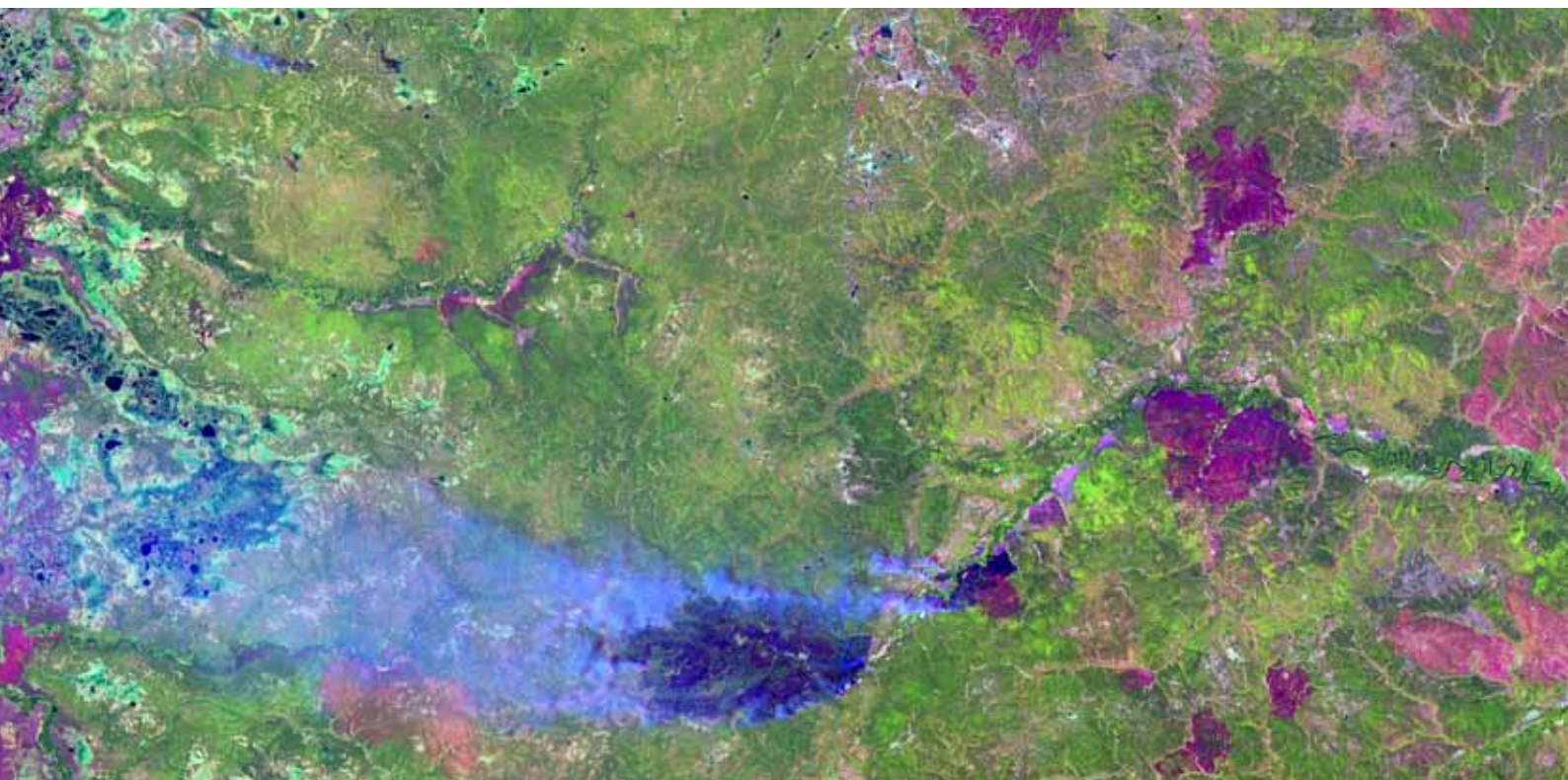




Report for Workshop on Application of Satellite Technologies for Emergencies Preparedness, Management and Response in Asia-Pacific Region

Ramada Bintang Bali Resort, Kuta, Indonesia
APEC Emergency Preparedness Working Group
October 30-31, 2013



APEC Project EPWG 01/2012A

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Preface



The workshop “Application of Satellite Technologies for Emergencies Preparedness, Management and Response in Asia-Pacific Region” was held at Ramada Bintang Bali Resort, Kuta – Indonesia on October 30-31, 2013 under the supervision of the Federal Space Agency of the Russian Federation. The event provided a platform for various stakeholders involved in disaster management, environment protection and remote sensing to discuss and review the use of satellite imagery for emergencies preparedness, management and response.

The workshop was conducted as the key element of APEC Project EP 01 2012A. The project was initiated by the Russian Federation with support of Viet Nam, Indonesia and Chinese Taipei as co-sponsoring economies. The workshop was co-organized by APEC, Federal Space Agency (Roscosmos), EMERCOM Russia and RDC SCANEX. The event was largely devoted to examining specific characteristics of satellite technologies application for different types of emergencies, discussion of international cooperation and mechanisms of fast remote sensing data delivery for EPMR and Crisis Management centers network development in Asia-Pacific Region.

The participants included experienced academicians, business actors, governmental officials and representatives of 12 APEC economies and 2 international organizations (UNOOSA and ASEAN). The workshop consisted of 5 plenary sessions, a key-note lecture, a breakout session, and comprehensive discussions leading to a number of follow-up recommendations that were accepted by all the participants.

We thank all the participants for their contribution and energy. Particular thanks to the facilitator and break-out facilitators as well as speakers and all those who sent comments to the draft write-up. We would also like to thank Ms. Anna Prokopchik from Roscosmos, Ms. Yulia Zhitina from EMERCOM Russia and Mr. Sergio Narea from the APEC Secretariat who have guided and supported us in delivering this project.

We fully anticipate that the outcomes of the workshop will be beneficial in supporting of overall objectives of the APEC Emergency Preparedness Working Group.

Project Overseer

Bochkarev Alexander
Deputy Director of International and Contractual Department
Federal Space Agency



Table of Contents

Preface	01
Table of Contents	03
Workshop Summary and Recommendations	04
Opening Remarks, Roscosmos	07
Opening Remarks, EMERCOM Russia	08
Workshop Agenda	09
List of Participants	12
Reports of the Workshop	16
Closing Remarks, EMERCOM Russia	165
Pictures	166



Workshop Summary and Recommendations

Delegates from 12 APEC economies (PRC, Indonesia, Malaysia, Mexico, Peru, Philippines, Russia, Thailand, Viet Nam, Australia, USA, Chinese Taipei) and 2 International organizations (UNOOSA/UN-SPIDER and ASEAN) met in Bali, Indonesia during October 30-31, 2013 to participate in the workshop on Application of Satellite Data for Emergencies Preparedness, Management and Response (EPMR) in Asia-Pacific Region. The workshop was conducted as key element of APEC Project EP 01 2012A, initiated by Russia and supported by Indonesia, Chinese Taipei and Viet Nam as co-sponsoring economies. The workshop was co-organized by APEC, Russian Federal Space Agency, EMERCOM Russia and RDC SCANEX.

The workshop attended by 32 delegates, saw experts in satellite Remote Sensing (RS) technologies, officials/experts from Emergency and International Agencies, Space Agencies and Universities sharing experience and best practices in application of satellite data for emergencies preparedness, management and response.

The workshop consists of 21 presentations divided into 5 sessions and breakout group discussions. Representatives of APEC economies presented information about regional experience in use of satellite technologies for EPMR; development and future trends in application of space images for EPMR; predicting of natural disasters in agriculture using remote sensing; near real time identification of adverse forest effects; optimizing of satellite technologies for coastal disaster mitigation. Workshop participants were briefed by Roscosmos on work of the International Charter "Space and Major Disasters". UNOOSA/UN-SPIDER participant presented an approach to reduce vulnerabilities to hazards through good practices in geospatial information management. EMERCOM Russia representatives reported about crisis centers development, plan for its network development and use of space monitoring for operational control. Participant from ASEAN announced information about recent activity of ASEAN coordinating centre for humanitarian assistance on disaster management (AHA Centre). Workshop participants were briefed on new social oriented initiative "Space Watch" – a system of public monitoring from space.

During breakout session workshop participants discuss and elaborate recommendations for APEC on application of satellite technologies for different types of emergencies, crisis management centers network development, international and regional cooperation in application of satellite data for EPMR.

The overarching recommended solutions include:

APEC

- APEC should address and try to mitigate the existing asymmetries or differences in capacities between developed and developing economies in the APEC region.
- APEC should continue to raise capacities and technical knowledge of the importance of space

technology in addressing EPMR by government and non-government stakeholders located in the Asia Pacific region. The hosting of this important workshop with EMERCOM, ROSCOSMOS and SCANEX is an important contribution, which should be continued or followed up.

- It is advisable to reorganize GNSS subgroup, (existing within the framework of the APEC Transportation WG), and create on its basis a fully functional WG on applied satellite technologies for a wide range of solutions within the framework of APEC (EPMR, supporting sustainable agriculture and forestry, marine resource management, etc.) and develop a close relationship with the International Committee on GNSS with Secretariat at UNOOSA in Vienna (<http://unoosa.org/oosa/en/SAP/gnss/icg.html>).
- It is desirable that at the annual meeting of the working group representatives from APEC economies deliver reports on:
 - their respective use of and access to satellite-based data/product in satisfying their emergency management needs over the preceding 12 months, highlighting extant arrangements, areas where difficulties were encountered and any recommendations for future improvement;
 - initiatives and recommendations, prepared by each economy covering the accounting year within the framework of past events (conferences, seminars, etc.);
 - plans and specific activities aimed at implementation of these initiatives and recommendations.

Education

- To conduct a regular training courses/workshops on technical issues on the access and use of space-based tools, applications, data and products for EPMR on annual basis.
- Creation of educational programs and training of employees of key stakeholders at various levels, from local to government. For these purposes it is necessary to give a full picture of the possibilities of modern satellite imagery and other space-based tools and applications, as well as the existing and used practices in different areas (disaster management, ecological monitoring etc.).
- The participants to the APEC workshops reiterated the need for APEC to include not just technical staff but decision makers in the participants list of future workshops. There is a danger to only involve technical experts. This will not assist in increasing the broad use of space technologies for EPMR among APEC economies. Management needs to support technical staff to be better trained and to increase the use of these technologies.

Research

- APEC should sponsor the implementation of pilot projects of high priority to economies of the Pacific region. Disasters continue to present obstacles for the economic development of the region. A regular activity that is sponsored by APEC-EPWG that implements projects on a regular basis in order to improve disaster management should be a priority. These pilots should rotate on an annual basis across different categories of disasters: hydro-meteorological, geo-hazards, technological hazards, etc.
- Involvement of the scientific community is required to conduct local research, as well as various



types of joint research work. It is necessary to develop common approaches and requirements for the various types of monitoring, etc.

Institutional

- Developed APEC economies should leverage and make available existing centers of excellence (e.g. Pacific Disaster Center, SCANEX, Moscow State University, Emergency Management Australia, UN-SPIDER Beijing Office) to improve capacities of developing economies and better access to satellite technologies for EPMR by developing countries in the Pacific region.
- Creating a network of stations and clearinghouses with the possibility of online access, fast delivery of data, standardized products and maps to help all participants speak the same language.
- Combining modern satellite technologies (remote sensing, satellite positioning and monitoring of ships traffic, satellite telecommunication, etc.) to solve EPMR problems.

Web

- To open a special web-site with unified space image metadata archive from all leading satellite operator and data providers, and linking to similar initiatives at the regional and global levels;
- To open a special web-site with recommendations, best practice cases, educational and training materials in EPMR, and linking to similar initiatives at the regional and global levels;
- Creating a common platform: regions - geo-portals, etc.

Finance/Legal

- Promoting the pooling of financial, technical and human resources to increase access to remote sensing data reception facilities and for data processing across the APEC economies;
- To assess a special funding or special conditions of data exchange based on open data policies in case of emergency situations (cross border natural and anthropogenic disasters) - legal base;
- To facilitate open access and distribution of commercial space imagery from license limitation during emergency to complement existing international or regional mechanisms that may not be accessible for all phases of the disaster management cycle or cover smaller, but still damaging and costly disasters.

Opening Remarks

Vasily Gudnov

Head of International Legal Department of the Federal Space Agency,
International Contractual Directorate

Ladies and gentlemen, dear colleagues and guests!

I am very pleased and honored to address you. Let me open our workshop held by Roscosmos, EMERCOM and RDC SCANEX in the frame of APEC Emergency Preparedness WG. My special thanks to LOC and Indonesian authorities for hospitality and opportunity. It's a real pleasure to be here in Indonesia, in such beautiful and amazing place!

And some words about Roscosmos. This April the "Keystones of state policy of the Russian Federation in the area of space activities till 2030 and with a further perspective" were adopted by the Government. The document specifies principles, purposes, expected results and priority directions of space activities. Special attention is paid to international space cooperation. International cooperation in the area of space activities will always be a priority of Russian space policy. In our point of view, successful performance of ambitious projects of any kind is based on efficient international cooperation. Asia Pacific region is one of the most important for us because Russia is a part of it. We always suppose satellite technology as a tool for different branches of economy, people's prosperity, safety and security. Our special attention is paid to the widening of space technology applications used for mitigation of emergencies. The GLONASS constellation today comprises 29 satellites. Accessibility of the GLONASS navigation field is 100% and available to all users. In the near future we are planning transition to a new generation of navigation spacecraft with a longer assured life cycle. New satellites will be equipped with the COSPAS-SARSAT receivers and transmitters providing the global application with operational efficiency and high object positioning accuracy in case of accidents.

This year Roscosmos has become a fully potential member of the International Charter on Space and Major Disasters, whose main task is to mitigate the consequences of natural and anthropogenic disasters by providing states suffered from emergencies with free-of-charge remote sensing data over the area of the emergency. Roscosmos will contribute to the Charter work by providing remote sensing data from. The deployment of an orbital constellation of remote sensing spacecraft is planned for the near future. The Federal Space Program of the Russian Federation provides for tripling the orbital remote sensing spacecraft constellation by 2018, whose information is also expected to be provided in the interests of the International community.

So, I expect we could use this workshop to share the best practices among the APEC states for better understanding our needs and capabilities. Thank you!



Opening Remarks

Maksim Zayko
Head of International organizations unit, International Cooperation Unit,
EMERCOM of Russia

Good afternoon, dear colleagues!

First of all, I would like to thank all attendees for their attention to the subject of space monitoring. Currently, a lot is said on the subject, and many countries have stated or are stating their wish to use remote sensing of Earth for solving practical tasks, yet in reality, very few practically use 100% of possibilities of space monitoring. This happens for a variety of reasons – often due to the lack of necessary information (high resolution imaging, various specters needed for analysis and prognosis), the lack of technological capabilities of data processing, and one of the most relevant reasons is the lack of practical experience of using space monitoring data for prevention and elimination of emergency situations and natural disasters.

During the international seminar, we will look not only at the various methods of using and processing of data, but at the different fields of use of remote sensing of Earth. For example, some countries are advanced in the use of space monitoring with the goal of elimination of consequences of large-scale floods and earthquakes, while others successfully battle with forest fires of with its help, and other parties have reached significant progress in the field of lowering the risks of crop loss – which as we can probably agree, is too important both, for the socio-economic development of the country, and for the region. Not a year goes by for us not to find a new field of application of data, received from Earth’s satellites. EMERCOM of Russia wishes for this platform to become a bridge for exchange of experience and knowledge between experts who are representing APEC economies, in the field of space monitoring. EMERCOM of Russia sees evident gain that can stem from using data from remote sensing for prevention, as well as the elimination of emergency situations. Wholesomeness, depth and high quality of space imagery, ability to conduct comparison in time, analysis of the situation and recommendations that were based on them, helped avoid human losses during the large-scale flooding in the Far-Eastern region in the spring and autumn of this year – and that is the most important aspect in our field of work!

At the same time, a number of problems were brought to surface during the response, in particular the lack of an established, well-running informational exchange between crisis management centres, especially when the situation stops being local and turns into a interstate, global level. Thus, for this seminar, EMERCOM of Russia sees the work on suggestions for the development of guidelines on data exchange between CMCs, and easing the space monitoring data exchange between countries, that are involved in the response process for eliminating the consequences of natural disasters, that have interstate characteristics.

Workshop Agenda

Day 1	
8.30 – 9.00	Registration
9.00 – 9.05	Workshop opening, announcements on administrative and logistical issues Oganes Targulyan, RDC SCANEX, Russia
9.05 – 9.20	Welcome and Opening Remarks Vasily Gudnov, Federal Space Agency (Roscosmos), Russia Maksim Zayko, EMERCOM Russia
9.20 – 10.10	Keynote lecture: Alexey Kucheiko, RDC SCANEX, Russia “Application of Satellite and Communication Technologies for EPMR”
10.10 – 10.20	Group Photo
10.20 – 10.30	Coffee Break
Session 1 10.30 – 12.00	Regional and international experience in application of satellite and communication technologies for EPMR (Chairman Oganes Targulyan) Zhang Wei, Department of Satellite and Remote Sense, National Disaster Reduction Center, China “Space Technology Application for Disaster Management in China” Cesar Carcamo, School of Public Health and Administration Universidad Peruana Cayetano Heredia, Peru “The use of GIS data for the projection of the impact of an earthquake in Peru” Kriengkrai Khovadhana, National Disaster Warning Center, Ministry of Information and Communication Technology, Thailand “Application of Satellite Technologies for Disaster Warning in Thailand” Bui Quang Huy, Disaster Management Center Ministry of Agriculture and Rural Development, Viet Nam “Space Technology Application on Disaster Risk Reduction in Vietnam” Fernando R. Echavarria, U.S. Department of State, Office of Space & Advanced Technology, Bureau of Oceans, Env. & Science (OES/SAT), USA “Remote Sensing and Disaster Management: A U.S. Perspective” Tzu-Yin CHANG, National Science and Technology Center for Disaster Reduction, Chinese Taipei “APPLICATION OF GEOSPATIAL DATA AND REMOTE SENSING TECHNIQUES FOR DISASTER SURVEILLANCE IN CHINESE TAIPEI”



12.00 – 13.00	Lunch
Session 2 13.00 – 14.30	Specific characteristics of satellite technologies application for different types of emergencies (Chairman Alexey Kucheiko) Mikhail Zimin, RDC SCANEX, Russia “Satellite technologies and remote sensing: from first steps to advanced use” Andrey Sarychev, RDC SCANEX, Russia “Predicting natural disasters in agriculture using remote sensing data” JULIO CASTILLO URDAPILLETA, Director of Space Security, Mexican Space Agency “Mexican Early Warning System For Disasters”
14.30 – 15.00	Coffee Break
Session 2 15.00 – 16.00	Specific characteristics of satellite technologies application for different types of emergencies – continuation (Chairman Alexey Kucheiko) Maria Dorofeeva, RDC SCANEX, Russia “Modern and prospective satellite systems and their application for EPMR” Natalia Filimonova, RDC SCANEX, Russia “Satellite monitoring as basis of expeditious control of sea water areas” Andrey Sarychev, RDC SCANEX, Russia “Near real-time identification of adverse forest effect using remote sensing data” Enggar Sadtopo, Deky Rahma Sukarno, Ministry of Marine Affairs and Fisheries (MMAF), Indonesia “Indonesian Experience on Optimizing Satellite Technology for Coastal Disaster Mitigation: Case Study of North Coast of Java”
16.00 – 16.45	Breakout sessions: Application of satellite technologies for different types of emergencies, Crisis management centers network development, international and regional cooperation in application of satellite data for EPMR The main goal is the discussion and elaboration of recommendations for APEC economies to be included into Final Document Group 1 moderator: Mikhail Zimin Group 2 moderator: Alexey Kucheiko Group 3 moderator: Andrey Sarychev
16.45 – 17.15	Breakout sessions reports back (by group discussion facilitators)
17.15 – 17.30	Announcements
19.00 – 22.00	Gala Dinner

Day 2	
Session 3 9.00 – 10.00	International cooperation and mechanisms of fast remote sensing data delivery for EPMR (Chairman Oganeg Targulyan) Vasily Gudnov, Roscosmos, Russia “Roscosmos participation in the International Charter “SPACE and MAJOR DISASTERS”” Luc St-Pierre, Senior Programme Officer, United Nations Office for Outer Space Affairs (UNOOSA) “UN-SPIDER: A model approach to reduce vulnerabilities to hazards through good practices in geospatial information management”
Session 4 10.00 – 11.00	Crisis Management centers network development in Asia-Pacific Region (Chairman Oganeg Targulyan) Maksim Zayko, EMERCOM of Russia, Andrey Kudinov, Russian National Emergency Management Centre, EMERCOM of Russia “Using the information of space monitoring system for operational control in EMERCOM of Russia” Janggam Adhityawarma, ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) “Current Status and Future Needs of Space-based Information for Regional Disaster Monitoring and Response at AHA Centre” Andrey Kudinov, Russian National Emergency Management Centre, EMERCOM of Russia Maksim Zayko, EMERCOM of Russia “Results of the work on the creation of centers for Crisis Management unified state system of prevention and liquidation of emergency situations and objectives for their development”
11.15 – 11.30	Coffee Break
Session 5 11.30 – 12.15	Remote Sensing and Emerging Environment Issues (Chairman Andrey Sarychev) Maria Dorofeeva, RDC SCANEX, Russia “Space Watch” – a system of public monitoring from space Philippe Courrouyan, CLS-Asia “Prevention and Management of Natural Disasters”*
12.15 – 12.30	Workshop Closing remarks Maksim Zayko, EMERCOM Russia
12.30 – 12.40	Workshop Adjourn
13.00 – 14.00	Lunch
16.00 – 21.30	Technical Tour

* Presentation was not presented during workshop due to technical reasons (flight delay – late speaker arrival), slides included into Project Final Report



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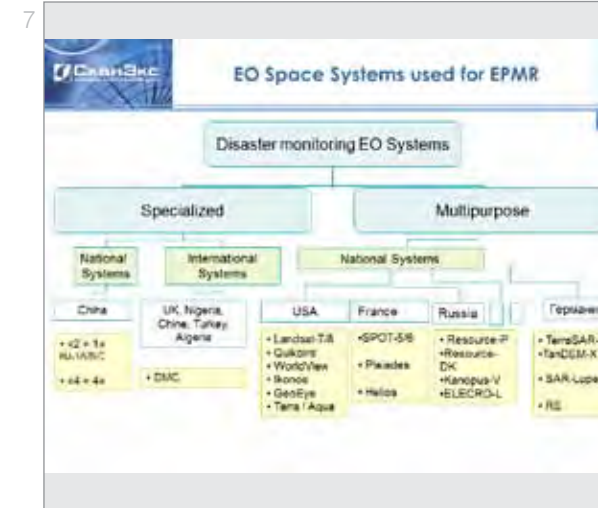
СКАНЭКС
International Space Research Center

**Application of Satellite Technologies for
Emergencies Preparedness,
Management and Response (EPMR) in
Asia-Pacific Region**

Kucheiko Alexey
Deputy General Director
R&D Center SCANEX

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- 2
- CleanSpace
1. Space Imaging and Its Role in Disaster Monitoring
 2. History of Remote Sensing Technologies in EPRM
 3. Main Requirements to Data and Services for Disaster Monitoring
 4. Operative Response – what is it?
 5. Best Practice in Space-Based Disaster Monitoring
 6. Some Examples from Russian Experience

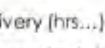


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Progress in EO Technology

Military Imagery Intelligence IMINT

 - Race for spatial resolution ($\ll 1$ m)
 - Race for fast response and fast image delivery (hrs...)
 - Race for weather and light condition independent duty cycle (SAR, IR, Hyperspectral...)
 - Race for better informational content (multi-, hyperspectral, lidars, news sensors, data fusion,...)
 - Race for better and remote access (mobile sets, web-access, cloud technology,...)



- EO Satellite Systems
- 170 satellites with active EO sensors including meteosatellites were operated by 32 countries and organizations in 2013.
 - appr. 10 leading countries are operates >80% of satellites with EO sensors: USA, China, India, Russia, Germany, France, UK, Japan, Korea, Israel, and others.

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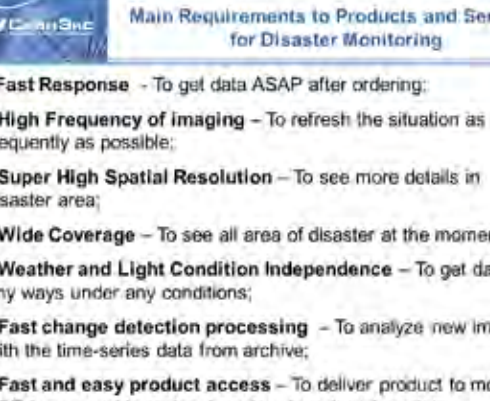
EO Technology Role in Emergencies
Preparedness, Management and Response

EO Systems are de-facto mandatory tools for EPMR

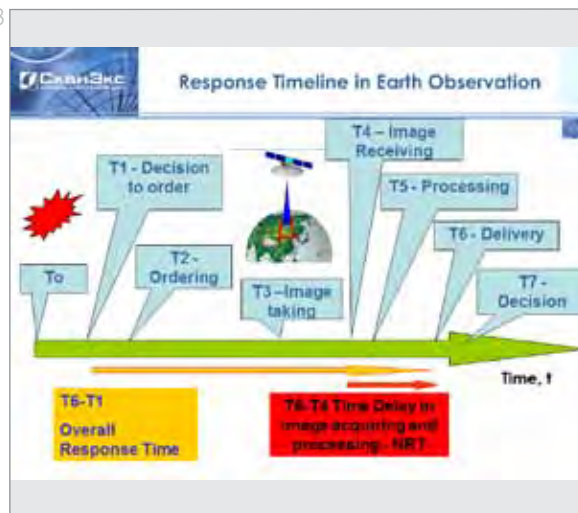
 - 2004 Indian Ocean Earthquake and Tsunami
 - 2010 Haiti Earthquake
 - 2011 Japan Tohoku Earthquake and Tsunami
 - 2012 Krymsk (Russia) Flash Rain Flooding
 - 2013 Far East Flooding in Russia and China

Floods, Typhoons, Fires, Landslides, Cyclone, etc



- 12
- 
- ## Main Requirements to Products and Services for Disaster Monitoring
- **Fast Response** - To get data ASAP after ordering;
 - **High Frequency of imaging** - To refresh the situation as frequently as possible;
 - **Super High Spatial Resolution** - To see more details in disaster area;
 - **Wide Coverage** - To see all area of disaster at the moment;
 - **Weather and Light Condition Independence** - To get data in any ways under any conditions;
 - **Fast change detection processing** - To analyze new images with the time-series data from archive;
 - **Fast and easy product access** - To deliver product to mobile S&R teams and to regional centers trough web-portal: 

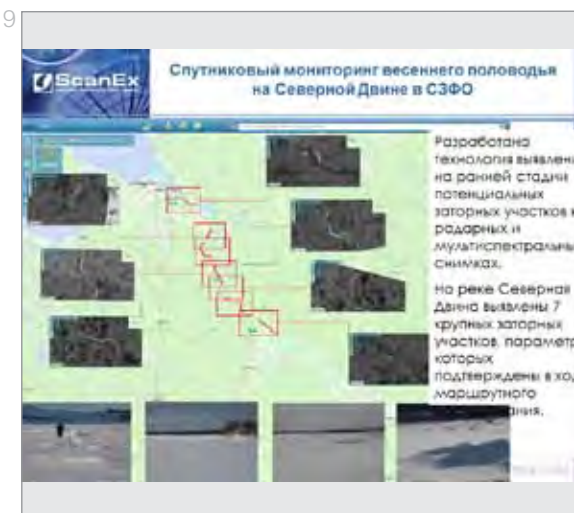
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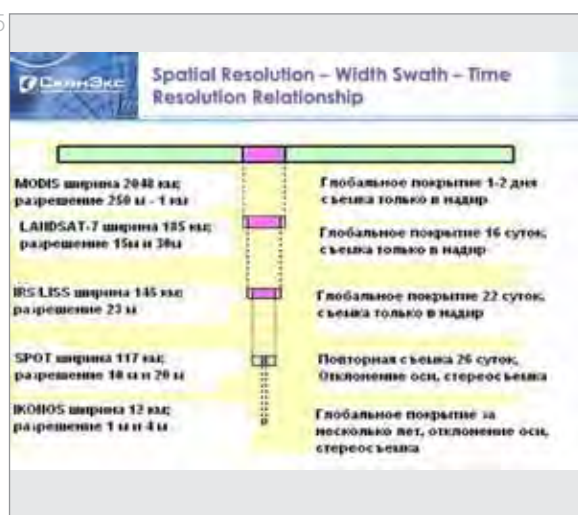
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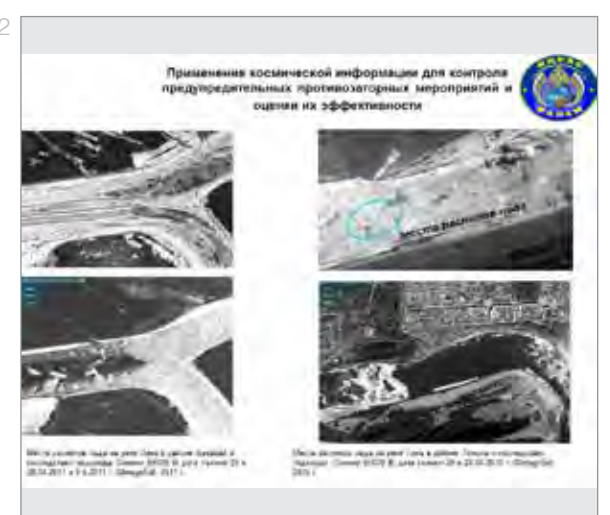
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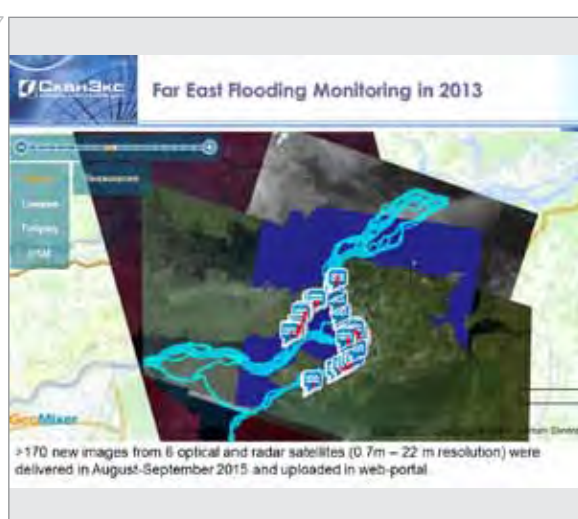
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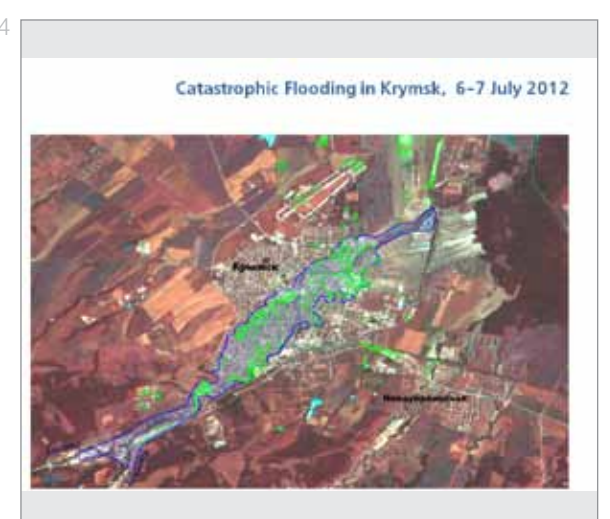
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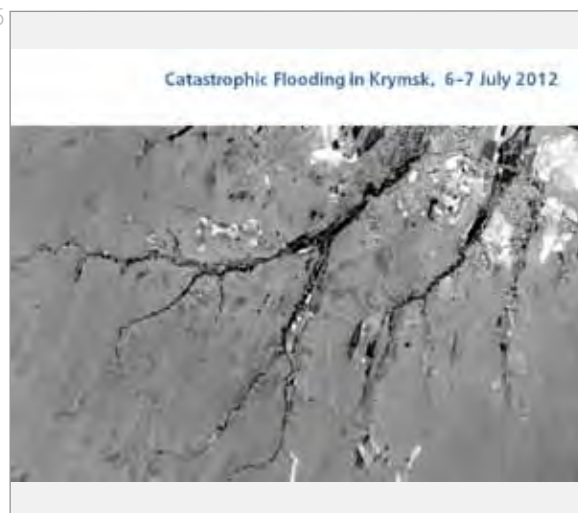
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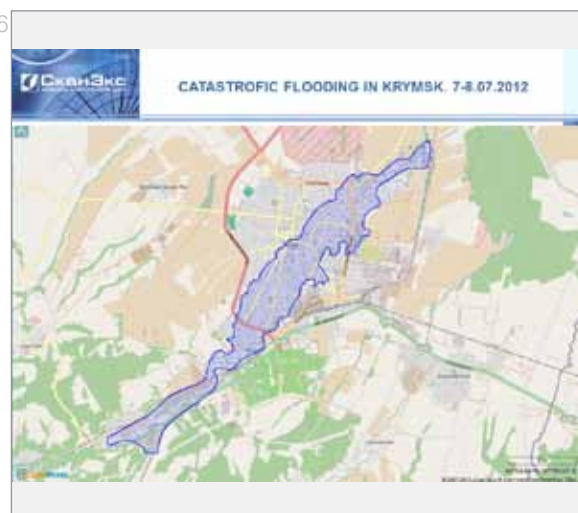
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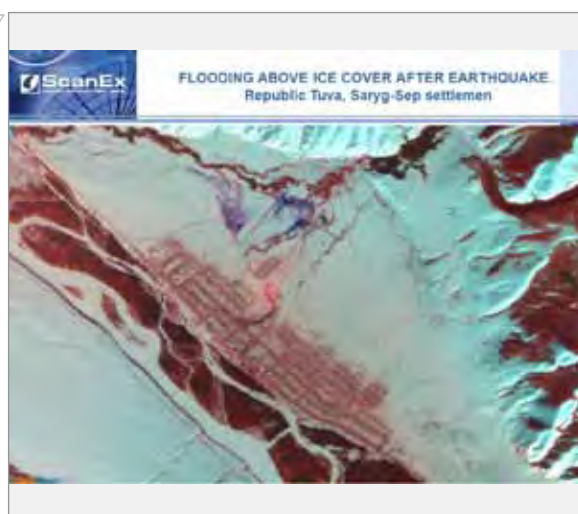
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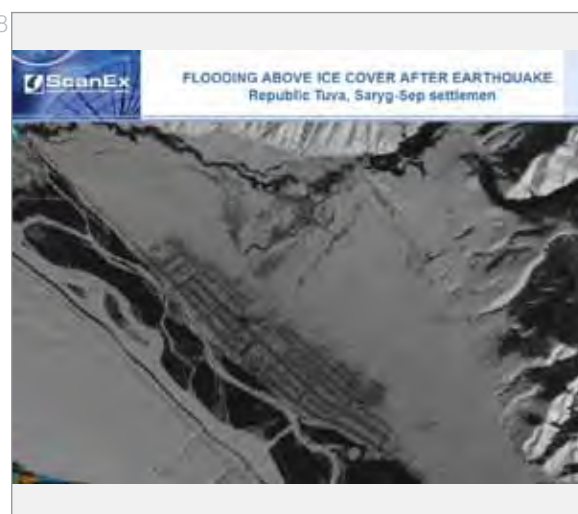
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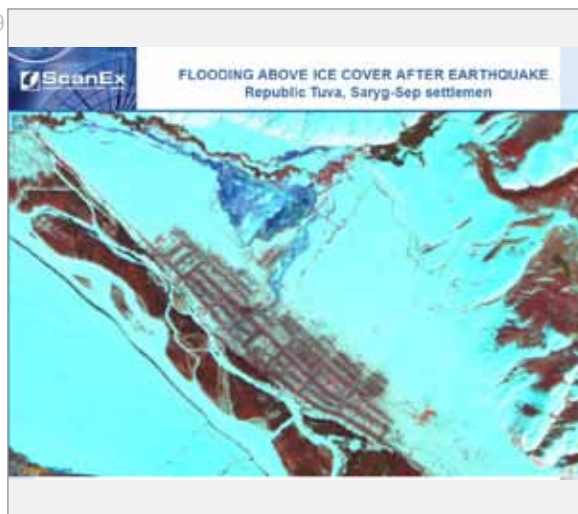
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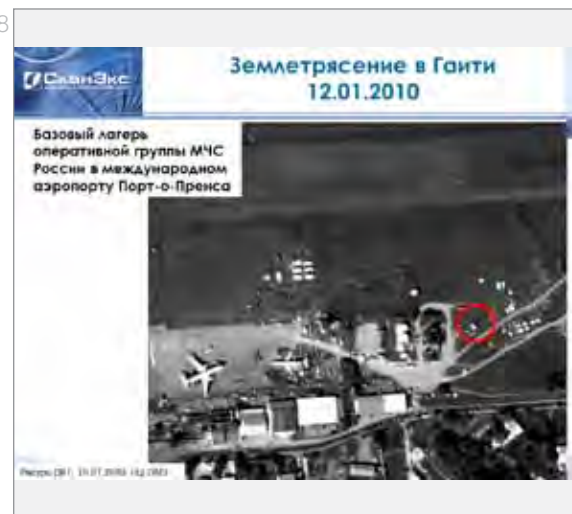
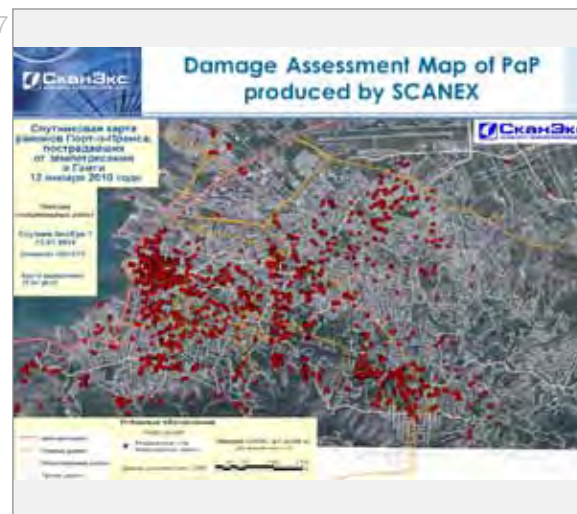
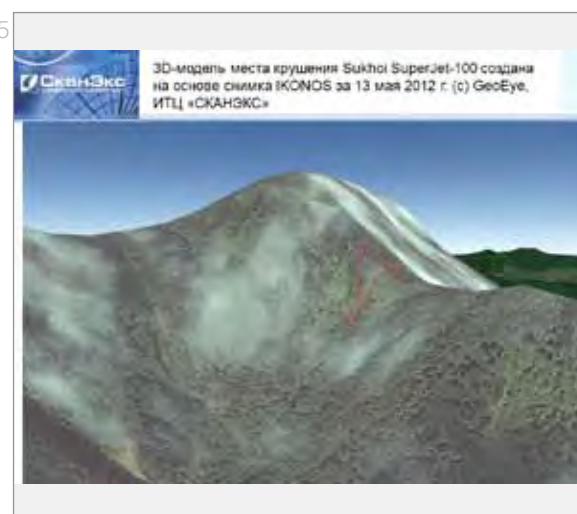
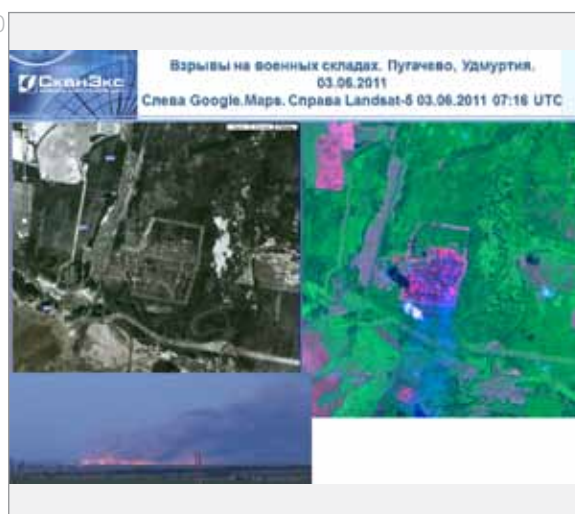
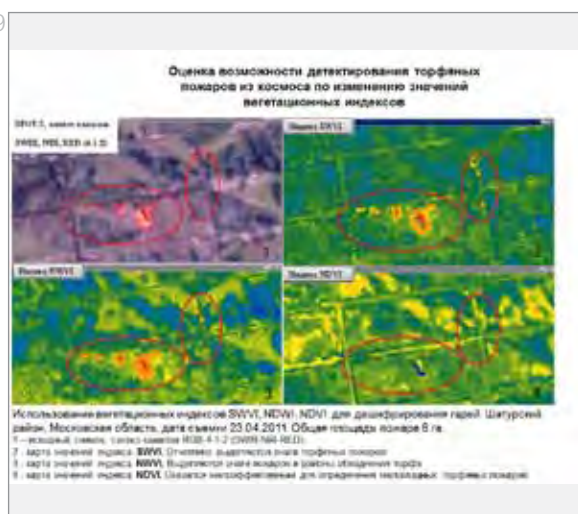
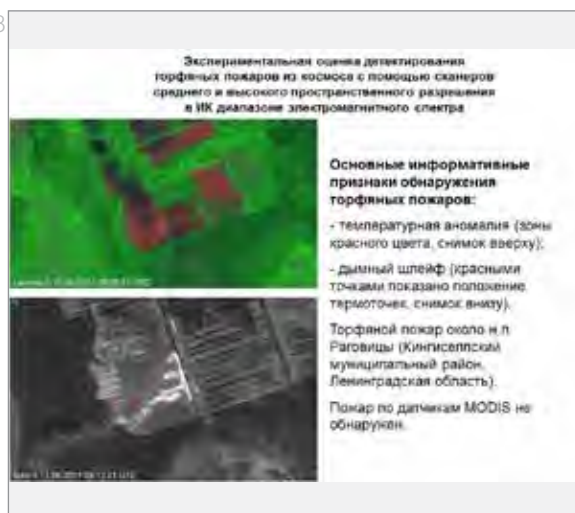


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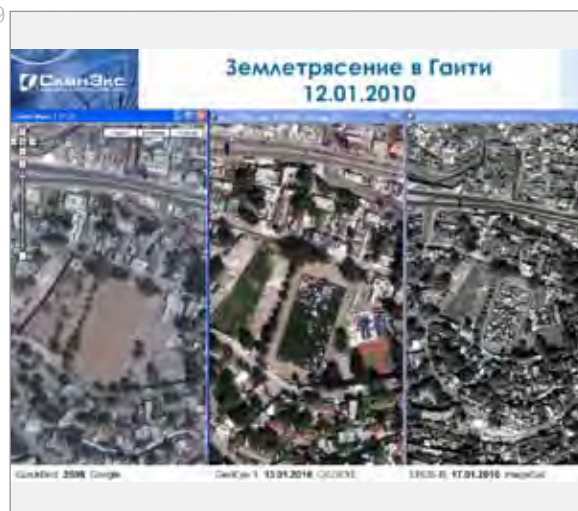


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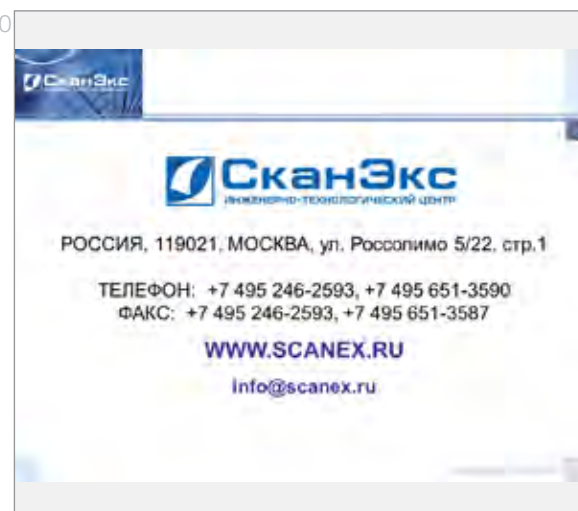




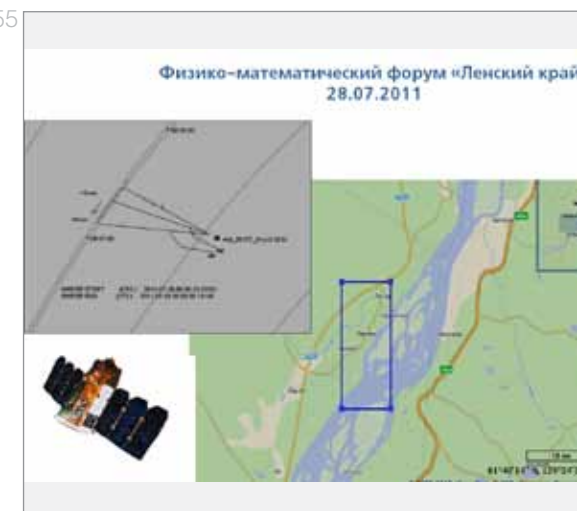
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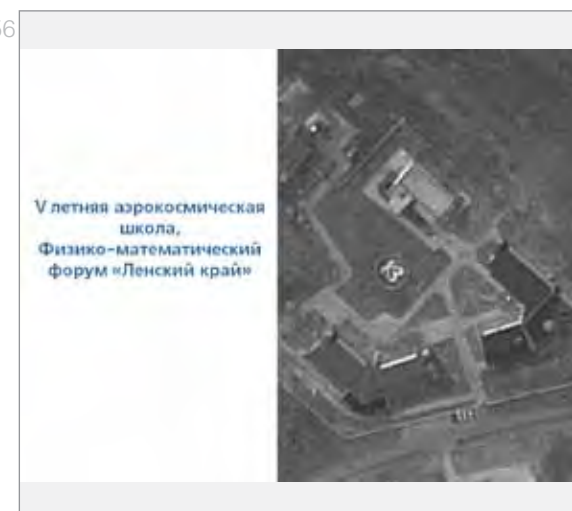
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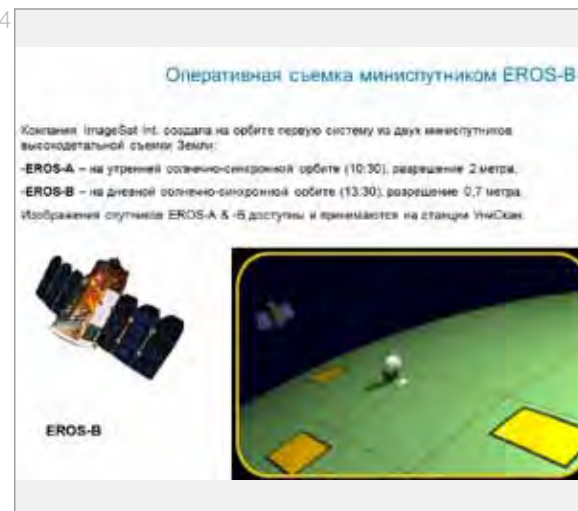
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1

Space Technology Application for Disaster Management in China

Dr. Zhang Wei
Department of Satellite Remote Sensing
National Disaster Reduction Center of China, MCA
China National Committee for Disaster Reduction
Oct, 2013

2

Content

- 1 Overview of Natural Disaster in China
- 2 Natural Disaster Management System
- 3 Space Technology Applications
- 4 International Cooperation

3

Content

- 1 Overview of Natural Disaster in China
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4

Overview of Natural Disasters

China is one of the countries in the world that suffer the numerous natural disasters. Along with global climate changes and its own economic takeoff and progress in urbanization, China suffers increasing pressure on resources, environment and ecology. The situation in the prevention of and response to natural disasters has become more serious and more complicated.

