Tracer Testing of Plume Movement

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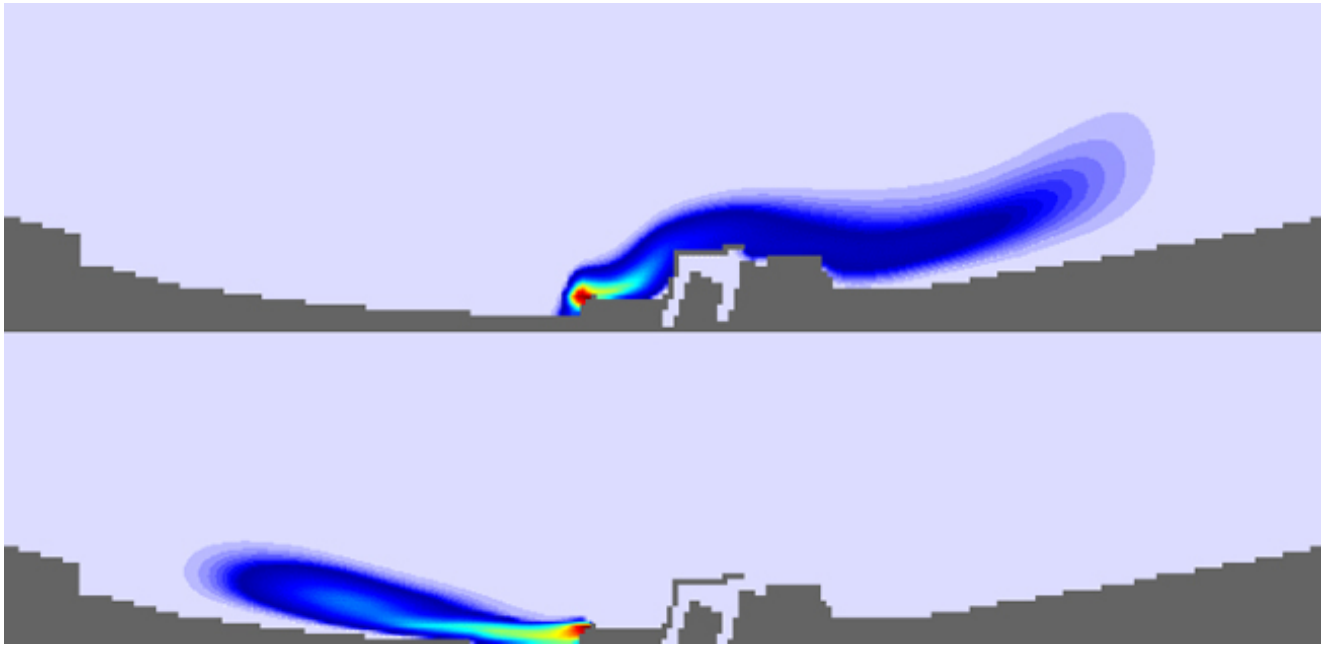
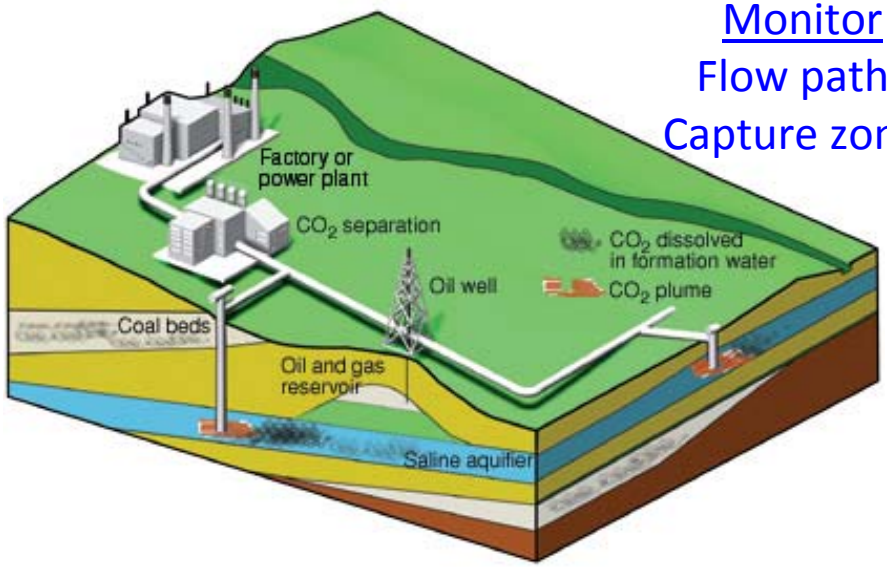


