

# Gaia-FUN-SSO at the Konkoly Observatory: first results and prospects for future work

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Gaia FUN-SSO workshop  
Paris, 20 September 2012



# In this talk:

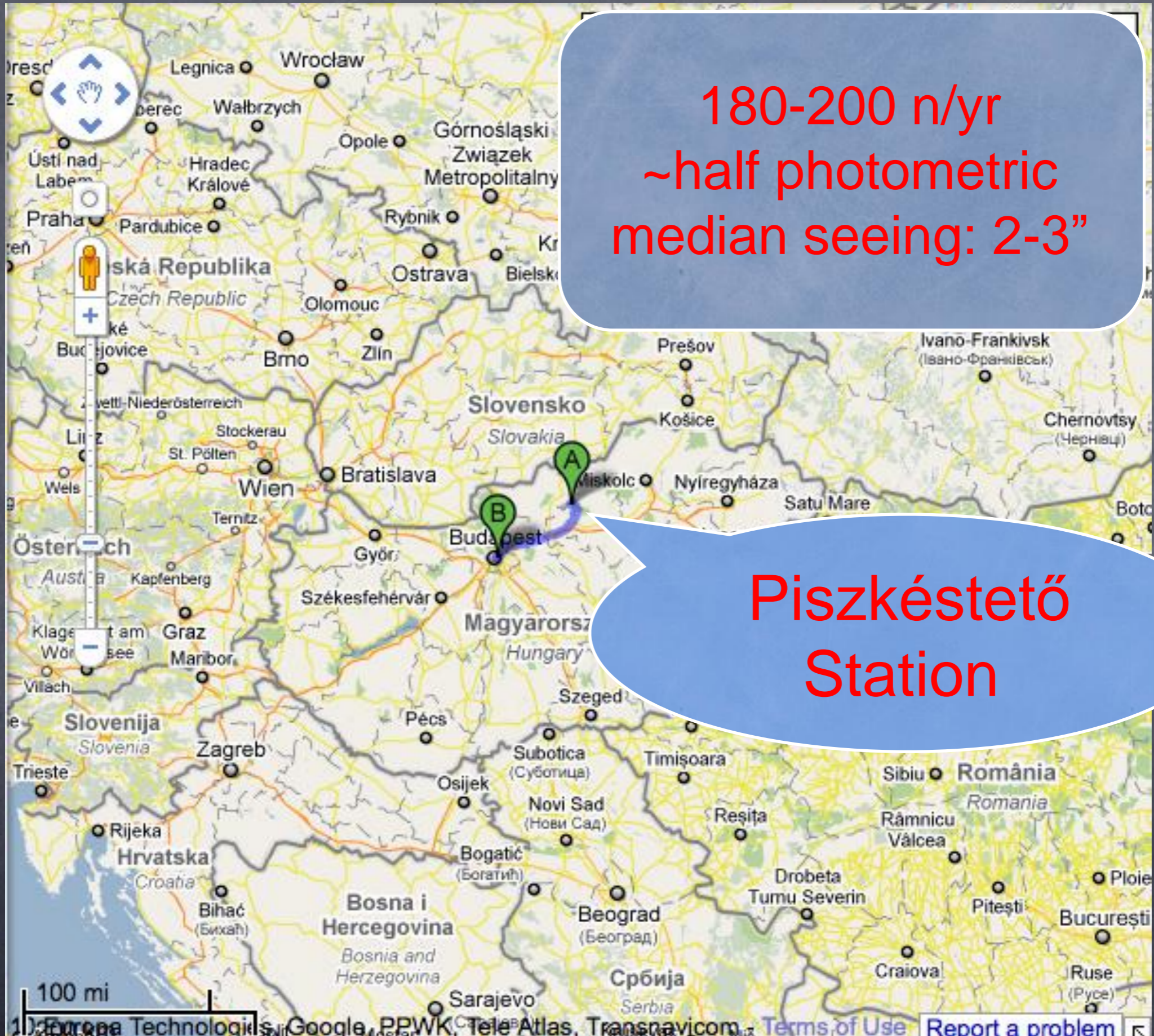
- Introduction to the Konkoly Observatory
- Instruments at the Piszkestető Mountain Station (MPC code 461): recent status and plans in 2012
- Results of Gaia-FUN SSO campaigns:
  - 2005 YU55 campaign
  - TP3522=2012 BS67 campaign
  - 1996 FG3 campaign
  - (99942) Apophis campaign
- Activity in Gaia DPAC CU7

