Twin M Dwarfs Appear Both Fraternal and Identical in Activity and Rotation

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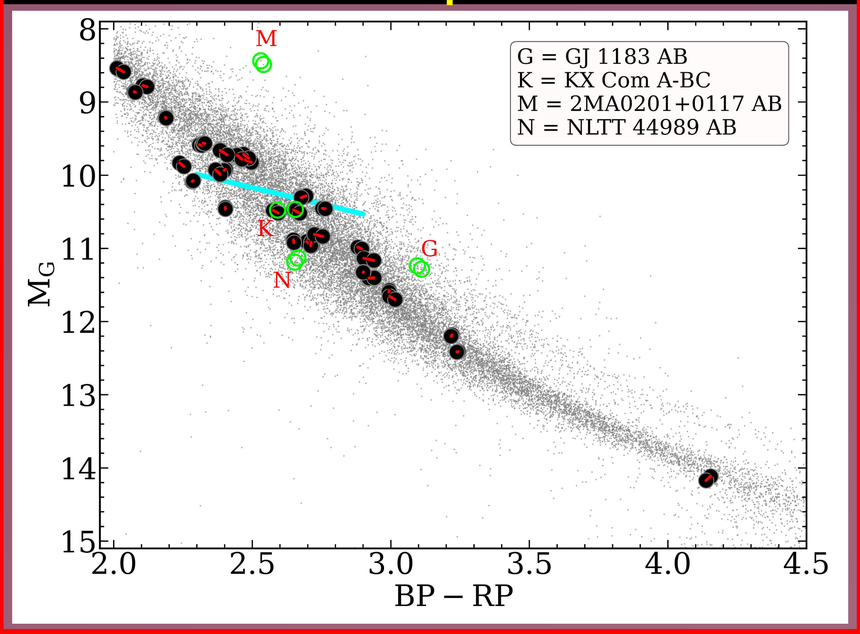
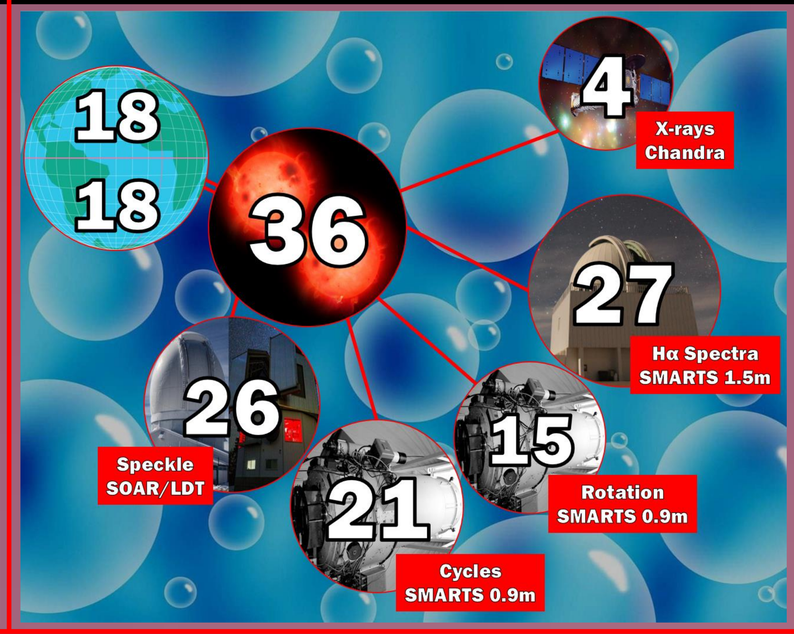
Abstract

