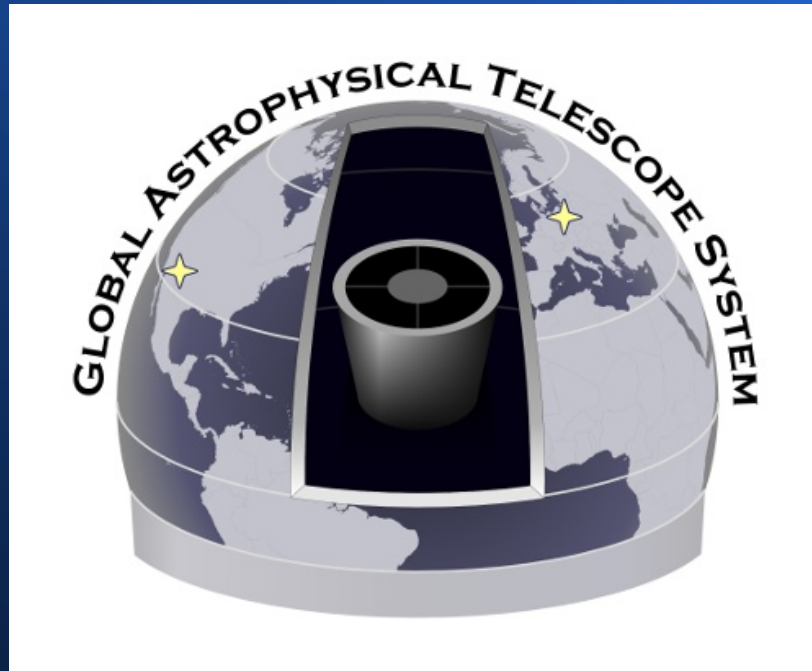


Small telescopes – wide spectrum of possibilities



Krzysztof Kamiński

Astronomical Observatory
Adam Mickiewicz University, Poznań, Poland



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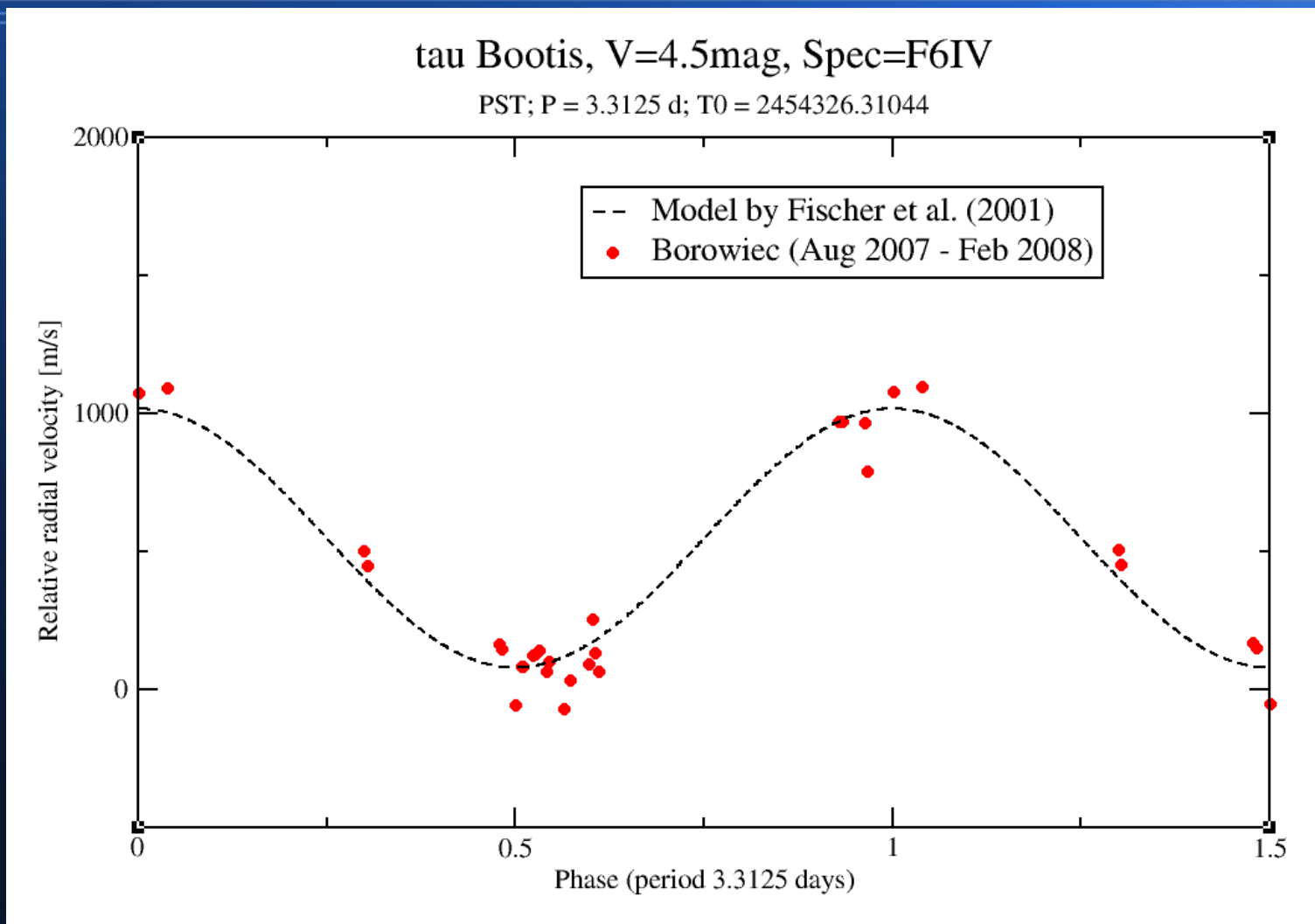
Poznań Spectroscopic Telescope 1



2 x 0.5m telescope with fiber fed echelle spectrograph



Poznań Spectroscopic Telescope 1



Spectroscopic exoplanet detection

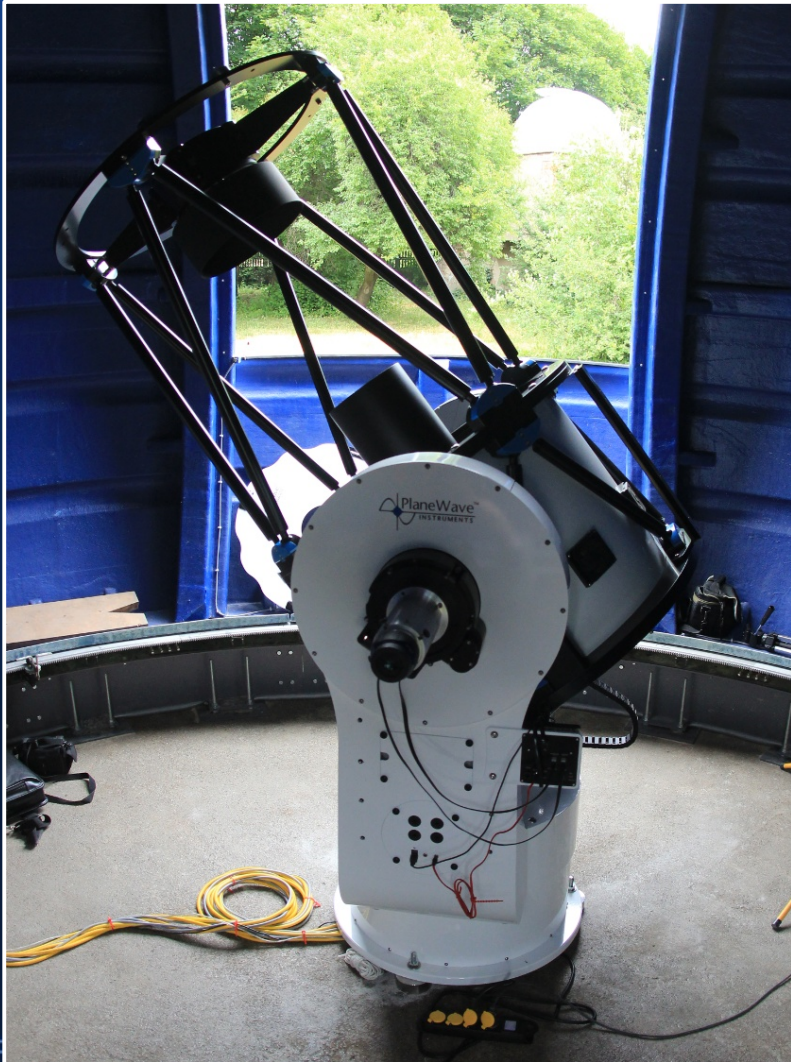


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Poznań Spectroscopic Telescope 2



0.7m, dual Nasmyth



fiber-fed, echelle spectrograph, $R \sim 40000$

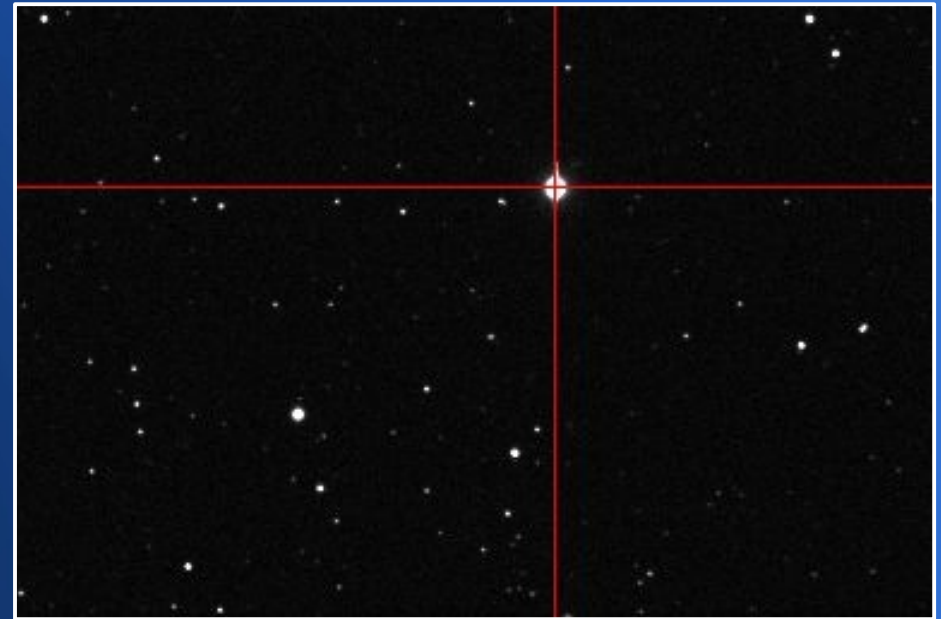
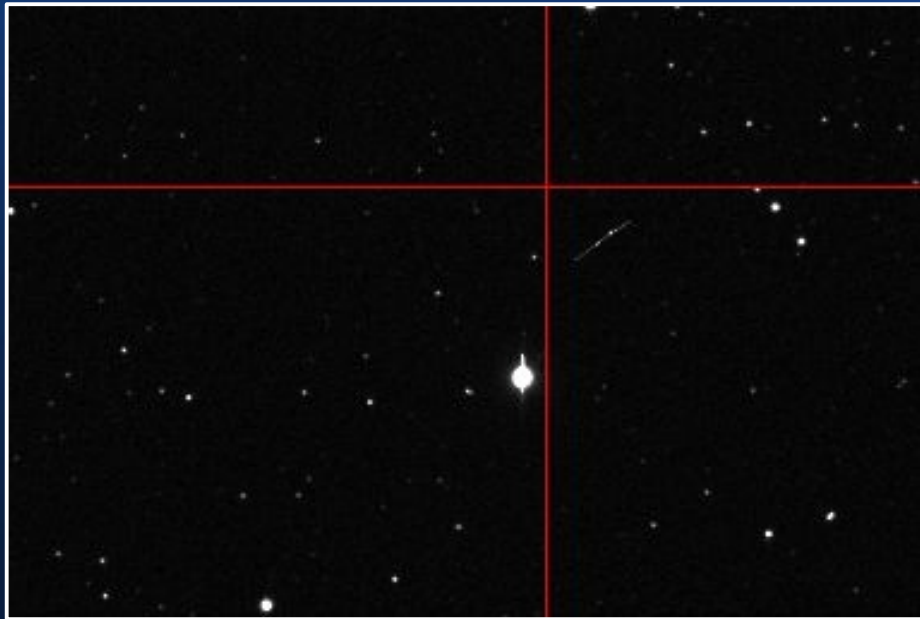