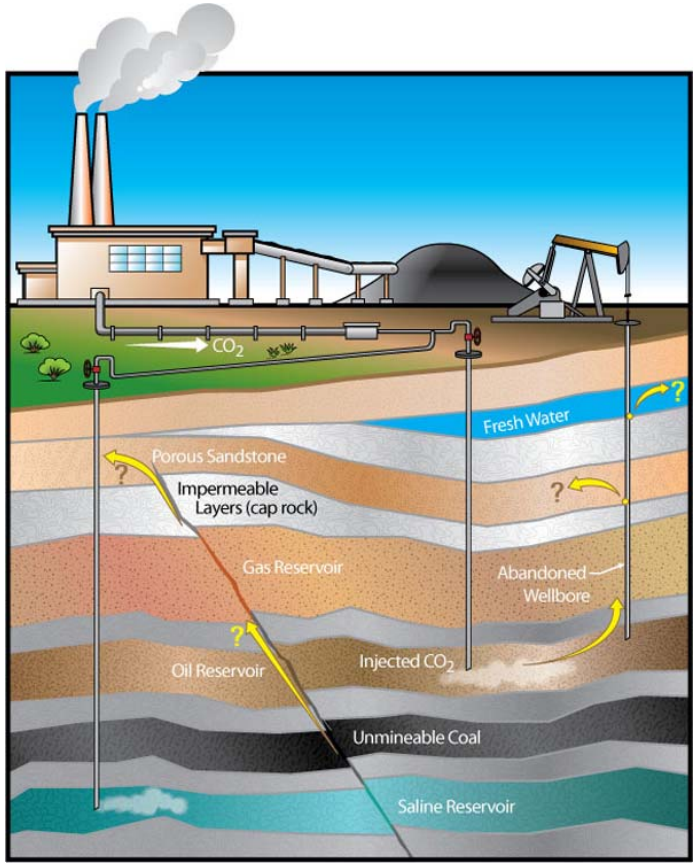
Plume modeling (atmosphere, reservoir, groundwater)

Purpose of Tracing Plumes

Monitor species of interest within reservoir



Monitor
Flow paths
Capture zones



Monitor species of interest outside reservoir

Monitor
Breaches
Extent of movement

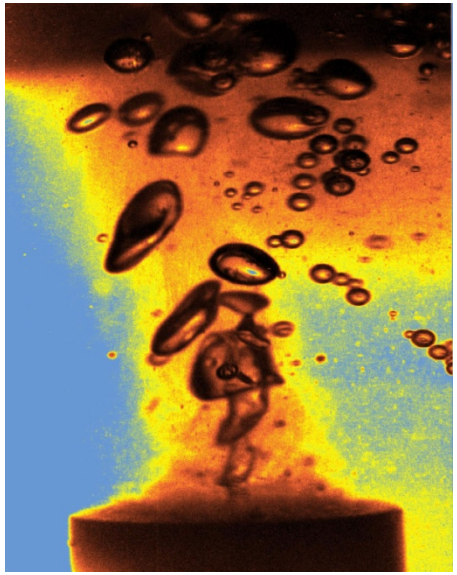
Desirable Tracer Characteristics

(1) Inexpensive (measurement, analytical)
(2) Low detection limits, no analytical interferences
(3) Quick, easy to sample and measure
(4) Non toxic, readily permitted
(5) Both sorbing/non-sorbing tracer use

