

Cellular Compressible Magnetoconvection: a Mechanism for Magnetic-Field Amplification and Structuring

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The amplification and structuring of magnetic field by cellular compressible magnetoconvection in a plane horizontal fluid layer heated from below is studied using numerical simulations. The cases of both horizontal and inclined initial magnetic fields are considered. A bipolar structure superposed with finer details (which is typical of solar magnetic regions) develops from a horizontal initial field. If the initial field is inclined, such a structure coexists with a strong unipolar concentration of magnetic flux. Convection cells form such structures over a fairly wide region in parameter space, and this property seems to be inherent in the very topology of the cellular flow. These new effects are complemented with the well-studied sweep of the vertical magnetic field to the cell boundaries and with a strong concentration of the horizontal magnetic field near the bottom boundary of the layer (so-called topological pumping)

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