Bulletin of the AAS • Vol. 54, Issue 8

# Physical properties of the trans-Neptunian binary 2000 YW134

**Mónica Vara-Lubiano[1] Estela Fernández-Valenzuela[2] Mike Kretlow[1] Nicolás Morales[1] Gustavo Benedetti-Rossi[3] Flavia Rommel[4] José Luis Ortiz[1] Bruno Sicardy[5] Pablo Santos-Sanz[1] Roberto Vieira-Martins[4] Felipe Braga-Ribas[5] Julio Camargo[4] Yucel Kilic[6] Bruno Morgado[4] Altair Gomes[3] Alvaro Alvarez-Candal[1] Jean Lecacheux[5] Marcelo Assafin[4] Rene Duffard[1] Damya Souami[5] Josselin Desmars[7] Stefano Mottola[8] Alfredo Sota[1] Andras Pal[9] Róbert Szakáts[9] Csaba Kiss[9] Cs. Kalup[9] Aliz Derekas[9] Michal Zejmo[10] Anna Marciniak[10] Waldemar Ogloza[11] Gerhard Dangl[12] Albino Carbognani[13] Giovanna Stirpe[13] Ivan Bruni[12] István Csányi[14] Jure Skvarč[15] Herman Mikuz[16] Stefan Meister[17] Matthieu Conjat[18] Fabrizio Ciabattari[19] Gregor Krannich[20]**

[1]Instituto de Astrofísica de Andalucía (IAA-CSIC),
[2]Florida Space Institute, University of Central Florida, Orlando, FL,
[3]UNESP- São Paulo State University,
[4]Laboratório Interinstitucional de e-Astronomia - LIneA & INCT, [5]LESIA, Observatoire de Paris,
[6]TÜBITAK National Observatory, Akdeniz University Campus,
[7]Institut Polytechnique des Sciences Avancées IPSA, [8]DLR-German Aerospace Center,
[9]Konkoly Observatory, Research Centre for Astronomy and Earth Sciences, Eötvös Loránd Research Network (ELKH),
[10]Adam Mickiewicz University, [11]MT. Suhora Observatory, Pedagogical University of Cracow,

**[12]Loiano Astronomical Park, INAF - Observatorio di Astrofisica e Scienza dello Spazio di Bologna,**
**[13]INAF - Osservatorio di Astrofisica e Scienza dello Spazio di Bologna,**
**[14]Baja Astronomical Observatory, [15]Isaac Newton Group of Telescopes, [16]Crni Vrh Observatory,**
**[17]Bülach Observatory, [18]Association AQUILA, [19]Osservatorio Astronomico di Monte Agliale,**
**[20]Roof Observatory Kaufering**

**Published on:** Oct 20, 2022

**URL:** https://baas.aas.org/pub/2022n8i413p01

The study of trans-Neptunian binaries (TNBs) remains one of the most active areas of progress in understanding the solar system beyond Neptune. TNBs have been found in every dynamical population of the trans-Neptunian region (Noll et al. 2020), with proportions ranging from 29 % in the cold classical population to 5.5 % for the remaining classes combined (Brunini 2020).

The formation of the contact TNB Arrokoth is one of the challenges that formation models face nowadays. The current angular momentum of Arrokoth is too low and the current binary formation scenarios, by either rotational fission or streaming instability (Nesvorný et al. 2019), require also loss of angular momentum (McKinnon et al. 2020). Additionally, formation mechanisms of close binaries may be distinct from those for the wider pairs. As the angular momentum of a system approaches that of an object spinning near its critical rotation period, rotational fission is the most likely explanation for their formation (Descamps et al. 2008), which is thought to be the case for the proposed satellites of Varuna and 2002 $TC_{302}$ systems (Fernández-Valenzuela et al. 2019; Ortiz et al. 2020). If close TNBs turn out to be common for objects rotating close to the breakup limit, that could reveal important clues about angular momentum evolution during accretion for TNOs (Petit et al. 2011). However, characterizing binary systems at such distances is challenging. From the ~120 known TNBs, only around 40 have their mutual orbit fully determined, let alone physical characterization.

2000 $YW_{134}$ is a TNB in a 3:8 resonance with an orbital semi-major axis of 57.4 au (a rare occurrence). On February 23rd, 2022, it occulted the Gaia EDR3 star 6273564583586365444 (V = 17.1 mag). The stellar occultation was initially predicted using the JPL orbit solution #24, and updated using data from the 1.5-m and 1.23-m telescopes at Sierra Nevada and Calar Alto Observatories, using the same methodology as explained in Ortiz et al (2020). From the 17 observatories involved, seven reported positive chords, with five of them corresponding to the main body and the other two chords corresponding to its satellite.

We are currently working on the analysis of these data in order to obtain the physical properties that characterize the system. Preliminary results show that the lower limit for the equivalent projected diameter of the satellite is twice the previously estimated size from HST observations (Stephens et al. 2006). We will also compare our results with the area-equivalent diameter and albedo obtained using thermal data from Herschel and Spitzer observations (Farkas-Takács et al. 2020).