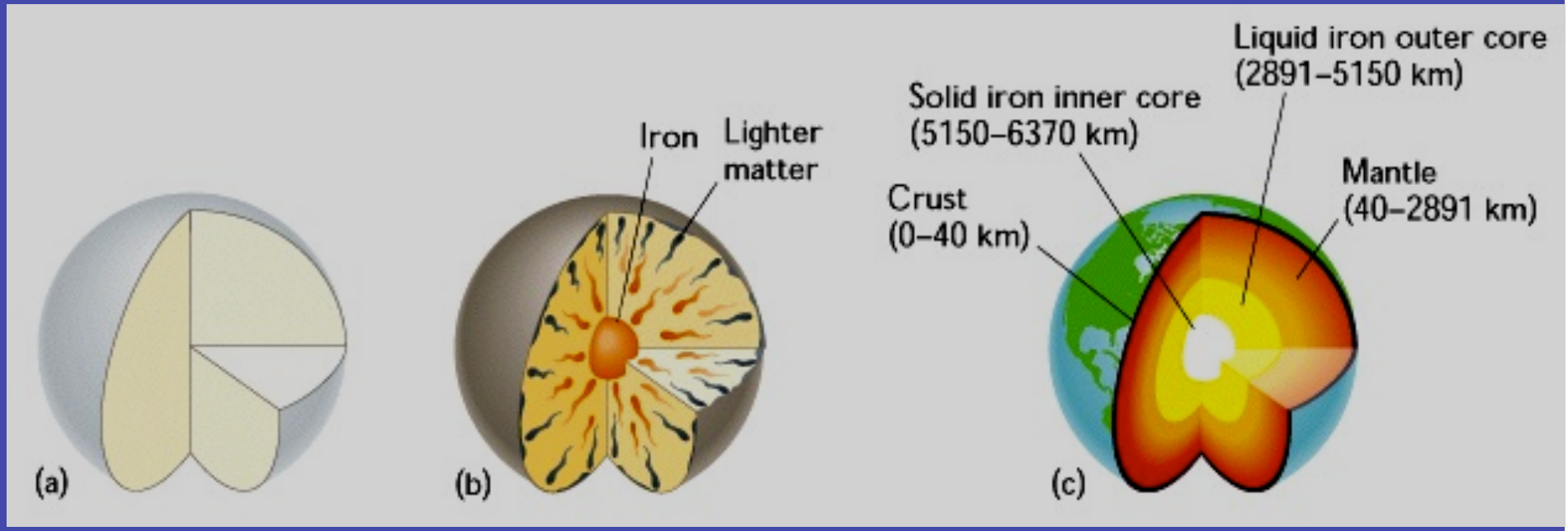
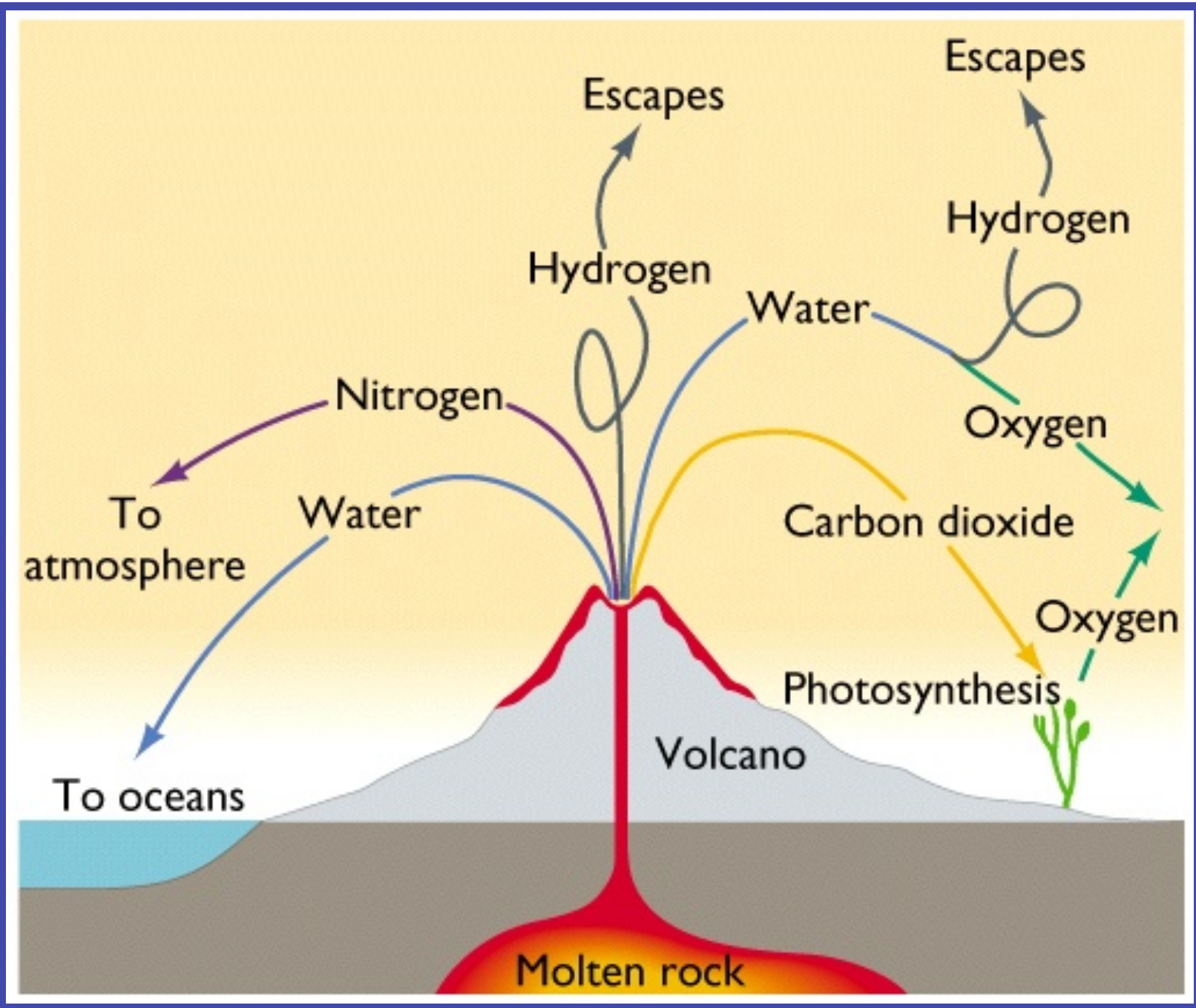
ERA	PERIOD	EPOCH	(Some Dates)
CENOZOIC	Quaternary	Holocene	Last 10,000 years
		Pleistocene	(Began 1.6 m.y.a.)
	Tertiary	Pliocene	
		Miocene	
		Oligocene	
		Eocene	
		Paleocene	(Began 65 m.y.a.)
MESOZOIC	Cretaceous		
	Jurassic		
	Triassic		(Began 251 m.y.a.)
PALEOZOIC	Permian		
	Carboniferous*		
	Devonian		
	Silurian		
	Ordovician		
	Cambrian		(Began 544 m.y.a.)

