“Low Amplitude Variables: Distinguishing RRL Stars form Eclipsing Binaries”

T.D.Kinman & W.R. Brown

arXiv:1003.3656

Impromptu review of a paper

(Not a real talk)

(so you can sleep through this....)

Karen Kinemuchi

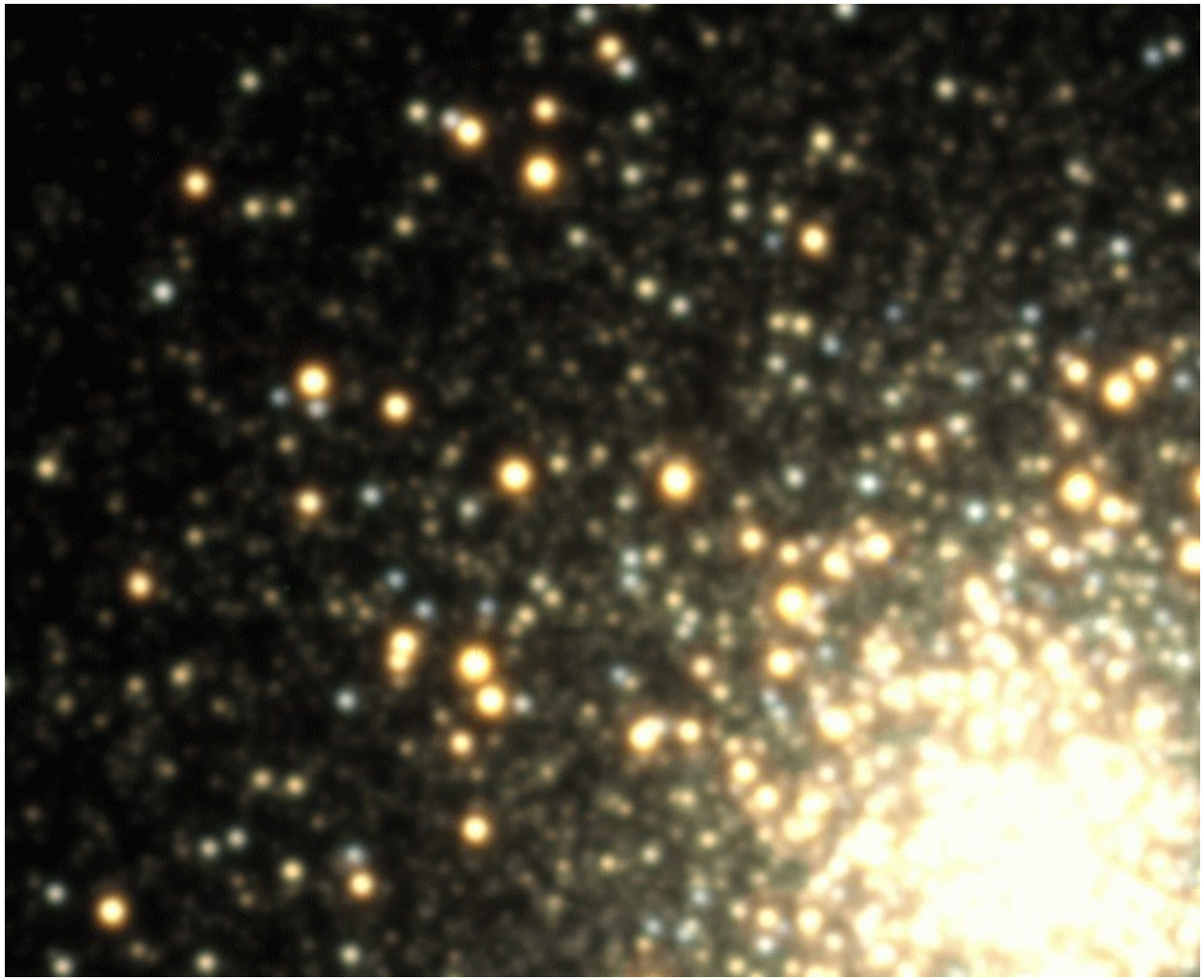
University of Florida/Universidad de Concepcion

Why am I curious about this?

- Proof that my thesis paper was read by someone else besides me and my thesis advisor!
- Proof that my thesis had something interesting to propel more research
- RR Lyrae stars are interesting stuff and everyone should like them.

