ASTEROSEISMOLOGY WITH SUPERWASP

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SUPER WIDE ANGLE SEARCH FOR PLANETS

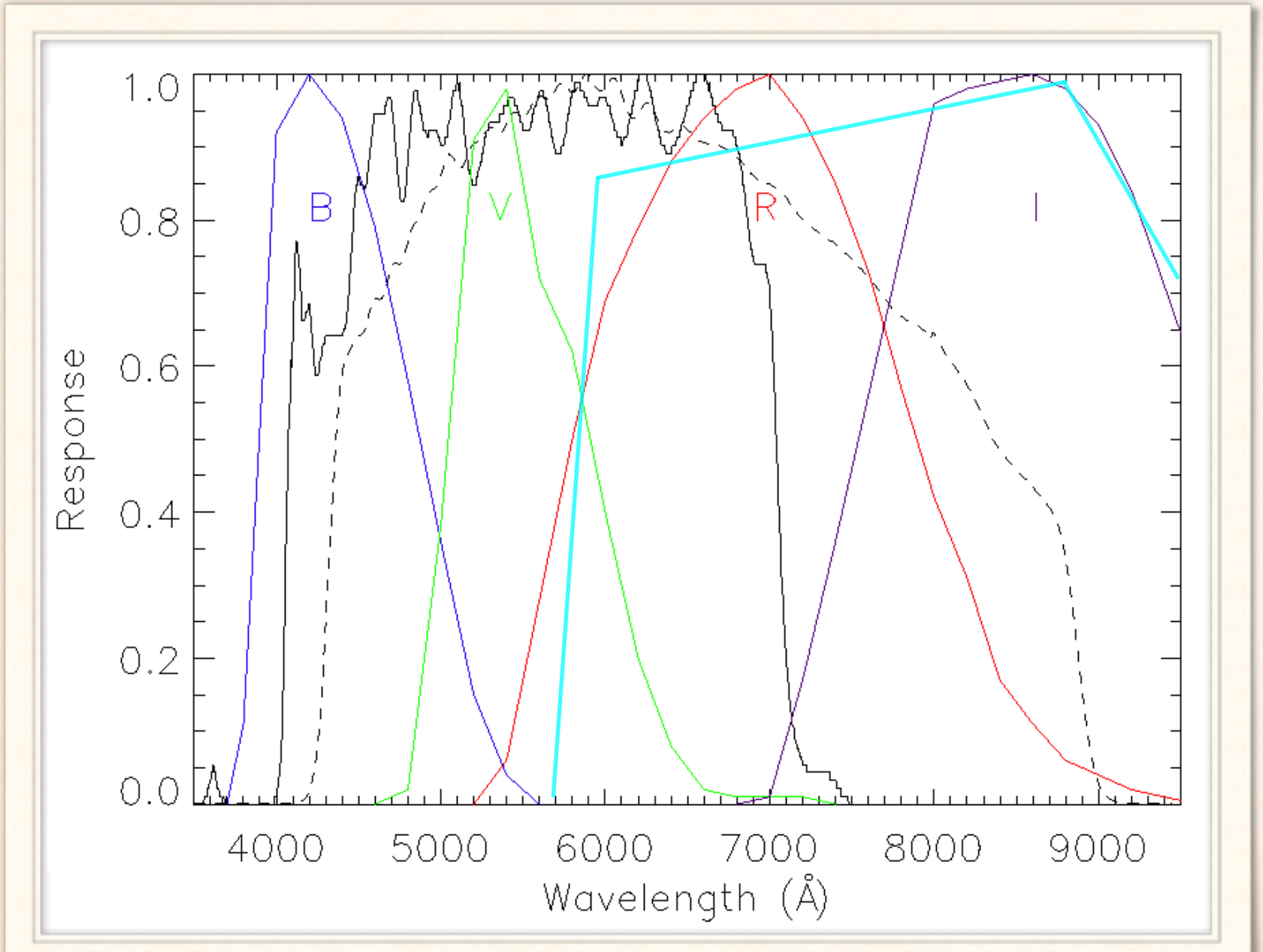
- SuperWASP is a UK based consortium performing the worlds largest survey for transiting extrasolar planets

- Over 150 planets discovered so far...

THE WASP INSTRUMENTS

- Fully Automatic:
  - Roll-off roof system
  - 8 cameras mounted in a 2x4 configuration
  - Standard 200mm telephoto lenses
  - 8x8 degree FOV
  - 13.7” Pixel size
  - Broadband filters

