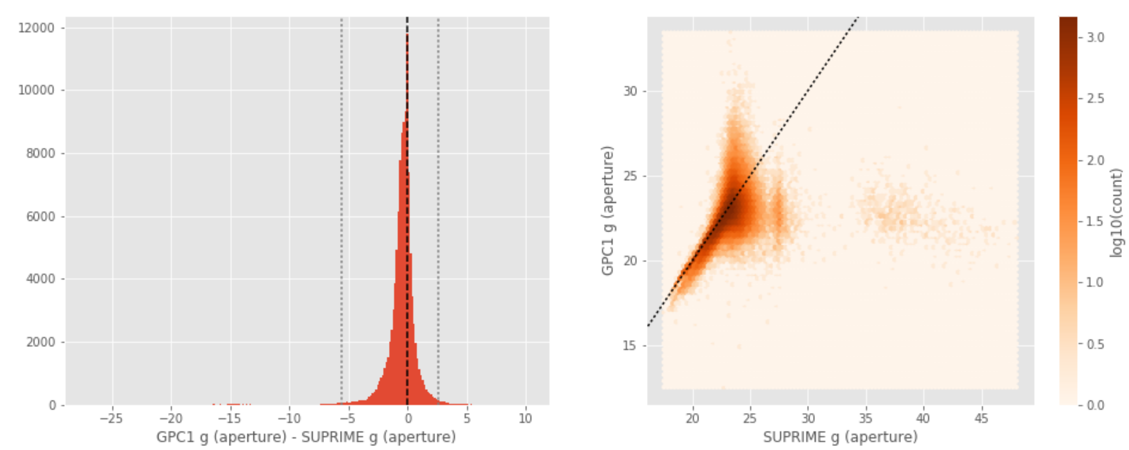
GPC1 g (aperture) - OMEGACam g (aperture):
- Median: -0.39
- Median Absolute Deviation: 0.38
- 1% percentile: -3.108083953857422
- 99% percentile: 2.434363727569579



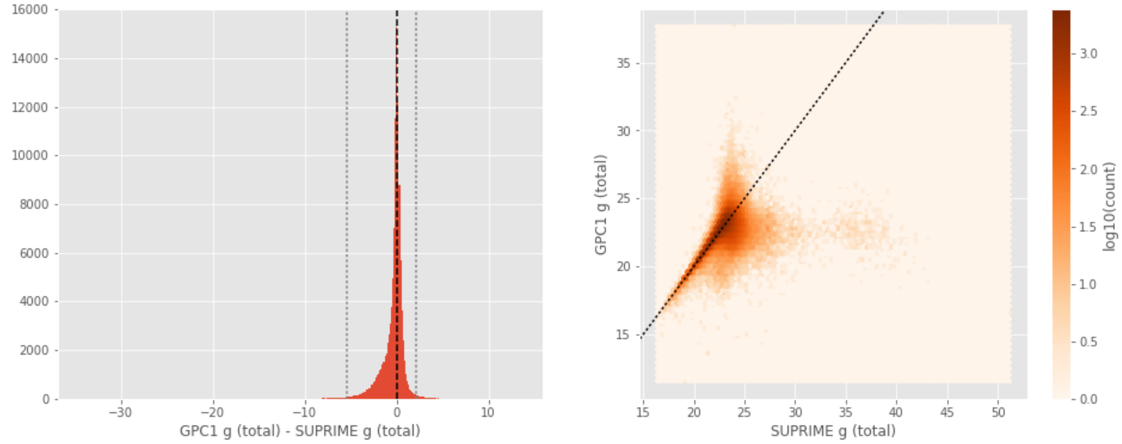
GPC1 g (total) - OMEGACam g (total):
- Median: -0.18
- Median Absolute Deviation: 0.30
- 1% percentile: -3.919437255859375
- 99% percentile: 1.9014898681640615



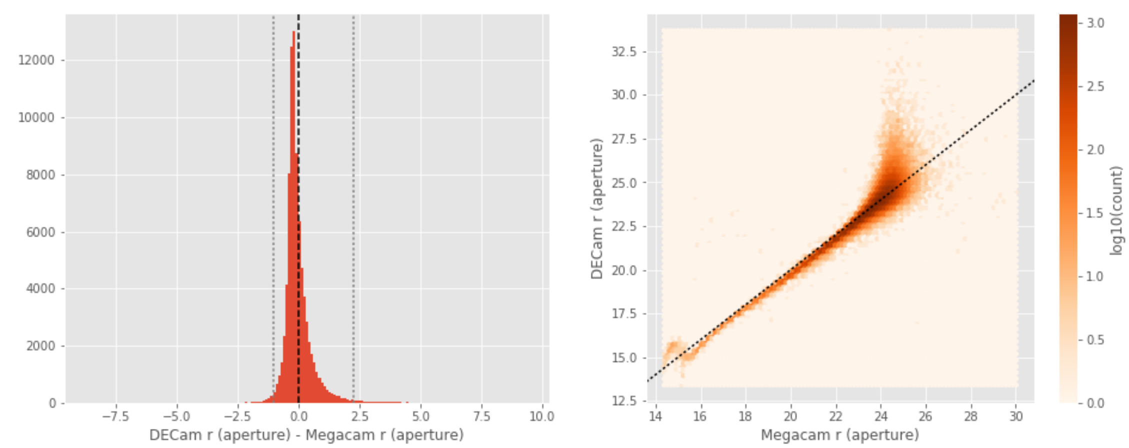
GPC1 g (aperture) - SUPRIME g (aperture):
- Median: -0.33
- Median Absolute Deviation: 0.45
- 1% percentile: -5.574190330505371
- 99% percentile: 2.6066500473022476



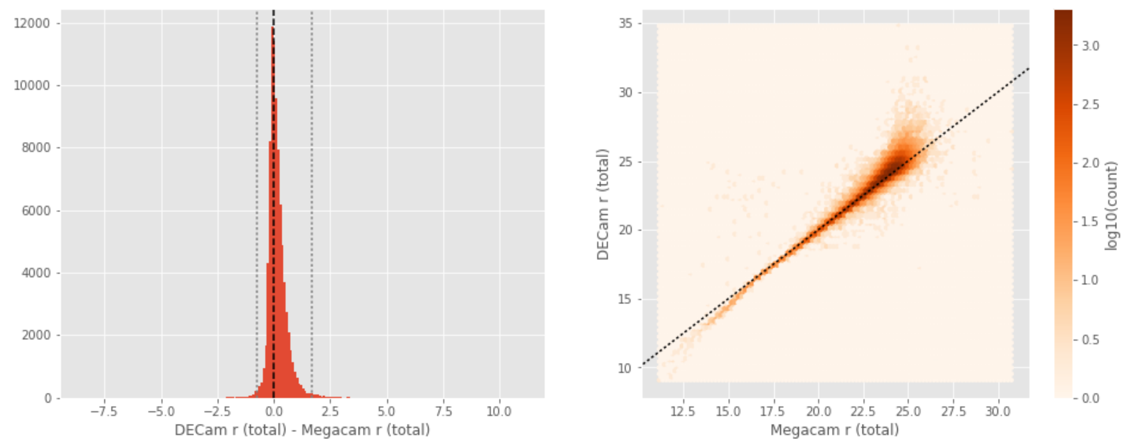
GPC1 g (total) - SUPRIME g (total):
- Median: -0.04
- Median Absolute Deviation: 0.36
- 1% percentile: -5.368672294616699
- 99% percentile: 2.1182360458374014



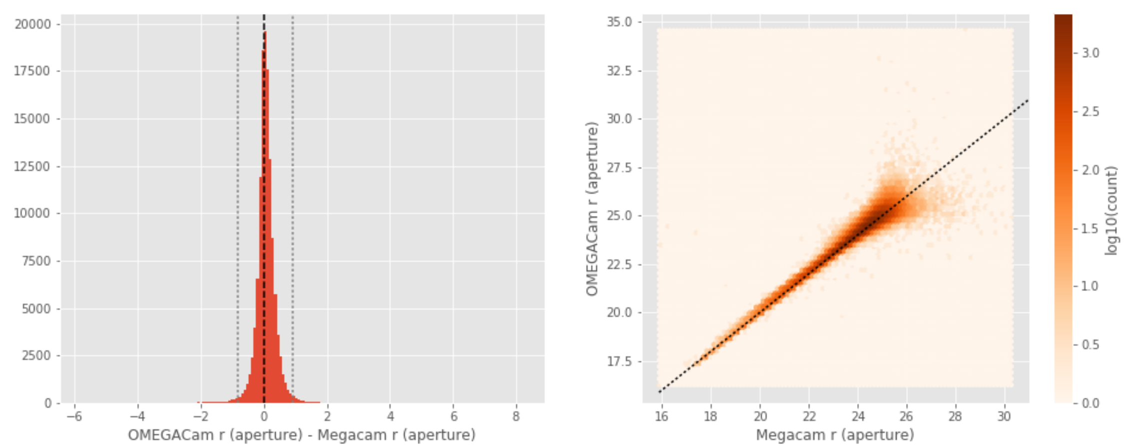
DECam r (aperture) - Megacam r (aperture):
- Median: -0.15
- Median Absolute Deviation: 0.20
- 1% percentile: -1.0357360649108887
- 99% percentile: 2.2620508766174314



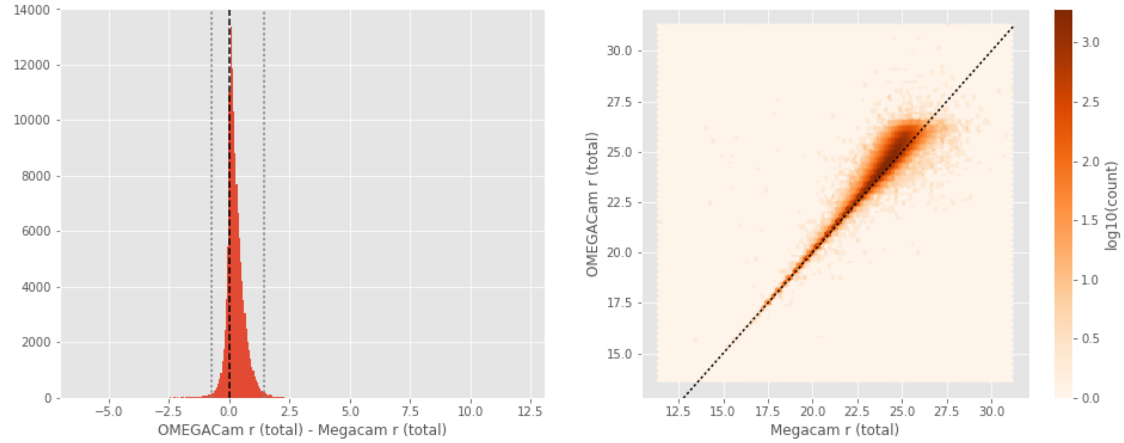
DECam r (total) - Megacam r (total):
- Median: 0.08
- Median Absolute Deviation: 0.20
- 1% percentile: -0.7194135856628417
- 99% percentile: 1.709892120361331



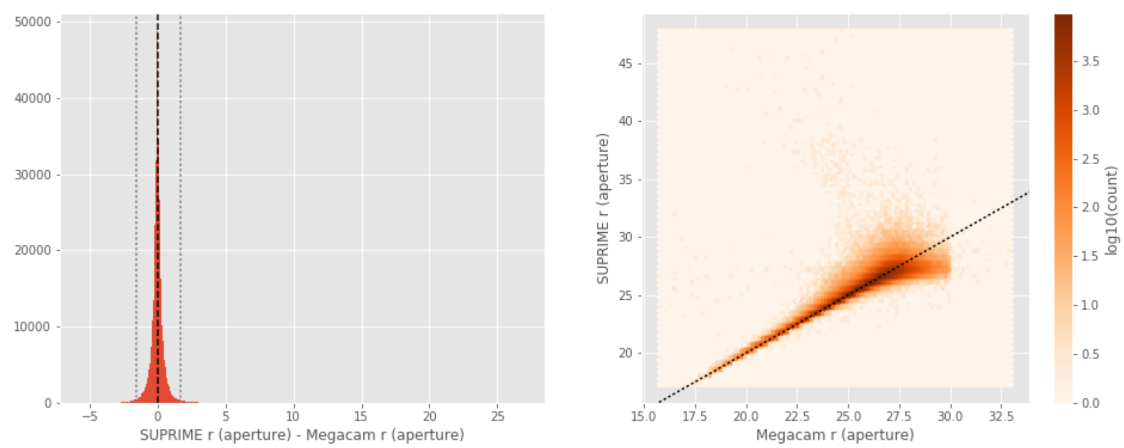
OMEGACam r (aperture) - Megacam r (aperture):
- Median: 0.05
- Median Absolute Deviation: 0.14
- 1% percentile: -0.8439453506469727
- 99% percentile: 0.9190123748779302



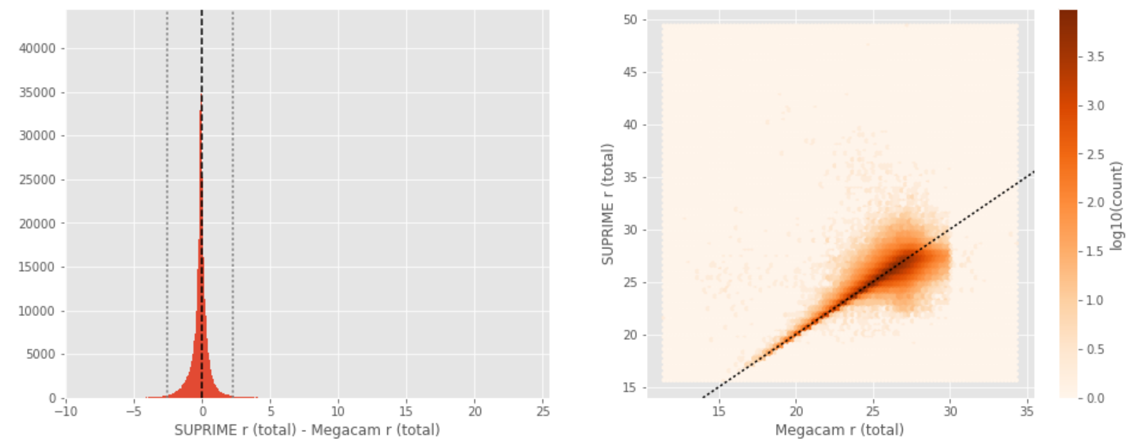
OMEGACam r (total) - Megacam r (total):
- Median: 0.20
- Median Absolute Deviation: 0.18
- 1% percentile: -0.749367790222168
- 99% percentile: 1.427065830230712



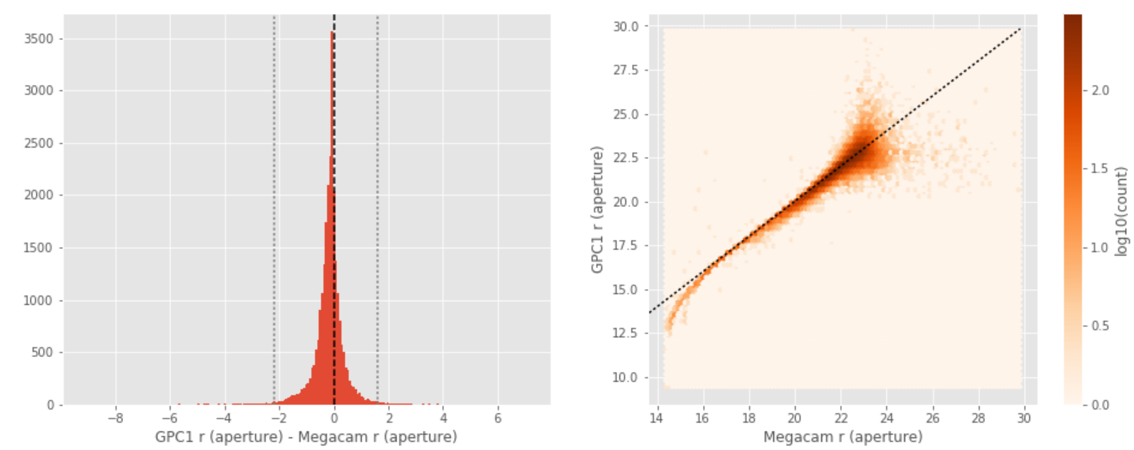
SUPRIME r (aperture) - Megacam r (aperture):
- Median: -0.04
- Median Absolute Deviation: 0.17
- 1% percentile: -1.5395031356811524
- 99% percentile: 1.7156336593627914



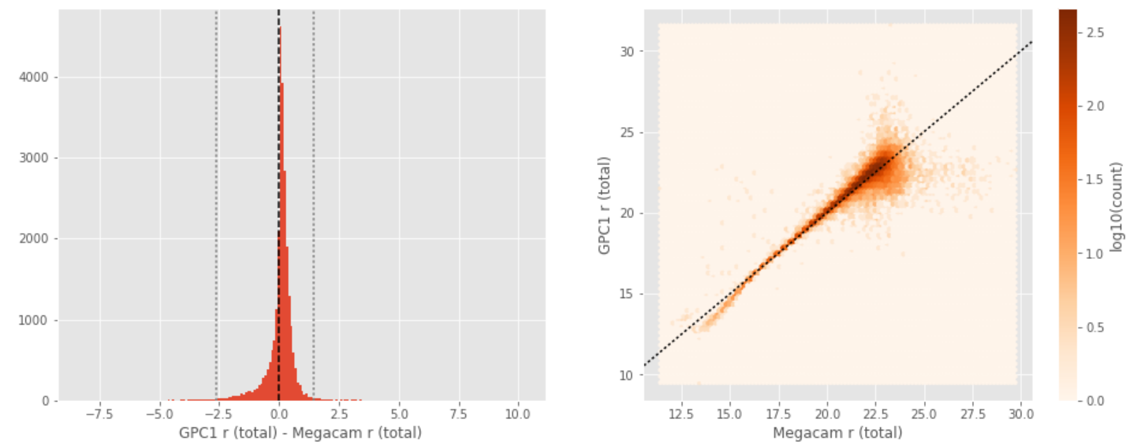
SUPRIME r (total) - Megacam r (total):
- Median: -0.10
- Median Absolute Deviation: 0.22
- 1% percentile: -2.5467380714416503
- 99% percentile: 2.2248780059814535



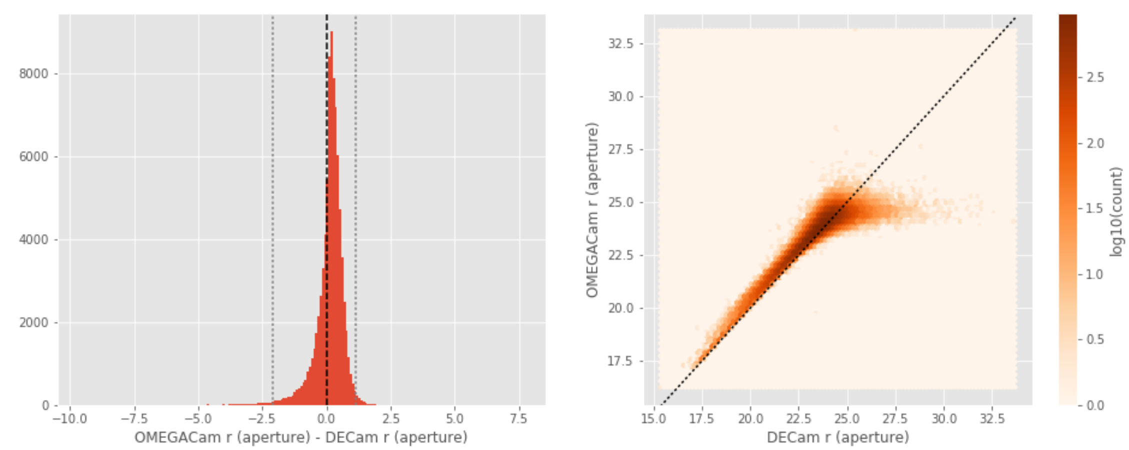
GPC1 r (aperture) - Megacam r (aperture):
- Median: -0.12
- Median Absolute Deviation: 0.21
- 1% percentile: -2.1942799758911136
- 99% percentile: 1.6077803039550798



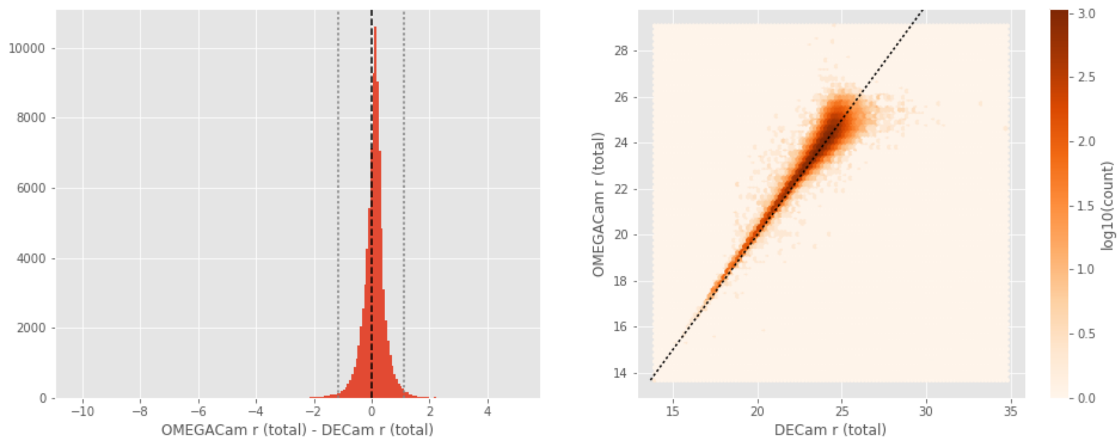
GPC1 r (total) - Megacam r (total):
- Median: 0.11
- Median Absolute Deviation: 0.16
- 1% percentile: -2.6401522827148436
- 99% percentile: 1.4628974342346184



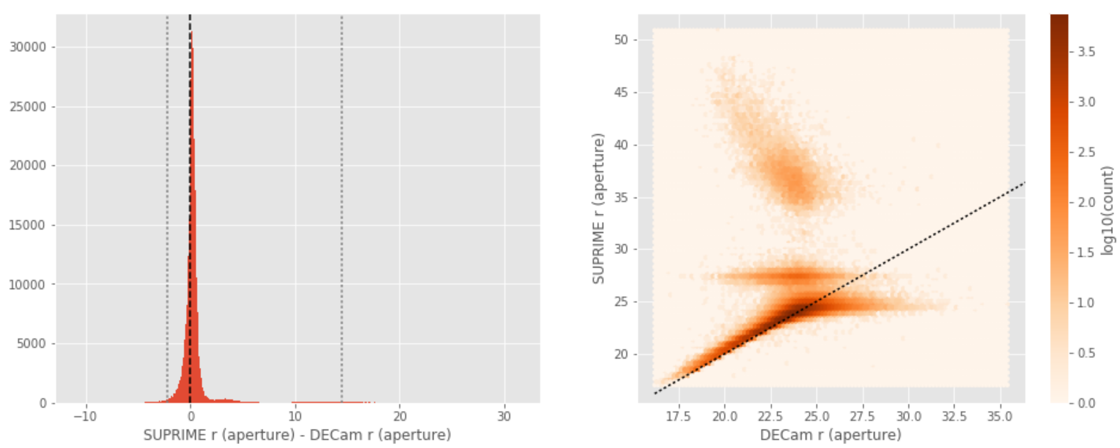
OMEGACam r (aperture) - DECam r (aperture):
- Median: 0.19
- Median Absolute Deviation: 0.24
- 1% percentile: -2.0809104156494143
- 99% percentile: 1.1332830810546874



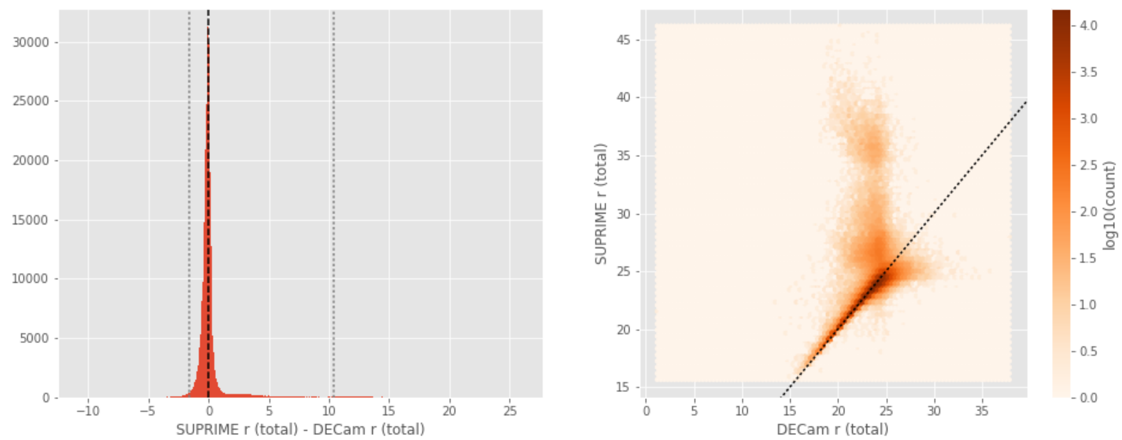
OMEGACam r (total) - DECam r (total):
- Median: 0.11
- Median Absolute Deviation: 0.18
- 1% percentile: -1.1362020111083986
- 99% percentile: 1.1351058959960851



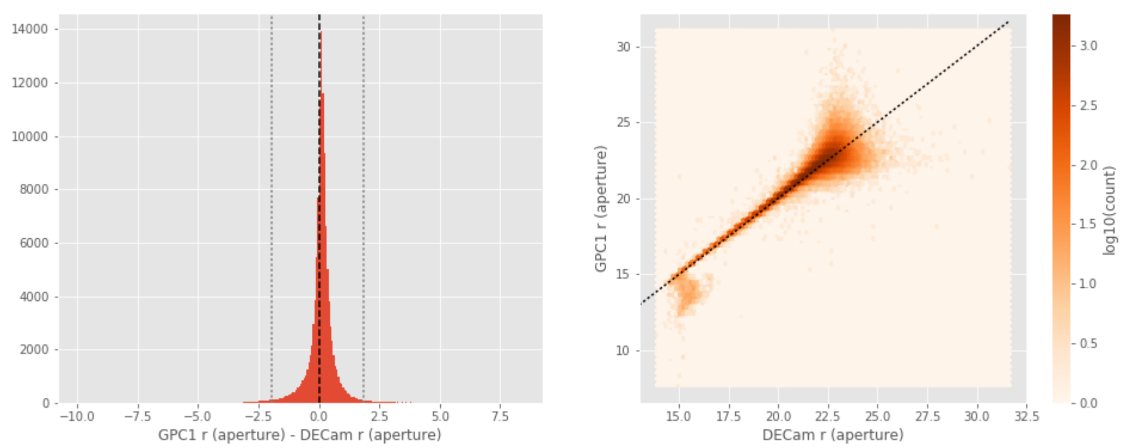
SUPRIME r (aperture) - DECam r (aperture):
- Median: 0.18
- Median Absolute Deviation: 0.27
- 1% percentile: -2.1635351181030273
- 99% percentile: 14.46567520141598



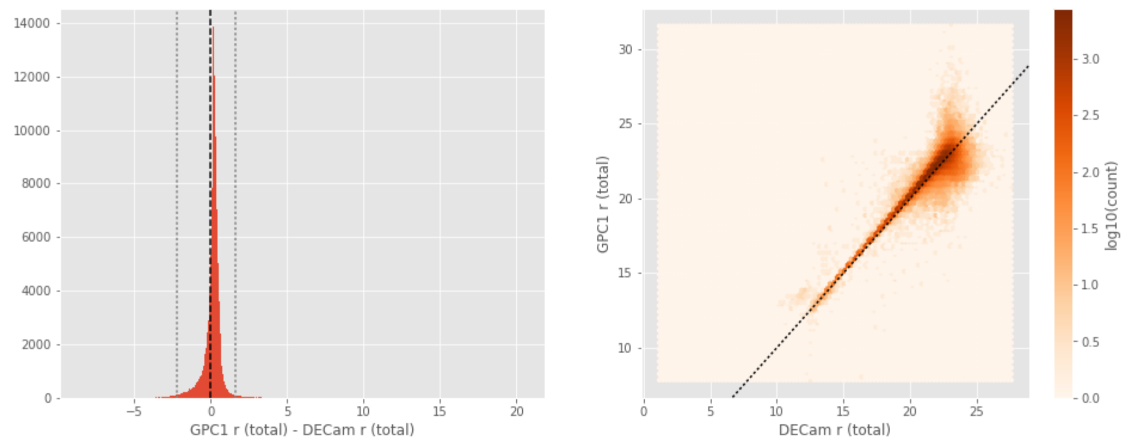
SUPRIME r (total) - DECam r (total):
- Median: -0.07
- Median Absolute Deviation: 0.21
- 1% percentile: -1.6292112731933592
- 99% percentile: 10.36987854003906



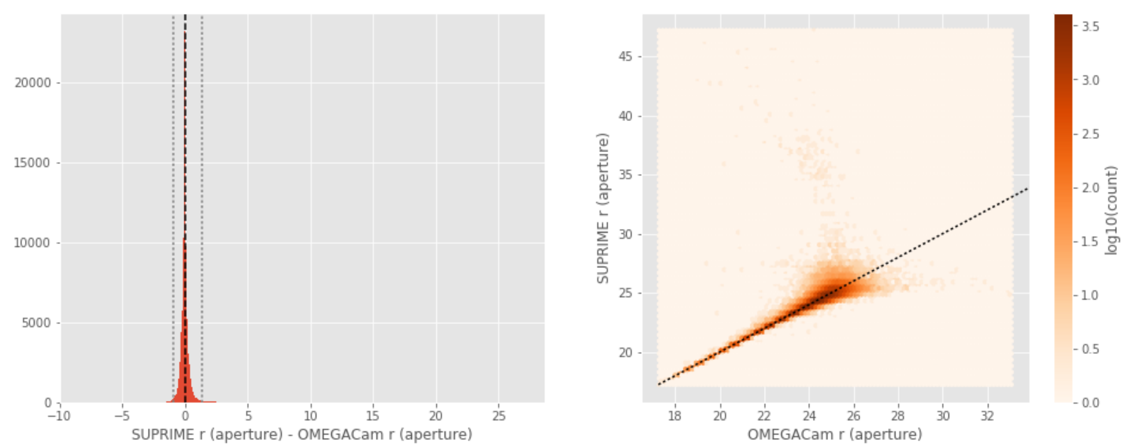
GPC1 r (aperture) - DECam r (aperture):
- Median: 0.11
- Median Absolute Deviation: 0.18
- 1% percentile: -1.944691390991211
- 99% percentile: 1.8248910522460917



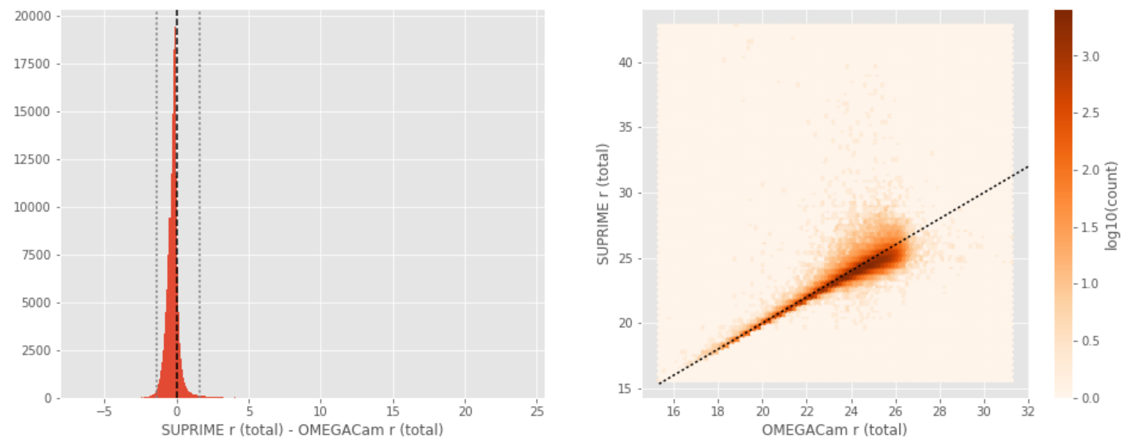
GPC1 r (total) - DECam r (total):
- Median: 0.19
- Median Absolute Deviation: 0.17
- 1% percentile: -2.194650650024414
- 99% percentile: 1.6236286163330078



