Enabling Effective Interagency Oil Spill Remote Sensing - The FOSTERRS Working Group

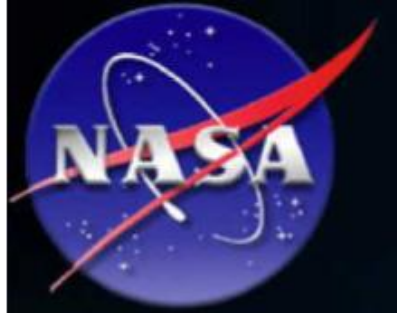Ira Leifer[1,2]

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Thanks ….

To the critical enabling support of:

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[7] Naval Research Laboratory, NRL, Stennis Space Center, MS

Federal Oil Spill Team for Emergency Response using Remote Sensing

Mission: **FOSTERRS seeks to connect agency information on airborne and spaceborne asset's availability, limitations, capabilities, and performance, and ancillary data needs to stake holders and responders.**

- Collect and disseminate information on state-of-the-art, oil spill response technologies and platforms.
- Solicit Technology Readiness Assessments.
- Provide Access to relevant reports.
- Organize Focused Workshops and Meetings.

Federal Oil Spill Team for Emergency Response using Remote Sensing

Participants: NOAA, NASA, NRL, USGS, USCG . . . .

Mission: **FOSTERRS comprises members from agencies with remote sensing assets and key end users, while outreaching to the larger community involved in marine disaster response and the development and implementation of remote sensing best practices.**

Old Time Airborne Oil Remote Sense

A Mississippi Canyon 252
Dinoflagellate and boatwake
Photo credit: NOAA LCDR Lambert

Dinoflagellate and boatwake

B Mississippi Canyon 252
Red emulsified oil with dull and silver sheens in convergence
Photo credit: NOAA Simecek-Beatty

Red emulsified oil with dull and silver sheens in convergence

C Mississippi Canyon 252
Sargassum
Photo credit: NOAA LCDR Lambert

Sargassum

D Mississippi Canyon 252
Red-orange emulsified oil in band with windrows of silver and dull colors
Photo credit: NOAA LCDR Lambert

Red-orange emulsified oil in bands with windrows of silver and dull sheen

E Mississippi Canyon 252
Brown Algae
Photo credit: Simecek-Beatty

Brown Algae

F Mississippi Canyon 252
Dark brown oil a 1/4 to 1/2 mile from source
Photo credit: Simecek-Beatty

Dark brown oil ~0.4 - 0.8 km from source

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Airborne Remote Sense (oil)

- Often can provide a synoptic view (for spills smaller than DWH)

- Task-able – can fly between clouds, loiter, or launch late or early

- Much higher resolution improves accuracy

- Higher SNR possible

- Diagnostic Hyperspectral Features Feasible
   (from space by HyspIRI in many years)

Spaceborne Remote Sense Issues (oil)

- Visual approaches require sunlight and no clouds – can be limiting
- Radar allows 24/7 observations if winds are in a narrow range, but many false positives (other data may reduce)
- Coarse resolution, or poor coverage, or slow revisit
- Slow revisit enhances cloud risk
- Non-diagnostic most useful if a spill is known and well behaved
- Visual best at low latitudes

