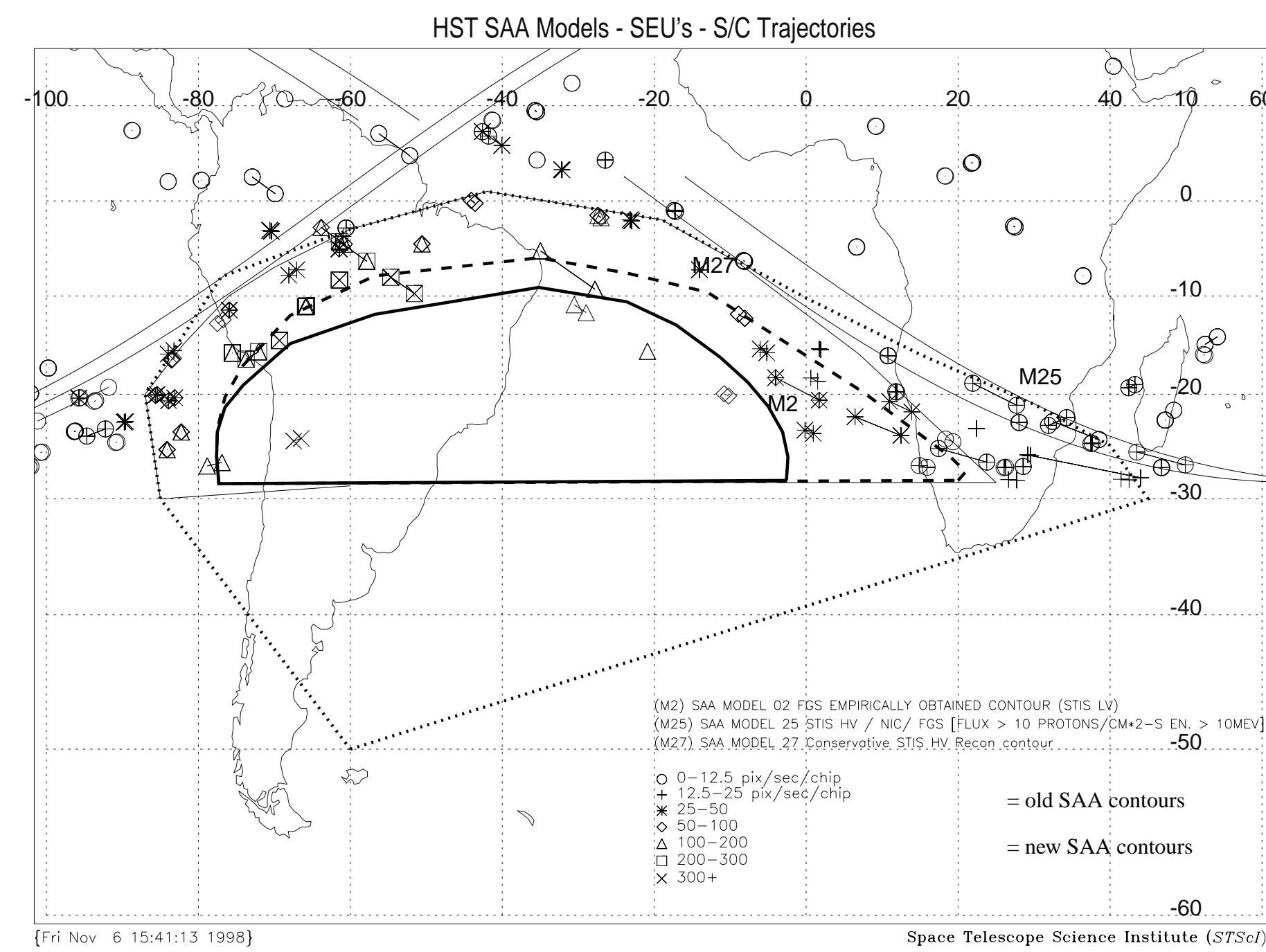


Wide Field Planetary Camera II Status Update

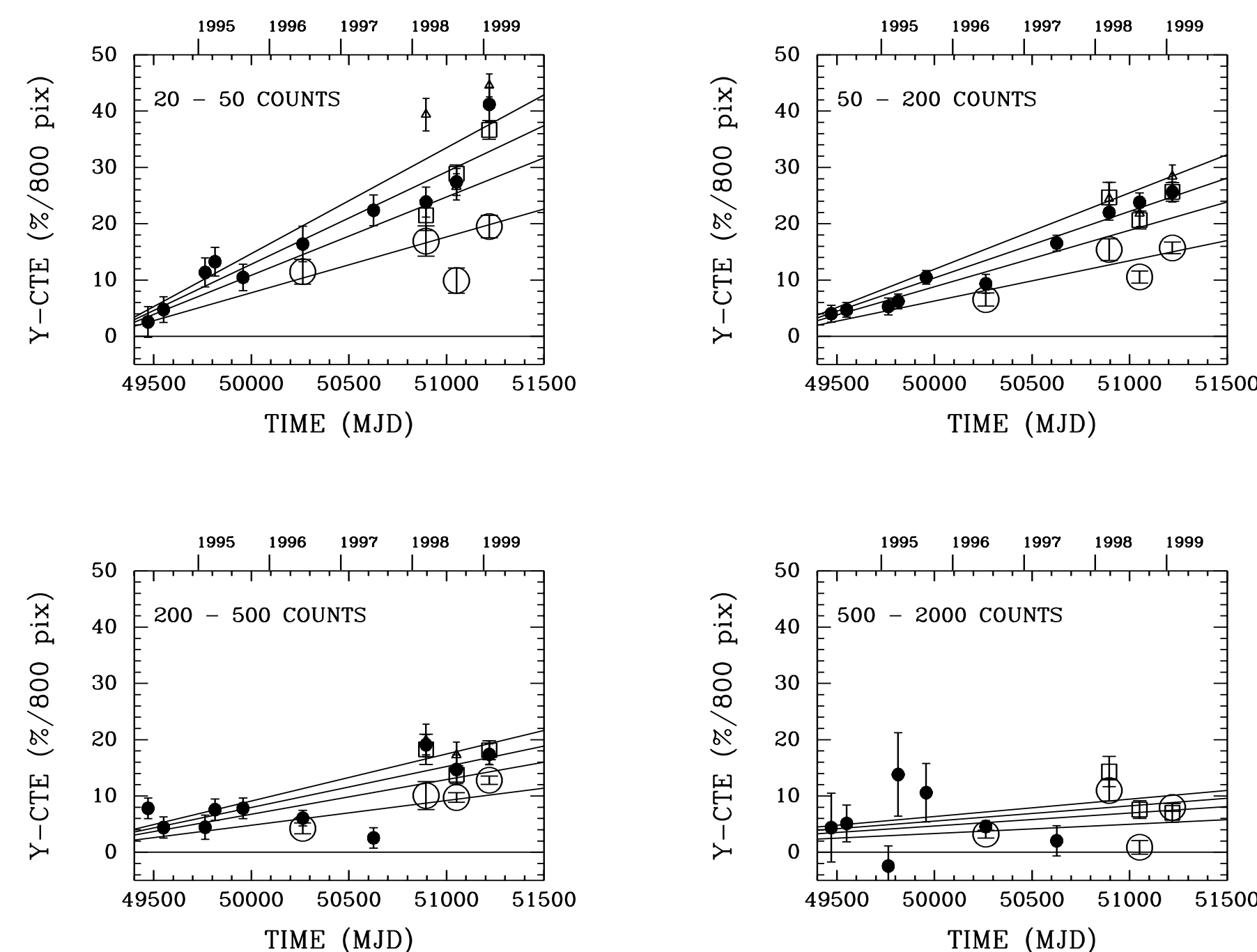
I. Heyer, J. Biretta, S. Baggett, S. Casertano, C. O'Dea, A. Schultz, S. Gonzaga, M. McMaster, M. Wiggs, A. Koekemoer, A. Riess (ST ScI)