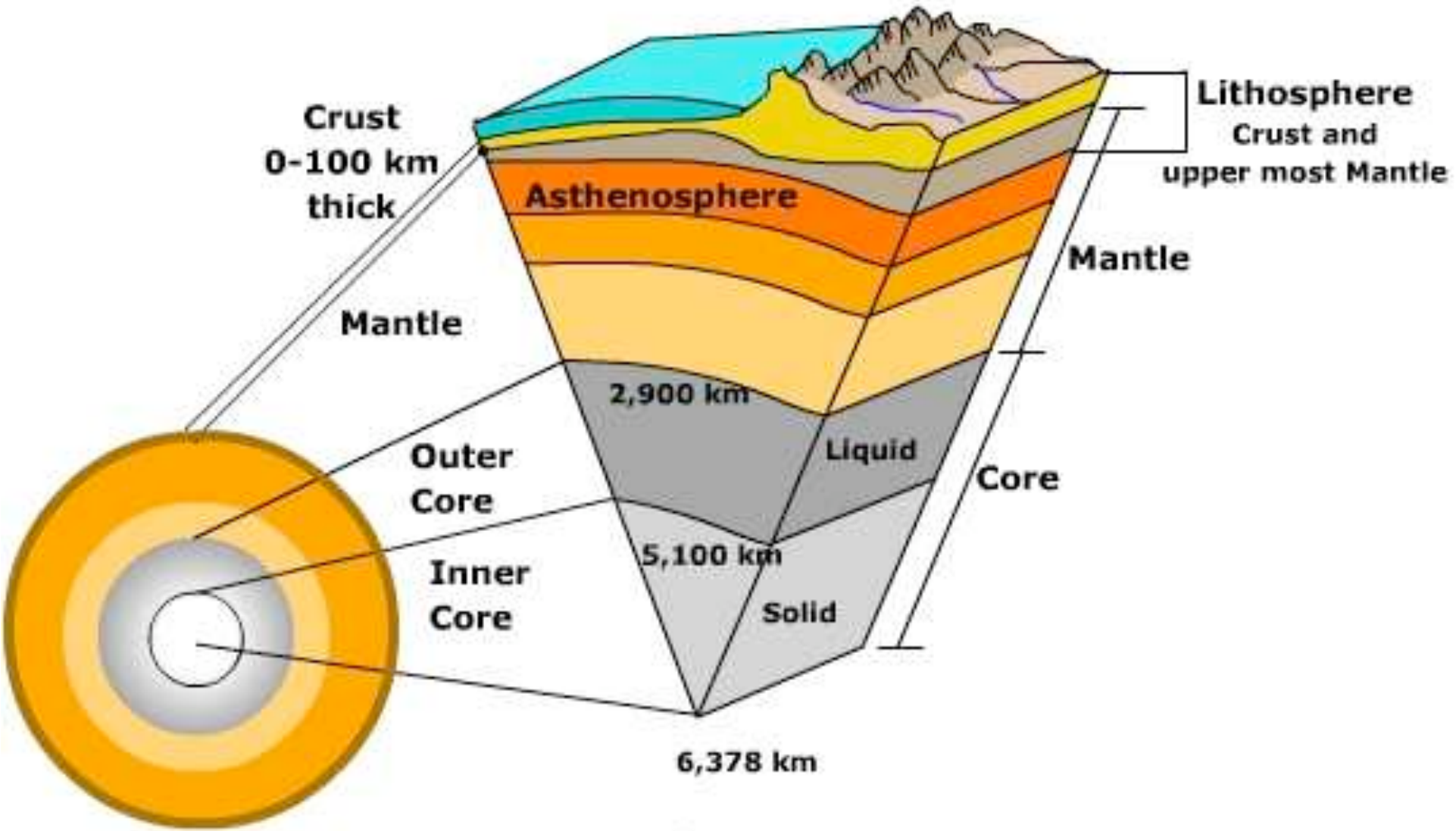
PRECAMBRIAN

4.6 BYA (age of the Earth)

Differentiation of the Earth




Escapes
Escapes
Hydrogen
Hydrogen
Water
Nitrogen
Oxygen
To
atmosphere
Water
Carbon dioxide
Oxygen
Photosynthesis
Volcano
To oceans
Molten rock



Earth Structure

(Not to Scale)

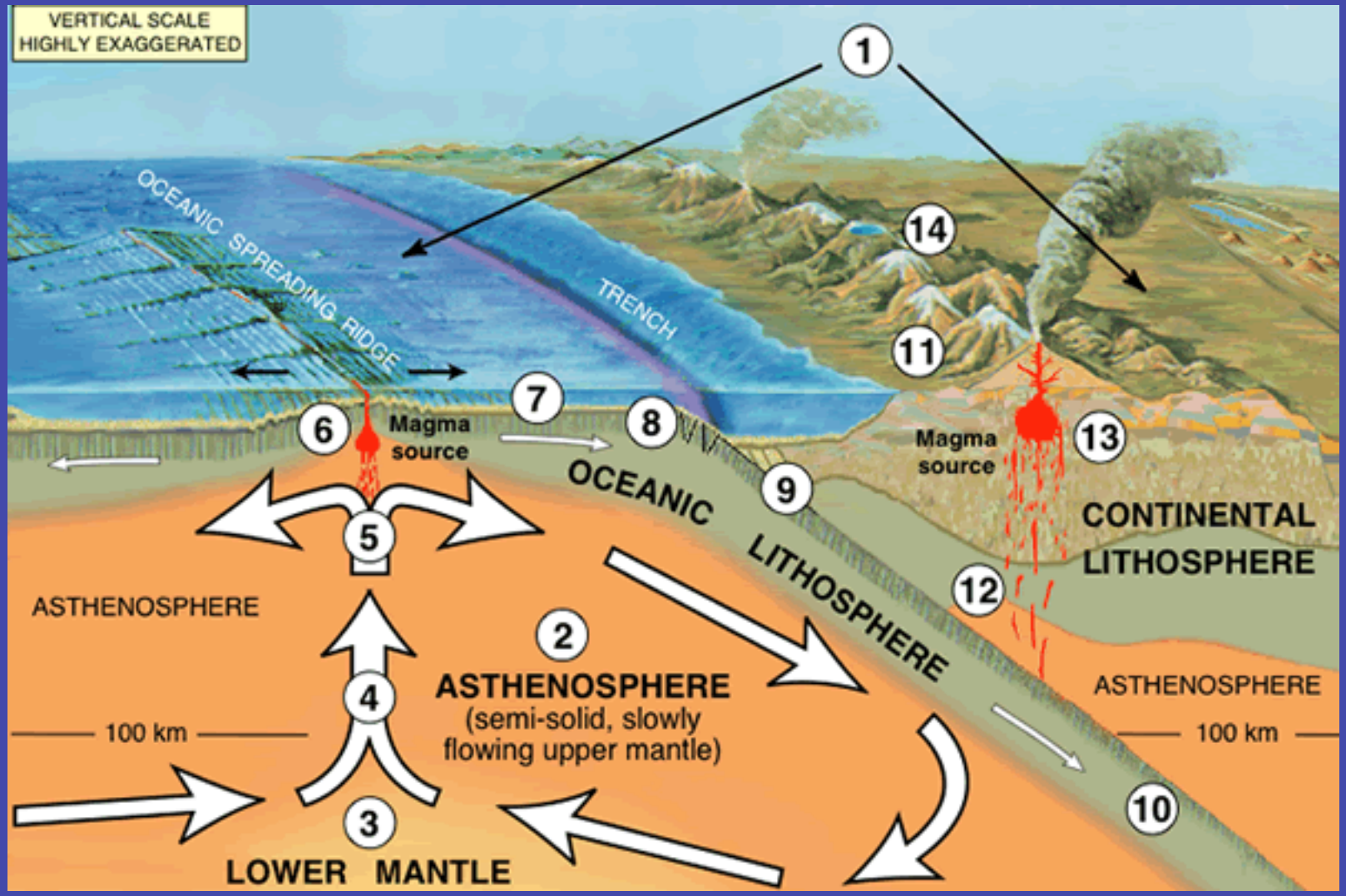
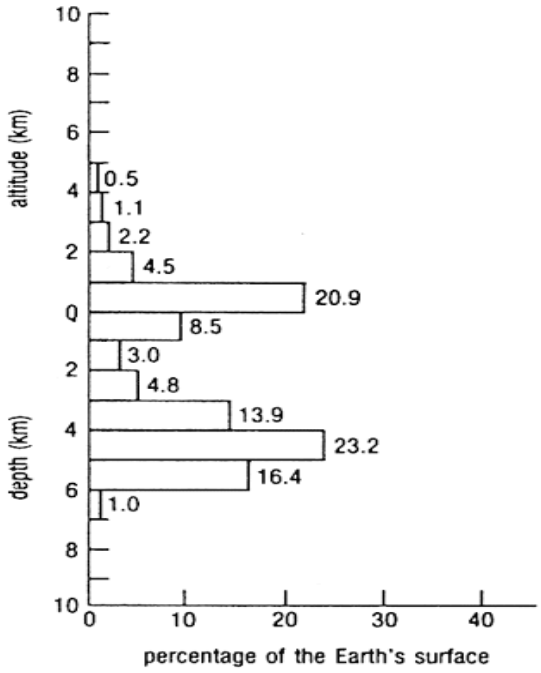

