Kinetic modelling of parallel transport in the tokamak scrape-off layer

Dominic Power, Imperial College London

Transport parallel to the magnetic field lines dominates over cross-field transport in the tokamak scrape-off layer. Experimental evidence and theoretical considerations suggest that a fluid approach to modelling this transport may miss some important behaviour. In particular, temperatures at the target may be modified by nonlocal heat flow, and plasma-impurity reaction rates may be influenced by strongly non-Maxwellian electron distributions. Both of these effects are closely related to detachment onset. Here, an approach to kinetic modelling of parallel transport using the code SOL-KiT will be presented, which features a three species model (electrons, ions and hydrogenic neutral atoms) in which the electrons may be treated kinetically or as a fluid. Some early work on impurity transport will also be presented, highlighting differences between Maxwellian-averaged plasma-impurity reaction rates and rates obtained directly from the electron velocity distribution from SOL-KiT.