UNOOSA

India Conference

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Transforming Geospatial Data into Disaster Management Information: Challenges and Opportunities

March 8, 2016

UN/India Workshop

Use of EO Data for Disaster Management and Risk Reduction

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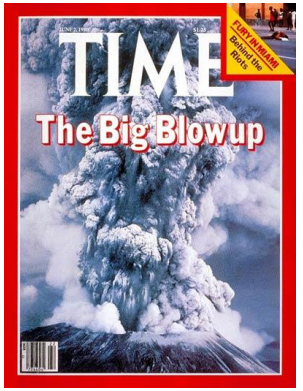
Current Disaster Characteristics

1. Increasing number and severity of natural disasters
2. Short or no-warning disasters
3. Low probability, high-impact disaster
4. Devastation of complex, cascading disasters
5. Importance of an understanding of facts by disaster managers



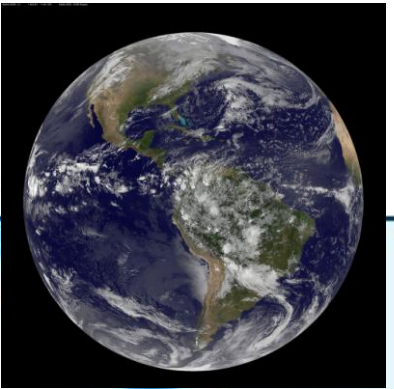

TIME
ON THE TRAIL OF
TWISTERS
What real scientists are learning about the mysteries of tornadoes
Dole's Veep Sweepstakes
Israel's Vote: Which Way to Peace?
TIME
The Big Blowup
FURY IN MIAMI
Behind the Riots
Disasters of All Types Increase in Number and Severity Around the Globe
TIME
FORECAST:
EARTHQUAKE
TIME
SPECIAL REPORT
TSUNAMI
DECEMBER 26, 2004
Capetown, South Africa

Short Background – Professor James Hagen

- Executive Board member, the Planetary Studies Foundation (PSF)
- Certified Emergency Response Coordinator
- Master Exercise Planner (FEMA)
- University Professor Disaster Management, Strategic management, Public Health and Business
- Research microbiologist/immunologist
- Public health incident commander
- Regional Director North America, The International Emergency Management Society (TIEMS)

Topics to be Addressed

- Impact of the Big Data Revolution
- Global Earth Observation System of Systems (GEOSS)
- Evolving Scope of Remote Sensing
  - From monsoons to microbes
- Transformation of Geospatial Data for Risk Reduction & Disaster Management
  - Challenges
  - Opportunities



Big Data

1. Exactly what is it and what does in include/exclude?
2. When we speak of using Big Data for Disaster Response, what does that mean?
3. How does that scope of information change when we include all phases of Disaster Management?

Big Data

1. Exactly what is it and what does in include/exclude? Is more always better??

The concept of Rich Data vs. the Data Warehouse

- Big data consolidates information. Rich data drive actual growth
- Big data gathers the picture. Rich data makes it meaningful.
- Big data quantifies the world. Rich data changes it.

http://www.computerworld.com/article/2887218/big-data-vs-rich-data.html

Big Data

2. When we speak of using Big Data for Disaster Response, what does that mean? US-JAPAN Collaboration
   - Human-Centered Situation Awareness Platform for Disaster Response and Recovery
   - Data-Driven Critical Information Exchange in Disaster-Affected Public-Private Networks
   - Efficient and Scalable Collection, Analytics and Processing of Big Data for Disaster Applications
   - Disaster Preparation and Response via Big Data Analysis and Robust Networking
   - A Big Data Computational Laboratory for the Optimization of Olfactory Search Algorithms in Turbulent Environments
   - Dynamic Evolution of Smartphone-Based Emergency Communications Networks

