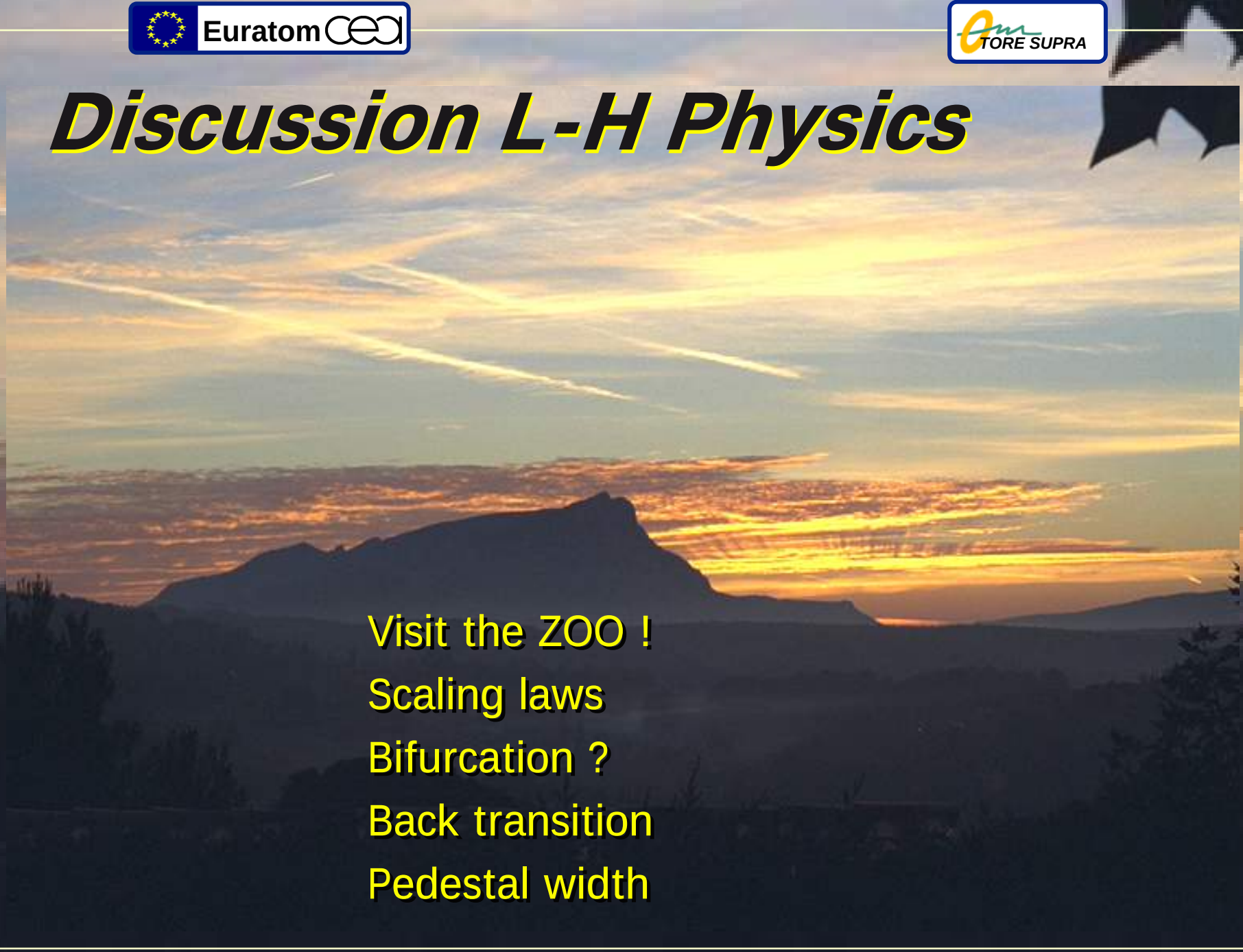
Discussion L-H Physics



Visit the ZOO !

Scaling laws

Bifurcation ?

Back transition

Pedestal width

What is in our ZOO ?

