

1.1_HSC-SSP

March 8, 2018

1 Herschel Stripe 82 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`, N921 aperture magnitude in 2" that we aperture correct;
- The `g, r, i, z, y`, N921 kron fluxes and magnitudes.
- The extended flag that we convert to a `stellariy`.

We don't know when the maps have been observed. We will use the year of the reference paper.

```
This notebook was run with herchelhelp_internal version:  
0246c5d (Thu Jan 25 17:01:47 2018 +0000) [with local modifications]  
This notebook was executed on:  
2018-02-25 17:44:52.881348
```

1.2 I - Aperture correction

To compute aperture correction we need to determine two parameters: 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:

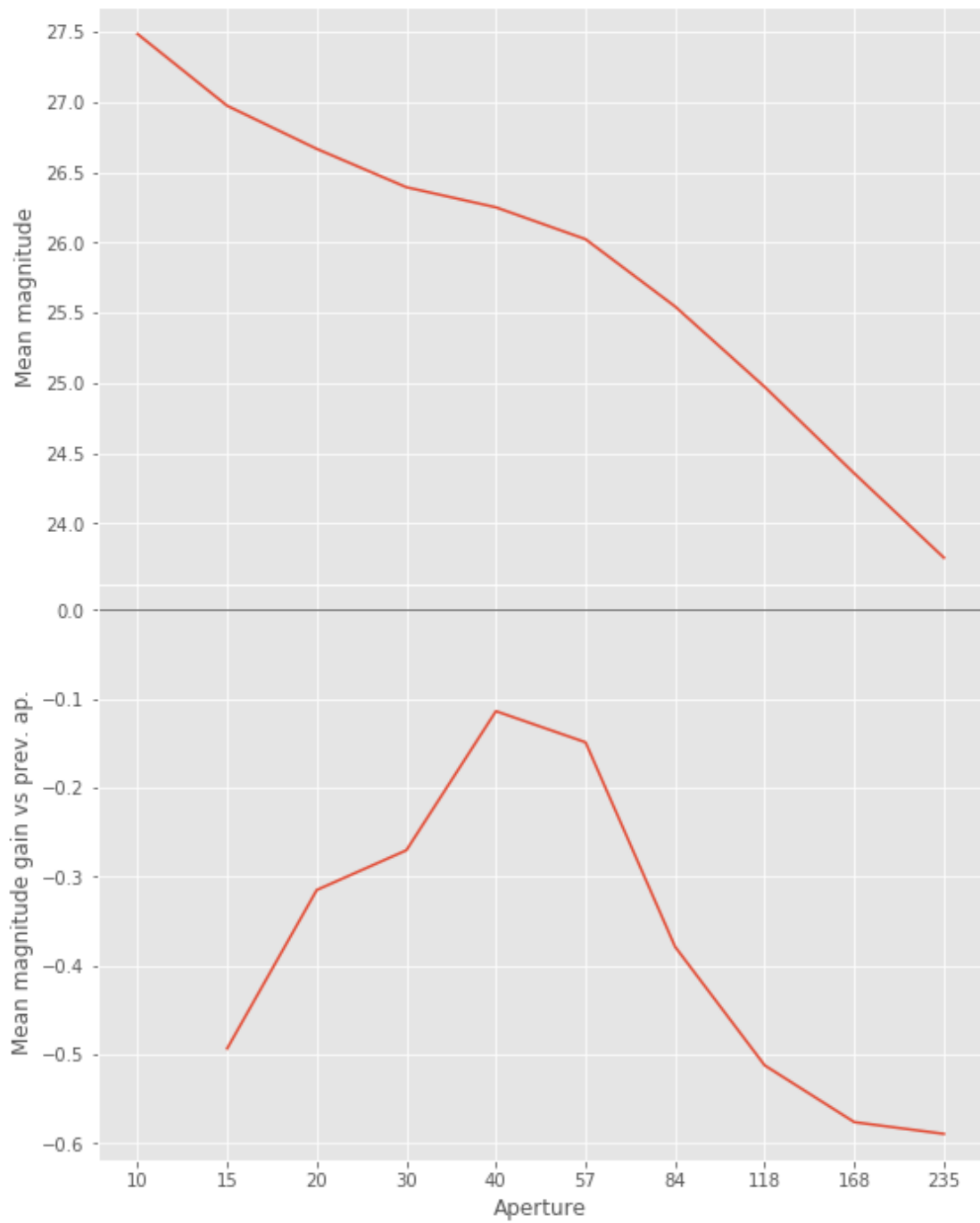
- The evolution of the magnitudes of the objects by plotting on the same plot aperture number vs the mean magnitude.
- The mean gain (loss when negative) of magnitude is each aperture compared to the previous (except for the first of course).

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

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 value  
  mags = magnitudes[:, stellerity > stel_threshold].copy()
```

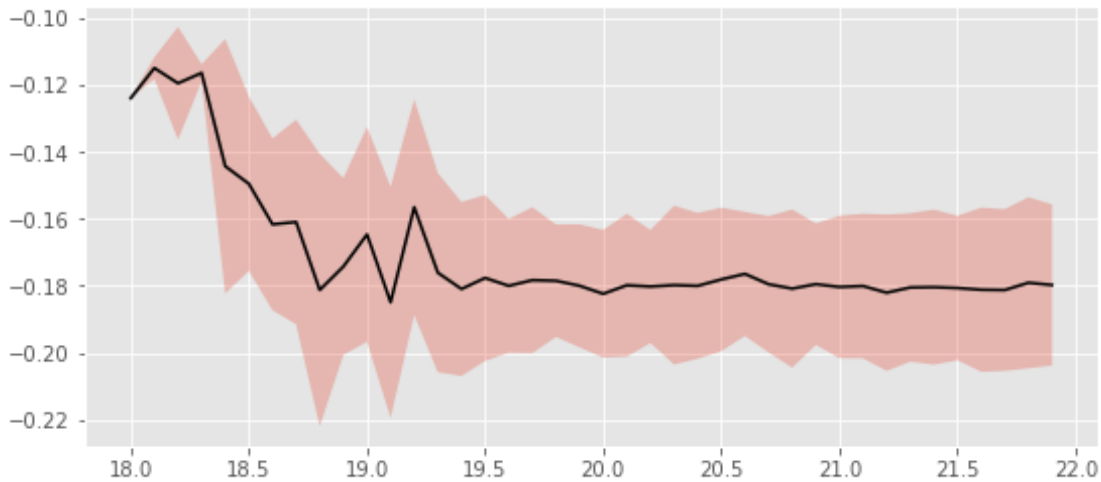


We will use aperture 40 as target.

```

/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid value encountered in less
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:103: RuntimeWarning: invalid value encountered in less
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 encountered in less
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value encountered in less
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value encountered in less
  mask &= (mag <= mag_max)

```



We will use magnitudes between 18.5 and 20.8

```

Aperture correction for g band:
Correction: -0.17906951904296875
Number of source used: 2220
RMS: 0.021197122735309888

```

```

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

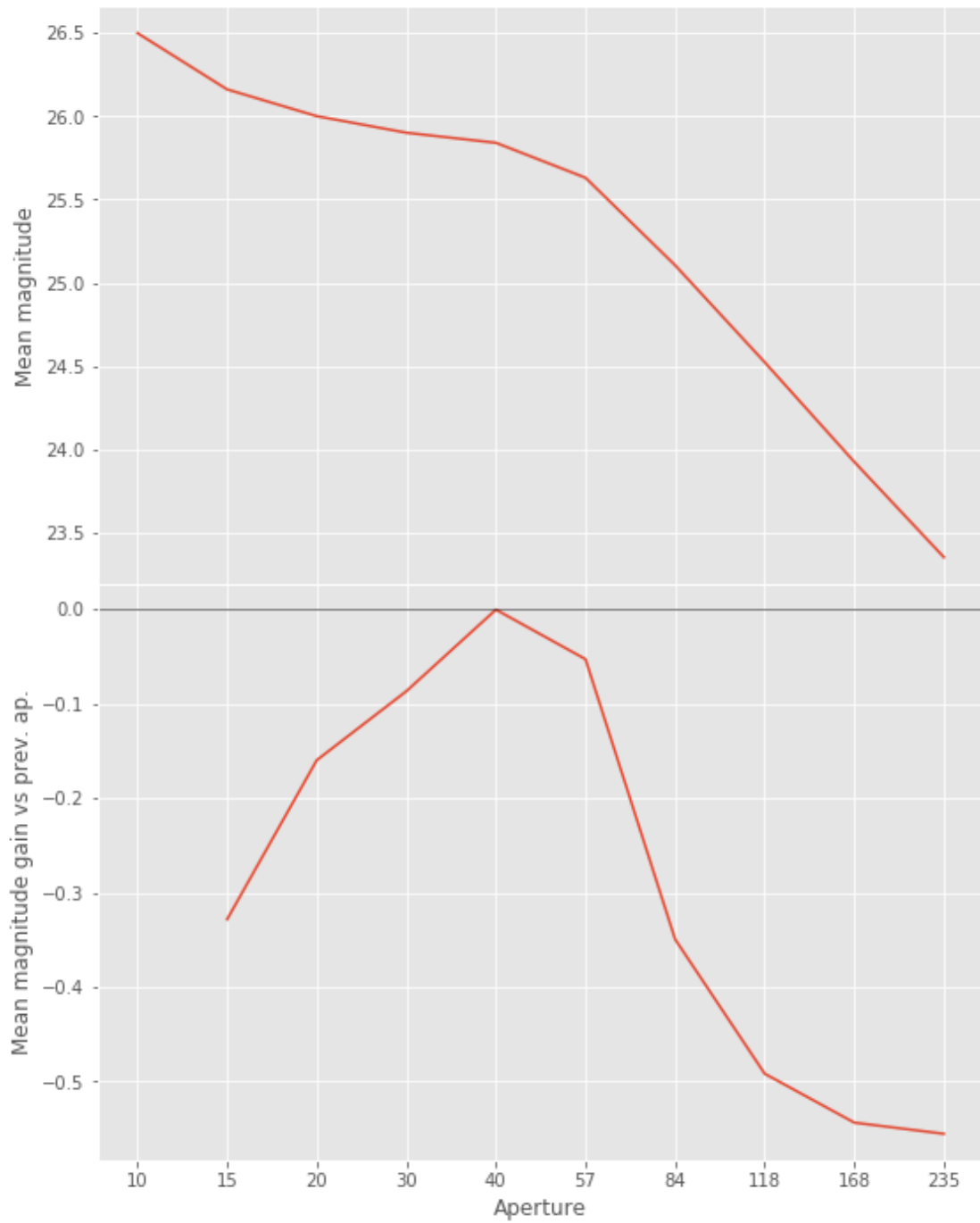
```

1.2.2 I.b - r band

```

/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid value encountered in less
  mags = magnitudes[:, stellarity > stel_threshold].copy()

```

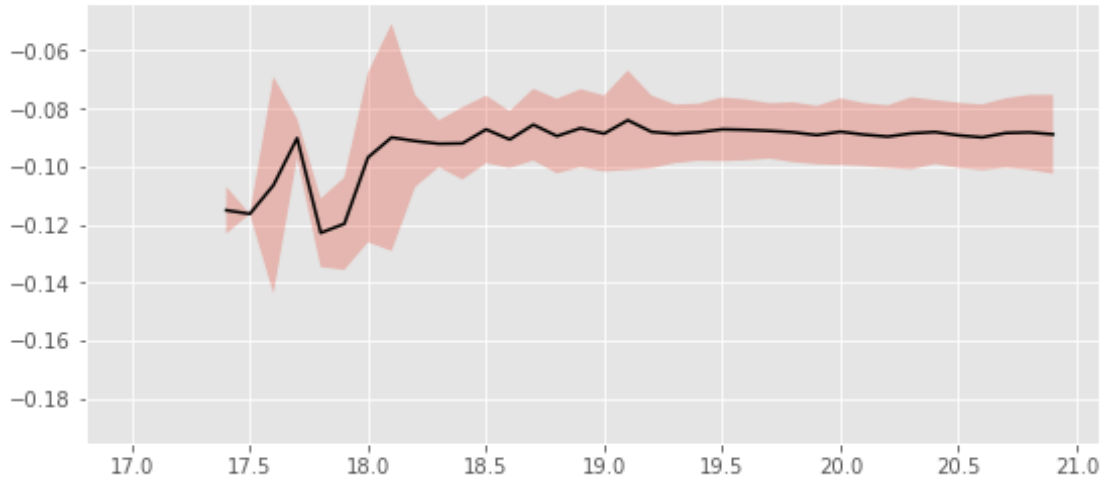


We will use aperture 40 as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid value for  
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 encountered
mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value encountered
mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value encountered
mask &= (mag <= mag_max)
```



We use magnitudes between 17.6 and 19.7.

```
Aperture correction for r band:
Correction: -0.08814620971679688
Number of source used: 1214
RMS: 0.01139705968377968
```

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

1.2.3 I.c - i band

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



We will use aperture 40 as target.

```

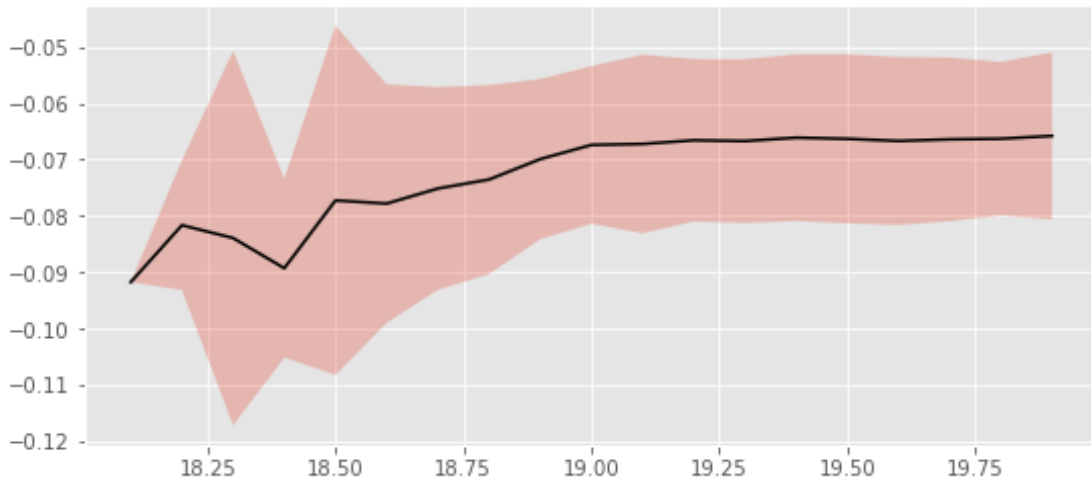
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid value
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self,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

```

```

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

```



We use magnitudes between 18.5 and 19.8.

```

Aperture correction for i band:
Correction: -0.06712055206298828
Number of source used: 4684
RMS: 0.014996732229935764

```

```

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

```

1.2.4 I.d - z band

```

/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid value encountered in  $\&=$ 
  mags = magnitudes[:, stellarity > stel_threshold].copy()

```



We will use aperture 40 as target.

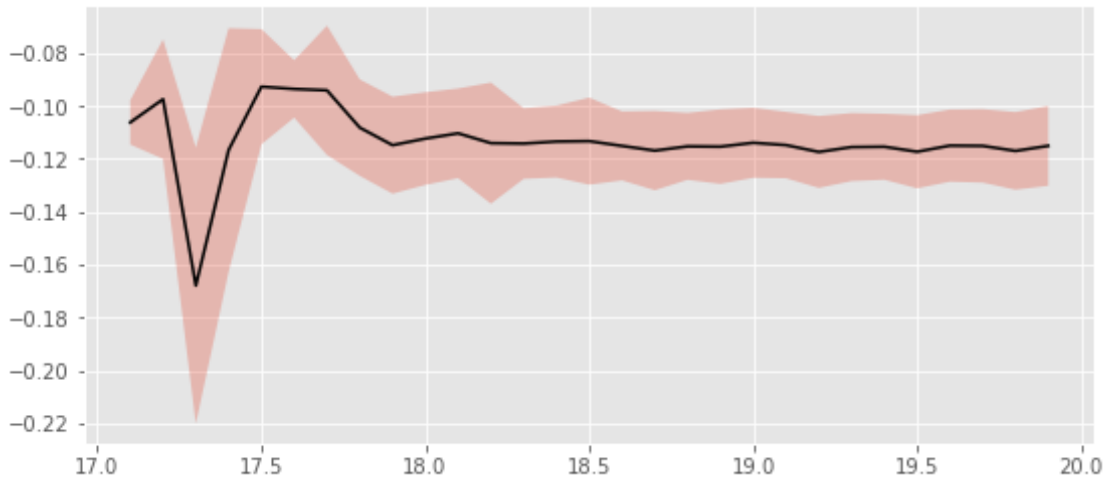
```

/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid value
  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 encountered in   
mask &= (stellarity > 0.9)  
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value encountered in   
mask &= (mag >= mag_min)  
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value encountered in   
mask &= (mag <= mag_max)
```



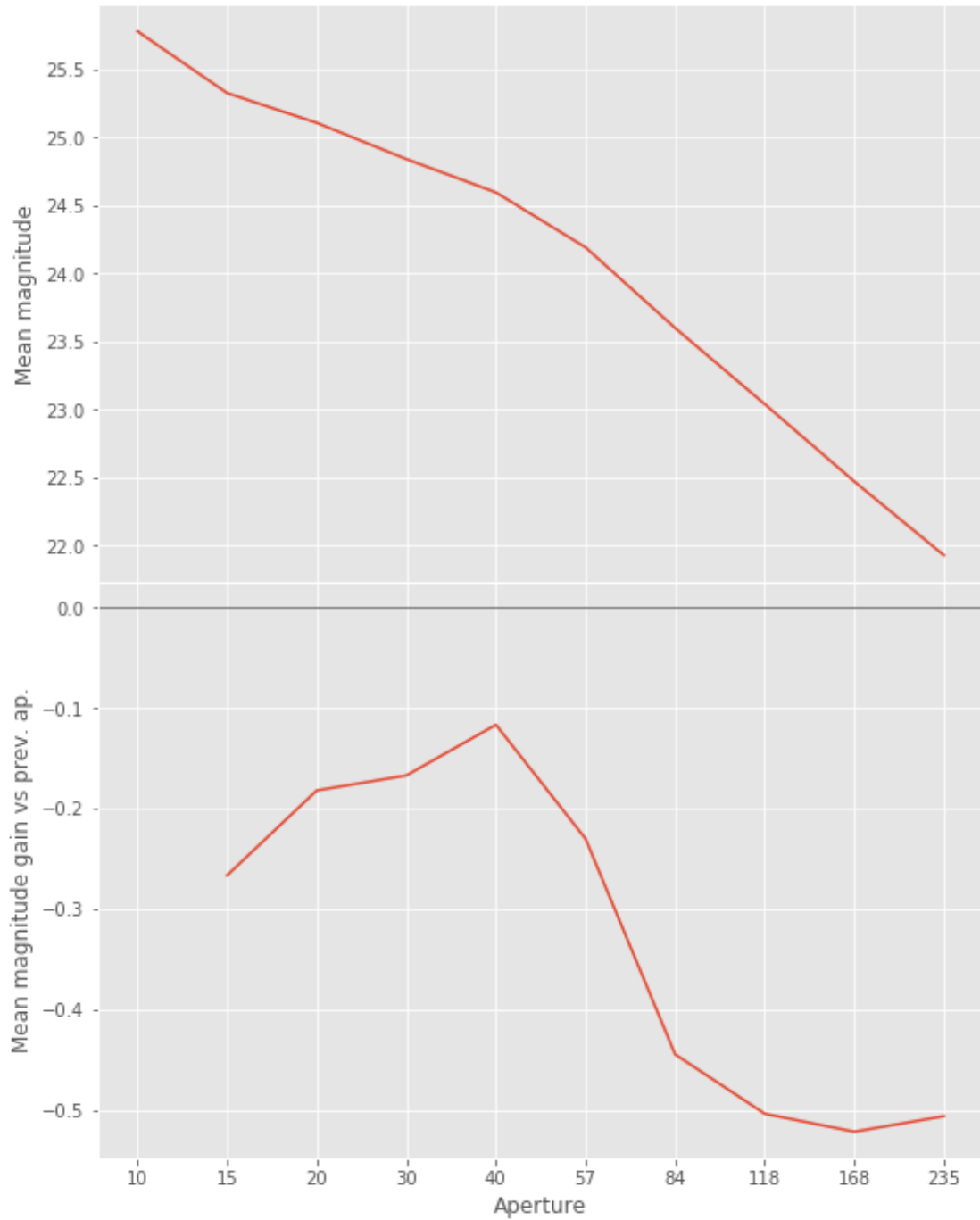
We use magnitudes between 17.5 and 19.8.

```
Aperture correction for z band:  
Correction: -0.11537742614746094  
Number of source used: 7648  
RMS: 0.013625932147155698
```

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

1.2.5 I.e - y band

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



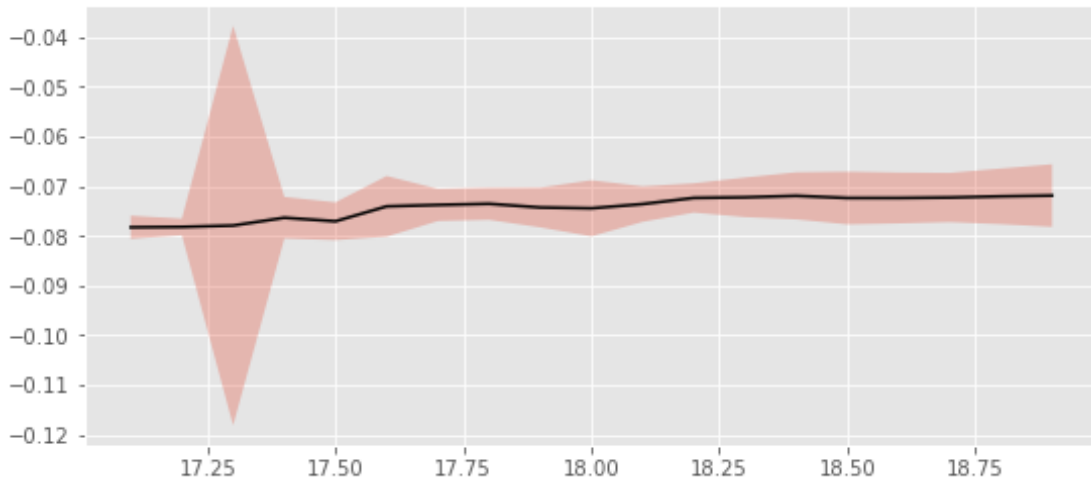
We will use aperture 40 as target.

```

/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid value
  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 encountered in  $\&=$ 
mask  $\&=$  (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value encountered in  $\&=$ 
mask  $\&=$  (mag  $\geq$  mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value encountered in  $\&=$ 
mask  $\&=$  (mag  $\leq$  mag_max)
```



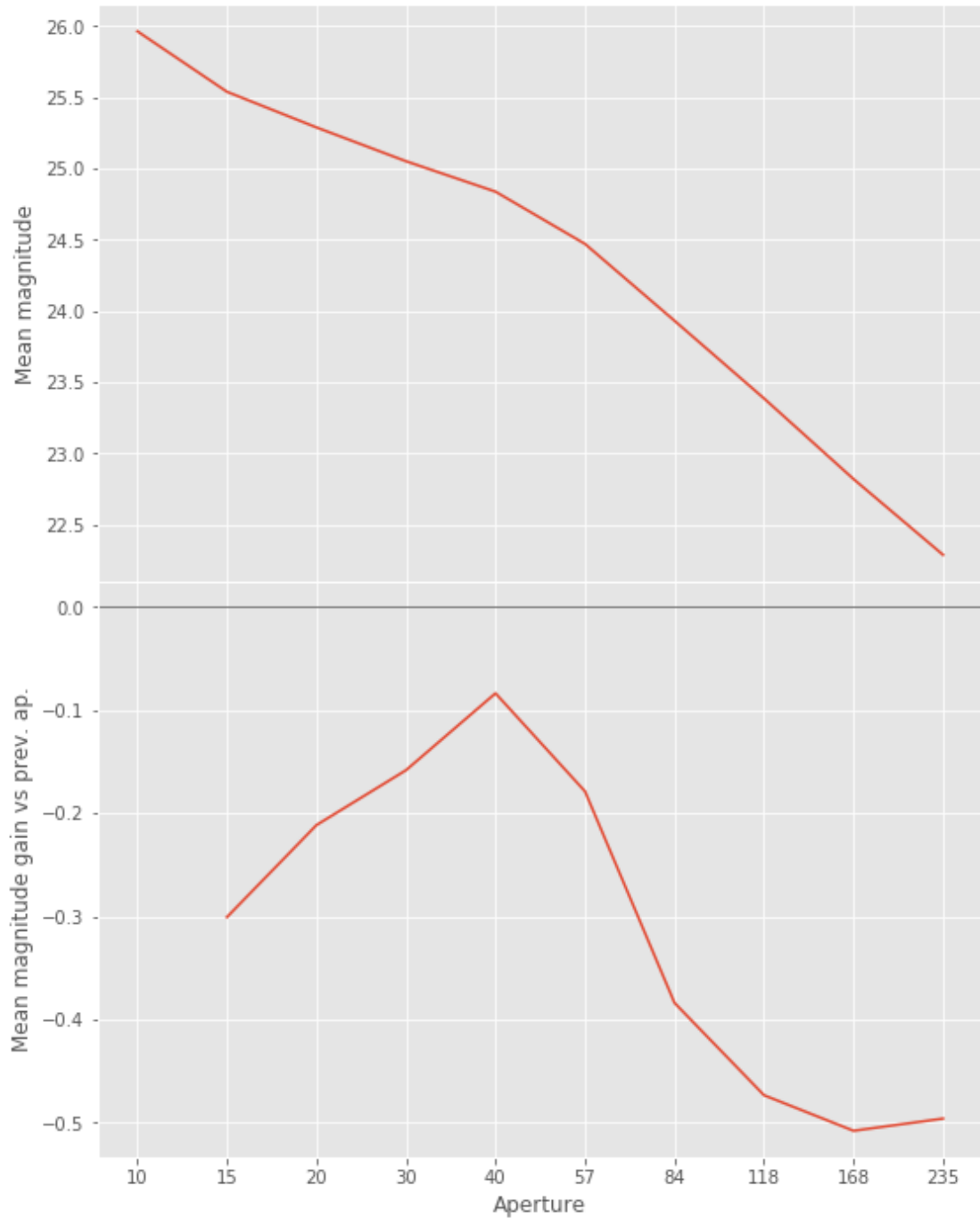
We use magnitudes between 17 and 18.7.

```
Aperture correction for y band:
Correction: -0.07273674011230469
Number of source used: 1738
RMS: 0.004619679368482173
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value encountered in  $\&=$ 
mask  $\&=$  (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: RuntimeWarning: invalid value encountered in  $\&=$ 
mask  $\&=$  (mag  $\geq$  mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value encountered in  $\&=$ 
mask  $\&=$  (mag  $\leq$  mag_max)
```

1.2.6 I.f - N921 band

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid value encountered in  $\&=$ 
mags = magnitudes[:, stellarity > stel_threshold].copy()
```



We will use aperture 40 as target.

```

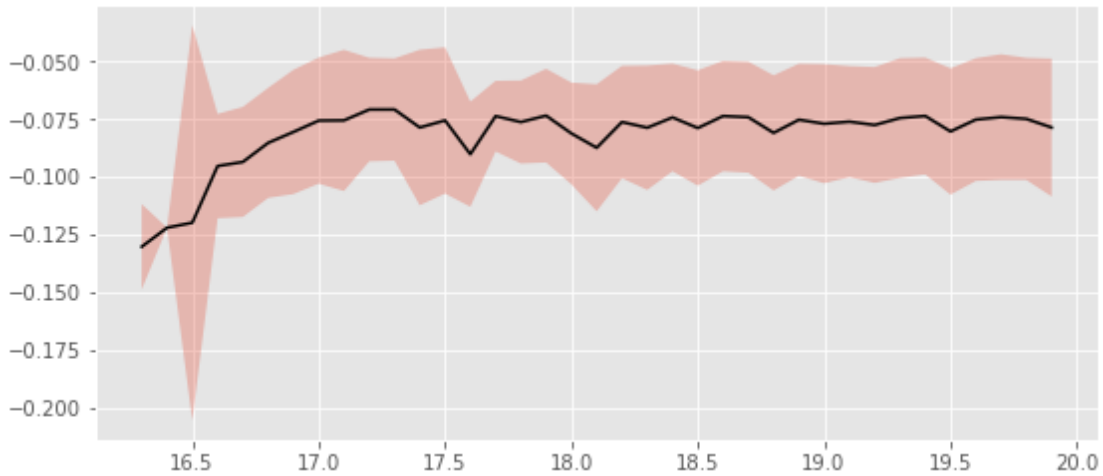
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid value
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self,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

```

```

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

```



We use magnitudes between 16.5 and 18.7.

```

Aperture correction for N921 band:
Correction: -0.077545166015625
Number of source used: 1233
RMS: 0.02450862579659783

```

```

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

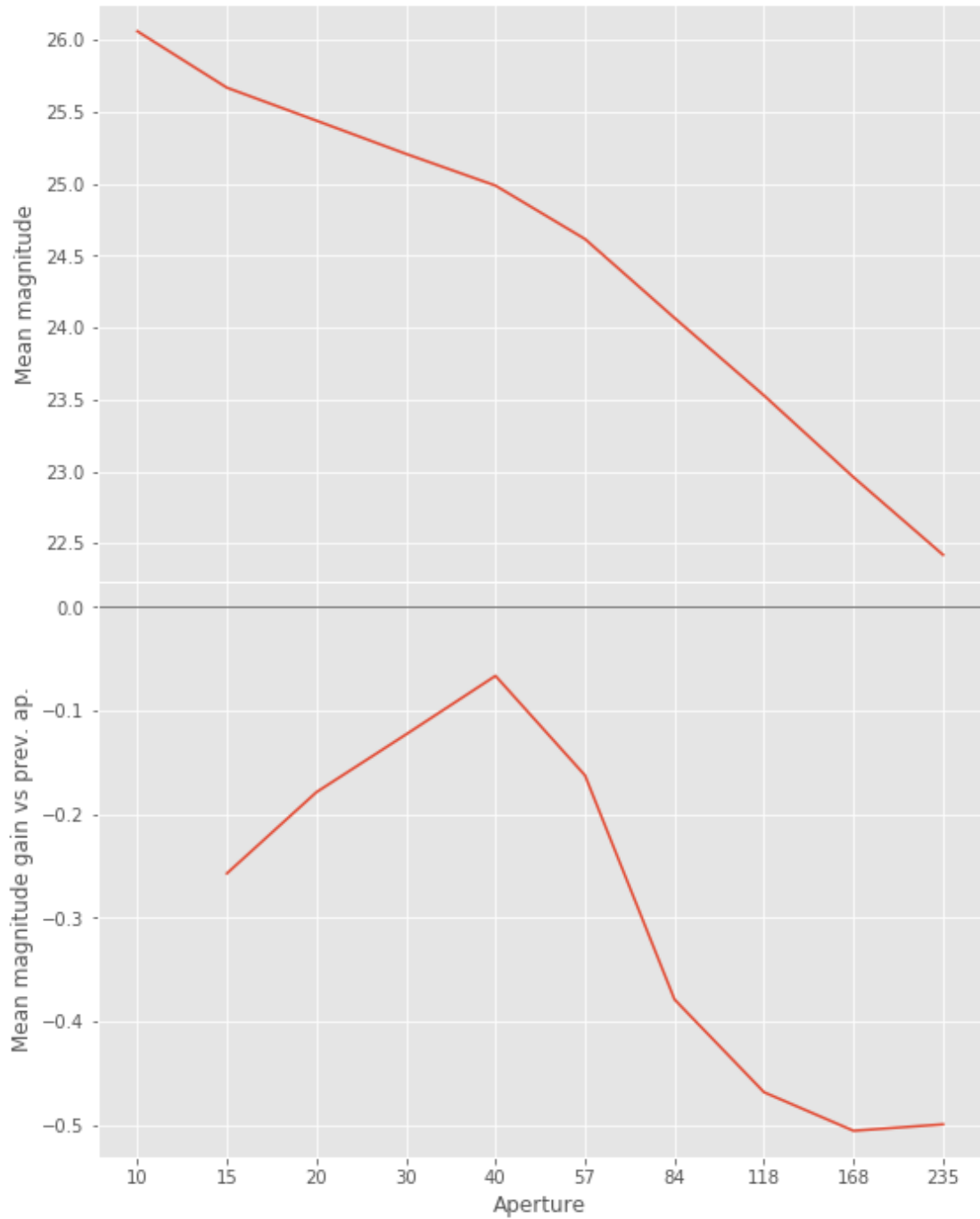
```

1.2.7 1.g n816

```

/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid value encountered in  $\>$ 
  mags = magnitudes[:, stellarity > stel_threshold].copy()

```



We will use aperture 40 as target.

```

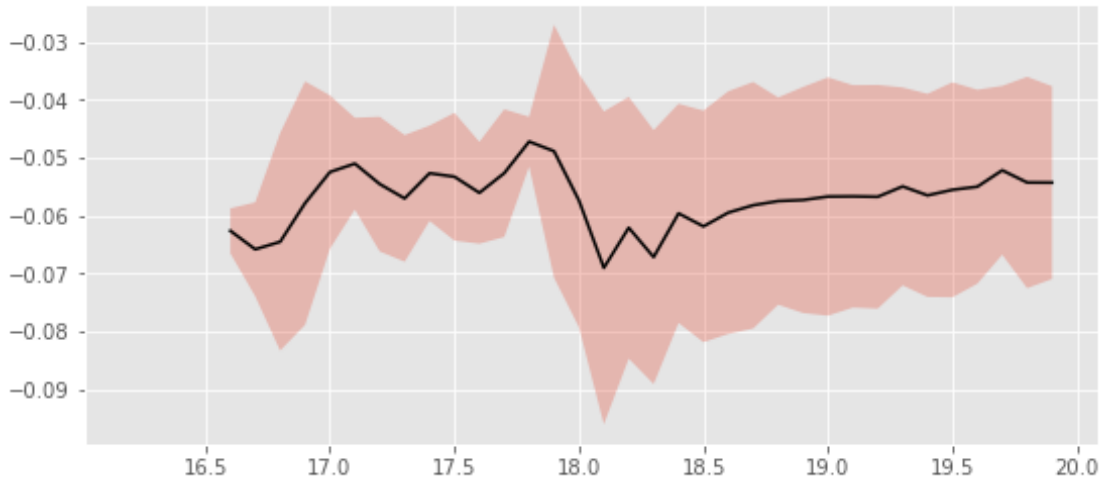
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid value
  mask = stellarity > .9
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, 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 16.5 and 18.7.

```

Aperture correction for N816 band:
Correction: -0.057849884033203125
Number of source used: 448
RMS: 0.021115571577458442

```

```

/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)

```

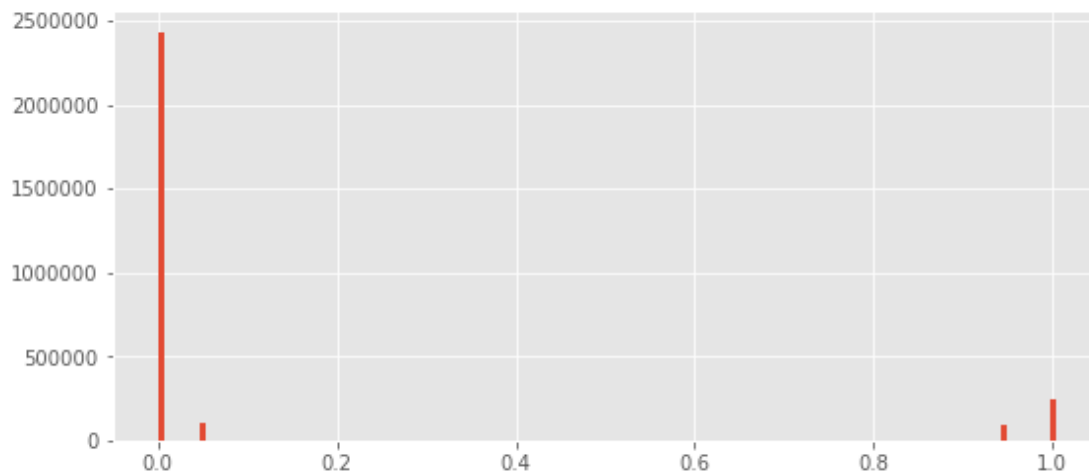
1.3 II - Stellarity

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

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/ipykernel/__main__.py:8: R
/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[35]: <IPython.core.display.HTML object>

1.5 III - Removal of duplicated sources

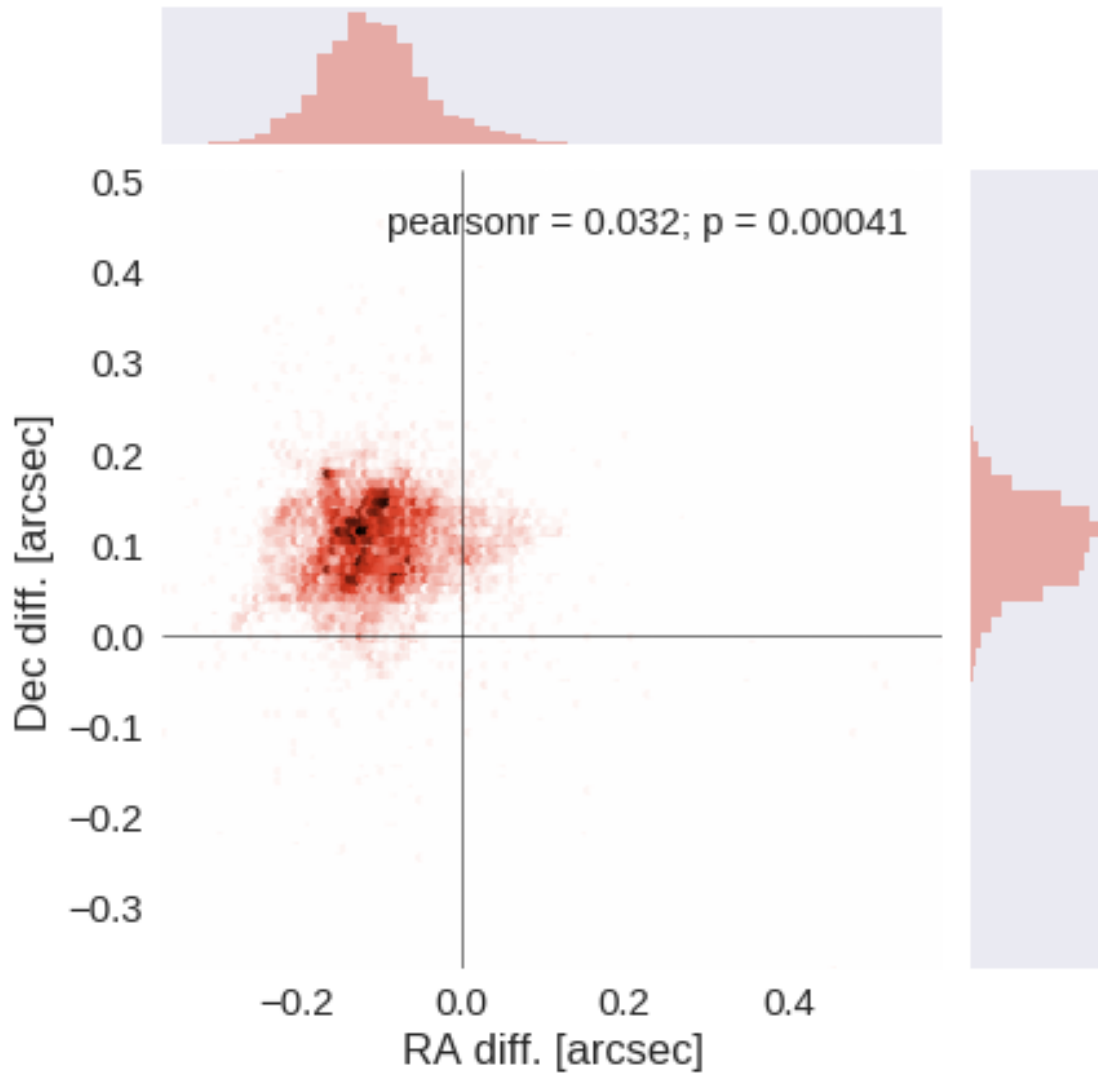
We remove duplicated objects from the input catalogues.

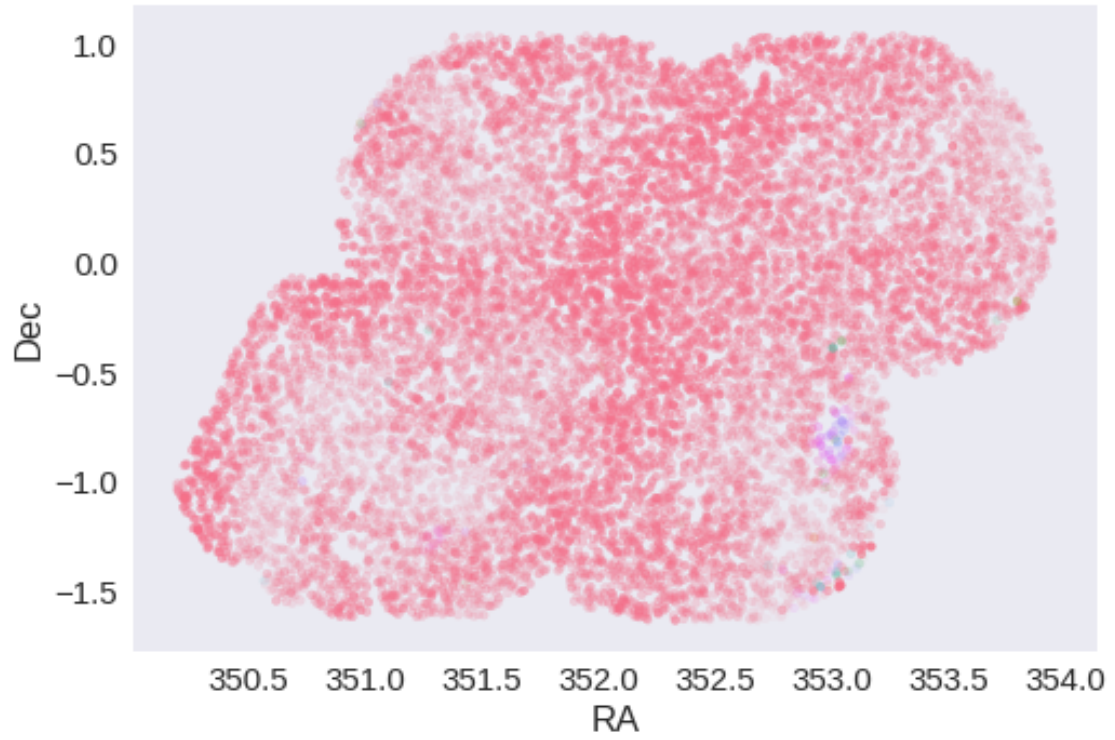
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
ma.MaskedArray.__setitem__(self, index, value)
```

The initial catalogue had 2868474 sources.
The cleaned catalogue has 2868272 sources (202 removed).
The cleaned catalogue has 168 sources flagged as having been cleaned

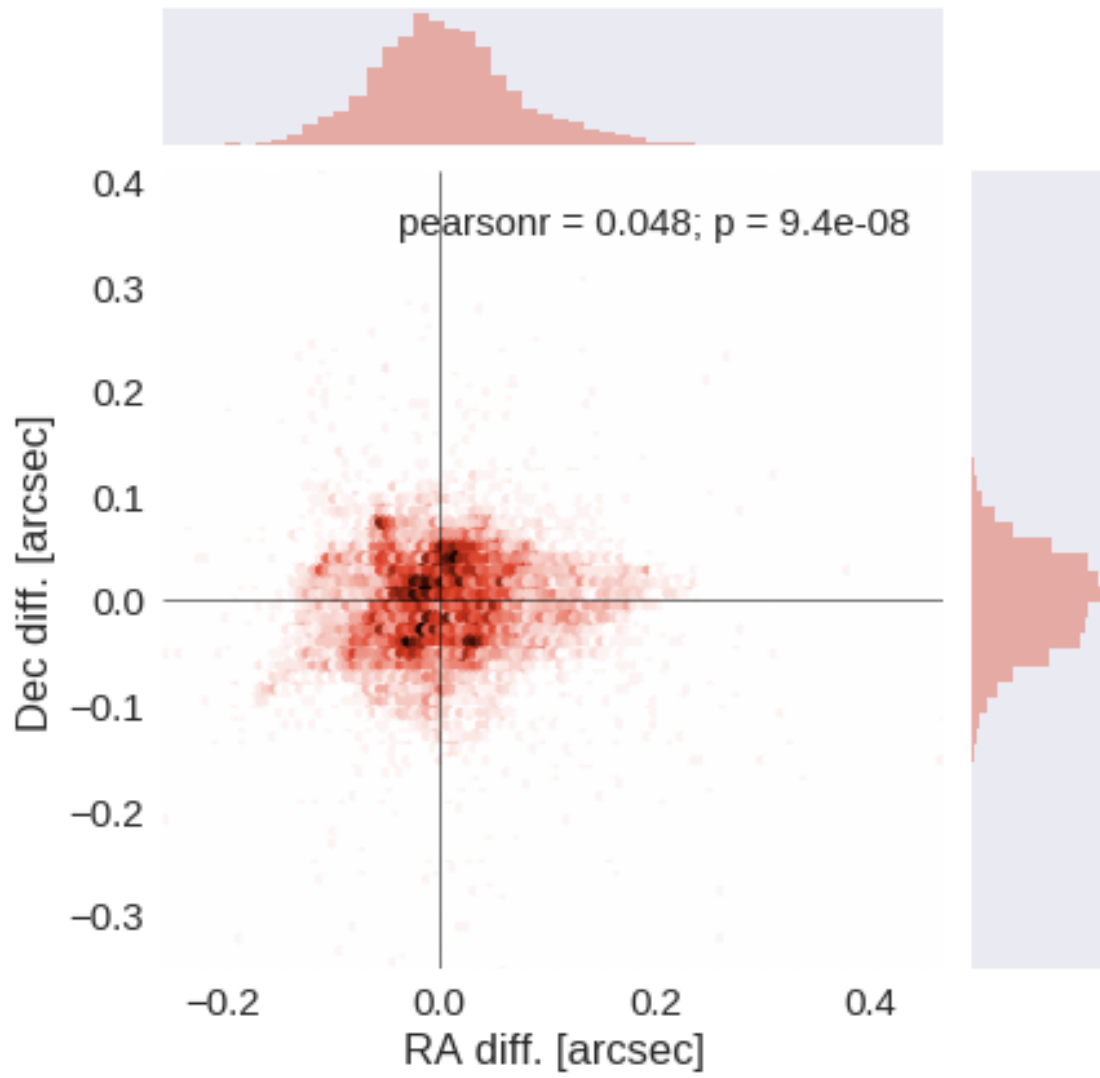
1.6 III - Astrometry correction

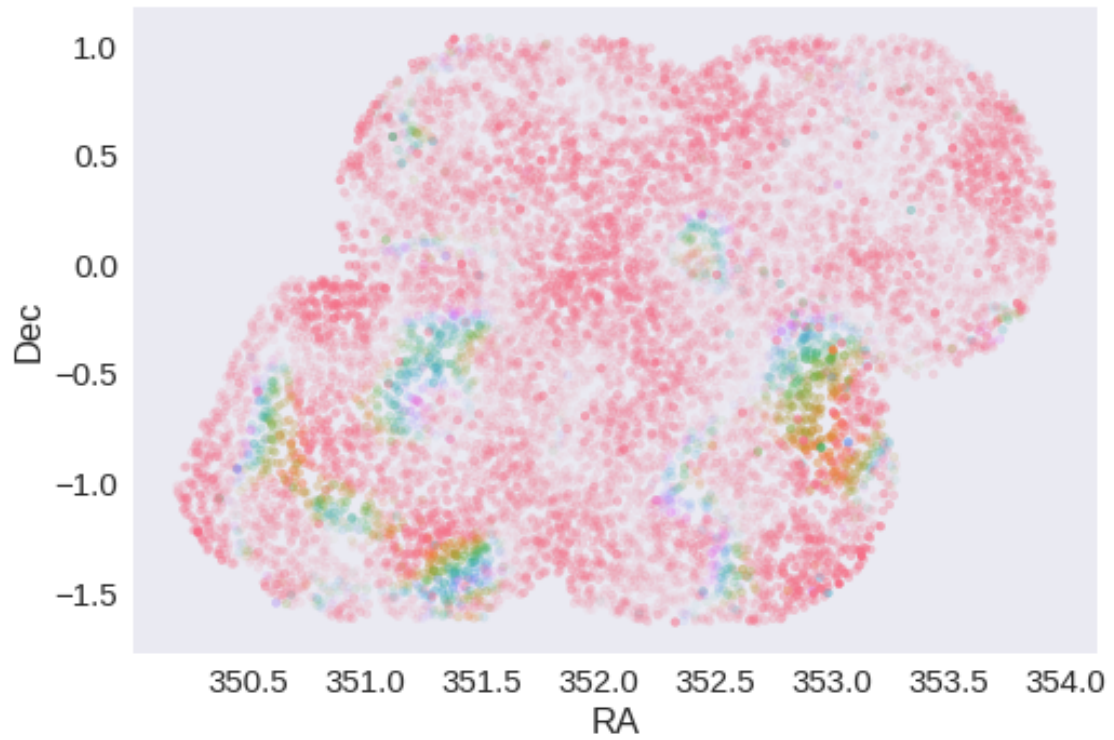
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.





RA correction: 0.109708158538524 arcsec
Dec correction: -0.10202967583285982 arcsec





1.7 IV - Flagging Gaia objects

12702 sources flagged.

2 V - Saving to disk

1.2_VISTA-VHS

March 8, 2018

1 Herschel Stripe 82 master catalogue

1.1 Preparation of VHS data

VISTA telescope/VHS catalogue: the catalogue comes from `dmu0_VHS`.

In the catalogue, we keep:

- The identifier (it's unique in the catalogue);
- The position;
- The stellarity;
- The magnitude for each band.
- The kron magnitude to be used as total magnitude (no "auto" magnitude is provided).

We don't know when the maps have been observed. We will use the year of the reference paper.

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

1.3 II - Removal of duplicated sources

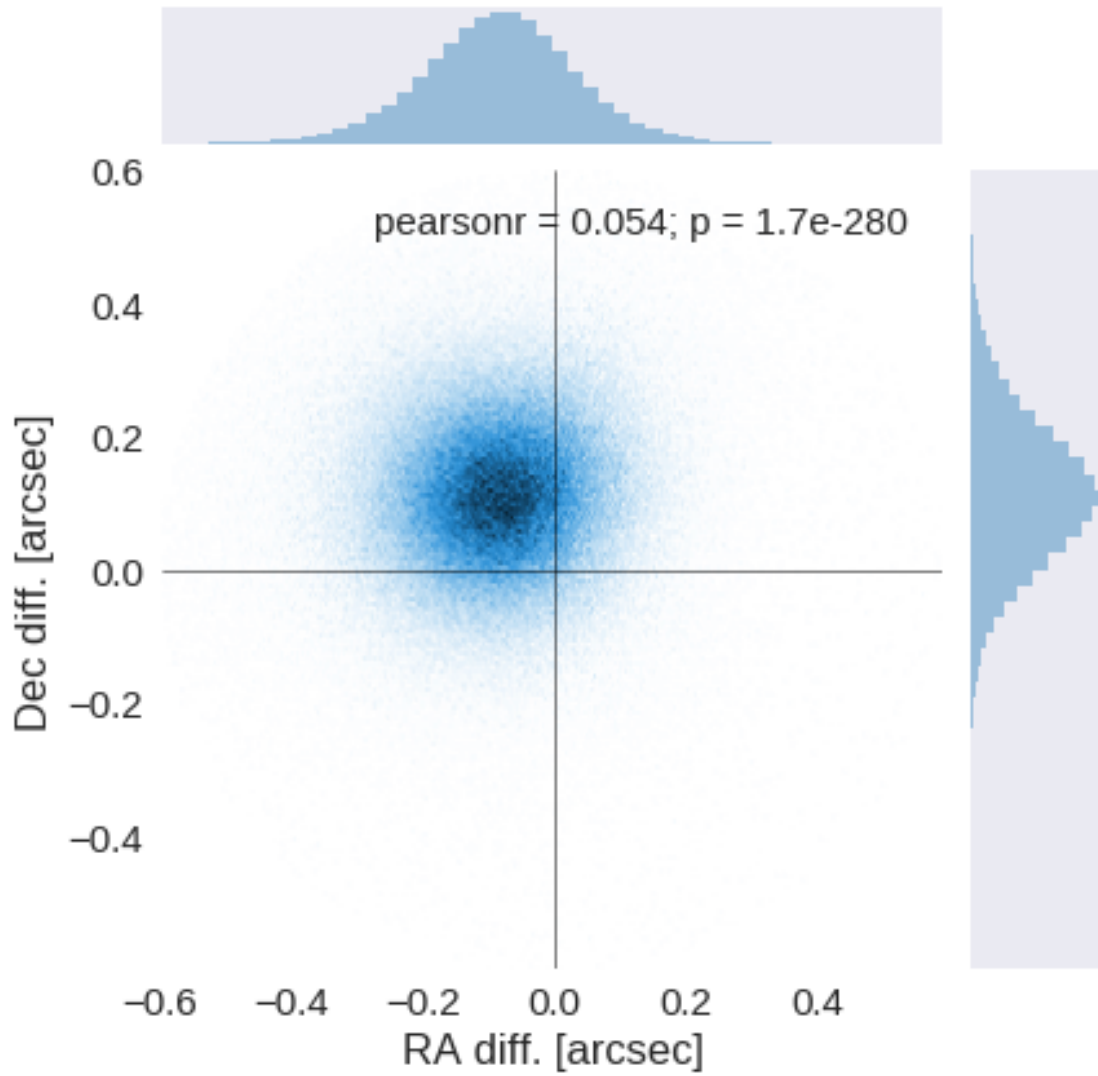
We remove duplicated objects from the input catalogues.

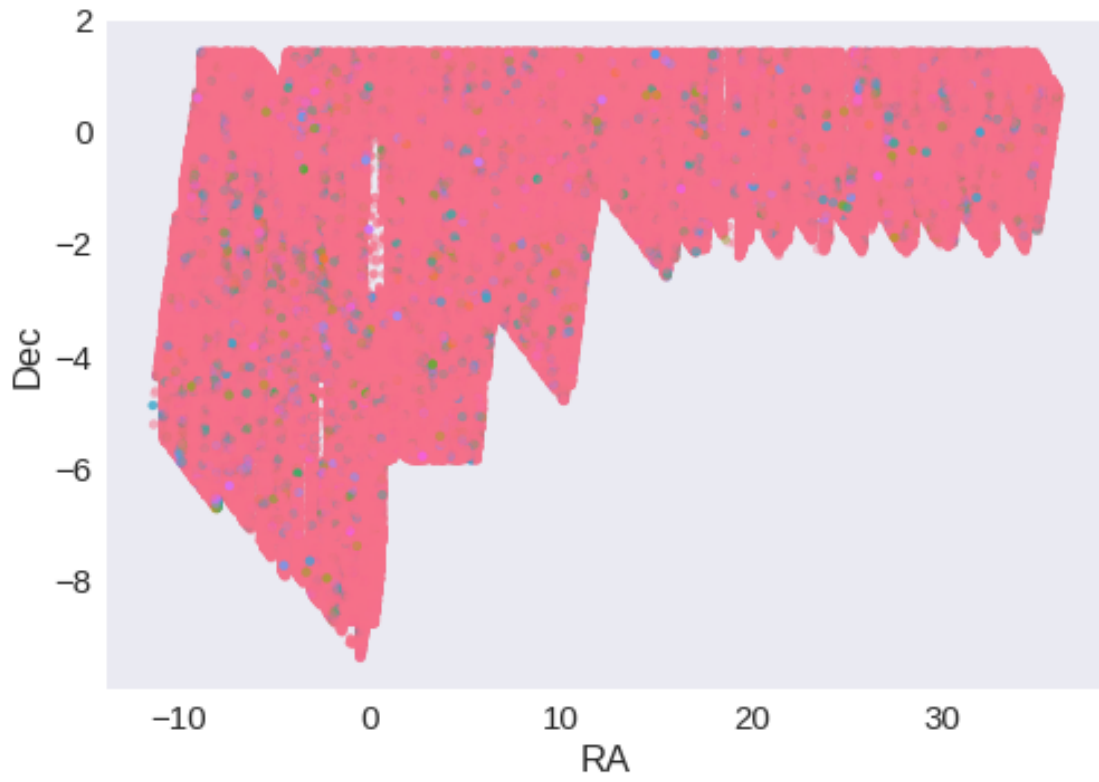
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10  
Check the NumPy 1.11 release notes for more information.  
ma.MaskedArray.__setitem__(self, index, value)
```

The initial catalogue had 4723782 sources.
The cleaned catalogue has 4708094 sources (15688 removed).
The cleaned catalogue has 15670 sources flagged as having been cleaned

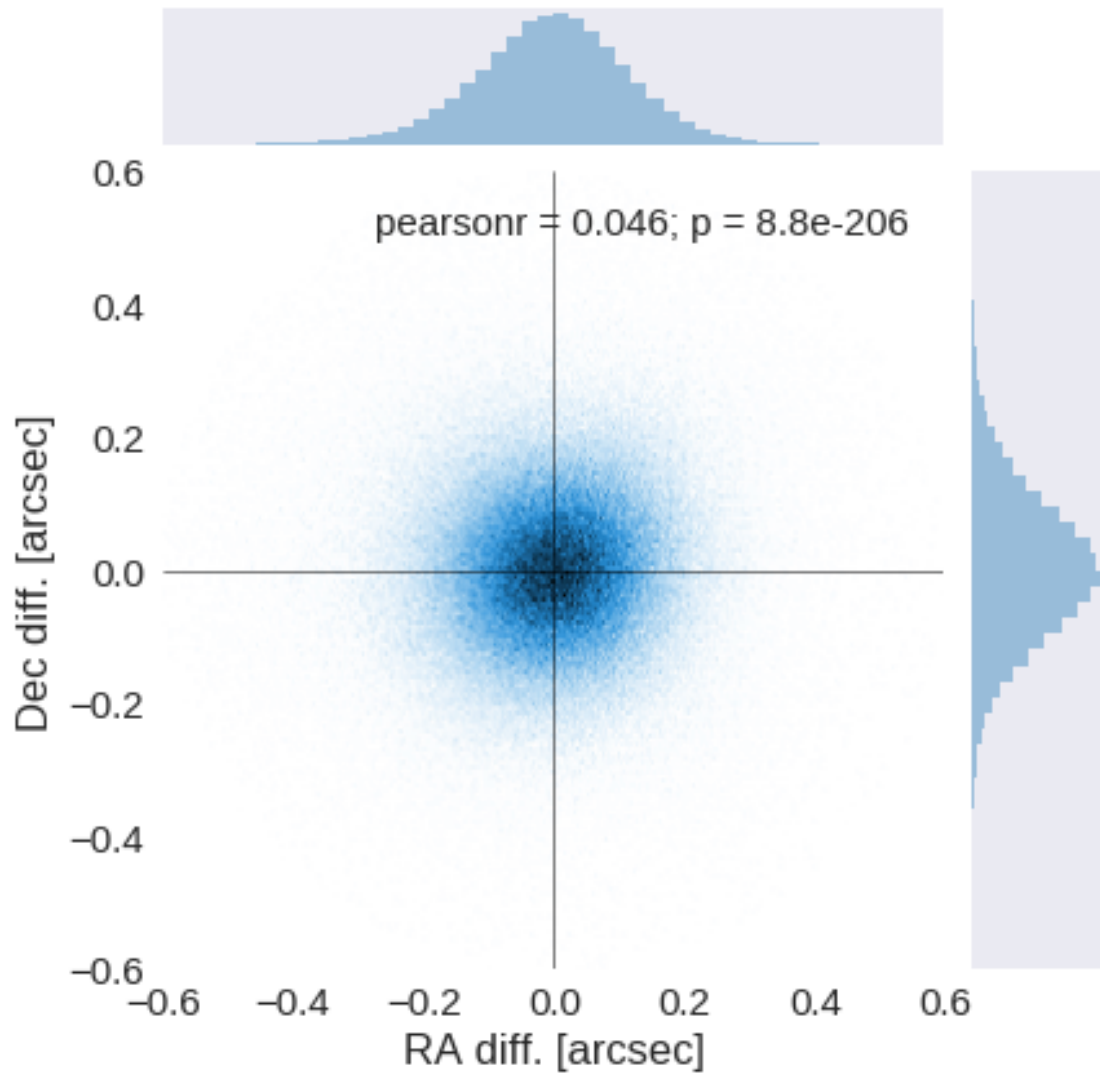
1.4 III - Astrometry correction

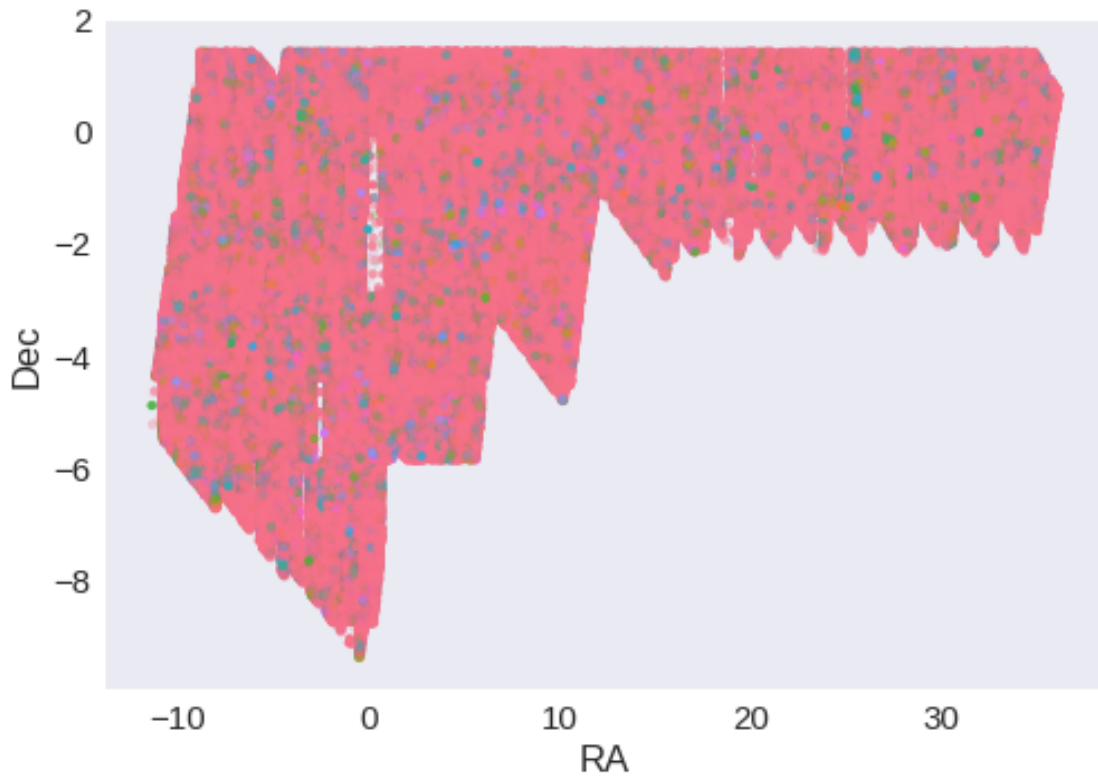
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.





RA correction: 0.08399760600354966 arcsec
Dec correction: -0.11251507613907474 arcsec





1.5 IV - Flagging Gaia objects

443115 sources flagged.

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.3_VICS82

March 8, 2018

1 Herschel Stripe 82 master catalogue

1.1 Preparation of VISTA/CFHT Telescope / VIRCAM/WIRCAM Camera data

VISTA/CFHT Telescope / VIRCAM/WIRCAM Camera VICS82 catalogue: the catalogue comes from dmu0_VICS82.

The catalogue is described here: <https://arxiv.org/pdf/1705.05451.pdf>

In the catalogue, we keep:

- The identifier (it's unique in the catalogue);
- The position;
- The stellarity;
- The magnitude for each band.
- The auto magnitude to be used as total magnitude .

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 13:24:21.212625

1.2 I - Column selection

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
```

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

1.3 II - Removal of duplicated sources

We remove duplicated objects from the input catalogues.

1.4_UKIDSS-LAS

March 8, 2018

1 Herschel Stripe 82 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 epochs. 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 supported

`/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)
```

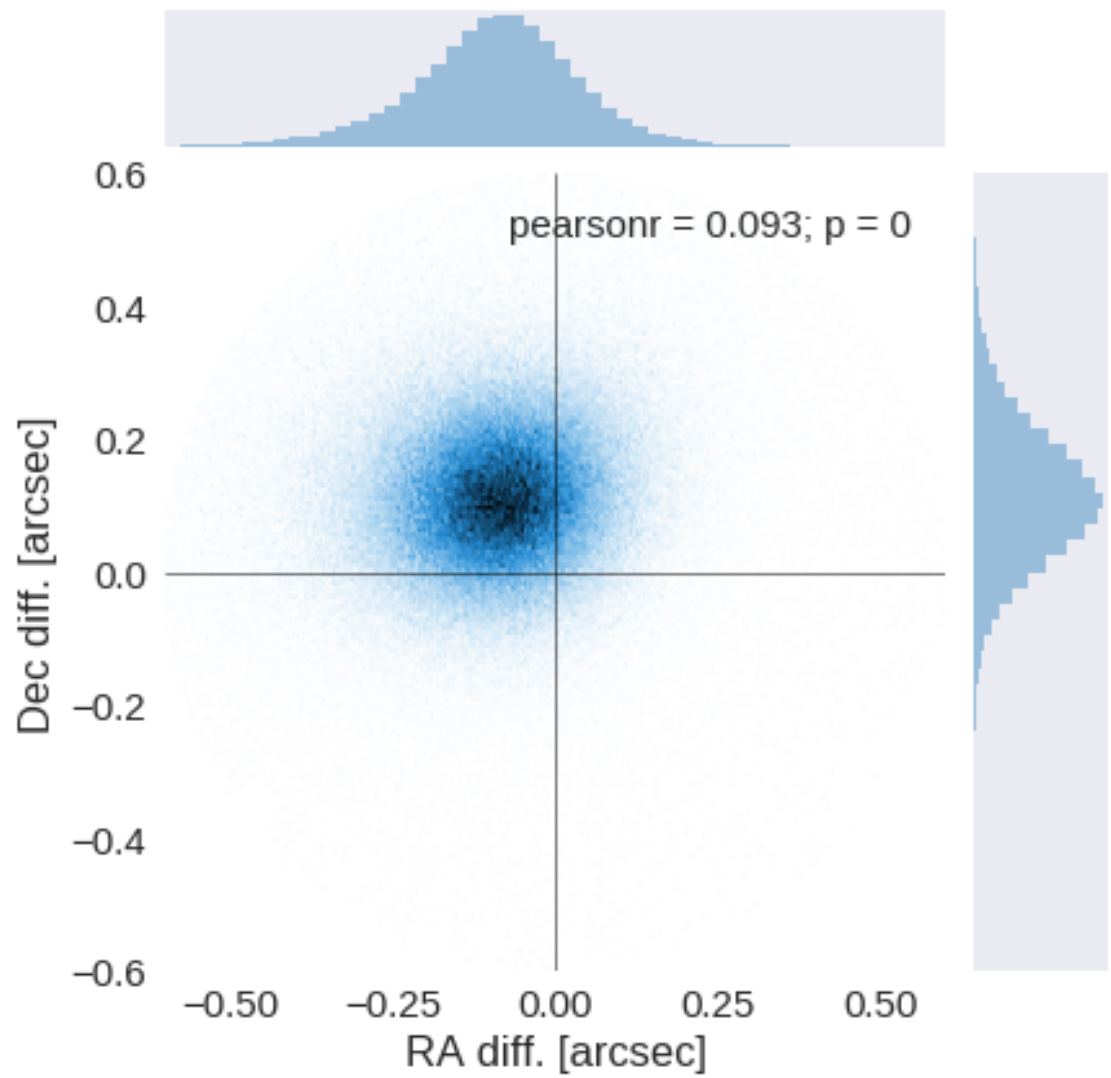
The initial catalogue had 3298592 sources.

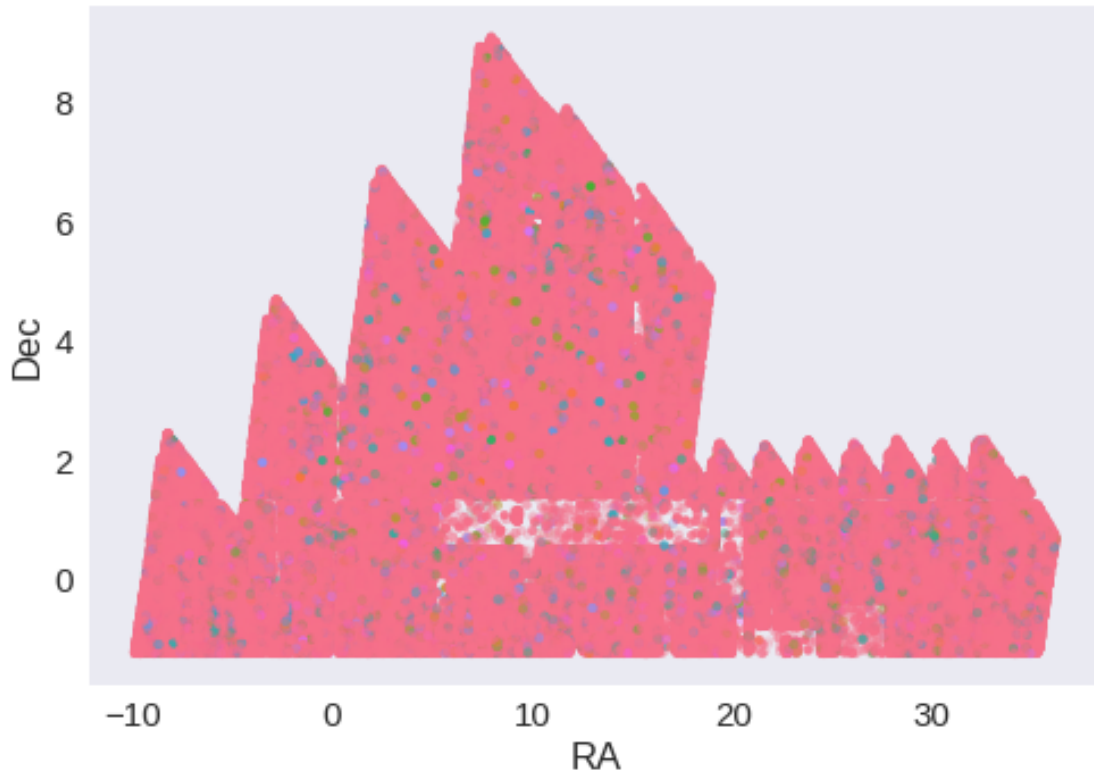
The cleaned catalogue has 3296181 sources (2411 removed).

