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

Shelby Barrett, William Carey University (Project Lead)

Emma Strong, University of Southern Mississippi

Jeffrey Frazier, Texas A&M University at Galveston

Brandon Hill, Texas A&M University at Galveston

Kirsten Stokes, Texas A&M University at Galveston

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

Community Concerns

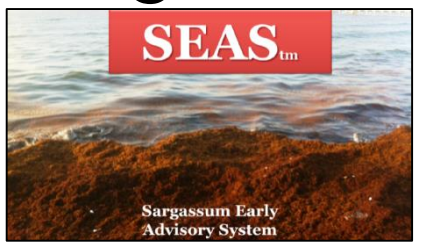
- Can trap **plastics, paper, medical** and **industrial waste**
- Decomposition of *Sargassum* and the organisms therein give rise to **unattractive odors**
- Poses a serious **threat to local tourism**, which brings in $7 million annually

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

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

Partners/End-users

- *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**

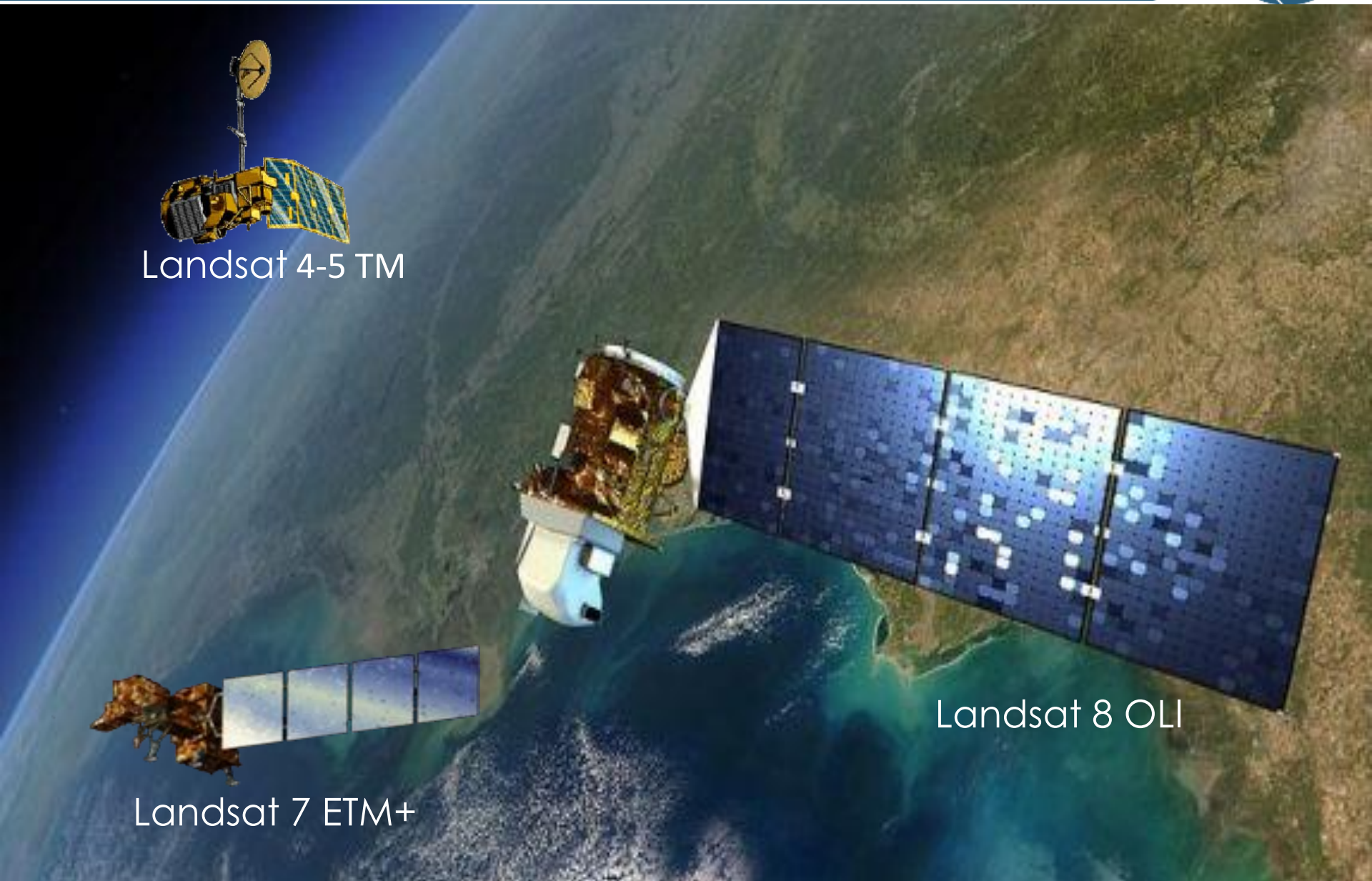


Goal & Objectives

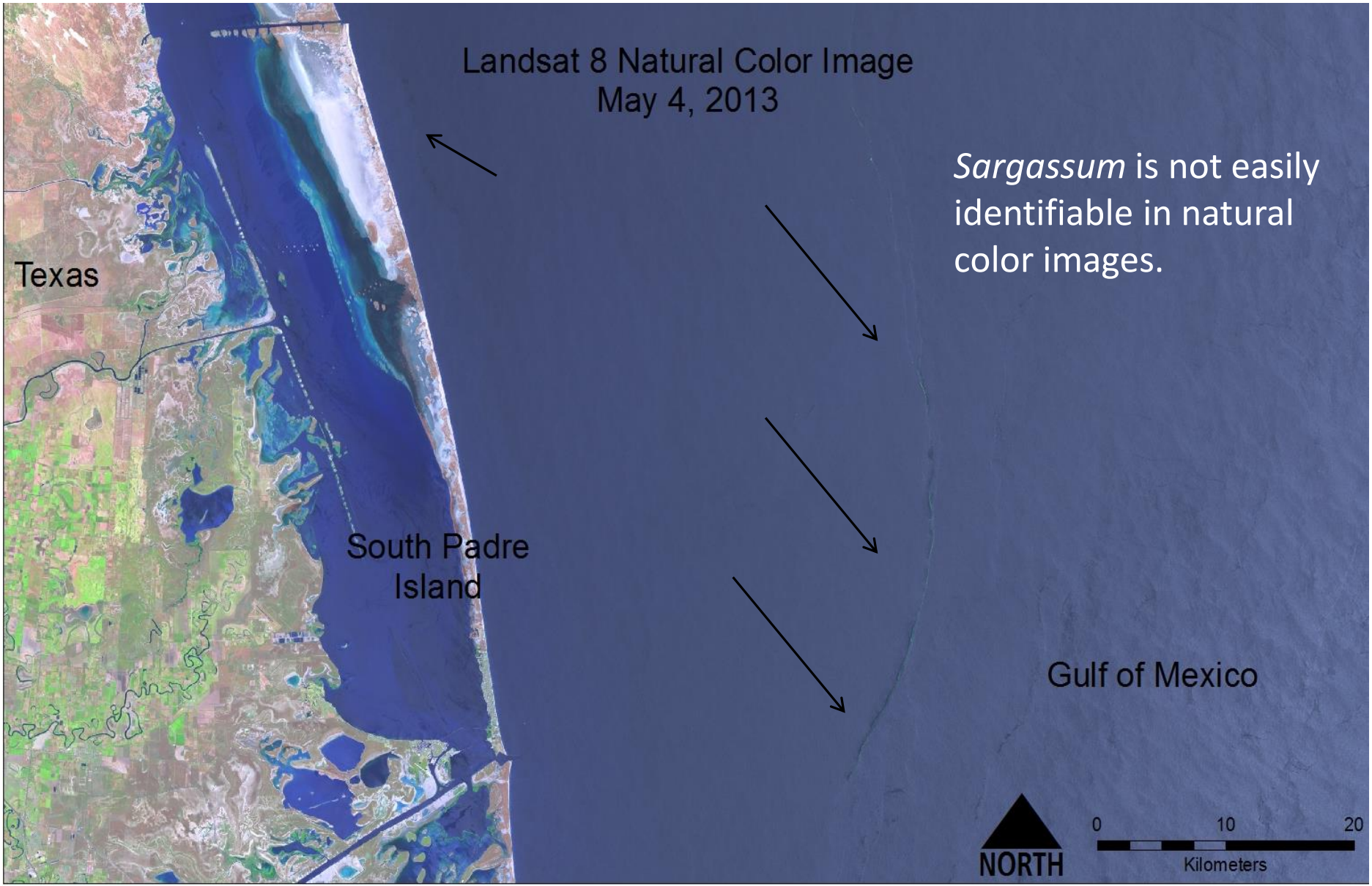
1. **Improve estimations of *Sargassum* landings** in coastal environments through the use of NASA remote sensing

