Spill Modeling Applications for ExxonMobil

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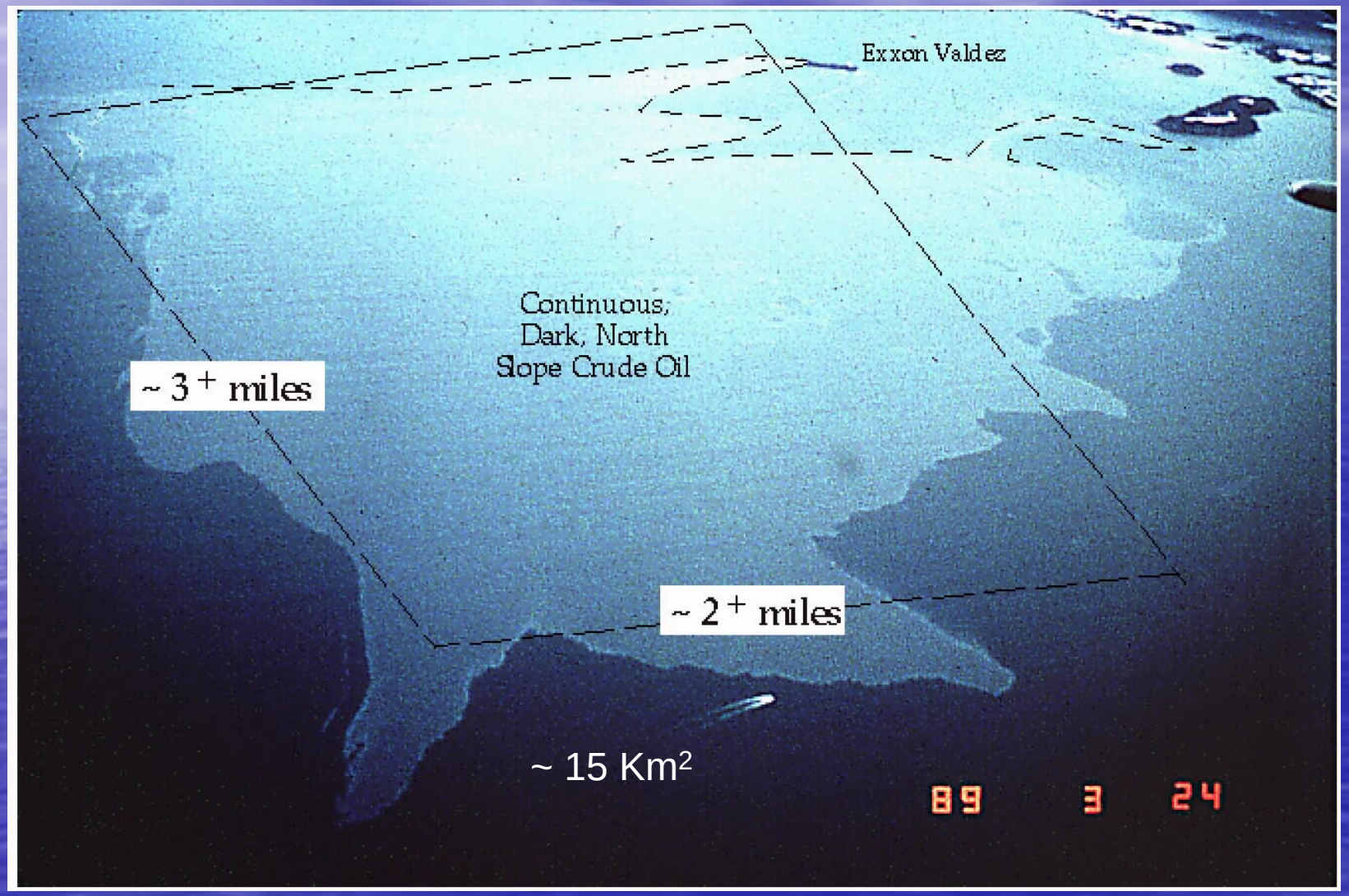
Modeling Tools

- Oil Spill Models
  - 2 Dimensional, deterministic and stochastic (50+ licenses)
  - 3 Dimensional, deterministic includes air model and NOAA Spill Tools (2 licenses)
- Chemical Spill Models, 3 Dimensional deterministic, includes air model (6 licenses)
- Hydrodynamic modeling, provides current data for oil and chemical spills (2 licenses)

