

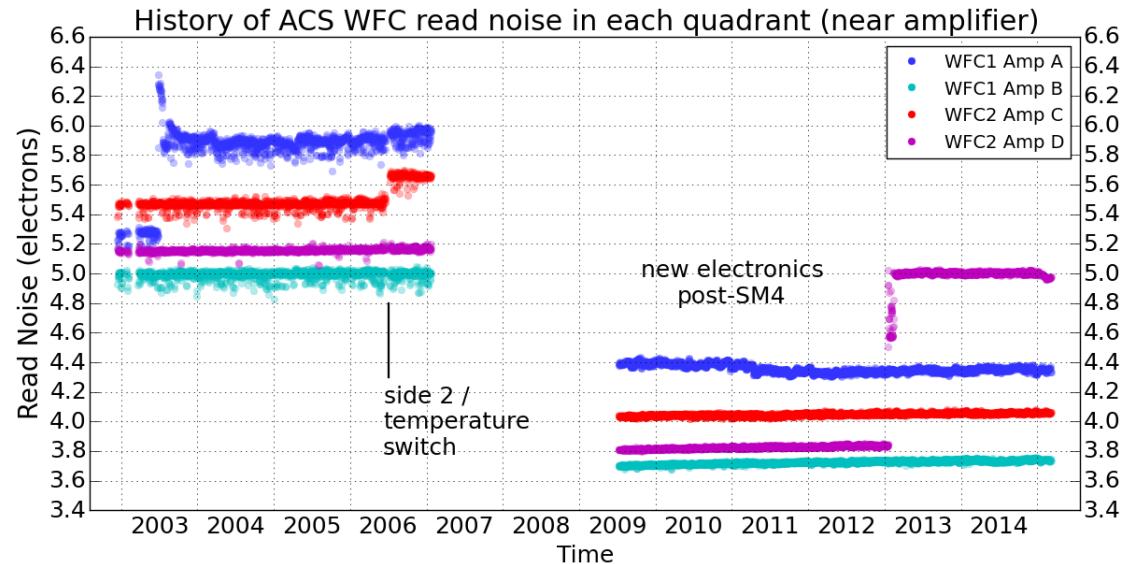
ACS Instrument Status

(N. Grogin and the ACS Team)

ACS : Going Strong after 13 Years

- Usage of ACS increasing from Cycle 21 → 22:
 - ACS prime orbits : 13.1% → 16.8%
 - Coordinated parallel orbits : 29.3% → 39.4%
 - Doubling of SBC programs & orbits in Cyc 22
- ACS crucial in high-impact GO/DD programs
 - E.g.: WFC & HFFs; SBC & Mars/comet fly-by
- Net improvement of delivered WFC image quality b/c understanding is outpacing aging
 - E.g.: Geometric distortion; CTE; etc.

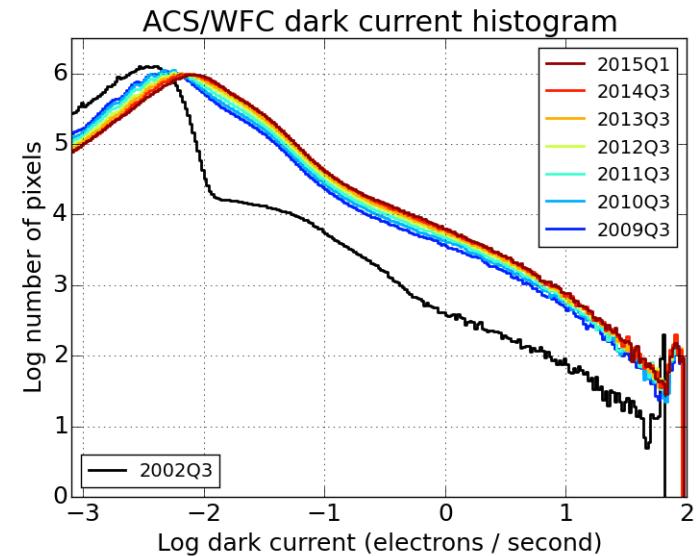
ACS Long-Term Monitoring Programs



→ WFC read noise stable for >2yrs since last glitch

WFC dark current ← slowly but steadily worsening with time

[Also, SBC filter sensitivities are steady for past >11 years]

