THE GEOMETRICAL STRUCTURE OF ACTIVITY IN THE AR LAC SYSTEM

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Although solar activity is seen to exhibit a very inhomogeneous and convoluted set of structures, and we have good reason to expect that stellar activity is also very structured, it is naturally quite difficult to resolve such structures on other stars. One of the best opportunities for doing so is afforded by an active eclipsing system of short period, in which both the eclipses and stellar rotation serve to cover and uncover features on reasonable time scales. AR Lac is the nearest and most suitable such system, it is an RSCVn system comprised of an active G dwarf and active K subgiant with a two day period. We report here on simultaneous X-ray and UV coverage of an eclipse in this system obtained with the Einstein and IUE observations. More details are given in reports in IAU Coll. No. 71 and IAU Symp. No. 102.

The eclipse was seen in all the activity diagnostics observed. The rise of the X-ray light curve coming out of primary eclipse was more rapid than can be accomodated by a symmetrical corona, implying a concentrated low-lying corona on the leading edge of the G dwarf. The UV observations also imply that almost all the chromospheric activity was concentrated on the leading half of the G star. They additionally show that a hardening of the X-rays near fourth contact was followed by the emergence of a very bright active region on the K subgiant from behind its limb. This region contained as much MgII emission as the rest of the star and was perhaps 10° wide in longitude. The secondary X-ray eclipse had its strongest dip at first contact, implying an extended (~ stellar radius) coronal component on the K star, also on the leading edge. The UV transition diagnostics were compatible with approximately equal surface fluxes on both components.

These observations demonstrate both the strongly structured nature of stellar activity and the utility of multi-spectral eclipse observations for studying it. Much more data will be required to develop a comprehensive picture of the activity on even a few well chosen active stars. Such data are crucial if we are to properly interpret the usual spatially unresolved activity diagnostics; treating them as though they are averaged over the stellar surface can yield physically misleading models.

Richard M. West (ed.), Highlights of Astronomy, Vol. 6, 650.