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Chaos generated subdiffusion and related convection in toroidal confinement devices R.B. WHITE, Plasma Physics Laboratory, P.O.Box 451, Princeton, NJ, 08543, S. CAPPELLO, Consorzio RFX, Euratom-ENEA Association, Corso Stati Uniti 4, 35127 Padova - Italy, L. MARRELLI, F. SATTIN, G. SPIZZO, Consorzio RFX, Euratom-ENEA Association — Transport in toroidal devices is usually described as the sum of diffusion and convection, $\Gamma = -D\nabla n + v \cdot n$, and v is interpreted as the spatial variation $\partial D/\partial r$ of D. When the magnetic field is chaotic and it is near the stochastic threshold (as it is the case for the reversed-field pinch, RFP), the assumption that particles moving along chaotic field lines diffuse in the system is not valid. Instead, in such a condition, a convective velocity term appears quite naturally due to the streaming motion of particles with velocity nearly parallel to the magnetic field (i.e., with pitch $\lambda = v_{\|}/v$ close to 1), while particles with small pitch diffuse collisionally through the magnetic field. The convective term is a consequence of the intrinsic, non-diffusive character of the transport. Diffusive motion is recovered when the configuration consists of closed nested flux surfaces, such as in the ideal single helicity (SH) condition [1]. The study is carried on calculating magnetic field lines and particle orbits with the code ORBIT for a typical multiple helicity (MH) chaotic field, provided by a 3D MHD numerical simulation (SpeCyl) of the RFP.

[1]D. F. Escande *et al.*, Phys. Rev. Lett. **85 (15)**, 3169 (2000).

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