Challenges in detecting and differentiating floating algae and other materials in ocean color imagery

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What challenges in remote sensing?

- Patchy and small
    - o Mixed pixels
    - o Extremely difficult to validate
- Spectral ambiguity
    - o Lack of spectral bands
    - o Similarity in different types
- Clouds, cloud shadows, sun glint
    - o Moving targets
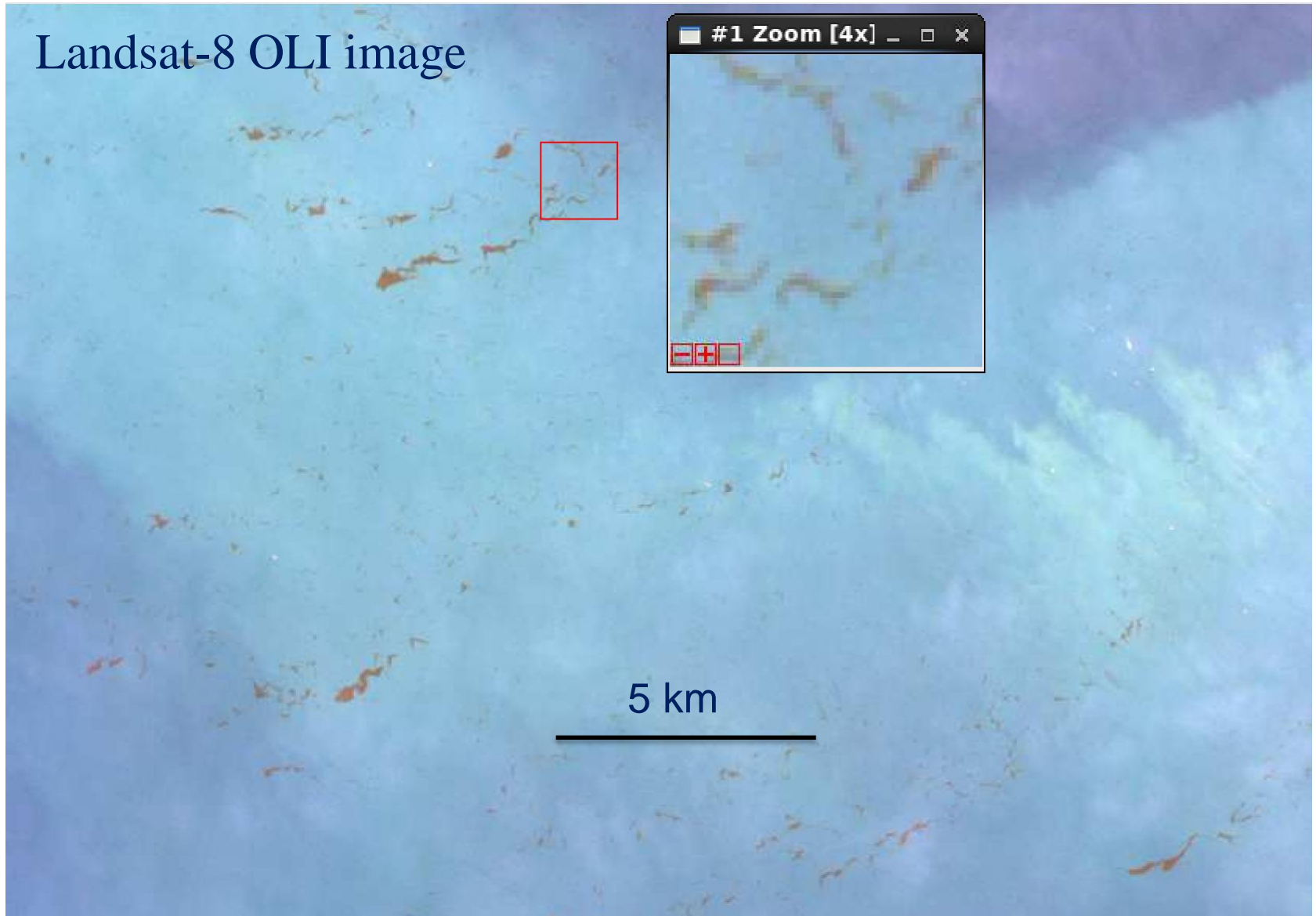   - o Often difficult to mask

What's an ideal solution?

High spatial, temporal, spectral, and radiometric resolutions – not possible in the near future!
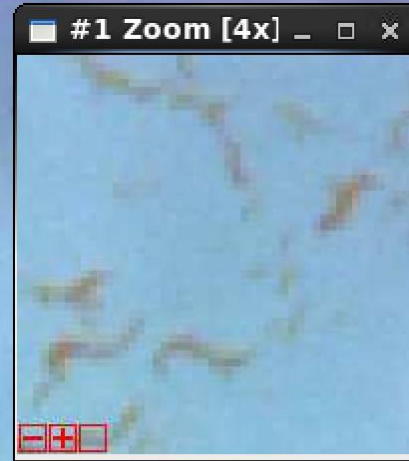
How patchy and small?

