

# **Astrometry and Photometry in sky areas of Karin Asteroid Family Members**

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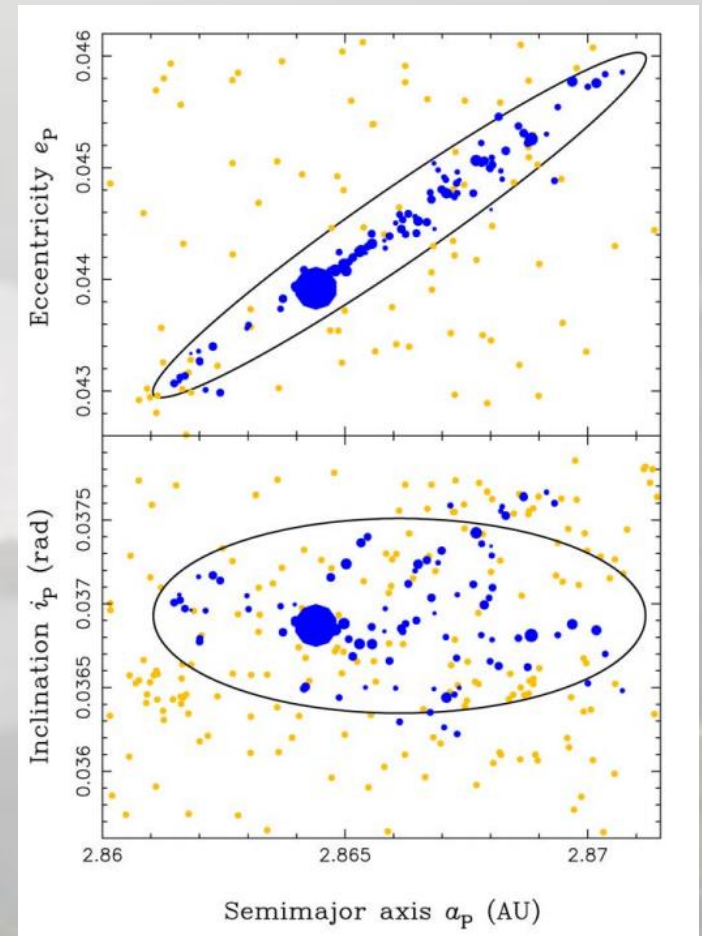
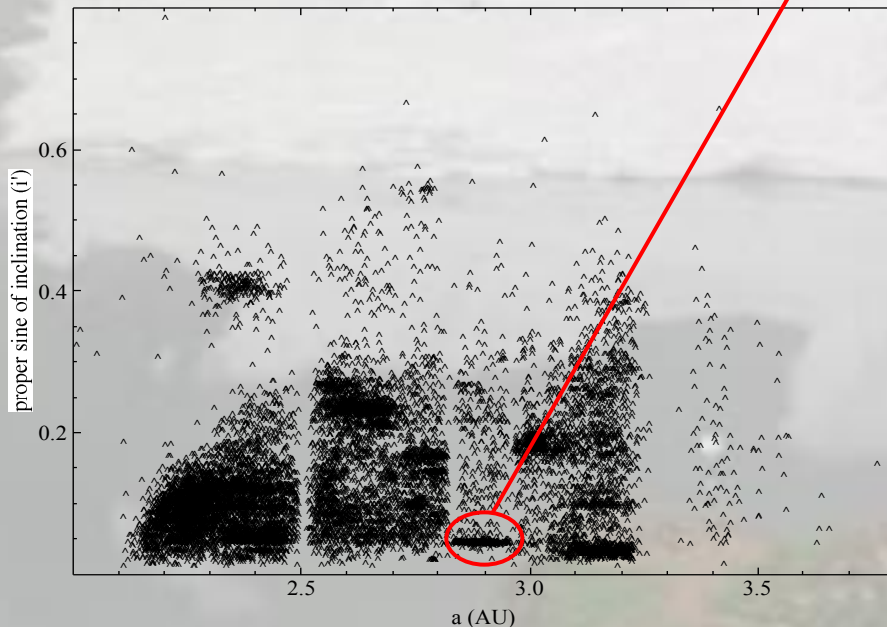
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**Gaia-FUN-SSO-3  
Paris Observatory,  
24-26 November 2014**