— Excerpts From China's Actions for Disaster Prevention and Reduction (2009)

5

Distribution of Frequent Natural Disasters in China

- Diverse types
- Wide scope of distribution
- High frequency
- Huge losses

6

Content

- 1 Overview of Natural Disaster in China
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- 4 International Cooperation

7

National Committee for Disaster Reduction (NCDR)

National disaster reduction center of China (NDRCC)

- information management
- disaster risk assessment and product service
- space technology application
- research on scientific technology and policies
- research and development of technical equipment and disaster relief materials
- publicity and education
- training
- international cooperation

8

Content

- 1 Overview of Natural Disaster in China
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9

Disaster management demand for space technology

$D = E \cap H \cap S$

Stability
H - Risk
V - Vulnerability
D - Severity

Space technology is important means.

10

Supporting to Disaster Management

Space technology

Risk assessment
Early warning
Monitoring
Damage assessment

Disaster management

Prevention
Preparation
Emergency Response
Reconstruction

Support

11

Application Products

Products of space technology application

- Disaster Characteristic Parameter
- Disaster Risk Assessment
- Disaster Monitoring
- Disaster damage assessment
- Disaster recovery assessment

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Earthquake

Damaged Buildings Assessment in yushu earthquake

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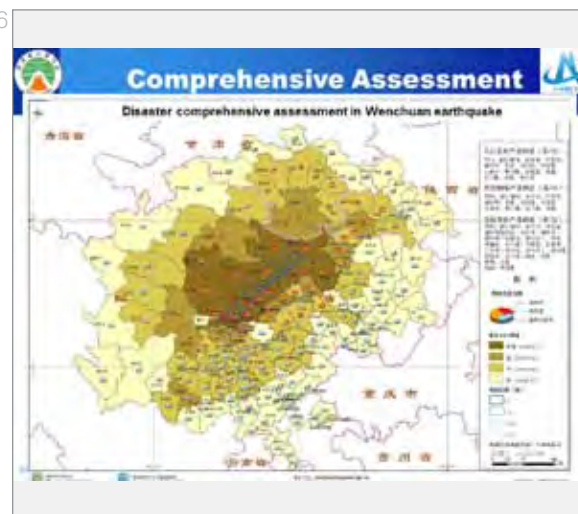
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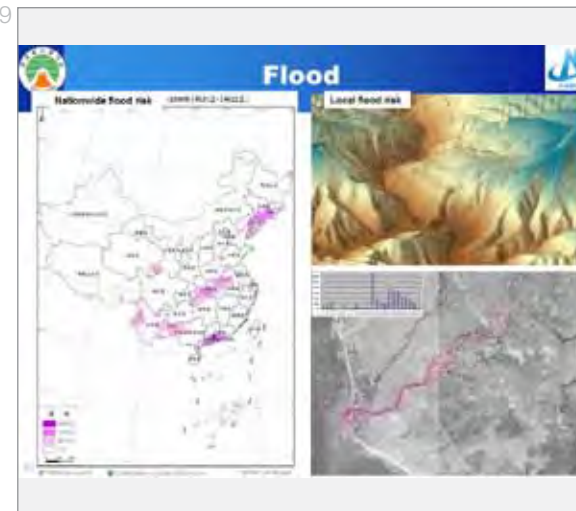
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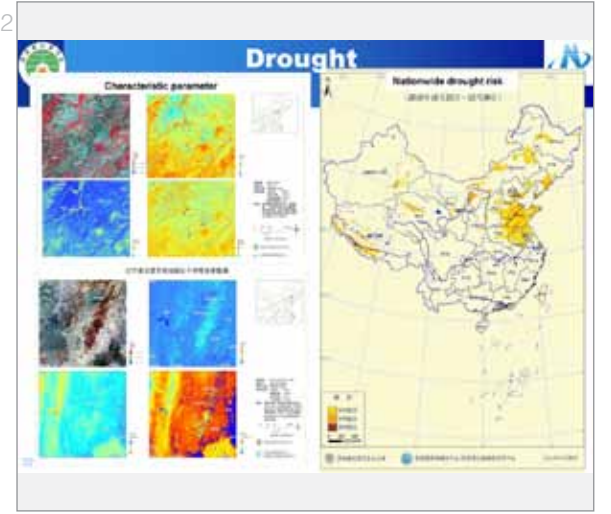
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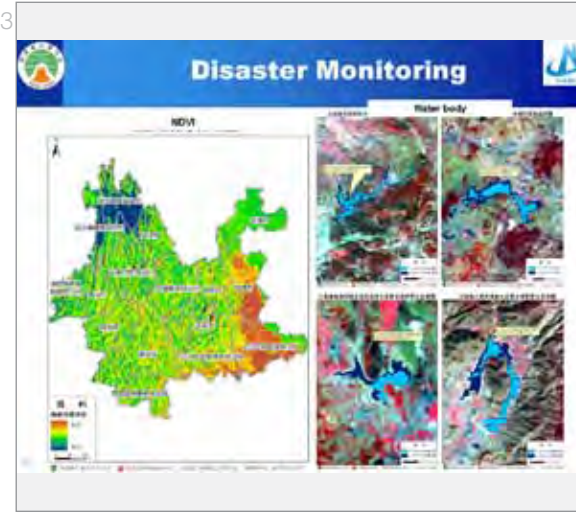
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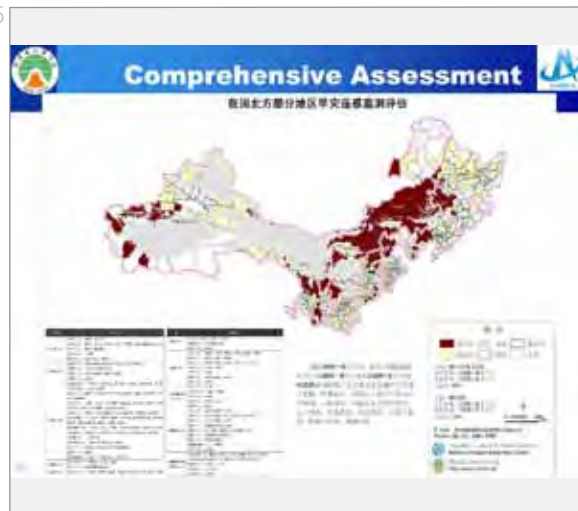
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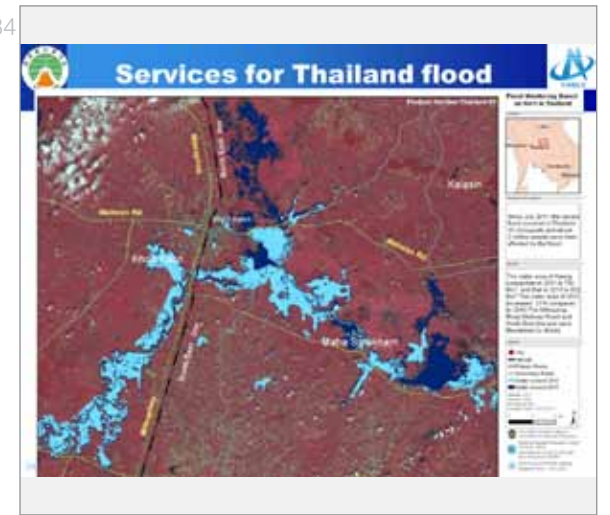
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Services for Australia Wide Fire 2003

“thank you, and through you, to thank other Chinese agencies and the Chinese government, for your wonderful support for fire-fighting over the last four weeks in Victoria, Australia, by providing HJ and other satellite imagery and analysis reports.”

“The tremendous support Australia received from China in accessing your satellites has demonstrated to us the potential for great gains to Australia in growing the Australia-China friendship.”

Dr. Peter Woodgate

38

Services for Australia Wide Fire 2013

- 19 Oct, 2013, NDRCC received the Australia fire requirement, immediately started up “Working Procedure for Emergency Response with Space Technology Application” and arranged satellite observation plan.
- At 7 am Beijing time, 20 Oct, 2013, NDRCC successfully imaged disaster area. At the same, NDRCC offer data and products to Australia.
- By now, NDRCC has arranged 7 tracks of HJ-1, provided 14 data and 5 products. This work is still ongoing.

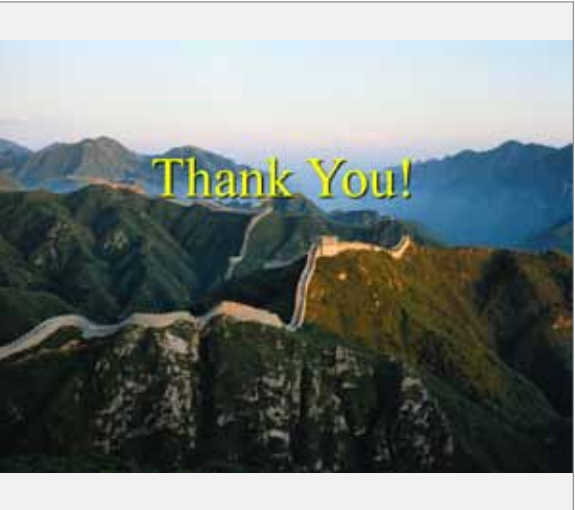
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Services for Mexico sea oil

Monitor in 10th. May

Monitor in 13th. May

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1

The use of GIS data for the projection of the impact of an earthquake in Lima, Peru

Cesar Carcamo
School of Public Health and Administration
Universidad Peruana Cayetano Heredia

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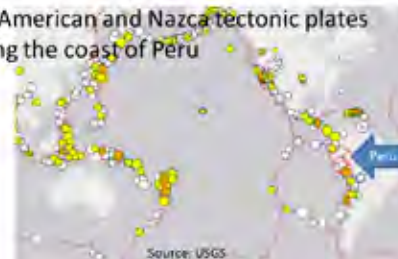
The project

- Title in Spanish: "Diseño de escenario sobre el impacto de un sismo de gran magnitud en Lima Metropolitana y Callao"
- Requested by: INDECI (Peruvian National Institute of Civil Defense)
- Carried out by: PREDES (Center for the study and prevention of disasters)
- Funded by: COSUDE (Swiss Agency for the for the Development and Cooperation)
- Full report at: http://www.predes.org.pe/predes/images/dis_esc_lim_a.pdf

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About Peru

- Population: 30'475,144
- Capital: Lima
- Located within the Ring of fire"
- The South American and Nazca tectonic plates collide along the coast of Peru



Source: USGS

4

About Lima

- Population of Lima: 8'021,630 (2007)
- A coastal city
- Affected by 19 big earthquakes and 117 tsunamis since 1552 – Thousands of deaths
- The soil in most of the city is alluvium (pebble, sand, silt)
- Some part of the city were built over sandy soil or former landfills
- Key for government, transportation and communications in the country



5

Study objective

- To build the scenario of an earthquake (magnitude 8 in the Richter scale) and a Tsunami, in order to:
 - Estimate the potential damage
 - Plan and improve a response
 - Identify and minimize risk

6

Methods

7

Methods

- Secondary data
- GIS used to organize the data
- Limited to the Callao province and most districts (41 of 48) of the Lima Province
- Time: 4 AM (most people at their homes)
- Results at the district level (or smaller when possible)

8

Estimation of damage by an Earthquake

- Based on:
 - Soil composition
 - Evaluation of seismic amplification
 - Estimation of vulnerability of the buildings (district level or smaller):
 - Construction material
 - Age
 - Height
 - Maintenance status
 - Intensity of use
 - Others
 - Population density

9

Estimation of the delay and wave height of a tsunami

- Location: 70 Km west of the coast
- Intensity: VIII (Modified Mercalli)
- Depth: 33 Km
- Estimation based on:
 - Bathymetry of the ocean floor
 - Magnitude of the earthquake
 - Altitude on land (Google earth)

10

Results

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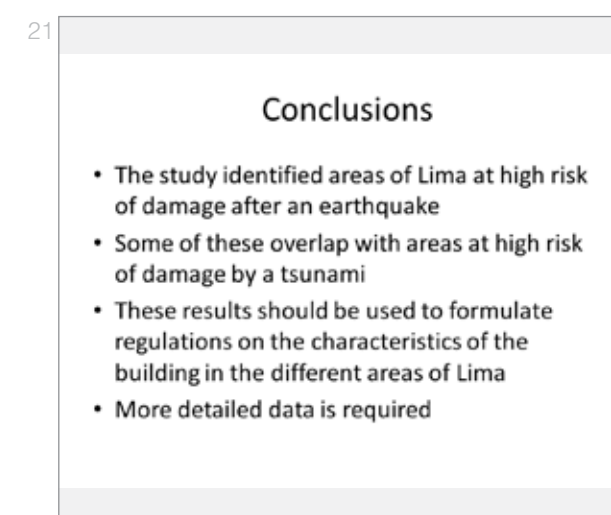
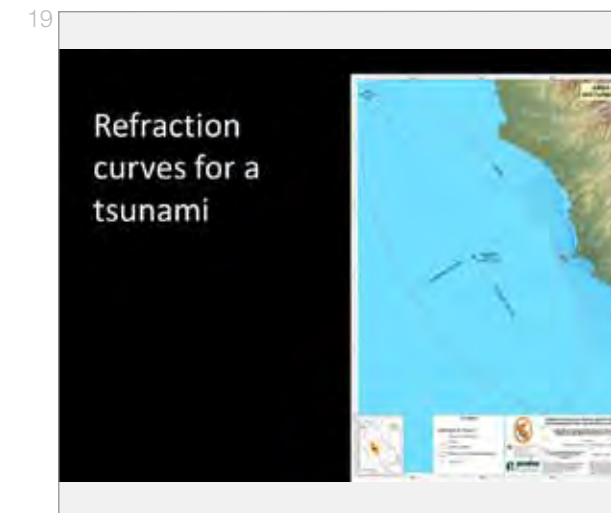
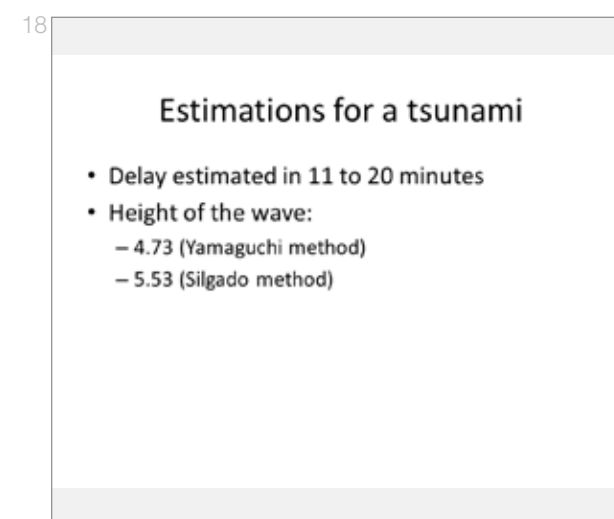
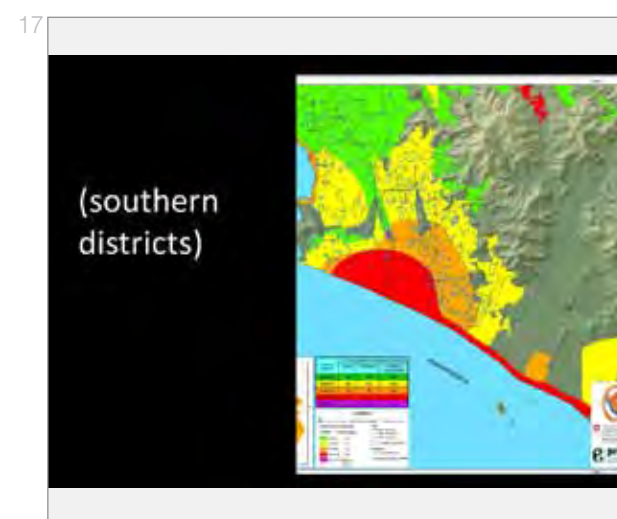
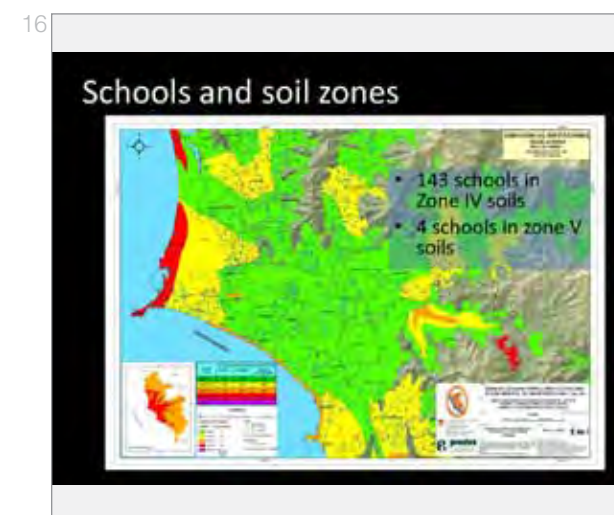
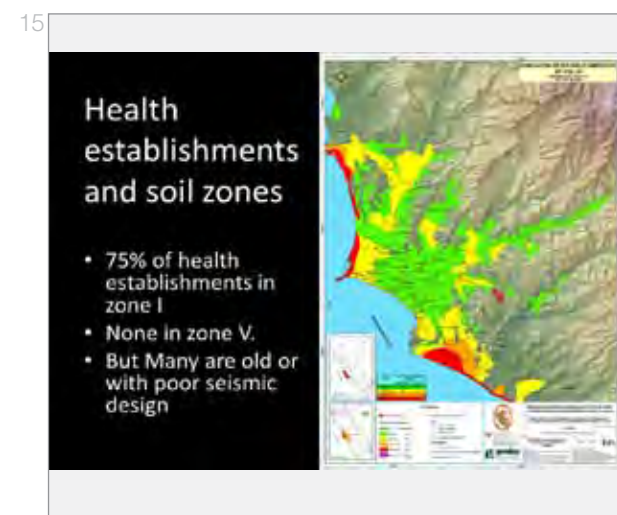
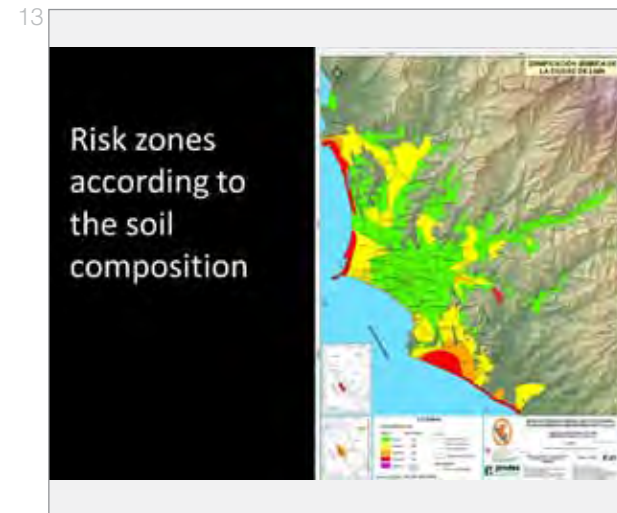
Potential damage by an earthquake

- 51,019 deaths
- 686,105 wounded
- 200,345 (11%) homes destroyed
- 348,328 (19%) homes uninhabitable
- Some of the main hospitals would also collapse

12

Soil composition

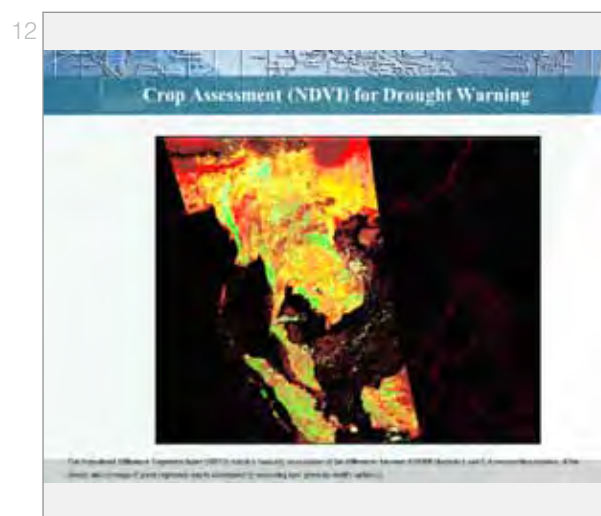
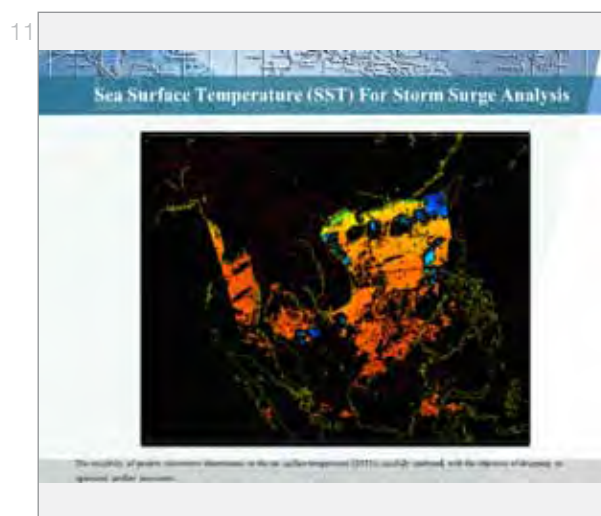
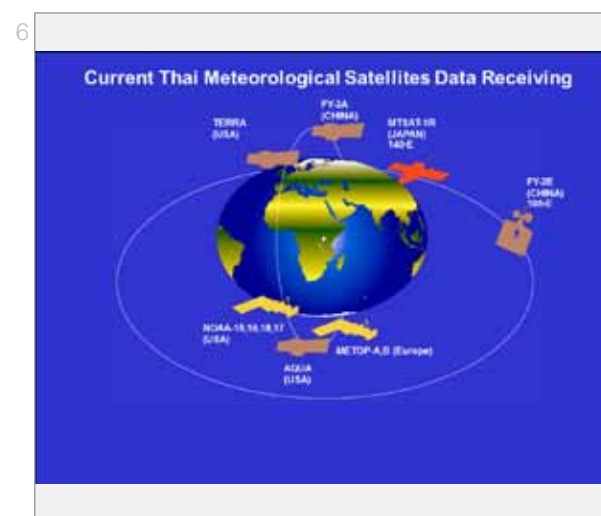
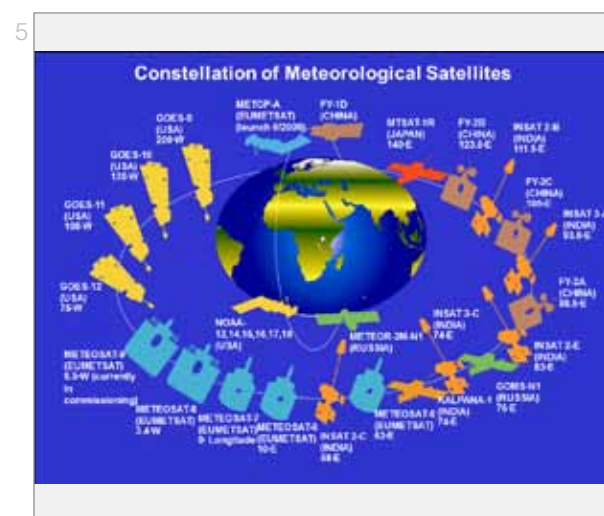
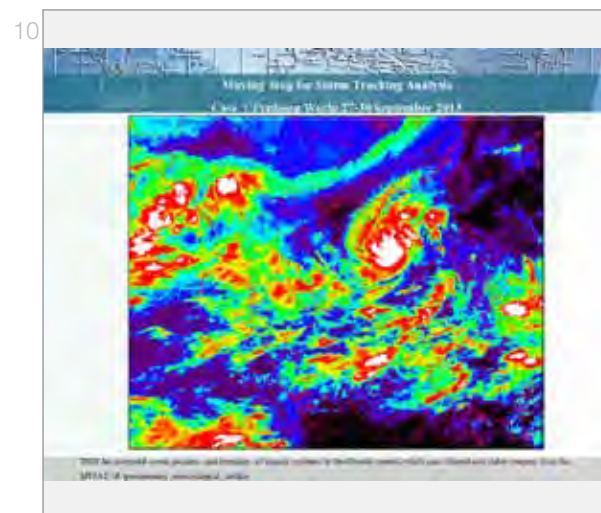
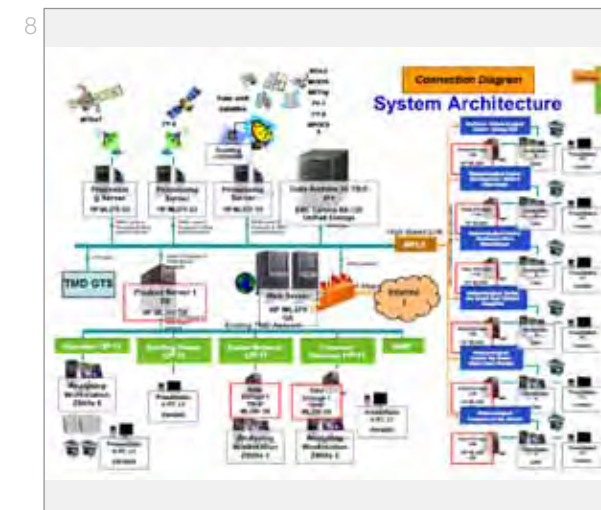
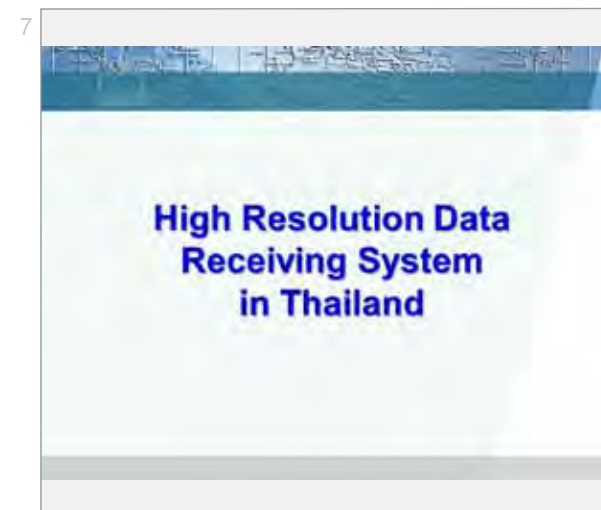
- Five risk zones identified:
 - Zone I: Low risk. Rock or solid alluvial soil
 - Zone II: Intermediate risk. Thin layer of fine material on top of solid ground
 - Zone III: High risk. Thick layers of fine material and sand
 - Zone IV: Very high risk. Thick layers of sand deposited by wind or the ocean
 - Zone V: Unmeasured risk. Landfills





Application of Satellite Technologies for Emergencies Preparedness, Management and Response (EPMR) In Thailand

Kriengkrai Khovadhana, National Disaster Warning Center



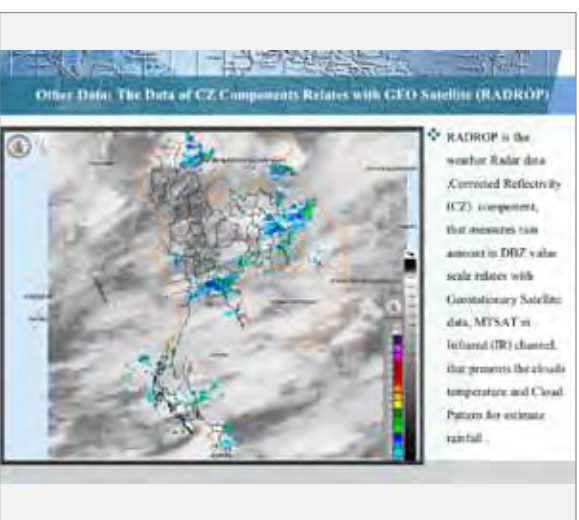
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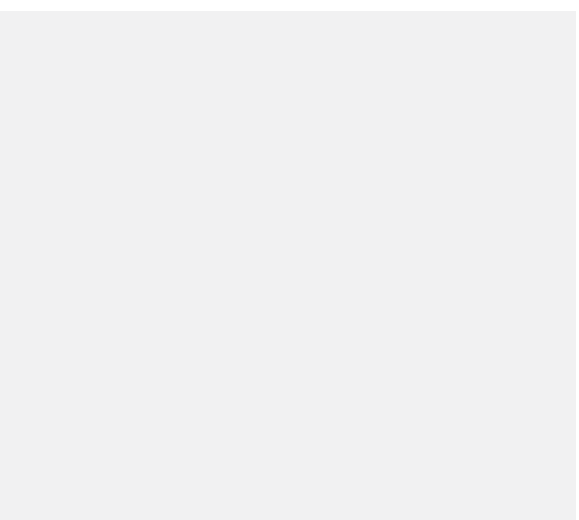
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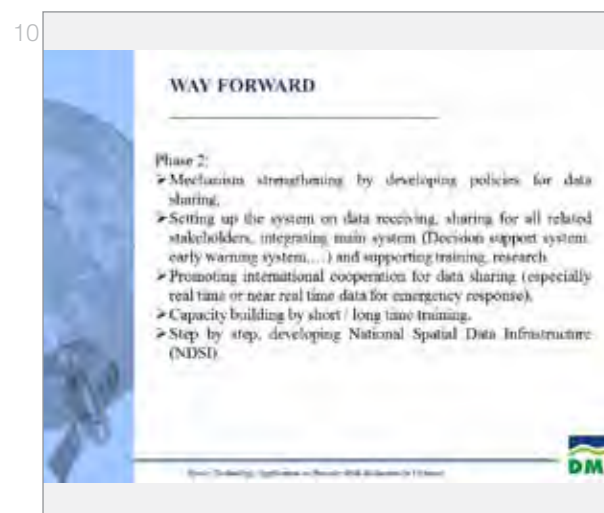
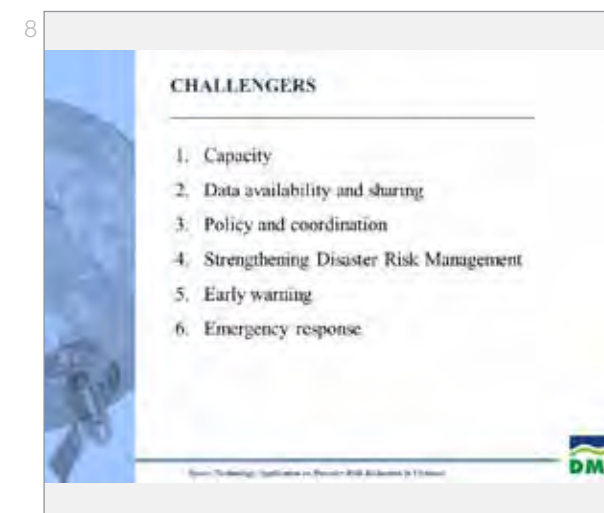
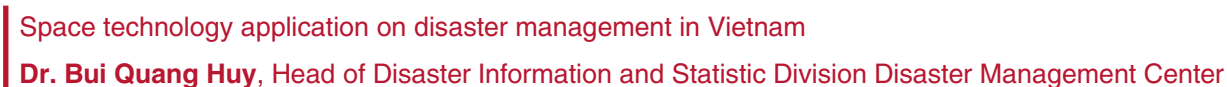


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Space Technologies & Disaster Management: a U.S. Perspective

Fernando R. Echavarría, Ph.D.
Bureau of Oceans, Env. & Science,
Office of Space & Advanced
Technology, OES/SAT,
U.S. Dept. of State,
Washington, D.C., USA

APRC-EPWID Workshop:
Applications of Remote
Sensing Technologies for Emergency
Preparedness, Management &
Response (EPWID) - Alaska, Alaska,
October 20-21, 2013



Source: USGS
Lena River Delta, Siberia,
7/27/2000, Landsat-7

Outline

- What do U.S. government agencies in this area?
 - NASA research + supports operations
 - Multiple hazards: tornados, oil spills, earthquakes
 - Contributes to programs such as: SERVIR, FEWSNET
 - NOAA operational using Geostationary and Polar orbiting satellites
 - Weather Ready Nation
 - GEONETCAST
 - USGS research and operational work
 - Interferometric SAR, VDAP
 - GNSS for seismic and volcanic hazard risk assessments
 - U.S. and International Partnerships
 - CEO and CEOS
 - Int'l Charter on Space and Major Disasters
 - Some U.S.G contacts on Disasters



NASA: Remote Sensing Technologies and Data Analysis for Disaster Response

©2011 NASA/ESA/USRA

NASA Disaster Area Challenges

- NASA is a research agency
 - In the event of a disaster NASA applies available assets
- Some overlap between disaster response and science research and analysis
 - Immediate need for information greater for disaster response than for science
- Transferring application research results to end-users
 - Requires existing partnerships and collaborations
 - Is facilitated by joint projects and simulations
 - Develop communication and identify existing gaps

NASA Applied Sciences Natural Disasters Program

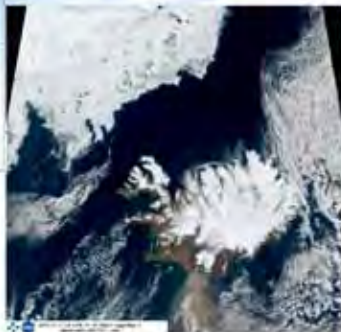


Iceland Volcano 2011

Eyjafjallajökull Volcano Eruption Ash Plume

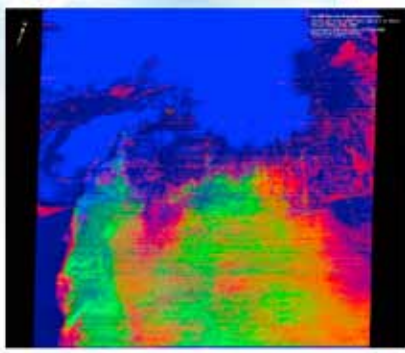
Iceland's Eyjafjallajökull Volcano burst into life on March 20, 2010. In mid-April, a huge plume of ash erupted and spread across the North Atlantic, shutting down air traffic in Europe. By April 21st, the eruption had quieted, but some ash emissions continued.

MODIS (Terra) visible imagery of the plume monitoring posted on the Iceland Met Office April 17, 2010





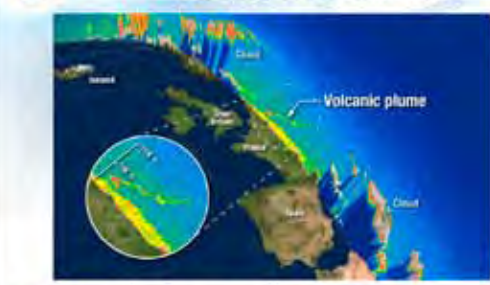
Eyjafjallajökull Volcano Eruption Plume Composition



ASTER (Terra) data were used in this processed image showing the composition of the plume – silicate ash (red), water vapor (green) and ice (blue).



Eyjafjallajökull Volcano Eruption Tracking of the Ash Plume

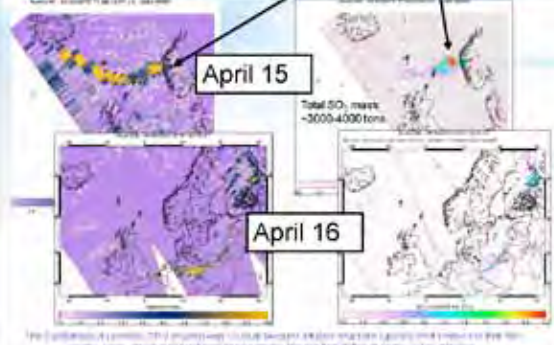


- CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations) satellite provided a bird's-eye view of the ash cloud's horizontal spread
- Ash cloud is seen as a thin, wispy layer of particles ranging in altitude from about 5,000 to 22,000 feet



Volcanic Plume Detection with Aura/OMI

OMI detects ash (Aerosol Index, AI) and SO₂



April 15
April 16

Total SO₂ mass ~3000-4000 tons



Deepwater Horizon Gulf of Mexico Oil Spill May – October 2010



Gulf Oil Spill Response

Science, response and recovery objectives are:

- To map locations of oil on the Gulf of Mexico's surface in support of direct mitigation efforts, including initializing and verifying NOAA's spill trajectory models
- To exploit AVIRIS's unique spatial and spectral characteristics to estimate volume of oil spilled (experimental, but based on results from USGS studies conducted after Hurricane Katrina)
- To document the condition of coastal ecosystems "before" any spilled oil reached them and to collect additional data "after" to understand the ecosystem impacts and the trajectories of natural and human-managed system responses to the oil spill



NASA Response to Gulf of Mexico Oil Spill

MODIS Visible: 29 April 2010
MODIS Infrared: 29 April 2010
ASTER: 24 May 2010

Satellites: Continuously monitored the "extent" of the spill

- Terra & Aqua / MODIS – visible and infrared daily synoptic
- Terra / ASTER – visible, near IR and thermal IR high res
- EO-1 / Advanced Land Imager and Hyperion – highest res
- Terra / MISR and CALIPSO / CALIOP

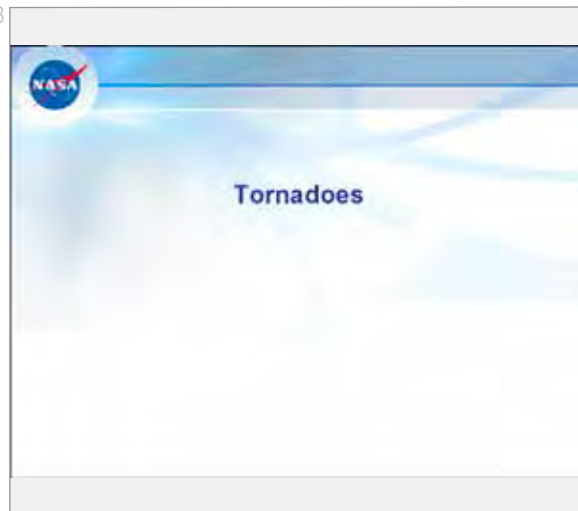
Airborne sensors: Measured spill extent and oil volume

- ER-2 / AVIRIS and DCS: 18 sorties, >120 flight hours
- Two Otter / AVIRIS: 32 sorties, 187 flight hours
- DC-8 / MISR: 5 sorties, 16 flight hours
- UAVSAR: 22-24 June: 4 sorties, 21 flight hours

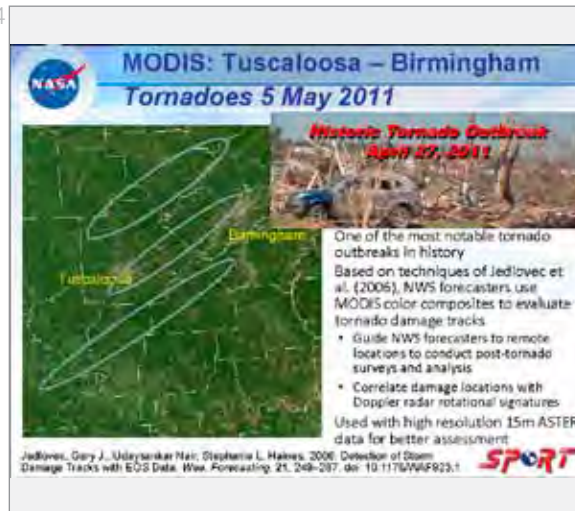
ER-2 Flights

Data provided for use by first responders:
NOAA used radiances to initialize trajectory model.
USGS used data to detect oil concentrations

