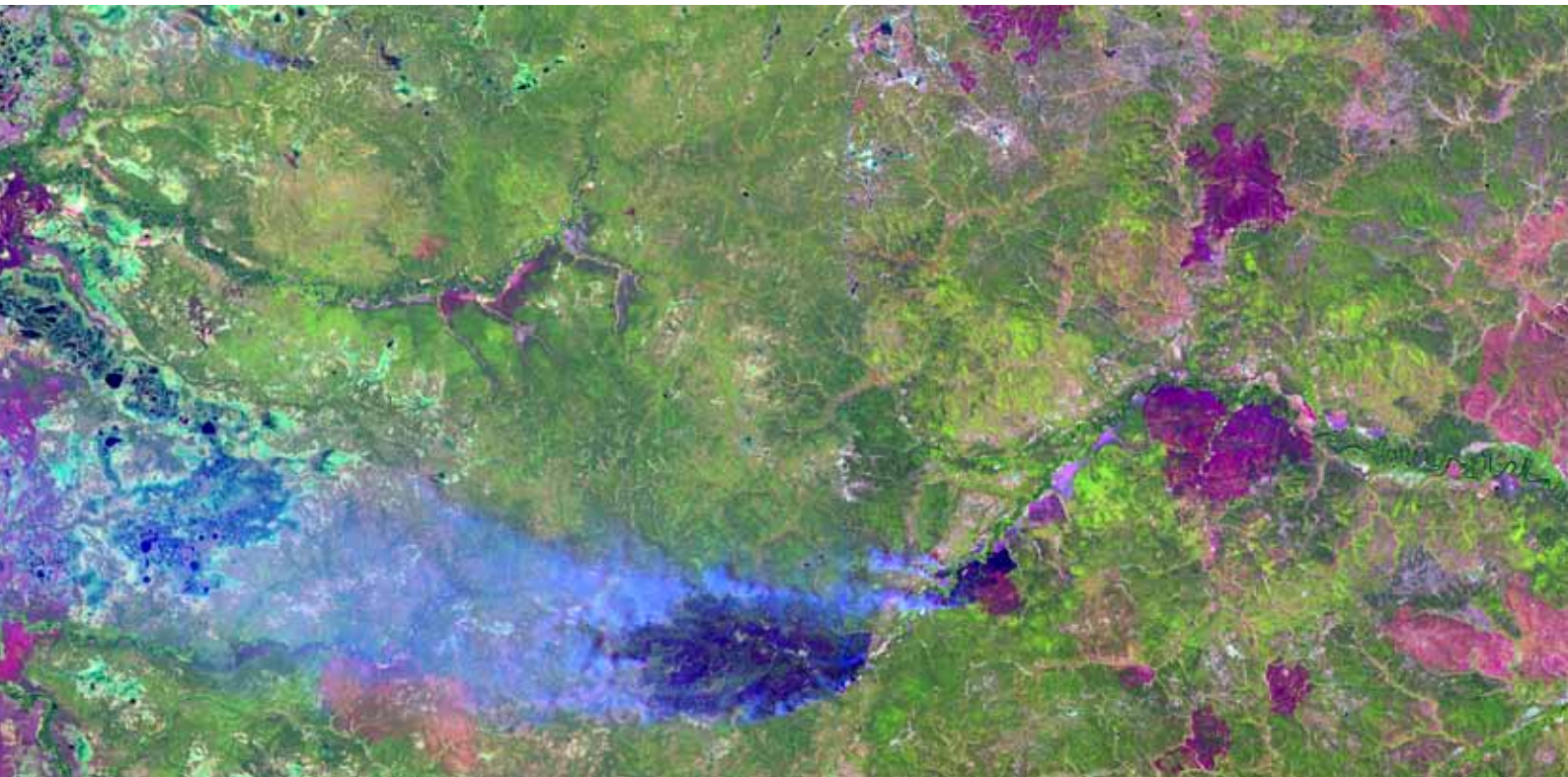




**Asia-Pacific
Economic Cooperation**

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



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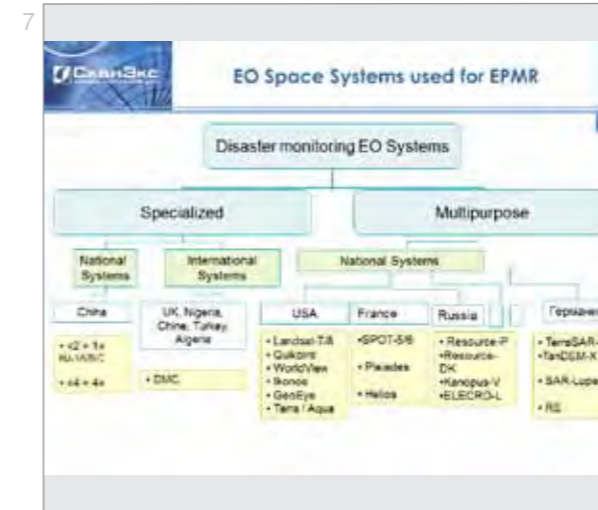
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Application of Satellite Technologies for Emergencies Preparedness, Management and Response (EPMR) in Asia-Pacific Region

Kucheiko Alexey
Deputy General Director
R&D Center SCANEX

2

1. Space Imaging and Its Role in Disaster Monitoring
2. History of Remote Sensing Technologies in EPMR
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



3

Soviet Chief Constructor of Spacecraft and Rocket Systems

S.P. Korolev (1907-1966)



10

Progress in EO Technology

Military Imagery Intelligence IMINT

- Race for spatial resolution (<<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...)

5

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.

6

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

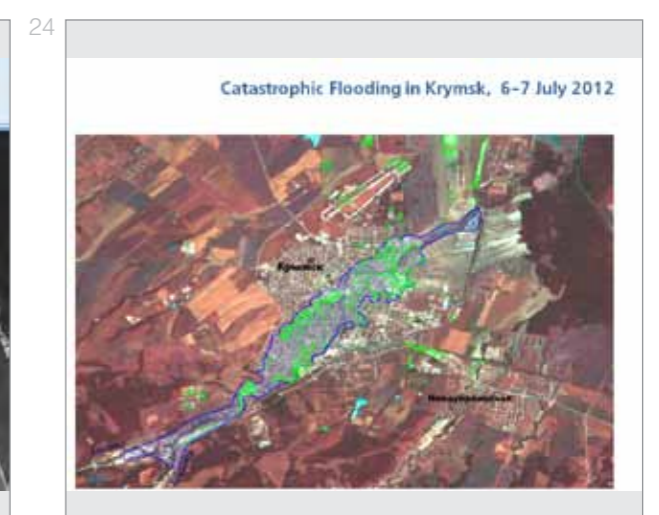
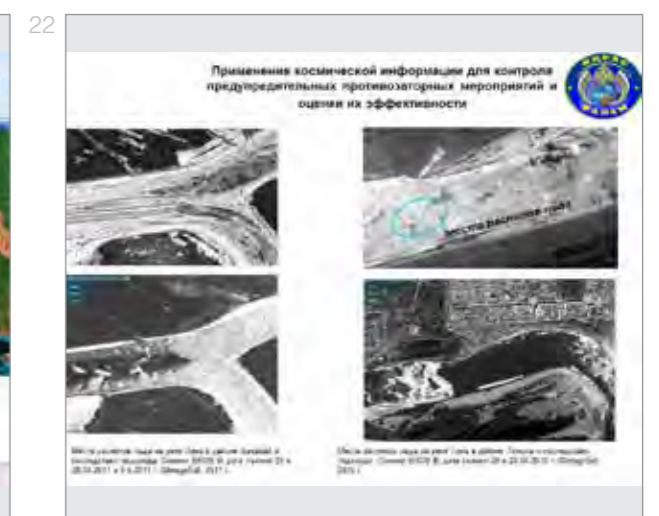
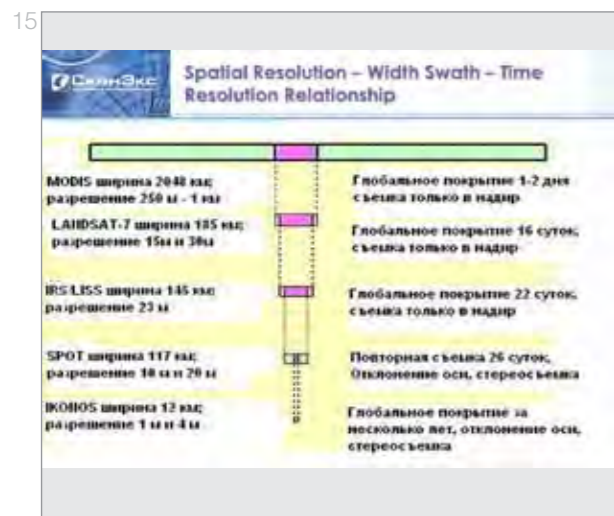
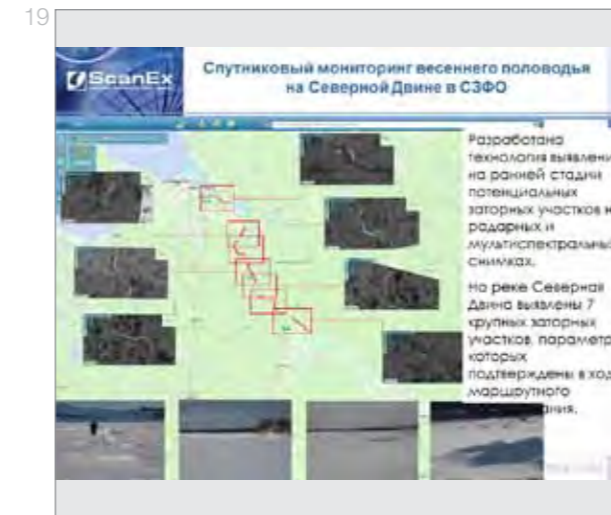
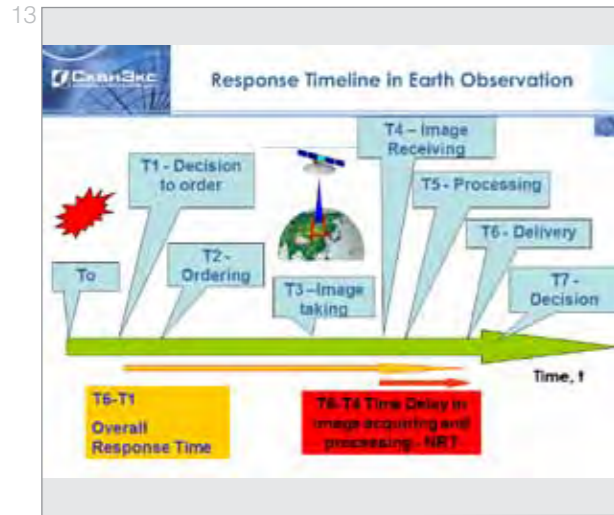
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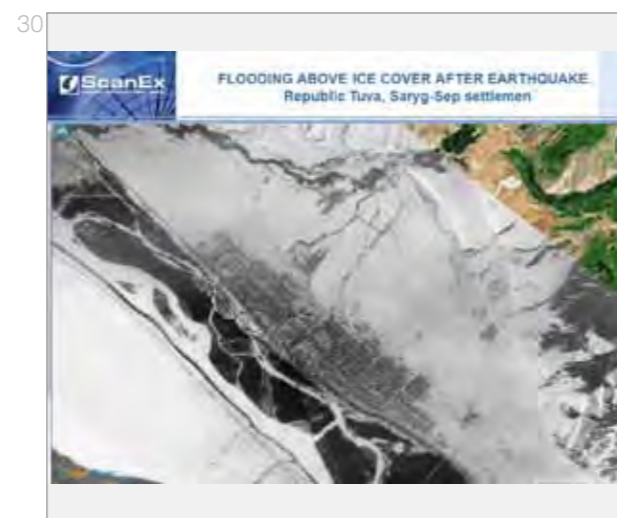
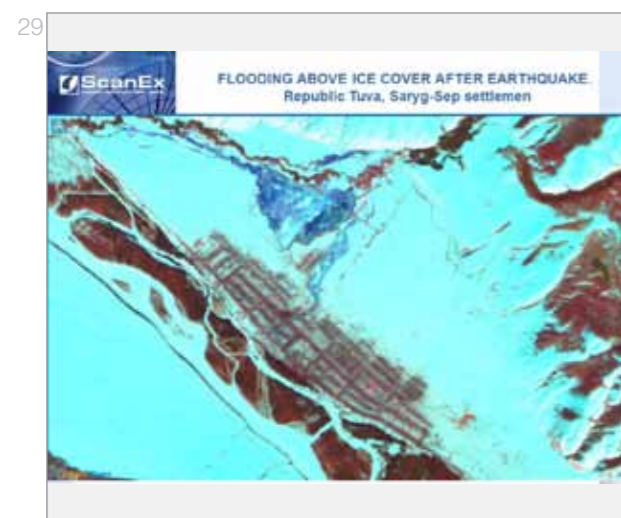
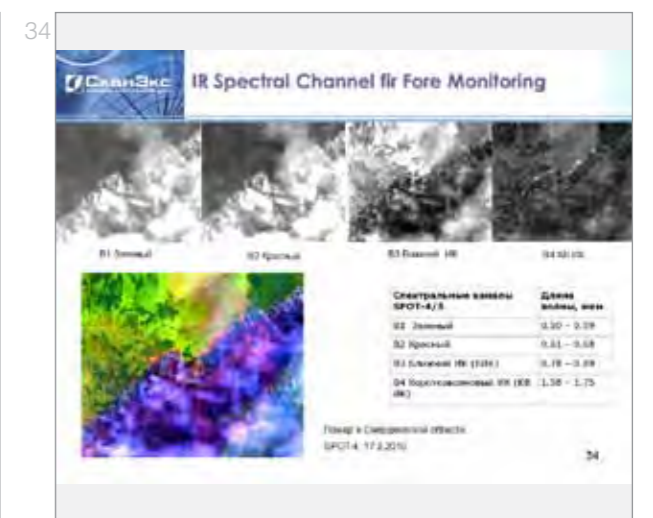
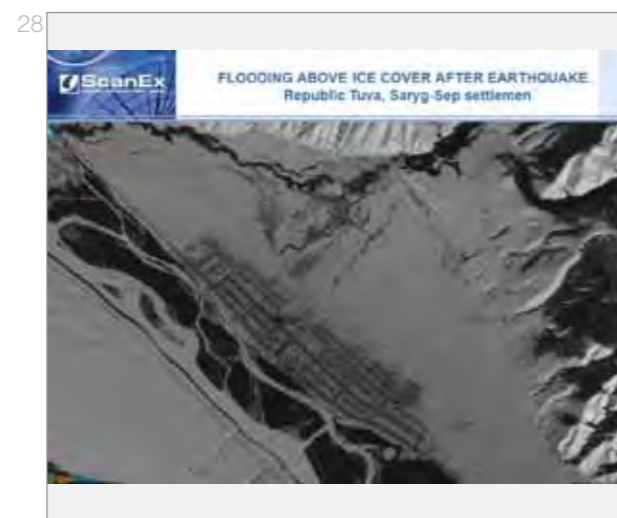
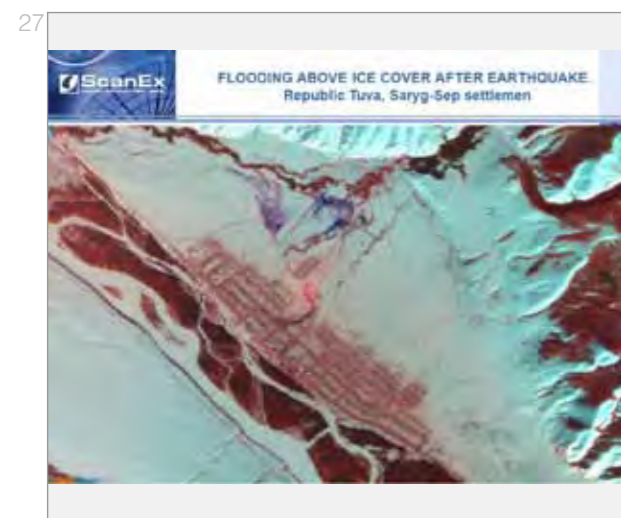
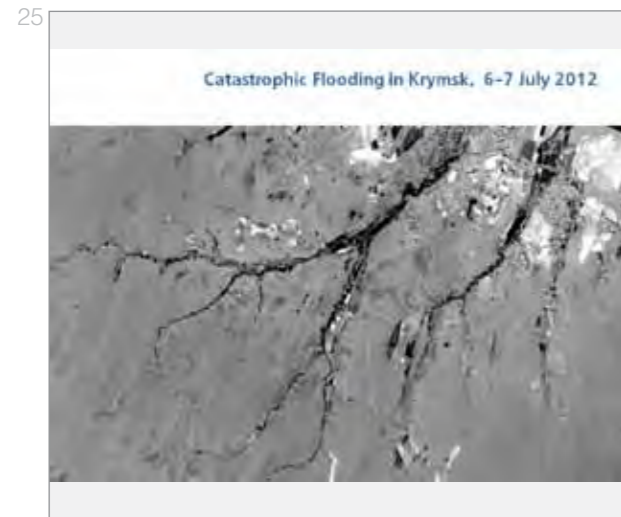
Видовая разведка – новые тенденции, Новые системы, новые страны

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: etc





37 Экспериментальная оценка детектирования торфяных пожаров из космоса с помощью сканеров среднего и высокого пространственного разрешения в ИК диапазоне электромагнитного спектра

Иллюстрация возможности выявления торфяных пожаров с помощью ИК сканеров среднего и высокого пространственного разрешения в 2011 г. Снимки получены с помощью сканера (1) полевой станции, наземного сканера (2) и спутника (3). Показаны: торфяной пожар (4), торфяной пожар (5), торфяной пожар (6), торфяной пожар (7), торфяной пожар (8), торфяной пожар (9), торфяной пожар (10), торфяной пожар (11), торфяной пожар (12), торфяной пожар (13), торфяной пожар (14), торфяной пожар (15), торфяной пожар (16), торфяной пожар (17), торфяной пожар (18), торфяной пожар (19), торфяной пожар (20).