VERTICAL SCALE
HIGHLY EXAGGERATED
1
OCEANIC SPREADING RIDGE
TRENCH
14
11
7
8
6
Magma source
Magma source
13
9
OCEANIC LITHOSPHERE
CONTINENTAL LITHOSPHERE
5
ASTHENOSPHERE
12
2
ASTHENOSPHERE
(semi-solid, slowly flowing upper mantle)
ASTHENOSPHERE
4
100 km
100 km
10
3
LOWER MANTLE

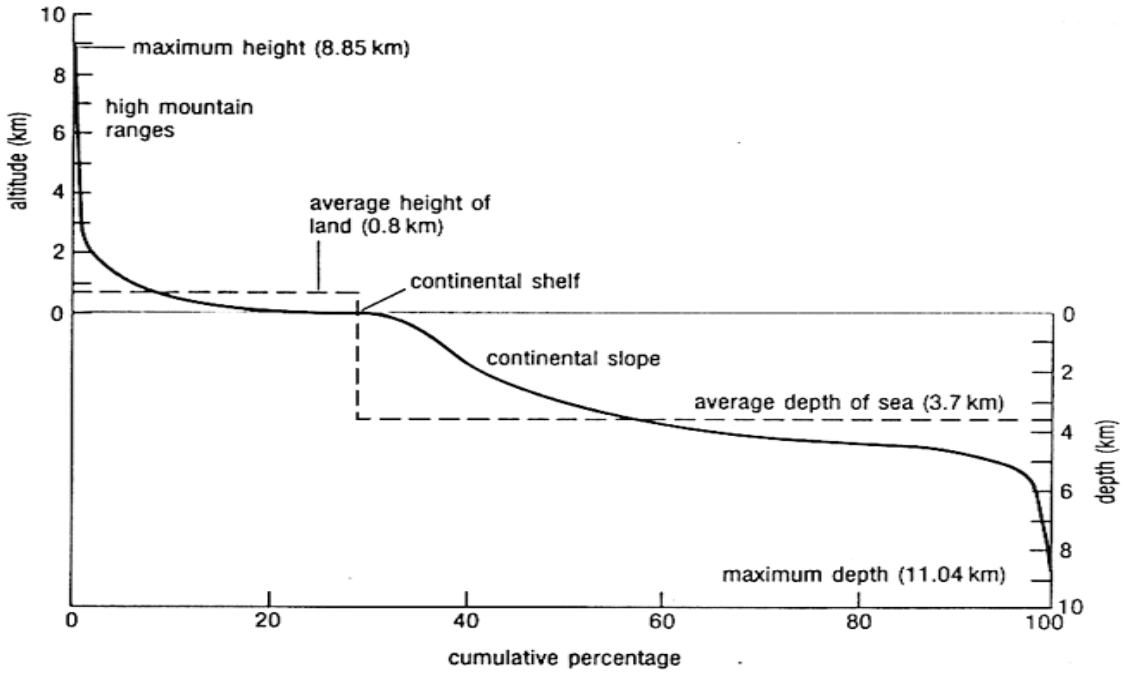
Figure 2.4 The distribution of levels on the Earth's surface.

(a) A histogram showing the actual frequency distribution.

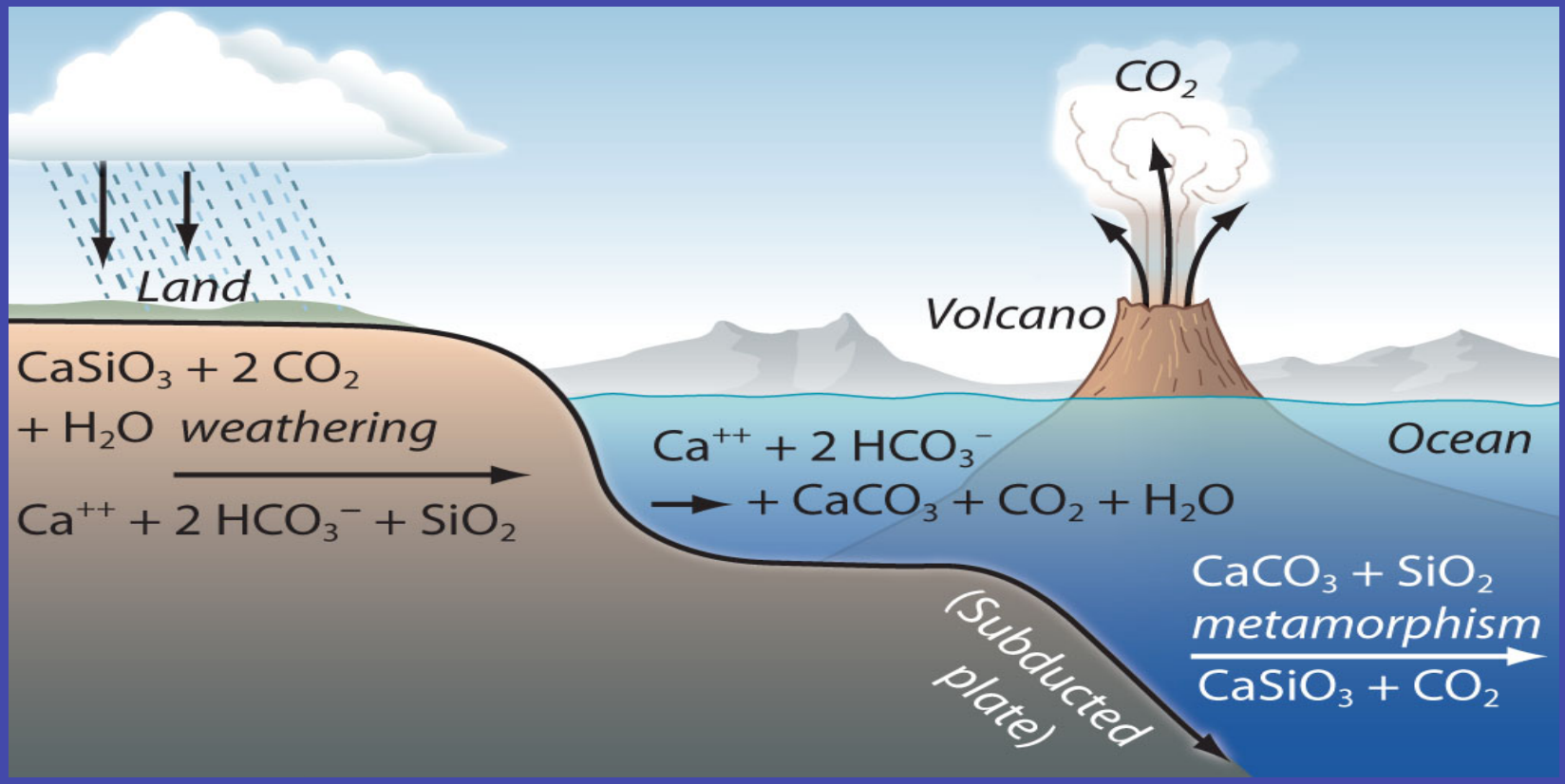
(b) The hypsographic curve: a cumulative frequency curve based on (a). This is *NOT* a profile of the Earth's surface; it is a curve showing the percentages of the Earth's surface that lie above, below, or between any given levels.