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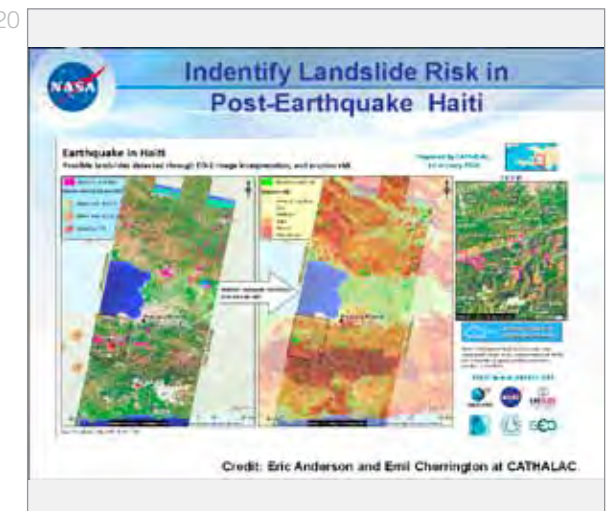
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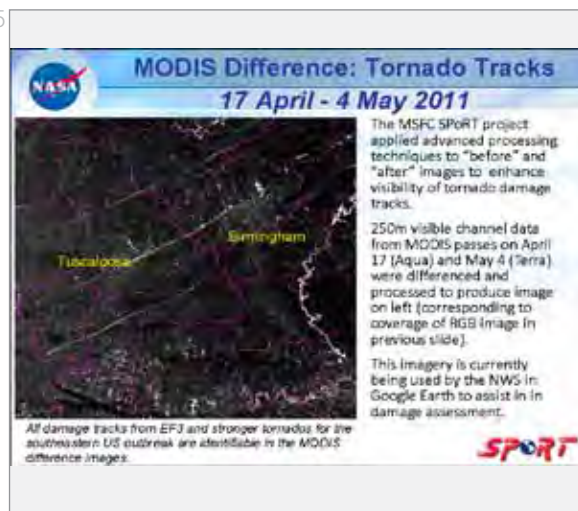
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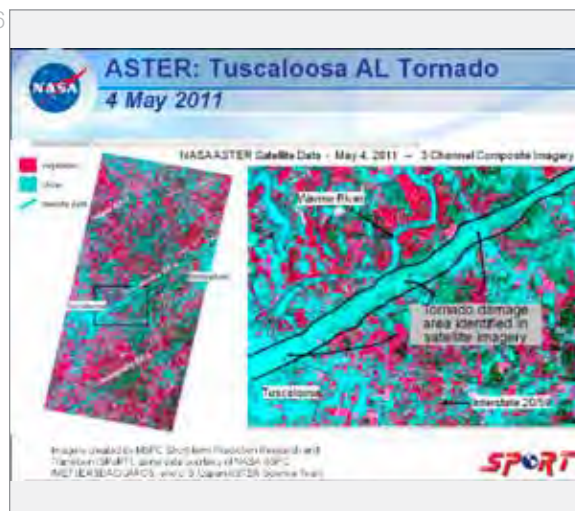
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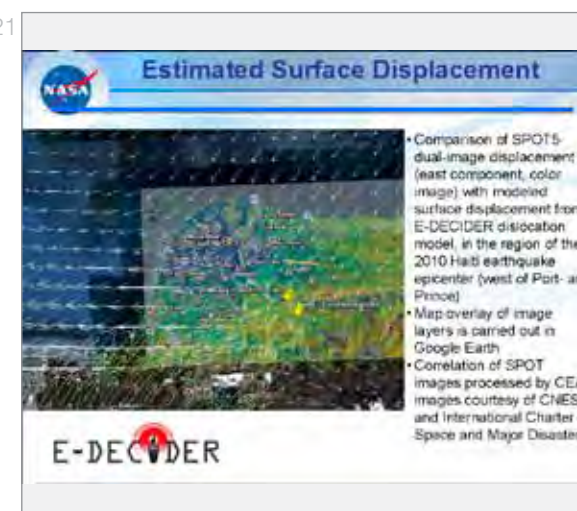
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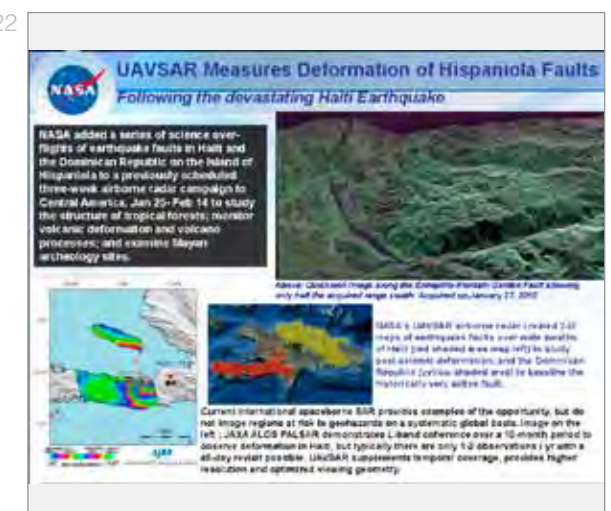
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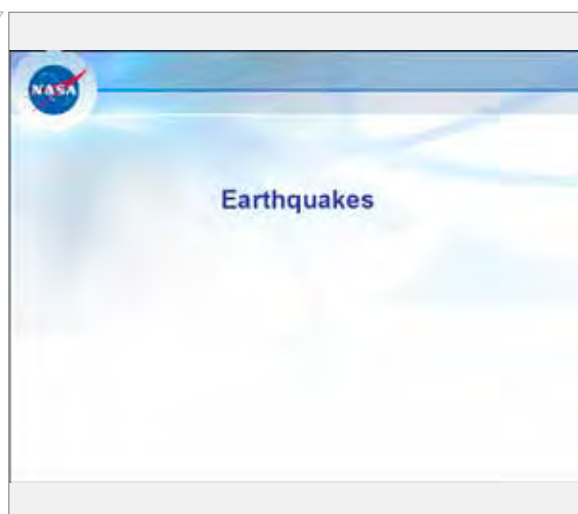
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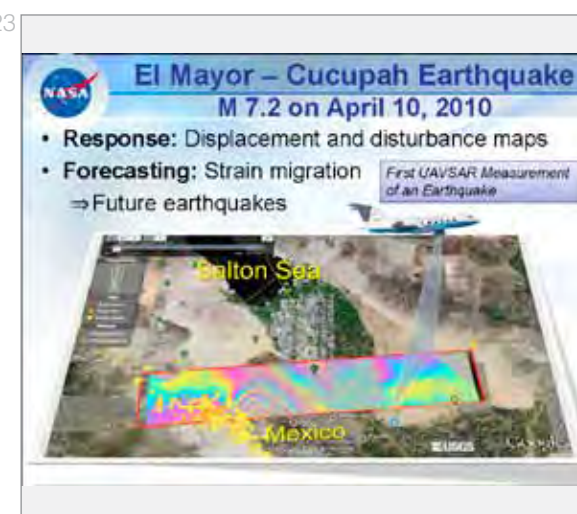
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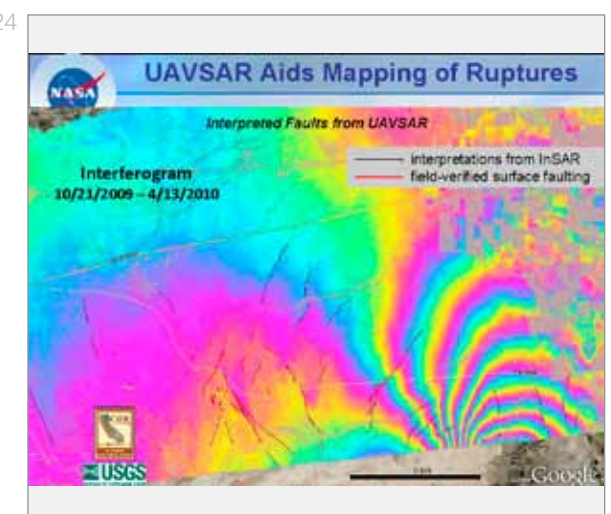
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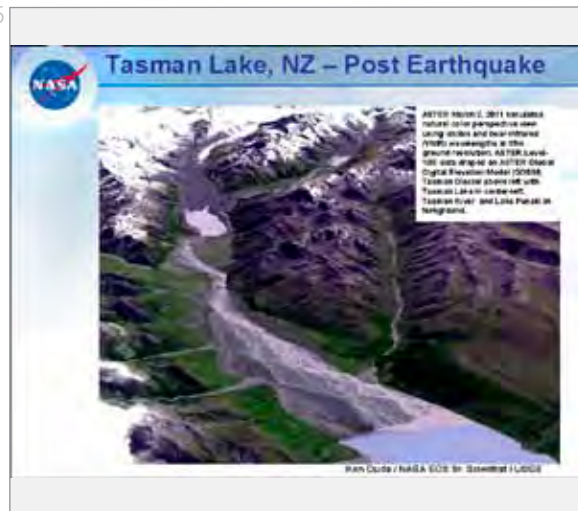
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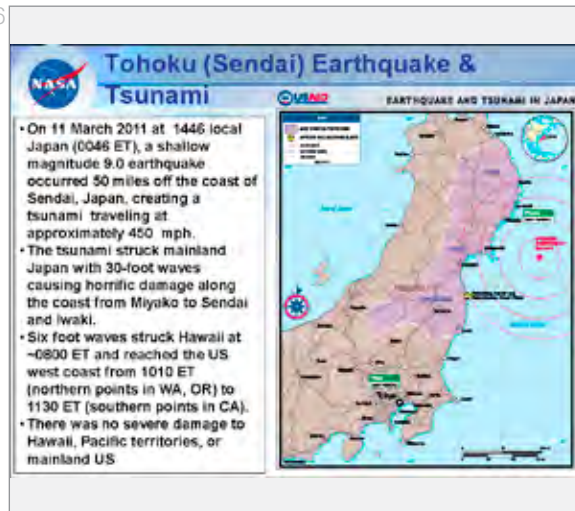
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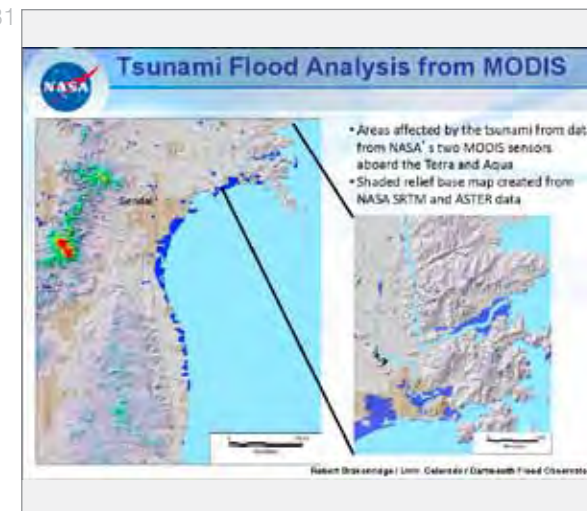
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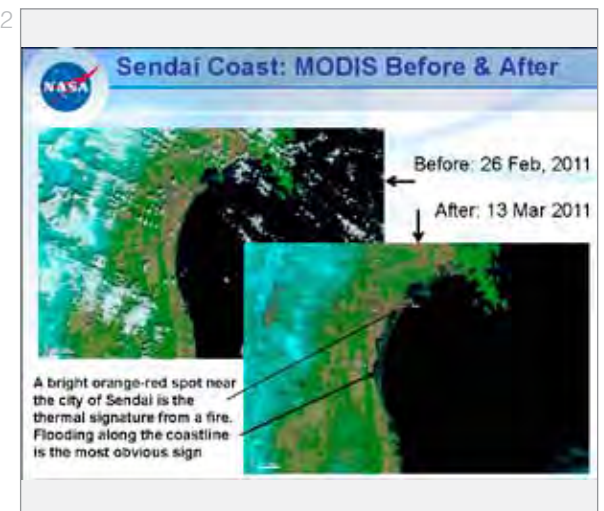
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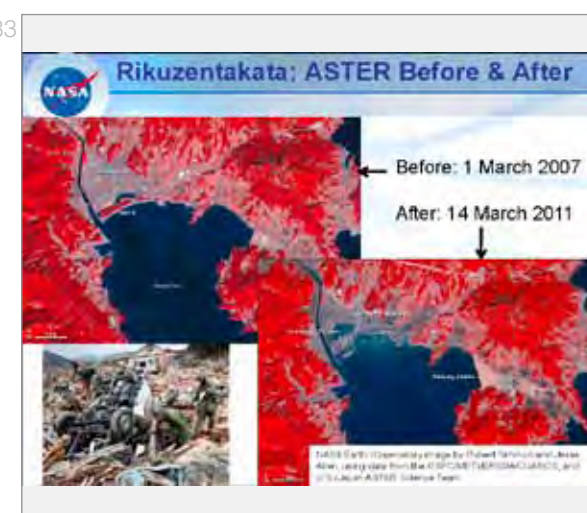
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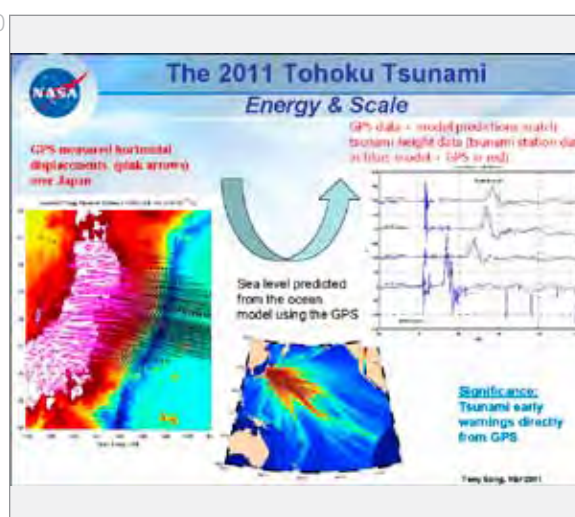
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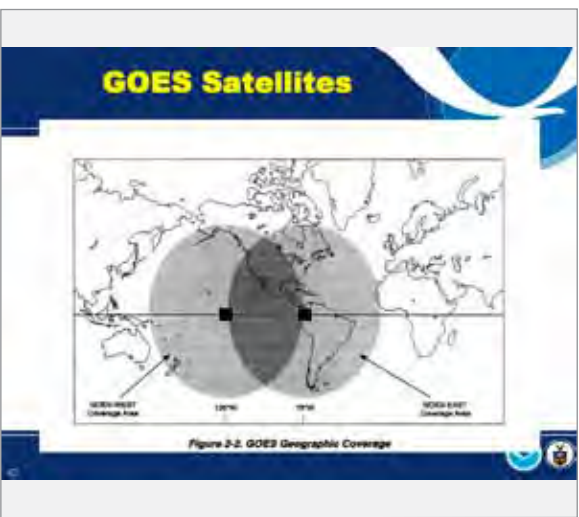
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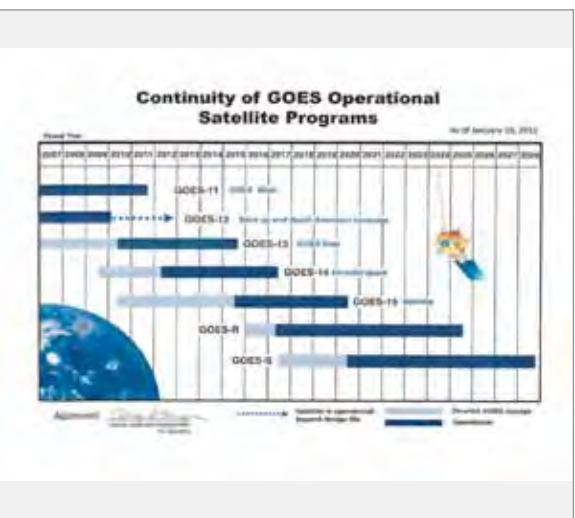
38



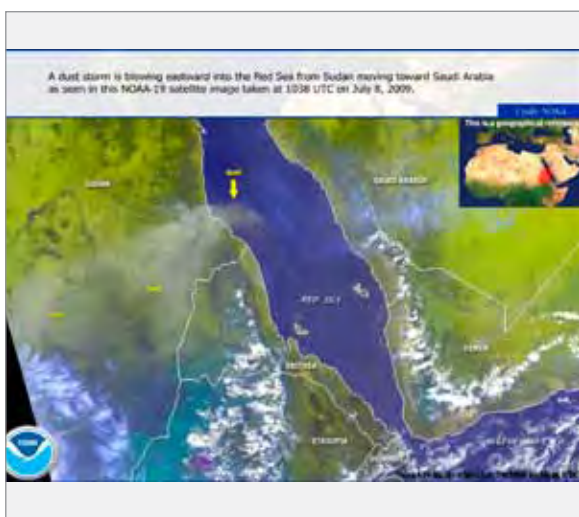
39



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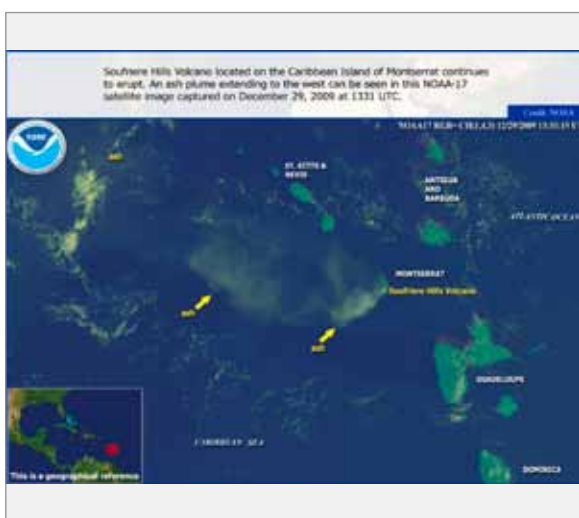
43



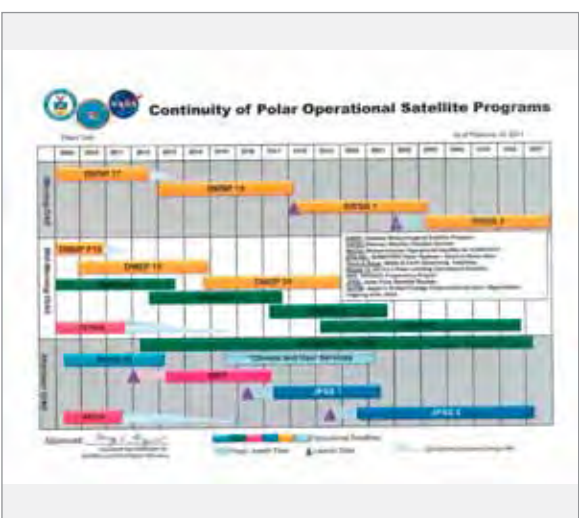
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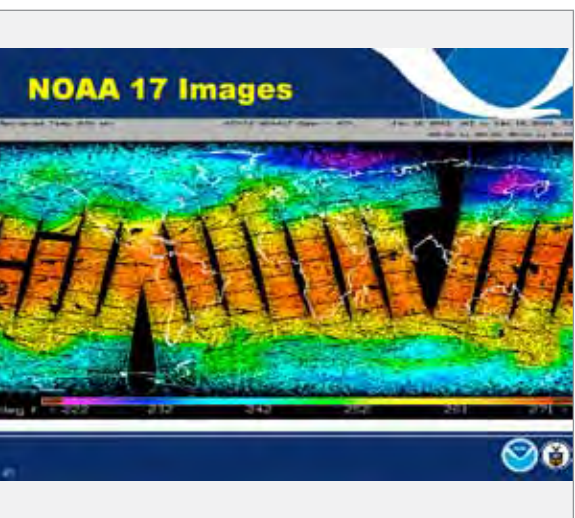
46



41



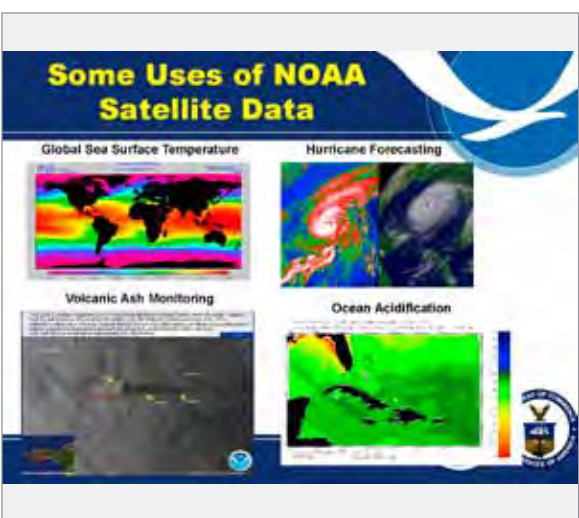
42



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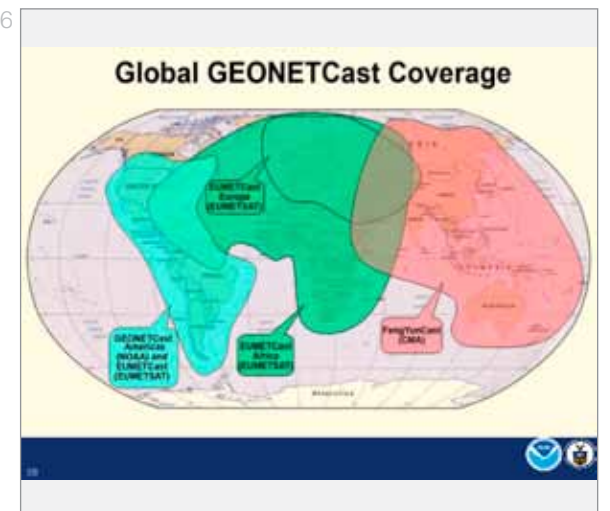


55

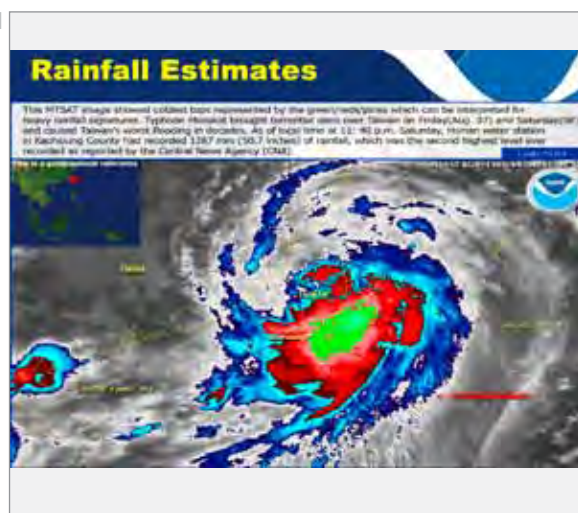
The GEONETCast Americas System

- US Contribution to GEO (Group on Earth Observations) and GEOSS (Global Earth Observation System of Systems)
- Operated by NOAA and Several Partners:
 - Brazil's INPE
 - Costa Rica's IMN
 - CATHALAC, Panama
 - Argentina's CONAE

56



51



52



57

GEONETCast Americas System

- Broadcasts 5,000 files/day over 19 subchannels
- Intelsat-9 (IS-9) geostationary comms satellite covers most of the Americas using a multiplexed C-band DVB-S transponder
- >99.9% service availability

58

GEONETCast Main Features

- Low Cost: Less than US \$ 3,000
- Once System Installed, Service is Free
- High Reliability
- No Internet Access: Can be Installed Anywhere
- It Disseminates Products, not Data → Doesn't Require Highly Trained Specialists
- Users Can Request Products

53

Satellite Products Relevant to LAC

Monitoring of Severe Weather

- Hurricanes and storms affect the LAC region, and pose major risks to life and property. Accurate and timely severe weather information is critical for responding to these events. Products:
 - Real-time rainfall
 - Ocean surface vector winds
 - Hurricane / extreme weather monitoring using microwaves
- Additional information on severe weather products is available at: <http://www.saf.nesdis.noaa.gov/star/amcd.php>

54

NOAA leads this initiative for the US

GEONETCast

Delivering Environmental Data to Users Worldwide

GEONETCast AMERICAS REGIONAL BROADCAST

Paul Seymour, NOAA, NESDIS, OSPD, SPSD, DSB
Eric Madsen, GEONETCast Point of Contact

59

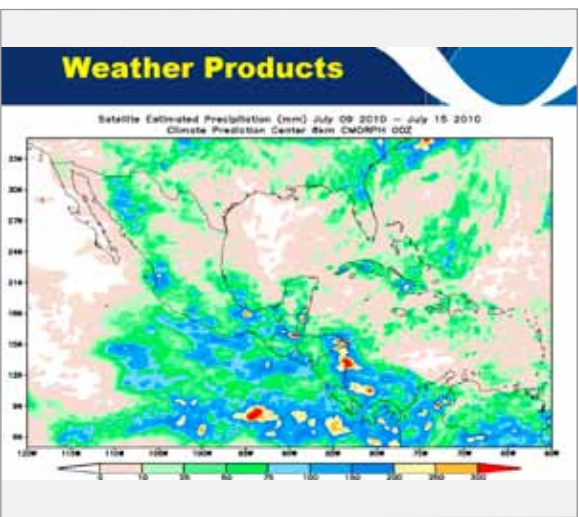
System Components

A photograph of a satellite dish antenna and a computer monitor. The text on the slide describes the system components and the data provided.

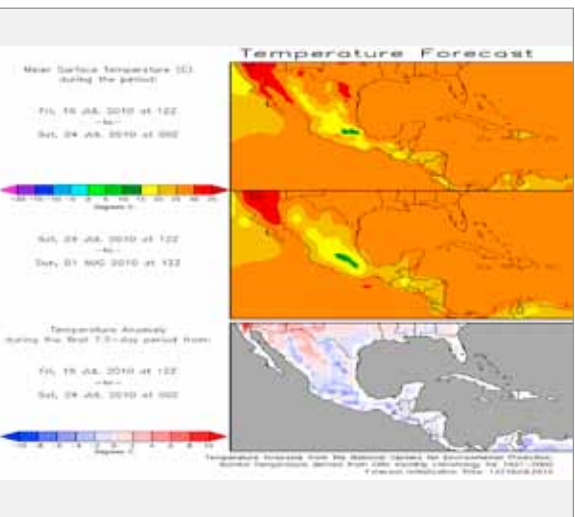
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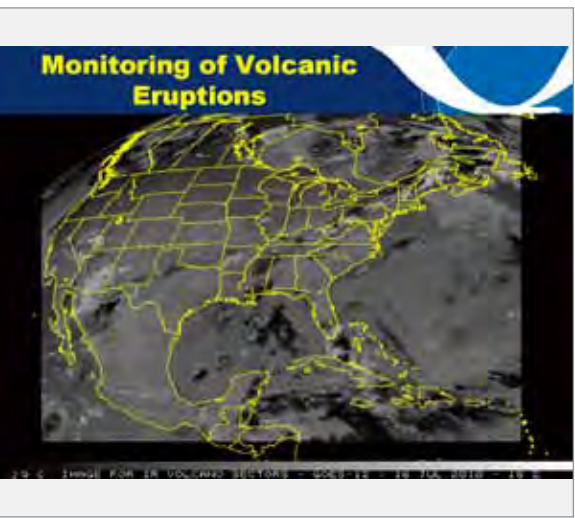
68



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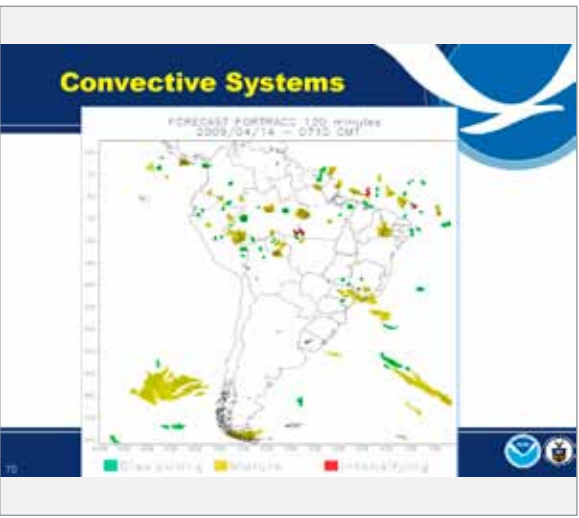
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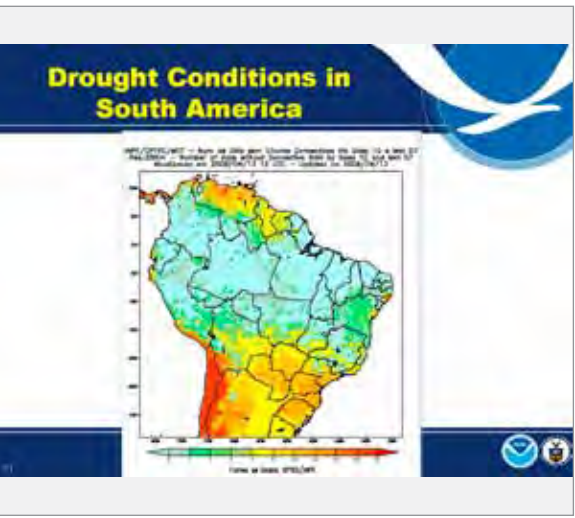
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65



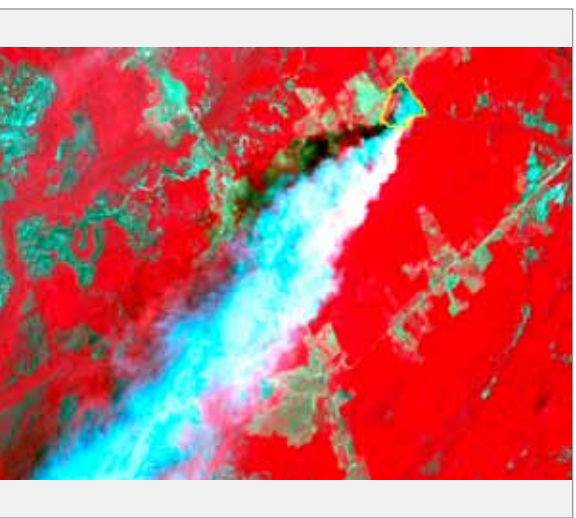
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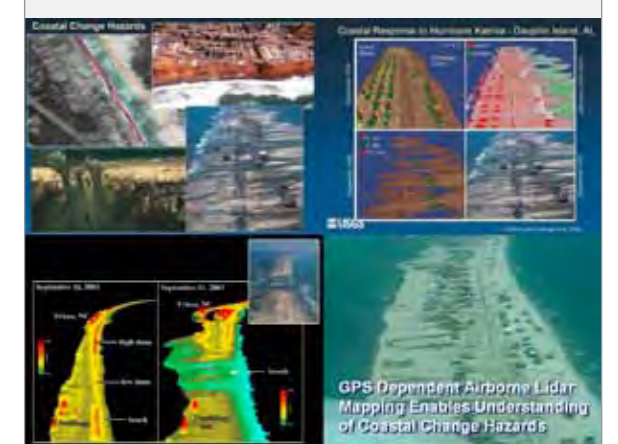
74



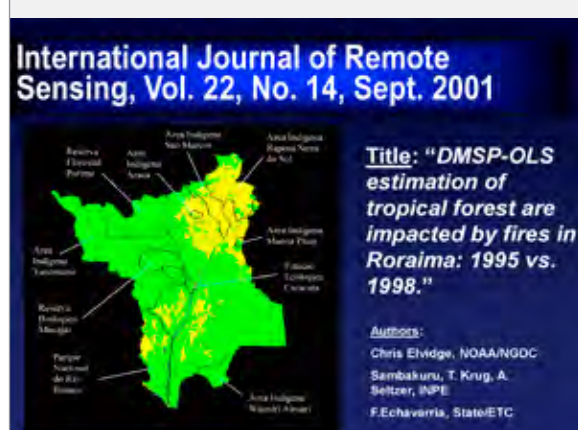
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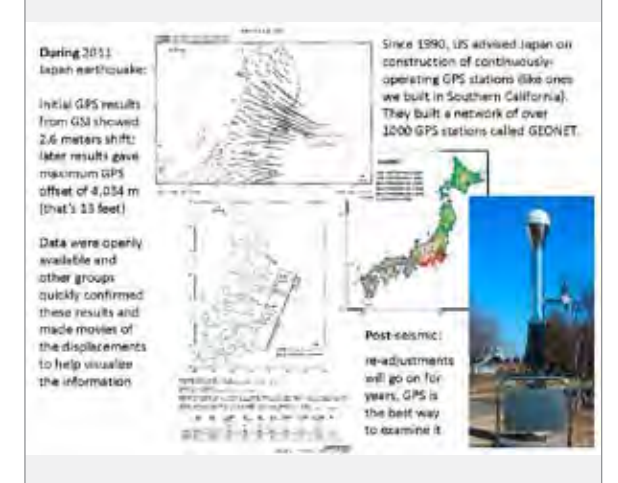
78



83



84



85

GNSS from GSI, Japan; M9 Tohoku



86

GNSS uses for volcano monitoring



- Key component of volcano monitoring for flank movements and lava dome growth
- Integral part of US National Volcano Early Warning System plan for monitoring build-out
- Over 300 continuous GPS units are currently in use by USGS volcano observatories (nearly all of these are telemetered precise dual-frequency stations, many are Plate Boundary Observatory stations operated by UNAVCO with NSF funding)



91

Best known crisis response

1991 PHIVOLCS & VDAP saved 20,000 lives at Pinatubo



- Validated VDAP Program
- Growth of PHIVOLCS institution
- Growth of VDAP's forecasting toolbox



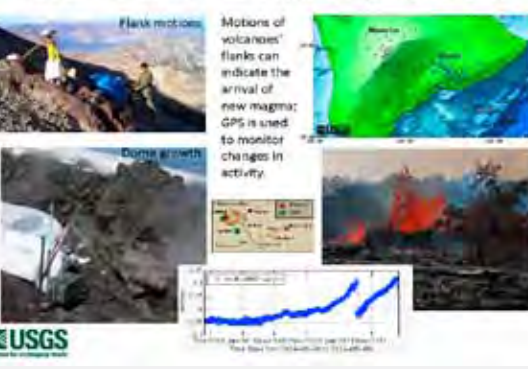
92

Typical progression in earthquake types & energy release preceding an eruption



87

USGS uses precise GPS for eruption monitoring of Kilauea, Mount Saint Helens and other volcanoes (Alaska, Long Valley, Yellowstone)



88

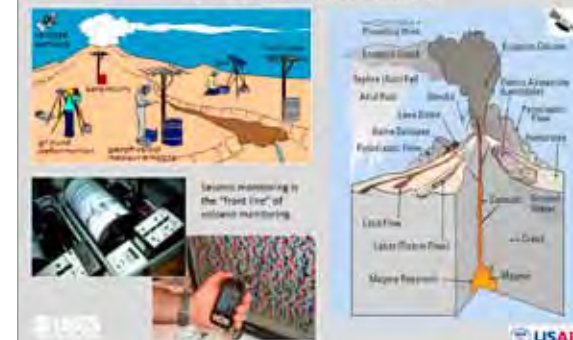
GNSS for hazards management

- GNSS is an essential enabling technology for the mapping and precise monitoring needed to accomplish science missions in support of hazard warnings and other societal needs.
- In the aftermath of a significant disaster event, re-mapping and establishing a grid and geo-referenced incident data is essential in support of immediate response (e.g., Urban Search & Rescue) as well as for long-term recovery (e.g., organizing debris removal).



93

Real-time volcano monitoring is essential to save lives and property



94

VDAP's Indonesia Program



- Capacity building
- Infrastructure projects (monitoring networks) in N. Sulawesi & Sangihe, and Java
- Training programs & workshops

89

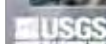
Volcano Disaster Assistance Program (VDAP) 25th Anniversary of the OFDA-USGS Partnership in Volcano Disaster Prevention



John Pallister and Jeff Margo

VDAP's Mission: Preventing volcano crises from becoming disasters

- 1) crisis response team & cache
- 2) infrastructure projects
- 3) training



90

Working "behind the scenes" in the developing world since 1986



- 26 major crisis responses
- Infrastructure in 12 countries
- Contributed to saving 10's of thousands of lives & 100's of \$millions
- (FY-03-11): 53 infrastructure missions, 12 crisis responses, 15 countries

95

New emphasis on training & education in partnership with universities; Volcano Remote Sensing & Seismology workshops; annual CSAV program



96

International partnership & diplomacy – signing a MOU, 2008



97



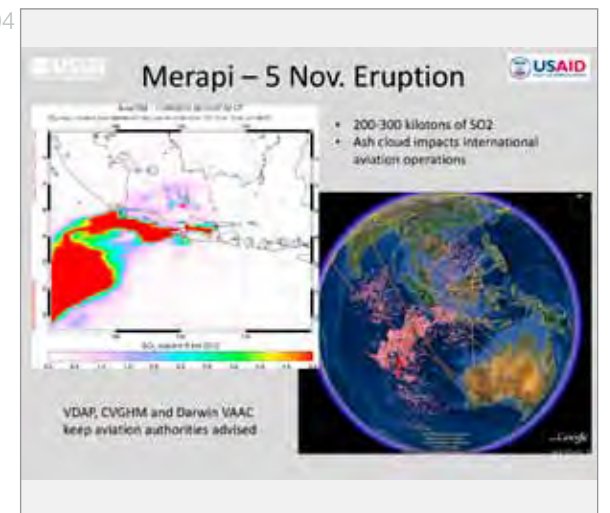
98



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100



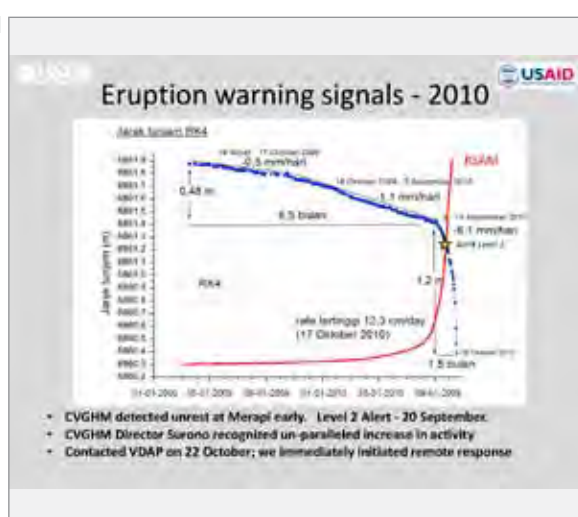
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106



101



102



107



108



109

US Govt. (VDP) Contributions:

- Replacement seismic instruments, telemetry, computers, seismic data acquisition & processing systems, laser monitoring instruments
- Expert consultation
- Satellite remote sensing – Unprecedented crisis response (in scope and extent) – daily updates on situation at the volcano utilizing USGovt. & International resources

Consultation

Monitoring equipment & technical assistance

Rapid response: 20 months equipment to Yogyakarta

110

Briefing the Vice President of Indonesia

29 Nov 2010

Message to the GÖI

- The Indonesian response to the 2010 eruption of Merapi is one of the most significant successes in modern volcano hazards & risk mitigation and the actions of CVGHM saved many thousands of lives.
- The VDP team is honored to have assisted CVGHM in their successful response to the eruption, and looks forward to continued work together to further enhance Indonesia's National Volcano Early Warning System.

115

www.disasterscharter.org

Emergency enquiries from users requiring direct access to Charter resources should be addressed to:

General requests for information should be addressed to:

116

HDDS Explorer- Graphical Interface

<http://hdds.usgs.gov/hdds2>

111

International Charter Space and Major Disasters

International Charter – Space and Major Disasters

A voluntary organization of space agencies to share e.o. when a natural or man made disaster is declared.

www.disasterscharter.org

112

International Charter Space and Major Disasters

- An International agreement among Space Agencies to support with space-based data and information relief efforts in the event of emergencies caused by major disasters.
- Disaster response**
 - Multi-satellite data acquisition planning
 - Fast data turn-around – priority acquisition
 - Archive retrievals and spacecraft tasking
 - Data processing at pre-determined level
 - Space Agency contribution in image/data
 - Space Agency initiative for value-added-data fusion

117

Hazards Data Distribution System (HDDS)

HDDS Hosted Datasets - Satellite

- Landsat TM - Landsat ETM+ - ASTER - EO ALI - EO Hyperion - SPOD (Restricted) - GeoEye (Restricted) - Worldview-1/2 (Restricted) - QuickBird (Restricted) - IKONOS (Restricted) - MODIS - AQUA - ALOS (Restricted)	- Cartosat (Restricted) - RapidEye (Restricted) - Envisat MERIS (Restricted) - Radarsat-1/2 (Restricted) - TerraSAR-X (Restricted) - Envisat ASAR (Restricted) - COSMO SkyMed (Restricted) - OrbView - DMSP - AVHRR - Toposat - Awifs - LISS - IRS
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118

Hazards Data Distribution System (HDDS)

HDDS Hosted Datasets – Other

- UAV SAR (Restricted)
- DEM
- LIDAR
- ARCHER (Restricted)
- EPA ASPECT (Restricted)
- AVIRIS (Restricted)
- Aerial Photography
- Handheld oblique

113

Charter Members

USAID logo

114

Charter Activations (disaster types)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Sub-totals
Earthquake	1	1	1	1	1	1	1	1	1	1	1	1	1	14
Landslide	1	1	1	1	1	1	1	1	1	1	1	1	1	14
Volcano	1	1	1	1	1	1	1	1	1	1	1	1	1	14
Storm/Hurricane	1	1	1	1	1	1	1	1	1	1	1	1	1	14
Flashflood/Heavy Rain	1	1	1	1	1	1	1	1	1	1	1	1	1	14
Forest Fire	1	1	1	1	1	1	1	1	1	1	1	1	1	14
Tsunami	1	1	1	1	1	1	1	1	1	1	1	1	1	14
Other	1	1	1	1	1	1	1	1	1	1	1	1	1	14
TOTAL	1	1	1	1	1	1	1	1	1	1	1	1	1	14

As of August 15, 2013 - 143 activations

119

Post-Tsunami Image along West Coast of Aceh Province

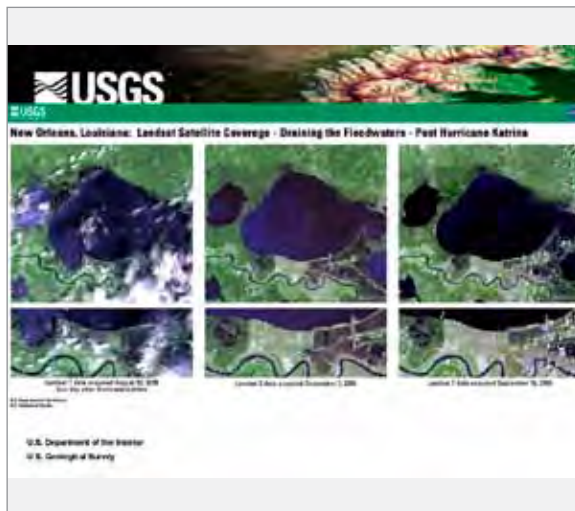
UNSAT logo

120

Emergency Operations: Useful Links

- USGS EO Portal
 - <http://hdds.cr.usgs.gov/>
- HDDS (Directory View)
 - <http://hdds.cr.usgs.gov/hdds/>
- HDDS (Graphical View)
 - <http://hdds.cr.usgs.gov/hdds2/>
- EO User Quick-Guide
 - <http://hdds.cr.usgs.gov/EO/library.php>
- International Charter Website
 - <http://www.disasterscharter.org/>

121



122



127



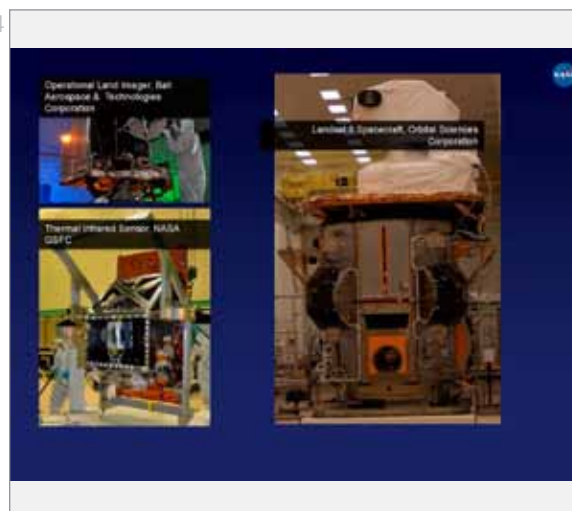
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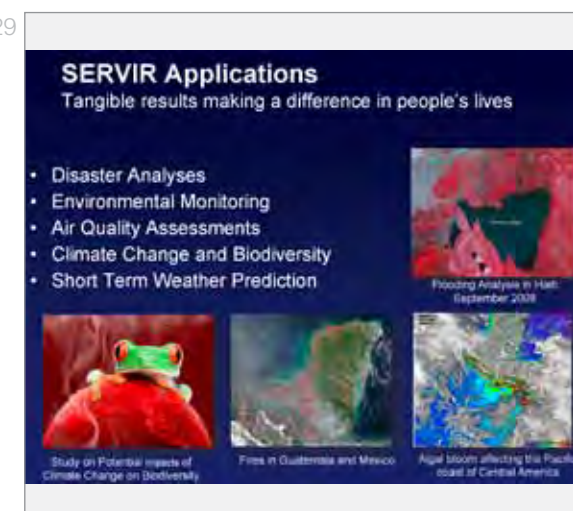
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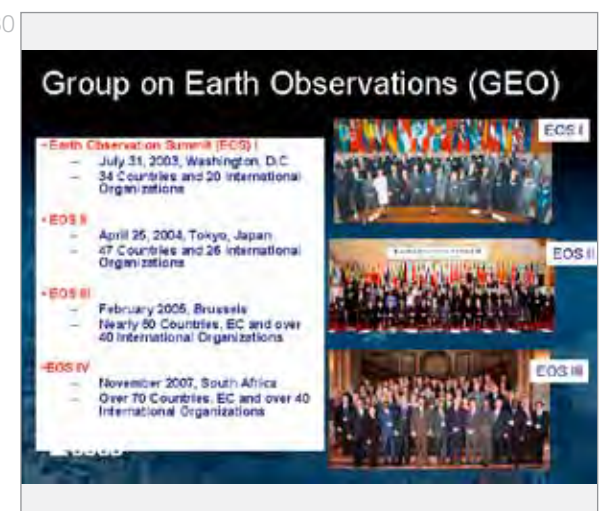
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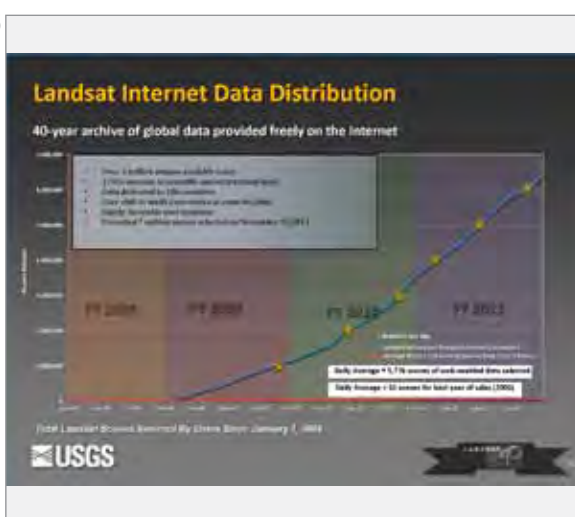
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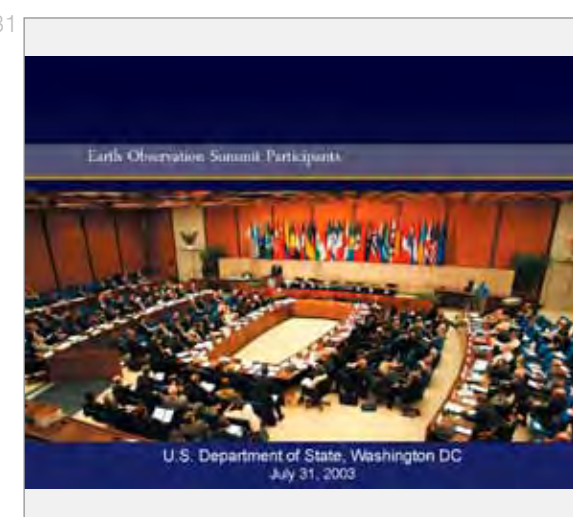
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126



131



132



133

CEOS – Ad-hoc Working Group on Disaster Risk Management

Background

- In a difficult economic situation worldwide, the political attention on preparedness and mitigation is increasing while maintaining the past level efforts on response and reconstruction. The financial efforts to support the prevention/mitigation phases can be to seven times less expensive than rebuilding and repairing the damages caused by hazards. Mortality might be reduced by 40%.

Main CEOS Goals

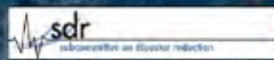
- Increase and strengthen the contribution of Earth Observation satellite to various disaster risk management phases through a series of coordinated enlarged actions.
- Raise the awareness of politicians, decision-makers and major stakeholders on the benefits of using satellite Earth Observation in all phases of Disaster Risk Management.



