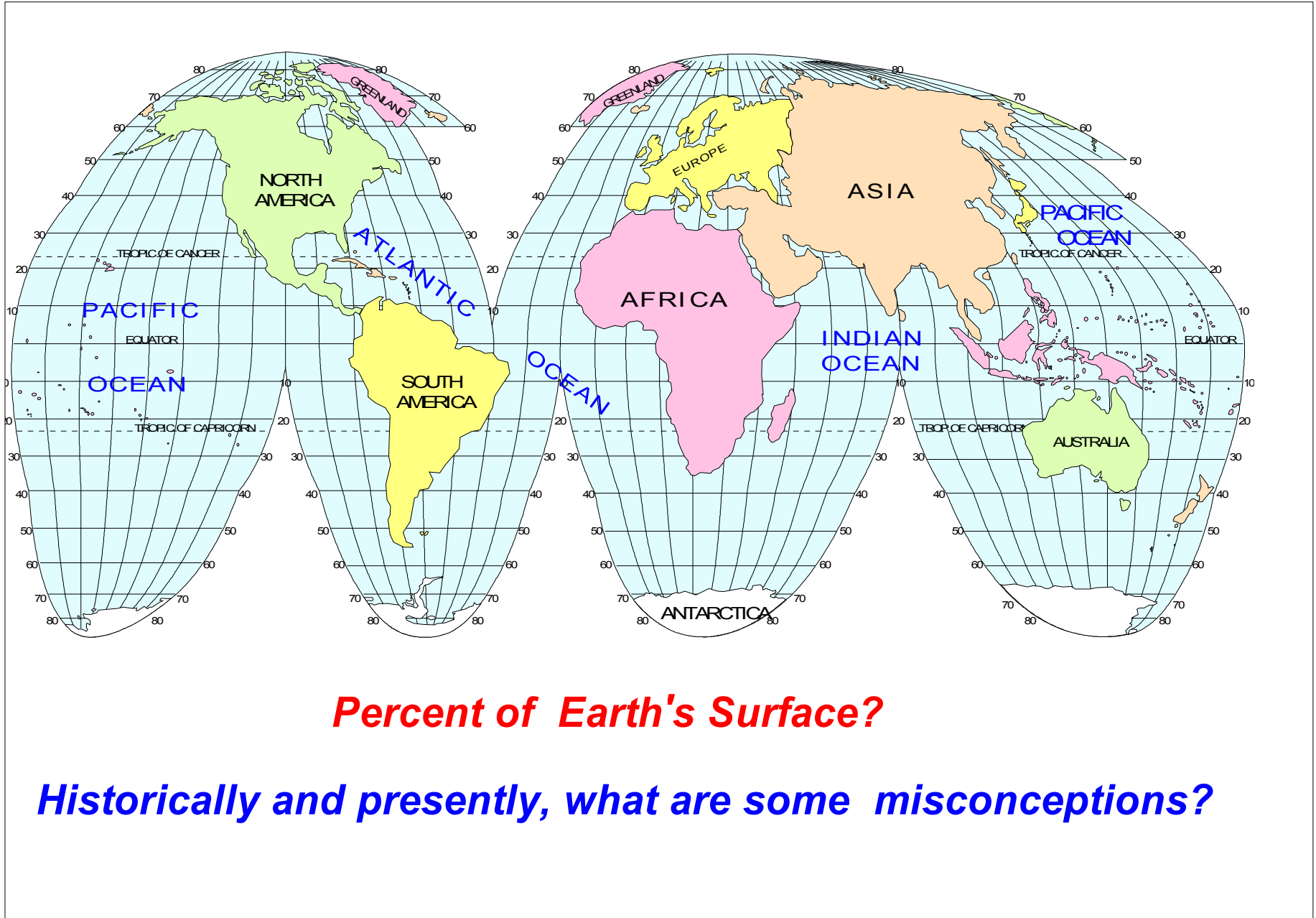


OCEANOGRAPHY

Biological
Geological
Chemical
Physical



Southern Ocean, Anarctica



Percent of Earth's Surface?

Historically and presently, what are some misconceptions?

