Crucial Role of Zonal Flows and EM Effects in ITER Turbulence Simulations Near Threshold [Candy TH/P2-7]

ITER and reactor core turbulence is **challenging** to simulate gyrokinetically

- Extensive **GYRO** low-k simulations
- Turbulence is **weak**, closer to stability threshold than DIII-D plasmas
- Energy fluxes often **bursty** or can collapse (see green shaded region)
- Nonlinear **zonal-flow** physics important, exhibiting **Dimits-shift** phenomenon
- Introduce new reactor **benchmark** cases to **recalibrate TGLF** for this regime
- ITER fusion power increases **40%** with modified TGLF
- **Multiscale** simulations ultimately required (see Holland IAEA talk).

Turbulent energy flux

$i_1 : 0.123$
$i_2 : 0.11$
$e : 0.037$

Q/Q_{GB} (total.)

$(c_s/a)t$

Fluctuation Intensity

$n = 0$
$n > 0$

$\langle e\phi/T_i \rangle / \rho_*$

$(c_s/a)t$

GENERAL ATOMICS