

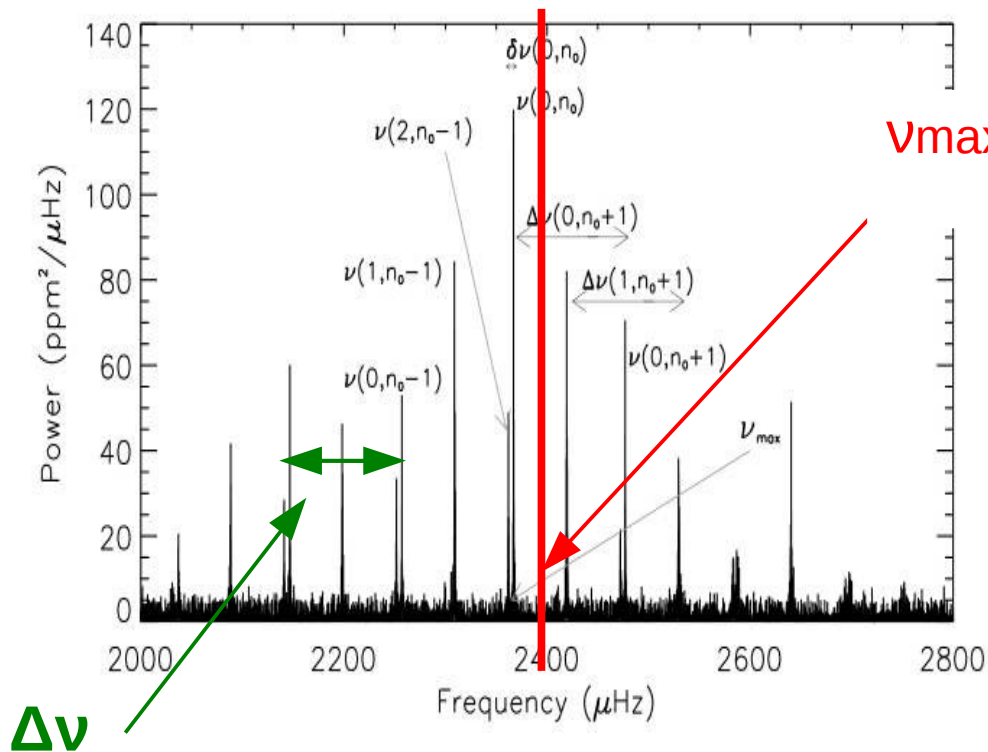
SPICA

Science Perspective in the global
asteroseismic context

Orlagh Creevey
Valrose University, Nice
17 Jan 2017

Solar-like oscillations

Typical power spectrum of sun-like oscillations



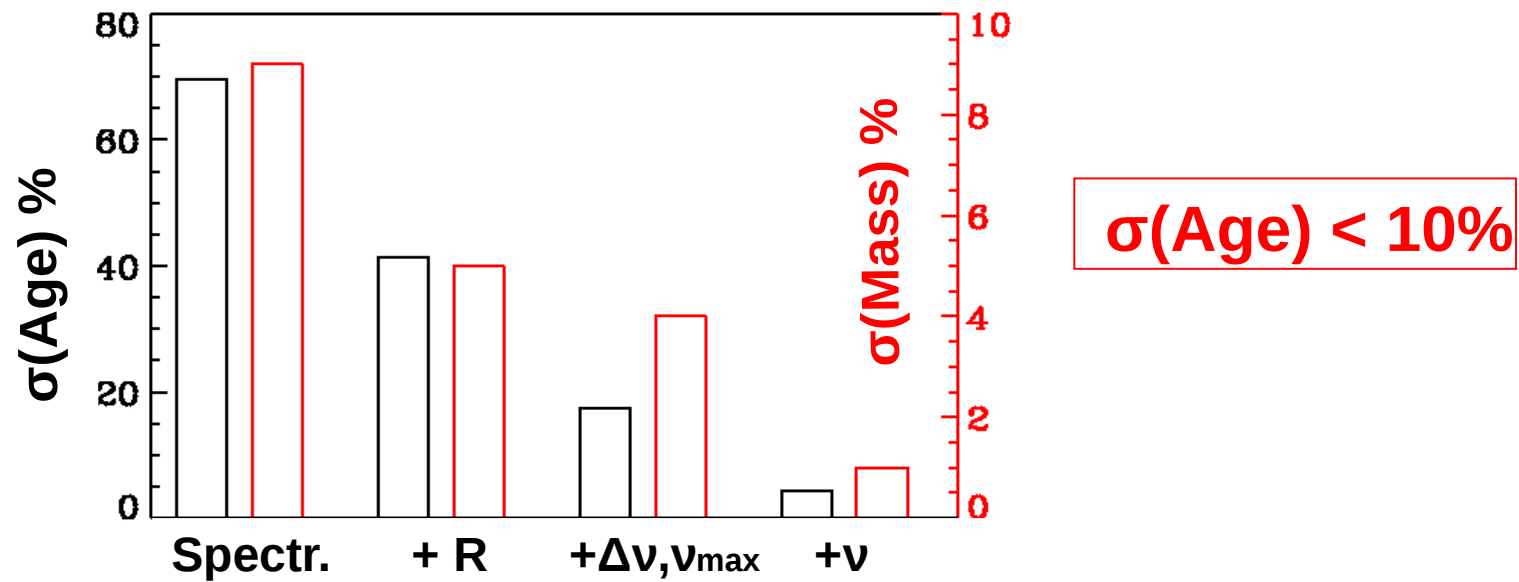
$$R = \frac{v_{max}}{\Delta\nu^2} T_{eff}^{0.5}$$

