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Global gyrokinetic investigation of the nonlinear interaction of energetic particles and turbulence in tokamak plasmas ALBERTO BOTTINO, ALESSANDRO BIANCALANI, FRANCESCO VANNINI, Max Planck Institute of Plasma Physics — Understanding turbulent transport is crucial for achieving a comprehensive theoretical knowledge of present day tokamaks and a predictive capability of future reactors. Energetic particles (EP), due to fusion reactions and to external heating mechanisms, have been shown to modify the turbulence dynamics both experimentally and theoretically. Due to its intrinsic multi-scale character, the problem of turbulence in toroidal plasmas is challenging, and a theoretical study is numerically demanding. This has forced previous studies to assume strong approximations on the physical models. Therefore, at present day, a comprehensive investigation is missing. In this work, the global gyrokinetic particle-in-cell code ORB5 is used to investigate in a selfconsistent way the nonlinear interaction of microturbulence modes and EPs. The effect of EPs on the turbulence dynamics is investigated here with electrostatic and electromagnetic simulations. A global model offers the opportunity of including selfconsistently the effect of meso-scale modes like zonal structures or Alfven modes, which are naturally excited in such a nonlinear system. Emphasis will be given on the analysis of the turbulent heat and particle fluxes, in dependence on the EP concentration, temperature, and radial localisation.

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