The Quiescent and Flaring Corona of Algol as seen by the Chandra HETG

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Abstract

On April 1st 2000, we obtained a 52 kilosecond HETG/ACIS-S spectrum of the protypical evolved binary Algol. This active binary has an orbital period of 2.87 days, and contains a primary B8V star, and a secondary K2 IV star which is filling its Roche lobe and rotating in synchronism with the orbital period. The observation commenced during secondary eclipse, and, as the secondary came into view, it was evident that a large flare was in process. The durations of the 'rising' and declining phases of this flare were about 5 and 7 ks, respectively, although the former timescale almost certainly is the eclipse modulation timescale and not the actual true flare rise time.

We compare and contrast the overall flare spectrum, and derived quantities such as the coronal temperature structure and metal abundances, with the observed spectrum and inferred parameters of the corona during the last 30 ksec of the observation when the system was essentially quiescent, and with an HETG/ACIS-S observation of the RS CVn binary system UX Ari that was obtained in January 2000 when this system was in a relatively quiescent state. We analyze the H-like and He-like resonance line features of the abundant elements such as O, Si, and Mg in both the flaring and quiescent Algol spectra, and discuss the presence of electron density and radiative transfer effects, as well the evidence for kinematical effects such as enhanced line broadening due to turbulence, Doppler shifts, particularly during the flare interval. Finally, we discuss the possible detection in the flare spectrum of fluorescent Fe Kα emission from photospheric/chromospheric plasma irradiated by the hard ($\geq$ 7 keV) tail of the coronal flare plasma.

CATEGORY: NORMAL STARS AND WHITE DWARFS