NOAA Office of Response and Restoration (OR&R)

Dave Westerholm, Director
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National Oceanic and Atmospheric Administration
National Ocean Service

Emergency Response
Presentation for ITAC 2019

Scott Lundgren, OR&R
Emergency Response Division Chief
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Photo: NOAA

Our Mission

To protect and restore ocean and coastal resources from the impacts of oil, chemicals, marine debris, and other hazards. We provide expert leadership, training, and time-critical services that benefit the environment, the public, and the economy.

- **Planning and preparedness**
- **Emergency response**
- **Damage assessment**
- **Restoration and recovery**

Photo: NOAA

Working Across the Nation

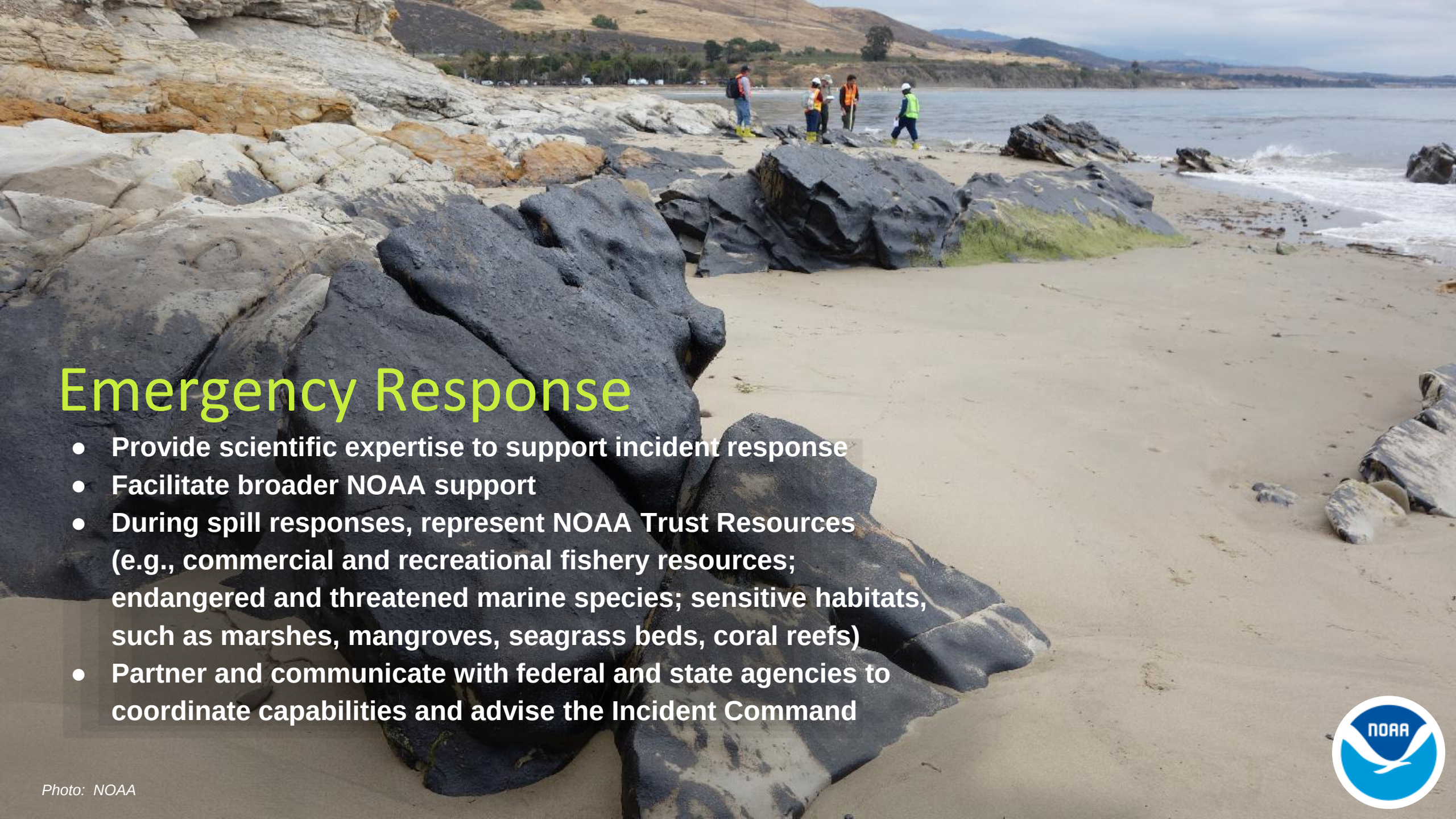
OR&R MAIN OFFICES
Silver Spring, MD
Seattle, WA

ARD
(Assessment and Restoration Division)
Silver Spring, MD
Seattle, WA
Anchorage, AK
Chicago, IL
Ann Arbor, MI
Santa Rosa, CA
New York, NY
Boston, MA
Philadelphia, PA
St. Petersburg, FL
Charleston, SC
Long Beach, CA

ERD
(Emergency Response Division)
Silver Spring, MD
Seattle, WA
Anchorage, AK
Alameda, CA
Honolulu, HI
Cleveland, OH
Lowell, MA
Point Pleasant Beach, NJ
Miami, FL
Mobile, AL
Houston, TX
New Orleans, LA

MDP
(Marine Debris Program)
Silver Spring, MD
Seattle, WA
Gloucester, MA
Charleston, SC
Mobile, AL
Honolulu, HI
Oakland, CA
Oak Harbor, OH
St. Petersburg, FL

DPP
(Disaster Preparedness Program)
Silver Spring, MD
Seattle, WA
Mobile, AL - Disaster Response Center



Emergency Response

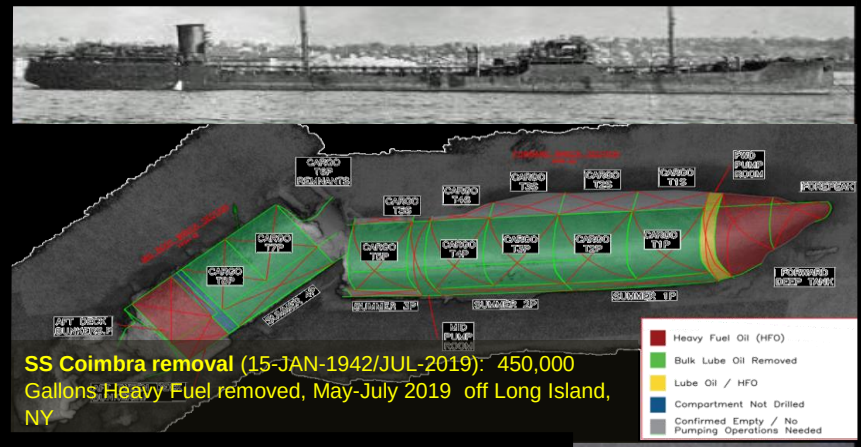
- Provide scientific expertise to support incident response
- Facilitate broader NOAA support
- During spill responses, represent NOAA Trust Resources (e.g., commercial and recreational fishery resources; endangered and threatened marine species; sensitive habitats, such as marshes, mangroves, seagrass beds, coral reefs)
- Partner and communicate with federal and state agencies to coordinate capabilities and advise the Incident Command