FILTER RESPONSE FUNCTION

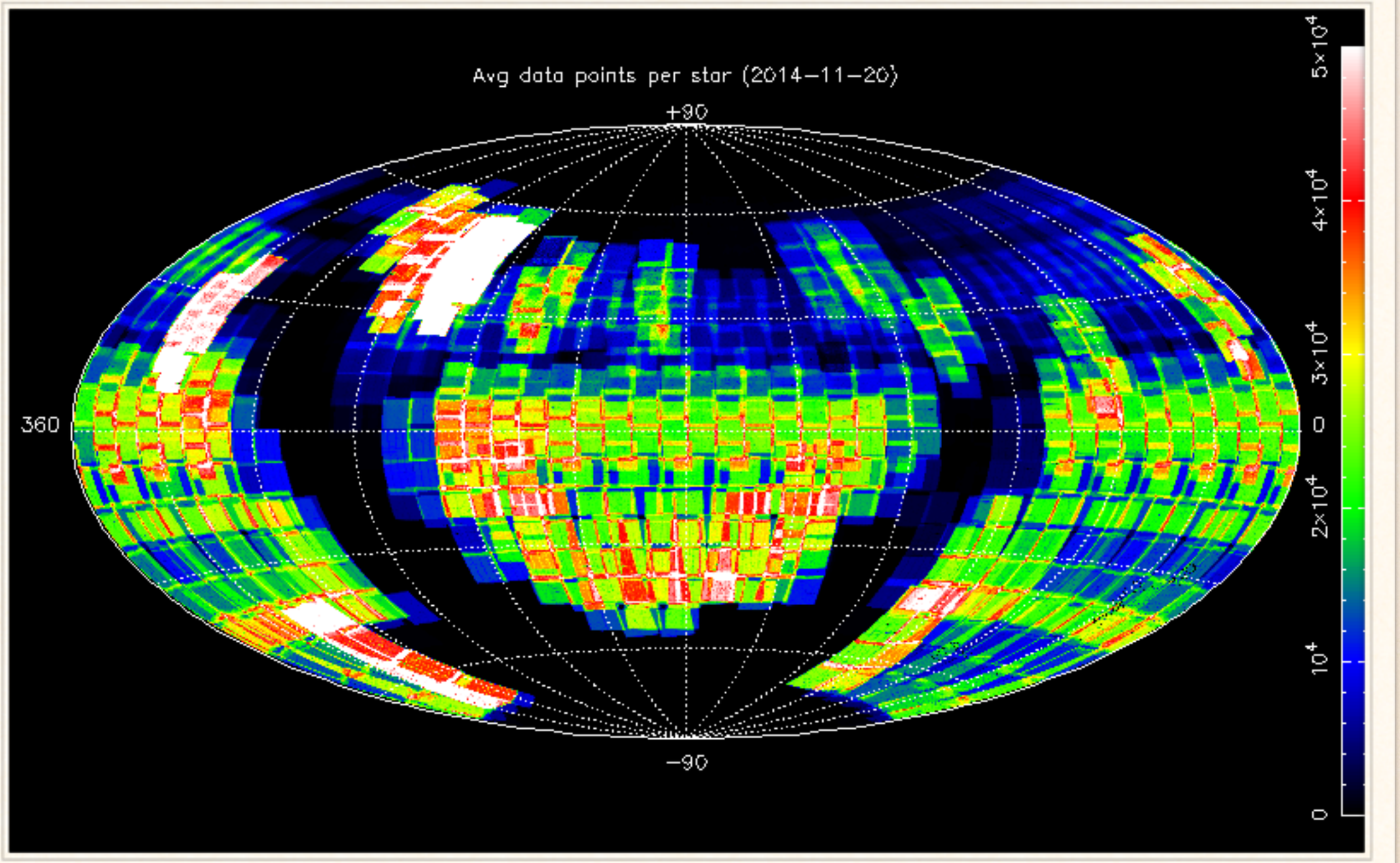


- 4000-7000Å
- Ideal for transiting planets
- Not ideal for hot stars

OBSERVING STRATEGY

- Capable of observing entire sky in ~40 min
- Takes two 30s exposures back-to-back
- Focuses on pre-programmed ‘hot spots’
- Returns to the same patch of sky every ~10 mins
- Typically 3000 data point per season of 100-150 days

OBSERVATIONS



SUPERWASP PHOTOMETRY

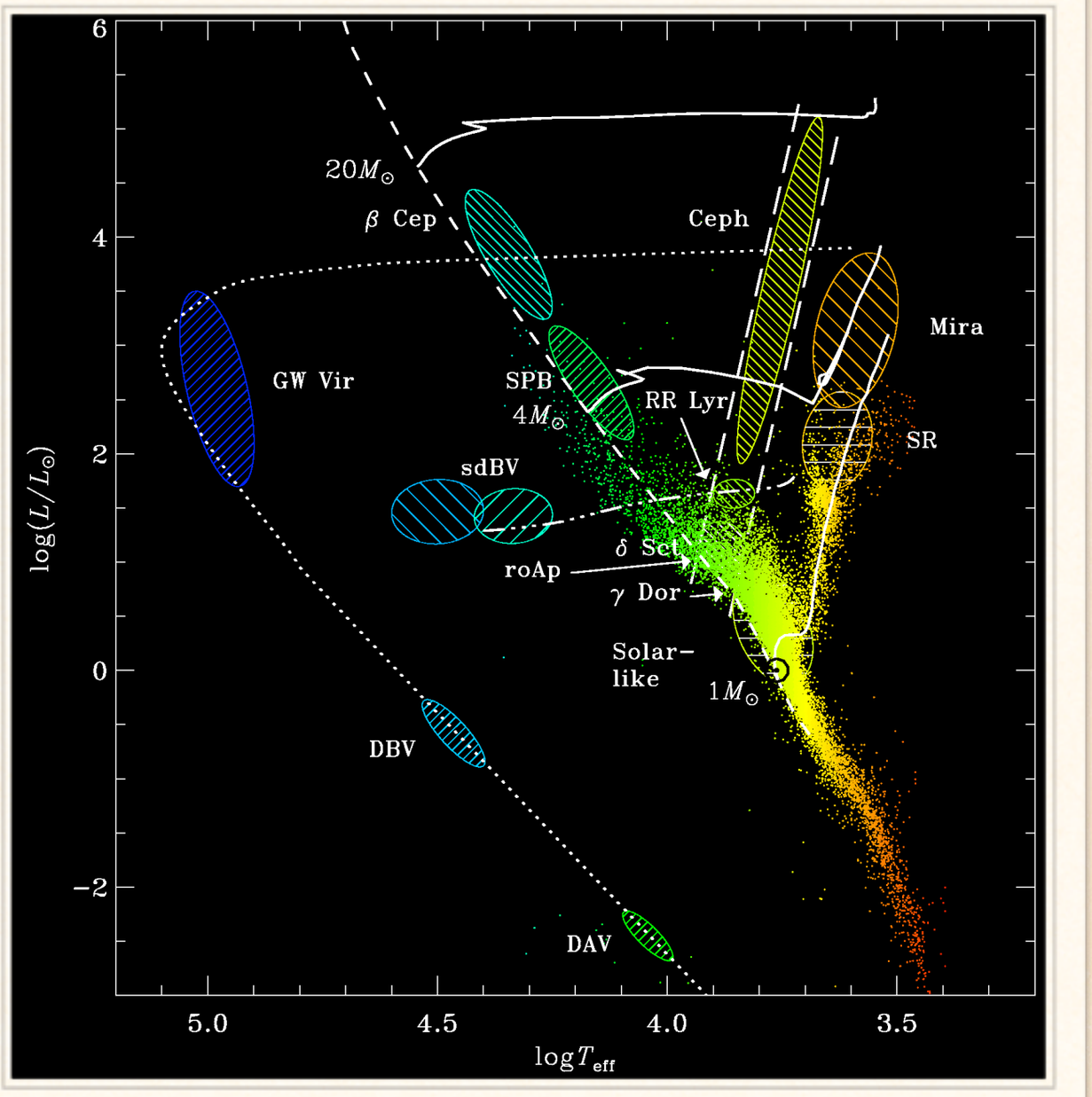
- Automated photometry extraction pipeline
  - USNO B1.0 input catalogue
  - 3.5 pixel aperture = 48”
  - Transformed to Tycho-2 V magnitudes
    corrected for primary & secondary extinction
- Systematics removed with SysRem (Tamuz+ 2005)

Better than 1% for V<11.5 nd 0.5% for V<9.4

Pollacco+ 2006

SUPER WIDE ANGLE SEARCH FOR ~~PLANETS~~ Pulsations!

