

A belgian contribution to COROT:

BetaDat

A β 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_{\odot}

BetaDat: A β Cephei Database

β Cephei stars:

- Simple internal structure:
Convective core ($\sim 0.3 M_{\text{star}}$) surrounded by radiative envelope
- Modelling: fit the frequencies, the position in the HR diagram, the metallicity ... long and tedious exercise BUT very nice results!
- Observation from the ground:
 - Info on global parameters (M, R, age)
 - + info on overshooting parameter
 - + info on envelope differential rotation

BetaDat: A β Cephei Database

COROT *main* targets include β Cephei stars

HD 180642 in LRC1

Need for a tool to obtain results fast

 BetaDat

BetaDat: A β Cephei Database

Grid of stellar models: CLES

$M = 8$ to $20 M_{\odot}$ by step of 0.1

$Z = 0.010, 0.015, 0.020, 0.025$

$X = 0.60, 0.65, 0.70$

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

$\sim 10\,000$ 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 $|n| < 20$

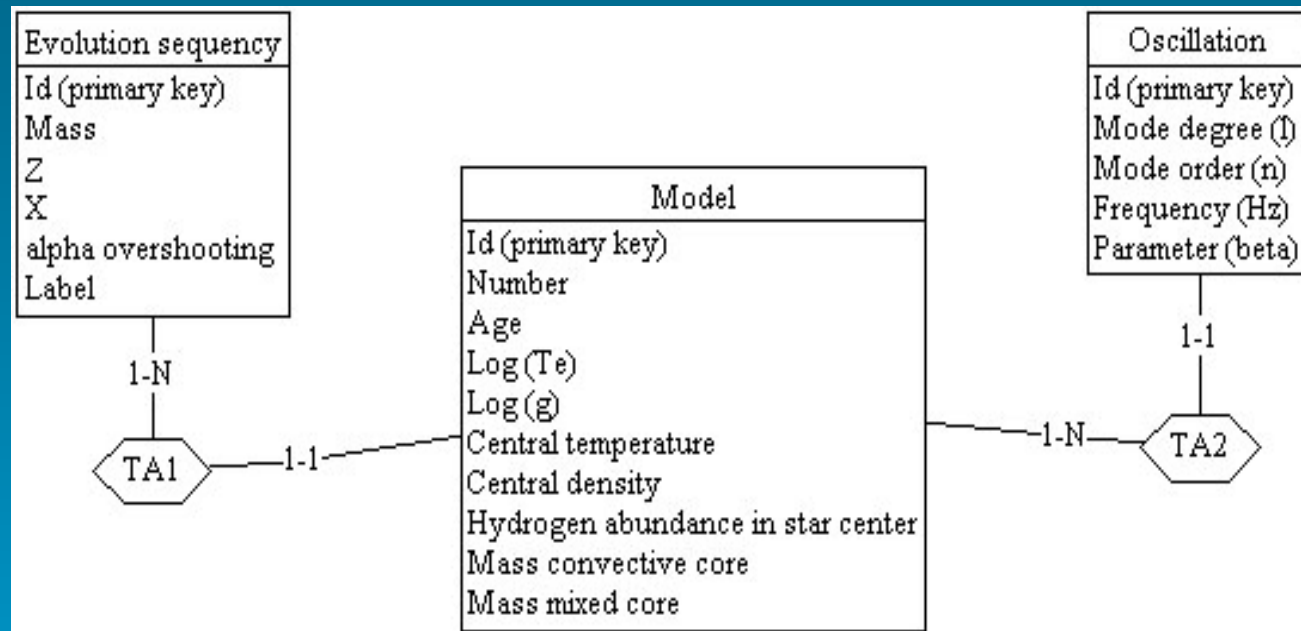
~ 50 million frequencies

Note: in progress... higher values of α_{ov} needed

BetaDat: A β Cephei Database

Database: MySQL

Database structure: 3 tables:



BetaDat: A β Cephei Database

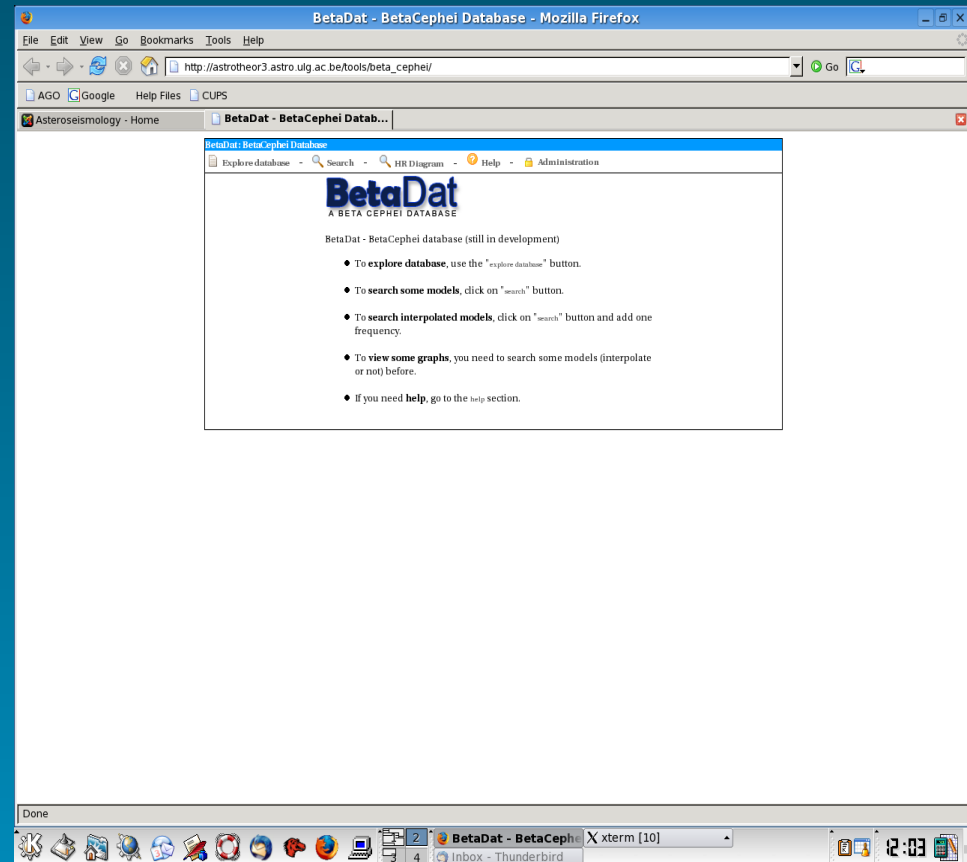
Accessible through Web Interface

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

BetaDat: A β Cephei Database

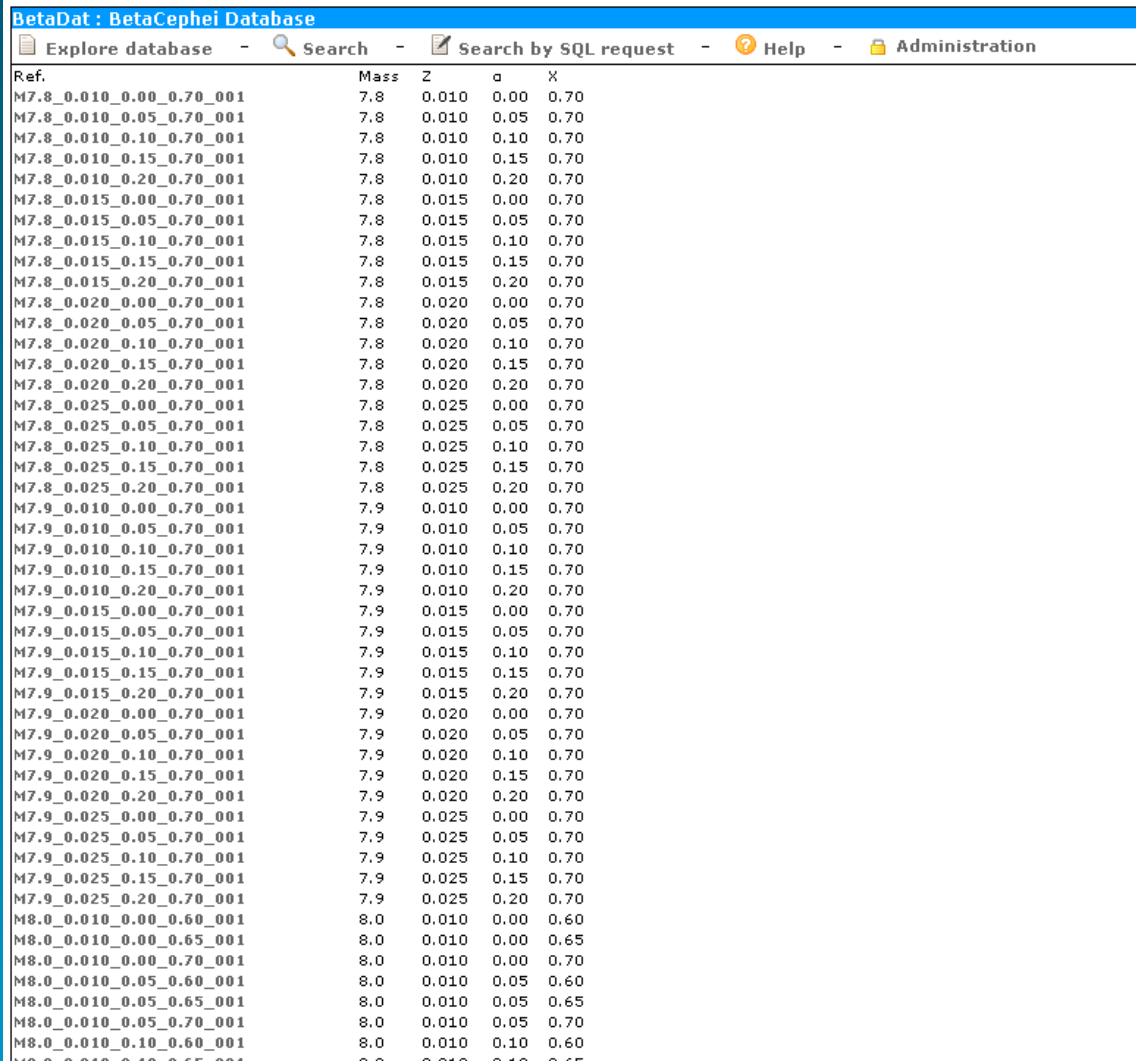
Several possibilities:

- Explore evolution sequences and models
 - ... with oscillation spectra
- Search with constraints
 - ... with or without constraint on oscillation frequency
- Graphical Interface



BetaDat: A β Cephei Database

Explore Database: list of sequences of evolution



The screenshot shows a web browser window titled "BetaDat : BetaCephei Database". The browser's address bar contains "Explore database" and navigation links for "Search", "Search by SQL request", "Help", and "Administration". The main content area displays a table with five columns: "Ref.", "Mass", "Z", "a", and "X". The table lists 100 rows of data, representing sequences of evolution for different stars. The "Ref." column contains identifiers like "M7.8_0.010_0.00_0.70_001", "M7.9_0.010_0.00_0.70_001", and "M8.0_0.010_0.00_0.60_001". The "Mass" column shows values like 7.8, 7.9, and 8.0. The "Z", "a", and "X" columns show numerical values ranging from 0.00 to 0.70.

Ref.	Mass	Z	a	X
M7.8_0.010_0.00_0.70_001	7.8	0.010	0.00	0.70
M7.8_0.010_0.05_0.70_001	7.8	0.010	0.05	0.70
M7.8_0.010_0.10_0.70_001	7.8	0.010	0.10	0.70
M7.8_0.010_0.15_0.70_001	7.8	0.010	0.15	0.70
M7.8_0.010_0.20_0.70_001	7.8	0.010	0.20	0.70
M7.8_0.015_0.00_0.70_001	7.8	0.015	0.00	0.70
M7.8_0.015_0.05_0.70_001	7.8	0.015	0.05	0.70
M7.8_0.015_0.10_0.70_001	7.8	0.015	0.10	0.70
M7.8_0.015_0.15_0.70_001	7.8	0.015	0.15	0.70
M7.8_0.015_0.20_0.70_001	7.8	0.015	0.20	0.70
M7.8_0.020_0.00_0.70_001	7.8	0.020	0.00	0.70
M7.8_0.020_0.05_0.70_001	7.8	0.020	0.05	0.70
M7.8_0.020_0.10_0.70_001	7.8	0.020	0.10	0.70
M7.8_0.020_0.15_0.70_001	7.8	0.020	0.15	0.70
M7.8_0.020_0.20_0.70_001	7.8	0.020	0.20	0.70
M7.8_0.025_0.00_0.70_001	7.8	0.025	0.00	0.70
M7.8_0.025_0.05_0.70_001	7.8	0.025	0.05	0.70
M7.8_0.025_0.10_0.70_001	7.8	0.025	0.10	0.70
M7.8_0.025_0.15_0.70_001	7.8	0.025	0.15	0.70
M7.8_0.025_0.20_0.70_001	7.8	0.025	0.20	0.70
M7.9_0.010_0.00_0.70_001	7.9	0.010	0.00	0.70
M7.9_0.010_0.05_0.70_001	7.9	0.010	0.05	0.70
M7.9_0.010_0.10_0.70_001	7.9	0.010	0.10	0.70
M7.9_0.010_0.15_0.70_001	7.9	0.010	0.15	0.70
M7.9_0.010_0.20_0.70_001	7.9	0.010	0.20	0.70
M7.9_0.015_0.00_0.70_001	7.9	0.015	0.00	0.70
M7.9_0.015_0.05_0.70_001	7.9	0.015	0.05	0.70
M7.9_0.015_0.10_0.70_001	7.9	0.015	0.10	0.70
M7.9_0.015_0.15_0.70_001	7.9	0.015	0.15	0.70
M7.9_0.015_0.20_0.70_001	7.9	0.015	0.20	0.70
M7.9_0.020_0.00_0.70_001	7.9	0.020	0.00	0.70
M7.9_0.020_0.05_0.70_001	7.9	0.020	0.05	0.70
M7.9_0.020_0.10_0.70_001	7.9	0.020	0.10	0.70
M7.9_0.020_0.15_0.70_001	7.9	0.020	0.15	0.70
M7.9_0.020_0.20_0.70_001	7.9	0.020	0.20	0.70
M7.9_0.025_0.00_0.70_001	7.9	0.025	0.00	0.70
M7.9_0.025_0.05_0.70_001	7.9	0.025	0.05	0.70
M7.9_0.025_0.10_0.70_001	7.9	0.025	0.10	0.70
M7.9_0.025_0.15_0.70_001	7.9	0.025	0.15	0.70
M7.9_0.025_0.20_0.70_001	7.9	0.025	0.20	0.70
M8.0_0.010_0.00_0.60_001	8.0	0.010	0.00	0.60
M8.0_0.010_0.00_0.65_001	8.0	0.010	0.00	0.65
M8.0_0.010_0.00_0.70_001	8.0	0.010	0.00	0.70
M8.0_0.010_0.05_0.60_001	8.0	0.010	0.05	0.60
M8.0_0.010_0.05_0.65_001	8.0	0.010	0.05	0.65
M8.0_0.010_0.05_0.70_001	8.0	0.010	0.05	0.70
M8.0_0.010_0.10_0.60_001	8.0	0.010	0.10	0.60
M8.0_0.010_0.10_0.65_001	8.0	0.010	0.10	0.65

