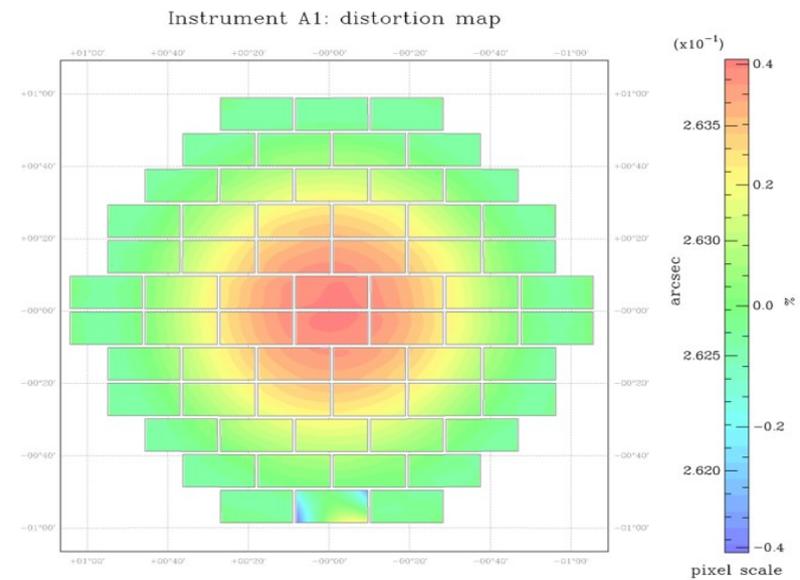


Astrometry Update

Texas A&M DES Collaboration Meeting

Dec 12, 2012



Brian Yanny
Fermilab

Requirements:

Relative Astrometry: 100 mas (R-4)

Absolute Astrometry: 100 mas (R-14)

**Differential Chromatic Refraction:
100 mas in
adjacent filters (R-15)**

Which reference catalog to use?

USNO-B1: Goes deep, all sky coverage.
Systematic errors of 400 mas in places

2MASS: Goes fairly deep, all sky coverage.
Optical/IR filter mismatch may be
problem for u,g,r DCR?

SDSS-R6,7,8: Goes deep, coverage only around
equator (nothing with dec < -15 deg)

UCAC-4: Goes not so deep, all sky coverage.
Sufficient overlap with u-band?

Two ways to run Scamp > v2.0v4 from E. Bertin's

Astromatic suite:

[How to do it:](#)

1. “Simultaneous exposure mode” (run one-time or seasonally)

Feed in sextractor catalogs of stars in N overlapping DECam exposures. Feed in initial guess CRPIX1/2, CD1/2_2/1. Allow Fourth order focal plane distortion Model. Set Stability_Type is Instrument.

Use to get best relative/internal errors (< 30 mas) and output PV-term (higher order term) .ahead file for solving single Exposures (below). OK to mix/match filters.

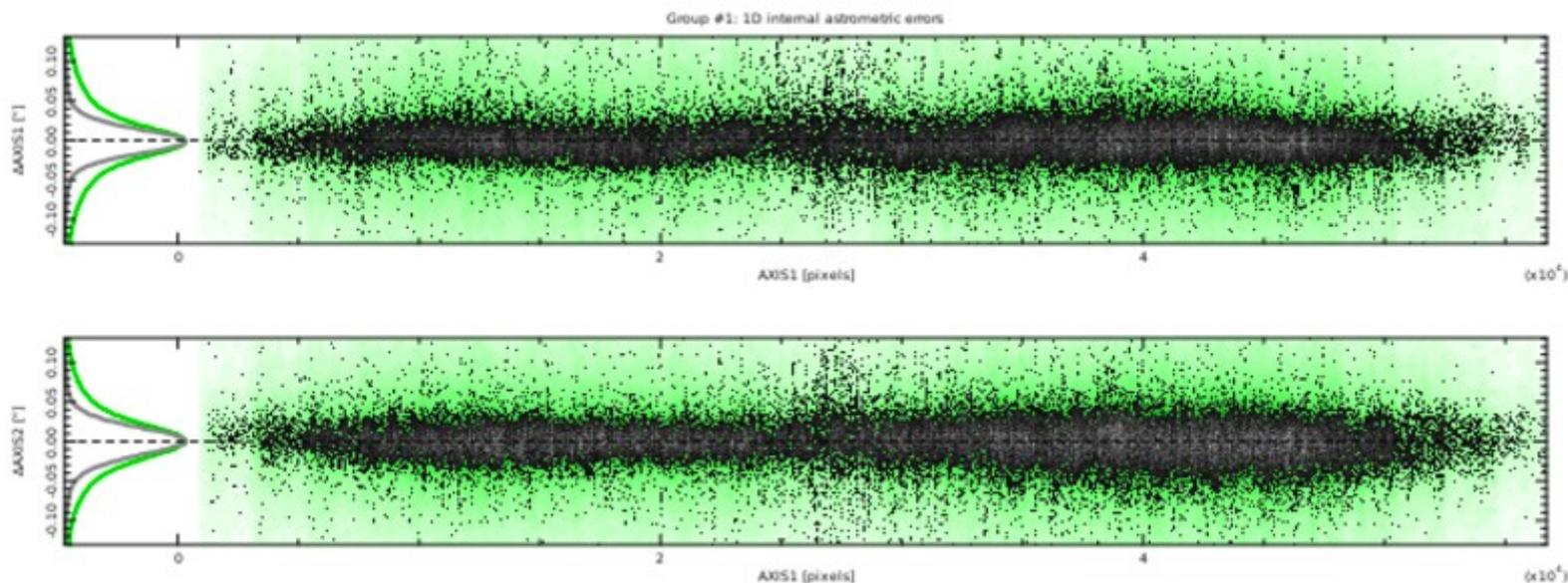
2. “One exposure at a time mode” (nightly data processing)

Feed in sextractor catalog of stars (61/62 chips) of one exposure. Include PV.ahead solution from above.

