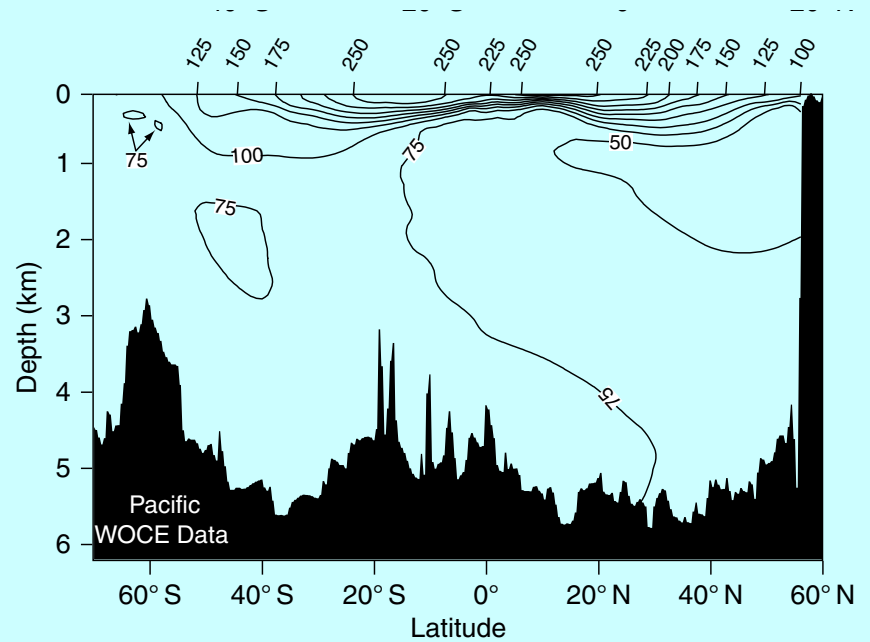
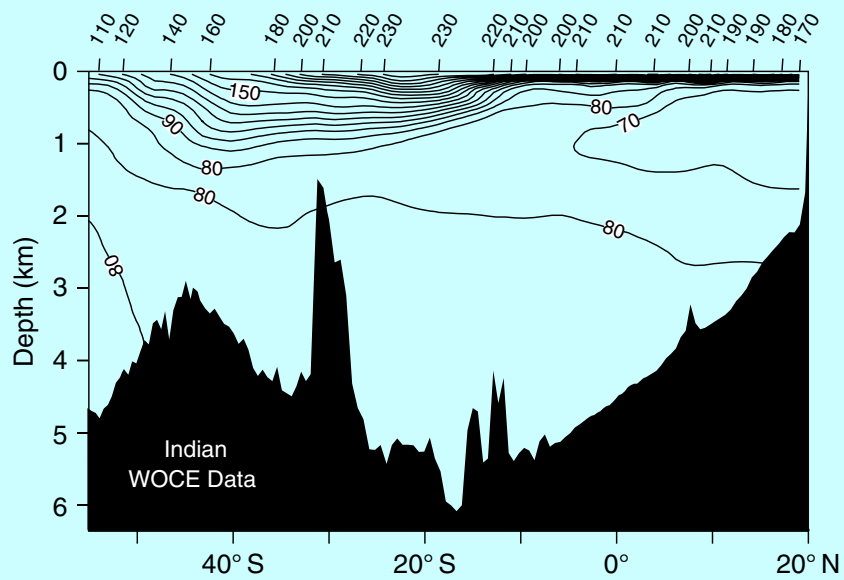
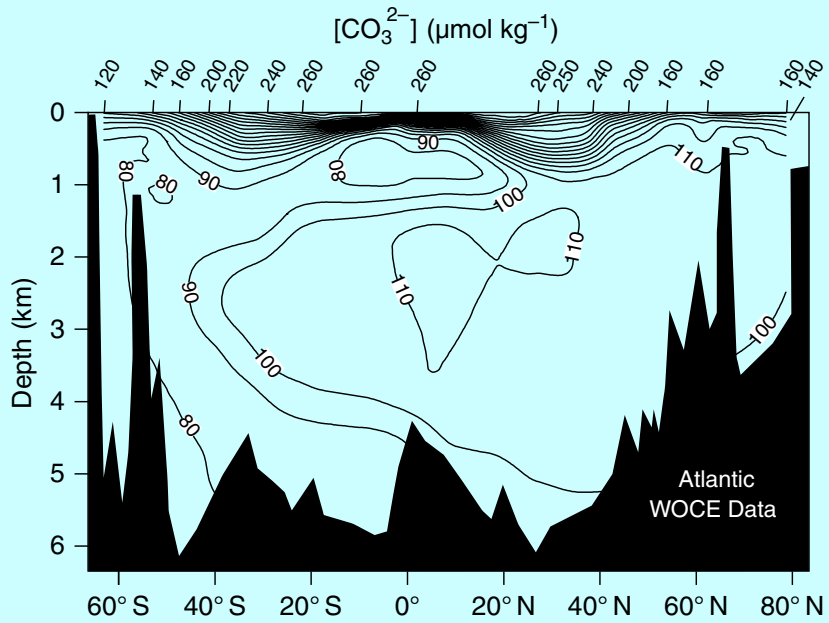
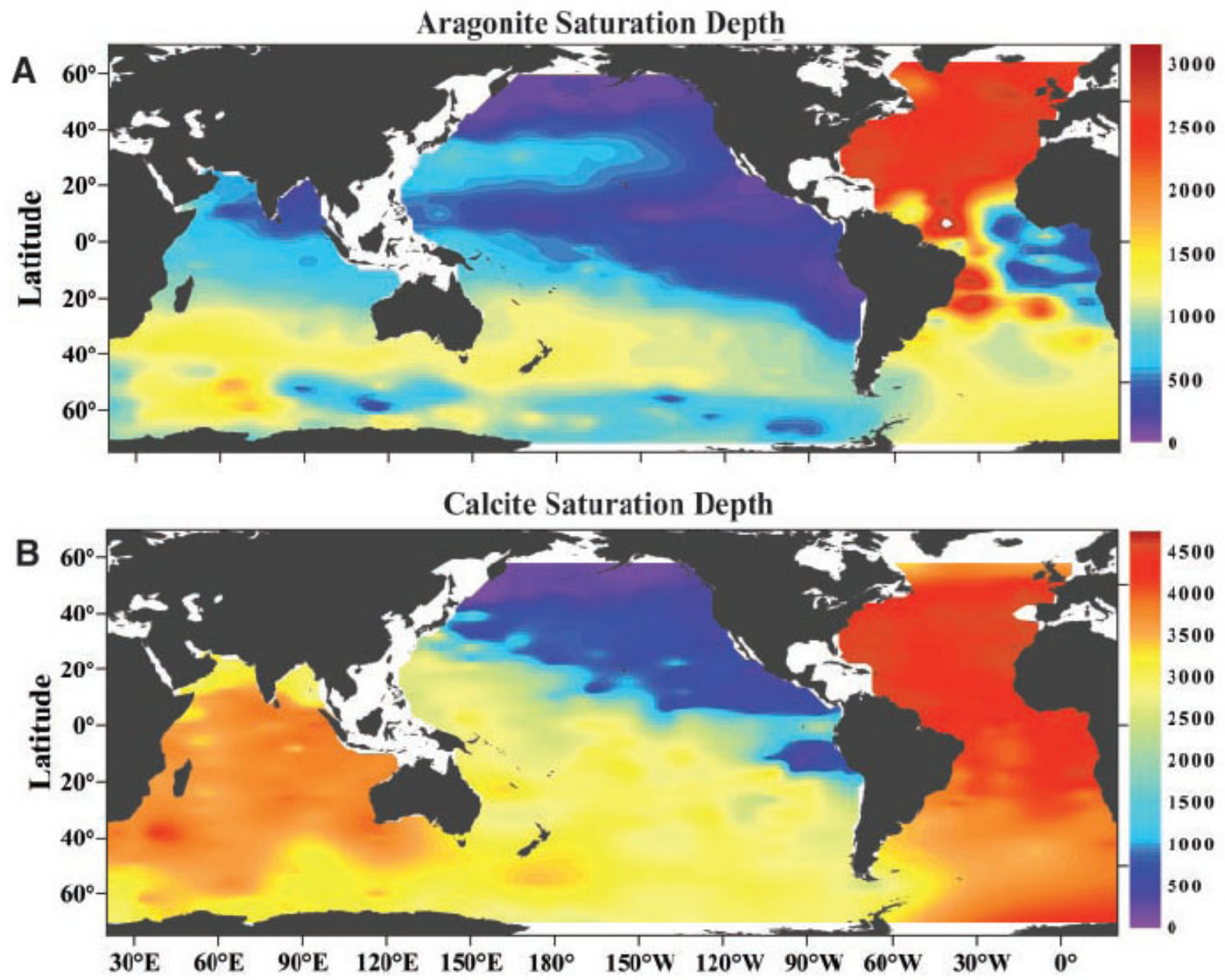


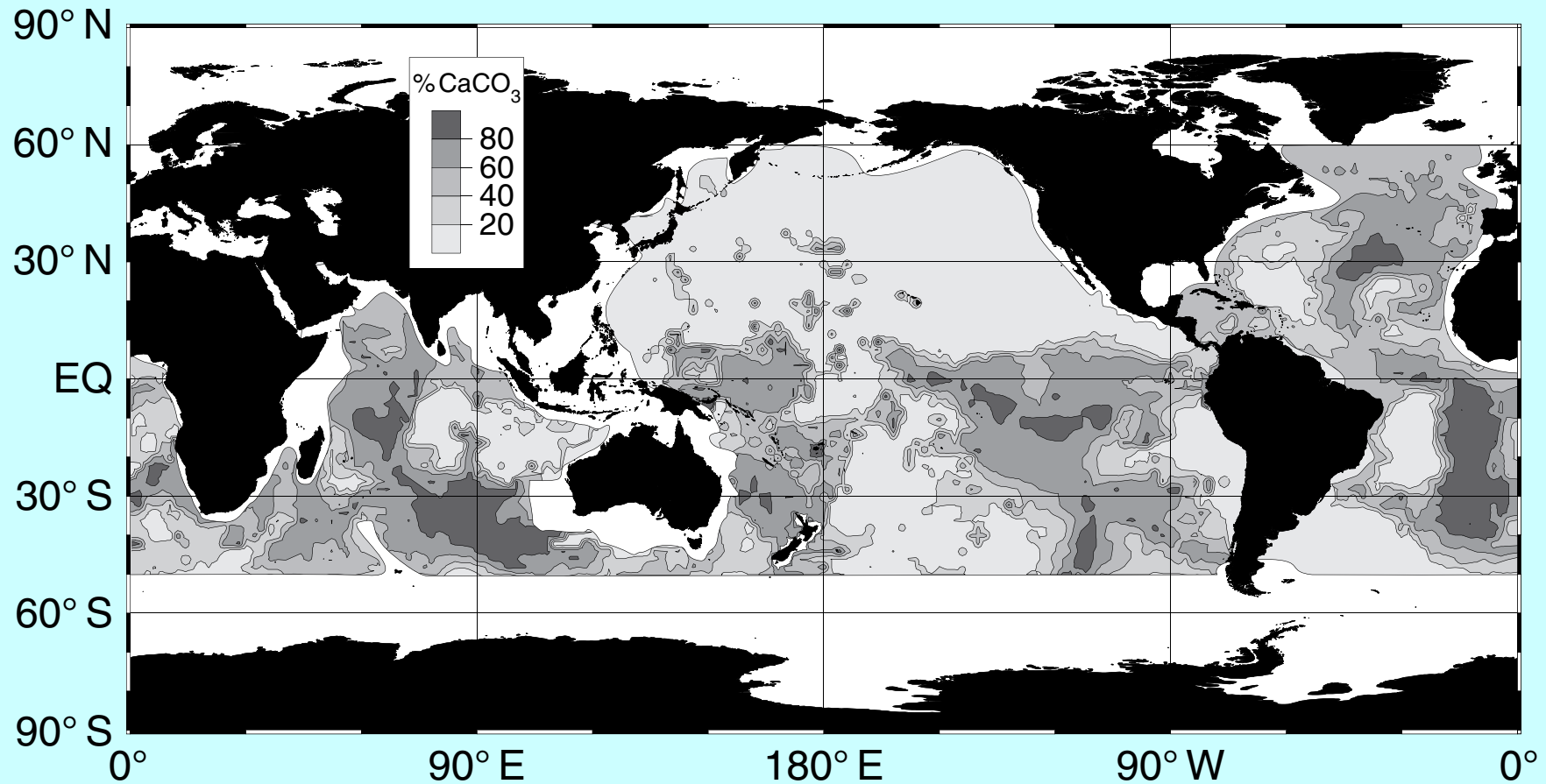
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CO₃⁼ Sections

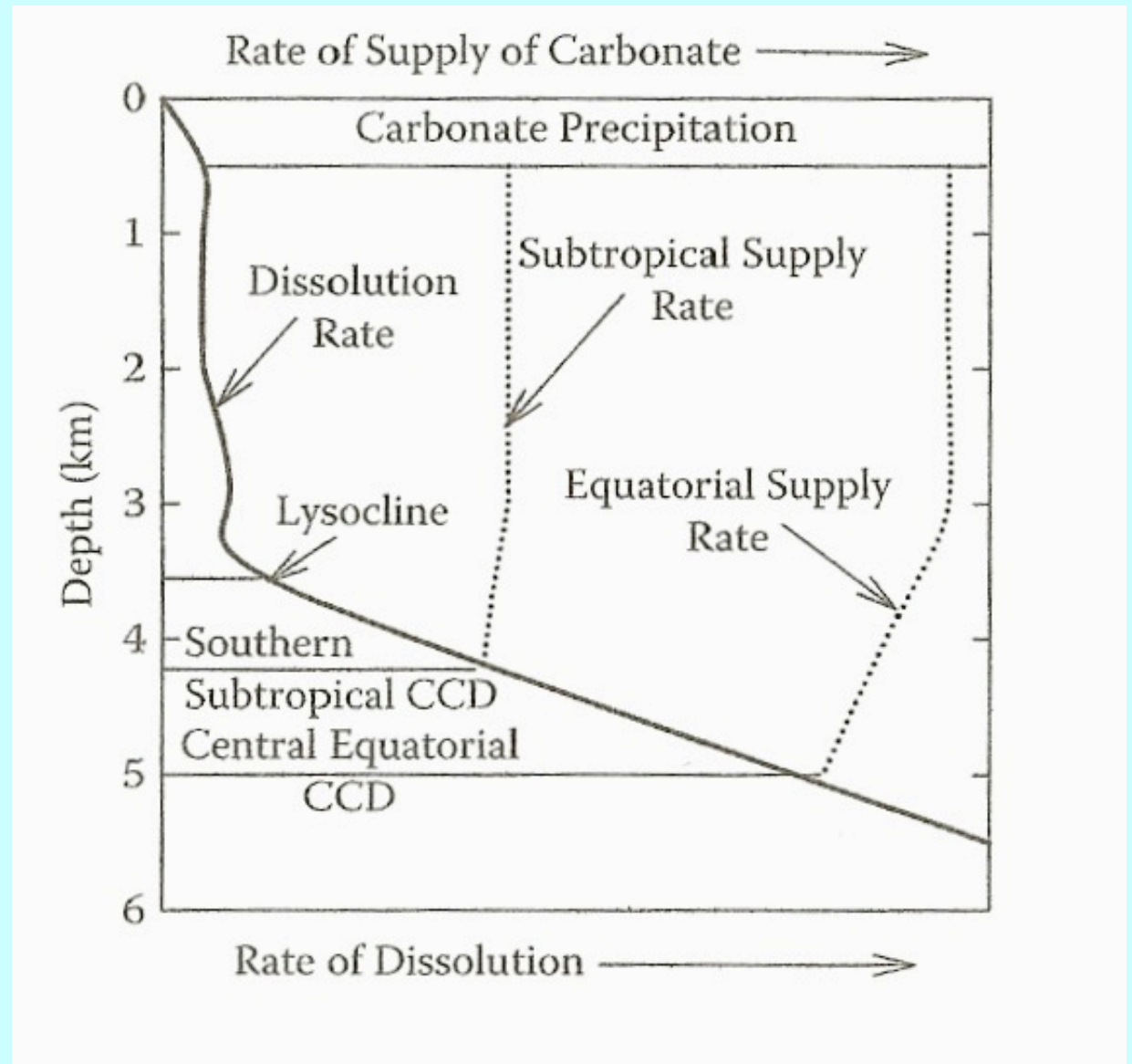




CaCO₃ Distribution in Sediments



Kinetic Considerations



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Figure 12.14. Porewater profiles of oxygen concentration and ΔpH (the pH difference between the value in the porewater and the value in bottom water) in the top c.10 cm of sediments from two locations on the Ceara Rise in the Equatorial Atlantic. Points are individual measurements, sometimes from different electrodes (different symbols) on the same deployment. Solid symbols in the overlying water are measurements in the bottom water after the porewater profile. Solid and dashed curves are model solutions. The dashed lines indicate the predicted ΔpH if there were no CaCO_3 dissolution caused by organic matter degradation in the sediments. Solid lines are the predicted pH for CaCO_3 dissolution in response to organic matter degradation using a dissolution rate more than 100 times slower than that determined in the laboratory experiments of Figure 12.13. In the top graphs (Station C), the bottom waters are saturated or supersaturated with respect to calcite. In the bottom graphs (Station G), bottom waters are undersaturated with respect to calcite. Redrafted from Hales and Emerson (1997b).

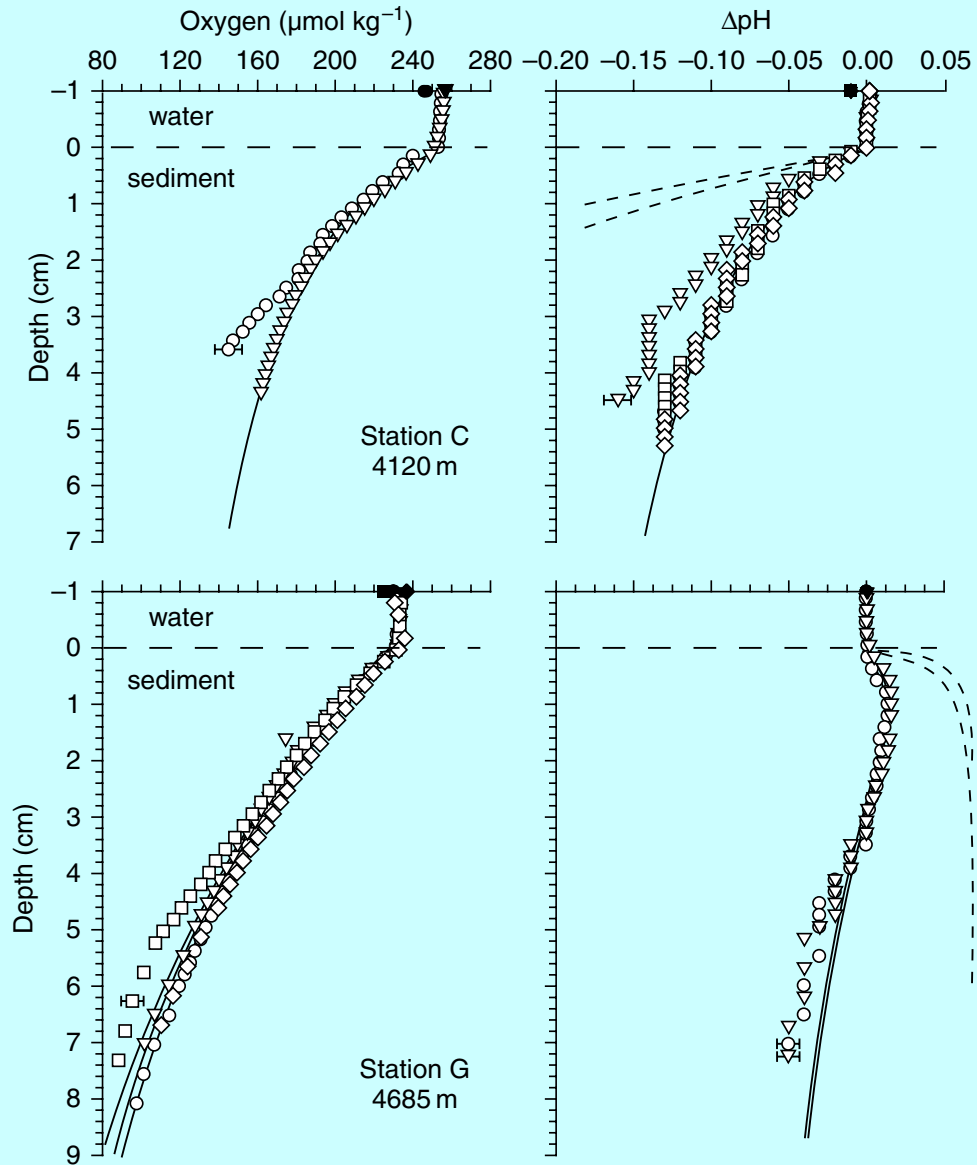


TABLE 7.7
Changes in the CO₂ System Due to the
Dissolution of CaCO₃

	Initial ^a	<u>ΔCaCO₃ (mM)</u>		% Change
		0.05	0.10	
ΔCO ₂	0	0.05	0.10	—
TCO ₂	2.200	2.250	2.300	4.5 ± 0.1
CA	2.487	2.587	2.687	72 ± 0.05
pCO ₂	350	310	290	-17 ± 1.0
pH	8.200	8.264	8.321	1.5 ± 0.04
[CO ₂]	0.012	0.011	0.010	-17
[HCO ₃ ⁻]	1.889	1.892	1.844	0.3
[CO ₃ ²⁻]	0.299	0.348	0.397	33

^a All the concentrations are mM.

Correcting for salinity variations:

$$\text{NTA} = \text{TA} \times 35/S$$

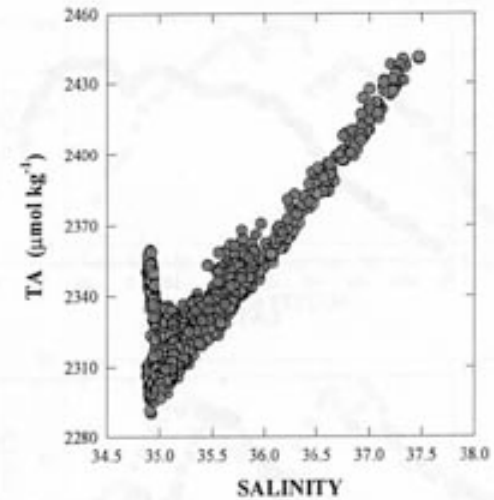


FIGURE 7.25. The total alkalinity as a function of salinity for surface waters in the Atlantic Ocean

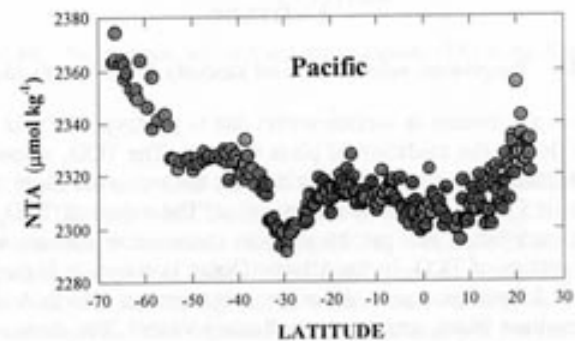
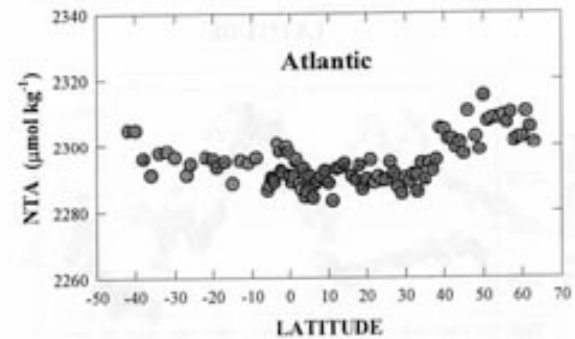
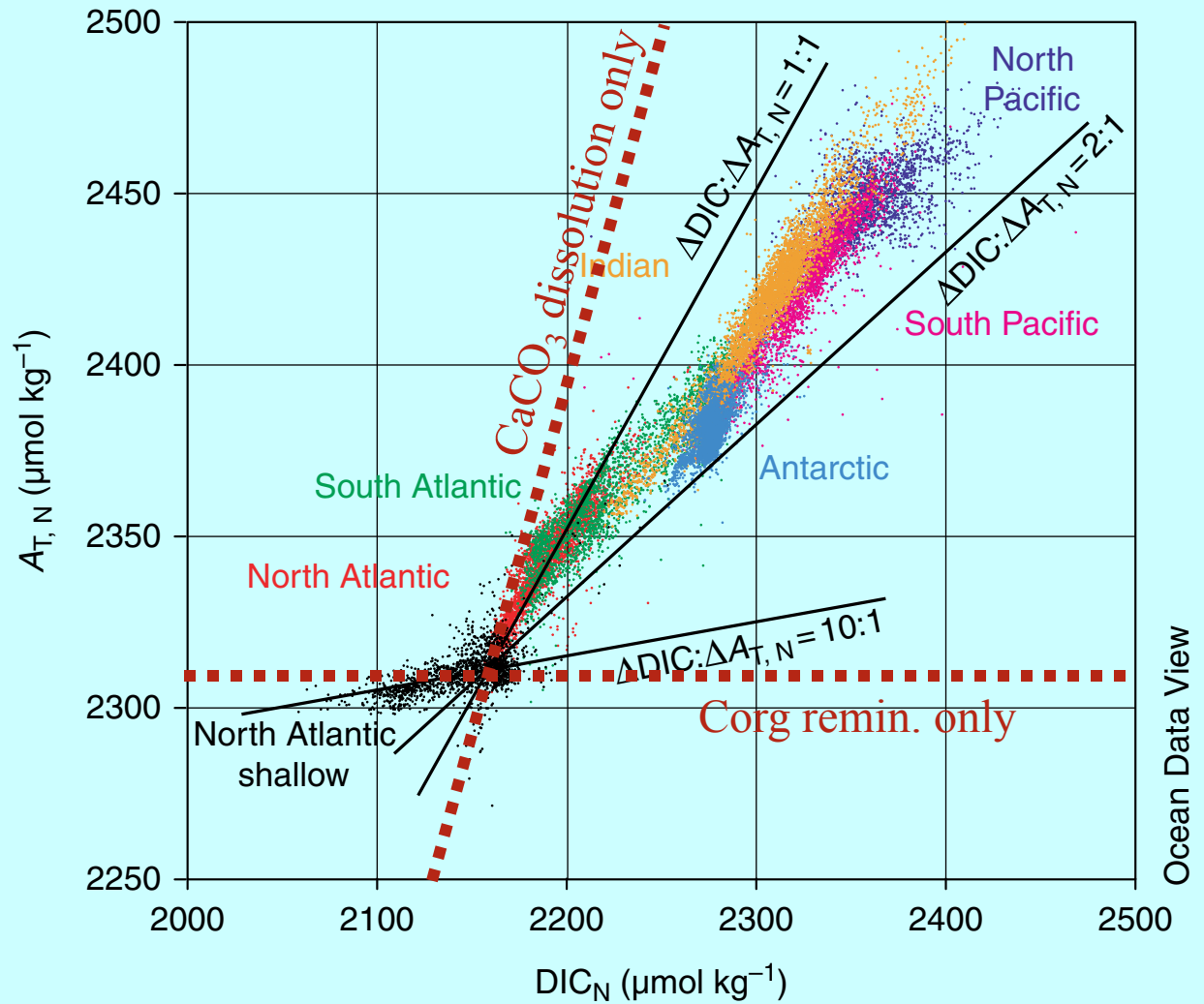
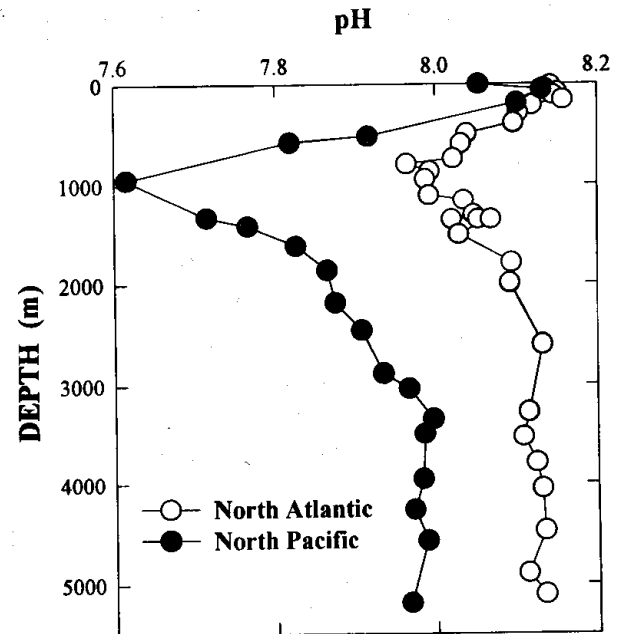
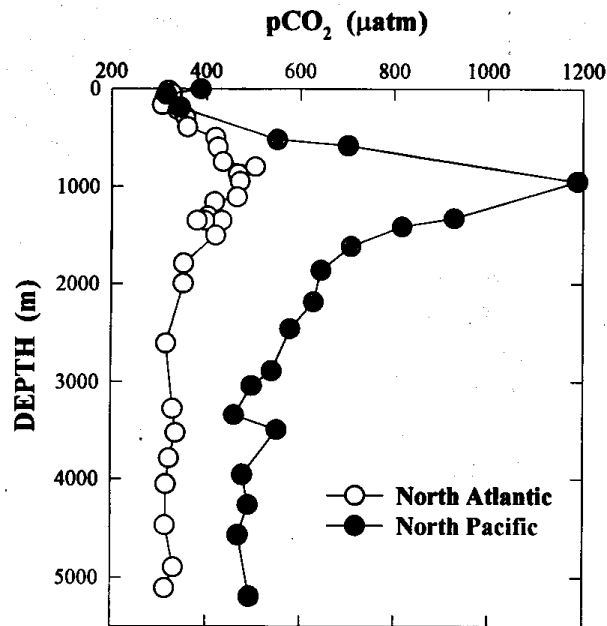
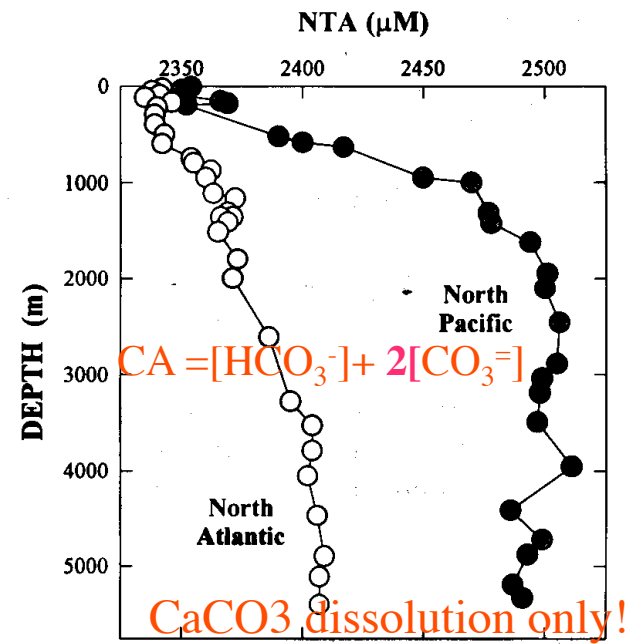
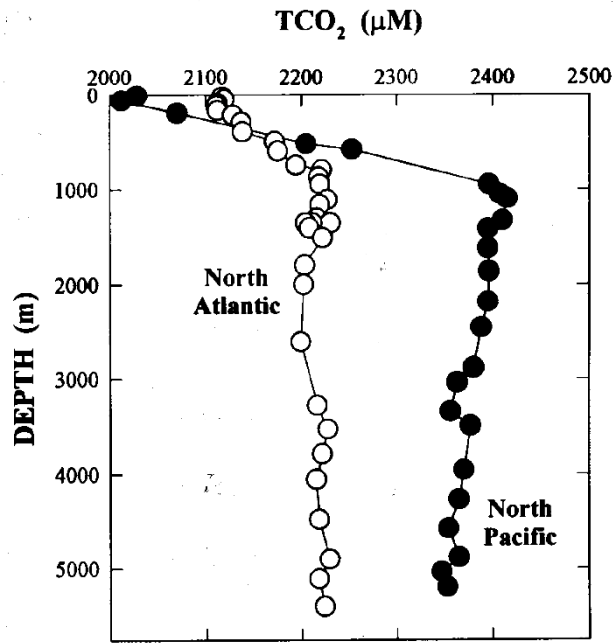


FIGURE 7.26. Normalized total alkalinity (NTA) in the Atlantic and Pacific Oceans.

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Plate 2 Salinity-normalized ($S = 35$) total alkalinity, $A_{T,N}$, versus salinity-normalized dissolved inorganic carbon, DIC_N , for the world's ocean. Data are for the deep ocean at depths >2.5 km except for the section labeled "North Atlantic Shallow", which is 100–1000 m in the North Atlantic Ocean. Lines indicate different $DIC_N:A_{T,N}$ ratios.





Anthropogenic CO₂ Invasion and CaCO₃

A negative feedback?

(Feely et al., *Science* 2004)

