BetaDat: A ⧓ Cephei Database

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BetaDat: A β Cephei Database

β Cephei stars:

- Main sequence pulsating variables of spectral type B0 to B3
- Periods 2 to 8 hours
- Amplitudes 0.01 to 0.3 magnitudes
- Often Multiperiodic
- Long-lived low degree low-order p and g modes (κ mechanism)
- Sparse spectrum
- Slow rotators
- Rotational splitting small compared to frequency separation
- Solar metallicity
- 7 to 20 M_o

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β Cephei stars:

- Simple internal structure:
Convective core (~ 0.3 M_{star}) surrounded by radiative envelope

- Observation from the ground:

  ⟶   Info on global parameters (M, R, age)
  + info on overshooting parameter
  + info on envelope differential rotation

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Grid of stellar models: CLES

M = 8 to 20 M_o by step of 0.1

Z = 0.010, 0.015, 0.020, 0.025

X = 0.60, 0.65, 0.70

$\diamond_{ov}$ = 0, 0.05, 0.10, 0.15, 0.20

~10 000 evolution sequences

Oscillations: OSC

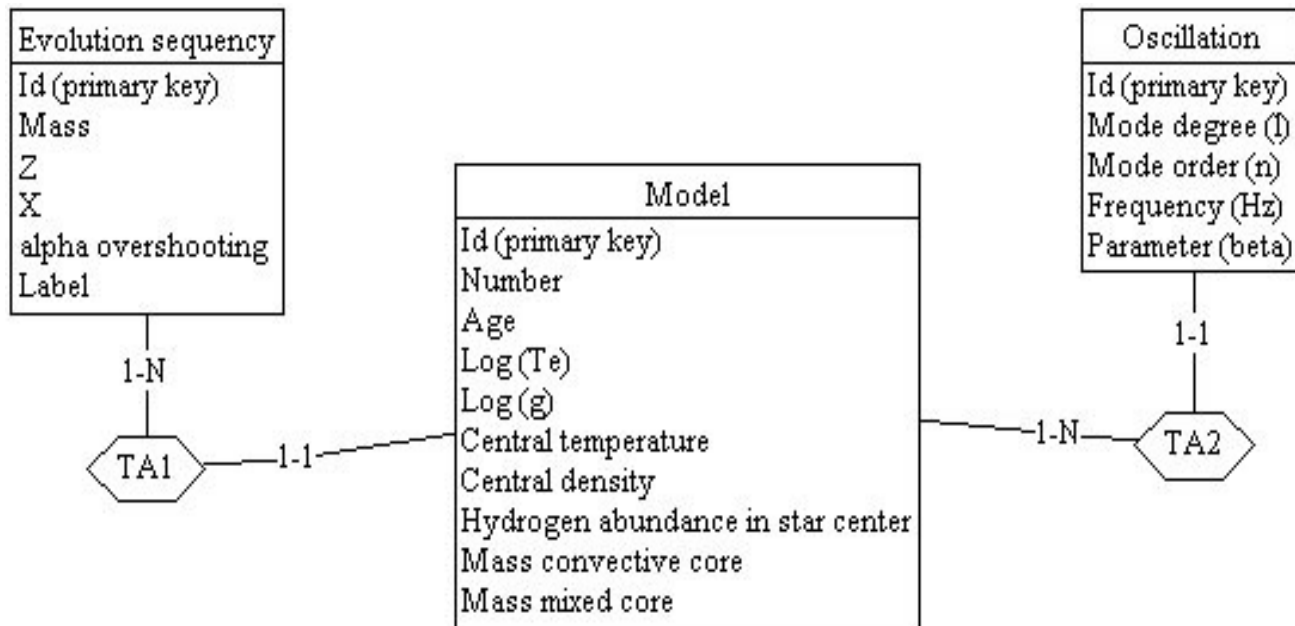~100   stellar models on main sequence

~ 1 million stellar models

low-degree low-order modes
l = 0,1,2,3 and |n| < 20

~ 50 million frequencies

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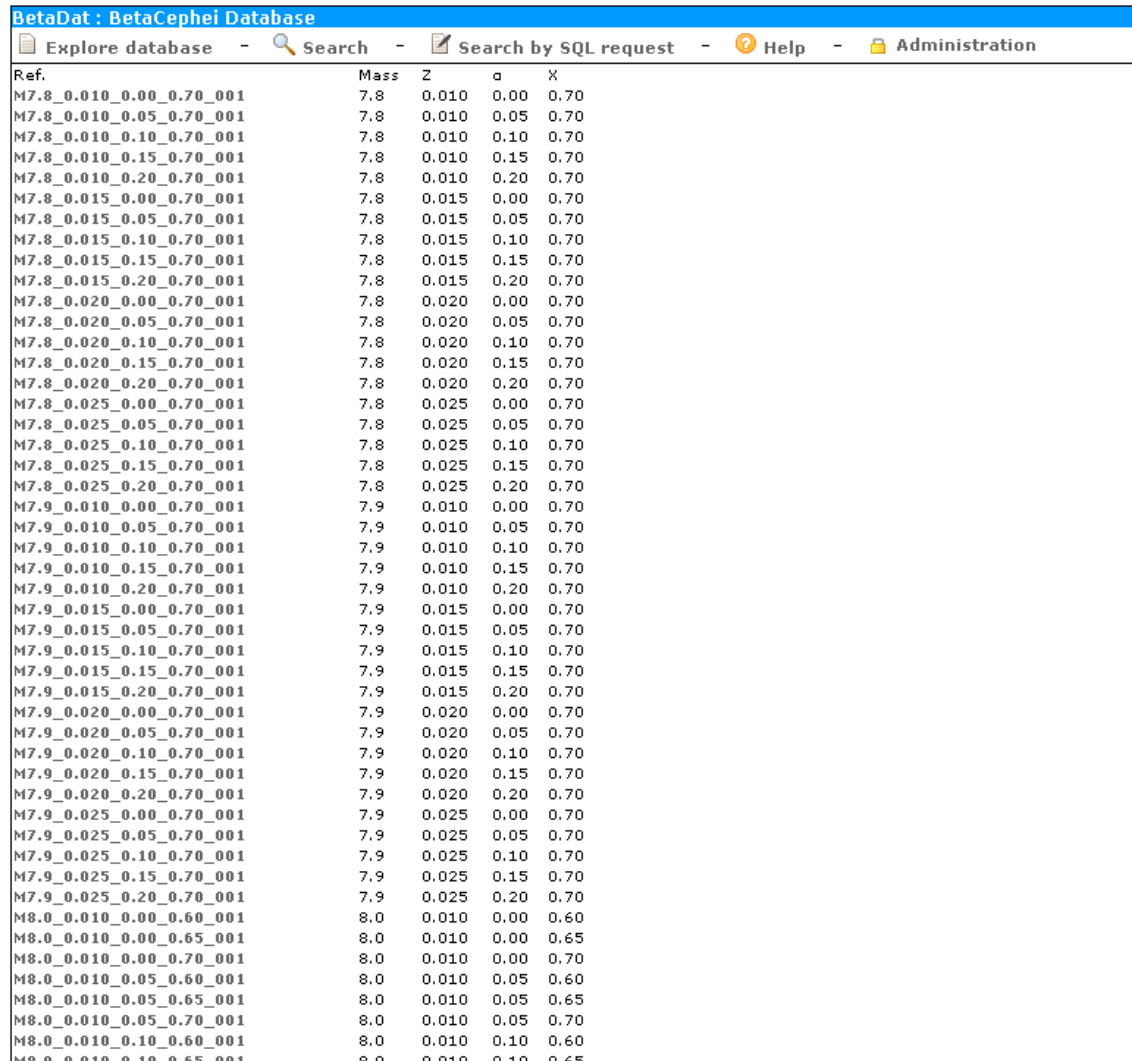# BetaDat: A β Cephei Database

Database structure: 3 tables:

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BetaDat: A β Cephei Database

Accessible through Web Interface

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BetaDat: A β Cephei Database

Explore Database: list of sequences of evolution

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Explore Database: Models on an evolution sequence
age, $\log T_e$, $\log g$, T_c, ρ_c, X_c, M_c, M_{mix}

BetaDat : BetaCephei Database

📄 Explore database – 🔍 Search – 📝 Search by SQL request – ❓ Help – 🔒 Administration

