

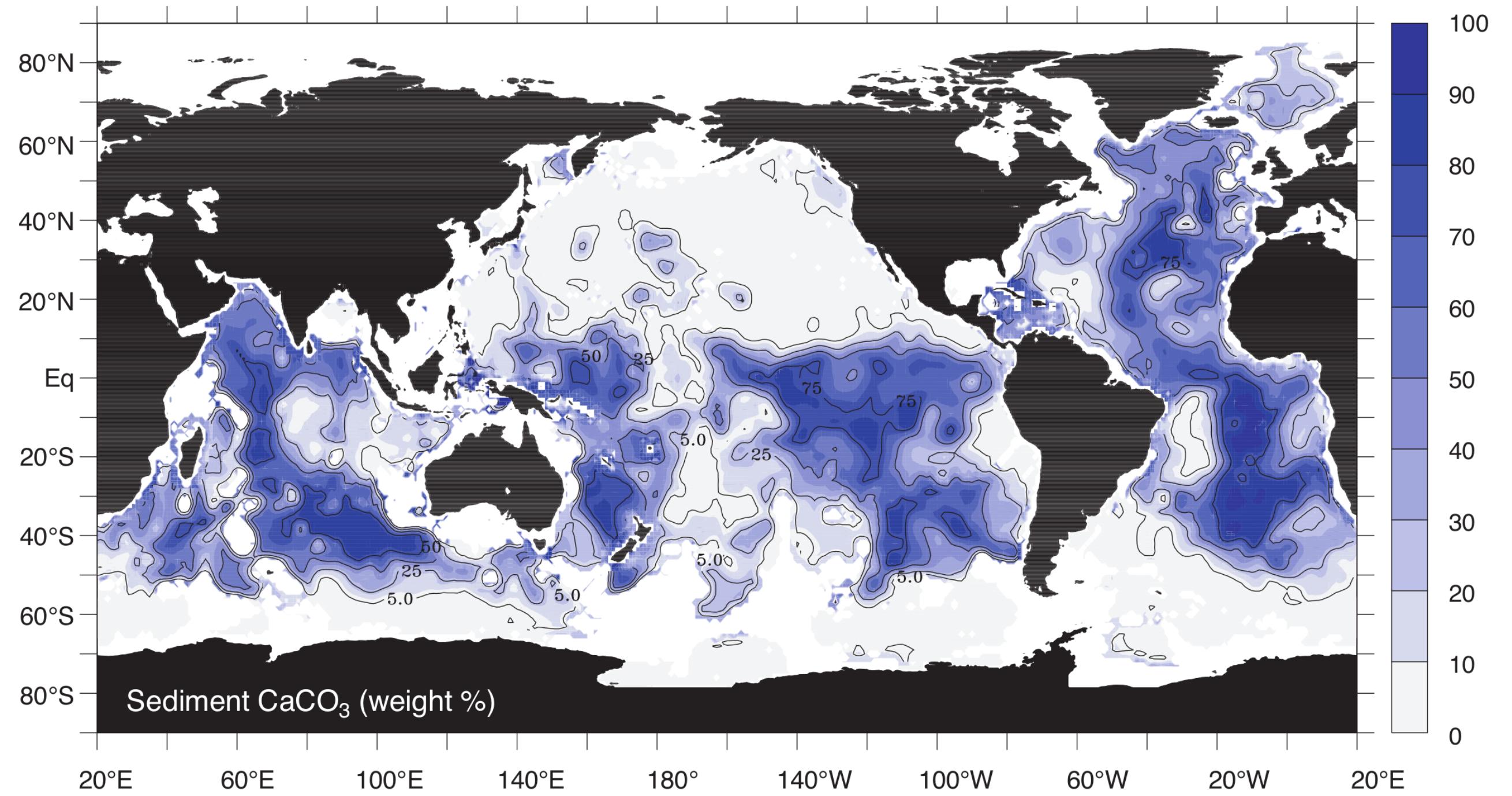


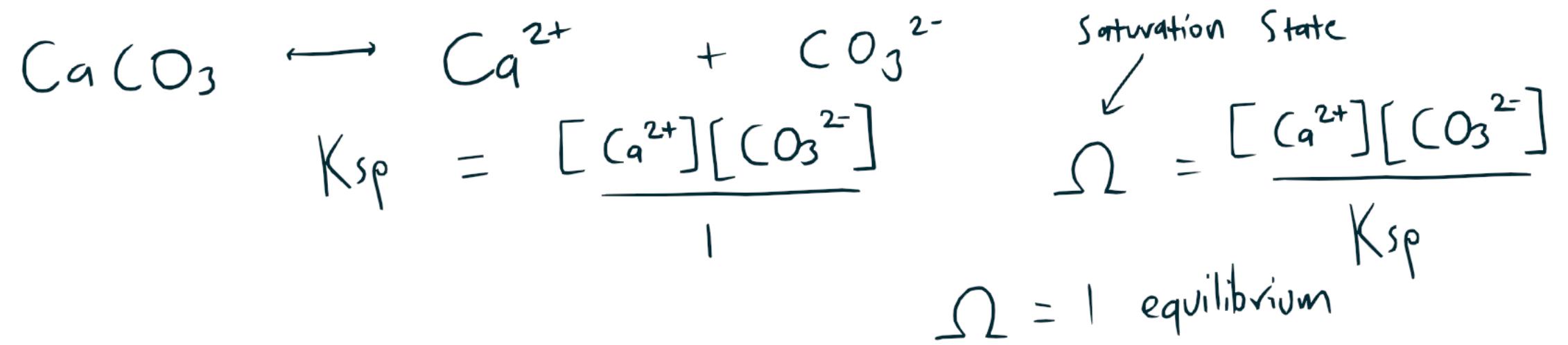
Lecture 20: CaCO₃ saturation

1. CaCO₃ Saturation and compensation
 - A. Seafloor CaCO₃
 - B. Pressure and Temperature sensitivity of K_{sp}
 - C. [CO₃²⁻] and reactions that change it
 - D. Circulation
 - E. Compensation for Alkalinity source changes

We acknowledge and respect the lək'ənən peoples on whose traditional territory the university stands and the Songhees, Esquimalt and WSÁNEĆ peoples whose historical relationships with the land continue to this day.