134

U.S. National Science & Technology Council Subcommittee on Disaster Reduction

- SDR is an element of the President's National Science & Technology Council charged with establishing clear national goals for Federal science and technology investments in disaster reduction.
- Promotes interagency cooperation for natural and technological hazards and disaster planning.
- Facilitates interagency approaches to identification and assessment of risk, and to disaster reduction.
- Advises the Administration about relevant resources and the work of SDR member agencies.
- Serves as the US national platform for UN International Strategy for Disaster Reduction



139

U.S contacts on Disasters



- Francis Lindsay, NASA, Disasters Manager, francis.lindsay-1@nasa.gov
- Nancy Searby, NASA, Capacity Building Nancy.D.Searby@nasa.gov
- Brenda Jones, USGS, Coordinator, Disaster Response, bjones@usgs.gov
- Charles W. Mandeville, Coordinator, Volcano Hazards Program, USGS, charles.mandeville@usgs.gov
- Kenneth W. Hudnut, Caltech and USGS, hudnut@caltech.edu
- Martin Medina, NOAA-NESDIS, martin.medina@noaa.gov
- David Green, NOAA-NWS, david.green@noaa.gov
- Sezin Tokar, USAID-Office of Foreign Disaster Assistance, stokar@usaid.gov
- Fernando R. Echavarria, Dept. of State, fernando.echavarria@state.gov

135

National Science & Technology Council Subcommittee on Disaster Reduction

- Centers for Disease Control and Prevention
- Department of Defense
- Department of Energy
- Department of Homeland Security
- Department of Housing & Urban Development
- Department of the Interior
- Department of State
- Department of Transportation
- Environmental Protection Agency
- FEMA
- NASA
- National Geospatial-Intelligence Agency
- National Guard Bureau
- National Institute of Standards and Technology
- National Oceanic & Atmospheric Administration
- National Science Foundation
- U.S. Agency for International Development
- U.S. Army Corps of Engineers
- U.S. Coast Guard
- U.S. Department of Agriculture
- U.S. Forest Service
- U.S. Geological Survey
- U.S. Public Health Service
- U.S. Nuclear Regulatory Commission



136

Implementation plans released March 2008

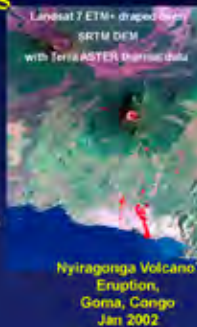


Available at
www.sdr.gov

137

U.S. space agencies supports multiple International Disaster Management partnerships

- FEWSNET
- VDAP
- GEO & CEOS
- SERVIR
- GeoNETCast
- Int'l Charter on Space & Disasters
- Landsat
- NSTC-SDR



138

U.S. Geospatial Resources

- www.geospatialrevolution.psu.edu
- <http://ceos.org>
- <http://landsat.usgs.gov/>
- <http://landsat.gsfc.nasa.gov/>
- <http://www.esri.com/software/landsat-imagery>
- <http://www.servirglobal.net>
- <http://www.fews.net>
- <http://appliedsciences.nasa.gov>
- <http://eros.usgs.gov/>
- <http://modis-atmos.gsfc.nasa.gov/IMAGES/index.html>
- <http://modis-land.gsfc.nasa.gov>
- <http://www.earthobservations.org/>
- <http://water.gsfc.nasa.gov/>



Application of Geospatial Data and Remote Sensing Techniques for Disaster Surveillance in Chinese Taipei

Dr. Tzu-Yin CHANG, Assistant Researcher, National Science and Technology Center for Disaster Reduction

1

Application of Geospatial Data and Remote Sensing Techniques for Disaster Surveillance in Chinese Taipei

Speaker: Tzu-Yin Chang
Assistant Researcher, National Science and Technology Center for Disaster Reduction
E-mail: geost@ncdr.nat.gov.tw

2

Basic Information

- Geographic features
 - 400 km from north to south
 - 145 km from east to west
 - Area: 36,000 Km² over 70% in slope land
- Tectonic Conjunctions:
 - Philippine Sea plate
 - Euro-Asia Plate
- Subtropical zone
 - 3.6 typhoons/year
- Population (2006)
 - 22,900,00 in total, 67.70% in urban areas
- Density: 633/ Km², only lower than Bangladesh

3

World Bank: Major Types of Natural Disasters

- ✓ earthquake
- ✓ drought
- ✓ volcano
- ✓ typhoon
- ✓ flood
- ✓ landslide

4

Issues in Typhoon Morakot

- 1 Long duration & High intensity rainfall
- 2 Collapse of extensive slope land
- 3 Landslide
- 4 Road and bridge damage
- 5 Water shortage due to reservoir sedimentation
- 6 Impact on social economy
- 7 Landslides due to dikes broken

5

Key elements of succeed emergency response

- Information
- Decision
- Action
- Evaluation
- In-time Operation
- Real-time Monitoring

6

Scientific Modeling

- Typhoon Forecast
- Typhoon Path
- Typhoon Intensity
- Typhoon Impact

7

Real-time Monitoring

- Satellite
- Radar Network
- Surface stations
- Auto rain-gauge
- Real-time Monitoring

8

Evacuation Operation

- Issue and warning
- Early warning
- Evacuation operation
- Typhoon landfall time
- Landslide in Lai-Yi
- 32 hours ahead

9

Geospatial Data

- Mitigation
- Preparedness
- Response
- Recovery
- Geospatial Data

10

Disaster Survey: Flood hazard-prone area

- Historical event
- Flooding range and depth
- Flooding time
- Hazard-prone area
- Low-lying area
- Land subsidence
- Inundated and narrowing of river path
- Confluence part

11

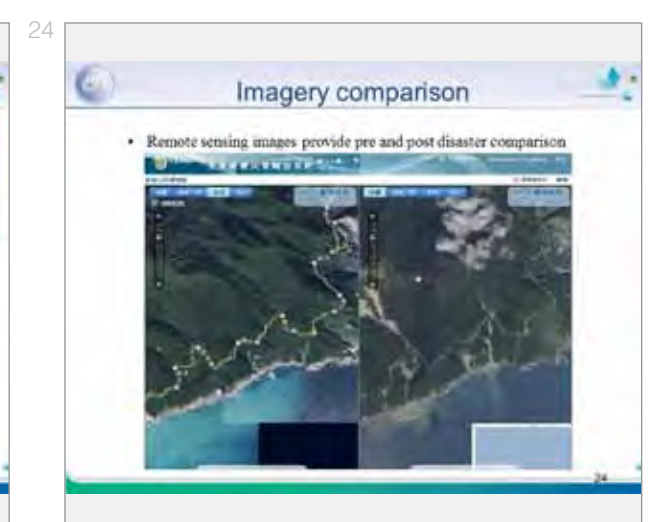
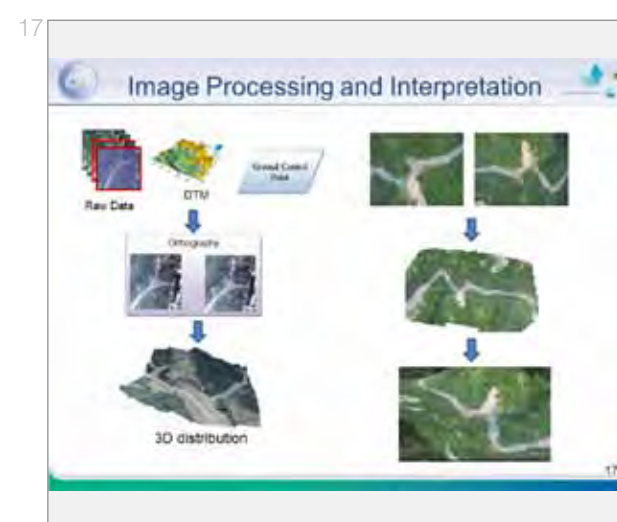
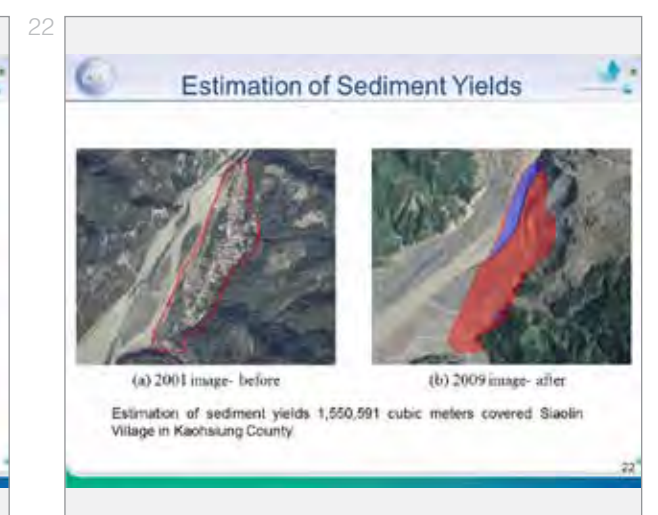
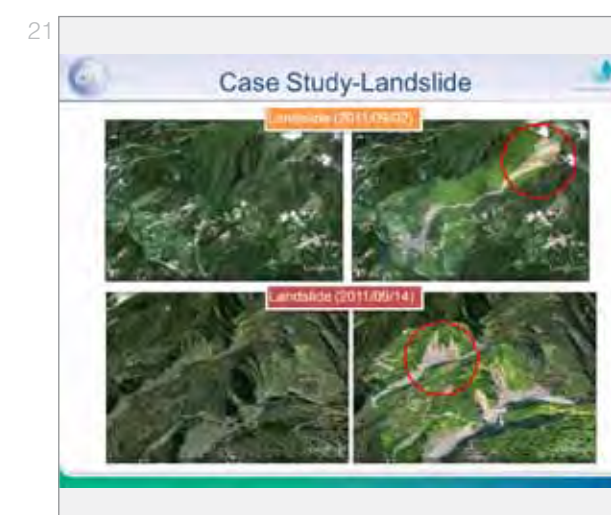
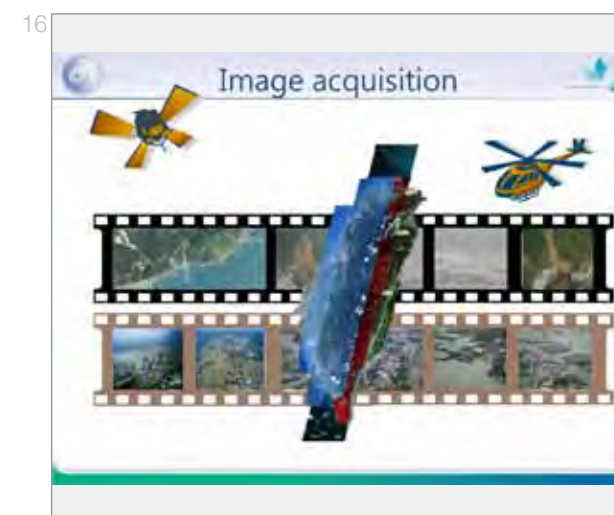
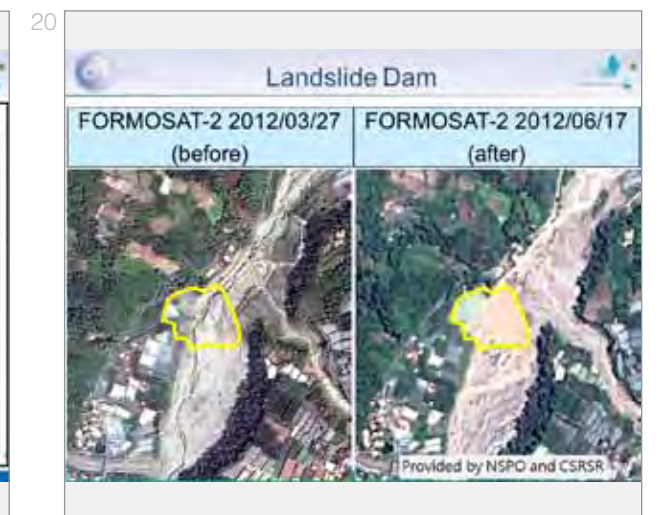
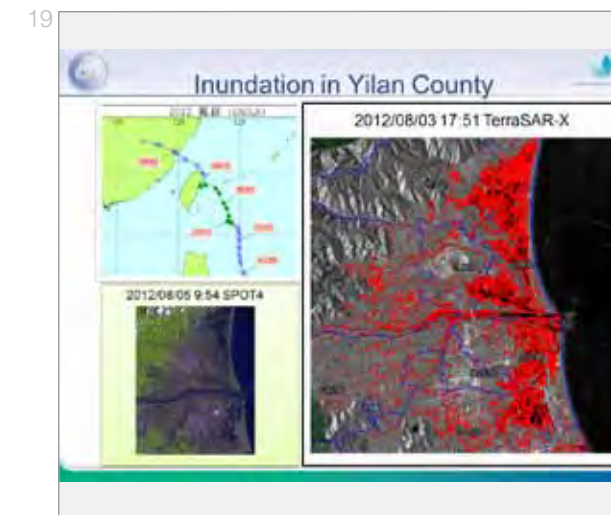
Disaster Survey: Sediment hazard-prone area

- Historical event
- Location
- Affected range
- Magnitude
- Rainfall amount
- Hazard-prone area
- Geologic survey
- River Terrace
- Old landslide
- Artificial Slope
- retaining wall

12

Hazard-prone map

- Detailed information survey
- Vulnerable factors
- Hazard-prone area
- Flood and Slope/land collapse
- Protect targets
- Roadway, alternative road
- Bridge, temporary bridge
- Flood prevention facilities
- Shelters
- Rescue Resource
- Simulated the precipitation magnitude
- Administrative map
- Social welfare institutions
- Public transportation
- Road map
- MRT
- High Speed Road
- Water level stations
- Water status
- Rain gauge stations
- Precipitation



25



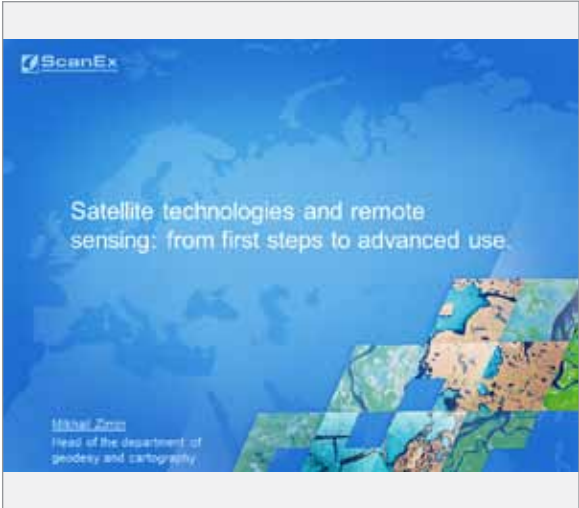
26

Summary

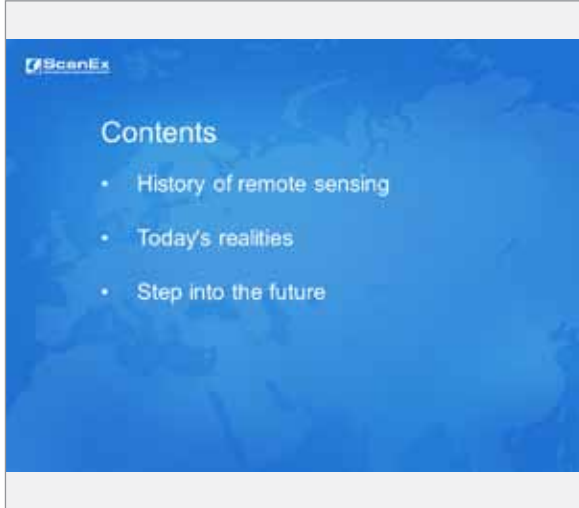
- Satellite imagery and aerial photography incorporated with GIS can give emergency officials useful information for assessment, analysis and monitoring of natural disasters from small to large regions. Therefore, to organize an emergency remote sensing group which invite related institutes join in can effectively accelerate image processing work and allow each institute to interpret based on its own specialties.
- Different disaster management phases need different geo-information. For the disaster prevention, there geo-information and remote sensing imagery can be used to detect land overuse and illegal development on hill slopes. It is also helpful to regular environment surveillance in disaster mitigation.



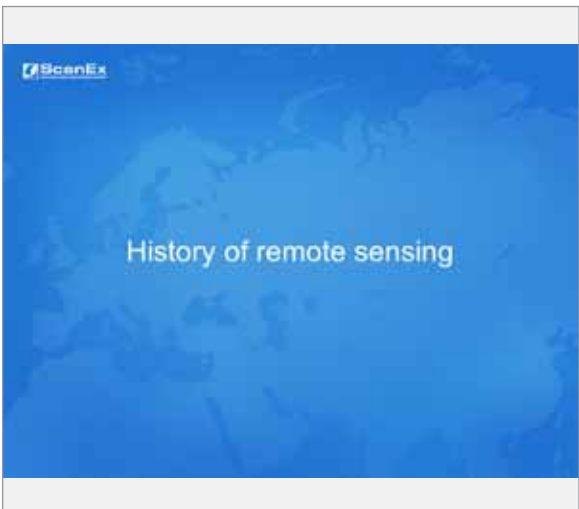
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13

History of remote sensing

The First World War, like all other wars in general, was a significant catalyst in the development of aeronautics and photography. In comparison with the effect of surprise used by German troops, allied forces have focused on receiving of actual information about movements of German troops by using remote sensing methods, where a visual methods took place.



14

History of remote sensing

- At the end of the Second World War, Germany began to use rockets that marks a new stage in the development of remote sensing
- October 24, 1946 a group of soldiers and scientists in the desert of New Mexico have launched a modified German V-2 rocket (V-2). 35mm camera was installed on the rocket and it was the first time our planet be captured from space (shooting height of about 100 km)
- Further technology is beginning to develop rapidly. USSR launches the first artificial of the Earth (Sputnik-1, 1957), the first manned flight into space (Yuri Gagarin, 1961)

19

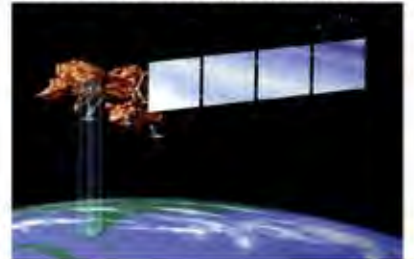
Today's realities



20

Today's realities

July 23, 1972 satellite Landsat 1 was launched and a breakthrough in the field of remote sensing of the Earth. This is the first remote sensing satellite whose main objective was to assess and monitor natural resources. Installed on it opto-electronic camera (MSS) allow you to take pictures in four spectral bands with a spatial resolution of 80 meters. Follow the series of satellites (Landsat 1-8), de facto and has been the standard of quality and productivity for resource satellites.



15

History of remote sensing

During the 60's the United States launches into orbit around a dozen satellite TIROS - the main purpose of which is to monitor weather information. Satellite-mounted TV camera takes imagery with the frequency of once a day and provides information about the dynamics of the different layers of the atmosphere.

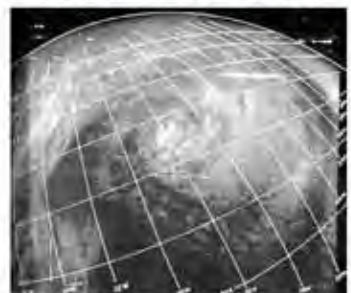


16

History of remote sensing

For the first time in the history of science weather satellites has provided a global picture of cloud cover and allow to visualize the patterns of atmospheric circulation for it to occur in the structure of clouds.

A similar system (Meteor) starts since 1967 by USSR.



21

Today's realities

Commercial VHR satellites have been implemented by launching IKONOS satellite (September, 1999). Specifications imaging system is practically not inferior (spatial resolution of 0.89 m, four spectral channels). Thus, remote sensing came out perfectly on a new level of development, when the relevance of the use of funds imagery is understood not only at the level of decision-making within the country or commonwealths, and clear and transparent for building business processes.



22

Today's realities

- Meteorological satellite
- Resource satellite
- Cadaster Satellite

17

History of remote sensing

As it was before, the main impulse for the development of technology are the arms race and very tense relations between the USSR and the USA. The apogee of the tension can be called Caribbean crisis reached its peak in autumn 1962, while with it spy plane U-2 were found working on construction sites average range.



Oblique view covering top secret site.

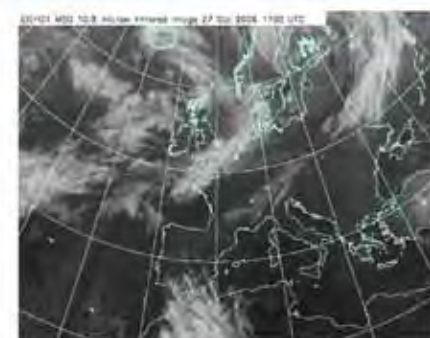
18

History of remote sensing

- In the future, both countries regularly carry out manned space launches spacecraft (Vostok, Vostok, Soyuz, Mercury, Gemini, Apollo), form their own orbital station (Salyut, Mir, Skylab); Launch intelligence photographic satellites, Greatly modernized methods and technologies
- Completely independent Aerospace segment of remote sensing starts working on the inside economies of different countries. Along with the Soviet Union and the United States since the mid 80's, India and France starts their own space remote sensing programs.
- By the beginning of the 21st century, thanks to significant technological breakthrough in the field of information Technology, which occurred in the mid 90's, commercial direction of the satellite imagery was formed, where the demands of the market played a crucial role in shaping the future of remote sensing.

23

Today's realities



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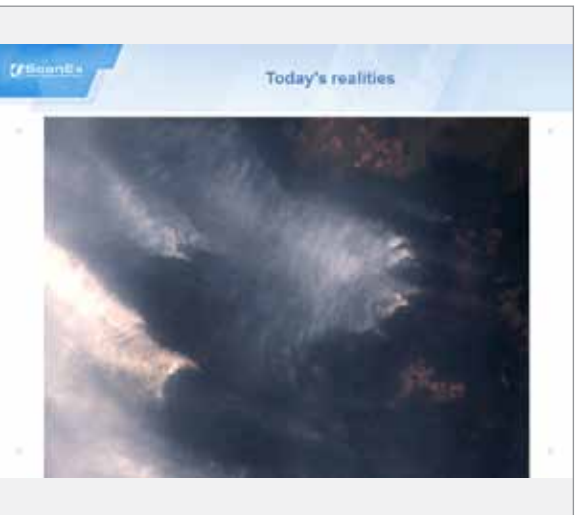
Today's realities



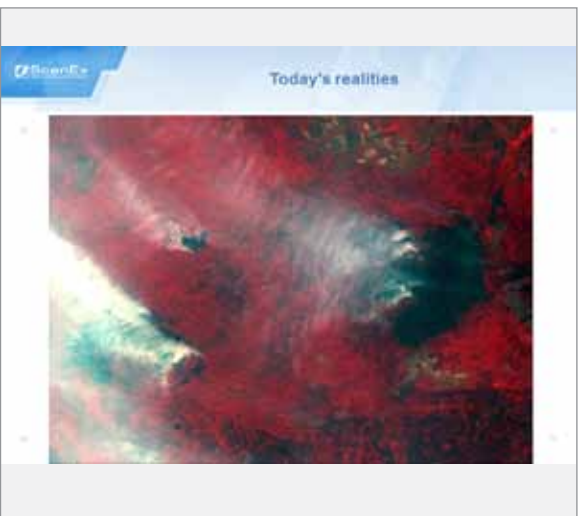
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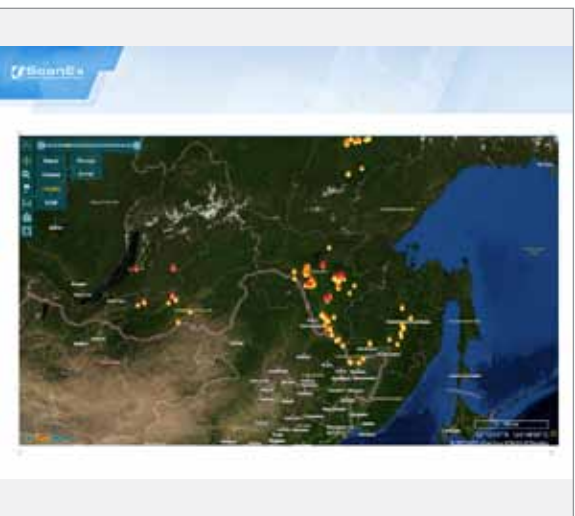
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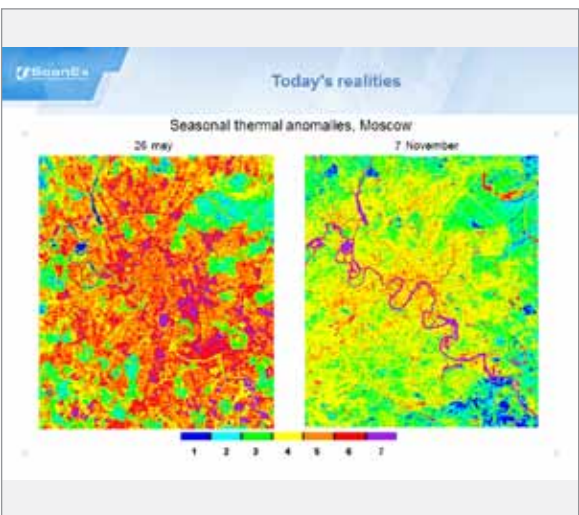
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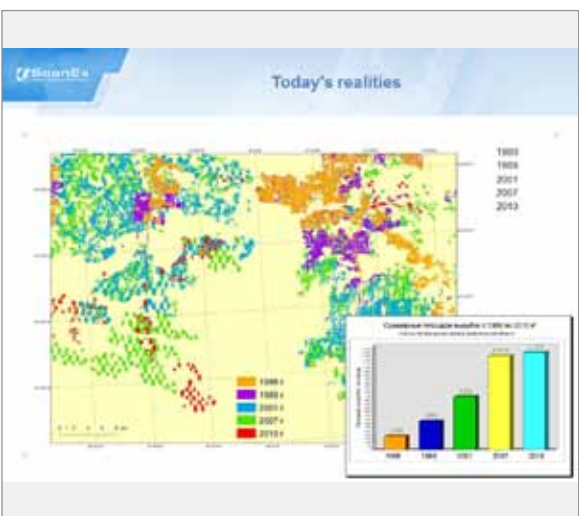
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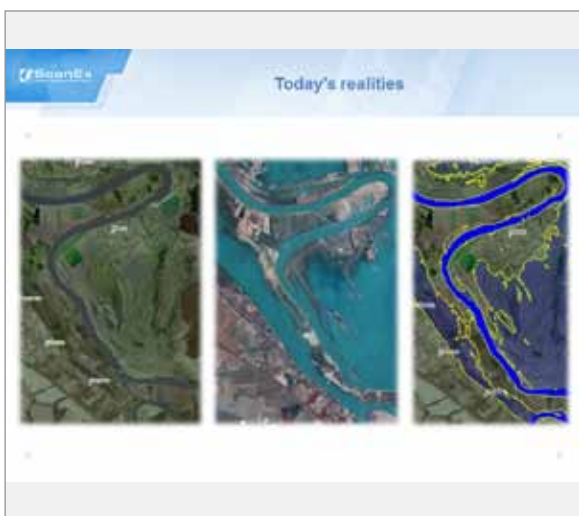
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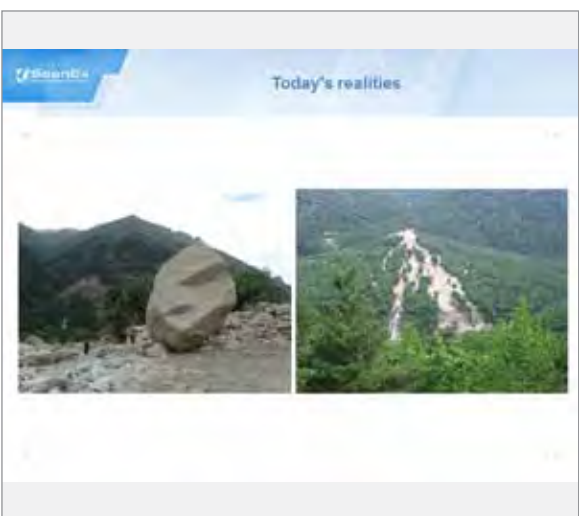
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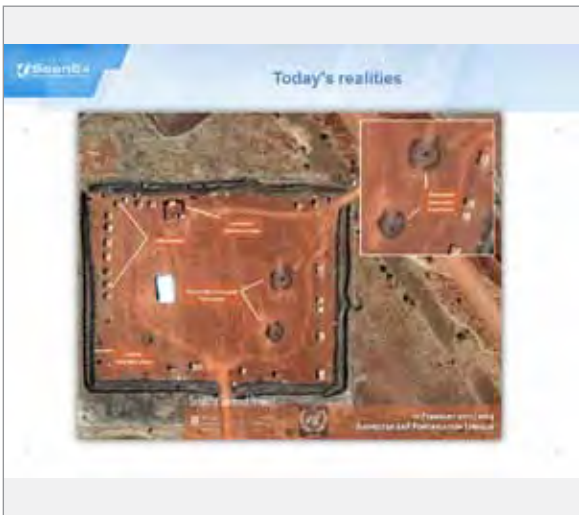
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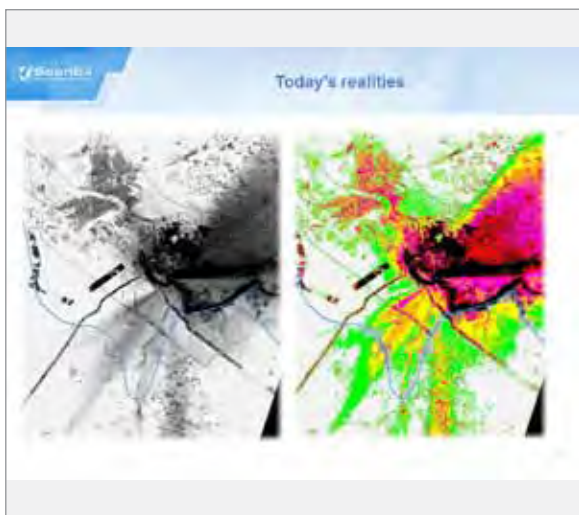
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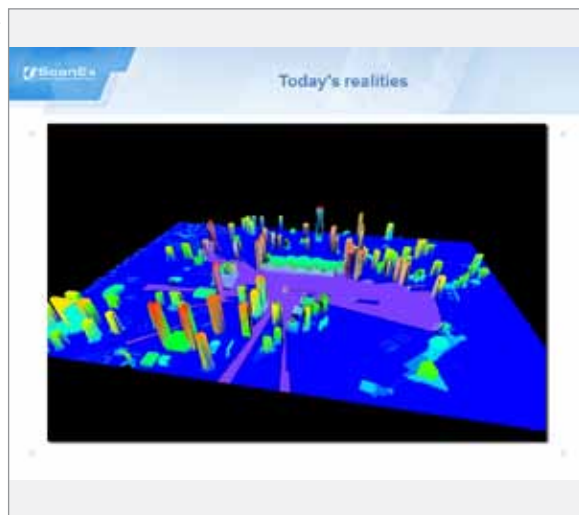
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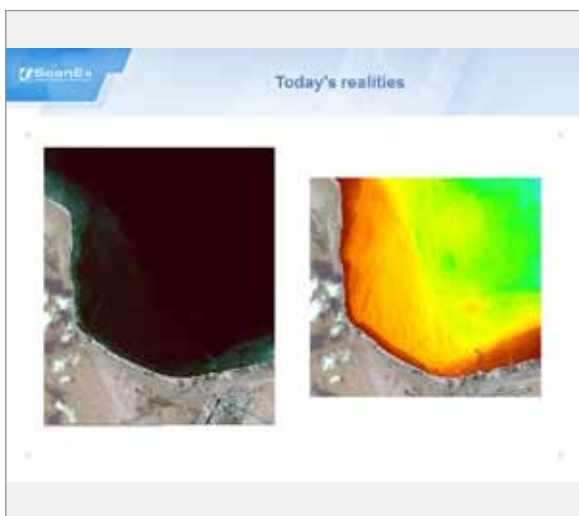
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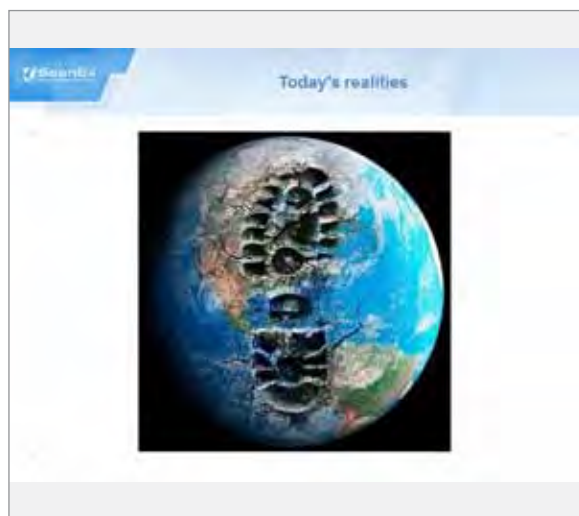
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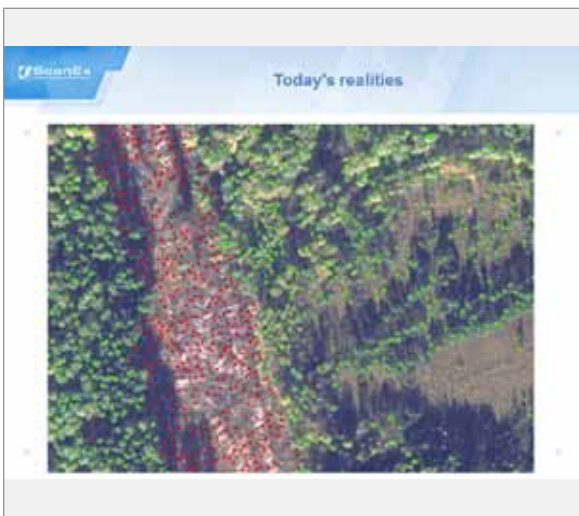
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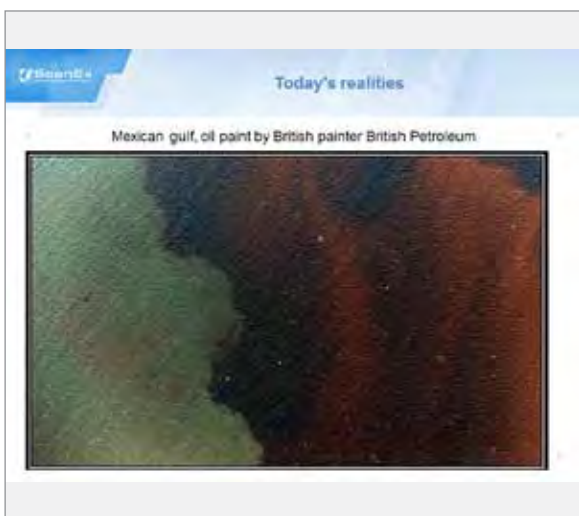
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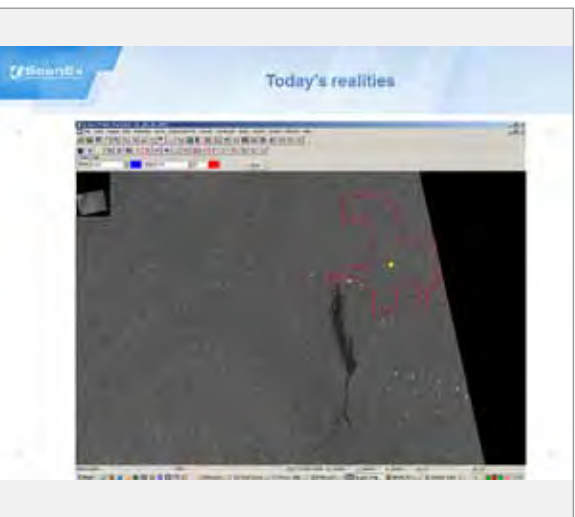
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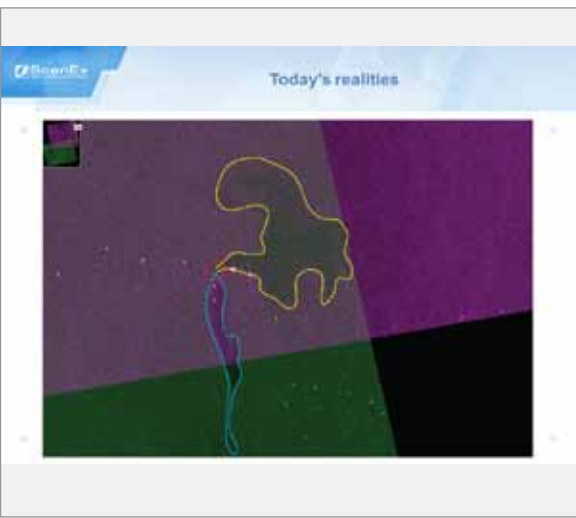
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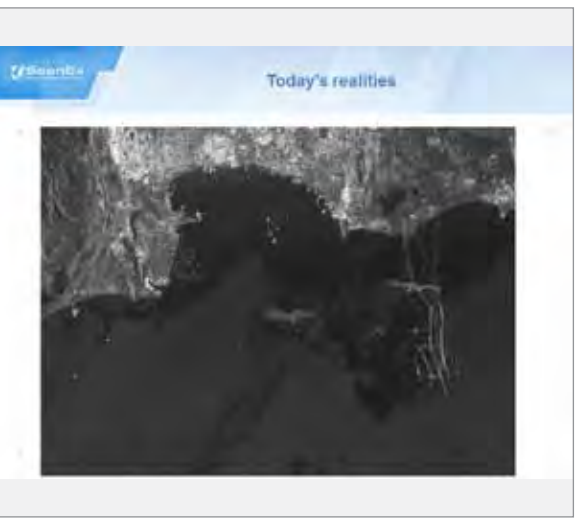
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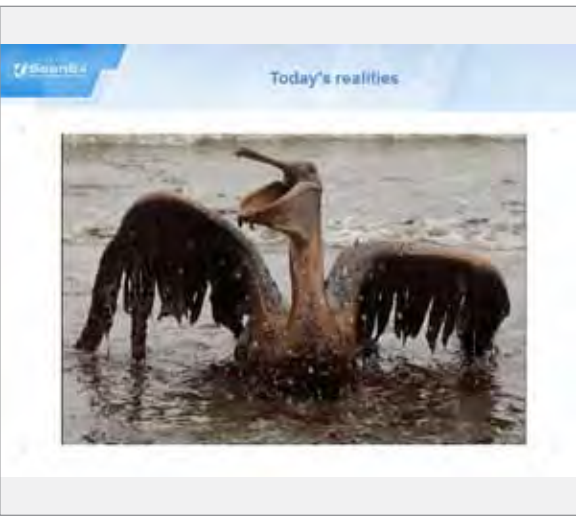
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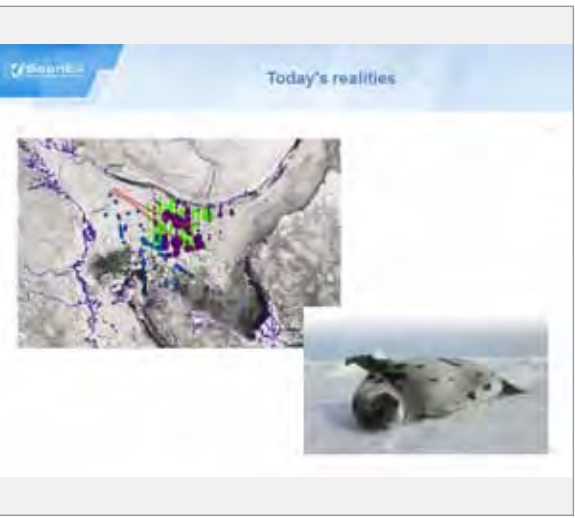
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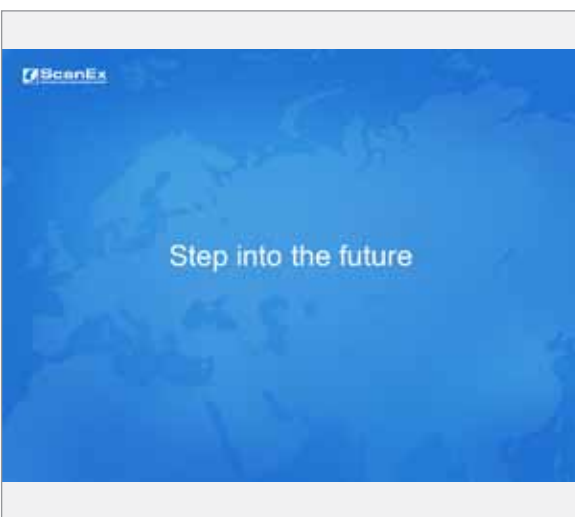


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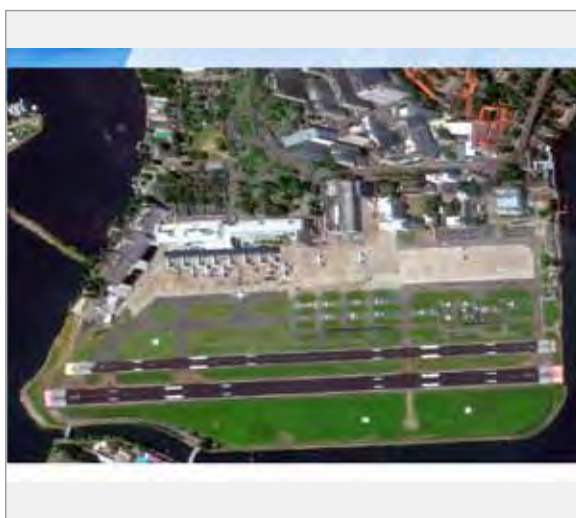
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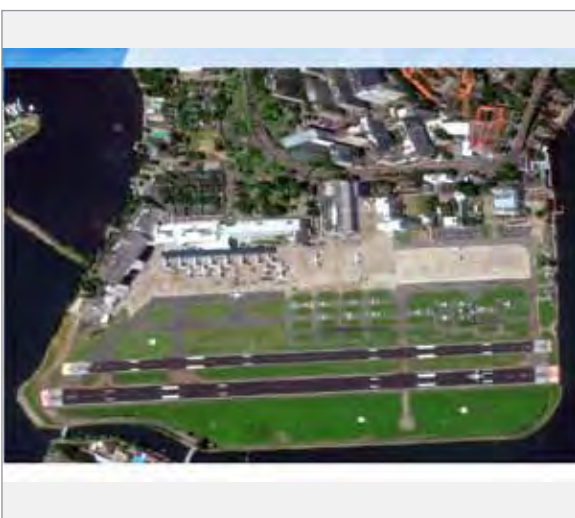
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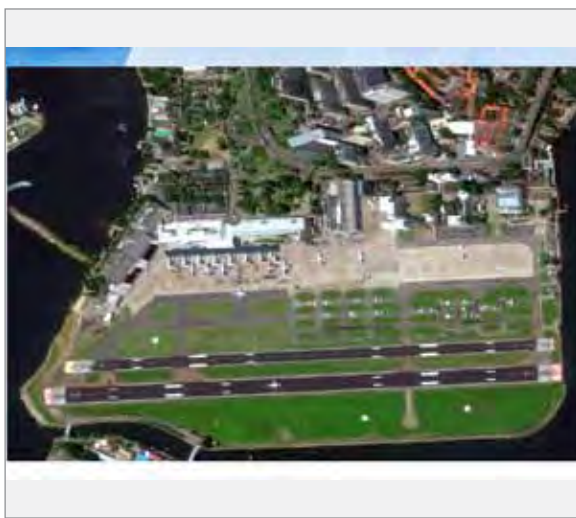
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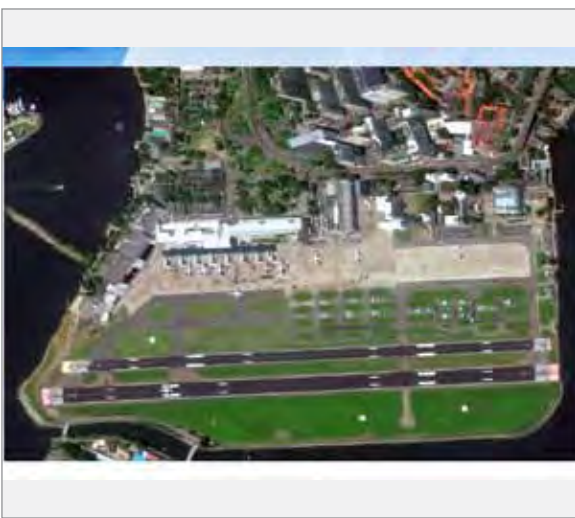
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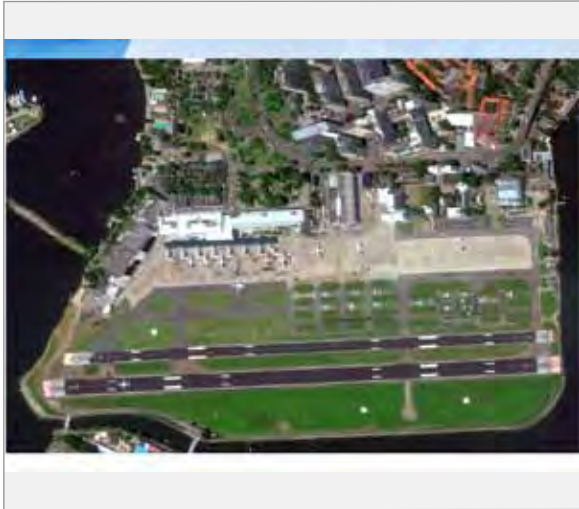


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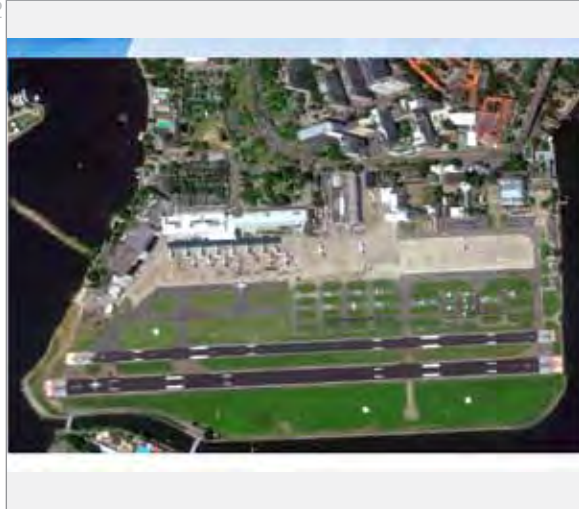