$$M = \frac{v_{max}^3}{\Delta\nu^4} T_{eff}^{1.5}$$

Log g

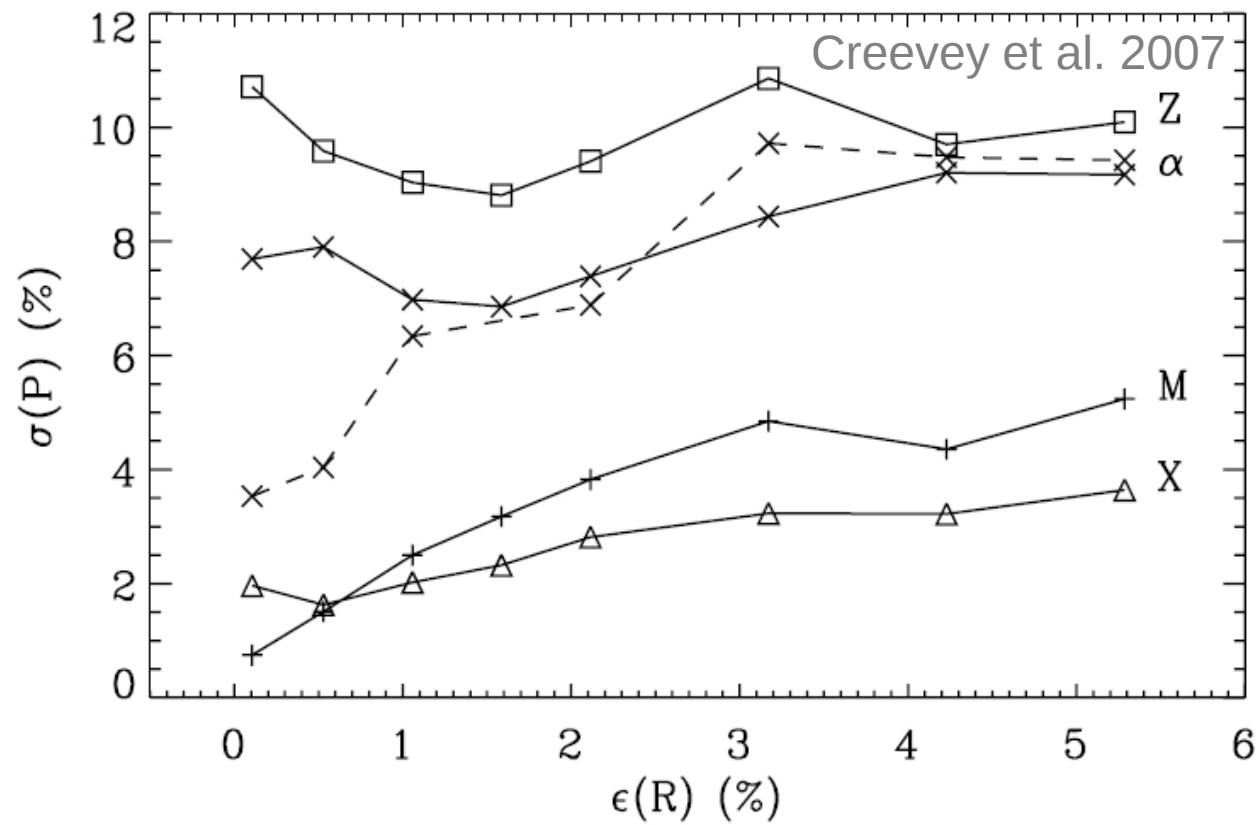
Dont forget classical pulsators: important constraint because of mode-id, badly constrained

