

Astrophysical and Magnetically Confined Plasmas are driven, dissipating, out of equilibrium...

- *Finite range ‘turbulence’, anomalous ‘bursty’ transport and diffusion*
- *Non-linear processes on multiple scales, cross-scale coupling*
- *Correlated extremes, coherent structure formation*
- *Emergence- transitions from disorder to ordered flows*

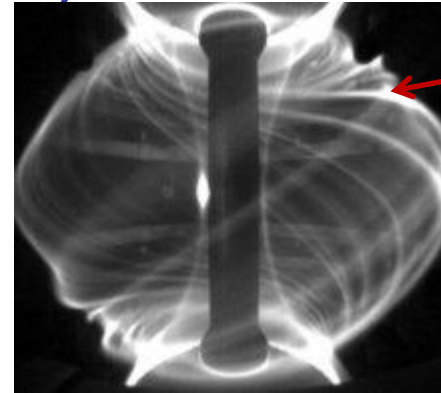
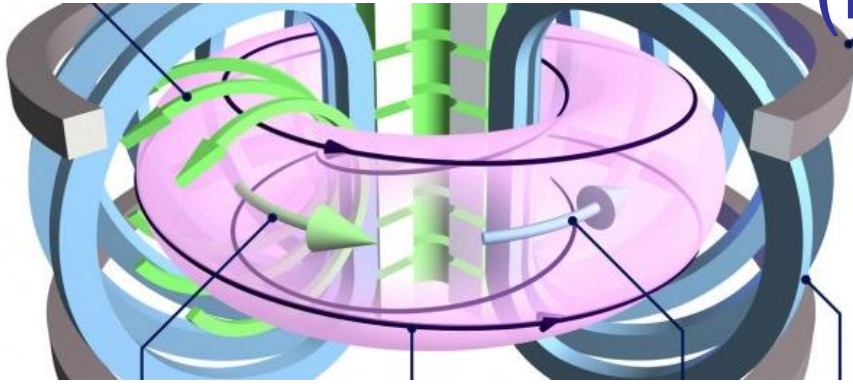
Centre for Fusion, Space and Astrophysics, Warwick

Key staff for Network+ are Chapman (centre director), Hnat, McMillan

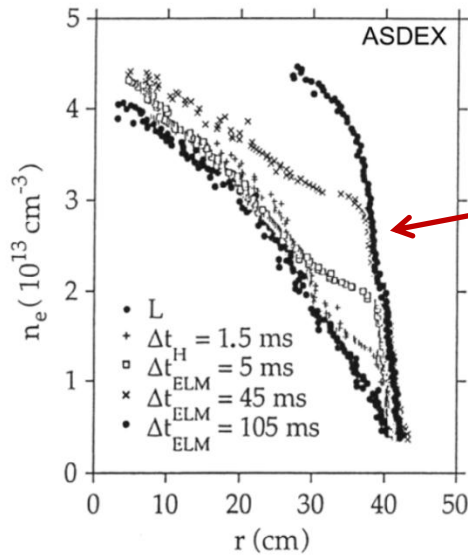
- Space and astrophysical plasmas at Warwick in 1995, CFSA in 2006
- 7 full time academics (+2 p.t/em); 1AF, 1 Warwick Global Fellow, 10 PDRAs, 31 PhDs
- Side-by side research themes in plasma astrophysics (STFC Rolling Grant, EU Networks..) and both MCF and ICF (EPSRC S&I, ‘responsive mode’..)
- Side-by-side methodology- theory, HPC (plasma codes on all scales, fluid to kinetic, unique in UK), data analysis, with nonlinear/complex systems emphasis. Close coupling to Complexity and Centre for Scientific Computing. Interdisciplinary built-in.
- Collaborations with the experimental programme at Culham, and international fusion research programme more widely.
- Participants (Co-Is, guest investigators, science team members) in current and future missions for solar and space plasma observatories.

Emergence in magnetic confinement for fusion

(MCF)



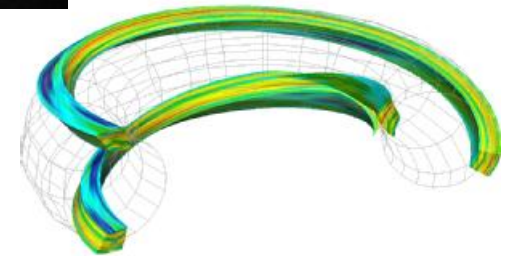
Edge Localized Modes (ELMs) accompany H-mode



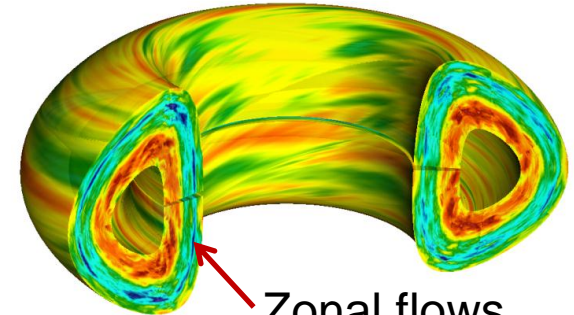
Transport/energy release is 'bursty'

'H- mode: steepened density profile and reduced transport'

ENHANCED CONFINEMENT



Gyrokinetics at Warwick (GKW) an outcome of our S&I



Zonal flows

Discovered 30 yrs ago, seen since in all MCF devices