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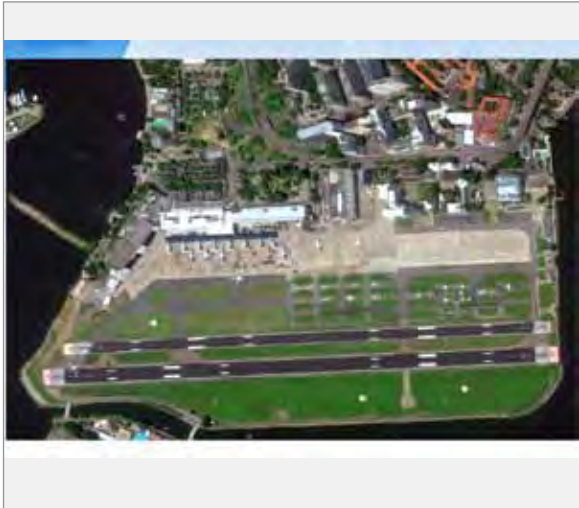
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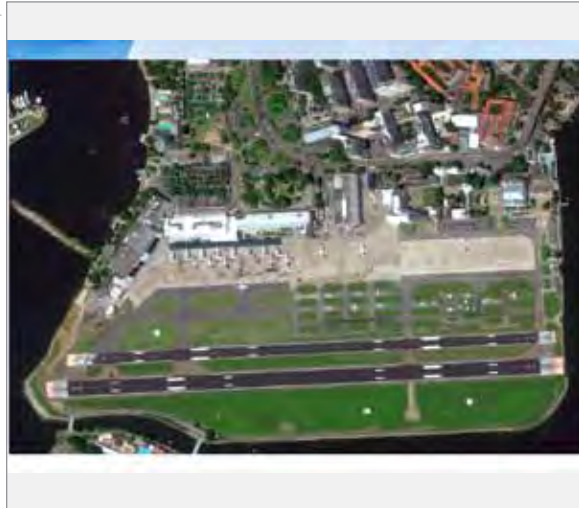
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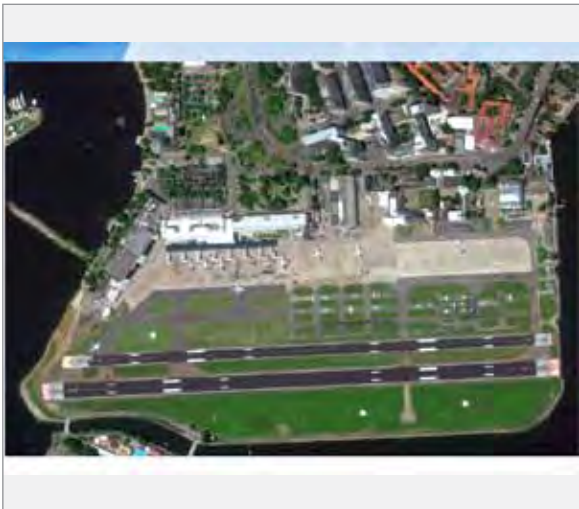
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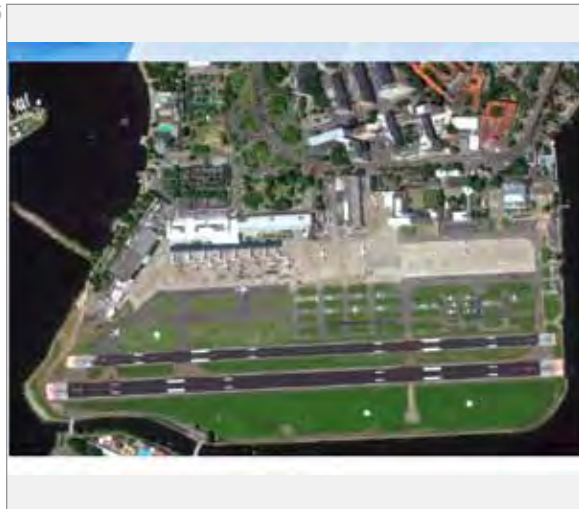
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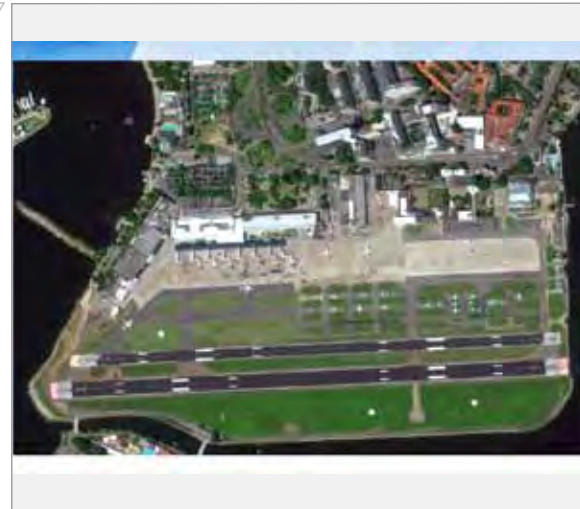
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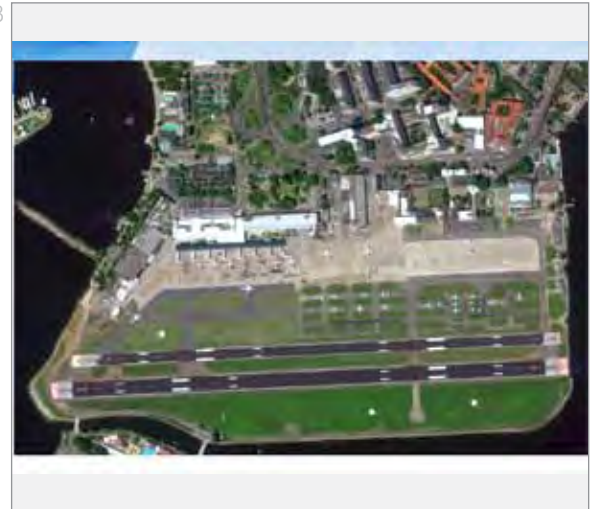
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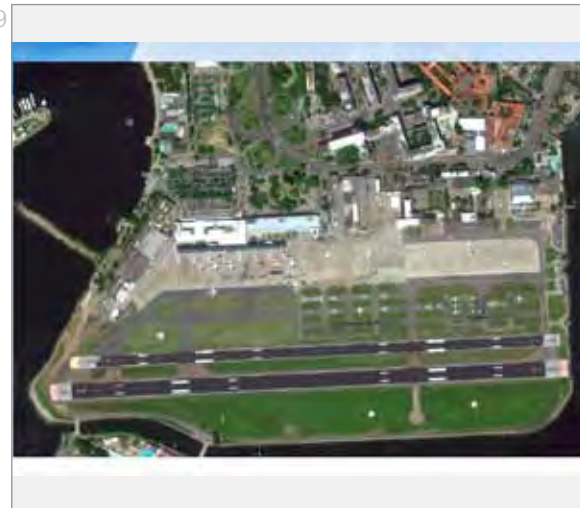
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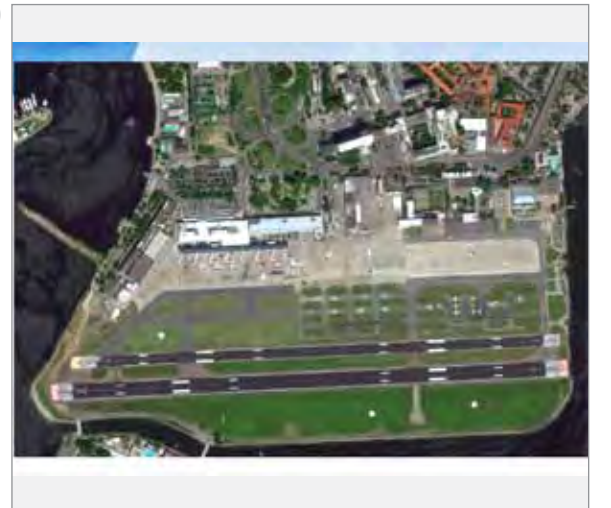
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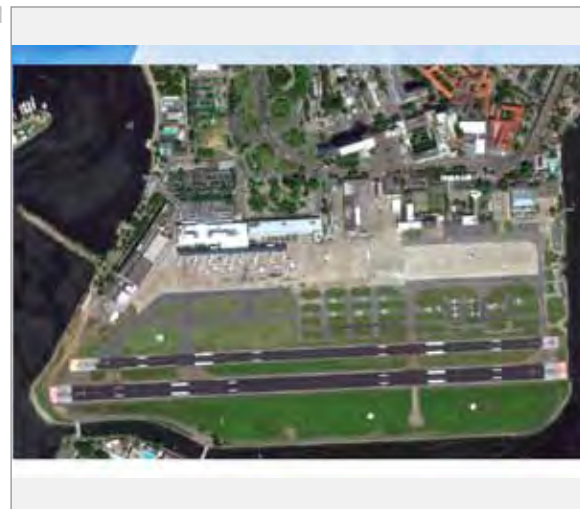
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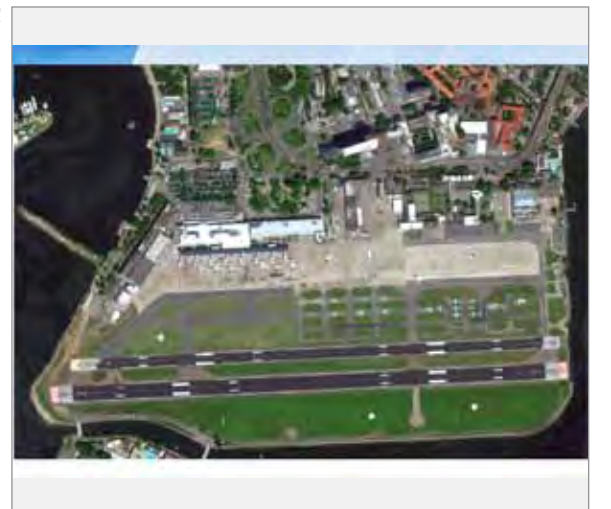
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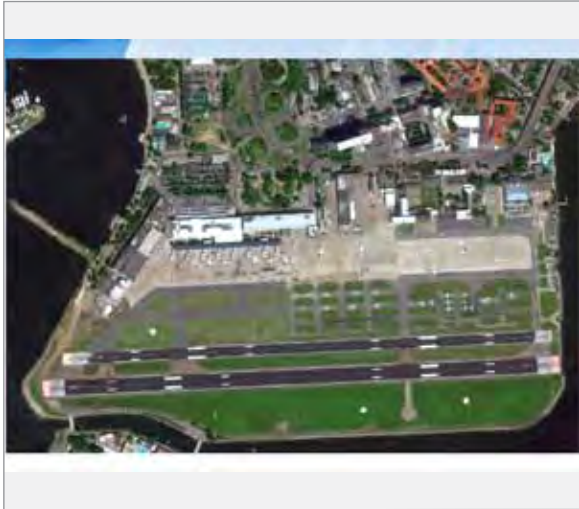
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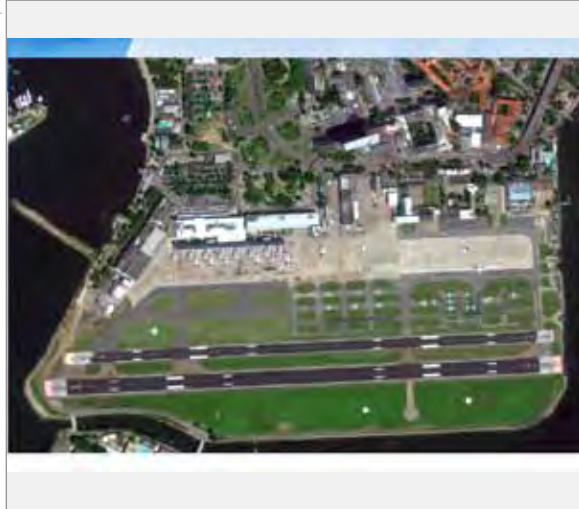
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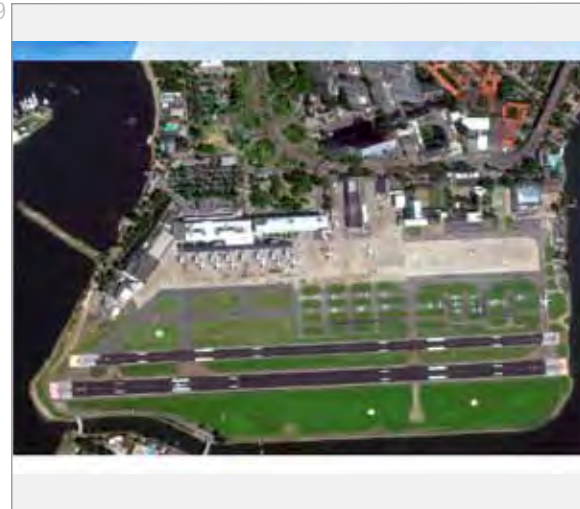
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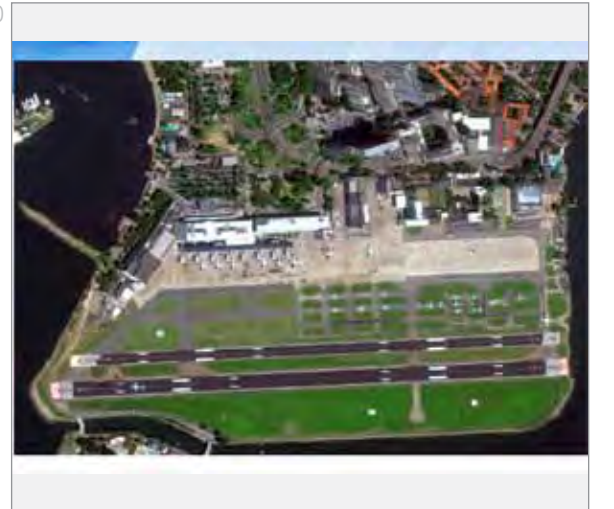
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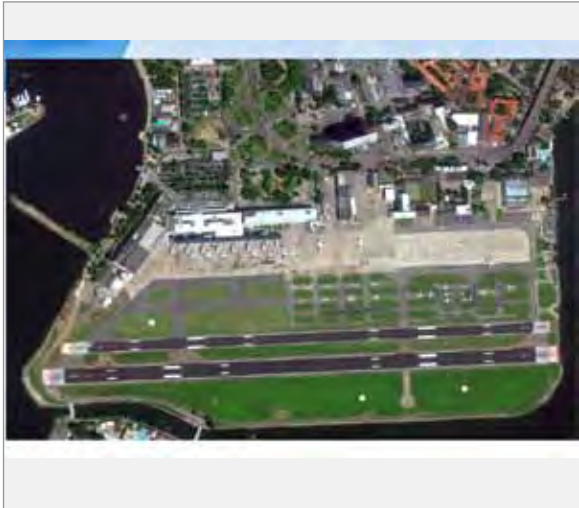
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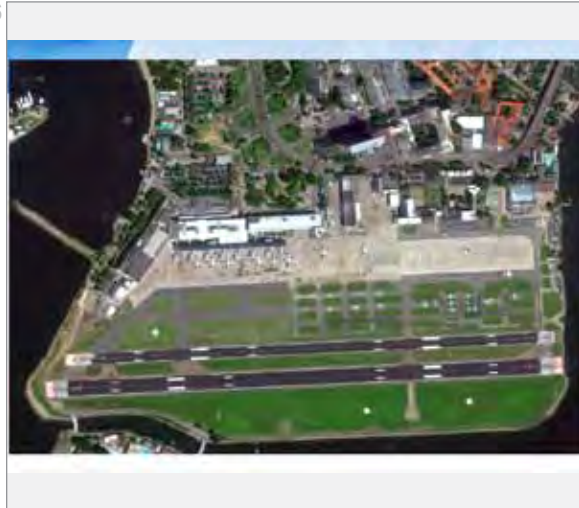
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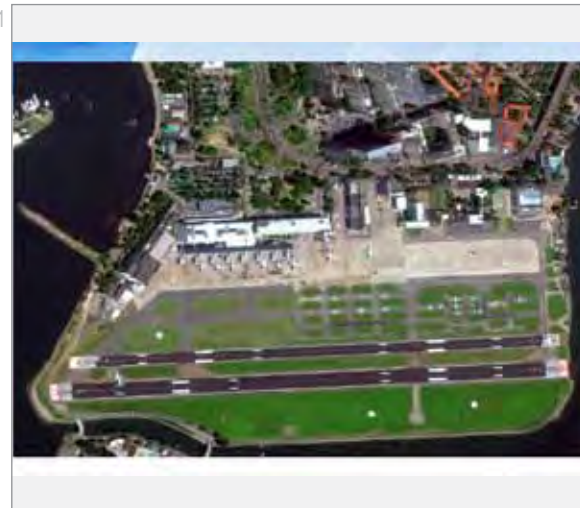
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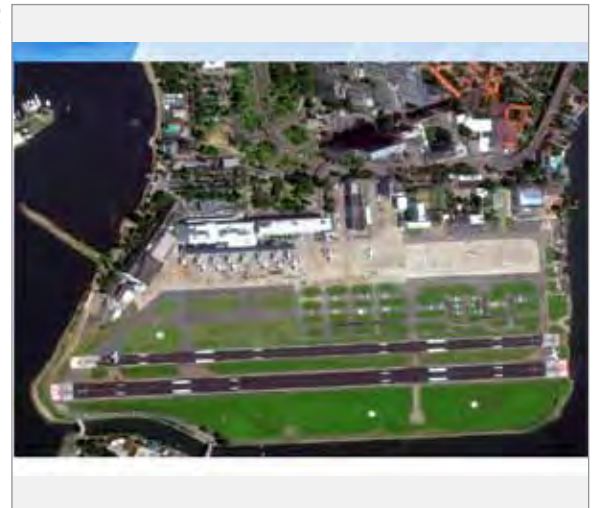
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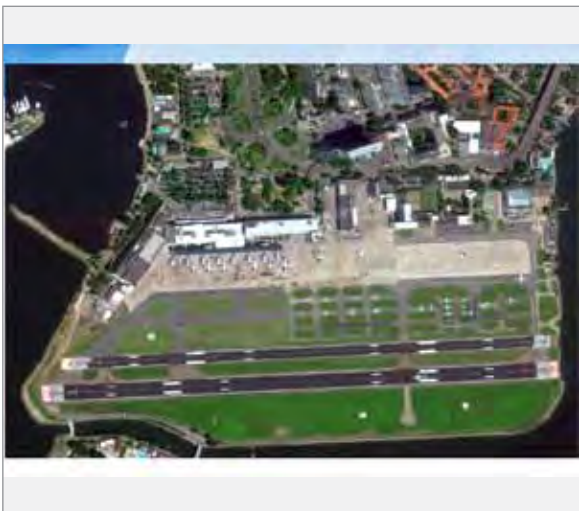
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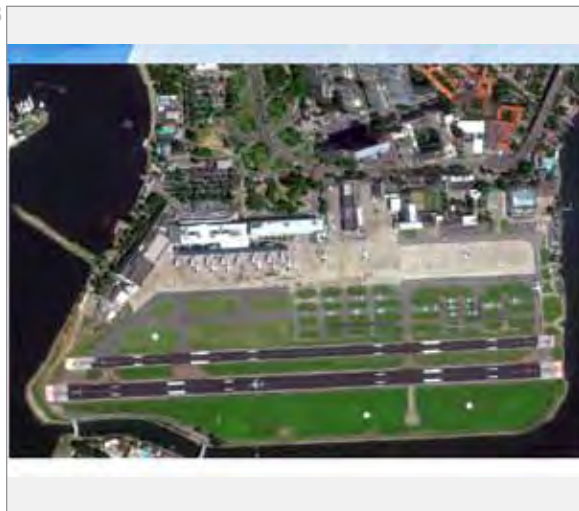
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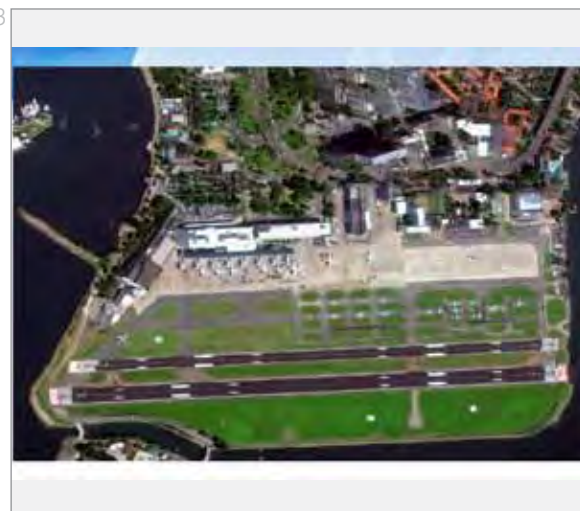
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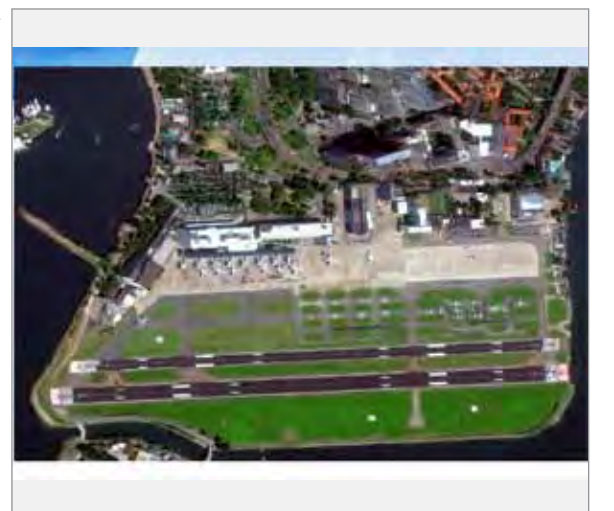
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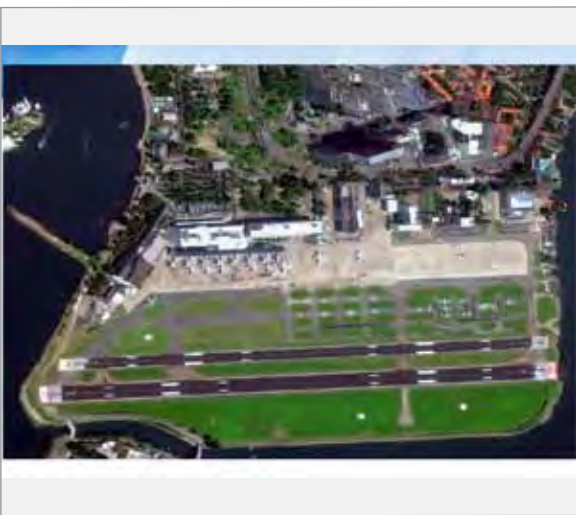
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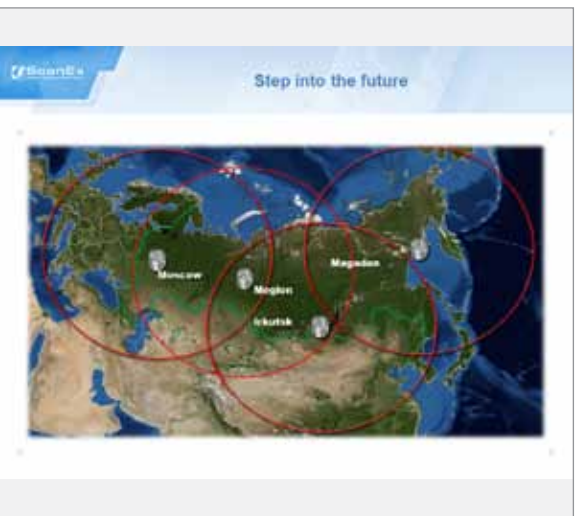
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ScanEx

Thank you for your attention!
We look forward
to working with you!

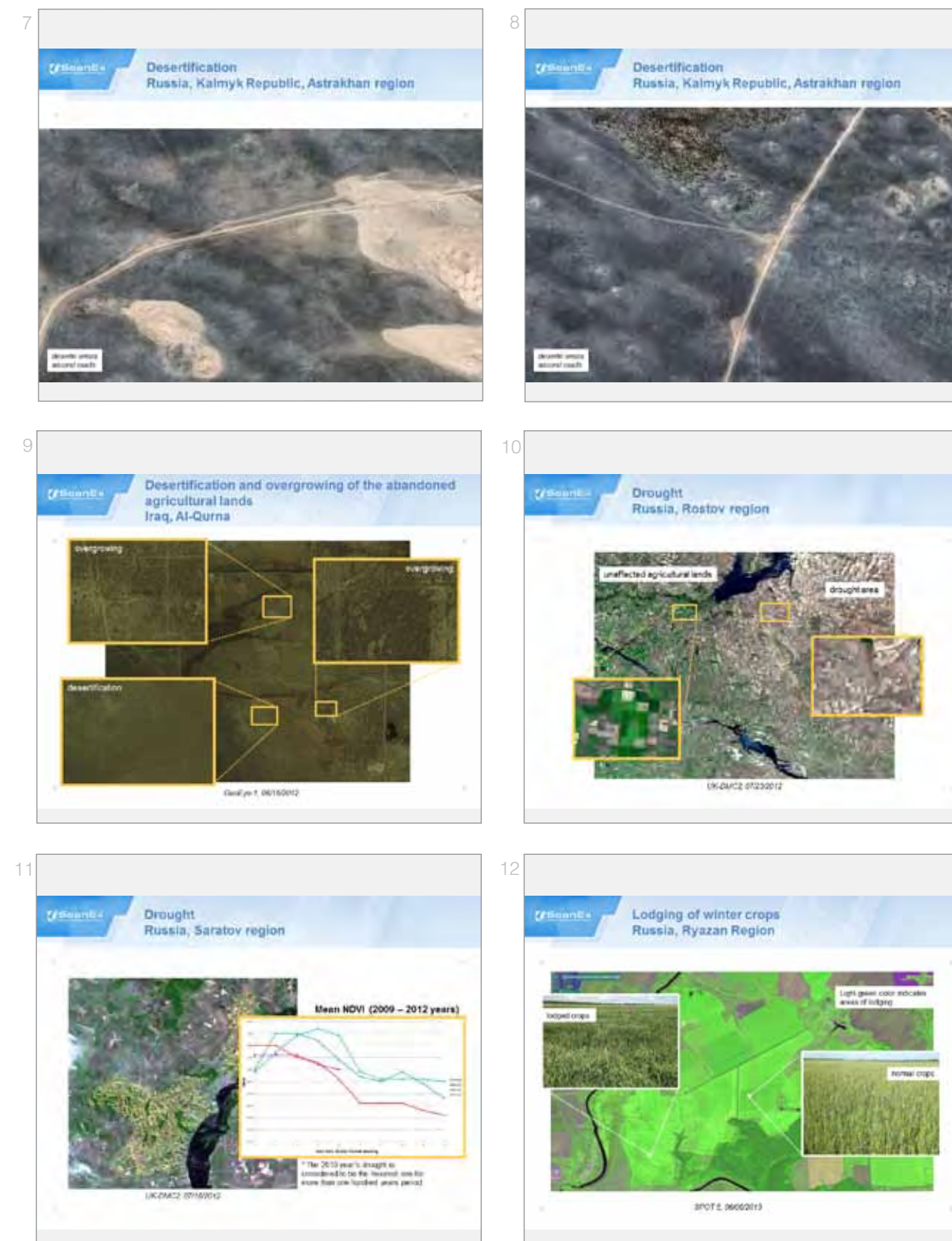
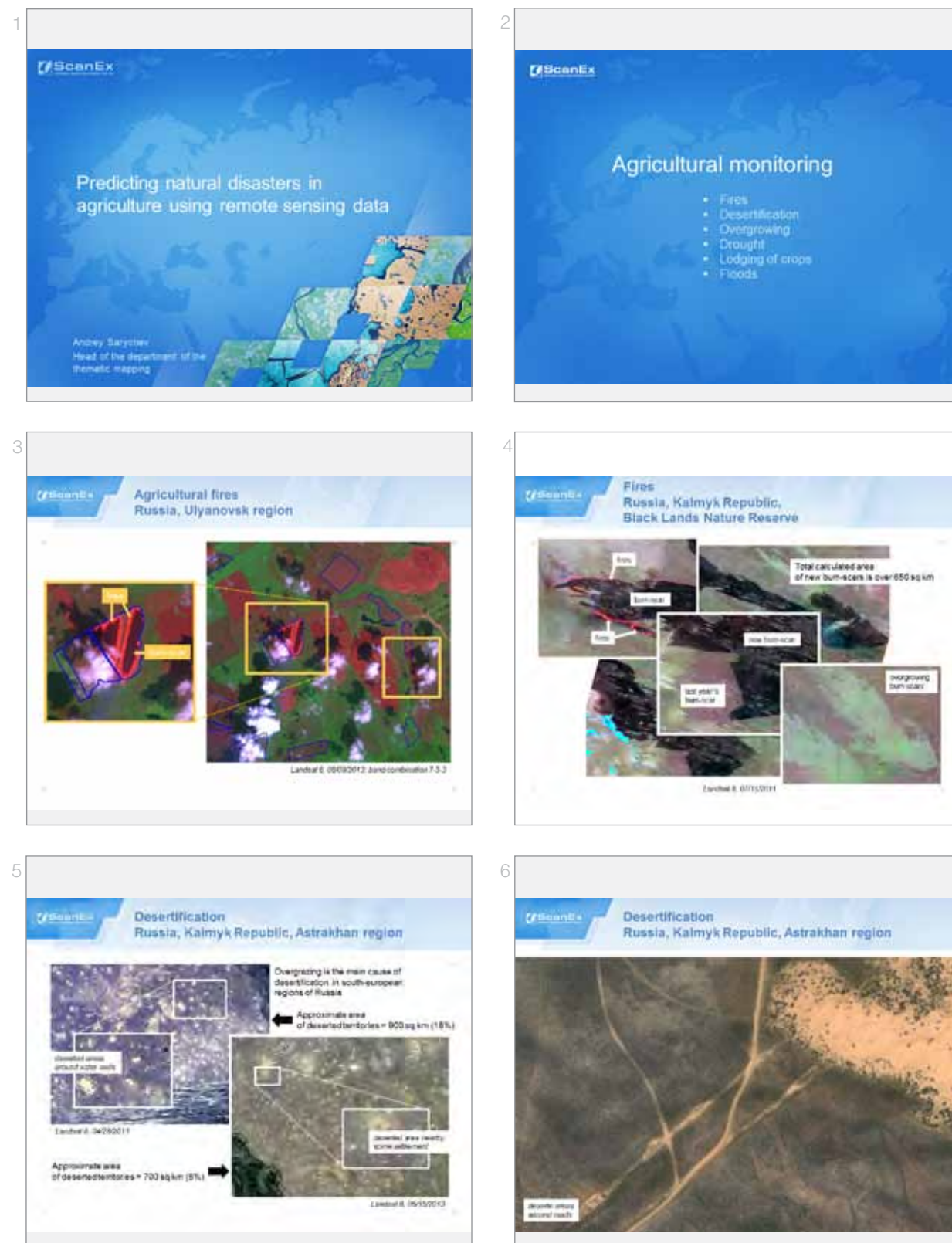
Office: 819a, Build. 1, Business-Park "Rumyantsevo",
Rumyantsevo village, Moscow, 142784, RUSSIA
Phone/Fax: +7 (495) 739-73-85

www.scanex.com info@scanex.ru



Predicting natural disasters in agriculture using remote sensing data

Andrey Sarychev, Head of the department of the thematic mapping, RDC SCANEX



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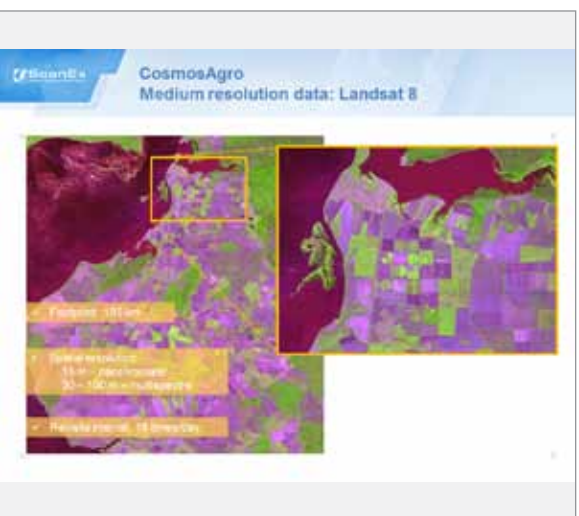
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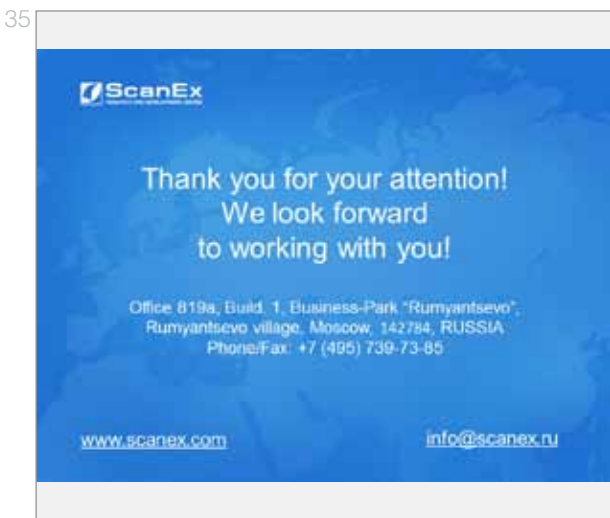
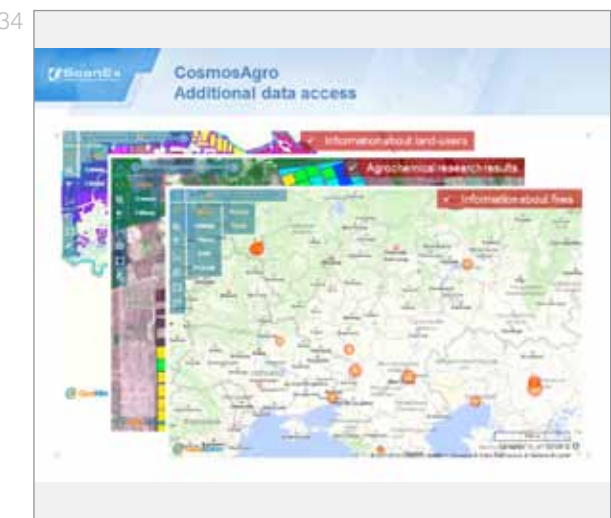
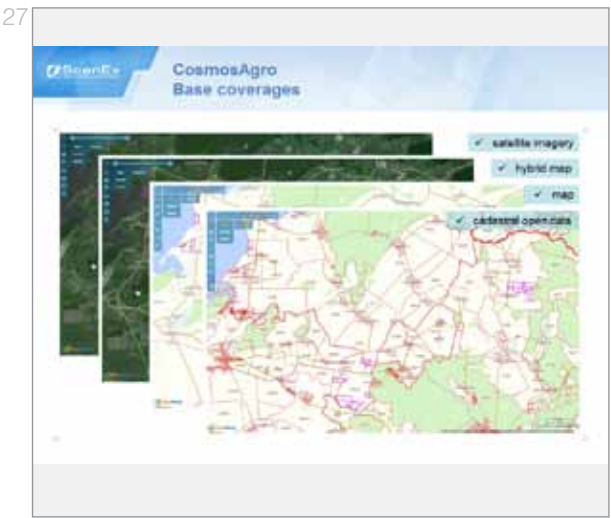
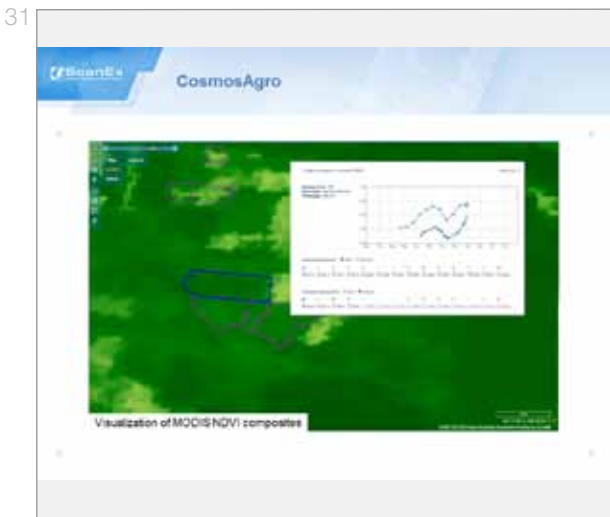
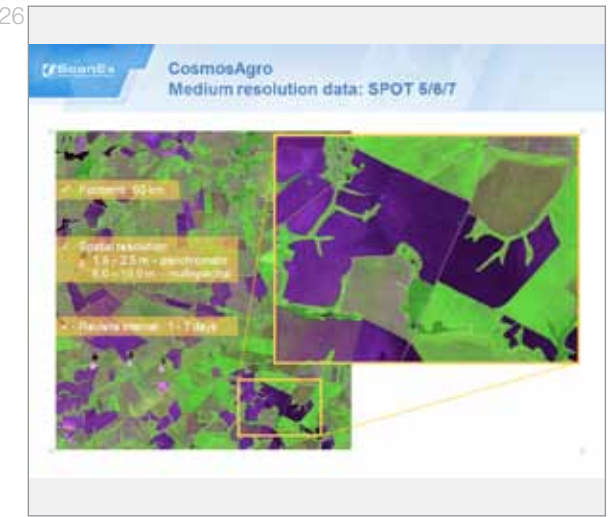


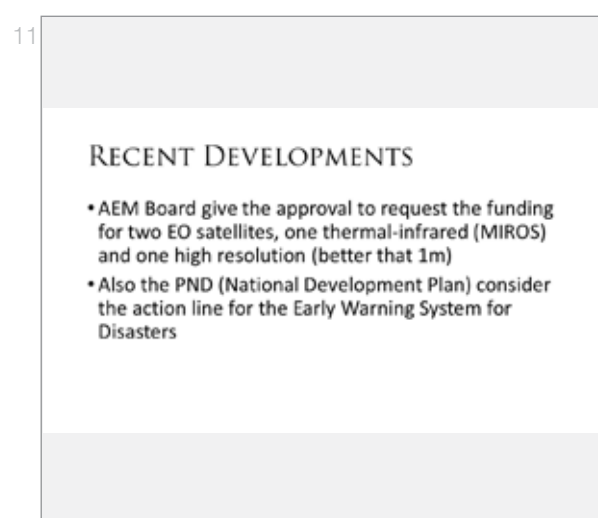
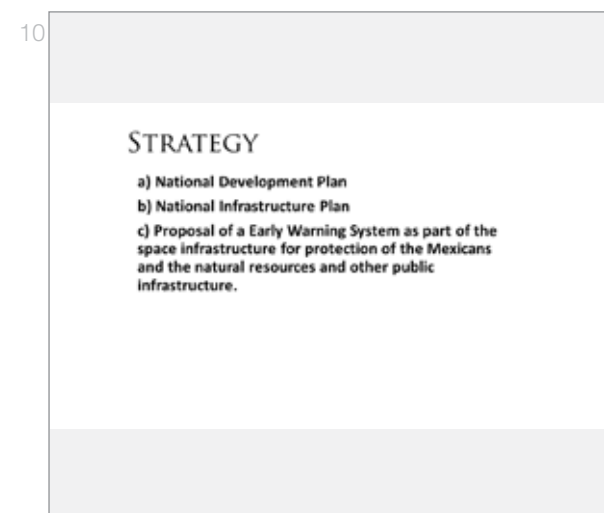
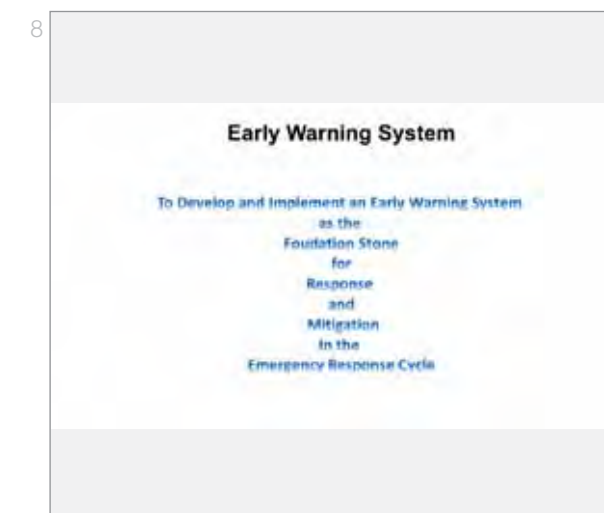
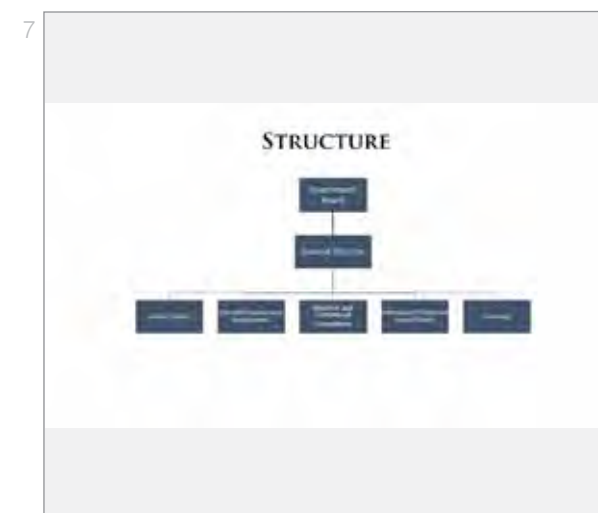
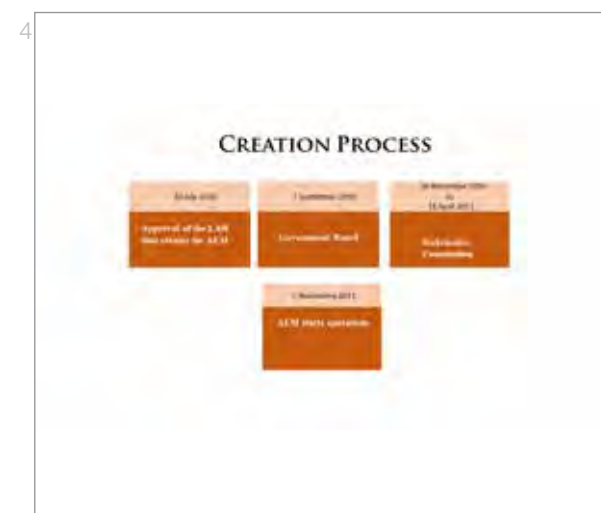
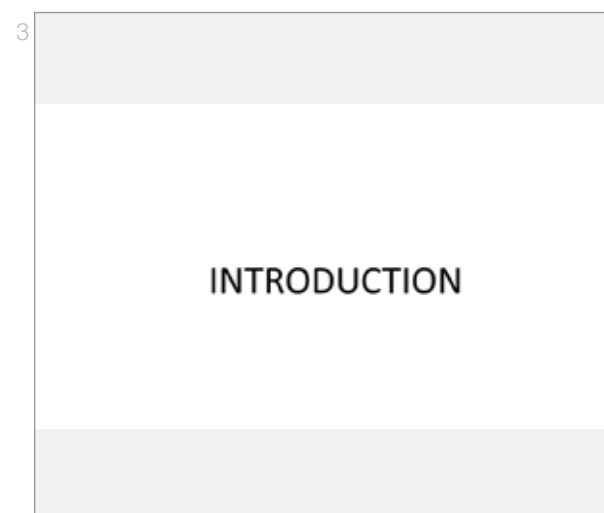
23



24







Early Warning System Deliverables



ADDITIONAL ACTIONS

- Trust CONACYT-AEM as dedicated funding for space projects.
- Regional development supported by States
- International collaboration

Many Thanks !

Dr. Benito Orozco Serna
and
Julio Castillo

Mexican Space Agency

What we need?



Team Work

INRAESTRUCTURA ESPACIAL PARA OBSERVACIÓN
DE LA TIERRA

SPACE INFRASTRUCTURE FOR SATELLITE COMMUNICATIONS



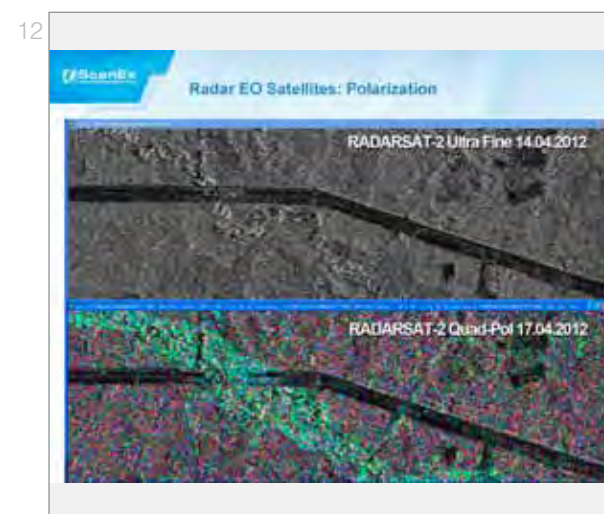
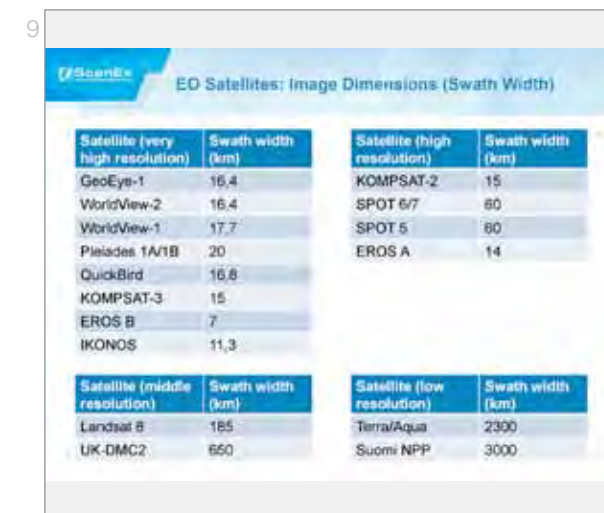
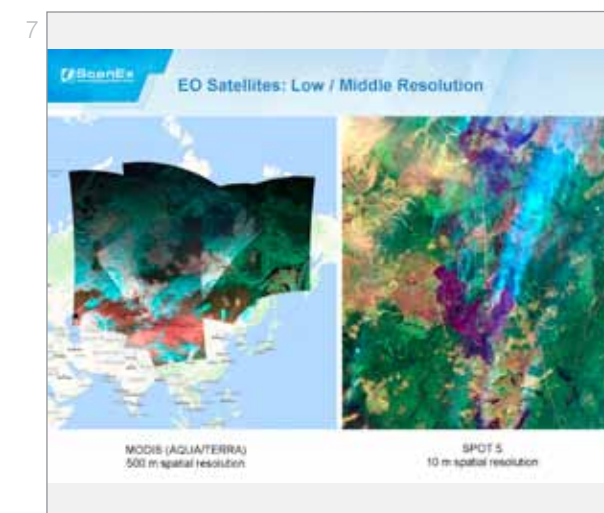
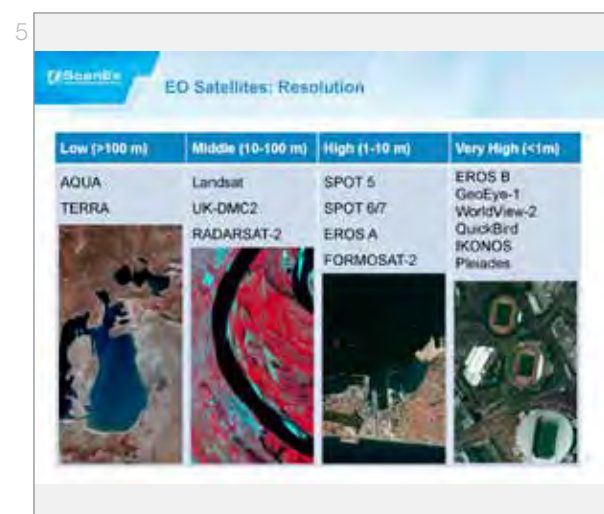
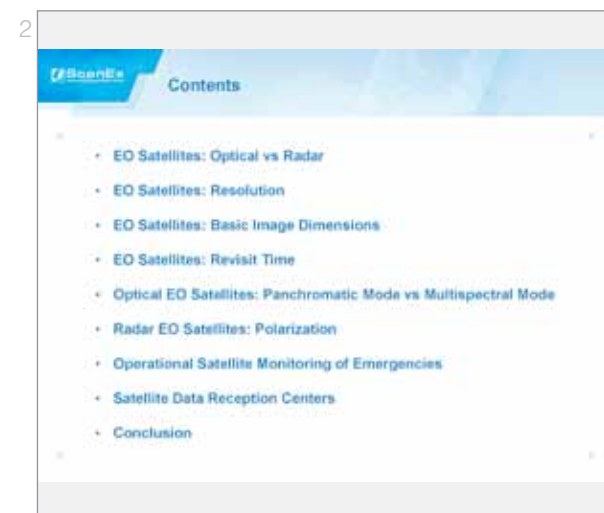
MIROS-DLR





Modern and Prospective Satellite Systems and Their Application for Emergencies Preparedness, Management and Response (EPMR)

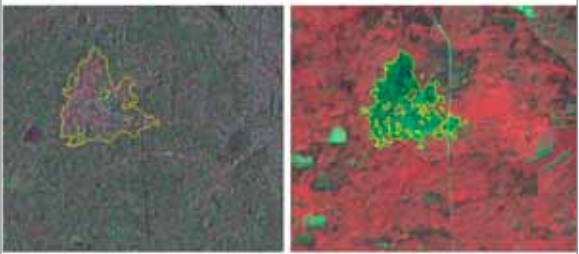
Maria Dorofeeva, Lead Specialist, Operational Satellite Monitoring Group, RDC SCANEX



13

Radar EO Satellites: Polarization

Satellite radars will help quickly mapping forest fires in any weather



Burnt area, highlighted on the RADARSAT-2 image, 19.08.2010, QuadPol Fine mode (left); and on SPOT 4 image, 15.09.2010, (right). MDA, SPOT Image, ScanEx, 2010

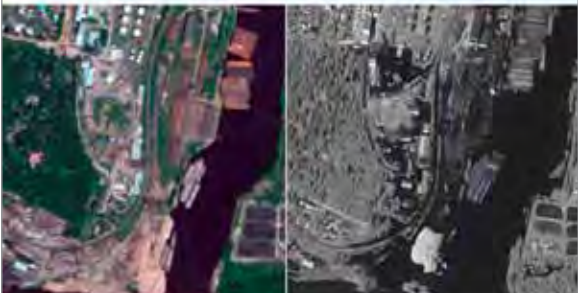
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MODIS Data: ScanEx Fire Monitoring Service
<http://fires.kosmosnimki.ru>



19

EROS A/B



Blagoveshchensk, the area where the Selenge River falls into the Amur River. EROS B satellite image, acquired on August 20, 2013. Left: satellite images of the area received before the flood in low-flow period. Right: the flooded areas outlined in blue (© ImageSat © DigitalGlobe Inc., ScanEx RDC)

20

RADARSAT-2

SAR imaging modes parameters and polarization types

Imaging mode	Nominal resolution	Scene size, km x km	Scene area, km²	Polarization types	
				Single polarization	Quadrature polarization
Ultra-Fine	3	20 x 30	400	Yes	
Multi-Look Fine	8	50 x 50	2500	Yes	
Fine	10	10 x 50	2500	Yes	Yes
Standard	25	100 x 100	10 000	Yes	Yes
Wide	30	150 x 150	22 500	Yes	Yes
ScanSAR Narrow	50	300 x 300	90 000	Yes	Yes
ScanSAR Wide	100	500 x 500	250 000	Yes	Yes
Extended high	25	75 x 75	5 625	Yes	Yes
Fine Quad-Pol	8	25 x 25	625		Yes
Standard Quad-Pol	25	25 x 25	625		Yes

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SPOT 5/6/7 + Pléiades 1A

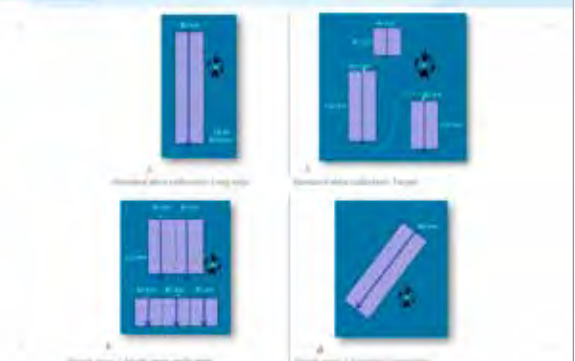


Advantages

- 1 - One planning system
- 2 - Repeat period - 2 times/24 hours
- 3 - Super high 4-satellite system capacity - 8 min sq. km/day
- 4 - First in the world high resolution satellites constellation (spatial resolution 1.5 m and better)

