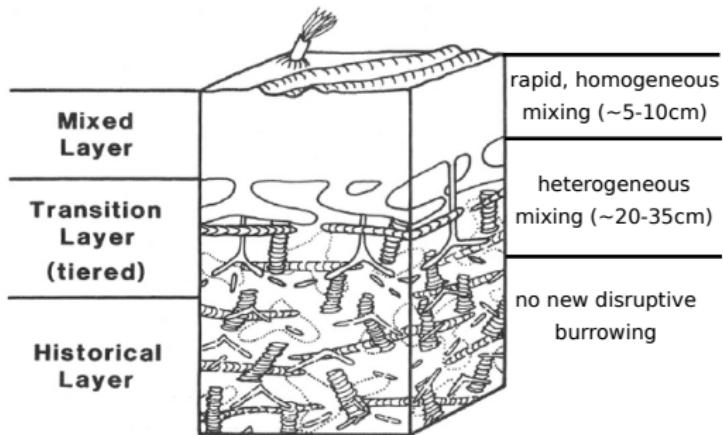


# TURBO2: A MATLAB simulation to study the effects of bioturbation on paleoceanographic time series

16. Mai 2018  
Riverside - lab meeting

# Sediment mixing/bioturbation in TURBO2

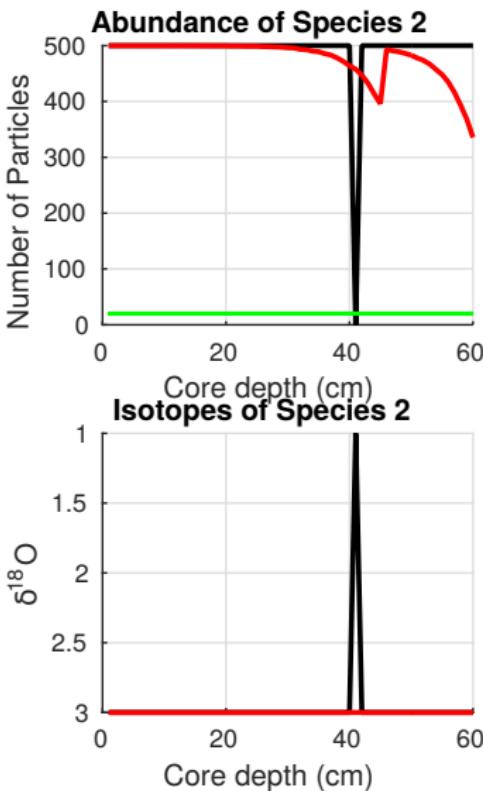
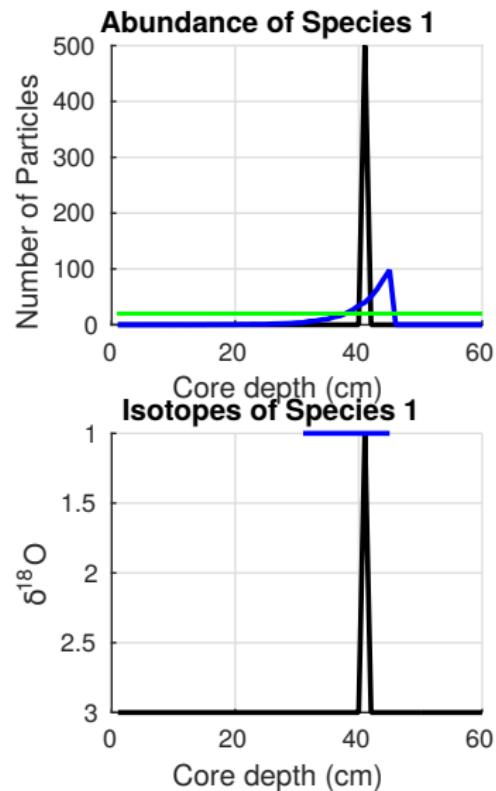
- Simulates the effect of bioturbation on single sediment particles
- Mixed layer model with instantaneous, homogenous mixing
- Mixing depths that vary along the length of the core
- Models signal distortions of isotopic signals from stratigraphic carriers (forams)



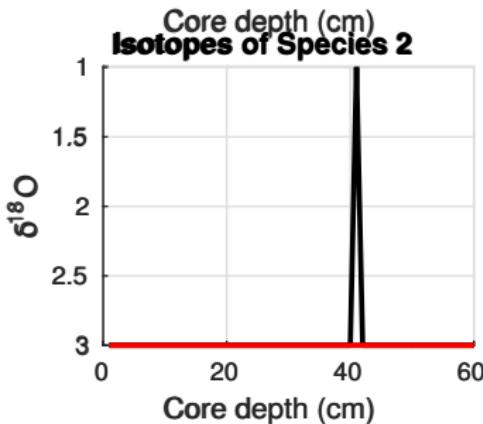
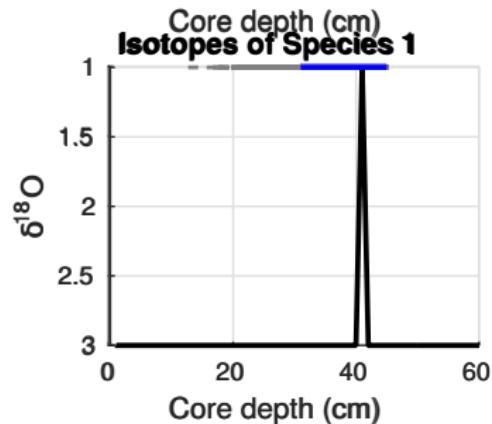
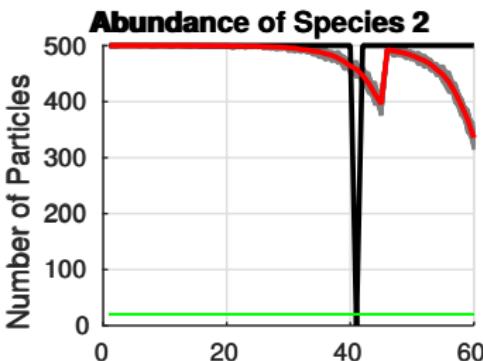
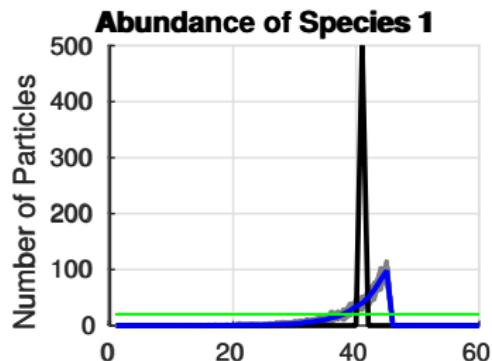
# Experiments

- Simulate influence of different bioturbation depths on abundance and isotopic signals of 2 species
- real abundance and isotopic signal are covaried (e.g. impulse- or stepchange for both signals)
- ~500 total particles in each layer
- after mixing, 20 of each foram species are picked in each layer and their isotope values are measured