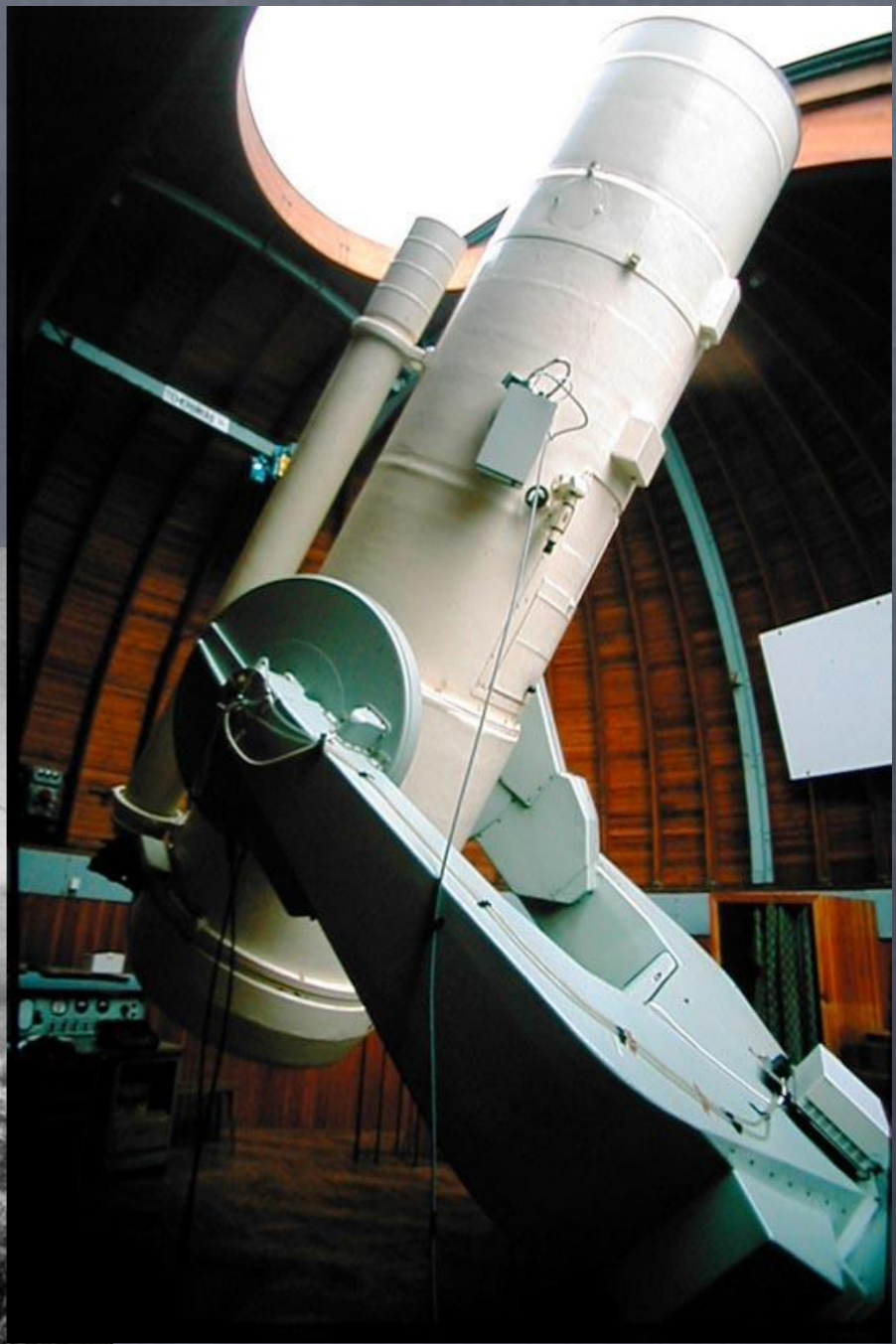
# Research fields at the Konkoly

- ◉ Variable stars:
  - ◉ pulsating stars, asteroseismology (ground-based, Kepler, CoRoT)
  - ◉ stellar activity
  - ◉ eclipsing binaries
- ◉ Interstellar matter, star formation (KISAG)
- ◉ **Small bodies of the Solar System (ground-based astrometry, comets with HST/Spitzer, TNOs with Herschel)**
- ◉ Exoplanets
- ◉ Gamma-ray bursts

180-200 n/yr  
~half photometric  
median seeing: 2-3"

Piszkéstető  
Station





# The 60/90/180 cm Schmidt telescope

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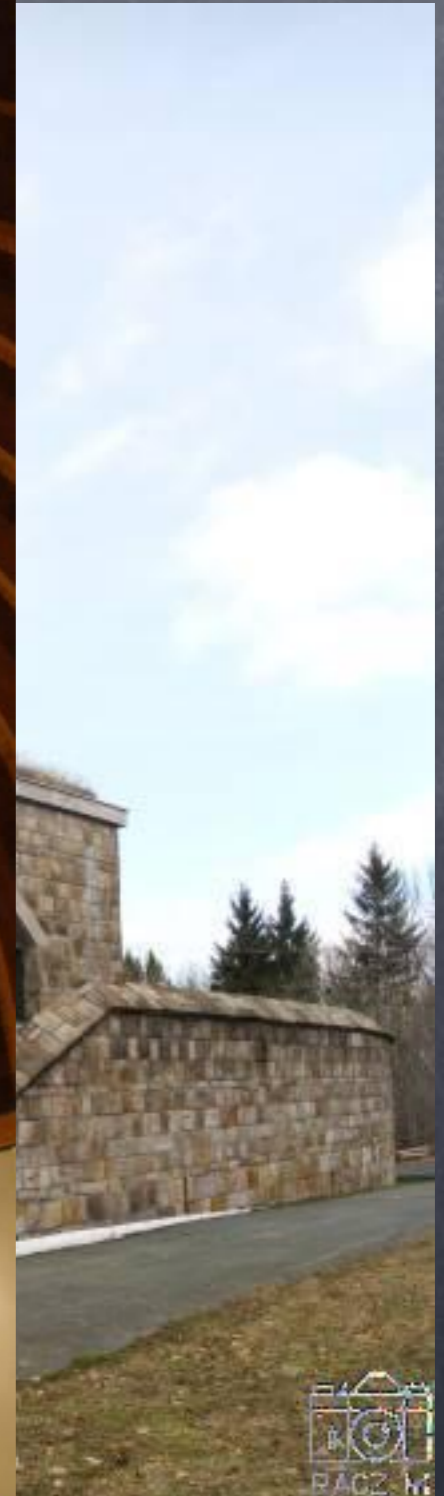


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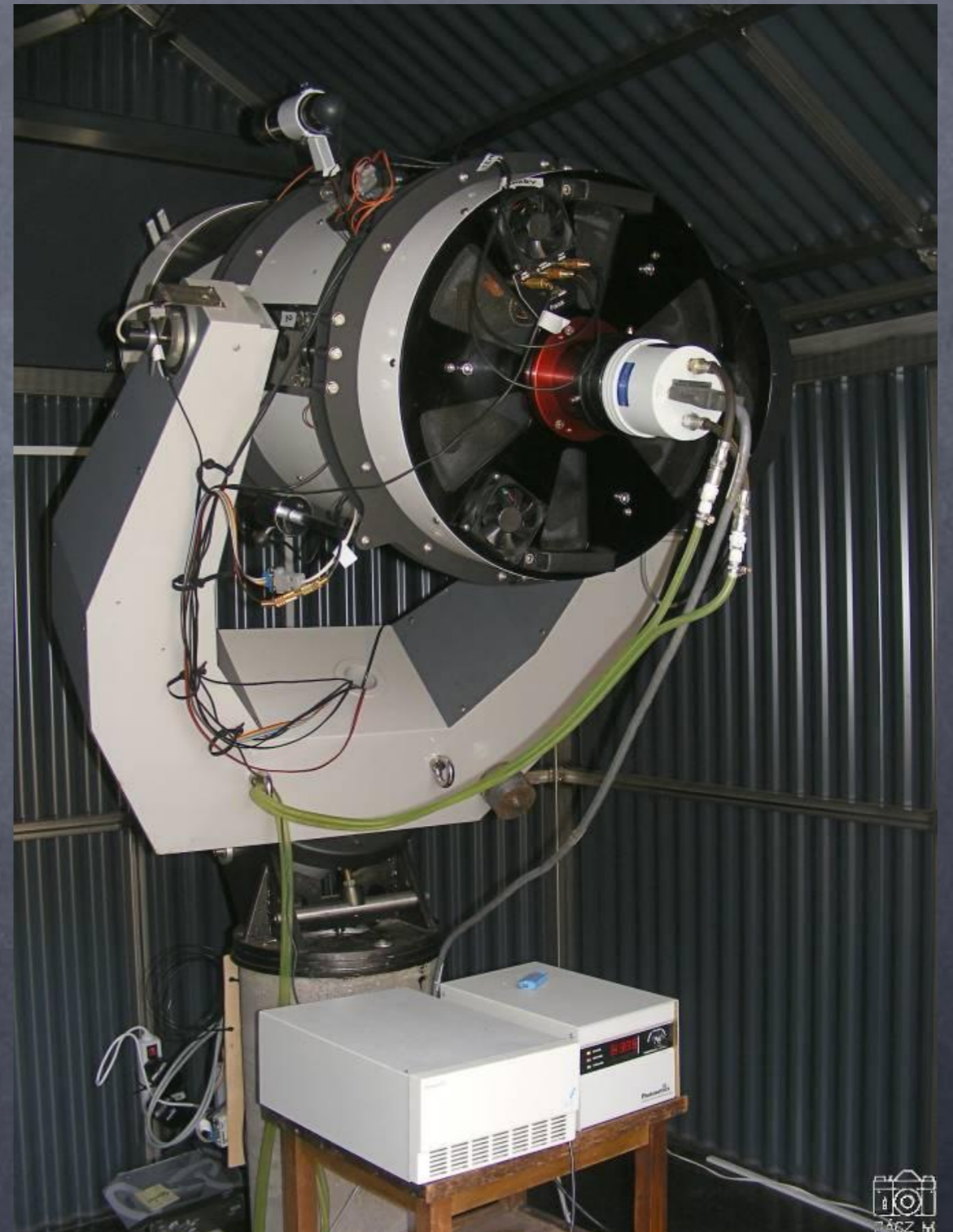


