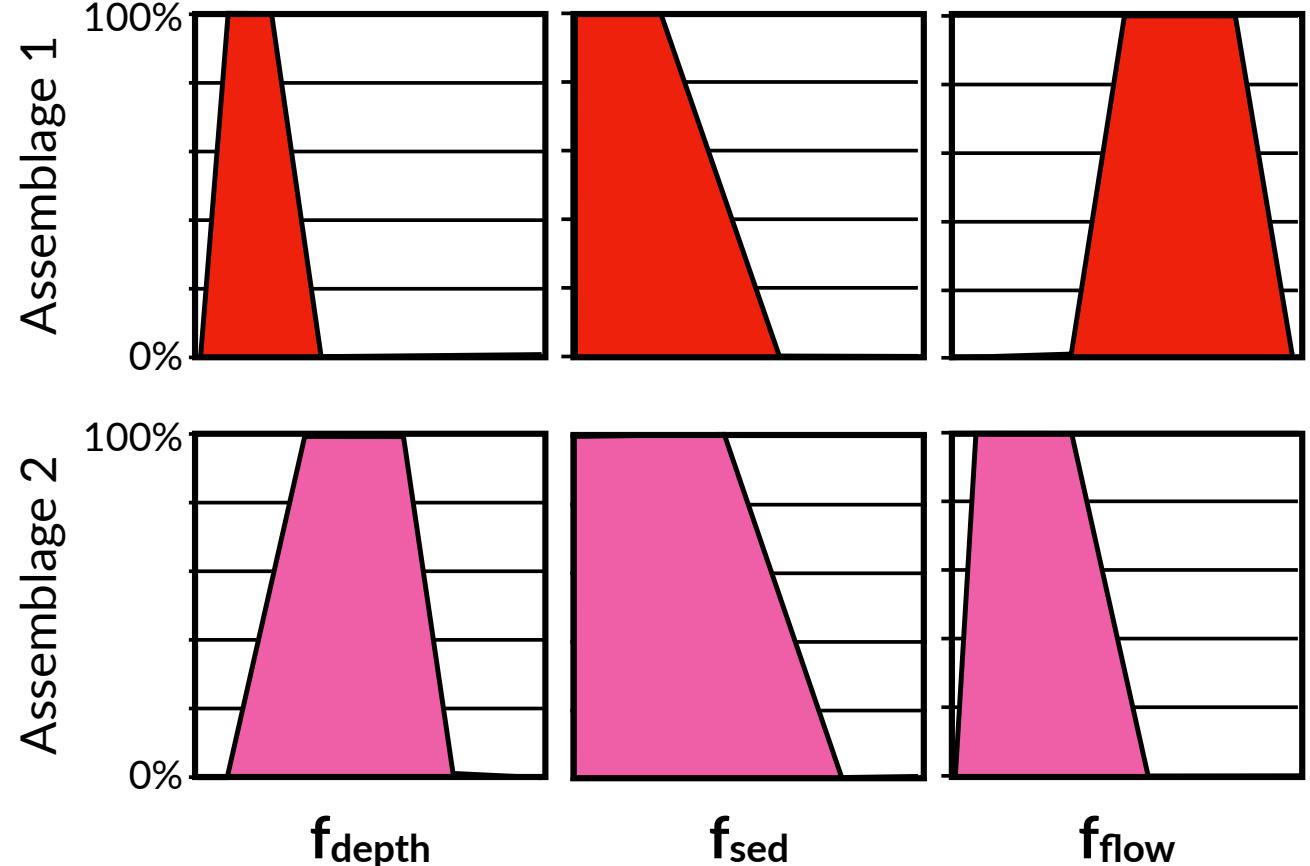




competitive & habitat-complexity

Environmental tolerance threshold functions for each assemblage



$$\min\{f_{\text{depth}}, f_{\text{sed}}, f_{\text{temp}}, f_{\text{pH}}, f_{\text{nu}}, f_{\text{flow}}\} = f_{\text{env}}$$

