Fate Subgroup Notes

R&G Gaps

Emulsification
Either in the plume or at the surface, an emulsion may occur if enough turbulence is present.
Emulsification at the surface by the mechanical effects of the surfacing plume.
Evaporation at the surface will facilitate emulsification.
Empirical relationships for specific oils, but no general formulations, exist.
Ixtoc oil came up largely emulsified; DWH did not; why?
Did the DWH emulsified oil (near the wellhead) not make it to the surface for lack of sufficient buoyancy?
De-emulsification of oil en route to the surface
Actions
• How to describe a subsurface emulsion: turbulence, water properties, oil properties
• Consult with pipeline community
• Define the science needs to be addressed

Hydrates
Increase the persistence of the gas phase, allowing the oil to get to shallower depths.
How to put this into a model?
Identify conditions for hydrates (T, P, bio-surfactants, oil composition, including H2S)?
Hydrate effects on mitigation efforts and conversely
Actions
• Hydrate thermodynamics requires validation
• Effects of hydrates on bubbly/oily plumes

Biodegradation
Temperature dependence
Nutrient limitations
Actions
• Use natural oil seeps to test lab-based biodegradation study results.

Dissolution
At what size are particles considered to be dissolved?
What are the mechanical effects of Langmuir circulations and wave breaking on promoting dissolution of surface oil.
Similarly what are the effects of photolysis on dissolution.
Actions
• Dissolution rates from oil droplets and bubbles with hydrates
• Preferential dissolution of hydrocarbon compounds/phases.
• Effects of mechanical processes on dissolution of surface oil.

Tar ball Formation
Mats of tar sink to the bottom, versus tar balls that strand on beaches. What determines these differences? To get the tar ball formation correct it presumes that all other fate products are well defined because the tar balls are the end product.

**Actions**
- General formulation for tar ball formation
- If we understand emulsion formation better we will understand tar ball formation.

**Near field fates, versus far field fates**
Pressure and mechanical effects
Marine snow effects

**Protocols are needed for improved surface and subsurface sampling**
Including targeted water sampling in the near and far fields
Marine snow sampling

**Background state**
To describe perturbations about an oceanographic background state we first must specify what the background state is.
The Gulf of Mexico remains oceanographically under sampled, despite the potential for future accidents from O&G exploration/production.
The Loop Current evolution and eddy formation, the controlling factors for the large scale circulation remains poorly understood.