MDWG OVERVIEW: FLOODS STAR JPSS 2017 Annual Science Team Meeting



14 AUGUST 2017

Agenda

- Modeling and Data Working Group (MDWG)
- Flood Decision Support/Guidance Documents
 - Flood Decision Support Architecture (HDSA) and Executive Decision Support Guide
 - MoDI Scenario Analysis for Flood Response
 - Geospatial Framework (21 Standard GIS Products)
- Modeling Capabilities and Lessons Learned
 - Defining the Impacts: Flood
 - Recent Highlights
 - 2016 Louisiana Flooding
 - Hurricane Matthew
 - Superstorm Sandy
 - Flood Incident Journal

Modeling and Data Working Group: Overview

Overview:

 An interagency working group appointed by the Emergency Support Function Leadership Group (ESFLG) in 2012

Mission: Information Gathering

- Assess the current state of modeling systems
- Identify consistent, reliable, authoritative models and datasets to enable response planning and operational decision making

Goals:

- Assess the current modeling systems in use or under development
- Identify state-of-the-art capabilities to incorporate into response operations
- Maintain the Model and Data Inventory (MoDI)
- Identify gaps and recommend solutions

Modeling and Data Working Group: Status Update

Accomplishments to Date:

- 2012 2016: Completed interviews, analyses, reports and SOPs for hurricanes, earthquakes, INDs, flooding, and biological hazards
- 2016: Expanded initiative to include Recovery-related data and tools
- Created the Model and Data Inventory (MoDI), a central repository for modeling and data resources



2017 Efforts:

- Monthly meetings focused on incidentand capabilityspecific requirements
- Expand MoDI to include Chemical Hazards

Follow-on Issue Papers

- Identify major findings, areas for improvement, and proposed path forward
- MoDI Updates
 - Maintain up-to-date information on tool uses, POCs, and access

REMAINING MEETINGS:

Earthquakes

Disaster Analytics

Critical Infrastructure

Chemical Hazards

Floods

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 Incorporate new data sets, models, and resources

MDWG Flood Summit: Nov 15, 2017 USGS Headquarters, Reston, VA

Goals:

- Review state-of-the-art flood modeling software and identify datasets and models critical for responding to flooding events.
- Evaluate the response and recovery timeline following a flood and work to integrate the S&T community with the operational response.
- Review the current flood information in the Model and Data Inventory (MoDI) to ensure the content is up-to-date and inclusive of the latest modeling tools available.

Anticipated Program Updates:

- DHS S&T Flood Apex Program
- NOAA/NWS/National Water Center and Office of Water Prediction
- FEMA Risk Mapping, Assessment, and Planning (Risk MAP)

For more information:

Contact FEMA-MDWG@fema.dhs.gov

MDWG Coordination Efforts

MDWG holds incident- and capability-specific monthly meetings

- Journal and app development leverages MDWG research and findings
- GIS training familiarizes staff with process/products and prepares them for response operations

MDWG		Damage Assessments	IND	Power Outages	Tornado Gotha	Debris m Shield	Hurricane	Disaster Analytics	Earthquake	Critical Infrastructure	Chemical	Flood		
Journal Development	December	January	February	March	April 🔽	May	June	July	August	September	October	November	December	January
	Application Maintenance			Damage Assessment App	IND Journal	Power Outage App	Tornado Journal	Debris App	Hurricane Journal	App Maintenance	Earthquake Journal	Critical Infrastructure	Chemical Journal	Flood Journal
	• ArcGIS Upgrade • Template Updates • Data Refresh • Begin Migration to National GeoPlatform			Creation of new Damage Assessment application for existing journals based on DMWG	Create new IND Journal based on existing framework	• Create Power Outage app for existing journals based on MDWG	NOAA Data Create new Tornado Journal based on existing framework	 Creation of new Debris Model application for existing journals based on the research of the MDWG 	Update Journal based on recent improvements Deploy to National GeoPlatform	Upgrade all journals to latest templates Update data to latest sources & releases	• USGS ShakeMaps • Create new Quake Journal based on framework	Enhancement to Critical Infrastructure model based on research of the MDWG	Create new Chemical Journal in existing framework based on new and research of the MDWG	• Create new Flood Journal based on new model and research of the MDWG
Training		Kickoff • GTG/Skills review concept	Tutorial • GeoAnalytics	Technical IND 2-day Seminar 	Tutorial •Remote Sensing	Technical Tornado 	Debrief • STLL • Hurricane	Tutorial	Technical Earthquake 	Debrief • STLL • Flood				

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Flood Decision Support



Flood Decision Support Architecture

- Also know as the response timeline or "whiteboard"
- Links critical decisions with analytics products

Decision Timeline and Checklist

- Flip-book format for notice and non-notice incidents
- Condensed version of the Executive Decision Support Guide and the HDSA, highlighting key decision points

MoDI Scenario Analysis for Flood Response

- Provides a framework for response operations, with a focus on the models and datasets for a major flood, and includes:
 - The time frame for when models are applicable
 - How model results meet emergency response data requirements
 - Model/data access information

Flood Decision Support Architecture

Flood planning, response and recovery activities are organized over time by:



Flood Decision Support Architecture



Geospatial Framework



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Modeling Capabilities and Lessons Learned

- Defining the Impacts: Flood
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Defining the Impact: Floods



Flood Incident Journal

Models and Data Used

- NWS Watches & Warning
- Census Data
- HIFLD Data
- FEMA Planning Factors

Goals

- Support Key Federal Decisions
- Automate analysis
- Improve response

Challenges

- Data
- Dissemination
- Consumption



Other Incident Journals



130,795 ...