$\Omega = 1$ equilibrium

$\Omega > 1$ super saturated (^{min} precipitates)

$\Omega < 1$ under saturated (^{min} dissolves)

calcite

$$K_{\text{sp}} = 10^{-6.37}$$

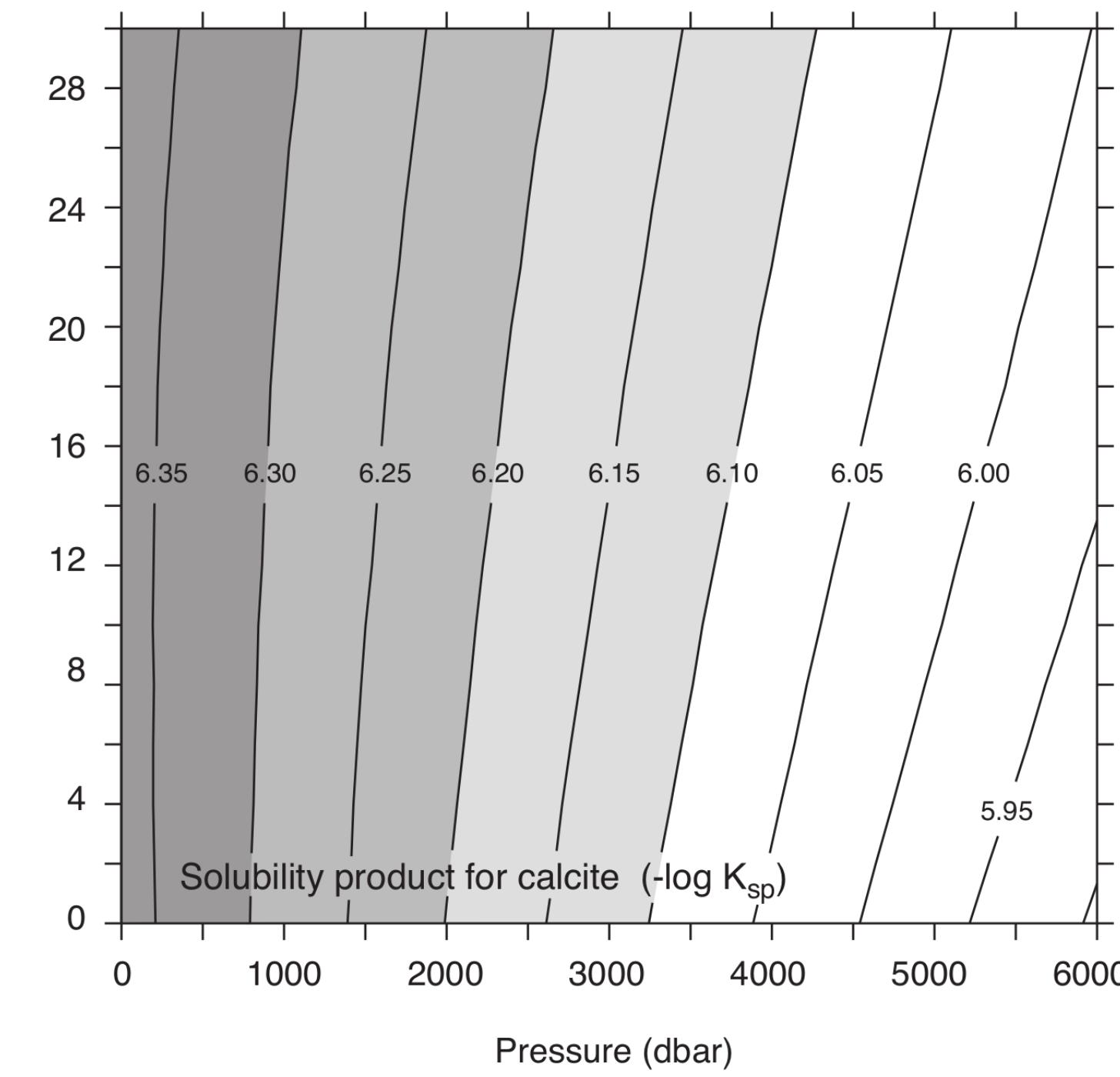
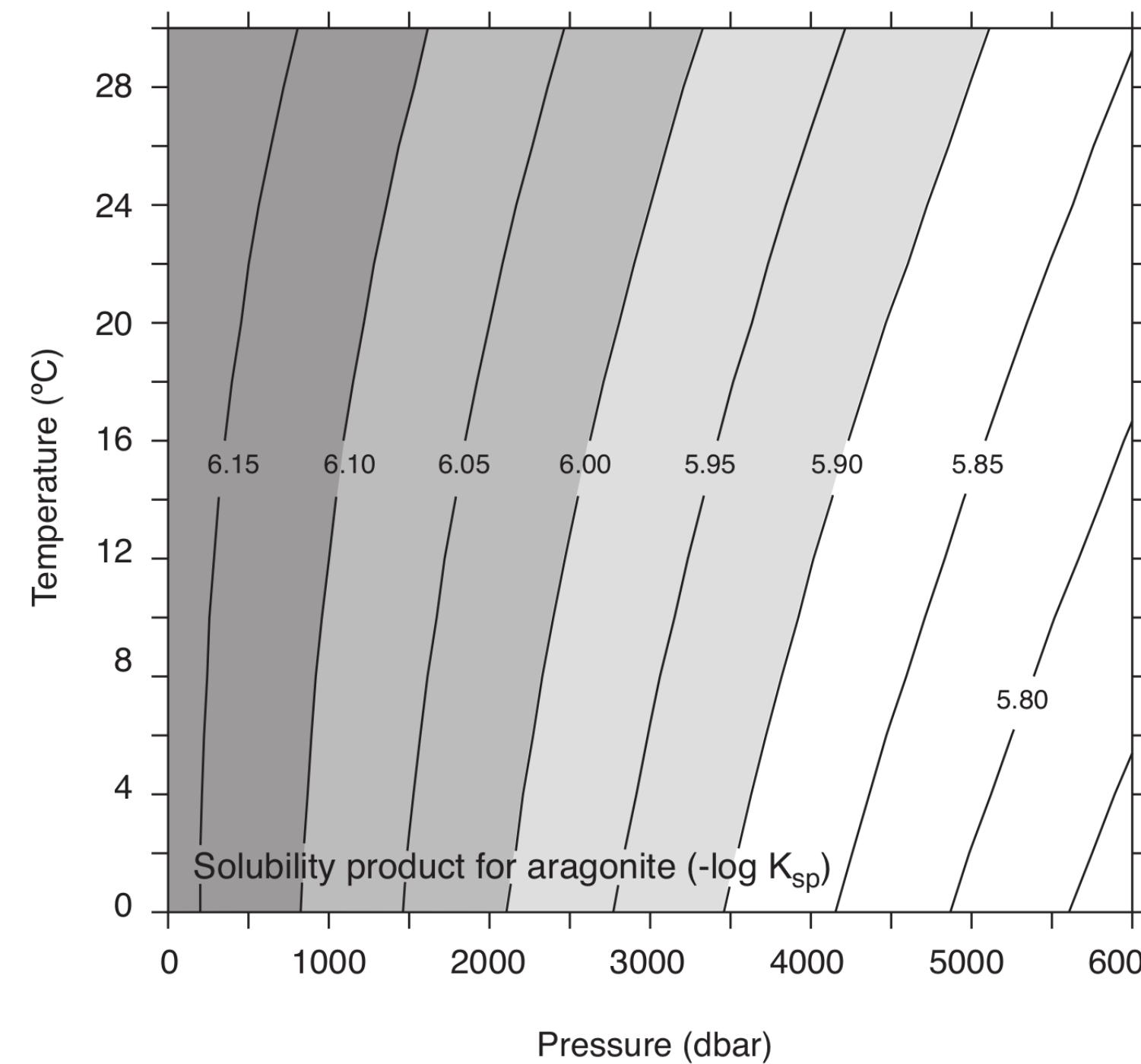
which mineral is more
soluble in seawater?

Aragonite

$$K_{\text{sp}} = 10^{-6.19}$$

*Aragonite higher
K_{sp} so "easier"
to dissolve.

