

# fakePipe Test Using `hscPipe 4.0.0` and the `hsc-1361` Datasets

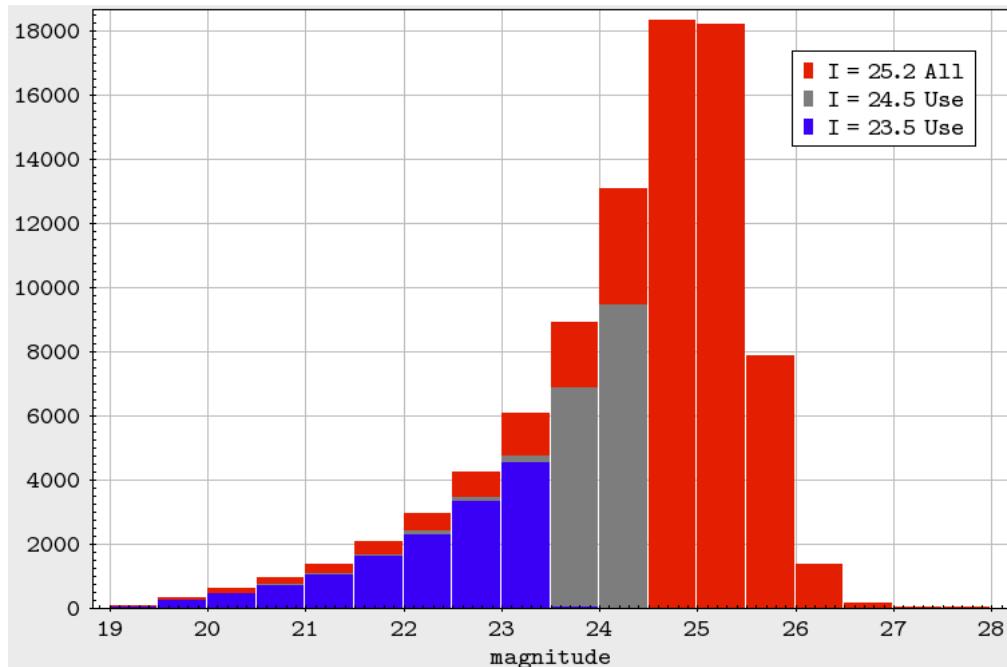
----- Song Huang 2015-12-22 -----

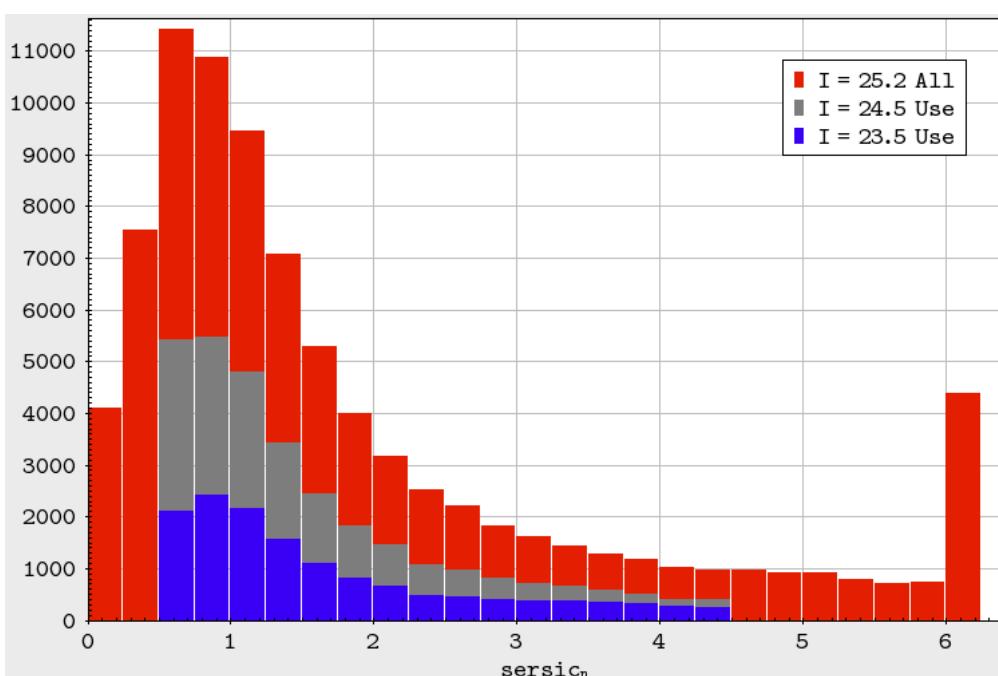
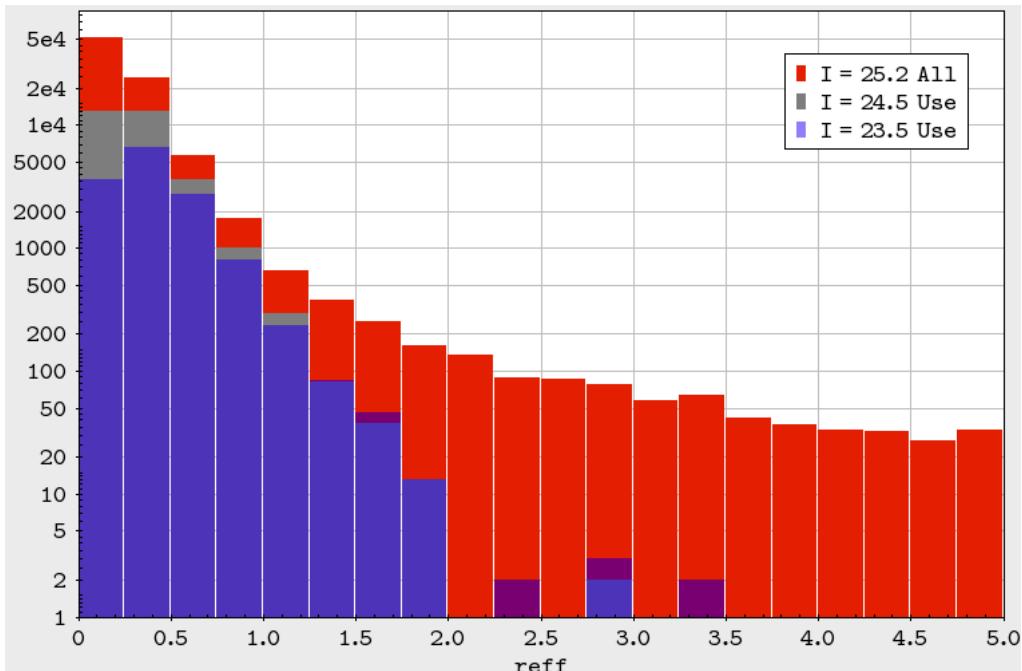
## Basic Information

