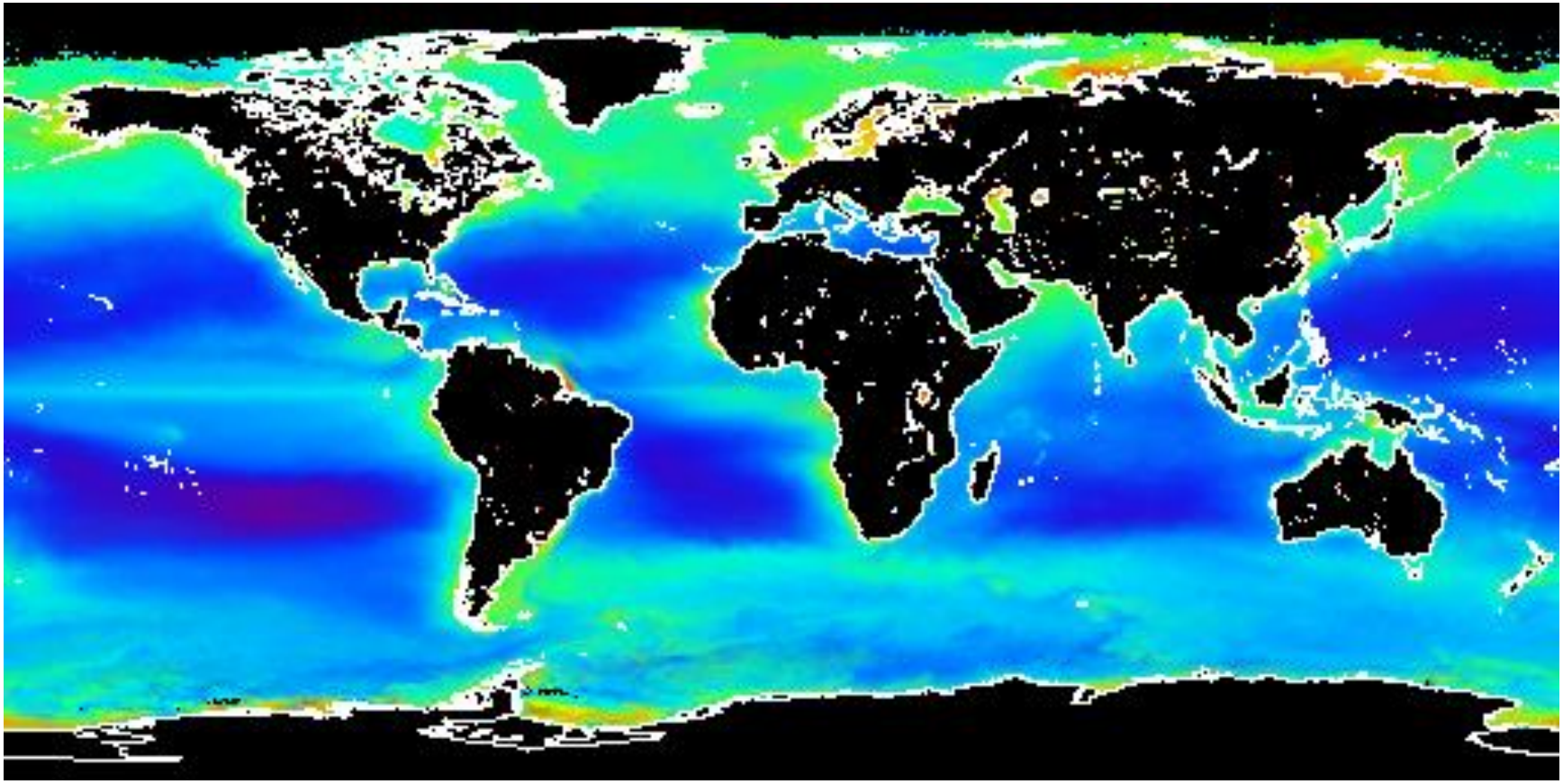
Marine Productivity

Global map of ocean color from SEAWIFS satellite chlorophyll →phytoplankton (where the nutrients are)

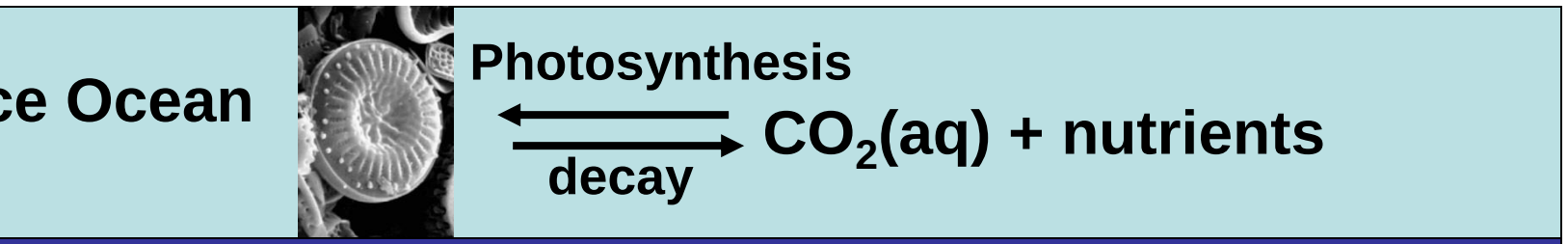
remember upwelling and convection?