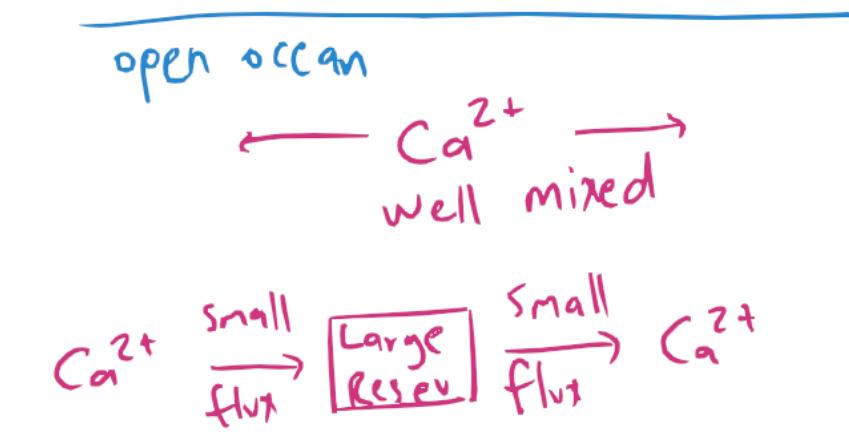




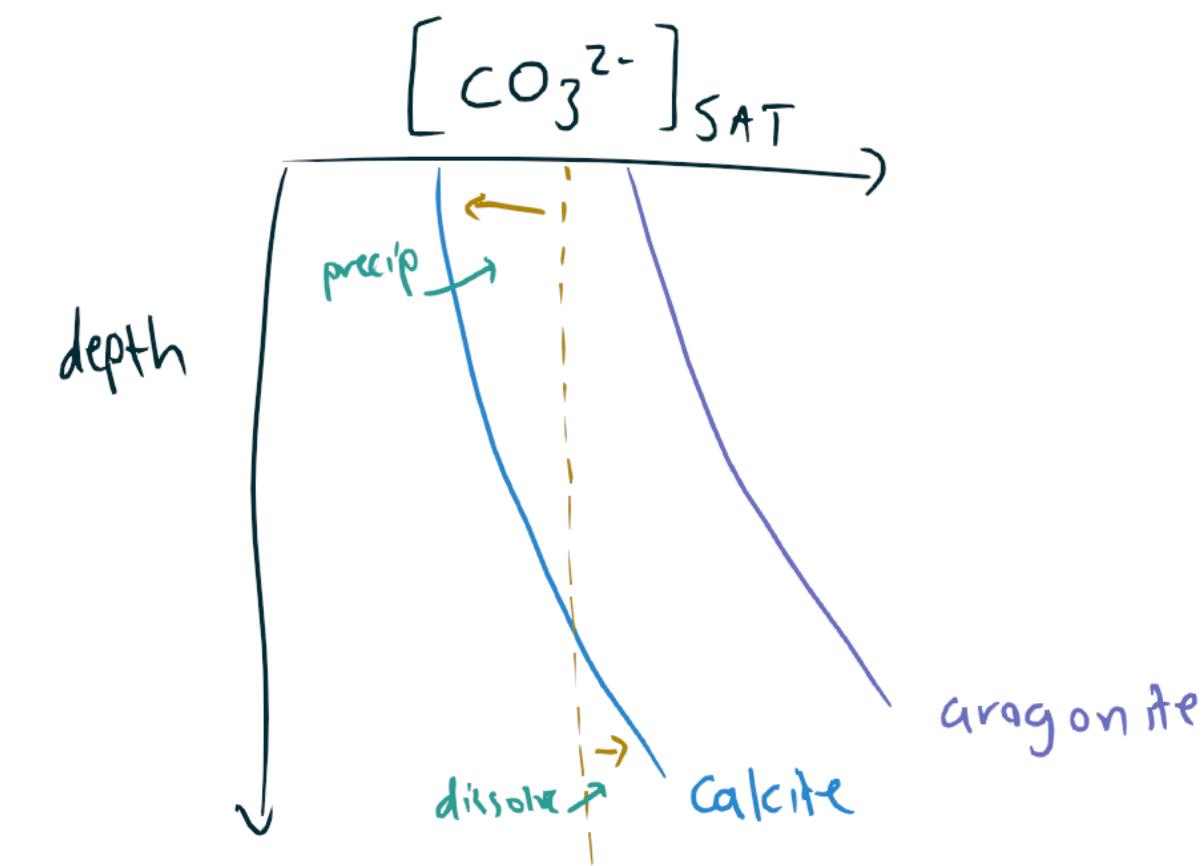
Note: 1 dbar is approximately the hydrostratic pressure for 1 meter of water depth