(a)



(b)


CO_2
Land
Volcano
$CaSiO_3 + 2\ CO_2$
$+ H_2O$ *weathering*
$Ca^{++} + 2\ HCO_3^- + SiO_2$
$Ca^{++} + 2\ HCO_3^-$
$+ CaCO_3 + CO_2 + H_2O$
Ocean
$CaCO_3 + SiO_2$
metamorphism
$CaSiO_3 + CO_2$
(Subducted plate)

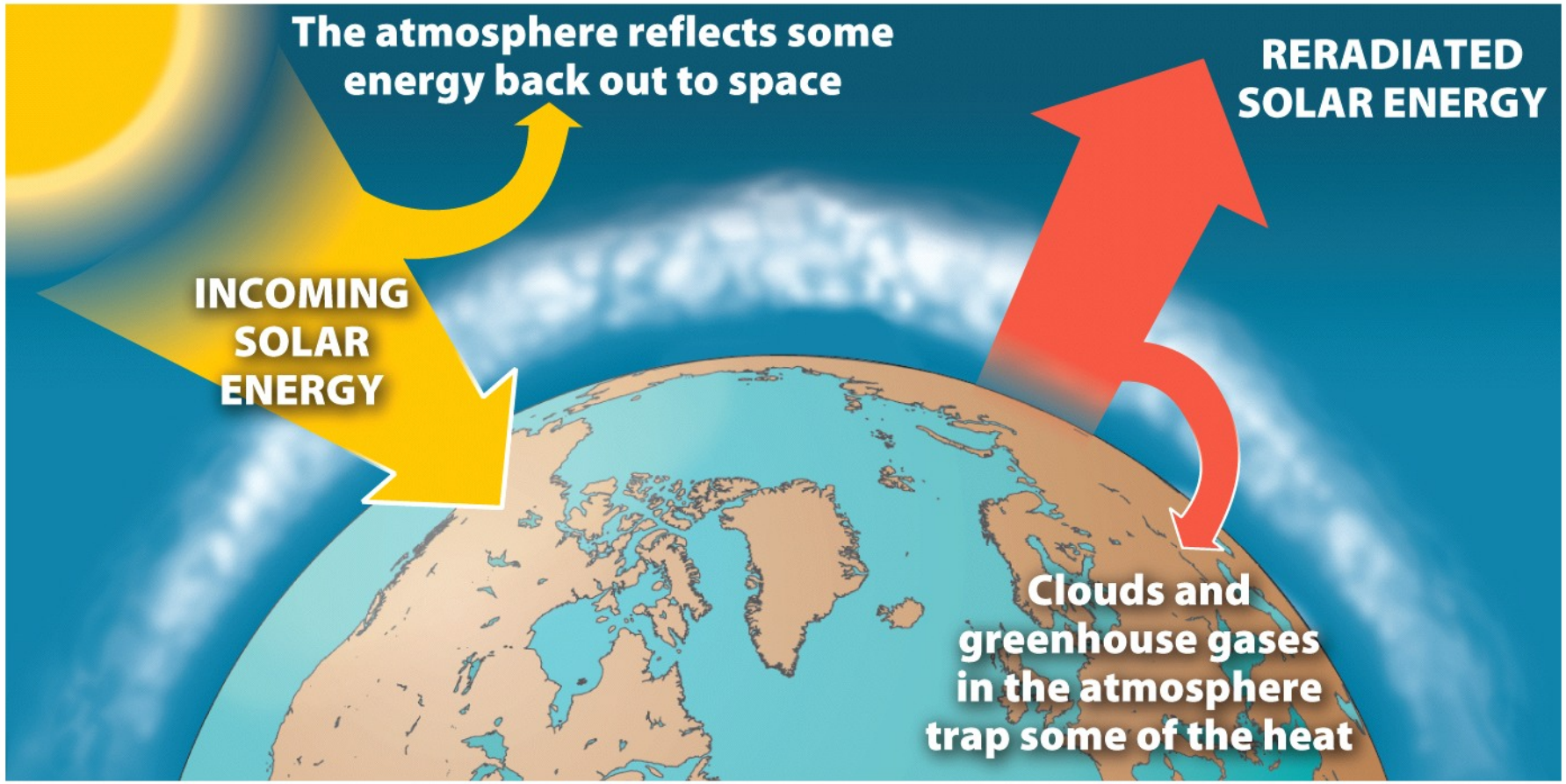
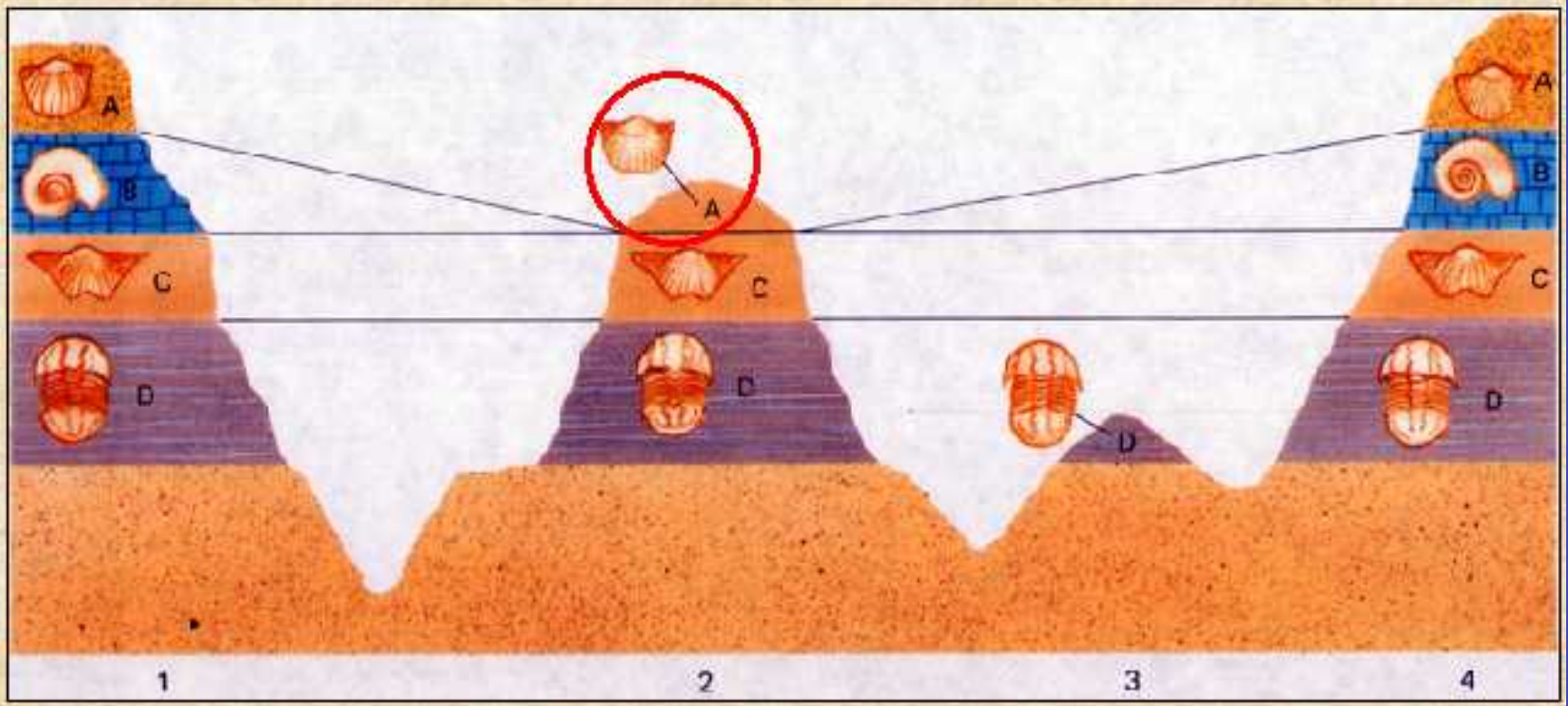