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Robotic observations



Finderscope images showing automatic identification and placement of a target



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Remote control and robotic observations

DB: 0 2 [s] auto: OFF status: 1 [commands](#) last: (-1) current: (-1) next: (0) power_up [edit](#)

Device name	Status	Current comm	Comm res	_error	_log	_out	_params	_in_auto	_in_manual
Planewave CDK700	4		none	more...	more...	more...	more...	more...	more...
Andor iKon-L CCD	4		0	more...	more...	more...	more...	more...	more...
Andor iXon EMCCD	4		none	more...	more...	more...	more...	more...	more...
SBIG ST-7 (abox)	4		none	more...	more...	more...	more...	more...	more...
SBIG ST-7 (expo)	4		0	more...	more...	more...	more...	more...	more...
SBIG ST-7 (guider)	4		none	more...	more...	more...	more...	more...	more...
Shelyak calibration lamps	0		0	more...	more...	more...	more...	more...	more...
FLI filter wheel	0		none	more...	more...	more...	more...	more...	more...
ScopeDome	none	none	none	more...	more...	more...	more...	more...	more...
Thermometer	0			more...	more...	more...	more...		
Oasis chiller	7			more...	more...	more...	more...		
Barometer	0			more...	more...	more...	more...		
Thermostat	0			more...	more...	more...	more...		
APC UPS	0			more...	more...	more...	more...		
Weather station	none			more...	more...	more...	more...		

AUTO

STOP WORK

POWER OFF

CLOSE ROOF

Planewave CDK700	RA _{J2000} = 0.000000	Dec _{J2000} = 0.000000	tracking OFF	focuser: 0	rotator: 0.000°	m3: 0
Andor iKon-L	T _{CCD} : -6.6°C	t _{exp} : 1.00s	max signal: 21157 ADU		T _{oasis} : 19.60°C	Eff _{oasis} : -100
Andor iXon EMCCD	T _{CCD} : 0.0°C	t _{exp} : 1.00s		AG _{corr} : (,)	fiber _{RA,Dec} : (,)	filter: L
SBIG ST-7 (abox)	T _{CCD} : 0.0°C	t _{exp} : 0.20s		AG _{corr} : (,)	fiber _{x,y} : (0.000, 0.000)	
SBIG ST-7 (expo)	T _{CCD} : 0.0°C	t _{exp} : 0.20s	total signal: ADU/pix			
SBIG ST-7 (guider)	T _{CCD} : 0.0°C	t _{exp} : 0.20s	total signal: 0.0 ADU/pix	AG _{corr} : (,)	fiber _{RA,Dec} : (,)	filters OFF
Thermo & Baro	T _{now} : 28.01°C	power ₀ : 0.3550		press: 1004.40 hPa		
Lab-El	T ₁ : 28.62°C	T ₂ : 27.97°C	T ₃ : 28.7°C	press: 1004.7 hPa	humidity: 40.6%	
Other	UPS power: AC	Shelyak: M F				
last file saved	ikon /home/gats/obs/i0000000506stability_test_flat.fits			ikon		
	abox			guider		
	expo					

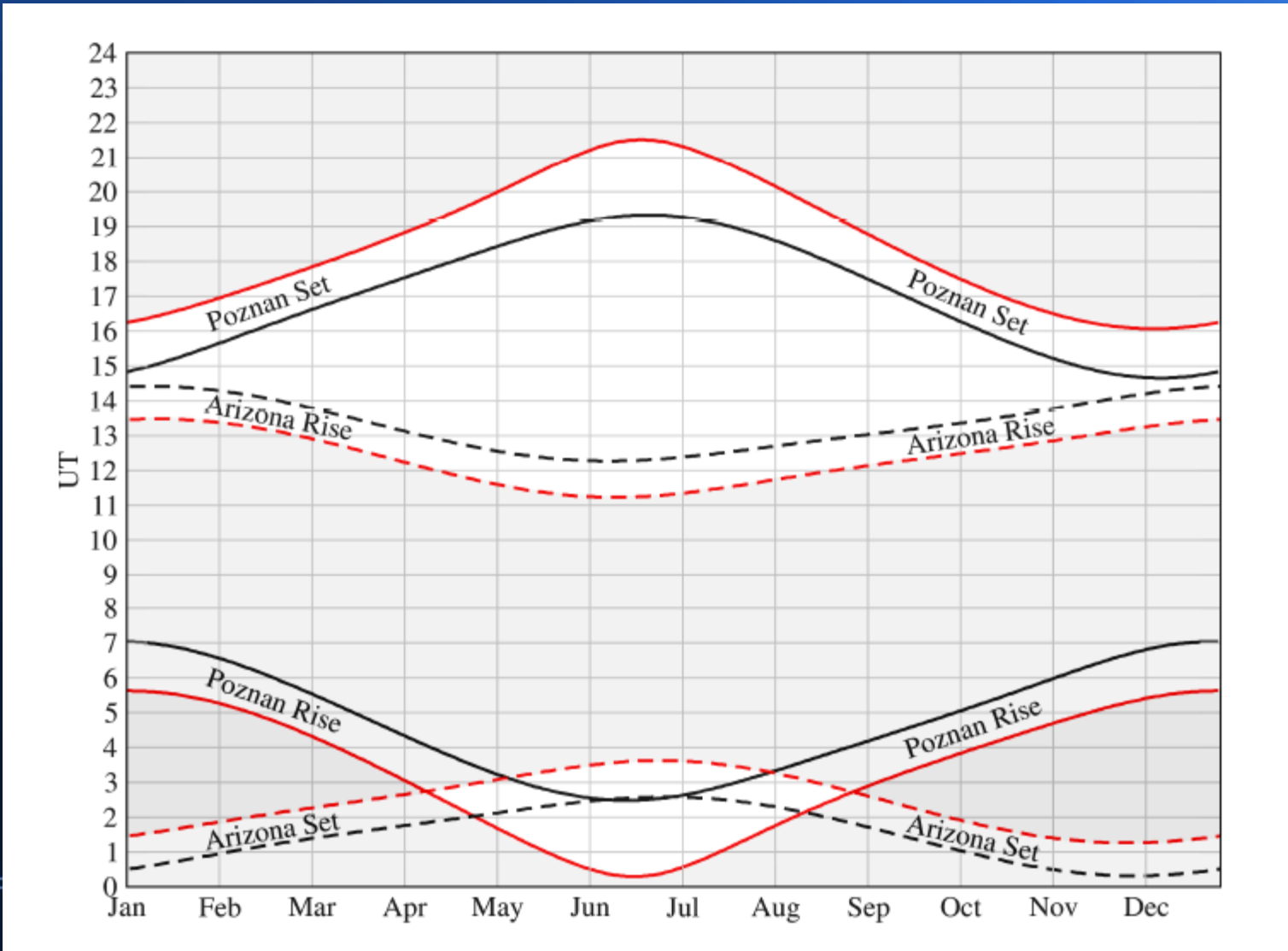


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Time coverage



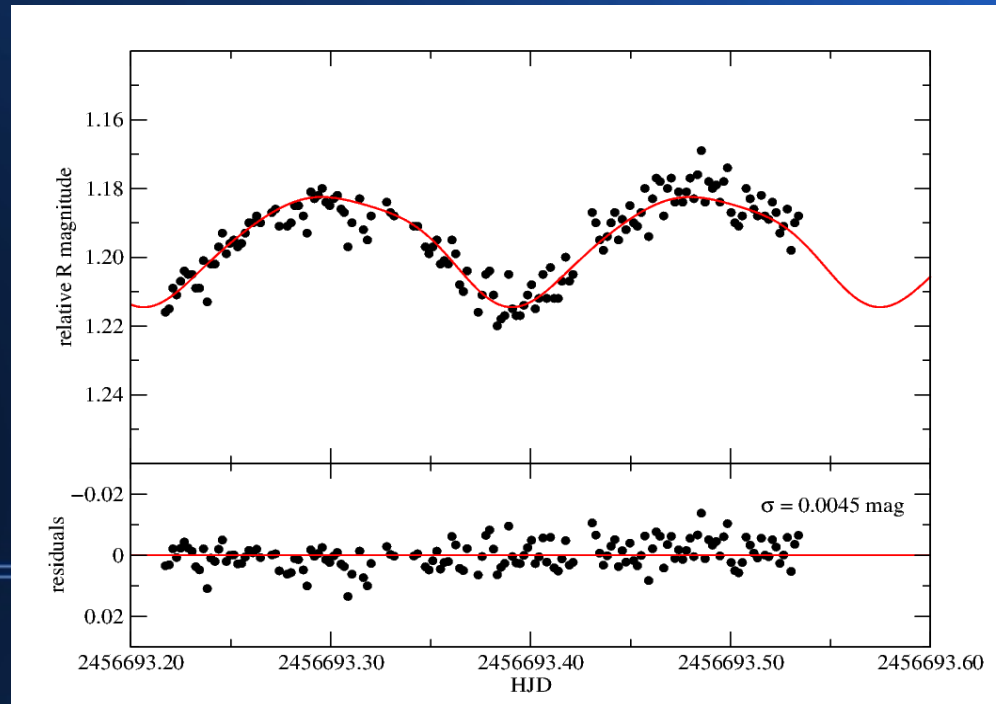
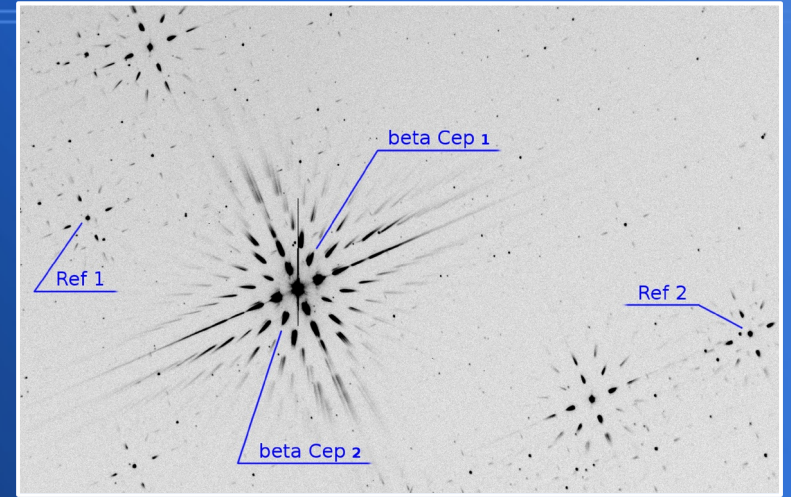
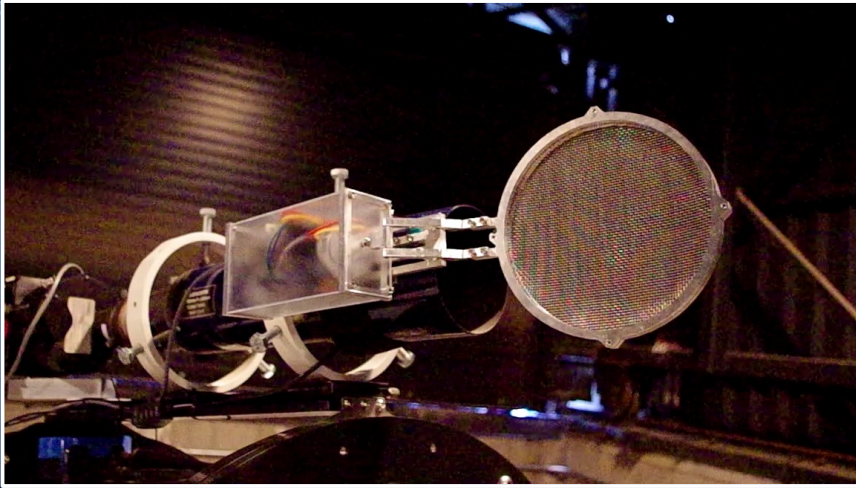


