Carnegie Mellon University
Department of Civil and Environmental Engineering

12-725: Fate, Transport, and Physicochemical Processes of Organic Contaminants in Aquatic Systems and their Measurement in Environmental Samples

Problem Set #7 Spring 2020
Due March 26, 2020 by 5pm

1.   P16.4 in EOC

2.   SOM and DOC can influence on the fate of highly hydrophobic organic contaminants. Assume that you have a lake containing 500 mg/L or soil particles (f_{oc}=0.03) and DOC at 20 mg/L. You can assume that $K_{iDOC,w}$=1/2 of $K_{ioc,w}$. Approximate the fraction of mass of a 1) pentachloro-PCB and 2) 1,2-dichlorophenol associated with the SOM and DOC in the lake. What fraction of the mass is present in the truly dissolved form? State any assumptions that you make. Could the presence of SOM and DOC influence the fate either of these compounds in the lake, e.g. reactions with sunlight or uptake by organisms? Why or why not?

3.   Q17.3 and Q17.9 in EOC

4.   P17.8 in EOC

5.   What are the three types of air-water mass transfer models that we discussed? How is the temperature dependence built into each model?

6.   What physical process(es) predominantly control the rate of air-water exchange in a) rivers, b) lakes, c) oceans? When does the situation become a bit nebulous?

7.   P19.2 in EOC

8.   P19.4 in EOC