Spectroscopic analysis of four dynamo-driven chromospherically active RS Canum Venaticorum Binary Stars

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The RS Canum Venaticorum stars are close binary systems with tidal synchronization of spin and orbital motion. They display the indicators of strong magnetic dynamos, including starspots, coronal X-rays emission and flaring.

I carried out and I present an analysis based on high cadence and high spectral resolution spectroscopy of four canonical RS Canes Venaticorum binary systems (AR Lac, Z Her, V711 Tau and UX Ari), to show the effect of including the stellar activity on the spectral formation and the derived property of the systems.

From the computed radial velocity (RV) profiles for all targets I found the stellar masses for both components and possible chromospheric structures visible in the line profiles. To analyze the activity of each stellar component I separated the two contributions and computed a grid of synthetic NLTE spectra with the *PHOENIX* model atmosphere code, using a scaled solar chromosphere attached to a photospheric model and compared these synthetic data to new high-resolution phase resolved visible-range (3700-9000 Å) data obtained in 2017 from July to mid-November with the *HEROS* spectrograph.

I concluded that while AR Lac and Z Her show weaker activity with a relative emission strength in Ca II, H-K, UX Ari and V711 Tau are very active, and they show a shift between the chromospheric and photospheric velocity curves. The Ca II line profiles revealed a possible extended structure, which moves with a different velocity amplitude than the center of mass and is likely a prominence at high latitude.

Finally, I derived new systemic parameters and also confirmed that Z Her is the only system showing an inverted mass ratio. Assuming no mass and angular momentum loss from the system, the mass transfer event for Z Her probably occurred at the beginning of the subgiant branch.