SCIENTIFIC **VALIDATION** OF **ASKAP** CONTINUUM **DATA**

Jordan Collier | CASS & WSU

19th July 2017 | SPARCS VII

WESTERN SYDNEY UNIVERSITY

CSIRO ASTRONOMY & SPACE SCIENCE
www.csiro.au

| Josh Marvil | Ray Norris | Denis Leahy |
| ACES team | EMU team | ASKAP collaboration |

Motivation

- ASKAP
  - New instrument
  - New technology
  - Extended commissioning period expected
    - Debug telescope and software
    - Figure out how telescope generally works
- EMU will produce a deep (~10 uJy rms) continuum map of southern sky
- We need to validate the continuum data for science, ensuring instrument and software are producing adequate data

Motivation

- Precursors
  - New instrument
  - New technology
  - Extended commissioning period expected
    - Debug telescope and software
    - Figure out how telescope generally works
- ?? will produce a deep (?? rms) continuum map of sky
- We need to validate the continuum data for science, ensuring instrument and software are producing adequate data

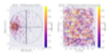
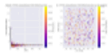
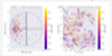
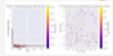
The Goal

- End-to-end analysis of ASKAP continuum image / catalogue
  - Keep other radio data in mind
- Present a validation report
  - Options were
    - PDF
    - HTML (😐)
    - Interactive plots in jupyter notebook
      - plotly or matplotlib / aplpy or bokeh
  - Could host on EMU wiki or CASS webserver, etc

The Goal

- We chose to produce a HTML report, with option for plot on screen
  - Write html of matplotlib figures using mpld3
  - Produce several tables summarising data and validation metrics
  - Clickable thumbnails with interactive plots

Cross-matches

Survey	Frequency (MHz)	Cross-matches	Median offset (arcsec)	Median flux ratio	Median spectral index
NVSS	1400.0	720	-6.45 ± 2.09 (RA) 0.41 ± 2.27 (Dec) 	0.86 ± 0.16 (extrapolated) 	
SUMSS	843.0	283	-6.15 ± 1.82 (RA) -0.07 ± 3.33 (Dec) 	0.88 ± 0.17 (extrapolated) 	-0.53 ± 0.42 

ASKAP continuum validation metrics

Flux Ratio (ASKAP / NVSS extrapolation)	Flux Ratio Deviation (ASKAP / NVSS extrapolation)	Positional Offset (arcsec) (ASKAP — NVSS)	Positional Offset Deviation (arcsec) (ASKAP — NVSS)	Resolved Fraction from int/peak Flux (ASKAP)	Spectral Index (ASKAP in-band)	Source Counts χ_{red}^2 (ASKAP)
0.86	0.16	6.46	3.08	0.91	0.00	7.30

ASKAP image

- Read in the ASKAP image in fits format
  - SBID, project ID, date, duration, frequency and synthesised beam from header
  - Also derive an appropriate search radius
    - FWHM/5, assuming S/N >= 5 (Condon 97)
  - Field centre from the central pixel
  - ASKAPsoft and pipeline versions from header

Observations

SBID	Project	Date	Duration (hours)	Field Centre	Central Frequency (MHz)
2827	AS032	2016-12-03T04:51:31.6	5.22	22:59:45.5907 -32:30:40.871	1368.49

Image

File: 'image.i.gama.2827.cont.GAMA23_T0-0A.linmos.restored.fits'

ASKAPsoft version	Pipeline version	Synthesised Beam (arcsec)	Median r.m.s. (uJy)	Image peak (Jy)	Dynamic Range	Sky Area (deg^2)
0.18.0	0.18.3	16.9 x 12.0	340	1.11	7E+02	35.78

Source Finding

- Pass in Selavy noise map and catalogue
- As output from ASKAPsoft pipeline, OR
- Run BANE and Aegean to produce noise map and catalogue
  - Optionally produce a model and residual map
- Based on catalogue, report number of sources, multi-component islands, sum of image and catalogue flux, median spectral index, and source counts

Catalogue

File: 'selavy-image.i.gama.2827.cont.GAMA23_T0-0A.linmos.restored.components.xml'

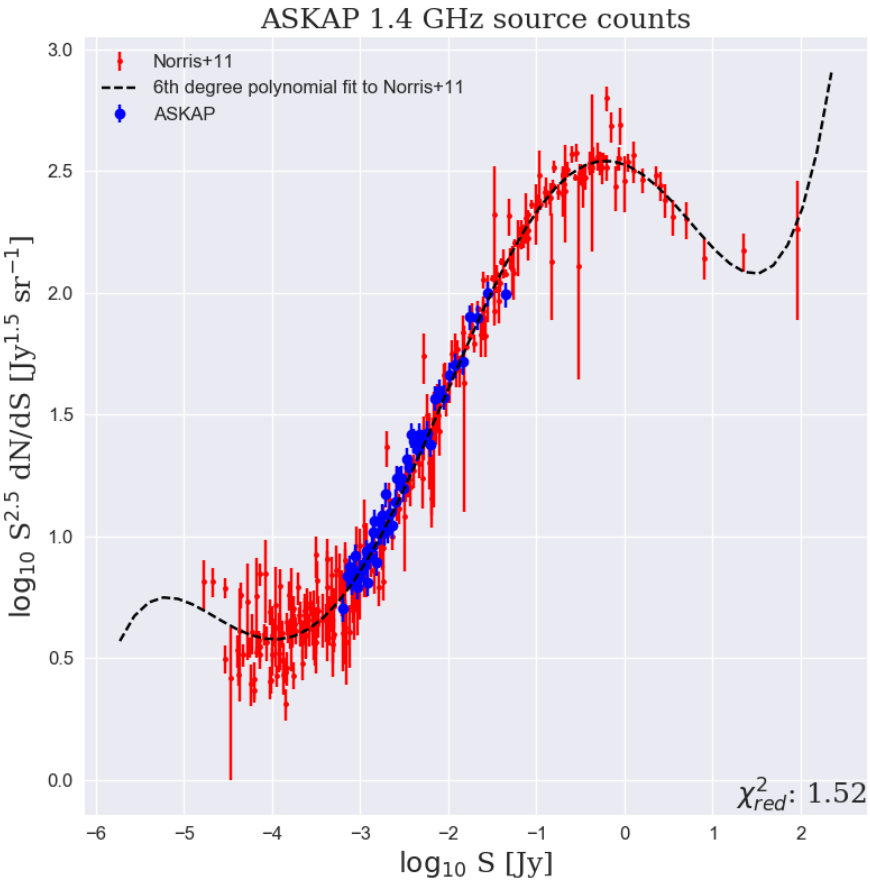
Source Finder	Flux Type	Number of sources (≥5.0σ)	Multi-component islands	Sum of image flux vs. sum of catalogue flux	Median spectral index	Source Counts χ_{red}^2
selavy	integrated	2160	170	32.3 Jy vs. 34.7 Jy	0.00	7.30 

Catalogues

- Read Selavy or Aegean catalogue into pandas
- Same process as reading in any other catalogue (e.g. NVSS)
  - Currently reads fits, xml, csv or other delimited file
  - Set source finder to Aegean or Selavy to use default column names & units
  - OR pass in catalogue, column names and units via a configuration file
  - Also pass in unique short-hand name, which also acts as dictionary key
- Create numpy / pandas lists of data in standardised units
  - Peak and integrated flux, uncertainties (10% or otherwise) and rms in Jy
  - RA and Dec in degrees
- Create other standardised values
  - Search radius in arcsec
  - Frequency in MHz

Validation step 1 – Source Counts

- Reject sources with S/N < 5
- Shift counts to 1.4 GHz using spectral index of -0.8
- Use bins with equal number of sources (default 50 bins)
- Reject highest bin dominated by a few bright sources
- Derive bin centre (S) as mean value of all fluxes in bin
- Derive solid angle from noise map (S/5) or use fixed value from user
- Plot differential Euclidean counts
- Compare to fit to Norris+11



Catalogues

- Filter sources before cross-matching
- Reject ASKAP sources based on parameters in configuration file
- OR
- Reject ASKAP sources using default criteria
  - < 1 mJy
  - int / peak flux > 1.4
  - Multi-component sources
  - Sources flagged as bad
  - Fitted major axis > 1.5 times PSF major axis
  - Std of residual flux in island boundaries > 3 times island rms

Catalogues

- Example output of filtering process

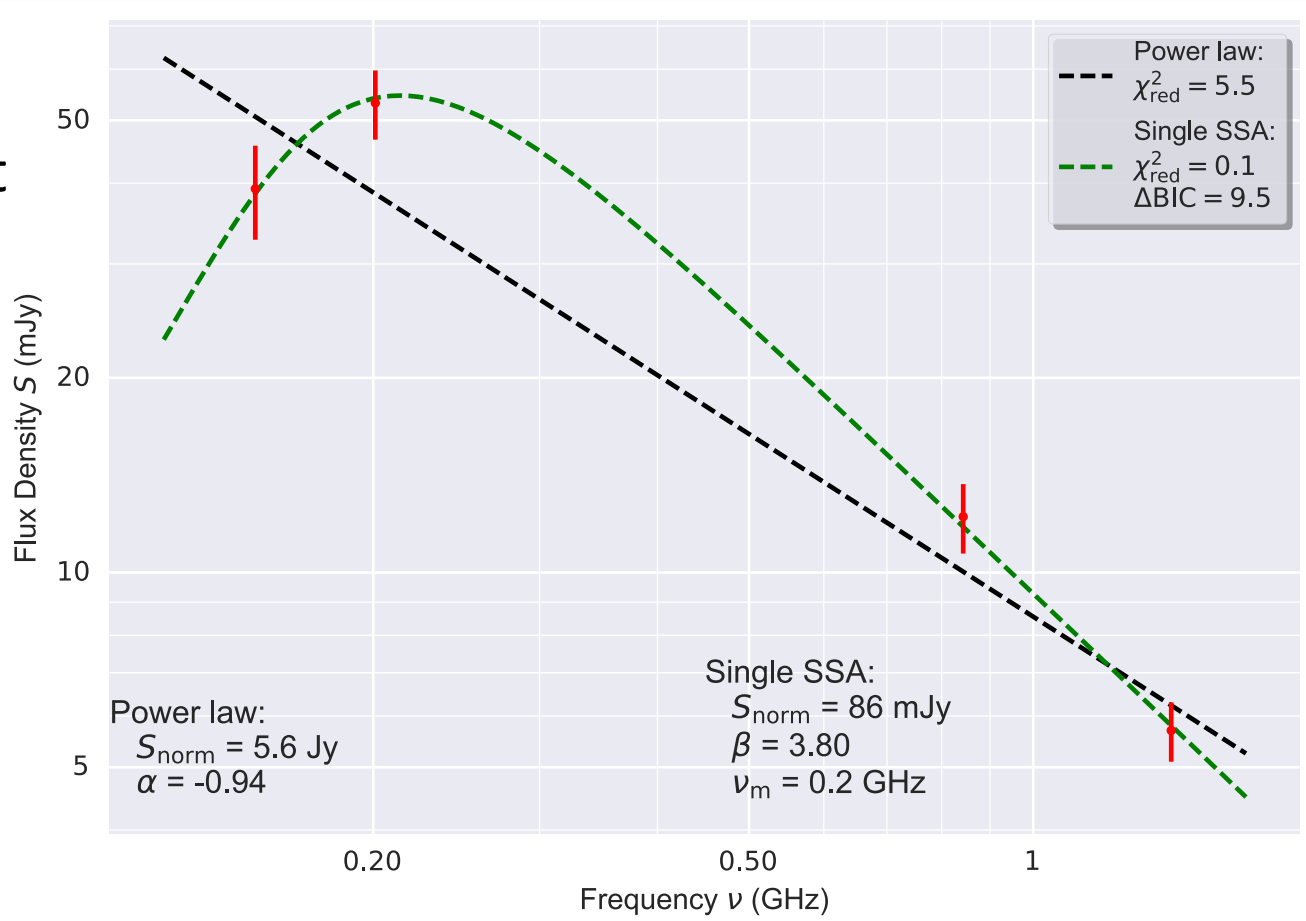
```
Filtering sources in 'image.i.gama2827.cont.GAMA23_T0-0A.linmos.taylor.0.restored_aegean_filtered.csv'...
Initial number of sources: 2420.
Rejected (faint) sources below 0.001 Jy.
Number remaining: 2420.
Rejected (resolved) sources with total flux > 1.4 times the peak flux.
Number remaining: 1612.
Rejected (resolved) sources belonging to a multi-component island.
Number remaining: 1547.
Rejected (resolved) sources with fitted major axis > 1.5 times the psf major axis.
Number remaining: 1547.
Rejected (poorly fit) sources with standard deviation in residual > 3 times the rms.
Number remaining: 1472.
Rejecting (problematic) sources with flags.
Number remaining: 1463.
```