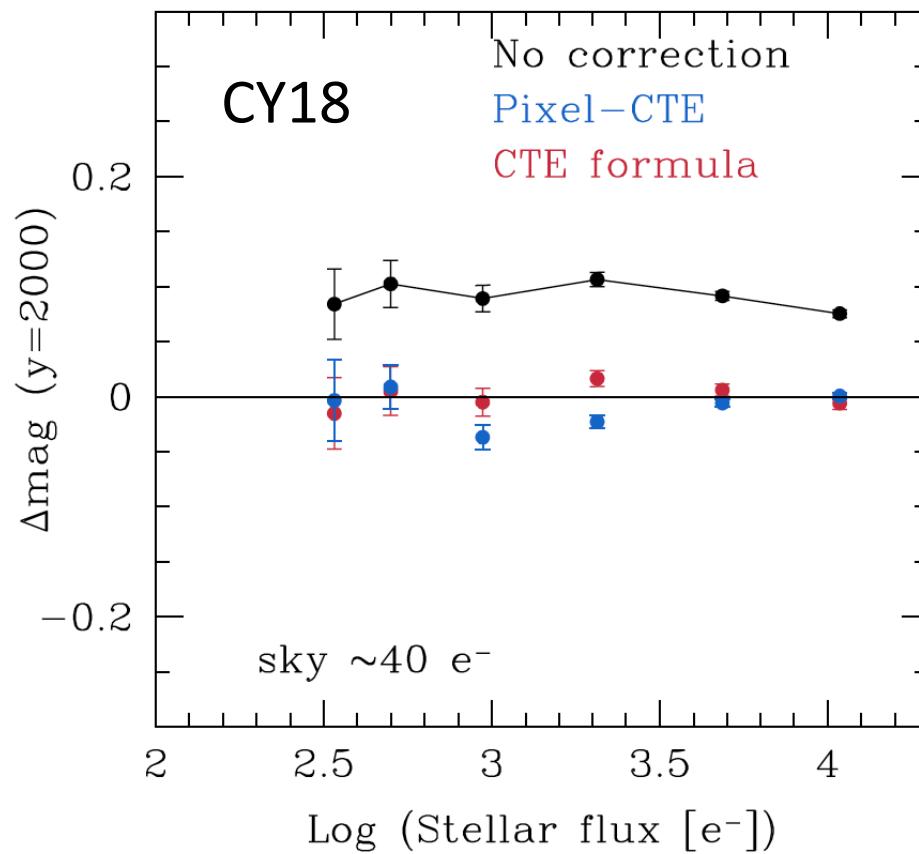


Long-term Monitoring of WFC CTE

- Yearly imaging of 47 Tuc calibration field
- Measurements of CTE loss as functions of:
 - WFC parallel transfers; background level; stellar flux; MJD of observation
- Comparisons between:
 - Uncorrected stellar photometry (FLTs)
 - Post-hoc CTE photometric correction formula (FLTs)
 - Pixel-based CTE correction (FLCs)

Pixel-based CTE correction (blue) vs Photometric correction formula (red)

