Variable Stars

2008/04/10

恆星的光度為什麼會改變？

- 星球半徑改變：發光面積改變
- 軌道互繞：「食」(eclipsing)
  - 雙星系統
- 發光能力改變
  - 溫度改變
  - 爆發現象

光變曲線可以告訴我們什麼？

- 是否是週期性變化？週期有多長？
  - 光變現象不一定是週期性的變化，有不小的比例是非週期性或是週期很長
  - 有很大比例的變星有兩個以上的光變週期，我們所看到的光變曲線是不同光變週期疊合的結果
  - 不同的光變週期對應了不同的物理機制，因此對於光變週期的研究是瞭解星球演化很好的方式
- 光變震幅有多大？
  - 偵測器的靈敏度限制了我們所能看到的光變大小
  - 即使如太陽這樣的主序星一樣會有小幅度的光度變化

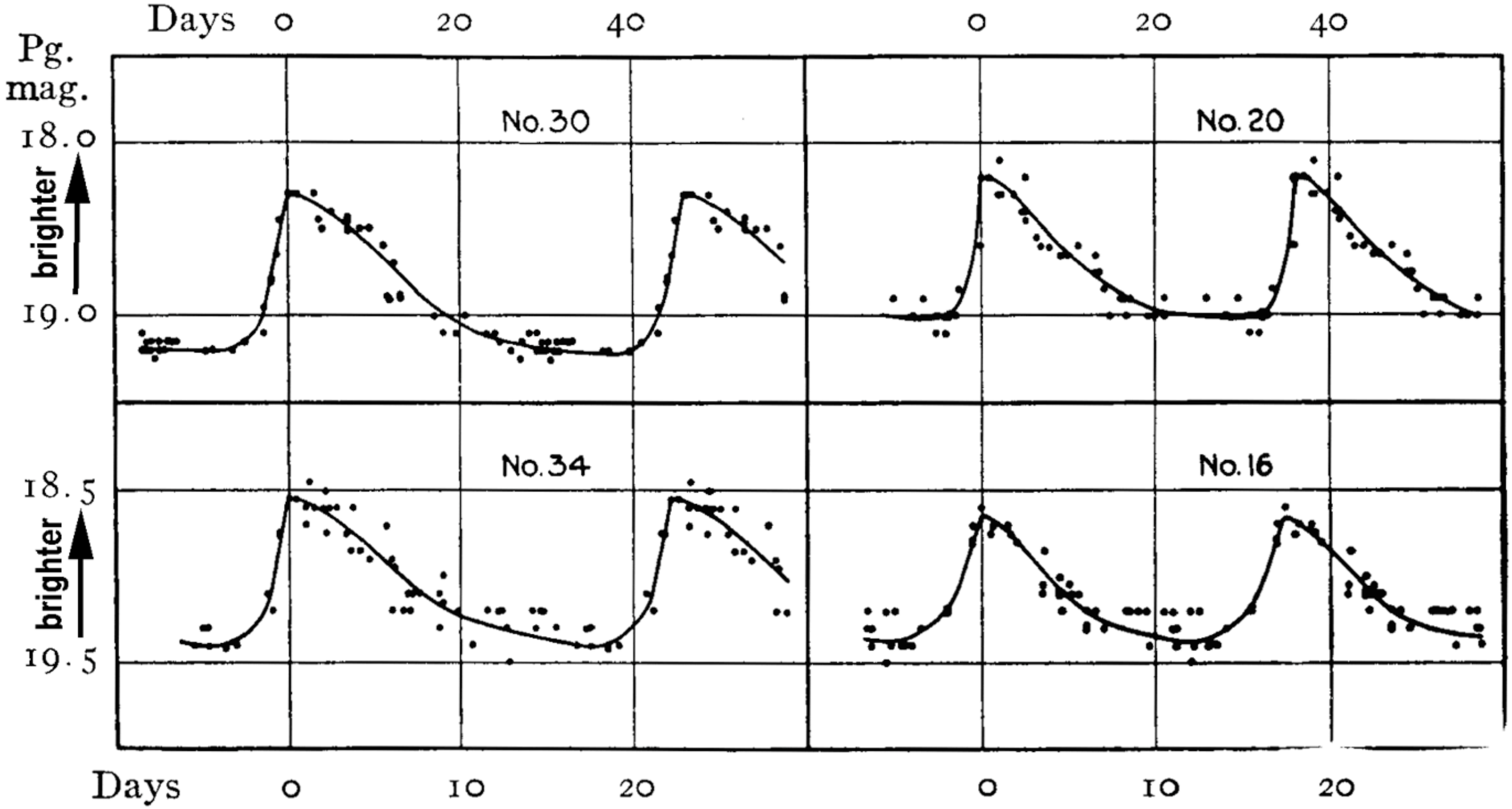
變星的種類

- 脈動星(Pulsating star)
- RR Lyrae
- Cepheids
- δ Scuti
- 食雙星(Eclipsing binaries)
- EA
- EB
- EW
- 激變變星(Cataclysmic variables)
- X 光雙星
- 超新星(Supernovae)

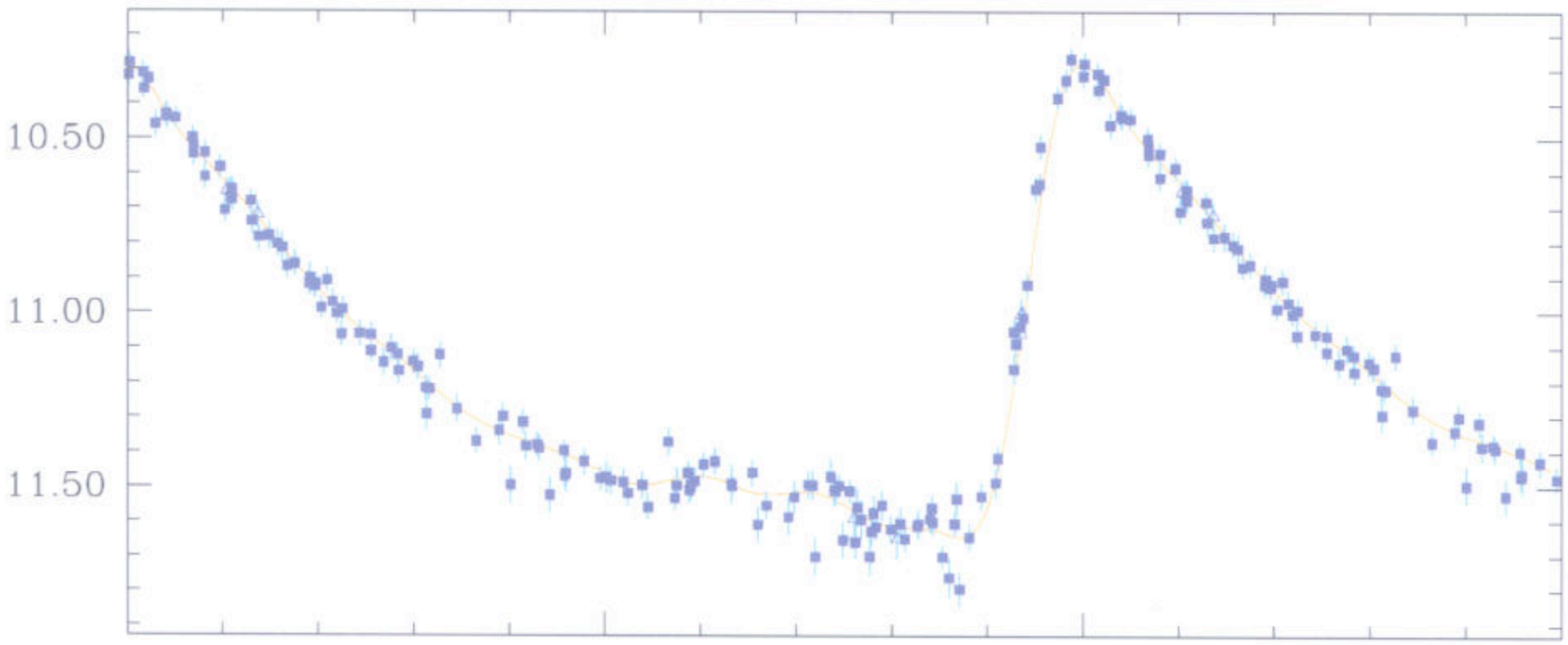
Table 2. The principle types of variable star (see also Appendix E)

