

Sonderseminar

von

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über

“The solar and astrophysical dynamos and magnetic helicity”

The hydro-magnetic dynamo mechanism in turbulent media of highly conducting cosmic plasmas is responsible for origin and re-generation of magnetic fields in astrophysical bodies. The solar dynamo theory is based on the concept of the conversion of toroidal magnetic fields, represented by sunspots, into poloidal magnetic fields of the quiet solar background. The reversed process of amplification and conversion of poloidal magnetic energy into its toroidal counterpart is based on the differential rotation within the solar interior which is relatively well known by means of helioseismology. The former process is crucial for the dynamo theory and can be quantified and diagnosed by the amounts of magnetic helicity, the measure of correlation of the magnetic field (pseudo-)vector components with the components of the magnetic vector potential and the electric current. The proxies of the magnetic helicity can be observed by systematic measurement of magnetic field vector in the solar photosphere, and is agreement with long-term observations of the solar observatories in the USA, China, and Japan. The self-consistent theory of the solar dynamo with helicity is presented. Further challenges are open for extension of the theory and its observational support for other astrophysical bodies such as magnetically active stars.

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des Institutes für Astrophysik, Türkenschanzstraße 17, 1180 Wien