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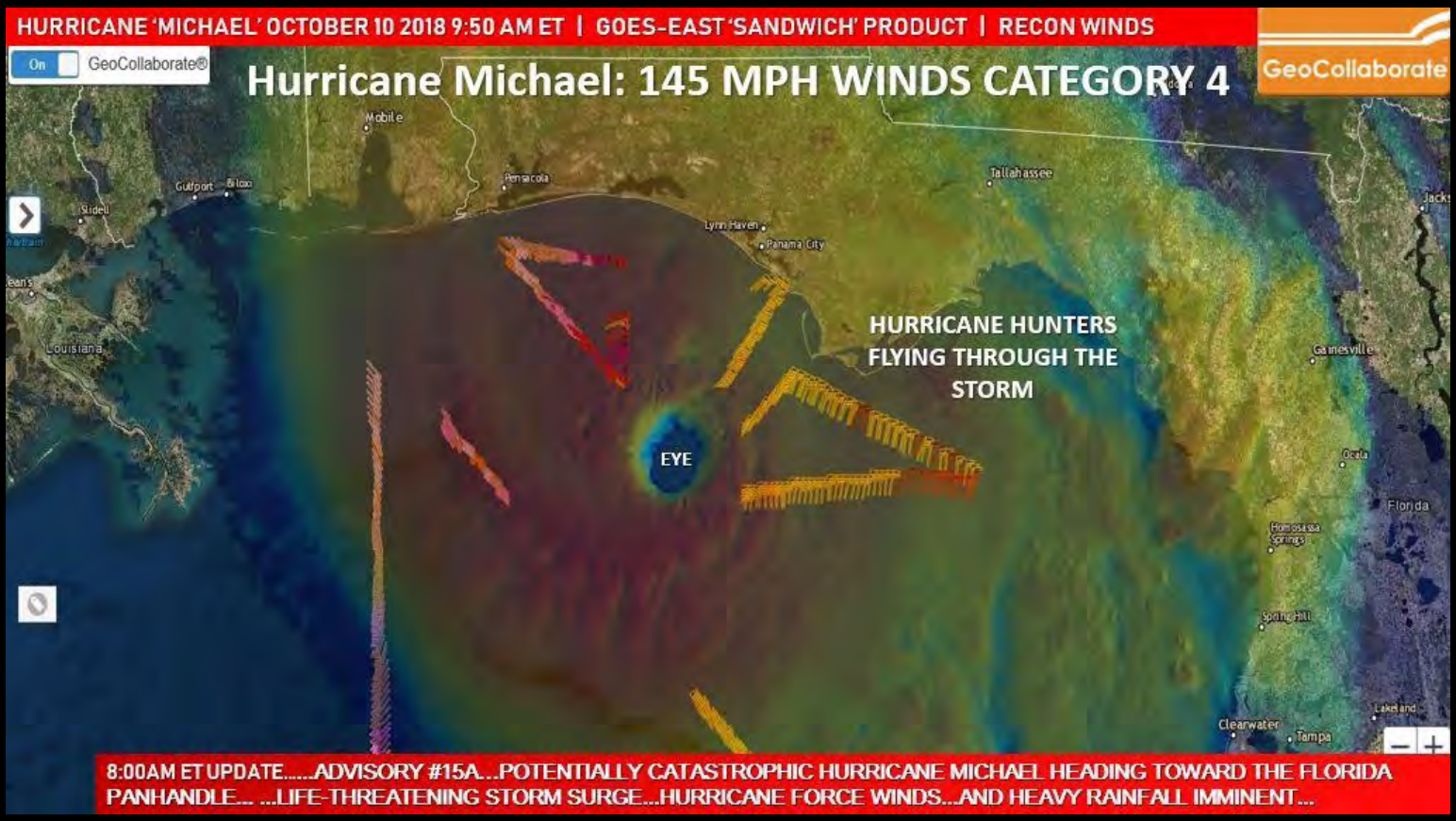
EXPANDING ACCESS TO AND USE OF SATELLITE DATA THROUGH GEOCOLLABORATE®

IMPROVING SITUATIONAL AWARENESS AND DECISION MAKING IN DIVERSE, MULTI-SECTOR ENVIRONMENTS

The information in this article is based, in part, on the February 25, 2019 JPSS science seminar presented by Dave Jones, Founder & CEO StormCenter Communications, Inc. It features work being done by StormCenter with support from the JPSS Fire & Smoke and River, Ice & Flooding Initiatives. It also features work being performed in partnership with the All Hazards Consortium (AHC) to leverage trusted data sources from federal, state and private sector organizations.