# KARIN FAMILY OF ASTEROIDS

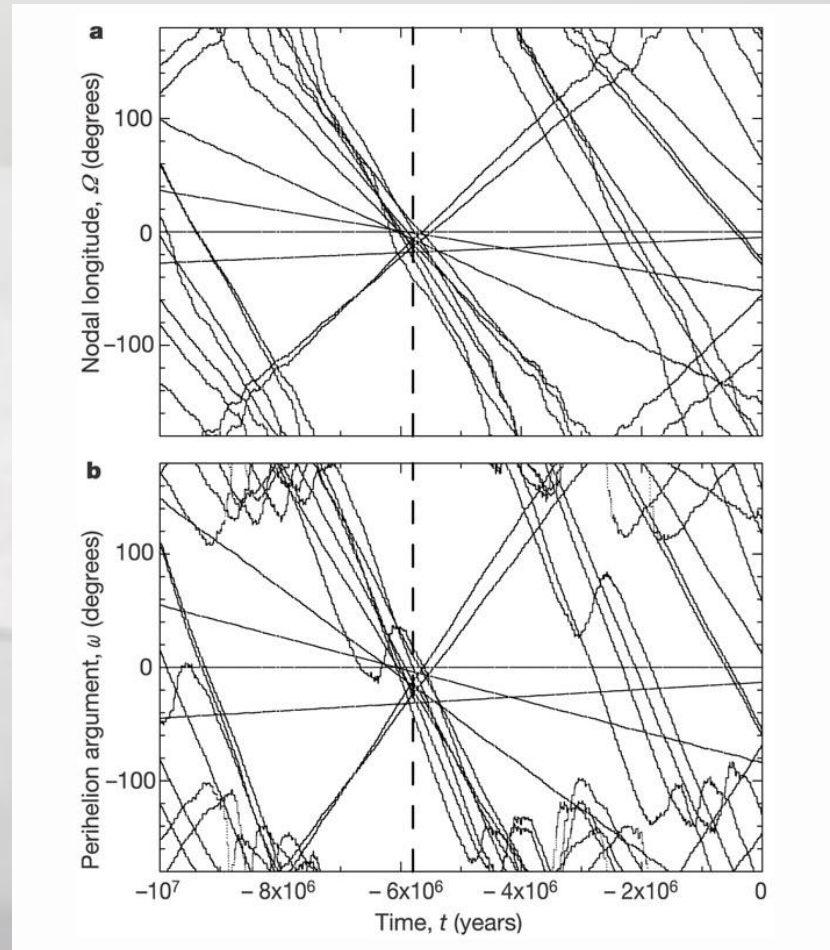
- Young Family (collision into the old family of Koronis)
- ~100 members
- The biggest: 832 Karin



