Threshold Physics Makes an NTM Linearly Stable and Non-Linearly Unstable

$$\frac{\tau_R}{r^2}\frac{dw}{dt} = \Delta' + \varepsilon^{1/2}\frac{L_q}{L_p}\beta_p\left[\frac{w}{w^2 + w_d^2} - \frac{w_{pol}^2}{w^3}\right]$$

transport threshold

polarization threshold

- **Transport threshold (R. Fitzpatrick 1995)**
  - ★ **transport along $\vec{B}$ in island is fast compared to perpendicular**
    - – helical pressure perturbation washed out if perpendicular transport dominates

$$w_d \approx \left(\frac{L_s^2}{k_\theta^2}\frac{\chi_\perp}{\chi_\parallel}\right)^{1/4} \sim 1\ \text{cm}$$

- **Polarization threshold (H.R. Wilson et al., 1996)**
  - ★ **inertial effects are important in frame of E×B equilibrium flow**
    - – polarization currents induced by island propagation are stabilizing for $\omega(\omega_{*i} - \omega) > 0$

$$w_{pol} \approx (L_q/L_p)^{1/2}\varepsilon^{1/2}\,\rho_{\theta i} \sim 1\ \text{cm}$$