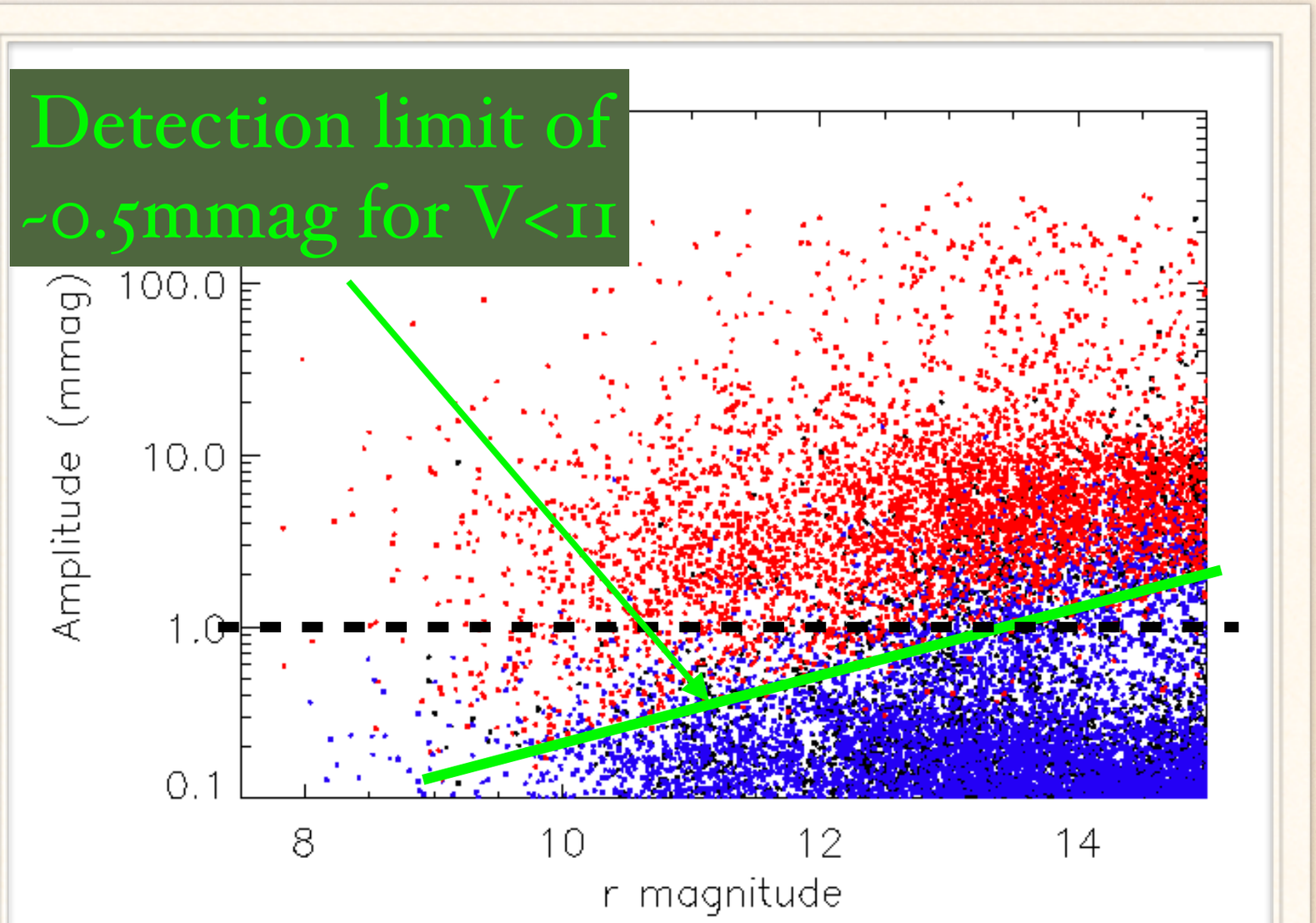
- >31 million stars
  - Multi-season multi-site photometry
- Large database of time-series photometry
  - Statistical studies of variable stars
  - Find ‘rare’ pulsators



