BIOGRAPHICAL INFORMATION

Allen Jakobitz
Hazards Technology Program Manager
Washington State Emergency Management (WSEM)

Specific Responsibilities

Worked at WSEM since 1991. Responsible for operating and maintaining all software used for hazard analysis. Project Manager for NASA grant to develop use of remote sensing in emergency management operations. Lead all geographic information systems activities.

Past Experience

Chemical Stockpile Emergency Preparedness Exercise and Training Officer, WSEM
Program Coordinator, WSEM E9-1-1 Office
Adjunct Instructor, Centralia College
Regional, Account & Project Manager, British Telecom
Systems and Programmer Analyst, TYMNET
Actuarial Research Specialist, Blue Cross of Northern California
Health Care Administrator, USAF
Adjunct Instructor, Chapman College
Personnel Technician, USAF

Educational Information

A.A. – Language and Literature
B.S. – Business Administration, Sacramento State College
M.P.A. – Federal, State an Urban Governance, Golden Gate University

Professional Memberships

Information Processing Management Association
Washington Geographic Information Council
Urban and Regional Information Systems Association

HEIGHTENED AWARENESS THROUGH THE USE OF REMOTE SENSING IN EMERGENCY MANAGEMENT

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ABSTRACT

Emergency Management is separated into four functions: Response; Recovery; Mitigation; and Preparedness. Emergency Managers must first identify all of the hazards in their jurisdiction. They will then create plans that address the four functions for each hazard. The level of awareness of a particular hazard in time and space has been dictated by history and seasons. History indicates with certainty exactly when and where a particular hazard created an emergency situation. Many natural hazards have general seasons and prone areas in which they occur. Remote sensing has been available and used in other disciplines for decades. Being able to detect conditions on earth's surface can add information that will make hazard analysis more robust. Remote sensing provides us additional information to use during analysis that should heighten awareness of hazards.

EXISTING METHODS OF REMOTE SENSING

Washington State Emergency Management currently employs several different methods of remote sensing. Examples are the lahar and earthquake sensors.

Lahar

Lahars are volcanic mudflows, which can cause tremendous destruction. The lahar from the 1980 Mt. St. Helen's eruption flowed about 10 to 25 miles per hour damaging 27 bridges, nearly 200 homes. The lahar reduced the Columbia River channel depth from 40 to 14 feet stranding 31 ships in upstream ports.

Because Mt. Rainier is an active volcano in reach of tens of thousands of people, Pierce County has installed motion detectors armed with radio transmitters. When earth motion is detected, alarms are then sent to the dispatch center for Pierce County and the State Emergency Operations Center.

Earthquake

An earthquake is a sudden, violent shaking of the ground. The 2001 Nisqually earthquake was measured a magnitude of 6.8 at a depth of 52 kilometers and was centered 30 miles southwest of Seattle. There were 12,148 residents registering for disaster aid and the total recovery costs were estimated at $322 million.

The Pacific Northwest Seismograph Network automatically collects and analyzes data to provide rapid and accurate information about earthquake activity using over 150 seismograph stations. Earthquake information is sent electronically directly to the State Emergency Operations Center. The keen interest in this data has resulted in the development in Rapid Alert for Cascadia Earthquakes (RACE), which broadcasts basic information to multiple users using a commercial paging system

POTENTIAL REMOTE SENSING PRODUCTS

Satellites carry instrumentation that collect a myriad of data. This data tells us about current and past conditions on the earth. This can lead to some inferences that may assist with hazards analysis. Examples are NDVI and LST.

NDVI

The Normalized Difference Vegetation Index (NDVI) is an measure of vegetation amount and condition. It can identify growing seasons and plant classification. Viewing a NDVI time series can clearly show distinct ecological zones. High NDVIs indicate more and healthier growth, while lower numbers indicate less or unhealthy growth.

LST

The Land Surface Temperature (LST) detects thermal emission from the landscape "surface", including the top of the canopy for vegetated surfaces as well as other surfaces (such as bare soils). It can be used for land classification. Deserts tend to have very high LSTs, forests and plant-covered lands have more moderate temperatures, and permafrost lands have much colder temperatures.

METHODS OF AWARENESS

Alarms

In the 24-hour Duty Room of the State Emergency Operations Center, the Lahar monitor is attached to both a strobe light and audible alarm. This ensures that those present are immediately aware of an existing emergency.

The earthquake monitor is running on a separate computer with the display visible at all times. When an earthquake occurs, a single flash of the screen and single beep occur. It is very possible to not notice immediately.

Exercise

Exercises are designed to test plans. These could any of the four functions of emergency management. Exercises are well organized and involve many people. Since they focus on objectives it is possible to simulate any number of variables that test the plan.

An earthquake plan would identify shelters for displaced persons. An exercise could simulate that one or more of these shelter would not be available because of a recent fire or because the road to the shelter is not passable or any remotely possible variation. As a result the persons exercising would need to identify alternative shelters.