Catalogues

- Individually process each catalogue configuration file passed in as a comma-separated list
  - Cut out catalogue sources in a box based on bounding box of fits image
  - Perform a nearest neighbour cross-match
    - Default is to use largest of the two search radii
    - Default is to keep all sources from ASKAP
    - Keep a running list of names of all cross-matched catalogues
    - Use this as dictionary key, appending lists of number of sources, frequency, radius, ra, dec, flux and uncertainty and rms to dictionary
  - Derive several properties between ASKAP and this catalogue
    - Spectral indices (if > 10% different in frequency)
    - Flux ratios (if < 1% different in frequency)
    - Positional offsets

Catalogues

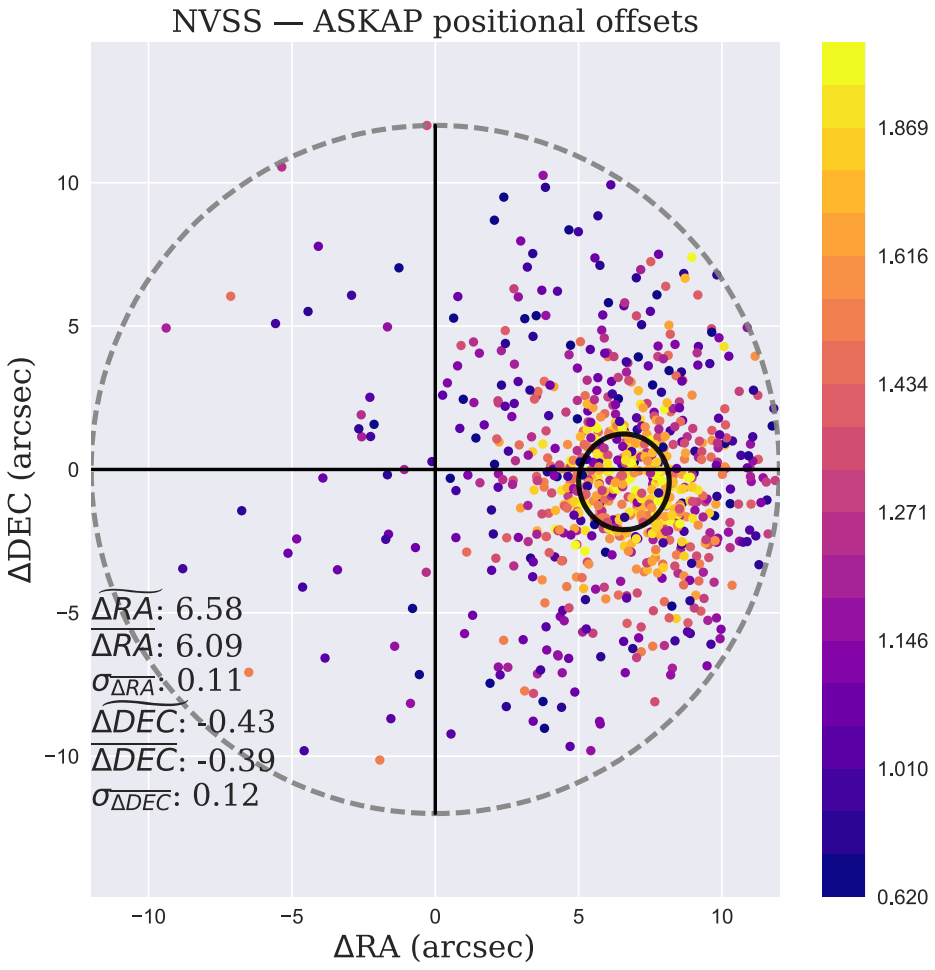
- Optionally use all cross-matched catalogues except ASKAP to derive radio SEDs
- Optionally write figures of these SEDs

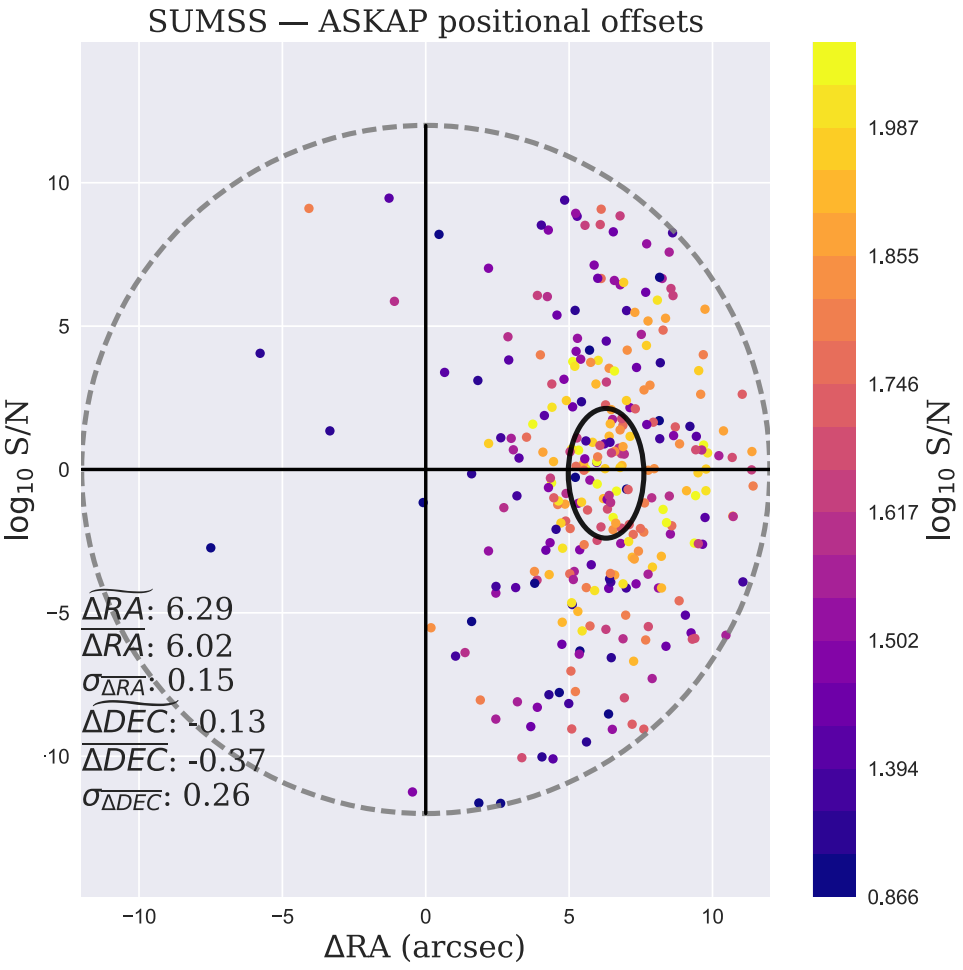


Catalogues

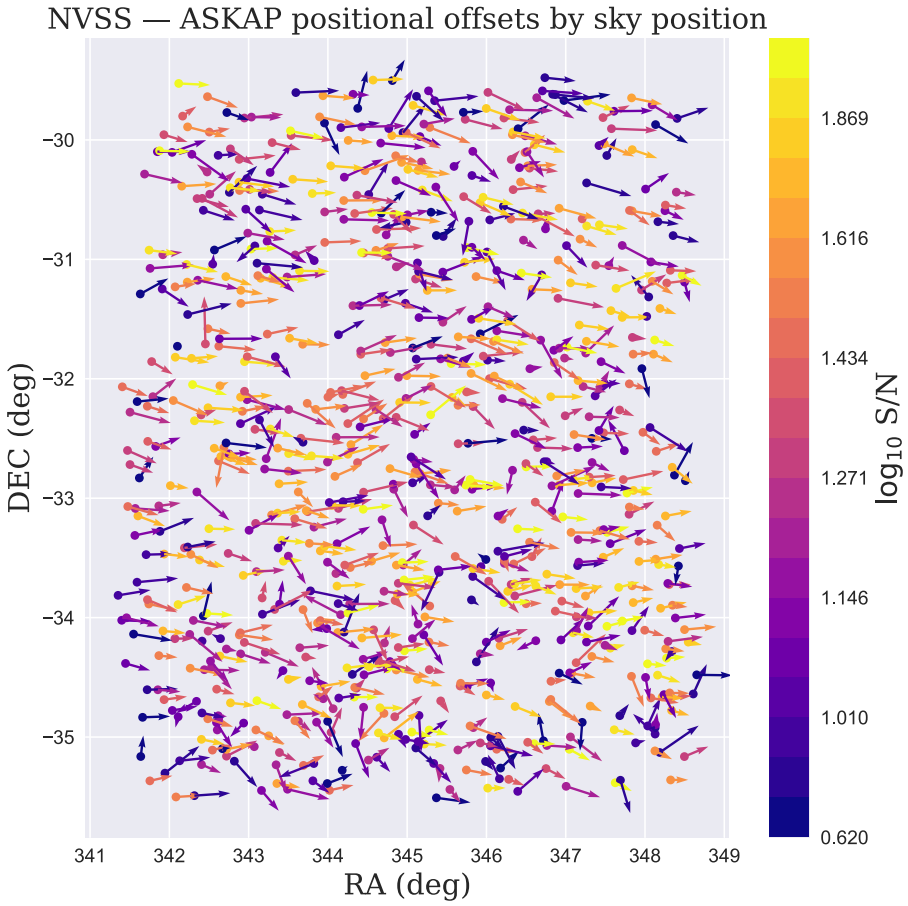
- Otherwise just use assume spectral index of -0.8 and extrapolate from each cross-matched catalogue
- Derive the flux at the ASKAP frequency
- Derive a fitted / measured flux density ratios from these
- Validation step 2
  - Test validation of the data using each cross-matched catalogue

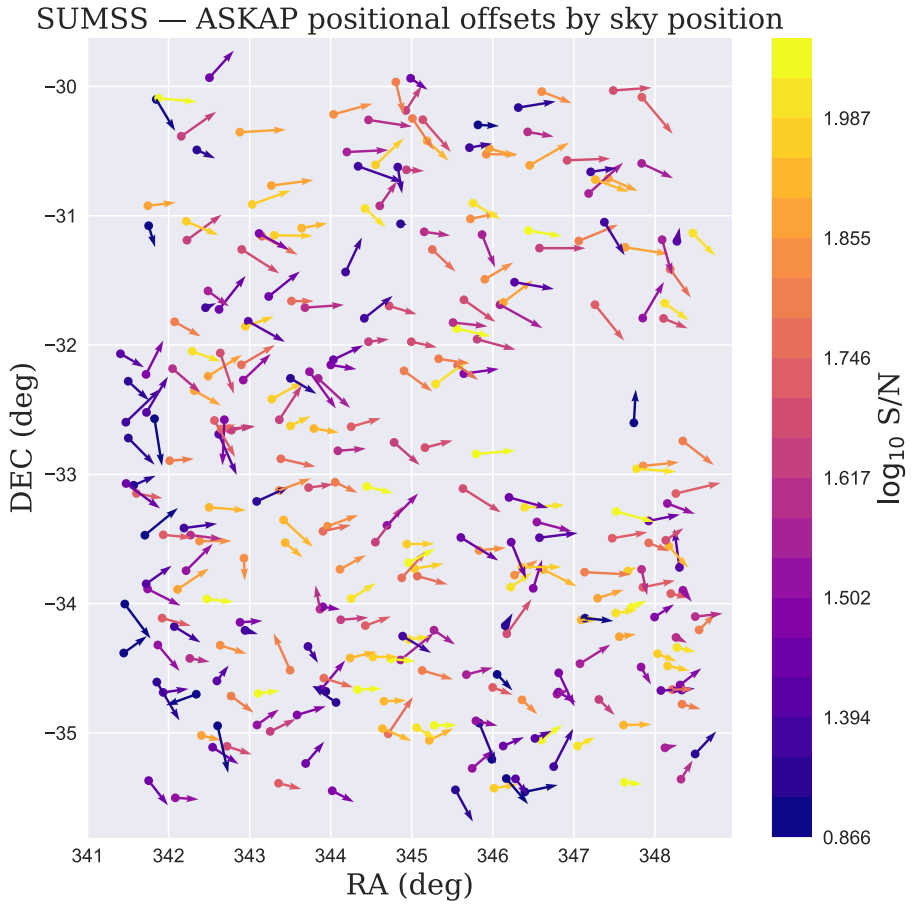
Validation


NVSS — ASKAP positional offsets
ΔDEC (arcsec)
ΔRA (arcsec)
log10 S/N
1.869
1.616
1.434
1.271
1.146
1.010
0.620
$\widetilde{\Delta RA}$: 6.58
$\overline{\Delta RA}$: 6.09
$\sigma_{\overline{\Delta RA}}$: 0.11
$\widetilde{\Delta DEC}$: -0.43
$\overline{\Delta DEC}$: -0.39
$\sigma_{\overline{\Delta DEC}}$: 0.12