Photo: NOAA

NOAA Office of Response and Restoration

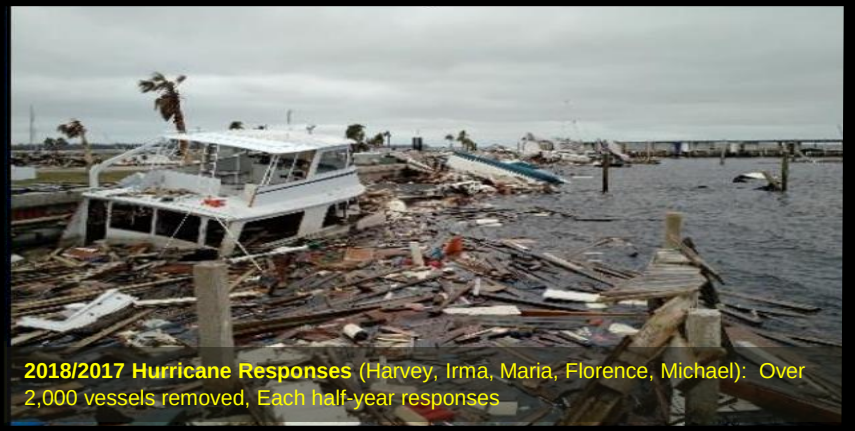
ITC Tank Farm Fire, 17 MAR 2019, Deer Park, TX
15 Tanks of 80,000bbl potential various light products

Bayport Channel Collision (05-May 2019): 1M Gal Gasoline Reformate spill, Houston Ship Channel, Bayport, TX



SS Coimbra removal (15-JAN-1942/JUL-2019): 450,000 Gallons Heavy Fuel removed, May-July 2019 off Long Island, NY

Lake Washington A10 Well Leak (09-DEC-2018)
Up to 129bbl/day crude during discharge



2018/2017 Hurricane Responses (Harvey, Irma, Maria, Florence, Michael): Over 2,000 vessels removed, Each half-year responses

Port Williams Shuyak Island spill (26-FEB-2018): 3,000 gallons heavy fuel oil, near Kodiak, AK

Straits of Mackinac leak (02-APR-2018): Estimated 600 gallons dielectric fluid released, Michigan

Superior Refinery Co. explosion (26-APR-2018): 630,000 gallons hot asphalt release, Wisconsin

Ex-USS Prinz Eugen (DEC-1946/01-SEP-2018): 228,900 gallons Navy special fuel oil removed, Kwajalein Atoll

Emergency Response Advances

Modeling – GNOME Suite

- **Visualizations (BSEE project, 2019)**
- **Remote Sensing Ingestion (BSEE project, 2020)**
- **Improved Arctic Modeling (ADAC, CRRC 2019-2020)**
- **Oil Library (BSEE, MPRI)**

Training – Chemical and Oil Response Course enhancements

Autonomous and Remote Sensing Systems – Partnership with Senior Scientist on methods development

Researcher/Academic Engagement – CRRC and GOMRI S&L workshops, American Academy publication

Photo: NOAA

Working with Partners to Advance Research

- Expand the use of remote sensing to meet response and assessment objectives
- Oil weathering, fate, and toxicity research for model enhancement
- Surface oil dynamics for inhalation and aspiration

Photo: NOAA

Recent Research and Methods Development in Support of Spill Response and Assessment

Lisa DiPinto, Ph.D.
Senior Scientist
NOAA Office of Response and Restoration

Photo: NOAA

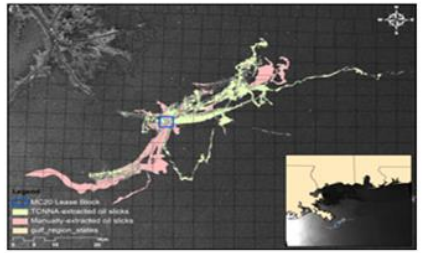
Broad Research Areas

- Characterizing oil in the environment – especially via remote platforms
  - Remote sensing platforms, sensors and samplers
  - AUVs and ROVs
- Enhancing oil spill modeling tools, emphasis on shallow surface mixing layer
- Advancing understanding oil exposure and toxicity
- Rapid data processing and display

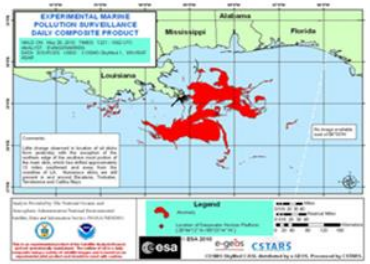
Deepwater Horizon Lessons Learned Studies and Operational Tools Development (BSEE-NOAA)

Controlled Experiment

Marine Validation



Methods and Implementation



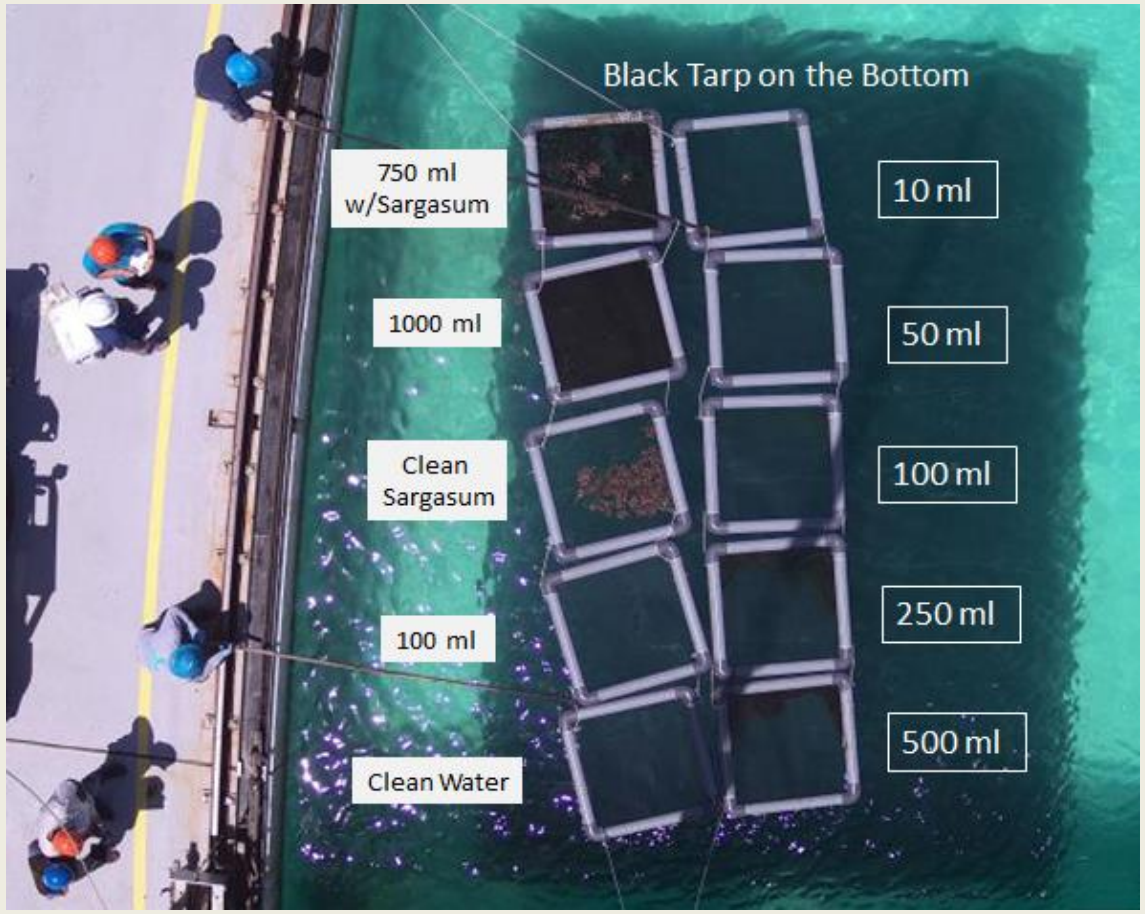
- Detection of Oil Thickness and Emulsion Mixtures using Remote Sensing Platforms