$$0 < f_{\text{env}} < 100\%$$

$$f_{\text{env}}^1$$

$$f_{\text{env}}^2$$

Population growth limited by environmental factors

**Malthusian parameter**

if population = 0:  
if  $f_{\text{env}} > f_{\text{opt}}$ :  
begin growth

**GLV equation**

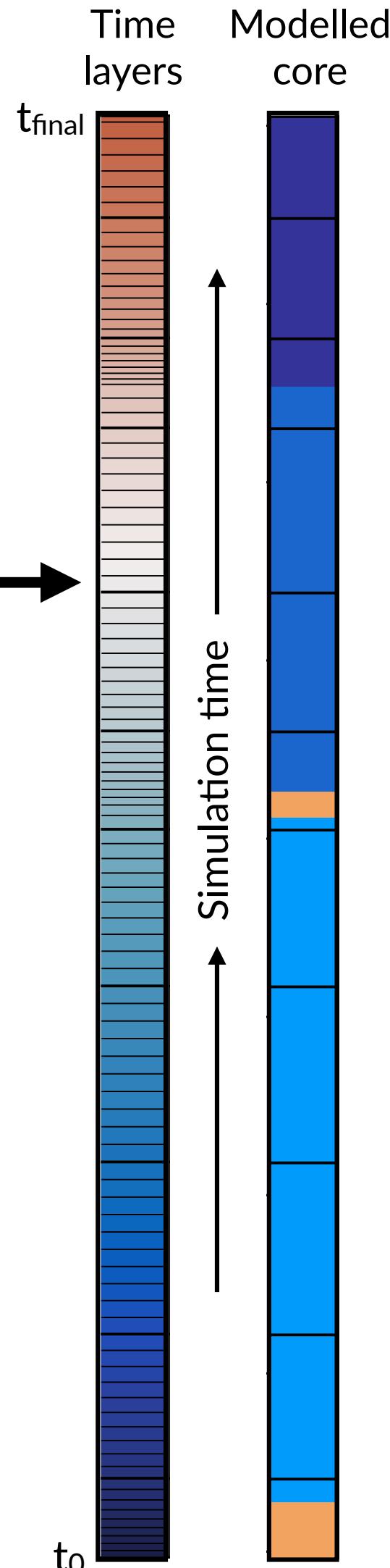
**Community population**

**Carbonate production**

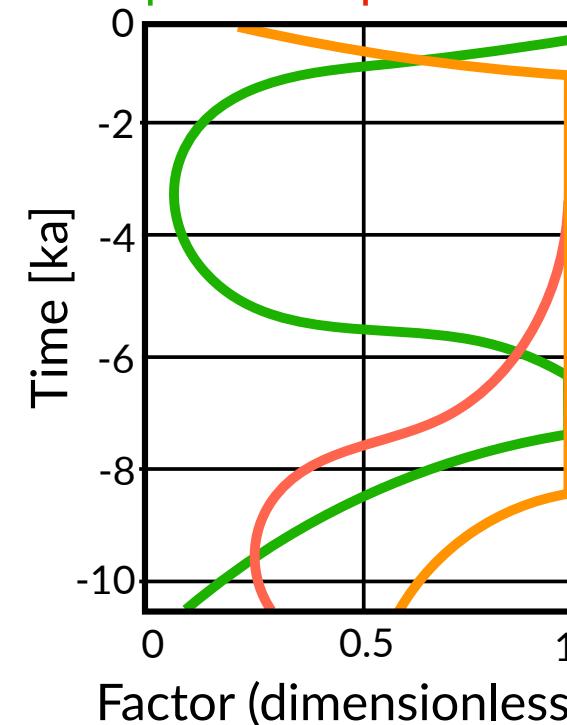
**Carbonate karstification**

Community interaction matrix

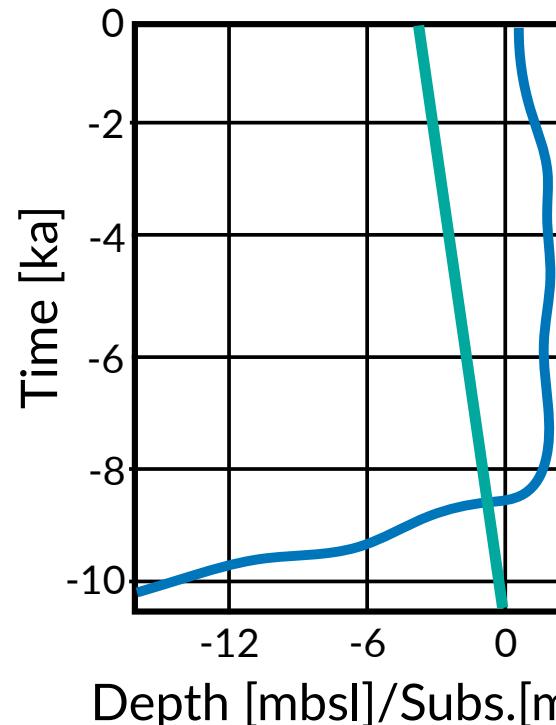
$$A = \begin{bmatrix} \alpha_{1,1} & \alpha_{2,1} \\ \alpha_{1,2} & \alpha_{2,2} \end{bmatrix} \quad -1 < \alpha_{ij} < 0$$



