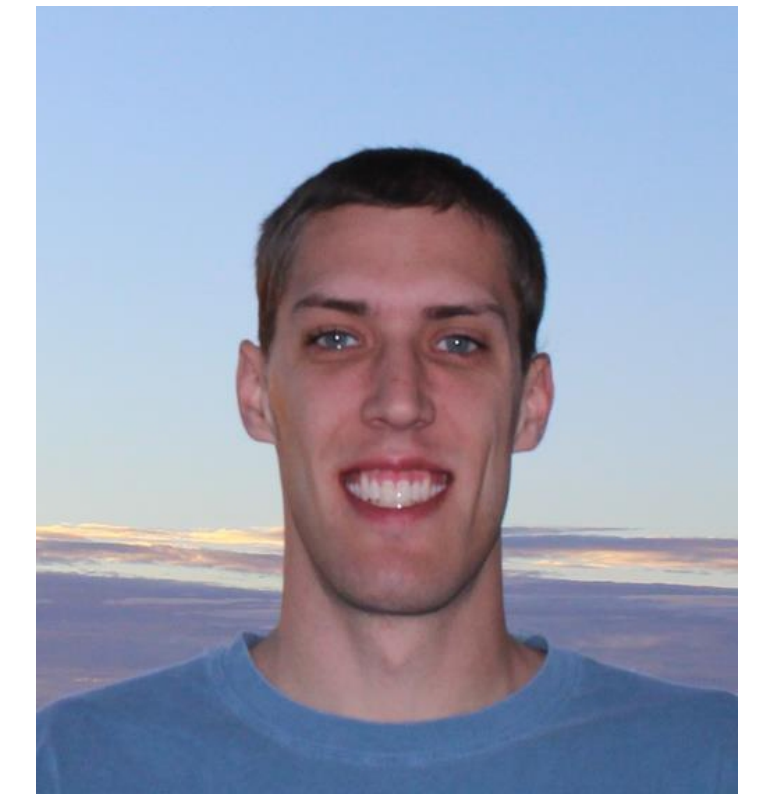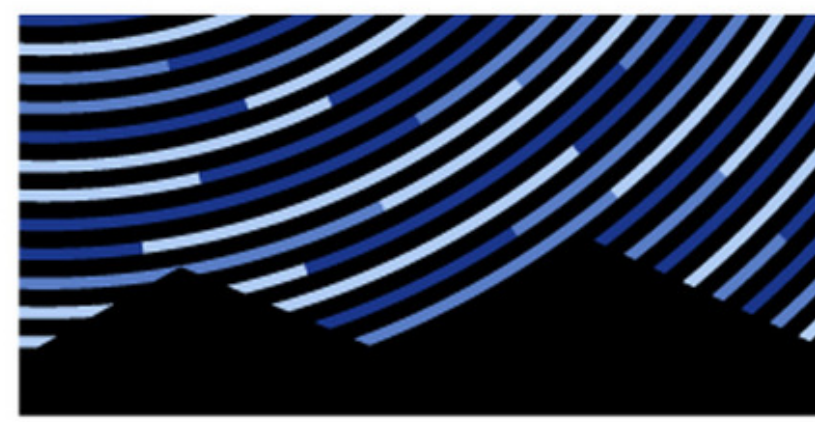# Stellar Companions to Intermediate-Mass Stars

Kevin Gullikson[1], Adam Kraus[1], Sarah Dodson-Robinson[2]

