MAST Users Group Meeting

December 15-16, 2016

Wide Field Camera 3

Ivelina Momcheva

+ WFC3 Team

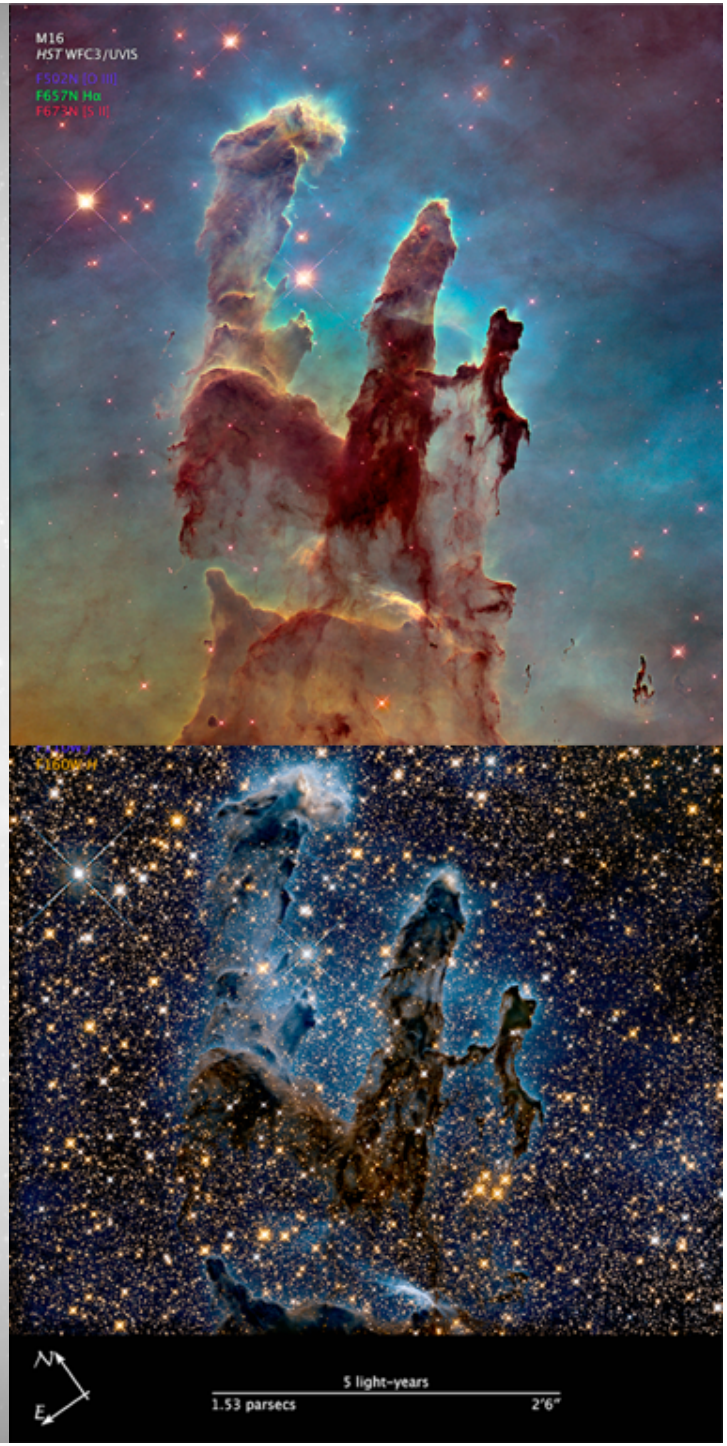
Instruments Division

MAST Users Group Meeting

December 15-16, 2016

Instrument Overview

- Installed in 2009, one of two imagers on HST now
- UV + optical channel: 200 – 1000 nm
- IR channel: 800 – 1700 nm
- 3 grisms for slitless spectroscopy
- Spatial scanning imaging and spectra



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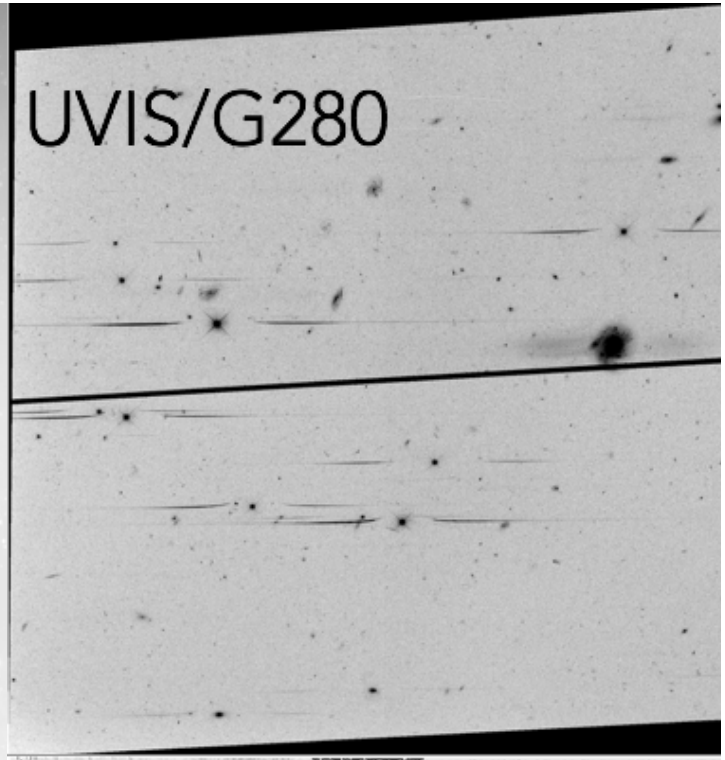

