EUROPLANET 2021 VIRTUAL SCHOOL

GORA:

Contributions to the scientific community as a result of intense amateur and professional collaboration.

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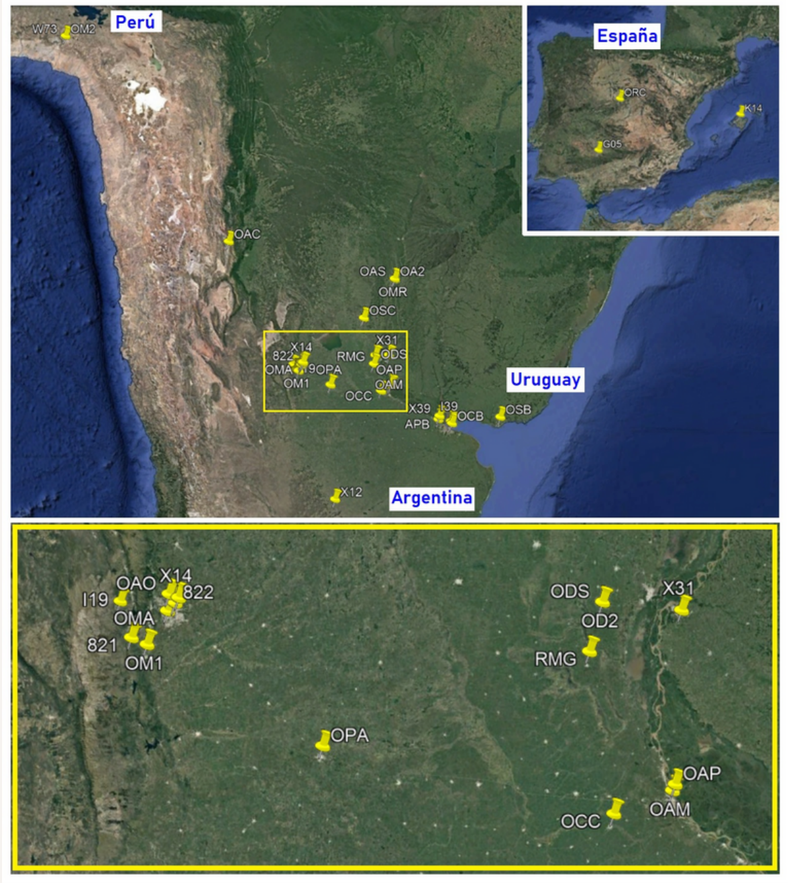
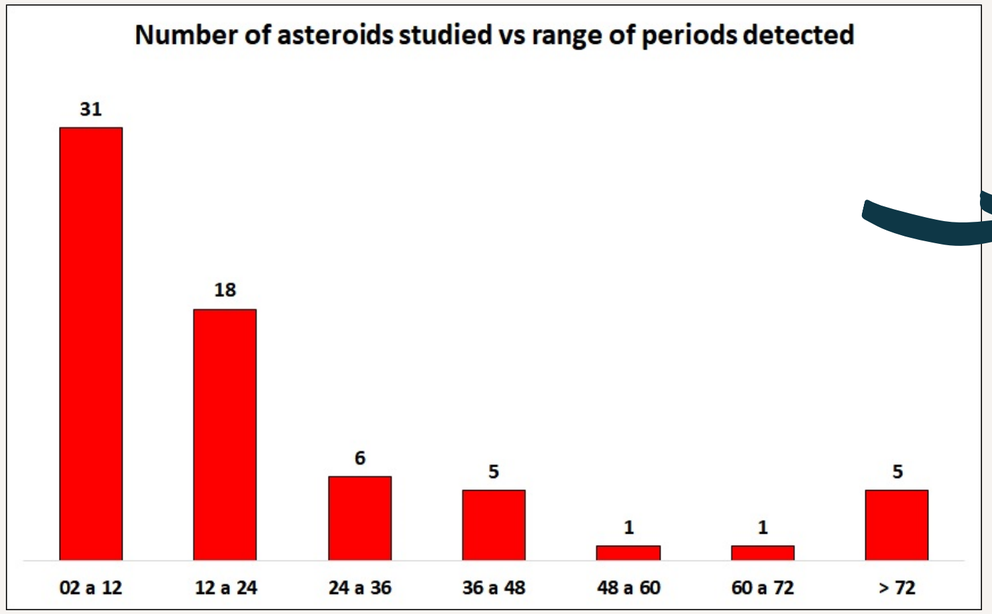
INTRODUCTION

Collaboration between amateur and professional astronomers is an important source of scientific production worldwide. Particularly, amateur astronomers from Argentina have been working together with professionals for decades, making great discoveries such as the rings of the asteroid Chariklo or the dwarf planet Makemake.

