*Multi-Wavelength Investigations of Solar Activity*
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# Magnetic field reversal of the Sun in polarization of radioemission 17GHz

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**Abstract.** Polarization of radio emission on the solar disk was studied according to of Nobeyama radio heliograph observations during 1992-2003. The latitude-time diagrams of polarization circular radio emission were constructed. For a decrease of the noises we used several solar images for a day. We found polarization drifts of radio emission in the high-latitudes activity and at latitude band of the sunspots. Process of the magnetic field reversal of the large-scale magnetic field in polarization of radio emission of the Sun was found during 22-23 cycles. An analysis of polarization for the structures various brightness temperatures has been carried.

Studying of the solar activity has various observational aspects. Recently to the optical observations were added regular observations in UF and X-ray ranges, heliosyismology and radio observations with good spatial resolution. Complex studying of solar activity allows to restore more full picture of generation of the magnetic fields inside the Sun and to study the properties of weak magnetic fields. The basic properties of solar cycle in the radio range have been obtained on the base of regular observations of radio heliograph Nobeyama (Shibasaki (1998)).

Regular observations of polarization on the radio heliograph Nobeyama allow carrying out the distribution of polarization on all disk of the Sun on different phases of solar activity. In this article the analysis of distribution of the size and sign of polarization on the wave $\lambda = 1.76$ cm was carried out for the period 1992-2003. The initial data for an analysis were the daily data on circular polarization (R-L) of radio heliograph Nobeyama presented in fits a format. The images received with 1 second accumulation of a signal were used. Averaging the images received within day with periodicity of 10 minutes has been applied for each day of observation. Besides it the received series has been subjected to procedure of a filtration. For this purpose the criterion of a level of noise was calculated as average polarization above a disk of the Sun. Calculation of polarization was carried out on a disk of the Sun at distance from the central meridian no more than on 60°. Thus, matrixes of monthly average values of polarization in the latitude band $\pm 80°$ degrees have been generated. For the analysis of polarization of different kinds of activity procedure of definition of polarization also was applied to elements with various brightness temperatures. For this purpose the data of polarization were defined at joint processing images of polarization and intensity of a radio emission.

The direction of a magnetic field will determine by a sign of circular polarization. Fig. 1. shows the latitude-time distribution of polarization. The background magnetic fields on these diagrams with areas above 200 in terms of brightness temperature did not taken into account. Various colors present the regions of prevailing polarity of the right or left polarization. It is possible to note, that distribution of polarization depends on a cycle of activity not only in the region of formation sunspots, but also at the high-altitude zones. With the beginning of the cycle 23 1996-2000 drift of polarization of an opposite sign to poles was observed. A phase of drift in polarization of a radio emission is close to drift

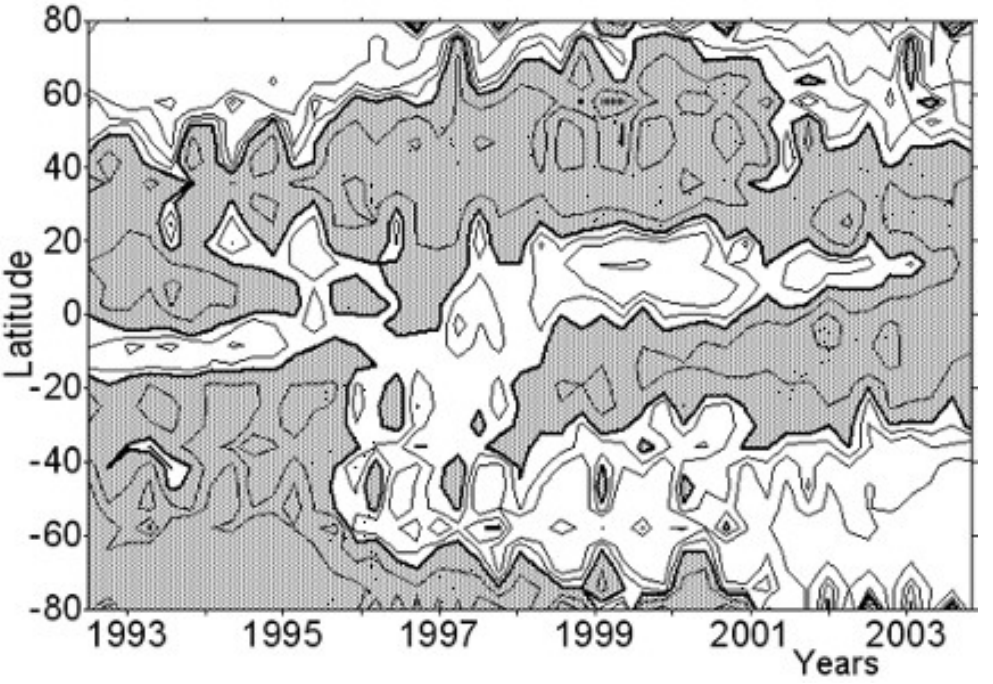


**Figure 1.** The latitude-time diagram of distribution of polarization of the radio emission, received under the daily synthesized images, on the basis of 10 minute data Nobeyama. Areas with a level more than higher 200° $T_b r$ are excluded.

of the neutral lines during reversal of a large-scale magnetic field. With the beginning of the cycle 23 1996-2000 drift of polarization of an opposite sign to poles was observed. A phase of drift in polarization of a radio emission is close to drift of the neutral lines during reversal of a large-scale magnetic field.

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