Community Access Time and Visibility Calibration

Gail Schaefer

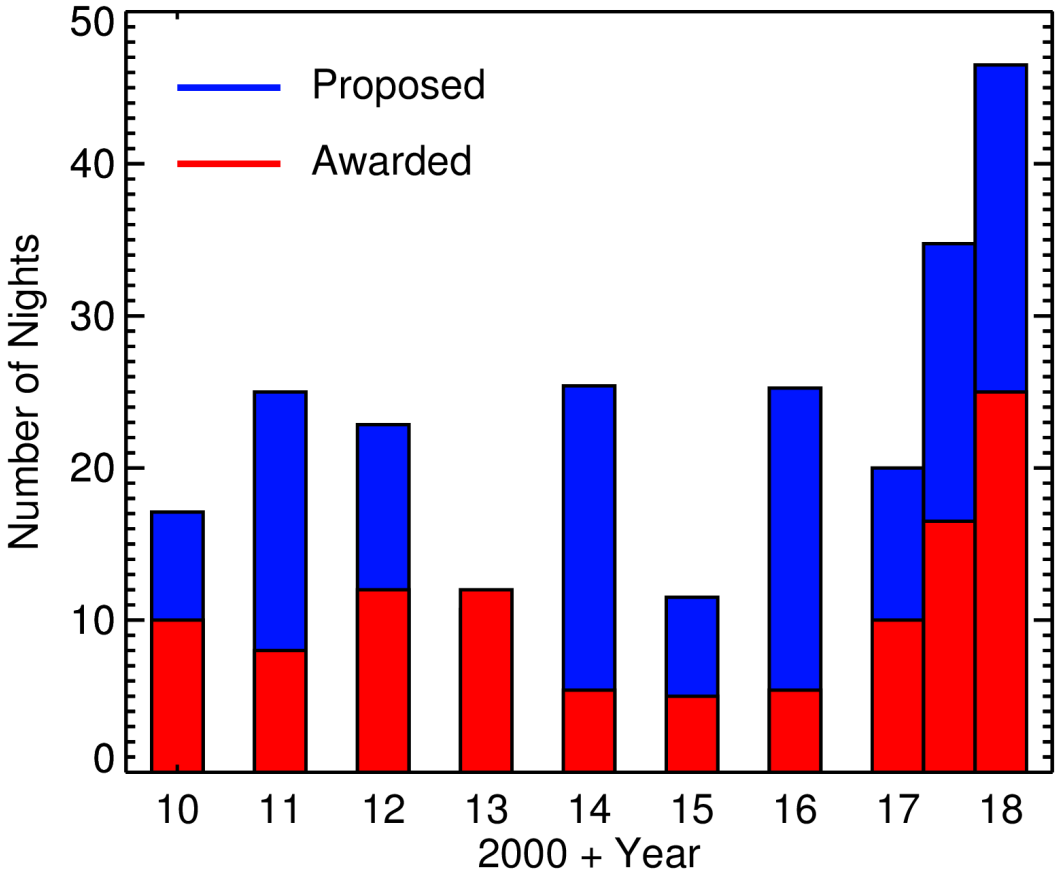
The CHARA Array of
Georgia State University

Mount Wilson, CA

Open Access Time at CHARA

- Initiated an open access program at CHARA
  - Supported by NSF/MSIP award
- Community access to telescope time
- Provides 50 nights/year over next four years
- Time allocated through NOAO TAC:
  - Proposals due at the end of March and September
  - Next deadline is April 2 (for time in Aug-Dec)
- User-friendly database of archival data
  - Jeremy's talk yesterday

Open Access Time at CHARA



Average over-subscription rate ~ 2.2

Community Access Statistics

- 2017B
  - 6 accepted proposals (low mass stars, exoplanet hosts, binaries)
  - 4 PI's former CHARA consortium members at new institutions
  - 2 PI's new to CHARA
- 2018A
  - 9 accepted proposals (low mass stars, exoplanet hosts, binaries, novae)
  - 4 PI's former CHARA consortium members at new institutions
  - 5 PI's new to CHARA

Support for Community Access Programs

- Visitor Support Scientist: Gail Schaefer
- Data Scientist: Jeremy Jones
- Observational Assistance: Chris Farrington, Robert Klement, Norm Vargas, Olli Majoinen

- Provide help with planning and taking observations
- Provide calibrated OIFITS files

While processing data for an NOAO program that used CLASSIC .....

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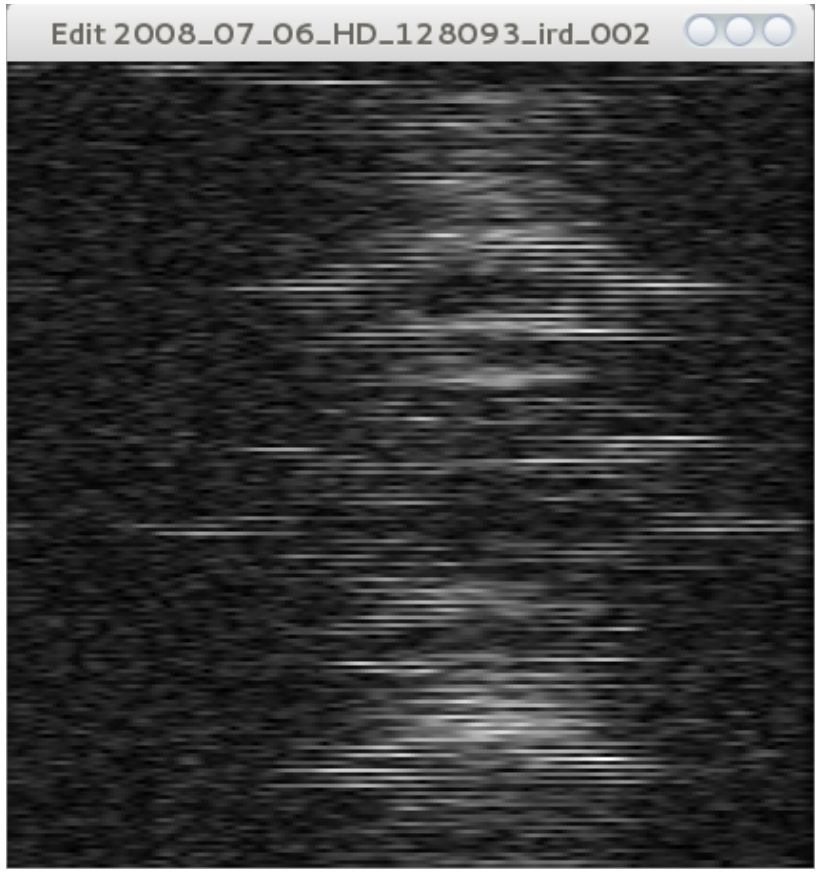
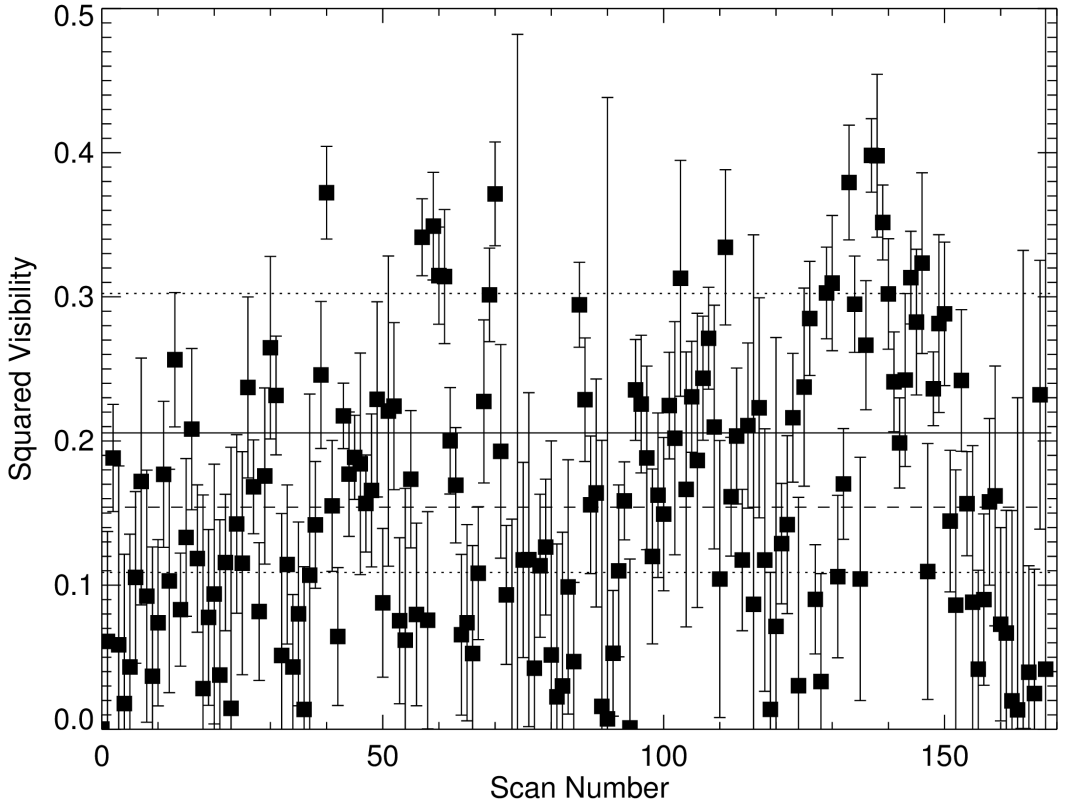
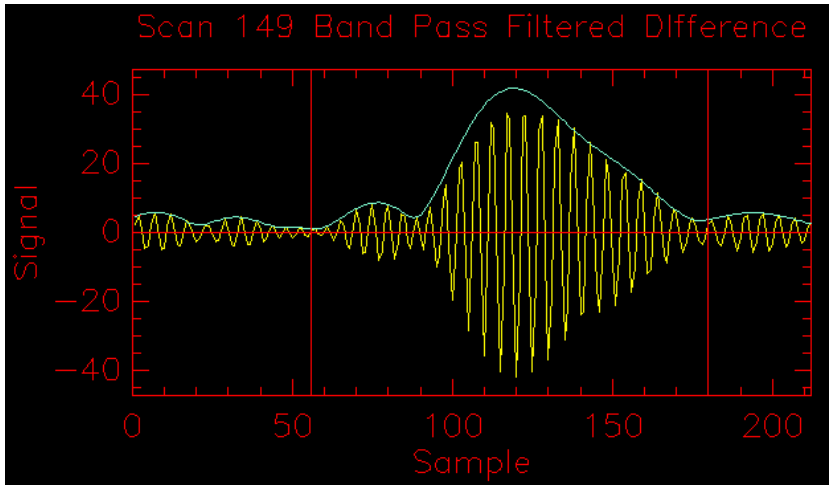
Started looking into different methods for calculating visibilities. Used sample data on HD 128167 (Boyajian et al. 2012).

