The third phase

- Can also consider the DOC phase
  \[ f_d = \frac{1}{1 + K_w m + K_{DOC} \cdot DOC} \]

- Which gives us 3 fractions
  - dissolved
  - particulate
  - DOC-bound

\[ f_p = \frac{10^6 K_{m, POC}}{1 + 10^6 K_{m, TOC}} \]
\[ f_p = \frac{10^6 K_{m, POC}}{1 + 10^6 K_{m, TOC}} \]
\[ f_p = \frac{10^6 K_{m, DOC}}{1 + 10^6 K_{m, TOC}} \]
Black Carbon

- A pyrolytic form of carbon
  - Diesel soot
  - Other pyrolytic sources
  - Non-pyrolytic
    - e.g., tire wear & urban runoff
- Behaves like GAC
  - Non-linear adsorption
    - Freundlich Isotherm

PtOC & BC model

- Two terms
  \[ C_s = f_{oc} K_{oc} C_w + f_{BC} K_{BC} C_w^n \]
  - Simple partitioning for normal PtOC
  - Freundlich isotherm adsorption for BC
- And Re-arranging
  - where \[ C_s = K_d C_w \]
  \[ K_d = f_{oc} K_{oc} + f_{BC} K_{BC} C_w^{n-1} \]

Accardi-Dey & Gschwend, 2002, Env. Sci. & Technol. 36(1)21-29
Env. Data

- Boston Harbor Study

![Graph showing concentration of dissolved pyrene (µg/L) against concentration of dissolved pyrene (µg/L) with Freundlich exponent n = 0.62 ±0.12](image)

Accardi-Dey & Gschwend, 2002, Env. Sci. & Technol. 36(1)21-29

Simple Dual Mode Model

- Simple DMM
- Developed to accommodate
  - “dissolution” behavior
  - Linear partitioning
  - competitive adsorptive behavior
  - Langmuir-type isotherm
  - Affinity coeff, b ≡ K_{ad} / K_{de}

\[
v = \frac{v_m c_d}{k_d c_d + c_d}
\]

\[
v = \frac{v_m \left(\frac{k_d}{k_{ad}}\right) c_d}{1 + \left(\frac{k_d}{k_{ad}}\right) c_d}
\]

\[
v = \frac{v_m b c_d}{1 + b c_d}
\]
Extended DMM

- Accounts for plasticization by the sorbate

\[ v = K_d e^{\sigma v^*} c_d + \frac{v_m (1 - \frac{v^*}{v_m}) b c_d}{1 + b c_d} \]


- To next lecture