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Recent progress in understanding global solar dynamo

A.S. Brun
DSM/IRFU/SAp, CEA-Saclay & UMR AIM, CEA-CNRS-Université Paris 7, 91191 Gif-sur-Yvette, France

Abstract. We present recent 3-D high resolution MHD simulations made with the ASH code to model self-consistently the solar global dynamo in a turbulent convection zone coupled with a stable sheared region below. We show that the introduction of such a stable layer indeed favors the emergence of strong axisymmetric magnetic field which otherwise would not exist in a purely unstable convective layer rotating at the solar rate. The dynamo action operating in the convection zone is found to be highly intermittent both in space ant time. Further it is found that large scale meridional flows, magnetic diffusion and turbulent convective plumes serve to pump down magnetic field in the stable sheared layer. There, the ω-effect acts efficiently to organize the field into strong toroidal structures (the mean toroidal energy being about 100 times higher). This field is found to be antisymmetric with respect to the equator, as observed in the Sun and is associated with a deep poloidal (dipolar like) field. This stable organised poloidal field seems to stabilize the poloidal field generated by the turbulent and intermittent convection envelope.