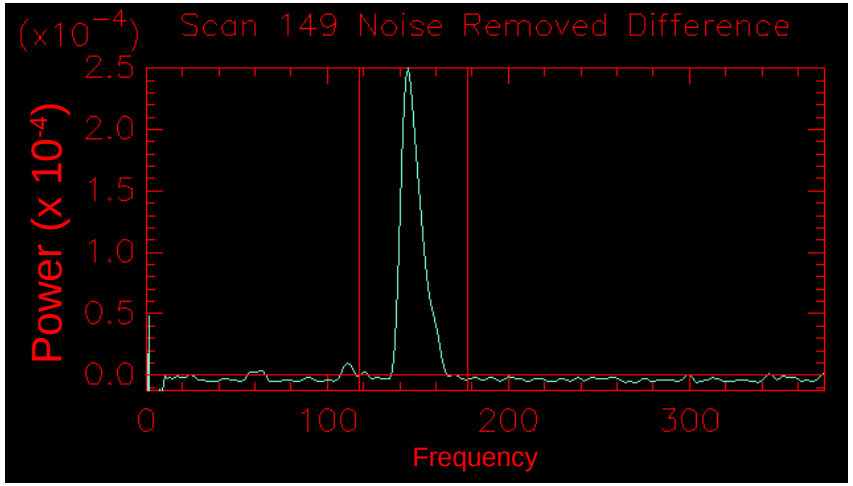
For a single observation…



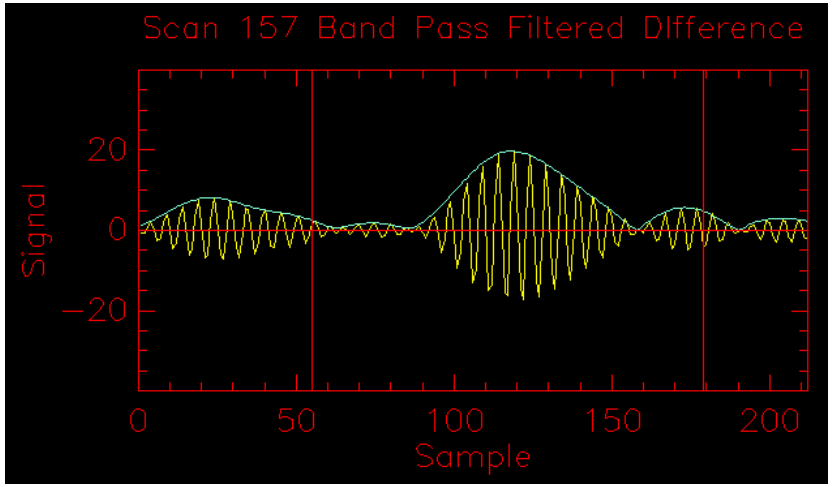


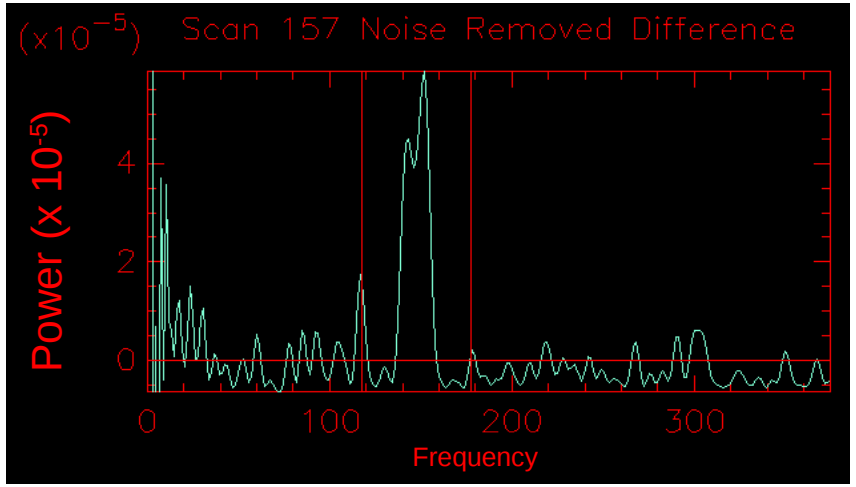
Fringe Weights





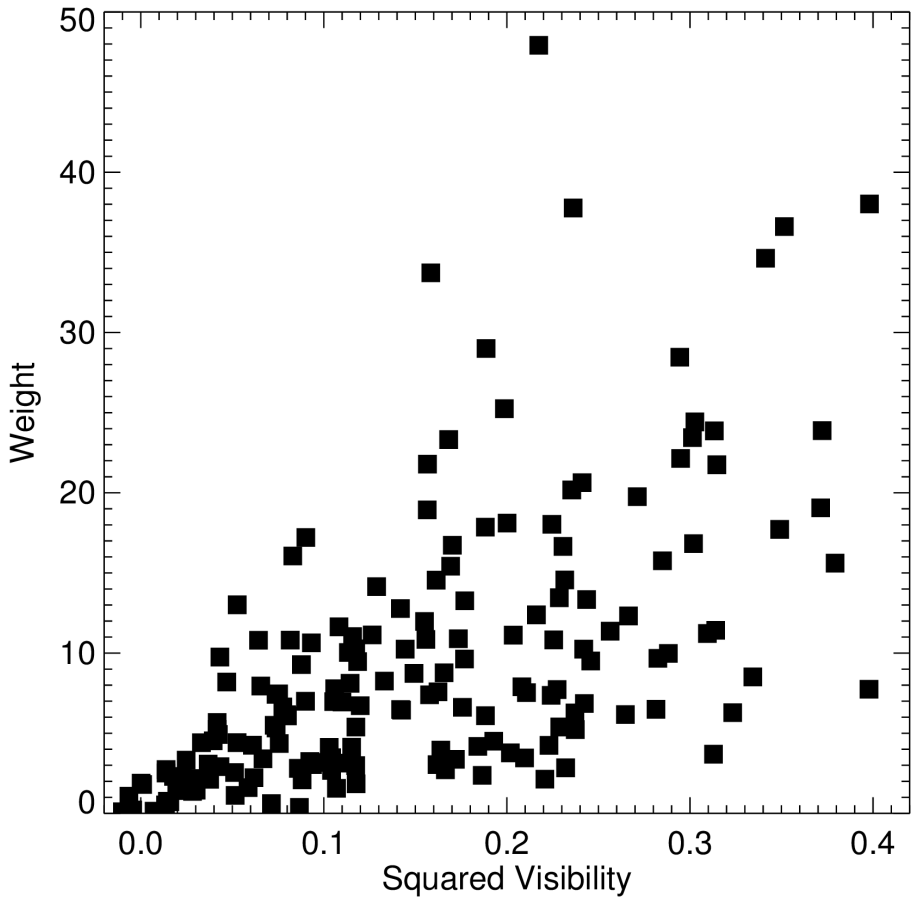
High Weight
$V^2 = 0.31$