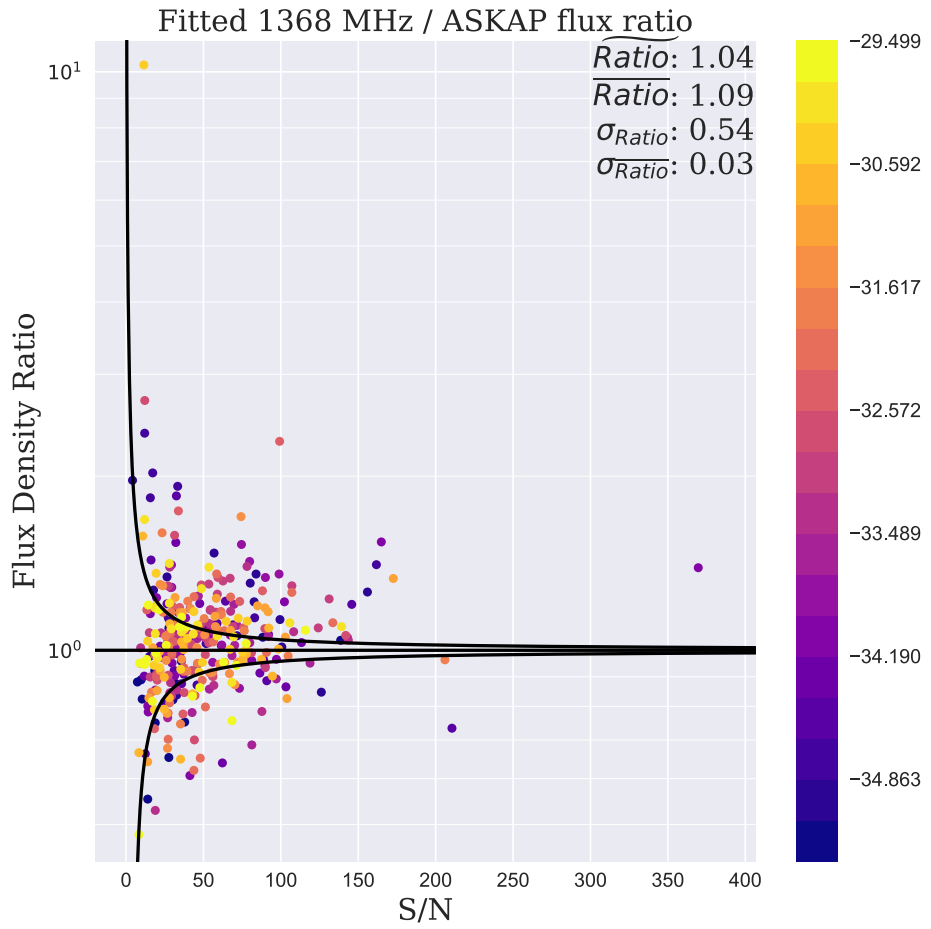

SUMSS — ASKAP positional offsets
ΔRA (arcsec)
log10 S/N
1.987
1.855
1.746
1.617
1.502
1.394
0.866
$\widetilde{\Delta RA}$: 6.29
$\overline{\Delta RA}$: 6.02
$\sigma_{\overline{\Delta RA}}$: 0.15
$\widetilde{\Delta DEC}$: -0.13
$\overline{\Delta DEC}$: -0.37
$\sigma_{\overline{\Delta DEC}}$: 0.26

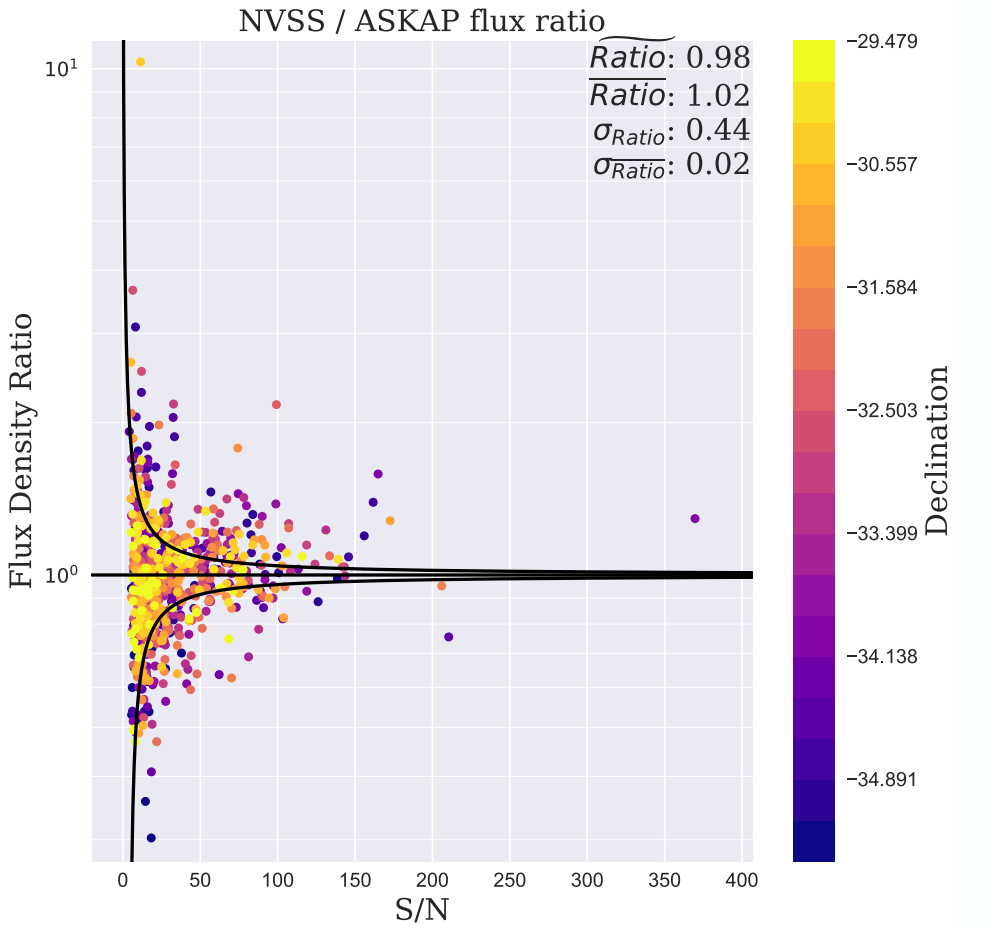
Validation


NVSS — ASKAP positional offsets by sky position
DEC (deg)
RA (deg)
−30
−31
−32
−33
−34
−35
341
342
343
344
345
346
347
348
349
1.869
1.616
1.434
1.271
1.146
1.010
0.620
log10 S/N

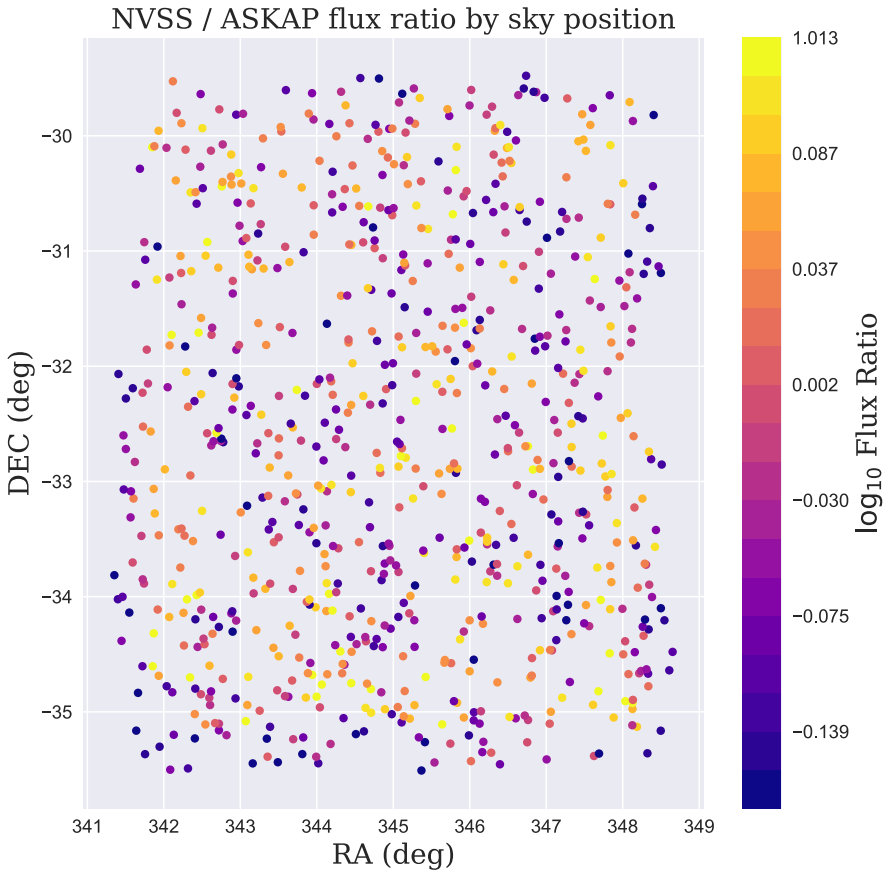

SUMSS — ASKAP positional offsets by sky position
DEC (deg)
RA (deg)
−30
−31
−32
−33
−34
−35
341
342
343
344
345
346
347
348
1.987
1.855
1.746
1.617
1.502
1.394
0.866
log10 S/N

