DETERMINATION OF THE INTERSTELLAR EXTINCTION TOWARD WN STARS FROM OBSERVED *ubv* COLOR INDICES

WILLIAM D. VACCA and WERNER SCHMUTZ
Joint Institute for Laboratory Astrophysics
University of Colorado, Boulder, CO 80309-0440, USA

Recent observations of Wolf-Rayet stars by Massey (1984) and Torres-Dodgen and Massey (1988) have yielded high quality, absolutely calibrated spectra of nearly all known Wolf-Rayet objects. These observations also indicate that discontinuities, or "jumps", are present in the continuum spectra of some Wolf-Rayet stars. Such continuum jumps are predicted by the current theoretical models of Wolf-Rayet atmospheres. In general, these models provide good fits to the observed spectra of Wolf-Rayet stars. The models also indicate that, between jumps, the intrinsic continuum can be closely approximated by a power law in wavelength. In this case, we have the following relation between the intrinsic colors:

$$(u-b)_0 = 0.83(b-v)_0 + D_{3645} \quad ,$$

where

$$\frac{\log \lambda_u \; - \; \log \lambda_b}{\log \lambda_b \; - \; \log \lambda_v} \; = \; 0.83 \quad ,$$

and D_{3645} is the strength of the He II ($n = 4$) jump at 3645 Å in mags. This relation holds because the central wavelength of the u filter ($\lambda_u = 3650$ Å) is nearly coincident with that of the He II jump. In addition, models of WN stars with helium-dominated atmospheres predict a correlation between D_{3645} and $(b-v)_0$:

$$(b-v)_0 = -0.98 D_{3645} - 0.28 \quad .$$

The intrinsic uncertainty in this relation is ± 0.02 mags in $(b-v)_0$. Using these theoretical relations, we can derive a formula for calculating the E_{b-v} color excesses for WN stars from the observed narrow-band $u-b$ and $b-v$ color indices:

$$E_{b-v} = [(u-b) + 0.20(b-v) + 0.28]/[k + 0.20] \quad ,$$

where $k \equiv E_{u-b}/E_{b-v}$. We adopt the value $k = 0.74$ (which is the average obtained from several extinction laws) and determine color excesses for WN stars in the Galaxy and the Large Magellanic Cloud. We find excellent agreement between our values and those determined by Lundström and Stenholm (1984) for WN stars which are probable or definite members of Galactic associations or open clusters.

K. A. van der Hucht and B. Hidayat (eds.),
Wolf-Rayet Stars and Interrelations with Other Massive Stars in Galaxies, 640.