Type	Symbol	Period	Amplitude	Remarks
Pulsating variables				
RR Lyrae	RR	0.2–1 d	0.5–1.5	Spectra : A or F
Cepheids	C	1–50 d	0.2–2.0	Sp: F or G. Several types
RV Tauri	RV	30–150 d	1.0–3.0	Sp: G or K
Semi-regular	SR	20–500 d	0.2–2.5	Sp: M, C, S. Several types
Long period	M	100–600 d	2.5–10	Sp: M, C or S
Irregular	L	Non-periodic	0.2–2.0	Sp: M, C or S
β Canis Majoris	βC	0.1–0.5 d	<0.2	Sp: B0 to B4
Dwarf Cepheids	RR	0.05–0.25 d	0.5–1	Sp: A or F
δ Scuti	δ Sc	0.05–0.2 d	<0.2	Sp: A or F
α Canum Venaticorum	α CV	0.5–>100 d	<0.2	Sp: peculiar A
ZZ Ceti	ZZ	1–15 min	<0.05	White dwarfs
Eruptive variables				
Novae	N		7–>15	Explosion of part of stellar atmosphere
Supernovae	SN		>20	Stellar explosion
Novoids	N1			Several types
Dwarf novae	UG,Z	10–500 d	2–6	Repeated explosions
Nebular variables	In,Is		1–4	Interaction with gaseous nebulae
	UVn		1–4	Flare stars
Red dwarfs	UV,BY		0.1–5	Sp: K or M. Flare stars
Eclipsing binaries				
Algol variables	EA	0.1–10000 d	0.1–3	All sp. present
β Lyrae	EB	0.5–200 d	0.1–1.5	Giants O, B and A
W Ursae Majoris	EW	0.2–1 d	0.2–1	Dwarfs F, G or K

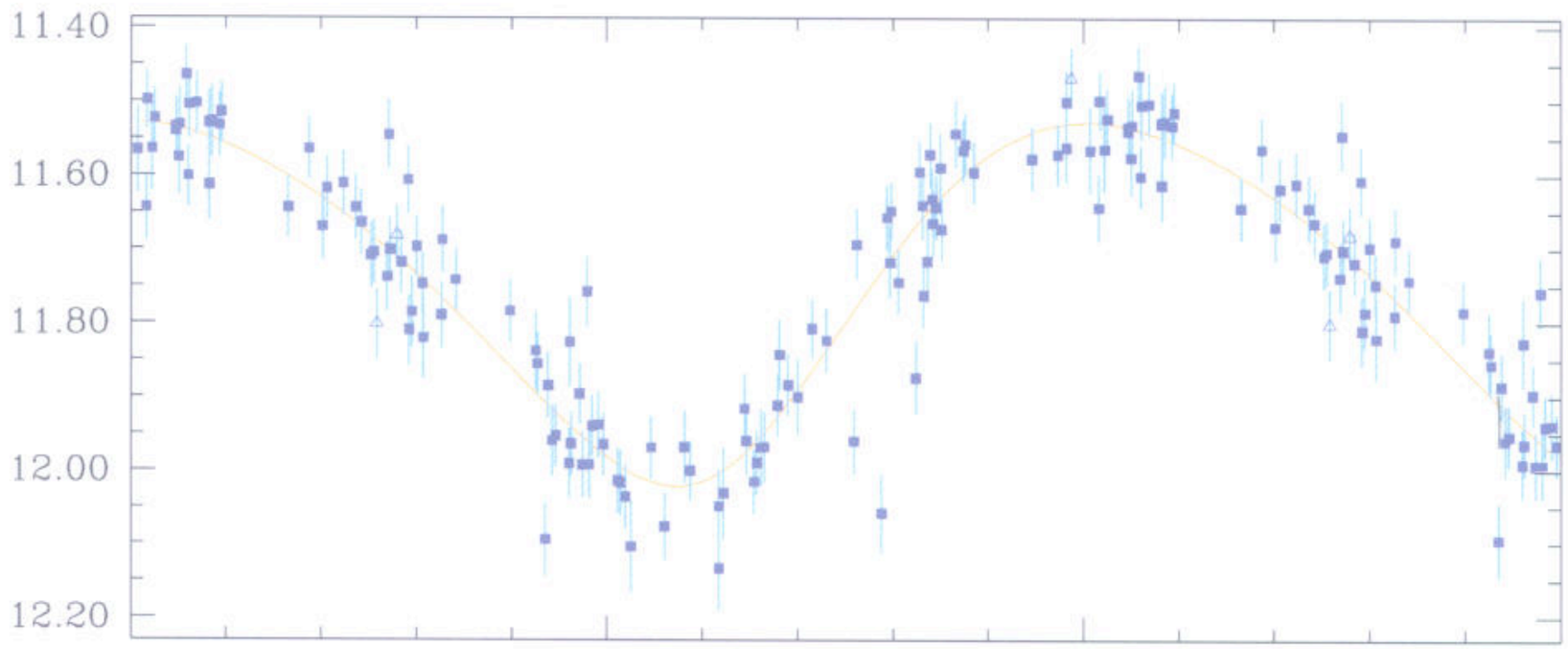
Cepheid Variables



RR Lyrae



HIP 006094
Name : VW Scl
Var. Type : RRAB
Period : 0.510913 d
Max : 10.282
Min : 11.649



HIP 006115
Name : AM Tuc
Sp. Type : A9.5:
Var. Type : RRC
Period : 0.405769 d
Max : 11.529
Min : 12.023

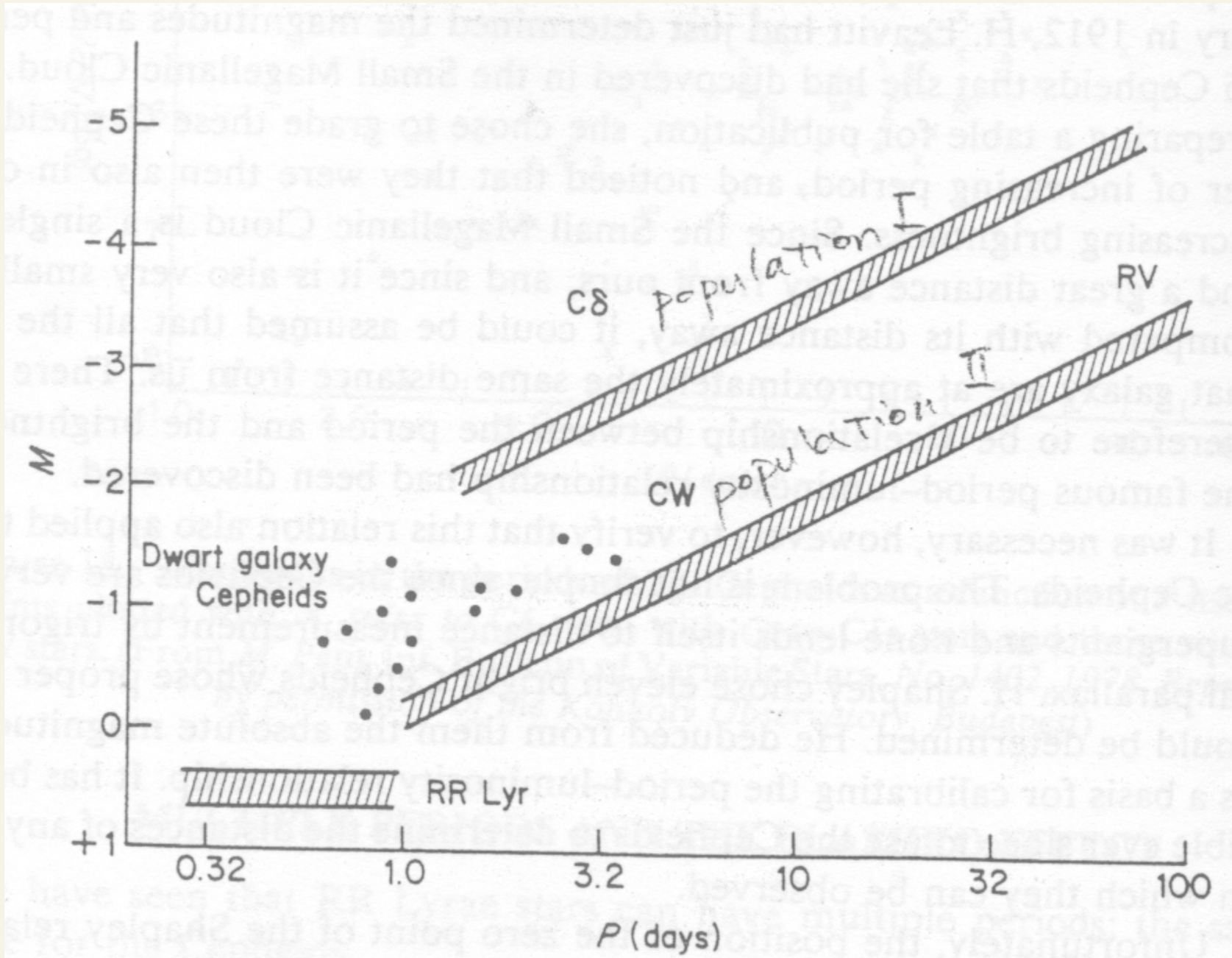
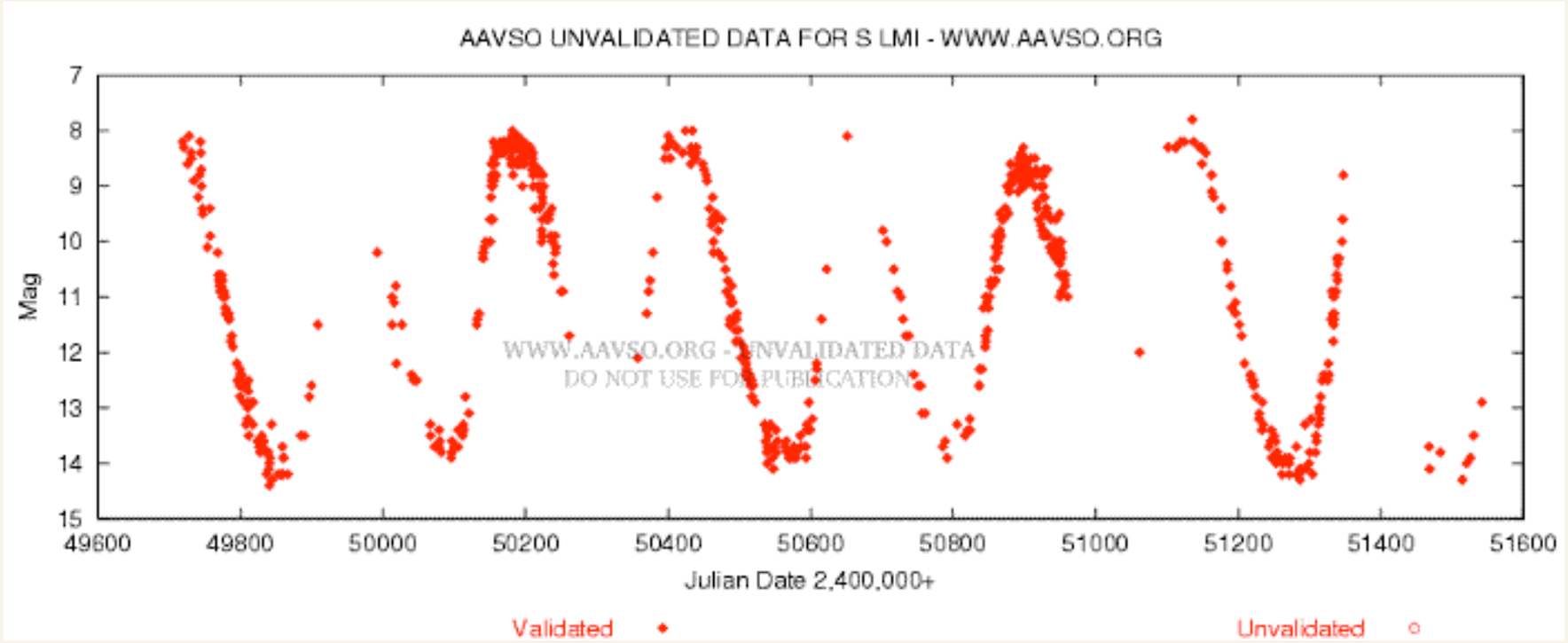
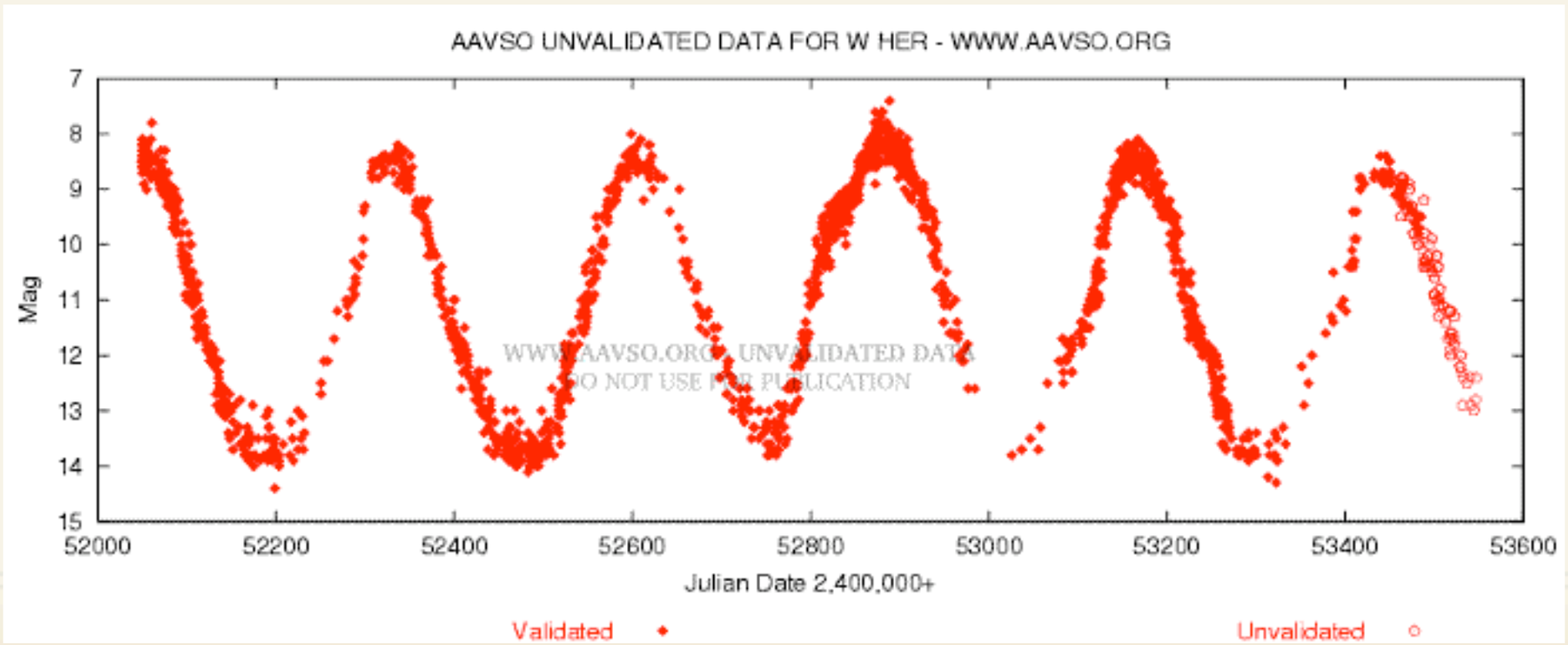


