

Using biogeochemical models to constrain ancient carbon fluxes

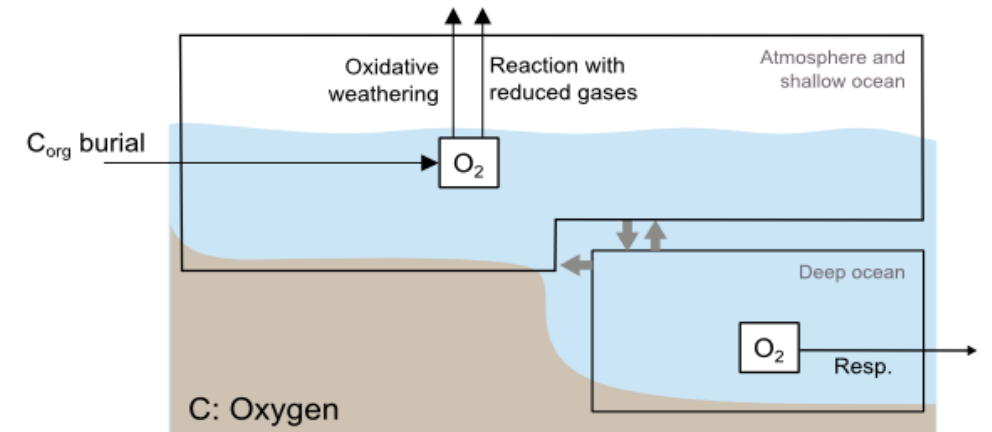
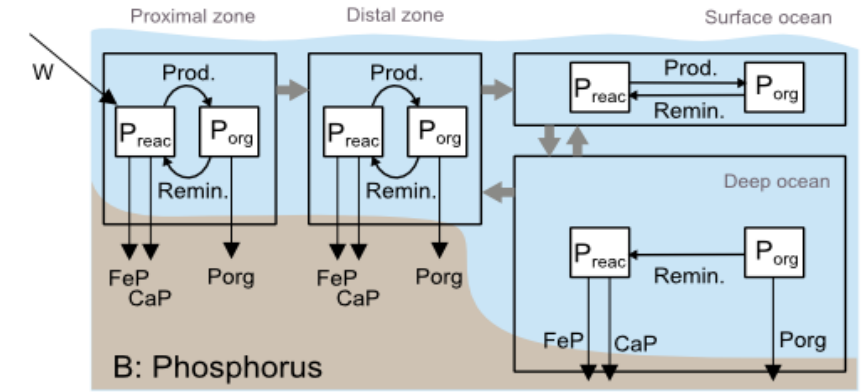
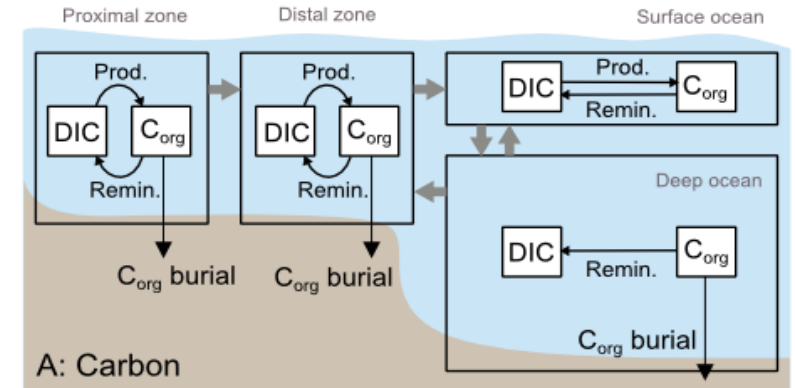