# Example: point event + complete species change

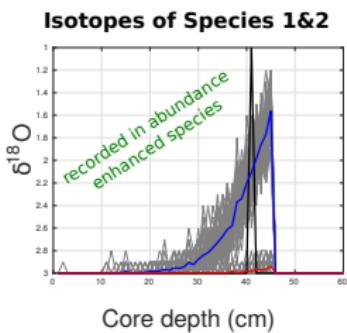
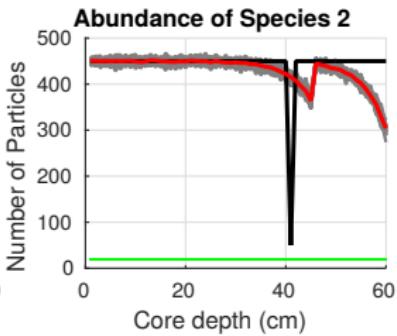
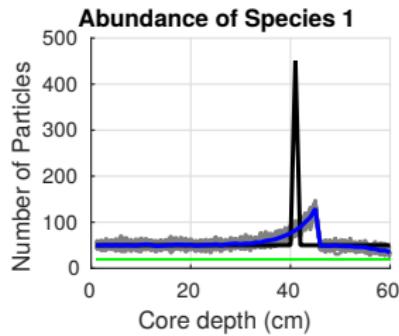


# Example: point event + complete species change

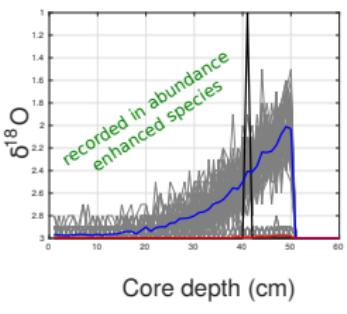
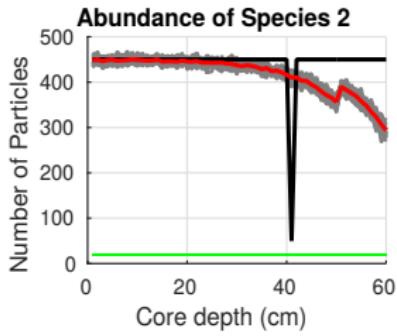
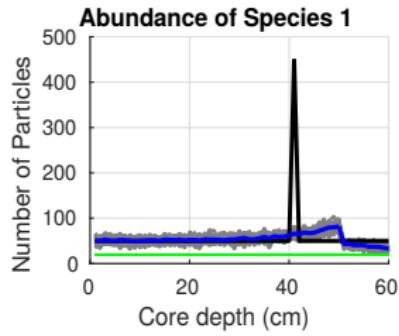


# Example: point event + with background abundance

**zbio = 5cm**

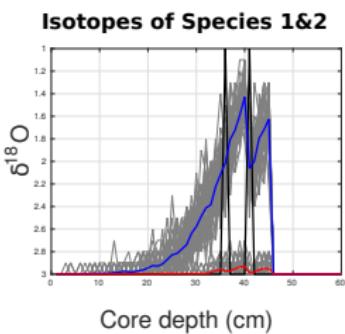
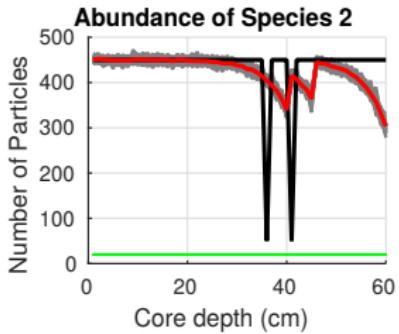
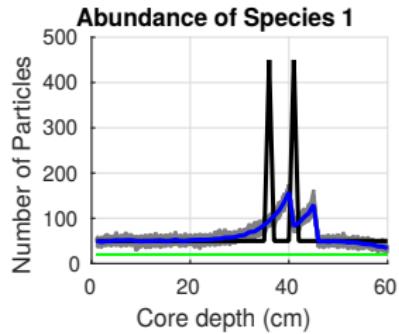


**zbio = 10cm**

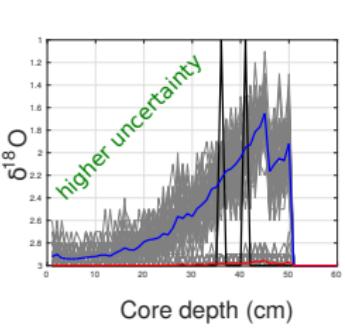
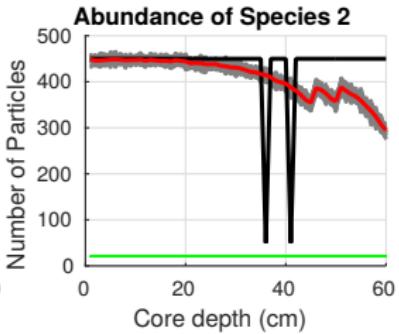
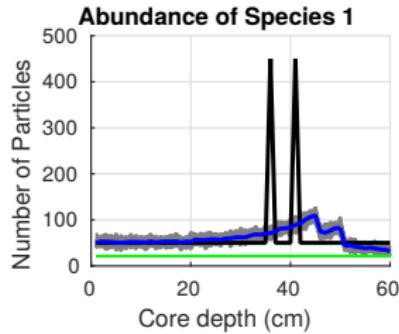


# Example: 2 point events + with background abundance

**$z_{bio} = 5\text{cm}$**

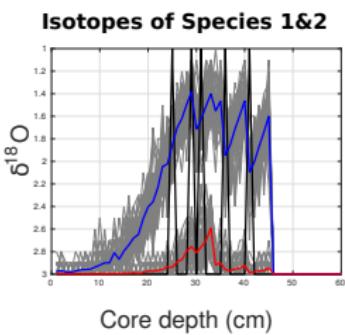
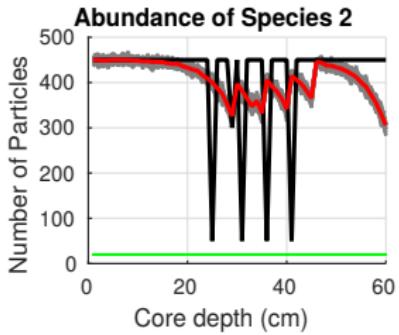
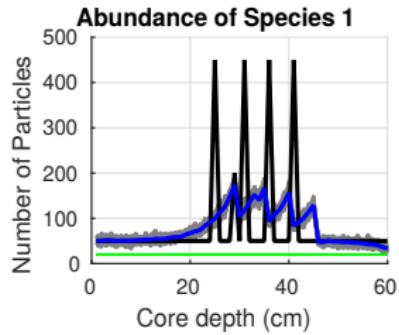


**$z_{bio} = 10\text{cm}$**

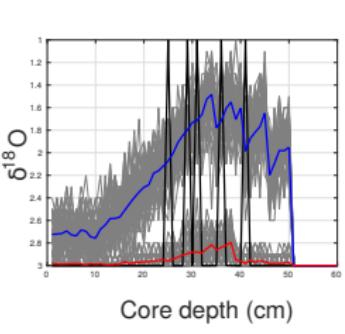
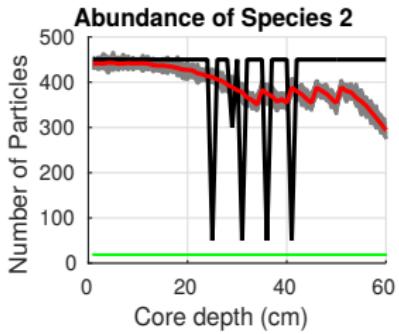
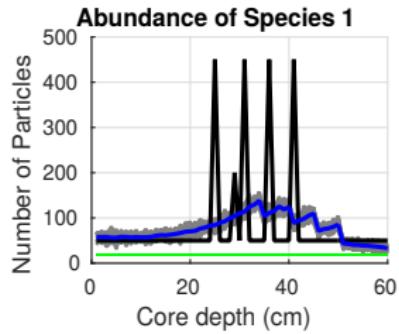


