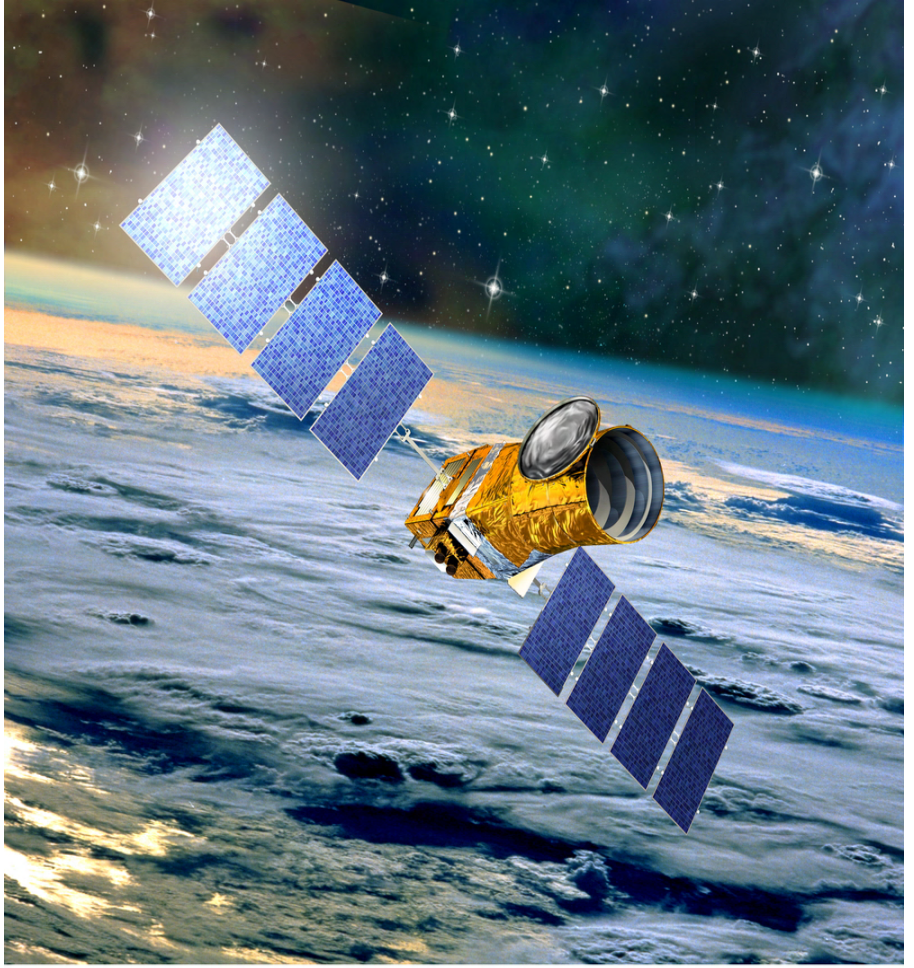
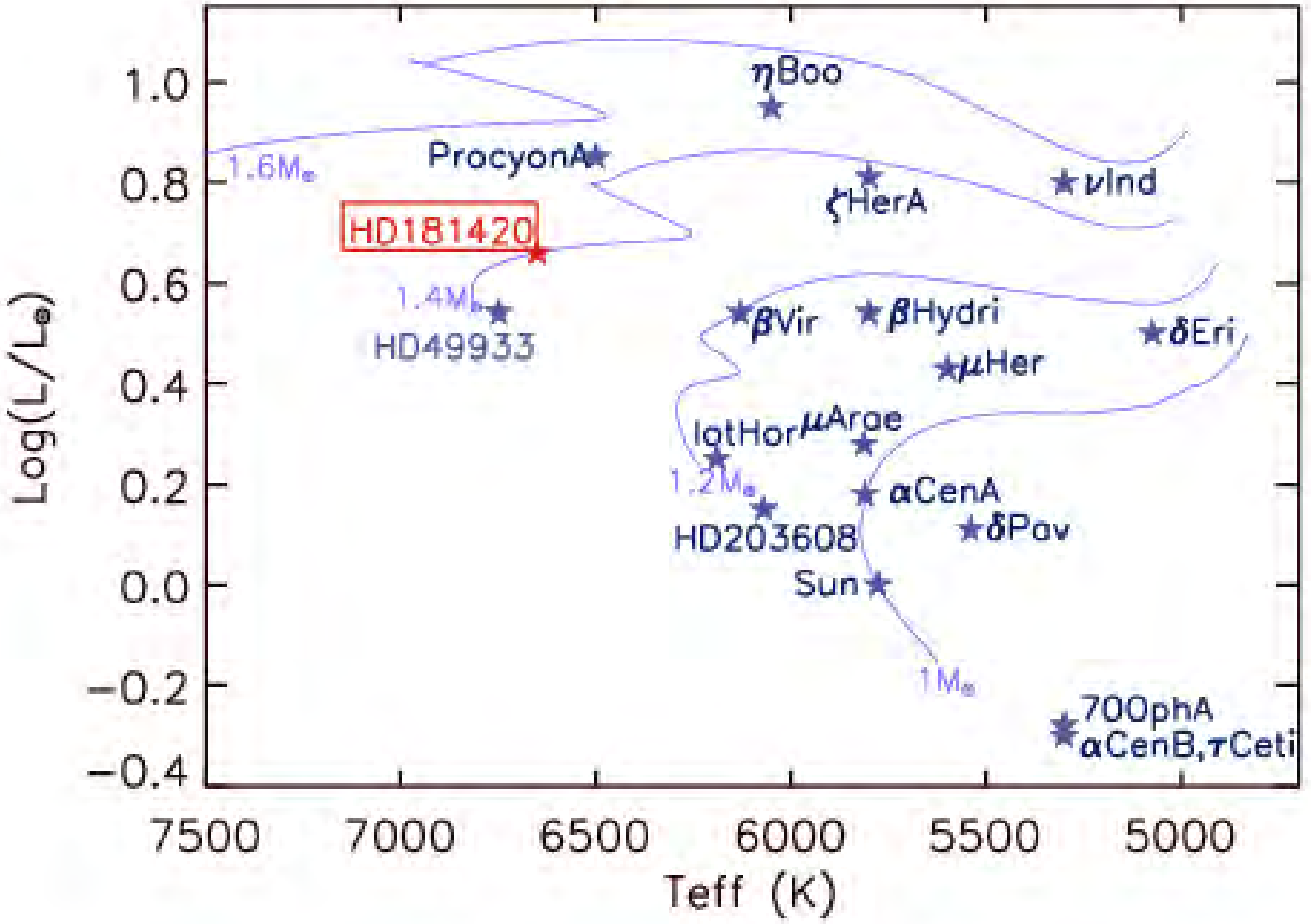
Solar-like oscillations in the F-star HD181420 as observed by CoRoT



C. Barban (LESIA, Observatoire de Paris)

T. Appourchaux (IAS, Paris XI), M. Auvergne (LESIA), A. Baglin (LESIA), J. Ballot (Obs. MIP), F. Baudin (IAS, Paris XI), P. Boumier (IAS, Paris XI), C. Catala (LESIA), W.J. Chaplin(BHAM), S. Deheuvels (LESIA), Elsworth, Y. (BHAM), R.A. García (CEA), P. Gaulme (IAS, Paris XI), S. Mathur (IIA), E. Michel (LESIA), B. Mosser (LESIA), C. Régulo (IAC), I. Roxburgh (QMUL), R. Samadi (LESIA), G. Verner (QMUL) and the COROT team.