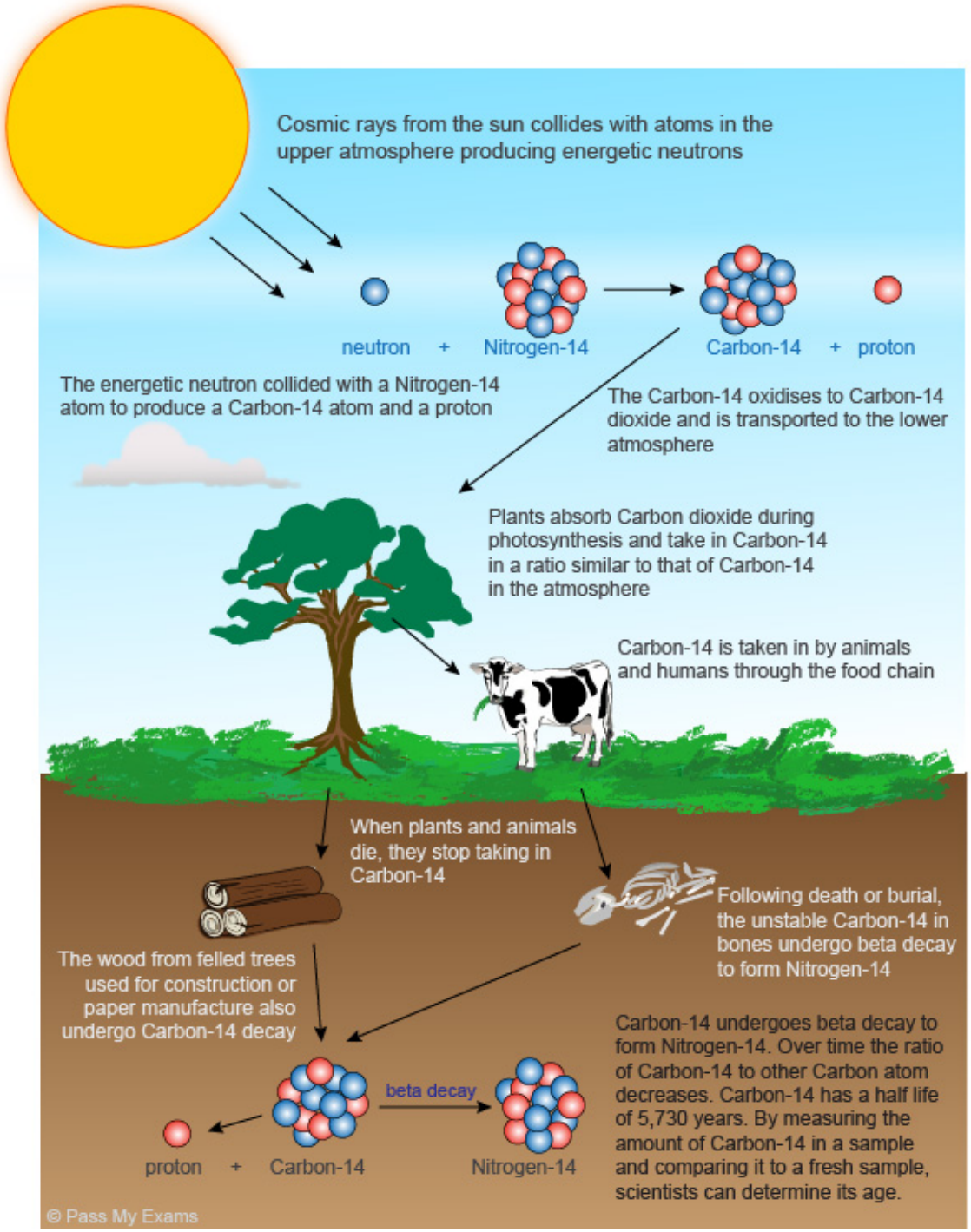
Figure 1-18
Environmental Geology, Second Edition

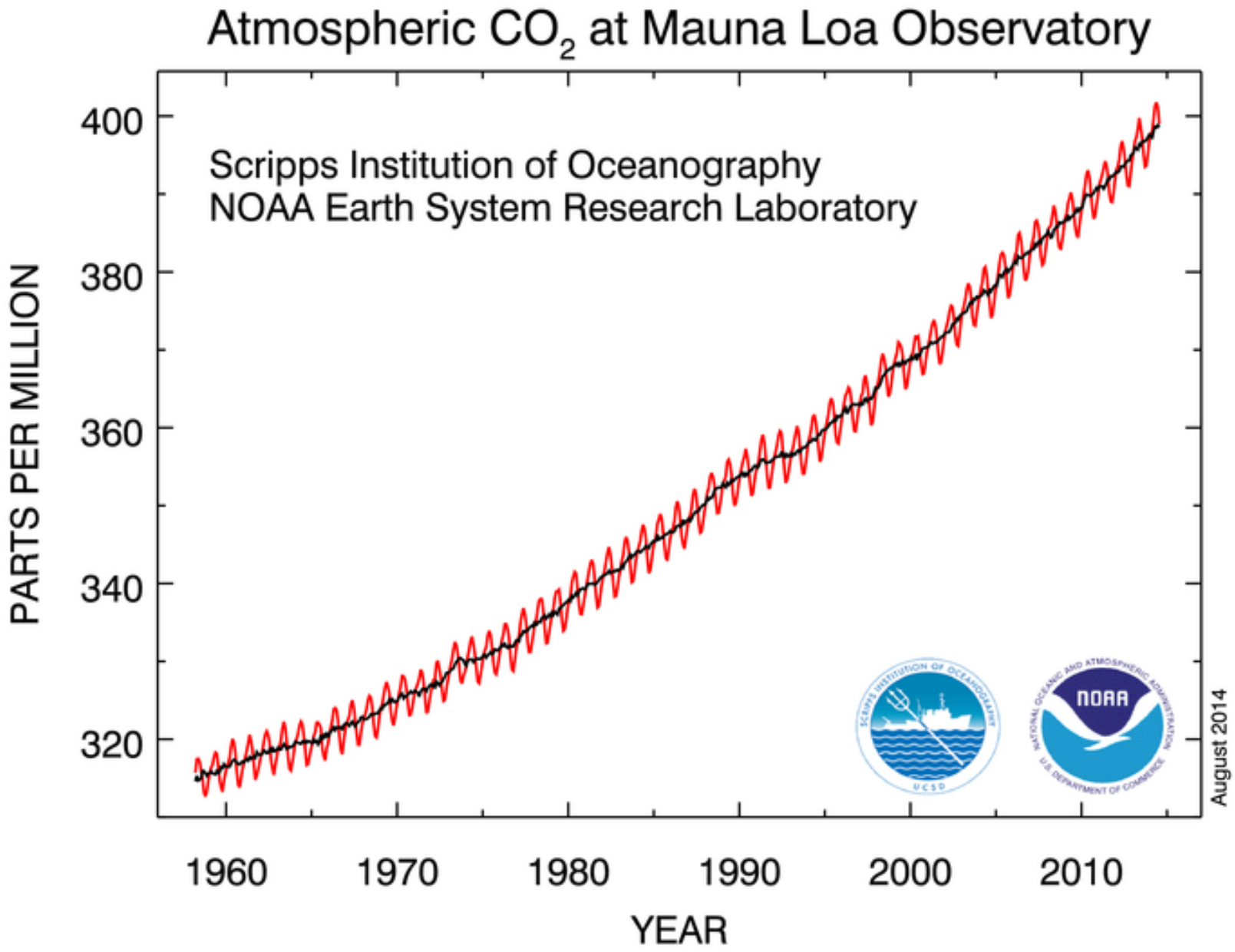
Principles of relative age dating :

1. superposition
2. original horizontality
3. fossil succession

Correlation




Cosmic rays from the sun collides with atoms in the upper atmosphere producing energetic neutrons
neutron + Nitrogen-14
Carbon-14 + proton
The energetic neutron collided with a Nitrogen-14 atom to produce a Carbon-14 atom and a proton
The Carbon-14 oxidises to Carbon-14 dioxide and is transported to the lower atmosphere
Plants absorb Carbon dioxide during photosynthesis and take in Carbon-14 in a ratio similar to that of Carbon-14 in the atmosphere
Carbon-14 is taken in by animals and humans through the food chain
When plants and animals die, they stop taking in Carbon-14
Following death or burial, the unstable Carbon-14 in bones undergo beta decay to form Nitrogen-14
The wood from felled trees used for construction or paper manufacture also undergo Carbon-14 decay
beta decay
proton + Carbon-14
Nitrogen-14
Carbon-14 undergoes beta decay to form Nitrogen-14. Over time the ratio of Carbon-14 to other Carbon atom decreases. Carbon-14 has a half life of 5,730 years. By measuring the amount of Carbon-14 in a sample and comparing it to a fresh sample, scientists can determine its age.
© Pass My Exams