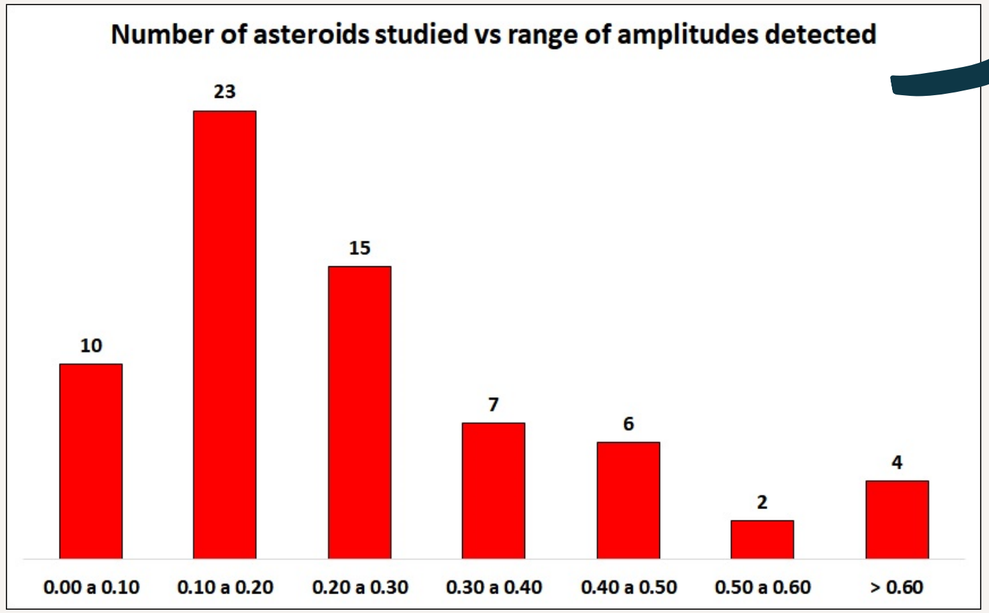
GORA (Grupo de Observadores de Rotaciones de Asteroides) counts on the national and international participation of more than 40 professional and amateur astronomers. The main objectives of this group are 1) To measure asteroid rotation periods in order to contribute to the databases used by the scientific community to search for information to carry out research on minor solar system bodies. 2) To promote the observation of variability in point objects where other frequent astronomical events occur and which are accessible to amateur astronomers: variable stars, supernovae, exoplanet transits, and asteroidal occultations.



STATISTICS OF OUR WORK



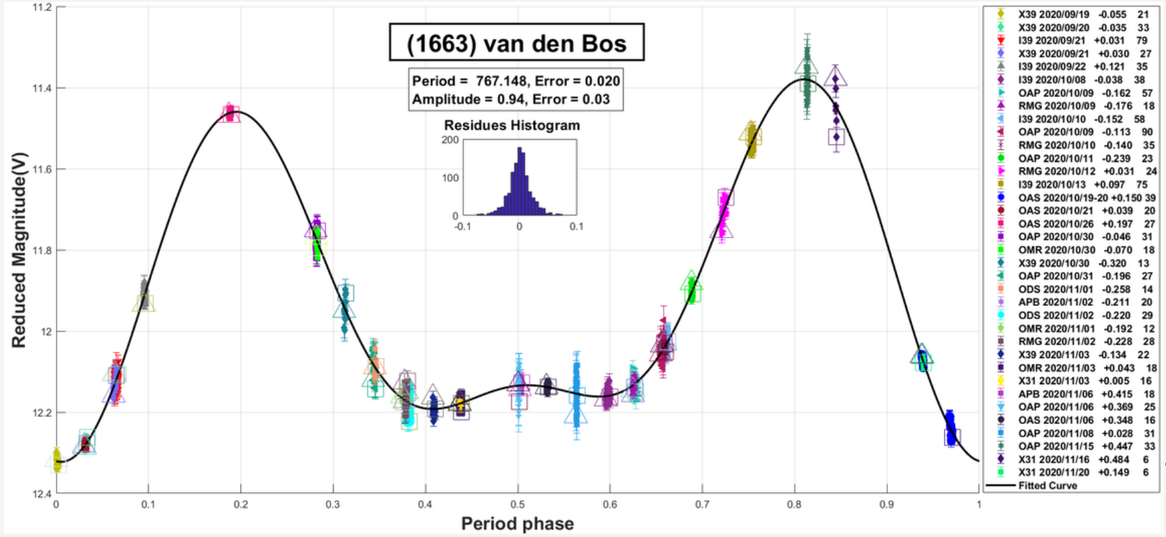
Here, we present some statistics about our work. In this first bar chart, we show the number of asteroids studied per period range. As we can see from the graph, we have covered already a wide range of asteroid periods.