BetaDat: A β Cephei Database

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

BetaDat: BetaCephei Database

Evolution frequency: 9.4_0.020_0.20_0.60

Number	Age	LogTe	LogL/Lo	Radius	Logg	Tc	rhoc	Xc	Mnc_no_over	Mnc_over
0	0.000000e-1	3.395174e+0	3.874573e+0	1.296631e+13	8.703390e-1	4.004098e+5	1.529300e-5	6.000000e-1	1.869048e+34	1.869063e+34
1	1.804093e+1	3.397194e+0	3.853593e+0	1.253368e+13	8.994590e-1	4.139603e+5	1.690607e-5	6.000000e-1	1.869053e+34	1.869066e+34
2	3.716786e+1	3.399181e+0	3.83151e+0	1.213646e+13	9.278470e-1	4.276116e+5	1.863955e-5	6.000000e-1	1.869057e+34	1.869069e+34
3	5.796806e+1	3.601170e+0	3.812608e+0	1.174472e+13	9.563460e-1	4.417557e+5	2.054946e-5	6.000000e-1	1.869061e+34	1.869072e+34
4	8.047833e+1	3.603139e+0	3.792031e+0	1.136622e+13	9.847590e-1	4.563341e+5	2.265478e-5	6.000000e-1	1.869065e+34	1.869074e+34
5	1.048008e+2	3.605118e+0	3.771575e+0	1.100095e+13	1.013170e+0	4.713424e+5	2.496747e-5	6.000000e-1	1.869068e+34	1.869076e+34
6	1.312329e+2	3.607089e+0	3.750995e+0	1.064630e+13	1.041633e+0	4.868900e+5	2.752388e-5	6.000000e-1	1.869071e+34	1.869078e+34
7	1.597883e+2	3.609034e+0	3.730443e+0	1.030419e+13	1.070003e+0	5.028820e+5	3.033087e-5	6.000000e-1	1.869073e+34	1.869080e+34
8	1.906783e+2	3.610987e+0	3.709893e+0	9.973382e+12	1.098328e+0	5.193880e+5	3.341792e-5	6.000000e-1	1.869075e+34	1.869082e+34
9	2.240976e+2	3.612928e+0	3.689371e+0	9.654012e+12	1.126615e+0	5.363900e+5	3.681300e-5	6.000000e-1	1.869077e+34	1.869083e+34
10	2.603022e+2	3.614867e+0	3.668835e+0	9.344617e+12	1.154908e+0	5.536960e+5	4.052338e-5	6.000000e-1	1.869079e+34	1.869084e+34
11	2.994953e+2	3.616795e+0	3.648273e+0	9.045332e+12	1.183182e+0	5.719382e+5	4.468464e-5	6.000000e-1	0.000000e-1	1.869086e+34
12	3.418749e+2	3.618708e+0	3.627708e+0	8.756219e+12	1.211398e+0	5.920545e+5	4.926318e-5	6.000000e-1	0.000000e-1	0.000000e-1
13	3.876888e+2	3.620627e+0	3.607230e+0	8.476962e+12	1.239550e+0	6.087780e+5	5.434270e-5	6.000000e-1	0.000000e-1	0.000000e-1
14	4.374279e+2	3.622540e+0	3.586678e+0	8.206121e+12	1.267755e+0	6.277586e+5	6.001197e-5	6.000000e-1	0.000000e-1	0.000000e-1
15	4.912322e+2	3.624444e+0	3.566163e+0	7.944367e+12	1.295888e+0	6.470987e+5	6.632338e-5	6.000000e-1	0.000000e-1	0.000000e-1
16	5.495400e+2	3.626338e+0	3.545703e+0	7.691616e+12	1.323996e+0	6.668880e+5	7.337364e-5	6.000000e-1	0.000000e-1	0.000000e-1
17	6.129101e+2	3.628272e+0	3.525217e+0	7.446356e+12	1.352143e+0	6.871670e+5	8.128480e-5	6.000000e-1	0.000000e-1	0.000000e-1
18	6.816585e+2	3.630183e+0	3.504756e+0	7.209242e+12	1.380252e+0	7.079863e+5	9.015612e-5	6.000000e-1	0.000000e-1	0.000000e-1
19	7.563494e+2	3.632093e+0	3.484310e+0	6.979867e+12	1.408337e+0	7.293988e+5	1.001320e-4	6.000000e-1	0.000000e-1	0.000000e-1
20	8.375577e+2	3.634002e+0	3.463882e+0	6.758047e+12	1.436388e+0	7.514717e+5	1.113723e-4	6.000000e-1	0.000000e-1	0.000000e-1
21	9.259714e+2	3.635905e+0	3.443485e+0	6.543514e+12	1.464409e+0	7.742771e+5	1.240728e-4	6.000000e-1	0.000000e-1	0.000000e-1
22	1.022277e+3	3.637812e+0	3.423150e+0	6.336206e+12	1.492372e+0	7.978742e+5	1.384533e-4	6.000000e-1	0.000000e-1	0.000000e-1
23	1.127542e+3	3.639727e+0	3.402846e+0	6.135466e+12	1.520336e+0	8.224133e+5	1.548243e-4	6.000000e-1	0.000000e-1	0.000000e-1
24	1.242773e+3	3.641644e+0	3.382567e+0	5.941190e+12	1.548284e+0	8.480127e+5	1.732094e-4	6.000000e-1	0.000000e-1	0.000000e-1
25	1.369066e+3	3.643571e+0	3.362371e+0	5.753350e+12	1.576189e+0	8.747907e+5	1.949403e-4	6.000000e-1	0.000000e-1	0.000000e-1
26	1.506038e+3	3.645517e+0	3.342244e+0	5.571435e+12	1.604097e+0	9.029597e+5	2.196388e-4	6.000000e-1	0.000000e-1	0.000000e-1
27	1.651475e+3	3.647477e+0	3.322170e+0	5.395219e+12	1.632013e+0	9.327523e+5	2.482860e-4	6.000000e-1	0.000000e-1	0.000000e-1
28	1.813131e+3	3.649463e+0	3.302220e+0	5.224721e+12	1.659950e+0	9.644036e+5	2.816937e-4	6.000000e-1	0.000000e-1	0.000000e-1
29	2.020463e+3	3.651487e+0	3.282397e+0	5.059440e+12	1.687826e+0	9.983038e+5	3.210481e-4	6.000000e-1	0.000000e-1	0.000000e-1
30	2.232427e+3	3.653565e+0	3.262738e+0	4.899116e+12	1.715795e+0	1.034913e+6	3.679212e-4	6.000000e-1	0.000000e-1	0.000000e-1
31	2.471906e+3	3.655706e+0	3.243258e+0	4.743474e+12	1.743838e+0	1.074879e+6	4.245434e-4	6.000000e-1	0.000000e-1	0.000000e-1
32	2.744882e+3	3.657934e+0	3.224082e+0	4.592530e+12	1.771927e+0	1.119053e+6	4.940719e-4	6.000000e-1	0.000000e-1	0.000000e-1
33	3.060988e+3	3.660282e+0	3.205297e+0	4.445935e+12	1.800105e+0	1.168808e+6	5.816755e-4	6.000000e-1	0.000000e-1	0.000000e-1
34	3.434090e+3	3.662807e+0	3.187138e+0	4.303704e+12	1.828346e+0	1.228807e+6	6.959813e-4	5.999999e-1	0.000000e-1	0.000000e-1
35	3.890270e+3	3.665365e+0	3.170207e+0	4.165913e+12	1.856610e+0	1.297471e+6	8.540132e-4	5.999998e-1	0.000000e-1	0.000000e-1
36	4.495127e+3	3.668004e+0	3.155769e+0	4.033065e+12	1.884760e+0	1.372717e+6	1.089564e-3	5.999995e-1	0.000000e-1	0.000000e-1
37	5.354731e+3	3.673969e+0	3.150323e+0	3.918335e+12	1.908828e+0	1.459771e+6	1.563414e-3	5.999991e-1	0.000000e-1	0.000000e-1
38	6.299911e+3	3.678533e+0	3.172298e+0	3.935105e+12	1.906118e+0	1.725764e+6	2.104344e-3	5.999922e-1	0.000000e-1	0.000000e-1
39	7.782735e+3	3.680311e+0	3.197541e+0	4.018153e+12	1.887978e+0	1.803523e+6	2.335966e-3	5.999856e-1	0.000000e-1	0.000000e-1
40	1.736085e+3	3.681615e+0	3.220538e+0	4.101263e+12	1.870196e+0	1.890966e+6	2.493288e-3	5.999791e-1	0.000000e-1	0.000000e-1
41	7.478946e+3	3.682989e+0	3.244036e+0	4.187156e+12	1.852193e+0	1.911804e+6	2.638212e-3	5.999719e-1	0.000000e-1	0.000000e-1
42	7.803844e+3	3.684415e+0	3.26532e+0	4.262981e+12	1.836604e+0	1.939021e+6	2.771050e-3	5.999647e-1	0.000000e-1	0.000000e-1
43	8.143823e+3	3.686038e+0	3.283328e+0	4.320814e+12	1.824800e+0	2.003827e+6	2.909457e-3	5.999576e-1	0.000000e-1	0.000000e-1
44	8.557677e+3	3.688128e+0	3.297327e+0	4.347968e+12	1.819438e+0	2.050682e+6	3.084456e-3	5.999506e-1	0.000000e-1	0.000000e-1
45	9.219575e+3	3.691474e+0	3.302814e+0	4.306612e+12	1.827356e+0	2.109222e+6	3.38920e-3	5.999438e-1	0.000000e-1	0.000000e-1
46	1.054367e+4	3.695365e+0	3.292527e+0	4.145832e+12	1.860807e+0	2.197132e+6	4.078915e-3	5.999369e-1	0.000000e-1	0.000000e-1
47	1.251294e+4	3.705454e+0	3.294153e+0	3.996877e+12	1.891938e+0	2.324000e+6	5.361145e-3	5.999300e-1	0.000000e-1	0.000000e-1
48	1.389541e+4	3.715487e+0	3.316538e+0	3.919079e+12	1.906683e+0	2.442938e+6	6.567446e-3	5.999238e-1	0.000000e-1	0.000000e-1
49	1.477685e+4	3.724422e+0	3.338503e+0	3.857316e+12	1.923460e+0	2.536735e+6	7.519217e-3	5.999188e-1	0.000000e-1	0.000000e-1
50	1.550041e+4	3.729951e+0	3.360969e+0	3.797109e+12	1.939417e+0	2.696125e+6	8.418903e-3	5.999139e-1	0.000000e-1	0.000000e-1