Utilization of Modeling Applications

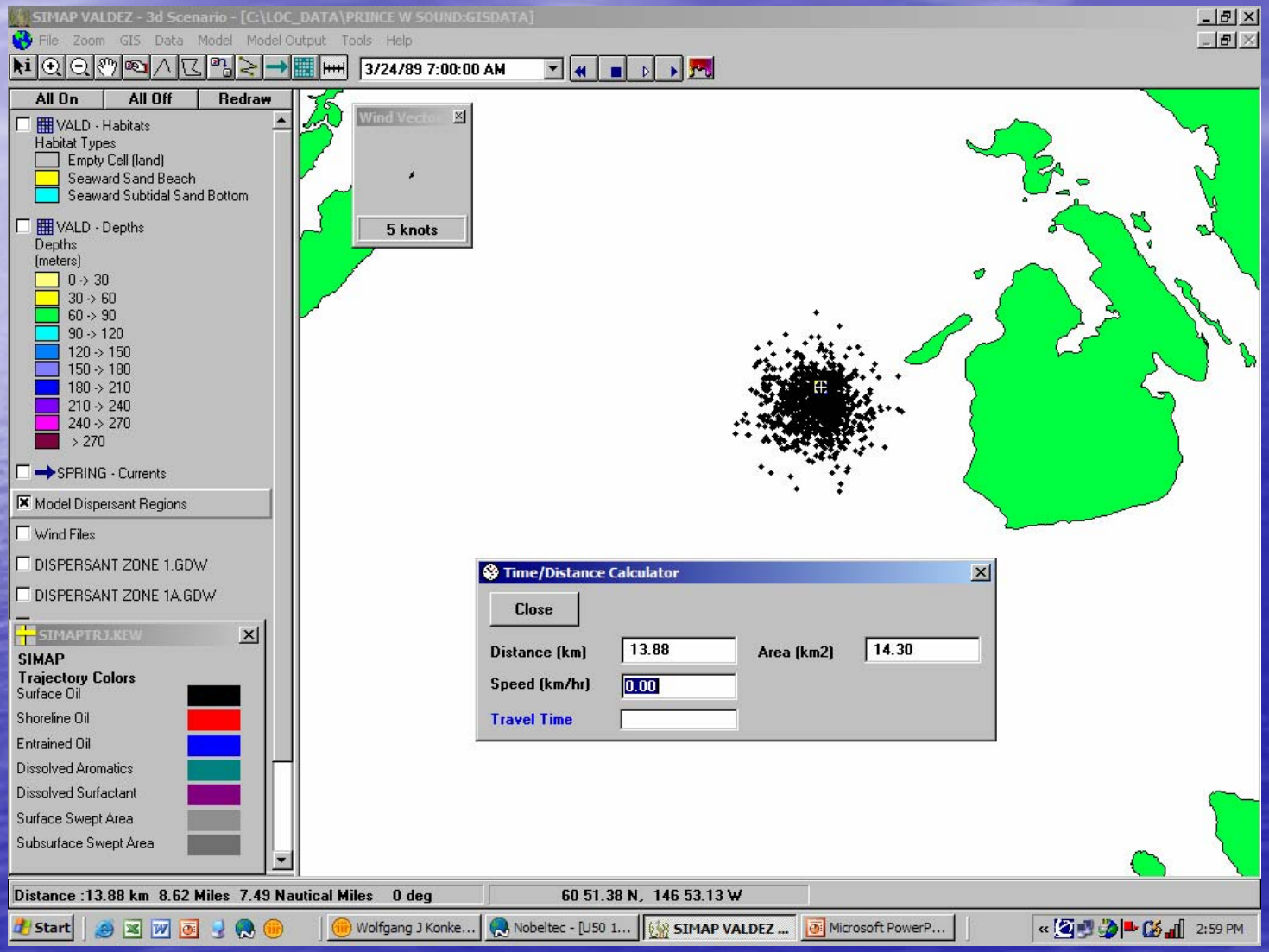
- Oil Spill
  - Exercise Support
  - Spill Response Analysis
  - Dispersant Advocacy
  - Contingency Plans
  - Accidental Spills
- Chemical Spill
  - Operations Support
  - Exercise Support
  - Accidental Spills