What are H-modes ?

density rises (uncontrolled) & Dα is reduced

they ELM

L/H is a bifurcation

$\exists$ Power threshold (control parameter)

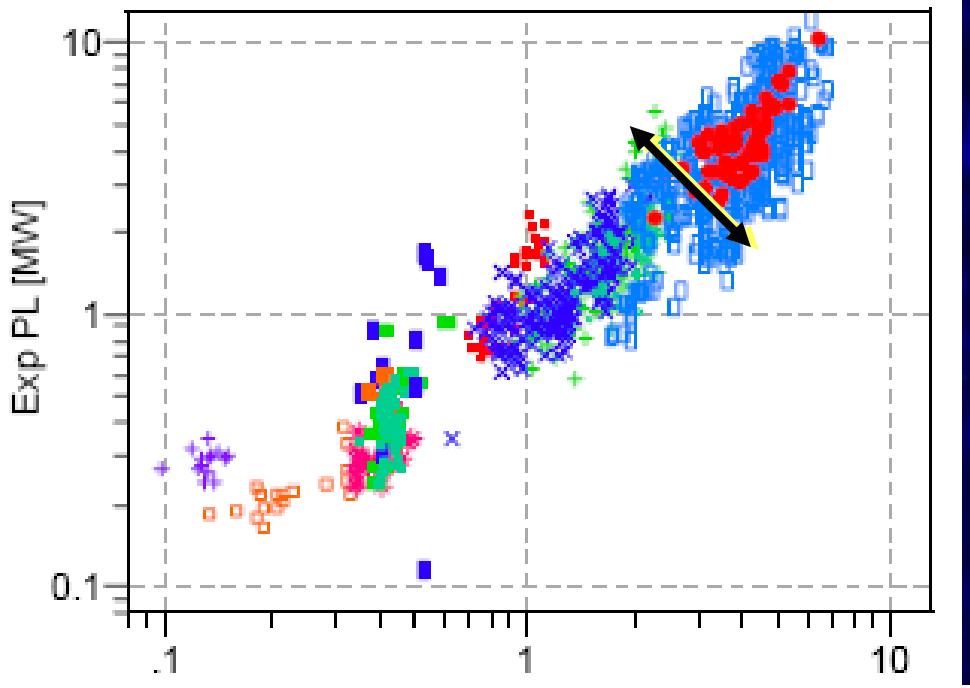
$\exists$ confinement = scaling law

self consistent !

Anything that bifurcates to an ELMing state !

- $\exists \infty$ of control parameters
- geometry : δ, κ, ∇B toward/away X point, Xpoint, high shear
- purity (wall conditionning, hence closed divertor + Be)
- divertor strike point (vertical plates)
- flows (SOL & core) and currents
- density and magnetic field
- 6 ELM types !

Scaling laws



$$P_{thresh} = 3.44 \bullet n_e^{0.47} \bullet B_\varphi^{0.65} \bullet a^{1.37} \bullet R^{0.26}$$

$$P_{thresh} = 0.042 \bullet n_e^{0.67} \bullet B_\varphi^{0.77} \bullet S^{0.97}$$

dimensionless parameters ?

dimensionaly correct

$P \propto \rho^{*2.1}\, \beta^{-0.04}\, \nu^{*0.5}\, B^{2.7}$

$(B^{2.8}$!)

scatter !

monomial ?

to what ?

Priority beast

ITER geometry

ITER H-mode confinement = 2 * P_{LH}

hence closed divertor + Be)