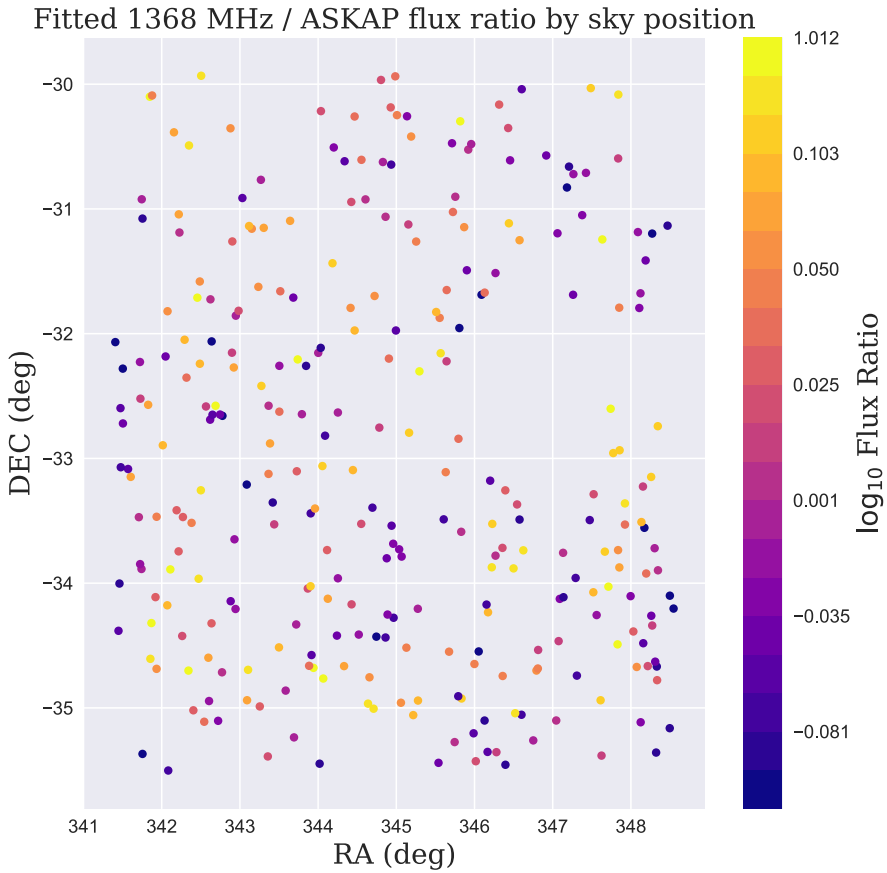
Validation


Fitted 1368 MHz / ASKAP flux ratio
$\widetilde{Ratio}$: 1.04
$\overline{Ratio}$: 1.09
σ_{Ratio}: 0.54
$\sigma_{\overline{Ratio}}$: 0.03
Flux Density Ratio
10^1
10^0
0
50
100
150
200
250
300
350
400
S/N
−29.499
−30.592
−31.617
−32.572
−33.489
−34.190
−34.863

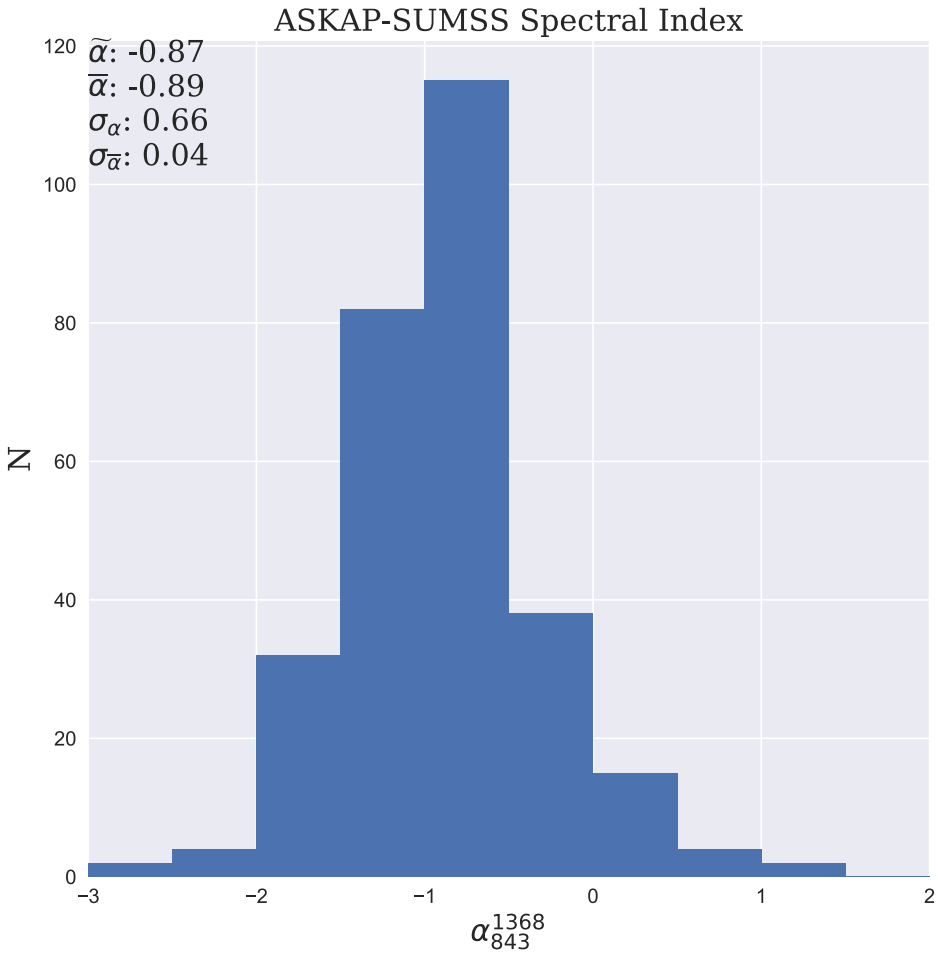

NVSS / ASKAP flux ratio
$\widetilde{Ratio}$: 0.98
$\overline{Ratio}$: 1.02
σ_{Ratio}: 0.44
$\sigma_{\overline{Ratio}}$: 0.02
Flux Density Ratio
10^1
10^0
0
50
100
150
200
250
300
350
400
S/N
−29.479
−30.557
−31.584
−32.503
−33.399
−34.138
−34.891
Declination

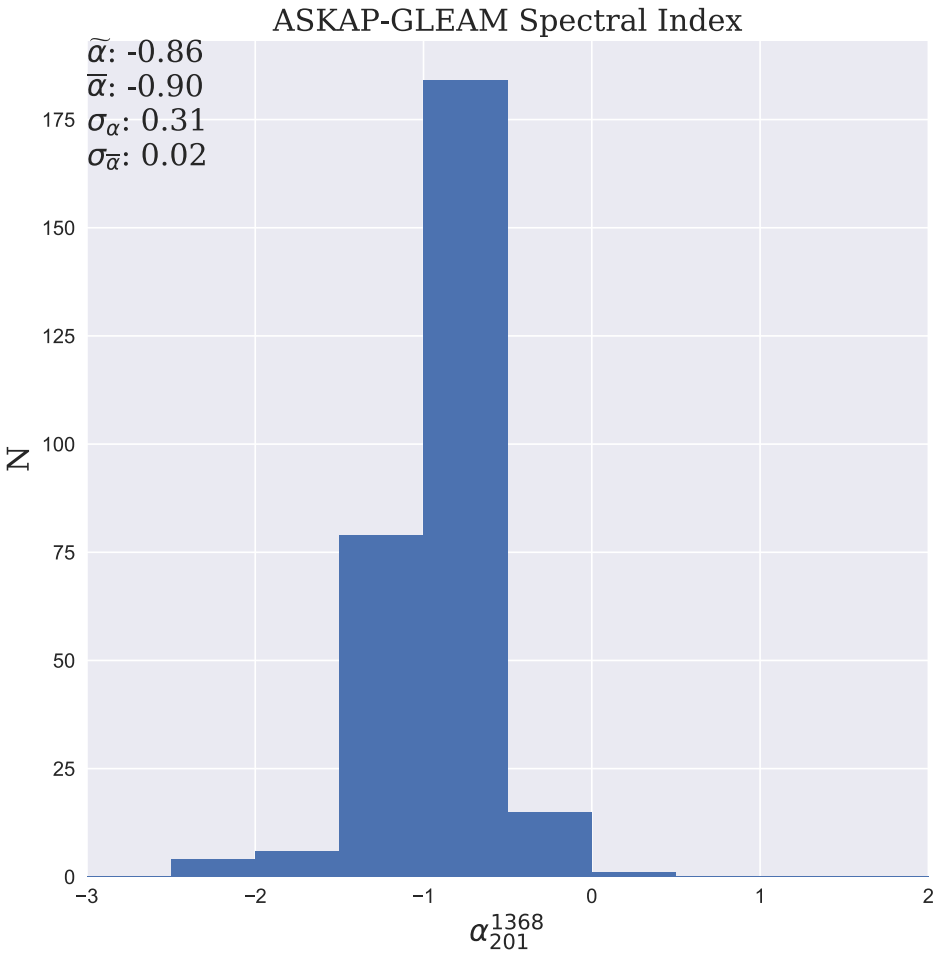
Validation


NVSS / ASKAP flux ratio by sky position
DEC (deg)
RA (deg)
log10 Flux Ratio
1.013
0.087
0.037
0.002
−0.030
−0.075
−0.139


Fitted 1368 MHz / ASKAP flux ratio by sky position
DEC (deg)
RA (deg)
log10 Flux Ratio
1.012
0.103
0.050
0.025
0.001
−0.035
−0.081

Validation

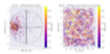
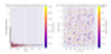
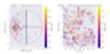
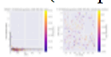

ASKAP-SUMSS Spectral Index
$\widetilde{\alpha}$: -0.87
$\overline{\alpha}$: -0.89
σ_{α}: 0.66
$\sigma_{\overline{\alpha}}$: 0.04
N
α_{843}^{1368}


ASKAP-GLEAM Spectral Index
$\widetilde{\alpha}$: -0.86
$\overline{\alpha}$: -0.90
σ_{α}: 0.31
$\sigma_{\overline{\alpha}}$: 0.02
N
α_{201}^{1368}

Validation

- Produce row in report table for each cross-matched catalogue
- Write median positional offset, flux ratio and spectral index

Cross-matches

Survey	Frequency (MHz)	Cross-matches	Median offset (arcsec)	Median flux ratio	Median spectral index
NVSS	1400.0	720	-6.45 ± 2.09 (RA) 0.41 ± 2.27 (Dec) 	0.86 ± 0.16 (extrapolated) 	
SUMSS	843.0	283	-6.15 ± 1.82 (RA) -0.07 ± 3.33 (Dec) 	0.88 ± 0.17 (extrapolated) 	-0.53 ± 0.42 

Validation step 3 – validation metrics

- Write the values of our seven validation tests and whether they were a pass / fail based on several tolerance values agreed on
  - Really depends on what science you're doing
  - A few failed tests will not result in image being rejected from archive
- Values used from catalogue with largest number of cross-matches

Validation step 3 – validation metrics

- Seven tests (good; uncertain; bad):
  - Distance of median flux density ratio from 1.0 (< 0.05; < 0.1; > 0.1)
  - Deviation of median flux density ratios (< 0.1; < 0.2; > 0.2)
  - Median positional offset (< 1 arcsec; < 5 arcsec; > 5 arcsec)
  - Deviation of median position offsets (< 5 arcsec; < 10 arcsec; > 10 arcsec)
  - Fraction of resolved sources (considered resolved when difference between int and peak flux > 3 uncertainties – 0.05 < frac < 0.2; N/A; < 0.05 or > 0.2)
  - Distance of median spectral index away from –0.8 (< 0.2; N/A; > 0.2)
  - Reduced chi squared of source counts (< 3; < 50; > 50)

