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Geometric Considerations for Zonal Flow Activity in Stellarators as the Starting Point for Transport Modeling (PhD Oral-24)[1] CARLOS D. MORA MORENO, JOSEFINE H. E. PROLL, Eindhoven Univ of Tech, GABRIEL G. PLUNK, PAVLOS XANTHOPOULOS, Max-Planck IPP — Turbulent transport in fusion plasmas causes limited performance in present-day experiments. While turbulent fluctuations can possibly be suppressed by exploiting the freedom of stellarator magnetic fields, this task requires robust transport models to enable fast predictions, preferably based only on magnetic geometry. The current state-of-the-art models are built using extrapolations from linear physics. However, the nonlinear character of turbulence calls for the inclusion of the mechanisms responsible of turbulence saturation. With aims to develop a transport model that includes zonal flows as saturation mechanisms of ion-temperature-gradient (ITG) turbulence, we will present the characteristics of zonal flow levels in various geometries of Wendelstein 7-X, simulated using the gyrokinetic code GENE. The exponential decay of the linear response is found to be highly affected by the characteristic geodesic curvature lengthscale, opposite to what is seen in nonlinear simulations. Nonlinearly, the shape of the turbulent mode is increasingly modulated by the drift well, where we define a characteristic lengthscale. We then propose that both lengthscales can be directly related to zonal flow generation and decay, to set the basis for improved transport prediction

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