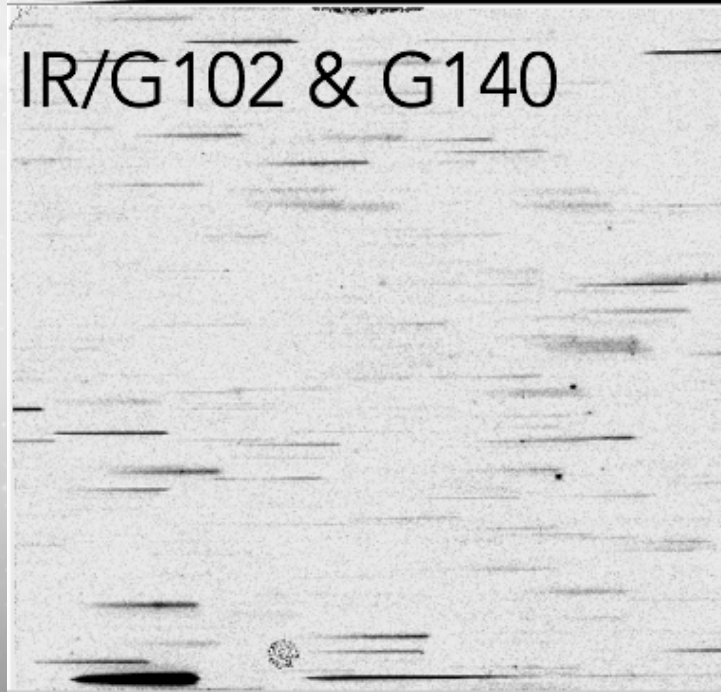

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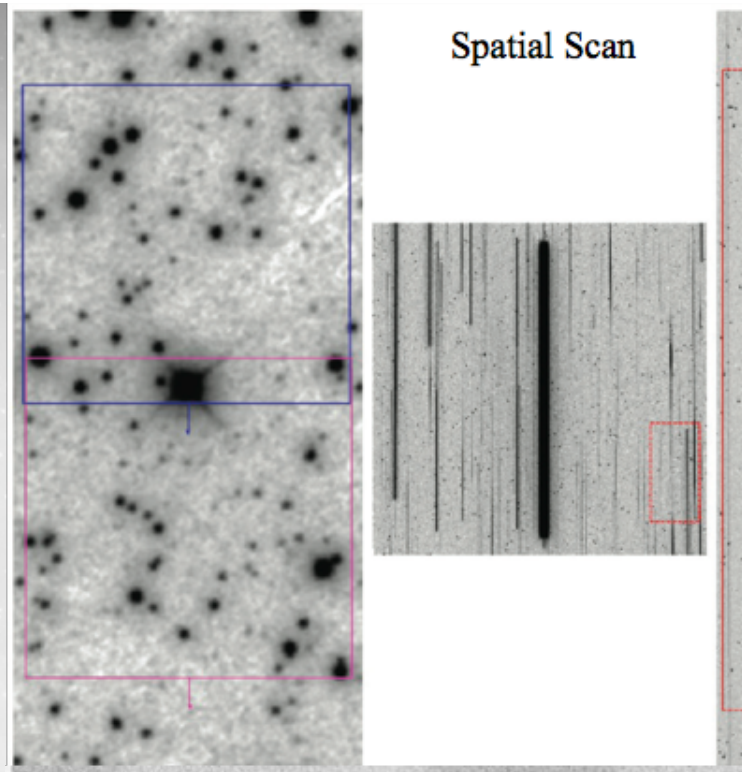

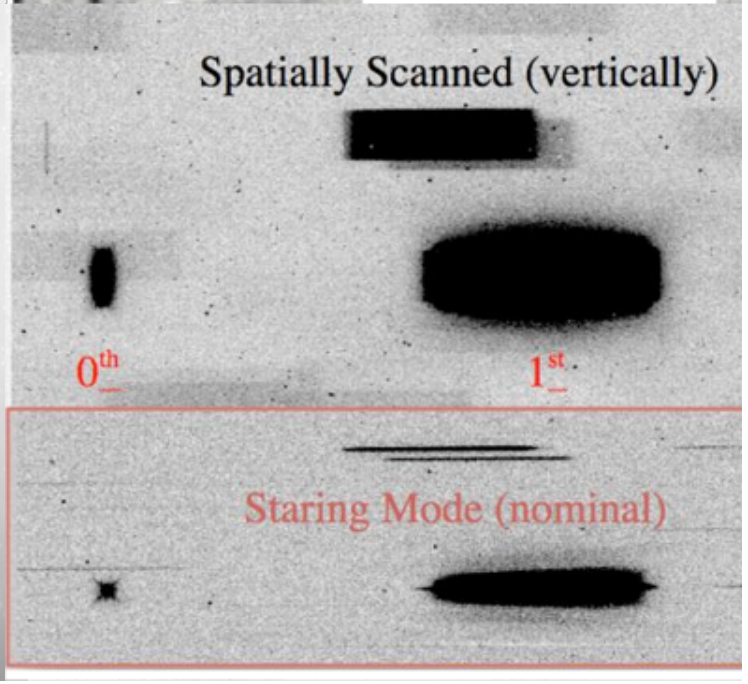

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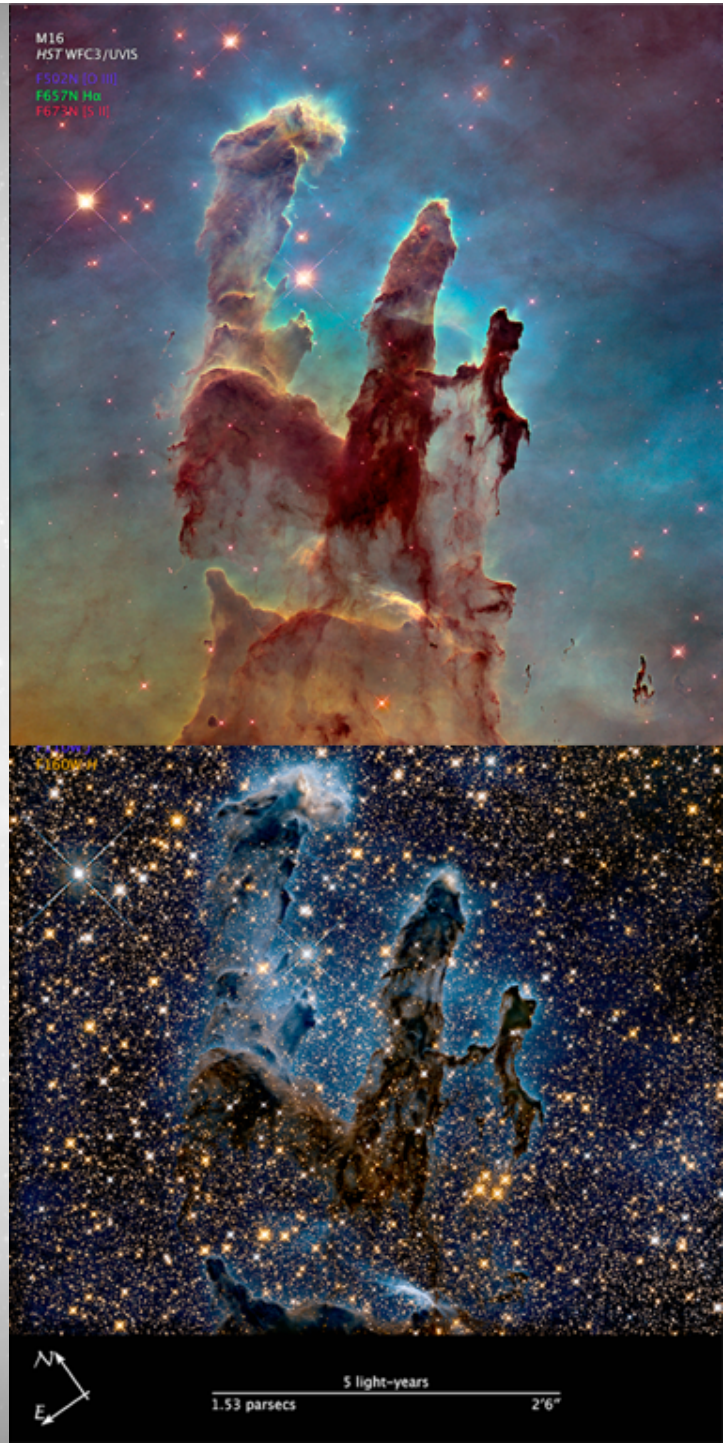
Instrument Status

- Instrument is operating nominally
- Photometric zero-points stable to 1%
- Astrometry is stable
- UVIS CTE is declining as expected
- Gains are stable to 1%
- Channel Select Mechanists nominal



2016 New Developments

- Two pipeline deliveries: calwf3 v3.3 & v3.4 (Feb. & Oct. 2016)
- New data processing pipeline for WFC3/UVIS: UVIS 2.0
  - Chip dependent photometric zero points
  - Pixel based CTE correction and bias subtraction, including most sub-arrays
  - Sink pixels
  - Improved flat
  - Improved super darks
  - Improved scan products
- No ramp fitting for scanned data