Category 4 (CAT 5 at landfall) Hurricane Michael approaches the Florida Panhandle with its destructive winds, devastating storm surge and intense rainfall. NOAA GOES-East data channels are combined in a 'sandwich' product from CIMSS RealEarth combined with NOAA Recon reports from the NOAA P-3 hurricane hunter aircraft, accessed and shared across multiple platforms to decision makers for improved situational awareness via GeoCollaborate. More NOAA data is now available for GeoCollaborate to share putting more NOAA data in the hands of real users who can begin to assess threats, response, damage assessments and recovery.

We are exposed to a wide variety of extreme weather events, such as wildfires, floods, earthquakes, severe storms, and volcanic eruptions. Natural hazards turn into disasters when lives are lost and livelihoods are damaged or destroyed. Some hazards, whether manmade or natural, become catastrophic disasters or large scale mass casualty events, which bring entire regions to a standstill. When these incidents occur, all those involved in responding and making decisions need to collaborate on the same map at the same time with accurate geospatial data in real time across multiple platforms. Personnel on the ground need critical information to assist in responding and making damage assessments, whether it's wildfires spreading in shifting winds, intense flooding that requires evacuations and rescue, or a hazardous chemical spill, while those in other support capacities provide resources and information, while keeping the big picture in mind.

In 2017, a trifecta of storms—Hurricanes Harvey, Irma and Maria—rolled ashore bringing storm surge, heavy rainfall, and violent wind to portions of the United States, Puerto Rico, and the Caribbean Islands. Harvey made landfall along the Texas coast on August 25, 2017. Its slow movement and record-setting rainfall over the Houston metro area led to widespread flooding over multiple days. Irma crossed over the Caribbean Islands and Florida, and moved into the southeastern United States. Hurricane Irma's landfall on the U.S. coastline roughly two weeks after Harvey marked the first time in a century that two storms rated Category 4 or stronger struck the U.S. mainland in the same year. These storms left significant trails of damage and destruction in their wake, including coastal and inland flooding, extensive wind damage, and numerous power outages. The long-lasting impacts to the electrical infrastructure of Puerto Rico from Maria resulted in thousands of residents being without power for months.

As with any disaster, communities came together, and in their various capacities assisted those impacted. Federal, state and local agencies deployed units including first responders who navigated various conditions to perform operations on the ground. Without communications, many of the ongoing efforts would be extremely risky or futile.

COLLABORATIVE DECISION-MAKING

Sharing of real-time geospatial data in a collaborative environment is not only useful in emergency situations. Activities such as monitoring ports and dams, coordinating mass transit activities on roads, rails, air and waterways, and large-scale outdoor events such as concerts and football games, are examples where shared geospatial and other data help facilitate operations. It is referred to as disparate system interoperability or cross-platform communication.

Many organizations including federal, state and local agencies as well as those in the private sector employ a Common Operating Picture (COP) to share information. The term, which is widely used in armed forces and law enforcement, refers to displays of identical information—from a single unit—to multiple parties to achieve situational awareness or facilitate decision making. The idea behind a COP is to have many people sharing the same information at the same time, for example at meeting or conference events where many participants congregating at the same physical location can view data in real time from one screen, and/or enable other participants to view the same data remotely through web screen-sharing services.

Some organizations employ screen-sharing technologies that enable them to reach multiple parties outside the constraints of being in the same physical location. The National Weather Service (NWS) uses PowerPoint and screen sharing technology to provide briefings to emergency managers.

Constraints, such as inadequate system resources, bandwidth or administrative privileges needed to share screens can serve as barriers to critical information dissemination when most needed.

Moreover, screen-sharing technologies do not necessarily provide collaborative environments that allow the participants to incorporate the information shown in the presenter's desktop video stream. Remote participants can only view the information being broadcast on the presenter's desktop, and when the screen-sharing session ends, so does the remote user's access to the information.

