ABSOLUTE SPECTROPHOTOMETRY OF Be STARS

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Abstract

Absolute spectrophotometric data have been obtained for a sample of Be stars. These data were obtained with the York Observatory 60 cm telescope and vidicon spectrophotometer. The data have been corrected for differential atmospheric extinction, instrumental response, and interstellar extinction and calibrated in terms of absolute flux. Absolute Hα and Hβ fluxes have been determined.

Observations and Analysis

Observations were made over a period from September 1985 through March 1986. Table 1 lists the stars which were observed. The standard stars listed are taken from Breger's Catalogue of Spectrophotometric Scans of Stars (Breger 1976). A SIT vidicon system was used on the York 60 cm telescope (Weller, Herbst, Jeffers 1977; Jeffers, Stiff, Weller, 1983).

For absolute flux calibration we adopt the Hayes-Latham calibration of Vega (Breger 1976). To test the accuracy of our calibration a plot of log (absolute flux) against published V magnitudes is generated (Fig. 1). A_v = 1.0 mag$\cdot$ kpc^{-1} was chosen and the spectra de-reddened according to a model proposed by M. J. Seaton (1979).

Results

A typical result is displayed in Fig. 2. For the stars exhibiting emission lines the continuum was subtracted and the Hα and Hβ line profiles were integrated to yield absolute fluxes (Table 2). Fig. 3 is a scan of the Hα emission line in Gamma Cas. It has a total of Hα flux of 1.7 x 10^{34} erg s^{-1} adopting a distance of 194 pc (Lesh 1968). Using a radius of 5.3 x 10^{11} cm (Lamers & Snow 1978) this corresponds to a surface flux of 50 W cm^{-2} . Fig. 4 is a combined plot of the calibration stars from Breger's Catalogue (Fig. 1) and the program stars from Table 2.

References

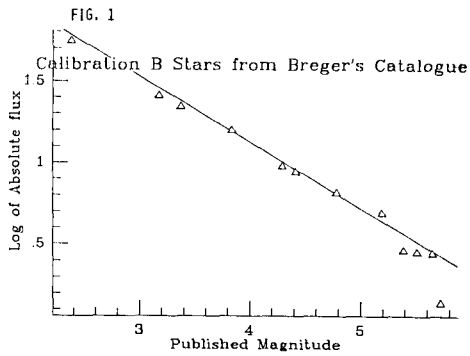
Breger (1976), Astrophysical Journal Supp. 32, p. 1.
Jeffers, Stiff, Weller (1983), Proceeding of S.P.I.E. 445, p. 199
Lamers & Snow (1978), Astrophysical Journal 219, p. 504.
Lesh (1968), Astrophysical Journal Supp. 17, p. 371.
Seaton (1970), Mon. Not. R. Astron. Soc. 187, p. 73.
Weller, Herbst, Jeffers (1977), Pub. Astron. Soc. Pacific 89, p. 935.

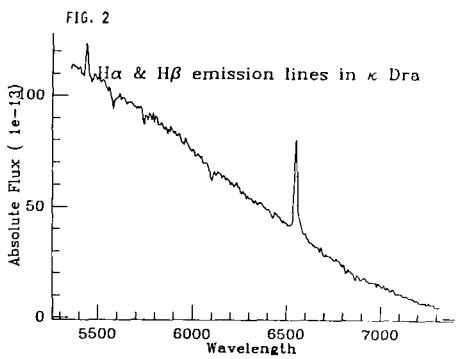
TABLE 1

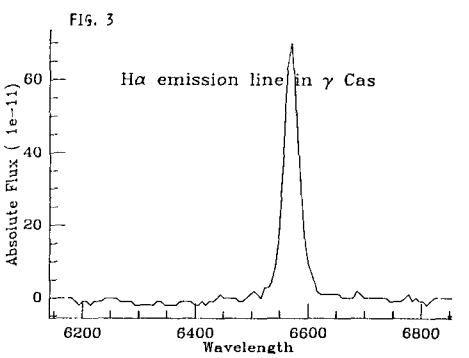
Program Star	Sp	m_V	Standard Star	Sp	m_V
HR 6502	B5 V	5.39	HR 6779	B9.5 V	3.83
HR 7307	B9.5 V	5.65	HR 7202	B5 V	5.51
HR 7608	B5 V	5.19	HR 7739	B3 V	4.78
HR 7656	B4 V	5.72	HR 7739	B3 V	4.78
HD 5394	B0 IVe	2.47	HR 403	A5 IV	2.68
HD 45542	B6 IIIe	4.15	HR 2159	B3 V	4.41
HD 109387	B6 IIIe	3.87	HR 4295	A1 V	2.38
HD 37202	B1 IIIe	2.98	HR 1641	B3 V	3.17

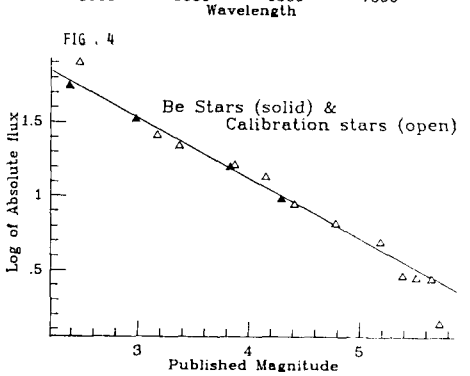
TABLE 2

Star	Sp	m_V	π/d	Absolute flux (erg/s/cm^2) x 10^{-9} V bandpass	H_α	H_β
HR 6502	B5 V	5.39	-	2.85		
HR 7307	B9.5v bin	5.65	.019"	2.77		
HR 7608	B5 V	5.19		4.94		
HR 7656	B4 V	5.72		1.38		
γ Cas	B0 IVe	2.47	194pc	79.0	4.08	1.01
HD 45542	B6 IIIe	4.15	.001"	13.5		
HD 109387	B6 IIIe	3.87	.010"	15.2	1.46×10^{-3}	2.83×10^{-4}
HD 37202	B1 IIIe	2.98	.002?	31.7	3.71×10^{-3}	









https://doi.org/10.1017/S0252921100116252 Published online by Cambridge University Press

DISCUSSION FOLLOWING STIFF

Underhill:

It would be very interesting to estimate from your measured energy in Hα (never mind "correcting" for underlying or unresolved absorptions) the total amount of energy radiated in the hydrogen spectrum. To correct from Hα to the full hydrogen spectrum you might use factors estimated by means of nebular theory. Is this radiation loss of the order of 10^{-4} L_* or 10^{-1} L_* or is it something different? The answer will be significant for the energetics of models of the mantle of the star.

Stiff:

That is something we had not thought of, but it sounds like an excellent idea. We have just completed an observing run this summer and expect that we will follow up your suggestion. As I recall, from a preliminary look at the data, all the stars we have observed had strong Hα lines in emission.

https://doi.org/10.1017/S0252921100116252 Published online by Cambridge University Press