the general lack of alternatives with appropriate period, light-curve, and color behavior. Modern photoelectric determinations of spot properties appear to favor spot temperatures a few hundred degrees cooler than the surrounding photosphere, but the results are not unique, and bright spots may also be present. Suggestions that spots may trace out differential rotation have come from the observed migration of the light curve with respect to the eclipses in RS CVn stars, and from period changes in dwarfs; however, it is not clear whether the period changes reflect differential rotation or spot evolution.

Spot variability may occur on timescales of days. However, photographic studies with a time baseline of 60 years, completed for four dwarfs, show long-term drifts in optical light on the order of 3%, with timescales of decades. No real evidence for 11 year cycles has been found, in contrast to Wilson's Ca II emission observations, but this discrepancy may be due to the limited accuracy of photographic plates. Similar kinds of behavior are present in RS CVn stars; spot areas may persist for periods up to decades.

Standard spot models translate the 3% optical variability into 1% luminosity variations; this should be confirmed by bolometric observations. The available long-term studies and statistical arguments suggest that variability may be intermittent. The long timescales present in the observations indicate that suppression or modification of convection in the outer envelopes persists for timescales longer than the overturning time.

Session 14: 1000–1200 (Room 277)

X-Ray Pulsars


The Vela pulsar (PSR 0833-45) has been observed with the two imaging detectors of the Einstein Observatory. The 10° x 10° field observed with the Imaging Proportionial Counter is filled with soft emission (0.1 - 0.28 keV) from the Vela SNR and also contains a discrete source of harder emission (0.5 - 3.0 keV) at the position of the pulsar. No X-ray pulsations in the radio period were detected in the data obtained 1978 November 29 and December 20-25, with a 95% confidence upper limit of 2 x 10^{-14} erg cm^{-2} sec^{-1}.

A comparison between this field and others within the Vela supernova remnant suggests that the pulsar is fortuitously located near a hot spot in the blast-wave emission from the large scale remnant. The High Resolution Imager (HRI) picture reveals a small scale nebula of ~80 arc sec extent centered on the pulsar, with the emission strongly peaked at the position of the pulsar. This detailed structure will be discussed in the context of models of hot neutron star emission and pulsar-nebula interactions.

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04.14.09 Observations of the X-ray Pulsar GX301-2 with SAS-3. B.R. KELLEY, H.V. BRADT, R. PETRE, and S.A. RAFFAPORT, M.I.T. - A thirty day pointed observation of the X-ray pulsar GX301-2 (4U1223-62) has been carried out with SAS-3 during 1979 January-February in which pulse arrival times were measured and high speed data (down to 0.1ms) taken, some during periods of extreme activity. Preliminary analysis of the pulse arrival data confirm the conclusion of White et al. (1) that the pulsar is a member of a long period binary system, although we find orbital elements different from theirs. Rapid, chaotic flaring was seen on two occasions in which flares with rise times of ~2s and lasting ~10s reached intensities of ~0.8 x 10^{-4} Crab, similar to those seen one year earlier (2). Refined orbital elements and results of analysis of high speed data will be presented.

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