

## P4.4008 Turbulence-induced transport dynamo mechanism

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See full abstract here:

<http://ocs.ciemat.es/EPS2019ABS/pdf/P4.4008.pdf>

Random motions of particles have an interesting property to break the magnetic field lines, and can induce a net transport flow crossing the field lines. The transport flow deserves special attention from the dynamo-theoretical point of view. By definition, the cross field diffusion velocity describes a relative one to the field line, and has a capability to generate a magnetic field in nearly frozen-in plasmas[1,2], accompanying a net change of the magnetic flux[3]. It turns out that classical diffusion due to the short range ion-electron can give rise to the magnetic change comparable to the resistive diffusion, whereas, for example, the Bohm type anomalous diffusion due to the drift turbulence can give rise to a much higher magnetic field amplification[4,5]. This dynamo mechanism by the transport flow is quite different from the conventional mean-field dynamo theory, which is based on average coupling of turbulent velocity and magnetic fluctuations [6]. The magnetic amplification by a transport flow can only be effective in a non-uniform plasma. To sustain such a flow, this mechanism requires a source and a sink. Ionization and recombination of atoms or molecules can play such roles to maintain the density profile, going through the recycling processes. In fact, in a fusion machine, recycling processes of neutrals have been known to be essential to sustain the particle confinement times[7]. In this paper, the possibility and implications of the magnetic field generation by the transport flows induced by turbulence are discussed in the context of laboratory astrophysics.

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