IT'S A DIRTY JOB, BUT …

Paul Van Cauteren

Wetenschappelijk werk

- Planeten
- Sterbedekkingen maan / asteroide
- Kunstmanen
- Variabelen

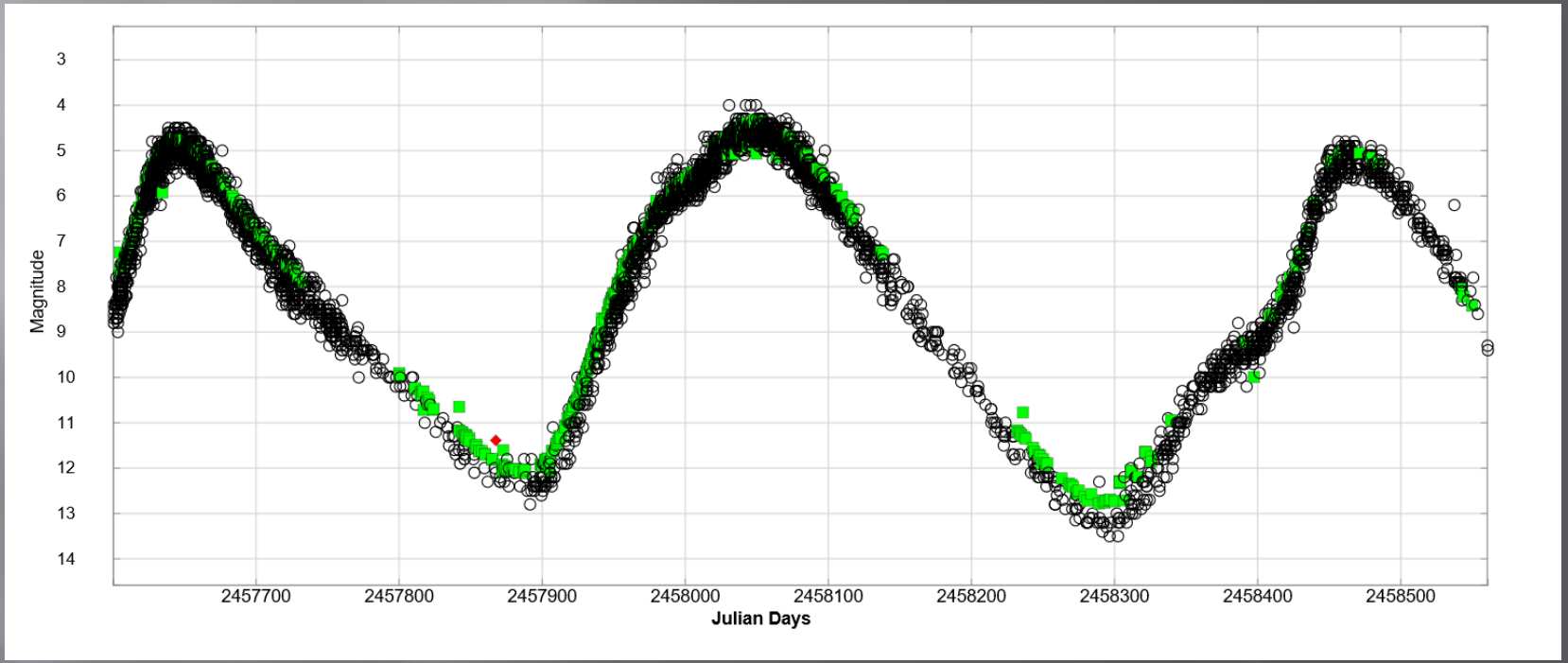
= sterren die van helderheid veranderen.





Geert Vandenbulcke

Chi Cyg, 1000 dagen (AAVSO)



Amateur vs prof

- Helderheidsschatting
- AAVSO database
- Geen credit voor de prestatie
- Metingen (PEP)

CCD Camera !!

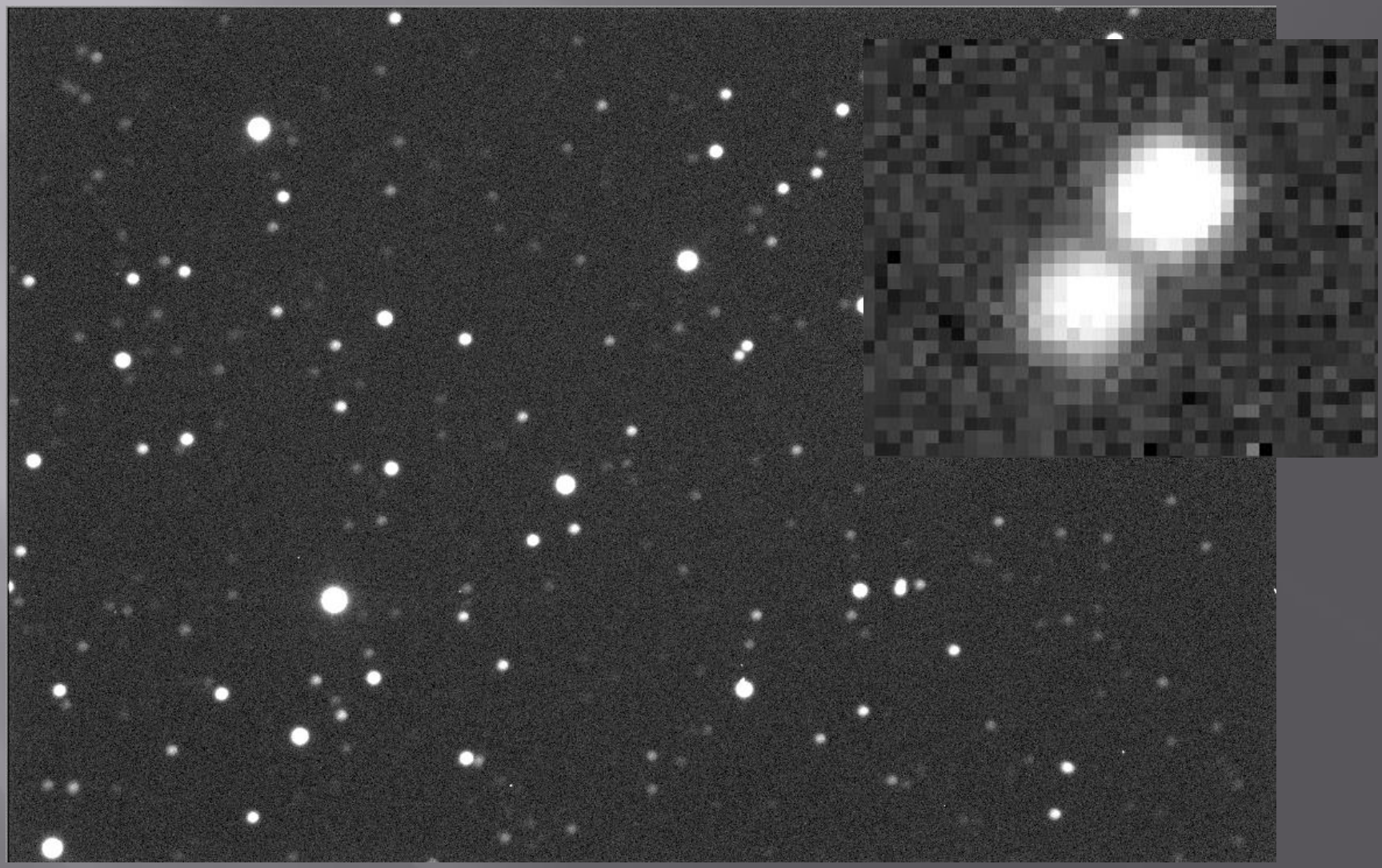
- Betaalbaar (?)
- Nauwkeurigheid
- Geregistreerde meting

