Participation of the NASA Applied Sciences: Disasters Program within the United States Coast Guard Sector Houston's Hurricane Area Exercises

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Introduction

- The United States Coast Guard (USCG) has many responsibilities after a hurricane impact their sector. These responsibilities include checking the status of infrastructure for ship navigation, opening all ports and shipping channels as quickly as possible, locating and cleaning up hazardous materials and performing search and rescue operations.
- In order to be prepared for an actual event the USCG hosts Hurricane Exercises (HURREX) to simulate response with assisting federal, state and local agencies.
- The NASA Earth Science: Disasters Program was invited to participate in Sector Houston's HURREX in February 2016 (Figure 1).
- The NASA Earth Science: Disasters Program is a unique collaboration between NASA centers to utilize assets and strengths of those centers to respond to disasters.
- Throughout the exercise, there was determined to be a unique opportunity for the NASA Earth Science: Disasters Program to provide imagery and products to the USCG to help with their response to hurricanes and other disasters.

Figure 1. United States Coast Guard Sector Houston, Houston, TX

Solution Development

- The NASA Earth Science: Disasters Program collaborated and presented the USCG Sector Houston with an idea that centered around developing a prototype web-viewer that served imagery via an open source web mapping service (WMS).
- The prototype web-viewer was designed using a combination of JavaScript, HTML5 and CSS3. The viewer was also set up to work off a "config" file, so a new viewer could be created for any disaster or event in under five minutes.
- The "config" file controls the way the data layers are laid out (Figure 2a) and what layers are available. Additionally, using the "config" file allows for data sources from outside NASA to be integrated from other web services (Figure 2b).

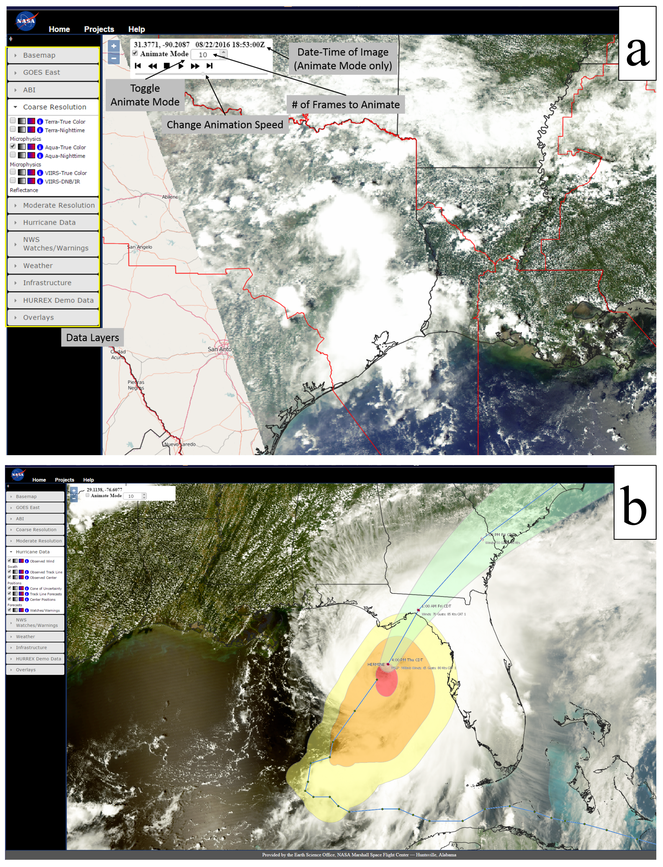

Figure 2. a) Aqua MODIS True Color image in prototype viewer with annotations on the controls. b) VIIRS True Color image of Hurricane Hermine with NHC forecast information.

Evaluation

- After developing the initial prototype, the NASA Earth Science: Disasters Program traveled back to Texas, to attend the Port Arthur Marine Safety Unit (MSU) HURREX to demonstrate and get feedback on initial products that were being offered (Figure 3).
- The USCG Sector Houston agreed to prototype this viewer and provide feedback throughout the 2016 Hurricane Season. At the end of the season NASA and the USCG Sector Houston would evaluate the viewer, imagery and products, and overall collaborations.
- During 2016 Hurricane Season conversations led to inquiring about integrating NASA's WMS into already existing platforms, such as internal USCG software and NOAA's Emergency Response Management Application (ERMA), which is heavily used during major oil spills.