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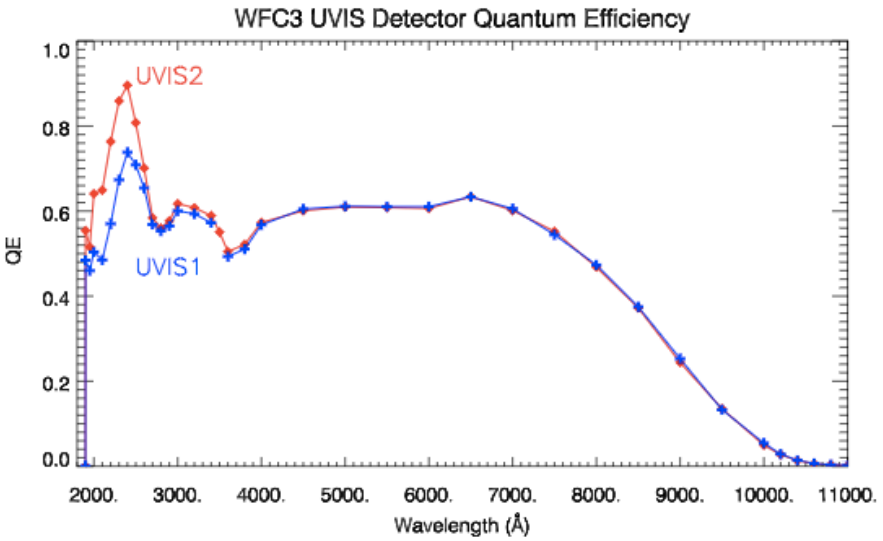

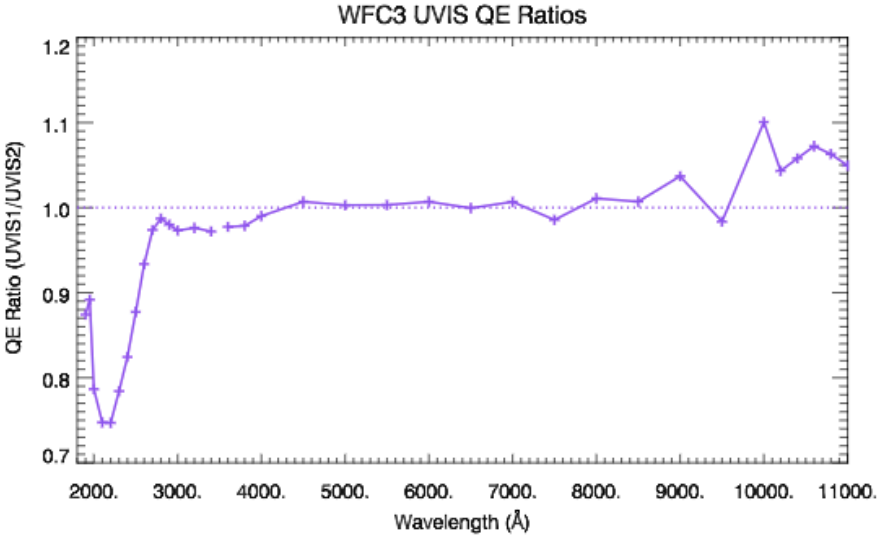

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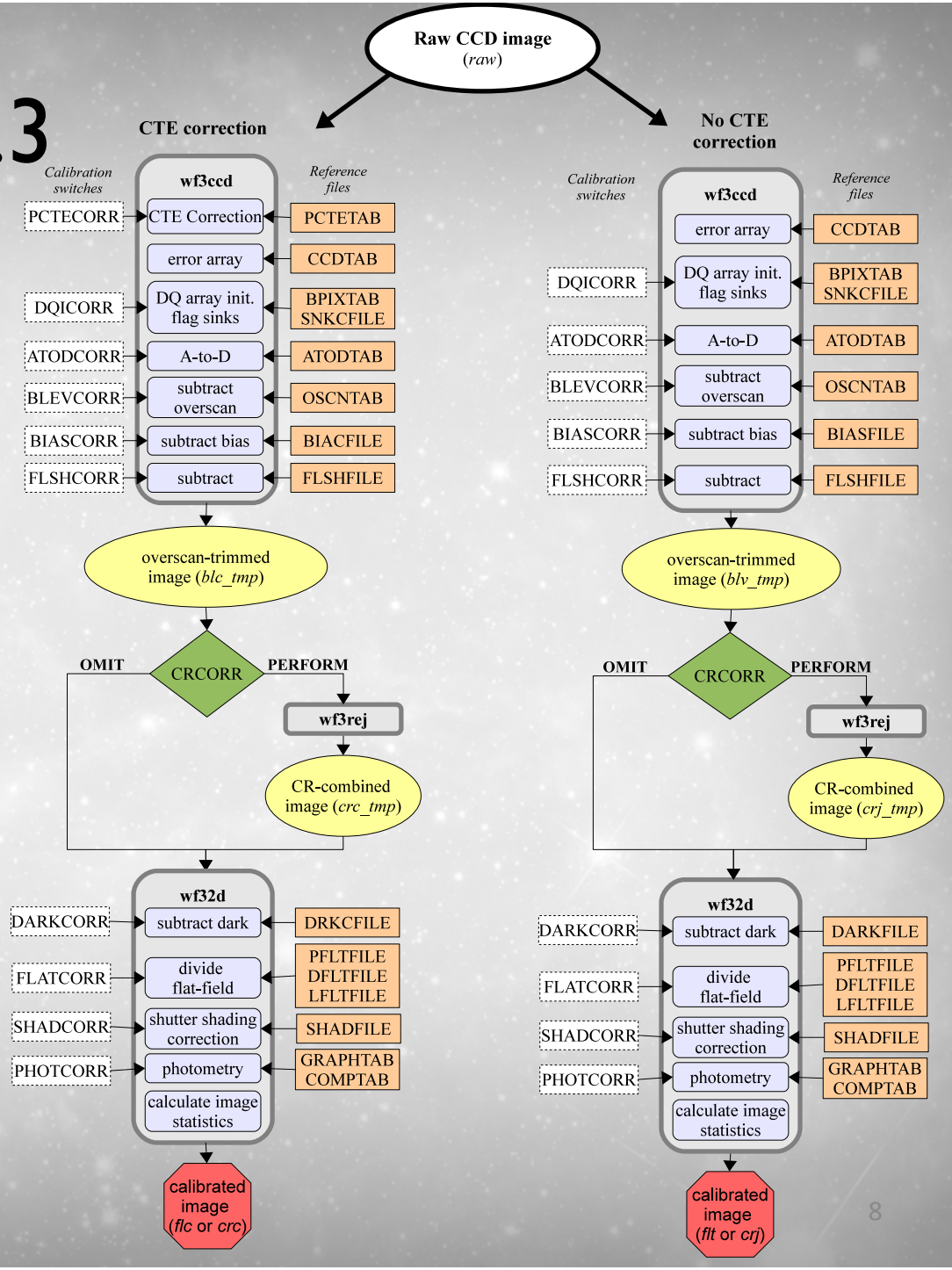
CALWF3 v3.3

(UVIS 2.0)