Abstract

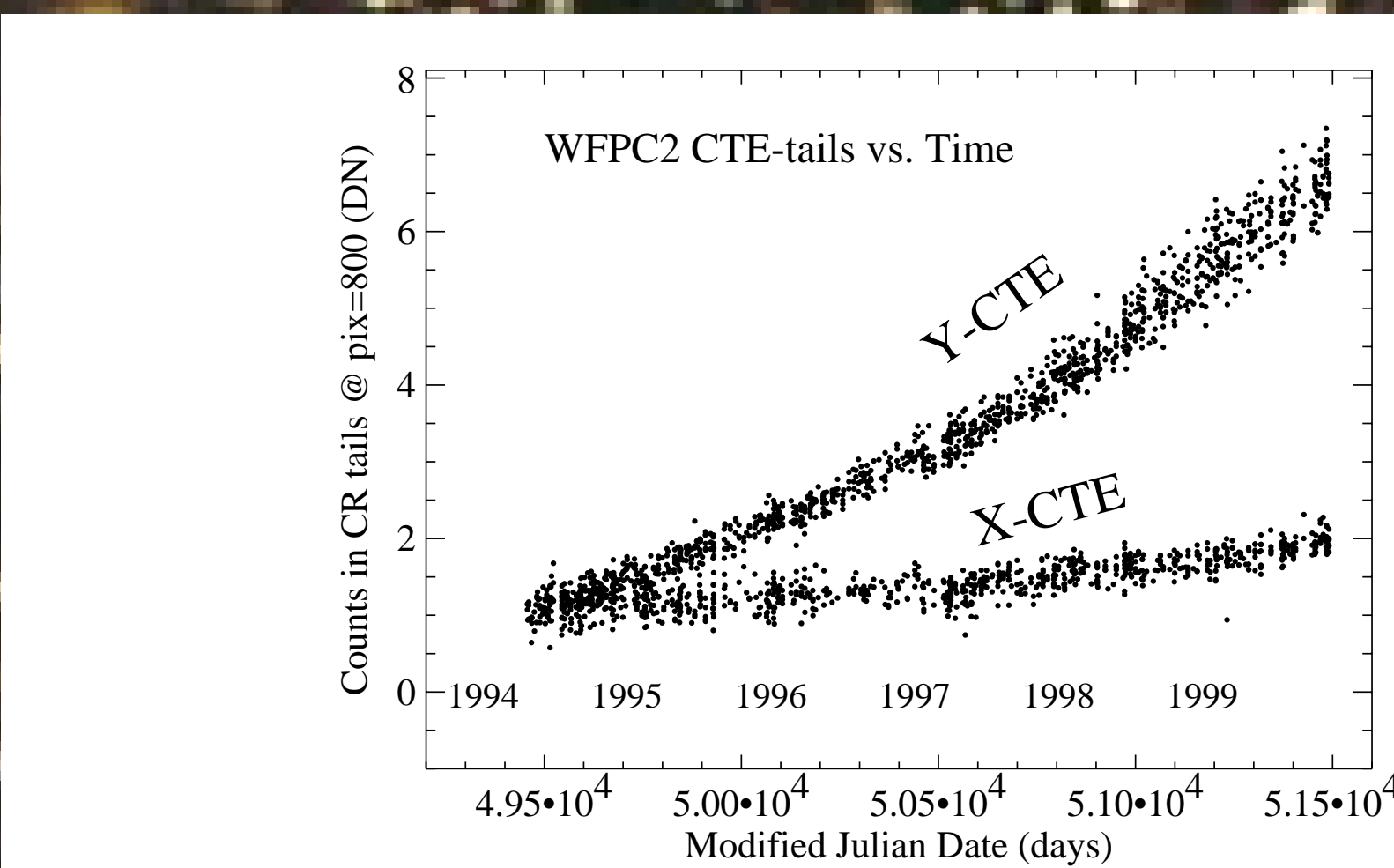
We review the status of the Wide-Field Planetary Camera II (WFPC2) onboard the Hubble Space Telescope as well as recent enhancements to calibration and analysis methods. The instrument continues to perform extremely well after ~70000 images*. Low level effects such as CTE and dark current continue to increase with long-term radiation exposure, but still affect only a minority of observations; work continues to characterize and monitor these effects. The long-term photometric stability appears to be excellent, with most filters showing changes of a few percent or less. Recent work shows that aperture photometry for small apertures (1-2 pixel radius) will be affected at the 5% to 10% level by target position in the field-of-view due to small focus variations. A new "on-the-fly calibration" feature of the HST archive allows instant re-calibration of WFPC2 data with the latest reference files; this should be a great benefit to both new observers and archival WFPC2 users. Recent results on polarization calibration, CTE, and other topics are discussed. *Based on the performance prior to the December 1999 Servicing Mission; post-SM3A recommissioning is proceeding normally.