RRL – the animated gif

courtesy of J. Hartman (Havard) and K. Stanek (OSU) APOD:2007 April 15



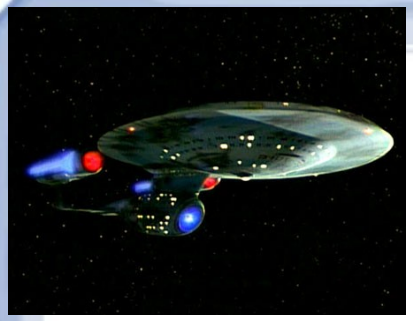
Quick background

- RR Lyrae (RRL) stars
  - Pop II pulsating stars and distance indicators
  - Spectral type A-F
  - Bailey types and pulsational modes
- Oosterhoff groups
  - Oo I : merger/accretion events, halo pop
  - Oo II: disk like, monotonic cloud formation

What's the problem?

- How to distinguish c-type RRL (RRc or RR1) from eclipsing binary stars (W UMa)
- Field survey inconsistencies
  - QUEST: 17% RRc; SDSS Strip 82: 22% RRc
  - ROTSE-I: 38% RRc
  - GGC: OoI clusters: 20%

    OoII clusters: 45%
- Period distribution inconsistency w/ ROTSE-I



Commandeering Data

- Photoelectric data from Lowell, CCD data from Tenagra Observatory (yes, from ST:TNG!)
- Additional photometric data from NSVS, ASAS
- Spectra from MMT
- Region near NGP – 21 RRL

