Energy transfer in ITG/KBM system

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1 model equation

$$\frac{dn}{dt} = a\frac{dn_{eq}}{dr} - n_{eq}\nabla_{\parallel} v + \nabla_{\parallel} j + \omega_d(n_{eq}\phi - p_e) + D_n\nabla_{\perp}^2 n \tag{1}$$

$$\frac{d\nabla_{\perp}^2\phi}{dt} = -aT_{eq}(\frac{1}{n}\frac{dn_{eq}}{dr} + \frac{1}{T_{eq}}\frac{dT_{eq}}{dr})\nabla_{\theta}\nabla_{\perp}^2\phi + \frac{1}{n_{eq}}\nabla_{\parallel} j - \omega_d(T_i + \frac{T_{eq}}{n_{eq}}n + \frac{p_e}{n_{eq}}) + D_U\nabla_{\perp}^4\phi \tag{2}$$

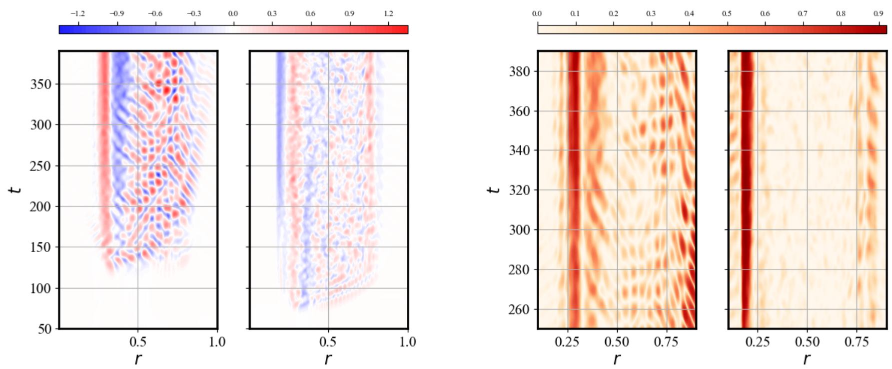
$$\frac{dv}{dt} = -\nabla_{\parallel} T_i - 2\frac{T_{eq}}{n_{eq}}\nabla_{\parallel} n - \beta a T_{eq}(\frac{2}{n_{eq}}\frac{dn_{eq}}{dr} + \frac{1}{T_{eq}}\frac{dT_{eq}}{dr})\nabla_{\theta} A + D_v\nabla_{\perp}^2 v \tag{3}$$

$$\beta\frac{\partial A}{\partial t} = -\nabla_{\parallel}\phi + \frac{T_{eq}}{n_{eq}}\nabla_{\parallel} n + \beta a T_{eq}\frac{1}{n_{eq}}\frac{dn_{eq}}{dr}\nabla_{\theta} A + \sqrt{\frac{\pi}{2}\frac{m_e}{m_i}}|\nabla_{\parallel}|(v - \frac{j}{n_{eq}}) - \eta j \tag{4}$$

$$\frac{dT_i}{dt} = \ldots \tag{5}$$

2 energy balance equation

3 zonal flow character



(a) (b)

Figure 1: (a)zonal flow as a function of radius and time,(b)$E_{k,ZF}/E_{k,all}$as a function of radius and time

4 energy drive of $E_{k,m=0,n=0}$ and $E_{p,m=1,n=0}$