# 1,02-m Ritchey-Chrétien Telescope



# 0,40-m Cassegrain Telescope

- ◉ Installed in 2010
- ◉ FLI ML8300 3326x2504 pixels
- ◉ 60% QE
- ◉ 44'x33' FOV





# (308635) 2005 YU55 campaign

	date	mag.	motion	tel.	exp. time	num. of positions	residuals in arcsec	
	2011.11.09. Dec	11.5 R	44"/min	60S	3 sec	36	0.3" RA	0.1"
	2011.11.12.	14.5 R	2.7	60S	60 sec	12	0.3" RA	0.4" Dec
	2011.11.15.	16.0 R	0.9	60S	90 sec	9	0.2" RA	0.3" Dec
	2011.11.17.	16.5 R	0.6	60S	90 sec	3	0.1" RA	0.3" Dec
	2011.11.22.	17.8 R	0.3	60S	120 sec	3	0.2" RA	0.4" Dec
	2011.11.23.	17.9 R	0.3	60S	120 sec	3	0.2" RA	0.4" Dec
	2011.11.27.	18.7 R	0.3	60S	120 sec	2	0.5" RA	0.5" Dec
	2011.11.28.	18.9 R	0.3	60S	120 sec	2	0.2" RA	0.3" Dec
	2011.11.29.	19.0 R	0.3	60S	120 sec	2	0.2" RA	0.4" Dec
	2011.11.30.	19.0 R	0.3	60S	120 sec	3	0.3" RA	0.4" Dec
	2011.12.02.	19.2 R	0.3	102RC	120 sec	4	0.1" RA	0.3" Dec

# (308635) 2005 YU55 campaign

## summary

- 👁 11 nights
- 👁 24 day arc of the orbit
- 👁 79 observations
- 👁 RMS error is  $0.237''$
- 👁 5 observers



# TP3522=2012 BS67 campaign

2012.01.25. 19.5 R 0.6"/min 60S 150 sec 3 0.3" RA 0.7"  
Dec

TP3522

Perihelion 2012 Mar 22.56993 TT

Epoch 2012 Jan 25.0 TT = JDT 2455951.5

Sarneczky

M 347.91178

(2000.0)