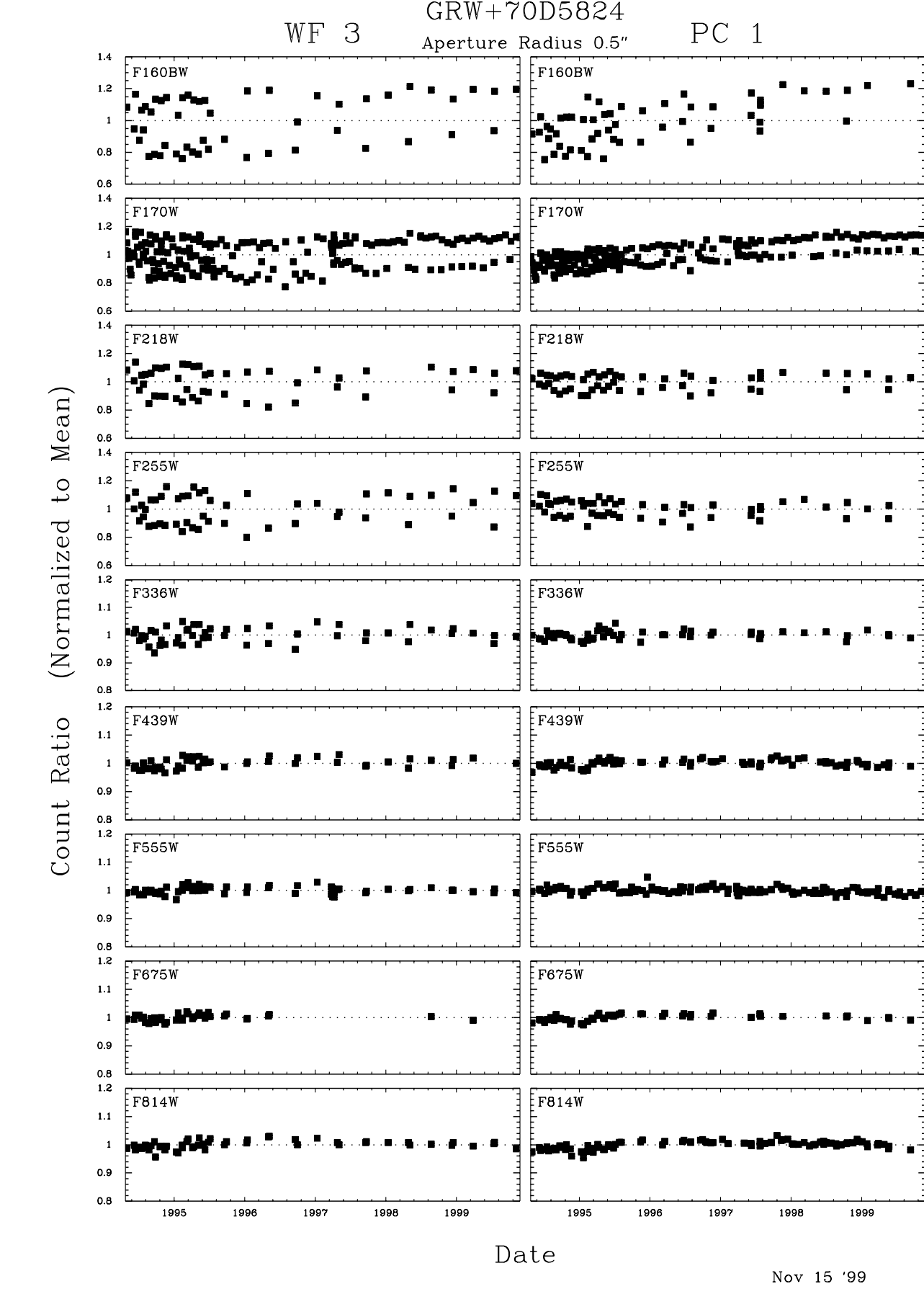
Long-range HST Schedule. Through most of 1998, approximately 20% of HST time was devoted to WFPC2 observations. With the suspension of NICMOS operations, this rate has increased to 50%. A recent study of the HST long-range plan shows that opportunities for long, contiguous observations (> 5 orbits) are over-subscribed. This is due to several factors, including a trend towards longer observations of fewer targets. A number of steps are being taken to alleviate this situation for WFPC2 observers. PIs have been asked to split their long visits into pairs of shorter ones wherever possible. This will avoid scheduling delays and help observers obtain the same data sooner than otherwise. We have also made the Southern Atlantic Anomaly avoidance region smaller for WFPC2 (M26 contour in figure). As a result, about 0.1% more time becomes available for scheduling long visits. Finally, for programs with short exposures, more effort will be made to utilize short visibility periods which are often available in the schedule, rather than requiring the usual ~56 minutes of visibility per orbit. We believe these changes will mitigate the over-subscription. The figure shows the distribution of the cosmic ray rate around the SAA with the revised WFPC2 SAA avoidance contour indicated (thin solid line). Curved lines indicate the HST orbit at points where it runs tangent to the old WFPC2 contour (M25, dotted line) and the new contour.