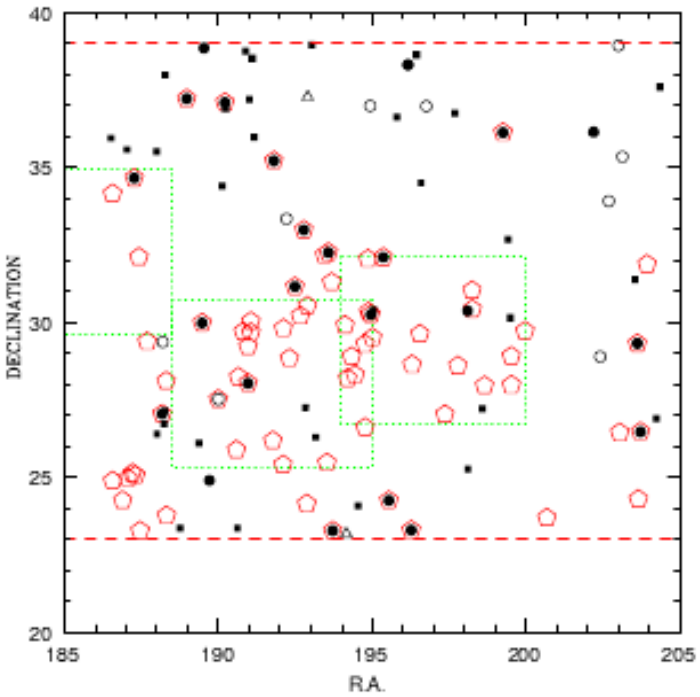


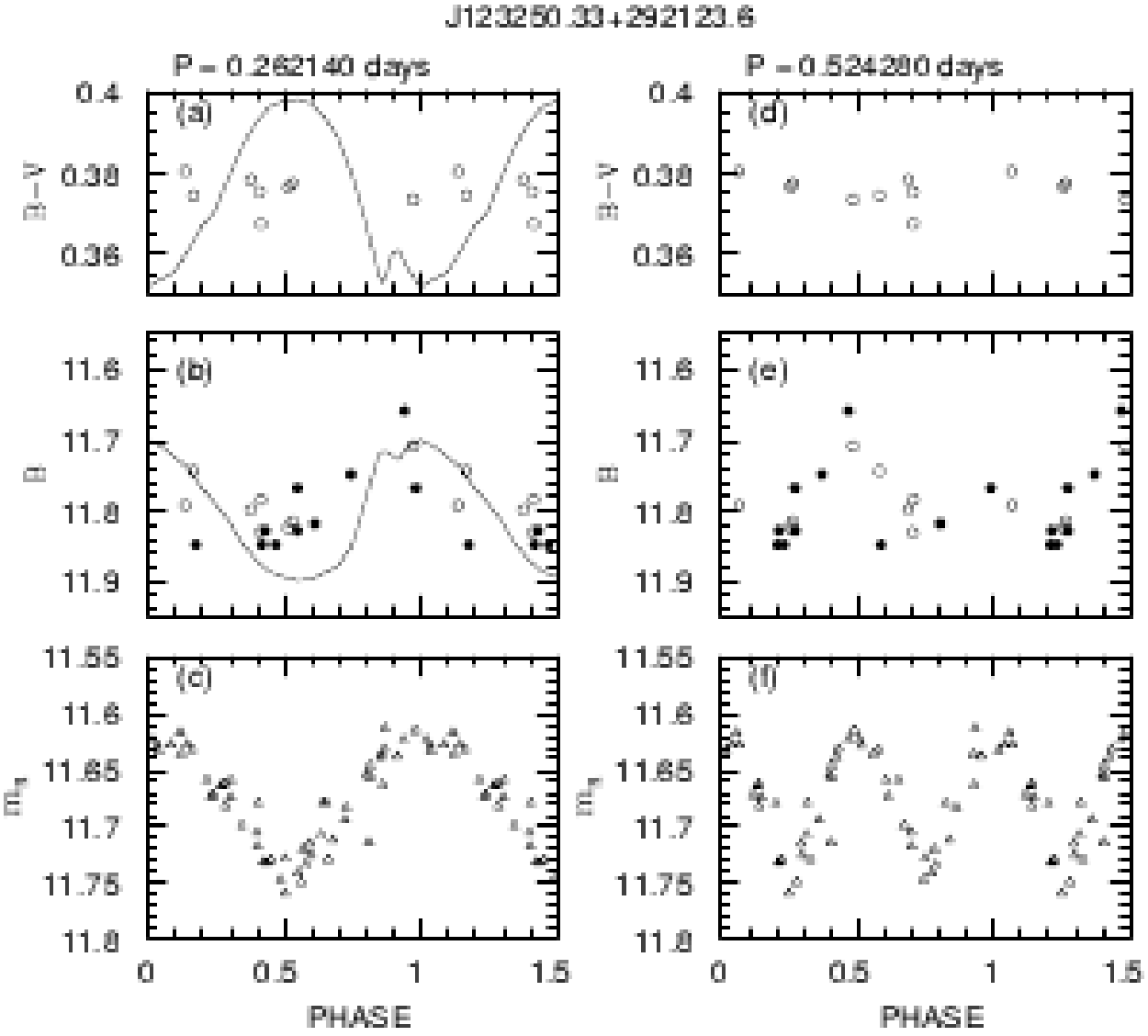
Fig1. Red pentagons: GCVS RRL. Filled circles are RRab, open circles are RRc, and open triangles are delta Scuti stars. Small filled squares are eclipsing binaries as defined by Akerlof et al. 2001.

Some LTC results:

old solution

open circles: Lowell photoelectric data

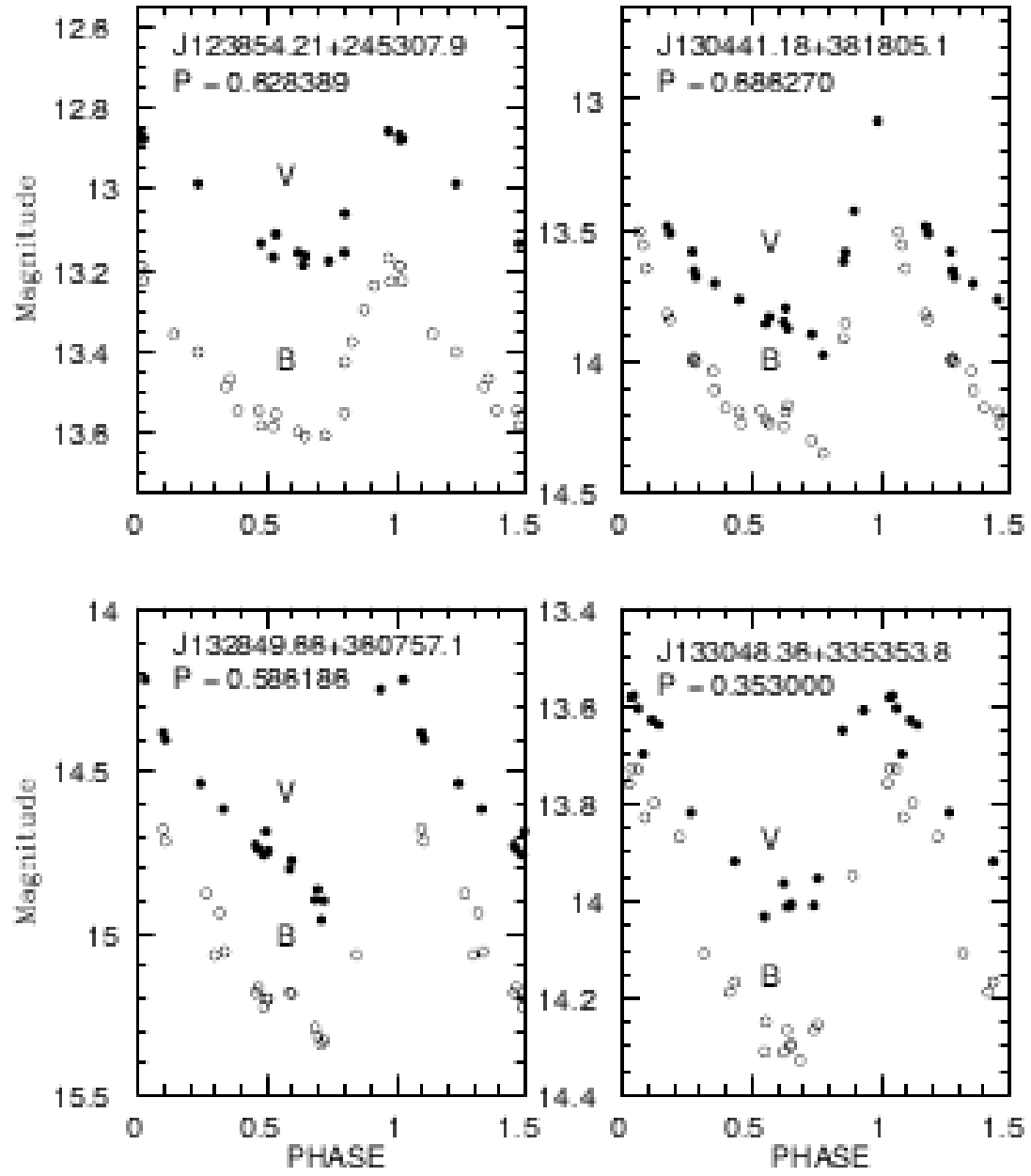
triangles: ROTSE-I photometry

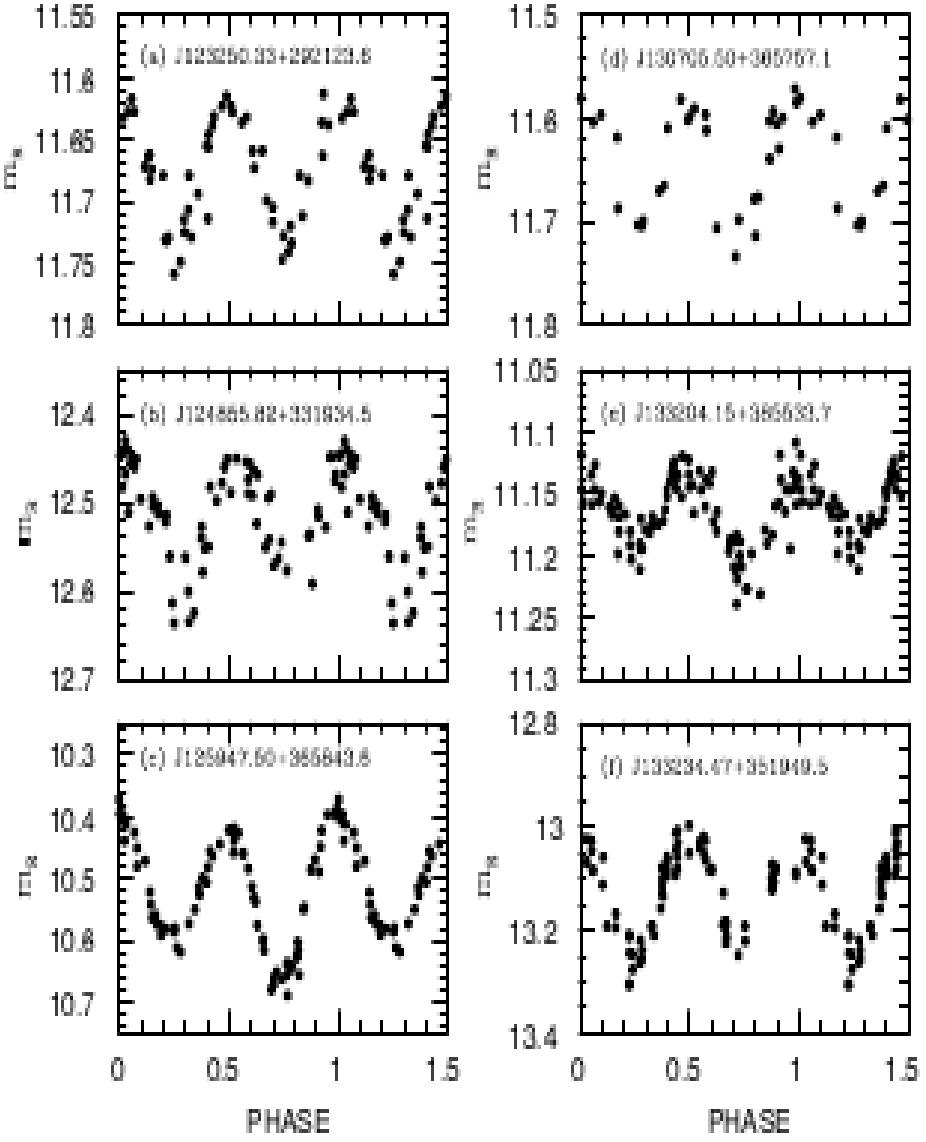


preferred solution

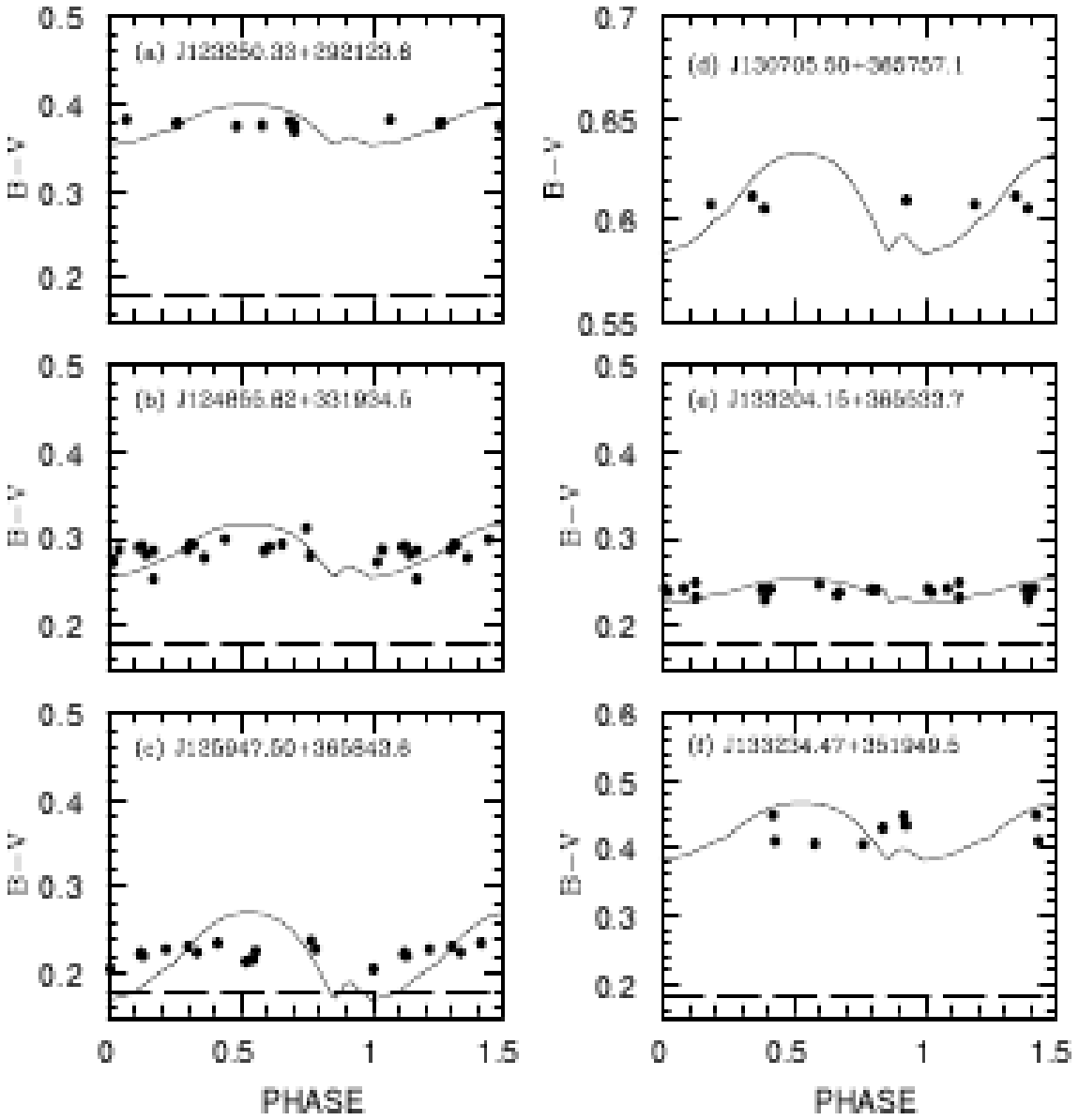
filled circle: Tenagra CCD

RRab & Eclipsers



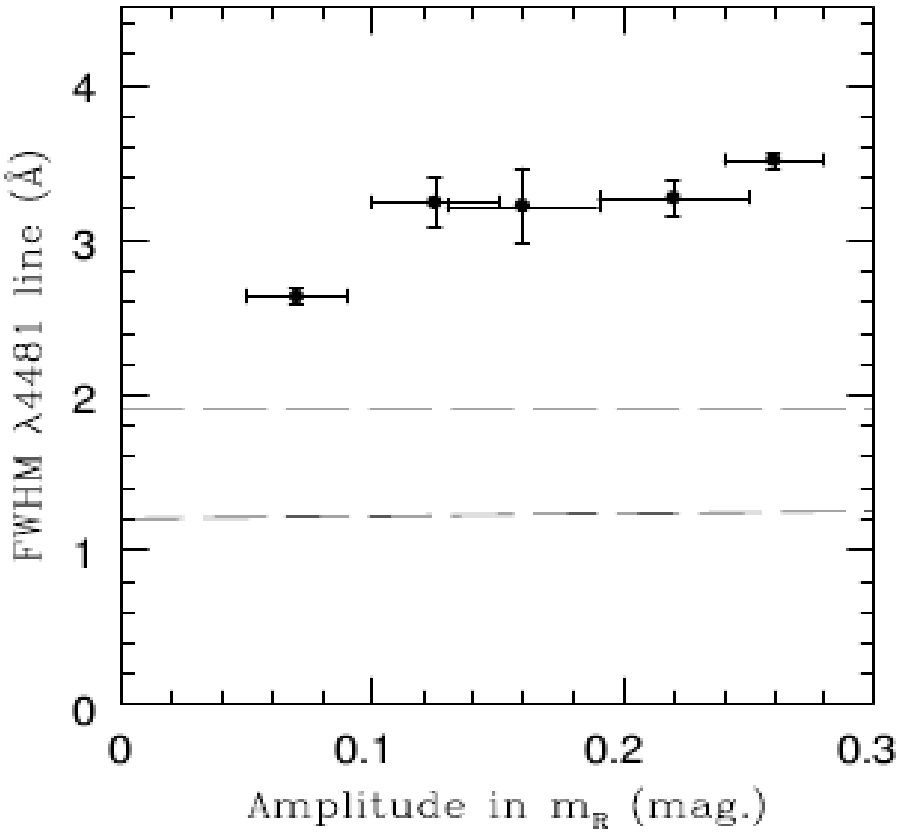


Reclassified RRc -> Eclipsers



Results from Spectra