Big Data

3. How does that scope of information change when we include all phases of Disaster Management?

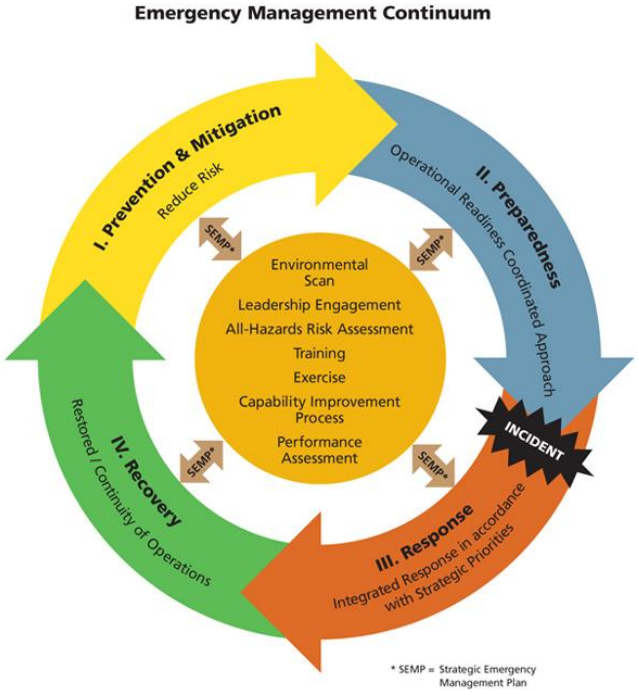
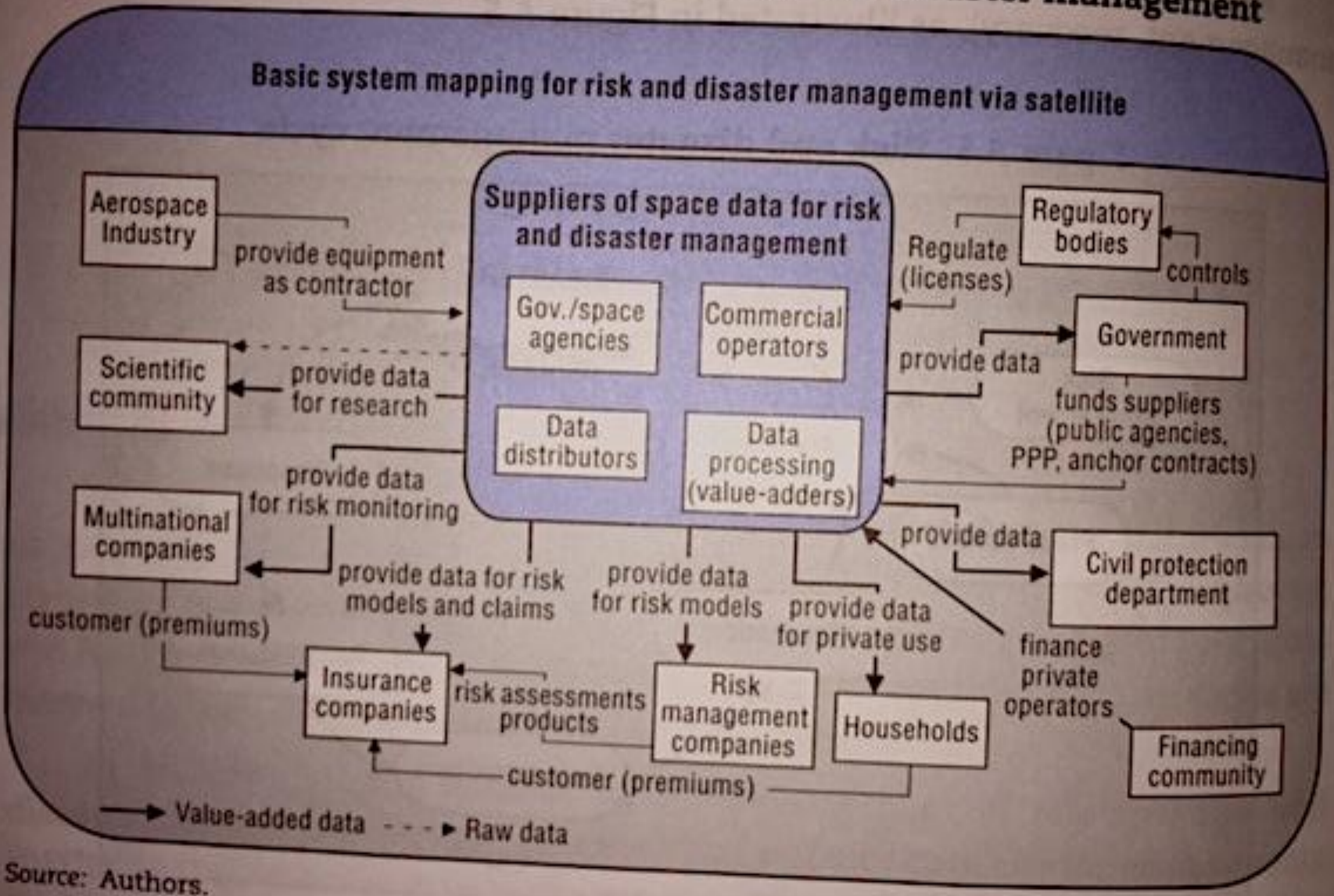