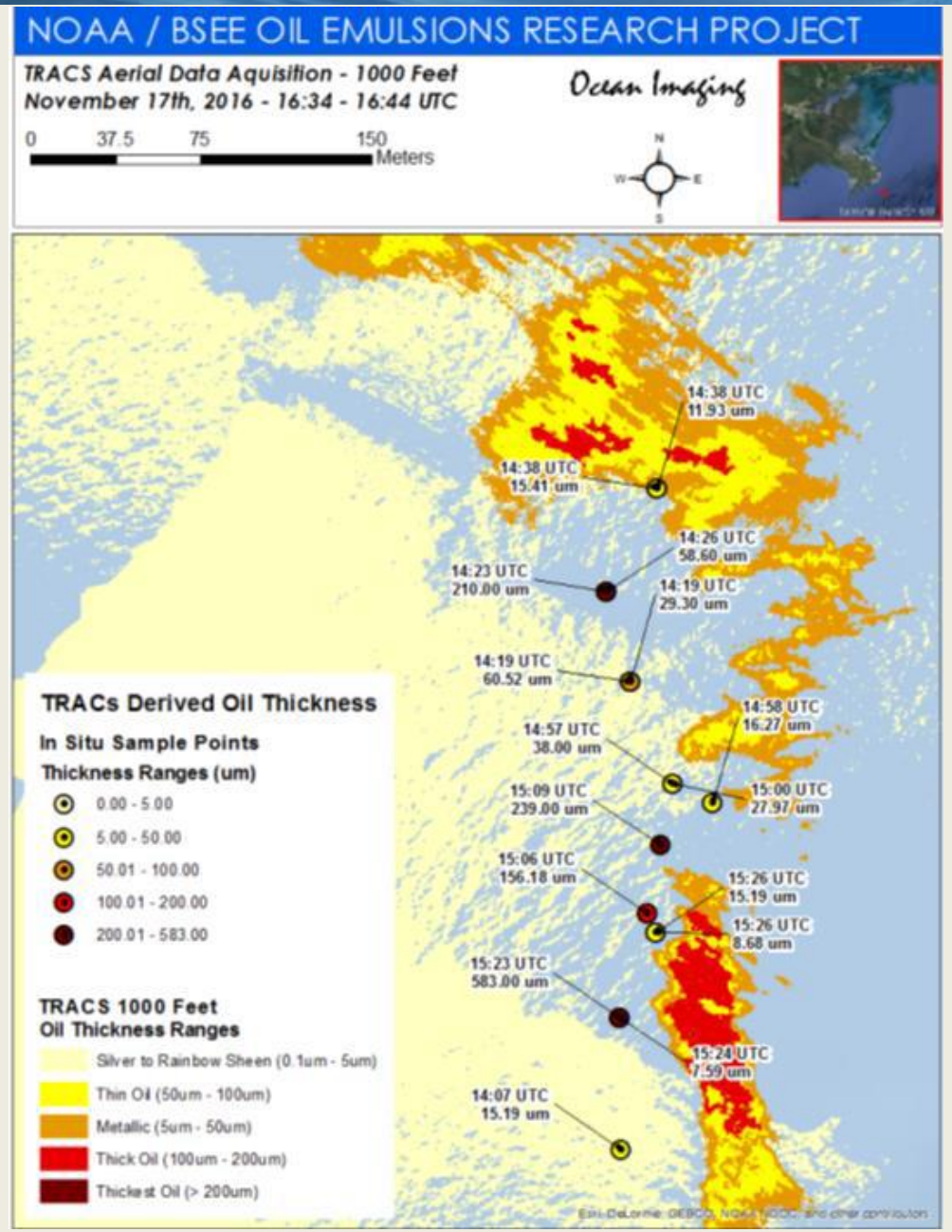
https://www.bsee.gov/research-record/osrr-1079-deepwater-horizon-lessons-learned-methodology-and-operational-tools-to

Expand the use of remote sensing to meet response and assessment objectives

Partners:
EPA, NASA, USGS, USCG, WHOI, UNT, USF, Abt Consulting, Ocean Imaging, Water Mapping, Fototerra, MDA Canada, MSRC

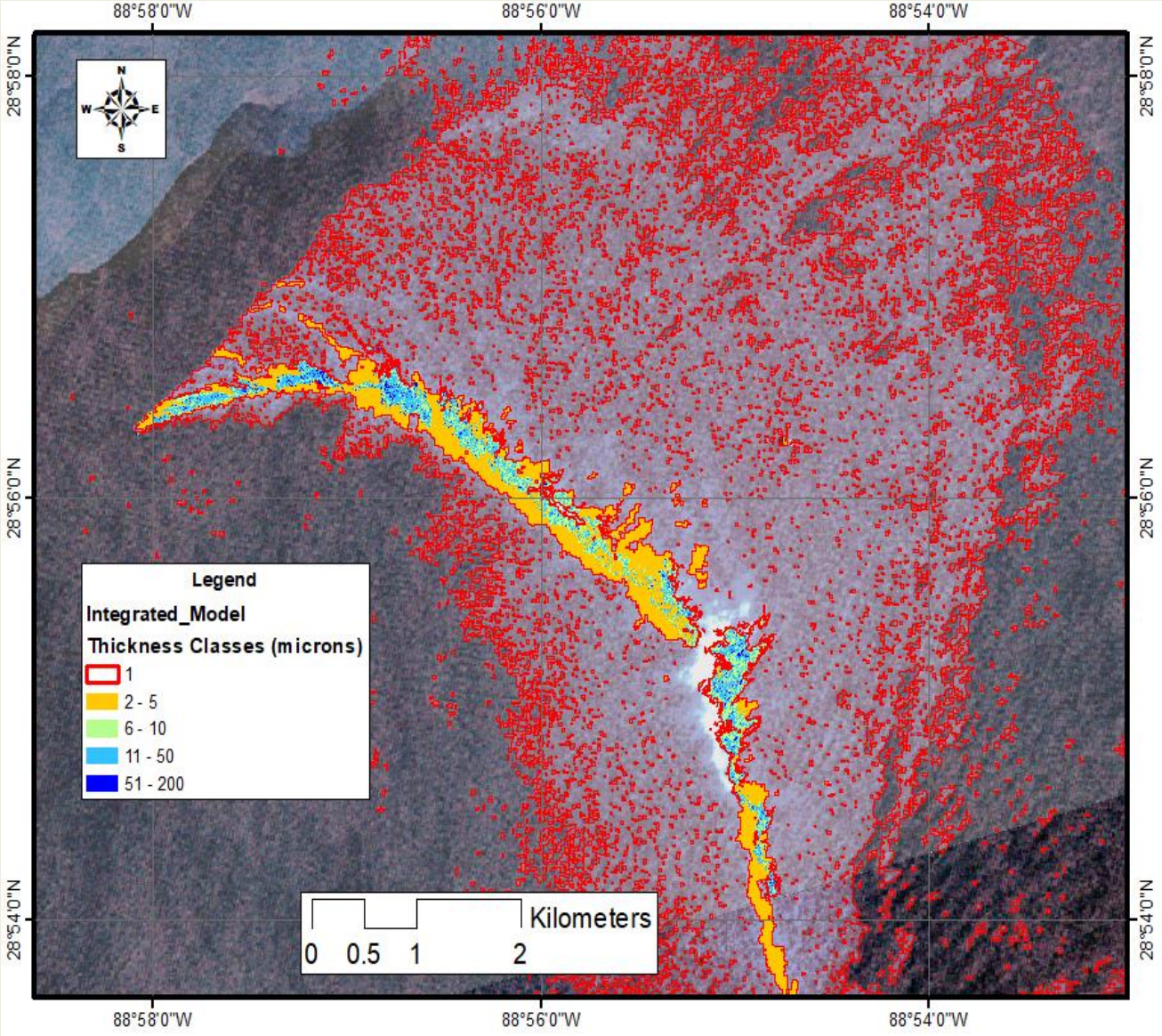
Development and Calibration of Multispectral UAS (Ohmsett)



