

**CHEMISTRY 253**  
**Spring, 2015 - Dixon**  
**Group Assignment #1**

Biogeochemical Cycles Questions:

1. Looking at Figure 10-1 in Baird and Cann,

a) calculate the turnover time in days for water in the atmosphere (using the combined precipitation rates)

$$t = \text{vol}/\text{precip rate} = 13,000 \text{ km}^3 / (111,000 + 385,000 \text{ km}^3/\text{year}) = 0.026 \text{ years} = \mathbf{9.6 \text{ days}}$$

b) If ice is assumed to be in steady state, and if its net sinks are 25,000 km<sup>3</sup>/year, what is its turnover time (in years)? How does this compare to the oceans (the only sink is evaporation)?

$$\text{ice: } t = \text{vol}/\text{loss rate} = 33,000,000 \text{ km}^3 / (425,000 \text{ km}^3/\text{year}) = \mathbf{1320 \text{ years}}$$

$$\text{ocean: } t = \text{vol}/\text{loss rate} = 1,350,000,000 \text{ km}^3 / (25,000 \text{ km}^3/\text{year}) = \mathbf{3176 \text{ years}}$$

**ice is faster than ocean**

c) Rivers constitute a pretty negligible reservoir of water, why are they still important in the hydrological cycle?

**They are important as a flux between surface water (labeled soil water in figure) and the oceans.**

Note: in this example, use of a “linear” model may not be that realistic (e.g. precipitation is not directly proportional to water concentration)

