Talk at Splinter Meeting

Splinter K

Understanding Solar and Stellar Dynamos with numerical simulations

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At the beginning of the cycle sunspots appear at high latitude, whereas at the end they appear close to the equator. This is associated with an underlying strong toroidal field which migrates equatorward. Since a few years this behavior has been reproduced in global convective dynamo simulations. I will present results from our simulations of global convective dynamos. All of these simulations produce cyclic and migrating mean magnetic fields. Through detailed comparisons, we show that the migration direction can be clearly explained by an alpha-Omega dynamo wave following the Parker-Yoshimura rule. This lead to the conclusion, that the equatorward migration in this and other work is due to a positive (negative) alpha-effect in the northern (southern) hemisphere and a negative radial gradient of rotation outside the inner tangent cylinder of these models. Furthermore, I will present results of identifying various dynamo mechanism in these simulation using obtain transport coefficients: alpha effect, turbulent pumping and the turbulent magnetic diffusivity calculated with the test-field method. These coefficients show a clear temporal variation with the activity cycle indicating a non-linear dynamo mechanism.