P

Q

n 0.20997456

Peri. 48.10110

-0.95443062

-0.19227291

a 2.80344212

Node 119.62180

+0.12919931

-0.95562069

e 0.3003634

Incl. 15.22163

+0.26901621

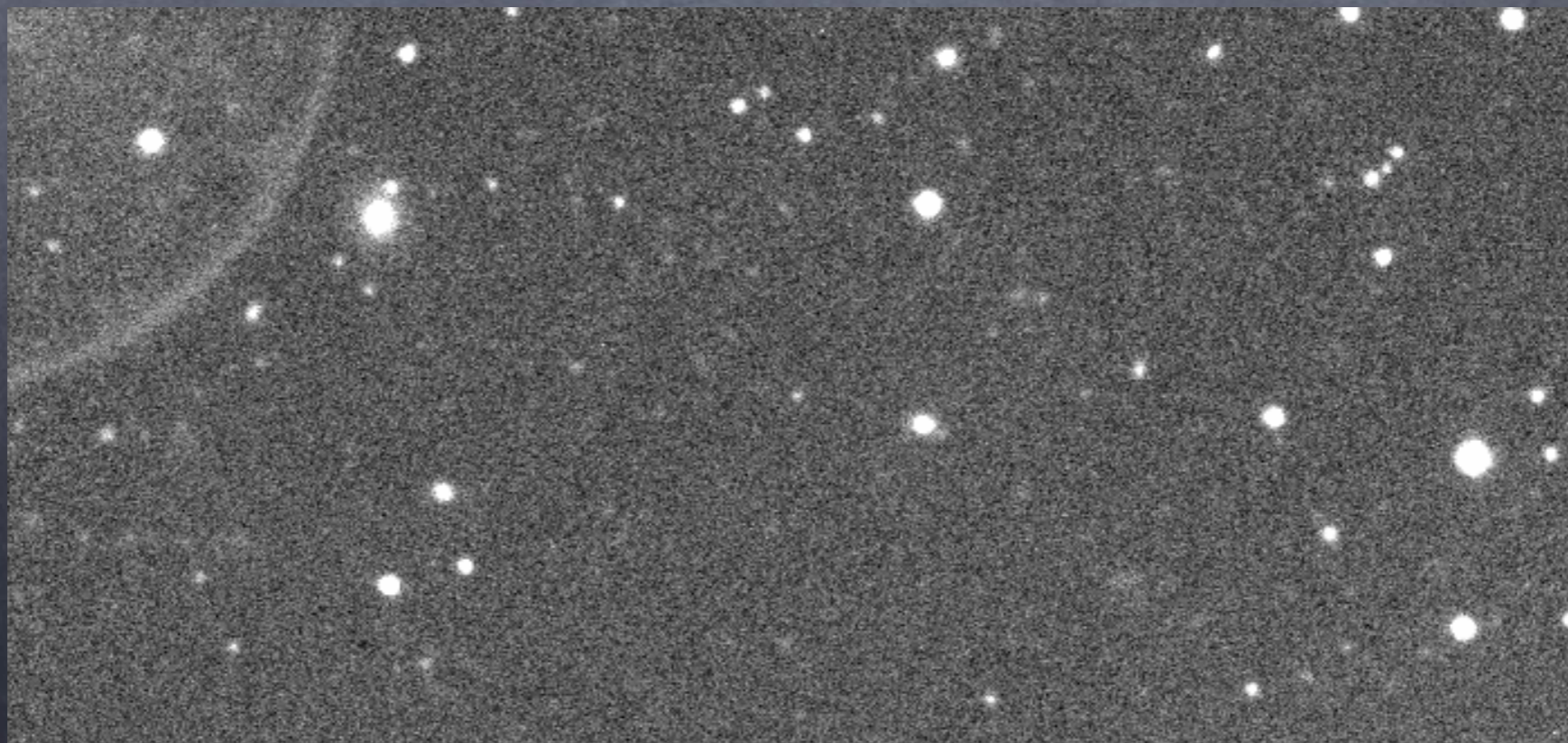
-0.22320443

P 4.69

H 17.1

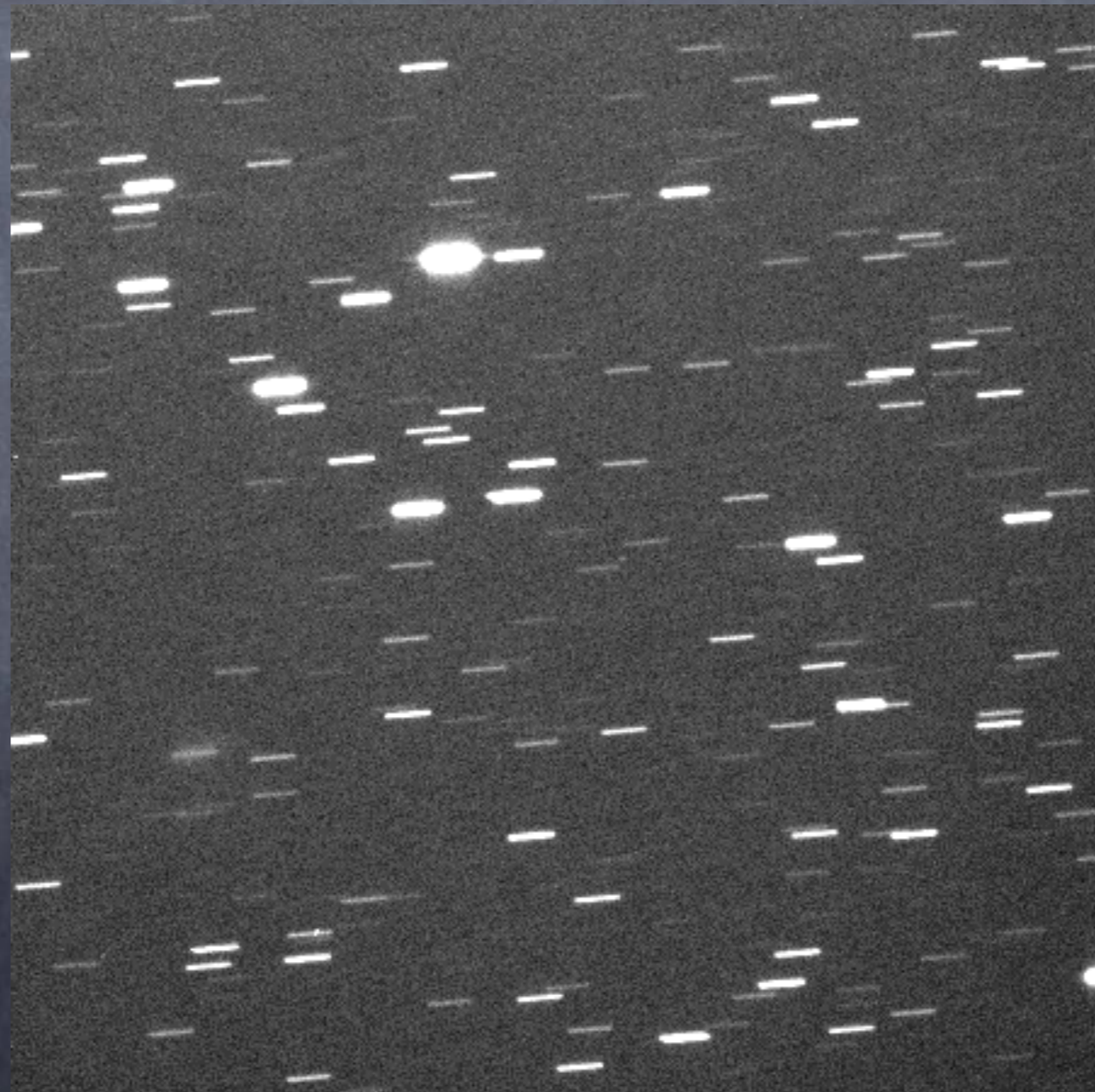
