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Gyrokinetic GDC turbulence simulations: confirming a new instability regime in LAPD plasmas[1] M.J. PUESCHEL, University of Wisconsin-Madison, G. ROSSI, D. TOLD, University of California, Los Angeles, P.W. TERRY, University of Wisconsin-Madison, F. JENKO, T.A. CARTER, University of California, Los Angeles — Recent high-beta experiments at the LArge Plasma Device have found significant parallel magnetic fluctuations in the region of large pressure gradients. Linear gyrokinetic simulations show the dominant instability at these radii to be the gradient-driven drift coupling (GDC) mode, a non-textbook mode driven by pressure gradients and destabilized by the coupling of ExB and grad-$B_\parallel$ drifts. Unlike in previous studies, the large parallel extent of the device allows for finite-k_z versions of this instability in addition to $k_z = 0$. The locations of maximum linear growth match very well with experimentally observed peaks of $B_\parallel$ fluctuations. Local nonlinear simulations reproduce many features of the observations fairly well, with the exception of Bperp fluctuations, for which experimental profiles suggest a source unrelated to pressure gradients. In toto, the results presented here show that turbulence and transport in these experiments are driven by the GDC instability, that important characteristics of the linear instability carry over to nonlinear simulations, and – in the context of validation – that the gyrokinetic framework performs surprisingly well far outside its typical area of application, increasing confidence in its predictive abilities.

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