Superstorm Sandy was one of the worst storms to ever hit the U.S. East Coast. The storm, which impacted a wide swath of the nation's Atlantic coastline in late October 2012, completely decimated some of the neighborhoods in its path. Unlike typical coastal storms that move north along the east coast, Sandy made an extremely rare hard left (westward) turn that put it in on a direct collision course with heavily populated regions along the Atlantic coastline. According to an information pamphlet detailing lessons learned from the Federal Emergency Management Agency's (FEMA) Hurricane Sandy response deployment procedures (www.hsdl.org/?view&did=784026), one of the biggest challenges for agencies was the inability to gather accurate, real-time information to match resources and capabilities to these needs and requirements. Superstorm Sandy demonstrated firsthand the challenges of not having access to critical data in time to inform their situational awareness. The pamphlet further states that a "lack of clear information" was an impediment to decision making as well as to reducing the severity of impacts or making improvements.

TRUSTED INFORMATION (TI)

TI is information that is from a reputable/reliable source. It can be combined with disparate TI sources from multi-agencies and private sector.

Each trusted data source is a separate data layer.

EXAMPLES

Weather Observations
NOAA satellite data
Pictures
Soil conditions in burn scars
Remote Sensing
Declarations, Waivers, Guidance
Critical Infrastructure
Drone Data
Cameras
Federal Open Datasets
State Datasets
Municipality Datasets

Taken as a whole, COPs enable data integration from multiple sources into one spatial data platform, and therefore help create a unified approach to situational awareness and decision making. Most COPs, however, are characterized as 'cylinders of excellence' as they typically operate in their own domain, and the information they provide is often restricted to authorized users. No other technology can perform cross-function operations or share their data in real-time into disparate platforms. During events where multiple parties need to respond and coordinate, as is in the case of disaster response, it can be a challenge for all those providing support to be on the same map. Many federal, state and local agencies use their own mapping environment to access data, but their systems cannot share those trusted data sources with each other. In some cases, they do not even have access to the same type of information.

Having a capability that allows for the different players in the field to access and share information in real time, including base layers and data from remote sites, is vital. And a system that improves situational awareness and enables data-driven decision-making through the sharing of trusted information among all stakeholders can save lives and protect property.

