Abstract

We extend to the lower main sequence stars the analysis of convection interacting with rotation in a compressible spherical shell, already applied to the solar case (Belvedere and Paterno, 1977; Belvedere et al. 1979a). We assume that the coupling constant ε between convection and rotation, does not depend on the spectral type. Therefore we take ε determined from the observed differential rotation of the Sun, and compute differential rotation and magnetic cycles for stars ranging from F5 to M0, namely for those stars which are supposed to possess surface convection zones (Belvedere et al. 1979b, c, d). The results show that the strength of differential rotation decreases from a maximum at F5 down to a minimum at G5 and then increases towards later spectral types. The computations of the magnetic cycles based on the $\alpha\omega$-dynamo theory show that dynamo instability decreases from F5 to G5, and then increases towards the later spectral types reaching a maximum at M0. The period of the magnetic cycles increases from a few years at F5 to about 100 years at M0. Also the extension of the surface magnetic activity increases substantially towards the later spectral types. The results are discussed in the framework of Wilson's (1978) observations.

References

Belvedere, G. and Paterno, L. 1977 Solar Phys. 54, 289.
Belvedere, G., Paterno, L. and Stix, M. 1979a Geophys. Astrophys. Fluid Dyn. (in press).
Belvedere, G., Paterno, L. and Stix, M. 1979b Astron. Astrophys. submitted.
Belvedere, G., Paterno, L. and Stix, M. 1979c Astron. Astrophys. submitted.
Belvedere, G., Paterno, L. and Stix, M. 1979d Astron. Astrophys. to be submitted.
Wilson, O.C. 1978, Astrophys. J. 226, 379.

CHANGES OF PHOTOSPHERIC LINE ASYMMETRIES WITH EFFECTIVE TEMPERATURE

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Abstract

Asymmetries in photospheric lines were described briefly in my earlier contribution to these proceedings and in more detail in the January 15, 1980 issue of the Ap. J. The cores of the stronger lines in α Boo (K2III) show a blue shift, quite opposite to the effect seen in the solar lines. Suspecting this difference to be due to the

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shift in ionization with effective temperature, two other stars were measured, one slightly hotter than α Boo (β Gem KOIII) and one slightly cooler (β UMi K4IV). The preliminary results seem to confirm the effective temperature dependence since no asymmetries were found for β Gem and stronger blue-shifted core asymmetries were found for β UMi.

SMALL-SCALE VERSUS LARGE SCALE MOTIONS IN THE SOLAR ATMOSPHERE DERIVED FROM A NON-LTE CALCULATION OF MULTIPLET 38 OF Ti I

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Abstract

A non-LTE computation of multiplet 38 of Ti I (11 lines) has been undertaken in order to determine small and large scale unresolved motions contributing to the Doppler broadening of solar lines at the centre of the disk (vertical motions) and at the edge of the disk (horizontal motions).

The abundance of Titanium and the total Doppler velocity (all scales) are determined by fitting observed and computed profiles of weak unsaturated lines (W < 12 mÅ) of the multiplet. Then saturated lines having the same lower level as the weak lines are computed for a variety of partitions of the total kinetic energy between the small scale and the large scale modes going from 0% small scale to 100% small scale. Oscillator strengths with internal accuracies of about 2% from Wahling (1977) have been used. The location of the observed profile (taken from Delbouille et al. for the centre of the disk and from Brault and Testerman, KPNO for $\mu = 0.2$) among the computed profiles yields the partition of the energy between the two modes.

The computations done so far with 4 levels and continuum give less than 20% of the energy in the small scale mode. Further computations with more levels are needed to establish this ratio with better accuracy. The total energy for vertical motions has a root square velocity of about 1.4 km/sec whereas the same quantity is 2.2 km/sec for horizontal motions.

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