Observing Lab:
Data Reduction & Modelling

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Keck Interferometer

Establishing Calibrated Data

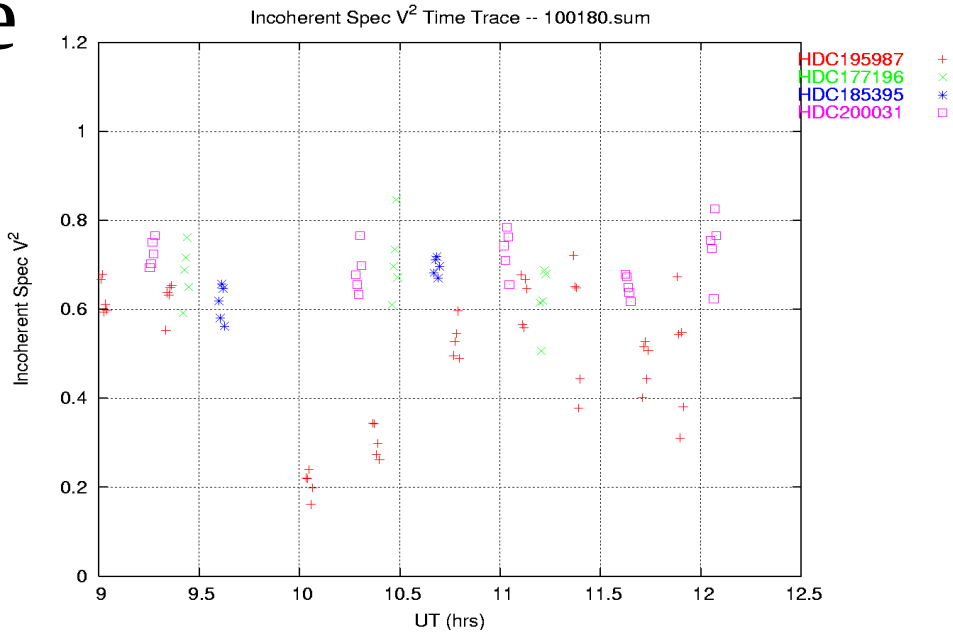
- Interferometer output: raw V^2 data (Level 0→Level 1)
  - Output by the interferometer
- Comparison to calibration stars: normalized V^2 data (aka ‘calibrated’ V^2 data; L1→L2)
  - Uses *a priori* knowledge/assumptions of calibration objects to normalize science target

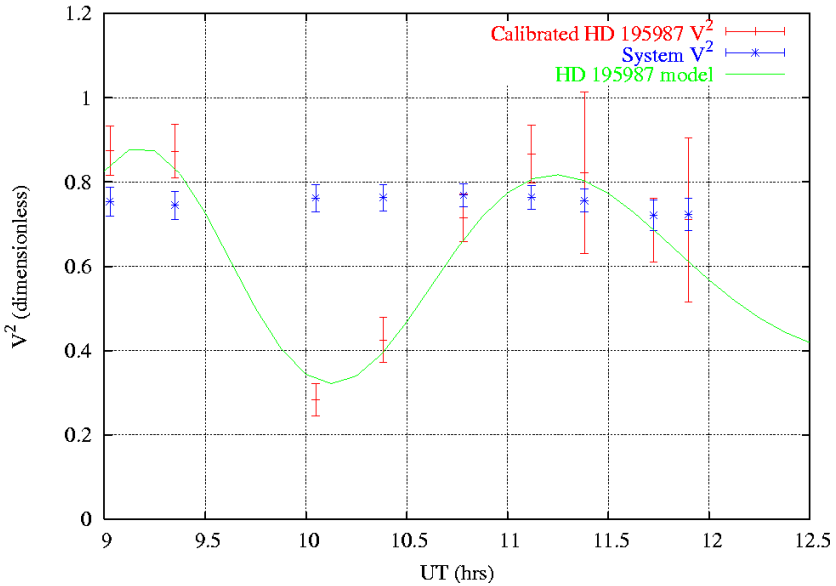
Calibration example

- PTI example:

`wbCalib cs.hd195987 100180.sum`

  - Script identifies science target, calibration sources
- Output
  - System visibility
  - Consolidation of data points into normalized ‘scans’
  - Scans can then be compared to models



