Gulf Integrated Spill Research (GISR)

Piers Chapman, Scott Scolofsky and the TAMU consortium
Scope of work

- There is a critical need to understand important physical and chemical processes on a variety of scales from wellhead to beach

- We plan an integrated suite of laboratory and fieldwork experiments that will enhance a suite of models at multiple scales
Deep-plume

Initial Conditions:
- Gas and Oil Flowrate
- Bubble and Droplet Size
- Density of Gas and Oil

Complications from Chemistry
- Gas Hydrate Formation
- Gas and Oil are Mixtures
- Gas and Oil Dissolution
- Oil may be at Effervescing some Gases
- Formation of Emulsions
Members of consortium

- Piers Chapman (TAMU) - PI and project management
- Georgia Tech: T. Stoesser
- MIT: E. Adams Management
- NCSU: R. He
- U. Maryland: E. North Modeling
- Stanford U: O. Fringer
- U.C. Berkeley: A. Goldstein, E. Variano Labwork
- U. Hawaii: S. Masutani
- U. Texas, Austin: B. Hodges Fieldwork
- Woods Hole OI: J. Ledwell
Objectives

• Build a multi-scale suite of models to look at the fate and transport of oil in the Gulf of Mexico (droplet to basin scales)

• Validate and improve models using existing data from Deepwater Horizon spill

• Conduct laboratory experiments on oil droplet scale processes, including formation, chemistry, dissolution, and turbulent dispersion

• Conduct field studies of dispersion using tracers
Modeling projects
Laboratory Experiments (Goldstein, Variano)

We will use laboratory models of:

- Swell waves
- Wind-sheared surface
- Turbulence in deep water

**To measure**

- Turbulent transport of oil droplets
- Chemically speciated hydrocarbon fluxes across the air-water interface

**Giving**

- Eddy diffusivity input for models
- Description of droplet break-up and coalescence

- Fate of hydrocarbons, e.g. oxidation $\rightarrow$ secondary aerosols
- Boundary conditions for modeling
Droplet trajectories

Droplet imaging tests

3D trajectory of single droplet
Droplet-scale Experiments (Masutani, Socolofsky)

Initial size distributions

Turbulent Mixing

Oil, gas and hydrate Dissolution
Moorings and Hydrography

- Deployment period: 2 years
  - Deploy: May 2012
  - Service/Maintenance: May 2013
  - Recovery: May 2014
- Star:
  - Full water column mooring
  - dye experiment initiation
  - 1500 m isobath
- Circles:
  - Short moorings: 1000-2000 m
- Triangles
  - Pressure Inverted Echo Sounder (PIES)
  - 500-2500 m
- Mooring Instrumentation
  - MOU with BOEM (in progress)
- Hydrography
  - CTD/oxygen/fluorescence
  - DIC/DOC
  - Hydrocarbon
  - All mooring and dye cruises
External Partners

• Advisory Committee
  • NOAA, TGLO, TWDB, BOEM

• Collaborations
  • API Dispersant Work Group
  • Other consortia