38 Экспериментальная оценка детектирования торфяных пожаров из космоса с помощью сканеров среднего и высокого пространственного разрешения в ИК диапазоне электромагнитного спектра

Основные информативные признаки обнаружения торфяных пожаров:

- температурная аномалия (зона красного цвета, снимок сверху);
- длинный шейф (красными точками показано положение термометра, снимок внизу).

Торфяной пожар около н.п. Раговицы (Кингисеппский муниципальный район, Ленинградская область). Пожар по данным MODIS не обнаружен.

43 OIL POLLUTION AFTER DISASTER IN TREBS OIL FIELD 20.04.2012

03.05.2012, EROS-B, ImageSat, СКАНЭКС, 2012

25.04.2012, SPOT-6, ASTRIUM GEO, СКАНЭКС, 2012

44 Место крушения самолета Sukhoi SuperJet-100, Индонезия, 09.05.2012. СНИМОК IKONOS, дата съемки 13 мая 2012 г.

39 Оценка возможности детектирования торфяных пожаров из космоса по изменению значений вегетационных индексов

Использование вегетационных индексов SAVI, NDVI, NDVI для детектирования гарей Шатурский район, Московская область, дата съемки 23.04.2011. Общая площадь пожара 6 га.

- 1 - исходный снимок, дата съемки 03.06.2011 07:16 UTC
- 2 - карта изменения индекса SAVI. Отмечены участки очагов торфяных пожаров
- 3 - карта изменения индекса NDVI. Выделены участки пожара в районе обнаружения пожара
- 4 - карта изменения индекса NDVI. Сделана корректировка для определения местоположения торфяных пожаров

40 Взрывы на военных складах. Пуганово, Удмуртия. 03.06.2011. Слева Google.Maps. Справа Landsat-5 03.06.2011 07:16 UTC

45 3D-модель места крушения Sukhoi SuperJet-100 создана на основе снимка IKONOS за 13 мая 2012 г. (с) GeoEye, ИТЦ «СКАНЭКС»

46 Землетрясение в Гаити 12.01.2010

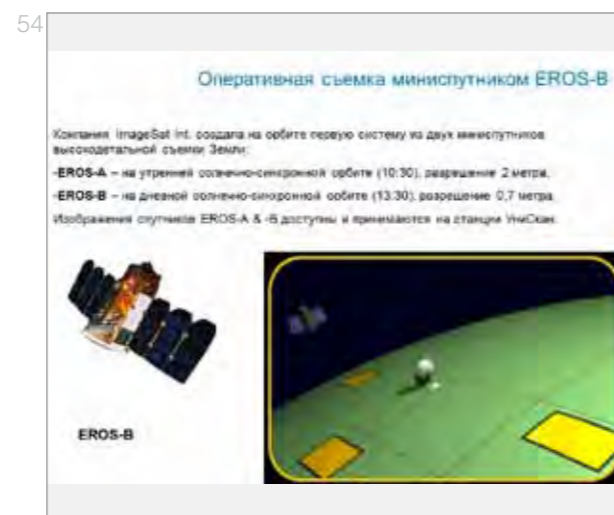
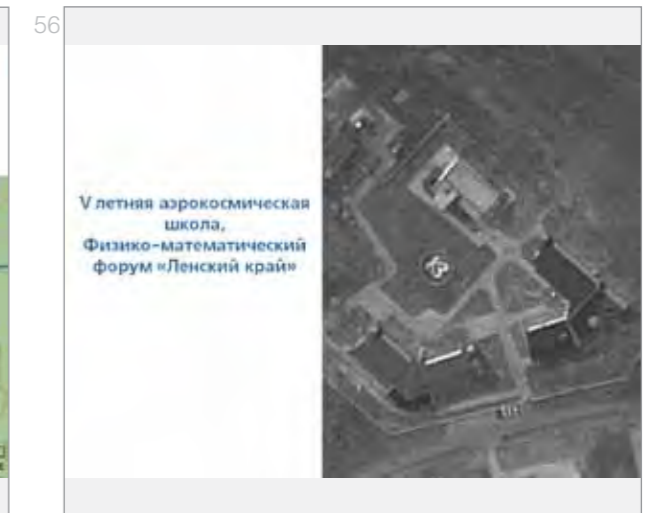
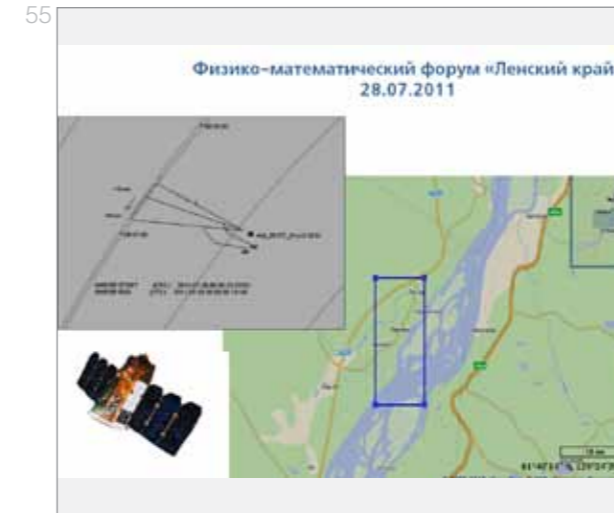
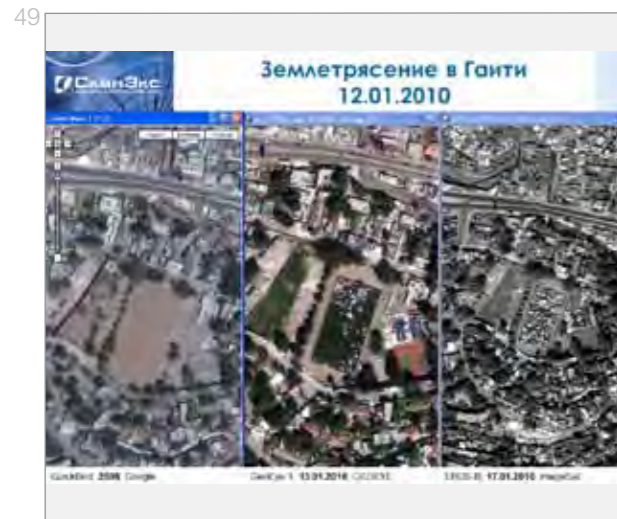
Epicentre Magnitude: 7.0 Date: 12 Jan 2010 Time: 16:53:09 Local Time

41 Взрывы на военных складах. Пуганово, Удмуртия. 03.06.2011. Снимок RADARSAT-2 03.06.2011 13:14 UTC

42 Взрывы на военных складах. н.п. Колтубановский. Оренбургская обл. 11.06.2012. Слева RADARSAT-2 12.06.2011. Справа EROS-A 14.06.2012

47 Damage Assessment Map of PaP produced by SCANEX

48 Землетрясение в Гаити 12.01.2010. Базовый лагерь оперативной группы МЧС России в международном аэропорту Порт-о-Пренс





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

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
- 2 Natural Disaster Management System
- 3 Space Technology Applications
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3

Content

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

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)

9

Disaster management demand for space technology

Disaster-prone environment (E), Hazard-inducing factors (H), Hazard-bearing Body (S), Disaster-prone environment (E)

$D = E \cap H \cap S$

- E - Stability
- H - Risk
- S - Vulnerability
- D - Severity

Space technology is important means.

10

Supporting to Disaster Management

Space technology

Risk assessment, Early warning, Monitoring, Damage assessment

Support

Disaster management

Prevention, Preparation, Emergency Response, Reconstruction

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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- 3 Space Technology Applications
- 4 International Cooperation

11

Application Products

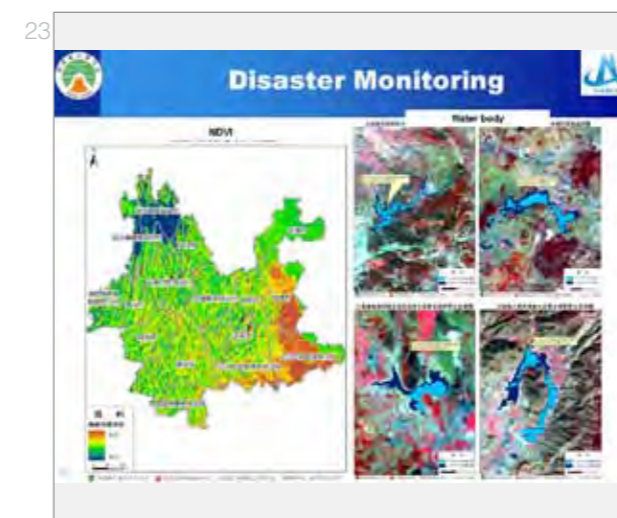
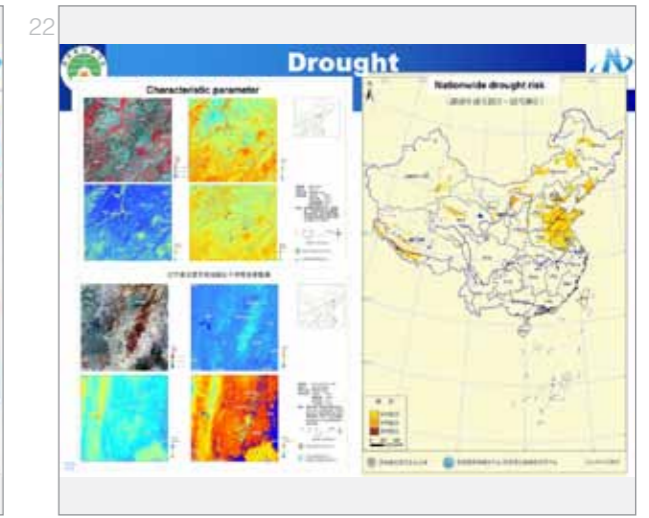
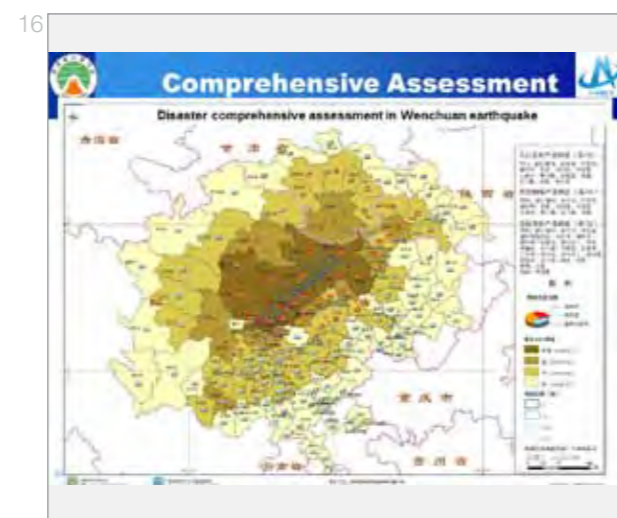
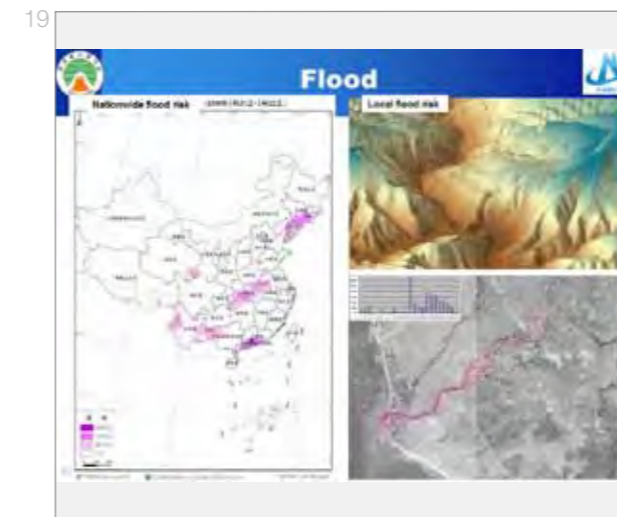
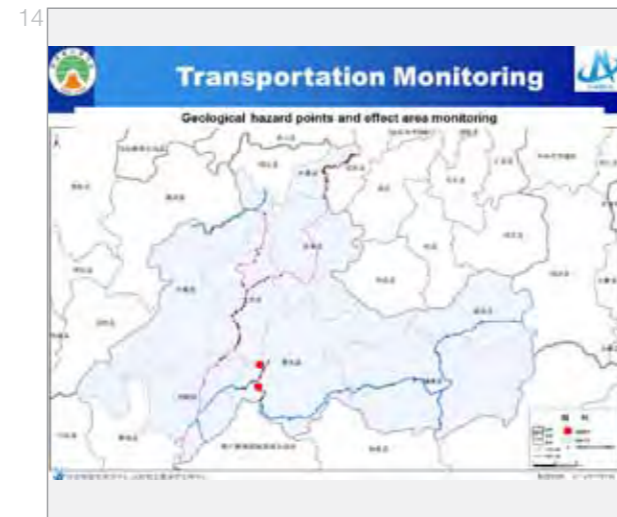
Products of space technology application

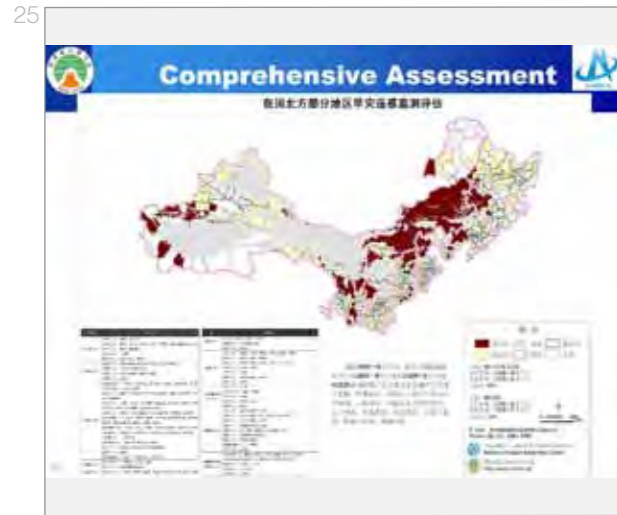
- Disaster Characteristics Parameter
- Disaster Risk Assessment
- Disaster Monitoring
- Disaster damage assessment
- Disaster recovery assessment

12

Earthquake

Damaged Buildings Assessment in yushu earthquake





- 27
- ### Content
- 1 Overview of Natural Disaster in China
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 - 3 Space Technology Applications
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29

International Conference and Training

NDRCC has involved in the work of the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) under UN Office for Outer Space Affairs(UNOOSA), and set up its Beijing Office.

