

## **The Coriolis drift pinch**

A.G. Peeters, University of Warwick (UK)

This talk will discuss recent advances in our understanding of toroidal momentum transport in tokamak plasmas. Toroidal rotation is of interest since a sheared rotation can stabilize turbulent transport. A finite toroidal rotation can furthermore stabilize the resistive wall mode, and recent experiments suggest that the toroidal rotation could lower the L-H mode transition. In many experiments the rotation is generated by the torque on the plasma due to the neutral beam heating. Since this torque is necessarily small in a reactor experiment like ITER, it has long been assumed that the toroidal rotation in ITER will be negligible. Recent experiments however have revealed that a rotation can exist even in the absence of a torque. This spontaneous plasma spin up can only be explained through a momentum flux up the (rotation) gradient.

The talk describes the theoretical developments in this area. The gyro-kinetic framework is used to describe the turbulent transport. This theory is then formulated in the frame that rotates with the plasma. The equations largely have the same structure when compared with the non-rotating case. The only difference being a new drift term which can be interpreted as the drift generated by the Coriolis force. This drift is, unlike the other drifts, proportional to the parallel velocity and therefore couples the density and temperature perturbations to the parallel velocity perturbation. The turbulence driven by the temperature gradient generates parallel velocity perturbations over this coupling and results in an inward pinch of toroidal momentum. The effect will be discussed on the basis of simplified analytic model equations as well as through state of the art nonlinear gyro-kinetic simulations.