Gyrokinetic simulations and analysis of pedestals

- **The modes causing transport in experimental pedestals are identified by the *ratios of effective diffusivities in different channels* (e.g. D_e/χ_e, χ_i/χ_e, $D_{impurity}/\chi_e$)**
- **Diverse experimental observations of transport in the various channels form a mutually reinforcing pattern: the dominant energy losses are from Micro-Tearing Modes and/or Electron Temperature Gradient (ETG) modes, but not MHD-like modes (Kinetic Ballooning Modes)**
  - Observations in many different channels considered: T_i, n_e and $n_{impurity}$
  - Density pump-out from RMPs, surprising, fits into and reinforces the picture
  - KBM possibly important to density transport, might enforce marginal stability via that channel
- **Many magnetic fluctuation observations can be identified as being MTM (not MHD-like)**
- **Extensive simulations of two DIII-D pedestals strongly reinforces the picture**
- **Comparisons of simulated ExB shear suppression of turbulent transport in pedestals to analytic theory of Zhang and Mahajan finds excellent agreement**
  - The making of first principles based criterion for whether modes are suppressed or not
  - Conventional pedestals at burning plasmas ρ^*: velocity shear may not suppress ITG/TEM
- **Regimes of greatly reduced ITG/TEM instability uncovered in a Simplified Kinetic Model (SKIM), and verified by simulations**
  - An specific combination of geometric effects and profiles leads to the regime
  - Low pedestal transport with low shear appears possible
  - Optimized core transport regimes also indicated

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