UCAC3 is coming!

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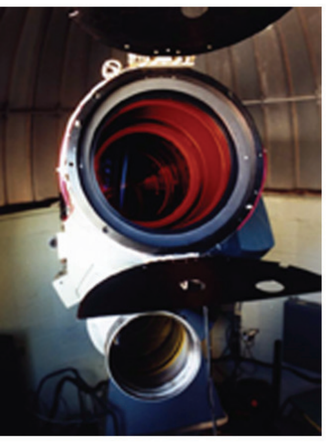
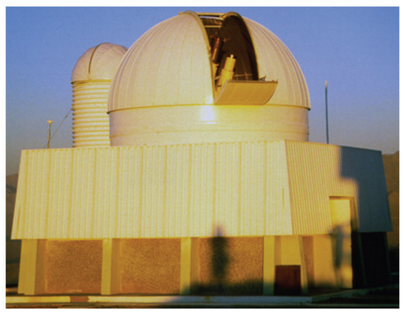


US Naval Observatory CCD Astrograph

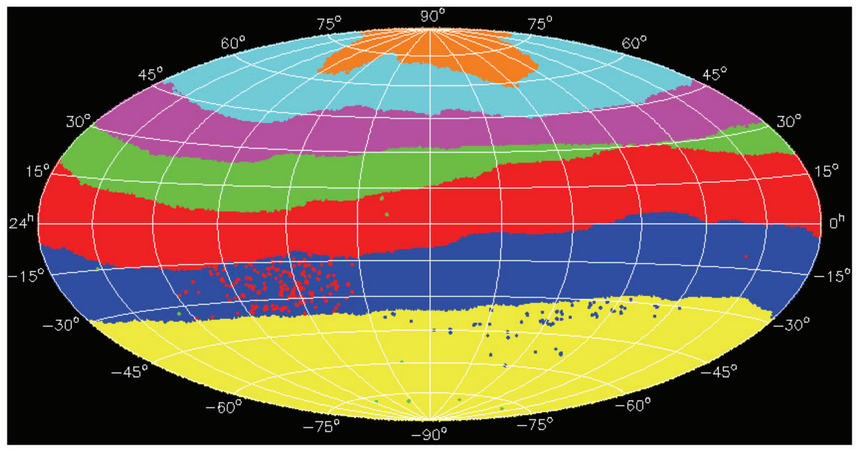
The telescope is a twin astrograph with 2 tubes mounted in parallel on a Boller & Chivens mount. Originally it carried a blue corrected lens and a visual bandpass corrected lens. The "blue lens" was replaced by a new "red lens", which is described in the following table. The CCD camera for our project is mounted behind the red lens. The visual lens is used for guiding with an ST-4 autoguider on an x,y slide, capable of moving in a 2 degree field of view.

Clear aperture	206 mm
Focal length	2057 mm
Plate scale	100 ″/mm
# lens elements	5
Spectral bandpass used	579 – 643 nm
Pixel scale	0.9 ″/px
Usable flat field of view	9 degree



The astrograph dome before sunset at Cerro Tololo, Chile, January 1998.

The astrograph back door at Naval Observatory Flagstaff Station.



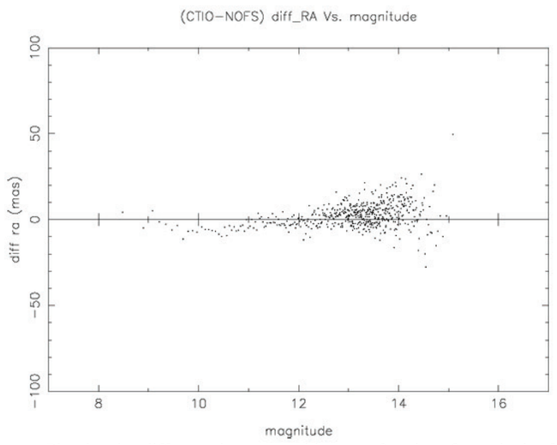
Color plot showing the yearly progress of survey fields taken with the astrograph from bottom (yellow, 1998) to top (orange, 2004).