Perflorocarbon Tracer deployment
NETL facilities

Classes of Tracers

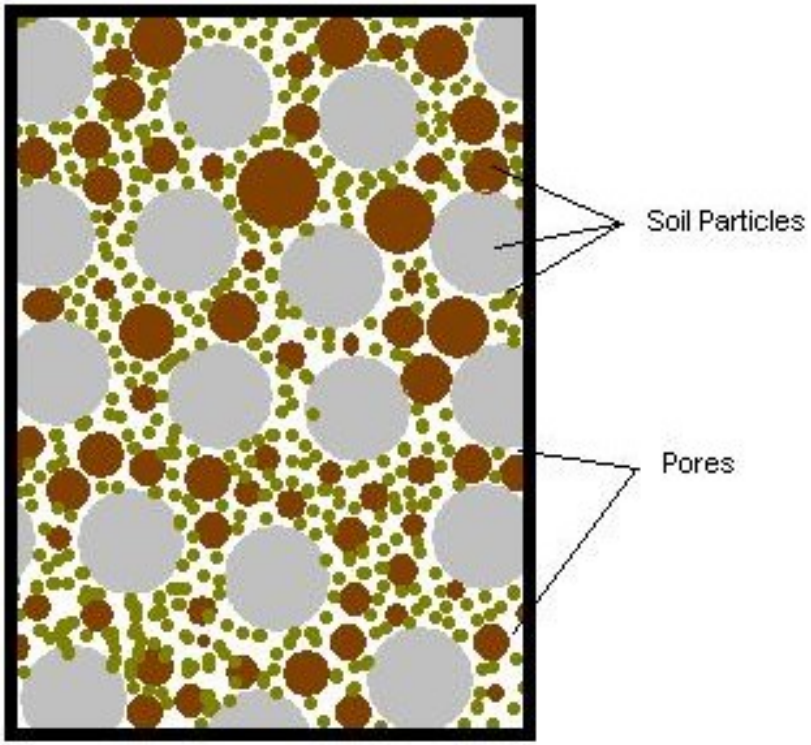
(1) Gas Phase
(2) Liquid Phase
(3) Organic, inorganic, aqueous
(4) Conservative/nonreacting
(5) Reactive with mineral surfaces or soluble in non-carrier phase
(6) Degrading (Bio or Thermal)
(7) Artificially introduced or naturally present



All tracers will partition into liquid and gas phases
-T,P, Depth Dependent

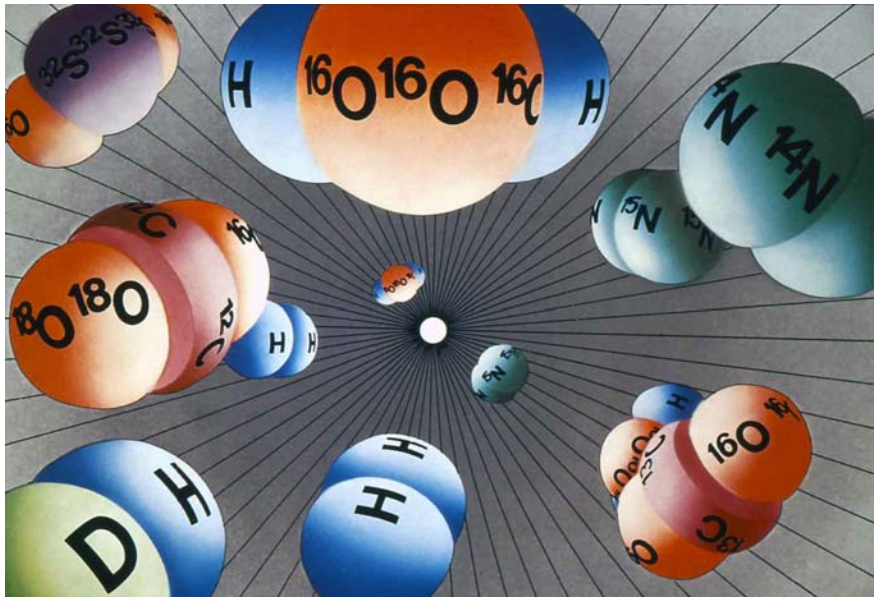
Information Gathered from Tracers

(1)Reservoir volume
(2)Flow dispersion/geometry/sweep efficiency
(3)Porosity
(4)Surface area, interfacial area
(5)Matrix diffusion and natural flow pathways