Combining Ast+Int



Adapted Creevey et al. (2007)

Combining Ast+Int



Two lines of thought

- SPICA providing complementary constraints
- SPICA providing independent checks

What will SPICA provide (me?)

- Angular Diameter

+ P_i , A_v , UBVJHK (or V+BC), M (SpT/models)

= T_{eff} , R , $\log g$

What will SPICA provide (me?)

- Angular Diameter

+ π , A_v , UBVJHK (or V+BC), M (SpT/models)

= T_{eff} , R , $\log g$

Complementary constraints

What will SPICA provide (me?)

- Angular Diameter

+ π , A_v , UBVJHK (or V+BC), M (SpT/models)

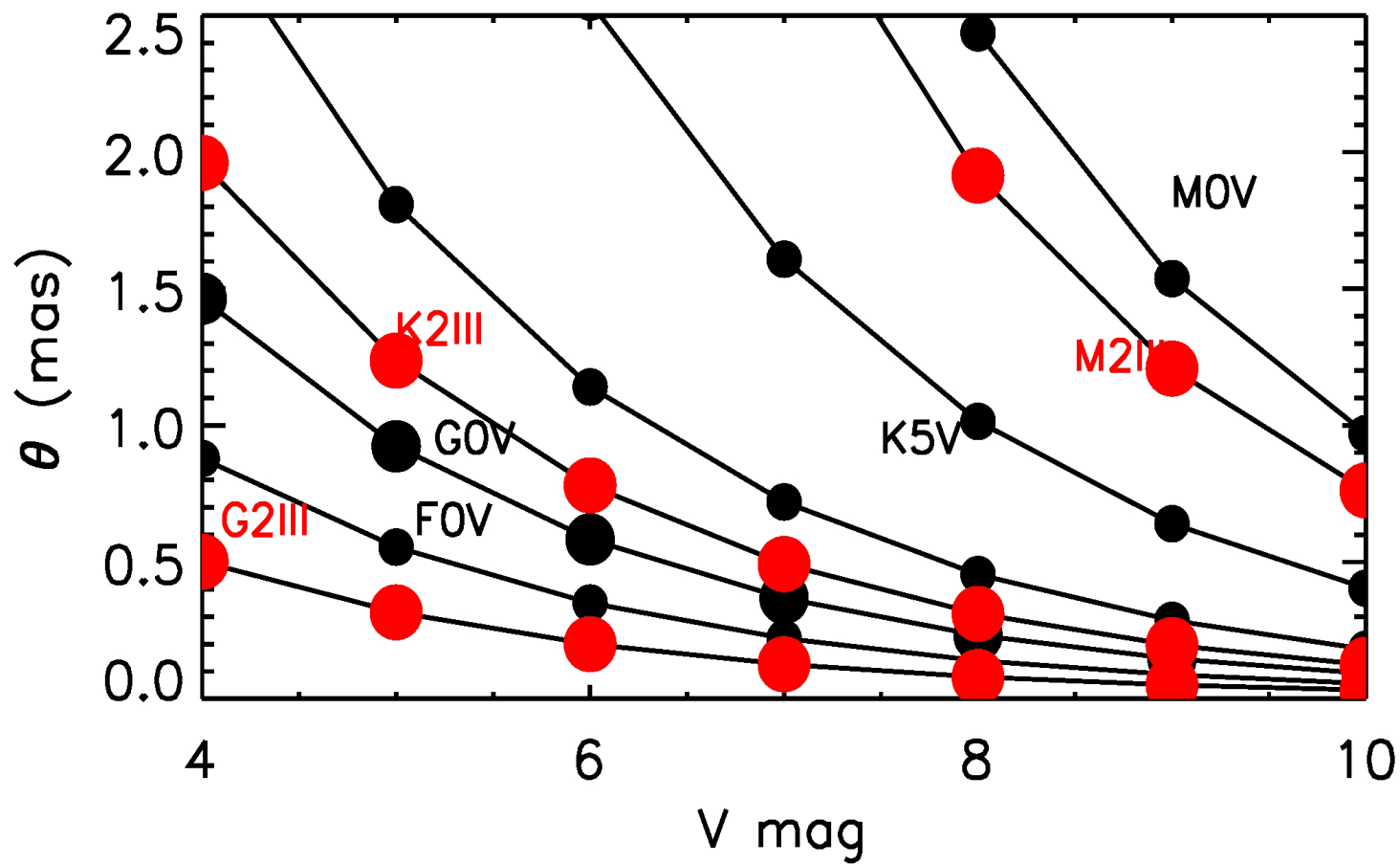
= T_{eff} , R, $\log g$

Independent checks

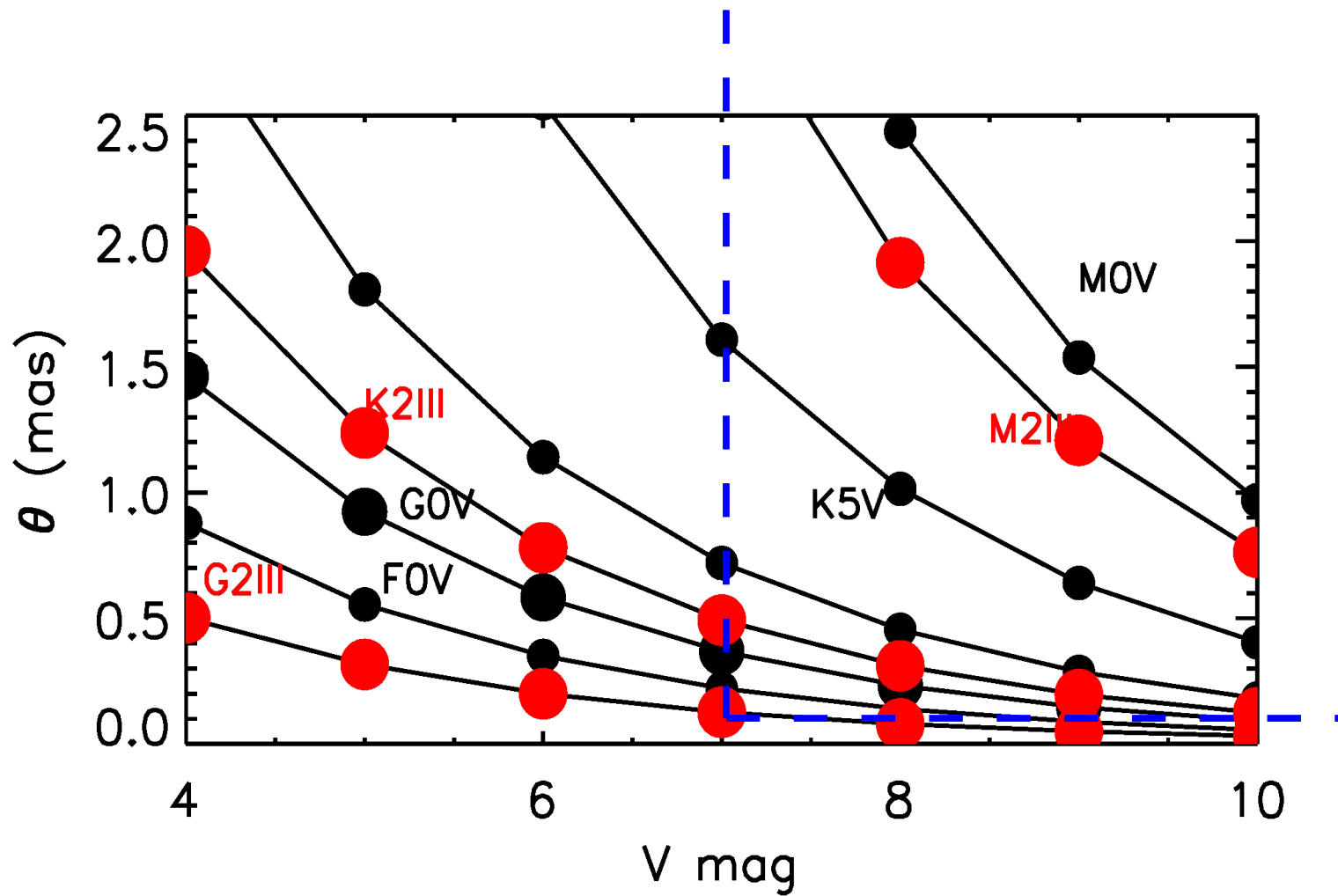
What will SPICA provide (me?)