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Bright stars photometry





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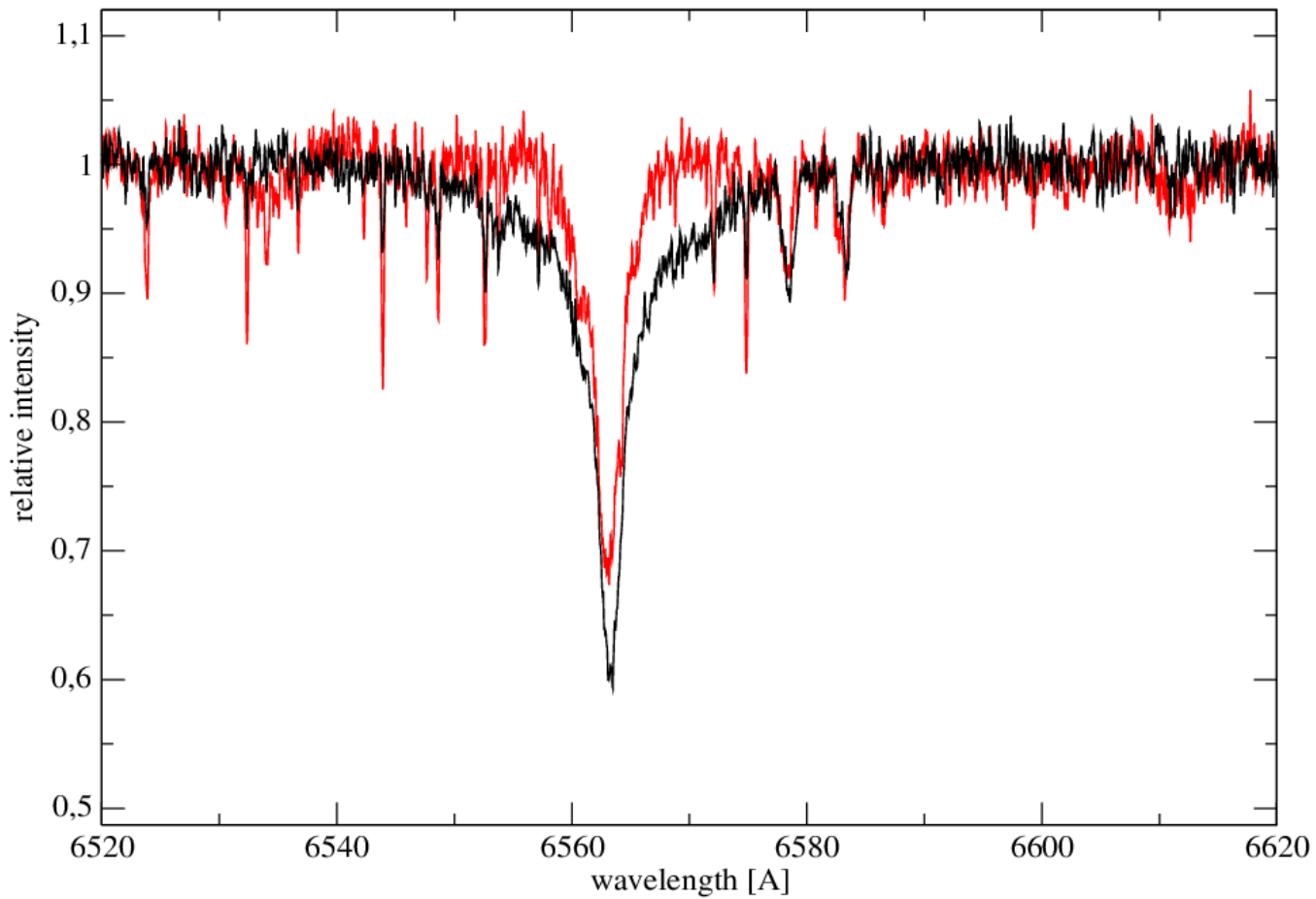
Automatic spectra reduction



Echelle spectrum



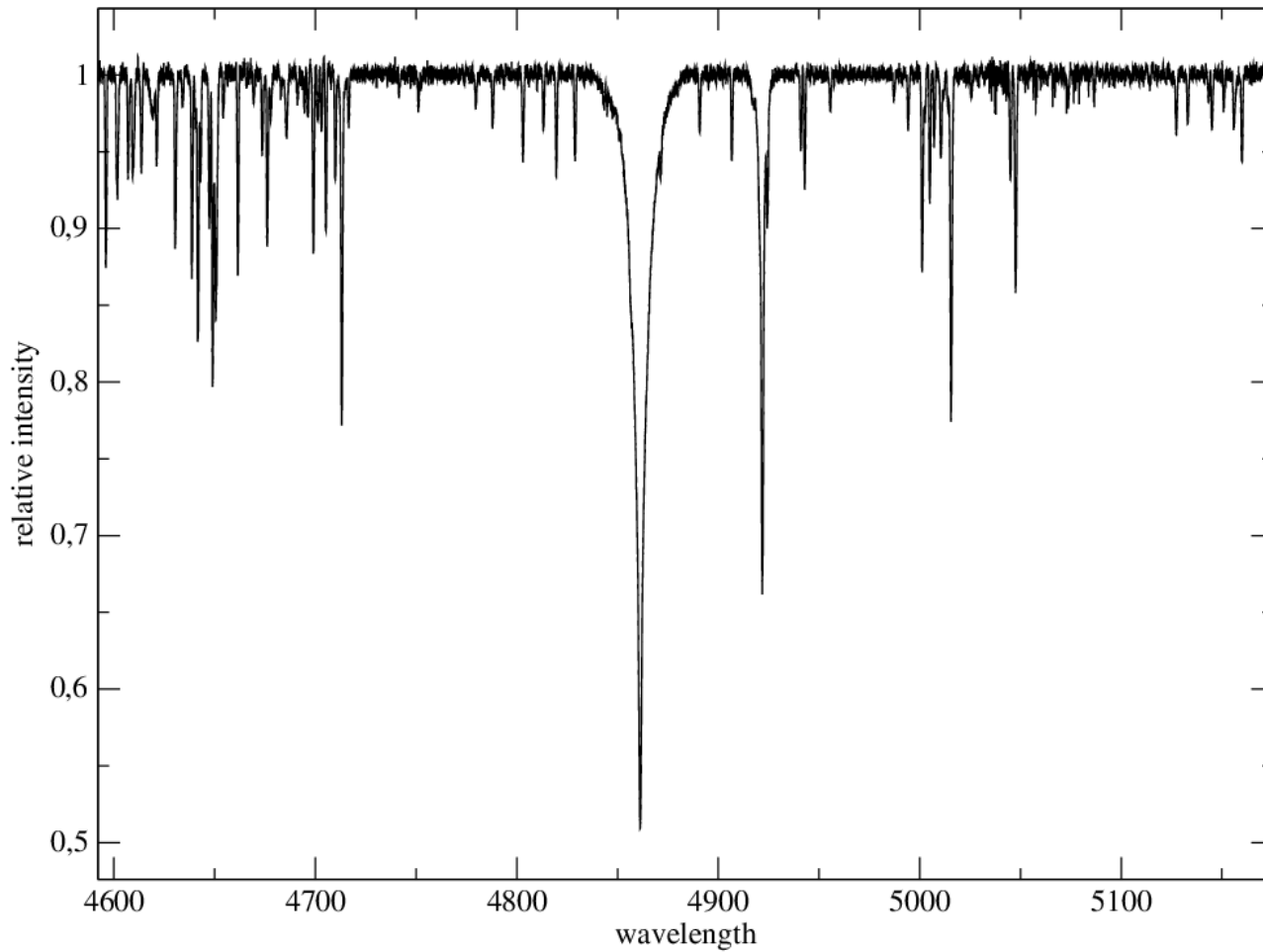
Automatic spectra reduction



old manual scripts (red) vs new automatic reduction (black)