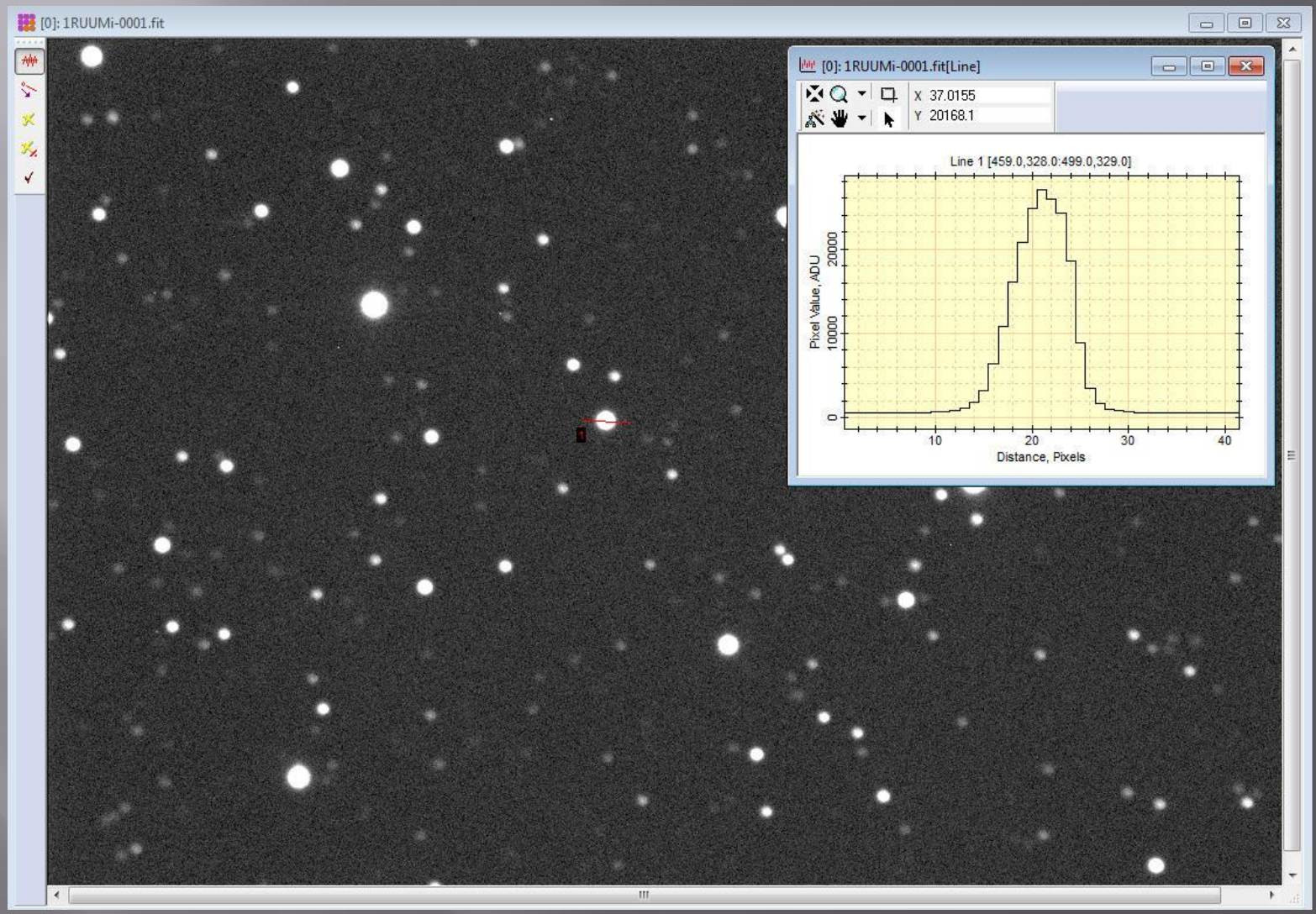


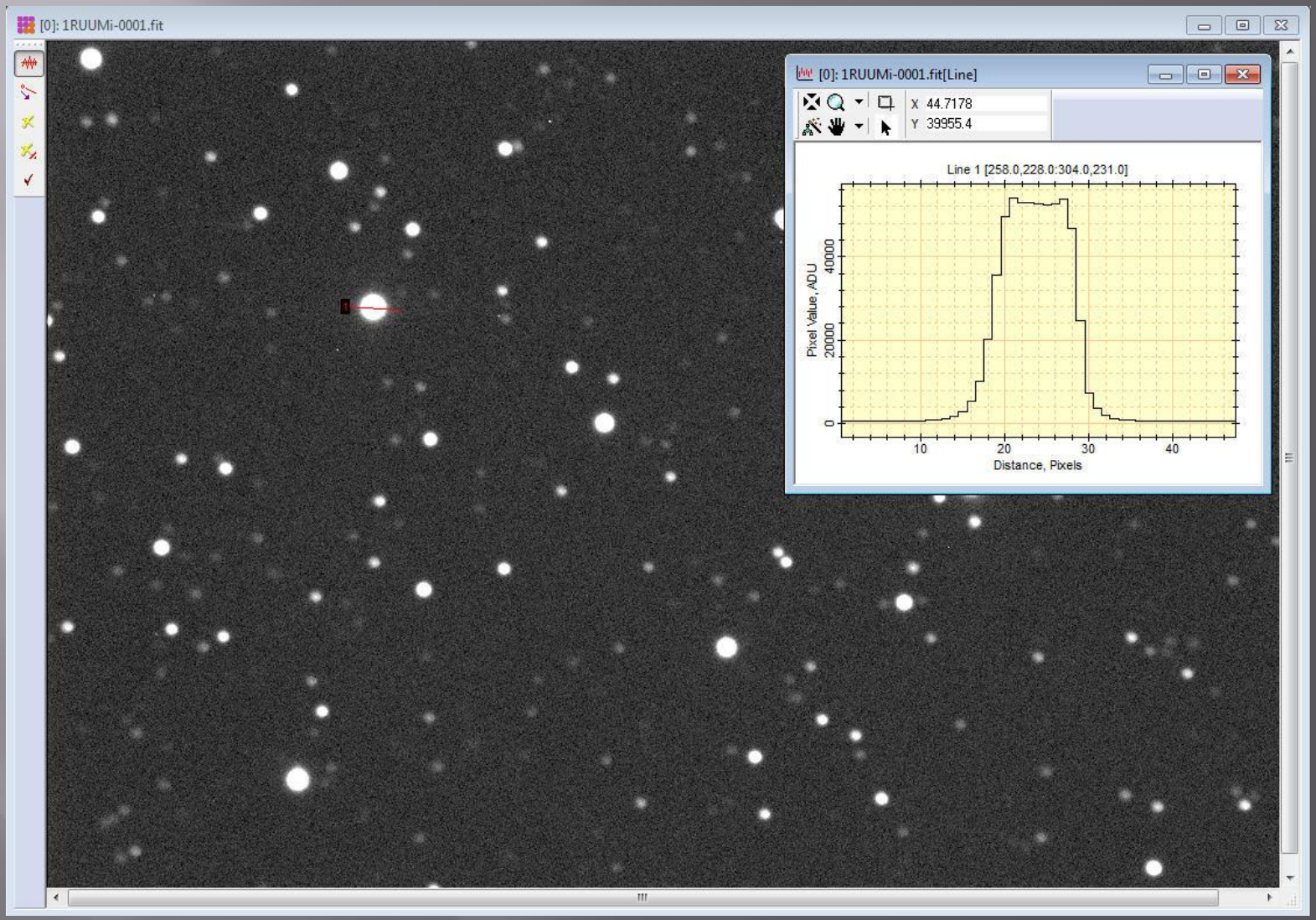


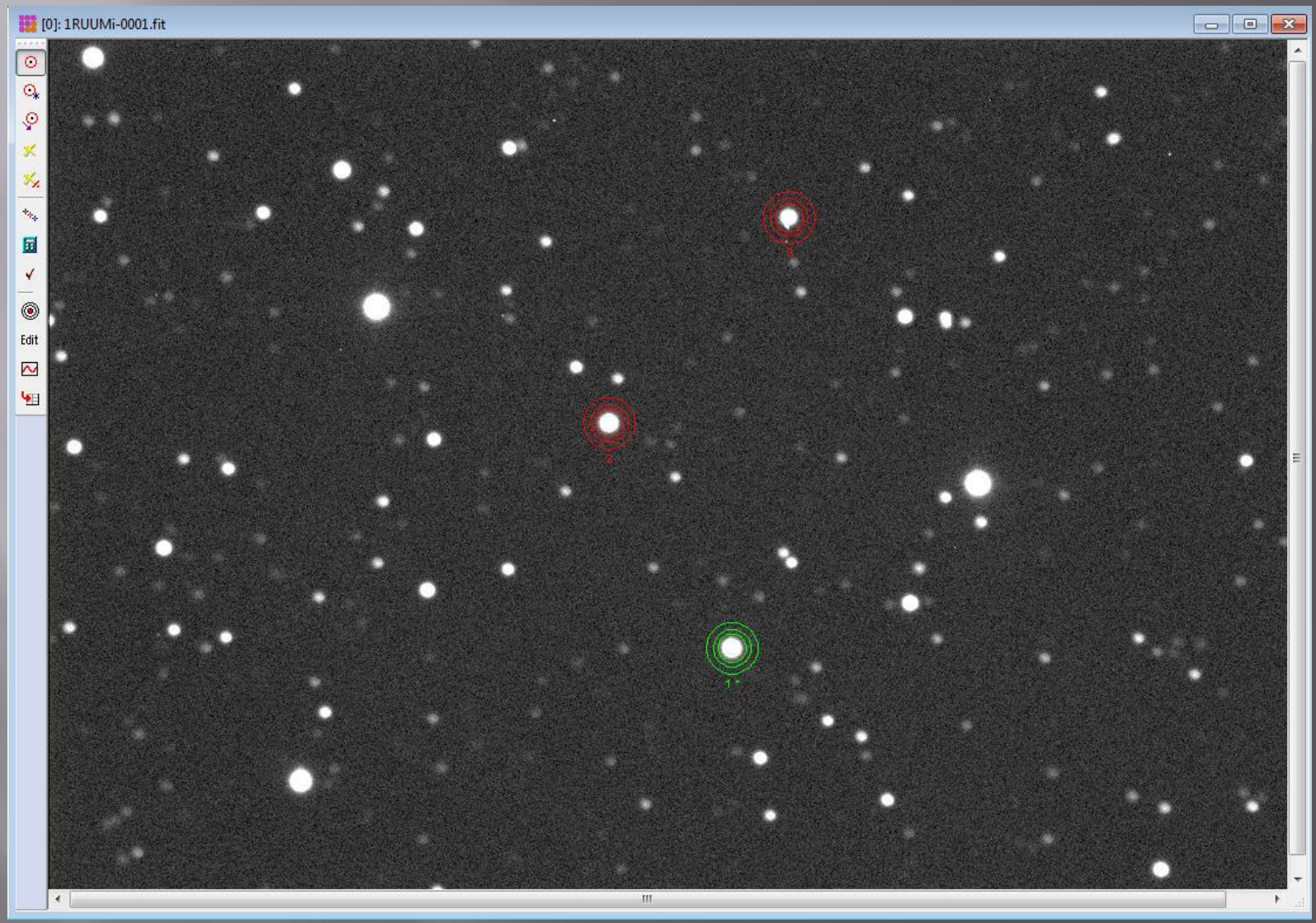
Delta Scuti sterren

- Pulserende sterren in DSCT instability strip
- Spectraal type A5 tot F2
- Enkelvoudige en meervoudige periode
- Kleine amplitude (<0.1mag) HADS/LADS
- Periode tussen 0.02 en 0.25 d




[0]: 1RUUMi-0001.fit
[0]: 1RUUMi-0001.fit[Line]
X 37.0155
Y 20168.1
Line 1 [459.0,328.0:499.0,329.0]
Pixel Value, ADU
0
10000
20000
10
20
30
40
Distance, Pixels

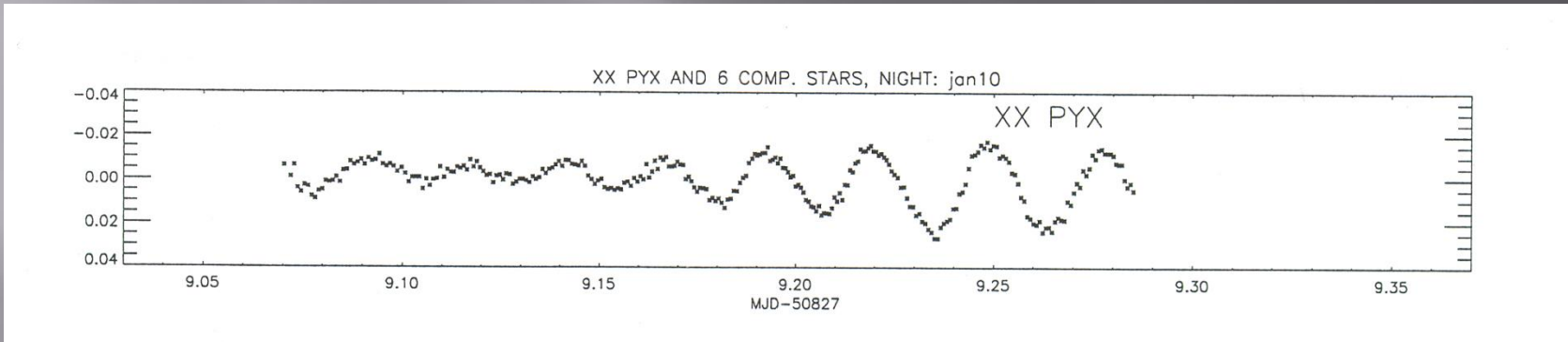

[0]: 1RUUMi-0001.fit
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X 44.7178
Y 39955.4
Line 1 [258.0,228.0:304.0,231.0]
Pixel Value, ADU
0
20000
40000
10
20
30
40
Distance, Pixels

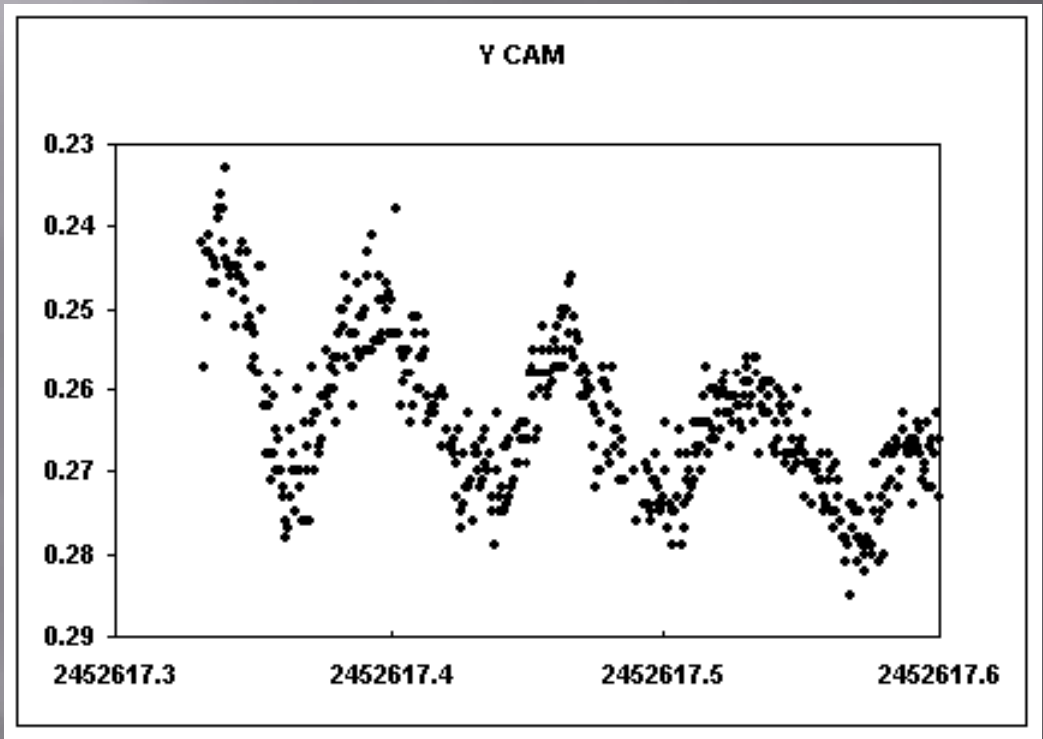

[0]: 1RUUMi-0001.fit
Edit

Photometry

Image	Index	Name	Mag	Std?	Error	Error(T)	X	Y	Column	Row	Backgr	S/N	Mag Std	Residual	Net Count	Filter	Date	Time	JD
1RUUMi-0001.fit	1	Mira-1	0.0000	*	0.0009	0.0009	584.184	519.831	584.184	519.831	577	1148.0	0.0000	0.0000	1.54186e+06		2019-02-27	23:15:42.000	2458542.4695833
1RUUMi-0001.fit	2	Mira-2	0.1307		0.0010	0.0010	479.378	327.707	479.378	327.707	575	1071.4		0	1.36704e+06		2019-02-27	23:15:42.000	2458542.4695833
1RUUMi-0001.fit	3	Mira-3	1.3306		0.0021	0.0020	632.576	152.193	632.576	152.193	570	536.7		0	452676		2019-02-27	23:15:42.000	2458542.4695833

