

Understanding M Dwarf Radius Inflation

Insights from Low-Mass Eclipsing Binaries

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Low-mass stars are the most common stellar objects in our solar neighbourhood and ideal candidates for the detection of Earth-sized exoplanets.

ACCURATE STELLAR PARAMETERS ARE CRUCIAL TO CONFIDENTLY DETERMINE EXOPLANET PARAMETERS.

Low-mass eclipsing binaries provide opportunities to obtain empirical mass and radius relations and relate them to stellar evolution models.

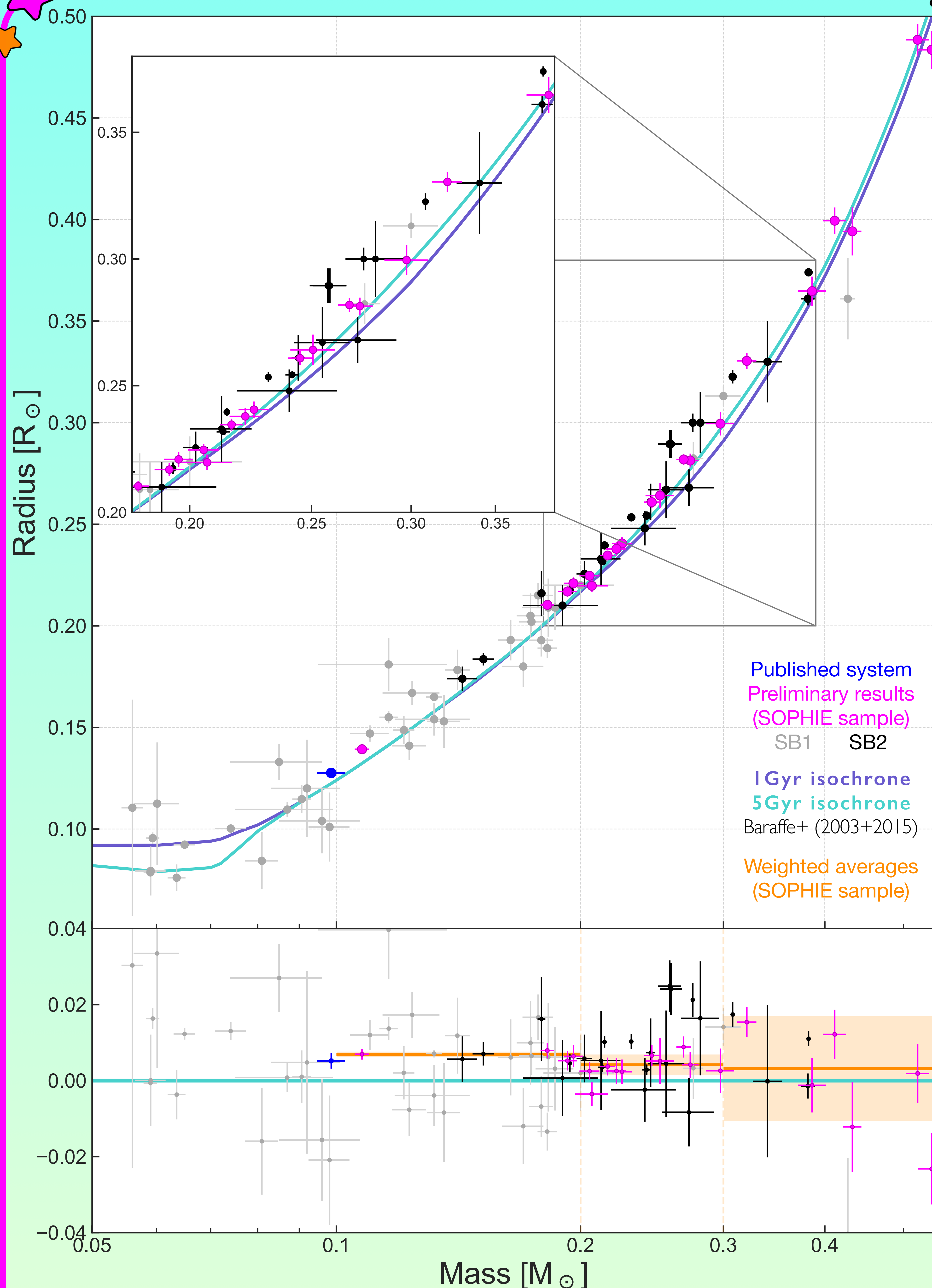


Figure 1: Mass-radius diagram with logarithmic mass axis, showing published single-lined systems (SB1) in grey, double-lined binaries (SB2) in black, and preliminary results from this work in pink.

EBLM J2114-39 (Davis+ 2024)

Examples of photometry and radial velocity data for the low-mass eclipsing binary (EBLM) systems being studied in this sample.