Tame the beast

scaling, back-transition,

pedestal width, pedestal gradient

Feed the beast

neutral source and flows

impurity accumulation

Boundary Layer

SOL heat source

ETB = turbulent electrons with $T_e < T_i$

neoclassical ions

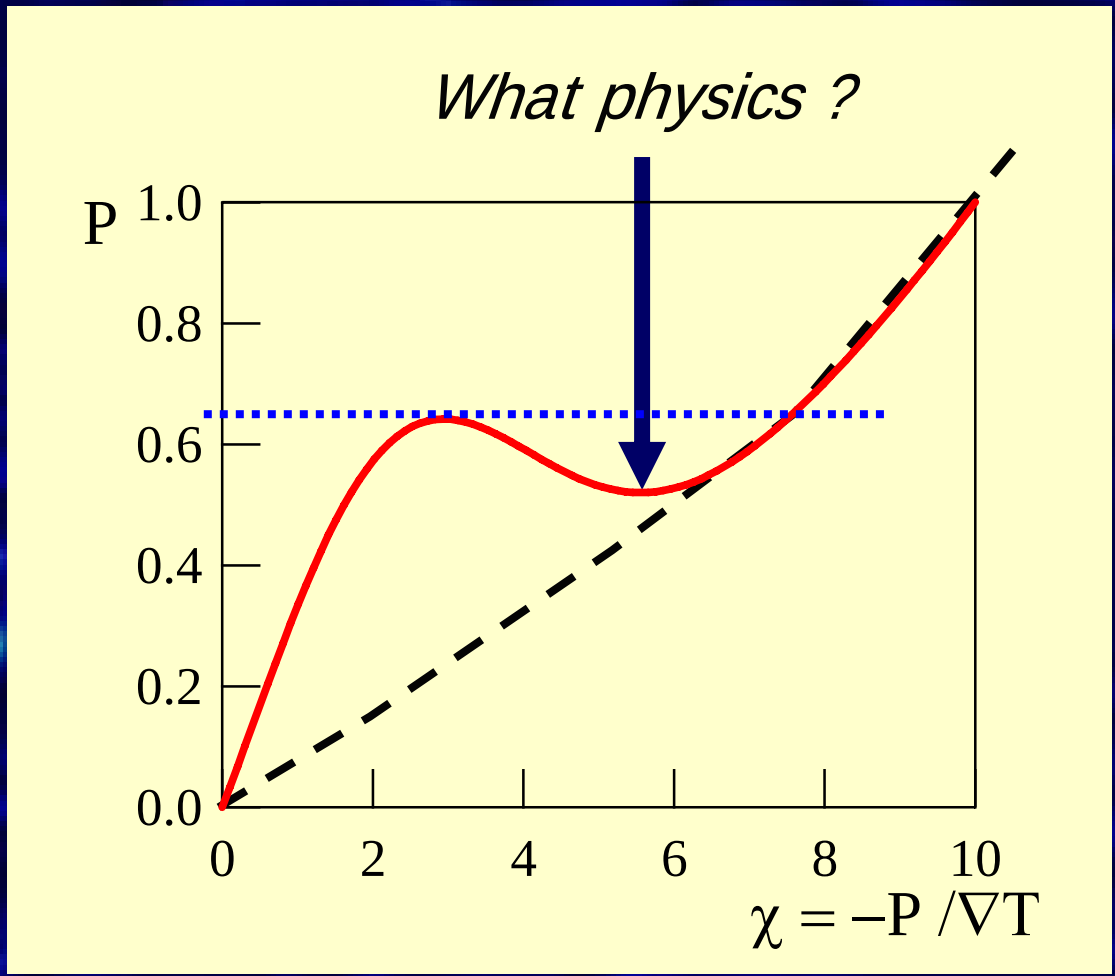
$P^e_{SOL} \approx 0$, $P^i_{SOL} = P_{sep}$?