Abstract

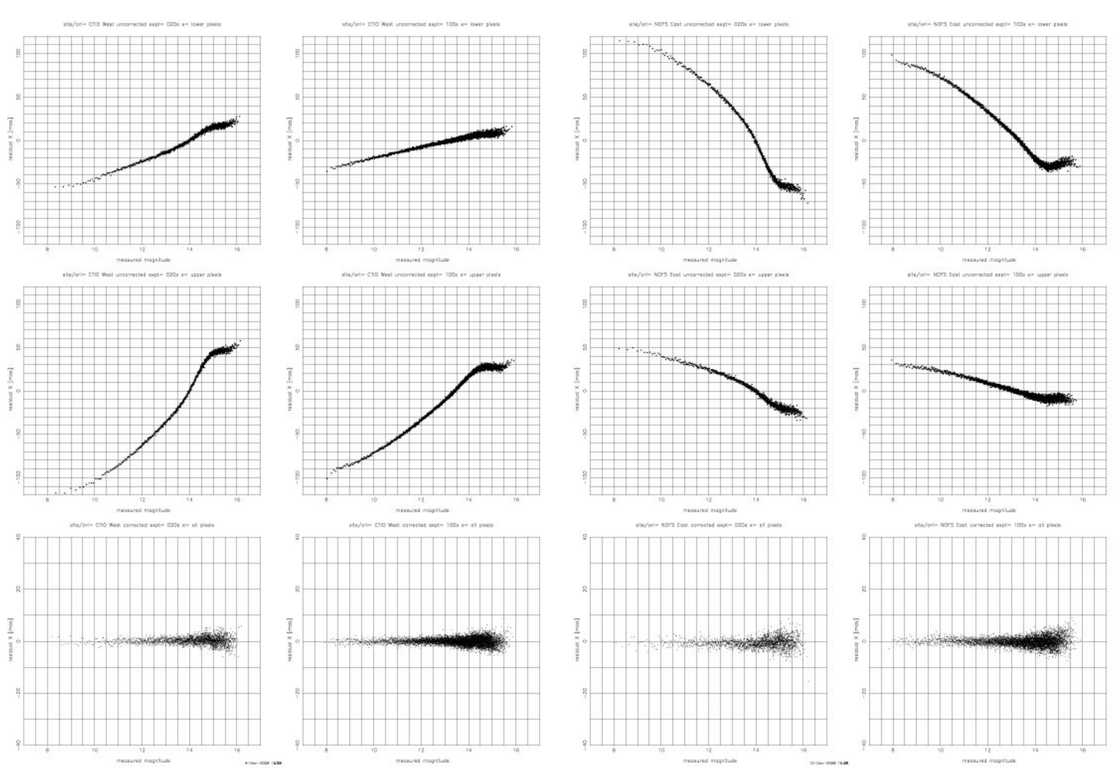
All sky observations of the USNO CCD Astrograph Catalog were completed in 2004. The final data release, UCAC3, will become available in 2009. A complete re-reduction of the pixel data (over 250,000 frames taken at Cerro Tololo and Naval Observatory Flagstaff station) has been completed in March 2008. The Two Micron All Sky Survey (2MASS) is used to probe the UCAC data for systematic errors. The Tycho-2 stars are used as reference frame for the final reductions and ICRF QSOs are utilized for the extragalactic reference frame link of UCAC3.

UCAC3 will go slightly deeper than UCAC2 and will have improved astrometry and photometry for about 80 million stars in the R = 8 to 16 mag range. In addition to the early epoch data used for the UCAC2 proper motions, UCAC3 utilizes about 5000 astrograph plates with previously unpublished positions as well as a complete re-reduction of the NPM and SPM first epoch data to lower the systematic errors of UCAC3 proper motions significantly.