United Nations International Conference on Space-based Technologies for Disaster Management-"Disaster risk identification, assessment and monitoring"
21-25 Oct.2013
Beijing china
UNOOSA,MCA

- 30
- ### International Conference and Training
- Short-term Seminar**
- China-ASEAN Seminar Disaster Early Warning and Space Technology Application
 - China-ASEAN Seminar Space Information Products Sharing in Disaster Risk Reduction
- International Training Course**
- NDRCC-UN-SPIDER Beijing Office : Space Technology for Drought Monitoring in Africa and Asia (2012)
 - NDRCC-APSCO : Demonstration of Remote Sensing Data Usage for Earthquake Monitoring and Evaluation (2012)
 - NDRCC-APSCO-UN-SPIDER Beijing Office : Space Technology for Flood & Drought Risk Mapping & Assessment (2013)



37

Services for Australia Wide Fire 2009

“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.

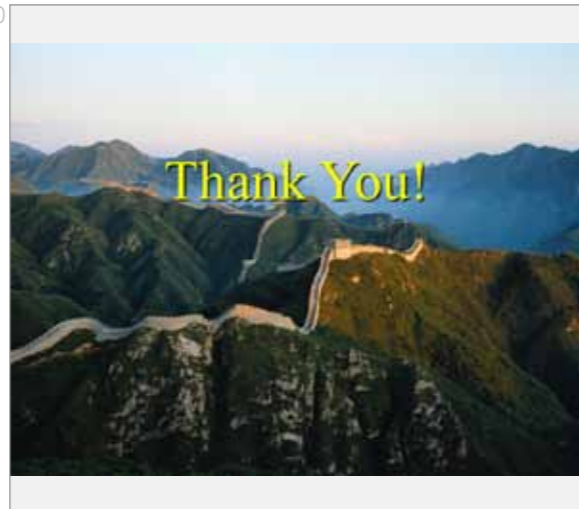
39

Services for Mexico sea oil

Monitor in 10th.May

Monitor in 13th.May

40





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

2

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/imagenes/dis_esc_lim_a.pdf

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

3

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



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

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

11

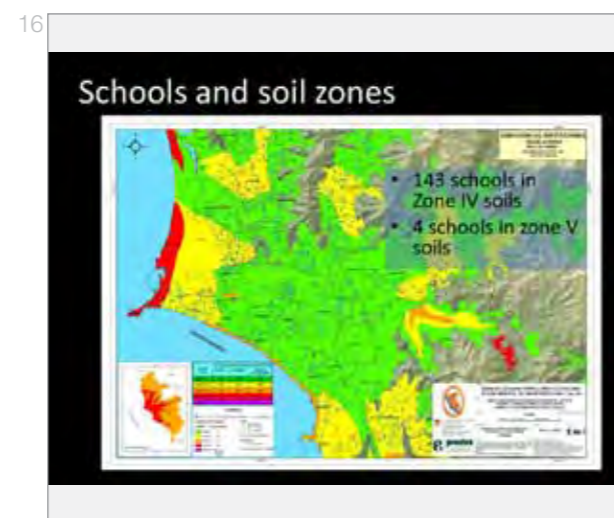
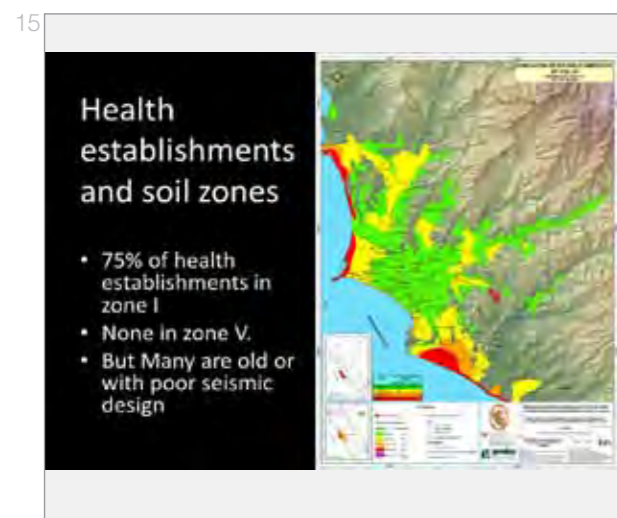
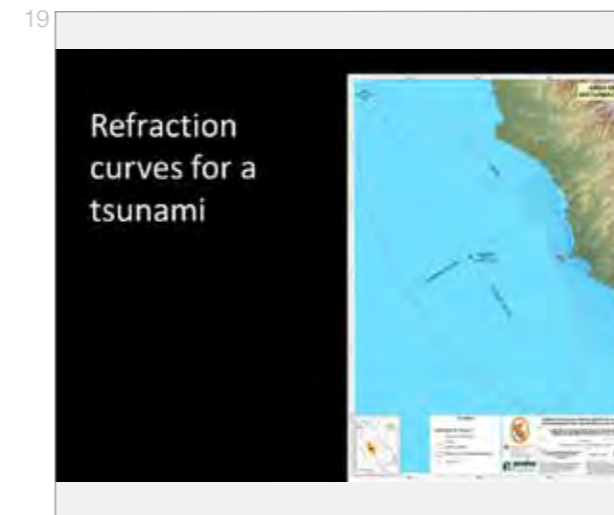
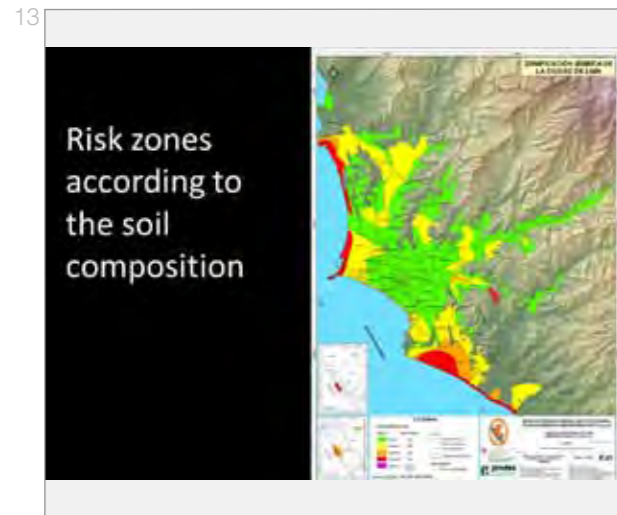
Potential damage by an earthquake

- 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

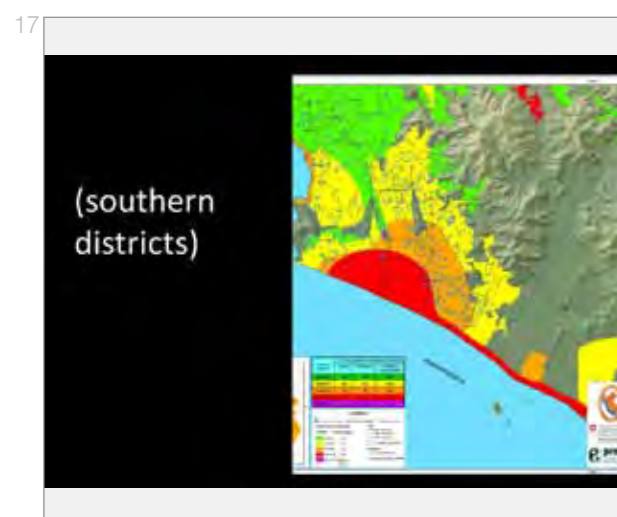
- Five risk zones identified:
 - Zone I: Low risk. Rock or solid alluvial soil
 - Zone II: Intermediate risk. Thin layer of fine material on top of solid ground
 - Zone III: High risk. Thick layers of fine material and sand
 - Zone IV: Very high risk. Thick layers of sand deposited by wind or the ocean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



21

Conclusions

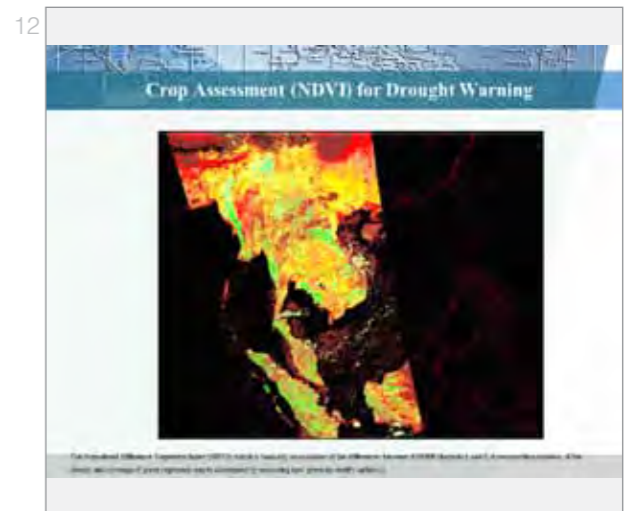
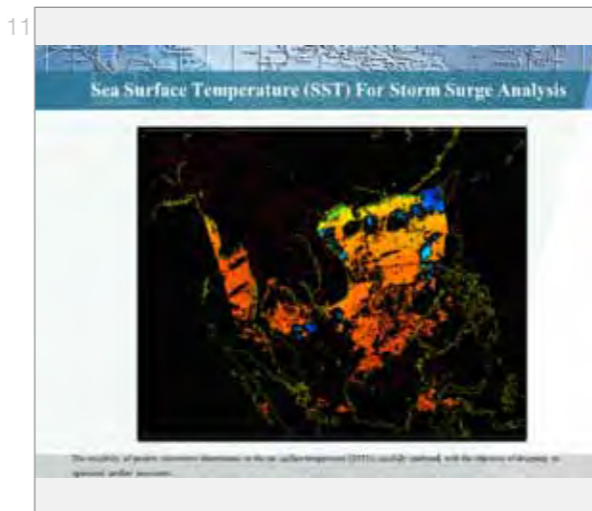
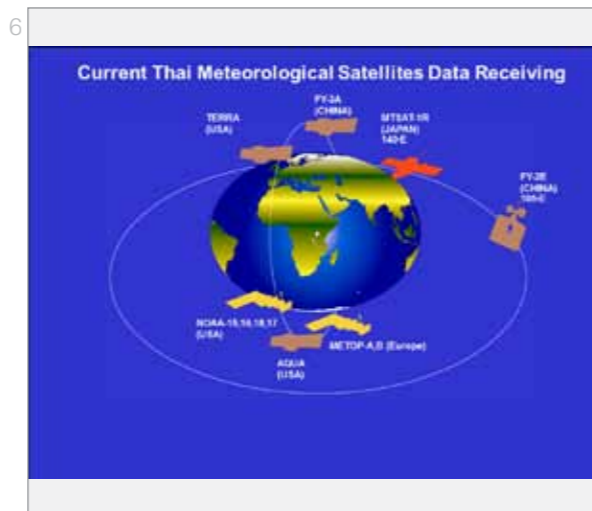
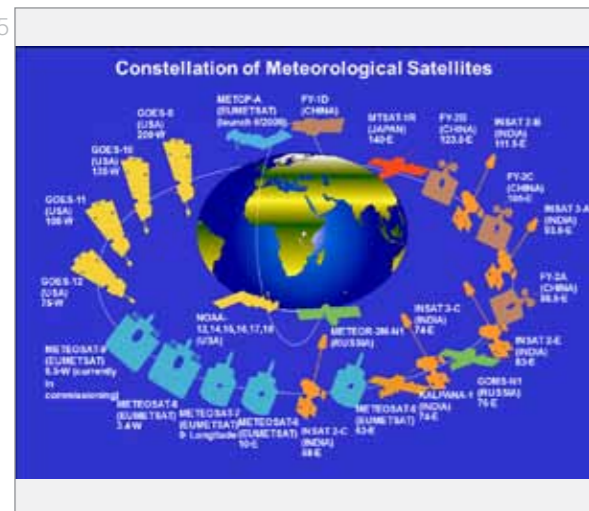
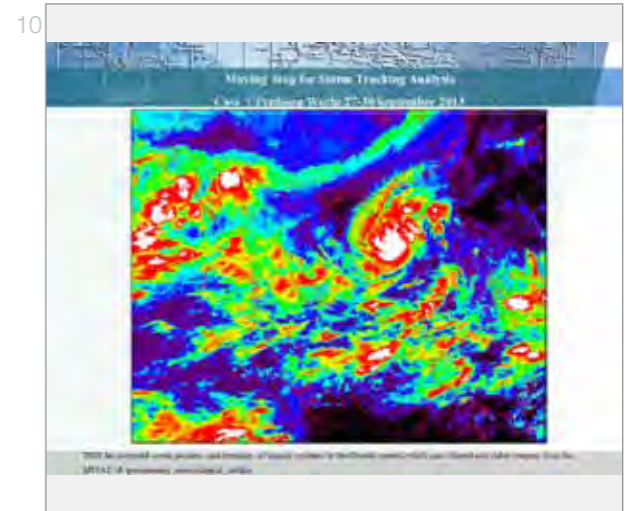
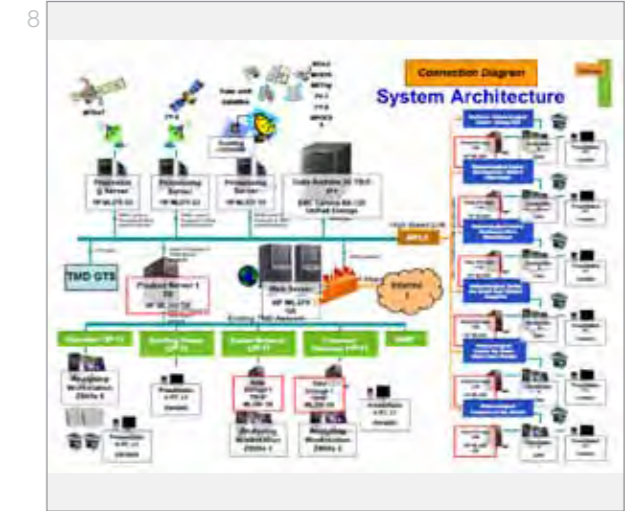
- The study identified areas of Lima at high risk of damage after an earthquake
- Some of these overlap with areas at high risk of damage by a tsunami
- These results should be used to formulate regulations on the characteristics of the building in the different areas of Lima
- More detailed data is required



18

Estimations for a tsunami

- Delay estimated in 11 to 20 minutes
- Height of the wave:
 - 4.73 (Yamaguchi method)
 - 5.53 (Silgado method)



13

Hot Spot for Forest Fire Warning

The satellite image shows a hot spot for forest fire warning. The image is a grayscale satellite view with a red arrow pointing to a bright red area, indicating a hot spot. The text below the image reads: "The satellite image shows a hot spot for forest fire warning. The hot spot is a bright red area, indicating a hot spot." (Note: the text in the image is partially obscured and difficult to read).

14

Hot Spot for Forest Fire Warning

The satellite image shows a hot spot for forest fire warning. The image is a color satellite view with a red arrow pointing to a bright red area, indicating a hot spot. The text below the image reads: "The satellite image shows a hot spot for forest fire warning. The hot spot is a bright red area, indicating a hot spot." (Note: the text in the image is partially obscured and difficult to read).