The cleaned catalogue has 2394 sources flagged as having been cleaned

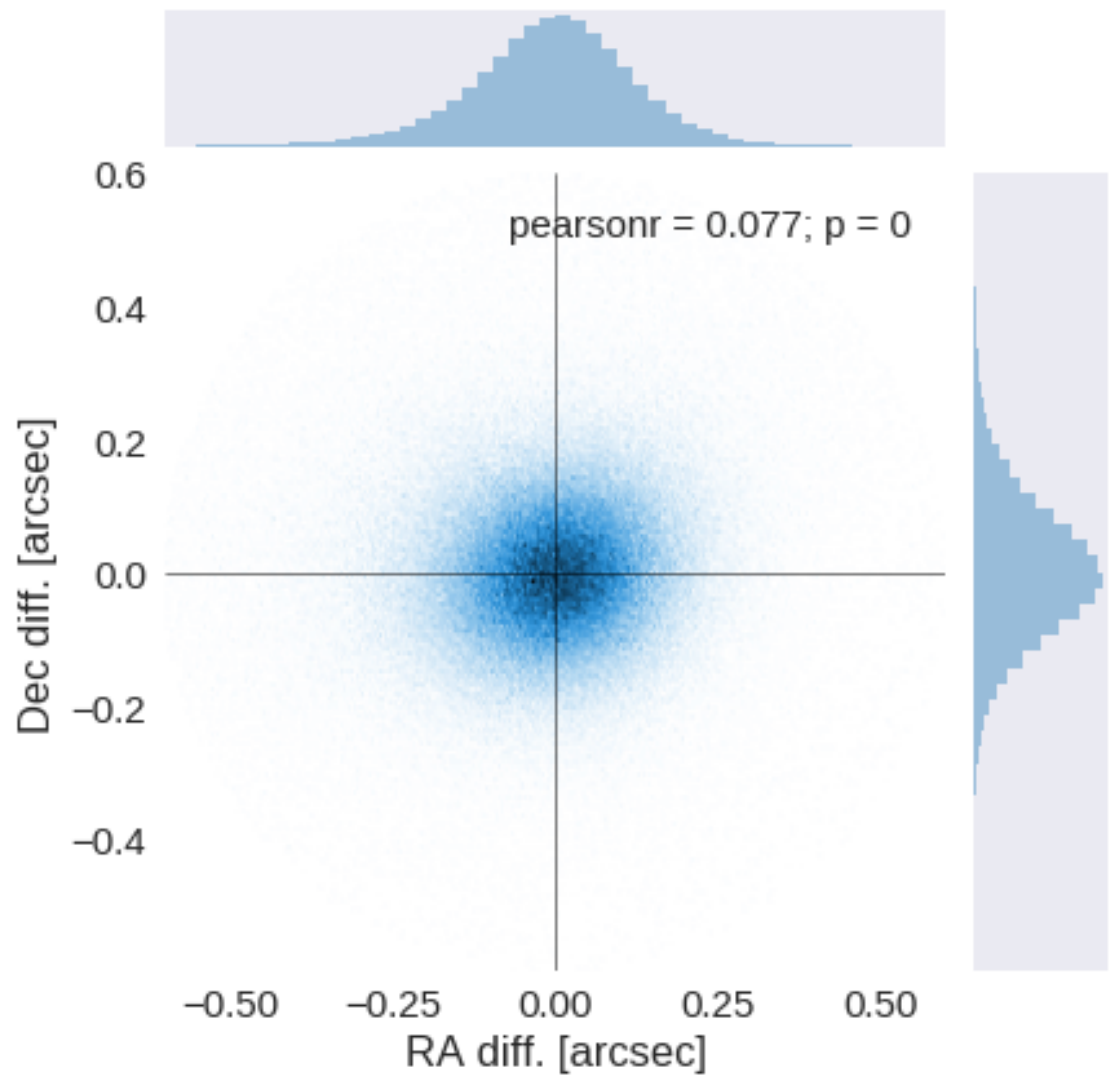
1.4 III - Astrometry correction

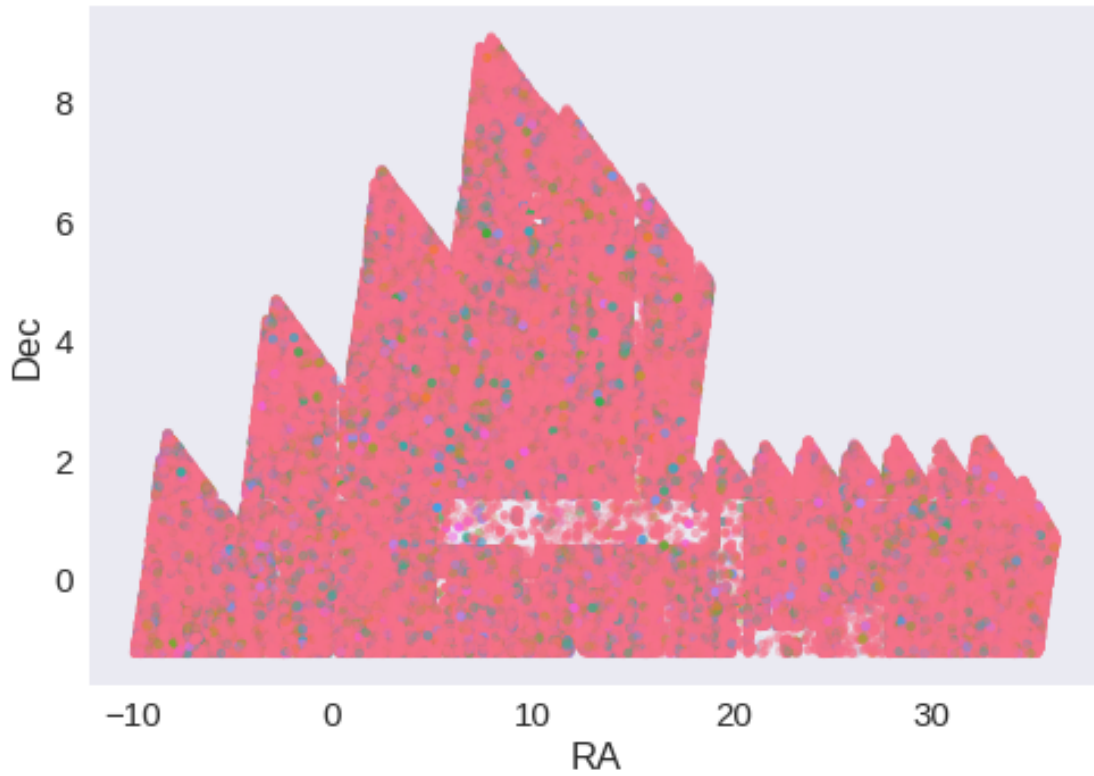
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.





RA correction: 0.08633676337694851 arcsec
Dec correction: -0.1104300686126436 arcsec





1.5 IV - Flagging Gaia objects

438850 sources flagged.

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.5_PanSTARRS-3SS

March 8, 2018

1 Herschel Stripe 82 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 `uniquePspSTid` as unique object identifier;
- The r-band position which is given for all the sources;
- The grizy `<band>FApMag` aperture magnitude (see below);
- The grizy `<band>FKronMag` 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 were done between 2010 and 2015 ([ref](#)).

TODO: Check if the detection flag can be used to know in which bands an object was detected to construct the coverage maps.

TODO: Check for stellarity.

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

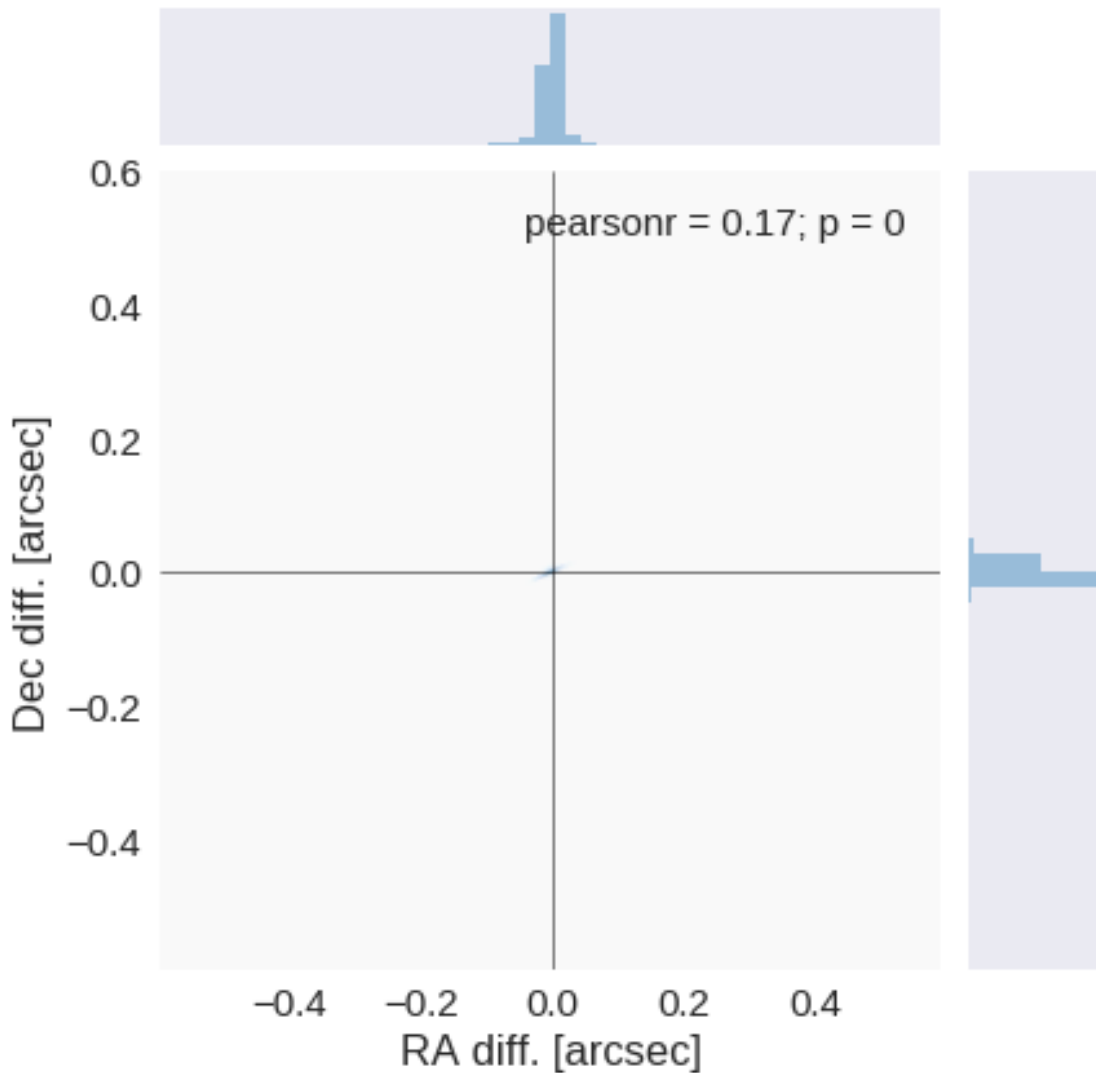
We remove duplicated objects from the input catalogues.

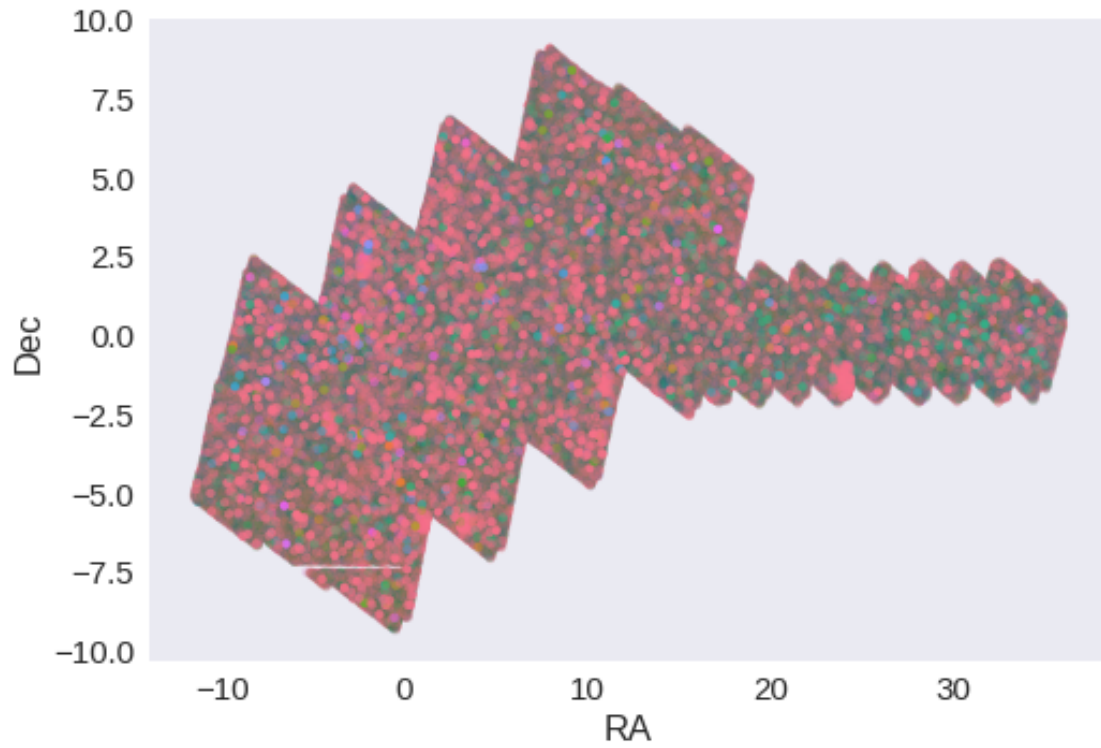
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
ma.MaskedArray.__setitem__(self, index, value)
```

The initial catalogue had 6797876 sources.
The cleaned catalogue has 6795065 sources (2811 removed).
The cleaned catalogue has 2810 sources flagged as having been cleaned

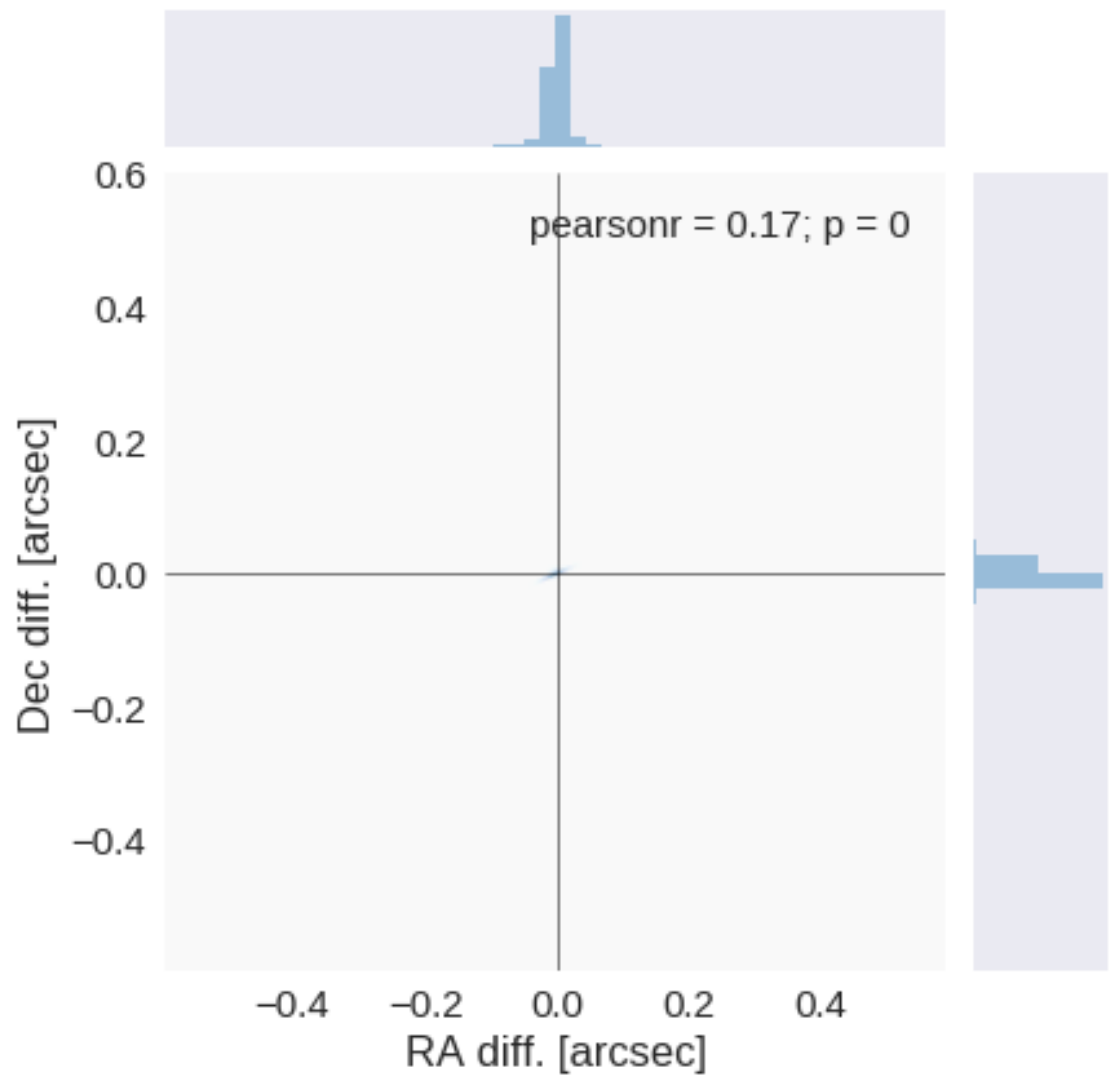
1.4 III - Astrometry correction

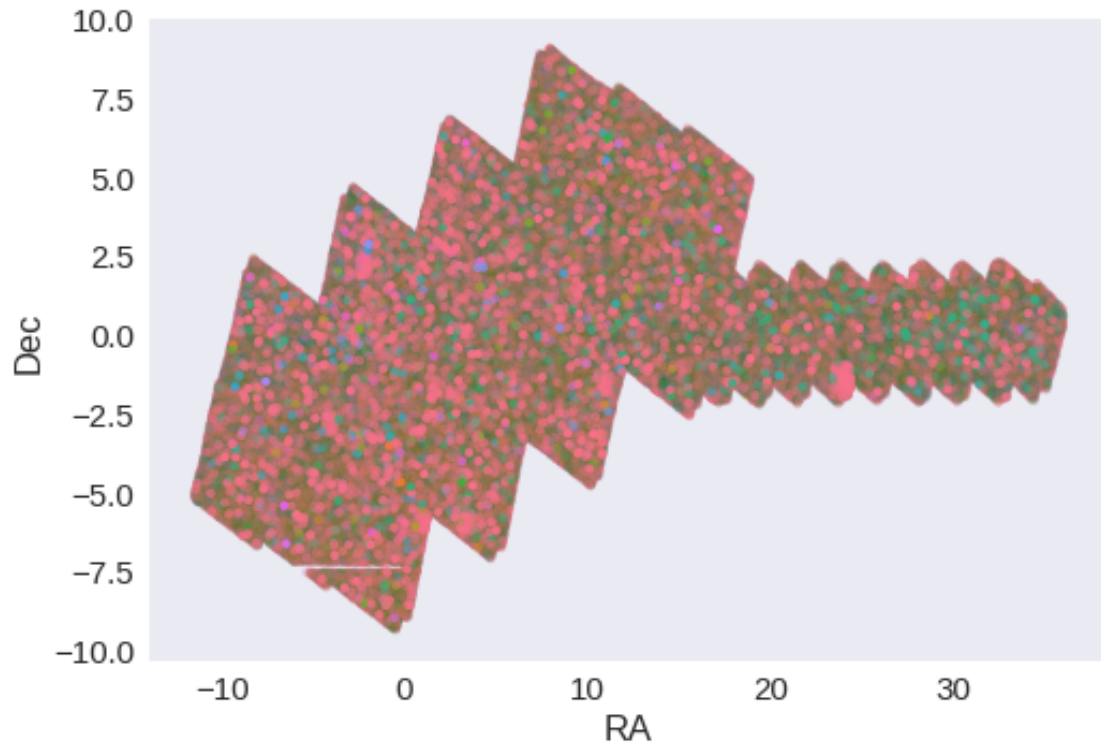
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.





RA correction: 0.0001763459522408084 arcsec
Dec correction: -0.0009540056027157462 arcsec





1.5 IV - Flagging Gaia objects

881634 sources flagged.

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.6_SHELA

March 8, 2018

1 Herschel Stripe 82 master catalogue

1.1 Preparation of Spitzer SHELA data

The Spitzer/HETDEX Exploratory Large-Area (SHELA) survey covers ~24 sq. deg at 3.6 and 4.5 microns. The Spitzer/SHELA catalogues are available in `dmu0_SHELA`.

In the catalogue, we keep:

- The internal identifier;
- The position;
- The fluxes in 4 arcsecond apertures;
- The “auto” flux;

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 encountered in divide  
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.

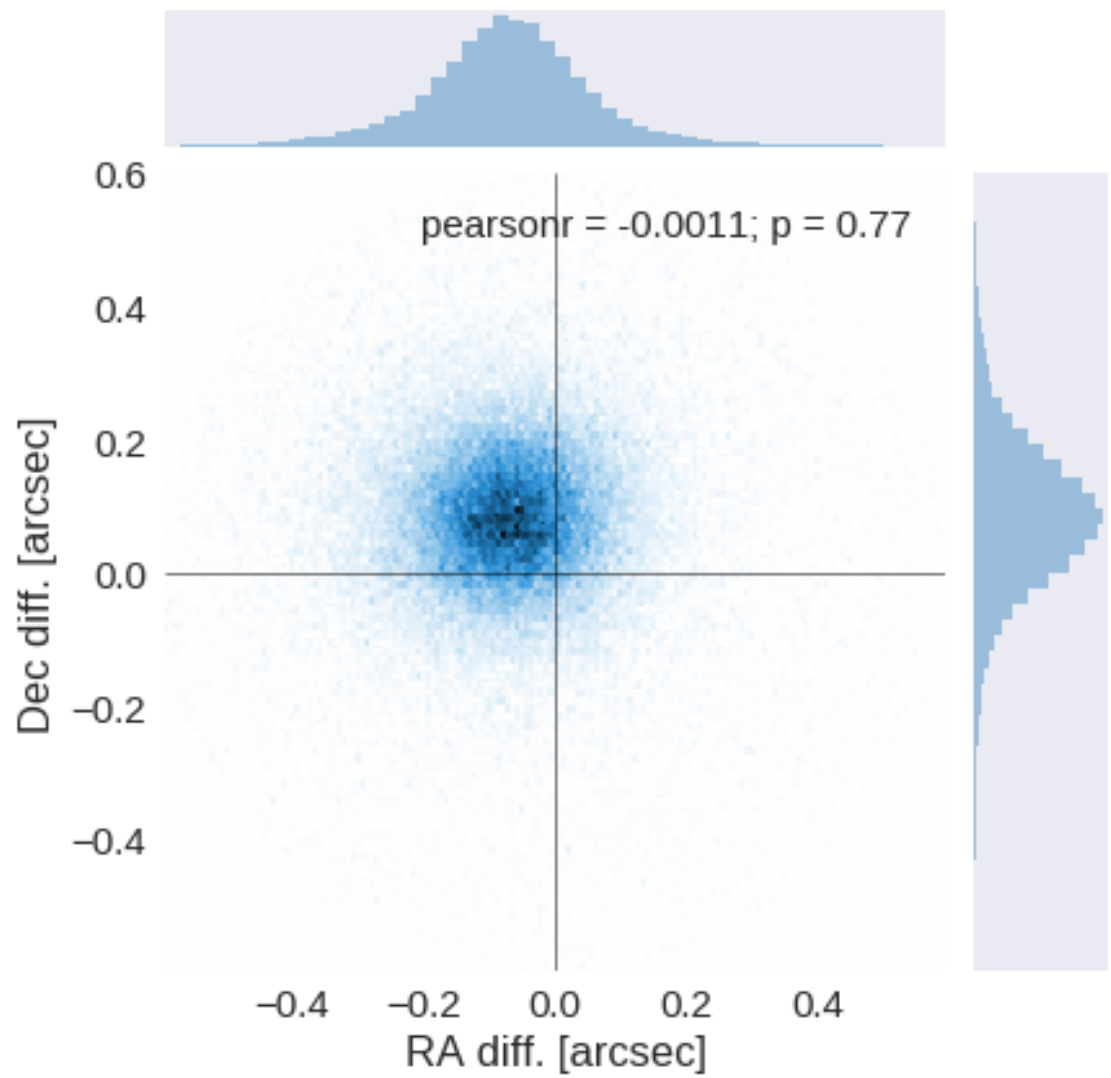
The initial catalogue had 2294786 sources.

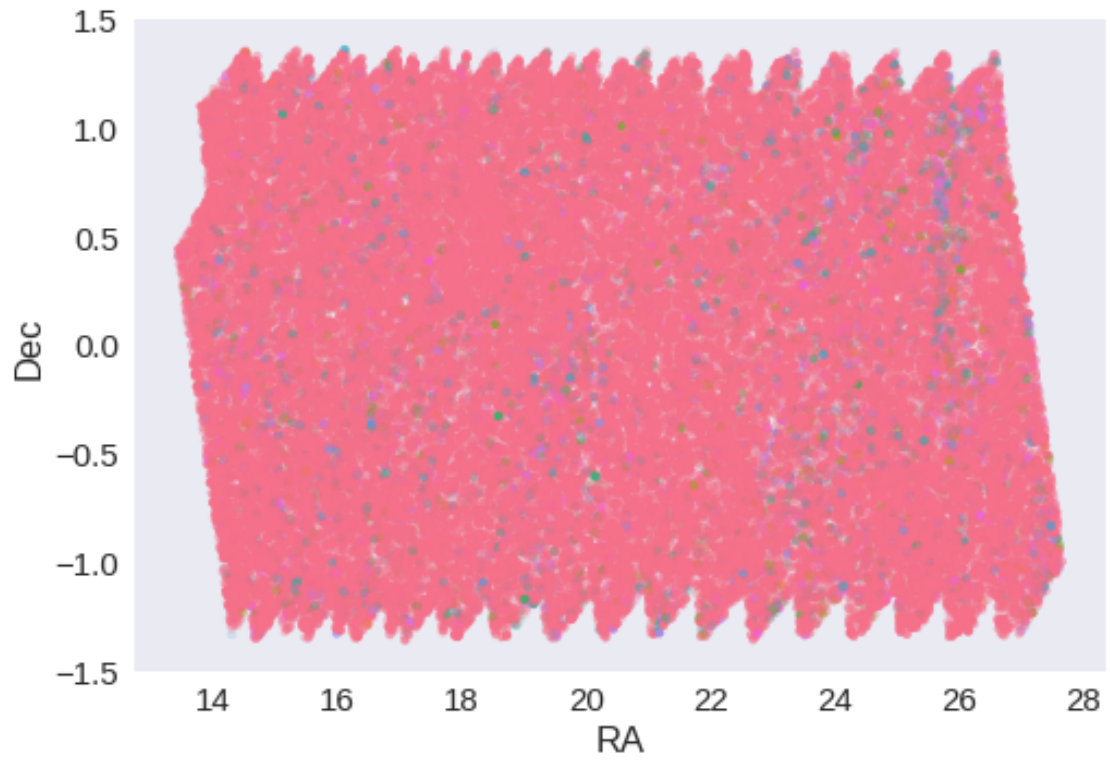
The cleaned catalogue has 2294786 sources (0 removed).

The cleaned catalogue has 0 sources flagged as having been cleaned

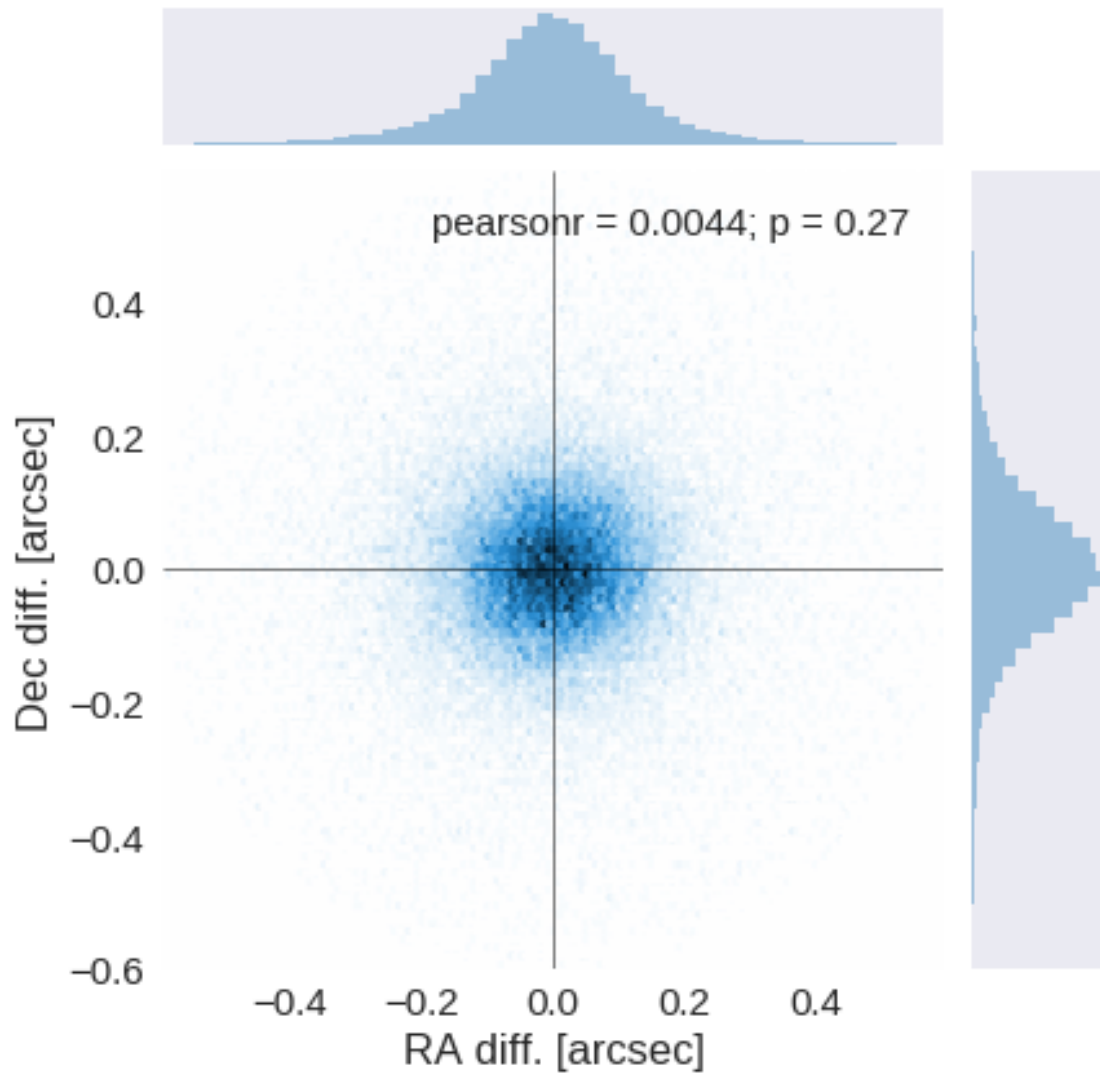
1.4 III - Astrometry correction

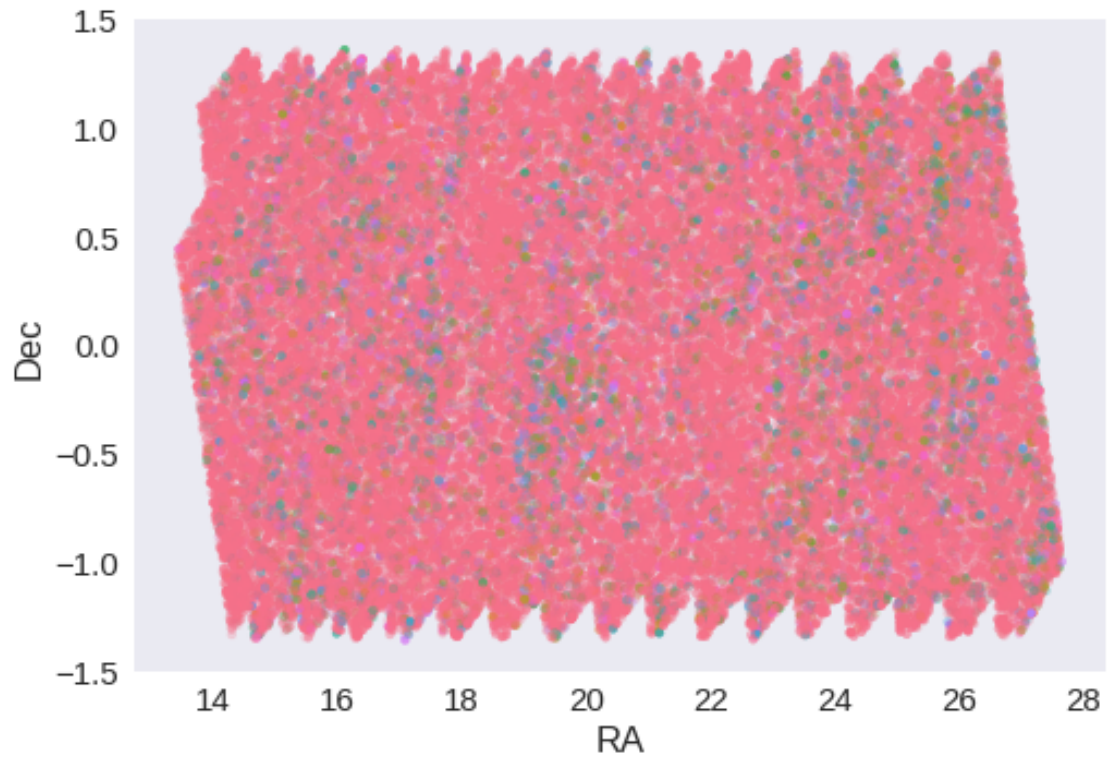
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.





RA correction: 0.07131256496677452 arcsec
Dec correction: -0.08313942358052495 arcsec





1.5 IV - Flagging Gaia objects

68747 sources flagged.

1.6 V - Flagging objects near bright stars

1.7 VI - Saving to disk

1.7_SpIES

March 8, 2018

1 Herschel Stripe 82 master catalogue

1.1 Preparation of Spitzer SpIES data

The Spitzer catalogues are available in `dmu0_SpIES`. Lucia told that the magnitudes are aperture corrected.

In the catalogue, we keep:

- The internal identifier (this one is only in HeDaM data);
- The position;
- The fluxes in aperture 2 (1.9 arcsec);
- The “auto” flux (which seems to be the Kron flux);
- The stellarity in each band

TODO: Epoch?

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 encountered in divide
  magnitudes = 2.5 * (23 - np.log10(fluxes)) - 48.6
```

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

1.3 II - Removal of duplicated sources

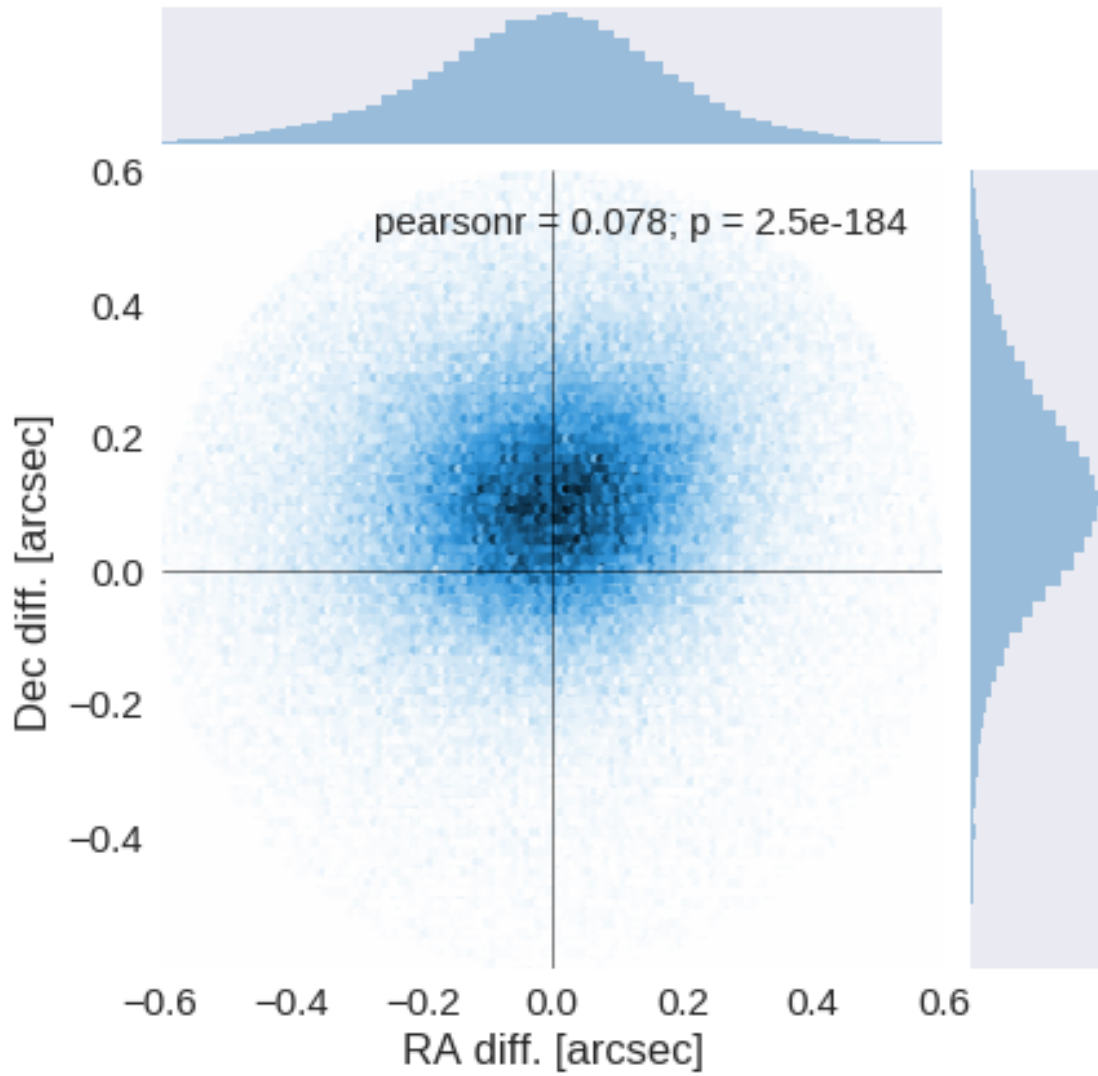
We remove duplicated objects from the input catalogues.

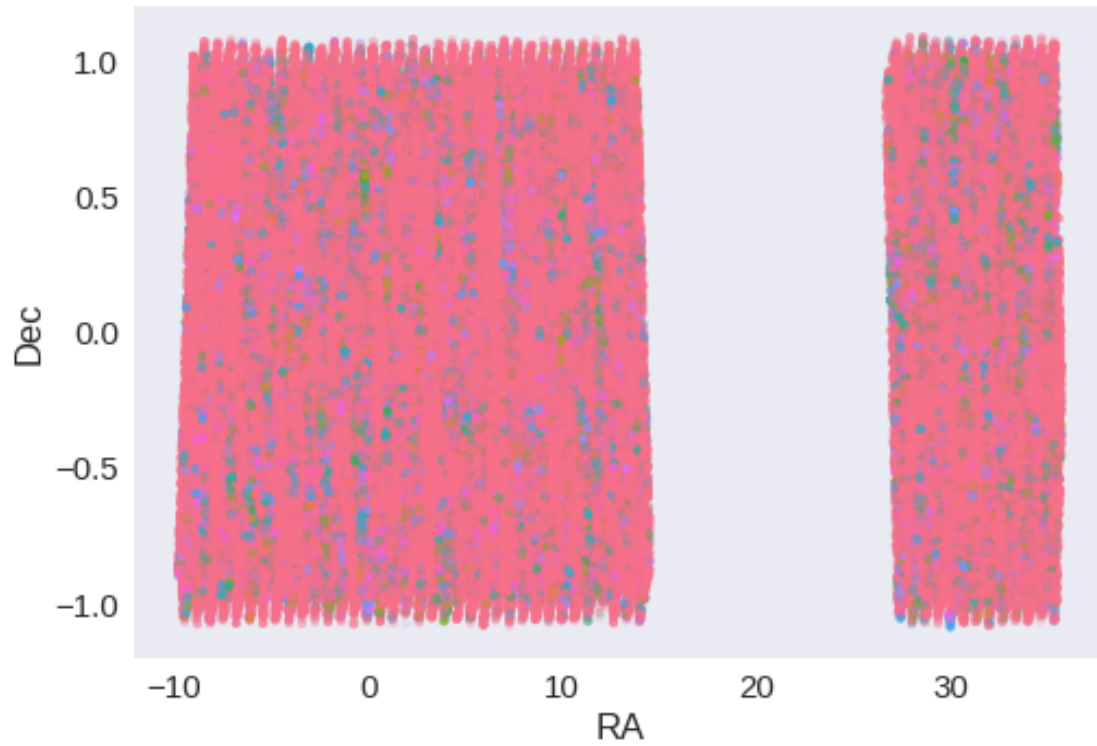
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10:
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

The initial catalogue had 3365594 sources.
The cleaned catalogue has 3365594 sources (0 removed).
The cleaned catalogue has 0 sources flagged as having been cleaned

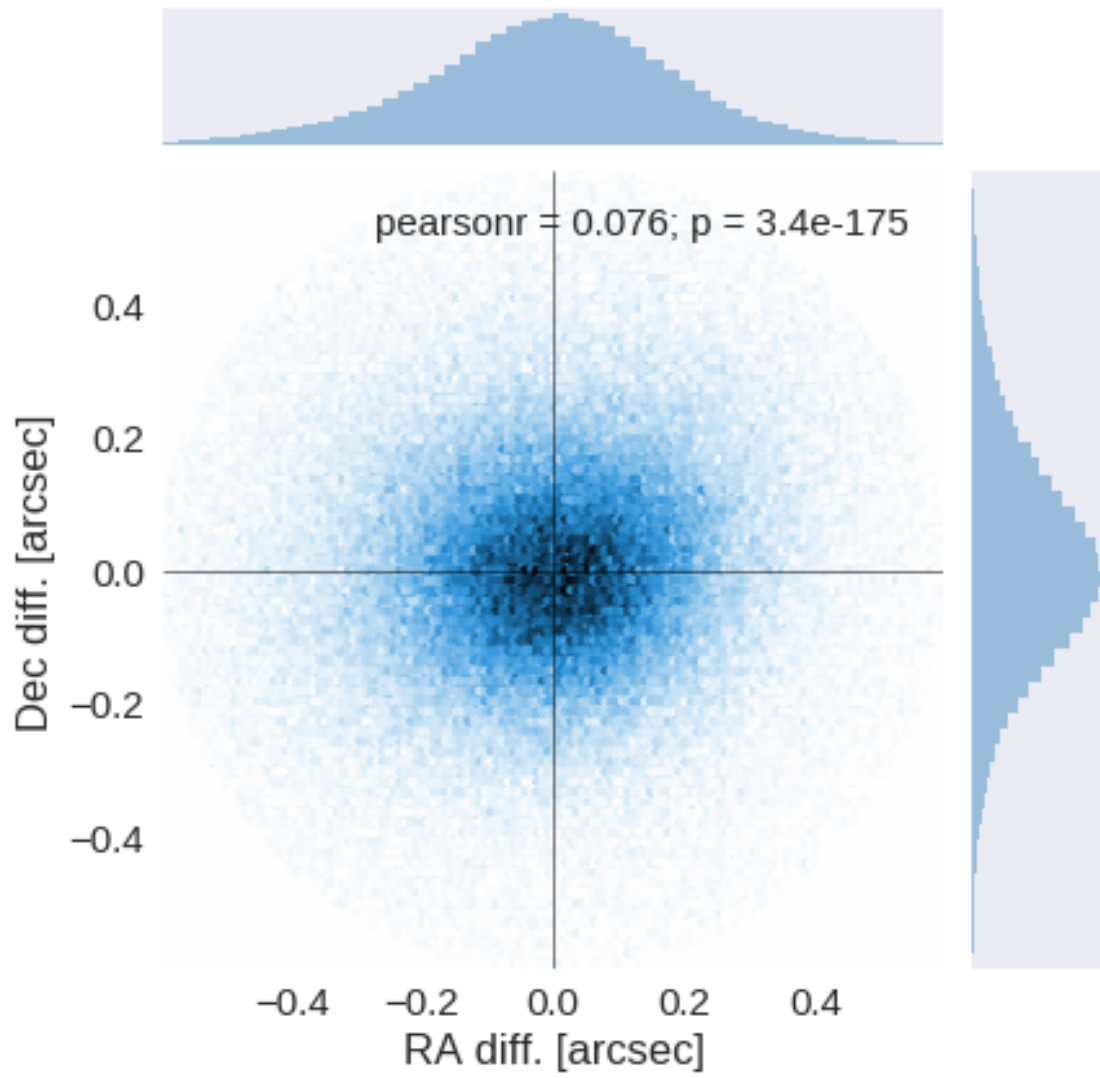
1.4 III - Astrometry correction

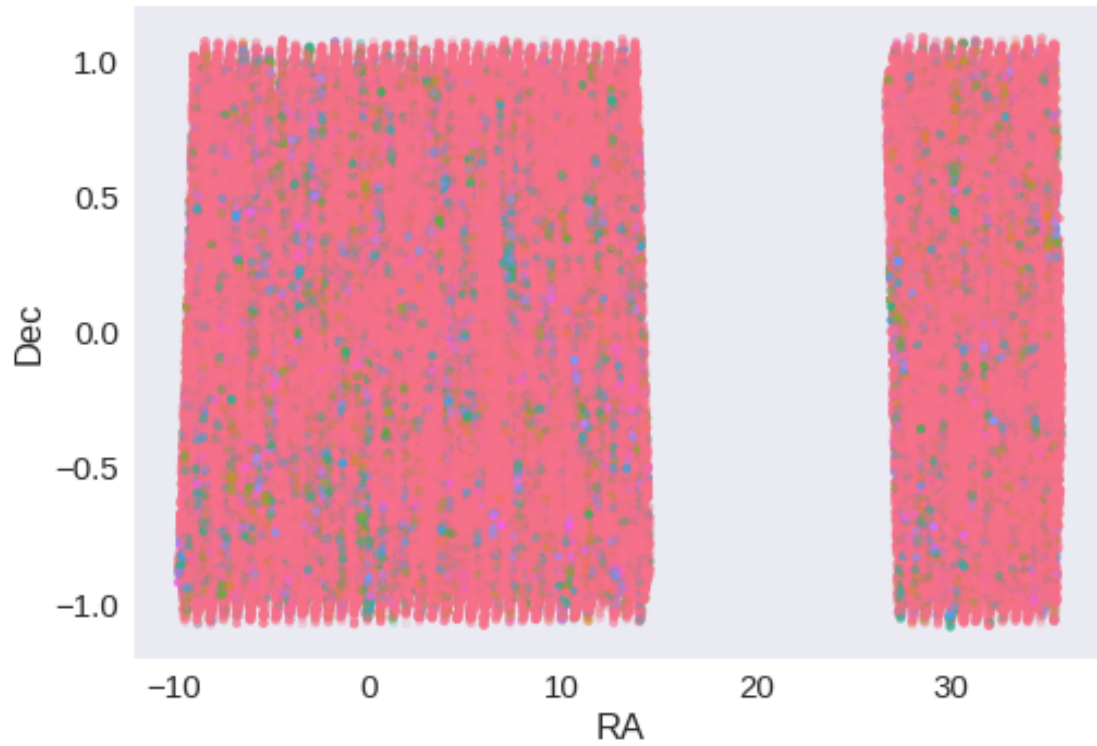
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.





RA correction: 0.007062192162266001 arcsec
Dec correction: -0.10853834623070213 arcsec





1.5 IV - Flagging Gaia objects

148366 sources flagged.

1.6 V - Flagging objects near bright stars

1.7 VI - Saving to disk

1.8.1_DECaLS

March 8, 2018

1 Herschel Stripe 82 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 `herchelhelp_internal` version:
33f5ec7 (Wed Dec 6 16:56:17 2017 +0000)

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

1.2 I - Aperture correction

To compute aperture correction we need to determine two parameters: 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).

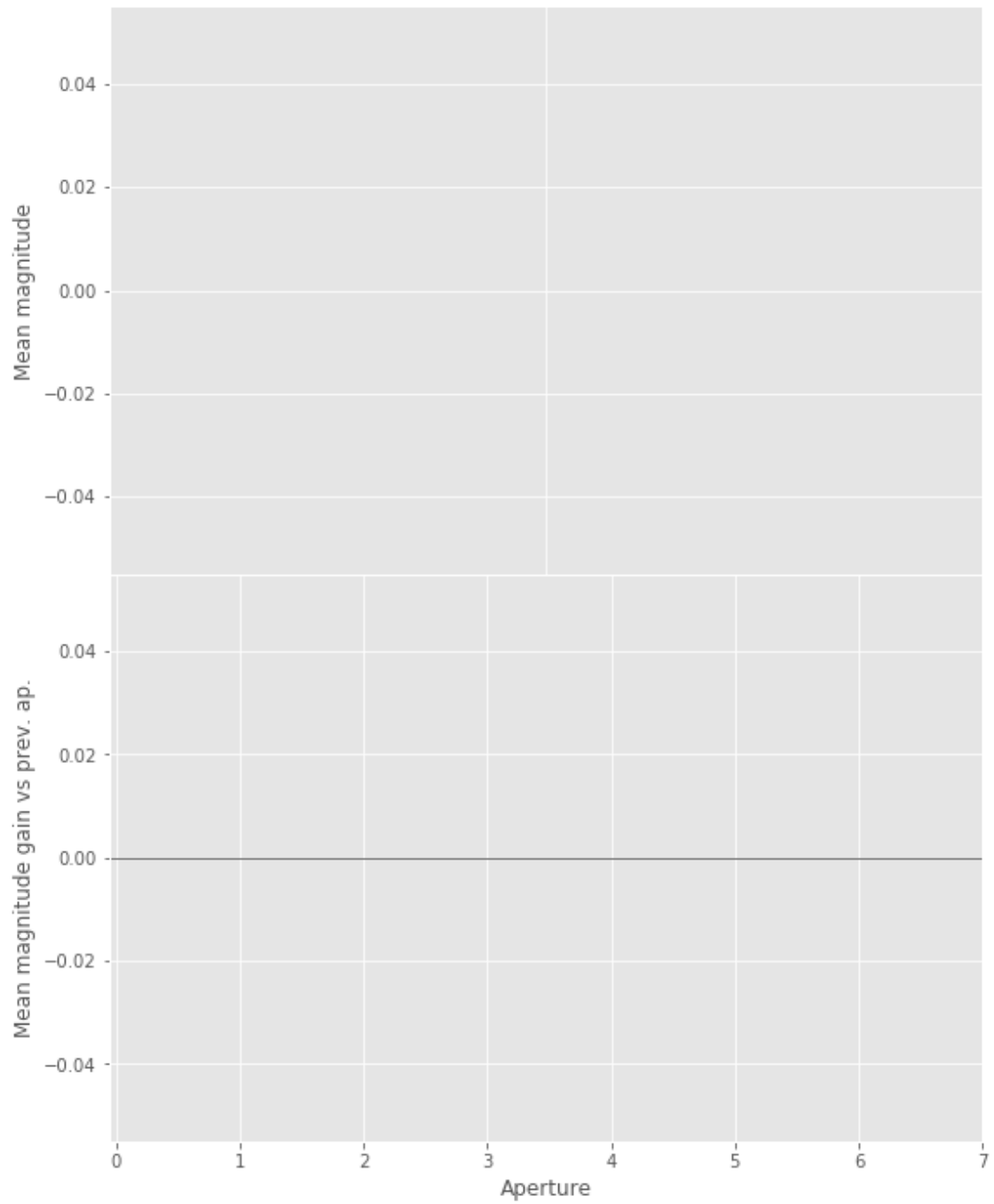
As target aperture, we should use the smallest (i.e. less noisy) aperture for which most of the flux is captured.

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

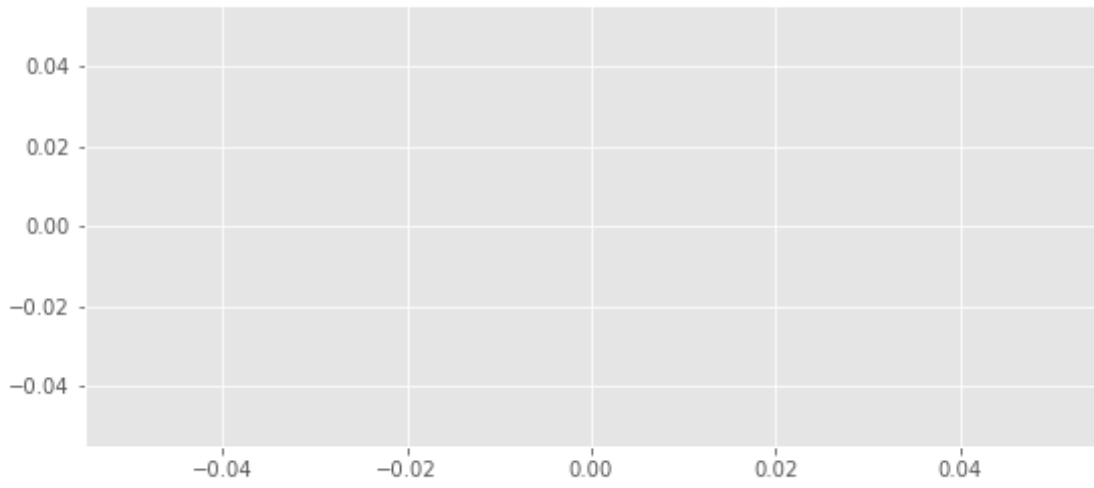
1.2.1 1.a u band

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:170: RuntimeWarning: Mean of empty slice
  warnings.warn("Mean of empty slice", RuntimeWarning)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:170: RuntimeWarning: Mean of empty slice
  warnings.warn("Mean of empty slice", RuntimeWarning)
```

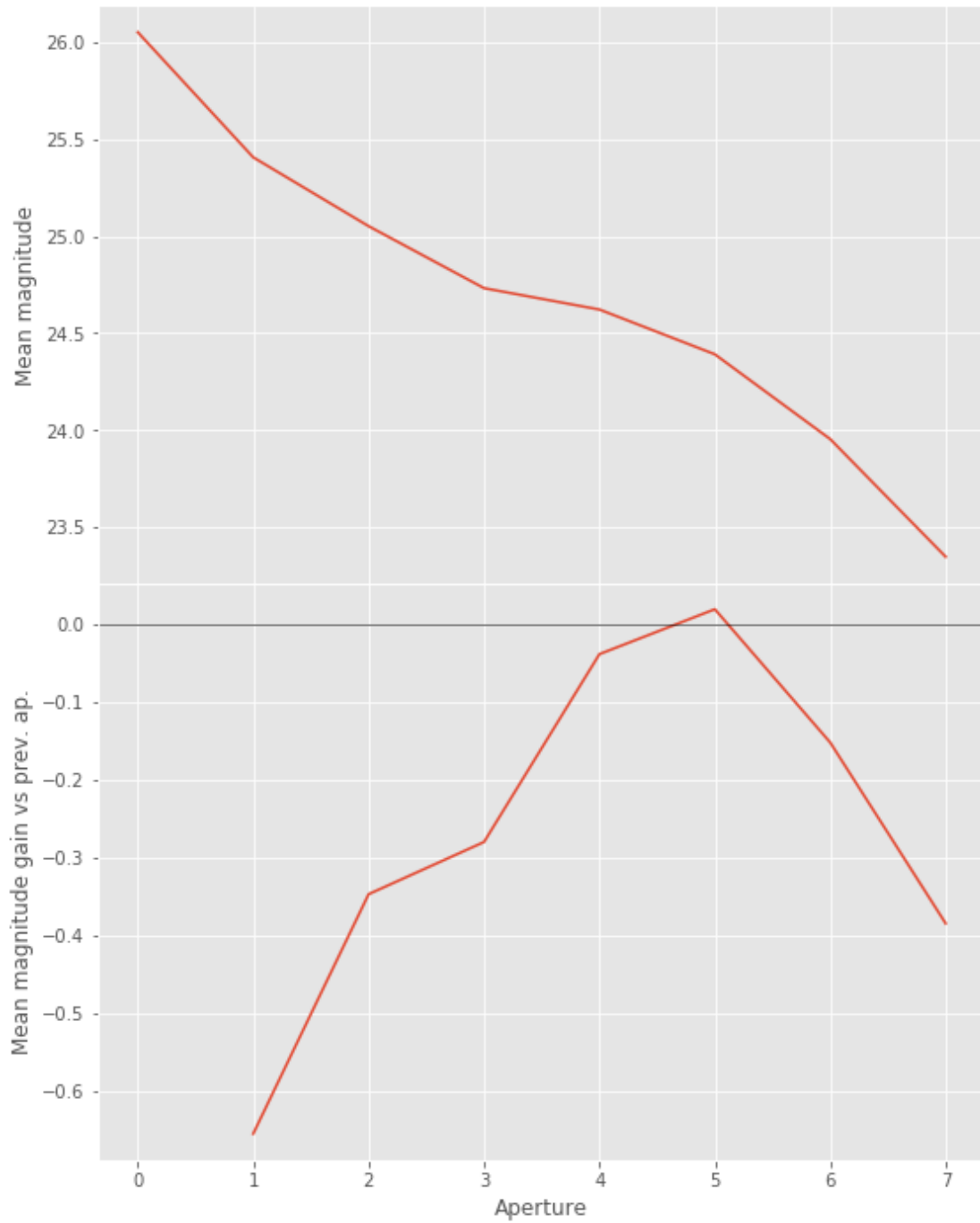


u band is all nan

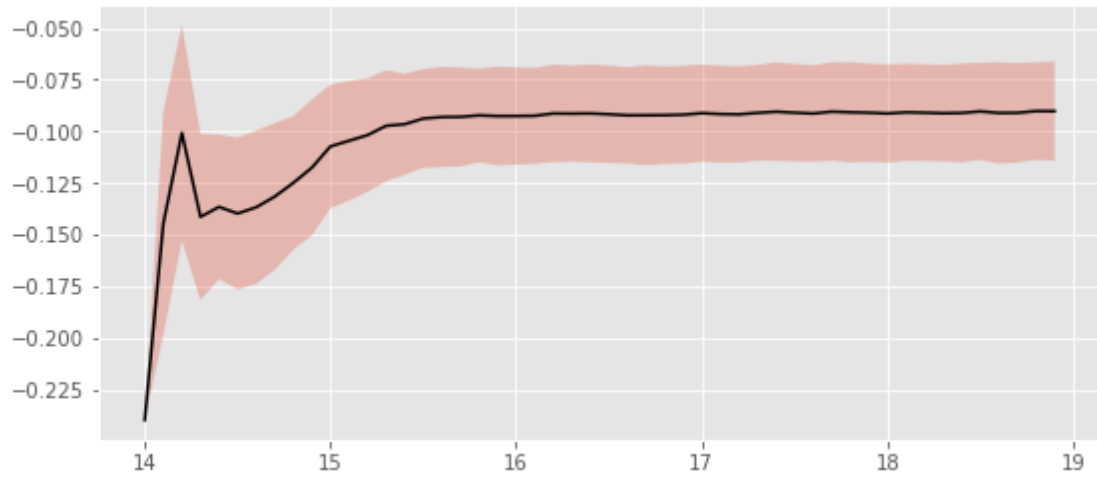
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:  
warnings.warn("All-NaN slice encountered", RuntimeWarning)
```



1.2.2 I.a - g band



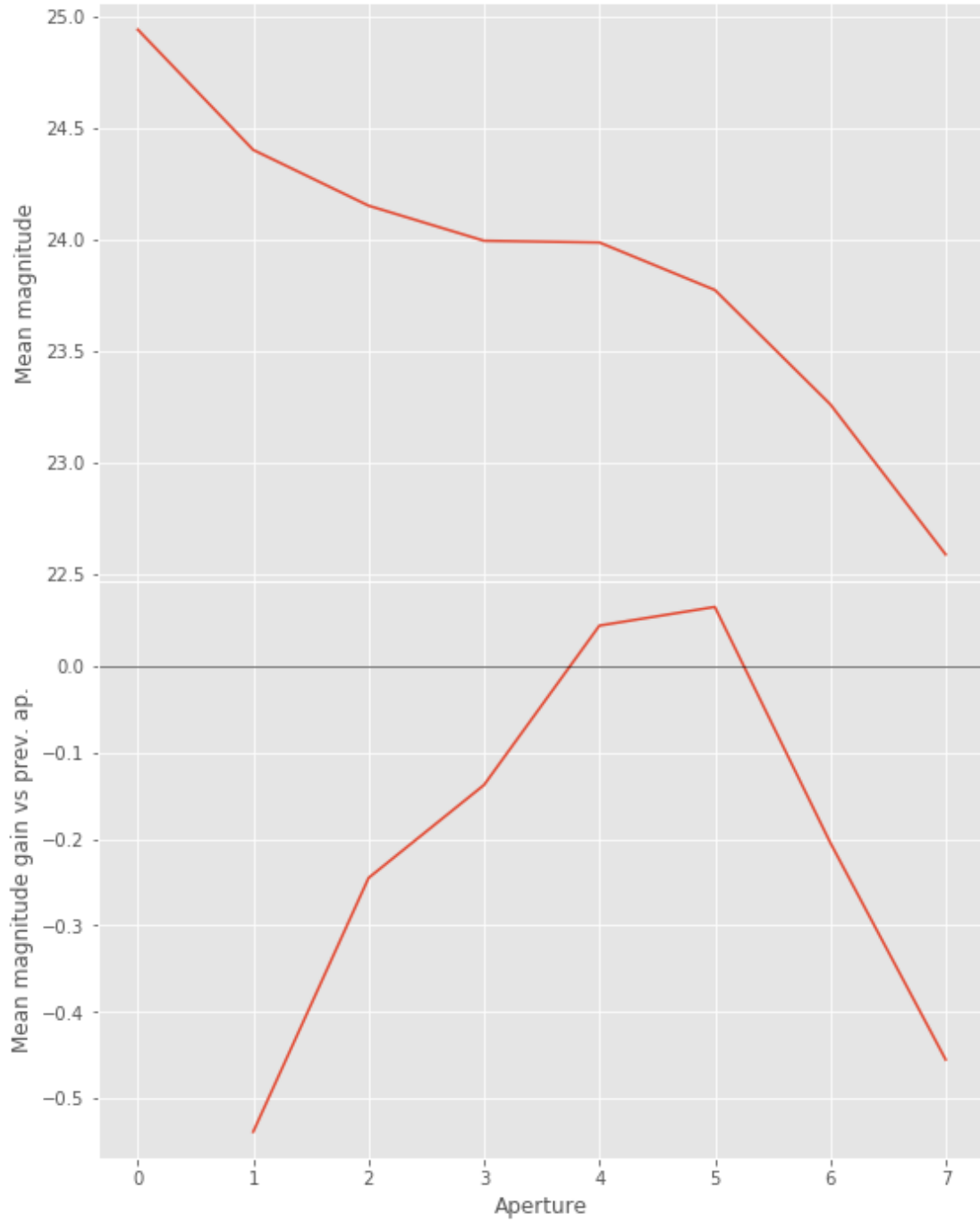
We will use aperture 5 as target.



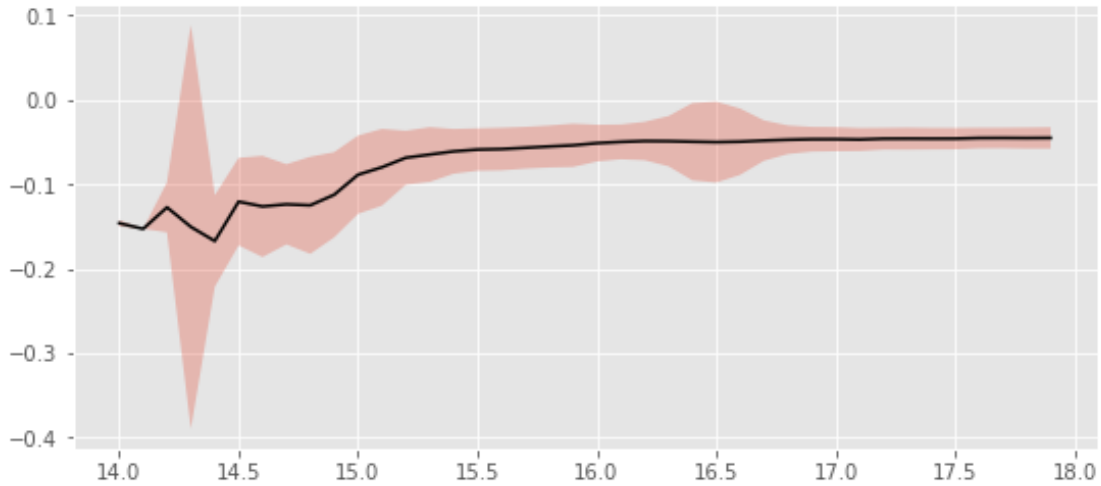
We will use magnitudes between 16.0 and 19.0

Aperture correction for g band:
Correction: -0.0911514235846056
Number of source used: 151015
RMS: 0.02364389650630337

1.2.3 I.b - r band



We will use aperture 5 as target.

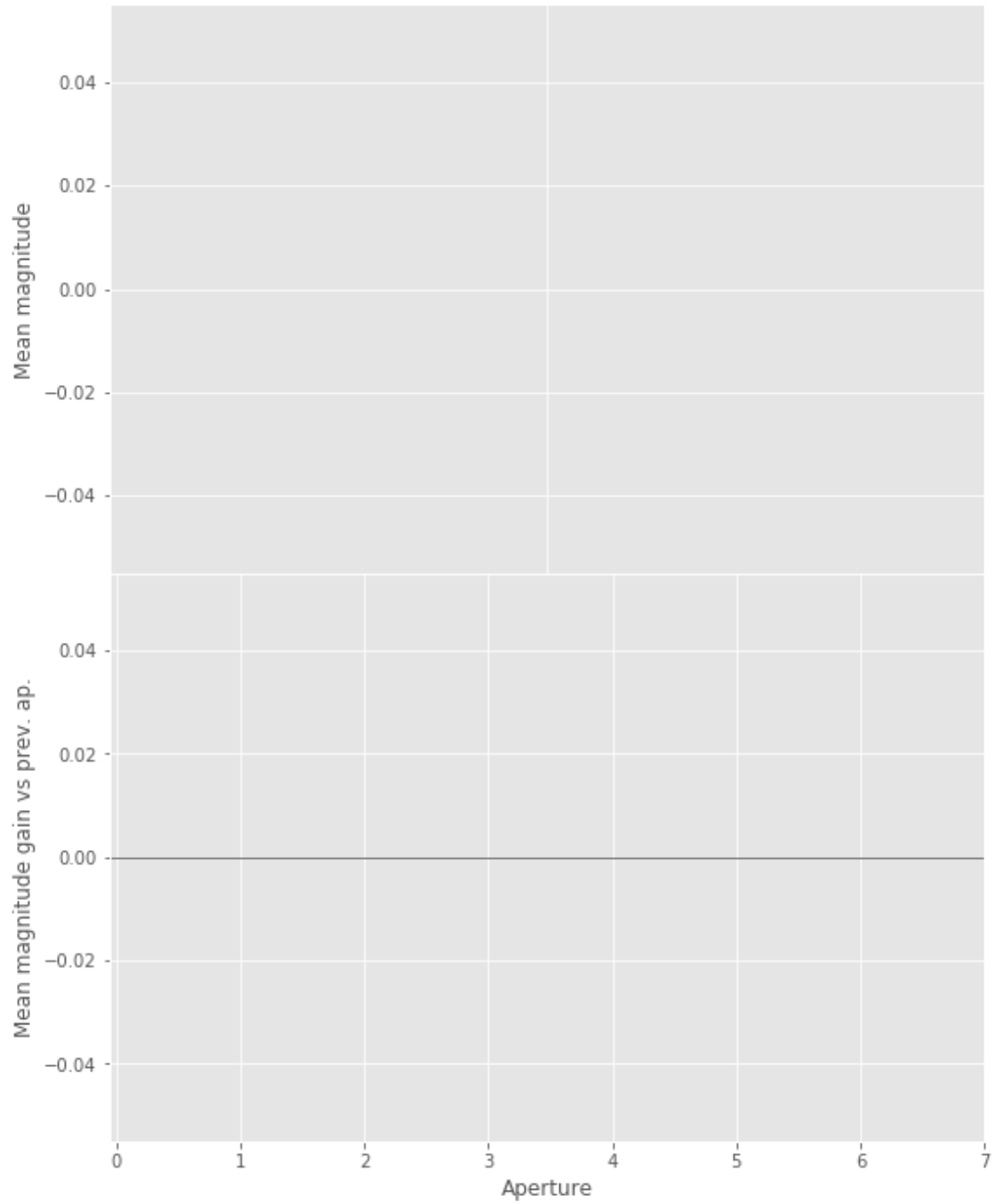


We use magnitudes between 16.0 and 18.0.