http://astro.phys.au.dk/%7Ejcd/HELAS/puls_HR/

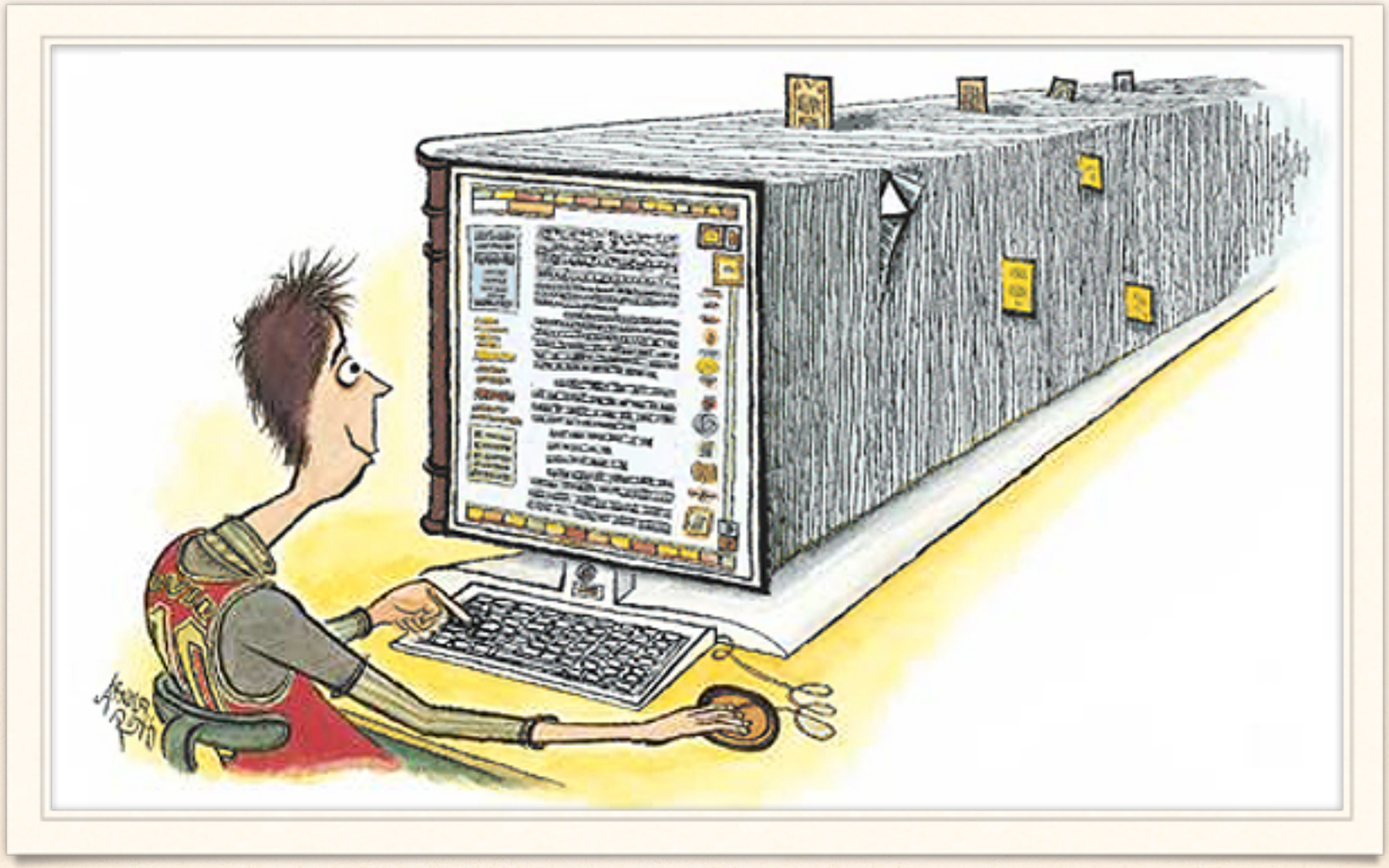
WASP CAPABILITIES

- Dependant on:
  - Blending
  - Magnitude
  - Noise
  - Data length



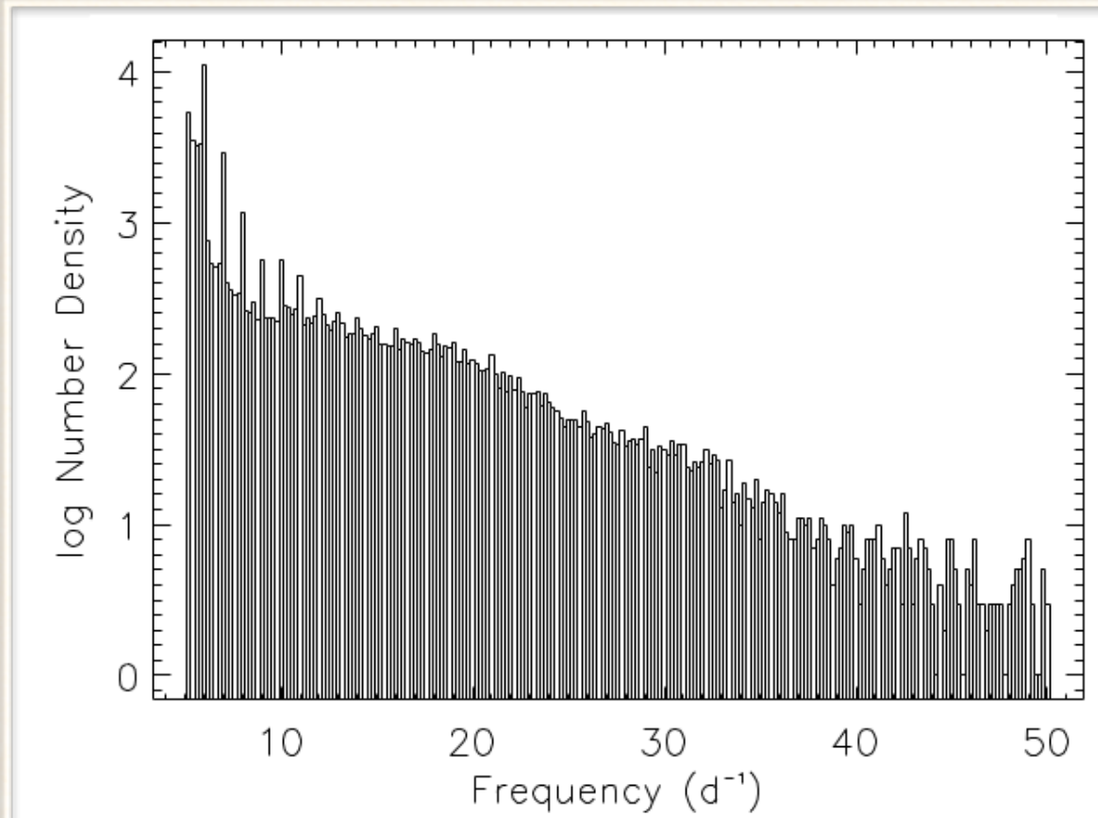
Holdsworth 2015

WHAT'S IN THE ARCHIVE?