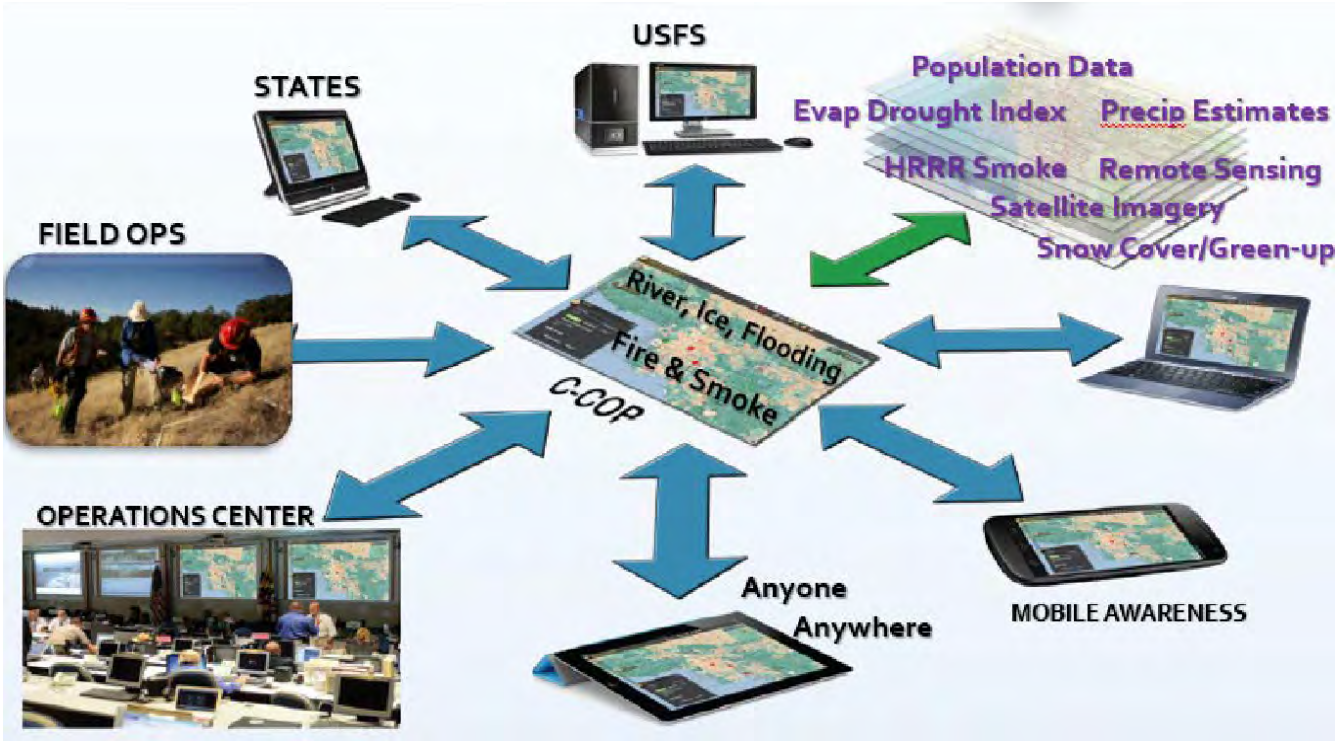
STORMCENTER COMMUNICATIONS

StormCenter Communications was launched in 2001 to help expand access to and use of science data to improve situational awareness and decision making. It has been working to access and deliver high resolution data from NOAA's polar orbiting satellites for broadcast use and improved situational awareness and decision making.

The company created GeoCollaborate®, a technology that allows for real-time sharing of data, such as weather, critical infrastructure and emergency management information, across multiple platforms.

GEOCOLLABORATE

GeoCollaborate is a patented multi-platform and device data sharing cloud-based service, developed through the Small Business Innovation Research (SBIR) program under a NASA grand challenge. It enables data to be accessed and shared in real time simply through a web browser or integrated into multiple disparate web maps to create a collaborative environment. After years of development, GeoCollaborate has now obtained the highly-sought, and rare, SBIR Phase III status, and is the U.S. Federal Government's 'preferred provider' for geospatial data sharing and collaboration.

