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Spatio-Temporal Multiscaling Dynamics of Impurity Transport in Turbulent Plasmas SADRI BENKADDA, SHIMPEI FUTATANI, France-Japan Magnetic Fusion Laboratory LIA 336 CNRS, DIEGO DEL-CASTILLO-NEGRETE, Oak Ridge National Laboratory — The spatio-temporal dynamics of the turbulent transport of impurities is studied in the Hasegawa-Wakatani model. Two transport scenarios are studied: a freely decaying case, and a forced case in which the impurity is forced by an externally imposed gradient. The results of the numerical simulations are analyzed using Proper Orthogonal Decomposition (POD) techniques. The low rank spatial POD eigenfunctions capture the large scale coherent structures and the high rank eigenfunctions capture the small scale fluctuations. The temporal evolution at each scale is dictated by the corresponding temporal POD eigenfunctions. In the decaying case the POD reveals the presence of "bursty" dynamics in which successively small scales are intermittently activated during the mixing process. In the forced simulations, the temporal dynamics exhibits stationary fluctuations. Spatial intermittency or "patchiness" in the mixing process characterizes the distribution of the passive tracer in the decaying quasi-hydrodynamic regime. The spatio-temporal POD scales exhibit a diffusive-type scaling in the quasi-adiabatic regime. However, diffusive scaling seems to be absent in the quasi-hydrodynamic regime.

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