DEBRECEN HELIOPHYSICAL OBSERVATORY

(Report from a Solar Observatory)

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Abstract. This article provides a brief summary of the progress in the solar physics research at the Debrecen Observatory in the last 12 years.

1. Introduction

Since my first report (Dezső, 1967) the equipment of the observatory has been improved considerably. The facilities for observations and data analysis achieved its present research capacity around the middle of the 1970's. The number of scientific staff is 12, two thirds of them graduated during the last six years. Since 1972 the observatory has also had a permanent small observing station about 100 km south of Debrecen, at the top of a 40 m high water tower in Gyula, at an altitude of about 130 m above mean sea level.

2. Instrumentation

Two fairly similar *photoheliographs,* (one of which is the only telescope in Gyula) are used for regular patrol observations to obtain full-disc 'white'-light solar photographs. The aperture generally used is between 10–14 cm, the focal length of the objectives is 2 m, but at the secondary focus the diameter of the full solar disc is about 10.5 cm. The photographs are taken through filters of broad passband of 100 Å or more. Usually we manage to obtain white light heliograms for at least a quarter of an hour each day on about 300 days per year; of these some are taken in Debrecen and some in Gyula.

The *Lyot-coronagraph* of Kislovodsk-type has mainly been used since 1977 for observations of flares and prominences with high spatial and temporal resolution. The prototype of this instrument has been previously described by Gnevyshev *et al.* (1967). The diameter of its single lens objective is 53 cm; the primary and secondary focal lengths are 8 m and 12 m, respectively. Accessories: grating spectrograph of 8 m focal length and birefringent Hα filters ($\frac{1}{2}$ Å filter tunable $\pm$ 1 Å; $\frac{1}{4}$ Å filter tunable $\pm$ 2 Å and a 3 – 6 Å filter for prominence observations at the solar limb).

The telescopes, i.e. the Sun's primary image forming objectives, are located in the open air to minimize optical degradation due to turbulence of rising hot air masses. If feasible the seeing is monitored visually and the photographs are taken at the moments of better-than-average seeing.

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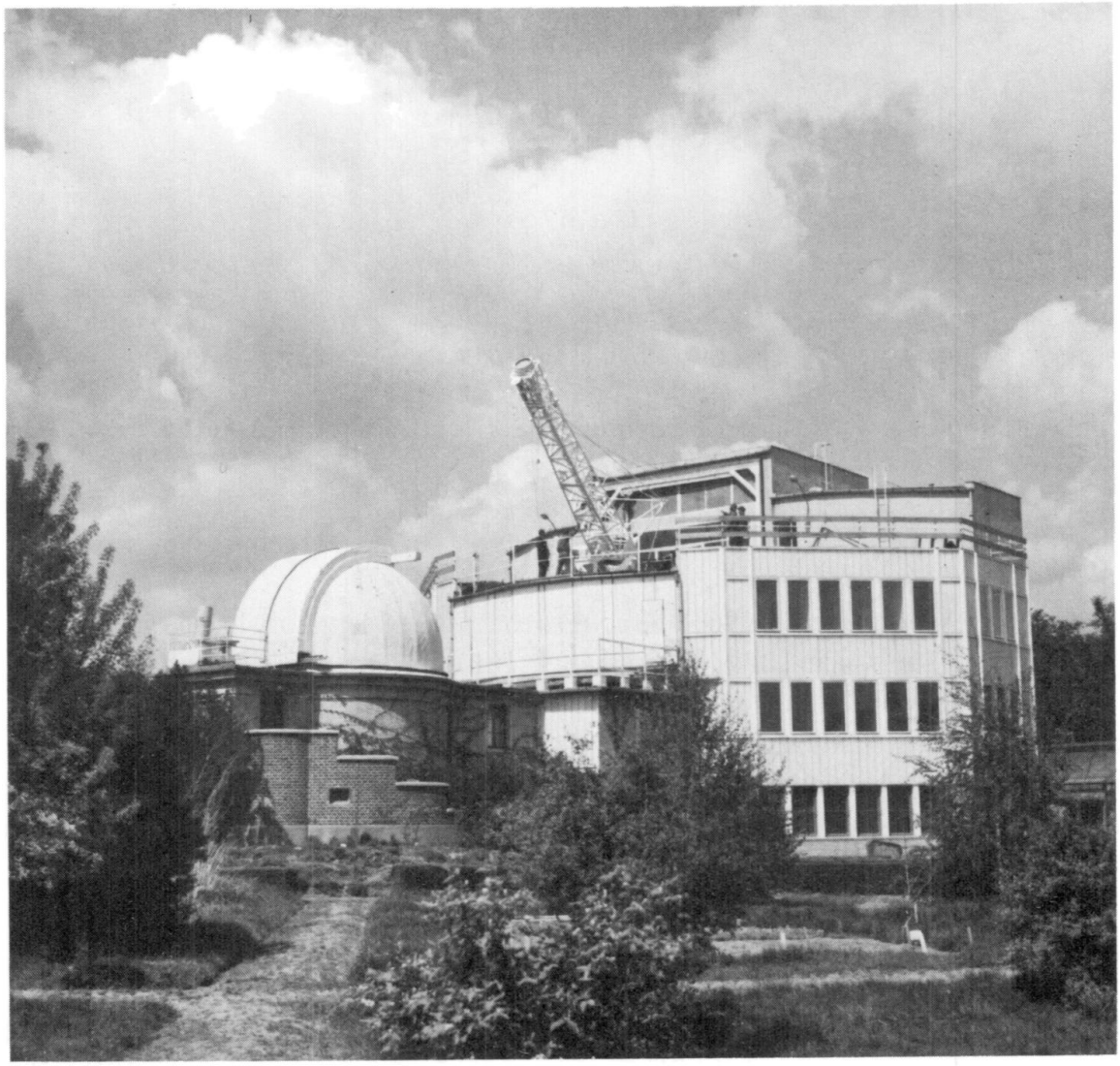