COLLECTING DATA FROM THE OCEANS

Geological

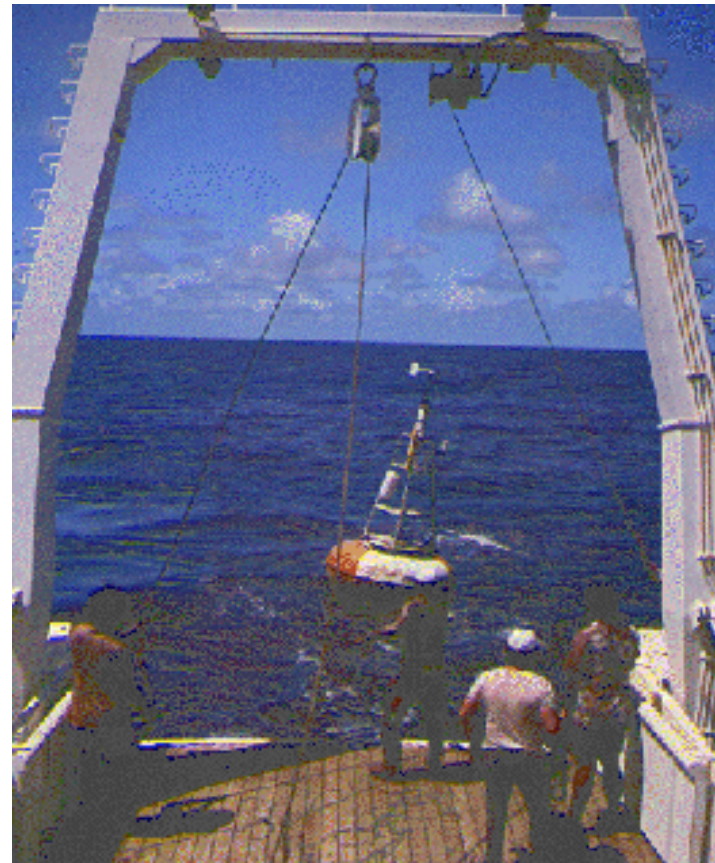
*depth recording, dredging,
coring, seismic profiling*

Biological

*scuba, submersible,
tow, depth sampling*

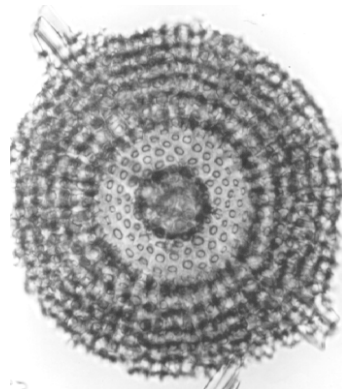
Physical and Chemical

*Nansen bottles,
Reversing thermometers,
wind direction, current
meters, drift bottles*



Biological Oceanography

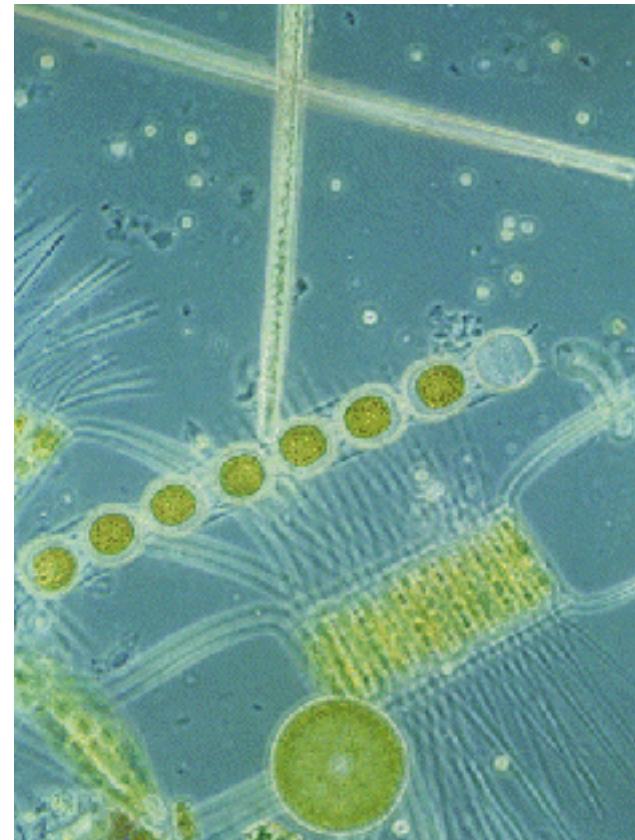
**little critters to big critters
productivity
ecosystems**