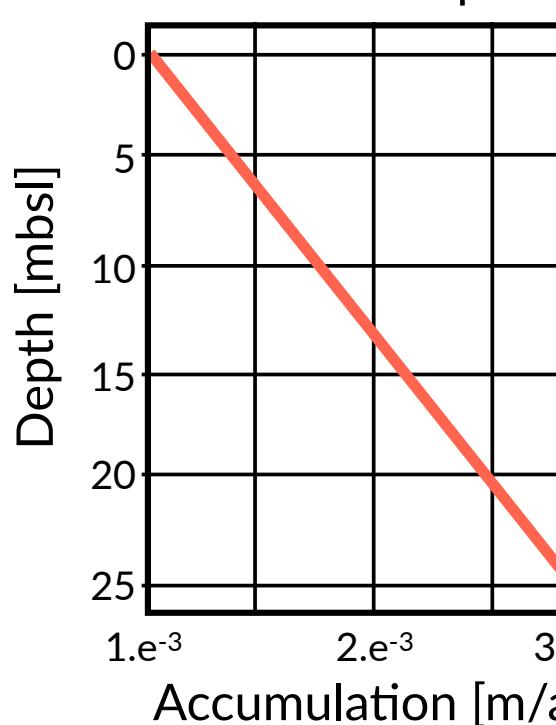
Temperature/pH/Nutrients



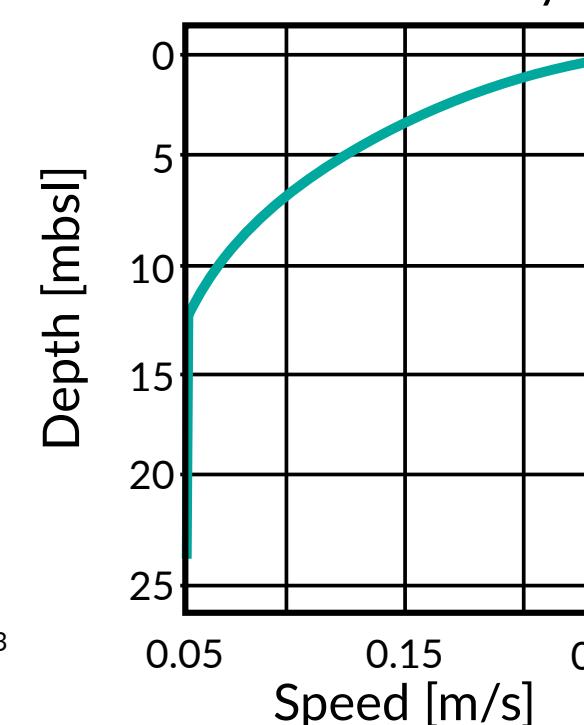