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

Satellites

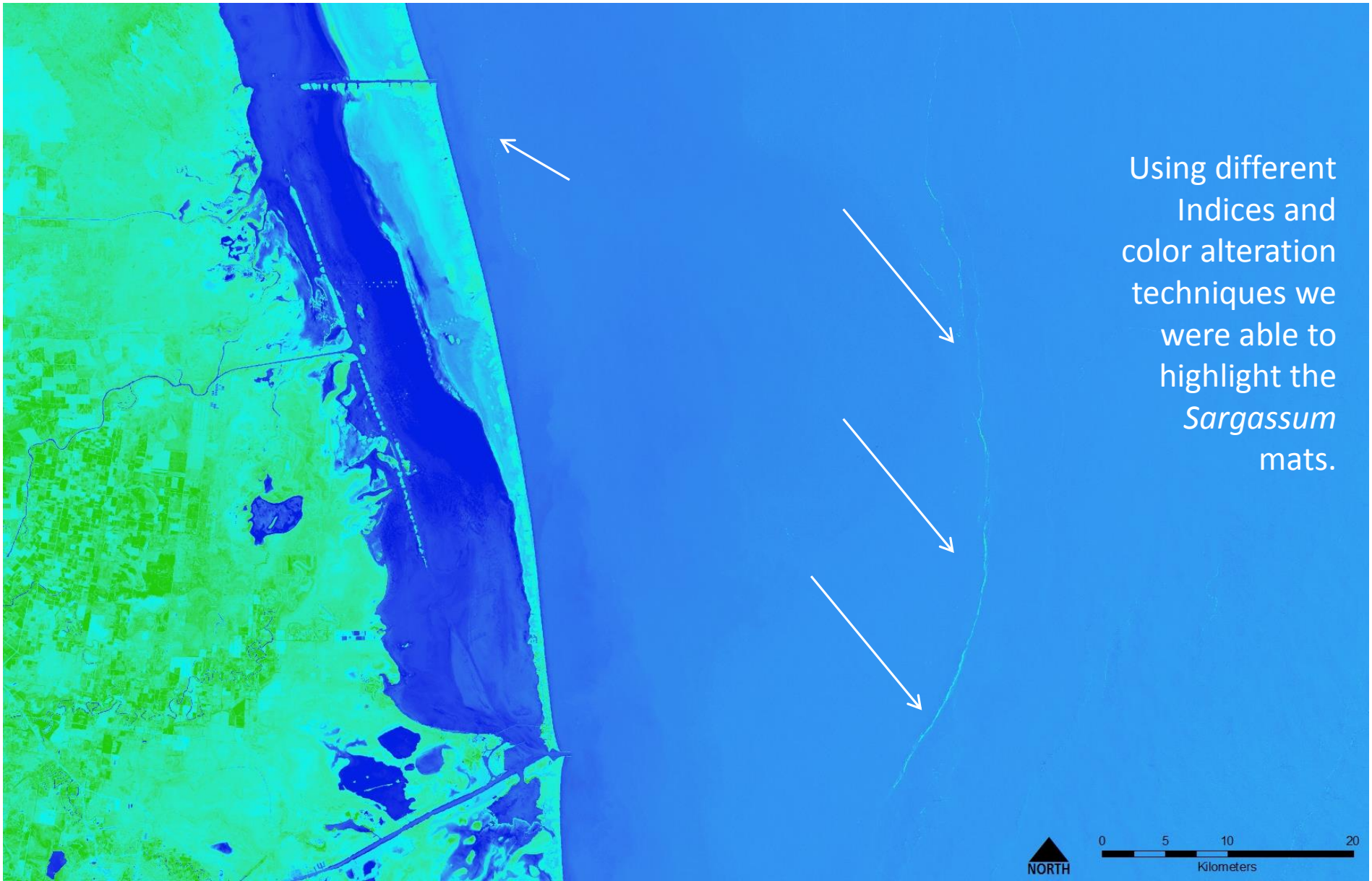