w = 22





Low Weight
$V^2 = 0.07$
w = 8

Weight vs. Visibility



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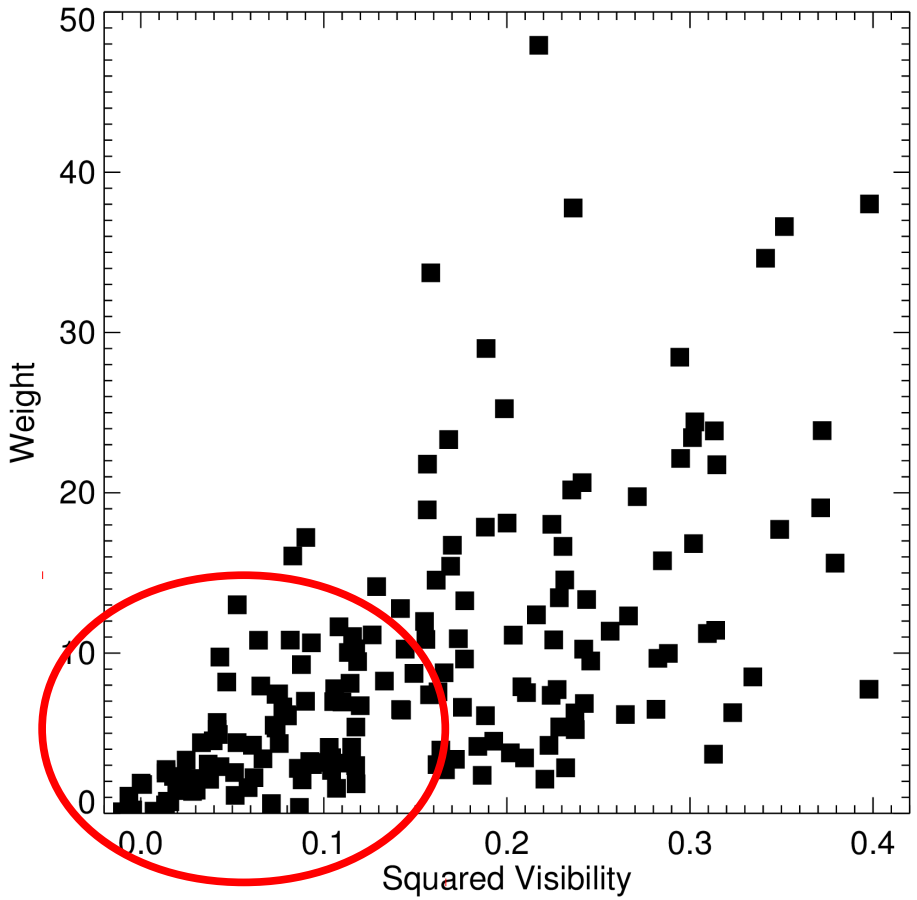
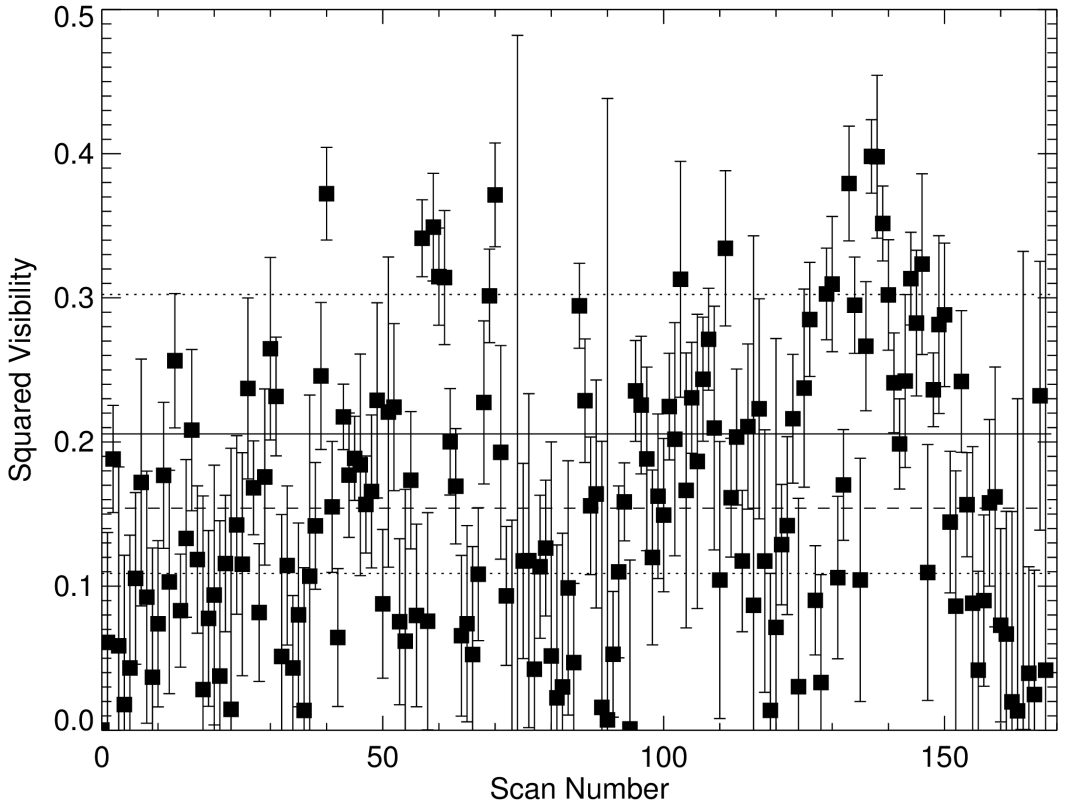
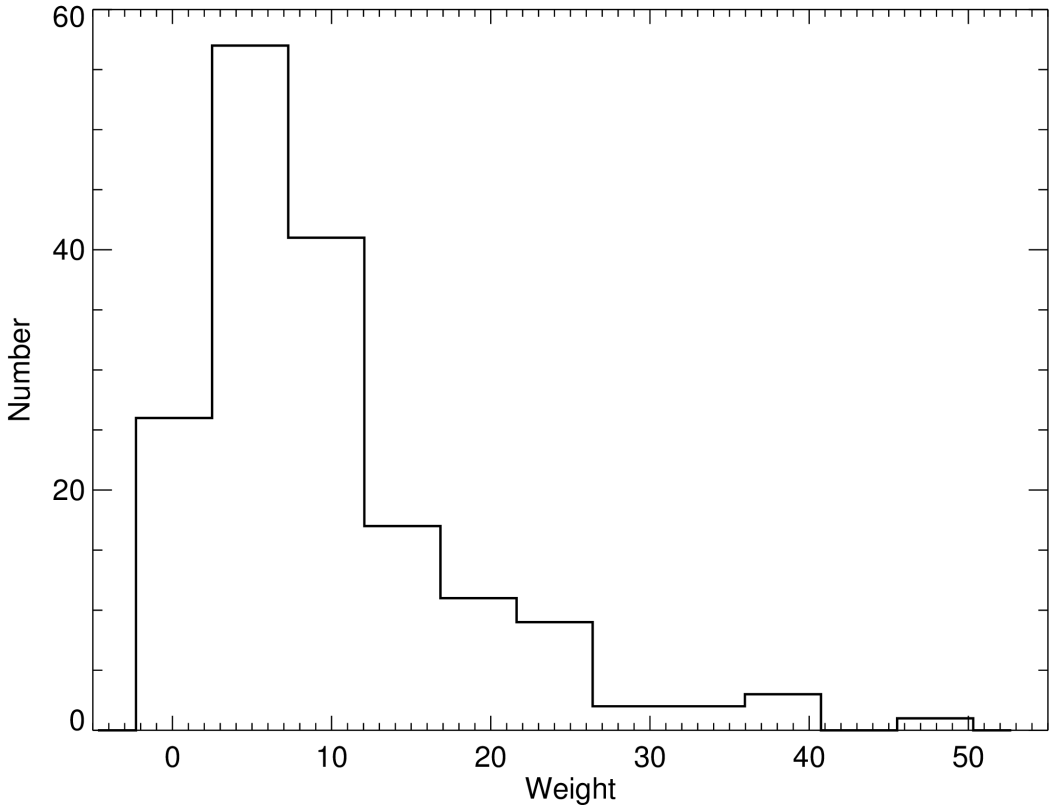