Households

55.277

Housing Units

91,000

MATTHEW ADV 40

Seniors (65+)

29.733

Recent Highlights:

Geospatial Successes

- Louisiana Floods
 - 92% of claims were located inside the modeled flood extent, which was delivered within days of impact
 - >\$10.5m in expedited rental assistance grants provided to >12,500 disaster survivors
- Hurricane Mathew
 - Statewide assessments delivered ~24hrs after landfall
 - For NC and SC, geospatial assessments were within 1'-2' of IA HWMs



- Expedited \$130m in rental assistance to 44k applicants with 99% accuracy
- Analysis of NFIP policy exposure and loss potential was used to increase the borrowing limit by \$9.7B



*Figure: LA Flood, Aug 2016 Comparative Analysis

Actionable geospatial analysis is typically delivered within days. Conventional approaches may take months.

Backup Slides



Case Study

- Spring Flooding in central US
- Nearly 1000 images collected by May 6
- 715 are high resolution, aerial photos from Civil Air Patrol





 With relatively minimal post processing of the pre & post event imagery - 'automated' change detection can reveal impacts not immediately apparent to the naked eye over broad areas (below)

2011 Minot, ND Floods (cont...)



Damage Classification Case Study

2011 Minot, ND Floods:

- FEMA Funded Contractor Analysis
- Priority Area of Oak Park
- 12 Priority Structures Identified for Detailed In-Depth Assessment
- Used Pre-Post Imagery w/ Parcel Info
- Google Earth, Bing Maps, Pictometry

Example of Priority Structure:

- Facility: Holiday Inn
- Description: 7 story hotel with a connection ballroom, indoor pool and entertainment casino area.
- Square Footage: 1) Hotel 109,203 2) Warehouse 12,460 3) Casino 22,425. Total 144,088
- Water depth at first floor: 2-5 feet







How does FEMA use Imagery?

Remote Sensing Product	Example of FEMA Uses	Flood	Hurricane	Tornado	Earthquake	QNI
Flood Extent	Flood depth grid Damage estimation	Х	Х			
Debris Detection	 Damage estimation Debris detection Debris removal planning 	х	х	х	х	х
Debris Volume Estimation	Debris volume estimation Debris removal planning	Х	Х	Х	Х	Х
Soil Moisture	 Flood forecasting Landslide prediction Wildfire mitigation 	x	x			
Potential Shelter Locations	Temporary shelter planning Relief supplies distribution planning	x	x	x	x	х
NDVI (Normalized Difference Vegetation Index)	 Wet debris estimation (several weeks post-event) 	х	х			
Identify Displaced Persons Camps	Support/relief planning Rescue efforts	Х	Х	Х	Х	Х
Damage Assessment	Damage assessment	Х	Х	Х	Х	Х
Ground Deformation	Damage assessment Debris estimation				Х	
Landslide Detection	Landslide prediction Landslide detection	Х	Х		Х	
Radiation Detection	Response planning operations					x
Identify Isolated Areas	Response planning operations	х	х	х	х	х
Routing Map	Response planning operations	х	х	х	х	х
Hot Spot/Thermal Mapping	Fire rescue				Х	Х

(J) Barriers & Challenges to Success

- Emergency management is a time dominant regime Acquiring and using imagery can be time intensive.
- Cloud cover and environmental conditions can impact airborne (collection)
- Satellite revisit times and aircraft mobilization maintenance can impact needed timelines
- Resource and processing intensive (software, server/disk space, expertise etc.)



Cloud Covered Satellite Image





Aircraft Maintenance

Processing Software



Sufficient Imagery

 Every major event initiates imagery collections plan to ensure sufficient imagery is collected in a timely manner.

 Interagency groups in situ telecons works to ensure all national, international, research and commercial resources are appropriately coordinated and brought to bear, given available resources.

















Hurricane Incident Journal

Operational Uses:*

- Updates automatically with every National Hurricane Center advisory
- Estimates call volumes and staffing needs
- Estimates shelter, food, and water requirements
 - Note: Planning factors correspond to the Decision Support Tool (DST)
- Reports demographics of impacted areas
- Estimates building impacts
- Logs IA applications
- Provides live traffic updates
- Current weather events

creation of the Map Journal that will likely change the way we do business in the future and the products provided...they are the central resource for data and request for information that keeps us consistent and quickly meets the needs of both internal and external requirements.

Our GIS staff have plowed new ground in the

~ Federal Coordinating Officer DR-4285-NC

Ongoing Efforts:

- Socialization of the journal's format, capabilities, and uses
- Sr. Leadership feedback
- Community feedback at the MDWG

* The Hurricane Incident Journal has only been used operationally for (1) Hurricane Hermine and (2) Hurricane Matthew.