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Investigating the Dimits Shift using the Second-order Cumulant Expansion Statistical Closure[1] D.A. ST-ONGE, J.A. KROMMES, Princeton University — The Dimits shift is the nonlinear upshift of the critical temperature gradient that signals the onset of collisionless ion-temperature-gradient-driven turbulence.[2,3] This phenomenon is caused by the shearing away of turbulent streamers in the radial direction by poloidal zonal flows (ZFs). While the effect is witnessed in both gyrokinetic and gyrofluid simulations, there exists no analytical model that satisfactorily describes the mechanics through which it operates. In this work, a new model is developed by applying the second-order cumulant expansion closure to a simplified set of gyrofluid equations.[4] In particular, we calculate the threshold for the zonostrophic instability[5] of a two-field model, generalizing the work of Parker and Krommes[6] on the modified Hasegawa–Mima equation, and assess whether the Reynolds-stress-generated ZFs can be destabilized in the model, thus indicating a Dimits shift.

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