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Photometric analysis of NEOs in Arecibo supporting from NEOROCKS project

H. Medeiros[1,2], J. de León[1,2], J. Licandro[1,2], M. Serra-Ricart[1,2], M. Popescu[3], N. Pinilla-Alonso[4], M. Devogéle[5]

(1) Instituto de Astrofísica de Canarias, C/ Vía Láctea s/n, 38205, San Cristóbal de La Laguna, Tenerife (Spain), hmedeiros@iac.es **(2)** Universidad de La Laguna, Departamento de Astrofísica, 38205, San Cristóbal de La Laguna, Tenerife (Spain) **(3)** Astronomical Institute of the Romanian Academy, 5 Cuţitul de Argint, 040557 Bucharest, Romania **(4)** Florida Space Institute, University of Central Florida, Orlando, FL 32816, USA **(5)** Lowell Observatory, 14000 W Mars Hill Rd, Flagstaff, AZ 86001, USA

NEO ROCKS

Near Earth Object Rapid Observation, Characterization and Key Simulations

The NEOROCKS project.

The NEOROCKS project is funded (2020-2022) through the H2020 European Commission programme to improve knowledge on NEOs by connecting expertise in performing small body astronomical observations and the related modeling needed to derive their dynamical and physical properties. The IAC, and in particular members of the Solar System Group, participates in the NEOROCKS project and is currently leading one specific task to do observations of NEOs in support of the Arecibo Planetary Radar.

NEO ROCKS

Near Earth Object Rapid Observation, Characterization and Key Simulations

The Sample

Targets. We observed 11 Near-Earth Asteroids that also have radar data from the Arecibo Observatory.

Reduction. The images are being reduced using IRAF and the Photometry Pipeline from Mommert, M. (2017).

Ligth curves. To find the rotational period from the asteroids, we are using MPO Canopus.

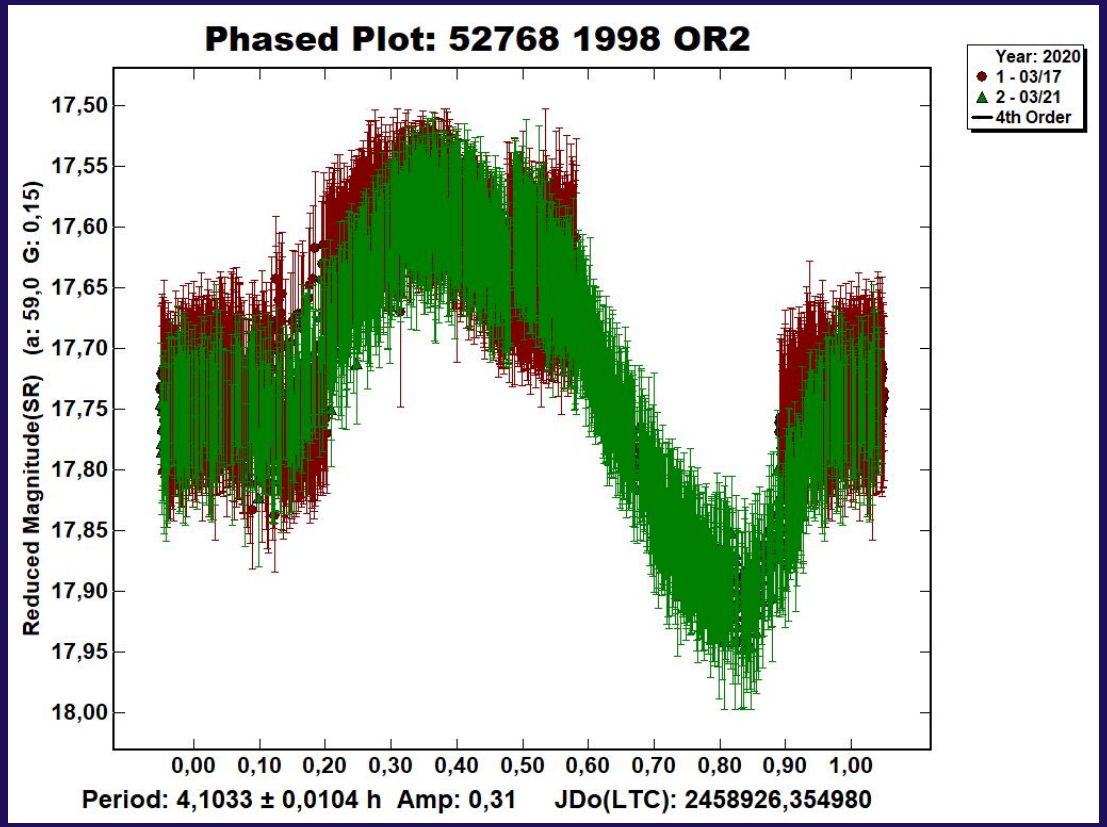
Photometric Shape Model. We have different observations (light curves) on distinct viewing geometry for some targets. This information allows us to obtain the photometric shape model using the light-curve inversion method (Kaasalainen, M. and Torppa, J., 2001; Kaasalainen et al., 2001).