HD 181420: fundamental parameters



F2.0

Teff = 6650 ± 100 K

[Fe/H] = -0.04

L/Lsun = 4.92 ± 0.20

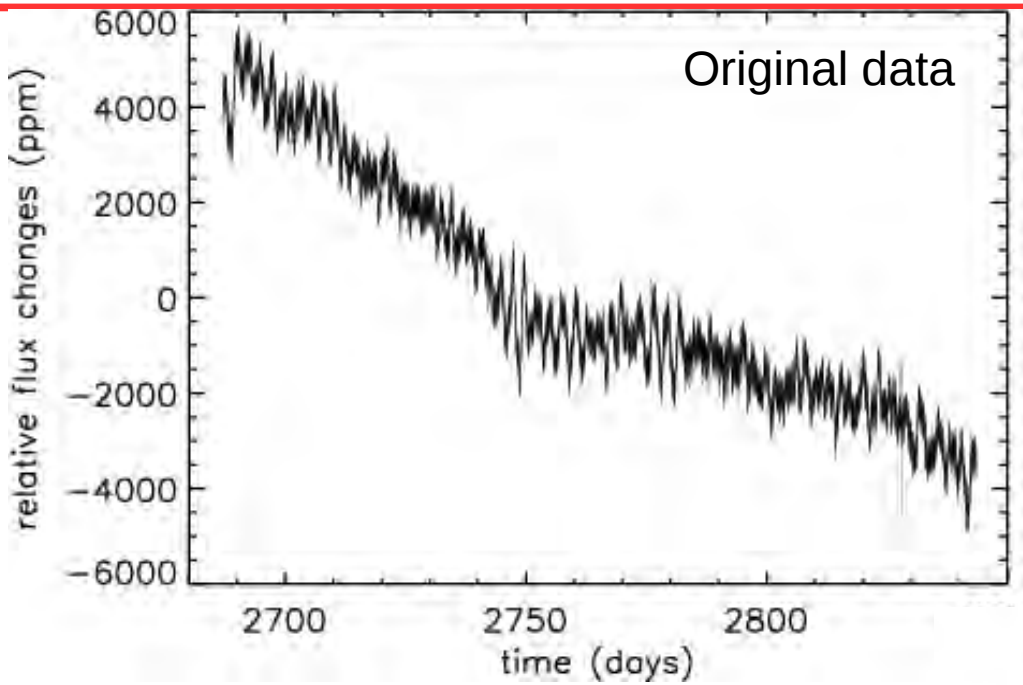
M/Msun = 1.4 ± 0.1

logg = 4.25

Π = 20.21

vsini = 21 km/s

HD 181420: CoRoT light curve



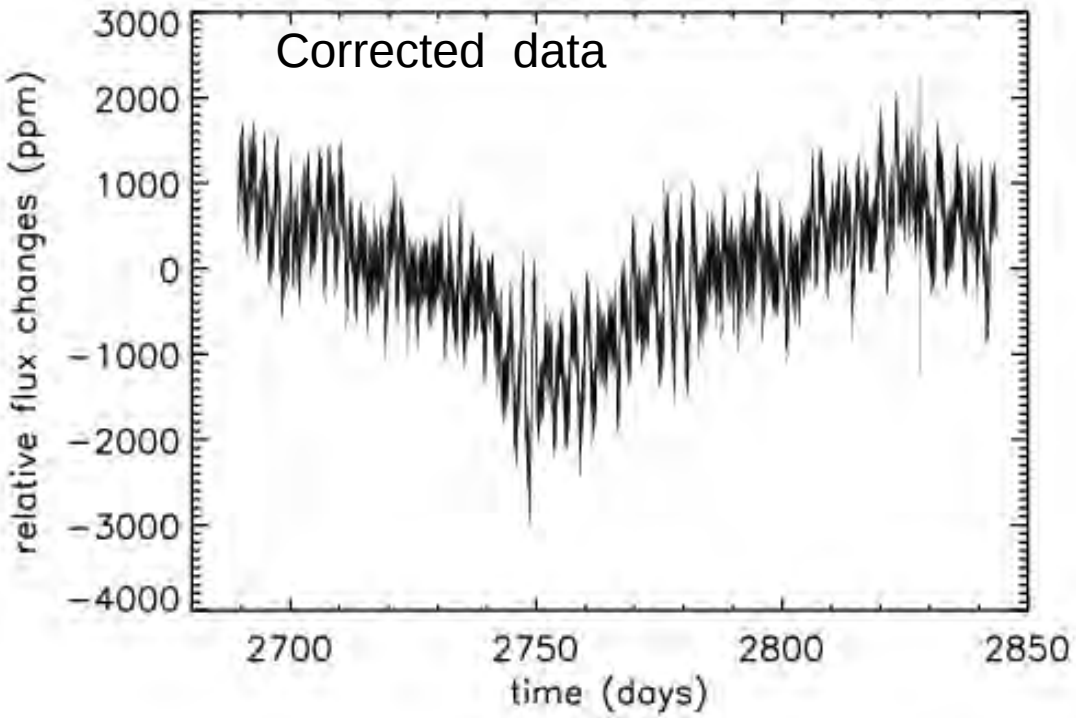
1st long run (LRC1)

N2- HELREG: instrumental effects corrected + resampled onto a regular cadence in the heliocentric frame