radiolarians

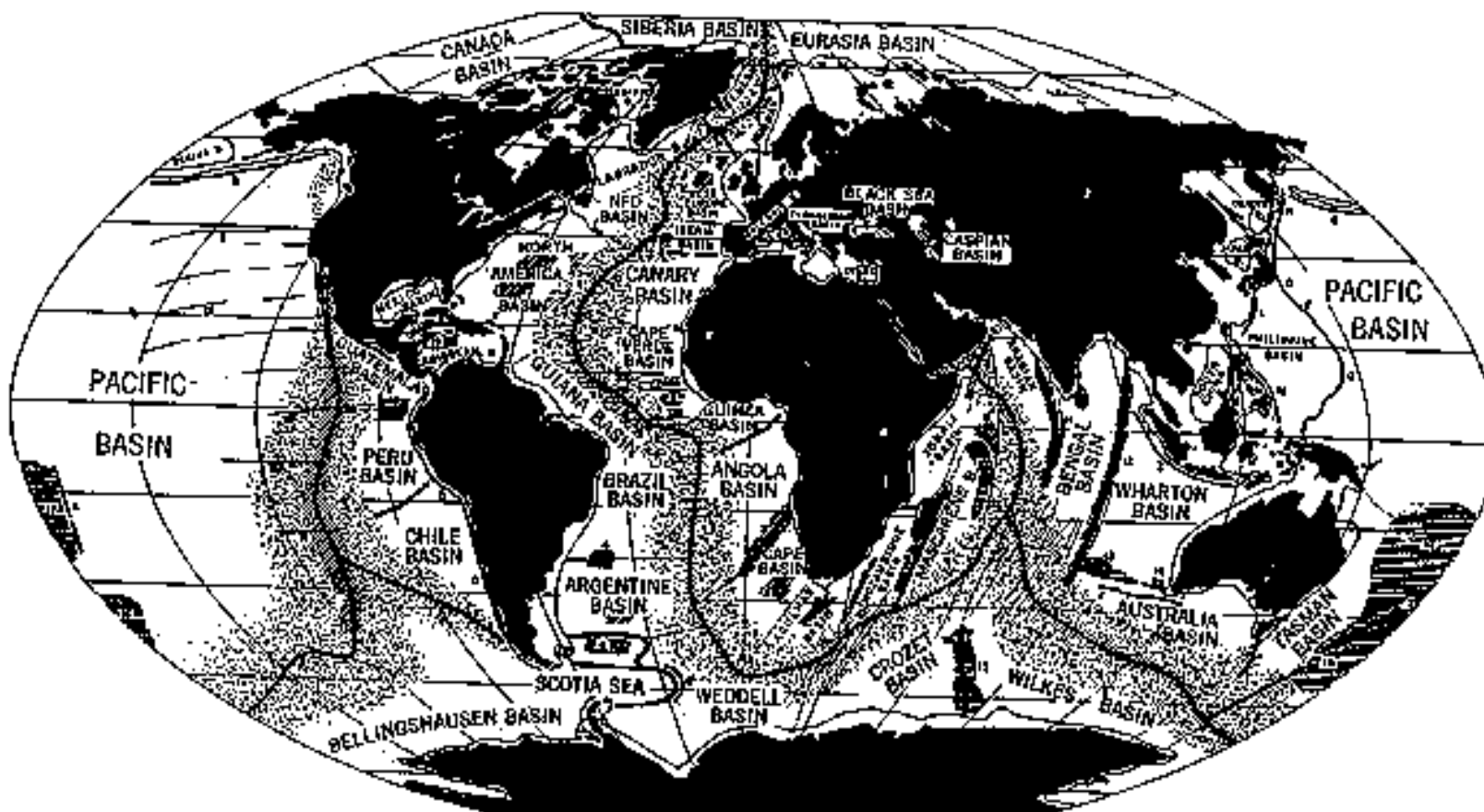


sea slug



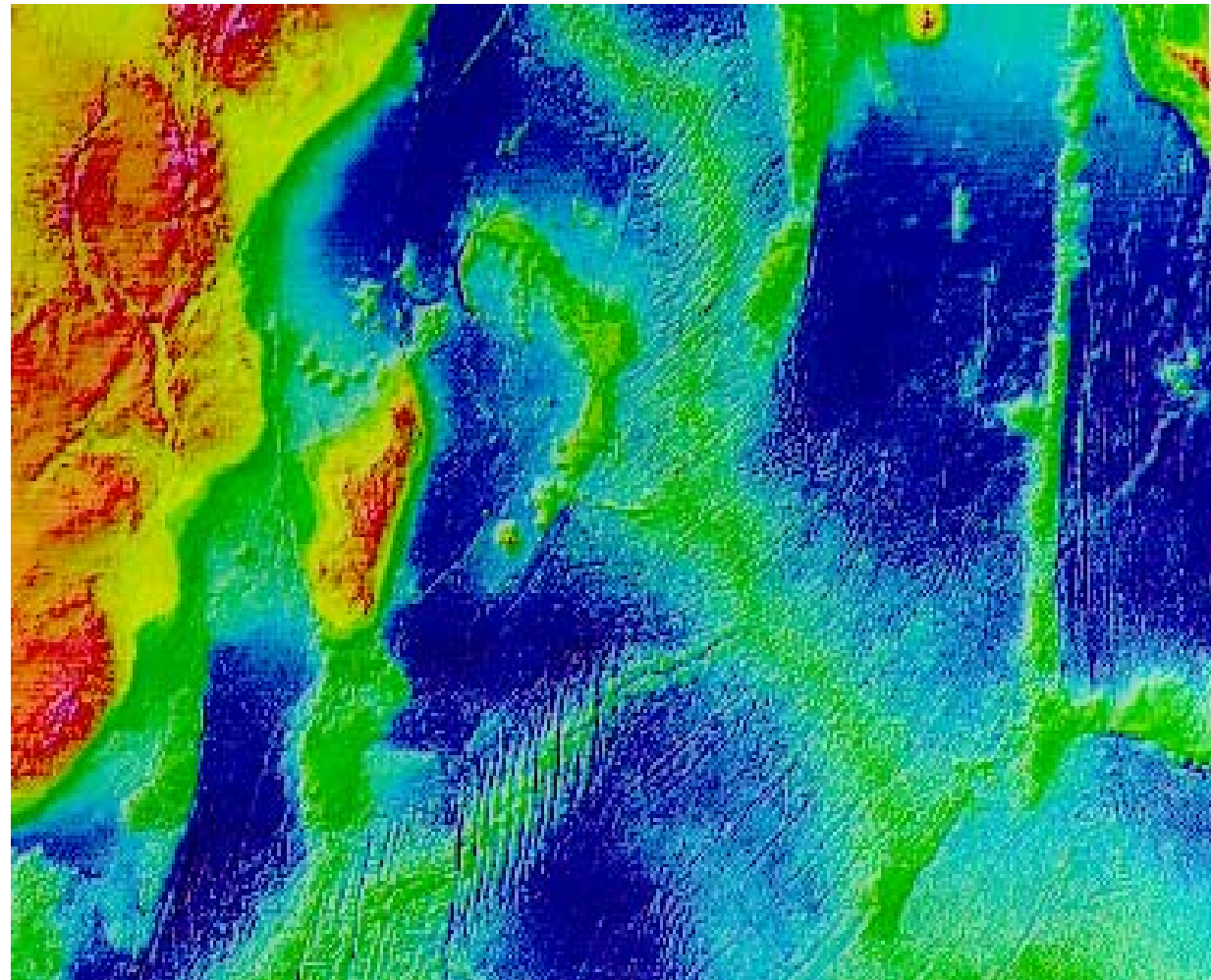
diatoms

Geological Oceanography



contributed to the study of plate tectonics

Indian Ocean



Islands
Ocean Sediments
Mining
Thermal Vents

Chemical Oceanography

Salinity
Solar Radiation
Temperature
Density
Pressure
Nutrients
 PO_4
 NO_3

H																		He
Li	Be											B	C	N	O	F		Ne
Na	Mg											Al	Si	P	S	Cl		Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br		Kr
Rb	Sr	Y	Zr	Nb	Mo					Ag	Cd	In	Sn	Sb		I		Xe
Cs	Ba		Hf	Ta	W					Au	Hg	Tl	Pb	Bi				Rn
	Ra																	
			La	Ce	Pr	Nd		Sm	Eu	Gd		Dy	Ho	Er	Tm	Yb	Lu	
				Th	Pa	U												