LOW-FREQUENCY VARIABLES

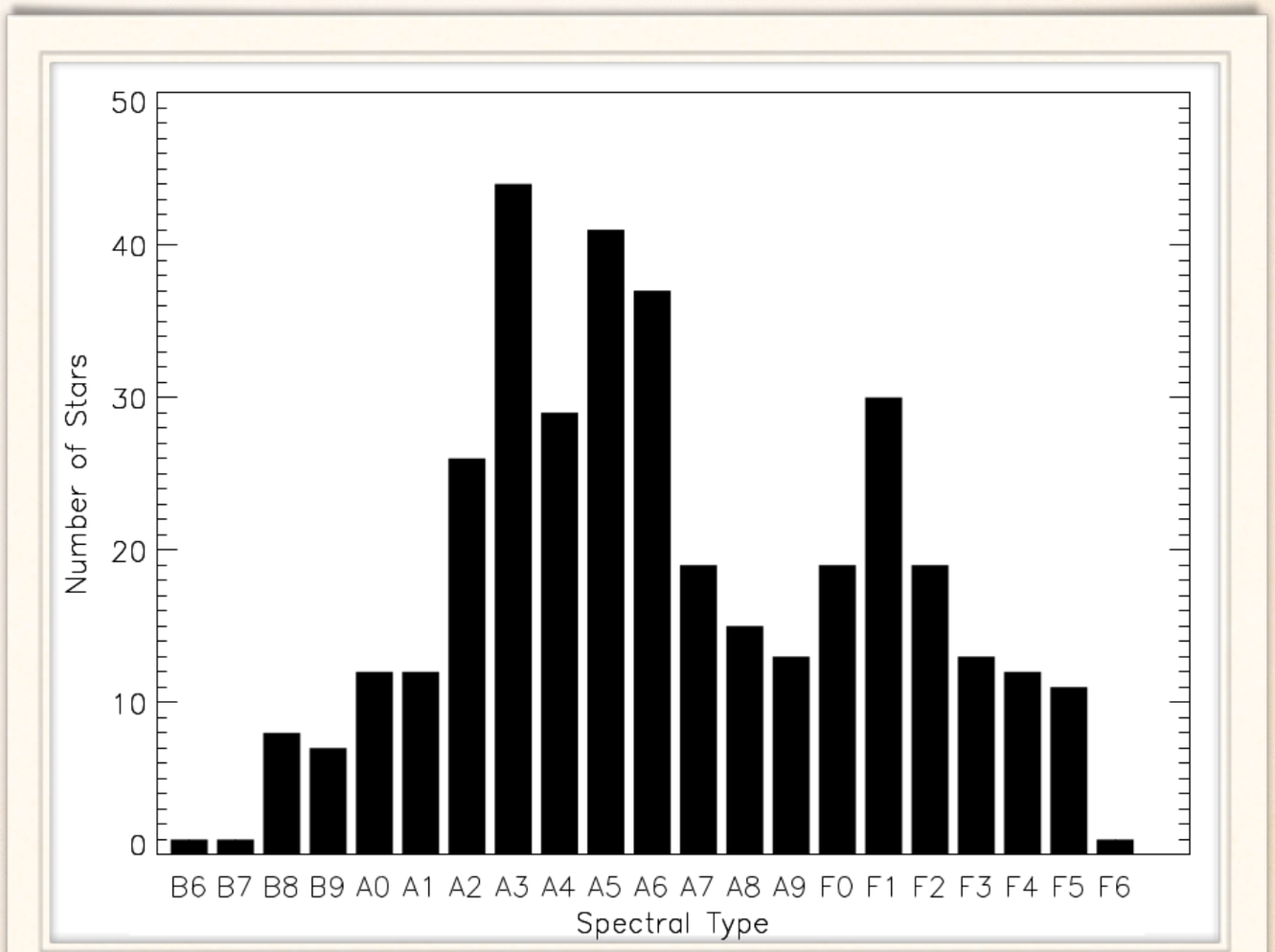
- ~80,000 targets with frequencies 5-50d^{-1}
- Plagued by aliasing
- Harmonics of binaries
- Require a star-by-star analysis
- Studies include:
  - Pulsations in Am stars (Smalley+ 2011)
  - Am binary stars (Smalley+ 2014)
  - λ Boo stars with γ Dor & δ Sct pulsations (Paunzen+ 2014, 2015)
  - Rotational modulation of CP stars (Bernhard+2015)



See Paul's talk next & Barry's on Friday

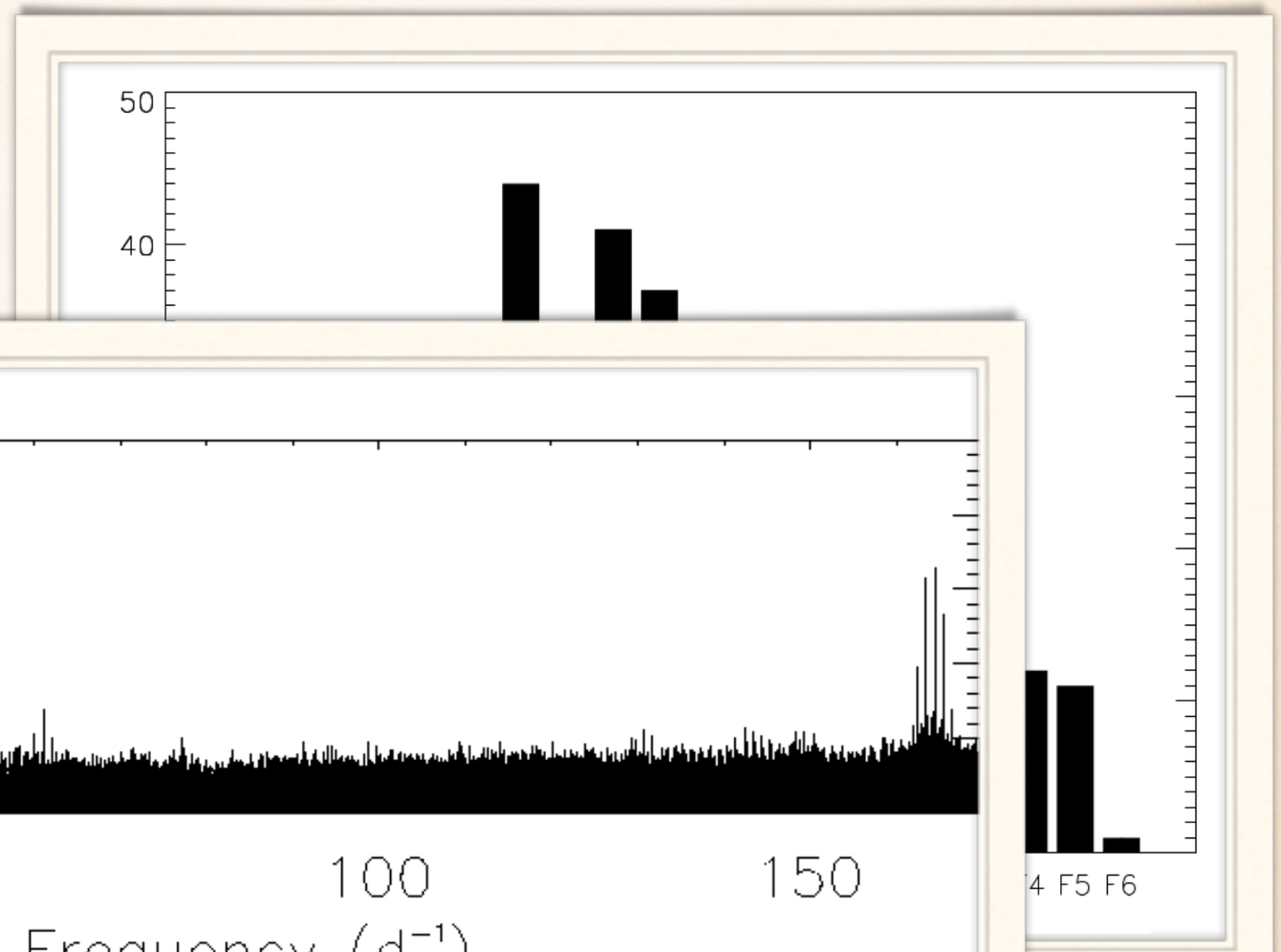
HIGH-FREQUENCY VARIABLES

- These include some of the rarer pulsating stars:
  - The roAp stars
  - Short period δ Sct stars
  - Compact pulsators