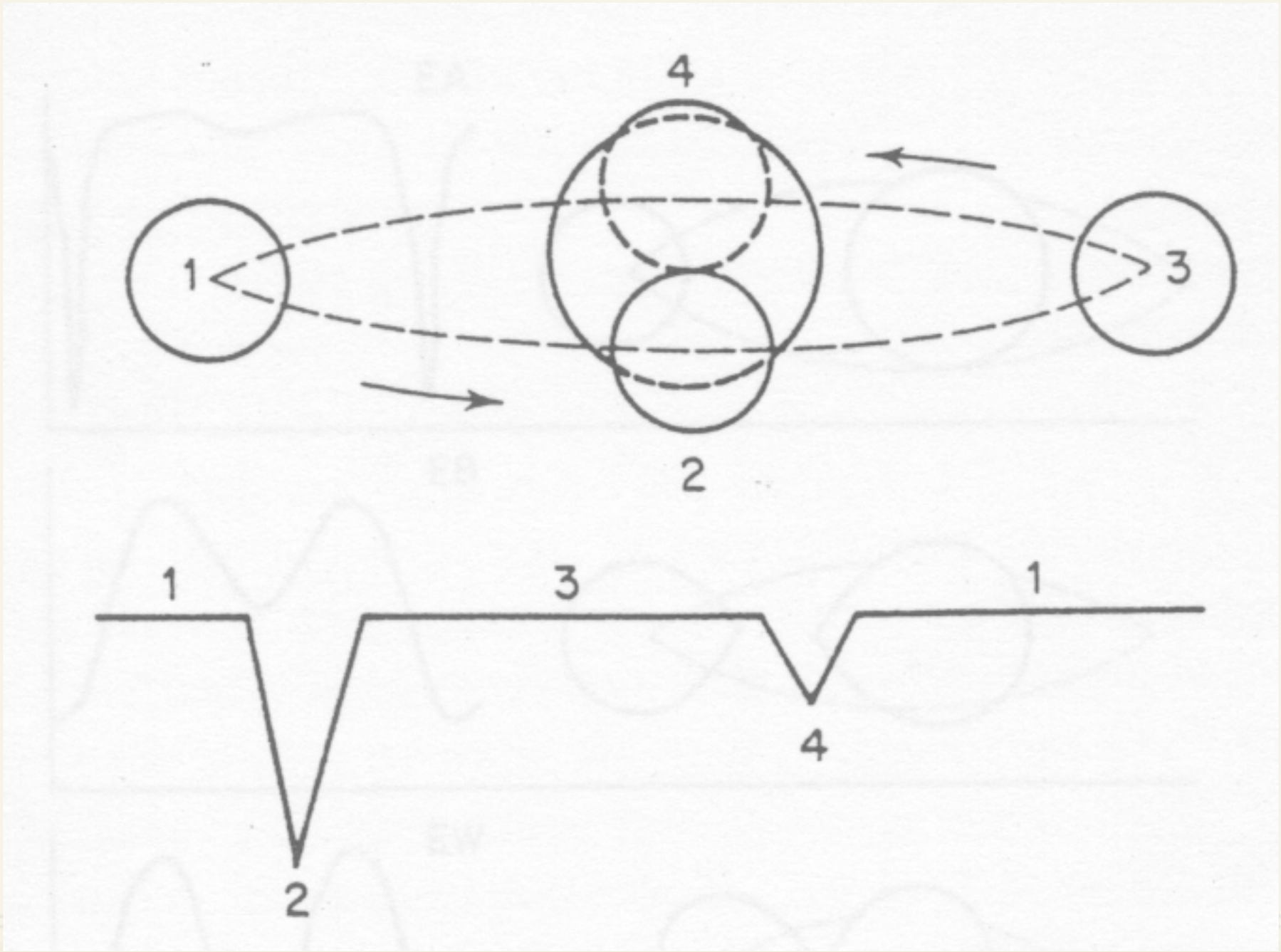
Figure 19. The luminosity–period relationship