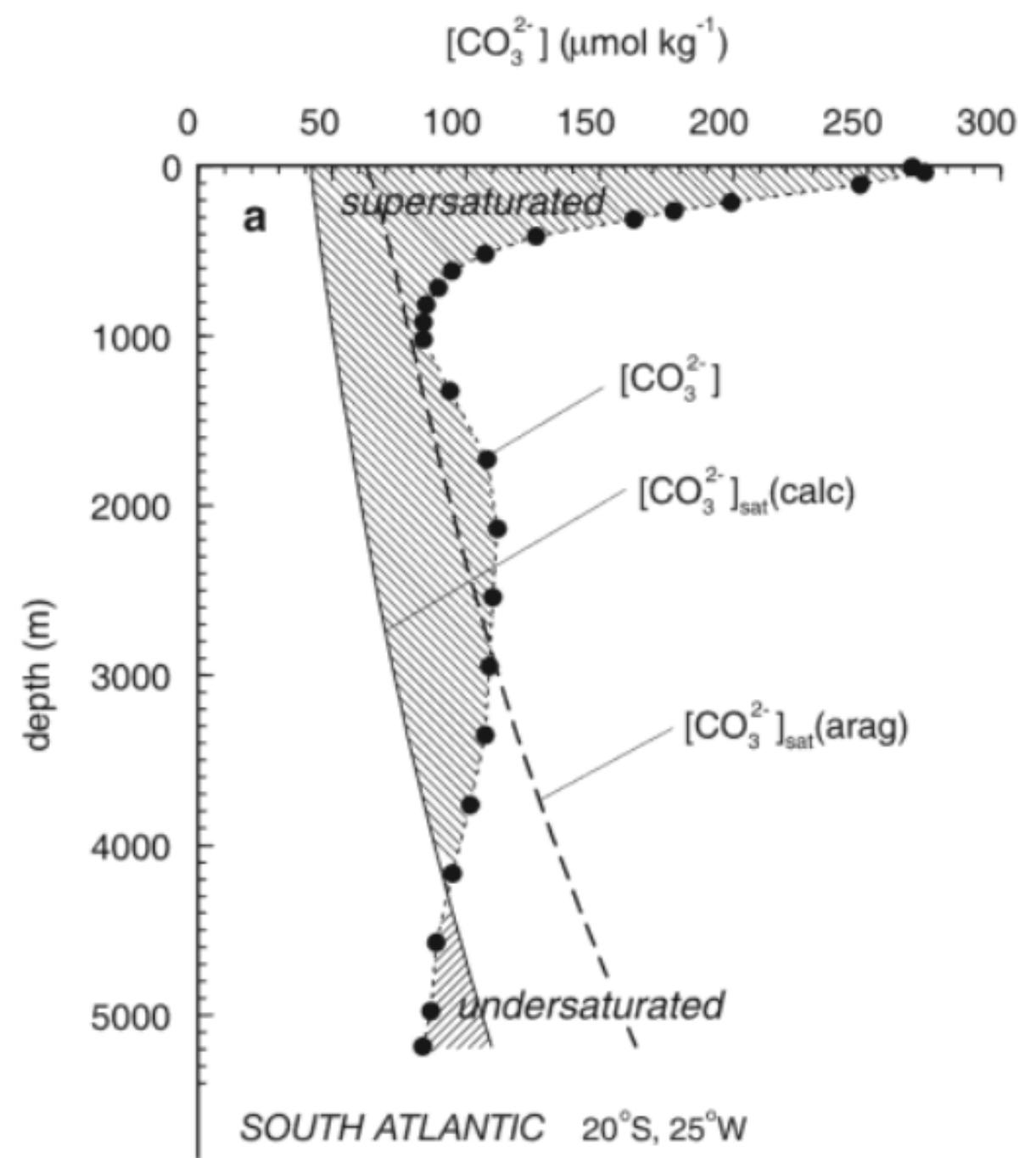


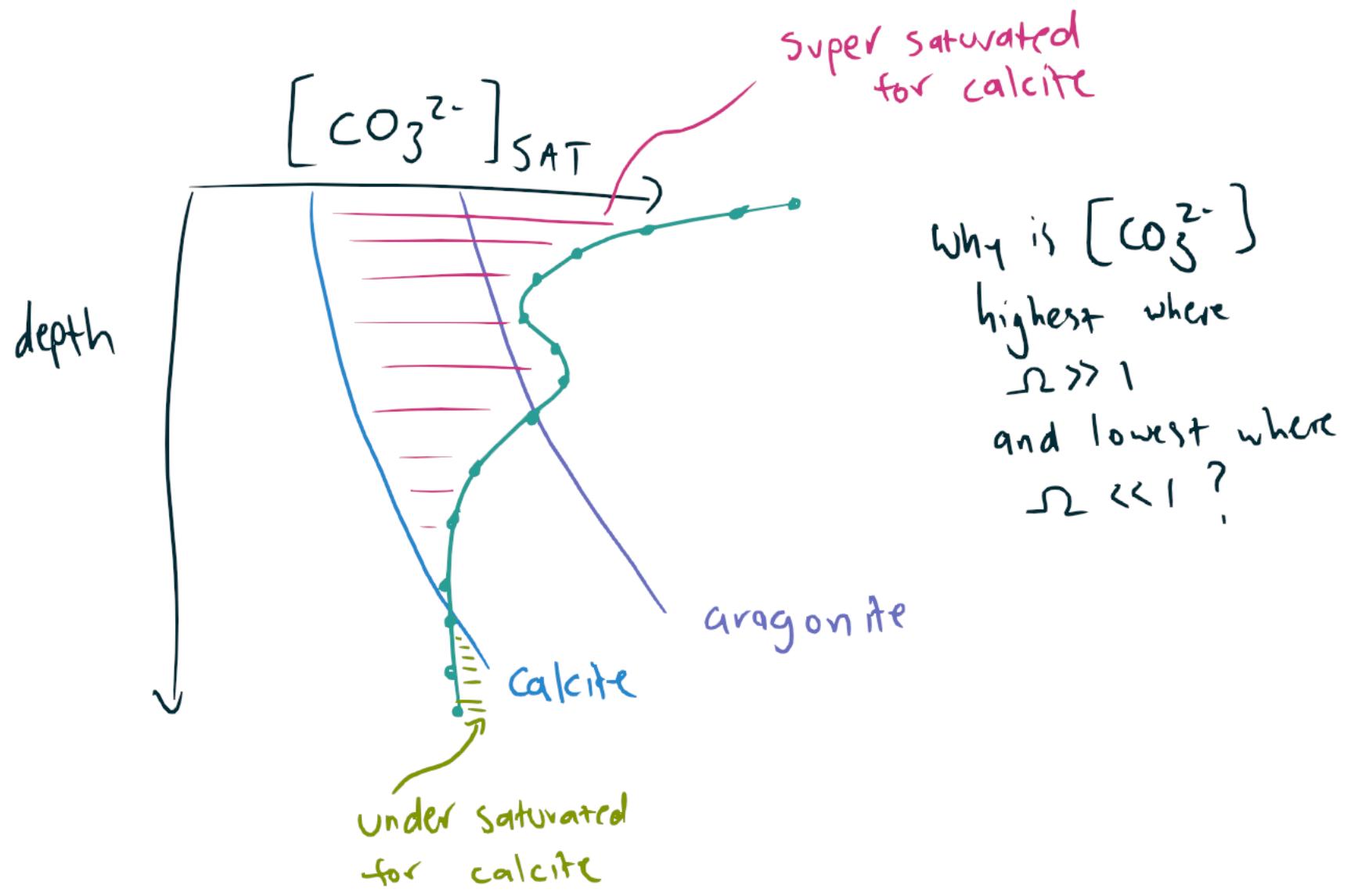
$$K_{sp} = [Ca^{2+}]_{sw} [CO_3^{2-}]_{SAT}$$



What do you think ocean looks like?