15

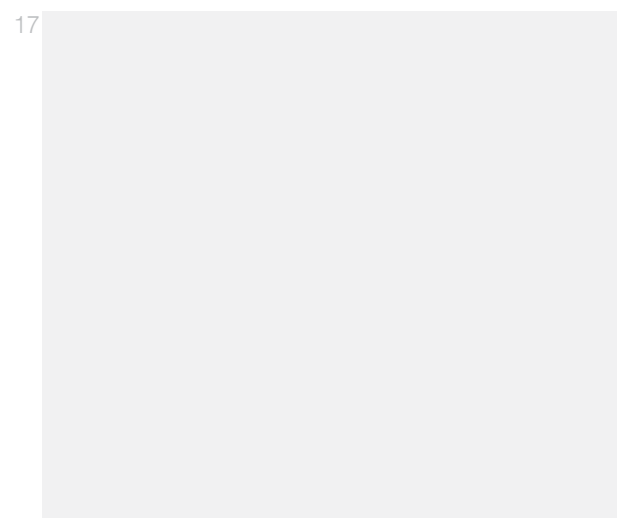
Other Data: The Data of CZ Components Relates with GEO Satellite (RADROP)

RADROP is the weather Radar data Corrected Reflectivity (CZ) component, that measures rain amount in DBZ value scale relates with Geostationary Satellite data, MTSAT in Infrared (IR) channel, that presents the clouds temperature and Cloud Pattern for estimate rainfall.

16

Data On Web : <http://www.tmd.go.jp/newversion/mergesat.html>

The screenshot shows a web browser displaying a satellite image of a forest fire hot spot. The URL in the address bar is <http://www.tmd.go.jp/newversion/mergesat.html>. The image shows a bright red area in the center, indicating a hot spot.



1

MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT
Disaster Management Center in Vietnam

SPACE TECHNOLOGY APPLICATION ON DISASTER MANAGEMENT IN VIETNAM

Bui Quang Huy
 Head of Disaster Information and Statistic Division
 Disaster Management Center
 Email: buiquanghuy@dmcc.gov.vn
 Web: www.dmc.gov.vn

2

DISASTER IN VIETNAM

Vietnam is a affected country by many kind of disaster, especially by flood, typhoon, flashflood and landslide

Flood Typhoon Flashflood Landslide

In recent years, some disaster had increase frequency and caused more damage, such as drought, salt intrusion, whirlwind....

7

SPACE TECHNOLOGY APPLICATION ON DISASTER MANAGEMENT

1. Launching VNREDSat1 satellite
2. Hazard mapping for small area and main disaster (typhoon, flood, flashflood)
3. Affected areas after disaster
4. Warning and forecasting (typhoon)
5. Coastal line erosion
6. Rice mapping and yield estimation

8

CHALLENGERS

1. Capacity
2. Data availability and sharing
3. Policy and coordination
4. Strengthening Disaster Risk Management
5. Early warning
6. Emergency response

3

DISASTER MANAGEMENT IN VIETNAM

Vietnam Government had approved some policy, main programs for disaster management, such as:

1. National Strategy on the prevention and mitigation of disasters by 2020
2. Disaster Management Law
3. National program for Community based disaster risk management.

Which focus on main point:

- Mechanism
- Warning system
- Capacity building and awareness raising
- Technology application
- Cooperation



9

WAY FORWARD

Developing the national program for using information based on space technology to disaster management. This program will be included 02 phase with some main activity.

Phase 1:

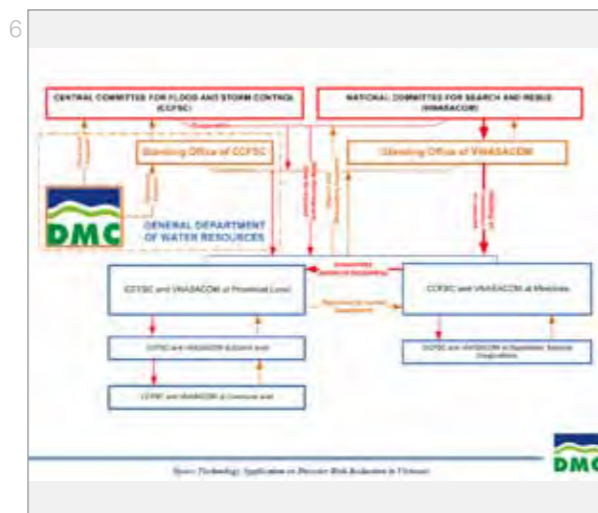
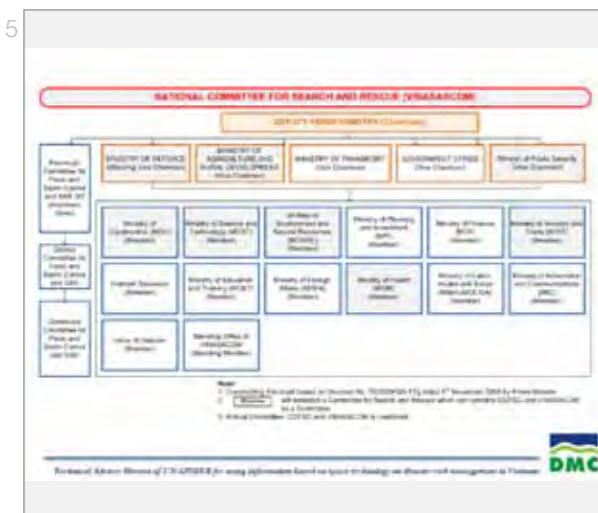
- Analyze and unify all existing resource of national agency, satellite image (especially real time or near real time) support for emergency case, production based on space technology, training...
- Developing the mechanism between user agencies and providing agencies.
- Establishing the core team including members of main technical agencies which support for decision maker of CCFSC through updating the disaster situation, setting up quickly affected area and damage estimation.
- Training and cooperations strengthening

10

WAY FORWARD

Phase 2:

- Mechanism strengthening by developing policies for data sharing.
- Setting up the system on data receiving, sharing for all related stakeholders, integrating main system (Decision support system, early warning system, ...) and supporting training, research
- Promoting international cooperation for data sharing (especially real time or near real time data for emergency response).
- Capacity building by short / long time training.
- Step by step, developing National Spatial Data Infrastructure (NSDI).



11

Thank you for your kind attention



1

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

APBC-EPWQ Workshop on
Applications of Remote
Sensing for Emergency
Preparedness, Management &
Response (EPWQ) Book, 2013
October 29-31, 2013

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

2

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
 - GEO and CEOS
 - Int'l Charter on Space and Major Disasters
- Some U.S.G contacts on Disasters

7

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).

8

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.

3

NASA: Remote Sensing Technologies and Data Analysis for Disaster Response

4

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 Science Natural Disasters Program

9

Volcanic Plume Detection with Aura/OMI

OMI detects ash (Aerosol Index, AI) and SO₂

April 15
April 16
Total SO₂ mass ~3000-4000 tons

10

Deepwater Horizon Gulf of Mexico Oil Spill
May - October 2010

5

Iceland Volcano 2011

6

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

11

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

12

NASA Response to Gulf of Mexico Oil Spill

MOORE Visible 29 April 2010, MODIS Infrared 29 April 2010, ASTER 24 May 2010

Satellites: Continually 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
 - Twin Otter / AVIRIS: 32 sorties, 187 flight hours
 - DC-8 / INSPIRE: 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.

13

Tornadoes

14

MODIS: Tuscaloosa – Birmingham Tornadoes 5 May 2011

Historic Tornado Outbreak April 27, 2011

One of the most notable tornado outbreaks in history. Based on techniques of Jedlovac et al. (2006), NWS forecasters use MODIS color composites to evaluate tornado damage tracks.

- Guide NWS forecasters to remote locations to conduct post-tornado surveys and analysis
- Correlate damage locations with Doppler radar rotational signatures

Used with high resolution 15m ASTER data for better assessment.

Jedlovac, Gary J., Udayanakar Nar, Stephanie L. Hayes, 2006. Detection of Storm Damage Tracks with EOS Data. *Wm. Forecasting*, 21, 269-287. doi: 10.1175/WAF823.1

SPORT

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EO-1 Advanced Land Imager (ALI) Identifies Haitian Areas Impacted by Disasters

Comparison of ALI imagery (on EO-1 satellite) of Port-au-Prince from 14 Sep 2005 after Hurricane Ike

- Excessive sediment discharge in river delta from Hurricane Ike

15 Jan 2010 post-earthquake

- The pier in the center of the 2006 image collapsed during the earthquake and is not visible in the 2010 image

10m resolution

ALI provides wide-angle optics and a highly integrated multispectral and panchromatic spectrometer in six Landsat Enhanced Thematic Mapper bands with three additional bands covering 0.433-0.450, 0.645-0.690, and 1.20-1.20 μm .

Cover: Dr. Fyfe-GOT and Lawrence Ongian at NASA GSFC.

20

Identify Landslide Risk in Post-Earthquake Haiti

Earthquake in Haiti

Visible landslides detected through EO-1 image interpretation, and vector risk

Credit: Eric Anderson and Emil Cherrington at CATHALAC

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MODIS Difference: Tornado Tracks 17 April - 4 May 2011

The MSFC SPoRT project applied advanced processing techniques to "before" and "after" images to enhance visibility of tornado damage tracks.

250m visible channel data from MODIS passes on April 17 (Aqua) and May 4 (Terra) were differenced and processed to produce image on left (corresponding to coverage of RGB image in previous slide).

This imagery is currently being used by the NWS in Google Earth to assist in damage assessment.

All damage tracks from EF-3 and stronger tornadoes for the southeastern US outbreak are identifiable in the MODIS difference images.

SPORT

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ASTER: Tuscaloosa AL Tornado 4 May 2011

NASA ASTER Satellite Data - May 4, 2011 - 3 Channel Composite Imagery

Tornado damage area identified in satellite imagery

Images created by MSFC Short-term Prediction Research and Training (SPoRT), same data courtesy of NASA GSFC, ASTER/ASTER/AMC3, and/or JPL/ASTER/AMC3 (space team)

SPORT

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Estimated Surface Displacement

Comparison of SPOT5 dual-image displacement (east component, color image) with modeled surface displacement from E-DECIDER dislocation model, in the region of the 2010 Haiti earthquake epicenter (west of Port-au-Prince)

- Map overlay of image layers is carried out in Google Earth
- Correlation of SPOT images processed by CEA, and International Charter on Space and Major Disasters.

E-DECIDER

22

UAVSAR Measures Deformation of Hispaniola Faults Following the devastating Haiti Earthquake

NASA added a series of science overflights of earthquake faults in Haiti and the Dominican Republic on the island of Hispaniola to a previously scheduled three-week airborne radar campaign to Central America, Jan 20-Feb 14 to study the structure of tropical forests, monitor volcanic deformation and volcanic processes, and examine Mayan archeology sites.

Current orbital and aperture to SAR provides examples of the opportunity, but do not image regions at risk to earthquakes on a systematic global basis. Image on the left: JAXA ALOS PALSAR demonstrates L-band coherence over a 10-month period to observe deformation in Haiti, but typically there are only 1-2 observations per year with a 40-day repeat period. UAVSAR complements to improve coverage, provides higher resolution and optimized viewing geometry.

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Earthquakes

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ASTER instrument Observes Haiti Quake Aftermath

Port-au-Prince: some of the damage has been caused by shallow slips on the faults. AP Photo/Mark

Slide 4 at the road through the mountains leading to Jacmel, 16 Jan 2010 (AP Photo/Lynne Gady)

14 January 2010 post-event

Possible landslides circled

23

El Mayor – Cucupah Earthquake M 7.2 on April 10, 2010

- Response: Displacement and disturbance maps
- Forecasting: Strain migration \Rightarrow Future earthquakes

First UAVSAR Measurement of an Earthquake

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UAVSAR Aids Mapping of Ruptures

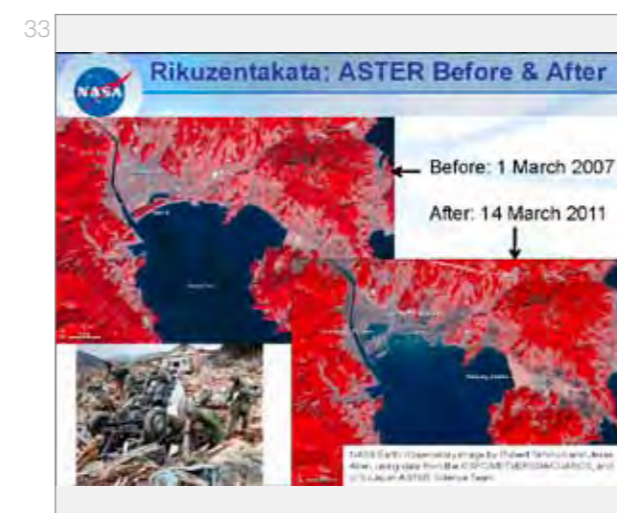
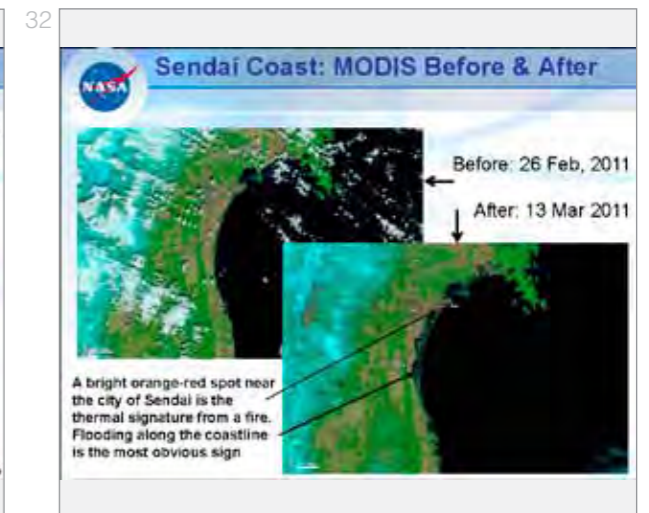
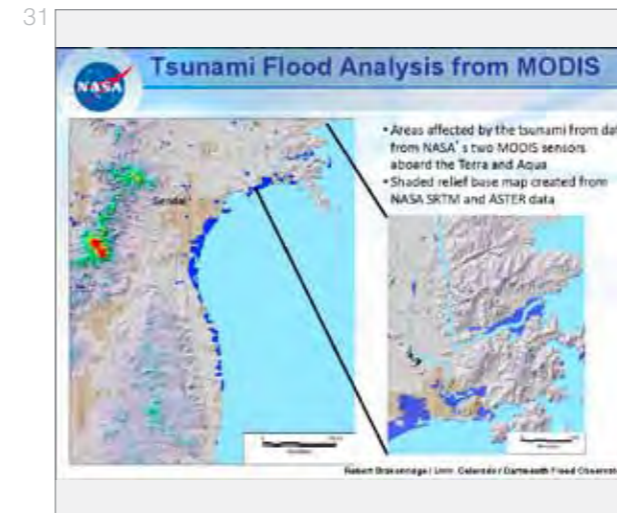
Interferogram 10/21/2009 – 4/13/2010

Interpretations from InSAR

field-verified surface faulting



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NOAA Satellites

NOAA Operates Geostationary Satellites (GOES) and Polar-Orbiting Satellites (POES)

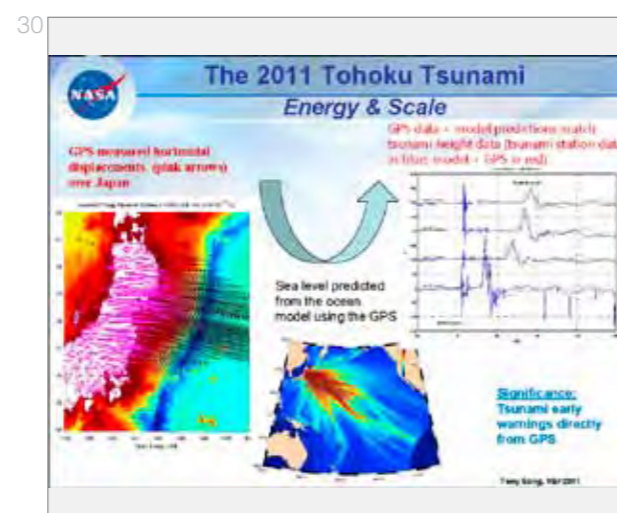
- Satellites in operation 24 hours a day, 7 days a week
- Archive data from NOAA satellites for long-term environmental monitoring