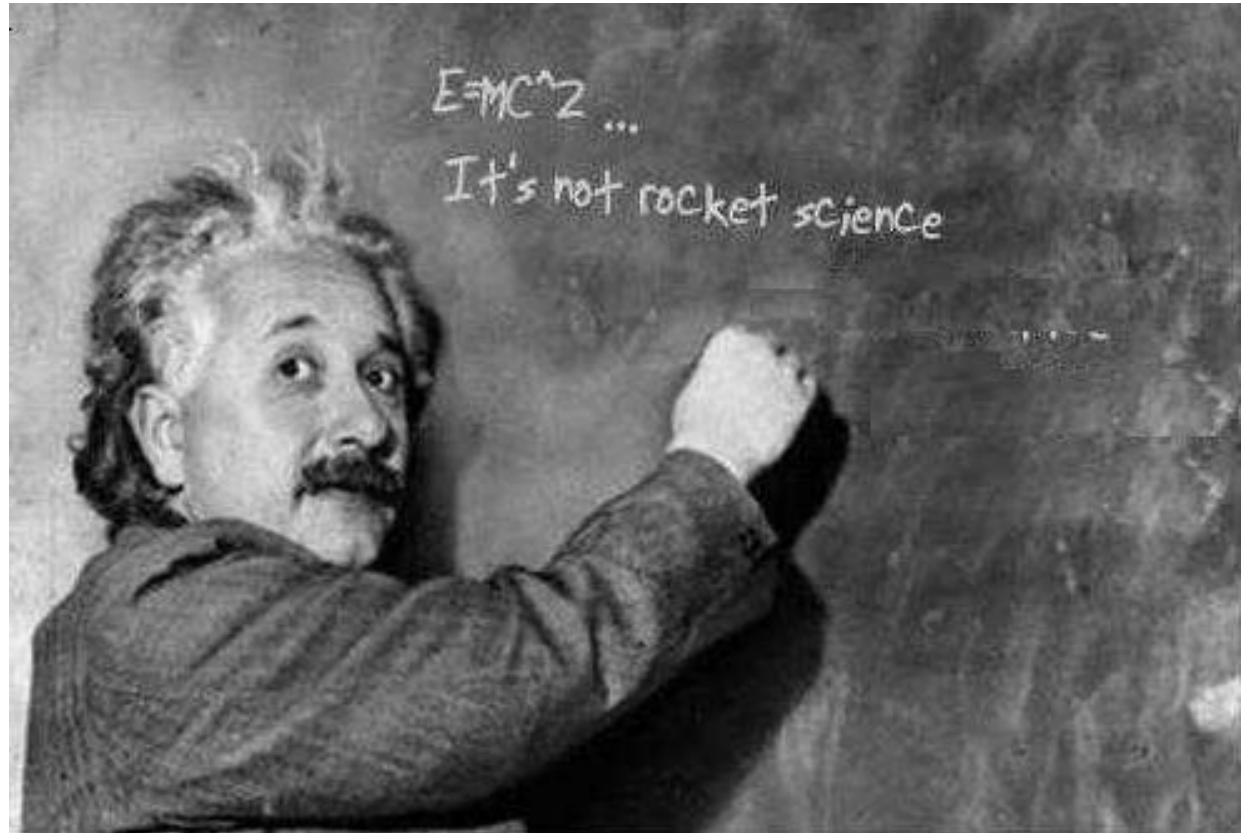# Ideal: Diagnostic Remote Sensing

Hyperspectral Oil Imaging Spectroscopy
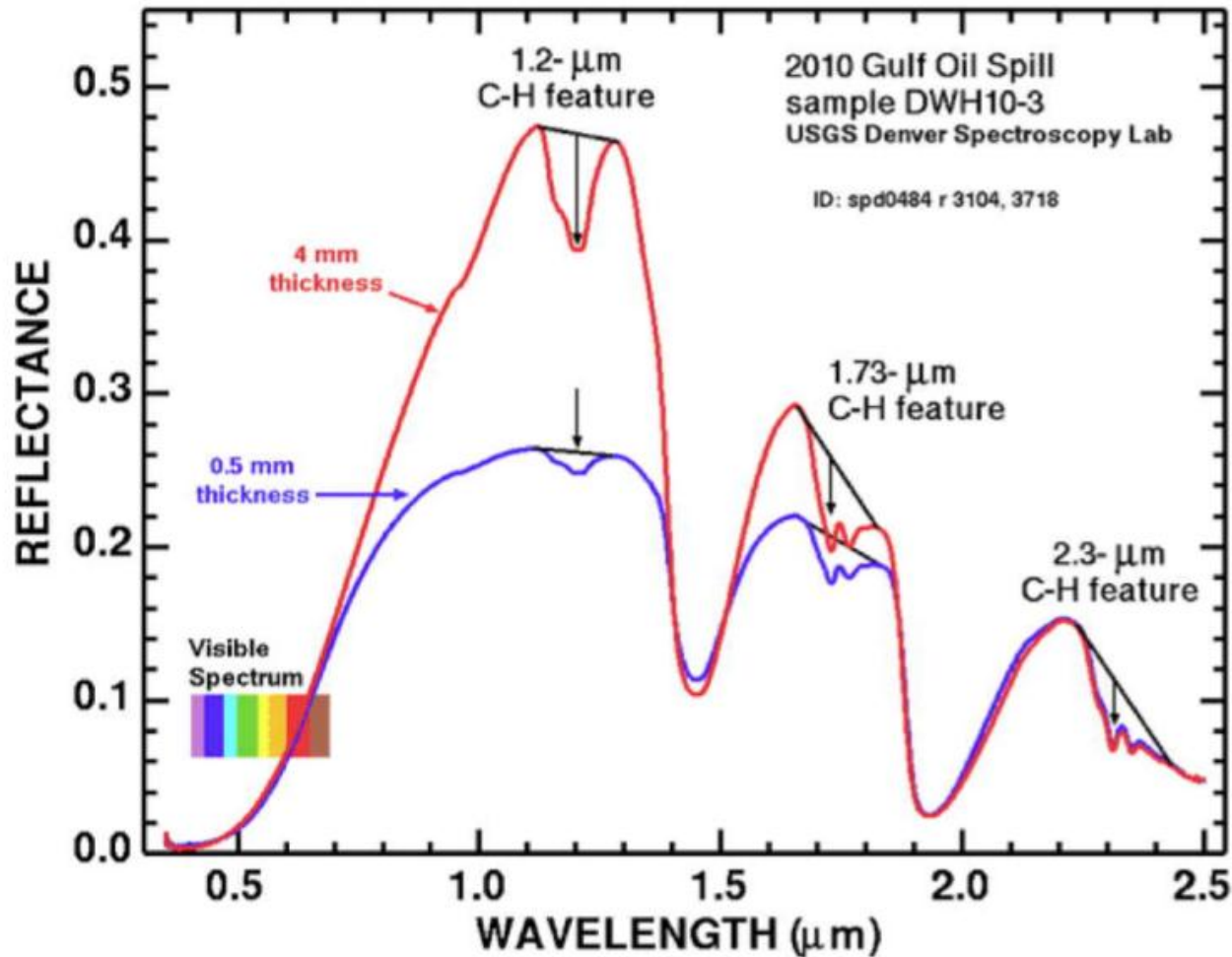
USGS first Mapping of 1200, 1730, and 2300 nm Carbon-Hydrogen Bond Absorption with AVIRIS

