STELLAR OCCULTATION BY THE CHARIKLO RING SYSTEM OBSERVED FROM JWST. B. J. Holler[1], P. Santos-Sanz[2], A. R. Gomes Júnior[3], B. E. Morgado[4], J. Stansberry[1], H. B. Hammel[5], J. L. Ortiz[2], B. Sicardy[6,7], N. Morales[2], J. Desmars[8], N. Pinilla-Alonso[9], R. G. French[10], Z.-Y. Lin[11], E. Fernández-Valenzuela[9], M. Vara-Lubiano[2], M. Kretlow[2], D. Souami[7,11,*], F. Braga-Ribas[13], J. Camargo[14], G. Benedetti-Rossi[15], F. L. Rommel[14], R. Duffard[2], M. Assafin[16], R. Leiva[2], [1]Space Telescope Science Institute, USA (bholler@stsci.edu), [2]IAA-CSIC, Spain (psantos@iaa.es), [3]Federal U. of Uberlândia, Brazil, [4]Valongo Observatory/UFRJ, Brazil, [5]AURA, USA, [6]Sorbonne U., France, [7]Obs. de Paris, France, [8]IPSA/IMCCE, France, [9]FSI/UCF, USA, [10]Dept. of Astronomy, Wellesley College, USA, [11]IANCU, Taiwan, [12]U. California, Berkeley, USA, [13]UTFPR/DAFIS, Brazil, [14]Obs. Nacional/LineA, Brazil, [15]São Paulo State U./LineA, Brazil, [16]U. Federal do Rio de Janeiro/LineA, Brazil. *Fulbright Visiting Scholar (2022-2023)

Introduction: Perhaps the most surprising discovery in the field of minor body science over the past decade was the identification of rings around the Centaur Chariklo, an object too small to even be in hydrostatic equilibrium [1]. Since that time, rings have been discovered around another Centaur, Chiron [2, 3], and the large trans-Neptunian objects Haumea [4], and Quaoar [5]. Minor body ring systems provide important clues to the dynamical and collisional history of the outer solar system, specifically the trans-Neptunian region [6, 7], as well as the formation mechanism of satellites, a topic opened for debate after the discovery of the ring of Quaoar well outside its Roche limit [5]. Other open questions include the mechanism that confines dense rings and why the three rings discovered so far around small bodies areclose to the 1:3 spin-orbit resonance with the primary [8-10].

Observations: We predicted and observed a stellar occultation by Chariklo from the James Webb Space Telescope (JWST) on October 18th, 2022 UT. Observations were made as part of Guaranteed Time Observation (GTO) program 1271 (PI: P. Santos-Sanz; time provided by H. Hammel) with the NIRCam instrument in time series mode. Individual frames were obtained at a cadence of 3.3 Hz simultaneously through the very wide-band F150W2 and F322W2 filters to maximize signal-to-noise. In total, 14,827 frames were obtained over a ~1.25-hour period.

Results: The final geometry of the occultation is shown in Fig. 1. JWST was not in the shadow-path for the solid-body occultation, but drop-outs from the rings on either side of Chariklo were observed. This near-miss placed valuable constraints on the size and shape of Chariklo. The long time-baseline also enabled a search for additional, more distant structures.

Discussion: This is the first stellar occultation observed from JWST and is a successful proof-of-concept of the feasibility of using JWST to characterize solar system minor bodies and rings using this powerful technique [11]. The challenges encountered predicting the stellar occultation and the instrumental setup used to observe this occultation will also be discussed. We will present preliminary results from this successful occultation, showing details of Chariklo's rings and possibly other structures.

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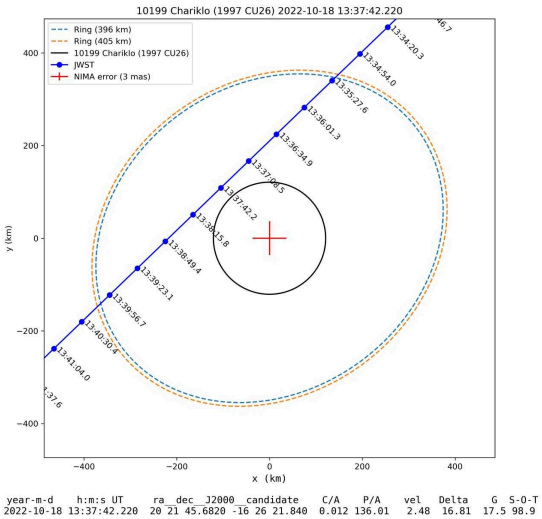

Figure 1: Final prediction of the Chariklo occultation on October 18th, 2022 UT, as observed by JWST.