HIGH-FREQUENCY VARIABLES

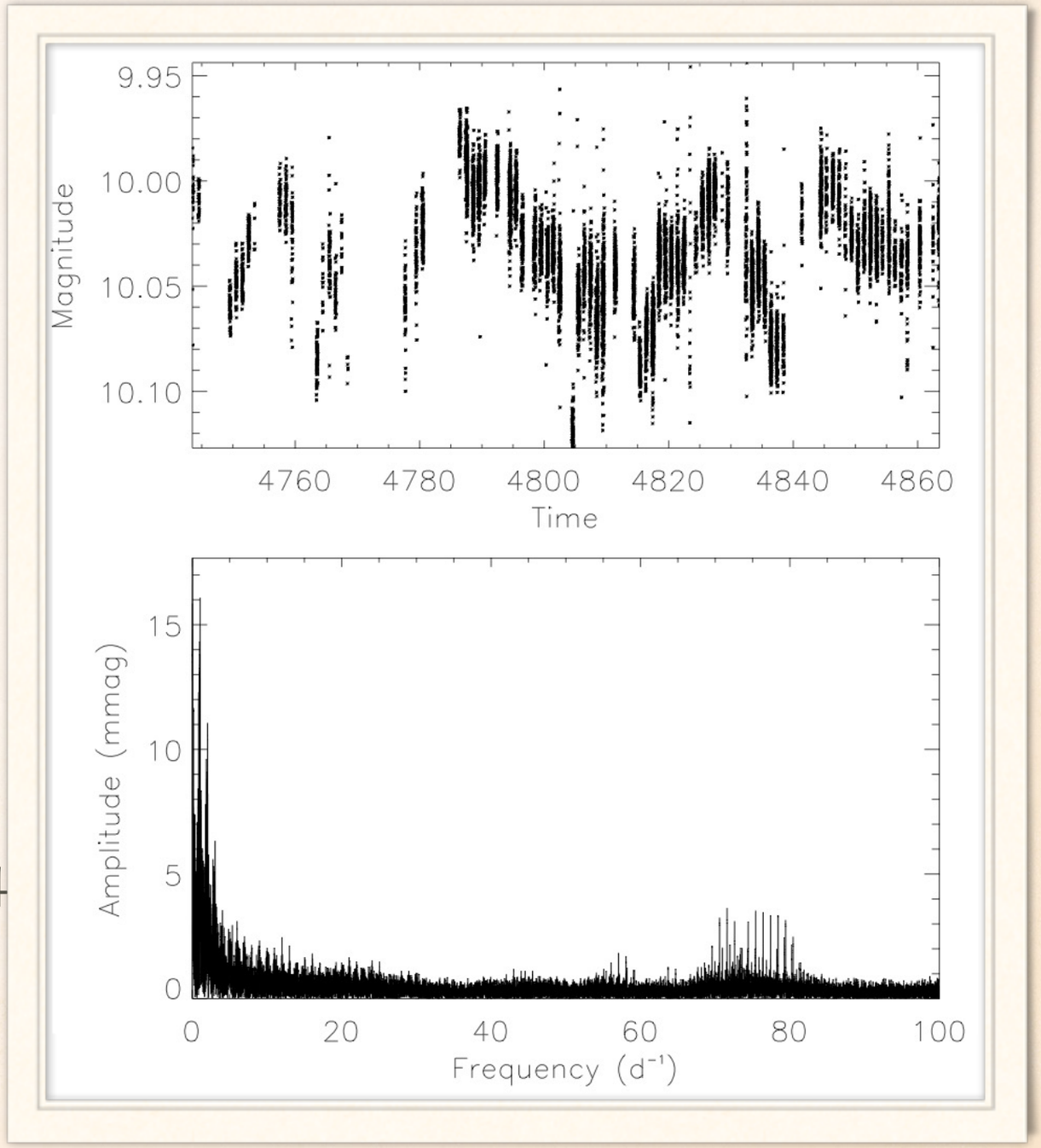
- These include some of the rarer pulsating stars:
  - The roAp stars
  - Short period δ Sct stars
  - C



PMS STARS

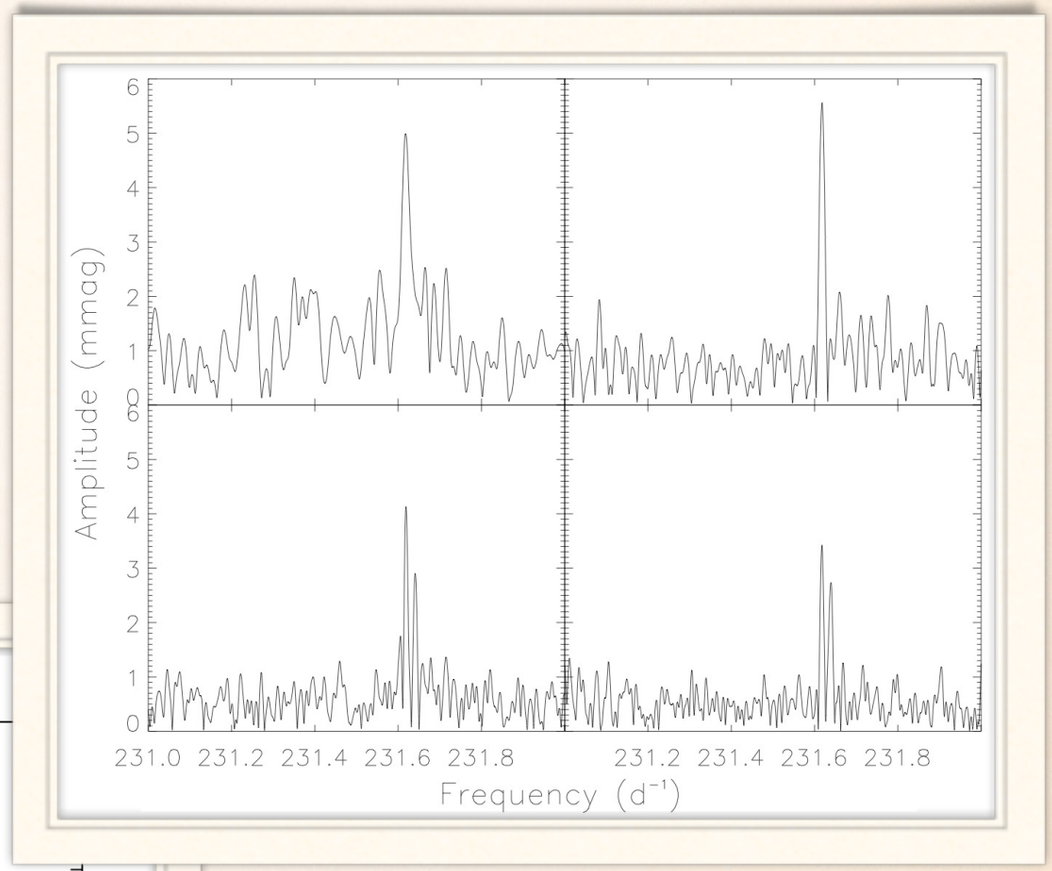
- HD 34282
  - Pre-main sequence star
  - IR excess
- High-frequency δ Sct pulsations
  - 79.5 & 71.3 d^{-1} Amando+ 2004