Marine Biosphere Organic Carbon Cycle

Marine Organic C Cycle

$CO_2(g)$



Marine Organic C Cycle

$CO_2(g)$

Surface Ocean

Photosynthesis

$CO_2(aq)$ + nutrients

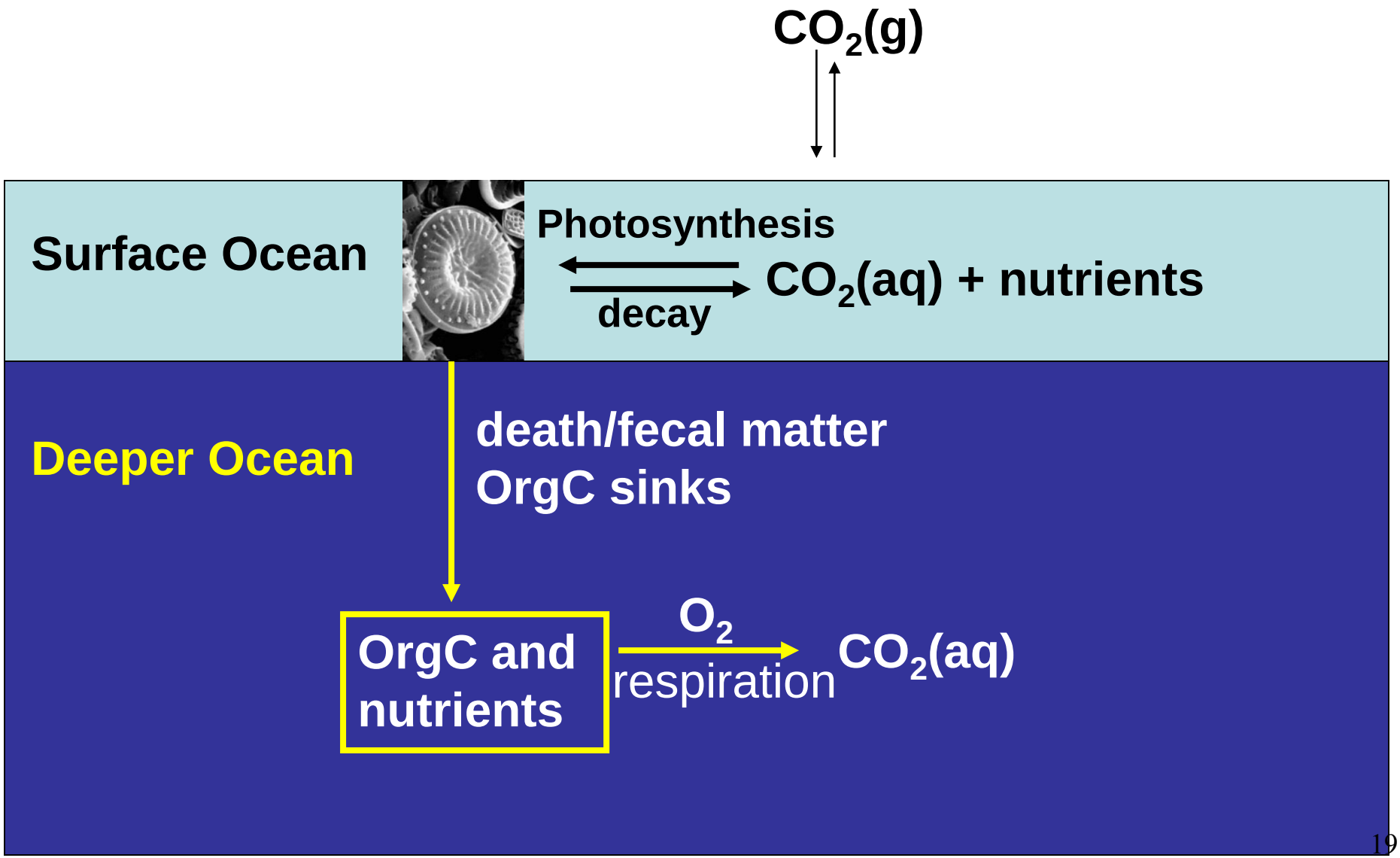
decay

Deeper Ocean

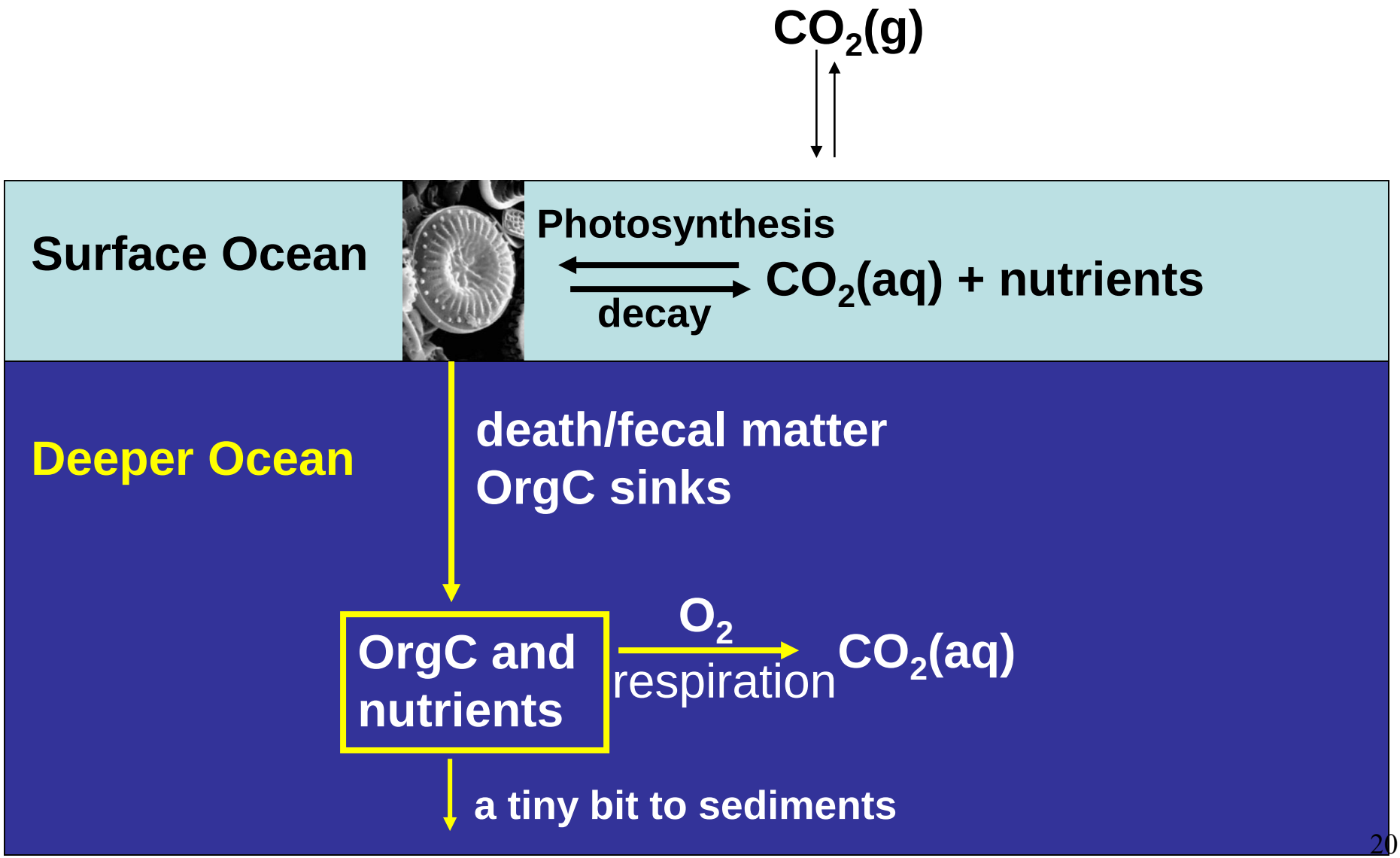
death/fecal matter
OrgC sinks

OrgC and nutrients

Marine Organic C Cycle



Marine Organic C Cycle

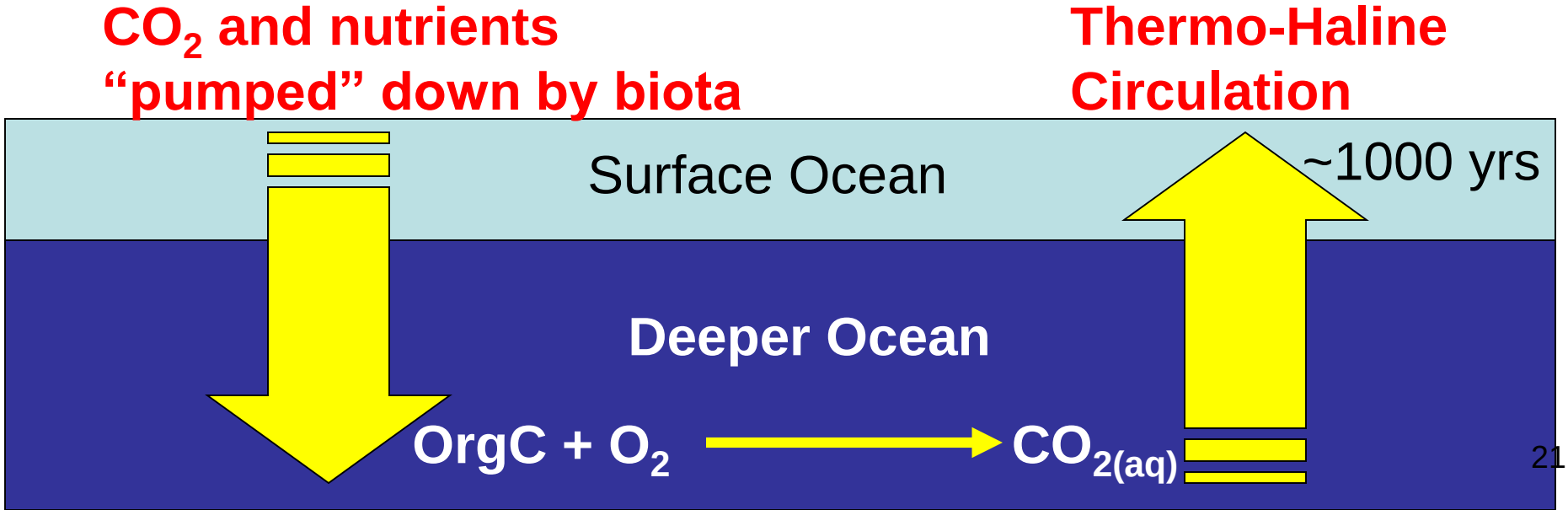


Marine Biological OrgC Pump: Key Points

1. Surface ***depleted*** (relatively) in C and nutrients

2. Deep ocean ***enriched*** in C and nutrients

3. Sinking of OrgC net pumps atm. CO_2 into ocean
–a net sink of CO_2 on ~1000 year timescale



Poll Question

Suppose global T decreases. This cooling leads to less precipitation (right?), less precipitation leads to drier soils and thus more windblown soil dust, which contains, Iron (Fe), a critical nutrient for phytoplankton.

