

A stellar occultation by a small plutino with RECON

Rodrigo Leiva (1), Marc Buie (1), John Keller (2), Elizabeth Wilde (2), Ryder Strauss (2), Sean Haley (2) and the RECON-team

(1) Southwest Research Institute, Boulder, CO, USA.(rodleiva@boulder.swri.edu) (2) Astrophysical and Planetary Sciences, University of Colorado Boulder, Boulder, CO, USA.

Abstract

We present preliminary results from a stellar occultation by the small Trans-neptunian object (523764) 2015 WC₅₁₀. (523764) is a plutino and the smallest of that class measured with a stellar occultation.

This measurement is possible thanks to the unique design of the occultation network RECON extending more than 2000 km across the west coast of USA.

Positive detections from 5 sites plus constrains from sites with no detections show a body of ~ 150 km in diameter.

This size range in TNOs is vital to characterize the ratio of close and contact binaries which are a direct constraint to models of formation and early evolution of the Solar System.

1. Introduction

Plutinos are TNOs in 3:2 resonance with Neptune implanted in their current orbits after the early migration of Neptune. Rotational light curves seem to show a large fraction of contact binaries among the plutinos compared to the cold classical TNOs [2].

Stellar occultations are a powerful tool to measure accurate sizes and shapes and to measure the fraction of close and contact binaries. The Research and Education Collaborative Network (RECON) is a network of over 50 portable small telescopes spread across the East coast of EEUU and operated by high schools teachers and students [1]. RECON is a unique experiment designed to work as a single instrument to measure sizes and shapes of Trans-Neptunian bodies down to ~ 100 km and to detect and characterize close and contact binaries.

This complements the capabilities of HST for the detection of binaries which is limited by the angular resolution and relative brightness of the components.

2. Observations and preliminary results

RECON predictions requires regular astrometric measurements to keep TNOs orbits uncertainties at bay. We make use of all astrometric measurements submitted to the Minor Planet Center (MPC). Additionally we perform regular astrometric measurement of TNOs and Centaurs larger than ~ 100 km ($H_v > 9$) with different 4m-class facilities (DCT, APO/Arctic, CFHT/Megacam).

The astrometry used for the prediction of the occultation by (523764) came exclusively from Panstarrs survey and a full-network campaign was lunched on Dec 1st, 2019. 11 RECON sites obtained usable data while 5 of those detected an occultation. Analysis of the data is consistent with either a same-size binary object of about 150 km or a single object occulting two stars.

3. Summary

This is the first occultation by the object (523764) 2015 WC₅₁₀ and it is the smallest plutino measured by a stellar occultation. This result probes the capabilities of ground-based occultations for the physical characterization of TNOs in a range of sizes poorly explored. It also shows the unique possibilities of RECON project performing as a single instrument capable to measure small TNOs and the ratio of close and contact binaries in different dynamical classes.

Acknowledgements

The RECON is funded by NSF grants AST-1413287 and AST-1848621.

References

- [1] Buie, M., and Keller, J.: The Research and Education Collaborative Network, AJ, 151, 73, 2016.

[2] Thirouin, A. and Sheppard, S.: The Plutino population:
An Abundance of contact binaries, *AJ*, 155, 248, 2018.