Evolution of Satellites from Weather Mission to Multi-mission

- Weather • Climate • Oceans

NOAA Satellites Provide Data in Support of:

- Weather
 - Routine weather forecasting
 - Warnings of severe weather events
 - Space weather
- Long-term climate monitoring
- Ocean monitoring
- Ecosystems monitoring
- Disaster management



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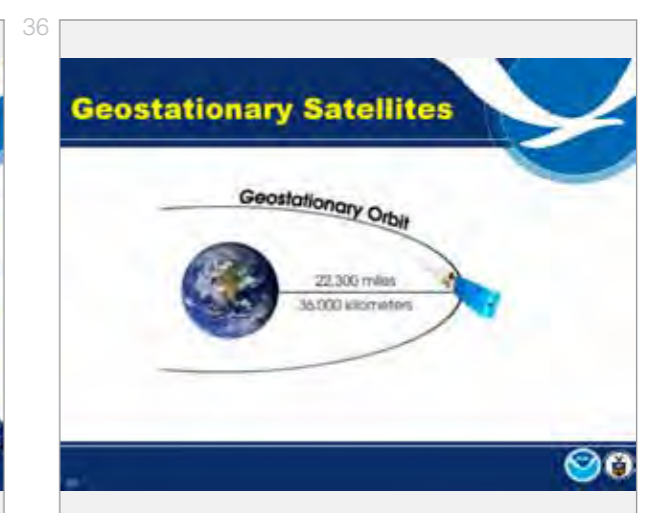
NOAA Satellites

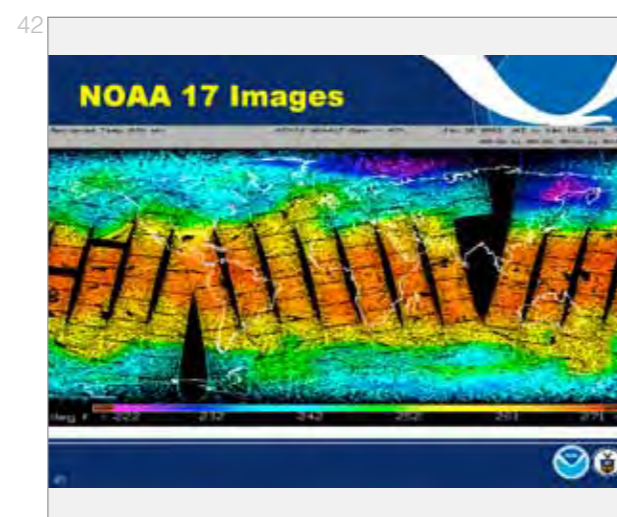
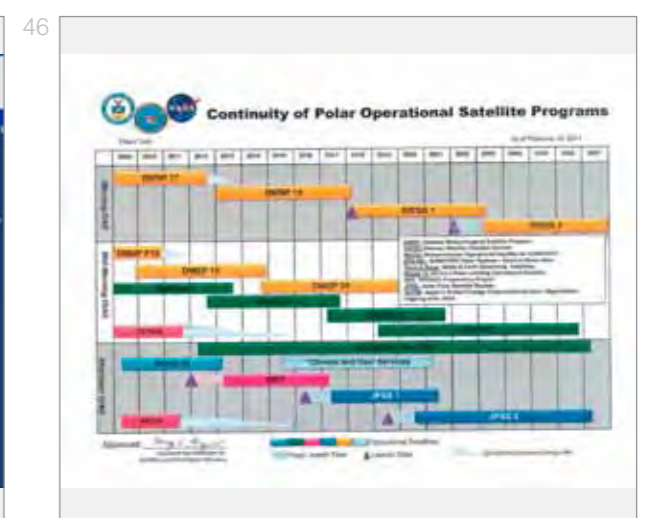
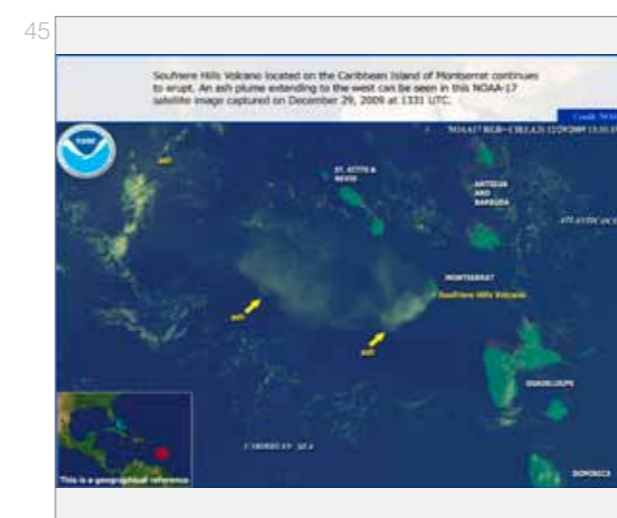
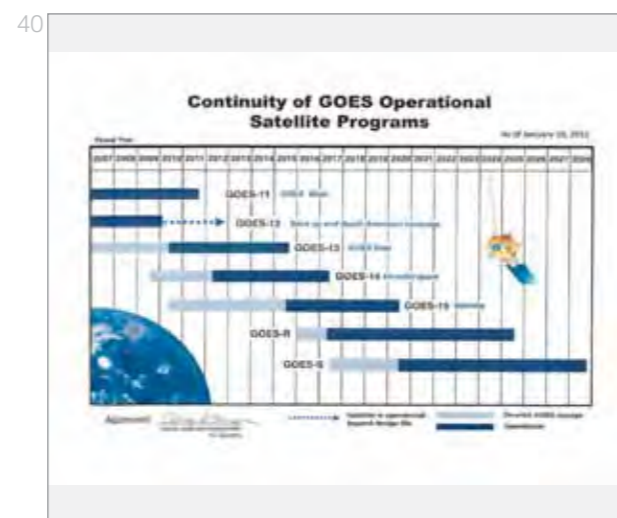
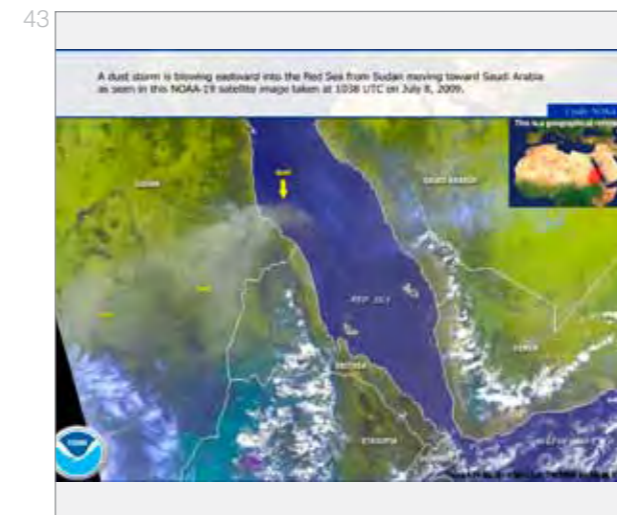
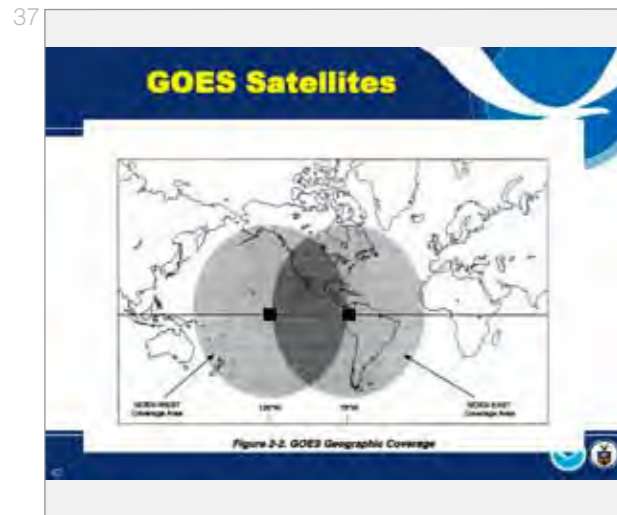
Current Satellite Programs

- 24/7 Satellite operations and product processing
- Geostationary satellites (GOES)
- Polar-orbiting satellites (POES)

Future Satellite Programs

- Joint Polar Satellite System (JPSS, formerly NPOESS)
- GOES-R





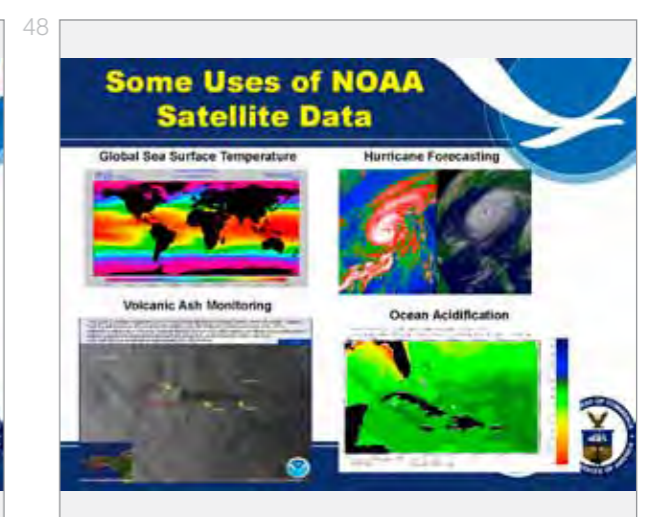
47

National Data Centers

NCDC: the world's largest active archive of weather data

National and Global Data Sets on Weather, Climate, and the Environment

From historical observations in the 1700s to the present



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Satellite Products

NOAA logo

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Hurricane / Storm Tracking

NOAA logo

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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

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Global GEONETCast Coverage

NOAA logo

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Rainfall Estimates

NOAA logo

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Oil Spill May 24, 2010

NOAA and NASA logos

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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

NOAA logo

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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

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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>

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NOAA leads this initiative for the US

Delivering Environmental Data to Users Worldwide

GEONETCast AMERICAS REGIONAL BROADCAST

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

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System Components

NOAA logo

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Weather Products

NOAA logo



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Quemadas - Vegetation Fires

Mapa de incendios con SIG para Brasil, Bolivia, Paraguay y Perú.

79

GPS is used to provide precise positions of airborne sensors so that highly accurate base geospatial data products such as high resolution terrain (elevation) data and orthorectified imagery can be produced efficiently.

USGS

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Coastal Change Hazards

Coastal Response to Hurricane Katrina - Dauphin Island, AL

GPS Dependent Airborne Lidar Mapping Enables Understanding of Coastal Change Hazards

75

International Journal of Remote Sensing, Vol. 22, No. 14, Sept. 2001

Title: "DMSP-OLS estimation of tropical forest are impacted by fires in Roraima: 1995 vs. 1998."

Authors:
Chris Elvidge, NOAA/NGDC
Sambakuru, T. Krug, A. Seltzer, INPE
F. Echaverría, State/ETC

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International Cooperation on Satellite Activities

- NOAA is Donating 14 GEONETCast receive stations to Mexico, Costa Rica and El Salvador

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Aerial Images from GSI, Japan
M9 Tohoku – need to re-establish a grid

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Aerial Images from GSI, Japan
M9 Tohoku – need to re-establish a grid

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International Charter Space and Major Disasters

GEONETCast Americas Now Broadcasts Satellite Imagery When the International Charter is Activated

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USGS
Network for a Changing World

Earthquakes and Other Natural Hazards: GNSS for Disaster Management

Ken Hudnut, Ph.D. - U. S. Geological Survey
hudnut@caltech.edu
hudnut@usgs.gov

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SCIGN
SOUTHERN CALIFORNIA INTEGRATED GPS NETWORK

GPS network measures plate tectonic motions to an accuracy of better than 1 mm/yr

We can see whether the motion is "slow and steady," or perhaps more interestingly it may sometimes accelerate or decelerate

84

During 2011 Japan earthquake:

Initial GPS results from GSI showed 2.6 meters shift; later results gave maximum GPS offset of 4,054 m (that's 13 feet)

Data were openly available and other groups quickly confirmed these results and made movies to help visualize the information

Since 1990, US advised Japan on construction of continuously operating GPS stations (like ones we built in Southern California). They built a network of over 1200 GPS stations called GEONET.

Post- seismic: re-adjustments will go on for years, GPS is the best way to examine it

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GNSS from GSI, Japan; M9 Tohoku

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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

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Typical progression in earthquake types & energy release preceding an eruption

Plus Hybrids of HF & LF

HF Volcano-tectonic earthquakes

LF Long-period earthquakes

Volcanic tremor and

87

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

Flank motions

Motions of volcanoes' flanks can indicate the arrival of new magma; GPS is used to monitor changes in activity.

Dome growth

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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).

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

Systems monitoring in the "front line" of volcano monitoring.

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VDAP's Indonesia Program

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

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

John Pallister and Jeff Marjo

VDAP's Mission: Preventing volcano crises from becoming disasters

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

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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

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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

What's next?

In 2009, VDAP was asked to help CVGHM at 8 high-risk volcanoes on the island of Java, the most populous and volcanically active island in the world.

In 2010 we built a new monitoring network at Tangkuban Parahu (Bandung's "city volcano"). In 2011 & 2012 the focus is in East Java. (Plus, follow-up work at Merapi)

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Cereme (1512)
1800 feet, 1000-1500 ft. of pyroclastic surge
8 volcanic towers

Slamet (1596)
1800 feet, 1000-1500 ft. of pyroclastic surge
8 volcanic towers

Dieng Complex
Dieng, 1000-1500 feet, 1000-1500 ft. of pyroclastic surge
8 volcanic towers

Sundoro (1971)
National government
Bupati Merapi (1971)

Sumbing (1710)
1800 feet, 1000-1500 ft. of pyroclastic surge
8 volcanic towers

Merapi (1800)
1800 feet, 1000-1500 ft. of pyroclastic surge
8 volcanic towers

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Remote sensing & seismicity show threat not over

- 31 Oct. - 4 Nov. - Big lava dome grows in crater; constant tremor felt to 25 km
- 4 Nov. - Suroso calls VDAP; extends evacuations to 20 km - saves thousands of lives
- 5 Nov. 00:05. Largest eruption (VEI 4) - ash cloud to 55,000', pyroclastic flows to 18 km

International (US & Japanese) response teams requested by President of Indonesia

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Merapi - 5 Nov. Eruption

- 200-300 kilotons of SO₂
- Ash cloud impacts international aviation operations

VDAP, CVGHM and Darwin VAAC keep aviation authorities advised

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Response to Merapi, 2010

Yogyakarta, pop. 1.6 million

100

The principal hazard at Merapi: **pyroclastic flows (PFs) and surges** - fast moving 500°C hot "ash hurricanes" generated by collapse of summit lava domes (or explosions)

Anatomy of a Merapi-type dome-collapse pyroclastic flow

1. Surge cloud
2. Buoyant ash cloud (enriched from PF)
3. Pyroclastic flow (density current)

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Merapi - 5 Nov. Eruption

- 5 Nov. 00:05. Largest eruption (VEI 4) - ash cloud to 55,000', pyroclastic flows to 15 km
- New large crater at summit
- Hot gas and ash surge cloud devastates ~20 km² in populated region

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Mount Merapi Volcanic Eruption

Central Java, Indonesia

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Eruption warning signals - 2010

- CVGHM detected unrest at Merapi early. Level 2 Alert - 20 September.
- CVGHM Director Sorono recognized un-paralleled increase in activity
- Contacted VDAP on 22 October; we immediately initiated remote response

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25-26 Oct. 2010

- CVGHM correctly anticipated large explosive eruption
- 25 October, 18:00 - CVGHM issued Level 4 Alert; evacuations to 10 km
- 26 October, 17:02 - 23 hours later: large explosive eruption (VEI 3) - Deadly pyroclastic flows to 8 km
- Mbah Mariglan & ~30 who refused to evacuate killed at Kinalrejo, 7 km from summit
- Thousands of lives saved by Alert and evacuations
- 27-30 October, people return to homes...