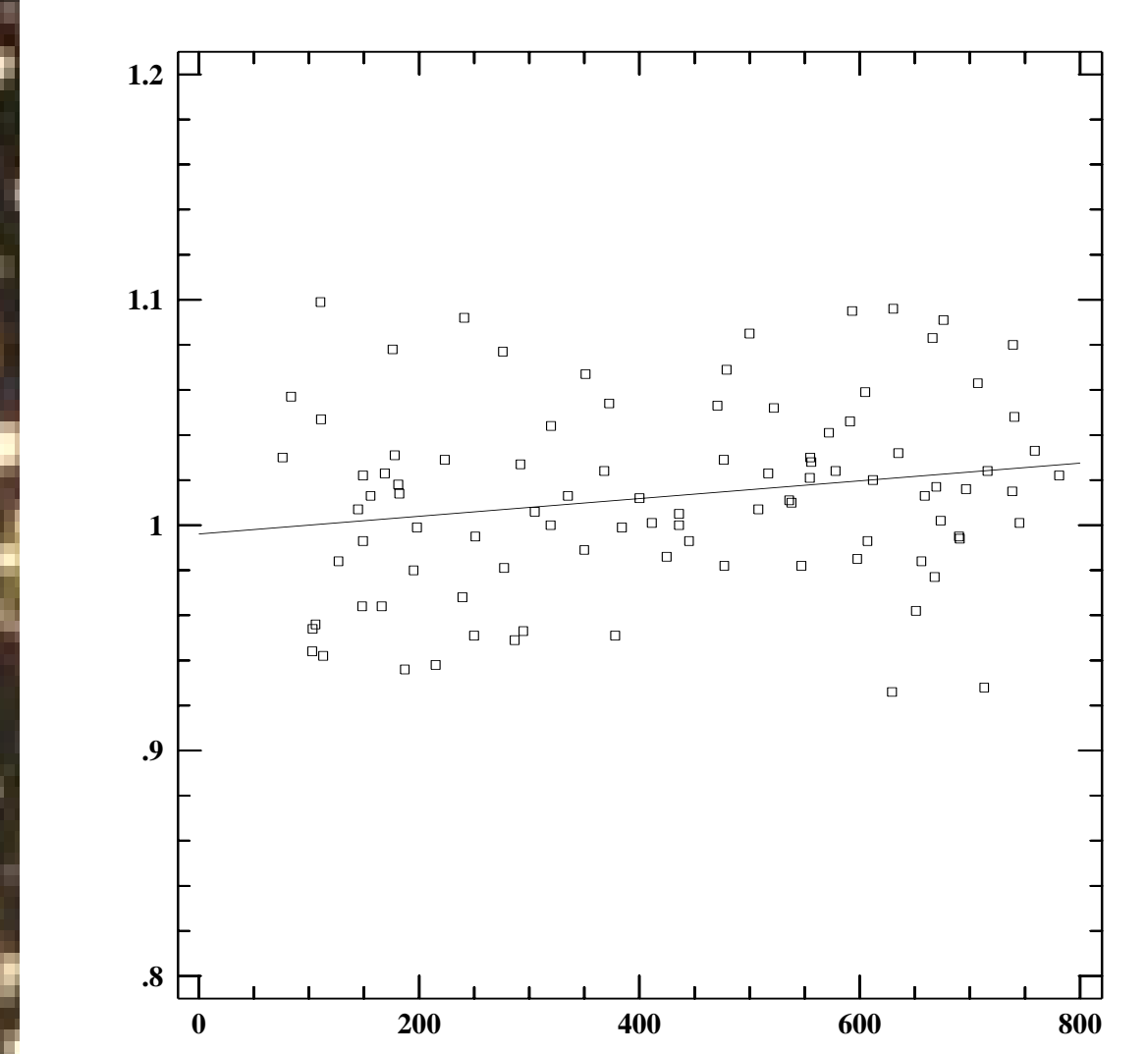
Charge Transfer Efficiency of WFPC2. Observations of Omega Cen have been used to characterize the Charge Transfer Efficiency (CTE) of the Wide Field and Planetary Camera 2 (WFPC2) onboard the Hubble Space Telescope. A set of formulae has been developed to correct aperture photometry for CTE loss with dependencies on the X and Y positions, the background counts, the brightness of the star, and the time of the observation. The observations indicate that for very faint stars on a very faint background, the CTE loss from the top to the bottom of a chip has increased from about 3% shortly after the cool-down of WFPC2 (April 23, 1994) to roughly 40% in February 1999. In general, typical WFPC2 exposures are much longer than these short calibration images, resulting in higher background which significantly reduces the CTE loss and minimizes the CTE problem for most science exposures. The full paper will be available in the December issue of PASP: B. Whitmore, I. Heyer, S. Casertano, 1999, "Charge-Transfer Efficiency of WFPC2", PASP, 111, 1559.