In this bar chart, we can see the number of asteroids studied per amplitude range. Although we have measured plenty of objects with amplitudes between 0.10 and 0.30, we have also covered a significant range of values for this parameter.

One of the major challenges taken by GORA is the analysis of objects: a) with very long rotation periods, and b) with short rotation periods but low amplitude or very narrow observational window. Both types of asteroids are, in general, poorly studied, due to the complications associated with their observation or the processing of their data (Marciniak et al. (2019)). What follows is a presentation of prototypical cases of challenging slow rotators and fast rotators involving some of difficulties mentioned above.

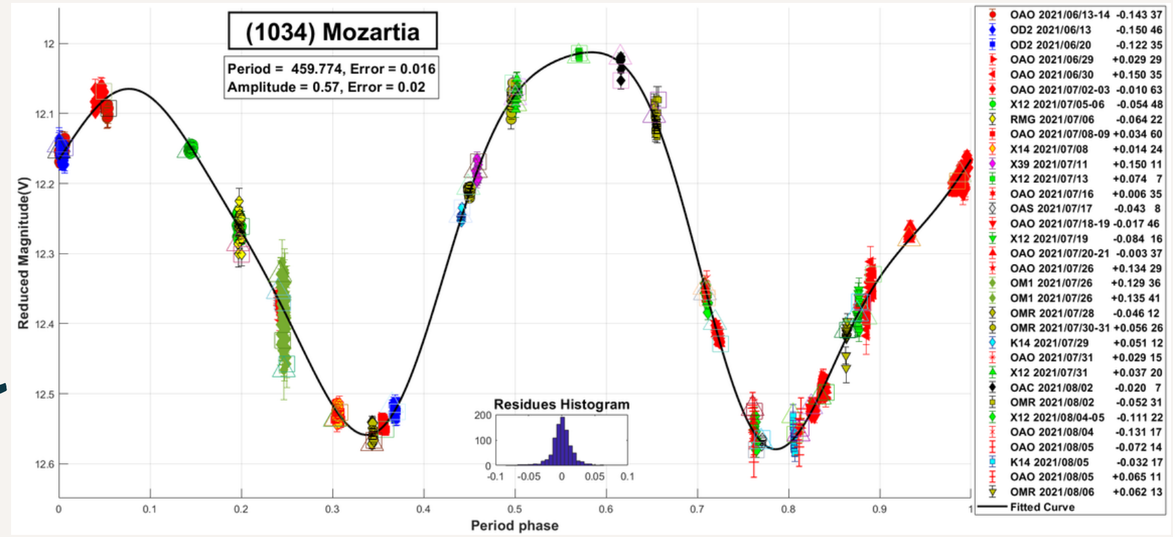
LIGTHCURVES Slow rotators



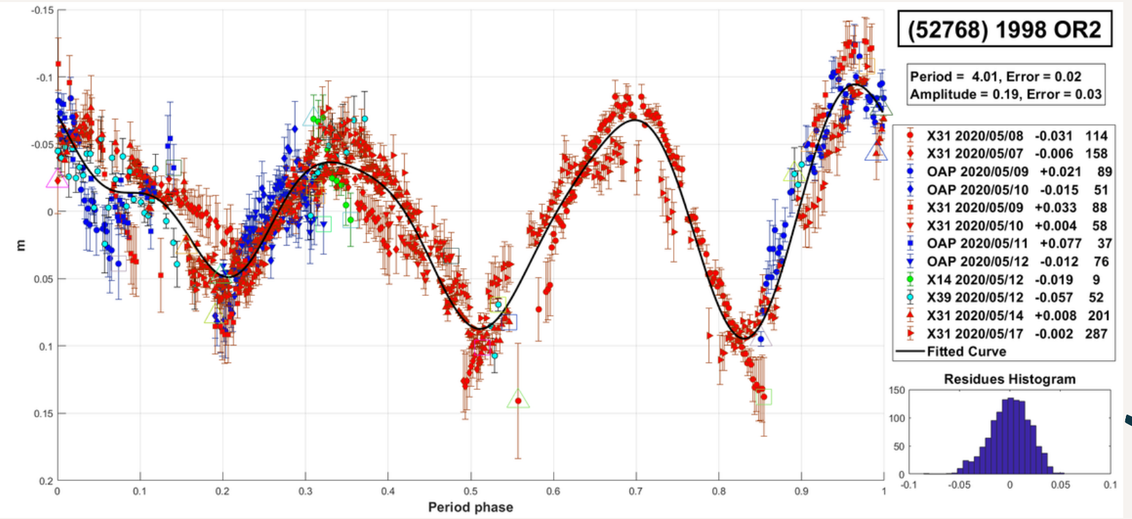
The periods reported in the literature for this asteroid suggest that it is a case of a slow rotator: P = 155 ± 5 h with Δm = 0.5 ± 0.1 mag (Ruthroff, 2011) and P = 740 ± 10 h with Δm = 0.80 ± 0.05 mag (Stephens and Higgins, 2011). The results we obtained, P = 767.148 ± 0.020 h with Δm = 0.94 ± 0.03 mag, are similar to those obtained by Stephens and Higgins (2011), thus supporting the hypothesis that it is indeed a slow rotator.

