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Turbulent momentum transport in tokamaks[1]

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Momentum transport has become an active area of research in tokamaks in recent years because velocity shear has been shown theoretically to regulate turbulence levels. Thus, predicting and controlling the rotation in tokamaks has become an attractive goal, even more so with the increasing experimental evidence of different spontaneous rotation regimes. This talk reviews the requirements that gyrokinetic simulations must satisfy in order to self-consistently provide the correct rotation profile. Special emphasis on the up-down symmetry of the gyrokinetic equations is made because it places stringent conditions on the required accuracy. Different approaches to gyrokinetic simulations (full f vs. delta f, global vs. local) are examined. Finally, the first fully self-consistent, first-principles model for spontaneous rotation is presented. To simplify this description we expand in the small ratio of the poloidal to toroidal magnetic field amplitudes. This reduced model is now implemented in a local delta f gyrokinetic code, from which preliminary results will be presented.

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