1.1_VISTA-VIDEO

January 18, 2018

1 ELAIS S1 Master List Creation

1.1 Preparation of VIDEO/VISTA/VIRCAM data

The catalogue comes from `dmu0_VISTA_VIDEO-private`.

There is an old public version of the catalogue but we are using the newer private version in the hope that it will be public by the time we publish the masterlist.

Filters: Y,J,H,Ks

In the catalogue, we keep:

- The identifier (it's unique in the catalogue);
- The position (degrees);
- The stellarity;
- The magnitude for each band in apertude 3, which is 2 arcsec (rs548 presumes same for private catalogue).
- The "auto" magnitude is provided, we presume this is standard Sextractor units etc.

Yannick said the dates of observation for VIDEO are from 2009/11 to 2016/12. There is a paper from 2012 (Jarvis et al). So will use 2012.

```
This notebook was run with herschelhelp_internal version:
44f1ae0 (Thu Nov 30 18:27:54 2017 +0000)
```

```
Out[3]: 'en_GB'
```

1.2 I - Column selection

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

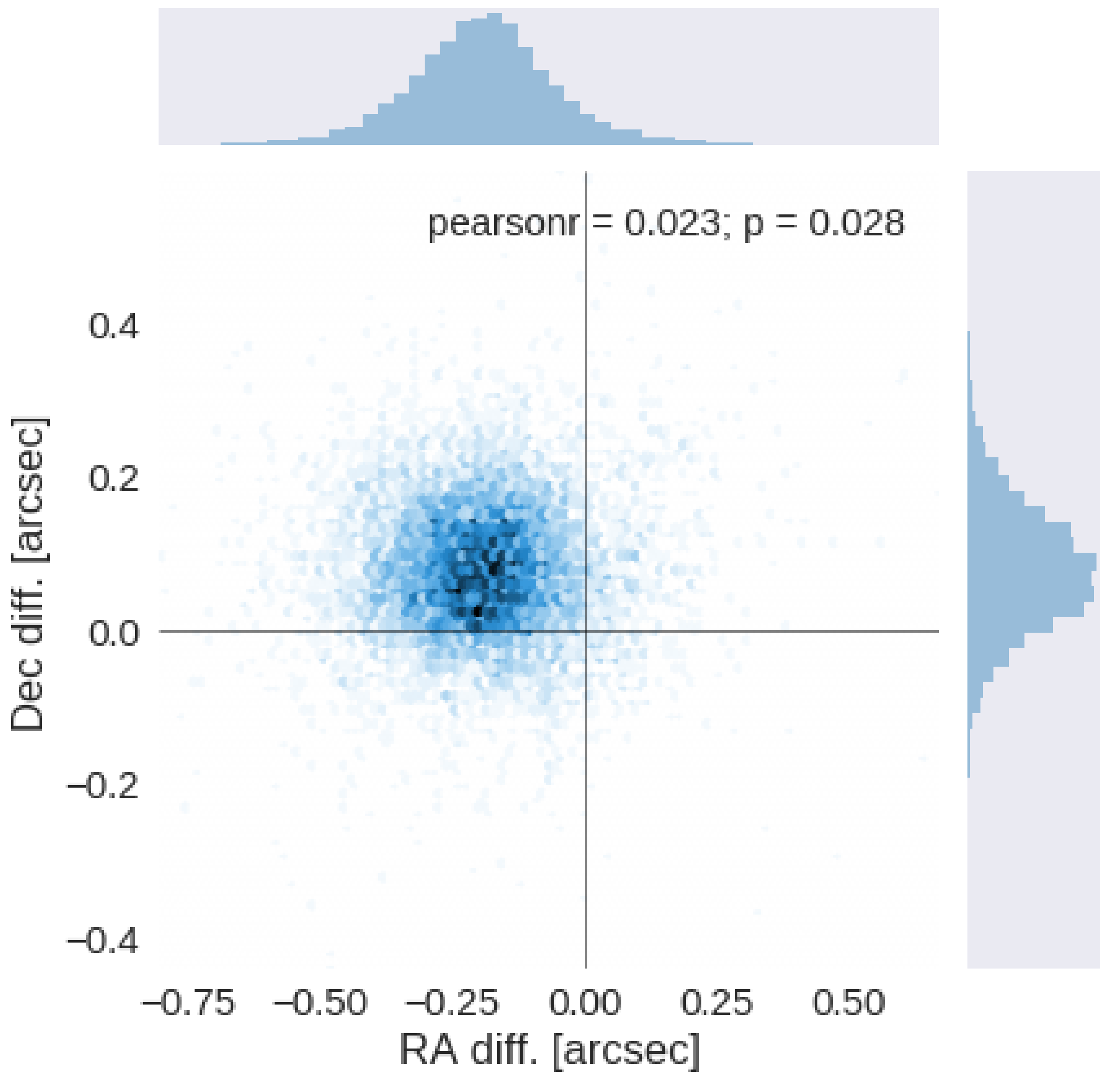
1.3 II - Removal of duplicated sources

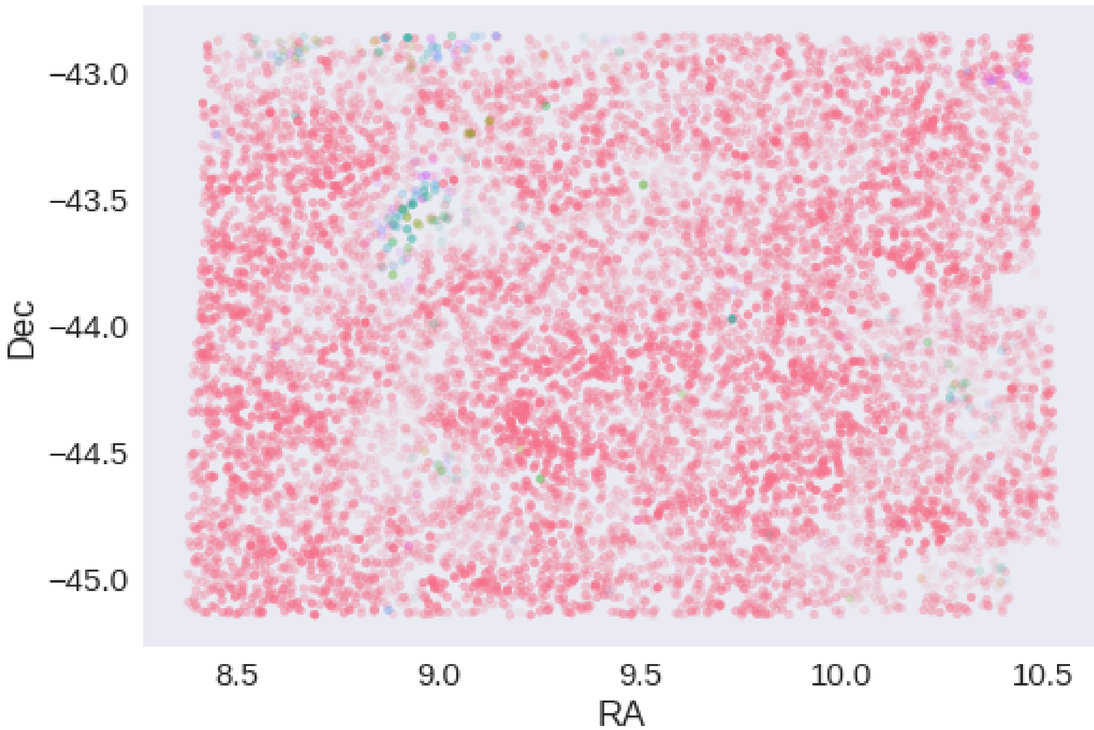
We remove duplicated objects from the input catalogues.

```
The initial catalogue had 831778 sources.
The cleaned catalogue has 830089 sources (1689 removed).
The cleaned catalogue has 1680 sources flagged as having been cleaned
```

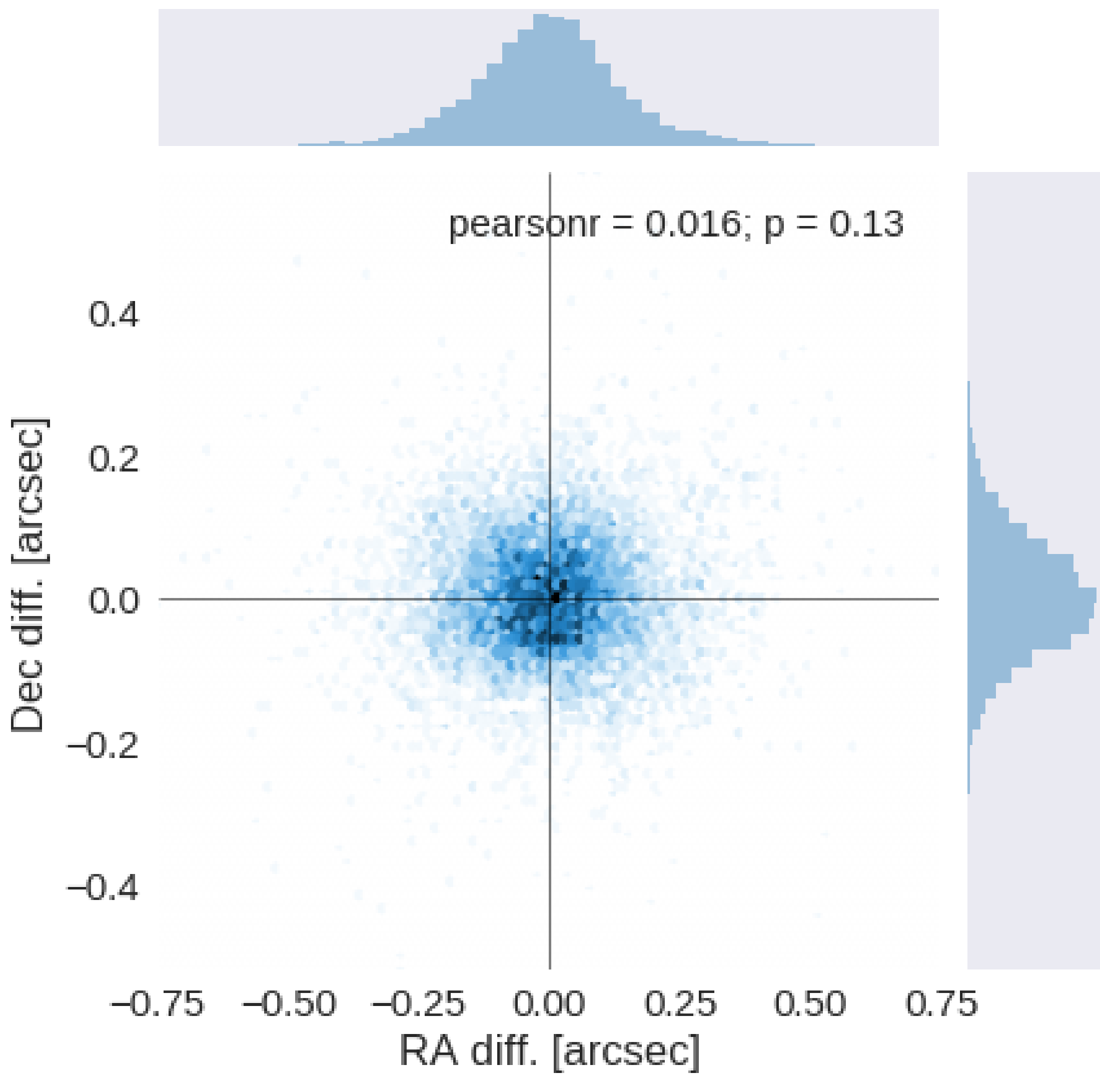
1.4 III - Astrometry correction

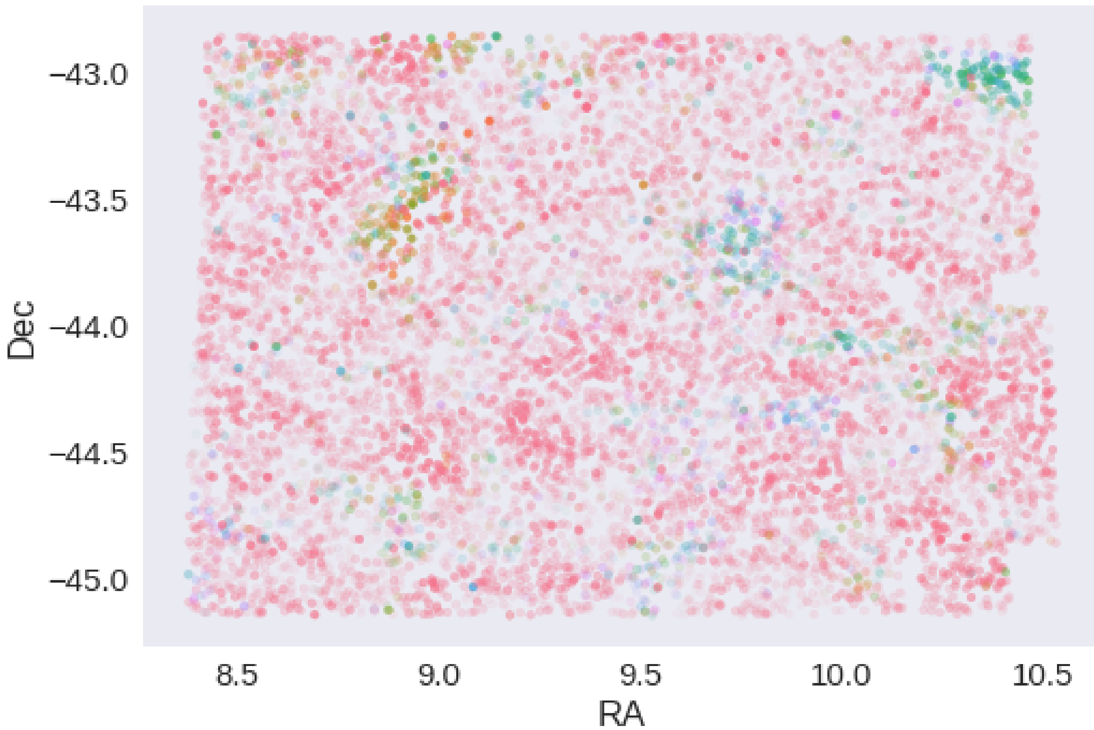
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.






```
RA correction: 0.19172828544000708 arcsec
Dec correction: -0.07611326062857415 arcsec
```


pearsonr = 0.016; p = 0.13
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
RA diff. [arcsec]