Parameter of the chosen evolution sequence:
 M , X , Z , α_{OV}

BetaDat: A β Cephei Database

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

l=0 {
l=1 {
l=2 {
l=3 {

BetaDat: A β Cephei Database

Search Database:

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

The screenshot shows the BetaDat web interface. At the top, there is a navigation bar with links for 'Explore database', 'Search', 'HR Diagram', 'Help', and 'Administration'. Below this is a search form with the following fields:

Parameter:	Condition:	Number 1:	Number 2:
Mass	=		

Buttons for 'Add', 'Search', and 'Reset' are located below the search form. To the right of the search form, a status box displays 'State: Ok' and 'Rule N°7 successfully deleted'.

Below the search form is a list of search results:

1	X = 0.70	delete
2	Z = 0.020	delete
3	Alpha = 0.1	delete
4	Te between 4.35 and 4.38	delete
5	g between 3.87 and 3.94	delete
6	Xc between 0.698 and 0.01	delete

Annotations in orange text and arrows point to the last three rows of the results table, stating 'error box in HR for HD129929' and 'main sequence only'.

BetaDat: A β Cephei Database

BetaDat: BetaCephei Database

Explore database - Search - HR Diagram - Help - Administration

Parameter: Mass Condition: = Number 1: Number 2:

Add Search Reset

State: Request completed
Evolution sequences: 16
Models: 91
Interpolated: 0
[Click here to see the SQL request](#)

- 1 X = 0.70 delete
- 2 Z = 0.020 delete
- 3 Alpha = 0.1 delete
- 4 Te between 4.35 and 4.38 delete
- 5 g between 3.87 and 3.94 delete
- 6 Xc between 0.698 and 0.01 delete

Ref.	Mass	Z	α	X
M9.2_0.020_0.10_0.70_001	9.2	0.020	0.10	0.70
M9.3_0.020_0.10_0.70_001	9.3	0.020	0.10	0.70
M9.4_0.020_0.10_0.70_001	9.4	0.020	0.10	0.70
M9.5_0.020_0.10_0.70_001	9.5	0.020	0.10	0.70
M9.6_0.020_0.10_0.70_001	9.6	0.020	0.10	0.70
M9.7_0.020_0.10_0.70_001	9.7	0.020	0.10	0.70
M9.8_0.020_0.10_0.70_001	9.8	0.020	0.10	0.70
M9.9_0.020_0.10_0.70_001	9.9	0.020	0.10	0.70
M10.0_0.020_0.10_0.70_001	10.0	0.020	0.10	0.70
M10.1_0.020_0.10_0.70_001	10.1	0.020	0.10	0.70
M10.2_0.020_0.10_0.70_001	10.2	0.020	0.10	0.70
M10.3_0.020_0.10_0.70_001	10.3	0.020	0.10	0.70
M10.4_0.020_0.10_0.70_001	10.4	0.020	0.10	0.70
M10.5_0.020_0.10_0.70_001	10.5	0.020	0.10	0.70
M10.6_0.020_0.10_0.70_001	10.6	0.020	0.10	0.70
M10.7_0.020_0.10_0.70_001	10.7	0.020	0.10	0.70

Result of the search: list of evolution sequences

BetaDat: A β Cephei Database

select one evolution sequence:
get the models which obey the constraints

The screenshot shows the BetaDat BetaCephei Database interface. At the top, there is a navigation bar with 'Explore database', 'Search', 'HR Diagram', 'Help', and 'Administration'. Below this is a search form with the following fields: 'Parameter:' (set to 'Mass'), 'Condition:' (set to '='), 'Number 1:', and 'Number 2:'. There are 'Add', 'Search', and 'Reset' buttons. To the right of the search form, the status is 'State: Request completed', 'Evolution sequences: 16', 'Models: 91', and 'Interpolated: 0'. Below the search form is a list of constraints: 1 X = 0.70, 2 Z = 0.020, 3 Alpha = 0.1, 4 Te between 4.35 and 4.38, 5 g between 3.87 and 3.94, and 6 Xc between 0.698 and 0.01. Each constraint has a 'delete' button. A red circle highlights the text 'Add these results to the HR Diagram' and a yellow circle highlights the text 'is: 9.9_0.020_0.10_0.70'. Below the constraints is a table of model results with columns: 'MP', 'Age', 'Log Te', 'Log L/L_o', 'Radius', 'Log g', 'T_c', 'rho_c', 'X_c', 'Mnc_no_over', and 'Mnc_over'. The table contains 10 rows of data, with the first row (MP 217) circled in yellow. A red circle highlights the text 'Add these results to the HR Diagram'.

MP	Age	Log Te	Log L/L _o	Radius	Log g	T _c	rho _c	X _c	Mnc_no_over	Mnc_over
217	1.443282e+7	4.368809e+0	3.930696e+0	3.922906e+11	3.931322e+0	3.374902e+7	9.314915e+0	3.612674e-1	4.362529e+33	4.836451e+33
218	1.468777e+7	4.367514e+0	3.935088e+0	3.966375e+11	3.921751e+0	3.383541e+7	9.354548e+0	3.521553e-1	4.317643e+33	4.786506e+33
219	1.494115e+7	4.366189e+0	3.939507e+0	4.011017e+11	3.912029e+0	3.392358e+7	9.395877e+0	3.430568e-1	4.272869e+33	4.737083e+33
220	1.519057e+7	4.364812e+0	3.943890e+0	4.056941e+11	3.902141e+0	3.401481e+7	9.440903e+0	3.337751e-1	4.228091e+33	4.687081e+33
221	1.542705e+7	4.363466e+0	3.948100e+0	4.101999e+11	3.892547e+0	3.410364e+7	9.485382e+0	3.249363e-1	4.185133e+33	4.639585e+33
222	1.565634e+7	4.362091e+0	3.952220e+0	4.147688e+11	3.882926e+0	3.419418e+7	9.532955e+0	3.160604e-1	4.143266e+33	4.592640e+33
223	1.587389e+7	4.360748e+0	3.956181e+0	4.192506e+11	3.873591e+0	3.428242e+7	9.580035e+0	3.076184e-1	4.103092e+33	4.548067e+33

here:
models
217
to
223

BetaDat: A β Cephei Database

Graphical tool: HR diagram

error box

The screenshot shows the BetaDat web interface. At the top, there is a navigation bar with links for 'Explore database', 'Search', 'HR Diagram', 'Help', and 'Administration'. Below this is a table of stars with columns for star ID, color, and a 'delete' link. The first row is highlighted and labeled '3.87-3.94/4.35-4.38 (Error Box)'. To the right of the table, there are three panels: 'Open HR Diagram (automatic scale)', 'Open HR Diagram (manualy scale)', and 'Error Box'. The 'Error Box' panel contains input fields for 'Log T' and 'Log G' with 'min' and 'max' values, and a button 'Add this error box'. Below that is the 'Set scale' panel with similar input fields and a 'Set the scale' button. At the bottom is the 'Update colors' panel with an 'Update' button. An orange arrow points from the text 'error box' to the first row of the table and another orange arrow points from the text 'error box' to the 'Error Box' panel.