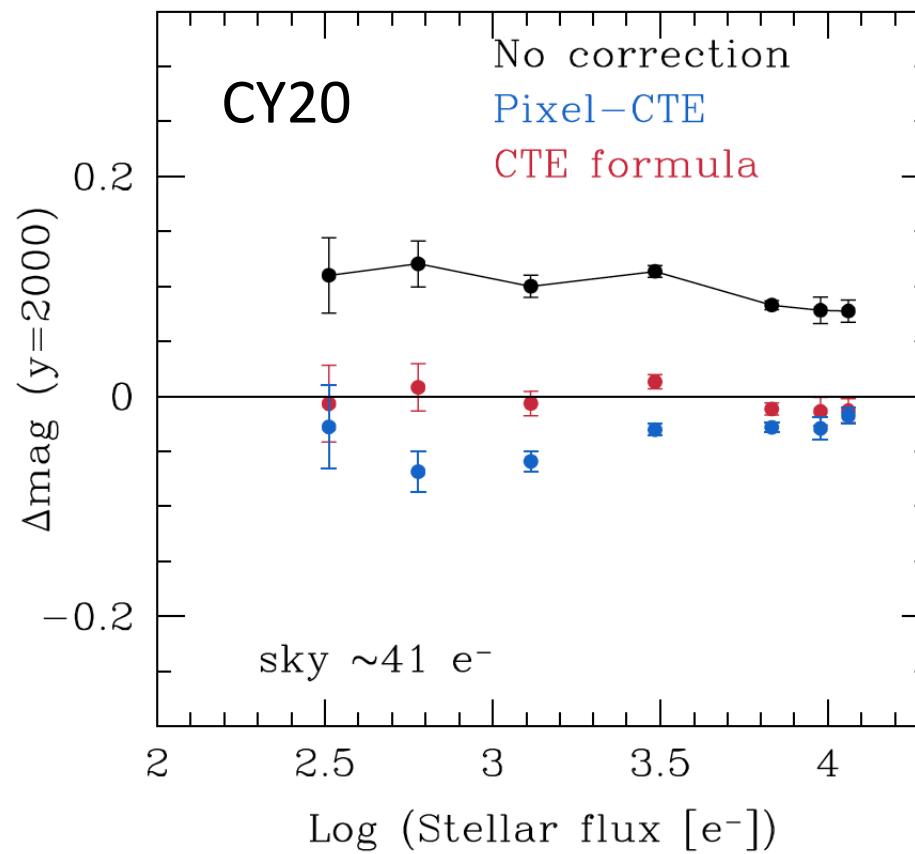
Cycles 18-20-21



CTE formula is more accurate than the pix-CTE correction

Pixel-based CTE correction (blue) vs Photometric correction formula (red)

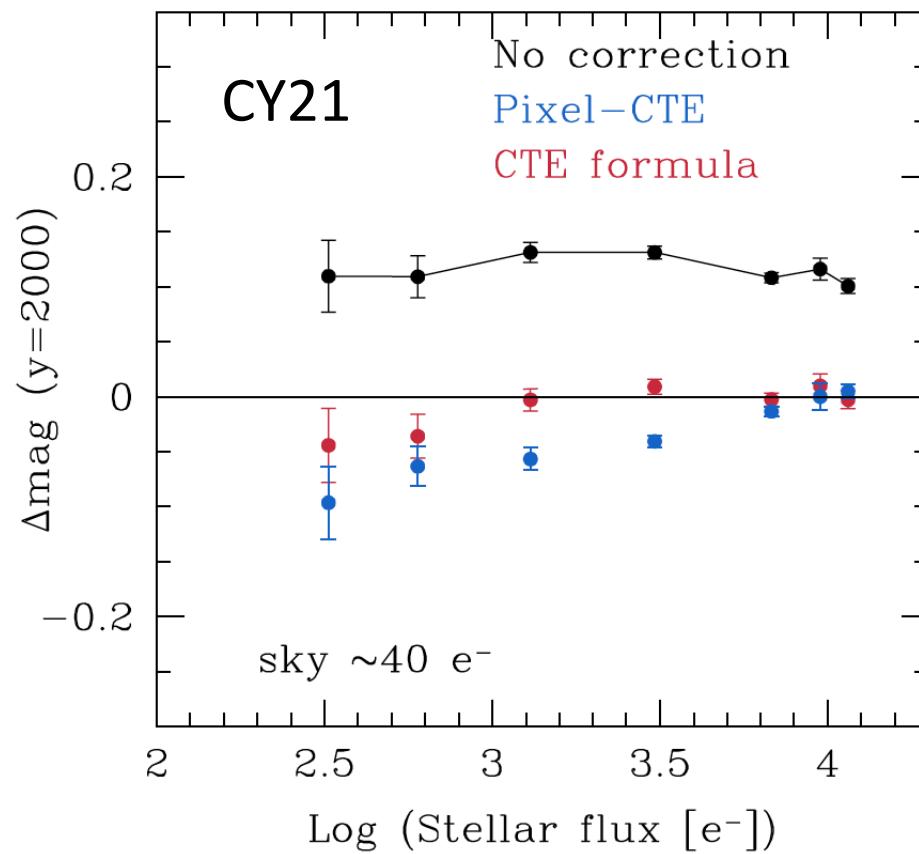
Cycles 18-20-21



CTE formula is more accurate than the pix-CTE correction

Pixel-based CTE correction (blue) vs Photometric correction formula (red)