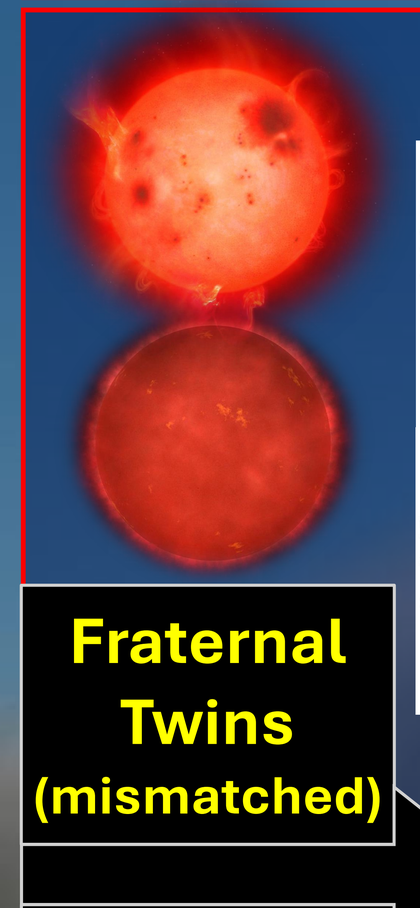
M dwarfs that host exoplanets – such as TRAPPIST-1 and Proxima Centauri – can demonstrate remarkably strong stellar activity, with a variety of potentially significant impacts on the orbiting planets and their atmospheres. Understanding the evolution of a planet's habitability therefore depends on reconstructing the evolution of its host star activity. However, the complex nature of M dwarfs has thus far prevented robust and precise determinations of this activity evolution. To this end, **we have assessed the general predictability of stellar activity by investigating a sample of 36 M dwarf wide binaries with identical `twin' components**. Key subsets have been observed with several campaigns to obtain **rotation periods, multi-epoch Hα equivalent widths, X-ray luminosities, and long-term optical photometry**. We also employ time series radial velocities and speckle interferometry to check for unresolved companions. Here we show results for the full sample, where **many twin stars have surprisingly congruent measurements, in contrast to four notable systems demonstrating consistent differences in activity and/or rotation** that might suggest star-planet interactions.

