Turbulent reconnection in large-scale dynamo in stratified turbulence

I. Rogachevskii*, S. Jabbari, A. Brandenburg, Dh. Mitra and N. Kleeorin
Ben-Gurion University of the Negev

We consider strongly stratified forced turbulence in a plane-parallel layer with helicity and corresponding large-scale dynamo action in the lower part and non-helical turbulence in the upper. The magnetic field is found to develop strongly concentrated bipolar structures near the surface. They form elongated bands with a sharp interface between opposite polarities. What is surprising is the long lifetime of the resulting bipolar regions, which exceeds several turbulent diffusion times. We show that the main reason why these intense magnetic structures survive longer is the magnetic reconnection phenomenon in the vicinity of the current sheet between opposite magnetic polarities. We determine the reconnection rate by measuring either the inflow velocity in the vicinity of the current sheet or by measuring the electric field in the reconnection region. We demonstrate that for large Lundquist numbers, $S > 1000$, the reconnection rate is nearly independent of the Lundquist number. The reconnection rate is also weakly dependent on the Ohmic resistivity and Alfven Mach number.