# Example: 5 point events + with background abundance

**zbio = 5cm**

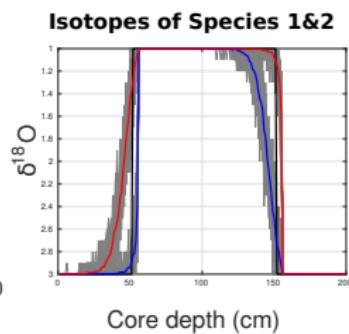
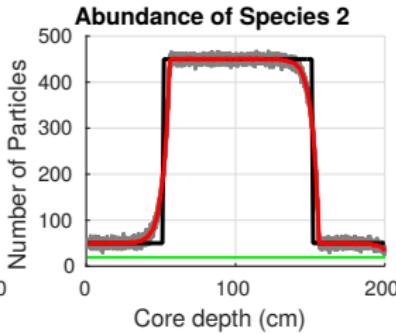
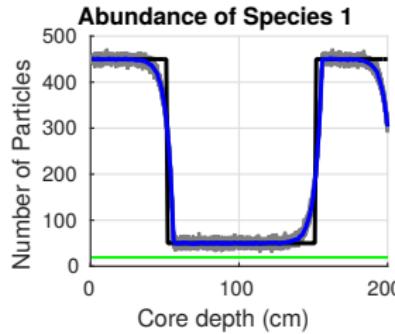


**zbio = 10cm**

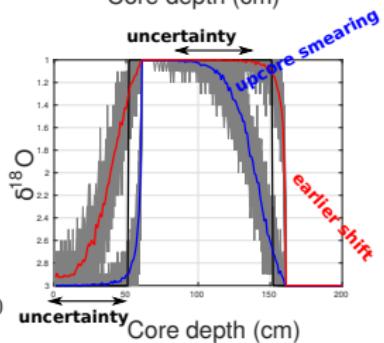
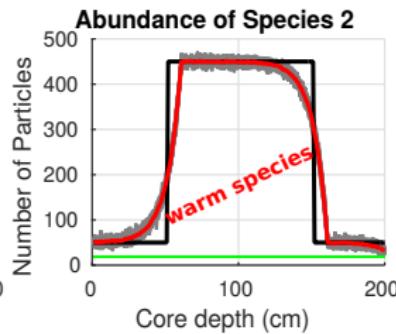
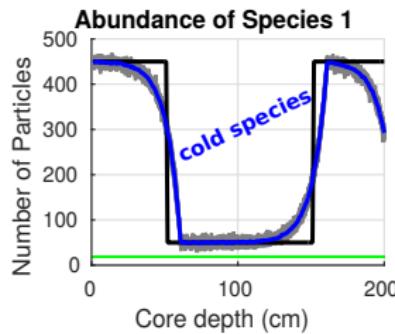


# Example: step change + with background abundance

**$z_{bio} = 5\text{cm}$**

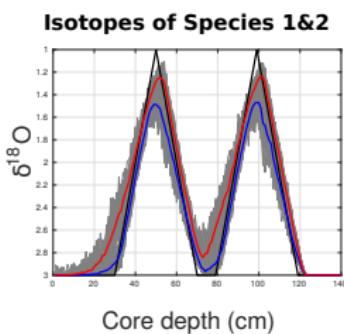
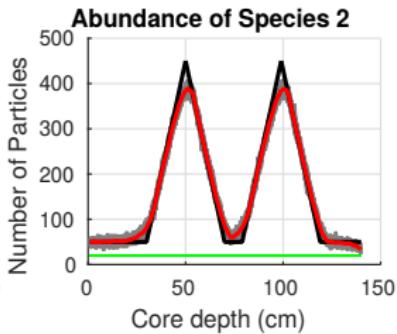
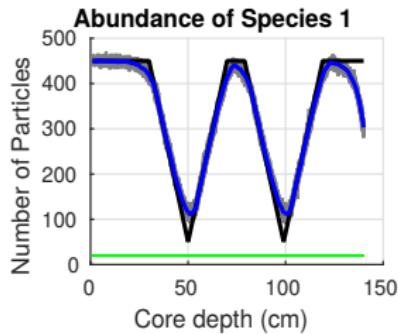


**$z_{bio} = 10\text{cm}$**

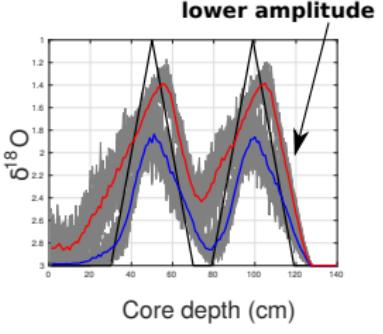
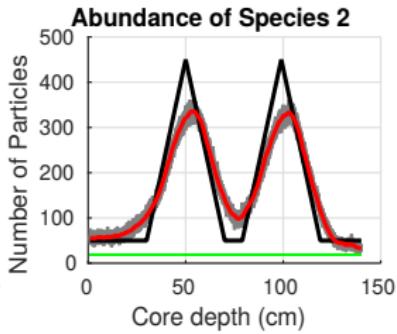
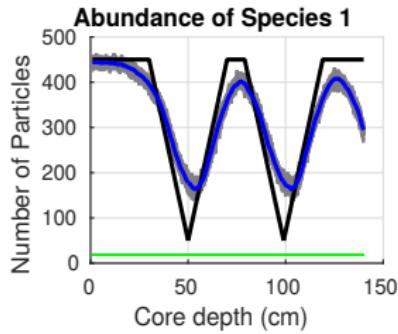


