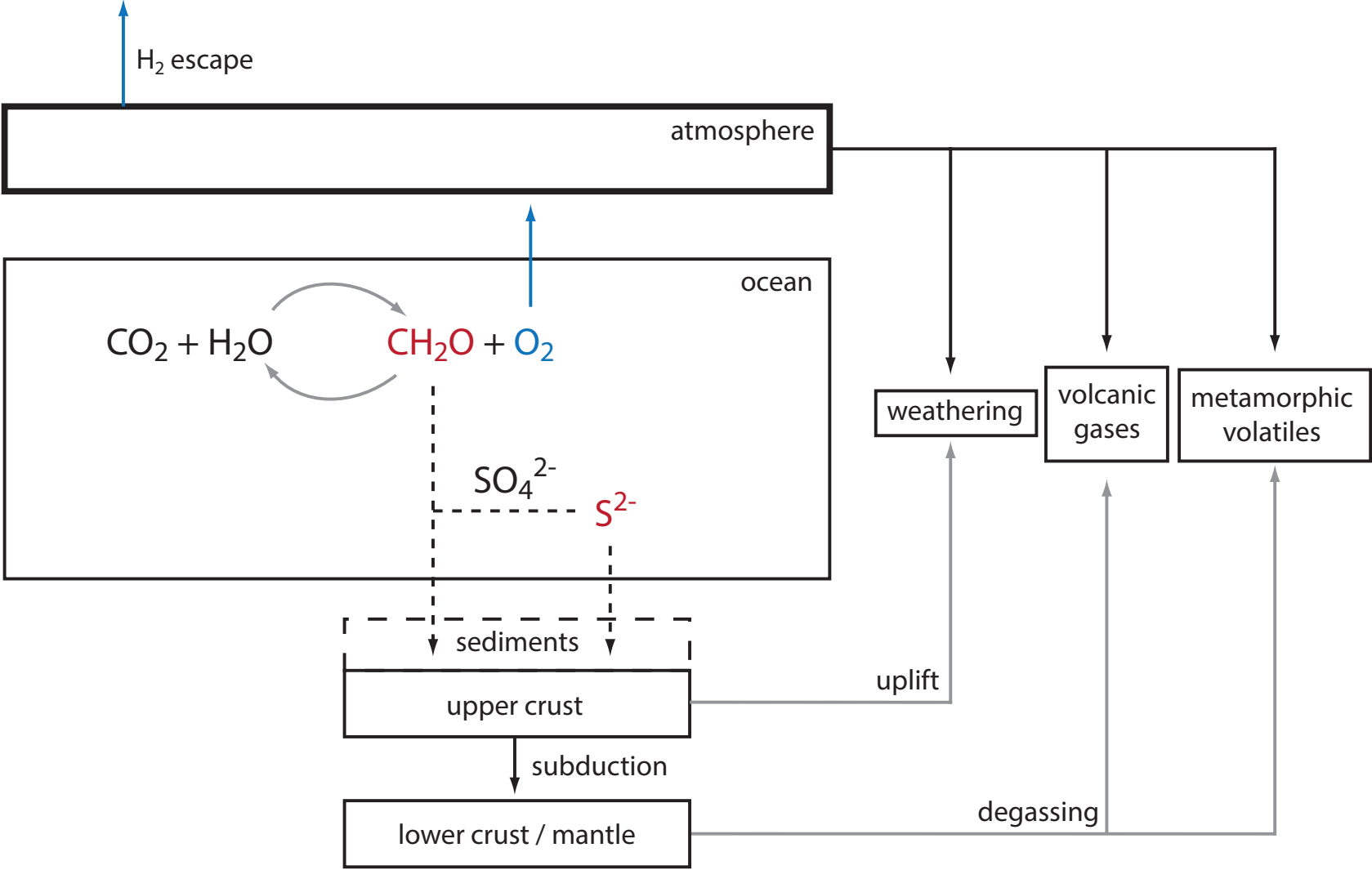


# stabilizing low pO<sub>2</sub>

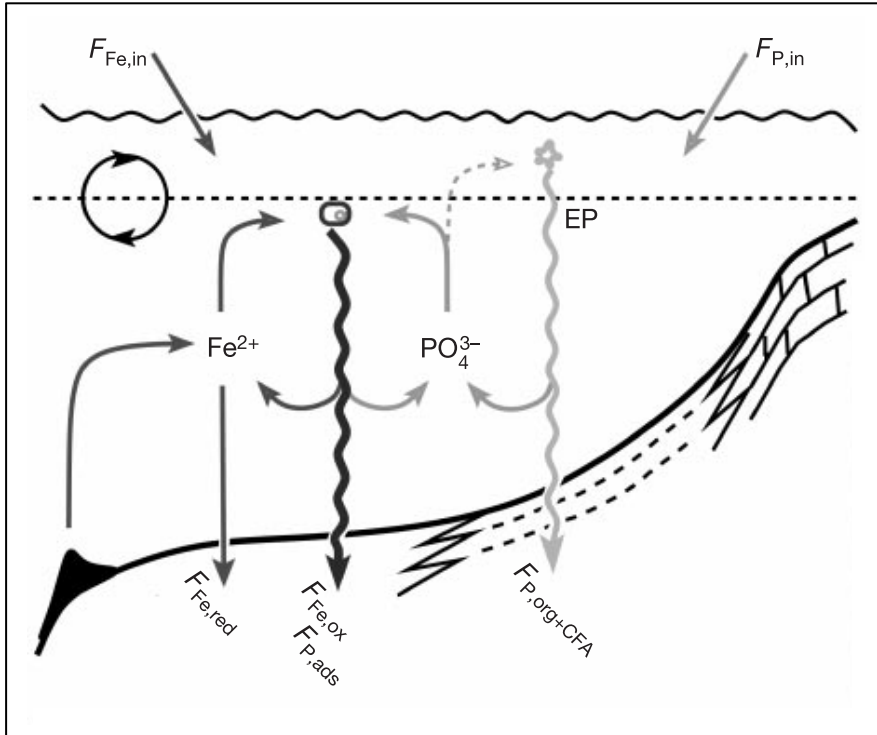