Atmospheric CO_2 at Mauna Loa Observatory
Scripps Institution of Oceanography
NOAA Earth System Research Laboratory
PARTS PER MILLION
400
380
360
340
320
1960
1970
1980
1990
2000
2010
YEAR
August 2014

The Global Carbon Cycle

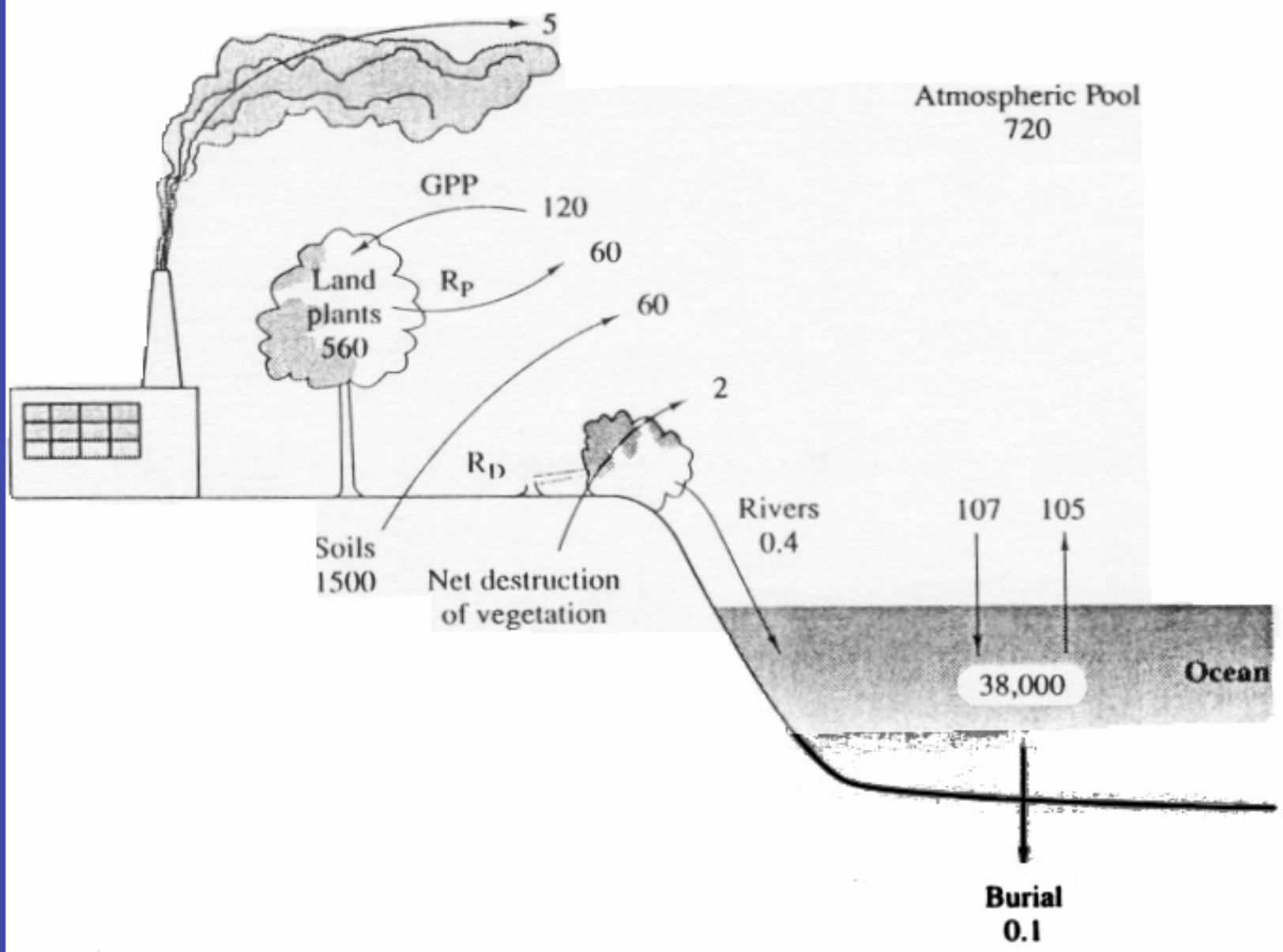
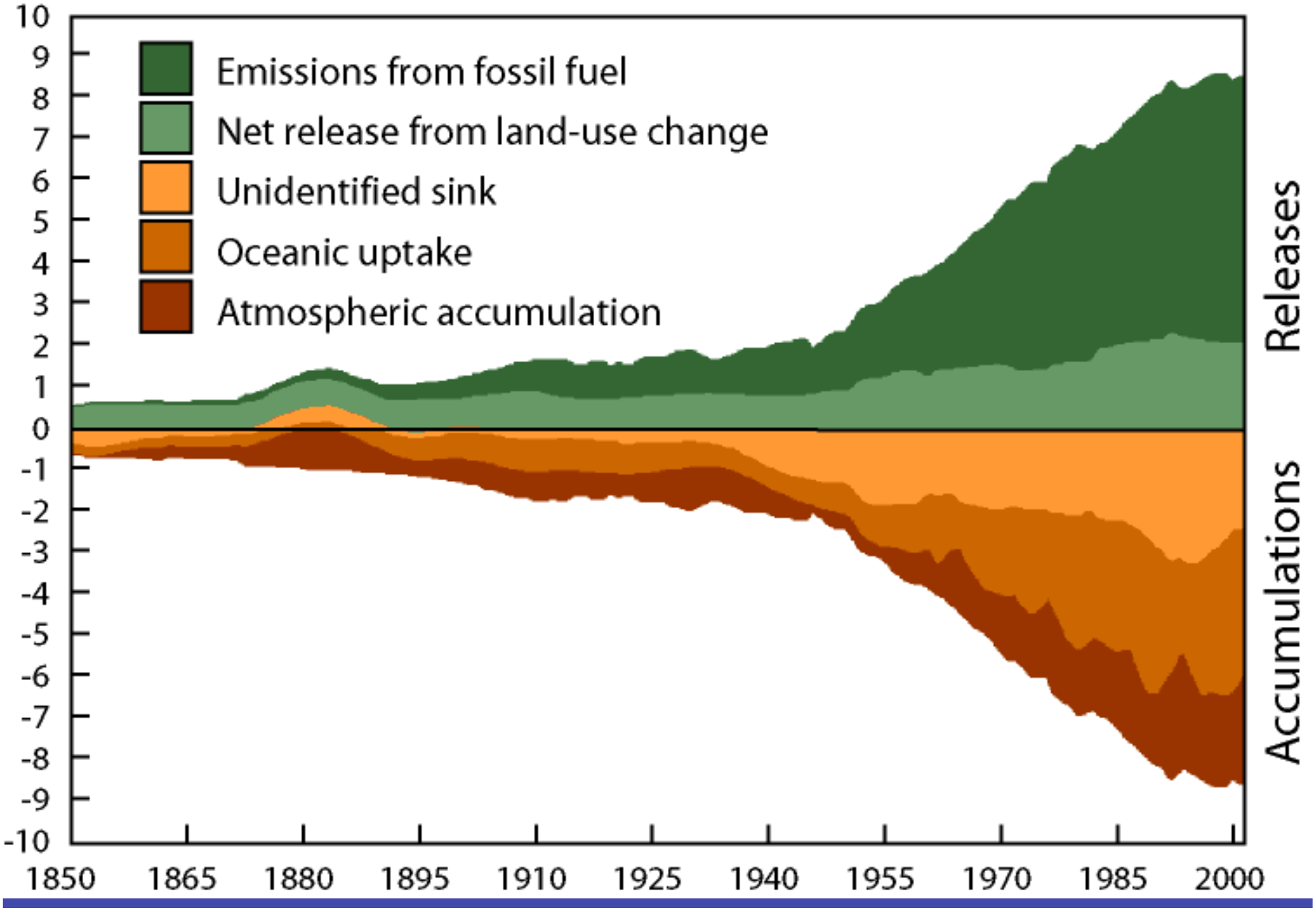
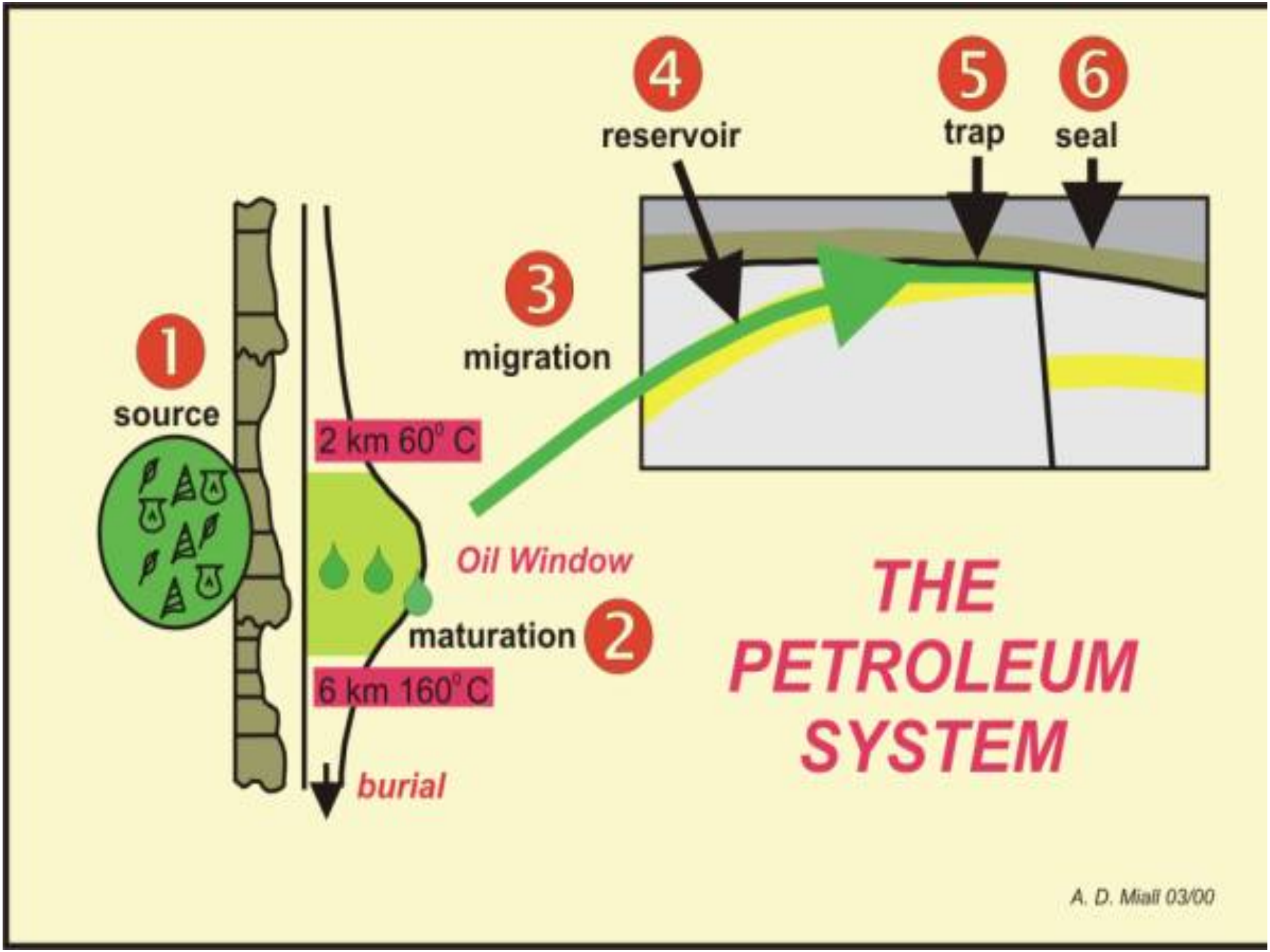
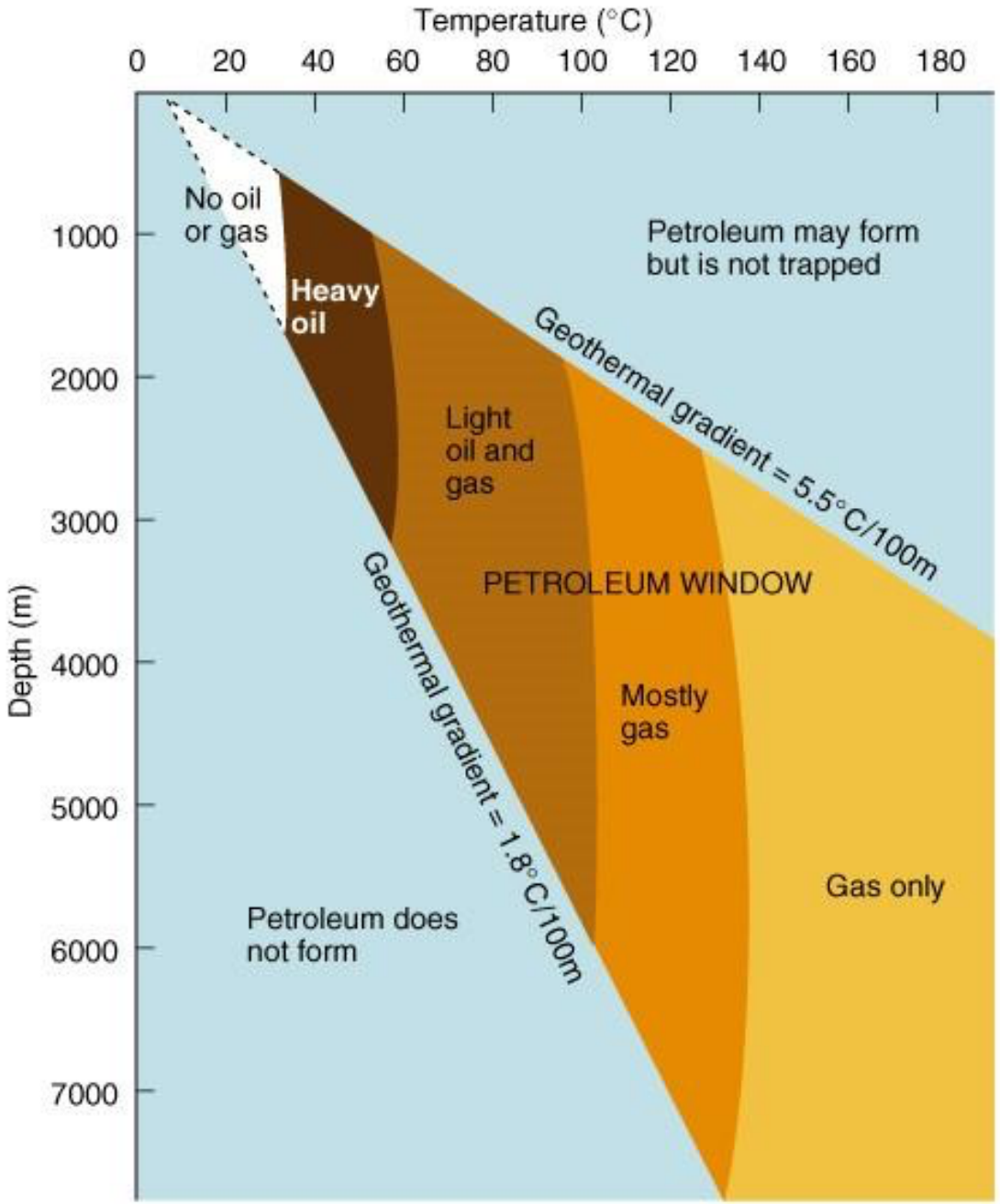