Sampling time = 32 s

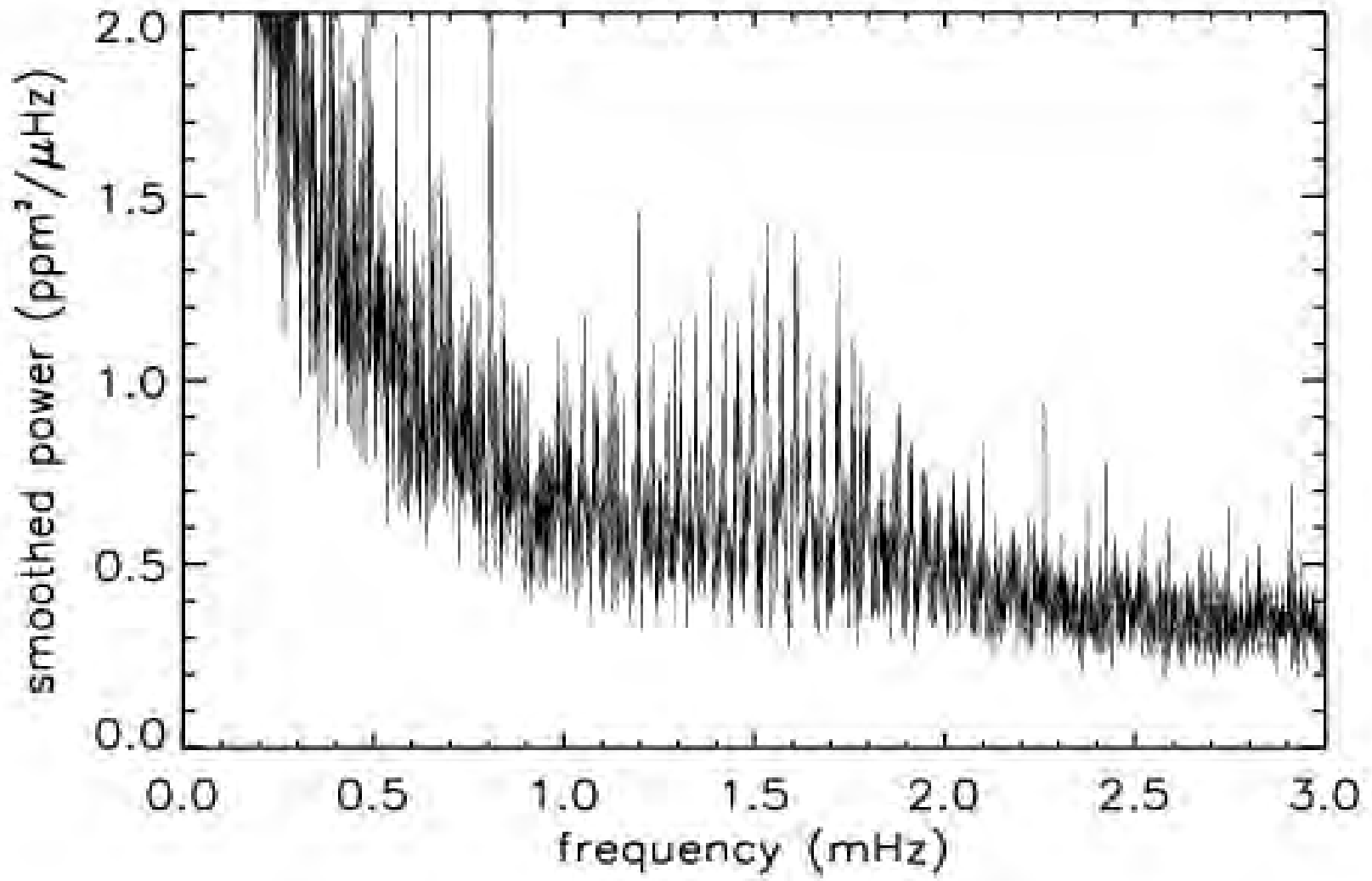
Length of the observations = 156.6 days

After correction of the measured instrumental long term trend.



HD 181420 power spectrum

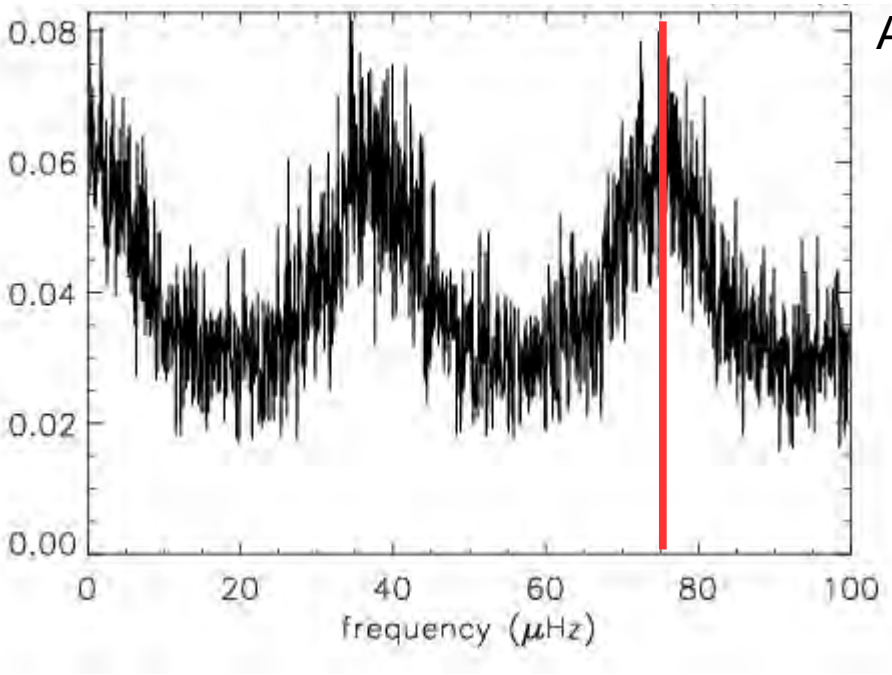
Excess power around 1.5 mHz in agreement with theoretical predictions using the known stellar parameters



Frequency resolution ~ 0.07 μHz

Smoothed power spectrum (15 bins)

HD 181420 power spectrum



Autocorrelation:

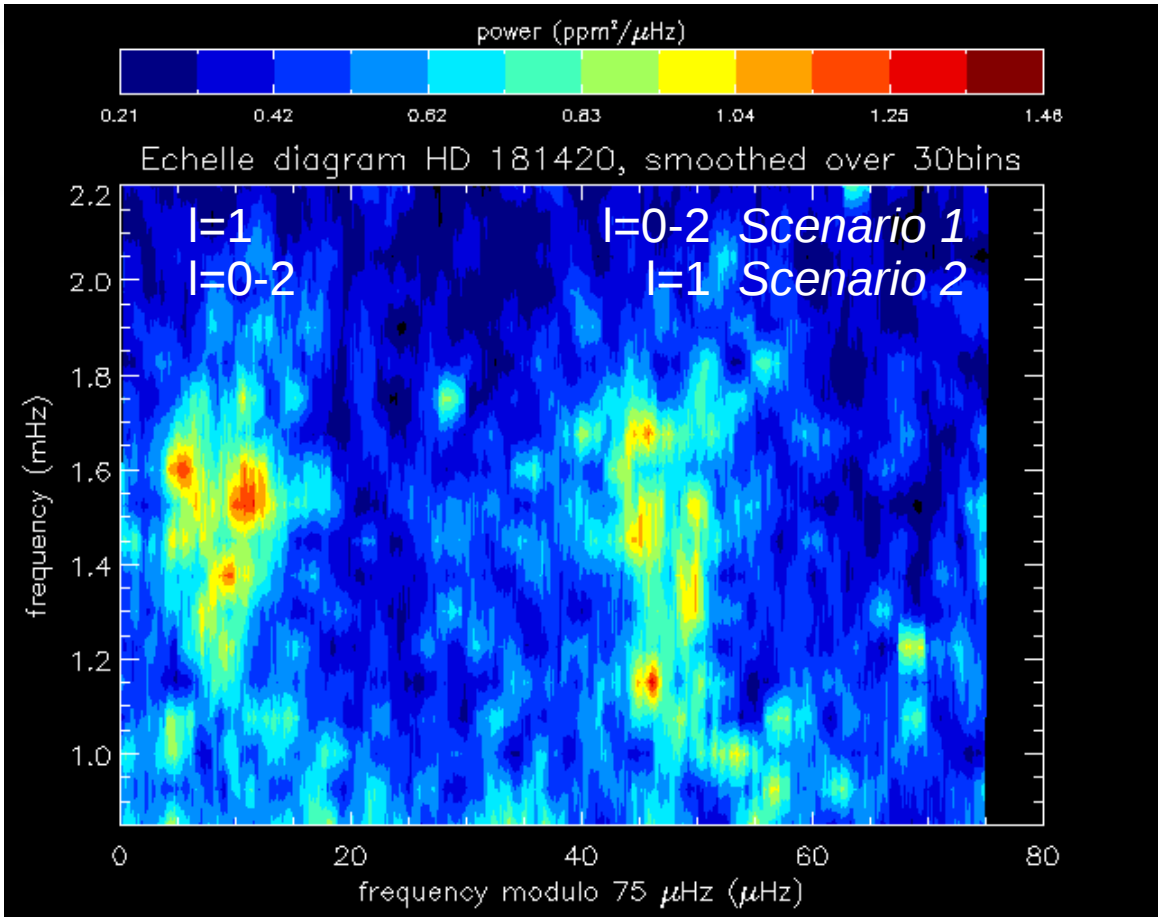
$\Delta\nu \sim 75\ \mu Hz$

in agreement with theoretical predictions using the known stellar parameters

Echelle diagram:

2 ridges

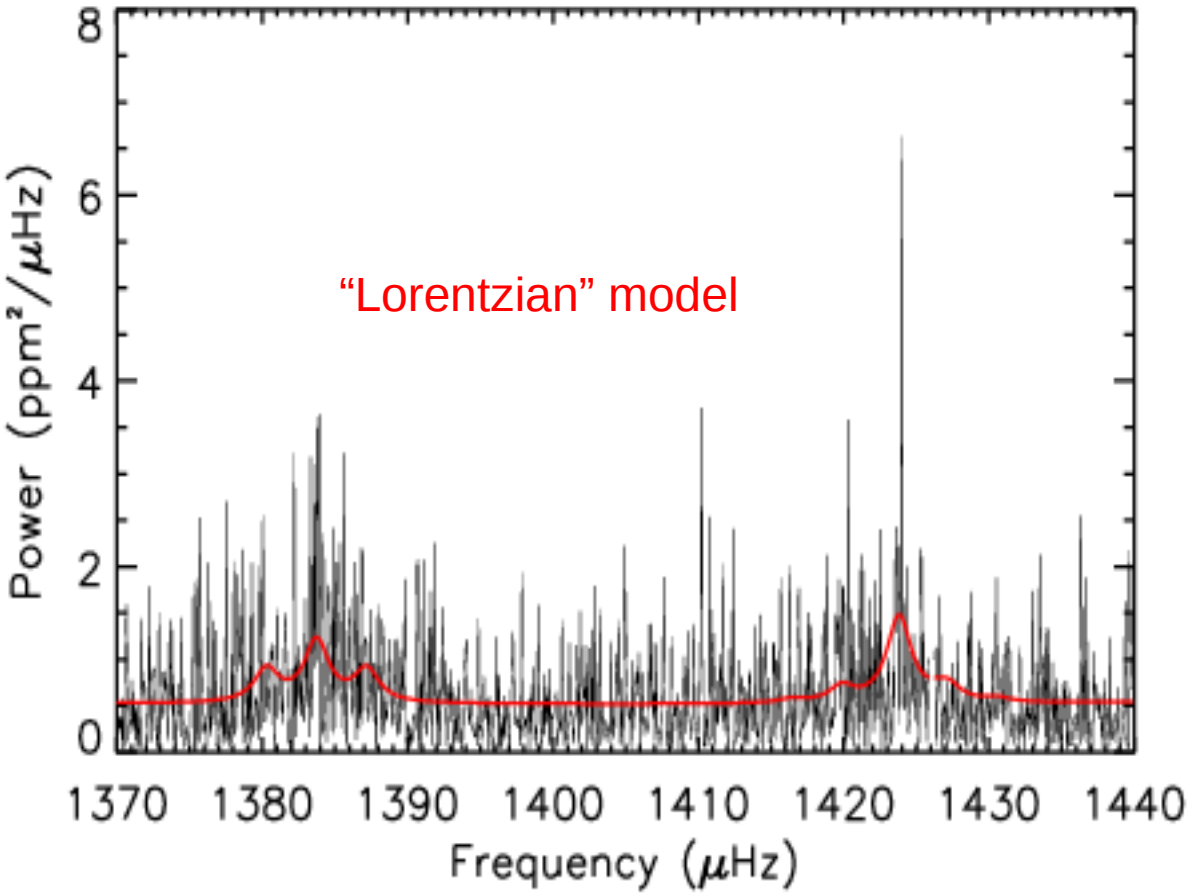
2 possible scenarii



HD 181420 mode parameters estimates

From Lorentzians fitting with a global approach

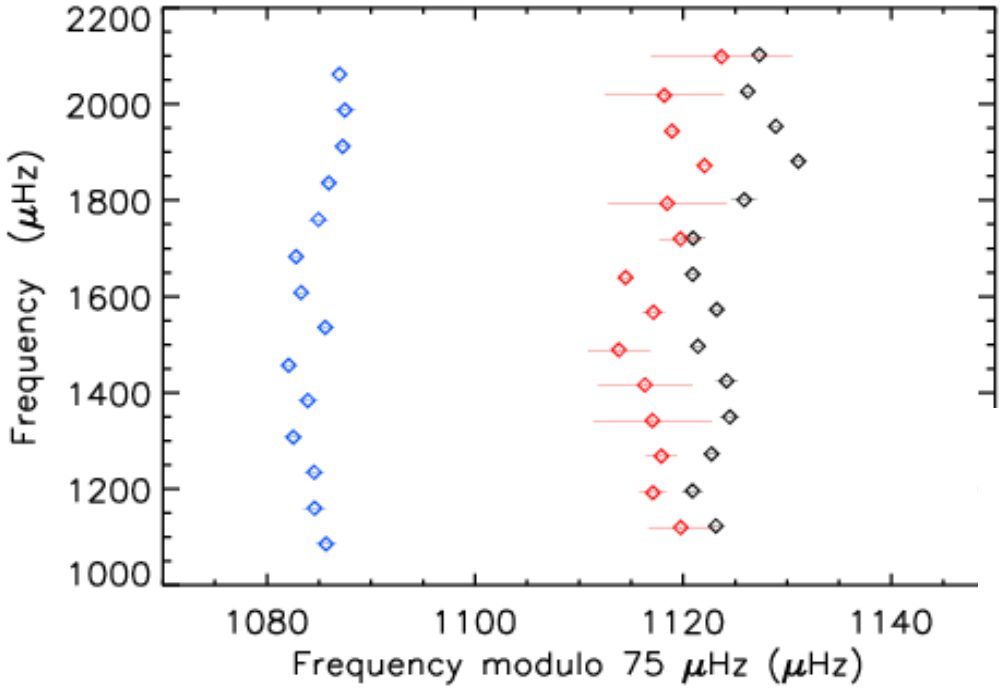
An example over 1 large spacing frequency range