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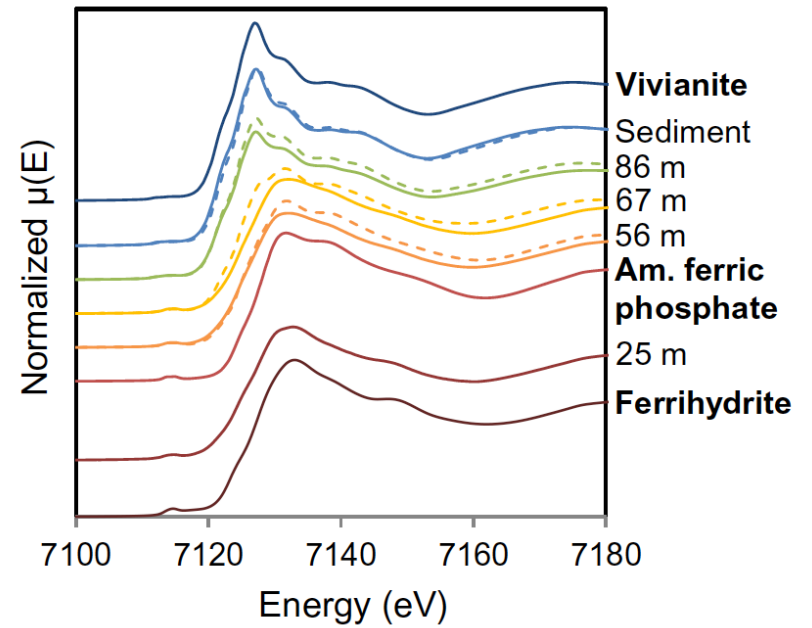
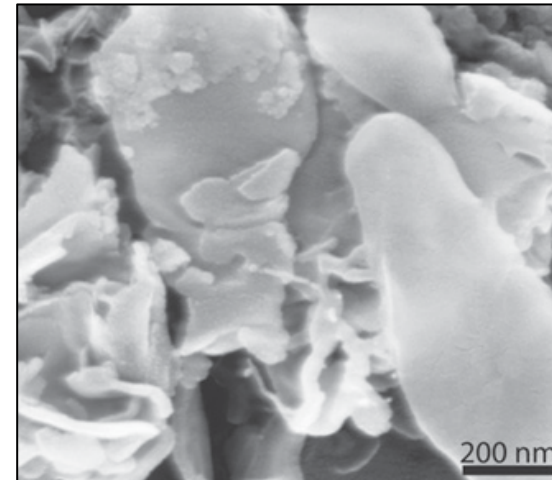
# stabilizing low $pO_2$