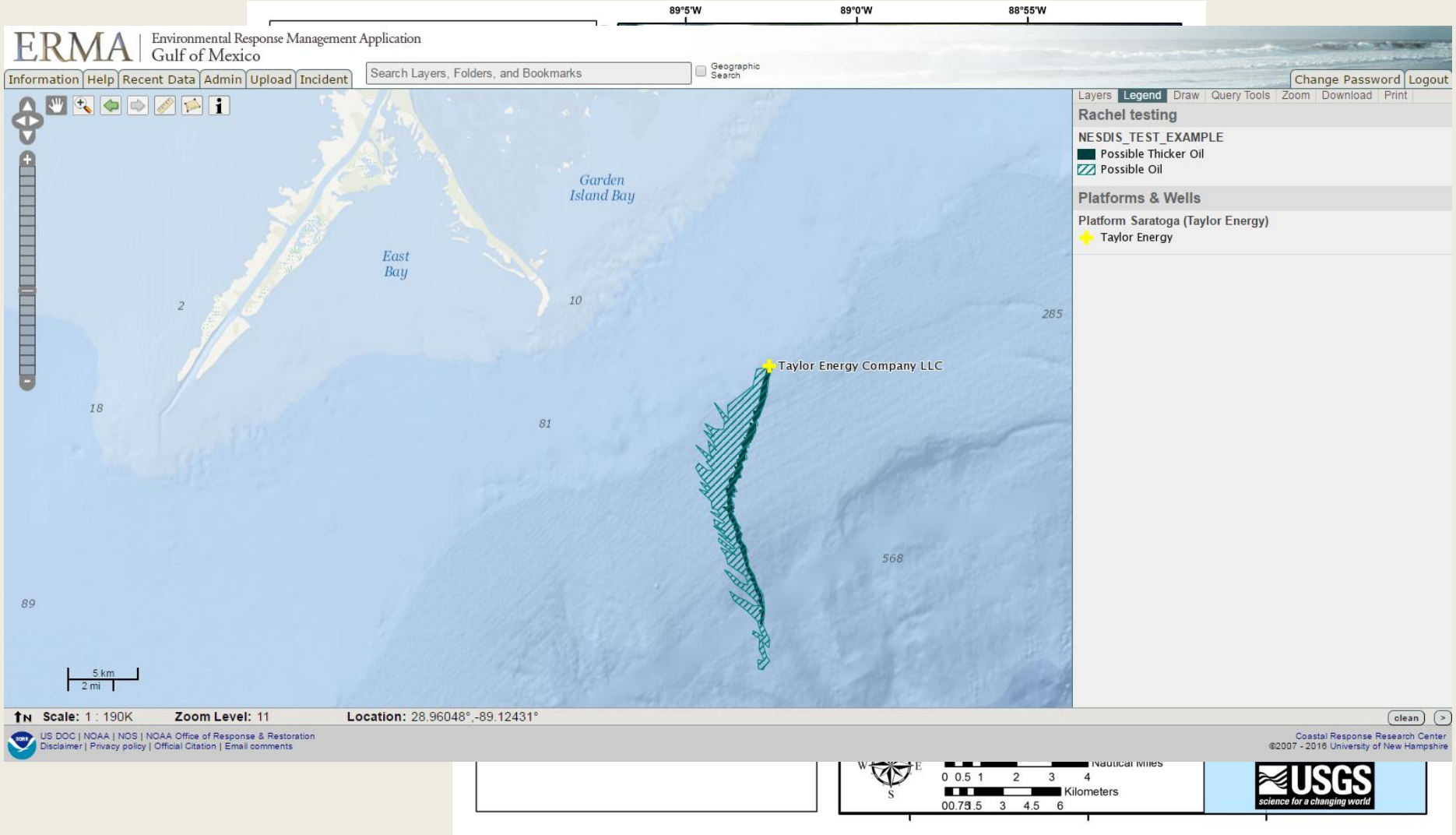


Ocean Imaging's classification of oil thickness ranges at MC20 on November 17, 2016, integrating boat-collected data with TRACS remote sensing signatures (MC20)