Fig. 1. View of the main building of the Debrecen Observatory showing the coronagraph in operation.

3. Programme of Investigation

The principal research programme of the Debrecen Observatory is specialized studies on solar activity. We study the dynamics of solar active regions, primarily the motion of sunspots, filaments and flare knots on the basis of series of photographic observations. Investigations on proper motions of sunspots have formed one of the main programmes for a couple of years now, therefore each day, whenever possible, several full-disc white-light solar photographs are taken.

We have participated in various international cooperative enterprises, including space research, in connection with studies of solar active regions, and we shall continue to do so in the future, too. We wish to extend our observations in two respects: to determine the magnetic polarity of sunspots and to investigate the variations of the profile of some Fraunhofer lines.

Besides its research studies, indicated above, the Debrecen Observatory is undertaking the responsibility for the continuation of the *Greenwich Photoheliographic Pro-*

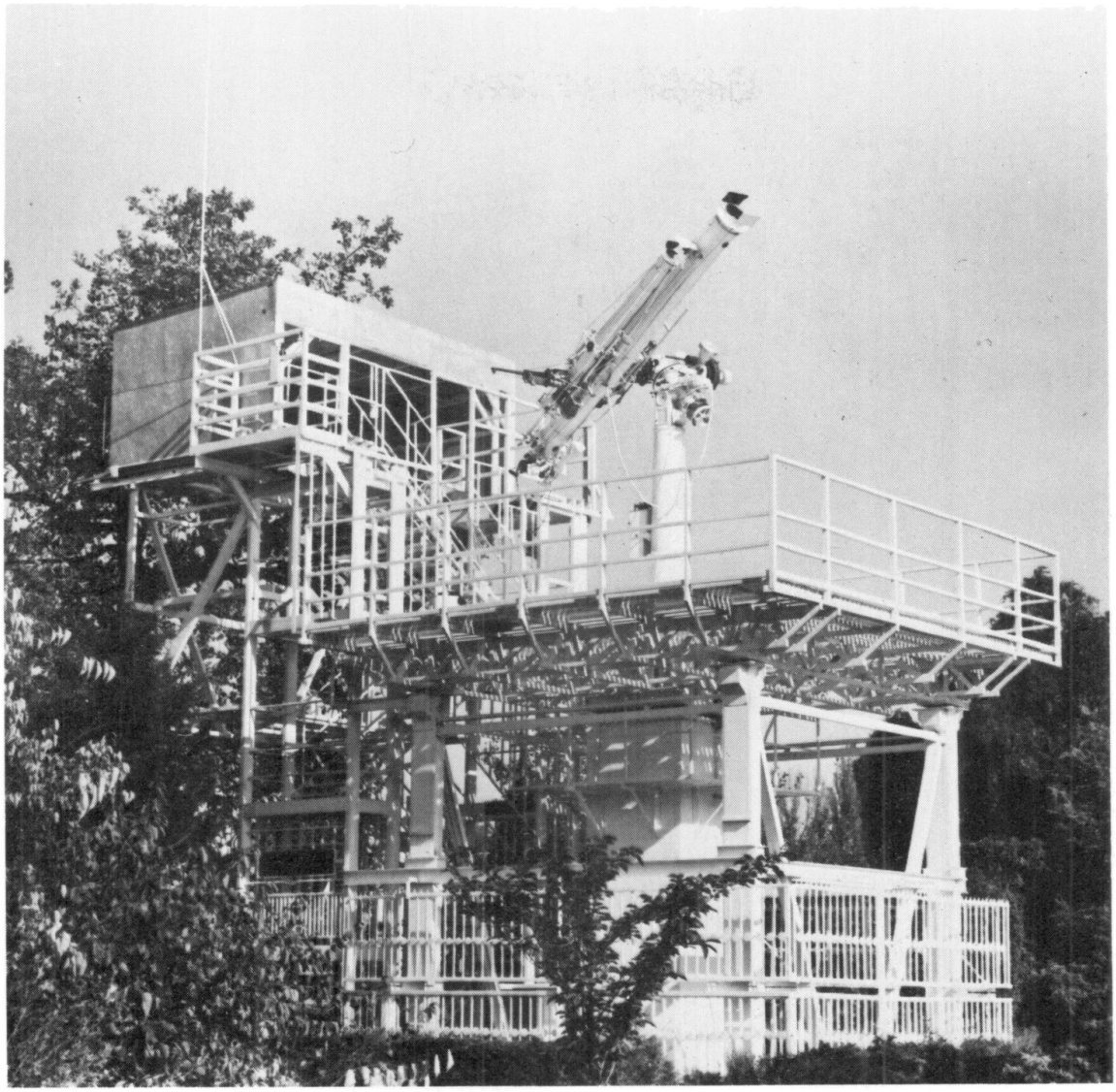

Fig. 2. The double photoheliograph in Debrecen with its movable platform of observation. (Notice its grid floor allowing free circulation of air.)

gramme, starting with January 1977. We established collaborative arrangements with the Kislovodsk and Kodaikanal observatories to ensure a continuous daily record, to fill in the gaps in the Debrecen-Gyula series. According to our plan, the yearly observations should be measured, reduced and published within the following calendar year. We intend to publish the data in a separate series of publication entitled '*Photoheliographic Results*', in accordance with the old Greenwich practice. We ensure the archiving of the original heliograms and we will make them accessible to all interested scientists around the world.

4. Some Results of Investigations

On the basis of the observations mentioned it has been confirmed that there are often links between the motion of some umbrae and some major flare occurrences (Kovács,