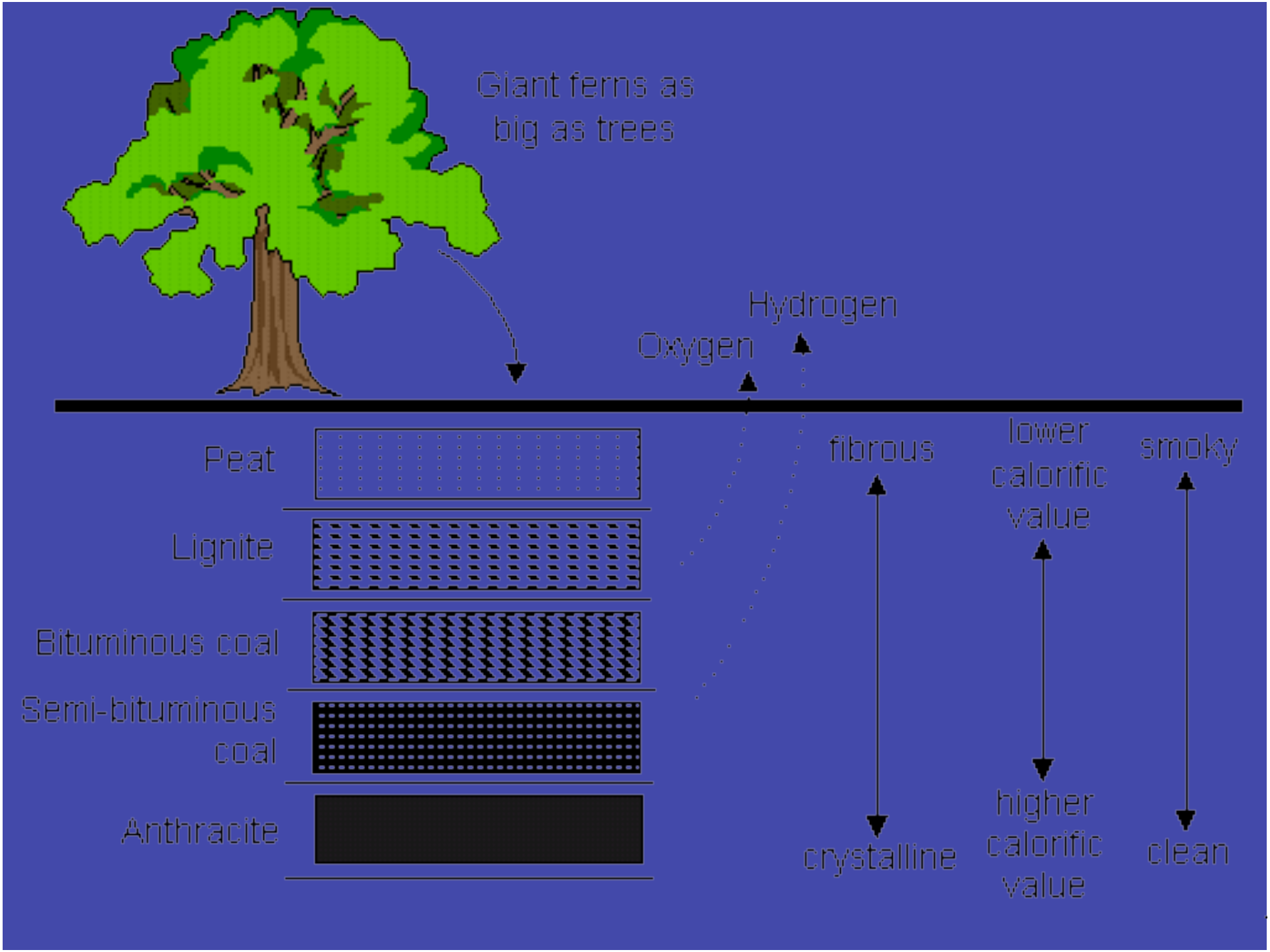
Figure 11.1 The present-day global carbon cycle. All pools are expressed in units of 10^{15} g C and all annual fluxes in units of 10^{15} g C/yr.

