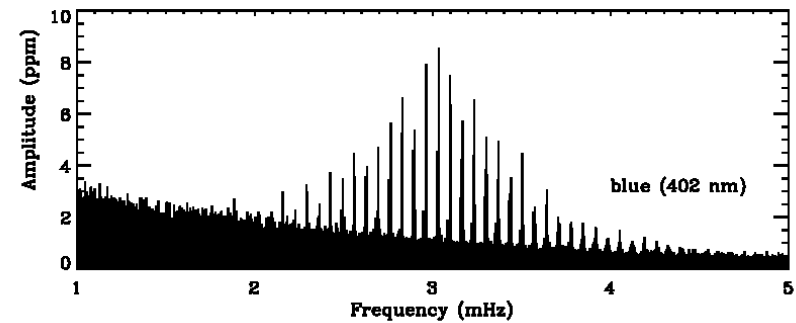


# Oscillations of solar-like stars and red giants: the observer perspective

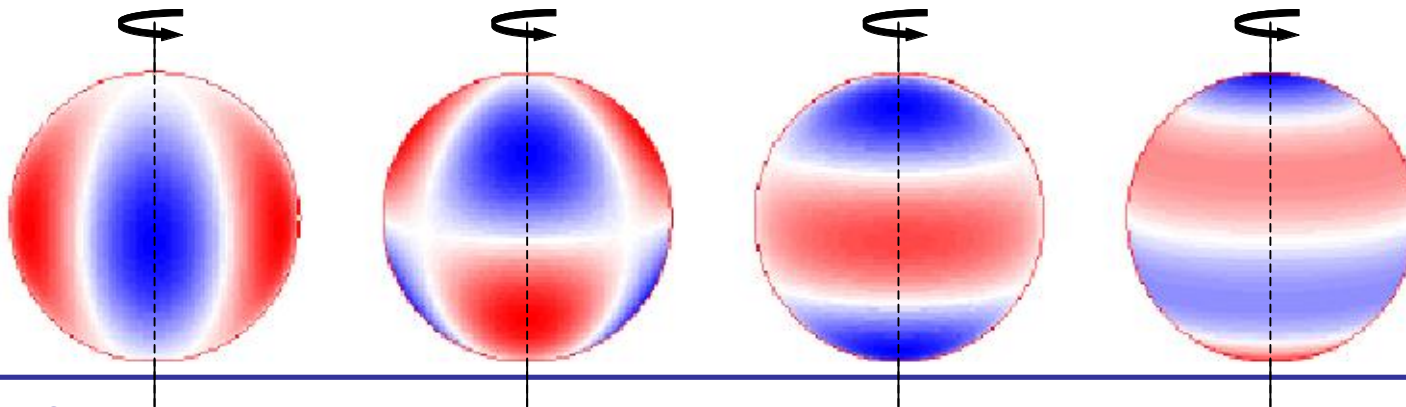
Saskia Hekker

University of Amsterdam  
Max Planck Institute for Solar System research

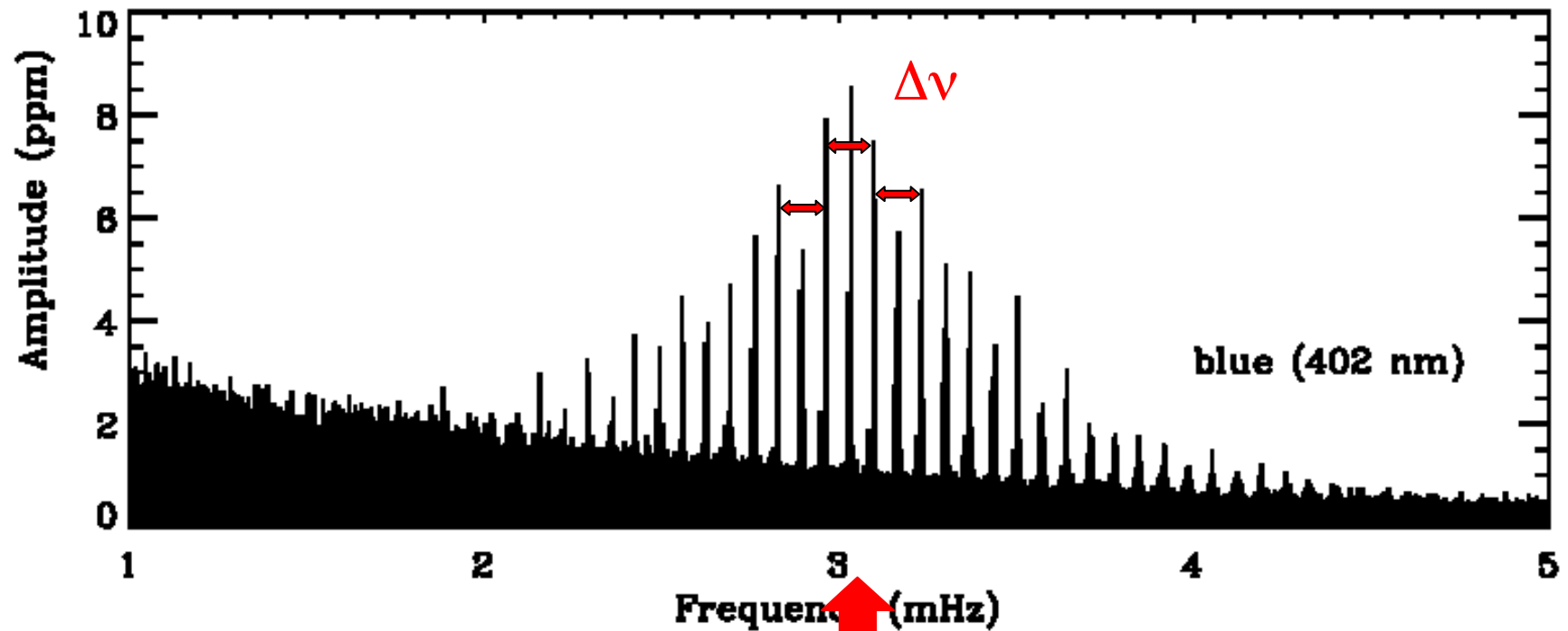
## Solar-like oscillations



- driven by turbulent convection in stellar atmosphere
- expected to be present in all stars with convective outer layers: solar-like stars, subgiants and red giants
- parameters:
  - frequencies
  - number and orientation nodal lines ( $n, l, m$ )