Sea level/Tectonics



Sediment input

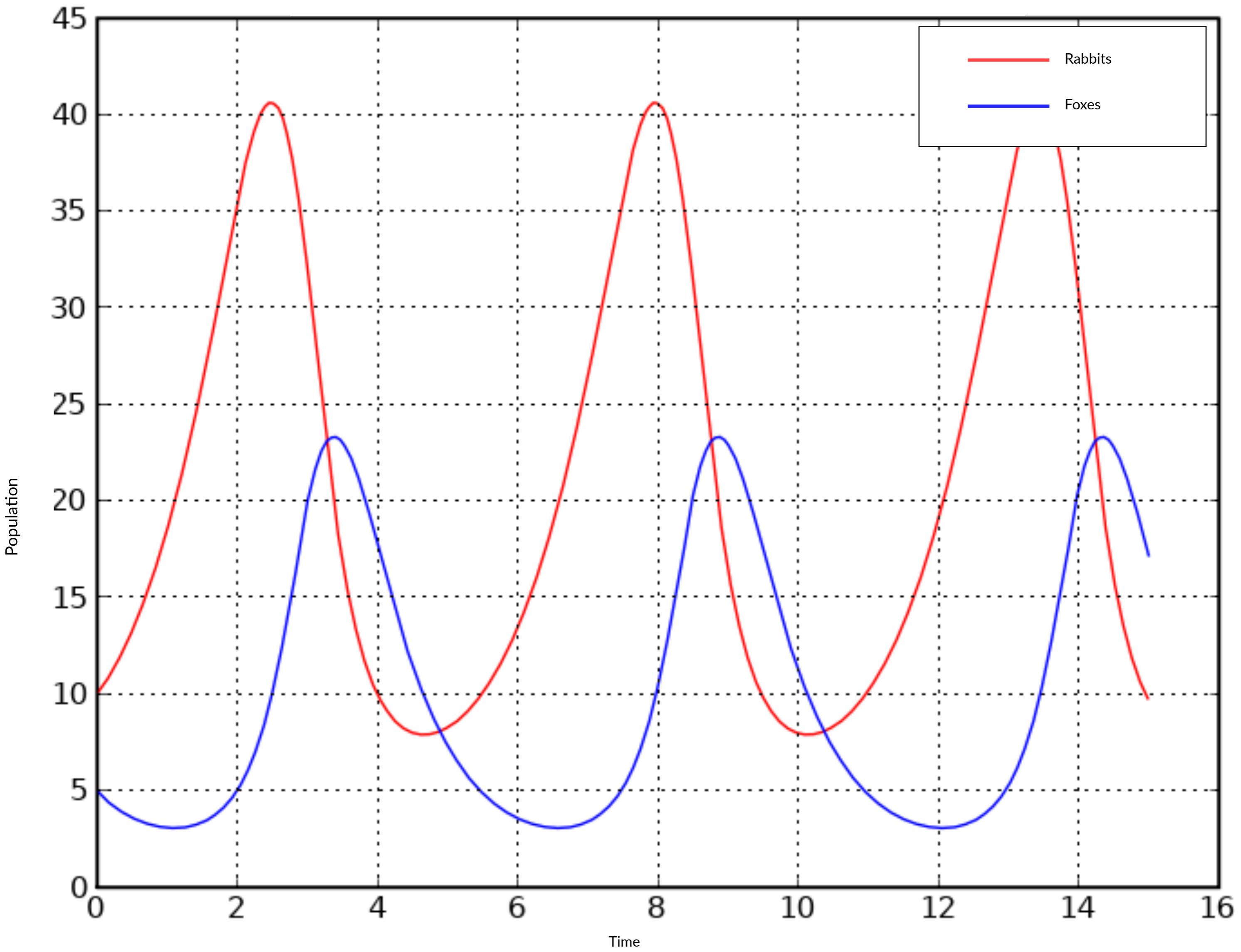


Water velocity



