

Ecology 8

- send answer to iClicker Question 36A now
- Efficiency, continued: principles
- Biogeochemical Cycles
 - ex. Carbon Cycle
 - chemistry
 - quantities
 - consequences
- iClicker Question 36B (last one) *there will be a custom on-the-spot one!*

⇒ Phylogenetic Collection report due to TA's mailbox in W-3-021 at regular lab time.

Final Exam Wednesday 5/19 11³⁰ - 2³⁰ (info in Ecology 5)

(Don't forget about Pizza Parlor Phylogeny!)

- Last names A - G in McCormack Cafe
- Last names H - Z here (1 bonus point for going to correct place!)
- If you would like to be a paid tutor for Bio 111 or 112 next year, send me e-mail

Don't forget SimUText (Ecology 2) - it will be on the final!

$$\text{production efficiency} = \frac{\text{biomass gained}}{\text{biomass eaten}}$$

what does efficiency depend on?

① food source - herbivores lose more in feces than carnivores
(easier to assimilate similar "stuff")

② "life style" / basal metabolic rate

- warm-blooded less efficient than cold-blooded
(WB lose more to respiration)

③ age - young, growing animals more efficient than mature animals
(mature animals ~ constant biomass)

examples * birds ~ 1.2% b/c fly \Rightarrow high basal metabolism

* carnivorous insects 55%

- cold blooded (low loss to respiration)

- carnivores (low loss to feces)

consequences assuming 10% average efficiency "the 10% rule"

① how much primary production (plants) does 1 g human biomass require if:

a) humans eat only plants? 10g

10g plant $\xrightarrow{10\% \text{ rule}}$ 1g humans

b) humans eat only cows? 100g

100g plants \longrightarrow 10g cows \longrightarrow 1g humans

c) humans eat only wolves? 1000g

1000g plant \longrightarrow 100g cow \longrightarrow 10g wolf \longrightarrow 1g human

② bio-accumulation of toxins (DDT, mercury, etc)

* assumption: organisms can't get rid of these toxins (~true)

\therefore at each trophic level

90% of biomass lost but 100% of toxins remain

- concentration in animals will increase ~ 10x

∴ concentration in animals will increase ~ 10x with each trophic level

∴ eating tuna fish (trophic level 4 or 5)

mercury level ↑ 10^4 or 10^5 x ⇒ bad news

Biogeochemical cycles "life earth chemistry"

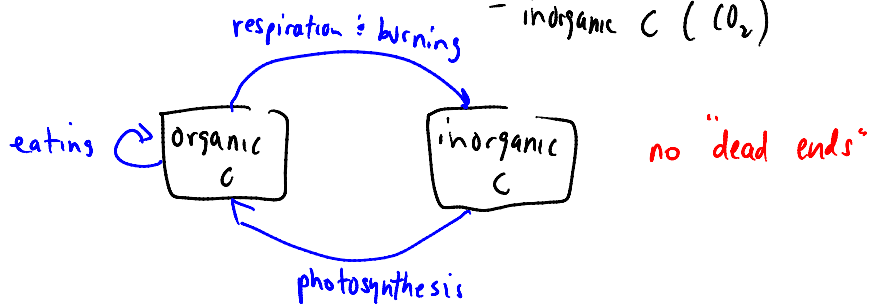
flow of atoms on global scale

ex. Carbon cycle

overall: 2 forms of C

- organic C (biomass)

- inorganic C (CO_2)



* ideally (long term) ~ in balance

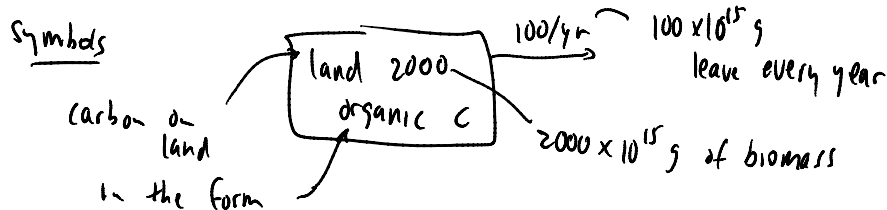
* in the past: photosynthesis >> respiration

⇒ net accumulation of organic C - became fossil fuels
depletion of CO_2 in atmosphere

* now (respiration + burning) > photosynthesis
due to burning of fossil fuels

∴ CO_2 in air ↑

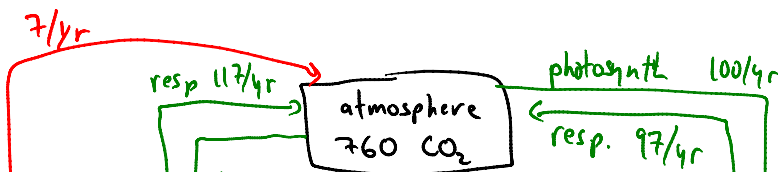
in more detail Global carbon cycle all units of 10^{15} grams of carbon

