WHAT IS BIENOR HIDING IN ITS PHOTOMETRIC BEHAVIOUR?

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Introduction: Centaurs originally came from the Trans-Neptunian Belt as a result of planetary encounters. Accordingly, centaurs are dynamically evolved objects with unstable orbits [1], and many of them may become short-period comets [2], [3]. At present, the interest in centaurs has considerably increased since the discovery of orbiting material shaped in the form of rings around two of them, Chariklo [4] and Chiron [5]. Bienor is one of the largest centaurs known to date besides Chiron and Chariklo. Hence it is an interesting object to observe and study.

Observations: We present time series photometry of Bienor in four observation campaigns from 2013 to 2016 in which we studied the light curve amplitude and the absolute magnitude (H) of Bienor. We compare them with previous observations in the literature dating back to 2000. The details of these observations can be found in [6].

Results: We noticed a remarkable decline in the amplitude of the rotational light curve (Fig. 1). This suggests that the angle between the rotation axis and the line of sight has changed noticeably during the last 16 years as Bienor orbits the Sun. Using a simple model of a triaxial ellipsoid we were able to determine the orientation of the rotation axis of Bienor, the b/a axial ratio of a Jacobi ellipsoidal body (with semi-axis a>b>c) and density under the usual assumption of hydrostatic equilibrium, $\beta_p = 50 \pm 3^o$, $\lambda_p = 35 \pm 8^o$, b/a = 0.45 ± 0.05 and $\rho = 594$ kg/m^3, respectively. We also noticed a remarkable increase in brightness, which can not be reproduced by the hydrostatic equilibrium model.

Discussion: We tried different explanations in order to reproduce the observational data (Fig. 1 and 2) fitting both, light curve amplitude and H. The best fit is obtained with the presence of ring material around the body although other possibilities cannot be discarded. A detailed discussion can be found in [6].

In both figures blue dashed line shows a simple body shape model under the usual assumption of hydrostatic equilibrium (HE). Yellow and orange dotted lines show hydrostatic and no hydrostatic equilibrium model, relaxing the constrains for effective diameter and albedo found with Herschel telescope observations (Herschel and NHE-Herschel, respectively). Green solid line shows the albedo vaiability model (Albedo). Pink solid line shows ring system model (Ring). Blue circle points represent data taken from literature. Green star points represent data obtained in this work.

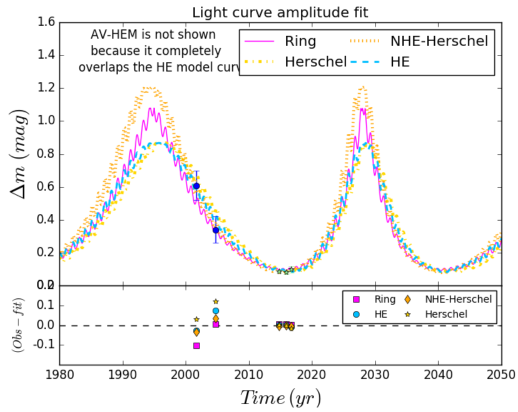

Figure 1. Light curve amplitude fit for different models.

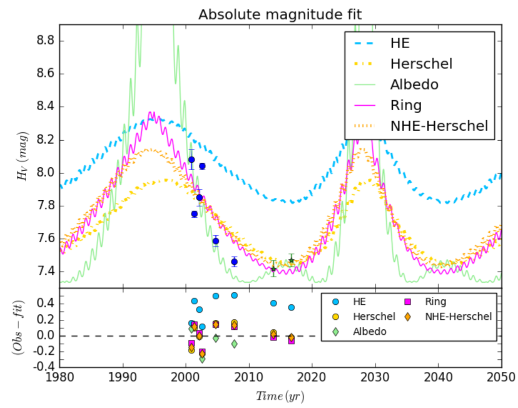

Figure 2. Absolute magnitude fits for different models.

Acknowledgments: Funding from AYA-2014-56637-C2-1-P, J. A. 2012-FQM1776 and European Union's Horizon 2020 Research and Innovation Programme, under Grant Agreement no 687378 are acknowledged.

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