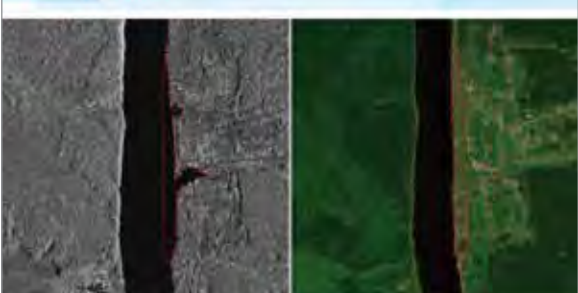
16

SPOT 6/7 imaging modes



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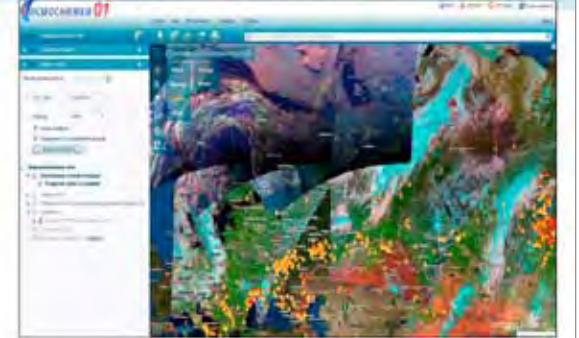
RADARSAT-2



Livlovka village. Left: Flooded areas; RADARSAT-2 image, acquired on August 7, 2013. Right: satellite images of the area received before floods in low-water period (© CSA, ScanEx RDC)

22

Operational satellite monitoring of emergencies: fires



MODIS data allow to detect hot spots

17

KOMPSAT Satellites
(Satrec Initiative Co., Ltd, South Korea)



KOMPSAT-2
Launch: July 2006
Optical
Resolution: 1 m

KOMPSAT-3
Launch: May 2012
Optical
Resolution: 0.7 m

KOMPSAT-3A
Launch: August 2013
Radar
Resolution: 1 m

KOMPSAT-3 (Korean Multi-Purpose Satellite)

- Spatial resolution up to 0.7 m (panchromatic mode) and up to 2.8 m (multispectral mode)
- Swath width 15 km

18

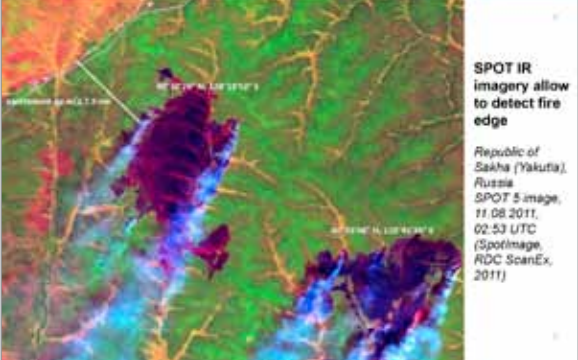
EROS B

- Near real-time data reception
- High maneuverability
- different imaging angles
- Possibility to take stereo image at one pass



23

Operational satellite monitoring of emergencies: fires

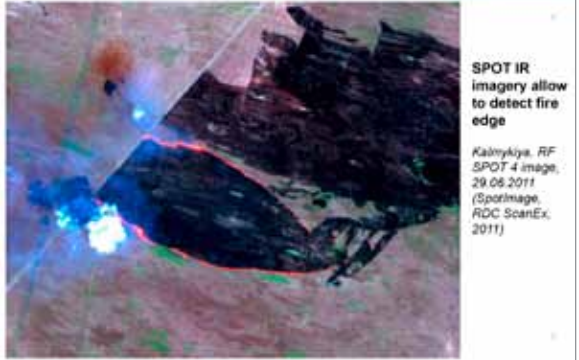


SPOT IR imagery allow to detect fire edge

Republic of Sakha (Yakutia), Russia
SPOT 5 image, 11.08.2011, 02:53 UTC (SpotImage, RDC ScanEx, 2011)

24

Operational satellite monitoring of emergencies: fires



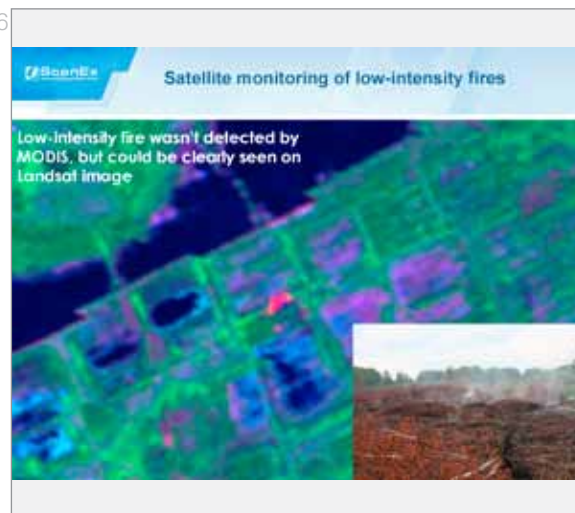
SPOT IR imagery allow to detect fire edge

Kalmykia, RF
SPOT 4 image, 29.08.2011 (SpotImage, RDC ScanEx, 2011)

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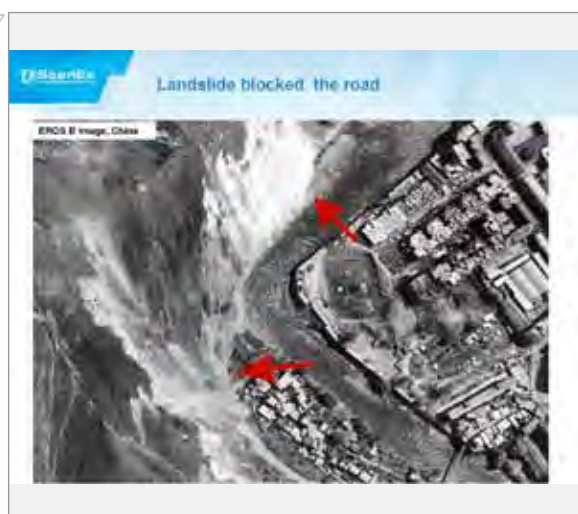
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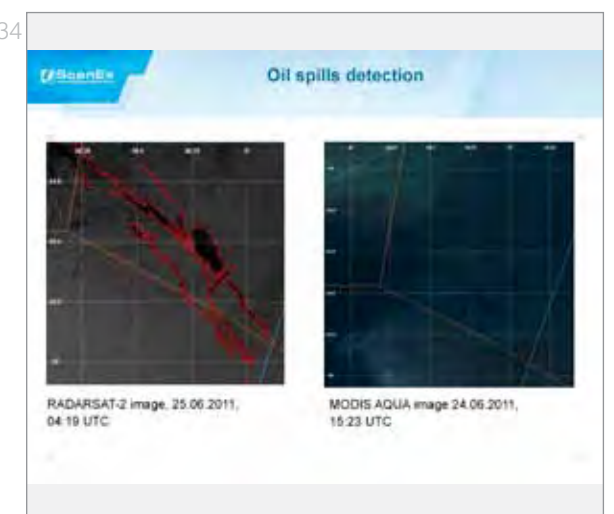
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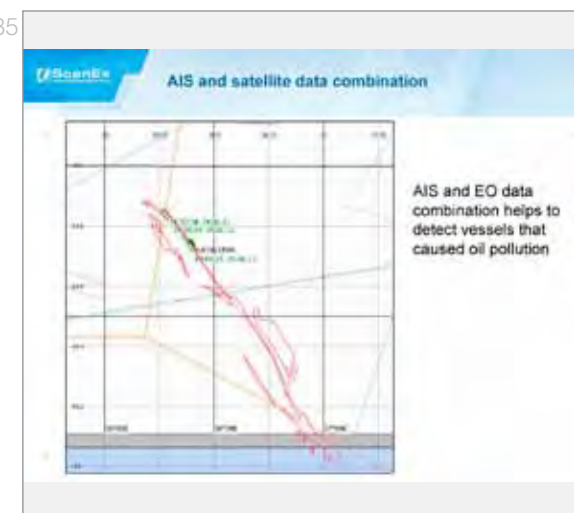
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From Earth RS satellites directly to UniScan™ ground station




EROS-A, EROS-B, FORMOSAT-2, Terra, Aqua, Suomi NPP, UK-DMC2, RADARSAT-2, SPOT-5, SPOT-6, SPOT-7

38

ScanEx Ground Stations Network



- 4 centers, 9 UniScan™ receiving stations
- Reception from RS satellites: Terra, Aqua, Suomi NPP, EROS-A, EROS-B, SPOT-4, SPOT-5, FORMOSAT-2, UK-DMC2, RADARSAT-1
- Over 150 passes per day, more than 600 GB data daily

43

Conclusion

Steps in case of emergency situation:



- Emergency situations monitoring - strict requirements: high resolution, fast data reception
- Ideal resolution is 10-20 cm (today the best possible resolution on the civil EO data market is about 0.5 m)

44

Thank you for your attention!
We look forward to working with you!

Office 819a, Build. 1, Business-Park "Rumyantsevo",
Rumyantsevo village, Moscow, 142784, RUSSIA
Phone/Fax: +7 (495) 739-73-85

www.scanex.com info@scanex.ru

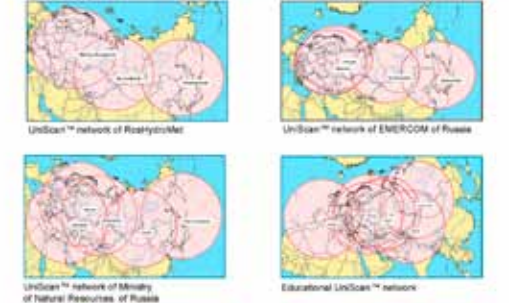
39

Remote Sensing Center of ScanEx in Moscow (MARC)



40

UniScan™ networks of state-run organizations



UniScan™ network of Roshydromet, UniScan™ network of EMERCOM of Russia, UniScan™ network of Ministry of Natural Resources of Russia, Educational UniScan™ network

41

Remote sensing centers on the base of UniScan™



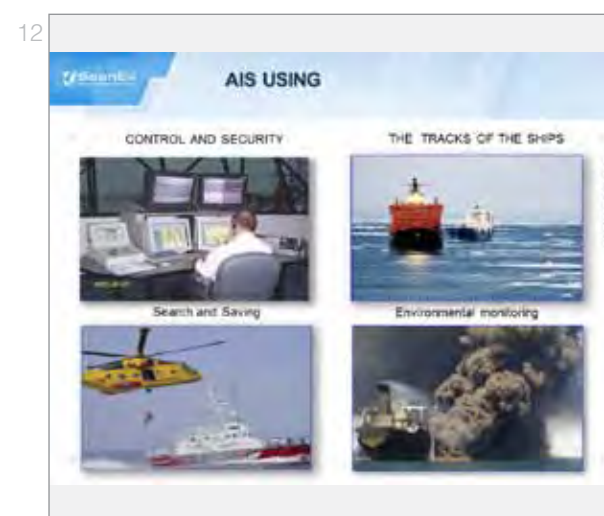
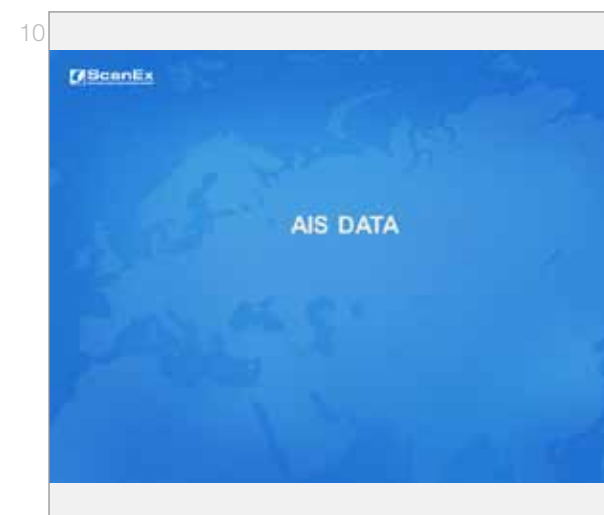
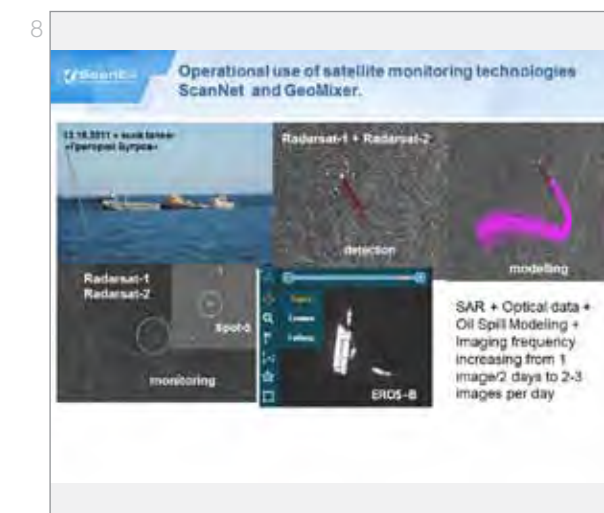
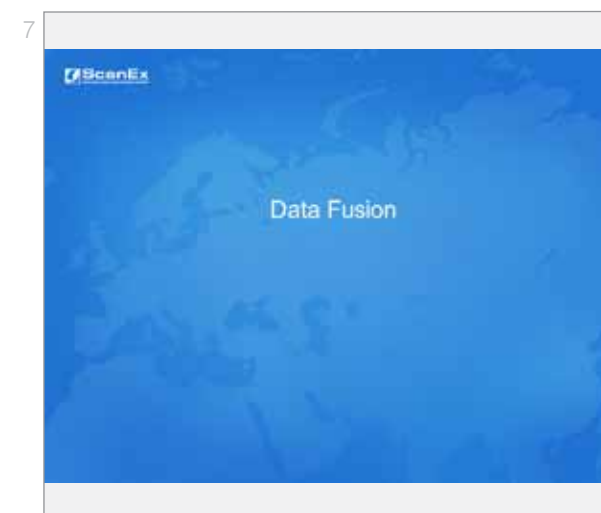
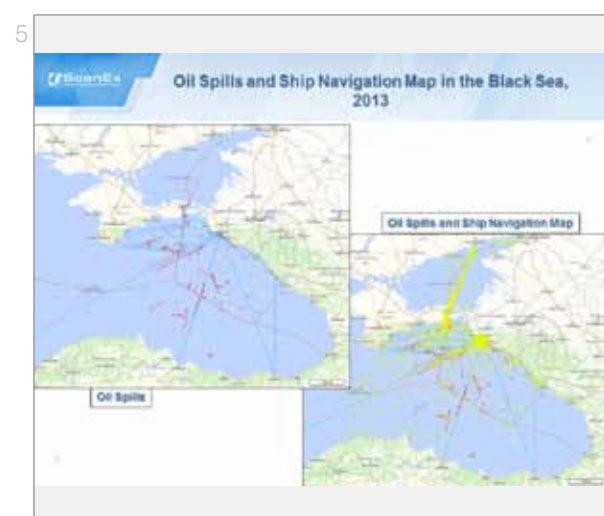
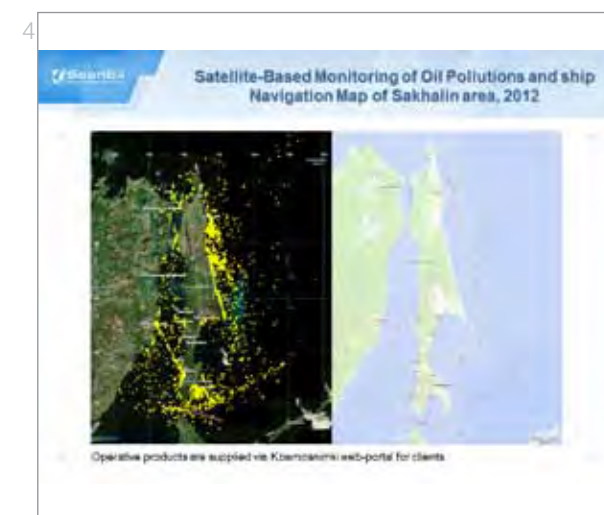
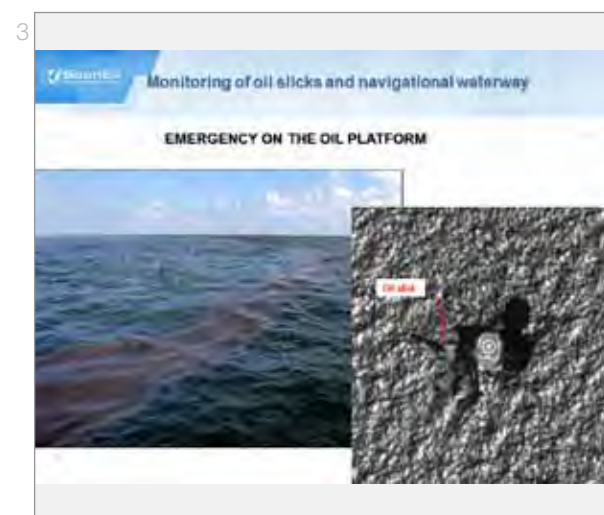
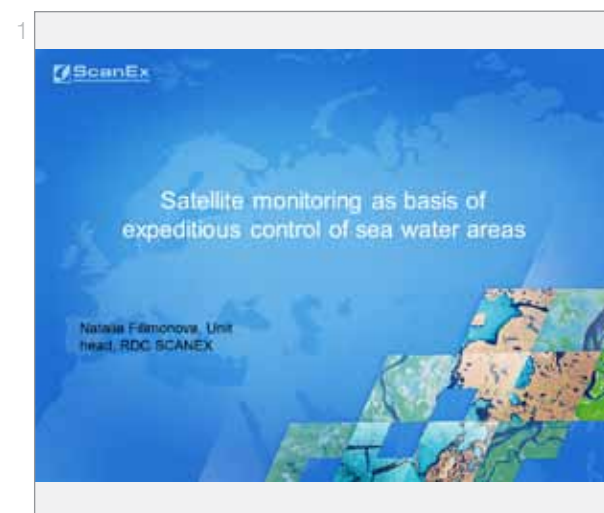
and other 60 RS Centers

42

Data integration: geoportals



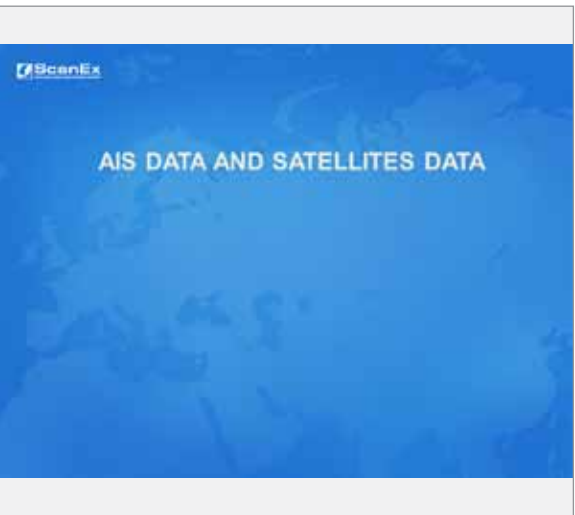
Geoportals, weather, Web-cameras, GLONASS/GPS data download, Objects search, Additional data



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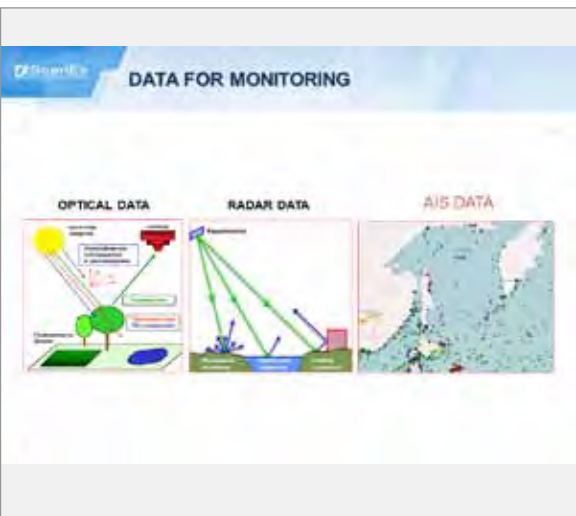
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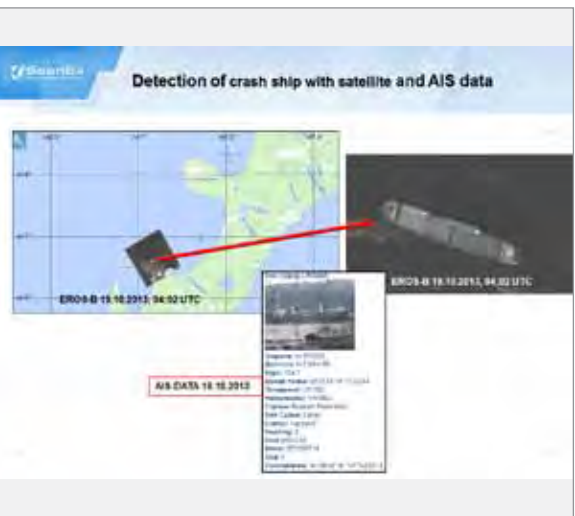
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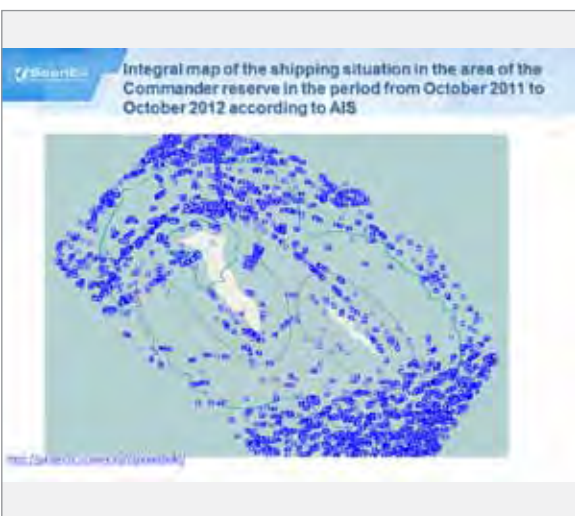
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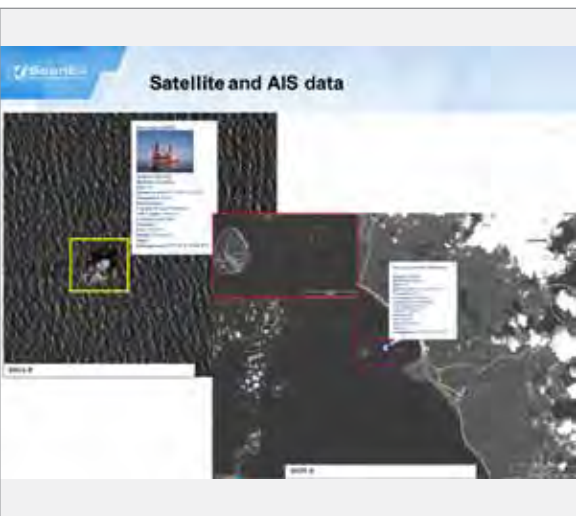
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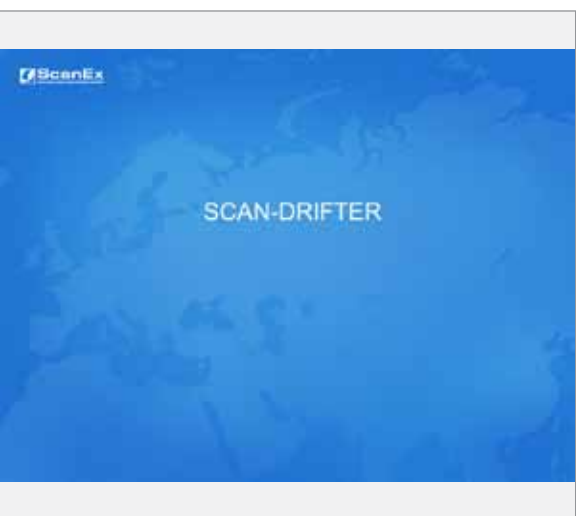
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Customized Web-Portals from SCANEX

- *Maritime control — <http://ocean.kosmosnimki.ru>
- *Flooding Monitoring — <http://rivers.kosmosnimki.ru>
- Image Archive Searching — <http://search.kosmosnimki.ru>
- Monitoring of Illegal Activity within the Nature Protected Areas — <http://ooot.kosmosnimki.ru>
- Fires Monitoring — <http://fires.kosmosnimki.ru>

* - only demo version of the web-portal is available for non-authorized users

28

Conclusions

- ✓ ScanEx makes extensive use of satellite imagery for operational monitoring of sea areas
- ✓ ScanNet technology and GeoMaer significantly improve its efficiency and effectiveness.
- ✓ WEB - interface organizes indoor multi-user access to timely and objective information.
- ✓ Integrated use of the data to minimize the risks.
- ✓ Satellite monitoring is an effective source of information about the marine waters

29

ScanEx

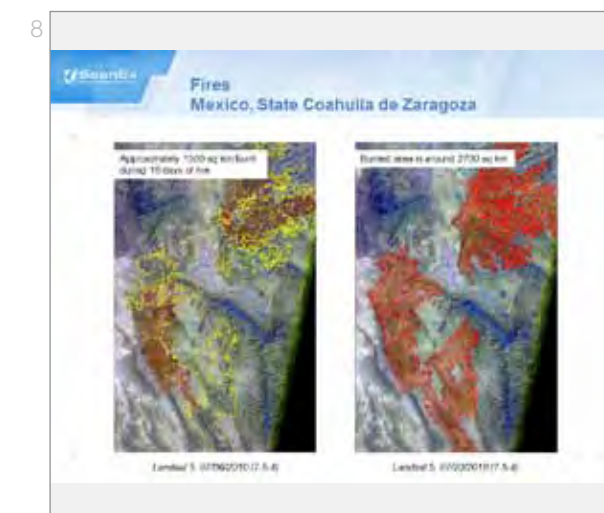
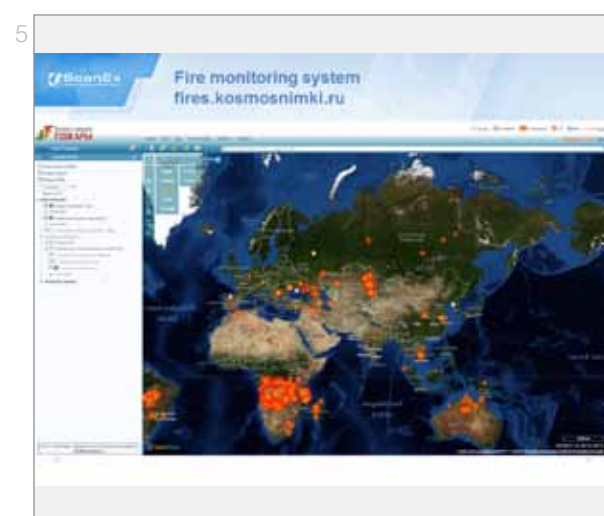
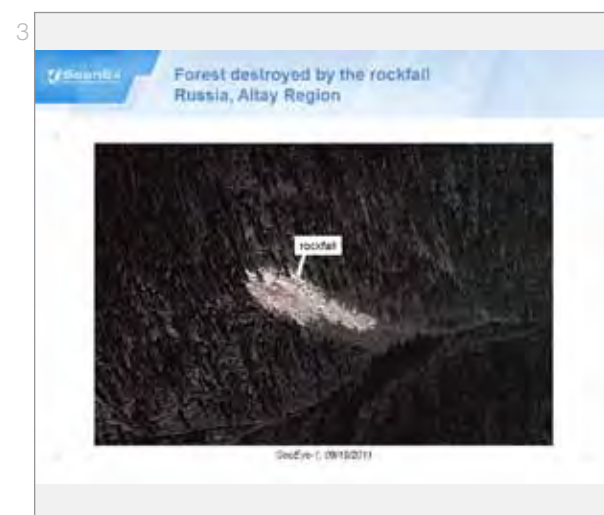
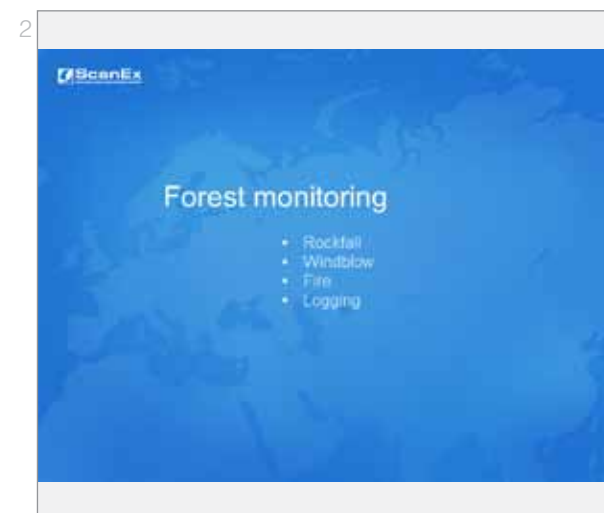
Thank you for your attention!
We look forward
to working with you!

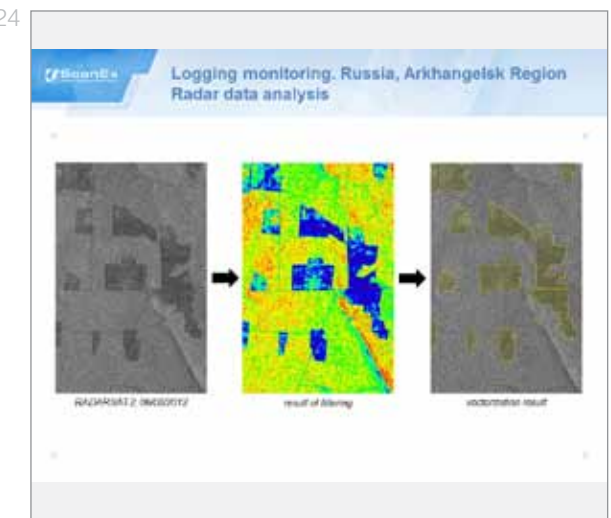
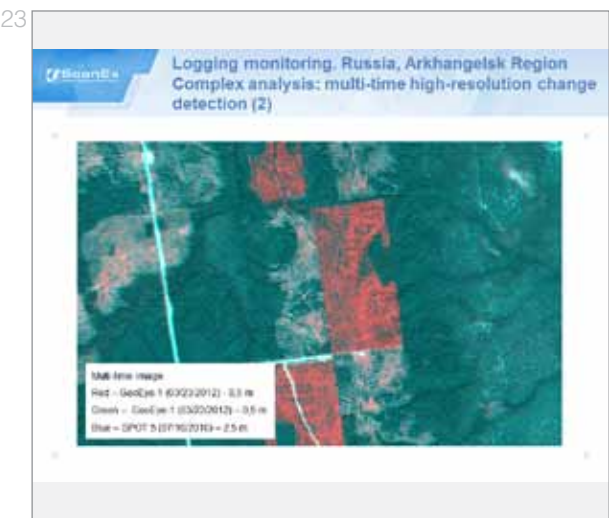
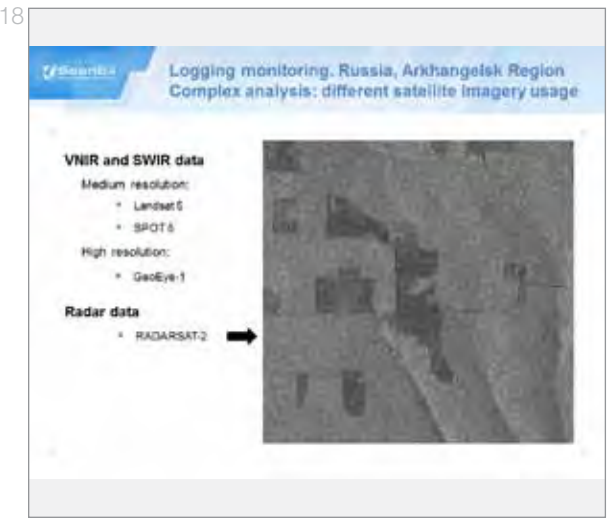
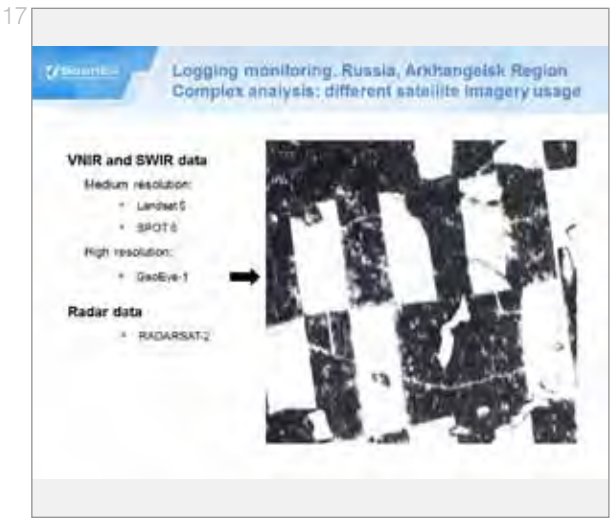
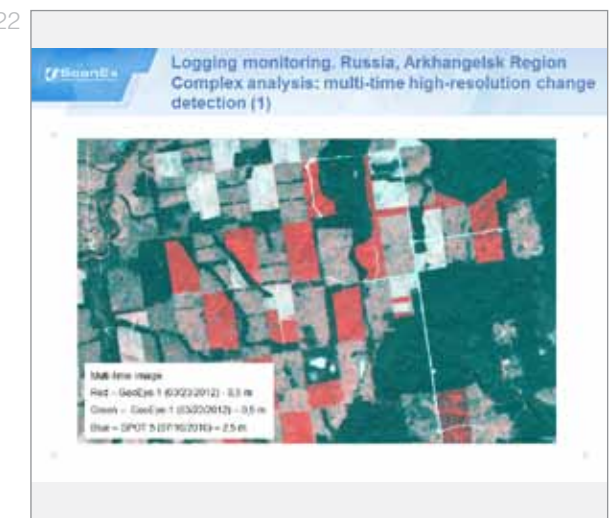
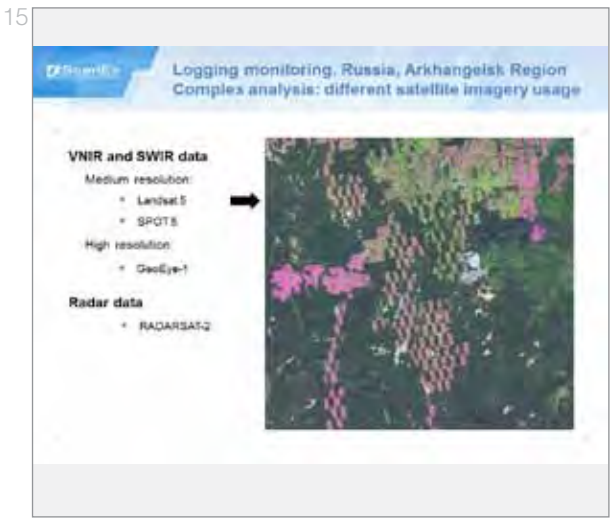
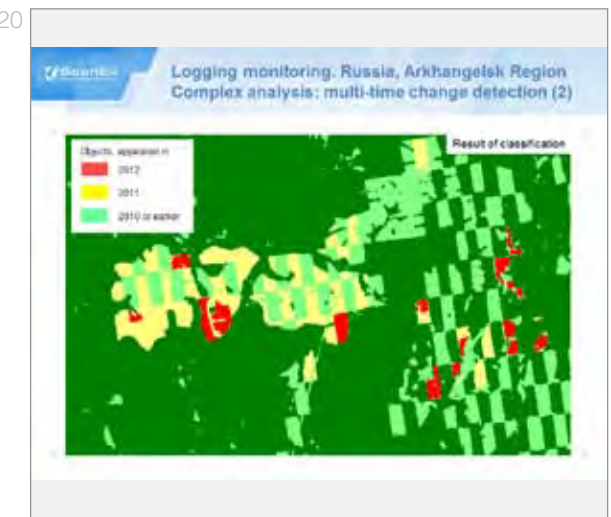
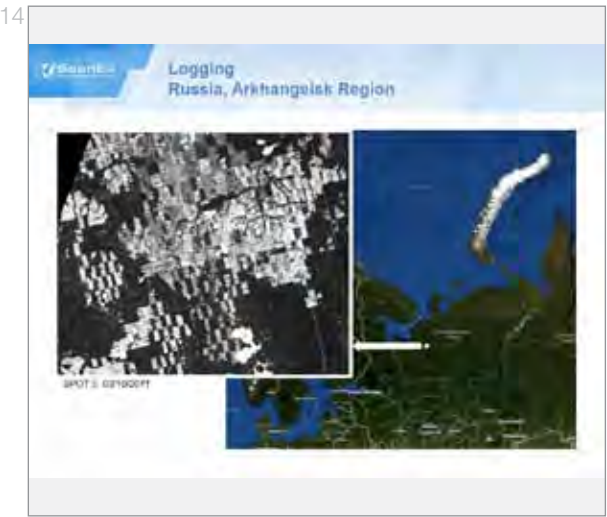
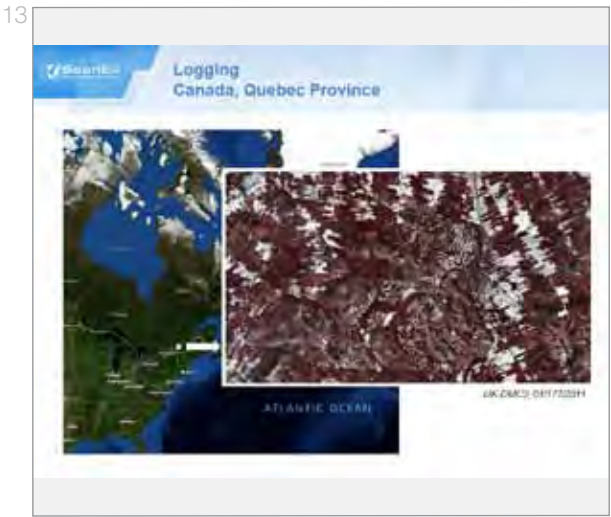
Office: 819a, Build. 1, Business-Park "Rumyantsevo",
Rumyantsevo village, Moscow, 142784, RUSSIA
Phone/Fax: +7 (495) 739-73-85

www.scanex.com info@scanex.ru

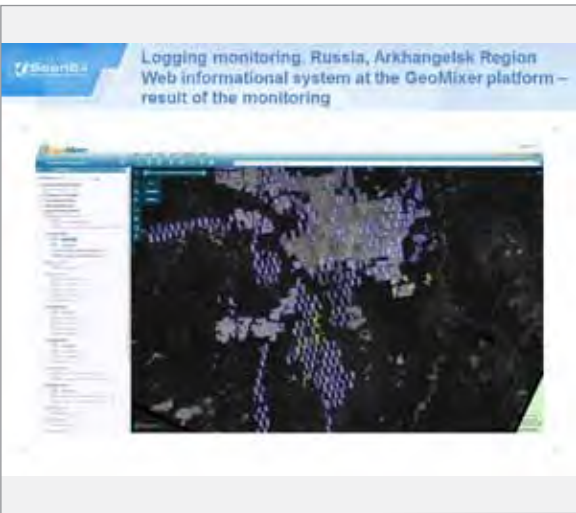


Near real-time identification of adverse forest effect using remote sensing data
Andrey Sarychev, Head of the department of the thematic mapping, RDC SCANEX

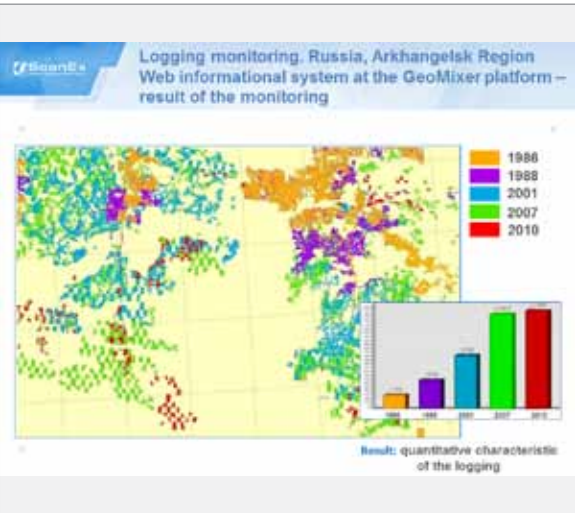




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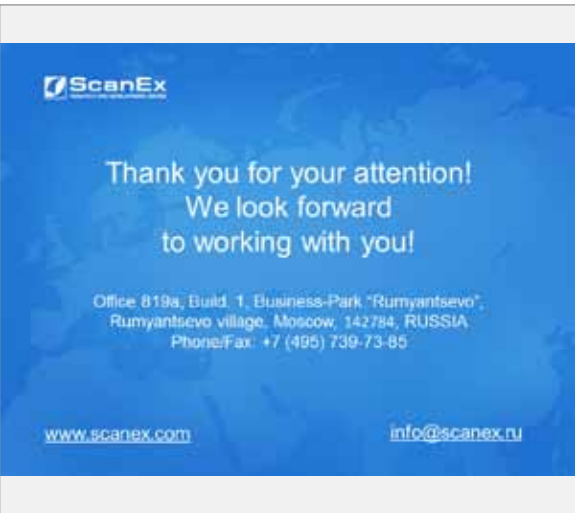
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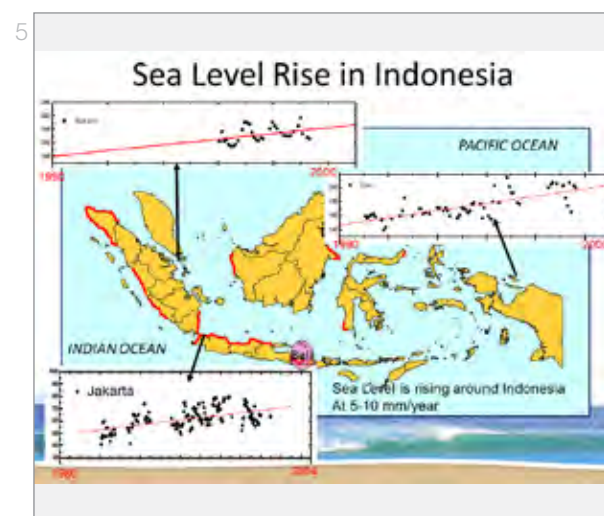
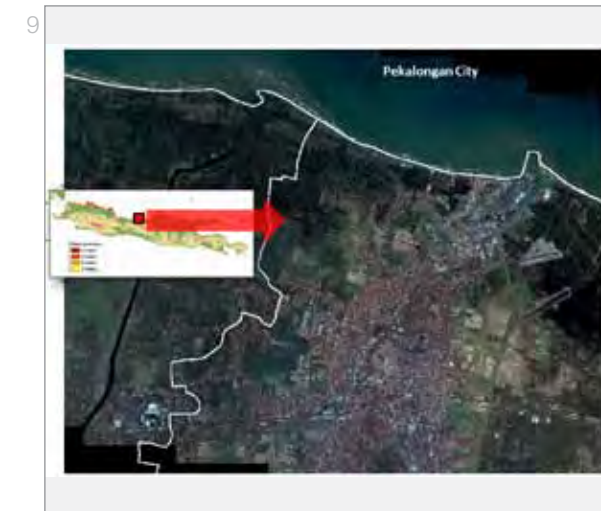
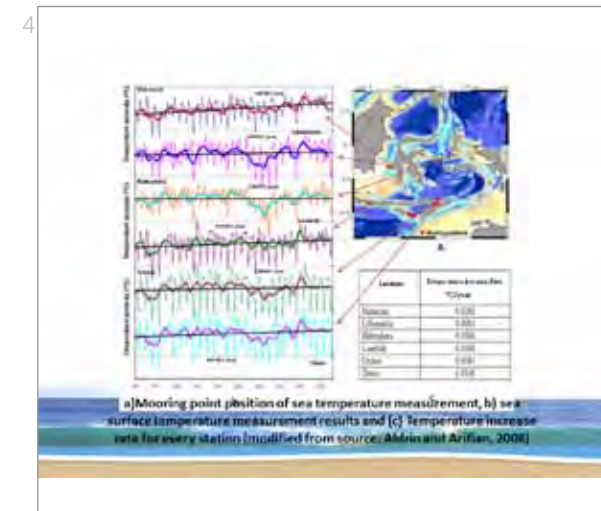
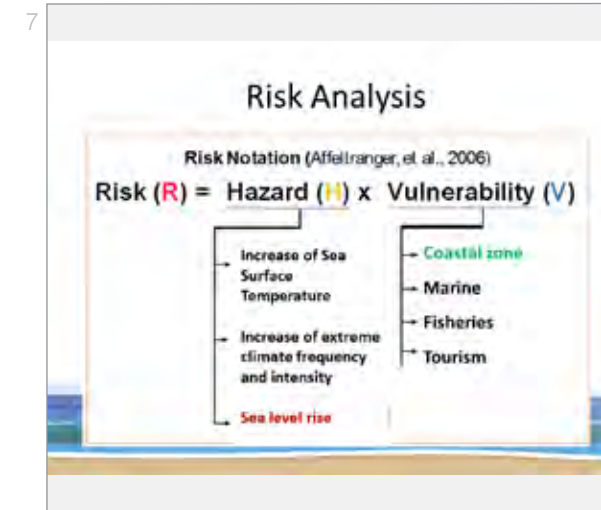
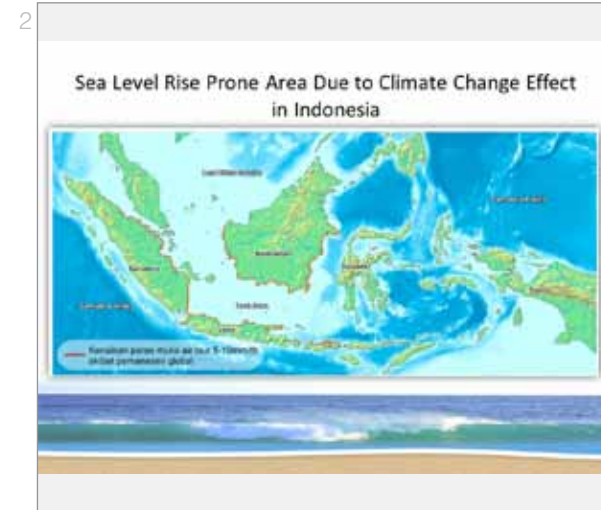


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6



Scale	Data Needs	Scope	Action Level	Attenuation	Cost
Macro	Qualitative	National	Policy	Low	Low
Meso	Combine of Qualitative and Quantitative	Regional (Province)	Strategy	Medium	Medium
Micro	Quantitative	Local	Action Plan	High	High



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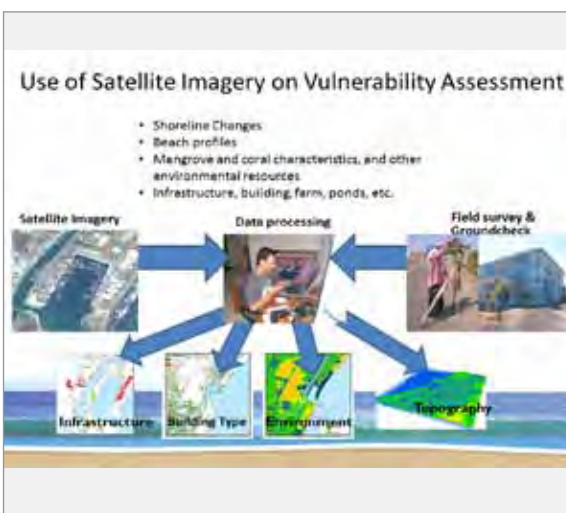
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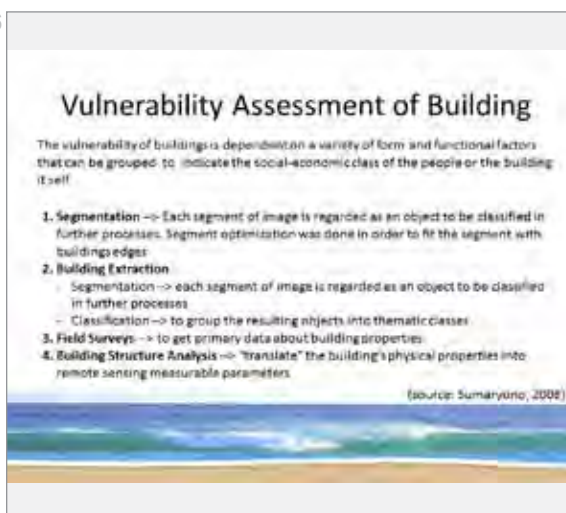
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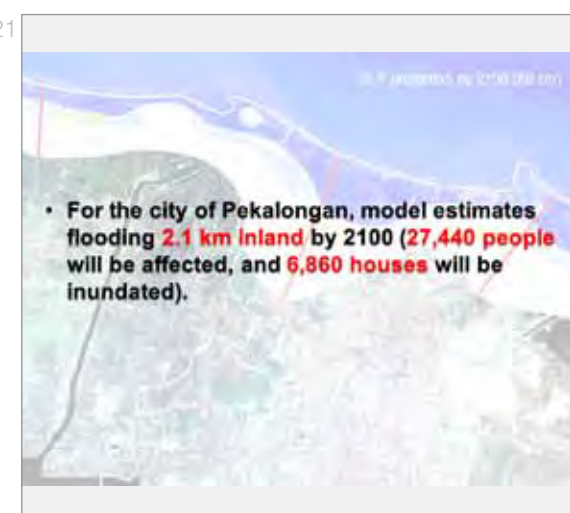
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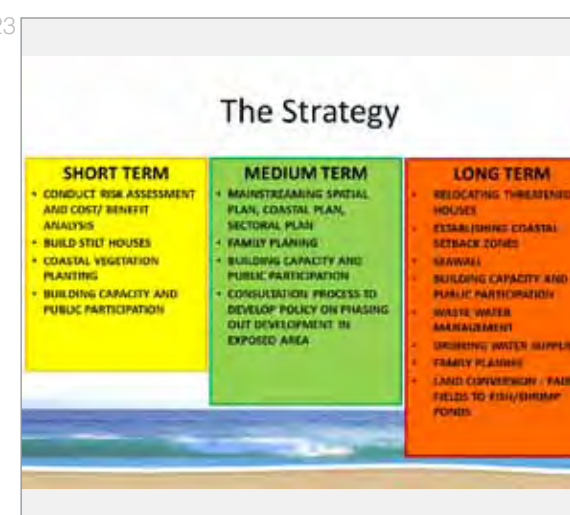
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GEOSPATIAL INFORMATION (www.bnpb.go.id)

"To provide geospatial information quickly and easily, BNPB provide basic maps, disaster maps, geospatial and remote sensing data that can be accessed free of charge by the public. There are over 1000 disaster maps in the BNPB's Geospatial Website"



Base Map:

- Indonesian Topographic map of scale 1: 250,000, and scale 1: 25,000 for disasters

Disaster Map:

- Hazard maps (earthquakes, tsunami, floods, landslides, vulnerability maps, map capacity, etc.)