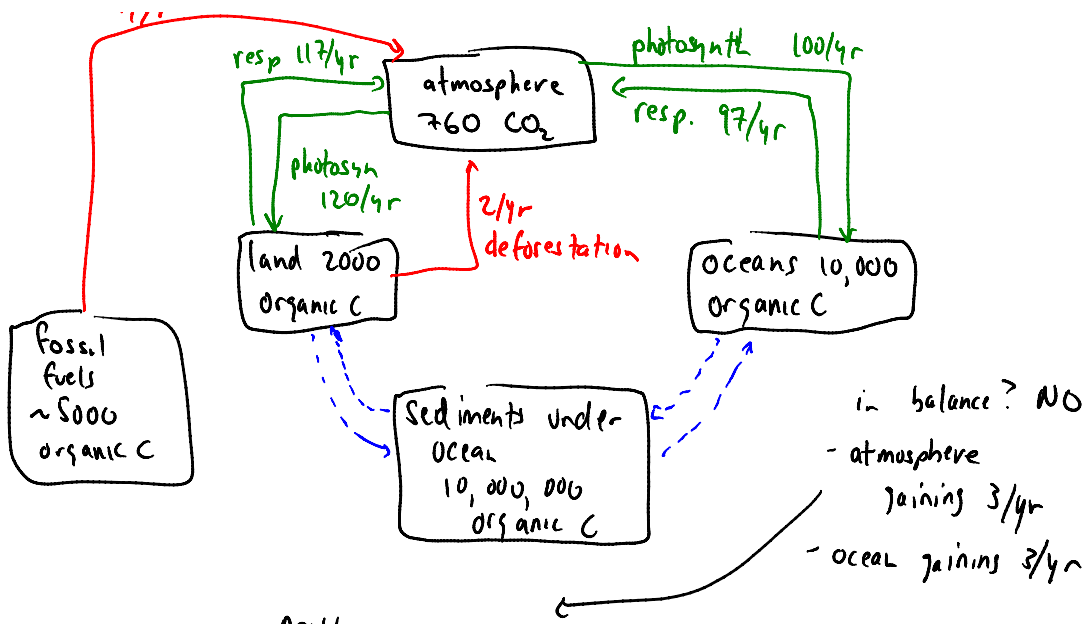


→ human effect

→ too small to measure

→ non human effects





in balance? NO
 - atmosphere gaining 3/yr
 - ocean gaining 3/yr

Problem:
 → global warming
 b/c CO₂ traps solar heat



#	year	mean	unc
	1959	315.99	0.12
	1960	318.91	0.12
	1961	317.64	0.12
	1962	318.45	0.12
	1963	318.99	0.12
	1964	319.62	0.12
	1965	320.04	0.12
	1966	321.38	0.12
	1967	322.16	0.12
	1968	323.04	0.12
	1969	324.62	0.12
	1970	325.68	0.12
	1971	326.32	0.12
	1972	327.45	0.12
	1973	329.68	0.12
	1974	330.17	0.12
	1975	331.08	0.12
	1976	332.05	0.12
	1977	333.78	0.12
	1978	335.41	0.12
	1979	336.78	0.12
	1980	338.68	0.12
	1981	340.11	0.12
	1982	341.22	0.12
	1983	342.84	0.12
	1984	344.41	0.12
	1985	345.87	0.12
	1986	347.19	0.12
	1987	348.98	0.12
	1988	351.45	0.12
	1989	352.90	0.12
	1990	354.16	0.12
	1991	355.48	0.12
	1992	356.27	0.12
	1993	356.95	0.12
	1994	358.64	0.12
	1995	360.62	0.12
	1996	362.36	0.12
	1997	363.47	0.12
	1998	366.50	0.12
	1999	368.14	0.12
	2000	369.40	0.12
	2001	371.07	0.12
	2002	373.17	0.12
	2003	375.78	0.12
	2004	377.52	0.12
	2005	379.76	0.12
	2006	381.85	0.12
	2007	383.71	0.12
	2008	385.57	0.12
	2009	387.35	0.12

year — ppm CO₂

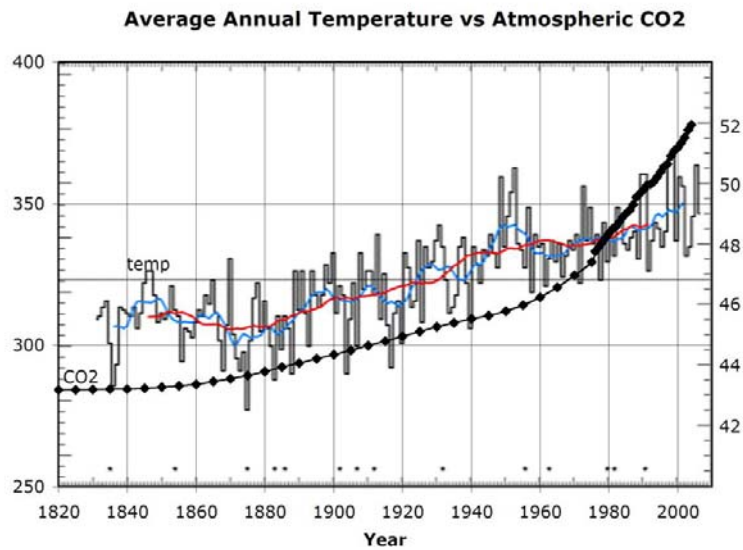
0.0315% CO₂

0.032%

0.034

0.035

0.039%



Ecology 7 - 2

Given that atmospheric CO₂ is rising
 what should also be happening to atmospheric O₂?

- A - rising
- B - stay the same
- C - falling
- D - I don't know
- E - I hit the wrong button