

variable_stars

November 28, 2022

```
[60]: # Open the database
import pandas as pd

vstar = pd.read_csv('vsx.csv')
```

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[61]: # Number of rows
len(vstar)
```

[61]: 451272

```
[62]: # Show the first 10 rows
vstar.head(10)
```

```
[62]:
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	iod	name	code	type	mag_min	mag_max	period	\
0	270915	VSX J000000.6+620044	0	SR	12.300	12.550	68.000000	
1	195	GM And	0	RRAB	12.430	13.300	0.706758	
2	287959	CSS_J000004.0+182425	0	RRAB	15.171	0.970	0.485160	
3	275753	Mis V1378	0	SR	11.400	12.700	NaN	
4	170899	UNSW-V 312	0	EA	13.630	0.066	1.057620	
5	64625	V0467 And	0	EW	15.210	15.610	0.353539	
6	25131	Z Peg	0	M	7.300	13.600	320.000000	
7	251805	V1023 Cas	0	RRAB	18.130	18.750	0.643700	
8	25281	EP Peg	0	SR	10.700	11.400	340.000000	
9	25257	DM Peg	0	EA/D:	10.800	11.600	2.588991	

	ra	dec
0	0.00271	62.01222
1	0.01521	35.36286
2	0.01669	18.40698
3	0.01717	57.10467
4	0.02500	-59.74675
5	0.02721	35.36692
6	0.02733	25.88647
7	0.02771	56.65331
8	0.02875	20.23736
9	0.03037	18.73808

```
[63]: vstar = vstar.drop(columns=['code', 'iod', 'ra'])
vstar.head(10)
```

```
[63]:
```

	name	type	mag_min	mag_max	period	dec
0	VSX J000000.6+620044	SR	12.300	12.550	68.000000	62.01222
1	GM And	RRAB	12.430	13.300	0.706758	35.36286
2	CSS_J000004.0+182425	RRAB	15.171	0.970	0.485160	18.40698
3	Mis V1378	SR	11.400	12.700	NaN	57.10467
4	UNSW-V 312	EA	13.630	0.066	1.057620	-59.74675
5	V0467 And	EW	15.210	15.610	0.353539	35.36692
6	Z Peg	M	7.300	13.600	320.000000	25.88647
7	V1023 Cas	RRAB	18.130	18.750	0.643700	56.65331
8	EP Peg	SR	10.700	11.400	340.000000	20.23736
9	DM Peg	EA/D:	10.800	11.600	2.588991	18.73808

```
[64]: # How many stars of each type?

vstar.type
vstar.type.value_counts().head(10)
```

```
[64]: VAR      65677
EW        53229
RRAB      50043
ROT       41104
SR        38206
MISC      27823
EA        22521
M         17983
RRC       15477
E         9956
Name: type, dtype: int64
```

```
[65]: # Add an amplitude column: (brightest range)
vstar['amplitude'] = vstar.mag_max - vstar.mag_min

# Discard the negative amplitudes (The data is formatted differently)
vstar = vstar[vstar.amplitude > 0]
```

```
[66]: # Drop any missing values
vstar = vstar.dropna()

# Filter for M-type variables
miras = vstar[vstar.type == 'M']
miras.head(10)
len(miras)
```

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[66]: 11049
```

```
[67]: miras.describe()
```

```
[67]:
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	mag_min	mag_max	period	dec	amplitude
count	11049.000000	11049.000000	11049.000000	11049.000000	11049.000000
mean	12.227227	15.588874	305.924404	-19.270900	3.361647
std	2.049992	2.051315	98.413172	30.089179	1.436329
min	0.900000	3.100000	58.200000	-88.270190	0.070000
25%	11.200000	14.600000	235.500000	-33.708080	2.400000
50%	12.300000	15.700000	294.000000	-27.674060	3.200000
75%	13.500000	16.800000	364.500000	-7.928030	4.200000
max	19.172000	22.000000	948.000000	88.274390	10.900000