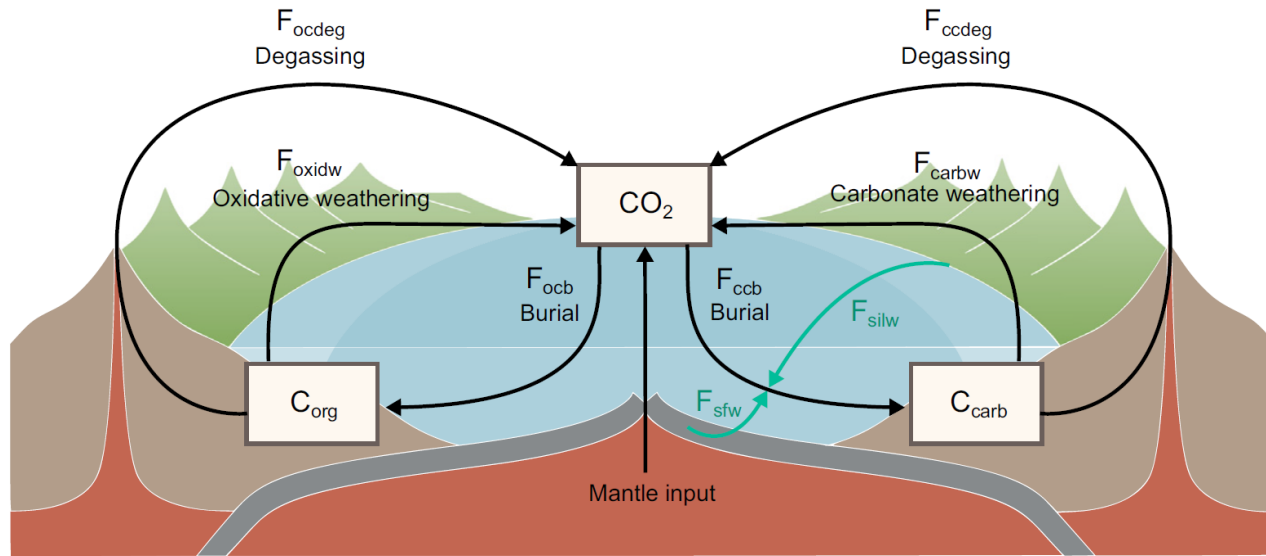
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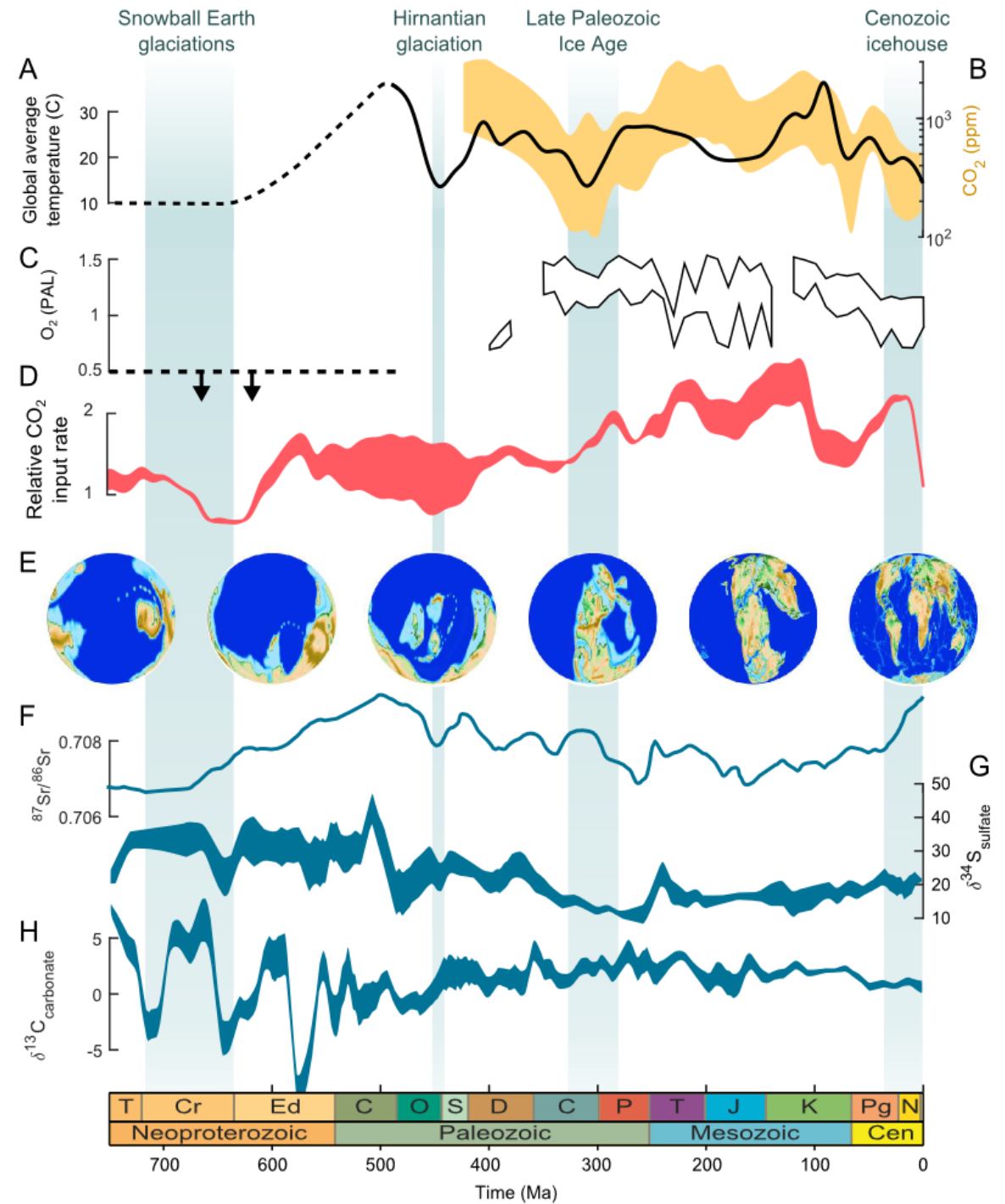
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