Minor planets and high proper motion stars have been identified. Double stars have been detected and properly fit. UCAC3 will be a compiled catalog of mean positions and proper motions, similar to UCAC2, however individual epoch observations of stars as well as processed images (pixel data) could be made public after the catalog release.

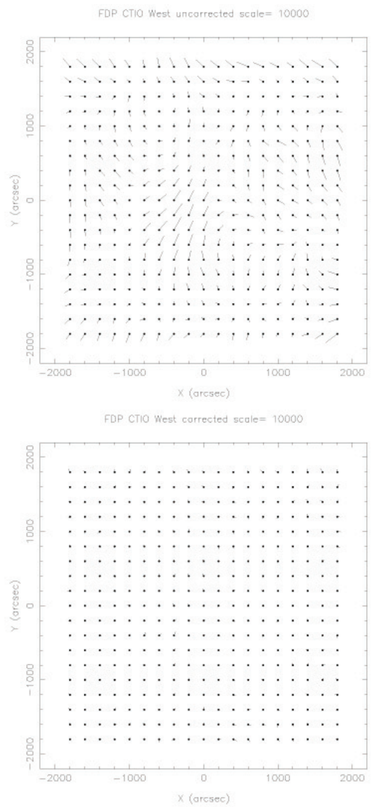


Plot showing difference in mean positions as a function of magnitude of CTIO and NOFS data using 1400 overlap fields.

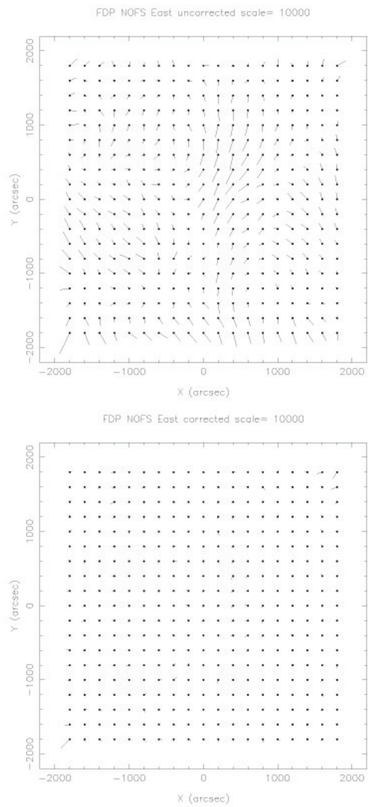


This plot shows the CTE effect of the 4k Kodak CCD. Data shown here is from CTIO using the West orientation with a binning of 5000. In this plot you can see how the systematic errors depend on exposure time and position on the CCD chip as a function of magnitude. The left column shows the 20s and the right column 100s exposures. Top row is the uncorrected data from the left side of the chip and the middle row from the right side as a function of x. Bottom row shows the corrected data for each case using the entire chip. Other dependencies come from orientation of the camera and telescope, and FWHM (seeing). There is also a difference between CTIO and NOFS data (see Figure to the right).

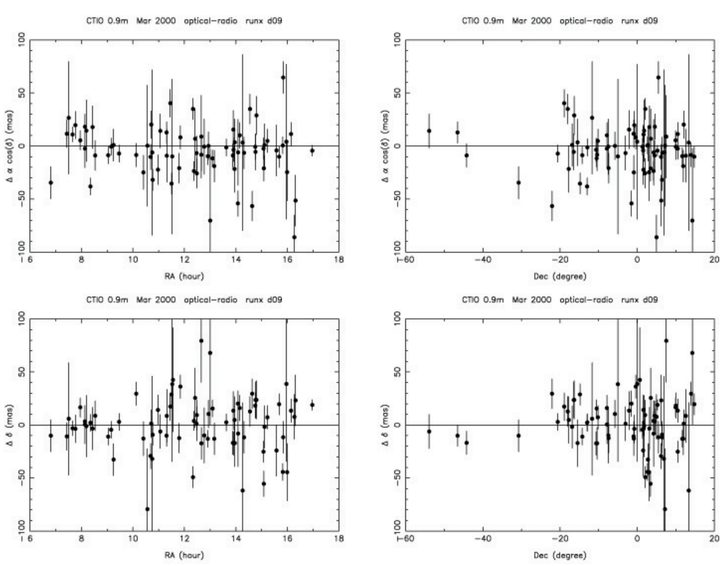
Same as the CTIO CTE plot to the left but from fields taken at NOFS using the East orientation.



