

# Bioturbation modelling

## Consequences of size dependent mixing

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**Definition:** Bioturbation refers to the biological reworking of soils and sediments. Sediment particles are displaced as a result of biological activities, such as locomotion, feeding and burrow construction [1,2].

This has important consequences for the interpretation of paleo records.

$$\text{Advection-Diffusion-Equation: } \frac{\partial C}{\partial t} = \frac{\partial}{\partial x} \left( D_{\text{bio}} \frac{\partial C}{\partial x} \right) - w * \frac{\partial C}{\partial x} - \kappa * C$$

C: Concentration [ $\frac{1}{\text{cm}^3}$ ],  $D_{\text{bio}}$ : Bioturbation diffusion coefficient [ $\frac{\text{cm}^2}{\text{year}}$ ], w: Sedimentation rate [ $\frac{\text{cm}}{\text{year}}$ ],  $\kappa$ : radioactive decay [ $\frac{1}{\text{year}}$ ]

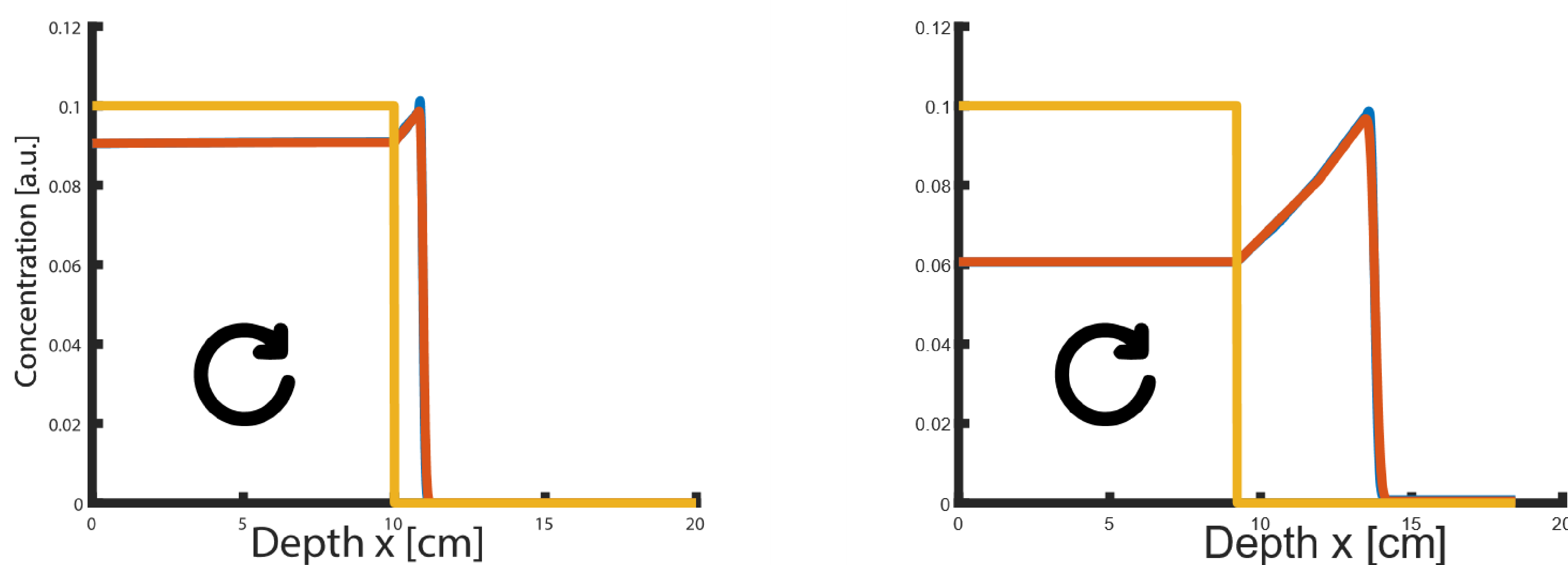
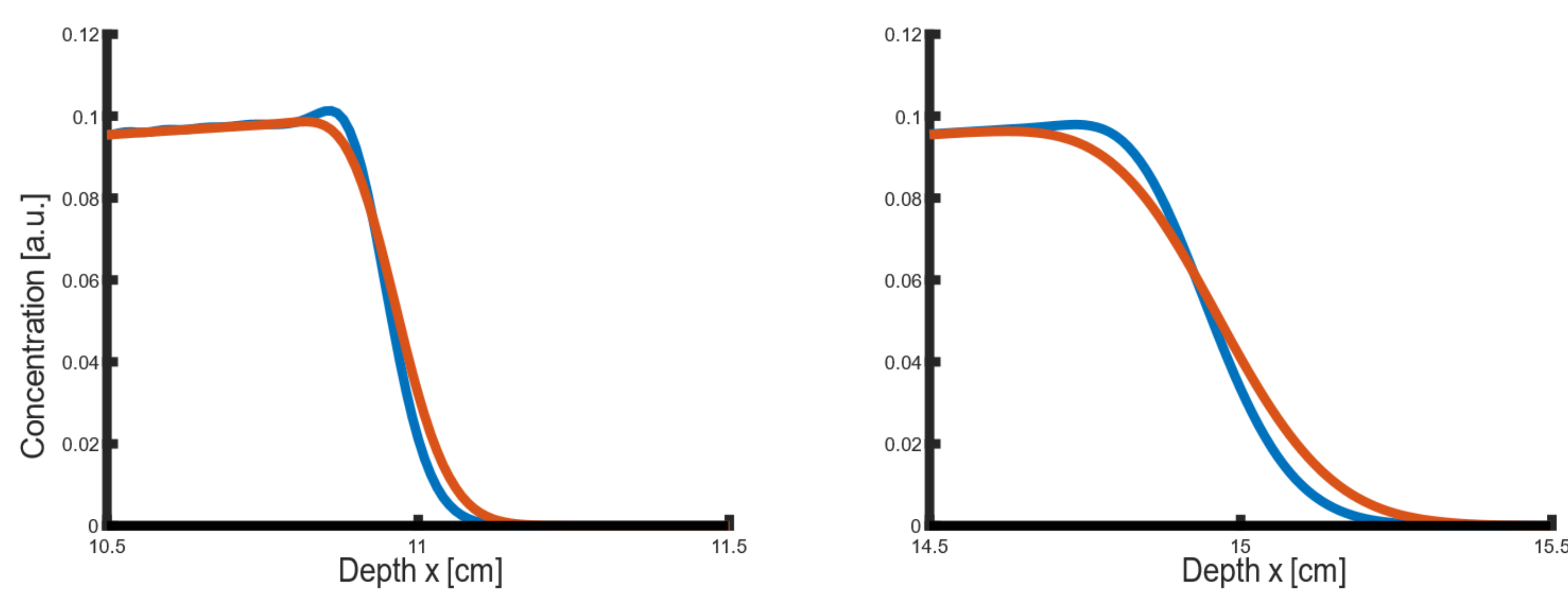


Fig.1: right: Continental slope:  $t = 50$  years,  $w = 0.1 \frac{\text{cm}}{\text{year}}$ ,  $D_{\text{bio}} = 10 \frac{\text{cm}^2}{\text{year}}$ . left: Deep sea:  $t = 1000$  years,  $w = 0.001 \frac{\text{cm}}{\text{year}}$ ,  $D_{\text{bio}} = 10 \frac{\text{cm}^2}{\text{year}}$ .



### Outlook:

- include non local mixing [3]
- stochastic description with biological parameters (step length-, waiting time- distribution) [4]

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References: [1] Aller, R. C., 1982. [2] Meysman, F.J.R. et al., 2006.

[3] Boudreau, B. P., 1986. [4] Meysman, F.J.R. et al., 2010.