National Aeronautics and Space Administration

Coastal Texas Oceans II

Enhancing Remote Sensing Capabilities of the Sargassum Early Advisory System (SEAS) Through the Use of NASA EOS and Open Source GIS

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Study Area

The study area for this project includes the Texas coastal waters in the Northwestern Gulf of Mexico. This includes Galveston, South Padre Island, and Corpus Christi, TX.

Background Information

- *Sargassum* is a **brown macroalgae** found floating in large, dense mats in the Gulf of Mexico

- **Two species found in GoM**: *S. natans and S. fluitans*

- Gas bubbles cause *Sargassum* to stay **afloat**

- Mats serve as a valuable **habitat** to unique communities of marine organisms

http://oarnorthwest.com/2013/03/daily-education-update-3-5-sargassum/

Sargassum natans, left, and *Sargassum fluitans*, right *photo by GCRL*

- Can trap **plastics, paper, medical** and **industrial waste**

- Decomposition of *Sargassum* and the organisms therein give rise to **unattractive odors**

- Poses a serious **threat to local tourism**, which brings in $7 million annually

http://www.flickr.com/photos/mermaidsocks/5564726185/
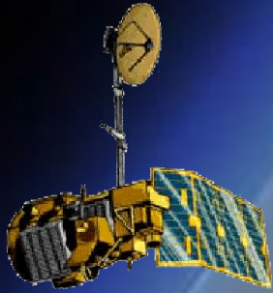

http://www.crystalbeach.com/weed.htm

- *Sargassum* **Early Advisory System** (SEAS)

- Produces **eight day forecasts** of *Sargassum* events

- SEAS Forecasting timeframe allows coastal managers to concentrate the appropriate *Sargassum* **mitigation techniques**

- Forecast absence of *Sargassum* mats allows beach managers to **focus equipment** use where most needed

- Such forecasting also helps beach managers to **better allocate their budget**

SEAS™
Sargassum Early Advisory System
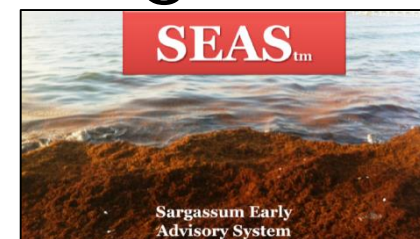
1. **Improve estimations of *Sargassum* landings** in coastal environments through the use of NASA remote sensing