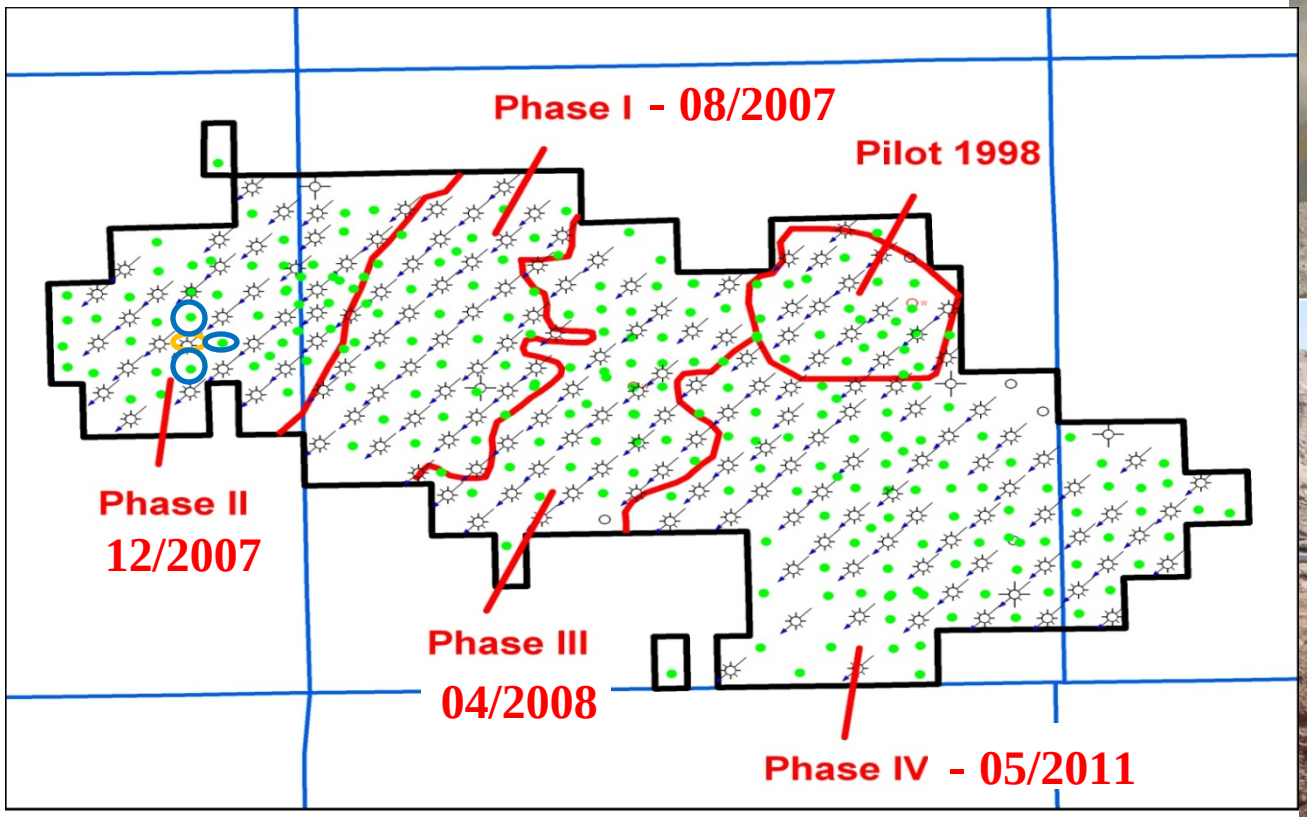


Types of Tracers (examples)