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Mount Merapi Volcanic Eruption (Affected Area)

Central Java, Indonesia

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Kopeng townsite, devastated by pyroclastic flow and surge - ~2400 houses destroyed. 10,000-20,000 lives saved by warnings and evacuations

109

US Govt. (VDAP) 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

USGS USAID

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Briefing the Vice President of Indonesia

25 Nov. 2010

Message to the GOI

- 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 CVGIM saved many thousands of lives.
- The VDAP team is honored to have assisted CVGIM in their successful response to the eruption, and looks forward to continued work together to further enhance Indonesia's National Volcano Early Warning System.

USGS USAID

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www.disasterscharter.org

Emergency enquiries from users requiring direct access to Charter resources should be addressed to: [email address]

General requests for information should be addressed to: [email address]

USGS

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HDDS Explorer- Graphical Interface

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

USGS

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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

USGS

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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

USGS

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Hazards Data Distribution System (HDDS)

HDDS Hosted Datasets - Satellite

- Landsat TM
- Landsat ETM+
- ASTER
- EO ALI
- EO Hyperion
- SPOT (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)
- DInVeo
- DMSP
- AVHRR
- TopSat
- Swift
- LISS
- IRS

USGS

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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

USGS

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Charter Members

USGS

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Charter Activations (disaster types)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Sub-totals
Earthquake	1	0	1	0	0	3	2	0	4	3	5	0	2	44
Landslide	1	1	2	2	1	1	1	4	2	2	2	2	1	15
Volcano	1	1	2	2	1	1	2	3	3	2	2	1	1	22
Storm/Hurricane*	1	1	2	3	4	1	0	0	1	1	2	0	2	21
Ice/Storm Surge**	1	1	1	1	1	1	1	1	1	1	1	1	1	12
River/Dam break**	3	0	0	0	13	10	22	23	18	25	16	20	11	193
Fire	0	0	0	1	2	4	2	4	1	3	2	1	1	24
Tsunami	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	9	11	15	18	21	25	45	40	40	51	32	40	17	281

USGS

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Post-Tsunami Image along West Coast of Aceh Province

UNSAT

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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/>

USGS

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USGS
New Orleans, Louisiana: Landsat Satellite Coverage - Delineating the Freshwaters - Post Hurricane Katrina

U.S. Department of the Interior
U.S. Geological Survey

122

Landsat at 40 - It's impact on Earth Observation, Current Status, and Landsat's Future.

Free data - glovis.usgs.gov

Rio de Janeiro, February 28, 2000
Landsat 7 ETM+

USGS
LANDSAT 40

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Connecting Space to Village
The SERVIR Regional Visualization and Monitoring System

Daniel Irwin
SERVIR Director, NASA

SERVIR
ICIMOD
USAID

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SERVIR Network

- Current Hub
- Graduated Hub
- Program Office (NASA/MOPC)
- Potential Future Hubs (to be completed in regions)

RCMRD - Host of SERVIR-East Africa
ICIMOD - Host of SERVIR-Himalaya

ICIMOD
USAID

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For all Landsat Data - Online search and download

Earth Explorer
<http://earthexplorer.usgs.gov>

GLOVIS
<http://glovis.usgs.gov>

USGS

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Operational Land Imager, Sun Aerospace & Technologies Corporation

Thermal Infrared Sensor, NASA GSFC

Landsat & Spacecraft, Orbital Sciences Corporation

NASA

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SERVIR Applications
Tangible results making a difference in people's lives

- Disaster Analyses
- Environmental Monitoring
- Air Quality Assessments
- Climate Change and Biodiversity
- Short Term Weather Prediction

Study on Potential Impacts of Climate Change on Biodiversity
Fires in Guatemala and Mexico
Flooding Analysis in Haiti, September 2009

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Group on Earth Observations (GEO)

- Earth Observation Summit (EOS I)**
 - July 31, 2003, Washington, D.C.
 - 34 Countries and 20 International Organizations
- EOS II**
 - April 25, 2004, Tokyo, Japan
 - 47 Countries and 26 International Organizations
- EOS III**
 - February 2005, Brussels
 - Nearly 50 Countries, EC and over 40 International Organizations
- EOS IV**
 - November 2007, South Africa
 - Over 70 Countries, EC and over 40 International Organizations

EOS I
EOS II
EOS III
EOS IV

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Landsat Internet Data Distribution
40-year archive of global data provided freely on the Internet

1999 2000 2010 2012

Daily Average = 1.75 exabytes of user-requested data returned
Daily Average = 32 exabytes for total user of data (2012)

USGS

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Famine Early Warning: www.fews.net

USAID
FEWS NET
USGS

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Earth Observation Summit Participants

U.S. Department of State, Washington DC
July 31, 2003

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CEOS
Committee on Earth Observation Satellites


Established in 1984, CEOS coordinates civil space-borne observations of the Earth, in order to enhance international coordination, data exchange and to optimize societal benefits.

www.ceos.org
As of June 2013 there are 53 members and associate members made up of space agencies, national and international organizations.

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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.



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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

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U.S contacts on Disasters



- Francis Lindsay, NASA, Disasters Manager, francis.lindsay-1@nasa.gov
- Nancy Searby, NASA, Capacity Building Nancy.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, kudnut@caltech.edu
- Martin Medina, NOAA-NESDIS, martin.medina@noaa.gov
- David Green, NOAA-NWS, dgreen@noaa.gov
- Sezin Tokar, USAID-Office of Foreign Disaster Assistance, stokar@usaid.gov
- Fernando R. Echavarría, Dept. of State, fernando.echavarria@state.gov

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National Science & Technology Council Subcommittee on Disaster Reduction

<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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
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Implementation plans released March 2008



Available at www.sdr.gov

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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



Nyiragonga Volcano Eruption, Goma, Congo Jan 2002

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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/>

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.nst.gov.tw

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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

7

Real-time Monitoring

Upper air sounding, Satellites, Radar Network, Surface stations, Lightning observations, Regional Model, Auto rain-gauge

8

Evacuation Operation

2010/9/18 05:30 14:00 15:00 2010/9/19 08:40 23:00

Issue land warning, Early warning, Evacuation operation, Typhoon landfall time, Landslide in Lai-Yi

32 hours ahead

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 dam
4. Road and bridge damage
5. Sedimentation in river
6. Water shortage due to reservoir siltation
7. Landslide due to dike broken
8. Impact of social recovery

9

Geospatial Data

Four phases of disaster management: Mitigation, Preparedness, Recovery, Response

Demand Analysis:

- Data Support for Demand:
 - Basic data
 - Digital elevation model (DEM)
 - Land use
 - Geological map
 - Disaster historical records
 - Administrative map
 - Facilities information
- Real-time data
 - Aerial photography
 - Satellite images
 - Gauges and sensors
 - Model data
 - Rainfall prediction
 - Water status prediction

10

Disaster Survey: Flood hazard-prone area

Historical event: Flooding range and depth, Flooding time

Hazard-prone area: Low-lying area, Inundated and narrowing of river path, Confluence part

5

Key elements of succeed emergency response

In-time Operation, Scientific Modeling, Real-time Monitoring

6

Scientific Modeling

Typhoon Forecast

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

simulated the precipitation magnitude 600mm accumulation

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
- Administrative map
- Social welfare institutions
- Public transportation
- Road map
- MRT
- High Speed Road
- Water level stations
- Water status
- Rain gauge stations
- Precipitation

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Near Real Time Disaster Surveillance

Coordinating Remote Sensing Image acquisition

Satellites Airplanes UAVs Helicopters

14

Coordinating via Video Conference

19

Inundation in Yilan County

20

Landslide Dam

FORMOSAT-2 2012/03/27 (before) FORMOSAT-2 2012/06/17 (after)

Provided by NSPO and CSRSR

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Mission design

NO.	MISSION PURPOSE	TYPE	DATE/TIME
1	DISASTER SURVEILLANCE	SAT	2012/03/27
2	DISASTER SURVEILLANCE	PLANE	2012/03/27
3	DISASTER SURVEILLANCE	UAV	2012/03/27
4	DISASTER SURVEILLANCE	HELICOPTER	2012/03/27

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Image acquisition

21

Case Study-Landslide

22

Estimation of Sediment Yields

Estimation of sediment yields 1,550,591 cubic meters covered Siaolin Village in Kaohsiung County

17

Image Processing and Interpretation

18

Case Study- Inundation

(2010/9/20)

23

Disaster Report

- Real-time hazard updates
- Inundation
- Electric interrupted
- Road and bridge damage
- locations of shelters and local emergency operation centers

24

Imagery comparison

- Remote sensing images provide pre and post disaster comparison

25

Disaster Surveillance

The diagram illustrates the disaster surveillance process. It starts with 'Emergency Remote Sensing Group Meeting' leading to 'Satellite Imagery' and 'Aerial Photography'. These feed into 'GIS'. The process then moves to 'Disaster Assessment', 'Disaster Response', and finally 'Disaster Mitigation'.

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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.



1

ScanEx

Satellite technologies and remote sensing: from first steps to advanced use.

Mikhail Zimin
Head of the department of geodesy and cartography

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ScanEx

Contents

- History of remote sensing
- Today's realities
- Step into the future

3

ScanEx

History of remote sensing

4

History of remote sensing

1826, French scientist **Joseph Niépce**, view from the Window at Le Gras (1826), the earliest surviving photograph of a scene from nature taken with a camera obscura

5

History of remote sensing

1858, **Gaspard-Félix Tournachon (Nadar)**, rising above Paris on balloon to an altitude of about 400 meters for the first time in the world look a photo with aircraft, and thus became the pioneer of remote sensing

6

History of remote sensing

April 1861, prof. **Thaddeus Lowe** (city of Cincinnati, Ohio, USA) look to the skies for weather observations, with help of balloon and strong wind was demolished him in to the area of active hostilities and was captured as a spy. Eventually, he was released and became head Balloon Corps of the U.S. Army used for intelligence purposes until 1863

7

History of remote sensing

Balloon Corps of the U.S. Army

8

History of remote sensing

Camera and the system of kites, **George Raymond Lawrence** (1906)

9

History of remote sensing

Panorama of the city of San Francisco taken from a kite by **George Raymond Lawrence**, 26 of May 1906, a month after catastrophic fire incident as a result of the earthquake

10

History of remote sensing

11

History of remote sensing

Bavarian pigeon fleet, the beginning of the 20th century

12

History of remote sensing

The further development of aeronautics was driven towards an aircraft, namely, airships and gliders and airplanes. In the years 1908-1909 the first aerial photographs were taken from the plane created by the Wright brothers.

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 look place.

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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)

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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.

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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 a spy plane U-2 were found working on construction sites average range.