1.5 IV - Flagging Gaia objects

```
9698 sources flagged.
```

1.6 IV - Flagging objects near bright stars

1.7 V - Saving to disk

1.2_VISTA-VHS

January 18, 2018

1 ELAIS S1 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:
44f1ae0 (Thu Nov 30 18:27:54 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

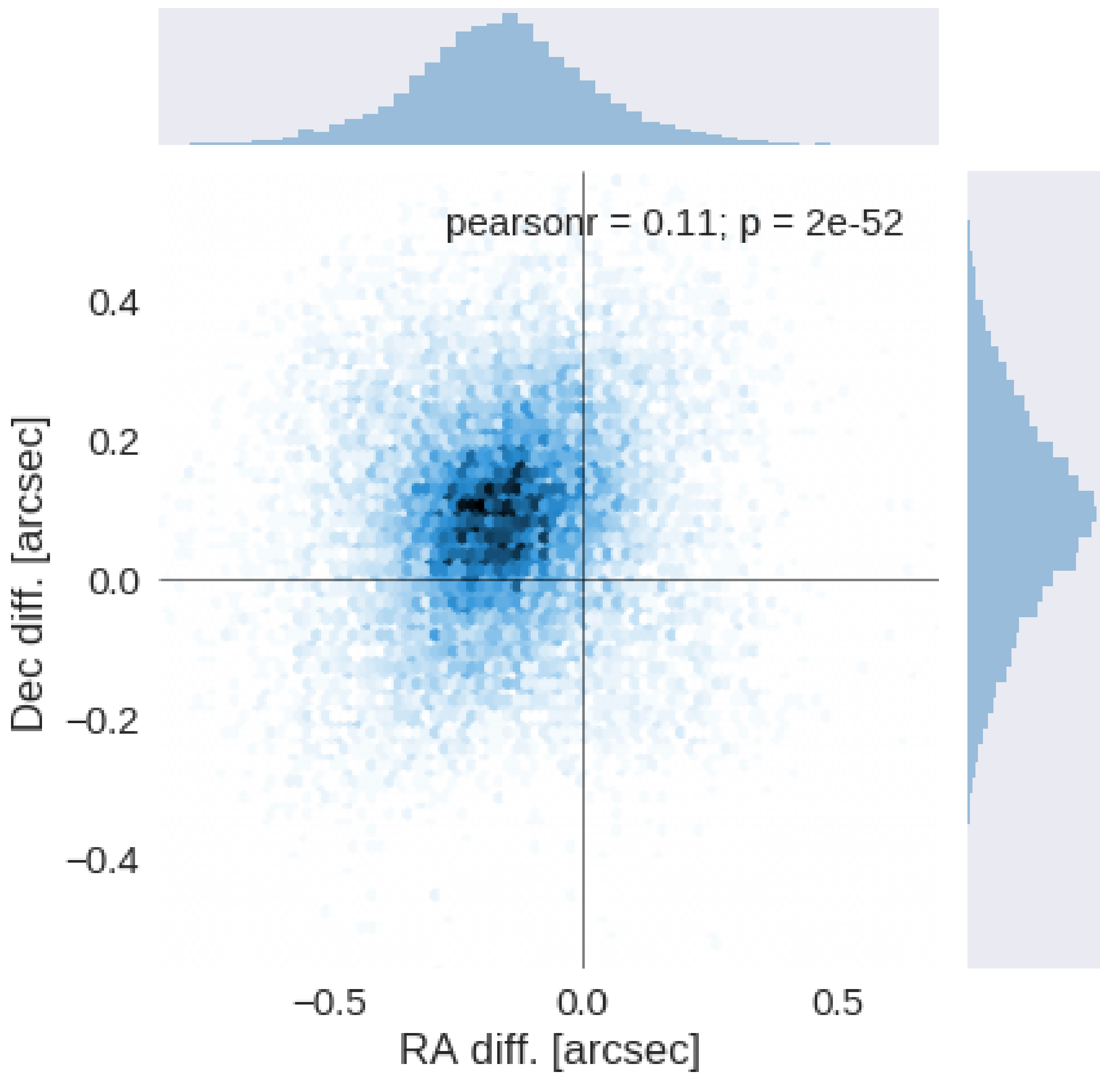
We remove duplicated objects from the input catalogues.

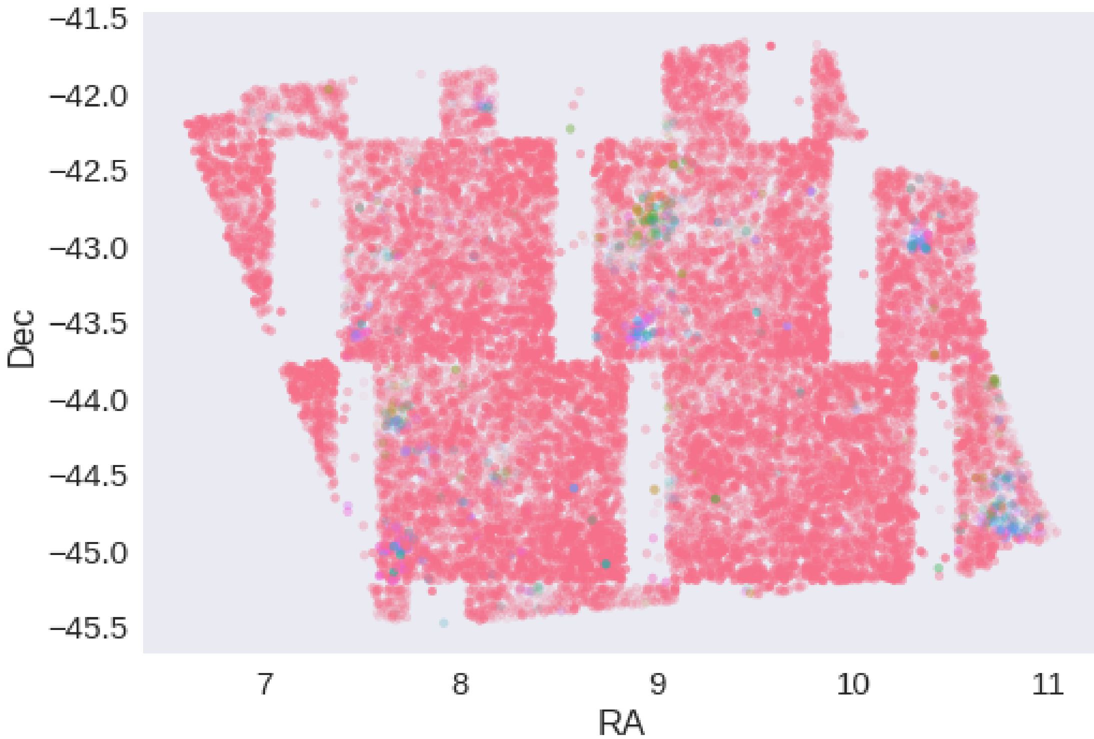
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
The initial catalogue had 242383 sources.
The cleaned catalogue has 242269 sources (114 removed).
The cleaned catalogue has 112 sources flagged as having been cleaned
```

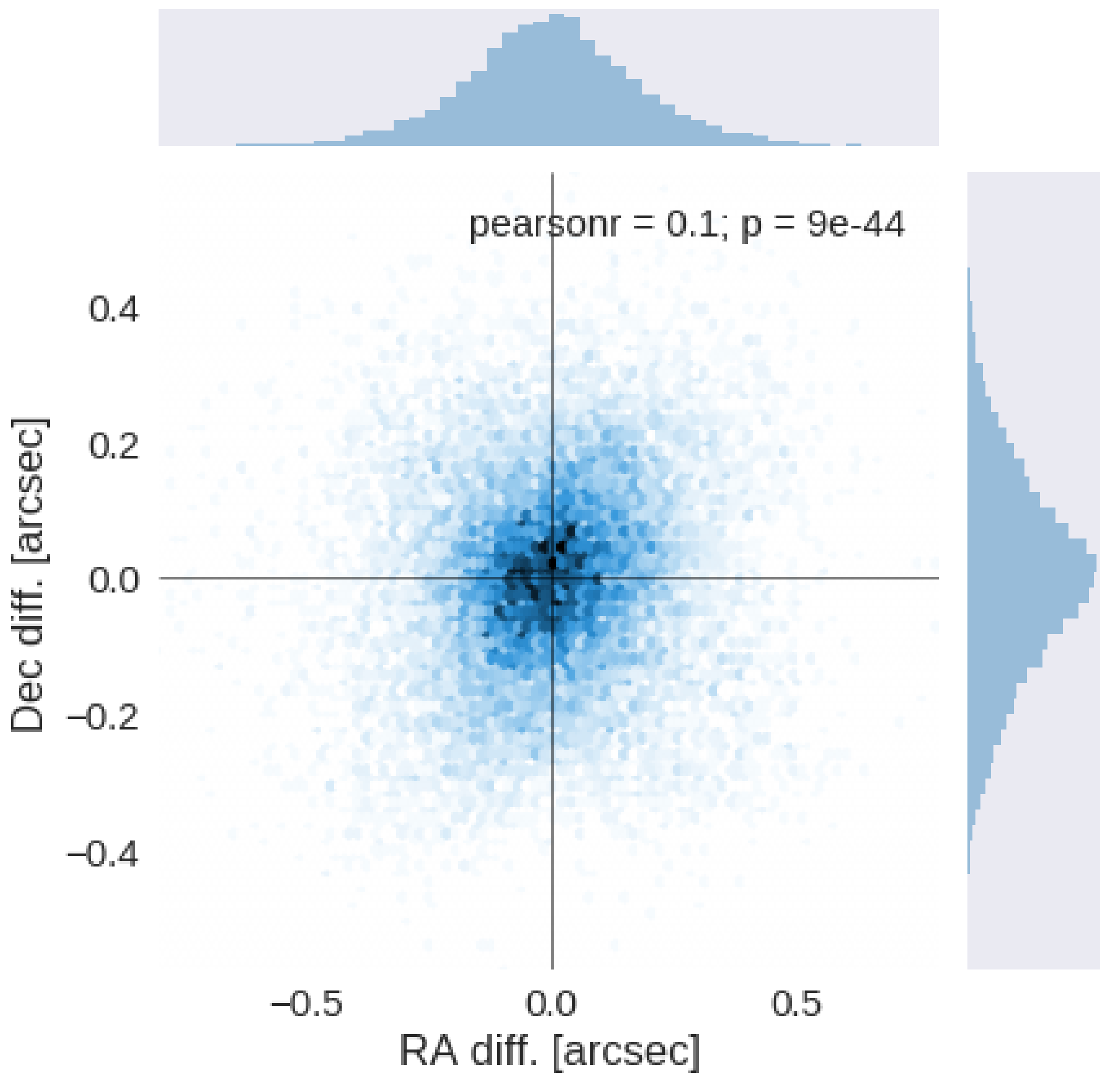
1.4 III - Astrometry correction

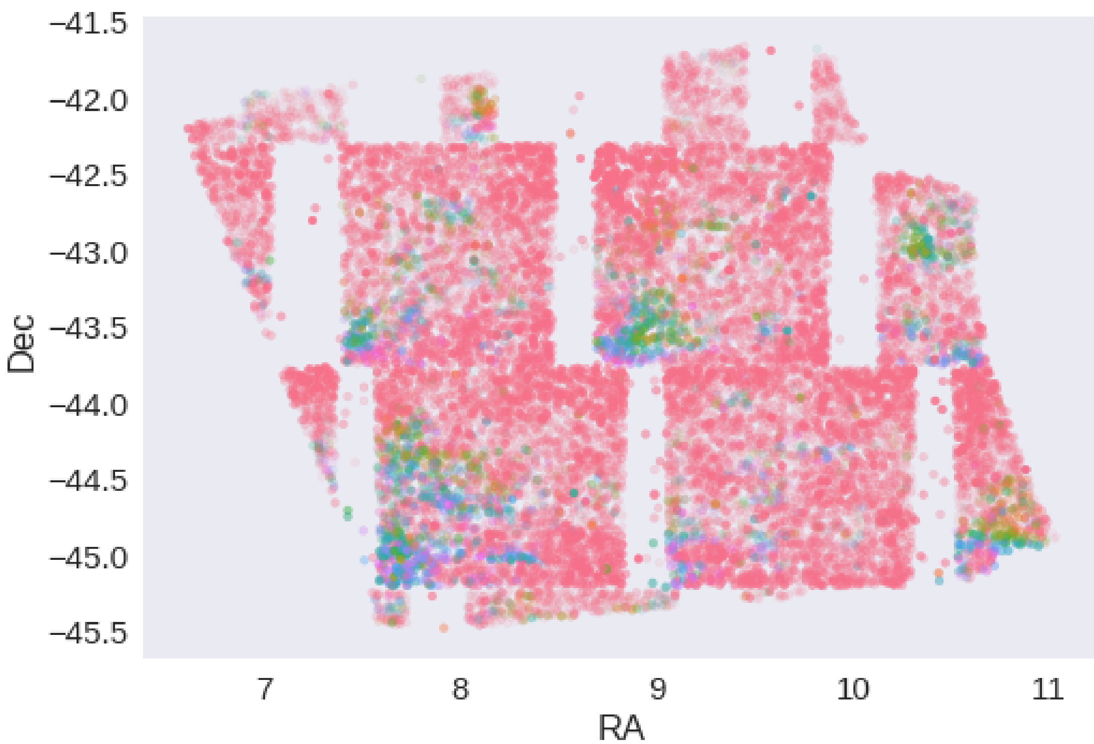
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.