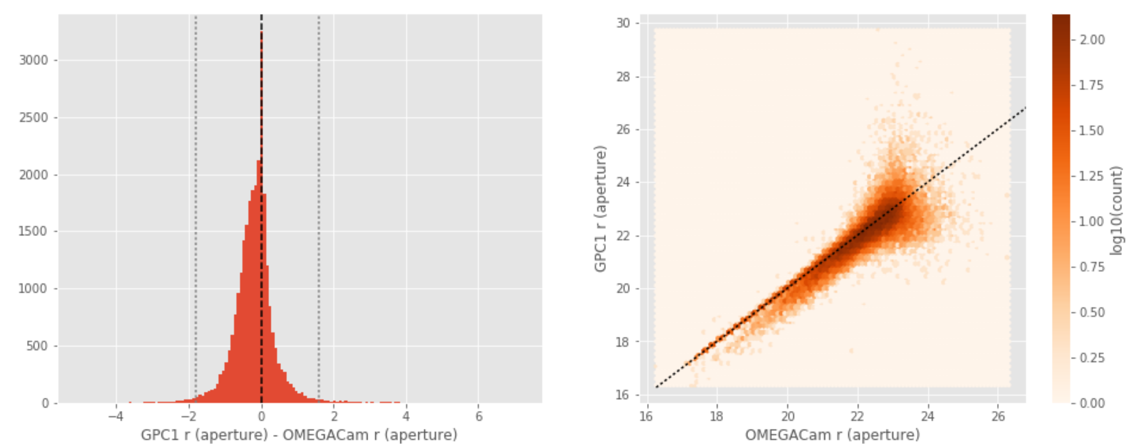
SUPRIME r (aperture) - OMEGACam r (aperture):
- Median: -0.04
- Median Absolute Deviation: 0.12
- 1% percentile: -0.8950608062744141
- 99% percentile: 1.3190444946289006



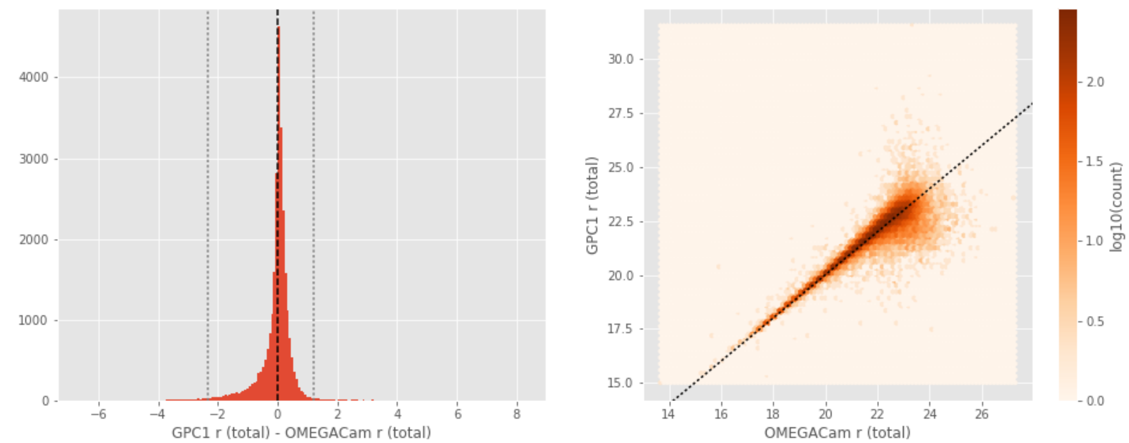
SUPRIME r (total) - OMEGACam r (total):
- Median: -0.25
- Median Absolute Deviation: 0.19
- 1% percentile: -1.4157127380371093
- 99% percentile: 1.6127704620361283



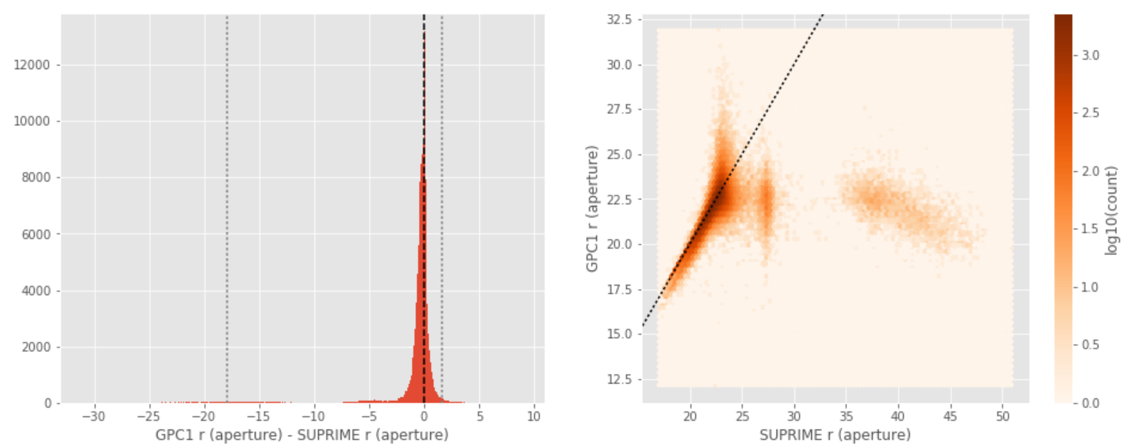
GPC1 r (aperture) - OMEGACam r (aperture):
- Median: -0.15
- Median Absolute Deviation: 0.26
- 1% percentile: -1.7939163589477538
- 99% percentile: 1.605987358093261



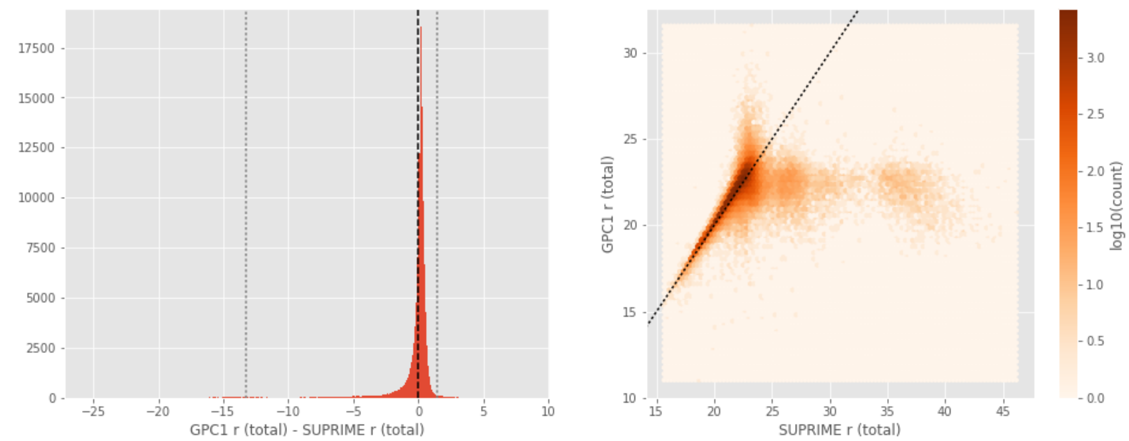
GPC1 r (total) - OMEGACam r (total):
- Median: 0.04
- Median Absolute Deviation: 0.16
- 1% percentile: -2.334157943725586
- 99% percentile: 1.2207813262939446



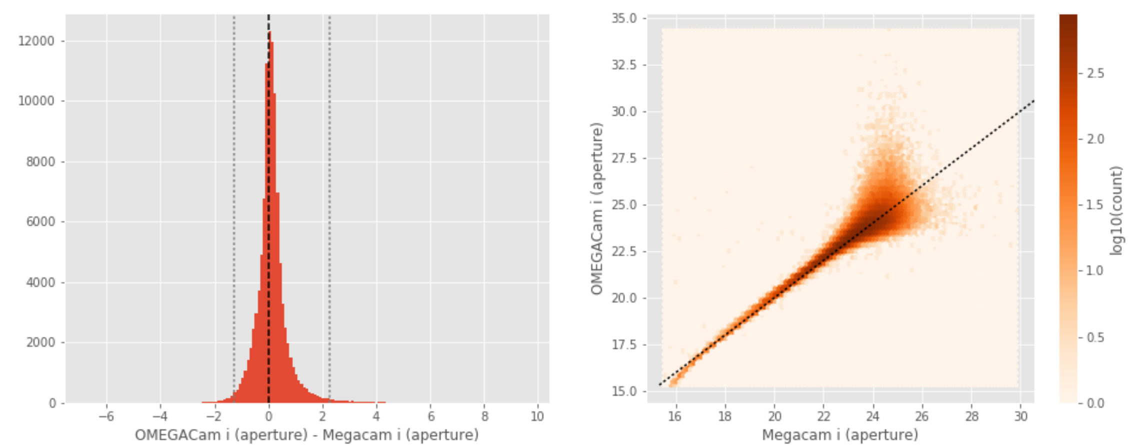
GPC1 r (aperture) - SUPRIME r (aperture):
- Median: -0.18
- Median Absolute Deviation: 0.30
- 1% percentile: -17.871509017944337
- 99% percentile: 1.6664178848266584



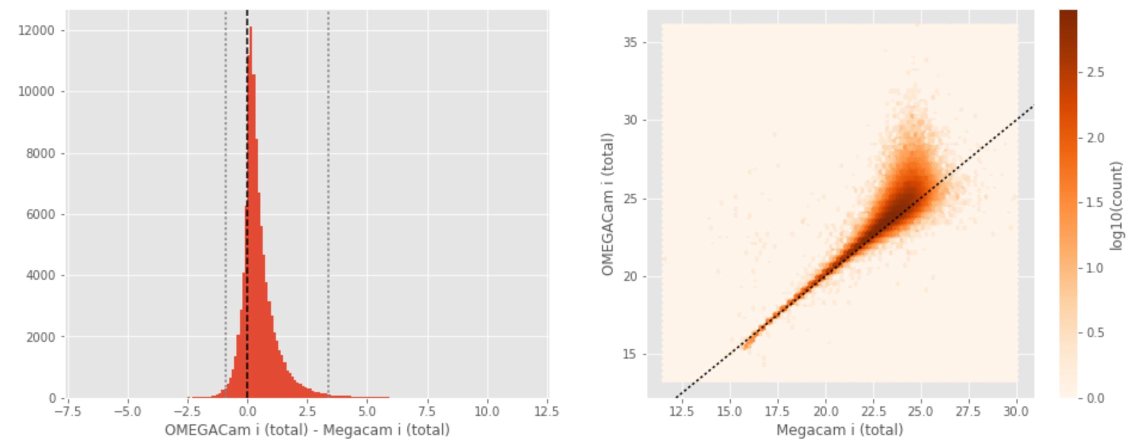
GPC1 r (total) - SUPRIME r (total):
- Median: 0.14
- Median Absolute Deviation: 0.21
- 1% percentile: -13.293508720397949
- 99% percentile: 1.428863525390624



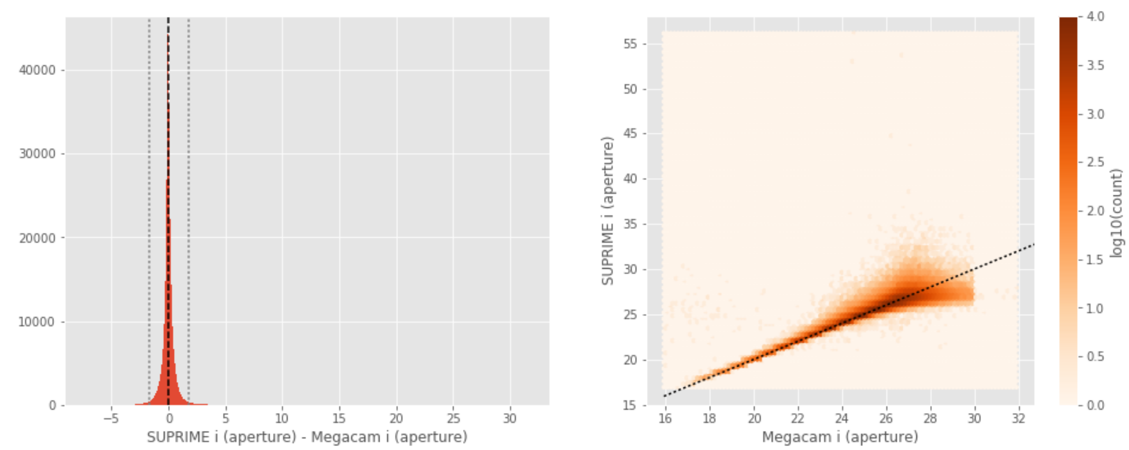
OMEGACam i (aperture) - Megacam i (aperture):
- Median: 0.09
- Median Absolute Deviation: 0.23
- 1% percentile: -1.2771854400634766
- 99% percentile: 2.2827608108520505



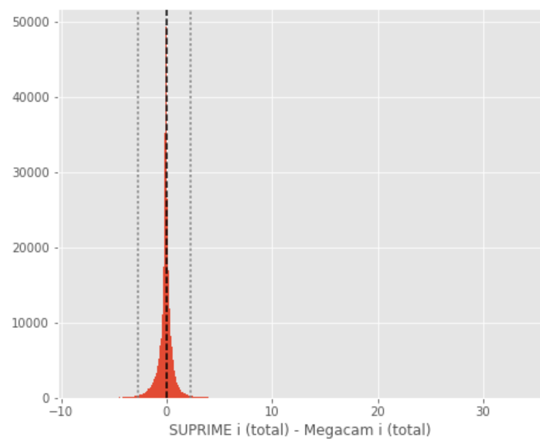
OMEGACam i (total) - Megacam i (total):
- Median: 0.31
- Median Absolute Deviation: 0.30
- 1% percentile: -0.9247077941894531
- 99% percentile: 3.3741300582885736

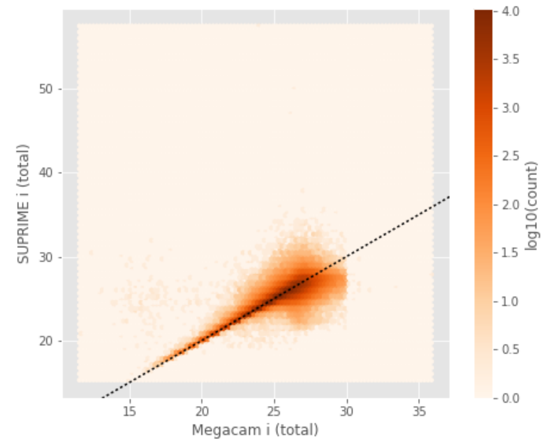


SUPRIME i (aperture) - Megacam i (aperture):
- Median: -0.02
- Median Absolute Deviation: 0.18
- 1% percentile: -1.679243698120117
- 99% percentile: 1.779090881347643

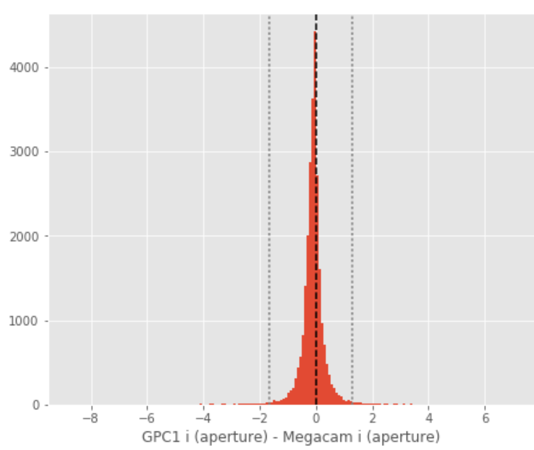


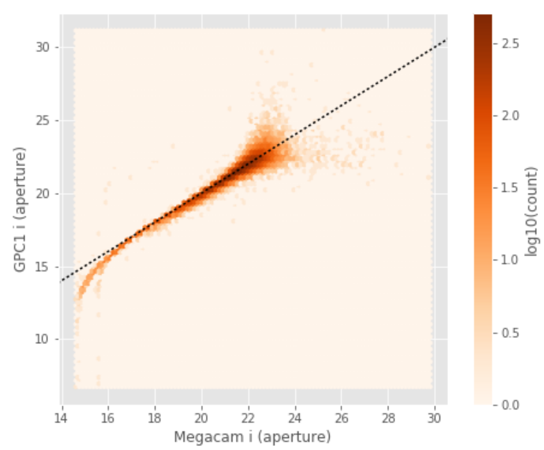
SUPRIME i (total) - Megacam i (total):
- Median: -0.08
- Median Absolute Deviation: 0.24
- 1% percentile: -2.680943222045898
- 99% percentile: 2.215664672851562



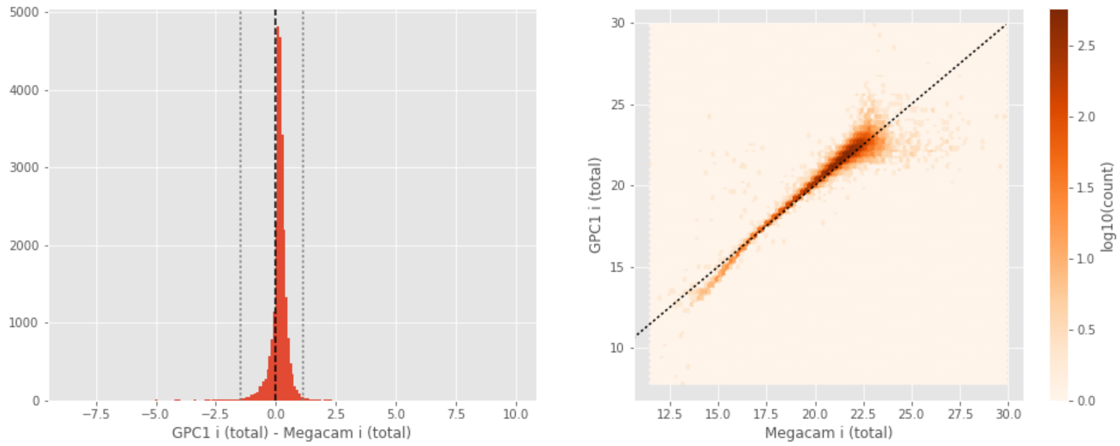


GPC1 i (aperture) - Megacam i (aperture):
- Median: -0.10
- Median Absolute Deviation: 0.16
- 1% percentile: -1.6688246726989746
- 99% percentile: 1.280550479888916

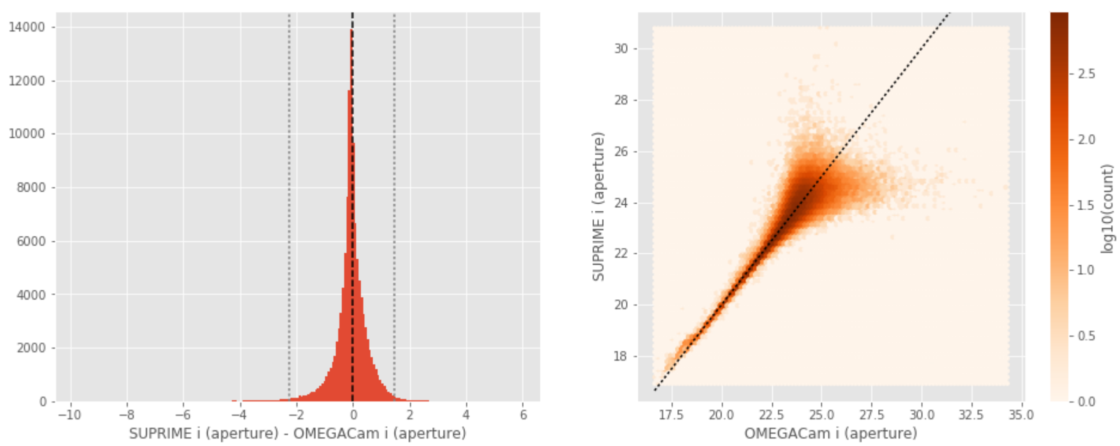




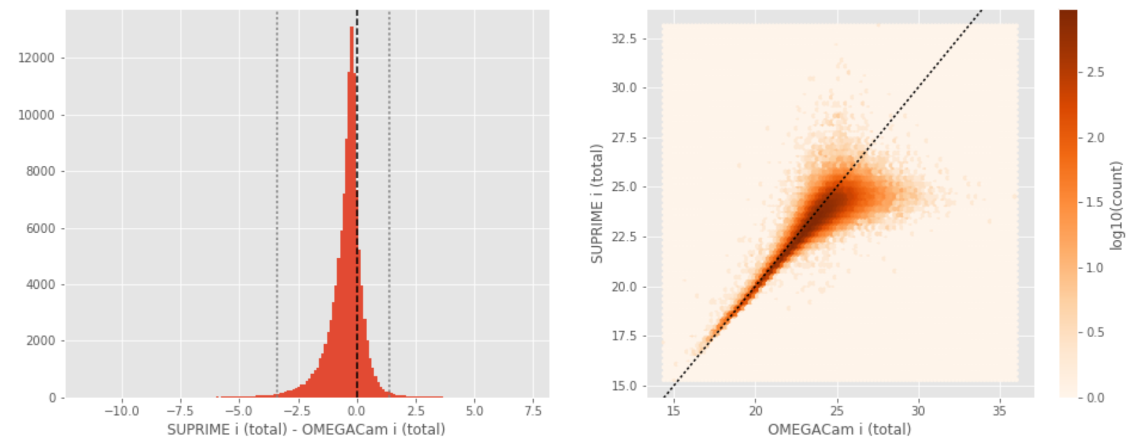
GPC1 i (total) - Megacam i (total):
- Median: 0.16
- Median Absolute Deviation: 0.13
- 1% percentile: -1.484436664581299
- 99% percentile: 1.118515129089356



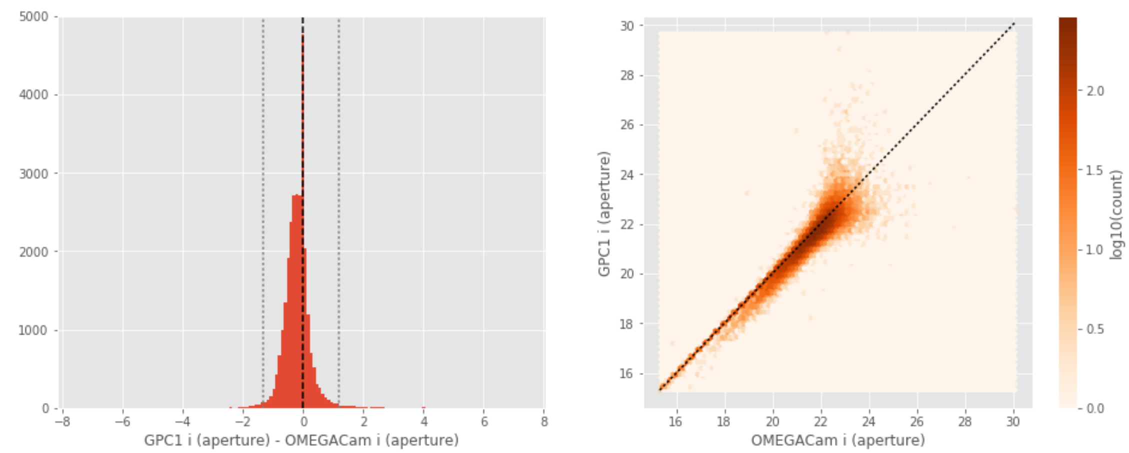
SUPRIME i (aperture) - OMEGACam i (aperture):
- Median: -0.06
- Median Absolute Deviation: 0.23
- 1% percentile: -2.2401300048828126
- 99% percentile: 1.4570802307128905



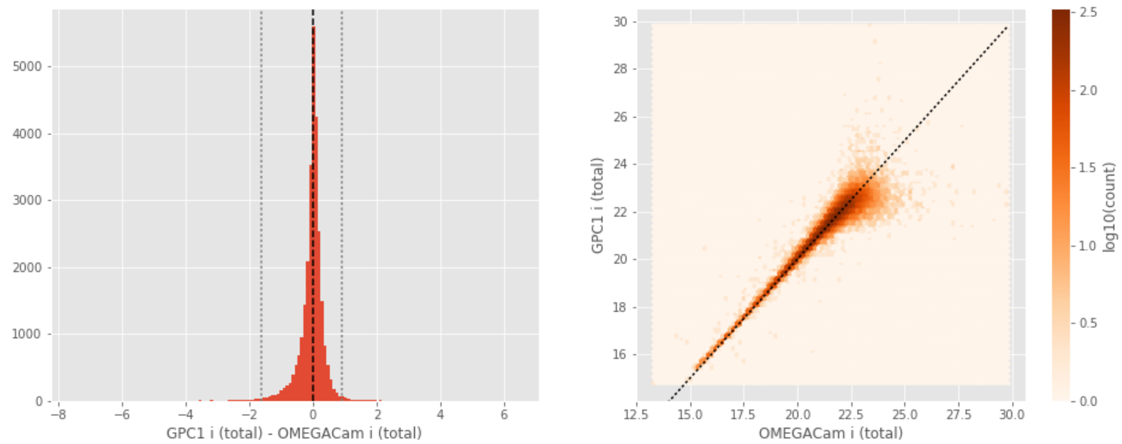
SUPRIME i (total) - OMEGACam i (total):
- Median: -0.33
- Median Absolute Deviation: 0.32
- 1% percentile: -3.381352691650391
- 99% percentile: 1.3634735107421871



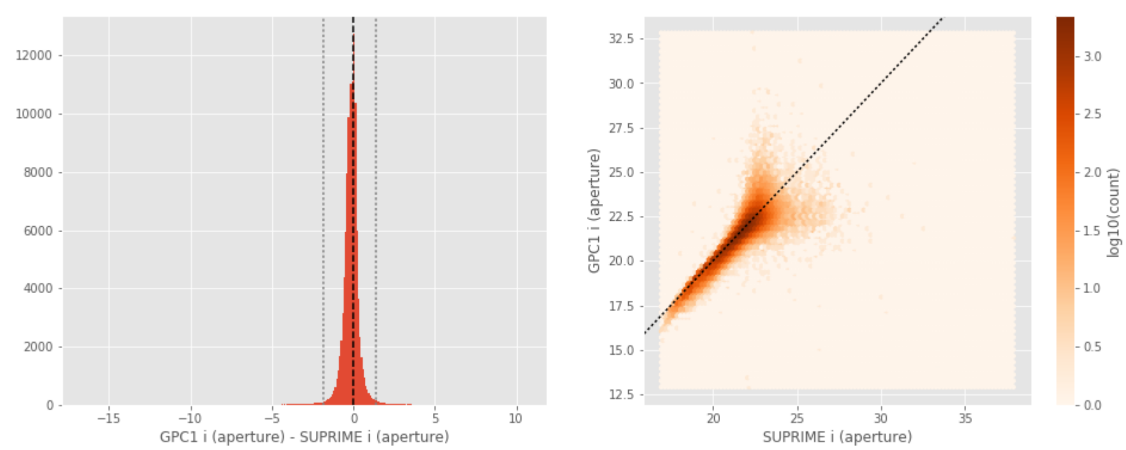
GPC1 i (aperture) - OMEGACam i (aperture):
- Median: -0.18
- Median Absolute Deviation: 0.21
- 1% percentile: -1.3513908195495603
- 99% percentile: 1.1719453048706063



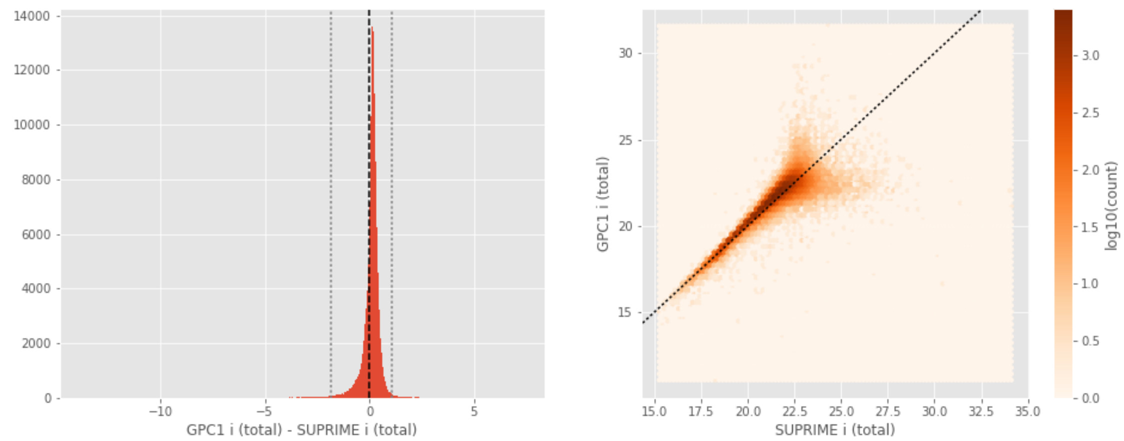
GPC1 i (total) - OMEGACam i (total):
- Median: 0.01
- Median Absolute Deviation: 0.14
- 1% percentile: -1.627739009857178
- 99% percentile: 0.9032410049438482



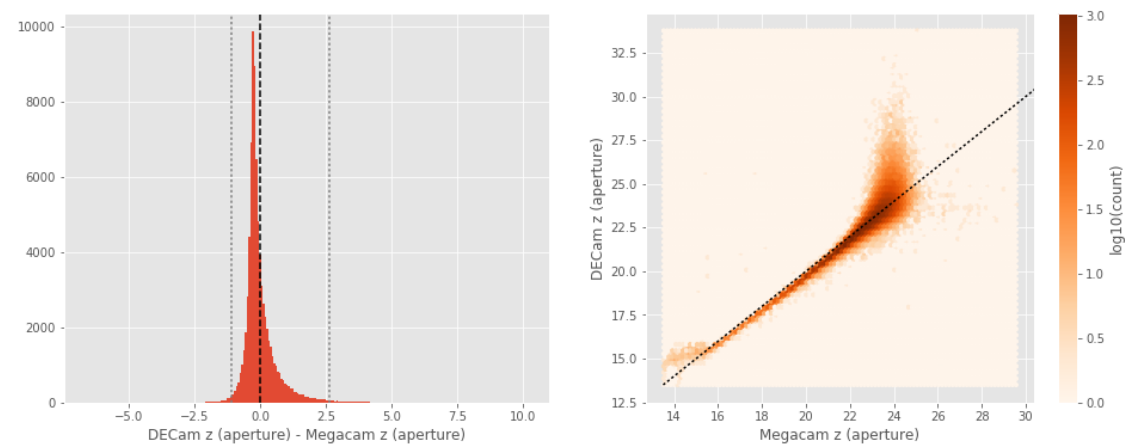
GPC1 i (aperture) - SUPRIME i (aperture):
- Median: -0.12
- Median Absolute Deviation: 0.23
- 1% percentile: -1.8379167556762694
- 99% percentile: 1.35901165008545



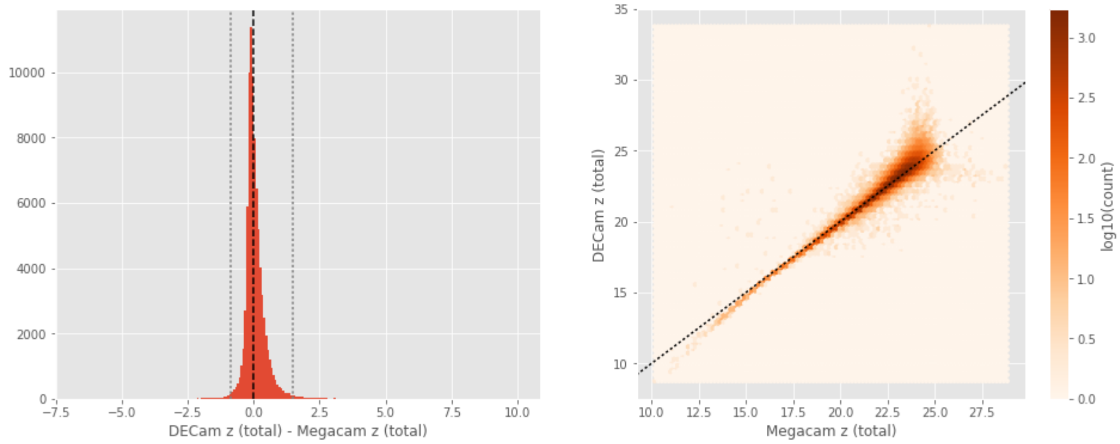
GPC1 i (total) - SUPRIME i (total):
- Median: 0.18
- Median Absolute Deviation: 0.15
- 1% percentile: -1.8483230590820312
- 99% percentile: 1.0811426925659178



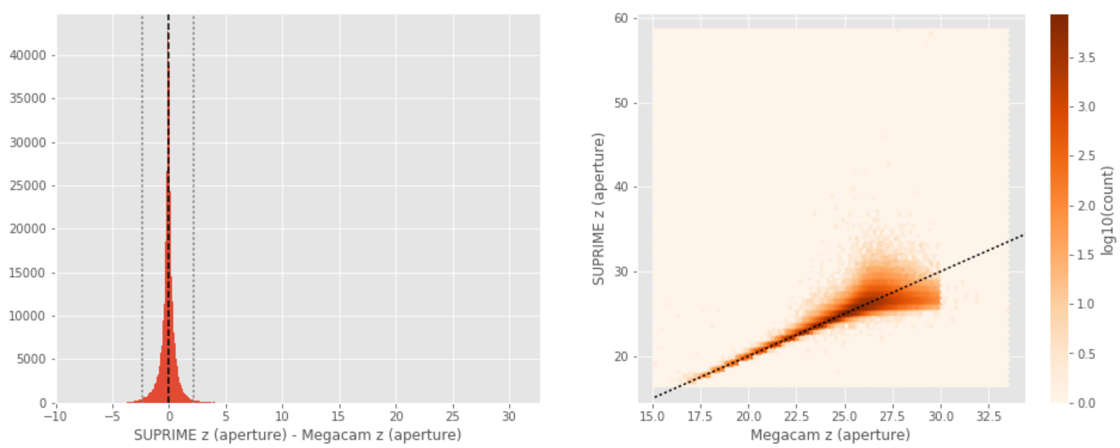
DECam z (aperture) - Megacam z (aperture):
- Median: -0.19
- Median Absolute Deviation: 0.20
- 1% percentile: -1.0989385986328126
- 99% percentile: 2.650307807922356