from Clark et al., 2010b. Open source report
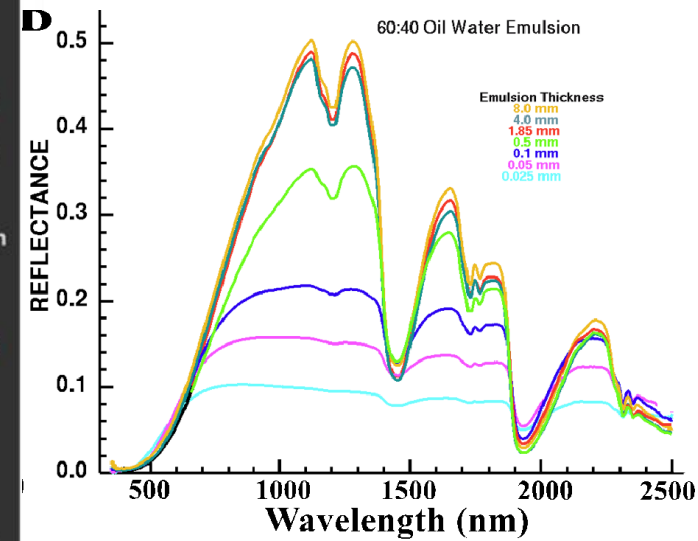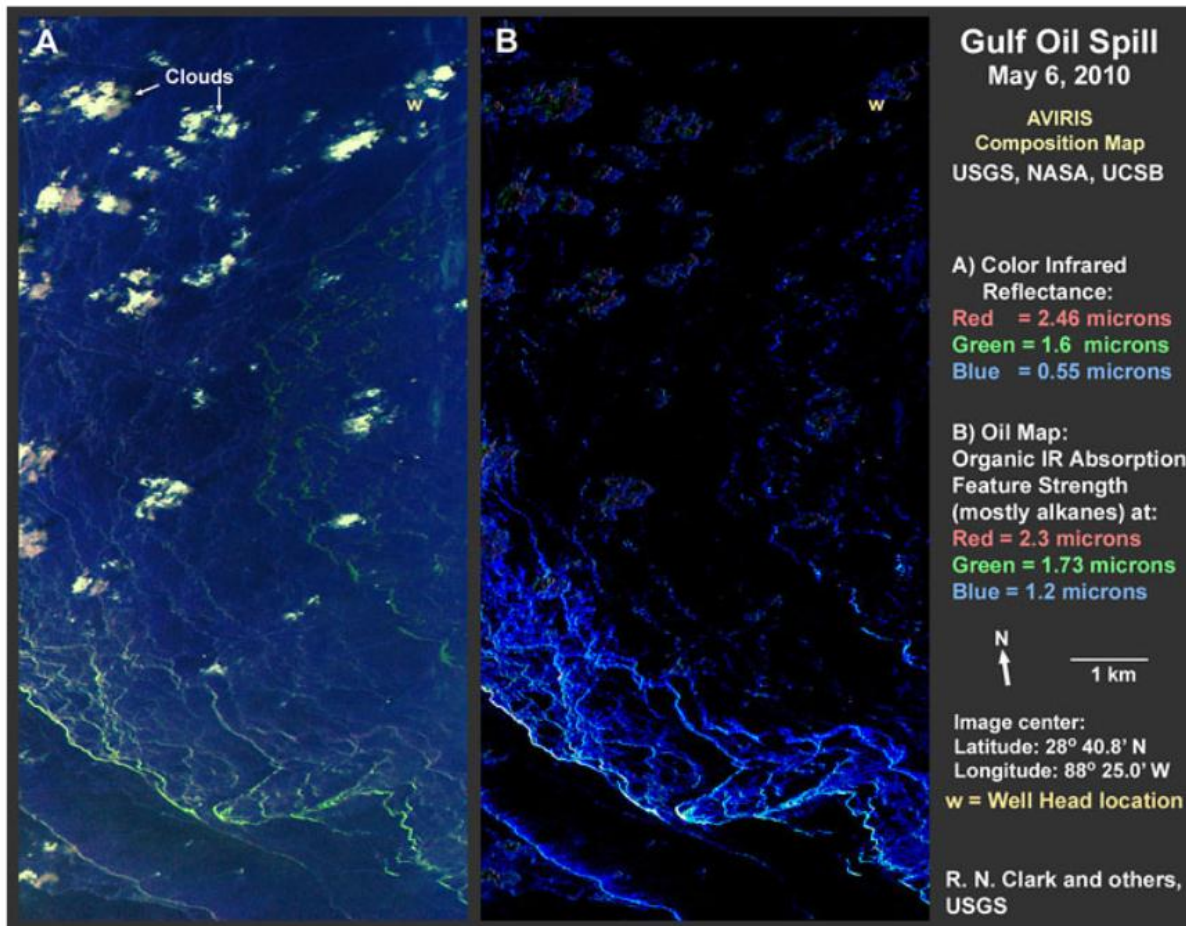
Reality:
Oil spill response is need-based science

Fast
Proven
Reliable
Well Understood
USEFUL!!!