Sample

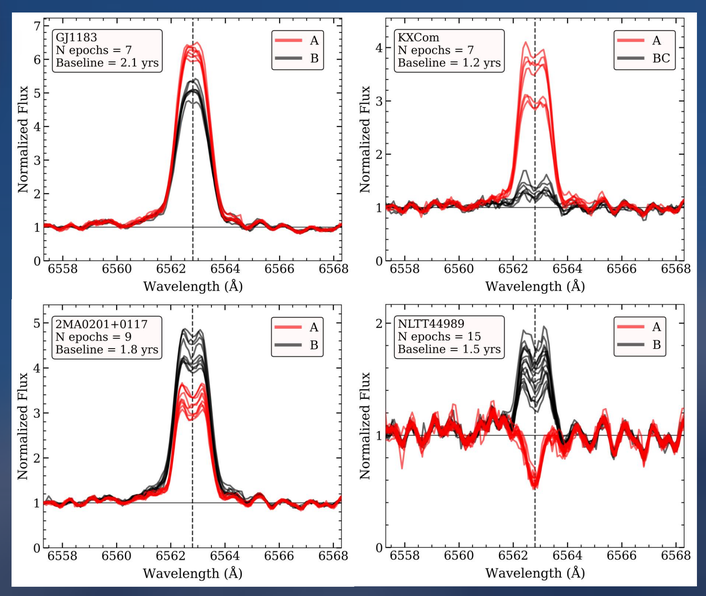


Observations

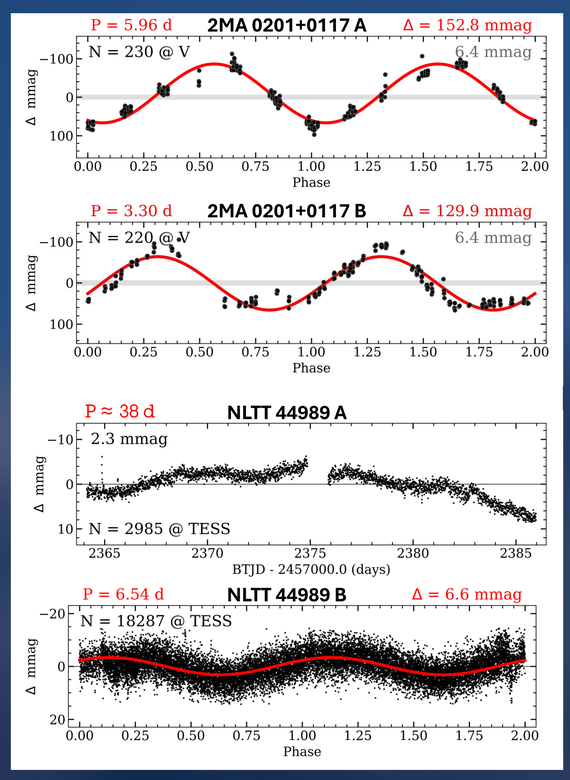




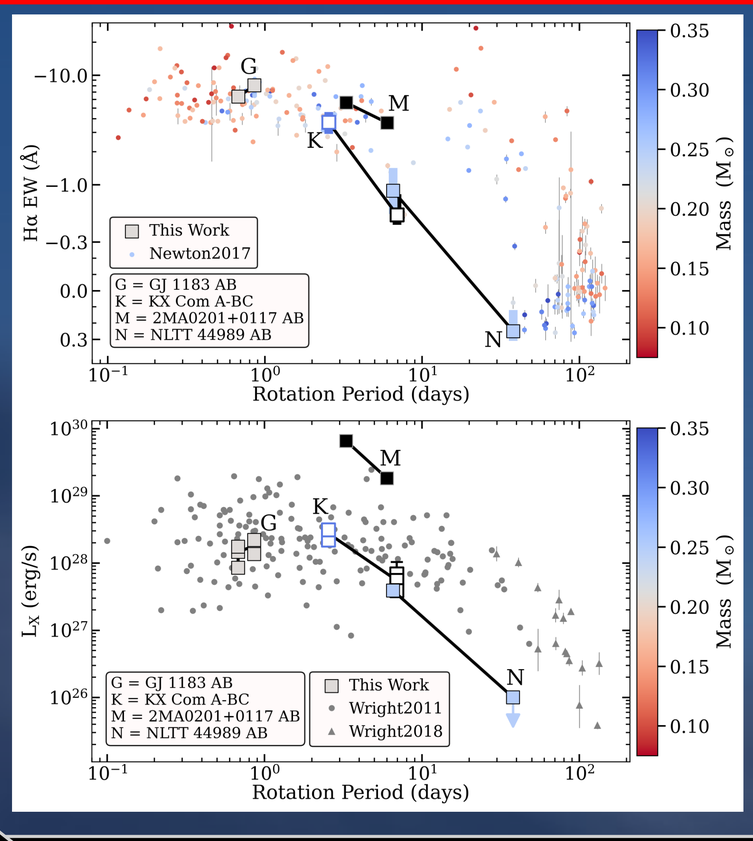
Fraternal Twins (mismatched)