Figure A.6. **The systemic view for risk and disaster management**



Source: Authors.

Disaster Types

Technological Disasters

Natural Disasters

“Complex” Disasters or Terrorism acts

Dohna Batts, MD, FACEP
National Center for Env. Health, 2008

Preparedness
Sustainability
Resilience

- There have been great strides in making geospatial data available in image and thematic data sets.
  - Challenges include:
  - How fast is information available. To whom is data available
  - Who has expertise to “translate that data to information
  - Is there training or a guidebook as to what information can be made available specific to each type of disaster or disaster type?
  - Is information available to in-the-field incident commanders and disaster managers
  - Who is being trained in what “information is needed, what is available, and how to get it?
  - Train–the-Trainer Programs:
  - UN-SPIDER Knowledge Portal
  - MESA – Monitoring for Environment and Security in Africa
  - OTI - Open Training Institute
  - UN/ESA – European Space Agency - TIGER (Terrestrial Initiative in Global Environmental Research)

Advanced Earth Observation

- Worldview-3
- TanDem-X
- ICEsat-1 & 2
- Landscan
- Envisat
- CEOS

GEOSS – Global Earth Observation System of Systems - 2003

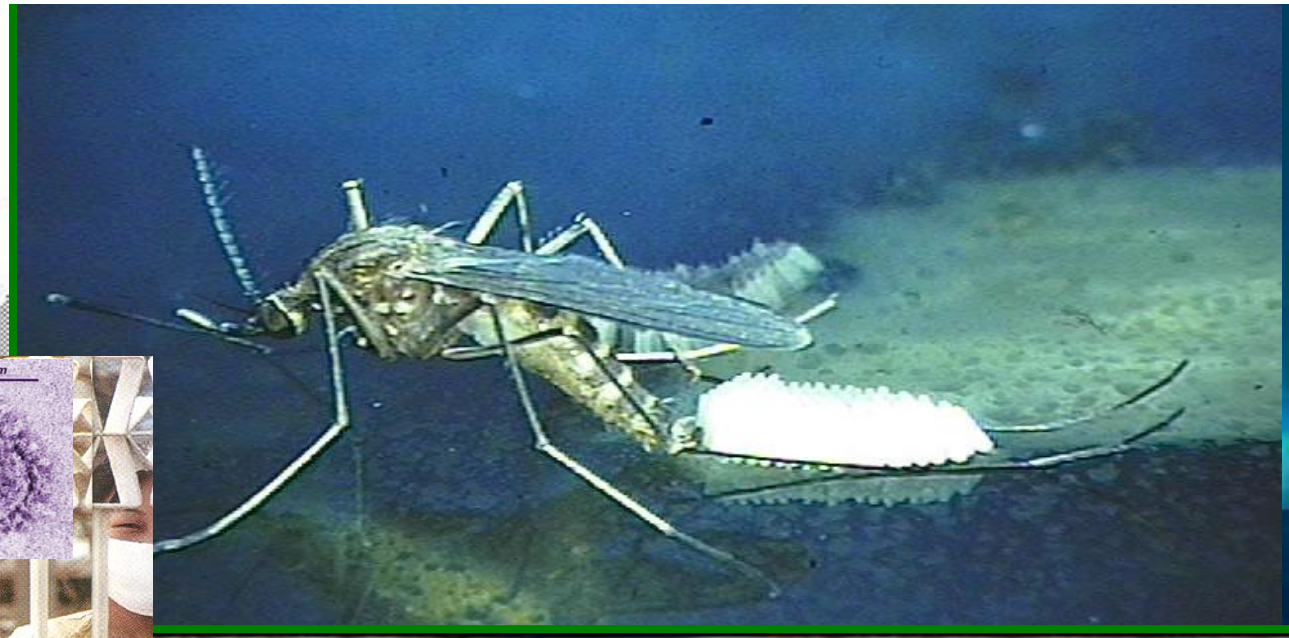
- Nine societal areas:
  disasters, health, energy, climate, water, weather, ecosystems, agriculture. Biodiversity
- In the area of health, this would:
  1. improve environmental data
  2. Improve health statistics
  3. Focus on disease prevention