# stabilizing low $pO_2$

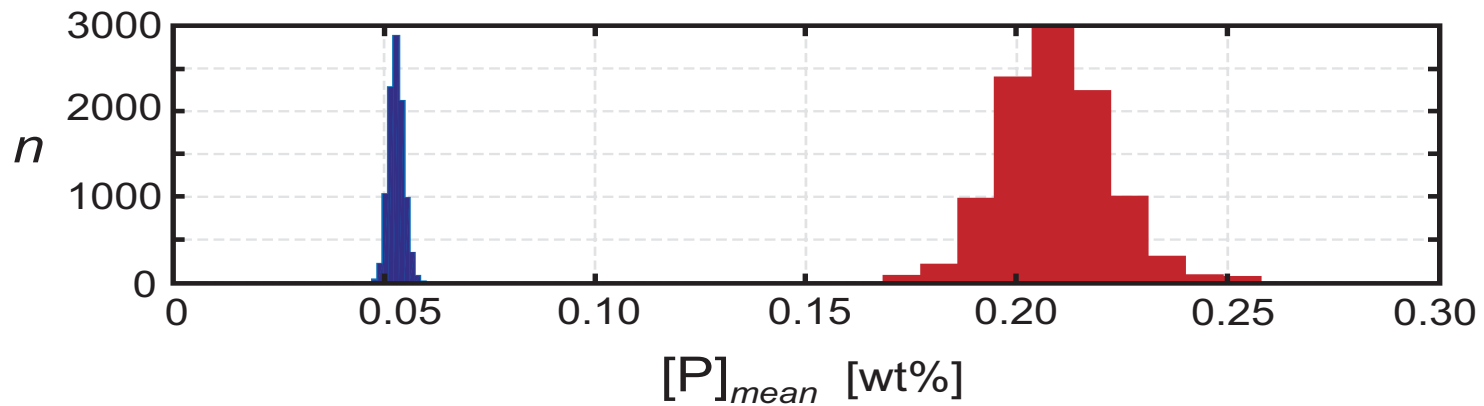
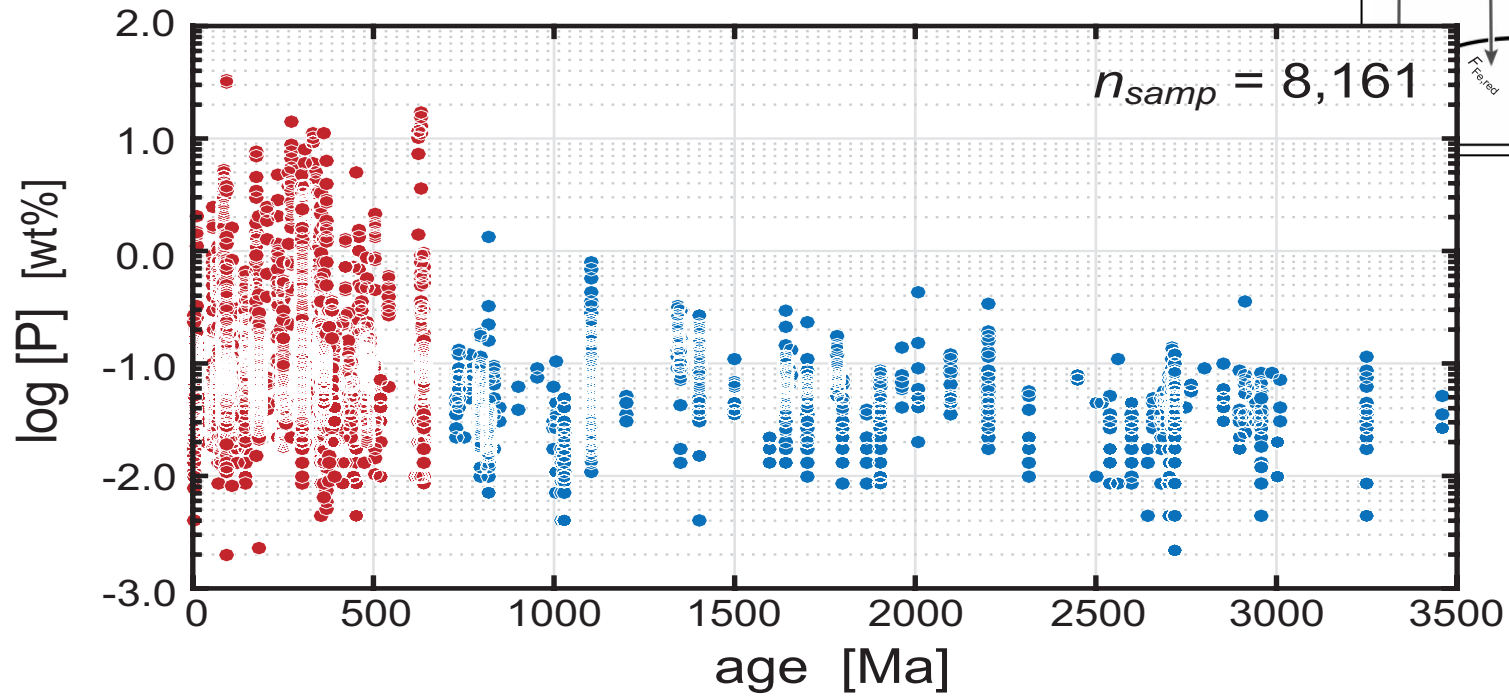
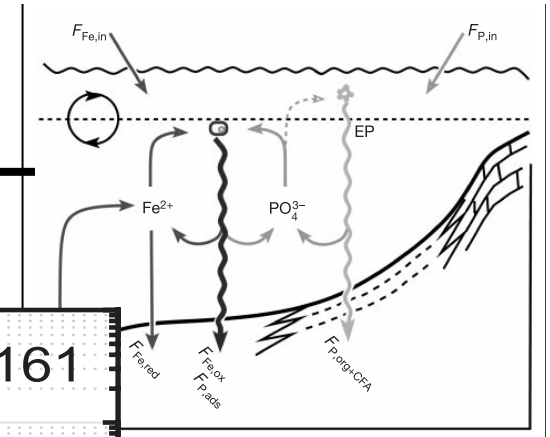