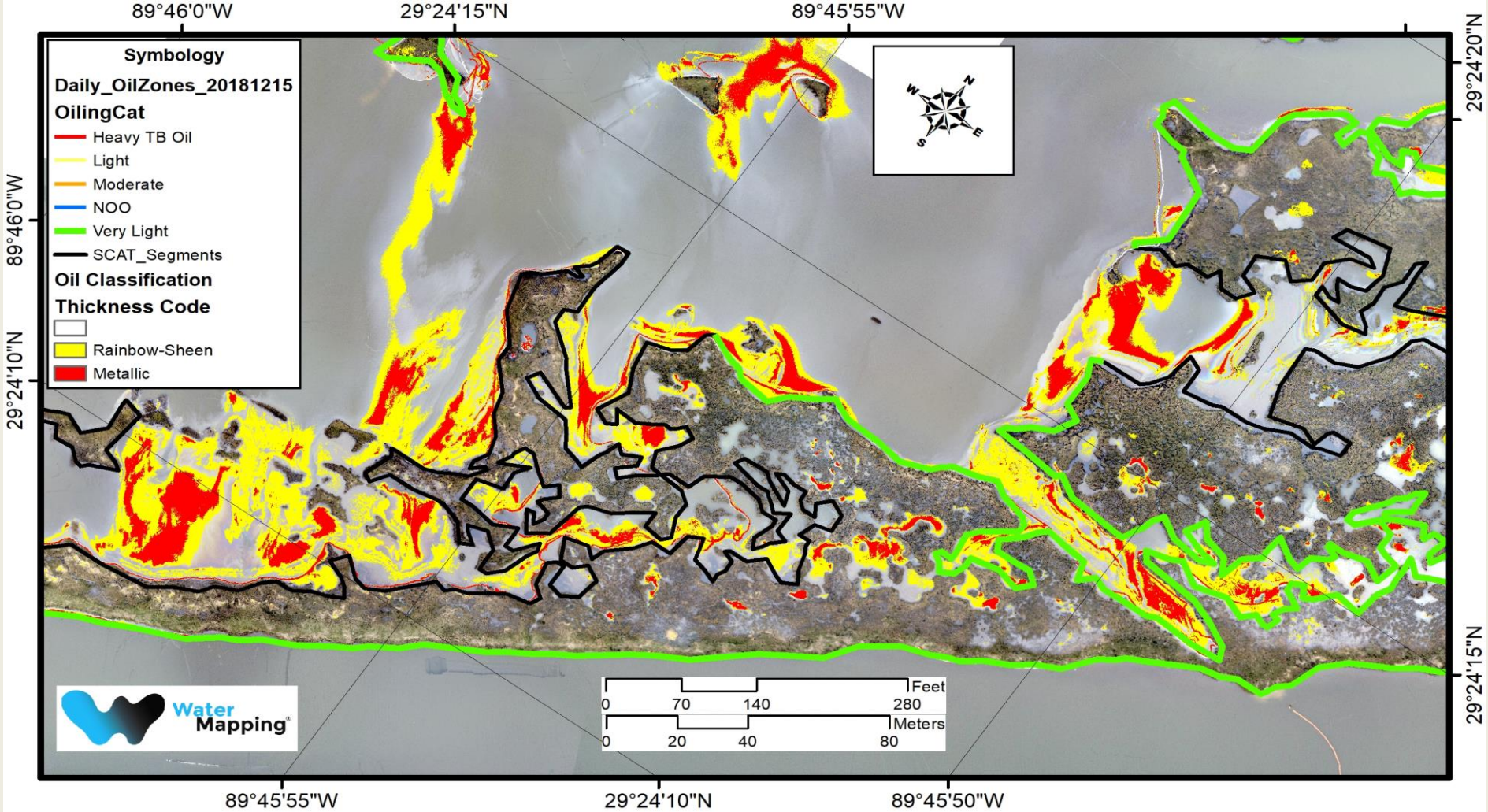
Satellite-UAS-in-situ Integrated Model



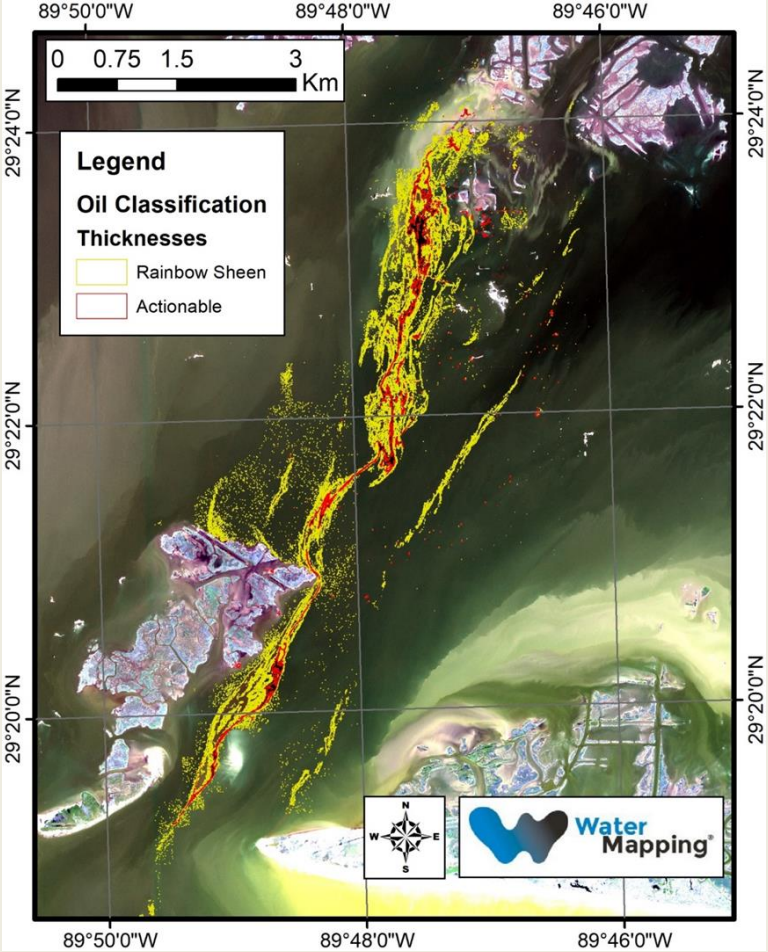
From Research to Application



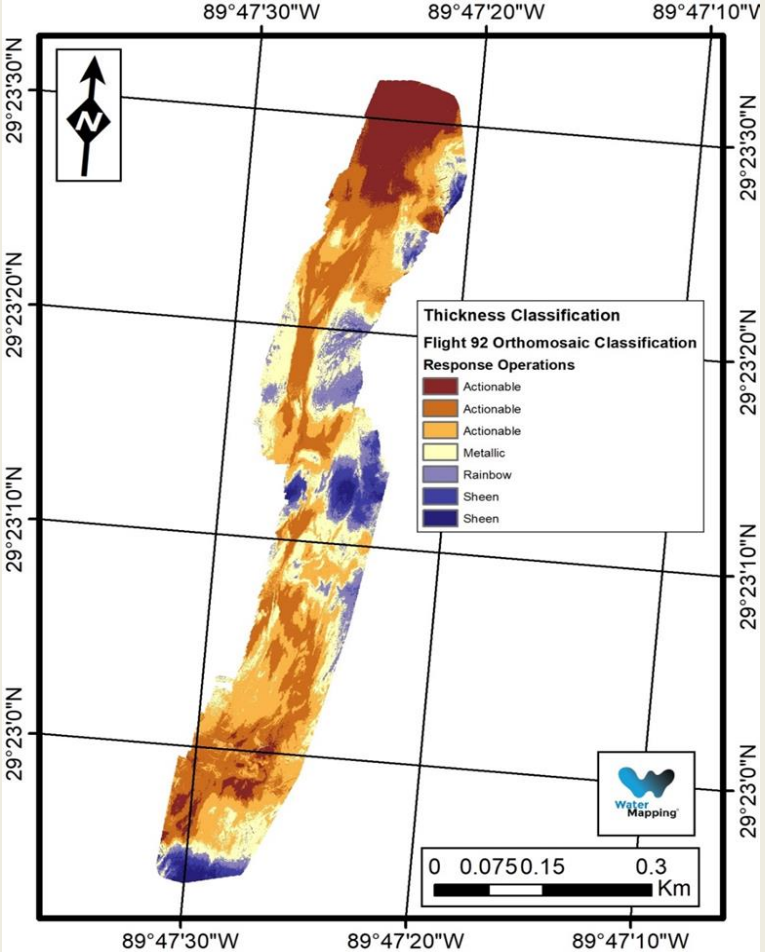
Lake Washington
UAS Oil Thickness Classification