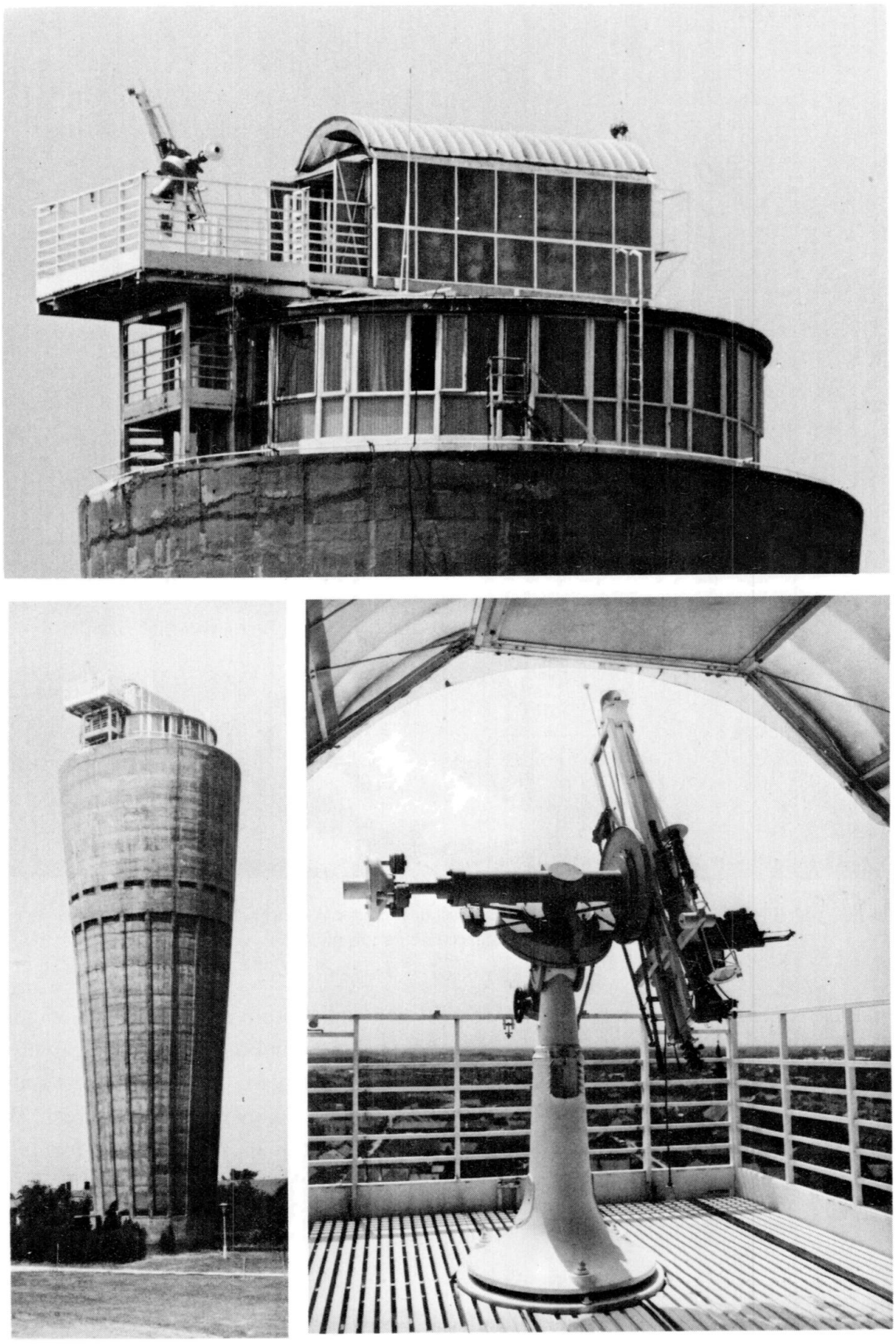

Fig. 3. The observing station in Gyula.

1977; Dezső *et al.*, 1980). On the other hand it was shown in several cases the rapid convergent motions of small umbrae (or pores) of the same magnetic polarity form larger umbrae by coalescence. This process of development, the mergence of sunspots through motion may be considered the crucial point in the course of evolution of sunspot groups (Dezső *et al.*, 1971, 1972; Gesztelyi, 1977; Kovács, 1977; Nagy and Ludmány, 1980; Dezső, 1980).

Using daily vector-magnetograms, obtained at the Crimean Astrophysical Observatory (U.S.S.R.) to supplement the Debrecen photospheric observations, some properties of the interdependent variations of the magnetic field and sunspot proper motions were derived (Kálmán, 1976, 1977); further it was shown, that the penumbra-photosphere boundary follows the 500–1000 G isogauss lines of the absolute value of the magnetic field, and the penumbral filaments are aligned along the horizontal component of the magnetic field (Kálmán, 1979).

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