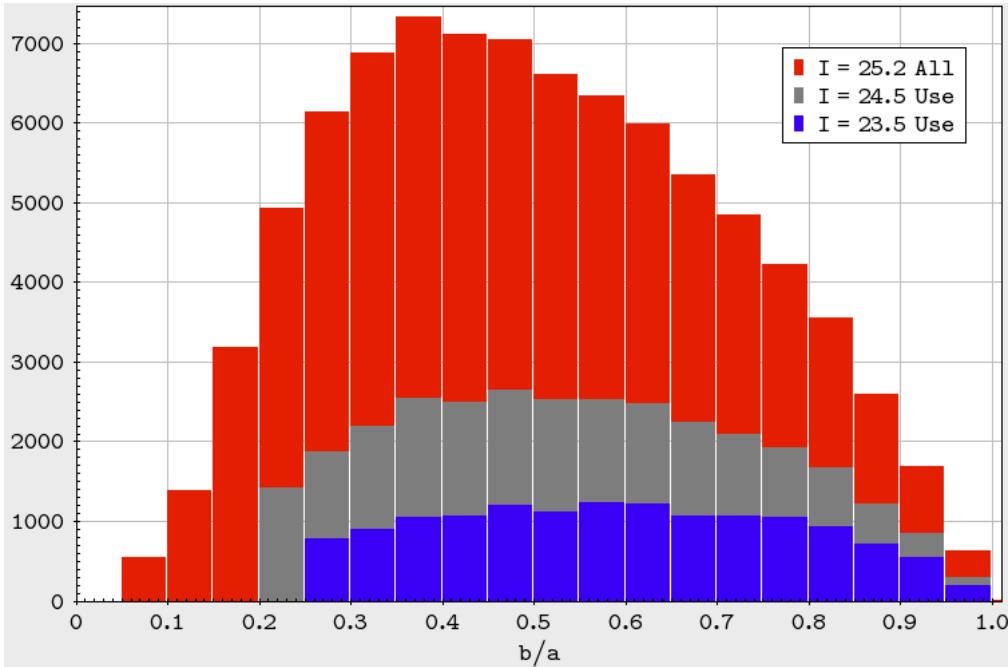
- Using `hscPipe 4.0.0`
- Use data from: `/lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide`
- The results can be found at: `/lustre/Subaru/SSP/rerun/song/fake/ssp400_wide`
- The config files and pipeline outputs can be found in folders: `add_r`, `add_i`, and `multiband`
- For now, only test using HSC-I and HSC-R bands.

## Input Fake Catalog:

- From Claire's fit to COSMOS galaxies, down to `F814W=25.2 mag`:
  - `ser_25.2_listarcsec.fits`
  - There are **86440** galaxies
- Select the ones with reasonable properties, and suitable for fakePipe tests:  
`mag <= 24.5 && reff >= 0.05 && reff <= 6.0 && sersic_n >= 0.5 && sersic_n <= 4.5 && b_a >= 0.20 && b_a <= 0.99`
  - This results in **31130** galaxies.
- There is a population of faint galaxies with very large `reff` (when plotting `mag` against `reff`). Exclude them from the sample:  
`mag <= 23.0 || reff <= (-0.2 * mag + 6.0)`
  - This results in **30983** galaxies.
- Make a multiband catalog:
  - `g-i` = 0.5
- Save the catalog: `cosmos_24.5_multiband.fits`







## Wide: Tract:8766

### Find Visits:

```
tractFindVisits.py hsc-1361/20151104/wide 8766 --filter='HSC-I'
tractFindVisits.py hsc-1361/20151104/wide 8766 --filter='HSC-R'
tractFindVisits.py hsc-1361/20151104/wide 8766 --filter='HSC-Z'
tractFindVisits.py hsc-1361/20151104/wide 8766 --filter='HSC-G'
tractFindVisits.py hsc-1361/20151104/wide 8766 --filter='HSC-Y'
```

```
# Input visits for Tract=8766 Filter=HSC-I
# Input CCDs includes 14 Visits
7300^7304^7318^7322^7338^7340^7344^7358^7384^7386^19468^19470^19482^19484

# Input visits for Tract=8766 Filter=HSC-R
# Input CCDs includes 7 Visits
11442^11446^11476^11478^11506^11532^11534

# Input visits for Tract=8766 Filter=HSC-Z
# Input CCDs includes 14 Visits
9708^9712^9724^9726^9730^9732^9736^9750^9772^9774^17738^17740^17750^17752

# Input visits for Tract=8766 Filter=HSC-G
# Input CCDs includes 14 Visits
9852^9856^9868^9870^9888^9898^9900^9912^11568^11572^11582^11588^11596^11598

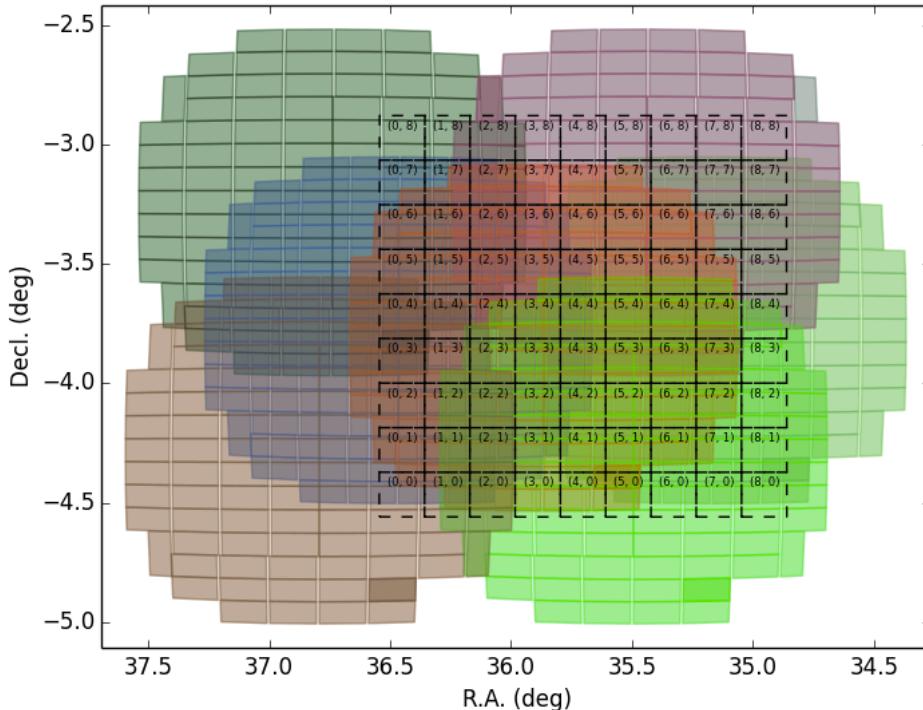
# Input visits for Tract=8766 Filter=HSC-Y
# Input CCDs includes 10 Visits
6478^6482^6496^6498^6522^6524^6528^6544^13152^13154
```