Options for Data Products

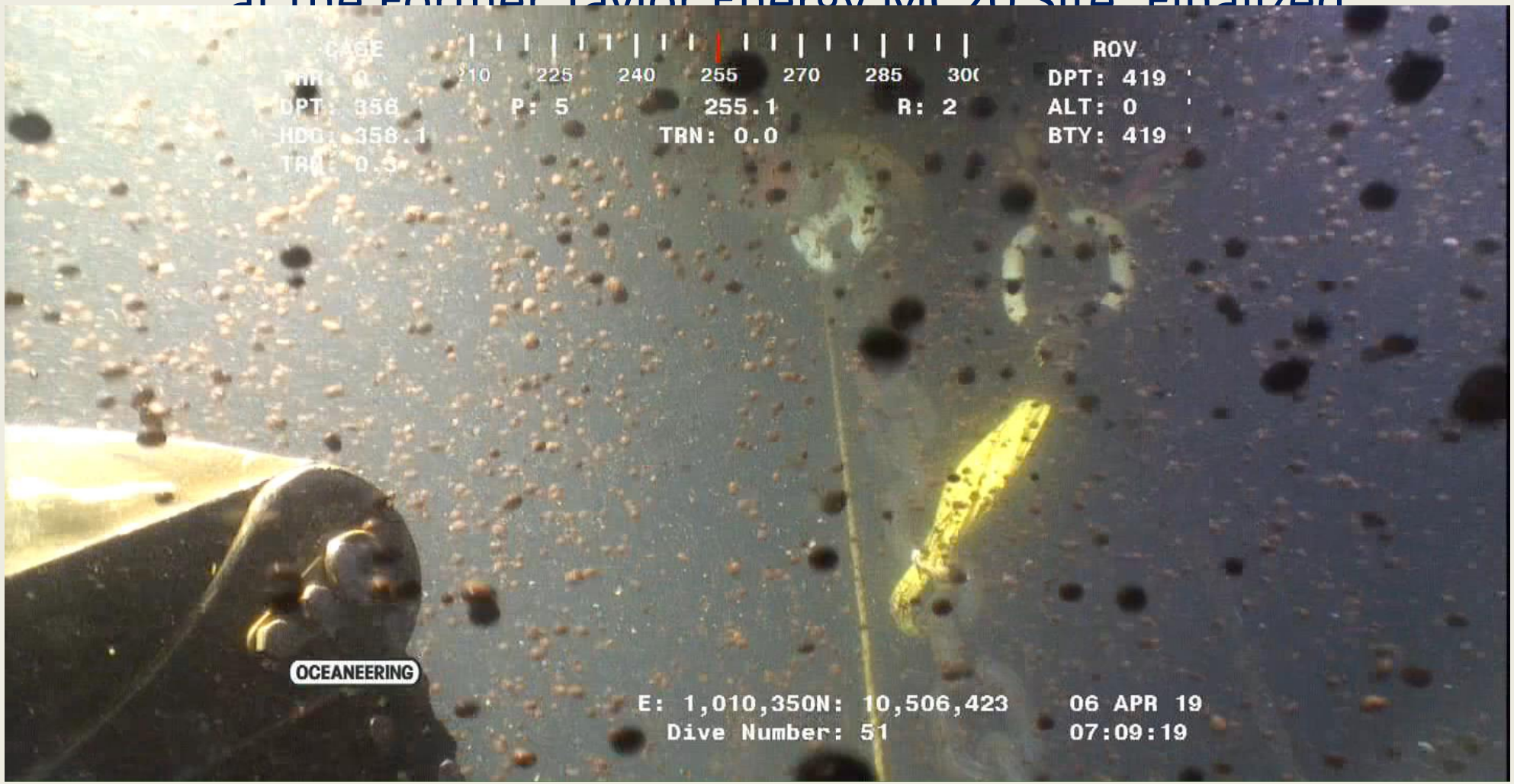


2-tiered oil classification?



"Actionable" and "non-actionable" oil based on pre-determined criteria?

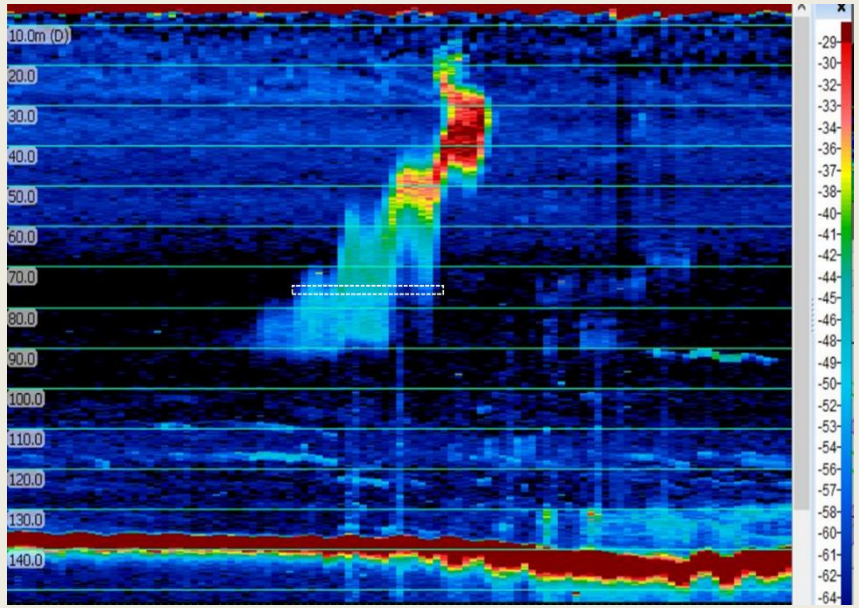
An Integrated Assessment of Oil and Gas Release into the Marine Environment at the Former Taylor Energy MC20 Site: Finalized

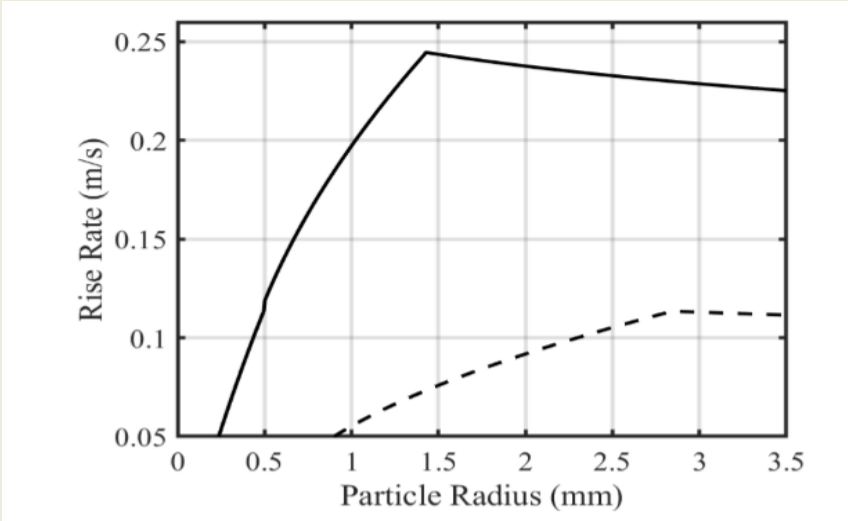


https://coastalscience.noaa.gov/project/mc20report/

Estimating flux – Acoustic method

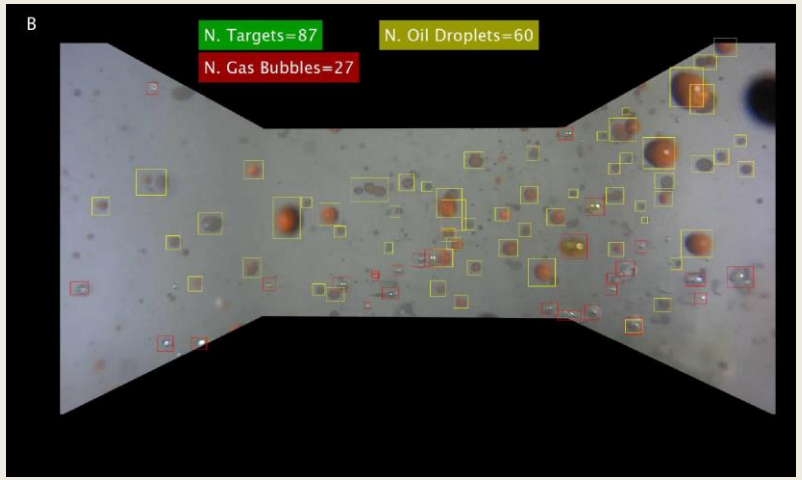
- Use acoustic backscatter from plume cross-sections to estimate density of bubbles
- Assume range of bubble sizes measured using bubblometer
- Assume ratios of oil:gas bubbles from bubblometer
- Model rise rates based on theory and empirically from plume trajectory, corrected for ADCP-derived currents

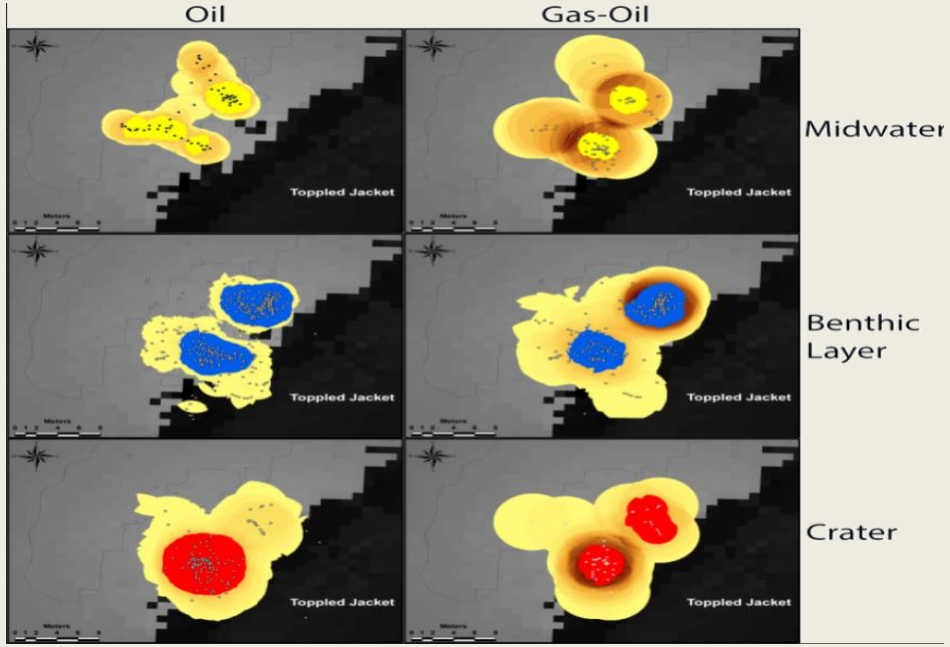




Estimating flux – Visual method

- Estimate density of oil bubbles, including 35% oil by volume in gas bubbles
- Estimation assumes median and mean values for bubble sizes
- Model rise rates based on theory assuming density and viscosity forces
- Scale densities to cross-sectional area of plume delineated from kernel density contours





