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Radial transfer effects for poloidal rotation KLAUS HALLATSCHEK, IPP-Garching — Radial transfer of energy or momentum is the principal agent responsible for radial structures of Geodesic Acoustic Modes (GAMs) or stationary Zonal Flows (ZF) generated by the turbulence. For the GAM, following a physical approach, it is possible to find useful expressions for the individual components of the Poynting flux or radial group velocity allowing predictions where a mathematical full analysis is unfeasible. Striking differences between up-down symmetric flux surfaces and asymmetric ones have been found. For divertor geometries, e.g., the direction of the propagation depends on the sign of the ion grad-B drift with respect to the X-point, reminiscent of a sensitive determinant of the H-mode threshold. In nonlocal turbulence computations it becomes obvious that the linear energy transfer terms can be completely overwhelmed by the action of the turbulence. In contrast, stationary ZFs are governed by the turbulent radial transfer of momentum. For sufficiently large systems, the Reynolds stress becomes a deterministic functional of the flows, which can be empirically determined from the stress response in computational turbulence studies. The functional allows predictions even on flow/turbulence states not readily obtainable from small amplitude noise, such as certain transport bifurcations or meta-stable states.

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