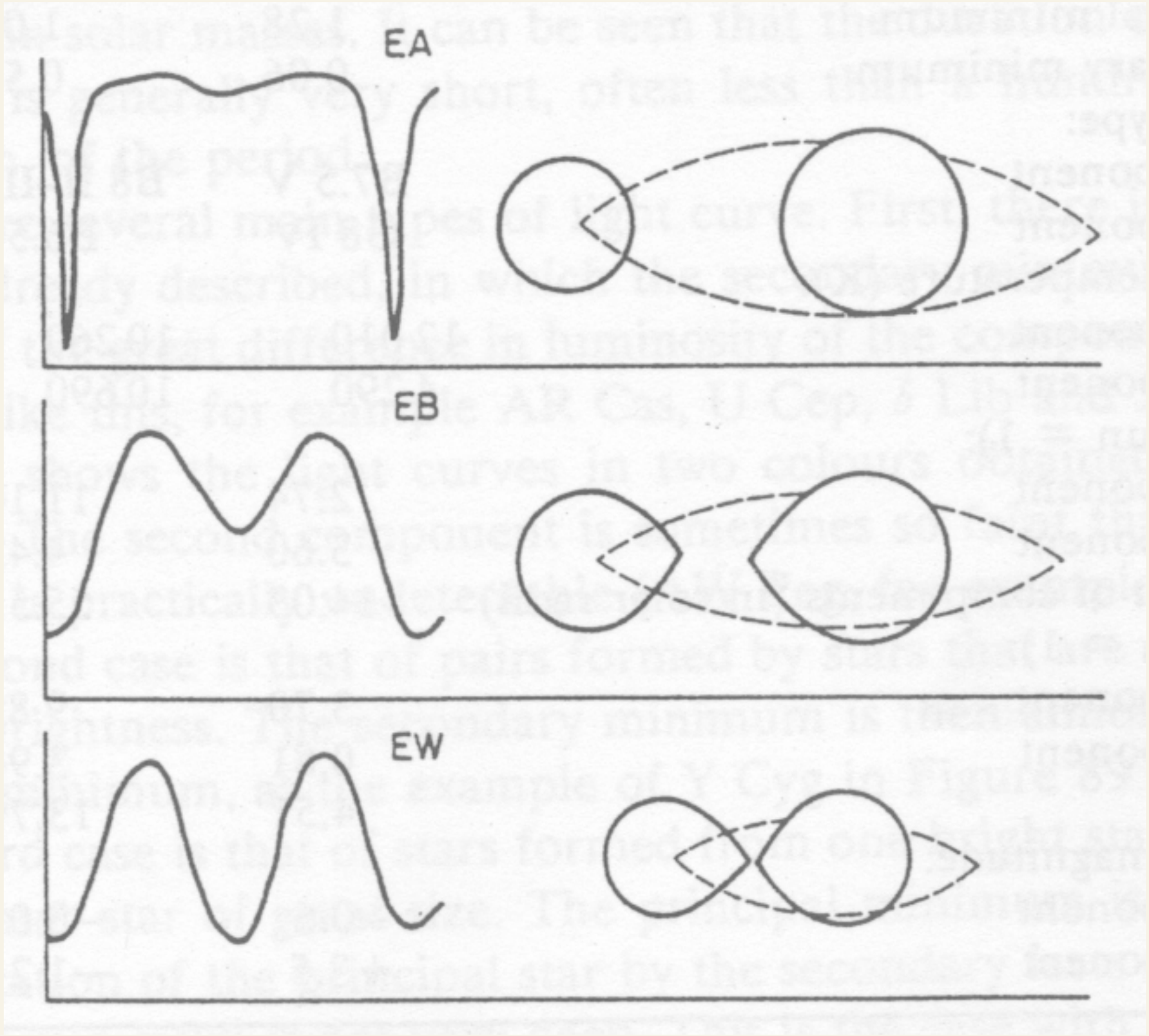
Miras

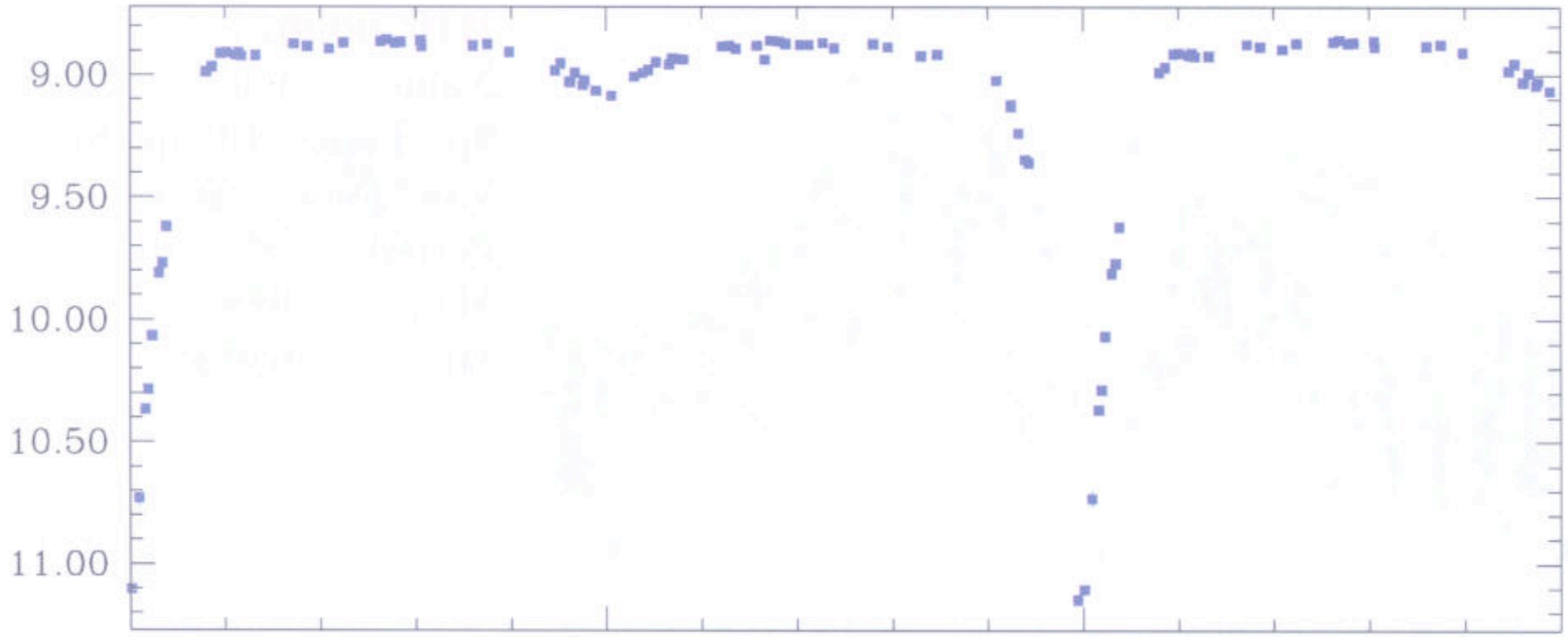

AAVSO UNVALIDATED DATA FOR S LMI - WWW.AAVSO.ORG
Mag
7
8
9
10
11
12
13
14
15
49600
49800
50000
50200
50400
50600
50800
51000
51200
51400
51600
Julian Date 2,400,000+
WWW.AAVSO.ORG - UNVALIDATED DATA
DO NOT USE FOR PUBLICATION
Validated
Unvalidated


