RADIO ASPECTS OF STELLAR ACTIVITY IN CLOSE BINARIES

R.M. Hjellming
National Radio Astronomy Observatory
Socorro, NM 87801, U.S.A.

Excluding single stars, star systems with very strong X-ray sources, thermally radiating winds and circumstellar envelopes, marginal detections, and binary systems that are far from "normal", there are about 21 close binary systems that show clear signs of stellar activity in the form of variable radio emission. Sixteen of these are RS CVn binaries. Typical events are smoothly varying with time scales of from a few hours to a few days. In the RS CVn binaries UX Ari and V711 Tau variable circular polarization is sometimes observed, with occasional appearence of components with only one frequency and one circular polarization, part of which shows "oscillations" with "periods" of about 4 minutes. Different stars and different events typically have inferred electron energies of about 5 MeV and inferred magnetic fields of 1 - 30 Gauss. The radiation mechanisms are usually assumed to be synchrotron or gyro-synchrotron; however, radiation from plasma processes cannot be ruled out in some cases, and it will be very important to establish or rule out this possibility. Most radio binary events show clear signs of self-absorption, so the variations appear most strongly at the higher frequencies. Typical rise times of events are about 30% of decay times. Maximum radio luminosities range from 10^{13} to a few times 10^{17} ergs s^{-1} Hz^{-1}. Most radio flares are mainly at cm-wavelenghts and have observable and inferred energies 10^{4} - 10^{6} times those for the largest solar events, a scaling which is similar to that for X-ray emission measures of these stars when compared to solar coronal loop emission measures. Most importantly, VLBI measurements of Algol indicate that the sizes of the radio emitting regions for very strong events are of the order of 2 - 3 stellar radii. Single stars appear to be active at radio wavelengths much less commonly than close binary systems. In many cases this may be due to the way dynamo action and convection near the surface are affected by increased rotation forced by the synchronization induced by the binary system.

Patrick A. Wayman (ed.), Highlights of Astronomy, Vol. 5, 857.