Nesvorny et al, Nature 2002

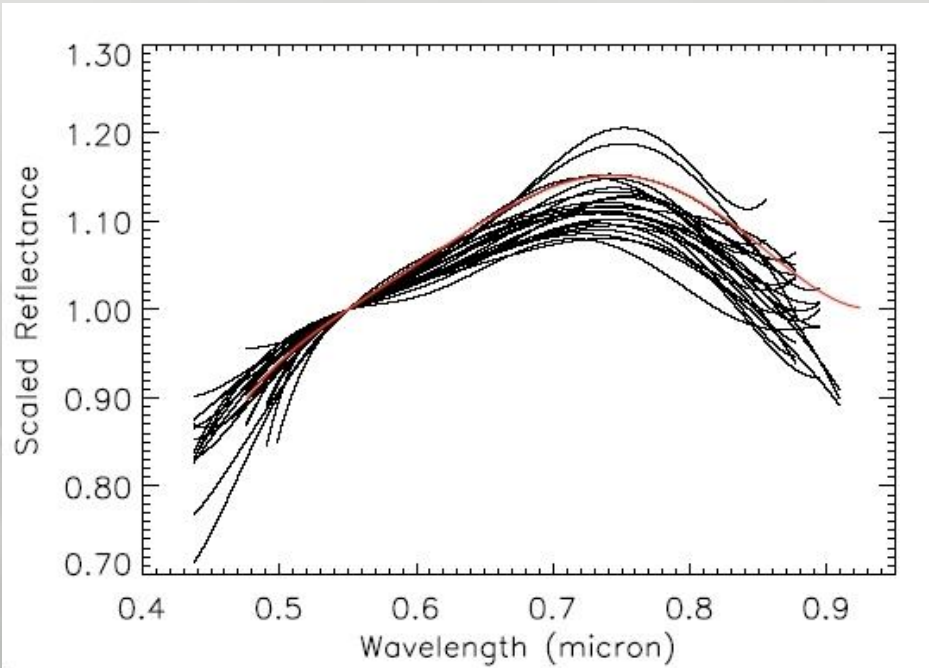
# Karin Family

-Backward  
integration:  
~5.8 million  
years ago

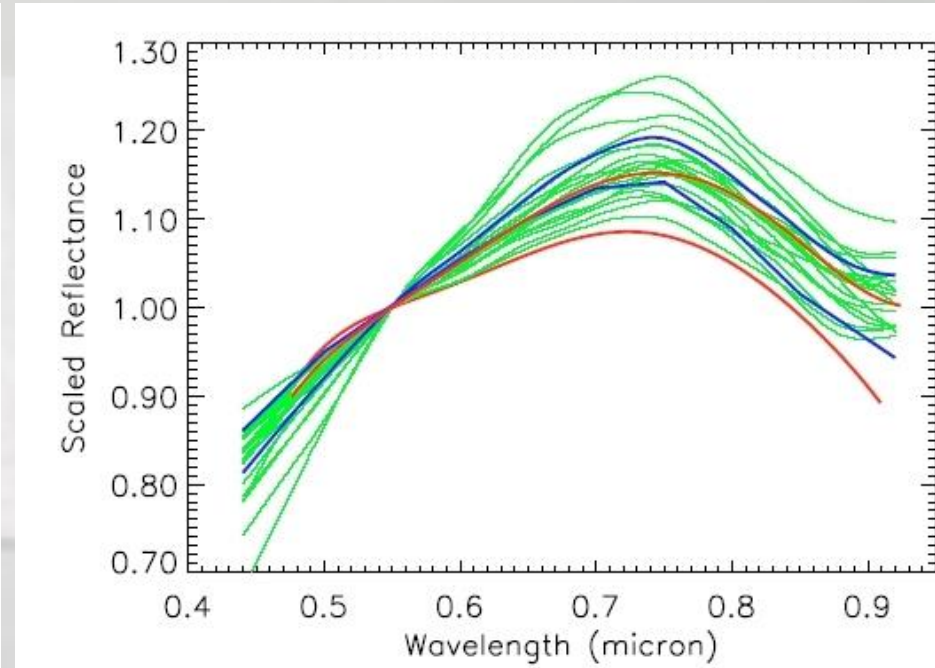


# Observations & results

- 24 objects observed in the visible



Karin family (in red the spectrum of 854 Karin)



Spectral trend of Karin members inside the Koronis family; similarities with Sq taxonomic class

# OBSERVATIONAL PROJECT

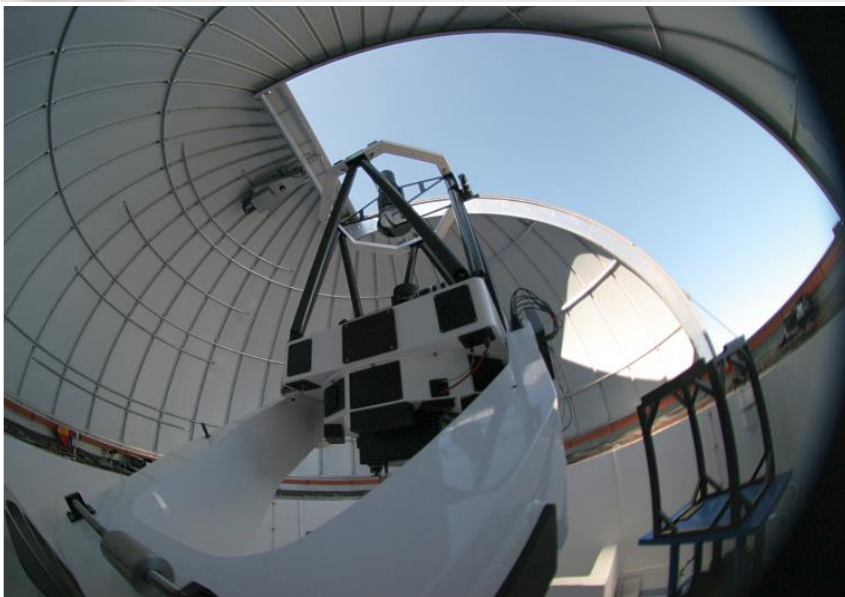
- Photometry of at least 25% of Karin family members;
- Good statistics in terms of lightcurve periods
- Input for the validation of various hypothesis concerning the parent body of Karin family
- By-product: astrometry of Karin members and serdipitios asteroids in the field