CTE Monitoring. We have developed a method to monitor the change in CTE over the lifetime of WFPC2. The method measures cosmic ray trails in dark frames resulting from the short time-scale trapping of charge. The counts in these trails show a strong dependence on the number of parallel transfers (i.e., Y pixel number), serial transfers (i.e., X pixel number), background, counts in the cosmic rays, and lifetime of the camera. This method offers a way to perform a monitor of X-CTE and Y-CTE without extra observing requirements (see above figure) and may provide more insight into the process of CTE.



Photometric Monitor. The standard star GRW+70D5824 is regularly observed to monitor photometric throughput. These observations, conducted since May 1994, indicate that the throughput for most filters has been stable to ~2%. However, the far-UV throughput in the PC appears to be increasing with time. This effect, seen in F160BW and F170W filter plots, is probably due to the slow outgassing of some contaminants. Note: the bi-modal appearance of the UV filters is due to the decontamination procedure, where the WFPC2 is warmed to approximately 20 degrees Celsius for 6-12 hours to remove the build-up of contaminants. High points indicate high-throughput measurements taken after decontamination.



Preliminary Results of the Noiseless Preflash Test. We report preliminary results from analysis of the WFPC2 noiseless preflash test data (program ID: 8450). The short 16 sec. exposures were analyzed for this report. (The long exposure observations of 80 and 400 sec. were lost due to guide star re-acquisition failure, HOPR 587 was filed against 8450, and a repeat has been approved.) The calibration lamp was used to preflash the wide field CCDs to about 2000 counts, and the preflash was read out before the start of the science observations. In principle, this might fill the CCD traps while introducing no noise in the science image (i.e. noiseless). Stars within the globular cluster Omega Cen (HD116790, NGC 5139) were positioned in the WF4, WF3, and WF2 apertures. Photometry of faint star images showed on average a 3.0+/-0.9% enhancement in the stellar counts (at Y=800) in the preflash exposures. This is consistent with the noiseless preflash giving only a partial reduction in CTE. The majority of the CTE effect must be due to traps which release their charge on time scales of less than two minutes.

OTFC - On The Fly Calibration.

Introduction

- Up to now, data are calibrated as they are received at STScI. Results are stored in the HST archive (DADS), and can be retrieved via Starview from DADS.
- OTFC calibrates data as it is requested by users from the HST archive, using latest calibration software, files, and recommended parameter values.
