Examine Flare Rates in Close M Dwarf + White Dwarf Binary Pairs

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M dwarfs (dMs) with close binary companions, white dwarfs (WDs) in this case, are known to have an increase in their “quiescent” magnetic activity (Hα emission) as compared to the field population (right). Can a close binary companion also cause an increase in the occurrence rate of flares?

Searching for flares in the SDSS Stripe 82 Catalog

248 out of 1756 spectroscopically confirmed WD+dMs from Morgan et al. (2012) matched to SDSS Stripe 82 catalog: 76 are active.

We selected candidate flares using a flare variability index ($\Phi_{uv}$), an increase in the u and g-band fluxes weighted by measurement errors, vs. the u-band flaring flux. Imposed quality cuts of $\Phi_{uv} > 100$ (vertical dotted line) and a minimum of 0.7 magnitude increase in the u-band ($\Delta u > 0.7$, horizontal dotted line; Kowalski et al. 2009).

Time series photometry from two flaring stars.

11 flaring stars, 13 flares total

Comparison close WD+dM flare sample to previous studies

We show a higher fraction of flaring epochs in the M0-M1 and M2-M3 bins than the field study by Kowalski et al. (2009), yet the M4-M6 bin shows a lower fraction. Our preliminary sample size is low, motivating the need for building a larger sample.

The majority of flaring stars had separations less than one AU; including the two active systems. 81±10% of our flaring sample is inactive, significantly higher than the 8±3% reported by Kowalski et al. (2009).

Preliminary analysis suggests that the presence of a close companion may increase the likelihood of large ($\Delta u > 0.7$) flaring events in dMs; perhaps even those that appear inactive (no Hα emission).

Next Steps: Continue analysis with photometrically selected sample of close WD+dM pairs.

Using color cuts (shown above, inside dashed lines) along with proper motions cuts, we can isolate close WD+dM pairs with <10% contamination rate by other sources.


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