# Observations in TUG

Total awarded – **35 days**

2013 – 11 days

2014 – 24 days



Optic class: RC

Aperture: 100 cm

f ratio: f/10

CCD Camera

SI 1100 UV, BI

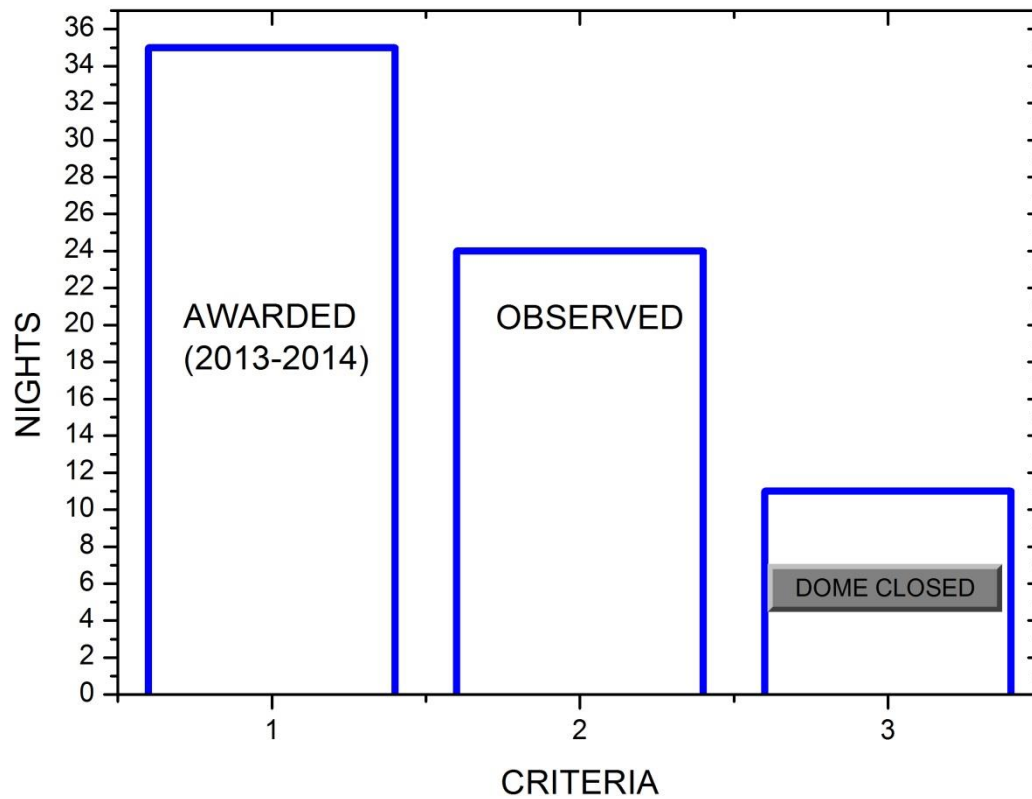
Cryo-cooling, -100 C

4096x4096, 15  $\mu$

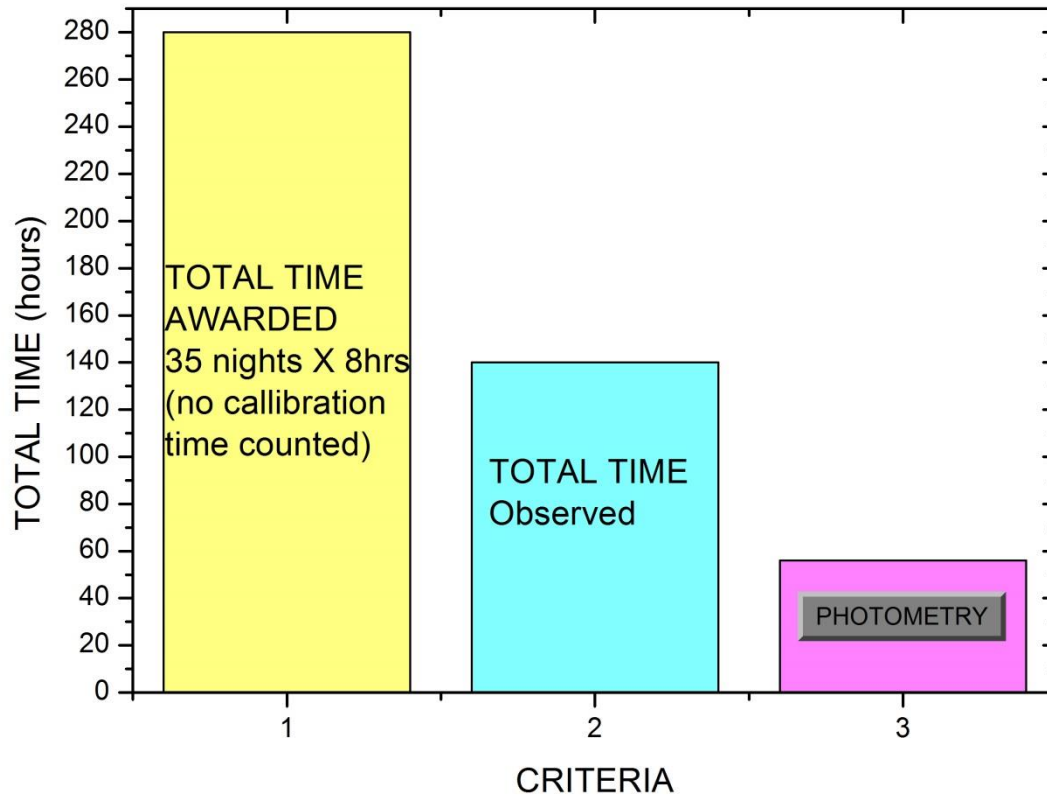
21.5x21.5 arcmin

0.32"/pixel