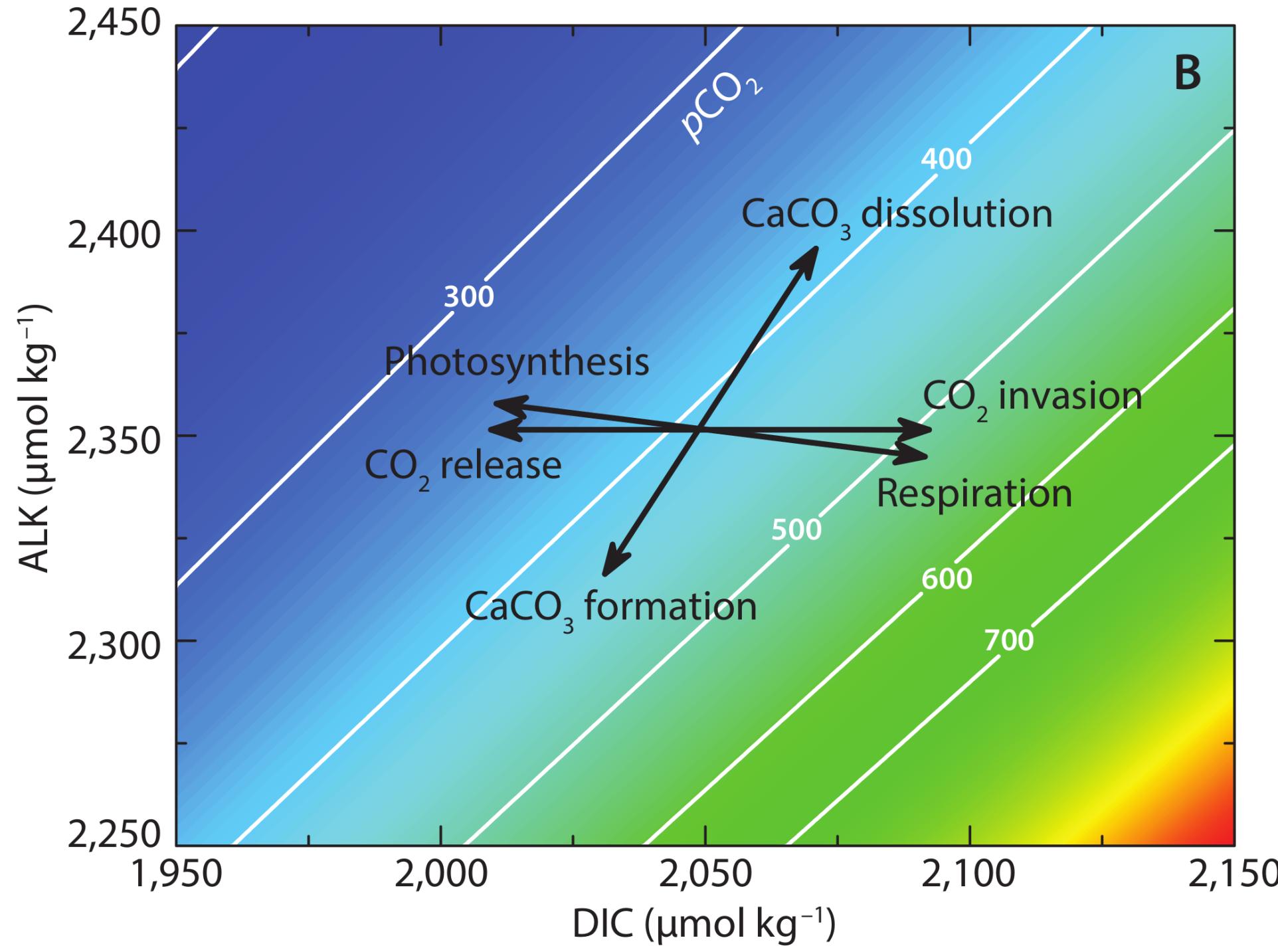


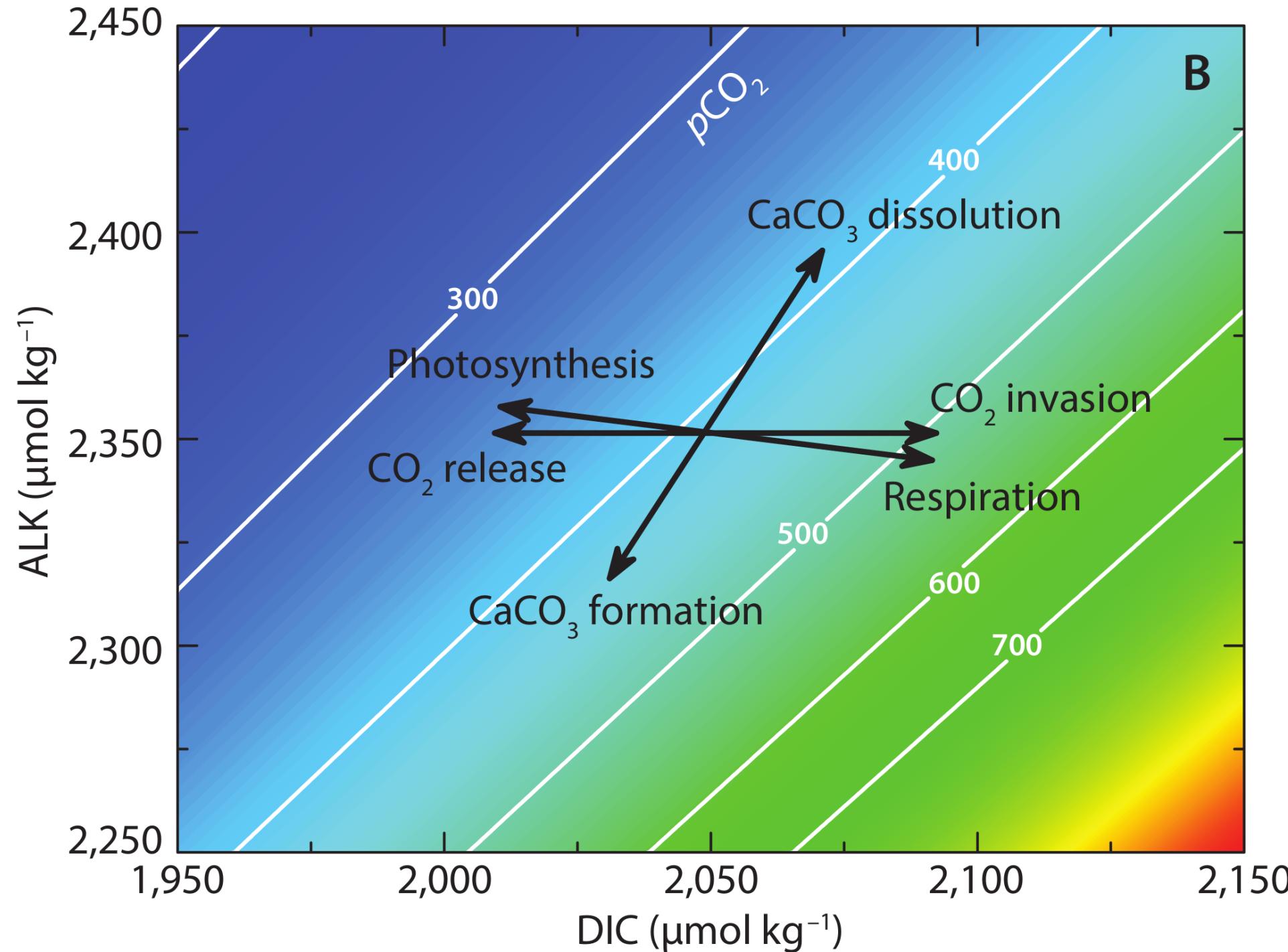




Why is $[CO_3^{2-}]$ highest where $\sigma \gg 1$ and lowest where $\sigma \ll 1$?