Star ID	Color	Action
3.87-3.94/4.35-4.38 (Error Box)	red	delete
9.2_0.020_0.10_0.70 (Evolution sequency)	blue	delete
9.3_0.020_0.10_0.70 (Evolution sequency)	blue	delete
9.4_0.020_0.10_0.70 (Evolution sequency)	blue	delete
9.5_0.020_0.10_0.70 (Evolution sequency)	blue	delete
9.6_0.020_0.10_0.70 (Evolution sequency)	blue	delete
9.7_0.020_0.10_0.70 (Evolution sequency)	blue	delete
9.8_0.020_0.10_0.70 (Evolution sequency)	blue	delete
9.9_0.020_0.10_0.70 (Evolution sequency)	blue	delete
10.0_0.020_0.10_0.70 (Evolution sequency)	blue	delete
10.1_0.020_0.10_0.70 (Evolution sequency)	blue	delete
10.2_0.020_0.10_0.70 (Evolution sequency)	blue	delete
10.3_0.020_0.10_0.70 (Evolution sequency)	blue	delete
10.4_0.020_0.10_0.70 (Evolution sequency)	blue	delete
10.5_0.020_0.10_0.70 (Evolution sequency)	blue	delete
10.6_0.020_0.10_0.70 (Evolution sequency)	blue	delete
10.7_0.020_0.10_0.70 (Evolution sequency)	blue	delete

Open HR Diagram (automatic scale)

Open HR Diagram (manualy scale)

Error Box

Log T min - max

Log G min - max

Add this error box

Set scale

Log T min - max

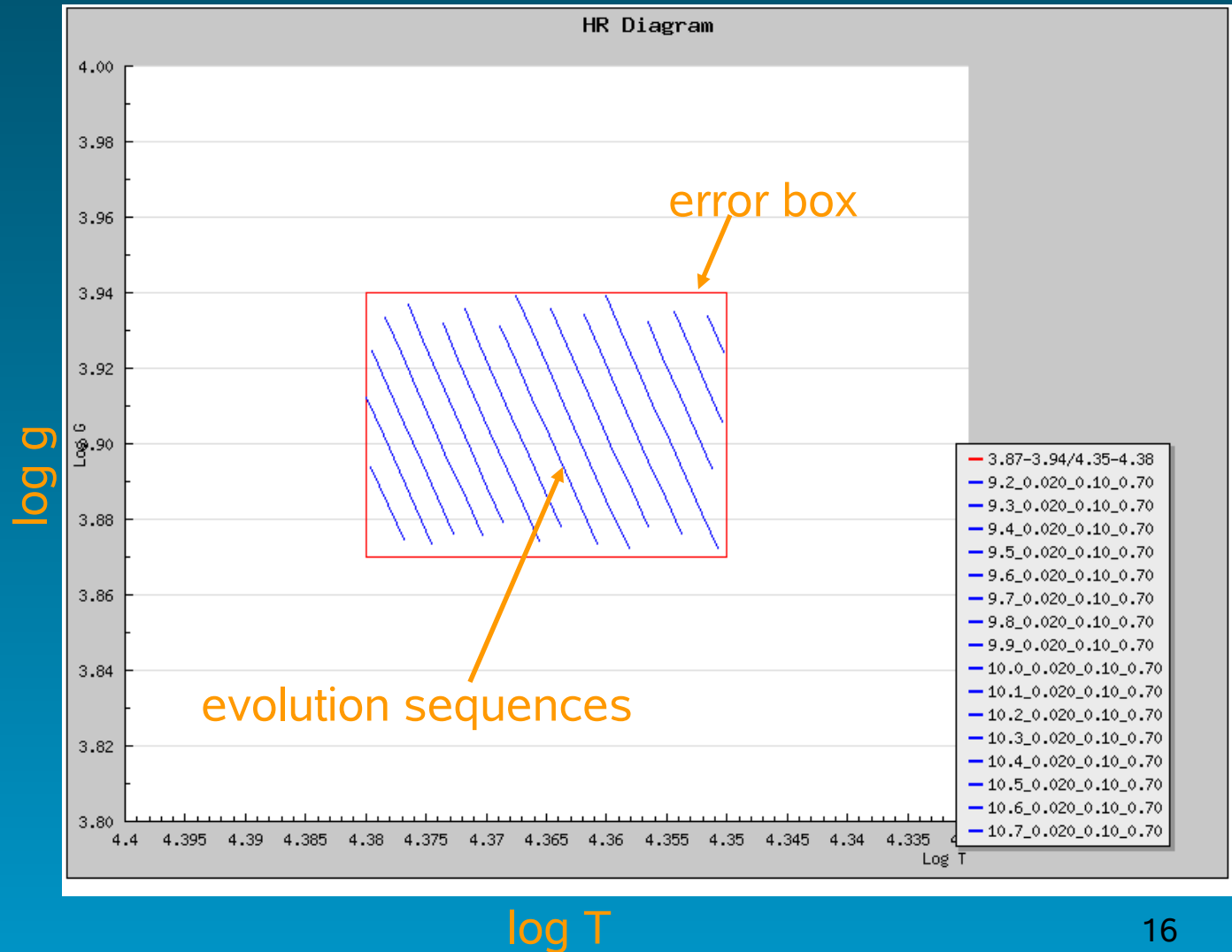
Log G min - max

Set the scale

Update colors

Update

BetaDat: A β Cephei Database



BetaDat: A β Cephei Database

Search Database:

It is also possible to request a given frequency of oscillation, here one of the observed frequencies of HD129929:

7.6284e-5Hz, an identified $l=0$ mode

The screenshot shows the BetaDat BetaCephei Database interface. At the top, there is a navigation bar with links for 'Explore database', 'Search', 'HR Diagram', 'Help', and 'Administration'. Below this is a search form with the following fields: 'Parameter:' (set to 'Mass'), 'Condition:' (set to '='), 'Number 1:', and 'Number 2:'. There are 'Add', 'Search', and 'Reset' buttons below the form. To the right of the form, a status box indicates 'State: Ok' and 'Rule N°8 successfully added'. Below the search form is a table of search results:

Number	Parameter	Action
1	X = 0.70	delete
2	Z = 0.020	delete
3	Alpha = 0.1	delete
4	Te between 4.35 and 4.38	delete
5	g between 3.87 and 3.94	delete
6	Xc between 0.698 and 0.01	delete
7	Hz = 7.6284e-5	delete
8	l = 0	delete

Two orange arrows point from the text above to the search results table. One arrow points from '7.6284e-5Hz' to the entry '7 Hz = 7.6284e-5', and the other points from 'an identified l=0 mode' to the entry '8 l = 0'. Both entries in the table are circled in orange.

