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Gyrokinetic Turbulence Simulations for Stellarators F. MERZ, P. XANTHOPOULOS, T. GORLER, F. JENKO, D. MIKKELSEN, IPP Greifswald — While there is an abundance of publications on plasma microturbulence in tokamaks, not much is presently known about its character in nonaxisymmetric devices. The present work constitutes the first attempt to investigate turbulent transport in modern stellarators, using the gyrokinetic turbulence code GENE and realistic magnetic equilibria. First, linear and nonlinear gyrokinetic simulations of ion-temperature-gradient (ITG) and trapped electron modes are presented for the optimized stellarator Wendelstein 7-X which is currently under construction at Greifswald, Germany. The newly developed code TRACER – based on field line tracing – is employed to extract the required geometric information from the MHD equilibria [Phys. Plasmas **13**, 092301 (2006)]. Extensive linear studies reveal substantial differences with respect to axisymmetric geometry [Phys. Plasmas **14**, 042501 (2007)]. Nonlinear ITG simulations are also presented [Phys. Rev. Lett., in print]. Several fundamental features are discussed, including the role of zonal flows for turbulence saturation, the resulting flux-gradient relationship and the co-existence of ITG modes with trapped ion modes in the saturated state. Similar studies will be presented for the stellarator experiment NCSX at PPPL with the aim to comprehend the effects of quasi-axisymmetric geometry on the properties - both linear and nonlinear - of various microinstabilities.

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