A High Dispersion IUE Atlas of Central Stars of Planetary Nebulae

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New and archival high dispersion IUE data acquired with the short wavelength (SWP) camera sampling the wavelength range 1150-2000 angstroms have been coadded to produce a spectral atlas of twelve CSPN with signal-to-noise ratios greatly enhanced from those of individual IUE spectral images. Extensive line identification, using the latest available atomic data has been performed for these objects. Numerous stellar spectral features, as well as emission features from the surrounding nebulae, are identified. The variation in excitation among the stars is easily seen in the stellar absorption spectra. The stars comprising this atlas are listed with the number of spectra coadded in order of approximate decreasing surface temperature: LT-5 (1), NGC 7293 (3), NGC 246 (3), NGC 4561 (2), Longmore-8 (3), Abell-36 (4), NGC 6543 (4), NGC 6058 (1), NGC 3242 (3), NGC 4593 (4), and IC 418 (13). The twelve stars exhibit effective temperatures starting from ≈ 30,000 K to over 100,000 K, and should be of great value in more detailed quantitative analyses and planning future observations with UV satellites such as the Hubble Space Telescope.

Be Stars in Young Magellanic Cloud Clusters

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We present a photometric method to identify Be stars and calibrate their Hα fluxes using imaging in only two broad-band filters and one Hα filter.

Very little is known about the Be star content in the Magellanic Clouds. Young clusters and associations may be expected to have Be stars among their B stars, and they form a coherent population. We obtained CCD frames of a number of young SMC and LMC clusters and searched for Be stars there using our photometric method.

We find a pronounced difference between the Be star content in MC clusters and in the Milky Way. The young SMC cluster NGC 330 is outstanding in its high Be star content. The highest fraction can be found among the earliest B type stars. In the LMC, we find lower Be star fractions which turn out to be double-peaked. The first and strongest frequency peak can be found at B0, and a second peak is located at B6.

In contrast, in the Galaxy we find the highest Be star frequency at B2 and faint indications for a second peak at B6. Both peaks are at most half as high as what we find in the MCs.

The ages of the clusters investigated constrain at the same time ages and evolutionary status of the Be stars found. The majority of our Be stars belongs to the main sequence. In NGC 330, a number of Be stars were found to be θ Eri variables. Not enough data are yet available, though, to decide whether this is a general property of the stars in the Magellanic Clouds. Furthermore, we may expect to find high rotational velocities a general property of the investigated clusters. However, we do not yet have an explanation for either the high Be star fractions in the MCs nor for the different frequency peaks.

A Near Infrared Spectroscopic Survey of M Dwarfs

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We present preliminary results of a fairly large scale infrared spectroscopic survey of nearby M stars. Given the important role of these stars in the total mass of the Galaxy, and their similarities to brown dwarfs, a better understanding of their characteristics impacts a number of research fields. To date, the few attempts at recording representative infrared M dwarf spectra have been limited in scope, typically containing only 5-10 stars. Many of the limitations of past observations of M dwarfs stem from their faintness at visible wavelengths and from previously inadequate instrumentation in the infrared, where these objects emit their peak flux. With the recent addition of KSPEC to the facility instruments at the UIH 88" though, we are now acquiring a much larger infrared spectroscopic database than has ever been possible. Some of the immediate benefits of creating such a database include better constraints on low mass star models through a better understanding of the dominant opacity sources in these stars. Effective temperature values for low mass stars could be much better defined through the fitting of temperature sensitive lines to spectra rather than the frequently used technique of broad band photometry. Finally, it should be possible for the first time to establish an M star spectral sequence ranging from MO-M10+ based on 1.0-2.5 μm spectroscopy. This result would clearly have a broad impact on low mass star and star formation research and could be used to compare established M stars with more peculiar low mass stars, like T Tauri stars, in embedded clusters.

Circular and Linear Polarization of S10 Masers

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We have measured the circular and linear polarization characteristics of the S10 masers from several late type stars. Both the ν=1, J=2-1 (86 GHz) and the ν=1, J=1-0 (43 GHz) transitions have been observed. In VY CMa, we find the lower frequency transition to be more circularly polarized than the higher frequency transition. The highest fractional polarization in the 43 GHz line is about 4%. Results from the larger data set will be presented and discussed with respect to polarization mechanisms suggested in the literature.

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Newly Identified, Faint Dwarfs Near the Sun: Brown Dwarfs Masquerading as M Stars?

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The goal of this program is to recognize previously missed, low-luminosity (and presumably low-mass) dwarfs in the solar vicinity. Proper motion objects originally identified by Luyten — yet still unclassified — are being observed spectroscopically over the range 6300 to 9000 Å. To date, several dwarfs as late as M8 have been uncovered, and spectroscopic parallaxes indicate that many are within 20 pc, making them new additions to the Catalogue of Nearby Stars (Gillies & Jahieris 1991).

As a result, a database is being amassed of the latest M dwarfs, where late-type targets announced by other investigators have also been observed. The list now includes over twenty objects with spectral types of M7 or later. Follow-up 1.0-2.5 μm spectra are also being acquired to understand better the temperature dependence of spectral features near the region of peak flux and to determine how the spectrum-to-spectrum differences seen in the red translate to the infrared.

Recent observational evidence may indicate that these latest M dwarfs are the brown dwarfs researchers have been struggling to find. The number density of the early-M dwarfs is slightly higher (~1.2x) toward southern galactic latitudes than toward northern ones, demonstrating, as have a variety of other investigations, that the sun lies a few tens of parsecs north of the galactic mid-plane. The late-M dwarfs, on the other hand, show a density in the south which is many times larger than that in the north, indicating that we are looking down upon a population with a small scale height (i.e., young). It would appear either that the older analogues of this population never formed (their birth being precluded by the low metalicities present in star forming regions at earlier epochs) or that these analogues have since cooled beyond current detection limits — which would be true if this population were substellar.