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Global electromagnetic simulations of tokamak scrape-off layer turbulence[1] FEDERICO HALPERN, PAOLO RICCI, SEBASTIEN JOLLIET, JOAQUIM LOIZU, ANNAMARIA MOSETTO, Centre de Recherches en Physique des Plasmas, Ecole Polytechnique Federale de Lausanne — We discuss recent studies addressing the properties of tokamak SOL turbulence using a global, electromagnetic, fluid drift-reduced Braginskii model. Non-linear simulations are carried out using the Global Braginskii Solver (GBS) code [1], which is capable of carrying out self-consistent, global three-dimensional simulations of the plasma dynamics in the tokamak SOL. The simulations involve plasma profile formation in the SOL as a power balance between plasma flux from the core, the turbulent radial transport, and the losses at the plasma sheath where the magnetic field lines intersect with the vessel. A gradual approach in increasing complexity has made possible (a) to determine the dominant instabilities driving the SOL turbulence, (b) to identify the mechanisms that saturate the growth of the linear modes and therefore regulate the level of radial transport, and (c) to study the role of electromagnetic effects in enhanced transport regimes. The non-linear dynamics revealed by the simulations agree with the analytical estimates that have been carried out. A scaling for the SOL width in circular limited plasmas has been derived and compared against experimental data from several tokamaks.

[1] P. Ricci et al., Plasma Physics and Controlled Fusion, 2012, 54, 124047.

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