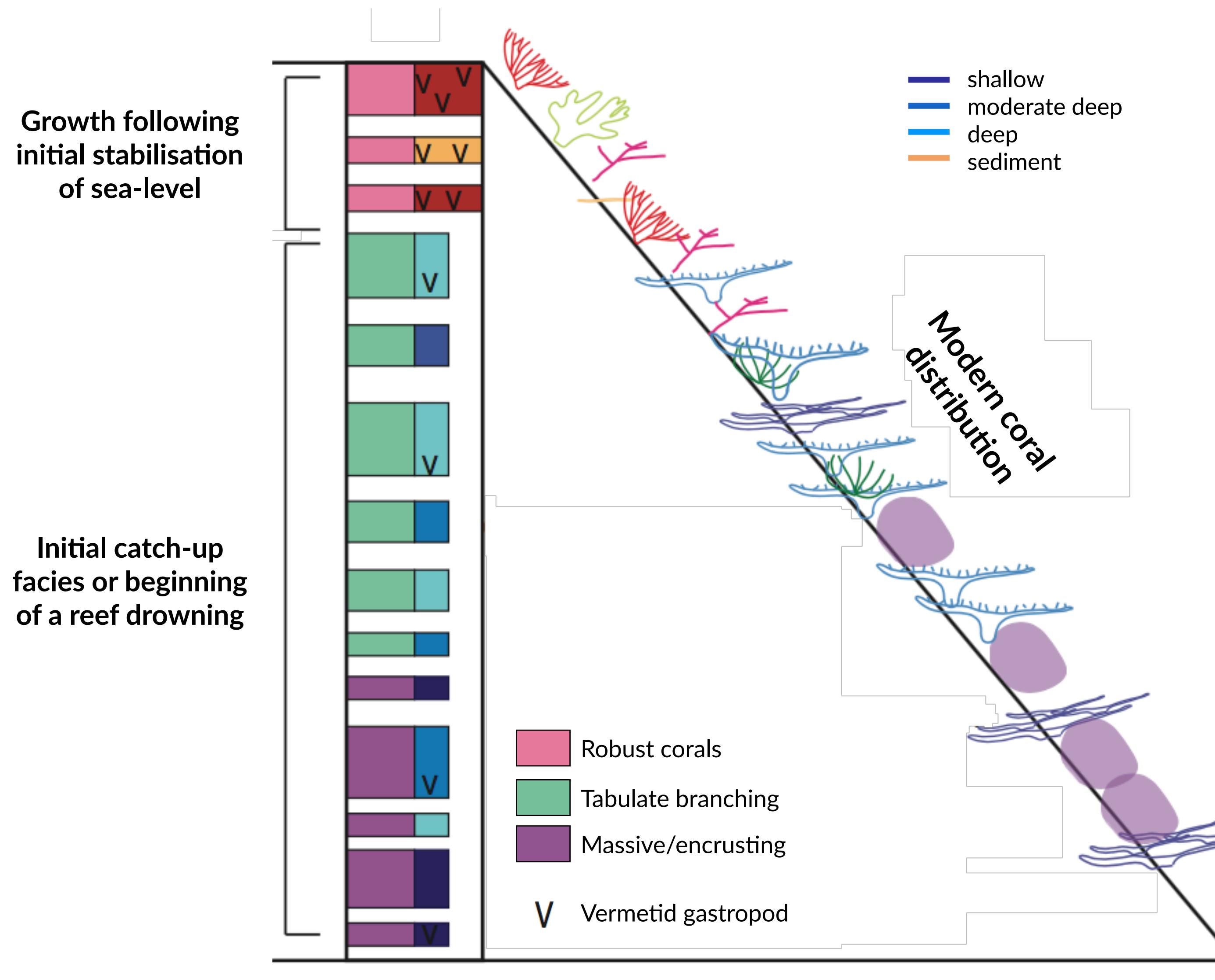
Repeat for each time steps ( $0.1 < \Delta t < 0.25$  years) from start time to present.

