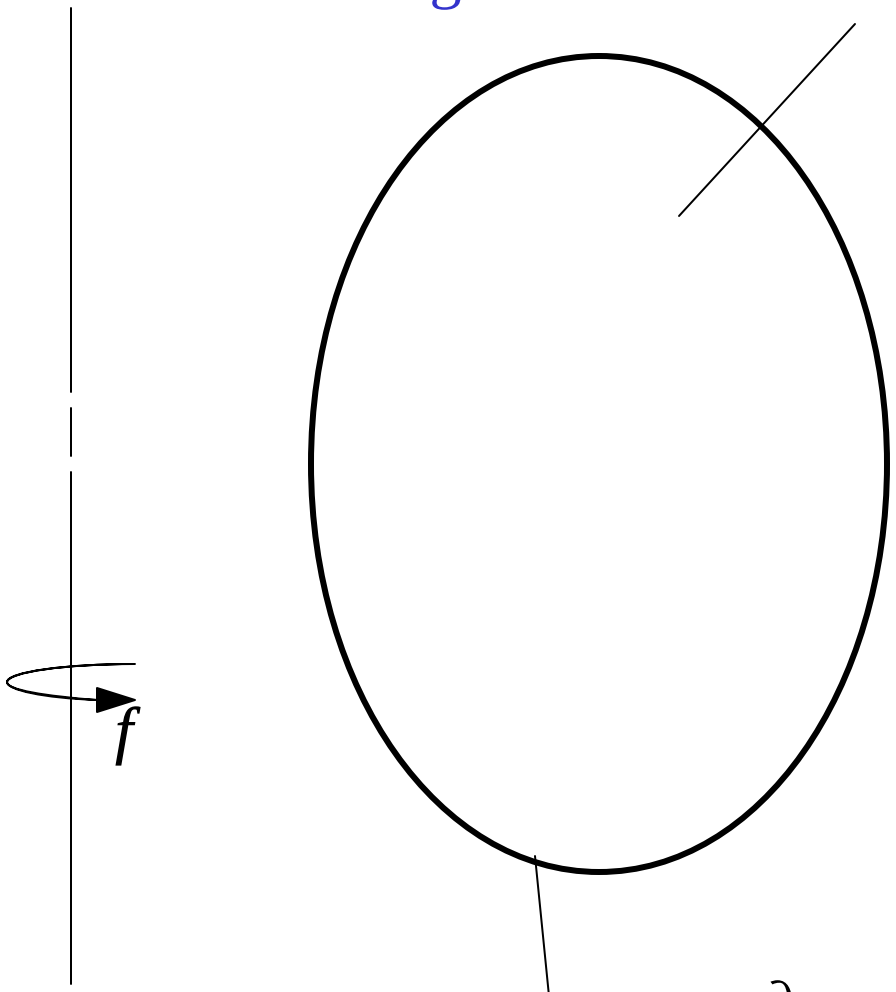
M3D Code now has thin shell and vacuum region



In plasma:

$$\vec{B} = \nabla y \times \nabla f + \frac{1}{R}\nabla_\perp F + I\nabla f$$

$$\nabla\cdot\frac{1}{R}\nabla_\perp F = -\frac{1}{R^2}\frac{\partial I}{\partial f}$$

$$\nabla_\perp \equiv \nabla - \nabla f\cdot\frac{\partial}{\partial f}$$

In vacuum:

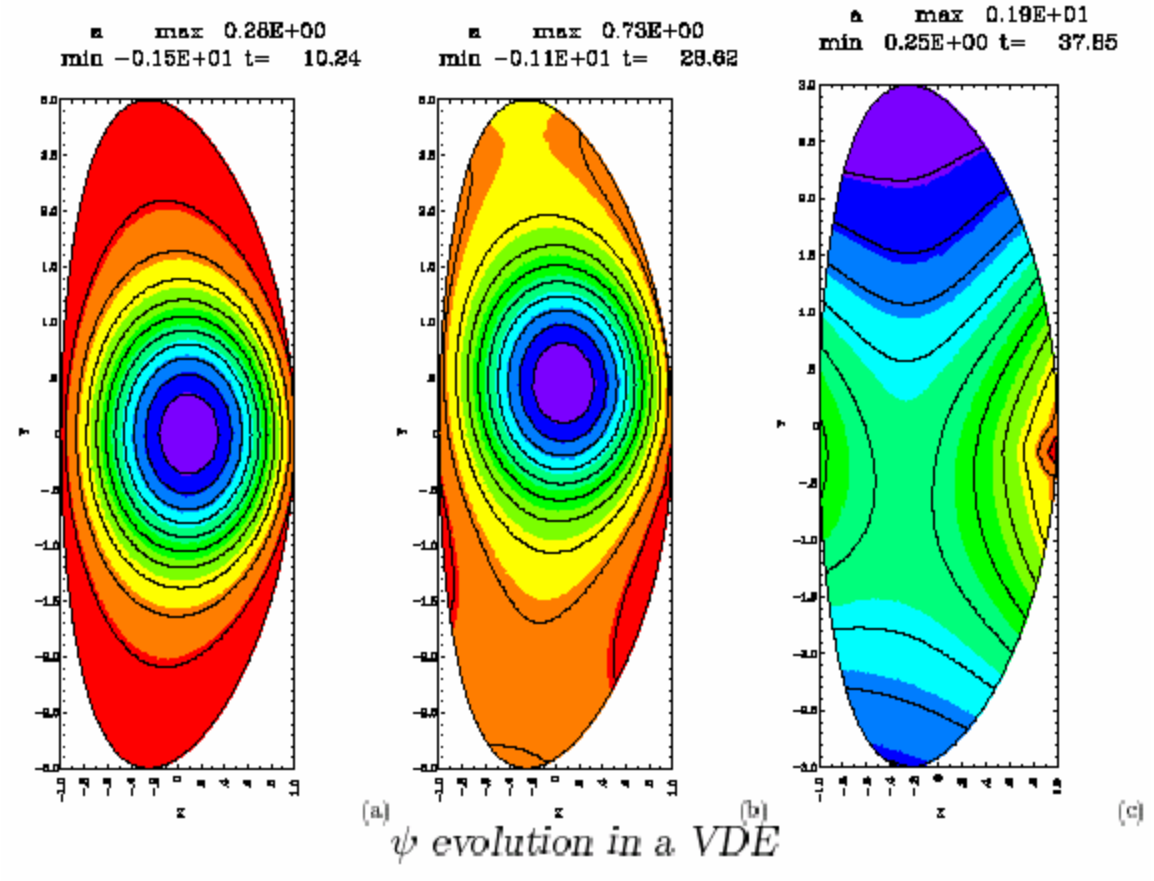
$$\vec{B}_V = \nabla y_V \times \nabla f + \nabla l + I_0\nabla f$$