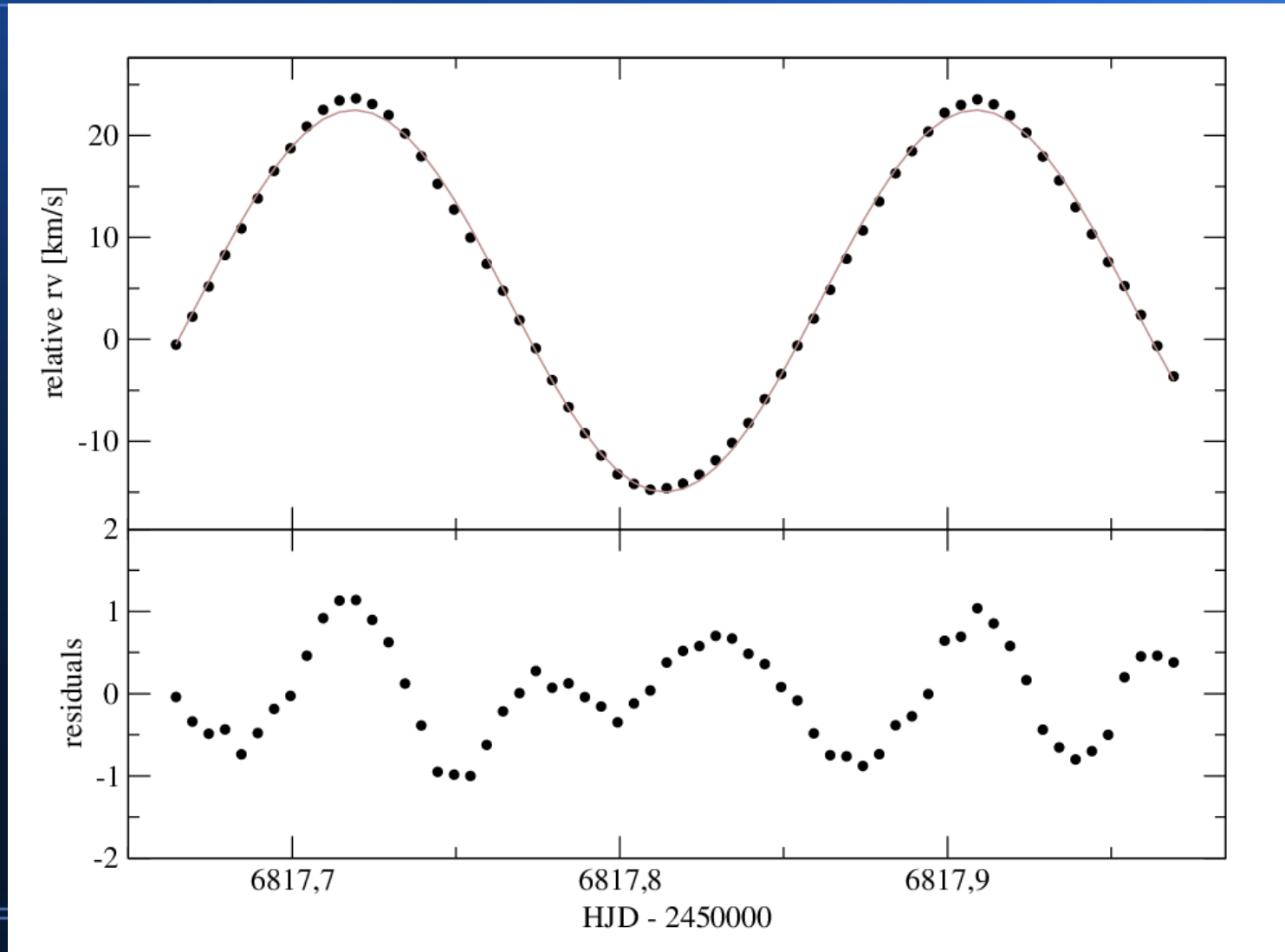
Beta Cep



Average beta Cep spectrum (S/N~170 → 450), PI: Krzysztof Kamiński



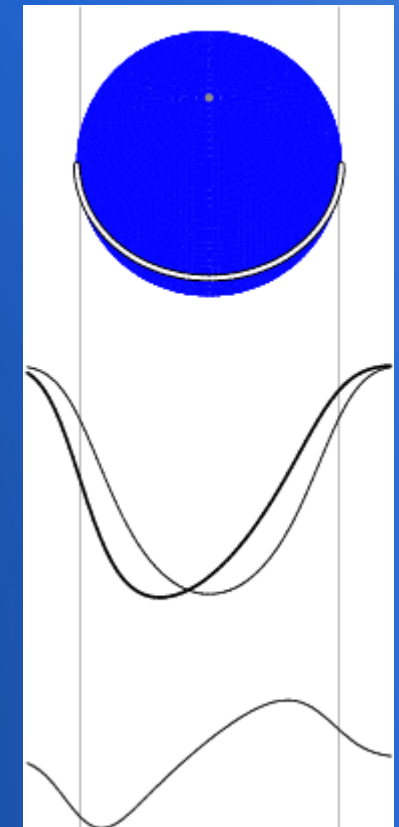
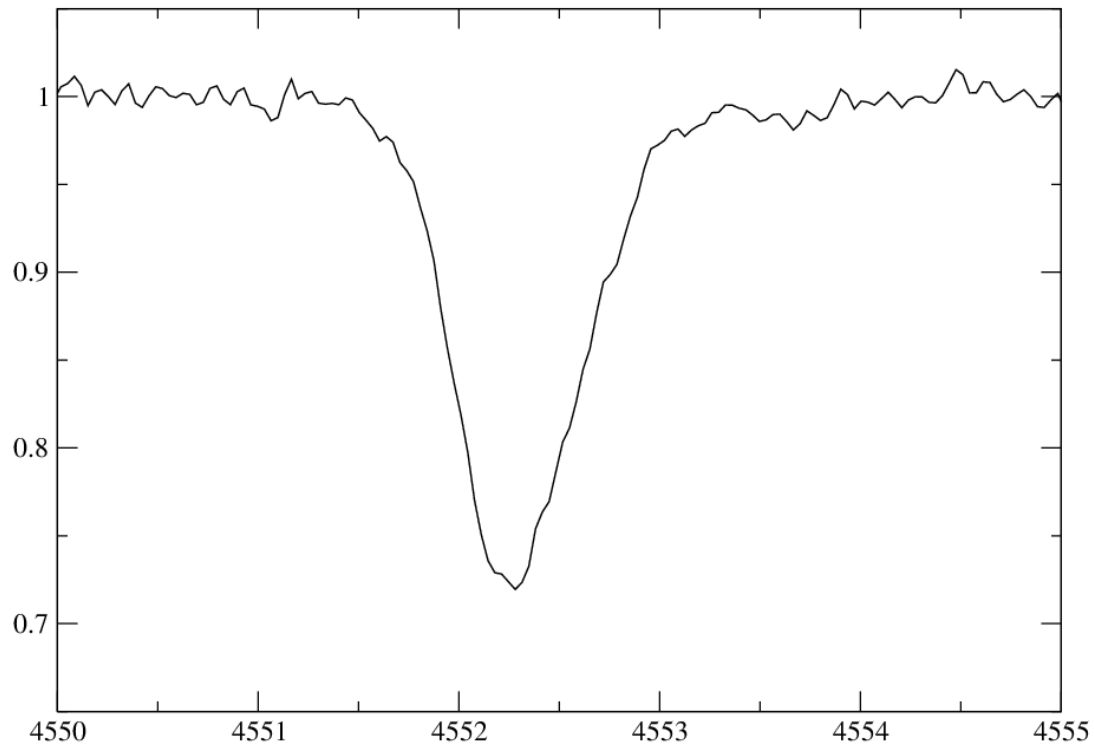
Beta Cep



Radial velocities sin fit and residuals.



Beta Cep



Line variations from radial pulsation.

Beta Cep line profile variations.



Beta Cep

symbol	frequency	SNR	note	Telting et al. (1997)
f1	5.250	71		yes (radial)
f2	5.389	8		yes (non radial)
f3	10.499	9	2f1	yes
f4	15.749	16	3f1	yes
f5	5.065	5	~(f1-f6)	yes (rotation splitting)
f6	0.167	6		yes (rotation)
f7	4.914	7	~(f1-2f6)	yes (rotation splitting)
f8	20.999	11	4f1	yes
f9	5.423	8	~(f1+f6)	yes (rotation splitting)

Radial velocity pulsation frequencies.

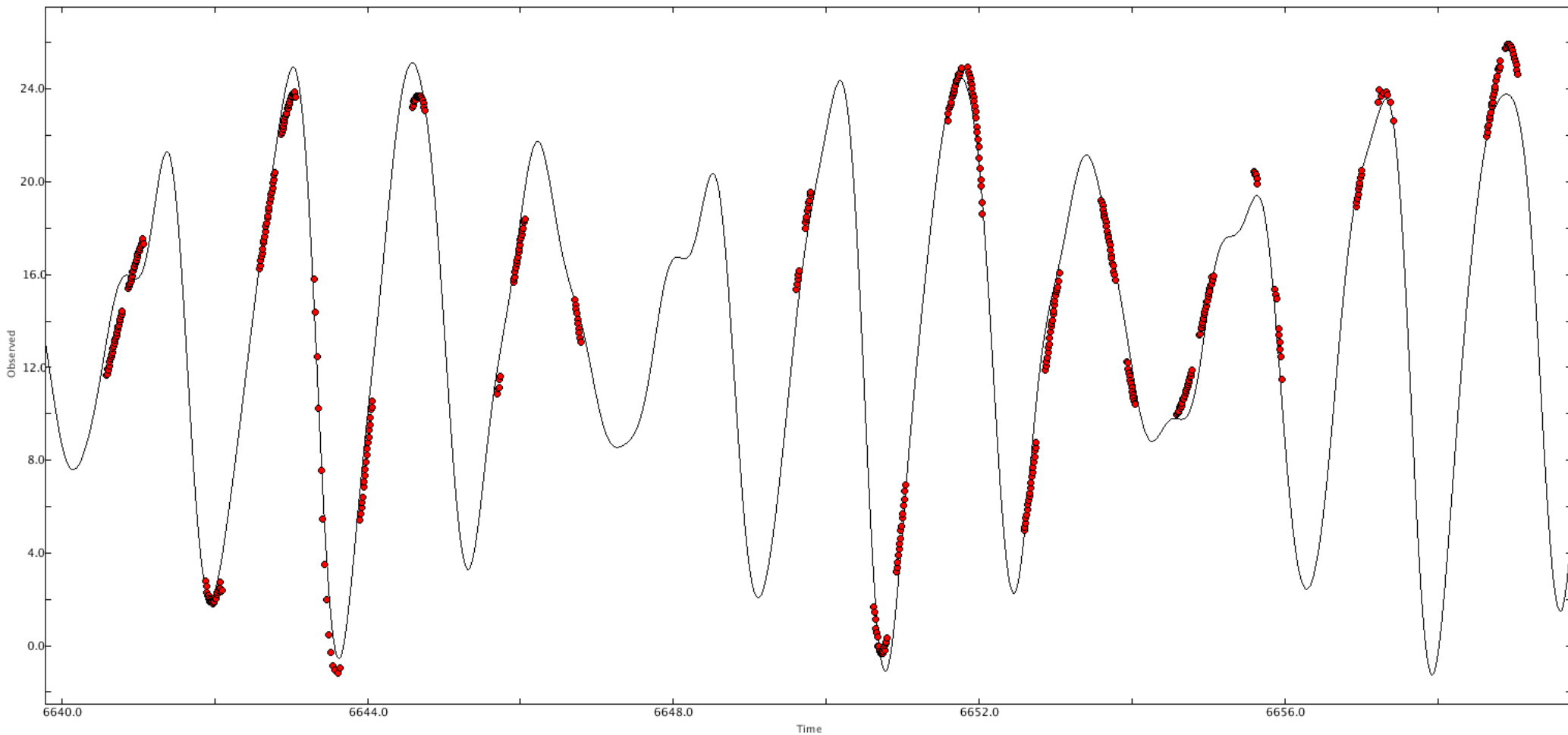


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CO Aur



CO Aur radial velocity variations with a fit using over 30 Fourier terms.