Evolution of fox and rabbit population

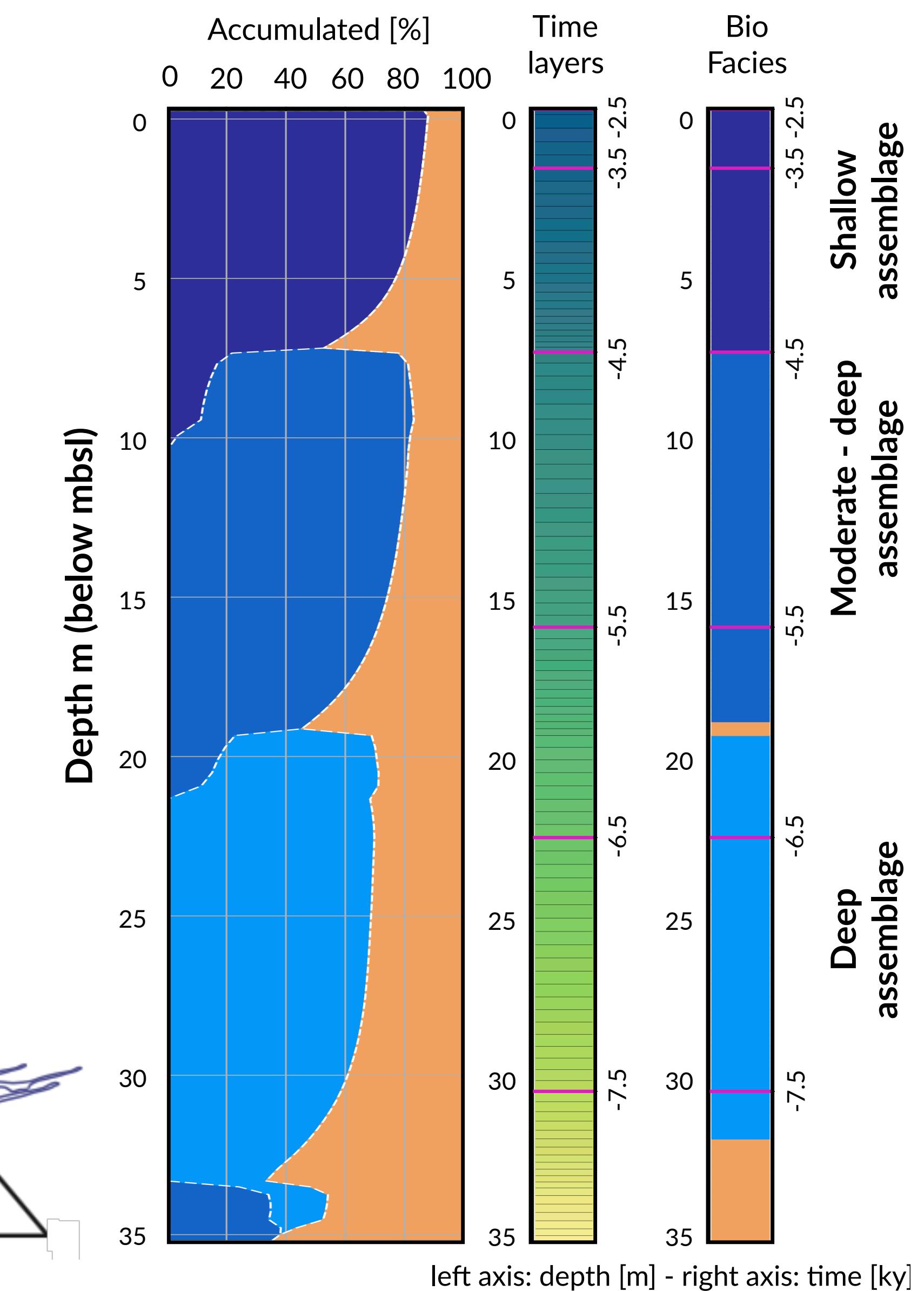


**Scholarship  
of Geosciences**

# pyReef-core – testing using GBR idealised coral distribution



Idealised vertical fossil reef sequences on an exposed margin



pyReef-Core simulated core

# pyReef-core – 1D ecological model & habitat competition