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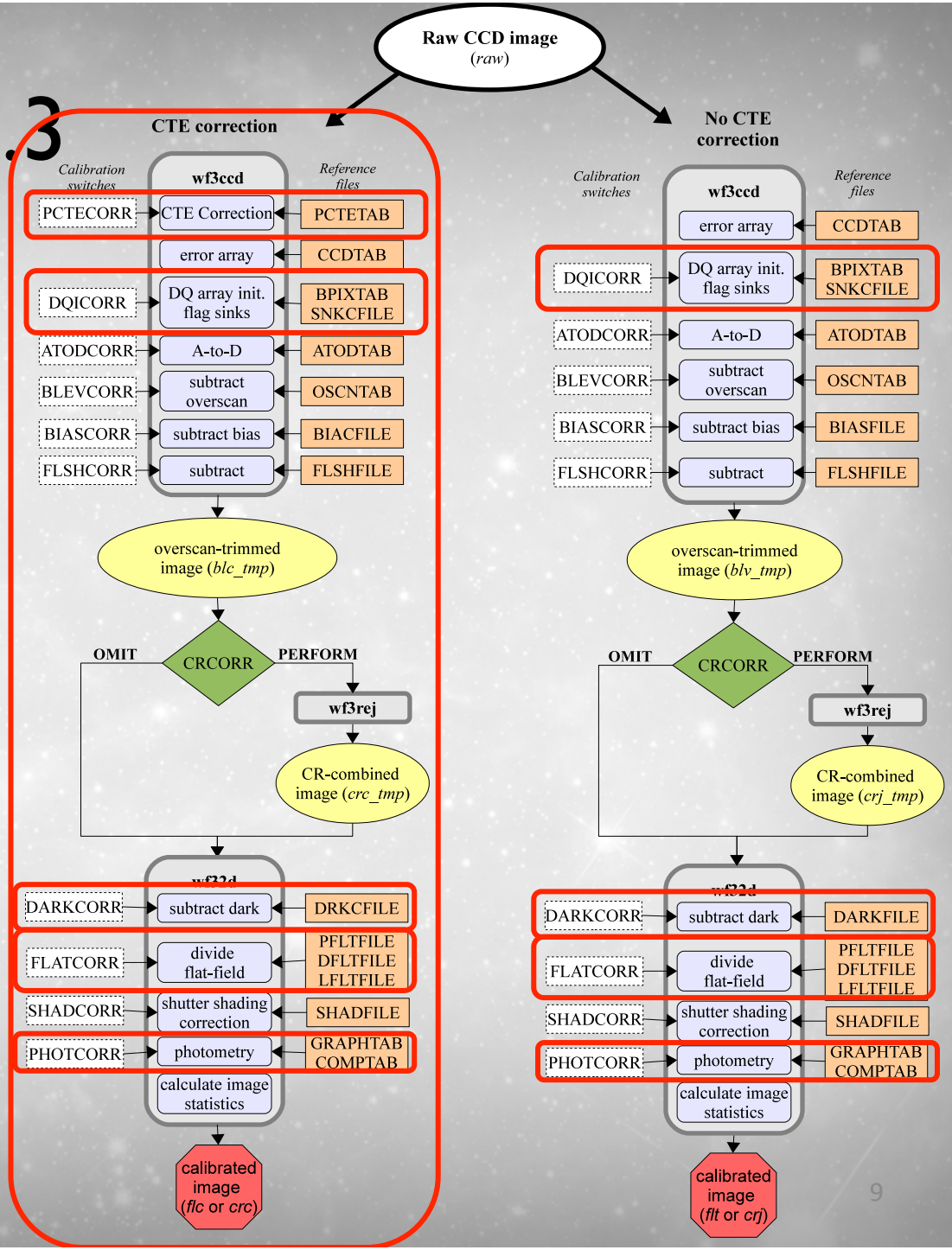

R. Ryan et al., WFC3 2016-1

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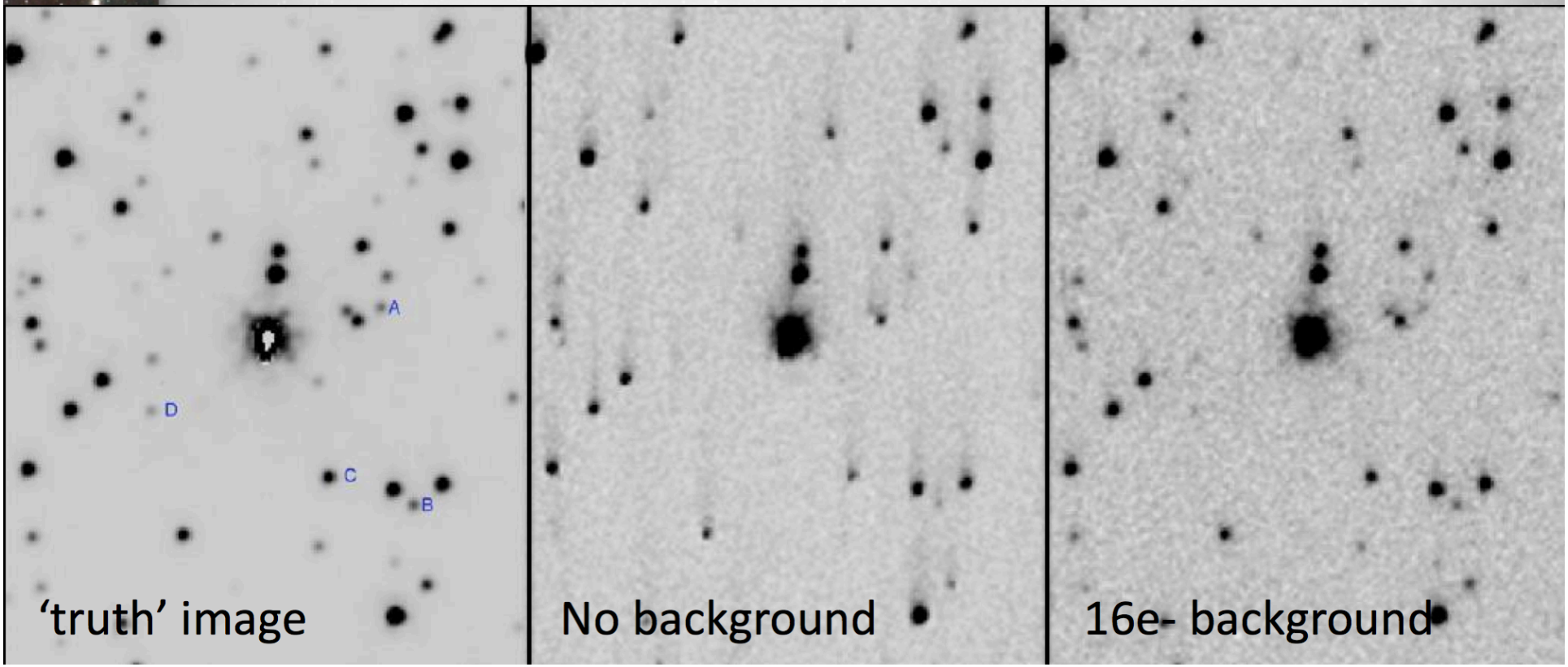
Pixel Based CTE Correction

The radiation environment of HST's low-earth orbit damages CCDs, generating hot pixels, increasing dark current, and decreasing charge transfer efficiency (CTE). Subarrays added in Oct. 2016.

Biretta & Bourque, 2013; Bagget et al., 2014; Anderson et al, 2012 et al.



