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Self-consistent dynamics of impurities in magnetically confined plasmas: turbulence intermittency and non-diffusive transport F. SHIMPEI, ITER Organization, France, D. DEL-CASTILLO-NEGRETE, Oak Ridge National Laboratory, X. GARBET, CEA, IRFM, France, S. BENKADDA, International Institute for Fusion Science, Aix Marseille Universite-CNRS France, N. DUBUIT, Aix Marseille Universite-CNRS France — Self-consistent turbulent transport of high-concentration impurities in magnetically confined fusion plasmas is studied using a three-dimensional nonlinear fluid global turbulence model which includes ion-temperature gradient (ITG) and trapped electron mode (TEM) instabilities. It is shown that the impurity concentration can have a dramatic feedback in the turbulence and, as a result, it can significantly change the transport properties of the plasma. High concentration impurities can trigger strong intermittency, that manifests in non-Gaussian heavy tails of the probability density functions (PDFs) of the $\mathbf{E} \times \mathbf{B}$ fluctuations and of the ion-temperature flux fluctuations. At the heart of this self-consistent coupling is the existence of inward propagating ion-temperature fronts with a sharp gradient at the leading edge that give rise to instabilities and avalanche-like bursty transport. Numerical evidence of time non-locality (i.e., history dependence) in the response of the flux to the gradient is presented. Related to this, the temporal, cross-correlation function between the impurity flux and the impurity density gradient exhibits a delay in the response depending on the concentration of the impurity.

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