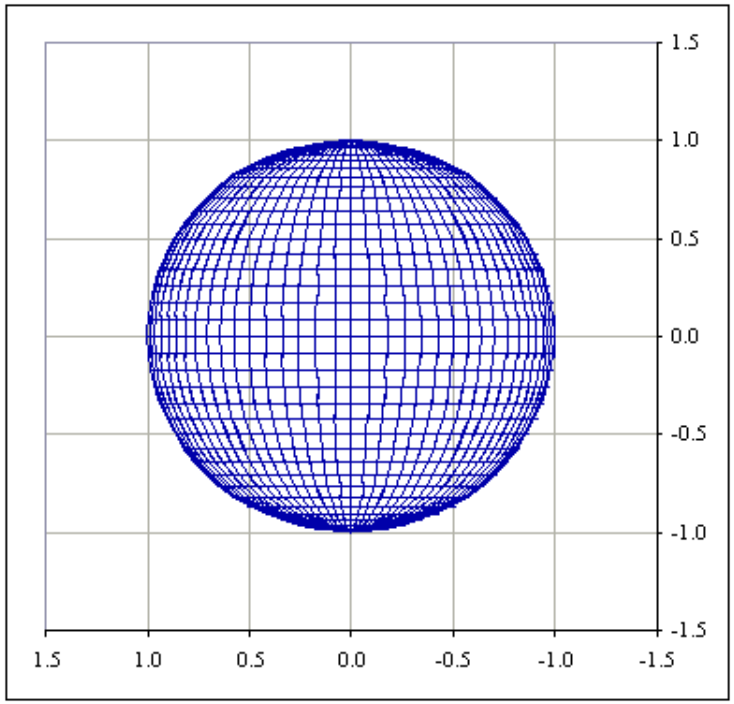


Using Calibrated Data

- Fit to a UD disk: angular size θ_{UD} (L2→L3)
  - Uses *a priori* knowledge/assumptions of goodness of UD fit
  - Noting the usual caveats of UD fits
- Fit angular sizes to a Roche model: rapid rotator parameters
  - i – inclination, α – orientation, R_p – polar radius, u – fractional rotational speed