- Angular Diameter
 - + π , A_v , UBVJHK (or V+BC), M (SpT/models)
 - = T_{eff} , R , $\log g$
- **And** for $V \rightarrow 9$, $\theta \rightarrow 0.1$ mas, + precision

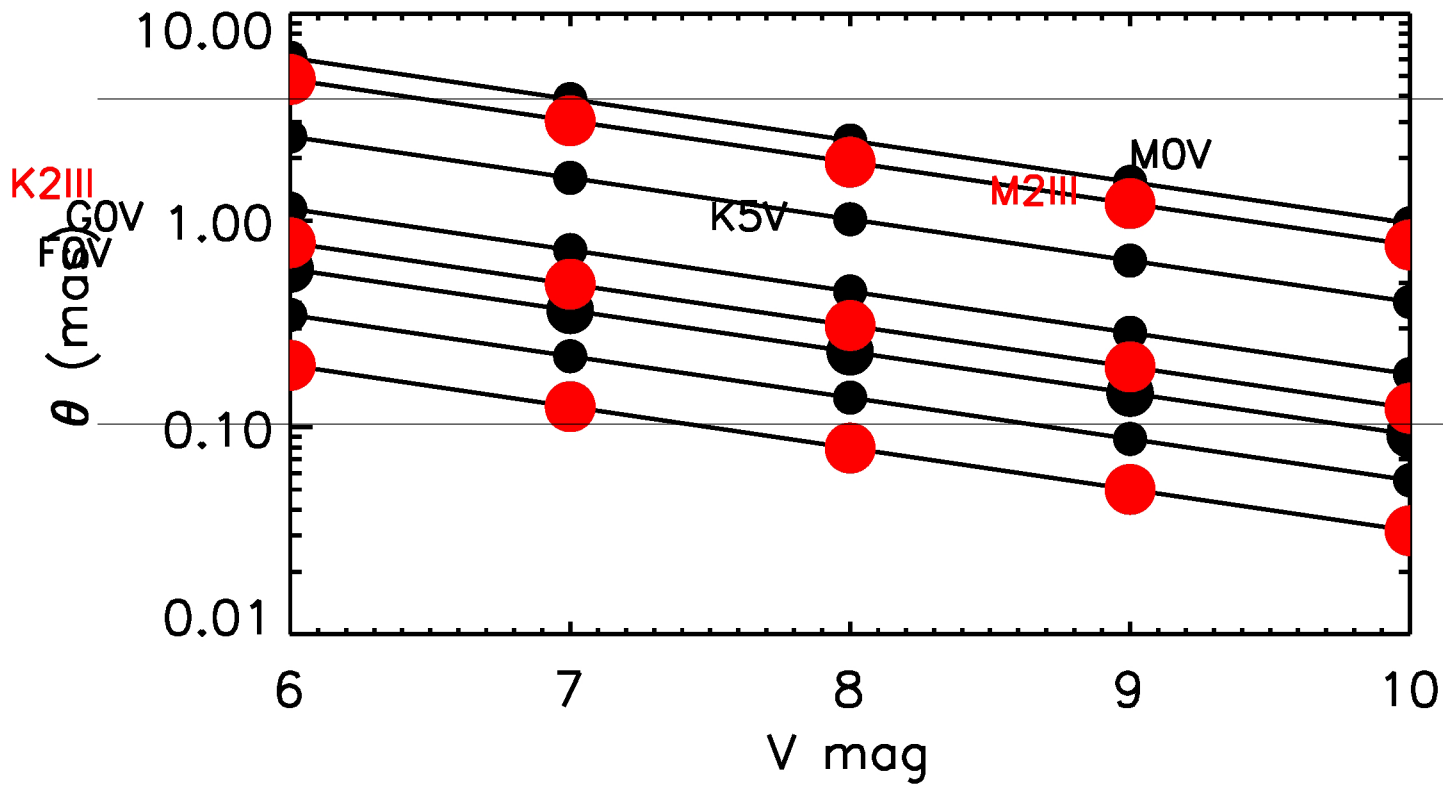
Which stars?



Which stars?



Which stars?