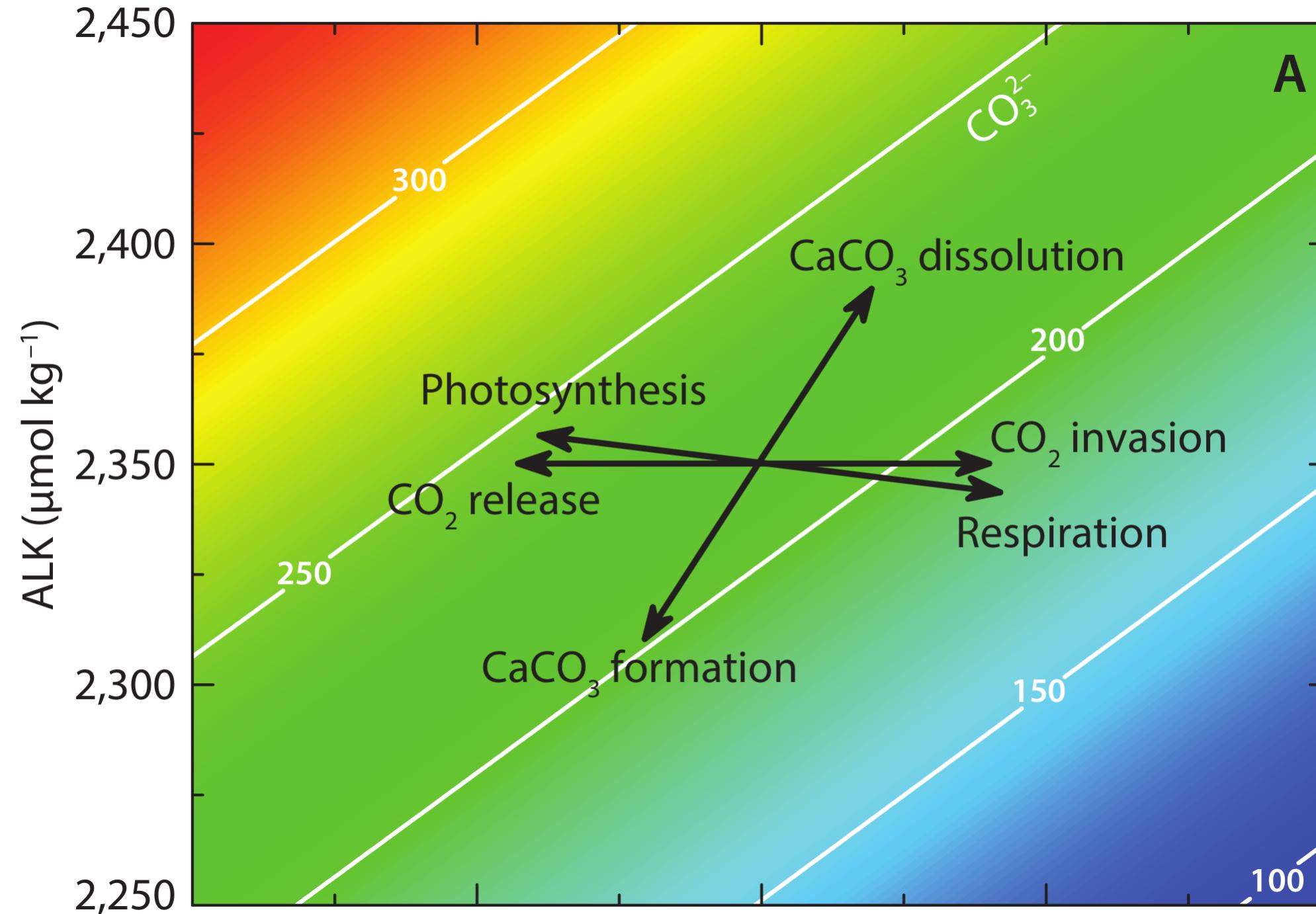






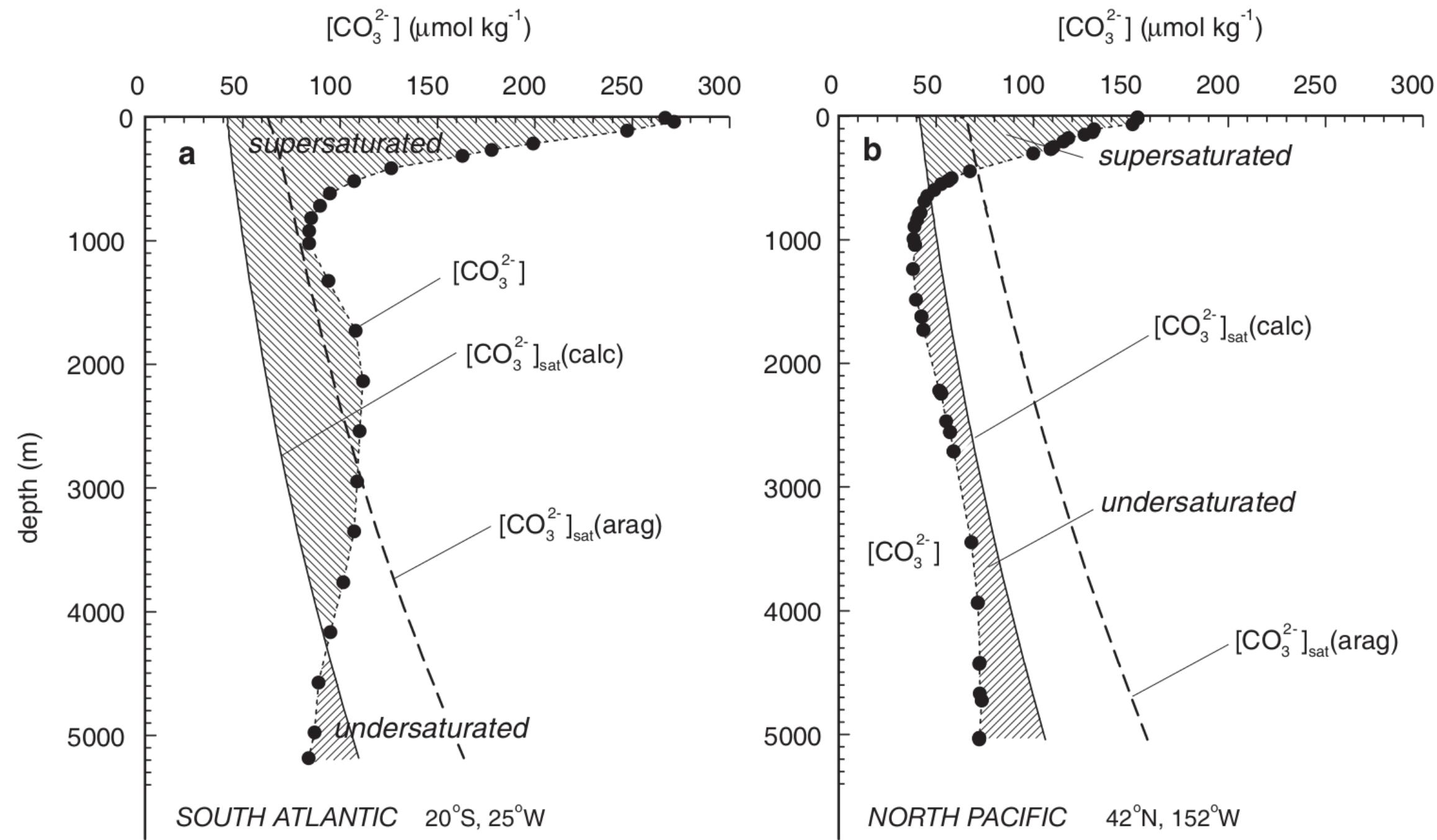
Recall that $[\text{CO}_3^{2-}] \approx \text{ALK-DIC}$