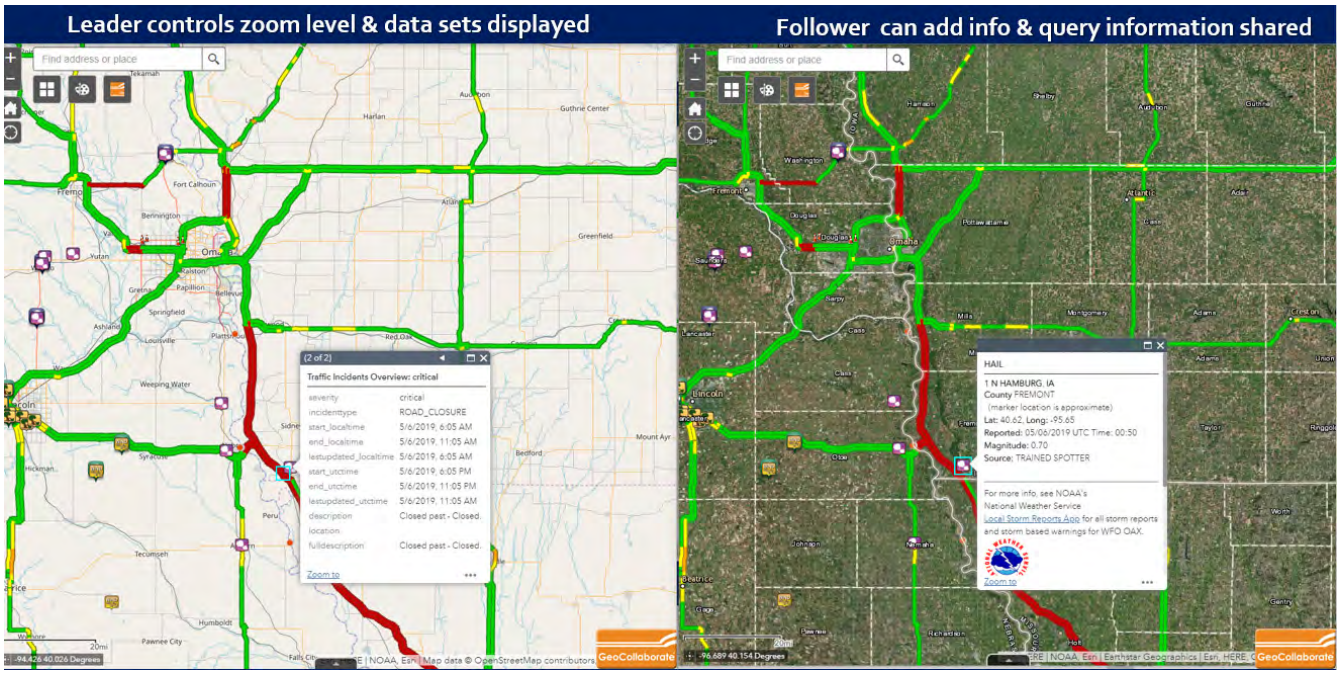


Data sharing and collaboration use case for fighting wildfires. GeoCollaborate can introduce a cross-agency coordination capability that leverages low bandwidth environments and open government data such as NOAA JPSS and GOES satellite imagery to any device in the field or operations center enabling decision makers to see NOAA data in combination with their own.

This means that as a " sole source" provider of this technology, StormCenter Communications, Inc. can easily and quickly be contracted for licensing, customizing, training, professional services and workshops on the topics of data sharing, collaboration, cross-platform interoperability, collaborative decision making, virtual globe data sharing, training and more.

The concept behind GeoCollaborate is simple: allow anyone to author the content of a lead web map, share that content, and collaborate with others in real time on follower web maps. GeoCollaborate is available on the cloud as a hosted web map and a data sharing and collaborative service that meshes data feeds from various sources including satellites, in-situ observations, crowdsourced information, critical infrastructure and even socio-economic analytics to create map displays, imagery, critical infrastructure, real-time vehicle location visualizations and more. Datasets can be easily downloaded through low-bandwidth cell phone and wireless networks and combined with other geospatial information on-site, to ease collaboration across all stakeholders including those who interpret the data (authors, analysts, and subject matter experts) and those who make decisions based on that data (managers and team leaders), which can lead to effective and valuable decision support services.

Besides sharing and visualizing data on the go, GeoCollaborate can also accelerate the ability for the delivery of Impact-based Decision Support Services (IDSS) to a wide variety of NOAA partners. Any product visualized within the Advanced Weather Interactive Processing System (AWIPS) can be exported for rapid inclusion into the data-sharing environment. GeoCollaborate also leverages the expanding GIS services offered by NWS. As more and more products produced by NOAA are offered via the NWS' Information Dissemination Portal (IDP) and NOAA nowCOAST, GeoCollaborate can access and share these services across multiple platforms so everyone can be on the same map at the same time. This significantly improves situational awareness and accelerates decision making that can save millions of dollars in wasted efforts.



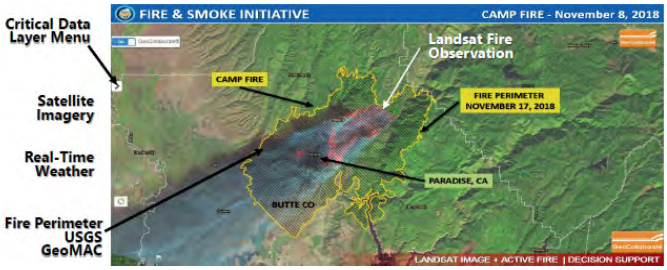
Disparate system interoperability is demonstrated here with two different instances of GeoCollaborate sharing data between them. This powerful capability can enable existing mapping environments to become collaborative and lower the training curve because no-one has to change their existing mapping system or switch to another vendor. This opens the doors to enabling each agency, organization or nation to accelerate their situational awareness and approach to decision making and is a breakthrough for placing more NOAA data to work serving decision makers.

APPLICATION EXAMPLES

Task orders under two JPSS initiatives—Fire and Smoke, and River, Ice and Flooding—have helped demonstrate how various datasets can be accessed and incorporated into decision-making environments. Flooding and power restoration after a severe weather event have been popular use-cases for GeoCollaborate with many others beginning to surface as more utilities and emergency managers realize the powerful benefits that real-time data sharing offers.

