HIGH LUMINOSITY F-K STARS MOTIONS AND Hα EMISSIONS

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Abstract

Changes and differences in radial velocities between neutral and ionized metals have been found for three F5-type supergiants: HD 231195, HD 10494, and HD 17971. Fifteen high dispersion coudé spectrograms (6 Å/mm) were used and 33 to 165 lines were measured on each. Semi-regular time variations up to about 8 km s^{-1} in radial velocity have been found. In addition, Hα line profiles for 8 high luminosity F-K stars have been analyzed. All of the stars show Hα emissions, variable in time, which is probably a common phenomenon in very luminous stars. Metallic emission lines with low excitation potentials, in particular the Ca I 6572.8 and the Fe I 6574.2 lines, are present in 5 of these stars.

TURBULENCE IN THE ATMOSPHERE OF B-TYPE STARS

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Abstract

The stationary turbulent surface layer, whose depth is of the order of the pressure scale height in the subphotospheric layer, was investigated for B-type stars, using the momentum and the continuity equations with the inertia term neglected but the turbulence-viscosity term included. The mean velocity field is dominated by the horizontal component of the meridional circulation, driven by the pressure-density unbalance in the radiative envelope of the rotating star, and the differential rotation induced by the Coriolis force.

The model calculation for a B3IV-V star with the equatorial rotational velocity

https://doi.org/10.1017/S0252921100075357 Published online by Cambridge University Press

of 200 km/s led to the conclusions that the velocity field due to the differential rotation is of the order of 0.1-1 km/s, the velocity field of the meridional circulation itself is negligible, the velocity field of the three-dimensional shear turbulence is of the order of 0.1 km/s, and its scale is comparable to or less than the pressure scale height, the velocity field of the horizontal two-dimensional turbulence is of the order of 1-10 km/s, and its maximum scale ranges from a few times the pressure scale height to one-fiftieth of the stellar radius. If the index of the energy density law is close to 3.5, the turbulent surface layer may be dominated by the large scale (two-dimensional) barotropic eddies whose energy is fed by the small scale (three-dimensional) baroclinic turbulence in a way similar to the planetary atmospheres. In this case we may expect the tangential macroturbulence of the order of 1-10 km/s, though the interaction between this and the small-scale three-dimensional turbulence still remains to be investigated.

https://doi.org/10.1017/S0252921100075357 Published online by Cambridge University Press