1:University of Texas   2: University of Delaware
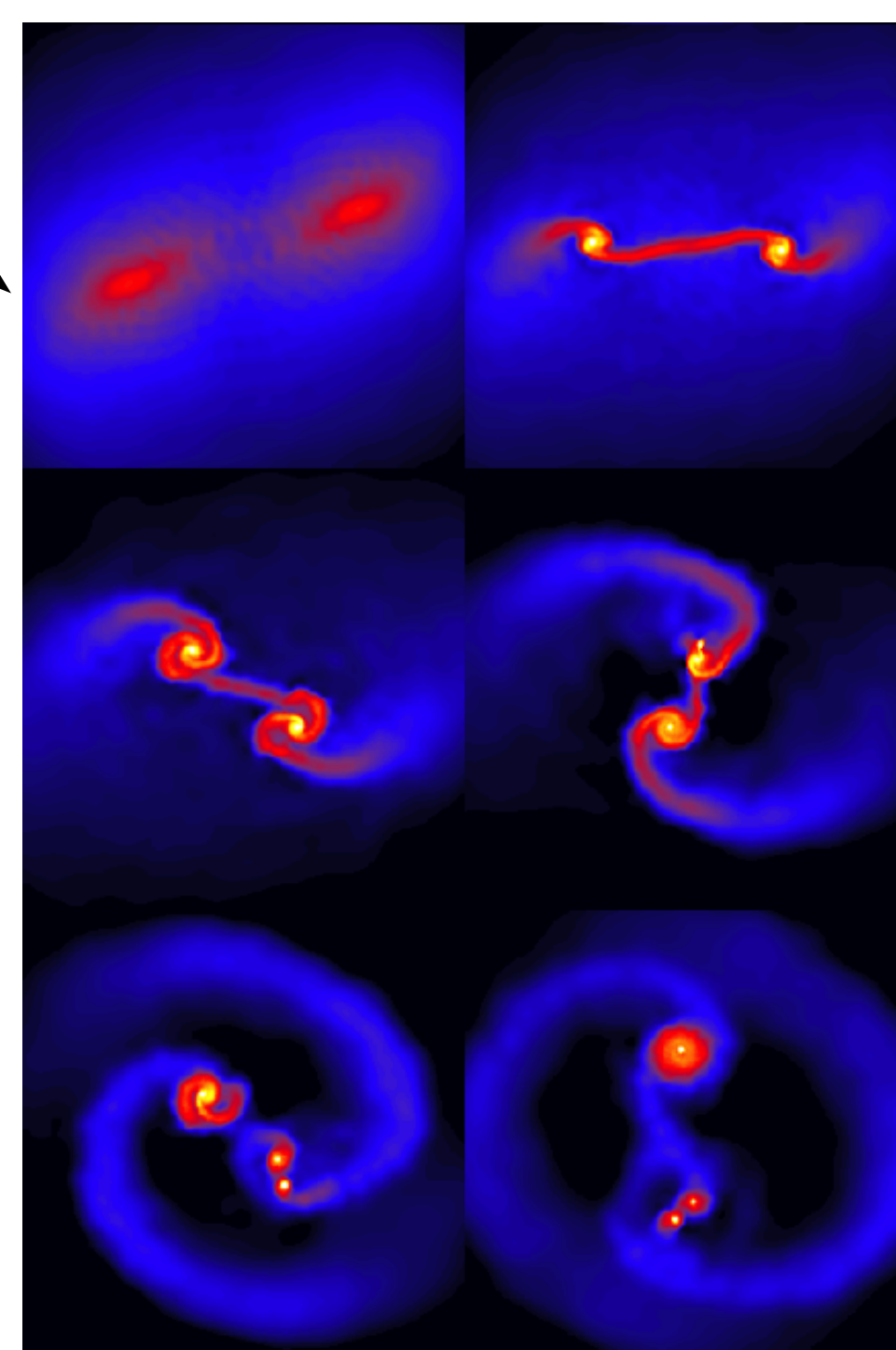
kgulliks@astro.as.utexas.edu
www.as.utexas.edu/~kgulliks

