Quasi-Linear transport model EDWM: Update and benchmarking

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In this poster we present the latest updates to EDWM [1] and benchmark it against other Quasi-Linear models such as TGLF and QLK for discharges at JET. EDWM is a quasi-linear fluid model which can handle an arbitrary number of ions in arbitrary many charge states [2] and several improvements have been made. Firstly, a new filter which describes the electrostatic potential wave number spectrum has been developed which has significant impact on the fluxes. An updated mixing length assumption has been developed which includes all the spectral dependence in a filter $f(k_y)$ combined with a saturation level at a correlation scale, k_a: $e\phi/T_e = f(k_y)\gamma_{lin,a}/k_a k_a \rho_s c_s$. Here k_y is the wavenumber in the polodial direction, ρ_s and c_s are the sound speed and wave length. To have the correct spectral dependence is especially important for the particle channel, as the major part of the outward diffusion and inward pinch might be located at different spectral scales. Hence, an erroneous filter might quench one and not the other, leading to an incorrect flux. Zonal flows have previously been shown to play a major role for the turbulent transport saturation [3] and its effect are included in the filter. This spectral dependence is verified against non-linear simulations with the gyrokinetic code GENE [4]. Secondly, EDWMs' response to the safety factor has been improved by comparing with safety factor scans done with the gyrokinetic code GYRO [5]. Results show that a stronger response for EDWM is needed which will lead to a larger transport in the outer regions of the plasma. Lastly, a new flux normalization has been performed to accommodate the new features of EDWM by comparing with the fluxes from experiments at JET and GENE simulations. This includes an updated fraction between the ion and electron heat transport.

References

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