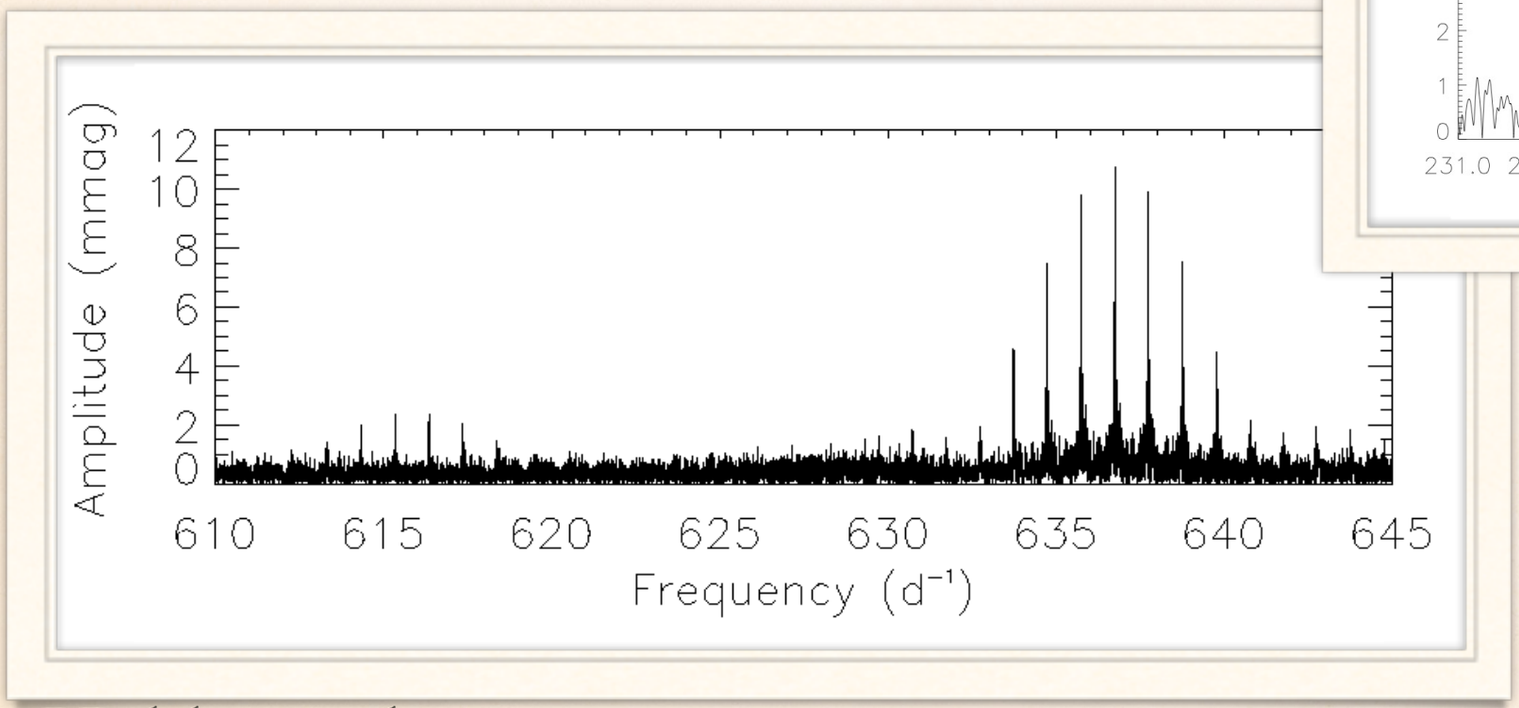
See Konstanze's talk on Thursday



SDBV STARS

- Able to probe to at least 1440 d^{-1}
- Noise is not fully characterised





Holdsworth+ in prep

- At least 3 newly identified
- p and g modes in single star

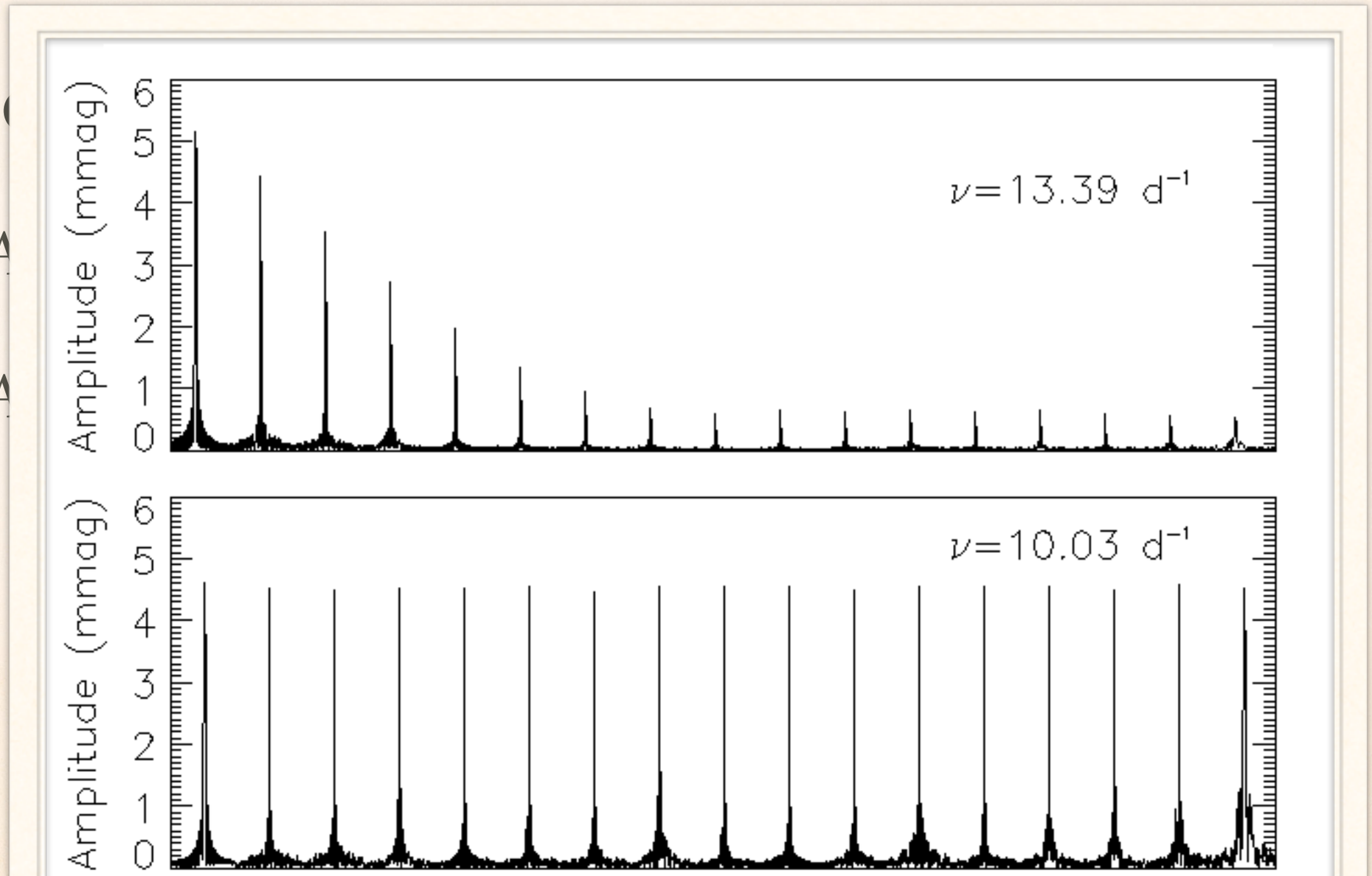
WASP DATA TO SUPPLEMENT KEPLER (K2/TESS) OBSERVATIONS