New Strategy for redfluor: Compute Weighted Means





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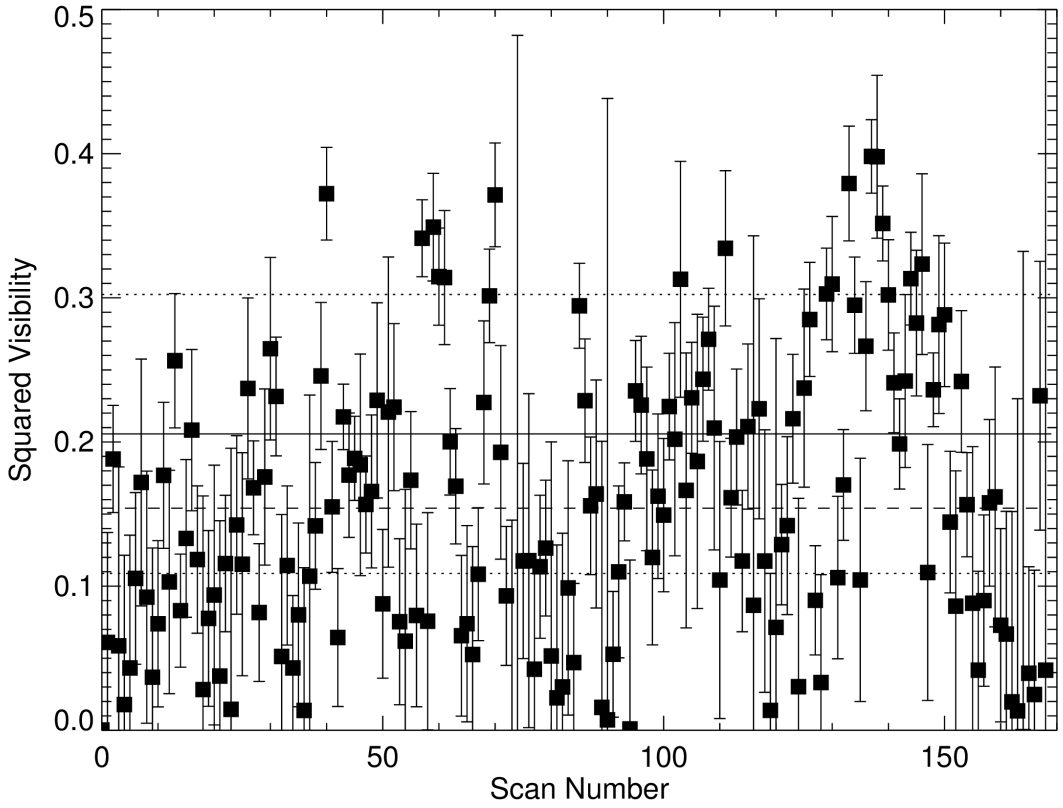

- Edit scans by fringe weight
  - E[min_weight]
  - Risk of biasing data
- Number of standard deviations for outlier removal
  - o[n_sigma]

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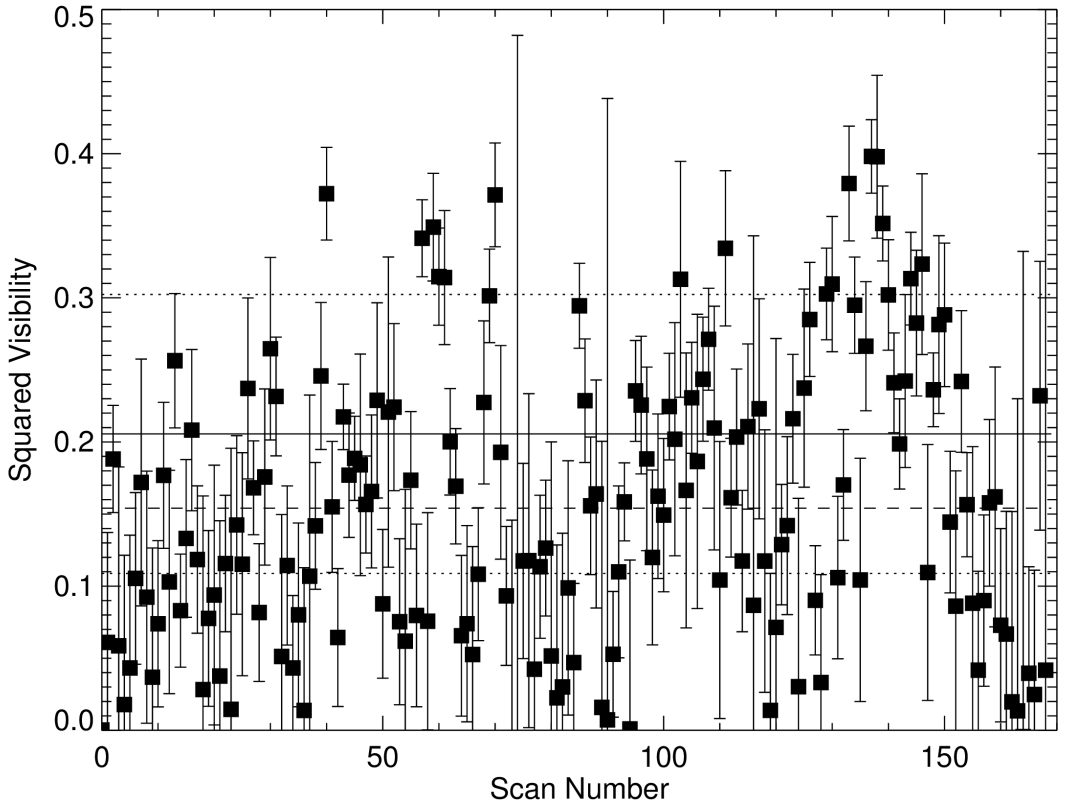