Binary Star Formation

- Core collapse begins
- Jean mass decreases
- Core fragments

Both stars accrete from core material

Disk formation
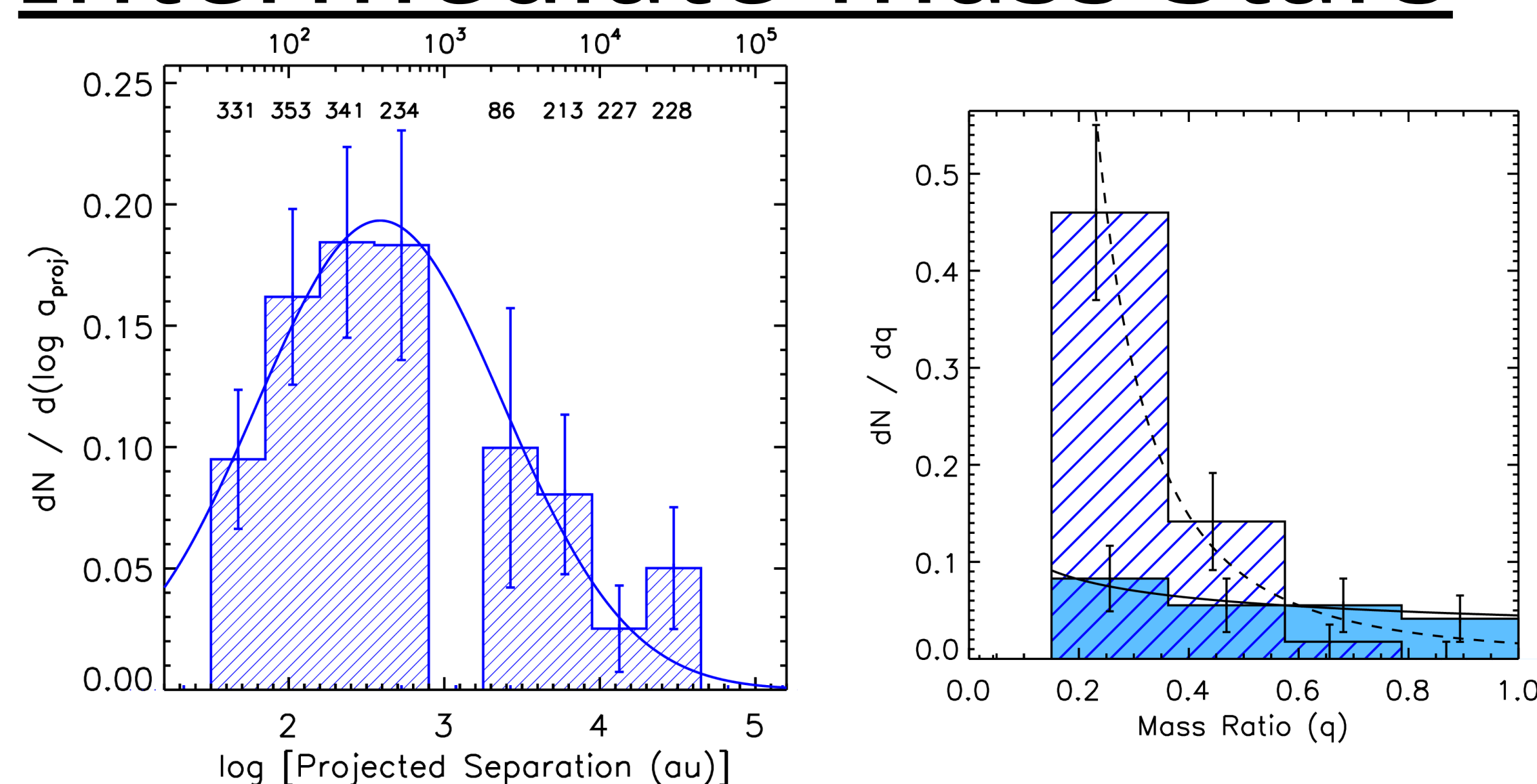
Possible disk fragmentation