When poll is active, respond at **PollEv.com/joelathornto254**

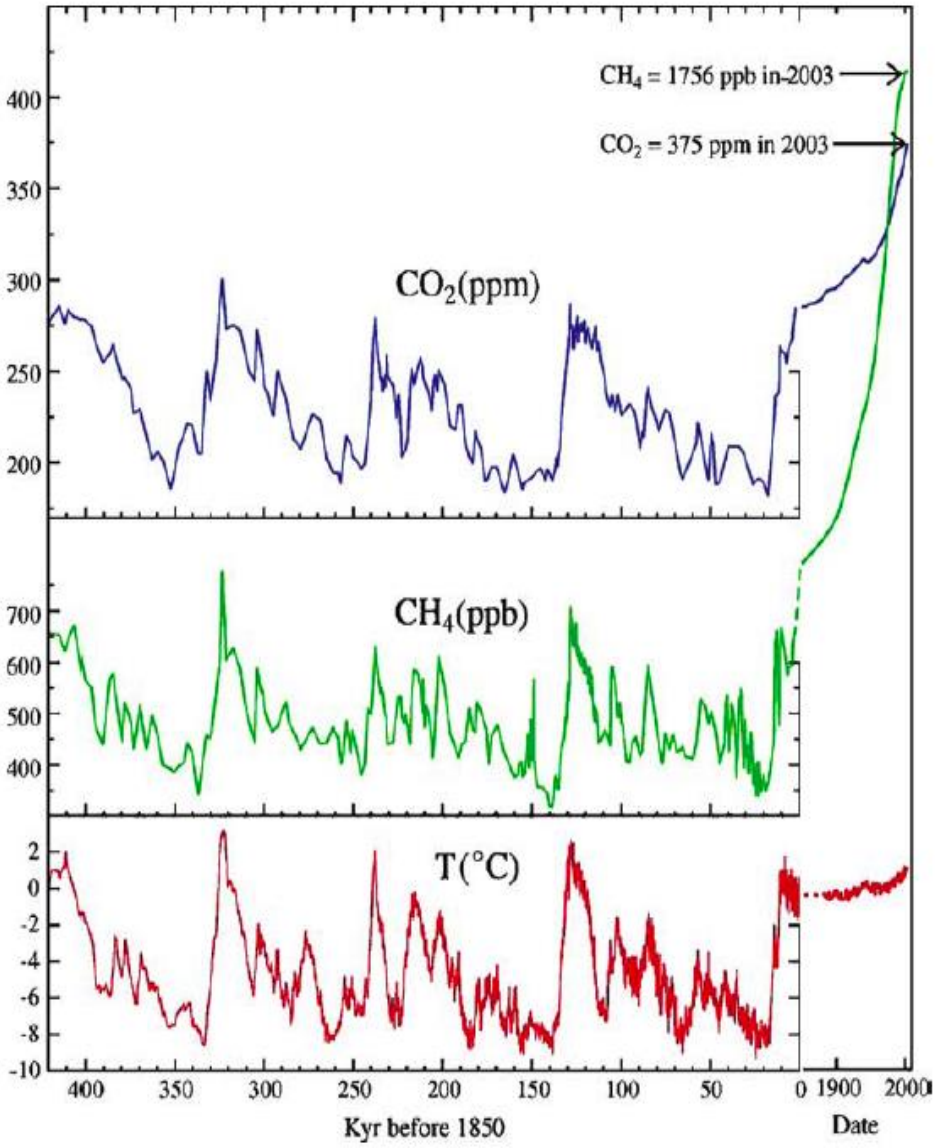
Text **JOELATHORNTO254** to **22333** once to join