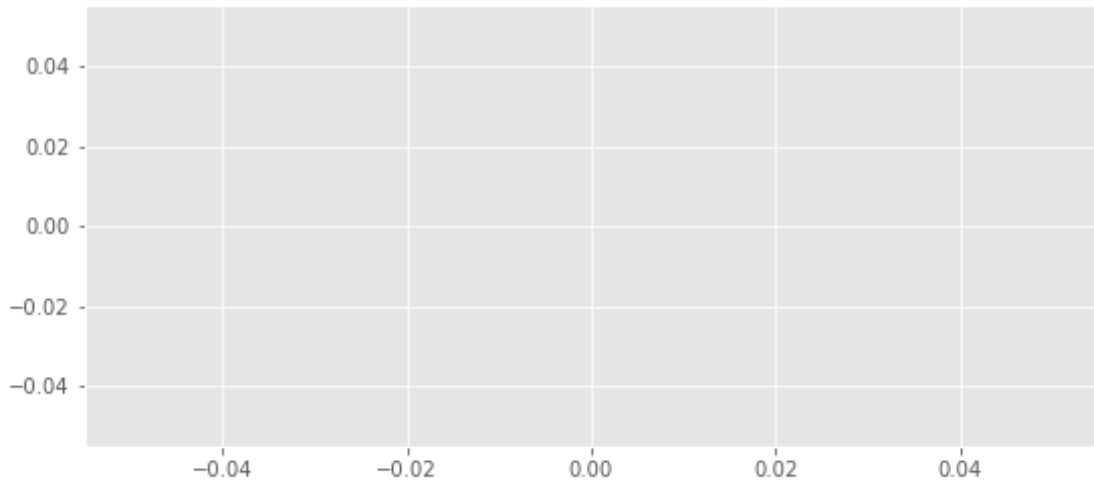
```
Aperture correction for r band:
Correction: -0.0465021447682048
Number of source used: 149159
RMS: 0.013977600173198289
```

1.2.4 I.d - i band

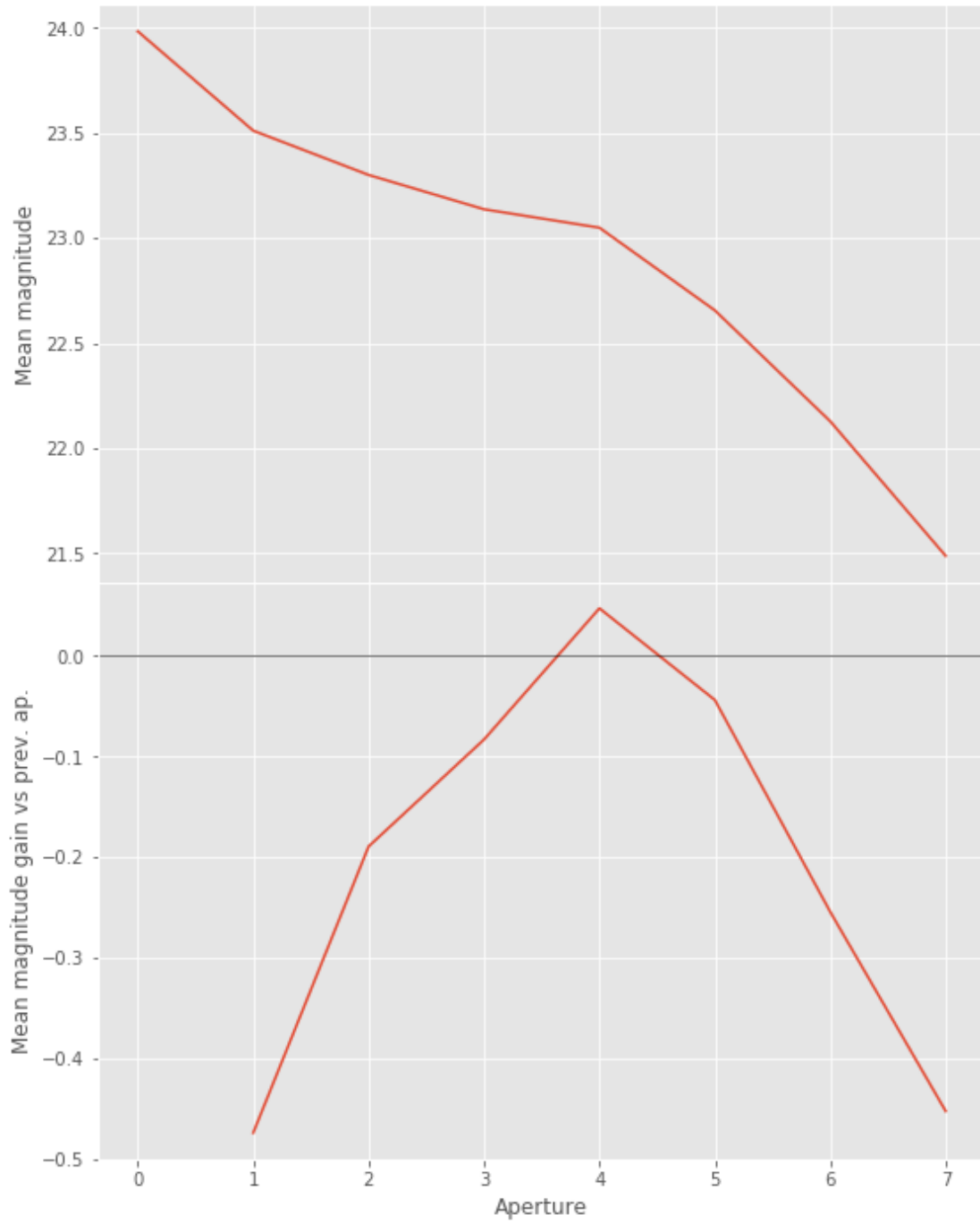
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:
  warnings.warn("Mean of empty slice", RuntimeWarning)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:
  warnings.warn("Mean of empty slice", RuntimeWarning)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



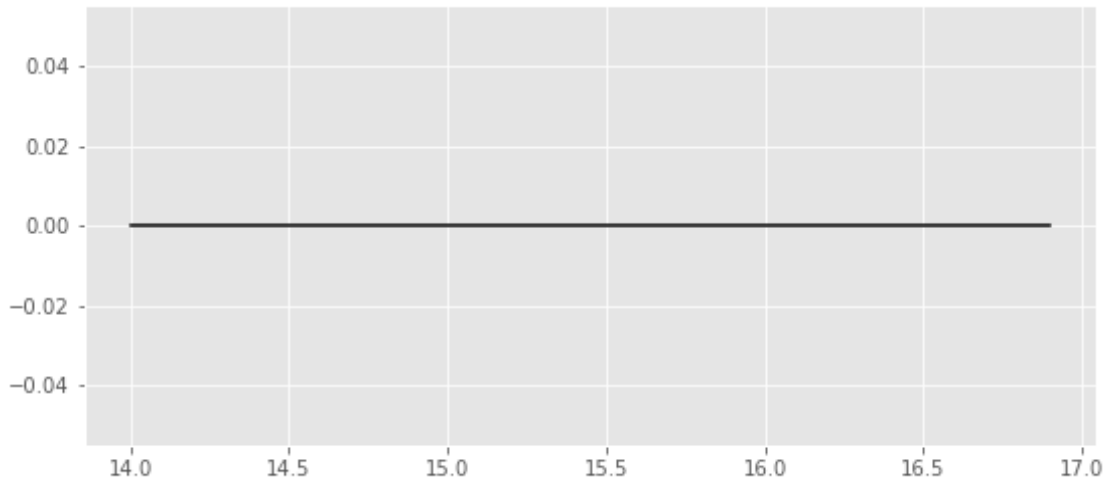
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/lib/nanfunctions.py:  
warnings.warn("All-NaN slice encountered", RuntimeWarning)
```

1.2.5 I.e - z band



We will use aperture 4 as target.

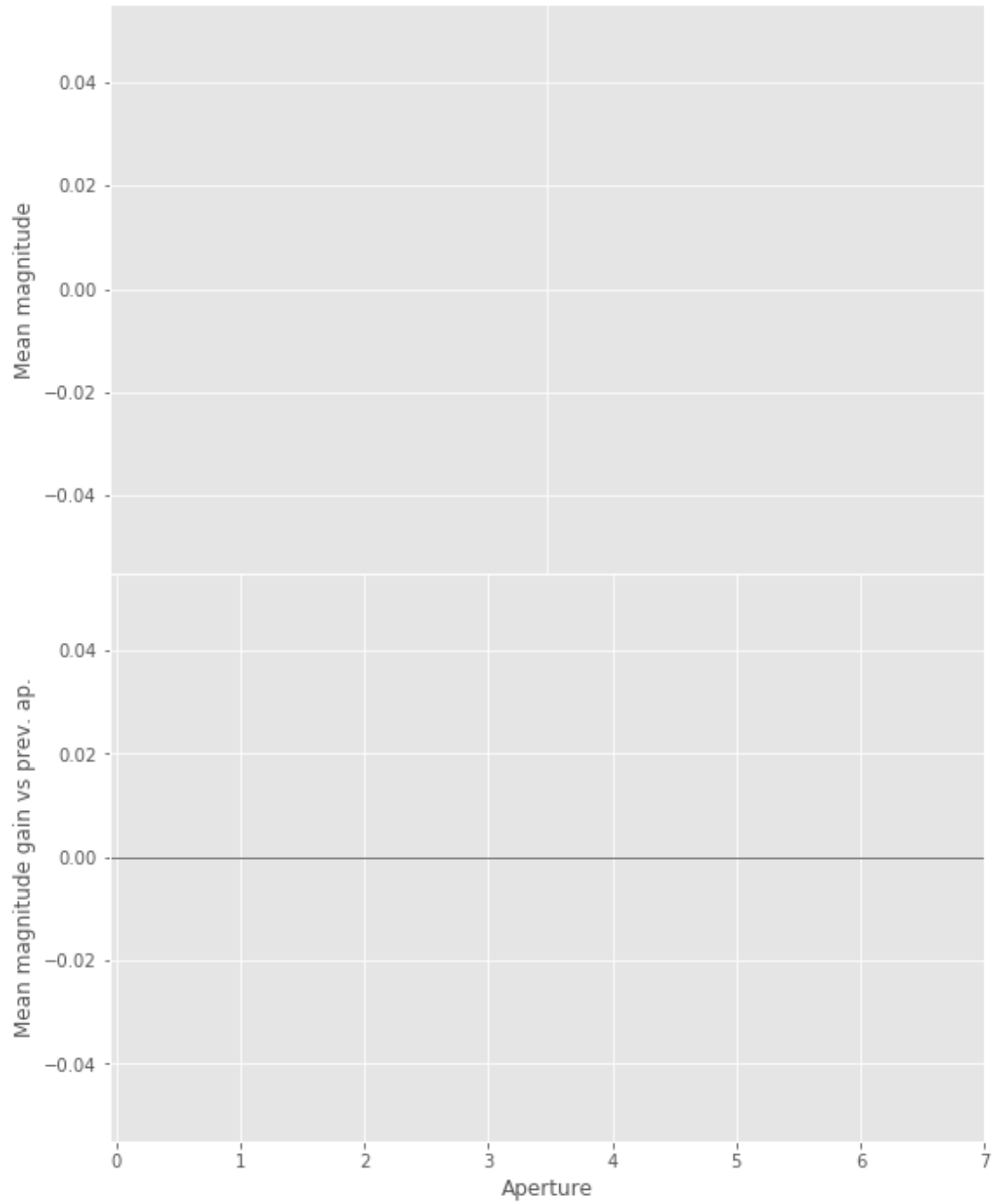


We use magnitudes between 16.0 and 17.5.

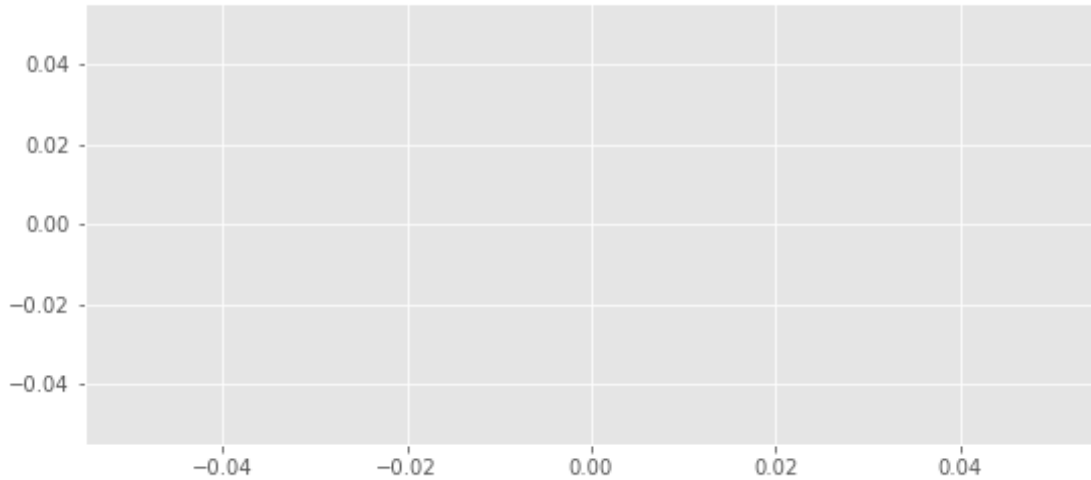
Aperture correction for z band:
Correction: 0.0
Number of source used: 176285
RMS: 0.0

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 stellerity so we replace items flagged as PSF according to the following table:

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

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 FITS
WARNING: UnitsWarning: 'nanomaggy' did not parse as fits unit: At col 0, Unit 'nanomaggy' not supported
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 FITS
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:76: RuntimeWarning: invalid value encountered in divide
  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)
```

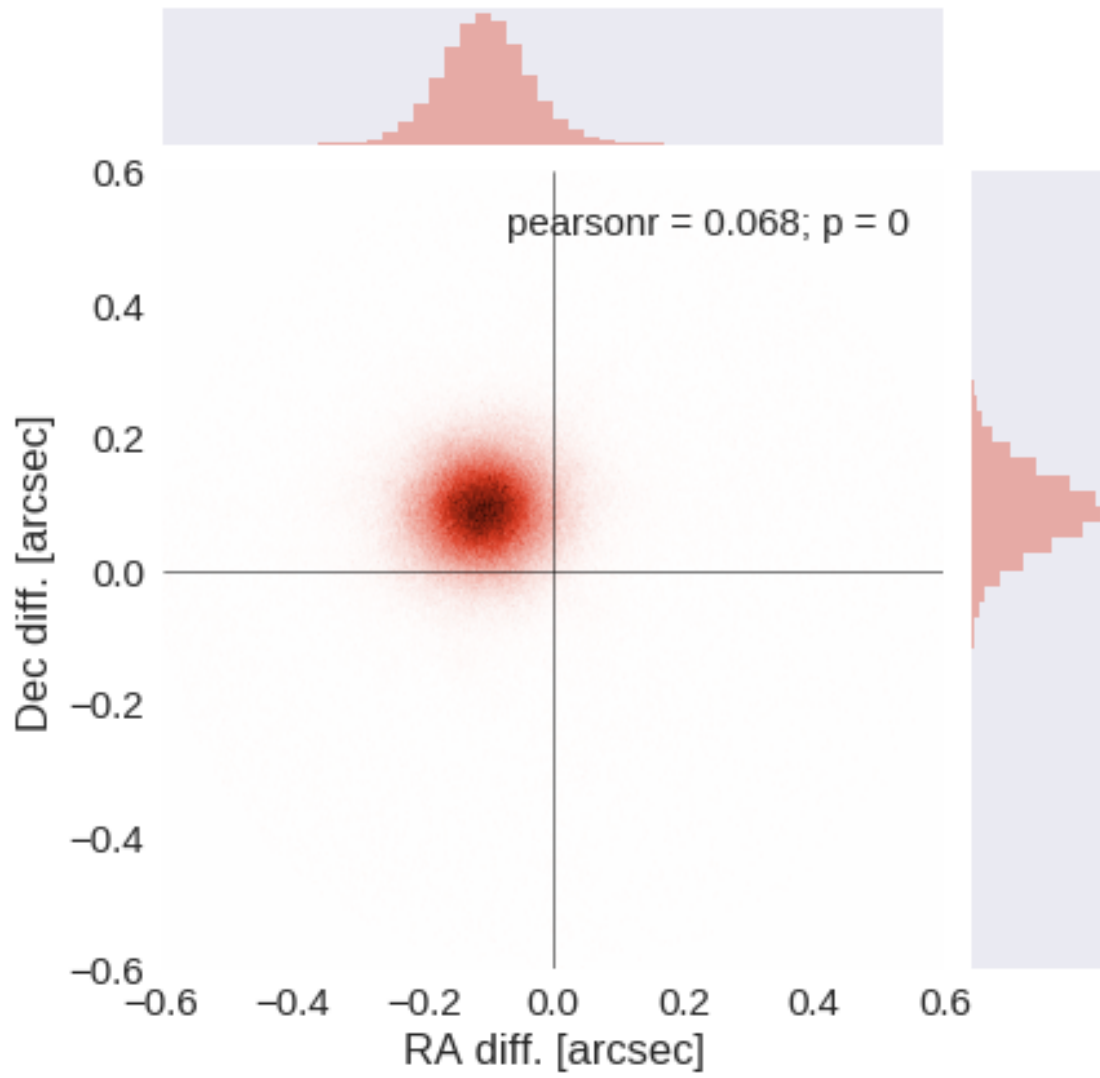
The initial catalogue had 24089956 sources.

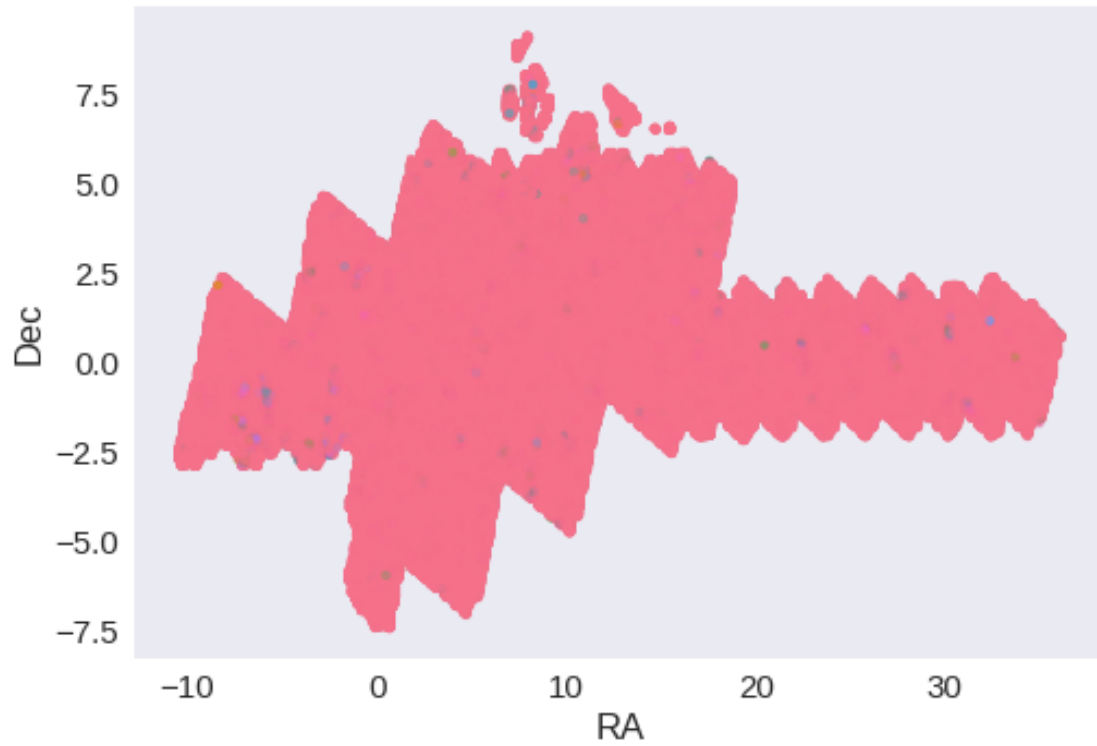
The cleaned catalogue has 24084781 sources (5175 removed).

The cleaned catalogue has 5169 sources flagged as having been cleaned

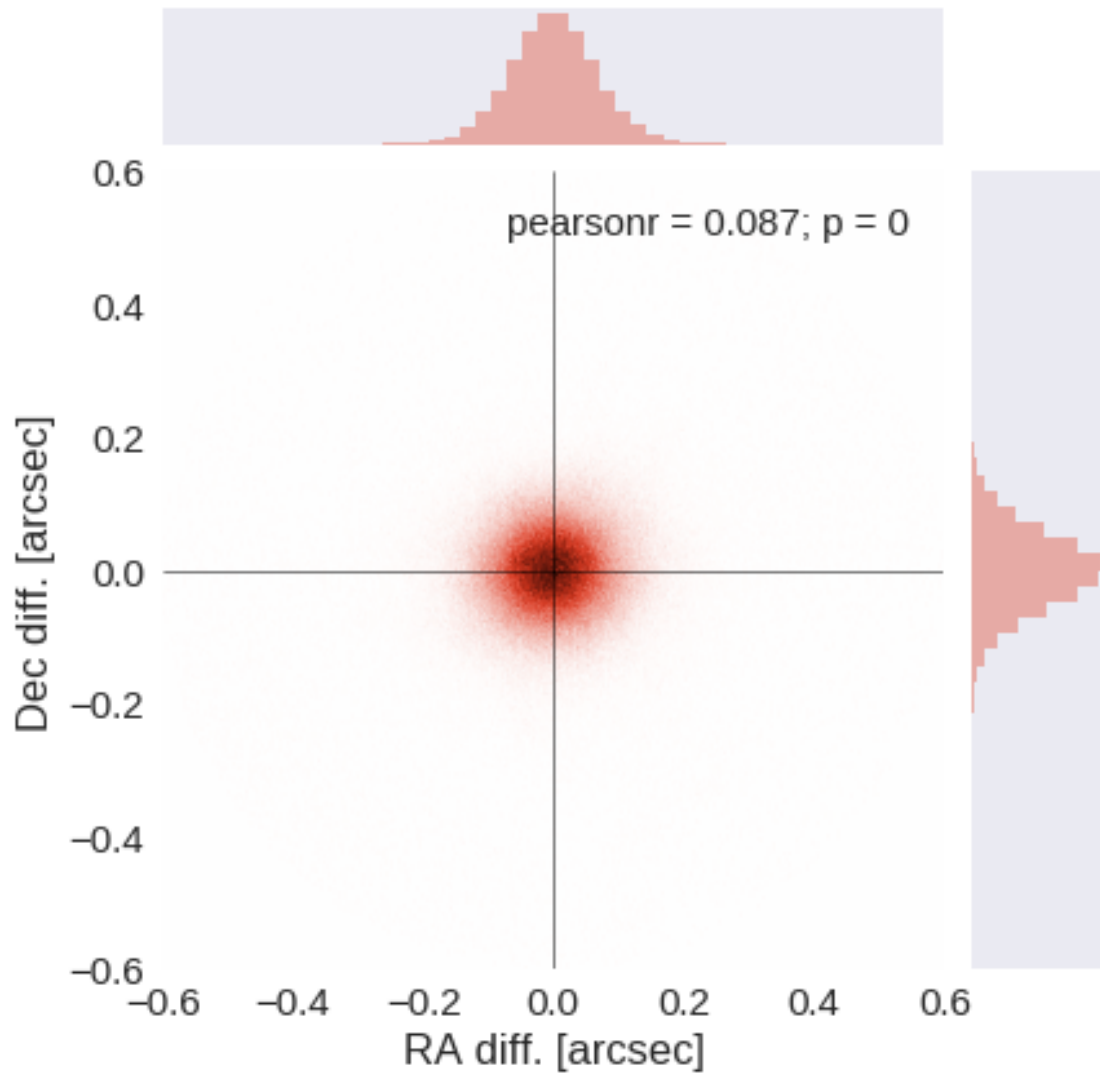
1.6 III - Astrometry correction

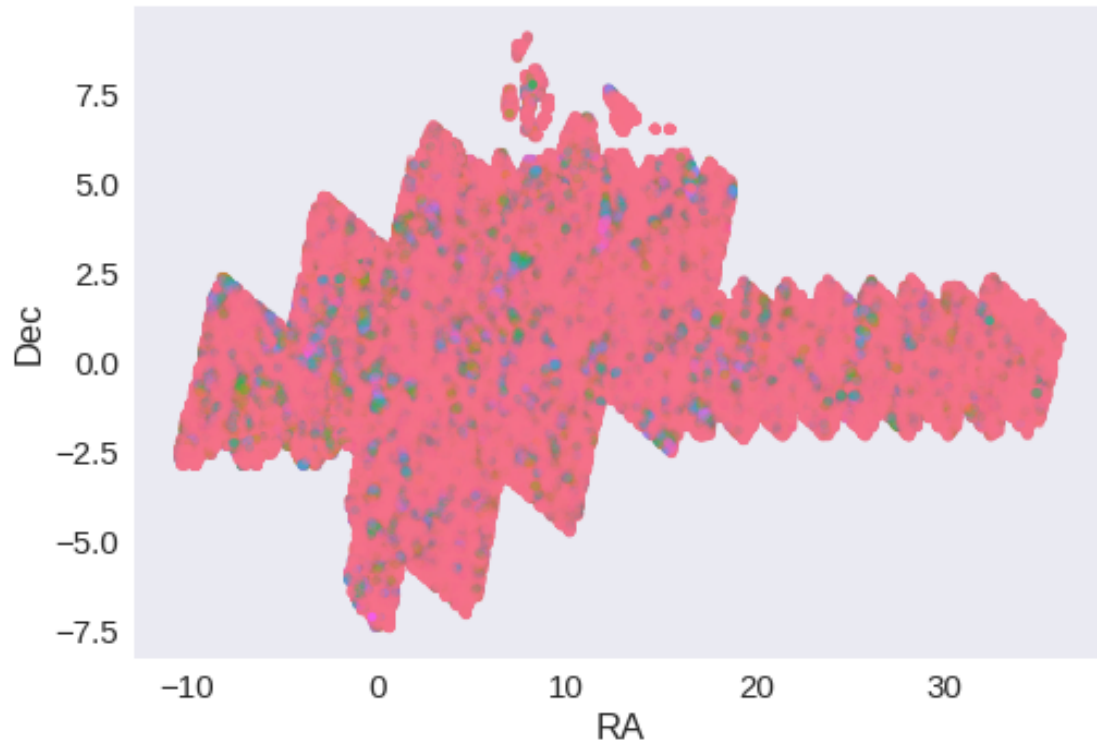
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.





RA correction: 0.10549986955084023 arcsec
Dec correction: -0.0907548244944989 arcsec





1.7 IV - Flagging Gaia objects

717665 sources flagged.

2 V - Saving to disk

1.8.2_DES

March 8, 2018

1 Herschel Stripe 82 master catalogue

1.1 Preparation of DES data

Blanco DES catalogue: the catalogue comes from `dmu0_DES`.

In the catalogue, we keep:

- The identifier (it's unique in the catalogue);
- The position;
- The G band stellarity;
- The magnitude for each band.
- The auto/kron magnitudes/fluxes to be used as total magnitude.
- The aperture magnitudes, which are used to compute a corrected 2 arcsec aperture magnitude.

We don't know when the maps have been observed. We will take the final observation date as 2017.

```
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:
2018-02-21 16:08:13.764397
```

1.2 1 - Aperture correction

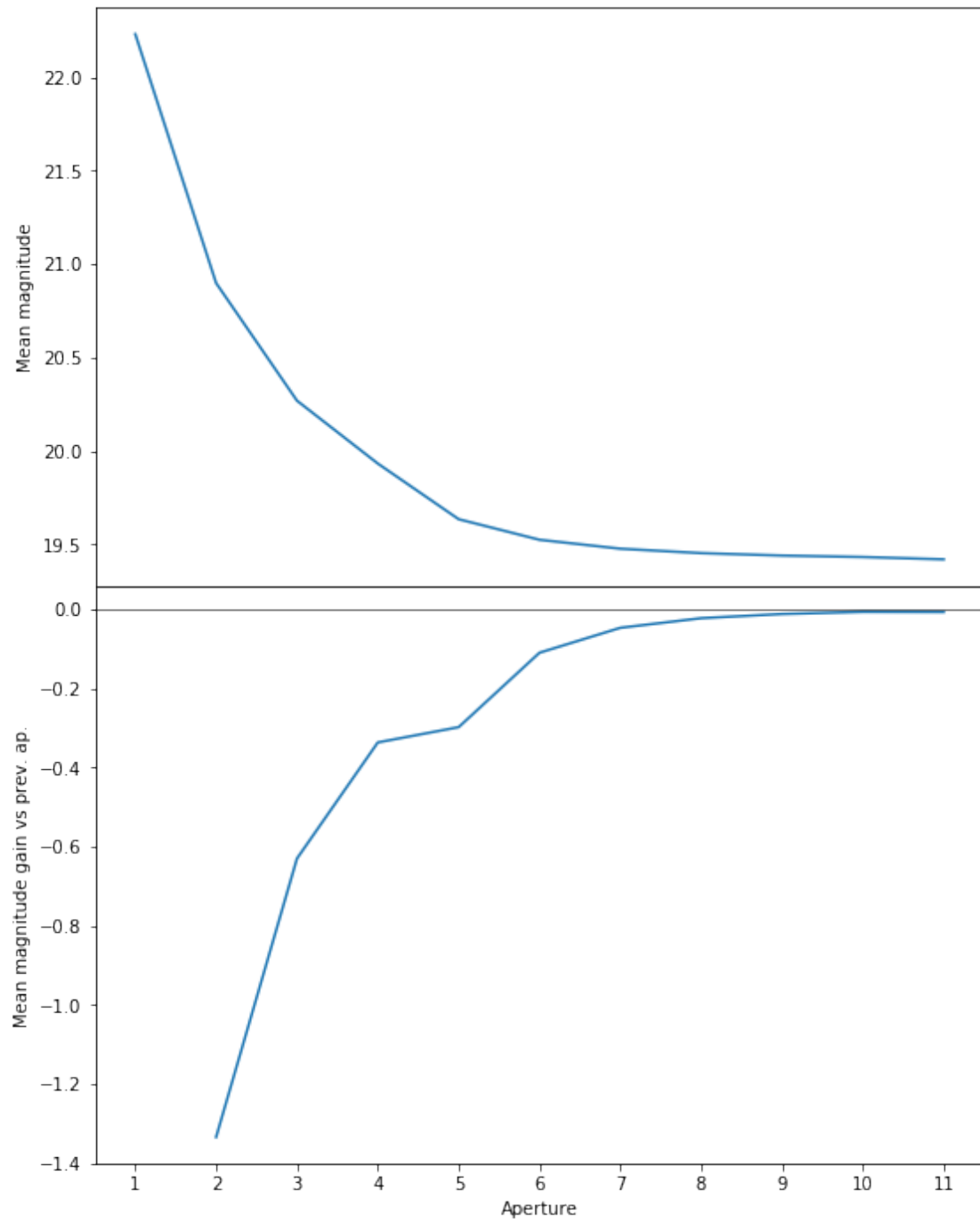
To compute aperture correction we need to determine two parameters: the target aperture and the range of magnitudes for the stars that will be used to compute the correction.

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

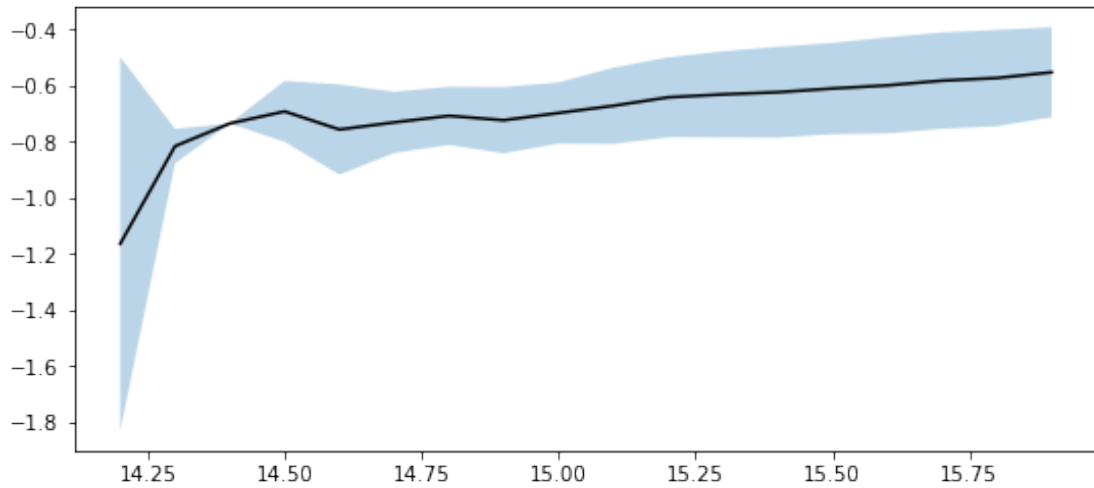
The evolution of the magnitudes of the objects by plotting on the same plot aperture number vs the mean magnitude. The mean gain (loss when negative) of magnitude is each aperture compared to the previous (except for the first of course). As target aperture, we should use the smallest (i.e. less noisy) aperture for which most of the flux is captured.

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



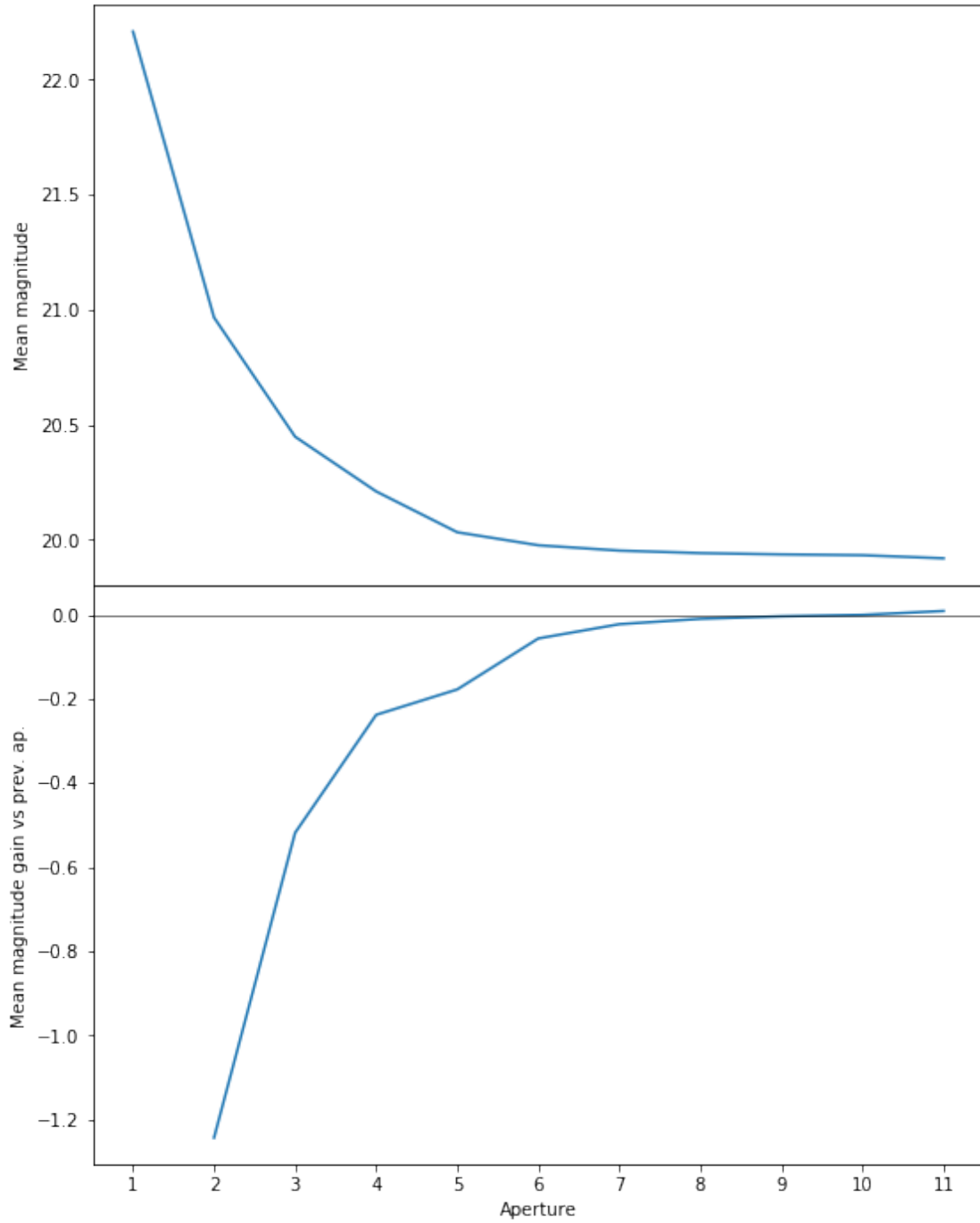
We will use aperture 10 as target.



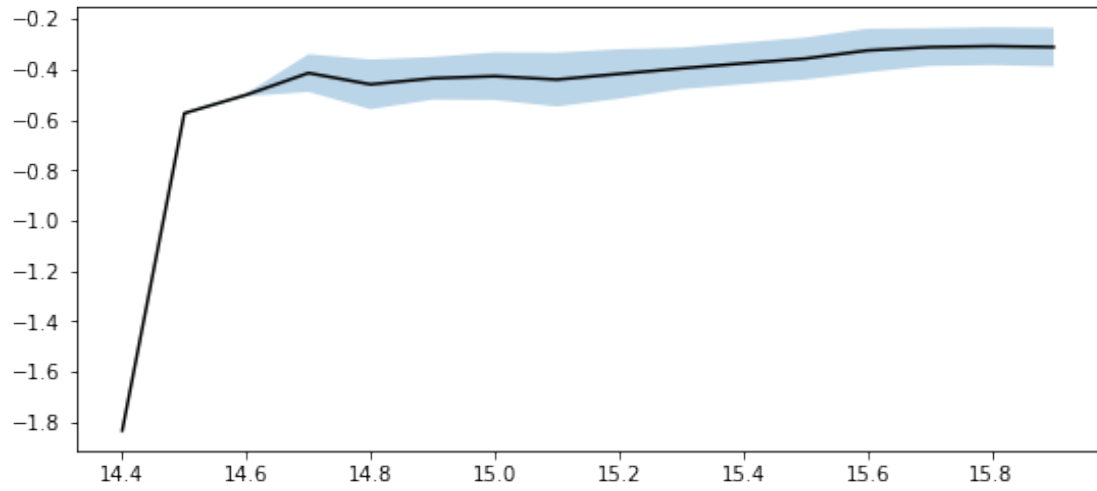
We will use magnitudes between 15.0 and 16.0.

Aperture correction for g band:
Correction: -0.5932698249816895
Number of source used: 22506
RMS: 0.16802000445200524

1.2.2 I.b - r band



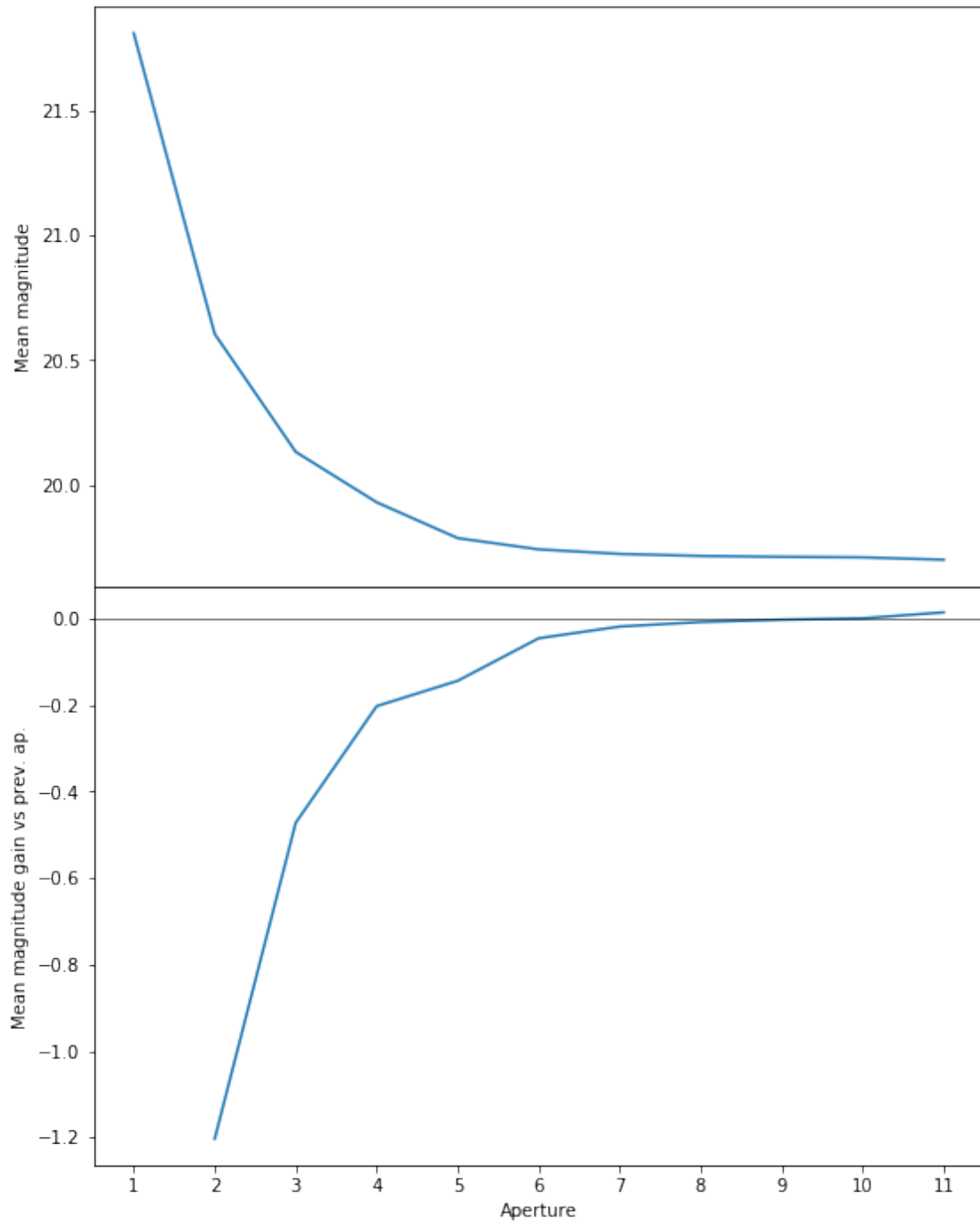
We will use aperture 10 as target.



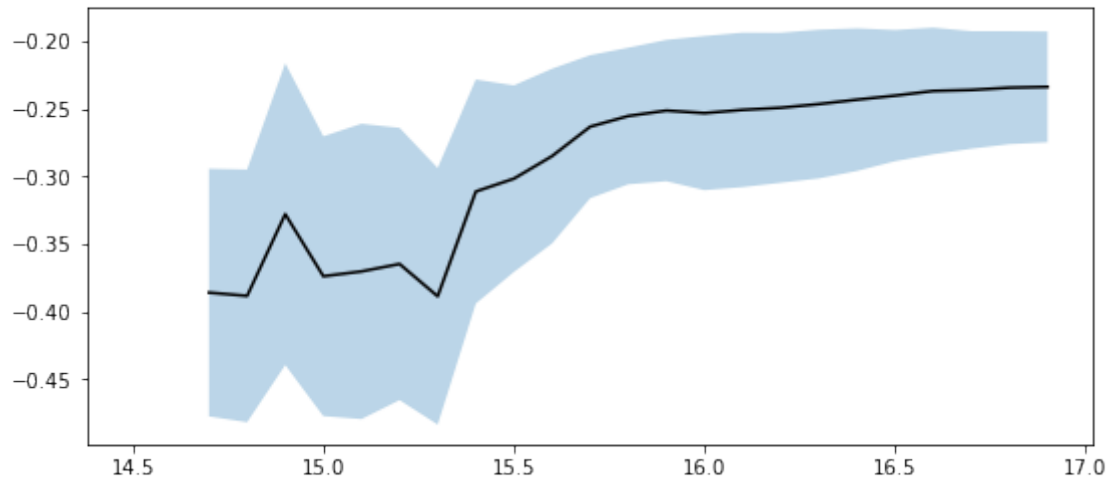
We use magnitudes between 15.0 and 16.0.

Aperture correction for r band:
Correction: -0.320955753326416
Number of source used: 12685
RMS: 0.08297723889436244

1.2.3 I.b - i band



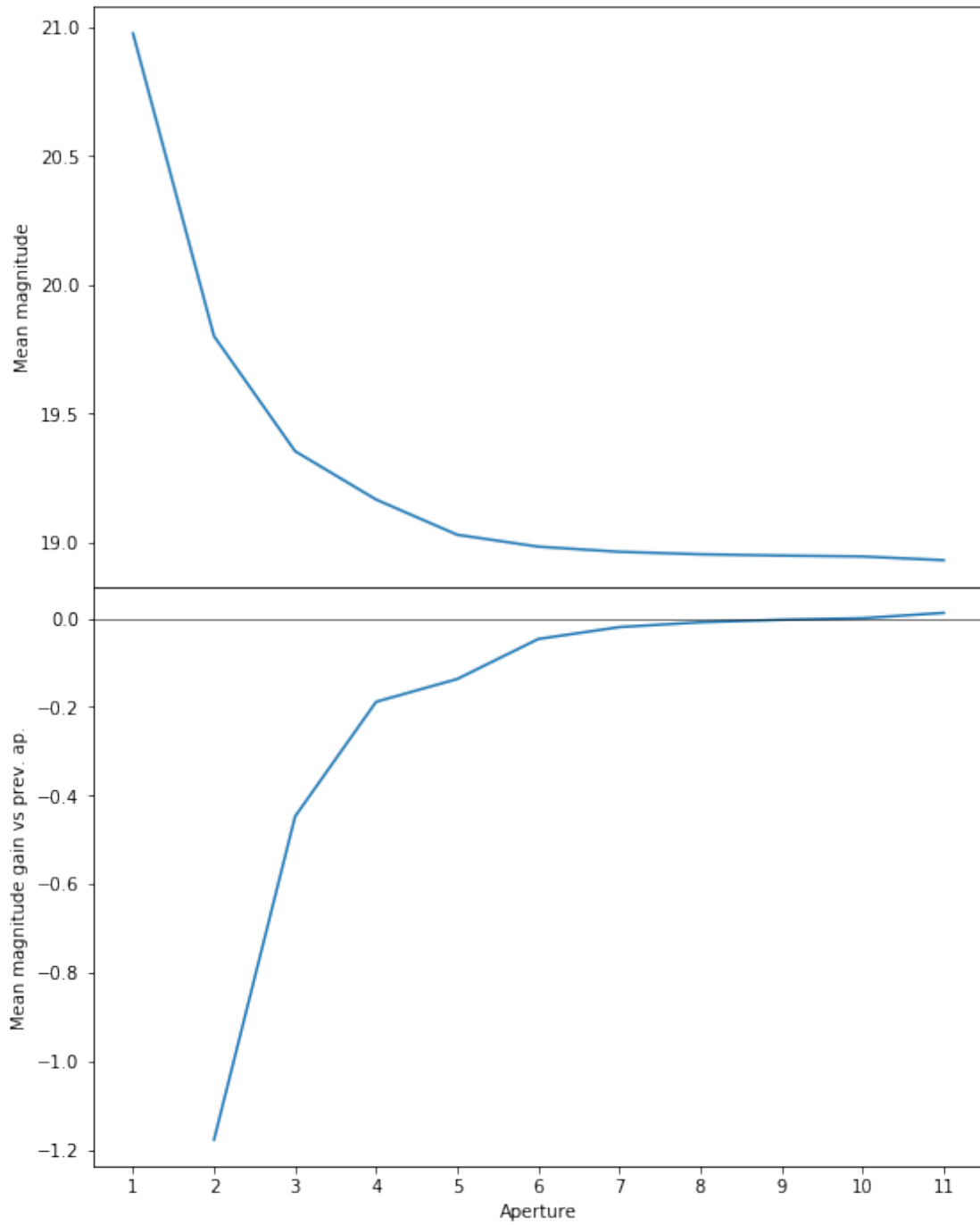
We will use aperture 10 as target.



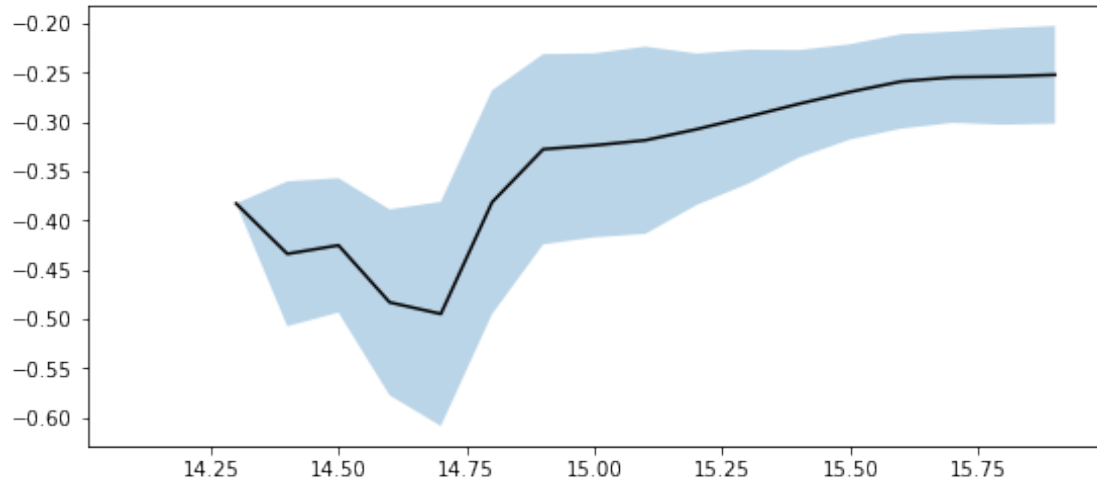
We use magnitudes between 15.0 and 16.0.

Aperture correction for i band:
Correction: -0.2617053985595703
Number of source used: 9658
RMS: 0.05830405422460197

1.2.4 I.b - z band



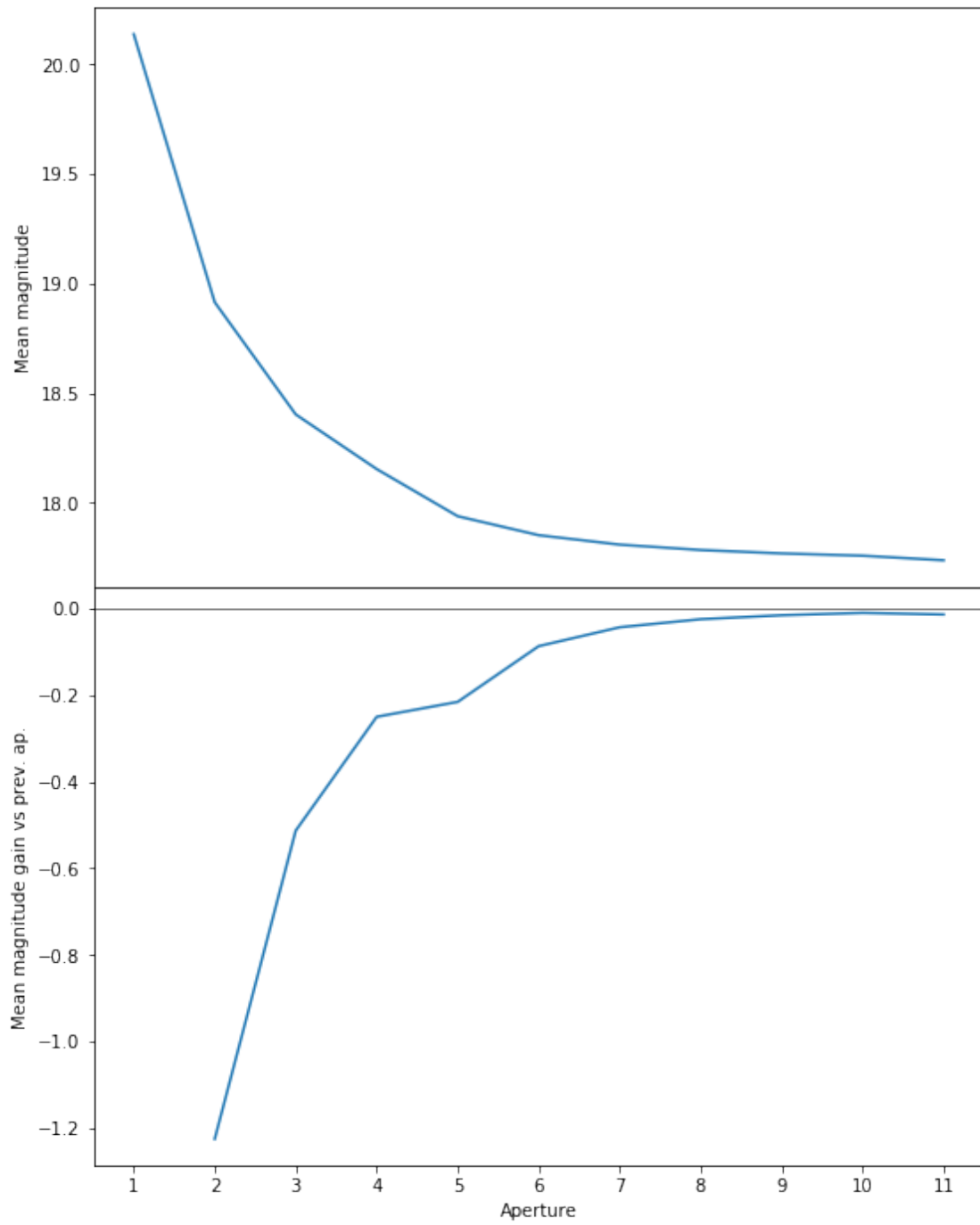
We will use aperture 57 as target.



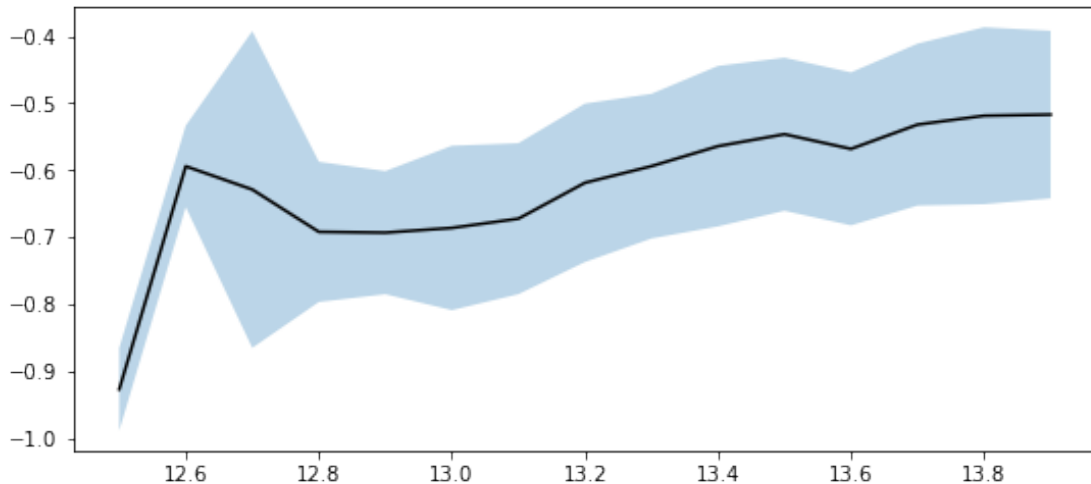
We use magnitudes between 15.0 and 16.0.

Aperture correction for z band:
Correction: -0.25720882415771484
Number of source used: 21509
RMS: 0.04975790000653155

1.2.5 I.b - y band



We will use aperture 10 as target.



We use magnitudes between 15.0 and 16.0.

```
Aperture correction for y band:
Correction: -0.40020275115966797
Number of source used: 17480
RMS: 0.10348509881891124
```

1.3 2 - 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[24]: <IPython.core.display.HTML object>

1.4 II - Removal of duplicated sources

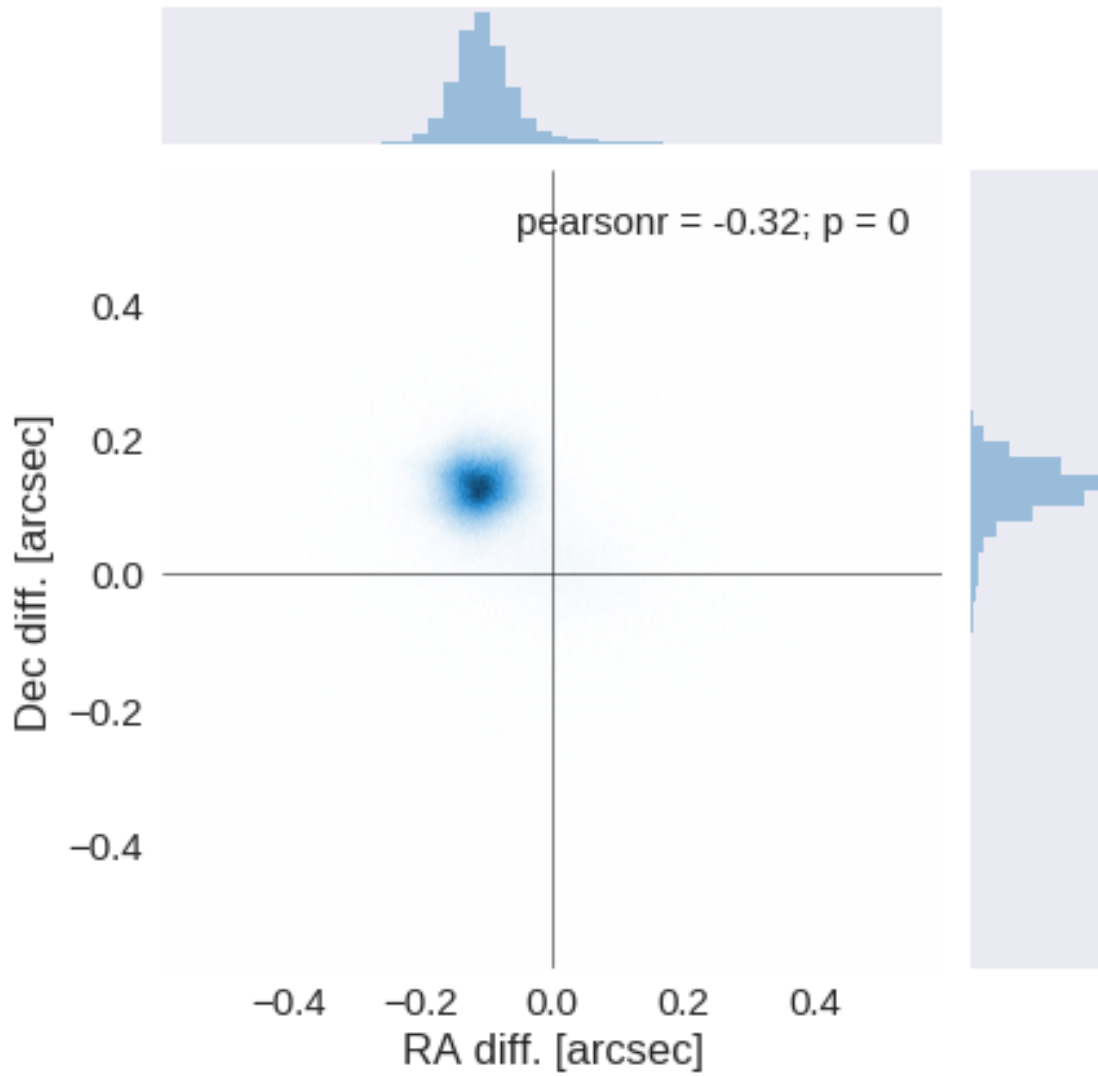
We remove duplicated objects from the input catalogues.

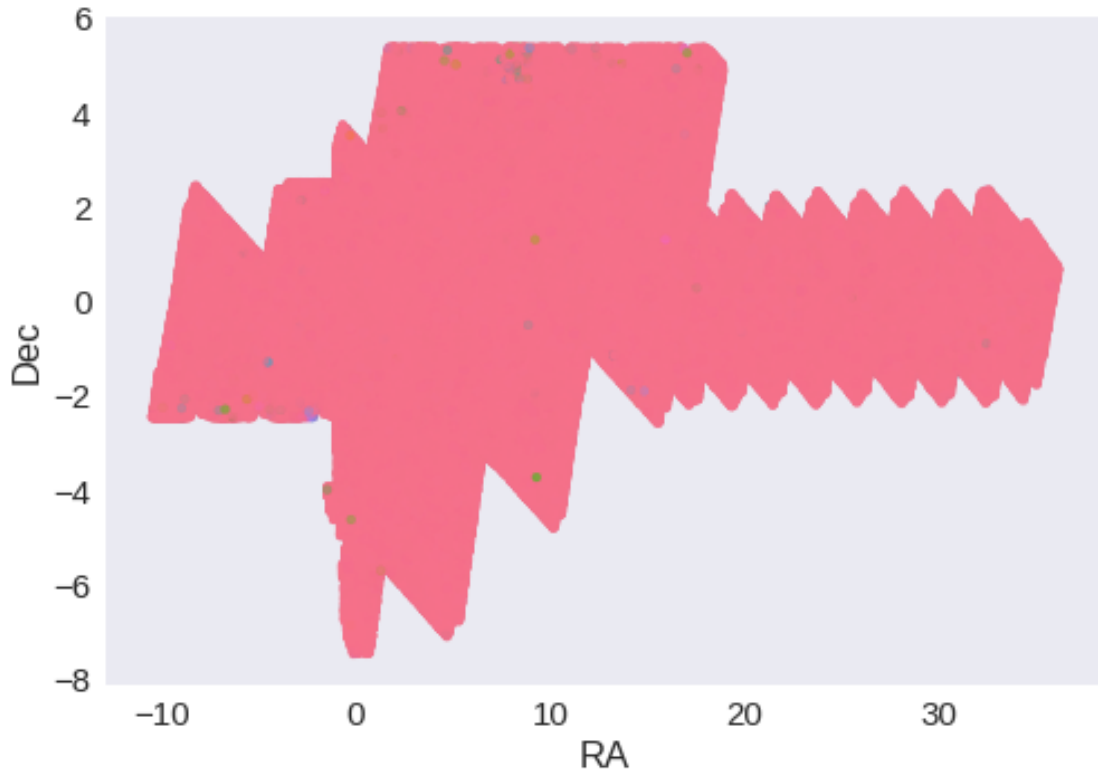
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
ma.MaskedArray.__setitem__(self, index, value)
```

```
The initial catalogue had 18518766 sources.
The cleaned catalogue has 18518555 sources (211 removed).
The cleaned catalogue has 211 sources flagged as having been cleaned
```

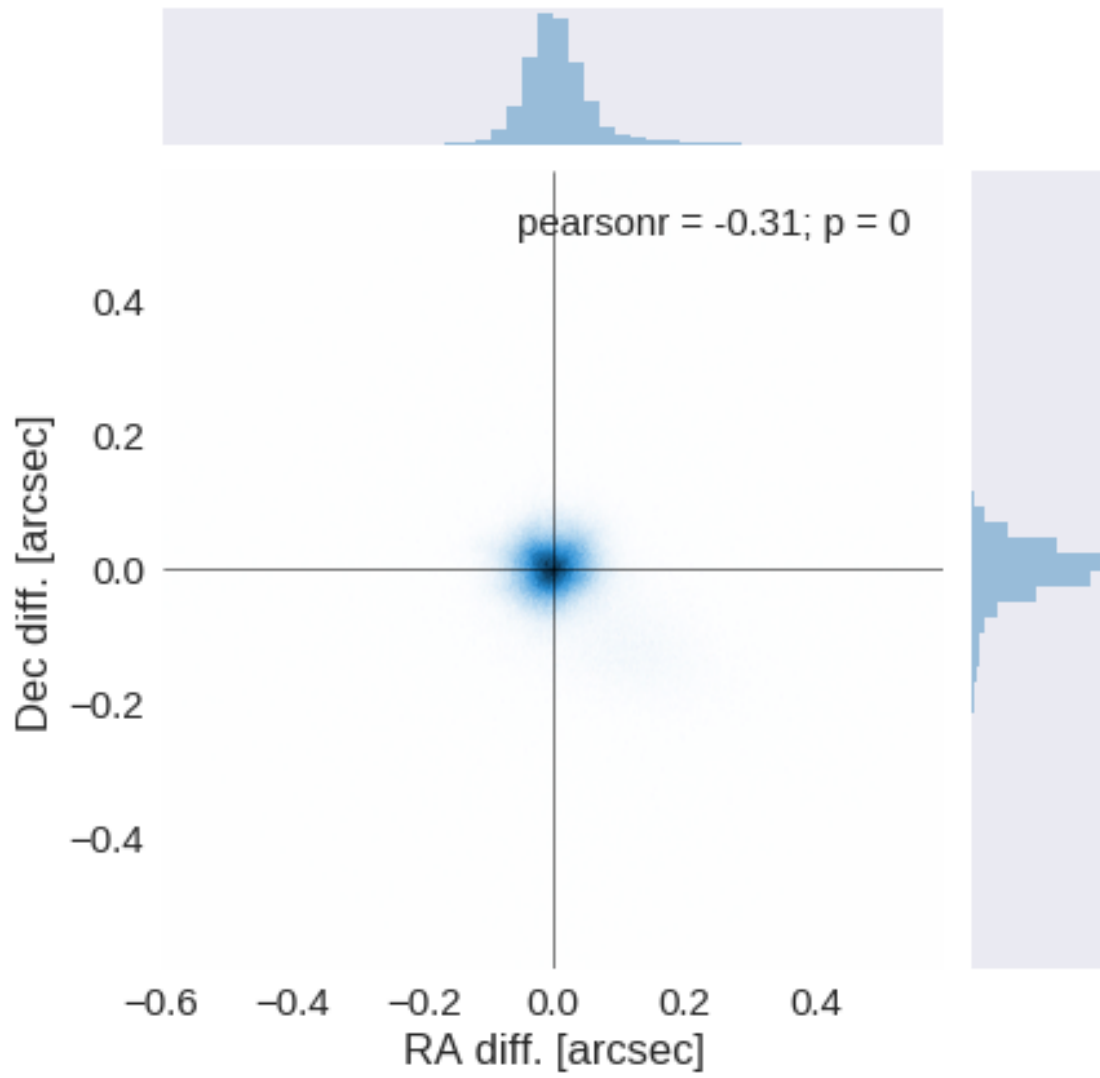
1.5 III - Astrometry correction

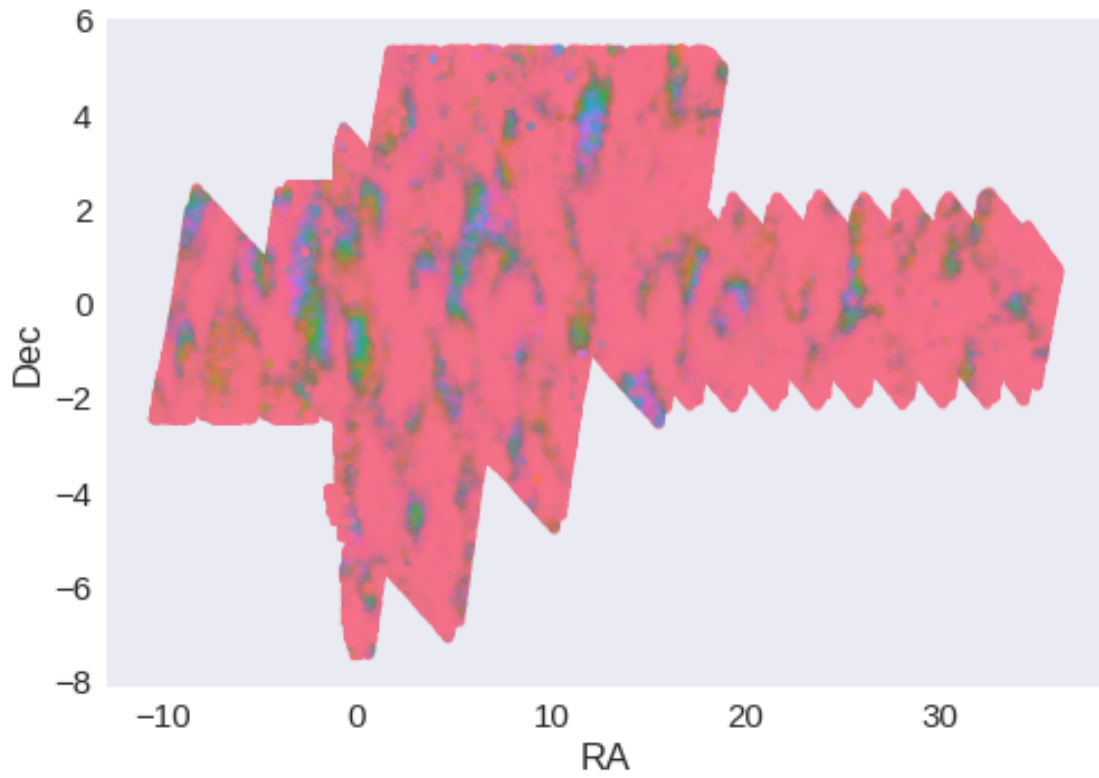
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.





RA correction: 0.10772843384074804 arcsec
Dec correction: -0.12958925090371665 arcsec





1.6 IV - Flagging Gaia objects

668327 sources flagged.

1.7 V - Flagging objects near bright stars

2 VI - Saving to disk

1.9_RCSLenS

March 8, 2018

1 Herschel Stripe 82 master catalogue

1.1 Preparation of Red Cluster Sequence Lensing Survey (RCSLenS) data

This catalogue comes from `dmu0_RCSLenS`.

In the catalogue, we keep:

- The id as unique object identifier;
- The position;
- The `g, r, i, z, y` auto magnitudes.

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:

2018-02-20 21:21:58.071622

1.2 I - Column selection

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:39: RuntimeWarning: overflow encountered  
fluxes = 10 ** ((8.9 - magnitudes)/2.5)
```

```
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:43: RuntimeWarning: invalid value encountered  
errors = np.log(10)/2.5 * fluxes * errors_on_magnitudes
```

```
/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
```

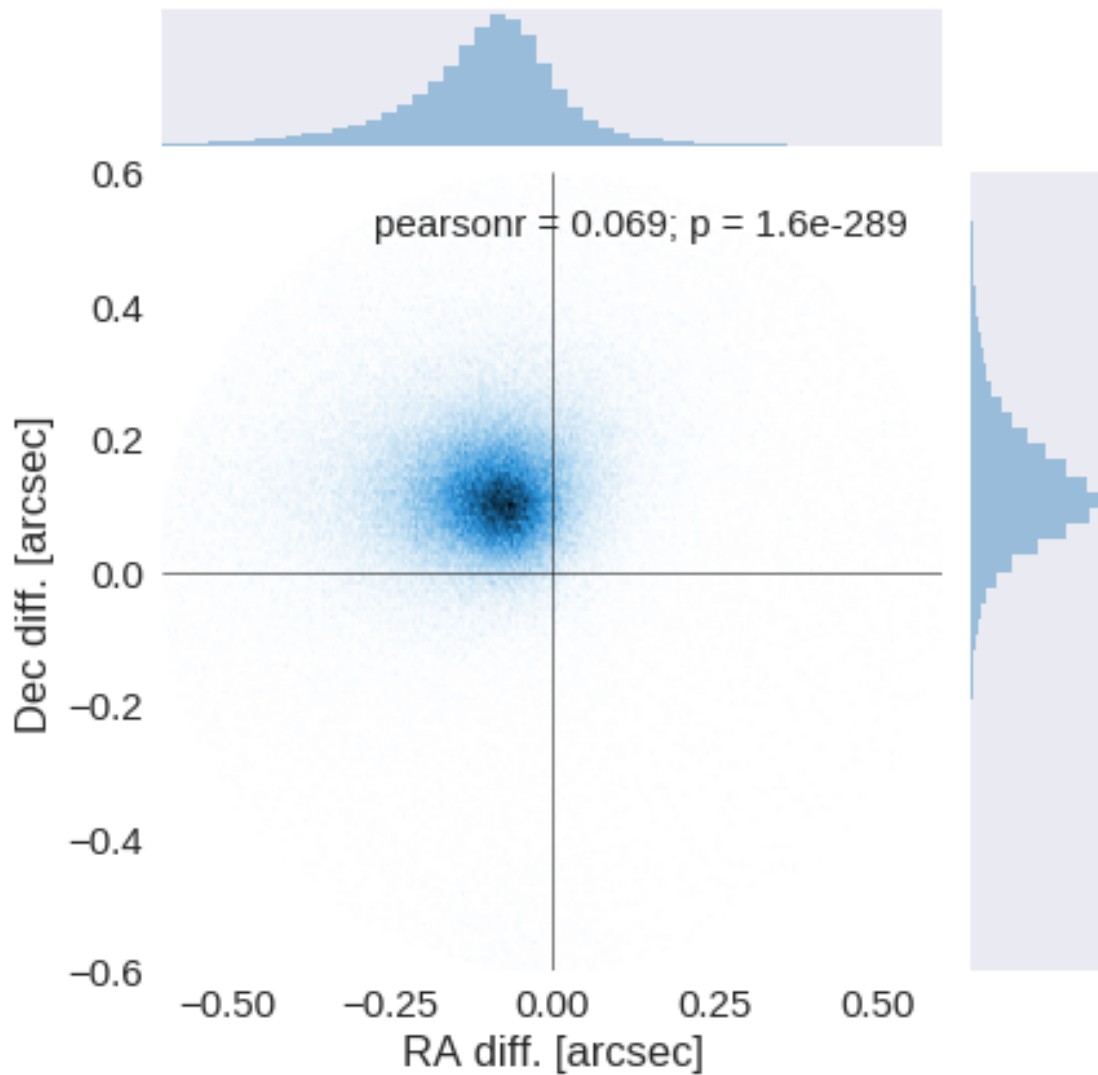
Check the NumPy 1.11 release notes for more information.

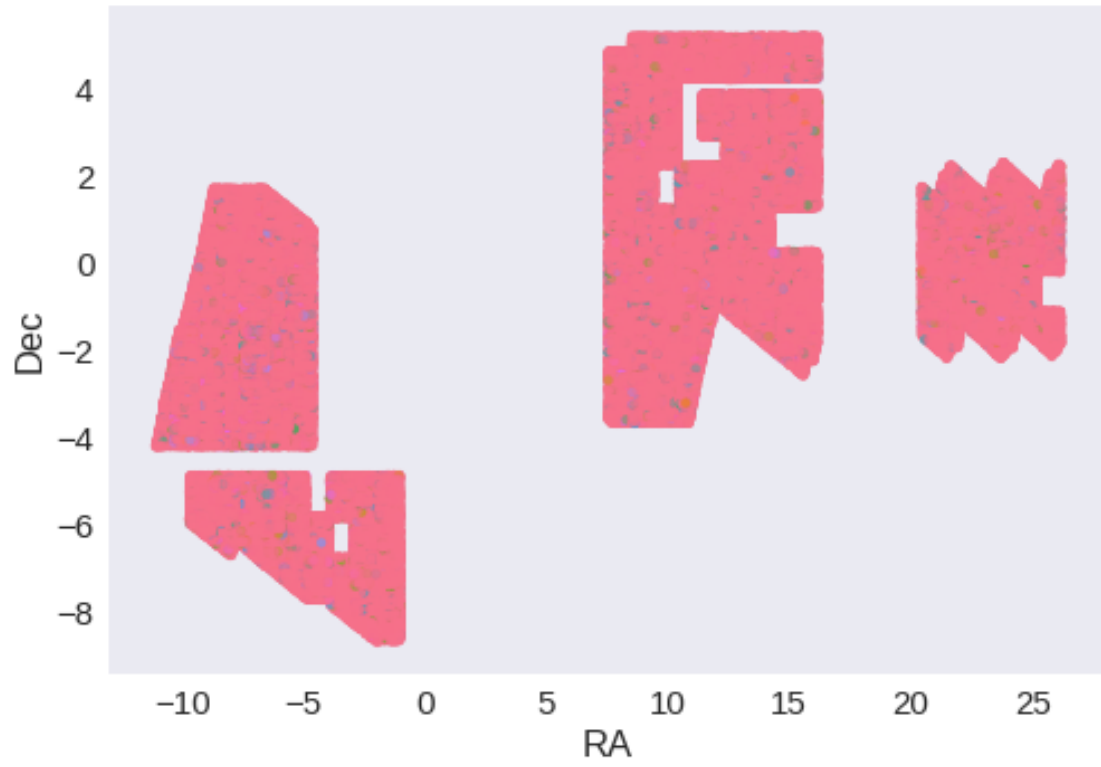
```
ma.MaskedArray.__setitem__(self, index, value)
```

The initial catalogue had 13515631 sources.
The cleaned catalogue has 13137406 sources (378225 removed).
The cleaned catalogue has 371540 sources flagged as having been cleaned

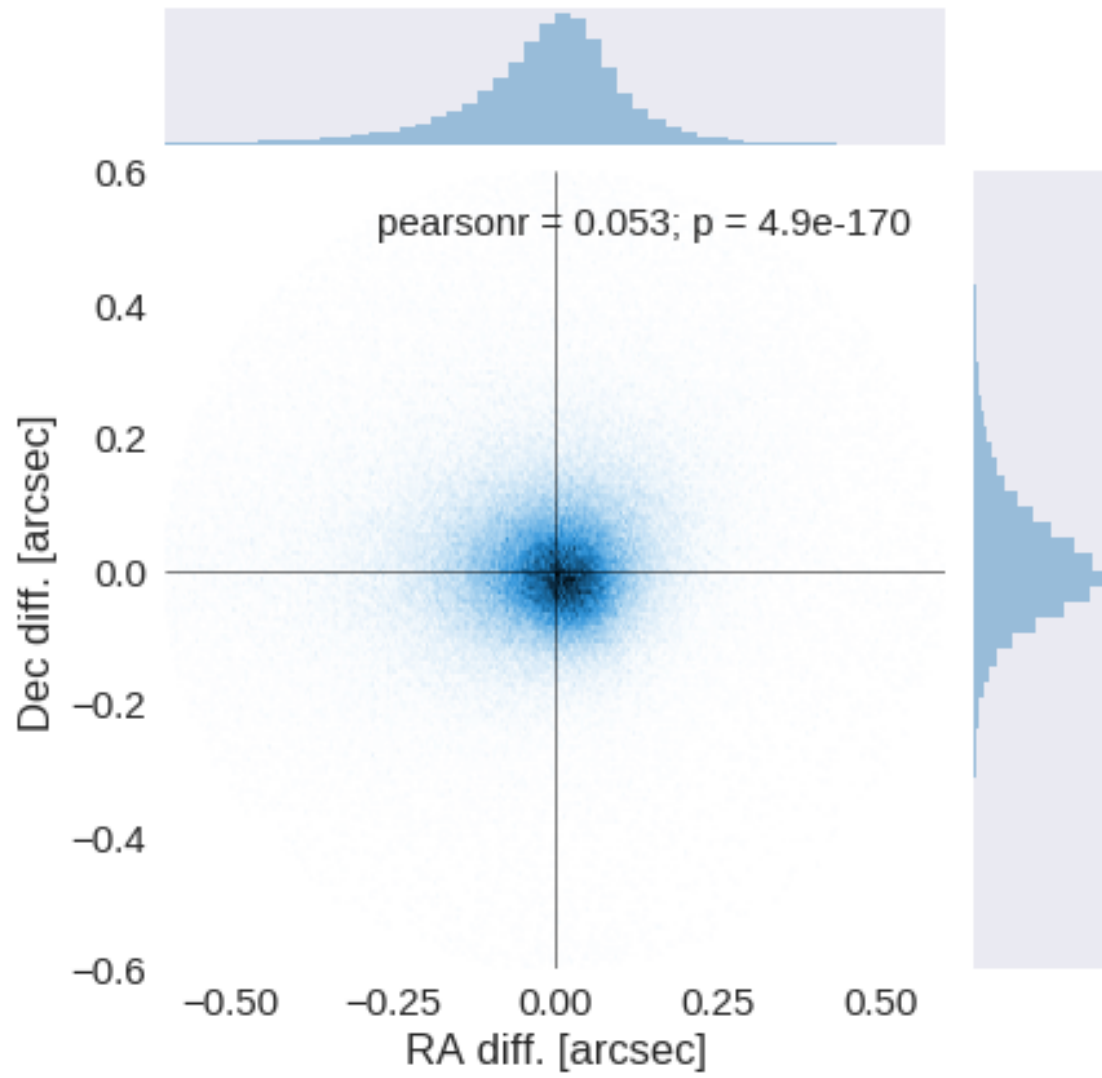
1.4 III - Astrometry correction

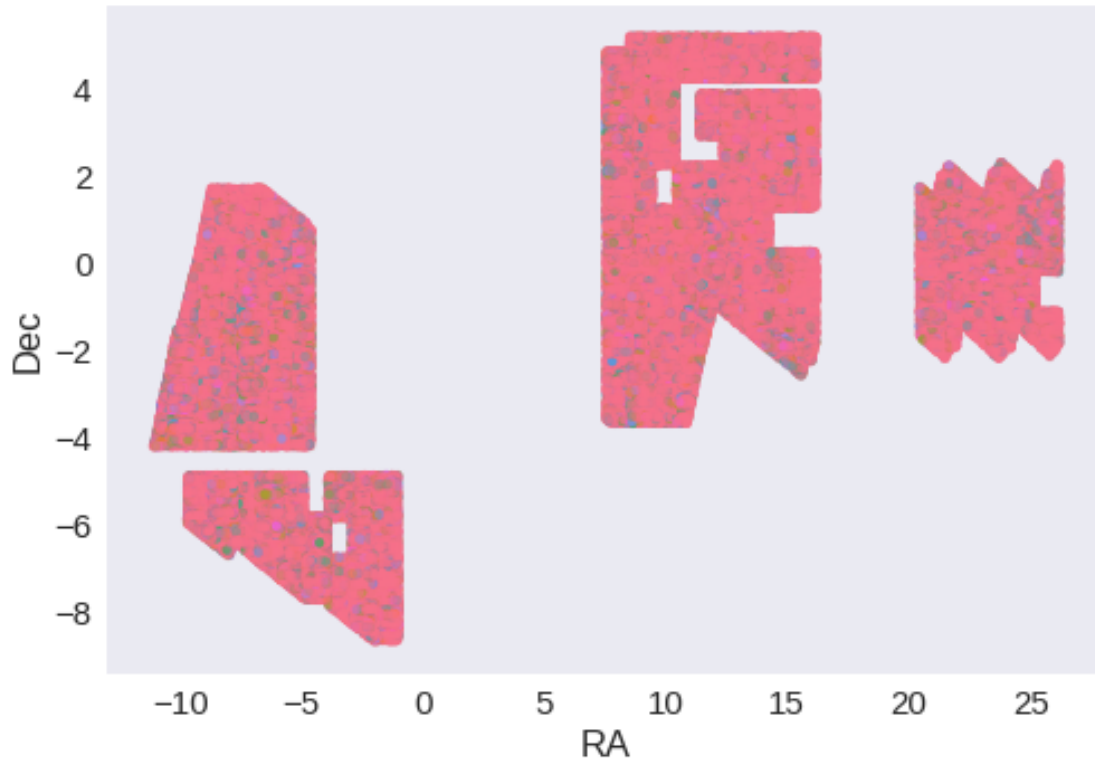
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.