	A	B	C	D
1	JD	HJD	var	check
2	2458225.386	2458225.3869	-0.0483	1.3623
3	2458225.386	2458225.3874	-0.03	1.3844
4	2458225.387	2458225.3879	-0.0352	1.3774
5	2458225.387	2458225.3884	-0.0718	1.3575
6	2458225.388	2458225.3889	-0.0642	1.3281
7	2458225.388	2458225.3894	-0.0522	1.3572
8	2458225.389	2458225.3899	-0.0563	1.3876
9	2458225.389	2458225.3904	-0.0456	1.3678
10	2458225.39	2458225.3909	-0.0507	1.3433
11	2458225.39	2458225.3914	-0.0298	1.3813
12	2458225.391	2458225.3919	-0.0402	1.3735
13	2458225.391	2458225.3924	-0.0678	1.3738
14	2458225.392	2458225.3929	-0.0508	1.3358
15	2458225.392	2458225.3934	-0.0414	1.3336
16	2458225.393	2458225.3939	-0.0181	1.3456
17	2458225.393	2458225.3944	-0.037	1.3485
18	2458225.394	2458225.3949	-0.01	1.3569
19	2458225.394	2458225.3954	-0.0206	1.3675
20	2458225.395	2458225.3958	-0.0336	1.3391
21	2458225.395	2458225.3963	-0.0101	1.3747
22	2458225.396	2458225.3968	-0.0319	1.3959
23	2458225.396	2458225.3973	-0.0208	1.3509
24	2458225.397	2458225.3978	-0.0139	1.3303
25	2458225.397	2458225.3983	-0.0306	1.3234
26	2458225.398	2458225.3988	-0.0078	1.3576
27	2458225.398	2458225.3993	0.0114	1.4086
28	2458225.399	2458225.3998	-0.0314	1.3419
29	2458225.399	2458225.4003	-0.02	1.3415
30	2458225.4	2458225.4008	-0.0135	1.3292
31	2458225.4	2458225.4013	-0.0138	1.3352
32	2458225.401	2458225.4018	0.0035	1.3325
33	2458225.401	2458225.4023	0.033	1.3664
34	2458225.402	2458225.4028	0.0303	1.3685


XX PYX AND 6 COMP. STARS, NIGHT: jan10
XX PYX
−0.04
−0.02
0.00
0.02
0.04
9.05
9.10
9.15
9.20
9.25
9.30
9.35
MJD−50827

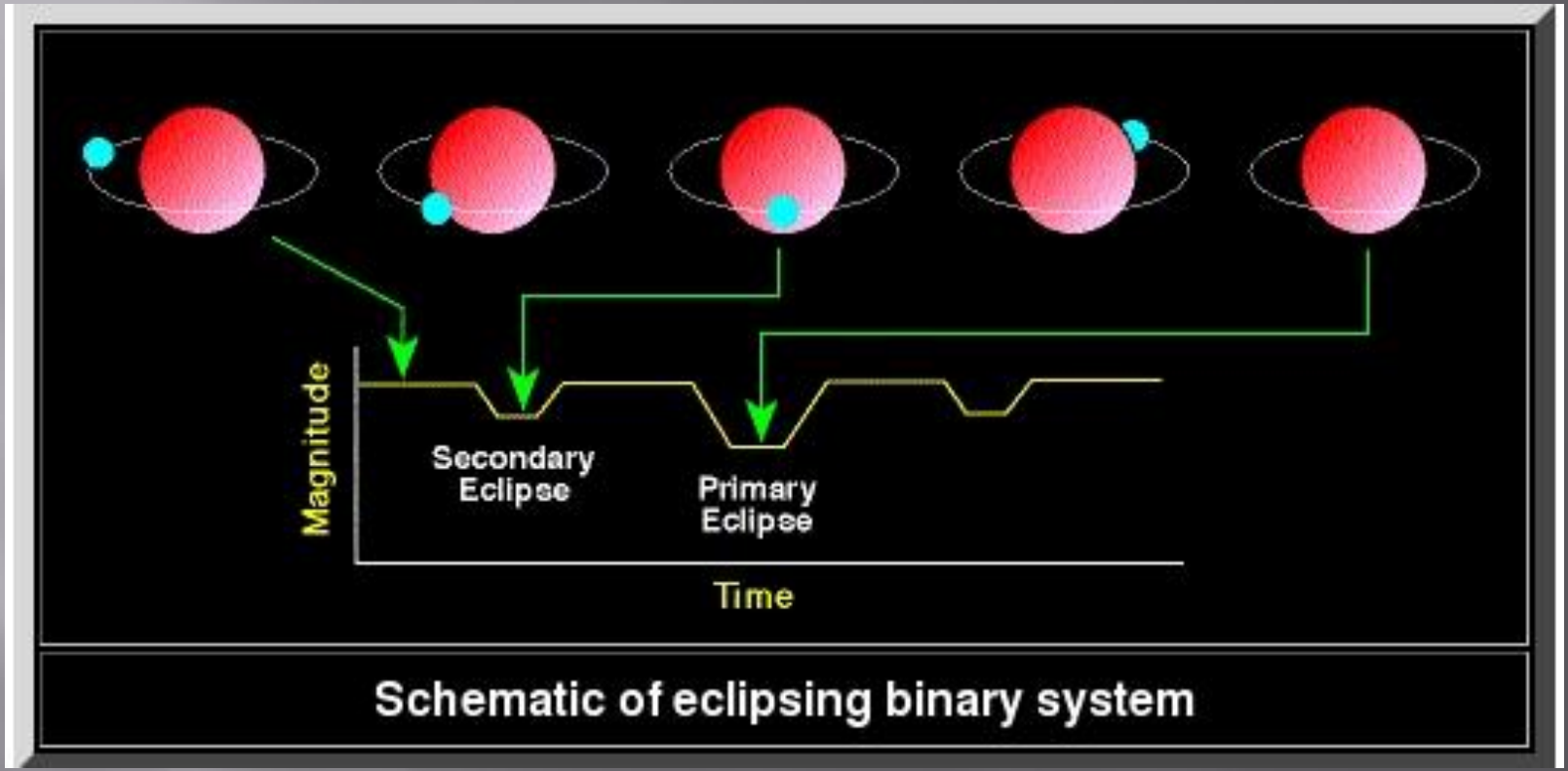

Y CAM
0.23
0.24
0.25
0.26
0.27
0.28
0.29
2452617.3
2452617.4
2452617.5
2452617.6

Nauwkeurigheid

- S/N ratio
- Lichtpollutie
- Seeing

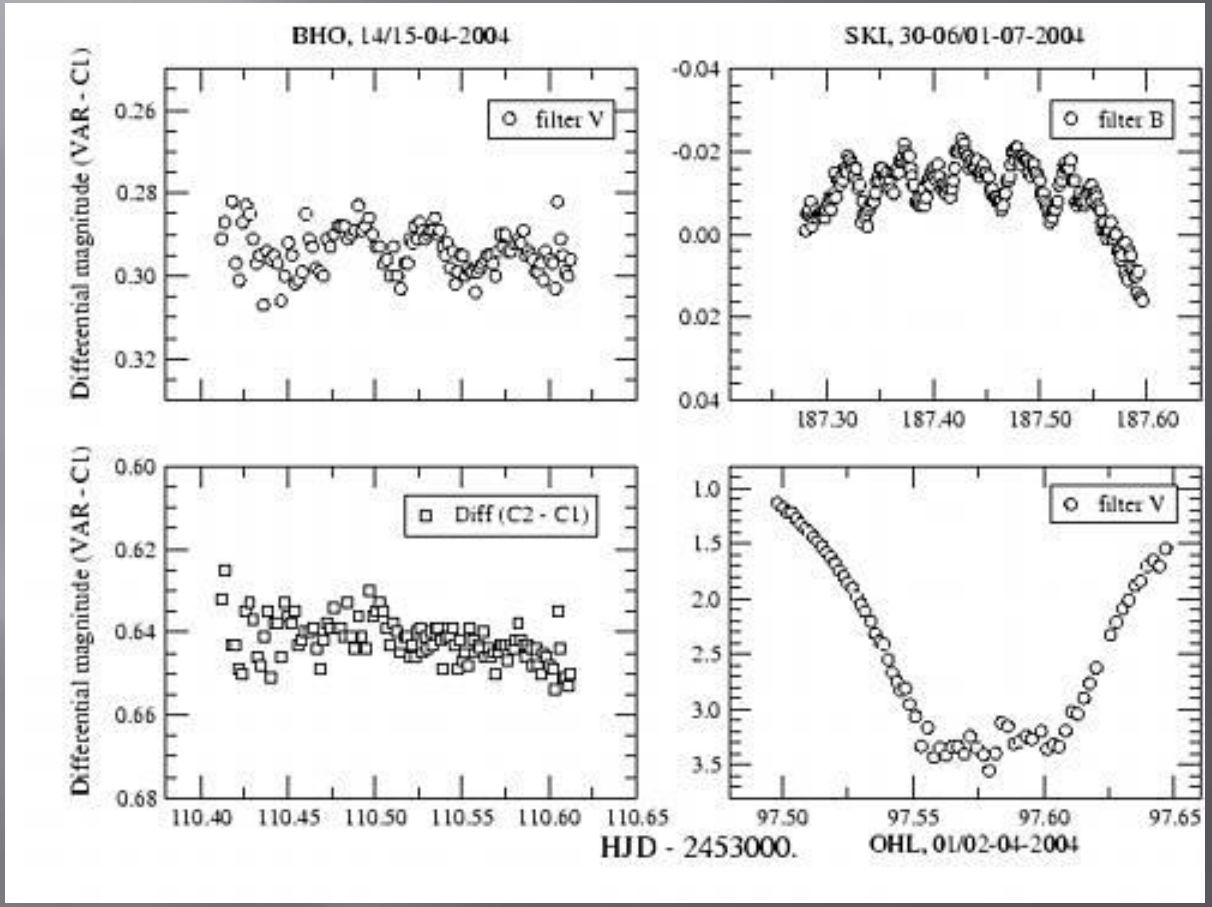
New class of pulsators: the oscillating EA stars