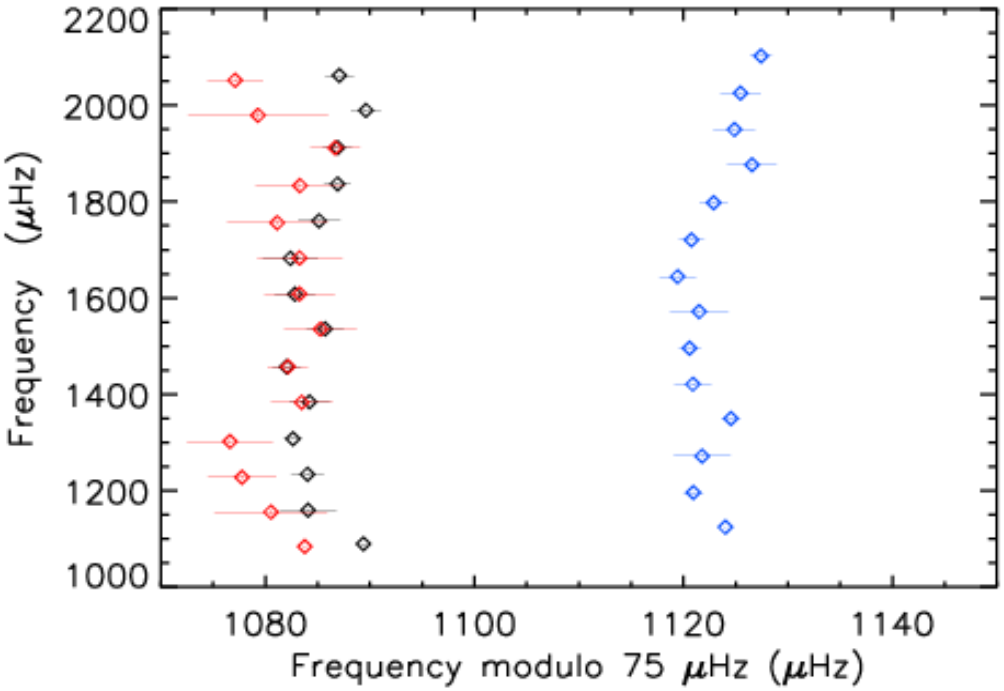
8 independant groups among the CoRoT DAT involved in the data analysis

HD181420 echelle diagram

Scenario 1

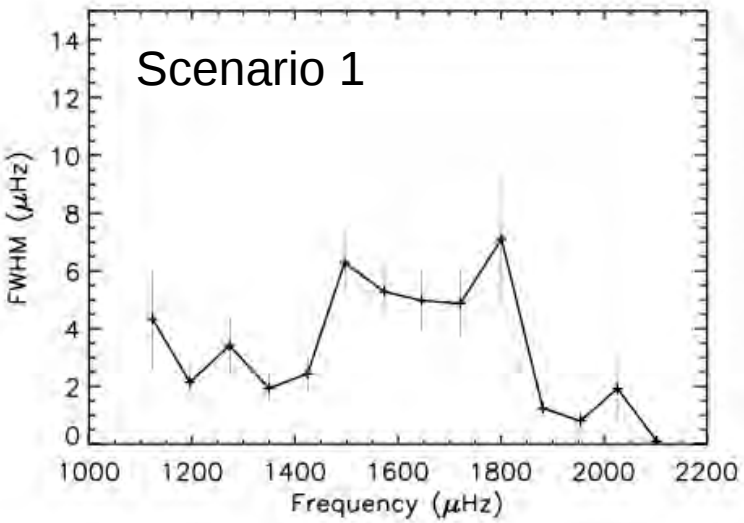


Scenario 2

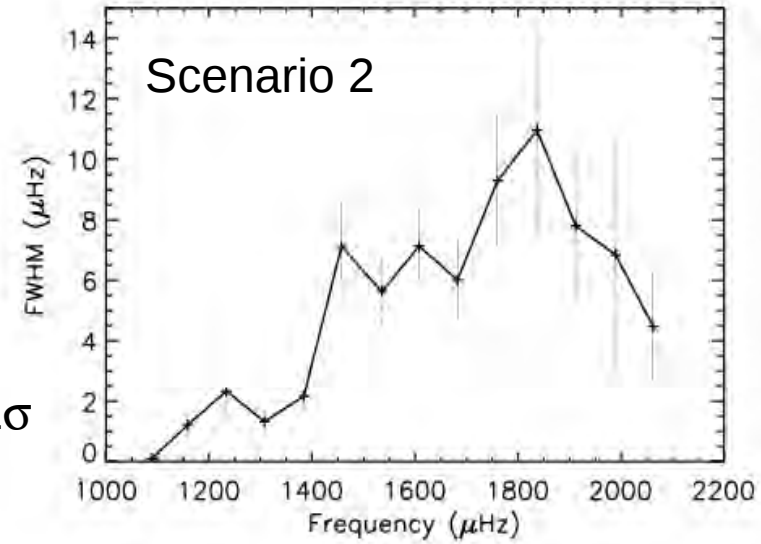


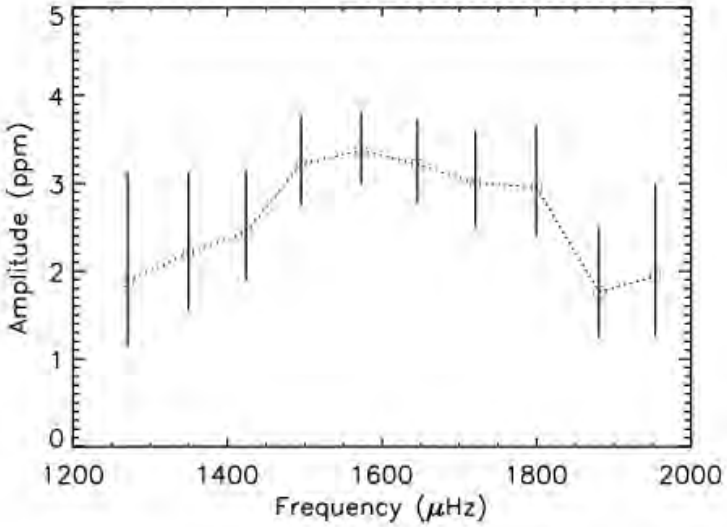
Error bars = 3σ

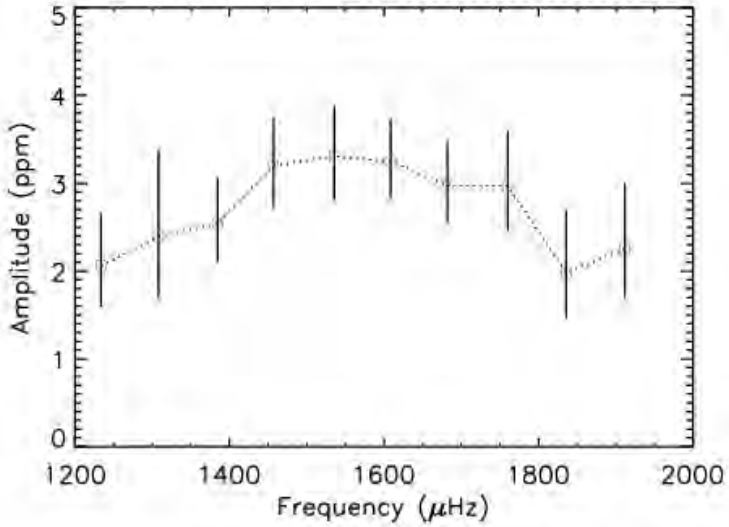
HD181420 mode linewidths, amplitudes



error bars = 1σ







Slightly lower than the lastest theoretical predictions
in agreement with amplitude derived from smoothed excess power
(see Michel et al. 2008, Science 322, 558).

