Turbulence induced by magnetic reconnection in the Earth's magnetosphere: numerical simulations and comparison with observations

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Turbulence and magnetic reconnection are two non-linear phenomena that go hand in hand in plasmas. On the one hand, magnetic reconnection spontaneously takes place in plasma turbulence between magnetic vortexes. On the other hand, reconnection produces outflow jets that trigger turbulence in the reconnection exhaust. The latter process is investigated in this presentation in the context of the Earth magnetospheric plasma and by means of full kinetic particle in cell numerical simulations. Two cases are considered: reconnection in the magnetotail and reconnection in the magnetopause. In both cases, simulation parameters are acquired from observations. For what concerns the magnetotail, we show that the numerical simulation is able to reproduce the observed turbulence properties in reconnection outflows, namely, the electric and magnetic spectrum, the statistics of field-particle energy exchange, and the intermittency[1]. For the magnetopause case, we show that the numerical simulation may help in reconstructing the 3D picture of reconnection jet collision as observed in-situ. Also in this case, the properties of the turbulence produced in the outflow are discussed in comparison with observations[2].

References

[1] F. Pucci, S. Servidio, L. Sorriso-Valvo, V. Olshevsky, W. H. Matthaeus, F. Malara, M. V. Goldman, D. L. Newman, and G. Lapenta, The Astrophysical Journal **841**, 60 (2017)

[2] F. Pucci, W. H. Matthaeus, A. Chasapis, S. Servidio, L. Sorriso-Valvo, V. Olshevsky, D. L. Newman, M. V. Goldman and G. Lapenta, The Astrophysical Journal **867**, 10 (2018)