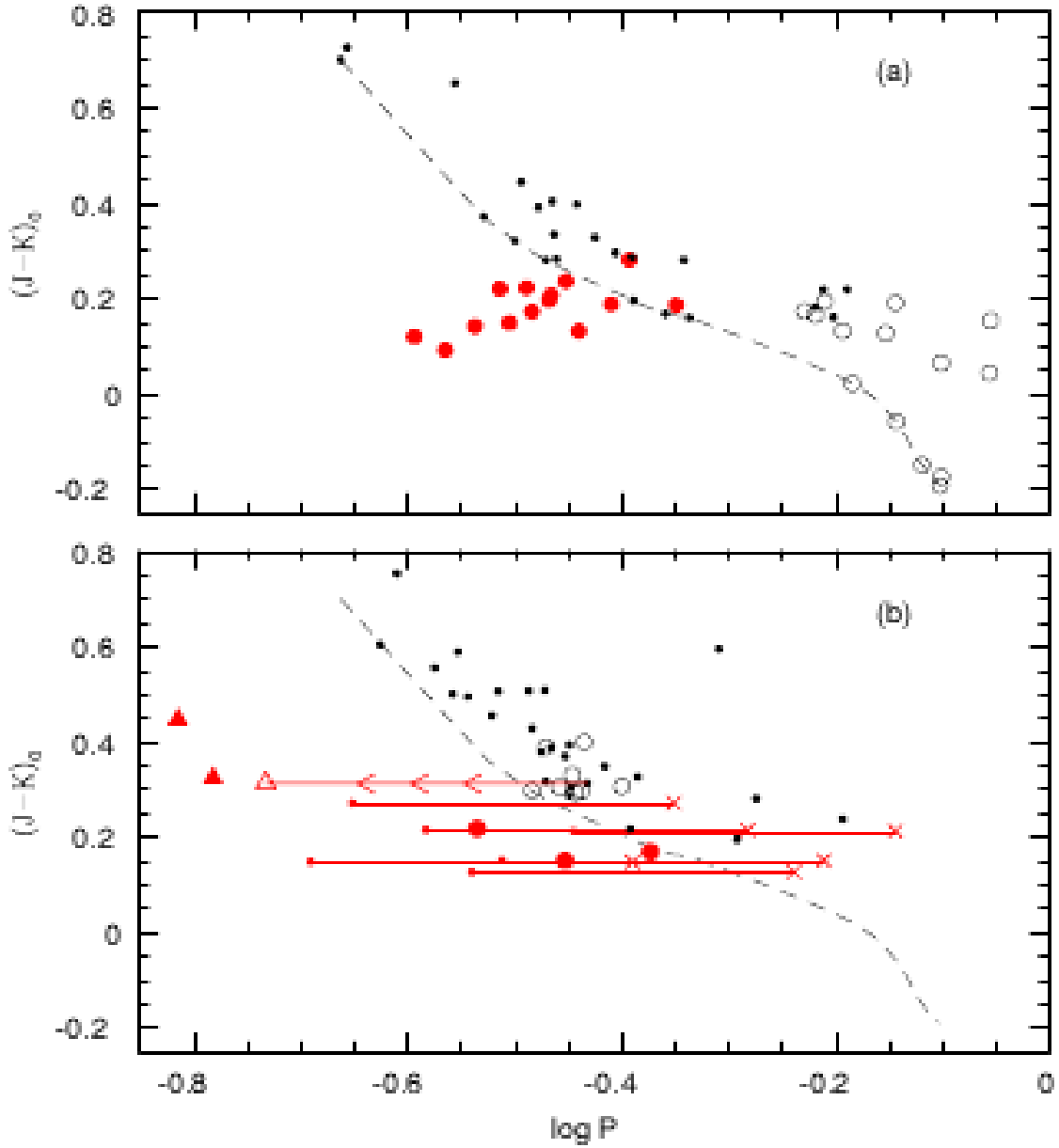
- Measured MgII (4481) line for rotational broadening. Wider for eclipsers.
- Derived metallicity using EW. Eclipsers: solar. RRL-> halo.



More results

- From the light curves, derived Fourier decomposition parameters, amplitudes, rise times. Used Sandage 2004 to derive [Fe/H].
- Determined absolute magnitudes and distances; paired with rad. vel. and proper motions
- Eclipsers: DISK
- RRL: HALO
- Thus, reclassification of 6 stars to eclipser

Distinguishing RRL vs Eclipser



Red: RRL
Black: Eclipser
triangles: delta Sct
red crosses: reidentified eclipsers

upper plot: local neighborhood

lower plot: their field sample

Questions posed....

- From their sample size, 25% are RRc. Is this representative of ROTSE-I survey area (originally 38%)?
- How robust is the photometric method to obtain metallicity? Sandage (2004) method vs. Jurcsik & Kovacs (1996) method??
- Spectroscopic technique good for small sample, but not for a big one!

Where do I go from here?

- We need to confirm photometric vs spectroscopic method – stay tuned!

  (some papers are coming....)

- Follow up work on RRc from NSVS ....