Functional exercises for a lahar plan are essential because mudflows move at tremendous speed. So often evacuations must be practice and evacuation routes re-evaluated to ensure the best chance of survival for those in harm's way.

Frequent and well thought out exercises take much of the surprise element that accompany each disaster.

Internet

The Internet has been providing robust access to applications and data at an astounding rate. It can literally reach anyone in the world with access to a computer and Internet connection. The Internet can reach those people directly concerned with a hazard; those who can benefit from the work of others; and those that can themselves add to the body of work addressing hazards.

Alarms provide only a few persons with knowledge of an event. The Internet can be used to extend the number of recipients to anyone with any kind of communication device (pager, cell phone, wireless hand-held computers, etc.)

Exercises provide key players with the opportunity to test plans before they must be implemented. The Internet can be used to include persons from diverse locations in the exercise through the use of audio, video, graphic and other technologies.

ENHANCING AWARENESS THROUGH REMOTE SENSING

Response

Response is handled by the law enforcement, medical and fire first responders; not emergency managers. Remote sensing instruments are always acquiring data. However, it takes time to get satellite data and then process it for an emergency manager's use. While some older data may assist in decision-making, it is unusual to use remote sensing products during response due to the time element. Increased used of alarms tied to ground sensors is likely to continue as early warning devices.

Recovery

Remote sensing products are often obtained and compared in order to determine the extent of recovery needed from a macro-level. Images of a disaster area before and after can assist decision makers in determining the extent of damage. Used with Geographic Information Systems it is possible to make some preliminary dollar loss estimates by overlaying assessor plat information with remotely sensed product displaying damaged areas. Using the Internet to gather and distribute information is routinely done with earthquakes and is growing with other hazards.

Planning

Planning should be going on at all times. This eliminates the time factor. It includes exercising those plans. Remote sensing products such as NDVI and LST provide important trend information, which could affect plans. Change detection is becoming more effective in comparing disparate times to the same space. In that way it is possible to note that current vegetation or temperature is different from previous checks. These changes are indicators that the earth is become more or less susceptible to a particular hazard. Increased vegetation in a particular area should lessen the chances of landslide or avalanche. Increased temperature could increase the chances of drought or wildland fire susceptibility.

Mitigation

Mitigation activities are undertaken to lessen the impact of a disaster should it occur. Remote sensing products provide clues to the long-term activity of the earth, which may impact mitigation decisions. When deciding to relocate a home based upon being in a flood plain, it would be prudent to review the LST history for that same region. If it looks as though the temperature has been rising, then the water table may have been decreasing. This could be justification to update the flood plain information. Any available information should be included in an analysis. If this same area had a NDVI indicator that vegetation was less lush, this could add credence to the belief that the area is becoming less susceptible to flood. On the other hand, these factors could also lead one to believe that the area was in a drought, which could mean the area is more susceptible to flood..

Distribution

The NASA (National Aeronautics and Space Administration) offers several remote sensing products at no cost. These products can be downloaded from the Internet or obtained on a CD mailed through the postal service. Once these products have been processed and used in hazard analysis, the results should be made public. The fastest method with the broadest impact at the lowest cost continues to be the Internet.

CONCLUSION

WSEM (Washington State Emergency Management) received a NASA grant to develop the use of remote sensing in emergency management. WSEM partnered with the University of Washington and the Western Disaster Center. This project is half complete. All of the data has been collected. Regular monthly remote sensing products are now being produced. These products are used in conjunction with other materials to produce a monthly hazard report (MHR), which addresses the relative risks in of hazards in Washington State three months in the future.

The MHR promotes awareness of the potential risks within Washington each month. The awareness indicators encourage local emergency managers to start with this information and gather addition local data before examining their action plan. WSEM has chosen to initiate a web site called AWARE (All-hazard Warning and Risk Estimation). It is currently under development and will be on-line the end of 2004. AWARE will be aimed at local emergency managers in Washington State, but available to everyone. It will have a monthly hazard analysis completed by WSEM experts that includes the use of remote sensing products. Methodology of analysis as well as remote sensing products will be available through AWARE.

By publishing the remote sensing products to the Internet, Emergency Managers will have another tool in the hazard analysis arsenal. Heightened awareness through the use of remote sensing in emergency management will surely result.

REFERENCES

Mt. St. Helen's Lahar: http://wrgis.wr.usgs.gov/fact-sheet/fs036-00/

Mt. Rainier Volcano Lahar Warning System:
http://volcanoes.usgs.gov/About/Highlights/RainierPilot/Pilot_highlight.html

Nisqually Earthquake Damage: http://www.fema.gov/diz01/d1361n30.shtm

Rapid Alert for Cascadia Earthquakes:
http://www.geophys.washington.edu/SEIS/PNSN/OUTED/RACE/welcome.html

The Pacific Northwest Seismograph Network:
http://www.geophys.washington.edu/SEIS/PNSN/INFO_GENERAL/INFOSHEET/welcome.html

Land Surface Characteristics including LST and NDVI:
http://www.calmit.unl.edu/storm/newpage31.htm