The biological pump causes a positive feedback

The biological pump causes a negative feedback

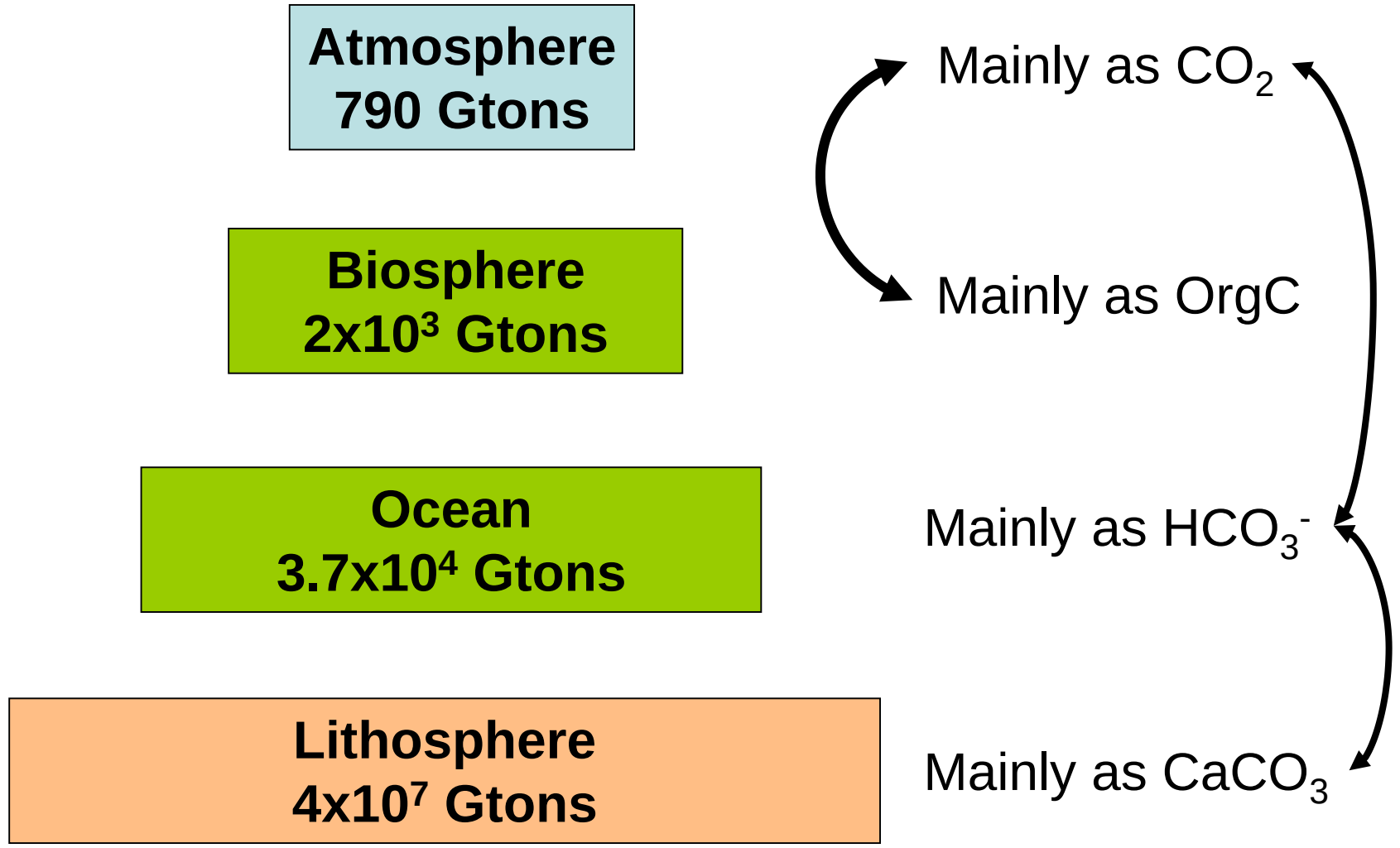
Total Results: 0

Slow Carbon Cycles



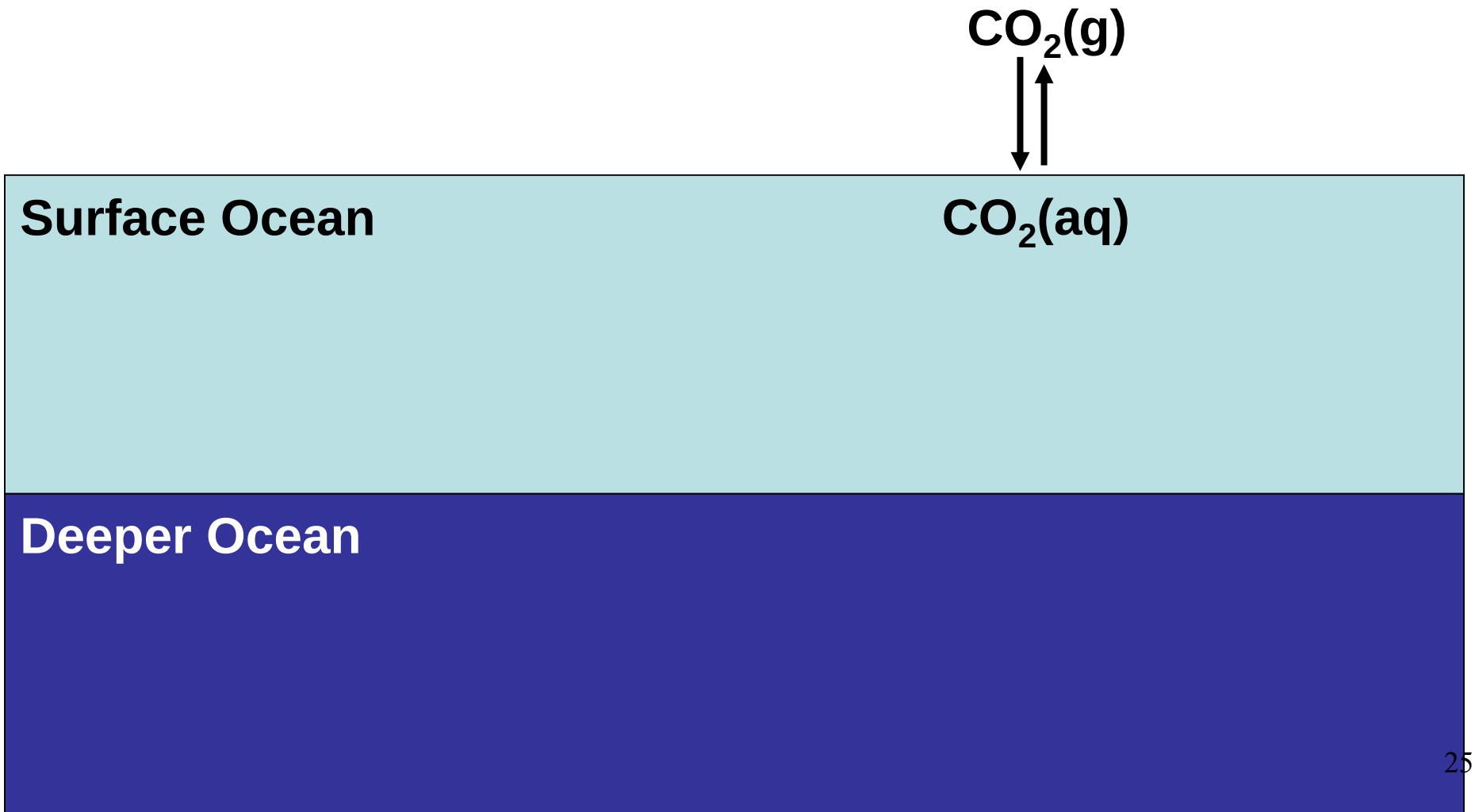