G 0.15

From 35 observations 2012 Jan. 17-25; RMS error 0.473 arcseconds



# (175706) 1996 FG3 campaign

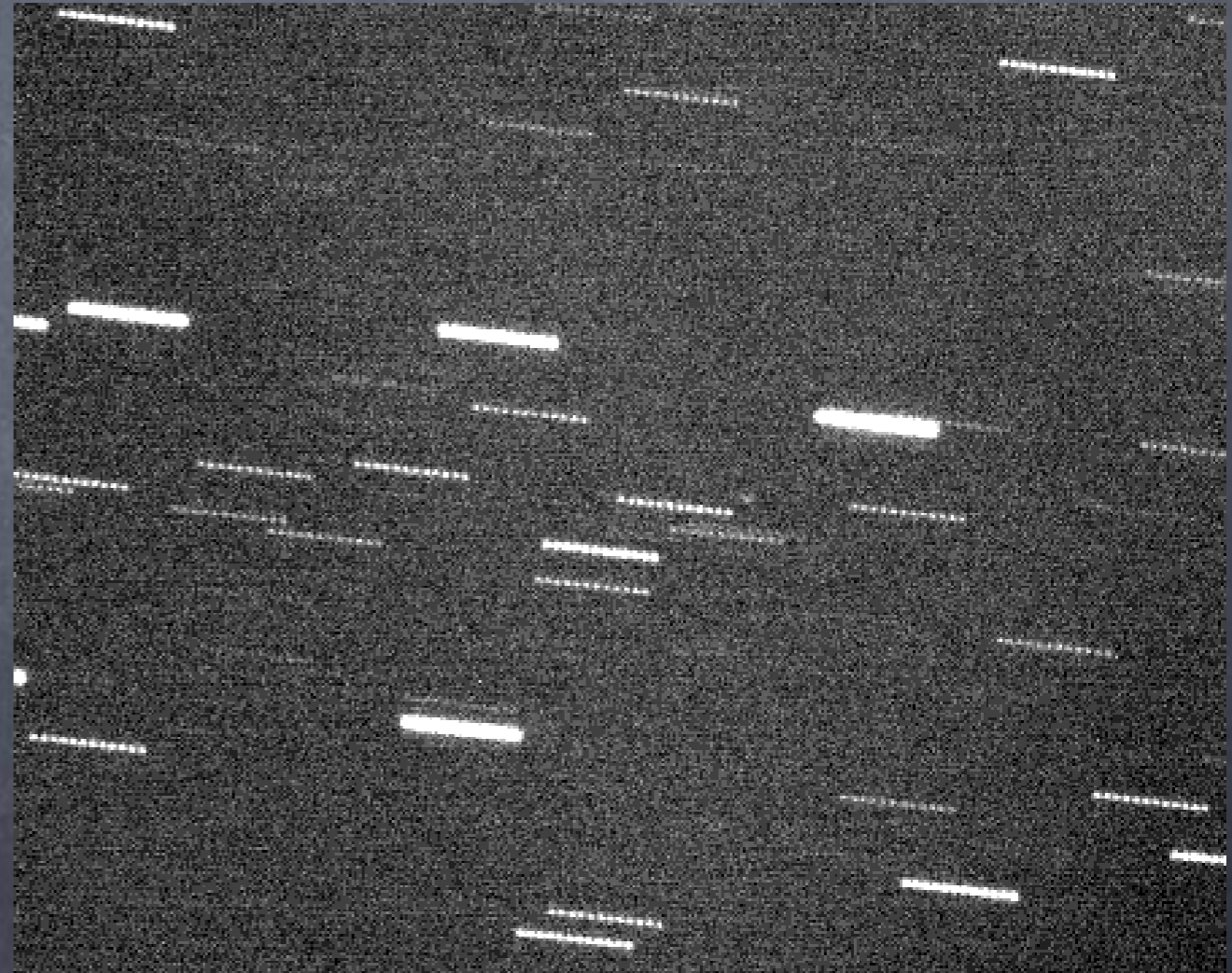
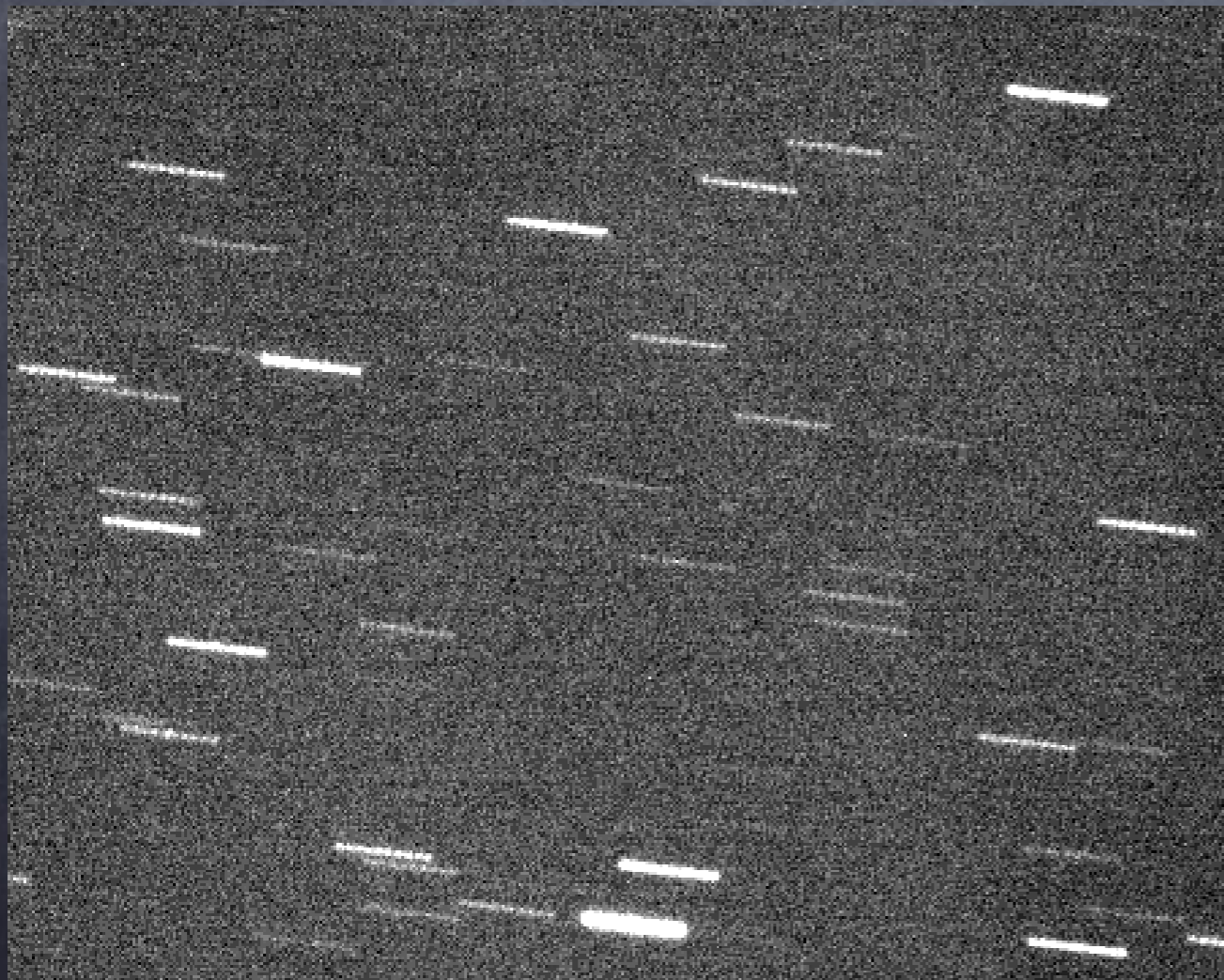
2012.03.23. 20.1 R 1.1"/min 102RC 10x60 sec 4 0.1" RA 0.2"  
Dec