- KIC 7106205
  - Amplitude variable star (Bowman & Kurtz 2014)
  - Amplitude drops from ~5mmag to 0.5mmag

See Dominic's talk tomorrow

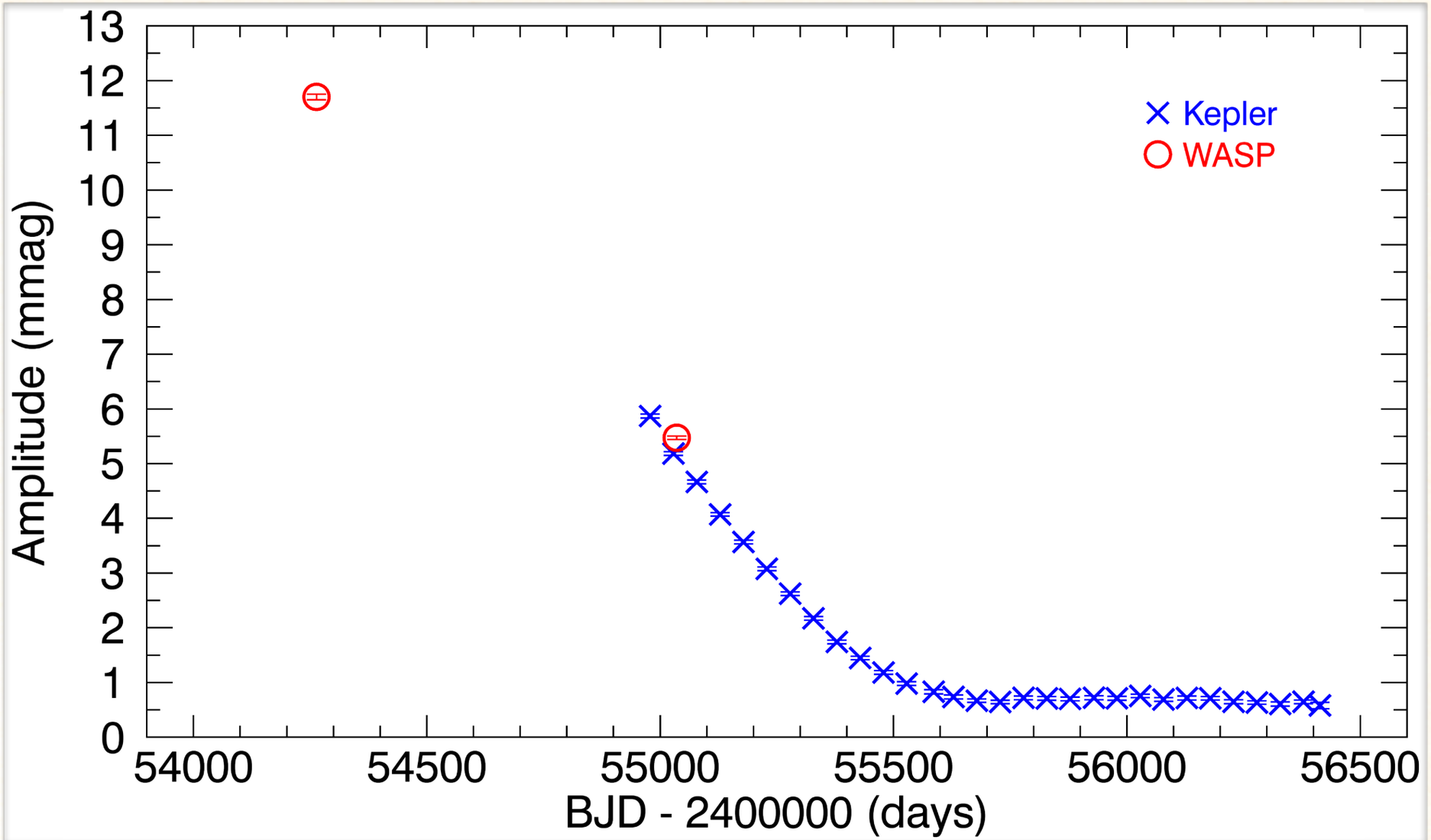
WASP DATA TO SUPPLEMENT KEPLER (K2/TESS) OBSERVATIONS

- KI
  - A
- A



WASP DATA TO SUPPLEMENT KEPLER (K2/TESS) OBSERVATIONS

- K



Bowman 2016

SUMMARY

- Over 31 million objects
- 'All'-sky coverage in approx. *V*-band
- Test for variability in the range of minutes to a decade
- Caution: large pixels make blending an issue

Ideal for extending Kepler/K2/TESS observations and proposing targets for the K2/TESS missions!!