X-RAY CORONAE FROM SINGLE LATE-TYPE DWARF STARS

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1. Introduction

Study of X-ray coronae from late-type stars with moderate resolution X-ray spectroscopy with *ASCA*, has led to the characterization of temperatures and measurements of elemental abundances in their coronae. Several RS CVn and Algol-type binary systems, and single late-type stars have been observed. We present here the results obtained from X-ray spectroscopy of *recently observed single F-G-K-M type dwarfs.* The sample observed with *ASCA* contains αCen (Mewe et al. 1997), π^1UMa (Drake et al. 1994), YY Gem, Speedy Mic, GJ 890 (Singh et al. 1997), EK Dra, HN Peg, κ^1Cet (Guedel et al. 1997), AB Dor (Mewe et al. 1996) and HD 35850 (Tagliaferri et al. 1997).

2. X-ray Activity vs. Rotation Period

The ratio of "quiescent" X-ray luminosity to the bolometric luminosity is an indicator of the X-ray activity level. Being independent of the radius and distances of the stars it allows us to combine stars of different spectral types. Augmenting the *ASCA* observed sample above with the *ROSAT* observed G dwarfs from Guedel et al., we find that the log L_x/L_{bol} shows a strong correlation with the period of rotation of stars and saturates near the value of -3 reached by stars rotating with periods of a day or faster.

K. Koyama et al. (eds.), The Hot Universe, 222-223.

3. X-ray Spectroscopy

3.1. DIFFERENTIAL EMISSION MEASURES (DEM)

Application of continuous emission measure polynomial method and using plasma emission models "MEKAL" (Mewe et al. 1995) shows that in the very rapidly rotating dwarfs e.g., GJ 890 and Speedy Mic, DEM is best represented by a bimodal temperature distribution, and shows the presence of a very hot component (kT $\geq$ 2 keV). These stars show DEM characteristics similar to that observed in the RS CVn and Algol type binaries (Singh et al. 1995, Singh et al. 1996, Kaastra et al. 1996). During the frequently observed X-ray flares on active K and M dwarfs the temperature of the plasma and the emission measure in the hotter cpmponents increases significantly. Very hot components with kT$\geq$ 1 keV are, however, not found in the Sun like stars e.g., αCen and π^1UMa.

3.2. CORONAL ABUNDANCES

The coronae of rapid rotators show extremely weak line emission and consequently a depletion (factor 3 to 8) of elemental abundances when compared to the solar photospheric abundances (Anders & Grevesse 1989). This underabandance appears to be more than that observed in Algol and AR Lac. The First Ionization Potential (FIP) effect as observed in the solar corona, where the low FIP elements have enhanced abundances compared to the high FIP elements has not been detected in the X-ray spectra of rapid rotators.

In single solar-types G stars, e.g. αCen (and π^1UMa), the corona is relatively cooler and the elemental abundances in them are closer to that in the solar corona, and thus indicative of the FIP effect as seen in the Sun.

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