Methodology



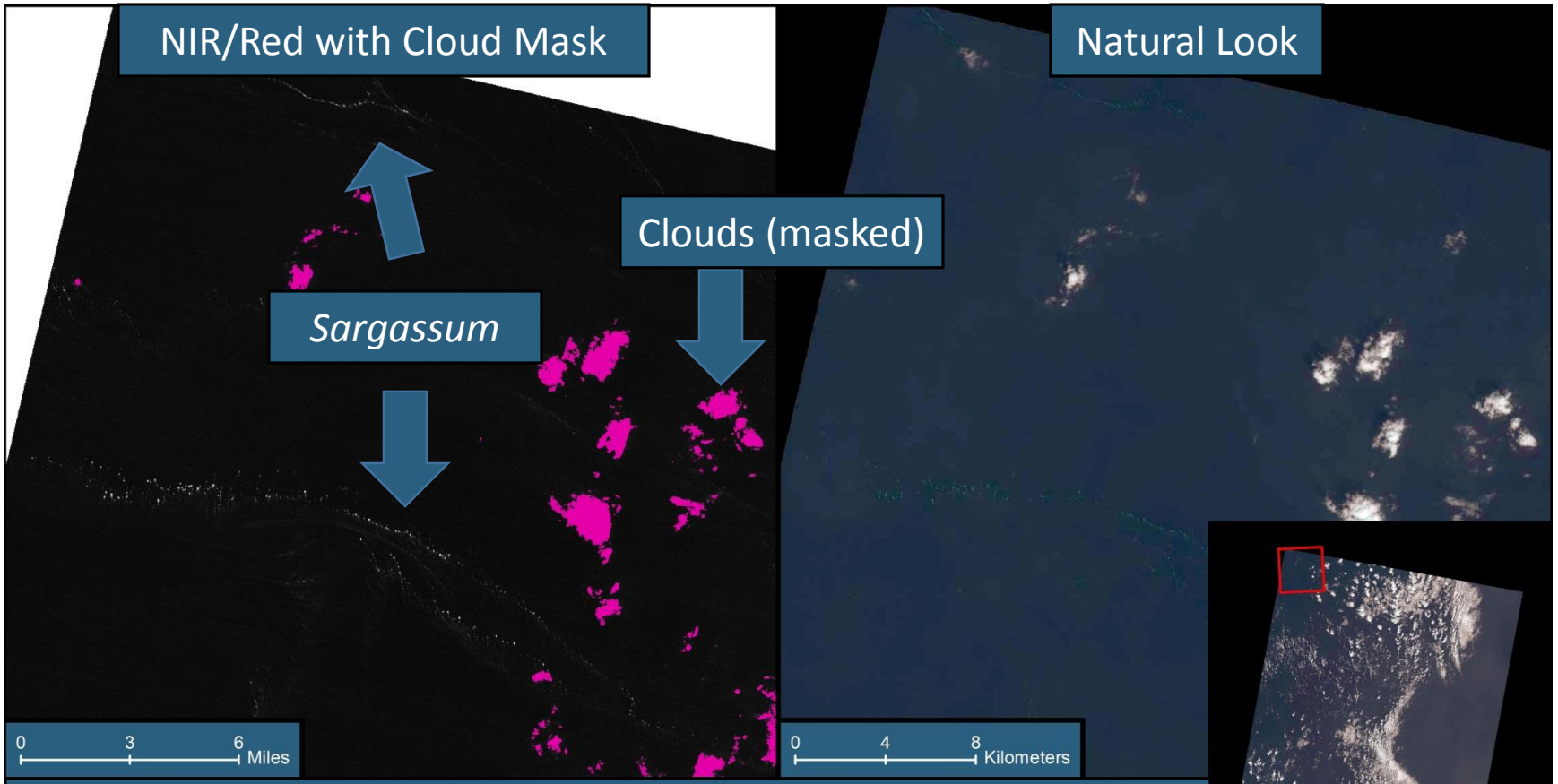
Sargassum is not easily identifiable in natural color images.

