Stellar Rotation
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New Projected Rotational Velocities of All Southern B-type Stars of the Bright Star Catalogue

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Abstract. We have re-determined in an homogeneous way $v \sin i$ values for all the B-type stars of the Bright Star Catalogue with southern declinations.

1. Introduction

We have measured the projected rotational velocities of all southern B-type stars in the Bright Star Catalogue. We have measured 1027 southern stars. This work completes the recent determination for the northern B-type stars of the same catalogue made by Abt, Levato & Grosso (2002). We have also measured $v \sin i$ for 40 northern stars to compare the homogeneity of the results between north and south. In a future paper we will discuss correlations with spectral peculiarities and binarity with the largest homogeneous sample available.

2. Observations and Method

The observations were obtained at the 2.1m telescope at CASLEO (Complejo Astronómico El Leoncito) using a REOSC echelle spectrograph at the Cassegrain focus. The detector used is a CCD TEK1024. The pixel size is 24 μ and the 1-px resolution is 0.14 $\AA$ or 8 km s^{-1}. The range of the REOSC spectra goes from 3800 up to 5400 $\AA$ in 20 orders. Spectra were flatfielded and wavelength calibration was done using a Th-Ar lamp. The reduction was done using IRAF package. A Gaussian or Voigt profiles were adjusted to Mg II λ 4481 and He I λ 4471. When these adjustments were not possible we have measured directly the FWHM. We have checked on hardcopies all the measurements. As a by product we have measured equivalent widths of Mg II λ 4481 and He I λ 4471 for all stars in the sample. To measure $v \sin i$ we have used 112 standard stars selected from Slettebak et al. (1975) and observed with the same equipment and conditions. Calibration plots between $v \sin i$ and fwhm were produced for dwarfs for three spectral ranges: B0-B3, B4-B7, B8-B9.5 and for evolved stars (subgiants and giants) for the same spectral ranges. We produced a plot for Mg II λ 4481 and another for He I λ 4471 for each spectral range and luminosity. For those stars we were able to derive $v \sin i$ values from both lines the final $v \sin i$ is a simple average.

3. Results

We compared our measurements with Slettebak's measurements for our 112 stars in common. The result is

$$v \sin i(LG) = v \sin i(SCBWP)0.98 + 3.4$$

The mean scatter per star is 15.3 km s^{-1}. This number is a good estimation of the accuracy of our measurements per star. We have also compared our results with those of Abt et al. (2002) for 40 stars in common. The result is:

$$v \sin i(LG) = 0.96 v \sin i(ALG) + 2.6$$

Table 1 indicates the mean projected rotational velocities for all southern stars with known luminosity classes, the standard errors in the means and between brackets, the number of stars involved.

Table 1. Mean Projected Rotational Velocities

MK	V	IV	III
B0-B2	124± 8(118)	82± 10(44)	91± 11(42)
B3-B5	118± 8(119)	88± 9(48)	81± 14(28)
B6-B8	144± 7(124)	106± 12(41)	75± 6(68)
B9-B9.5	128± 6(151)	73± 16(26)	78± 11(37)

The preliminary results confirm previous findings from the northern sample as follows: 1) There is a similar average $v \sin i$ observed in the whole range B0-B9.5 for dwarfs with a marginal increased of 20 km/sec for the B6-B8 range 2) We found 1.5% of the stars with $v \sin i$ larger than 300 km s^{-1} and 0.2% with $v \sin i$ larger than 350 km s^{-1}. 3) We have found in the range B0-B2 for luminosities III,IV, and V, a large number of stars with $v \sin i$ less than 50 km s^{-1}. The number of objects declines steeply down to 0 for the range 350-400 km s^{-1}. 4) During the process of measuring the fwhm for the 1027 stars we have noticed around 4 dozen objects with double lines, quite asymmetric profiles or features that may indicate a binary nature. Some of these objects were previously known SB2 systems but others were not.

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References

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