Contributed Talk

Splinter Activity

Dynamo mechanism for magnetic activity and cycles of stars

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The magnetic field in the Sun undergoes a cyclic modulation with a reversal typically every 11 years due to a dynamo operating under the surface. Observations of other stars have revealed magnetic activity being present at a large variety. I will start by presenting some theoretical background about what determine the cycle period in dynamos. Furthermore, I will present result from simulation of rapidly rotating solar-type stars, where the interplay between convection and rotation self-consistently drives a large-scale magnetic field. With the help of the test-field method, we are able to measure the turbulent transport coefficients in these simulations and therefore get insights about the dynamo mechanism operating in these simulations. It will allow us to derive a scaling of the cycle period with the relevant effects of the dynamo. Furthermore, I will discuss how magnetic helicity is a key quantity connecting the stellar convection zone with the stellar surface and the stellar coronae. Magnetic helicity is produced in the convection zone of stars via a dynamo in the present of convection and rotation. At the surface, it plays an important role in the formation process of active regions. In the corona, it is believed to be essential for the release of energy leading to the eruption of plasma via coronal mass ejection and it might play an important role in the heating process of the coronal plasma. Using numerical simulations of stellar convection zones and the solar corona allow us to investigate this process. I will present some preliminary results linking the magnetic helicity below the surface to the heating process in the corona. This connection is crucial for understanding the rotation-activity relation of stars.