Methodology



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

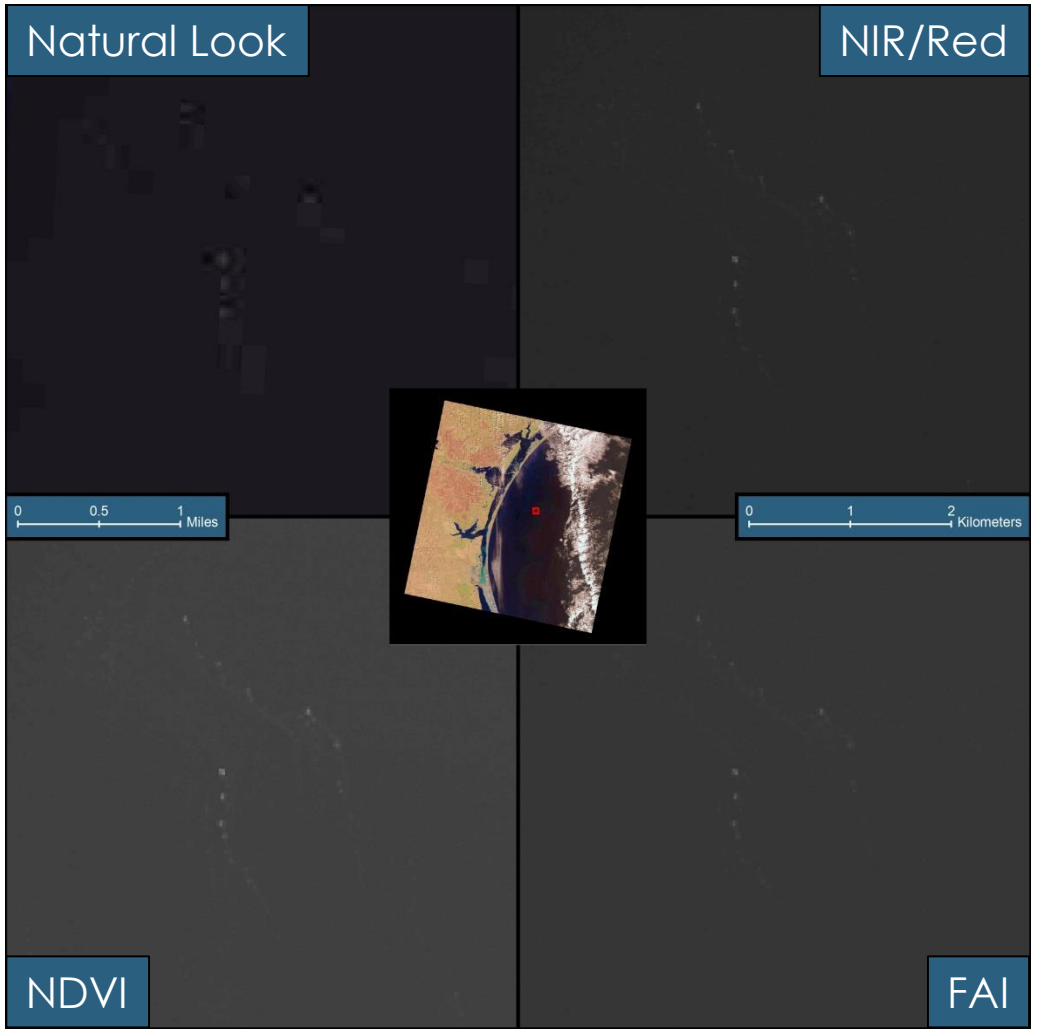
Results



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



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

Acknowledgements

Dr. Kenton Ross – NASA Langley Research Center, Science Advisor

Joe Spruce – CSC Senior Scientist, Stennis Space Center, Science Advisor

Ross Reahard – DEVELOP SSC Center Lead

Jason Jones – DEVELOP NPO Special Assistant

Amber Jones – DEVELOP YP, Center support

Scott Barron – DEVELOP YP, Python script writer

Capt. Robert Webster– University of Texas A&M at Galveston

Dr. Thomas Linton – University of Texas A&M at Galveston

This work is supported by NASA through contract NNL11AA00B and cooperative agreement NNX14AB60A.

Spring 2016 Project

- 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?

Questions?

Thank You!