1 cm² squares

0.5 km

50μm < Thickness ≤ 200μm
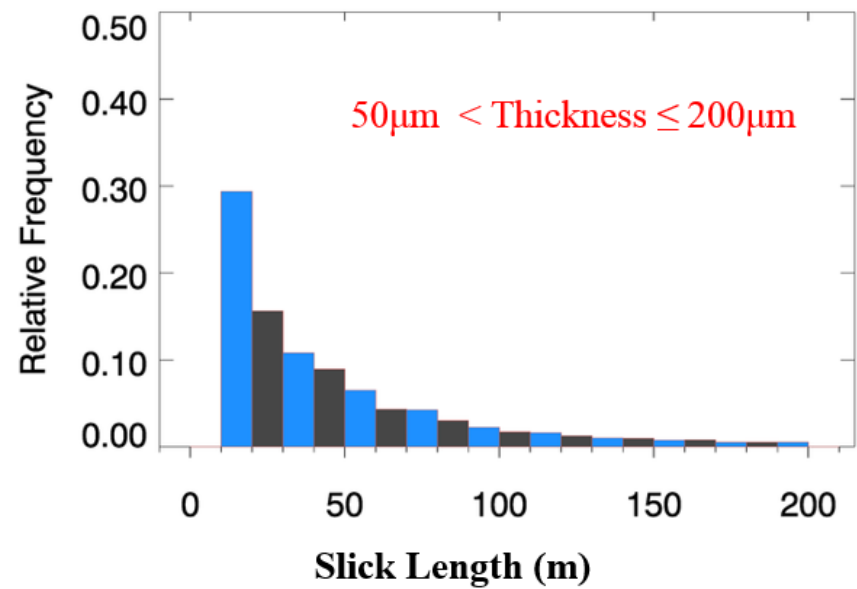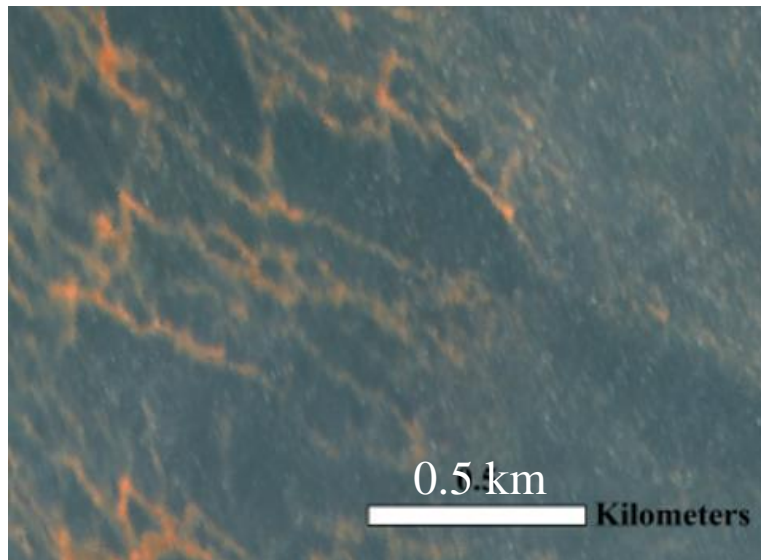
How patchy and small?

Landsat-8 OLI image

#1 Zoom [4x]

5 km

What spatial resolution?

Landsat-8 OLI image

#1 Zoom [4x]