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  - Turn off using -M flag

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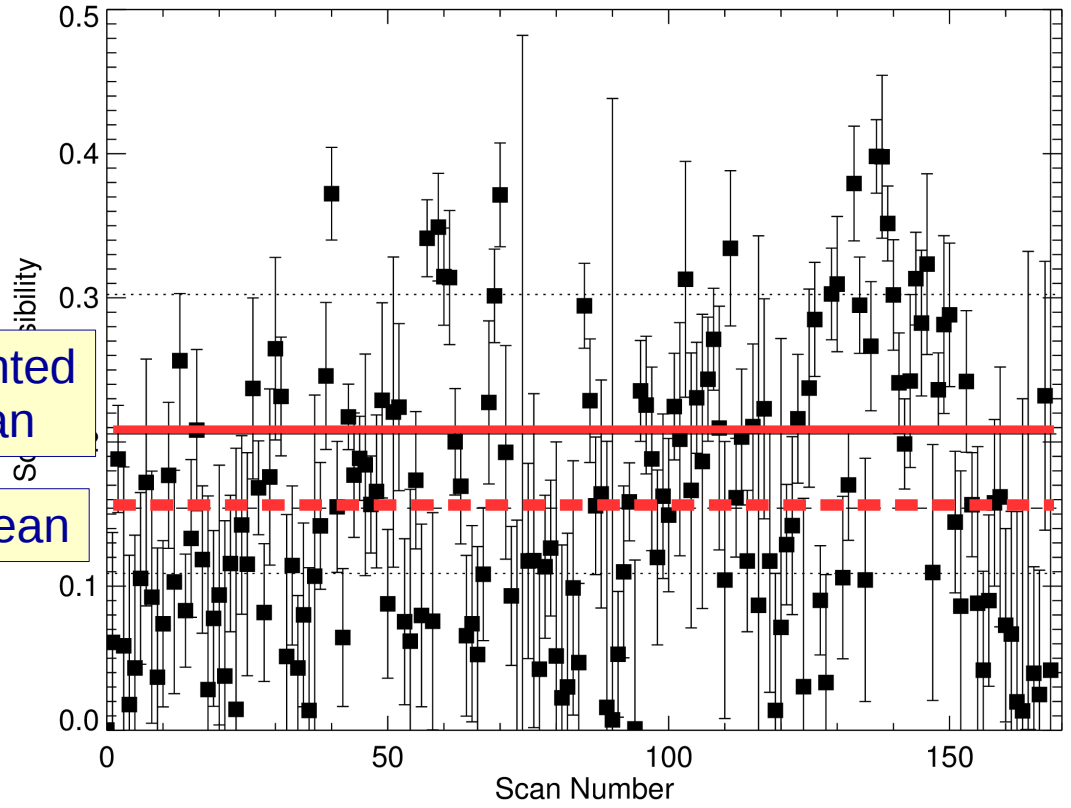

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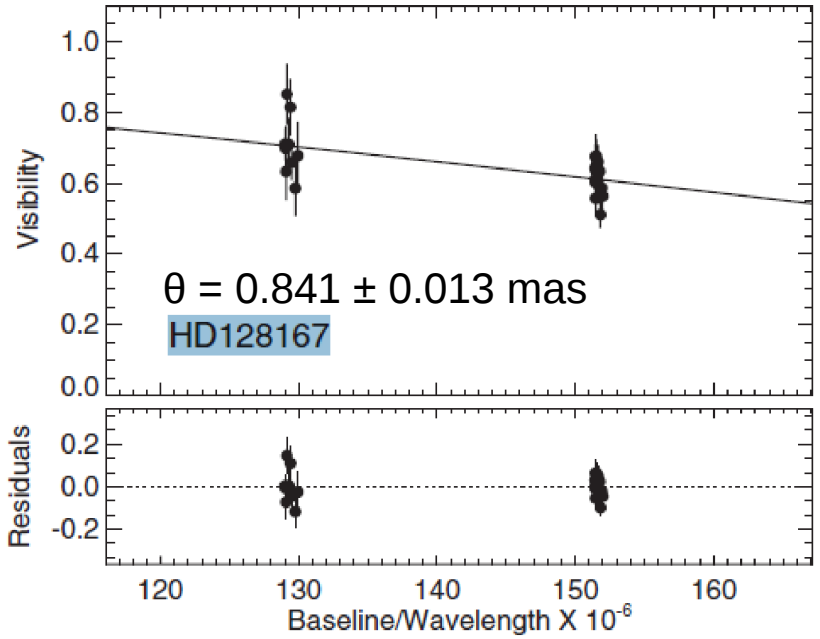
Comparison of Results

Analysis from Boyajian et al. (2012)



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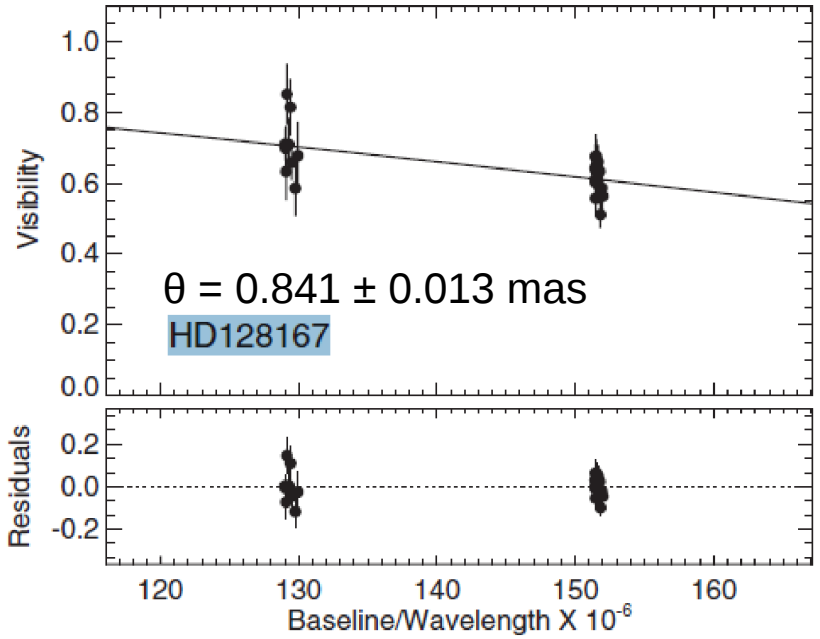
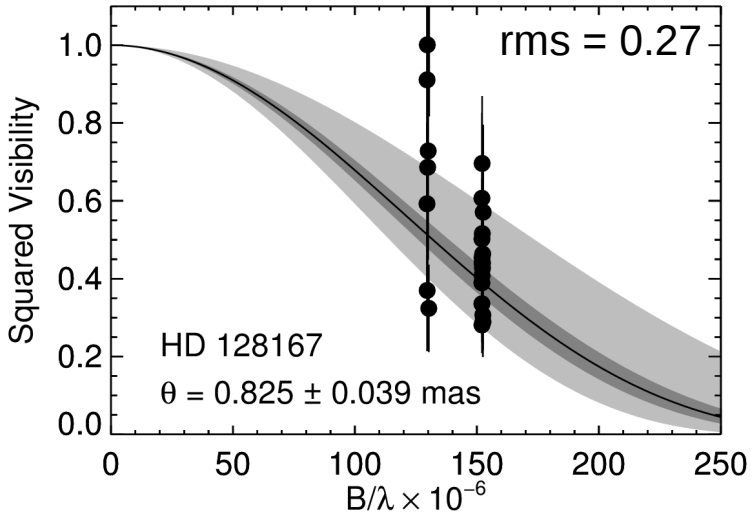


Quick reduction using median visibilities



Note: Uncertainties scaled to force $\chi^2 = 1$

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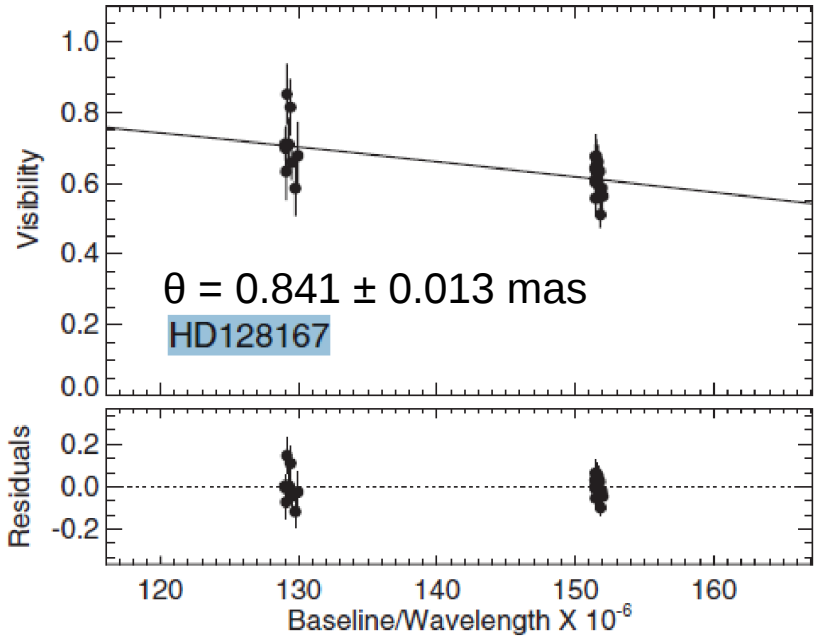

