Studying EFFECT of ocean margin CHANGE On the global carbon cycle

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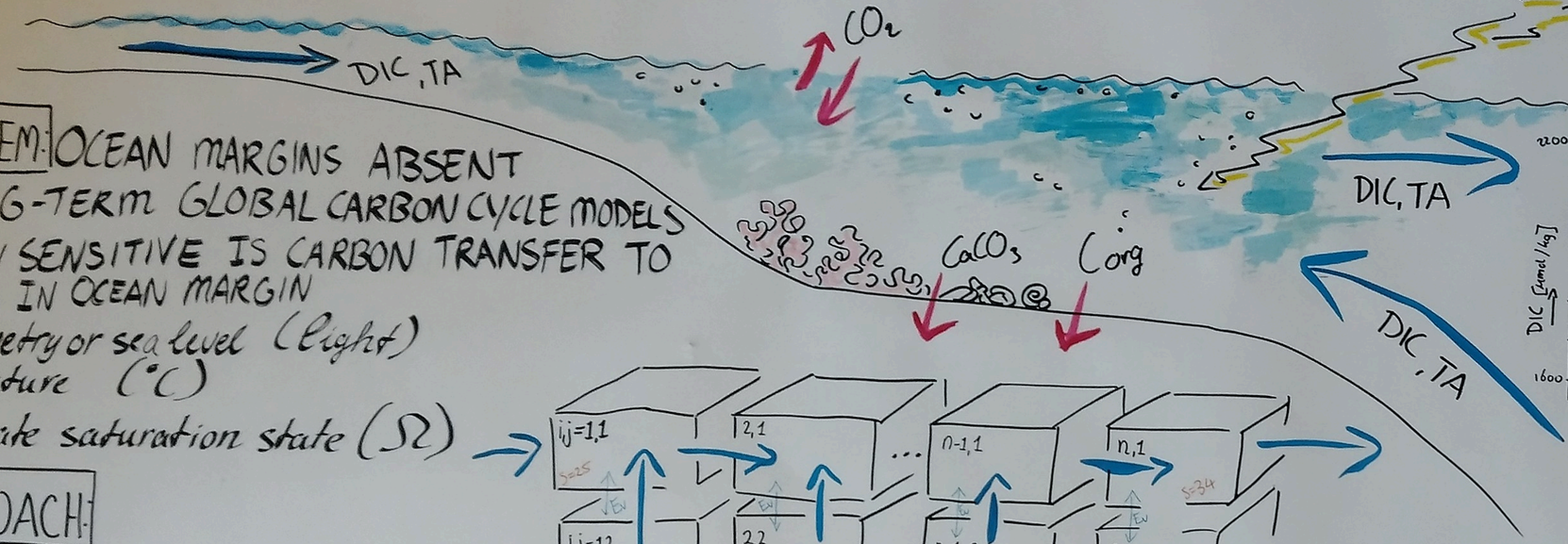


1. PROBLEM: OCEAN MARGINS ABSENT IN LONG-TERM GLOBAL CARBON CYCLE MODELS

→ HOW SENSITIVE IS CARBON TRANSFER TO CHANGES IN OCEAN MARGIN

- bathymetry or sea level (light)
- temperature (°C)
- carbonate saturation state (Ω)

2. APROACH:

Build a flexible box model

- Representing global ocean margins
- Tool for studying sensitivity of global carbon cycle to changes in ocean margin domain

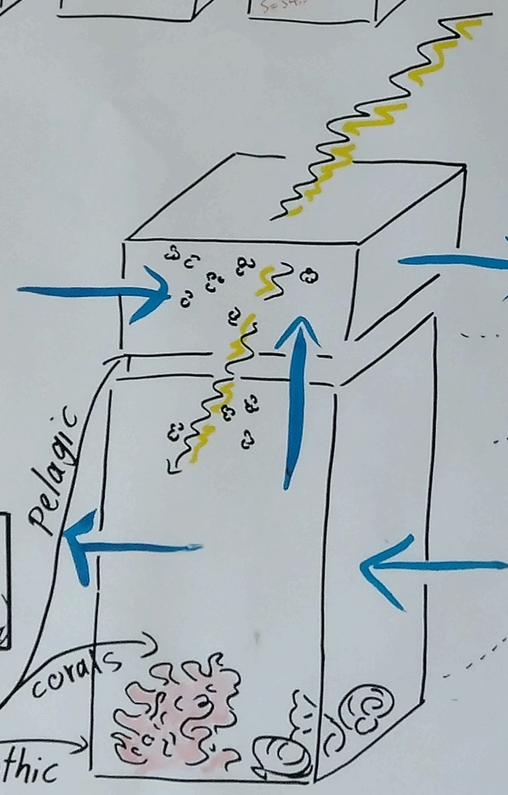
3. MODEL SETUP:

- key variables of interest: dissolved inorganic carbon (DIC) and total alkalinity (TA)
- simple physics describing water flow
→ based on water and salt balance, with prescribed salinity in each box

$$Q_{out(i,1)} = Q_{up(i,2)} + Q_{in(i,1)}$$

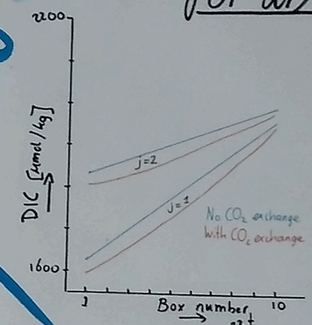
$$Q_{out(i,1)} S_{(i,1)} = Q_{up(i,2)} \cdot S_{(i,2)} + Q_{in(i,1)} \cdot S_{(i-1,1)} + E_{v_{(i,2)}} (S_{(i,2)} - S_{(i,1)})$$

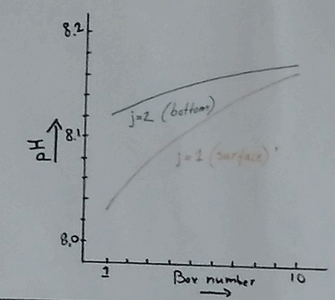
- functions describing processes affecting DIC and TA
→ CO_2 exchange
→ Biogenic calcification
→ Organic matter production

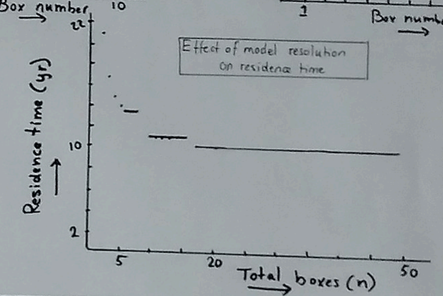


4. MODEL PERFORMANCE:

for abiotic ocean







5. WHAT WE NEED NOW:

Simple calcification formula's with separate dependence on temperature, light and CO_2 (Ω)

$$G_{pelagic} = PP \cdot f(\Omega)$$

$$G_{corals} = G_{max} \cdot f(light) \cdot f(°C) \cdot f(\Omega)$$

$$G_{molluscs} = G_{max} \cdot f(\Omega)$$

$$PP = Plankton\,growth_{max} \cdot f(°C) \cdot f(light)$$