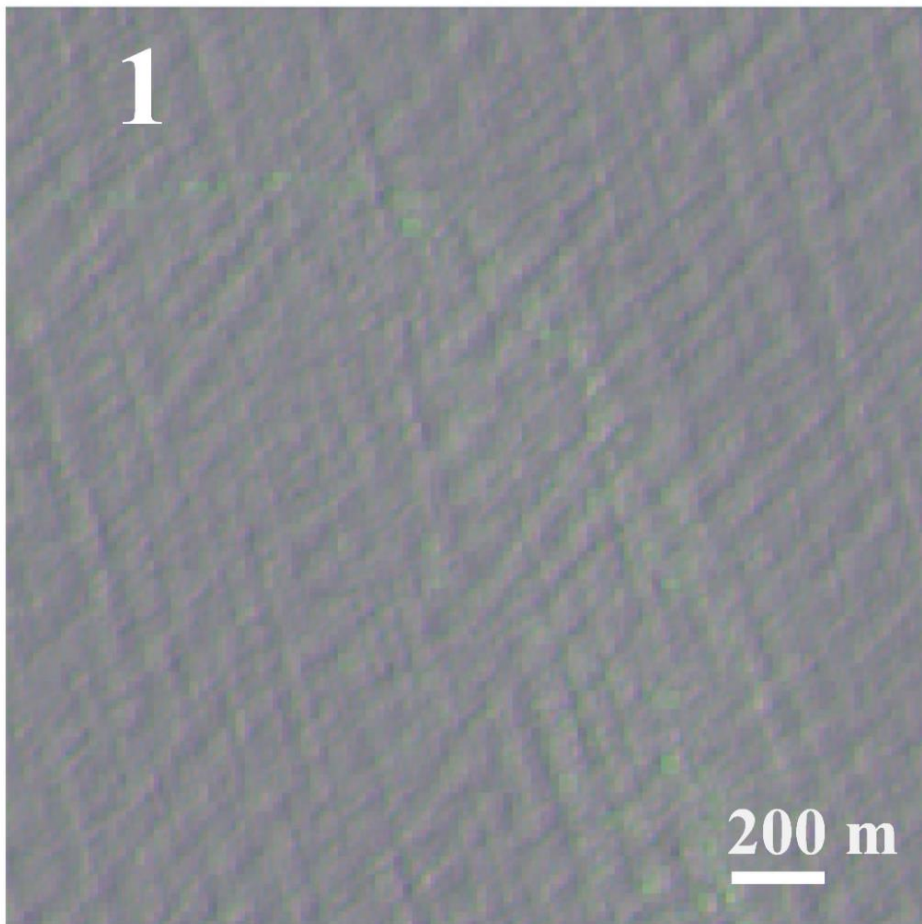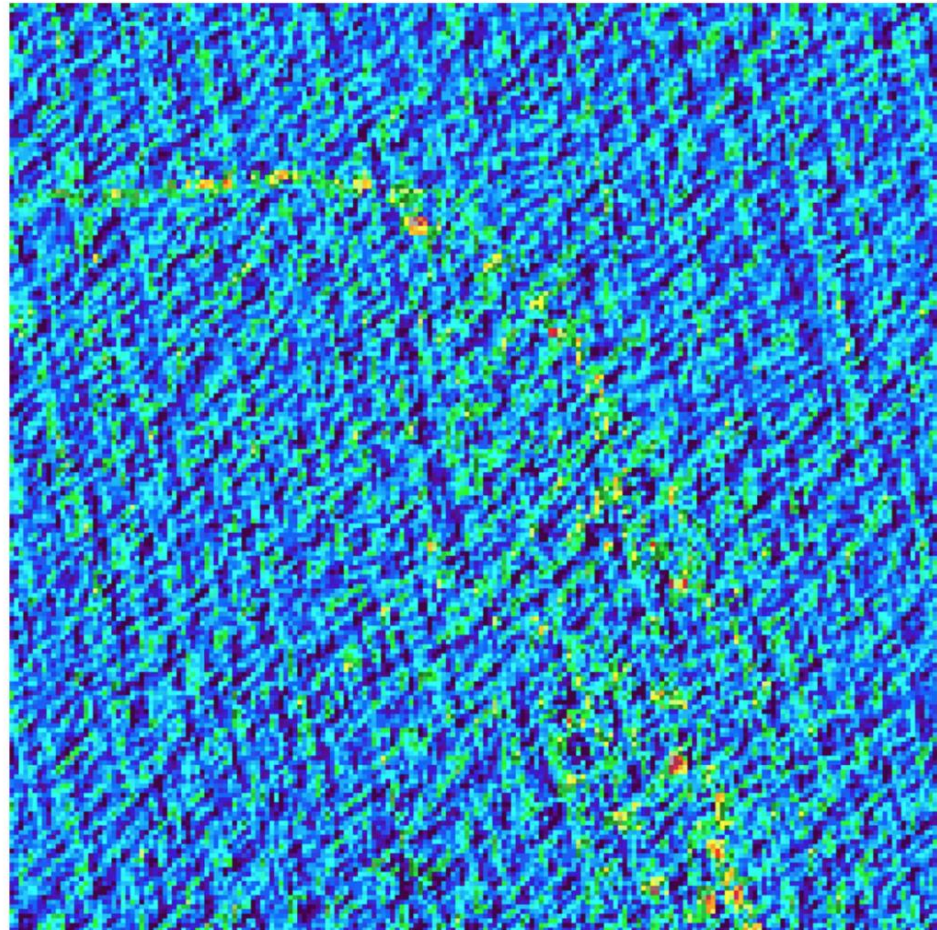| Sensor	SNR	Detection Limit
MODIS 1-km:	1000:1	0.2% = 2000 m^2
MODIS 250m:	200:1	1% = 625 m^2
L8 OLI 30m:	50:1	4% = 36 m^2