RA correction: 0.0935626064688222 arcsec
Dec correction: -0.11601334717702416 arcsec





1.5 IV - Flagging Gaia objects

307433 sources flagged.

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.10.1_SDSS-S82-IAC

March 8, 2018

1 Herschel Stripe 82 master catalogue

1.1 Preparation of SDSS Stripe 82 - IAC Legacy Survey data

This catalogue comes from `dmu0_IAC_Stripe82_Legacy_Project`.

One must choose between this catalogue and the official SDSS catalogue in 'dmu0_SDSS-S82'. Currently we choose this one.

In the catalogue, we keep:

- We generate a unique object identifier;
- The position;
- The u, g, r, i, z, aperture magnitude (for now in 3");
- The u, g, r, i, z, auto fluxes and magnitudes.

We don't know when the maps have been observed. We will use the year of the reference paper.

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.

```
INFO:herschelhelp_internal.masterlist:The catalogue is divided in 37 x 3 (RA, Dec) tiles
INFO:herschelhelp_internal.masterlist:Processing RA between -0.000355 and 0.999645, and Dec betwe
INFO:herschelhelp_internal.masterlist:Processing RA between -0.000355 and 0.999645, and Dec betw
INFO:herschelhelp_internal.masterlist:Processing RA between -0.000355 and 0.999645, and Dec betw
INFO:herschelhelp_internal.masterlist:Processing RA between 0.999645 and 1.999645, and Dec betwe
INFO:herschelhelp_internal.masterlist:Processing RA between 0.999645 and 1.999645, and Dec betwe
INFO:herschelhelp_internal.masterlist:Processing RA between 0.999645 and 1.999645, and Dec betwe
INFO:herschelhelp_internal.masterlist:Processing RA between 1.999645 and 2.999645, and Dec betwe
INFO:herschelhelp_internal.masterlist:Processing RA between 1.999645 and 2.999645, and Dec betwe
```


INFO:herschelhelp_internal.masterlist:Processing RA between 33.999645 and 34.999645, and Dec bet
INFO:herschelhelp_internal.masterlist:Processing RA between 34.999645 and 35.999645, and Dec bet
INFO:herschelhelp_internal.masterlist:Processing RA between 34.999645 and 35.999645, and Dec bet
INFO:herschelhelp_internal.masterlist:Processing RA between 34.999645 and 35.999645, and Dec bet
INFO:herschelhelp_internal.masterlist:Processing RA between 35.999645 and 36.999645, and Dec bet
INFO:herschelhelp_internal.masterlist:Processing RA between 35.999645 and 36.999645, and Dec bet
INFO:herschelhelp_internal.masterlist:Processing RA between 35.999645 and 36.999645, and Dec bet

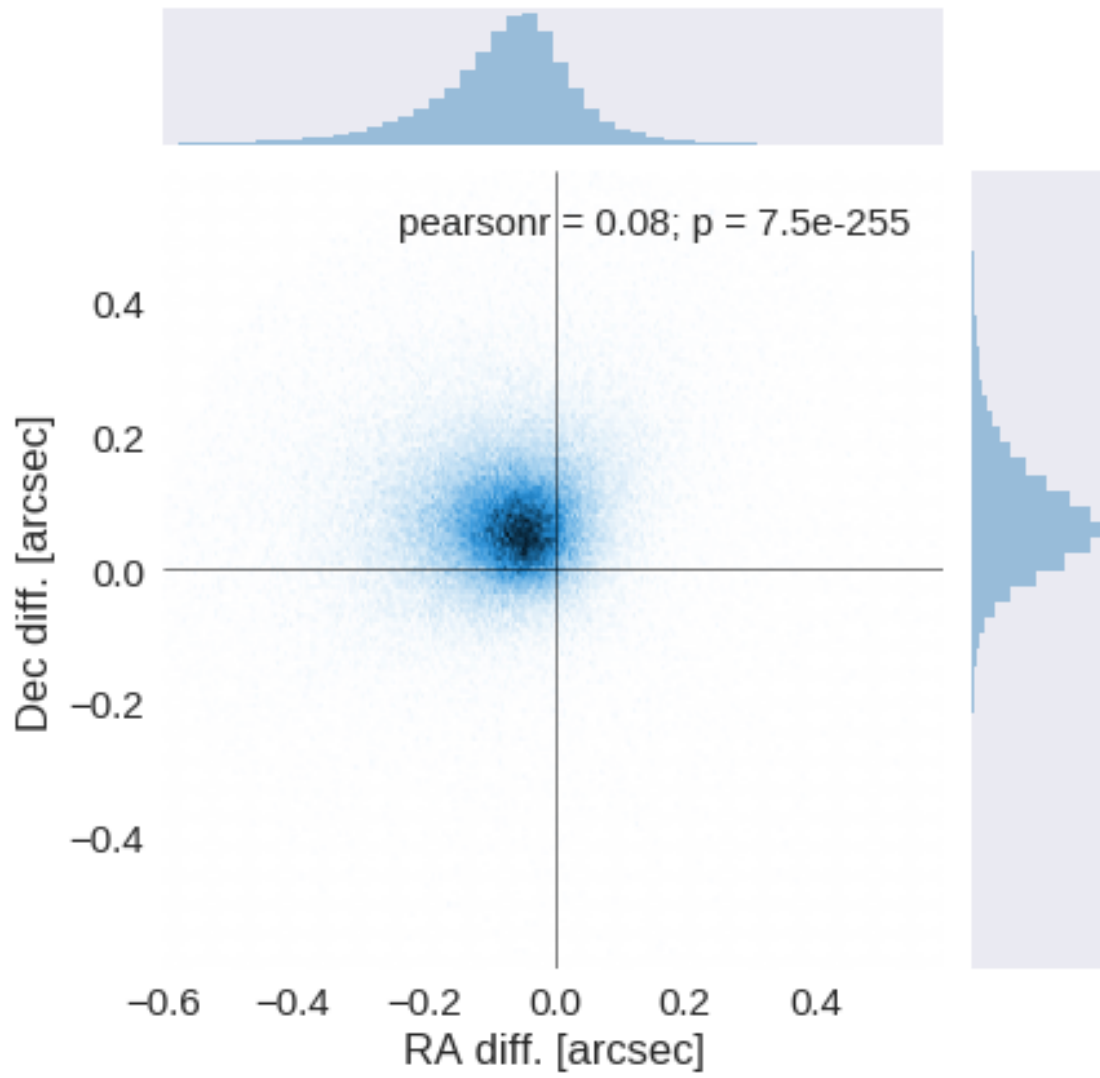
The initial catalogue had 5290888 sources.

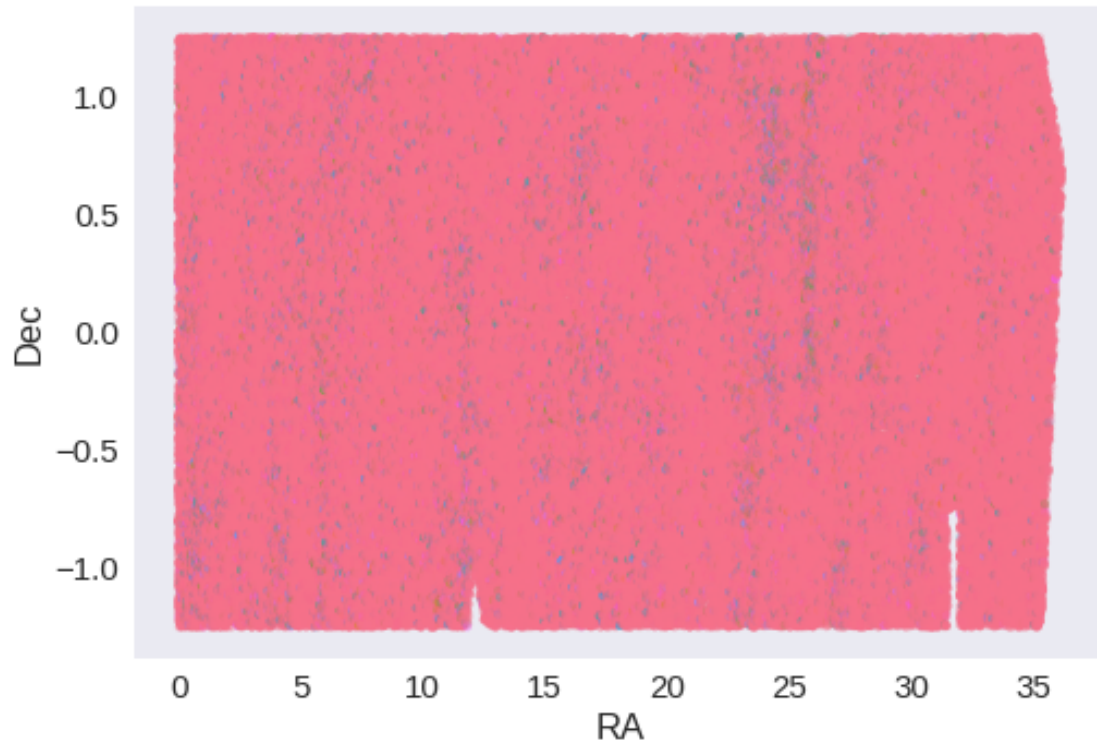
The cleaned catalogue has 5279317 sources (11571 removed).

The cleaned catalogue has 11560 sources flagged as having been cleaned

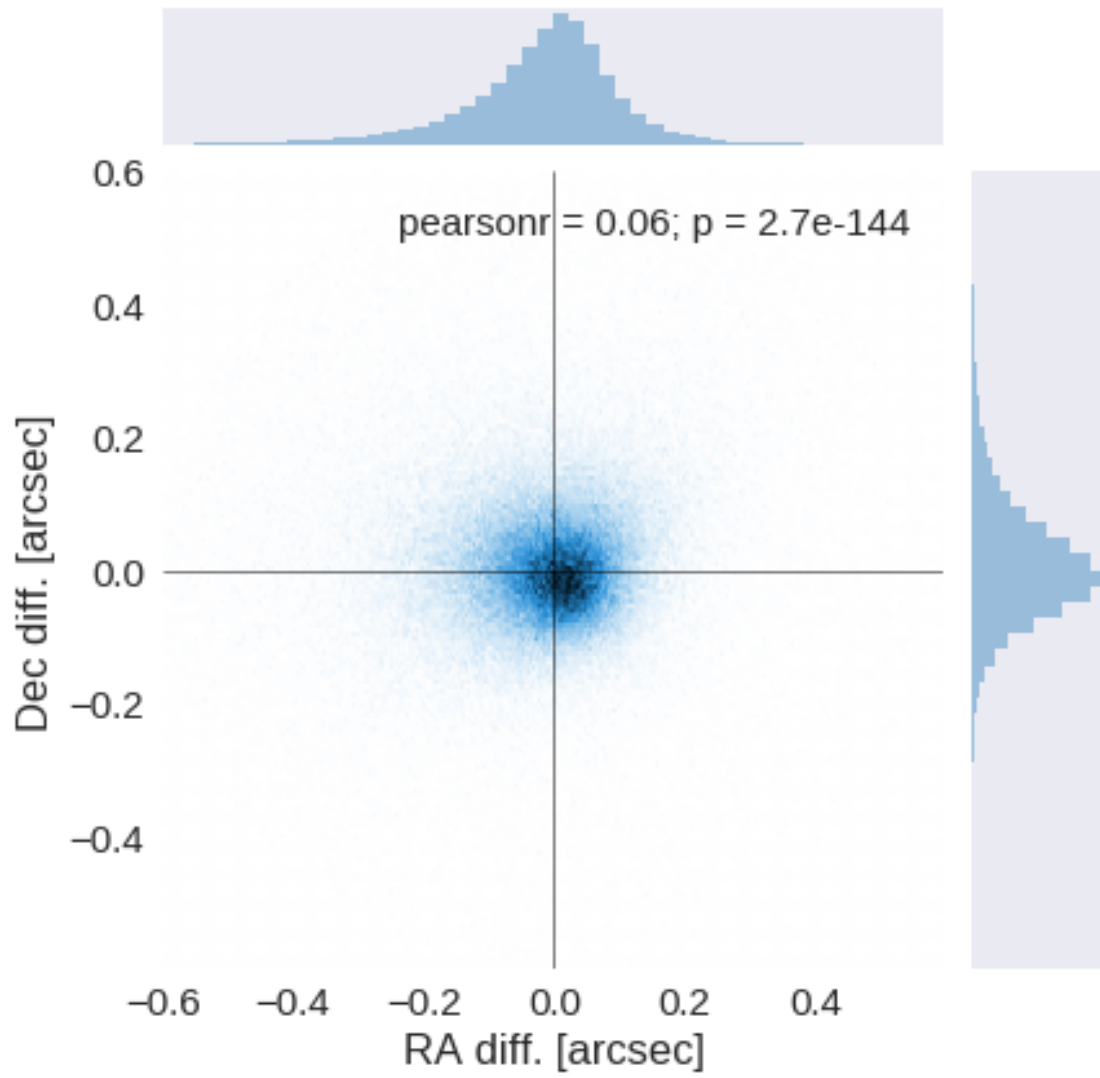
1.4 III - Astrometry correction

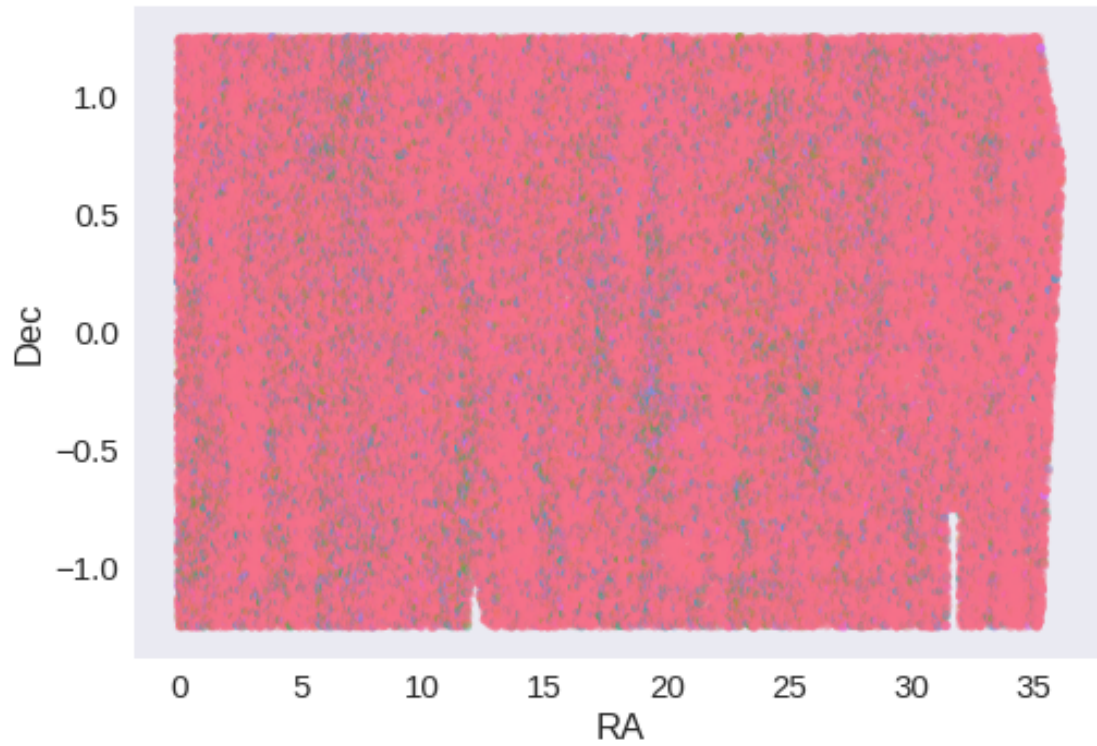
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.





RA correction: 0.06390892208401056 arcsec
Dec correction: -0.0685382447484173 arcsec





1.5 IV - Flagging Gaia objects

184058 sources flagged.

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.10.2_SDSS-S82

March 8, 2018

1 Herschel Stripe 82 master catalogue

1.1 Preparation of SDSS Stripe 82 data

This catalogue comes from `dmu0_SDSS-S82`.

In the catalogue, we keep:

- The `object_id` as unique object identifier;
- The position;
- The `u, g, r, i, z`, aperture magnitude (for now in 3");
- The `u, g, r, i, z`, auto fluxes and magnitudes.

We don't know when the maps have been observed. We will use the year of the reference paper.

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>

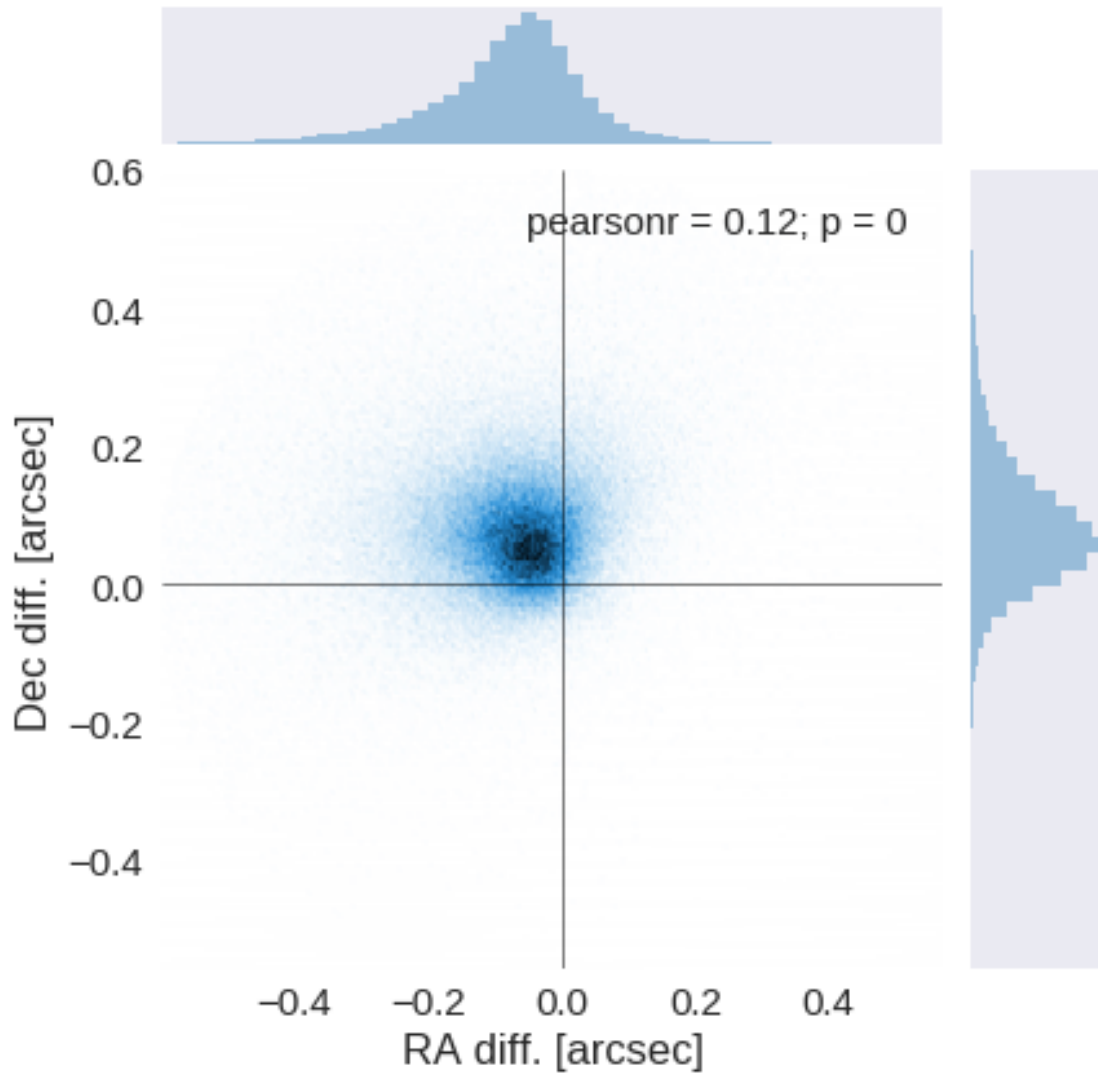
1.3 II - Removal of duplicated sources

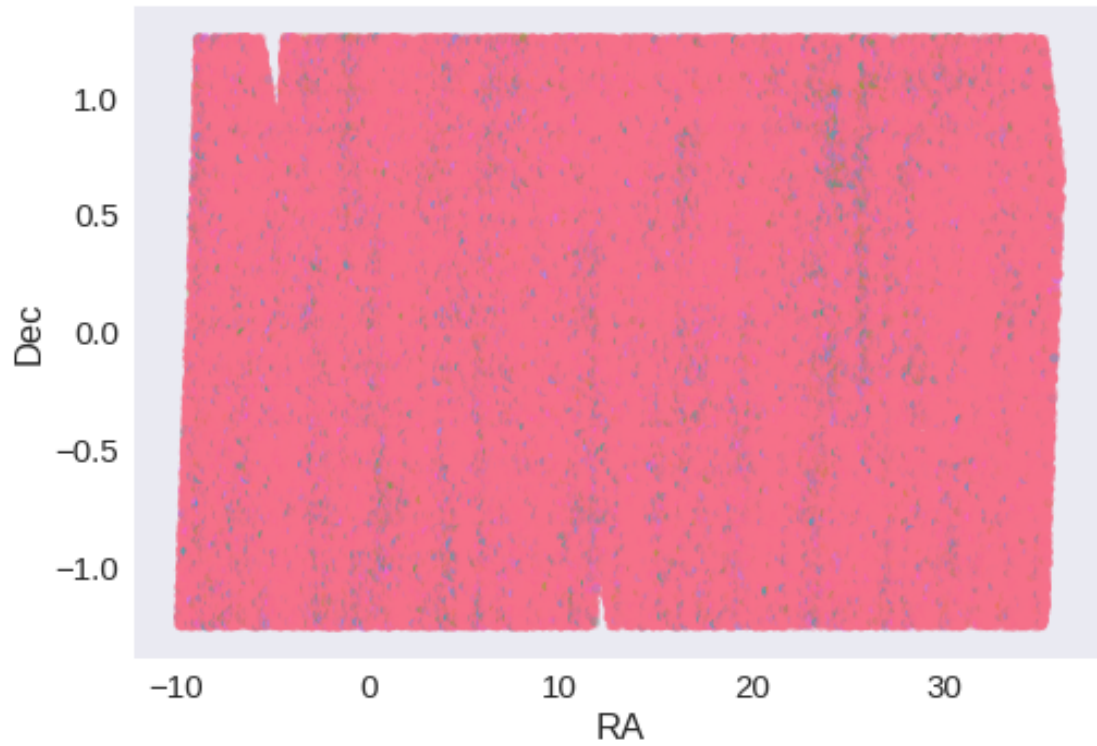
We remove duplicated objects from the input catalogues.

```
INFO:herschelhelp_internal.masterlist:The catalogue is divided in 47 x 3 (RA, Dec) tiles
INFO:herschelhelp_internal.masterlist:Processing RA between -9.924922 and -8.924922, and Dec bet
/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)
INFO:herschelhelp_internal.masterlist:Processing RA between -9.924922 and -8.924922, and Dec bet
INFO:herschelhelp_internal.masterlist:Processing RA between -9.924922 and -8.924922, and Dec bet
INFO:herschelhelp_internal.masterlist:Processing RA between -8.924922 and -7.924922, and Dec bet
INFO:herschelhelp_internal.masterlist:Processing RA between -8.924922 and -7.924922, and Dec bet
INFO:herschelhelp_internal.masterlist:Processing RA between -8.924922 and -7.924922, and Dec bet
INFO:herschelhelp_internal.masterlist:Processing RA between -7.924922 and -6.924922, and Dec bet
```

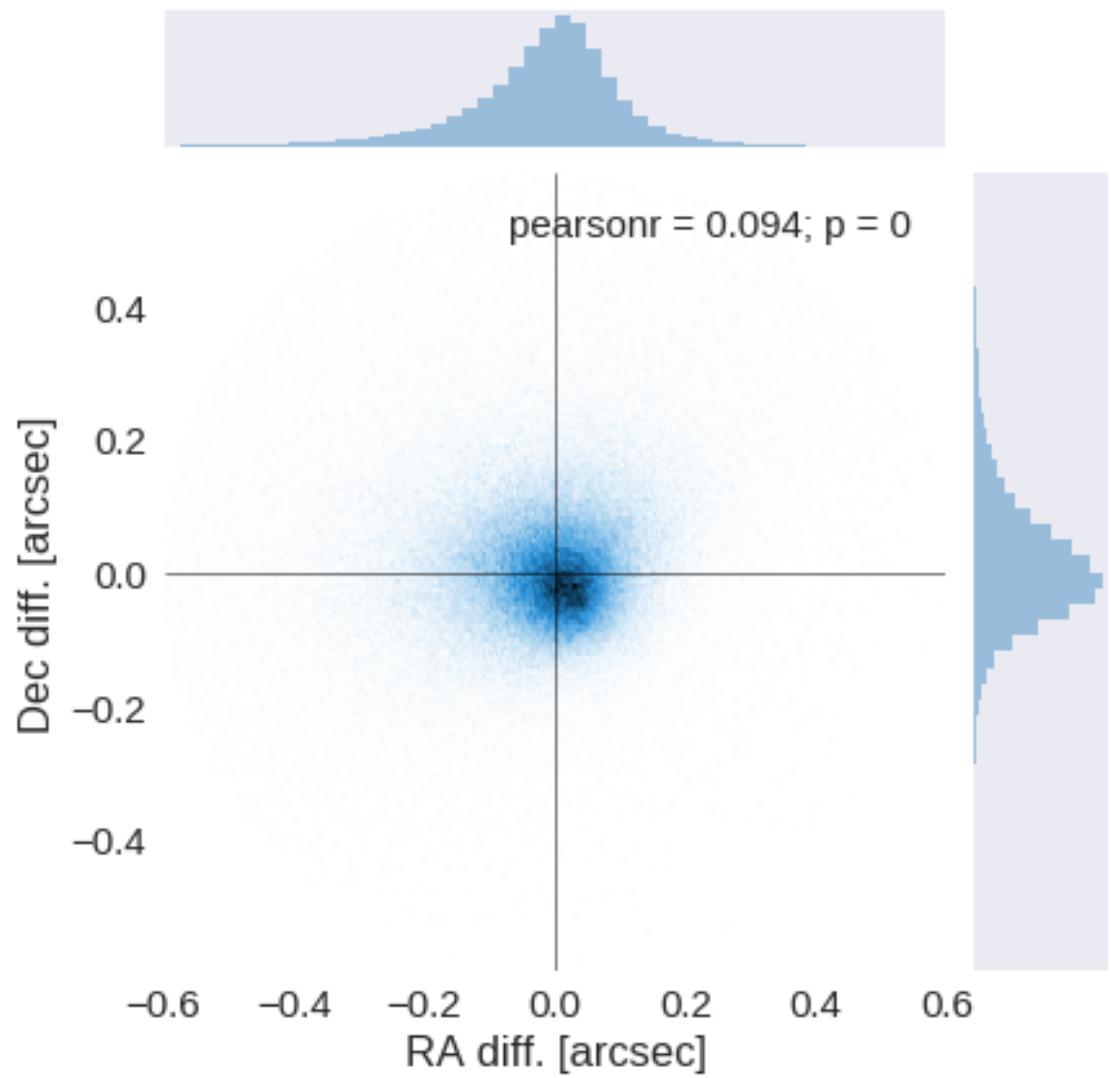

1.4 III - Astrometry correction

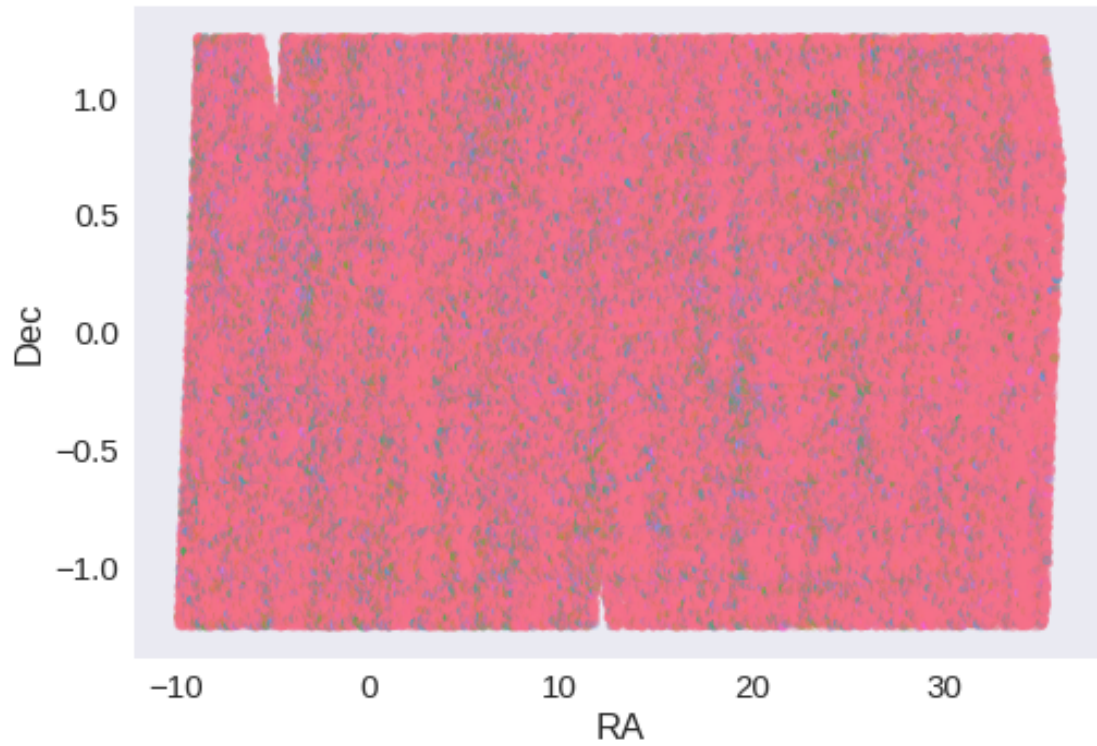
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.





RA correction: 0.06227235712685797 arcsec
Dec correction: -0.0734814464327993 arcsec





1.5 IV - Flagging Gaia objects

232639 sources flagged.

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

2.1_IRAC_merging

March 8, 2018

1 Herschel Stripe 82 IRAC merging

Both SHELA and SpIES provide IRAC fluxes which have marginally overlapping coverage. We chose which to use here since in order to run in low memory mode we must have one catalogue per band before merging

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

1.1 I - Reading the prepared pristine catalogues

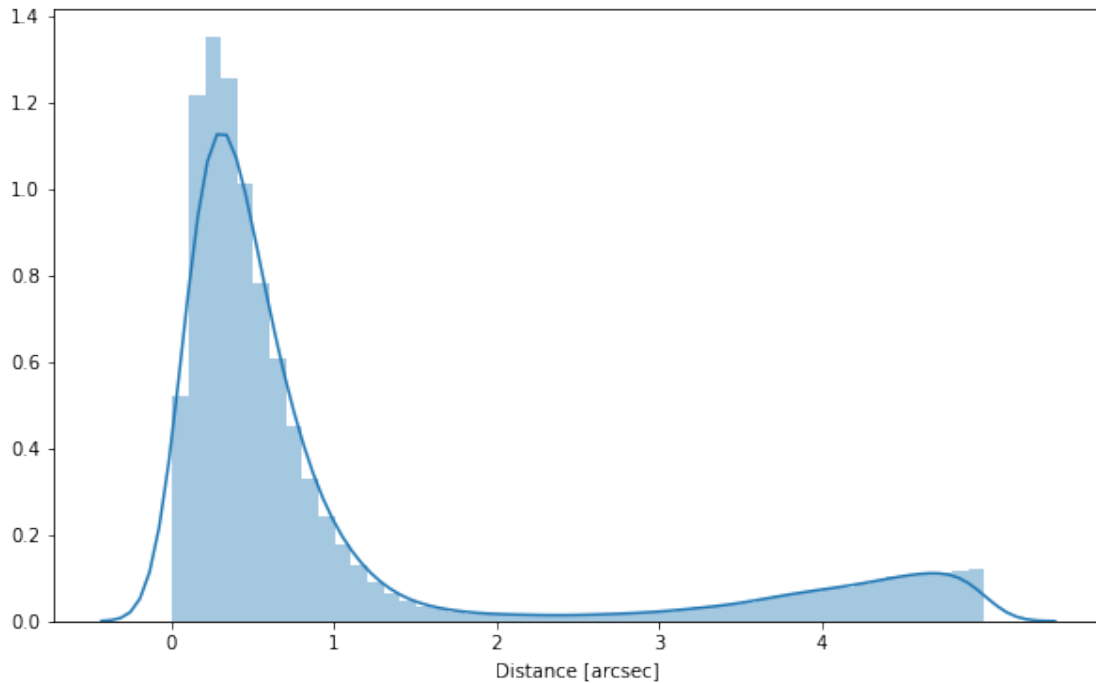
1.2 II - Merging tables

We first merge the optical catalogues and then add the infrared ones: HSC, VHS, VICS82, UKIDSS-LAS, PanSTARRS, SHELA, SpIES.

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 SHELA

1.3 Add SpIES



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

1.4 III - Merging flags and stellerity

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.

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 stellerity columns indicating the probability (0 to 1) of each source being a star. We merge these columns taking the highest value.

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


1.5 VIII - Cross-identification table

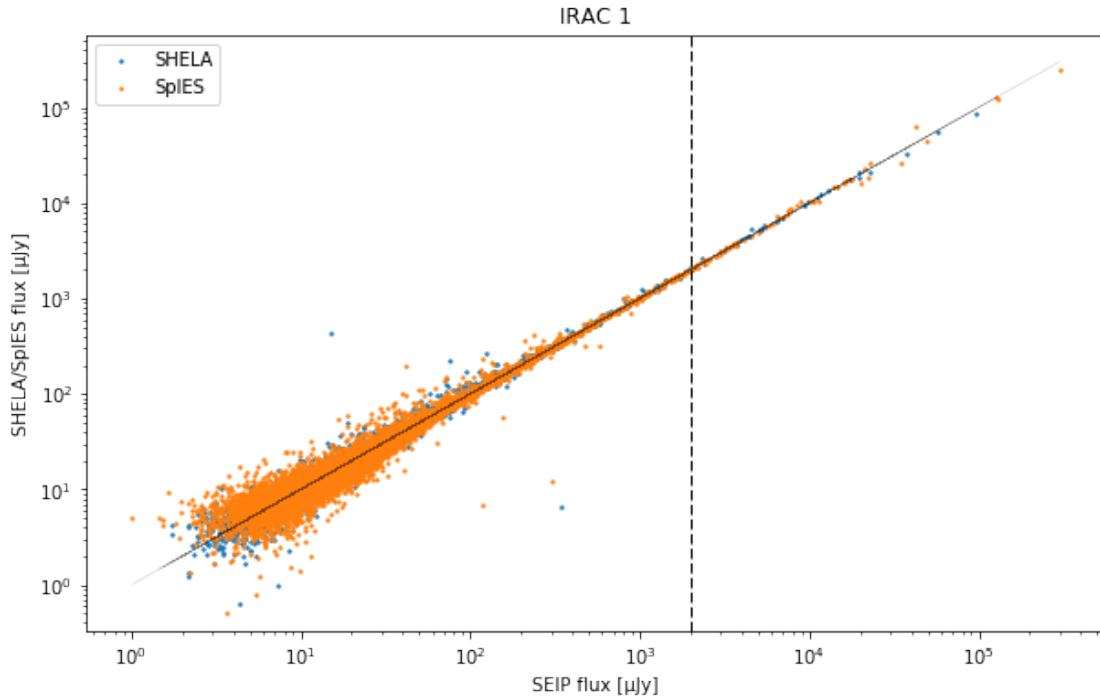
We are producing a table associating to each HELP identifier, the identifiers of the sources in the pristine catalogue. This can be used to easily get additional information from them.

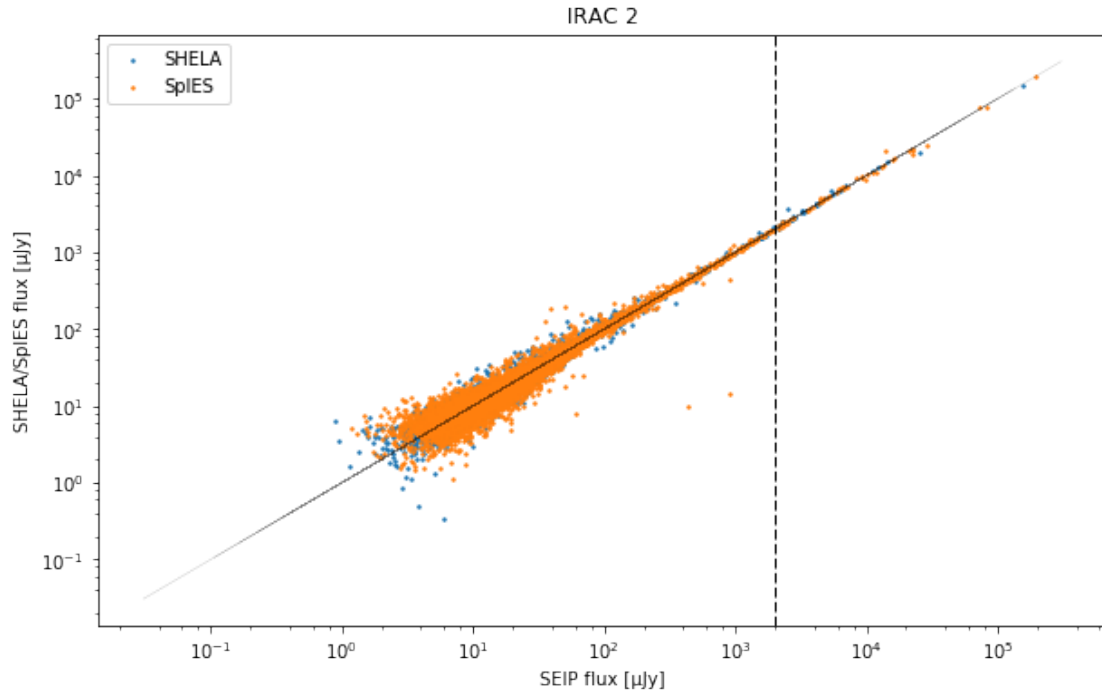
```
['shela_intid', 'spies_intid', 'irac_intid']
```

1.6 VI - Choosing between multiple values for the same filter

Both SHELTA and SpIES provide IRAC1 and IRAC2 fluxes. SpIES seems to go deeper and neither appear to suffer from the bright drop off that affects both SERVS and SWIRE.

WARNING: UnitsWarning: 'e/count' did not parse as fits unit: At col 0, Unit 'e' not supported by
WARNING: UnitsWarning: 'image' did not parse as fits unit: At col 0, Unit 'image' not supported





When both SHELGA and SpIES fluxes are provided, we use the SpIES flux.

We create a table indicating for each source the origin on the IRAC1 and IRAC2 fluxes that will be saved separately.

```
2240390 sources with SHELGA flux
3365594 sources with SpIES flux
64802 sources with SHELGA and SpIES flux
2240390 sources for which we use SHELGA
3300792 sources for which we use SpIES
```

```
2240390 sources with SHELGA total flux
3365594 sources with SpIES total flux
64802 sources with SHELGA and SpIES total flux
2240390 sources for which we use SHELGA
3300792 sources for which we use SpIES
```

```
2244367 sources with SHELGA flux
3365594 sources with SpIES flux
66244 sources with SHELGA and SpIES flux
2244367 sources for which we use SHELGA
3299350 sources for which we use SpIES
```

```
2244367 sources with SHELGA total flux
3365594 sources with SpIES total flux
```

66244 sources with SHELA and SpIES total flux
2244367 sources for which we use SHELA
3299350 sources for which we use SpIES

1.7 IX - Saving the catalogue

```
Out[25]: ['shela_intid',  
          'ra',  
          'dec',  
          'flag_merged',  
          'spies_intid',  
          'irac_flag_cleaned',  
          'irac_flag_gaia',  
          'irac_stellarity',  
          'irac_intid',  
          'f_ap_irac_i1',  
          'ferr_ap_irac_i1',  
          'm_ap_irac_i1',  
          'merr_ap_irac_i1',  
          'f_irac_i1',  
          'ferr_irac_i1',  
          'm_irac_i1',  
          'merr_irac_i1',  
          'flag_irac_i1',  
          'f_ap_irac_i2',  
          'ferr_ap_irac_i2',  
          'm_ap_irac_i2',  
          'merr_ap_irac_i2',  
          'f_irac_i2',  
          'ferr_irac_i2',  
          'm_irac_i2',  
          'merr_irac_i2',  
          'flag_irac_i2']
```

Missing columns: set()

```
Out[29]: <IPython.core.display.HTML object>
```

2.2_DECAM_merging

March 8, 2018

1 Herschel Stripe 82 DECAM merging

Both DES and DECaLS provide DECam fluxes which have overlapping coverage. We chose which to use DES preferentially. In this notebook we cross match both catalogues and take the DES fluxes where available, using DECaLS otherwise

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:
2018-02-23 15:38:22.712743

1.1 I - Reading the prepared pristine catalogues

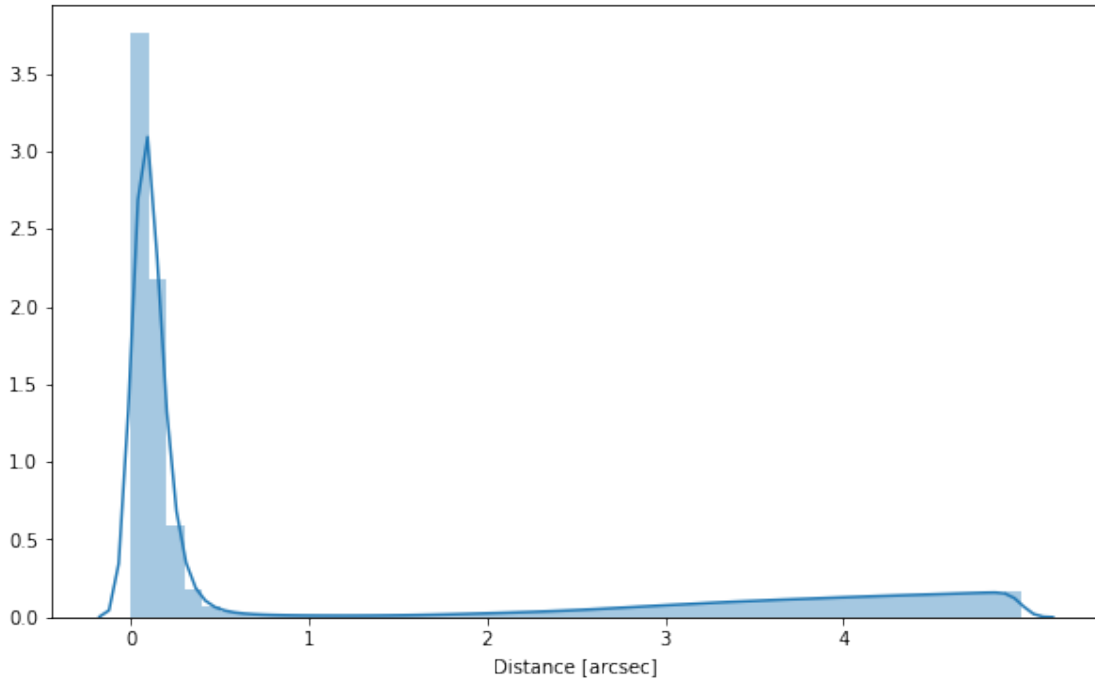
1.2 II - Merging tables

We first merge DES and DECaLS.

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 DES

1.3 Add DECaLS



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

1.4 III - Merging flags and stellerity

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.

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 stellerity columns indicating the probability (0 to 1) of each source being a star. We merge these columns taking the highest value.

1.5 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.

```
['des_id', 'decals_id', 'decam_intid']
```

1.6 VI - Choosing between multiple values for the same filter

```
/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[19]: <IPython.core.display.HTML object>
```

1.7 IX - Saving the catalogue

```
Out[21]: ['des_id',  
         'ra',  
         'dec',  
         'm_decam_i',  
         'merr_decam_i',  
         'm_ap_decam_i',  
         'merr_ap_decam_i',  
         'm_decam_y',  
         'merr_decam_y',  
         'm_ap_decam_y',  
         'merr_ap_decam_y',  
         'f_decam_i',  
         'ferr_decam_i',  
         'flag_decam_i',  
         'f_ap_decam_i',  
         'ferr_ap_decam_i',  
         'f_decam_y',  
         'ferr_decam_y',  
         'flag_decam_y',  
         'f_ap_decam_y',  
         'ferr_ap_decam_y',  
         'flag_merged',  
         'decals_id',  
         'decam_flag_cleaned',  
         'decam_flag_gaia',  
         'decam_stellarity',  
         'decam_intid',  
         'f_decam_g',  
         'ferr_decam_g',  
         'm_decam_g',  
         'merr_decam_g',  
         'flag_decam_g',  
         'f_ap_decam_g',  
         'ferr_ap_decam_g',  
         'm_ap_decam_g',
```

```
'merr_ap_decam_g',  
'f_decam_r',  
'ferr_decam_r',  
'm_decam_r',  
'merr_decam_r',  
'flag_decam_r',  
'f_ap_decam_r',  
'ferr_ap_decam_r',  
'm_ap_decam_r',  
'merr_ap_decam_r',  
'f_decam_z',  
'ferr_decam_z',  
'm_decam_z',  
'merr_decam_z',  
'flag_decam_z',  
'f_ap_decam_z',  
'ferr_ap_decam_z',  
'm_ap_decam_z',  
'merr_ap_decam_z']
```

Missing columns: set()

Out[25]: <IPython.core.display.HTML object>

2.3_VICS82_VHS_merging

March 8, 2018

1 Herschel Stripe 82 VICS82 - VHS merging

VICS 82 and VHS contain VISTA J and Ks fluxes which need to be merged

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

This notebook was executed on:
2018-02-27 15:01:12.533619

1.1 I - Reading the prepared pristine catalogues

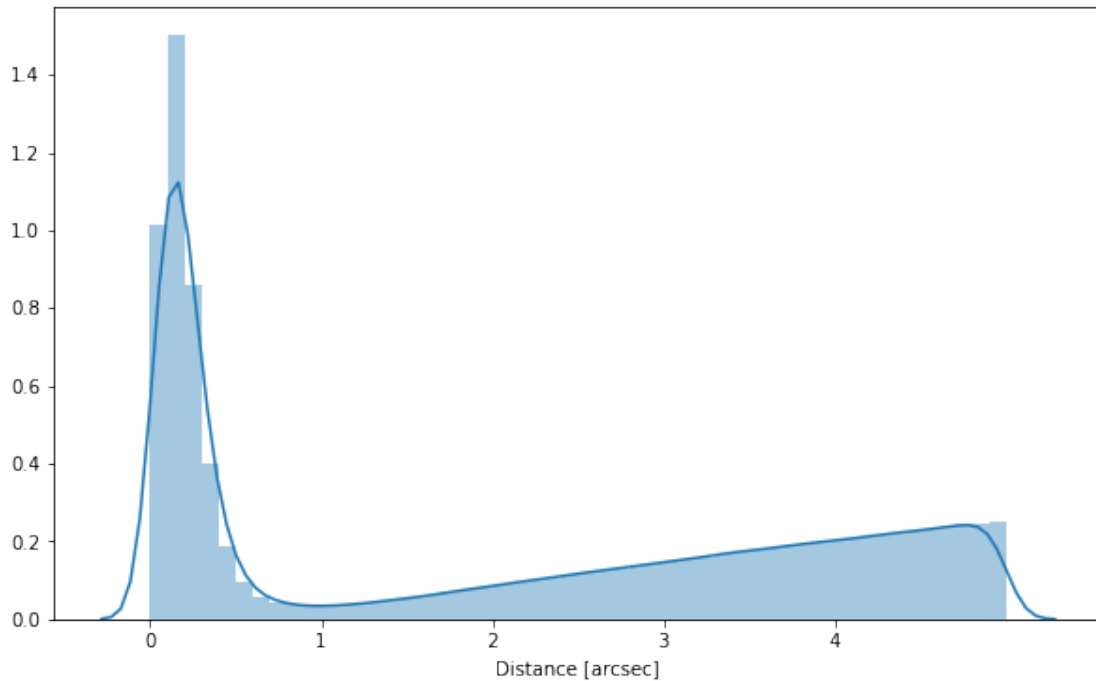
1.2 II - Merging tables

We first merge the optical catalogues and then add the infrared ones: VHS, VICS82,

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 VHS

1.3 Add VICS82



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

1.4 III - Merging flags and stellerity

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.

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 stellerity columns indicating the probability (0 to 1) of each source being a star. We merge these columns taking the highest value.

1.5 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.

```
['vhs_id', 'vics82_id', 'vista_intid']
```

1.6 VI - Choosing between multiple values for the same filter

```
/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[18]: <IPython.core.display.HTML object>
```

1.7 Rename old vhs cols

1.8 IX - Saving the catalogue

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

```
Out[24]: <IPython.core.display.HTML object>
```

2.4_Merging

March 8, 2018

1 Herschel Stripe 82 master catalogue

This notebook presents the merge of the various pristine catalogues to produce HELP mater catalogue on Herschel Stripe 82.

```
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:  
2018-03-01 17:33:29.608345
```

1.1 I - Reading the prepared pristine catalogues

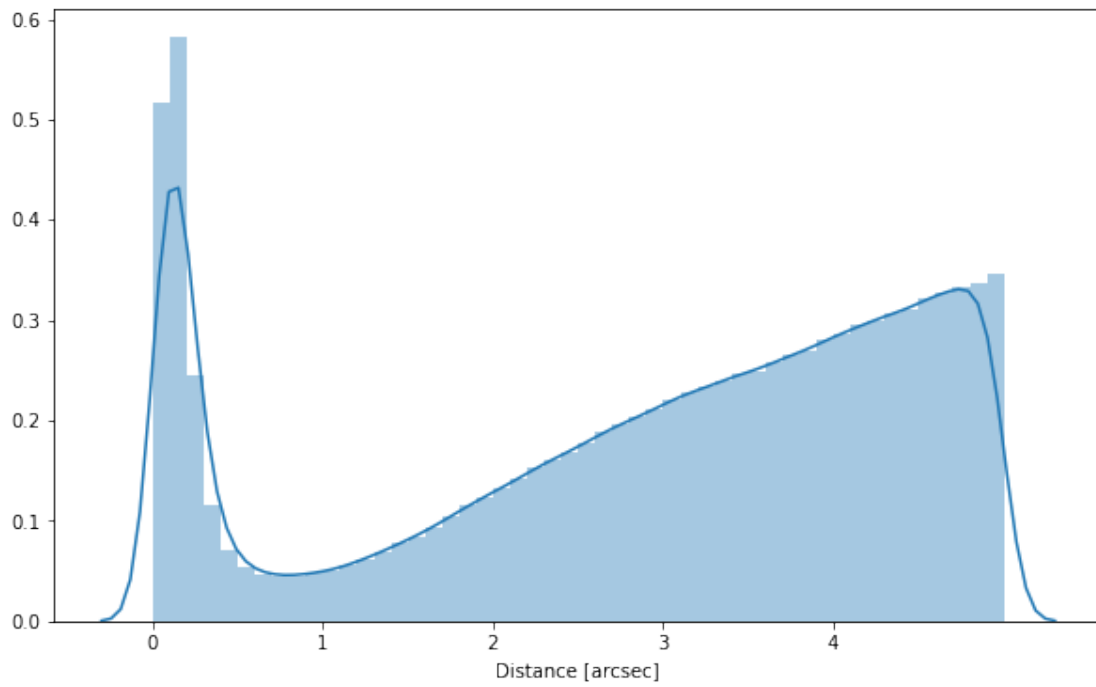
1.2 II - Merging tables

We first merge the optical catalogues and then add the infrared ones: HSC, VHS, VICS82, UKIDSS-LAS, PanSTARRS, SHELA, SpIES.

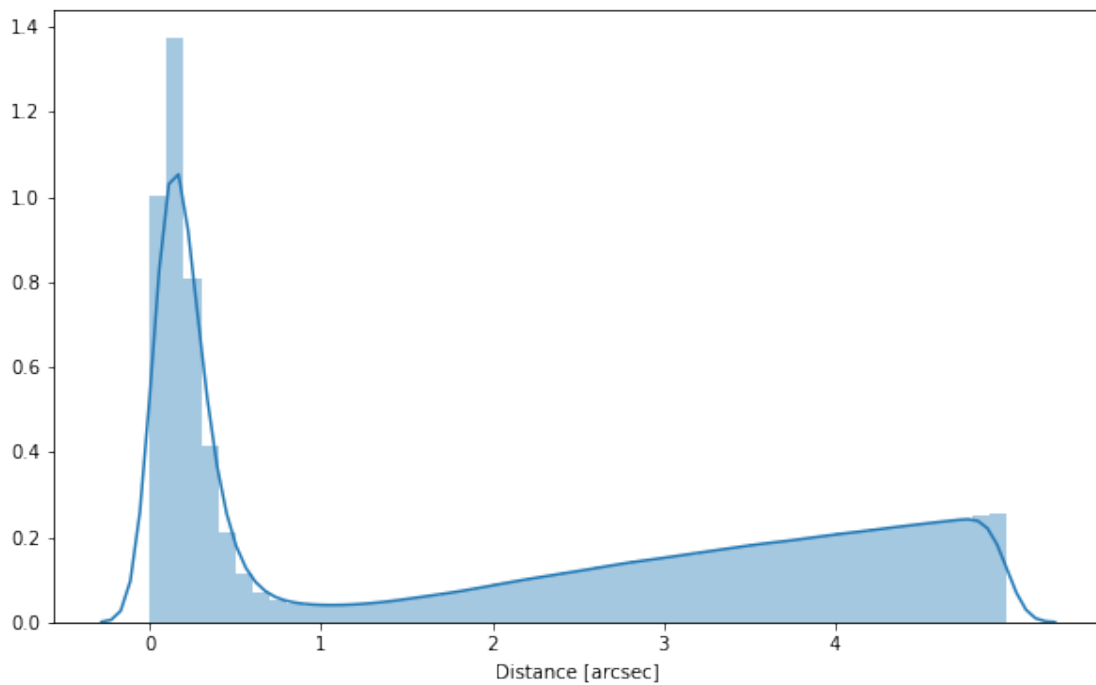
At every step, we look at the distribution of the distances to the nearest source in the merged catalogue to determine the best crossmatching radius.

1.2.1 HSC

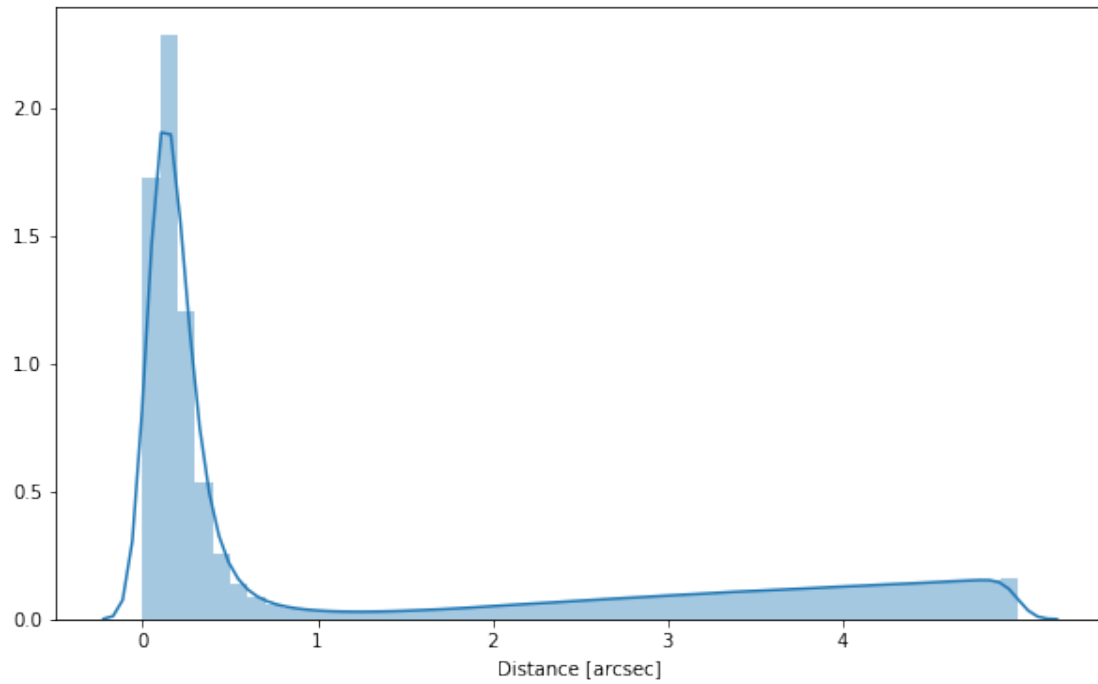
1.2.2 Add VISTA (VHS and VICS82 pre-merge)



1.2.3 Add LAS

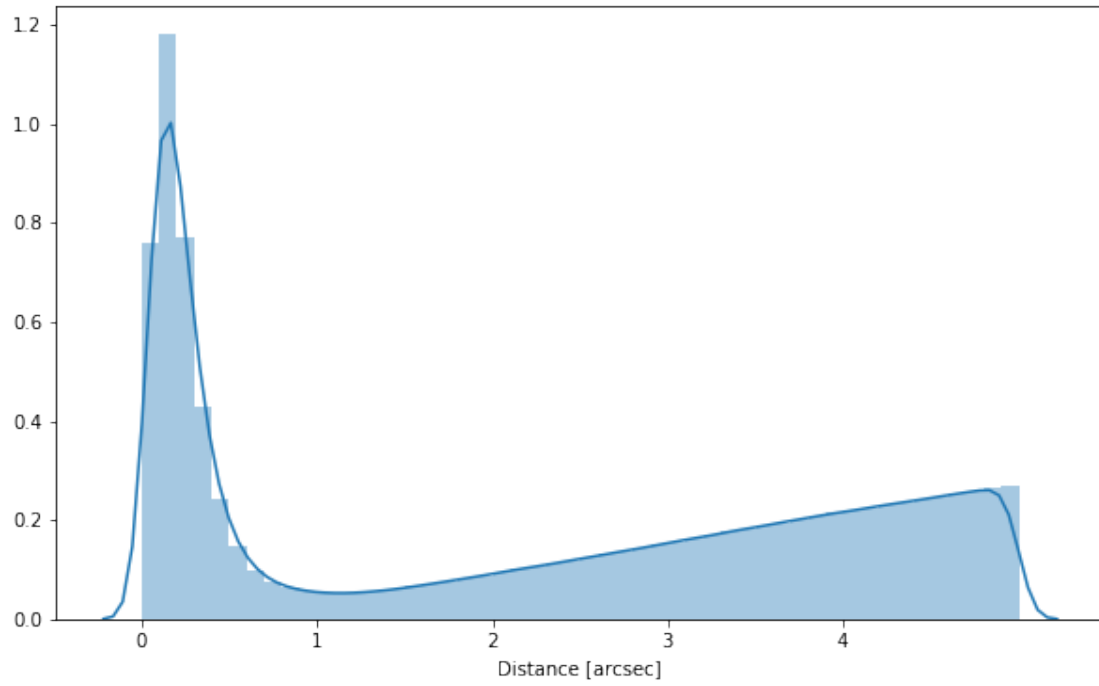


1.2.4 Add PanSTARRS

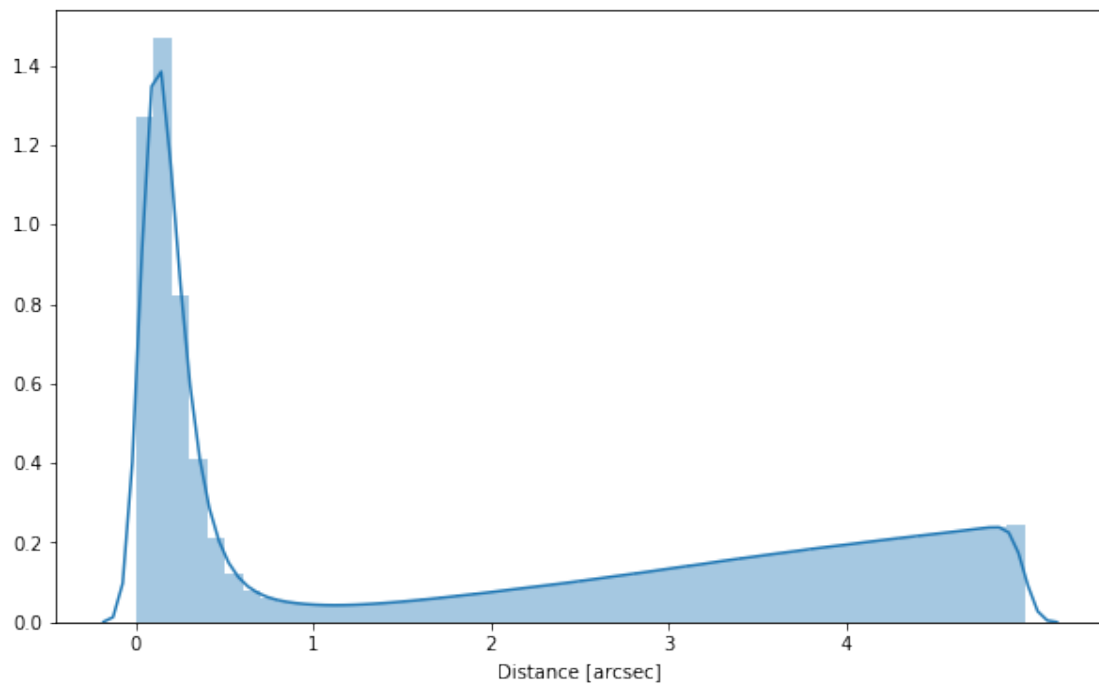


1.3 Add SDSS

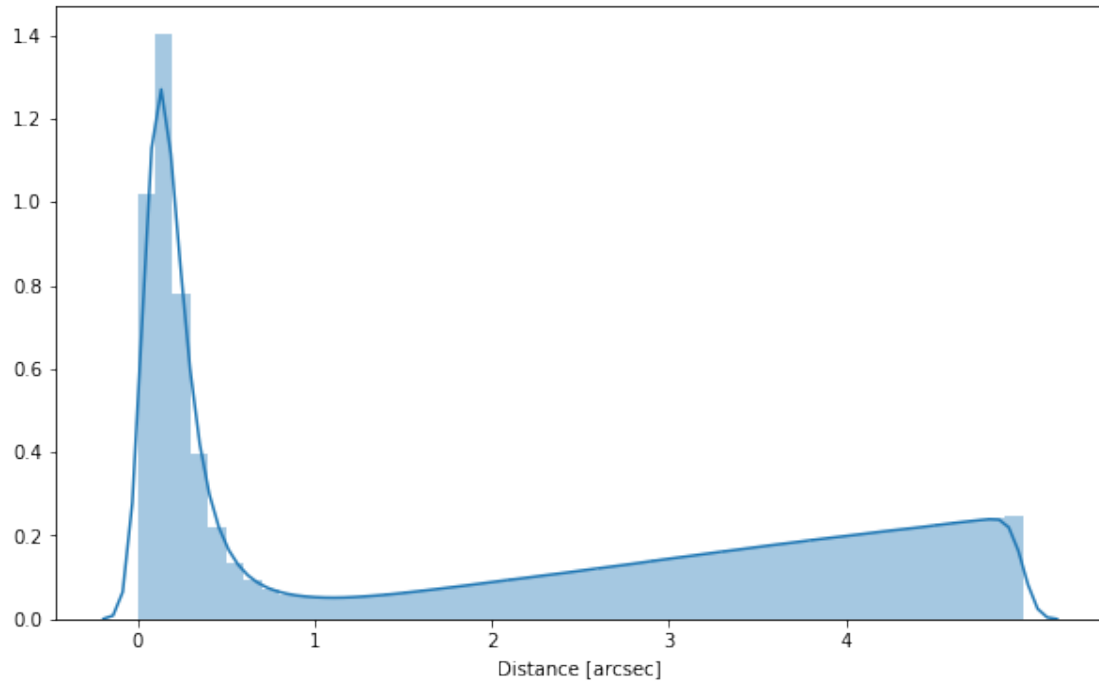
We are waiting for a new SDSS-82 catalogue, which does not suffer from the issue of multiple sources per object due to including all exposure extractions.



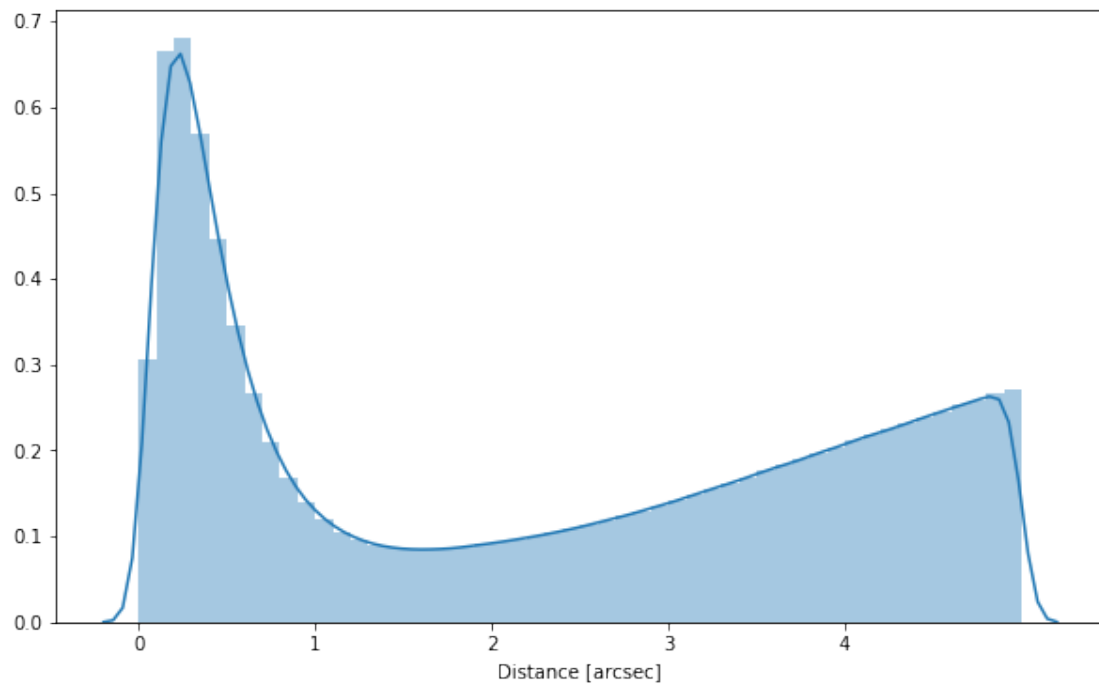
1.4 Add DECam (DECaLS and DES)



1.5 Add RCSLenS



1.6 Add IRAC (SHELA and SpIES)



1.6.1 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 [21] : <IPython.core.display.HTML object>

1.7 III - Merging flags and stellerity

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.

This now happens in the final merging loop

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 stellerity columns indicating the probability (0 to 1) of each source being a star. We merge these columns taking the highest value.

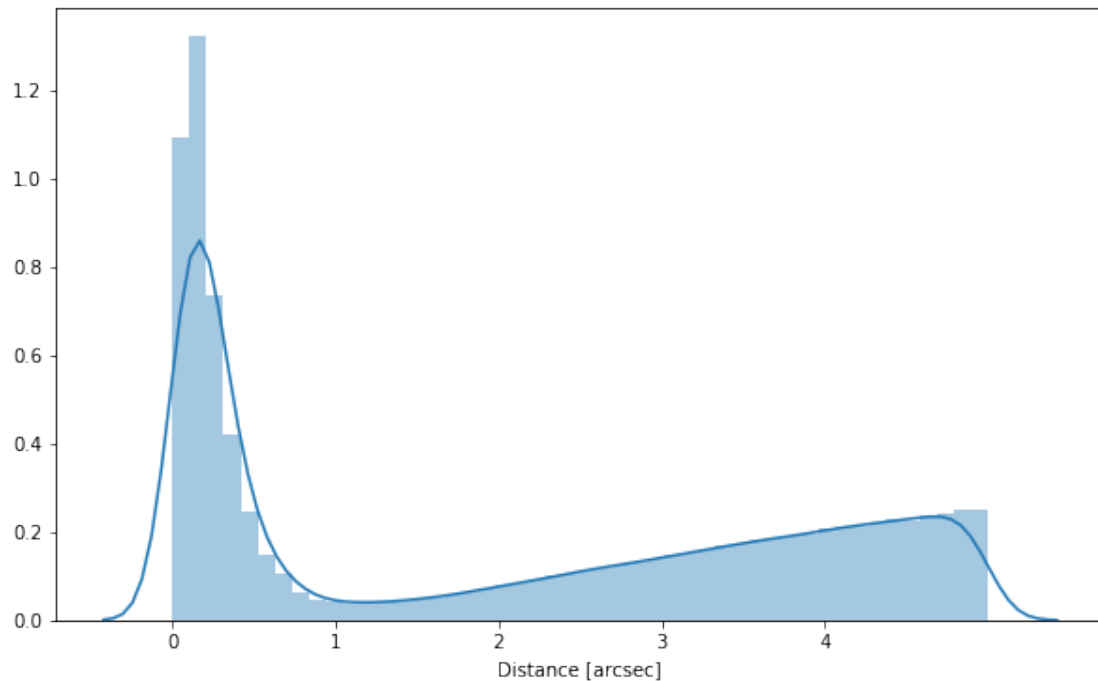
vista_stellariry, las_stellariry, sdss_stellariry, decam_stellariry, rcs_stellariry, irac_stella

1.8 IV - Adding E(B-V) column

1.9 V - Adding HELP unique identifiers and field columns

OK!

1.10 VI - Adding spec-z



1.11 VII.a Wavelength domain coverage

We add a binary flag `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 but 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 the different depths in the catalogue we are using.

1.12 VII.b Wavelength domain detection

We add a binary flag `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.

This now takes place at the end of the notebook when the photometry is folded in.

1.13 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.

7885 master list rows had multiple associations.

```
['hsc_id', 'vics82_id', 'vhs_id', 'vista_intid', 'las_id', 'ps1_id', 'sdss_id', 'decam_intid', 'r
```

1.14 IX - Adding HEALPix index

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

1.15 X - Saving the catalogue

```
Missing columns: {'specz_id', 'decam_intid', 'zspec', 'zspec_association_flag', 'ps1_id', 'rcs_i
```

1.16 XI - folding in the photometry

On HS82 there is too much data to load all in to memory at once so we perform the cross matching without photometry columns. Only now do we fold in the photometry data by first cutting the catalogue up in to manageable sizes.