Minor constituent (more than 1 gram per ton)



Major constituent (more than 20 grams per ton)



Essential for plant growth



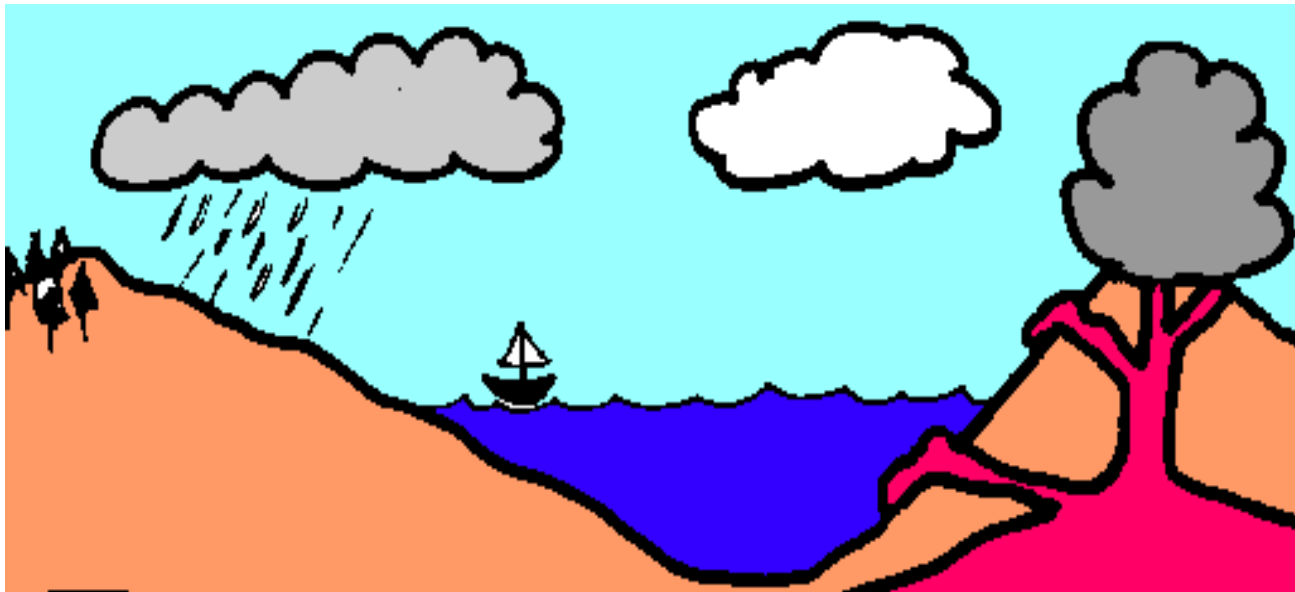
Trace constituent (less than 1 gram per ton)