5 km

What spatial resolution?
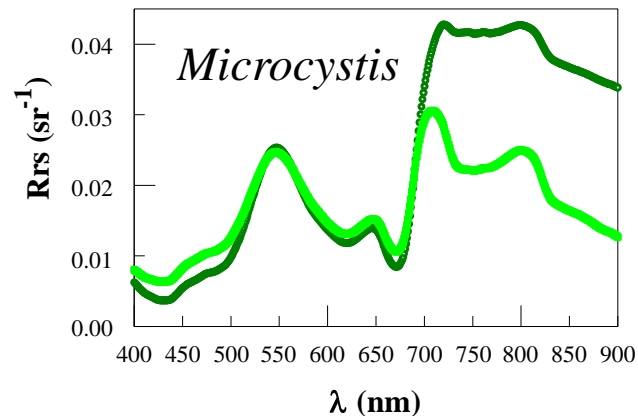
WV-2 versus MODIS
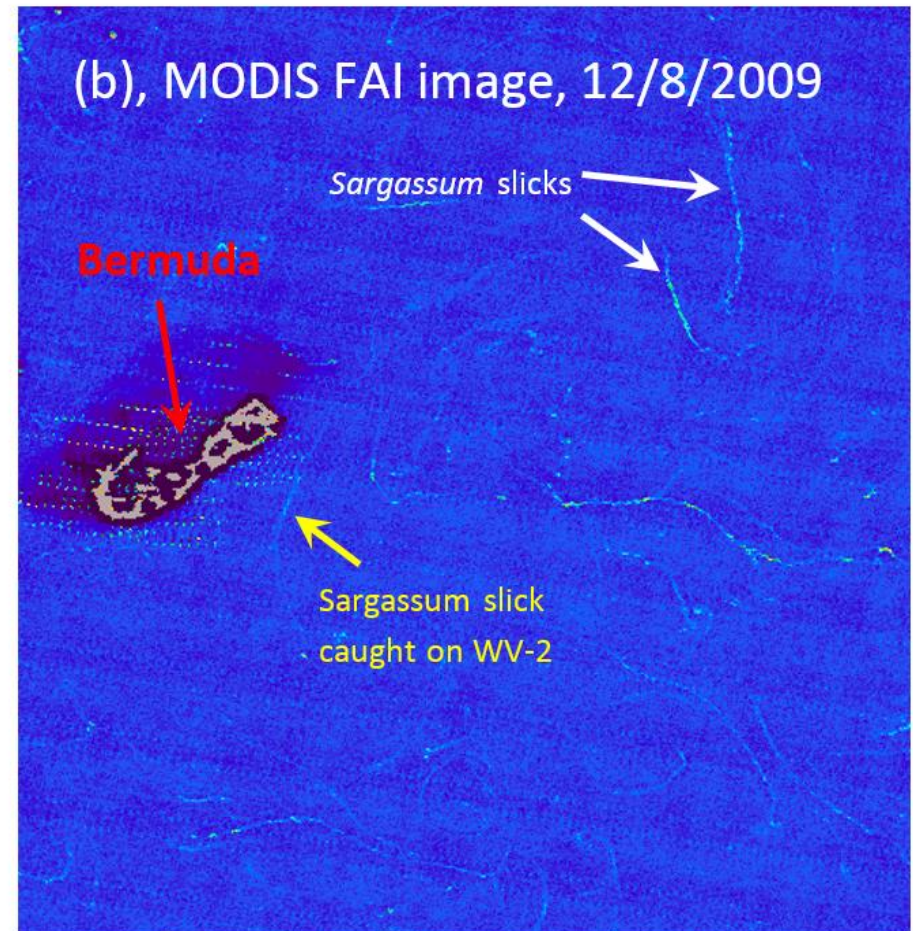