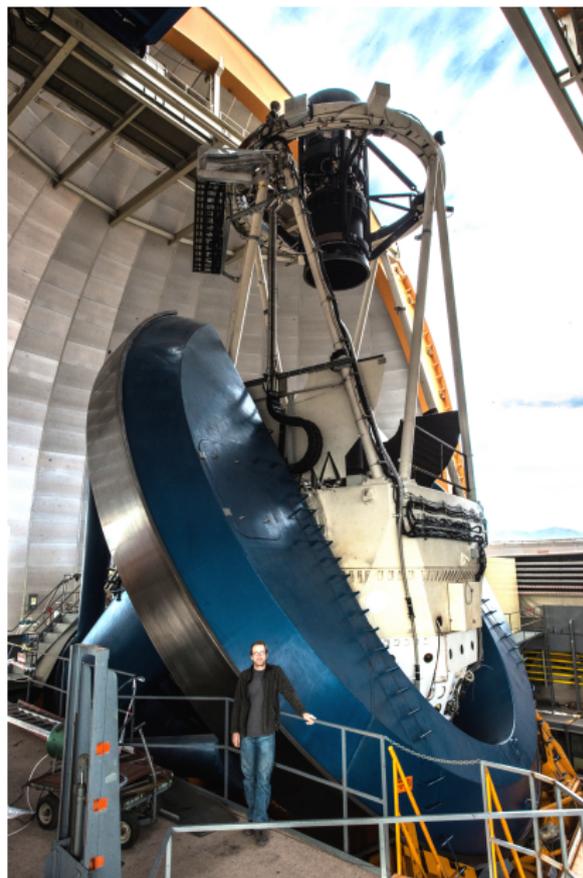
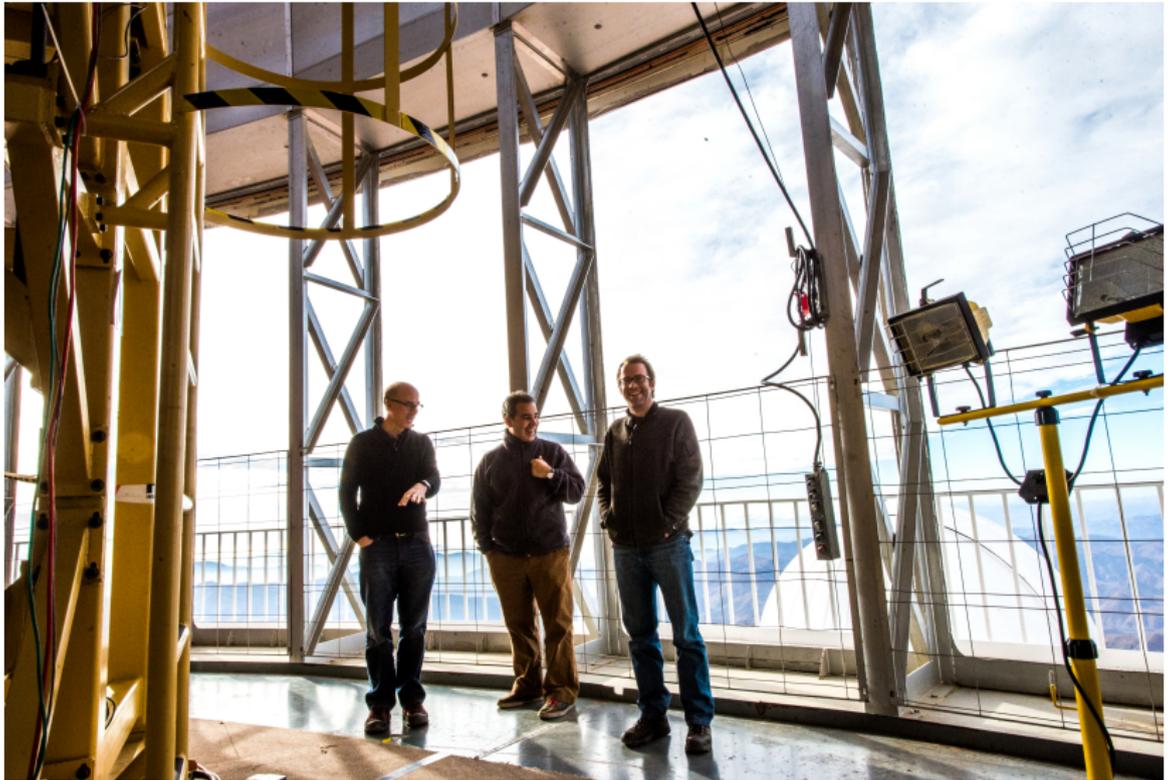