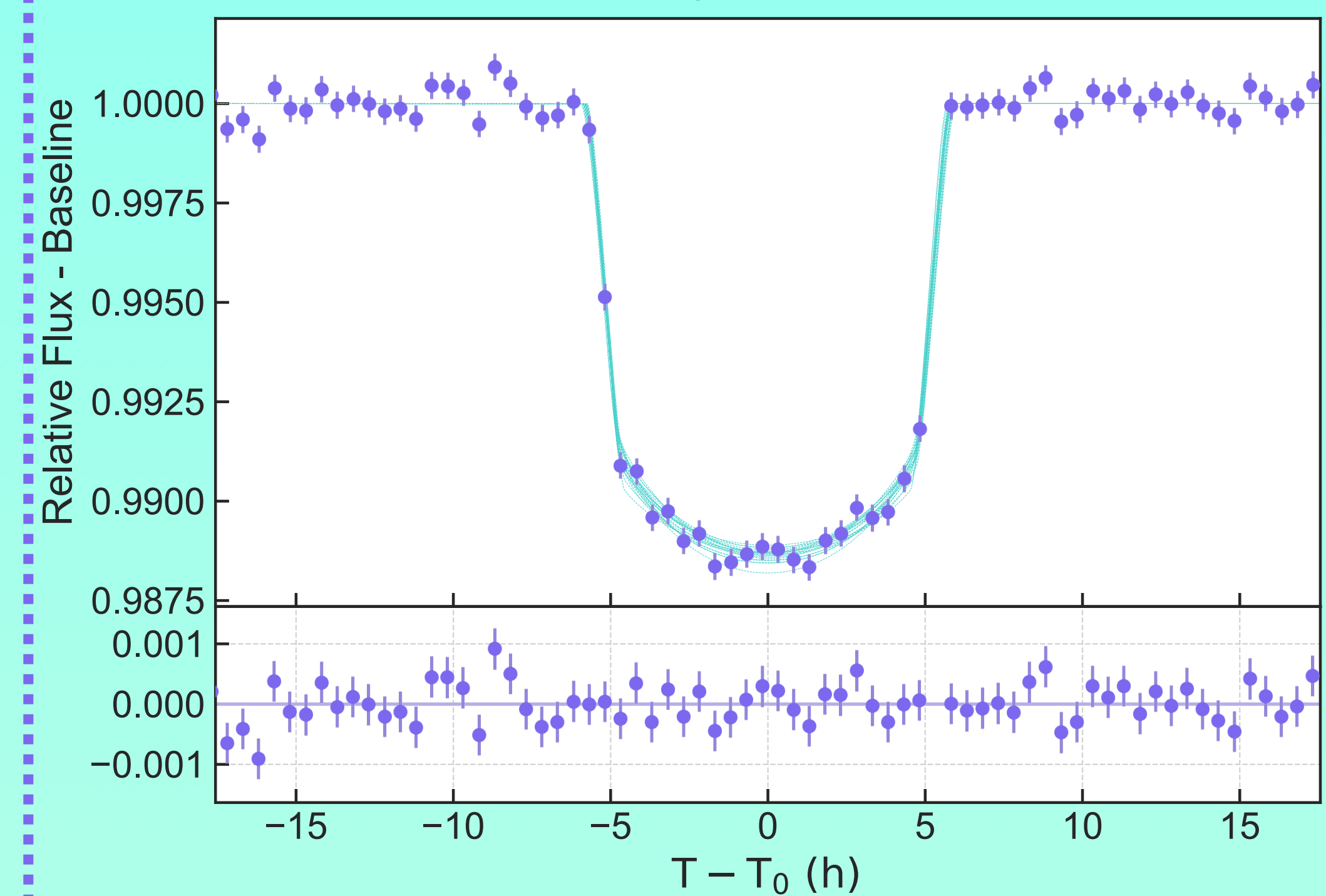


Figure 2: Phase shifted transit of EBLM J2114-39, data shown in purple. 20 random samples from the MCMC run are displayed in teal colour.

