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Modern gyrokinetic description of residual zonal flows

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Zonal flows play an important role in regulating turbulence and transport in magnetically confined plasmas.[1] Residual zonal flow level in collisionless toroidal plasma has been shown to be one of key quantities which determines the turbulence level.[2] This presentation will focus on physical elucidation and explicit calculation of residual zonal flows with arbitrary radial wavelength[3] in the context of the modern gyrokinetic[4] and bounce-kinetic theory.[5] This approach allows us to identify not only the relation between the (neo) classical polarization shielding and the residual zonal flows, but also various disparate temporal scales involved in the problem. It has been also useful for applications to specific MFE problems including the isotopic dependence,[6] the effect of impurities[7] and the effect of resonant magnetic perturbations.[8] Expectations for burning plasmas will be discussed in the end.

References

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