# Partial Results/Statistics



# Partial Results/Statistics

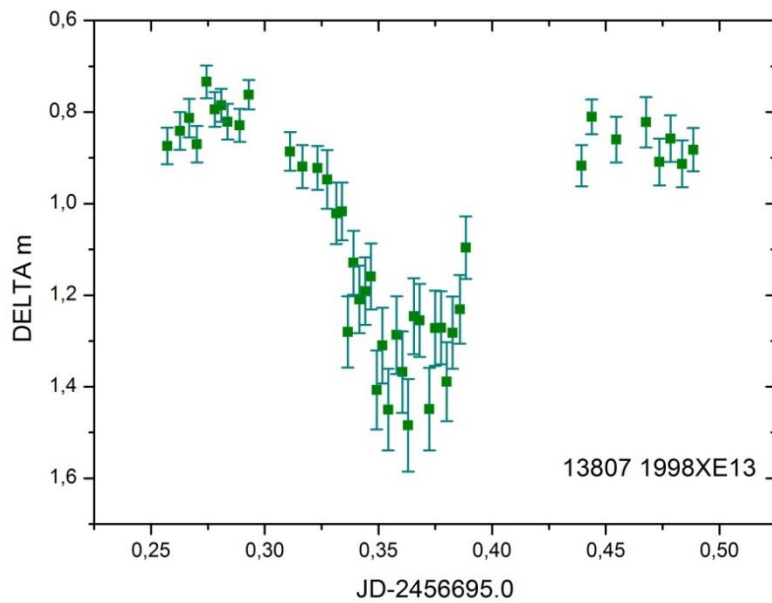




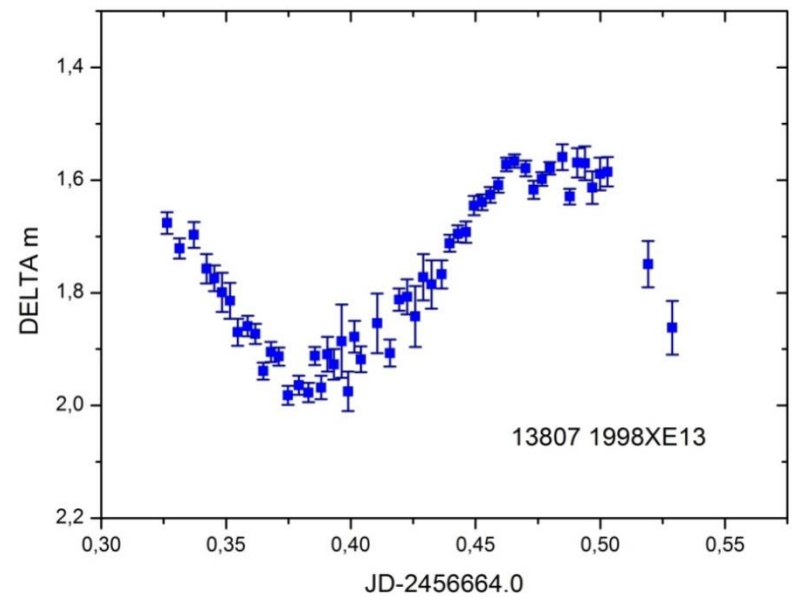
# LIGHTCURVES

- 10 members were observed with relatively good differential photometric measurements
- 2000EV136, Einer, 1996XE13, 1994PG35, 4153 T-2, 2000GO17,...
- Partially solved lightcurves
- On some of them the amplitude of lightcurve does not allow to derive a period