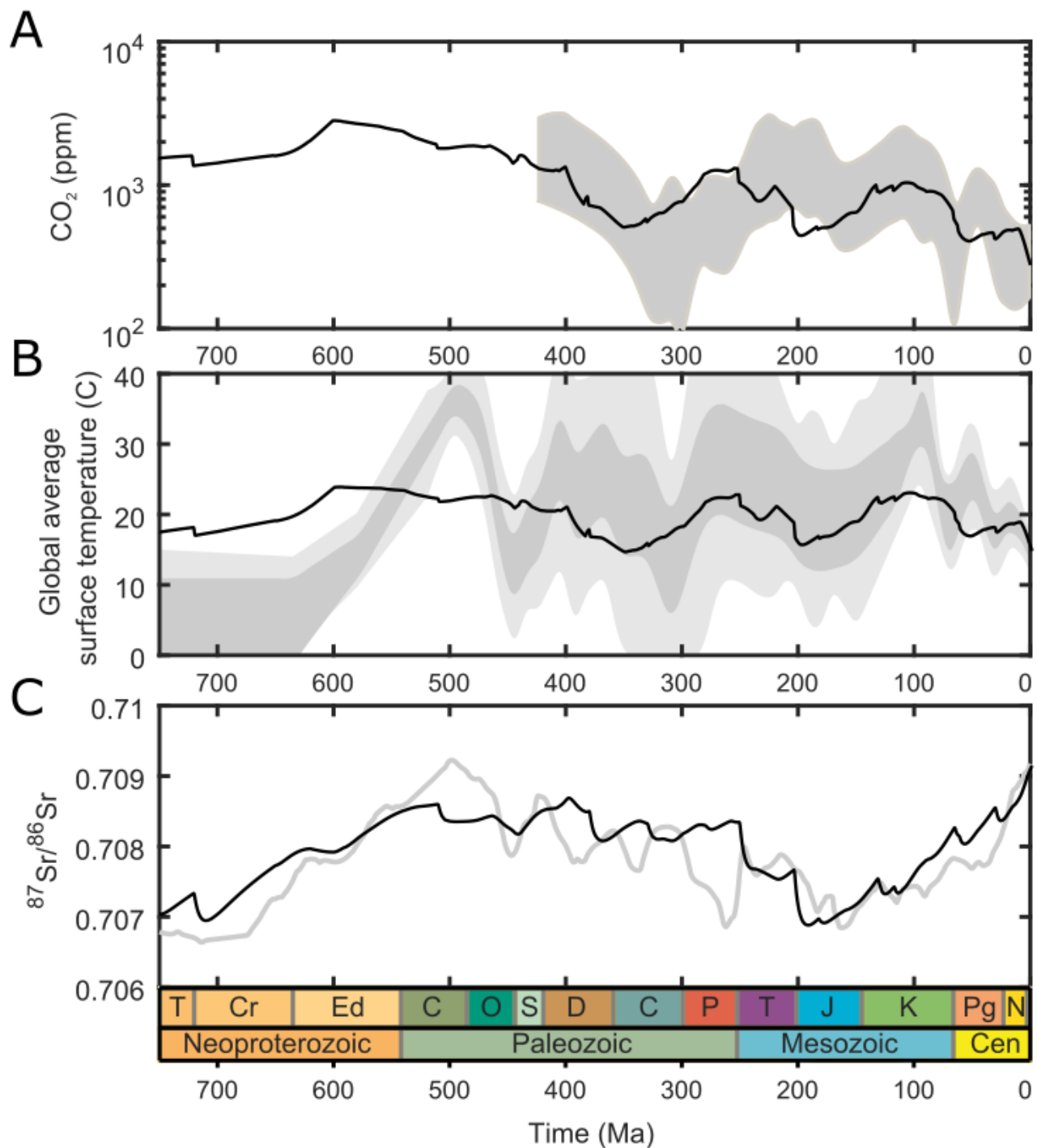
I make box models of global biogeochemistry, linked to the long term geological carbon, sulfur and oxygen cycles.