Hα Activity

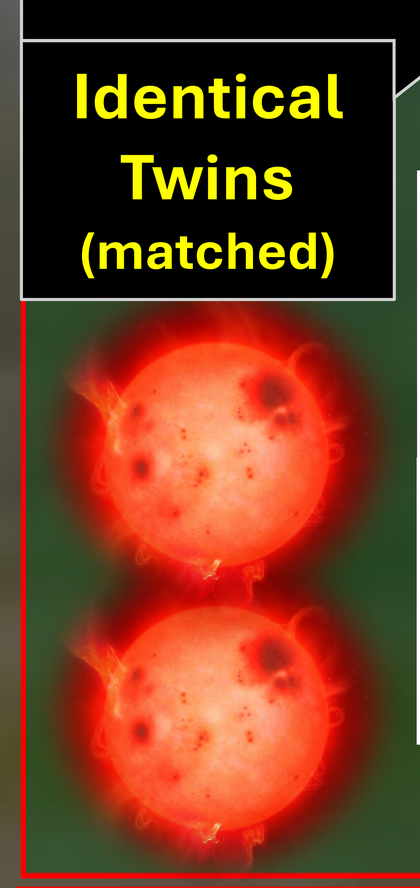


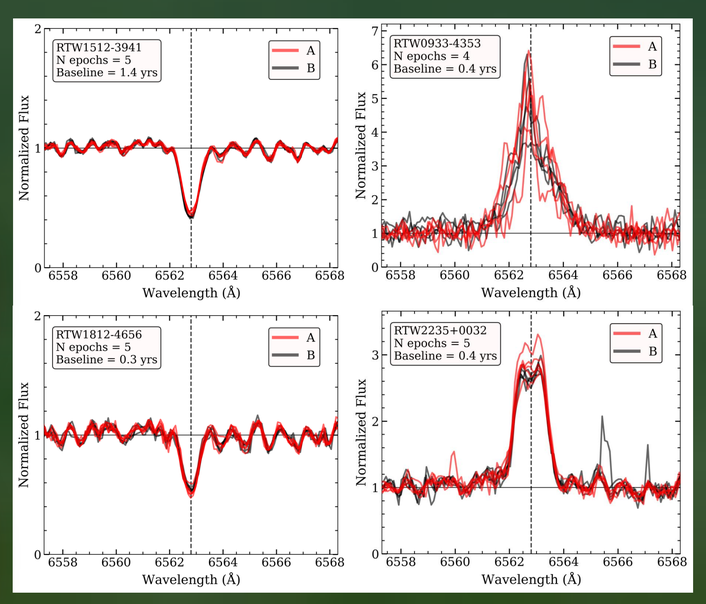
Rotation

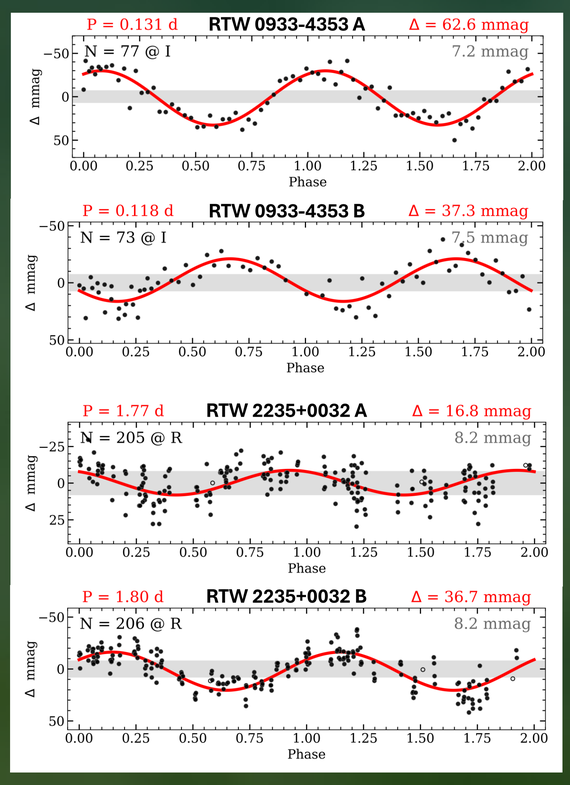


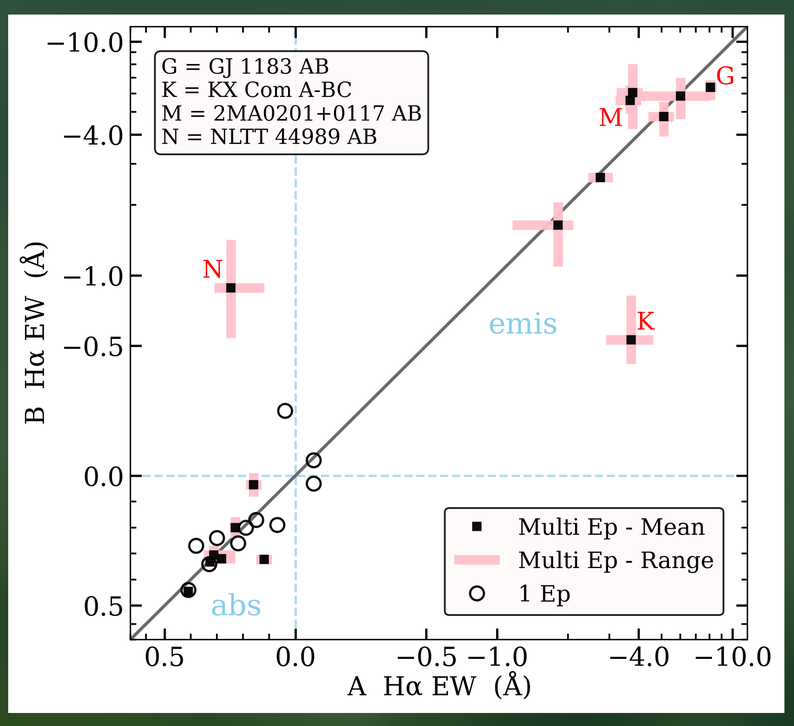
X-rays, rotation, Hα, oh my!

Identical Twins (matched)









(ePoster)

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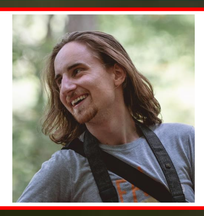

(website)