



Effects of Solar Meridional Circulation on the Solar Dynamo and the Magnetic Cycle

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Examples of generation and self-sustaining of magnetic fields include planets, stars, galaxies etc. Generally accepted scenario for the formation of solar magnetic field assumes that dynamo activity results due to physical processes in the solar convection zone. The cycles of solar magnetic activity are associated with the action of the solar dynamo mechanism, which are based on the combined effect of the differential rotation and alpha-effect. Such representation provides a solution in the form of oscillating waves of toroidal field, extending from middle latitudes to the equator. We developed a WKB method for the asymptotic solution of the corresponding Parker dynamo equations. The relation of amplitudes of toroidal and poloidal magnetic field on the meridional circulation was built for single-layer and double layer Parker dynamo problems. The effect of meridional flow and turbulent diffusion coefficients for the duration of the solar activity cycle and the configuration of the dynamo waves is discussed. The growth of the intensity of the meridional flow of matter slows the spread of the dynamo waves. Minimum of magnetic solar activity may occur in the case of large intensity of the meridional circulation in both layers, as well as substantial differences in physical characteristics between the layers.