Wildfires

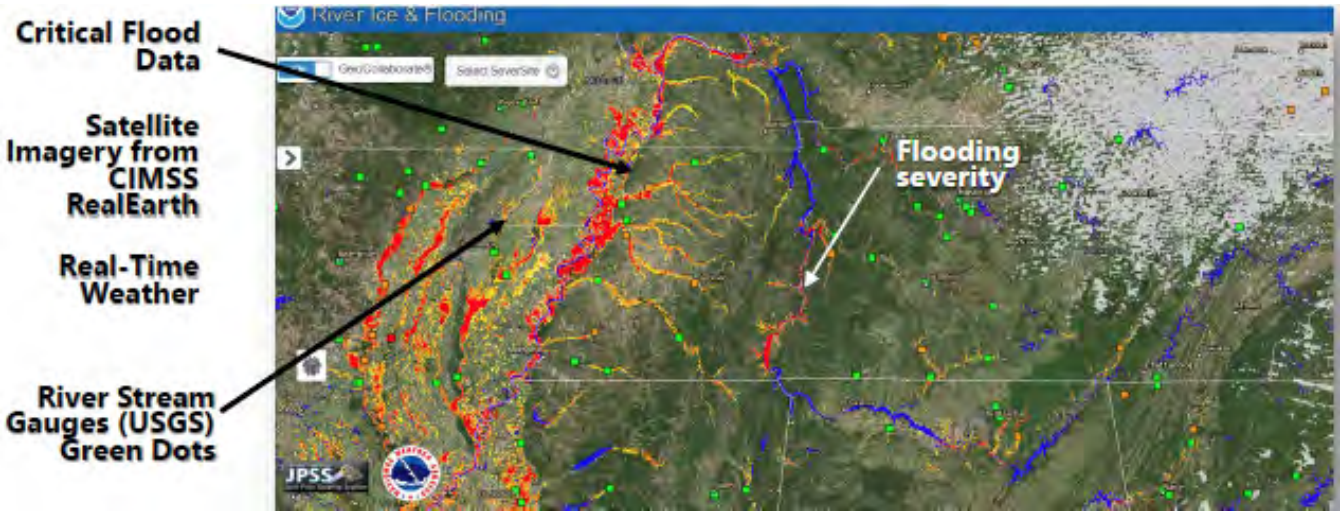
Wildfires can pose serious hazards to the environment. Meanwhile, long range transport of smoke emissions can adversely impact air quality, and exposure can lead to health complications for sensitive members of the population. Some population groups, particularly those living in the urban-wildland interface, are at considerably higher risk of the dangers wildfires pose to life and property. The following is an example of how a GeoCollaborate Dashboard delivers critical information for data driven decision making (3DM) during a wildfire event in Northern CA. This example from 2018 shows several data layers including satellite imagery marked with fire perimeters of the Camp fire in Butte County, California. All of the data layers originate from trusted sources such as NOAA, USGS GeoMAC (a multiagency coordination information source), USGS Landsat imagery and critical infrastructure datasets from utilities and the private sector. This information is useful for immediate situational awareness and coordination because all decision makers can be on the same map looking at the same data at any moment providing local, state or federal partners with access to unique datasets.



The JPSS Fire & Smoke Initiative GeoCollaborate session depicts the latest fire perimeter data layer from USGS GeoMAC overlaid onto a timely Landsat image during the Camp Fire in Northern CA. Introducing this capability can enable a unified multi-agency approach to situational awareness and decision making.

Floods

Flooding along rivers causes billions of dollars of damage every year. Extreme rainfall, snowmelt and jams caused by the breakup of river ice happens frequently, putting lives and livelihoods at risk. The following is an example of a dashboard for data-driven decision making (3DM) during a flooding event. A product like the one below can help officials on the ground and at FEMA determine the extent of the flooding and think about who else may be at risk. These steps can aid evacuations, planning and closing of businesses so inventories can be saved and properties protected.



This example shows flooding along the Mississippi River as a combination of snow melt and heavy rains from severe thunderstorms and heavy downpours impacted Missouri, Arkansas and Tennessee. Rapid response algorithms from the JPSS River, Ice and Flooding Initiative. Can identify where flooding is occurring and provide decision makers such as local officials and FEMA with a broad understanding of the flooding extent. This helps plan the extent of evacuations and in preparing businesses with information so they can save their inventory before the flood arrives.

Hurricanes and Power Restoration

When hurricanes hit, power often goes out. Lives are threatened and those who rely on power to sustain life-support functions need assistance right away. The All Hazards Consortium's (AHC) Fleet Response Working Group (FRWG) Sensitive Information Sharing Environment (SISE) GeoCollaborate® Dashboard was used to provide sensitive information to fleet utility vehicles responding to requests for mutual assistance in the Carolinas and Virginia as a result of the impacts from Hurricane Florence.