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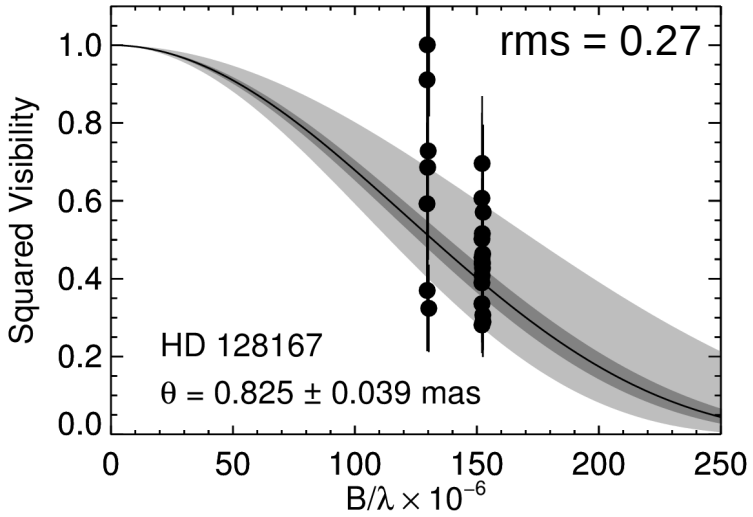
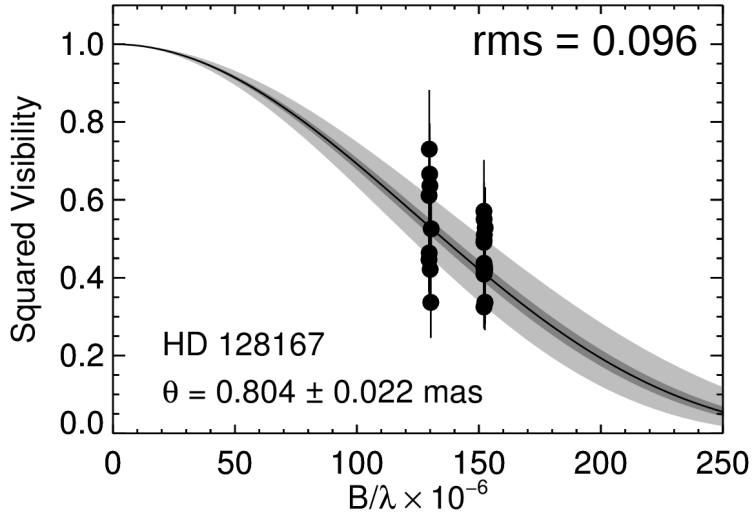


Quick reduction using weighted mean visibilities



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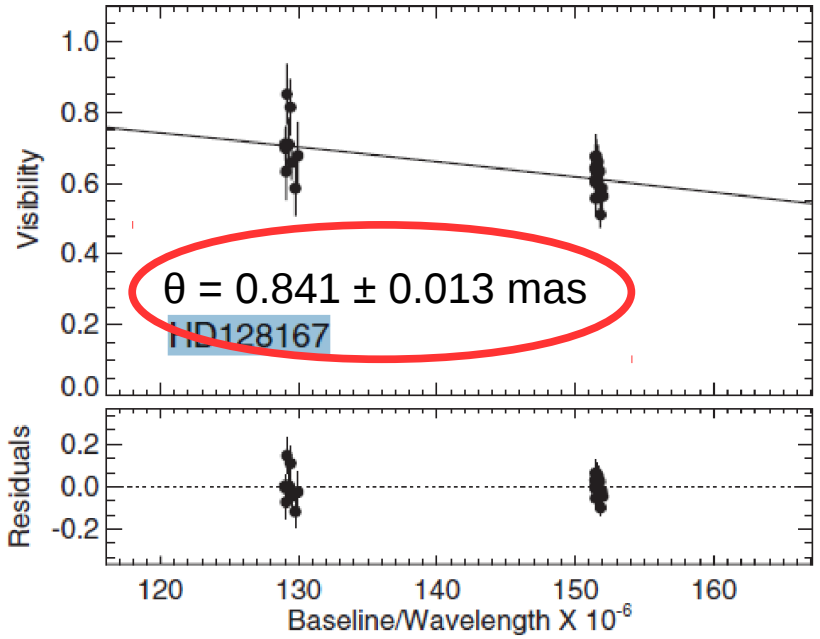

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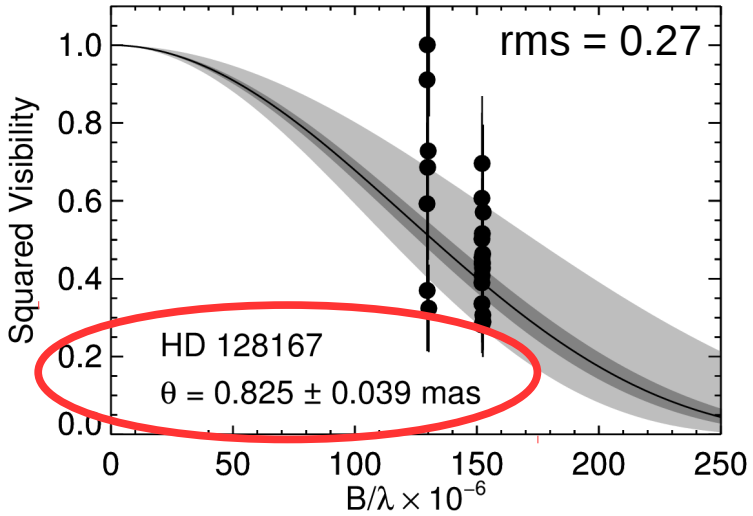

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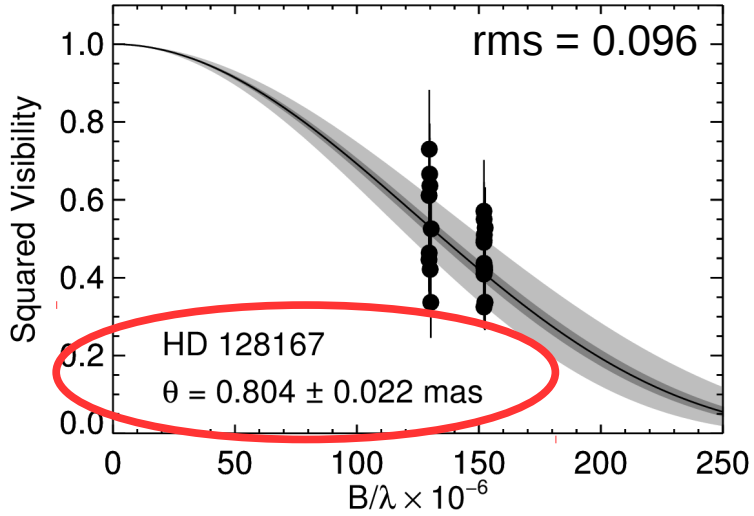