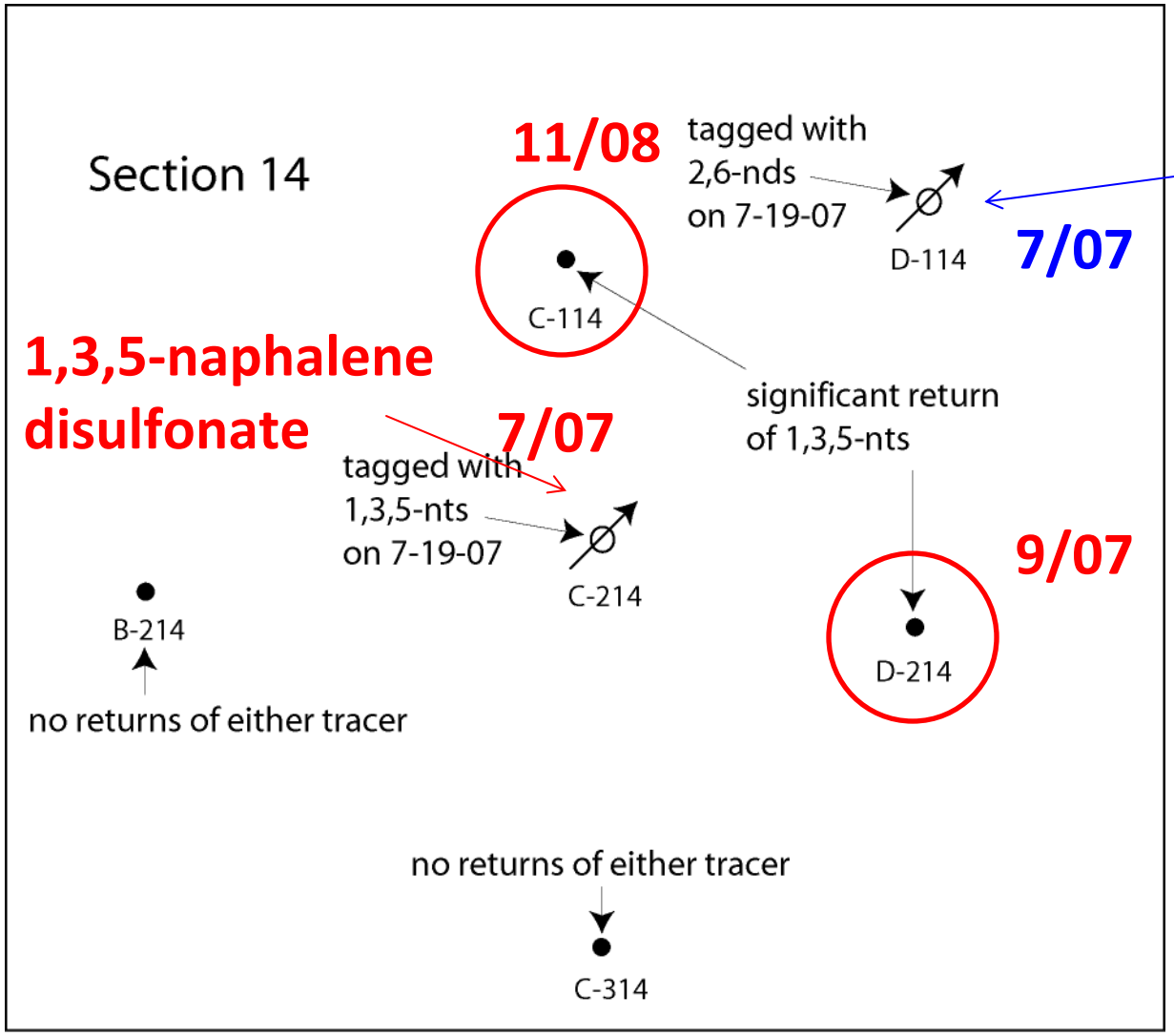
Environmental = isotopes, trace elements, major/minor ions
Inorganic ions – salts (Br, Cl, I)
Organic – alkanes, sulfonates
Aqueous – alcohols, surfactants (biodegradation)
Inert Gases – Nobel gases, SF6
Fluorescent compounds – organic aromatic rings, perfluorocarbons
DNA strands, fullerenes/buckyballs



Case Study - Aneth Experiment (SWP)



SW Partnership – Water Tracer Test



2,6-naphalene disulfonate

Measure water flooding
Inert tracer trace fluids