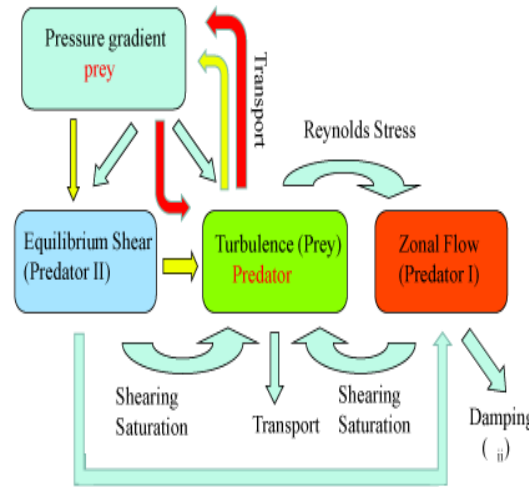# LCOs in L-I-H transitions and physics model
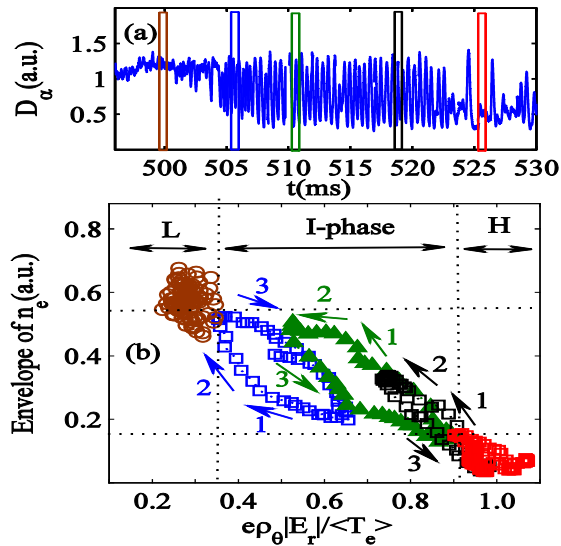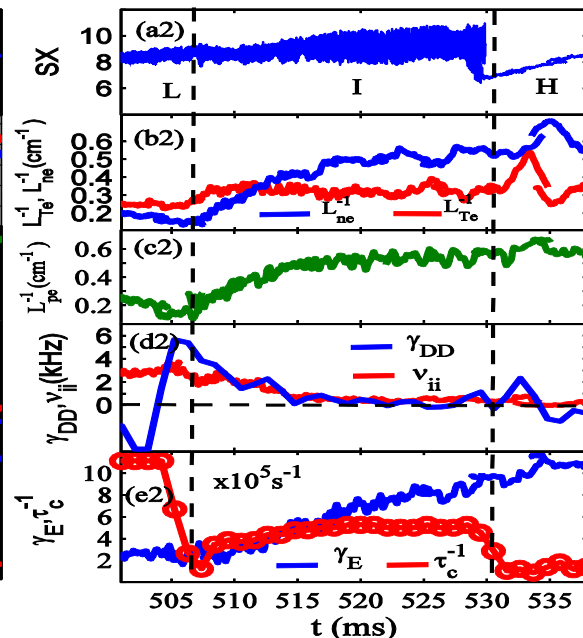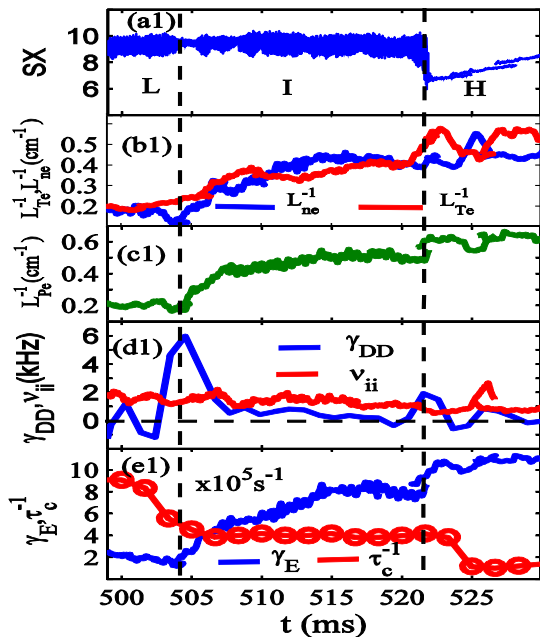
(Left) The evolution of Dα emission (a) and the Lissajous diagram in the phase space of $e\rho_\theta |E_r|/T_e$ and envelope of density fluctuations (b).

(Right) Sketch of the three plausible loops for the two types of LCOs and I-H transition.

The time evolutions of soft X-ray (a), inverses of the scale lengths of gradients of electron temperature $1/L_{te}$ and density $1/L_{ne}$ (b), and pressure $1/L_{Pe}$ (c), the ion-ion collision frequency ν_{ii}, growth rate of the diamagnetic drift flow γ_{DD} (d), the $E \times B$ flow shearing rate $\gamma_{E \times B}$ and the decorrelation rate of the turbulence $1/\tau_c$ (e) for two shots.

Figure (a): D_α (a.u.) vs t(ms)

Figure (b): Envelope of n_e (a.u.) vs $e\rho_\theta|E_r|/\langle T_e \rangle$; L, I-phase, H

Block diagram: Pressure gradient prey — Transport — Reynolds Stress; Equilibrium Shear (Predator II), Turbulence (Prey) Predator, Zonal Flow (Predator I); Shearing Saturation, Transport, Shearing Saturation, Damping (ν_{ii})

(a1) SX; L, I, H
(b1) L_{ne}^{-1}, L_{Te}^{-1} (cm^{-1}); L_{ne}^{-1}, L_{Te}^{-1}
(c1) L_{Pe}^{-1} (cm^{-1})
(d1) γ_{DD}, ν_{ii} (kHz); γ_{DD}, ν_{ii}
(e1) γ_E, τ_c^{-1}; x10^{5}s^{-1}; γ_E, τ_c^{-1}
t (ms)

(a2) SX; L, I, H
(b2) L_{ne}^{-1}, L_{Te}^{-1} (cm^{-1}); L_{ne}^{-1}, L_{Te}^{-1}
(c2) L_{Pe}^{-1} (cm^{-1})
(d2) γ_{DD}, ν_{ii} (kHz); γ_{DD}, ν_{ii}
(e2) γ_E, τ_c^{-1}; x10^{5}s^{-1}; γ_E, τ_c^{-1}
t (ms)