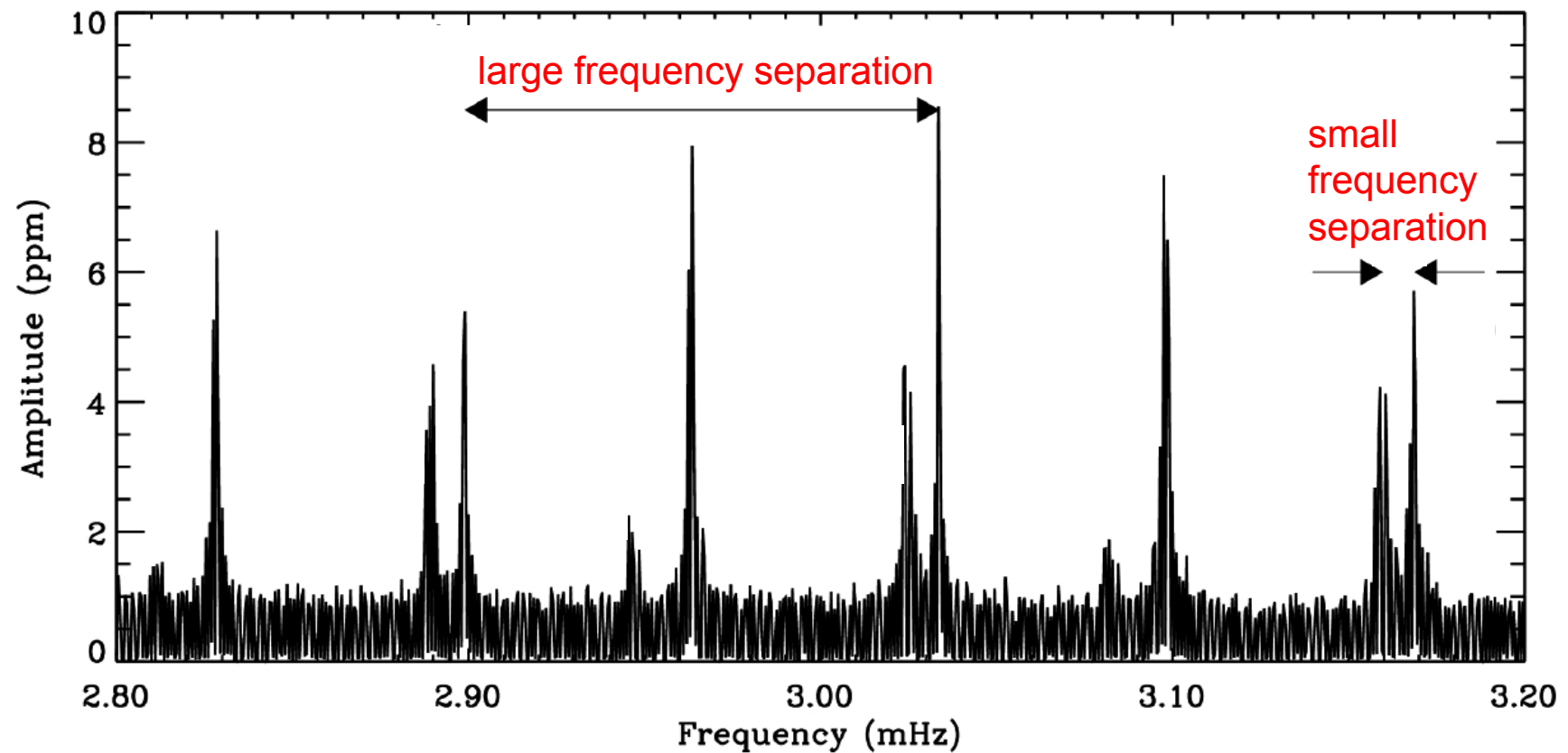
## Parameters to measure: $\Delta\nu$ and $\nu_{\max}$