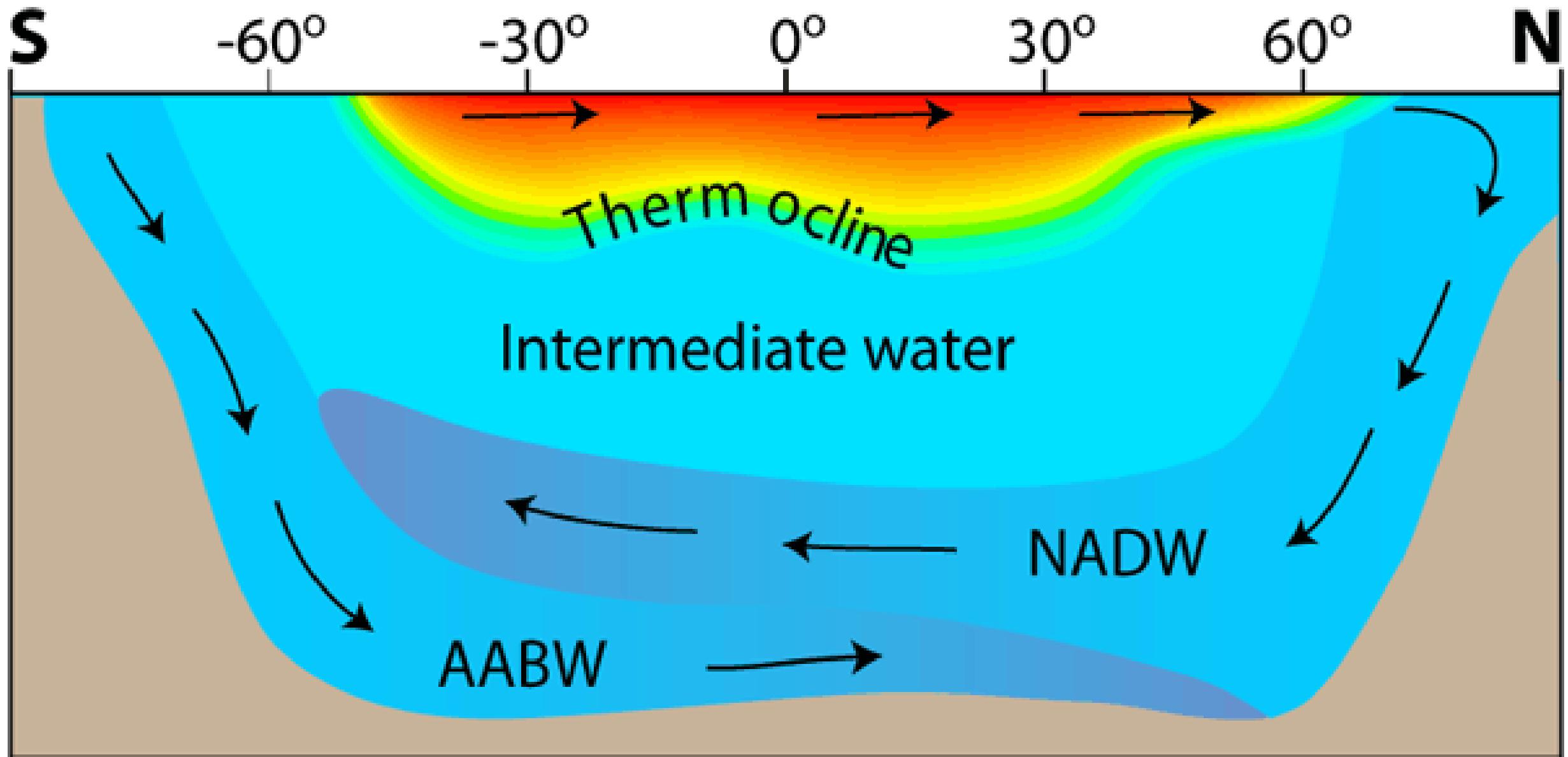




Recall that $[\text{CO}_3^{2-}] \approx \text{ALK-DIC}$

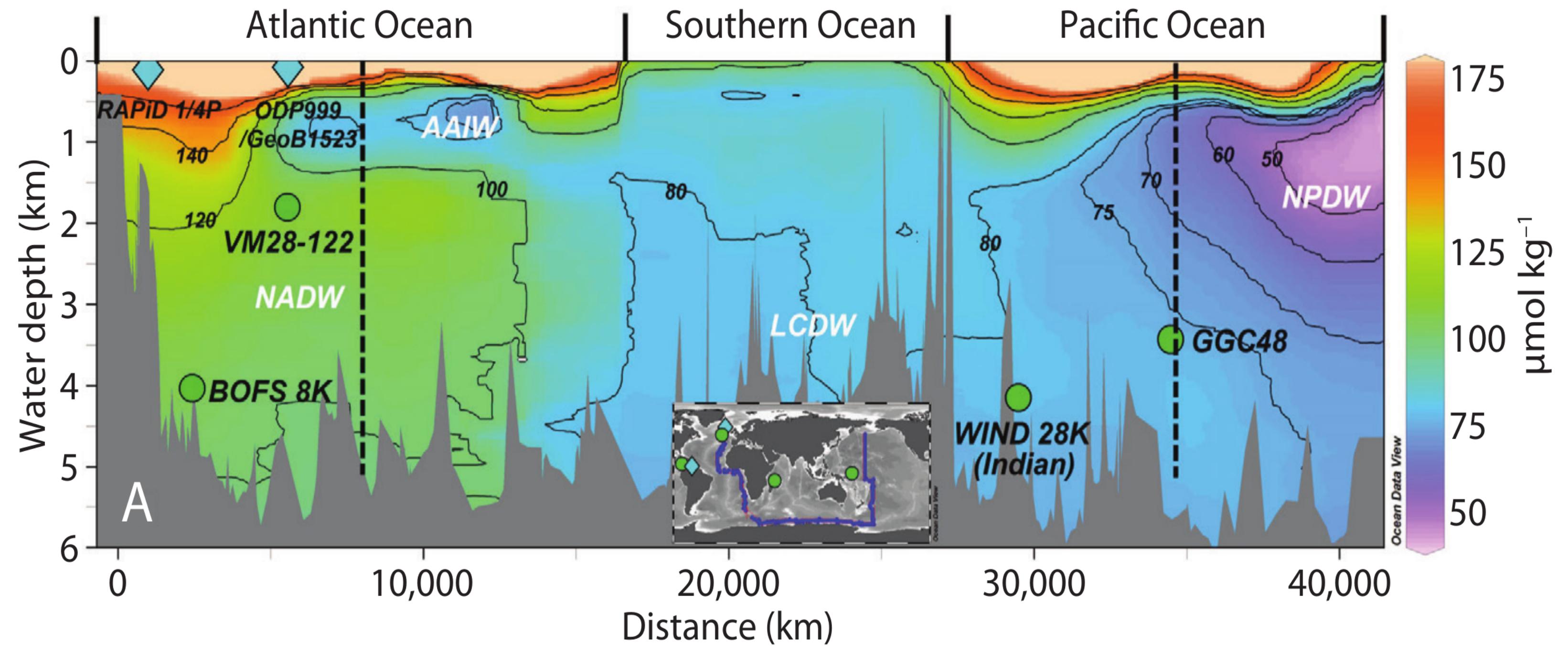


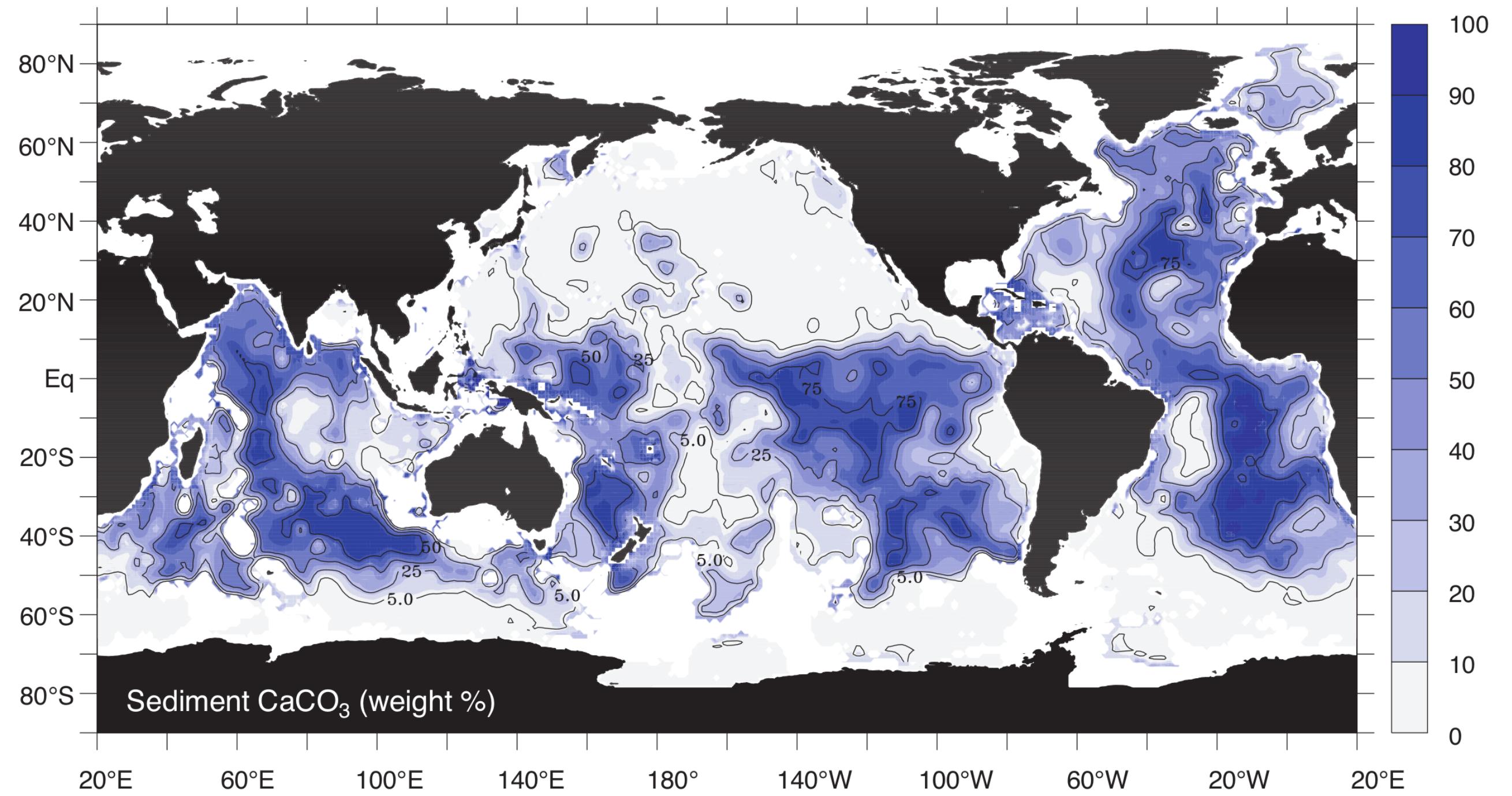


