Turbulence driven magnetic islands: fundamental mechanisms

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The nonlinear properties of a turbulence driven magnetic island (TDMI) are investigated, both, theoretically and numerically. Starting from a minimal magnetohydrodynamic (MHD) fluid model that provides for the generation of a TDMI and using scale separation arguments along with numerical simulation findings [1, 2, 3], we elucidate the links between the nonlinear transport properties of such magnetic islands and the characteristic features of the small scale turbulence. We also explain the phenomenon of partial pressure flattening inside the TDMI. Finally, we investigate the role of zonal flows through extensive 3D MHD numerical simulations.