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1.17 How to generate final catalogue

After this notebook has been run there will be a set of sub catalogues in data/tiles/

These need to be stacked using stilts:

For many purposes this file may be too large. In order to run checks and diagnostics we typically take a subset using something like:

2.5_Join

March 8, 2018

1 Herschel Stripe 82 master catalogue

This notebook presents the merge of the various pristine catalogues to produce HELP mater catalogue on Herschel Stripe 82.

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 12:09:02.360306

```
/Users/rs548/anaconda/envs/herschelhelp_internal/lib/python3.6/site-packages/seaborn/apionly.py:  
warnings.warn(msg, UserWarning)
```

1.1 XI - folding in the photometry

On HS82 there is too much data to load all in to memory at once so we perform the cross matching without photometry columns. Only now do we fold in the photometry data by first cutting the catalogue up in to manageable sizes.

12

1.2 How to generate final catalogue

After this notebook has been run there will be a set of sub catalogues in `data/tiles/`

These need to be stacked using `stilts`:

For many purposes this file may be too large. In order to run checks and diagnostics we typically take a subset using something like:

3_Checks_and_diagnostics

March 8, 2018

1 Herschel Stripe 82 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:
2018-03-05 12:51:28.117841

Diagnostics done using: `master_catalogue_herschel-stripe-82_RANDOM10PCSAMPLE_20180301.fits`

1.2 0 - Quick checks

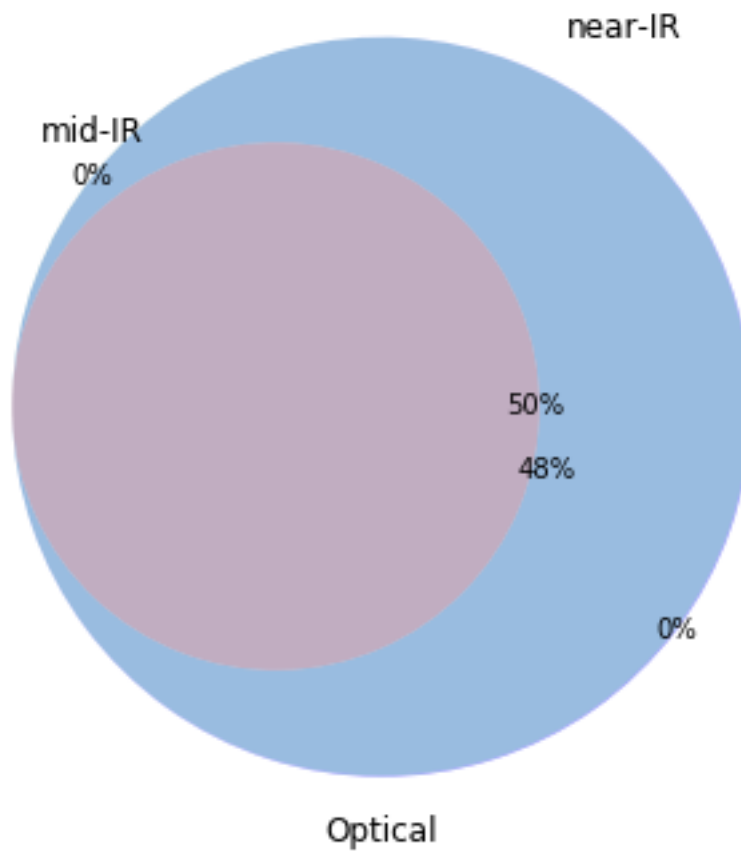
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/core/numeric.py:301:
  format(shape, fill_value, array(fill_value).dtype), FutureWarning)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/numpy/core/numeric.py:301:
  format(shape, fill_value, array(fill_value).dtype),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

Table shows only problematic columns.

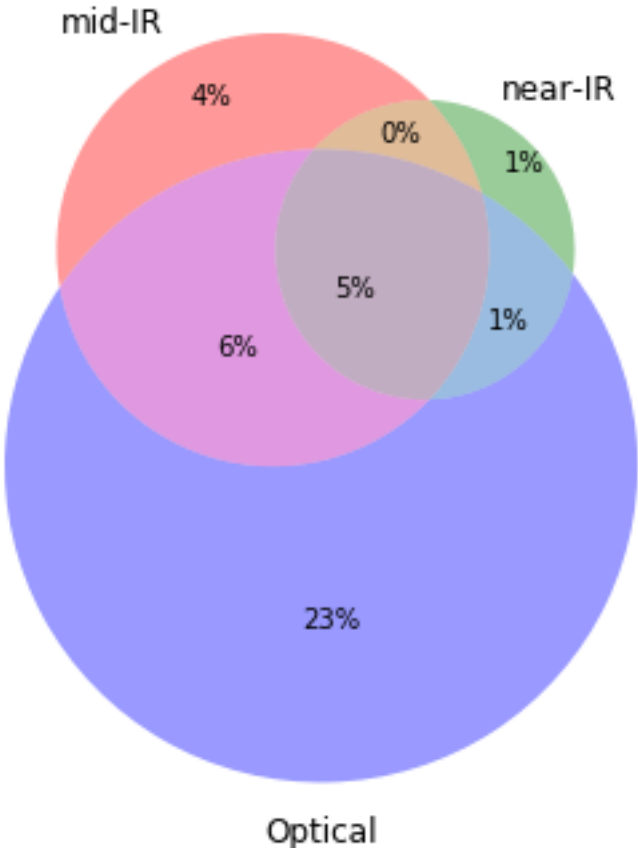
`Out[4]:` <IPython.core.display.HTML object>

1.3 I - Summary of wavelength domains

Wavelength domain observations

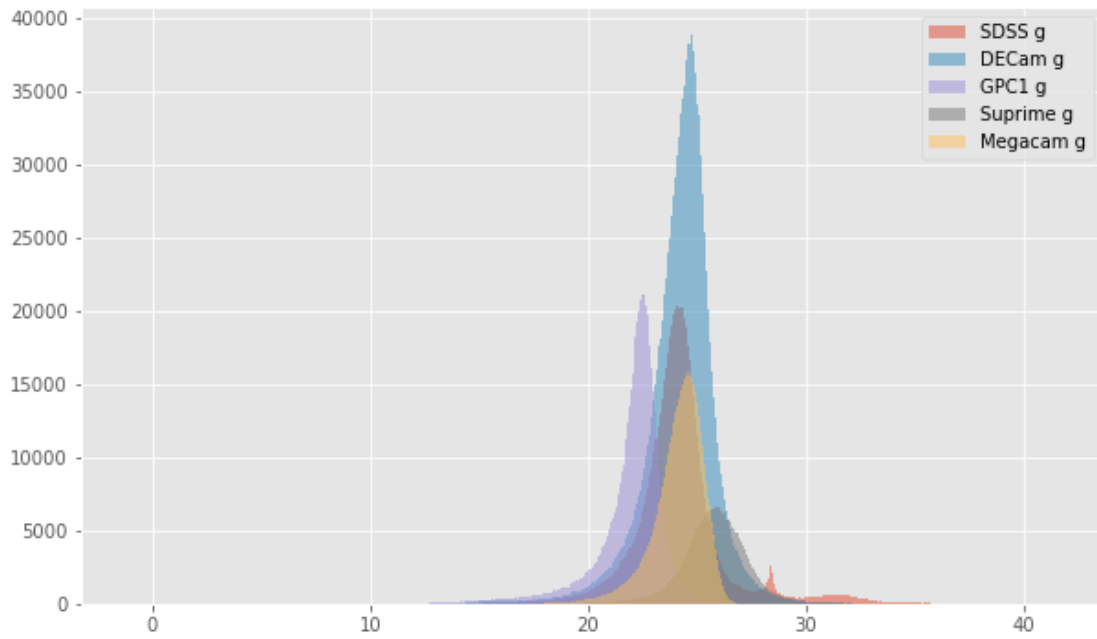
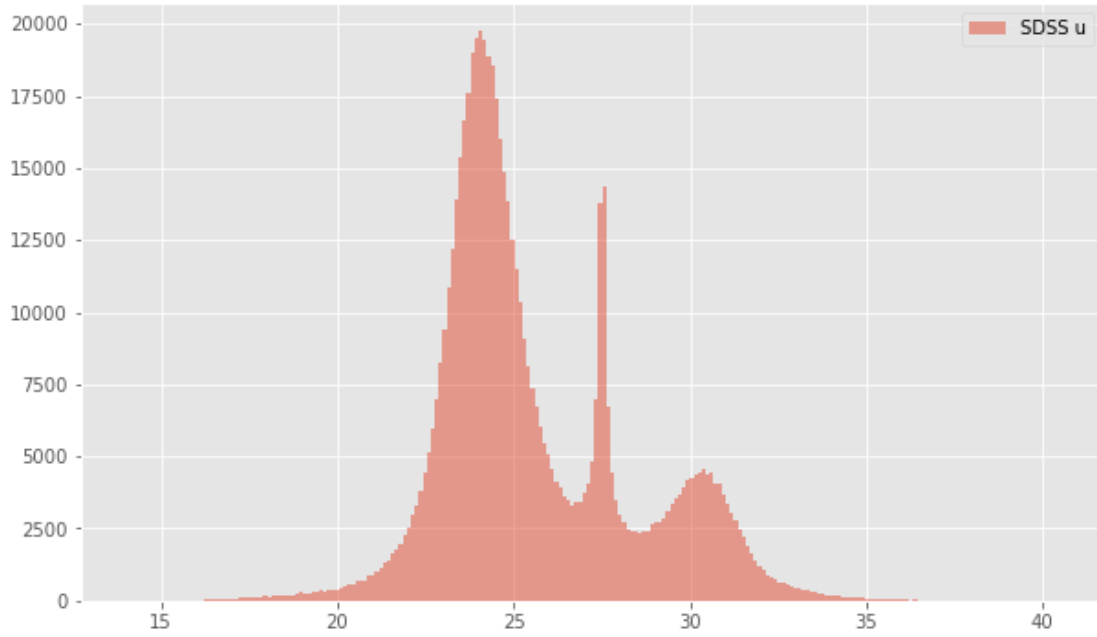


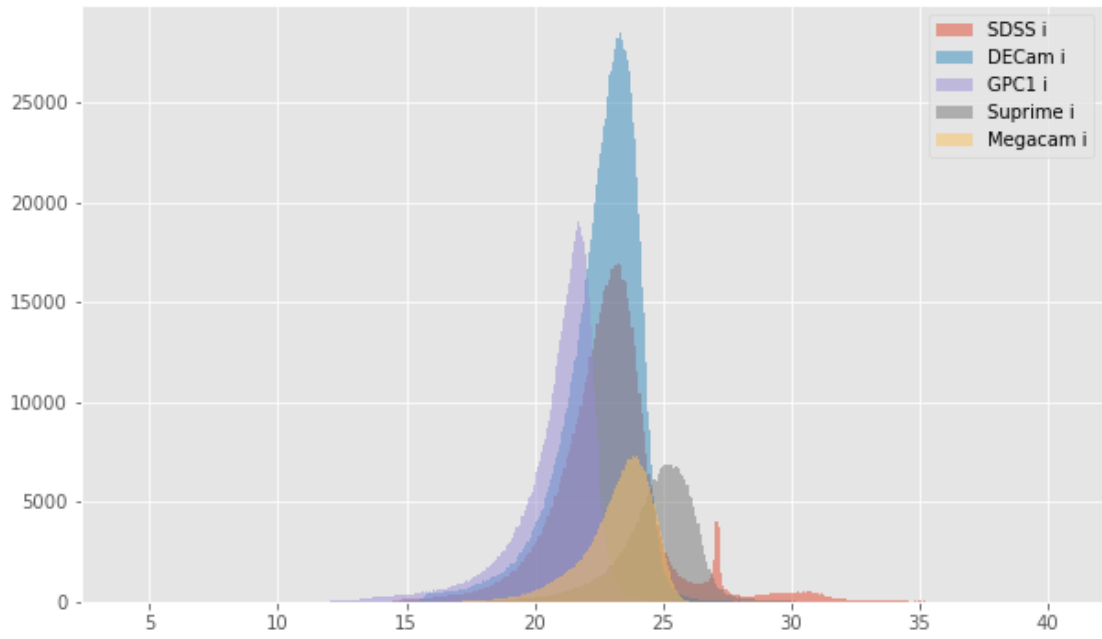
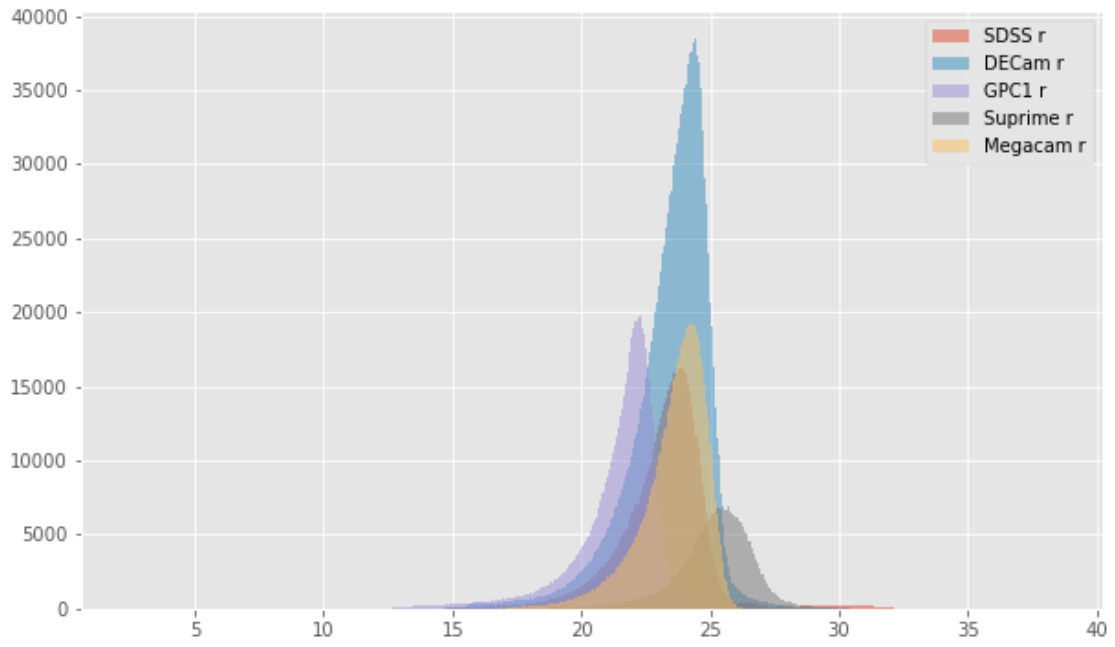
Detection of the 3,165,182 sources detected in any wavelength domains (among 5,019,646 sources)

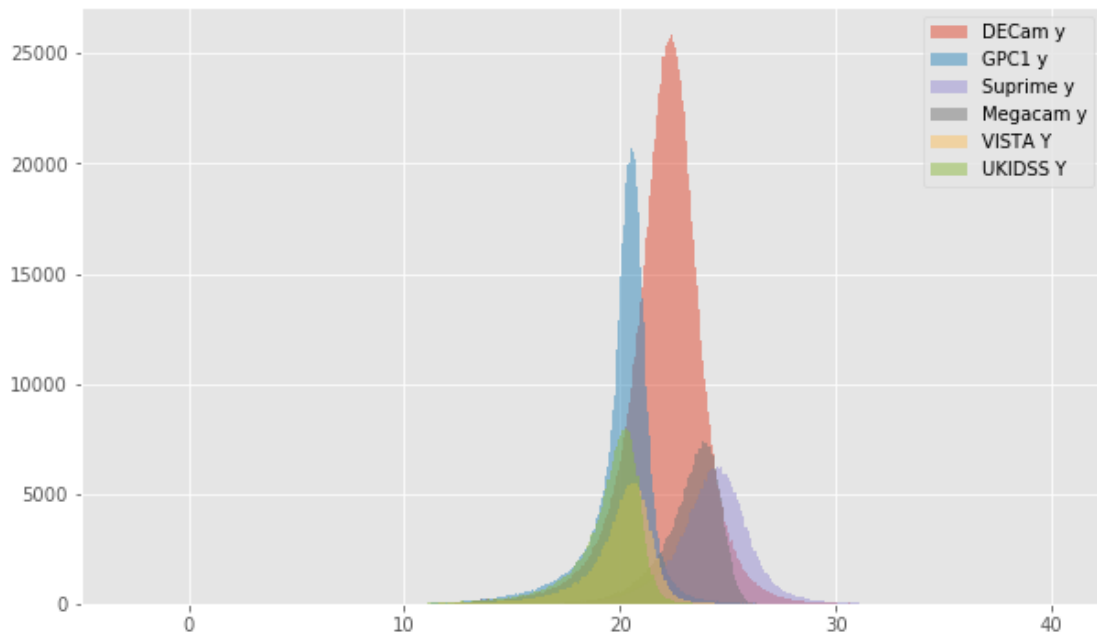
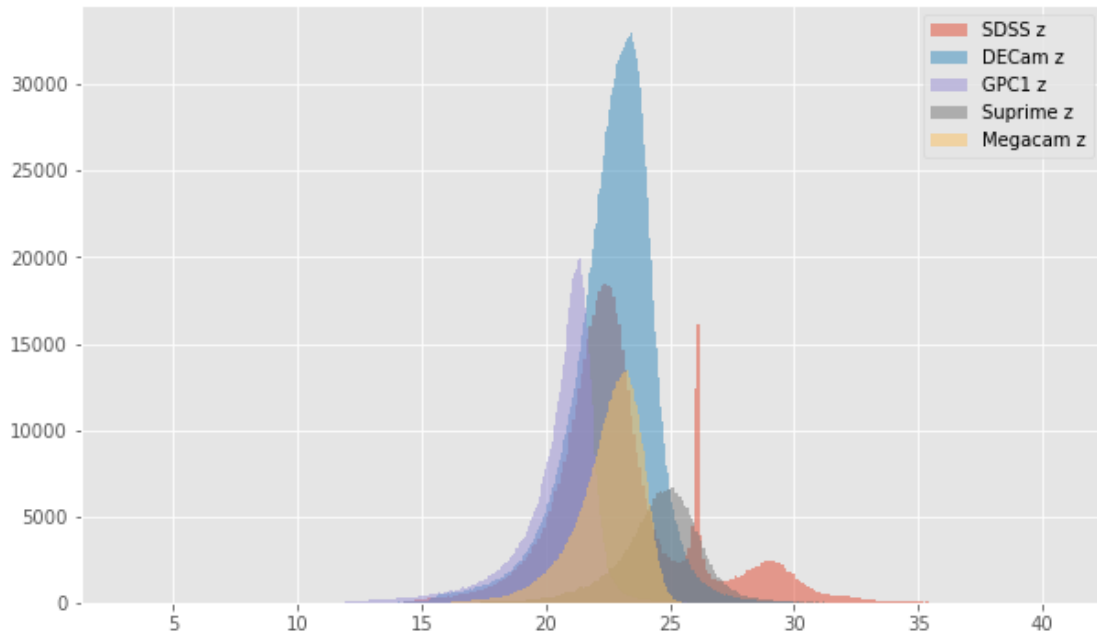


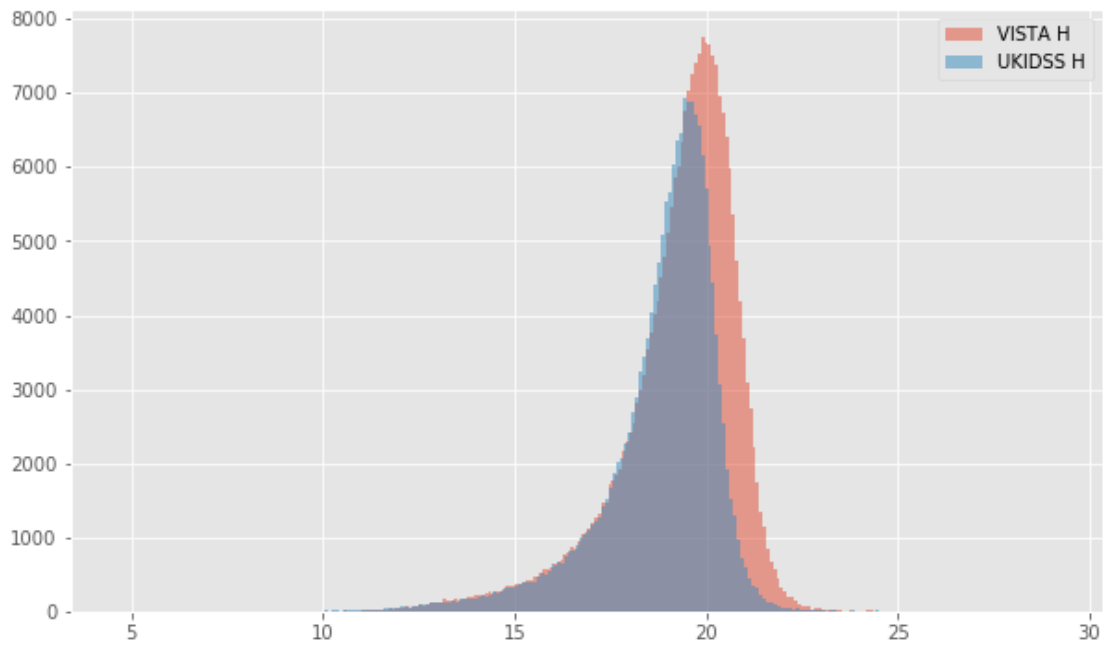
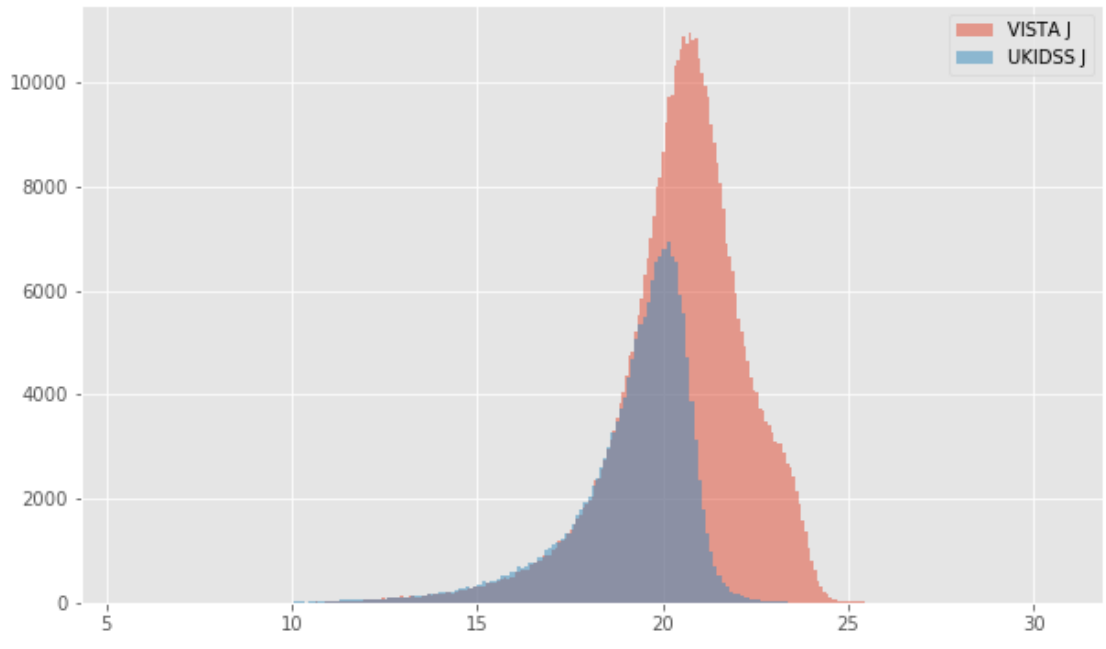
1.4 II - Comparing magnitudes in similar filters

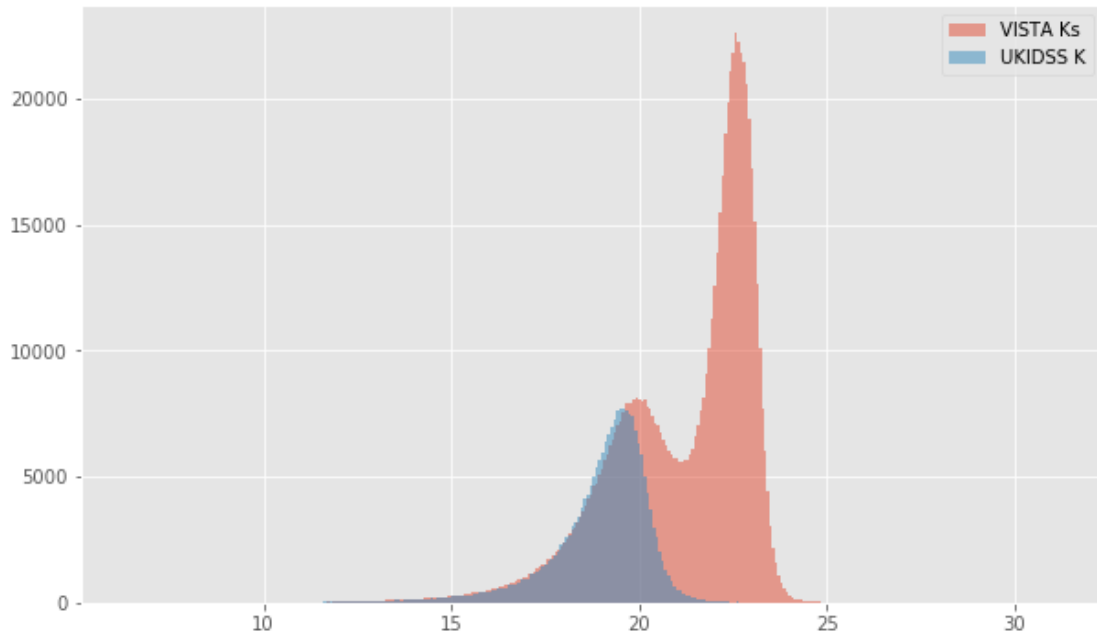
The master list is composed of several catalogues containing magnitudes in similar filters on different instruments. We are comparing the magnitudes in these corresponding filters.





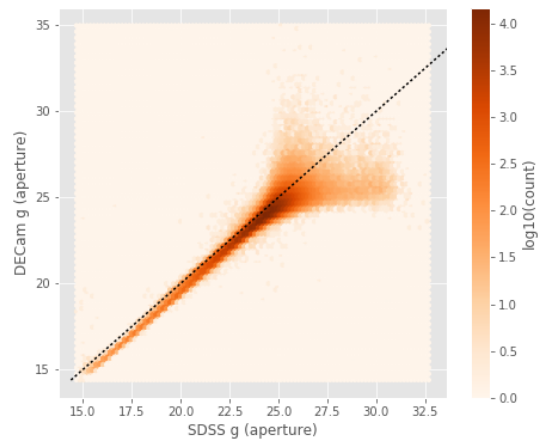
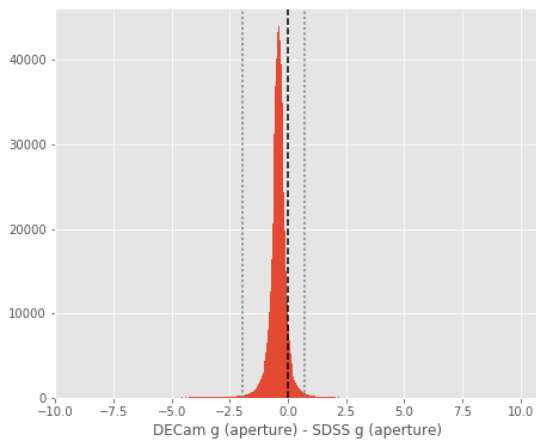






DECam g (aperture) - SDSS g (aperture):

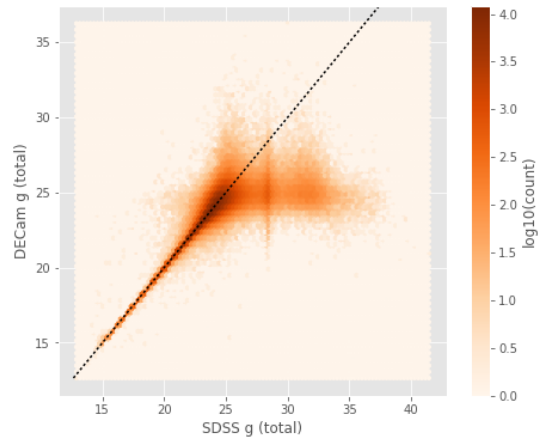
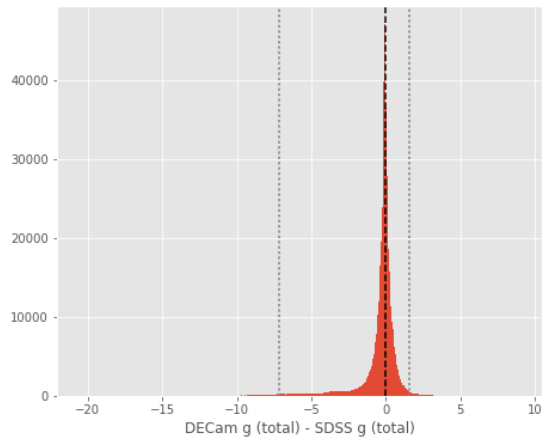
- Median: -0.40
- Median Absolute Deviation: 0.17
- 1% percentile: -1.9671457099914549
- 99% percentile: 0.703652725219726



DECam g (total) - SDSS g (total):

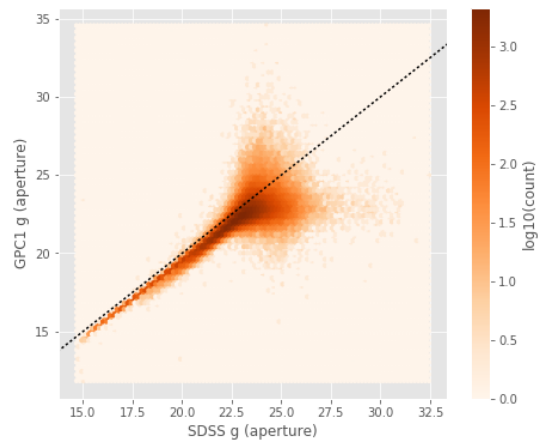
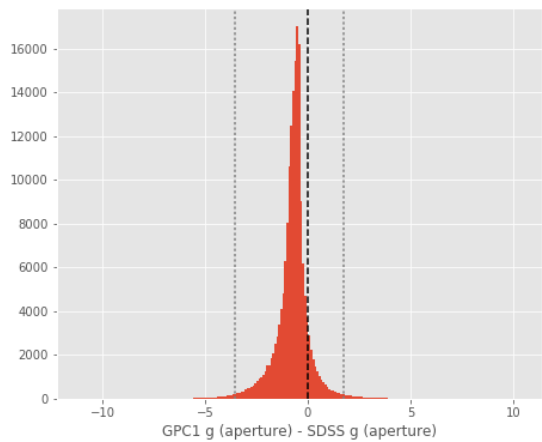
- Median: -0.09
- Median Absolute Deviation: 0.26

- 1% percentile: -7.1443001174926755
- 99% percentile: 1.5880007362365758



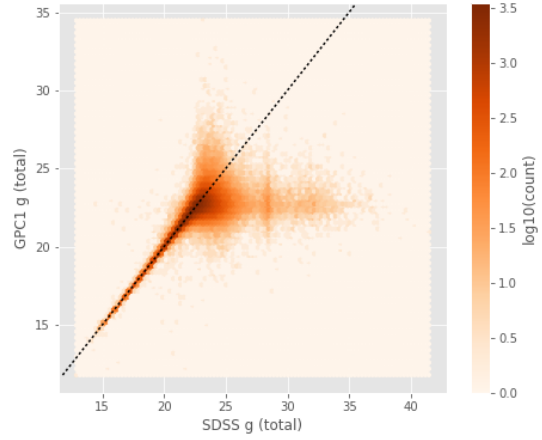
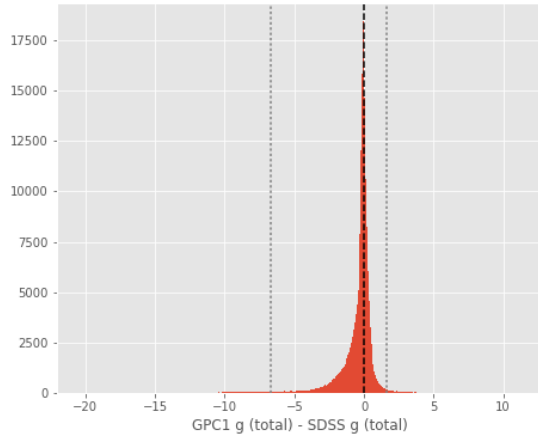
GPC1 g (aperture) - SDSS g (aperture):

- Median: -0.65
- Median Absolute Deviation: 0.30
- 1% percentile: -3.552445411682129
- 99% percentile: 1.7575154304504395



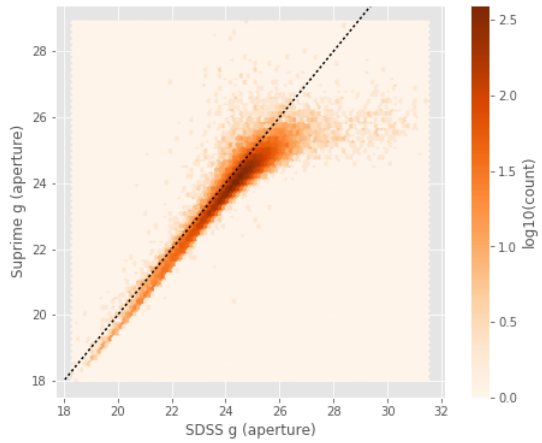
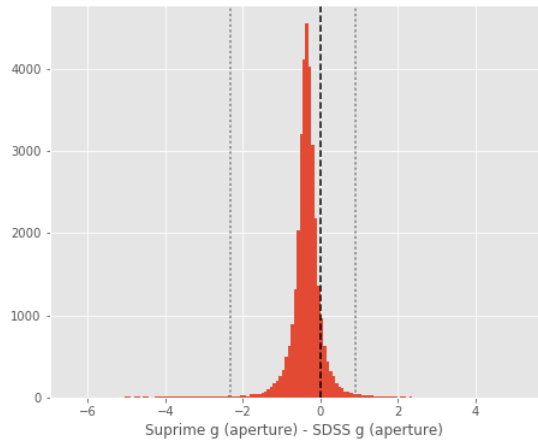
GPC1 g (total) - SDSS g (total):

- Median: -0.13
- Median Absolute Deviation: 0.30
- 1% percentile: -6.71096441268921
- 99% percentile: 1.6234559440612586



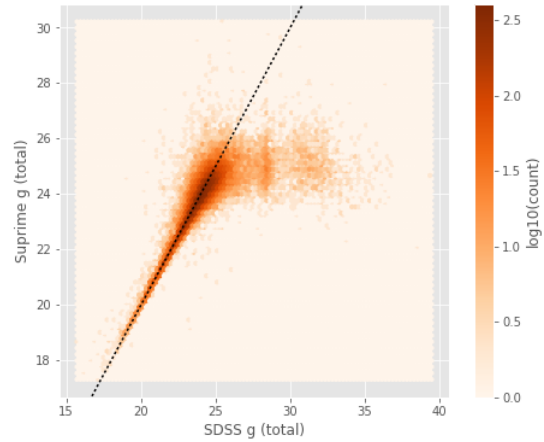
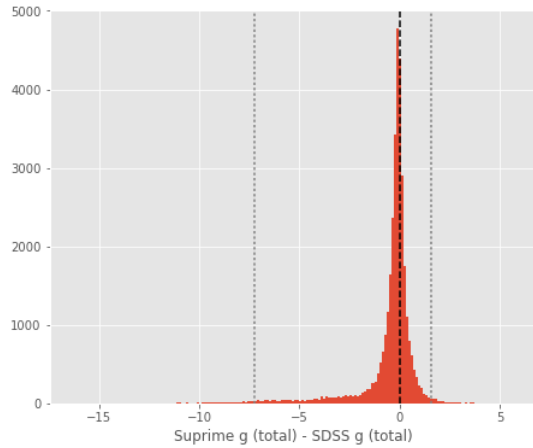
Suprime g (aperture) - SDSS g (aperture):

- Median: -0.35
- Median Absolute Deviation: 0.16
- 1% percentile: -2.3089782333374025
- 99% percentile: 0.8983423233032231



Suprime g (total) - SDSS g (total):

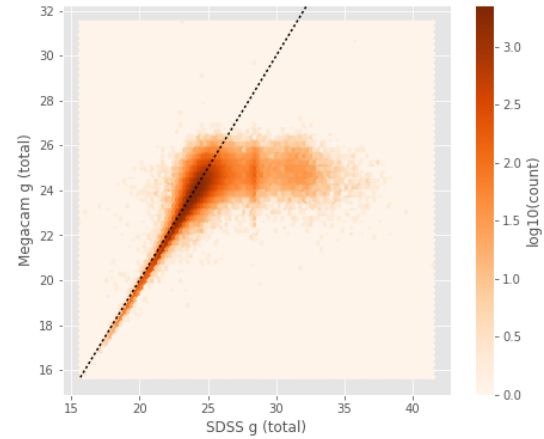
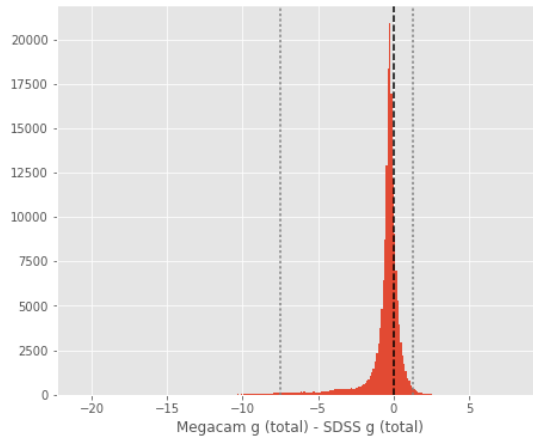
- Median: -0.13
- Median Absolute Deviation: 0.27
- 1% percentile: -7.252045516967773
- 99% percentile: 1.5834791946411273



One of `m_ap_sdss_g` and `m_ap_megacam_g` is empty or missing any cross matches.

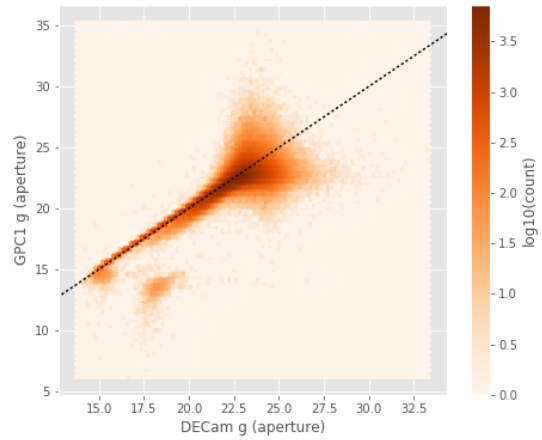
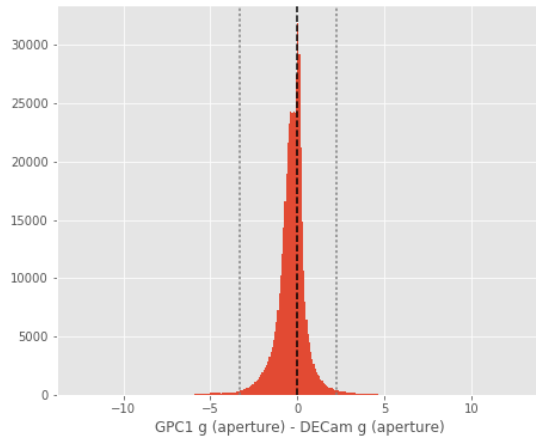
Megacam g (total) - SDSS g (total):

- Median: -0.29
- Median Absolute Deviation: 0.29
- 1% percentile: -7.513359050750732
- 99% percentile: 1.2580677986144988



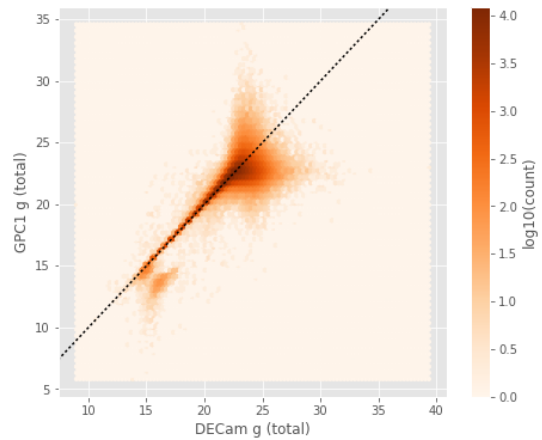
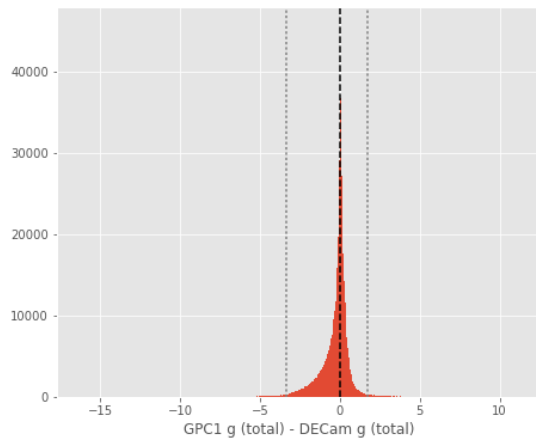
GPC1 g (aperture) - DECam g (aperture):

- Median: -0.26
- Median Absolute Deviation: 0.39
- 1% percentile: -3.312507438659668
- 99% percentile: 2.2125233650207523



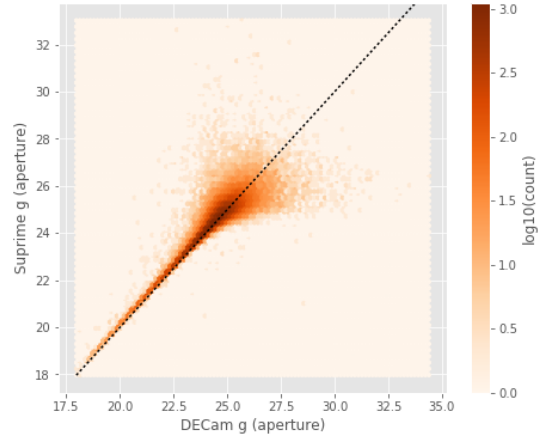
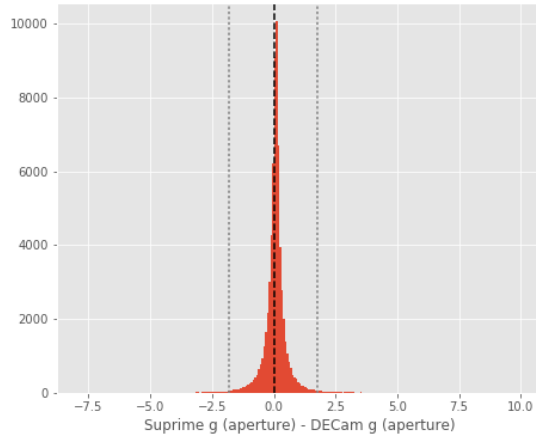
GPC1 g (total) - DECam g (total):

- Median: -0.03
- Median Absolute Deviation: 0.27
- 1% percentile: -3.3497455978393553
- 99% percentile: 1.7369924545288078



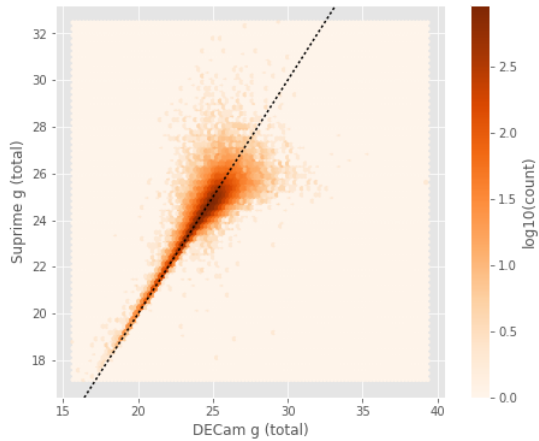
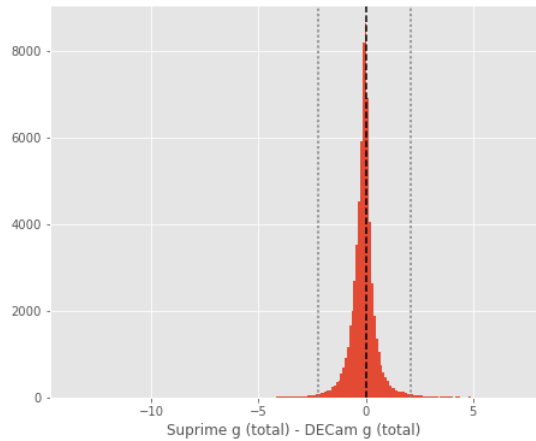
Suprime g (aperture) - DECam g (aperture):

- Median: 0.09
- Median Absolute Deviation: 0.16
- 1% percentile: -1.802632122039795
- 99% percentile: 1.7788101291656575



Suprime g (total) - DECam g (total):

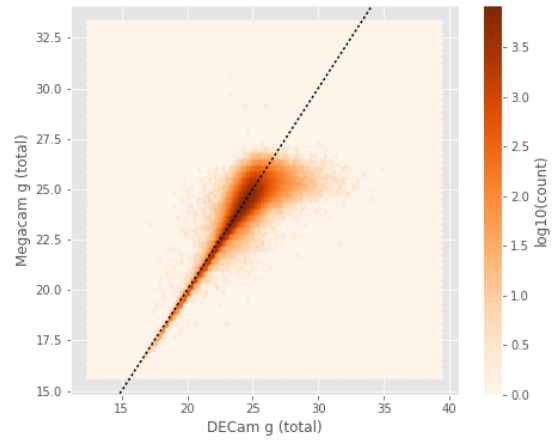
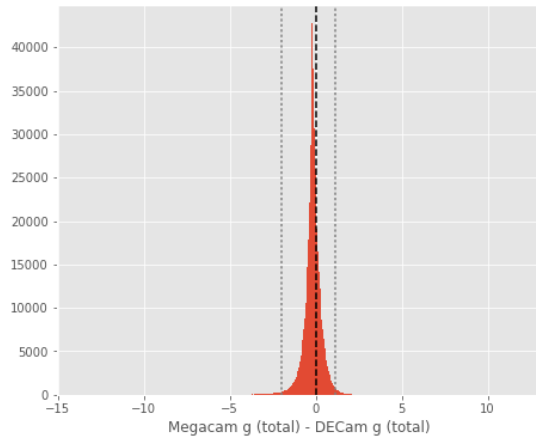
- Median: -0.07
- Median Absolute Deviation: 0.24
- 1% percentile: -2.228298988342285
- 99% percentile: 2.0991744232177716



One of m_ap_decam_g and m_ap_megacam_g is empty or missing any cross matches.

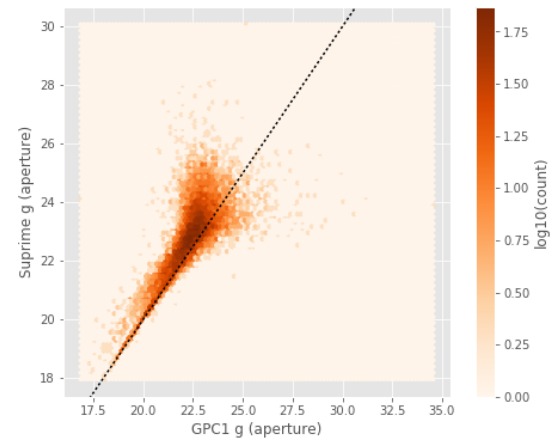
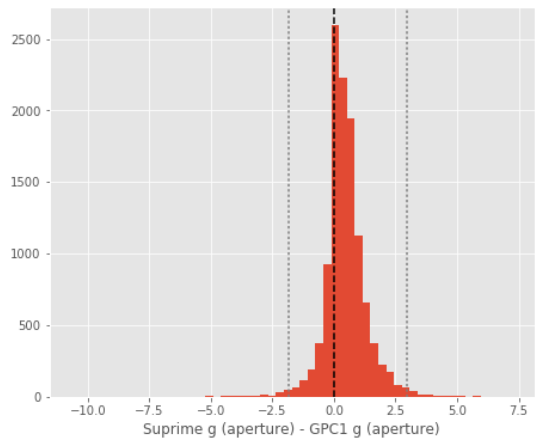
Megacam g (total) - DECam g (total):

- Median: -0.18
- Median Absolute Deviation: 0.22
- 1% percentile: -1.977711238861084
- 99% percentile: 1.111849880218506



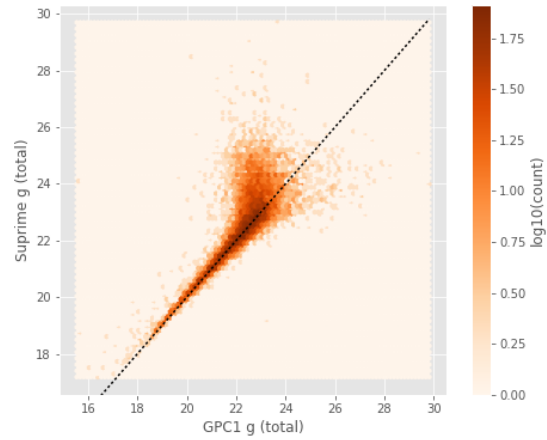
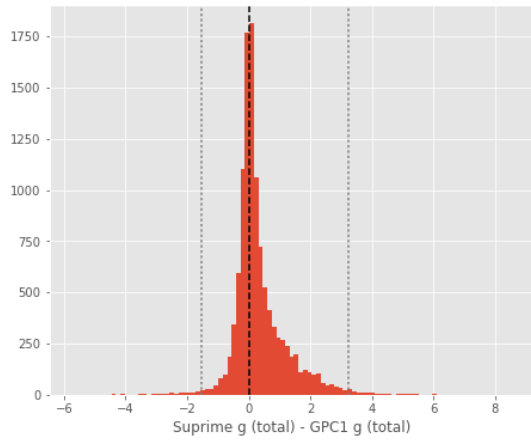
Suprime g (aperture) - GPC1 g (aperture):

- Median: 0.39
- Median Absolute Deviation: 0.40
- 1% percentile: -1.8537890625
- 99% percentile: 2.9814341735839847



Suprime g (total) - GPC1 g (total):

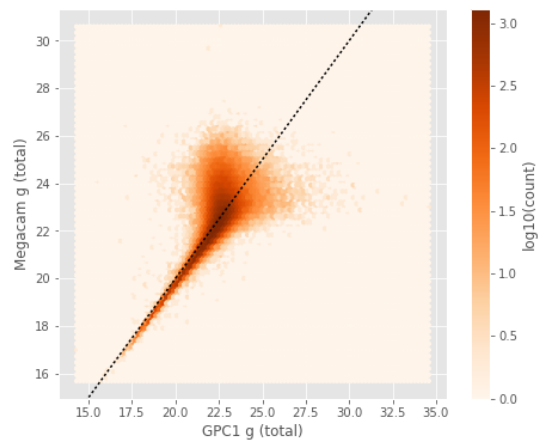
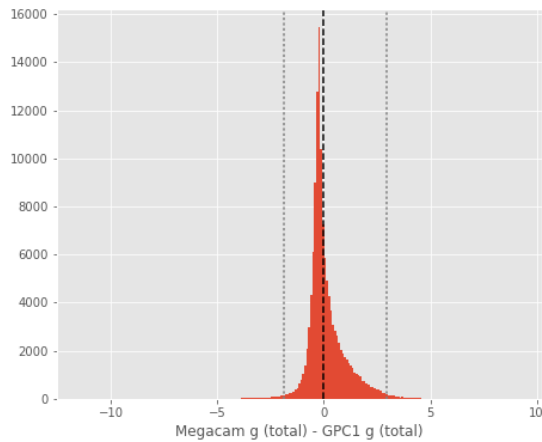
- Median: 0.12
- Median Absolute Deviation: 0.29
- 1% percentile: -1.529188232421875
- 99% percentile: 3.2246953582763687



One of `m_ap_gpc1_g` and `m_ap_megacam_g` is empty or missing any cross matches.

Megacam g (total) - GPC1 g (total):

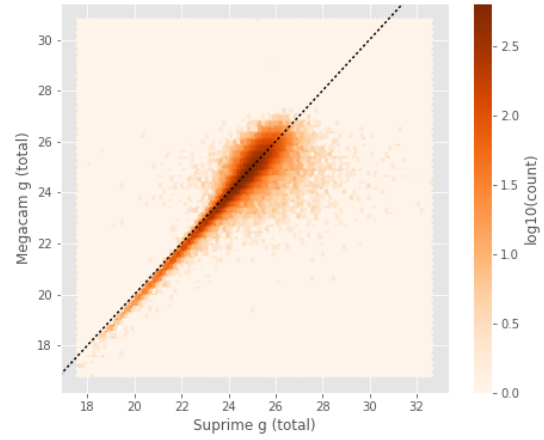
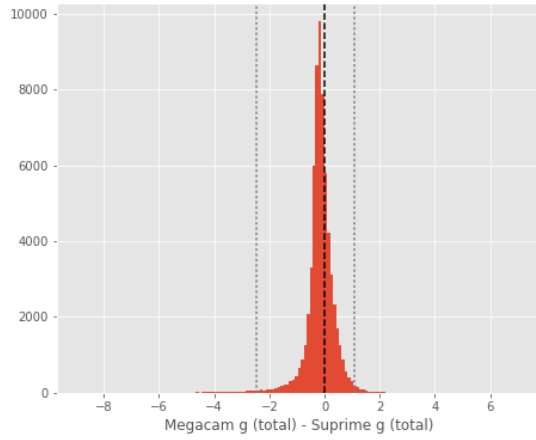
- Median: -0.14
- Median Absolute Deviation: 0.32
- 1% percentile: -1.9020120429992675
- 99% percentile: 2.971358852386471



One of `m_ap_suprime_g` and `m_ap_megacam_g` is empty or missing any cross matches.

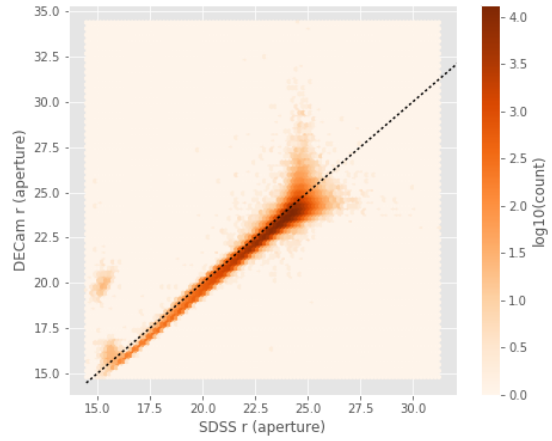
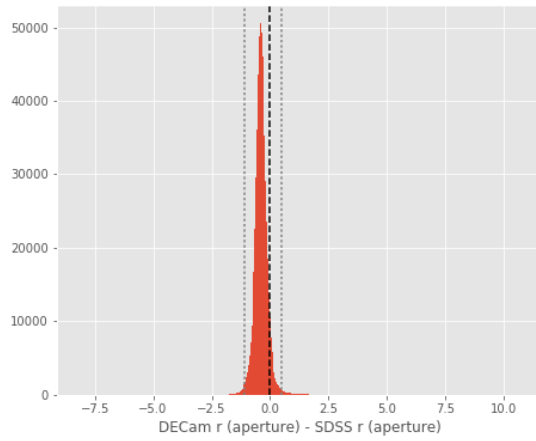
Megacam g (total) - Suprime g (total):

- Median: -0.16
- Median Absolute Deviation: 0.21
- 1% percentile: -2.453547477722168
- 99% percentile: 1.0863218307495117



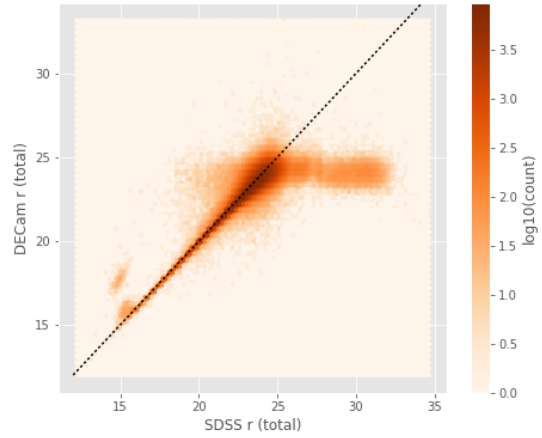
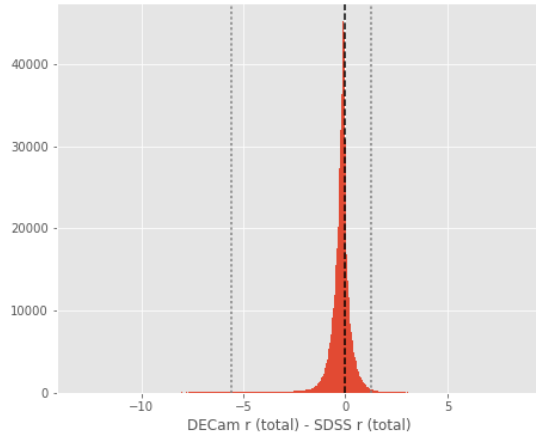
DECam r (aperture) - SDSS r (aperture):

- Median: -0.39
- Median Absolute Deviation: 0.15
- 1% percentile: -1.0931969642639159
- 99% percentile: 0.49852478027344027



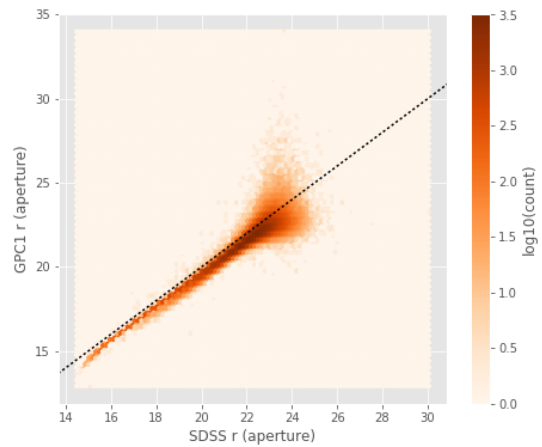
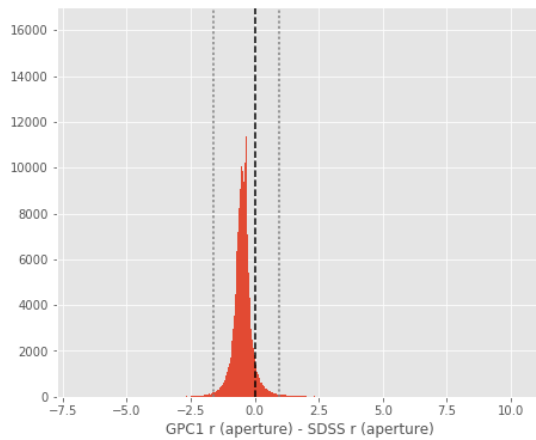
DECam r (total) - SDSS r (total):

- Median: -0.17
- Median Absolute Deviation: 0.20
- 1% percentile: -5.564190902709961
- 99% percentile: 1.2825418090820286



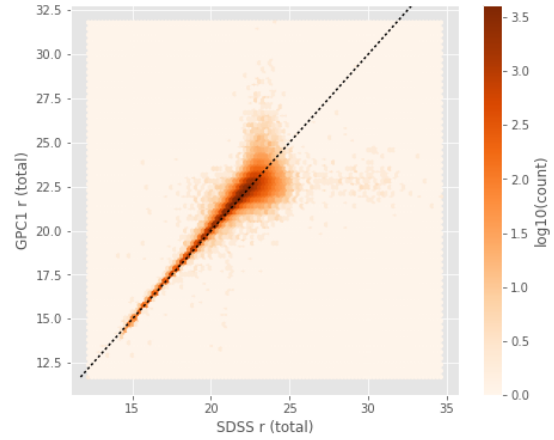
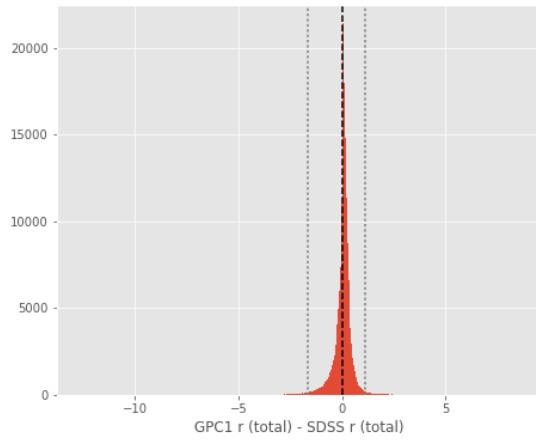
GPC1 r (aperture) - SDSS r (aperture):

- Median: -0.45
- Median Absolute Deviation: 0.17
- 1% percentile: -1.5938448333740234
- 99% percentile: 0.959390010833745



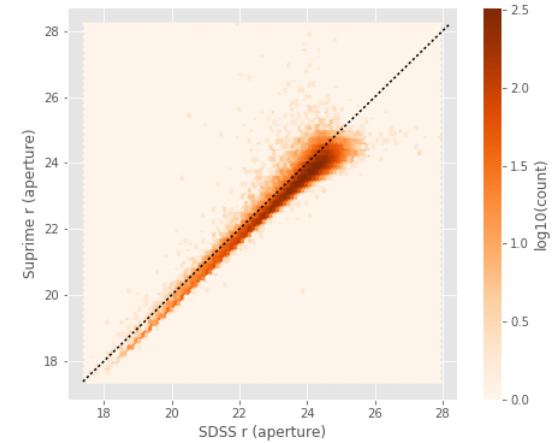
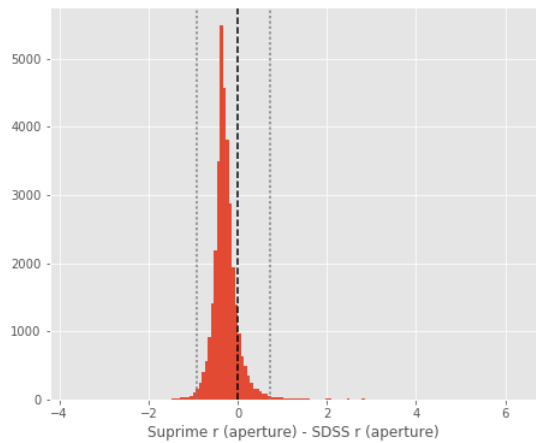
GPC1 r (total) - SDSS r (total):

- Median: 0.07
- Median Absolute Deviation: 0.14
- 1% percentile: -1.6326355743408203
- 99% percentile: 1.096263542175293



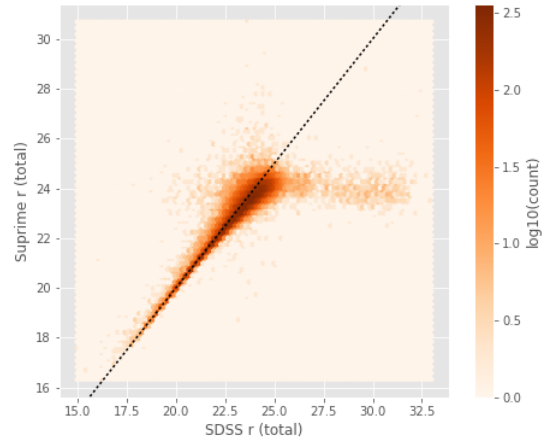
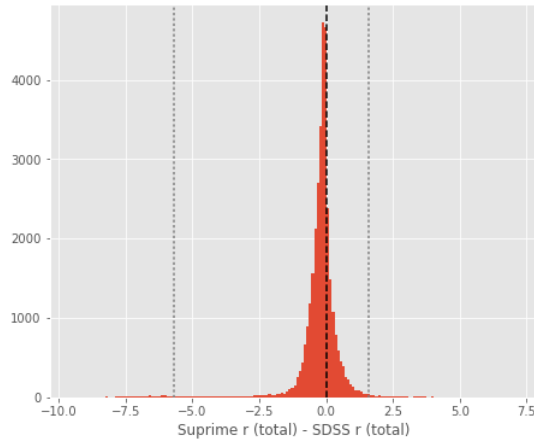
Suprime r (aperture) - SDSS r (aperture):

- Median: -0.31
- Median Absolute Deviation: 0.13
- 1% percentile: -0.9293233489990235
- 99% percentile: 0.7317904663085901



Suprime r (total) - SDSS r (total):

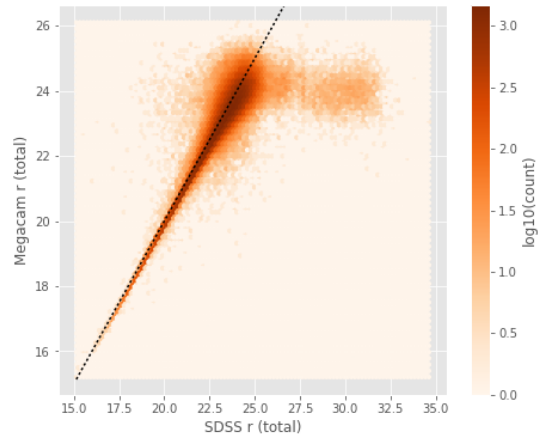
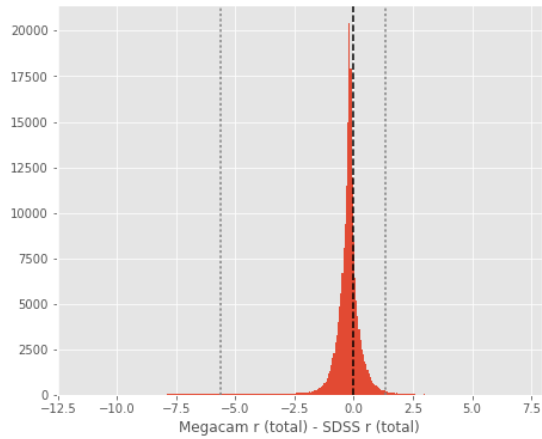
- Median: -0.13
- Median Absolute Deviation: 0.21
- 1% percentile: -5.688134784698486
- 99% percentile: 1.600395870208742



One of `m_ap_sdss_r` and `m_ap_megacam_r` is empty or missing any cross matches.

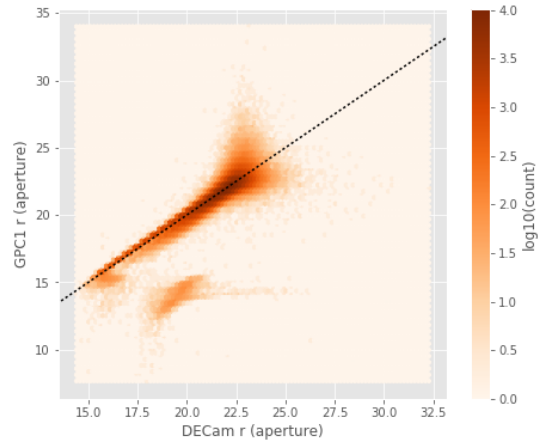
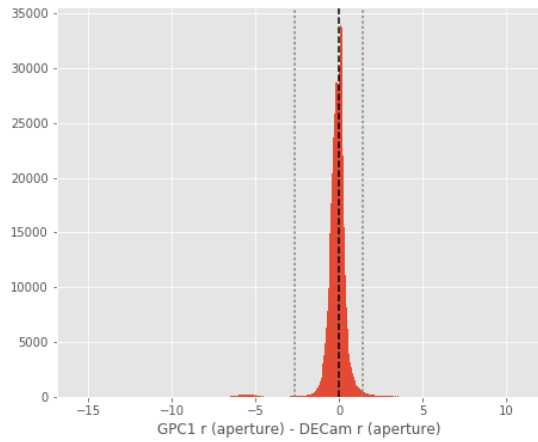
Megacam r (total) - SDSS r (total):

- Median: -0.20
- Median Absolute Deviation: 0.21
- 1% percentile: -5.614786605834961
- 99% percentile: 1.3313832473754883



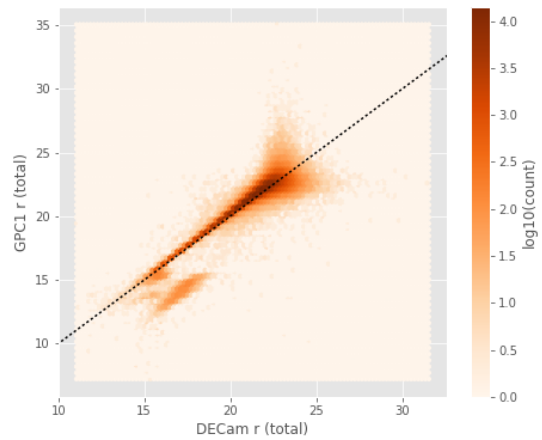
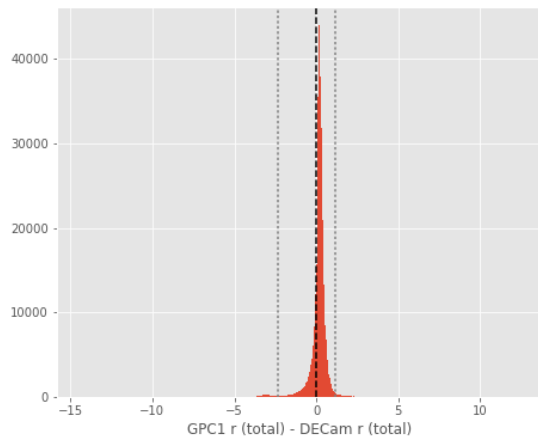
GPC1 r (aperture) - DECam r (aperture):

- Median: -0.07
- Median Absolute Deviation: 0.26
- 1% percentile: -2.6482713890075678
- 99% percentile: 1.4242031288146908



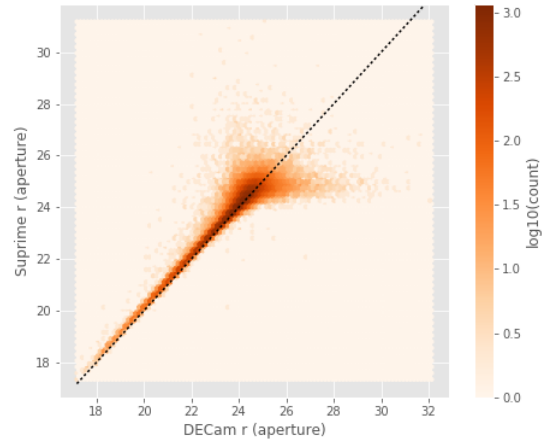
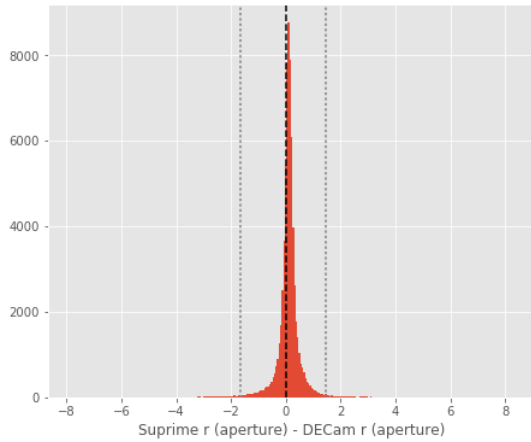
GPC1 r (total) - DECam r (total):

- Median: 0.20
- Median Absolute Deviation: 0.14
- 1% percentile: -2.377806682586695
- 99% percentile: 1.1733572959899896



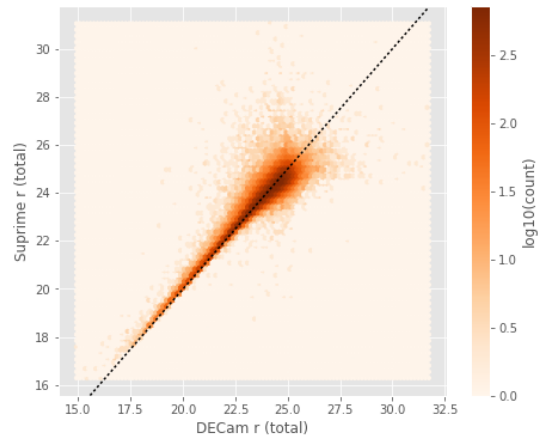
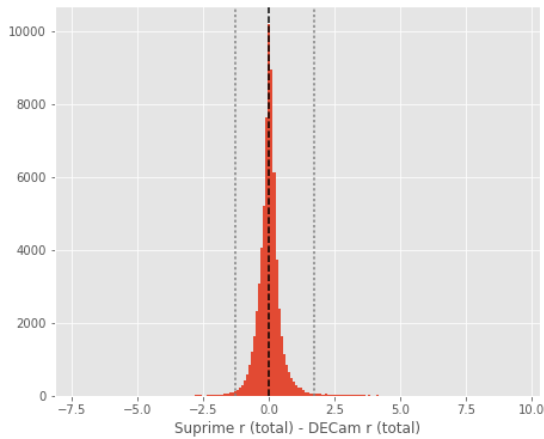
Suprime r (aperture) - DECam r (aperture):

- Median: 0.10
- Median Absolute Deviation: 0.13
- 1% percentile: -1.6590740203857424
- 99% percentile: 1.447081184387196



Suprime r (total) - DECam r (total):

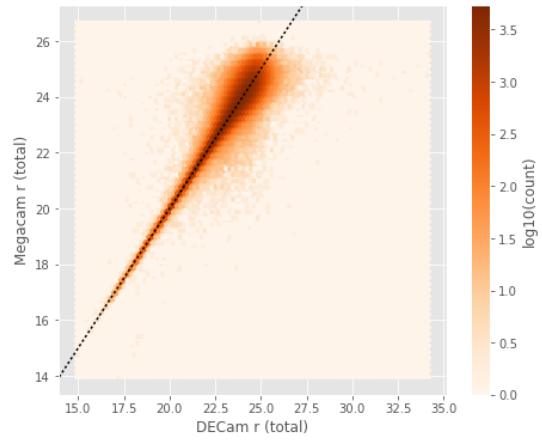
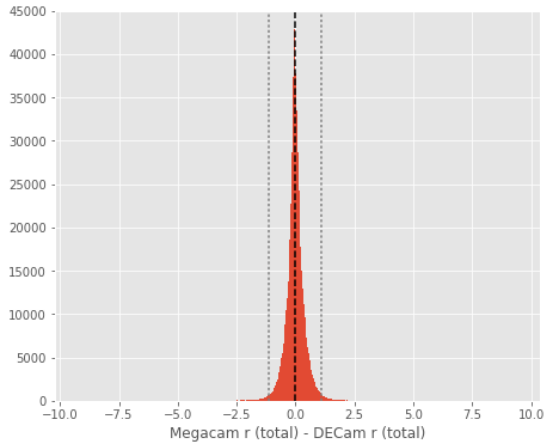
- Median: 0.01
- Median Absolute Deviation: 0.19
- 1% percentile: -1.2872486114501953
- 99% percentile: 1.7412889480590794



One of `m_ap_decam_r` and `m_ap_megacam_r` is empty or missing any cross matches.