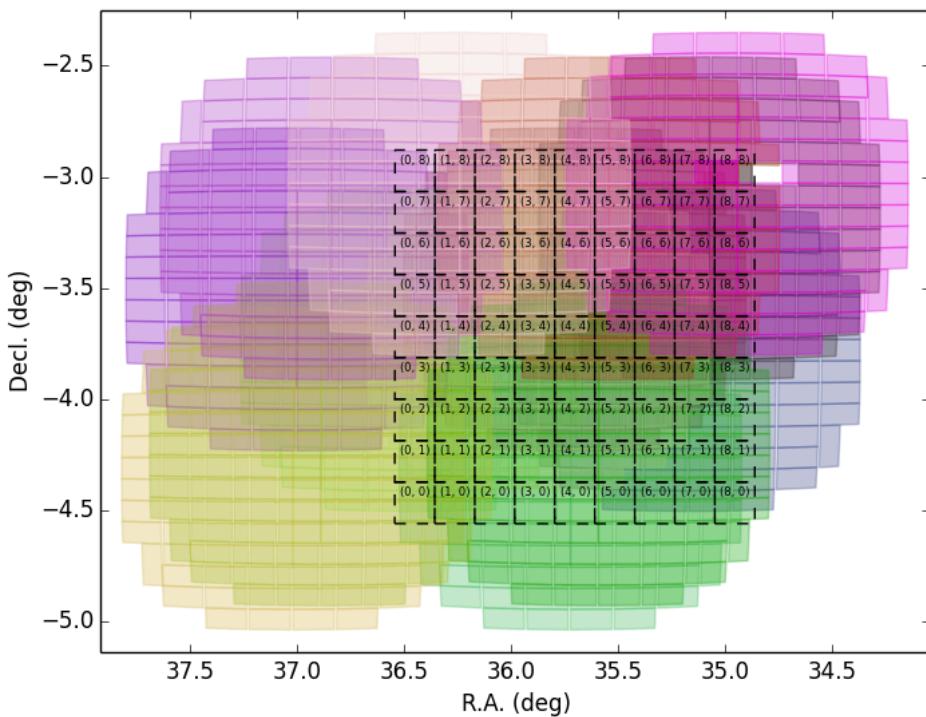
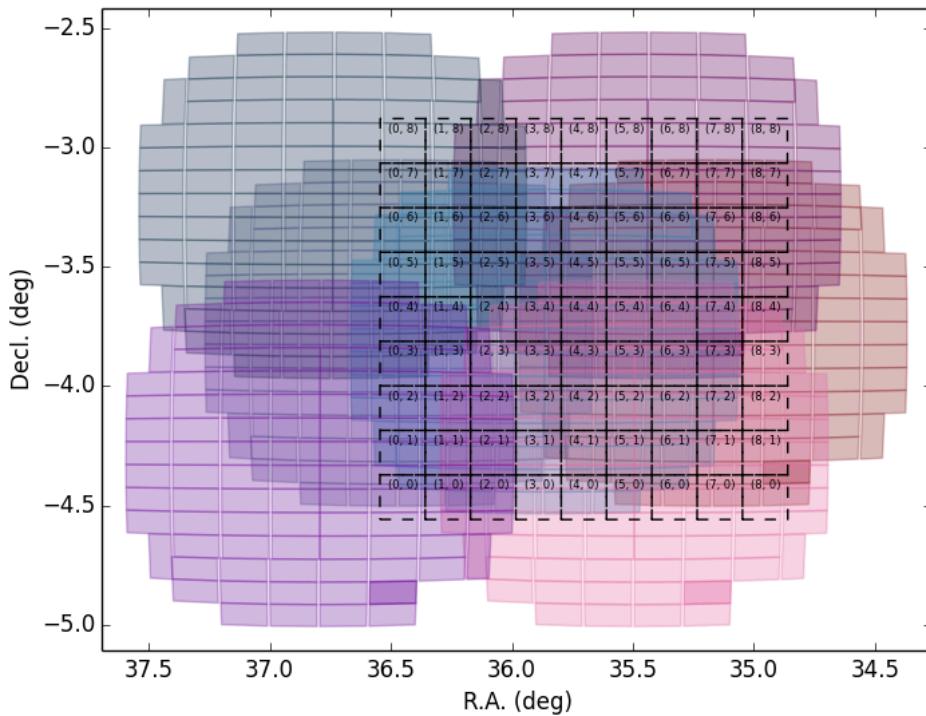
### Show Visits

```

showTractVisit.py /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide 8766 \
    7300^7304^7318^7322^7338^7340^7344^7358^7384^7386^19468^19470^19482^19484 \
    -p -s
showTractVisit.py /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide 8766 \
    7300^7304^7318^7322^7338^7340^7344^7358^7384^7386^19468^19470^19482^19484 \
    -p
showTractVisit.py /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide 8766 \
    11442^11446^11476^11478^11506^11532^11534 \
    -p
showTractVisit.py /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide 8766 \
    11442^11446^11476^11478^11506^11532^11534 \
    -s -p
showTractVisit.py /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide 8766 \
    9708^9712^9724^9726^9730^9732^9736^9750^9772^9774^17738^17740^17750^17752 \
    -p
showTractVisit.py /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide 8766 \
    9708^9712^9724^9726^9730^9732^9736^9750^9772^9774^17738^17740^17750^17752 \
    -s -p
showTractVisit.py /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide 8766 \
    9852^9856^9868^9870^9888^9898^9900^9912^11568^11572^11582^11588^11596^11598 \
    -p
showTractVisit.py /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide 8766 \
    9852^9856^9868^9870^9888^9898^9900^9912^11568^11572^11582^11588^11596^11598 \
    -s -p
showTractVisit.py /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide 8766 \
    6478^6482^6496^6498^6522^6524^6528^6544^13152^13154 \
    -p
showTractVisit.py /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide 8766 \
    6478^6482^6496^6498^6522^6524^6528^6544^13152^13154 \
    -s -p

```





#### Region files:

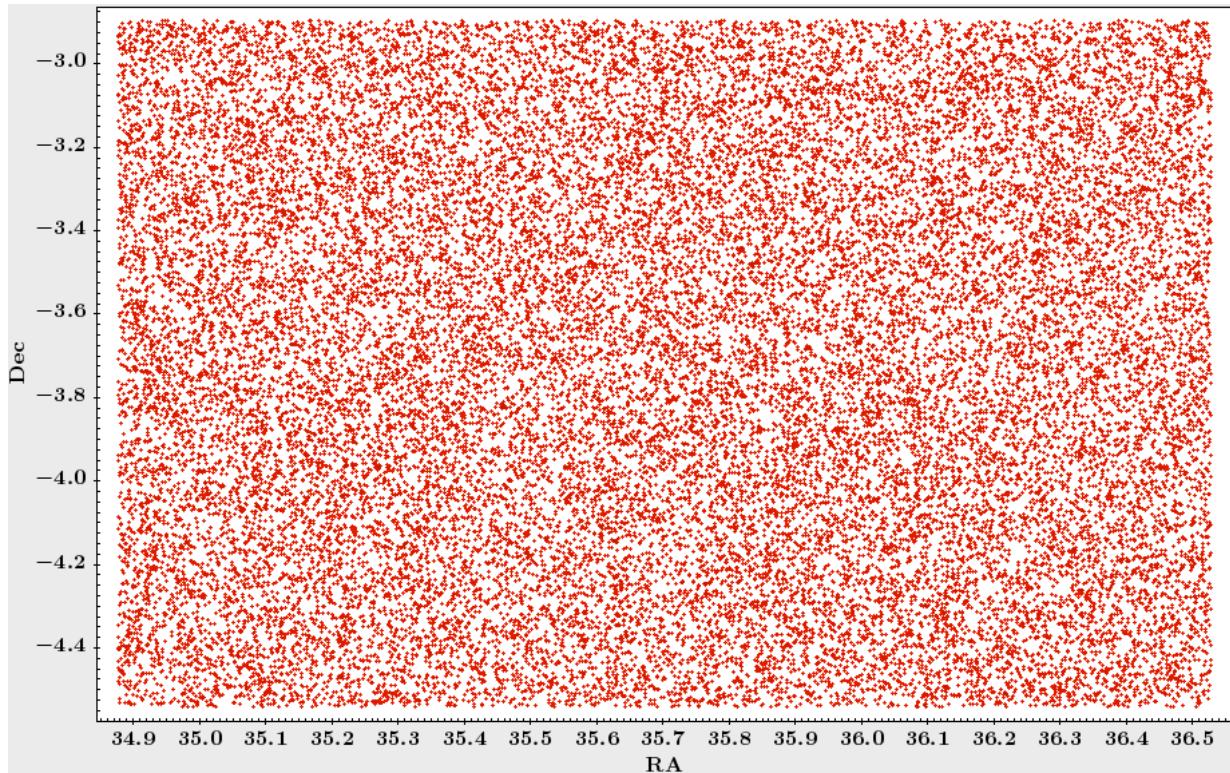
- Tract Shape : `hsc1361_wide_8766_HSC-I_shape_all.wkb`
- Big NO\_DATA Mask: `hsc1361_wide_8766_HSC-I_nodata_big.wkb`
- All NO\_DATA Mask: `hsc1361_wide_8766_HSC-I_nodata_all.wkb`