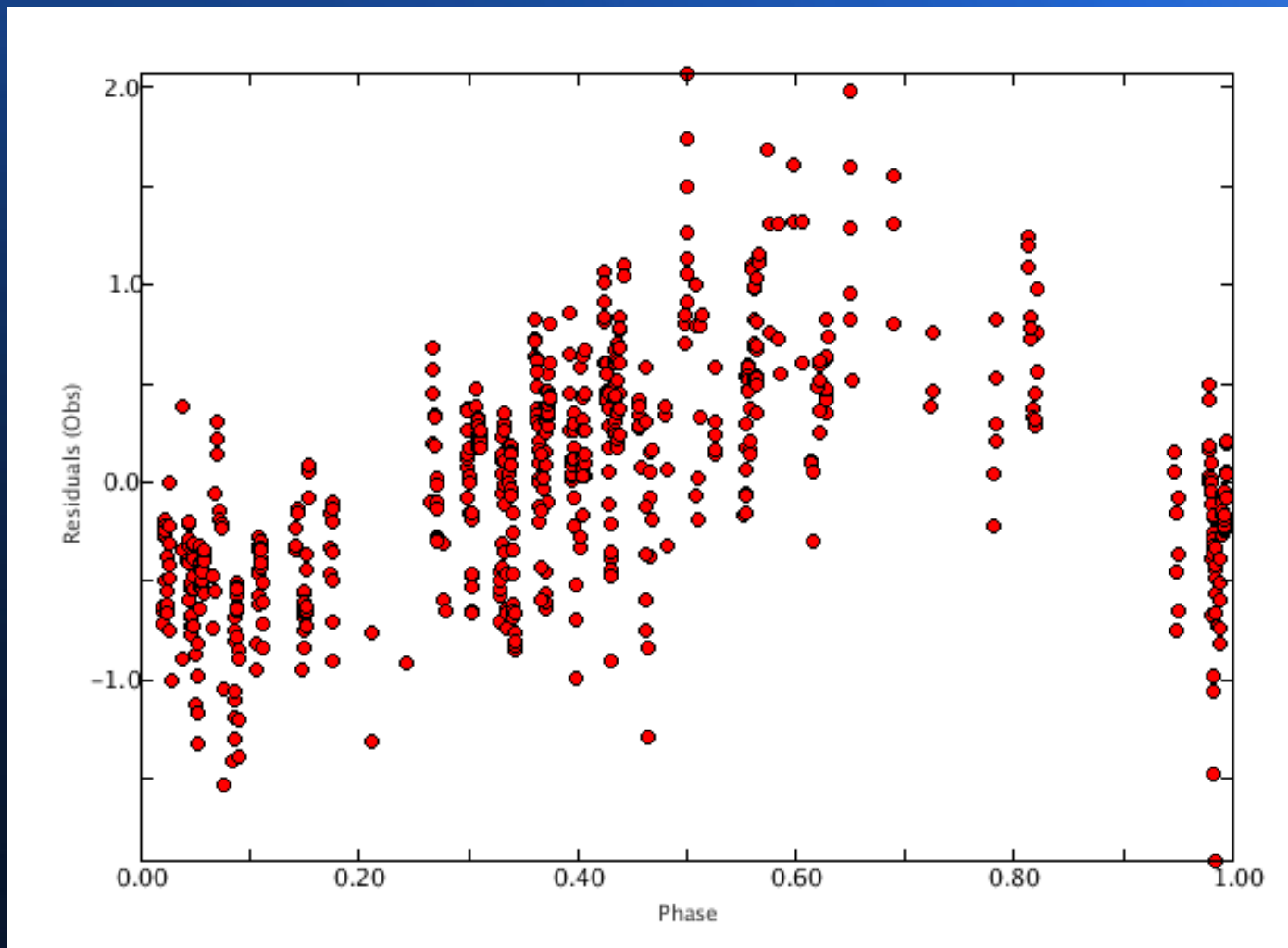


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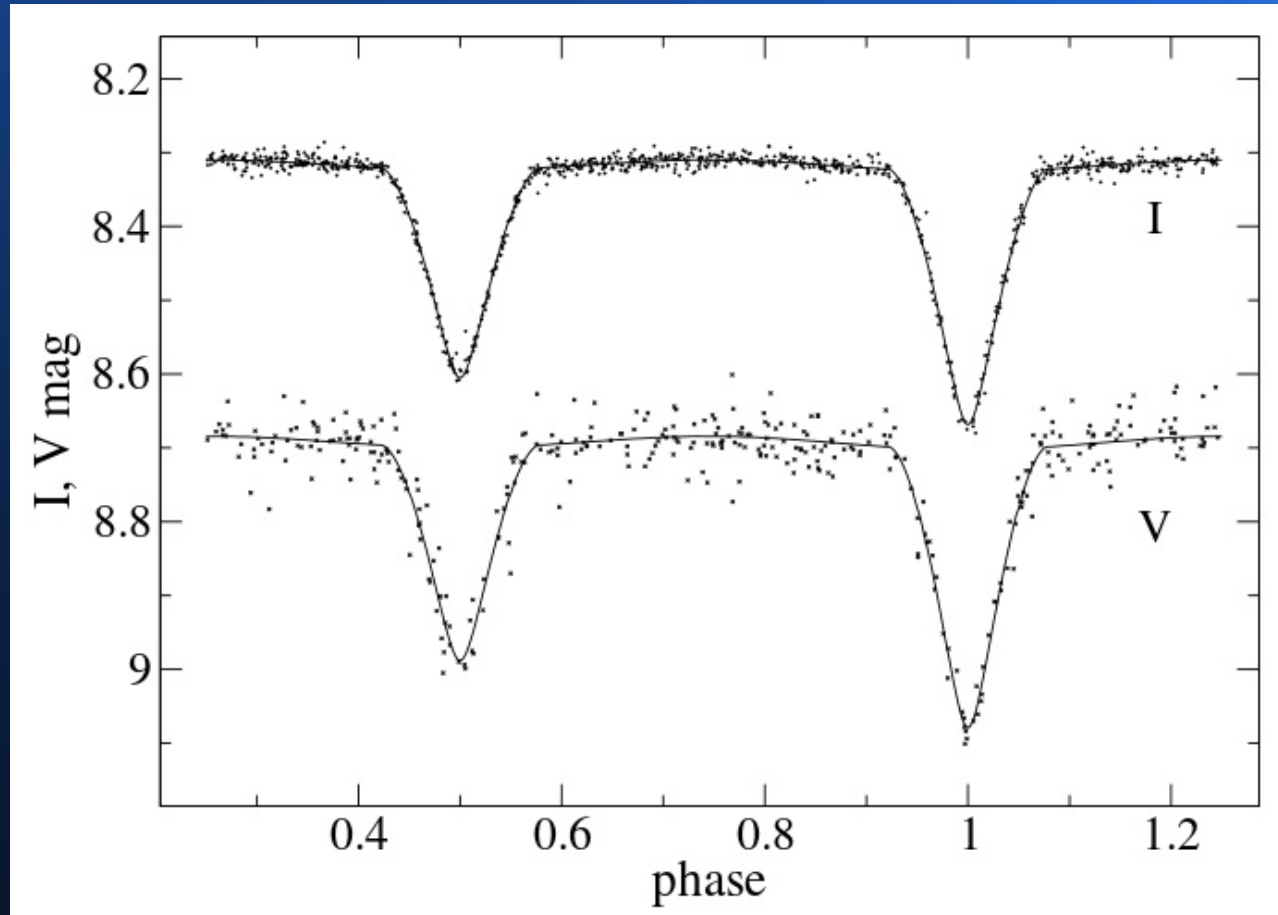
CO Aur



Pulsation residuals, $P = 31.5d$



Eclipsing stars – DY Lyn



Light curve from ASAS data.

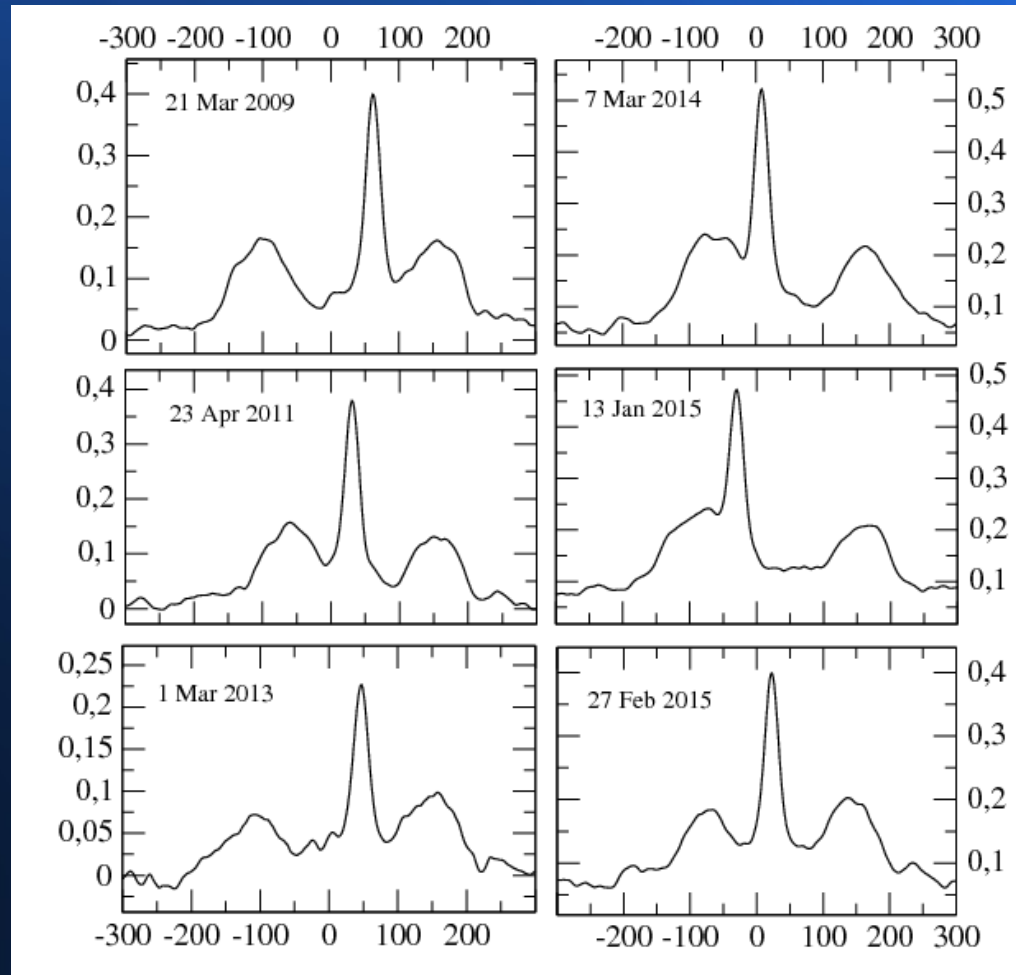


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DY Lyn



Cross correlation function at different moment of time.

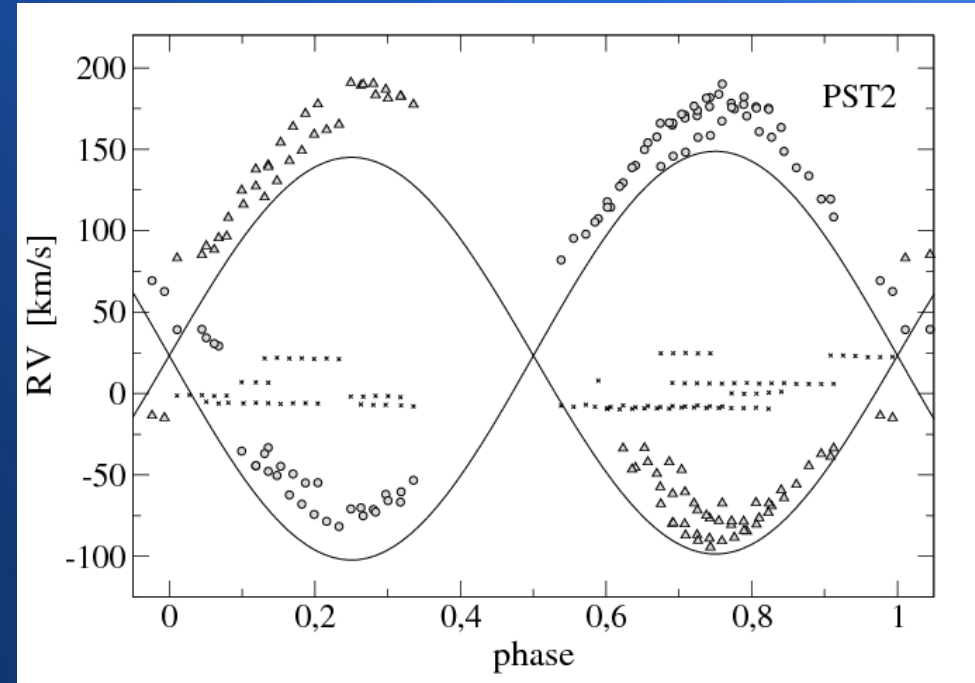
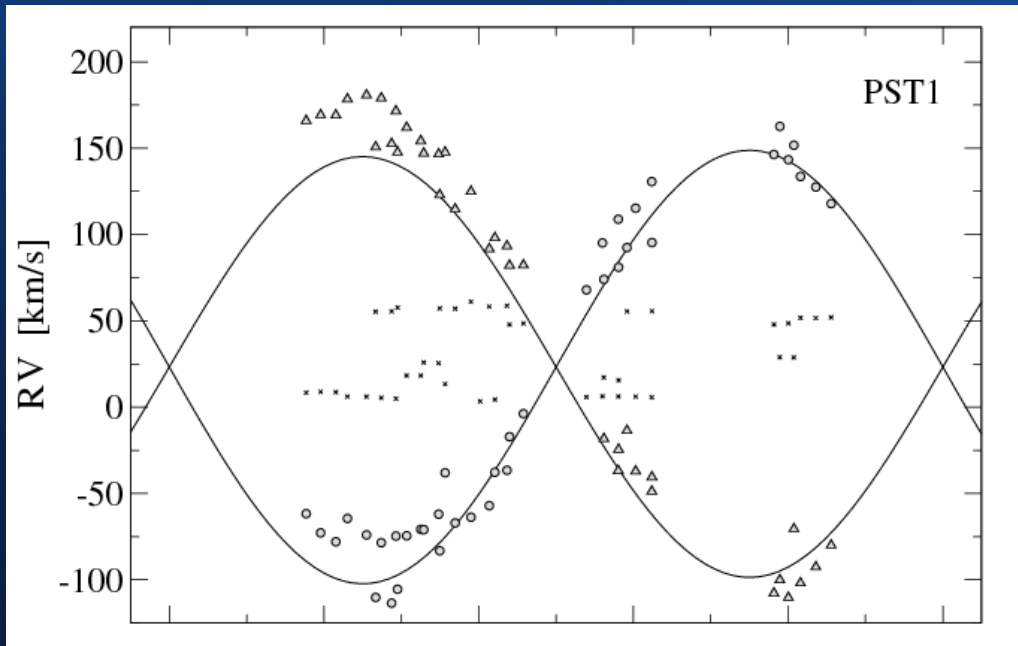