# Example: gradual change + with background abundance

**$z_{bio} = 5\text{cm}$**

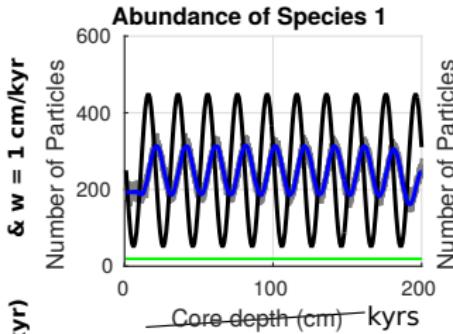


**$z_{bio} = 10\text{cm}$**

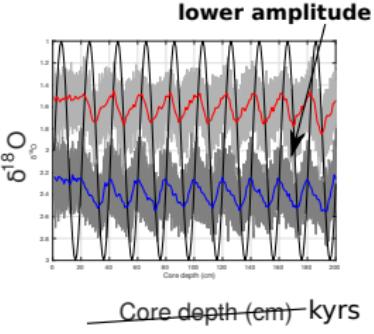
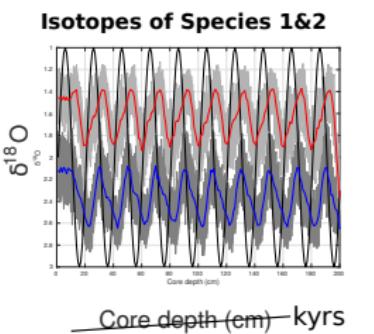
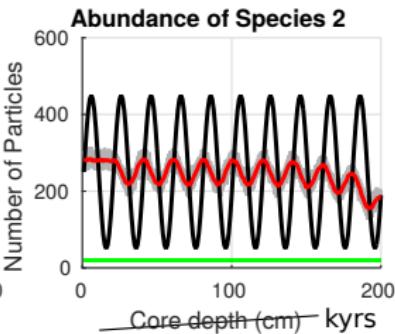
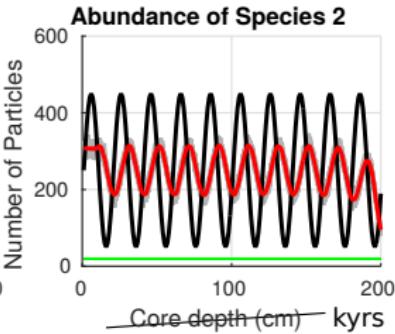
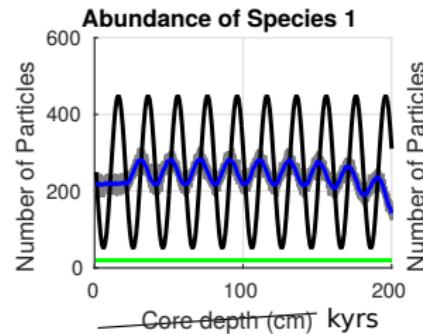


# Example: 20kyrs cycle

$zbio = 10\text{cm}$

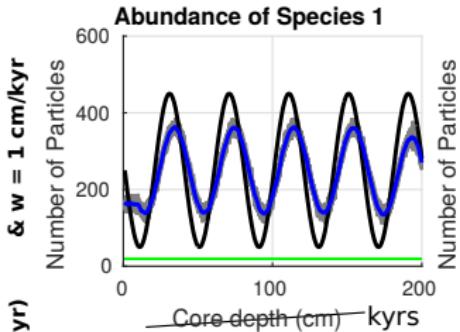


$zbio = 20\text{cm} \& w=1\text{cm/kyr}$

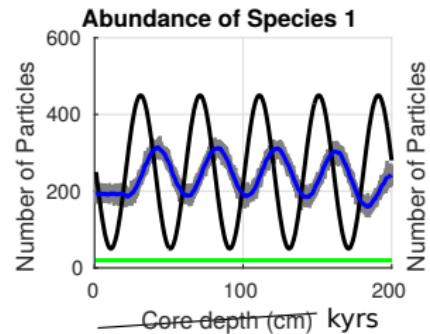


# Example: 40kyrs cycle

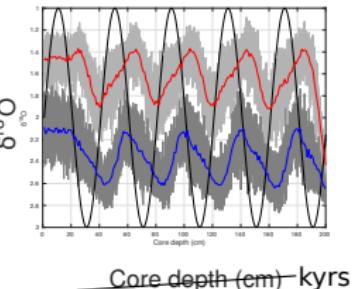
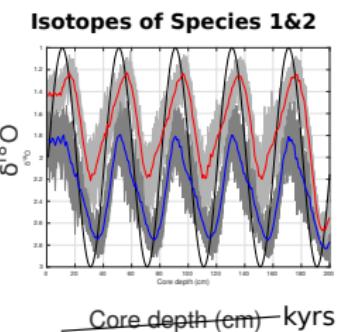
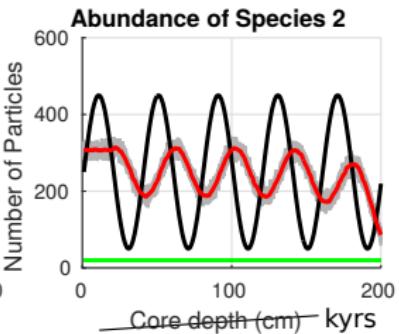
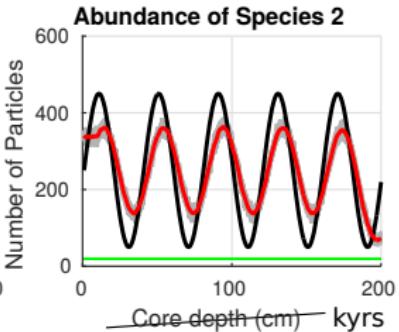
$zbio = 10\text{cm}$



$zbio = 20\text{cm} \& w=1\text{cm/kyr}$

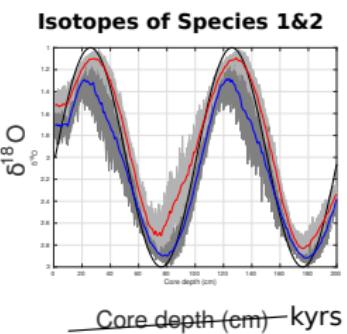
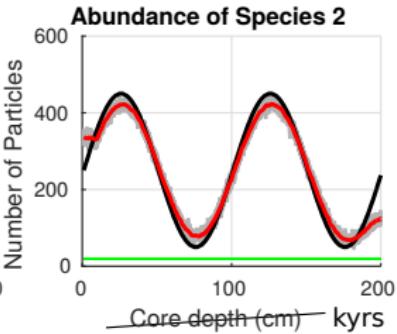
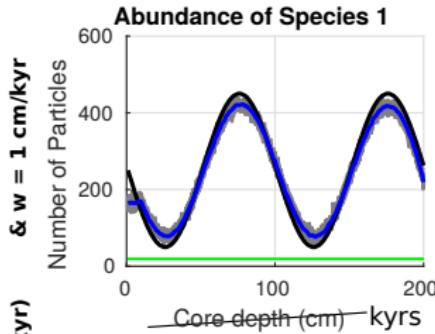


$\& w = 1\text{ cm/kyr}$

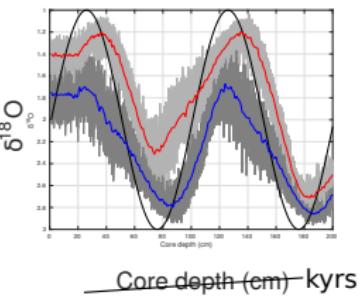
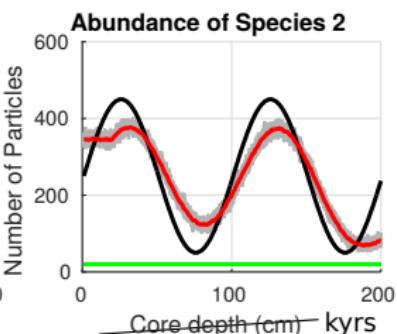
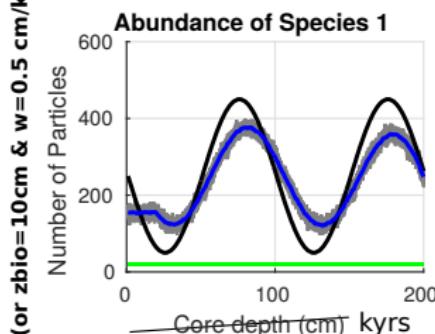