2. Develop and demonstrate methods for **enhanced *Sargassum* detection** in open source GIS software for cost-effectiveness
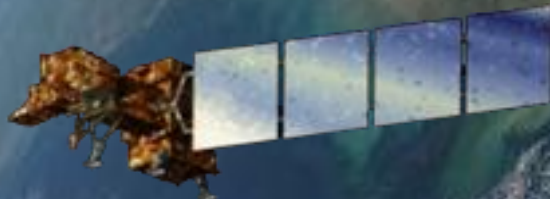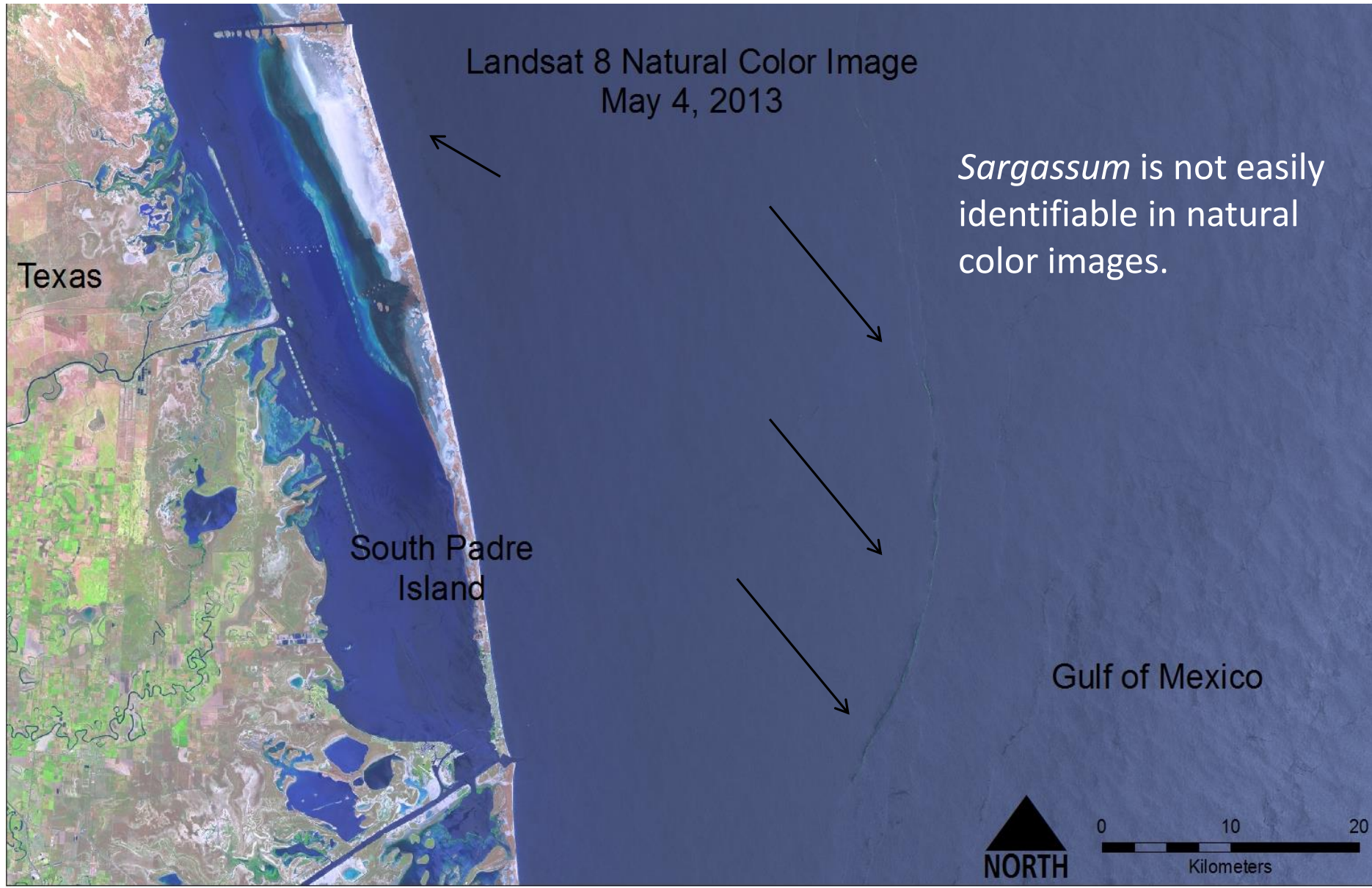
Landsat 4-5 TM

