Investigation of ELMs on Alcator C-Mod


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Motivation and Introduction
- Understanding ELMs is of crucial importance both because they cause the pedestal pressure gradient and because of dilation they pose to the first wall and divertor.
- L-mode diverters are known to suffer from Type-I ELMs and therefore coronal-type core plasma conditions in L-mode are not easily achieved since Type-I ELMs are present.

- Recently, a new region of operational space has been accessed where divertor, relatively large ELMs are observed.
- The present work results of investigations of these ELMs:
  - D-mode, extended H-mode (HITER98(y,2) >1)
  - Steady EDA, small ELMs with lower pedestal
  - precursor oscillation
  - transport properties, see M. Greenwald

Core Plasma Characteristics
- 

ELM Dynamics
- 

ELM Pedestal Energetics
- 

Pedestal Stability Analysis using MHD codes

- ELITE (ideal MHD) and M3D (extended MHD)
- Magnetic reconnection may be occurring in ejection process

Summary and Conclusions
- Deconvolution, relatively large ELMs occur repetitively in the non-nanoclass C-mode ($q_{95} \approx 2.75$)
- Rapid mode growth precedes rapid mode growth, localized in outboard pedestal, radial slab structure.
- Note that magnetic reconnection may be occurring in ejection process
- ELITE MHD stability code shows closeness of pedestal profiles to peeling/ballooning instability boundary
- For higher gradient pedestal, modes with $n=0$ are unstable and peeling/ballooning balancing with weaker peeling component

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ELM Evolution Paradigm - Summary

- Rapid mode growth precedes magnetic reconnection
- Sheet of high density (10^20 m^-3) generated due to rapid mode growth
- Rapid mode growth is associated with rapid mode growth, localized in outboard pedestal, radial slab structure.
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Evidence for ELM control
- Neoclassical transport reductions
- Enhanced pedestal heat, particle transport
- ELMs on Alcator C-Mod, M3D: (extended MHD)
- Low-$\ell$ modes are less sensitive to MHD, with toroidal flux perturbation
- However, inboard edge is affected by ELMs, but no filaments are observed in inboard 필터.

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