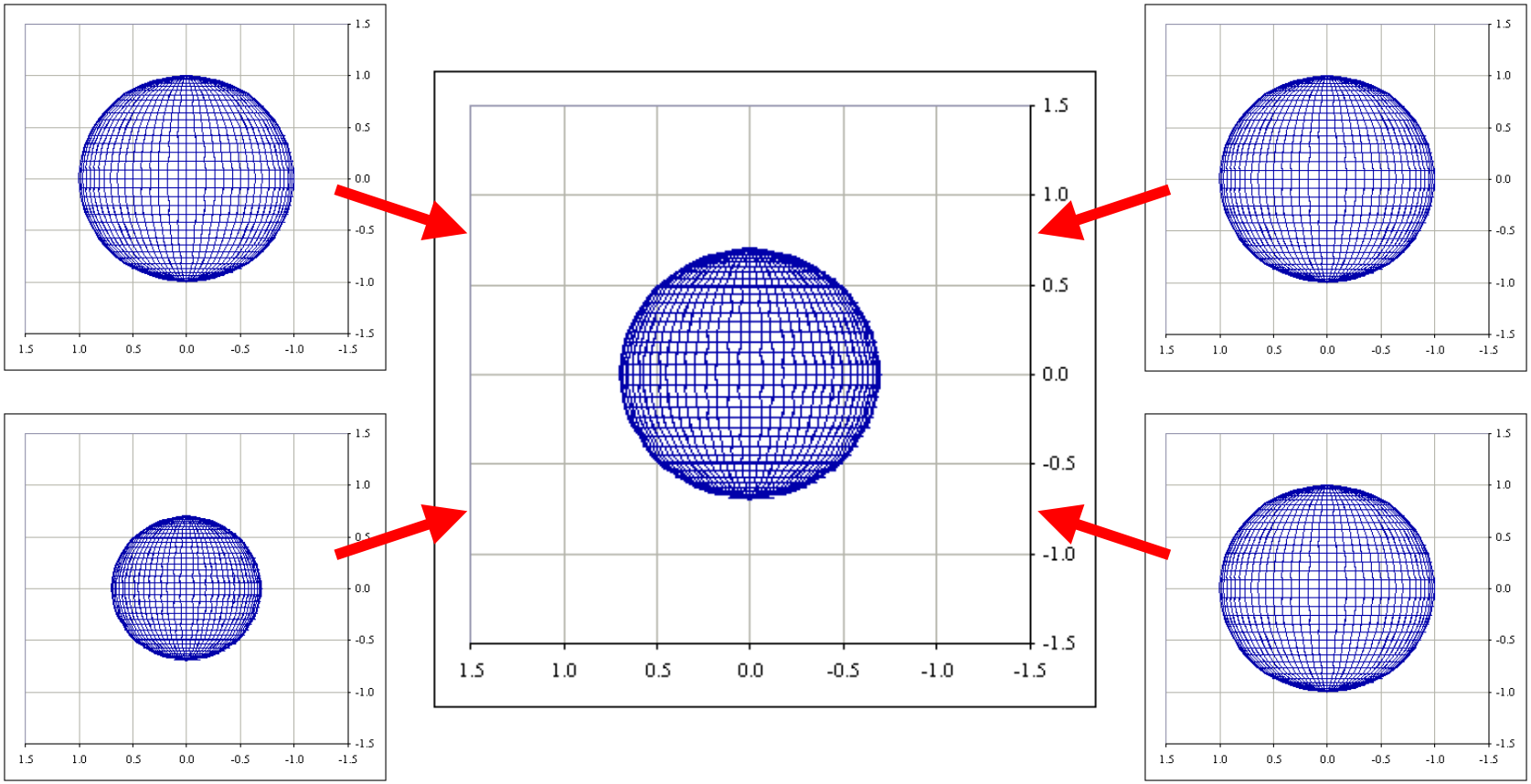
Elements of a Roche Model. I

- Four independent parameters define Roche model on the backdrop of the sky
  - i – inclination
  - α – orientation
  - R_p – polar radius
  - u – fractional rotational speed
- Assumes a mass M and distance d for the object is known