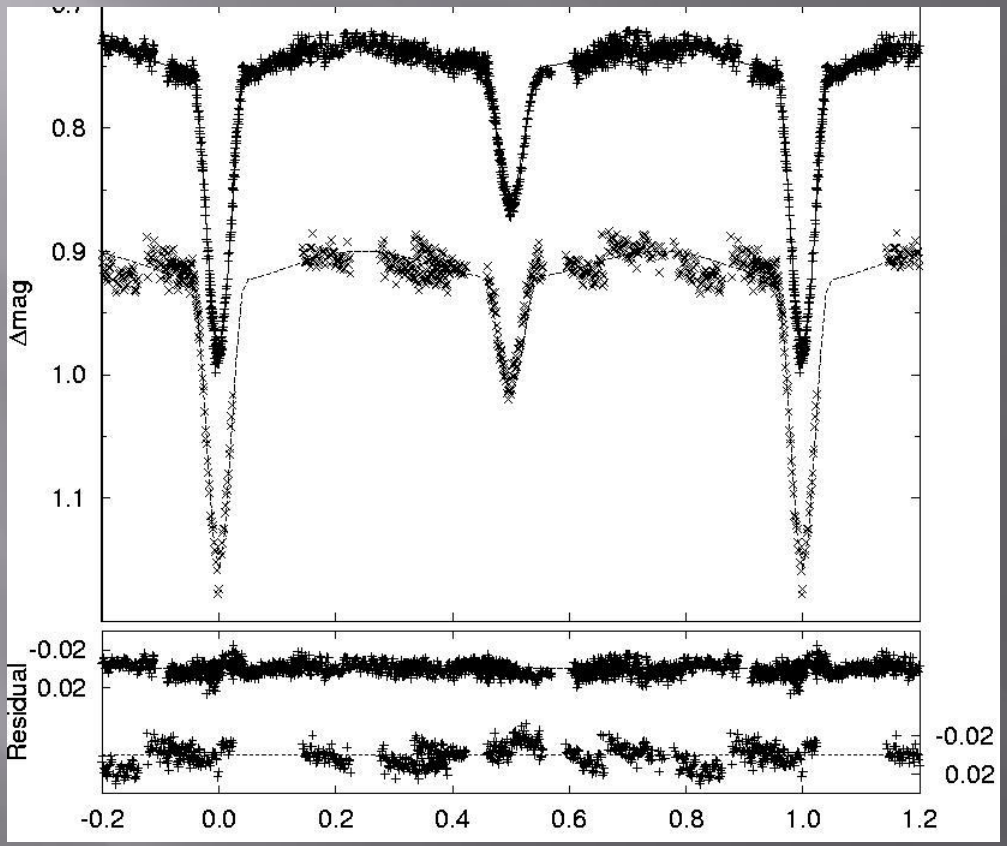
- **oEA stars = *Mass-accreting* A/F-type comp.s in semi-detached binary (Algol) systems showing δ Scuti-like pulsation (Mkrtichian 2002, 2004)**
- ***Co-existence* of pulsation(s) & mass transfer (accretion)**



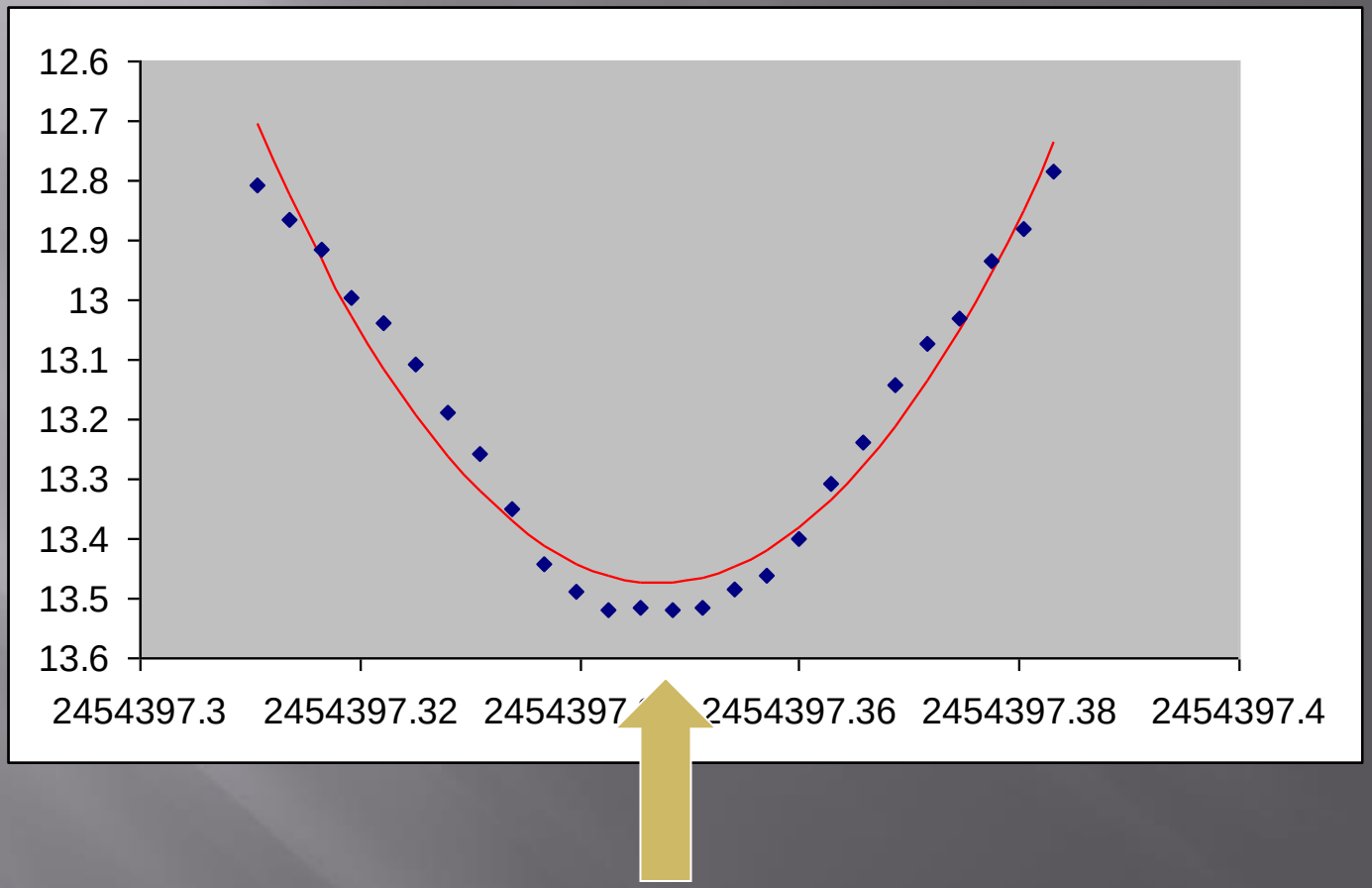
Schematic of eclipsing binary system

TU Her


BHO, 14/15-04-2004
SKI, 30-06/01-07-2004
OHL, 01/02-04-2004
filter V
filter B
Diff (C2 - C1)
Differential magnitude (VAR - C1)
HJD - 2453000.
0.26
0.28
0.30
0.32
-0.04
-0.02
0.00
0.02
0.04
187.30
187.40
187.50
187.60
0.60
0.62
0.64
0.66
0.68
110.40
110.45
110.50
110.55
110.60
110.65
1.0
1.5
2.0
2.5
3.0
3.5
97.50
97.55
97.60
97.65


0.8
0.9
1.0
1.1
Δmag
Residual
-0.02
0.02
-0.02
0.02
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2

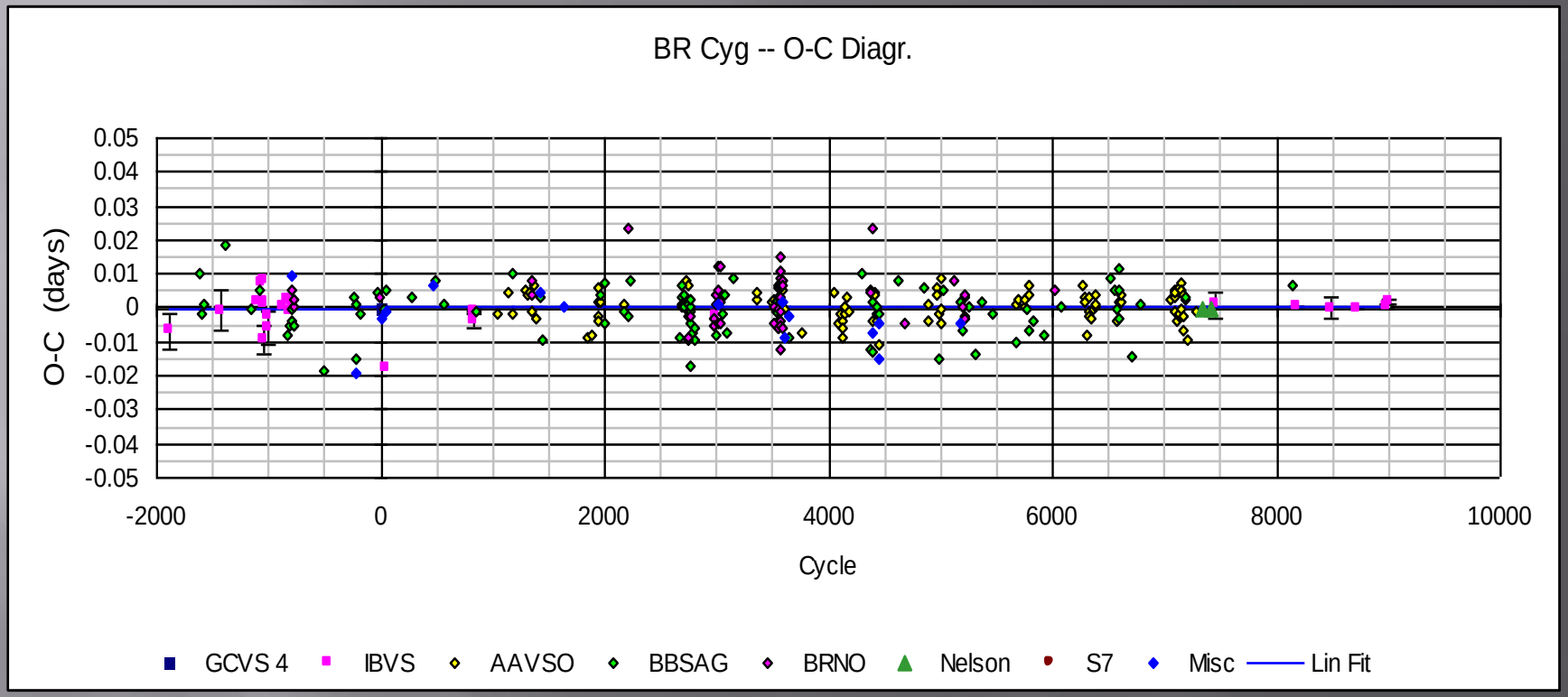
Paraboolfit geeft tijd van min.