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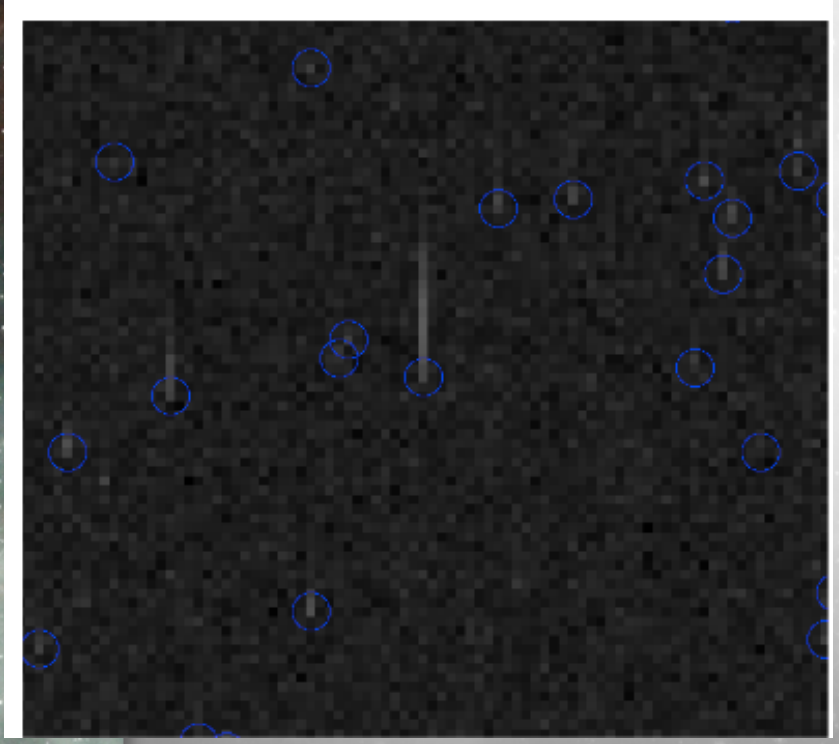
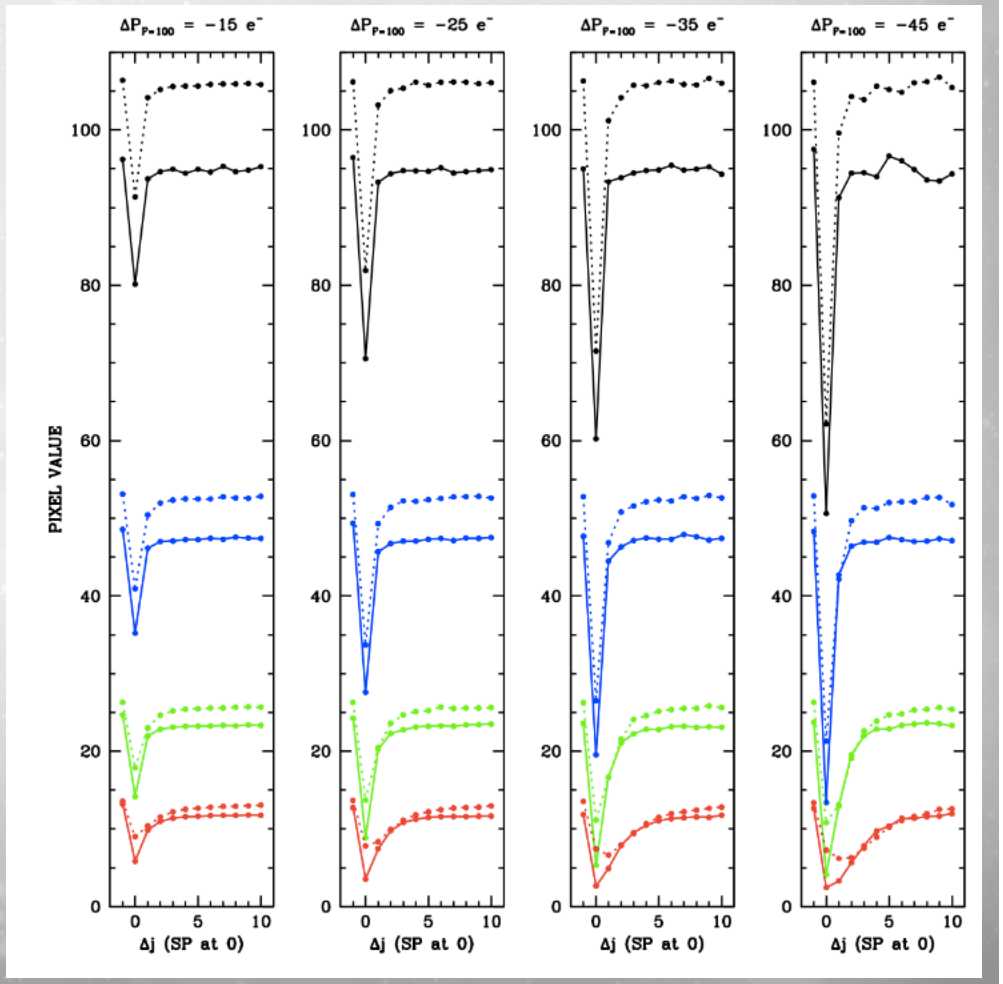
Sink Pixels

Sink pixels have 20 to 100 traps and, when read, do not correctly report the number of e- generated.





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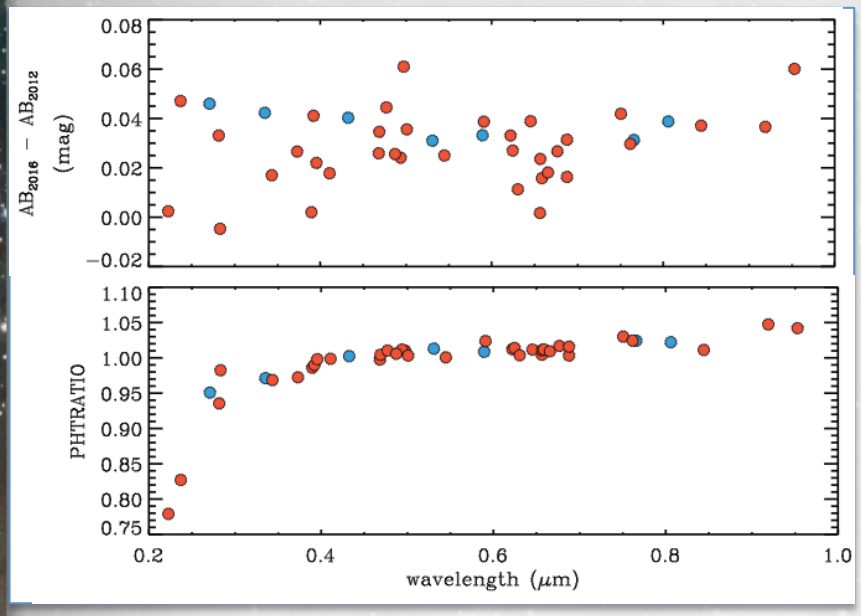
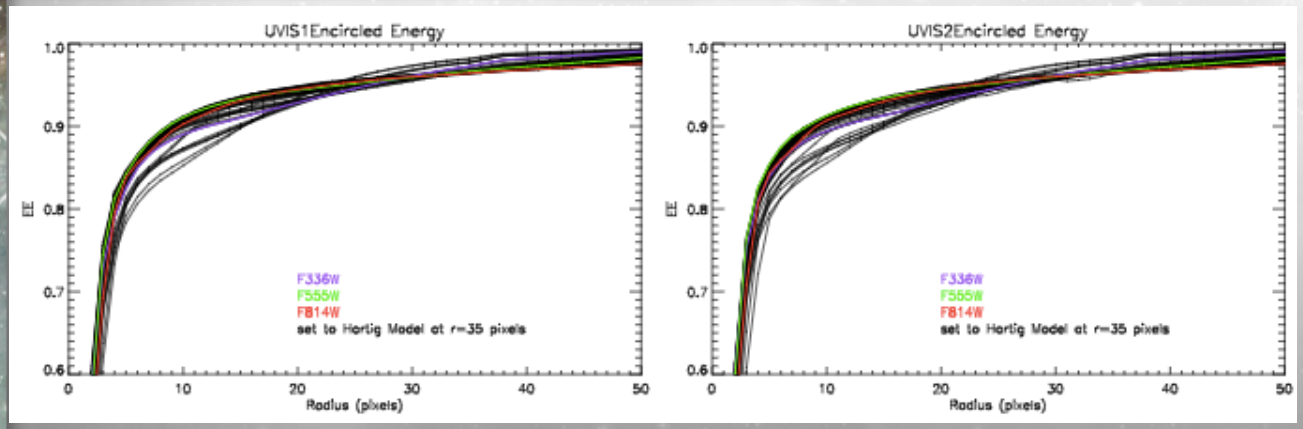
Two-Chip Photometry

Deustua et al., WFC3 2016-3



- Zero-points and encircled energy derived for each chip
- Encircled energy measured to 75 pixels (Hartig 2009 model at R>35 pixel).
- Zero-points determined at r=10 pixels (=0.3962 arcsec) using the WD models in CALSPEC.
- The new zero-points are 3.5% (~0.03 mag) brighter than the 2012 values., and accurate to ~1%.