Models make predictions for atmosphere/ocean composition and also predict key geochemical records

Comparing model predictions to the geological record lets us test hypotheses, or reconstruct climate at times where proxy data is sparse.





Example:

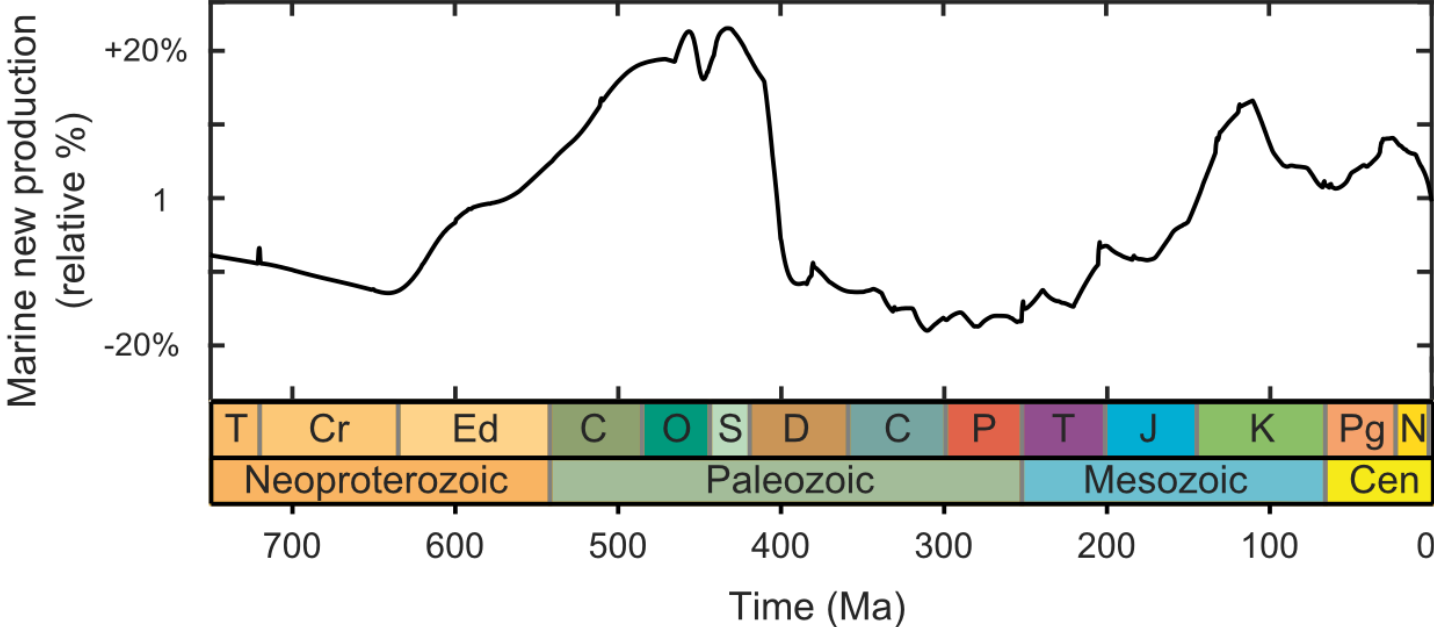
‘COPSE’ model predictions for climate and geochemistry

(also produces reasonable fits to $\delta^{13}\text{C}$, $\delta^{34}\text{S}$, $[\text{SO}_4]$)

Mills et al., 2019

Gondwana Research

Additional information: A warmer world may not mean more marine new production



Conclusions:

Deep-time warm climates may be poor analogues for future warming, because they are not driven entirely by excess CO₂ input, but a complex combination of changes to carbon sources and sinks.