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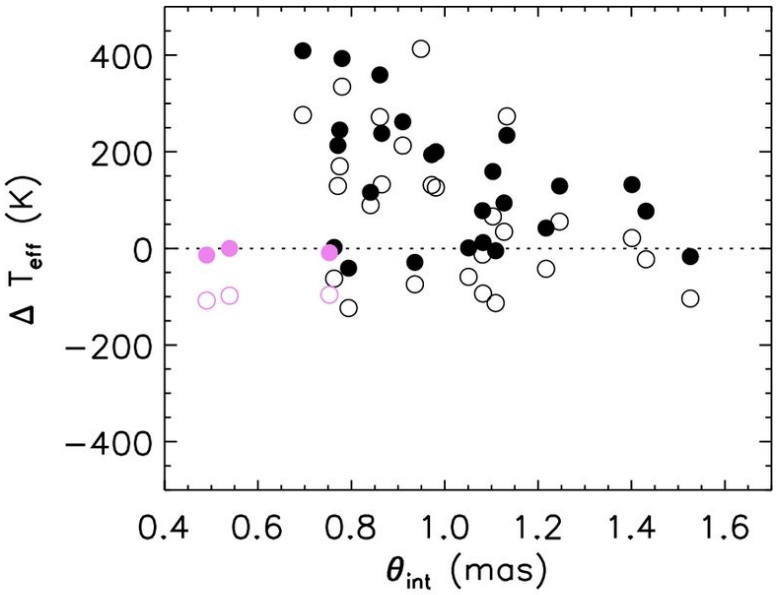
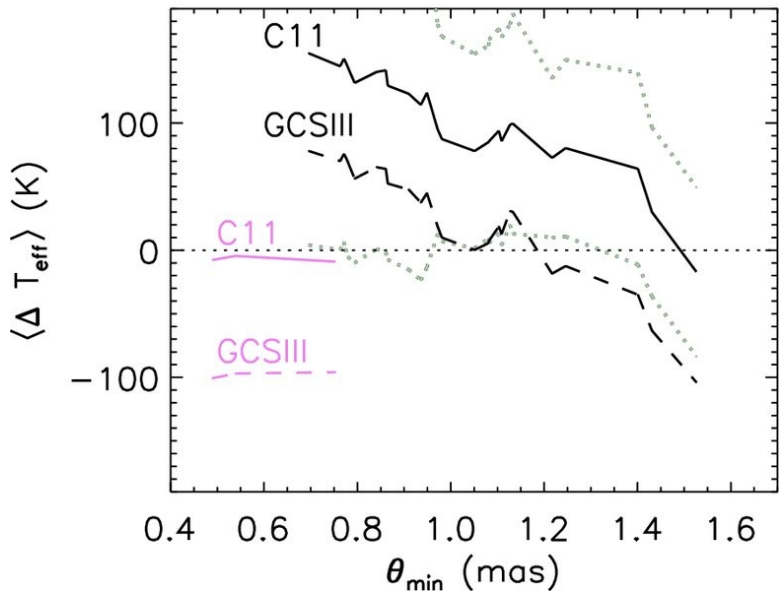
Comparison of Photometric and Interferometric Measurements

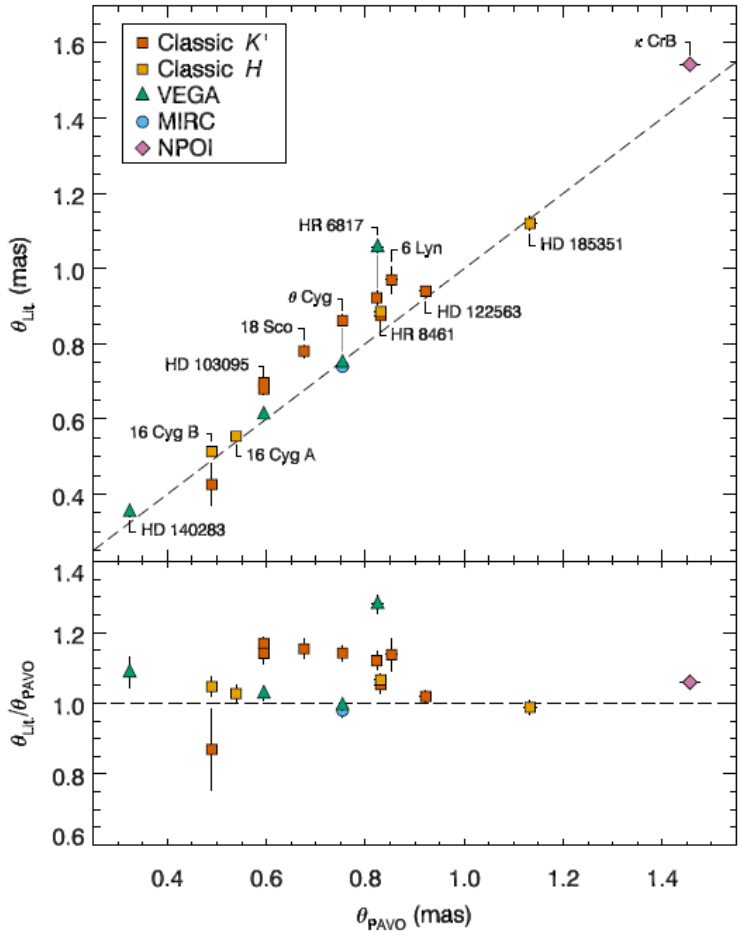




- Comparison of photometric and interferometric Teff
- Systematic trend in at smallest diameters
- Teff for small diameters ($\theta < 1$ mas with CLASSIC) are hotter by as much as 100-400 K

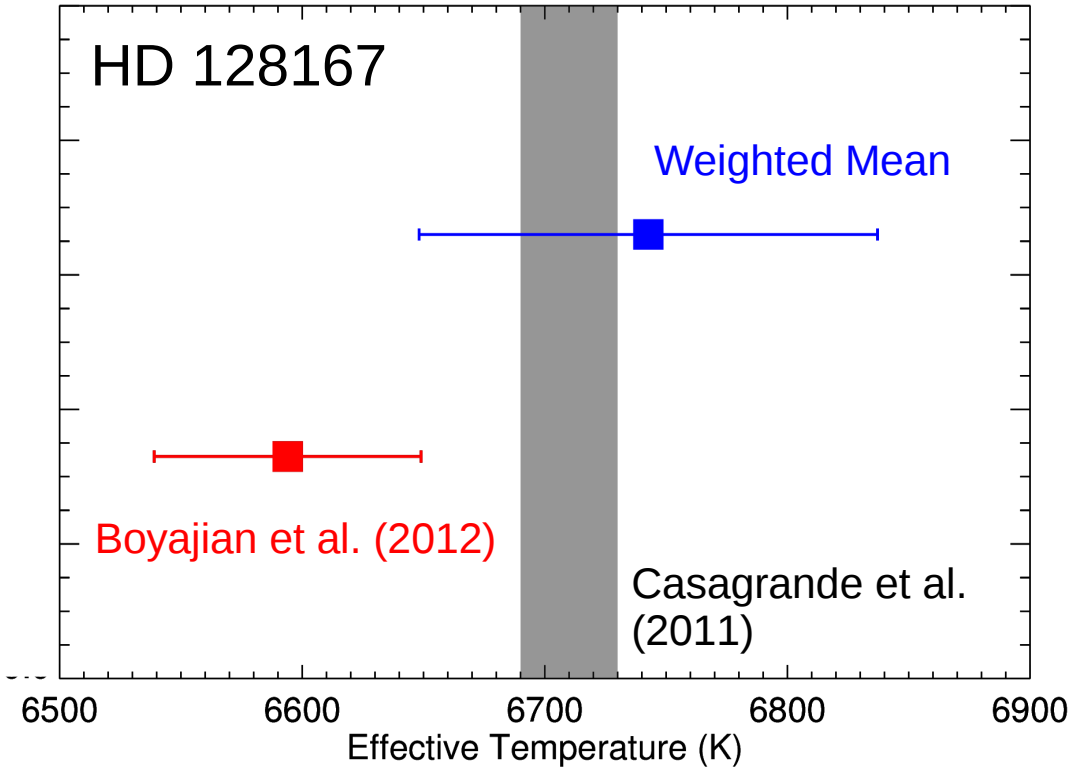
Casagrande et al. (2014)