```
RA correction: 0.15926903843137552 arcsec
Dec correction: -0.08703663225020364 arcsec
```


pearsonr = 0.1; p = 9e-44
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.5
0.0
0.5
RA diff. [arcsec]



1.5 IV - Flagging Gaia objects

```
18175 sources flagged.
```

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.3_ESIS-VOICE

January 18, 2018

1 ELAIS-S1 master catalogue

1.1 Preparation of ESO-Spitzer Imaging extragalactic Survey (ESIS) / 2.2-m MPG/ESO telescope at La Silla

The catalogue comes from `dmu0_ESIS-VOICE`.

In the catalogue, we keep:

- The identifier (it's unique in the catalogue);
- The position;
- The stellarity;
- The magnitude for each band in aperture 4 (2″). These are now corrected.
- The total (auto) magnitude.

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:
44f1ae0 (Thu Nov 30 18:27:54 2017 +0000)
```

1.2 0 - Parameters for aperture correction

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

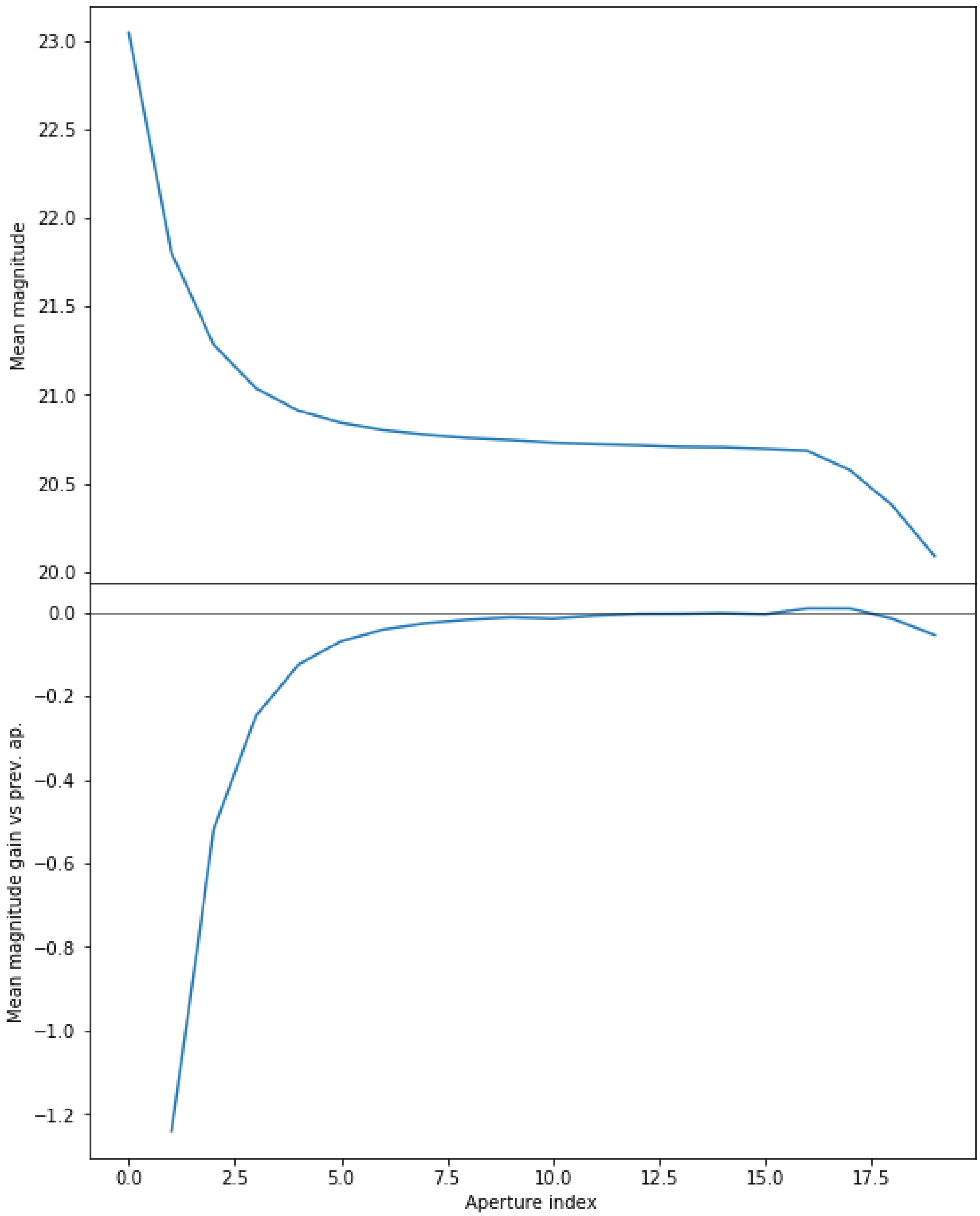
Target aperture: To determine the target aperture, we simulate a curve of growth using the provided apertures and draw two figures: - The evolution of the magnitudes of the objects by plotting on the same plot aperture number vs the mean magnitude. - The mean gain (loss when negative) of magnitude is each aperture compared to the previous (except for the first of course).

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

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

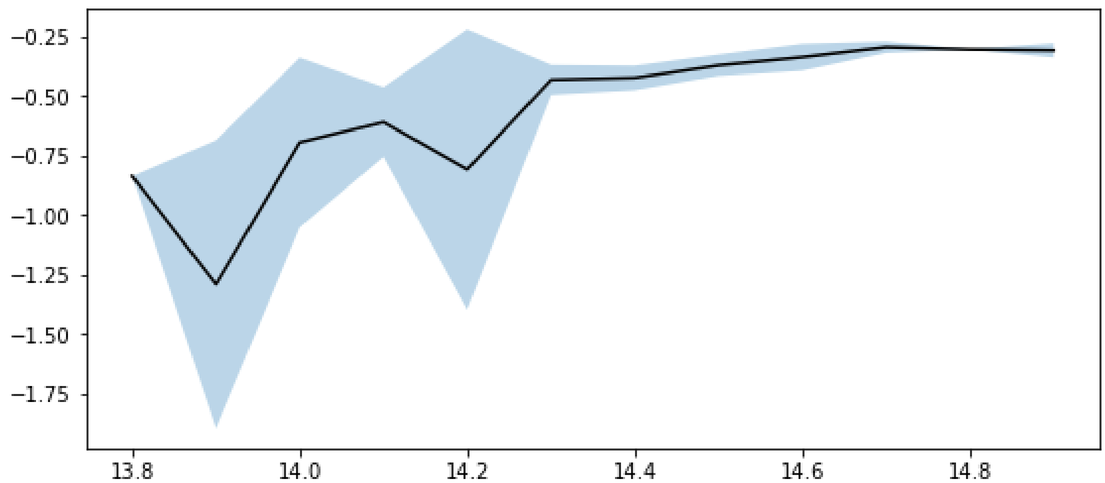
1.2.1 I.a b99-band

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



We will use the 13th (12+1) (aperture number above begin at 0) aperture as target.

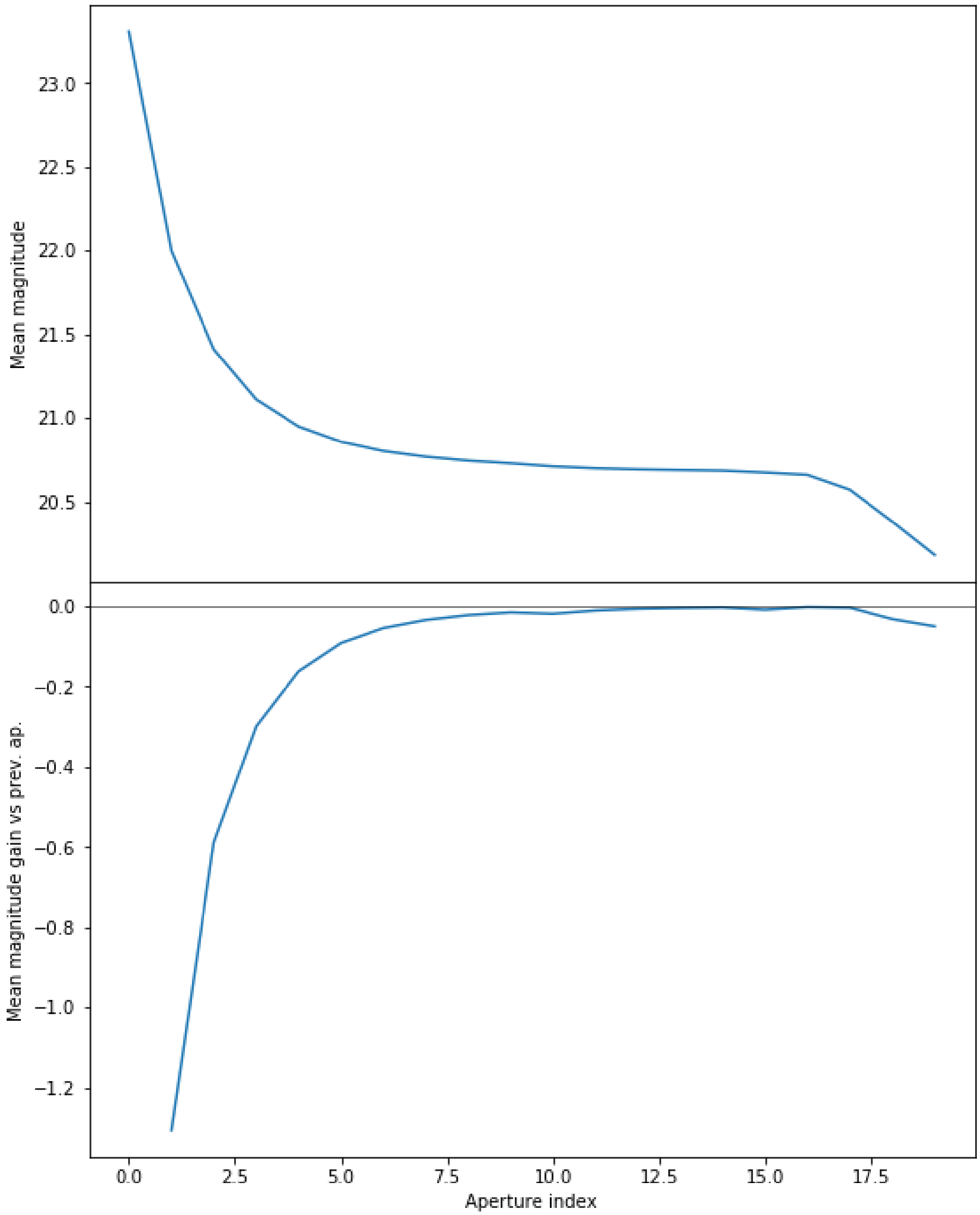
```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:129: RuntimeWarning: invalid value enc
  mask &= (stellarity > 0.9)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:131: 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 14.3 and 14.6.

1.2.2 I.b b123-band

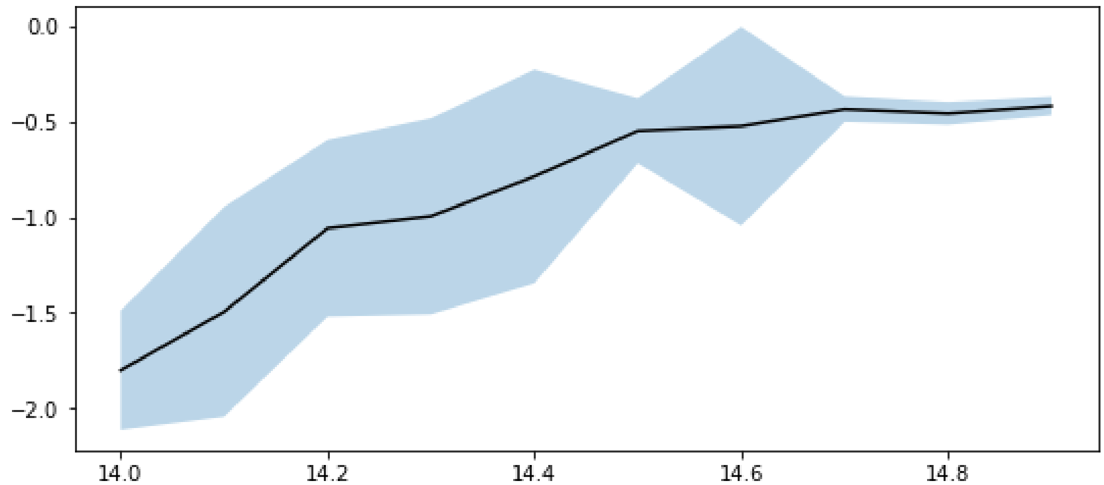
```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```



We will use the 13th (12+1) (aperture number above begin at 0) aperture as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/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
```

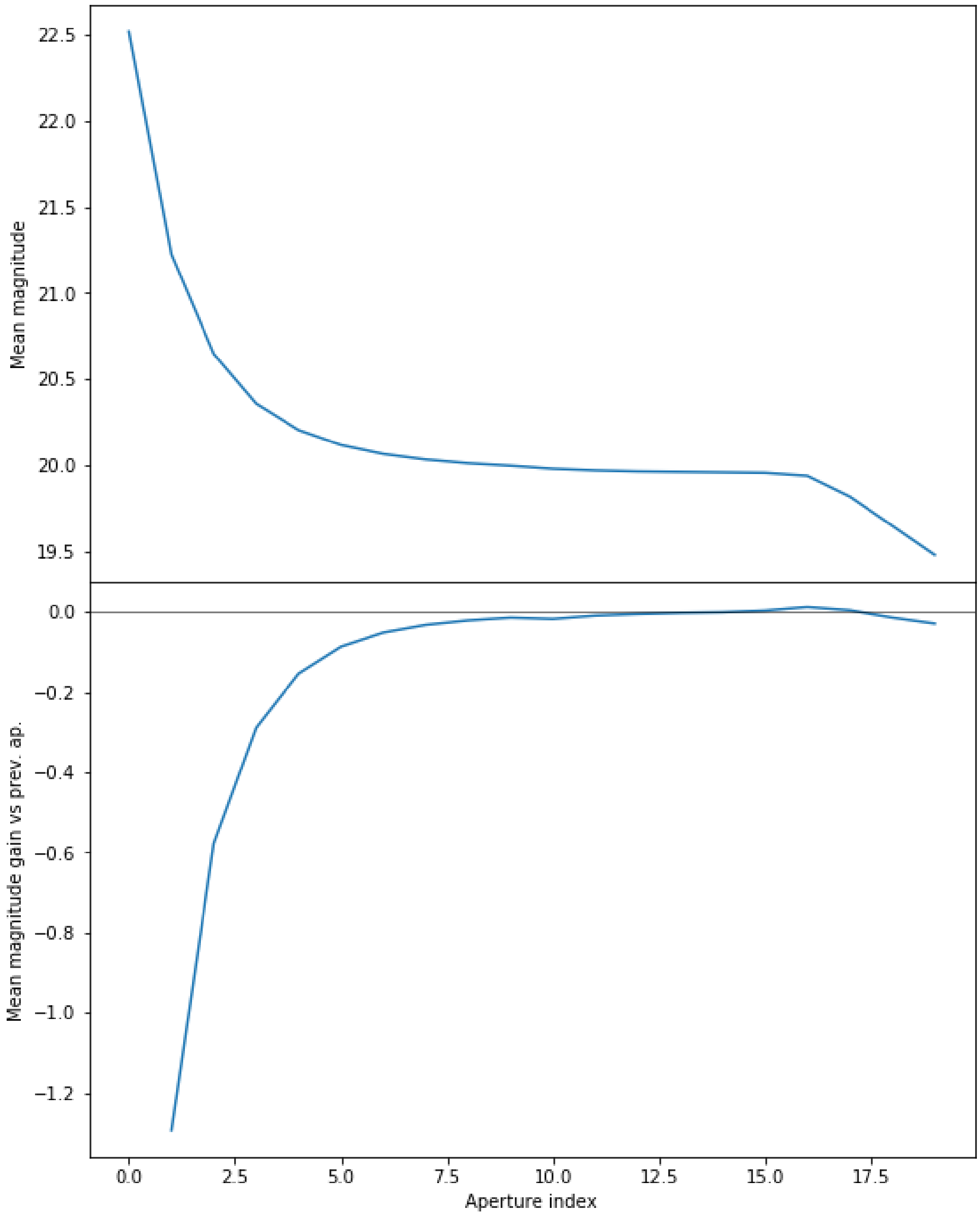
```
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



We use magnitudes between 14.0 and 16.0.

