Workshop on Large-Scale Disaster Recovery in APEC
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Disaster Impact and Recovery Mapping Using Space Technologies

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• Overview of Pacific Disaster Center

• Remote Sensing for Disaster Response and Recovery
  – Indian Ocean Tsunami
  – Typhoon Nargis
  – International Charter

• Szechwan Earthquake

• Remote Sensing Challenges

• Q&A
PDC Mission

Provide applied information research and analysis support for the development of more effective policies, institutions, programs and information products for the disaster management and humanitarian assistance communities of the Asia Pacific region and beyond.
Building a Bridge

Science Community

Peer Review

Low

Complex

Technical Groups

Decision Makers

The Public

Audience

Comfort with uncertainty

Vocabulary

Associations

High

Simple

Very Public
Space-based technologies used to monitor the recovery status and progress of communities impacted by the December 2004 Indian Ocean Tsunami.
Banda Aceh, Indonesia: Pre-event
June 23, 2004 QuickBird

Port Intact
Homes Intact
Aquaculture Intact
Banda Aceh, Indonesia: Post-event
Dec 28, 2004 QuickBird

- Soil Stripped of Vegetation
- Port Destroyed
- Few Buildings Remaining
- Aquaculture Destroyed
Banda Aceh, Indonesia: Recovery
June 29, 2005 IKONOS

Vegetation Returning to Stripped Areas
Port and Aquaculture Remain Destroyed
Some New Construction
Banda Aceh, Indonesia: Recovery
July 30, 2007 QuickBird

Vegetation Returning & New Construction Throughout Area

Port and Aquaculture Rebuilt
NDVI Time Series

6 Months After Tsunami

Pre-Tsunami
Immediately After Tsunami
6 Months After Tsunami

NDVI
High : 1
Low : 0
Infrastructure Damage Severity Index (IDSI)
- Developed by PDC
- Documents relative damage in affected areas
- Prepared through manual interpretation of high-resolution (~1m) satellite imagery
Quantification of Lost/Recovering Infrastructure

Study Areas
Quantification of Lost/Recovering Infrastructure
Quantification of Lost/Recovering Infrastructure
NASA's Terra satellite captured this image of the Burma coast on April 15, 2008, before Tropical Cyclone Nargis flooded the region.

NASA's Terra satellite captured this image of the Burma coast on May 5, 2008, showing the devastation of flooding caused by Tropical Cyclone Nargis.

Credit: NASA/MODIS Rapid Response Team
International Charter

Following the UNISPACE III conference held in Vienna, Austria in July 1999, the European and French space agencies (ESA and CNES) initiated the International Charter “Space and Major Disasters”, with the Canadian Space Agency (CSA) signing the Charter on October 20, 2000. In September of 2001, the National Oceanic and Atmospheric Administration (NOAA) and the Indian Space Research Organization (ISRO) also became members of the Charter. The Argentine Space Agency (CONAE) joined in July 2003. The Japan Aerospace Exploration Agency (JAXA) became a member in February 2005. The United States Geological Survey (USGS) has also joined the Charter as part of the U.S. team.

The International Charter aims at providing a unified system of space data acquisition and delivery to those affected by natural or man-made disasters through Authorized Users. Each member agency has committed resources to support the provisions of the Charter and thus is helping to mitigate the effects of disasters on human life and property.

The International Charter was declared formally operational on November 1, 2000. An Authorized User can now call a single number to request the mobilization of the space and associated ground resources (RadarSAT, ERS, Envisat, SPOT, IRS, SAC-C, NOAA satellites, Landsat, and others) of the member agencies to obtain data and information on a disaster occurrence.

- European Space Agency (ESA)
- Centre national d'études spatiales (CNES)
- Canadian Space Agency (CSA)
- Indian Space Research Organisation (ISRO)
- National Oceanic and Atmospheric Administration (NOAA)
- Argentina’s Comisión Nacional de Actividades Espaciales (CONAE)
- Japan Aerospace Exploration Agency (JAXA)
- United States Geological Survey (USGS)
- DMC International Imaging (DMC)
NDRC China Response

**Destroyed Houses Assessment Map in Dujiangyan City**

The 2008 Wenchuan earthquake at a magnitude 7.8 Ms, occurred at 14:28, 12 May 2008, in Sichuan province of China, which has caused lots of houses collapsed and south destroyed. The satellite houses assessment map was based on IRS-1 (15 May 2008) and SPOT 5 image (15 August 2008).

**Dujiangyan City**
Remote Sensing Challenges

- Type of Disaster
- Existing Imagery
- Post-Event Collections
- Weather Conditions
BEIJING, Sept. 3 (Xinhua) -- China will launch the first of eight satellites to monitor environment and natural disasters from the country's north Taiyuan Satellite Launch Center this week, according to the China Aerospace Science and Technology Corporation (CASC).

The satellite "Environment 1", an optical satellite, will be sent into orbit by a Long March 2C carrier.

It will monitor most of the country and send back data daily, making up for the country's earth observation data shortage, said Wu Xiaoqing, vice minister of Environmental Protection, Wednesday's "China Business News" reports.

"Launch of the satellite will largely enhance our environment monitoring ability," said Wu, explaining that the present environment monitoring and researching method was not good enough to cope with the dynamic environment and the occurrence of natural disasters.

The satellite will work as a constellation with seven other satellites yet to be launched. Its observational footprint is 720 km.

It is expected to forecast and monitor natural disasters such as flooding, drought, typhoon, landslide and earthquake, said Wu.
Conclusions

- Earth Observing Imagery has been used for more than 30 years to document disasters.
- Spatial & temporal resolution have increased dramatically in the past 5 years.
- Biggest gains (from DM perspective), however, have been in rapid collection and dissemination for VA-analysis and targeted re-distribution to end users.