Evolution sequency: 8.0_0.010_0.20_0.70

Number	Age	Log Te	Log g	Tc	rhoc	Xc	Mnc_no_over	Mnc_over
0	0.00000e-1	3.62667e+0	1.22821e+0	5.26937e+5	5.35530e-5	7.00000e-1	1.59071e+34	1.59071e+34
1	5.50165e+1	3.62864e+0	1.25810e+0	5.45174e+5	5.93123e-5	7.00000e-1	1.59071e+34	1.59071e+34
2	1.10666e+2	3.63046e+0	1.28584e+0	5.62655e+5	6.52044e-5	7.00000e-1	1.59071e+34	1.59071e+34
3	1.71174e+2	3.63229e+0	1.31371e+0	5.80784e+5	7.17141e-5	7.00000e-1	1.59071e+34	1.59071e+34
4	2.36624e+2	3.63411e+0	1.34156e+0	5.99478e+5	7.88664e-5	7.00000e-1	1.59071e+34	1.59072e+34
5	3.07401e+2	3.63594e+0	1.36939e+0	6.18752e+5	8.67234e-5	7.00000e-1	1.59071e+34	1.59072e+34
6	3.84076e+2	3.63775e+0	1.39724e+0	6.38656e+5	9.53702e-5	7.00000e-1	1.59071e+34	1.59072e+34
7	4.66831e+2	3.63955e+0	1.42500e+0	6.59132e+5	1.04849e-4	7.00000e-1	0.00000e-1	1.59072e+34
8	5.56322e+2	3.64136e+0	1.45274e+0	6.79901e+5	1.15339e-4	7.00000e-1	0.00000e-1	1.59072e+34
9	6.53264e+2	3.64315e+0	1.48050e+0	7.01000e+5	1.26990e-4	7.00000e-1	0.00000e-1	0.00000e-1
10	7.57936e+2	3.64493e+0	1.50817e+0	7.22390e+5	1.39901e-4	7.00000e-1	0.00000e-1	0.00000e-1
11	8.71304e+2	3.64671e+0	1.53583e+0	7.44268e+5	1.54272e-4	7.00000e-1	0.00000e-1	0.00000e-1
12	9.94075e+2	3.64850e+0	1.56346e+0	7.66362e+5	1.70284e-4	7.00000e-1	0.00000e-1	0.00000e-1
13	1.12711e+3	3.65027e+0	1.59107e+0	7.89027e+5	1.88154e-4	7.00000e-1	0.00000e-1	0.00000e-1
14	1.27119e+3	3.65203e+0	1.61861e+0	8.12198e+5	2.08104e-4	7.00000e-1	0.00000e-1	0.00000e-1
15	1.42751e+3	3.65379e+0	1.64612e+0	8.35959e+5	2.30441e-4	7.00000e-1	0.00000e-1	0.00000e-1
16	1.59723e+3	3.65555e+0	1.67360e+0	8.60377e+5	2.55500e-4	7.00000e-1	0.00000e-1	0.00000e-1
17	1.78189e+3	3.65732e+0	1.70107e+0	8.85557e+5	2.83701e-4	7.00000e-1	0.00000e-1	0.00000e-1
18	1.98321e+3	3.65909e+0	1.72856e+0	9.11617e+5	3.15552e-4	7.00000e-1	0.00000e-1	0.00000e-1
19	2.20273e+3	3.66088e+0	1.75604e+0	9.38624e+5	3.51572e-4	7.00000e-1	0.00000e-1	0.00000e-1
20	2.44272e+3	3.66268e+0	1.78354e+0	9.66719e+5	3.92482e-4	7.00000e-1	0.00000e-1	0.00000e-1
21	2.70522e+3	3.66448e+0	1.81103e+0	9.95990e+5	4.39040e-4	7.00000e-1	0.00000e-1	0.00000e-1
22	2.99286e+3	3.66628e+0	1.83849e+0	1.02656e+6	4.92221e-4	7.00000e-1	0.00000e-1	0.00000e-1
23	3.30867e+3	3.66810e+0	1.86594e+0	1.05859e+6	5.53216e-4	7.00000e-1	0.00000e-1	0.00000e-1
24	3.65660e+3	3.66994e+0	1.89338e+0	1.09228e+6	6.23584e-4	7.00000e-1	0.00000e-1	0.00000e-1
25	4.04110e+3	3.67179e+0	1.92083e+0	1.12790e+6	7.05224e-4	7.00000e-1	0.00000e-1	0.00000e-1
26	4.46776e+3	3.67367e+0	1.94828e+0	1.16578e+6	8.00595e-4	7.00000e-1	0.00000e-1	0.00000e-1
27	4.94353e+3	3.67558e+0	1.97574e+0	1.20634e+6	9.12880e-4	7.00000e-1	0.00000e-1	0.00000e-1
28	5.47686e+3	3.67753e+0	2.00317e+0	1.25015e+6	1.04613e-3	7.00000e-1	0.00000e-1	0.00000e-1
29	6.07991e+3	3.67955e+0	2.03057e+0	1.29804e+6	1.20602e-3	6.99999e-1	0.00000e-1	0.00000e-1
30	6.77209e+3	3.68166e+0	2.05802e+0	1.35147e+6	1.40098e-3	6.99999e-1	0.00000e-1	0.00000e-1
31	7.58087e+3	3.68390e+0	2.08546e+0	1.41254e+6	1.64201e-3	6.99998e-1	0.00000e-1	0.00000e-1
32	8.55182e+3	3.68631e+0	2.11271e+0	1.48487e+6	1.94257e-3	6.99995e-1	0.00000e-1	0.00000e-1
33	9.77388e+3	3.68895e+0	2.13941e+0	1.57504e+6	2.31341e-3	6.99989e-1	0.00000e-1	0.00000e-1
34	1.14495e+4	3.69189e+0	2.16496e+0	1.69144e+6	2.74294e-3	6.99975e-1	0.00000e-1	0.00000e-1
35	1.41250e+4	3.69523e+0	2.19070e+0	1.82111e+6	3.25603e-3	6.99950e-1	0.00000e-1	0.00000e-1
36	1.87517e+4	3.69920e+0	2.21681e+0	1.92531e+6	4.21780e-3	6.99933e-1	0.00000e-1	0.00000e-1
37	2.56679e+4	3.70424e+0	2.21923e+0	2.05376e+6	6.30263e-3	6.99929e-1	0.00000e-1	0.00000e-1
38	2.79945e+4	3.70619e+0	2.20664e+0	2.12347e+6	7.31965e-3	6.99929e-1	0.00000e-1	0.00000e-1
39	2.95545e+4	3.70775e+0	2.19153e+0	2.18368e+6	8.15359e-3	6.99929e-1	0.00000e-1	0.00000e-1
40	3.07908e+4	3.70920e+0	2.17519e+0	2.23903e+6	8.91341e-3	6.99929e-1	0.00000e-1	0.00000e-1
41	3.20333e+4	3.71096e+0	2.15590e+0	2.30177e+6	9.78397e-3	6.99929e-1	0.00000e-1	0.00000e-1
42	3.30897e+4	3.71272e+0	2.13826e+0	2.35985e+6	1.06065e-2	6.99929e-1	0.00000e-1	0.00000e-1
43	3.40456e+4	3.71457e+0	2.12292e+0	2.41634e+6	1.14253e-2	6.99929e-1	0.00000e-1	0.00000e-1
44	3.49829e+4	3.71663e+0	2.10962e+0	2.47552e+6	1.23069e-2	6.99929e-1	0.00000e-1	0.00000e-1

