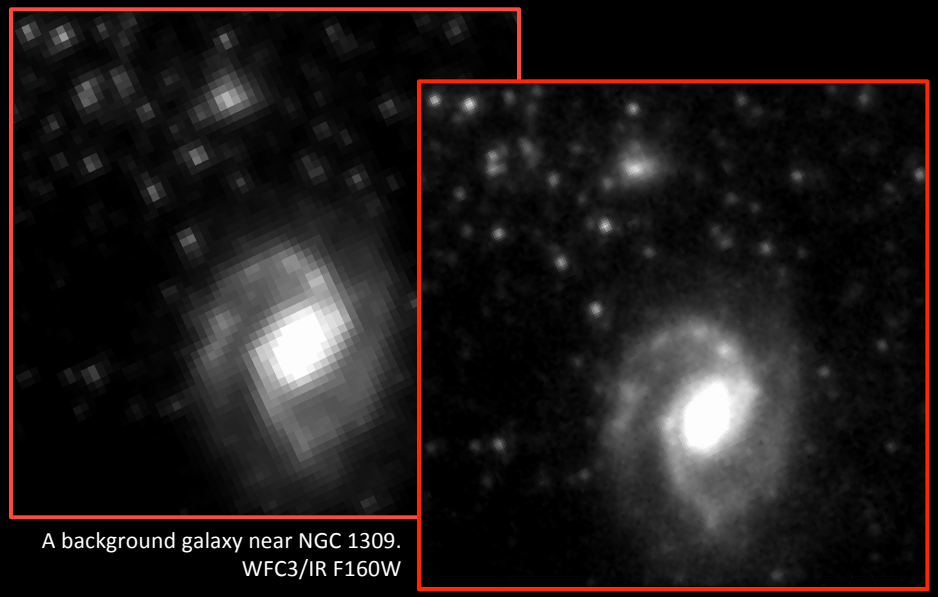
DrizzlePac

New software for aligning and drizzling HST images, with improved handling of astrometric data

Latest updates at ***drizzlepac.stsci.edu***



A background galaxy near NGC 1309.
WFC3/IR F160W

DrizzlePac and its flagship task ***AstroDrizzle*** are *new software, replacing* the *Dither* package and *MultiDrizzle*

DrizzlePac in a nutshell:

- Identical or improved output in comparison with *MultiDrizzle*
- All astrometric and distortion information will be included in calibrated images, removing the need for external calibration files
- Multiple astrometric solutions, stored in images under uniquely-named labels, that can be tied to another image, standard catalog, or user-created catalog
- Astrometric solutions can be exchanged amongst users in the form of small FITS files called 'headerlets'
- Task parameter settings can be easily saved to 'configuration files' for future use or to share with collaborators
- Parallelization will speed up processing of images

Introducing ***tweakreg***, a powerful new *DrizzlePac* task for aligning dithered images using point sources

HST images in a single visit are generally well-aligned with each other. However, offsets as large as 0.5" can occur for the same pointing at different visits. *tweakreg*, a new *DrizzlePac* task, will align calibrated (flt.fits) images by matching sources between an image and reference image. Source files for each image are created using a routine similar to *DAOfind*, or can be supplied by the user. For images heavy with cosmic rays, a cosmic ray-cleaned image can be generated by *AstroDrizzle* for use in *tweakreg* for improved source identification.

TEAL, a convenient new interface for editing task parameters

DrizzlePac tasks parameters can be set using a new graphical user interface called TEAL (Task Editor and Launcher). Dependencies between parameters can be established to help prevent user errors. Users will be able to edit, save, and load 'configuration files,' provided by instrument teams or collaborators that contain specific task parameter settings.

Extended Simple Image Polynomials (SIP), a convention used for expressing image distortion corrections

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} CD1\_1 & CD1\_2 \\ CD2\_1 & CD2\_2 \end{pmatrix} \begin{pmatrix} u + f(u,v) + LT_x(u,v) \\ v + g(u,v) + LT_y(u,v) \end{pmatrix}$$

where x,y are sky coordinates and u,v are instrumental coordinates. The CD matrix fully represents linear distortion corrections. Other large-scale distortion corrections are expressed as high order polynomials f and g. Look-up tables LT contain high frequency distortion corrections. Small scale detector distortion corrections, if any, are applied to u,v before use in the equation (only required for WFPC2 and ACS/WFC).

DrizzlePac

NGC 1309
ACS/WFC F555W

Information regarding *DrizzlePac*, including the DrizzlePac Handbook, is available at http://drizzlepac.stsci.edu. Questions can be sent to help@stsci.edu.

New extensions in pipeline-calibrated ACS FITS images

Calibrated ACS images from the HST Archive will have additional distortion corrections stored as look-up tables in FITS image extensions. An example of this is shown below for an ACS/WFC image, using the task *catfits*.

```
--> catfits jb7310ymq_flt.fits
EXT#  FITSNAME      FILENAME   EXTVE   DIMENS    BITPI OBJECT
0     jb7310ymq_flt jb7310ymq_flt.fits                  16
1       IMAGE       SCI                1     4096x2048    -32
2       IMAGE       ERR                1     4096x2048    -32
3       IMAGE       DQ                 1     4096x2048    16
4       IMAGE       SCI                2     4096x2048    -32
5       IMAGE       ERR                2     4096x2048    -32
6       IMAGE       DQ                 2     4096x2048    16
7       IMAGE       D2IMARR            1     4096         -32
8       IMAGE       WCSDVARR           1     65x33        -32
9       IMAGE       WCSDVARR           2     65x33        -32
10      IMAGE       WCSDVARR           3     65x33        -32
11      IMAGE       WCSDVARR           4     65x33        -32
```

Extensions ([0] through [6]) are familiar: the primary header followed by science, error, and data quality arrays, for chips 2 and 1, respectively. The new 'D2IMARR' extension is a one-dimensional vector that holds corrections for physical distortions in the ACS/WFC CCD columns. The new 'WCSDVAR' extensions, present for all ACS data, have look-up tables containing residual optical distortions not modeled by the polynomial fits. ('D2IMARR' and 'WCSDVAR' distortion corrections used to be in the DGEOFILE reference image used by MultiDrizzle.)

Headerlet, a small FITS file containing a unique astrometric solution

An astrometric solution in an image header can be extracted into a 'headerlet,' a small FITS file in a convenient format for sending to other users, or for retrieval from the HST Archive. For instance, users analyzing data from a Treasury program could retrieve headerlets associated with that data in order to use the same astrometric solutions created by other users.

Key references:
Fruchter, A. S., Hook, R. N., 1997, "A Method for the Linear Reconstruction of Undersampled Images" PASP
Fruchter, A. S., et al., BetaDrizzle: A Redesign of the MultiDrizzle Package, STScI Calib. Workshop, 2010
Gonzaga, S., et al., The DrizzlePac Handbook, STScI 2012