O-C methode

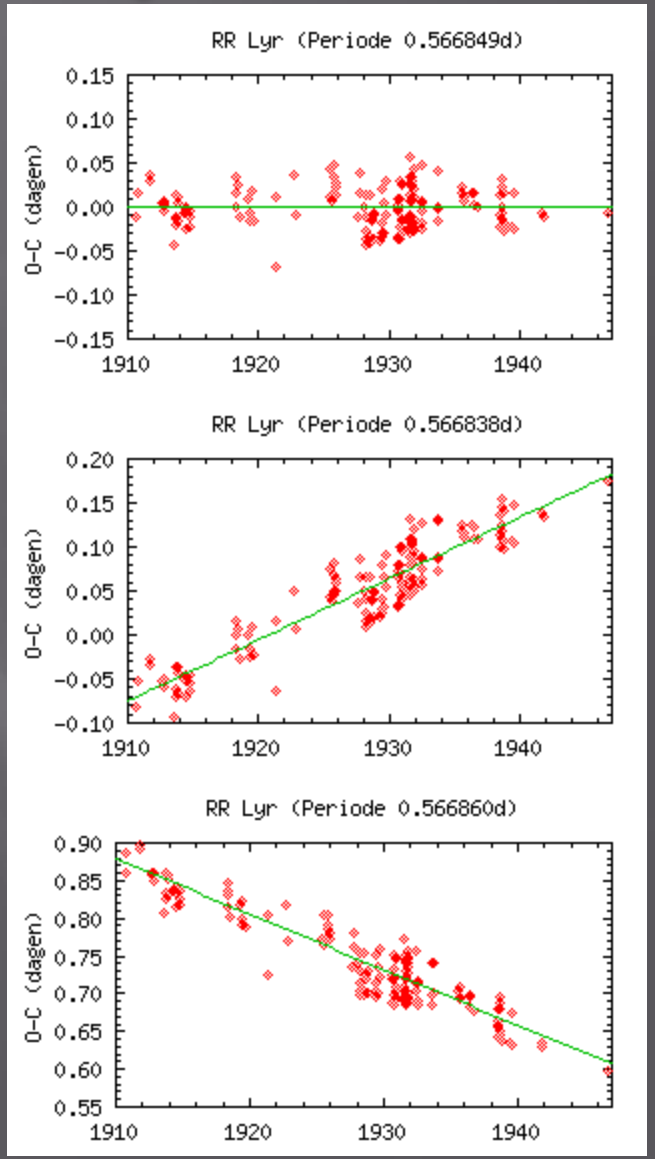
- Traditionele methode om periodeveranderingen te (onder)zoeken
- Bepalen van extrema (hier minima)
- Tellen van aantal cycli (E) tussen minima
  - Goede beginperiode is noodzakelijk!
- Berekenen van de periode (kleinste kwadraten)
- Berekenen van de verschillen
  - O(bserved) – C(alculated)
- Plotten van de verschillen

Tks to PW


BR Cyg -- O-C Diagr.
O-C (days)
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
-2000
0
2000
4000
6000
8000
10000
Cycle
GCVS 4
IBVS
AAVSO
BBSAG
BRNO
Nelson
S7
Misc
Lin Fit

O-C methode: Constante periode

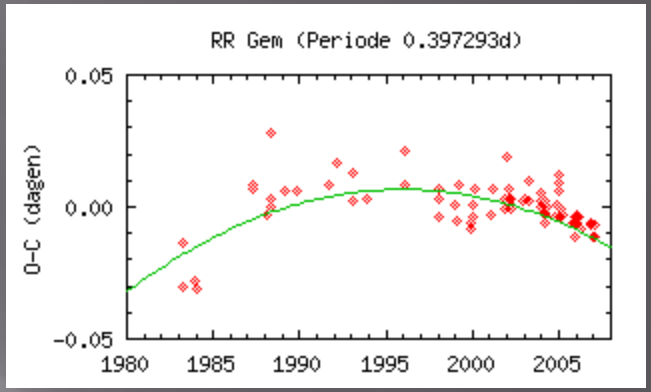
- Juiste periode
- Te korte periode
- Te lange periode