Bjerrum & Canfield [2002]



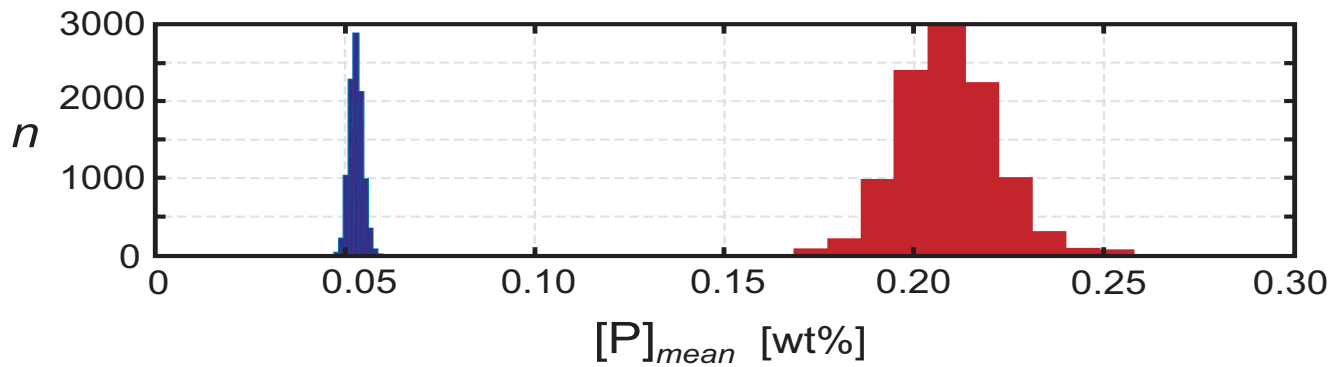
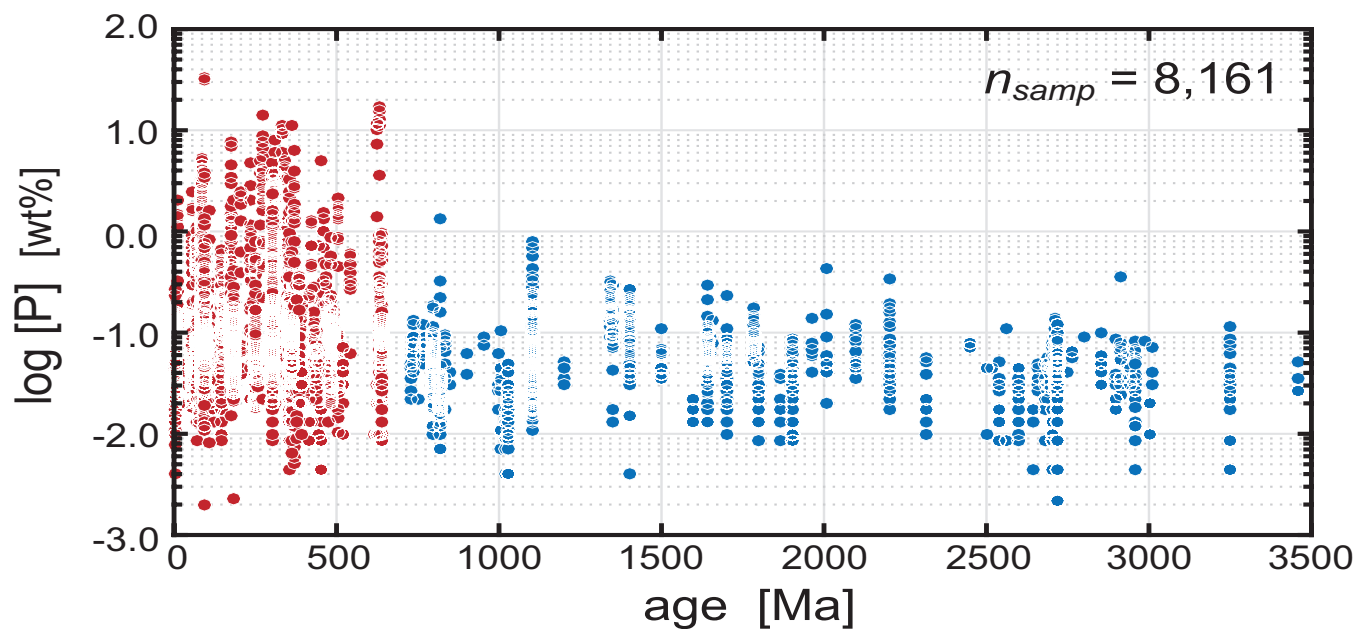
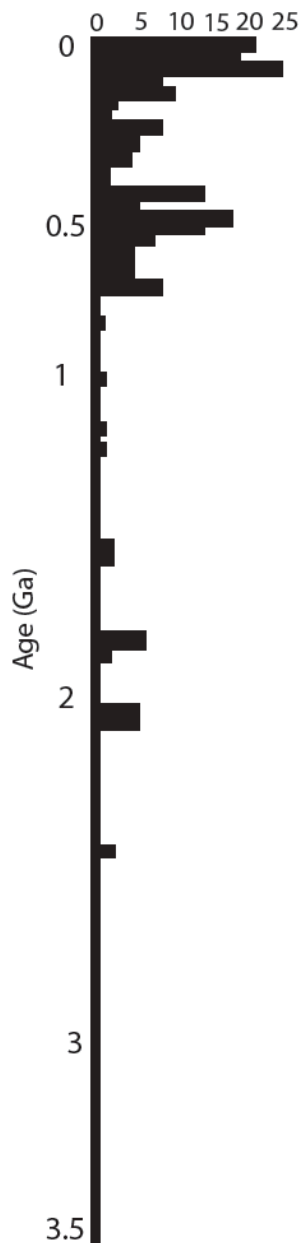
Zegeye et al. [2012]; Cosmidis et al. [2014]