Comparison of Measurements From Different Combiners



T. White et al. (submitted)

Comparison of Photometric and Interferometric Measurements



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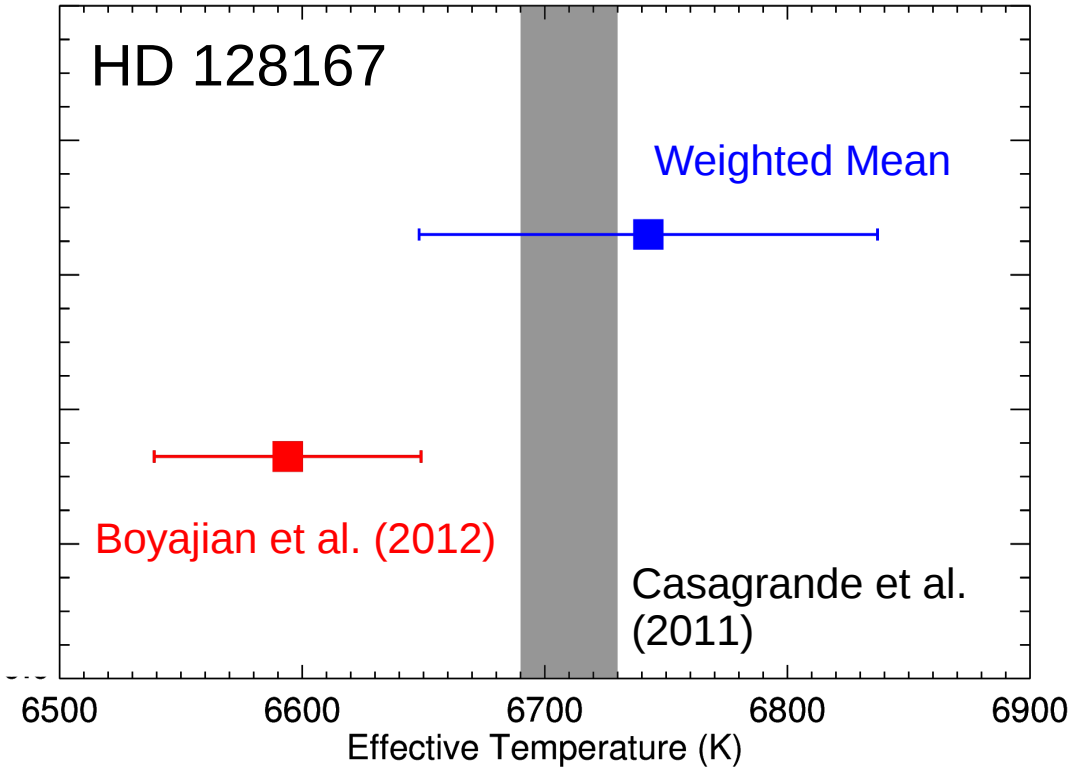
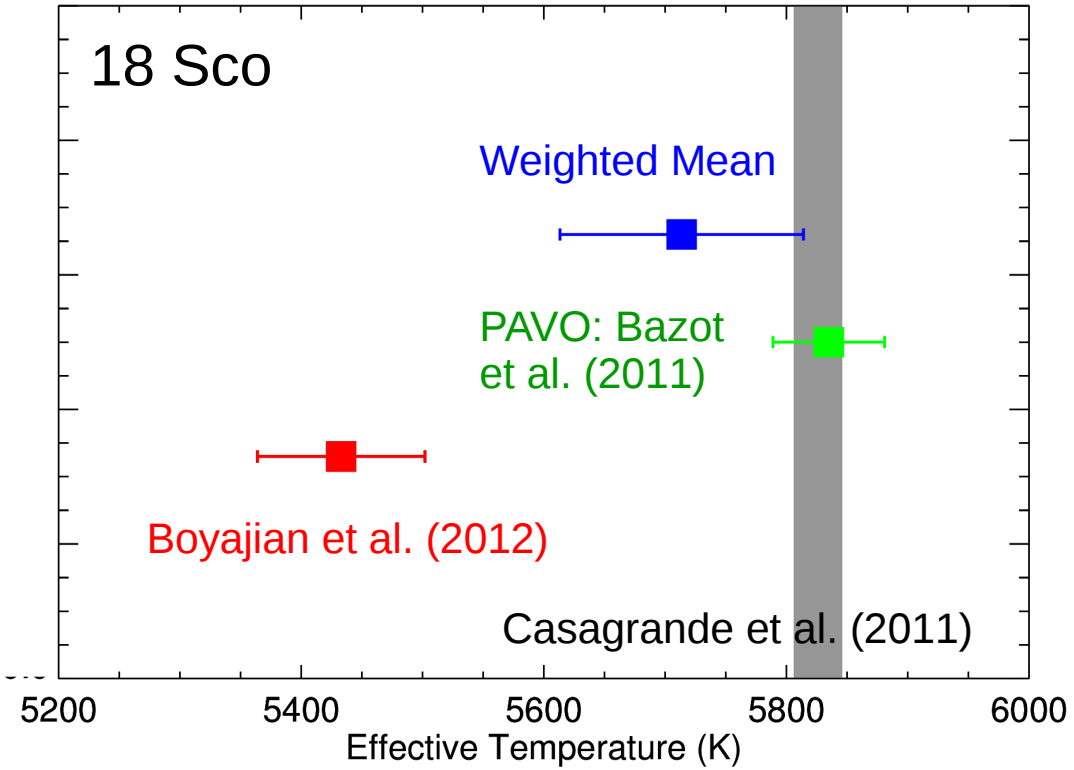
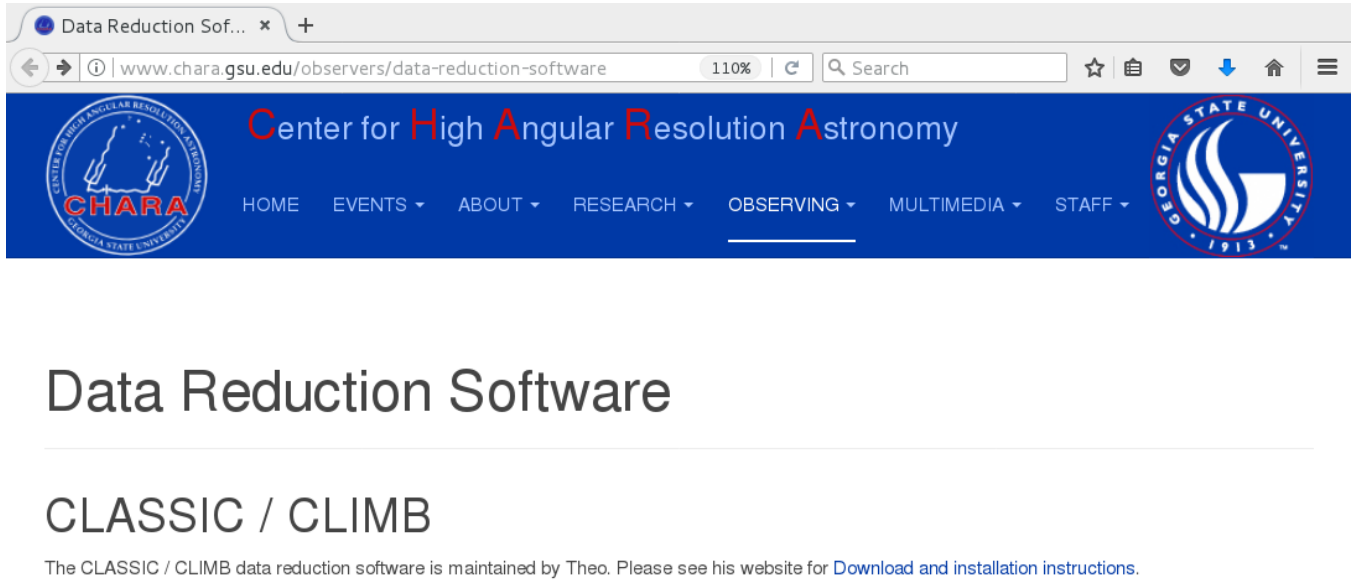




redfluor: Weighted Means



- Computing weighted means is currently the default option for redfluor.
- V2_SCANS visibility estimator
- This can be turned off using the -M flag.
- redfluor -V

  VERSION: V3.1 Wed Feb 28 14:48:15 PST 2018

Summary

- Updates to redfluor code (CLASSIC)
  - Weighted means is currently the default option for redfluor
  - Warm shutters and sky backgrounds [Theo's talk yesterday]
- Possible steps for the future – look into uncertainties
  - Standard deviation overestimates scatter in observations
  - Standard error underestimates scatter in observations