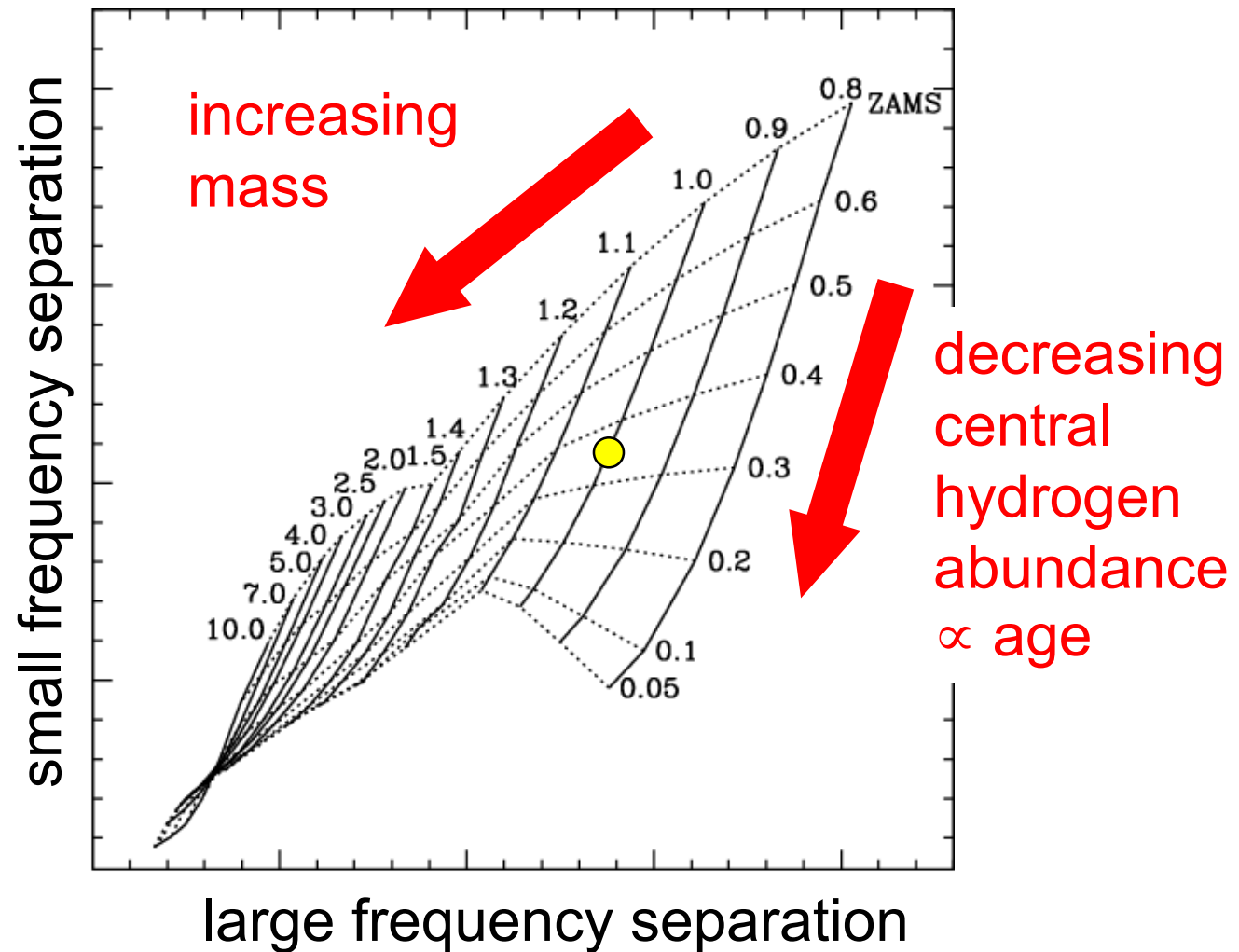
$$\Delta\nu \propto \sqrt{\rho}$$

$$\nu_{\max} \propto \frac{g}{\sqrt{T_{\text{eff}}}}$$

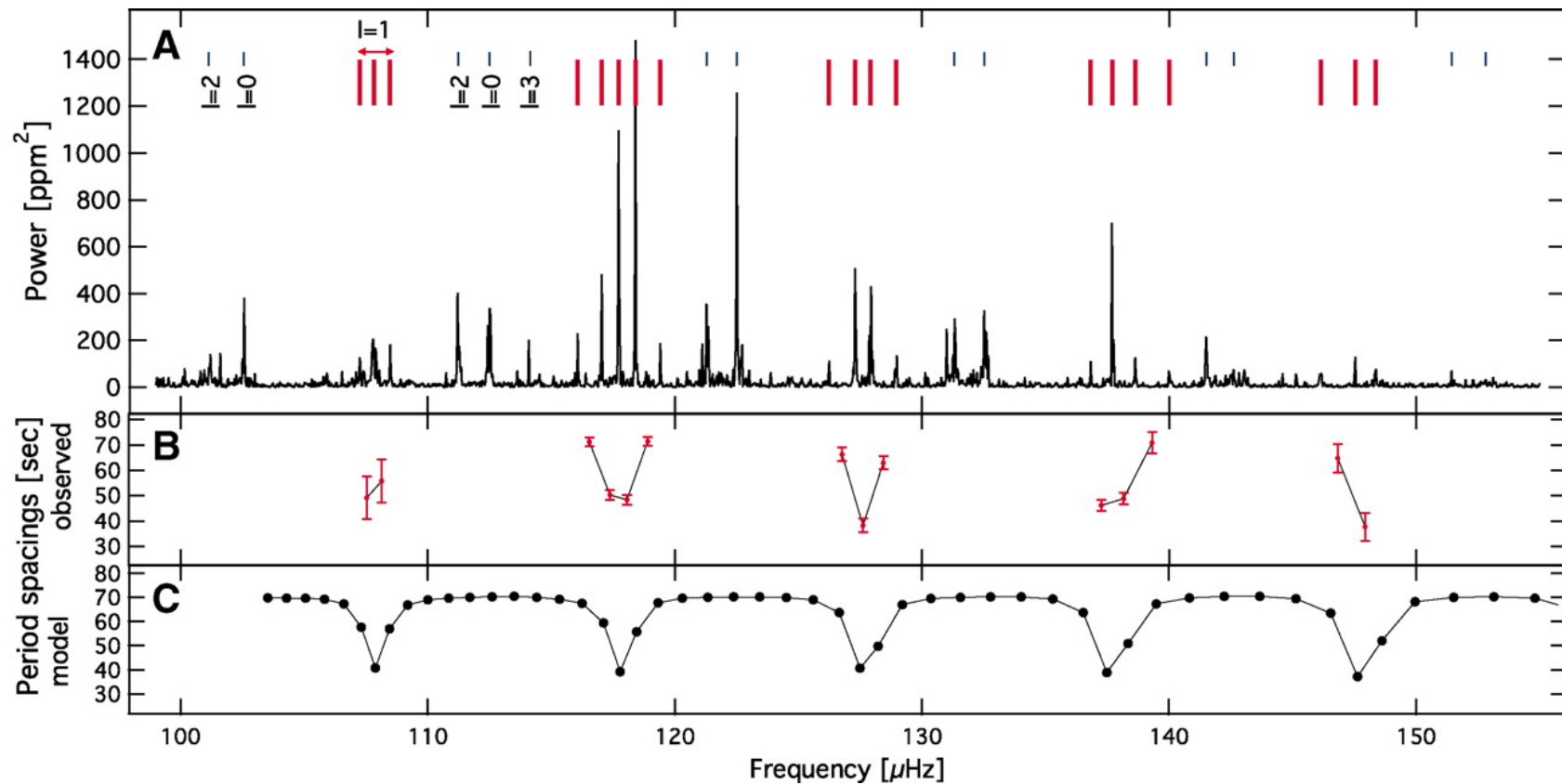
# Parameters to measure: small frequency separation



