Resonant Modes in Drift Wave Transport

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For large aspect ratio tokamaks, the particle transport driven by drift waves at the plasma edge is investigated by a drift-kinetic model that describes the guiding-center motion. We assume a fluctuating potential as a function of the spatial and time modes. Chaotic trajectories are calculated by integrating canonical equations of motion for the flow formed by the equilibrium sheared flow and resonant modes. This model allows investigating the particle transport dependence upon monotonic and non-monotonic radial electric fields. Our analysis is based on numerical procedures used in chaos theory to describe the chaotic orbits, such as Poincaré maps for particle drift trajectories. The standard deviation for particle position has been calculated for these equilibrium fields. We observed that the chaotic transport at the plasma edge can be reduced by properly modifying the electric and magnetic shears profiles. For non-monotonic radial electric field, the model leads to a non twist transport barriers with shearless invariants, which is indentified by extremum values of rotation number profiles of the invariant curves. These barriers at the electric shearless position are displaced due to the magnetic shear. We have also considered the transport modifications introduced by secondary resonant modes.

[1] W. Horton, et. al., *Phys. Plasmas:* **5**, 3910 (1998)
[2] F.A. Marcus, et. al., *Nucl. Fusion:* **48**, 024018 (2008)
[3] K.C. Rosalem, et. al., *Nucl. Fusion:* "Influence of the electric and magnetic shears on tokamak transport" (Accepted for publication in March 2014)