Flux of Carbon (Pg C/yr)




4
reservoir
5
trap
6
seal
3
migration
1
source
2 km 60° C
Oil Window
maturation
2
6 km 160° C
burial
THE PETROLEUM SYSTEM
A. D. Miall 03/00

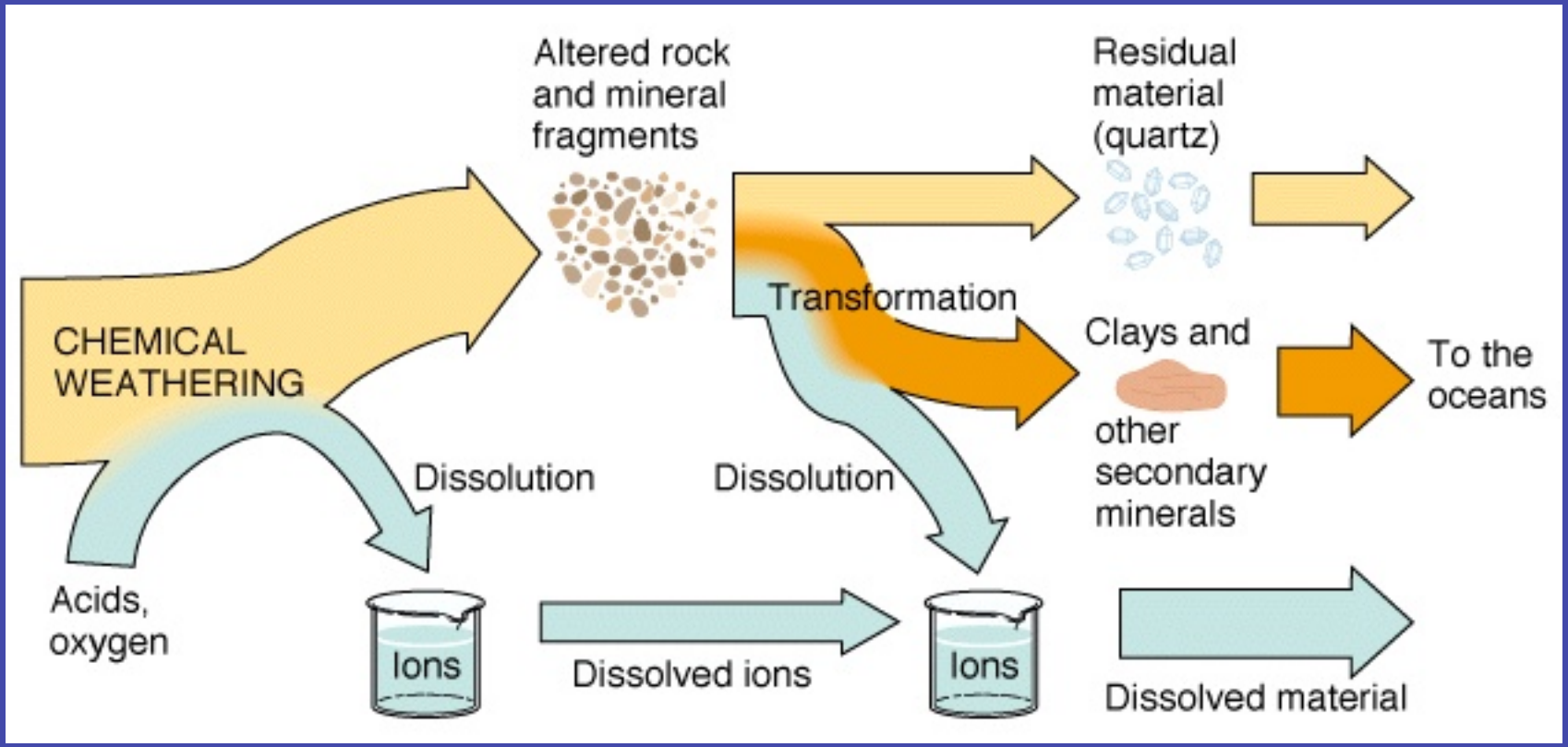



Giant ferns as big as trees
Hydrogen
Oxygen
Peat
Lignite
Bituminous coal
Semi-bituminous coal
Anthracite
fibrous
crystalline
lower calorific value
higher calorific value
smoky
clean

Soil

- The dynamic biogeochemical interface between the
  - atmosphere
  - hydrosphere
  - biosphere
  - lithosphere

From Text (Fig. 6-7)



Essentials of Chemical Weathering