In the Public Health Arena, Areas Where Remote Sensing is Needed* Include:

- Climate Change Parameters and Health
- Heat Island Effects in Urban Areas
- Precipitation (water, drought)
- Data on Risk Populations
- Detection of Algal Blooms That Are Harmful to Health
- Pesticides and Crop Prediction

*Communication issues exist between scientists and community health providers

Wigbels, L.D. 2011. Using Earth Observation Data to Improve Health in the United States: Accomplishments and Future Challenges. Center for Strategic and International Studies.

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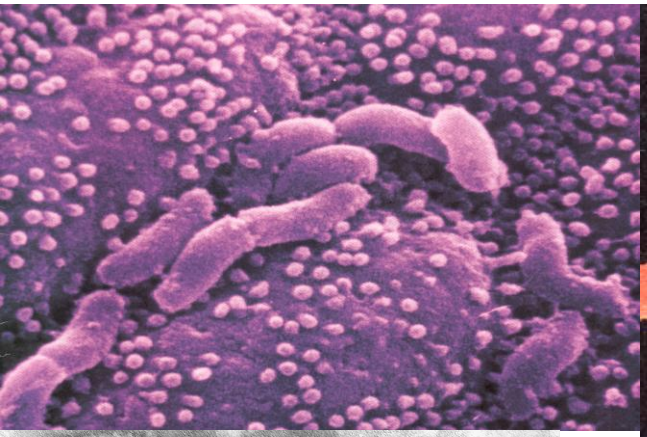