Dark Energy Survey (DES)

- Imaging survey of 5000 square degrees in the southern sky (CTIO) through 5 optical filters.
- Study Dark Energy using weak lensing, galaxy clusters, supernovae and large scale structure.
- First Light Fall 2012
- Survey Start Aug. 31 2013
- Erin Sheldon **associate member and builder**; data rights for himself, postdoc, students.
- Anders Plazas postdoc working on characterization of detector effects and weak lensing.



Oct. 2013 DES Observing Run



Sept. 2013 DES Observing Run

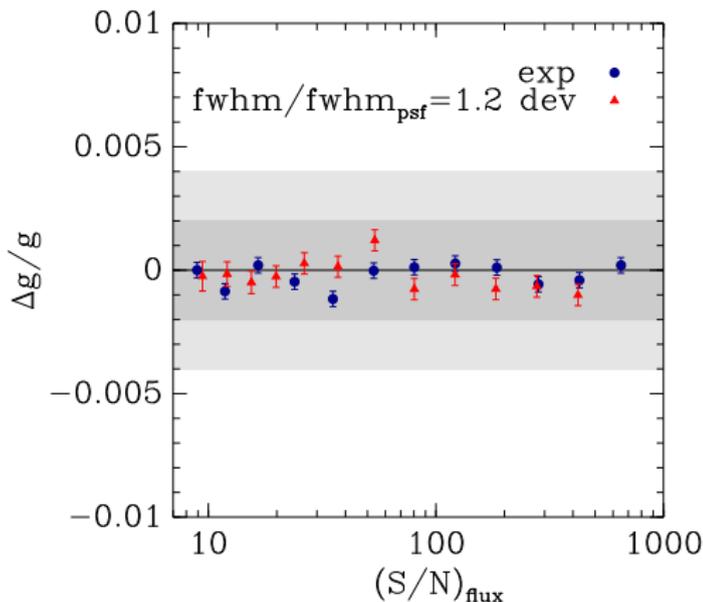


DES Contributions from Erin Sheldon

- DES data is multi-epoch: the same area of sky is observed multiple times during the survey. Early data has ~ 10 epochs. Optimal processing for lensing involves a full joint fit to all data, no coadding.
- Erin Sheldon built infrastructure to facilitate transparent processing DES multi-epoch data. All lensing pipelines now use this infrastructure.
- Erin Sheldon is finalizing a Bayesian shear measurement pipeline, based on recent theoretical developments (Bernstein & Armstrong). This method meets DES requirements for lensing calibrations (and indeed LSST as well). See next slide. This pipeline is running on DES data.
- Erin Sheldon and Peter Melchior built the “Exposure Checker”, a *crowdsourcing* project that allows scientists to examine exposures from DES on the web, mark them for defects (or awesomeness), and easily report findings.

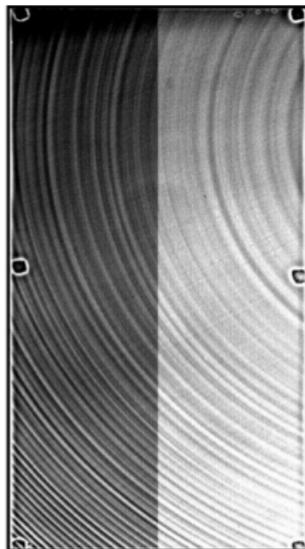
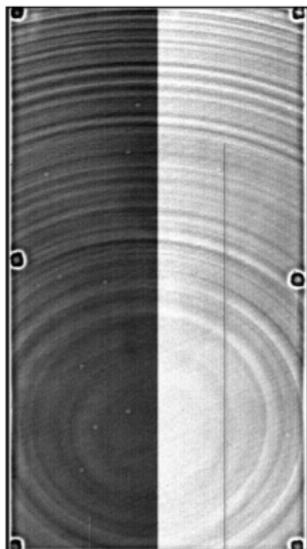
Bayesian Lensing Shear Measurement