# stabilizing low $pO_2$



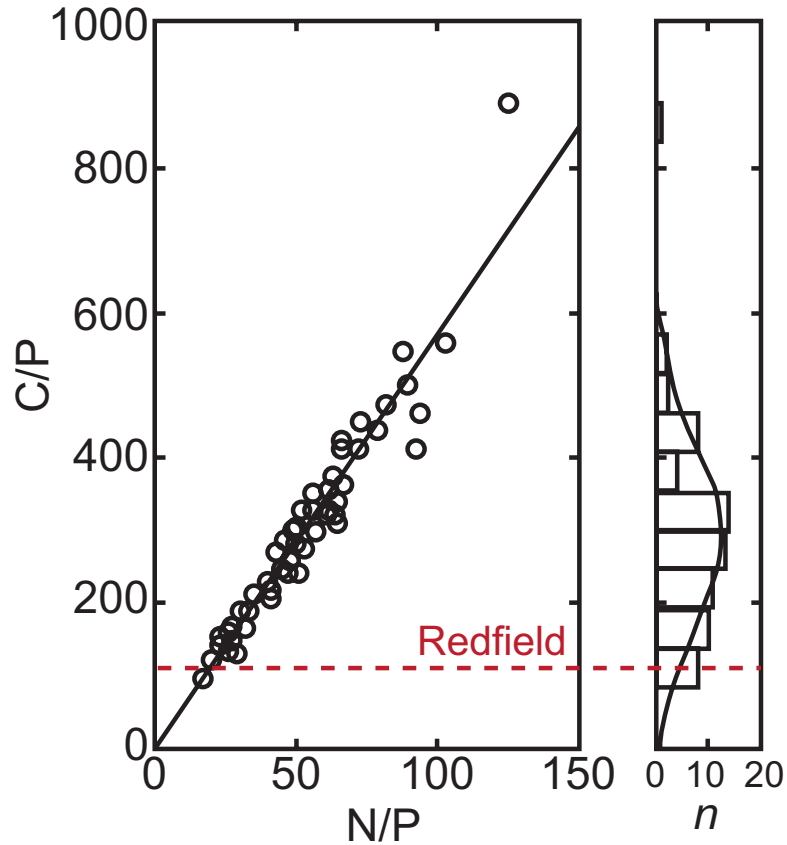
# stabilizing low $pO_2$

Phosphorite Occurrences



# stabilizing low $pO_2$

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