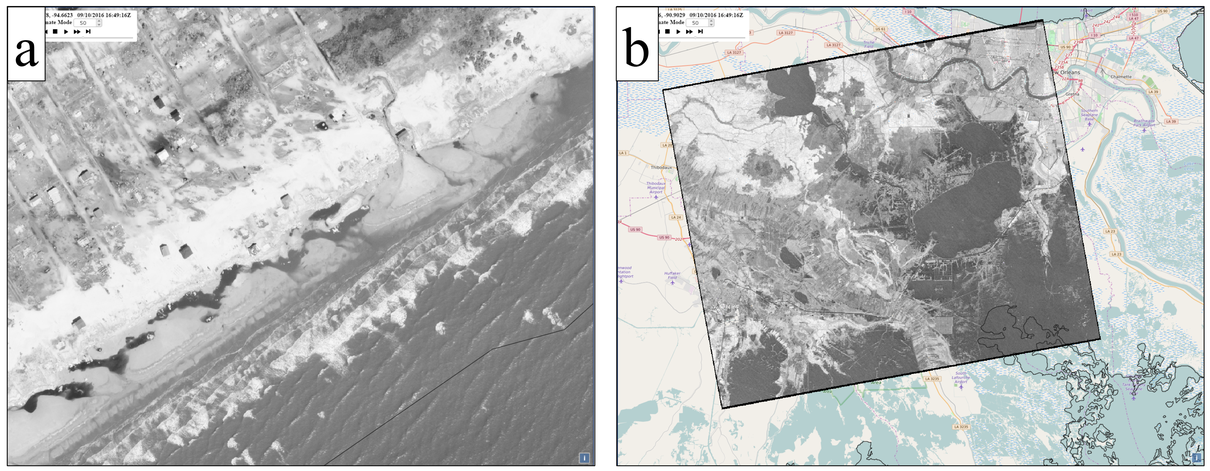

Figure 3. The USCG responded heavily towards, several products, but two of the more popular products, were (a) high resolution commercial satellite imagery and (b) synthetic aperture radar (SAR) imagery.

Conclusions & Future Work

- The NASA Earth Science: Disasters Program began collaborations with the United States Coast Guard to help provide additional support when the USCG responds to both natural and environmental disasters.
- A prototype web-viewer was designed to view imagery and products served through an open source web mapping service (WMS). The viewer is easily customizable dependent on the natural or environmental disaster.
- An assessment of the prototype viewer and products was conducted during the 2016 Hurricane Season where the feedback was positive and constructive suggestions were provided.
- Future work will have NASA Earth Science: Disasters Program will continue to develop imagery and products that will help the USCG identify and respond to environmental disasters (i.e. oil spills, Figure 4).

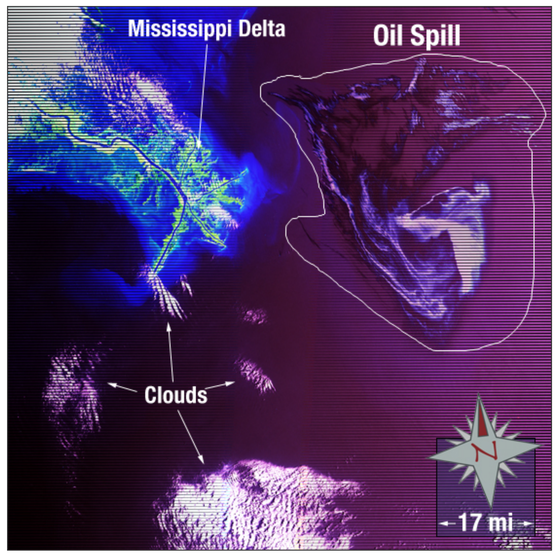

Figure 4. Landsat-7 ETM+ False Color RGB 1 May 2010 (USGS/NASA GSFC)

- NASA Earth Science: Disasters Program will be exploring developing new WMS services that provide expanded features and that utilize visualizations tools provided by Esri.