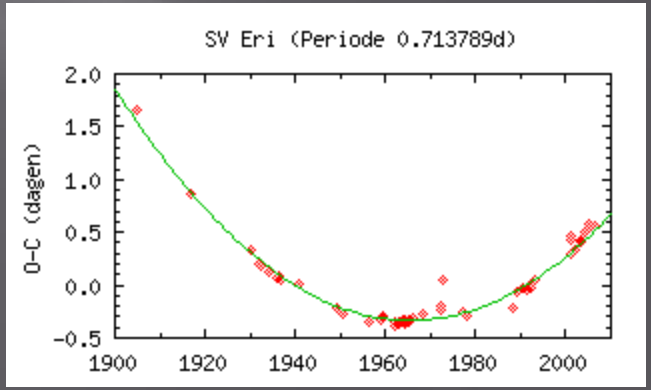
Tks to PW

O-C methode: Constante periodeverandering

- Constante afname

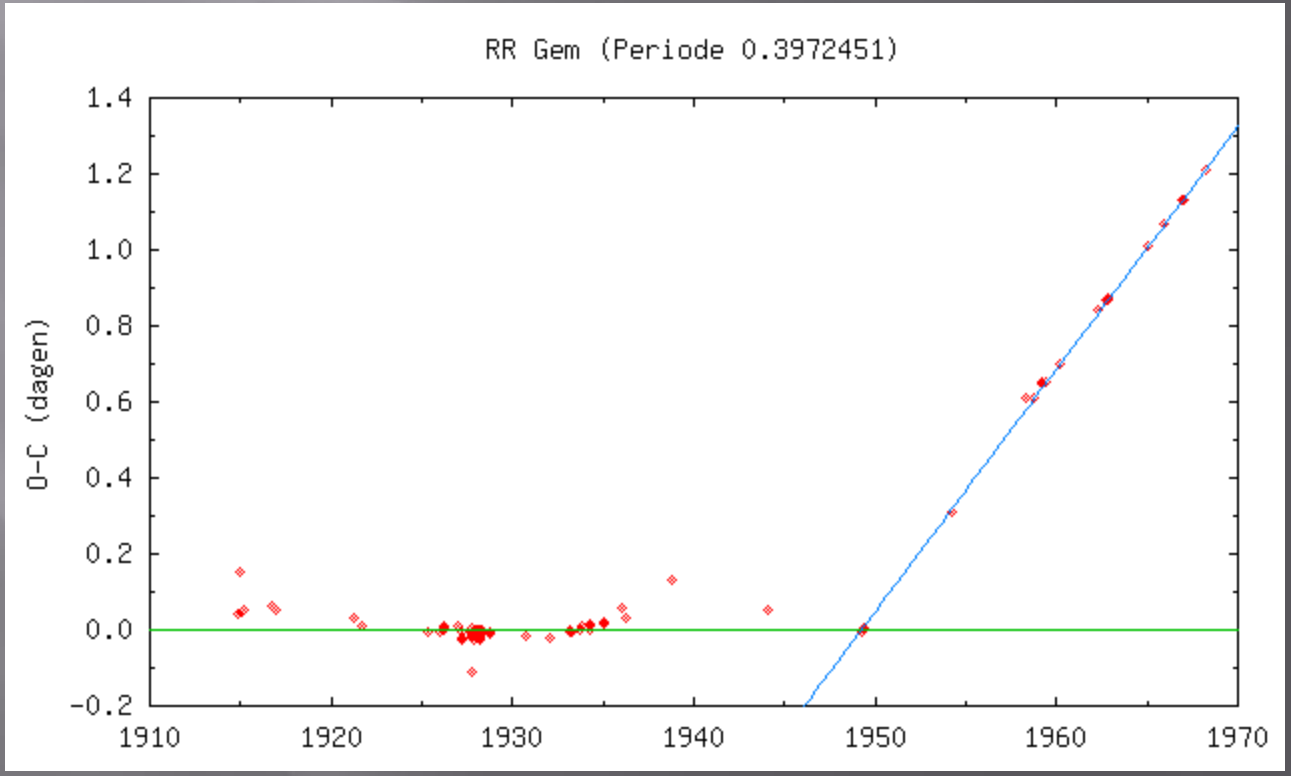


- Constante toename

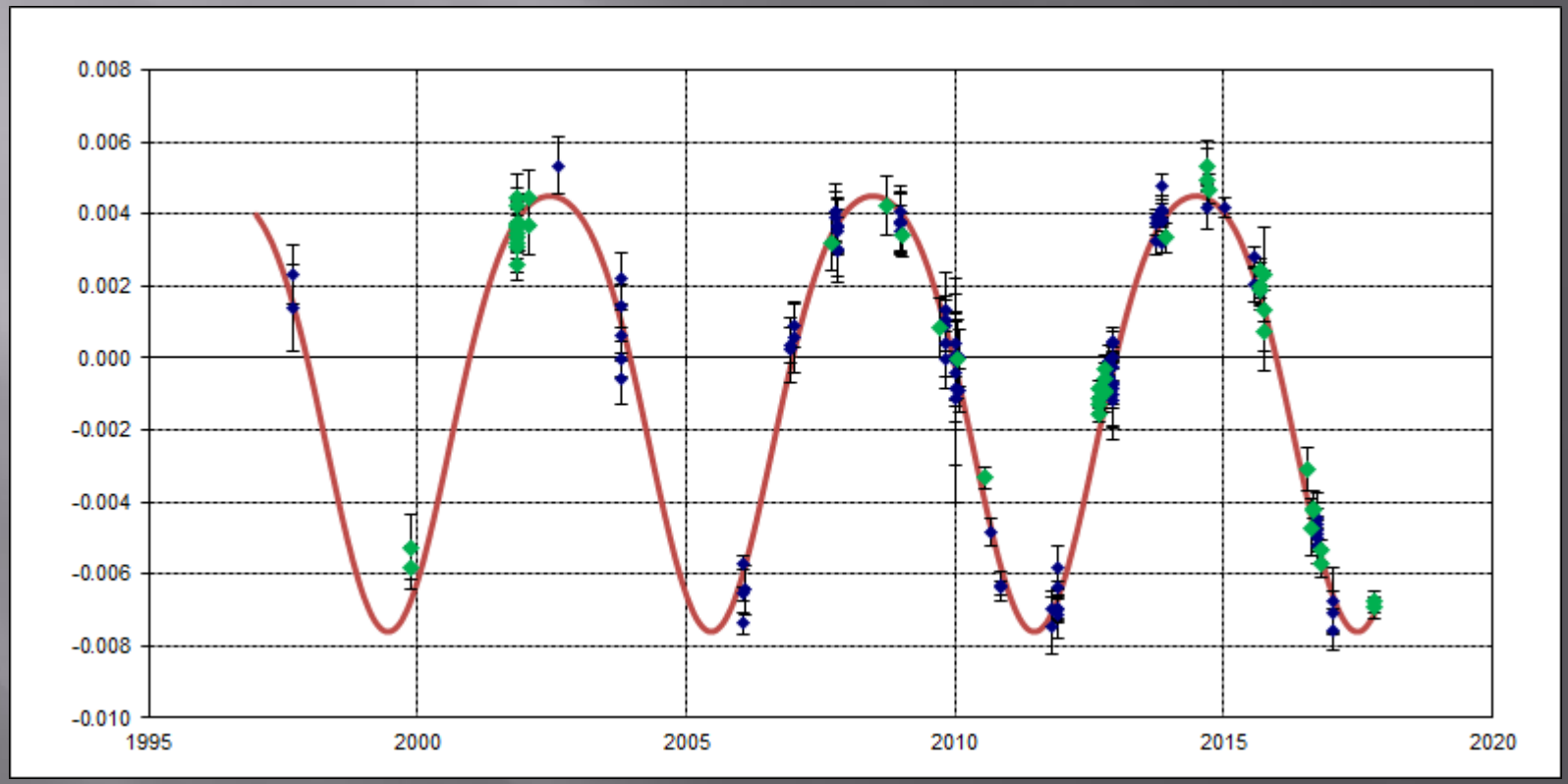


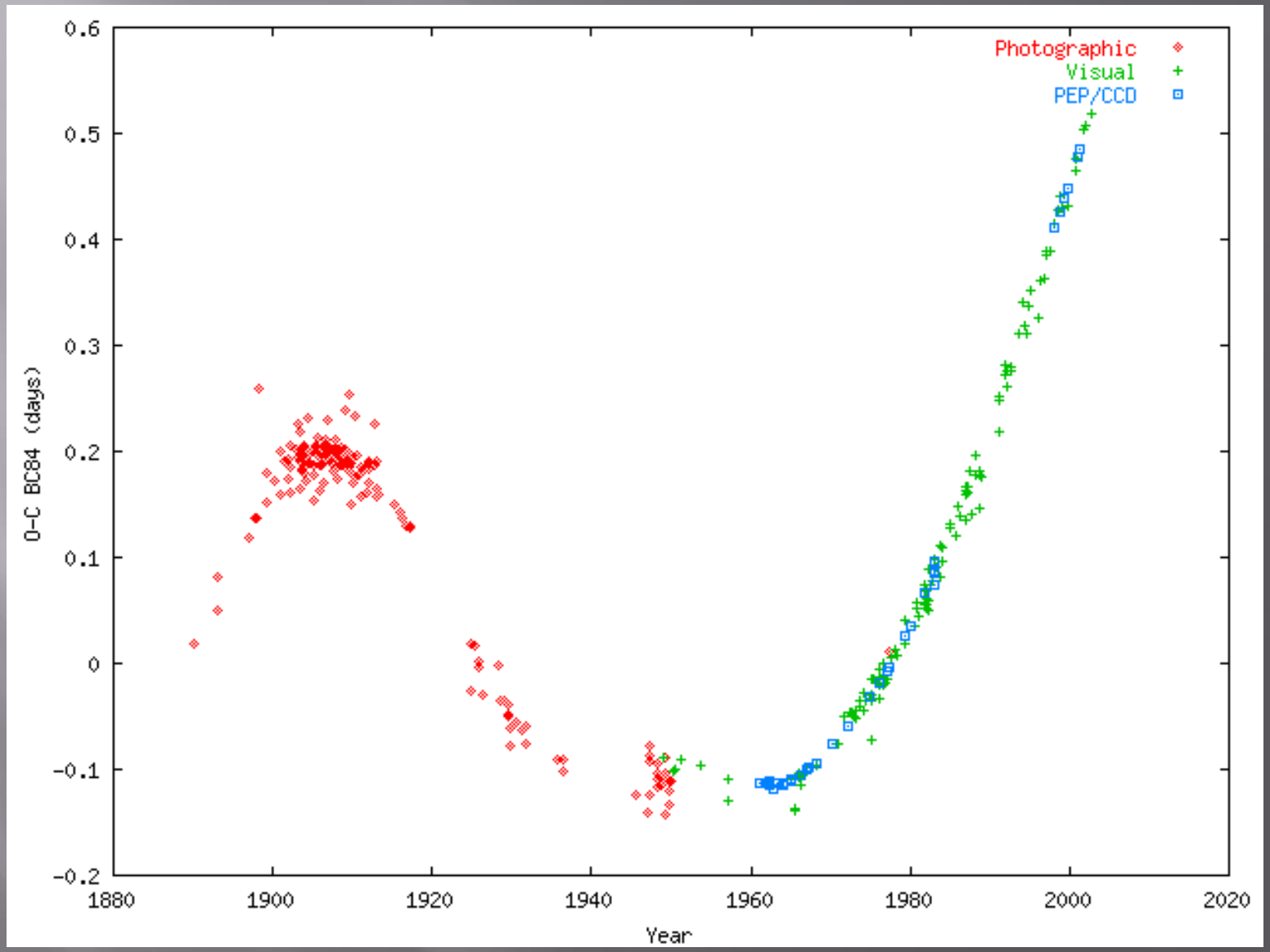
O-C methode: Plotse periodeverandering

- Plotse toename van de ware periode



DW Psc (HADS) (tks, PW)




Photographic
Visual
PEP/CCD
O-C BC84 (days)
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
1880
1900
1920
1940
1960
1980
2000
2020
Year

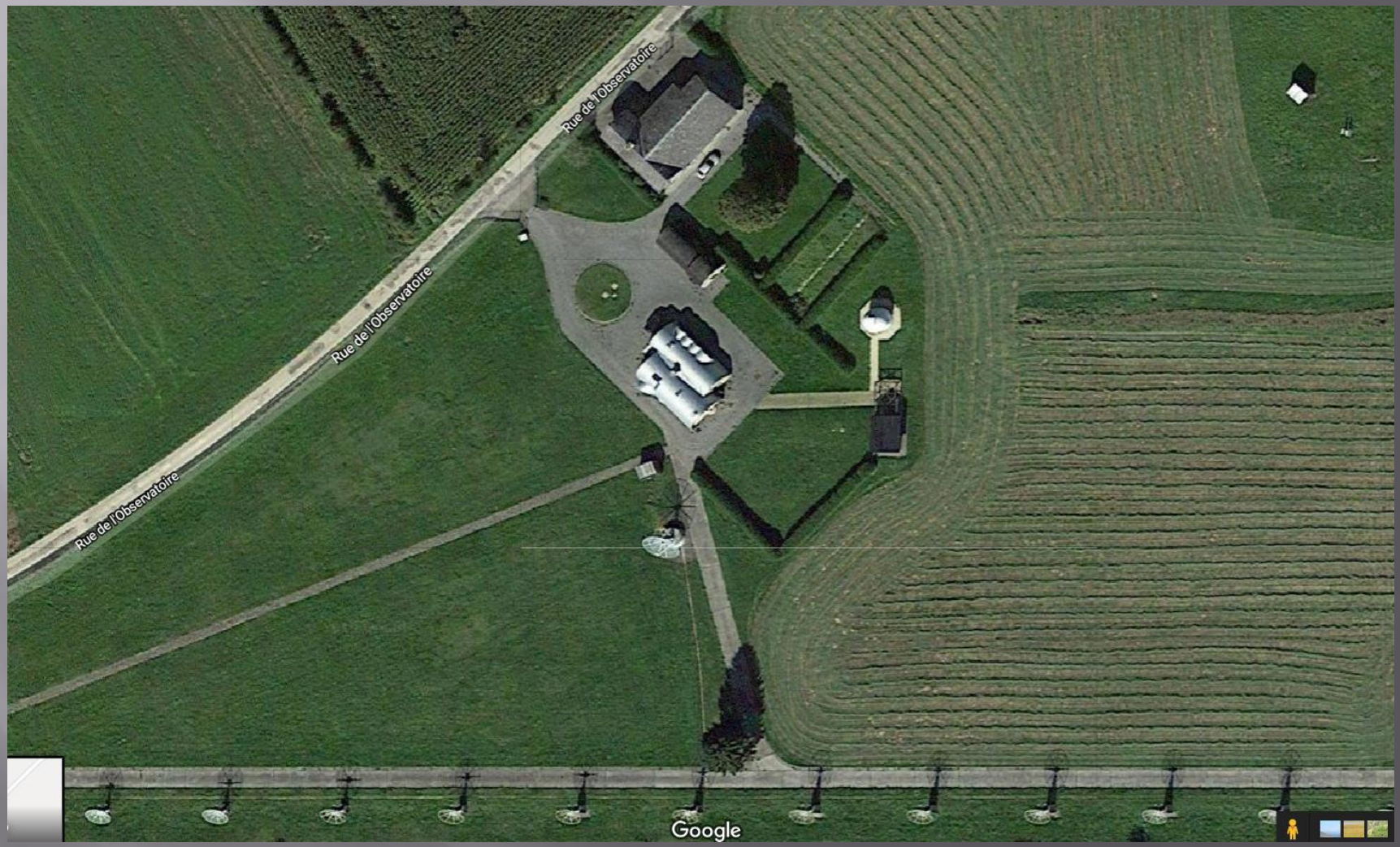
Samenwerking met prof

- Hoge eisen
- Communicatie
- Voldoende aantal waarnemingen doen
- Rapportering
- What's in it for me?

Op zoek naar een betere site

- Donkerder
- Seeing
- Bereikbaar
- Betaalbaar


Rue de l'Observatoire
Rue de l'Observatoire
Rue de l'Observatoire
Chemin du Point d'Arrêt
Chemin du Point d'Arrêt
Rue Louis Banneux
Rue Louis Banneux