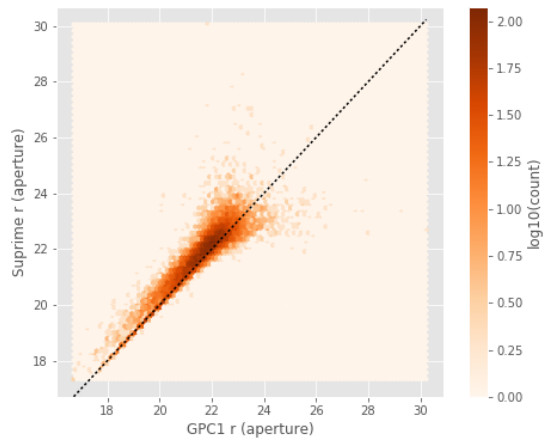
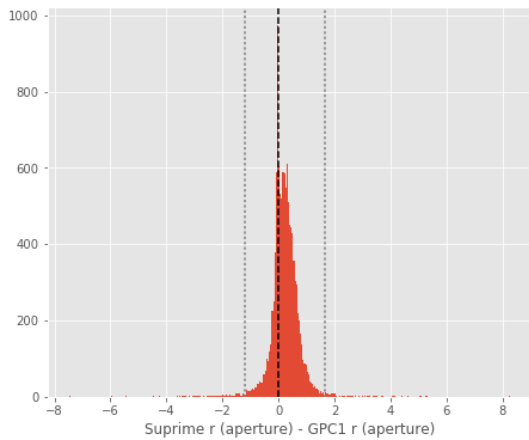
Megacam r (total) - DECam r (total):

- Median: -0.02
- Median Absolute Deviation: 0.18
- 1% percentile: -1.1506827545166016
- 99% percentile: 1.1078530883789068



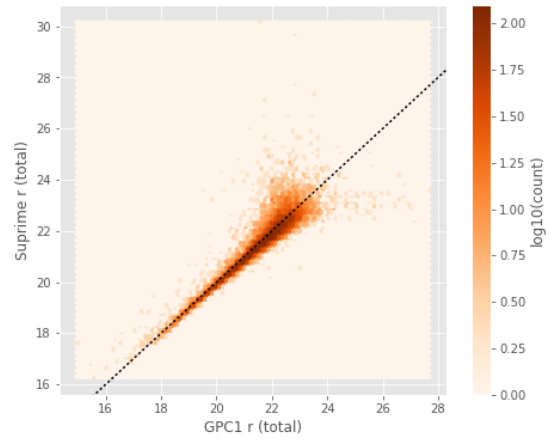
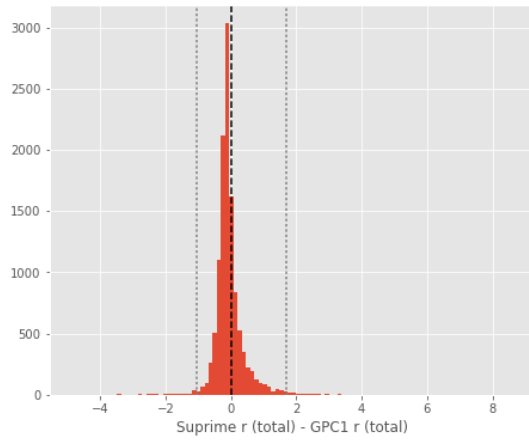
Suprime r (aperture) - GPC1 r (aperture):

- Median: 0.20
- Median Absolute Deviation: 0.24
- 1% percentile: -1.2068672180175781
- 99% percentile: 1.6733665466308594



Suprime r (total) - GPC1 r (total):

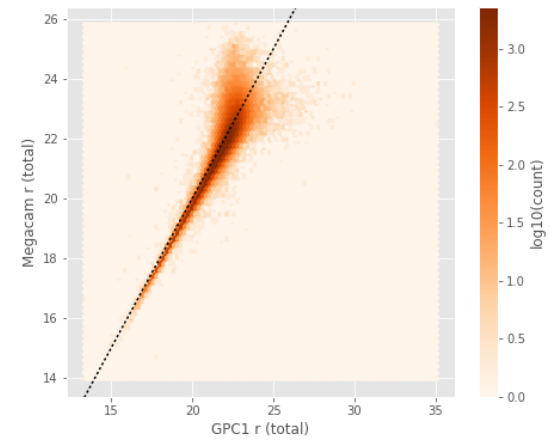
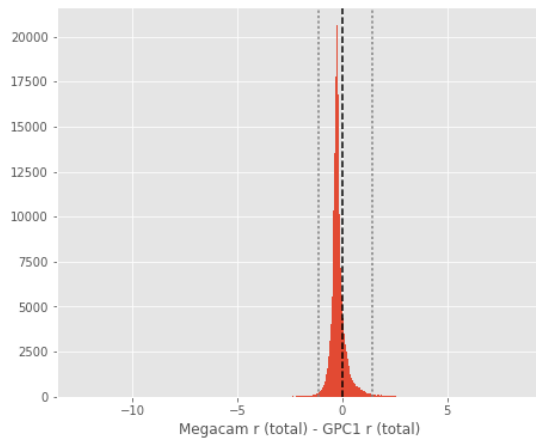
- Median: -0.11
- Median Absolute Deviation: 0.15
- 1% percentile: -1.0372185897827146
- 99% percentile: 1.683487567901607



One of `m_ap_gpc1_r` and `m_ap_megacam_r` is empty or missing any cross matches.

Megacam r (total) - GPC1 r (total):

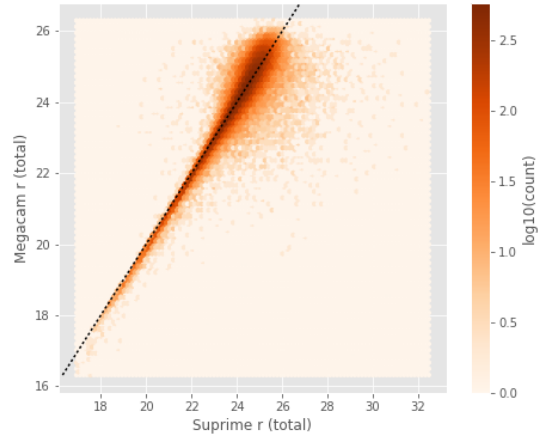
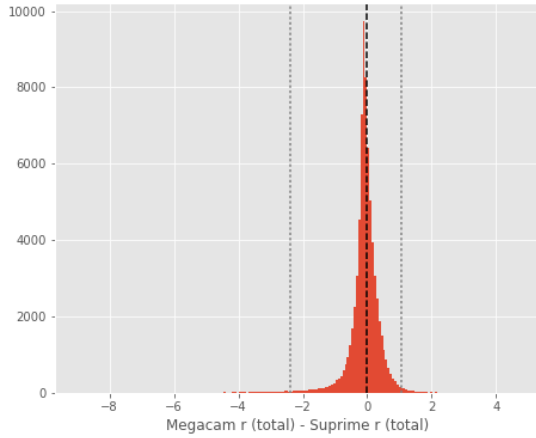
- Median: -0.23
- Median Absolute Deviation: 0.14
- 1% percentile: -1.1535848999023437
- 99% percentile: 1.4095993041992188



One of `m_ap_suprime_r` and `m_ap_megacam_r` is empty or missing any cross matches.

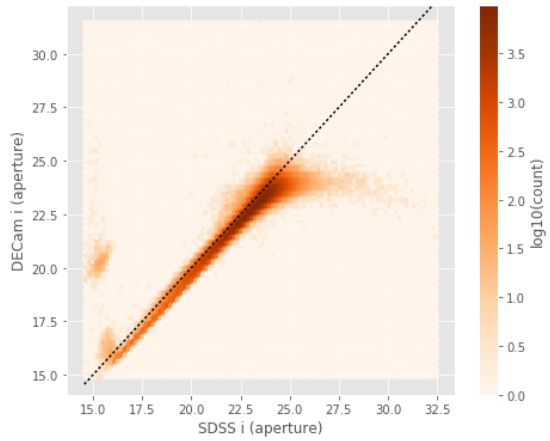
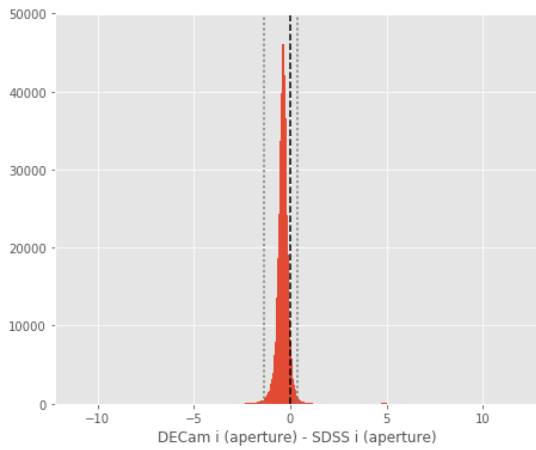
Megacam r (total) - Suprime r (total):

- Median: -0.07
- Median Absolute Deviation: 0.17
- 1% percentile: -2.4046614074707033
- 99% percentile: 1.03928192138672



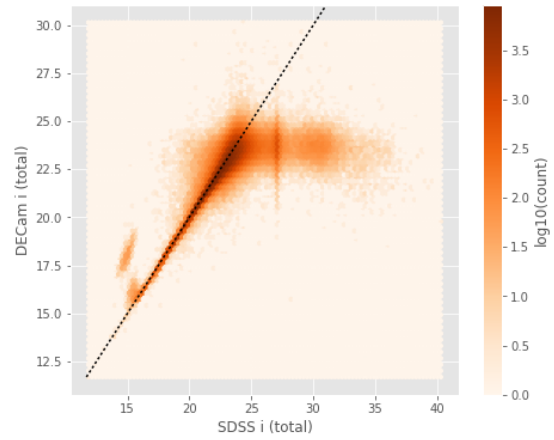
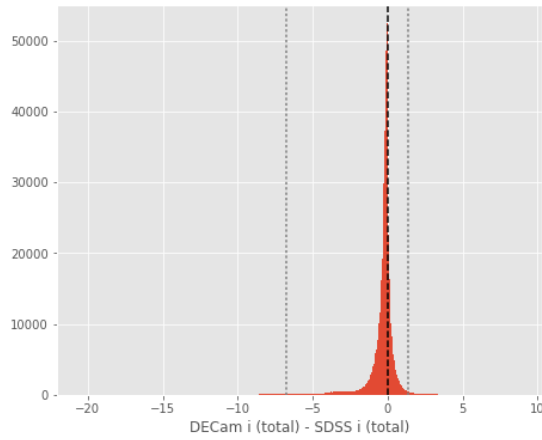
DECam i (aperture) - SDSS i (aperture):

- Median: -0.37
- Median Absolute Deviation: 0.15
- 1% percentile: -1.3394854736328126
- 99% percentile: 0.37291526794433594



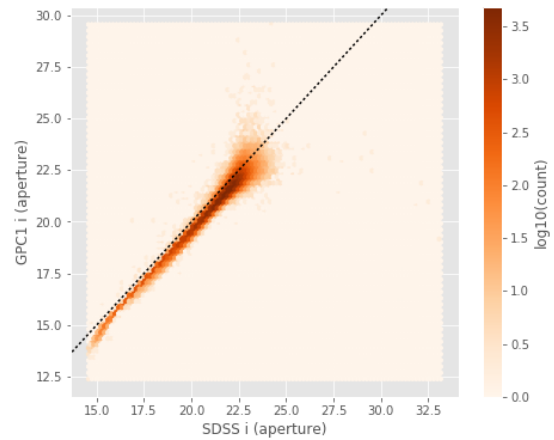
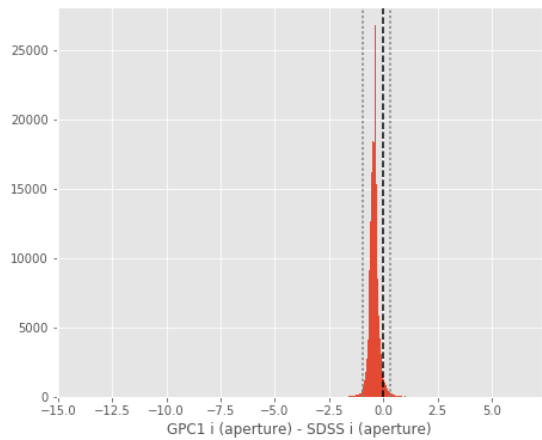
DECam i (total) - SDSS i (total):

- Median: -0.16
- Median Absolute Deviation: 0.20
- 1% percentile: -6.78022747039795
- 99% percentile: 1.3788430213928253



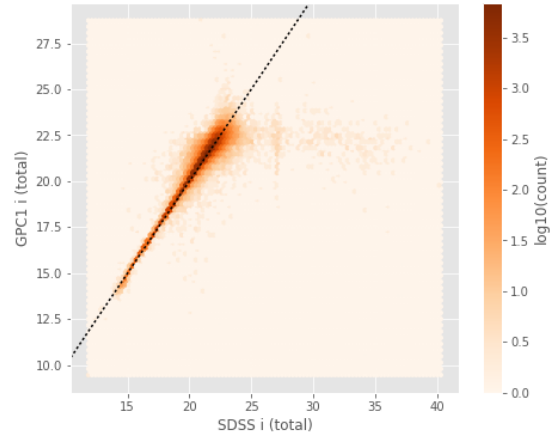
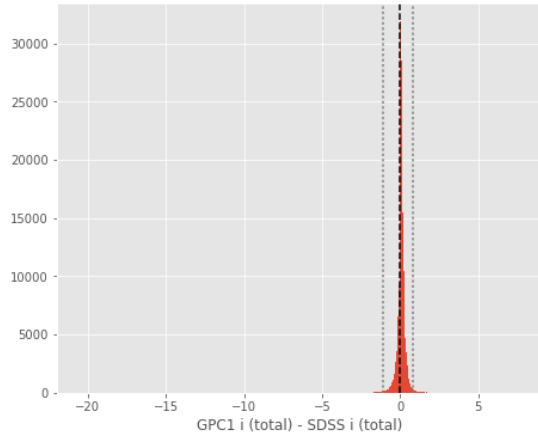
GPC1 i (aperture) - SDSS i (aperture):

- Median: -0.42
- Median Absolute Deviation: 0.11
- 1% percentile: -0.9702605819702148
- 99% percentile: 0.30517593383789055



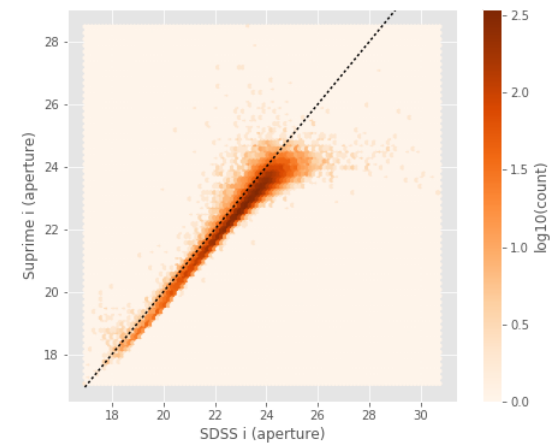
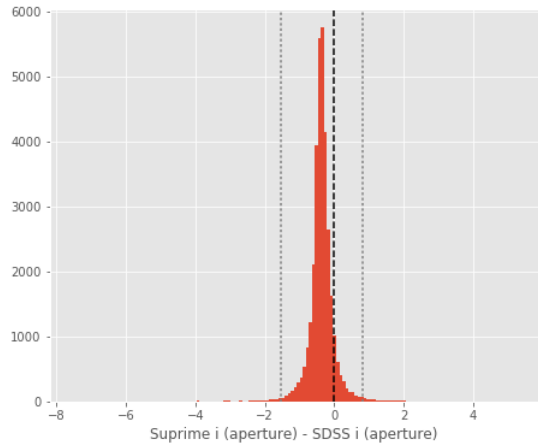
GPC1 i (total) - SDSS i (total):

- Median: 0.07
- Median Absolute Deviation: 0.09
- 1% percentile: -1.062618408203125
- 99% percentile: 0.8286868286132807



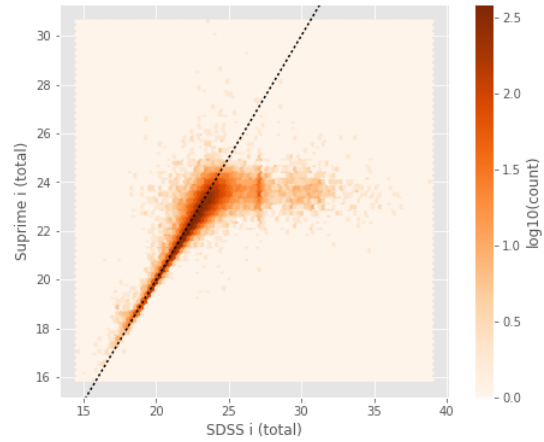
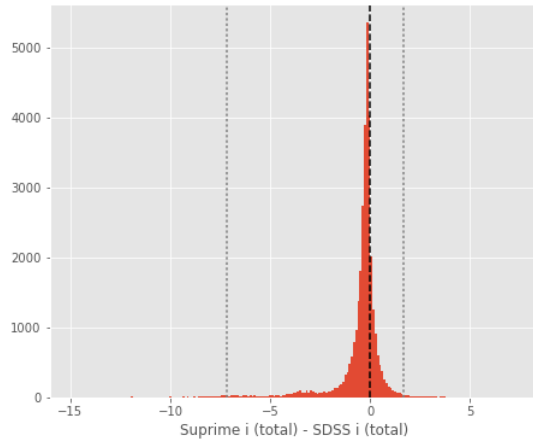
Suprime i (aperture) - SDSS i (aperture):

- Median: -0.37
- Median Absolute Deviation: 0.14
- 1% percentile: -1.549600658416748
- 99% percentile: 0.8243486022949214



Suprime i (total) - SDSS i (total):

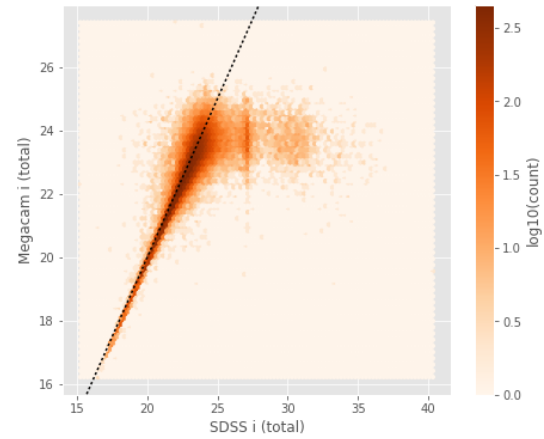
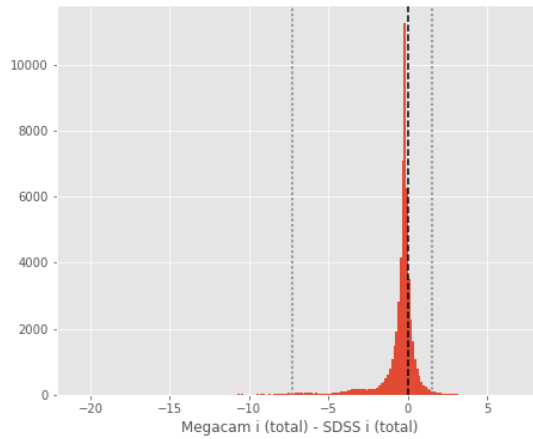
- Median: -0.21
- Median Absolute Deviation: 0.23
- 1% percentile: -7.17905948638916
- 99% percentile: 1.684645290374756



One of `m_ap_sdss_i` and `m_ap_megacam_i` is empty or missing any cross matches.

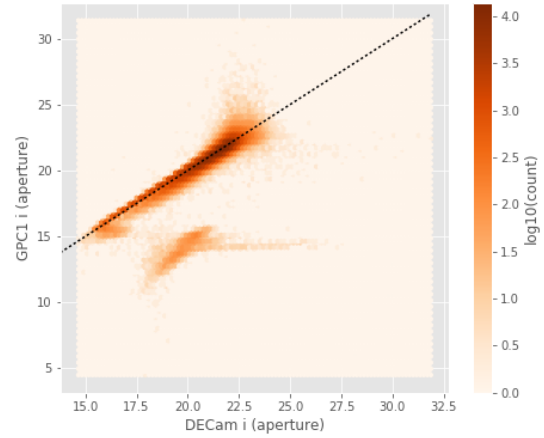
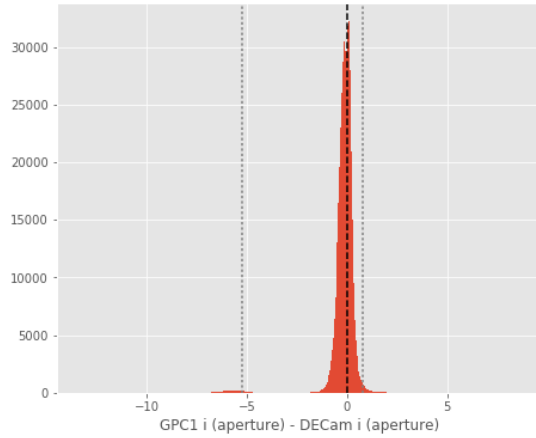
Megacam i (total) - SDSS i (total):

- Median: -0.22
- Median Absolute Deviation: 0.24
- 1% percentile: -7.254104881286621
- 99% percentile: 1.5275684738159172



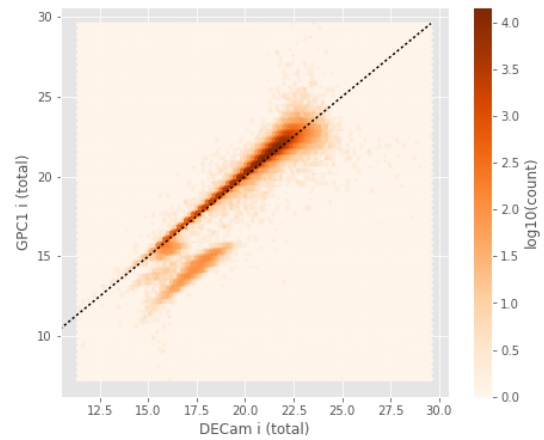
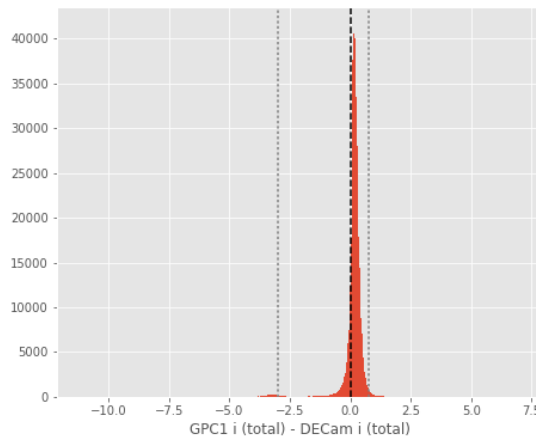
GPC1 i (aperture) - DECam i (aperture):

- Median: -0.09
- Median Absolute Deviation: 0.21
- 1% percentile: -5.272638645172119
- 99% percentile: 0.7723507308959952



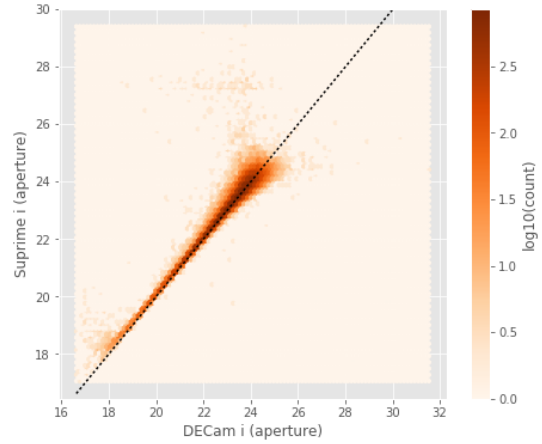
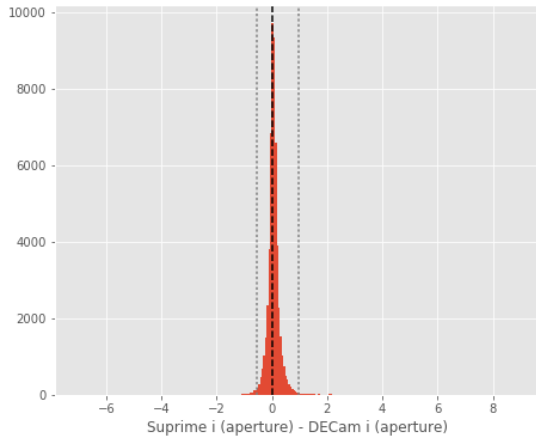
GPC1 i (total) - DECam i (total):

- Median: 0.18
- Median Absolute Deviation: 0.10
- 1% percentile: -2.9689798831939695
- 99% percentile: 0.7644220161437992



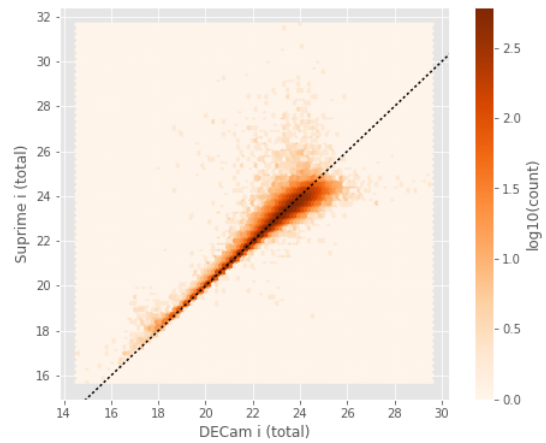
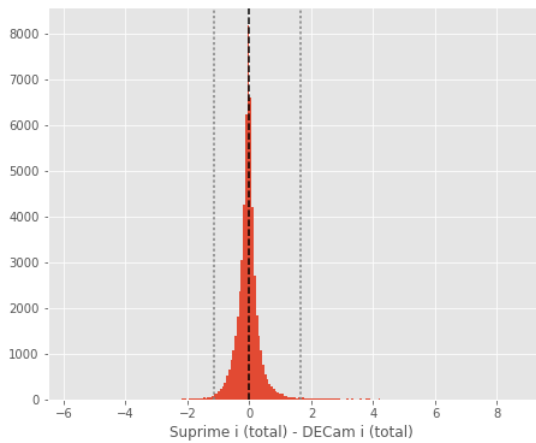
Suprime i (aperture) - DECam i (aperture):

- Median: 0.05
- Median Absolute Deviation: 0.09
- 1% percentile: -0.5619280624389649
- 99% percentile: 0.9474334907531683



Suprime i (total) - DECam i (total):

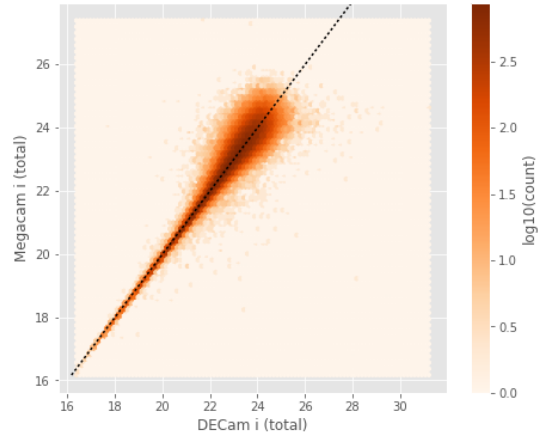
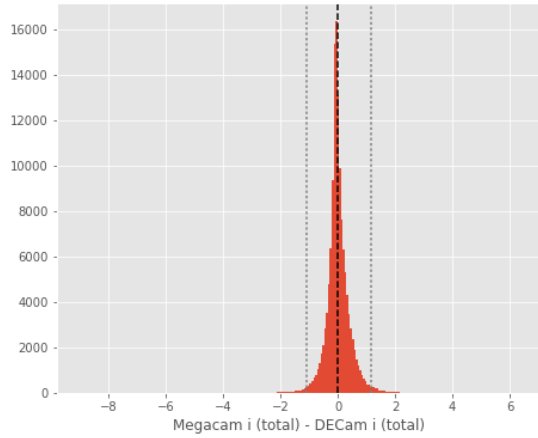
- Median: -0.04
- Median Absolute Deviation: 0.15
- 1% percentile: -1.1238285064697267
- 99% percentile: 1.6645146179199146



One of m_ap_decam_i and m_ap_megacam_i is empty or missing any cross matches.

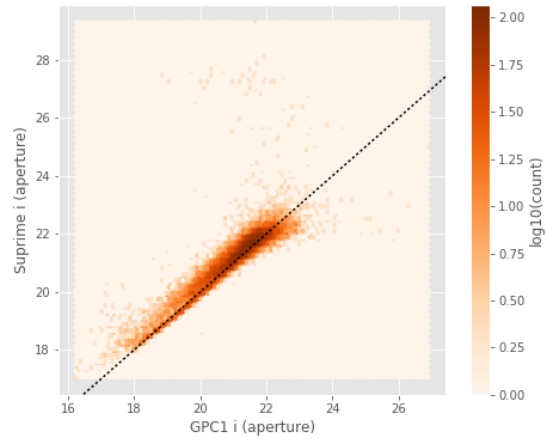
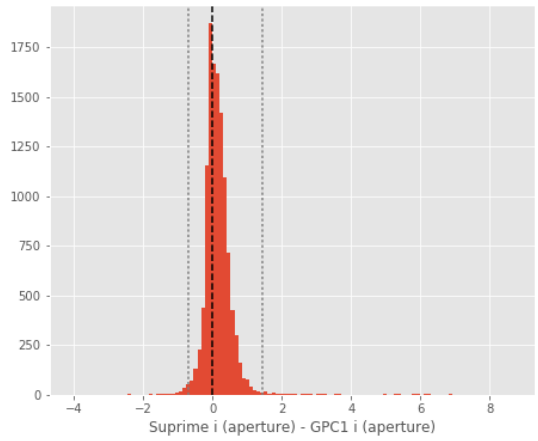
Megacam i (total) - DECam i (total):

- Median: -0.03
- Median Absolute Deviation: 0.17
- 1% percentile: -1.0902095985412599
- 99% percentile: 1.1743927955627438



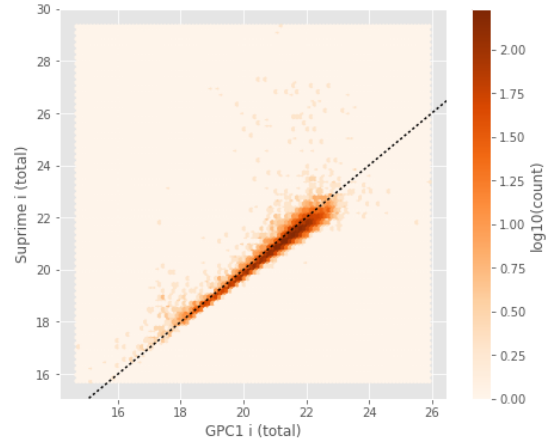
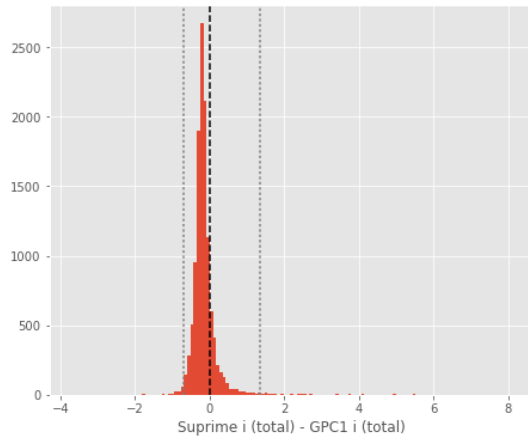
Suprime i (aperture) - GPC1 i (aperture):

- Median: 0.11
- Median Absolute Deviation: 0.19
- 1% percentile: -0.7052503204345703
- 99% percentile: 1.4366386413574261



Suprime i (total) - GPC1 i (total):

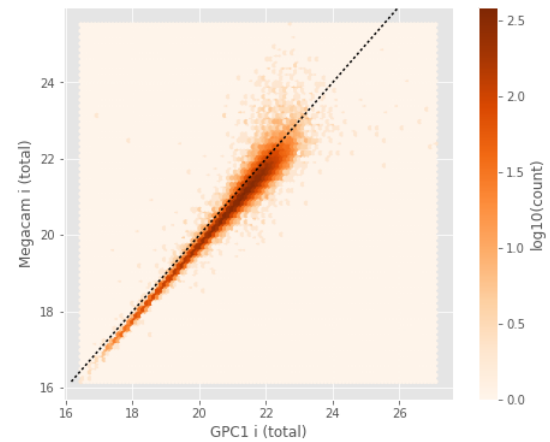
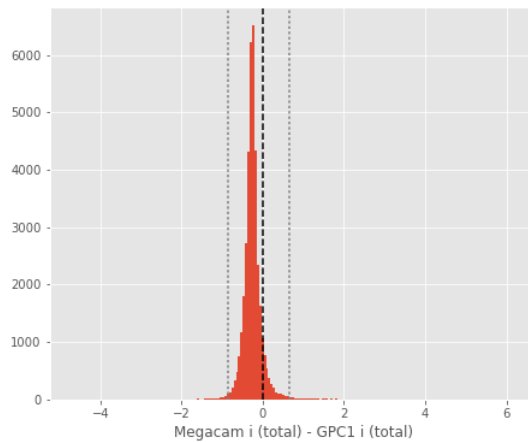
- Median: -0.19
- Median Absolute Deviation: 0.11
- 1% percentile: -0.7100362396240234
- 99% percentile: 1.3624930572509615



One of `m_ap_gpc1_i` and `m_ap_megacam_i` is empty or missing any cross matches.

Megacam i (total) - GPC1 i (total):

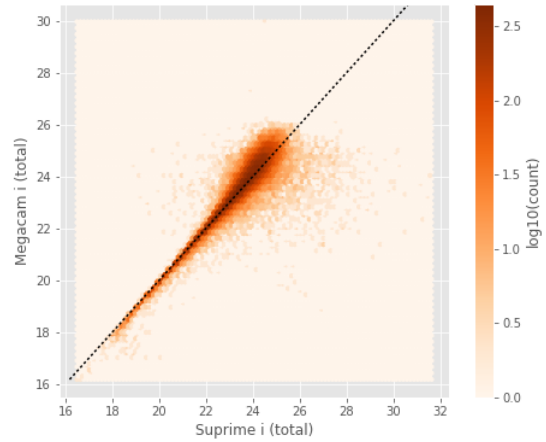
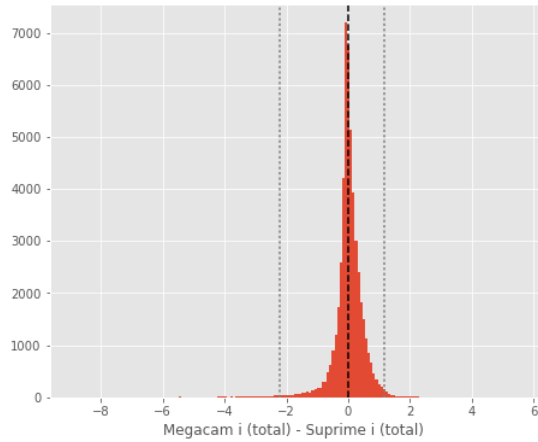
- Median: -0.26
- Median Absolute Deviation: 0.09
- 1% percentile: -0.8435804748535156
- 99% percentile: 0.6483203124999961



One of `m_ap_suprime_i` and `m_ap_megacam_i` is empty or missing any cross matches.

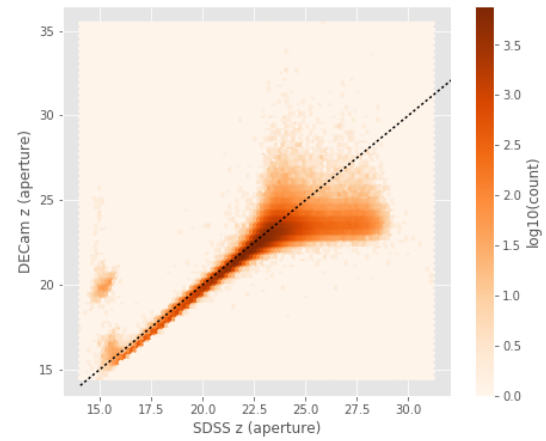
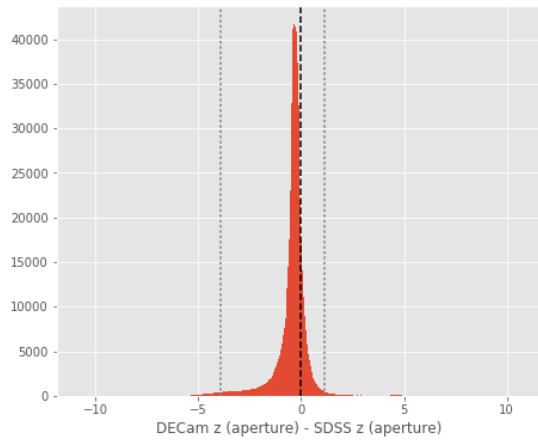
Megacam i (total) - Suprime i (total):

- Median: 0.01
- Median Absolute Deviation: 0.18
- 1% percentile: -2.22402889251709
- 99% percentile: 1.1762334823608396



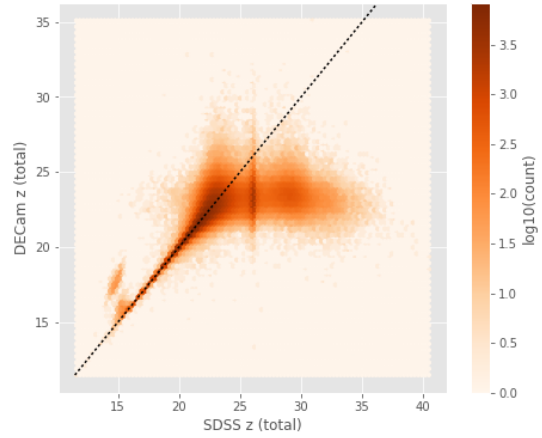
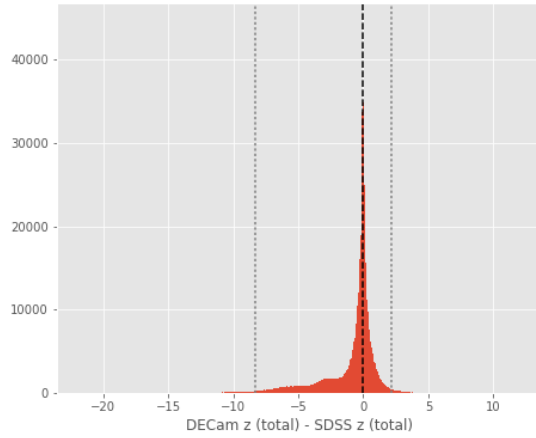
DECam z (aperture) - SDSS z (aperture):

- Median: -0.32
- Median Absolute Deviation: 0.22
- 1% percentile: -3.904133071899414
- 99% percentile: 1.1352174663543617



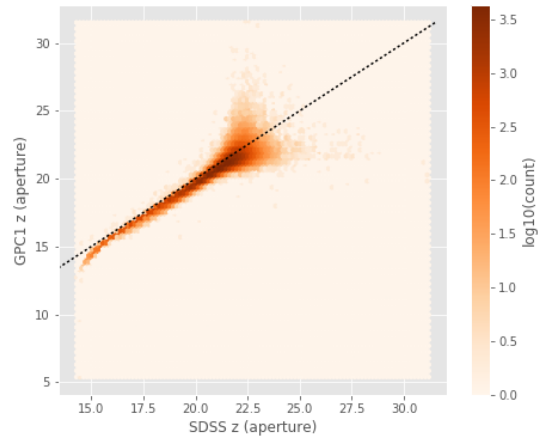
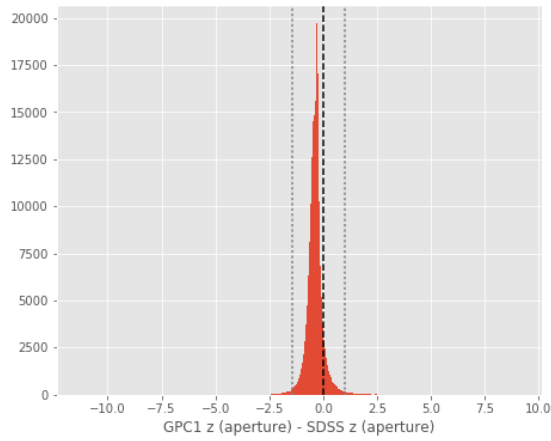
DECam z (total) - SDSS z (total):

- Median: -0.13
- Median Absolute Deviation: 0.42
- 1% percentile: -8.324228210449219
- 99% percentile: 2.1582082366943376



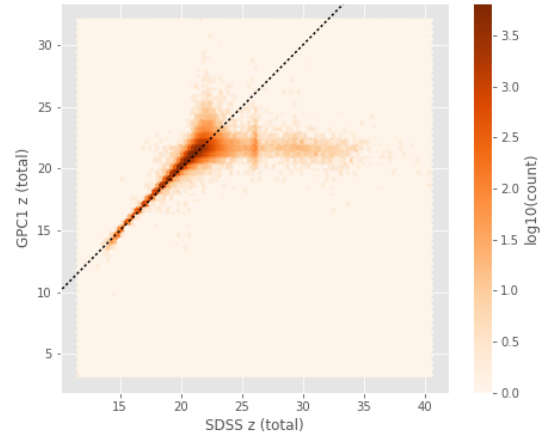
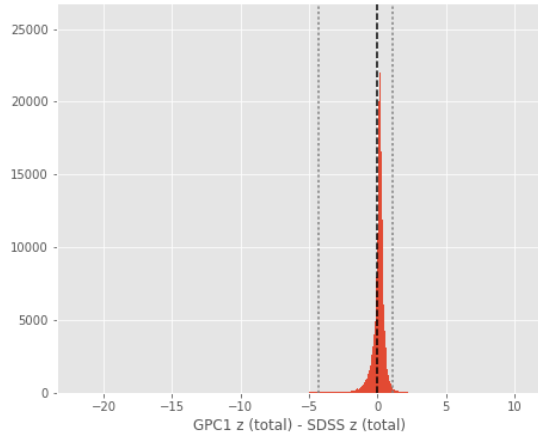
GPC1 z (aperture) - SDSS z (aperture):

- Median: -0.37
- Median Absolute Deviation: 0.16
- 1% percentile: -1.4609078216552733
- 99% percentile: 0.9889400482177724



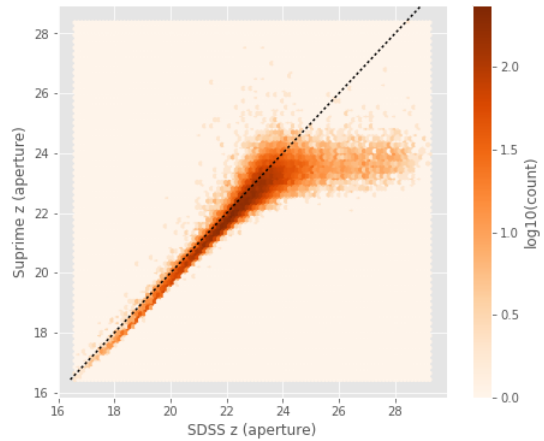
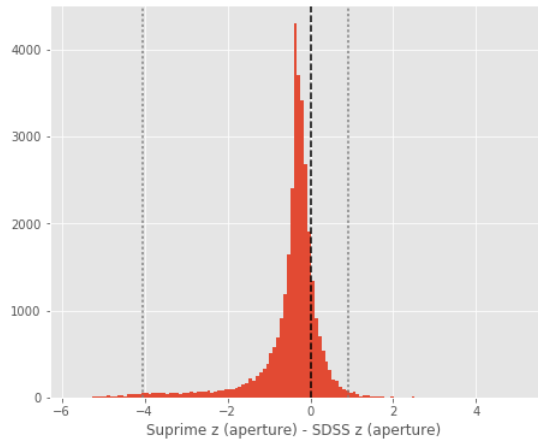
GPC1 z (total) - SDSS z (total):

- Median: 0.14
- Median Absolute Deviation: 0.16
- 1% percentile: -4.298278045654296
- 99% percentile: 1.1149420928955078



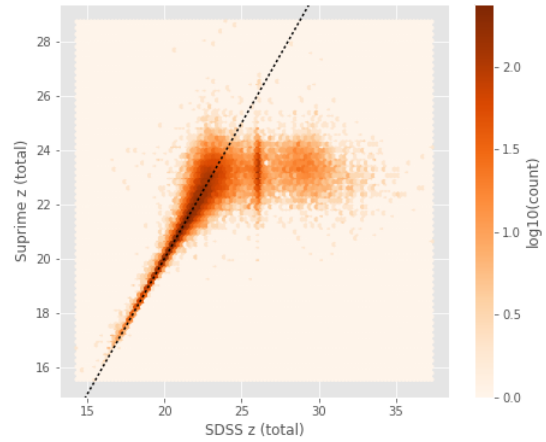
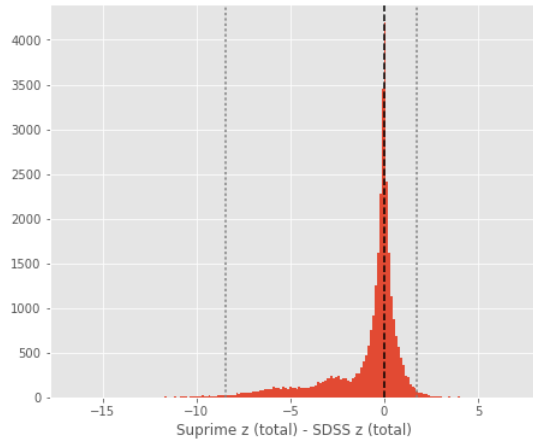
Suprime z (aperture) - SDSS z (aperture):

- Median: -0.32
- Median Absolute Deviation: 0.22
- 1% percentile: -4.047902908325195
- 99% percentile: 0.9234291076660153



Suprime z (total) - SDSS z (total):

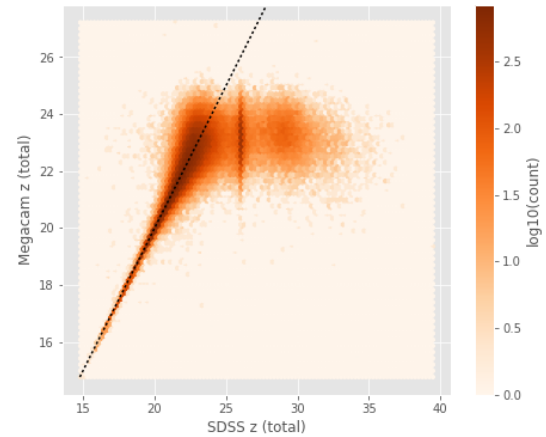
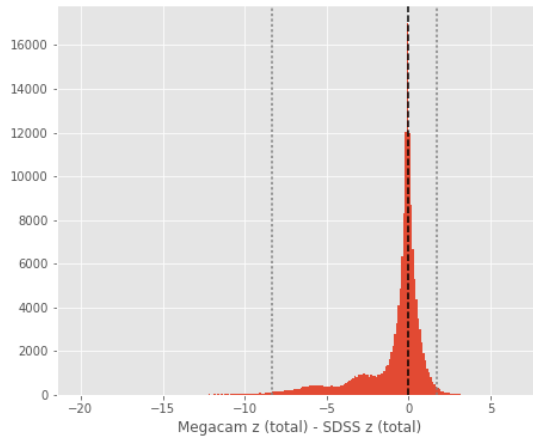
- Median: -0.14
- Median Absolute Deviation: 0.43
- 1% percentile: -8.438457412719726
- 99% percentile: 1.742085800170898



One of `m_ap_sdss_z` and `m_ap_megacam_z` is empty or missing any cross matches.

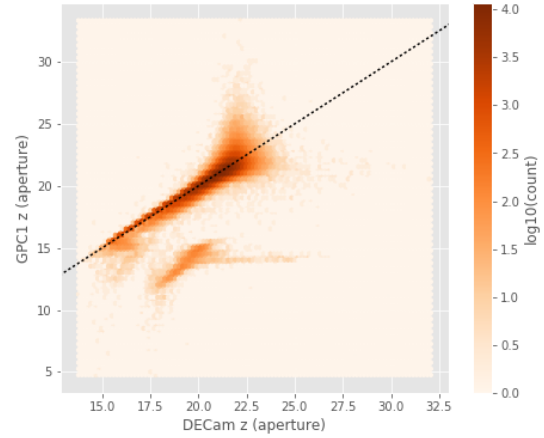
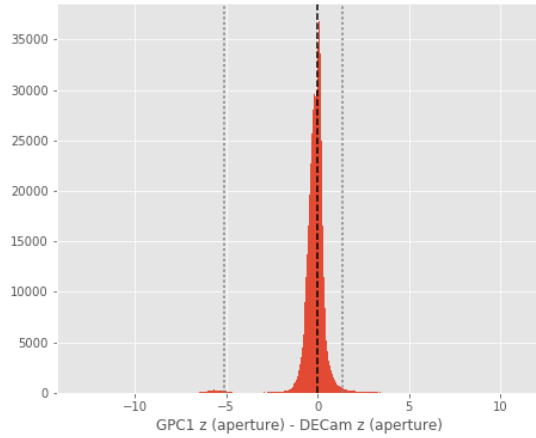
Megacam z (total) - SDSS z (total):

- Median: -0.18
- Median Absolute Deviation: 0.47
- 1% percentile: -8.368116683959961
- 99% percentile: 1.6796271896362291



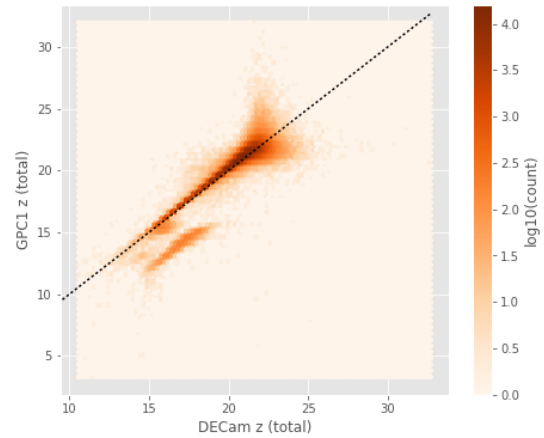
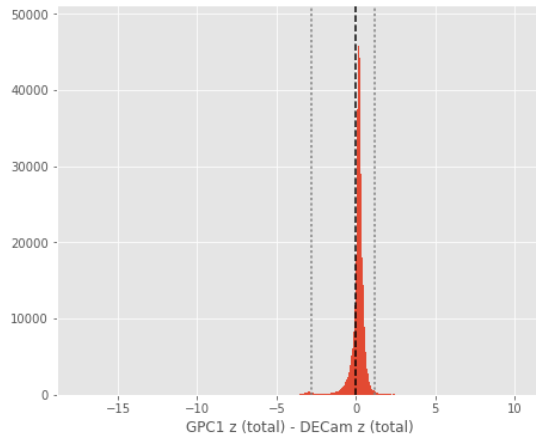
GPC1 z (aperture) - DECam z (aperture):

- Median: -0.09
- Median Absolute Deviation: 0.25
- 1% percentile: -5.1068462371826175
- 99% percentile: 1.3607732772827146



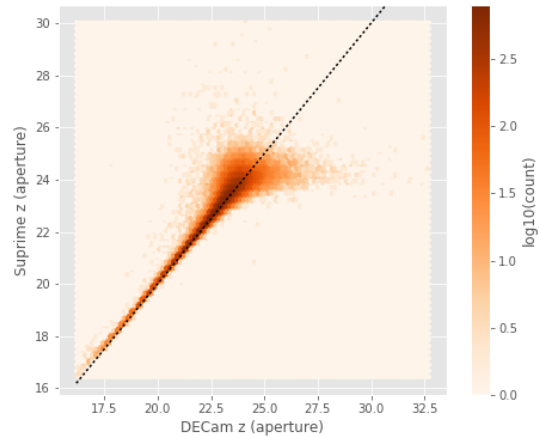
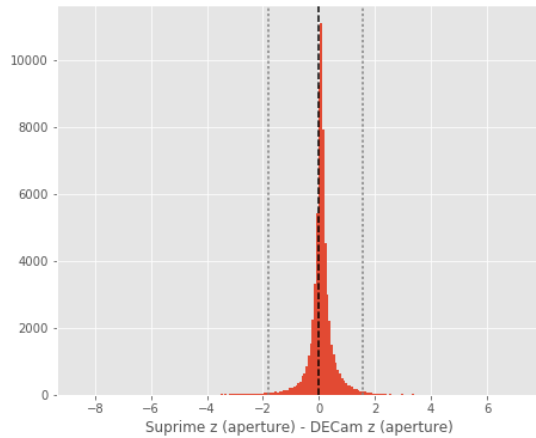
GPC1 z (total) - DECam z (total):

- Median: 0.19
- Median Absolute Deviation: 0.14
- 1% percentile: -2.7804293251037597
- 99% percentile: 1.1634951400756852



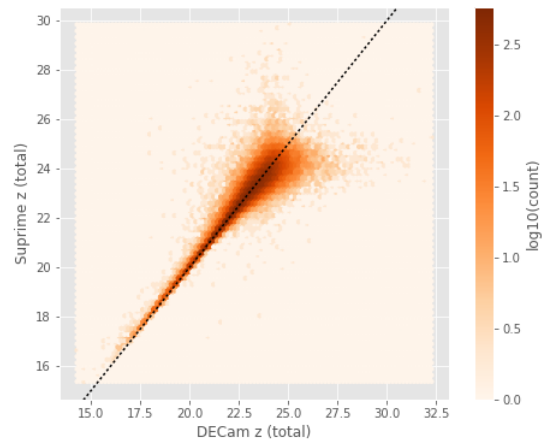
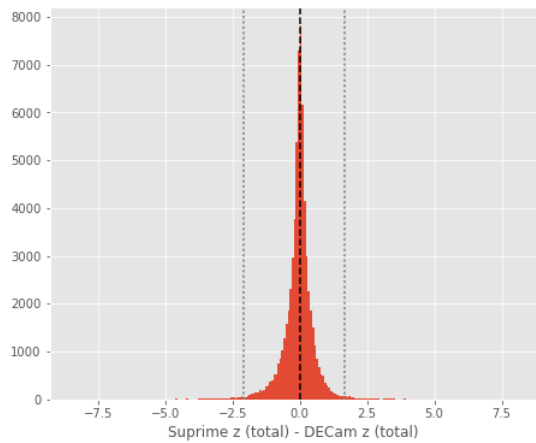
Suprime z (aperture) - DECam z (aperture):

- Median: 0.07
- Median Absolute Deviation: 0.14
- 1% percentile: -1.8022286796569824
- 99% percentile: 1.5773025894165065



Suprime z (total) - DECam z (total):

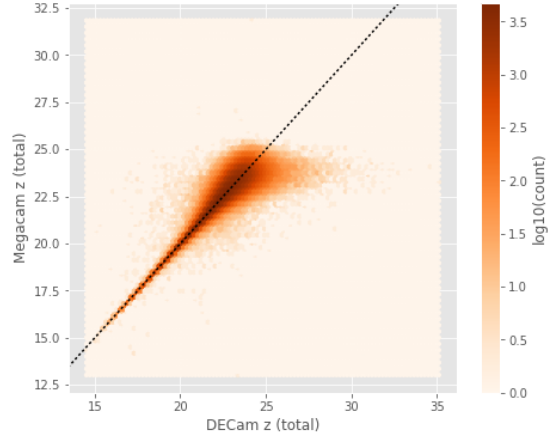
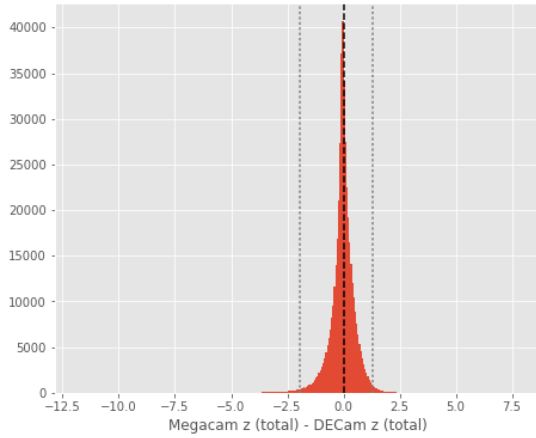
- Median: -0.00
- Median Absolute Deviation: 0.21
- 1% percentile: -2.0705056190490723
- 99% percentile: 1.6448681259155227



One of m_ap_decam_z and m_ap_megacam_z is empty or missing any cross matches.

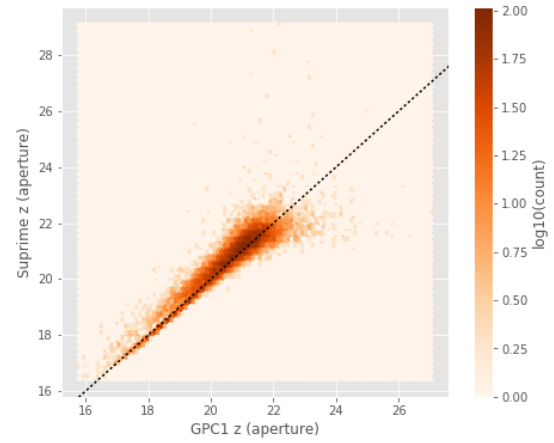
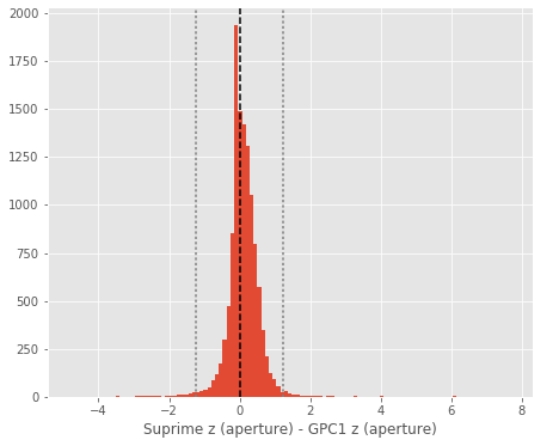
Megacam z (total) - DECam z (total):

- Median: -0.03
- Median Absolute Deviation: 0.24
- 1% percentile: -1.9663681030273437
- 99% percentile: 1.298355102539061



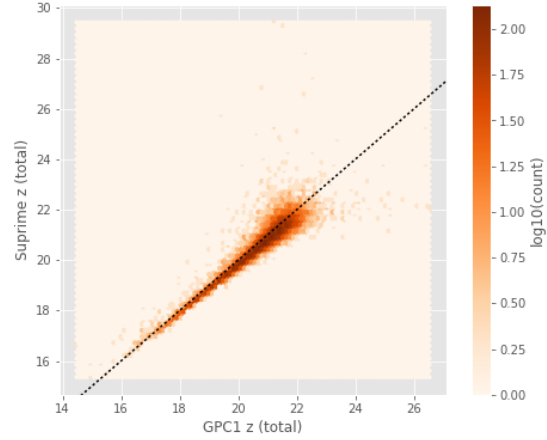
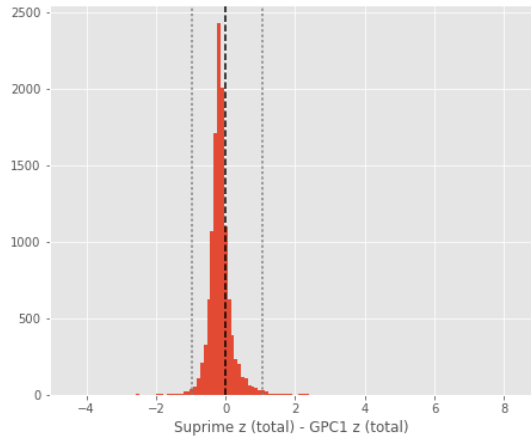
Suprime z (aperture) - GPC1 z (aperture):

- Median: 0.08
- Median Absolute Deviation: 0.21
- 1% percentile: -1.2238394927978515
- 99% percentile: 1.2267708587646455



Suprime z (total) - GPC1 z (total):

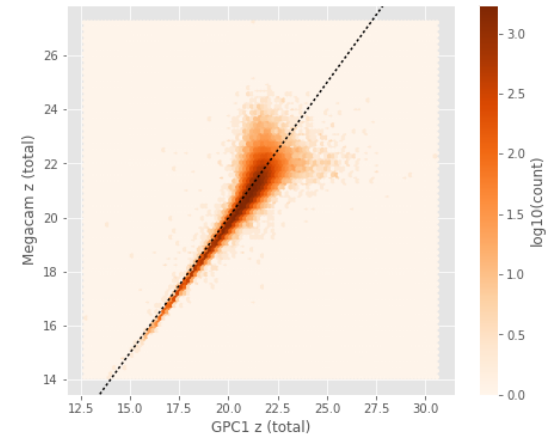
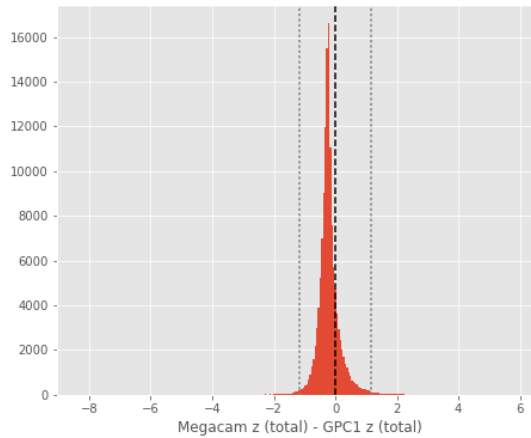
- Median: -0.17
- Median Absolute Deviation: 0.14
- 1% percentile: -0.9772318267822265
- 99% percentile: 1.0508264923095703



One of `m_ap_gpc1_z` and `m_ap_megacam_z` is empty or missing any cross matches.

Megacam z (total) - GPC1 z (total):

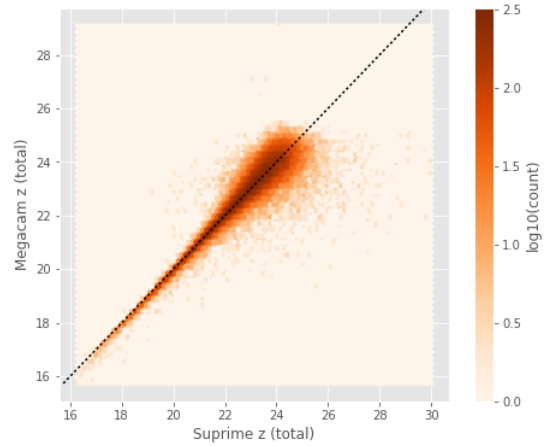
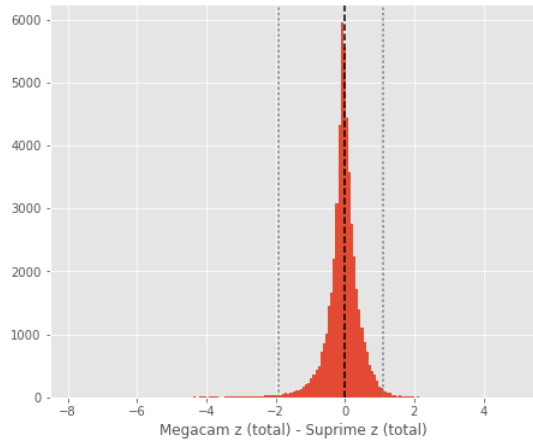
- Median: -0.24
- Median Absolute Deviation: 0.15
- 1% percentile: -1.1813249206542968
- 99% percentile: 1.1712478637695294



One of `m_ap_suprime_z` and `m_ap_megacam_z` is empty or missing any cross matches.

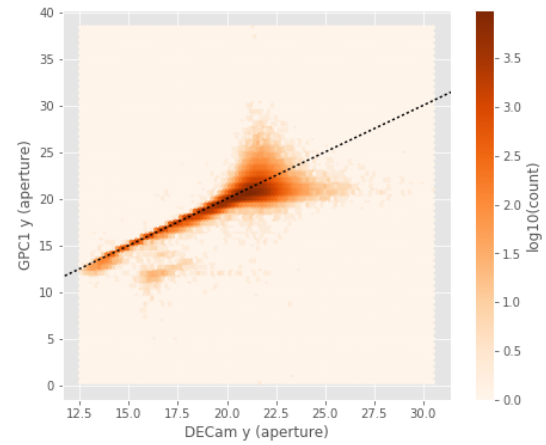
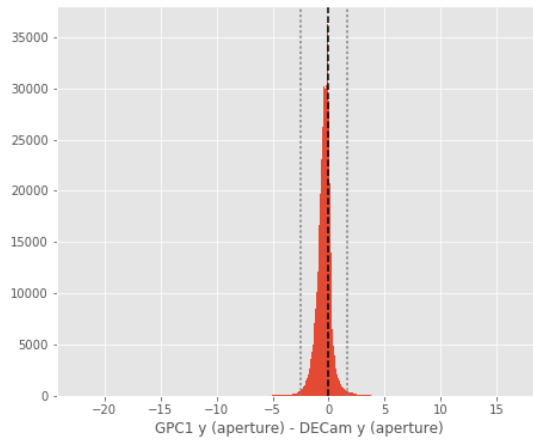
Megacam z (total) - Suprime z (total):

- Median: -0.04
- Median Absolute Deviation: 0.20
- 1% percentile: -1.913664722442627
- 99% percentile: 1.0910887718200664



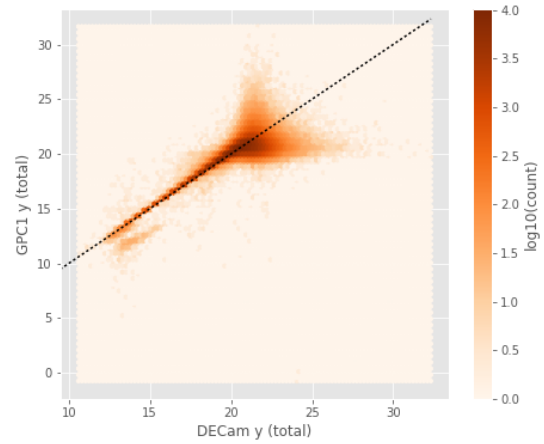
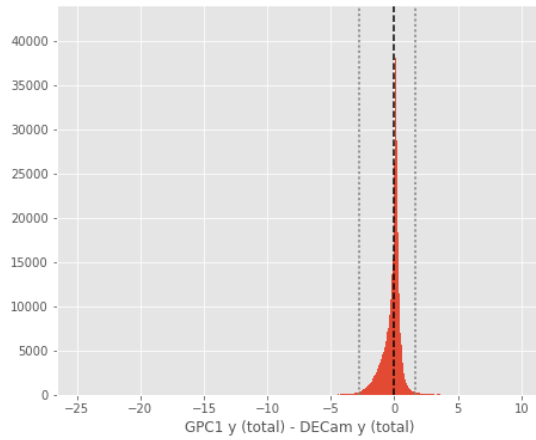
GPC1 y (aperture) - DECam y (aperture):

- Median: -0.36
- Median Absolute Deviation: 0.33
- 1% percentile: -2.461588134765625
- 99% percentile: 1.6309505844116168



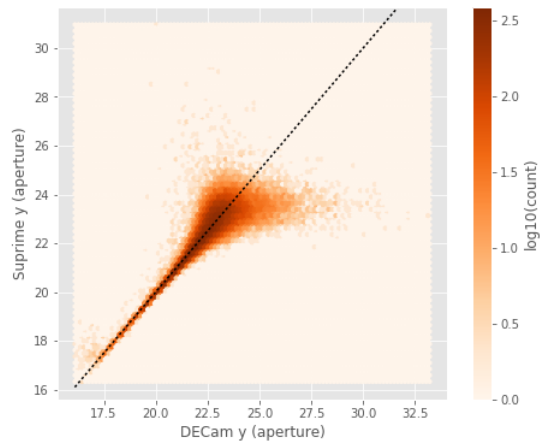
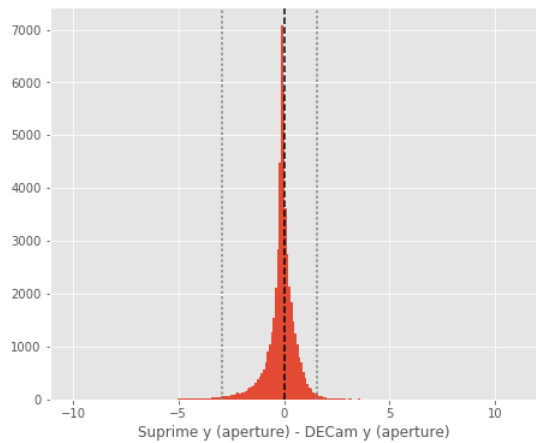
GPC1 y (total) - DECam y (total):

- Median: 0.02
- Median Absolute Deviation: 0.27
- 1% percentile: -2.7683295440673827
- 99% percentile: 1.641684951782227



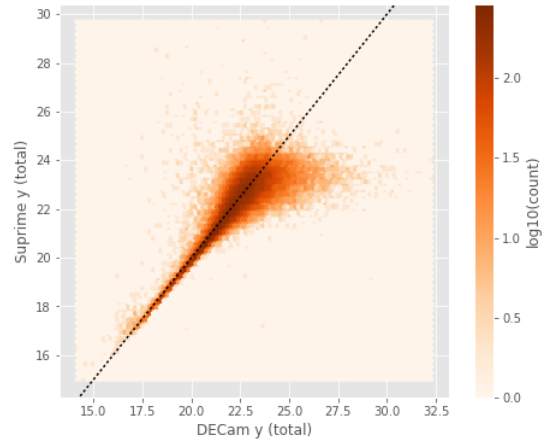
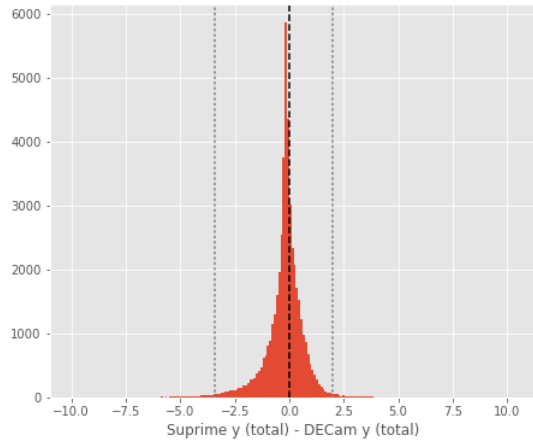
Suprime y (aperture) - DECam y (aperture):

- Median: -0.08
- Median Absolute Deviation: 0.26
- 1% percentile: -2.9443212509155274
- 99% percentile: 1.5640913009643536



Suprime y (total) - DECam y (total):

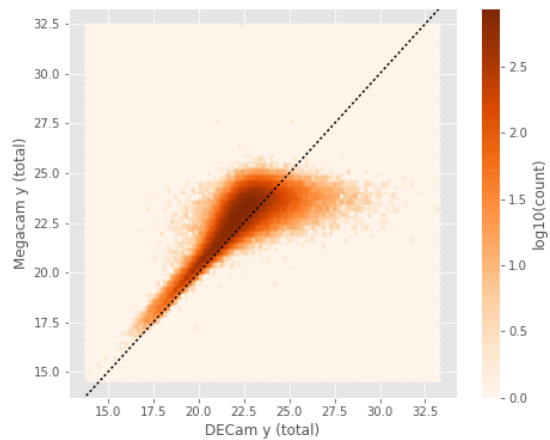
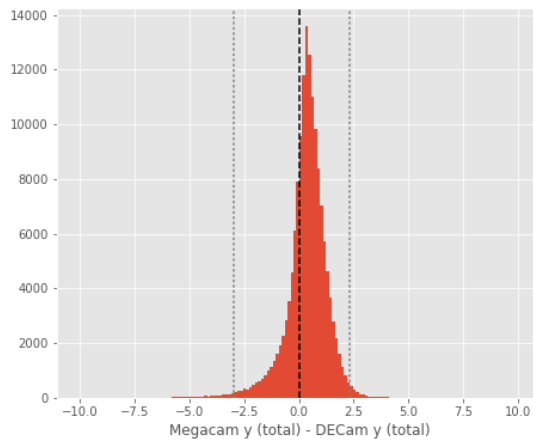
- Median: -0.14
- Median Absolute Deviation: 0.35
- 1% percentile: -3.4242658233642578
- 99% percentile: 1.989264163970949



One of `m_ap_decam_y` and `m_ap_megacam_y` is empty or missing any cross matches.