Two-Chip Photometry

In v3.3 & v3.4 each CCD is processed independently. New keywords have been added to the headers of the calibrated images:

Photometry Header Keywords

PHOTFLAM = Inverse sensitivity for UVIS1 (= PHTFLAM1)
PHTFLAM1 = inverse sensitivity for UVIS1 + filter
PHTFLAM2 = inverse sensitivity for UVIS2 + filter
PHTRATIO = PHTFLAM2/PHTFLAM1

Photometry Calibration Switches and default values:

PHOTCORR = PERFORM (PHTRATIO is calculated and keyword are populated in the header)
FLUXCORR = PERFORM (UVIS2 is scaled to UVIS1)

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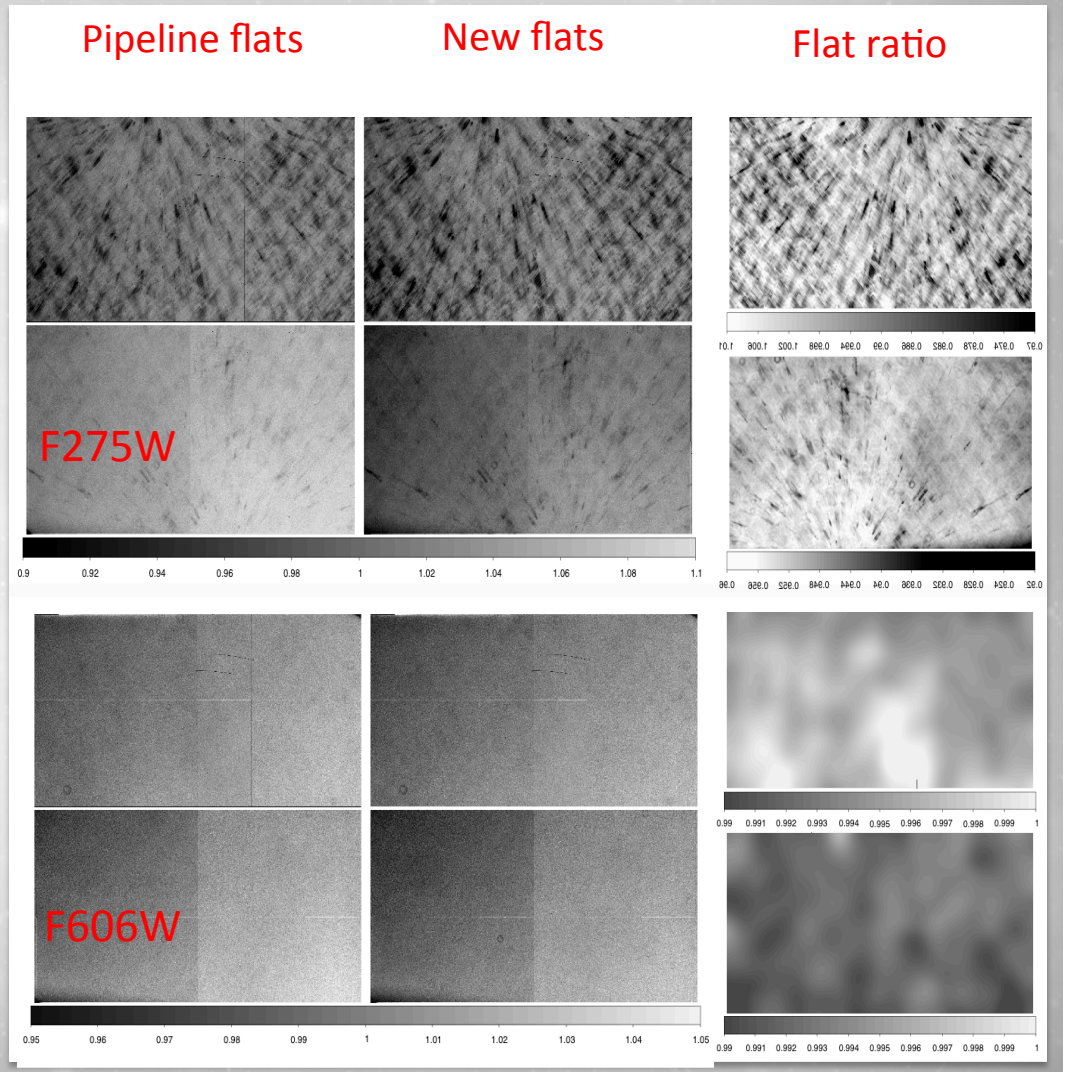
New UVIS Flats

- New flats computed from CTE-corrected images.
- LP-flats independently normalized to the median value for each chip
- UV flats (F218W, F225W, F275W, F280N) now include temperature correction.



