THE DISSIPATIVE EVOLUTION OF GLOBAL MAGNETIC FIELD ON THE SUN AND THE HELIOSPHERE ROTATION MECHANISM

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The new model of general solar magnetic cycle that was suggested earlier together with the mechanism that can explain the rotation of inner (within 1-2 solar radius) heliosphere is discussed. The model is based on the idea that the magnetic flux generated near the bottom of convective zone "comes out" into this zone after some critical magnitude of magnetic field strength is attained. Within the convective zone magnetic field is subject to the intensive chaotic mixing in the scales of superconvection and smaller while in the greater ones it forms the regular structure which subordinates the number of quite general restrictions. Arising as self-organising dissipative structure, the global magnetic field in convective zone turns to be the axial force-free linear one ($rotB =\sim B, \sim= const$). In favour of the hypothesis assuming the global field of the Sun being force-free whitnesses the result obtained by Boozer. He has shown that in the convective resistive medium subject to the chaotic mixing the "pumping" of electric currents parallel to the magnetic field lines occurs significantly more effectively than in the transverse direction. Thus, the large-scale magnetic field tends to the force-free structure. The geometrical form of this field represents the system of magnetic toroids that fill in the spherical layer of convective zone. (The strong magnetic fields leading to the appearance of active regions, arise now as the derived effect, "twisting up" out from the present large-scale background field by differential rotation.) The linear force-free magnetic field have a number of signicant properties: under the given magnitude of helicity it possesses the minimum of energy, and also has the minimal ohmic dissipation (the minimum entropy production according to the Prigozhin principle). Besides, the damping of such magnetic field, in consequence of its convective diffusion in the scales of supergranulation, proceedes by such a way that its geometrical (toroidal) form is saifed. In the present model the typical diffusion time is close to the solar cycle period (22 years). The process of dissipation results in the "swelling" of magnetic toroids and the displacement of the outer one beyond the solar radius, into the inner heliosphere. This outer torus, set free from the dense photosphere plasma, appears to be unstable against the finite turns relatively to any axis tranverse to the axis of the symmetry of the system (the magnetic moment of electric currents in each magnetic torus is antiparallel to the moments of neighboring toroids). During the magnetic cycle two toroids come out into the outer solar atmosphere, and each of them rotates sequentially at an angle of 180°. Thus, the proposed model describes the global evolution both of large-scale magnetic field of the Sun and the rotation of inner heliosphere.