

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS

Number 2969

Konkoly Observatory
Budapest
22 December 1986
HU ISSN 0374-0676

ON THE CORONAL ACTIVITY OF RS CVn SYSTEMS

Re-examination of the x-ray emission from RS CVn systems altered the picture of coronal activity for these systems almost completely. It was found, contrary to the general belief, that the stellar radius but not the rotation of the stellar surface is the dominant parameter in the level of coronal activity of the components of RS CVn systems.

X-ray data used in the analysis are from HEAO1 A2 and Einstein surveys (Walter and Bowyer, 1981). X-ray luminosity L_x was taken to be the coronal activity indicator. Non-existence of the rotation period-coronal activity relation for these systems has been confirmed after Rengarajan and Verma(1983). Majer et al.(1984) also found no significant rotation-activity correlation for the RS CVn stars they studied. They also used L_x as coronal activity indicator. It was shown that same result persists (contrary to the findings by Walter and Bowyer, 1981; and Basri, et. al., 1985) even when surface x-ray fluxes, but not flux ratios, are used. The bolometric luminosity used in obtaining flux ratios has long been known to be an orbital period dependent quantity for the sub-giant stars in binaries (e.g. Gratton, 1950, see also Young and Koniges,1977) and produces an artificial rotation-activity relation for the subgiants in RS CVn systems (Rengarajan and Verma, 1983).

The coronal activity was found to be correlated with the square of radius and the relation is much better defined when the both components in the systems are assumed to be active (see Fig. 1.). In some systems e.g. RZ Cnc RT Lac, VV Mon, AR Mon, RW UMa less massive components are more evolved and it seems they are more active components of the respective algol-like systems. In addition to nineteen RS CVn systems two other binaries (Algol and V471 Tau) from two different classes have been included in the analysis for comparison. It looks in general that mass transferring systems do not obey the same radius-activity relation. Here, the duplicity effects such as Roche-lobe overflow or stellar wind to the companion and interacting coronae or non-synchronism in long period binaries should be operative. All these effects to the activity

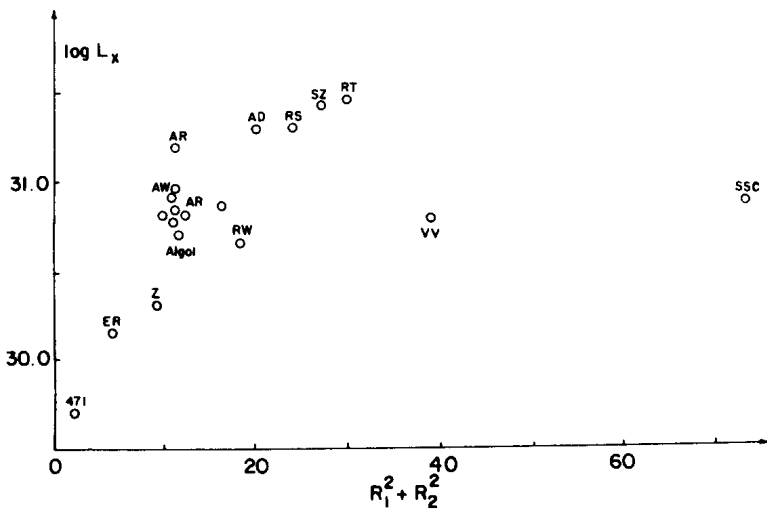


Figure 1

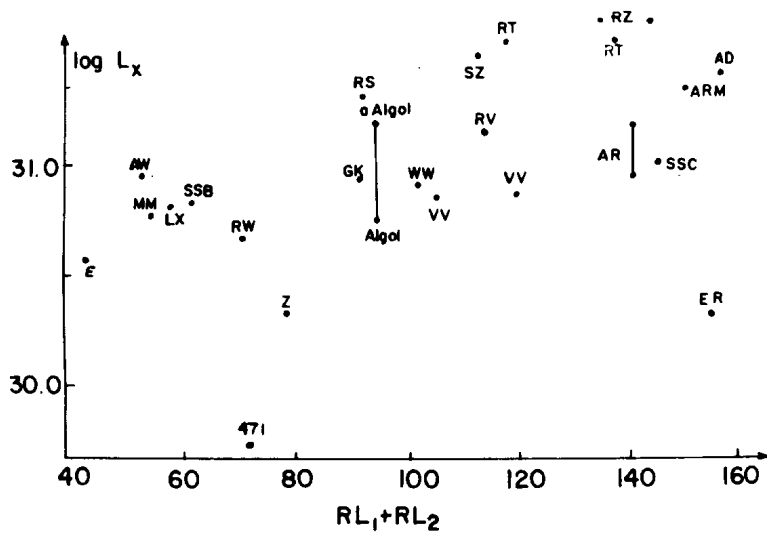


Figure 2

seem to be represented by a single parameter called Roche-lobe filling percentage RL. A clear correlation is found between RL and coronal activity (see Fig. 2). Not only the cooler, more evolved components but both components contribute to the x-ray emission as proportional to their RL. Effective temperature, bolometric luminosity and mass seem not to correlate with coronal activity for the components of RS CVn systems.

I believe that R and RL represent the most important dynamo parameter namely thickness of the convective layer for the late type evolved stars in binaries, and surface rotation rates of these stars are quite different from convective velocity where the dynamo works. This is why rotation activity correlation is not seen in RS CVn systems. Such a result can be understood with the assumption that the dynamo works on the base of a differentially rotating thick convective layer of the late type stars.

Details of this work will be published elsewhere.

OSMAN DEMIRCAN
Physics Department,
Middle East Technical
University, Ankara
Turkey

References:

- Basri G., Laurent R., Walter F.M., 1985, Ap.J., 298,761.
Gratton L., 1950, Ap.J., 111,31.
Majer P., Schmitt J., Golub L.,Harnden F., Rosner R., 1984, Bull. Amer. Astr. Soc., 16,504.
Rengarajan T.N., Verma R.P., 1983, M.N.R.A.S. 203,1035.
Walter F.M., Bowyer S., 1981, Ap.J. 245,671.
Young,A., and Koniges, A., 1977, Ap. J., 211 836.