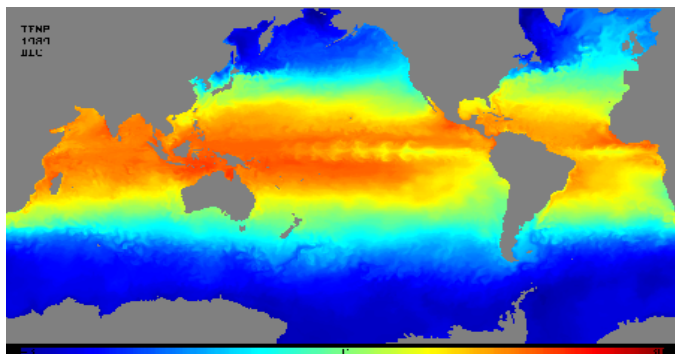
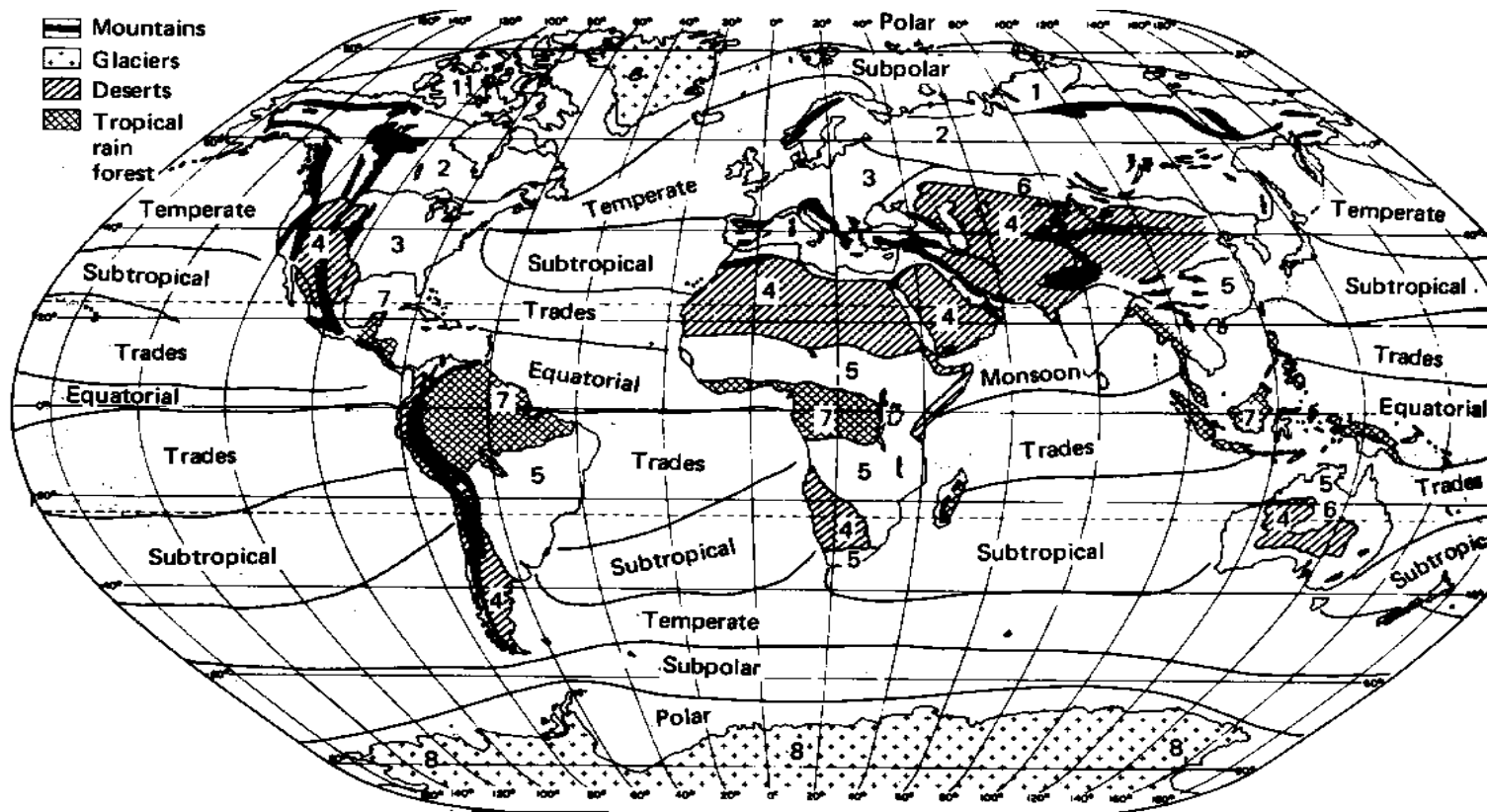


Dissolved gases, in part

SALT + H₂O = SEAWATER

(SOLUTE) +(SOLVENT) = (SOLUTION)

