38.03

The Ionization State of the Local Interstellar Medium as Determined by Extreme UV Spectroscopy of Hot White Dwarf Stars

T. Rumpf (CEA/UCB)

Observations of the local interstellar medium (ISM) over the past two decades have led to the view of the solar system imbedded in a small, low-density, low-temperature cloud, which is imbedded in a much larger volume of very diffuse, hot gas. Little data is available to constrain models of this configuration. One of the most basic indicators of the physical state of the ISM is the ionization states of hydrogen and helium. Spectroscopic data provided by the Extreme Ultraviolet Explorer (EUVE) has allowed us to measure ISM absorption in the EUV spectra of several hot white dwarf stars, including GD 246, HZ 43, and Feige 24. We have found He I autolocalization and He I and He II continuum absorption in these spectra, and have established the ionization fraction of helium. From analysis of EUV far UV spectra of these objects, and from the cosmic abundance ratio of H and He, we have measured the hydrogen ionization fraction. By combining these data we have determined the total ionization state of the ISM along these lines of sight.

This work has been supported by NASA contract NAS5-30180.

38.04

EUVE Observations of Epsilon CMa

J. P. Cassinelli (U. Wisc.)

The brightest EUV source in the sky in the long wavelength spectrometer band of EUVE is the B2 II star Epsilon CMa. The star is also detected in the short and medium wavelength spectral bands and several emission lines from Fe and from He II are present. These provide exciting new information regarding the shocked wind of the star. A strong stellar continuum flux is present throughout the long wavelength band from about 400 to 700 A, with a continuum jump due to the ionization of He I near 504 A. The jump contains information about the very small interstellar attenuation that is present along the 187 parsecs towards this star, as well as about the confines of lines just longward of the jump. The observations are used in conjunction with angular diameter and UV data on this star to derive $T_{eff}$ and other fundamental astrophysical parameters. Basic results from fits of the observations to model atmospheres and stellar winds are presented in the talk, and reference is made to the related posters by members of our group of investigators: J. MacFarlane, D. Cohen at U. Wisc; J. Vallenya, B. Welsh, P. Wedder at CEA; and J. Drew and M. Hoare at the U. of Oxford.

38.05

Coronal Spectroscopy and Structure of the RS CVn Binary HR1099 Using EUVE


The RS CVn binary system HR1099 (Y711 Tau) was observed by the Extreme Ultraviolet Explorer (EUVE) satellite as a calibration target on 1992 October 22-24. Emission from the system is detected in both the short (75-175 A) and medium (150-370 A) wavelength EUVE spectrometer. No stellar signal is seen in the long wavelength spectrum. Over 20 coronal and transition region emission lines are present, along with continuum emission from hot (~ 10^6 K) coronal plasma at the shorter wavelengths. The short wavelength spectrum is dominated by coronal lines from the hot 10^6 K coronal component; the highest excitation line definitely present is Fe XXIII 132.8 A. The medium wavelength spectrum is dominated by He II 304 A from transition region (10^5 K) plasma. The volume emission measure (VEM) distribution of HR1099 is determined over the temperature range 10^5 to 10^6 K. This distribution is compared with previous broadband X-ray estimates of the coronal temperature and VEM for HR1099. The implications of these data for the likely coronal structure of active binaries like HR1099 are discussed.

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38.06

The Corona of F-K Dwarfs: Factors Controlling Their Properties

C. Jordan (U. of Oxford)

X-ray observations of late-type stars can be used to determine average coronal emission measures, $E(M(t))$, and temperatures, $T_e$, provided the spectra can be fitted adequately by single temperatures. $E(M(t))$ and $T_e$ can be correlated with stellar properties, such as the rotation period, or with convection zone parameters, such as the Rossby number $(Ro = P/rot)/turnover$ time at the base of the convection zone. Including F and K dwarfs, the closest correlations are found between $E(M(t)) g^{-1}$ and $Ro$ and $T_e g^{-1}$ and $Ro$. The total energy losses from the corona (radiation plus thermal conduction) can, with some assumptions, also be expressed in terms of $E(M(t))$ and $T_e$. These total losses, and hence the non-thermal energy required to heat the corona, scale approximately as $Ro^{-1}$. The coronal magnetic field can also be expressed in terms of $E(M(t))$ and $T_e$ through the pressure and plasma Beta, and comparisons can be made with specific heating mechanisms. Some recent results will be presented, including the relation between these implied coronal fields and surface magnetic fields and filling factors. The contribution from new observations with ROSAT, and expected from EUV, will be discussed.

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38.07

Analysis of EUV Spectra of Cool Stars

A. K. Dupree (CIA)

Spectroscopy on board EUVE are obtaining stellar spectra in the extreme ultraviolet region that contain a wealth of unique information about atmospheres of cool stars. EUVE spectra of the RSCVs binary system Capella (HD 34029; G8 III + G0 III) are presented in this session (Dupree, Doschek, Green, & Raymond, EUVE Spectra of Capella (Alpha Aurigae), Bull. AAS, this volume). In addition, updated calculations of coronal ionization equilibrium (Brickhouse, Raymond, & Smith, Bull. AAS, this volume) increase the confidence of the analysis. These spectra and calculations will be used to illustrate major scientific questions that can be addressed through EUV spectroscopy: what is the distribution of temperature and emission measure in the atmosphere of the system? what are the atmospheric densities? are non-equilibrium ionization processes present? is there evidence for a stellar wind?

38.08

Simultaneous Optical and EUVE Observations of a Flare on AD Leo

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An 80,000 second pointed observation of the flare star AD Leo was carried out during 1-3 March 1993 (UT) by EUVE. Concurrent optical monitoring observations were made using three telescopes at Lick Observatory and two telescopes at McDonald Observatory. On 2 March 1993 (UT), the first simultaneous optical and EUV observations of a stellar flare were obtained. The optical data include multi-color photometry, and low and high resolution spectroscopy. We present the data for this flare and compare it to previously observed stellar flares.

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