Useful => Answers useful questions in a useful manner.
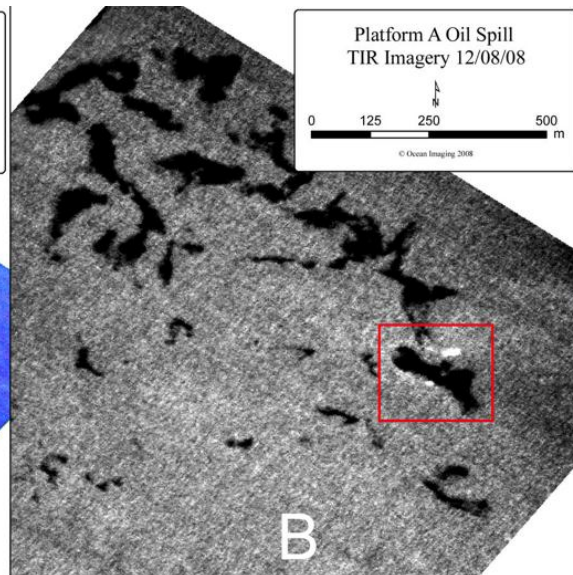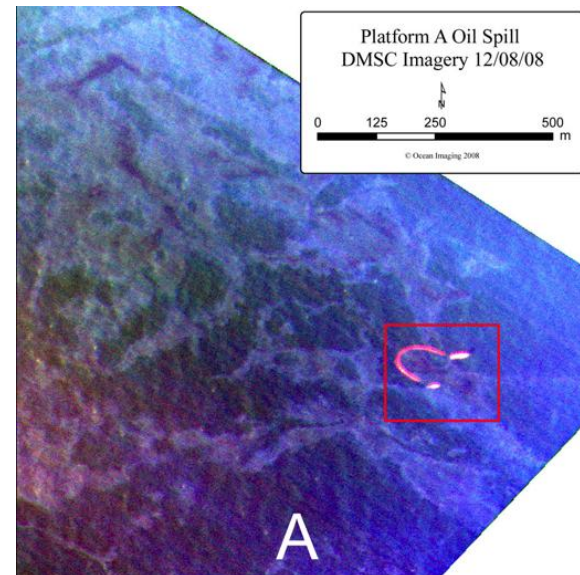
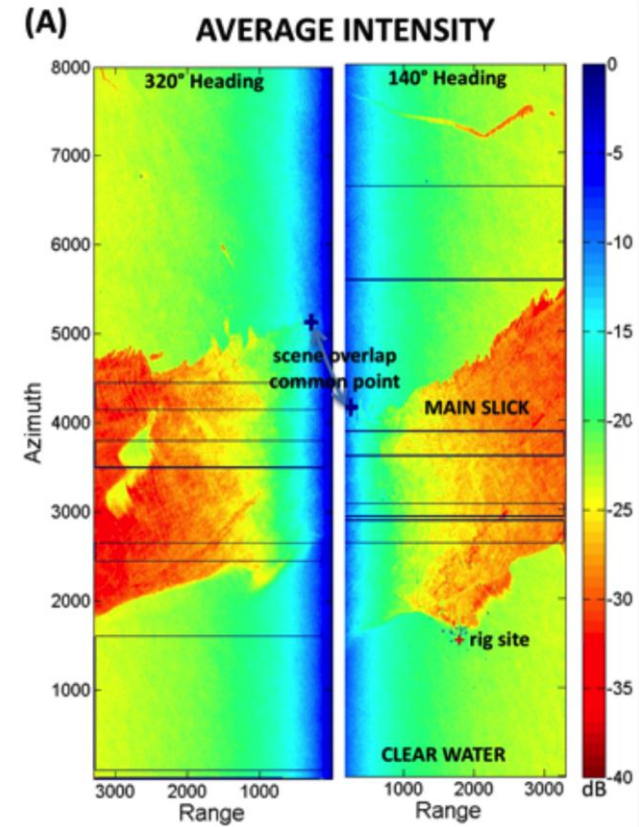# Oil Spill Science