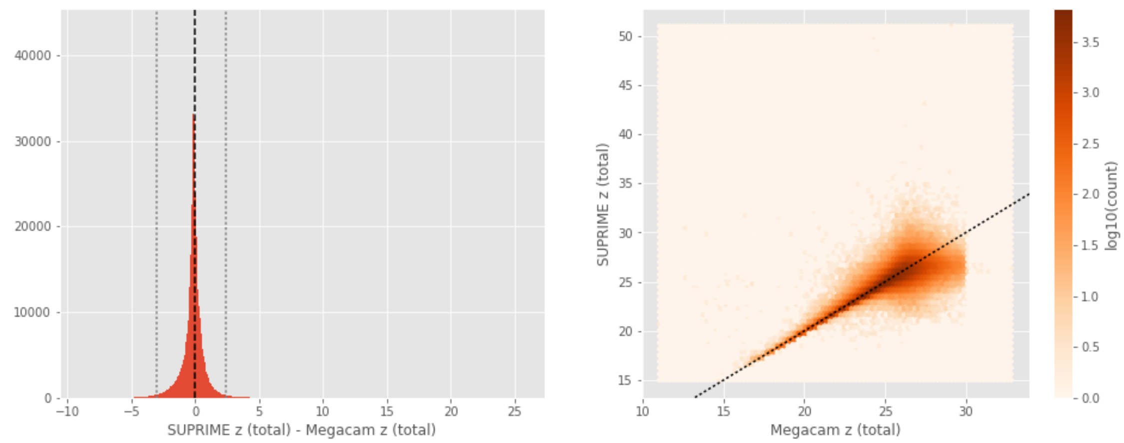
DECam z (total) - Megacam z (total):
- Median: -0.02
- Median Absolute Deviation: 0.17
- 1% percentile: -0.8688444519042969
- 99% percentile: 1.4678274726867706



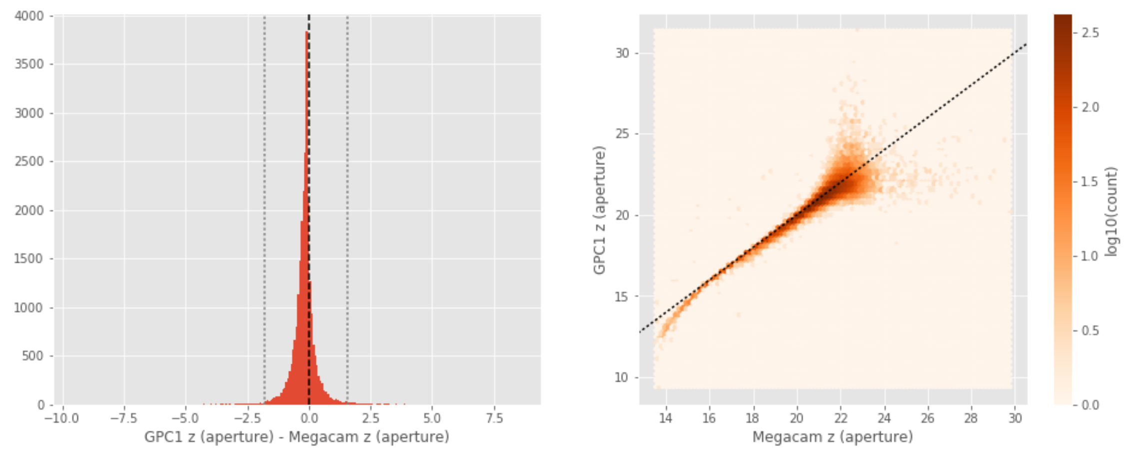
SUPRIME z (aperture) - Megacam z (aperture):
- Median: -0.07
- Median Absolute Deviation: 0.23
- 1% percentile: -2.3434569549560544
- 99% percentile: 2.15307258605957



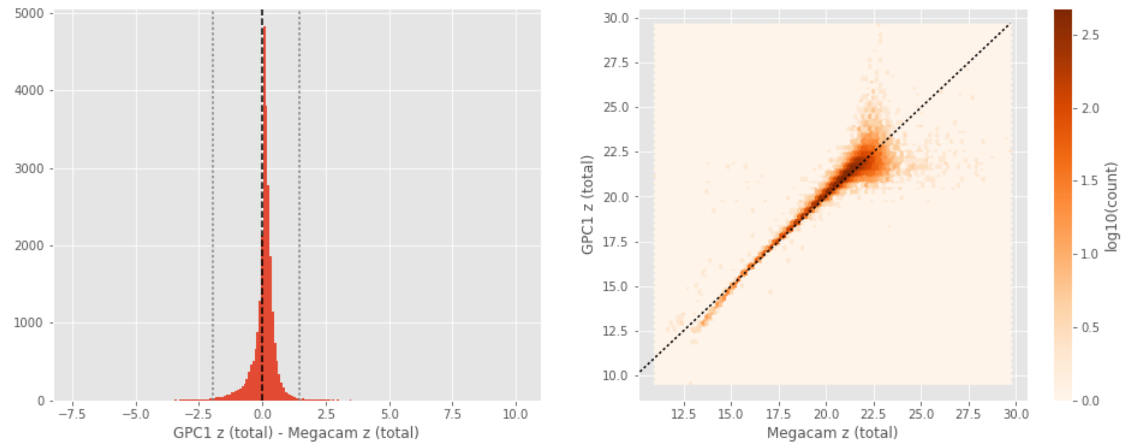
SUPRIME z (total) - Megacam z (total):
- Median: -0.14
- Median Absolute Deviation: 0.29
- 1% percentile: -3.058683300018311
- 99% percentile: 2.3672728538513192



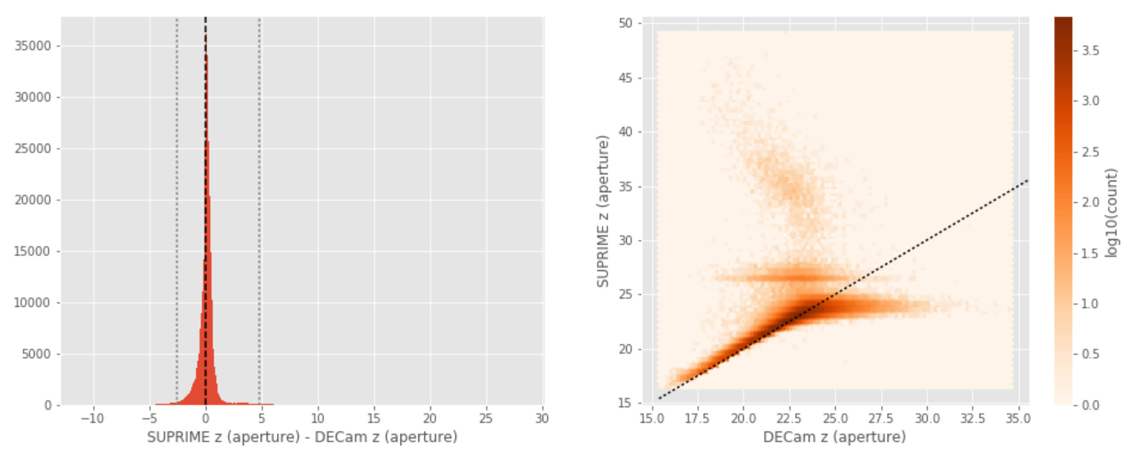
GPC1 z (aperture) - Megacam z (aperture):
- Median: -0.15
- Median Absolute Deviation: 0.18
- 1% percentile: -1.7988469886779783
- 99% percentile: 1.5873984718322791



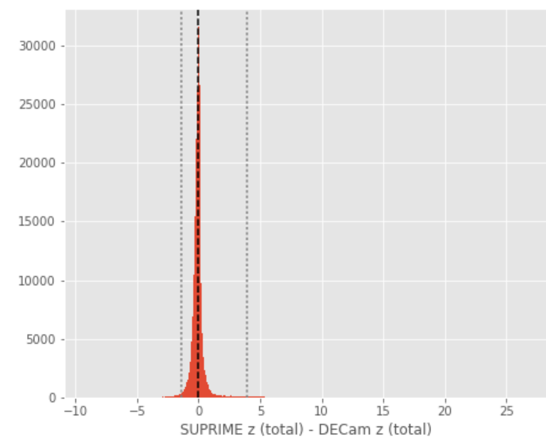
GPC1 z (total) - Megacam z (total):
- Median: 0.10
- Median Absolute Deviation: 0.15
- 1% percentile: -1.9294200897216796
- 99% percentile: 1.4494407653808676

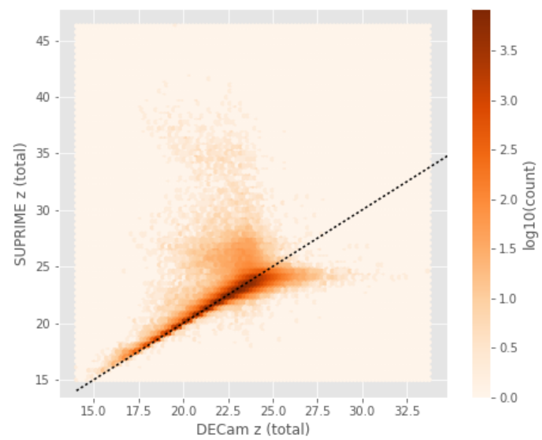


SUPRIME z (aperture) - DECam z (aperture):
- Median: 0.12
- Median Absolute Deviation: 0.25
- 1% percentile: -2.5004561805725096
- 99% percentile: 4.763002719879154

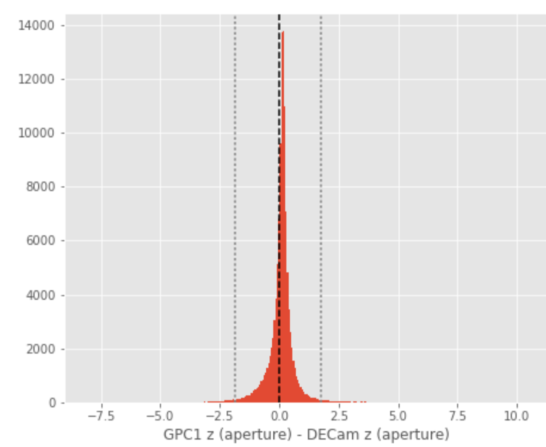


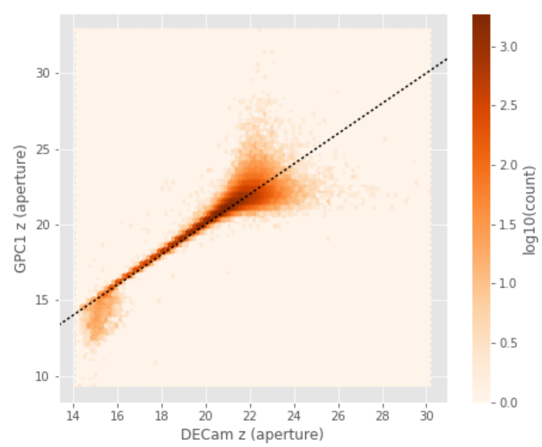
SUPRIME z (total) - DECam z (total):
- Median: -0.06
- Median Absolute Deviation: 0.17
- 1% percentile: -1.443832015991211
- 99% percentile: 3.931979255676256



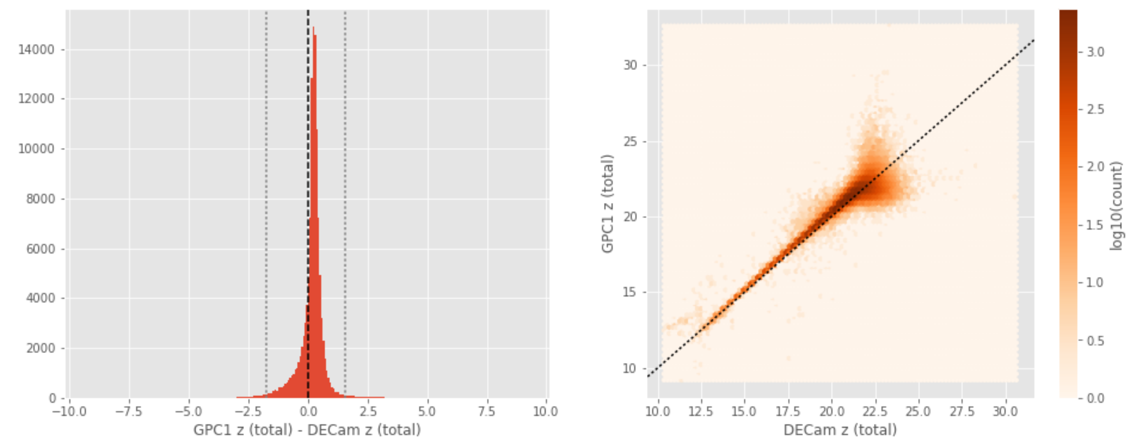


GPC1 z (aperture) - DECam z (aperture):
- Median: 0.12
- Median Absolute Deviation: 0.16
- 1% percentile: -1.844488754272461
- 99% percentile: 1.7412538909912096

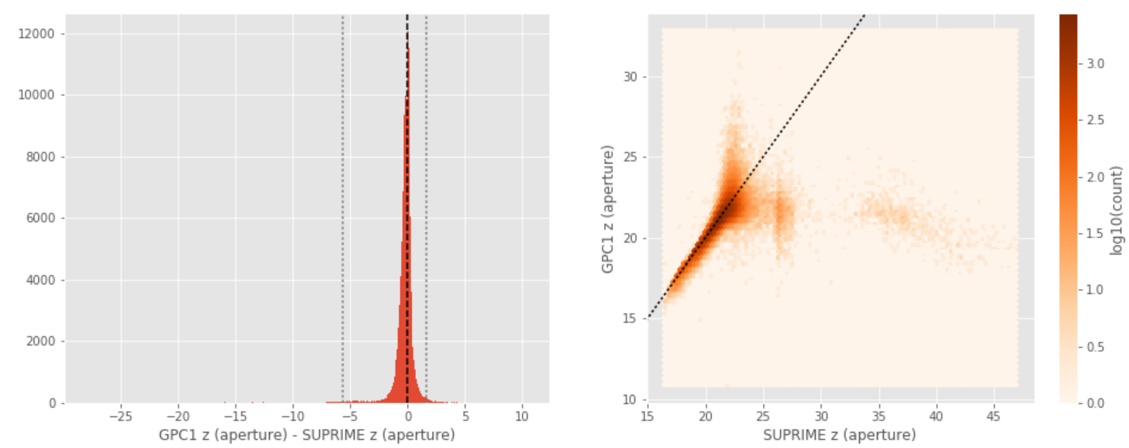




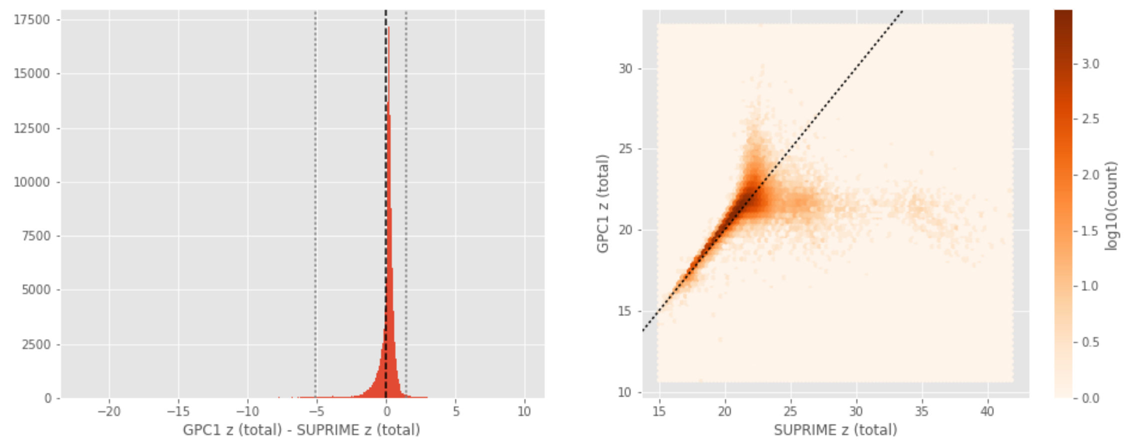
GPC1 z (total) - DECam z (total):
- Median: 0.23
- Median Absolute Deviation: 0.16
- 1% percentile: -1.749343681335449
- 99% percentile: 1.5593233108520559



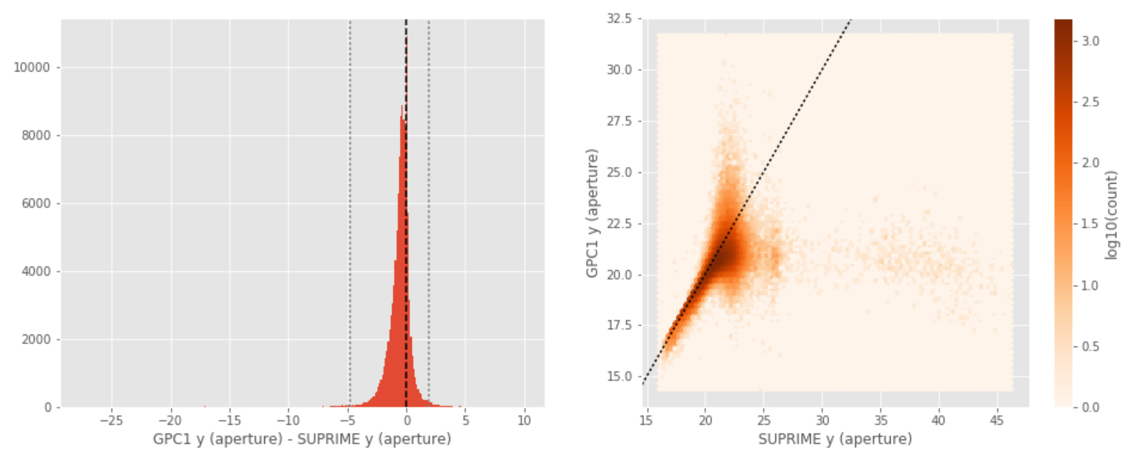
GPC1 z (aperture) - SUPRIME z (aperture):
- Median: -0.13
- Median Absolute Deviation: 0.26
- 1% percentile: -5.652035140991211
- 99% percentile: 1.673993778228756



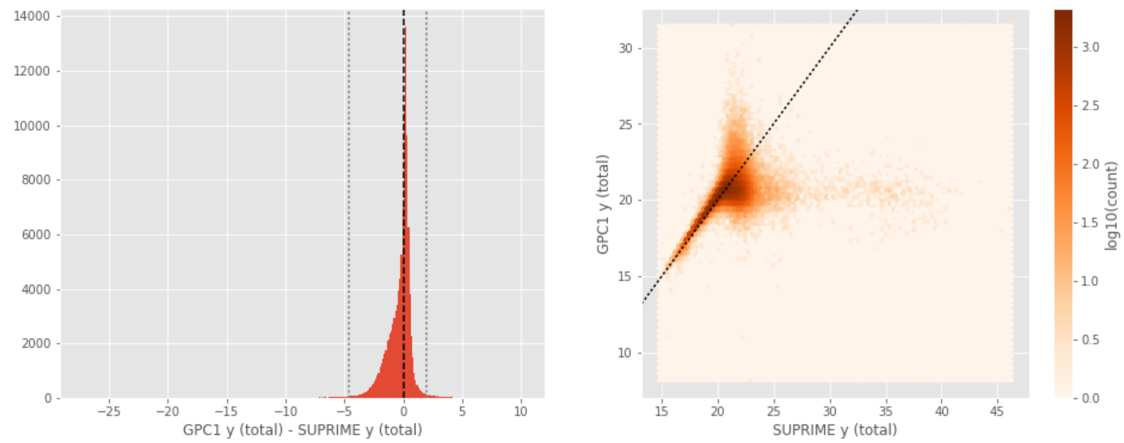
GPC1 z (total) - SUPRIME z (total):
- Median: 0.19
- Median Absolute Deviation: 0.18
- 1% percentile: -5.109778594970703
- 99% percentile: 1.4577860641479492



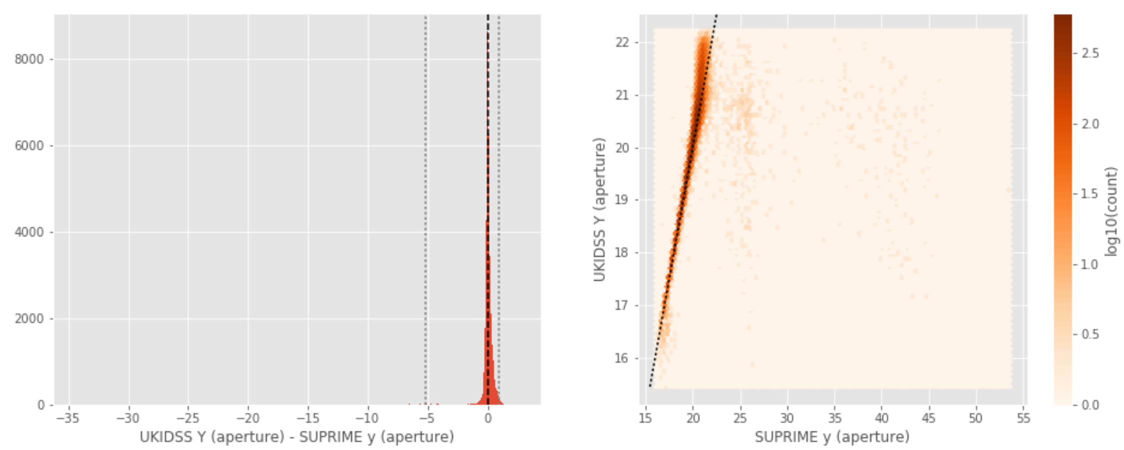
GPC1 y (aperture) - SUPRIME y (aperture):
- Median: -0.40
- Median Absolute Deviation: 0.43
- 1% percentile: -4.734822845458984
- 99% percentile: 1.8781716346740709



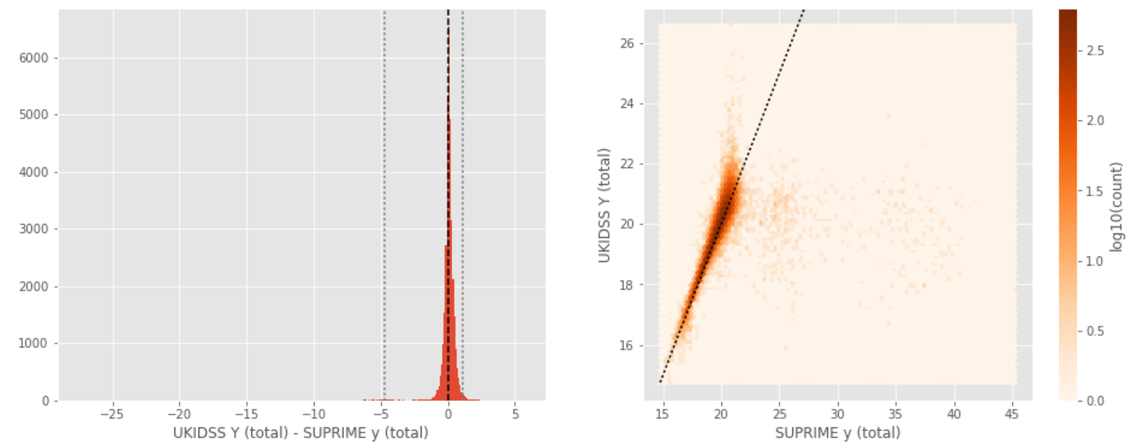
GPC1 y (total) - SUPRIME y (total):
- Median: -0.01
- Median Absolute Deviation: 0.41
- 1% percentile: -4.581078414916992
- 99% percentile: 2.0142618560790995



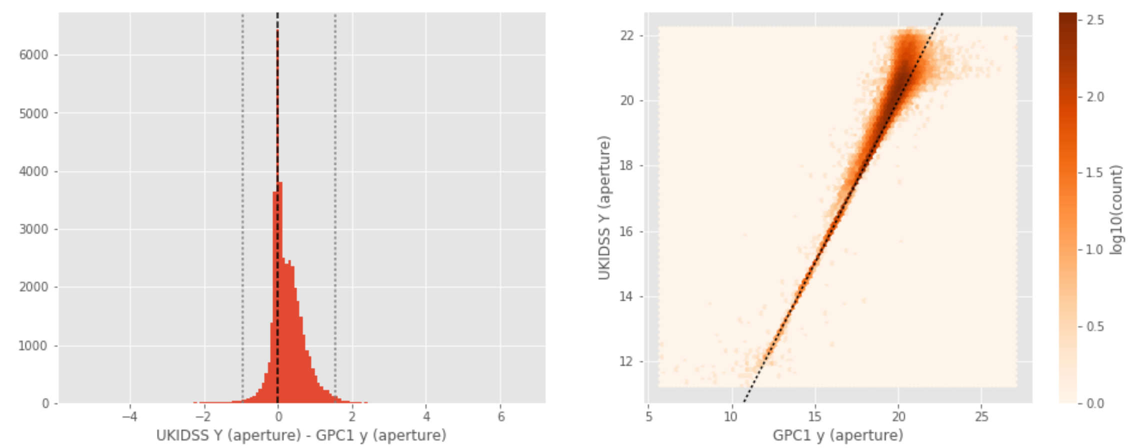
UKIDSS Y (aperture) - SUPRIME y (aperture):
- Median: 0.04
- Median Absolute Deviation: 0.11
- 1% percentile: -5.1563458824157715
- 99% percentile: 0.9319707298278811



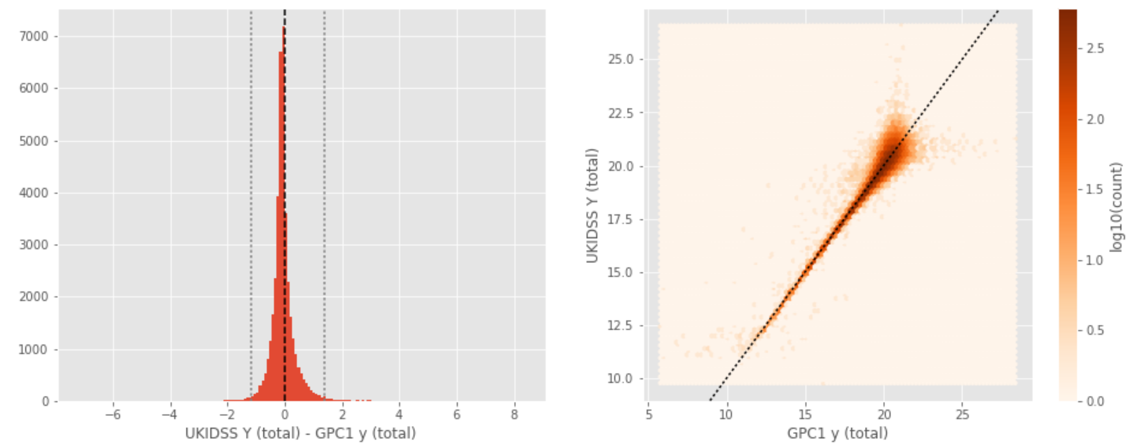
UKIDSS Y (total) - SUPRIME y (total):
- Median: 0.08
- Median Absolute Deviation: 0.16
- 1% percentile: -4.7431103515625
- 99% percentile: 1.152316741943361



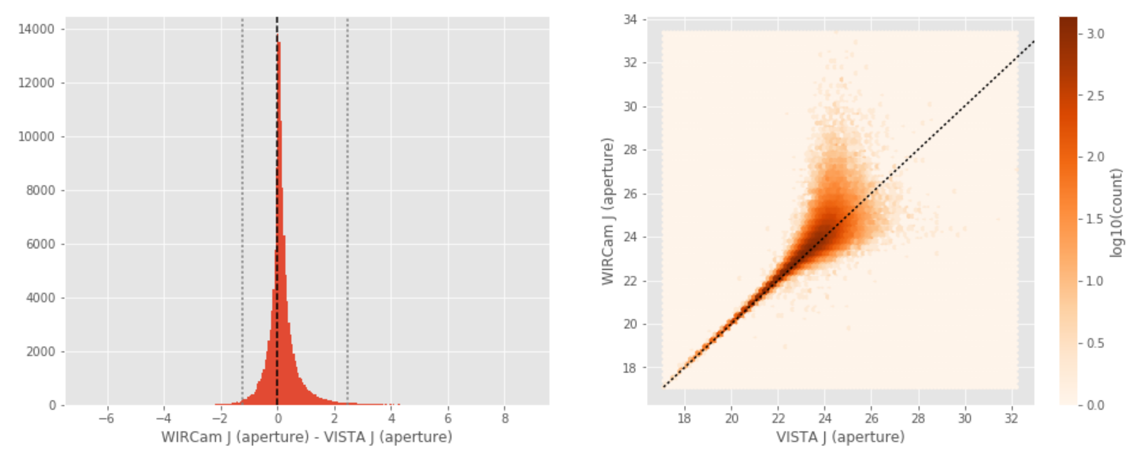
UKIDSS Y (aperture) - GPC1 y (aperture):
- Median: 0.15
- Median Absolute Deviation: 0.22
- 1% percentile: -0.9590471458435059
- 99% percentile: 1.5585036849975573



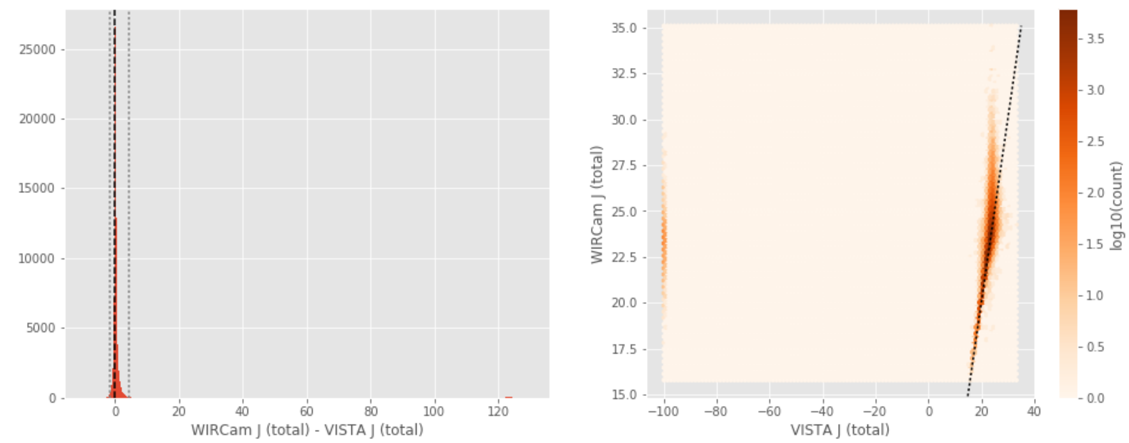
UKIDSS Y (total) - GPC1 y (total):
- Median: -0.09
- Median Absolute Deviation: 0.15
- 1% percentile: -1.1522045135498047
- 99% percentile: 1.3813939094543441



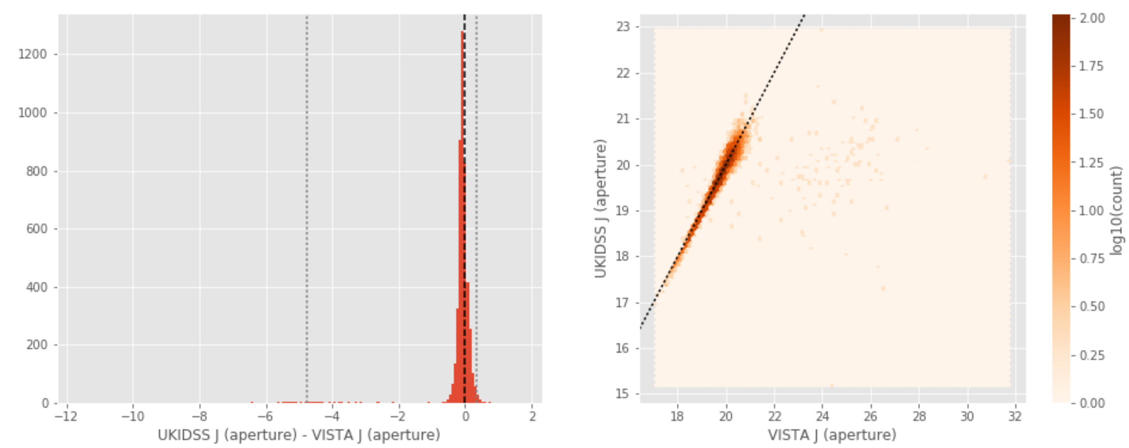
WIRCam J (aperture) - VISTA J (aperture):
- Median: 0.09
- Median Absolute Deviation: 0.18
- 1% percentile: -1.217284164428711
- 99% percentile: 2.489801483154296