BetaDat: A β Cephei Database

BetaDat: BetaCephei Database

Explore database - Search - HR Diagram - Help - Administration

Parameter: Condition: Number 1: Number 2:

Add Search Reset

State: Request completed
 Evolution sequences: 11
 Models: 11
 Interpolated: -5.5
[Click here to see the SQL request](#)

1	X = 0.70	delete
2	Z = 0.020	delete
3	Alpha = 0.1	delete
4	Te between 4.35 and 4.38	delete
5	g between 3.87 and 3.94	delete
6	Xc between 0.698 and 0.01	delete
7	Hz = 7.6284e-5	delete
8	l = 0	delete

```

SELECT `evolution_sequence`.`Id` AS EsId,`Rule1`.`Model` AS Mo1Id,`Rule2`.`Model` AS Mo2Id,`Rule1`.`Id` AS Fr1Id,`Rule2`.`Id` AS Fr2Id FROM `evolution_sequence`, `model`, `oscillation` AS Rule1, `oscillation` AS Rule2 WHERE `evolution_sequence`.`Id` = `model`.`Evolution_sequence` AND `model`.`Id` = `Rule1`.`Model` AND `Rule1`.`n` = `Rule2`.`n` AND `Rule1`.`l` = `Rule2`.`l` AND `Rule2`.`Model` = ( `Rule1`.`Model` + 1 ) AND `X`=0.70 AND `Z`=0.020 AND `Alpha`=0.1 AND ((`Te` BETWEEN 4.35 AND 4.38)OR(`Te` BETWEEN 4.38 AND 4.35)) AND ((`g` BETWEEN 3.87 AND 3.94)OR(`g` BETWEEN 3.94 AND 3.87)) AND ((`Xc` BETWEEN 0.698 AND 0.01)OR(`Xc` BETWEEN 0.01 AND 0.698)) AND (( 7.6284e-5 BETWEEN `Rule1`.`Hz` AND `Rule2`.`Hz` ) AND `Rule1`.`l`=0) OR (
Ref.           Mass    Z       $\alpha$     X
M9.3_0.020_0.10_0.70_001    9.3    0.020    0.10    0.70
M9.4_0.020_0.10_0.70_001    9.4    0.020    0.10    0.70
M9.5_0.020_0.10_0.70_001    9.5    0.020    0.10    0.70
M9.6_0.020_0.10_0.70_001    9.6    0.020    0.10    0.70
M9.7_0.020_0.10_0.70_001    9.7    0.020    0.10    0.70
M9.8_0.020_0.10_0.70_001    9.8    0.020    0.10    0.70
M9.9_0.020_0.10_0.70_001    9.9    0.020    0.10    0.70
M10.0_0.020_0.10_0.70_001   10.0   0.020    0.10    0.70
M10.1_0.020_0.10_0.70_001   10.1   0.020    0.10    0.70
M10.2_0.020_0.10_0.70_001   10.2   0.020    0.10    0.70
M10.3_0.020_0.10_0.70_001   10.3   0.020    0.10    0.70
  
```

result =
list of solutions

BetaDat: A β Cephei Database

interpolated model which fits the frequency:

BetaDat : BetaCephei Database

Explore database - Search - HR Diagram - Help - Administration

Parameter : Condition : Number 1 : Number 2 :

State: Request completed

Evolution sequences : 11
Models : 11
Interpolated : ~2.75

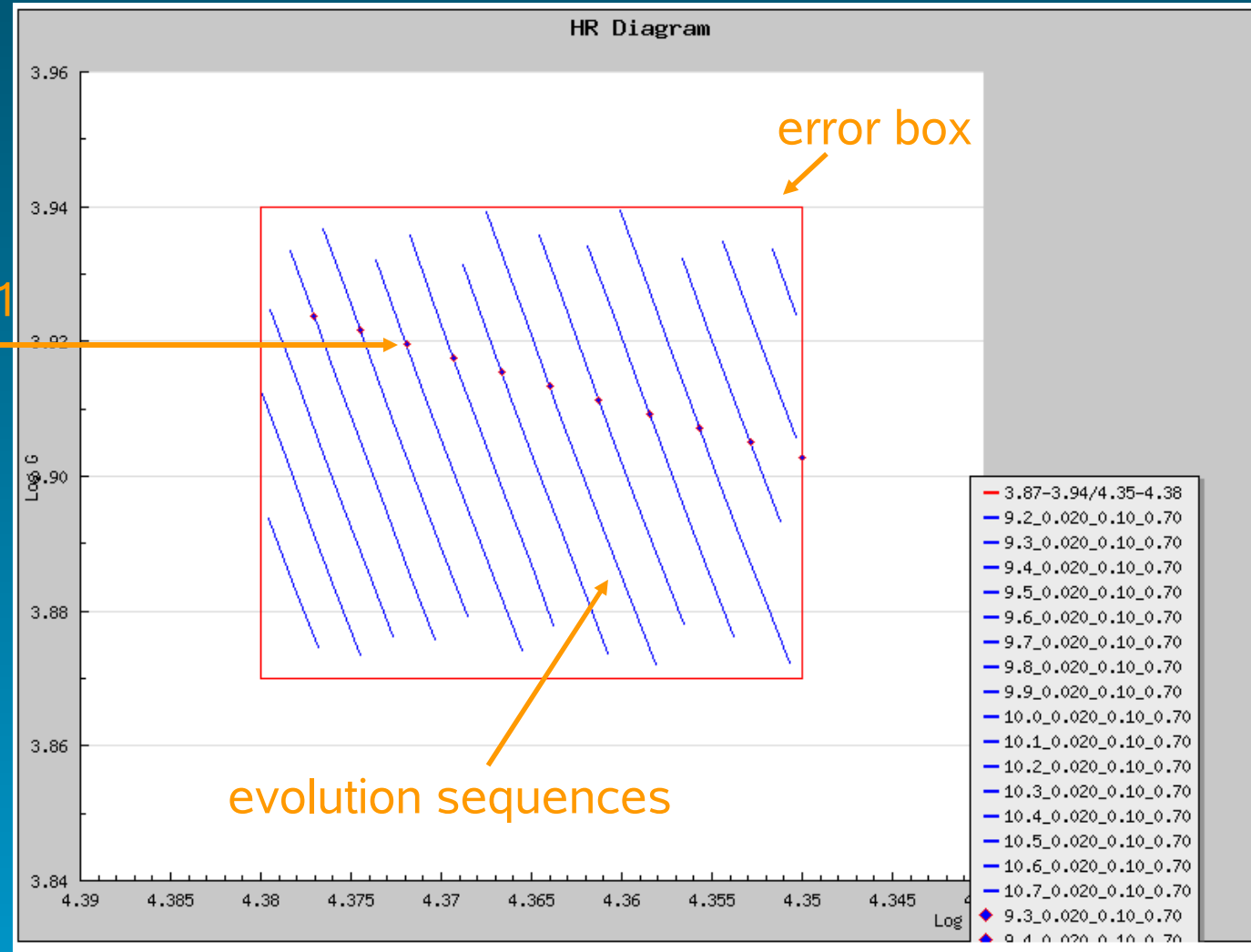
[Click here to see the SQL request](#)

Es: 9.5_0.015_0.10_0.70

Previous [Add these results to the HR Diagram](#)

N°	Age	Log Te	Log L/Lo	Radius	Log g	Tc	rhoc	Xc	Mnc_no	over	Mnc_over	l	n
219	1.647010e+7	4.366246e+0	3.921534e+0	3.927845e+11	3.912318e+0	3.463203e+7	1.048077e+1	3.087293e-1	3.935240e+33	4.364403e+33	0	1	
220	1.669849e+7	4.364871e+0	3.925587e+0	0.000000e-1	3.902766e+0	3.472789e+7	1.053687e+1	2.998912e-1	3.894973e+33	4.319240e+33			

BetaDat: A β Cephei Database



BetaDat: A β Cephei Database

We can also find the models which fit the other observed mode of HD129929, 8.0767e-5Hz, an identified l=1 mode

BetaDat: BetaCephei Database

Explore database - Search - HR Diagram - Help - Administration

Parameter: Condition: Number 1: Number 2: State: Request completed

Mass = [] [] Evolution sequences: 12
Models: 12
Interpolated: -6
[Click here to see the SQL request](#)

