Predictions of the divertor heat-flux width on ITER is a critical issue which has major implications for design and operation. Simulations with the edge gyrokinetic turbulence code XGC1 predicted an ITER heat-flux width ~10x larger than the expected value based on scalings from current experimental devices [1] (Eich scaling [2]). A plausible explanation for this was given that due to weaker ExB shearing layer (driven by device size), the turbulence correlation length is larger on ITER, and leads to turbulence spreading of the scrape-off layer heat flux [1].

In this work, we seek to further understand the turbulence and transport from the gyrokinetic perspective, including these XGC1 simulations of ITER. For current devices, by comparing XGC distribution functions to a reduced gyrofluid equation, it was shown that the drifts play an important role in parallel momentum balance [3]. This work will be extended to a gyrofluid-like energy conservation equation, to interpret from the XGC results how terms like the radial heat flux vary across the scrape-off layer, past the X-point and down into the divertor. Detailed turbulence characteristics will be shown between XGC1 simulations of ITER full-current (15 MA) and ITER lower-current discharges, showing the increase in turbulence correlation length, and change in cross-phase. These results will combine to give a better picture and basis for the mechanisms driving the increases divertor heat-flux width in the XGC1 simulations of the full-current ITER simulations.

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