Large (but slow) natural changes carbon

Reservoirs of Carbon

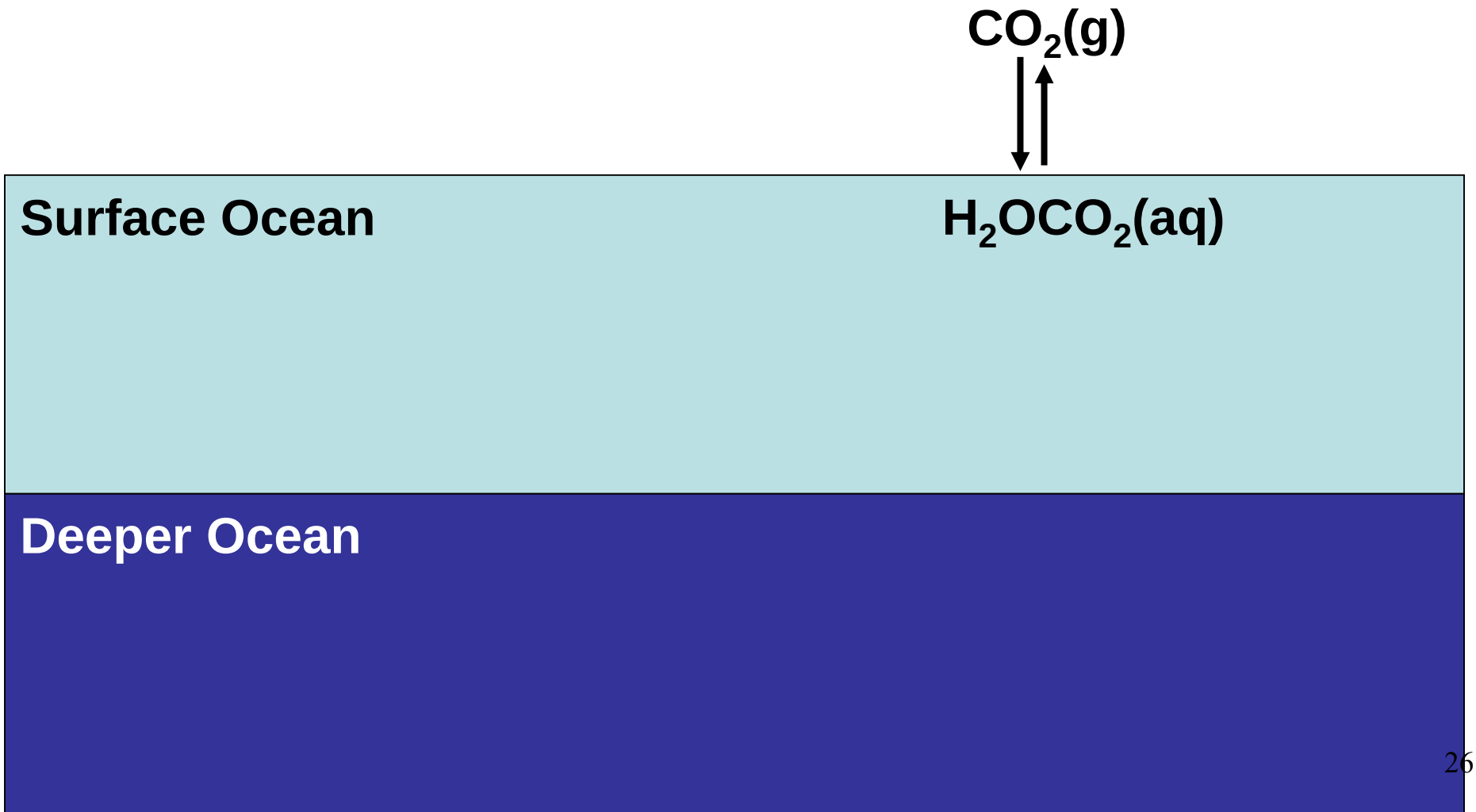


Carbon in the atmosphere and oceans mostly *inorganic*

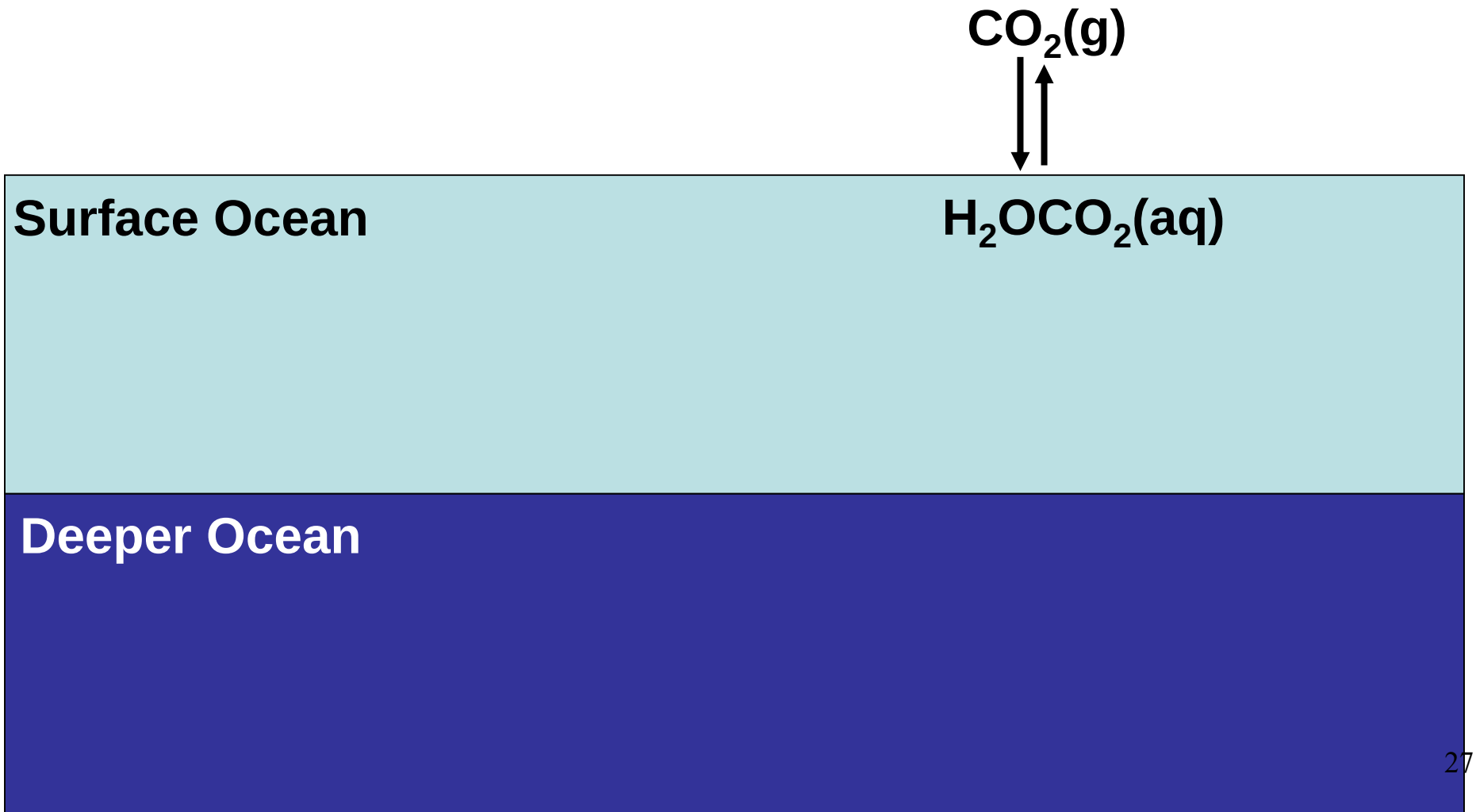
CO_2 Dissolution Into Ocean Water



