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Measurement of nonlinear energy transfer in two-dimensional plasma turbulence PETER MANZ, MIRKO RAMSICH, ULRICH STROTH, Institut fuer Plasmaforschung, Universitaet Stuttgart, D-70569 Stuttgart, Germany — An important questions concerning the turbulent cascade is how energy is transfered among the scales. In three-dimensional fluid turbulence the energy cascades from large to small scales. Whereas in two-dimensional fluid turbulence the transfer is in the opposite direction, via an inverse cascade in, while the enstrophy is transferred by a direct cascade. In magnetised plasmas the turbulence can be assumed two-dimensional. In this work the turbulent energy cascade in simulated and experimental data from toroidally confined plasmas is studied by bispectral methods, which base on the model of three-wave interaction. General properties of the two-dimensional Hasegawa-Wakatani turbulence are recovered, which are the analytically known growth rate, dispersion relation and the direction of the energy transfer. The results from measurements in density and potential fluctuations by using a 2D probe array in the torsatron TJ-K are in good agreement with the simulated data from the Hasegawa-Wakatani turbulence. The density fluctuations, which are advected by the vorticity, show free energy transfer to smaller scales, while the $E \times B$ energy of the potential fluctuations is transferred as an inverse cascade to larger scales.

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