Oil Spread from Valdez Spill Approximately 0700



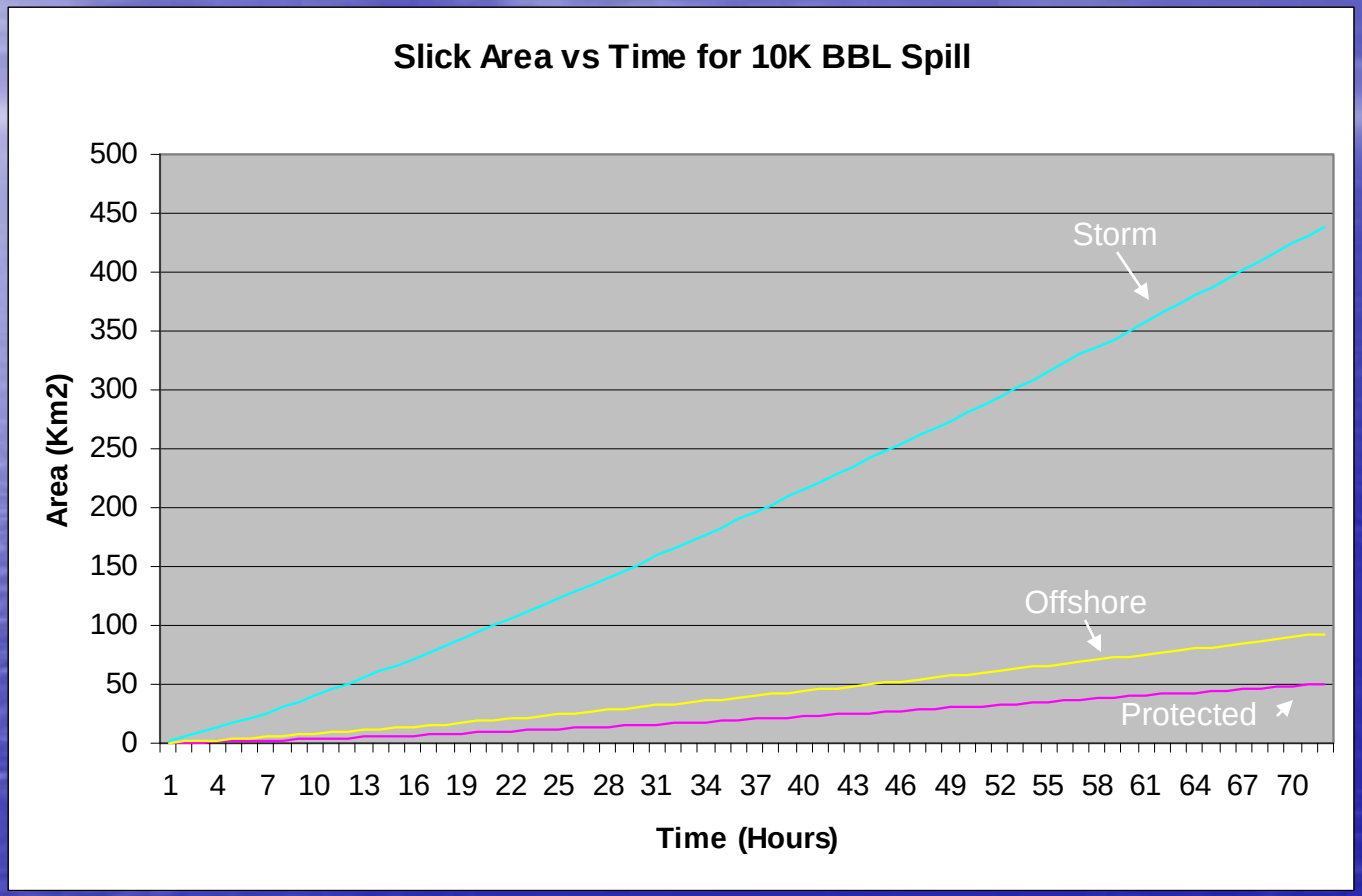
6 miles^2 ~ 15 km^2

Model Spreading Yields Similar Results



Historic 1989 winds and Spring hydrodynamic model utilized

Spreading Curve vs Time



Successful spill response requires the slick area to be intercepted (mechanical) for skimming, burning or treatment (dispersants).