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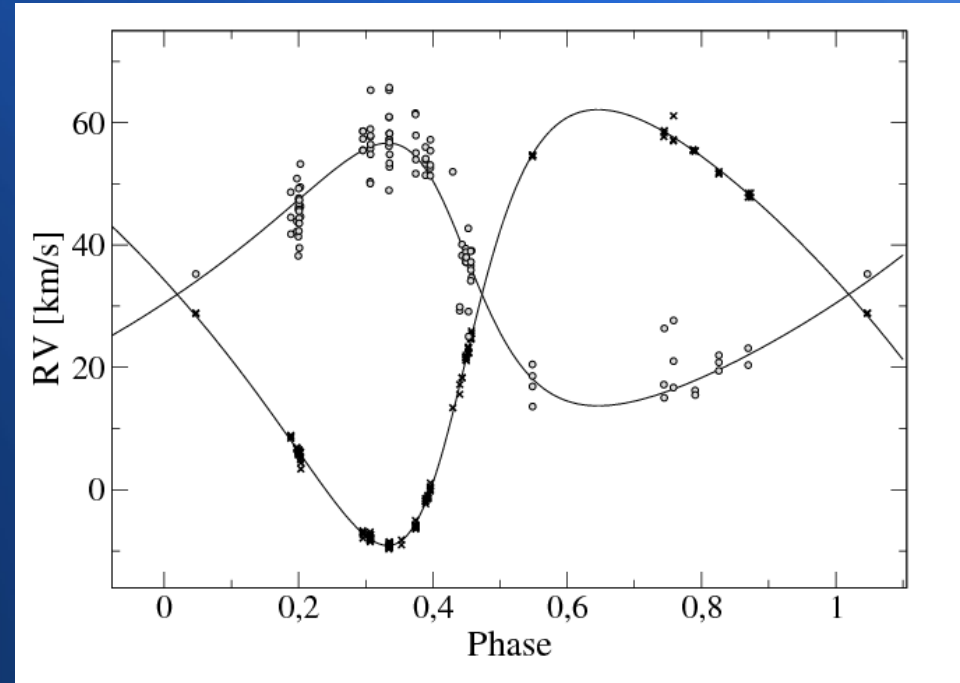
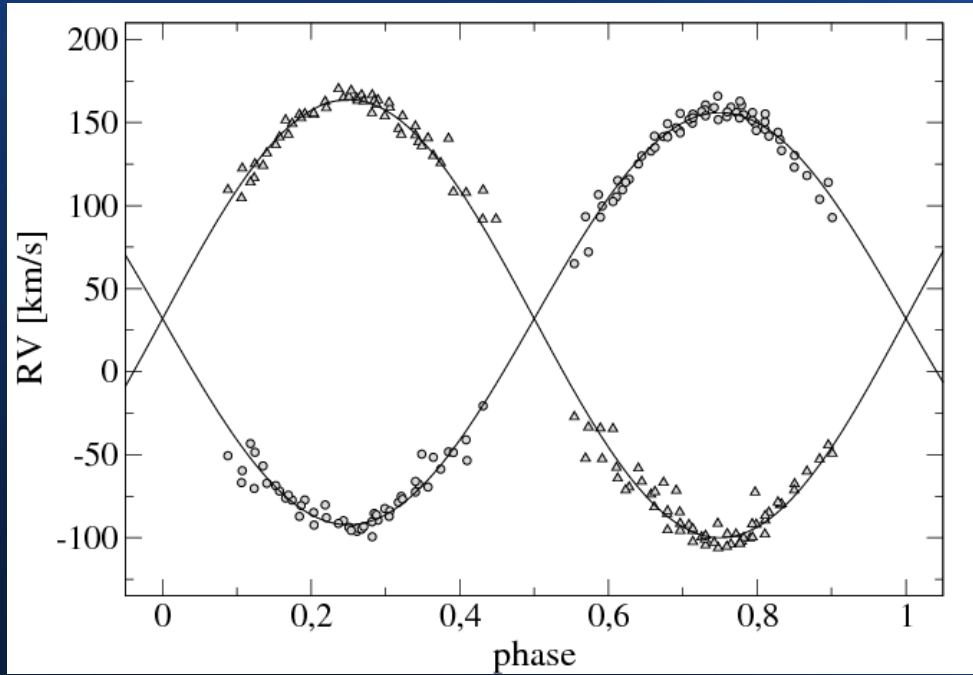
DY Lyn



Phaser radial velocity curves.



DY Lyn



Decoupled and phased radial velocity curves.



Global Astrophysical Telescope System

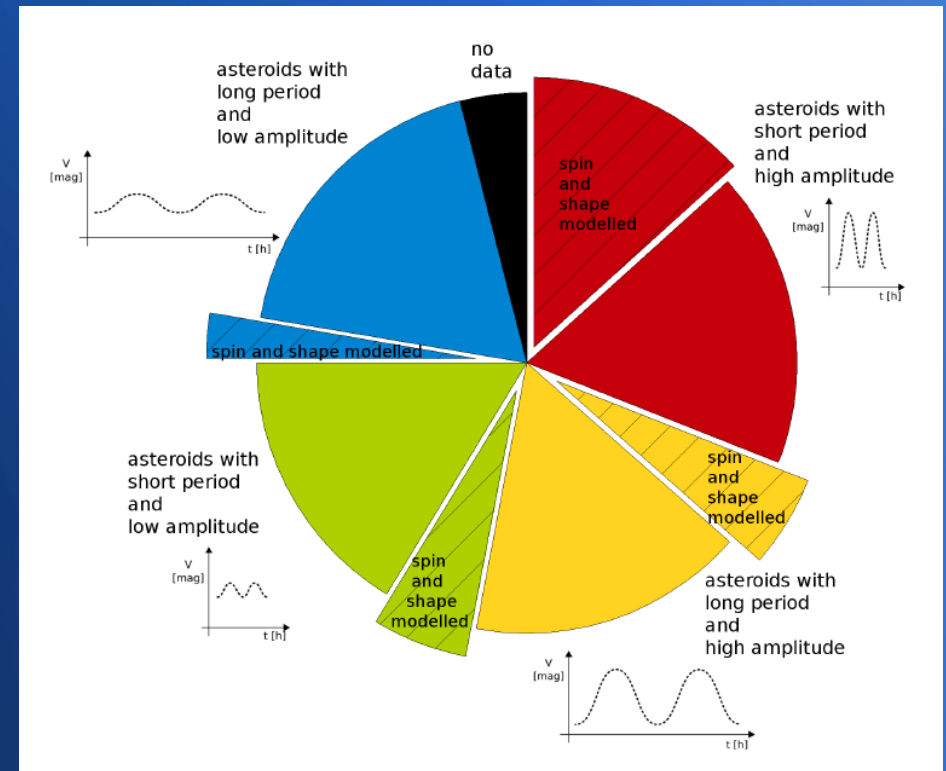
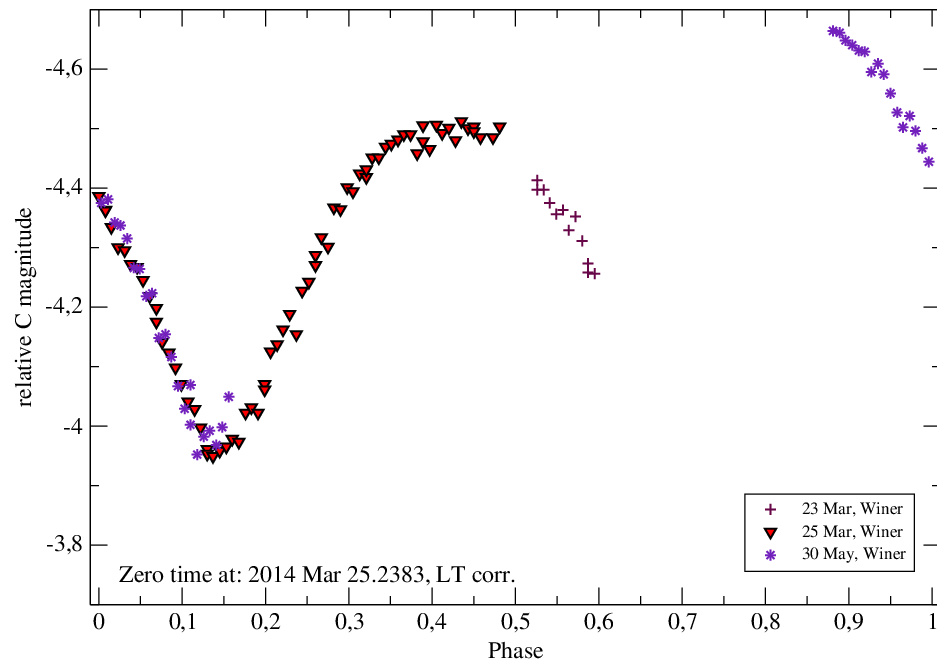
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Main belt asteroids