We have found only one published paper (Ditteon and Young (2018)) on this asteroid. However, these authors were unsuccessful in determining the light curve of this object. We have found no measurements of Mozartia's period in any of the databases. According to our observations, we propose a period that suggests that this is a slow rotator case:

P= 459.774 ± 0.016 h with an amplitude of A = 0.57 ± 0.02 mag.

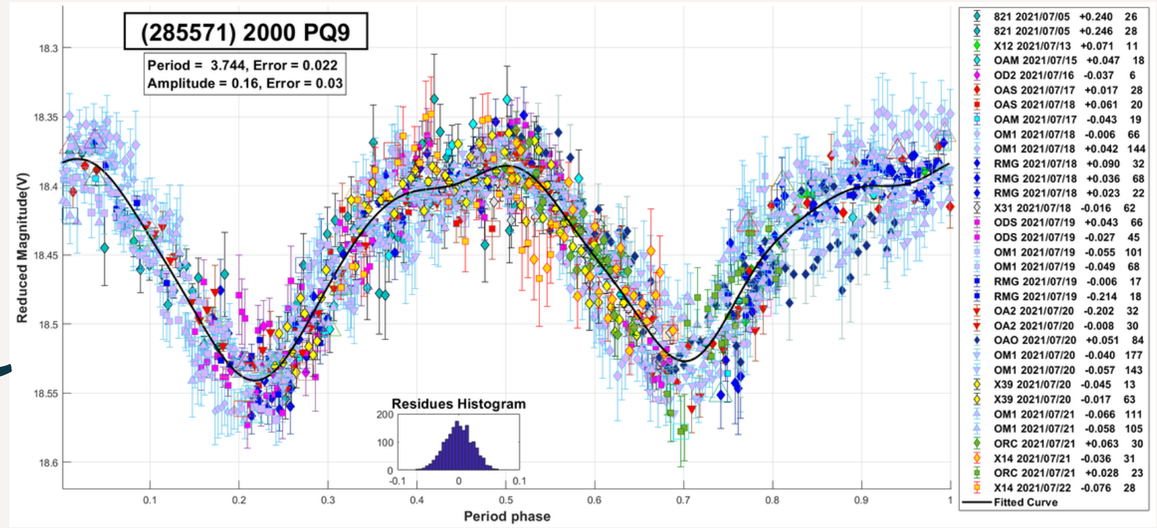


LIGTHCURVES Fast rotators



We found two different periods reported in the literature for this asteroid: P = 3.198 ± 0.006 h with A = 0.29 ± 0.02 mag (Betzler and Novaes, 2009) and P = 4.112 ± 0.002 h with A = 0.16 ± 0.02 mag (Koehn et al., 2014). Our results suggest a period of 4.01 ± 0.02 h with amplitude A = 0.19 ± 0.03 mag.

2000 PQ9 is another asteroid poorly studied so far. Our results suggest that this asteroid has a very short rotation period, of only 3.744 ± 0.022 h, and an amplitude of 0.16 ± 0.03. As can be seen in the Figure, we have achieved a good sampling of the light curve.



CONCLUSIONS

Asteroids play a fundamental role in improving our understanding of the origin and evolution of the Solar System. For this purpose, we need to explore at least their fundamental properties, such as their rotation period. Moreover, we usually focus on the less studied groups of asteroids, thus reinforcing the relevance and originality of our studies.

This is possible since GORA is a collaboration of amateur and professional astronomers who carry out their observations from different latitudes. Over the years, GORA has been improving its observational techniques and data analysis in order to provide valuable information on challenging asteroids. As a result, we are obtaining relevant results and publishing the data and will continue to do so in the future.

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