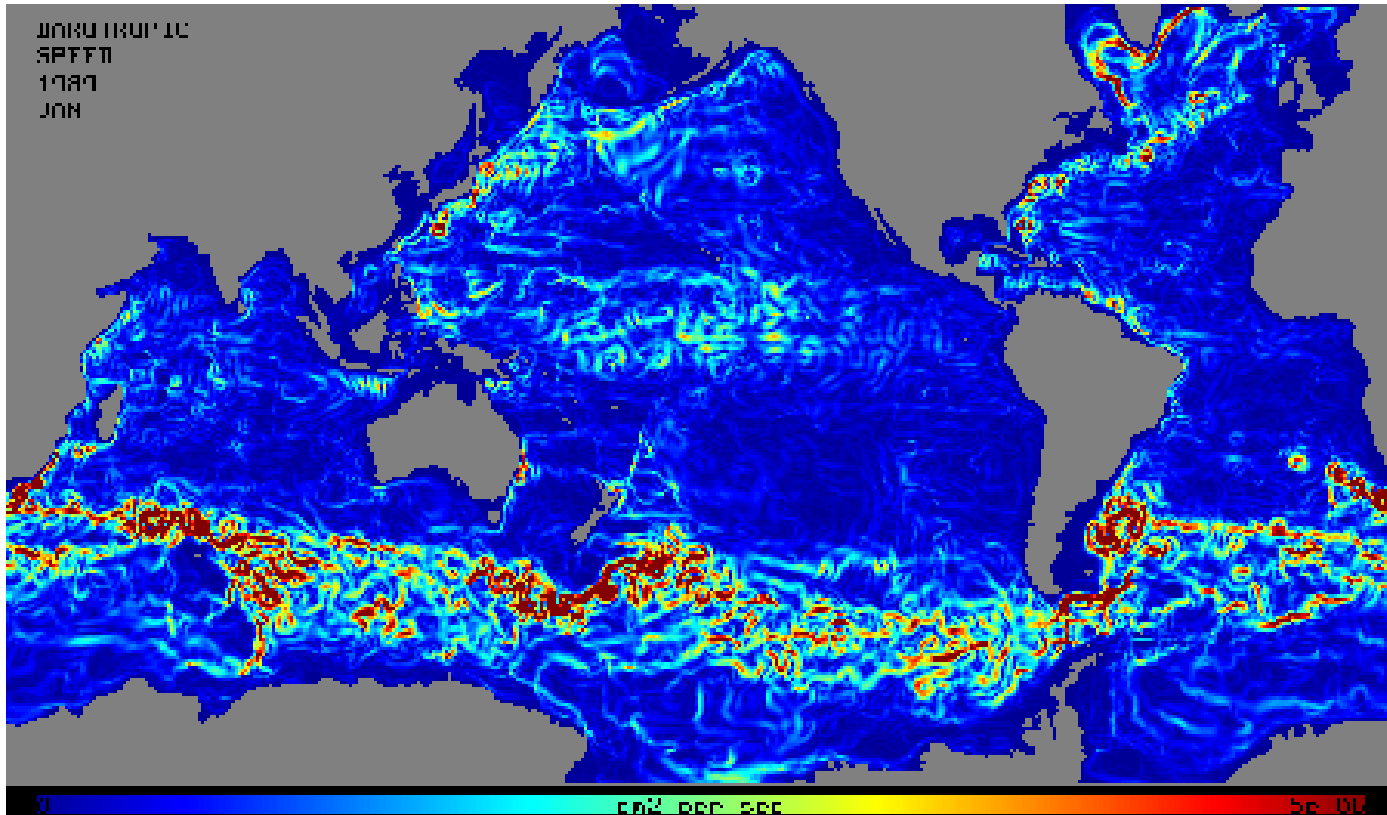
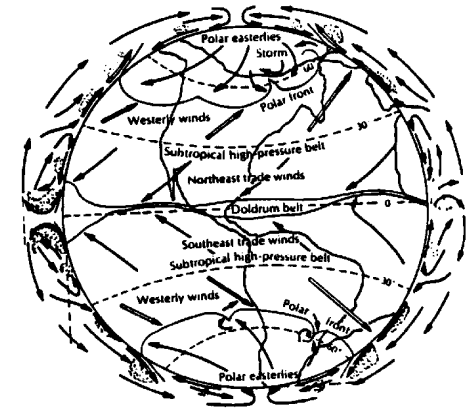




Physical Oceanography

MOTION IN THE OCEAN

currents, waves, tides



ice, topography, winds, temperature, density, Coriolis