# Example: 100kyrs cycle

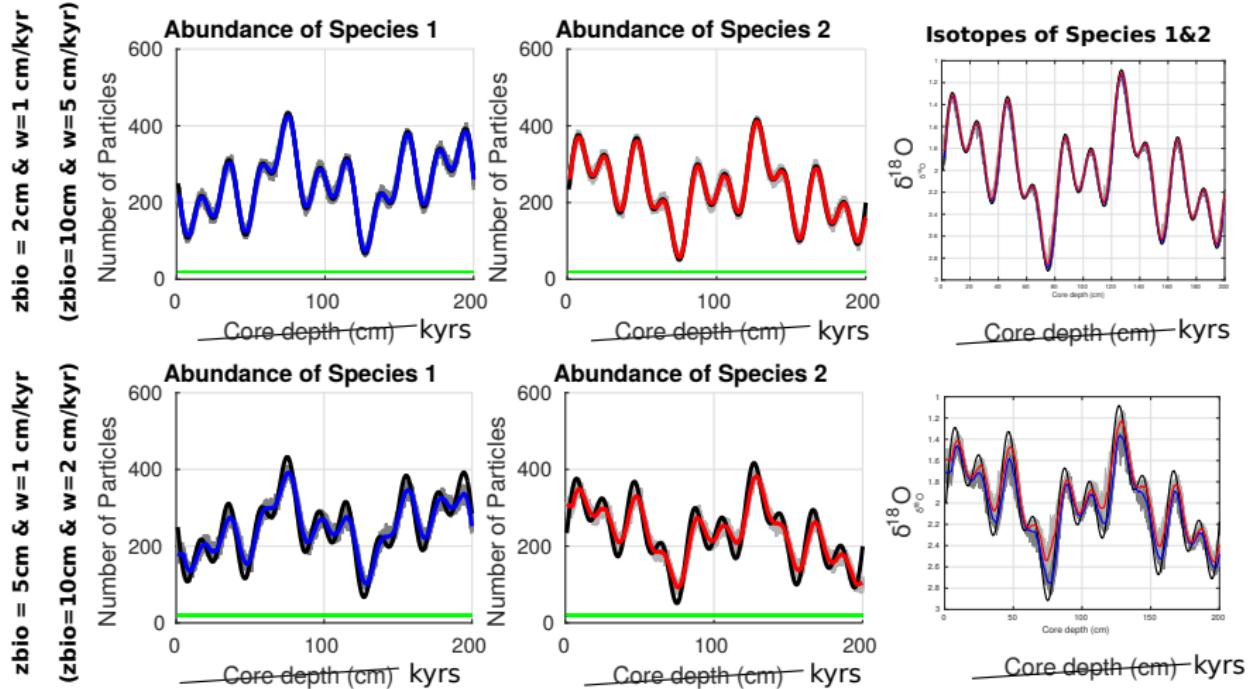
$zbio = 10\text{cm}$



$zbio = 20\text{cm} \& w=1\text{cm/kyr}$

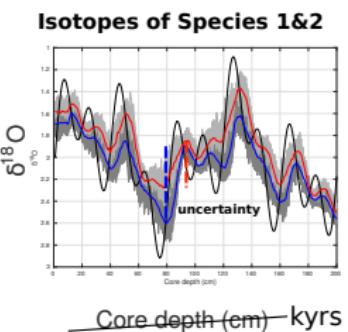
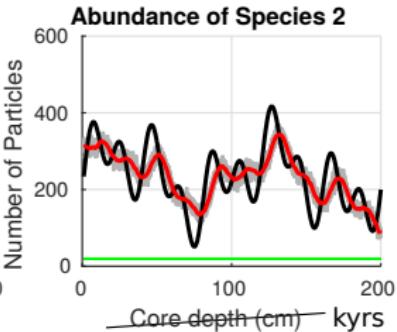
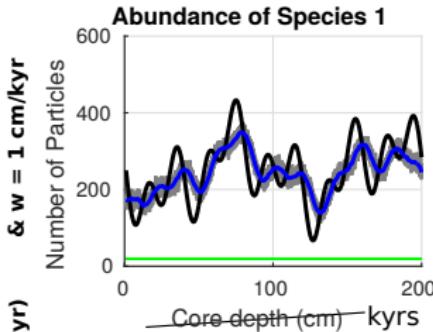


# Example: 3 cycles combined

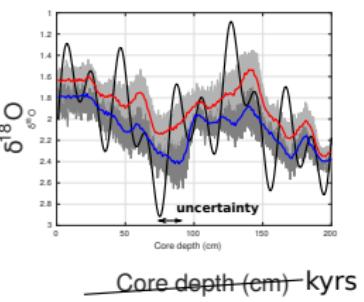
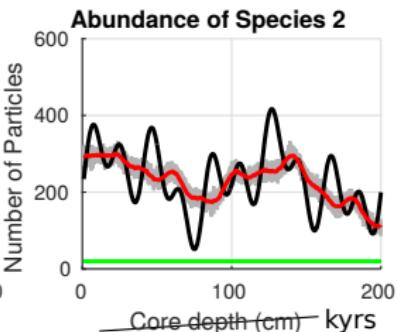
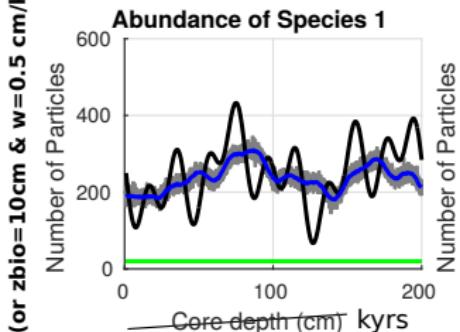