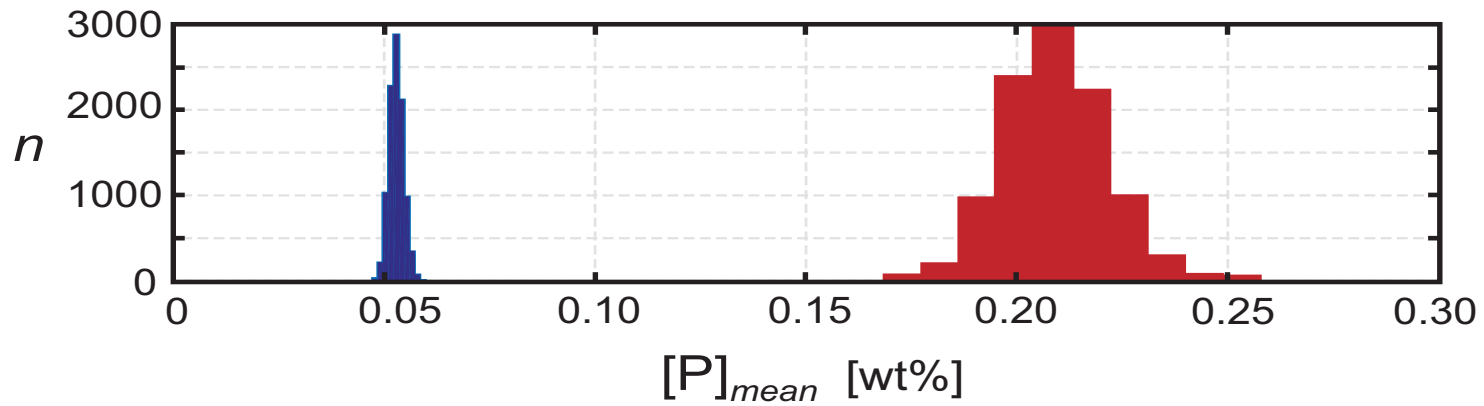
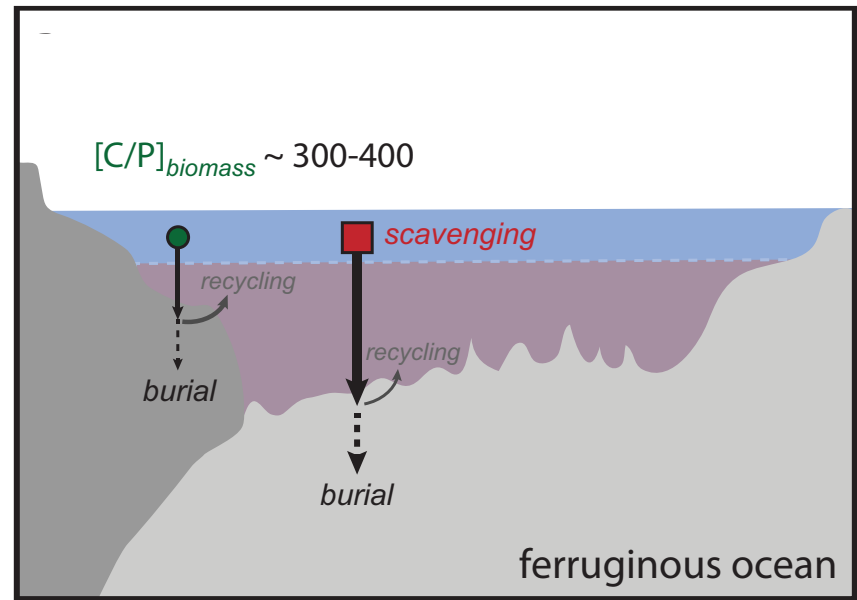
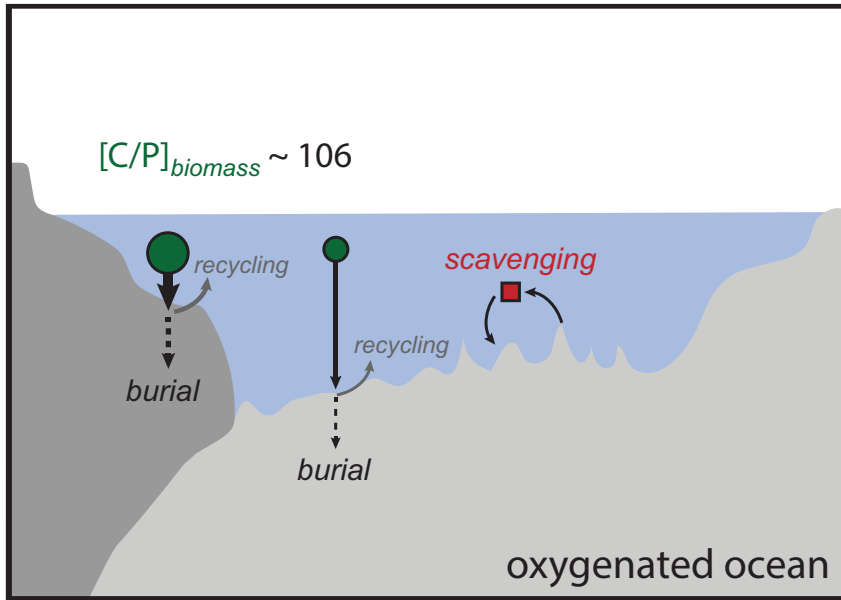
\* data from White et al. [2006]