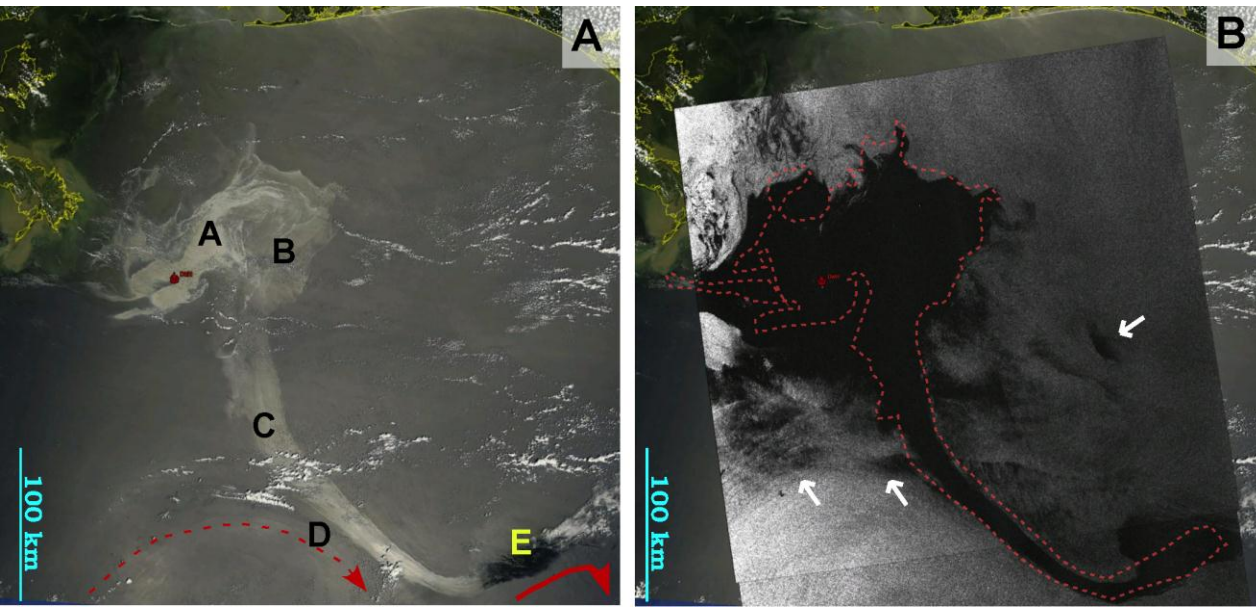**Useful (for remote sensing)**

1 - Triage – soon-est is best-est.

2 – Where is the thick oil? Is there thick oil? False positives.