# Example: 3 cycles combined

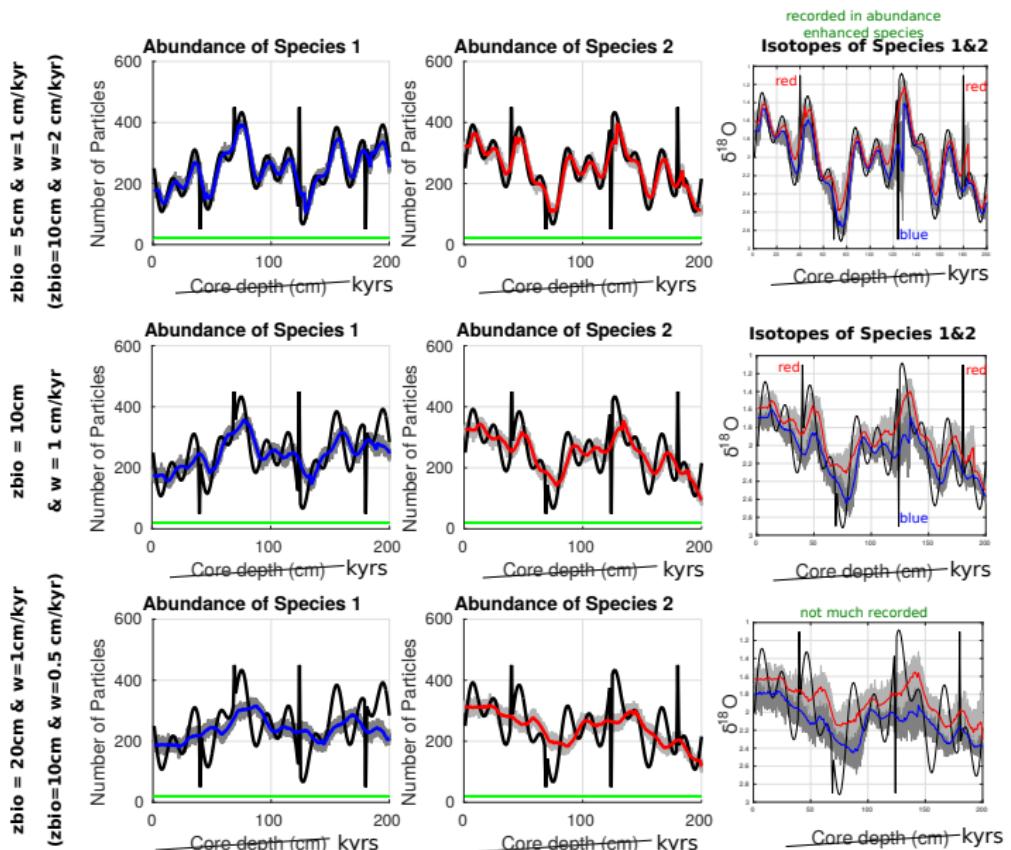
$zbio = 10\text{cm}$



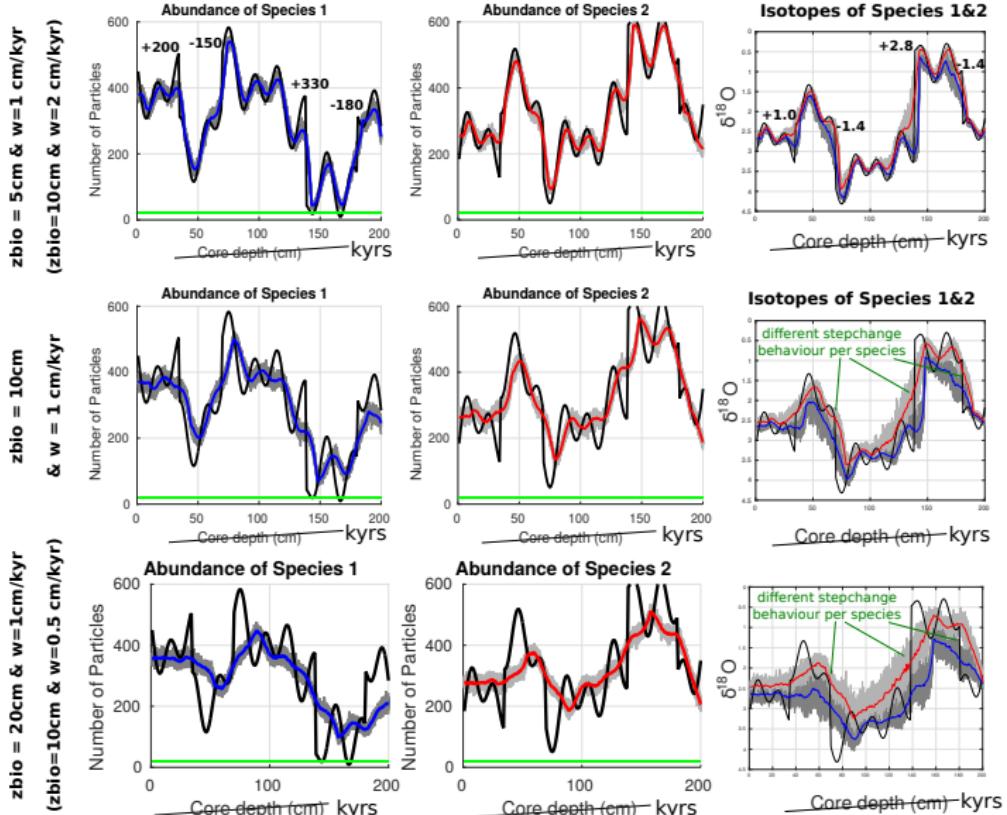
$zbio = 20\text{cm} \& w=1\text{cm/kyr}$



# Example: 3 cycles + point events



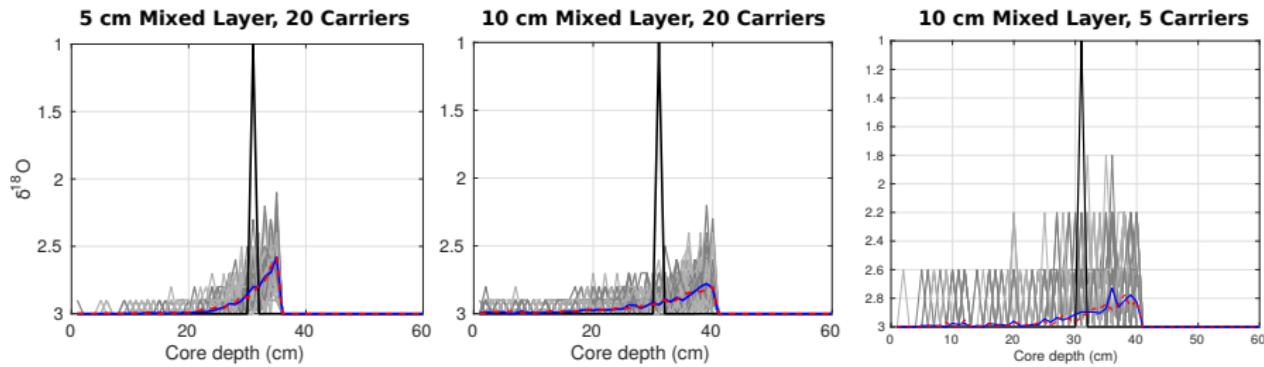
# Example: 3 cycles + step changes



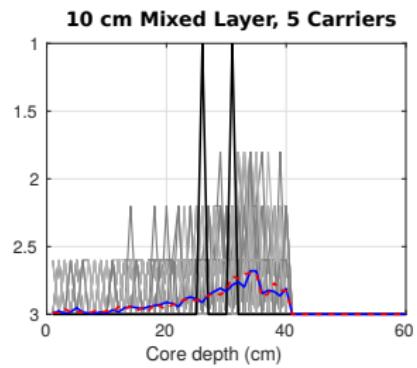
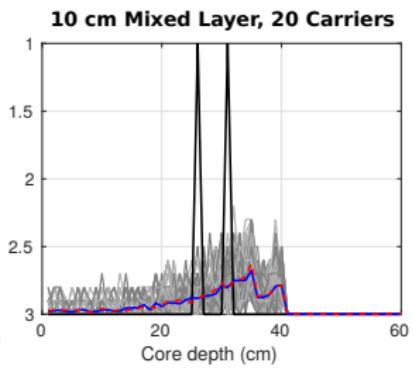
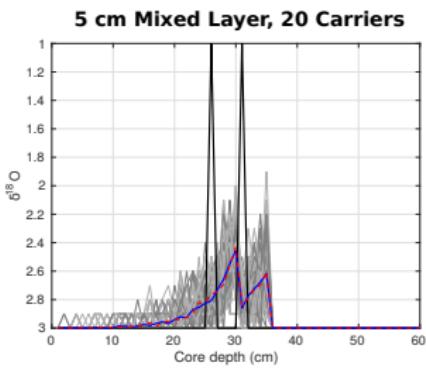
## Just changes in isotope values

- just isotopic signal is changed
- ~500 total particles in each layer (350: Species 1; 150: Species 2)
- after mixing, 20 or 5 of each foram species are picked in each layer and their isotope values are measured