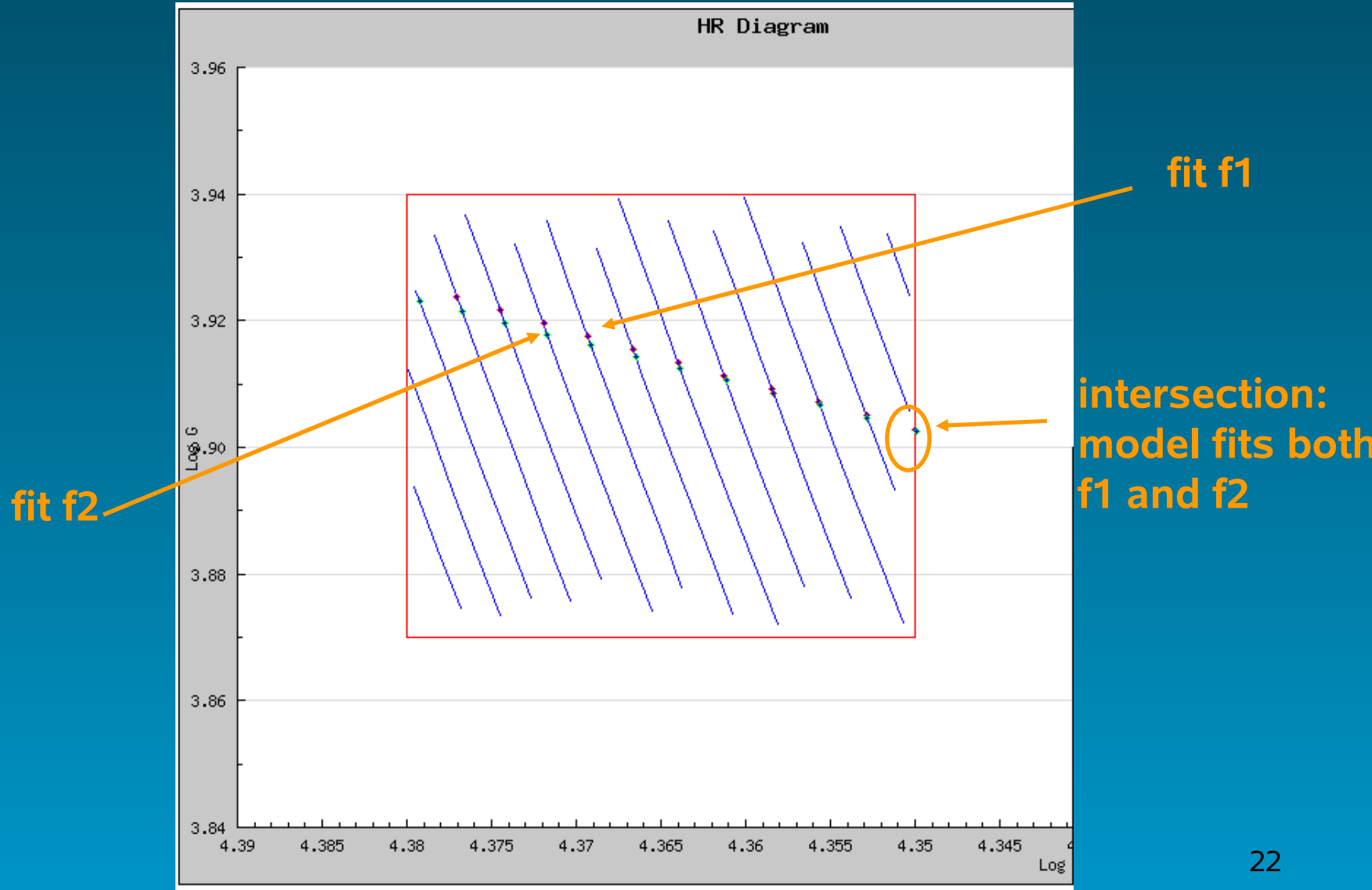
Add Search Reset

- X = 0.70 delete
- Z = 0.020 delete
- Alpha = 0.1 delete
- Te between 4.35 and 4.38 delete
- g between 3.87 and 3.94 delete
- Xc between 0.698 and 0.01 delete
- Hz = 8.0767e-5 delete
- l = 1 delete

```
SELECT `evolution_sequence`.`Id` AS EsId,`Rule1`.`Model` AS Mo1Id,`Rule2`.`Model` AS Mo2Id,`Rule1`.`Id` AS Fr1Id,`Rule2`.`Id` AS Fr2Id FROM `evolution_sequence`,`model`,`oscillation` AS Rule1,`oscillation` AS Rule2 WHERE `evolution_sequence`.`Id` = `model`.`Evolution_sequence` AND `model`.`Id` = `Rule1`.`Model` AND `Rule1`.`n` = `Rule2`.`n` AND `Rule1`.`l` = `Rule2`.`l` AND `Rule2`.`Model` = (`Rule1`.`Model` +1 ) AND `X`=0.70 AND `Z`=0.020 AND `Alpha`=0.1 AND ((`Te` BETWEEN 4.35 AND 4.38)OR(`Te` BETWEEN 4.38 AND 4.35)) AND ((`g` BETWEEN 3.87 AND 3.94)OR(`g` BETWEEN 3.94 AND 3.87)) AND ((`Xc` BETWEEN 0.698 AND 0.01)OR(`Xc` BETWEEN 0.01 AND 0.698)) AND (( 8.0767e-5 BETWEEN `Rule2`.`Hz` AND `Rule1`.`Hz` ) OR ( 8.0767e-5 BETWEEN `Rule1`.`Hz` AND `Rule2`.`Hz` )) AND `Rule1`.`l`=1
```

Ref.	Mass	Z	α	X
M9.3_0.020_0.10_0.70_001	9.3	0.020	0.10	0.70
M9.4_0.020_0.10_0.70_001	9.4	0.020	0.10	0.70
M9.5_0.020_0.10_0.70_001	9.5	0.020	0.10	0.70
M9.6_0.020_0.10_0.70_001	9.6	0.020	0.10	0.70
M9.7_0.020_0.10_0.70_001	9.7	0.020	0.10	0.70
M9.8_0.020_0.10_0.70_001	9.8	0.020	0.10	0.70
M9.9_0.020_0.10_0.70_001	9.9	0.020	0.10	0.70
M10.0_0.020_0.10_0.70_001	10.0	0.020	0.10	0.70
M10.1_0.020_0.10_0.70_001	10.1	0.020	0.10	0.70
M10.2_0.020_0.10_0.70_001	10.2	0.020	0.10	0.70
M10.3_0.020_0.10_0.70_001	10.3	0.020	0.10	0.70
M10.4_0.020_0.10_0.70_001	10.4	0.020	0.10	0.70

BetaDat: A β Cephei Database



BetaDat: A β Cephei Database

Assume the mode is not identified: unknown value for l

BetaDat: BetaCephei Database

Explore database - Search - HR Diagram - Help - Administration

Parameter: Condition: Number 1: Number 2:

Add Search Reset

State: Request completed

Evolution sequences: 13
Models: 19
Interpolated: -2.1600499167107E-12
[Click here to see the SQL request](#)

Es: 9.8_0.020_0.10_0.70
Previous
[Add these results to the HR Diagram](#)

- X = 0.70 delete
- Z = 0.020 delete
- Alpha = 0.1 delete
- Te between 4.35 and 4.38 delete
- g between 3.87 and 3.94 delete
- Xc between 0.698 and 0.01 delete
- Hz = 8.0767e-5 delete

N°	Age	Log Te	Log L/L _o	Radius	Log g	Tc	rhoc	Xc	Mnc_no_over	Mnc_over	l	n
219	1.502286e+7	4.364928e+0	3.921855e+0	3.953201e+11	3.920231e+0	3.378810e+7	9.464757e+0	3.501322e-1	4.239473e+33	4.702771e+33	1	1
	1.522747e+7	4.363855e+0	3.925356e+0	3.988876e+11	3.912437e+0	3.385933e+7	9.499430e+0	3.427655e-1	4.204223e+33	4.663385e+33	1	1
220	1.527997e+7	4.363580e+0	3.926255e+0	0.000000e-1	3.910437e+0	3.387761e+7	9.508327e+0	3.408751e-1	4.195177e+33	4.653278e+33	3	-1
217	1.450115e+7	4.367487e+0	3.913047e+0	3.867477e+11	3.939274e+0	3.351753e+7	9.387014e+0	3.682052e-1	4.327927e+33	4.800746e+33		
	1.454672e+7	4.367267e+0	3.913812e+0	3.874849e+11	3.937627e+0	3.363225e+7	9.398661e+0	3.686292e-1	4.320251e+33	4.792197e+33		
218	1.476287e+7	4.366221e+0	3.917440e+0	0.000000e-1	3.925818e+0	3.370204e+7	9.425184e+0	3.591542e-1	4.283847e+33	4.751648e+33		

search gives results for all possible values of l . Here, frequency f_2 can be $l=1$ or $l=3$