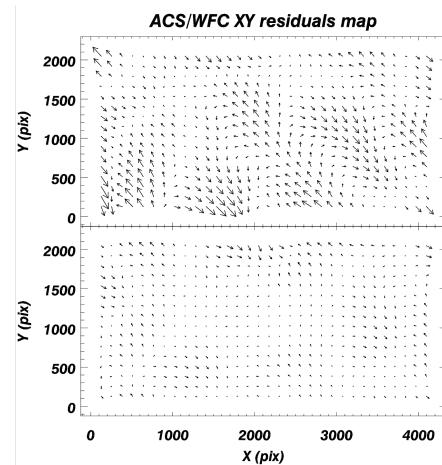
Cycles 18-20-21



CTE formula is more accurate than the pix-CTE correction

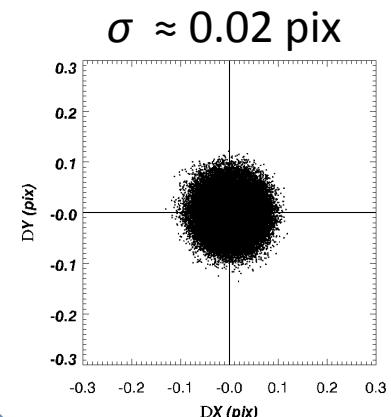
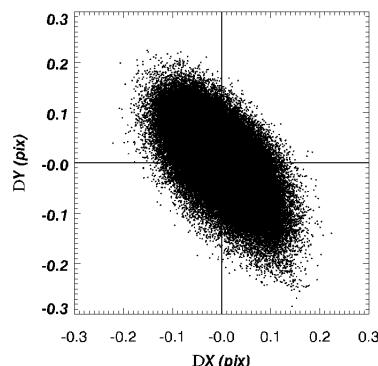
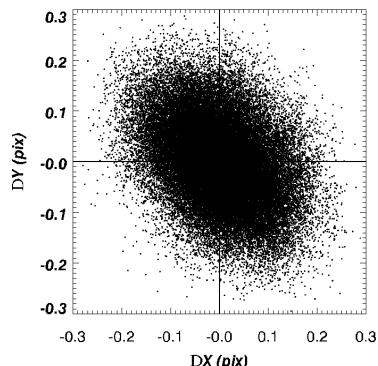
Refinements to WFC Geom. Dist.

- Leveraging 13yrs of 47 Tuc astrometry:
 - Dispersion of stars now limiting astrometry ($\sim 0.1\text{pix}$)
 - New reference catalog: includes proper motions
- Fully generalized 2D non-polynomial distortion
 - Removes manufacturing anomalies in plate scale
 - Removes filter-dependent residuals
- Sol'n cross-validated with HFFs
 - Scatter reduced to $\sim 0.02\text{ pix} (!)$