2022 West

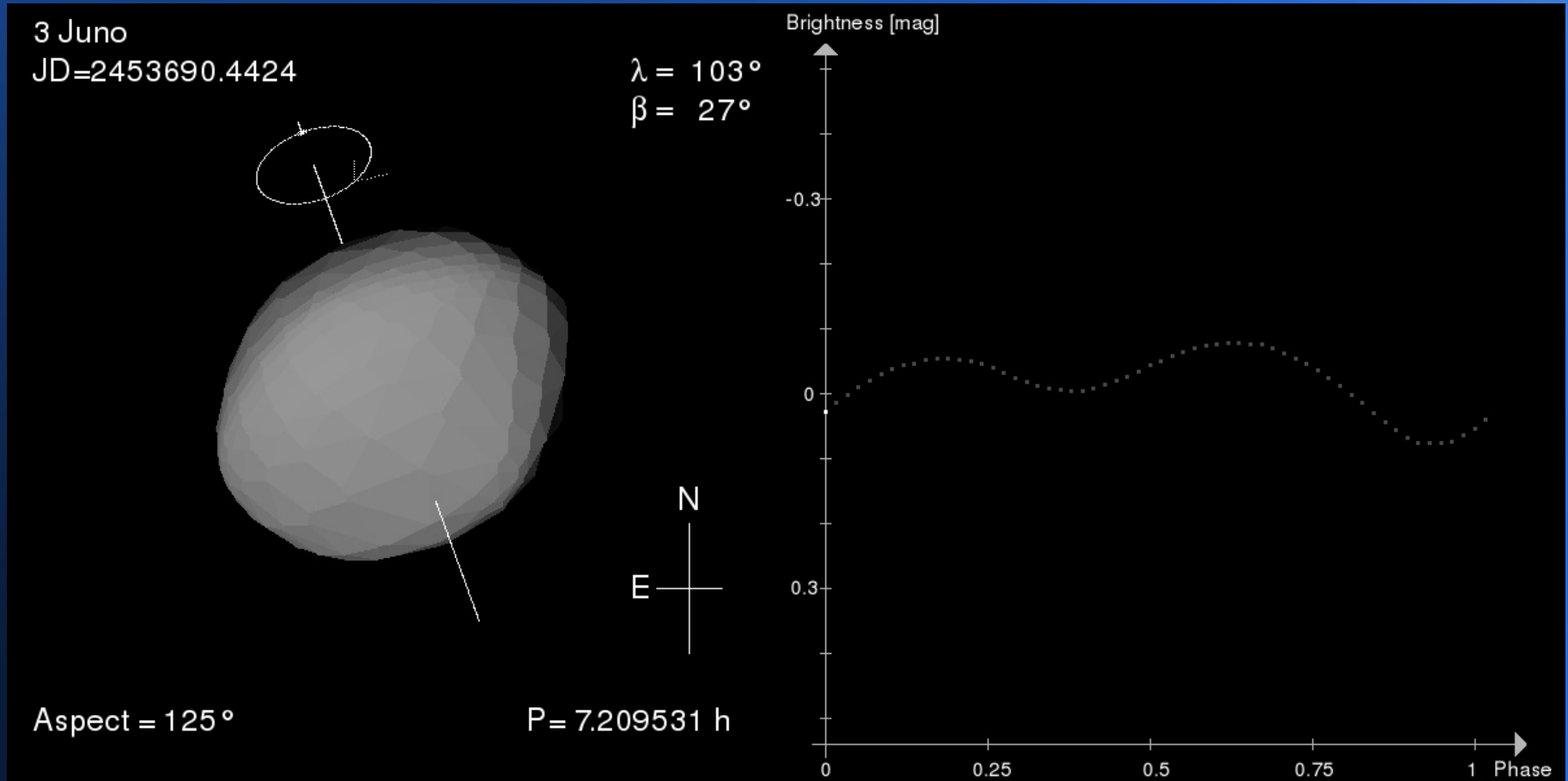
$P = 12.279$ h



PI: prof. UAM dr hab. Anna Marciniak



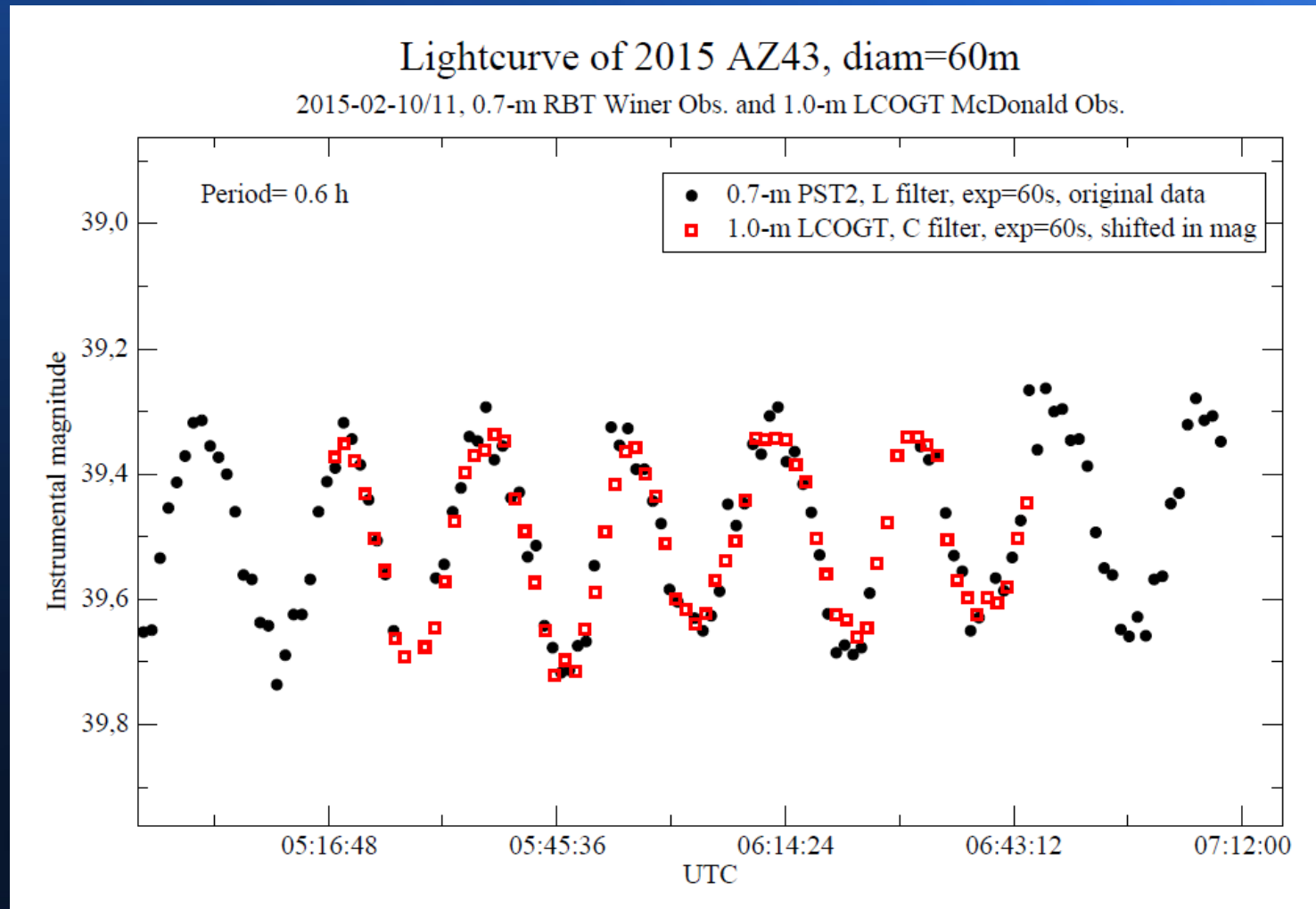
Asteroid shape modeling



Interactive service for asteroid models.

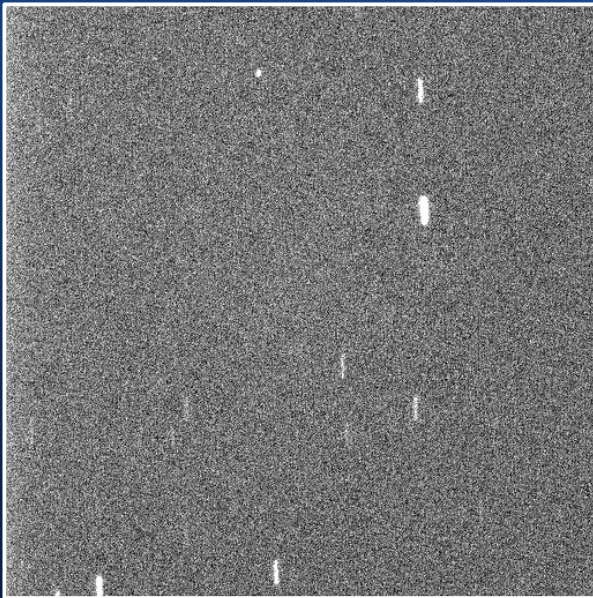


NEA photometry





Earth satellites and space debris



Lageos 1
distance: ~9000km
size: 0.6m
proper motion: 200"/s
brightness: ~13mag
exposure: 0.1s



Popacs 2
distance: ~1000km
size: 0.1m
proper motion: ~1000"/s
brightness: ~12mag
exposure: 0.05s

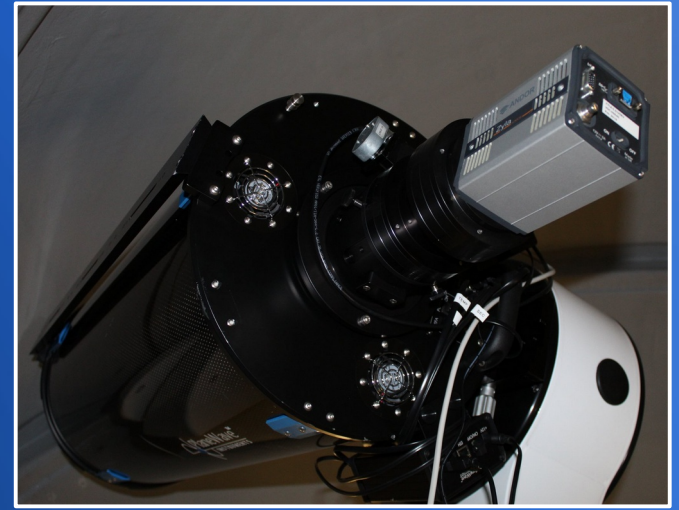
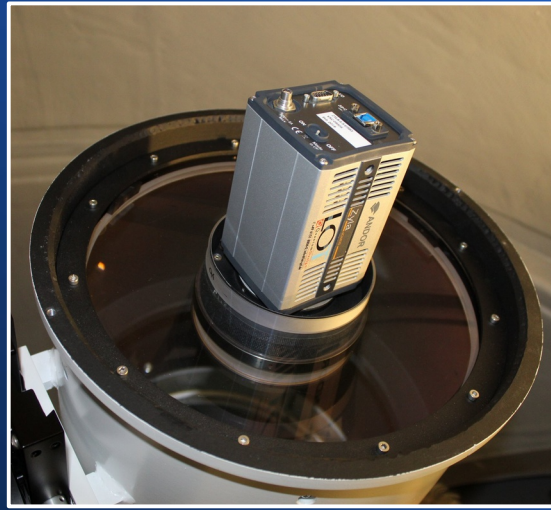


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PST3 – a cluster of 5 telescopes



1x 0.7m f/4.5
2x 0.3m f/1.0
2x 0.32m f/5.3

Poznań Space Surveillance and Tracking Telescope 3 (PST3)