# (99942) Apophis campaign

2012.03.23. 20.8 R 2.2"/min 102RC 10x60 sec 3 0.4" RA 0.4"  
Dec

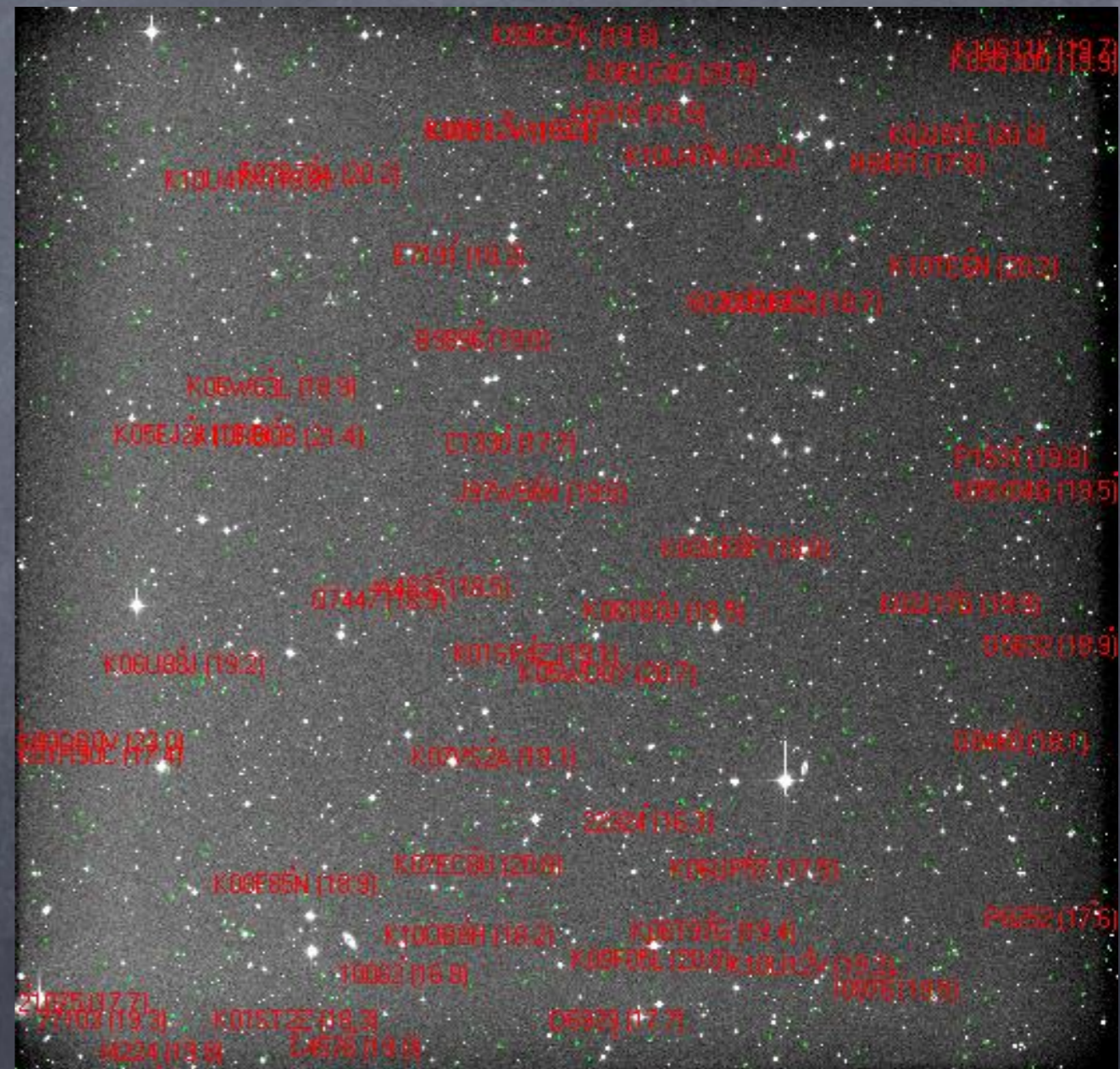
2012.03.24. 20.9 R 2.2"/min 102RC 12x60 sec 3 0.2" RA 0.2"  
Dec



# Summary of astrometric observations at Pizskéstető

(since Sept. 2010)

- 👁️ 49455 accurate positions
- 👁️ 8967 asteroids and 17 comets
- 👁️ 1281 newly-designated objects
- 👁️ 4 new NEOs
- 👁️ 1487 One-Night Stands
- 👁️ 20 observers



# CU7: variability data processing<sup>U</sup>

-active: ~78 people  
(+ 6)

-affiliate: ~31 people

Konkoly Observatory Gaia Team

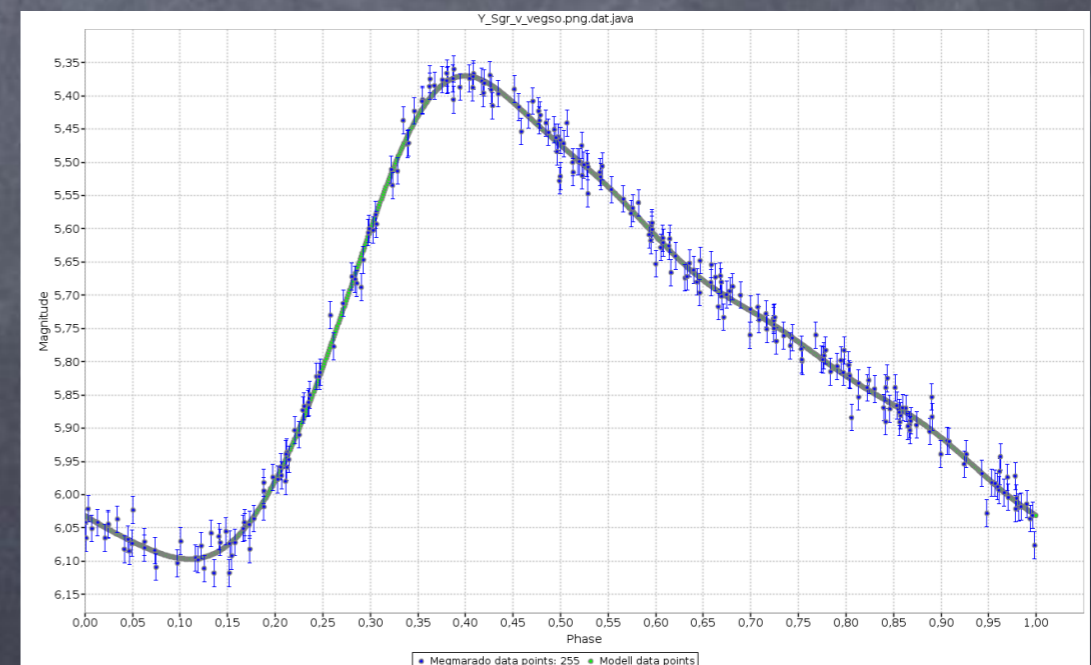
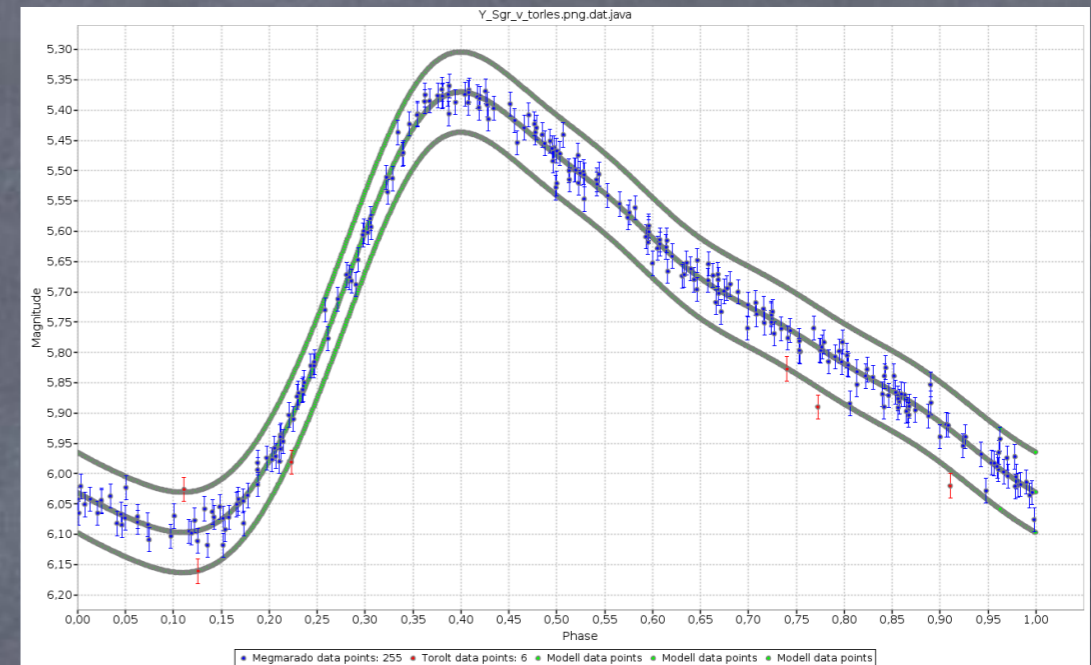
# Konkoly Observatory Gaia Team