Disaster Monitoring:

- The events of recent disasters in Indonesia. (source: BNPB)

26

Thank you



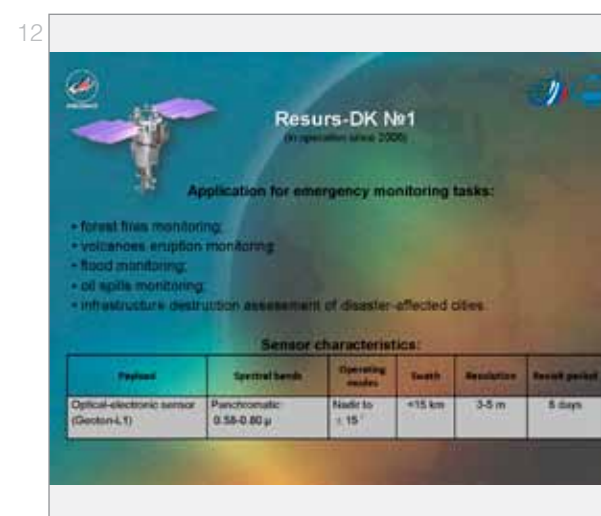
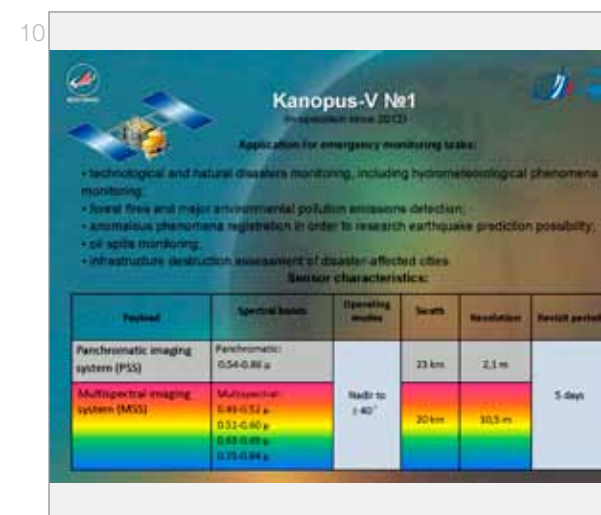
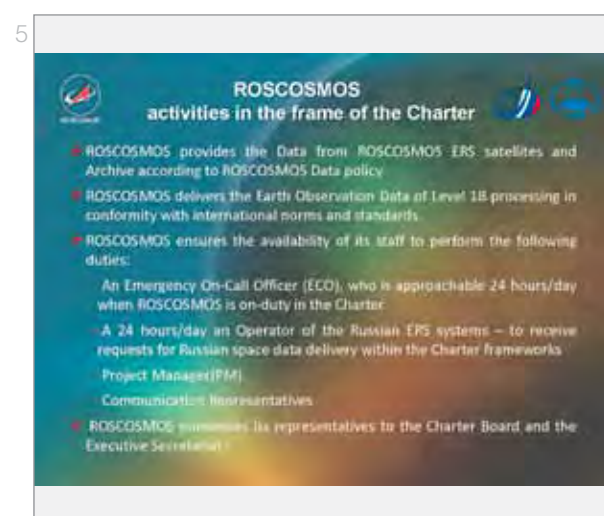
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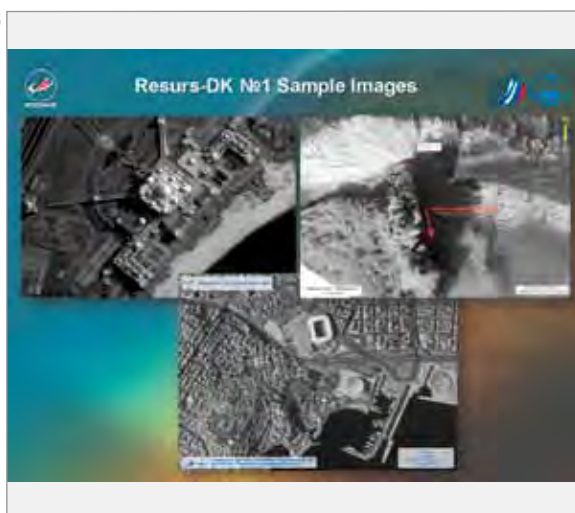


Roscosmos Participation in the International Charter on Space and Major Disasters

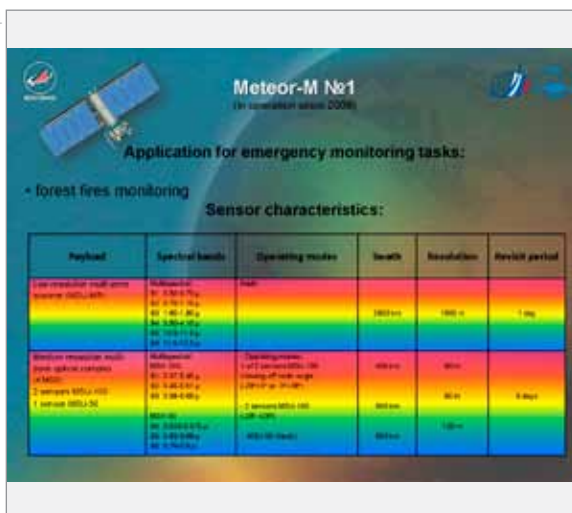
Vasily Gudnov, Head of International Legal Department, International Contractual Directorate, Roscosmos



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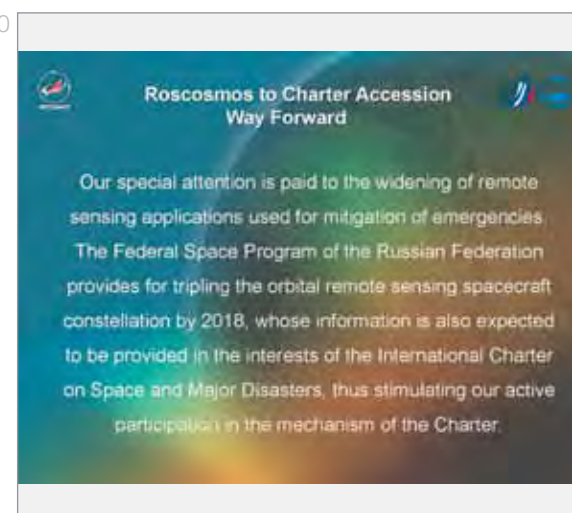
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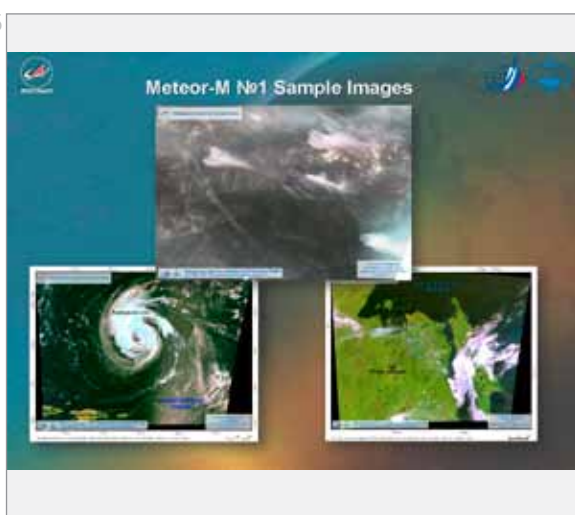
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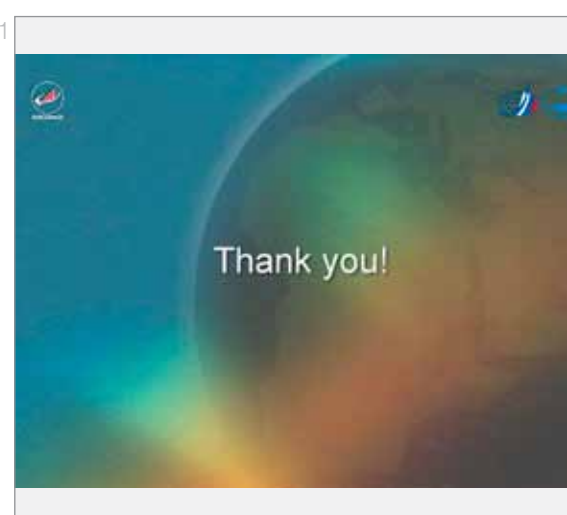
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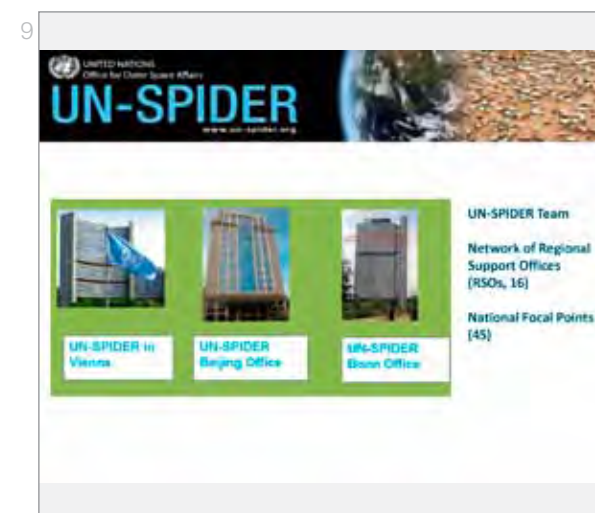


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UN-SPIDER
www.un-spider.org

Cyclone: Space inputs

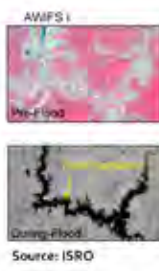
Pre-disaster
Preparedness plan

Prediction/early warning
Cyclone monitoring
Track prediction, landfall point, Storm and storm surge
Disaster warning station

Disaster
Flood and damage assessment

Post-Disaster
Rehabilitation

Source: ISRO



14

UN-SPIDER
www.un-spider.org

Floods: Space inputs

- Flood inundation map (near real-time)
- Duration of flood inundation
- Flood Hazard Zones
- Flood damage & loss assessment
- River Configuration & Flood control works
- Bank Erosion

Image source: ISRO



19

UN-SPIDER
www.un-spider.org

Technical Advisory Mission (2008 - 2013)



20

UN-SPIDER
www.un-spider.org

UN-SPIDER Technical Advisory Missions

Government
Meetings, Brainstorms and Workshop
Mission Team

Internal Report
Observations and Recommendations
Policy Coordination
Capacity Building
Information Sharing
Data standards
Data access

Recommendations
Action Plan
Cooperation
Emergency support
Long-term support

Improved DRR and ER practices involving Space Technology

15

UN-SPIDER
www.un-spider.org

Up-to-date thematic and baseline spatial data is a basic requirement

Baseline data
Utility and infrastructure data
Thematic data on terrain and natural resources
Satellite images (Pre and Post disaster event)
Disaster specific data

Most of the georeferenced information is derived from the satellite images

16

Baseline Data- Geographic Reference

Data	Description	Reference to Disaster management
Administrative units	National, provincial state, district boundaries to the locations of towns and villages	Basic administrative units and the village boundaries in GIS format to assist in all phases of disaster management. This format is also used to assist in the identification of vulnerable areas.
Demography	10 detailed physical population and distribution based on age, sex, education etc.	Demographic data is essential for the identification of vulnerable areas and for the assessment of the impact of disaster.
Socio-economic details	Education, occupation, income, assets and comprehensive information based on household survey	Socio-economic data is essential for the assessment of the impact of disaster and for the identification of vulnerable areas.
Amenities	Healthcare facilities including hospitals, clinics, medical services, schools, universities, gas stations etc.	Healthcare facilities are essential for the assessment of the impact of disaster and for the identification of vulnerable areas.

21

UN-SPIDER
www.un-spider.org

Follow-up Actions

- The ... should plan a workshop for wide dissemination of the TAM report and recommendations to all stakeholders in the country including government agencies, UN and other humanitarian partners and invite their support for implementation of TAM recommendations.
- UNDP and UNHCR offices in ... should provide the recommendations to disaster management related programmes developed by the UN agencies and the government.
- High level intervention (at ministerial level) is requested to encourage data sharing and follow-up of recommendations on Data Policy.
- UN-SPIDER and ... with the help of organizations which participated in the TAM and with the local support of organizations, could organize relevant short-term training programmes.
- UN-SPIDER, within its limited resources, could facilitate the capacity building for the staff of the Government through a series of training and technical assistance in cooperation with ...
- The government should consider organizing familiarization study tours of one or two countries operational "centres of excellence".
- During emergencies, UN-SPIDER could act as the bridge between users and product service providers (such as International Charter, Sentinel Asia, UN-SPIDER Regional Support Offices and other partners).

22

UN-SPIDER
www.un-spider.org

Dominican Republic, 13-17 May 2013

Follow-up Activity of TAM in 2010 and Institutional Strengthening Mission in 2011
Experts from UN-SPIDER and SRSOs

- Topic 1: Introduction to remote sensing for disaster risk management and emergency response
- Topic 2: Acquisition of satellite data and use of data products for flooding
- Topic 3: Pre-processing, supervised and unsupervised classification of multispectral images
- Topic 4: Calculation of indices and change detection with multispectral images
- Topic 5: Introduction to radar data
- Topic 6: Use of digital elevation models for hydrologic modelling
- Topic 7: Use of thermal data for change detection
- Topic 8: Introduction to the web portal TAMT
- Topic 9: Hands-on projects in groups

17

UN-SPIDER
www.un-spider.org

Utility and Infrastructure data – Risk and vulnerability assessment

Data on utility and infrastructure is critical risk reduction and response activities

Topic	Details	Reference to Disaster management
Transport network	Urban transport network including roads and other modes of transport (buses, taxis, etc.)	Urban transport network provides critical information during response phase. Road network is essential for the evacuation of people and for the distribution of relief supplies.
Electricity network	Urban electricity network including power lines and substations	Electricity network is essential for the functioning of urban infrastructure and for the distribution of relief supplies.
Cadastral details	Urban cadastral details including land use, land cover, and land ownership	Cadastral details are essential for the assessment of the impact of disaster and for the identification of vulnerable areas.
Region specific utility network	Region specific utility network including water supply, sewerage, and gas supply	Region specific utility network is essential for the assessment of the impact of disaster and for the identification of vulnerable areas.

18

Thematic data on terrain and natural resources

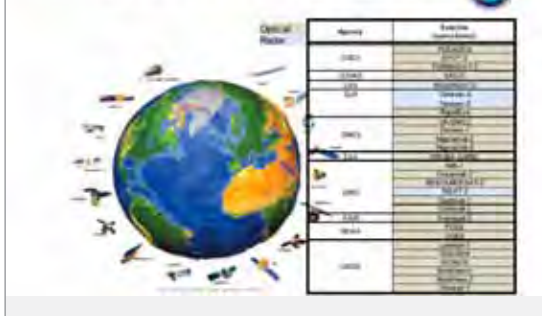
Topic	Details	Reference to Disaster management
Elevation and slope	Digital elevation model (DEM) and slope map	Elevation and slope data are essential for the assessment of the impact of disaster and for the identification of vulnerable areas.
Land use	Land use map showing different types of land cover	Land use data is essential for the assessment of the impact of disaster and for the identification of vulnerable areas.
Forest types	Forest type map showing different types of forest cover	Forest type data is essential for the assessment of the impact of disaster and for the identification of vulnerable areas.
Soil types	Soil type map showing different types of soil cover	Soil type data is essential for the assessment of the impact of disaster and for the identification of vulnerable areas.
River and drainage network	River and drainage network map showing the flow of water	River and drainage network data is essential for the assessment of the impact of disaster and for the identification of vulnerable areas.

23

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International Charter Space and Major Disasters

Overview of Current Virtual Constellation



24

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International Charter Space and Major Disasters

Charter Operational Loop



25

UN-SPIDER
United Nations Office for Outer Space Affairs
International Charter
Space and Major Disasters

Non-Disclosure Agreement (NDA)

- Each new PM or UA should sign the Charter NDA.
- In addition according to each Agency rules & procedures, a PM/UA could be asked to sign other NDAs before EO data be delivered by the order desk.

Non-Disclosure Agreement:

- The Requester (R) is the UN-SPIDER Partner (State or Non-State) who will request the EO data according to the Charter NDA.
- The Requester (R) is the UN-SPIDER Partner (State or Non-State) who will request the EO data according to the Charter NDA.
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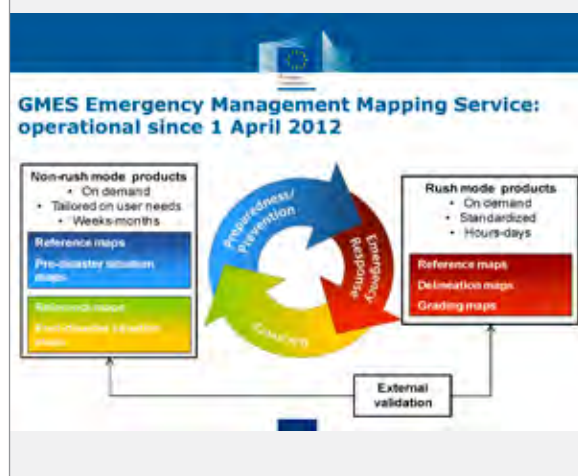
26

UN-SPIDER
United Nations Office for Outer Space Affairs
International Charter
Space and Major Disasters

General Activation Time Line

- 21/01/2013: Charter activation. And UNOSAT promotes as PM.
- PM immediately begins communications with End Users and maintains active consultations throughout the activation.
- 22/01/2013: First image received. End User provided with imagery schedule (updated as activation proceeds).
- 23/01/2013: First map product provided to End User.
- 24-31/01/2013: Additional map products and datasets provided to End Users.
- Situational maps, reports, vector datasets, web map.
- 04/02/2013: Final map products and datasets provided to End Users.
- 18/02/2013: PM recommended the closure of the Charter activation. Charter activation closed same day.

27



28

UN-SPIDER
United Nations Office for Outer Space Affairs

- Technical Advisory Mission to Vietnam, 25 – 29 March 2013
- Technical Advisory Mission to Ghana, Benin 2013
- Technical Advisory Mission to Malawi, 14 – 18 October 2013
- Technical Advisory Support (training) to Bangladesh, 12-18 May 2013
- Technical Advisory Support (training) to Sudan, 5 – 9 May 2013
- Technical Advisory Support (training) to Dominican Republic, 13 – 17 May 2013
- Technical Advisory Support (training) to Mozambique, November
- Technical Advisory Support to Indonesia, 5 – 6 September
- UN/Germany Early Warning Expert Meeting, Bonn, Germany, 25 – 26 June 2013
- SPIDER/DRCC training, Beijing, China, 21-22 October
- UN/China International Conference, Beijing, China, 23 – 25 October
- Beijing training: Flood Risk Mapping, Modeling and Assessment using Space Technology, Beijing, China, 27-31 October

Activities in 2013

29

UN-SPIDER
United Nations Office for Outer Space Affairs

- Technical Advisory Mission to Kenya
- Technical Advisory Mission to Pacific (including Vanuatu)
- Technical Advisory Mission to Gabon
- Technical Advisory Mission to Niger
- and Technical Advisory Missions to: Bhutan, Cambodia, Laos PDR, Mongolia, Senegal, Zambia, El Salvador

Activities in 2014-2015 (in development)

30

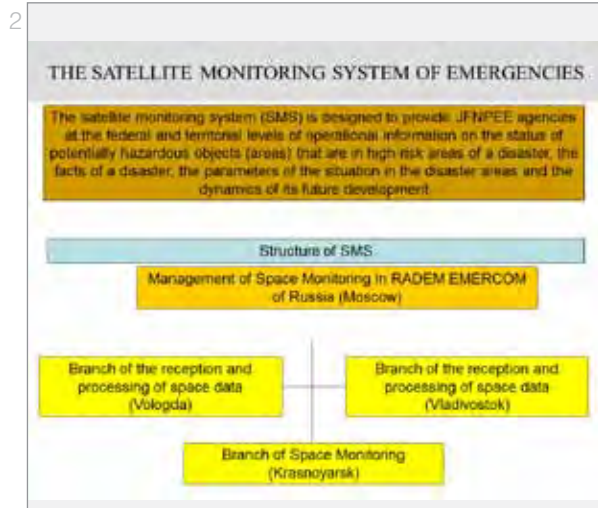
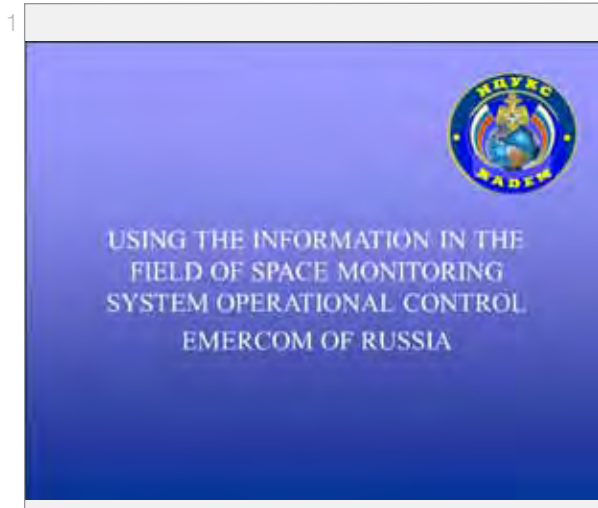
UN-SPIDER
United Nations Office for Outer Space Affairs

luc.st-pierre@unoosa.org

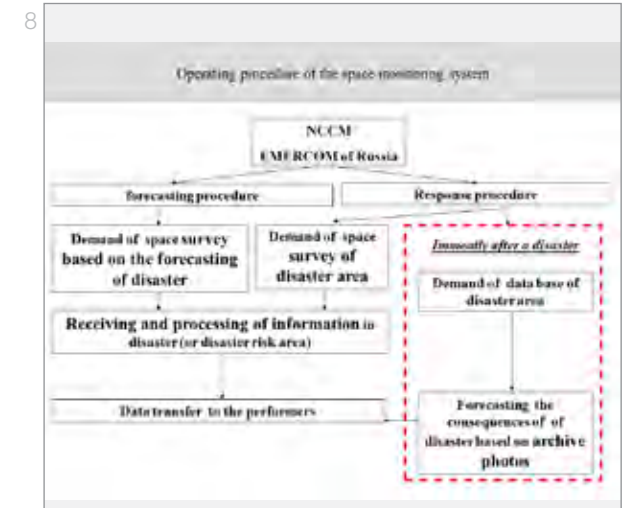
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www.un-spider.org

www.unoosa.org



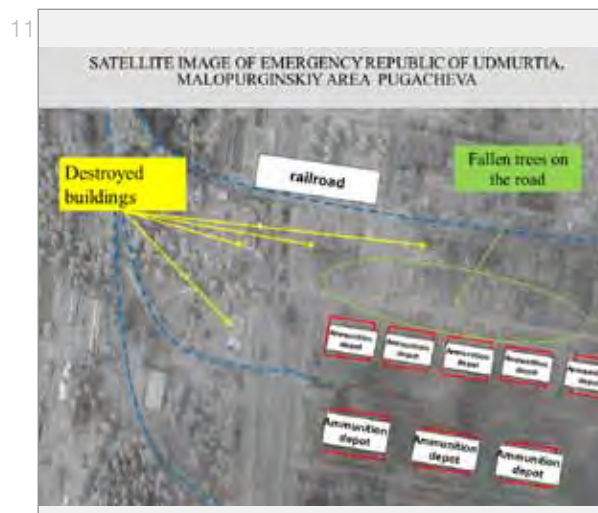
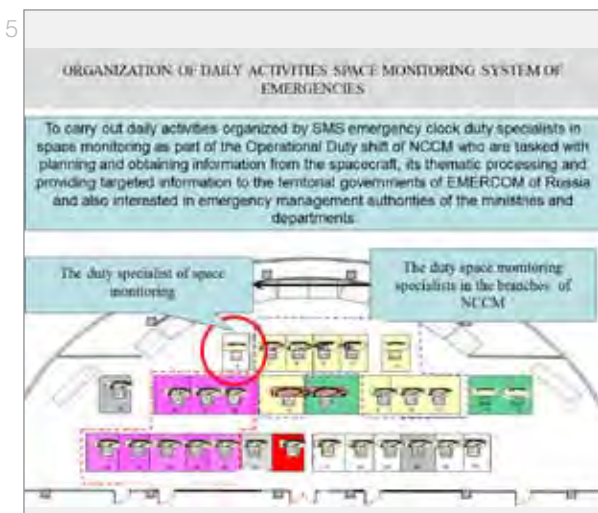
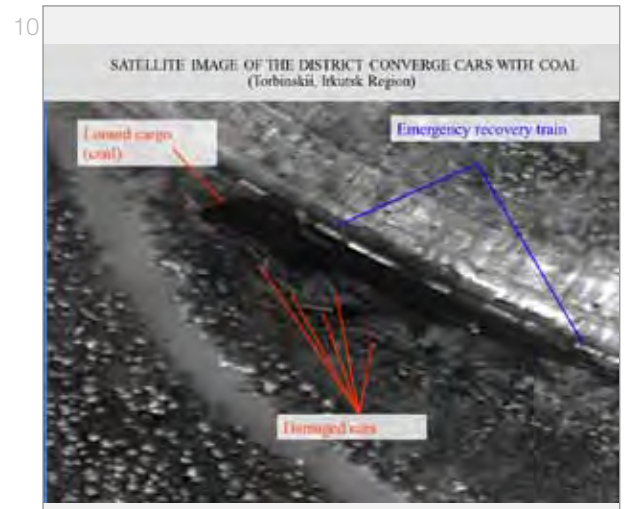
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- MISSIONS ARE BASED ON THE DATA OF THE SPACE MONITORING SYSTEM
1. Assessment the situation in the disaster area; assessment the condition of focal points in the disaster risk area.
 2. Monitoring of the inundation and flooding situation.
 3. Monitoring of the natural fire situation.
 4. Assessment the oil-spill situation.
 5. Maintenance the SAR operations.



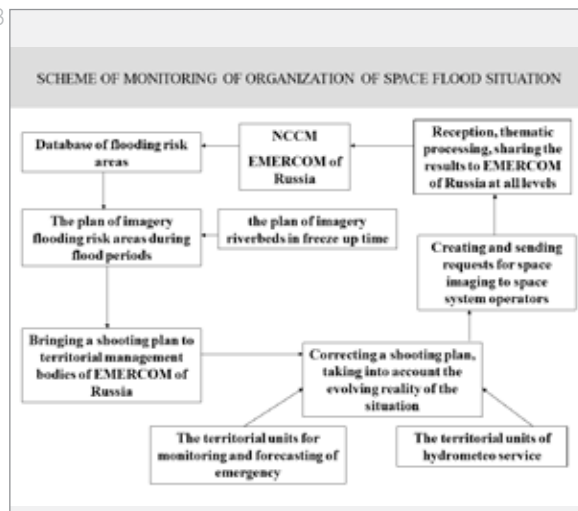
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SPACE MONITORING PERFORMANCE CAPABILITIES FOR THE DATA OBTAINED FROM THE SATELLITES

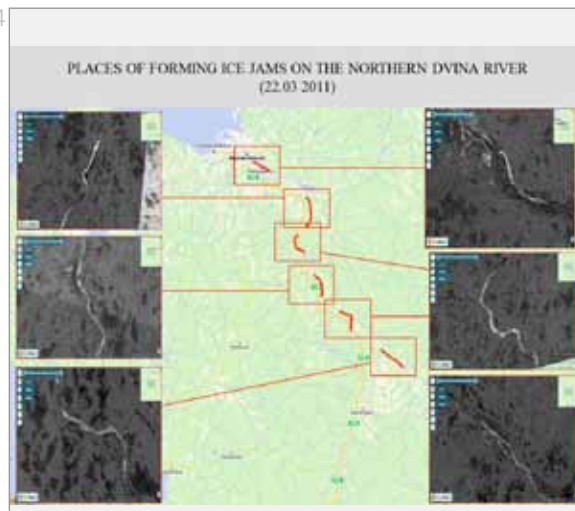
Type of satellite	EROS-B	SPOT-5	EROS-A	LandSat-5	UK DMSP	SPOT-4	TERRA	AQUA	Rainfall-1	ENVISAT-1
Spatial resolution	detailed			high and medium			low		high and medium	
Spectral resolution	the visible range			visible and near-infrared range			visible and infrared range		microwave range	
Velocity of moving of information	Primary: 1.5-2 days Follow: 1 time per day			Primary: is 2 days Follow: 1 time per day			3-4 times a day throughout the territory of the Russian Federation		Primary: after 2-3 days Follow: 1 time per day	
Conditions for information obtaining	upon the request			upon the request			understanding mode		upon the request	
Main tasks	Assessment of the disaster area (assessment of the status of infrastructure, facilities)			Assessment of the scope and parameters of disaster			Monitoring of forest fire situation		Monitoring areas (objects), disaster areas in a dense cloud, monitoring ice conditions and accidental oil spills in the waters	



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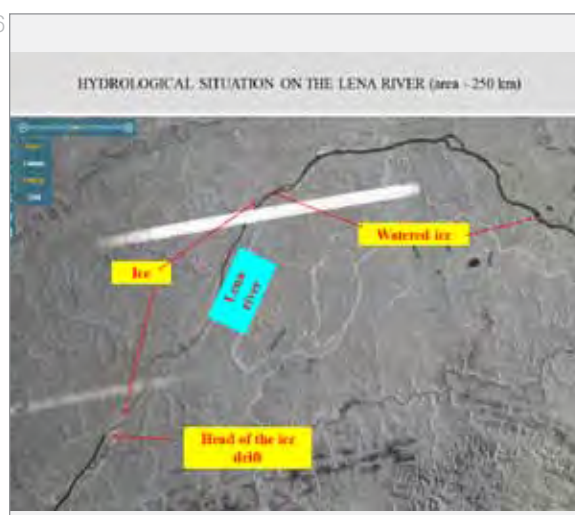
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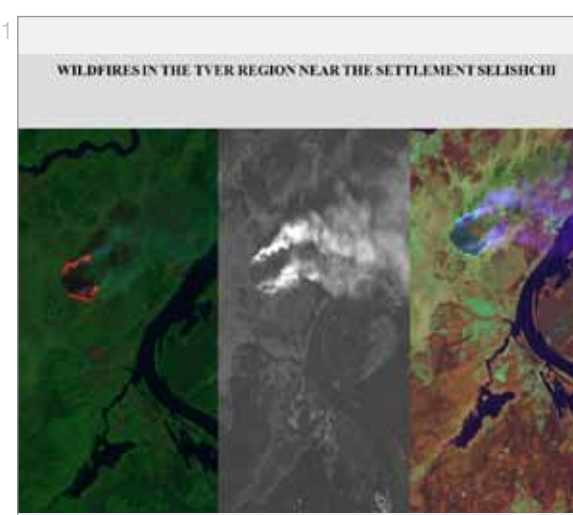
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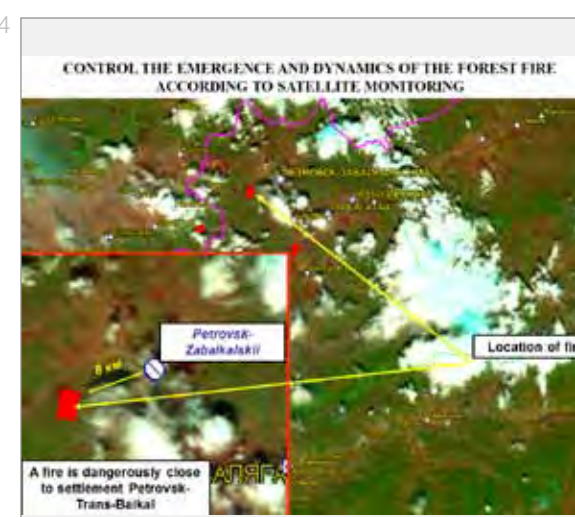
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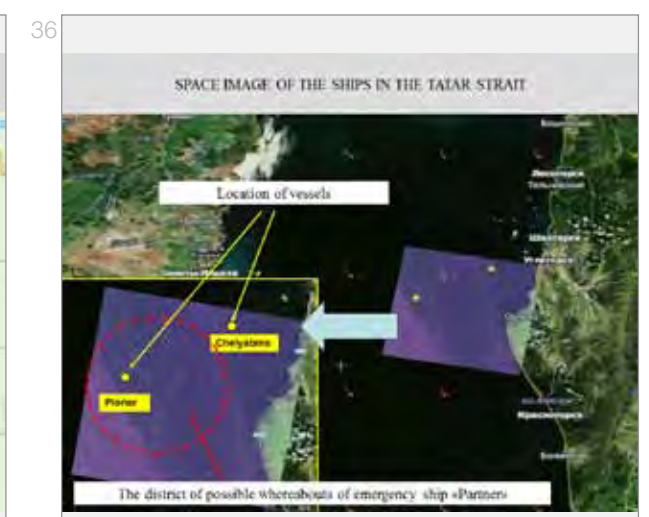
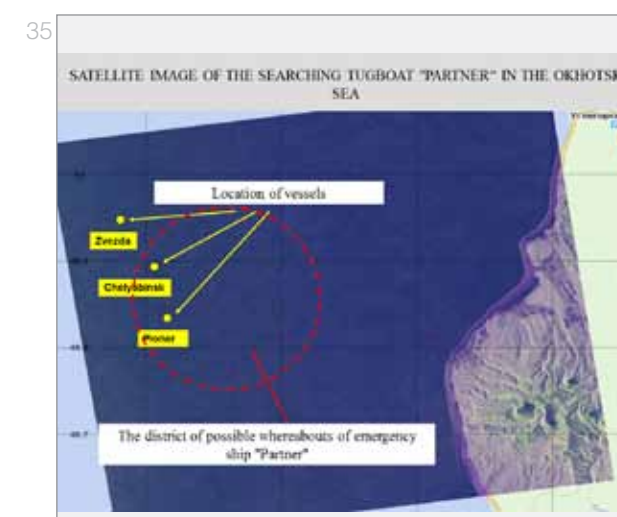
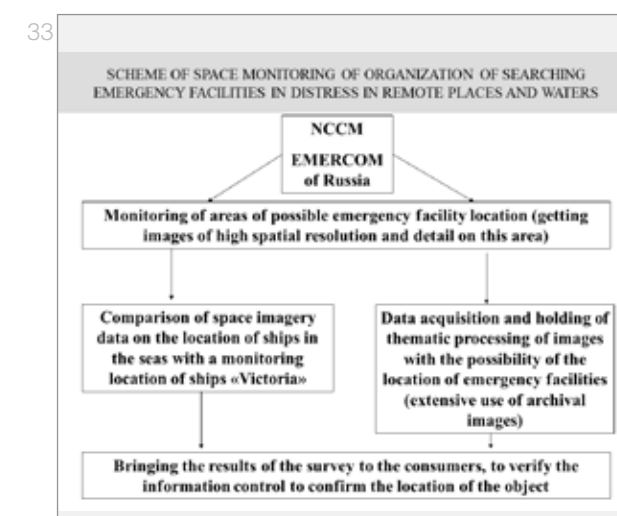
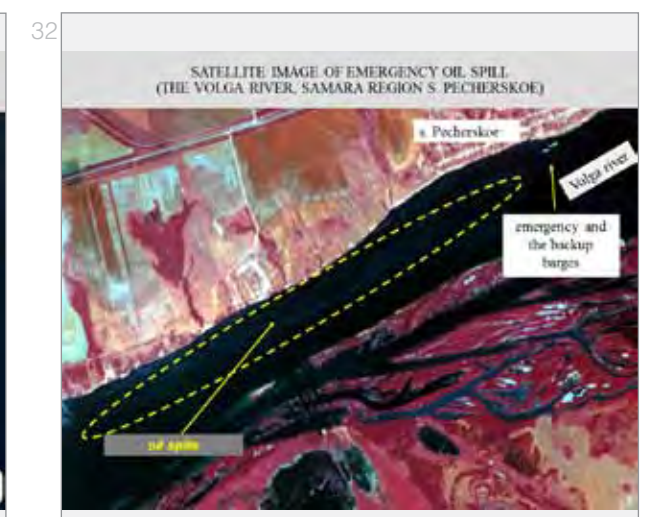
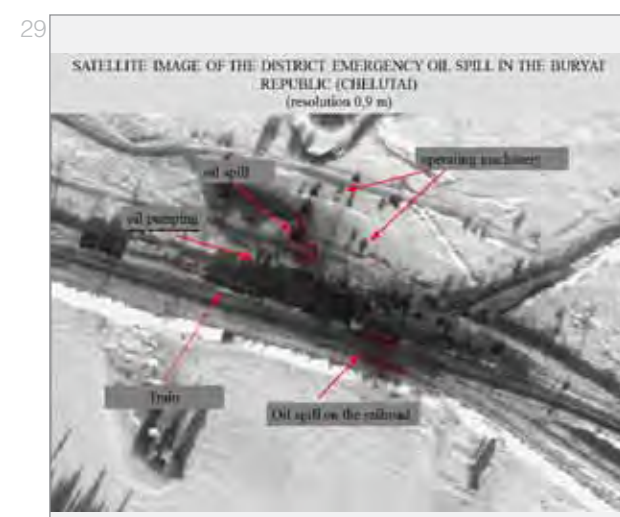
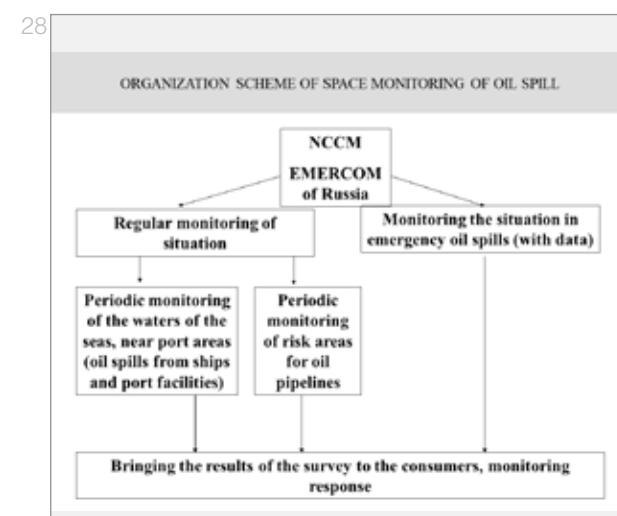
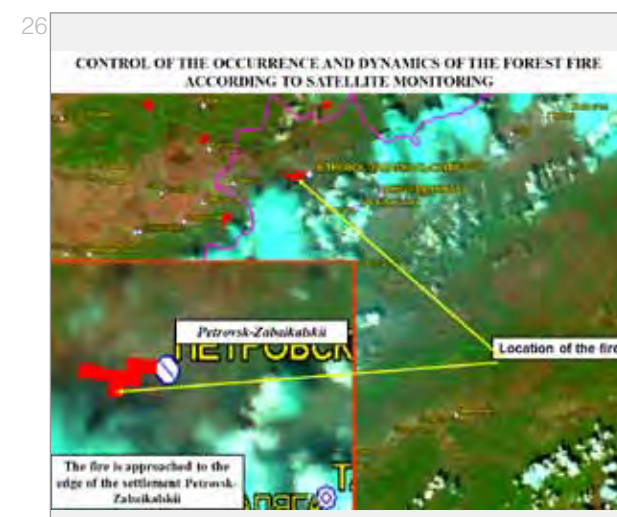
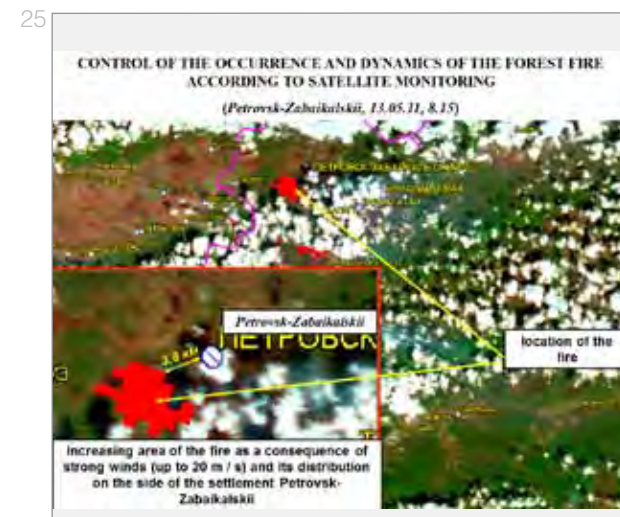


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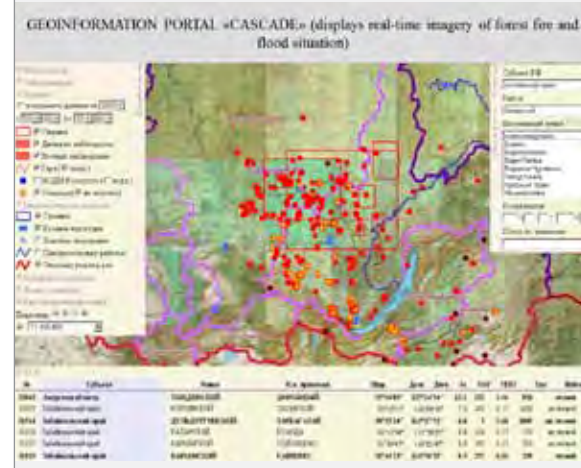




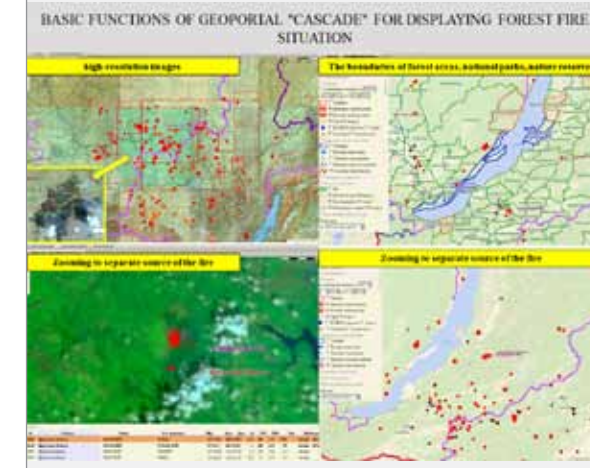
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Information resources based on space monitoring system of EMERCOM of Russia