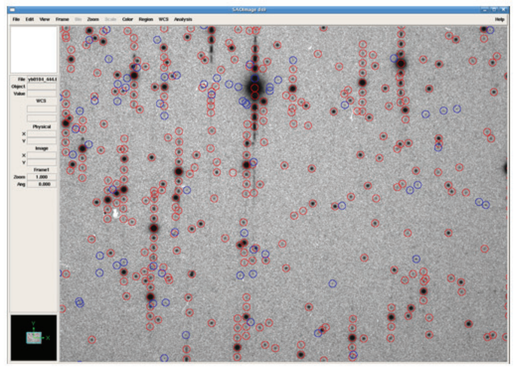
Field distortion pattern using fields taken from CTIO in the West orientation. Top plot shows the uncorrected FDP with largest effects seen at roughly 20 mas. Bottom plot shows the FDP after corrections are applied.



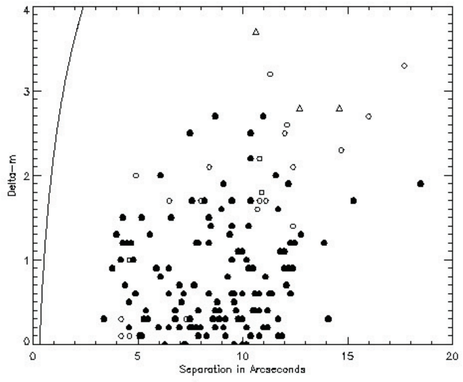
Same as CTIO FDP plot to the left, but using fields taken from NOFS in the East orientation. Largest effects seen in the top plot are roughly 40 mas.



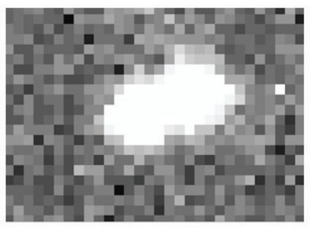
Plot showing the difference in optical and radio position of quasars. This sample shows results from 1 out of 14 observation runs with the CTIO 0.9 meter telescope.



Sample area of an SPM plate. These pixel data are from the PMM scans. Reductions are now performed for UCAC3 in collaboration with Yale University.



Plot showing separation and delta magnitude parameters for all measured pairs. In this diagram, filled circles are those which are measured and of adequate quality for comparison with UCAC3 separation measures. Open circles (ok) and triangles (weak) are those which are adequate for confirmation only.



UCAC3 doubles have been successfully fit with newly discovered systems that have already been confirmed using the USNO 26 inch telescope. The majority of the UCAC3 new discoveries are too faint for the 26 inch Speckle Program.

References

http://www.usno.navy.mil

Acronyms

2MASS	Two-Micron All Sky Survey
CTE	Charge Transfer Efficiency
CTIO	Cerro Tololo Inter-American Observatory
FDP	Field Distortion Pattern
NOFS	Naval Observatory Flagstaff Station
NOMAD	Naval Observatory Merged Astrometric Dataset
NPM	Northern Proper Motion Survey (Lick)
PMM	Precision Measure Machine
SPM	Southern Proper Motion Survey (Yale / San Juan)
UCAC	USNO CCD Astrograph Catalog