1.2.3 I.c v-band

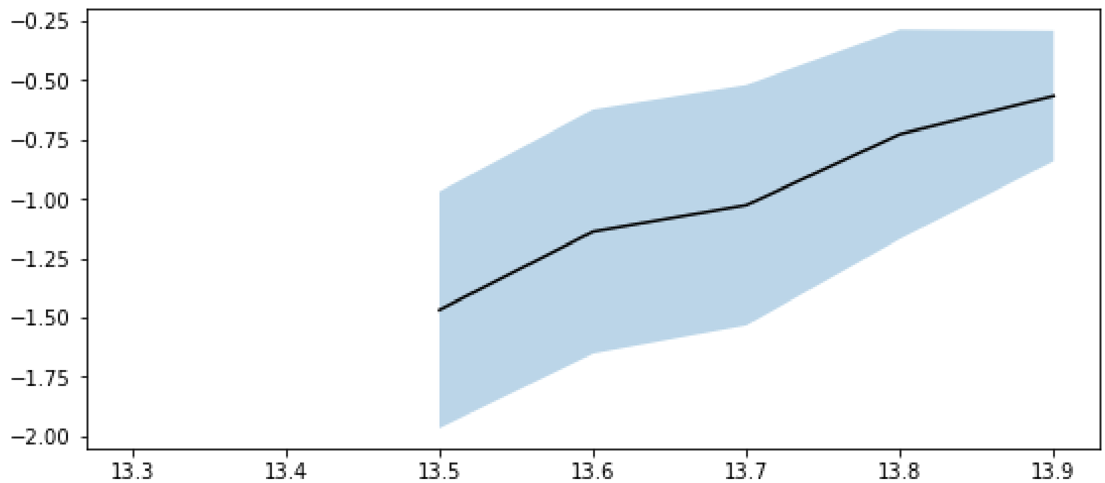
```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```



We will use the 13th (12+1) (aperture number above begin at 0) aperture as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/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
```

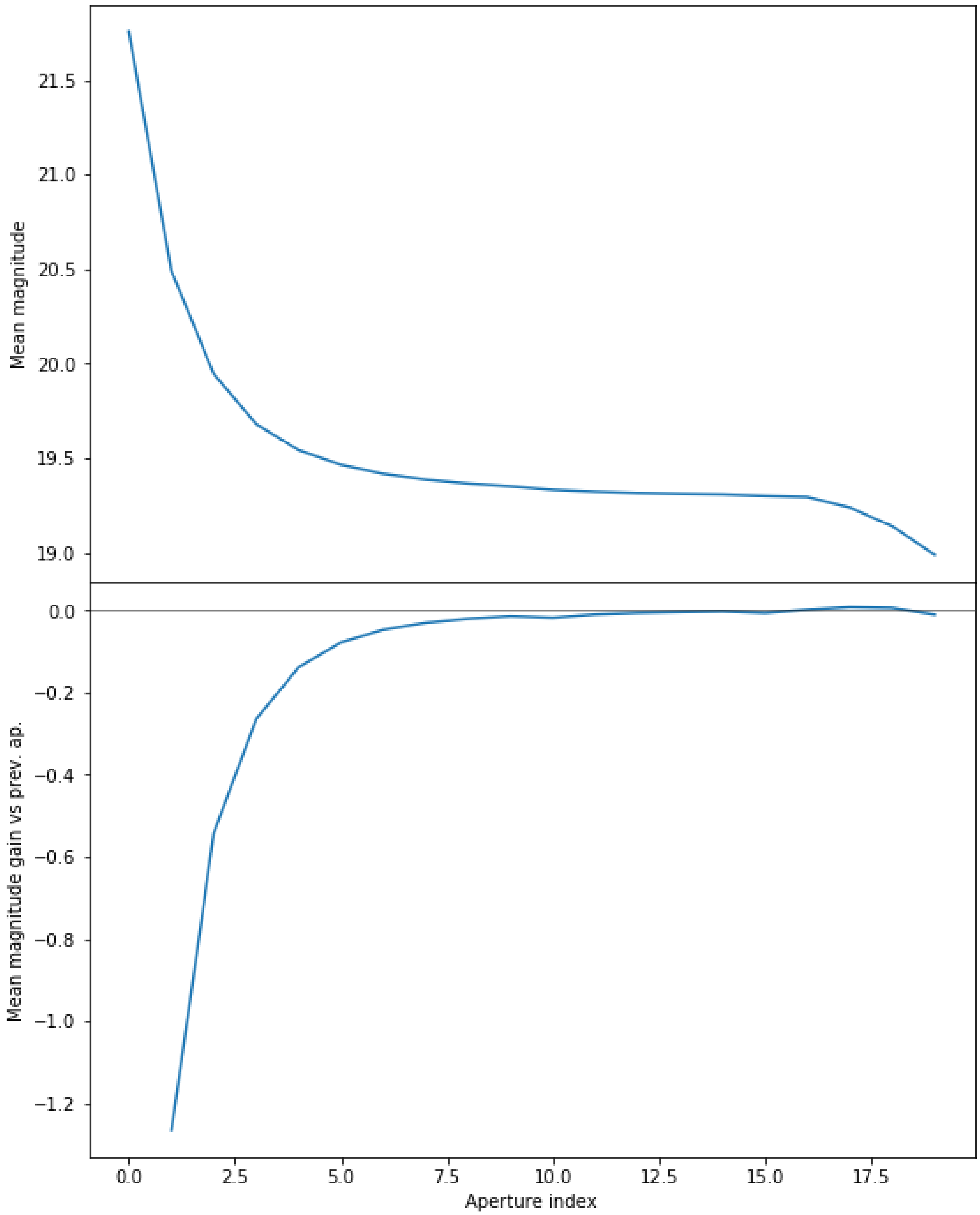
```
  mask &= (mag >= mag_min)
/opt/herschelhelp_internal/herschelhelp_internal/utils.py:133: RuntimeWarning: invalid value enc
  mask &= (mag <= mag_max)
```



We use magnitudes between 14.0 and 16.0.

1.2.4 I.d r-band

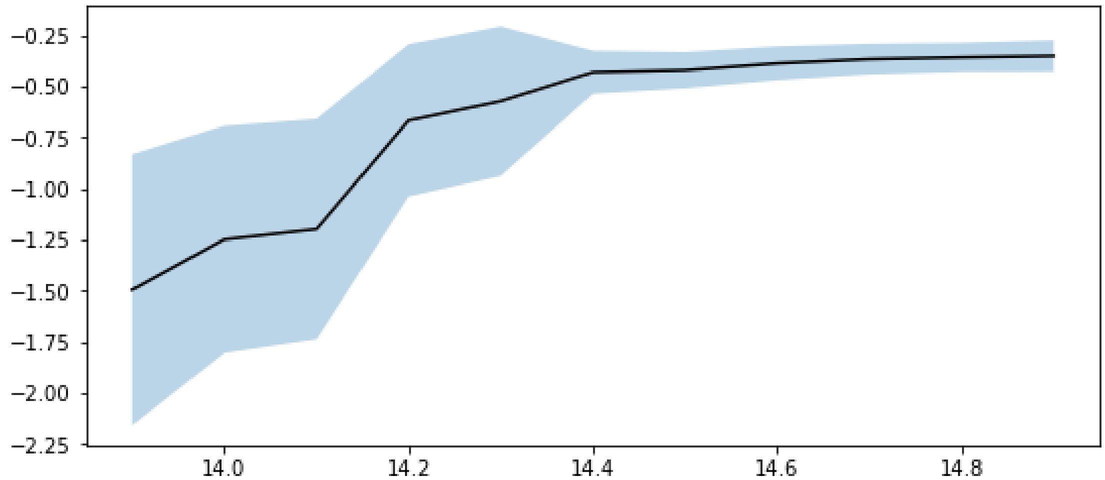
```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:850: RuntimeWarning: invalid valu
  mags = magnitudes[:, stellarity > stel_threshold].copy()
```



We will use the 13th (12+1) (aperture number above begin at 0) aperture as target.

```
/opt/herschelhelp_internal/herschelhelp_internal/masterlist.py:903: RuntimeWarning: invalid valu
  mask = stellarity > .9
/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 14.0 and 16.0.

1.3 I - Column selection

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/ipykernel/__main__.py:65:
/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)


Aperture correction for VOICE band b99:
Correction: -0.27787113189697266
Number of source used: 83
RMS: 0.04831492984158891
```

```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/ipykernel/__main__.py:99:
```

```
Aperture correction for VOICE band b123:
Correction: -0.4382314682006836
Number of source used: 711
RMS: 0.11412357895179506

Aperture correction for VOICE band v:
Correction: -0.3730955123901367
Number of source used: 791
RMS: 0.09074258714442375

Aperture correction for VOICE band r:
Correction: -0.36531543731689453
Number of source used: 1325
RMS: 0.12346733267578548
```

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

1.4 II - Removal of duplicated sources

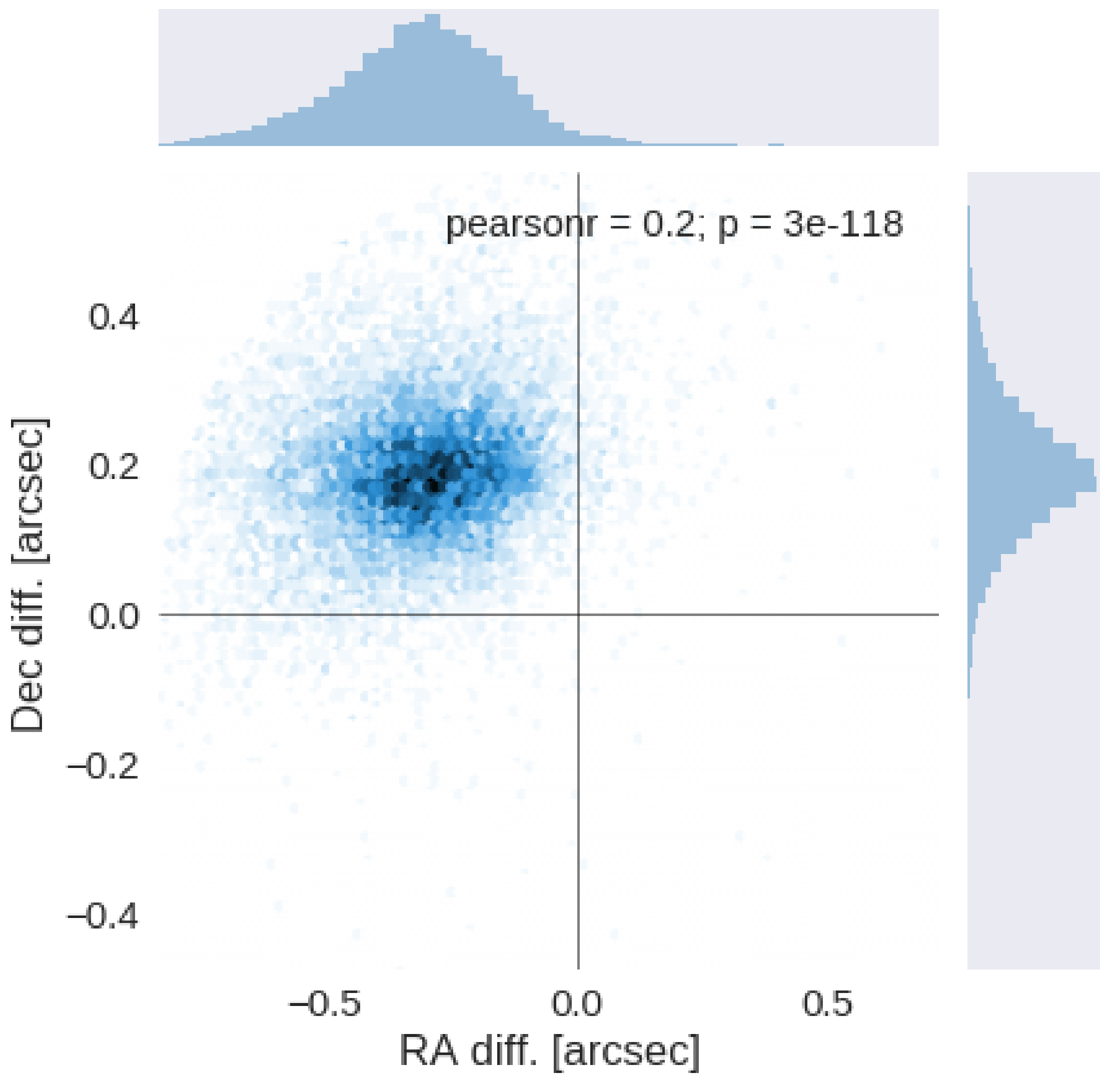
We remove duplicated objects from the input catalogues.