3– What is in the path of the oil? Ecosystem mapping

4 – Mitigation strategy evaluation

Remote Sensing Tools - Finding thick oil

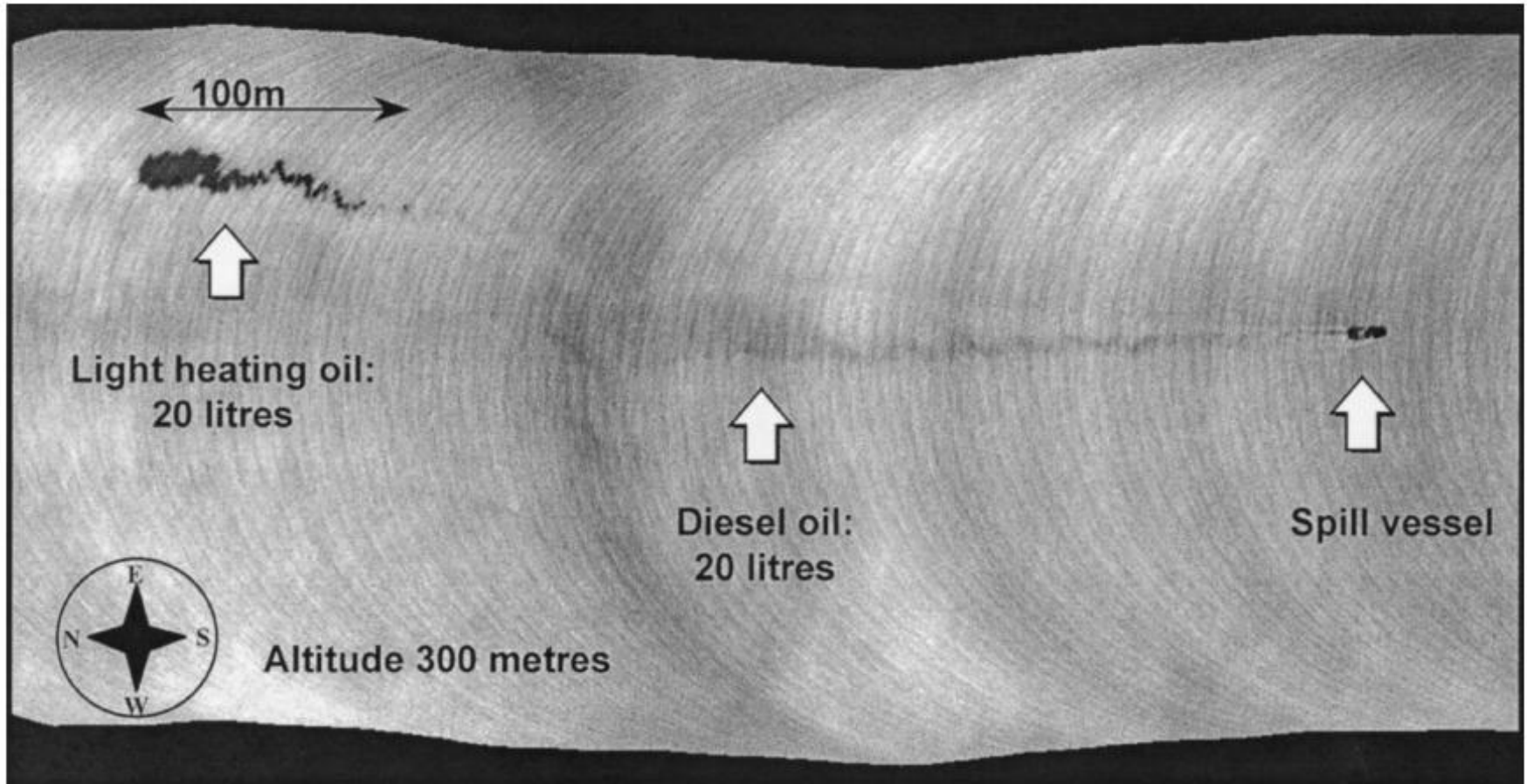# A Hot Diversion
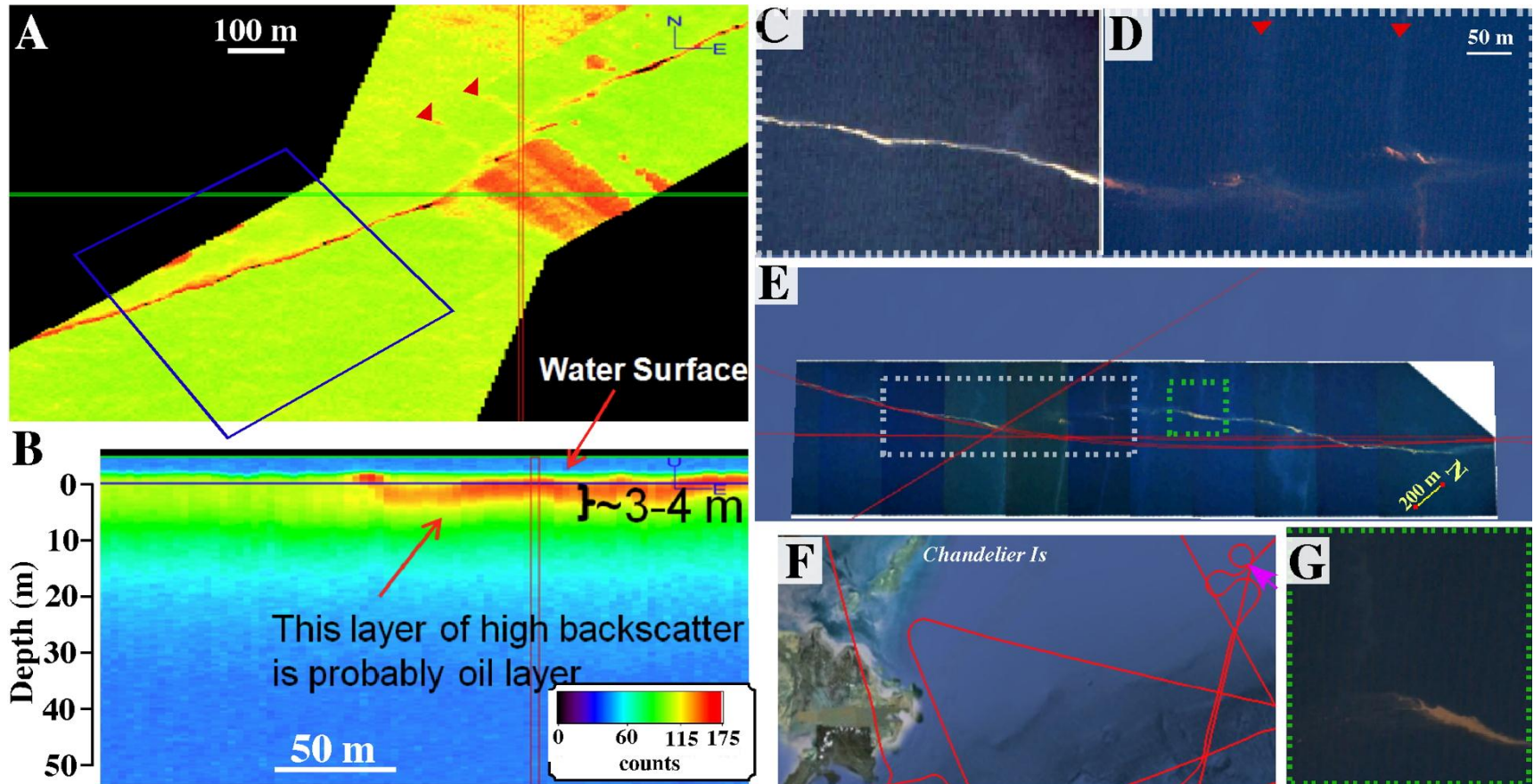# Thermal Remote Oil Sensin'