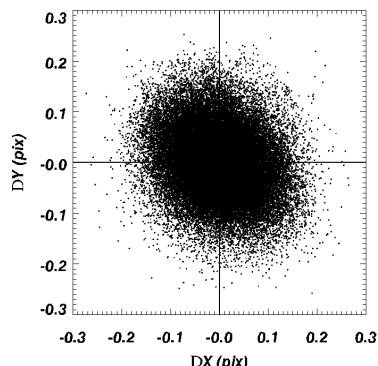


Geom. Dist.: Astrometric Residuals

WFC1



WFC2



Including 47Tuc
Proper Motions

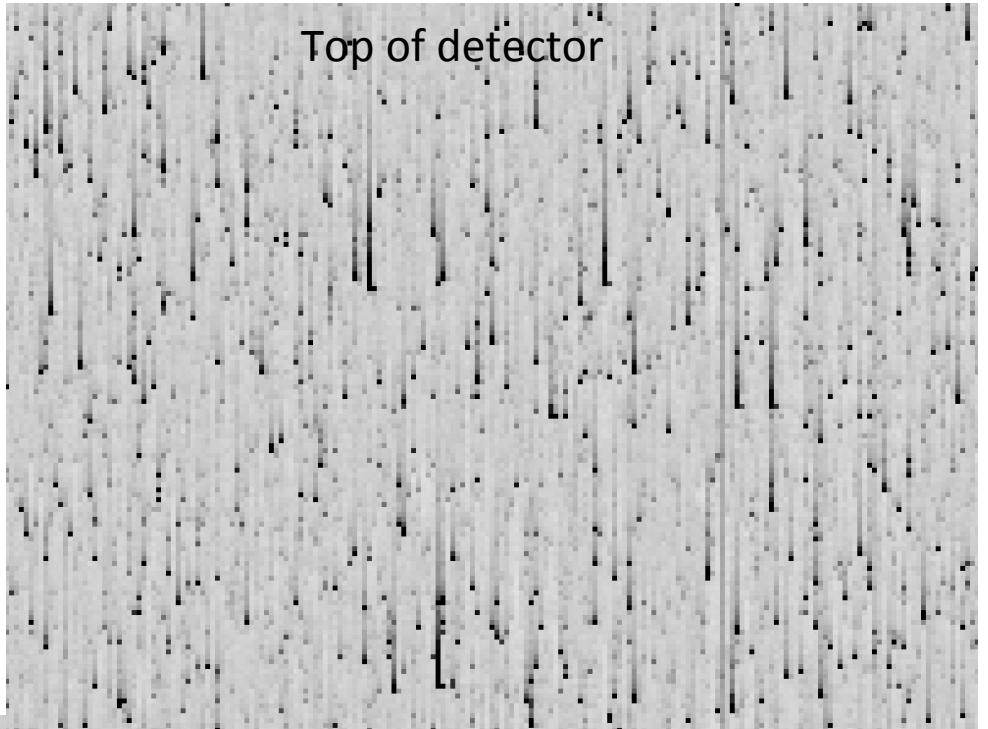
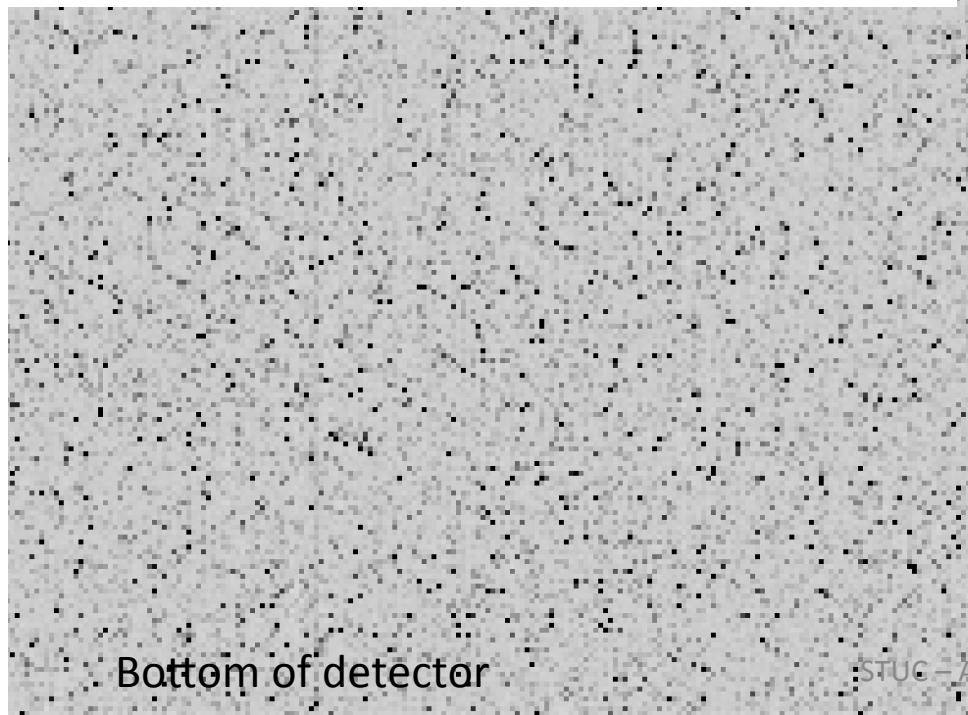


