The presented gas models required to fit the data show distinct phenomena:
1) An abrupt acceleration of the gas flow ($\Delta v \approx 10 \text{ km s}^{-1}$) is located in approximately the same region where the dust condensation occurs in the model (2.5 to 5 $R_\odot$). This observation is consistent with theories which predict that dust grains, accelerated by radiation pressure from the central star, drag the gas molecules outward.

2) A region of almost constant velocity located just past the dust condensation point (5 $R_\odot$) slowly accelerates from about 10.5 km s$^{-1}$ to the terminal expansion velocity of the shell (14.2 km s$^{-1}$ at 12 $R_\odot$). The evolution of the line profile shapes during the 12 years spanned by the data require this velocity plateau to expand radially by about 4 $R_\odot$.

In contrast with the 1.75 year period of pulsation of the central star, these variations in the line profiles suggest a rate of evolution for the inner envelope of the circumstellar shell on the order of decades.

50.11

To vary or not to vary: SiC Dust Emission from Circumstellar Shells

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Analysis of the low resolution spectra obtained by IRAS has shown that the 10 $\mu$m silicate dust grain emission feature varies in M type Miras variables in phase with their optical light curves (Little-Marenin and Stencel, 1992, ASP Conf. Ser. vol 26, 591). Both the strength of the emission feature and the 12 $\mu$m PSCII fluxes show the same dependence on time. The magnitude difference between maximum and minimum for those Miras is between 1-2 magnitudes, similar to their K magnitude variation. The strength of the emission feature varies by about 20-30% during the same time interval.

Of the 22 carbon star Miras with IRS spectra, 16 (70%) are listed in the point source catalog with a variability index greater than 7 indicating that the individual point source fluxes show variability. Among the M star Miras we also found that about 70% of the stars showed variability. However, unlike the 10 $\mu$m silicate feature in M Miras, the strength of the SiC dust emission feature in C stars shows little if any variation in strength with time despite the variations in the 12 $\mu$m broad bands flux of up to one magnitude, reflecting differences in the formation mechanisms between the silicate and SiC dust grains. The optical depths of the circumstellar shell in the 8-22 $\mu$m region for C stars with SiC dust grain features is usually small since this part of the spectrum can be matched with blackbody energy distributions close to the effective temperature of the star. We find that M stars with silicate features have larger optical depths since their blackbody temperature obtained by fitting the 8-22 $\mu$m region is typically around 600-800 K.

Session 51: Stellar Atmospheres and Late Type Stars Display Session Pavilion

51.01

Coronal Activity of the Once and Future Sun: ROSAT Observations of HD 129333 and $\beta$ Hydri

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ROSAT X-ray observations of the young solar-type star, HD 129333 (G0 V; $m_v \approx +7.5$; $r \approx 70$ Myr) and the old solar-type star $\beta$ Hydri (G2 V; $m_v = +2.80$; $r \approx 9$ Gyr) are discussed. HD 129333 represents the ZAMS Sun, 4.5 Gyr ago when it was rotating about 10 times faster than today and had correspondingly much greater levels of chromospheric and coronal activity. In contrast, $\beta$ Hydri represents the future Sun near the end of its hydrogen-core burning stage, when it should be rotating more slowly and should have lower levels of activity.

The ROSAT observations of the young sun HD 129333 show it to be a relatively strong source of coronal X-rays with an $L_\text{X}(0.1-2.0 \text{ keV}) \approx 1 - 2 \times 10^{26} \text{ ergs s}^{-1}$. The best fit to the X-ray energy distribution indicates a two-temperature component corona with $T_1 = 2 \times 10^6 \text{ K}$ and $T_2 = 10 \times 10^9 \text{ K}$. The high levels of coronal emission found for HD 129333 are consistent with its rapid rotation ($P_{\text{rot}} \approx 2.8 \text{ d}$) and the strong chromospheric and TR emissions seen in the IUE data. This study indicates that the early ZAMS Sun was an intense X-ray source about a thousand times stronger than the present Sun. The high levels of X-ray and UV emissions implied for the early Sun could have had a significant impact on the evolution and chemistry of the primordial atmospheres of the solar system planets -- including that of the Earth.

As discussed by Dravins and collaborators (1992), $\beta$ Hydri is an older Sun with a rotation period of $\approx 45^d$ and with chromospheric emissions which are about half those of the present Sun. ROSAT observations of $\beta$ Hydri indicate a cooler, less luminous corona with $T \approx 1.5 \times 10^6 \text{ K}$ and $L_\text{X} \approx 1 \times 10^{27} \text{ ergs s}^{-1}$. The ROSAT and IUE data and the available ground-based photometry will be discussed together with observations of other solar-type stars with intermediate ages. More ROSAT data is expected to be collected on $\beta$ Hydri, and these results will be presented if available.

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51.02

ROSAT Observations of $\alpha$ TrA and $\iota$ Aur

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We report here on pointed ROSAT observations of the hybrid chromosphere stars $\alpha$ TrA (K4III) and $\iota$ Aur (K3III). We detect $\alpha$ TrA at signal-to-noise greater than 50, and $\iota$ Aur marginally. The column density of absorption of X-rays from $\alpha$ TrA is consistent with IUE observations. We also see a flare type event in its lightcurve. Finally, we find that the X-ray emission from $\alpha$ TrA is mostly from plasma at temperatures greater than 1 keV.

51.03

$\alpha$ Centauri: A Stringent Test of Any Formulation of Convection not based upon Mixing-Length Theory

T.J. Lydon, S. Sofia (CSSR/Yale), P.A. Fox (HAO)

We construct a series of models of $\alpha$ Centauri A and B using both mixing-length theory (MLT) and a technique based upon a parameterization of energy fluxes determined through numerical simulations of turbulent compressible convection. We demonstrate that while MLT, through its adjustable parameter $\alpha$, can be used to match any luminosities and radii, the rival treatment of convection, which lacks any adjustable parameters, makes specific predictions of stellar radii. Finally, we construct a second set of models using MLT, this time adjusting $\alpha$ to yield not the "measured" radii but instead the radii predictions of the technique based upon numerical simulations. We conclude by assessing the appropriateness of using a single value of $\alpha$ to model a wide variety of stars.

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