bacterial photosynthesis dominant for the vast majority of Precambrian time

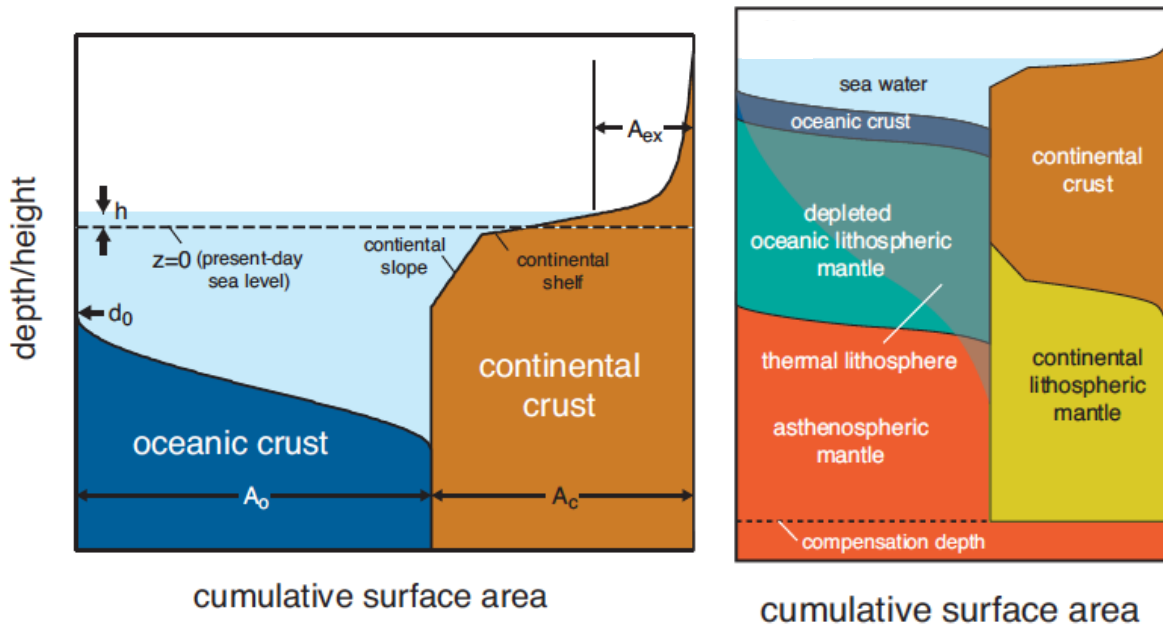
cyanobacteria show dramatic plasticity in growth status and biomass C:P when growing under P-limited conditions