Figure 3. Thermal imagery of the oil residue spills taken in darkness.

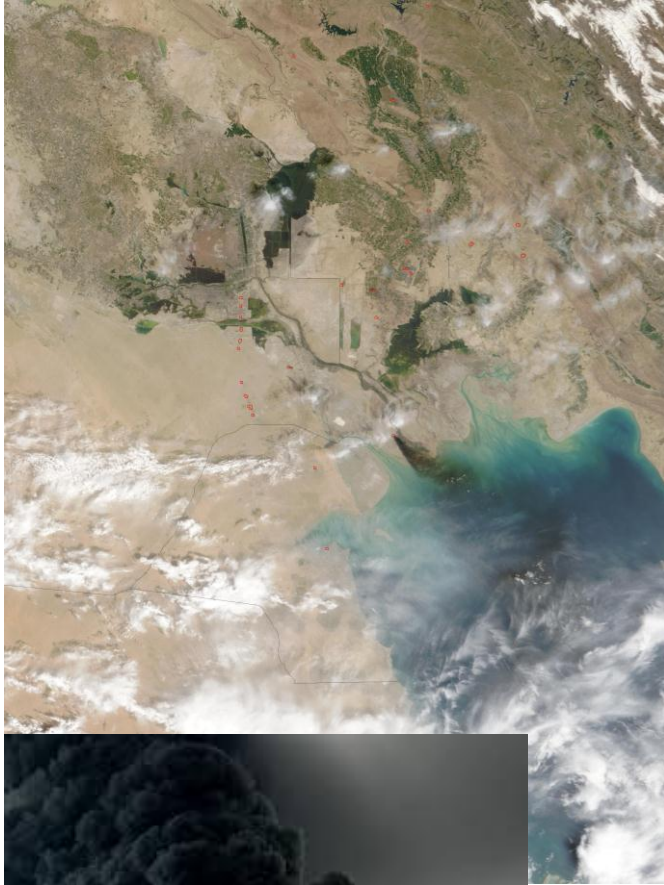*Thermal don't see thin oil…. Or does she?*

Remote Sensing
Not just Findin': *Fishin'!!*

A — 100 m, N, E

B — Depth (m): 0, 10, 20, 30, 40, 50; ~3-4 m; Water Surface; This layer of high backscatter is probably oil layer; 50 m; 0 60 115 175 counts

C

D — 50 m

E — 200 m, N

F — Chandelier Is

G

Remote Sensing
Not just Findin': *Smokin'!!*

Some Points

Remote sensing has many advantages

Pattern recognition has significant false positives

   -requires ancillary data (other sensors, other info, model)

Spectroscopy is diagnostic

Many novel applications, at lab research stage

Thermal spectroscopy is feasible, not implemented

Key Point:
The next spill will be different

Remote sensing can help

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