Concentration, units & dimensions

Learning Objectives:

- **Define** Environmental Fluid Mechanics (EFM)
- **List** and define three types of concentration measures
- **List** the dimensions of concentration, mass fraction, and the diffusion coefficient
- **Convert** concentration measures among various units (i.e. mg/l to mol/l)

Motivational Question:

- How do you quantify the amount of a chemical dispersed in the environment?
Examples of Environmental Fluid Mechanics Projects

OCEN 489 and 689
Scott A. Socolofsky

Zachry Department of CIVIL ENGINEERING | TEXAS A&M ENGINEERING
Environmental Fluid Mechanics

- **Definition:** Answers to how natural processes in the hydrosphere change concentrations

- **Transport processes:**
  - Diffusion (molecular and turbulent)
  - Advection

- **Transformation processes: (key processes)**
  - Dissolution
  - Chemical reactions
  - Critter metabolisms
Transport in the Hydrosphere

Courtesy of Chin Wu.
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Concentrations

Concentration boundary layer. Turbulence structure is clearly evident.

Waves collage courtesy of John Crimaldi

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Hydromechanics

Breaking waves move sediment, generate sea spray, oxygenate the water column and provide turbulence, among other important coastal and offshore processes.

Courtesy of Benoit Cushman-Roisin, Dartmouth College
Point Pollution Sources

Wastewater Outfalls

Shoreline Contact
Outfall Location

Courtesy of the CORMIX project

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Storm Water Runoff

Pollutant loads include point and non-point sources

Courtesy of USGS
Water Quality

Measurement of a wealth of water quality parameters

Courtesy of Cortland College
Zooplankton, phytoplankton, and other lake inhabitants

Courtesy of Gertrud Cronberg
Natural Preservation

Restoration and Provision for Natural Conditions

Courtesy of College of Natural Resources, University of Idaho
Topics

- Diffusion
- Advection
- River Mixing Processes
- Transformation
- Air/water Interface
- Sediment/water Interface
- Tidal Mixing
- Point source near-field: Jets and Plumes
- Environmental fate and transport modeling