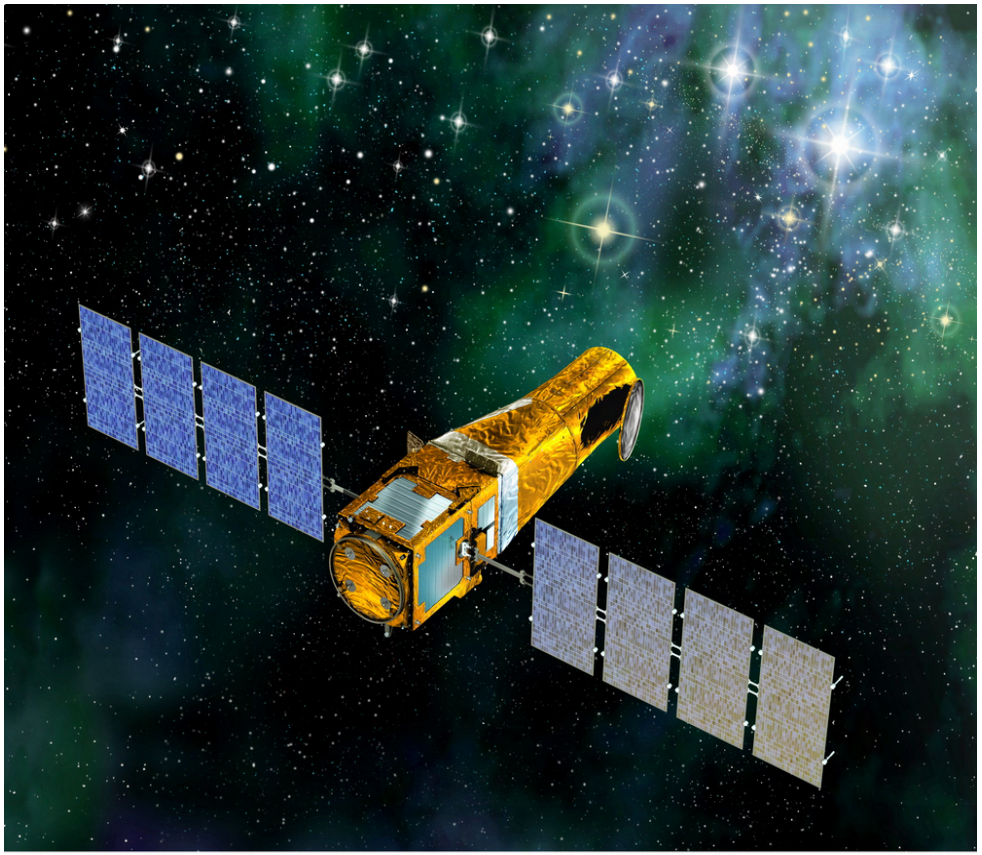
HD 181420: conclusion

A clear detection of p-modes

P-mode parameters estimates from Lorentzians fittings

2 possible mode identification scenarii

Similar results than for HD 49933 (CoRoT IR) published in Appourchaux et al. (2008).



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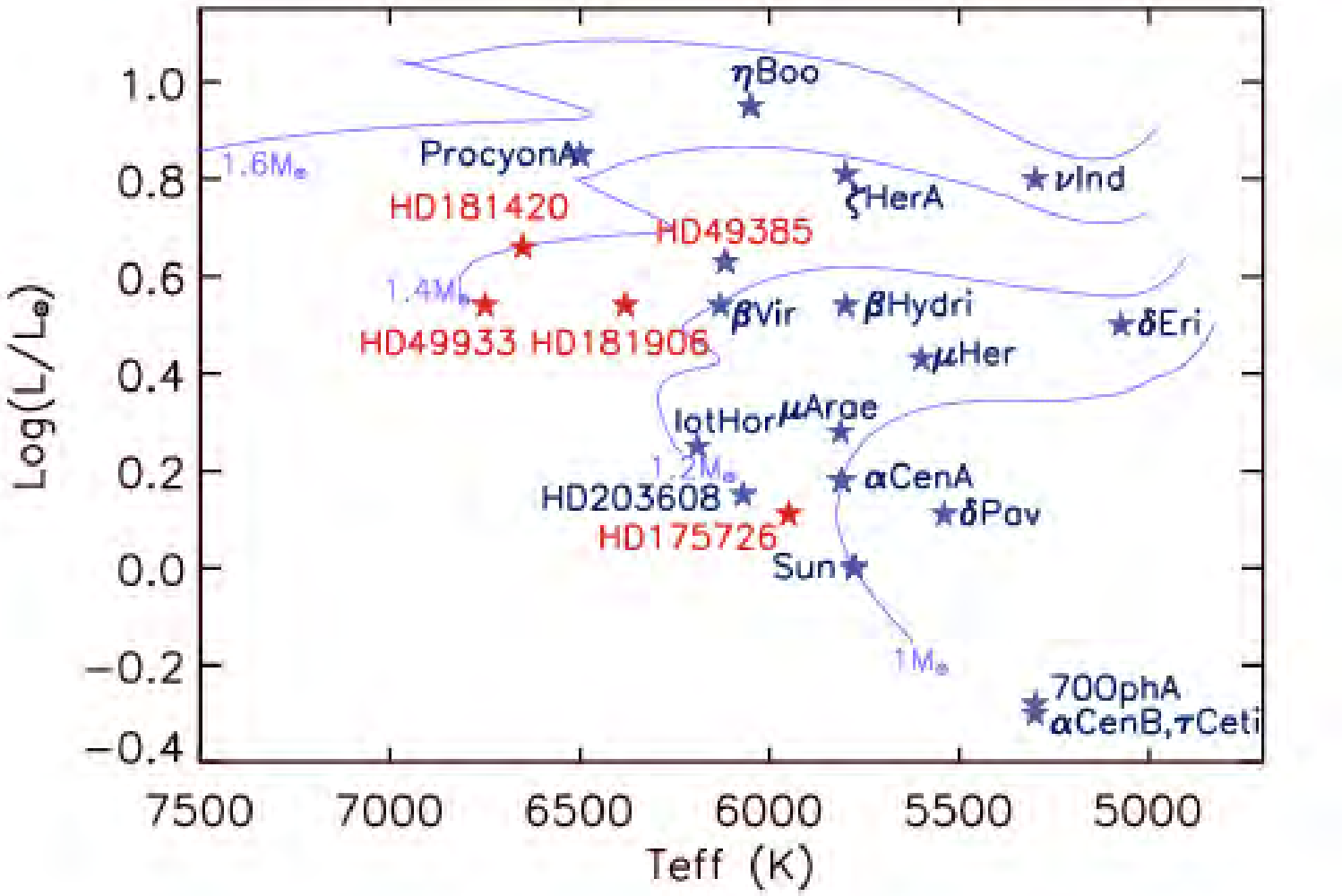
See also Poster PII-013 by Gaulme et al.
And Poster PII-019b by Roxburgh

