

Process DECam Images

This document is in early draft form! Not all intended content has been created, nor has it been vetted by experts!

This page will serve as a central reference for efforts being made to reduce DECam data using the LSST Stack. These may be broadly grouped into 2 sets of analysis: those using the `obs_camera` package, and those using some version of the `obs_decam` package. This page will contain practical techniques and use cases that demonstrate the quality of these reductions, as well as serve as a reference for co-development of an `obs_decam` package.

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- Using `obs_decam`

Using `obs_camera`

See work by Scott Dodelson

Using `obs_decam`

The URL for the `obs_decam` package is [here](#).

There is currently only one "mapper" defined for the analysis of DECam data, the `DecamInstcalMapper`. As the name suggests, this operates using the `instcal` (or Instrument Calibrated) data products. These have the instrumental signature removed, the background still in the image, and some measure of astrometric and photometric zeropointing. It also requires the associated `dqmask` (mask file) and `wmap` (weight map, stored as inverse variance) files for the same EXPNUM (visit), and requires that they are in the same subdirectory, which serves as the main input repository for processing. In particular, it requires:

```
dqmask/ instcal/ wmap/
```

The first step in this process is to build a registry that stores all the possible CCD images that can be analyzed. Since each DECam filename is unique, and they do not share a common string that associates the 3 files (`instcal`, `dqmask`, `wmap`) together, we associate the 3 files by using their common EXPNUM in the header. These file names are stored in the registry. If there are not the requisite 3 files (`instcal`, `dqmask`, `wmap`) having a common EXPNUM, this EXPNUM will not be entered in the registry.

The registry is built through the command

```
ingestImagesDecam.py decam/ --mode=link instcal/*fits
```

Things to note

- `ingestImagesDecam.py` is located in your path at `$OBS_DECAM_DIR/bin`
- The name of the output directory is given above as `decam/`. It is required that there is a file `_mapper` in this directory with the content: `lsst.obs.decam.decamMapper.DecamInstcalMapper`
- The "link" mode creates symbolic links to the original `instcals`. Other options are to "move" and "copy"
- Finally, point the script at the `instcals` you intend to analyze. Note the script expects the `dqmask/` and `wmap/` directories at the same level as `instcal/`. Also note that any `.fits` [`.fz/gz`] files must be uncompressed beforehand

This will create the file `decam/registry.sqlite3` which contains the table `raw` with the schema:

sqlite3 registry.sqlite3

```
sqlite> .tables
raw          raw_visit
sqlite> .schema raw
CREATE TABLE raw (id integer primary key autoincrement, taiObs text, instcal
text, wmap text, visit int, side text, filter text, ccdnum int, dqmask text, date
text, ccd int, expTime double, unique(visit, ccdnum));
```

These fields are defined [here](#).

The next step is to process the images. This looks like:

```
processCcdDecam.py decam --id visit=283453 ccdnum=10 --config
calibrate.doPhotoCal=False calibrate.doAstrometry=False
calibrate.measurePsf.starSelector.name="secondMoment"
doWriteCalibrate=False --clobber-config
```

Finally, to cluster the source measurements into lightcurves, run:

```
python $OBS_DECAM_DIR/examples/clusterSrc.py decam/ 0283453 0283454 0283455
...
```