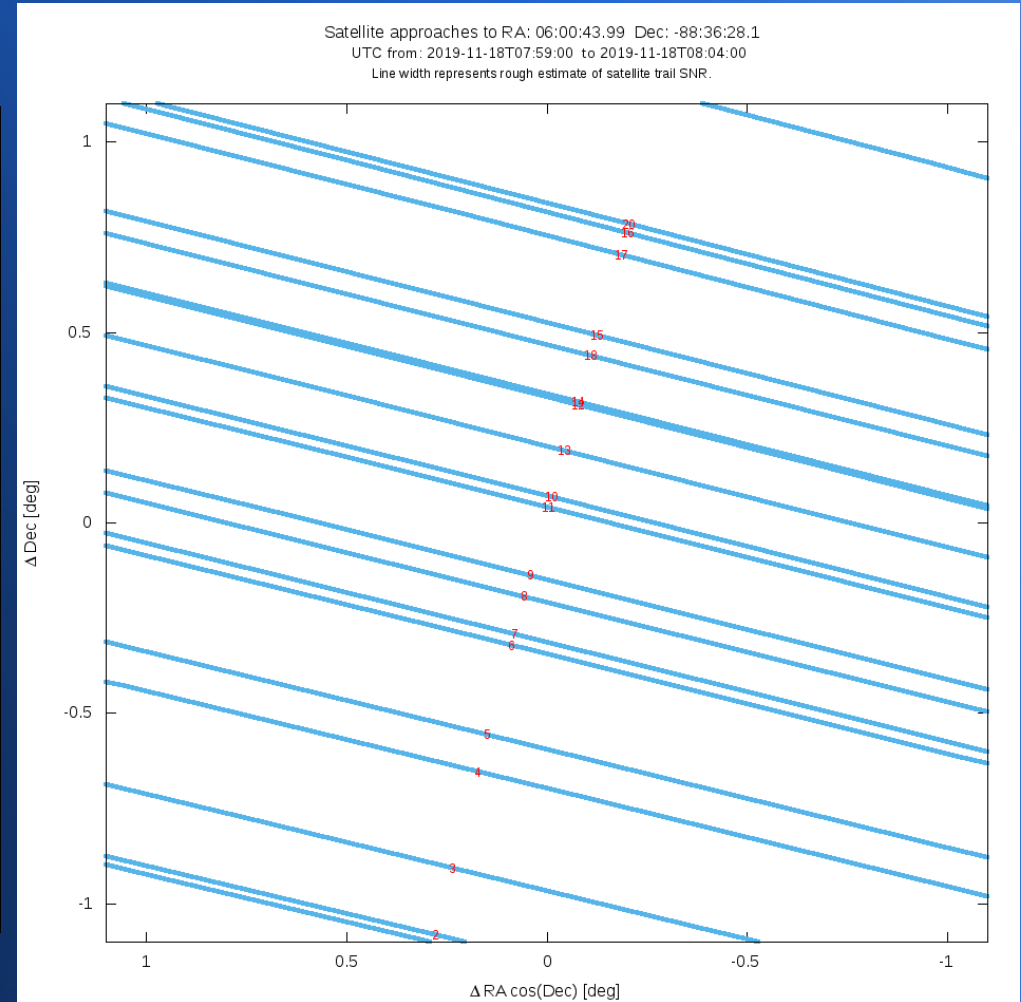
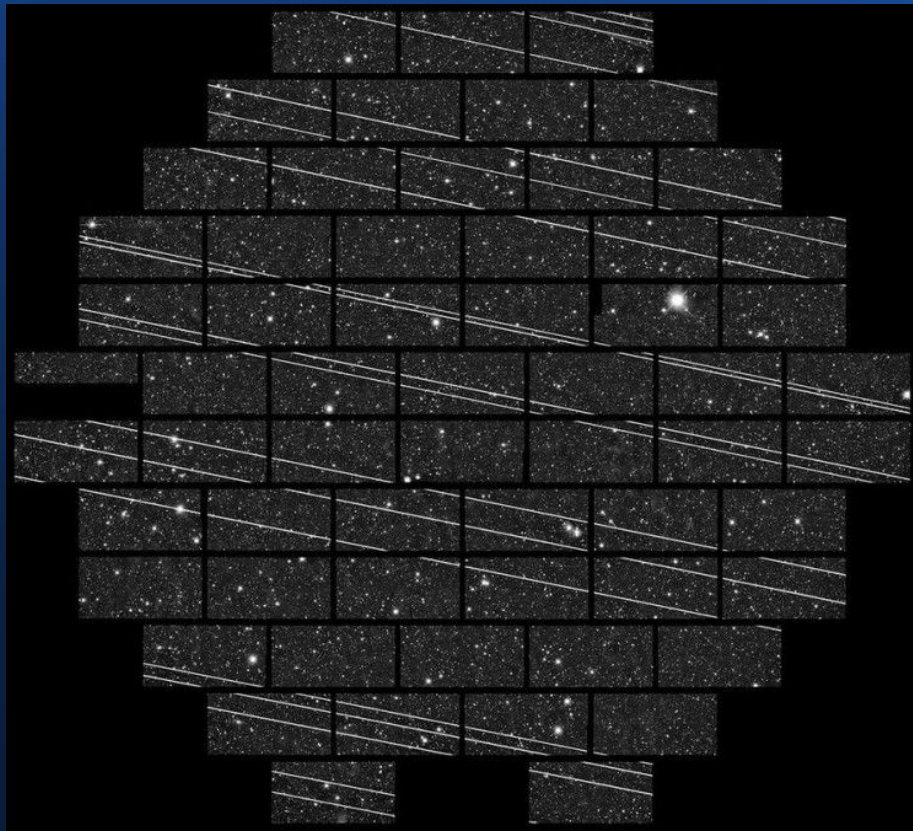


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Earth satellites and space debris



DECam camera on 4m telescope Blanco, CTIO (2019-11-20)

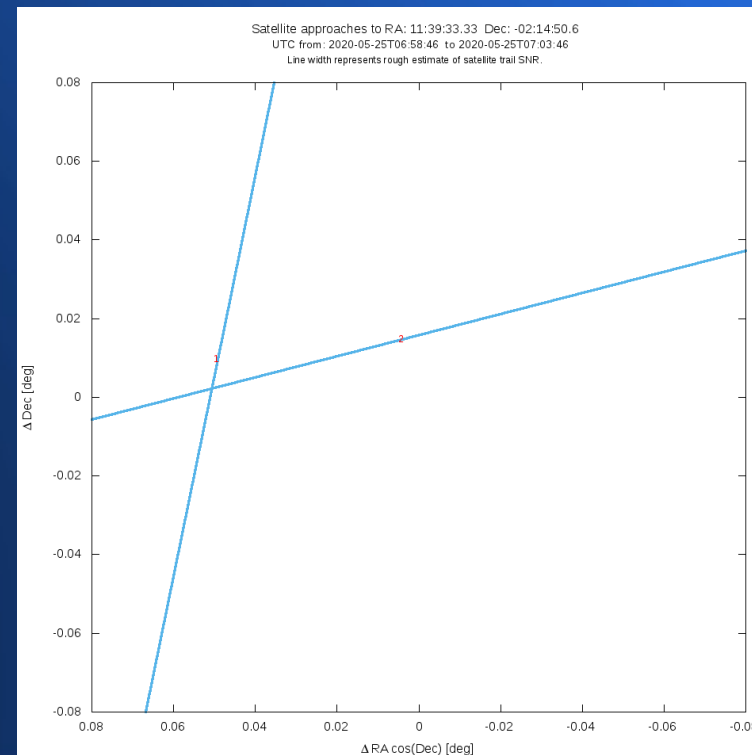


Satellite Trail Predictor

Satellite Trail Predictor

Online service for predicting satellite trails in telescope images and estimating their brightness and SNR.

www.astro.amu.edu.pl/STP



#	no	UTC	NORAD	COSPAR	dist	err	speed	PA	mag	SNR	name
1	2020-05-25T06:59:12.310	25366	98036D	3.0	2.1	383.6	-11.06	+10	19.7	"COSMOS 2355"	
2	2020-05-25T07:02:06.585	21639	91054B	0.9	0.6	15.9	+105.01	+13	42.4	"TDRS 5"	



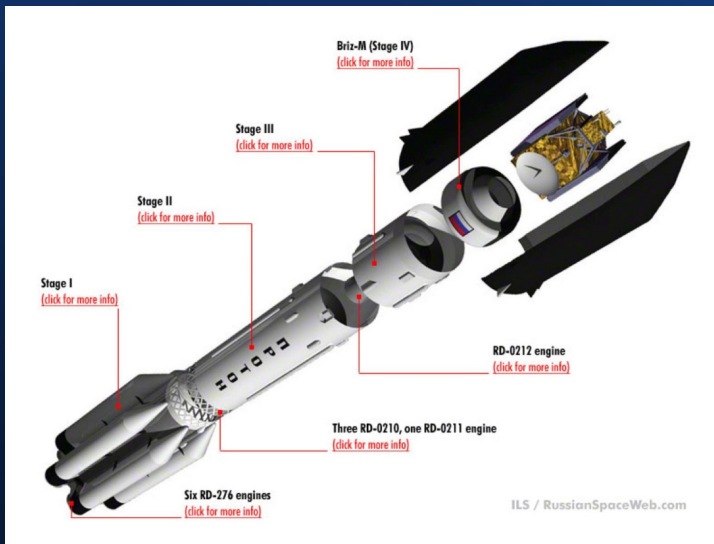
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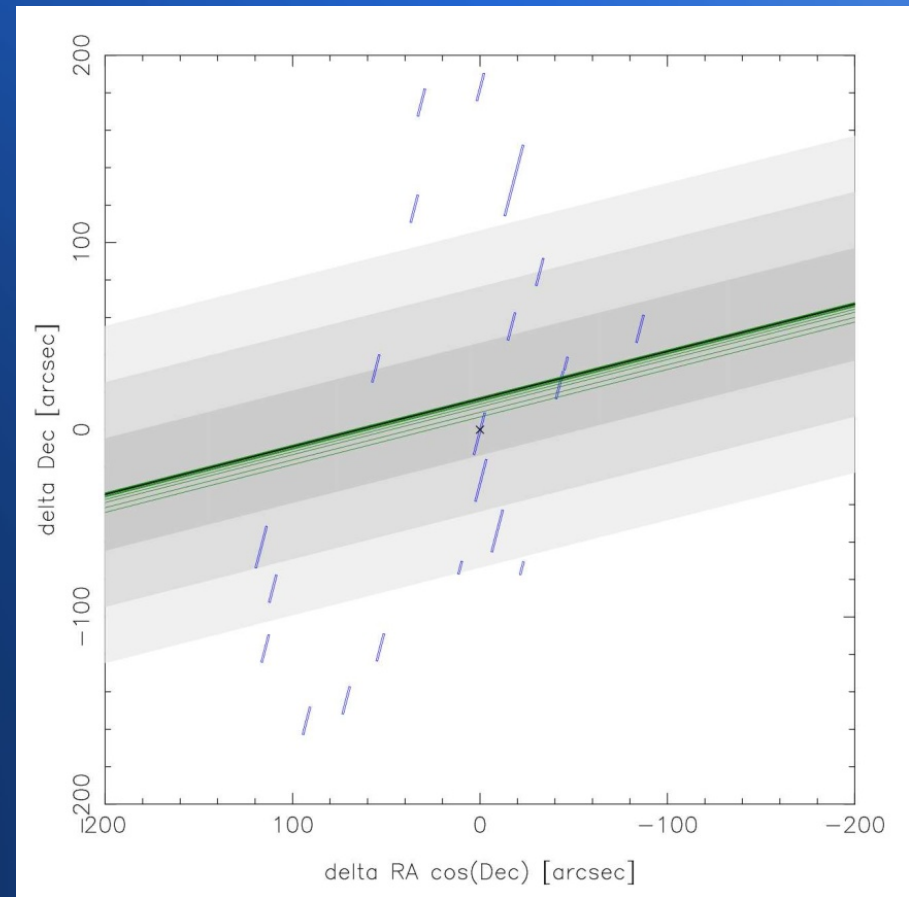


GN-z11-flash

Jiang et al. (2020):
GN-z11-flash - most distant GRB ($z = 10.957$)



Proton rocket with Briz-M stage



Briz-M satellite trail in Keck field of view.

Distance revised by 20 orders of magnitude(!) from $3.6 \cdot 10^{24}$ km to 15 000 km.