OBSERVATIONAL REQUIREMENTS: GROUND-BASED

Cornelis Zwaan
Observatory, Zonnenburg 2
3512 NL Utrecht, The Netherlands

Vigorous pursuit of the investigation of magnetic activity in stars with convective envelopes requires a diversity of observational studies and a variety of instrumentation. I leave out purely solar studies of magnetic structure and activity; it goes without saying that any well designed solar investigation contributes to better understanding of general astrophysical problems. Hence I restrict myself to observational programs pointed at stars (sections 1, 2, 3) and to solar studies necessary to interpret stellar data (section 4).

1. MAGNETIC DATA

In Marcy's review two possible ways of obtaining data on magnetic structure in late-type stars have been indicated:

(a) Determination of mean field strengths $<B>$ and magnetic filling factors from line profile analysis; this yields the most direct information on magnetic structure in stellar atmospheres;
(b) Measurements of linear polarization, which is presumably due to a difference in saturation between the π and the σ components in the spectral window. If this interpretation of the instrinsic linear polarization is correct, then it may yield the mean direction and an average magnitude of the transverse field component across the stellar disk.

2A. EXTENDED SERIES OF MEASUREMENTS

Long series of measurements of chromospheric emission flux are needed to follow the variability for many stars, for instance to determine rotation periods, or to search for activity cycles. These investigations require (i) *efficient line photometers* similar to the Mt. Wilson Ca II H and K photometer, and (ii) *dedicated telescopes* with apertures $D \gtrsim 1$ m. It is of prime importance that the program with the Mt. Wilson 60 inch telescope plus the H and K photometer be contintued for at least several more years. Moreover, similar instruments should be made available; at least one is needed in the southern hemisphere.

2B. CHROMOSPHERIC EMISSION FLUX MEASUREMENTS OF FAINT STARS

In order to compare the activity of stars of different ages, masses and chemical compositions, measurements are needed of stars in clusters and in the Magellanic Clouds. Thus very efficient photometers and large telescopes ($D \gtrsim 3.0$ m) are required.

J. O. Stenflo (ed.), Solar and Magnetic Fields: Origins and Coronal Effects, 503–504.

Programs under 2A and 2B require many man-years of steady labor in well defined programs in order to solve basic astrophysical problems. We should convince our scientific community, and eventually our funding institutions, that in the field of solar-stellar astrophysics cleverly designed "routine" programs are essential. These programs are very rewarding on time scales ranging from weeks to years and even decades.

The need for a large body of observational data will keep many observers busy. Before long we may need a standing working group coordinating and stimulating these observational efforts.

3. MEASUREMENTS OF GLOBAL VELOCITY FIELDS

The discovery of the stellar rotation rate as an important parameter in stellar magnetism calls for measurements of rotation rates, both from the rotational modulation in the chromospheric emission flux (see 2A), and from line profile analysis yielding $v \sin i$. Since synchronized spectroscopic binaries are extremely important in the study of stellar activity, we need programs for the detection of spectroscopic binaries and for the determination of the v_{rad} curves.

4. SOLAR–STELLAR STUDIES

The proper interpretation of chromospheric and coronal indicators of stellar activity requires special studies; some examples are given below.

(1) *Calibration* of the *"chromospheric magnetometers"*. For the Sun, magnetic flux densities and chromospheric emission fluxes should be compared for a variety of magnetic regions in various positions on the solar disk. For active stars simultaneous spectra for magnetic field determinations (see 1) and Ca II H and K line-core fluxes are needed.
(2) *"Hyperfine" fluxtube structure*: the basic structure of magnetic fluxtubes, their evolution and their role in chromospheric and coronal heating, will be studied by means of the *S*olar *O*ptical *T*elescope. SOT is not just another toy for a bunch of solar physicists; it is an instrument for fundamental astrophysical studies.
(3) *Relations between soft X-ray–, transition-region–, and chromospheric emission fluxes* for a variety of magnetic regions at various positions on the solar disk. These studies may rely on ATM data, to be supplemented at a later stage by SOT.