*Inhibited P burial in a nutrient stressed ocean*

# stabilizing low $pO_2$

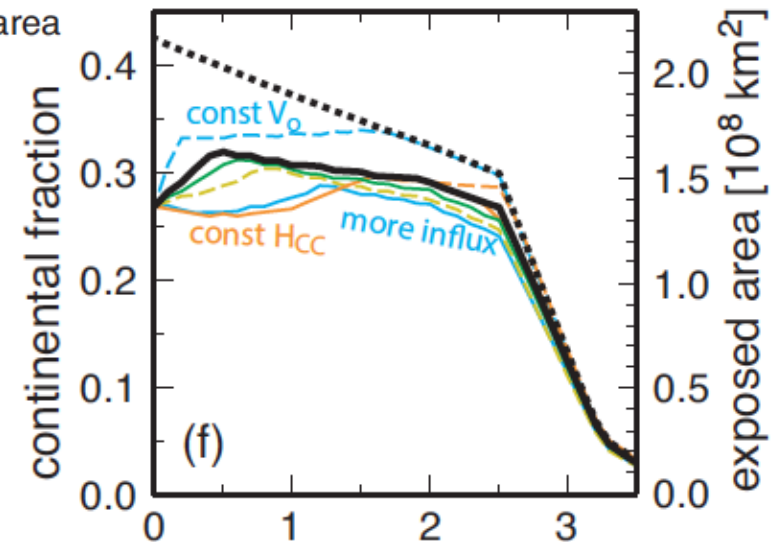


# stabilizing low $pO_2$



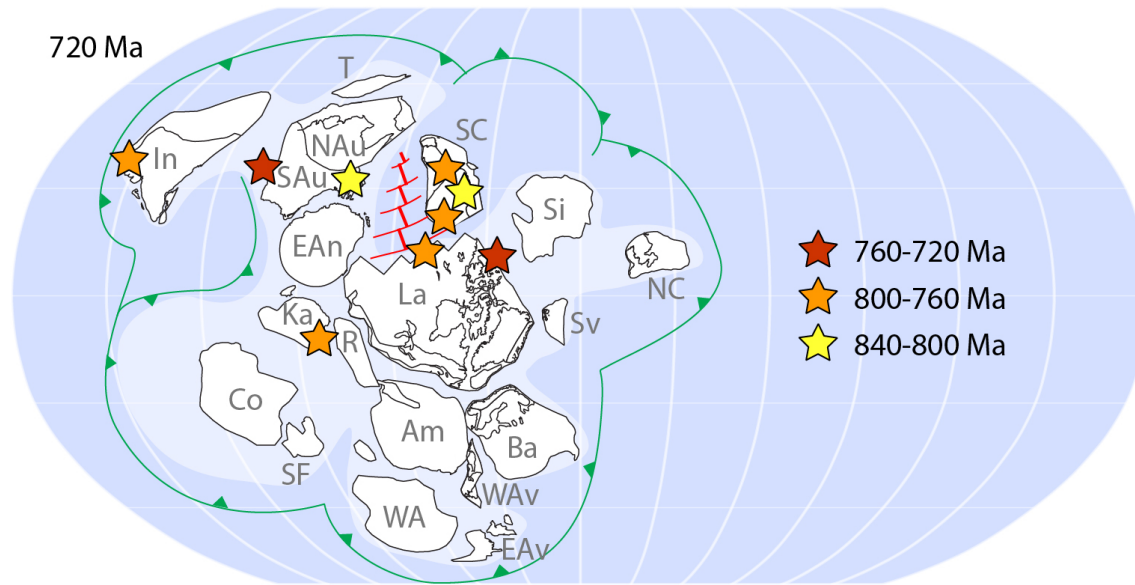
*No evidence for tectonic drivers of atmospheric oxygenation*

- Freeboard modeling from 'first principles' and geologic constraints assuming the operation of plate tectonics from 3.5 Ga.
- Includes the secular evolution of continental lithospheric mantle, in contrast to previous work.

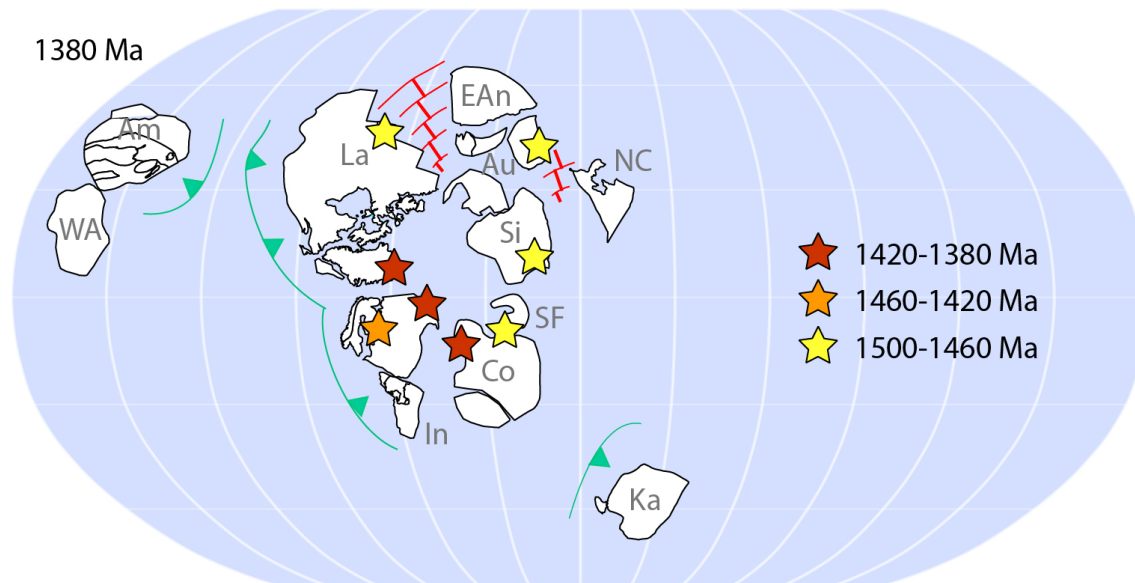




# stabilizing low $pO_2$



*Tectonic Drivers of Atmospheric Oxygenation?*



*Paleogeography? Igneous Events?*