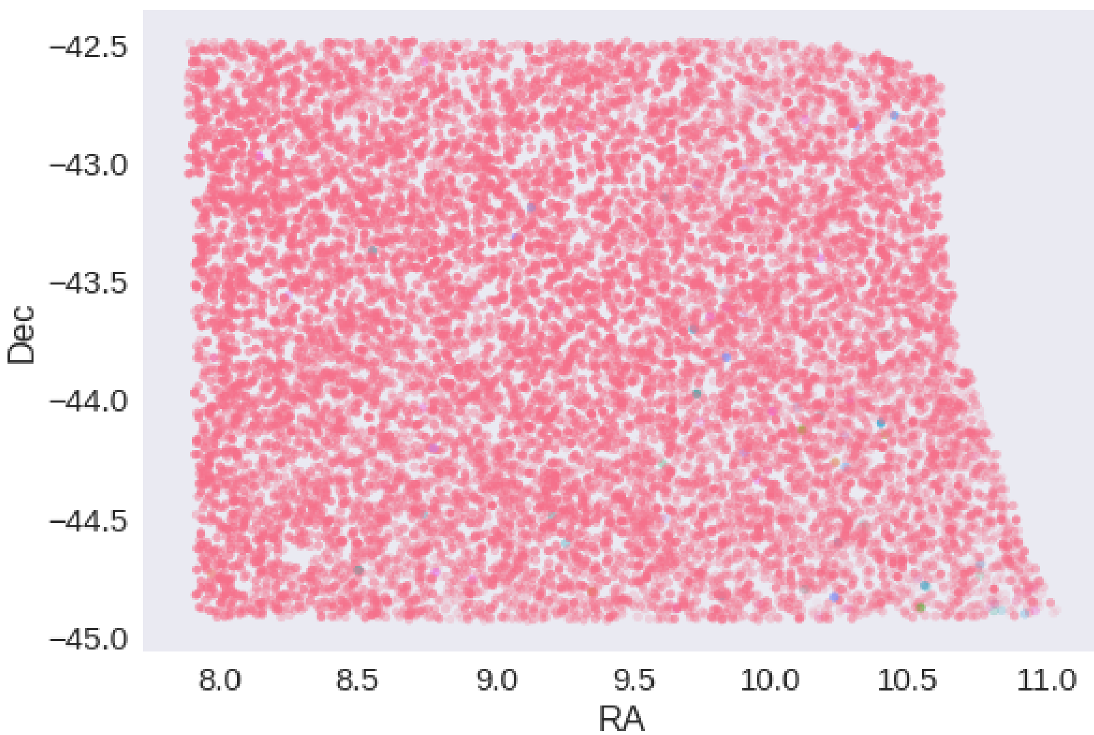
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)


The initial catalogue had 524564 sources.
The cleaned catalogue has 521143 sources (3421 removed).
The cleaned catalogue has 2873 sources flagged as having been cleaned
```

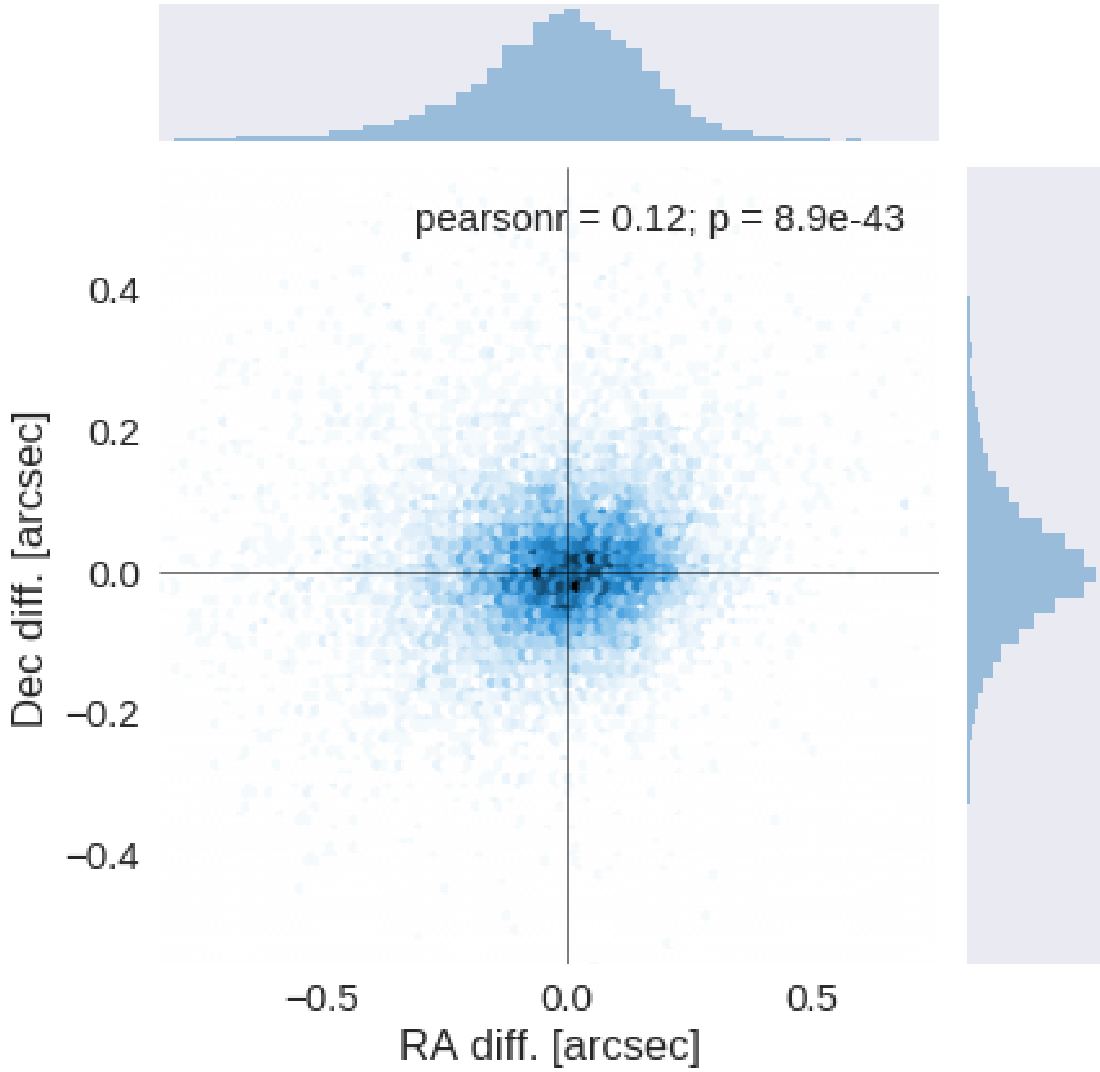
1.5 III - Astrometry correction

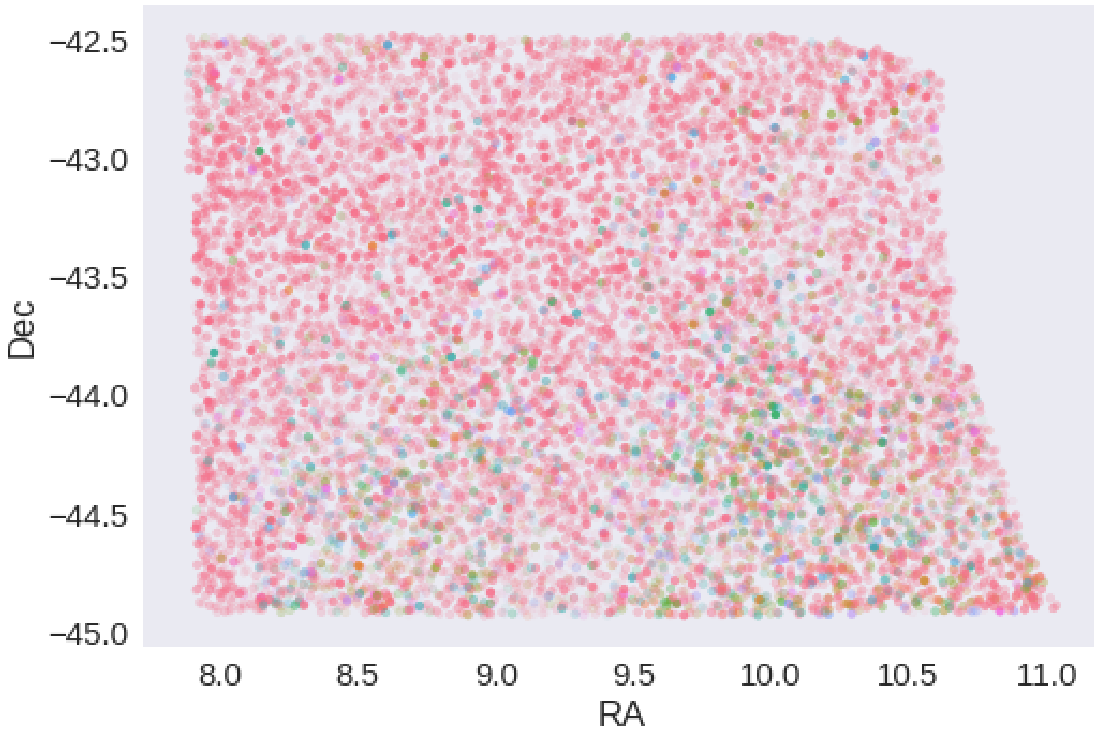
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.


pearsonr = 0.2; p = 3e-118
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.5
0.0
0.5
RA diff. [arcsec]




```
RA correction: 0.3032766990468616 arcsec
Dec correction: -0.18594075015698763 arcsec
```


pearsonr = 0.12; p = 8.9e-43
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.5
0.0
0.5
RA diff. [arcsec]



1.6 IV - Flagging Gaia objects

```
13627 sources flagged.
```

1.7 V - Flagging objects near bright stars

2 VI - Saving to disk

1.4_SWIRE

January 18, 2018

1 ELAIS-S1 master catalogue

1.1 Preparation of Spitzer datafusion SWIRE data

The Spitzer catalogues were produced by the datafusion team are available in `dmu0_DataFusion-Spitzer`. Lucia told that the magnitudes are aperture corrected.

In the catalouge, we keep:

We keep: - The internal identifier (this one is only in HeDaM data); - The position; - The fluxes in aperture 2 (1.9 arcsec) for IRAC bands. - The Kron flux; - The stellarity in each band

A query of the position in the Spitzer heritage archive show that the ELAIS-N1 images were observed in 2004. Let's take this as epoch.

We do not use the MIPS fluxes as they will be extracted on MIPS maps using XID+.

```
This notebook was run with herschelhelp_internal version:
44f1ae0 (Thu Nov 30 18:27:54 2017 +0000)
```

1.2 I - Column selection

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

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

1.3 II - Removal of duplicated sources

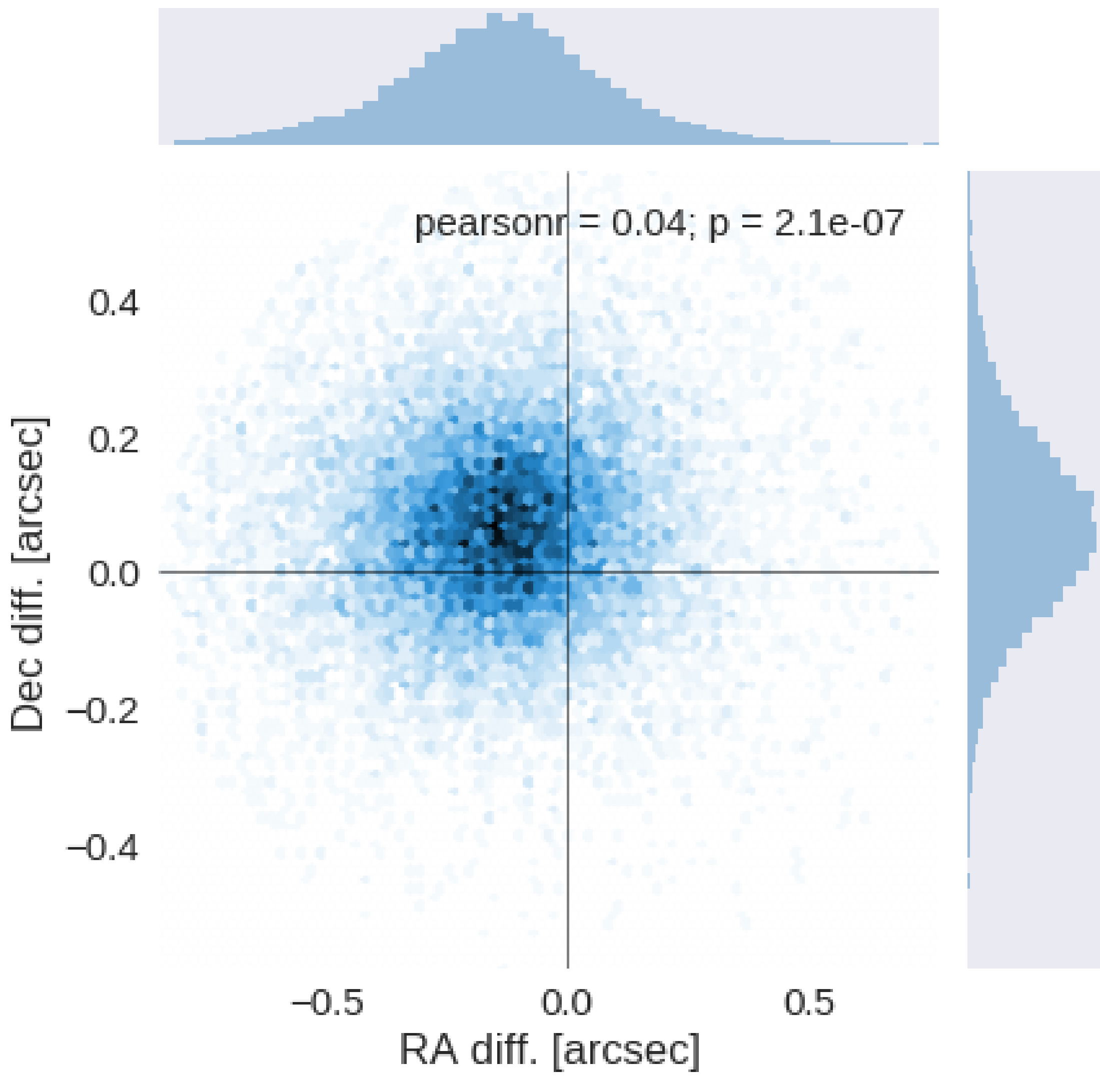
We remove duplicated objects from the input catalogues.

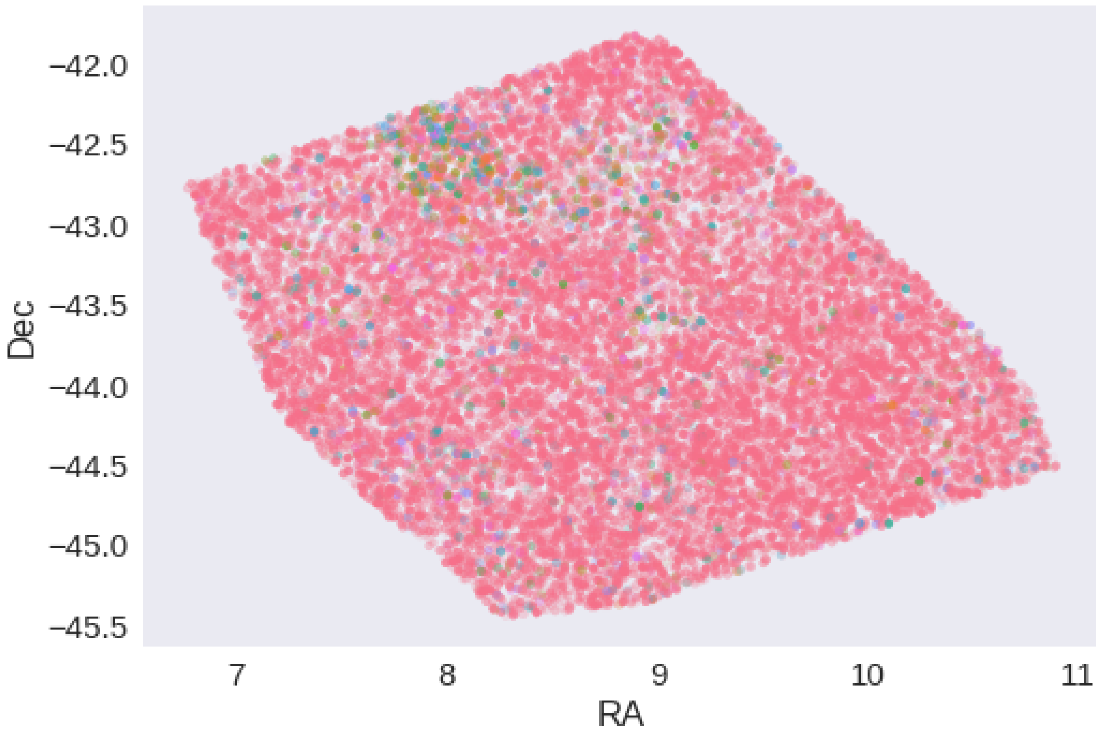
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)
```

```
The initial catalogue had 368900 sources.
The cleaned catalogue has 368884 sources (16 removed).
The cleaned catalogue has 16 sources flagged as having been cleaned
```