AAVSO UNVALIDATED DATA FOR W HER - WWW.AAVSO.ORG
Mag
7
8
9
10
11
12
13
14
15
52000
52200
52400
52600
52800
53000
53200
53400
53600
Julian Date 2,400,000+
WWW.AAVSO.ORG - UNVALIDATED DATA
DO NOT USE FOR PUBLICATION
Validated
Unvalidated

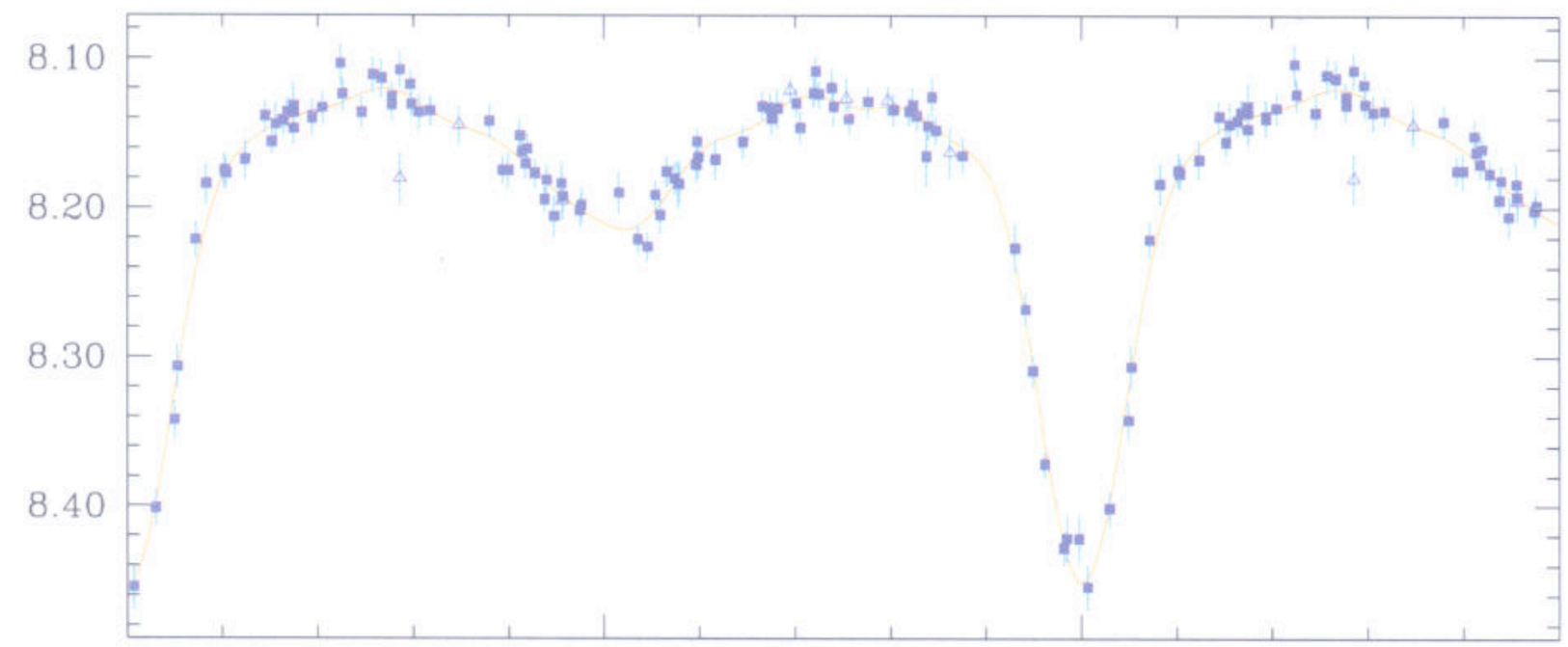
Eclipsing Binaries




EA
EB
EW

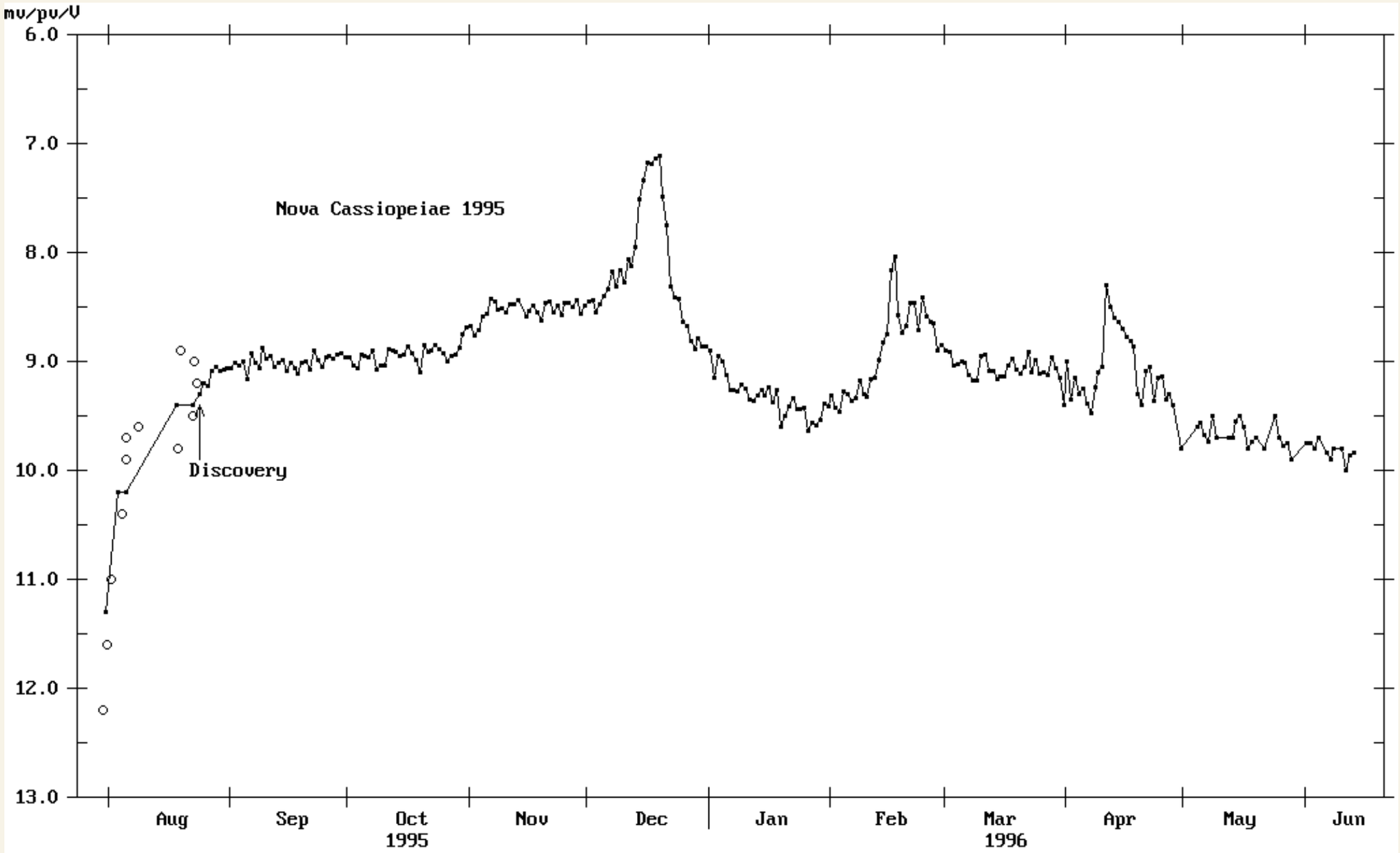


HIP 009383
Name : X Tri
Sp. Type : A7V
Var. Type : EA/SD
Period : 0.97154 d
Max : 8.850
Min : 11.150

