Class notes, SMS-618, Particle Dynamics.
Class # 1: Logistics and overview of particles in aquatic environments.

What is a particle?

Coherent structure.
Different density (or other property) than surrounding.
Opertional- filter pore size (or instrument detection which acts as a filter).
Different than continuum (which is defined by the scale of interest, e.g. krill may be a continuum for a whale…).
Size range restriction (macro-molecules-> diatom chains, sand)?
Passive vs. active? Living vs. non-living ? Solid vs. deformable?

Discussion:
Given the fuzziness of most criteria is needs to be defined before we can move on.

What particles do we find in aquatic environments?

Phytoplankton
Inorganic vs. organic particles?
Bubbles
Sediments (marine or terrestrial source)
Dead organic particles
Non-algal living particles

Discussion:
Organic: C-H bonds which burn at a give temperature.
There seem to be no perfectly organic or inorganic particles (most inorganic are coated by organics and organic particles have inorganic constituents). %organic carbon may provide the difference.

What are the sources/sinks of particles in aquatic environments?

Vents
River
Atmosphere (Aeolian)
Biological death/birth, ingestion/digestion.
Resuspension/settling
A-biological aggregation, flocculation, gelation. Breakage

Discussion
At a given point advection (by wave and current) may appear as a source.

What are the processes that affect their transport and transformation?
Turbulence
Currents
Waves
Aggregation/disaggregation
Swimming
Sinking
Chemistry (dissolution, adsorption)
Prey/predator interaction
Biologica/physical interactions
Temperature and pressure mediated processes.

What properties of these particles do/should we care about?
Size
Shape
Concentration
Porosity
Density
Passive/active
Composition (e.g. source, nutritional value, toxicity, radioactivity)
Optical/acoustical properties (effect on environment and detection)