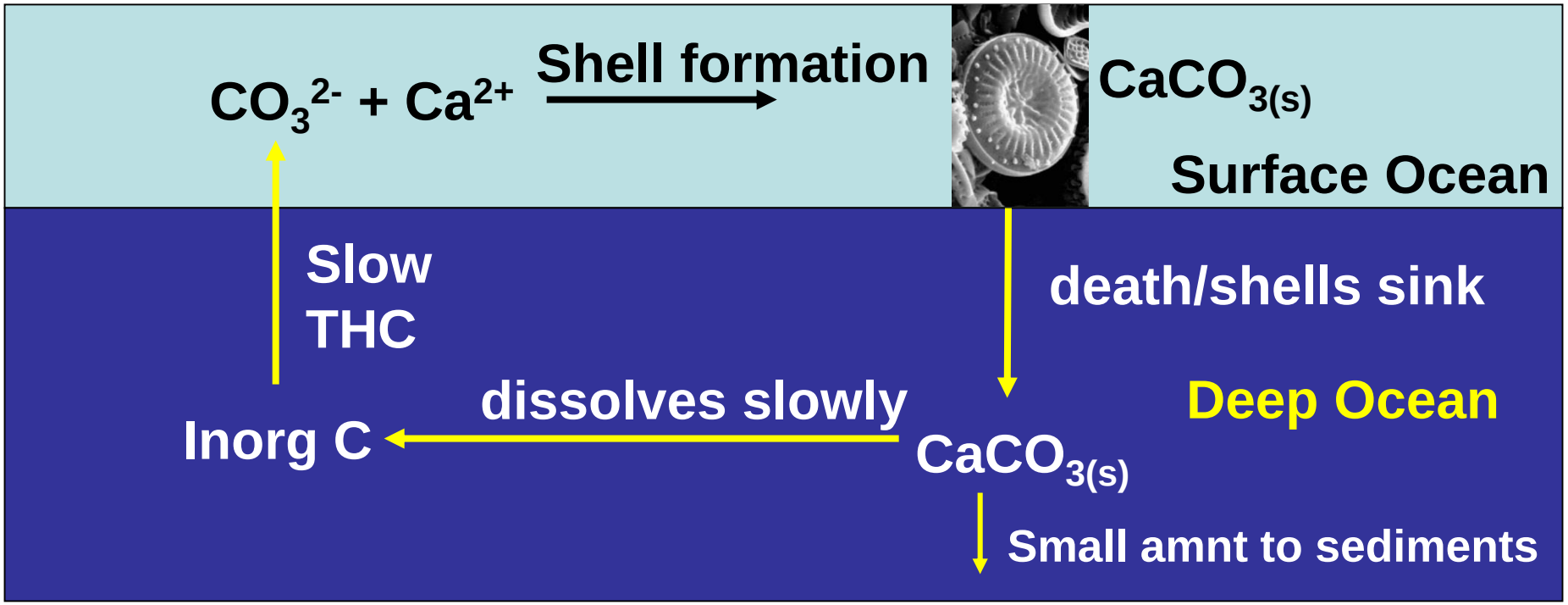
CO_2 Dissolution Into Ocean Water



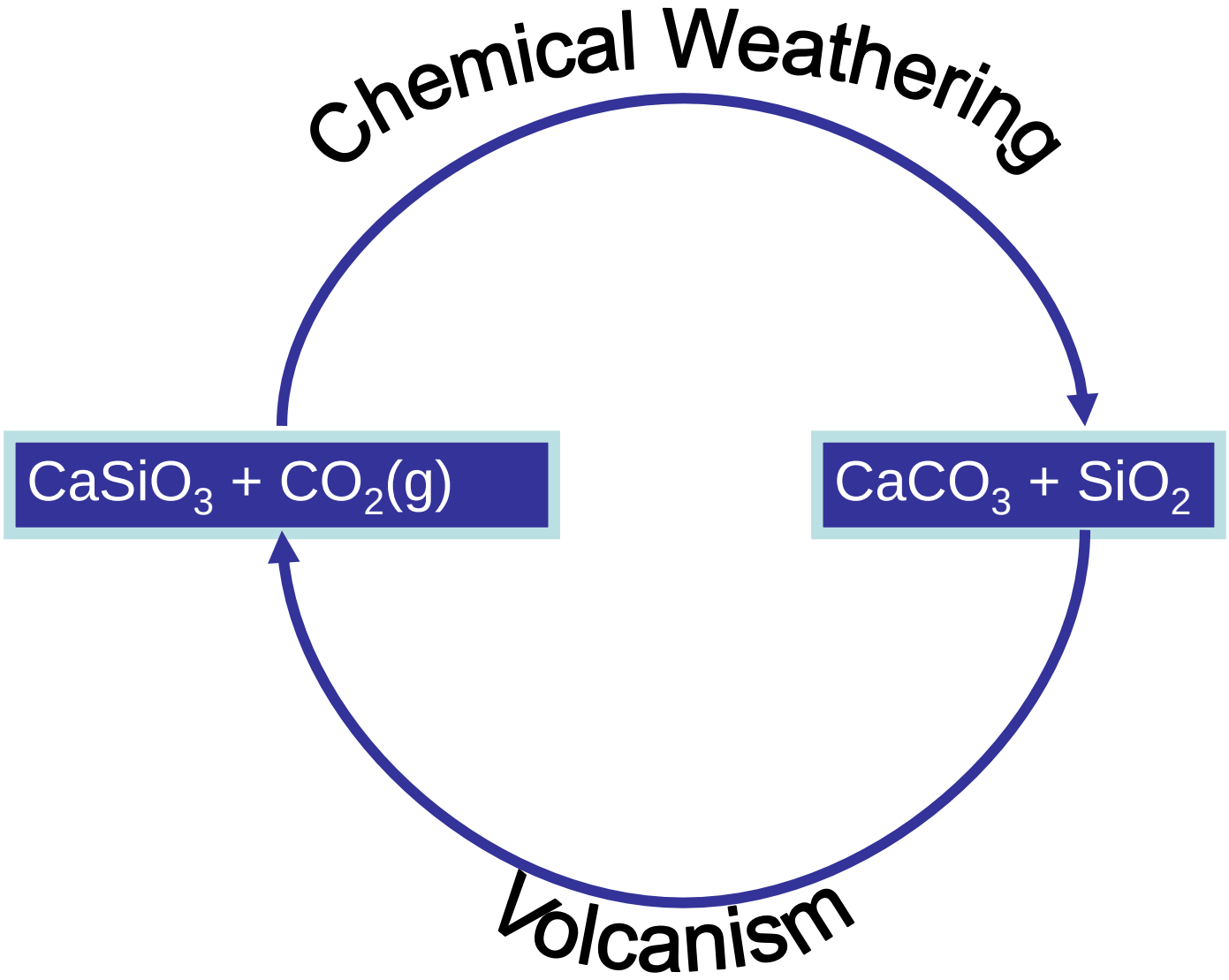
CO_2 Dissolution Into Ocean Water



Shell Formation (A Short-term InorgC Cycle)



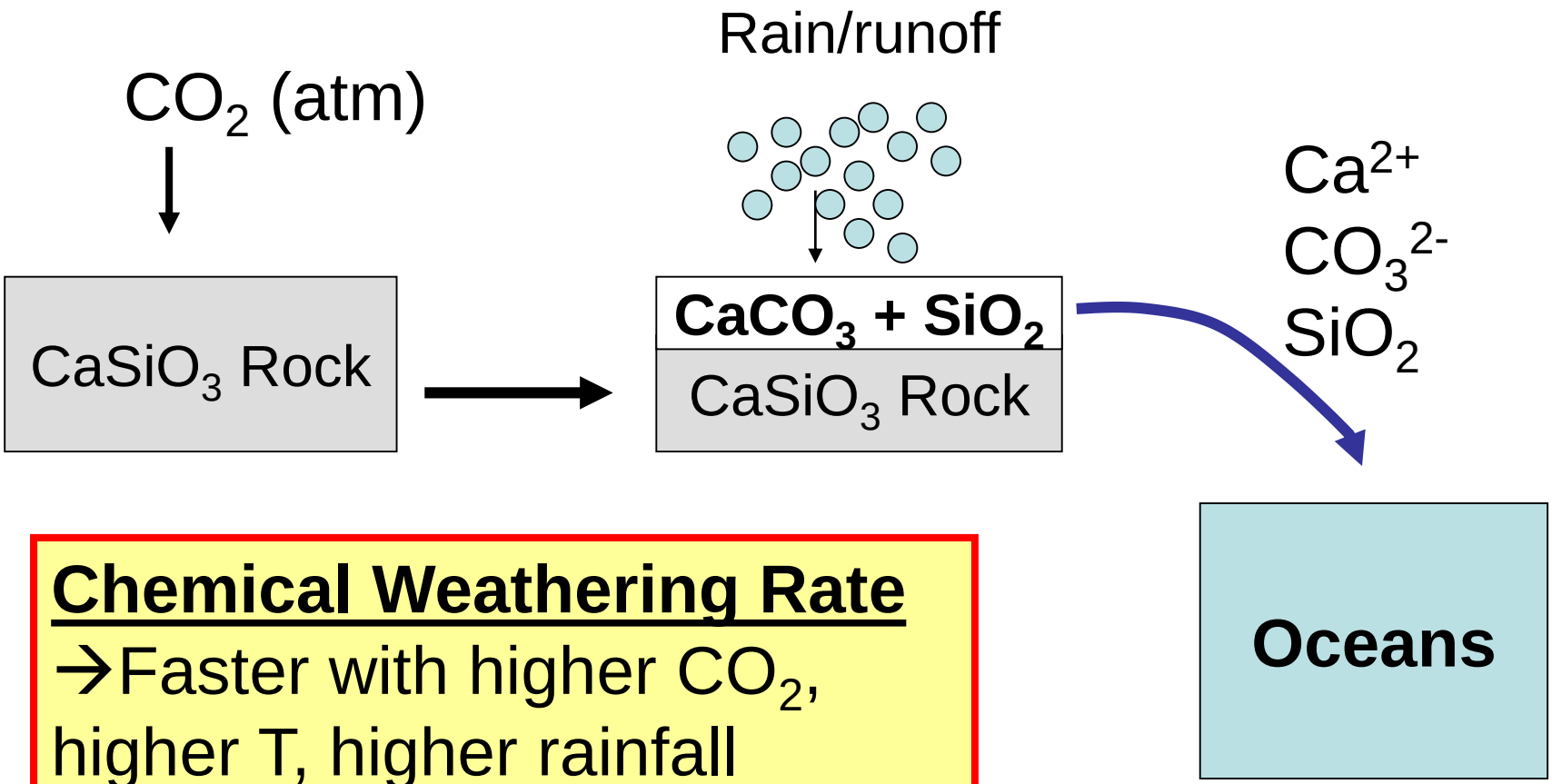
The "Ultimate" InorgC Cycle



Weathering and Volcanism: Rocks Do Chemistry

Example of Weathering ($CaCO_3$ dissolution)

Silicate Weathering (simplified)



Chemical Weathering Rate

→Faster with higher CO_2, higher T, higher rainfall