Mack et al., WFC3 2016-4

Photometric residuals across the FoV reduced from 3% to 0.5%

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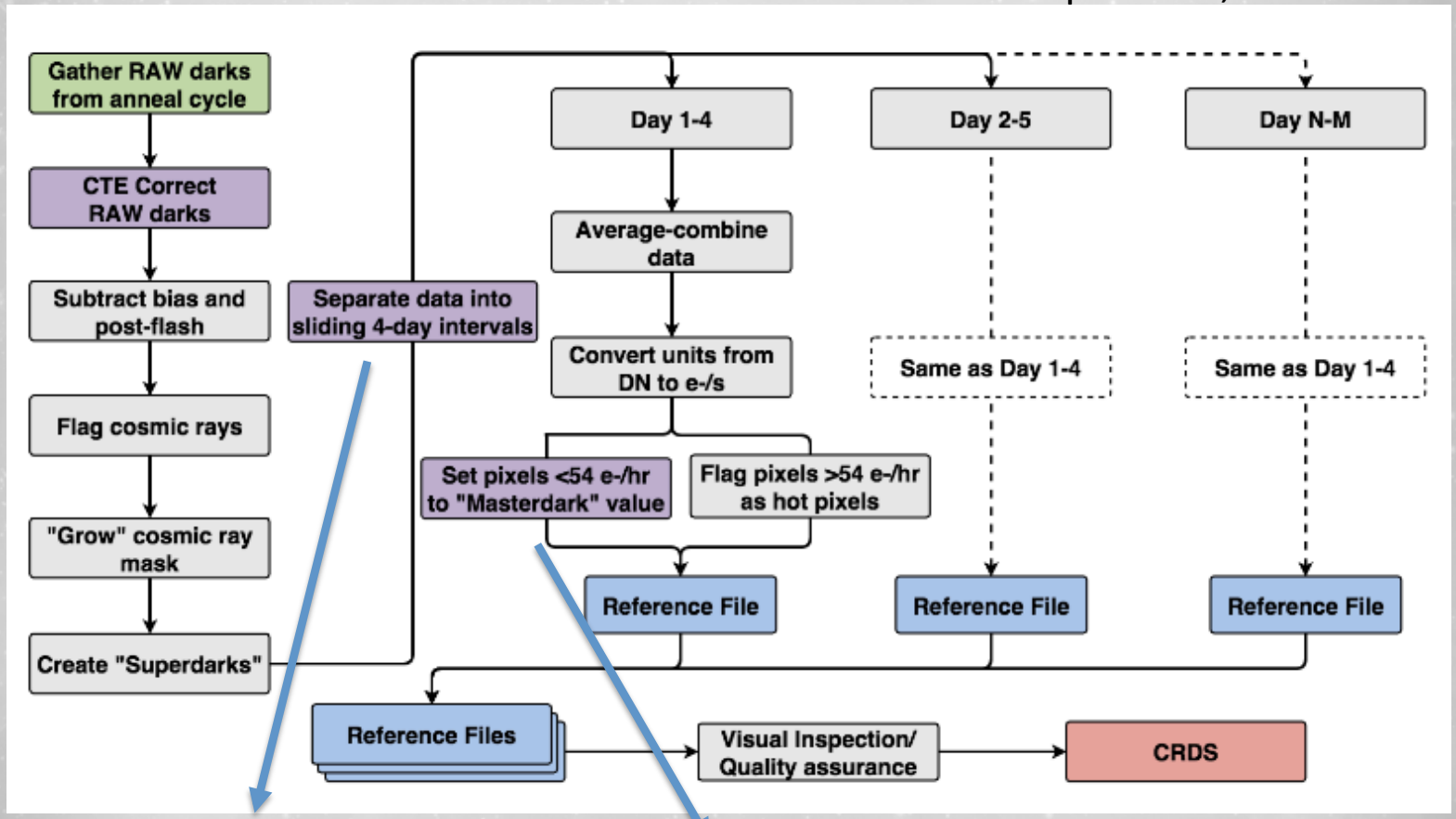
New UVIS Darks

Bourque et al., WFC3 2016-8



More accurate measurement of the true dark current across the detector.

Darks are generated daily; More accurate characterization of the hot pixels.

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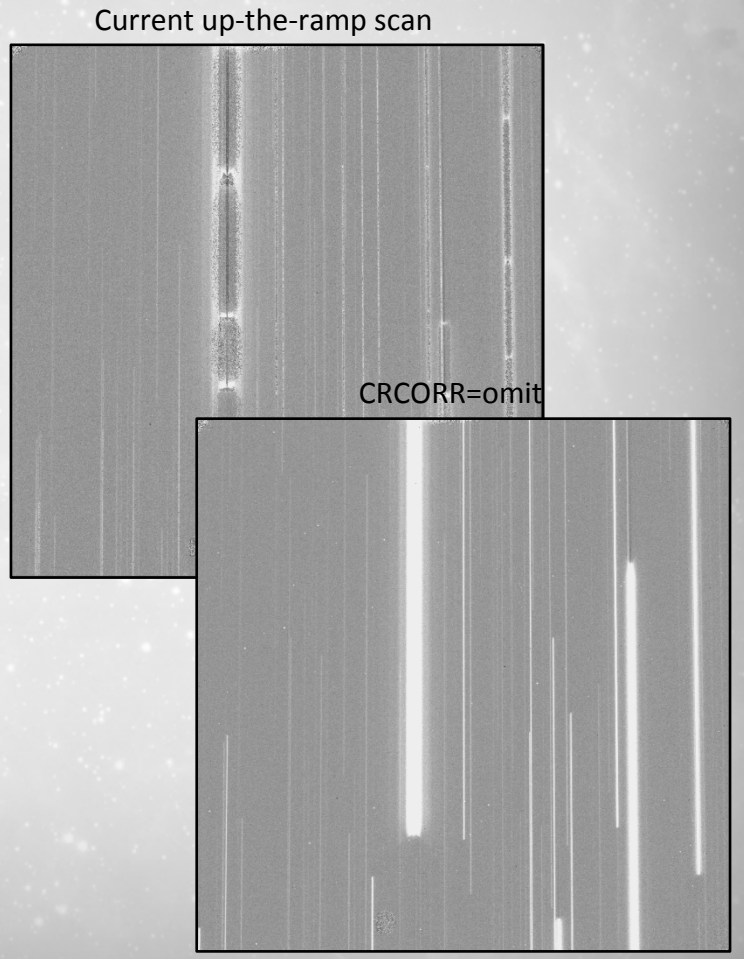
No Ramp Fitting For IR Scans

- CRCOR (i.e. ramp fit) has been disabled in Spatial and spectral scans
- New keywords from engineering added to header



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2017 Plans

- New IR flats
- New UVIS distortion corrections
- Fringing Correction

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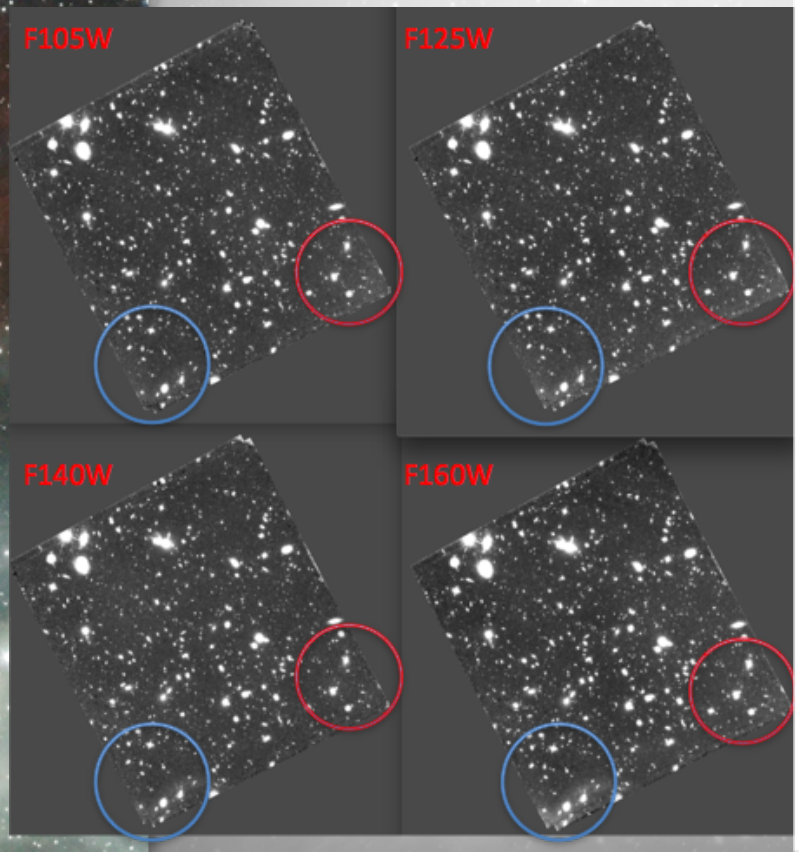
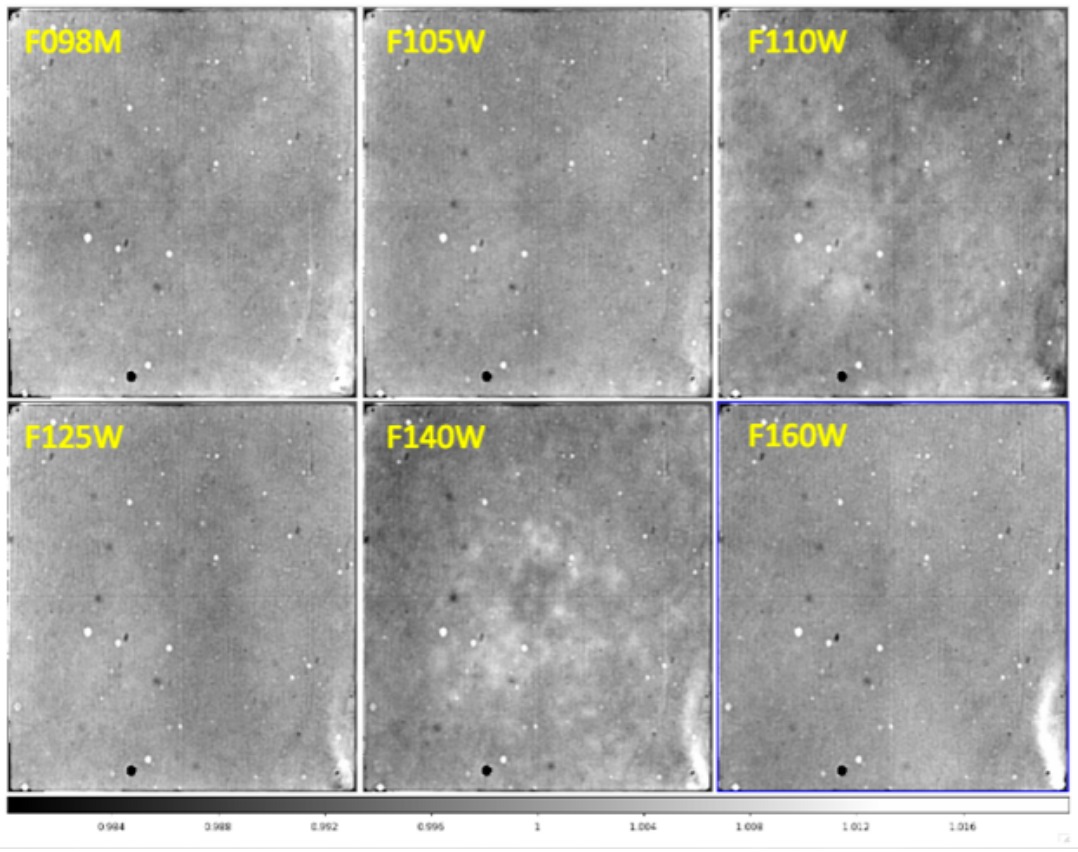
2017 Plans