Including 2D
Detector/Filter
Artifacts

Illuminating the WFC Darks

- Motivation:
 - Low bkgnd. of calibration darks → severe CTE trailing
 - Typical WFC use-case has substantial CTE-mitigating bkgnd.
 - HFF “self-calibration” achieves 20% boost in sensitivity
 - WFC3 team already flashing UVIS darks for CTE mitigation
- Cycle 21 Pilot Program:
 - Supplemental calibration program, executed in Aug/Sep'14
 - 16 internal orbits of biases/darks with LED FLASH=65e⁻
- Cycle 22 Implementation:
 - 4Q14 : Superdark generation script revised/tested for FLASH
 - Jan'15 : Switch-over to FLASH for most darks, half of biases

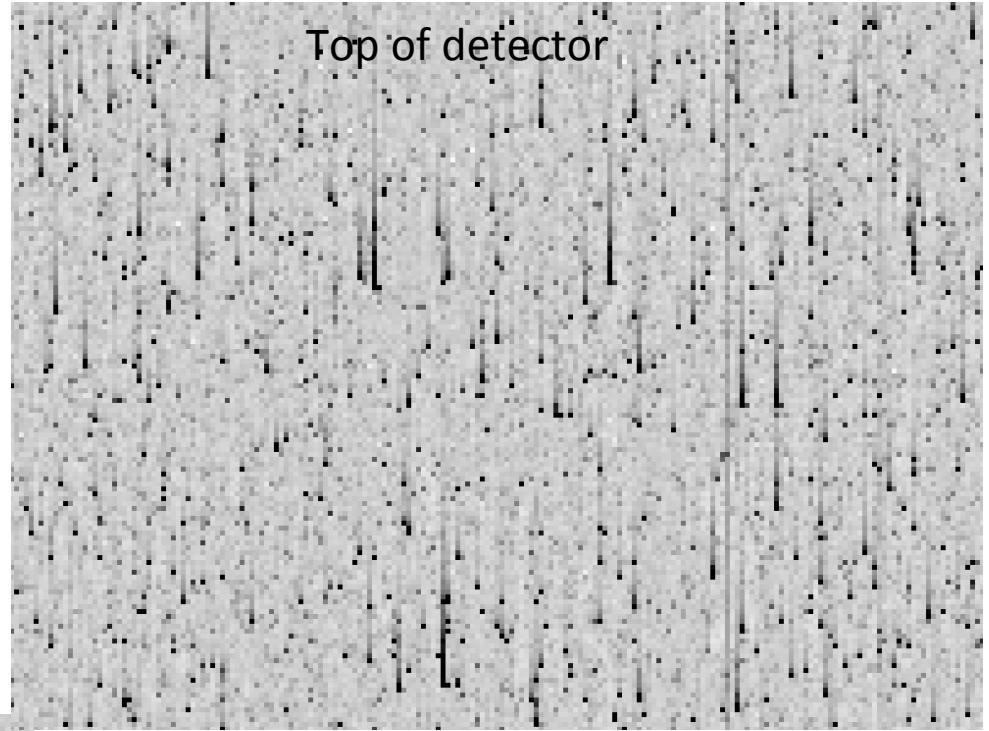
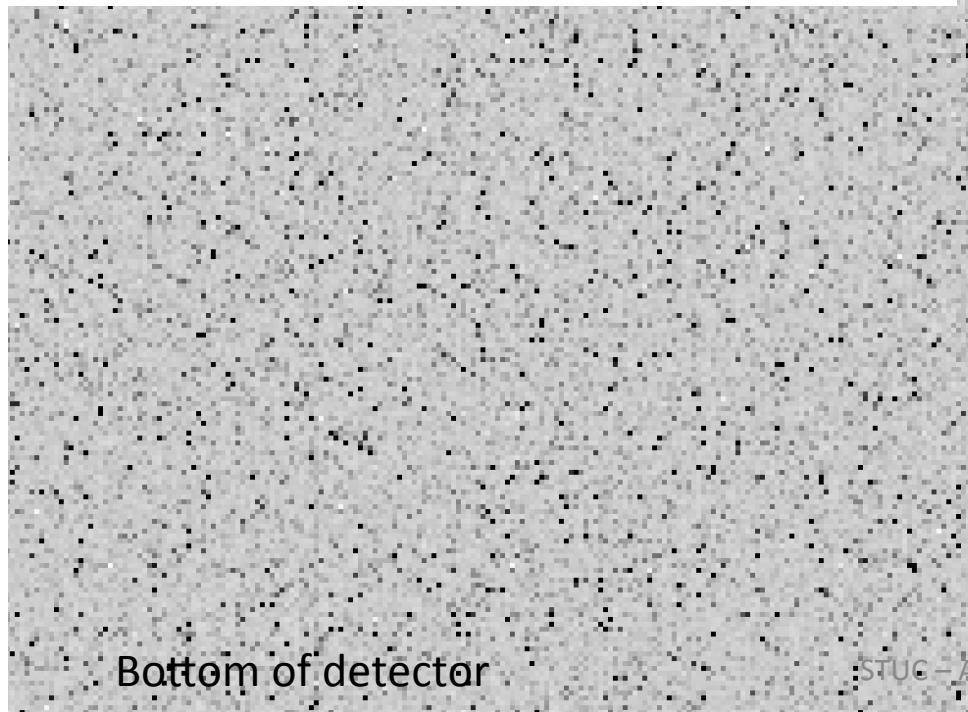
Unflashed 1000sec Dark



