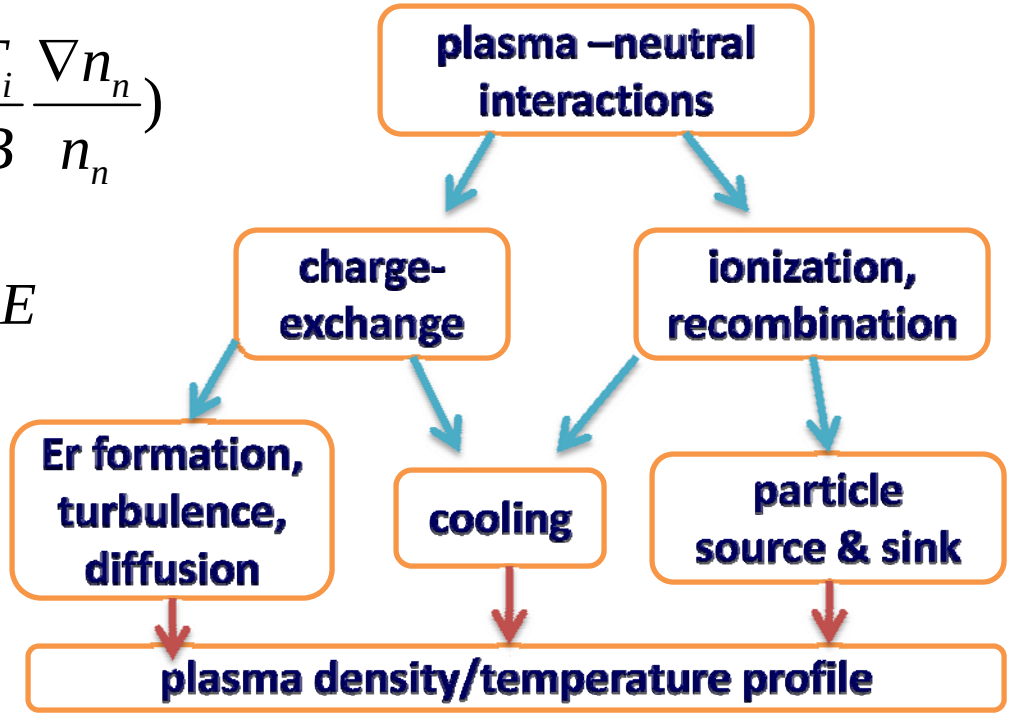
Simulation Study of Turbulence and Transport by Gyro-Center Shift Theory

$$J_r^{GCS} = en_i \frac{r_{Li}}{\lambda_{i-n}} \left(\frac{E}{B} - \frac{1}{eB} \frac{\nabla P_i}{n_i} + \frac{kT_i}{eB} \frac{\nabla n_n}{n_n} \right)$$

$$\mathrm{Re} = \frac{4}{\pi} \eta^2 \frac{\varepsilon_0 B}{m_i n_i (\sigma_{i-n} n_n)^2 \upsilon_i} \nabla^2 E$$

$$D = \frac{2}{\pi} \eta^2 \frac{kT_e}{eB}$$

[K.C. Lee, PPCF 2009]



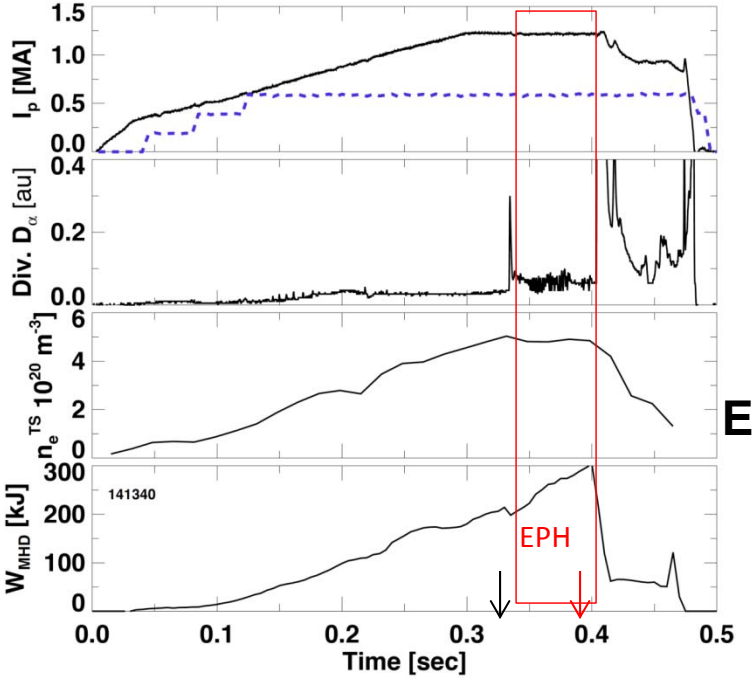
step-I . 1-D edge localized code development (steady state; L or H-mode)
combine with existing codes; TRANSP, DEGAS2, *etc*.
(for boundary conditions, neutral density, impurity *etc*.)