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Explore Database: oscillation frequencies of a model

BetaDat : BetaCephei Database			
Explore database – Search – Search by SQL request – Help – Administration			

Evolution sequency: **8.0_0.010_0.20_0.70**

l	n	Hz	beta
0	1	1.09770e-4	0.00000e-1
0	2	1.41150e-4	0.00000e-1
0	3	1.74760e-4	0.00000e-1
0	4	2.09410e-4	0.00000e-1
0	5	2.45560e-4	0.00000e-1
0	6	2.83680e-4	0.00000e-1
0	7	3.22620e-4	0.00000e-1
0	8	3.61770e-4	0.00000e-1
1	-2	3.65380e-5	5.50520e-1
1	-1	6.81580e-5	4.88730e-1
1	1	1.17200e-4	9.67110e-1
1	2	1.56940e-4	9.68340e-1
1	3	1.91360e-4	9.67880e-1
1	4	2.26420e-4	9.69290e-1
1	5	2.63550e-4	9.71260e-1
1	6	3.01830e-4	9.74240e-1
1	7	3.41060e-4	9.77280e-1
1	8	3.80180e-4	9.80050e-1
2	-3	4.13920e-5	8.80850e-1
2	-2	5.94440e-5	8.79190e-1
2	-1	9.98360e-5	7.44610e-1
2	0	1.14180e-4	9.20550e-1
2	1	1.37030e-4	7.98020e-1
2	2	1.72100e-4	9.06420e-1
2	3	2.06990e-4	9.35930e-1
2	4	2.42930e-4	9.49480e-1
2	5	2.80820e-4	9.59190e-1
2	6	3.19490e-4	9.65680e-1
2	7	3.58520e-4	9.71350e-1
3	-6	3.37280e-5	9.42850e-1
3	-5	3.87690e-5	9.34840e-1
3	-4	4.39780e-5	9.49840e-1
3	-3	5.55150e-5	9.63410e-1
3	-2	7.70960e-5	9.63160e-1
3	-1	1.10570e-4	8.61910e-1
3	0	1.32480e-4	9.55850e-1
3	1	1.48440e-4	8.77480e-1
3	2	1.83380e-4	9.19280e-1
3	3	2.18940e-4	9.41120e-1
3	4	2.56070e-4	9.52740e-1
3	5	2.94560e-4	9.62080e-1
3	6	3.33920e-4	9.68480e-1
3	7	3.73190e-4	9.73560e-1

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Search Database:

Send requests with constraints on any of these parameters:
M, X, Z, $\diamond_{ov}$, $\log T_e$, $\log g$, age, T_c, X_c,
with possibly error boxes.

It is also possible to request a given
mode of oscillation, here an
l=0 mode with a frequency of 7.6284e-5Hz

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Search Database:

Result = list of possible sequences of evolution

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BetaDat: A β Cephei Database

Search Database:
Click on a sequence ➡ interpolated model which fits the frequency

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Search Database:

Click on a model ➡ all the frequencies of oscillation

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BetaDat: A β Cephei Database

Soon available: graphical tool to plot the results in the HR diagram

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Access info:

http: //astrotheor3.astro.ulg.ac.be

Username and Password: Send mail to Anne.Thoul@ulg.ac.be

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