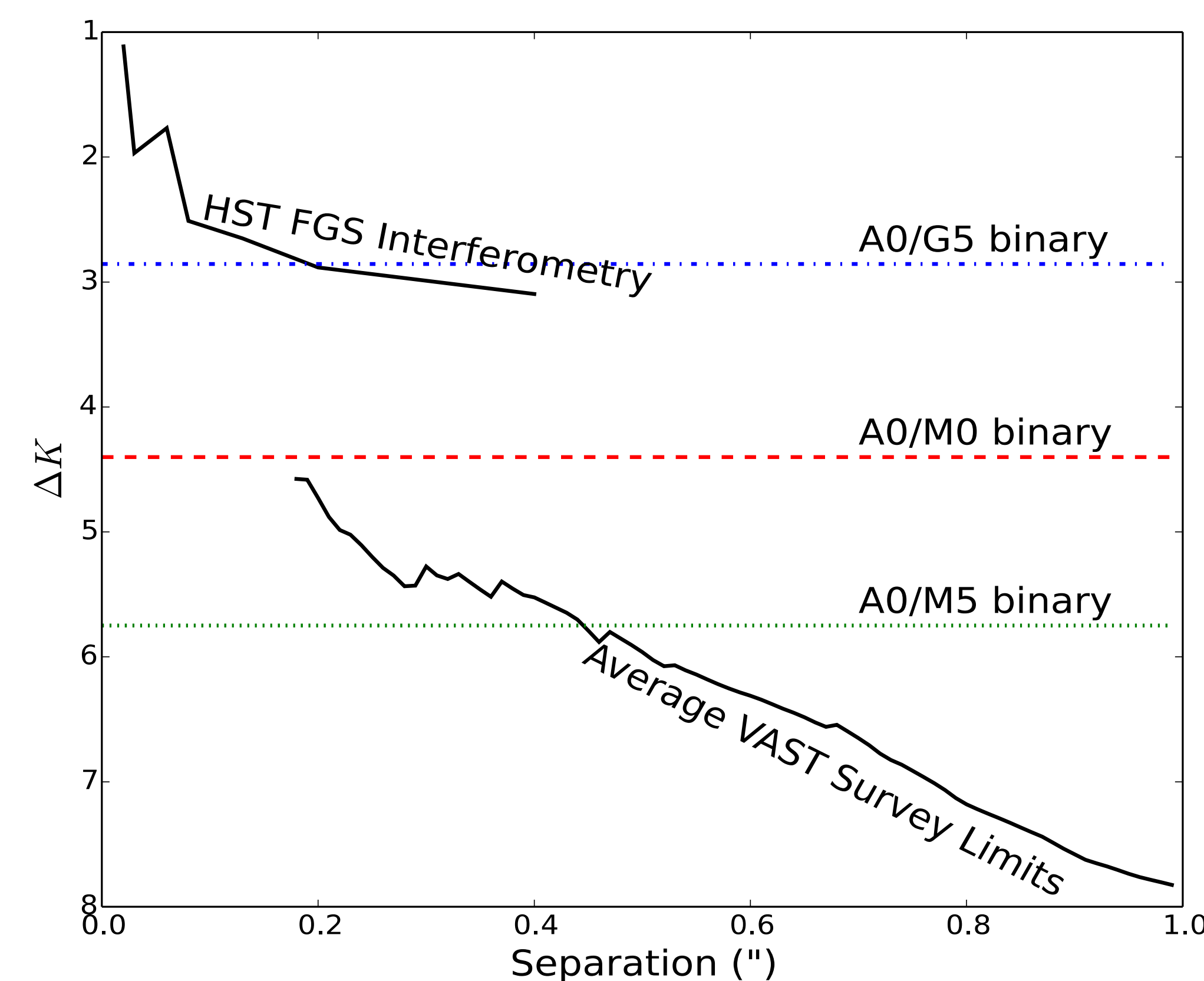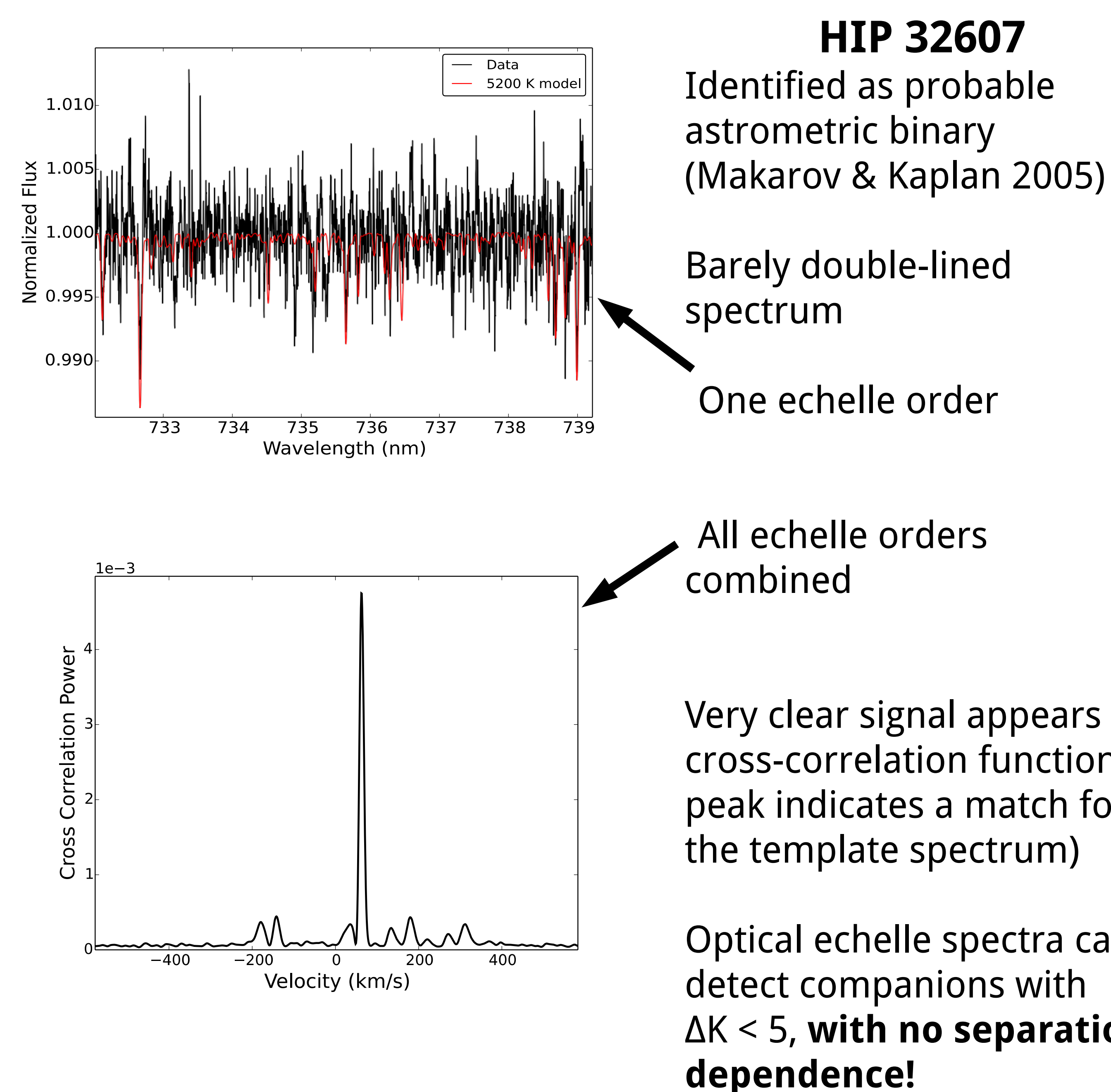
© Matthew Bate 2014

