Discussion on session C: Mode competition in turbulence and MHD driven by energetic particle

This working group discusses the mode competition of turbulence and coupling between turbulence and zonal flow and mode coupling to the MHD. We need expansion of the research field after the finding the turbulence suppression by zonal flow. This working group also covers the coupling to MHD mode driven by energetic particle. The effect of competition of turbulence on transport barrier is included in this working group.

- Session from this year: identify relevant problems
- Discuss relevant confinement issues
- Further research topics: Turb., (x,v), competition

Confinement issues related to mode competition

- Access to improved confinement

  -> mode competition seems essential

  Turb., GAM/ZF, WCM, EHO, … effect on each transport channel?

  difference?

- Up-Down asymmetry?

- Confinement scaling: Isotope?

  Single mode description inadequate

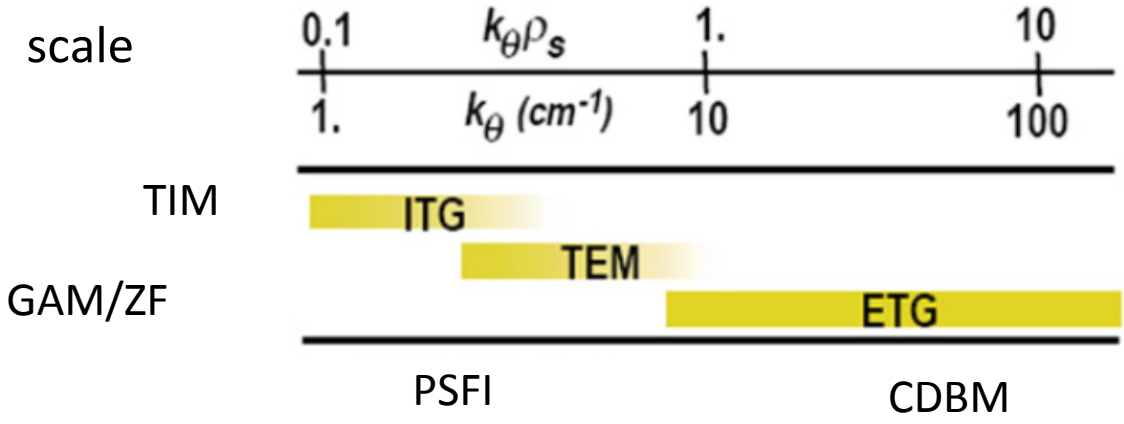
- Burning plasmas?

  Qualitative difference?

  MHD <–> turbulence, relevant issues?

Turbulence, modes

- Mode -> fluctuation, multi-scale nature (well-known, extensively studied)



NF (2007)

- Identification by experiments?

Electron scale: linear/ST doable. In conventional tokamaks?

Ion scale: ITG: localization in bad curvature? $\tilde{T}_i$?

Meso/Macro: streamer, avalanche, global mode, ….

Drive in velocity space

- Drive in velocity space $\nabla_v f$

  EP modes, AE, EGAM…

- Distribution function measurable

  Identification of direct link to instability drive? How?

  Fluctuation?

- Relevant secondary modes

  GAM, ZF Reynolds/Maxwell competition?

  What of zonal field? $(\tilde{f}, \tilde{f}, \tilde{B}_\theta)$

Mode competition: primary v.s. secondary

- Nonlinear growth of linearly stable modes

  -> Relevant 'Secondary': GAM/ZF, streamer, …

- GAM/ZF competition:

  Difference in drive? damping?

- Non-resonant modes and ITB formation?

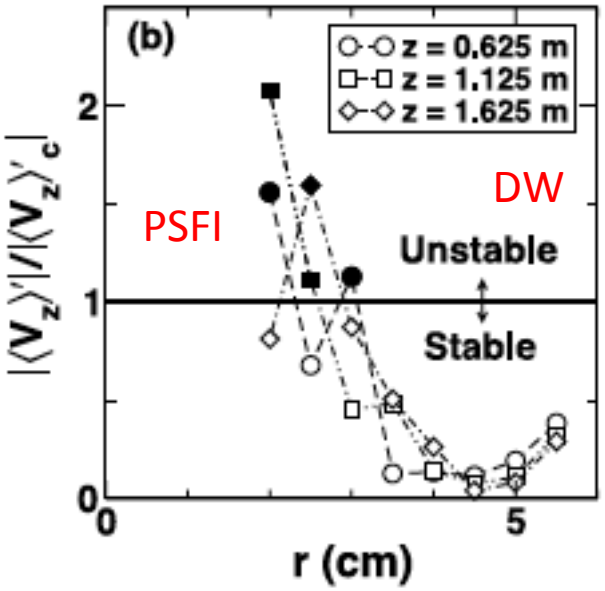
- Avalanches? How characterize?

Mode competition: spatial competition

- Spatial competition

  -> 1D measurement essential

  Transport channel may vary spatially



- ITG/TEM competition

  on-axis ECH + H-mode, Ohmic

  Core TEM, Edge residual ITG? Impact on rotation?

- Staircase: avalanches v.s. shear layers

  Observation?

Miscelaneous

- ‘Mode’?

  Tongues, blobs, ...