Extended neoclassical rotation theory for tokamaks and neoclassical predictions of transport and poloidal asymmetries

C. Bae\textsuperscript{1}, W. M. Stacey\textsuperscript{2}, S. G. Lee\textsuperscript{1}, L. Terzolo\textsuperscript{1}

\textsuperscript{1}National Fusion Research Institute, Daejeon, South Korea
\textsuperscript{2}Fusion Research Center, Georgia Institute of Technology, Atlanta, U.S.A.

The extended neoclassical theory formulated with the Miller flux surface geometry[1] presents a formalism to neoclassically predict plasma rotation velocities and the associated transports. Accounting for the poloidal asymmetries in density, velocities, and electrostatic potentials along the flux surfaces in the formalism, it allows numerical calculations of inertial (Reynold’s stress) and gyroviscous transports, which are believed to cancel each other (known as gyroviscous cancellation) in other theories, and enables predictions of the poloidal asymmetries as well. Recent calculations in the KSTAR[2] NBI H-mode discharges show that the inertial and gyroviscous transport frequencies, as strong functions of the poloidal asymmetries, are calculated to be non-negligible with no cancellation of each other and the predicted carbon velocities and the density asymmetries are shown to correspond well with the reported measurements in tokamaks.

References:
