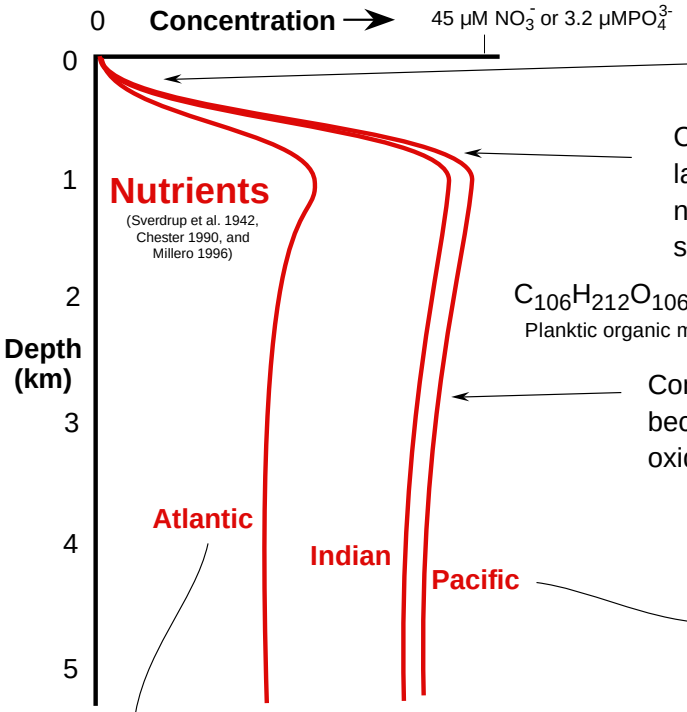
Variation in concentration of solutes in the oceans I: Nutrients (nitrate, phosphate, silica)



Concentrations of nutrients in the near-surface water are near zero because photosynthesizers use all available nutrient.

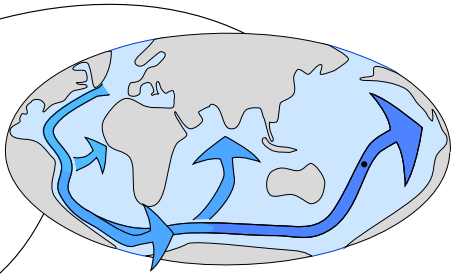
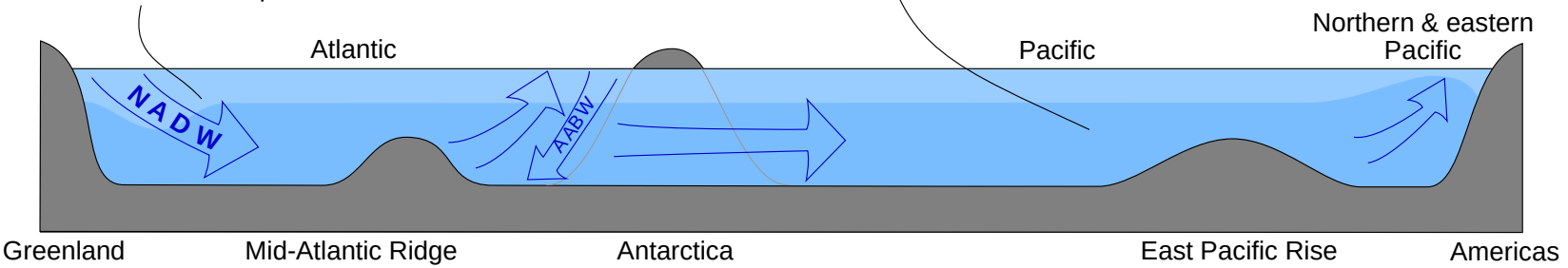
Concentrations of nuntrients just below the thermocline are relatively large because oxidation of sinking organic particles releases N and P as nitrate and phosphate, and bacterial degradation of organic coatings on siliceous tests allows dissolution of those tests to release SiO_2(aq).

$$C_{106}H_{212}O_{106}N_{16}P + 127.25\,O_2 + 9.5\,H_2O \;\text{-->}\; 106\,CO_2 + 106\,H_2O + 19\,H^+ + 16\,NO_3^- + PO_4^{3-}$$

Planktic organic matter — Nutrients

Concentrations in abyssal waters are greater than in near-surface water because no photosynthesizers are present to consume nutrients, and oxidation of organic matter releases nutrients to these waters.

Concentrations of nutrients in deep waters of the Pacific are typically greater than in the Atlantic because Pacific deep water has had more time to accumulate nutrients from oxidation of organic matter.



Concentrations in deep waters of the Atlantic are typically less than in the Pacific because Atlantic deep water has only recently descended from the nutrient-depleted surface waters.