# Examples

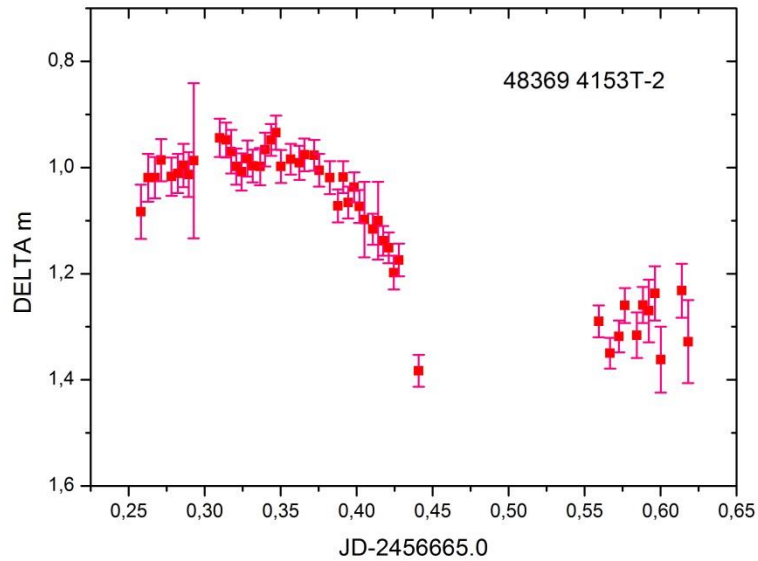


~6 hours

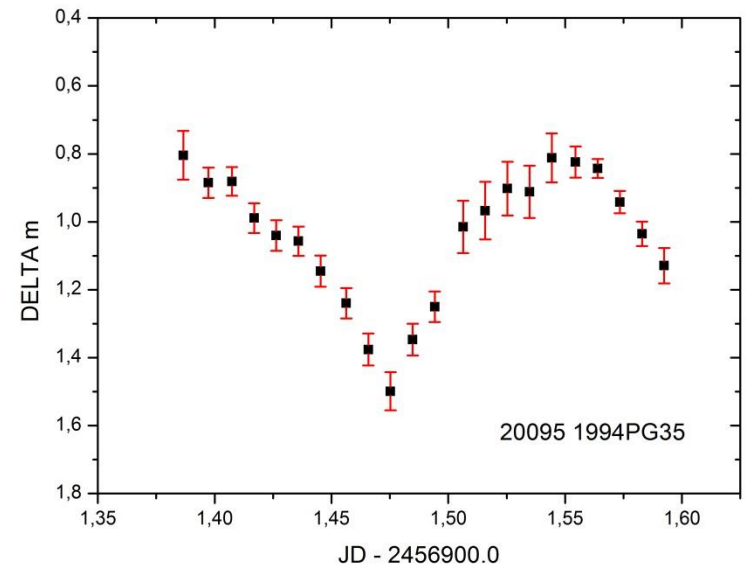


~5 hours

# Examples

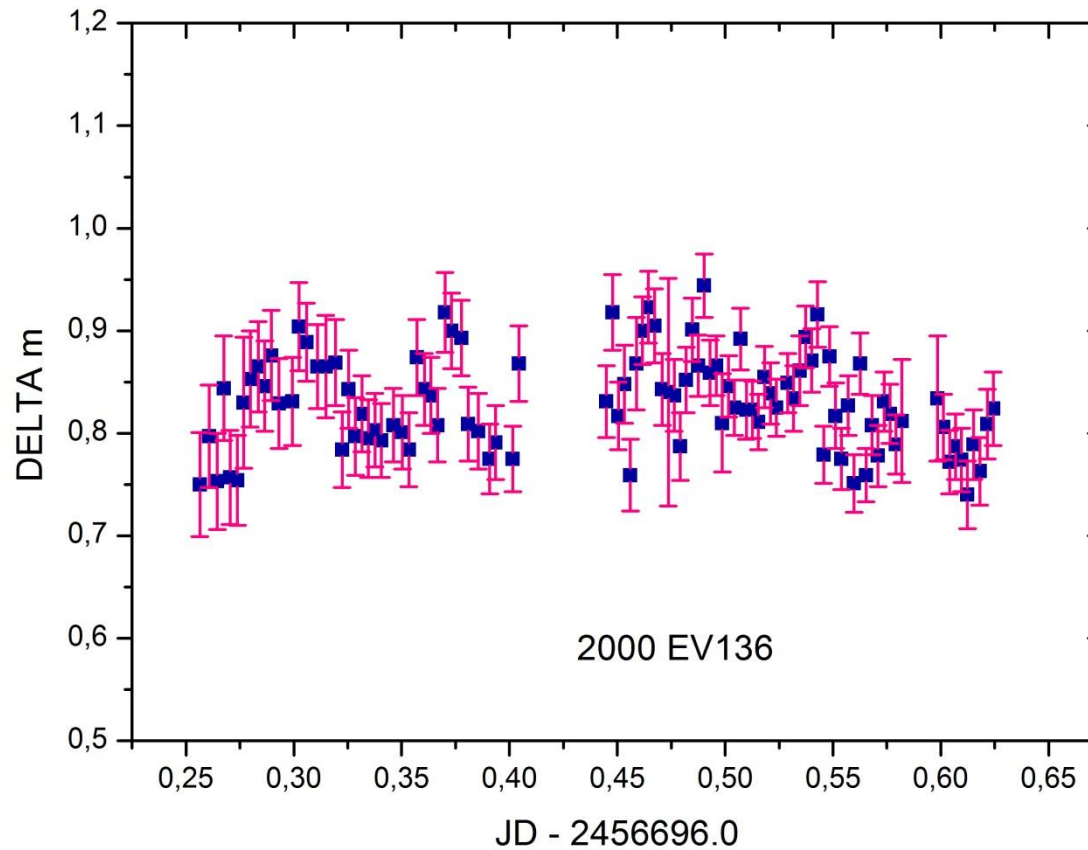


~9 hours



~5 hours

# Examples



~9 hours

# Astrometry

- ~800 positions of more than 90 objects were reported to Minor Planet Center
- 10% of all astrometry reported using the IAU Code A84 (Tubitak)
- 10 asteroids newly discovered (no discovery attributed to A84 (yet!))

# Astrometry/tools

- Data reduction: Astrometrica (© H. Raab)
- Star catalogue: NOMAD
- Ephemerids/visualisation:  
SkyBoT layer/service on  
Aladin CDS service
- Verification of astrometry: EuroNear & Fitsblink

# MPC Report (fragment)

COD A84

OBS Z. Eker, M. Kaplan, O. Erece, S. Kaynar

MEA M. Birlan

TEL TUG T100 + CCD

ACK MPCReport file updated 2013.11.01 02:48:30

AC2 [Mirel.Birlan@imcce.fr](mailto:Mirel.Birlan@imcce.fr)

NET NOMAD

43032	C2013 08 31.01598 00 59 18.65 +02 38 22.8	18.1 R	A84
