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**Comparing Turbulent Transport in Quasi-Helically Symmetric and Quasi-Axisymmetric Stellarators**[1] I.J. MCKINNEY, M.J. PUESCHEL, J.N. TALMADGE, D.T. ANDERSON, B.J. FABER, University of Wisconsin-Madison, Madison, Wisconsin, USA, H.E. MYNICK, Princeton Plasma Physics Laboratory, Princeton, New Jersey, USA — Stellarator optimization of turbulent transport requires designing a magnetic geometry unfavorable to excitation of microinstabilities and turbulence. This work focuses on a comprehensive comparison of two neoclassically optimized configurations, quasi-axisymmetry (NCSX) and quasi-helical symmetry (HSX), using a hierarchy of gyrokinetic models from adiabatic to kinetic electrons to fully electromagnetic physics. Linear simulations of the ion-temperature-gradient-driven mode with gyrokinetic code Gene reveal distinct differences between geometries. There are a significantly greater number of unstable eigenmodes in quasi-helical symmetry, with the long wavelength eigenmodes being more slab-like for quasi-helical symmetry as opposed to toroidal-like for quasi-axisymmetry. Additionally, each configuration has unique finite-$\beta$ and kinetic ballooning characteristics. Nonlinear simulations show key differences in transport levels and scaling between flux tubes in each geometry. These findings inform the next step: changing magnetic geometry to affect microturbulence.

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