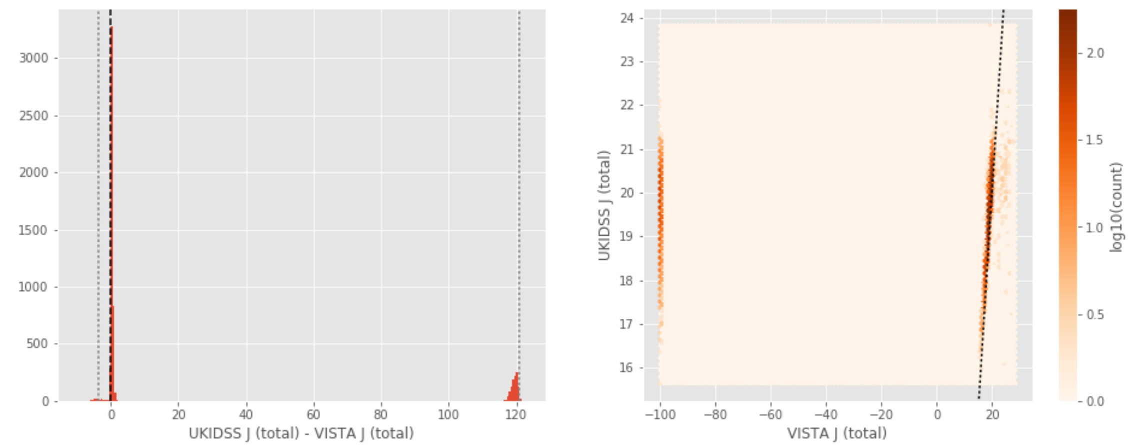
WIRCam J (total) - VISTA J (total):
- Median: 0.17
- Median Absolute Deviation: 0.25
- 1% percentile: -1.4488050079345702
- 99% percentile: 4.207304611206066



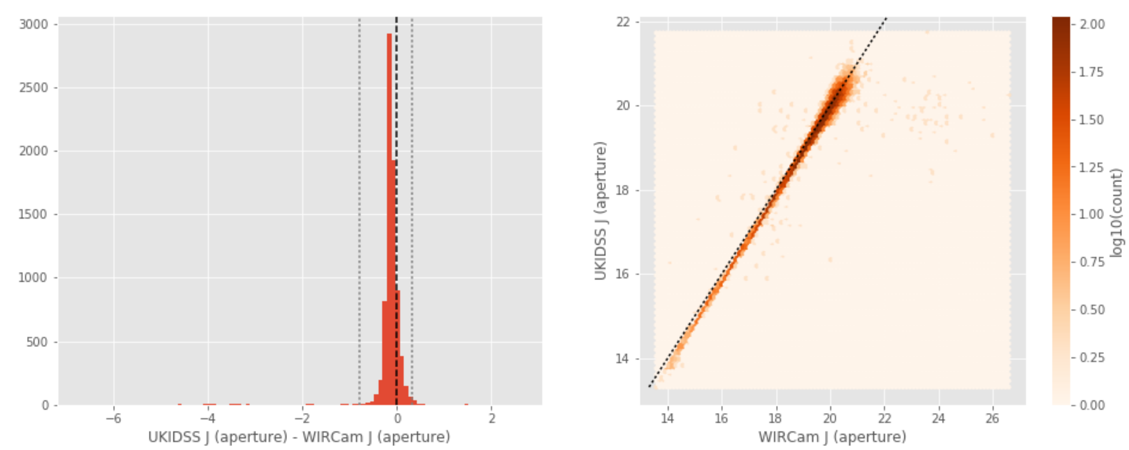
UKIDSS J (aperture) - VISTA J (aperture):
- Median: -0.07
- Median Absolute Deviation: 0.07
- 1% percentile: -4.767954254150391
- 99% percentile: 0.34275646209716853



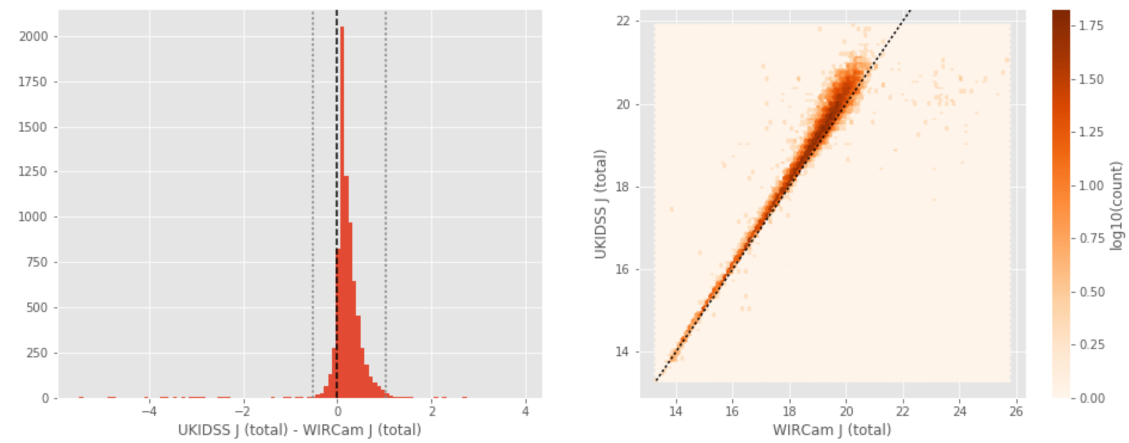
UKIDSS J (total) - VISTA J (total):
- Median: 0.42
- Median Absolute Deviation: 0.22
- 1% percentile: -3.6968894004821777
- 99% percentile: 120.74125699996948



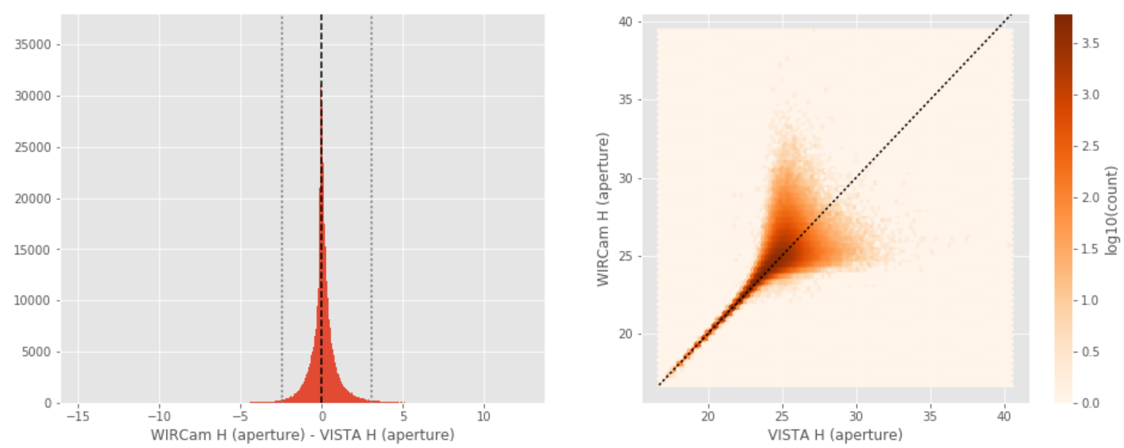
UKIDSS J (aperture) - WIRCam J (aperture):
- Median: -0.13
- Median Absolute Deviation: 0.06
- 1% percentile: -0.7987914085388184
- 99% percentile: 0.31058740615844727



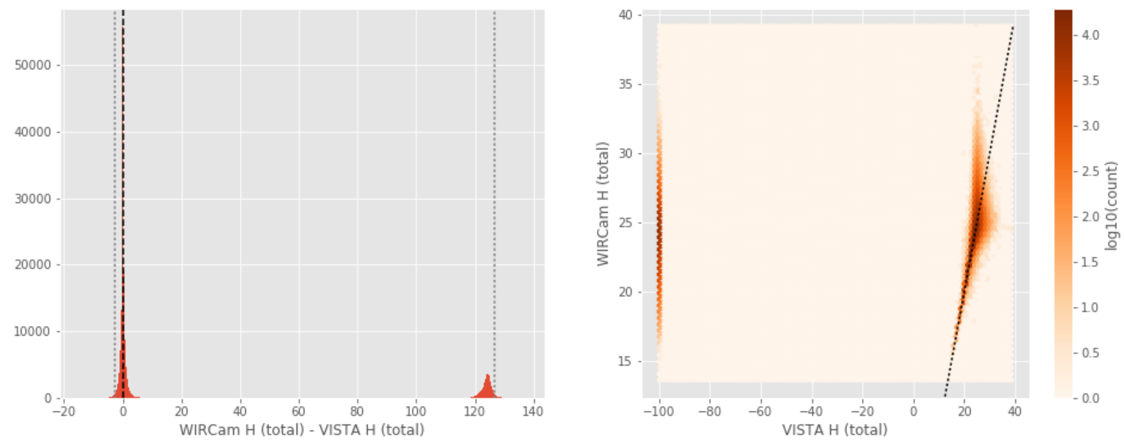
UKIDSS J (total) - WIRCam J (total):
- Median: 0.17
- Median Absolute Deviation: 0.11
- 1% percentile: -0.5228485488891601
- 99% percentile: 1.0357281112670884



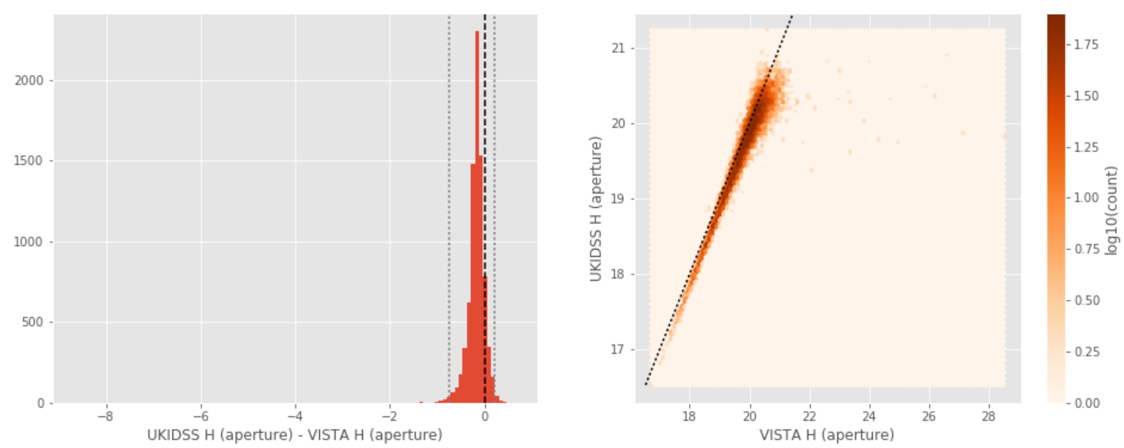
WIRCam H (aperture) - VISTA H (aperture):
- Median: 0.03
- Median Absolute Deviation: 0.28
- 1% percentile: -2.4690948486328126
- 99% percentile: 3.0697425842285164



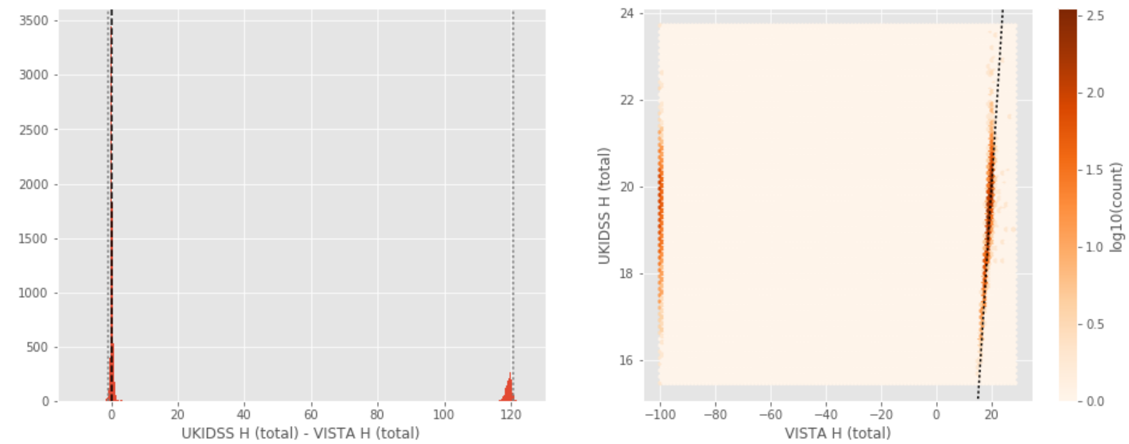
WIRCam H (total) - VISTA H (total):
- Median: 0.16
- Median Absolute Deviation: 0.56
- 1% percentile: -2.5811996459960938
- 99% percentile: 126.78960227966309



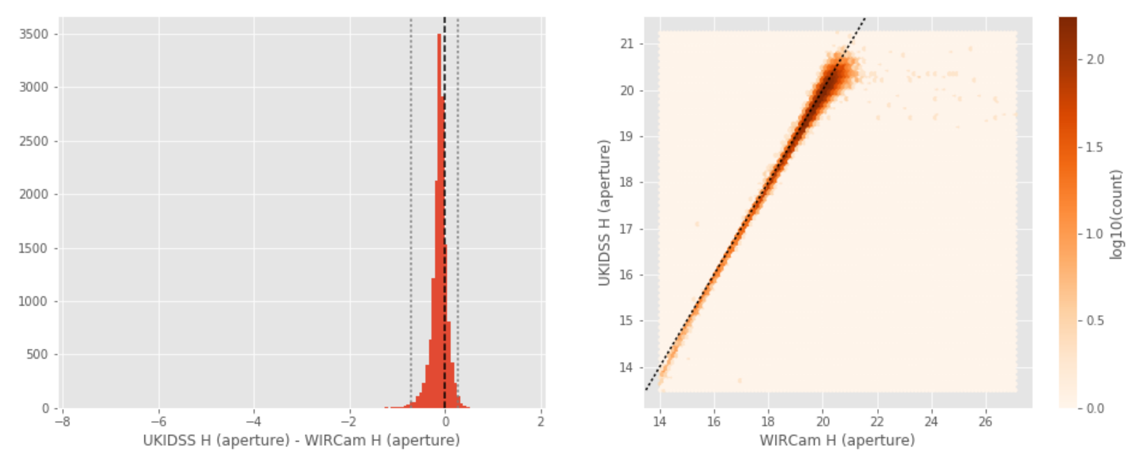
UKIDSS H (aperture) - VISTA H (aperture):
- Median: -0.16
- Median Absolute Deviation: 0.08
- 1% percentile: -0.7533025741577148
- 99% percentile: 0.20724439620971713



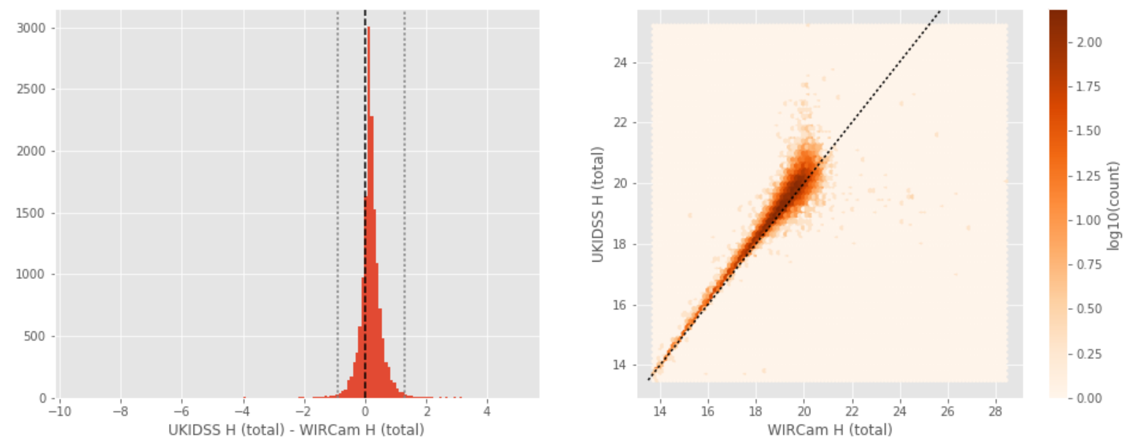
UKIDSS H (total) - VISTA H (total):
- Median: 0.21
- Median Absolute Deviation: 0.25
- 1% percentile: -0.841353988647461
- 99% percentile: 120.62915191650391



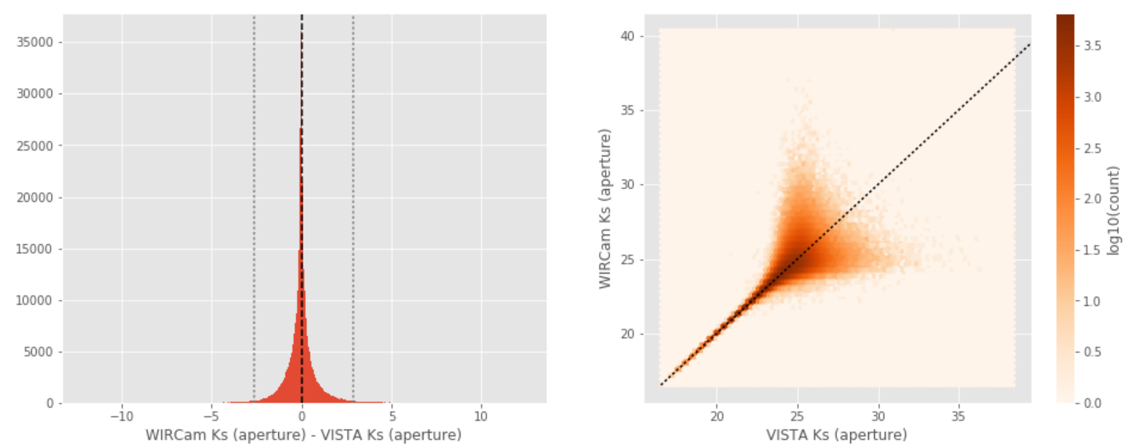
UKIDSS H (aperture) - WIRCam H (aperture):
- Median: -0.10
- Median Absolute Deviation: 0.08
- 1% percentile: -0.7209542846679687
- 99% percentile: 0.2708863830566407



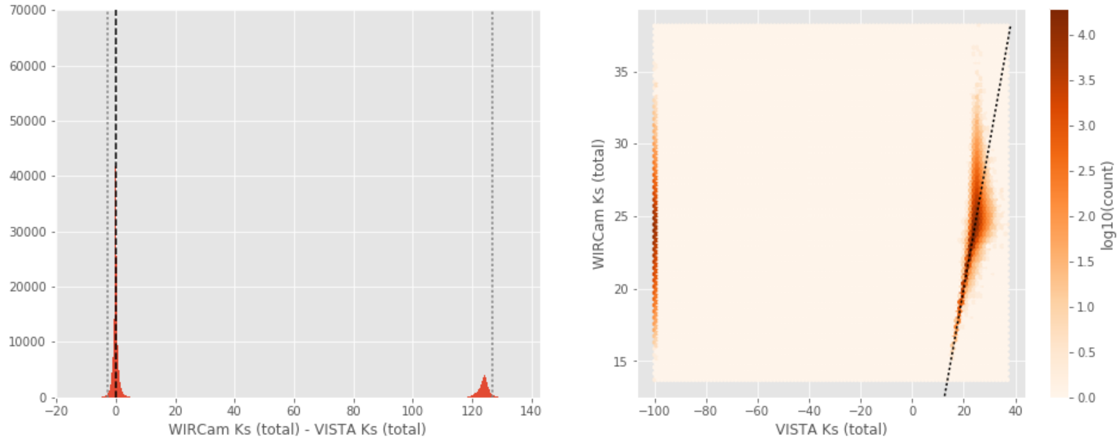
UKIDSS H (total) - WIRCam H (total):
- Median: 0.16
- Median Absolute Deviation: 0.15
- 1% percentile: -0.888087043762207
- 99% percentile: 1.2842176437377941



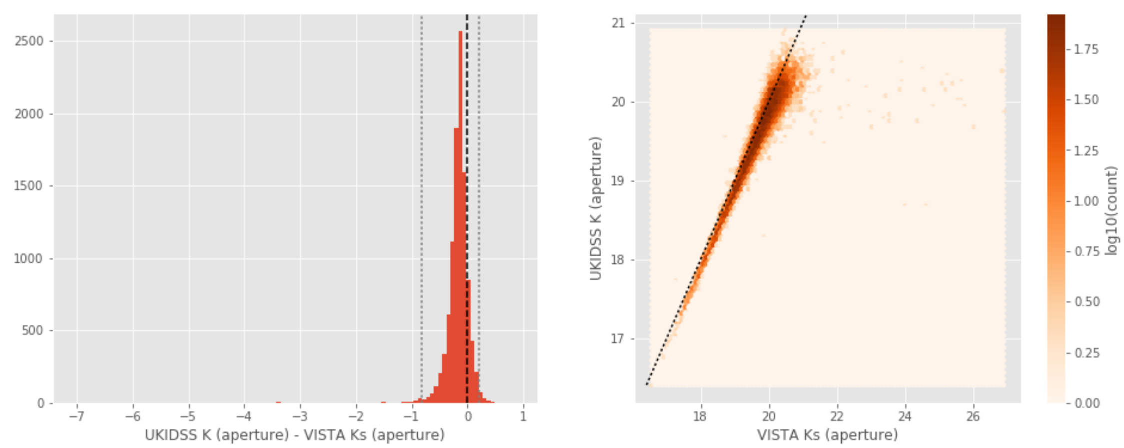
WIRCam Ks (aperture) - VISTA Ks (aperture):
- Median: -0.02
- Median Absolute Deviation: 0.26
- 1% percentile: -2.6148405456542965
- 99% percentile: 2.870211715698239



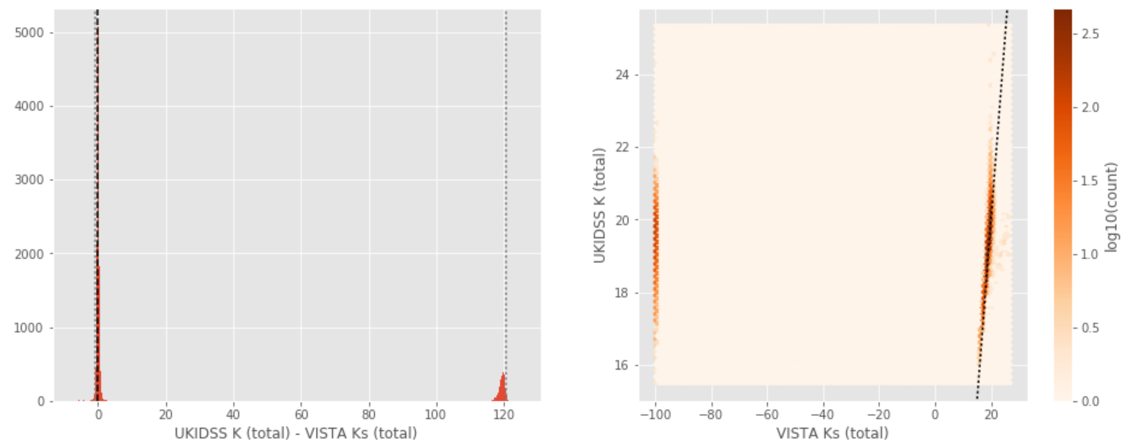
WIRCam Ks (total) - VISTA Ks (total):
- Median: 0.06
- Median Absolute Deviation: 0.56
- 1% percentile: -2.6953111648559567
- 99% percentile: 126.61100791931152



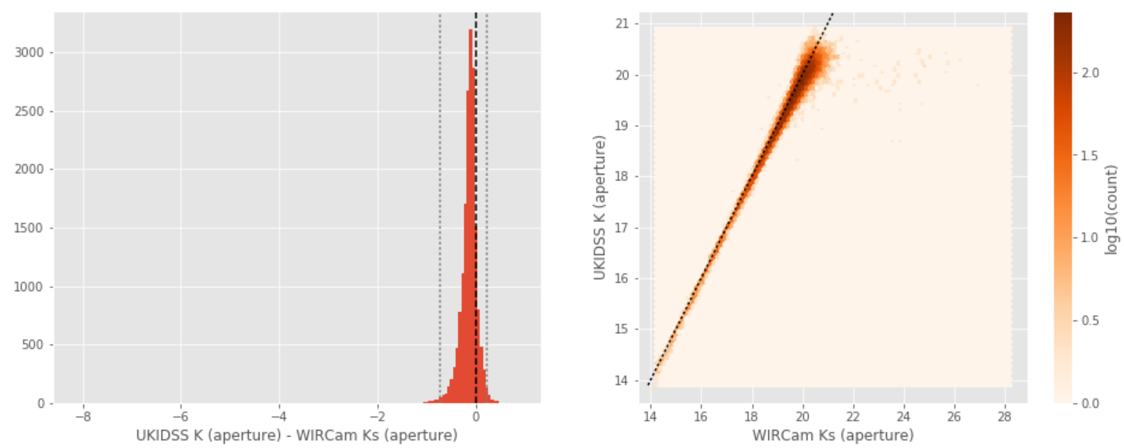
UKIDSS K (aperture) - VISTA Ks (aperture):
- Median: -0.15
- Median Absolute Deviation: 0.09
- 1% percentile: -0.8119423103332519
- 99% percentile: 0.21432039260864238



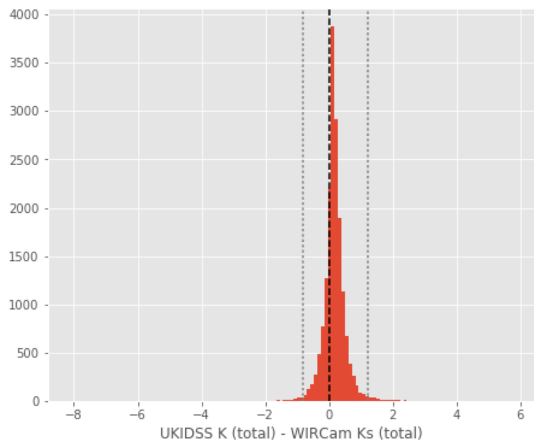
UKIDSS K (total) - VISTA Ks (total):
- Median: 0.20
- Median Absolute Deviation: 0.24
- 1% percentile: -0.841779670715332
- 99% percentile: 120.47884174346923

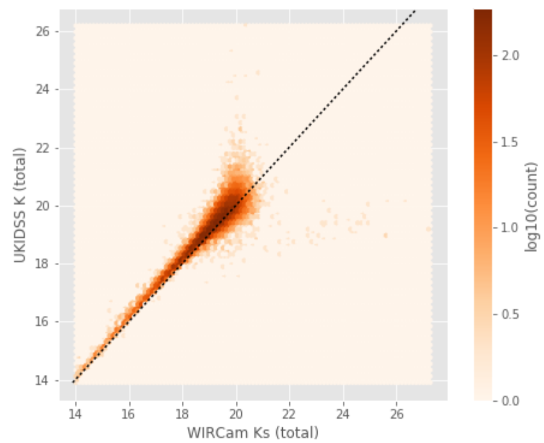


UKIDSS K (aperture) - WIRCam Ks (aperture):
- Median: -0.11
- Median Absolute Deviation: 0.08
- 1% percentile: -0.7296617126464844
- 99% percentile: 0.24024299621581907



UKIDSS K (total) - WIRCam Ks (total):
- Median: 0.16
- Median Absolute Deviation: 0.15
- 1% percentile: -0.8176431274414062
- 99% percentile: 1.2011849975585909





1.5 III - Comparing magnitudes to reference bands

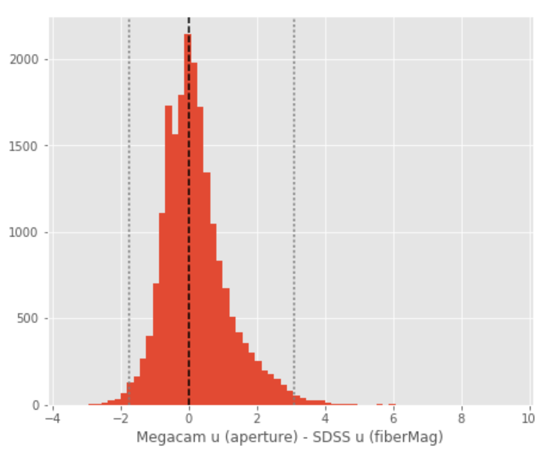
Cross-match the master list to SDSS and 2MASS to compare its magnitudes to SDSS and 2MASS ones.

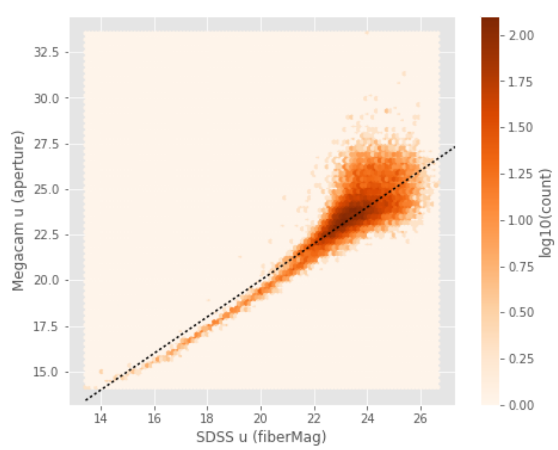
1.5.1 III.a - Comparing u, g, r, i, and z bands to SDSS

The catalogue is cross-matched to SDSS-DR13 withing 0.2 arcsecond.

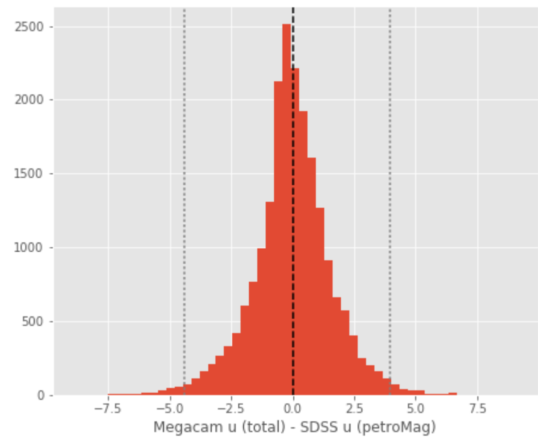
We compare the u, g, r, i, and z magnitudes to those from SDSS using `fiberMag` for the aperture magnitude and `petroMag` for the total magnitude.

