Modeling of Tumor Growth Undergoing Virotherapy
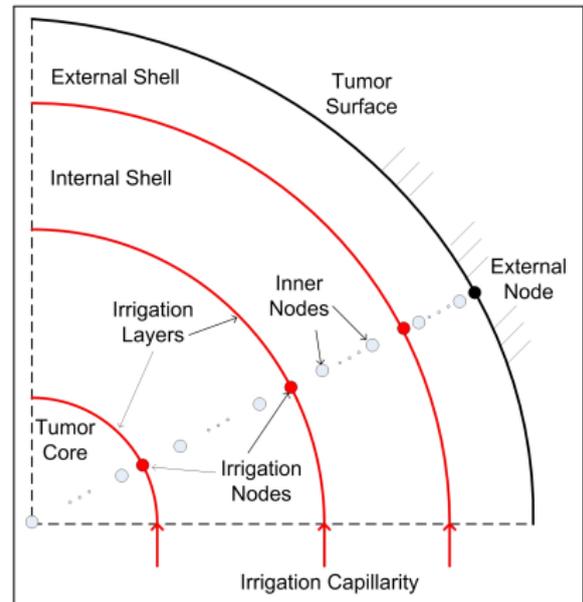
Ricardo Dunia

University of Texas at Austin
Chemical Engineering Department

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Motivation

- Current virotherapy models do not provide appropriate equilibrium conditions.

- Tumor vascularization is not being considered in current models.

- Need to established optimal virotherapy treatment applied at the body blood compartment.

Tumor Growth

- ▶ Tumor is considered in equilibrium (no growth) when $\frac{dR}{dt} = 0$
- ▶ Virotherapy treatment is limited by the immune suppression drug concentration in the blood.
- ▶ Therefore, virotherapy should be targeted to reach at least $\frac{dR}{dt} = 0$, case B in plot.
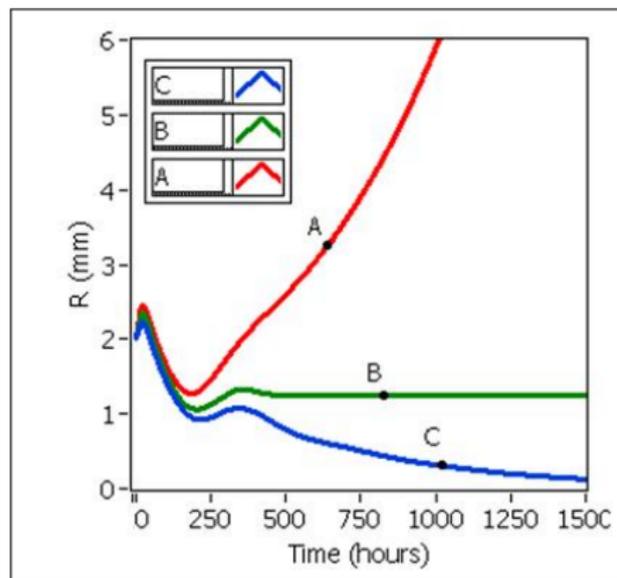
Equilibrium Lines

► Equilibrium line (green) provide the right amount of immune suppression drug (P) to allow virus to stop tumor growth.

► Doses above the equilibrium line (blue) shrink the tumor, while points below (red) do not stop tumor enlargement.

► β represents the degree of virus replication inside the tumor cells.
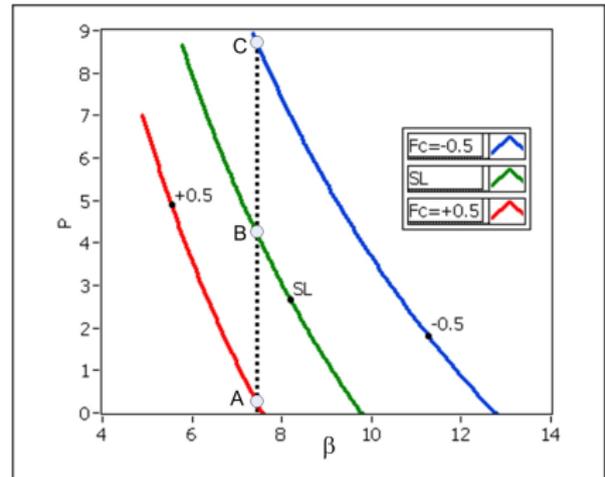
Phase Plots

- ▶ Phase plots can be used to compare model responses.

- ▶ Irrigation model is here compared against convection and diffusion models.

- ▶ Results demonstrate that the irrigation model provides an accurate representation of the body blood compartment.

- ▶ This blood compartment can be use to apply the control action and estimate the states of the system.