The All Hazard Consortium (AHC) Fleet Response Working Group includes both private and public sector individuals from energy companies, state emergency management agencies and logistics coordinators to engage in the important operational efforts to expedite the restoration of power, supply chains and other critical infrastructures that businesses and communities rely upon such as power, fuel, water, food, shelter, communications, transportation, etc.

The GeoCollaborate Dashboard is being used to coordinate the movement of fleet utility vehicles across state lines to get to disaster areas so power can be restored as quickly as possible. The green states represent 'pass-through' states for utility vehicles while purple states are states covered by transportation waivers from the Federal Motor Carriers Services Administration (FMCSA) and the red states are where declarations of emergency have been issued by the governors. NWS data layers are visible such as NHC hurricane wind field prediction, best track and time of arrival for tropical storm force winds. Key points point out specific information to support decision makers.

Critical to the process of moving utility vehicles into the right locations at the right times is accurate damage assessments after a disaster. GeoCollaborate brings together disparate data sources across all decision-making lines of authority to save money by improving

GeoCollaborate enables collaborative damage assessment activities, such as rapid labeling and drawing, across platforms so decision makers can determine how many power poles are down, destroyed or damaged. Critical infrastructure can be overlaid to provide an assessment of how much pipeline needs to be ordered to get communities back up and running with water, sewer and other services. By collecting imagery right after disasters, NOAA is enabling decisions to be made rapidly, saving millions of dollars.

efficiencies and leveraging data sources such as NOAA's rapid response Office of Marine and Aviation Operations (OMAO) high resolution imagery collections when tasked by FEMA.

The FRWG supports joint public/private 'integrated' planning, education and training, joint information sharing, and annual exercises to improve power restoration efforts and supply chain resiliency. GeoCollaborate has become a critical capability to enable improved efficiencies.

FUTURE PLANS

As more agencies and organizations at the state and federal levels as well as the private sector learn about the unique capabilities that GeoCollaborate brings to situational awareness and decision making, many doors will open for how NOAA data can support these efforts. For years, producers of science-based datasets and information sources have struggled to understand how research results can transition to operational implementation. GeoCollaborate can bridge that gap and place research products in front of decision makers rapidly and provide the capability to deliver feedback to those researchers.

GeoCollaborate can also improve efficiencies for quality-controlling datasets against in-situ measurements by bringing those disparate observations together. It is the hope of Dave Jones, Founder and CEO of StormCenter Communications, Inc. that GeoCollaborate can transform how researchers and operational decision makers work together to accelerate R2O and O2R and enable the sharing of research findings that can benefit innovation, decision makers and the private sector. Training can be accelerated and the connection between training center and operations can be maintained indefinitely. This has direct economic impacts and benefits to be gained as more people understand the power of real-time data sharing across platforms.

For NOAA, the invention of GeoCollaborate means that there is now a vehicle available to deliver trusted NOAA and other open government data sources into decision making environments efficiently and effectively, saving time and money. This means a host of new users

is just around the corner with every use case that gets identified. As weather events become more intense and climate change impacts more and more people around the world, GeoCollaborate can provide the environment for domestic and international collaboration from any computer, tablet or mobile device.

SUMMARY AND CONCLUSIONS

GeoCollaborate allows many users including federal, state and local agencies as well as private sector organizations to share trusted data in real time across any platform or device to enable collaboration and sharing of data when it's most needed. This is a capability that has been needed for decades and is still being identified as a need within agencies and the private sector to accelerate data access and sharing. Now that a data sharing and collaboration platform exists, more attention can be applied toward applications and applied benefits of NOAA data in both operational and research environments. This will benefit other agencies at the federal, state and local levels as well as the private sector and NGOs. ❖

Story Source

Materials obtained from JPSS February Science Seminar titled "Delivering JPSS Data to Improve Situational Awareness and Decision Making."

Additional Resources

How GeoCollaborate® works: https://www.youtube.com/watch?v=O20gjnti4Qk&index=3&list=PLEXjtR48sZXE881KLsXlcOr0X-LhpS-3u&t=0s

Member Highlight: StormCenter Communications, Inc. https://www.esipfed.org/member-highlights/member-highlight-stormcenter-communications-inc

The Promise of JPSS, Storm Center Communications. https://youtu.be/eulPPfwexaE

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