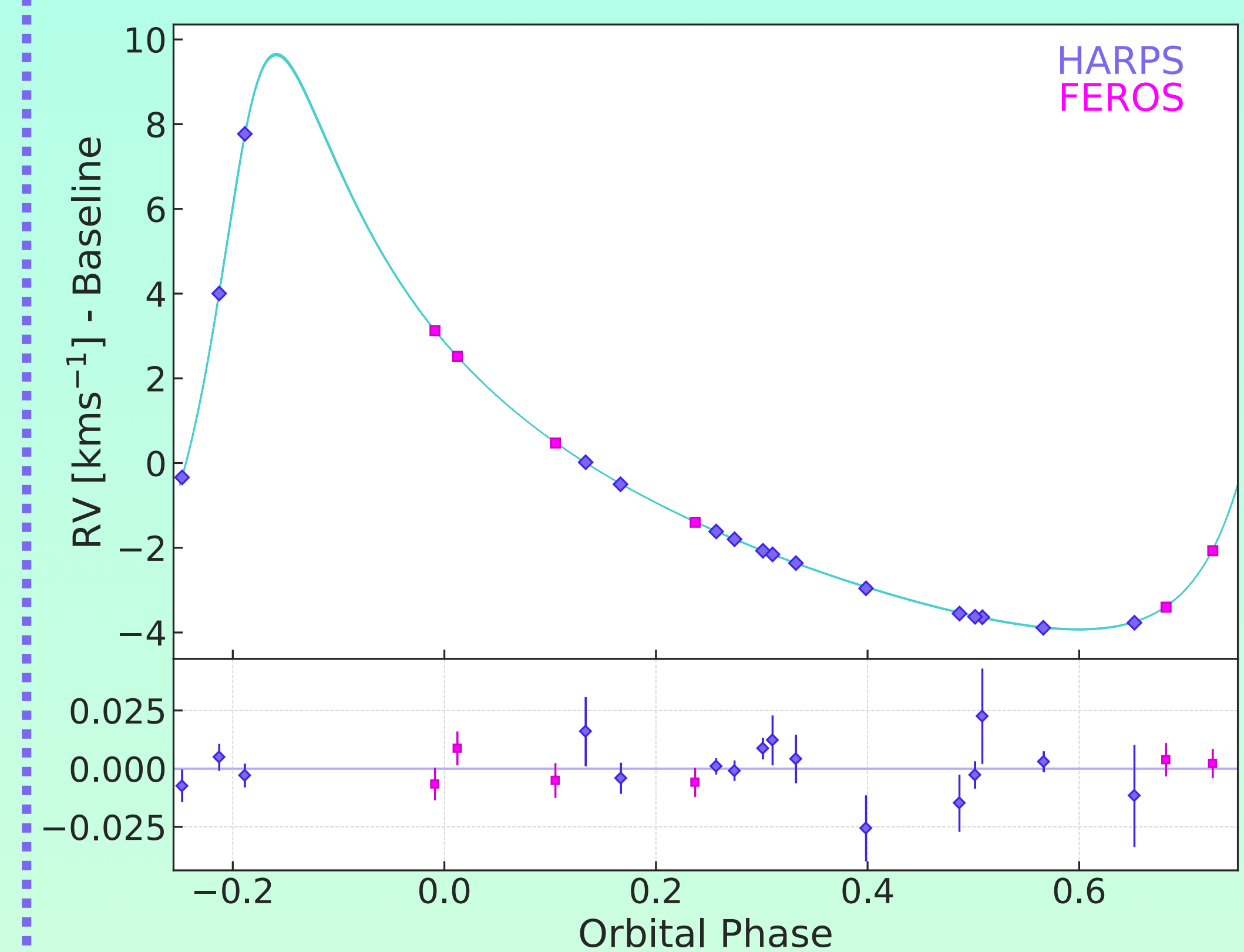


Figure 3: Phased radial-velocity measurements for EBLM J2114-39. Sample of 20 random models from the MCMC run shown in teal colour.

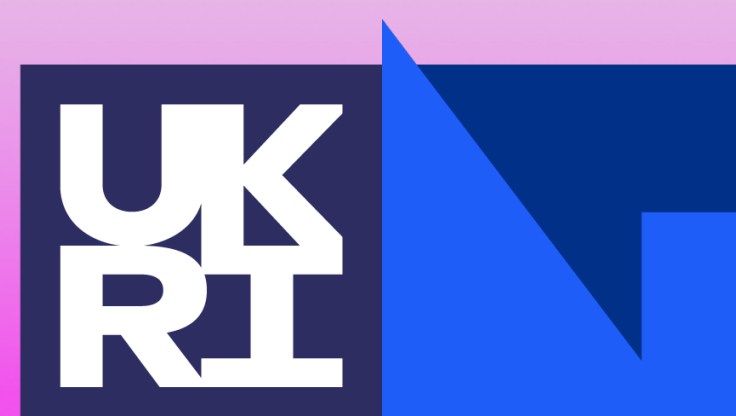
From the 20/71 systems which have been modelled so far we see radii are generally consistent with the Baraffe models. However, when we look at weighted averages in different mass bins we find radius increases of

0.1 - 0.2 M_{\odot}	➔	6.9%
0.2 - 0.3 M_{\odot}		1.3%
> 0.3 M_{\odot}		7.5%

We will have a sample of 71 homogeneously modelled low-mass eclipsing binary (EBLM) systems to investigate radius inflation and calibrate the mass-radius-luminosity-metallicity relation.



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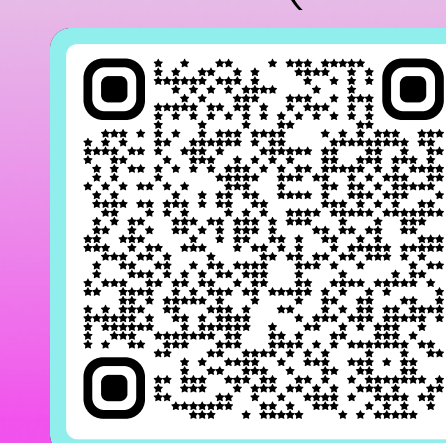


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EBLM XII
Davis+ (2024)



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