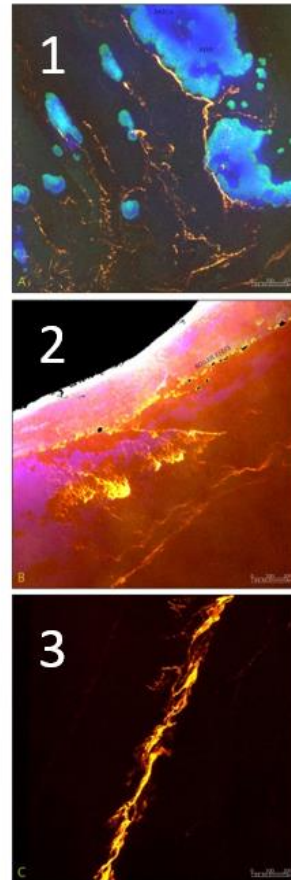
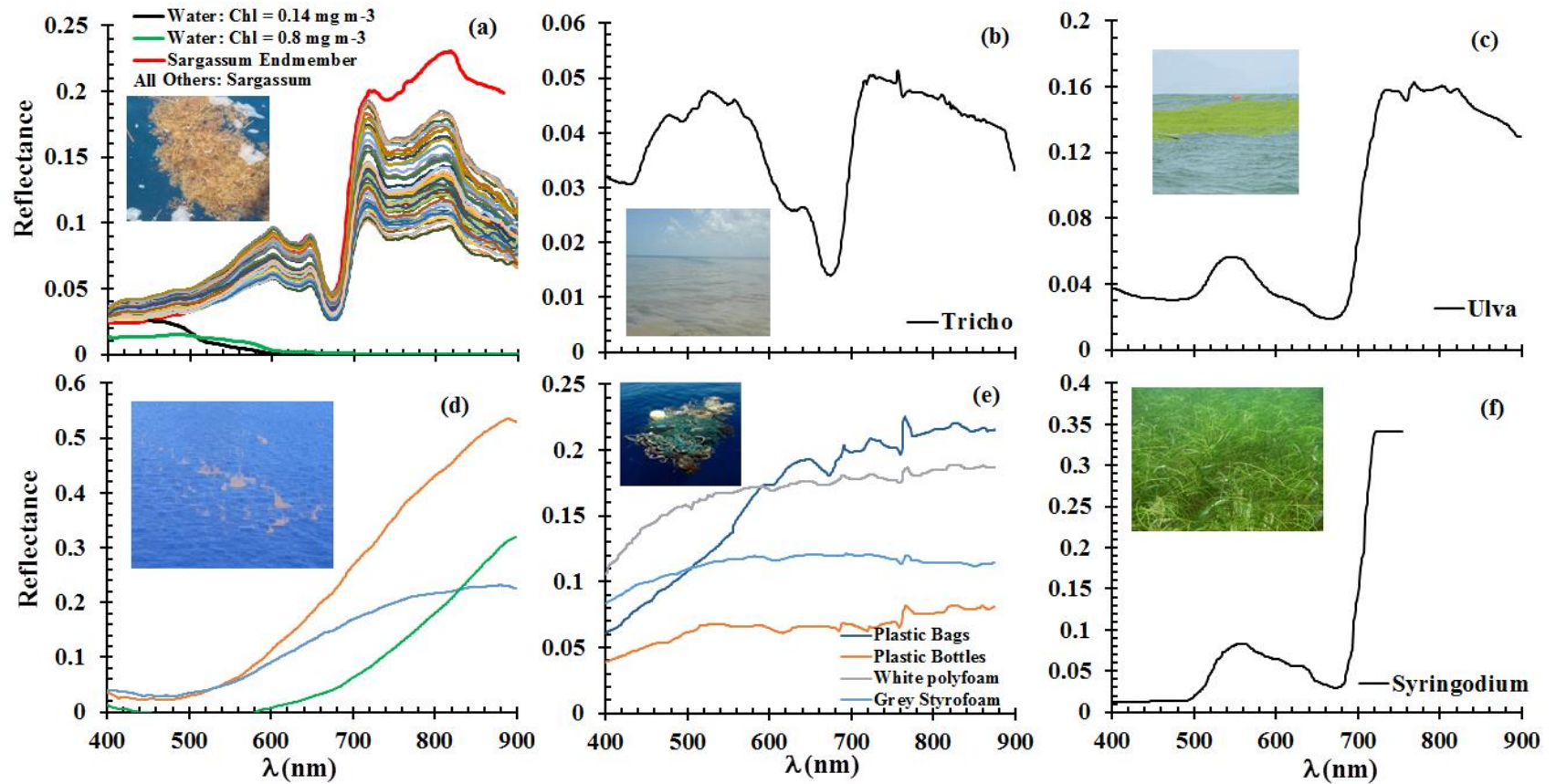# What spatial resolution?
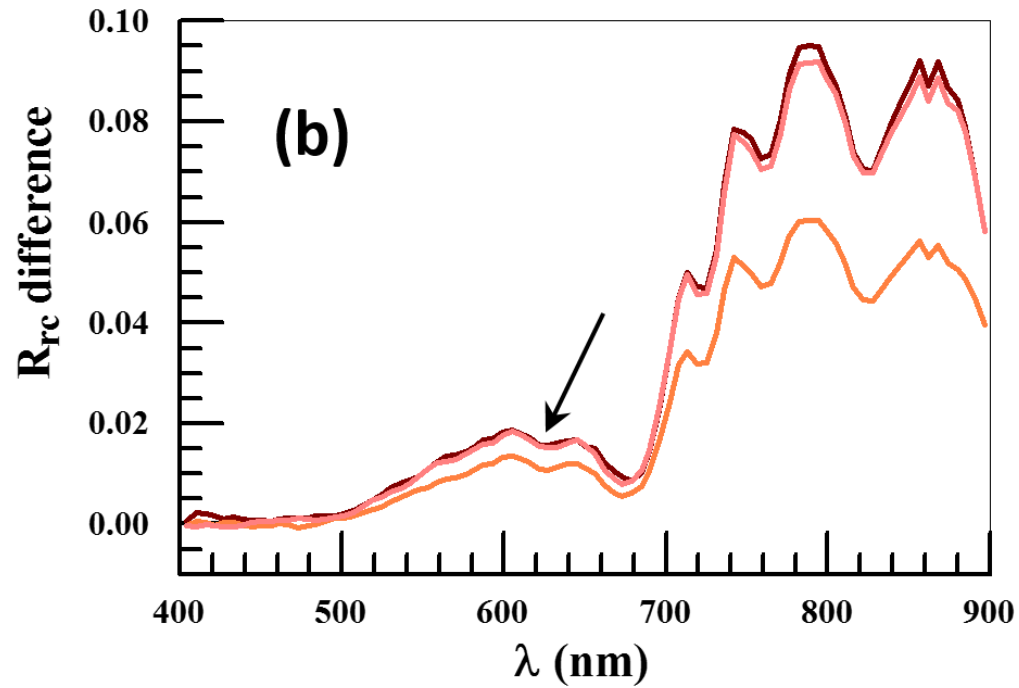