Calcium K line profiles as a function of latitu de and solar cycle phase

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Summary The sun as a star has been studied by many observers by monitoring the calcium K line profile. Skumanich et al (1984) proposed a three component model of the solar cycle variability of calcium K emission using extant contrast and fractional area parameters for (1) cell (2) network and (3) plage components. The computed line profile agreed well with the observed one at the solar minimum by taking the contribution of only cell and network features and using extant limb-darkening laws. The occurrence of plages during the growth of the solar cycle was found to be insufficient to account for the increase in K emission and therefore, they introduced an additional network component, 'Active network' in excess of the quiet sun value to explain the observed excess emission during the maximum phase.

To estimate the active component during different phases of the solar cycle, a technique has been developed to monitor the calcium K line profile as a function of latitutde and integrated over the visible longitude. The data have been analysed to study the variation of calcium line parameters as a function of latitude. The sunspots and related features tell us only about middle latitude belts but the changes in the chromosphere at polar regions are not well known. These spectra will provide this vital information about the polar regions as a function of the phase of the solar cycle. Singh and Livingston (1987) have shown that a power spectral analysis of the K-index yields a reliable value of the chromospheric rotation rate. Therefore, these data will be used to study chromospheric differential rotation and the variation of rotation rate (if any) with time or phase of the solar cycle. Finally the data will provide a clue to the movement in global activity and magnetic flux on the solar surface as a function of the solar cycle. To improve the quality of the data an optical arrangement has been developed which makes use of the unidirection focusing property of a cylindrical lens.

References

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