Rue de l'Observatoire
Rue de l'Observatoire
Rue de l'Observatoire
Google



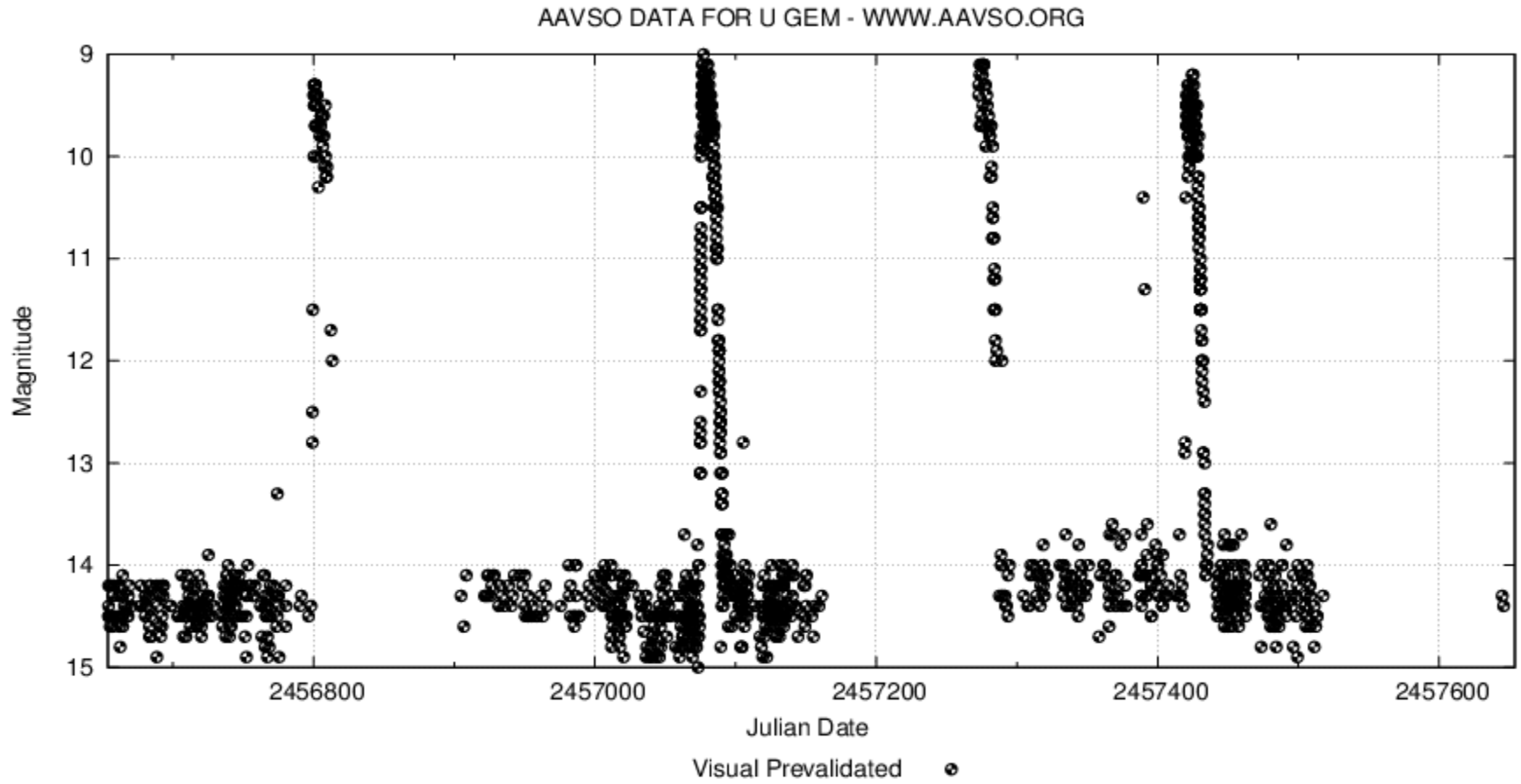




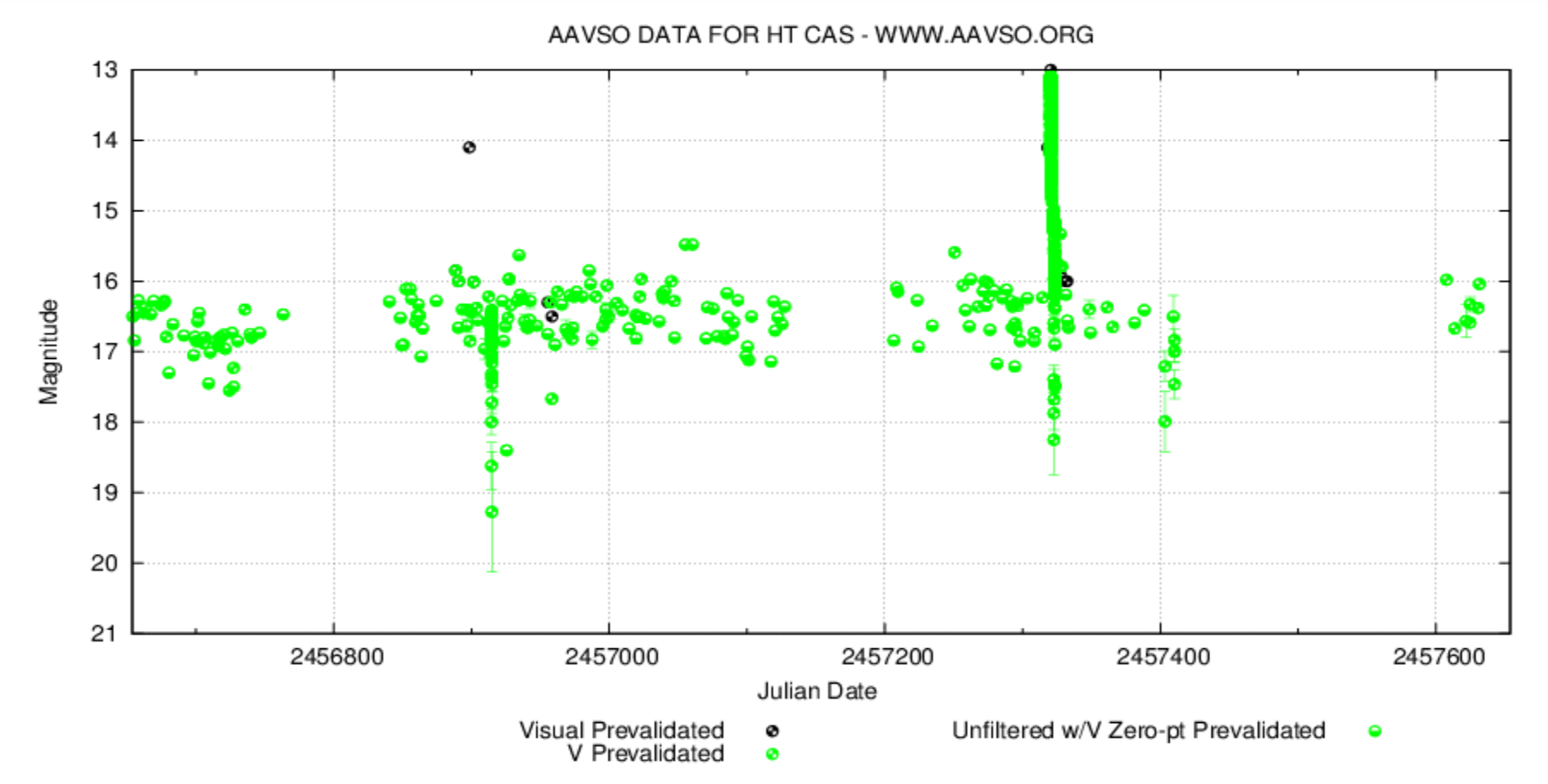
Bucket list:

“observe an eclipse of HT Cas

Dwarf novae

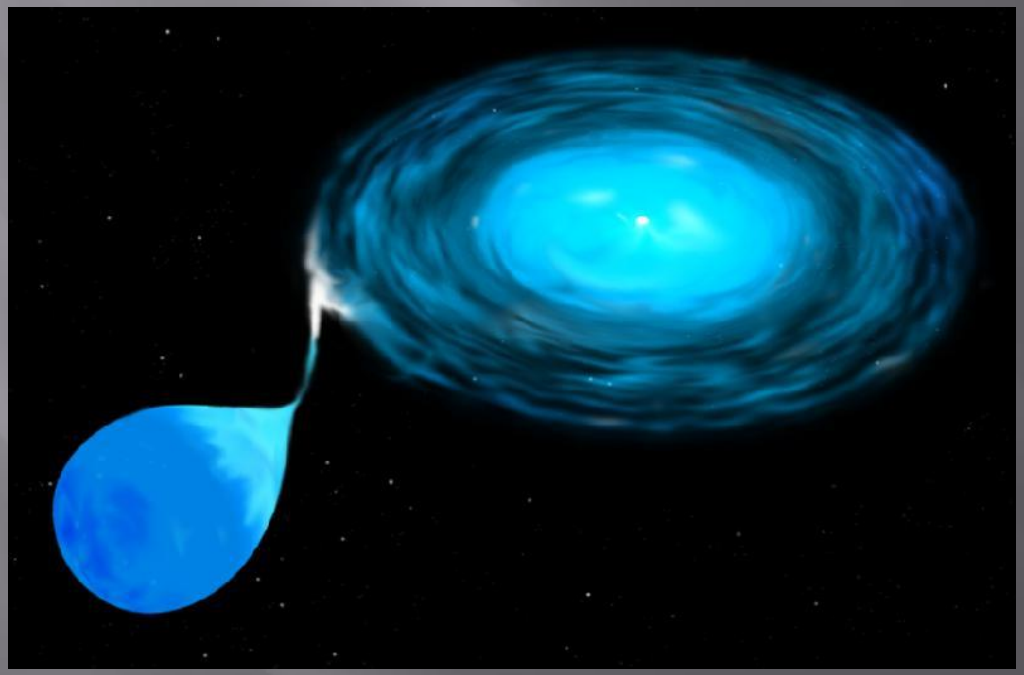

AAVSO DATA FOR U GEM - WWW.AAVSO.ORG
Magnitude
9
10
11
12
13
14
15
2456800
2457000
2457200
2457400
2457600
Julian Date
Visual Prevalidated

HT Cas- 1000days



Cataclysmic variable

- Secondary star + white dwarf (mass transfer to white dwarf) accretion disk, hot spot



Cataclysmic variable

- Minimum vs outburst (duration 2-6 days)
- Long period: HT Cas: 1-2 yr
- Eclipses visible at max and/or min depending on inclination of system.

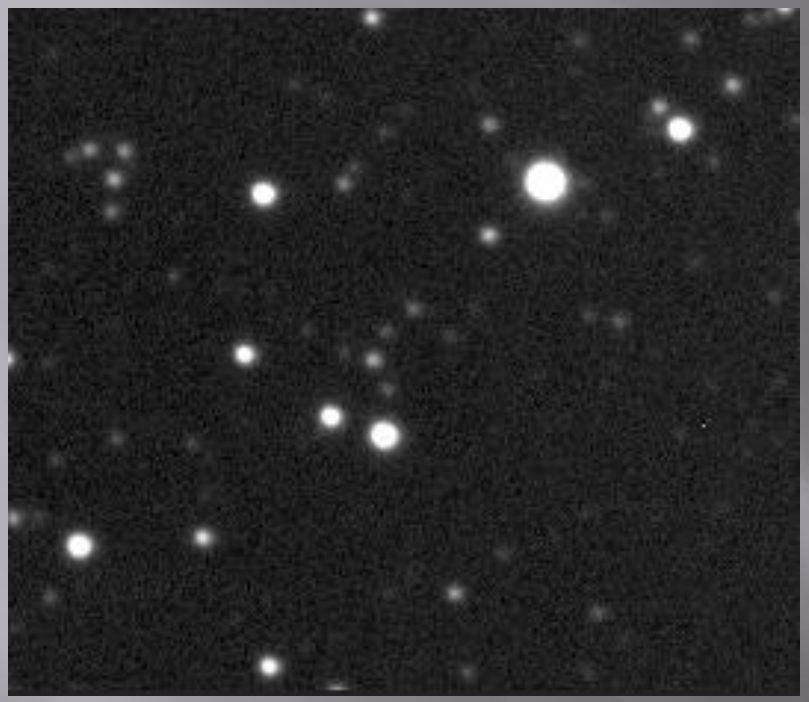
What makes HT Cas “impossible”

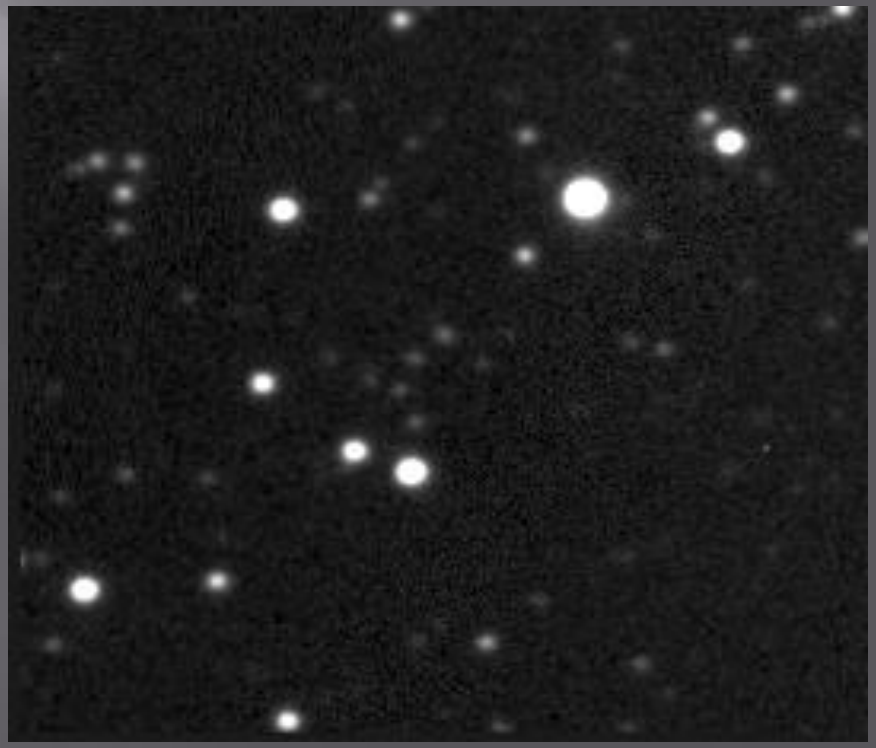
- Magnitude at minimum 17.0
- Orbital period : 1h45m
- Depth of eclipses: 1.5 mag i.e. mag 18.5!!
- Duration of eclipses: 7-8 MINUTES !
- Attempts with our 40cm f/5: negative (star not visible at mid-eclipse)

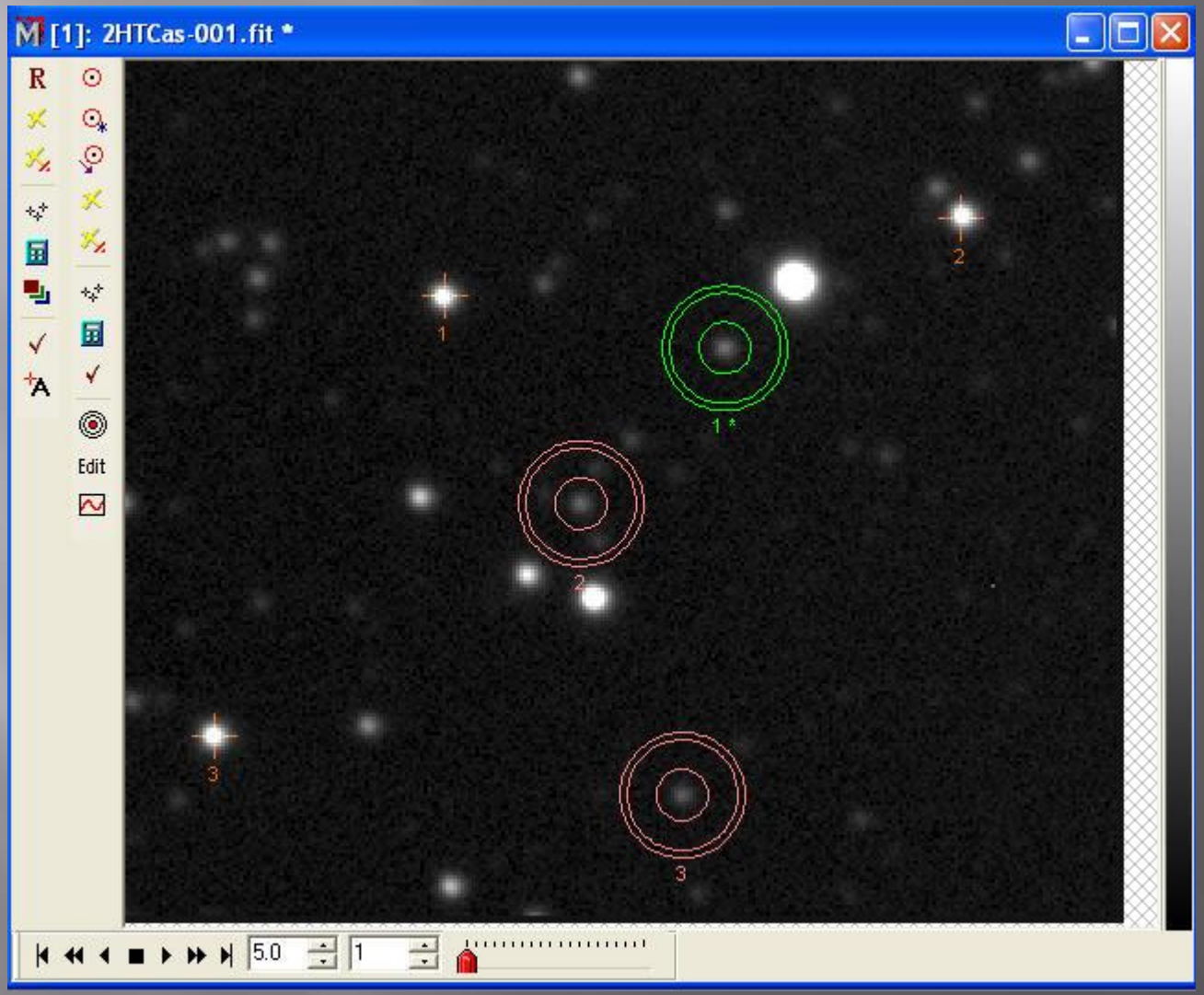
HT Cas, nieuwe poging ..