#### Make Sources

- Input: `cosmos_24.5_multiband.fits`
- acpMask: `hsc1361_wide_8766_HSC-I_shape_all.wkb`
- rejMask: `hsc1361_wide_8766_HSC-I_nodata_all.wkb`
- Only add to innerTract, and rename the ID column
- Outputs: `src_8766_radec_G/R/I/Z/Y.fits`

```
makeSourceList.py /lustre/Subaru/SSP \
--rerun=hsc-1361/20151104/wide \
--id tract=8766 filter='HSC-I' patch='4,4' \
-c inputCat='cosmos_24.5_multiband.fits' \
acpMask='hsc1361_wide_8766_HSC-I_shape_all.wkb' \
rejMask='hsc1361_wide_8766_HSC-I_nodata_all.wkb' \
rhoFakes=400 innerTract=True uniqueID=True
```

- 32330 galaxies are left in the catalog.
- The RA,Dec distribution of the fake sources is:



## Add Fakes

HSC-I: in folder `ssp400_wide`

- Config file: `addfake_i.config` under `add_i`

```
Python
from fakes import positionGalSimFakes
root.fakes.retarget(positionGalSimFakes.PositionGalSimFakesTask)
root.fakes.galList = src_8766_radec_I.fits
root.fakes.galType = 'sersic'
root.fakes.maxMargin = 150
root.fakes.addShear = False
```

- Test:

```
bash
runAddFakes.py /lustre/Subaru/SSP/ \
--rerun hsc-1361/20151104/wide:song/fake/ssp400_wide \
--id visit=7300 --clobber-config -C addfake_i.config \
--queue small --job addfake_i_test --nodes 5 --procs 10
```

- Command:

```
bash
runAddFakes.py /lustre/Subaru/SSP/ \
--rerun hsc-1361/20151104/wide:song/fake/ssp400_wide \
--id visit="7300^7304^7318^7322^7338^7340^7344^7358^7384^7386^19468^19470^19482^19484" \
--clobber-config -C addfake_i.config \
--queue small --job addfake_i_8766 --nodes 5 --procs 10
```

- Output: `42734.master`

```
bash
2016-01-04T03:49:06: : Config override file does not exist: '/data1a/ana/products2014/Linux64/obs_subaru/HSC-4.0.0'
```

```

2016-01-04T03:49:06: : Config override file does not exist: '/dataala/ana/products2014/Linux64/obs_subaru/HSC-4.0.0c
2016-01-04T03:49:06: : input=/lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide
2016-01-04T03:49:06: : calib=None
2016-01-04T03:49:06: : output=/lustre/Subaru/SSP/rerun/song/fake/ssp400_wide
2016-01-04T03:49:06: CameraMapper WARNING: Calibration root directory not found: /lustre/Subaru/SSP/rerun/hsc-1361/
2016-01-04T03:49:06: CameraMapper: Loading registry registry from /lustre/Subaru/SSP/rerun/song/fake/ssp400_wide/_l
2016-01-04T03:49:06: CameraMapper WARNING: Unable to locate calibRegistry registry in root: /lustre/Subaru/SSP/rer
2016-01-04T03:49:06: CameraMapper WARNING: Unable to locate calibRegistry registry in current dir: ./calibRegistry
2016-01-04T03:49:06: CameraMapper WARNING: No registry loaded; proceeding without one
RNG seed: 1
42733.master

```

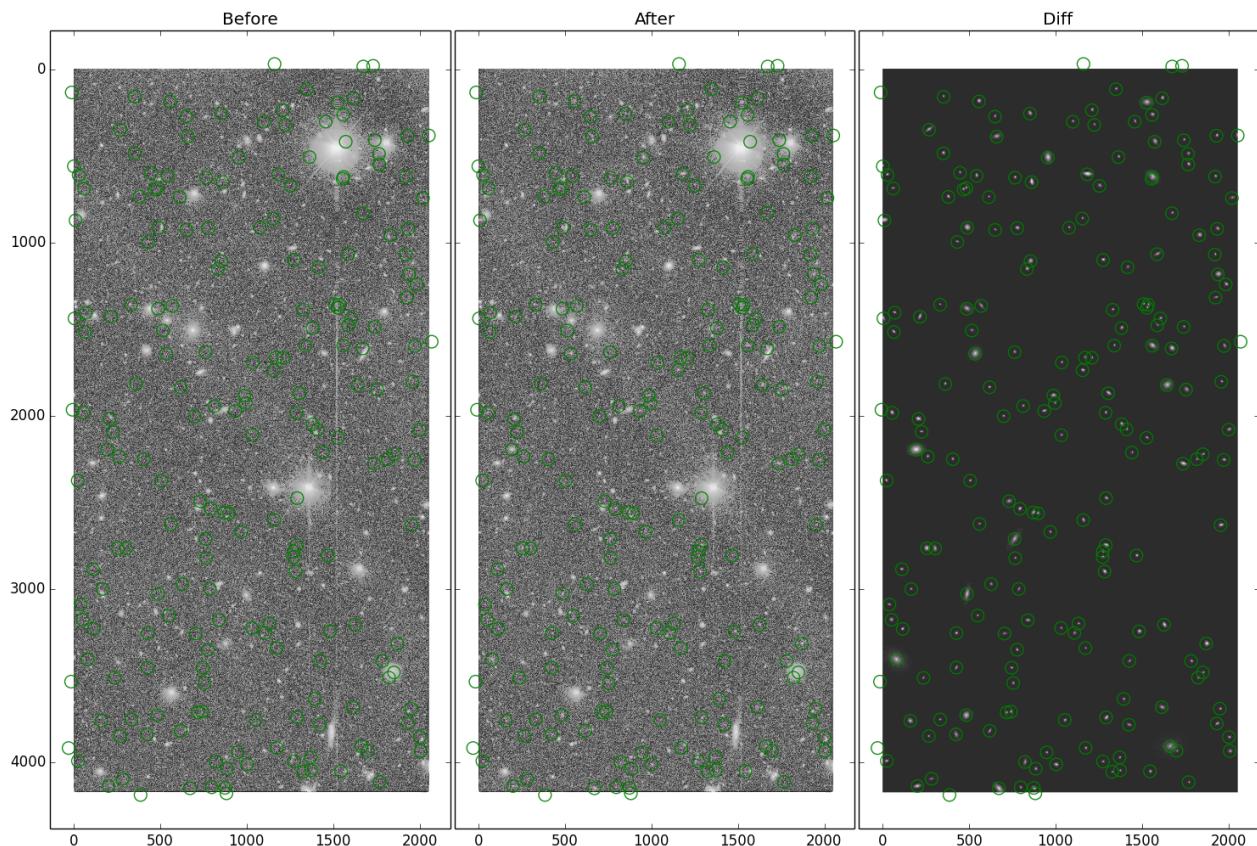
- Finished!

