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Fractional renormalization of plasma turbulence RAUL SANCHEZ, Universidad Carlos III de Madrid. SPAIN, BEN A. CARRERAS, Oak Ridge National Laboratory, DAVID E. NEWMAN, University of Alaska at Fairbanks, VICKIE E. LYNCH, Oak Ridge National Laboratory, BOUDEWIJN PH. VAN MILLIGEN, Laboratorio Nacional de Fusion, CIEMAT (SPAIN) — Several phenomenological models for plasma transport have been recently proposed based on fractional differential operators [1]. These operators provide with a mathematical framework that may outperform the standard diffusive paradigm when it comes to capturing the strange phenomena observed in tokamak plasmas: canonical profiles, anomalous scalings, etc. The reason is simple. They are designed to model transport mechanisms lacking characteristic scales as those apparently pointed to as relevant by the observed phenomenology. It is however not clear how fractional operators (non-local and non-Markovian in nature) can be formally derived from the usual turbulent plasma equations. In this contribution we will establish such a link by developing a scheme reminiscent of quasilinear theory. A careful analytical and numerical analysis of the conditions under which this procedure can be justified also results in a deeper understanding of the meaning of fractional operators in this context.

REFERENCES: [1] B.A. Carreras et al, Phys. Plasmas **8**, 5096 (2001); B.Ph. van Milligen et al, *ibid.* **11**, 2272 (2004); D. del-Castillo-Negrete et al, *ibid.* **11**, 3854 (2004); R. Sánchez et al, *ibid.* **12**, 056105 (2005)

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