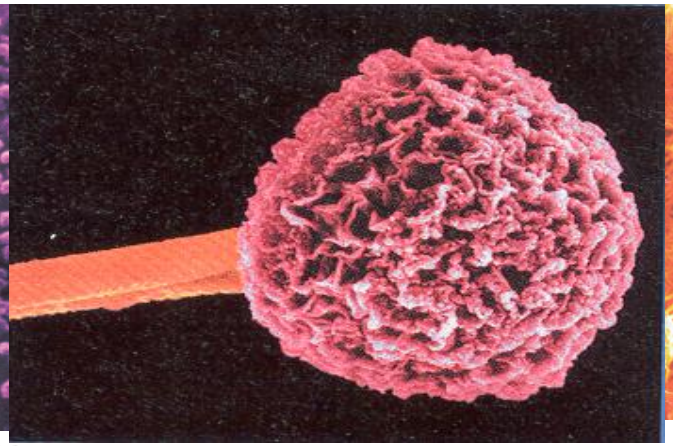

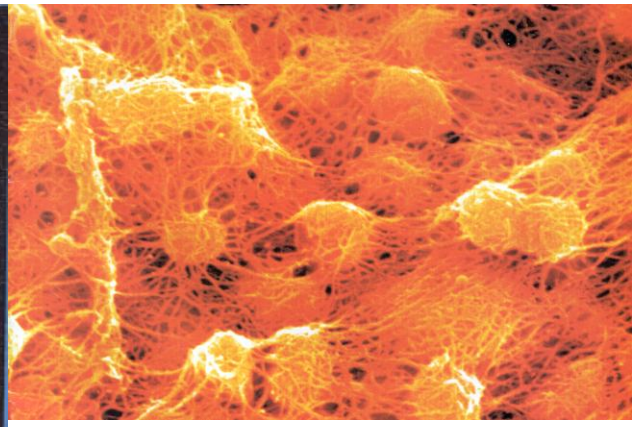

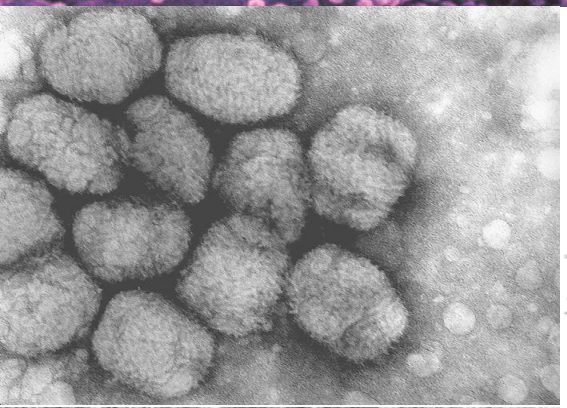

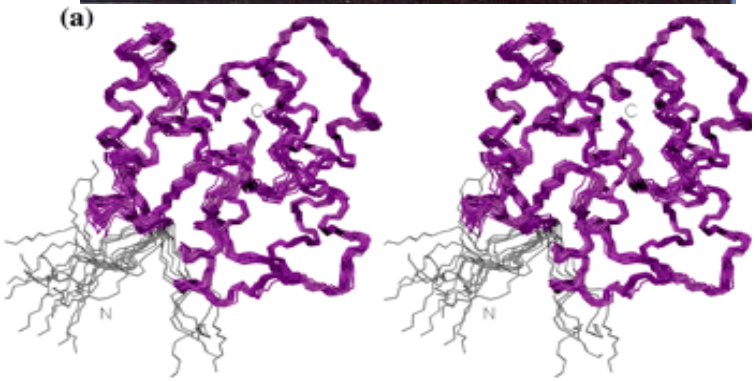
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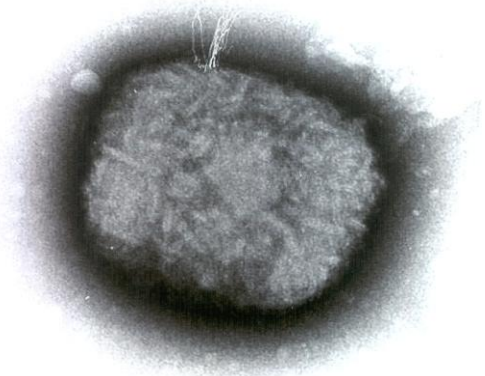
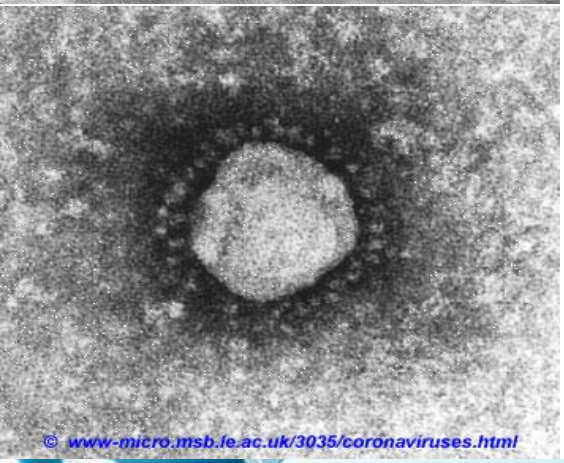
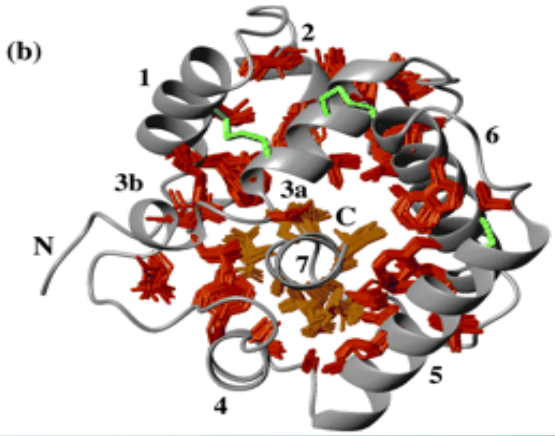



