Group 1

State of the Art/Science

Questions – what do we need models for?

- Risk analysis (stochastic) from facility/operations to release scenario to habitats at risk [response planning, equipment staging, response analysis] [mostly short term]
- Where is it going? How long to get there? What's it look like? (persistence, disp, etc.)
- What's going to get impacted/effects? (concern)
- Mass balance

Rivers (floating)

- Oil/sediment interactions
- Non-buoyant
- Impacts: f(data)

Estuaries

- Oil/sediment – different coefficients (horizontal, vertical)
- Wetting/drying
- Droplet size distribution

Coastal Nearshore

- Nontidal/episodic currents
- Shoreline retention (holding capacity)
- Waves (Stokes, Langmuir)

Inland – Oilmap land (3D) – always can be improved

Offshore (off the shelf)

- Model level of complexity vs. ephermeral data collection
- Response & detection so difficult

Ice

- Not clear - better models would make a difference (priority = detection)

Group 1

Future

- Better visualization of present capabilities (3D, 4D)
- GIS interface and/or other interface
- Improved hydrodynamics
- Improved wind forecast
- Improved biology (abundance, life stage, diversity, taxa)
- Improved toxicity (0-96 hr)
- Using observational data (HF Radar)
- Function of F & T models with other models (more open source, standards)
- Better parameterizations of processes (i.e., waves)

Uncertainty

- Propagation
- Sensitivity analysis to help focus on inputs needed and/or research priorities
- Integration of optical satellite imagery for observations & other sensors for data
- Challenge of cost effective models
- More transparency in model assumptions, parameters & defaults (can model write out assumptions?)
- Should we get to the point where we don't need a modeler to run a model? (no, we can, we shouldn't)
- Economic models (recreational/discounted losses, $$ values), closures
- Non-grid size dependent concentrations

Group 1

Research Questions

1. Do we need a comparative model analysis to really capture "State of the Art"?
2. Can we rank importance of different applications of modeling? (i.e., estuary vs offshore)
3. How do we move recent/ongoing research into modeling capabilities (i.e., flocculation, oil sediment interactions)
4. How do we scale wave tank/lab studies to the field or to other studies?
5. Visibility - How do we optimize the data we collect and how we implement the model? (minimum = 0 data, all uncertainty)
6. Predicting droplet size distribution $f(de/dt)$

7. Representative species (toxicity studies) for short term exp (0-48)
8. Oil sediment interactions
9. Sub surface/submerged oil F & T
10. Better wetting & drying
11. Better representation of wave mechanics (wind induced behavior-like LC)

Group 2

Response Forecast Decisions/Specific Incidents in Real-time

I. **State of the Art:** Models & Observations together – works well in short-term
II. **Limited by:** Input Data
- winds
- currents
- dispersion coefficients (sub-scale)

III. **Research Needs:**
- Real time data assimilation
- Emulsification – mechanistic algorithms [feeds back to other process]
- Resurfacing of droplets
- Sediment interactions
- Uncertainty characterization
- Visualization & presentation of results
- Verification/monitoring (techniques)

Group 2

Response Planning (cost benefit & ecological risk)

I. **State of the Art:** Models & Observations together – works well in short-term
- Probabalistic approach (Monte Carlo)
- Good reliable tools
- Not used as much as could/should

II. **Limited by:**
- Level of effort /client base
- Understanding by users

III. **Research Needs**:
- Education of potential users
- Synthesis and presentation of results
  - Visualization
  - Statistics / Uncertainty
  - Executive summary
- Perform analyses to answer general questions
  - Dispersant decision (e.g.)

Group 2

NRDA Hindcast

I. **State-of-the-art:**
- Models for short-term effects exist
- No models for:
  - Long-term effects on population
  - Ecosystem level effects
  - Recovery

II. **Limitations**: Input Data
- Short (<24 hr) term toxicity
- Long-term effects
- Population & ecosystem effects
- Recovery rates
- Biological densities (pre-spill baseline)

III. **Research Needs:**
- Uncertainty analysis
- Display of Results & Communication
- Input data list
- Validation – collect data in spills
- Monitoring in long-term injury
  - injury
  - restoration success

Group 3

State of the Art / Future / Research Needs

2D: Oil Fate OK except for emulsification
- need measures of uncertainty
- need quick analysis of oil samples

3D: Need N-F systems, including input data
- Vertical dispersion coefficients table
- SOTAR oil particle size distribution (surface & bottom) f oil type, environmental conditions

Need some (better than fluorometer) clever solution for monitoring underwater hydrocarbons
- Statistical analysis for sampling plan – generic – be modified during emergency]

Oil in ice – needs work (on-going)

Oil sediment interactions SOTAR
- Research underway
- Needs to be incorporated into models

Adaptive control of AUV (with Colin)

SAS HC Sensor (Synthetic Operative Sonar, Carl Brown)

Langmuir Circulation SOTAR

Biology
- Need short term exposure tests – external CROSERF work?
  - Use <96 hour tests
- Marine mammals & dispersed oil
  - How are marine mammals affected by dispersed oil? (Marine Sanctuary punch-back)
- Distribution & behavior of biota
  - Effects of NRDA need better distribution exposure
- Human health
  - Air plume – Exxon 300ppm to 100 ppm