Bubblometer Collections

BSEE-NOAA Project

- "Three-dimensional mapping of dissolved hydrocarbons and oil droplets using a REMUS AUV" ($696K)
- REMUS 600 Development
  - fluorescence, back scatter, holographic imaging, camera and water sampler for comprehensive 3-d hydrocarbon mapping.
- Field trials (Santa Barbara seeps area)
- Data outputs and delivery (DIVER, ERMA)

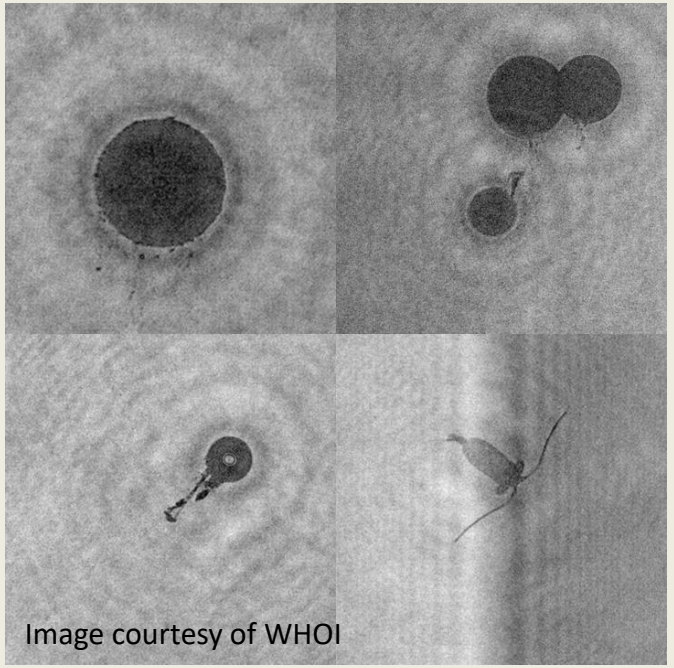
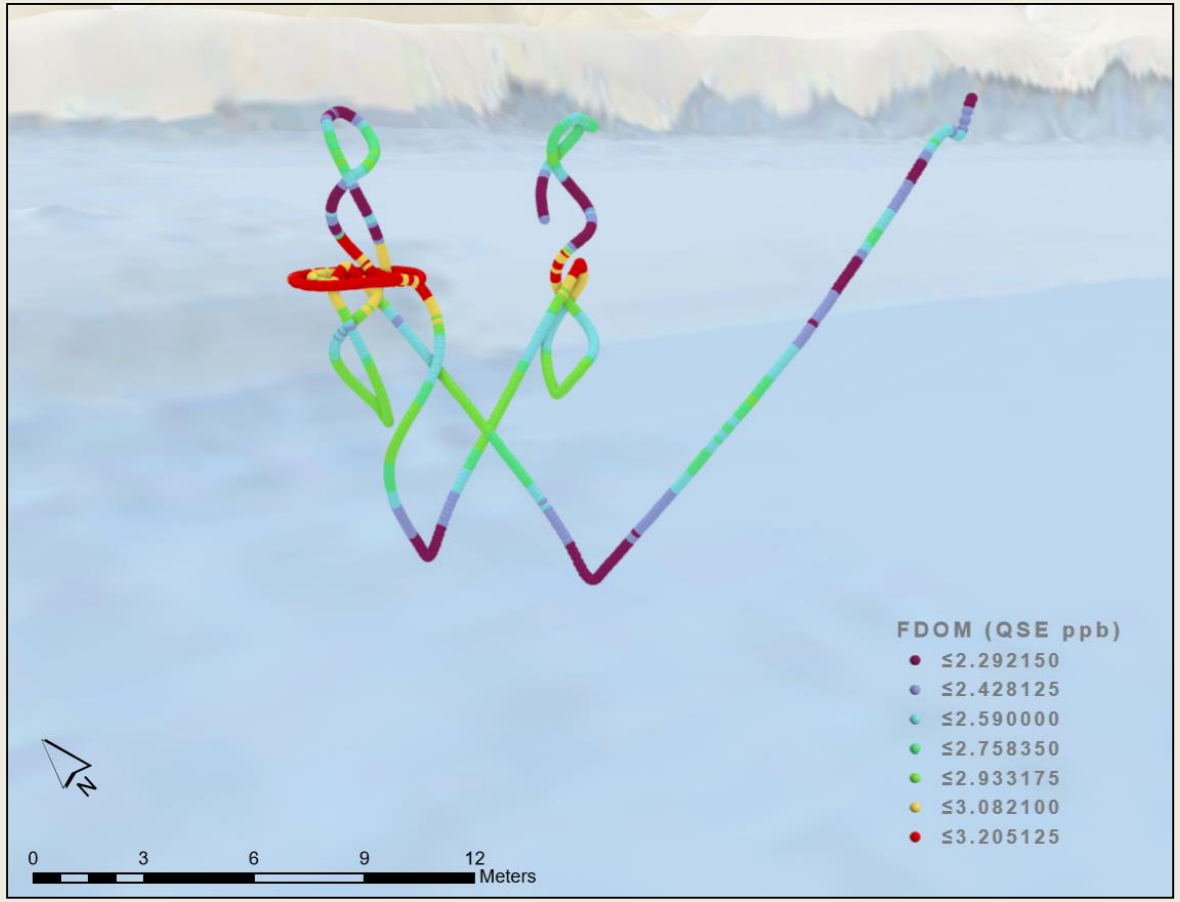
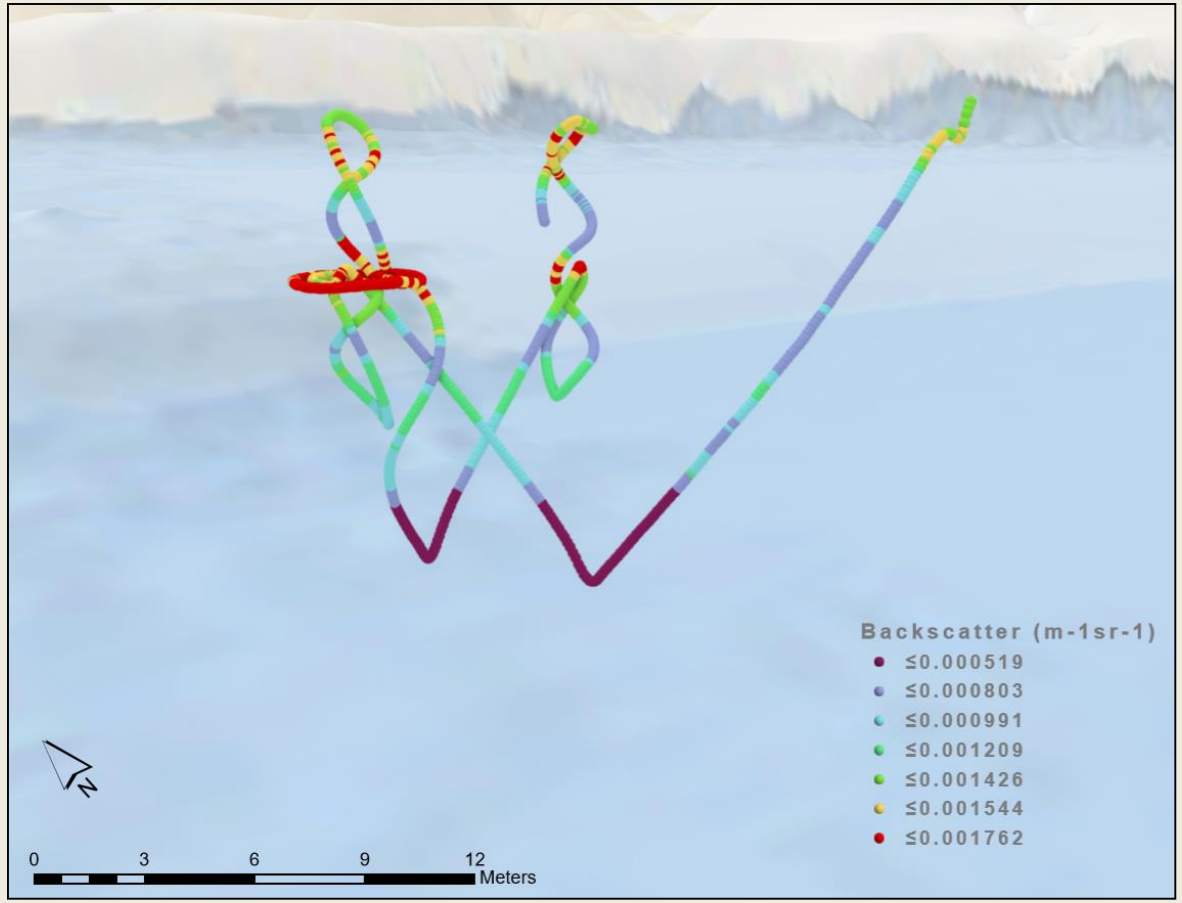