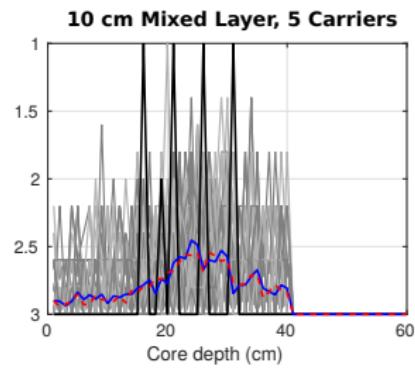
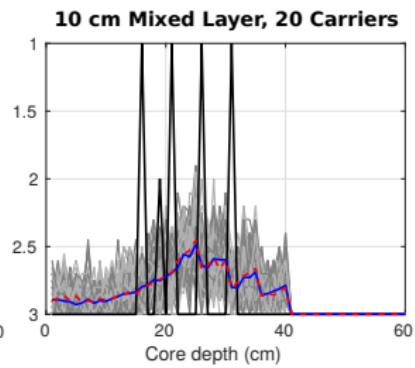
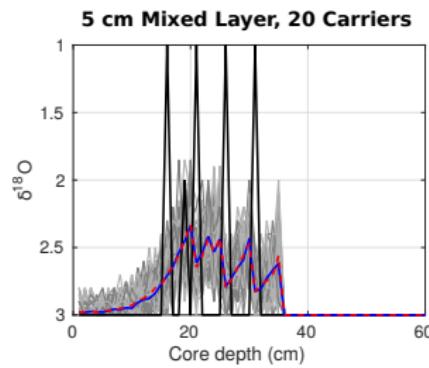
# Example: point event



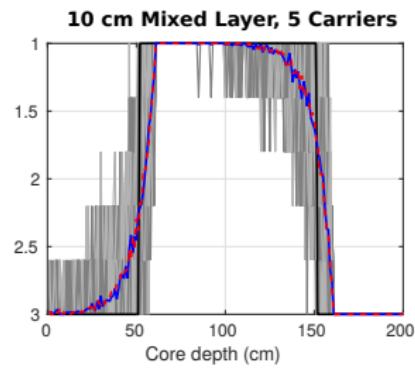
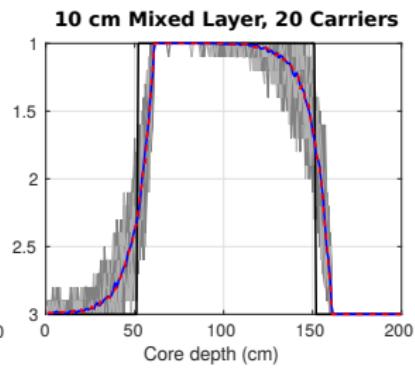
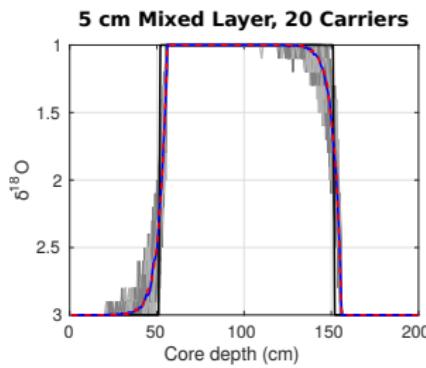
# Example: 2 point events



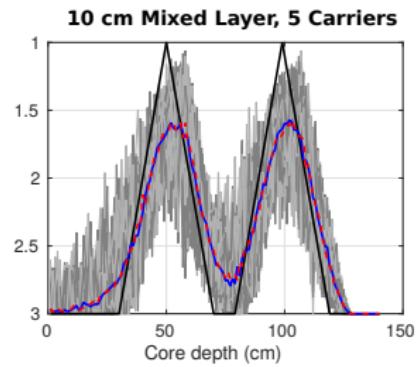
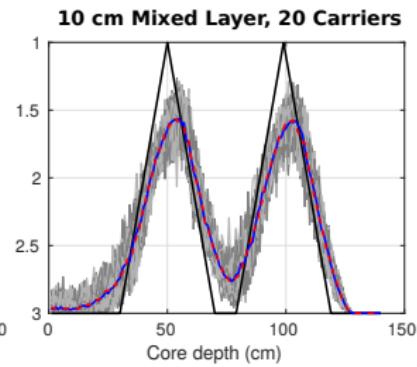
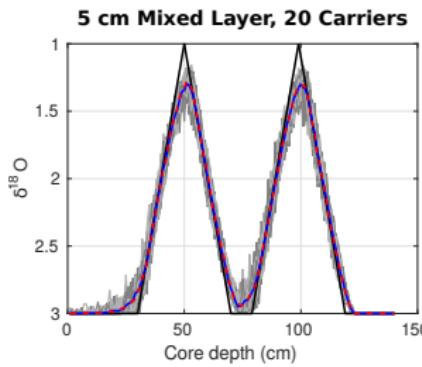
# Example: 5 point events



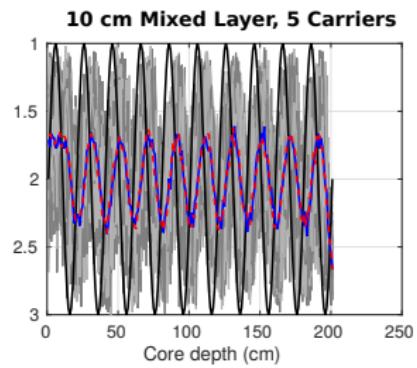
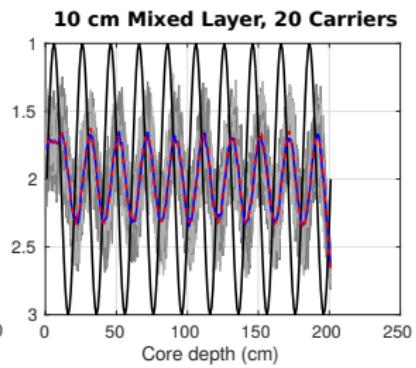
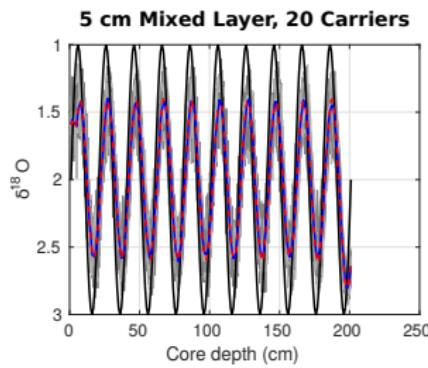
# Example: step change



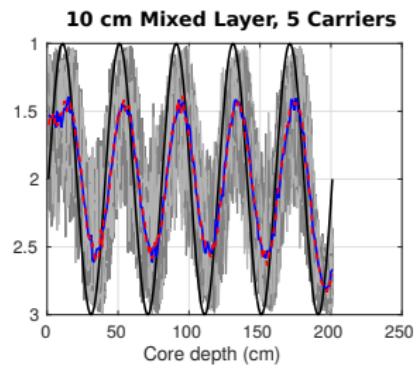
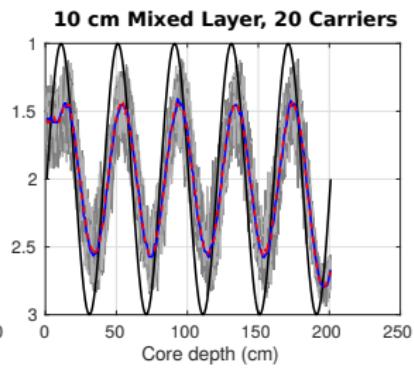
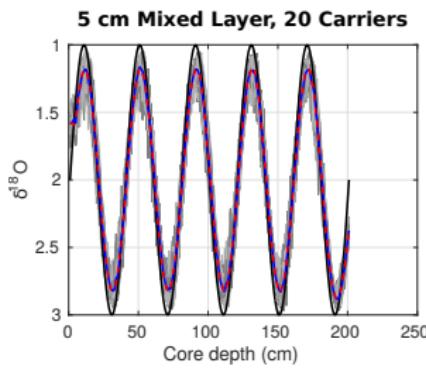
# Example: gradual change