Other stars observed by CoRoT



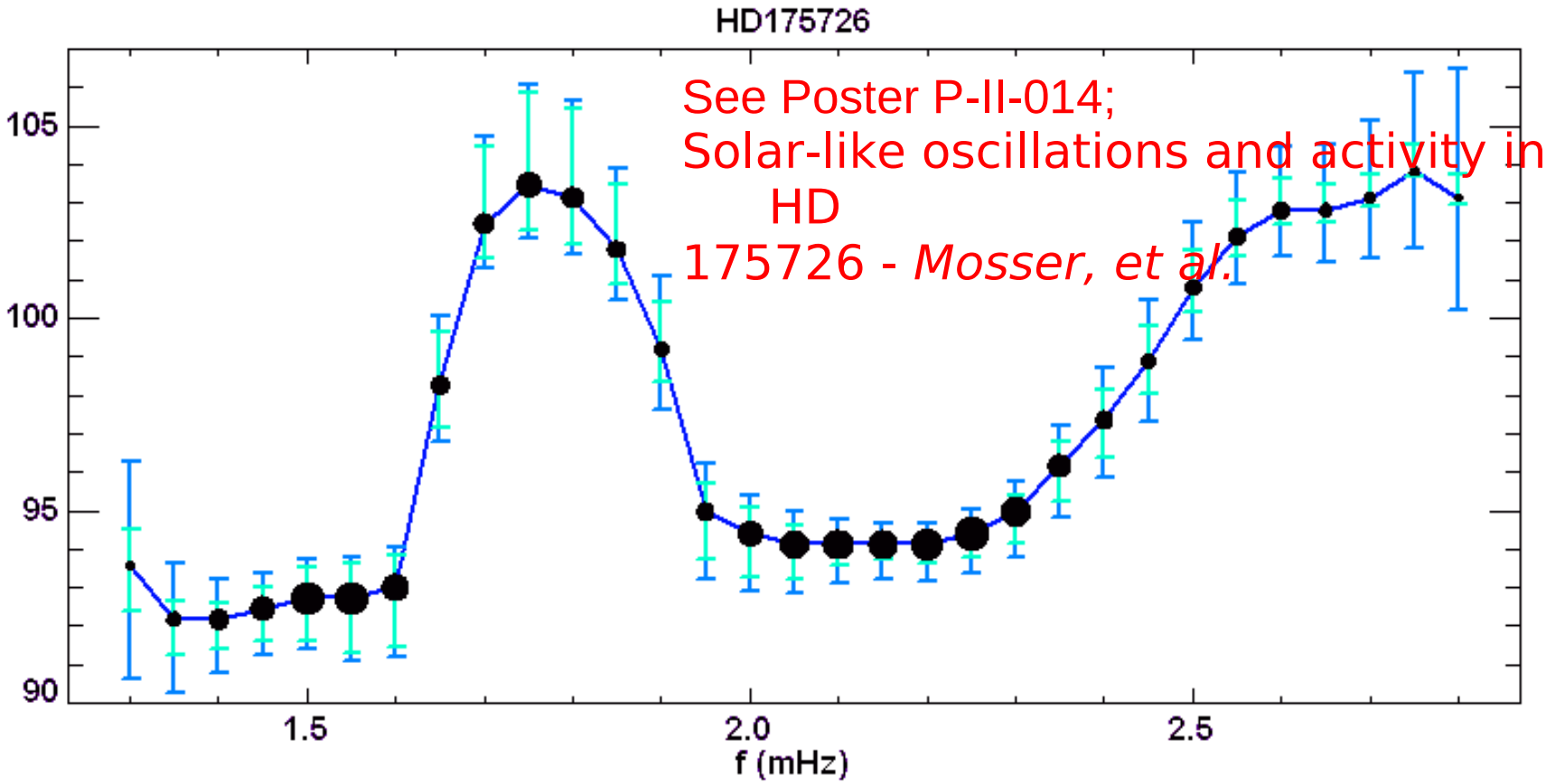
Data analysis published or in progress

HD 175726 (PI=B. Mosser)

HD 175726, seismic target of SRc1, observed for 27.2 days
F9/G0V ; mV = 6.72
Large activity signal, very tiny amplitudes, small observing time span:

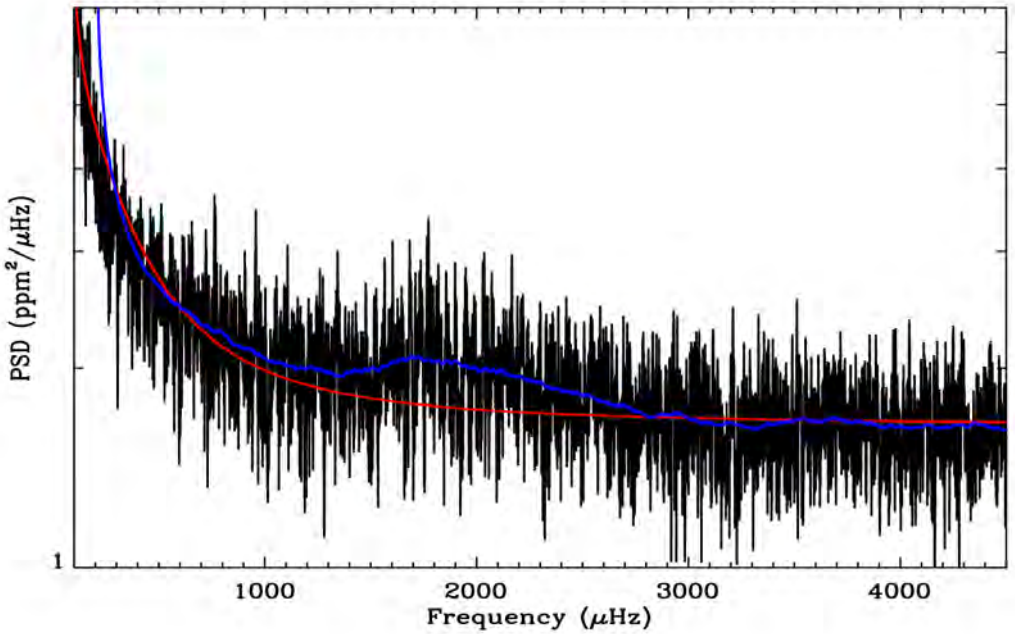
→ mean SNR < 1, no possible detection of individual eigenmodes

→ Measurement of the variation of the large separation, in the autocorrelation signal



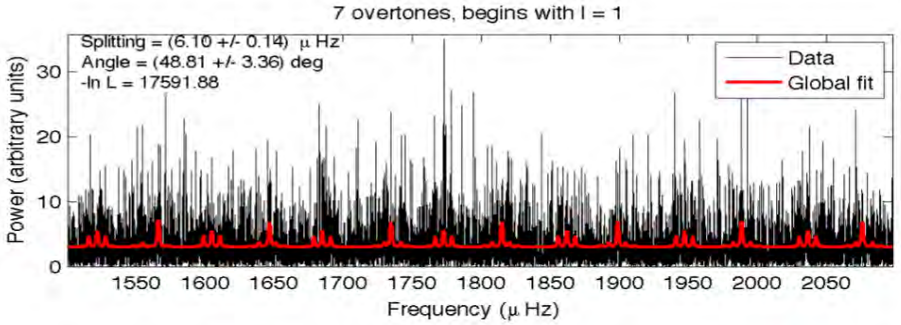
HD 181906 (PI=R. Garcia), Poster II-016

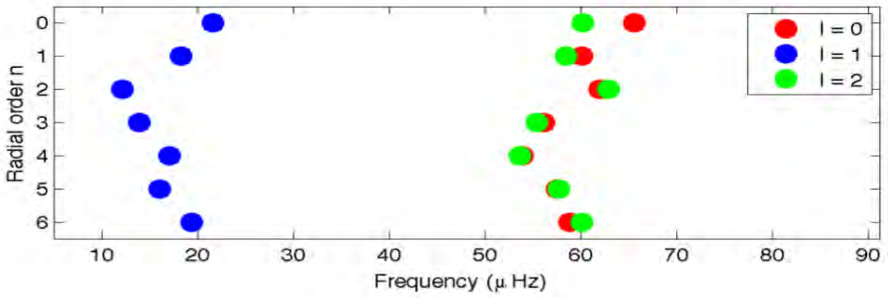
- Like HD181420, Main CoRoT target in the centre direction but fainter (V~7.65)
- F8 star with T_{eff} ~6530 K, ~1.22 M_{sol} and ~1.5 R_{sol}
-