18

History of remote sensing

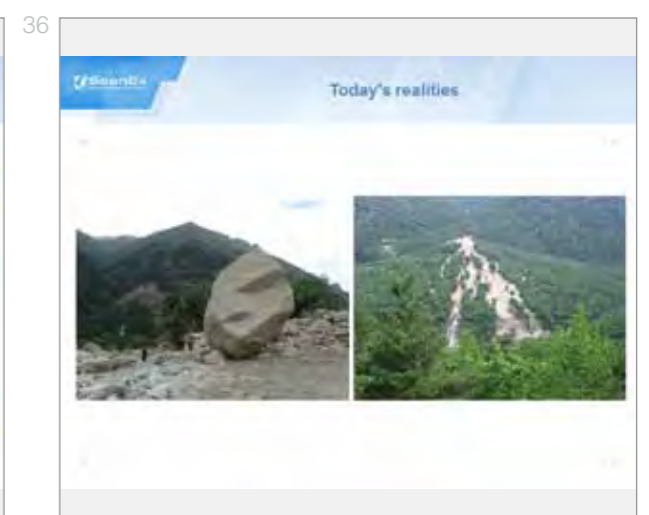
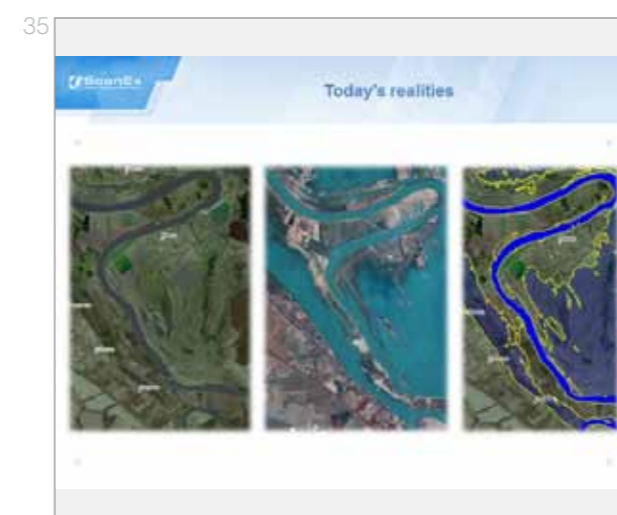
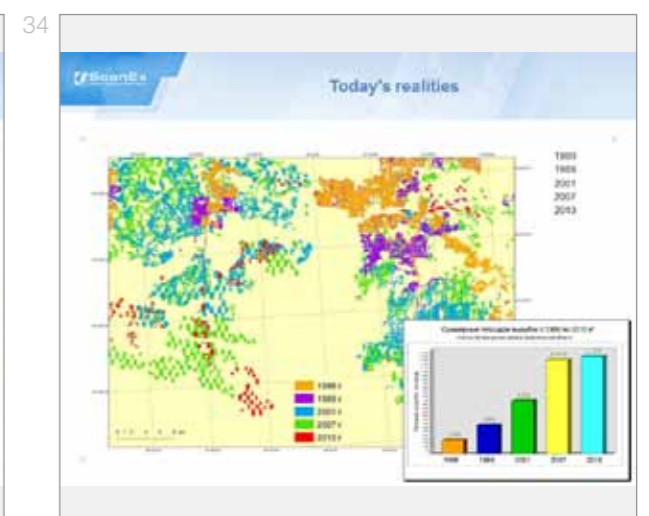
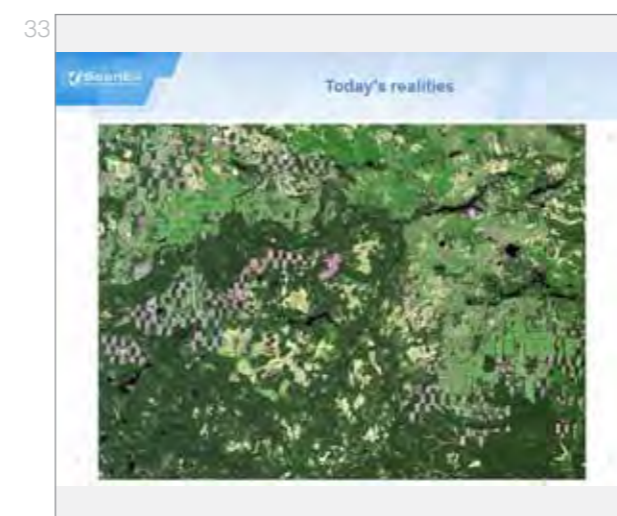
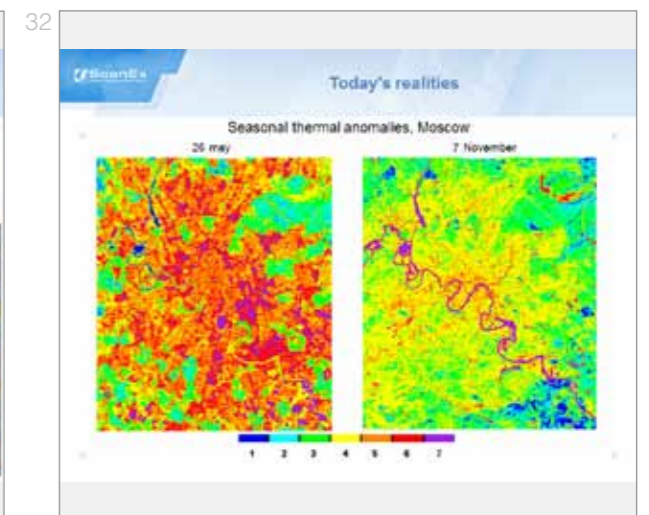
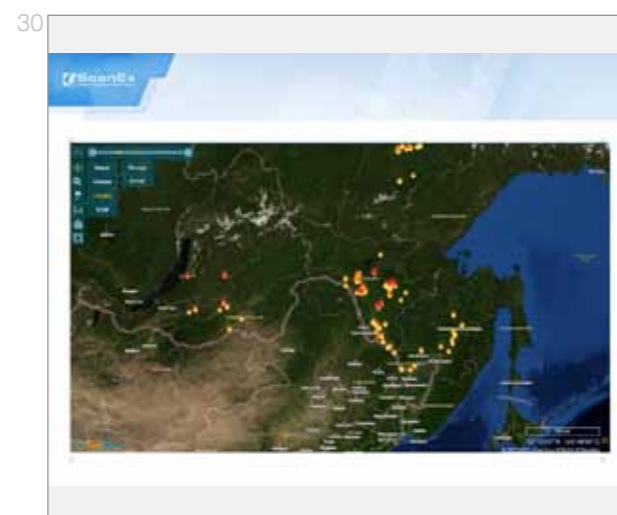
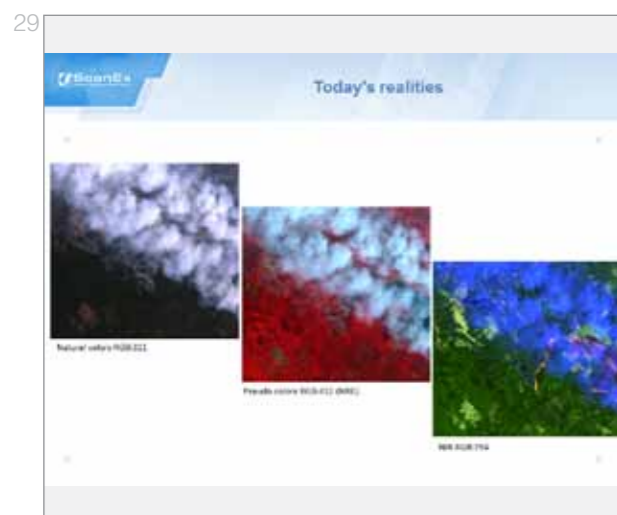
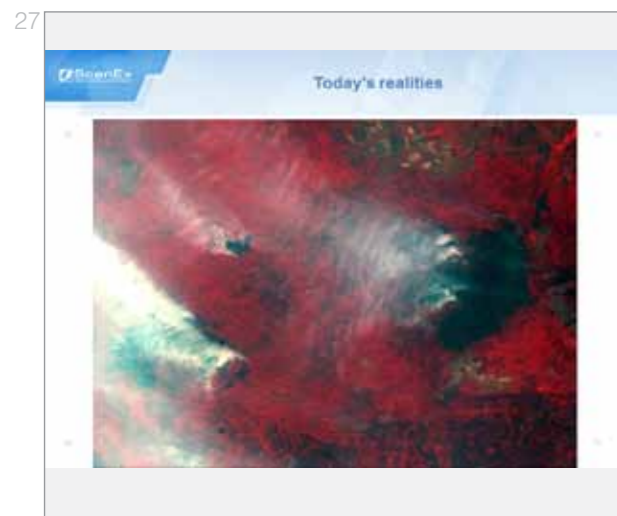
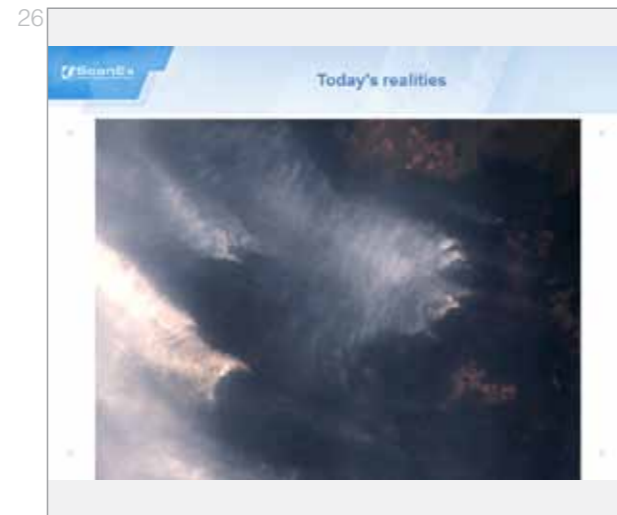
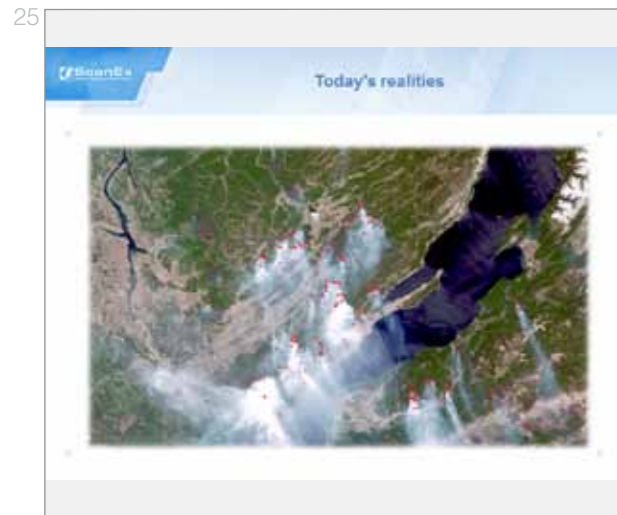
- In the future, both countries regularly carry out manned space launches spacecraft (Vostok, Voshkod, Soyuz, Mercury, Gemini, Apollo), Form their own orbital station (Salyut, Mir, Sklyab); Launch intelligence photographic satellites, Greatly modernized methods and technologies.
- Completely independent 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.

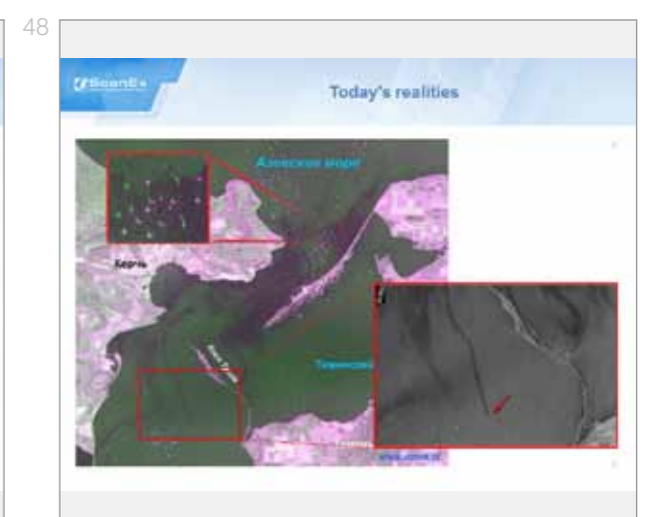
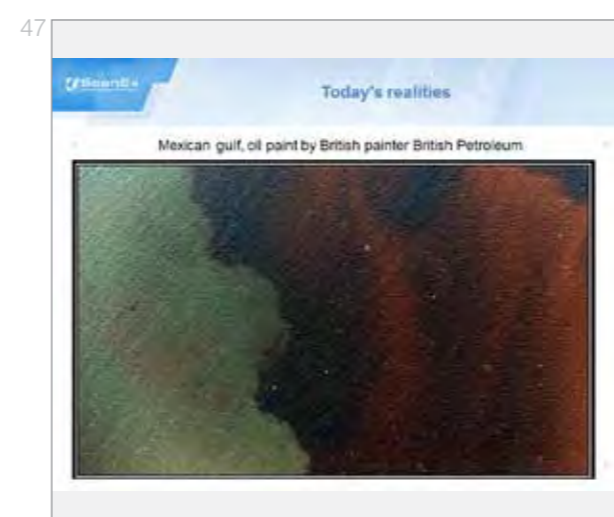
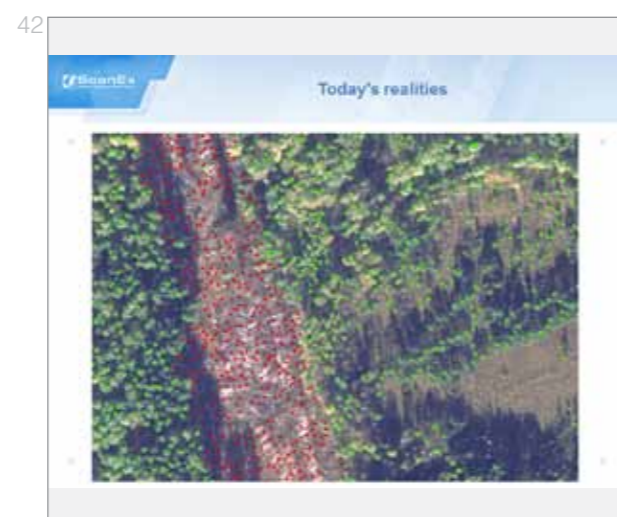
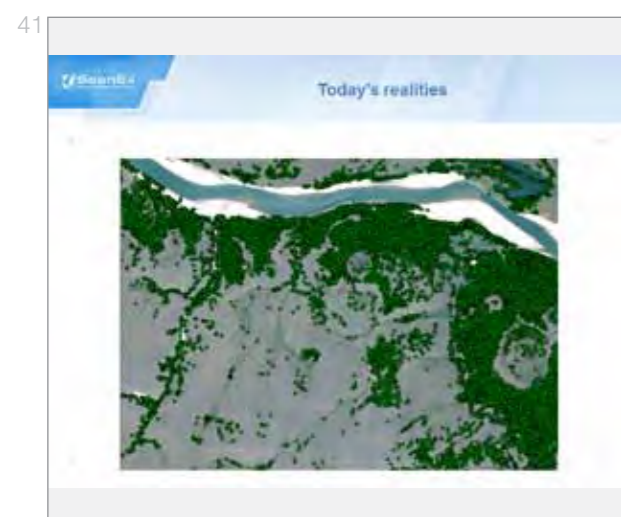
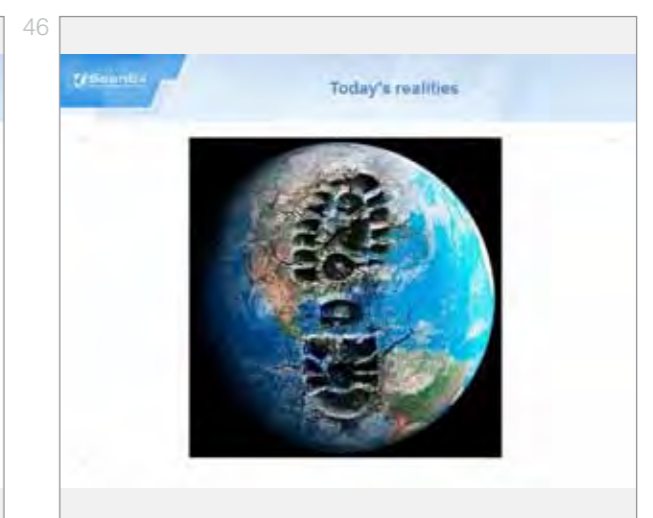
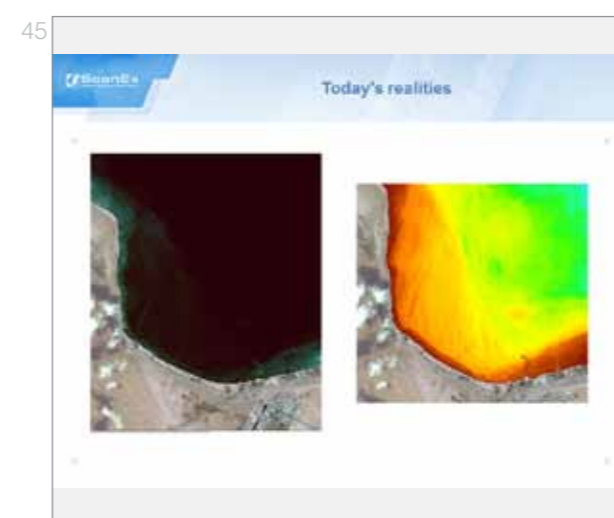
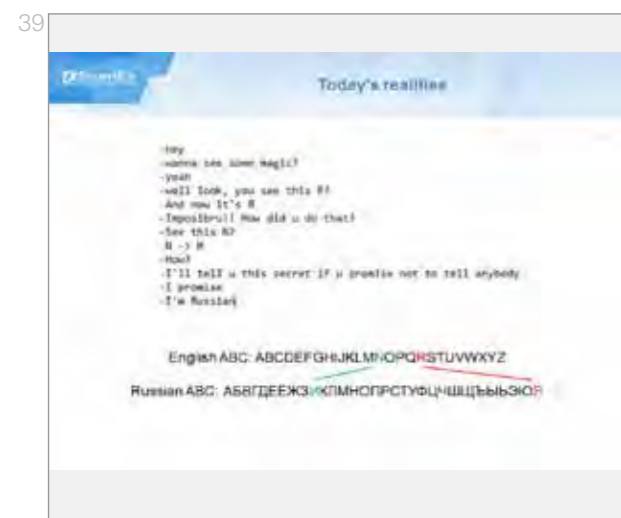
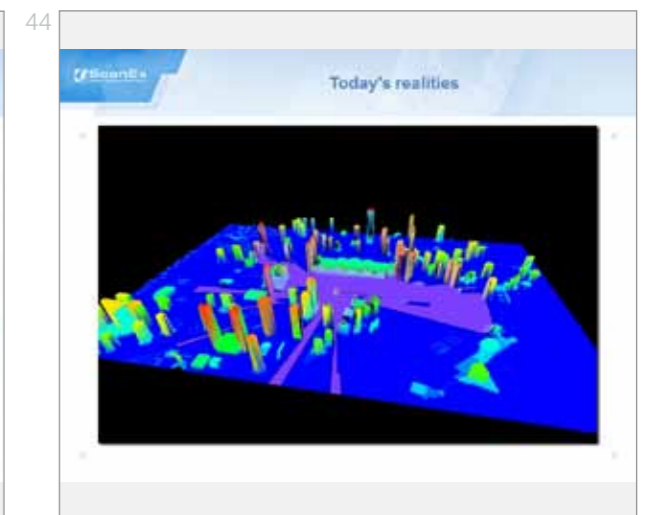
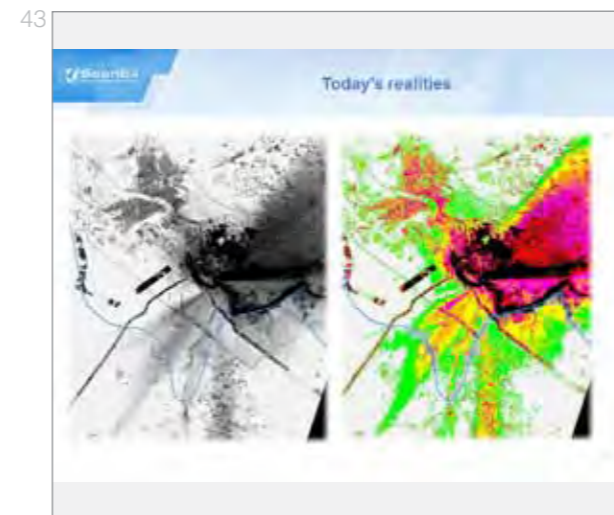
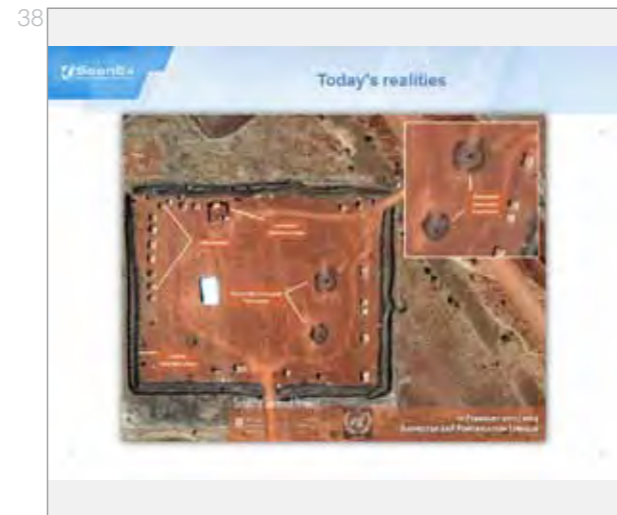
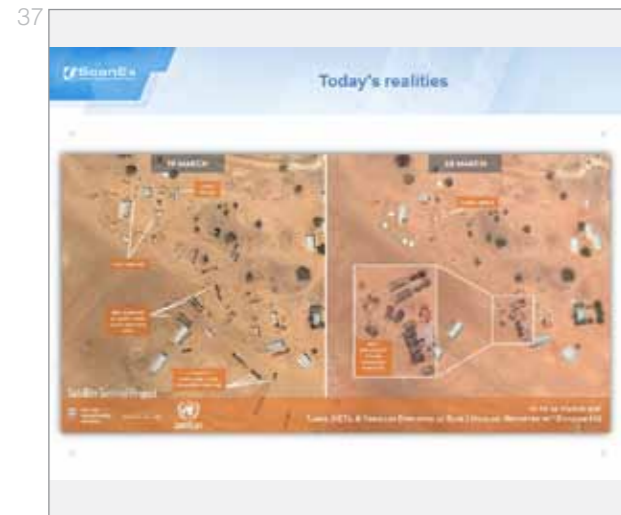
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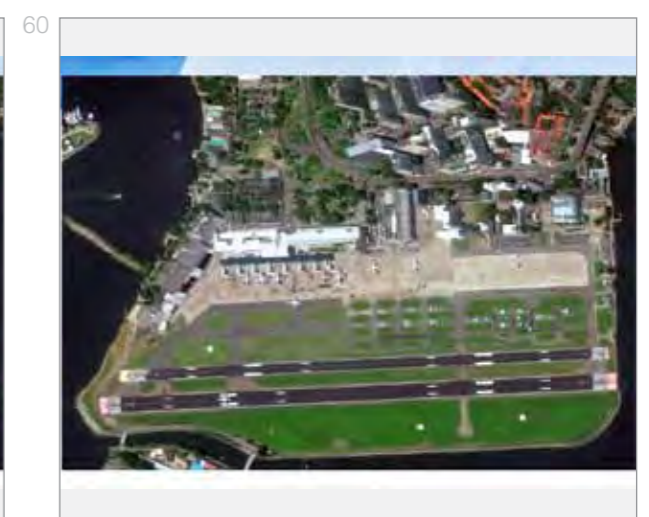
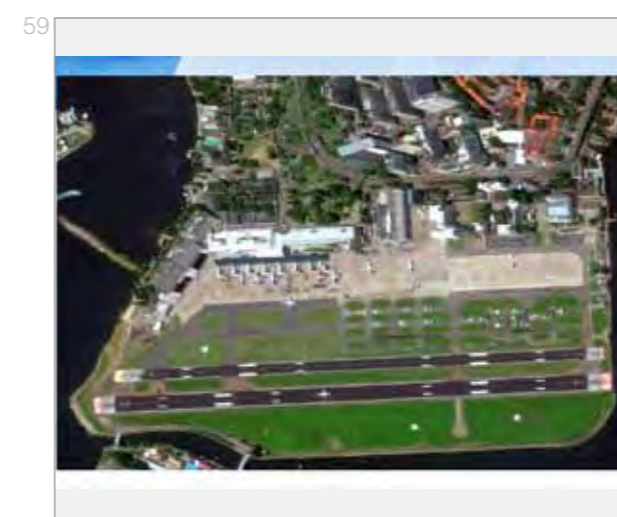
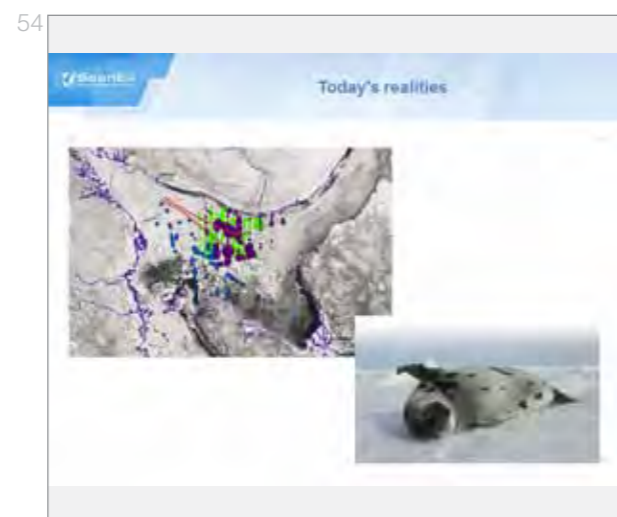
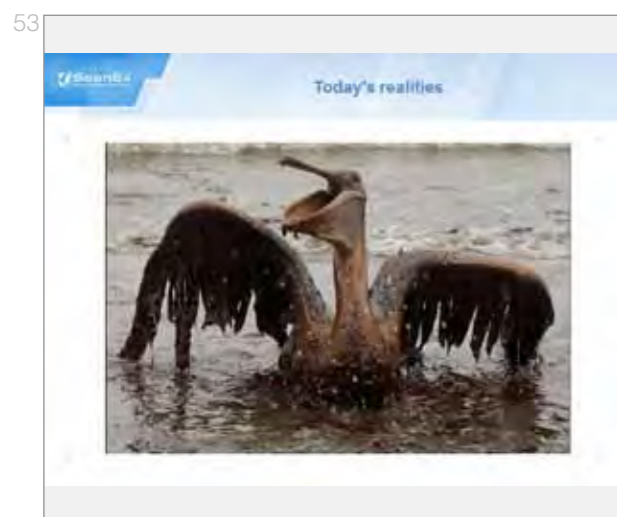
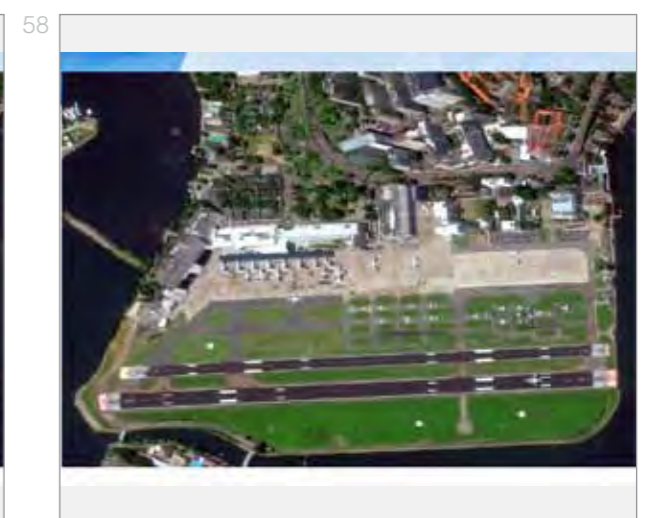
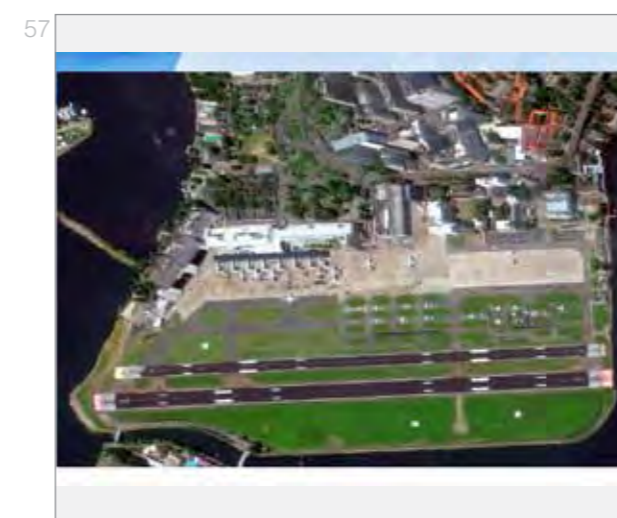
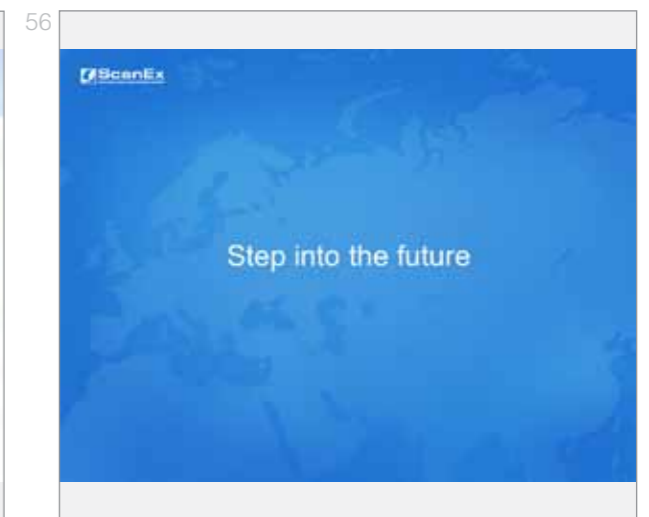
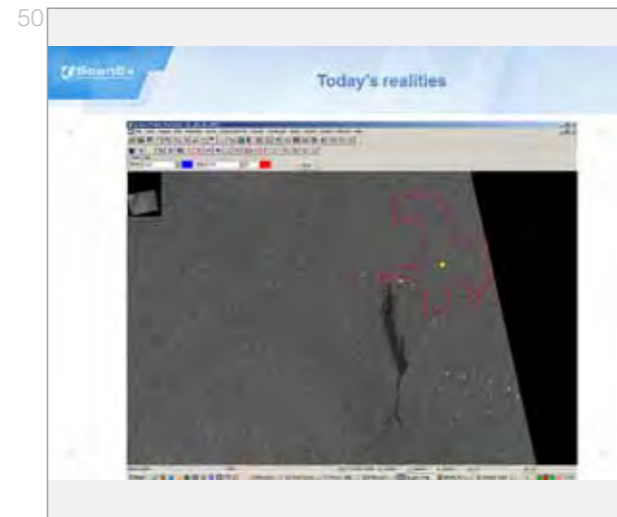
Today's realities