Response Operations are Encounter Rate Limited

RELATIVE AREA COVERAGE

	Km^2/Hour
Mechanical	
Small Skimmers	0.008 – 0.012
Medium Skimmers	0.0016 – 0.06
Large Skimmers	0.08 – 0.3
Burning	0.02 - 0.12
Dispersants	
Vessels	0.1 – 0.6
Helicopters	0.048 – 0.28
Small Planes	0.24 – 0.56
Large Aircraft	2 - 4

Some Numbers Courtesy of Al Allen

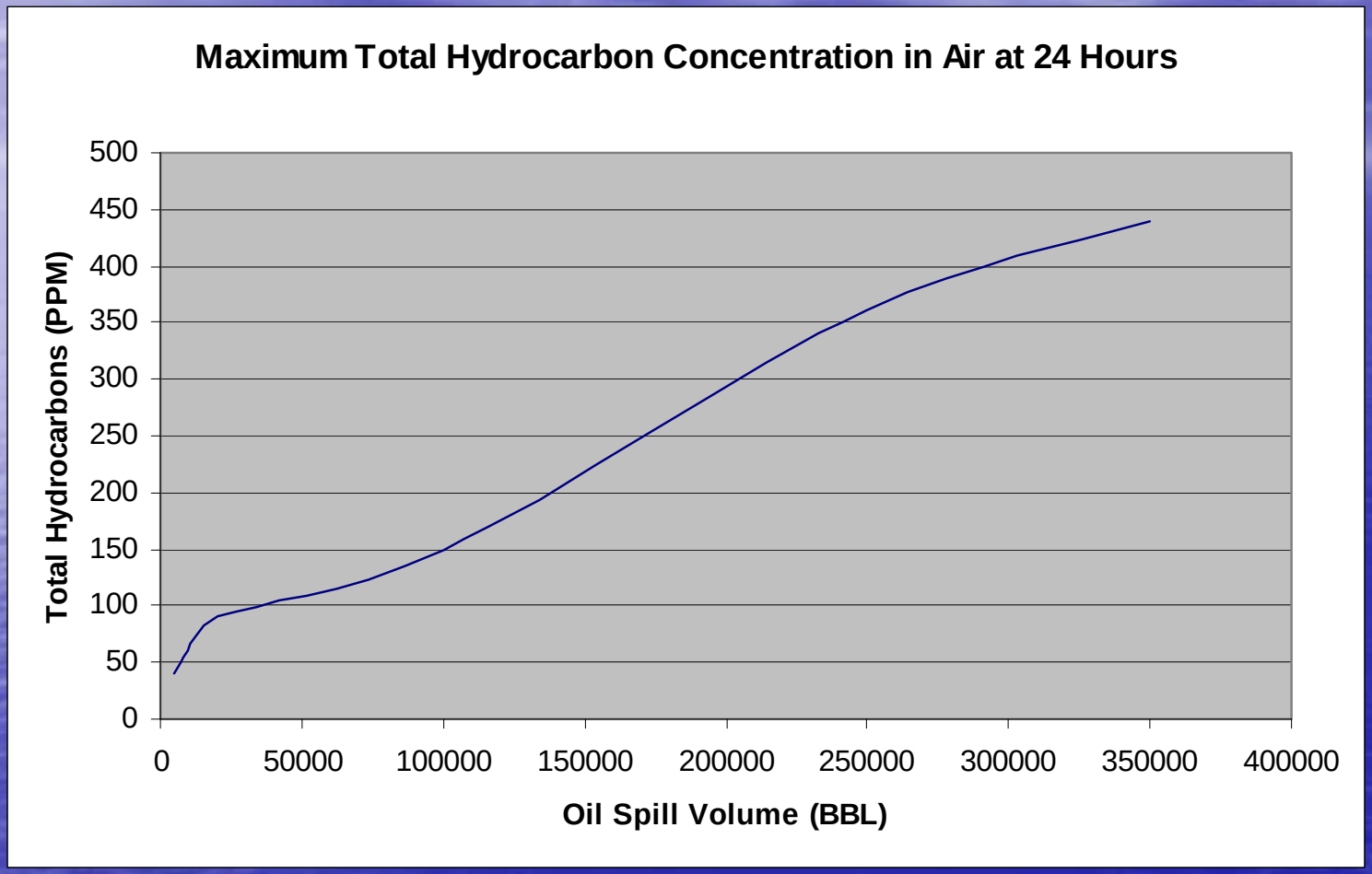
Improvements in Modeling Capabilities

- Digital map utilization and coverage
- Satellite and aerial images
- Access to gridded wind data, server based
- Access to remote hydrodynamics, server based
- Internationally recognized digital habitat data