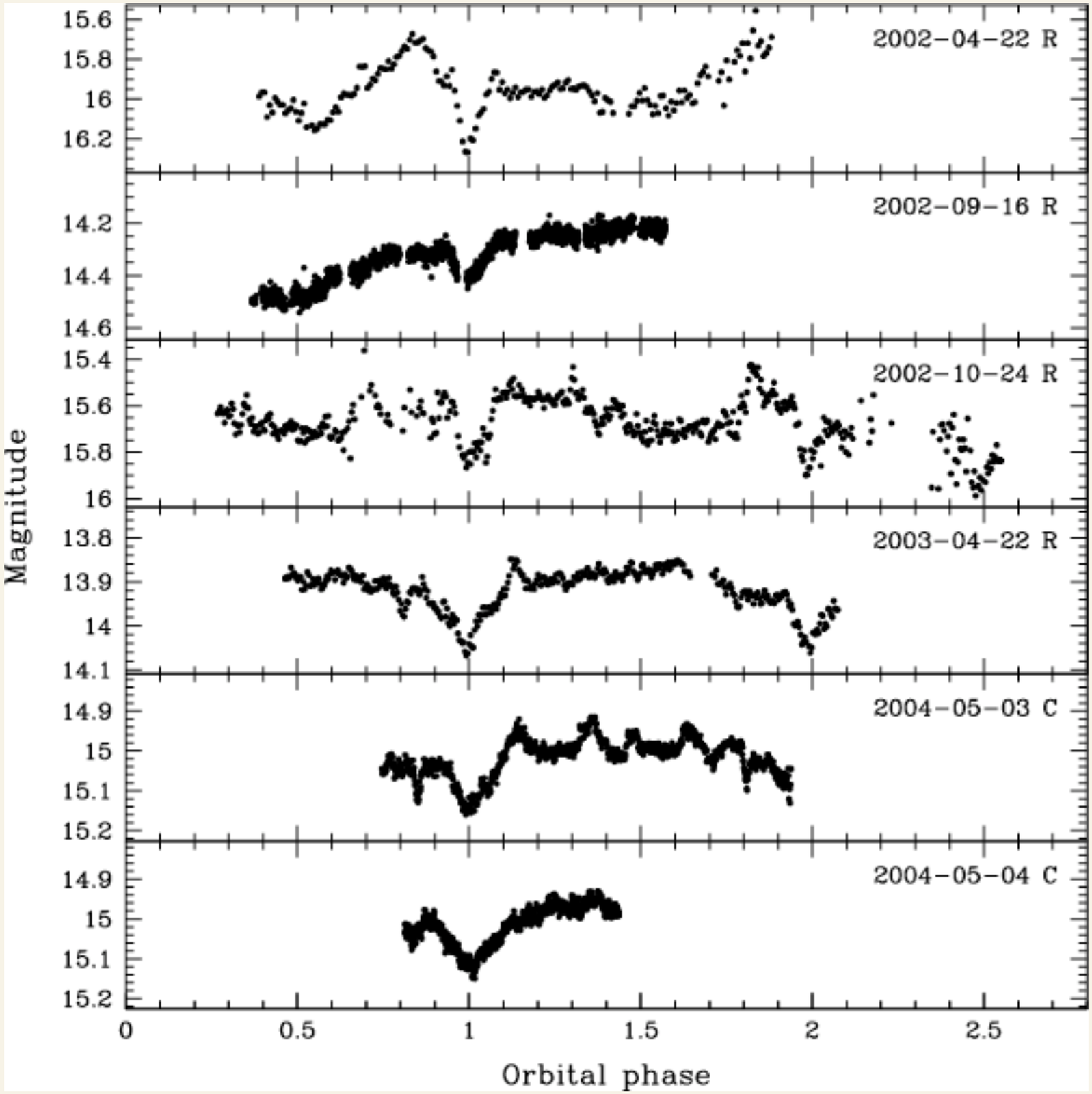


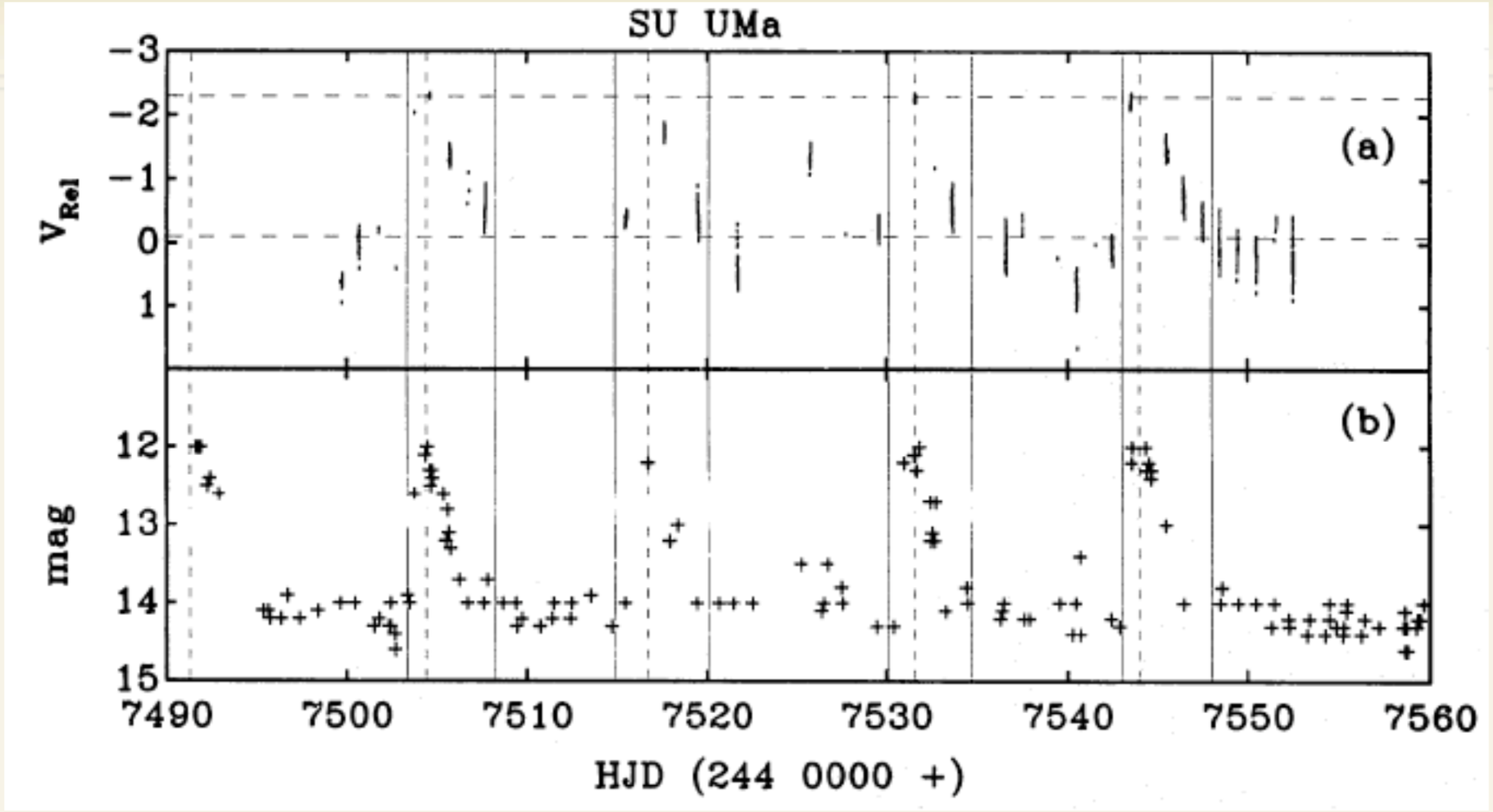
HIP 013074
Name : WZ Hor
Sp. Type : F3/F5V
Var. Type : EB
Period : 0.728851 d
Max : 8.121
Min : 8.452