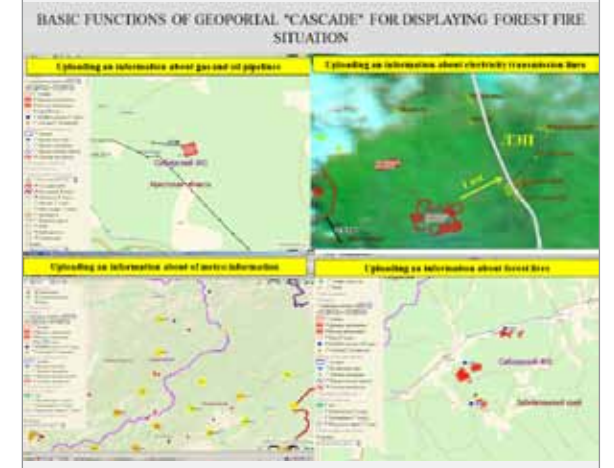
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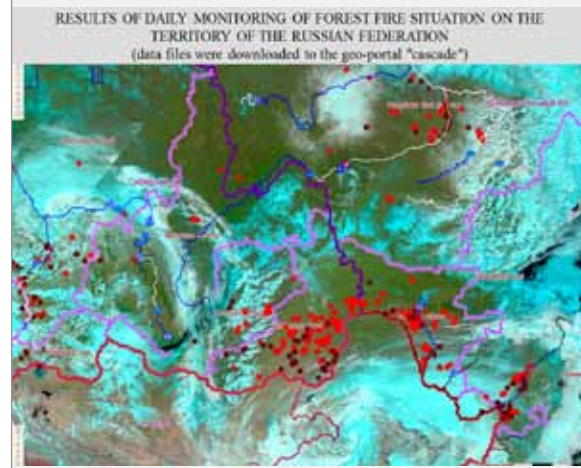
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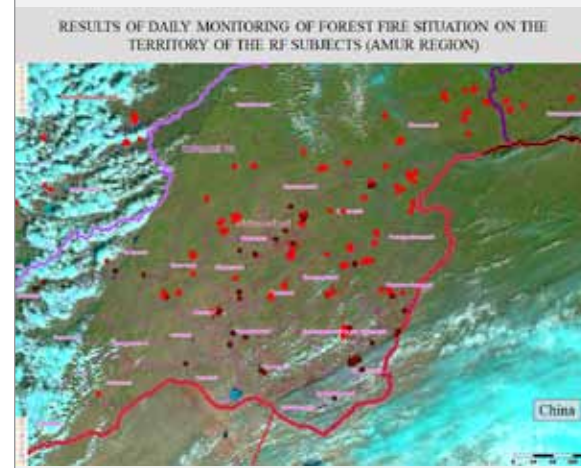
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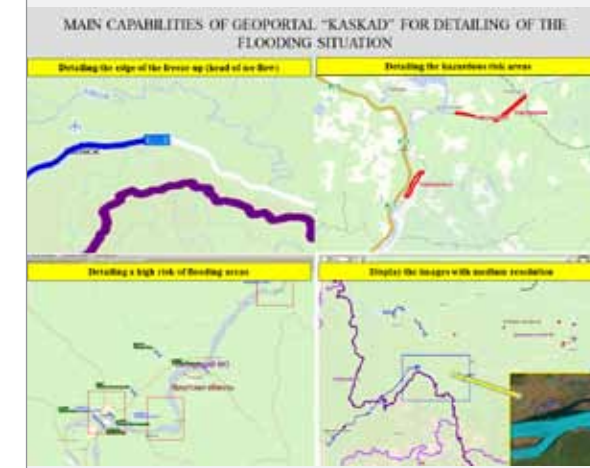
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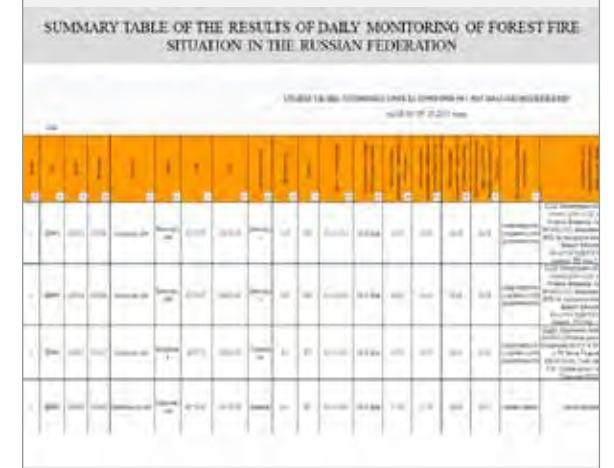
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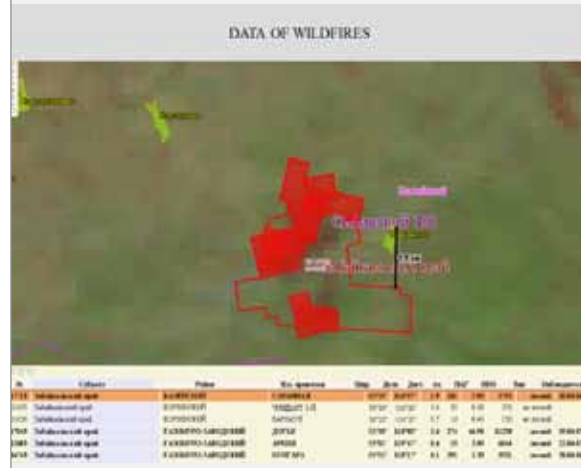
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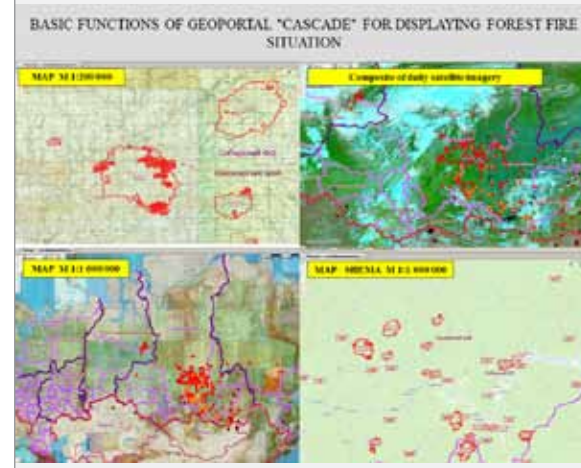
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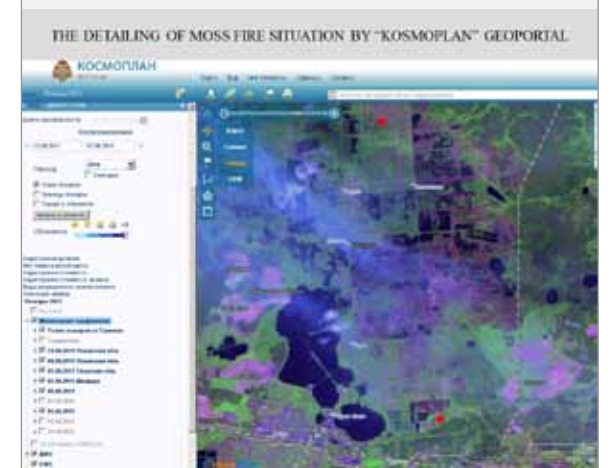
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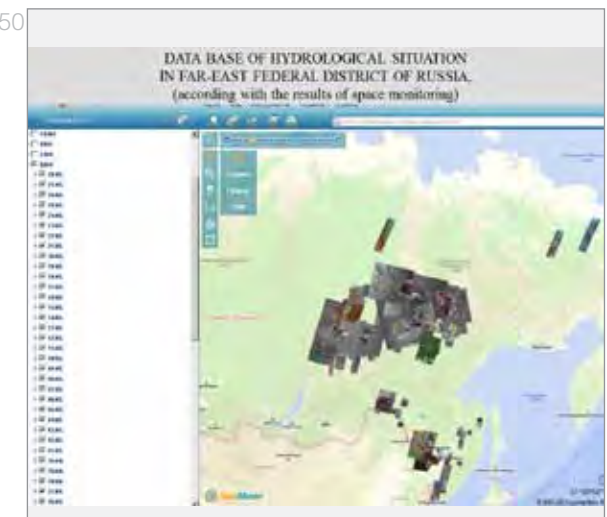
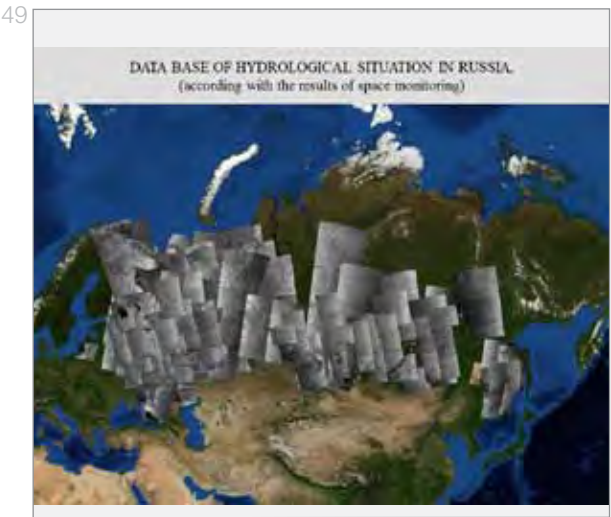


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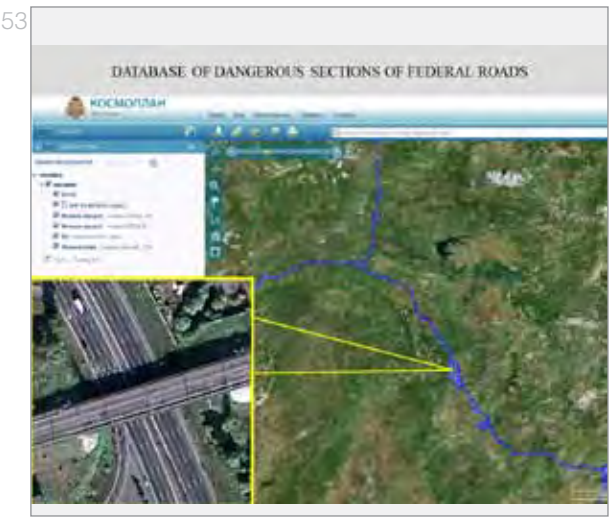
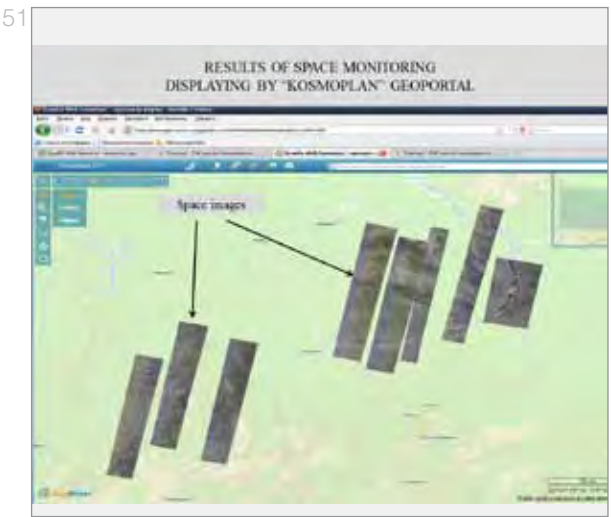
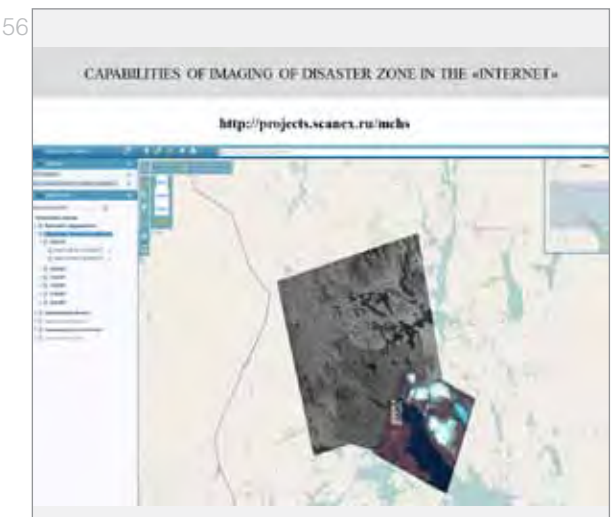


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INUNDATION SITUATION
(additional information from the local authorities)

СОСТОЯНИЕ ПЕРЕСЕЧЕНИЯ РЕК И ЖЕЛЕЗНОДОРОЖНЫХ ПУТЕЙ

Наименование	Ситуация на территории	Данные о состоянии объектов	Данные о состоянии объектов	Данные о состоянии объектов	Данные о состоянии объектов
Имя	Имя объекта	Имя объекта	Имя объекта	Имя объекта	Имя объекта
Имя	Имя объекта	Имя объекта	Имя объекта	Имя объекта	Имя объекта
Имя	Имя объекта	Имя объекта	Имя объекта	Имя объекта	Имя объекта



Current Status and Future Needs of Space-based Information for Regional Disaster Monitoring and Response at AHA Centre

Dr. Janggama Adhityawarma, Senior Disaster Monitoring and Analysis Officer, ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre)

AHA CENTRE
ASEAN Coordinating Centre for Humanitarian Assistance on disaster management

Current Status and Future Needs of Space-based Information for Regional Disaster Monitoring and Response at AHA Centre
Application of satellite technologies for Emergency Preparedness and Response (EP&R) in Asia-Pacific Region
11-13 October 2013, Bali, Indonesia

The Association of Southeast Asian Nations (ASEAN) consists of 10 countries, with nearly 600 million people. Every year, on average, the ASEAN region experiences losses related to natural disasters estimated at US\$ 4.6 billion.*

* Source: International Disaster Relief Centre (IDRC) and United Nations Office for Disaster Risk Reduction (UNDRR), 2012.

ASEAN DISASTER OVERVIEW

23 Disasters recorded in ASEAN for the month of October

57% is Flooding

233 Disasters recorded in ASEAN since January 2013 (10 months)

57% is Flooding

The two MEGA DISASTERS in ASEAN...

2004 Indian Ocean Tsunami

2008 Cyclone Nargis

Providing the momentum for the development of an ASEAN Agreement on Disaster Management and Emergency Response (AADMER)

Testing ASEAN's solidarity and relevance as a regional grouping

TO HAVE A MORE UNITED AND COORDINATED RESPONSES TOWARD DISASTER WITHIN THE REGION, ASEAN FOREIGN MINISTERS SIGNED AADMER ON 26 JULY 2009

A legal framework for all ASEAN member states and serves as a common platform in responding to disasters within the ASEAN

Objective: Reducing disaster impacts in ASEAN countries, and jointly respond to disaster emergencies

A comprehensive agreement that covers various aspects of Disaster Management, such as Disaster Risk Identification, Assessment, Prevention, Mitigation, Preparedness, Emergency Response, Rehabilitation, Scientific Research, Coordination and others.

Entered into force in December 2009

A LOT OF EFFORT HAS BEEN MADE BY ASEAN IN ESTABLISHING ASEAN COORDINATING CENTRE FOR HUMANITARIAN ASSISTANCE ON DISASTER MANAGEMENT (AHA CENTRE) AS THE OPERATIONAL ENGINE OF AADMER

The AHA Centre shall be established for the purpose of facilitating co-operation and co-ordination among the parties, and with relevant United Nations and international organizations, in promoting regional collaboration (AADMER article 20.1)

The AHA Centre shall work on the basis that the Party will act first to manage and respond to disasters. In the event that the Party requires assistance to cope with such situation, in addition to direct request to any Assisting Entity, it may seek assistance from the AHA centre to facilitate such request. (AADMER article 20.2)

AT THE 19TH OF ASEAN SUMMIT, WITNESSED BY ALL OF ASEAN HEAD OF STATES, THE AGREEMENT ON THE ESTABLISHMENT OF AHA CENTRE WAS SIGNED BY ASEAN FOREIGN MINISTERS ON 17 NOVEMBER 2011, IN BALI, INDONESIA.

AGREEMENT ON THE ESTABLISHMENT OF THE ASEAN COORDINATING CENTRE FOR HUMANITARIAN ASSISTANCE ON DISASTER MANAGEMENT

ORGANISATIONAL STRUCTURE OF AHA CENTRE

Relationship of AHA Centre to National Disaster Management Offices (NDMOs)

Member of ACDM ASEAN Committee on Disaster Management and Governing Board of AHA Centre

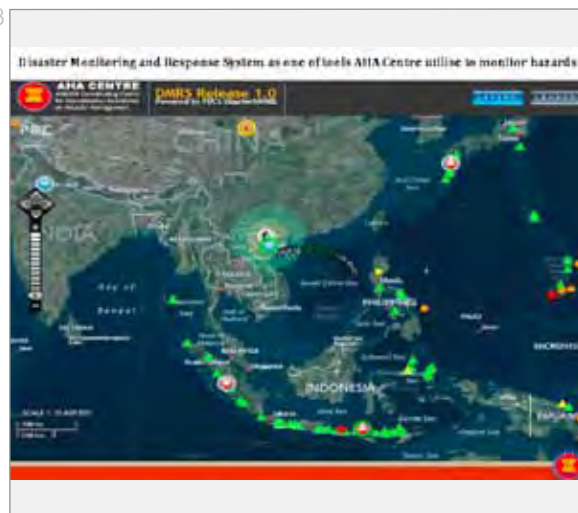
In addition to contribution from ASEAN Member States, the AHA Centre also supported by Dialogue Partners

- AUSTRALIA
- EUROPEAN UNION
- JAPAN
- NEW ZEALAND
- UNITED STATES OF AMERICA

THE CURRENT FUNCTIONS OF THE AHA CENTRE IN GENERAL ARE MANAGING INFORMATION/DATA, FACILITATING RESOURCES MOBILISATION AND COOPERATION AND COORDINATION AMONG RELEVANT PARTIES

ASEAN Disaster Monitoring and Response System (DMRS) provided by Pacific Disaster Centre (PDC) through US Agency for International Development (USAID) US-ASEAN Technical Assistance and Training Facility (TATF)

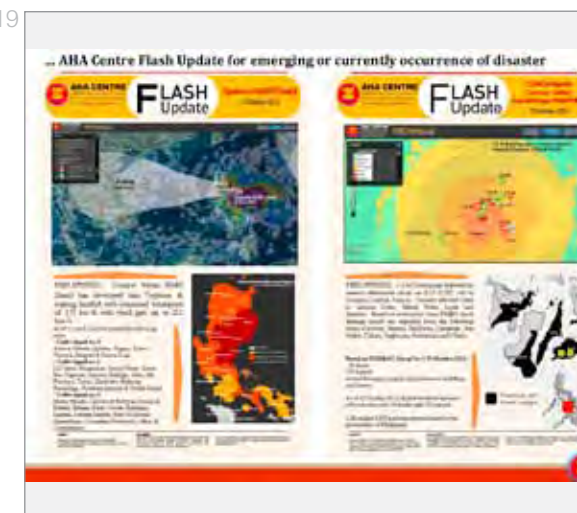
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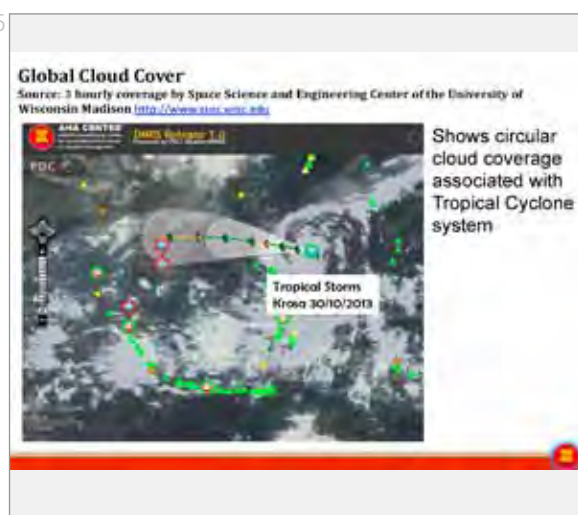
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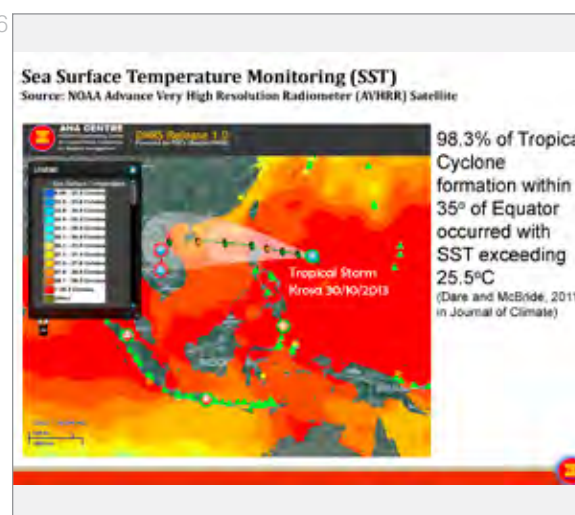
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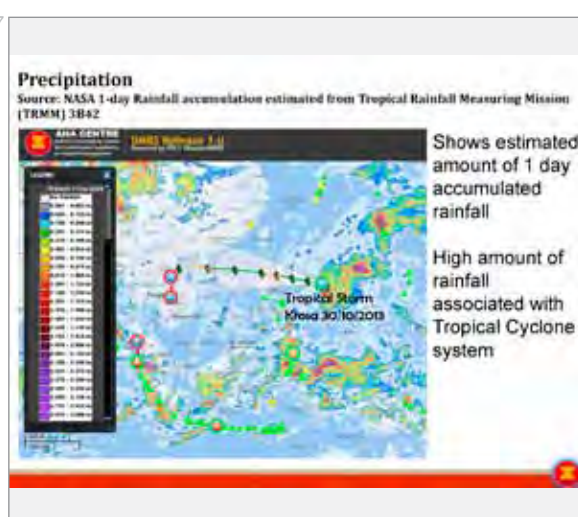
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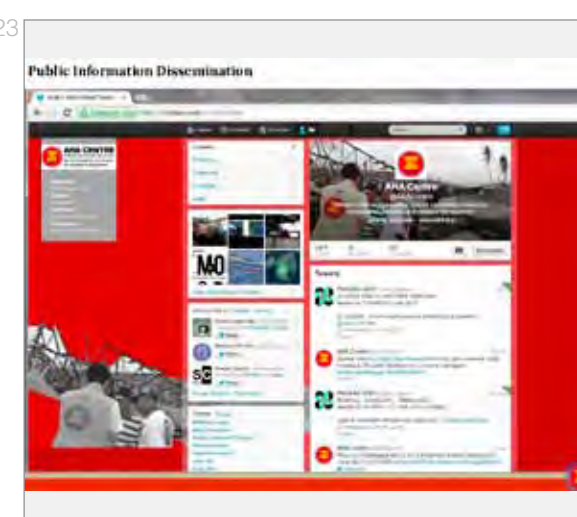
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23



24



AHA Centre Response to Aceh Earthquake 8 – 11 July 2013

1. Assessment of Disaster Impact (Phase: assessment and planning stage) of the disaster used as input for: funding, emergency aid, health aid, shelter, emergency relief aid, and for assessment of the disaster impact.

Report of the disaster impact was on 14 July 2013, at 16:30 hrs (GMT+7) from AHA team located in Banda Aceh.

- **Affected Village**
 - Bawe Village – 17 out of 220 village
 - South Target 205 and 220 village
 - 40 families in Bawe Village and 34 family Target
- **Emergency**
 - 12,000 people damaged
 - 120 buildings damaged, 100 health facility, medical school assistance
 - 40 high schools are the destroyed
 - 1000 people are in the 10,000 families, 50 approximately 10-110
 - More than 70 evacuation centre

DISASTER IMPACT

Village	Number of People Affected
Bawe Village	12,000
South Target 205	12,000
South Target 220	8,000
Bawe Village	4,000
South Target 205	4,000

The composite image illustrates the AHA Centre's response to the 5W Monsoon in the Philippines. The top left features a map of the Philippines with regions color-coded by response status: Green (No Action), Yellow (Preparedness), Orange (Response), and Red (Emergency). A legend on the right lists the corresponding actions for each status. The top right shows a control room with multiple monitors displaying various data. The bottom right shows a red inflatable rescue boat, a key piece of equipment for disaster response.

Future Needs

Ability to acquire satellite image within 72 hours of Disaster to support Disaster Emergency Response:

- Rapid impact assessment analysis
- Provide situation map

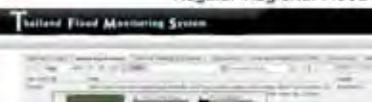


Future Needs

Regular Regional Flood Monitoring



Thailand Flood Monitoring System
Ministry of Natural Resources and Environmental Conservation
Department of Water Resources Development and Management



Example provided by Thailand Geo-Informatics and Space Technology Development

Available every 2 days

Utilizing available satellite i.e., Radarsat-2

AHA Centre Response to Flood in LAO 29 August – 2 Sept 2013

CASUALTY NUMBER (as of 26 Aug 2013)

Death	~70
Affected People	~112,500
Damaged Houses	213

Challenges

Flood in Cambodia
September – October 2013

168 death
1.5 millions people affected

Disaster Charter activation 21 October 2013

Activated by UNITAR/UNOSAT

By 25 October 2013
Several images available

4 days of Activation

[illegible]

 AHA CENTRE ASEAN Coordinating Centre for Humanitarian Assistance in Disaster Management	Current Status and Future Needs of Space-based Information for Regional Disaster Monitoring and Response at AHA Centre <i>Application of Satellite Technologies for Emergency Preparedness and Response (EP&R) in Asia-Pacific Region</i> 03-01 October 2013, Bali, INDONESIA
janggam.adhityawarma@ahacentre.org www.ahacentre.org http://adinet.ahacentre.org http://facebook.com/ahacentre	

Challenges



The screenshot shows the ADRC website interface for the 2013 Philippine Earthquake disaster charter activation. It includes a header with the ADRC logo and navigation tabs. The main content area displays the event title, date, and a list of participating organizations. A sidebar on the left contains a list of links. The right sidebar provides additional details about the event, including the number of deaths and affected people, the activation date, and the activating organization (ADRC).

Earthquake in Philippines
15 October 2013

194 death
2.9 millions people affected

Disaster Charter activation 15 October 2013

Activated by ADRC

Up to 31 October 2013
No images available yet

15 days of Activation

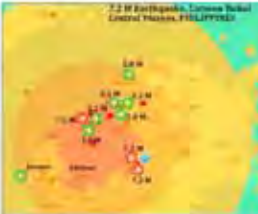
Challenges



Bohol island area: 3,219 sqkm.
City of Carmen near the epicenter area:
248 sqkm

Estimated cost
Pleiades US\$ 11,000 (for Carmen (Bundled,
50cm PAN, 2m MS)
Formosat US\$ 4,200 (Bundled 24 x 24
sqkm, 2m PAN, 8m MS)

Earthquake in Philippines
15 October 2013



7.2 M Earthquake, Luzon Strait
Central Mexico, PHILIPPINES

US\$ 11,000

Note: A cost estimate based on KSCAT 2013 pricing list



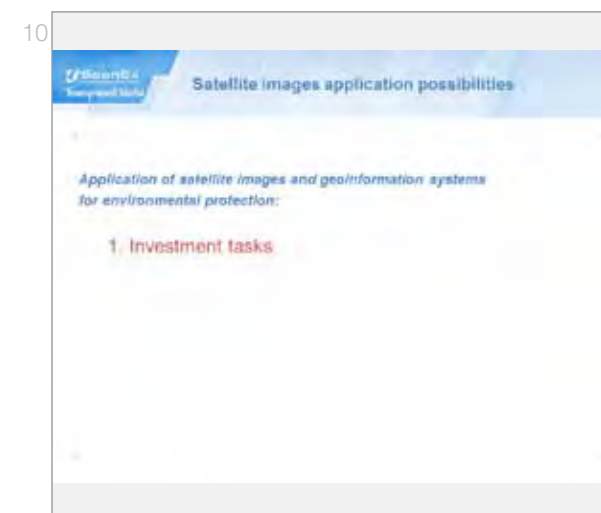
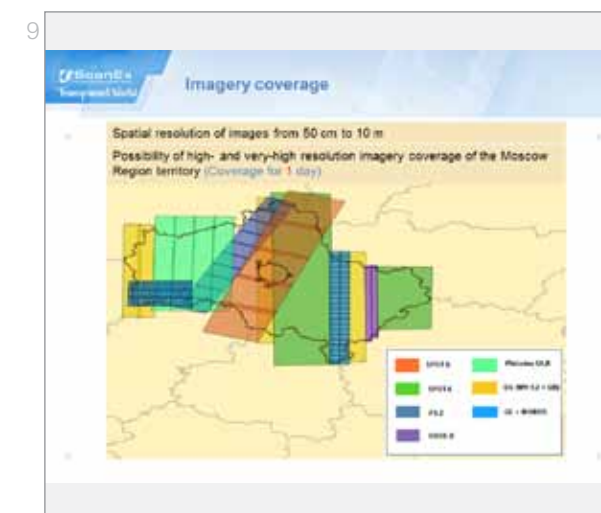
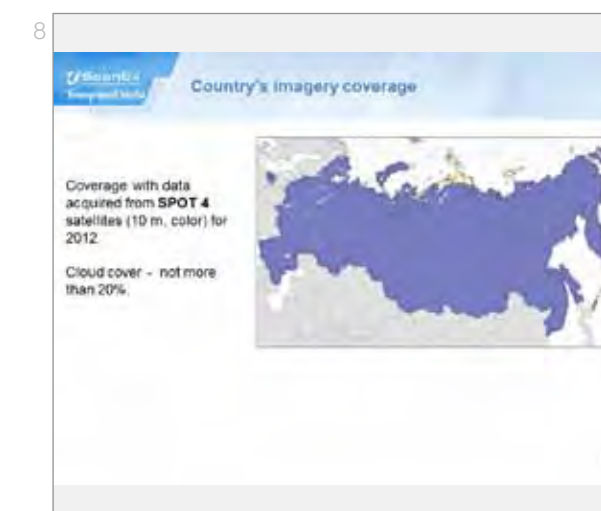
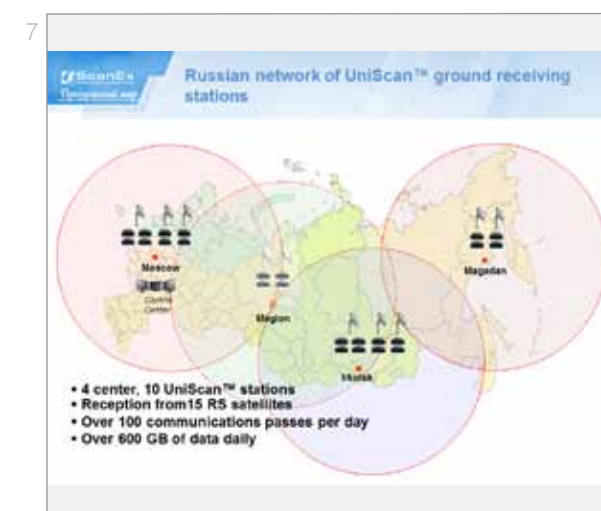
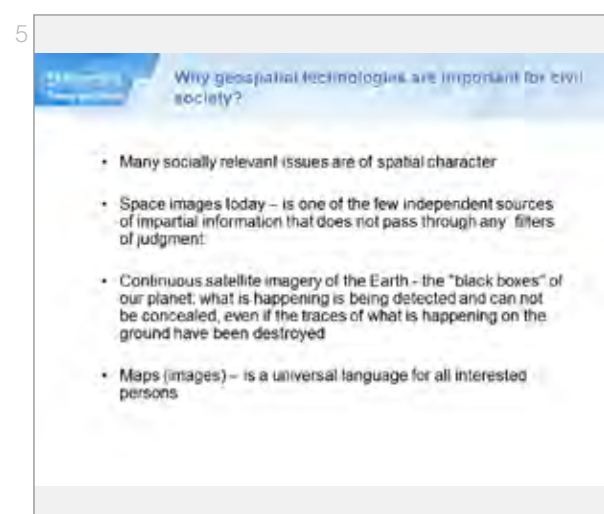
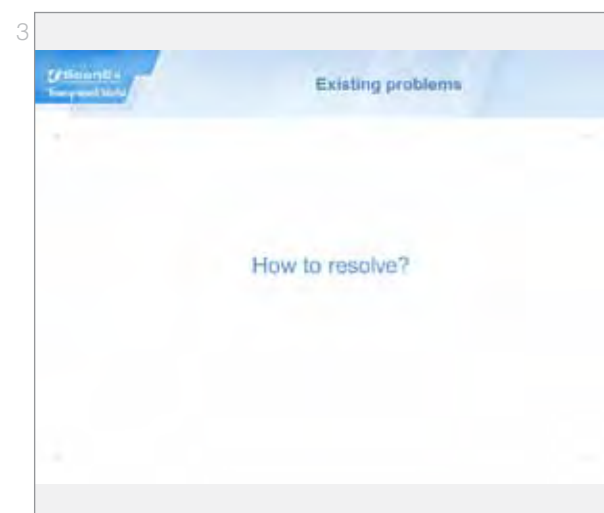
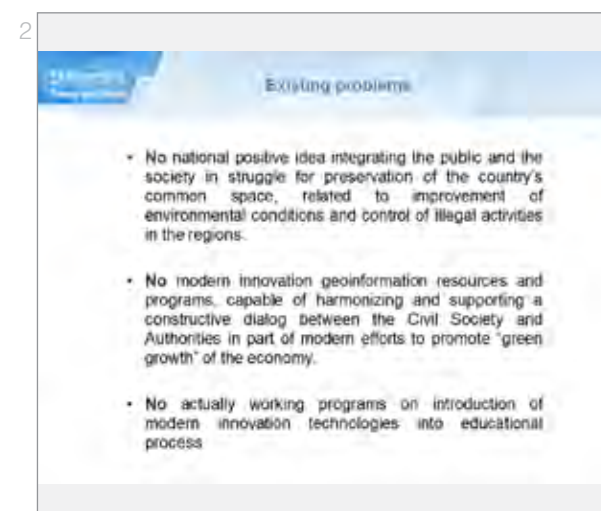
Andrey Kudinov, Head of Space Monitoring unit, Russian National Emergency Management Centre, EMERCOM of Russia, **Maksim Zayko**, Head of International Organizations unit, EMERCOM of Russia





"Space Watch" — a system of public monitoring from space

Maria Dorofeeva, Lead Specialist, Operational Satellite Monitoring Group, RDC SCANEX



13

Satellite images application possibilities

Monitoring

Permanent monitoring of protected natural areas and other areas to prevent illegal activities on such territories

The following can be detected for sure applying satellite images:

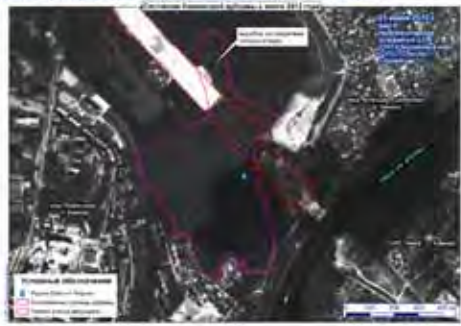
- Clearcuts.

14

Satellite images application possibilities

Monitoring

Clearcuts. Felling beyond the licensed area limits. Khimki forest



19

Satellite images application possibilities

Monitoring

Permanent monitoring of protected natural areas and other areas to prevent illegal activities on such territories

The following can be detected for sure applying satellite images:

- Clearcuts;
- Water areas filling;
- Inundations.

20

Satellite images application possibilities

Monitoring

Inundations. Peat-bogs inundations of the protected natural areas



15

Satellite images application possibilities

Monitoring

Clearcuts. Clearcuts on the territory of the protected natural area.



16

Satellite images application possibilities

Monitoring

Permanent monitoring of protected natural areas and other areas to prevent illegal activities on such territories

The following can be detected for sure applying satellite images:

- Clearcuts;
- Water areas filling.

21

Satellite images application possibilities

Monitoring

Inundations. Peat-bogs inundations of the protected natural areas



22

Satellite images application possibilities

Monitoring

Inundations. Peat-bogs inundations of the protected natural areas



17

Satellite images application possibilities

Monitoring

Water areas filling. Water protected areas of Lipka River and Lashoye Lake



18

Satellite images application possibilities

Monitoring

Water areas filling. Water protected areas of Lipka River and Lashoye Lake



23

Satellite images application possibilities

Monitoring

Inundations. Peat-bogs inundations of the protected natural areas



24

Satellite images application possibilities

Permanent monitoring of protected natural areas and other areas to prevent illegal activities on such territories

The following can be detected for sure applying satellite images:

- Clearcuts;
- Water areas filling;
- Inundations;
- Landfills.

25

Satellite images application possibilities

Monitoring.
Solid domestic wastes landfill



26

Satellite images application possibilities

Permanent monitoring of protected natural areas and other areas to prevent illegal activities on such territories

The following can be detected for sure applying satellite images:

- Clearcuts;
- Water areas filling;
- Inundations;
- Landfills;
- Natural resources production;

31

Satellite images application possibilities

Permanent monitoring of protected natural areas and other areas to prevent illegal activities on such territories

The following can be detected for sure applying satellite images:

- Clearcuts;
- Water areas filling;
- Inundations;
- Landfills;
- Natural resources production;
- Fires;
- Construction;

32

Satellite images application possibilities

Monitoring.
Construction. Urban sprawl



27

Satellite images application possibilities

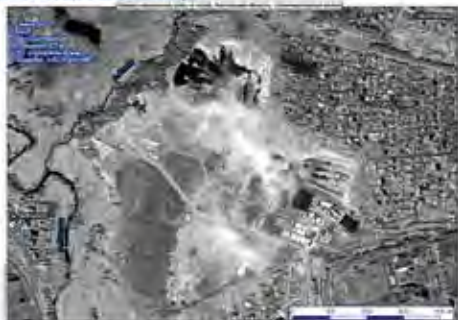
Monitoring.
Natural resources production. Sand pit



28

Satellite images application possibilities

Monitoring.
Natural resources production. Sand pit



33

Satellite images application possibilities

Monitoring.
Construction activities on the protected natural area



34

Satellite images application possibilities

Monitoring.
Construction activities on the protected natural area



29

Satellite images application possibilities

Permanent monitoring of protected natural areas and other areas to prevent illegal activities on such territories

The following can be detected for sure applying satellite images:

- Clearcuts;
- Water areas filling;
- Inundations;
- Landfills;
- Natural resources production;
- Fires;

30

Satellite images application possibilities

Monitoring.
Fires. Automatic detection based on satellite images in near real-time mode



35

Satellite images application possibilities

Permanent monitoring of protected natural areas and other areas to prevent illegal activities on such territories

The following can be detected for sure applying satellite images:

- Clearcuts;
- Water areas filling;
- Inundations;
- Landfills;
- Natural resources production;
- Fires;
- Construction;
- Pests attacks on vegetation;

36

Satellite images application possibilities

Monitoring.
Attacks of pests on plants. Bark beetles





1

CLS

Prevention and Management of Natural Disasters

PT CLS ASEAN
Philippe Courrouyan
Satellite Operational Solutions to Earth Problems

2

CLS

INTRODUCTION TO CLS/PT CLS

Created: 21 April 1986 / 1 January 2003

Core activities:

- Commercial operation of satellite systems for positioning, data collection, earth and ocean observation and surveillance
- Developing added-value applications and services based on satellite remote-sensing data.

Sectors of activity: environmental surveillance, sustainable management of marine resources, maritime security, oil and gas; disaster prevention and maintenance

PT CLS ARGOS INDONESIA :
20 Engineers and developers in Jakarta
Processing Centre di Jakarta 24/7
Clients : VSI/ KKP/Bakorkamla/Perhubungan etc ..

7

CLS

DISASTER MANAGEMENT: Before and After

-BEFORE
-Once disaster has been identified the most important action is to warn and alert populations which are in dangerous situation :

-THE CLS
- NATIONAL ALERT CENTRE

FROM Jakarta TO NYAS and other Kampung directly

8

CLS

NATIONAL ALERT CENTRE

3

CLS

Prevention Natural Disaster : a longlasting story between PT CLS and Indonesia

- 1995 : VSI
- Monitoring of 65 volcanoes by satellite
- Central Information and Warning System in Bandung and Jakarta .
- 3 succesful prevention operations

4

CLS

PREVENTION : A FORGOTTEN NATURAL RISK

- In Java, many major cities are built by the seaside
- Most of these cities "sink" which introduces risks of building collapse and flooding
- Solution: CLS satellite monitoring

LEARN LEAD

9

CLS

Warning Self powered Horns

- Self-contained with modular solar panel/battery power supply. Battery sized to sound the signal for 24 hours continuously. (AC power/Battery option available)
- Low Voltage and Low power consumption - 12 Volt Input, 54 Watts for 1 Mile Range
- Low installation cost - no connection to electrical grid needed
- Low maintenance costs - heavy Duty Cast Aluminum
- Housing, no moving parts
- Omni-directional
- Minimal preventative maintenance required to ensure 100%
- availability - IP 65 Rated, NEMA 4K, non-combustible
- GPS synchronization to synchronize the sounding of several horns at a given locale
- Manual On/Off Test/Control Switch and Remote activation

10

CLS

HORNS ARE IDEAL For Remote areas: Islands, mountain villages

- Example :
- Aceh,
- Indonesia Deployment
- Horn range :

5

CLS

Case study: Semarang Over-abstraction of ground water (BGR Indonesia)

Objective of the project:
• The objective of the project was to analyse ground motion for Semarang in Java, Indonesia
• This analysis was necessary because a large subsidence phenomenon in the city of Semarang - due to its coastal location - has led to increased flood risks.

Analysis and results:

- Subsidence analysis has been conducted in two time periods: 1998-2000 and 2002-2006
- Due to over-abstraction of ground water, subsidence phenomena has reached more than 20 cm / year in coastal areas
- The exact localisation of subsidence areas permits preventive measures to be taken in the most affected areas

The project aimed at supporting local government's actions in assessing and minimizing flood risks as a consequence of subsidence.

6

CLS

PT CLS : Operational solutions and Systems to Natural disaster Prevention

- Volcanoes
- Floodings
- Weather phenomenon: global (El Nino, La Nina) regional or local (at sea or on land" waves, lightning etc)
- Etc ..
- PT CLS a full array of customised solutions

11

CLS

After the Disaster

- Disaster Assessment :
 - After disaster happened
 - Area involved : size, population etc
 - Direct support / help sizing
 - After : definition of no-go zones

12

CLS

Case Study: Vietnam Flood Risk Monitoring before and after the hurricane

Historical movement maps provide useful information for identifying vulnerable zones and building strategies for facing natural disasters.



13



Closing Remarks

Maksim Zayko

Head of International organizations unit, International Cooperation Unit,
EMERCOM of Russia

Dear colleagues!

Firstly, I would like to thank everybody present for the fruitful work during the seminar. In these two days, we have gained an understanding not only about the various methods of remote sensing of Earth, but of further ways of developing this prospective technology. Representatives of different countries have presented us their plans of building groups of future satellite groups, as well as giving a detailed classification of already existent satellite systems.

EMERCOM of Russia has demonstrated practical methods of application of cosmic monitoring with the purpose of prevention and elimination of consequences of natural disasters - thanks to which, largely, it was possible to prevent losses of human lives, through real-life examples, including the example of the full-scale flooding in the Far Eastern region of the Russian Federation.

The results of the fruitful work in the working groups will be the recommendations, which EMERCOM of Russia, together with Roscosmos and SCANEX company, will send to APEC Secretariat. It is evident to us already, that one must continue to meetings and exchange of experience on the topic at hand. However, EMERCOM of Russia believes, that it is necessary to widen the circle of participants for such events and attract not only experts that deal with the issue of practical applications of cosmic monitoring, but also mid- and top-managers. Only through common efforts can we widen the spheres of application of remote sensing of Earth, and improve regular information exchange.

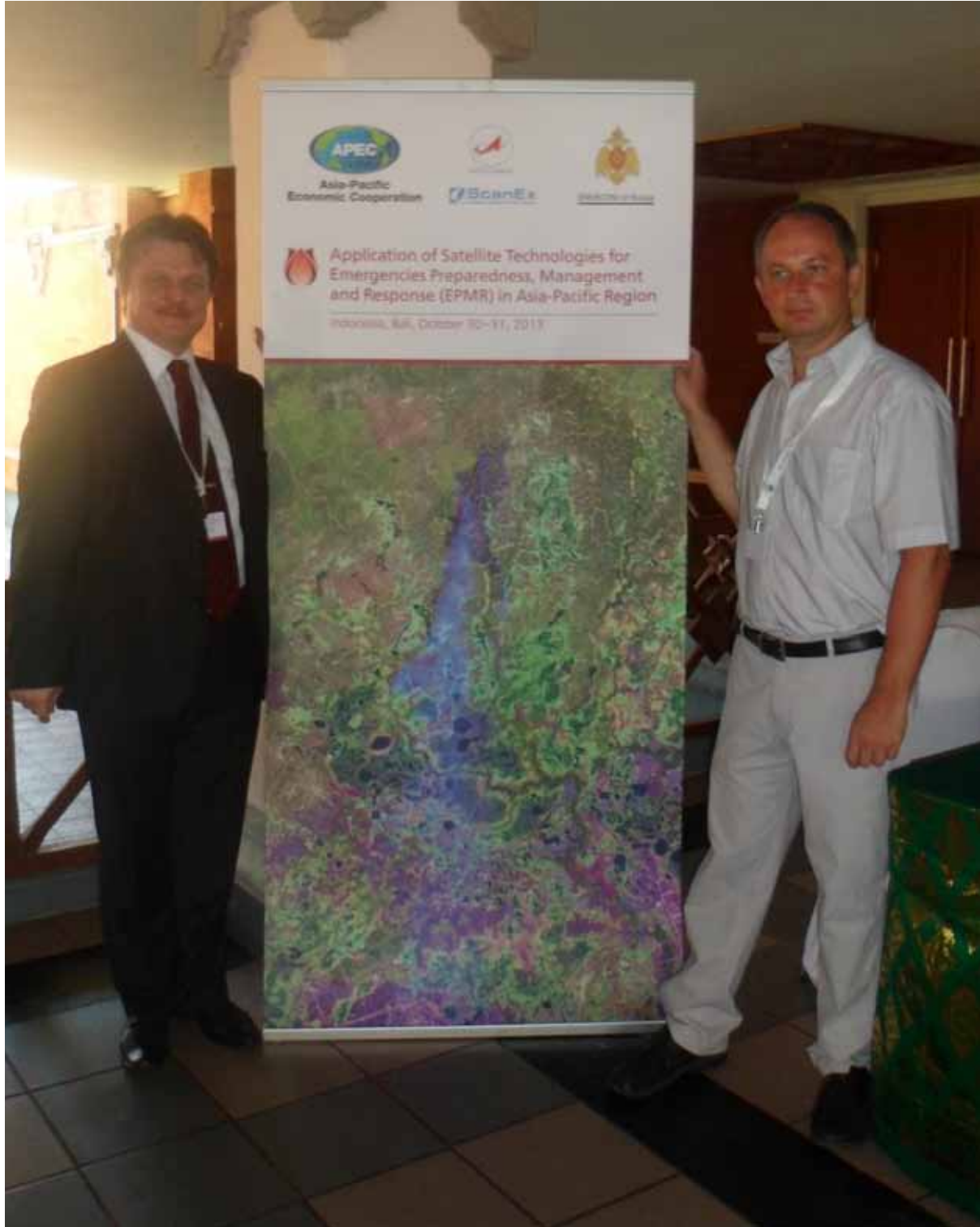
Russian Federation, represented by EMERCOM of Russia, is always open for cooperation and exchange of practice in the area of prevention and elimination of all types of natural and man-made disasters, as well as other types. Once again, thank you to all the participants!

We wish you great cosmic weather!

Pictures

















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