Pedestal geometry

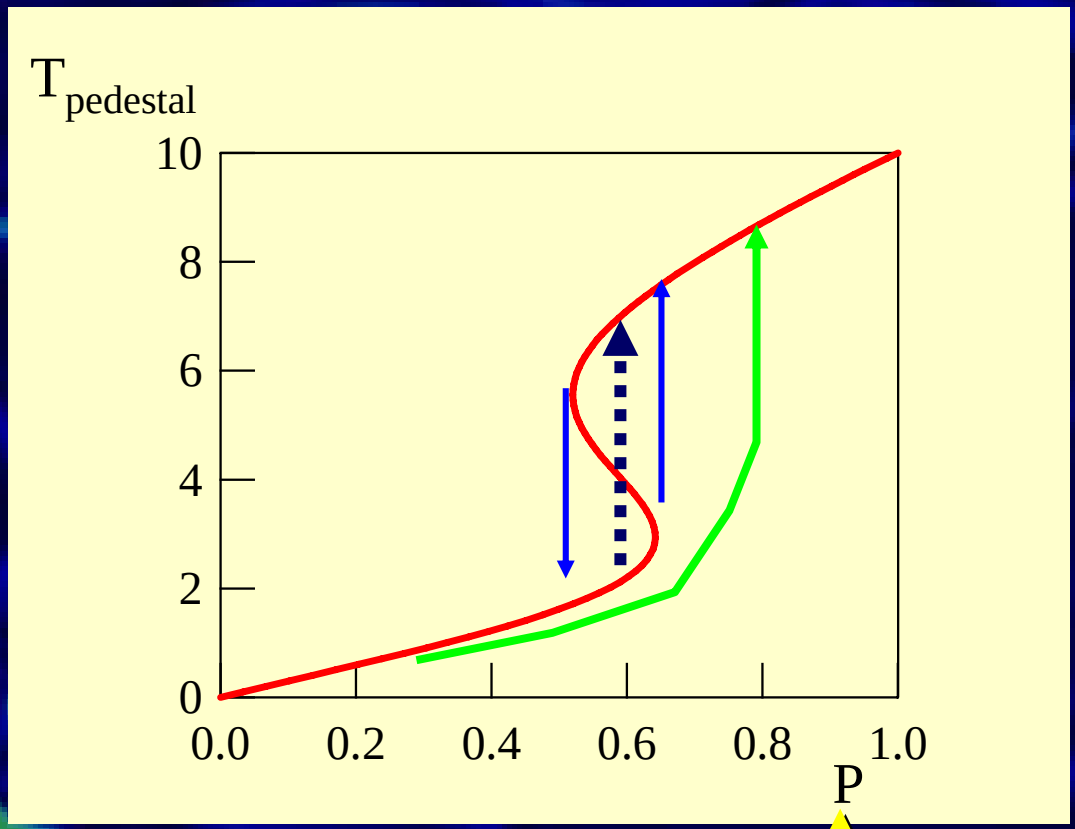
minimum model : 2D (Xpoint flows) ?

3D (turbulence)

Theory & pedestal physics



TRANSITION



Back transition :

Itoh ?

Diamond ?

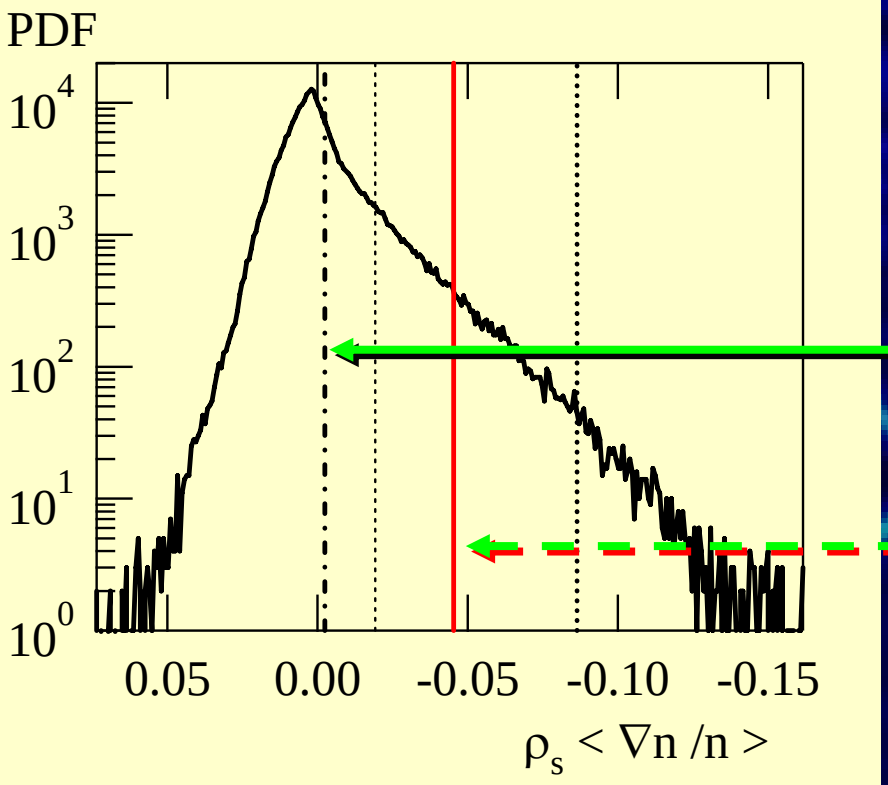
Standard

adiabatic /cycle

Control parameter = controlled (≥3D phase portrait)

appropriate control parameters

mean values / PDFs



In NL regime

most of data = linearly stable

> 2.55 r.m.s. = unstable

Finally, what are the questions ?