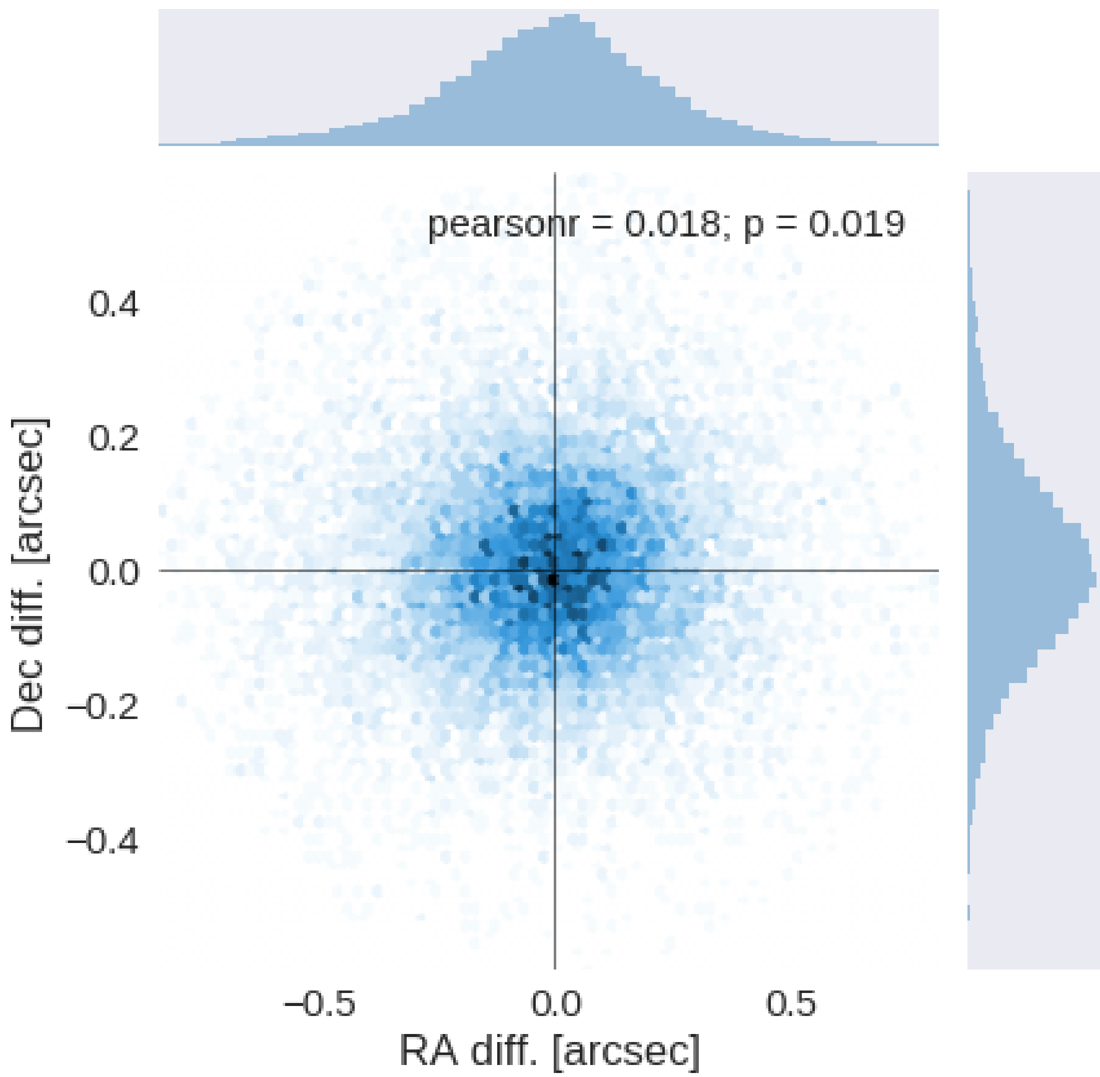
1.4 III - Astrometry correction

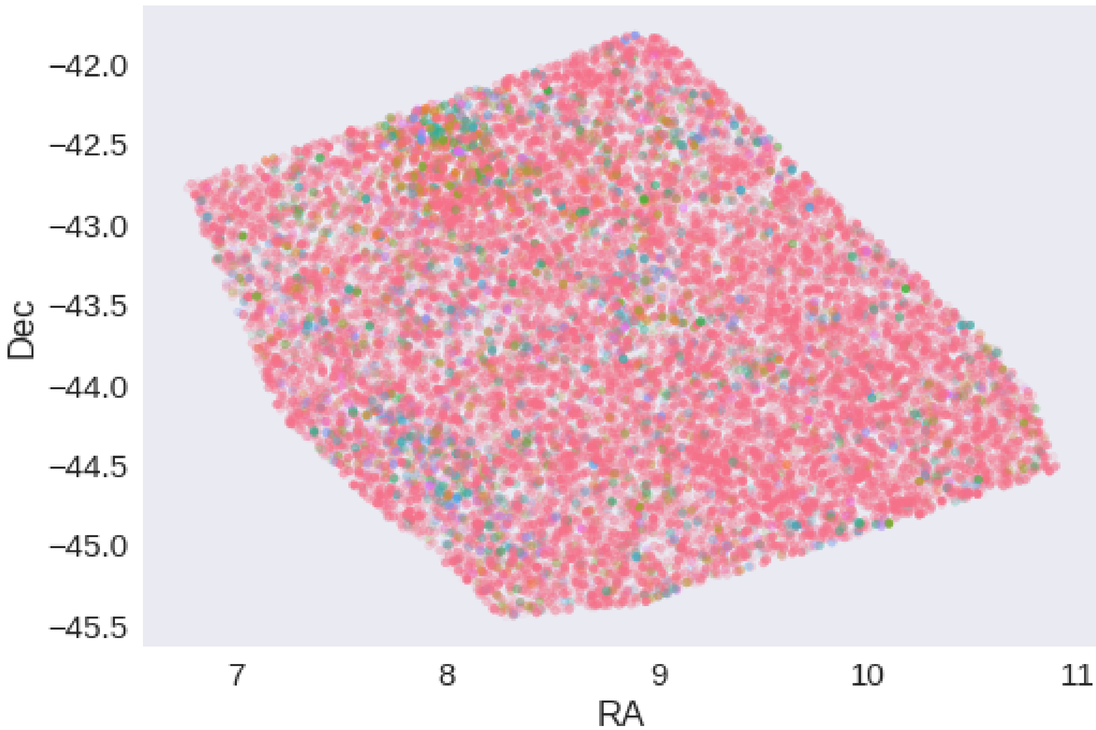
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.






```
RA correction: 0.13695796841588503 arcsec
Dec correction: -0.06500249892269494 arcsec
```


pearsonr = 0.018; p = 0.019
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.5
0.0
0.5
RA diff. [arcsec]



1.5 IV - Flagging Gaia objects

```
17650 sources flagged.
```

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

1.5_SERVS

January 18, 2018

1 ELAIS-S1 master catalogue

1.1 Preparation of Spitzer datafusion SERVS data

The Spitzer catalogues were produced by the datafusion team are available in `dmu0_DataFusion-Spitzer`. Lucia told that the magnitudes are aperture corrected.

In the catalouge, 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

A query of the position in the Spitzer heritage archive show that the SERVS-ELAIS-N1 images were observed in 2009. Let's take this as epoch.

```
This notebook was run with herschelhelp_internal version:
44f1ae0 (Thu Nov 30 18:27:54 2017 +0000)
```

1.2 I - Column selection

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

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

1.3 II - Removal of duplicated sources

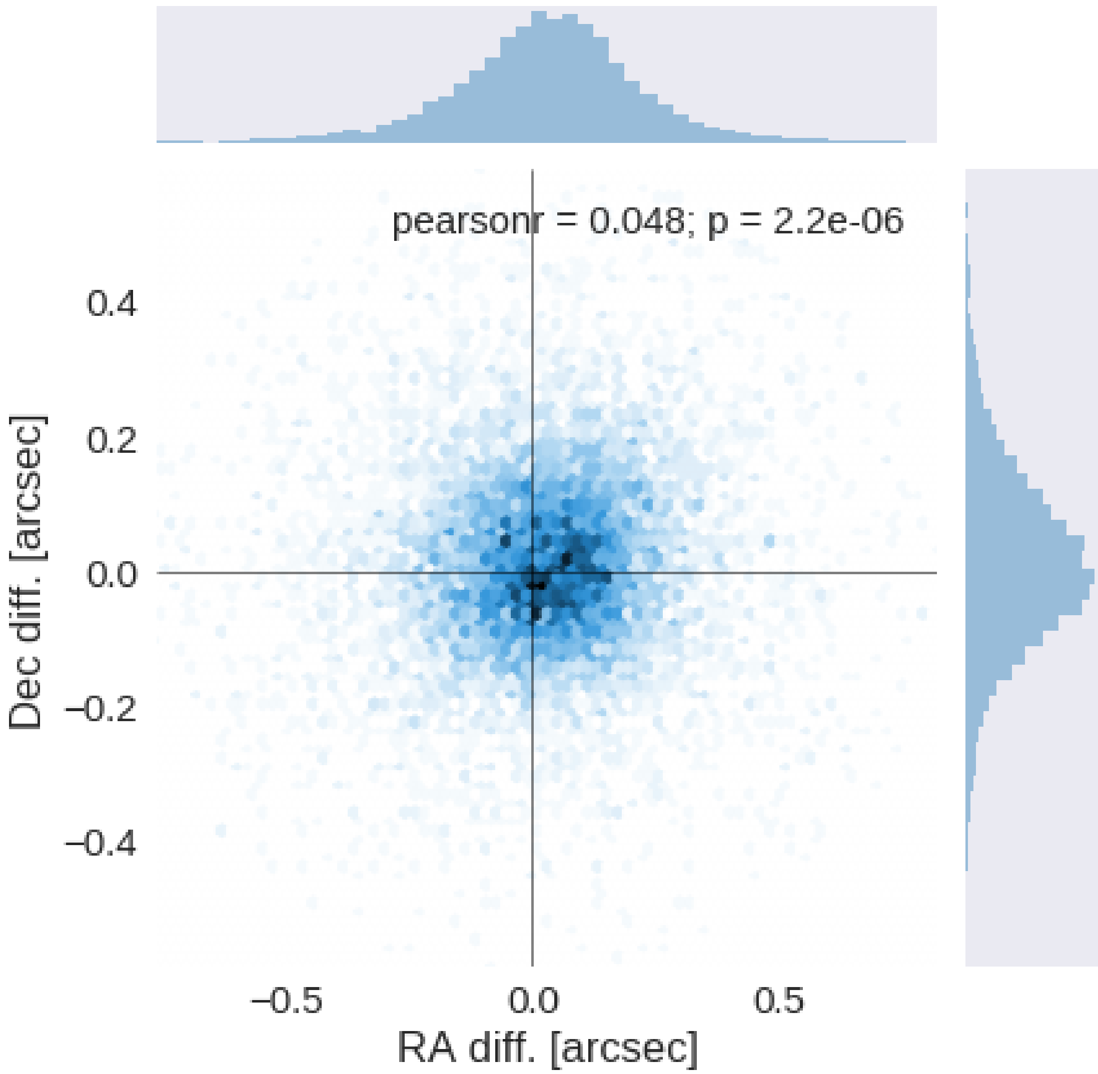
We remove duplicated objects from the input catalogues.