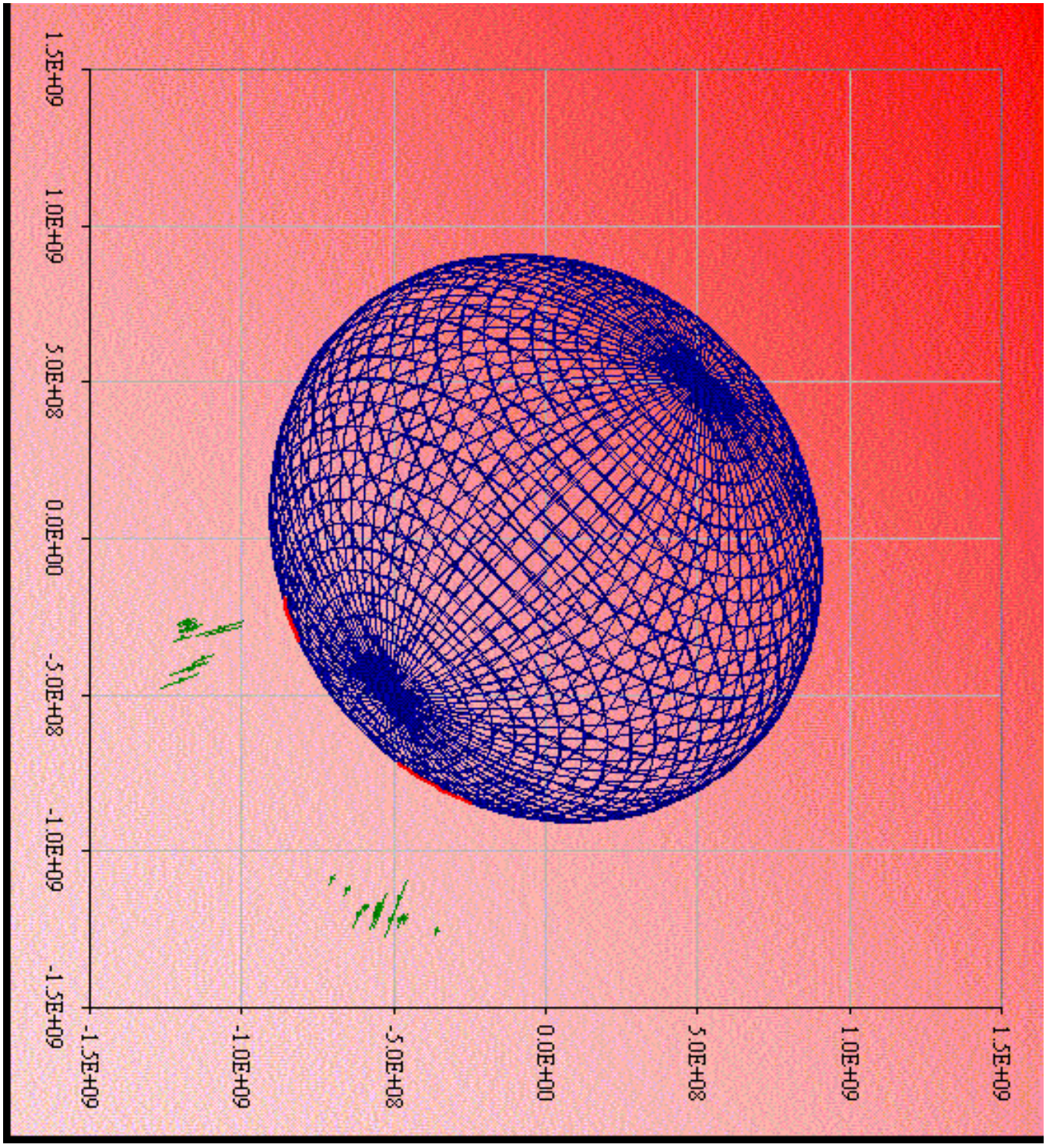


Elements of a Roche Model. II

- For a fast rotator, these degenerate parameters become unique



Exhaustive Search = Exhausting!