Match to UCAC-4 ASTREF catalog. Set Stability_Type PRE-DISTORTED. Obtain < 150 mas Absolute vs. catalog RMS in each of x,y.

Internal (multi-exposure solution) by E. Bertin:
(working on N=38 Orion field overlapping g,r,i,z exposures

**Mode
#1**

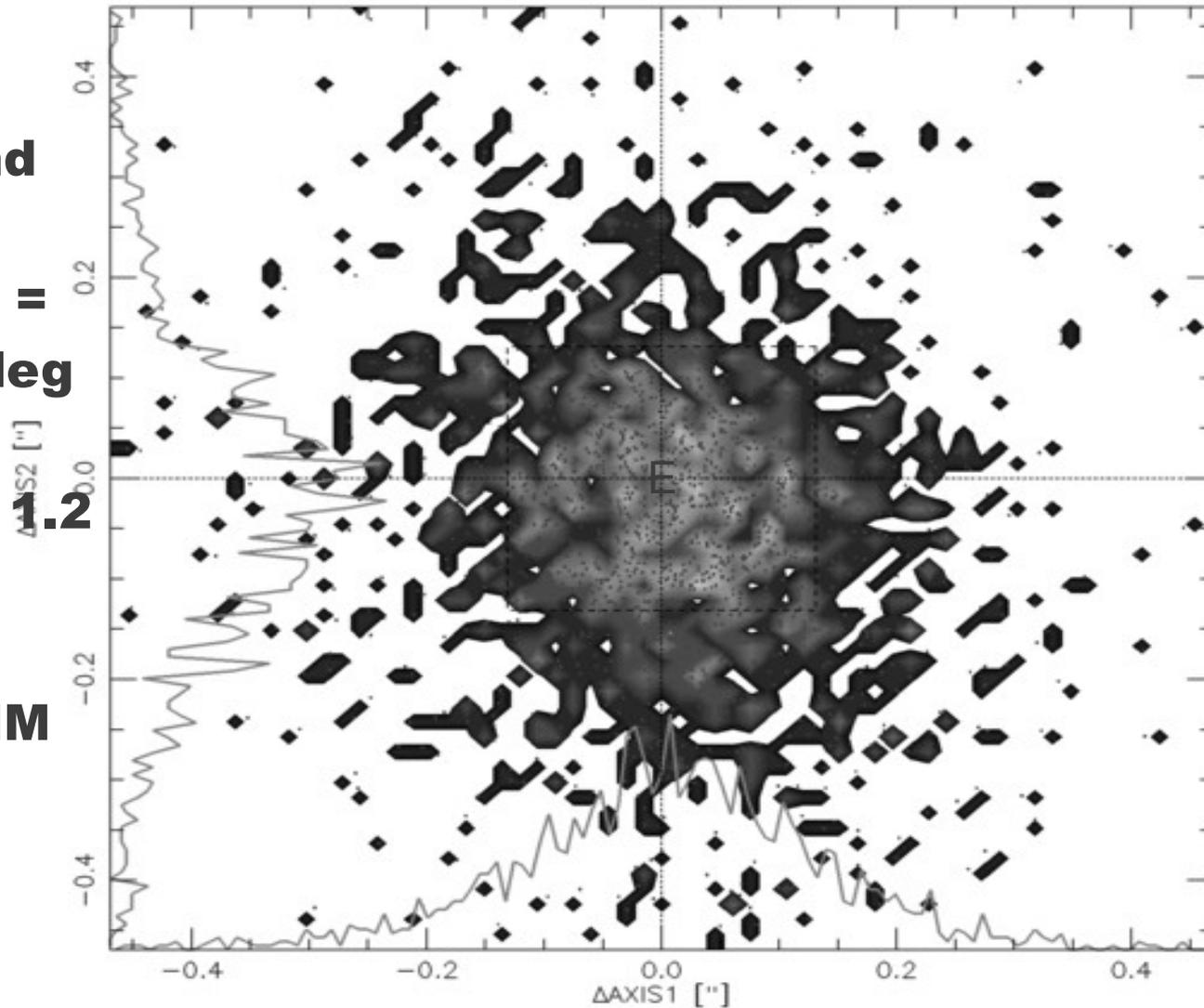


20 mas(!) internal errors for overlapping exposures (difference in positions for same star Detected in different exposures).

Degree of distortion: 4 (see Bertin doc)

Mode #2

Group #1: 2D reference astrometric errors



Exposure:
159522

90s r-band

(RA,DEC) =
(72,-63) deg

Airmass: 1.2

Seeing:
1.1\" FWHM

Ellip avg:
0.09

Astrom x-rms: 132 mas y-rms: 156 mas

**Single
Exposure
Running
Of SCAMP.**

**External
Absolute
Errors**

vs.

UCAC-4:

150 mas.

**Uses:
premade
PV term file.**

**What about the absolute ~100 mas requirement?
Can we meet it?**

Hopefully by getting relative solution down to few mas and using UCAC and covering a large area with many simultaneous exposures, we can reach absolute requirement, however this hasn't been demonstrated yet.

**Summary: Relative, Chromatic errors met.
Plenty good to start survey.
Absolute fine for coadds (150 mas rms)
Want to improve for full release, coadds
Supernovae, proper motions.**