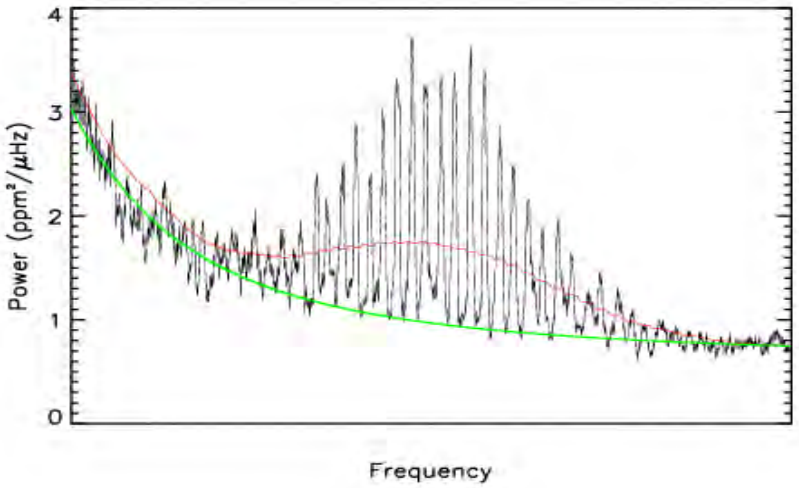
•Max. Amplitude of a l=0 ~3 ppm
•Δν≈ 83-90 μHz (depending on the region observed but centered at 1.8 mHz).

•Global fitting following different approaches
•Most of the resultant frequencies inside 3σ
•Not yet possible to choose between the 2 scenarios

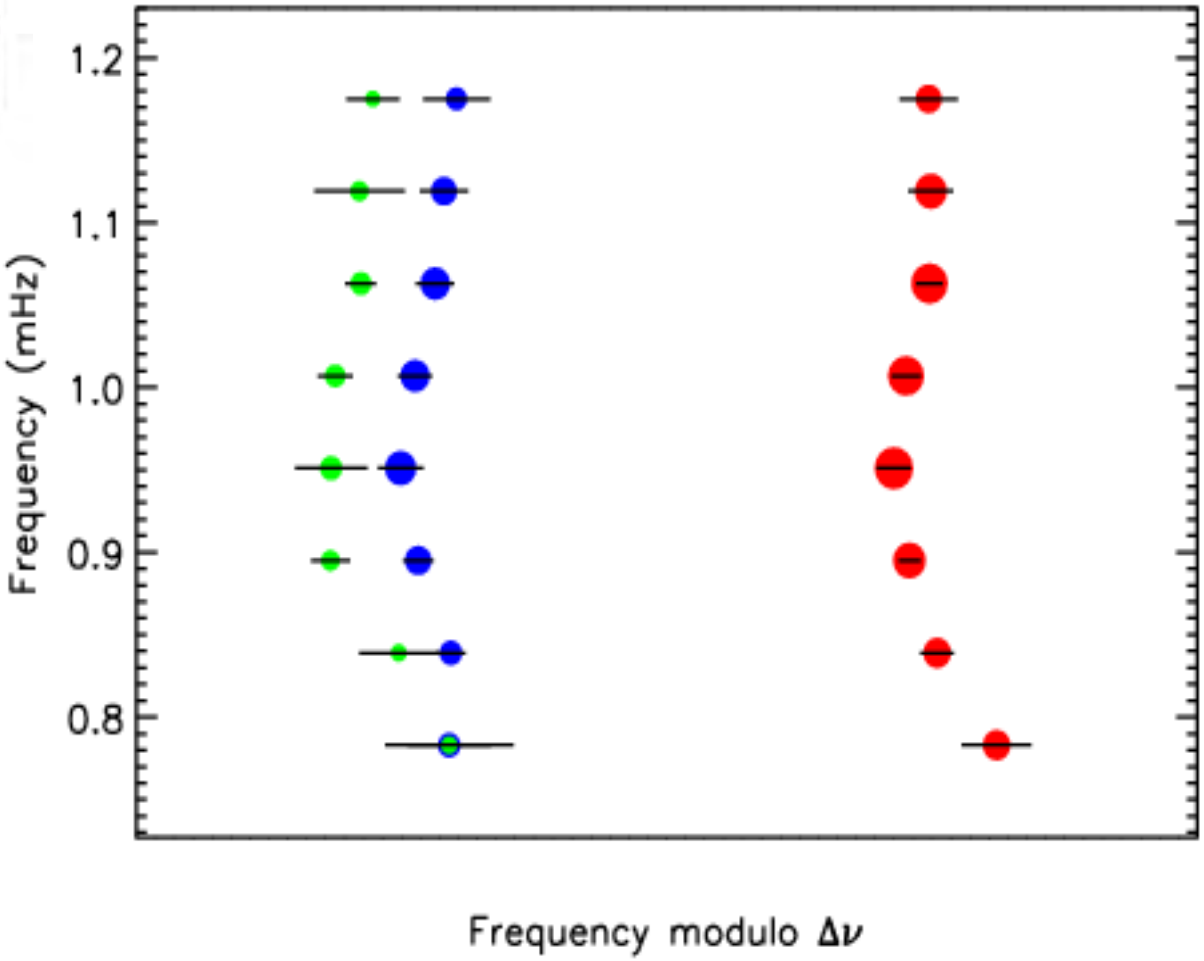




HD 49385 (PI=S. Deheuvels)



See poster P-II-018
Deheuvels et al.



THE END !

HD 181420: fitting method (1/2)

Global fitting with the following free parameters:

* Mode frequencies: ν (l=0), ν (l=1,m=0), ν (l=2,m=0)

* Mode heights: 1 for each overtone = H(l=0). The l=0:1:2 power ratios were fixed at 1.0:1.5:0.5.

* Mode width: 1 for each overtone.

* Rotationnal splitting: same for all the modes

* Inclination angle: same for all the modes and free parameter

* Background : Harvey model = 1 power law (3 parameters) + white noise (1 parameter)

Guess parameters from local fit.

Two scenarios for mode identification: S1 for l=0 at 1500 μHz and S2 for l=1 at 1500 μHz

2 cases: 10 (fmin=1211 et fmax=1970 microHz) and 14 overtones (fmin=1061 et fmax=2120 microHz)

Conclusions from the fitting results

Ref = Graham results

* SPLITTING: in favour of S1, 10 overtones
  no agreement within 3 sigma bewteen the different teams.
  Split ~ 3-6 microHz as seen the power spectrum at low freq.

* INCLINATION ANGLE: also in favour of S1, 10 overtones
  very good agreement within 1 sigma between the different team
  around 40 degrees

* MODE IDENTIFICATION: no significant differences in the likelihood between the 2 scenarii.

* MODE FREQ.: good agreement within 3 sigma between the different team
  (except very few points points)
  “a lot” witihin 1 sigma (case 10 ov.) for l=0 and l=1
  l=2: much more dispersion = no reliable results

* MODE FWHM: all within 3 sigma

* MODE HEIGHT: all within 3 sigma