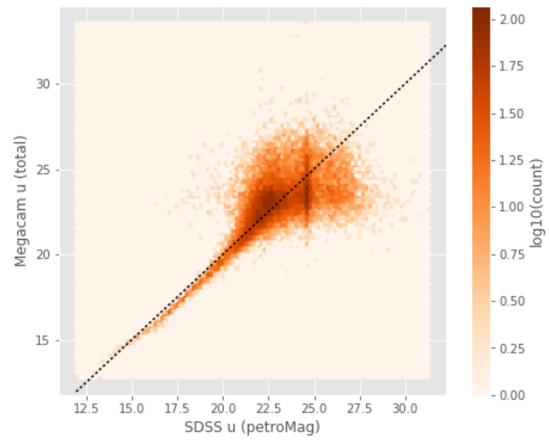
```
Megacam u (aperture) - SDSS u (fiberMag):
- Median: 0.08
- Median Absolute Deviation: 0.55
- 1% percentile: -1.735052299499512
- 99% percentile: 3.109880828857419
```



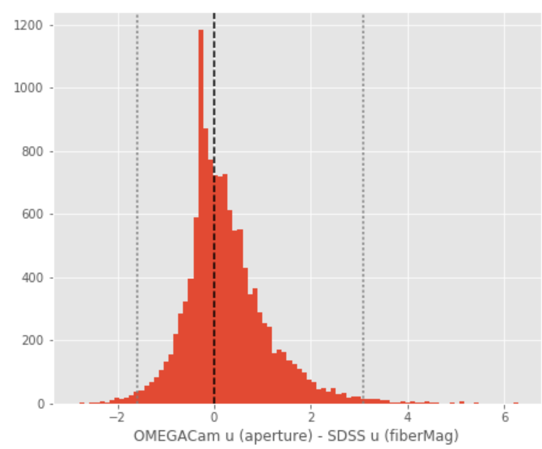


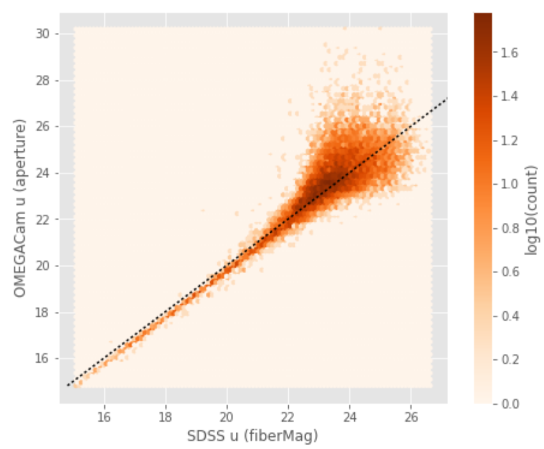
```
Megacam u (total) - SDSS u (petroMag):
- Median: -0.04
- Median Absolute Deviation: 0.84
- 1% percentile: -4.41092529296875
- 99% percentile: 3.967271518707274
```



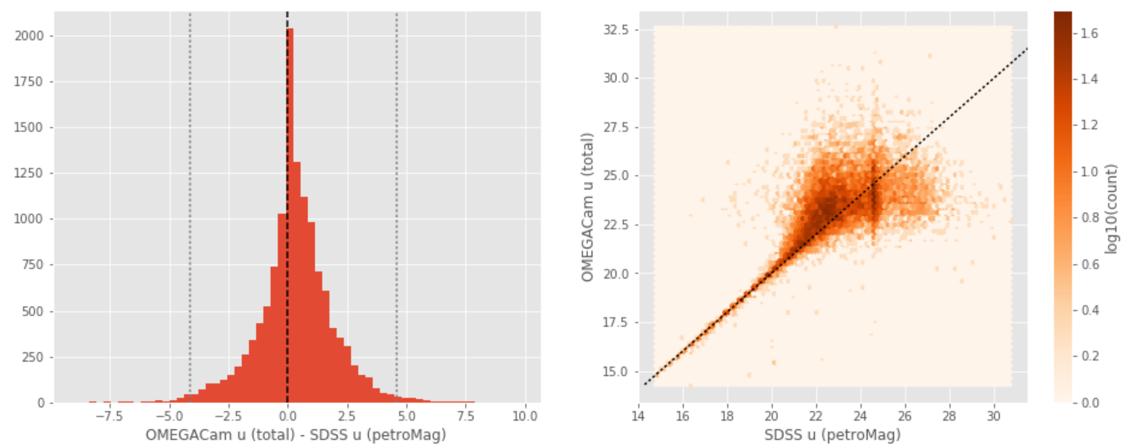



```
OMEGACam u (aperture) - SDSS u (fiberMag):
- Median: 0.11
- Median Absolute Deviation: 0.43
- 1% percentile: -1.596651840209961
- 99% percentile: 3.089199371337889
```

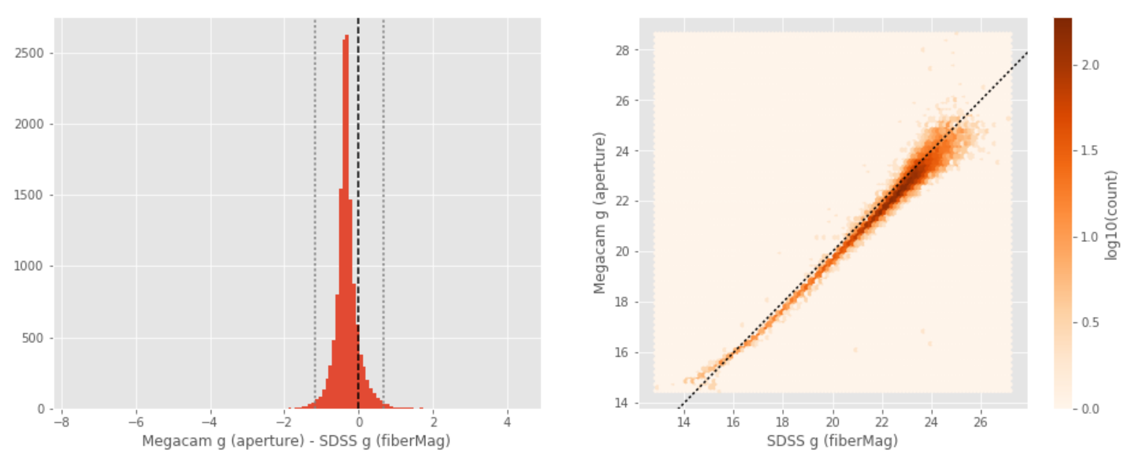




```
OMEGACam u (total) - SDSS u (petroMag):
- Median: 0.25
- Median Absolute Deviation: 0.77
- 1% percentile: -4.133014030456543
- 99% percentile: 4.614612464904785
```

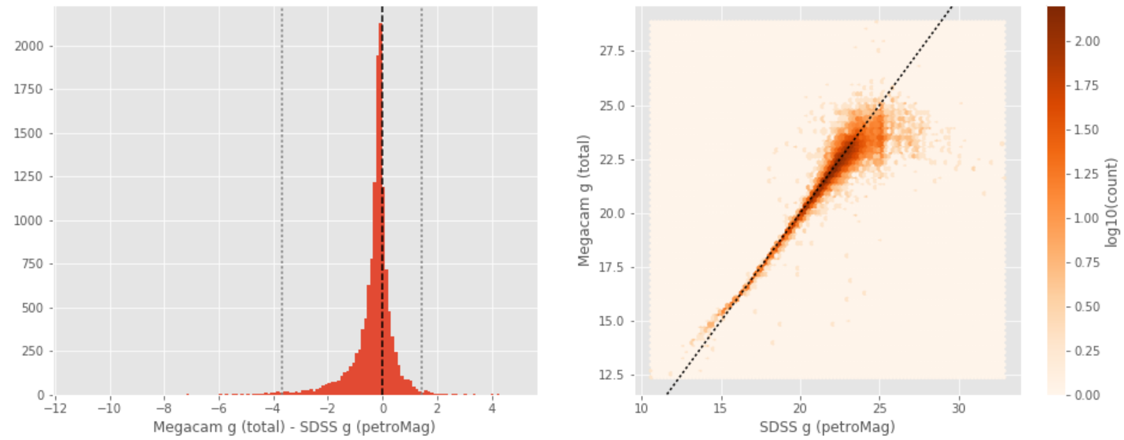



```
Megacam g (aperture) - SDSS g (fiberMag):
- Median: -0.34
- Median Absolute Deviation: 0.13
- 1% percentile: -1.1639002990722658
- 99% percentile: 0.6605275726318357
```

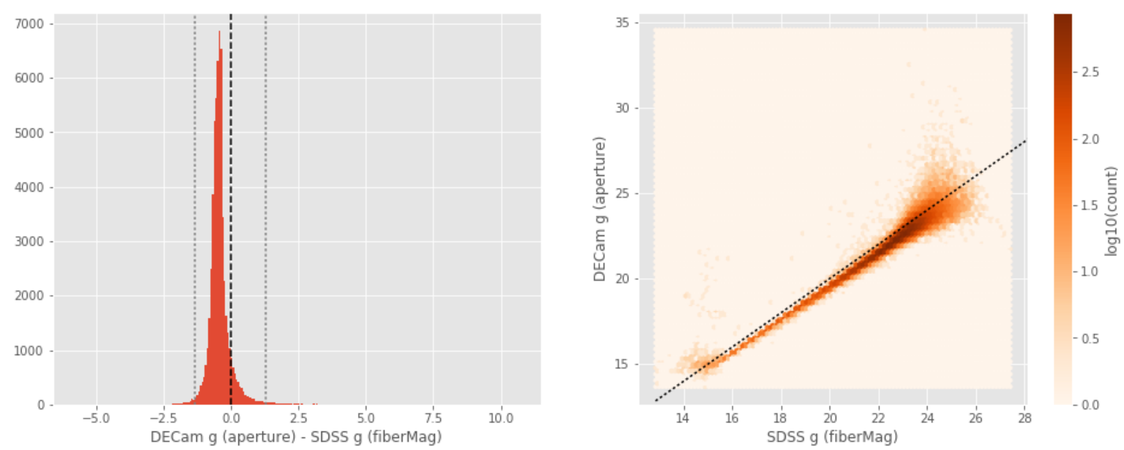



```
Megacam g (total) - SDSS g (petroMag):
- Median: -0.17
```

- Median Absolute Deviation: 0.23
- 1% percentile: -3.689757785797119
- 99% percentile: 1.435608062744142

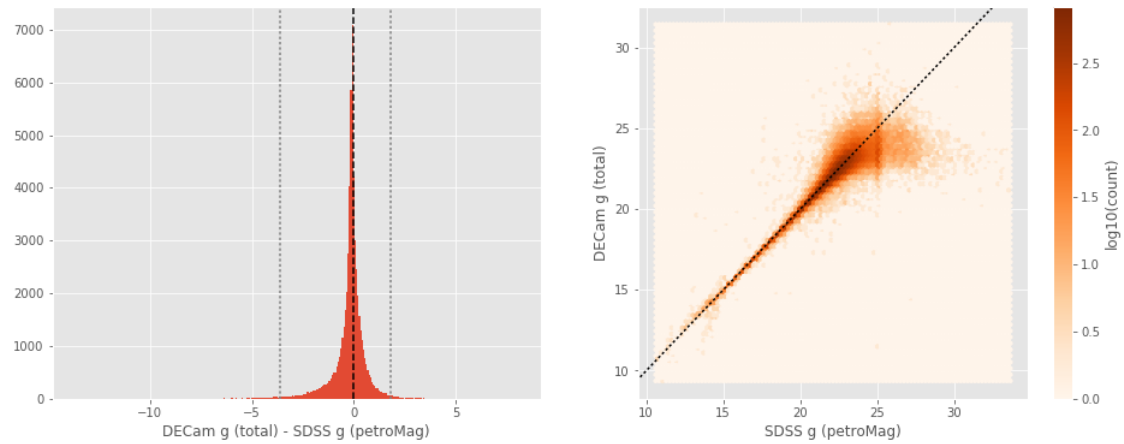


DECam g (aperture) - SDSS g (fiberMag):
- Median: -0.46
- Median Absolute Deviation: 0.15
- 1% percentile: -1.3317068481445313
- 99% percentile: 1.2690931510925285

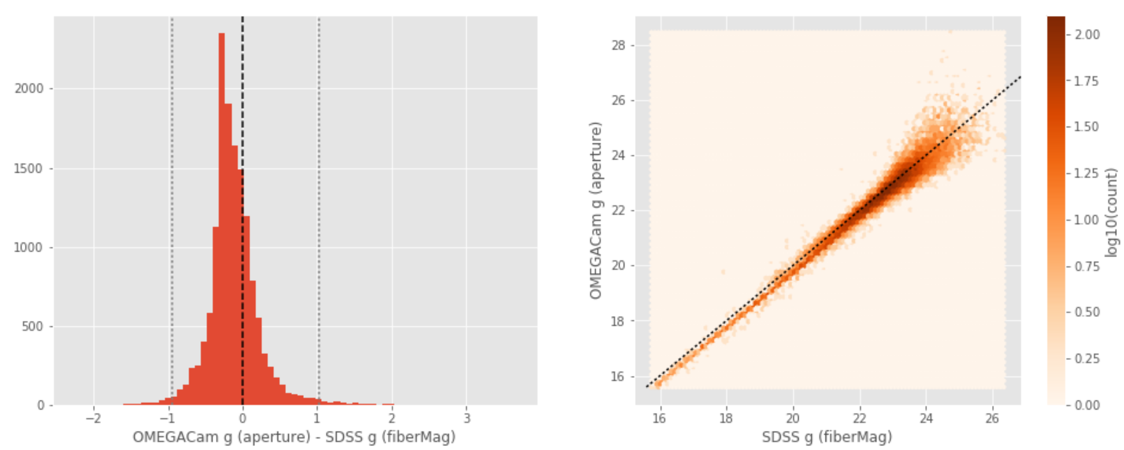


DECam g (total) - SDSS g (petroMag):
- Median: -0.11
- Median Absolute Deviation: 0.24
- 1% percentile: -3.6397795867919926

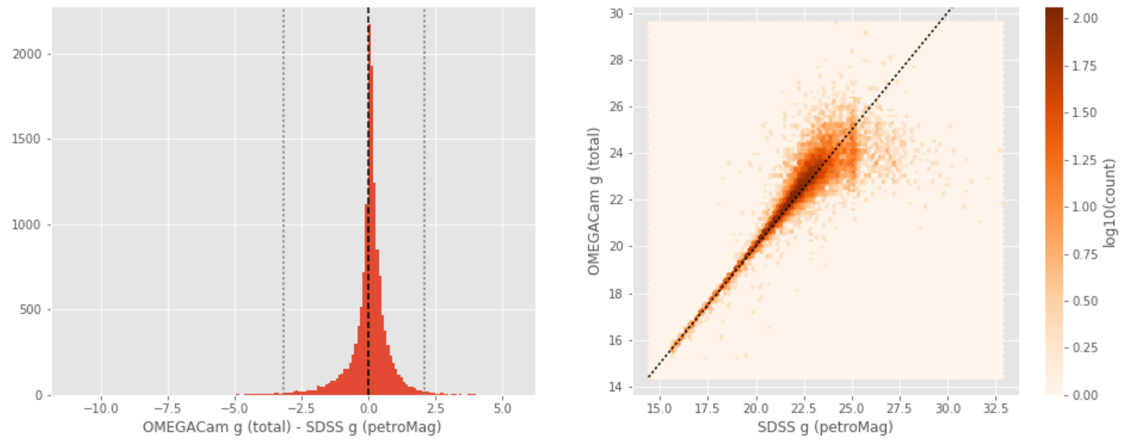
- 99% percentile: 1.8089286041259702



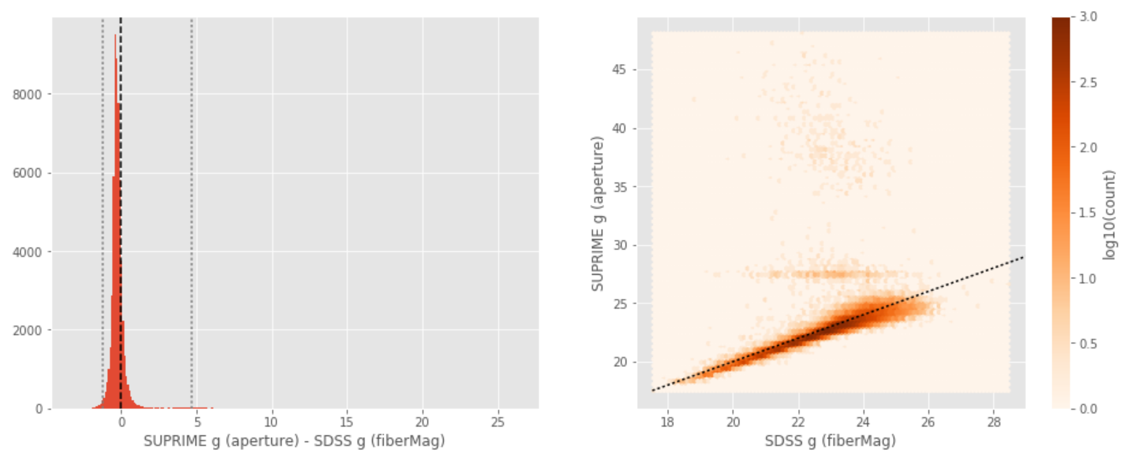
OMEGACam g (aperture) - SDSS g (fiberMag):
- Median: -0.16
- Median Absolute Deviation: 0.15
- 1% percentile: -0.9429903411865235
- 99% percentile: 1.019370994567871



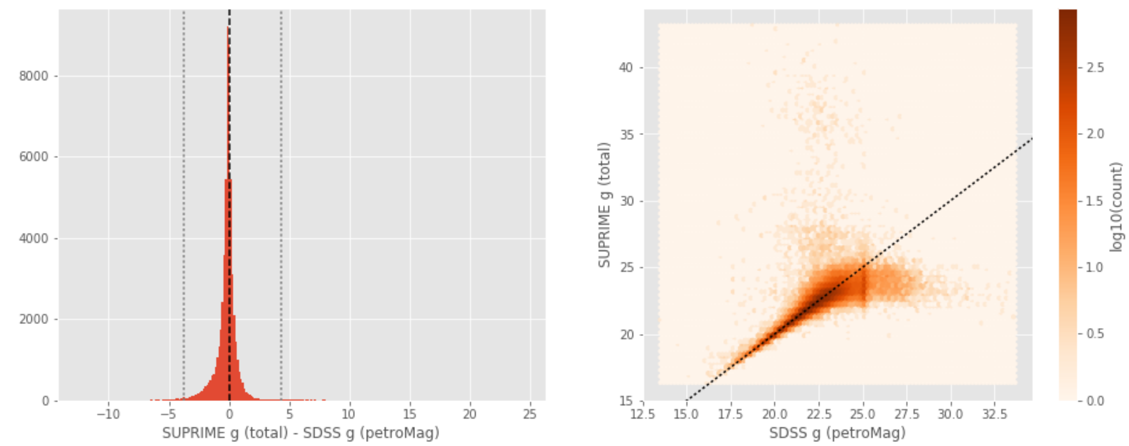
OMEGACam g (total) - SDSS g (petroMag):
- Median: 0.08
- Median Absolute Deviation: 0.24
- 1% percentile: -3.199727249145507
- 99% percentile: 2.094062232971188



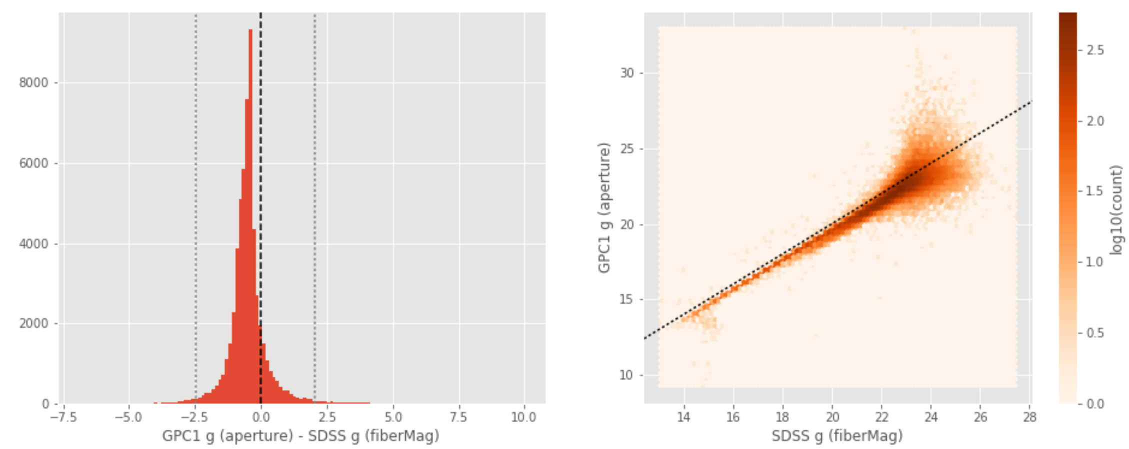
SUPRIME g (aperture) - SDSS g (fiberMag):
- Median: -0.27
- Median Absolute Deviation: 0.18
- 1% percentile: -1.1852587509155275
- 99% percentile: 4.643336791992211



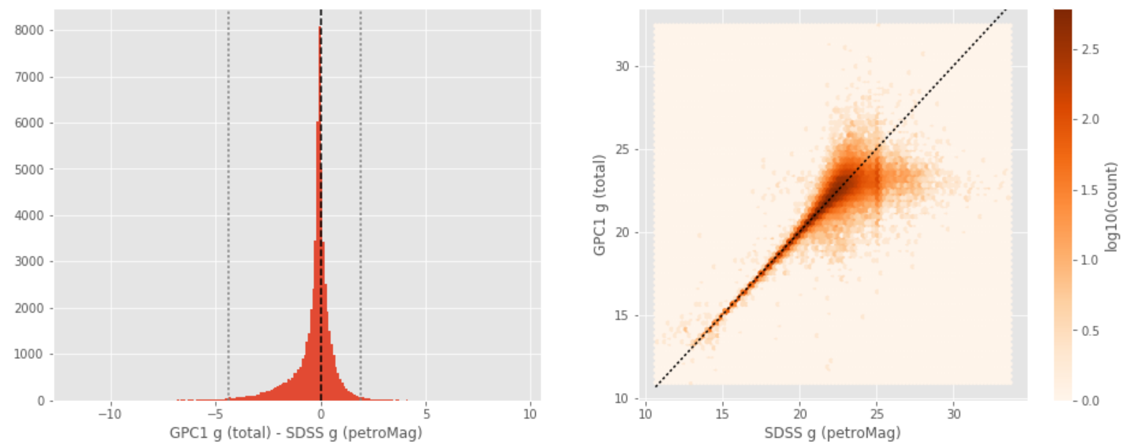
SUPRIME g (total) - SDSS g (petroMag):
- Median: -0.09
- Median Absolute Deviation: 0.28
- 1% percentile: -3.7602262115478515
- 99% percentile: 4.321117134094239



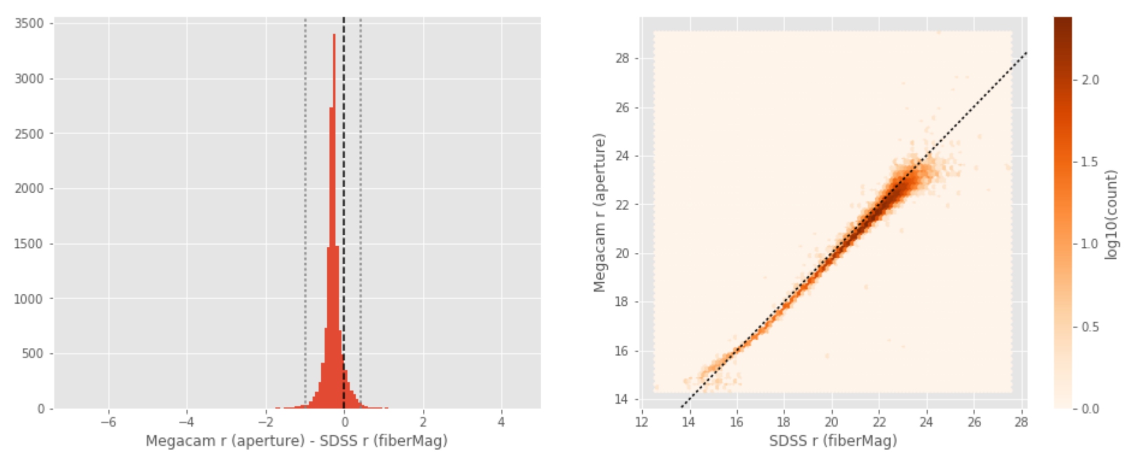
GPC1 g (aperture) - SDSS g (fiberMag):
- Median: -0.50
- Median Absolute Deviation: 0.27
- 1% percentile: -2.4781885528564453
- 99% percentile: 2.0431791305541993



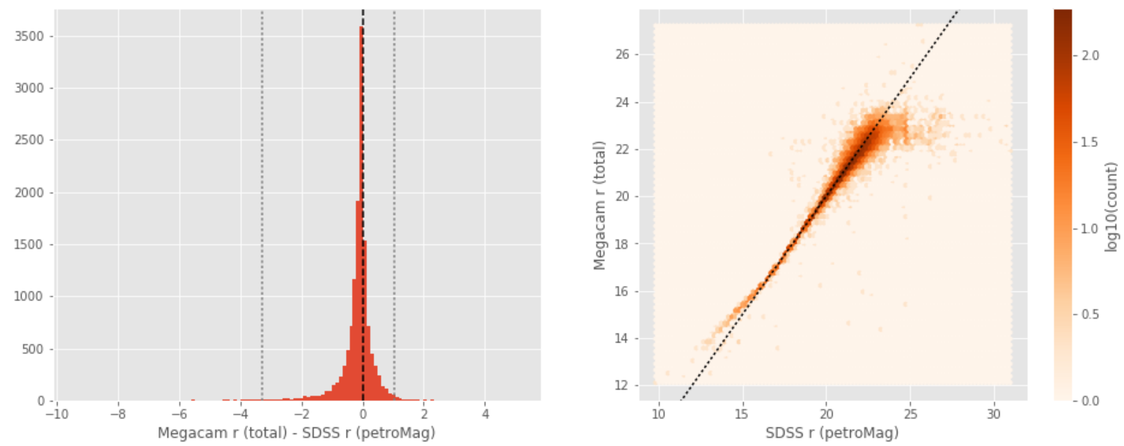
GPC1 g (total) - SDSS g (petroMag):
- Median: -0.09
- Median Absolute Deviation: 0.29
- 1% percentile: -4.374816207885742
- 99% percentile: 1.9304080581664997



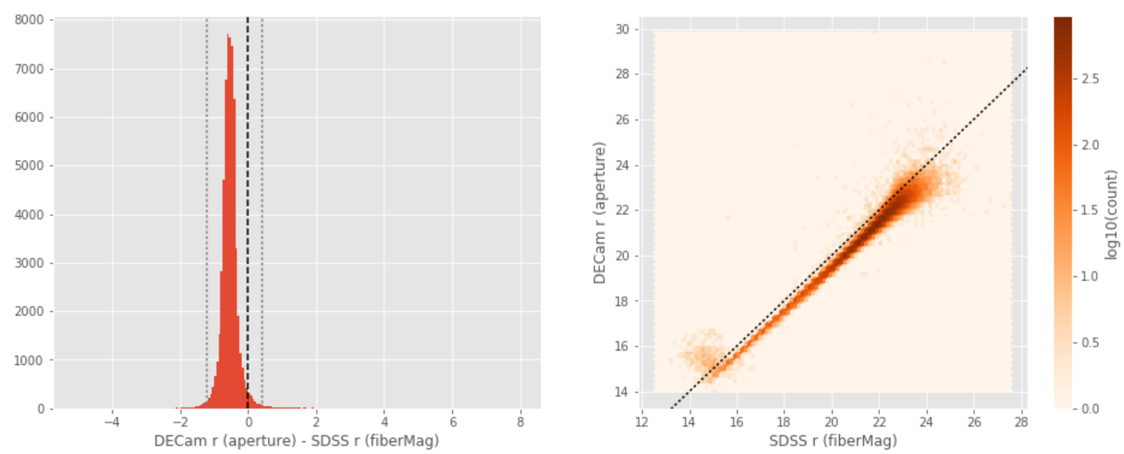
Megacam r (aperture) - SDSS r (fiberMag):
- Median: -0.28
- Median Absolute Deviation: 0.08
- 1% percentile: -0.9926081848144531
- 99% percentile: 0.43007174491882194



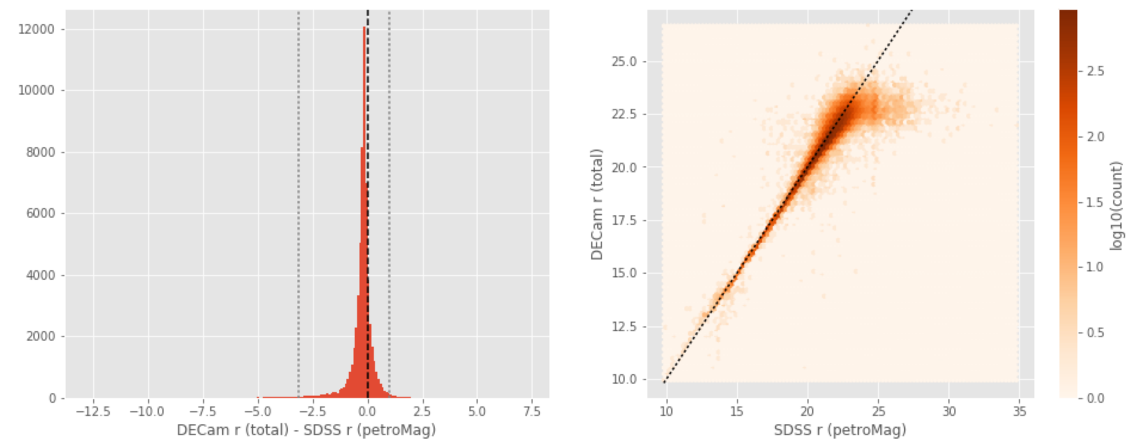
Megacam r (total) - SDSS r (petroMag):
- Median: -0.06
- Median Absolute Deviation: 0.15
- 1% percentile: -3.293231506347656
- 99% percentile: 1.050884590148922



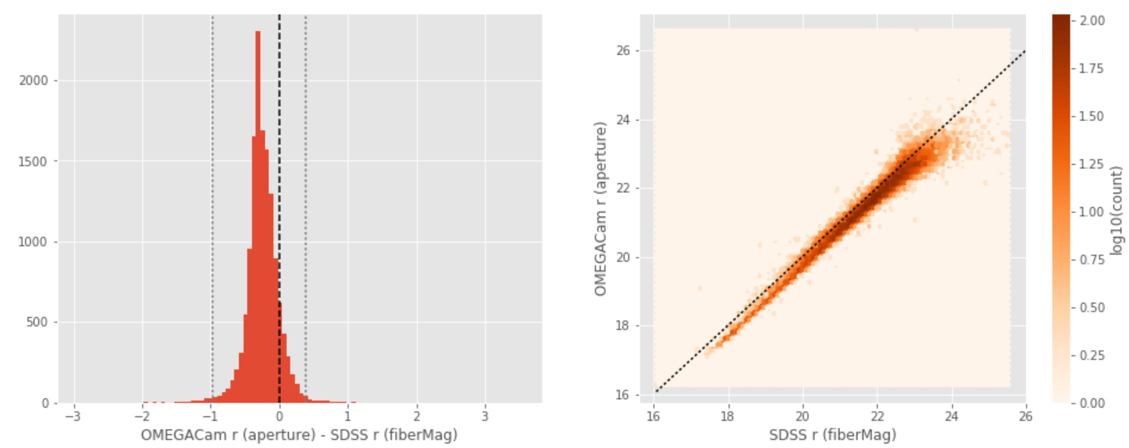
DECam r (aperture) - SDSS r (fiberMag):
- Median: -0.55
- Median Absolute Deviation: 0.12
- 1% percentile: -1.2170296859741212
- 99% percentile: 0.40372455596923895



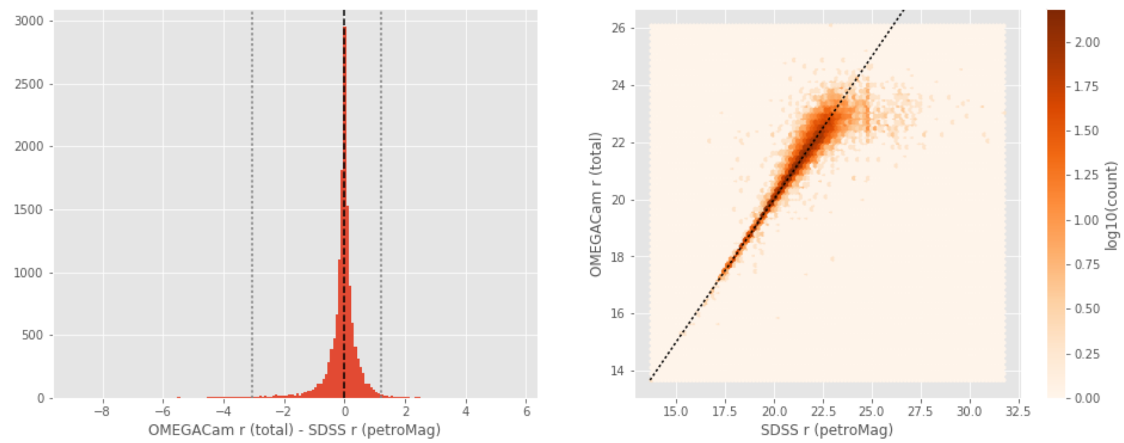
DECam r (total) - SDSS r (petroMag):
- Median: -0.16
- Median Absolute Deviation: 0.15
- 1% percentile: -3.148070240020752
- 99% percentile: 1.0046725273132298



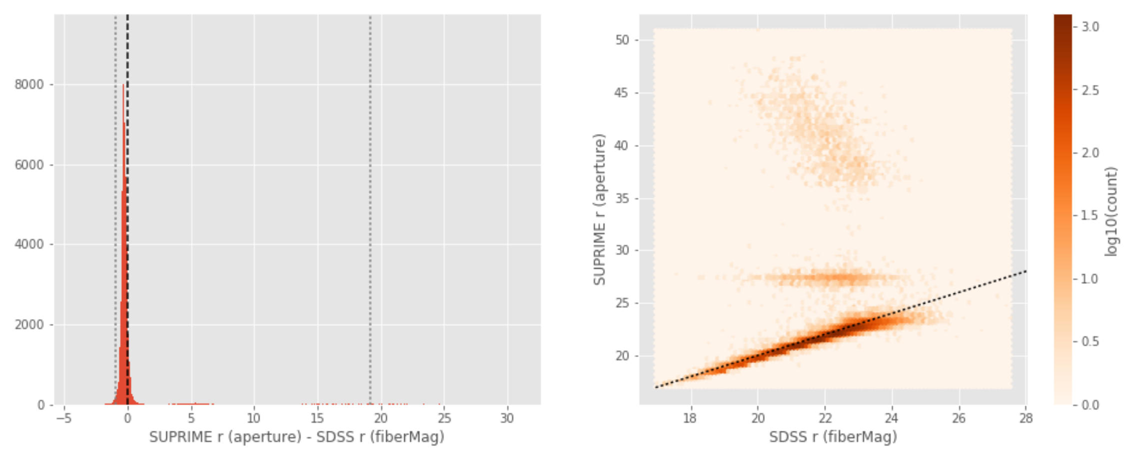
OMEGACam r (aperture) - SDSS r (fiberMag):
- Median: -0.26
- Median Absolute Deviation: 0.12
- 1% percentile: -0.964921817779541
- 99% percentile: 0.3830766105651858