- 👁️ **DPAC CU7 (Variability Processing) :**
  - 👁️ Specific Object Studies Work Package (mainly interested in studies of Cepheid variable stars)
  - 👁️ Supplementary Observations Work Package
  - 👁️ Ground Based Observations for Gaia
  - 👁️ Gaia Science Alert WG
  - 👁️ Secular evolution
- 👁️ **Gaia Research for European Astronomy Training (GREAT):**
  - 👁️ WGA5 (Gaia Alerts)
  - 👁️ WGA8 (Distance Scales)
  - 👁️ WGB2 (Stellar Variability)
  - 👁️ WGB3 (Binaries & Multiple Systems)



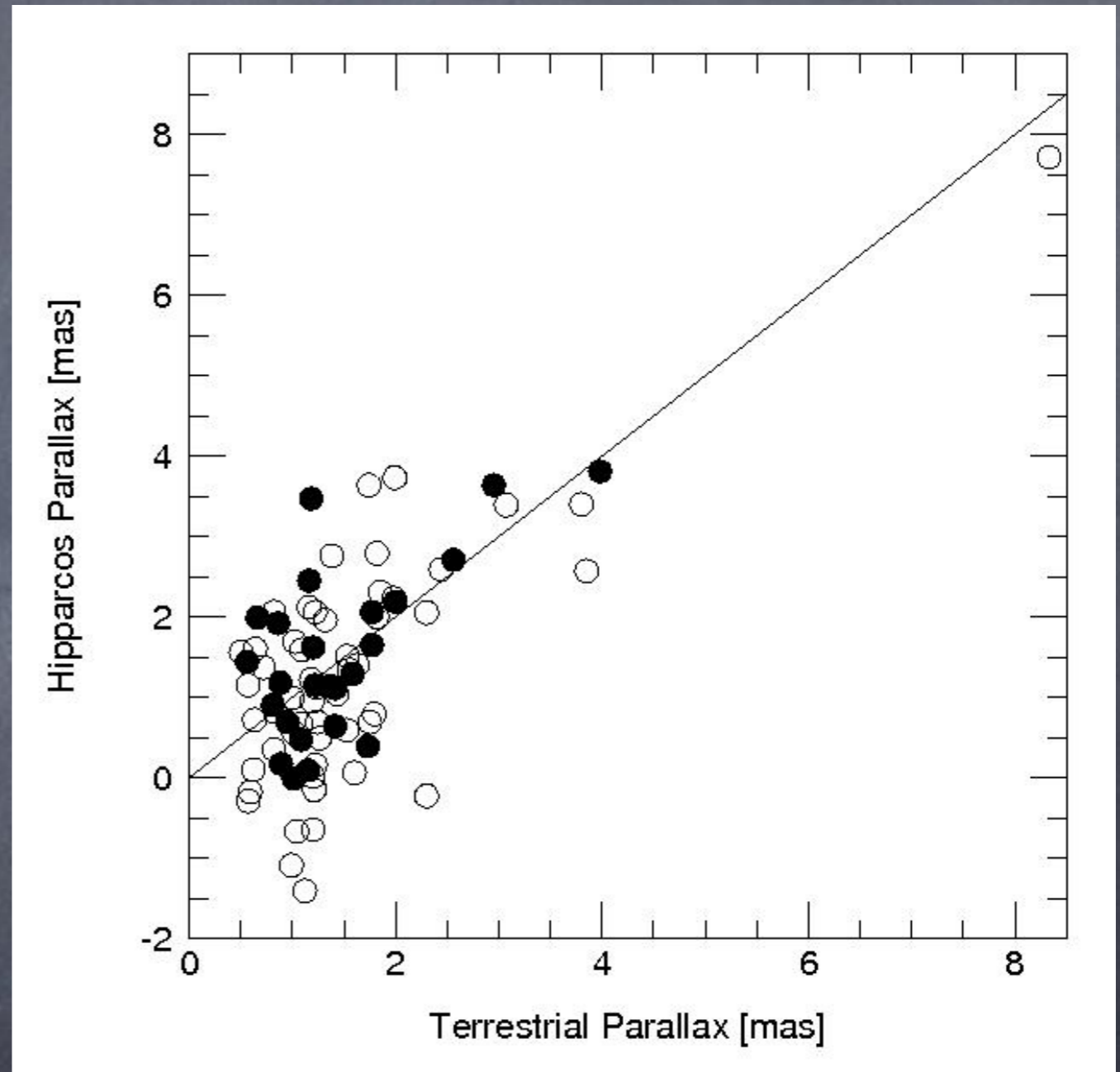
# CU7 – Specific Object Studies

- DPAC CU7 SOS WP
- Cepheids:
  - automatic selection of deviating data
  - selection of binary stars based on photometric criteria and radial velocity data (P-L relationship)
  - detection of faint visual companions