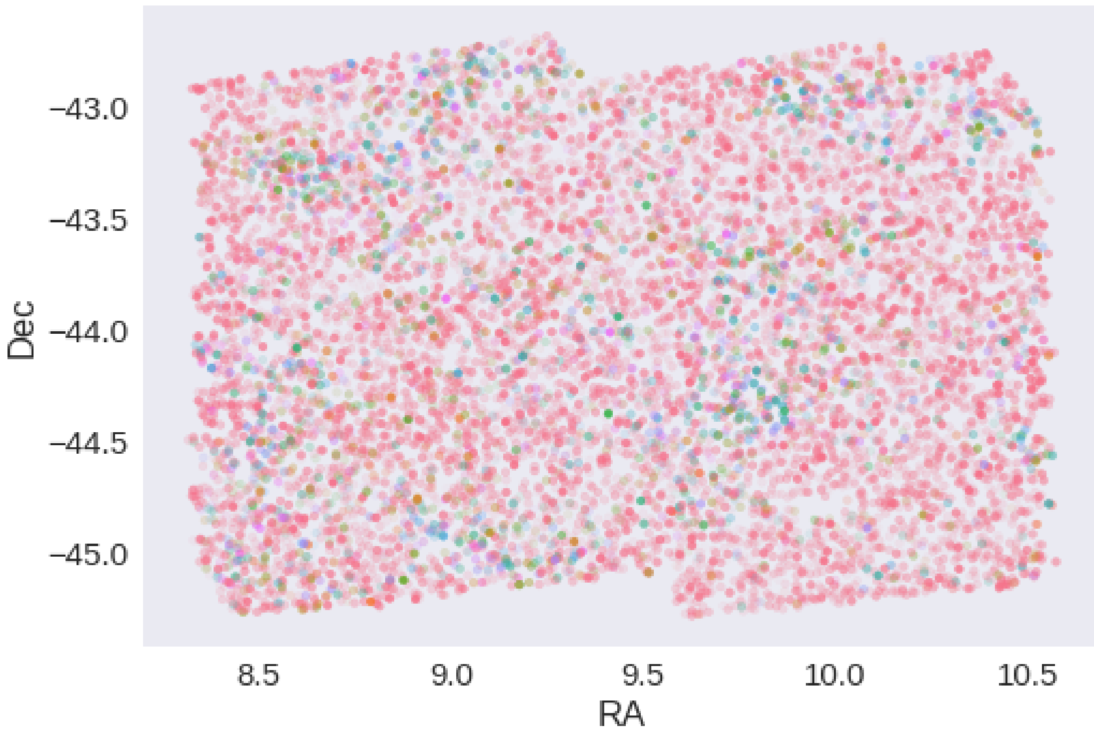
```
/opt/anaconda3/envs/herschelhelp_internal/lib/python3.6/site-packages/astropy/table/column.py:10
Check the NumPy 1.11 release notes for more information.
  ma.MaskedArray.__setitem__(self, index, value)


The initial catalogue had 605425 sources.
The cleaned catalogue has 605425 sources (0 removed).
The cleaned catalogue has 0 sources flagged as having been cleaned
```

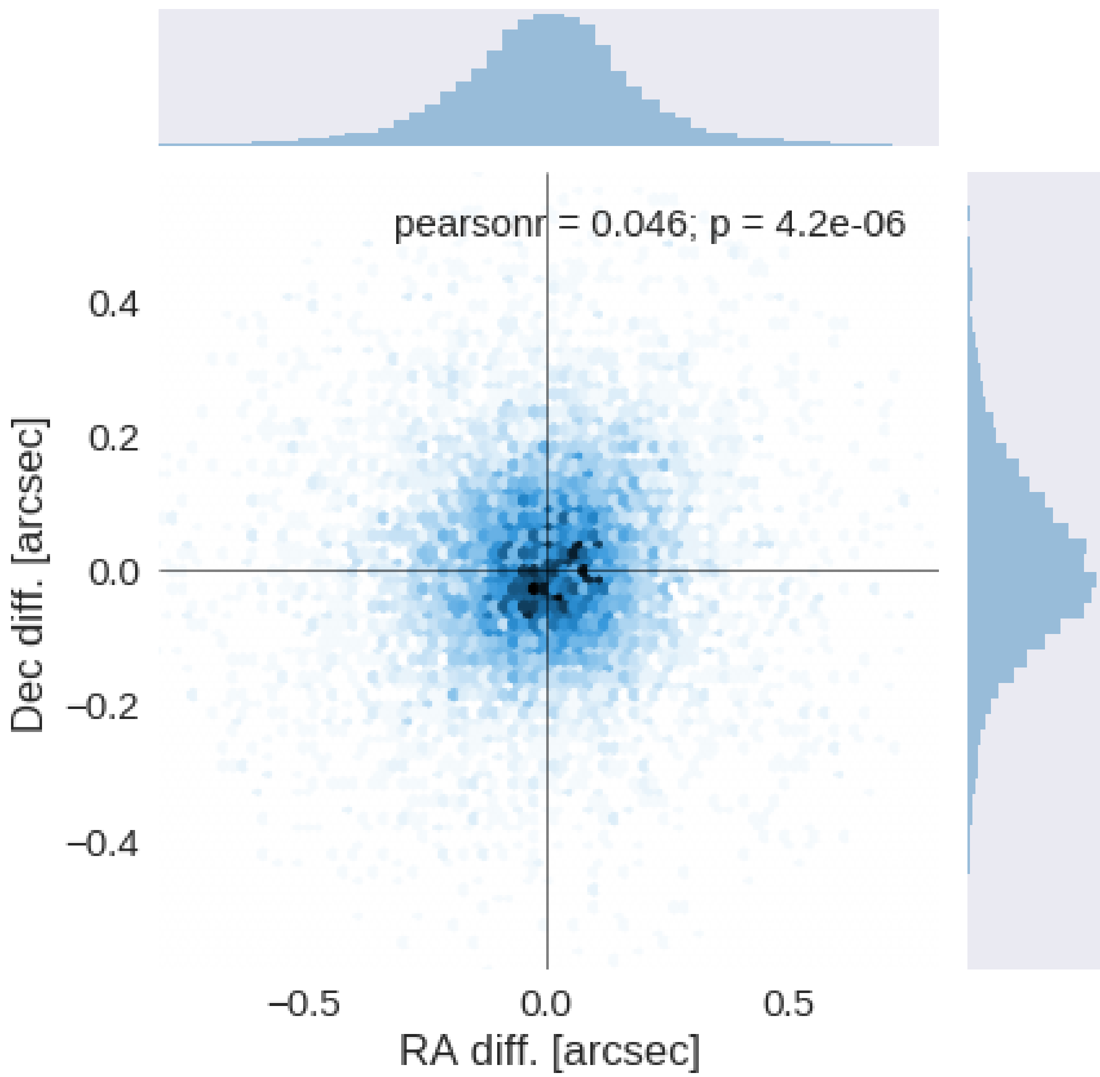
1.4 III - Astrometry correction

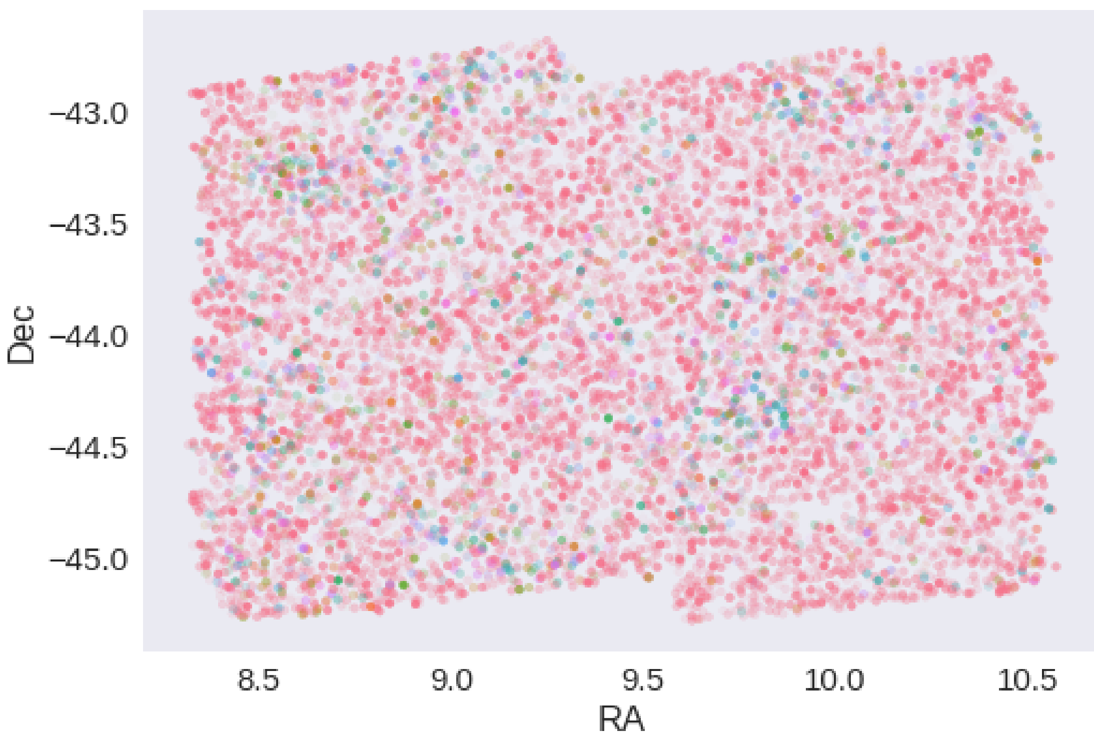
We match the astrometry to the Gaia one. We limit the Gaia catalogue to sources with a g band flux between the 30th and the 70th percentile. Some quick tests show that this give the lower dispersion in the results.






```
RA correction: -0.0358870084561147 arcsec
Dec correction: -0.00565381727994918 arcsec
```


pearsonr = 0.046; p = 4.2e-06
0.4
0.2
0.0
−0.2
−0.4
Dec diff. [arcsec]
−0.5
0.0
0.5
RA diff. [arcsec]



1.5 IV - Flagging Gaia objects

```
10348 sources flagged.
```

1.6 V - Flagging objects near bright stars

1.7 VI - Saving to disk

1.6_DES

January 18, 2018

1 ELAIS-S1 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 PSF fitted madnitudes/fluxes are used as aperture magnitudes.

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

1.2 I - Column selection

1.3 II - Removal of duplicated sources

We remove duplicated objects from the input catalogues.

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.

1.5 IV - Flagging Gaia objects

1.6 V - Flagging objects near bright stars

2 VI - Saving to disk

2_Merging

January 18, 2018

1 ELAIS-S1 master catalogue

This notebook presents the merge of the various pristine catalogues to produce HELP mater catalogue on ELAIS-S1.

```
This notebook was run with herschelhelp_internal version:
44f1ae0 (Thu Nov 30 18:27:54 2017 +0000)
```

1.1 I - Reading the prepared pristine catalogues

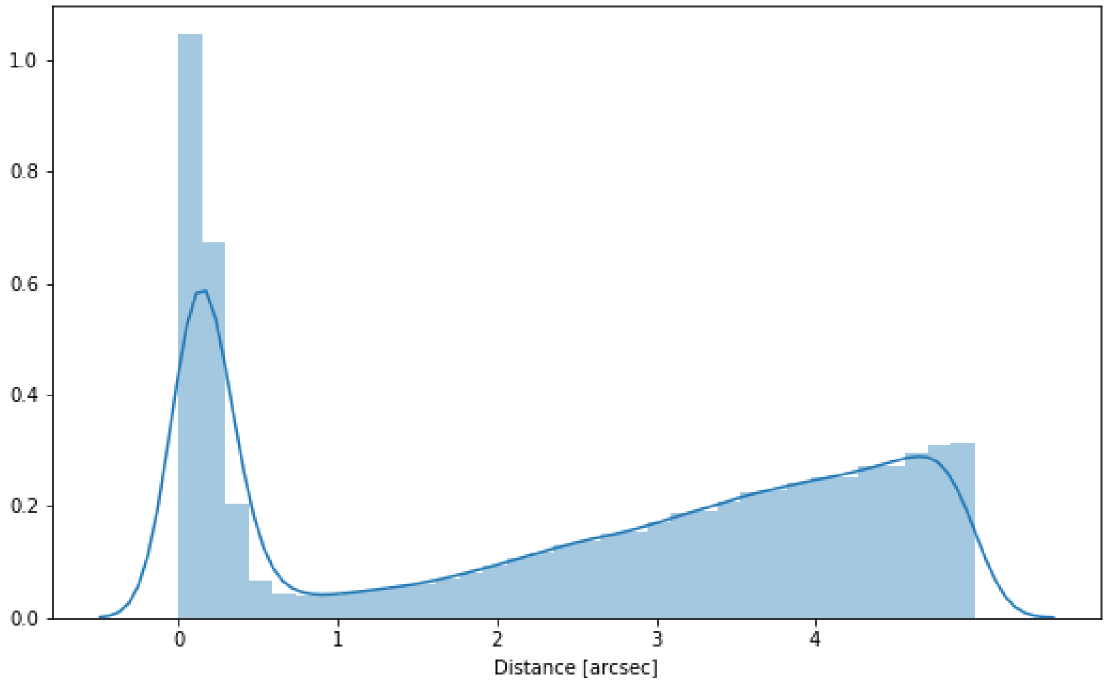
1.2 II - Merging tables

We merge in order of increasing wavelength: VIDEO, VHS, VOICE, SERVS, SWIRE.

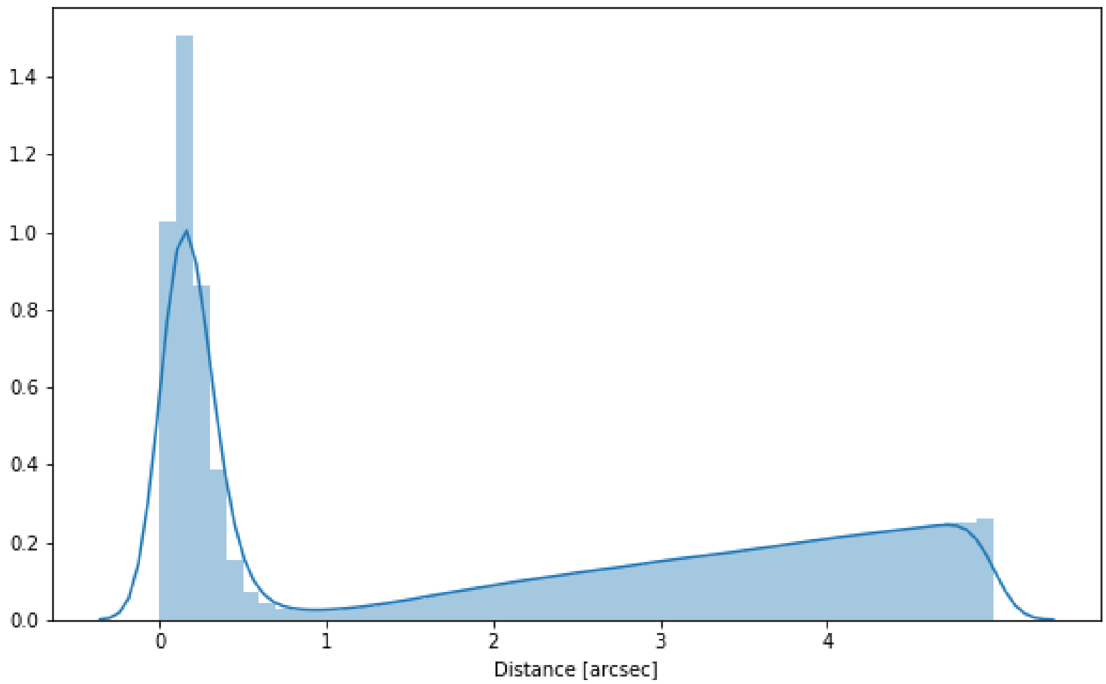
At every step, we look at the distribution of the distances to the nearest source in the merged catalogue to determine the best crossmatching radius.

