

IRAC 2nd Workshop on High Precision Time Series Photometry: Getting the Most out of Exoplanet and Brown Dwarf Light Curves

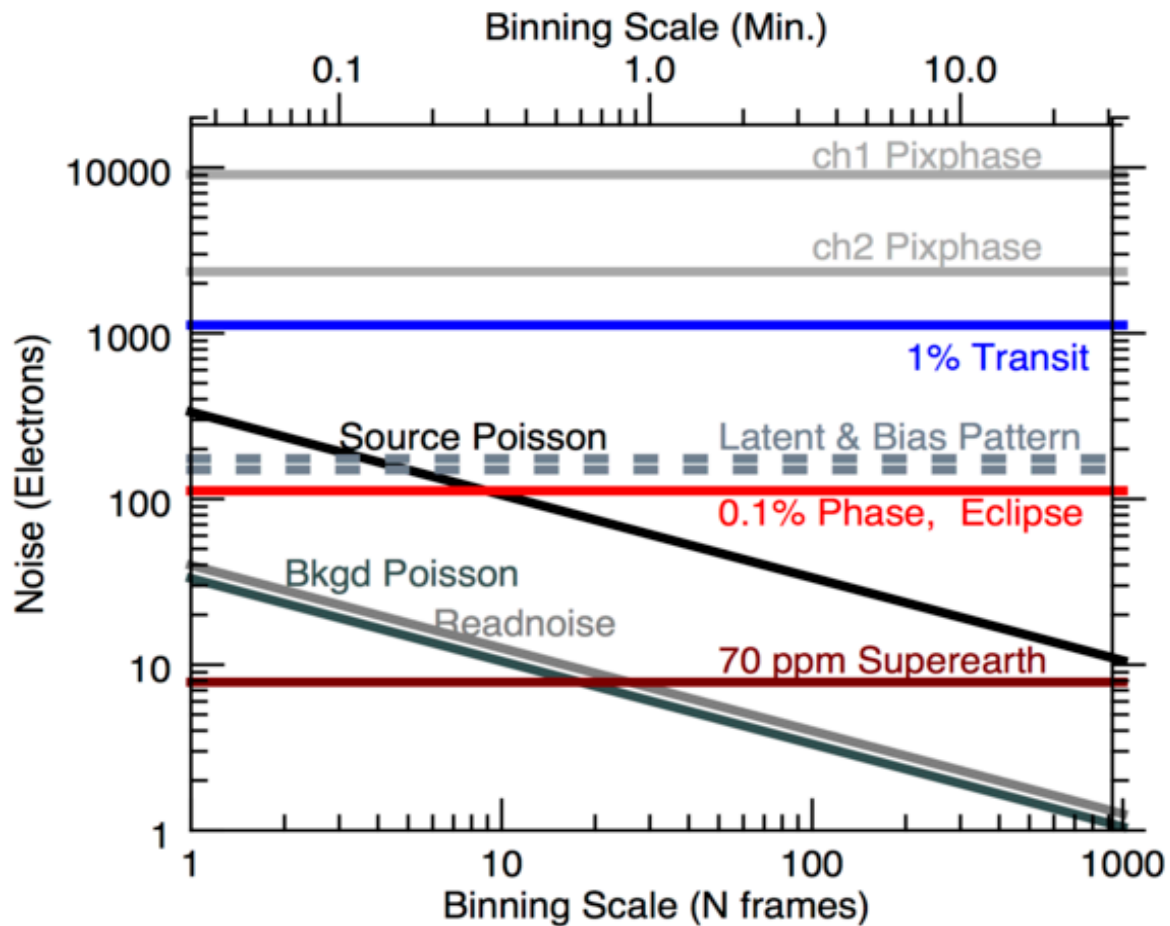
Jessica Krick, Jim Ingalls

Sean Carey, Carl Grillmair, Jason Surace,
Patrick Lowrance, Bill Glaccum, Seppo Laine