V mag

Seismology

Ground-based RV
e.g. HARPS,

CoRoT: few

Kepler:
~600V, 1000s III

CoRoT:
1000s III

Visible Interferometry (small diameters)

V = 0 mag

2

4

6

8

10

12

14

Seismology

Ground-based RV
e.g. HARPS,

CoRoT: few

CoRoT:
1000s III

Kepler:
~600V, 1000s III

TESS

PLATO

Visible Interferometry (small diameters)

SPICA

V = 0 mag

2

4

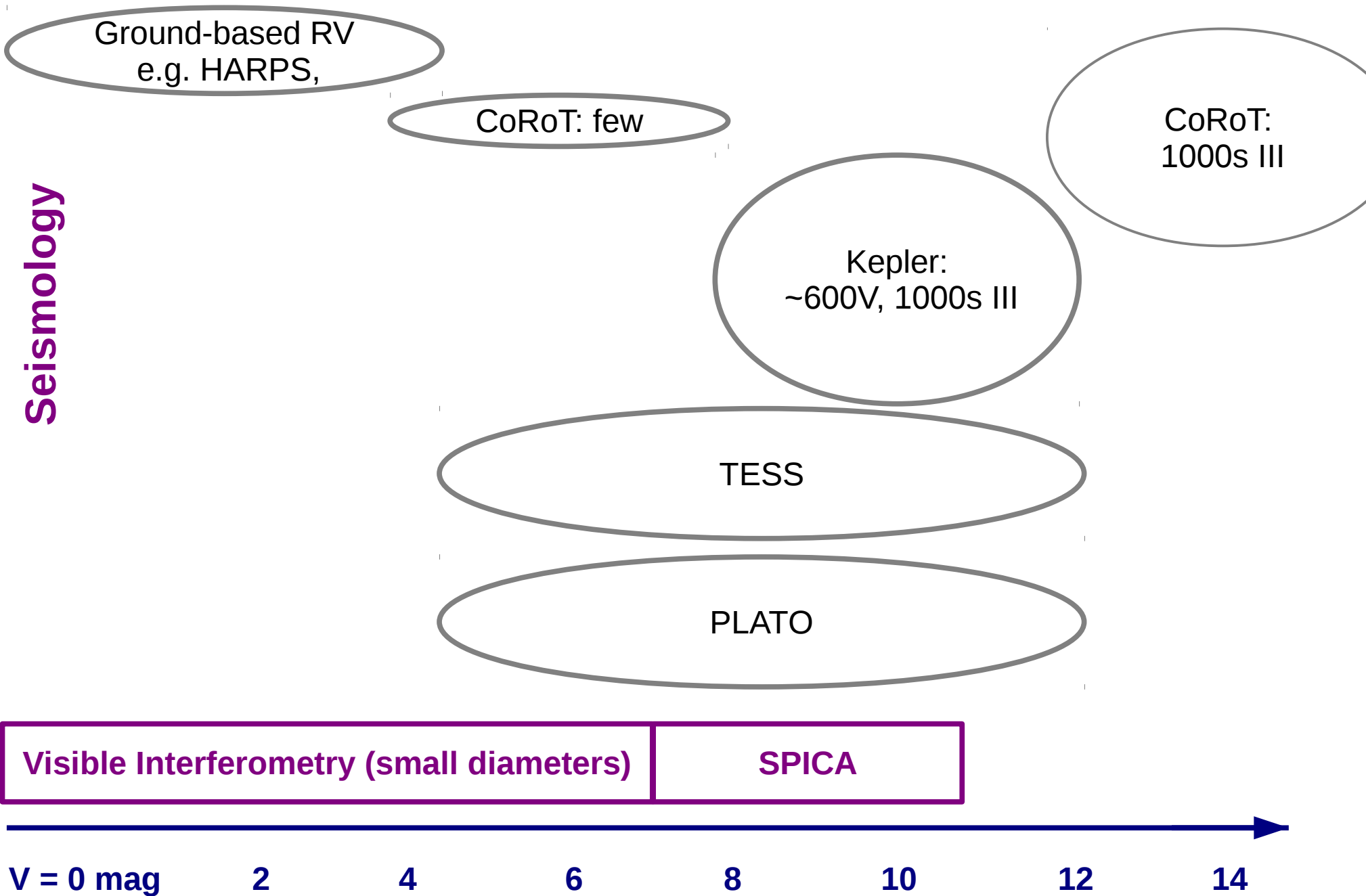
6

8

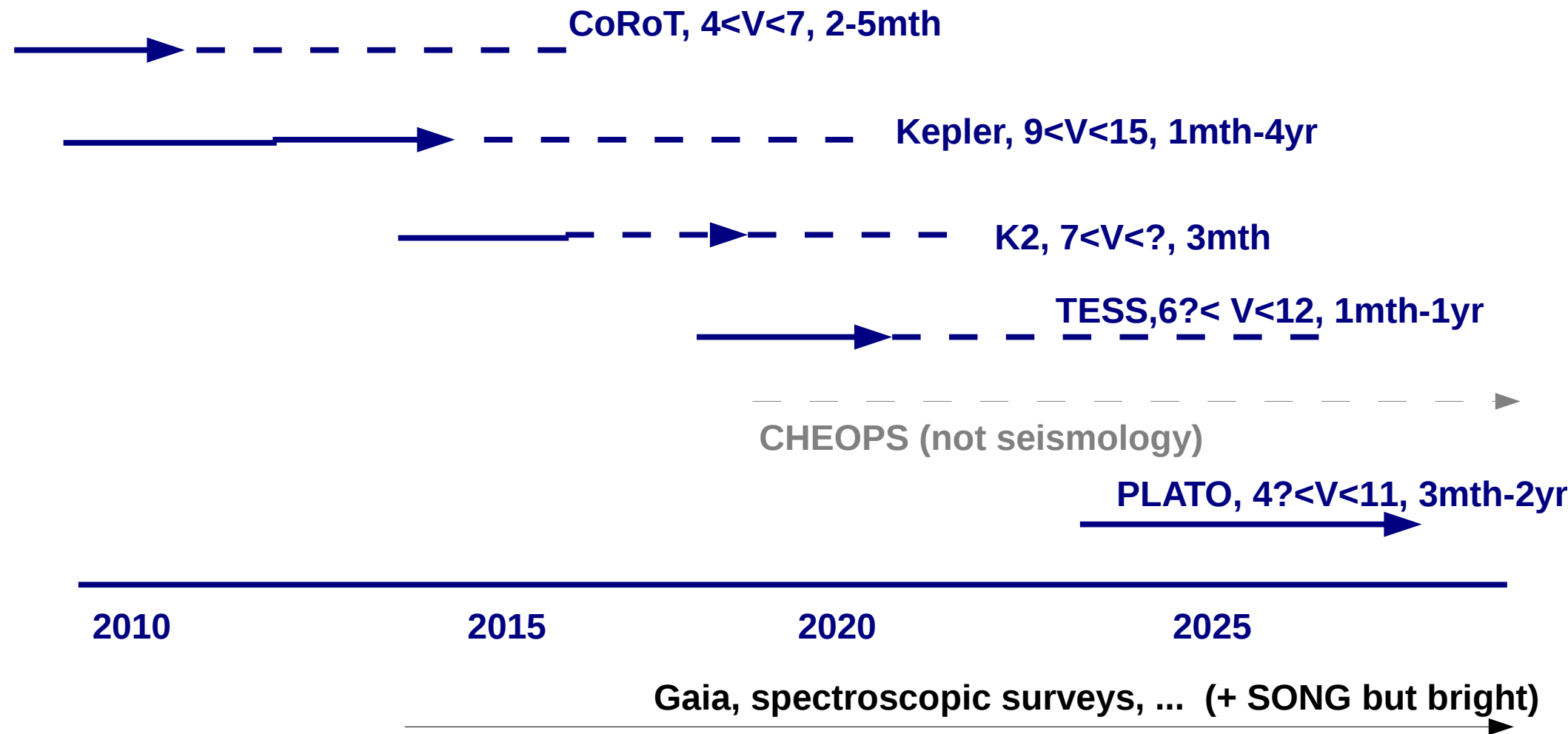
10

12

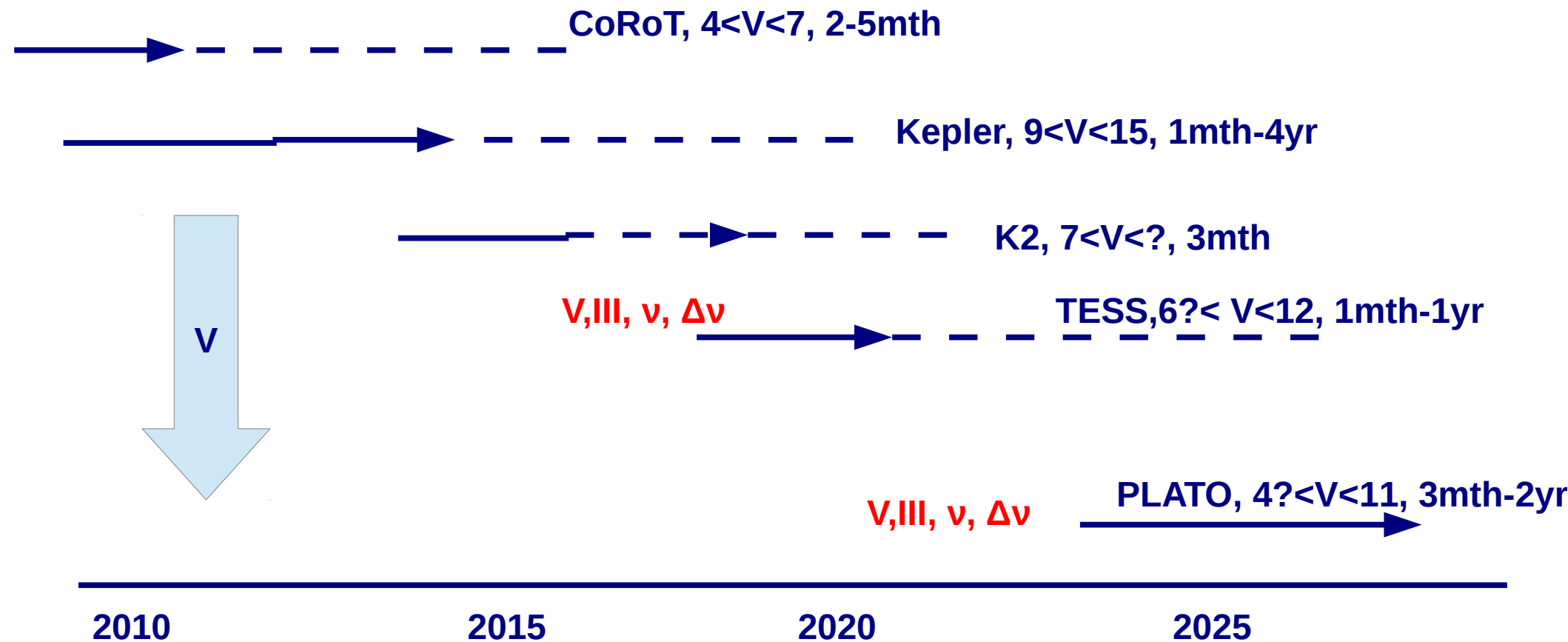
14



Asteroseismology -> 2026



Asteroseismology -> 2026



WHOLE SKY!

Kepler field 1 month data ~500 (150?) MS with Dnu for V: 9-11 (10)