The Sample

Asteroid	PHA	Period (h)	LCDB	Observed
(8014) 1990 MF	Yes	50.09	Jun - July 2020	June 2020
(85275) 1994 LY	No	2.6967	Jun 2007 - Aug 2020	Jun - Aug 2020
(52768) 1998 OR2	Yes	4.112	Jan 2009 - April 2020	Mar - April 2020
(85989) 1999 JD6	Yes	7.6638	May 2014 - Jun 2020	July 2020
(163373) 2002 PZ39	Yes	148.7	Jan - Feb 2020	February 2020
(388945) 2008 TZ3	Yes	39.15	Apr 2016 - May 2020	Apr - May 2020
(438908) 2009 XO	Yes	-	-	May 2020
(441987) 2010 NY65	Yes	4.9706 h	Jun 2016 - Jul 2018	June 2020
(159402) 1999 AP10	No	7.908 h	Sep 2009 - Jan 2021	Sep 2020 - Jan 2021
2000 KA	Yes	11.46 h	May 2020	May 2020
2013 XA22	No	2.2912	May 2020	May 2020

Information includes asteroid number and provisional designation, PHA classification, rotational period (from JPL Small-Bodies Database Browser), light curves available in the Asteroid Lightcurve Photometry Database (LCDB), and the date of our observations.

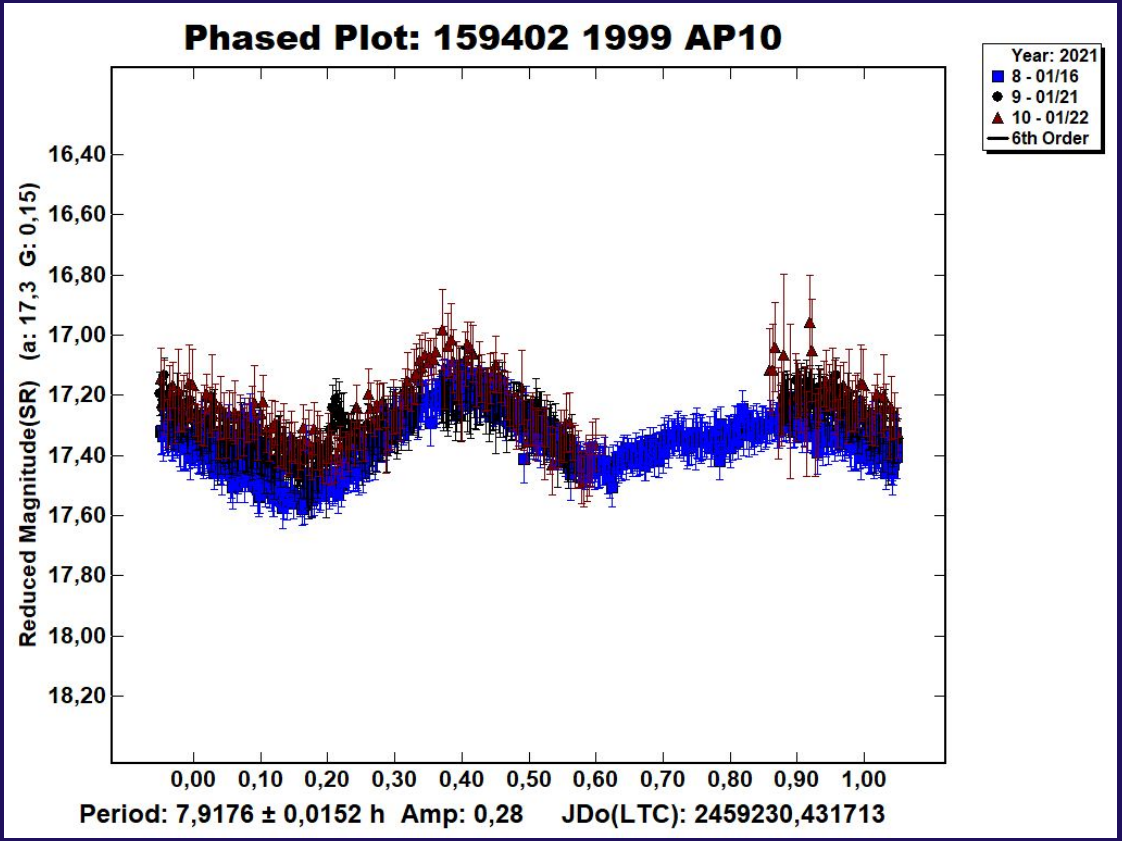
Preliminar results - light curves



(52768) 1998 OR2

- Period = 4.112 h (JPL webpage)
- Period = 4.1003 ± 0.0104 h (our data)
- D = 1.75 km (radar data from Arecibo Observatory)
- See Popescu et al. presentation.

Preliminar results - light curves



(159402) 1999 AP10

- Period = 7.908 h (JPL webpage)
- Period = 7.9176 ± 0.0152 h (our data)
- D = 2.068 km (radar data from Arecibo Observatory)

Conclusion and next steps

With MPO Canopus it was possible to confirm the rotational period from the two asteroids (52768) 1998 OR2 and (159402) 1999 AP10.

- We still need to reduce the images from others targets.
- To obtain the photometric shape model of the asteroids that we observed in different viewing geometry, we will use our data together with that of the Asteroid Lightcurve Photometry Database.
- We will also analyze our photometry data with radar data from Arecibo Observatory.

Acknowledgment

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References

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Kaasalainen, M., Torppa, J., Muinonen, K., *Optimization Methods for Asteroid Lightcurve Inversion. II. The Complete Inverse Problem*, 2001, Icarus, 153, 37-51.