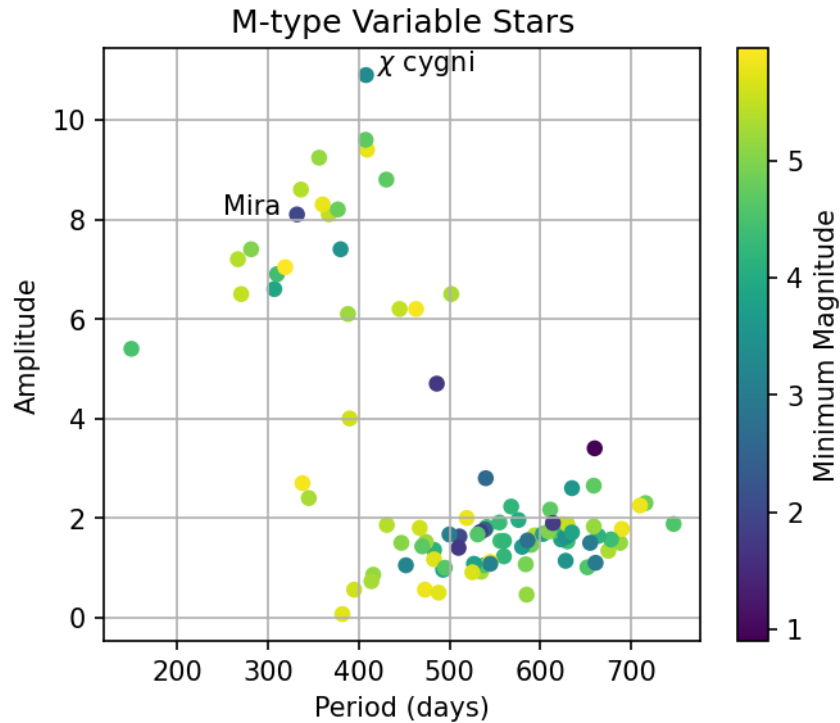
```
[81]: # Period vs. Amplitude in MIRA-type variable stars

# Let's focus on MIRAs that we might sometimes observe with the
# un-aided eye - that is, their minimum magnitude (brightest)
# is less than magnitude 6.

miras = miras[miras.mag_min < 6.0]

import matplotlib.pyplot as plt

plt.figure(figsize=(5,4), dpi=150)
plt.grid()
plt.scatter(miras.period, miras.amplitude, marker='.', s=100, c=miras.mag_min)
plt.xlabel('Period (days)')
plt.ylabel('Amplitude')
plt.title('M-type Variable Stars')
plt.text(420,11, '$\chi$ cygni')
plt.text(250,8.1, 'Mira')
plt.colorbar(label='Minimum Magnitude')
plt.show()
```



```
[69]: miras[miras.amplitude > 10]
```

```
[69]:      name type  mag_min  mag_max  period      dec  amplitude
402961  khi Cyg    M      3.3   14.2  408.05  32.91406    10.9
```

```
[72]: miras[miras.period>700]
miras[miras.period<200]
```

```
[72]:      name type  mag_min  mag_max  period      dec  amplitude
105266  S Car    M      4.5    9.9  149.49 -61.549     5.4
```

```
[71]: # variable stars YOU could monitor (sometimes) with your naked eye!

vstar[(vstar.dec > -10) & (vstar.mag_min < 4) & (vstar.amplitude>3) & (vstar.
↪type == 'M')].sort_values(['mag_min'])
```

```
[71]:      name type  mag_min  mag_max  period      dec  amplitude
6106    WX Psc    M      0.9    4.3  660.00  12.59800     3.4
448104  IZ Peg    M      1.7    6.4  486.00  10.91039     4.7
12453   omi Cet    M      2.0   10.1  331.96  -2.97764     8.1
402961  khi Cyg    M      3.3   14.2  408.05  32.91406    10.9
```

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[ ]:
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