Complementary constraint

- Depends on additional data, note: Gaia!
- Cas specifics:
 - Dnu only -> R, M, Age, (a)
 - -> Improve planet / Galaxy models / Seismic R
 - Nu -> details of star models and physics + f.p.
 - -> better ages, $\Delta Y/\Delta Z$, Y_0 (planet/Galaxy)
- Logg + Teff -> Abundances + metallicity
 - $\Delta Y/\Delta Z$, atmosphere improvements (planet/star/Galaxy)
- Asteroseismology = MODELS, so chance to improve!
(rotation, activity, outer layers)

Independent test

- Test parallaxes, although we hope Gaia is accurate
- If assume parallaxes good \rightarrow SB relations
- Extinction and Reddening

And what I didn't mention

- Binaries
- Mstars (models)
- Precision asteroseismic data
- D Scuti (fast) / Cepheids / roAp etc
- fin

4 cases

- MS stars and individual frequencies
 - Ages, physics of interiors, atmospheres
- III stars and individual frequencies
 - Cores of giants, Ages, Masses
- MS stars and Mean quantities
 - Mean density, evolution stage, fund par.
- III stars and Mean quantities
 - Rad, Mass, Ages, population studies

- Ref for SpT/AbsMag:
[http://www.isthe.com/chongo/tech/astro/
HR-temp-mass-table-byhrclass.html#below](http://www.isthe.com/chongo/tech/astro/HR-temp-mass-table-byhrclass.html#below)