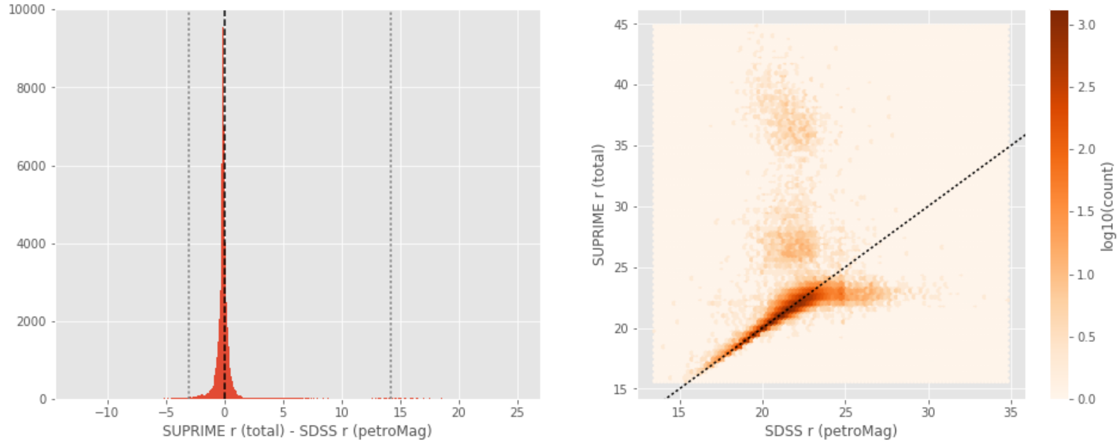
OMEGACam r (total) - SDSS r (petroMag):
- Median: -0.01
- Median Absolute Deviation: 0.15
- 1% percentile: -3.0445742225646972
- 99% percentile: 1.2092012405395518



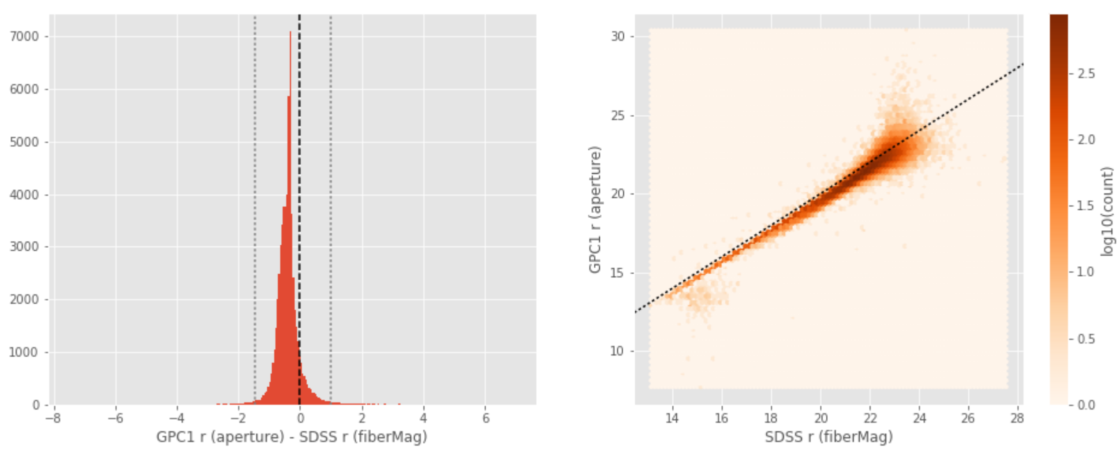
SUPRIME r (aperture) - SDSS r (fiberMag):
- Median: -0.27
- Median Absolute Deviation: 0.13
- 1% percentile: -0.9626075744628906
- 99% percentile: 19.201366863250726



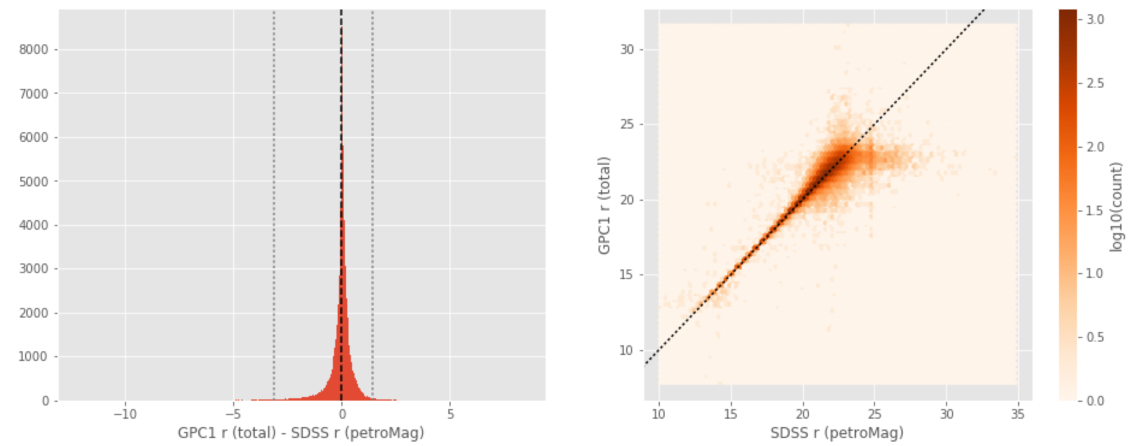
SUPRIME r (total) - SDSS r (petroMag):
- Median: -0.10
- Median Absolute Deviation: 0.18
- 1% percentile: -3.062121963500976
- 99% percentile: 14.236016082763706



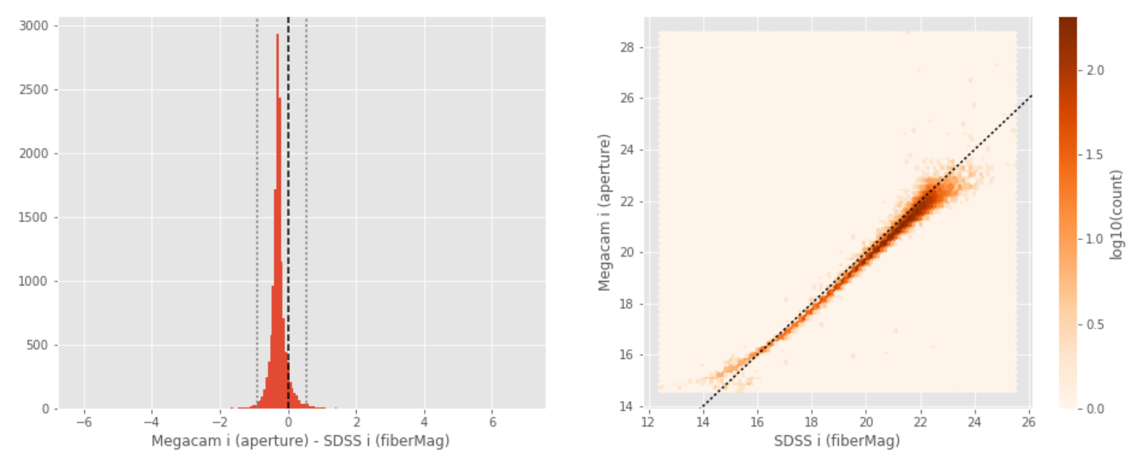
GPC1 r (aperture) - SDSS r (fiberMag):
- Median: -0.39
- Median Absolute Deviation: 0.17
- 1% percentile: -1.4749344825744628
- 99% percentile: 1.0008537864685025



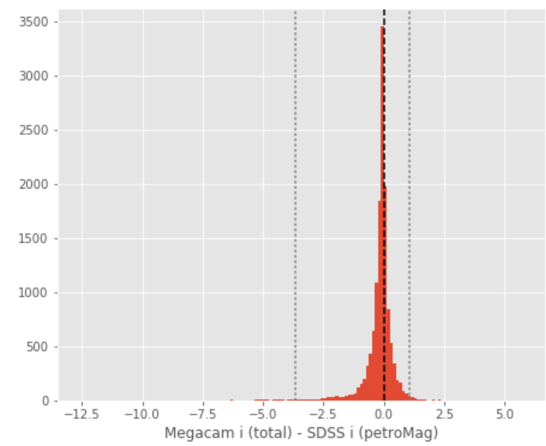
GPC1 r (total) - SDSS r (petroMag):
- Median: 0.03
- Median Absolute Deviation: 0.16
- 1% percentile: -3.0951134681701657
- 99% percentile: 1.447239818572998

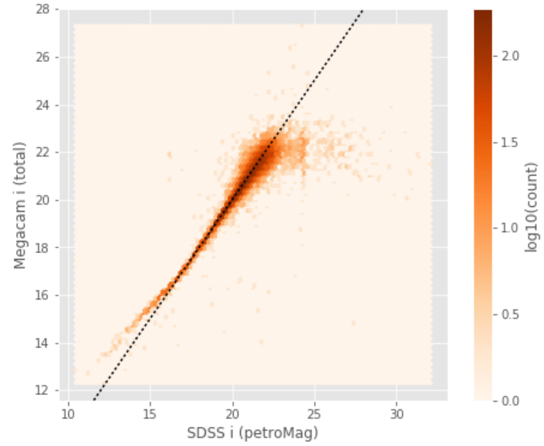


Megacam i (aperture) - SDSS i (fiberMag):
- Median: -0.29
- Median Absolute Deviation: 0.08
- 1% percentile: -0.9185096740722656
- 99% percentile: 0.5443773460388175

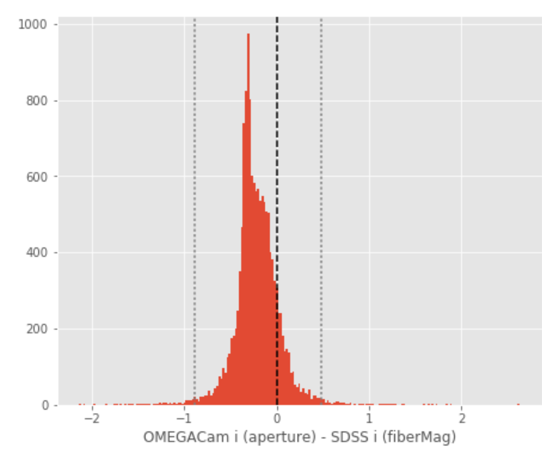


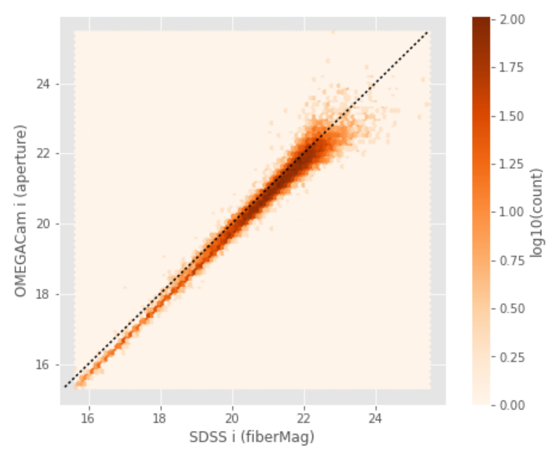
Megacam i (total) - SDSS i (petroMag):
- Median: -0.07
- Median Absolute Deviation: 0.16
- 1% percentile: -3.665563678741455
- 99% percentile: 1.0795299530029276



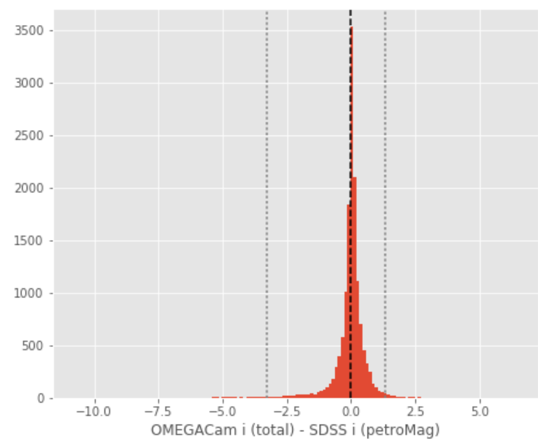


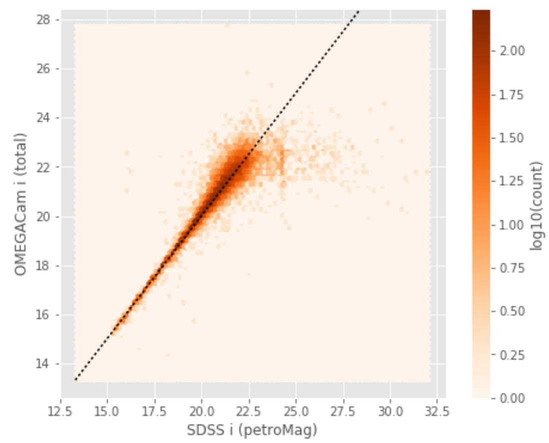
OMEGACam i (aperture) - SDSS i (fiberMag):
- Median: -0.24
- Median Absolute Deviation: 0.12
- 1% percentile: -0.8830828857421875
- 99% percentile: 0.4808610534667966



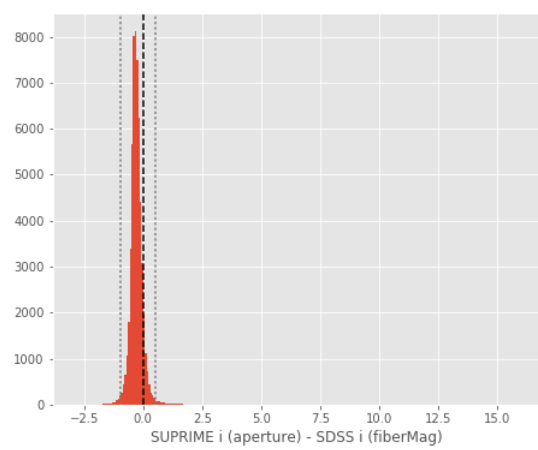


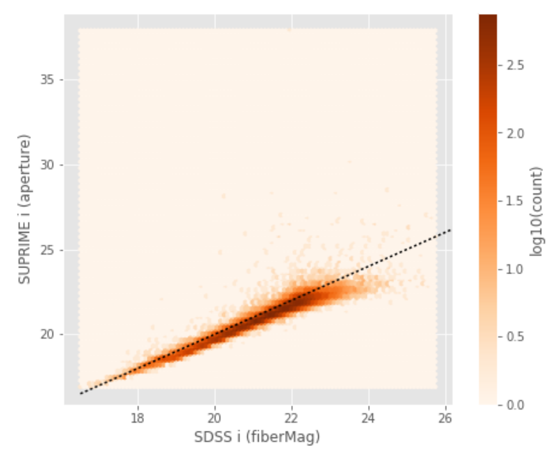
OMEGACam i (total) - SDSS i (petroMag):
- Median: 0.03
- Median Absolute Deviation: 0.16
- 1% percentile: -3.254360580444336
- 99% percentile: 1.348939208984375



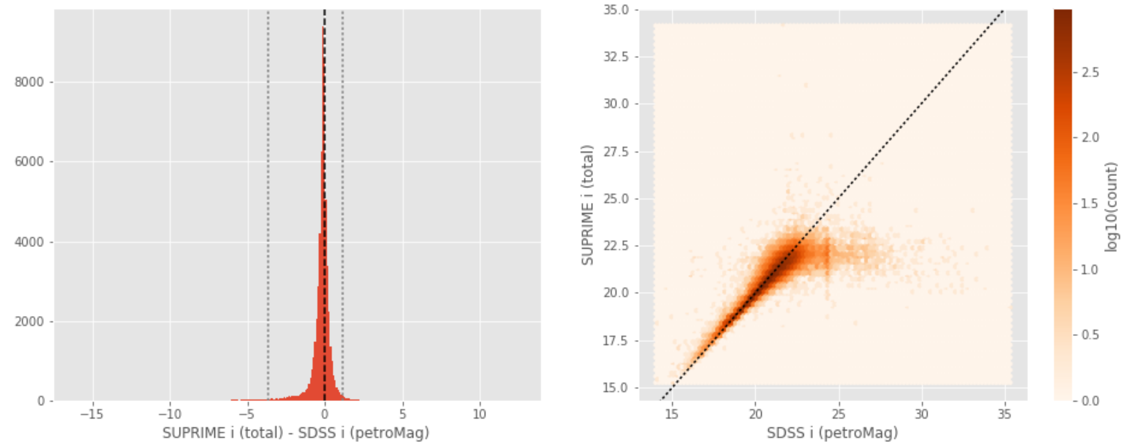


SUPRIME i (aperture) - SDSS i (fiberMag):
- Median: -0.29
- Median Absolute Deviation: 0.13
- 1% percentile: -0.9637155151367188
- 99% percentile: 0.5207080078125003

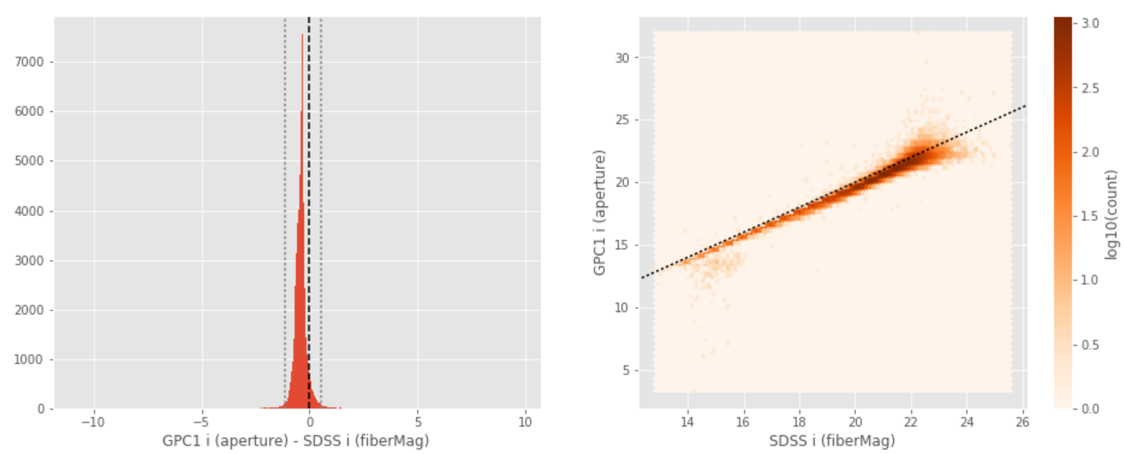




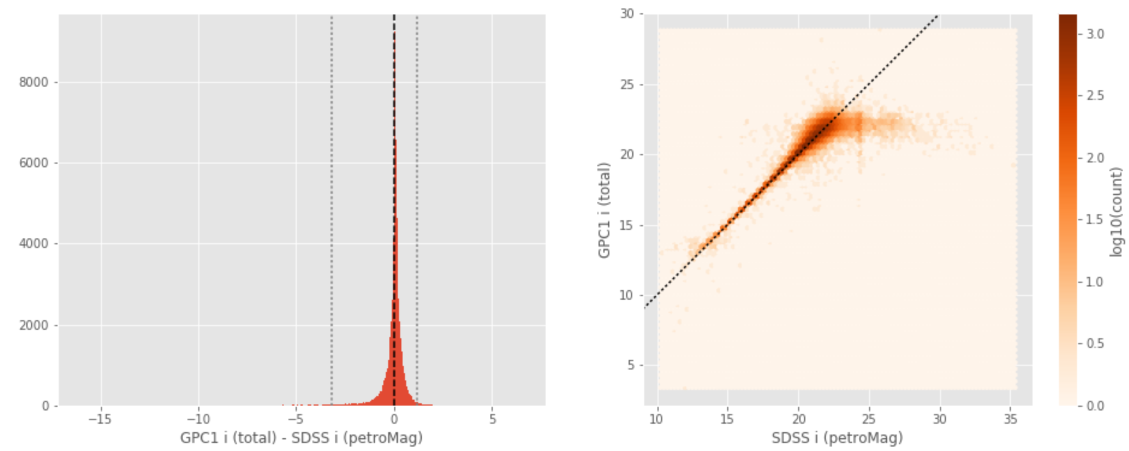
SUPRIME i (total) - SDSS i (petroMag):
- Median: -0.11
- Median Absolute Deviation: 0.19
- 1% percentile: -3.629803333282471
- 99% percentile: 1.141928634643548



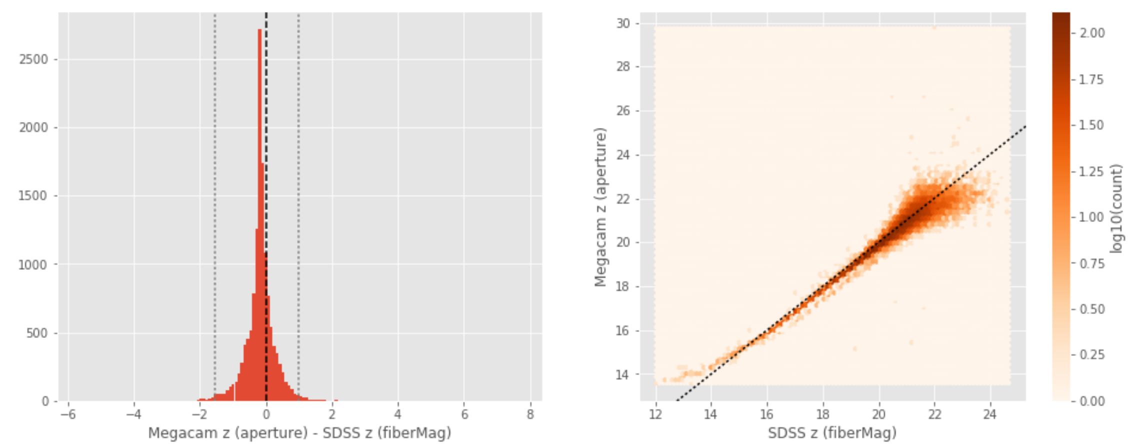
GPC1 i (aperture) - SDSS i (fiberMag):
- Median: -0.39
- Median Absolute Deviation: 0.13
- 1% percentile: -1.1593441009521483
- 99% percentile: 0.5544780731201178



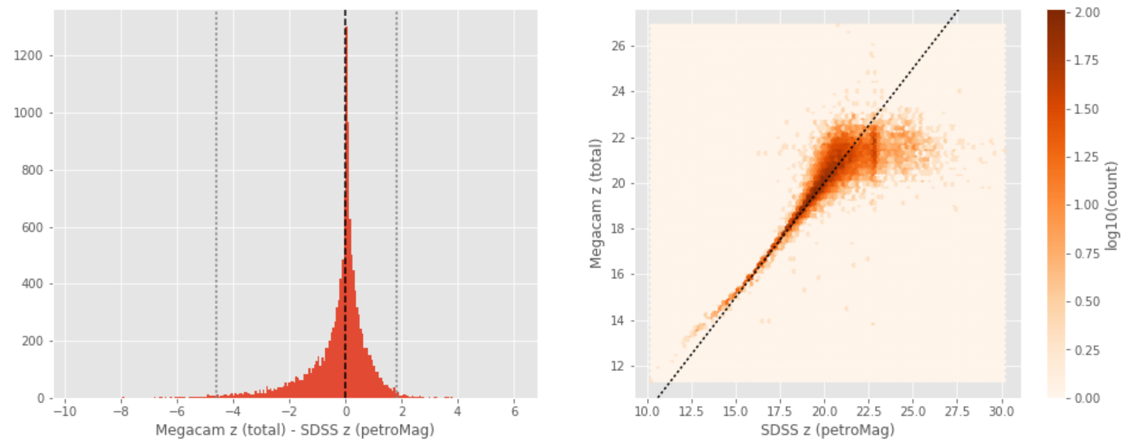
GPC1 i (total) - SDSS i (petroMag):
- Median: 0.05
- Median Absolute Deviation: 0.15
- 1% percentile: -3.2140436935424805
- 99% percentile: 1.1524100112915017



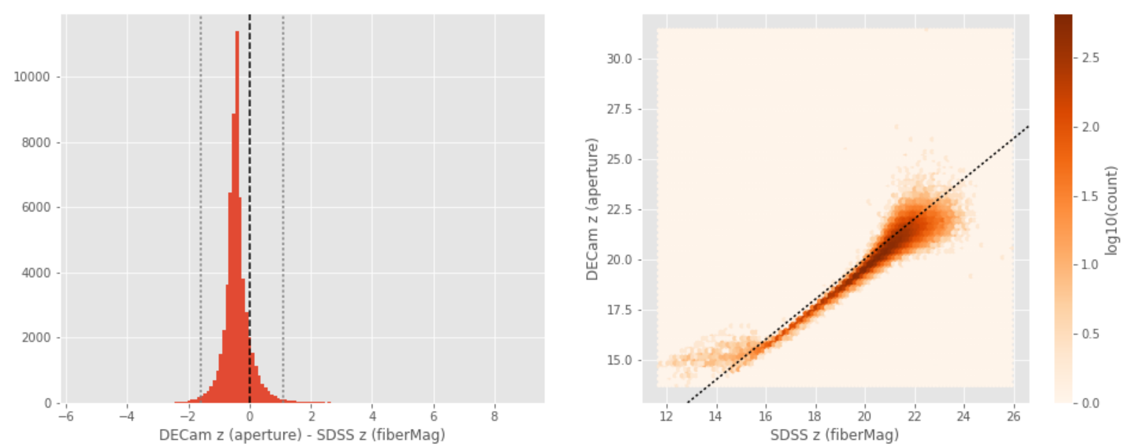
Megacam z (aperture) - SDSS z (fiberMag):
- Median: -0.17
- Median Absolute Deviation: 0.17
- 1% percentile: -1.5258906173706055
- 99% percentile: 1.0076086425781254



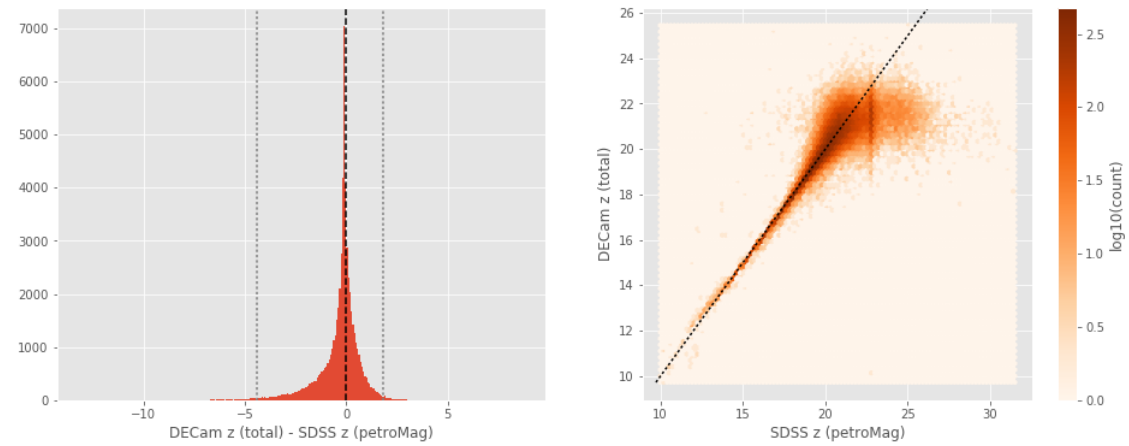
Megacam z (total) - SDSS z (petroMag):
- Median: 0.02
- Median Absolute Deviation: 0.38
- 1% percentile: -4.58455307006836
- 99% percentile: 1.844368133544923



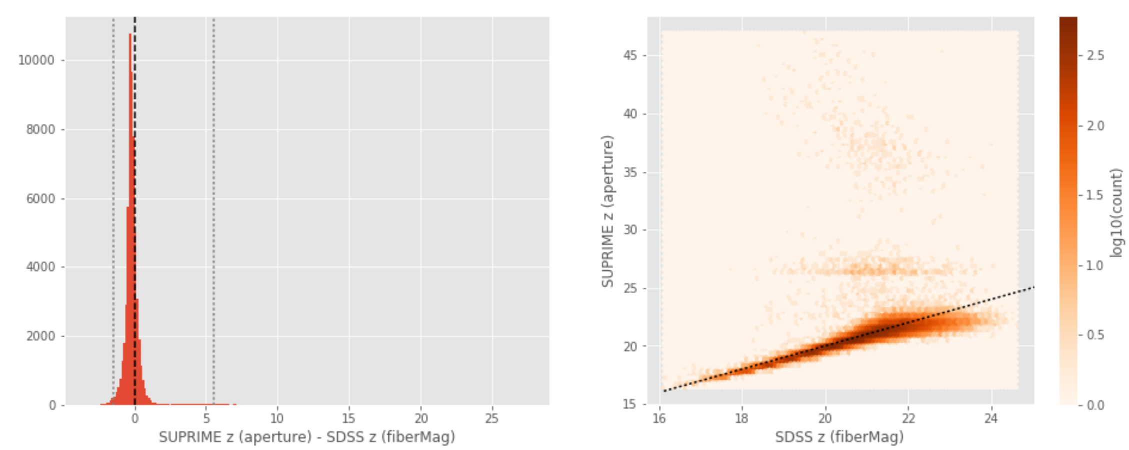
DECam z (aperture) - SDSS z (fiberMag):
- Median: -0.44
- Median Absolute Deviation: 0.18
- 1% percentile: -1.611388558795166
- 99% percentile: 1.0899633407592733



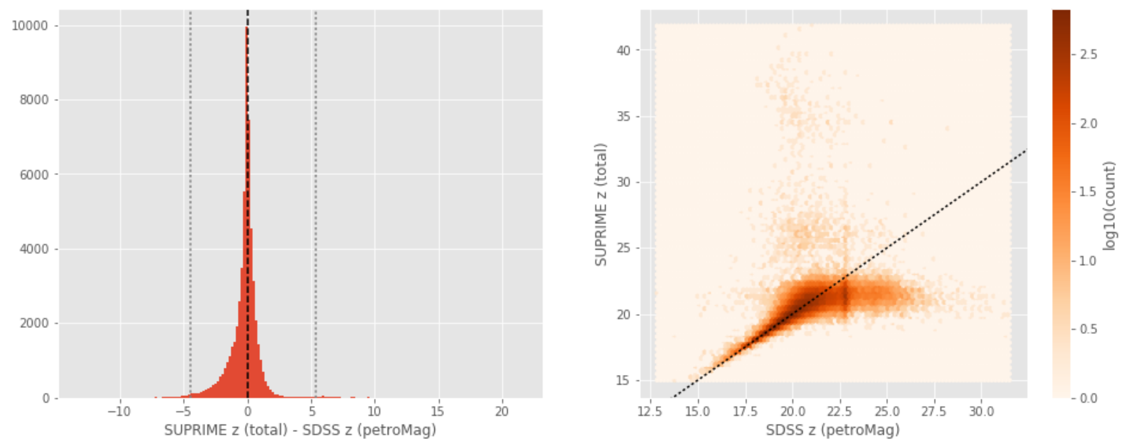
DECam z (total) - SDSS z (petroMag):
- Median: -0.12
- Median Absolute Deviation: 0.34
- 1% percentile: -4.40126142501831
- 99% percentile: 1.7904283905029283



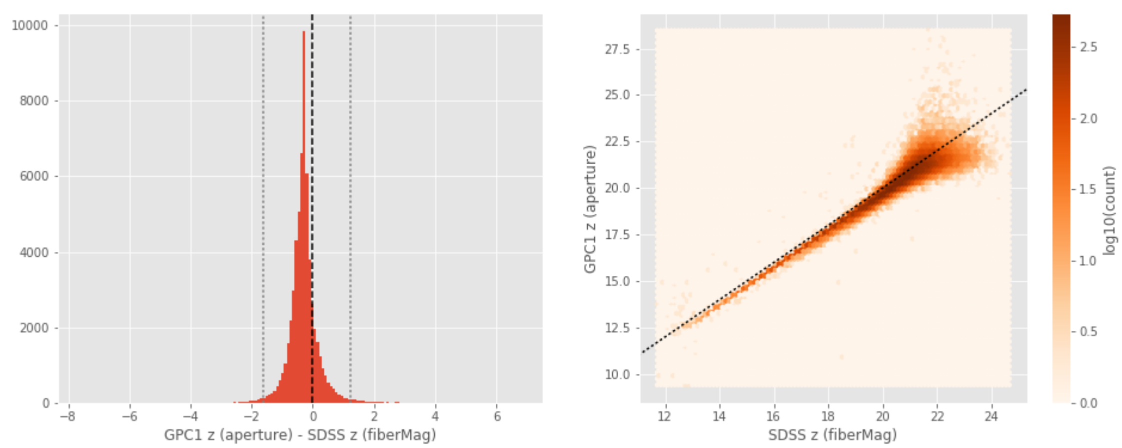
SUPRIME z (aperture) - SDSS z (fiberMag):
- Median: -0.20
- Median Absolute Deviation: 0.20
- 1% percentile: -1.4548544883728027
- 99% percentile: 5.562977943420412



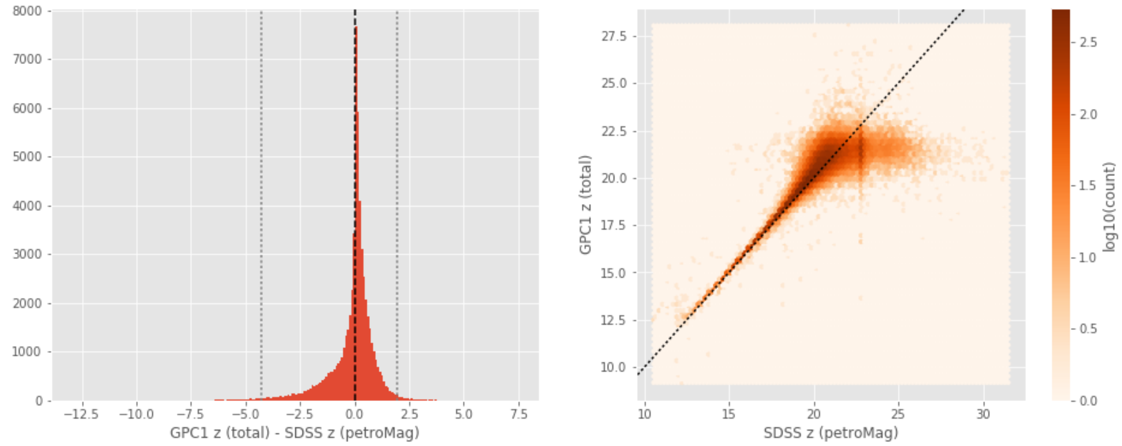
SUPRIME z (total) - SDSS z (petroMag):
- Median: -0.07
- Median Absolute Deviation: 0.40
- 1% percentile: -4.4408163070678714
- 99% percentile: 5.34305679321289



GPC1 z (aperture) - SDSS z (fiberMag):
- Median: -0.30
- Median Absolute Deviation: 0.20
- 1% percentile: -1.6199073982238767
- 99% percentile: 1.2484591674804684



GPC1 z (total) - SDSS z (petroMag):
- Median: 0.10
- Median Absolute Deviation: 0.34
- 1% percentile: -4.248807601928711
- 99% percentile: 1.96720136642456



1.5.2 III.b - Comparing J and K bands to 2MASS

The catalogue is cross-matched to 2MASS-PSC withing 0.2 arcsecond. We compare the UKIDSS total J and K magnitudes to those from 2MASS.