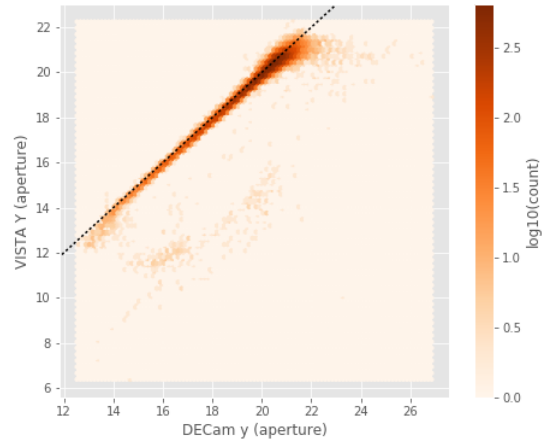
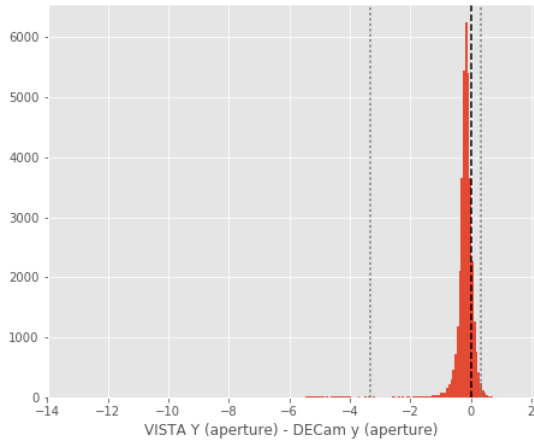
Megacam y (total) - DECam y (total):

- Median: 0.42
- Median Absolute Deviation: 0.46
- 1% percentile: -2.9525195884704587
- 99% percentile: 2.3311166763305593



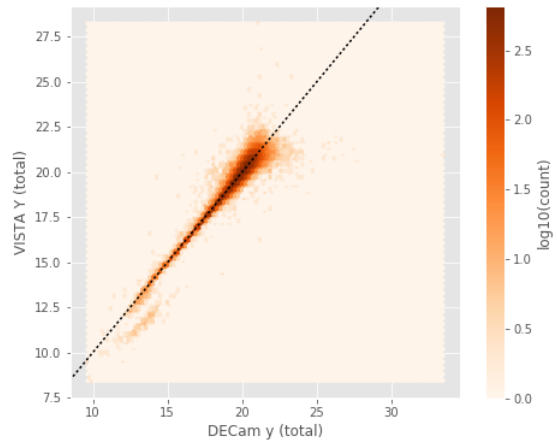
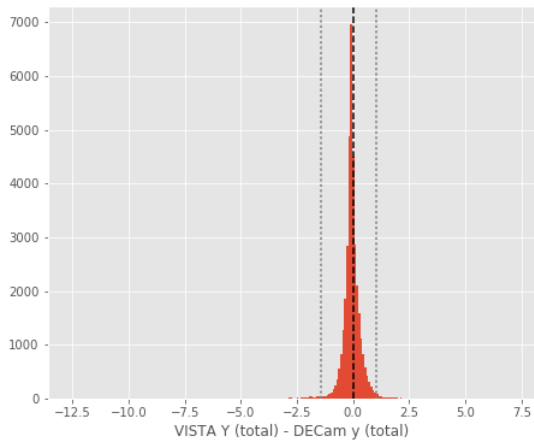
VISTA Y (aperture) - DECam y (aperture):

- Median: -0.16
- Median Absolute Deviation: 0.11
- 1% percentile: -3.3233765125274655
- 99% percentile: 0.33156589508056666



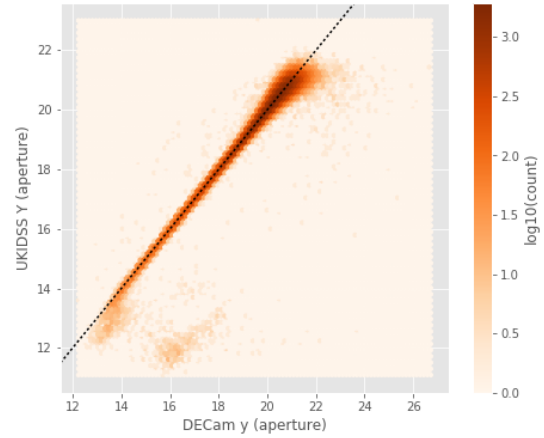
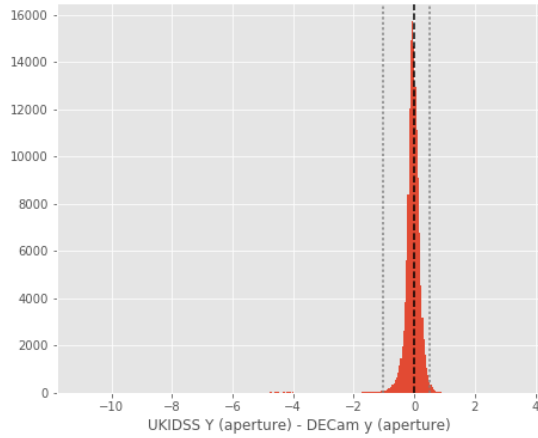
VISTA Y (total) - DECam y (total):

- Median: -0.07
- Median Absolute Deviation: 0.15
- 1% percentile: -1.4125679969787597
- 99% percentile: 1.0300574302673327



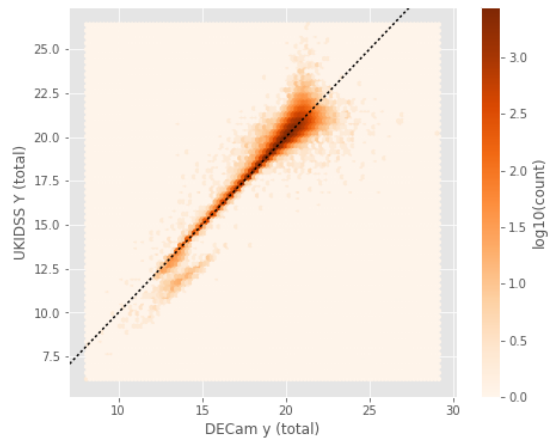
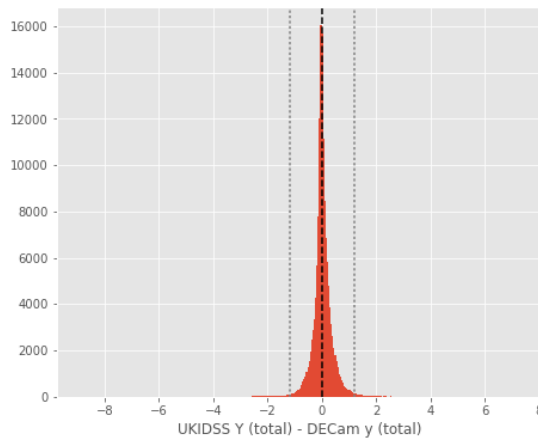
UKIDSS Y (aperture) - DECam y (aperture):

- Median: -0.05
- Median Absolute Deviation: 0.12
- 1% percentile: -1.0210210800170898
- 99% percentile: 0.4852939987182614



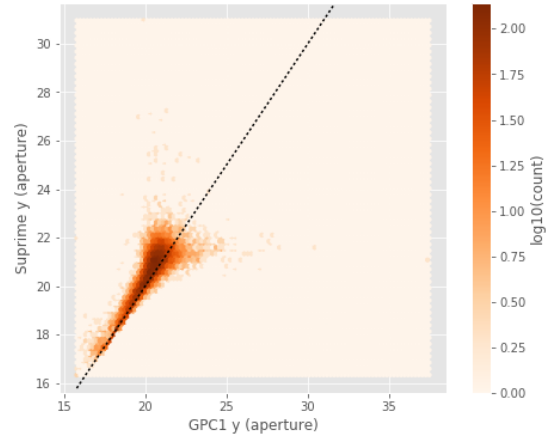
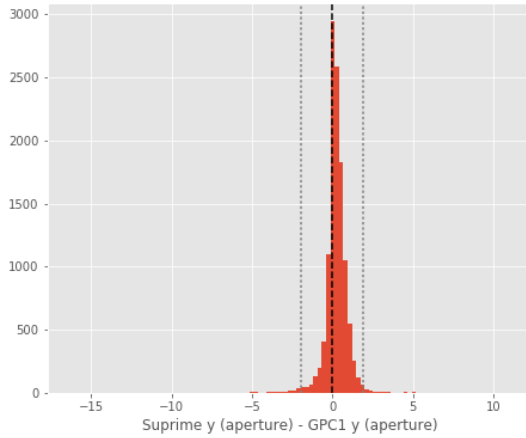
UKIDSS Y (total) - DECam y (total):

- Median: 0.01
- Median Absolute Deviation: 0.14
- 1% percentile: -1.1742112731933594
- 99% percentile: 1.191116104125977



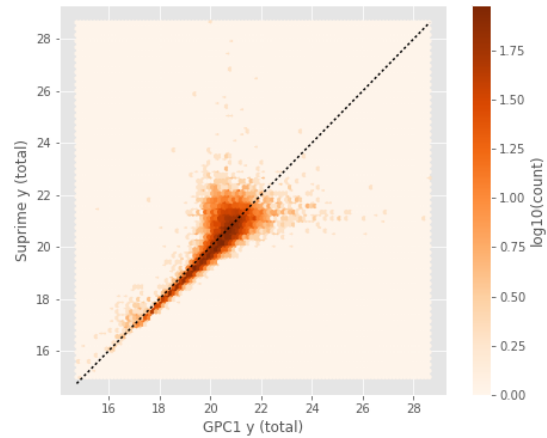
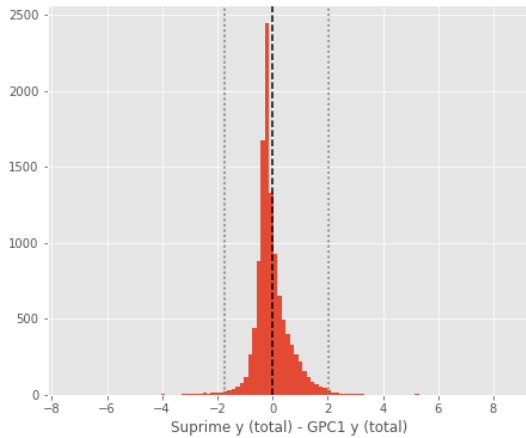
Suprime y (aperture) - GPC1 y (aperture):

- Median: 0.21
- Median Absolute Deviation: 0.29
- 1% percentile: -1.9312421035766603
- 99% percentile: 1.8914686203002926



Suprime y (total) - GPC1 y (total):

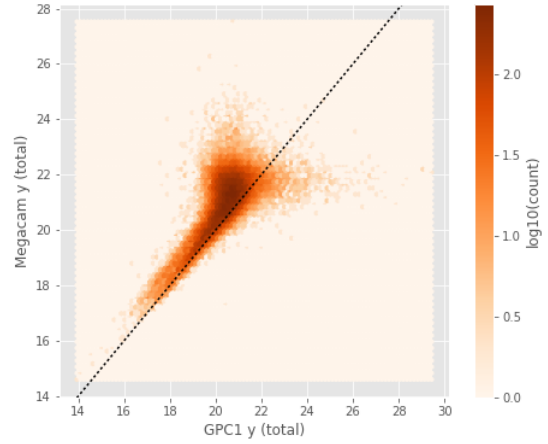
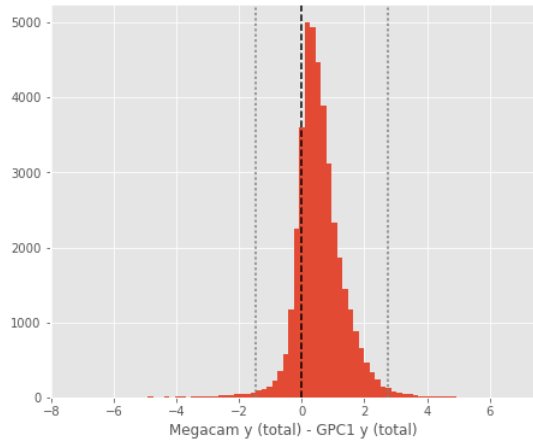
- Median: -0.16
- Median Absolute Deviation: 0.25
- 1% percentile: -1.7441064071655275
- 99% percentile: 2.044495429992678



One of m_ap_gpc1_y and m_ap_megacam_y is empty or missing any cross matches.

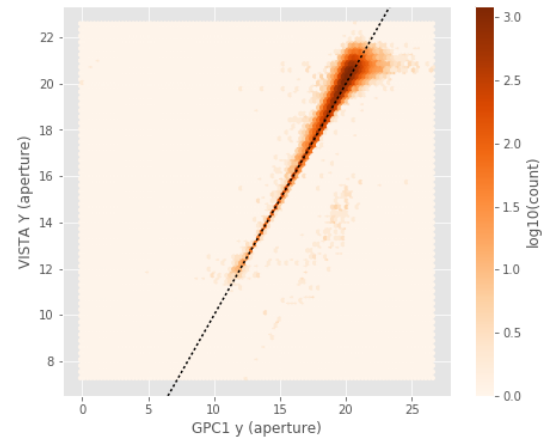
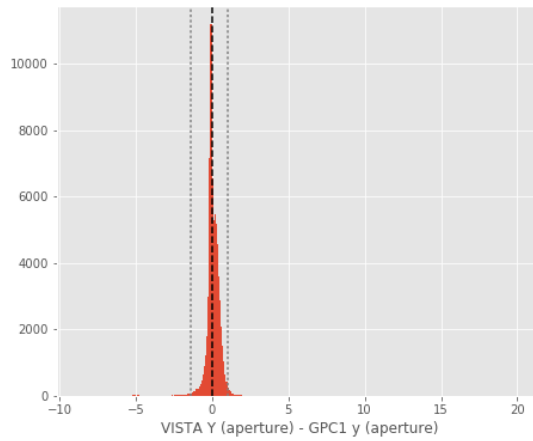
Megacam y (total) - GPC1 y (total):

- Median: 0.48
- Median Absolute Deviation: 0.40
- 1% percentile: -1.4708615303039552
- 99% percentile: 2.734095745086666



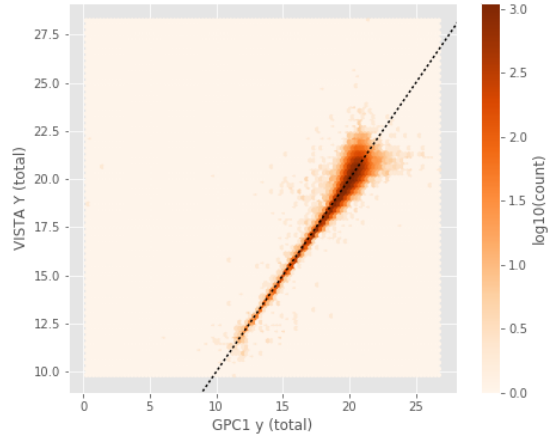
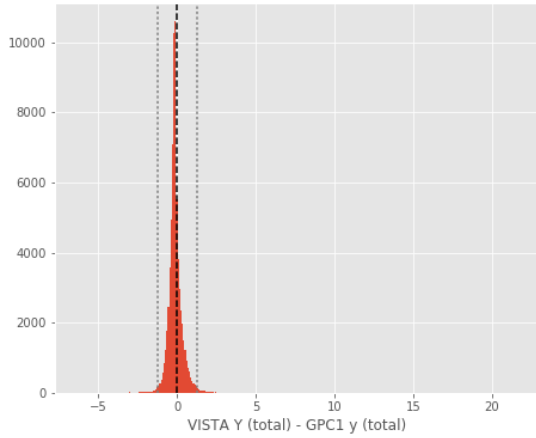
VISTA Y (aperture) - GPC1 y (aperture):

- Median: 0.05
- Median Absolute Deviation: 0.20
- 1% percentile: -1.4129962921142578
- 99% percentile: 1.064234733581543



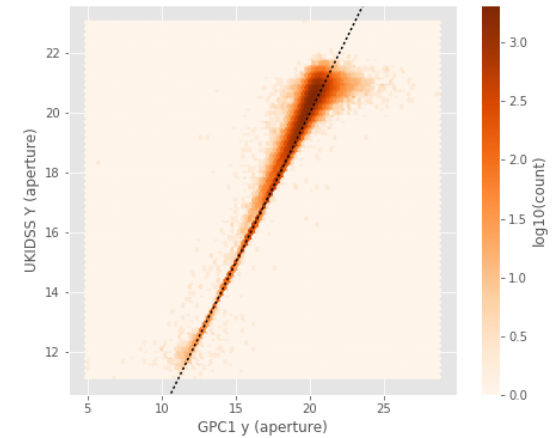
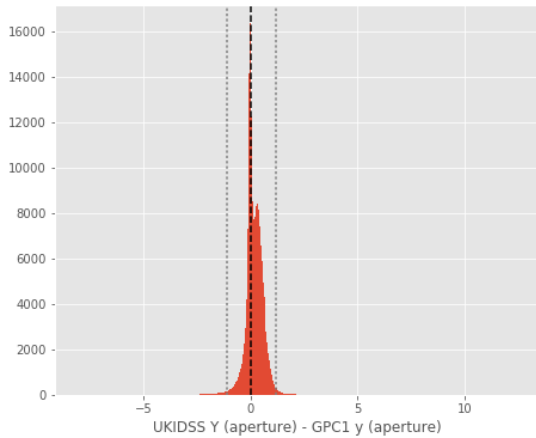
VISTA Y (total) - GPC1 y (total):

- Median: -0.15
- Median Absolute Deviation: 0.18
- 1% percentile: -1.209598922729492
- 99% percentile: 1.2537891387939515



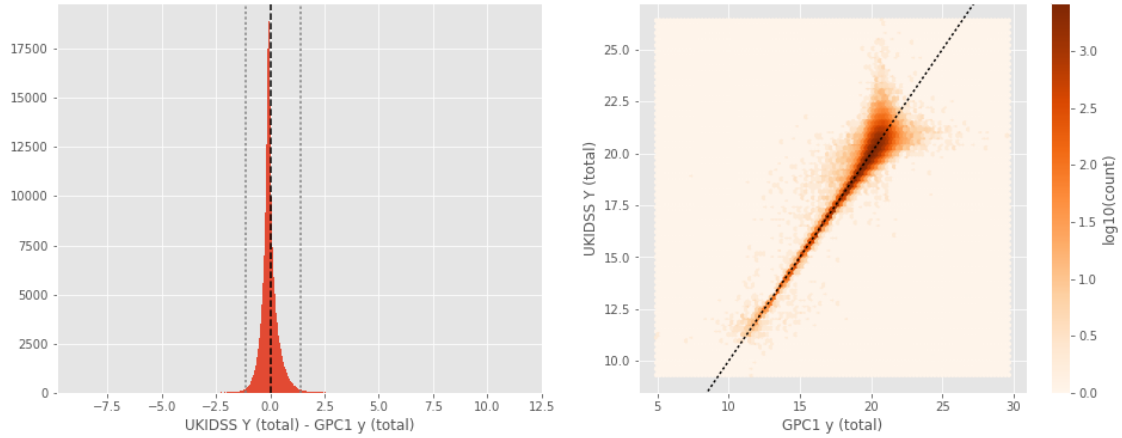
UKIDSS Y (aperture) - GPC1 y (aperture):

- Median: 0.15
- Median Absolute Deviation: 0.22
- 1% percentile: -1.0926820755004882
- 99% percentile: 1.1594430923461907



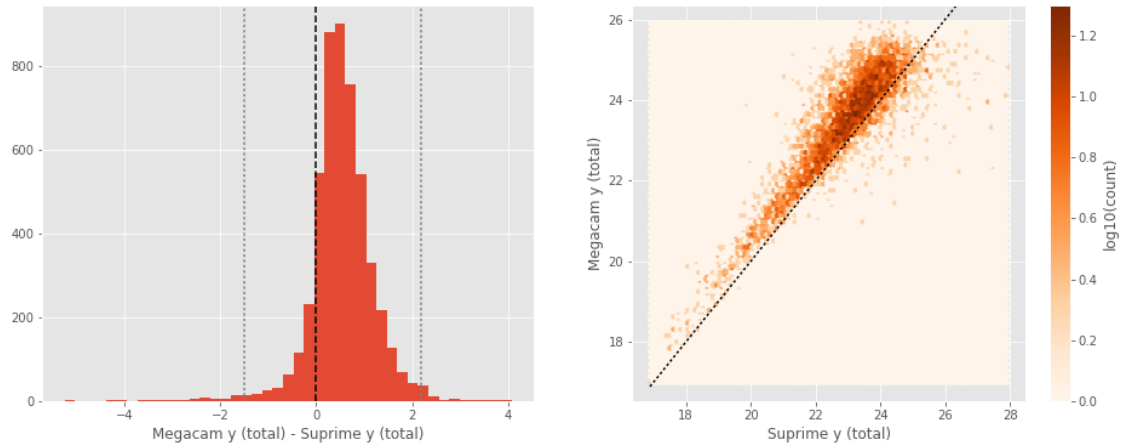
UKIDSS Y (total) - GPC1 y (total):

- Median: -0.08
- Median Absolute Deviation: 0.16
- 1% percentile: -1.1195072174072265
- 99% percentile: 1.4017032623290995



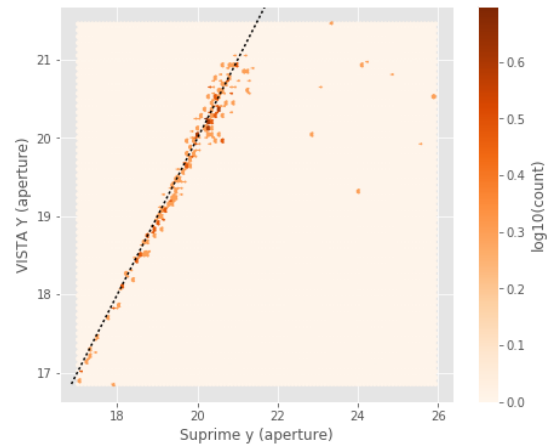
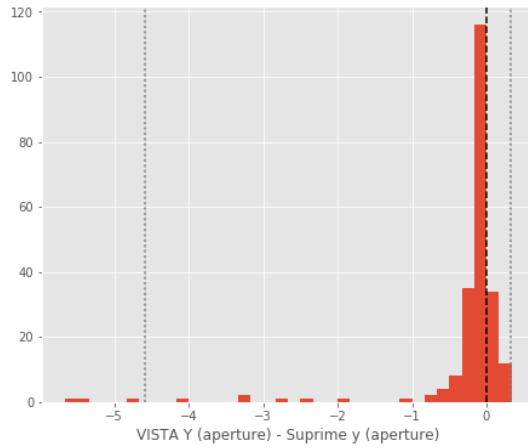
One of `m_ap_suprime_y` and `m_ap_megacam_y` is empty or missing any cross matches.
 Megacam y (total) - Suprime y (total):

- Median: 0.52
- Median Absolute Deviation: 0.32
- 1% percentile: -1.498688087463379
- 99% percentile: 2.174809799194336



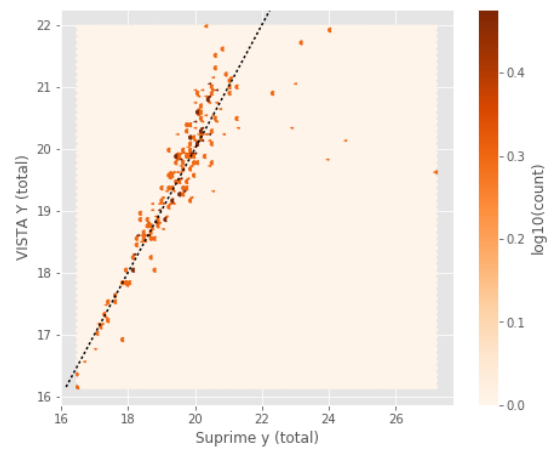
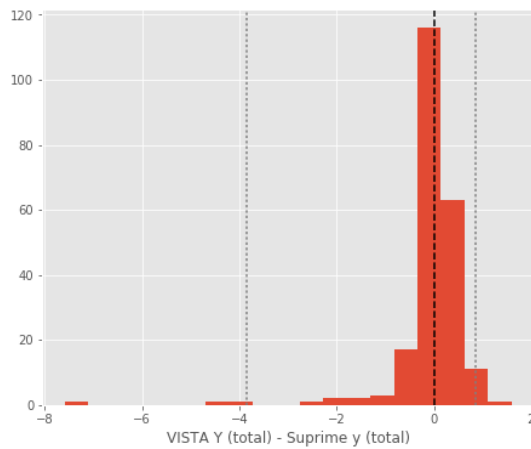
VISTA Y (aperture) - Suprime y (aperture):

- Median: -0.08
- Median Absolute Deviation: 0.08
- 1% percentile: -4.584782409667969
- 99% percentile: 0.3246856689453125



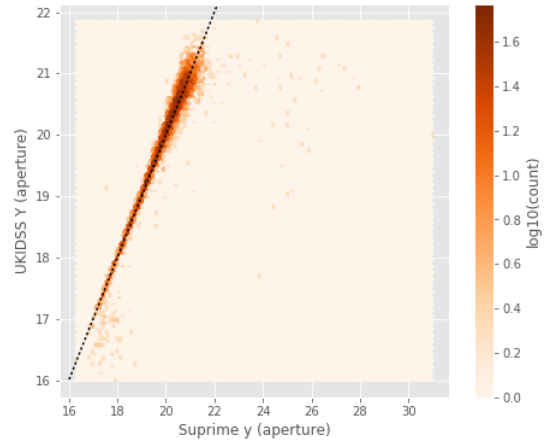
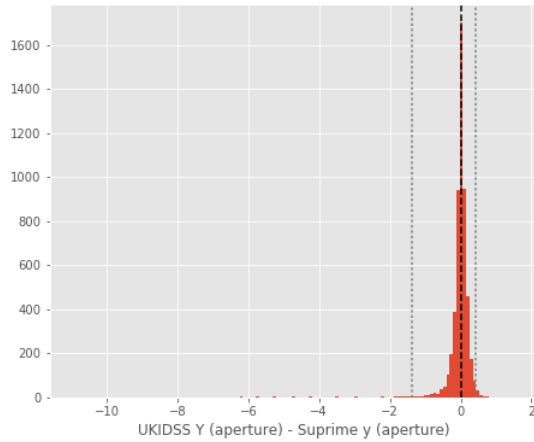
VISTA Y (total) - Suprime y (total):

- Median: 0.04
- Median Absolute Deviation: 0.22
- 1% percentile: -3.852187232971191
- 99% percentile: 0.8518907165527342



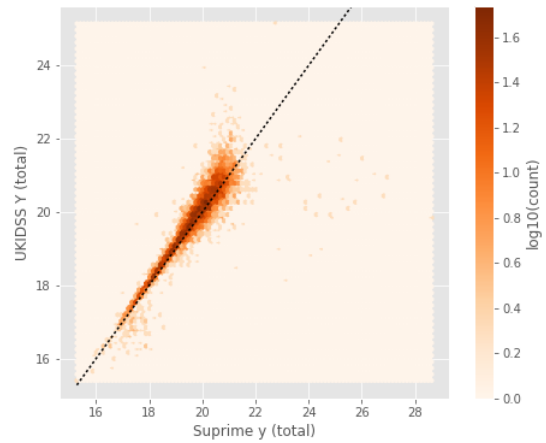
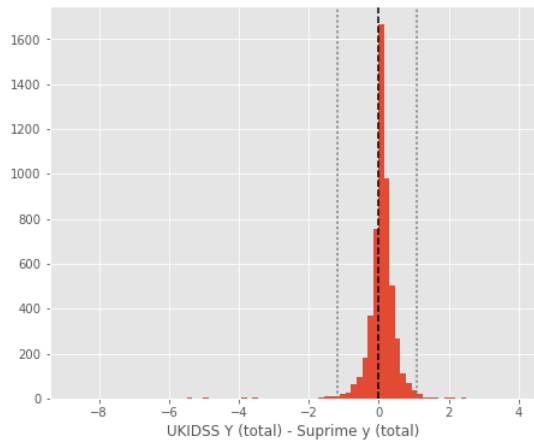
UKIDSS Y (aperture) - Suprime y (aperture):

- Median: 0.01
- Median Absolute Deviation: 0.08
- 1% percentile: -1.3829159355163574
- 99% percentile: 0.425249843597412



UKIDSS Y (total) - Suprime y (total):

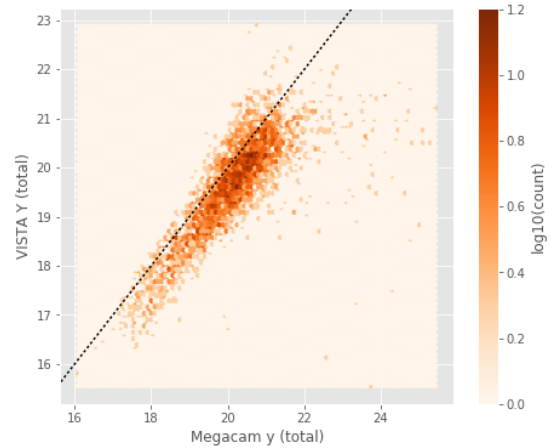
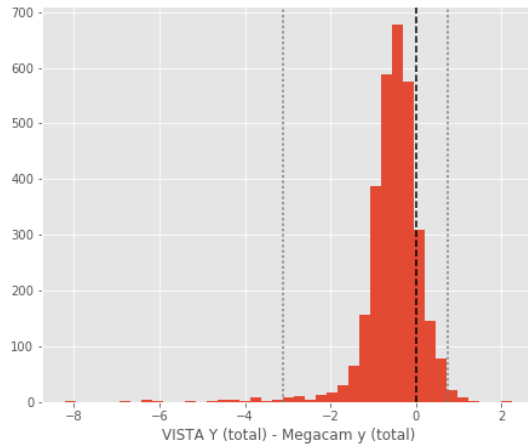
- Median: 0.10
- Median Absolute Deviation: 0.15
- 1% percentile: -1.1751368713378905
- 99% percentile: 1.089899597167966



One of m_ap_megacam_y and m_ap_vista_y is empty or missing any cross matches.

VISTA Y (total) - Megacam y (total):

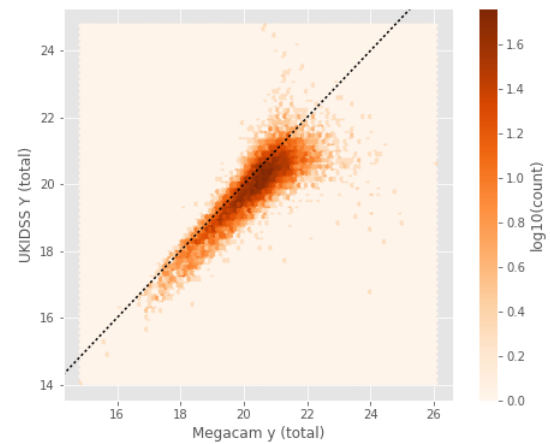
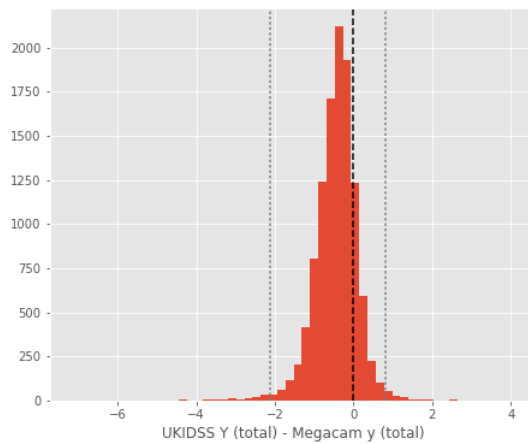
- Median: -0.47
- Median Absolute Deviation: 0.32
- 1% percentile: -3.1094839096069333
- 99% percentile: 0.7340143203735345



One of `m_ap_megacam_y` and `m_ap_ukidss_y` is empty or missing any cross matches.

UKIDSS Y (total) - Megacam y (total):

- Median: -0.40
- Median Absolute Deviation: 0.30
- 1% percentile: -2.1386332511901855
- 99% percentile: 0.8206896781921387

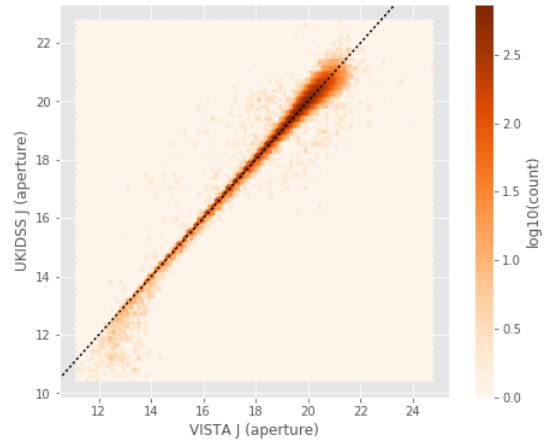
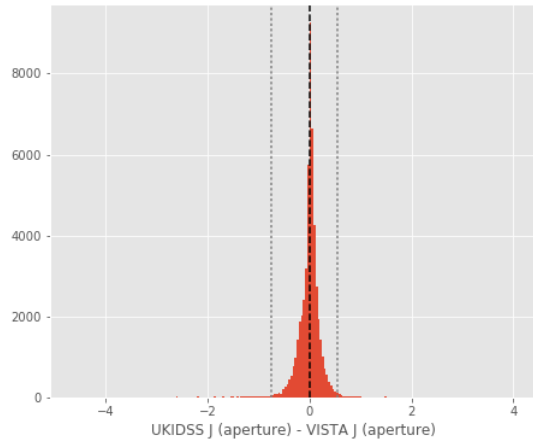


No sources have both VISTA Y (aperture) and UKIDSS Y (aperture) values.

No sources have both VISTA Y (total) and UKIDSS Y (total) values.

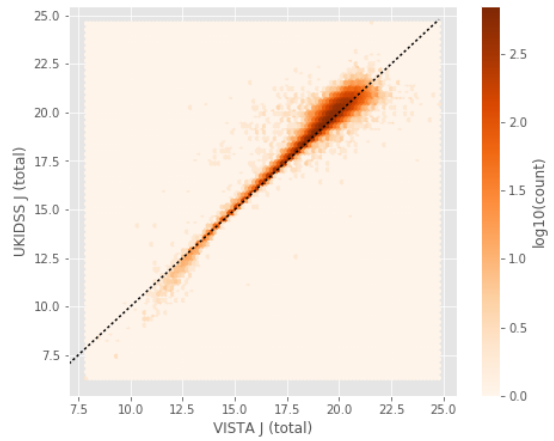
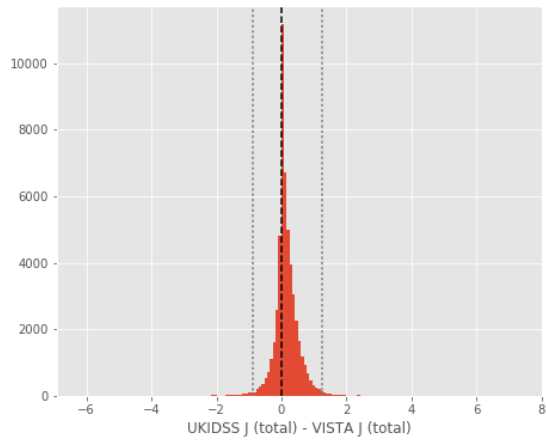
UKIDSS J (aperture) - VISTA J (aperture):

- Median: 0.02
- Median Absolute Deviation: 0.08
- 1% percentile: -0.7376995754241944
- 99% percentile: 0.553253726959229



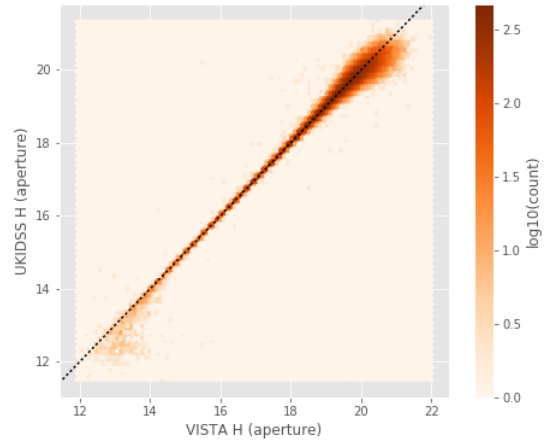
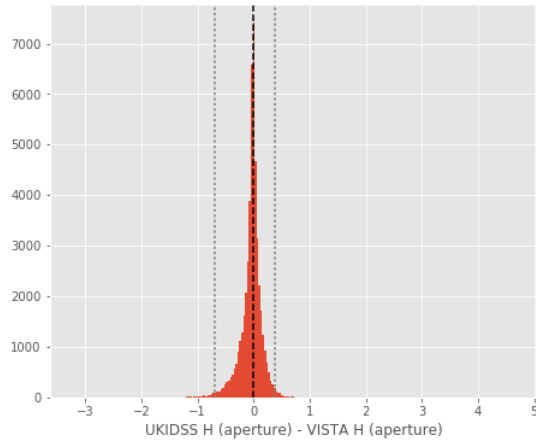
UKIDSS J (total) - VISTA J (total):

- Median: 0.09
- Median Absolute Deviation: 0.15
- 1% percentile: -0.8961040496826171
- 99% percentile: 1.250522422790528



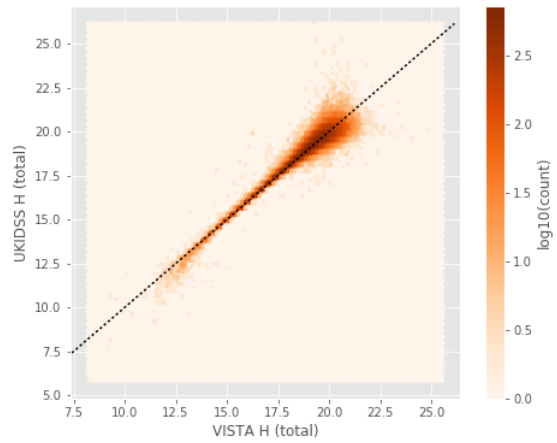
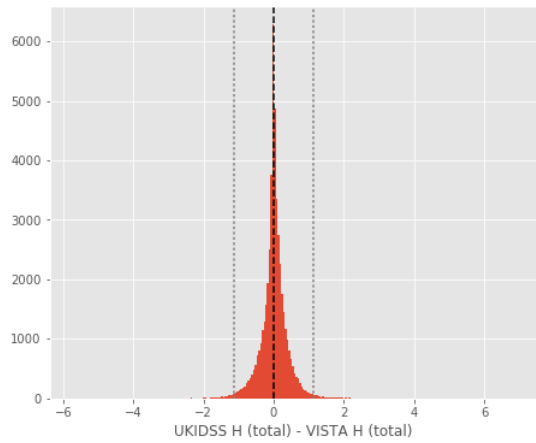
UKIDSS H (aperture) - VISTA H (aperture):

- Median: -0.02
- Median Absolute Deviation: 0.08
- 1% percentile: -0.6965235137939454
- 99% percentile: 0.3855552673339835



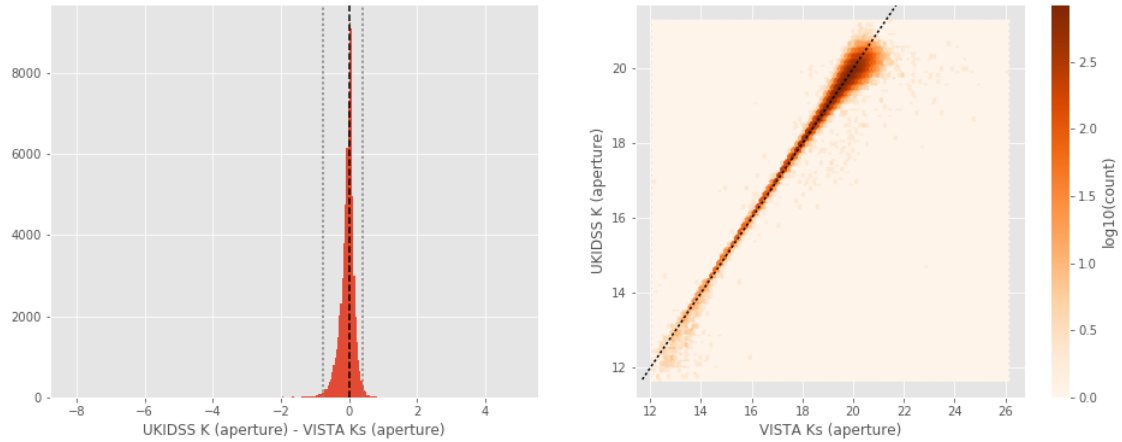
UKIDSS H (total) - VISTA H (total):

- Median: 0.01
- Median Absolute Deviation: 0.16
- 1% percentile: -1.1356221771240236
- 99% percentile: 1.142140331268311



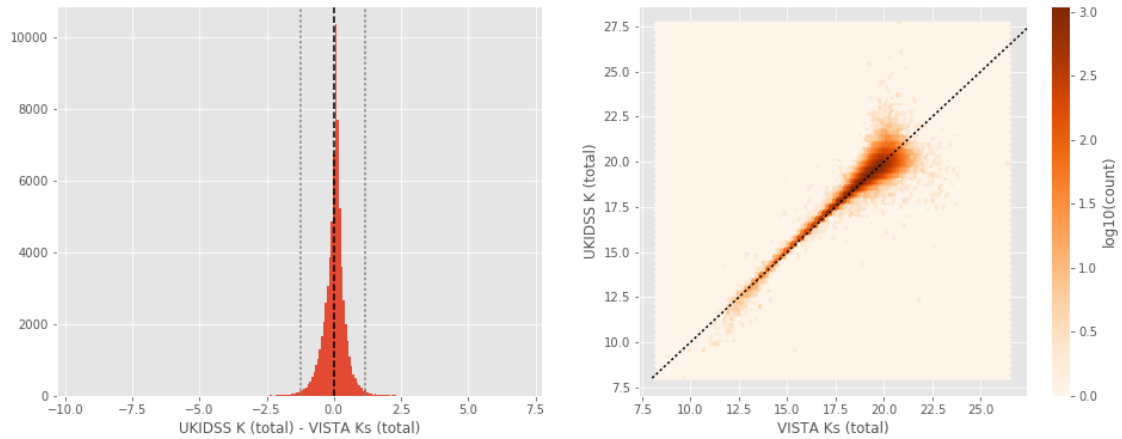
UKIDSS K (aperture) - VISTA Ks (aperture):

- Median: -0.01
- Median Absolute Deviation: 0.10
- 1% percentile: -0.7676759719848633
- 99% percentile: 0.4095736694335937



UKIDSS K (total) - VISTA Ks (total):

- Median: 0.06
- Median Absolute Deviation: 0.18
- 1% percentile: -1.2238235473632812
- 99% percentile: 1.169141101837158



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.

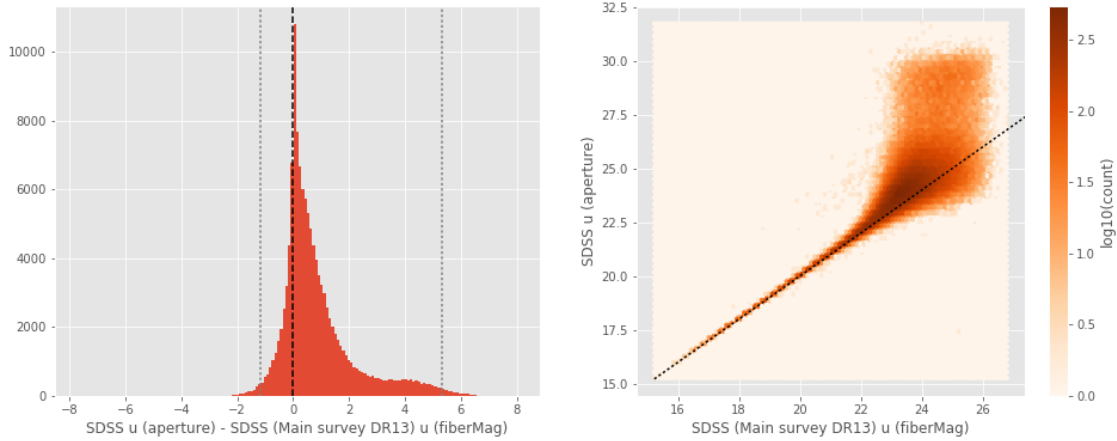
1.5.1 III.a - Comparing u, g, r, i, and z bands to SDSS

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.

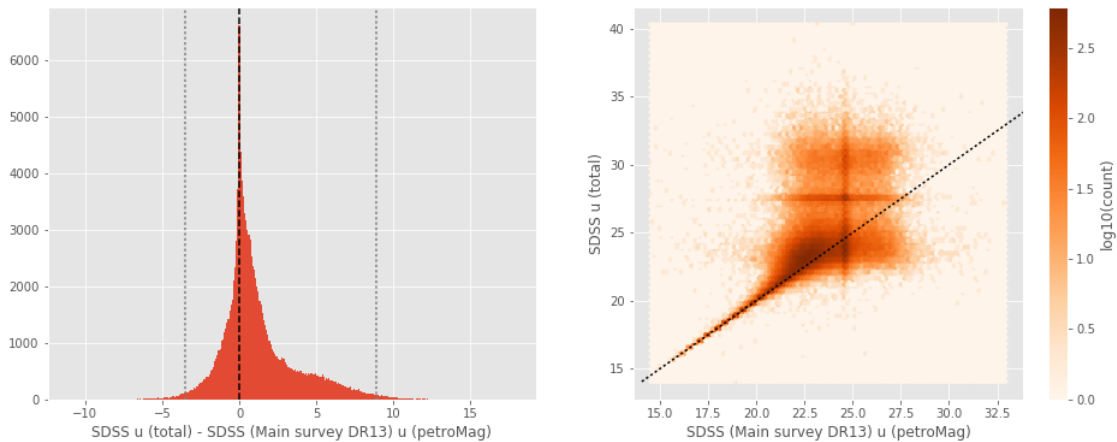
SDSS u (aperture) - SDSS (Main survey DR13) u (fiberMag):

- Median: 0.47
- Median Absolute Deviation: 0.51
- 1% percentile: -1.1662945556640625
- 99% percentile: 5.3054752349853525



SDSS u (total) - SDSS (Main survey DR13) u (petroMag):

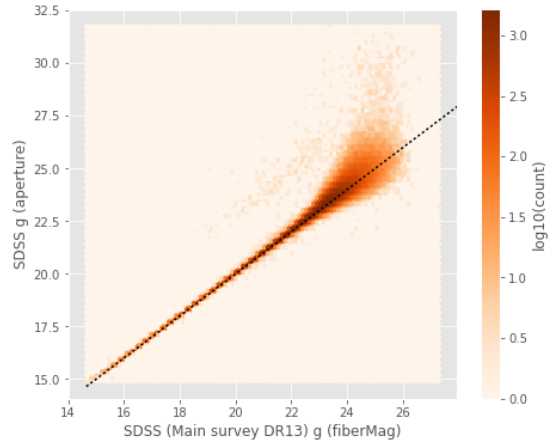
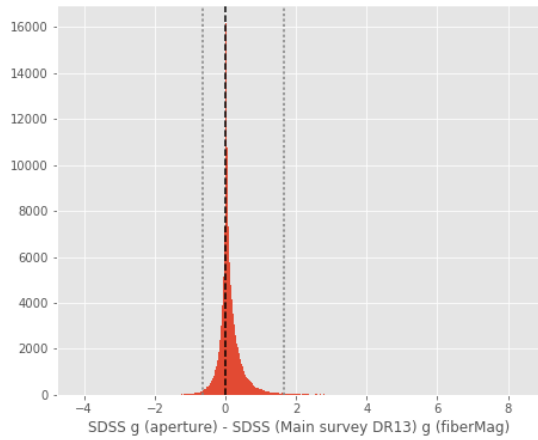
- Median: 0.56
- Median Absolute Deviation: 0.96
- 1% percentile: -3.5134815216064457
- 99% percentile: 8.87299057006836



SDSS g (aperture) - SDSS (Main survey DR13) g (fiberMag):

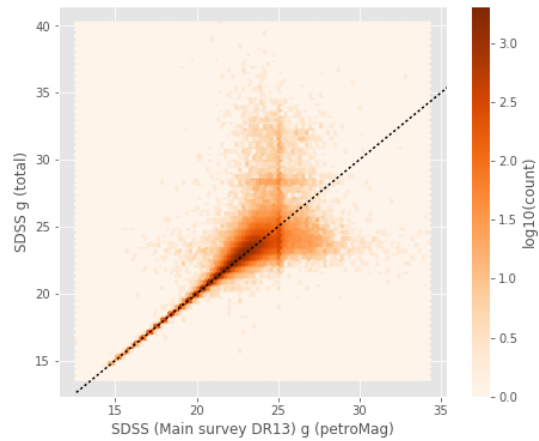
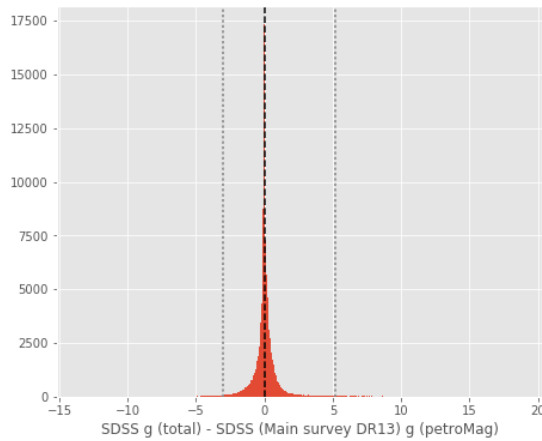
- Median: 0.05

- Median Absolute Deviation: 0.11
- 1% percentile: -0.6479984283447267
- 99% percentile: 1.6531977844238308



SDSS g (total) - SDSS (Main survey DR13) g (petroMag):

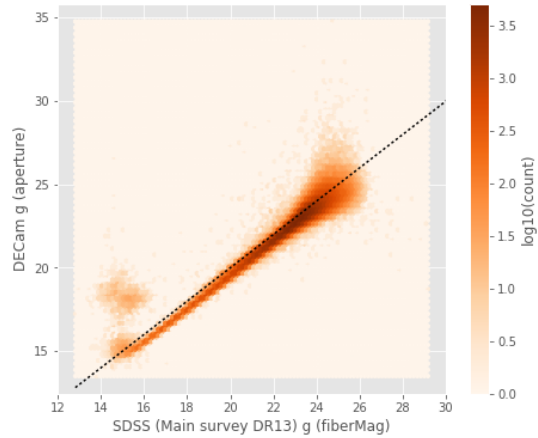
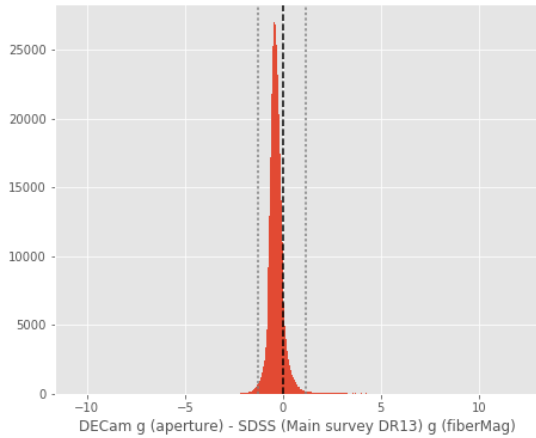
- Median: 0.00
- Median Absolute Deviation: 0.23
- 1% percentile: -2.9971901702880857
- 99% percentile: 5.182151870727542



```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
```

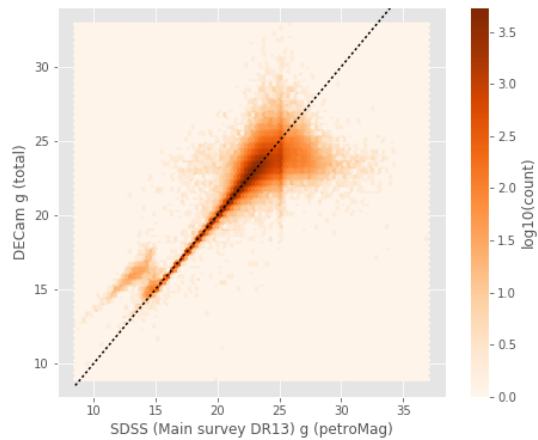
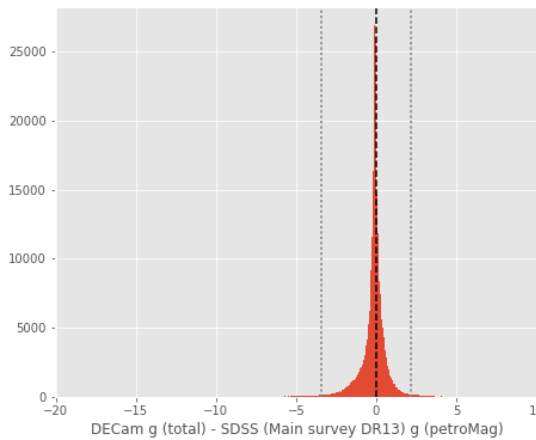
DECam g (aperture) - SDSS (Main survey DR13) g (fiberMag):

- Median: -0.37
- Median Absolute Deviation: 0.19
- 1% percentile: -1.26060453414917
- 99% percentile: 1.1906252861022946



DECam g (total) - SDSS (Main survey DR13) g (petroMag):

- Median: -0.08
- Median Absolute Deviation: 0.24
- 1% percentile: -3.4010794830322264
- 99% percentile: 2.18599571228028

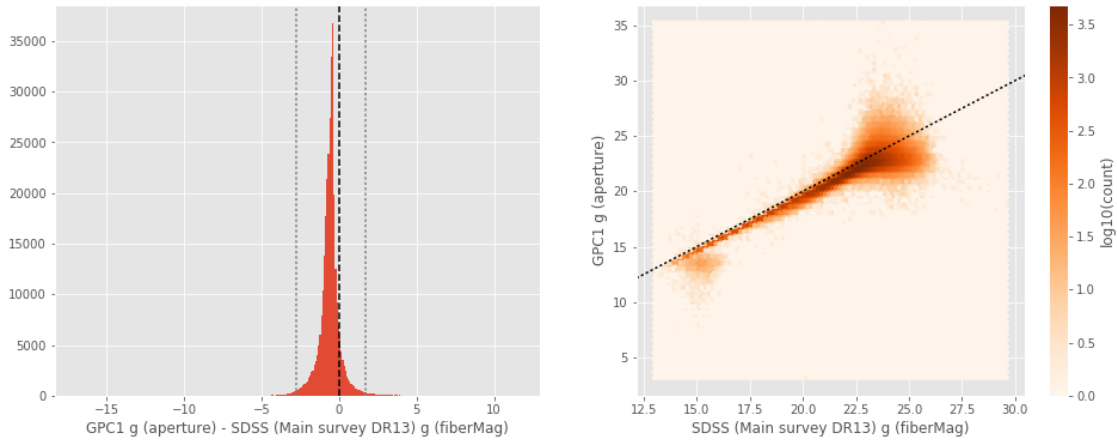


```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96  
    return getattr(self.data, op)(other)
```

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96  
    return getattr(self.data, op)(other)
```

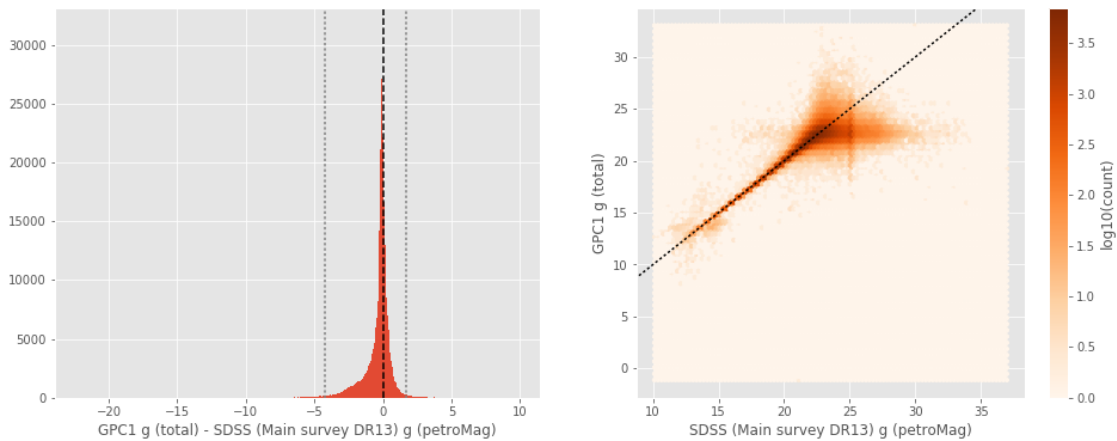
GPC1 g (aperture) - SDSS (Main survey DR13) g (fiberMag):

- Median: -0.56
- Median Absolute Deviation: 0.26
- 1% percentile: -2.735557174682617
- 99% percentile: 1.6844589233398426



GPC1 g (total) - SDSS (Main survey DR13) g (petroMag):

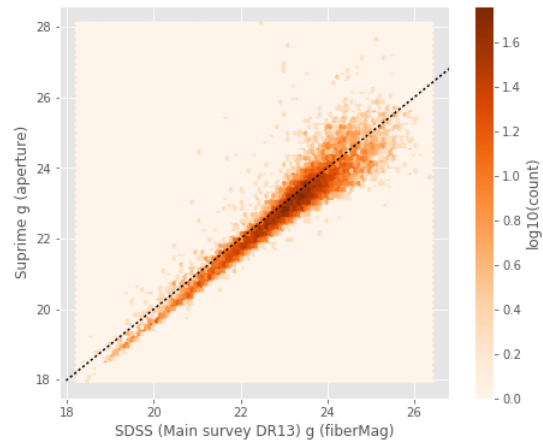
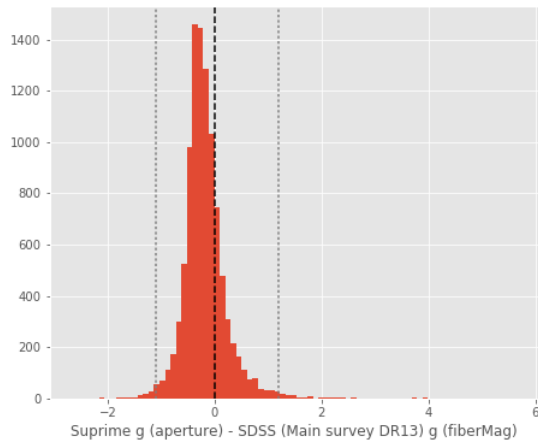
- Median: -0.11
- Median Absolute Deviation: 0.27
- 1% percentile: -4.253015518188477
- 99% percentile: 1.708326683044434



```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
```

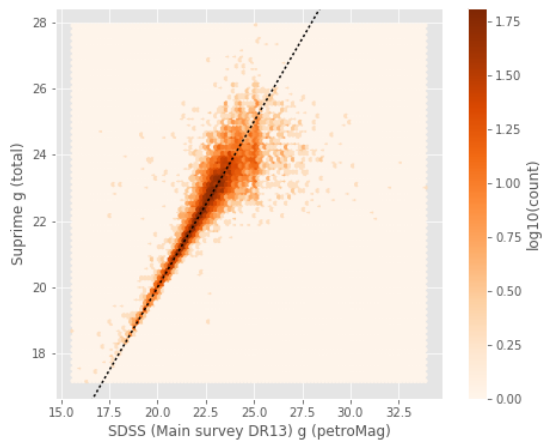
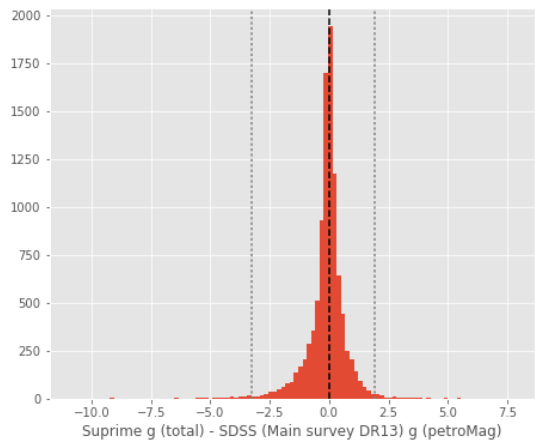
Suprime g (aperture) - SDSS (Main survey DR13) g (fiberMag):

- Median: -0.23
- Median Absolute Deviation: 0.19
- 1% percentile: -1.0930267333984376
- 99% percentile: 1.2037570953369157



Suprime g (total) - SDSS (Main survey DR13) g (petroMag):

- Median: -0.02
- Median Absolute Deviation: 0.28
- 1% percentile: -3.2505781555175783
- 99% percentile: 1.9196280670166028

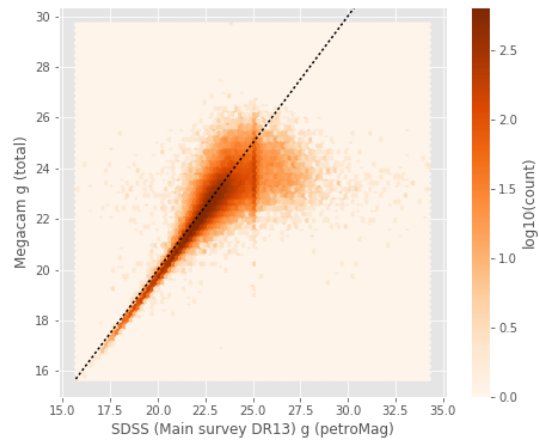
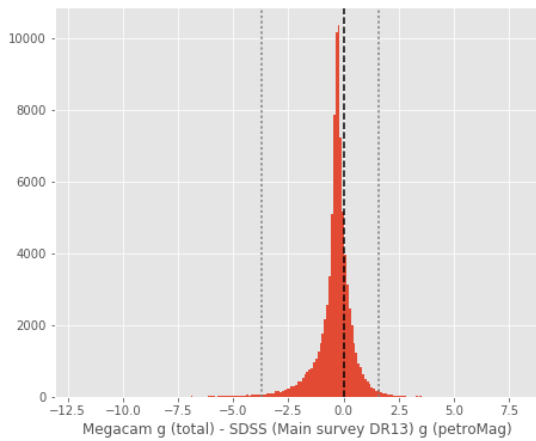


```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
```

No aperture mags for m_ap_megacam_g

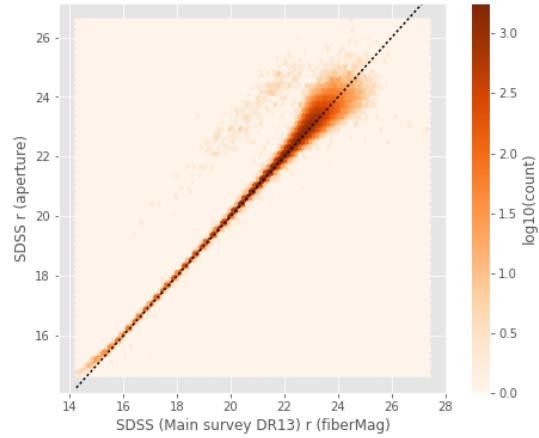
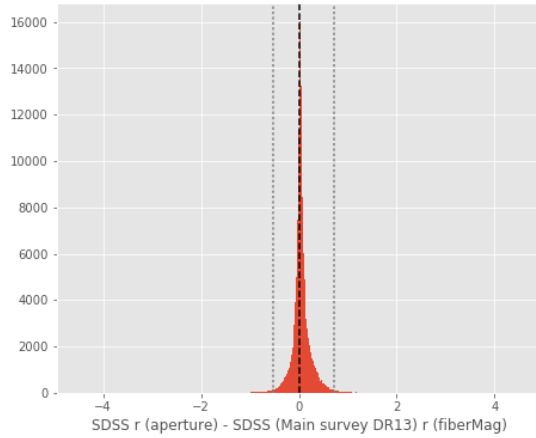
Megacam g (total) - SDSS (Main survey DR13) g (petroMag):

- Median: -0.29
- Median Absolute Deviation: 0.28
- 1% percentile: -3.704325294494629
- 99% percentile: 1.597099914550779



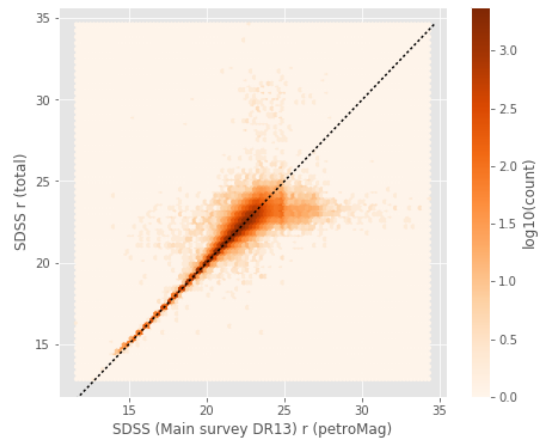
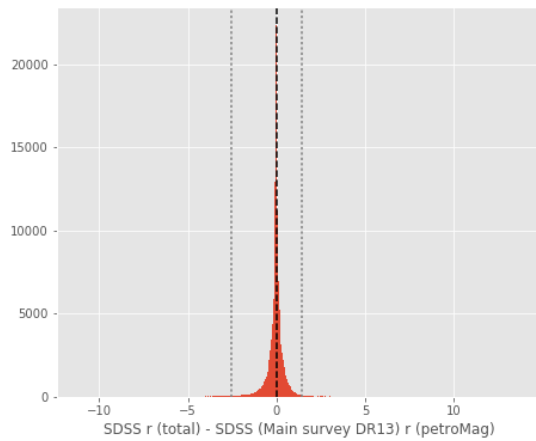
SDSS r (aperture) - SDSS (Main survey DR13) r (fiberMag):

- Median: 0.03
- Median Absolute Deviation: 0.07
- 1% percentile: -0.5305548858642578
- 99% percentile: 0.7259655761718752



SDSS r (total) - SDSS (Main survey DR13) r (petroMag):

- Median: -0.02
- Median Absolute Deviation: 0.14
- 1% percentile: -2.5521210479736327
- 99% percentile: 1.4518063354492203



```

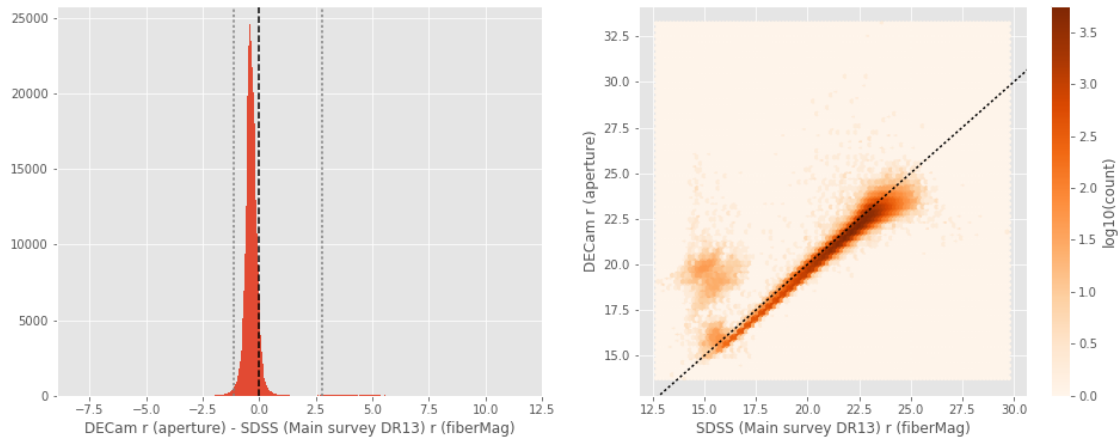
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)

```

DECam r (aperture) - SDSS (Main survey DR13) r (fiberMag):

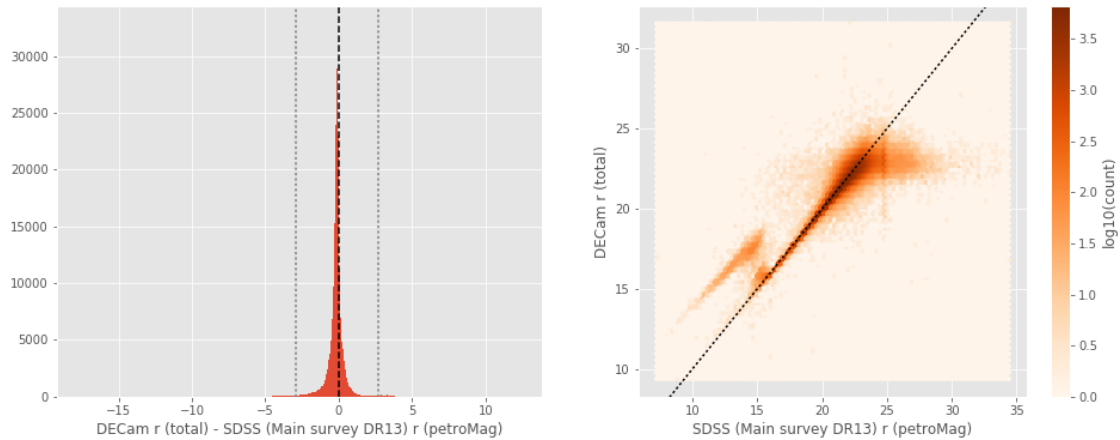
- Median: -0.36
- Median Absolute Deviation: 0.15

- 1% percentile: -1.1377024030685425
- 99% percentile: 2.7720863342285016



DECcam r (total) - SDSS (Main survey DR13) r (petroMag):

- Median: -0.14
- Median Absolute Deviation: 0.16
- 1% percentile: -2.9299356269836423
- 99% percentile: 2.666814746856679



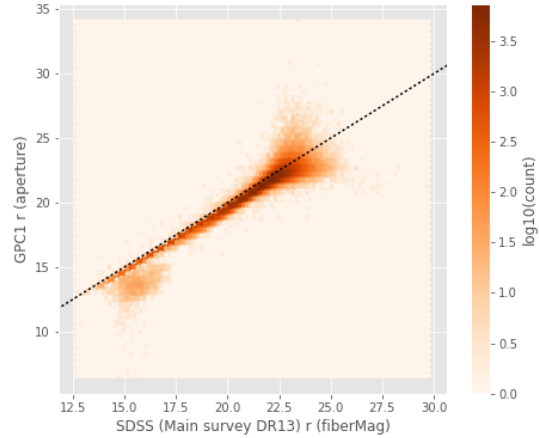
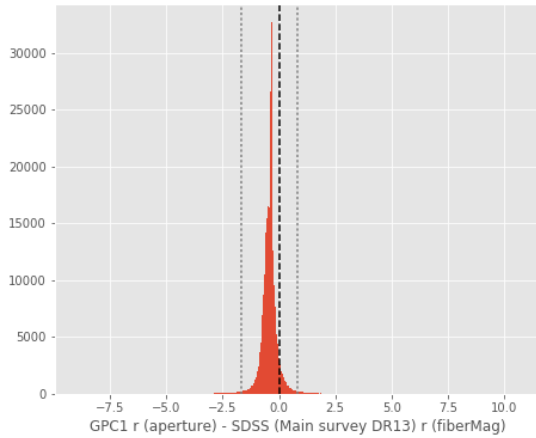
```

/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)

```

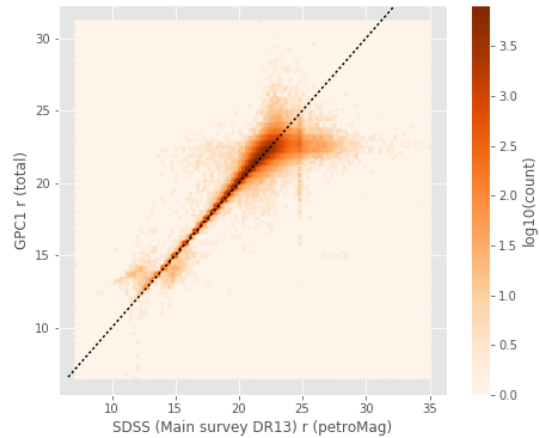
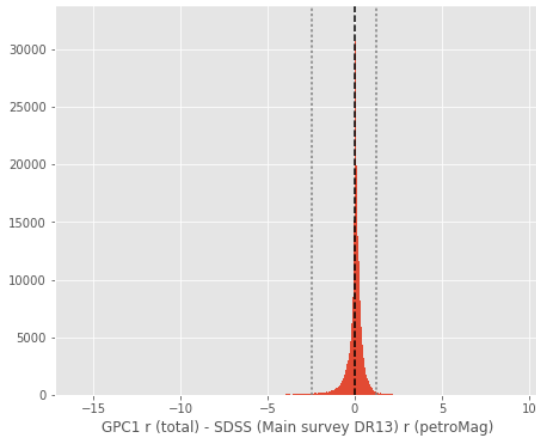
GPC1 r (aperture) - SDSS (Main survey DR13) r (fiberMag):

- Median: -0.40
- Median Absolute Deviation: 0.15
- 1% percentile: -1.6660145187377928
- 99% percentile: 0.8067936897277842



GPC1 r (total) - SDSS (Main survey DR13) r (petroMag):

- Median: 0.05
- Median Absolute Deviation: 0.15
- 1% percentile: -2.4857117462158205
- 99% percentile: 1.234417324066155

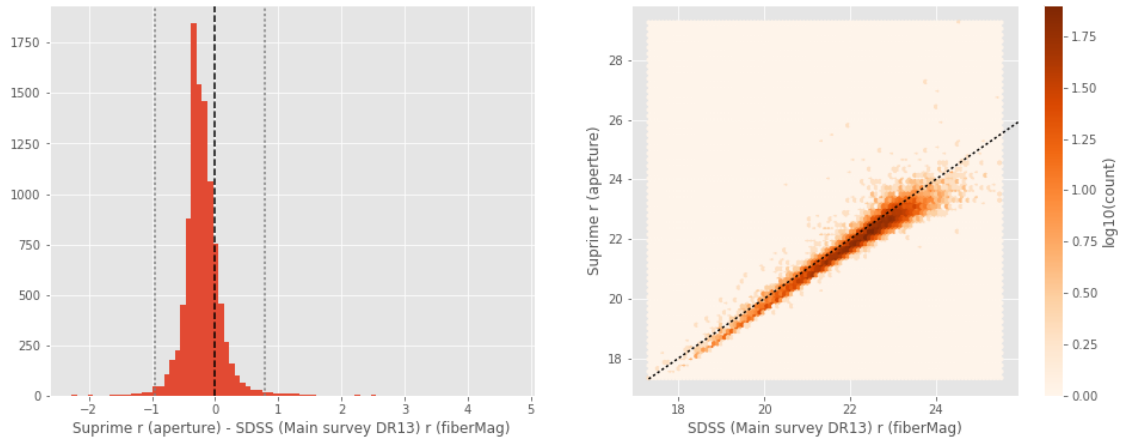