BetaDat: A β Cephei Database

BetaDat: BetaCephei Database

Explore database - Search - HR Diagram - Help - Administration

Parameter: Condition: Number 1: Number 2:

Mass =

Add Search Reset

State: Request completed

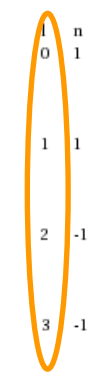
Evolution sequences: 14
Models: 42
Interpolated: -5.0067901611328E-06

Click here to see the SQL request

Es: 10.0_0.020_0.10_0.70
Previous
Add these results to the HR Diagram

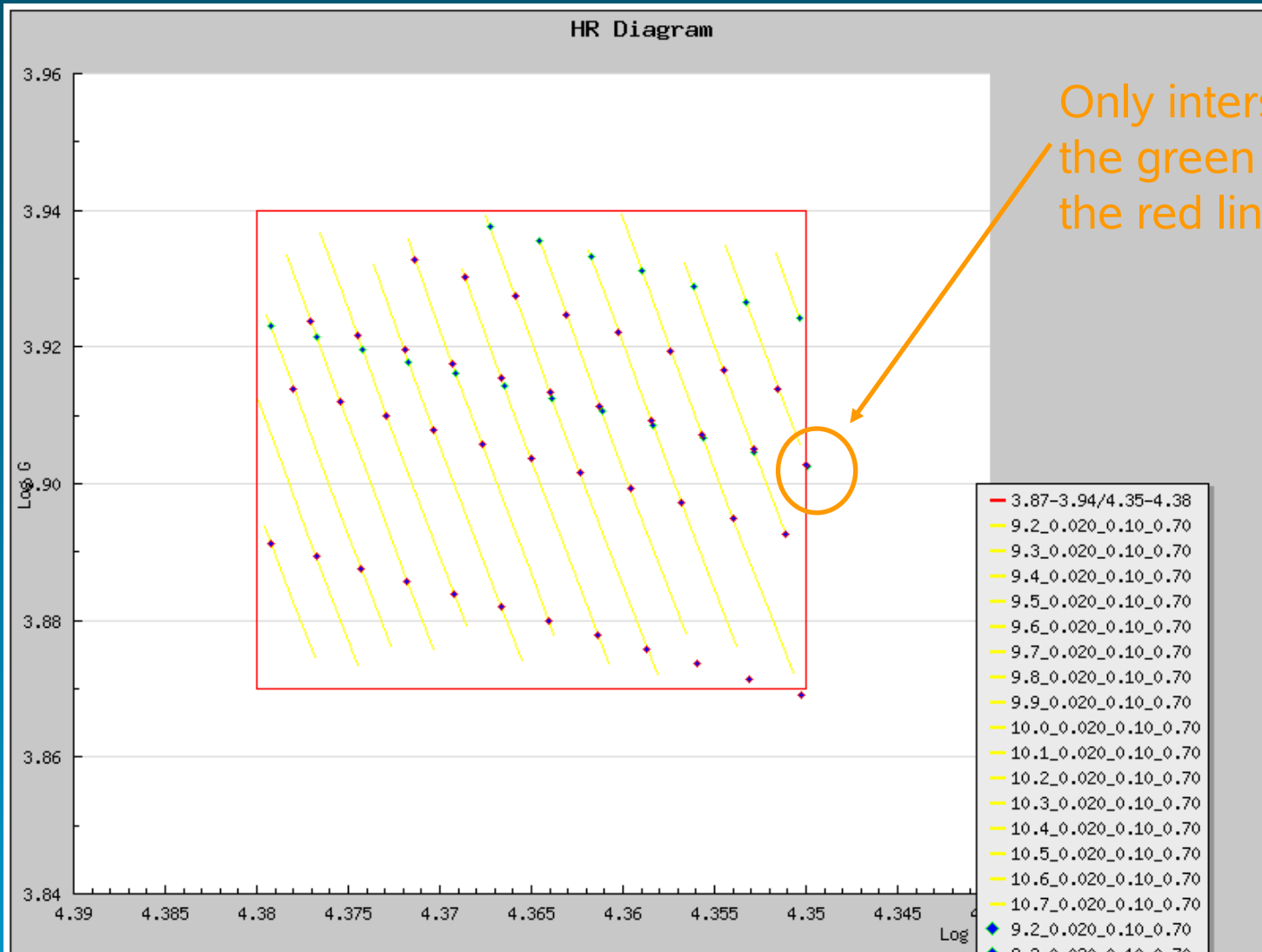
- X = 0.70 delete
- Z = 0.020 delete
- Alpha = 0.1 delete
- Te between 4.35 and 4.38 delete
- g between 3.87 and 3.94 delete
- Xc between 0.698 and 0.01 delete
- Hz = 7.6284e-5 delete

N ^o	Age	LogTc	LogL/Lo	Radius	Logg	Tc	rhoc	Xc	Mnc_no_over	Mnc_over	f1	n
218	1.429006e+7 1.451395e+7	4.370505e+0 4.368825e+0	3.946891e+0 3.950840e+0	3.965642e+11 4.005435e+11	3.926276e+0 3.917608e+0	3.385338e+7 3.398206e+7	9.232019e+0 9.268800e+0	3.572882e-1 3.490746e-1	4.412941e+33 4.372307e+33	4.889575e+33 4.844307e+33	0	1
219	1.453822e+7	4.369192e+0	3.951286e+0	0.000000e-1	3.916630e+0	3.394094e+7	9.272395e+0	3.481474e-1	4.367721e+33	4.839198e+33		
222	1.525502e+7 1.542846e+7	4.365128e+0 4.364049e+0	3.964191e+0 3.967382e+0	4.146846e+11 4.182868e+11	3.887467e+0 3.879964e+0	3.421015e+7 3.428126e+7	9.404008e+0 9.441422e+0	3.211138e-1 3.142254e-1	4.235322e+33 4.202400e+33	4.662344e+33 4.655443e+33	1	1
223	1.547614e+7	4.363753e+0	3.968259e+0	0.000000e-1	3.877901e+0	3.430081e+7	9.451706e+0	3.123318e-1	4.193350e+33	4.645300e+33		
217	1.403797e+7 1.411491e+7	4.371765e+0 4.371380e+0	3.942474e+0 3.943822e+0	3.922701e+11 3.985807e+11	3.935733e+0 3.982847e+0	3.376902e+7 3.379477e+7	9.195191e+0 9.206432e+0	3.662126e-1 3.634890e-1	4.457830e+33 4.444129e+33	4.939009e+33 4.923921e+33	2	-1
218	1.429006e+7	4.370505e+0	3.946891e+0	0.000000e-1	3.926276e+0	3.385338e+7	9.232019e+0	3.572882e-1	4.412941e+33	4.889575e+33		
220	1.478867e+7 1.481133e+7	4.367850e+0 4.367709e+0	3.955704e+0 3.956148e+0	4.055371e+11 4.060108e+11	3.906842e+0 3.905883e+0	3.403019e+7 3.408955e+7	9.314312e+0 9.318944e+0	3.390309e-1 3.380890e-1	4.322374e+33 4.317815e+33	4.789181e+33 4.784088e+33	3	-1
221	1.502714e+7	4.366473e+0	3.960033e+0	0.000000e-1	3.887004e+0	3.412143e+7	9.359487e+0	3.298456e-1	4.277912e+33	4.739461e+33		



frequency f1
can be
l=0, 1, 2,
or 3

BetaDat: A β Cephei Database



Only intersection between the green lines (f2) and the red lines (f1)

BetaDat: A β Cephei Database

Access info:

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

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