RESULTS FROM STELLAR OCCULTATIONS BY TRANSNEPTUNIAN OBJECT (84922) 2003 VS_2

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Introduction: Stellar occultations by Trans-Neptunian Objects (TNOs) is a powerful and direct technique to obtain accurate diameters, shapes and albedos of these bodies [1] which has produced fruitful results in the last decade [2,3,4]. Other fine details like atmospheres, satellites and even rings can be detected by this technique [5]. We present findings from three wide international observing campaigns that resulted in the detection of a multichord and two single-chord stellar occultations by the TNO (84922) 2003VS_2. The multichord occultation was observed from seven sites in Argentina, Uruguay, Chile and Brazil and it was positive from four sites. The two single-chord were observed from France and Israel.

Main results: From the multichord occultation on November 7th, 2014 we could not fit a satisfactory elliptical shape for the instantaneous cross section of the body at the time of the occultation without shifting the chords of the occultation, possibly because of timing errors in one or several of the lightcurves. With the least possible shifts in the chords to align their centers in an inclined line with respect to the chords, we obtain the lengths of the axes of the fitting ellipse. Because 2003VS_2 is expected to have a triaxial Jacobi ellipsoidal shape (based on its rotational lightcurve and on hydrostatic equilibrium considerations), we had to obtain time series photometry of the body to derive the rotational phase at which the occultation took place in order to try to reconstruct the three-dimensional shape. It turns out that the occultation took place near the absolute brightness maximum of the rotational lightcurve, which implies that 2003VS_2 occulted the star when the cross section was near its maximum. Unfortunately, the minimum-chord-shift ellipse fit derived from the occultation is not compatible with the amplitude of the lightcurve resulting from the figures of equilibrium for any density and any possible orientation of the spin axis, i.e. the occultation axial ratio is not high enough to be compatible with hydrostatic equilibrium.

Discussion: A possible solution to this axial ratio problem is to shift the chords of the occultation till the ellipse fit axial ratios are compatible with equilibrium figures. Using that approach, a family of solutions for various densities is obtained. The mean equivalent diameter obtained is then around 10% larger than the radiometrically derived diameter of 2003VS_2 through Herschel data, but compatible within the error bars. An alternative explanation could be that 2003VS_2 is a Maclaurin body with a large crater or topographic feature that would cause a large asymmetry in the body cross section. This is unlikely to be the case and the implied density would also seem to high.

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