```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96  
    return getattr(self.data, op)(other)
```

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
```

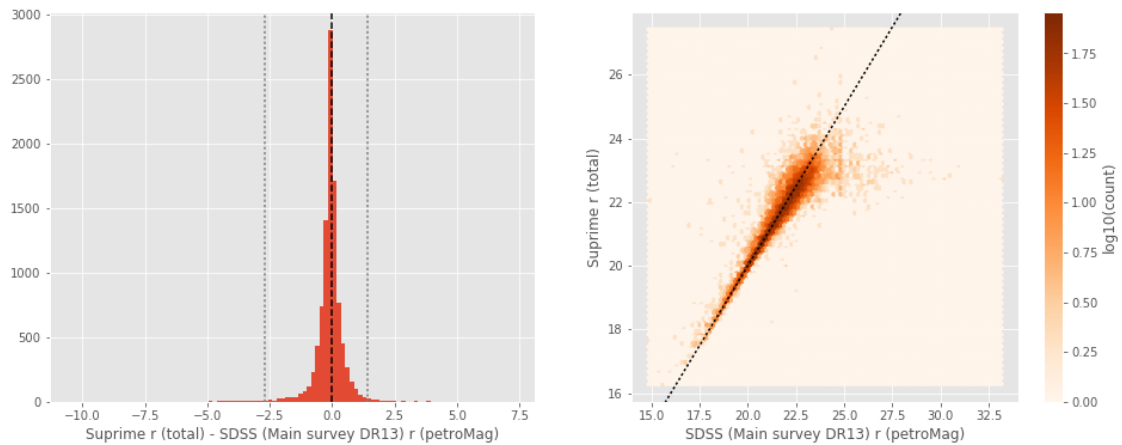
Suprime r (aperture) - SDSS (Main survey DR13) r (fiberMag):

- Median: -0.23
- Median Absolute Deviation: 0.14
- 1% percentile: -0.9455735778808594
- 99% percentile: 0.7845361328125033



Suprime r (total) - SDSS (Main survey DR13) r (petroMag):

- Median: -0.06
- Median Absolute Deviation: 0.18
- 1% percentile: -2.7214998245239257
- 99% percentile: 1.4282546806335437

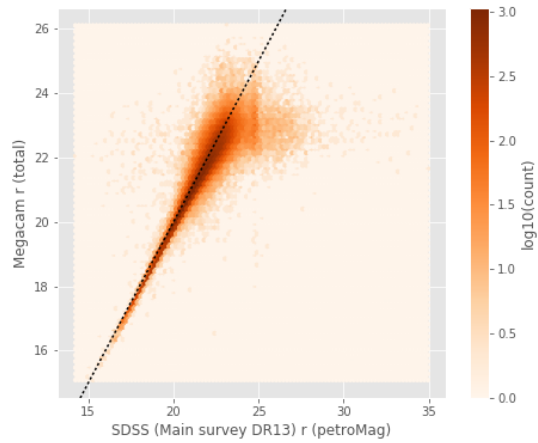
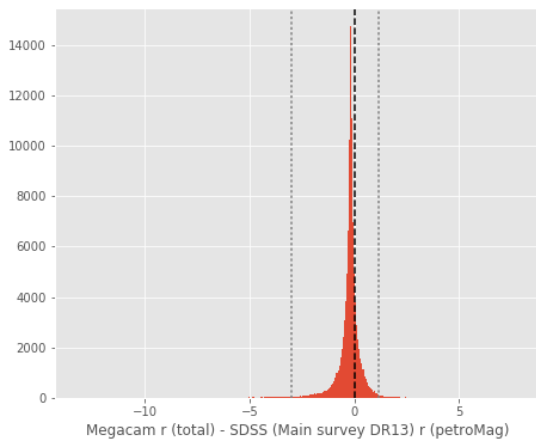


```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
```

No aperture mags for m_ap_megacam_r

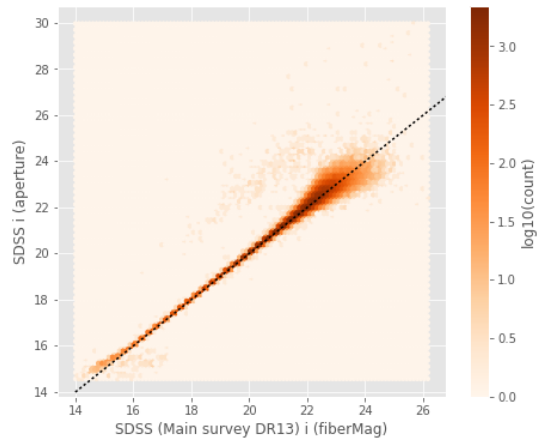
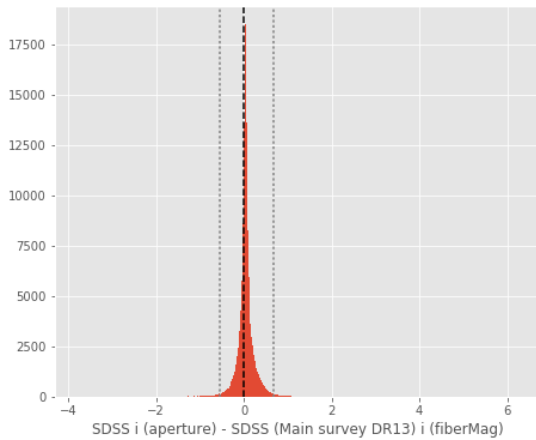
Megacam r (total) - SDSS (Main survey DR13) r (petroMag):

- Median: -0.18
- Median Absolute Deviation: 0.16
- 1% percentile: -3.0286756706237794
- 99% percentile: 1.1727687644958498



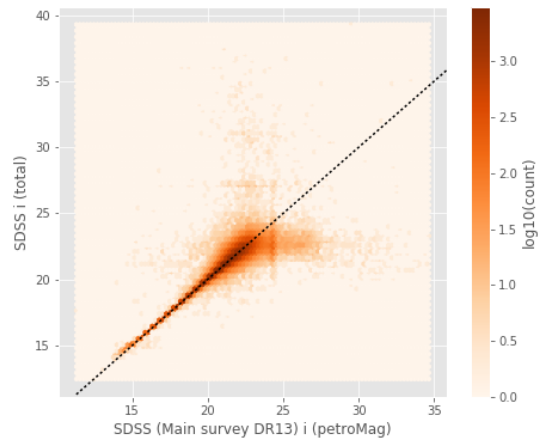
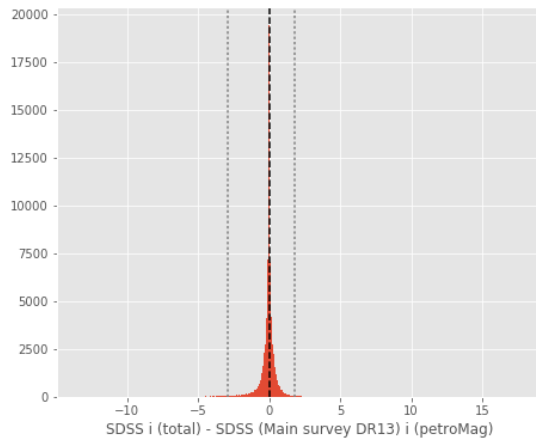
SDSS i (aperture) - SDSS (Main survey DR13) i (fiberMag):

- Median: 0.03
- Median Absolute Deviation: 0.06
- 1% percentile: -0.5589021301269531
- 99% percentile: 0.6856722259521489



SDSS i (total) - SDSS (Main survey DR13) i (petroMag):

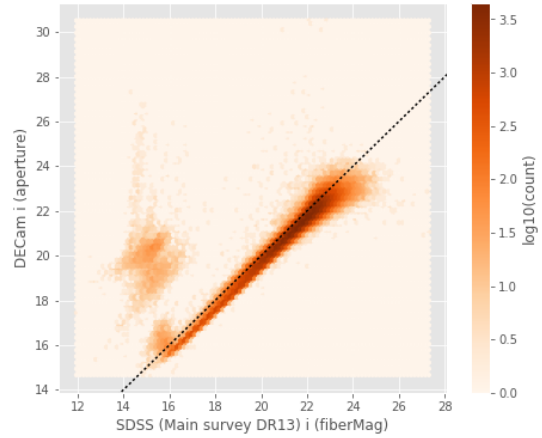
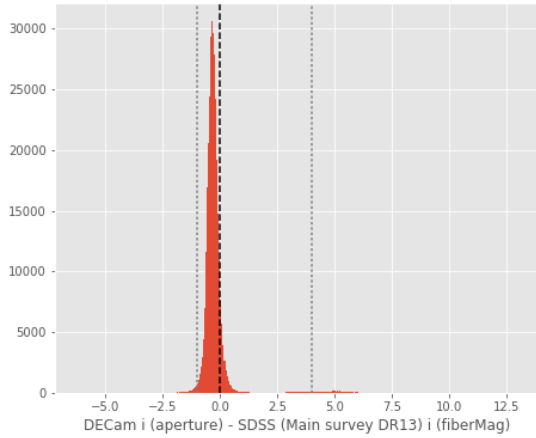
- Median: -0.01
- Median Absolute Deviation: 0.14
- 1% percentile: -2.925102844238281
- 99% percentile: 1.76518714904786



```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96  
    return getattr(self.data, op)(other)  
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96  
    return getattr(self.data, op)(other)
```

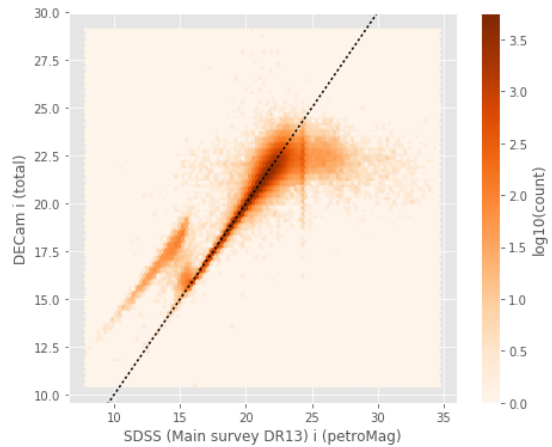
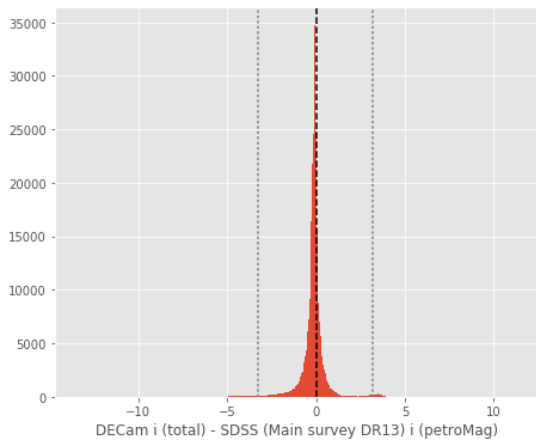
DECam i (aperture) - SDSS (Main survey DR13) i (fiberMag):

- Median: -0.32
- Median Absolute Deviation: 0.15
- 1% percentile: -1.0122640228271484
- 99% percentile: 4.0115745830535845



DECcam i (total) - SDSS (Main survey DR13) i (petroMag):

- Median: -0.11
- Median Absolute Deviation: 0.16
- 1% percentile: -3.2983285903930666
- 99% percentile: 3.1674051761627164



```

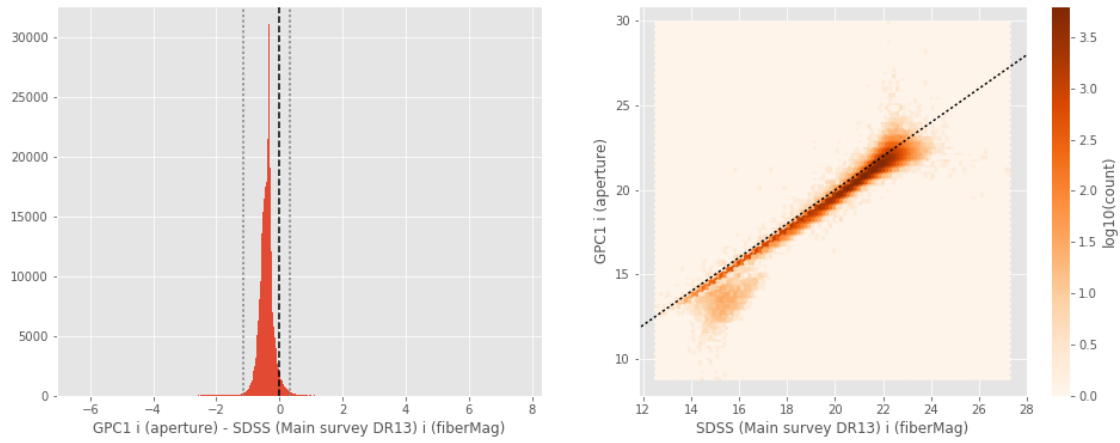
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)

```

GPC1 i (aperture) - SDSS (Main survey DR13) i (fiberMag):

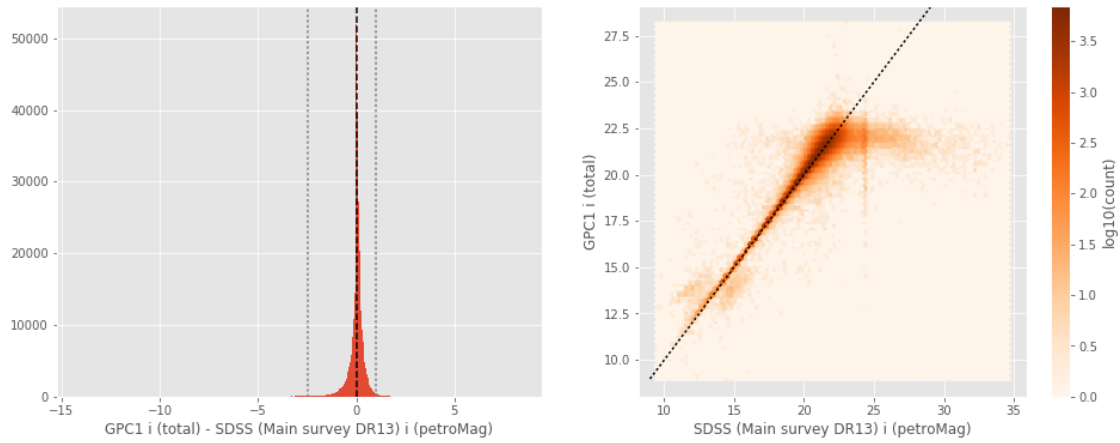
- Median: -0.39
- Median Absolute Deviation: 0.11

- 1% percentile: -1.1516051483154295
- 99% percentile: 0.31156303405761676



GPC1 i (total) - SDSS (Main survey DR13) i (petroMag):

- Median: 0.05
- Median Absolute Deviation: 0.12
- 1% percentile: -2.4436785888671873
- 99% percentile: 0.9845069885253944



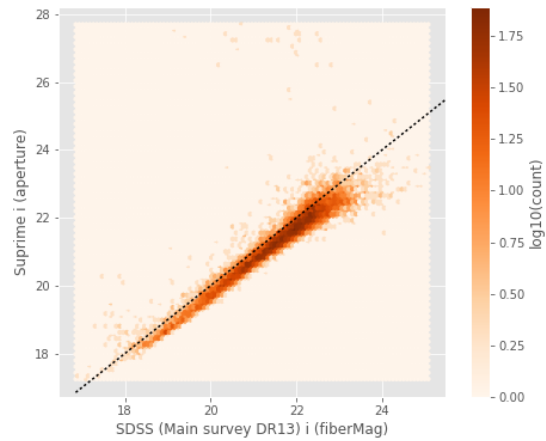
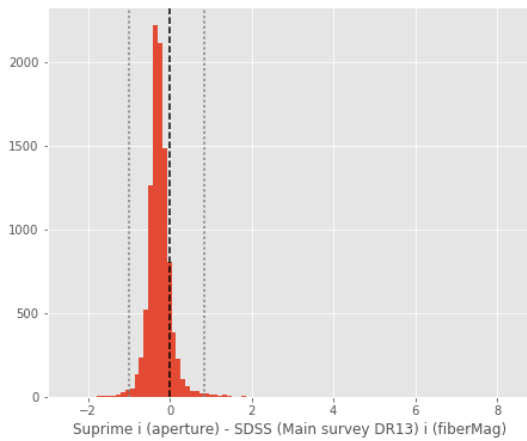
```

/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)

```

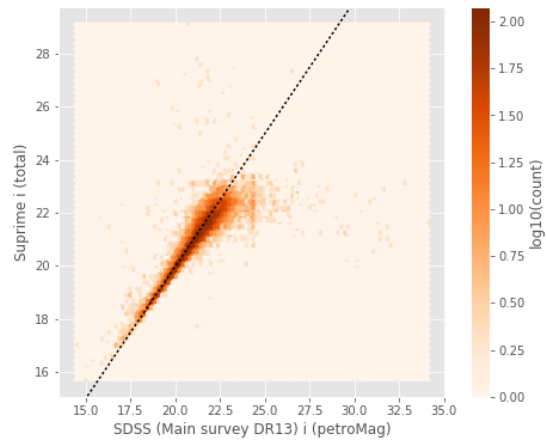
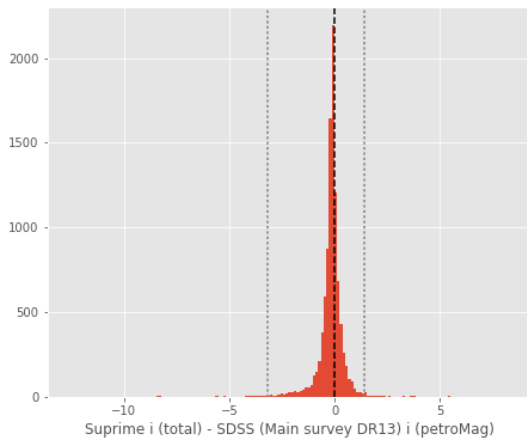
Suprime i (aperture) - SDSS (Main survey DR13) i (fiberMag):

- Median: -0.27
- Median Absolute Deviation: 0.13
- 1% percentile: -1.0071136474609375
- 99% percentile: 0.8465133666992227



Suprime i (total) - SDSS (Main survey DR13) i (petroMag):

- Median: -0.11
- Median Absolute Deviation: 0.19
- 1% percentile: -3.1658200073242186
- 99% percentile: 1.4102133178710943



```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96  
    return getattr(self.data, op)(other)
```

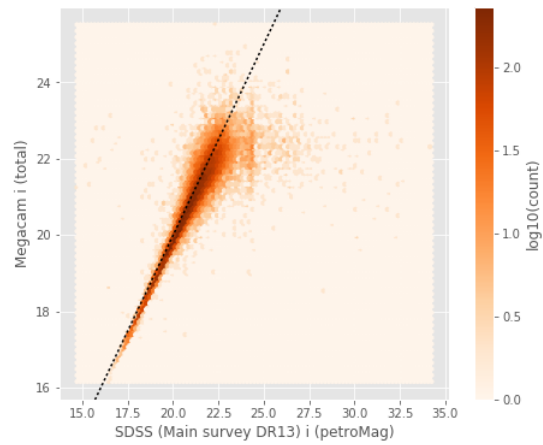
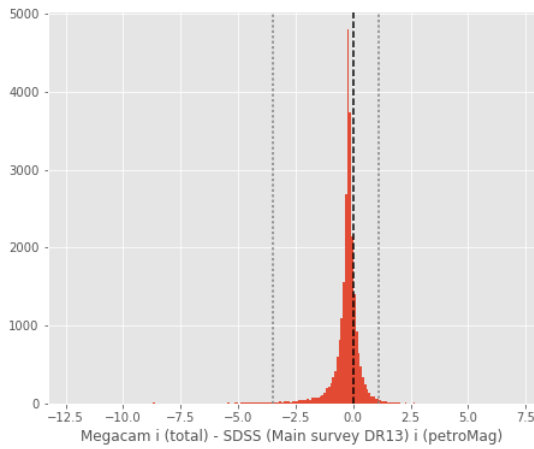


```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
```

No aperture mags for m_ap_megacam_i

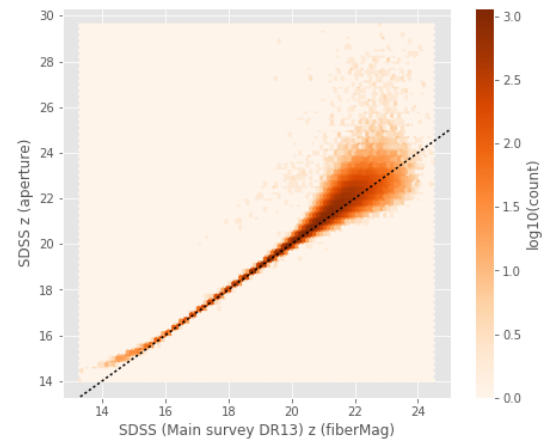
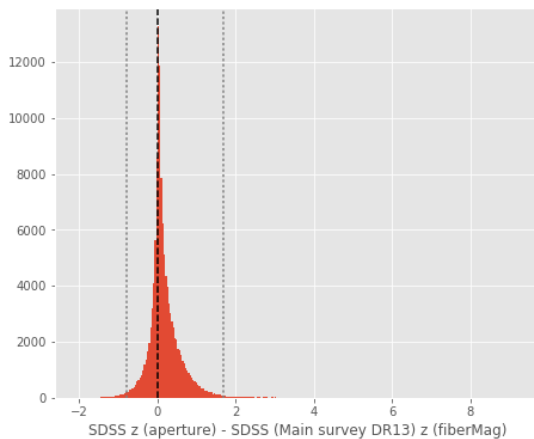
Megacam i (total) - SDSS (Main survey DR13) i (petroMag):

- Median: -0.20
- Median Absolute Deviation: 0.17
- 1% percentile: -3.4682626342773437
- 99% percentile: 1.1126172637939447



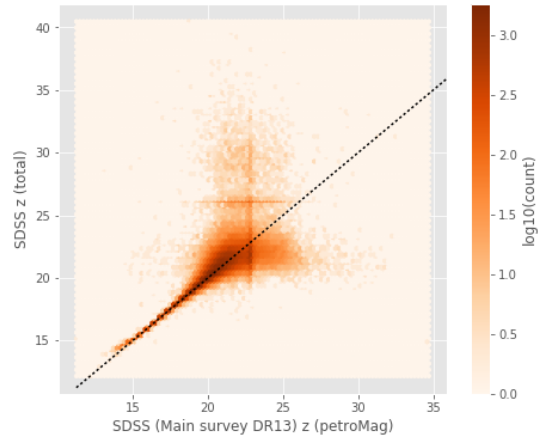
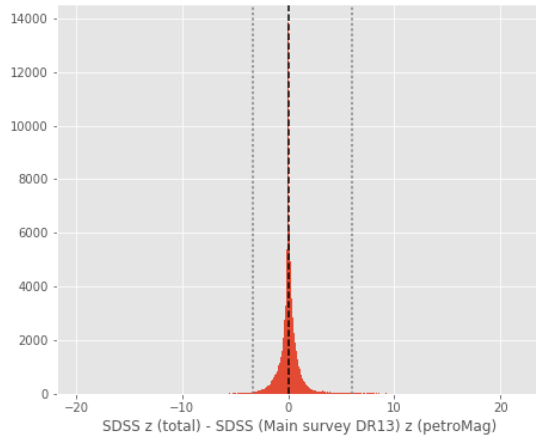
SDSS z (aperture) - SDSS (Main survey DR13) z (fiberMag):

- Median: 0.08
- Median Absolute Deviation: 0.15
- 1% percentile: -0.7951839447021485
- 99% percentile: 1.6876296234130859



SDSS z (total) - SDSS (Main survey DR13) z (petroMag):

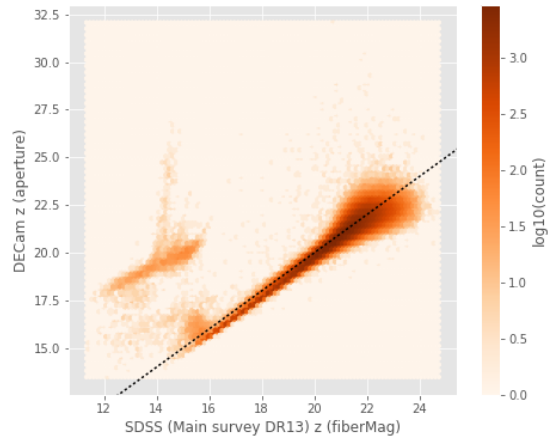
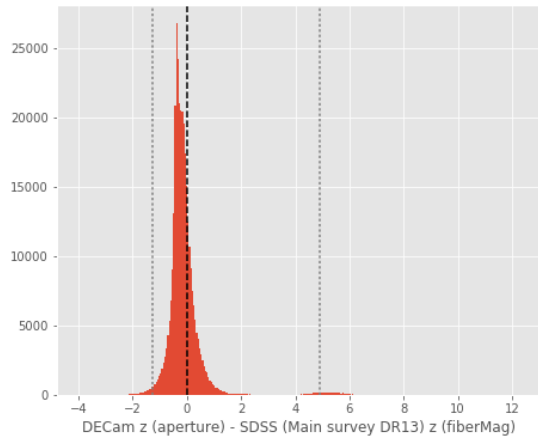
- Median: 0.01
- Median Absolute Deviation: 0.33
- 1% percentile: -3.3685269927978516
- 99% percentile: 5.986448974609386



```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96  
    return getattr(self.data, op)(other)  
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96  
    return getattr(self.data, op)(other)
```

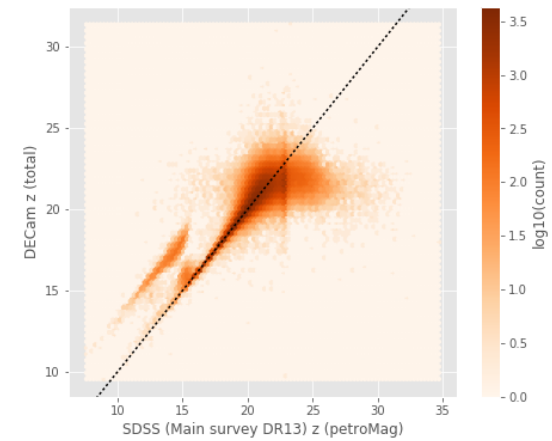
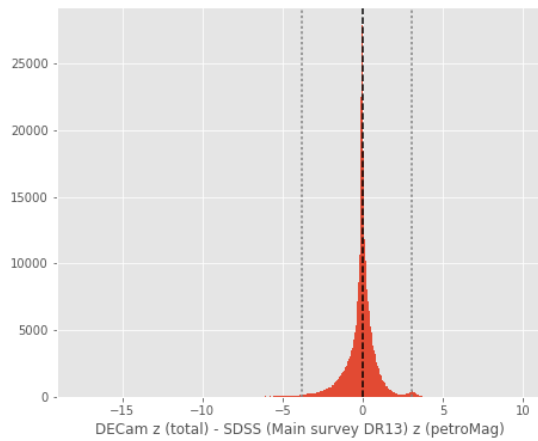
DECam z (aperture) - SDSS (Main survey DR13) z (fiberMag):

- Median: -0.20
- Median Absolute Deviation: 0.21
- 1% percentile: -1.2427624130249022
- 99% percentile: 4.901515693664551



DECcam z (total) - SDSS (Main survey DR13) z (petroMag):

- Median: -0.04
- Median Absolute Deviation: 0.34
- 1% percentile: -3.782515640258789
- 99% percentile: 3.0219324111938475



```

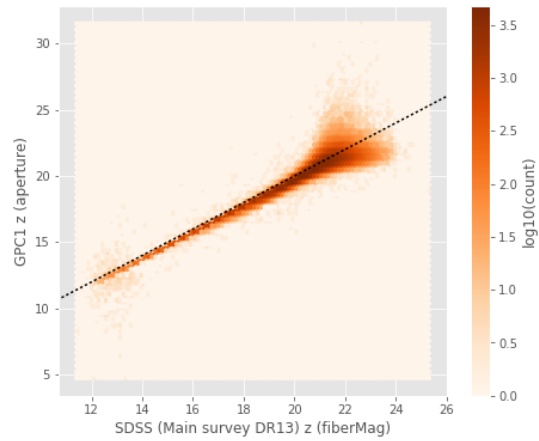
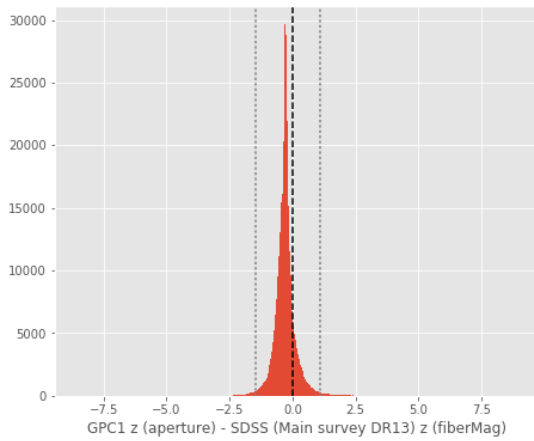
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)

```

GPC1 z (aperture) - SDSS (Main survey DR13) z (fiberMag):

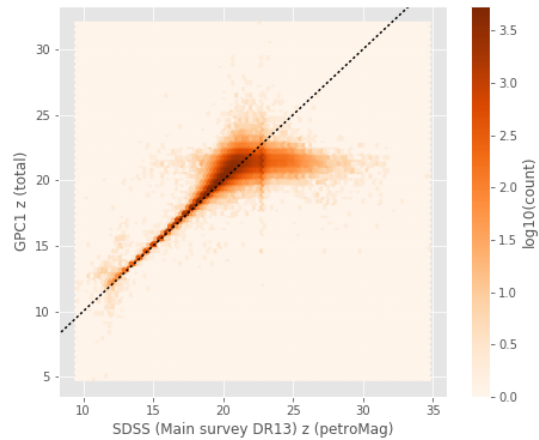
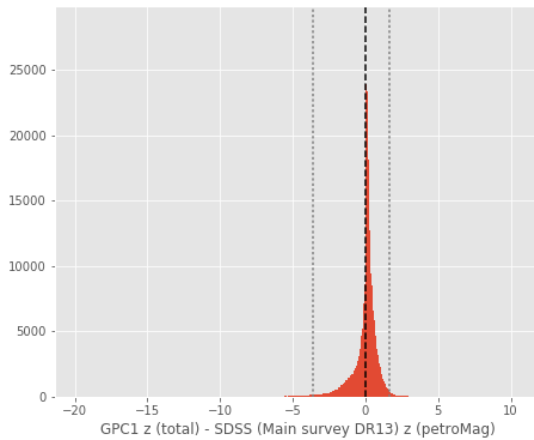
- Median: -0.30
- Median Absolute Deviation: 0.18

- 1% percentile: -1.4594875335693358
- 99% percentile: 1.0914287567138672



GPC1 z (total) - SDSS (Main survey DR13) z (petroMag):

- Median: 0.12
- Median Absolute Deviation: 0.26
- 1% percentile: -3.6241982078552244
- 99% percentile: 1.691168384552002



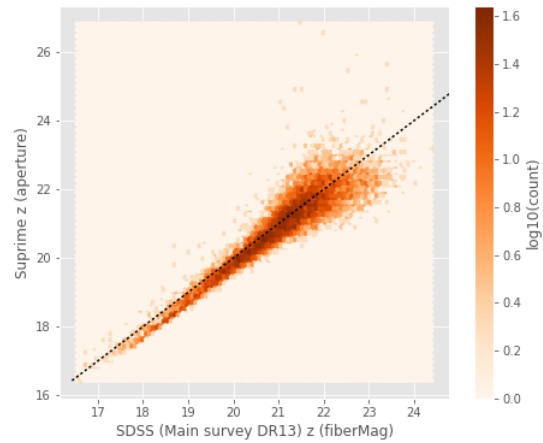
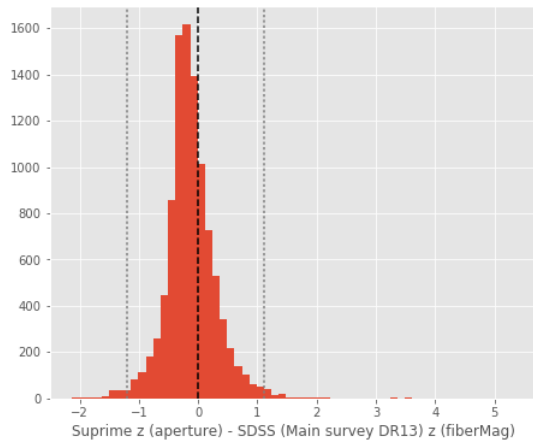
```

/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)

```

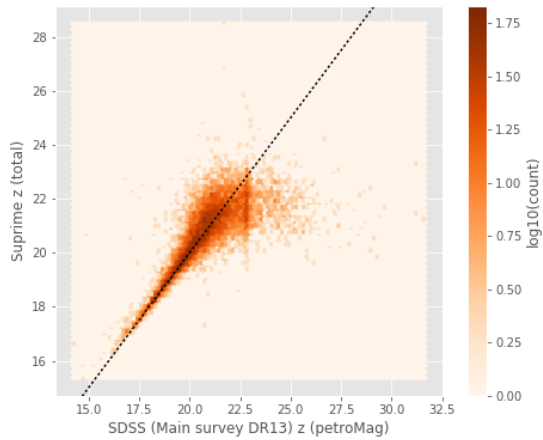
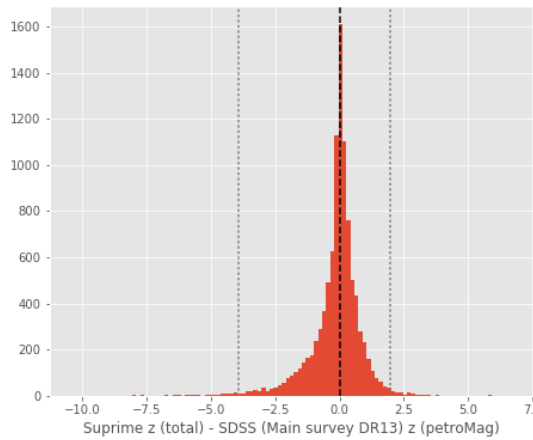
Suprime z (aperture) - SDSS (Main survey DR13) z (fiberMag):

- Median: -0.16
- Median Absolute Deviation: 0.21
- 1% percentile: -1.2107695579528808
- 99% percentile: 1.1201134109497073



Suprime z (total) - SDSS (Main survey DR13) z (petroMag):

- Median: -0.01
- Median Absolute Deviation: 0.36
- 1% percentile: -3.9397744941711426
- 99% percentile: 1.9816471862792966



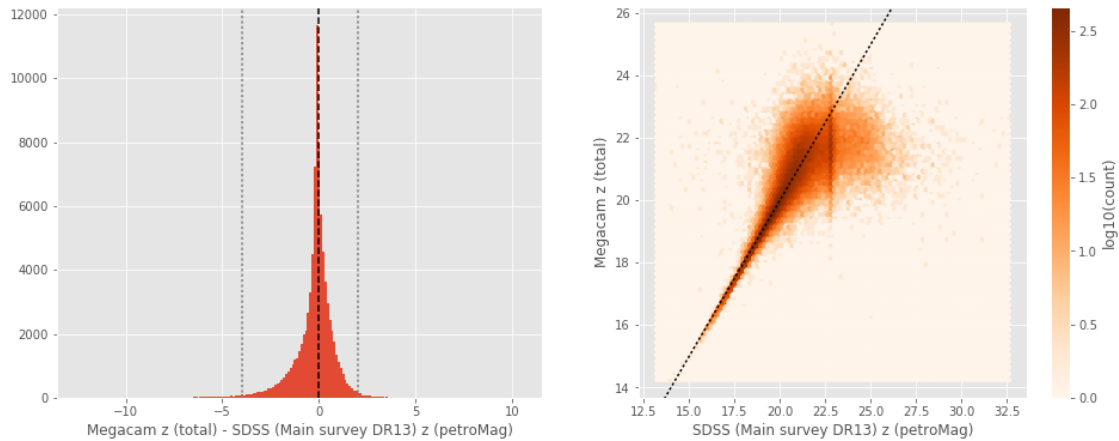
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96  
    return getattr(self.data, op)(other)
```

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:96
    return getattr(self.data, op)(other)
```

No aperture mags for m_ap_megacam_z

Megacam z (total) - SDSS (Main survey DR13) z (petroMag):

- Median: -0.10
- Median Absolute Deviation: 0.37
- 1% percentile: -4.00049057006836
- 99% percentile: 2.007762832641604



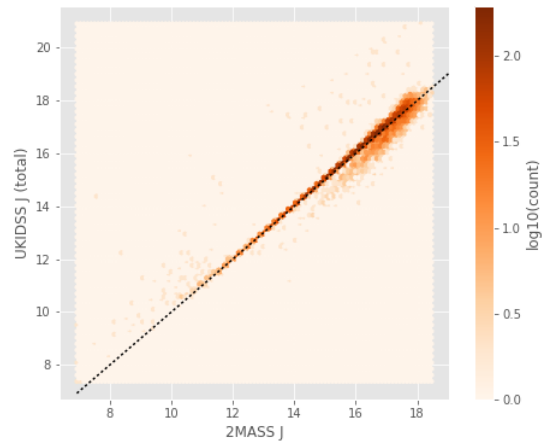
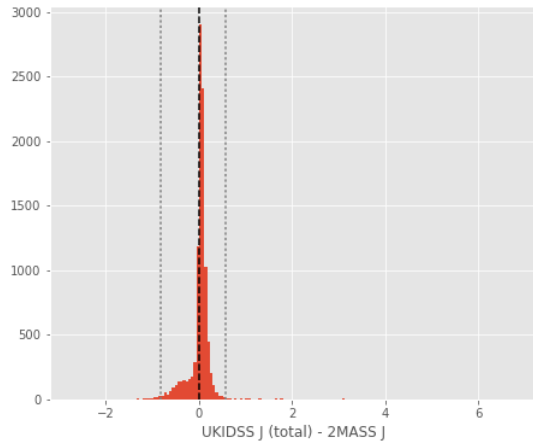
1.5.2 III.b - Comparing J and K bands to 2MASS

The catalogue is cross-matched to 2MASS-PSC withing 0.2 arcsecond.

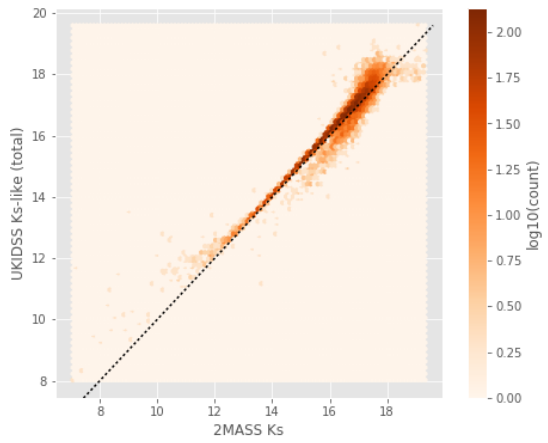
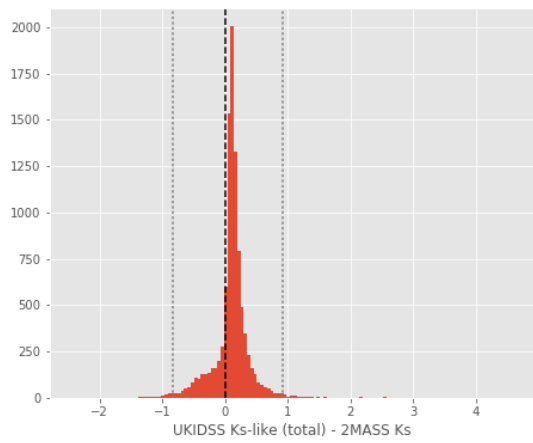
We compare the UKIDSS total J and K magnitudes to those from 2MASS.

UKIDSS J (total) - 2MASS J:

- Median: 0.05
- Median Absolute Deviation: 0.06
- 1% percentile: -0.8113546089078736
- 99% percentile: 0.5849801442049172

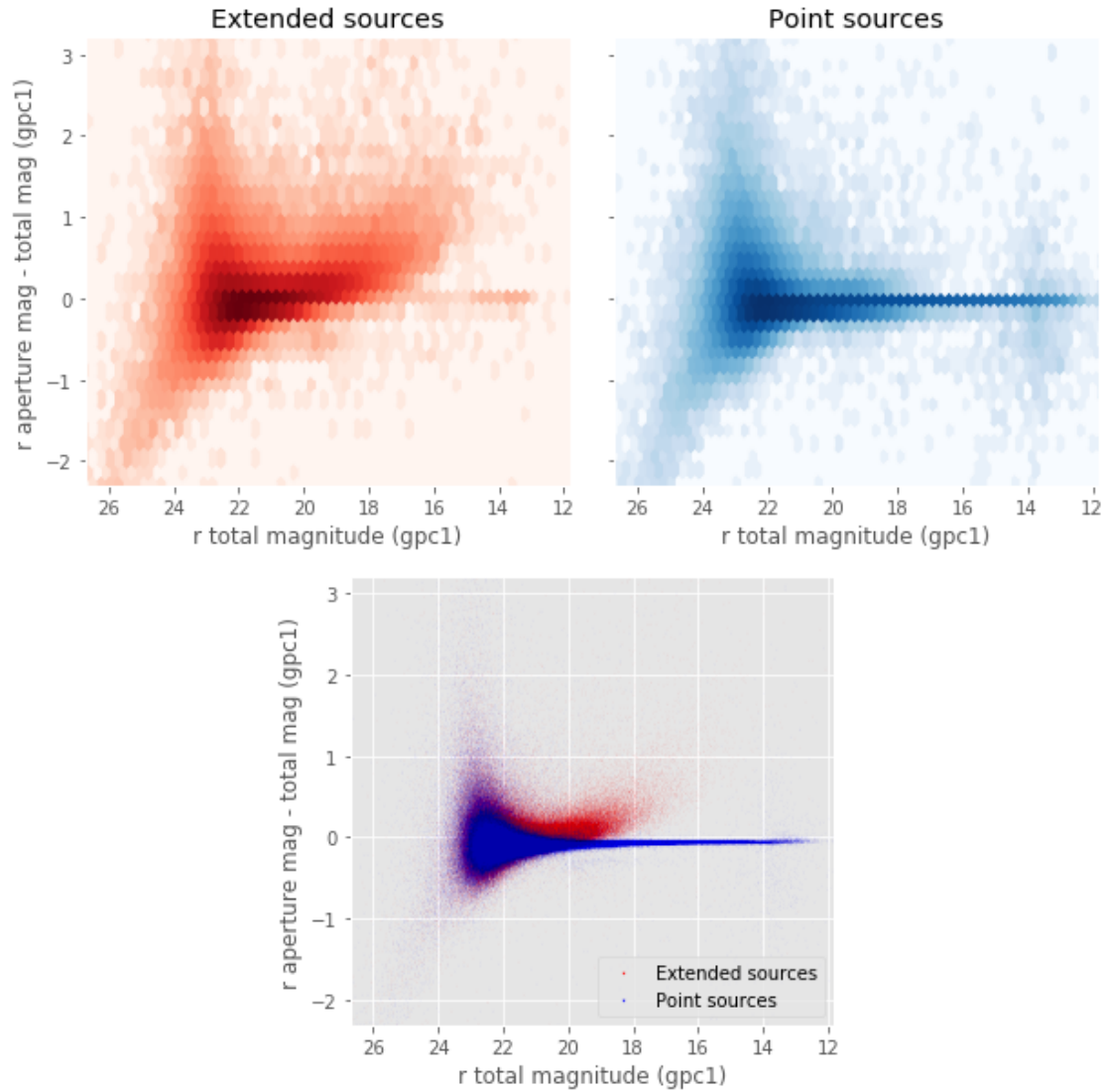


- UKIDSS Ks-like (total) - 2MASS Ks:
- Median: 0.11
 - Median Absolute Deviation: 0.08
 - 1% percentile: -0.8339668541582612
 - 99% percentile: 0.9274704844037486



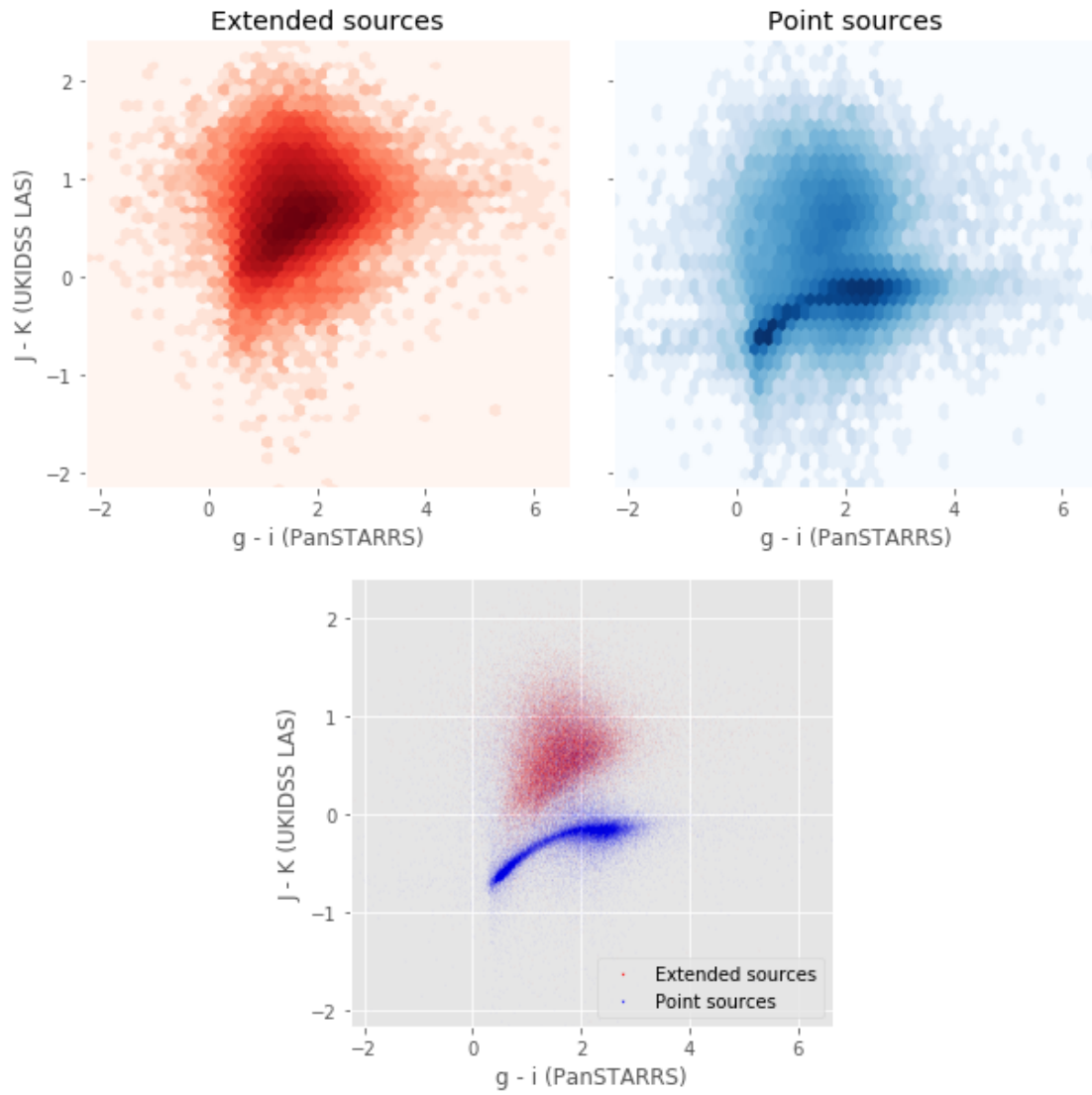
1.6 IV - Comparing aperture magnitudes to total ones.

Number of source used: 599198 / 5019646 (11.94%)

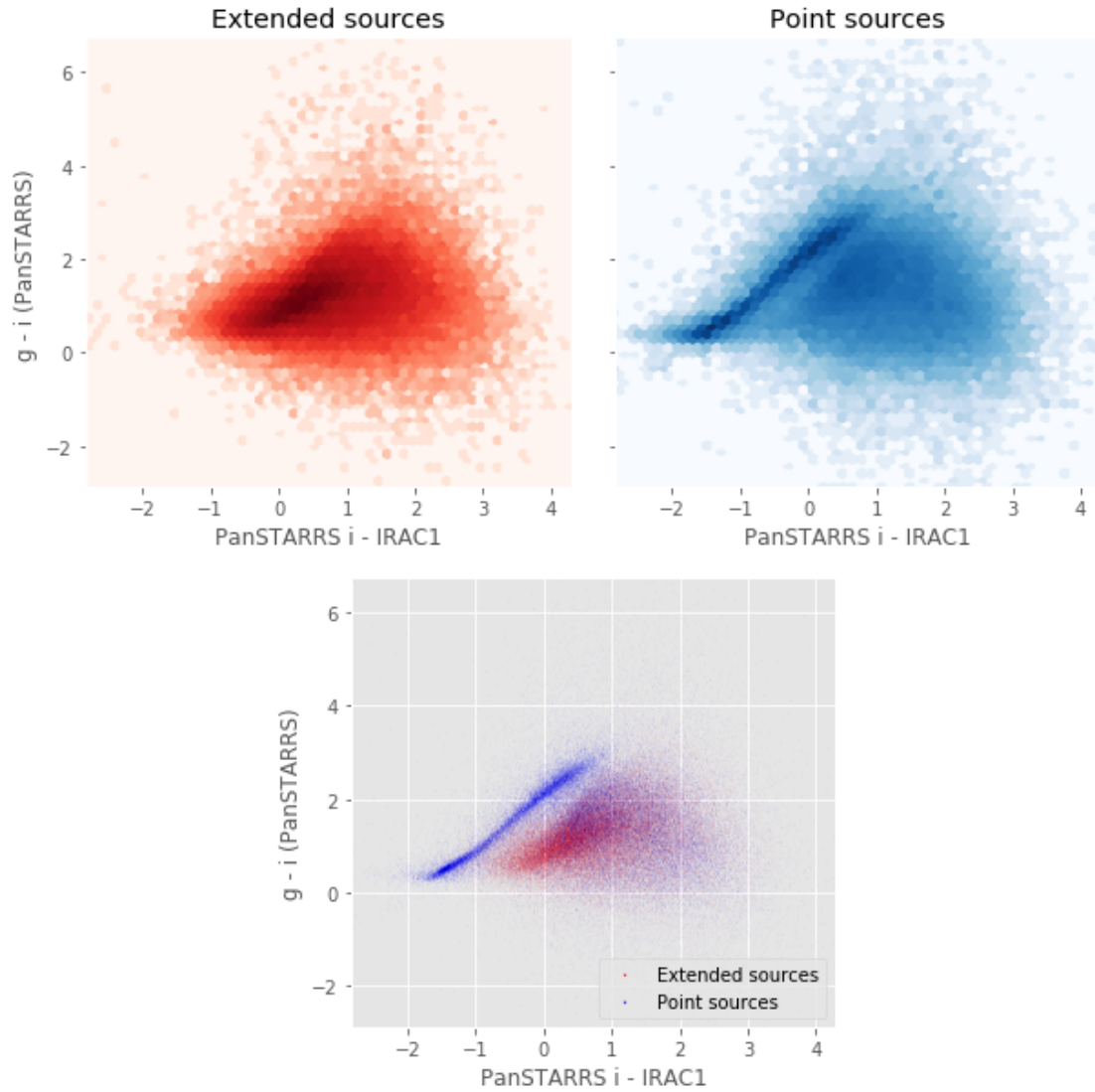


1.7 V - Color-color and magnitude-color plots

Number of source used: 112482 / 5019646 (2.24%)



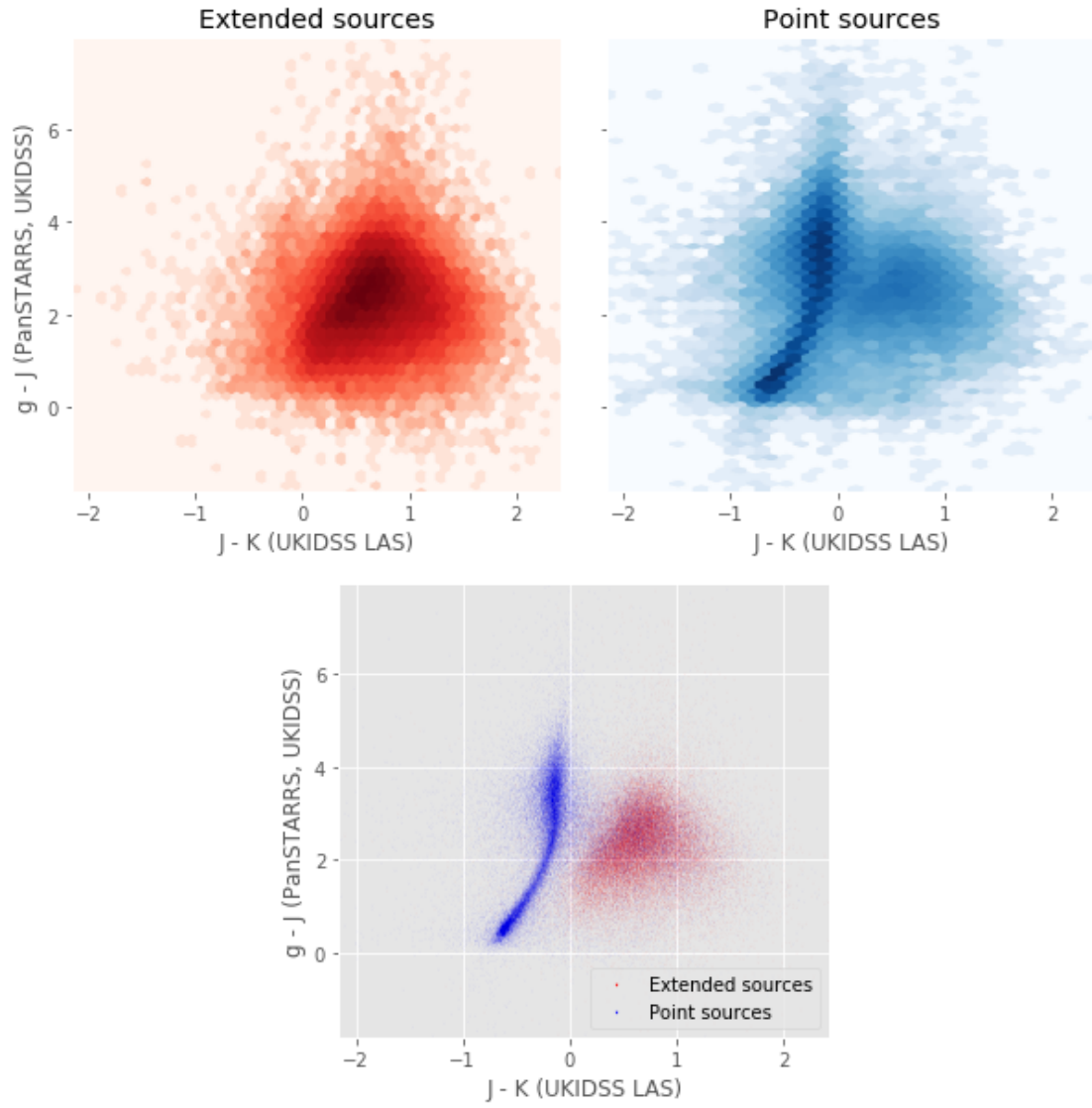
Number of source used: 133226 / 5019646 (2.65%)



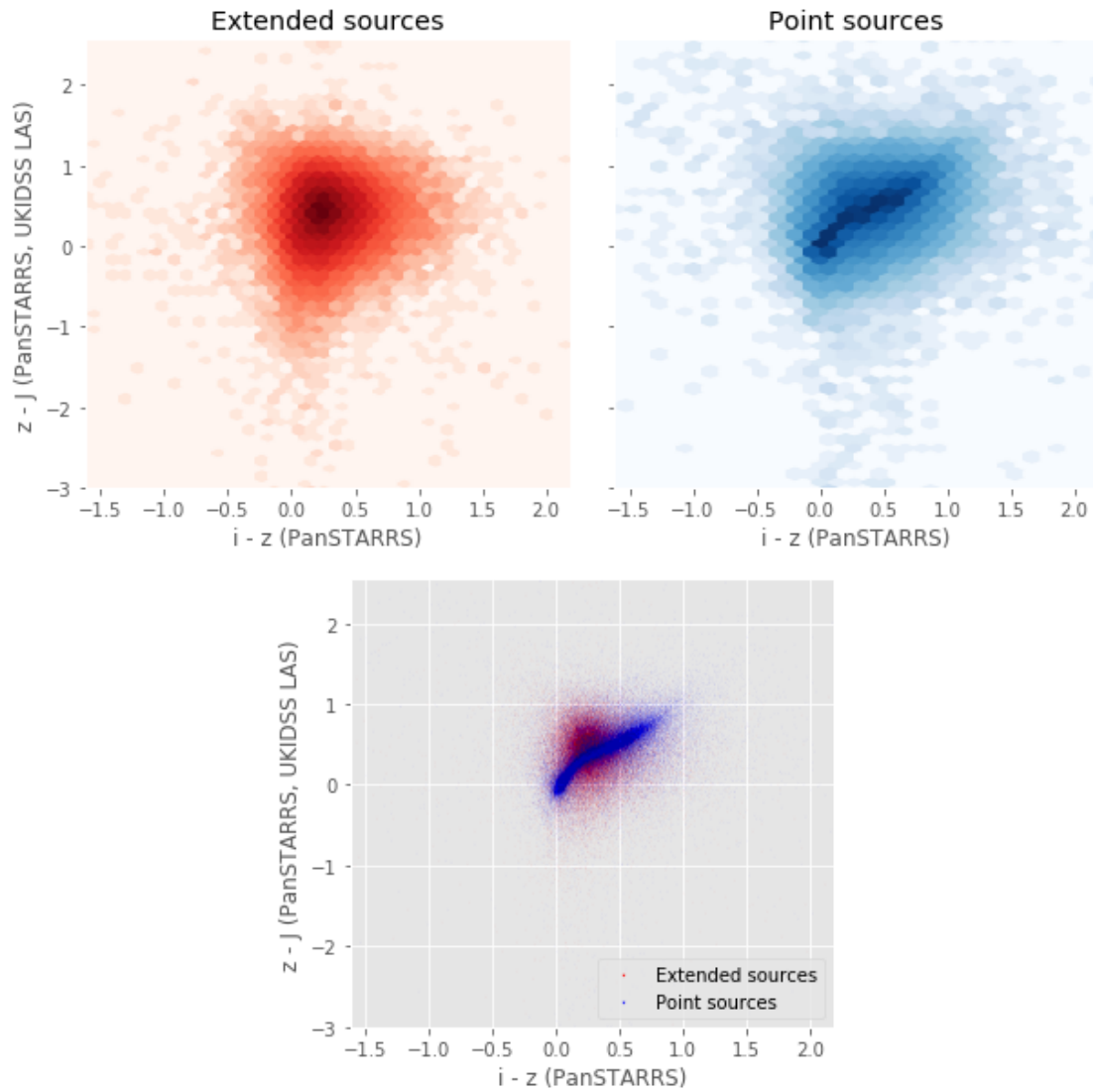
Number of source used: 0 / 5019646 (0.00%)

HELP warning: no sources with observations in both bands

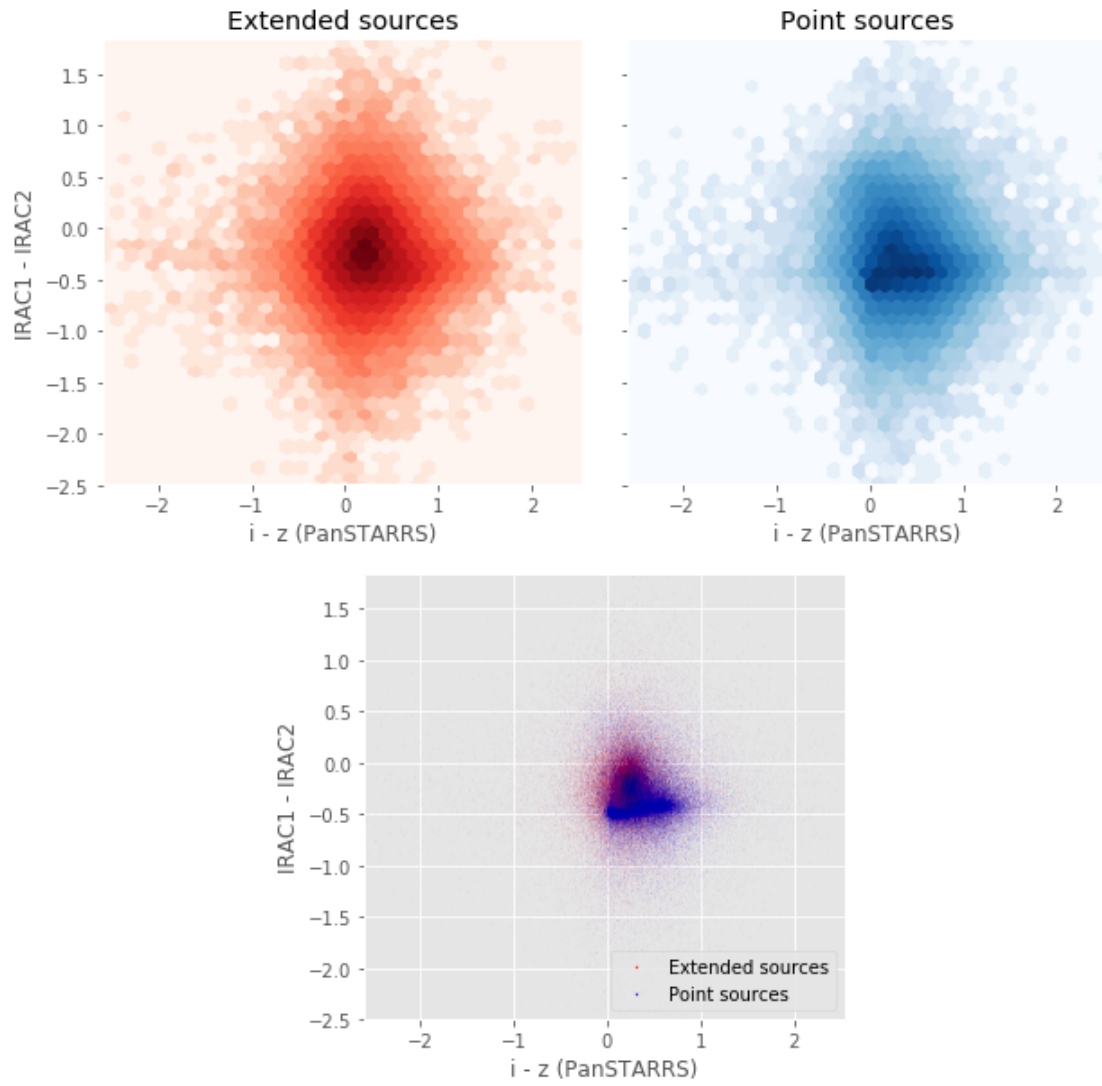
Number of source used: 112668 / 5019646 (2.24%)



Number of source used: 134037 / 5019646 (2.67%)



Number of source used: 138547 / 5019646 (2.76%)



4_Selection_function

March 8, 2018

1 Herschel-Stripe-82 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 12:41:22.340965
```

```
Diagnostics done using: master_catalogue_akari-nep_20180215.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[13]: <IPython.core.display.HTML object>
```

```
Out[15]: <IPython.core.display.HTML object>
```

```
Out[16]: <IPython.core.display.HTML object>
```

1.4 III - Save the depth map table

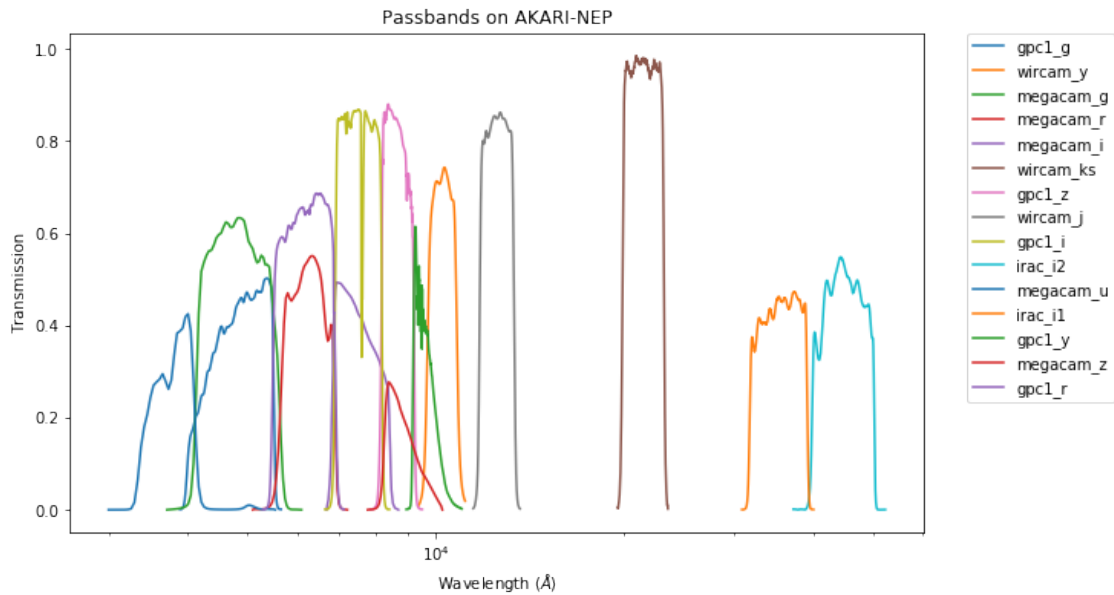
1.5 IV - Overview plots

1.5.1 IV.a - Filters

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

```
Out[43]: {'gpc1_g',  
          'gpc1_i',  
          'gpc1_r',  
          'gpc1_y',  
          'gpc1_z',  
          'irac_i1',  
          'irac_i2',  
          'megacam_g',  
          'megacam_i',  
          'megacam_r',  
          'megacam_u',  
          'megacam_z',  
          'wircam_j',  
          'wircam_ks',  
          'wircam_y'}
```

```
Out[34]: <matplotlib.text.Text at 0x10efb5710>
```



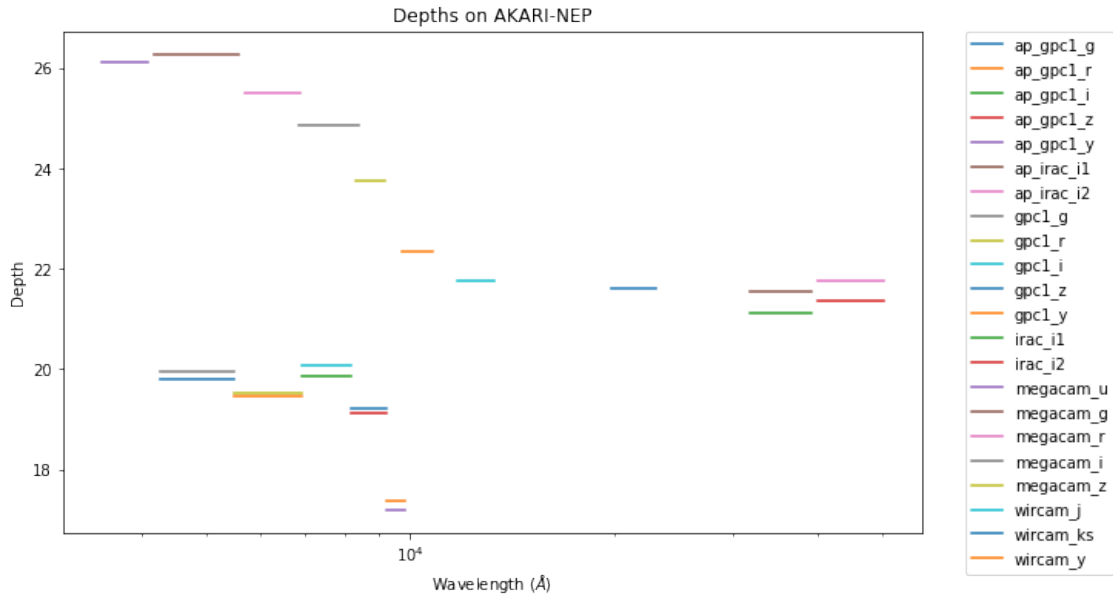
1.5.2 IV.a - Depth overview

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

gpc1_g: mean flux error: 8.806699357169498, 3sigma in AB mag (Aperture): 20.34516393653916
gpc1_r: mean flux error: 12.067129104246586, 3sigma in AB mag (Aperture): 20.00318696519175
gpc1_i: mean flux error: 8.251892546976062, 3sigma in AB mag (Aperture): 20.41581295290225
gpc1_z: mean flux error: 16.296125057512807, 3sigma in AB mag (Aperture): 19.676985991179073
gpc1_y: mean flux error: 97.42729605212693, 3sigma in AB mag (Aperture): 17.735495239381372
irac_i1: mean flux error: 1.7294846773147583, 3sigma in AB mag (Aperture): 22.112405066560406
irac_i2: mean flux error: 1.4147037267684937, 3sigma in AB mag (Aperture): 22.330533119207182
gpc1_g: mean flux error: 7.616552343703014, 3sigma in AB mag (Total): 20.50280078555148
gpc1_r: mean flux error: 11.285212165987328, 3sigma in AB mag (Total): 20.075922542249153
gpc1_i: mean flux error: 6.779790275782894, 3sigma in AB mag (Total): 20.62915621388678
gpc1_z: mean flux error: 15.101349154690517, 3sigma in AB mag (Total): 19.759657490950865
gpc1_y: mean flux error: 81.92646632009088, 3sigma in AB mag (Total): 17.9236363053817
irac_i1: mean flux error: 2.5585498809814453, 3sigma in AB mag (Total): 21.687212142426283
irac_i2: mean flux error: 2.087070941925049, 3sigma in AB mag (Total): 21.908353834496303
megacam_u: mean flux error: 0.025724060833454132, 3sigma in AB mag (Total): 26.681348043321556
megacam_g: mean flux error: 0.02217845991253853, 3sigma in AB mag (Total): 26.842368400316808
megacam_r: mean flux error: 0.04555840045213699, 3sigma in AB mag (Total): 26.060775694031584
megacam_i: mean flux error: 0.08159784972667694, 3sigma in AB mag (Total): 25.428000077349985
megacam_z: mean flux error: 0.2246941775083542, 3sigma in AB mag (Total): 24.32821731642934
wircam_j: mean flux error: 1.4508192539215088, 3sigma in AB mag (Total): 22.30316358695483
wircam_ks: mean flux error: 1.6619582176208496, 3sigma in AB mag (Total): 22.15564661013537
wircam_y: mean flux error: 0.8292735815048218, 3sigma in AB mag (Total): 22.9104522879201

gpc1_g (4260.0, 5500.0, 1240.0)
wircam_y (9702.0, 10806.0, 1104.0)
megacam_g (4180.0, 5580.0, 1400.0)
megacam_r (5680.0, 6880.0, 1200.0)
megacam_i (6831.7305, 8388.5557, 1556.8252)
wircam_ks (19870.0, 23135.0, 3265.0)
gpc1_z (8190.0, 9210.0, 1020.0)
wircam_j (11748.0, 13334.0, 1586.0)
gpc1_i (6910.0, 8190.0, 1280.0)
irac_i2 (39980.102, 50052.301, 10072.199)
megacam_u (3500.0, 4100.0, 600.0)
irac_i1 (31754.0, 39164.801, 7410.8008)
gpc1_y (9200.0, 9820.0, 620.0)
megacam_z (8280.0, 9160.0, 880.0)
gpc1_r (5500.0, 6900.0, 1400.0)

Out [54]: <matplotlib.text.Text at 0x12651ddd8>



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 [69]: <matplotlib.text.Text at 0x1273aa550>