Image courtesy of WHOI

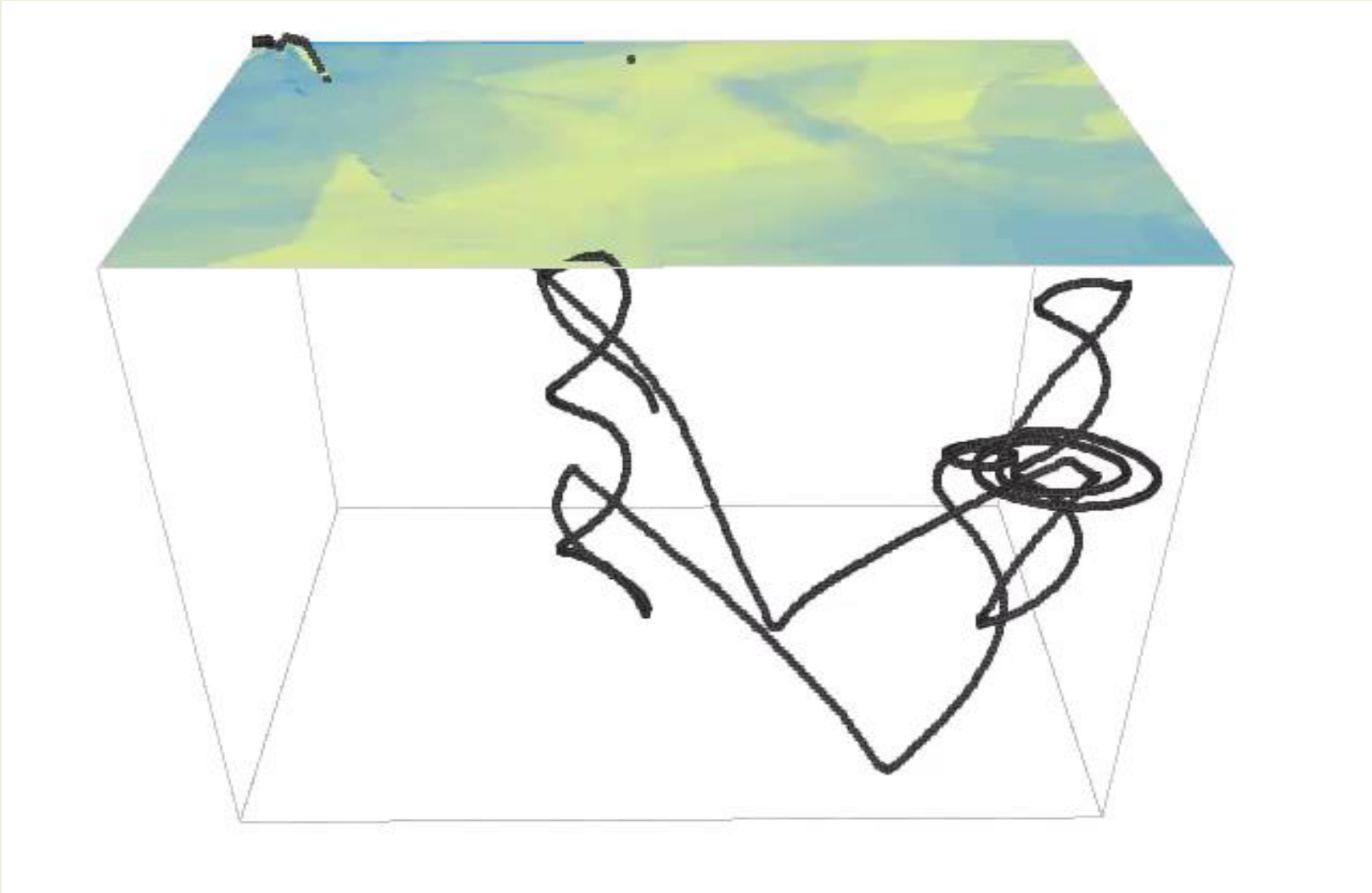
Santa Barbara Seeps REMUS 600 Field Trials (PRELIMINARY)





Data Product Credit: US EPA Robyn Conmy and Alex Hall

Options for Data Delivery



FDOM (QSE ppb)

Filled Contours

- 0.511525 - 2.285675
- 2.285675 - 2.4605
- 2.4605 - 2.596475
- 2.596475 - 2.78425
- 2.78425 - 2.93965
- 2.93965 - 3.0821
- 3.0821 - 4.9469

Data Product Credit: US EPA Robyn Conmy and Alex Hall

CA MPRI: Comparing Advances in Estimating and Measuring Oil Slick Thickness

1. Workshop (November 2019)
2. Side-by-side experiments in a controlled environment (Ohmsett test facility, New Jersey)
3. Field testing- location to be determined

More Research Planned

Advancing Detection Capabilities for Monitoring Oil Spills in Ice Environments

Technical Research Proposal for Development of UAS and AUV Operations presented by:

Lisa DiPinto, Ph.D.
Senior Scientist
NOAA Office of Response and Restoration

In collaboration with

Robyn Conmy, Ph.D.
Research Scientist
US EPA National Risk Management Research Lab

Scott Pegau, Ph.D.
Research Scientist and Program Manager
Prince William Sound Science Center
May 13, 2019

CRREL oil-ice testing facilities in New Hampshire. These facilities will be use during the sensor calibration phase 1.

Field trials proposed for testing sensors for detection of oil in cold water + ice environment. Location TBD

How can research help optimize future responses and assessments?

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