$$\nabla\cdot\frac{1}{R^2}\nabla_\perp y_V = 0 \qquad \nabla^2 l = 0$$

$$\frac{\partial y_V}{\partial f} = 0$$

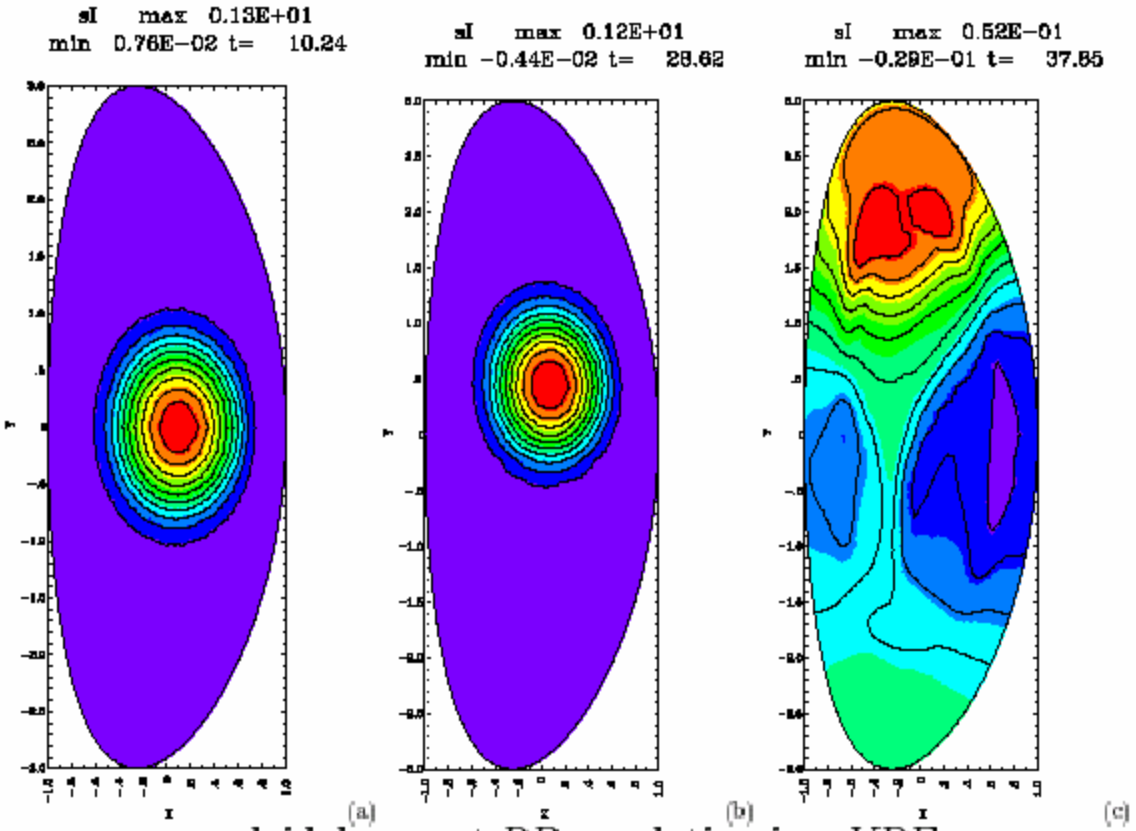
Thin Shell: $$\frac{\partial y}{\partial t} = \frac{h_W}{d}\left(\frac{\partial y_V}{\partial n} - R\frac{\partial l}{\partial \ell} - \frac{\partial y}{\partial n} + \frac{\partial F}{\partial \ell}\right)$$

Preliminary Results: 2D VDE Modeling with M3D



ψ evolution in a VDE

Preliminary Results: 2D VDE Modeling with M3D-2



poloidal current RB_ϕ evolution in a VDE