Surface Water Hydrology
Homework #1
Due on Feb. 3, 2014

Problem 1. Precipitation is typically measured as a volume [L^3] per unit area [L^2] which has dimensions of length [L]. The average annual precipitation at Dallas TX is 37 inches. What is the average annual precipitation in millimeters (mm) at Dallas?

Problem 2. In the United States, stream discharge is often measured in units of cubic feet per second (ft^3s^{-1}, or cfs). In most other countries, discharge is measured in cubic meters per second (m^3s^{-1}, or cms). What is the equivalent flow in cms of 20 ft^3s^{-1}?

Problem 3. In an average year, 1.2 meter of precipitation falls on a catchment with an area of 100 km^2.

A. What is the volume of water received during an average year in cubic meters?
B. In gallons?

Problem 4. The polar ice caps (area =$2.0x10^7 km^2$) are estimated to contain a total equivalent volume of $2.5x10^7$ km^3 of liquid water. The average annual precipitation over the ice caps is estimated to be 4 inches per year. Estimate the residence time of water in the polar ice caps, assuming their volume remains constant in time.

Problem 5. In an average year, a small (area =$5.0km^2$) agricultural catchment receives 1000 mm of precipitation. The catchment is drained by a stream, and a continuous record of stream discharge is available. The total amount of surface-water runoff for the year, determined from the stream discharge record, is $1.2x10^6$ m^3.

A. What is the volume of water (in m^3) evapotranspired for the year (assume no change in water stored in the catchment)?
B. What is the depth of water (in mm) evapotranspired for the year (again, assuming no change in water stored in the catchment)?
C. What is the runoff ratio ($\overline{Q_s}/\overline{P}$) for the catchment?