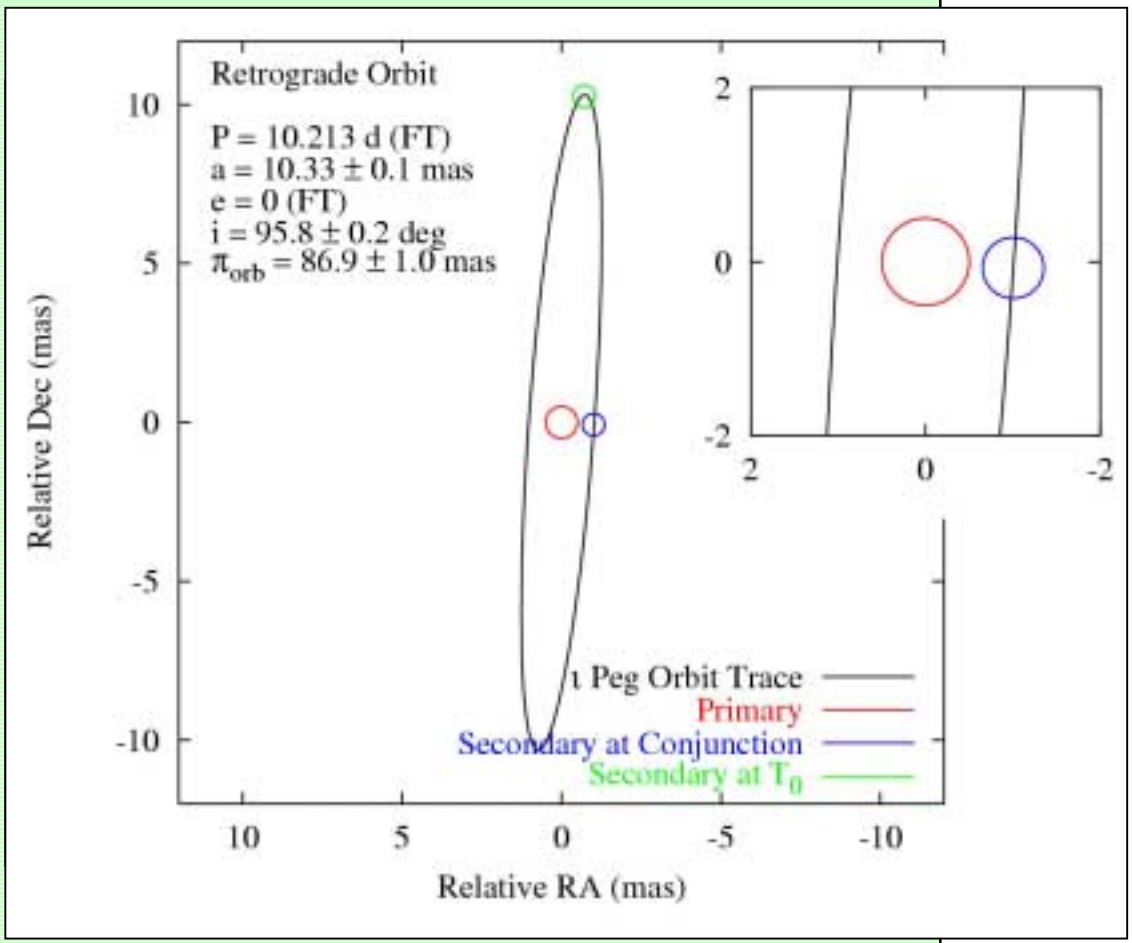


Backup Slides

ι Pegasi

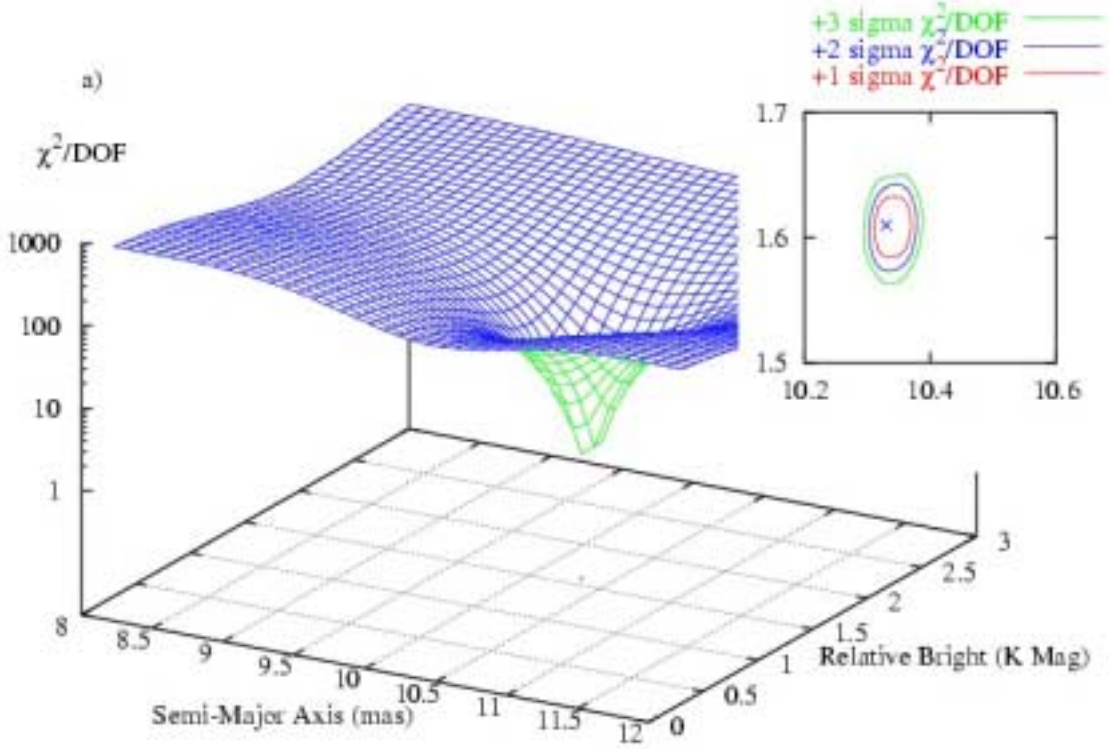
One HST WFPC 2 Pixel

- Well-known binary system
- Established as a SB2 by Fekel and Tomkin who inferred the "possibility of eclipses" (1983)
- Average Absolute V^2 Residual 1.4% Over 114 Scans
- Precision photometry : no eclipses (Boden *et al.* 1998 *ApJ*)



Binary Orbit Determination

- Fit V^2, radial velocity data by seven-element Keplerian orbit model
- Problem is non-linear with local minima



ι Peg χ^2 in *a*/r Subspace