Landsat 7 ETM+

Landsat 8 OLI
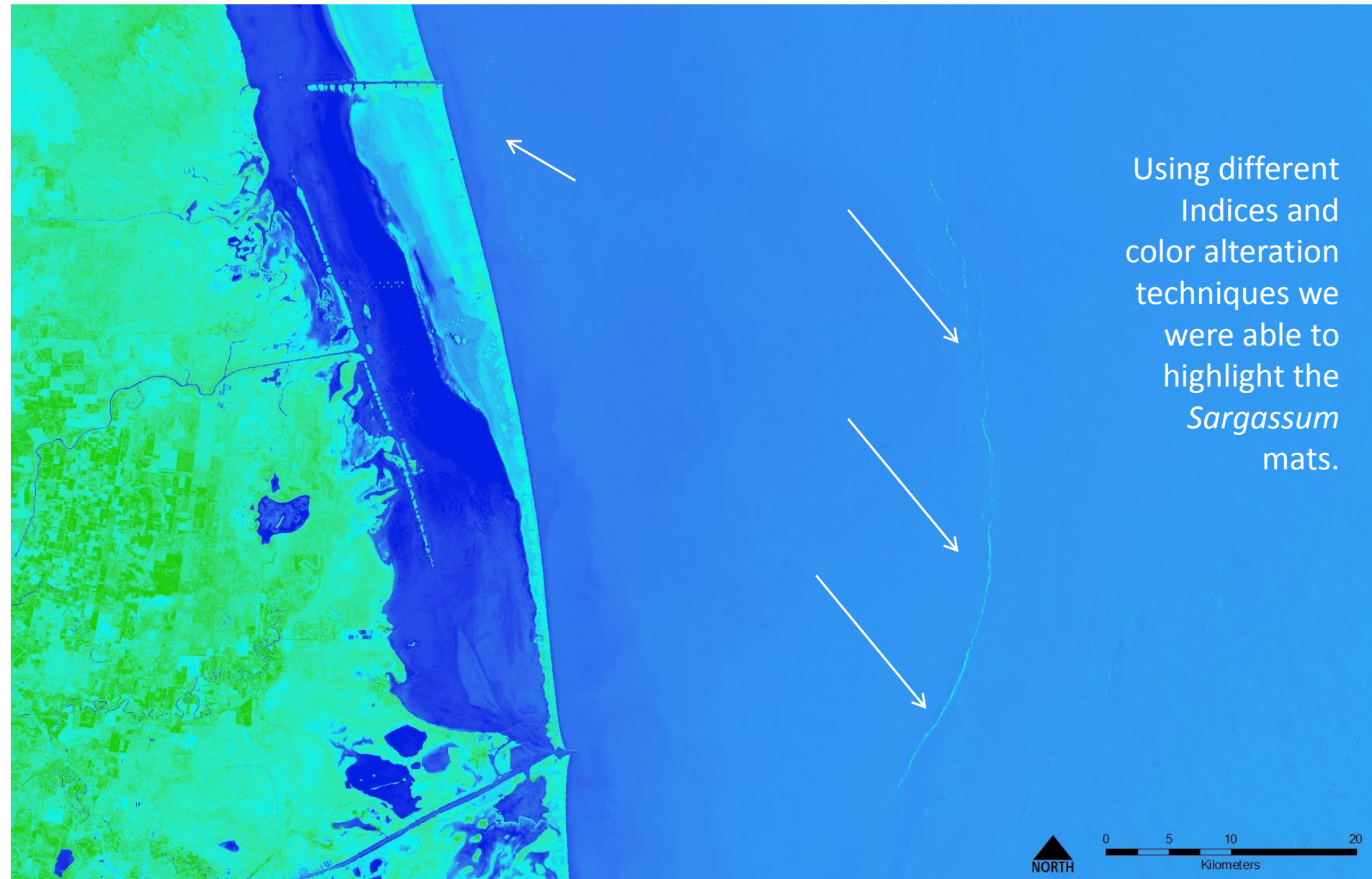
Landsat 8 Natural Color Image
May 4, 2013

Sargassum is not easily identifiable in natural color images.

Texas

South Padre Island

Gulf of Mexico

NORTH

0   10   20

Kilometers

Using different Indices and color alteration techniques we were able to highlight the *Sargassum* mats.

Results

NIR/Red with Cloud Mask

Natural Look

Sargassum

Clouds (masked)