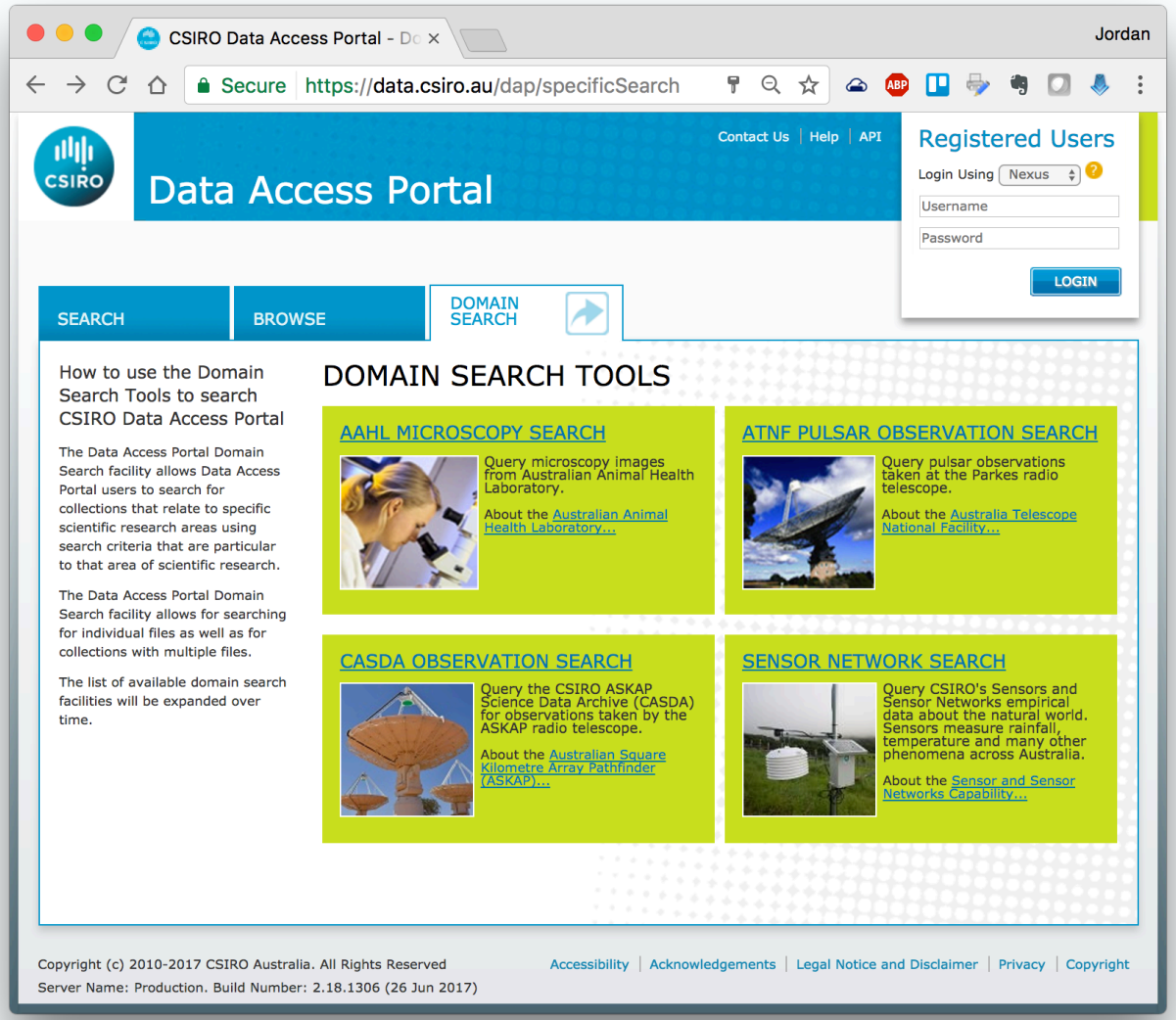
ASKAP continuum validation metrics

Flux Ratio (ASKAP / NVSS extrapolation)	Flux Ratio Deviation (ASKAP / NVSS extrapolation)	Positional Offset (arcsec) (ASKAP — NVSS)	Positional Offset Deviation (arcsec) (ASKAP — NVSS)	Resolved Fraction from int/peak Flux (ASKAP)	Spectral Index (ASKAP in-band)	Source Counts χ_{red}^2 (ASKAP)
0.86	0.16	6.46	3.08	0.91	0.00	7.30

Generated by Jordan Collier at 2017-06-29 07:21:15.826110

Validation step 4 – upload to CASDA

- Pass result into the CSIRO ASKAP Science Data Archive (CASDA)
- Use validation metrics to determine quality of data
- Query data based on metrics or flags
- Clickable link to CSIRO page with validation report



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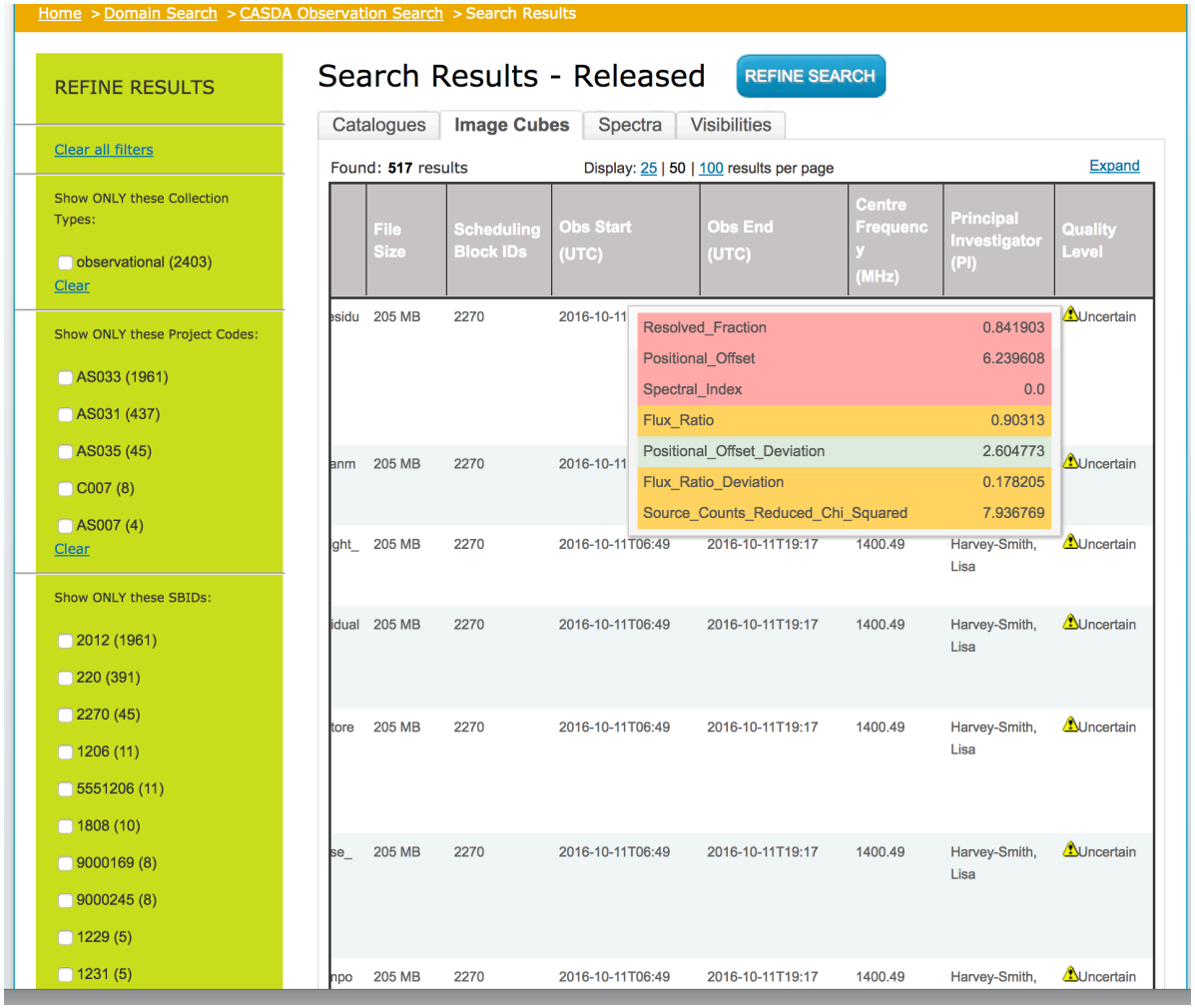

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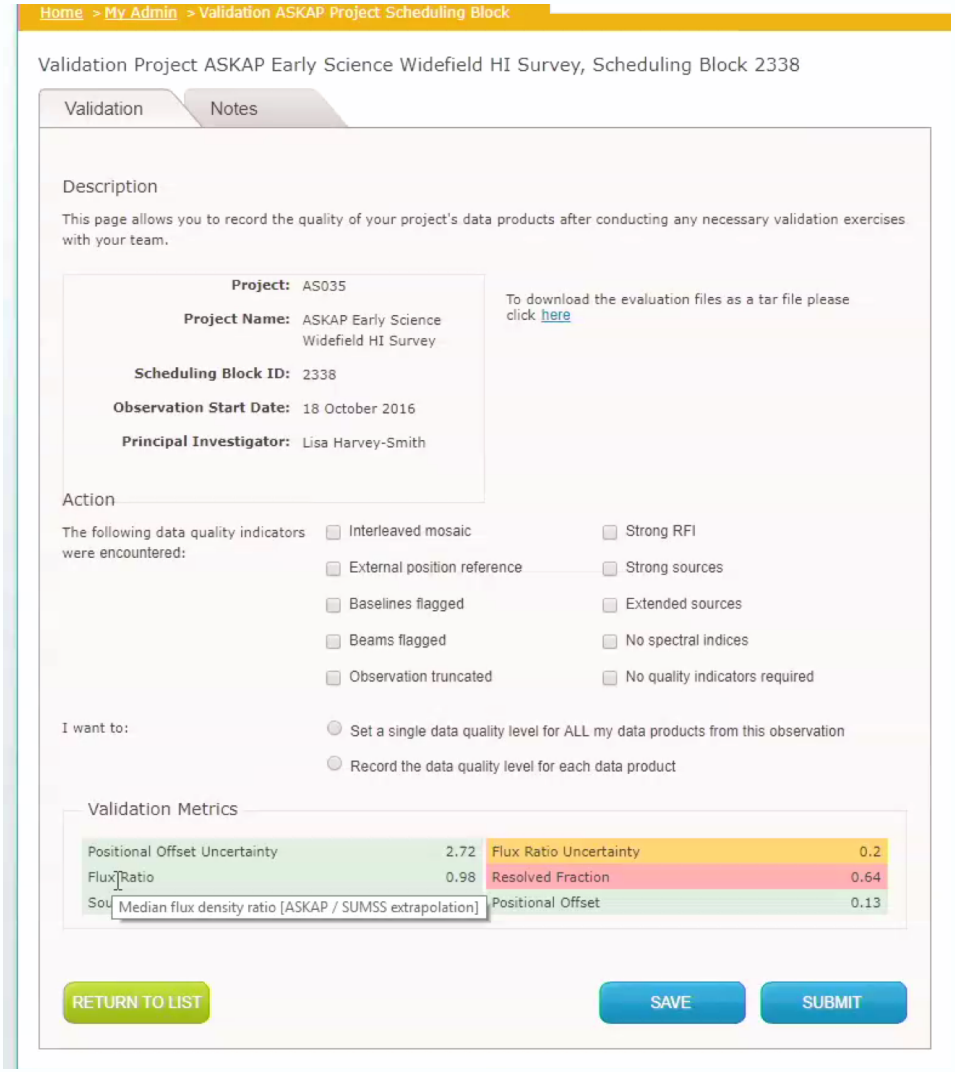

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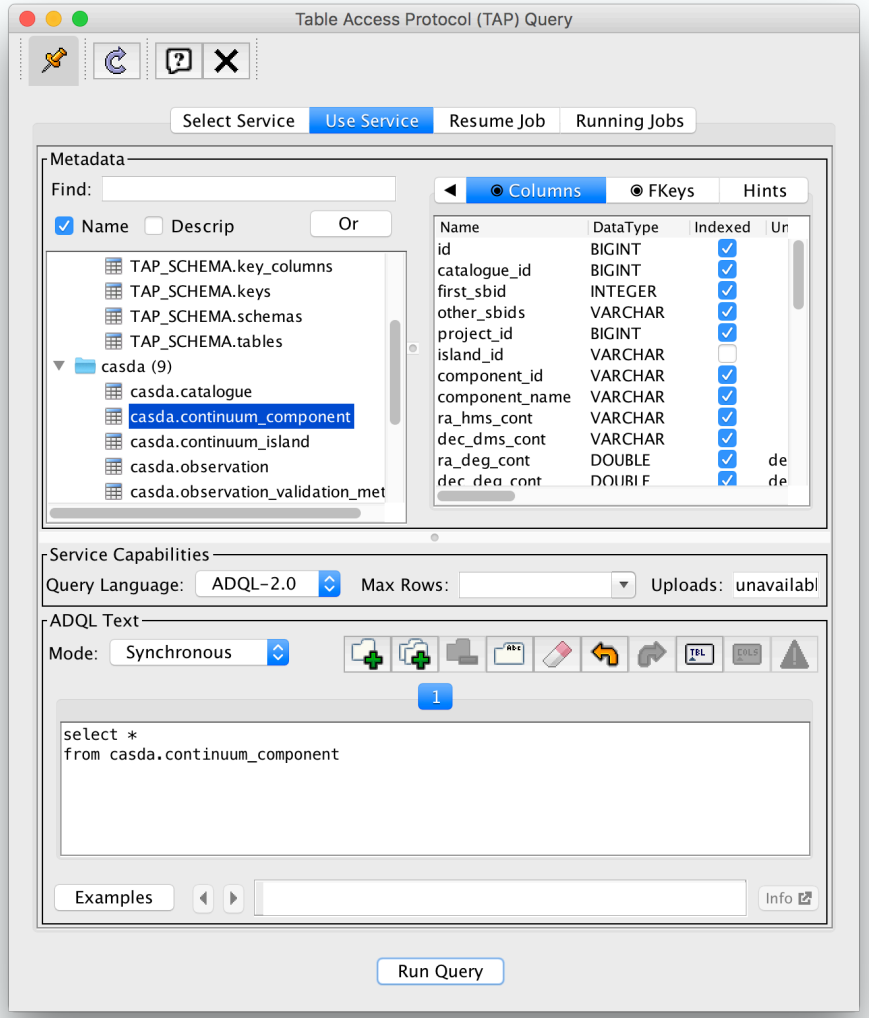