- New IR flats

Jennifer Mack





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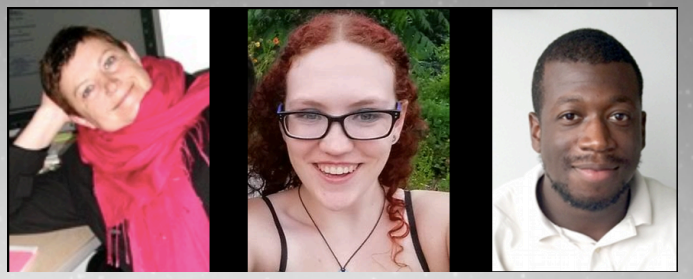
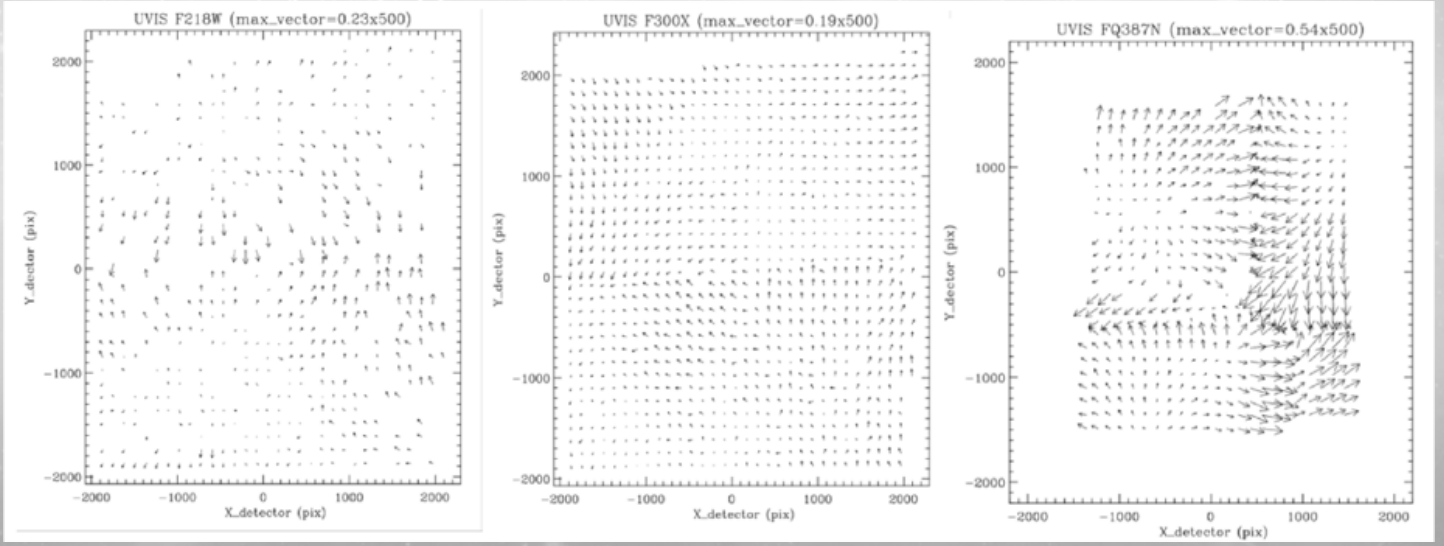


Vera Platais
Catherine Martlin
Myles McKay

- New IR flats
- **New UVIS distortion corrections**
- Fringing Correction



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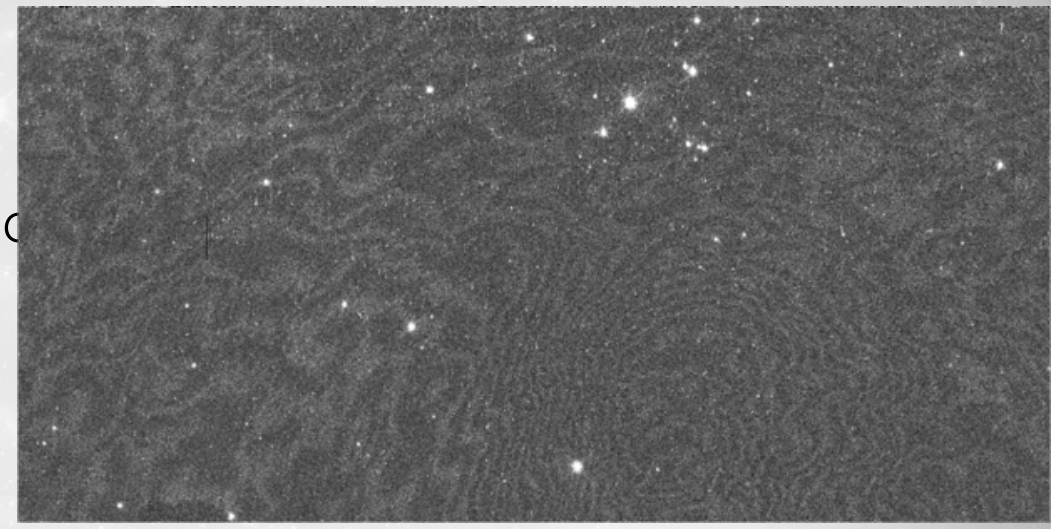

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