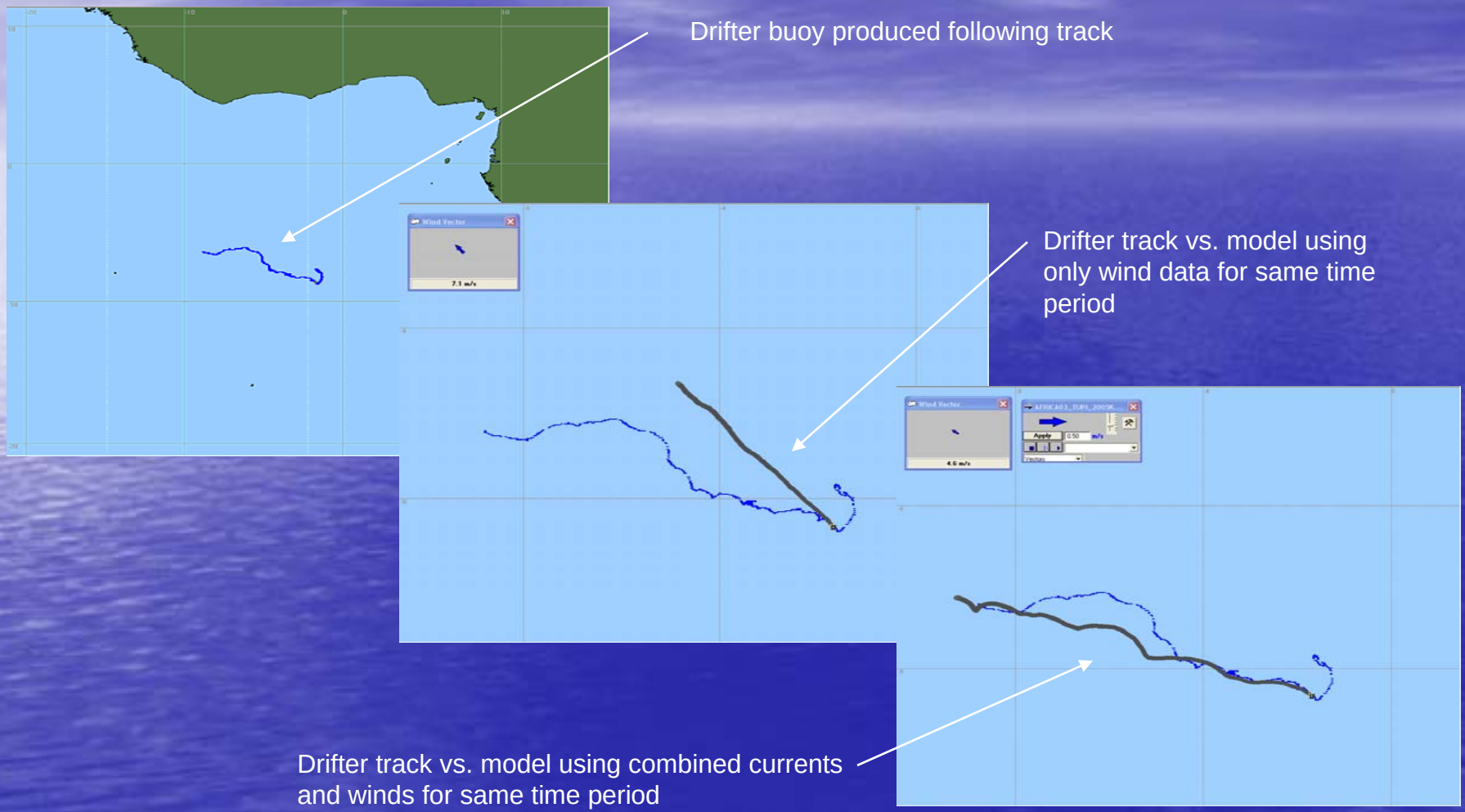
Air Issues

- Spill response in some locations within 2 hours
- ExxonMobil OEL for HC exposure is 100 ppm
- Air models indicate that large spills will produce that atmosphere for over 24 hours

Large Spills Produce Larger Hazardous Atmosphere



Comparison of Drifter vs. Model outputs



Drifter buoy produced following track

Drifter track vs. model using only wind data for same time period

Drifter track vs. model using combined currents and winds for same time period

Issues

- Local data collection and transmission is poor
- Server based data do not produce outputs that match field
- Requests for inappropriate utilization of tools
- Validation of air outputs