ABSTRACTS

22.21
CO Fundamental Bands: Diagnostic for Inhomogeneities in Cool Stellar Atmospheres

G.Wiedemann (NASA/GSFC) and T.R. Ayres (CASA/Univ. Colo.)

Carbon monoxide fundamental bands were used in a theoretical and observational study of the thermal structure of cool star upper atmospheres.

A newly developed radiation transfer program, using recently measured rates for the collisional de-excitation of vibrationally excited CO through atomic hydrogen, was employed to investigate the sensitivity of CO $\Delta v=1$ spectra to stellar parameters and non-LTE effects.

High resolution CO $\Delta v=1$ spectra were obtained from stars of spectral type F5-K5. Stellar 'boundary temperatures' were determined from atmospheric models constructed to match the observed CO spectra. In a group of cool stars including a Boo, o Tau, and e Gem the observed CO spectra are irreconcilable with the homogeneous chromospheres derived from observations of conventional diagnostics formed at similar latitudes. The agreement between the CO boundary temperatures and predictions from theoretical RE models is anti-correlated with levels of 'chromospheric activity' reported for the observed stars.

The results suggest that stellar atmospheres are horizontally inhomogeneous. 'Cool' areas, dominated by molecular cooling coexist with 'hot' areas responsible for the observed 'chromospheric' emission.

22.22
Observations of Stellar Coronae and Flares With the Extreme Ultraviolet Explorer

P.W. Vedder, J.V. Vallerga, P. Jelinsky, H.L. Marshall, and S. Bowyer (Space Sciences Laboratory, U. California, Berkeley)

Observations with the Einstein Observatory demonstrated that stars of all spectral types (with the possible exception of supergiants) are soft X-ray emitters. Of the 935 serendipitous sources detected by EXOSAT, 75% were stars. Estimates suggest that there are $\sim 4500$ main sequence stars of spectral types F, G, K and M out to 25 pc. The bulk of the soft X-ray emission from these stars originates in the corona in plasma material at temperatures between $10^5$ and $10^6$ K.

The Extreme Ultraviolet Explorer (EUVE) satellite will conduct a sensitive all-sky survey in the extreme ultraviolet (EUV) band (70 – 700 Å). The survey will be performed using three EUV telescopes equipped with filters which define four separate bandpasses. A fourth telescope will provide a deeper survey at the shorter wavelengths over a limited portion of the sky. EUVE also contains three spectrometers covering the wavelength range from 70 – 760 Å.

The capabilities of the EUVE scanners and spectrometers for observing late-type stars will be presented. Simulations suggest that numerous stellar coronal sources will be detected in the all-sky survey. Estimates of coronal temperatures will be possible using ratios of the measured count rates in different filter bandpasses for a given hydrogen column density. The resolution of the spectrometers (up to $\lambda/\Delta \lambda = 500$) will enable very accurate temperature measurements of numerous stellar coronae. Calculations also predict that EUVE will detect $\sim 5$ stellar flares from dMe stars during the 6 month all-sky survey. Pointed observations will permit 'time-resolved' spectroscopy of flares on nearby dMe stars. This research is supported by NASA contract NAS5-29298.

22.23
A Systematic Search for Brown Dwarfs Orbiting Nearby Stars

T.J. Henry and D.W. McCarthy (University of Arizona)

We have concluded a systematic search for brown dwarf and stellar companions to every M dwarf star within 5 parsecs north of $-30$. Using the technique of infrared speckle interferometry we are able to detect low luminosity companions, both stellar and substellar, to any of the stars in this volume-limited sample at separations approaching the diffraction limit of large telescopes (0.2′). We have examined a region approximately 5′ in radius, corresponding to solar system scales, around each star at the infrared H (1.6 μm) and K (2.2 μm) bands, at which low mass companions are emitting maximum radiation near their blackbody peaks. Of the 21 single stars and 6 stars in wide double pairs in the survey, two were found to have very low mass stellar companions previously undetected, G 208-44, which is an astrometric binary, and Gl 866. The five previously known close M dwarf binaries with well-determined masses and the two new M dwarf doubles, all with separations less than 2″, were observed at J (1.25 μm), H and K in order to produce mass-luminosity relations at these wavelengths.

All stellar and substellar masses to an absolute K magnitude of 13.0 in most cases would have been detected. Comparisons to the low mass star and brown dwarf evolutionary models of D'Antona and Mazzitelli (1985) yield corresponding mass limits of 30 and 60 Jupiters at ages of $10^5$ and $5 \times 10^5$ years for these fluxes. All astrometric companions to stars in the survey which remain undetected now have severe limits placed upon their infrared fluxes, and these companions, if real, must be of extremely low mass.

There are 19 single M dwarfs, 8 M dwarf binaries, one M dwarf triple system, and one M dwarf in a triple system with earlier spectral type components. We have found no brown dwarf companions on the scale of our planetary system (0.2 to 10 AU) around any M dwarfs within 5 parsecs and are now extending the survey to 10 parsecs.

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22.24
A Search for Low Luminosity Stars in the NIST Catalog

A.J. Loggins, P.A. Ianna (U. Virginia), N.S. Bessell (MSSSO)

As part of a CCD program to measure parallaxes for faint southern stars, primarily LS catalog objects, we are also examining the NIST catalog for additional faint parallax candidates. We have limited the sample to those stars with Palomar red magnitudes fainter than 16.0, annual proper motions between 0.3 and 0.5, and color class m or m+. The observations are being carried out on the 1 meter telescope at the Sliding Spring Observatory. Several quite red stars have been found in the initial group of objects we have observed. We intend to extend our survey into the northern hemisphere as well.

Attention is called to the continuing need for a southern, faint star proper motion survey.

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22.25
The High Resolution Spectroscopic Synoptic Program at the McMath Telescope

D. Jaksa and M. S. Giampapa (NSO/NOAO)

The NSO conducts a program of high resolution spectroscopic synoptic observations at the McMath telescope on Kitt Peak. This facility is the only one of its kind which is also available to the general astronomical community. A resident observer obtains spectra for Principal Investigators on a nightly basis without the investigator on site. In addition, the NSO supports a vigorous visitor program of short-term observations, including coordinated ground- and space-based projects. The original program has been recently