STELLAR SPECTROPHOTOMETRY WITH A MICROCOMPUTER BASED, INTENSIFIED, SILICON VIDICON

S. Jeffers and T. Stiff,
Physics Dept. and Centre for Research in Experimental Space Science,
York University, 4700 Keele St.,
North York, Ontario, Canada, M3J 1P3.

1. INTRODUCTION

We have developed several detector systems for use in observational astronomy. These include a rapid scanning spectrometer (Jeffers and Weller, 1973), a rapid chopping spectrophotometer (Stiff and Jeffers, 1978) and an intensified, silicon vidicon detector for use either for spectrophotometry (Jeffers, Stiff and Weller, 1983) or direct imaging (Jeffers, 1982). These detector systems have been used for rapid variability studies of emission line strengths and profiles in Wolf-Rayet and Of stars (Weller and Jeffers, 1979; Jeffers, Stiff and Weller, 1985) and for low dispersion spectrophotometry of these stars (Jeffers and Weller, 1985). Here we report on the spectrophotometric performance of the intensified, silicon vidicon detector (RCA 4804H) when used with a low dispersion spectrograph.

2. SPECTROPHOTOMETRIC CALIBRATIONS

In order to recover the stellar, spectral energy distribution above the earth's atmosphere it is necessary to correct for the effects of (I) differential extinction in the Earth's atmosphere and (II) the wavelength dependence of the instrumental sensitivity.

2.1 Determination of wavelength dependence of extinction in the Earth's atmosphere

The extinction star used was HR7202, B5V, mv = 5.96. On July 27/28, 1985 this star was observed at eight different air masses through a range from 1.03 to 2.28. The integration time was typically 72 seconds giving a S/N ratio ~ 150 at maximum. The spectrophotometric standard star HR6779 (B 9.5 V, mv = 3.83) was also observed (integration time 49.5 secs, S/N = 200 at maximum signal). The error in the measurement of individual extinction coefficients is ~ ± 5%. A plot of extinction coefficients vs $^1/\lambda^4$ was made and compared with that for pure Rayleigh scattering (R = .01085 ± .0021 mags/air mass/$^1/\lambda^4$ (van den Bergh and

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Henry, 1962) quoted for the nearby David Dunlap Observatory.) The maximum discrepance between the two is ~ 35%. Clearly the assumption of Rayleigh scattering is a poor one at least for an urban atmosphere where there may be an appreciable contribution to extinction from aerosols.

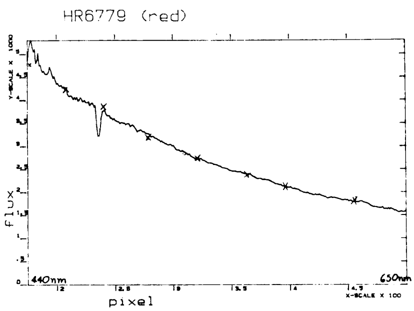

Figure 1. Reduced spectrum of HR6770. Crosses are from Breger's spectrophotometry

2.2 Instrumental Response Function

The instrumental response was determined from extinction corrected data for HR7202 which is a spectrophotometric standard star (Breger, 1976). Each extinction corrected data set was divided by a fit determined by Lagrangian interpolation to the published spectrophotometric data to yield the instrumental response. A mean instrumental response was computed and used in the reduction of the data for HR6779.

3. CONCLUSIONS

A low dispersion spectrophotometer incorporating an intensified silicon vidicon detector is being used for astronomical spectrophotometry. To recover accurate spectrophotometric data (± 1%) over the range of sensitivity of the detector, careful determinations of the wavelength dependence of atmospheric extinction must be made. Dependence on an assumed value of a Rayleigh coefficient leads to substantial errors.

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