Eclipsing Binaries from the Next Generation Transit Survey

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Abstract

The Next Generation Transit Survey (NGTS) is a world class facility for photometry located in Paranal, Chile. The flexibility of NGTS alongside its red optical capability, 4.5" pixels and fast 13s cadence have allowed us to make numerous contributions to the field of eclipsing binaries, especially for systems containing one or more late M dwarf or brown dwarf companions. Here we provide an overview of the eclipsing binary science being done within the NGTS consortium. This includes four rare spectroscopic double lined M+M binaries, as well as some of the longest period late M and brown dwarf companions ever discovered. We have also recently begun a programme to search for double white dwarf binaries in our dataset. NGTS is open to requests for observations for any science case and our streamlined proposal system makes it easy to request observations for your own targets.

Facility

Fig1. NGTS enclosure at Paranal

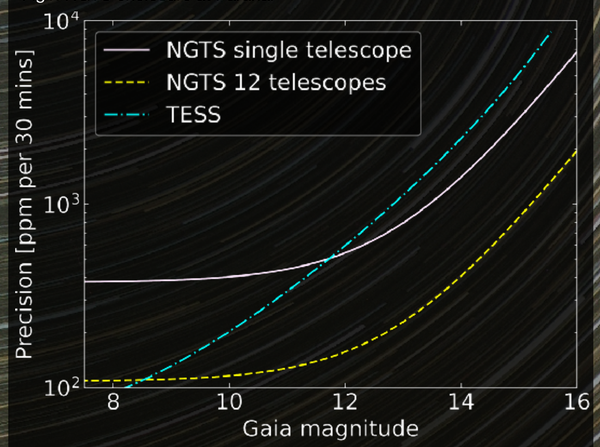
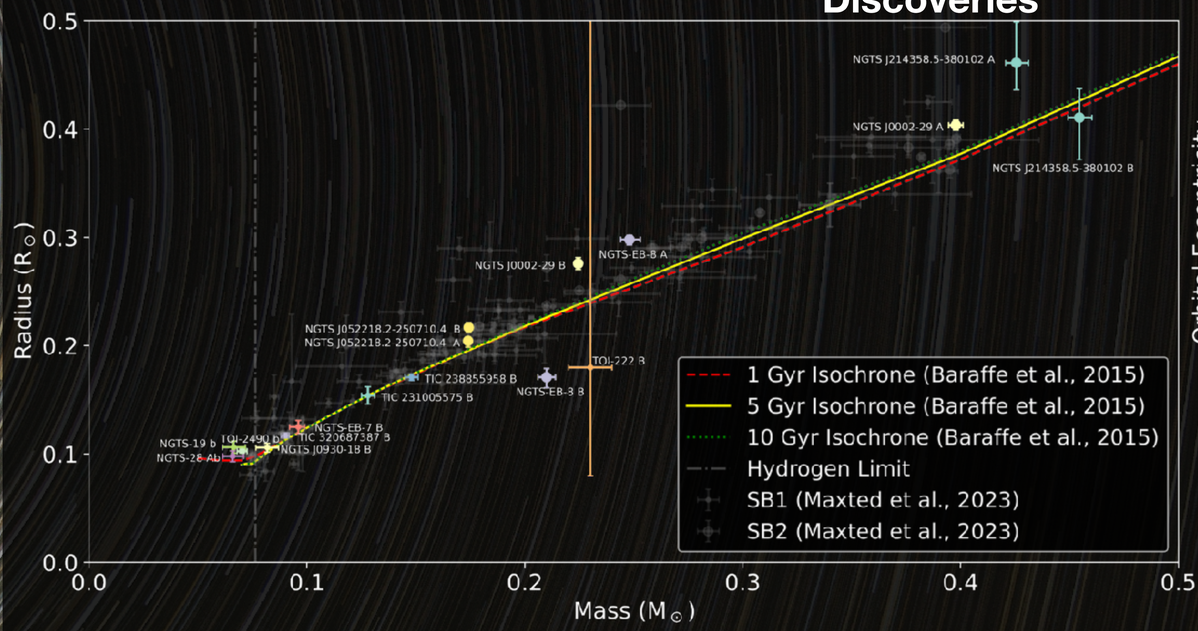


Fig 2, Lightcurve precision against stellar magnitude.

Located in Paranal Chile, NGTS[1] consists of 12 independent robotic 20cm telescopes. With precision rivalling TESS[2,3,4] it is one of the best ground based facilities for precise transit and/or eclipse photometry.

Discoveries



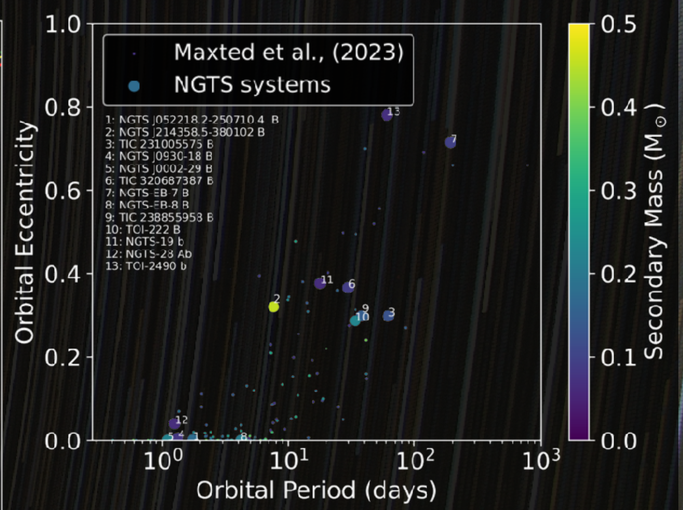


Fig3. Our ten eclipsing binary[5,6,7,8,9,10,11,12,13,14] and three brown dwarf[15,16,17] systems plotted in mass-radius space **(left)** and period-eccentricity space **(right)**. For comparison we overplot a sample of low mass eclipsing binaries from the EBLM project[118] as well as three model isochrones[19]. In the left plot double lined spectroscopic binaries are plotted with larger markers than single lined

To date, the NGTS consortium has led the discovery of ten eclipsing binary systems containing M dwarfs, most of which lie below the convective boundary at ~0.3 M_{sun}. Four of these systems are double lined spectroscopic M+M binaries, allowing model independent parameter derivations of both stars. Most of our remaining single lined binaries contain M dwarfs near the theoretical Hydrogen burning limit on wide, long-period orbits. This makes them good analogues for single star evolution and valuable for testing whether the observed radius inflation in some binary M dwarfs[18] is a product of close binary effects or a systematic error in stellar models. Our long period systems show little to no radius inflation, providing some evidence for a close binary induced explanation.

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Background image: Long exposure of NGTS at Paransl, Credit James McCormac

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