- CADC/ST-ECF developed an OTFC system (Crabtree, et al., 1996). OTFC at STScI requires high throughput capability and integration with existing data processing systems. In addition, it provides improved values to parameters (keywords) in archived datasets as they are determined by the instrument groups.

Motivations: Data Volume & Improved Calibration (Hanisch, et al., 1997)

- HST optical disk jukeboxes are full. Some data can be stored off-line and a transition to magneto-optic technology is underway, but there are limits.
- ACS will significantly increase the data flow rate.
- Data volume in the archive can be substantially decreased by storing raw data in compressed form and not storing calibrated data.
- Nearly all datasets can benefit from recalibration: improvements come from better calibration files, calibration parameters, and calxxx software.

Components and Dataflow (Lubow & Pollizzi, 1999)

- User interface (Starview or WWW) accepts and authenticates user requests.
- HST archive (DADS) provides raw data to OTFC and returns raw + calibrated data to users.
- Data cache holds all calibration files and some calibrated datasets.
- Exceptions system updates/adds to dataset keywords in DADS catalog.
- Bestref/bestswitch determines best calibration files & switches for each dataset.
- Getref/upref updates headers with proper calibration keywords and values.
- OPUS blackboards coordinate OTFC pipeline and calxxx (Rose, 1998).

Current Status: OTFC is now available for WFPC2 and STIS

- For more details, see the top-level STScI page (<http://www.stsci.edu/>) or the WFPC2 instrument page (http://www.stsci.edu/instruments/wfpc2/wfpc2_site.html).
- Support for NICMOS and ACS is planned for the future.

References

WWW
<http://www.stsci.edu>
<http://archive.stsci.edu/>
http://www.dpt.stsci.edu/otfc/external/otfc_index.html

Crabtree, D.R., Durand, D., Gaudet, S., Hill, N., and Pirenne, B. 1996, "The CADC/ST-ECF Archives of HST Data: Less is More", Astronomical Data Analysis Software and Systems V, A.S.P. Conference Series, Vol. 101, George H. Jacoby and Jeannette Barnes, eds., p. 505

Hanisch, R.J., Abney, F., Donahue, M., Gardner, L., Hopkins, E., Kennedy, H., Kyrianiou, M., Pollizzi, J., Postman, M., Richon, J., Swade, D., Travisano, J., and White, R. 1997, "HARP: The Hubble Astronomical Data Analysis Software and Systems VI, A.S.P. Conference Series, Vol. 125, Gareth Hunt and H. E. Payne, eds., p. 294

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Rose, J. 1998, "OPUS-97: A Generalized Operational Pipeline System", Astronomical Data Analysis Software and Systems VII, A.S.P. Conference Series, Vol. 145, R. Albrecht, R.N. Hook and H.A. Bushouse, eds., p.344

References to published results of the data discussed in this poster are available in a handout. If there are no handouts to be found beneath this poster, please ask at the STScI booth. At the booth we also have limited copies of the Drizzling Cookbook, the WFPC2 Handbook Update, and the CTE paper.