© www-micro.msb.le.ac.uk/3035/coronaviruses.html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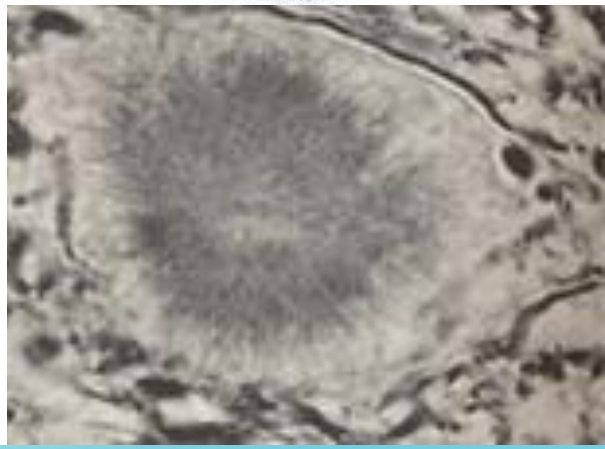

Tick-Borne Illness

- Brazilian Spotted Fever (Rickettsia rickettsiae)
- Difficulty in monitoring infectious agents, vectors an hosts
- Vector habitats need to be identified
- Use of hyperspectral imagery

Satellite Hyperspectral Imagery

- Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER)
- Landsat
- Moderate Resolution Imaging Spectroradiometer (MODIS)
- Advanced very high resolution radiometer (AVHRR)

Used for Detecting Mosquito and Other Insect-Borne Illnesses

- Plague
- Lyme Disease
- Leishmaniasis
- West Nile
- H5N1 Avian Influenza

Polo. G., Labruna, M.B., and Ferreira. 2015. Satellite Hyperspectral Imagery to Support Tick-borne Infectious Diseases Surveillance. PLOS ONE. 10:1371

Control of Zika?

- Aedes aegypti
- Transmits Zika, as well as dengue, yellow fever, chikungunya
- This mosquito is highly dependent on environmental conditions!
- Satellites are NOT highly specific to infectious agents unless unique environments are required

Transformation of Geospatial Data for Risk Reduction & Disaster Management – Challenges and Opportunities

1. Creation of a toolbox of products available to the disaster management community
2. Define, by disaster, types of data products most valuable in real time for disaster managers
3. Create networks and defined platforms for distribution of geospatial data products
4. Listing of open-source platforms for analysis of existing big data information
5. Resources available to perform analyses and create products
6. Clarity on training available to the disaster management community concerning remote sensing data and information
7. Generation of rich data rather than massive amounts of data

Transformation of Geospatial Data for Risk Reduction & Disaster Management – Challenges and Opportunities

8. How to analyze “large, noisy, and heterologous” data sets
9. How do we get accurate, appropriate information to citizens
10. Integration of crowdsourcing data
11. Need for a robust, scalable, geospatial data management system
12. Need for an open standard dissemination protocol
13. Use of an open Geospatial Consortium-based protocol
14. Overhead Imagery most common – other collection systems need to be less expensive and accessible (LIDAR, Radar)

Summary

- The field of data analytics is exploding as more and more data becomes available for inclusion in Big Data repositories. A uniform platform must be designated for collection, analysis and creation of data products.
- More data us not necessarily better if there is no clarity on how to transform the data into usable information. There must be better communication between geospatial data experts and disaster management professionals. Appropriate products must be defined and made available.
- There must be clear mechanisms for how to disseminate information to those needing it and for uniform procedures to train them how to use it.


Thank You for Your Kind Attention!
Please contact me for further information or reference source list.
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