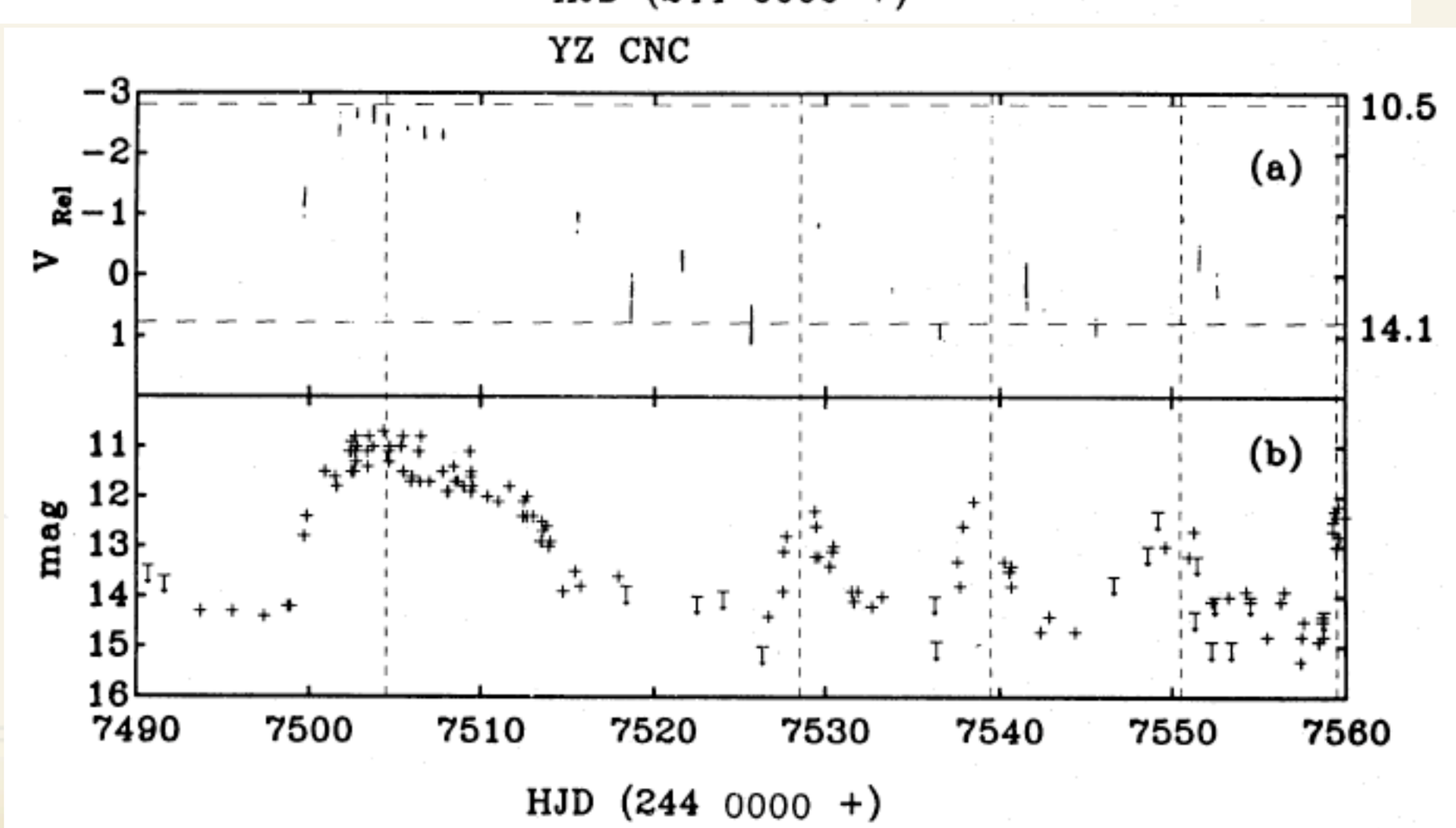
Cataclysmic Variables



Light curve based on daily averages of visual (mv), photovisual (pv), and photoelectric V (V and CV) observations from Bjørn H. Granslo's 'Nova Cassiopeiae 1995 - Photometry Update No. 13 (1996/06/14)'.
Non-mv/pv/V/CV observations before the discovery are marked by rings.
Prepared by Stig Linander, Denmark.


2002−04−22 R
2002−09−16 R
2002−10−24 R
2003−04−22 R
2004−05−03 C
2004−05−04 C
Magnitude
Orbital phase
15.6
15.8
16
16.2
14.2
14.4
14.6
15.4
15.6
15.8
16
13.8
13.9
14
14.1
14.9
15
15.1
15.2
14.9
15
15.1
15.2
0
0.5
1
1.5
2
2.5


SU UMa
V_{Rel}
−3
−2
−1
0
1
(a)
(b)
mag
12
13
14
15
7490
7500
7510
7520
7530
7540
7550
7560
HJD (244 0000 +)


YZ CNC
V Rel
−3
−2
−1
0
1
10.5
14.1
(a)
(b)
mag
11
12
13
14
15
16
7490
7500
7510
7520
7530
7540
7550
7560
HJD (244 0000 +)

常用網站

- 美國變星協會(AAVSO)
- SIMBAD
- Galactic Cepheid Database
- RR Lyrae Catalog
- Eclipsing Binaries Catalog
- Catalog of Cataclysmic Variables
- VSNET index of variable stars