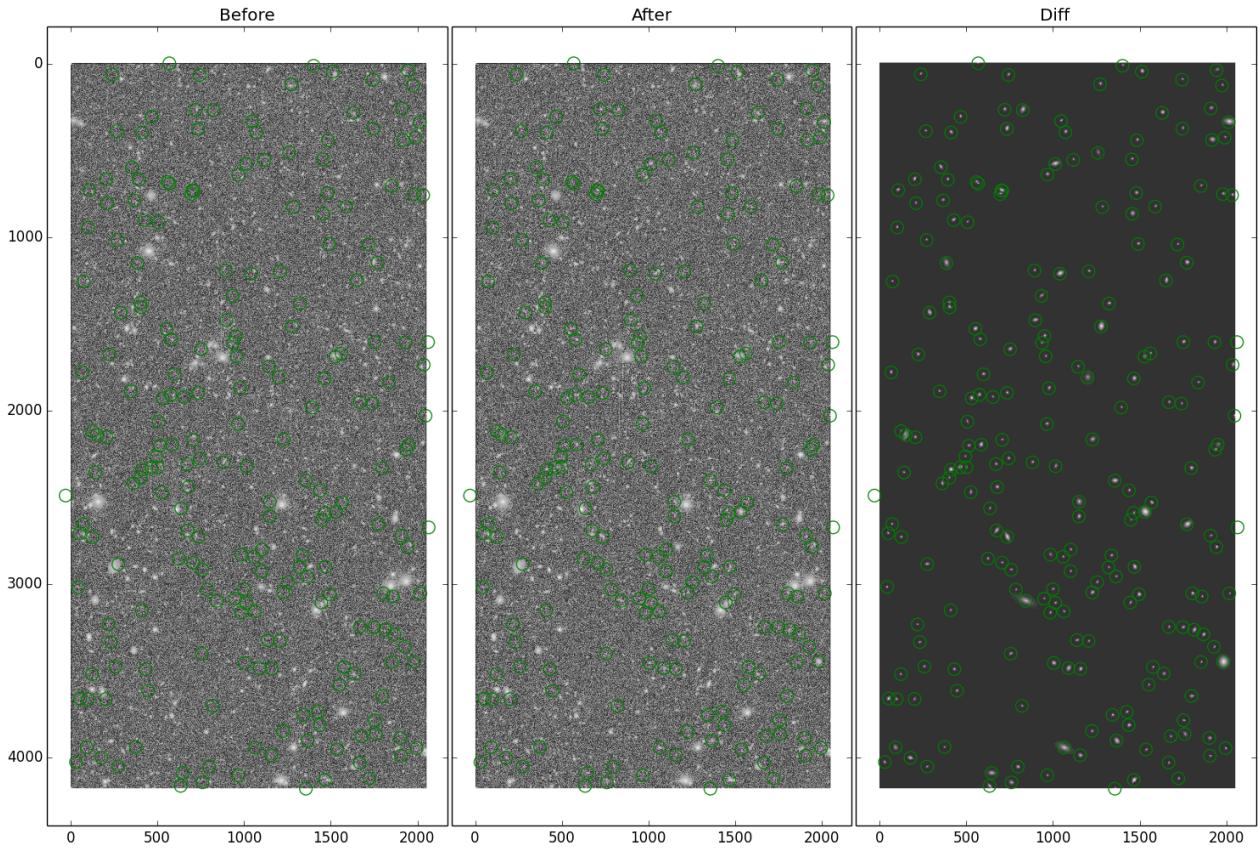
- Visually check the results:

```

# I-band
python compFakeGalaxy.py hsc-1361/20151104/wide song/fake/ssp400_wide 7300 40
python compFakeGalaxy.py hsc-1361/20151104/wide song/fake/ssp400_wide 7322 50

```





#### HSC-R: in folder `ssp400_wide`

- Config file: `addfake_r.config` under `add_r`

```
Python
from fakes import positionGalSimFakes
root.fakes.retarget(positionGalSimFakes.PositionGalSimFakesTask)
root.fakes.galList = src_8766_radec_R.fits
root.fakes.galType = 'sersic'
root.fakes.maxMargin = 150
root.fakes.addShear = False
```

- Command:

```
bash
runAddFakes.py /lustre/Subaru/SSP/ \
--rerun hsc-1361/20151104/wide:song/fake/ssp400_wide \
--id visit="11442^11446^11476^11478^11506^11532^11534" \
--clobber-config -C addfake_r.config \
--queue small --job addfake_r_8766 --nodes 5 --procs 10
```

- Output: `42735.master`

```
bash
2016-01-04T03:54:19: : Config override file does not exist: '/data1a/ana/products2014/Linux64/obs_subaru/HSC-4.0.0a'
2016-01-04T03:54:19: : Config override file does not exist: '/data1a/ana/products2014/Linux64/obs_subaru/HSC-4.0.0a'
2016-01-04T03:54:20: : input=/lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide
2016-01-04T03:54:20: : calib=None
2016-01-04T03:54:20: : output=/lustre/Subaru/SSP/rerun/song/fake/ssp400_wide
2016-01-04T03:54:20: CameraMapper WARNING: Calibration root directory not found: /lustre/Subaru/SSP/rerun/hsc-1361/
2016-01-04T03:54:20: CameraMapper: Loading registry registry from /lustre/Subaru/SSP/rerun/song/fake/ssp400_wide/_j
2016-01-04T03:54:20: CameraMapper WARNING: Unable to locate calibRegistry registry in root: /lustre/Subaru/SSP/rer
2016-01-04T03:54:20: CameraMapper WARNING: Unable to locate calibRegistry registry in current dir: ./calibRegistry
2016-01-04T03:54:20: CameraMapper WARNING: No registry loaded; proceeding without one
RNG seed: 1
```

- Finished!

- Visually check the results:

```
# R-band
python compFakeGalaxy.py hsc-1361/20151104/wide song/fake/ssp400_wide 11442 50
python compFakeGalaxy.py hsc-1361/20151104/wide song/fake/ssp400_wide 11476 7000_wide 11476 70
```

- Looks normal.

## Stack.py

### HSC-I band:

- Command: @42737.master

```
bash
stack.py /lustre/Subaru/SSP/ --rerun=song/fake/ssp400_wide \
--id tract=8766 filter=HSC-I \
--selectId visit="7300^7304^7318^7322^7338^7340^7344^7358^7384^7386^19468^19470^19482^19484" \
--queue small --nodes 4 --procs 8 \
--job stack_i_8766 \
--clobber-config \
--config makeCoaddTempExp.doOverwrite=True doOverwriteCoadd=True
```

- Output:

```
2016-01-04T05:10:10: : Loading config override file '/data1a/ana/products2014/Linux64/obs_subaru/HSC-4.0.0a_hsc/config/stacker.py'
2016-01-04T05:10:10: : Loading config override file '/data1a/ana/products2014/Linux64/obs_subaru/HSC-4.0.0a_hsc/config/hsc/stacker.py'
2016-01-04T05:10:10: : input=/lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide
2016-01-04T05:10:10: : calib=None
2016-01-04T05:10:10: : output=/lustre/Subaru/SSP/rerun/song/fake/ssp400_wide
2016-01-04T05:10:10: CameraMapper WARNING: Calibration root directory not found: /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide/CALIB
2016-01-04T05:10:10: CameraMapper: Loading registry registry from /lustre/Subaru/SSP/rerun/song/fake/ssp400_wide/_parent/_parent/registry.sqlite3
2016-01-04T05:10:10: CameraMapper WARNING: Unable to locate calibRegistry registry in root: /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide/CALIB/calibRegistry.sqlite3
2016-01-04T05:10:10: CameraMapper WARNING: Unable to locate calibRegistry registry in current dir: ./calibRegistry.sqlite3
2016-01-04T05:10:10: CameraMapper WARNING: No registry loaded; proceeding without one
```