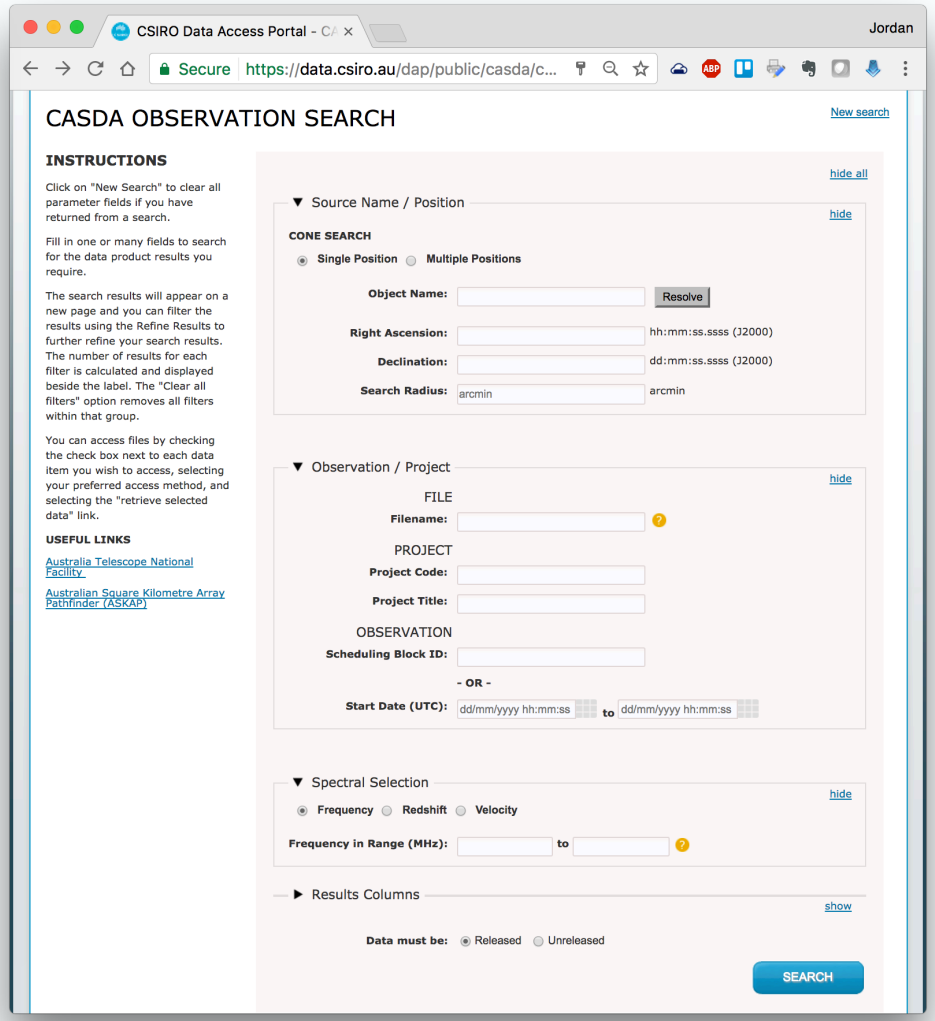

Gama G23 field

ASKAP Validation Report

Jordan

www.atnf.csiro.au/research/ASKAP/ASKAP-validation/image.i.gama.2827.cont.GAMA23_T0-0A.linmos.restored_continuum_validation_selavy_snr5.0_int/

ASKAP Continuum Data Validation Report

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Generated by Jordan Collier at 2017-06-29 07:21:15.826110

NGC 7232 field

ASKAP Validation Report — Jordan

www.atnf.csiro.au/research/ASKAP/ASKAP-validation/image.i.SB2347.cont.NGC7232_B_T0-0A.linmos.restored_continuum_validation_selavy_snr5.0_int/

ASKAP Continuum Data Validation Report

Observations

SBID	Project	Date	Duration (hours)	Field Centre	Central Frequency (MHz)
2347	AS035	2016-10-19T06:30:59.4	12.00	22:10:08.8896 -44:50:07.2262	1400.49

Image

File: 'image.i.SB2347.cont.NGC7232_B_T0-0A.linmos.restored.fits'

ASKAPsoft version	Pipeline version	Synthesised Beam (arcsec)	Median r.m.s. (uJy)	Image peak (Jy)	Dynamic Range	Sky Area (deg^2)
0.19.0	0.19.0	18.7 x 14.1	252	nan	7E+02	35.33

Catalogue

File: 'selavy-image.i.SB2347.cont.NGC7232_B_T0-0A.linmos.restored.components.xml'

Source Finder	Flux Type	Number of sources (≥5.0σ)	Multi-component islands	Sum of image flux vs. sum of catalogue flux	Median spectral index	Source Counts χ^2_{red}
selavy	integrated	2366	179	33.9 Jy vs. 33.6 Jy	-99.00	1.63

Cross-matches

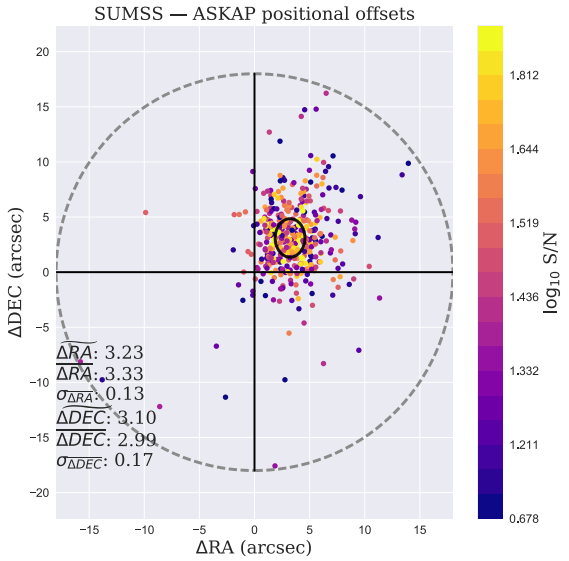
Survey	Frequency (MHz)	Cross-matches	Median offset (arcsec)	Median flux ratio	Median spectral index
SUMSS	843.0	419	0.01 ± 1.70 (RA) -0.13 ± 2.46 (Dec)	0.98 ± 0.19 (extrapolated)	-0.76 ± 0.39

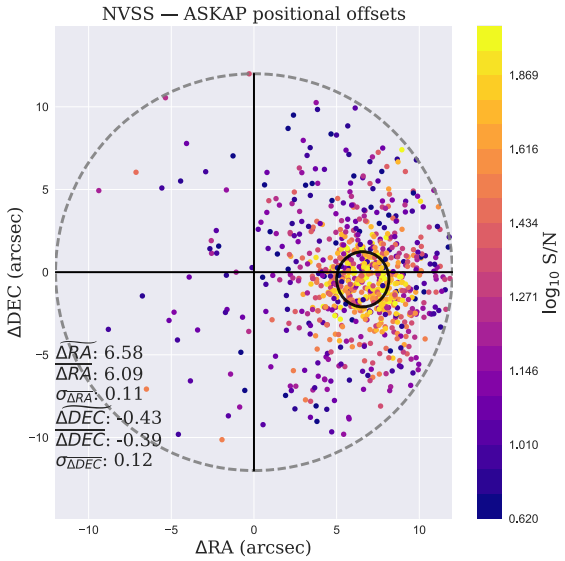
ASKAP continuum validation metrics

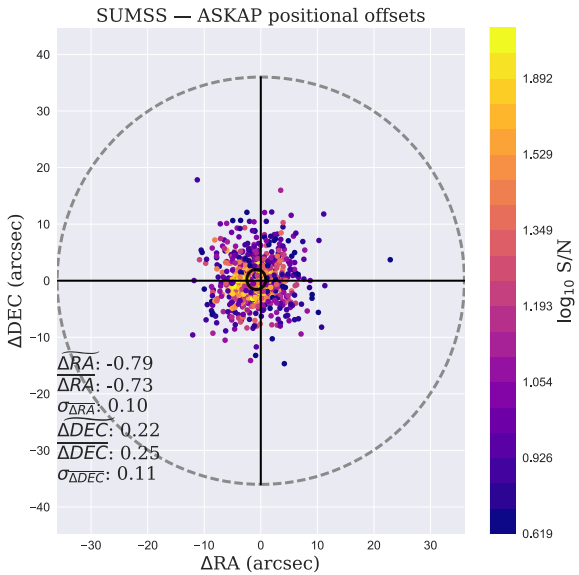
Flux Ratio (ASKAP / SUMSS extrapolation)	Flux Ratio Deviation (ASKAP / SUMSS extrapolation)	Positional Offset (arcsec) (ASKAP — SUMSS)	Positional Offset Deviation (arcsec) (ASKAP — SUMSS)	Resolved Fraction from int/peak Flux (ASKAP)	Spectral Index ()	Source Counts χ^2_{red} (ASKAP)
0.98	0.19	0.13	3.00	0.62	-99.00	1.63

Astrometry problems

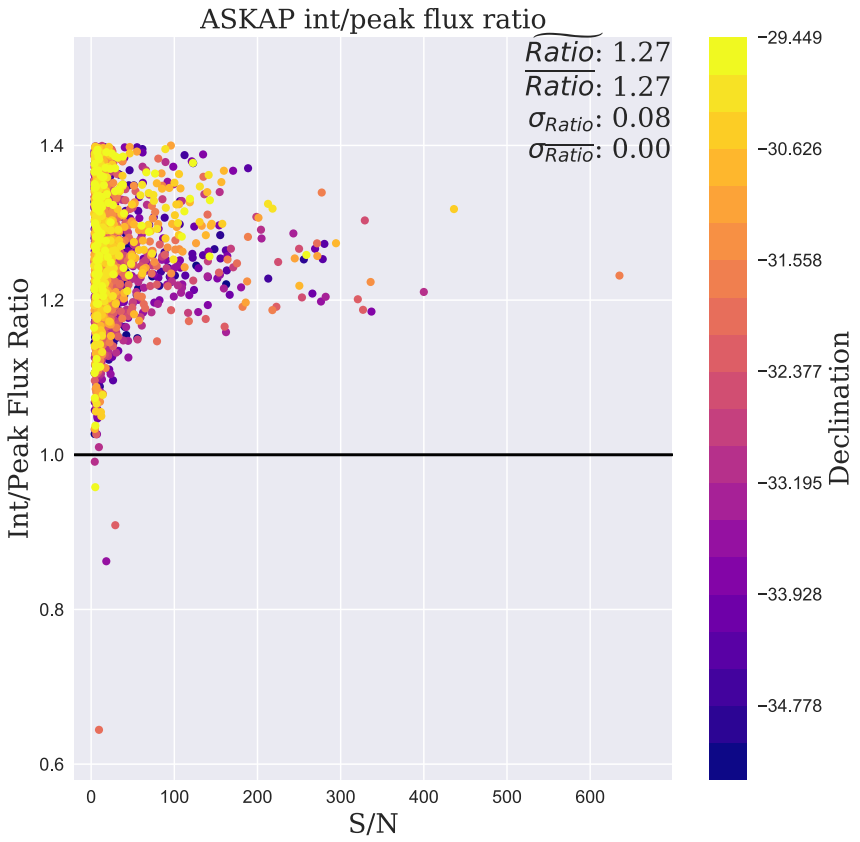
- Consistent offset of ~5 arcsec in RA, and occasionally in Dec
- Different nights affected by different offsets
  - Causes smearing of synthesised beam when mosaicked together
- Solution implemented to correct bulk offset in measurement set