43032	C2013 08 31.02159 00 59 18.51 +02 38 21.9	18.0 R	A84
43032	C2013 08 31.03527 00 59 18.16 +02 38 19.7	18.1 R	A84
43032	C2013 08 31.04608 00 59 17.90 +02 38 18.0	18.0 R	A84
43032	C2013 08 31.04926 00 59 17.82 +02 38 17.5	18.2 R	A84

- Confirmation of  
PannStarrs  
discovery  
2013 QQ19

**Asteroid 2013 QQ19 confirmed by Tubitak 1m telescope.**

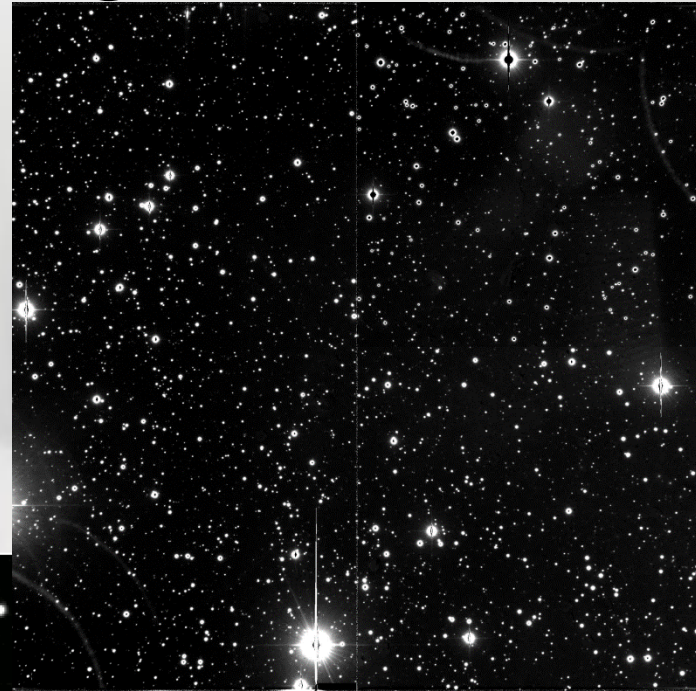
Asteroid 2013 QQ19 is the provisional name of one new asteroid included into Minor Planet Center recently.

The project of concerning observations of Karin family of asteroids was initiated in fall 2013 as a joint program between Institute de Mecanique Celeste et de Calculs des Ephemerides – France, Akdeniz University, Space Science and Technologies Department -Turkey, and the Astronomical Institute of the Romanian Academy. The main goal of the project is to characterize as much as possible physical properties of members of this young family of asteroids.

