Bifurcation analysis of microbiome steady states
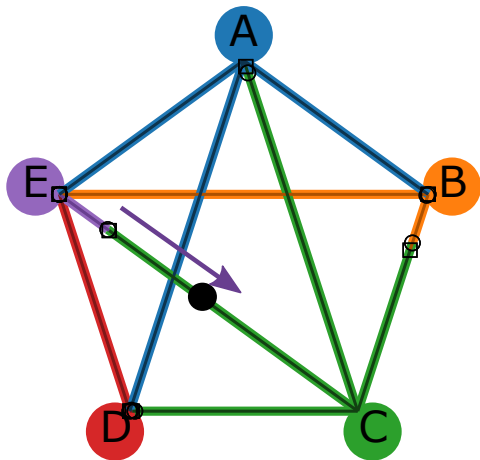
Jean Carlson group

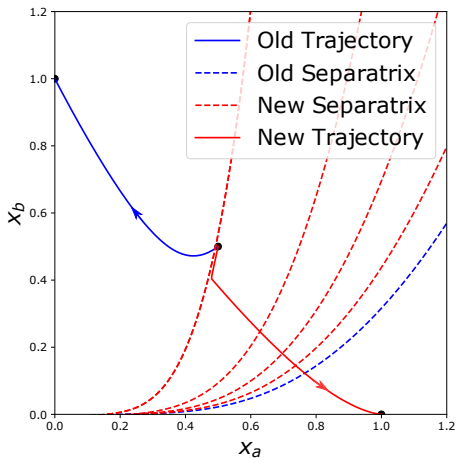UCSB

October 12, 2018

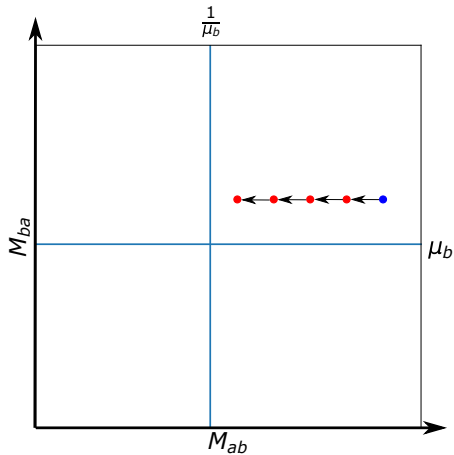# Project Goal

- Move separatrix to switch steady states
- Change interaction matrix using SSR as a guide
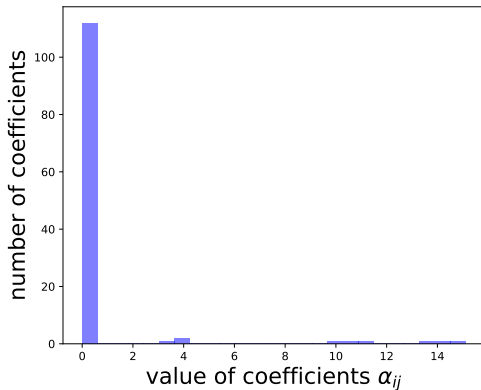
Change in 2-D matrix

Microbial Phase Space
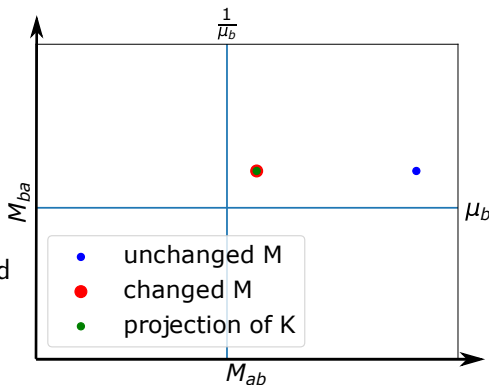
Parameter Space

Change in K

$$M_{ab} = \vec{y_a}^T K \vec{y_b}$$

$$= \sum_{i=1,j=1}^{11,11} \alpha_{ij} K_{ij}$$

- 121 coefficients
- Most are 0
- M_{ab} most sensitive to change in k_{ij} with the largest α_{ij} coefficient

Projection of ΔK back to 2-D

- Change in K is possible to change M_{ba}
- In this case M_{ba} does not change
- SSR coefficients for M_{ba} and M_{ab} may be orthogonal

Projection of ΔK back to 2-D
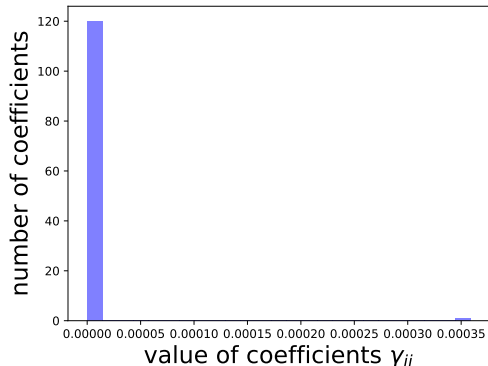
$$M_{ab} = \sum_{i=1,j=1}^{11,11} \alpha_{ij} K_{ij}$$

$$M_{ba} = \sum_{i=1,j=1}^{11,11} \beta_{ij} K_{ij}$$

$$\gamma_{ij} = \alpha_{ij}\beta_{ij}$$

▶ check the value of γ_{ij}

▶ nearly orthogonal, except one coefficient