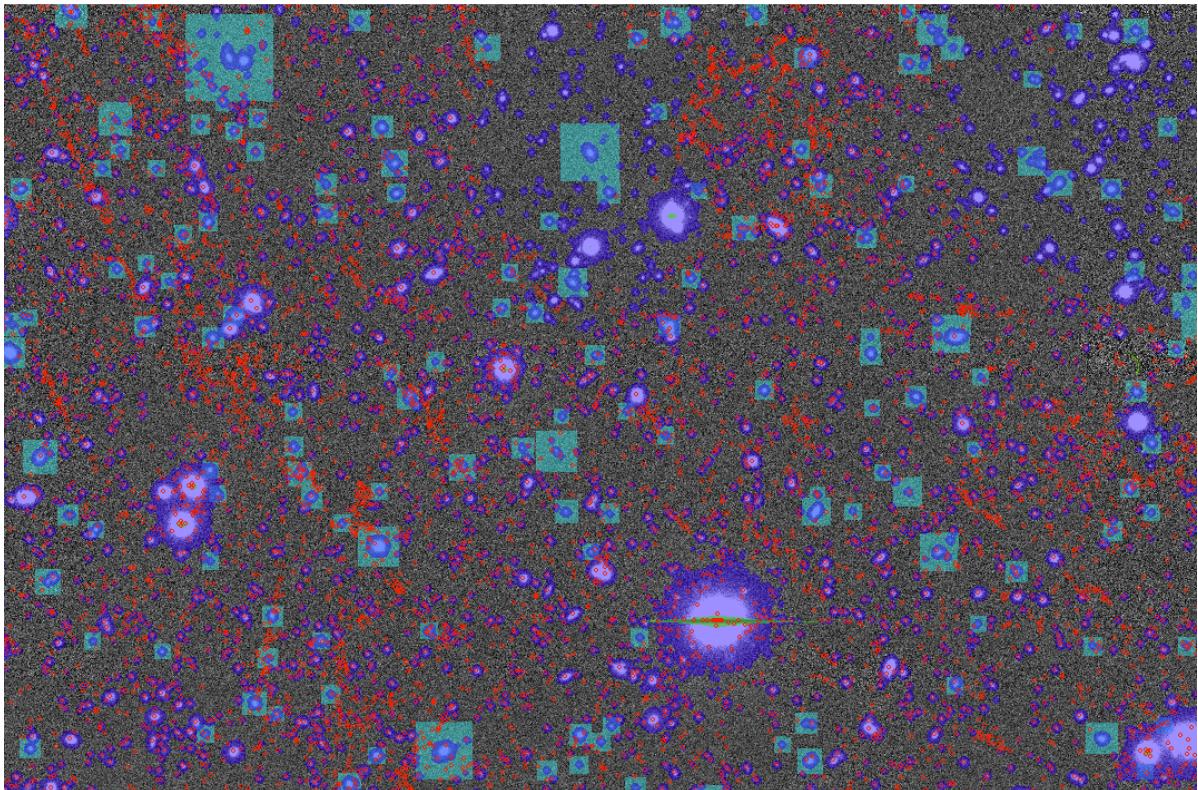
- Running ...

- Visually check the results:

- Show in DS9, check the Cyan box for FAKE mask plane:

```
python showInDs9.py /lustre/Subaru/SSP/rerun/song/fake/ssp400_wide 8766 5,5 -- filter HSC-I
```

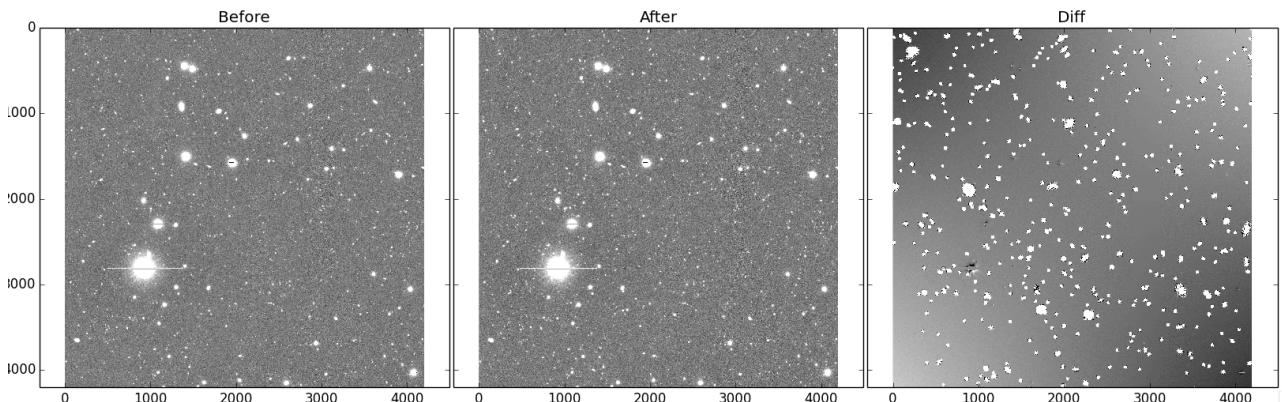
- It appears that the fake galaxies are correctly added to the coadd images.



- Generate a before-after comparison plot:

```
python compFakeCoadd.py hsc-1361/20151104/wide song/fake/ssp400_wide 8766 4,4 HSC-I
```

- The fake galaxies are added; But there is a smooth difference in background, and the noise level of fake galaxies on coadd images looks a little weird.



#### HSC-R band:

- Command: @42736.master

```
bash
stack.py /lustre/Subaru/SSP/ --rerun=song/fake/ssp400_wide \
--id tract=8766 filter=HSC-R \
--selectId visit="11442^11446^11476^11478^11506^11532^11534" \
--queue small --nodes 4 --procs 8 \
--job stack_r_8766 \
--clobber-config \
--config makeCoaddTempExp.doOverwrite=True doOverwriteCoadd=True
```

- Output:

```

2016-01-04T04:23:29: : Loading config override file '/dataala/ana/products2014/Linux64/obs_subaru/HSC-4.0.0a_hsc/config/stacker.py'
2016-01-04T04:23:29: : Loading config override file '/dataala/ana/products2014/Linux64/obs_subaru/HSC-4.0.0a_hsc/config/hsc/stacker.py'
2016-01-04T04:23:29: : input=/lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide
2016-01-04T04:23:29: : calib=None
2016-01-04T04:23:29: : output=/lustre/Subaru/SSP/rerun/song/fake/ssp400_wide
2016-01-04T04:23:29: CameraMapper WARNING: Calibration root directory not found: /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide/CALIB
2016-01-04T04:23:29: CameraMapper: Loading registry registry from /lustre/Subaru/SSP/rerun/song/fake/ssp400_wide/_parent/_parent/registry.sqlite3
2016-01-04T04:23:29: CameraMapper WARNING: Unable to locate calibRegistry registry in root: /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide/CALIB/calibRegistry.sqlite3
2016-01-04T04:23:29: CameraMapper WARNING: Unable to locate calibRegistry registry in current dir: ./calibRegistry.sqlite3
2016-01-04T04:23:29: CameraMapper WARNING: No registry loaded; proceeding without one

```

- Finished !

- Visually check the results:

- Show in DS9, check the Cyan box for FAKE mask plane:

```
python showInDs9.py /lustre/Subaru/SSP/rerun/song/fake/ssp400_wide 8766 5,5 -- filter HSC-R
```

- It appears that the fake galaxies are correctly added to the coadd images.