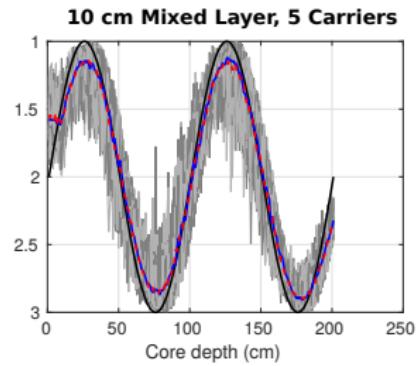
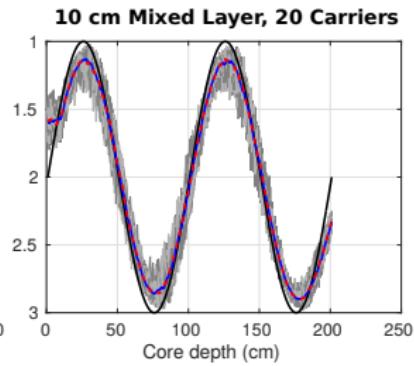
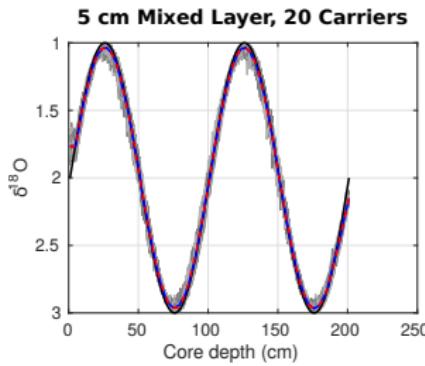
# Example: 20kyrs cycle



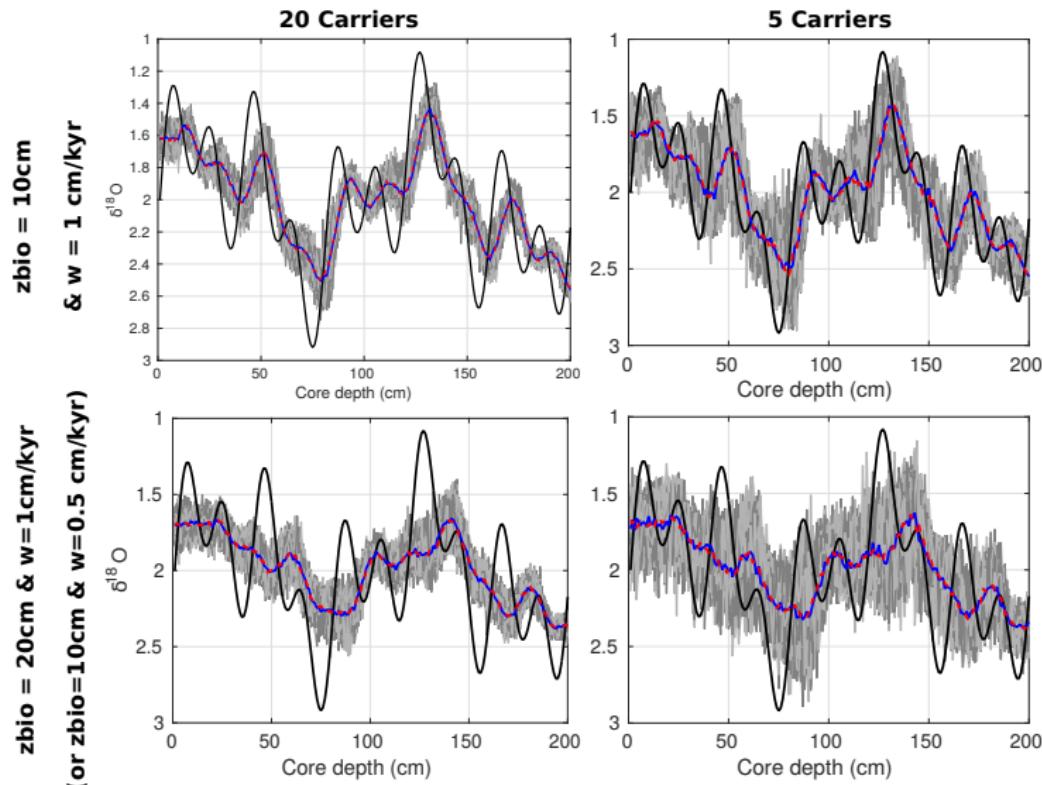
# Example: 40kyrs cycle



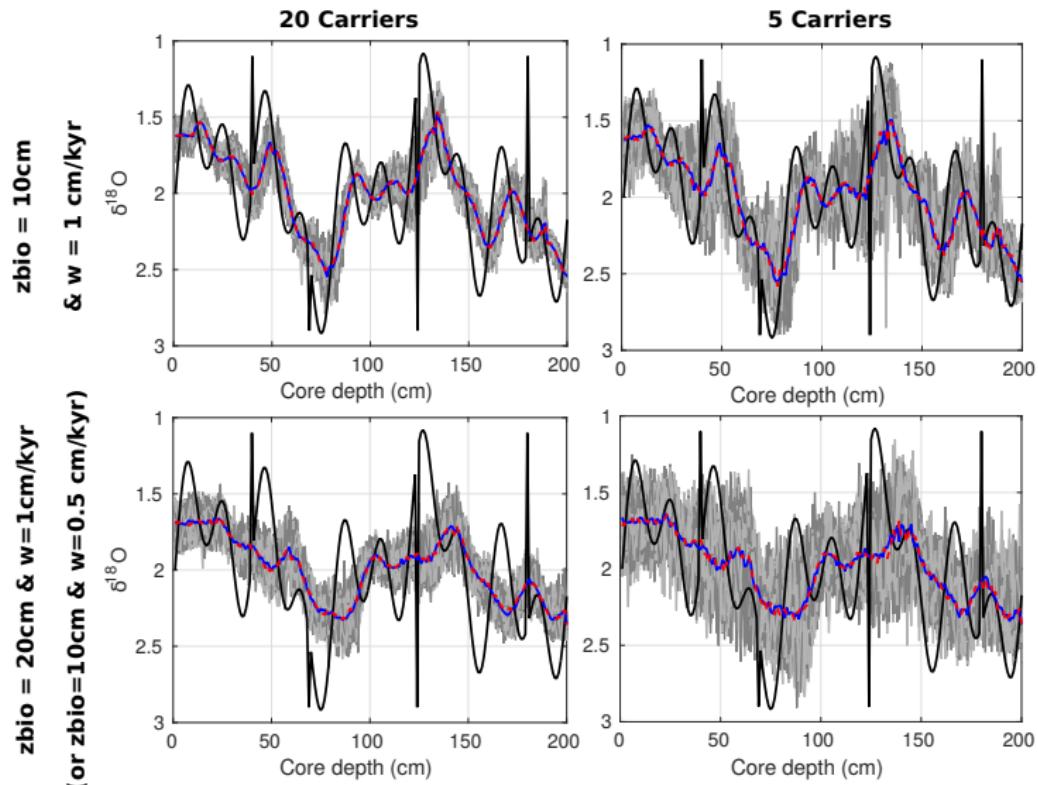
# Example: 100kyrs cycle



# Example: 3 cycles combined



# Example: 3 cycles + point events



# Example: 3 cycles + step changes