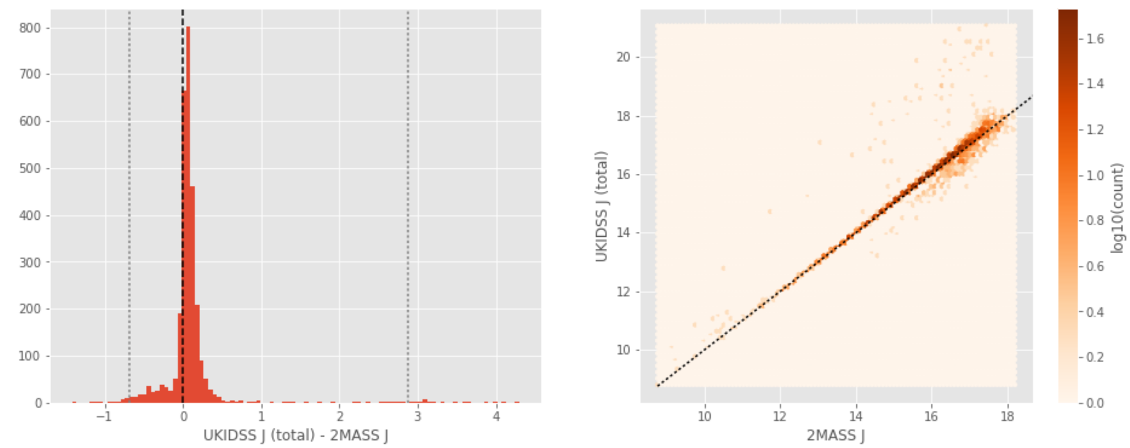
The 2MASS magnitudes are "*Vega-like*" and we have to convert them to AB magnitudes using the zero points provided on this page:

Band	F - 0 mag (Jy)
J	1594
H	1024
Ks	666.7

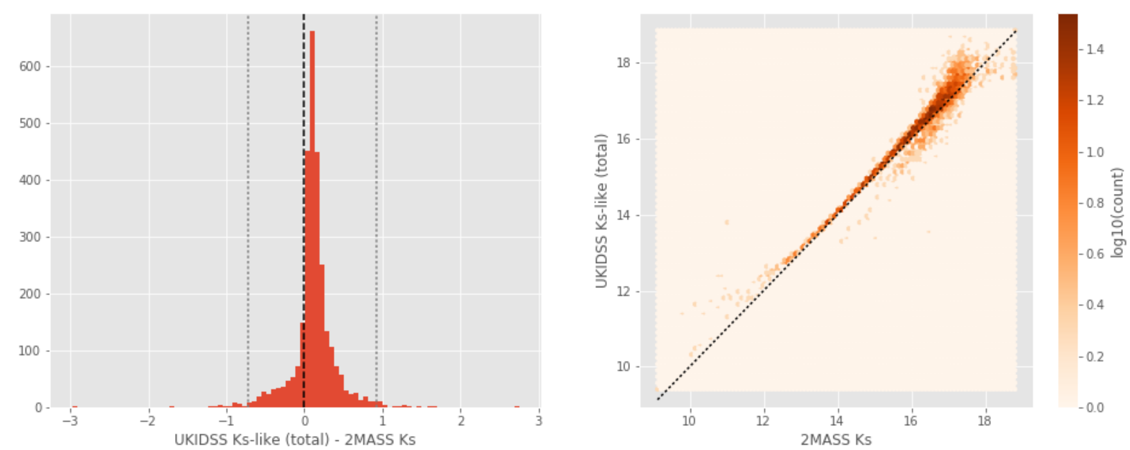
In addition, UKIDSS uses a K band whereas 2MASS uses a Ks ("short") band, this page give a correction to convert the K band in a Ks band with the formula:

$$K_{s(2MASS)} = K_{UKIRT} + 0.003 + 0.004 * (JK)_{UKIRT}$$

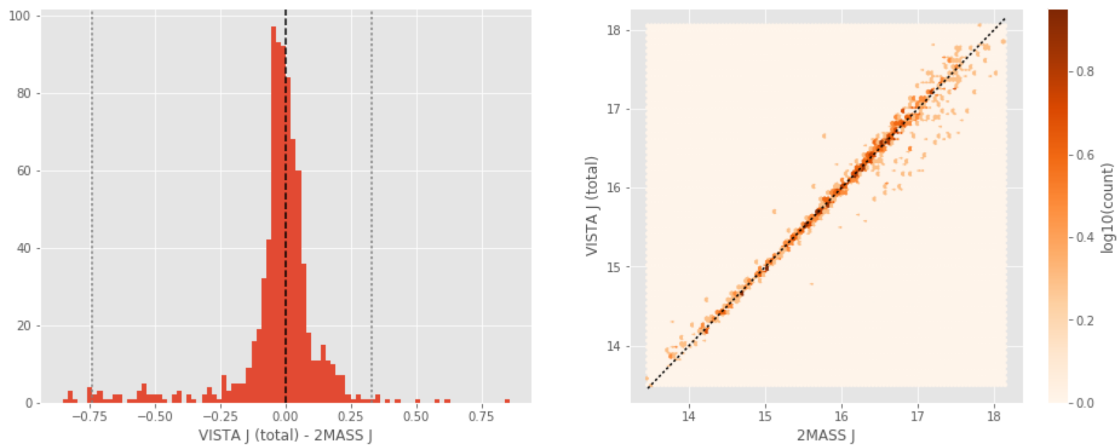
```
UKIDSS J (total) - 2MASS J:
- Median: 0.06
- Median Absolute Deviation: 0.05
- 1% percentile: -0.6913685057737169
- 99% percentile: 2.8818979037569252
```



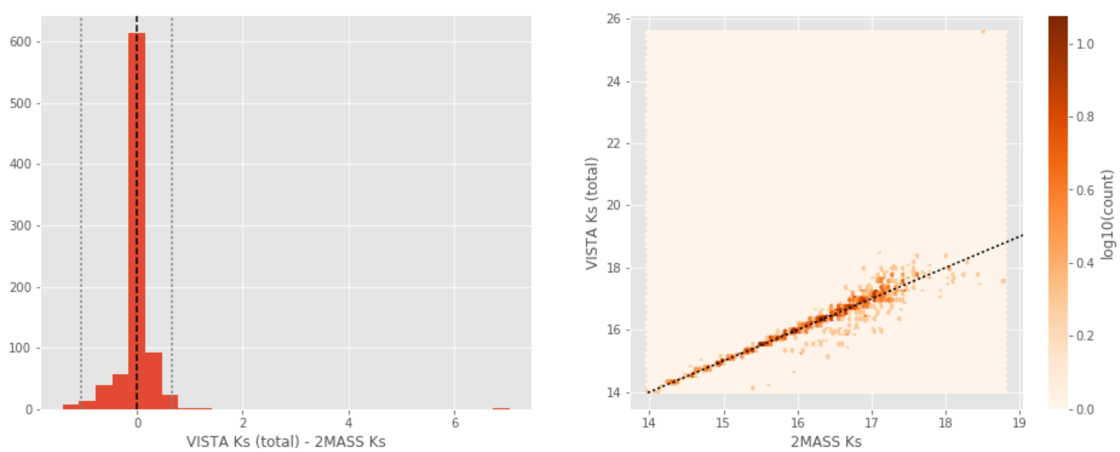
UKIDSS Ks-like (total) - 2MASS Ks:
- Median: 0.11
- Median Absolute Deviation: 0.08
- 1% percentile: -0.7151593208941027
- 99% percentile: 0.9297656571332391



VISTA J (total) - 2MASS J:
- Median: -0.01
- Median Absolute Deviation: 0.05
- 1% percentile: -0.7406802874662239
- 99% percentile: 0.328832618417565

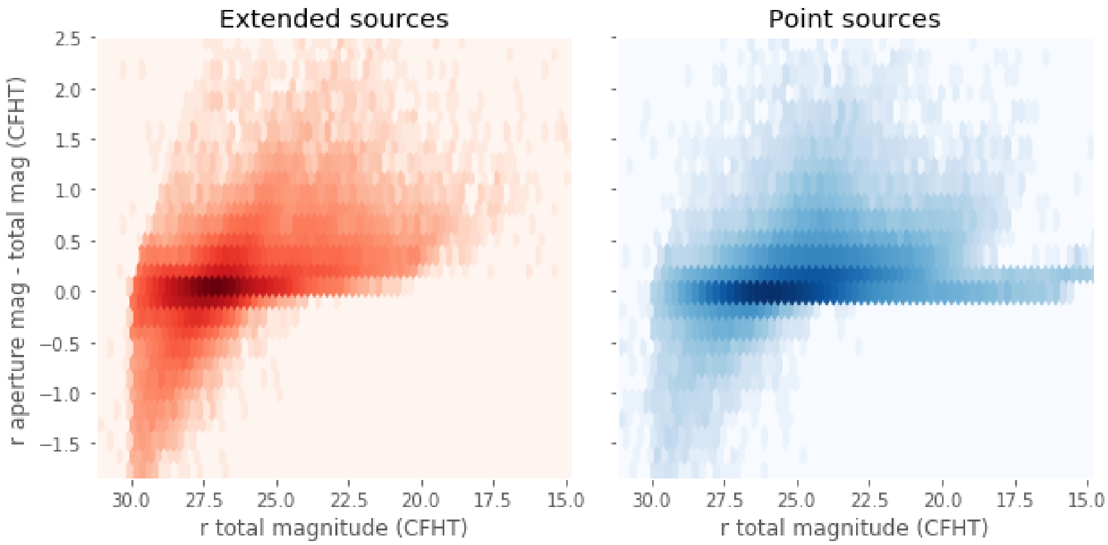


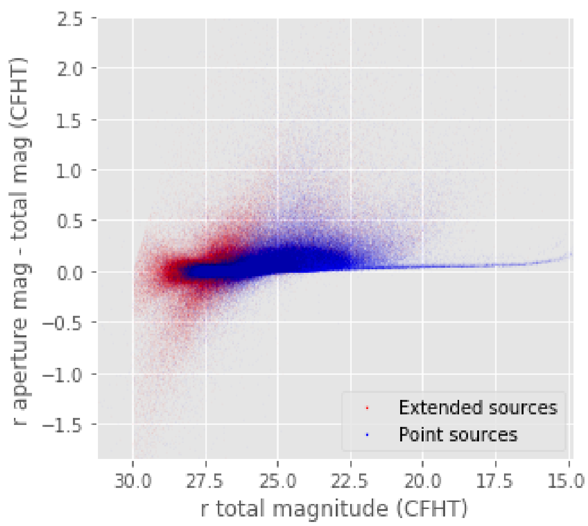
VISTA Ks (total) - 2MASS Ks:
- Median: 0.00
- Median Absolute Deviation: 0.07
- 1% percentile: -1.0670893799456174
- 99% percentile: 0.6706602271405657



1.6 IV - Comparing aperture magnitudes to total ones.

Number of source used: 547807 / 2599374 (21.07%)

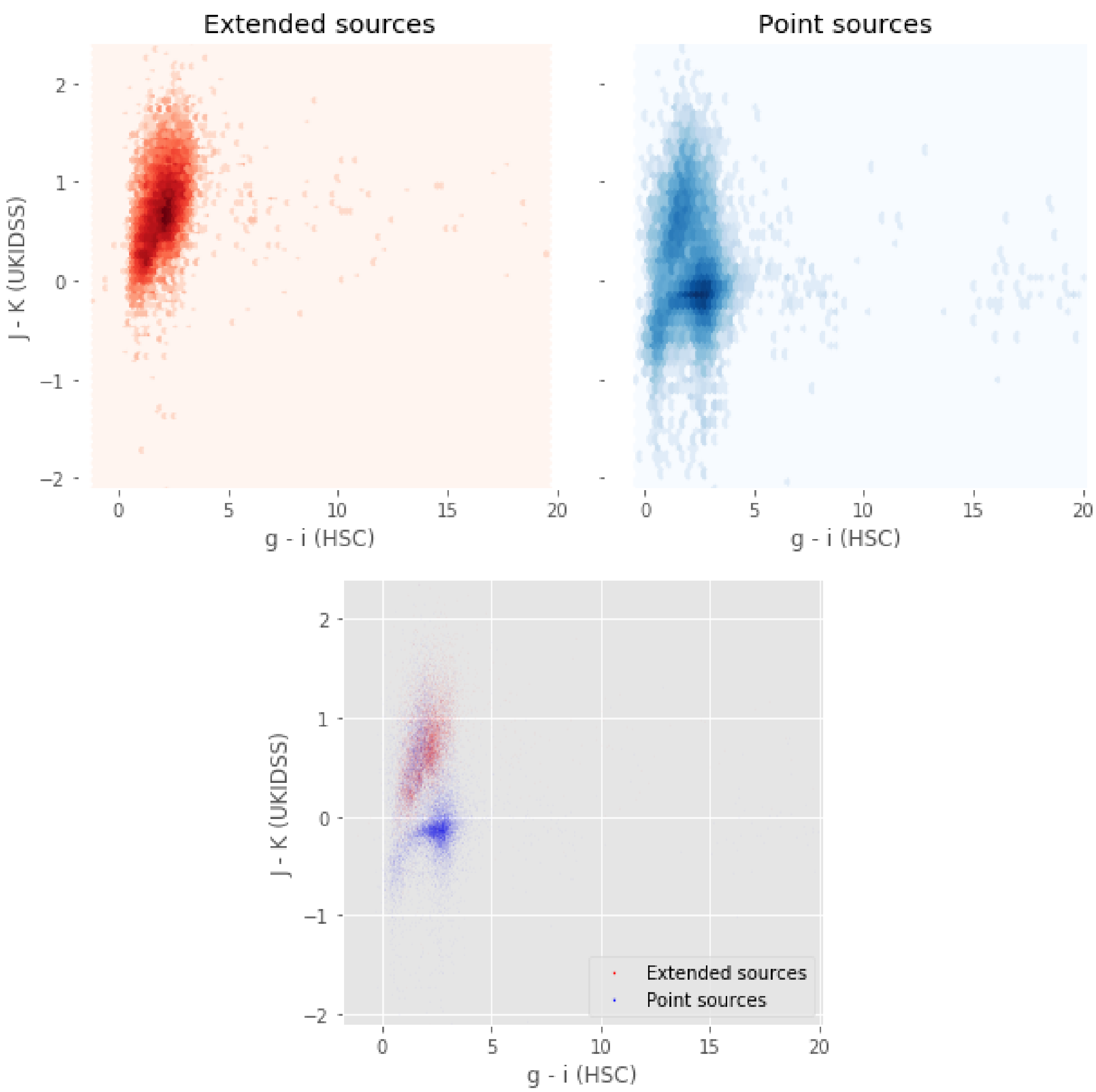




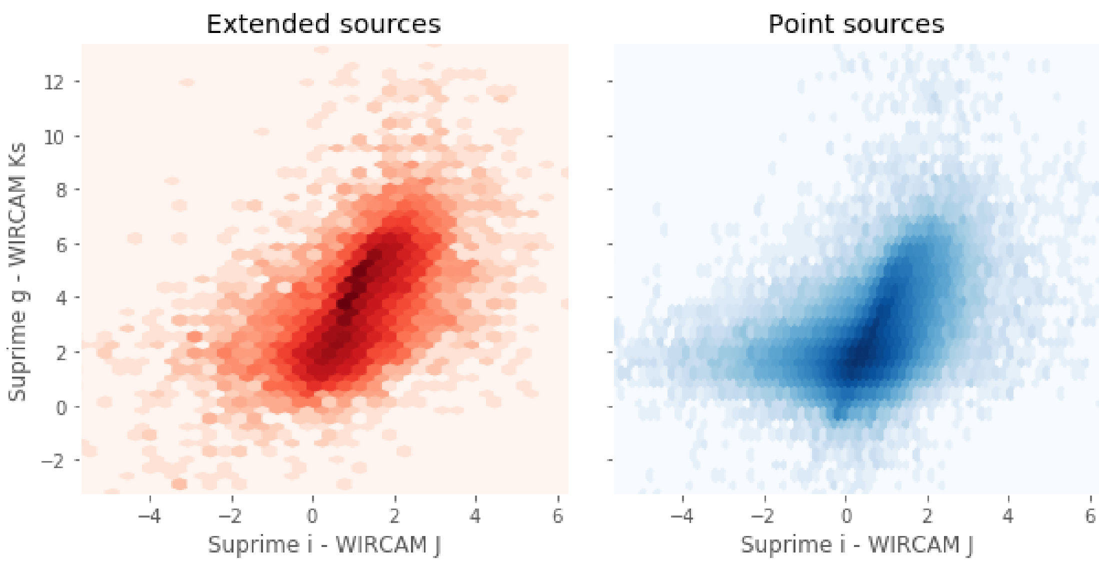
1.7 V - Color-color and magnitude-color plots

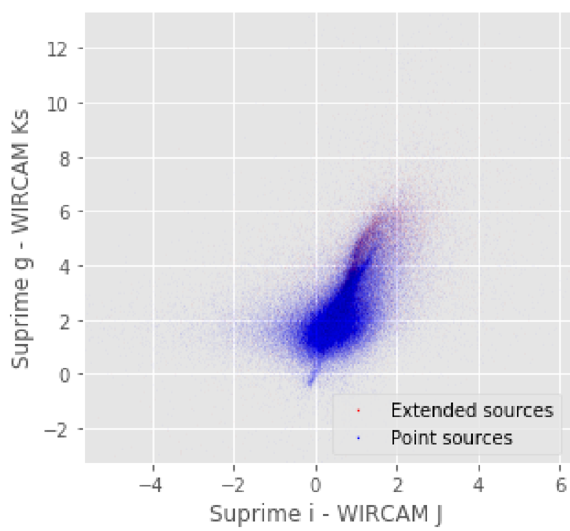
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/ipykernel/__main__.py:2: R
  from ipykernel import kernelapp as app
```

```
Number of source used: 24170 / 2599374 (0.93%)
```

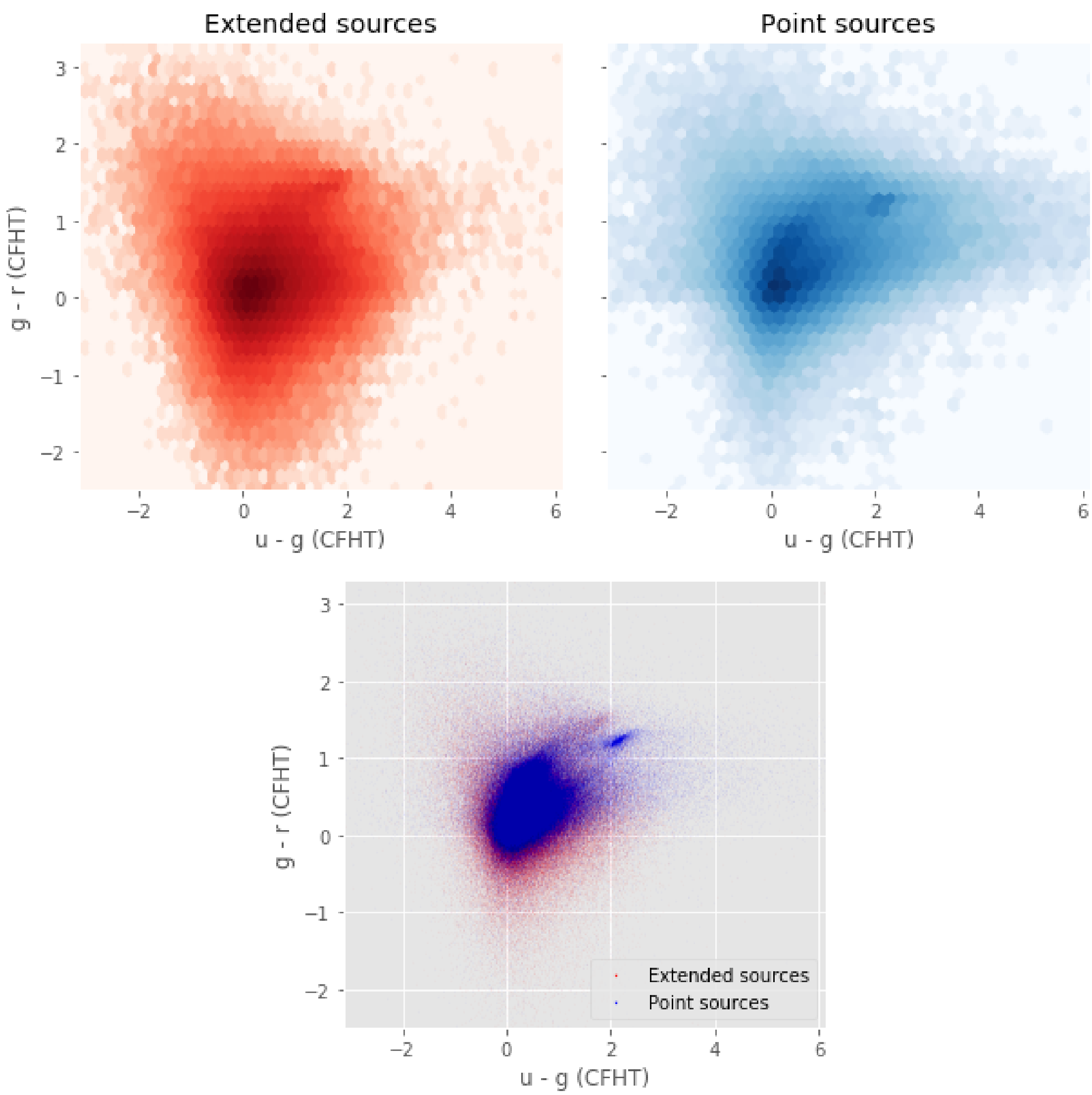


Number of source used: 139279 / 2599374 (5.36%)

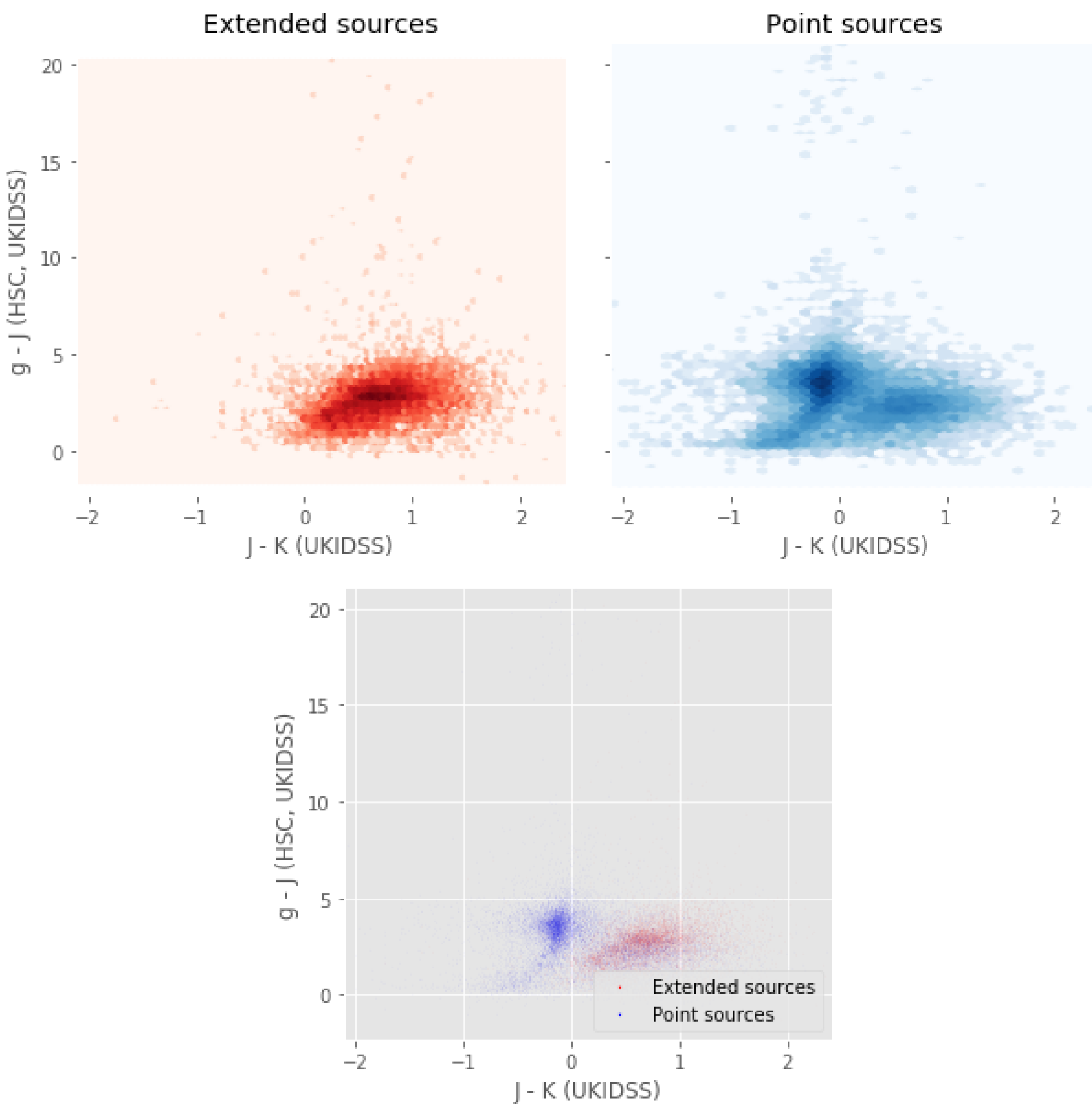





```
Number of source used: 472682 / 2599374 (18.18%)
```

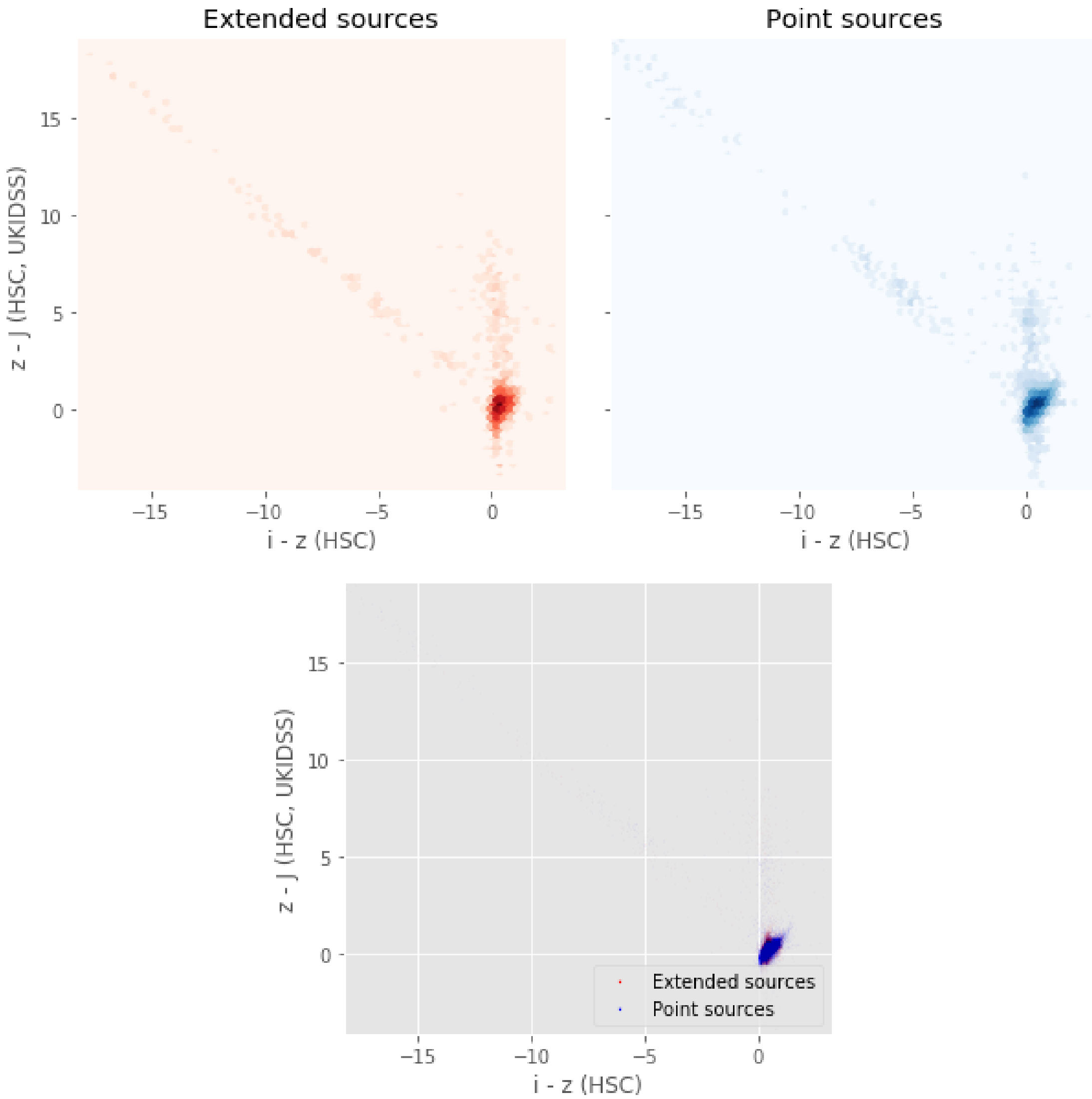


Number of source used: 24172 / 2599374 (0.93%)




```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/ipykernel/__main__.py:2: R
  from ipykernel import kernelapp as app
```

```
Number of source used: 27728 / 2599374 (1.07%)
```


Extended sources
Point sources
z - J (HSC, UKIDSS)
15
10
5
0
−15
−10
−5
0
i - z (HSC)
Extended sources
Point sources

4_Selection_function

March 8, 2018

1 COSMOS Selection Functions

1.1 Depth maps and selection functions

The simplest selection function available is the field MOC which specifies the area for which there is Herschel data. Each pristine catalogue also has a MOC defining the area for which that data is available.

The next stage is to provide mean flux standard deviations which act as a proxy for the catalogue's 5σ depth

```
This notebook was run with herschelhelp_internal version:
0246c5d (Thu Jan 25 17:01:47 2018 +0000) [with local modifications]
This notebook was executed on:
2018-02-27 18:53:01.791865
```

```
Depth maps produced using: master_catalogue_cosmos_20180217.fits
```

1.2 I - Group masterlist objects by healpix cell and calculate depths

We add a column to the masterlist catalogue for the target order healpix cell per object.

1.3 II Create a table of all Order=13 healpix cells in the field and populate it

We create a table with every order=13 healpix cell in the field MOC. We then calculate the healpix cell at lower order that the order=13 cell is in. We then fill in the depth at every order=13 cell as calculated for the lower order cell that that the order=13 cell is inside.