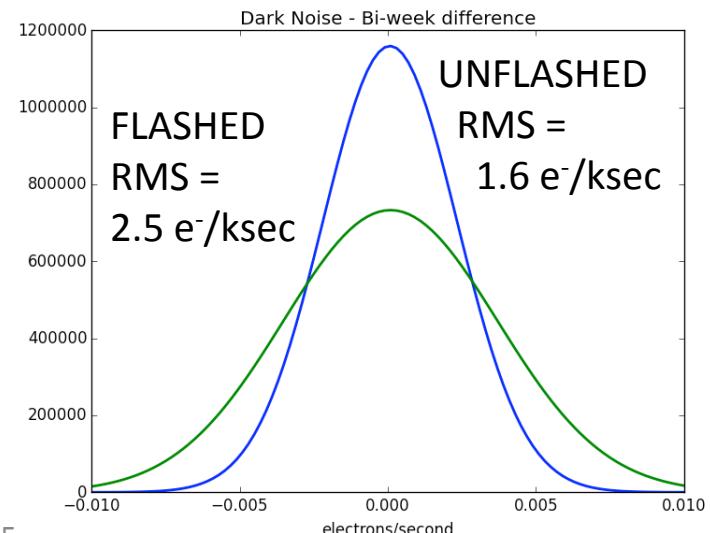
Note that warm-pixel structure seen at bottom of CCD is absent at top

FLASH=65e⁻ 1000sec Dark

(images already processed
through bias subtraction and flash
subtraction)