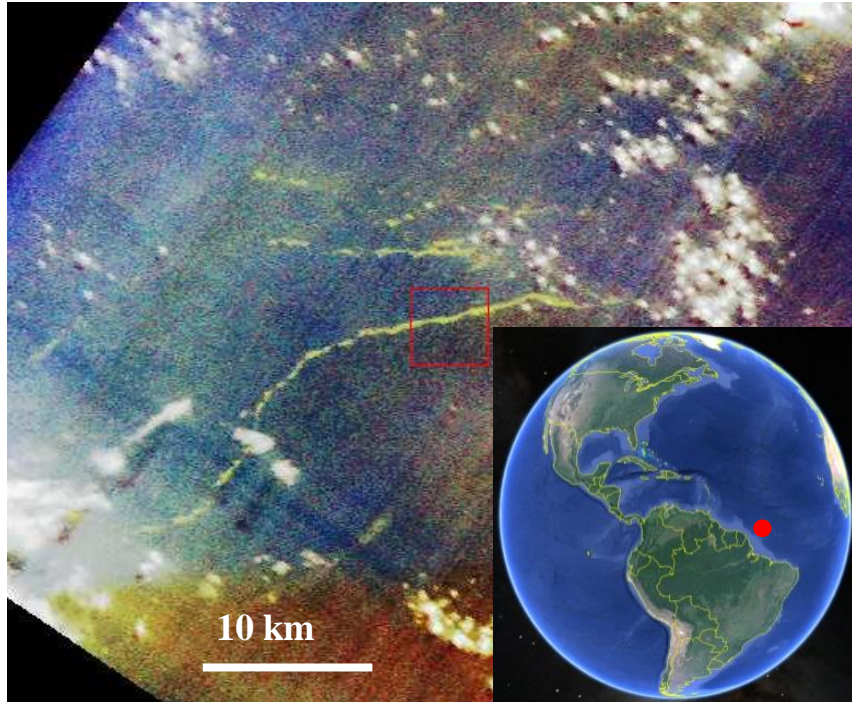
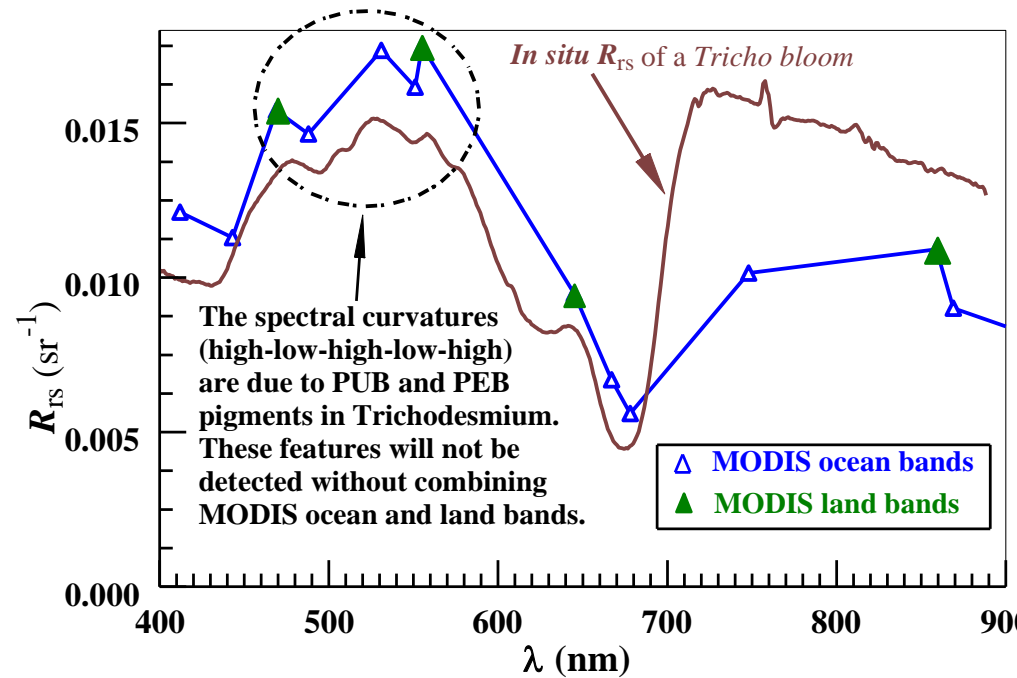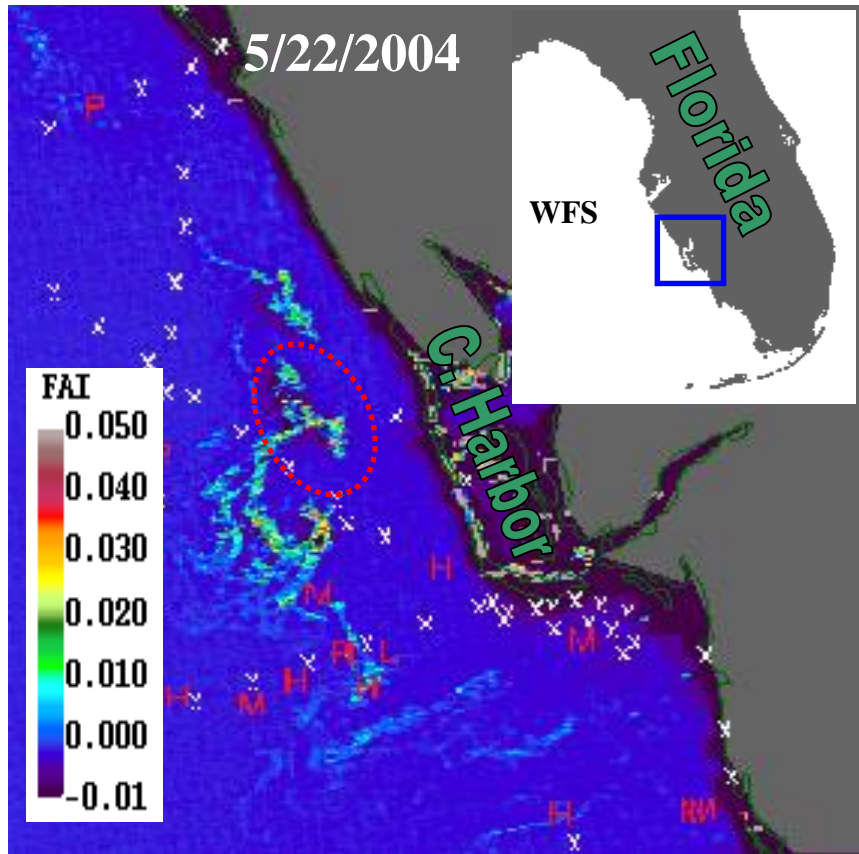## MSI 10-m resolution