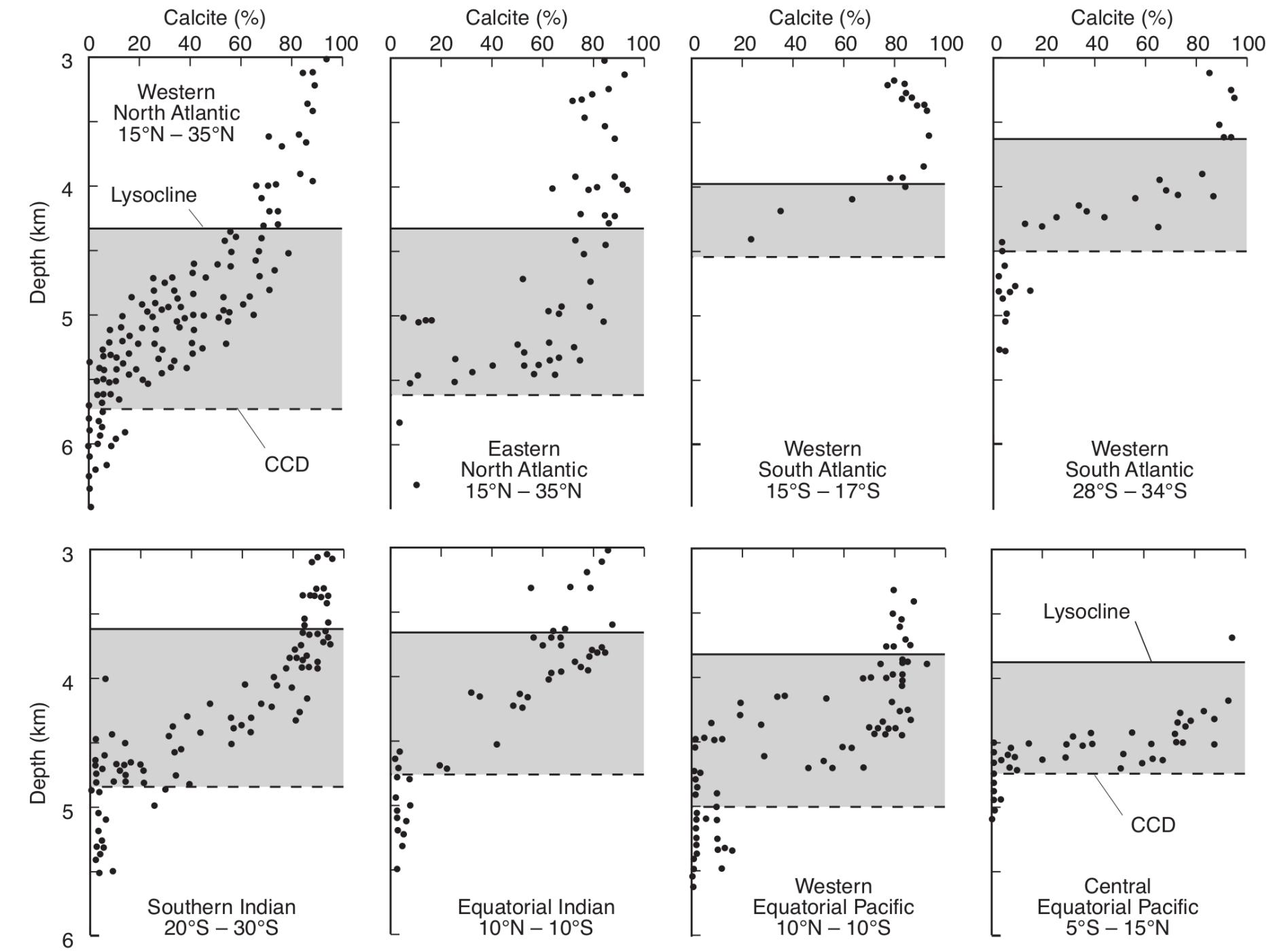


Increasing CO₂ & nutrients, decreasing O₂ Warm,
low nutrient water









What do you think controls the thickness of the grey region?