Intermediate-mass Stars

- Figures above from De Rosa et al 2014
- Most companions are 100s of AU from the primary
- Most companions are much less massive than the primary
- Very close companions different?
  - Disk interaction/preferential accretion?
  - Disk fragmentation?
  - Observational effect?
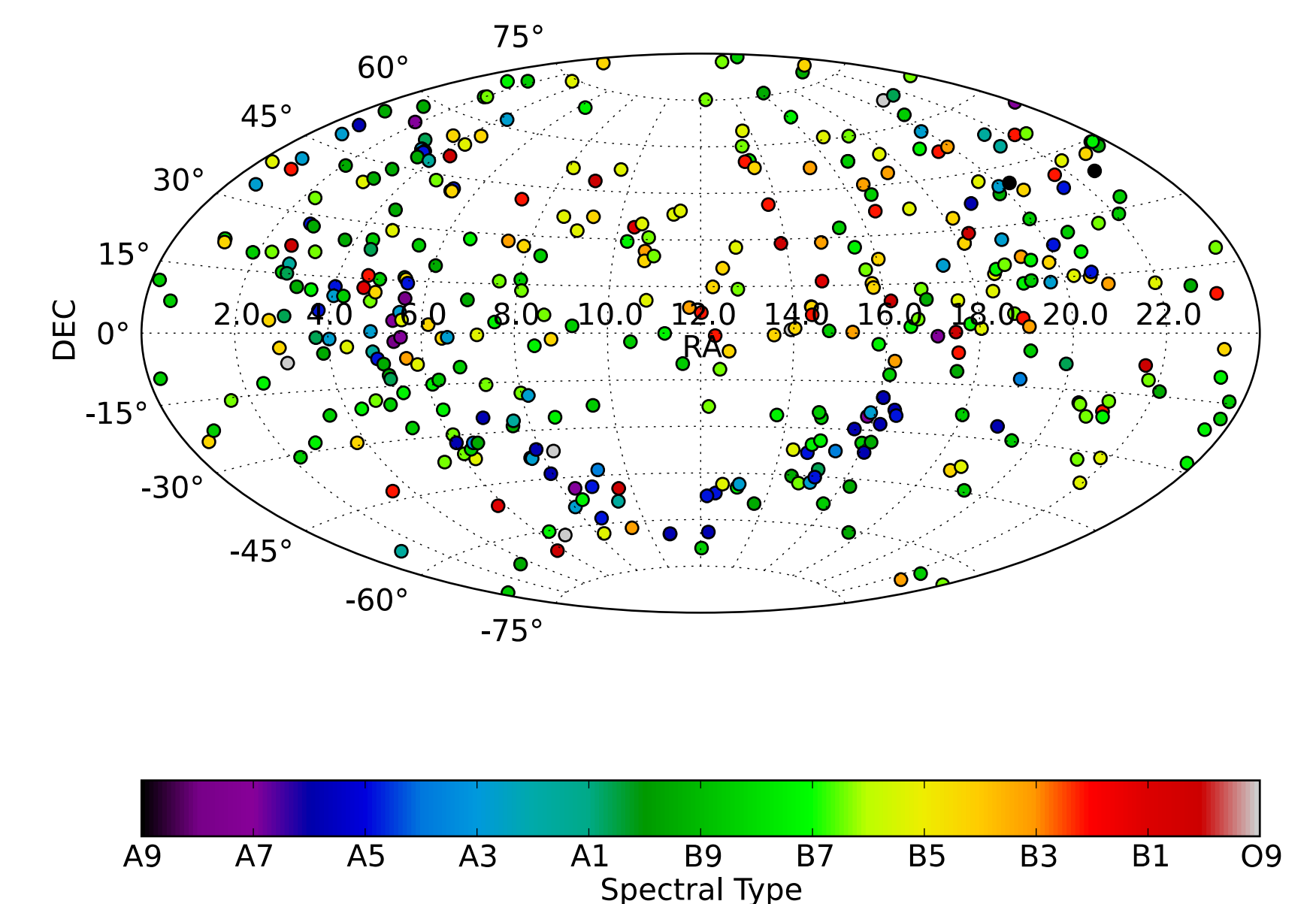
Detecting Close Companions

It is very difficult to detect close companions with traditional techniques!

Cross-Correlation Method

HIP 32607
Identified as probable astrometric binary
(Makarov & Kaplan 2005)

Barely double-lined spectrum

One echelle order

All echelle orders combined

Very clear signal appears in cross-correlation function (a peak indicates a match for the template spectrum)