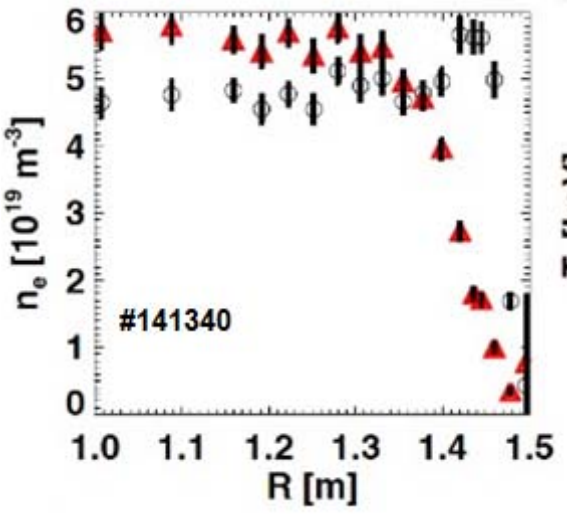
step-II. 2-D extended code development (transient; L-H transition)

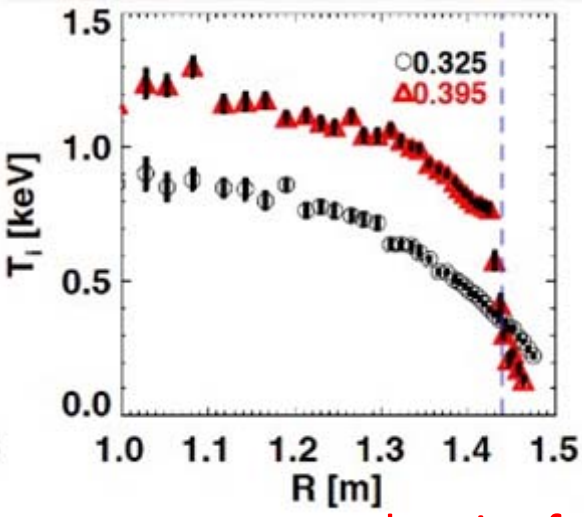
► EP(enhanced pedestal) H-mode transition on NSTX

$$\mathrm{Re} = \frac{4}{\pi}\eta^2 \frac{\varepsilon_0 B}{m_i n_i (\sigma_{i-n} n_n)^2 \upsilon_i} \nabla^2 E$$

EPH-mode with lower n_n : lower fueling & cooling
→ lower density & higher temperature



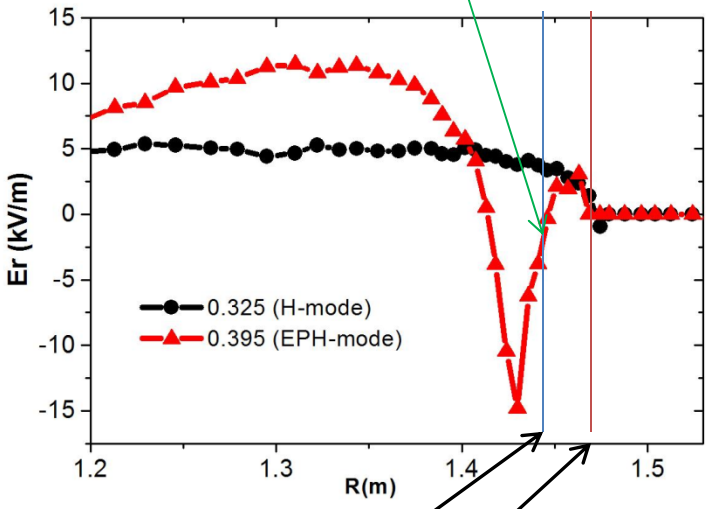




[R. Maingi, et al., PRL 2010]

inflection point

from CHERS



transport barrier for EPH-mode

transport barrier for early H-mode

K.C. Lee, Feb 14 2012