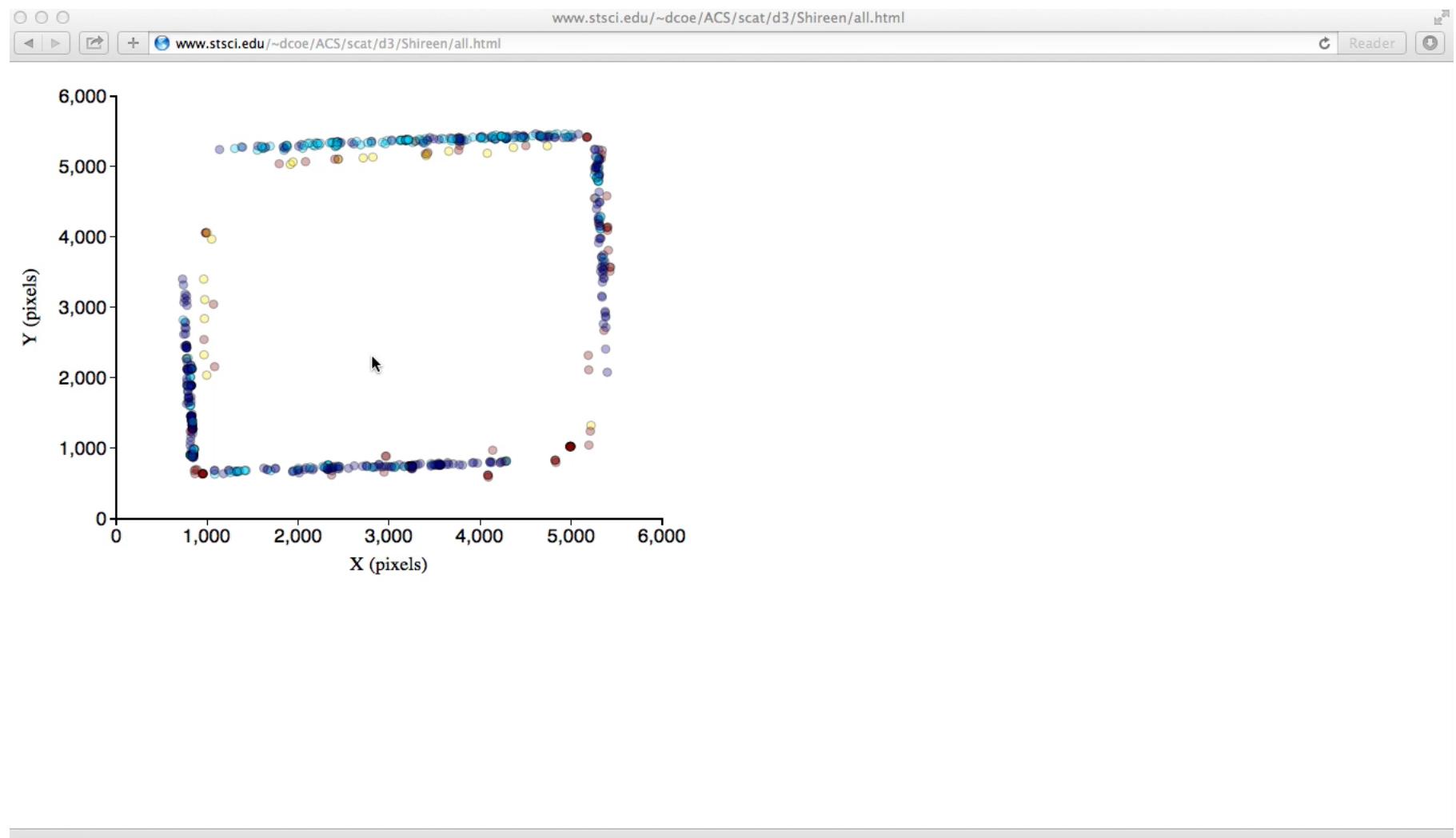


✓ Noise increase is tolerable



Scattered-Light Avoidance

[Coming Attraction]



For More Information...

- ACS Instrument Handbook & Data Handbook:
 - www.stsci.edu/hst/acs/documents/handbooks/current/cover.html
 - www.stsci.edu/hst/acs/documents/handbooks/currentDHB/acs_cover.html
- ACS Instrument Science Reports & Technical Instrument Reports:
 - www.stsci.edu/hst/acs/documents/isrs
 - www.stsci.edu/hst/acs/documents/tirs
 - 6 new ISRs & 2 new TIRs in the last 12 months (April 2014 to March 2015)
- ACS Team Website (www.stsci.edu/instruments/acs/):
 - Links to Exposure Time Calculators (ETCs); CTE-loss Estimator; etc.
 - Links to ‘acstools’ stand-alone Python codes & ‘selfcal’ FORTRAN codes
 - ‘acs_desstripe_plus.py’ : enhancements incl. 2K-subarrays; post-flash; masking
 - Links to development versions of geometric distortion reference files