1.2.1 VIDEO

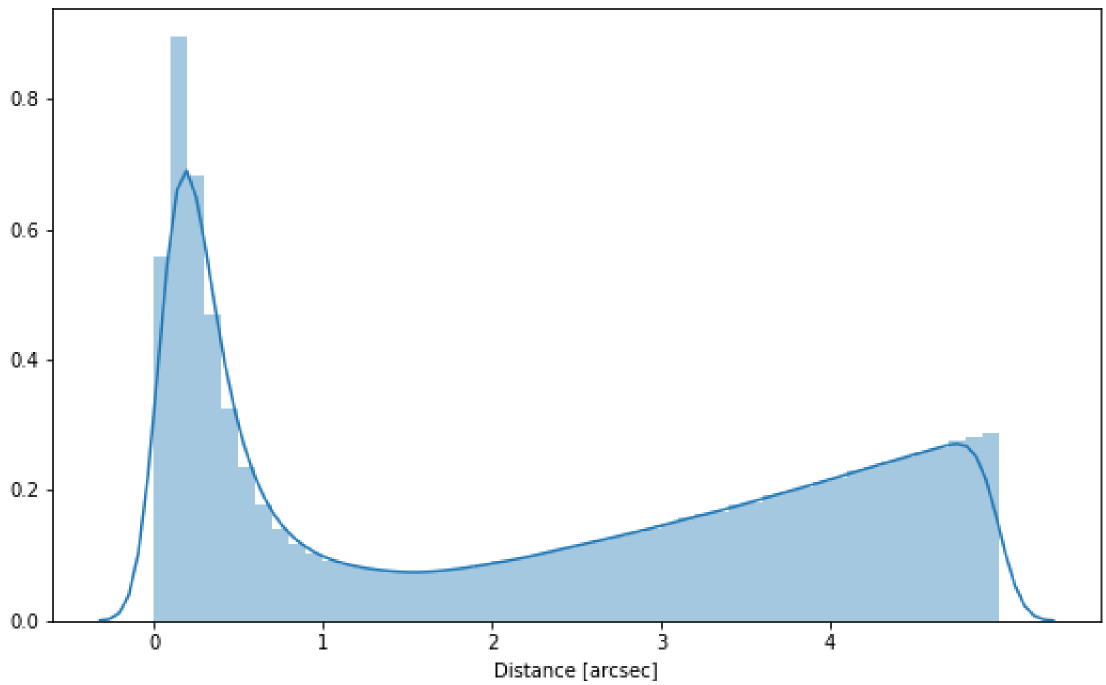
1.2.2 Add VHS



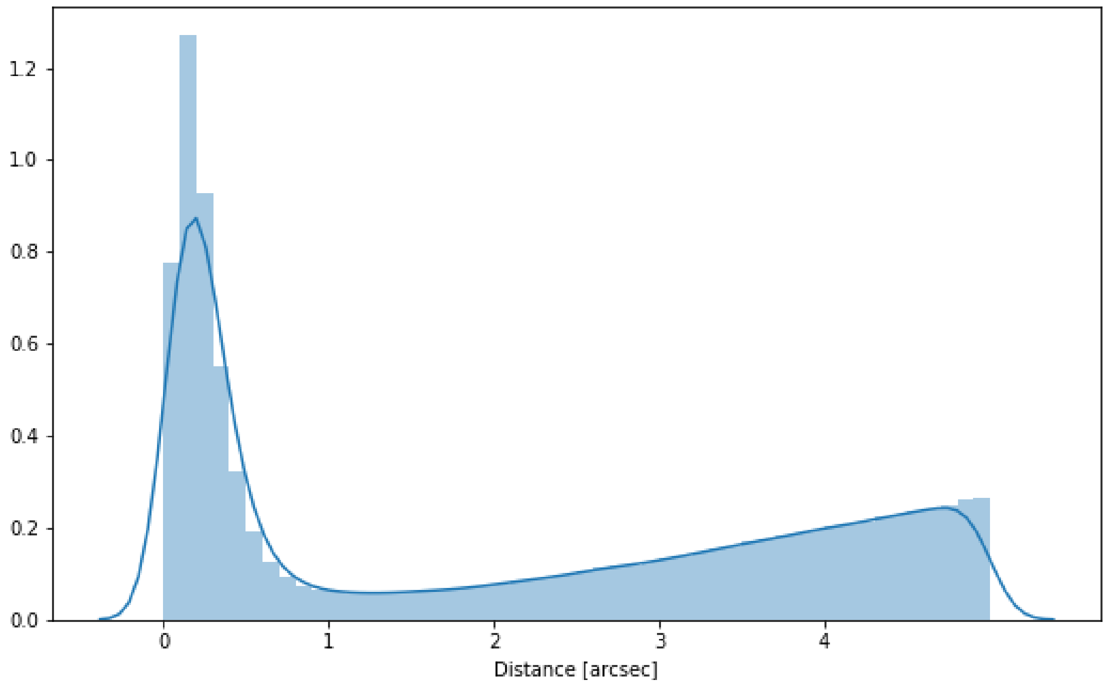
1.2.3 Add ESIS VOICE



1.2.4 Add SERVS



1.2.5 Add SWIRE



1.2.6 Add DES

1.2.7 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[15]: <IPython.core.display.HTML object>
```

1.3 III - Merging flags and stellarity

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

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

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

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

1.4 IV - Adding E(B-V) column

1.5 V - Adding HELP unique identifiers and field columns

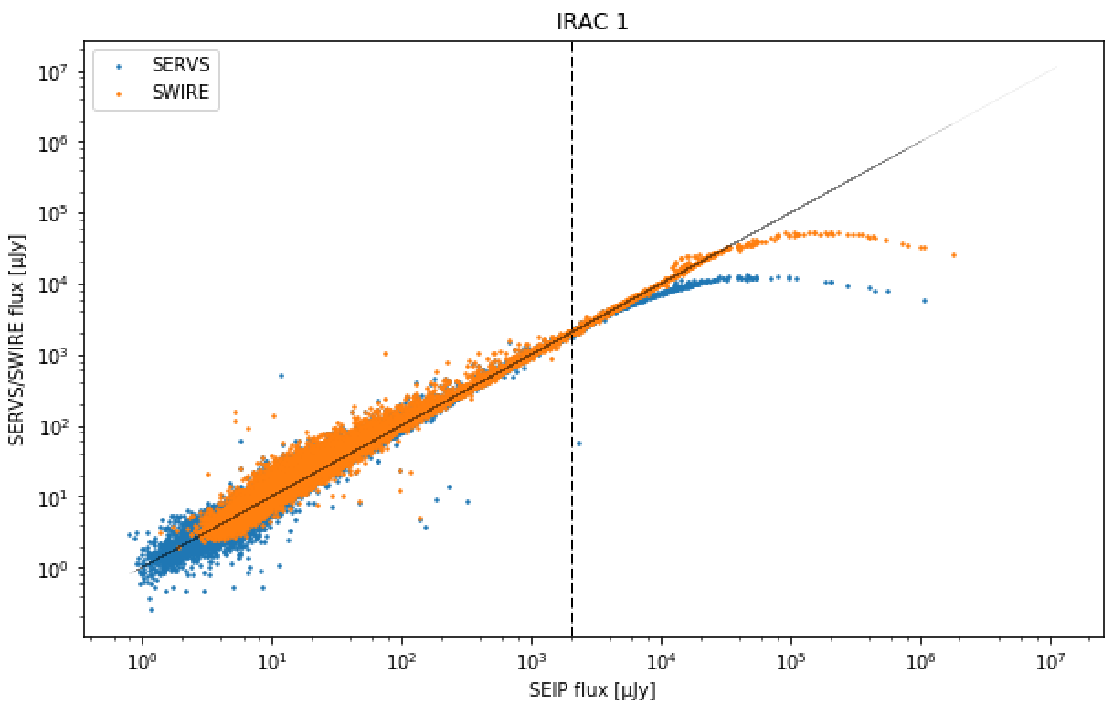
```
OK!
```

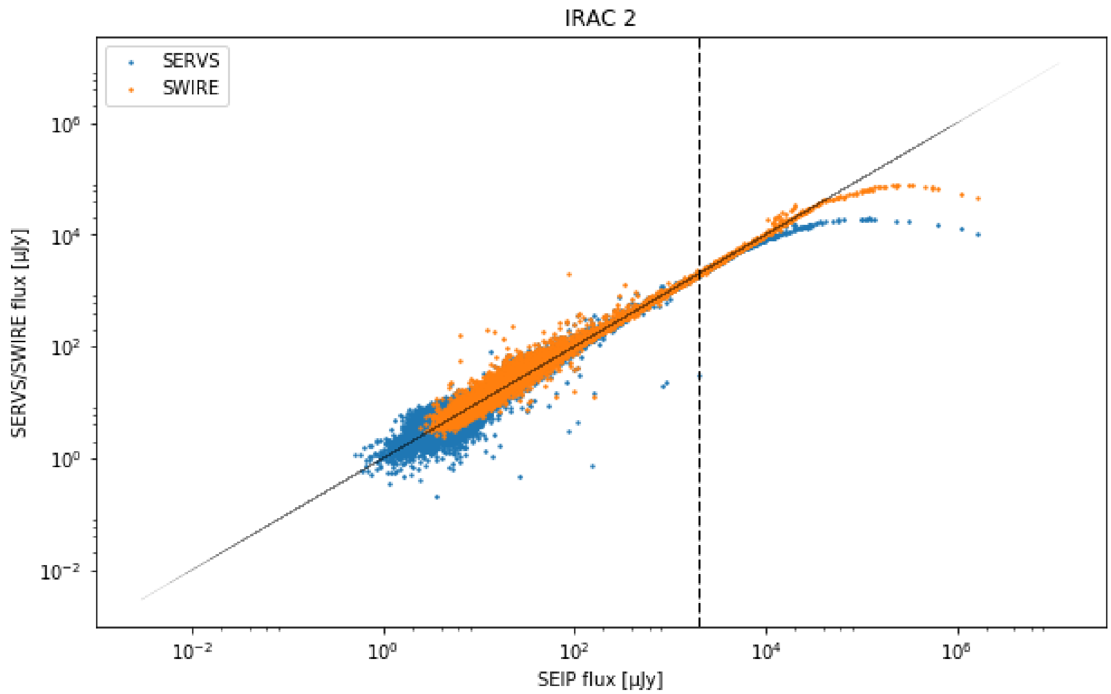
1.6 VI - Choosing between multiple values for the same filter

1.6.1 VI.a SERVS and SWIRE

Both SERVS and SWIRE provide IRAC1 and IRAC2 fluxes. SERVS is deeper but tends to underestimate flux of bright sources (Mattia said over 2000 ţJy) as illustrated by this comparison of SWIRE, SERVS, and Spitzer-EIP fluxes.

```
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 SWIRE and SERVS fluxes are provided, we use the SERVS flux below 2000 Jy and the SWIRE flux over.

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

```
450197 sources with SERVS flux
345740 sources with SWIRE flux
152731 sources with SERVS and SWIRE flux
449622 sources for which we use SERVS
193584 sources for which we use SWIRE
```

```
450197 sources with SERVS flux
345719 sources with SWIRE flux
152731 sources with SERVS and SWIRE flux
449600 sources for which we use SERVS
193585 sources for which we use SWIRE
```

```
457089 sources with SERVS flux
244560 sources with SWIRE flux
104641 sources with SERVS and SWIRE flux
456721 sources for which we use SERVS
140287 sources for which we use SWIRE
```

```
457089 sources with SERVS flux
244544 sources with SWIRE flux
104639 sources with SERVS and SWIRE flux
456701 sources for which we use SERVS
140293 sources for which we use SWIRE
```

1.6.2 VI.b VIDEO and VHS

According to Mattia Vacari VIDEO is deeper than VHS so we take the VIDEO flux if both are available

1.6.3 Vista origin overview

For each band show how many objects have fluxes from each survey for both total and aperture photometries.

```
Out[34]: <IPython.core.display.HTML object>
```

1.7 VII.a Wavelength domain coverage

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

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

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

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

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

1.8 VII.b Wavelength domain detection

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

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

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

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

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

1.9 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.

1.10 IX - Adding HEALPix index

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

1.11 IX - Saving the catalogue

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

3_Checks_and_diagnostics

January 18, 2018

1 ELAIS-S1 master catalogue

1.1 Checks and diagnostics

1.2 0 - Quick checks

1.3 I - Summary of wavelength domains

1.4 II - Comparing magnitudes in similar filters

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

1.4.1 II.a - Comparing depths

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

1.4.2 II.b - Comparing magnitudes

We compare one to one each magnitude in similar bands.

1.5 III - Comparing magnitudes to reference bands

Cross-match the master list to 2MASS magnitudes.

1.5.1 III.a - Comparing J and K bands to 2MASS

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

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

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

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

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

1.6 Keeping only sources with good signal to noise ratio

From here, we are only comparing sources with a signal to noise ratio above 3, i.e. roughly we a magnitude error below 0.3.

To make it easier, we are setting to NaN in the catalogue the magnitudes associated with an error above 0.3 so we can't use these magnitudes after the next cell.

1.7 IV - Comparing aperture magnitudes to total ones.

1.8 V - Color-color and magnitude-color plots