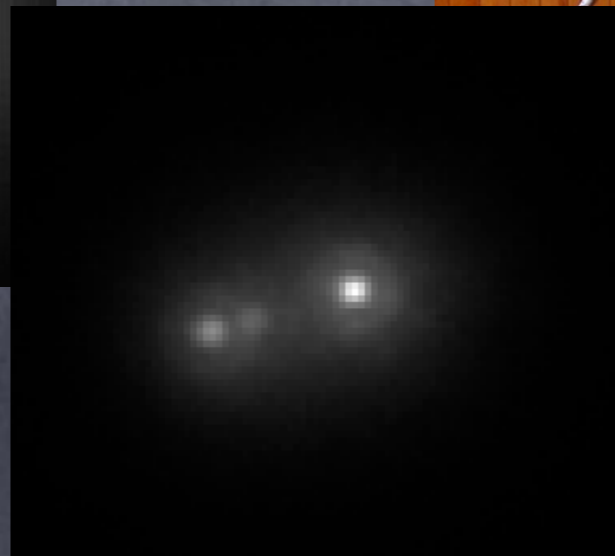
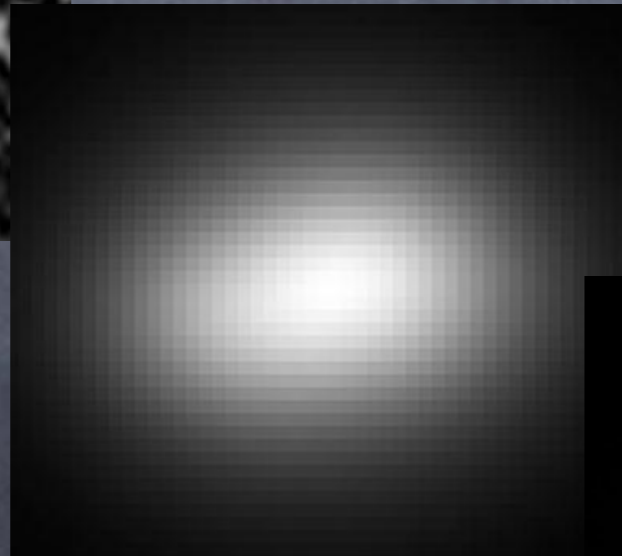
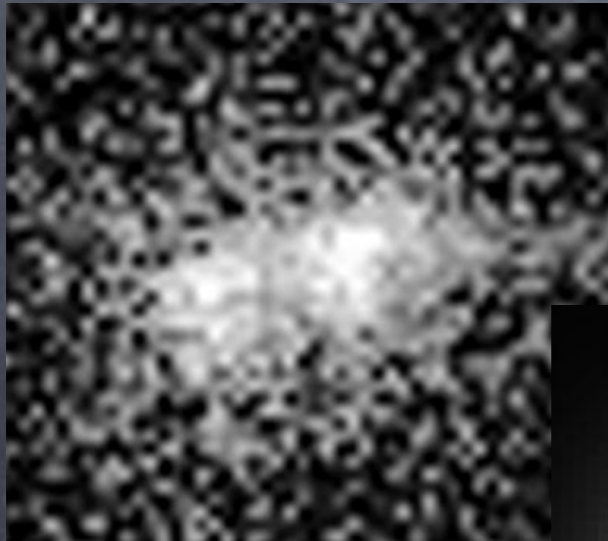
# CU7 – Specific Object Studies

All *negative*  
Hipparcos parallaxes  
of Cepheids are for  
those stars which  
belong to binary (or  
multiple) systems



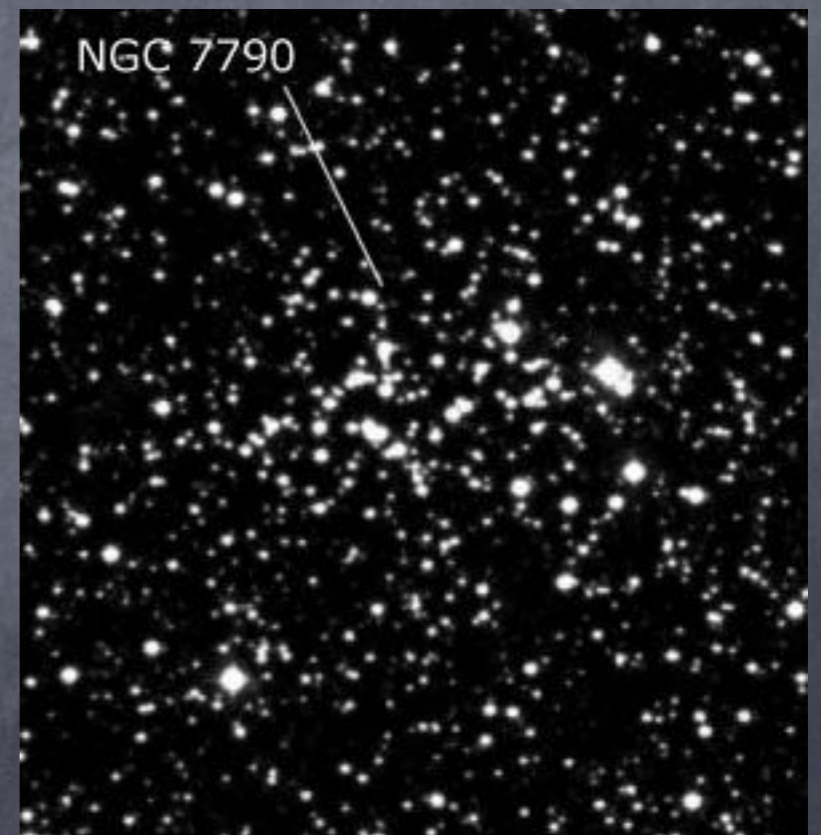
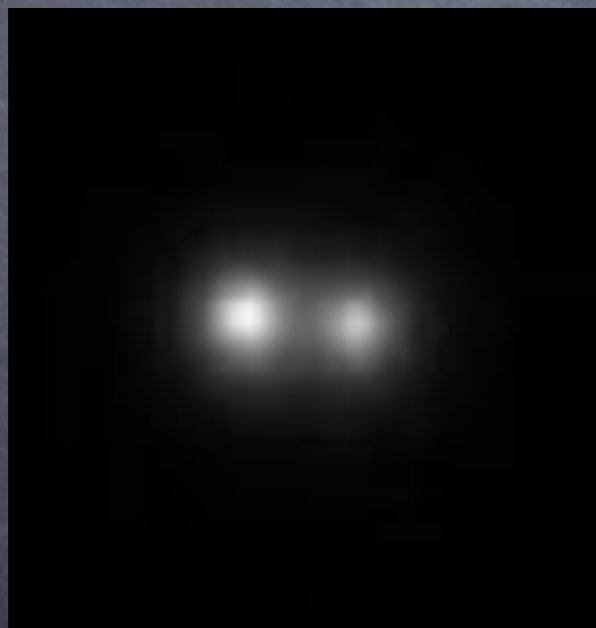
# CU7 – Specific Object Studies

Search for close visual companions of Cepheids by *lucky imaging* technique with an EMCCD camera @ 50 cm Cassegrain telescope.



# CU7 – Specific Object Studies

Example: *CE Cas* double Cepheid in the open cluster *NGC 7790*; both components are Cepheid variables with a 2,3 arc second separation



# Conclusions

- ① We observed all four Gaia-FUN-SSO targets between 12.5 and 21 mag. The proper motion of these asteroids was between 44"/sec and 0.3"/sec.
- ① We made the last (i.e. faintest magnitudes) Gaia-FUN-SSO observations on (99942) Apophis and (175706) 1996 FG3
- ① Recently finished and planned new upgrades make the site very suitable to provide astrometric support to Gaia.
- ① There is also strong willingness to join the efforts.

Thank you for your attention