## Parameters to measure: small frequency separation

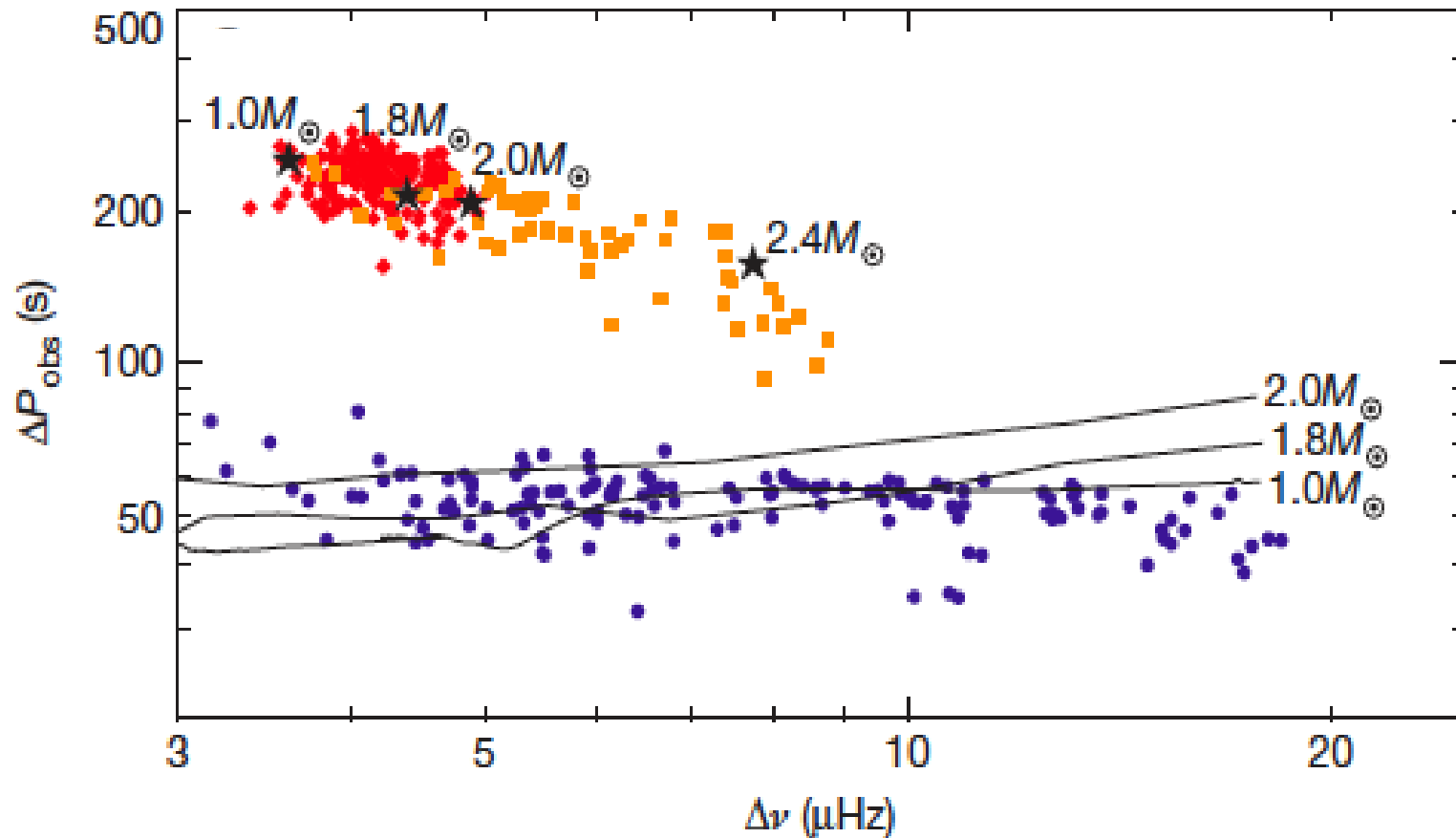


# Parameters to measure: period spacing



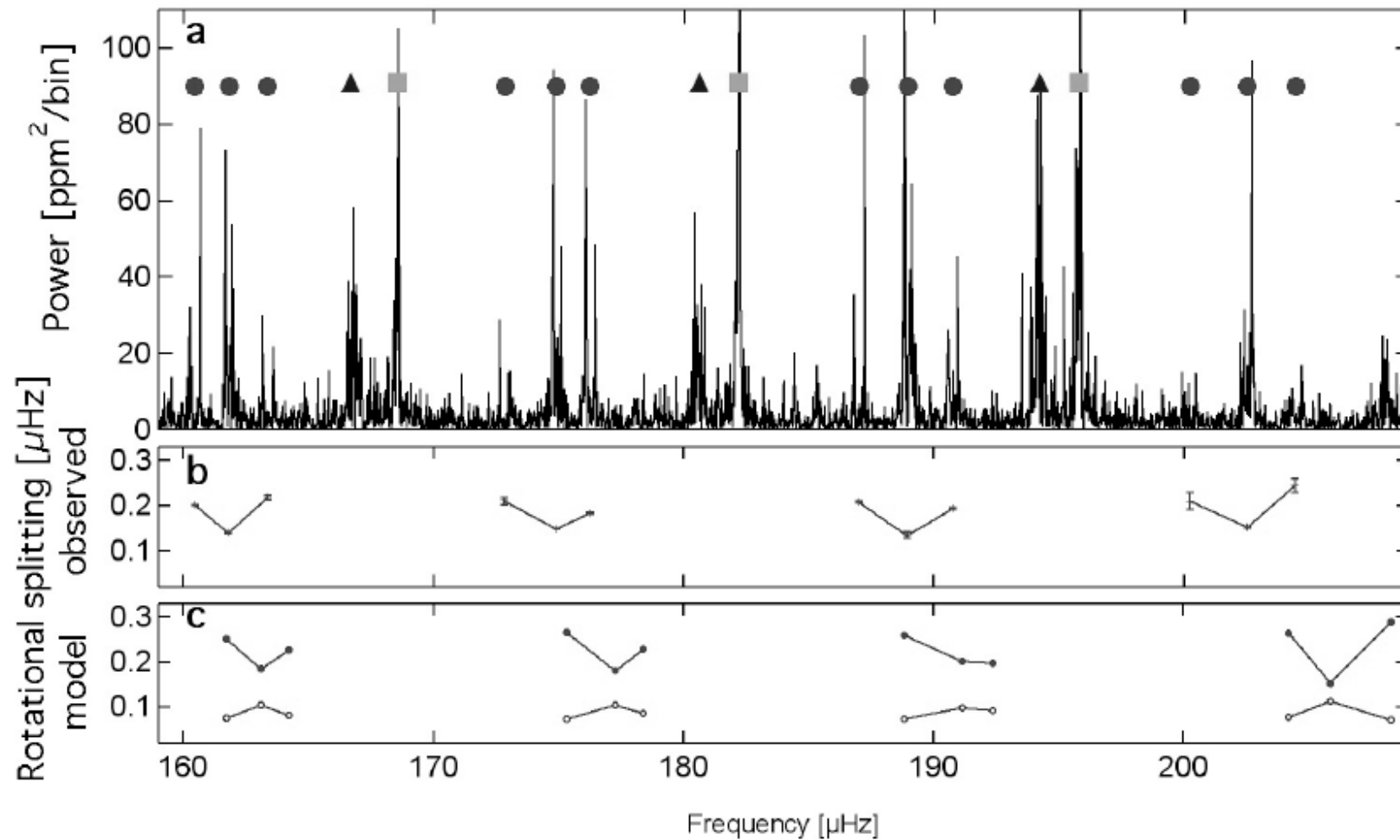
Beck et al. 2011, Science

## Parameters to measure: period spacing



Bedding et al. 2011, Nature

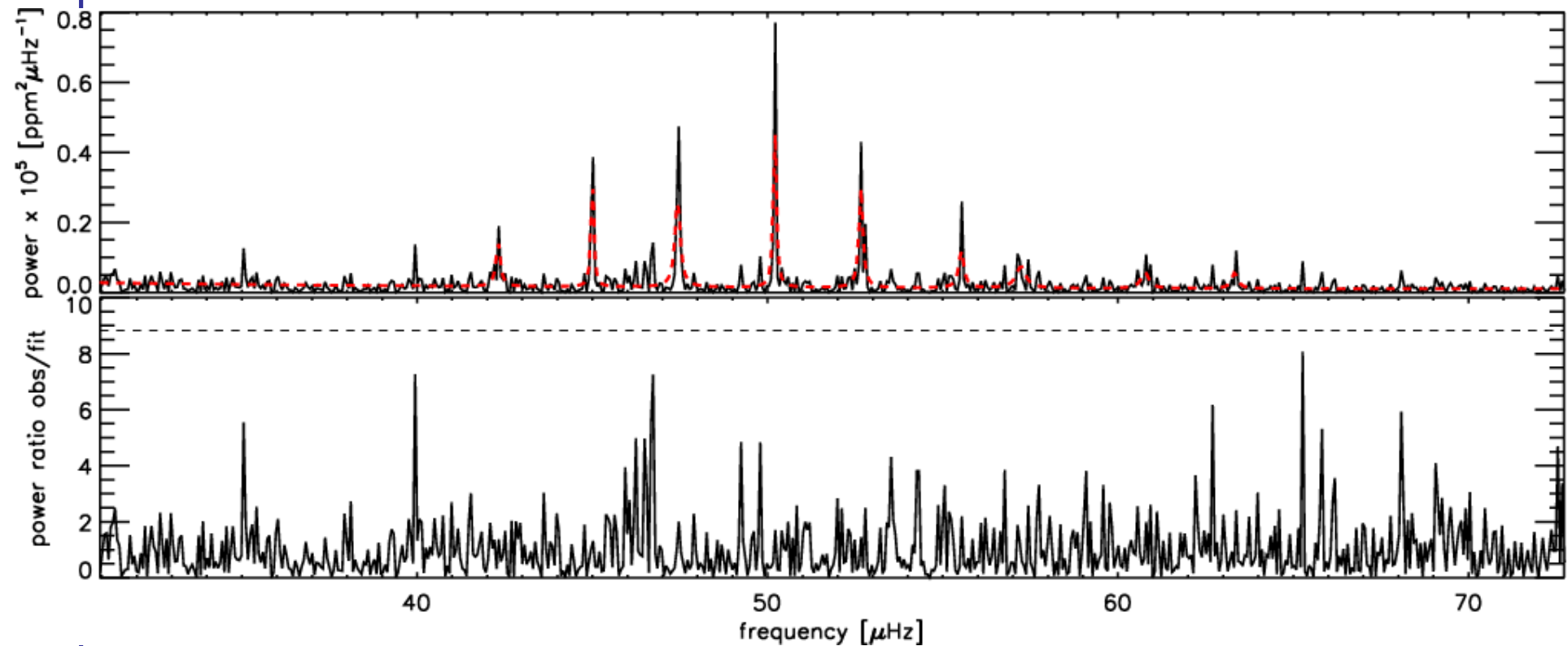
## Parameters to measure: rotational splitting



Beck et al. 2012, Nature



## Parameters to measure: frequencies + mode lifetime



Hekker et al. 2010

## What can be achieved with Plato?

maximum timespan of data: 2 years  
⇒ frequency resolution of  $\sim 0.016 \mu\text{Hz}$

long enough to:

- provide reliable estimates of  $\Delta\nu$  and  $\nu_{\text{max}}$  (Hekker et al. 2012)
- resolve modes with lifetimes up to  $\sim 70$  days ( $\tau \leq 0.1T$ ) (Hekker et al. 2010)
- resolve period spacings
- resolve rotational splittings
- probe stars with oscillations at frequencies of a few  $\mu\text{Hz}$ , i.e., stars on the lower and mid RGB and in the RC

## What can be achieved with Plato?

observing cadence: 25 seconds

⇒ Nyquist frequency of 20 000  $\mu\text{Hz}$

fast enough to:

- probe the oscillations in cool main-sequence stars with masses below 1  $M_{\text{Sun}}$

## What are the advantages of Plato over current data?

- brighter stars
  - Allows for more and more accurate ground-based complementary data.
- larger number of stars
  - Allows for more statistical studies and increases the chances to observe stars in short-lived evolutionary phases.
- larger field of view
  - Allows for a significant extension of the galaxy population studies (see talk A. Miglio tomorrow).

END