Spectral discrimination?

Spectral discrimination?

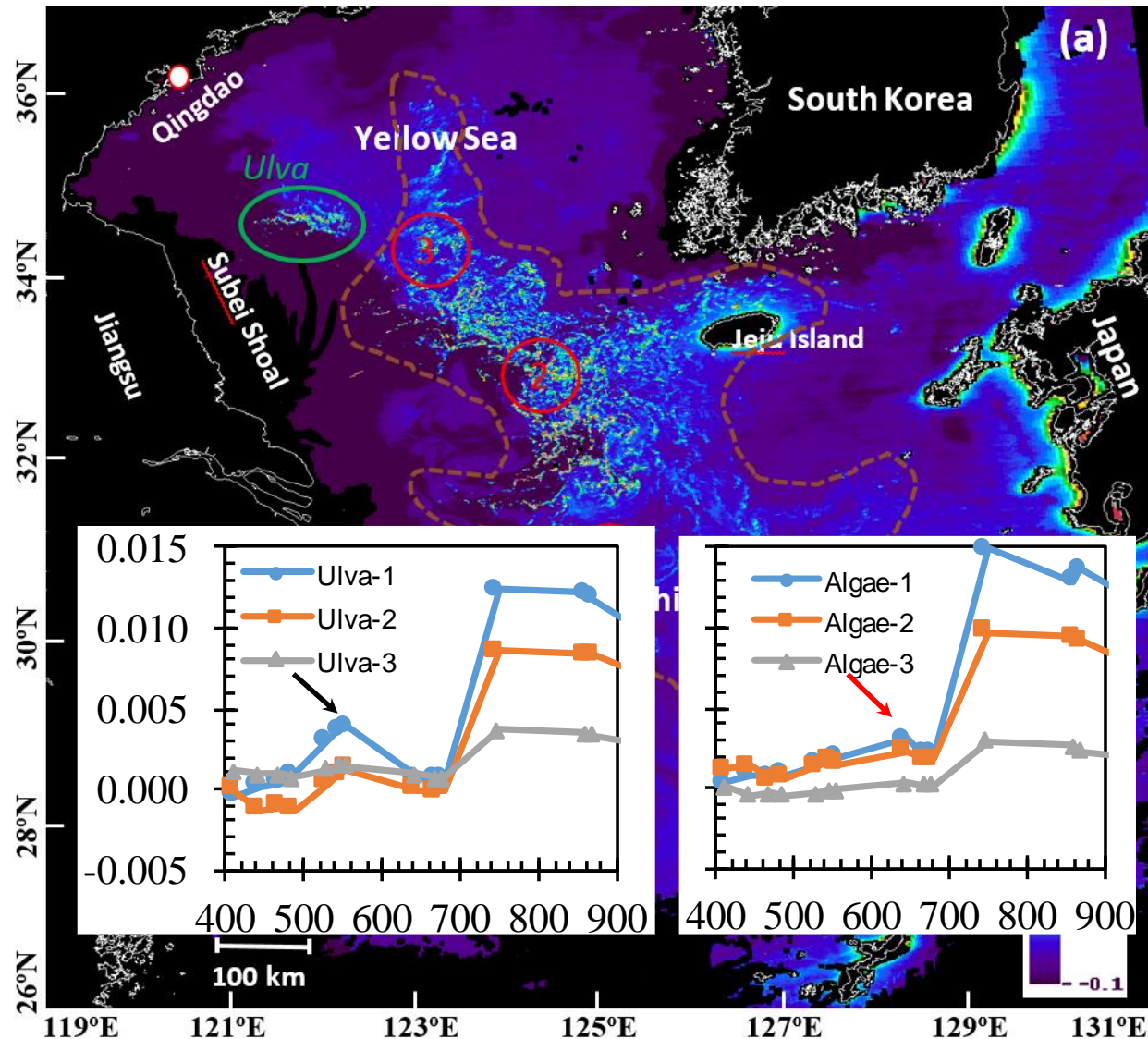## HICO fingerprints *Sargassum* in the Atlantic

Spectral discrimination?

