E P11 The decentered magnetic dipole - a challenge for modelling

E. Gerth[1] and Yu. V. Glagolevskij[2]

[1] *D-14471 Potsdam, Gontardstr. 130, Germany*
[2] *Special Astrophysical Observatory, Nizhnij Arkhyz, Karachaevo-Cherkesia, 369167 Russia*

The *magnetic dipole* reveals itself by modulation of the observed integral magnetic field strength in the rotational course of the star as an *oblique rotator*, defining the magnetic poles as topographic features fixed at the surface of the star. Assuming a central dipole, the phase curve of the integral magnetic field strength would be a sinusoidal one. The obviously existing deviations from the sinusoidal form J. D. Landstreet in 1970 explained by the heuristic assumption of a *decentered magnetic dipole,* which enables one to describe most of the observed magnetic phase curves rather well. In 1954 A. J. Deutsch was the first to represent the surface field analytically by a truncated expansion of spherical harmonics, which can be coordinated to dipoles, quadrupoles, etc. However, since for every degree n the number of parameters grows with $2n+1$, we have for a dipole 3 parameters, for dipole+quadrupole 8 parameters, etc. Truncating after the octupole yields 21 parameters. For modelling, these *parameters* would be taken as *generating magnitudes,* the physical meaning of which is not defined. This is, indeed, a challenge for modelling!

We recommend to use for the calculation the straight-forward way from the origin of the *magnetic dipole as a generating magnitude* on the physical base of the potential theory and the mathematical base of vector algebra. This is the foundation of modelling stellar magnetic field structures by using the method of the *Magnetic Charge Distribution* (MCD), proposed by the authors in former publications.