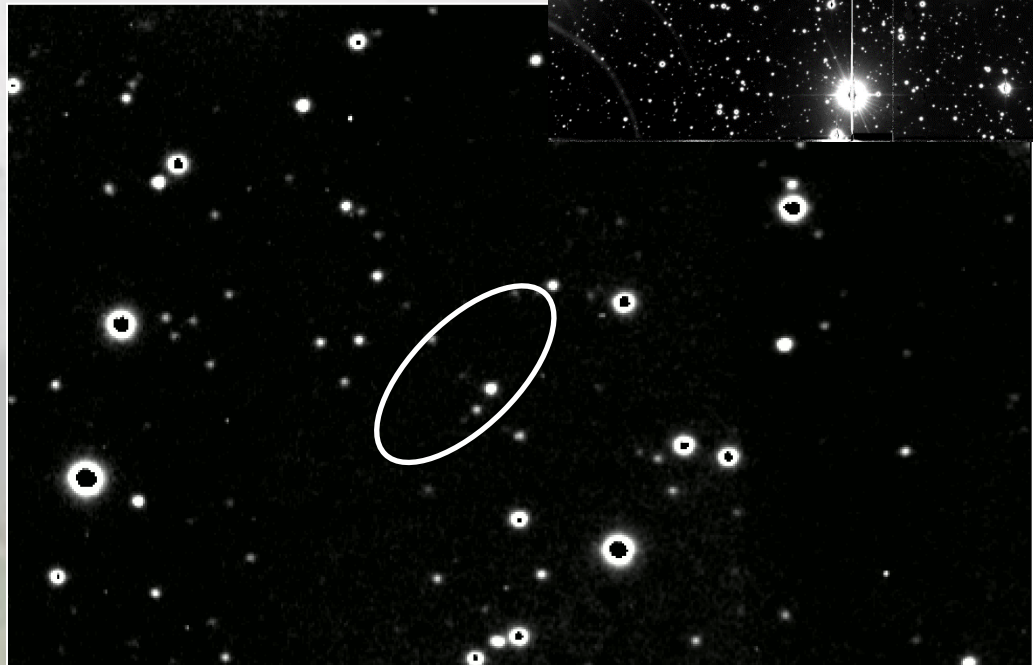
Photometry of asteroids was started at TUBITAK National Observatory using 1meter telescope operated remotely from Akdeniz University – Tubitak Headquarters. As a by-product, valuable astrometry of asteroids serendipitously presented on images was reported to International Astronomical Union Minor Planet Center in Smithsonian - USA.

# New detections

```
COD A84
OBS O. Erece, G. Aslan, Z. Eker, M. Kaplan
MEA M. Birlan
TEL TUG T100 + CCD
ACK MPCReport file updated 2014.03.21 19:31:41
AC2 Mirel.Birlan@imcce.fr
NET NOMAD
TUG_10 *C2014 02 05.79015 05 46 52.91 +20 44 28.5      20.5R      A84
TUG_10 *C2014 02 05.80056 05 46 52.81 +20 44 27.2      20.6R      A84
TUG_10 *C2014 02 05.81037 05 46 52.68 +20 44 26.0      20.7R      A84
TUG_10 *C2014 02 05.81986 05 46 52.56 +20 44 24.7      20.9R      A84
Q4362  C2014 02 05.73225 05 46 48.15 +20 49 28.1      19.9R      A84
Q4362  C2014 02 05.73971 05 46 48.11 +20 49 30.3      20.0R      A84
TUG_9  *C2014 02 05.79015 05 47 00.42 +20 44 08.8      20.0R      A84
TUG_9  *C2014 02 05.80056 05 47 00.30 +20 44 07.4      20.0R      A84
TUG_9  *C2014 02 05.81037 05 47 00.21 +20 44 06.0      20.0R      A84
TUG_9  *C2014 02 05.81986 05 47 00.15 +20 44 05.0      20.1R      A84
37592  C2014 02 05.73225 05 47 56.17 +20 40 13.7      19.4R      A84
37592  C2014 02 05.73971 05 47 56.09 +20 40 13.4      19.4R      A84
```



Crop of five images of the field of the asteroid (47640) 2000CA30 which contains a new detection





# FUTURE REQUESTS/ WORK ESTIMATION

- 50% of our targets were observed
- Need to increase the density of data and to observe at least 10 more objects
- Data reduction process : accomplished for ~80% of raw data
- Data modeling and period extraction : ~40% of periods (some objects do not exhibit variation in lightcurve)

# Solar system observational experience in the context of GAIA -FUN

- Experience after two years allows us a rapid response to GAIA alerts
- Training on data reduction and experience on tools devoted to Solar System object analysis
- Education through astronomy into an academic environment

A scenic view of a lake with a large white waterfall cascading into the water, surrounded by green hills and a clear sky. The text "THANKS for Listening ....." is overlaid in the center of the image.

**THANKS** for Listening .....