MODIS fingerprints *Trichodesmium* in the Gulf of Mexico
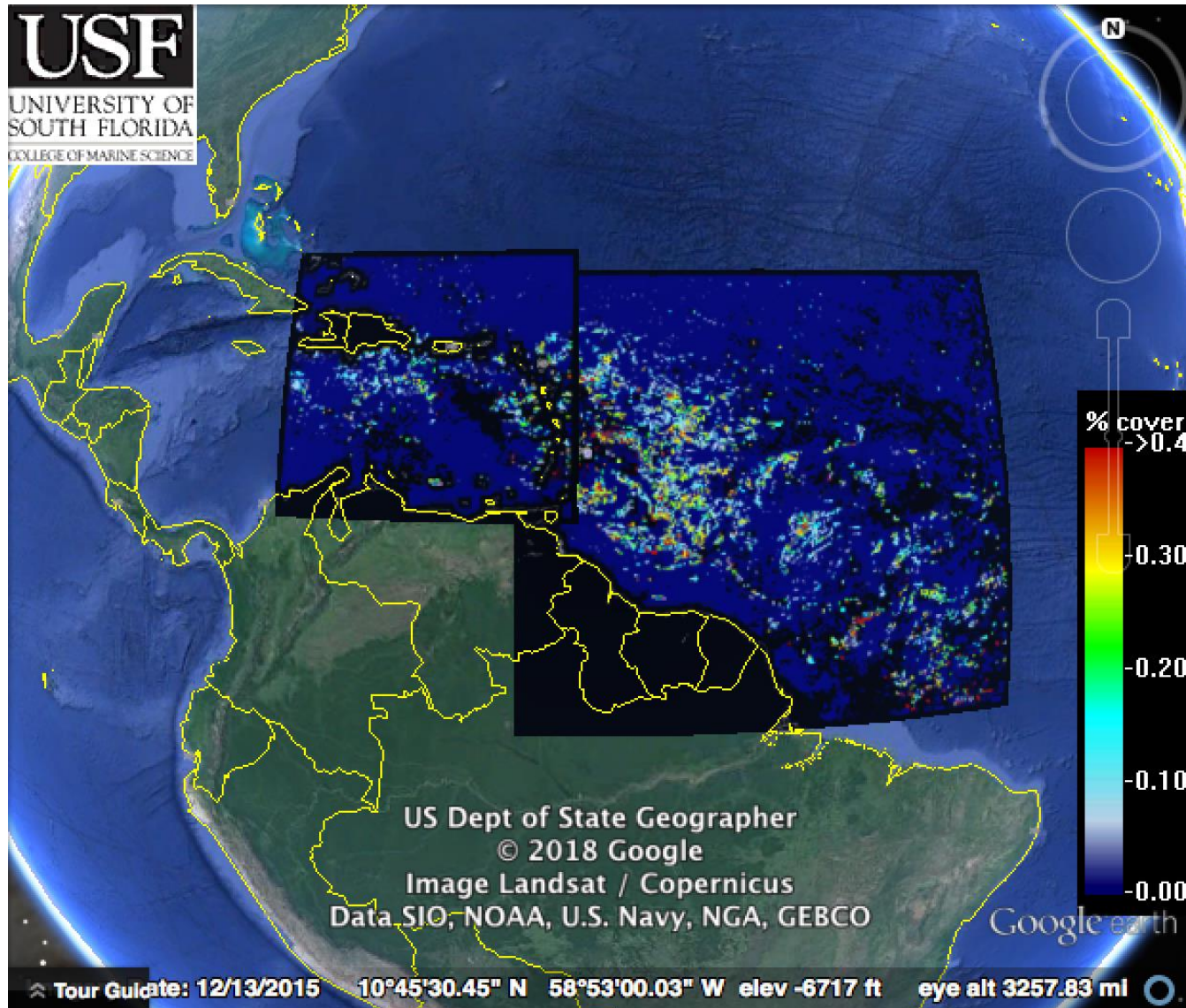
Spectral discrimination?

MODIS differentiates *Ulva* and *Sargassum*

With *a priori* knowledge

Areal density of *Sargassum* from MODIS observations

What floating algae and materials?

- Macroalgae *(Sargassum* and *Ulva*)
- Microalgae (*Trichodesmium*, *Microcytisis*)
- Dead seagrass
- Oil spills (crude and emulsion)
- Garbage (plastics, polyfoam,…)

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