```
Out[9]: <IPython.core.display.HTML object>
```

```
Out[11]: <IPython.core.display.HTML object>
```

```
Out[12]: <IPython.core.display.HTML object>
```

1.4 III - Save the depth map table

1.5 IV - Overview plots

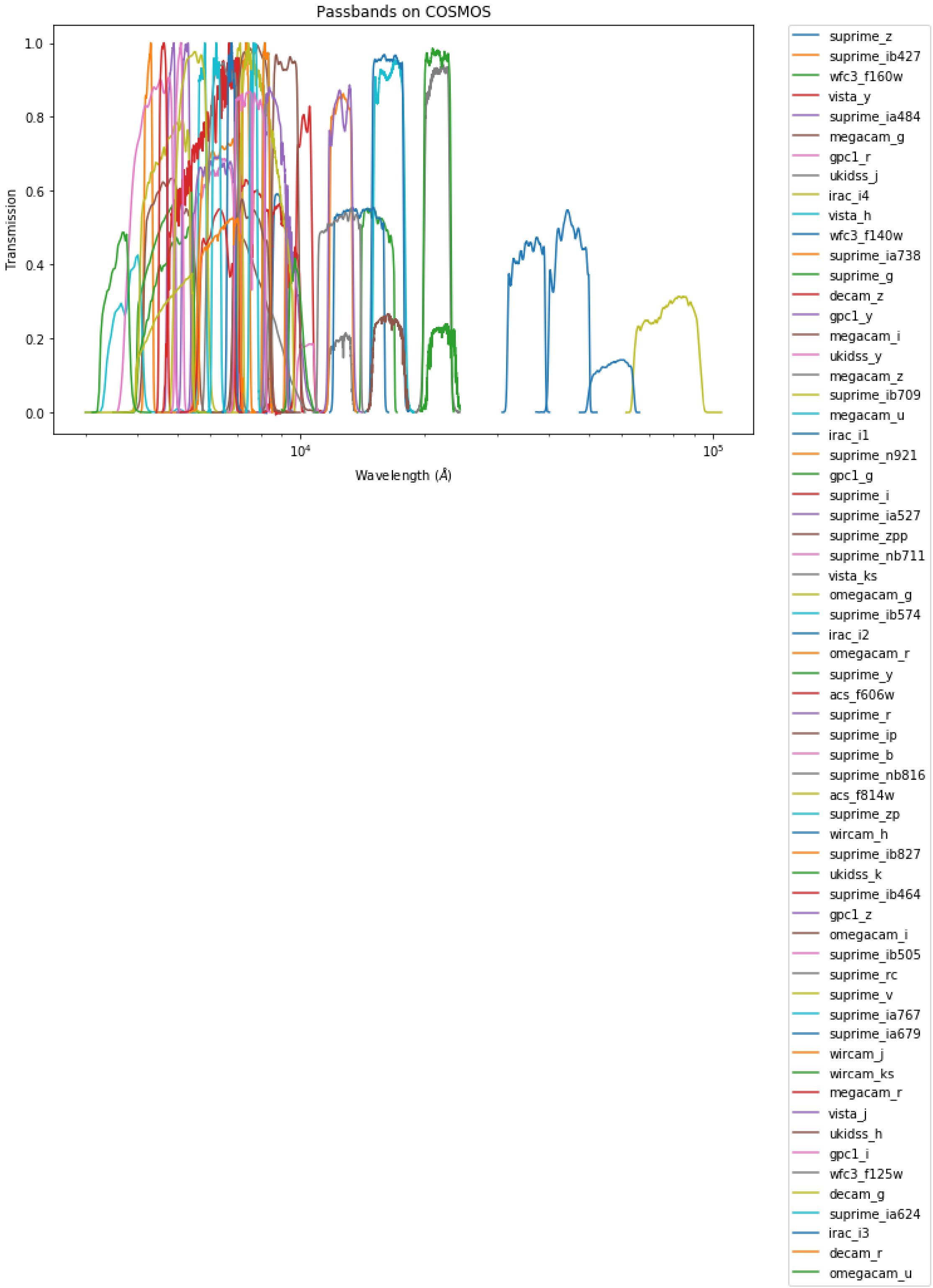
1.5.1 IV.a - Filters

First we simply plot all the filters available on this field to give an overview of coverage.

```
Out[14]: {'acs_f606w',
          'acs_f814w',
          'decam_g',
          'decam_r',
          'decam_z',
          'gpc1_g',
          'gpc1_i',
          'gpc1_r',
          'gpc1_y',
          'gpc1_z',
          'irac_i1',
          'irac_i2',
          'irac_i3',
          'irac_i4',
          'megacam_g',
          'megacam_i',
          'megacam_r',
          'megacam_u',
          'megacam_z',
          'omegacam_g',
          'omegacam_i',
          'omegacam_r',
          'omegacam_u',
          'suprime_b',
          'suprime_g',
          'suprime_i',
          'suprime_ia484',
          'suprime_ia527',
          'suprime_ia624',
          'suprime_ia679',
          'suprime_ia738',
          'suprime_ia767',
          'suprime_ib427',
          'suprime_ib464',
          'suprime_ib505',
          'suprime_ib574',
          'suprime_ib709',
          'suprime_ib827',
          'suprime_ip',
          'suprime_n921',
          'suprime_nb711',
```

```
         'suprime_nb816',
         'suprime_r',
         'suprime_rc',
         'suprime_v',
         'suprime_y',
         'suprime_z',
         'suprime_zp',
         'suprime_zpp',
         'ukidss_h',
         'ukidss_j',
         'ukidss_k',
         'ukidss_y',
         'vista_h',
         'vista_j',
         'vista_ks',
         'vista_y',
         'wfc3_f125w',
         'wfc3_f140w',
         'wfc3_f160w',
         'wircam_h',
         'wircam_j',
         'wircam_ks'}
```

```
Out[15]: <matplotlib.text.Text at 0x7f327aaabb00>
```


Passbands on COSMOS
Transmission
Wavelength (Å)
suprime_z
suprime_ib427
wfc3_f160w
vista_y
suprime_ia484
megacam_g
gpc1_r
ukidss_j
irac_i4
vista_h
wfc3_f140w
suprime_ia738
suprime_g
decam_z
gpc1_y
megacam_i
ukidss_y
megacam_z
suprime_ib709
megacam_u
irac_i1
suprime_n921
gpc1_g
suprime_i
suprime_ia527
suprime_zpp
suprime_nb711
vista_ks
omegacam_g
suprime_ib574
irac_i2
omegacam_r
suprime_y
acs_f606w
suprime_r
suprime_ip
suprime_b
suprime_nb816
acs_f814w
suprime_zp
wircam_h
suprime_ib827
ukidss_k
suprime_ib464
gpc1_z
omegacam_i
suprime_ib505
suprime_rc
suprime_v
suprime_ia767
suprime_ia679
wircam_j
wircam_ks
megacam_r
vista_j
ukidss_h
gpc1_i
wfc3_f125w
decam_g
suprime_ia624
irac_i3
decam_r
omegacam_u

1.5.2 IV.a - Depth overview

Then we plot the mean depths available across the area a given band is available

```
vista_ks: mean flux error: 0.17101176758904982, 3sigma in AB mag (Aperture): 24.62463187343169
vista_y: mean flux error: 0.07808369030752492, 3sigma in AB mag (Aperture): 25.475796037443025
vista_h: mean flux error: 0.1320023466072916, 3sigma in AB mag (Aperture): 24.905742733869182
vista_j: mean flux error: 0.09948736105467994, 3sigma in AB mag (Aperture): 25.21277708527773
suprime_b: mean flux error: 0.01500132614336406, 3sigma in AB mag (Aperture): 27.26687273034704
suprime_v: mean flux error: 0.02853652523131588, 3sigma in AB mag (Aperture): 26.568694138585933
suprime_ip: mean flux error: 0.02723502077989971, 3sigma in AB mag (Aperture): 26.61937758577772
suprime_rc: mean flux error: 0.022558077661538816, 3sigma in AB mag (Aperture): 26.8239416444878
suprime_zp: mean flux error: 0.15773326988522435, 3sigma in AB mag (Aperture): 24.71238859684688
suprime_zpp: mean flux error: 0.03602394135205551, 3sigma in AB mag (Aperture): 26.3157187959199
suprime_ia484: mean flux error: 0.034835223085850686, 3sigma in AB mag (Aperture): 26.3521503729
suprime_ia527: mean flux error: 0.03029676594218656, 3sigma in AB mag (Aperture): 26.50370618372
suprime_ia624: mean flux error: 0.03607412435988554, 3sigma in AB mag (Aperture): 26.31420736793
suprime_ia679: mean flux error: 0.05714617453483972, 3sigma in AB mag (Aperture): 25.81472895502
suprime_ia738: mean flux error: 0.04913981306871107, 3sigma in AB mag (Aperture): 25.97861311304
suprime_ia767: mean flux error: 0.0619369604841699, 3sigma in AB mag (Aperture): 25.727322141135
suprime_ib427: mean flux error: 0.03500936553271765, 3sigma in AB mag (Aperture): 26.34673626267
suprime_ib464: mean flux error: 0.03989008582262292, 3sigma in AB mag (Aperture): 26.20503443648
suprime_ib505: mean flux error: 0.04309929024789271, 3sigma in AB mag (Aperture): 26.12102156737
suprime_ib574: mean flux error: 0.04993093217474389, 3sigma in AB mag (Aperture): 25.96127267795
suprime_ib709: mean flux error: 0.04393368435726336, 3sigma in AB mag (Aperture): 26.10020279944
suprime_ib827: mean flux error: 0.06855022601728626, 3sigma in AB mag (Aperture): 25.61717463559
suprime_nb711: mean flux error: 0.07510778920646957, 3sigma in AB mag (Aperture): 25.51798441636
suprime_nb816: mean flux error: 0.06988536197585536, 3sigma in AB mag (Aperture): 25.59623131578
wfc3_f140w: mean flux error: 1.7319075056637885e-06, 3sigma in AB mag (Aperture): 37.11088512732
wfc3_f160w: mean flux error: 1.8086795555592633e-08, 3sigma in AB mag (Aperture): 42.06379278930
megacam_u: mean flux error: 0.01967026572271527, 3sigma in AB mag (Aperture): 26.97267129625336
megacam_g: mean flux error: 0.011095803246441601, 3sigma in AB mag (Aperture): 27.59429999541301
megacam_r: mean flux error: 0.015224260260325707, 3sigma in AB mag (Aperture): 27.25085636407049
megacam_i: mean flux error: 0.020030299674356183, 3sigma in AB mag (Aperture): 26.95297824608950
megacam_z: mean flux error: 0.042954704787316486, 3sigma in AB mag (Aperture): 26.12467001663207
decam_g: mean flux error: 2.1072497219157348e-07, 3sigma in AB mag (Aperture): 39.39790685020859
decam_r: mean flux error: 3.298256867451308e-07, 3sigma in AB mag (Aperture): 38.91148567476238
decam_z: mean flux error: 5.382935082040033e-07, 3sigma in AB mag (Aperture): 38.37964900751347
omegacam_u: mean flux error: 0.20381800145480622, 3sigma in AB mag (Aperture): 24.43409051624227
omegacam_g: mean flux error: 0.11826448644397333, 3sigma in AB mag (Aperture): 25.02506098761824
omegacam_r: mean flux error: 0.09408719406638162, 3sigma in AB mag (Aperture): 25.27337057096564
omegacam_i: mean flux error: 0.40783637430720815, 3sigma in AB mag (Aperture): 23.68098197011283
ukidss_y: mean flux error: 3.7431206271605397, 3sigma in AB mag (Aperture): 21.274112305522955
ukidss_j: mean flux error: 4.697561139564251, 3sigma in AB mag (Aperture): 21.02751576013447
ukidss_h: mean flux error: 5.560793087879484, 3sigma in AB mag (Aperture): 20.844355024026832
ukidss_k: mean flux error: 5.865862372280343, 3sigma in AB mag (Aperture): 20.786367190362263
wircam_j: mean flux error: 0.19179426644911765, 3sigma in AB mag (Aperture): 24.500107812927688
gpc1_g: mean flux error: 5.66336990784276, 3sigma in AB mag (Aperture): 20.824509541030885
gpc1_r: mean flux error: 18.092788142716127, 3sigma in AB mag (Aperture): 19.563433118564824
```

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gpc1_i: mean flux error: 59.142485191948076, 3sigma in AB mag (Aperture): 18.277447938677874
gpc1_z: mean flux error: 8.114928441402622, 3sigma in AB mag (Aperture): 20.433985126929848
gpc1_y: mean flux error: 919.7073782050579, 3sigma in AB mag (Aperture): 15.298072686809078
suprime_g: mean flux error: 0.021549871017772875, 3sigma in AB mag (Aperture): 26.87358517538555
suprime_r: mean flux error: inf, 3sigma in AB mag (Aperture): -inf
suprime_i: mean flux error: inf, 3sigma in AB mag (Aperture): -inf
suprime_z: mean flux error: inf, 3sigma in AB mag (Aperture): -inf
suprime_y: mean flux error: 0.16338771075144373, 3sigma in AB mag (Aperture): 24.674148393565837
suprime_n921: mean flux error: inf, 3sigma in AB mag (Aperture): -inf
wircam_h: mean flux error: 0.31255821382505966, 3sigma in AB mag (Aperture): 23.96986957229283
wircam_ks: mean flux error: 0.34980081095462584, 3sigma in AB mag (Aperture): 23.847644833243628
vista_ks: mean flux error: -inf, 3sigma in AB mag (Total): nan
vista_y: mean flux error: -inf, 3sigma in AB mag (Total): nan
vista_h: mean flux error: -inf, 3sigma in AB mag (Total): nan
vista_j: mean flux error: -inf, 3sigma in AB mag (Total): nan
suprime_b: mean flux error: 0.013323195225226786, 3sigma in AB mag (Total): 27.39567588402189
suprime_v: mean flux error: 0.02291448471870723, 3sigma in AB mag (Total): 26.80692162407953
suprime_ip: mean flux error: 0.030694173801384537, 3sigma in AB mag (Total): 26.489556993403347
suprime_rc: mean flux error: 0.022014015164786828, 3sigma in AB mag (Total): 26.85044870992089
suprime_zp: mean flux error: 0.06624944050452578, 3sigma in AB mag (Total): 25.654241325992807
suprime_zpp: mean flux error: 0.02782468683768608, 3sigma in AB mag (Total): 26.596121150399178
suprime_ia484: mean flux error: 0.03245683515634566, 3sigma in AB mag (Total): 26.42893143870397
suprime_ia527: mean flux error: 0.03137458280440119, 3sigma in AB mag (Total): 26.46575196418536
suprime_ia624: mean flux error: 0.04005966034987593, 3sigma in AB mag (Total): 26.20042870629871
suprime_ia679: mean flux error: 0.04369234698603036, 3sigma in AB mag (Total): 26.10618342825768
suprime_ia738: mean flux error: 0.05140446294237357, 3sigma in AB mag (Total): 25.92969479785737
suprime_ia767: mean flux error: 0.05450015585536648, 3sigma in AB mag (Total): 25.86620250259965
suprime_ib427: mean flux error: 0.03307630443206007, 3sigma in AB mag (Total): 26.40840441196848
suprime_ib464: mean flux error: 0.03619378644181617, 3sigma in AB mag (Total): 26.31061181433009
suprime_ib505: mean flux error: 0.04209555511166076, 3sigma in AB mag (Total): 26.14660626092701
suprime_ib574: mean flux error: 0.04032961421892777, 3sigma in AB mag (Total): 26.19313669396113
suprime_ib709: mean flux error: 0.03976082698865647, 3sigma in AB mag (Total): 26.20855834133765
suprime_ib827: mean flux error: 0.04771393306971261, 3sigma in AB mag (Total): 26.01058382064699
suprime_nb711: mean flux error: 0.09647062793073591, 3sigma in AB mag (Total): 25.24620909977174
suprime_nb816: mean flux error: 0.04355110119295295, 3sigma in AB mag (Total): 26.10969901157087
wfc3_f140w: mean flux error: 3.1689321742286077e-06, 3sigma in AB mag (Total): 36.45491450337078
wfc3_f160w: mean flux error: 5.207351085446414e-08, 3sigma in AB mag (Total): 40.91565471499205
megacam_u: mean flux error: 0.014918228608865634, 3sigma in AB mag (Total): 27.272903718071483
megacam_g: mean flux error: 0.014550831163781742, 3sigma in AB mag (Total): 27.299977359357506
megacam_r: mean flux error: 0.020316801170752793, 3sigma in AB mag (Total): 26.937558537149805
megacam_i: mean flux error: 0.02638752398130078, 3sigma in AB mag (Total): 26.653700260680914
megacam_z: mean flux error: 0.054047066985992424, 3sigma in AB mag (Total): 25.875266536365636
decam_g: mean flux error: 31.890471478623372, 3sigma in AB mag (Total): 18.94804451311392
decam_r: mean flux error: 1844.2174838476733, 3sigma in AB mag (Total): 14.542666525764886
decam_z: mean flux error: 2.1499435750001807, 3sigma in AB mag (Total): 21.876129208048603
omegacam_u: mean flux error: 0.24647155093771997, 3sigma in AB mag (Total): 24.22777986840496
omegacam_g: mean flux error: 0.11927874326265726, 3sigma in AB mag (Total): 25.01578922649511
omegacam_r: mean flux error: 0.1082410207176928, 3sigma in AB mag (Total): 25.12121716563741
```

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omegacam_i: mean flux error: 0.4447387226913513, 3sigma in AB mag (Total): 23.58693450214293
ukidss_y: mean flux error: 6.502840073858663, 3sigma in AB mag (Total): 20.674439179663004
ukidss_j: mean flux error: 6.331611269367058, 3sigma in AB mag (Total): 20.703411254686195
ukidss_h: mean flux error: 10.697908105461462, 3sigma in AB mag (Total): 20.13394970568735
ukidss_k: mean flux error: 11.464824146555895, 3sigma in AB mag (Total): 20.058778368995625
wircam_j: mean flux error: 0.3064025462723651, 3sigma in AB mag (Total): 23.99146593805593
gpc1_g: mean flux error: 4.962439440088945, 3sigma in AB mag (Total): 20.967958813644792
gpc1_r: mean flux error: 17.12301596203029, 3sigma in AB mag (Total): 19.62324620938241
gpc1_i: mean flux error: 69.01351685010913, 3sigma in AB mag (Total): 18.10986146539735
gpc1_z: mean flux error: 8.050054613631112, 3sigma in AB mag (Total): 20.442699796343852
gpc1_y: mean flux error: 841.729915815741, 3sigma in AB mag (Total): 15.394264956563177
suprime_g: mean flux error: inf, 3sigma in AB mag (Total): -inf
suprime_r: mean flux error: inf, 3sigma in AB mag (Total): -inf
suprime_i: mean flux error: inf, 3sigma in AB mag (Total): -inf
suprime_z: mean flux error: inf, 3sigma in AB mag (Total): -inf
suprime_y: mean flux error: 0.24242295430503263, 3sigma in AB mag (Total): 24.245762514481378
suprime_n921: mean flux error: inf, 3sigma in AB mag (Total): -inf
wircam_h: mean flux error: 0.24691009885431447, 3sigma in AB mag (Total): 24.225849729835083
wircam_ks: mean flux error: 0.27661743745603784, 3sigma in AB mag (Total): 24.102497978790772
wfc3_f125w: mean flux error: 8.067896134787598e-08, 3sigma in AB mag (Total): 40.44029611690819
acs_f606w: mean flux error: 57777203494.18263, 3sigma in AB mag (Total): -4.197194430533401
acs_f814w: mean flux error: 982955979054.0237, 3sigma in AB mag (Total): -7.274138308586991
irac_i1: mean flux error: -4.474766393076712, 3sigma in AB mag (Total): nan
irac_i2: mean flux error: -6.737385061782736, 3sigma in AB mag (Total): nan
irac_i3: mean flux error: -1.8133509286728664, 3sigma in AB mag (Total): nan
irac_i4: mean flux error: 2.4398669441888385, 3sigma in AB mag (Total): 21.738781505325512


ap_vista_ks (19930.0, 23010.0, 3080.0)
ap_vista_y (9740.0, 10660.0, 920.0)
ap_vista_h (15000.0, 17900.0, 2900.0)
ap_vista_j (11670.0, 13380.0, 1710.0)
ap_suprime_b (3827.0, 4906.0, 1079.0)
ap_suprime_v (4941.6001, 5925.7998, 984.19971)
ap_suprime_ip (6895.0, 8437.5, 1542.5)
ap_suprime_rc (5919.8999, 7079.5, 1159.6001)
ap_suprime_zp (8073.5, 8416.0, 342.5)
ap_suprime_zpp (8499.9004, 9883.9004, 1384.0)
ap_suprime_ia484 (4733.0, 4961.5, 228.5)
ap_suprime_ia527 (5139.0, 5381.0, 242.0)
ap_suprime_ia624 (6082.5, 6382.0, 299.5)
ap_suprime_ia679 (6613.0, 6948.5, 335.5)
ap_suprime_ia738 (7200.5, 7524.0, 323.5)
ap_suprime_ia767 (7498.0, 7861.0, 363.0)
ap_suprime_ib427 (4158.0, 4365.0, 207.0)
ap_suprime_ib464 (4525.0, 4742.5, 217.5)
ap_suprime_ib505 (4945.0, 5176.0, 231.0)
ap_suprime_ib574 (5626.0, 5898.5, 272.5)
```

```
ap_suprime_ib709 (6913.5, 7229.5, 316.0)
ap_suprime_ib827 (8073.5, 8416.0, 342.5)
ap_suprime_nb711 (7085.5, 7158.0, 72.5)
ap_suprime_nb816 (8094.0, 8211.5, 117.5)
ap_wfc3_f140w (12005.91, 15946.44, 3940.5303)
ap_wfc3_f160w (13996.34, 16869.92, 2873.5801)
ap_megacam_u (3500.0, 4100.0, 600.0)
ap_megacam_g (4180.0, 5580.0, 1400.0)
ap_megacam_r (5680.0, 6880.0, 1200.0)
ap_megacam_i (6831.7305, 8388.5557, 1556.8252)
ap_megacam_z (8280.0, 9160.0, 880.0)
ap_decam_g (4180.0, 5470.0, 1290.0)
ap_decam_r (5680.0, 7150.0, 1470.0)
ap_decam_z (8490.0, 9960.0, 1470.0)
ap_omegacam_u (3296.7, 3807.8999, 511.19995)
ap_omegacam_g (4077.8999, 5369.7002, 1291.8003)
ap_omegacam_r (5640.7002, 6962.7998, 1322.0996)
ap_omegacam_i (6841.5, 8373.7998, 1532.2998)
ap_ukidss_y (9790.0, 10820.0, 1030.0)
ap_ukidss_j (11695.0, 13280.0, 1585.0)
ap_ukidss_h (14925.0, 17840.0, 2915.0)
ap_ukidss_k (20290.0, 23820.0, 3530.0)
ap_wircam_j (11748.0, 13334.0, 1586.0)
ap_gpc1_g (4260.0, 5500.0, 1240.0)
ap_gpc1_r (5500.0, 6900.0, 1400.0)
ap_gpc1_i (6910.0, 8190.0, 1280.0)
ap_gpc1_z (8190.0, 9210.0, 1020.0)
ap_gpc1_y (9200.0, 9820.0, 620.0)
ap_suprime_g (4090.0, 5460.0, 1370.0)
ap_suprime_r (5440.0, 6960.0, 1520.0)
ap_suprime_i (6980.0, 8420.0, 1440.0)
ap_suprime_z (8540.0, 9280.0, 740.0)
ap_suprime_y (9360.0, 10120.0, 760.0)
ap_suprime_n921 (9146.5, 9279.0, 132.5)
ap_wircam_h (14855.0, 17760.0, 2905.0)
ap_wircam_ks (19870.0, 23135.0, 3265.0)
vista_ks (19930.0, 23010.0, 3080.0)
vista_y (9740.0, 10660.0, 920.0)
vista_h (15000.0, 17900.0, 2900.0)
vista_j (11670.0, 13380.0, 1710.0)
suprime_b (3827.0, 4906.0, 1079.0)
suprime_v (4941.6001, 5925.7998, 984.19971)
suprime_ip (6895.0, 8437.5, 1542.5)
suprime_rc (5919.8999, 7079.5, 1159.6001)
suprime_zp (8073.5, 8416.0, 342.5)
suprime_zpp (8499.9004, 9883.9004, 1384.0)
suprime_ia484 (4733.0, 4961.5, 228.5)
suprime_ia527 (5139.0, 5381.0, 242.0)
```

```
suprime_ia624 (6082.5, 6382.0, 299.5)
suprime_ia679 (6613.0, 6948.5, 335.5)
suprime_ia738 (7200.5, 7524.0, 323.5)
suprime_ia767 (7498.0, 7861.0, 363.0)
suprime_ib427 (4158.0, 4365.0, 207.0)
suprime_ib464 (4525.0, 4742.5, 217.5)
suprime_ib505 (4945.0, 5176.0, 231.0)
suprime_ib574 (5626.0, 5898.5, 272.5)
suprime_ib709 (6913.5, 7229.5, 316.0)
suprime_ib827 (8073.5, 8416.0, 342.5)
suprime_nb711 (7085.5, 7158.0, 72.5)
suprime_nb816 (8094.0, 8211.5, 117.5)
wfc3_f140w (12005.91, 15946.44, 3940.5303)
wfc3_f160w (13996.34, 16869.92, 2873.5801)
megacam_u (3500.0, 4100.0, 600.0)
megacam_g (4180.0, 5580.0, 1400.0)
megacam_r (5680.0, 6880.0, 1200.0)
megacam_i (6831.7305, 8388.5557, 1556.8252)
megacam_z (8280.0, 9160.0, 880.0)
decam_g (4180.0, 5470.0, 1290.0)
decam_r (5680.0, 7150.0, 1470.0)
decam_z (8490.0, 9960.0, 1470.0)
omegacam_u (3296.7, 3807.8999, 511.19995)
omegacam_g (4077.8999, 5369.7002, 1291.8003)
omegacam_r (5640.7002, 6962.7998, 1322.0996)
omegacam_i (6841.5, 8373.7998, 1532.2998)
ukidss_y (9790.0, 10820.0, 1030.0)
ukidss_j (11695.0, 13280.0, 1585.0)
ukidss_h (14925.0, 17840.0, 2915.0)
ukidss_k (20290.0, 23820.0, 3530.0)
wircam_j (11748.0, 13334.0, 1586.0)
gpc1_g (4260.0, 5500.0, 1240.0)
gpc1_r (5500.0, 6900.0, 1400.0)
gpc1_i (6910.0, 8190.0, 1280.0)
gpc1_z (8190.0, 9210.0, 1020.0)
gpc1_y (9200.0, 9820.0, 620.0)
suprime_g (4090.0, 5460.0, 1370.0)
suprime_r (5440.0, 6960.0, 1520.0)
suprime_i (6980.0, 8420.0, 1440.0)
suprime_z (8540.0, 9280.0, 740.0)
suprime_y (9360.0, 10120.0, 760.0)
suprime_n921 (9146.5, 9279.0, 132.5)
wircam_h (14855.0, 17760.0, 2905.0)
wircam_ks (19870.0, 23135.0, 3265.0)
wfc3_f125w (10993.5, 13997.47, 3003.9697)
acs_f606w (4835.3999, 7088.4702, 2253.0703)
acs_f814w (7069.6699, 9138.1104, 2068.4404)
irac_i1 (31754.0, 39164.801, 7410.8008)
```

```
irac_i2 (39980.102, 50052.301, 10072.199)
irac_i3 (50246.301, 64096.699, 13850.398)
irac_i4 (64415.199, 92596.797, 28181.598)
```

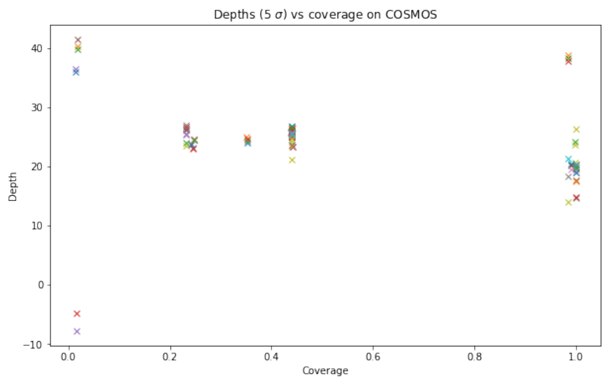
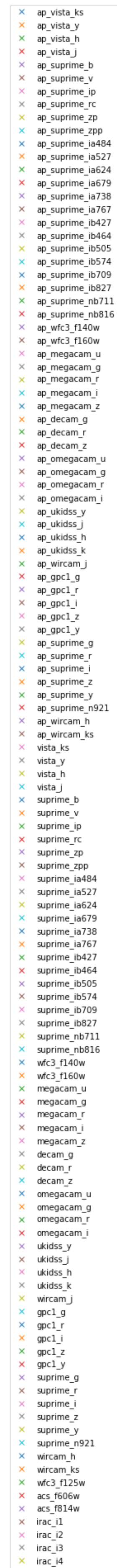
```
Out[20]: <matplotlib.text.Text at 0x7f327a41bd30>
```


Depths on COSMOS
Depth
40
30
20
10
0
−10
Wavelength (Å)
10^4
10^5
ap_vista_ks
ap_vista_y
ap_vista_h
ap_vista_j
ap_suprime_b
ap_suprime_v
ap_suprime_ip
ap_suprime_rc
ap_suprime_zp
ap_suprime_zpp
ap_suprime_ia484
ap_suprime_ia527
ap_suprime_ia624
ap_suprime_ia679
ap_suprime_ia738
ap_suprime_ia767
ap_suprime_ib427
ap_suprime_ib464
ap_suprime_ib505
ap_suprime_ib574
ap_suprime_ib709
ap_suprime_ib827
ap_suprime_nb711
ap_suprime_nb816
ap_wfc3_f140w
ap_wfc3_f160w
ap_megacam_u
ap_megacam_g
ap_megacam_r
ap_megacam_i
ap_megacam_z
ap_decam_g
ap_decam_r
ap_decam_z
ap_omegacam_u
ap_omegacam_g
ap_omegacam_r
ap_omegacam_i
ap_ukidss_y
ap_ukidss_j
ap_ukidss_h
ap_ukidss_k
ap_wircam_j
ap_gpc1_g
ap_gpc1_r
ap_gpc1_i
ap_gpc1_z
ap_gpc1_y
ap_suprime_g
ap_suprime_r
ap_suprime_i
ap_suprime_z
ap_suprime_y
ap_suprime_n921
ap_wircam_h
ap_wircam_ks
vista_ks
vista_y
vista_h
vista_j
suprime_b
suprime_v
suprime_ip
suprime_rc
suprime_zp
suprime_zpp
suprime_ia484
suprime_ia527
suprime_ia624
suprime_ia679
suprime_ia738
suprime_ia767
suprime_ib427
suprime_ib464
suprime_ib505
suprime_ib574
suprime_ib709
suprime_ib827
suprime_nb711
suprime_nb816
wfc3_f140w
wfc3_f160w
megacam_u
megacam_g
megacam_r
megacam_i
megacam_z
decam_g
decam_r
decam_z
omegacam_u
omegacam_g
omegacam_r
omegacam_i
ukidss_y
ukidss_j
ukidss_h
ukidss_k
wircam_j
gpc1_g
gpc1_r
gpc1_i
gpc1_z
gpc1_y
suprime_g
suprime_r
suprime_i
suprime_z
suprime_y
suprime_n921
wircam_h
wircam_ks
wfc3_f125w
acs_f606w
acs_f814w
irac_i1
irac_i2
irac_i3
irac_i4

1.5.3 IV.c - Depth vs coverage comparison

How best to do this? Colour/intensity plot over area? Percentage coverage vs mean depth?

```
Out[21]: <matplotlib.text.Text at 0x7f32785b28d0>
```


Depths (5 σ) vs coverage on COSMOS
Depth
Coverage
40
30
20
10
0
−10
0.0
0.2
0.4
0.6
0.8
1.0

ap_vista_ks
ap_vista_y
ap_vista_h
ap_vista_j
ap_suprime_b
ap_suprime_v
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ap_wfc3_f160w
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ap_megacam_g
ap_megacam_r
ap_megacam_i
ap_megacam_z
ap_decam_g
ap_decam_r
ap_decam_z
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decam_g
decam_r
decam_z
omegacam_u
omegacam_g
omegacam_r
omegacam_i
ukidss_y
ukidss_j
ukidss_h
ukidss_k
wircam_j
gpc1_g
gpc1_r
gpc1_i
gpc1_z
gpc1_y
suprime_g
suprime_r
suprime_i
suprime_z
suprime_y
suprime_n921
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wfc3_f125w
acs_f606w
acs_f814w
irac_i1
irac_i2
irac_i3
irac_i4