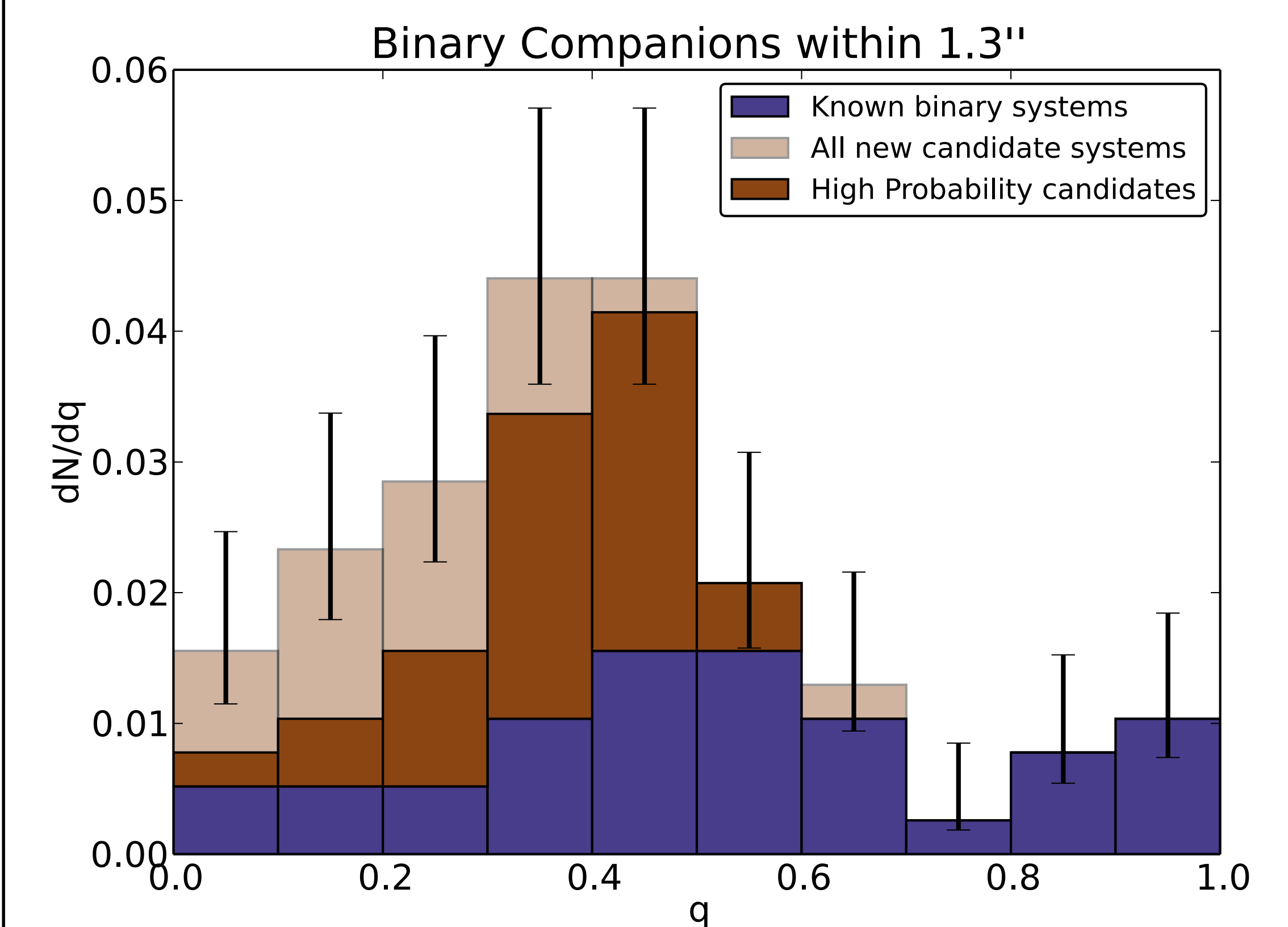Optical echelle spectra can detect companions with $\Delta K < 5$, **with no separation dependence!**

Survey

- B0V – A9V spectral types
- Rapid rotators (vsini > 80 km/s)
- V < 6
  - Median distance = 95 pc
  - Median detectable physical separation = 120 AU

Preliminary Results

- High probability = confirmed or >10σ
- **My sample ~doubles the low mass-ratio systems**
- Turn-down with q < 0.3 likely detection bias
- KS-Test against a flat distribution:
  - Known companions: p = 18%
  - Including high probability companions: p = 0.2%
  - Including all companions: p = 0.0012%