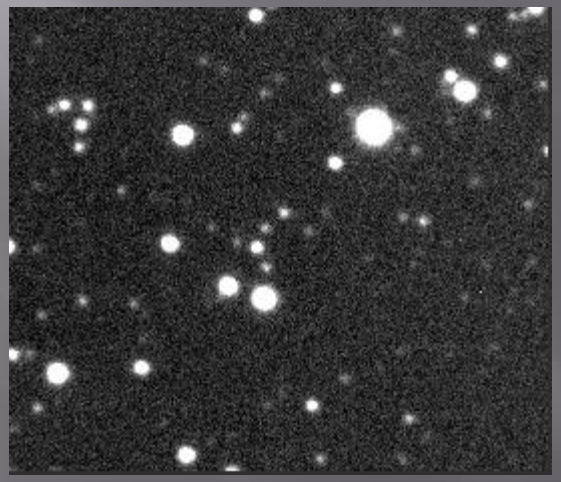
- 16” Meade ACF f/8
- Moravian CCD camera fast download
- crop

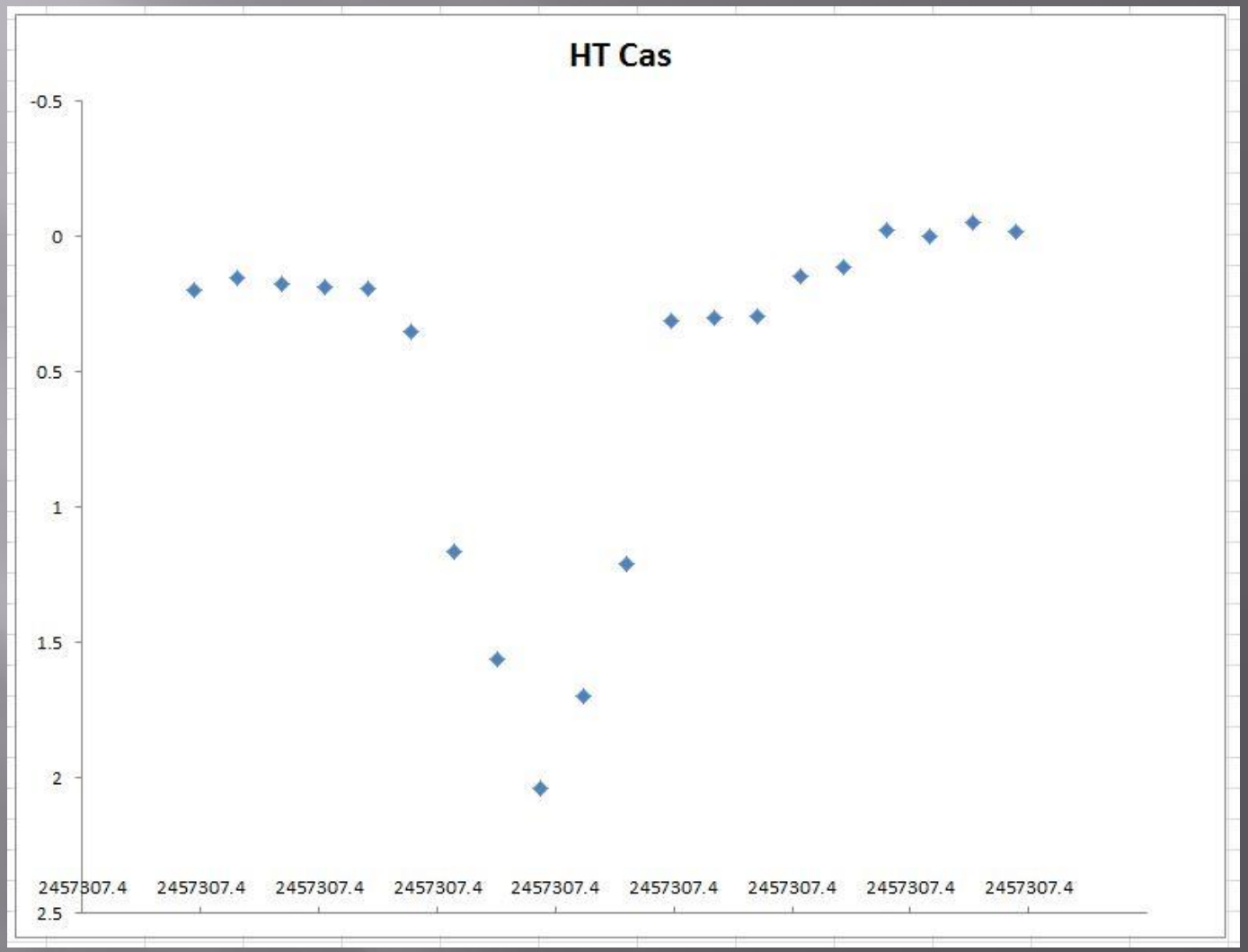




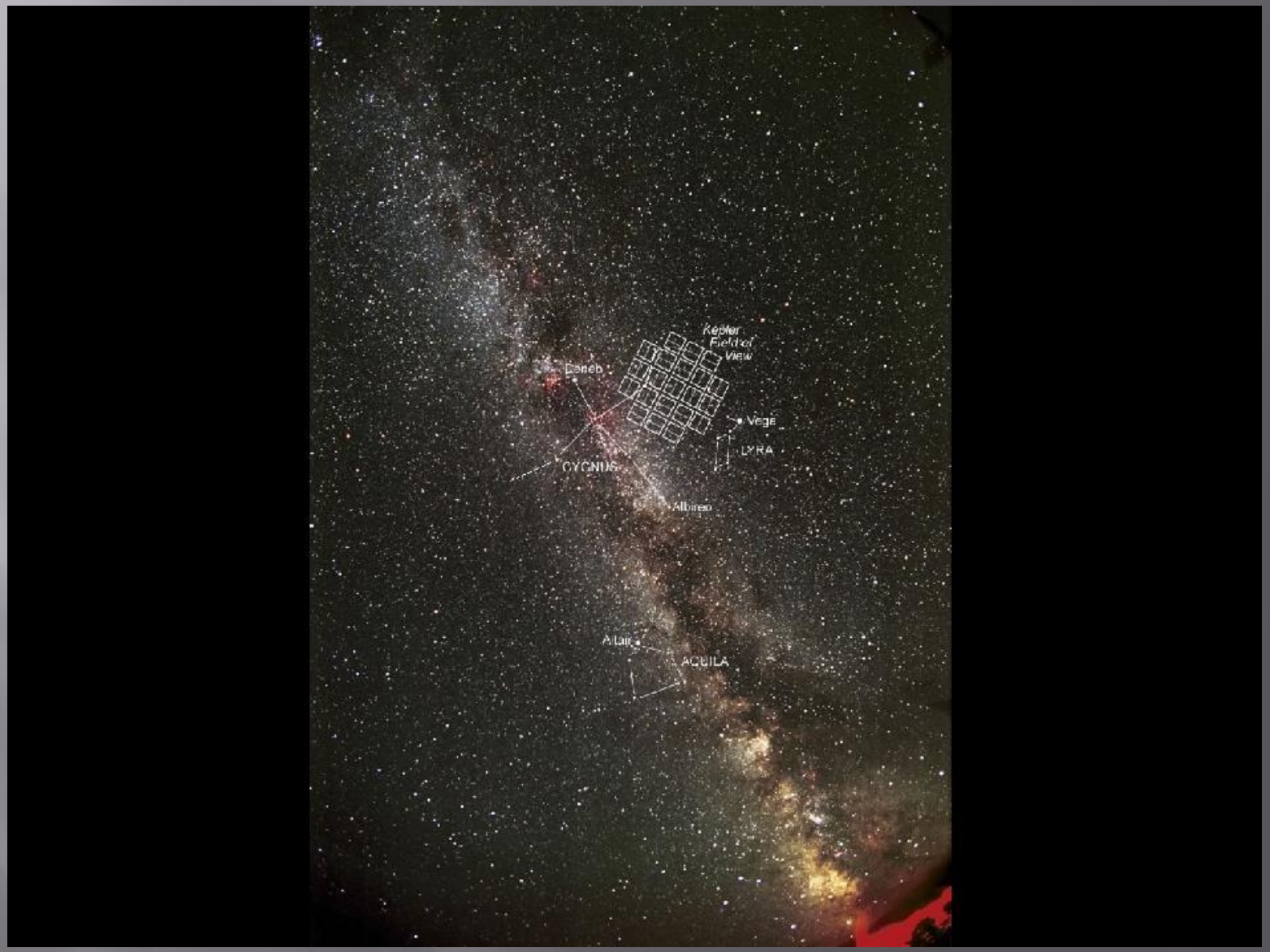



[1]: 2HTCas-001.fit *
R
Edit
1
2
1 *
2
3
3
5.0
1




HT Cas
-0.5
0
0.5
1
1.5
2
2.5
2457307.4
2457307.4
2457307.4
2457307.4
2457307.4
2457307.4
2457307.4
2457307.4
2457307.4

Kepler ..


Kepler Field of View
Deneb
Vega
LYRA
CYGNUS
Albireo
Altair
AQUILA

Mission Characteristics

- Continuously point at a single star field in Cygnus-Lyra region except during Ka-band downlink
- Roll the spacecraft 90 degrees about the line-of-sight every three months to maintain the sun on the solar arrays and the radiator pointed to deep space
- Monitor 150,000 main-sequence stars for planets
- Mission lifetime of 3.5 years extendible to at least six years
- D2925-10L (Delta II) launch into an Earth-trailing heliocentric orbit
- Scientific Operations Center and Project management (operations) at NASA's Ames Research Center
- Project management (development) at NASA's Jet Propulsion Laboratory
- Flight segment design and fabrication at Ball Aerospace & Technologies Corp.
- Mission Operations Center at Laboratory for Atmospheric and Space Physics (LASP)—University of Colorado
- Data Archive at tje Mikulski Archive for Space Telescopes (MAST) at Space Telescope Science Institute
- Deep Space Network for telemetry

Vandaag …

- Timings EB's Kepler field en oEA's
- Targets Hermes data (La Palma)
- Open Cluster variables

