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Heliolatitude distribution of photospheric magnetic fields

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Heliolatitude distribution of photospheric magnetic fields was studied on the base of synoptic maps of Kitt Peak observatory (1976-2003). The maps were averaged over the whole period under consideration separately for the groups of magnetic fields with different strength. In the study of the latitude distribution of the photospheric magnetic field two methods were used. 1) The magnetic field strength values were replaced by 1 or 0 depending on whether the value B is in the chosen interval or not. This approach allows to estimate the percentage of time when the fields from the given group were present on a certain latitude. 2) The magnetic field strength values were summed, which allows to study the latitude distribution of the magnetic flux for the given group of magnetic fields.

Heliolatitude distribution of magnetic fluxes obtained for the different groups of magnetic fields showed the regularities which persist even when averaging over three solar cycles and which are connected to some specific manifestations of the solar activity. The heliolatitude distribution of the magnetic fluxes is essentially symmetric with respect to the equator. Heliolatitude distributions were considered for each 5 G interval of strength separately. Our study shows that there exists a clear relation between the magnetic field strength and its latitudinal localization. Following field groups were observed:

1) From equator to 10° – weak fields (0 - 5 G).
2) From 10° to 30° - strong fields (more than 50 G – sunspots and active regions).
3) From 30° to 60° - weak fields (0 - 5 G).
4) In the narrow strip of latitudes from 70° to 80° - magnetic fields from 15 to 50 G – polar faculae.
5) High latitude regions over 60° - magnetic fields 5 -15 G – polar coronal holes.

We define the latitude where the maximum in the latitudinal profiles is attained and study the time-dependence of the magnetic flux on the given latitude for different groups of magnetic fields. Distinct correspondence was observed between the time-dependence of the magnetic flux for each of the above-mentioned groups of fields and the cyclic manifestations of the solar activity.