- Figure: Fractional error in the shear for simulated galaxies (exp,dev profiles) near smallest usable *observed* size $\text{fwhm}/\text{fwhm}_{\text{psf}} = 1.2$.
- Light Grey: DES requirements
- Dark Grey: LSST requirements



Implementation of recent theoretical work by Bernstein & Armstrong.

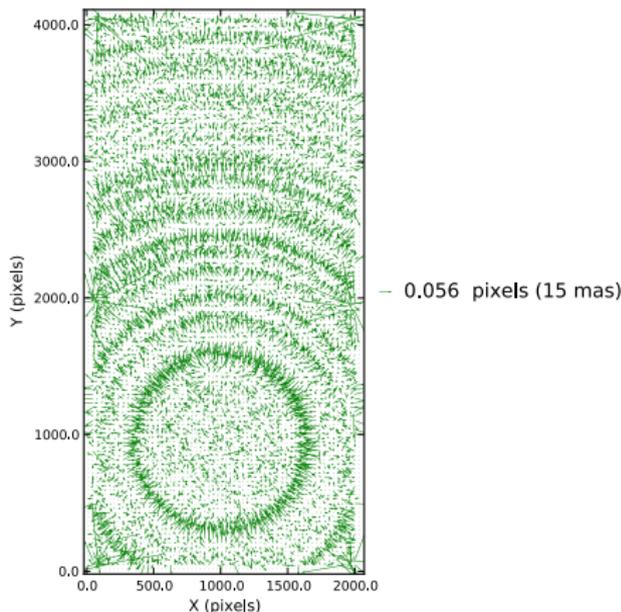
DES Detector Characterization: Andres Plazas



Tree rings and tape bumps in a flat field image.

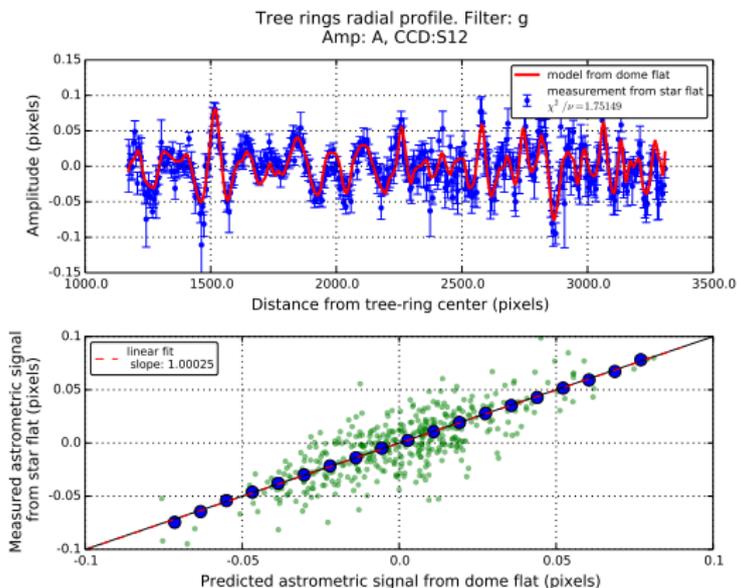
DES Detector Characterization: Andres Plazas

- Tree-rings are features in the CCDs that occur during fabrication. Variations in doping produces a spurious transverse electric field, changing the effective location and area of each pixel.
- In typical image reduction the data are divided by these calibration frames, but this is incorrect : our measurements indicate this introduces large systematic errors.
- We measure these instrumental signatures and produce models that fit the data well.



Astrometric residuals from polynomial model caused by the “tree rings”.

DES Detector Characterization: Andres Plazas



- Astrometric residuals binned in radius from center of tree ring.
- Prediction from model fit to the flat field matches well.