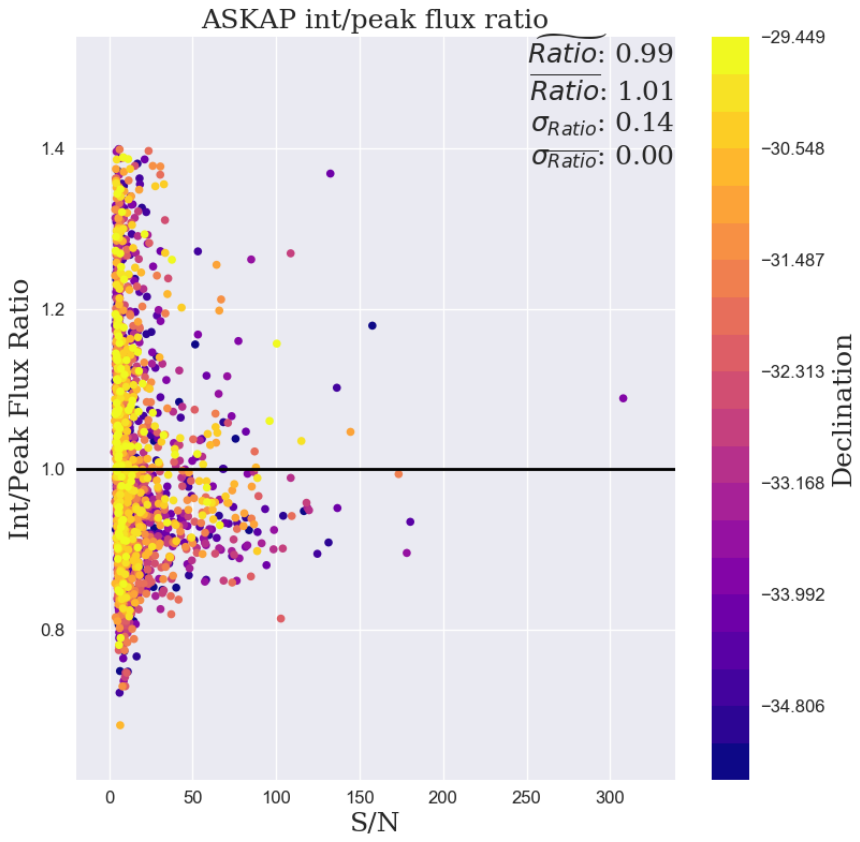






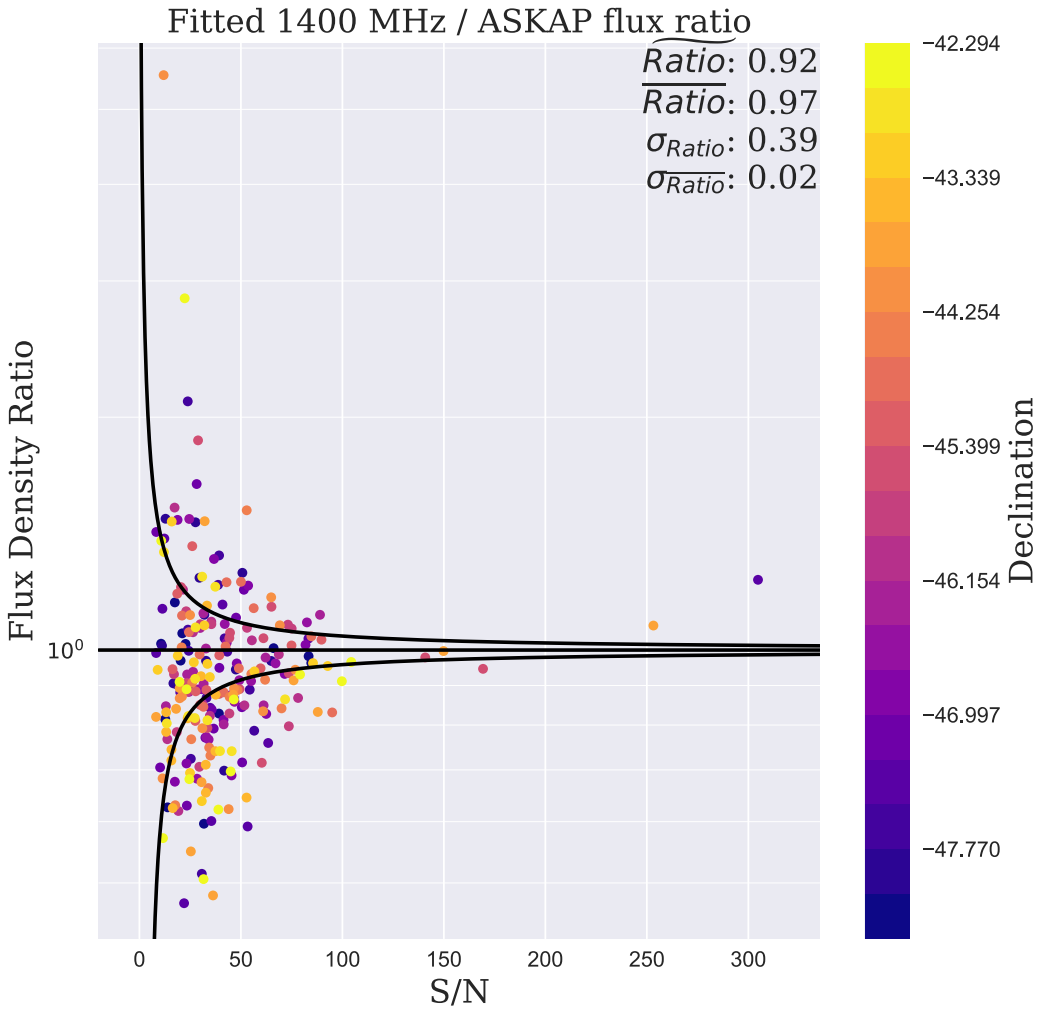
Flux problems





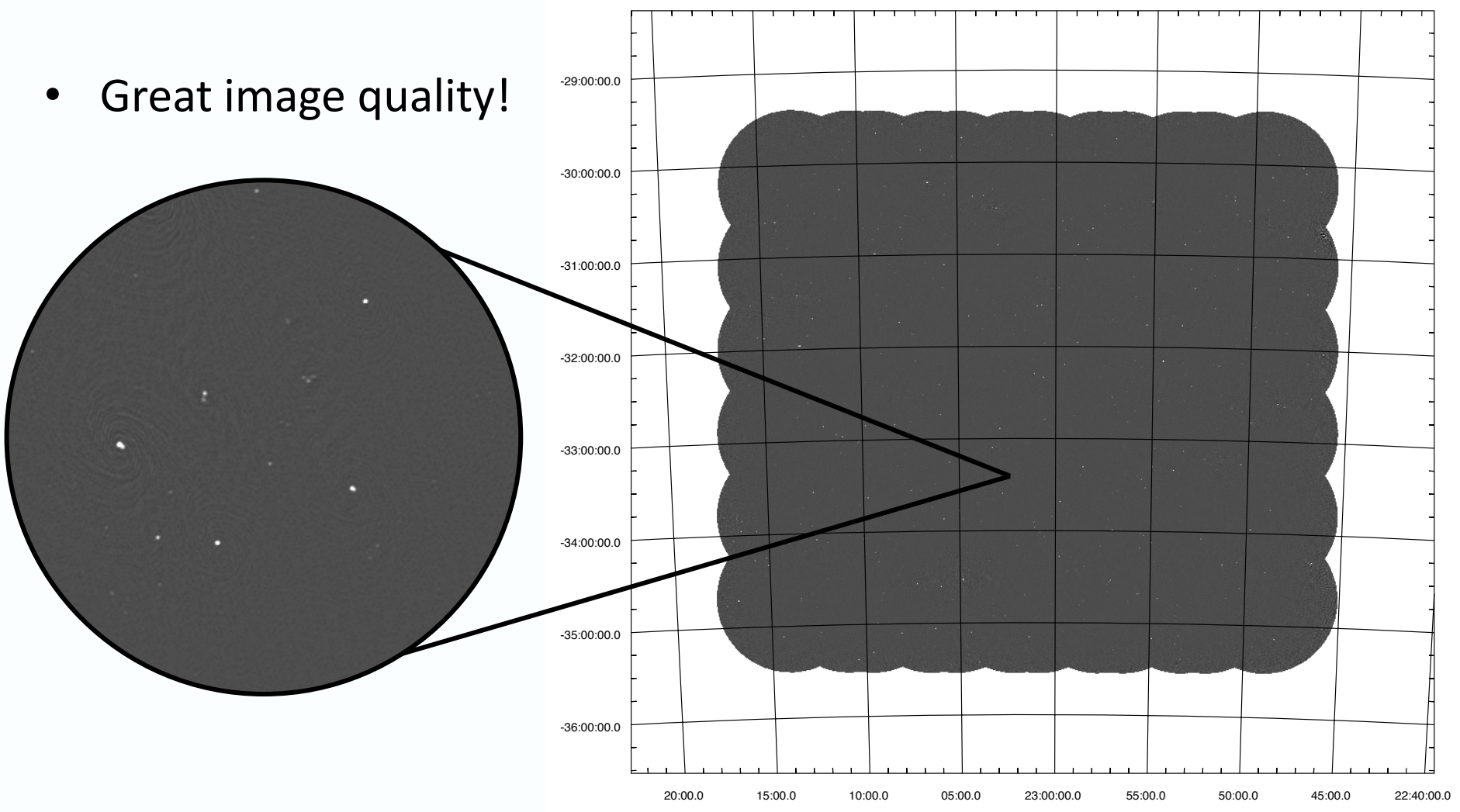
The good news!

- Peak fluxes largely ok



The good news!

- Great image quality!



The Script

1. bash

```
MC02RTBRAG8WP:~ jordan$ ASKAP_continuum_validation.py -h
Input an ASKAP continuum image and produce an external validation report (in html) of positions, fluxes, source counts, etc in the current directory.

Last updated: 28/06/2017

Usage:
  ASKAP_continuum_validation.py -h | --help
  ASKAP_continuum_validation.py [-S --Selavy=<cat>] [-N --noise=<map>] [-C --catalogues=<list>] [-F --filter=<config>] [-R --snr=<ratio>]
  [-v --verbose] [-f --refind] [-r --redo] [-p --peak-flux] [-w --write] [-x --no-write] [-m --SEDs=<models>] [-e --SEDfig=<extn>]
  [-d --main-dir=<path>] [-n --ncores=<num>] [-b --nbins=<num>] [-s --source=<src>] [-a --aegean-params] <fits-file>

Arguments:
  <fits-file>               A fits continuum image from ASKAP.

Options:
  -h --help                 Show this help message.
  -S --Selavy=<cat>         Use this Selavy catalogue of the input ASKAP image. Default is to run Aegean [default: None].
  -N --noise=<map>          Use this fits image of the local rms. Default is to run BANE [default: None].
  -C --catalogues=<list>    A comma-separated list of filepaths to catalogue config files corresponding to catalogues to use
                            (will look in --main-dir for each file not found in given path) [default: NVSS_config.txt,SUMSS_config.txt].
  -F --filter=<config>      A config file for filtering the sources in the input fits file [default: None].
  -R --snr=<ratio>          The signal-to-noise ratio cut to apply to the ASKAP catalogue and the source counts (doesn't affect source finding) [default: 5.0].
  -v --verbose              Verbose output [default: False].
  -f --refind               Force source finding step when catalogue already exists (sets redo to True) [default: False].
  -r --redo                 Force every step again (except source finding), even when catalogues already exist [default: False].
  -p --peak-flux            Use the peak flux rather than the integrated flux of the input ASKAP image (not used when -A used) [default: False].
  -w --write                Write intermediate files generated during processing (e.g. cross-matched and pre-filtered catalogues, etc).
                            This will save having to reprocess the cross-matches, etc when executing the script again. [default: False].
  -x --no-write             Don't write any files except the html report and any files output from BANE and Aegean. [default: False].
  -m --SEDs=<models>        A comma-separated list of SED models to fit to the radio spectra ('pow','SSA','FFA','curve',etc) [default: pow,powCIbreak,SSA].
  -e --SEDfig=<extn>        Write figures for each SED model with this file extension (may significantly slow down script) [default: None].
  -d --main-dir=<path>      The absolute path to the main directory where this script and other required files are located [default: $ACES/UserScripts/col52r].
  -n --ncores=<num>         The number of cores (per node) to use when running BANE and Aegean (using >=20 cores may result in memory error) [default: 8].
  -b --nbins=<num>          The number of bins to use when performing source counts [default: 50].
  -s --source=<src>         The format for writing plots (e.g. screen, html, eps, pdf, png, etc) [default: html].
  -a --aegean=<params>      A single string with any extra paramters to pass into Aegean (except cores, noise, background, and table) [default: --floodclip=3].
MC02RTBRAG8WP:~ jordan$
```

