

Lake Nyos Disaster

- 1700 people and many livestock died near Lake Nyos in Cameroon in 1986
- A survivor reported a 25m high water surge and odor of rotten eggs
- Caused by catastrophic release of supersaturated CO₂ from the hypolimnion
- CO₂ probably came from volcanic activity
- Landslide or cool weather released the gas
- Building up again, using pipes to release pressurized water

Forms of Carbon

- Inorganic Carbon-bicarbonate equilibrium
 - carbon dioxide CO₂
 - carbonic acid H₂CO₃
 - bicarbonate HCO₃⁻
 - carbonate CO₃²⁻
 - CO₂ + H₂O? H₂CO₃ ? HCO₃⁻ + H⁺ ? CO₃²⁻ + 2H⁺
- Organic Carbon
 - Carbohydrate
 - Hydrocarbon
 - Methane

Biochemical Oxygen Demand (BOD)

- a commonly performed water quality parameter
- the amount of dissolved oxygen that will be consumed in a water sample by microbial activity.
- is determined by taking a water sample, placing it in a BOD bottle, and measuring DO changes over time
- what compounds contribute to BOD?



Carbon

- Forms of Carbon
- Transformations of Carbon
 - DIC
 - CO₂, H₂CO₃, HCO₃⁻, CO₃²⁻
 - Alkalinity or acid neutralizing capacity
 - DOC
 - Humics and others
 - POM
 - CPOM
 - FPOM
 - BOD
- A General Introduction to Nutrient Cycling and the Carbon Cycle

Organic Carbon

- Dissolved versus particulate (DOC vs POC)
- CPOM and FPOM
- Biochemical Oxygen Demand (BOD)
- Tannins, lignins, cellulose
- Humic materials
 - humic acids (soluble in alkaline precip in acid)
 - fulvic acids (soluble in acid)
 - humins (not extractable by acid or base)

Transformations of Carbon

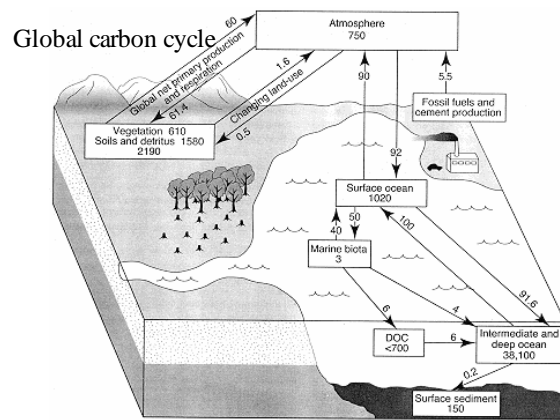
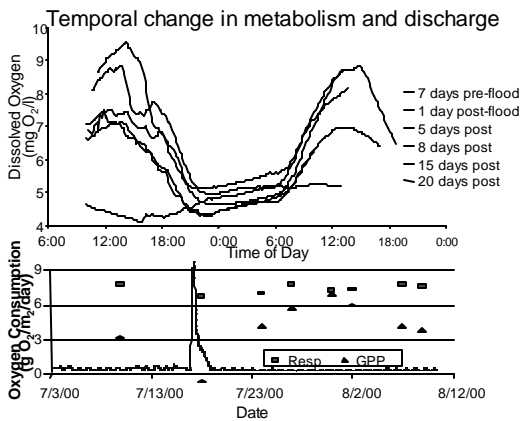
- Oxidation of Organic Carbon with Inorganic Electron Acceptors other than O₂
- Fermentation
- Methanotrophy
- Methanogenesis
- Autotrophy (photoautotrophy includes oxygenic and anoxygenic photosynthesis)
- Respiration

Methanotrophy and Methanogenesis

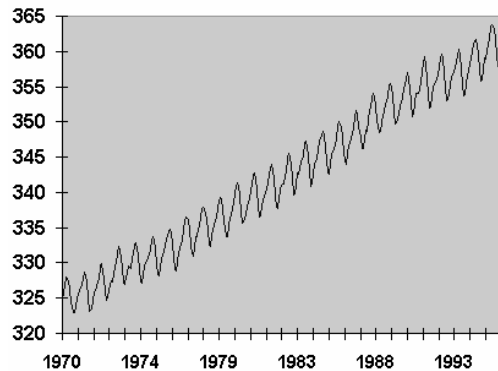
- Methanotrophs are aerobic organisms that “eat” methane and carbon monoxide. Very important in global carbon cycle
- Methanogens make methane from CO₂ and H₂ at very low redox. Also can use acetate. Important in global methane cycle

Primary productivity and community respiration

- $GPP = NPP + R$
- Oxygen
 - Easy to measure
 - Consumed by respiration
 - Produced by photosynthesis
 - Exchanges with atmosphere
 - Change in DO = $P - R \pm E$
 - Supersaturated water will lose gas to atmosphere
 - Under-saturated water will gain gas from atm
 - Saturation depends on pressure and temperature



Atmospheric CO₂ Concentration at Mauna Loa (ppm)



Carbon Dioxide Concentrations