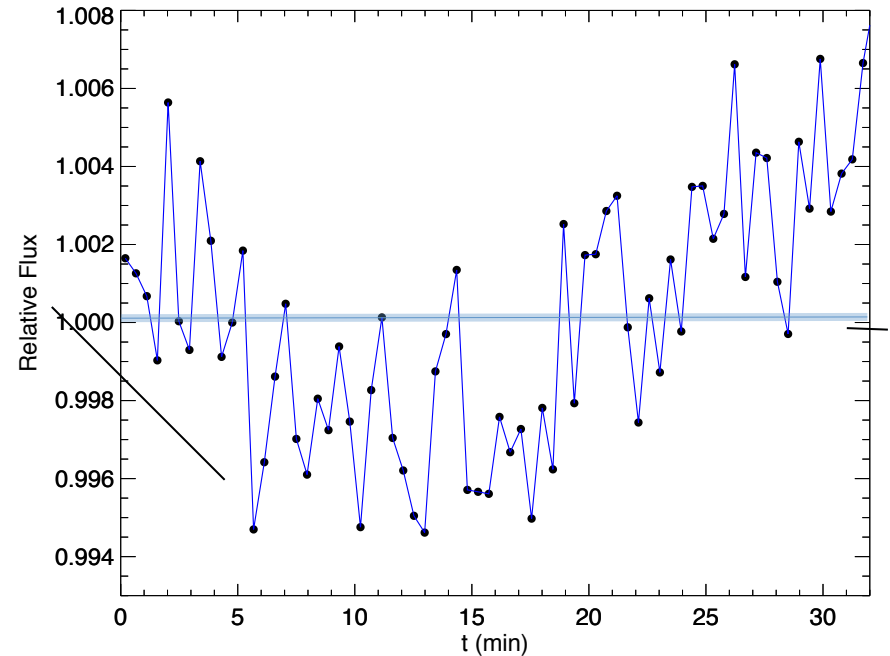
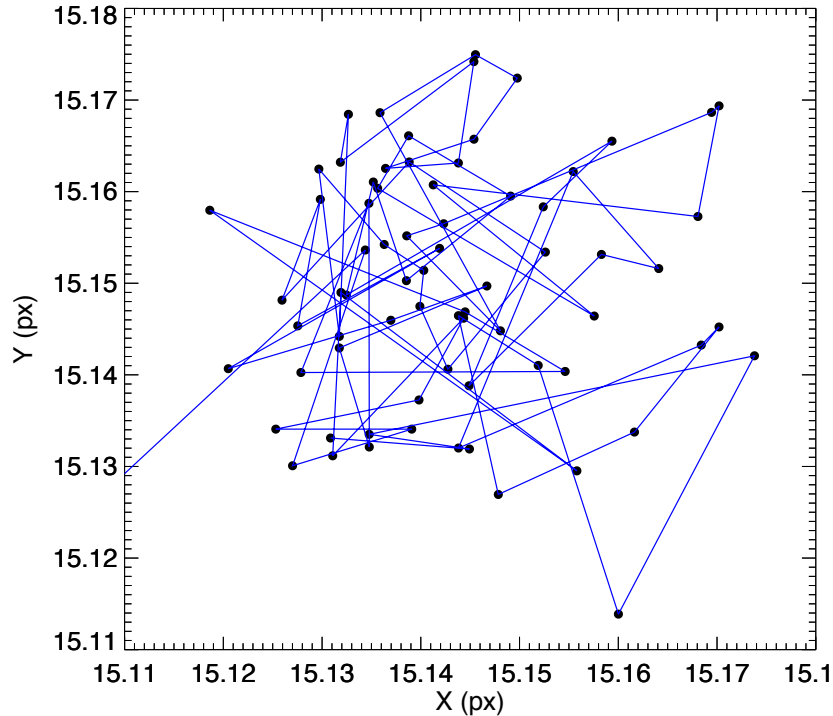
Resources

- Website: irachpp.spitzer.caltech.edu
 - Has section for contributed code!
- Helpdesk: help@spitzer.caltech.edu
- Email listserv: <https://lists.ipac.caltech.edu/mailman/listinfo/irac-hiprecphot>

Systematics Overview



Intrapixel Gain Variations



- PSF centroids undergo a random walk due to pointing jitter, wobble, and drift (30-min, CH1)
- Undersampled PSF, nonuniform pixel response cause intra-pixel gain variations. *Largest source of correlated noise. (8% Ch1, 3% Ch2)*

Methods to remove systematics

- BLISS mapping (Stevenson et al. 2011)
- Gain Mapping (Ballard et al. 2010)
- Gaussian Process Models (Evans et al. 2015)
- Independent Component Analysis (Morello et al. 2015)
- MCMC evaluation (Gillon et al. 2009)
- Nearest Neighbors (Knutson et al. 2012)
- Pixel Level Decorrelation (Deming et al. 2014)
- PMAP nearest neighbors (Krick & Ingalls et al. 2015)
- Polynomial (Charbonneau et al. 2005)

Discussion Questions:

- How do methods affect results?
- Are results repeatable (is IRAC stable enough in time to give the same light curve for a system that stays the same)
- Is there a single best reduction method for all light curves, or is it dependant on something?(Duration of observation? Location on the pixel? Size of the drift? Nature of systematics?)
- What are the limitations in the data (is there a noise floor?, are we limited by reduction methods?)
- What are the best practices for designing observations, particularly as we get into FY17/18

Agenda

10am: Introduction: Ingalls, Krick

10:15: Expected changes in data and performance during 2016 Grillmair

10:30: Repeatability and reliability of exoplanet measurements

Systematics which change as a function of time Krick

Community input (evidence of temporal stability/instability) Dragomir

How do we reach consensus on results? Desert

11:45: Update on new reduction techniques Morello, Evans, Ingalls

12:30pm-2:00: Lunch break

2:00: Data Challenge Ingalls

3:00: Open discussion / Future Directions Lowrance, Carey

What would community like from the SSC

How do reduction techniques influence results?

What science could be done with continued operations in 2017-2018

4:00: Adjourn