The Script – documentation

- CSIRO confluence page
  - https://confluence.csiro.au/display/askapsst/Continuum+validation+pipeline

The Script – configuration files

- Pass required values into catalogue configuration files

NVSS_config.txt — Open with TextEdit

```
filename=NVSS.fits
name=NVSS
frequency=1400
finder=None
search_rad=10
ra_col=RAJ2000
dec_col=DEJ2000
ra_fmt=deg
dec_fmt=deg
flux_col=S1_4
flux_err_col=e_S1_4
peak_col=None
peak_err_col=None
use_peak=False
rms_val=0.45
flux_unit=mJy
island_col=None
flag_col=None
maj_col=MajAxis
autoload=True
```

SUMSS_config.txt — Open with TextEdit

```
filename=SUMSS.fits
name=SUMSS
frequency=843
finder=None
search_rad=10
ra_col=RAJ2000
dec_col=DEJ2000
ra_fmt=deg
dec_fmt=deg
flux_col=St
flux_err_col=e_St
peak_col=Sp
peak_err_col=e_Sp
use_peak=False
rms_val=1.25
flux_unit=mJy
island_col=None
flag_col=None
maj_col=MajAxis
autoload=True
```

The Script – configuration files

- Can use finder=Aegean or finder=Selavy
- Can pass criteria for filtering ASKAP sources into configuration file

selavy_config_ex... Open with TextEdit

```
filename=/group/askap/raj030/Fornax/selavy/selavy-
results_apus.components.xml
name=ASKAP-Selavy
frequency=1400
finder=Selavy
search_rad=10
autoload=True
```

GLEAM_config.txt Open with TextEdit

```
filename=GLEAM.fits
name=GLEAM
frequency=201
finder=aegean
search_rad=30
ra_col=RAJ2000
dec_col=DEJ2000
col_suffix=_wide
use_peak=False
autoload=True
```

filter_config_exa... Open with TextEdit

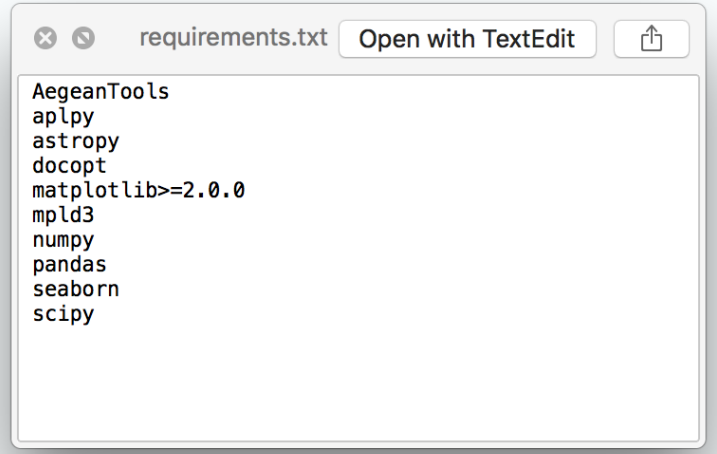
```
flux_lim=1e-3
SNR=0
ratio_frac=0
reject_blends=True
flags=False
psf_tol=1.5
residual_tol=3
```

The Script – installing

- Get access to ACES svn
  - Email Tony Maher
  - https://svn.atnf.csiro.au/askap/ACES
  - Also includes large fits files (e.g. NVSS catalogue)
- See relevant documentation about svn here
  - https://confluence.csiro.au/pages/viewpage.action?spaceKey=ACES&title=Getting+started+with+ACES+tools+on+Galaxy

The Script – running it on your machine

- Checkout script and associated files using ACES svn
- Install required modules from python



svn co https://svn.atnf.csiro.au/askap/ACES/UserScripts/col52r/

pip install -r requirements.txt

./ASKAP_continuum_validation.py -h

The Script – running it on Galaxy

- Add following to your ~/.bashrc file:
  export ACES=$HOME/ACES
  export PATH=$ACES/tools:$PATHexport
  PYTHONPATH=$ACES/pythonlib:$PYTHONPATH
- Checkout whole ACES svn:

```
cd $HOME
svn co https://svn.atnf.csiro.au/askap/ACES
```

- Load module with required python modules and run script:

```
module use /group/askap/continuum_validation
module load continuum_validation_env
aprun -n 1 -N 1
$ACES/UserScripts/col52r/ASKAP_continuum_validation.py -h
```

The Script – running it on Galaxy

example.job — ~/ACES/col52r

example.job

```
#!/bin/bash -l
#SBATCH --ntasks=1
#SBATCH --ntasks-per-node=1
#SBATCH --time=01:00:00
#SBATCH --job-name=continuum_validation
#SBATCH --cluster=galaxy
#SBATCH --export=NONE

module use /group/askap/continuum_validation
module load continuum_validation_env

aprun -n 1 -N 1 $ACES/UserScripts/col52r/ASKAP_continuum_validation.py -v gama_linmos.fits
```

example.job 1:1 LF UTF-8 Shell Script master 1 update

The Script – running it on Galaxy

validate_aegean.py — ~/ACES/col52r

validate_aegean.py

```
#!/usr/bin/env python
from glob import glob
import os
import sys

submit_jobs = True

this_name = 'validate_aegean'

slurm_header = """#!/bin/bash -l
#SBATCH --ntasks=1
#SBATCH --ntasks-per-node=1
#SBATCH --time=01:00:00
#SBATCH --job-name={1}
#SBATCH --cluster=galaxy
#SBATCH --export=NONE
#SBATCH --account=askaprt

module use /group/askap/continuum_validation
module load continuum_validation_env

aprun -n 1 -N 1 $ACES/UserScripts/col52r/ASKAP_continuum_validation.py {0}

"""


out1 = open( this_name+'.sbatch', 'w')
out1.writelines( slurm_header.format(sys.argv[1], this_name ))
out1.close()

if submit_jobs: os.system('sbatch '+this_name+'.sbatch')
```

validate_aegean.py 32:1 LF UTF-8 Python master 1 update

validate_selavy.py — ~/ACES/col52r

validate_selavy.p

```
#!/usr/bin/env python
from glob import glob
import os
import sys

submit_jobs = True

this_name = 'validate_aegean'

slurm_header = """#!/bin/bash -l
#SBATCH --ntasks=1
#SBATCH --ntasks-per-node=1
#SBATCH --time=01:00:00
#SBATCH --job-name={1}
#SBATCH --cluster=galaxy
#SBATCH --export=NONE
#SBATCH --account=askaprt

module use /group/askap/continuum_validation
module load continuum_validation_env

aprun -n 1 -N 1 $ACES/UserScripts/col52r/ASKAP_continuum_validation.py {0}.fits
-S selavy_{0}/selavy-{0}.components.xml -N selavy_{0}/noiseMap.{0}.fits

"""

imagename = sys.argv[1].replace('.fits','')

out1 = open( this_name+'.sbatch', 'w')
out1.writelines( slurm_header.format(imagename, this_name ))
out1.close()

if submit_jobs: os.system('sbatch '+this_name+'.sbatch')
```

validate_selavy.py* 26:1 LF UTF-8 Python master 1 update

Future Work

- Test more widely with other radio images
- Put it on GitHub, publish it and tell people about it

1. bash

```
MC02RTBRAG8WP:~ jordan$ Radio_continuum_validation.py -h
Input a radio continuum image and produce an external validation report (in html) of positions, fluxes, source counts, etc in the current directory.

Last updated: 26/06/2017

Usage:
  Radio_continuum_validation.py -h | --help
  Radio_continuum_validation.py [-I --fits=<img>] [-A --ASKAP=<main-cat>] [-N --noise=<map>] [-C --catalogues=<list>]
  [-F --filter=<config>] [-R --snr=<ratio>] [-v --verbose] [-f --refind] [-r --redo] [-p --peak-flux] [-w --write] [-x --no-write] [-m --SEDs=<models>]
  [-e --SEDfig=<extn>] [-t --telescope=<name>] [-d --main-dir=<path>] [-n --ncores=<num>] [-b --nbins=<num>] [-s --source=<src>] [-a --aegean-params]
  [-c --correct=<level>]

Required:
  -I --fits=<img>           A fits continuum image from ASKAP [default: None].
  AND/OR
  -A --ASKAP=<main-cat>     Use this catalogue config file of the input ASKAP image (overwrites options -p and -t). Default is to run Aegean [default: None].

Options:
  -h --help                 Show this help message.
  -C --catalogues=<list>    A comma-separated list of filepaths to catalogue config files corresponding to catalogues to use (will look in --main-dir for
                            each file not found in given path) [default: NVSS_config.txt,SUMSS_config.txt,GLEAM_config.txt,TGSS_config.txt].
  -N --noise=<map>          Use this fits image of the local rms. Default is to run BANE [default: None].
  -F --filter=<config>      A config file for filtering the sources in the input fits file [default: None].
  -R --snr=<ratio>          The signal-to-noise ratio cut to apply to the ASKAP catalogue and the source counts (doesn't affect source finding) [default: 5.0].
  -v --verbose              Verbose output [default: False].
  -f --refind               Force source finding step when catalogue already exists (sets redo to True) [default: False].
  -r --redo                 Force every step again (except source finding), even when catalogues already exist [default: False].
  -p --peak-flux            Use the peak flux rather than the integrated flux of the input ASKAP image (not used when -A used) [default: False].
  -w --write                Write intermediate files generated during processing (e.g. cross-matched and pre-filtered catalogues, etc).
                            This will save having to reprocess the cross-matches, etc when executing the script again. [default: False].
  -x --no-write             Don't write any files except the html report and any files output from BANE and Aegean. [default: False].
  -m --SEDs=<models>        A comma-separated list of SED models to fit to the radio spectra ('pow','SSA','FFA','curve',etc) [default: pow,powCIbreak,SSA].
  -e --SEDfig=<extn>        Write figures for each SED model with this file extension (may significantly slow down script) [default: None].
  -t --telescope=<name>     Unique name of the telescope or survey to give to the main catalogue (not used when -A used). [default: ASKAP].
  -d --main-dir=<path>      The absolute path to the main directory where this script and other required files are located [default: $ACES/UserScripts/col52r].
  -n --ncores=<num>         The number of cores (per node) to use when running BANE and Aegean (using >=20 cores may result in memory error) [default: 8].
  -b --nbins=<num>          The number of bins to use when performing source counts [default: 50].
  -s --source=<src>         The format for writing plots (e.g. screen, html, eps, pdf, png, etc) [default: html].
  -a --aegean=<params>      A single string with any extra paramters to pass into Aegean (except cores, noise, background, and table) [default: --floodclip=3].
  -c --correct=<level>      Correct the input fits image, write to 'name_corrected.fits' and use this to run through 2nd iteration of validation.
                            Fits image is corrected according to input level (0: none, 1: positions, 2: positions + fluxes) [default: 0].
MC02RTBRAG8WP:~ jordan$
```

Thank you

CASS / WSU

Jordan Collier

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