- Generate a before-after comparison plot:

```
python compFakeCoadd.py hsc-1361/20151104/wide song/fake/ssp400_wide 8766 4,4 HSC-R
```

- The comparison shows that the location of fake galaxies are consistent between these two bands.

## Multiband.py

- Config file: `multi.config` under `multiband`

```

root.measureCoaddSources.propagateFlags.flags={}
root.clobberMergedDetections = True
root.clobberMeasurements = True
root.clobberMergedMeasurements = True
root.clobberForcedPhotometry = True

```

- Right now, the `detectFakeOnly` option is still not available, so the `process` will try to measure everything, including the real galaxies.

- Command: @42740.master

```
python
multiBand.py /lustre/Subaru/SSP --rerun=song/fake/ssp400_wide --id tract=8766 filter=HSC-I^HSC-R --queue small --no
```

- Outputs:

```

2016-01-03T13:41:55: : Loading config override file '/dataala/ana/products2014/Linux64/obs_subaru/HSC-4.0.0a_hsc/config/multiband.py'
2016-01-03T13:41:56: : Loading config override file '/dataala/ana/products2014/Linux64/obs_subaru/HSC-4.0.0a_hsc/config/hsc/multiband.py'
2016-01-03T13:41:56: : input=/lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide
2016-01-03T13:41:56: : calib=None
2016-01-03T13:41:56: : output=/lustre/Subaru/SSP/rerun/song/fake/ssp400_wide
2016-01-03T13:41:56: CameraMapper WARNING: Calibration root directory not found: /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide/CALIB
2016-01-03T13:41:56: CameraMapper: Loading registry registry from /lustre/Subaru/SSP/rerun/song/fake/ssp400_wide/_parent/_parent/regionistry.sqlite3
2016-01-03T13:41:56: CameraMapper WARNING: Unable to locate calibRegistry registry in root: /lustre/Subaru/SSP/rerun/hsc-1361/20151104/wide/CALIB/calibRegistry.sqlite3
2016-01-03T13:41:56: CameraMapper WARNING: Unable to locate calibRegistry registry in current dir: ./calibRegistry.sqlite3
2016-01-03T13:41:56: CameraMapper WARNING: No registry loaded; proceeding without one

```

## runMatchFakes.py

- Results are under: `/lustre/Subaru/SSP/rerun/song/fake/ssp400_wide/match`

### HSC-I band

- Command:

```
bash runMatchFakes.py /lustre/Subaru/SSP/rerun/song/fake/ssp400_wide 8766 -f HSC-I -c src_8766_radec_I.fits -o src
```

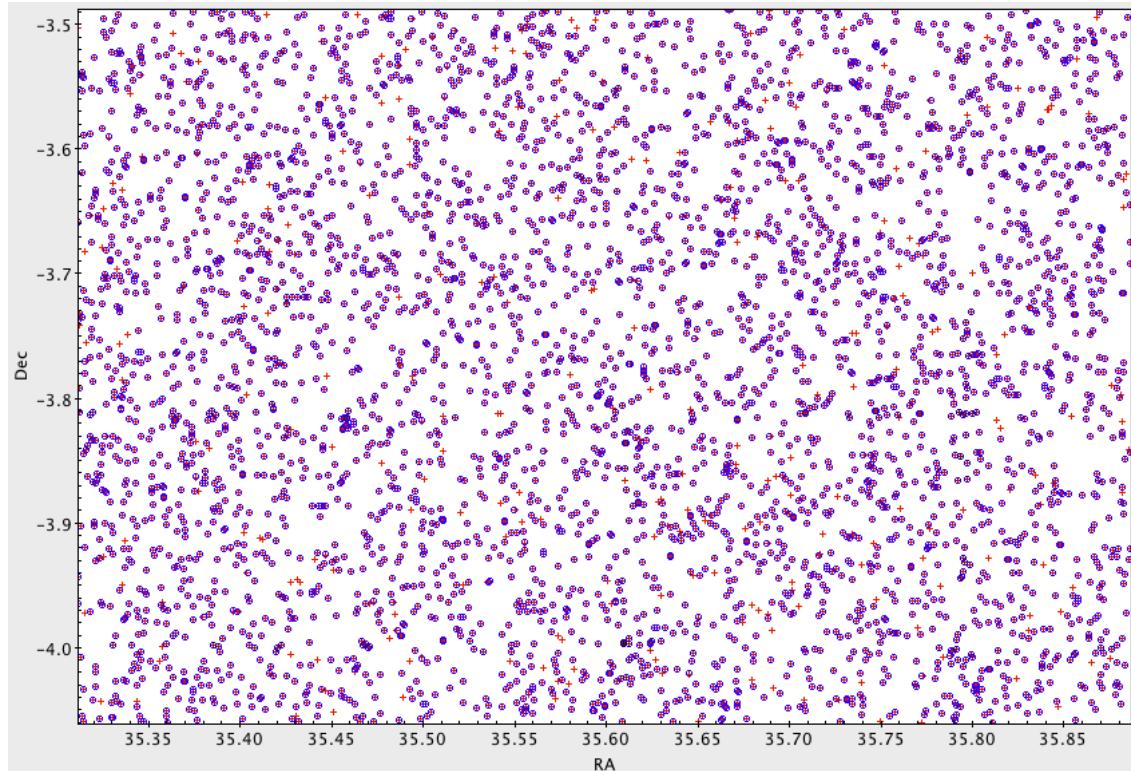
### HSC-R band

- Command:

```
bash runMatchFakes.py /lustre/Subaru/SSP/rerun/song/fake/ssp400_wide 8766 -f HSC-R -c src_8766_radec_R.fits -o src
```

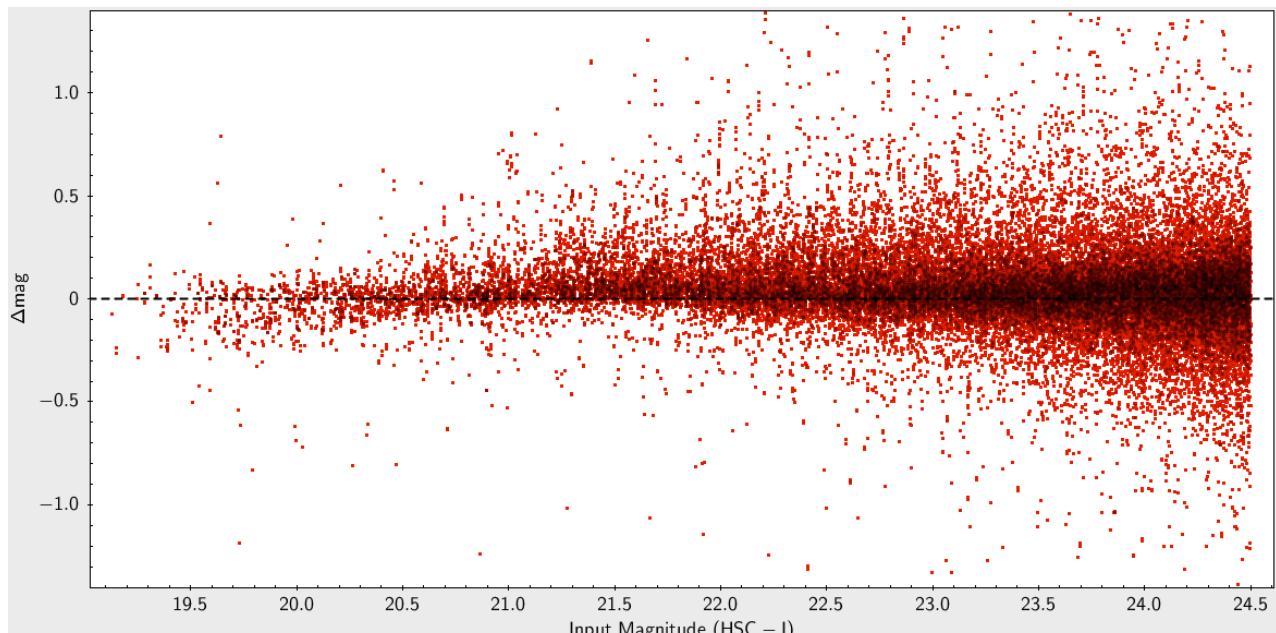
### Preview of results:

#### Coordinates:



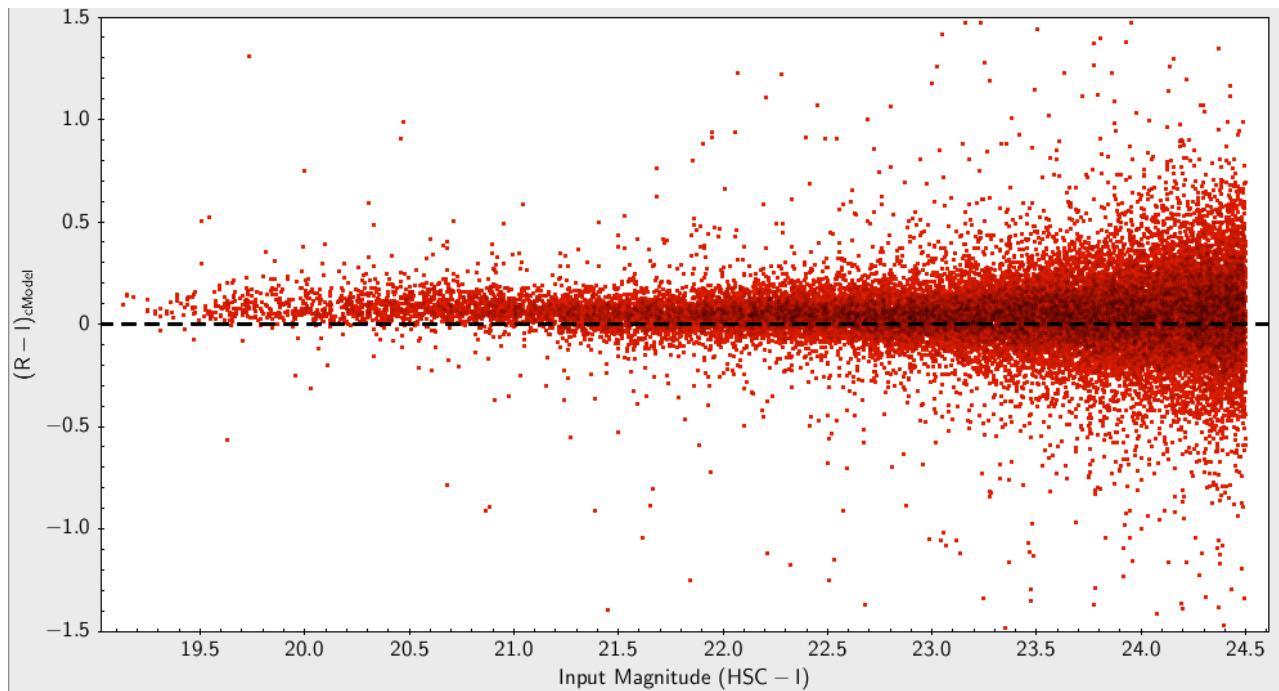
- Red: Fake Objects ; Blue: Matched Objects from HSC Pipeline (This is a zoom-in region)

#### cModel Magnitude:



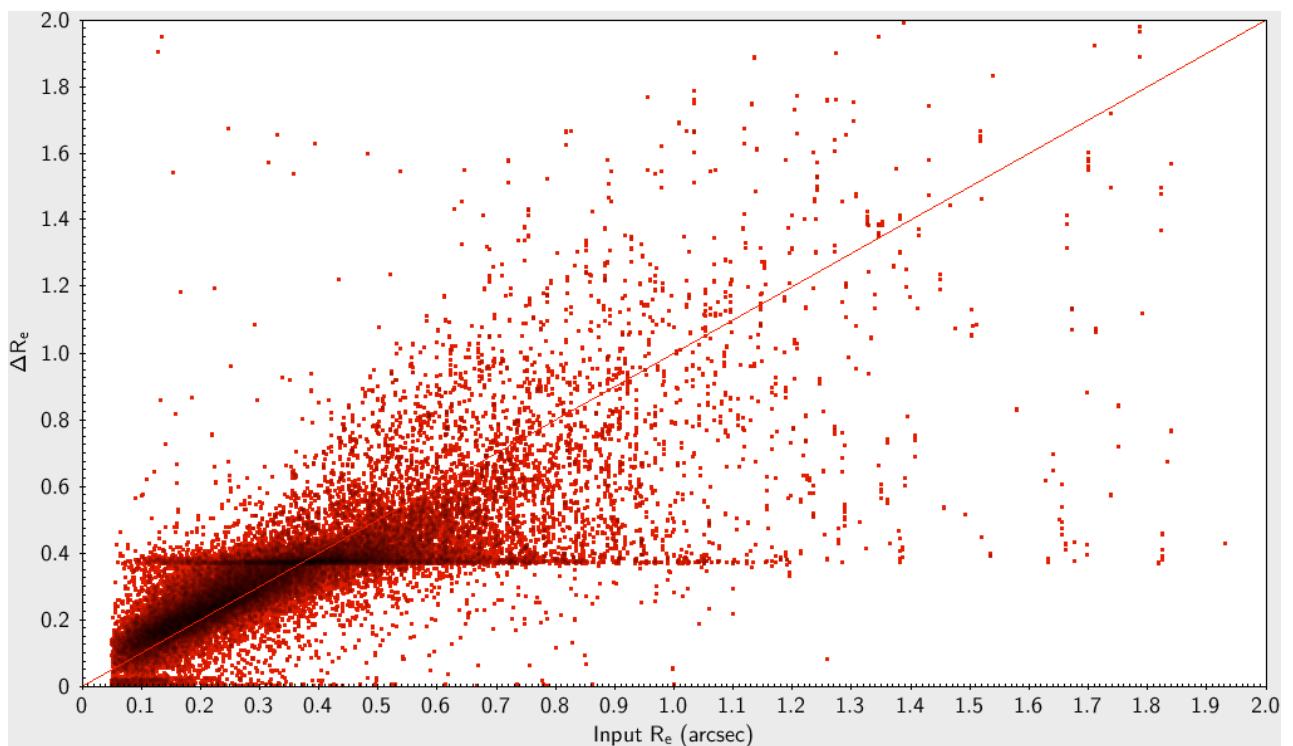
\* X: Input HSC-I magnitude; Y: cModel\_Mag\_I - Input\_Mag  
 \* \*\*This is just a quick look, without any cut\*\*

#### cModel Color:



\* X: Input HSC-I magnitude; Y:  $(R - I)$  color using cModel magnitude.  
 \* \*\*This is just a quick look, without any cut\*\*

#### Effective Radius:



\* X: Input Effective Radius in arcsec; Y: Exponential model  $R_e$  from cModel (arcsec)  
 \* \*\*WARNING:\*\* There are some weird behaviours of the new cModel shape measurements. But, again, **this** is just a very quick look.