0   3   6 Miles

0   4   8 Kilometers
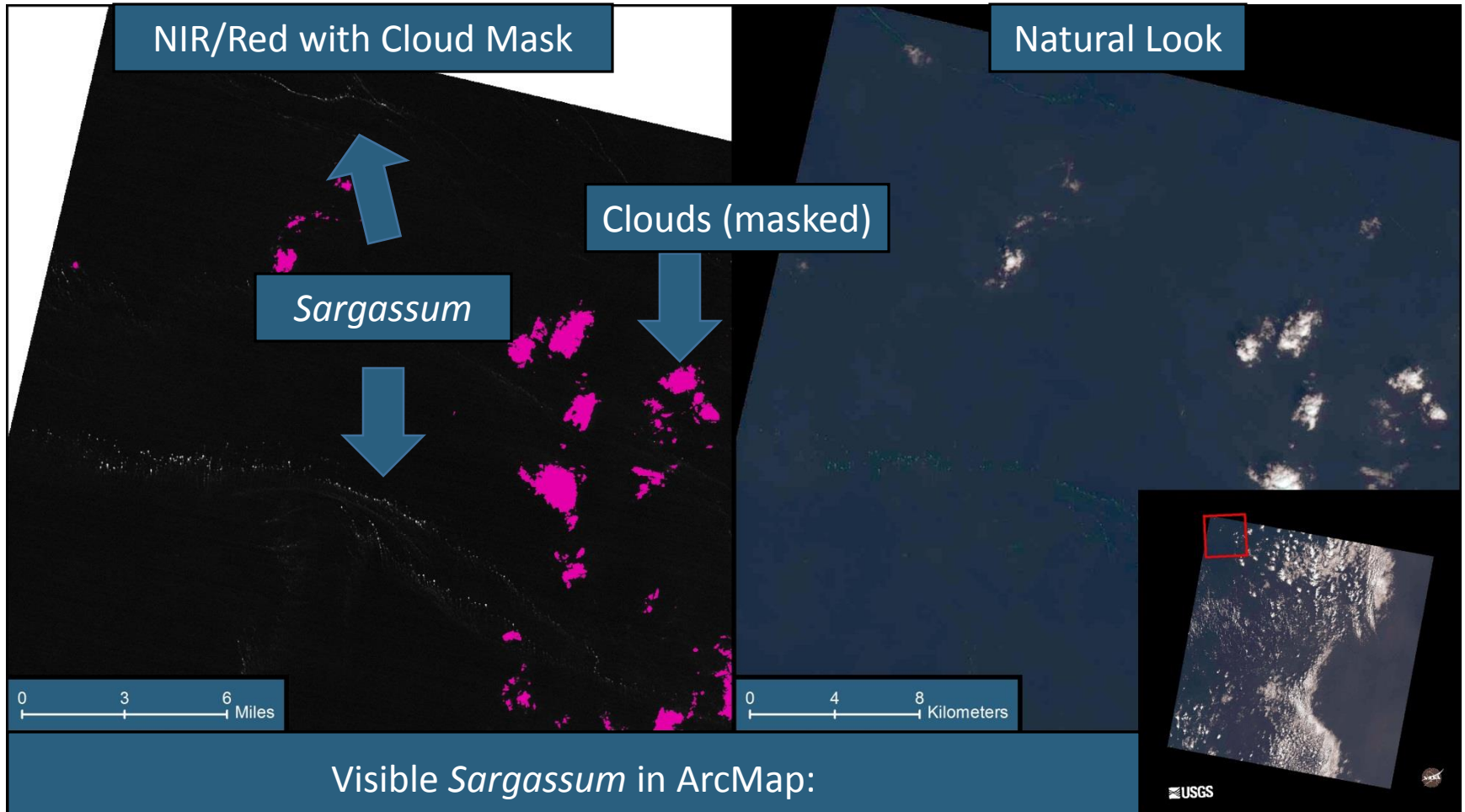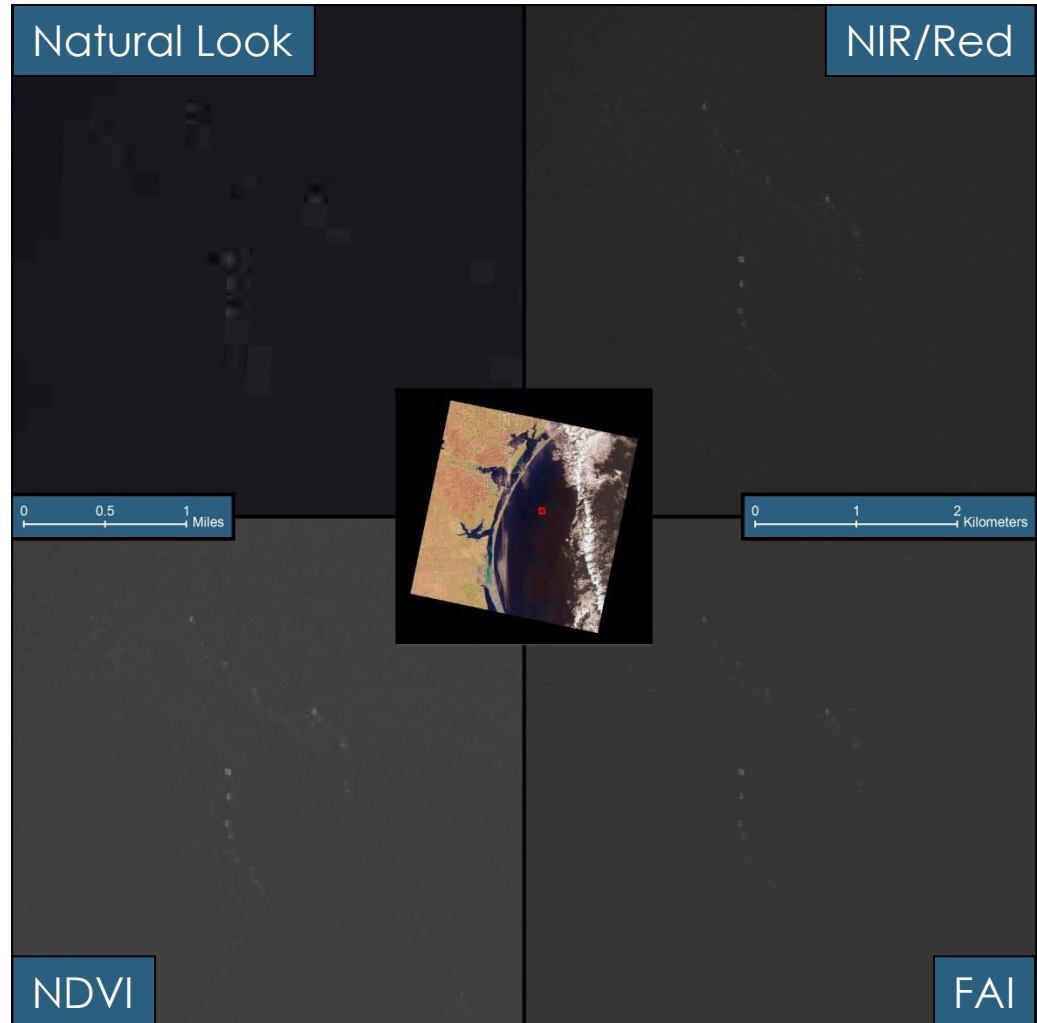
Visible *Sargassum* in ArcMap:
Confidence Level: 3
Landsat 8: Path 24 Row 42, 18 February 2014

Results

Visible *Sargassum*
ArcMap
Confidence Level: 2
Landsat 8
Path 26 Row 41
31 January 2014

Natural Look

NIR/Red

NDVI

FAI

Conclusions

- **NIR/Red ratio, NDVI, and modified FAI** showed good potential for improving *Sargassum* mat visualization and detection – these could enable automated detection with additional research and development

- **Enhanced "Natural Color" RGBs** derived from Landsat Level 1 data also **increased visibility of subtle *Sargassum* mats** compared to GloVis Natural Color images

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- Proposed project at **NASA Ames** Research Center (January – April, 2016)

- Objective: Create **Early Advisory System** of *Sargassum* in Caribbean

- **Ground data** needed to validate satellite imagery

- **End-users** / **collaborators** interested?

Thank You!