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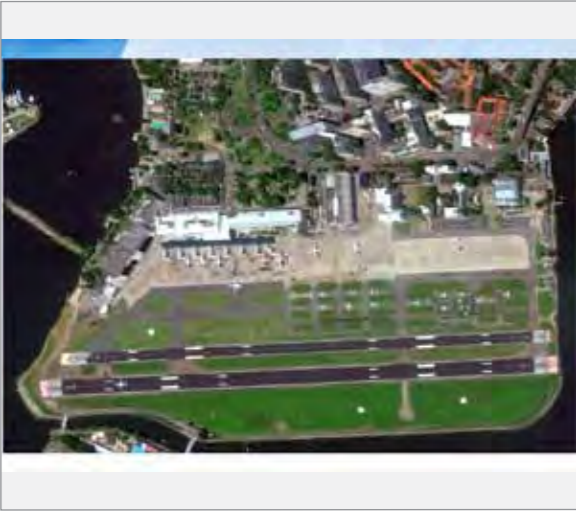
Today's realities



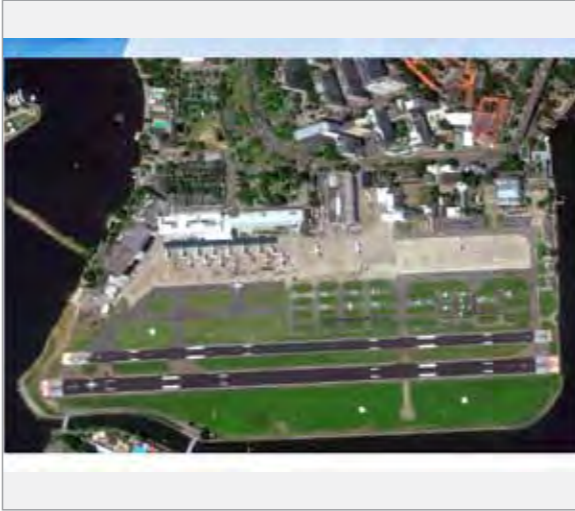




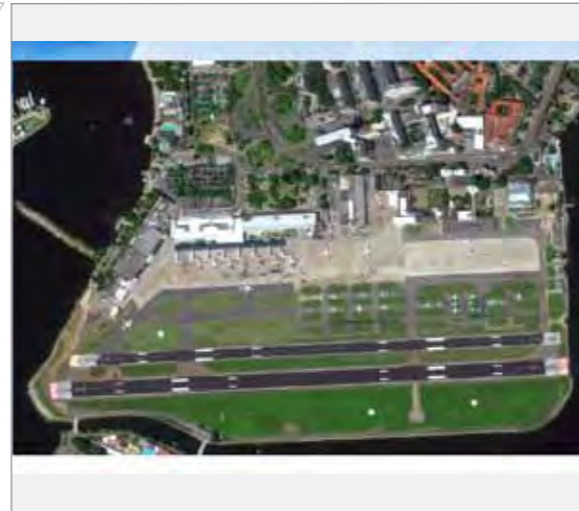
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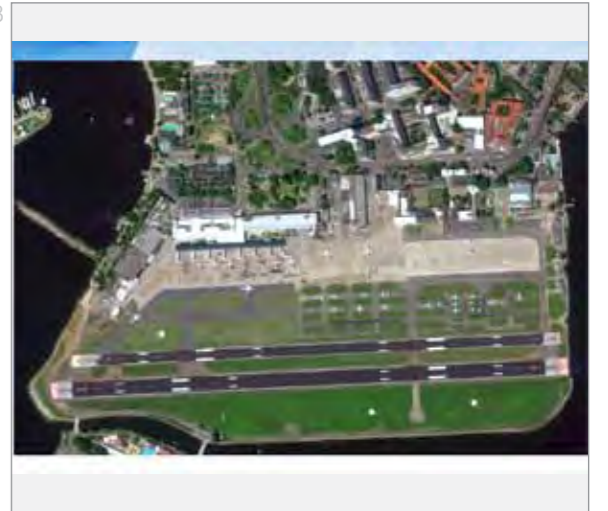
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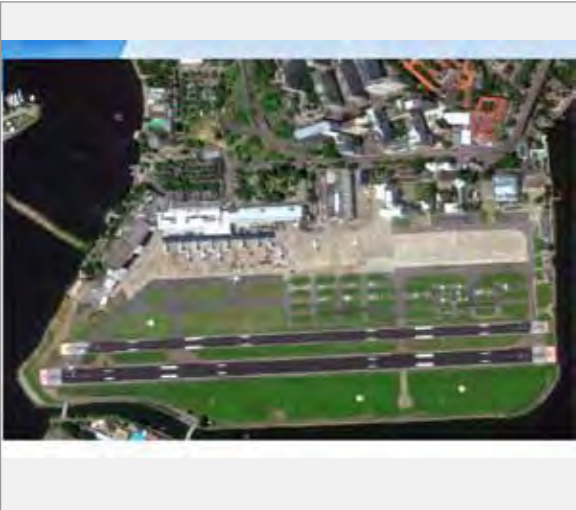
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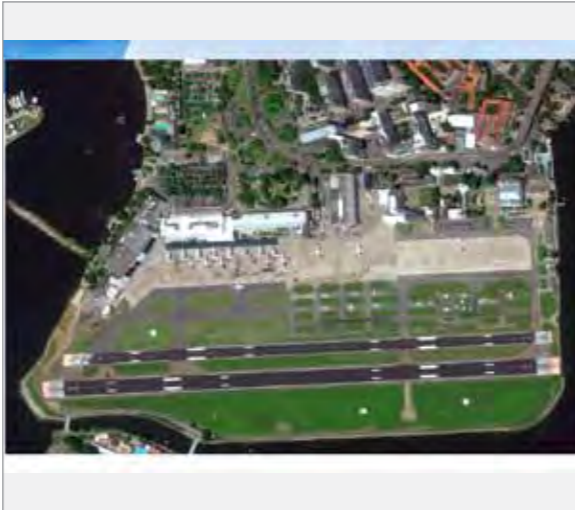
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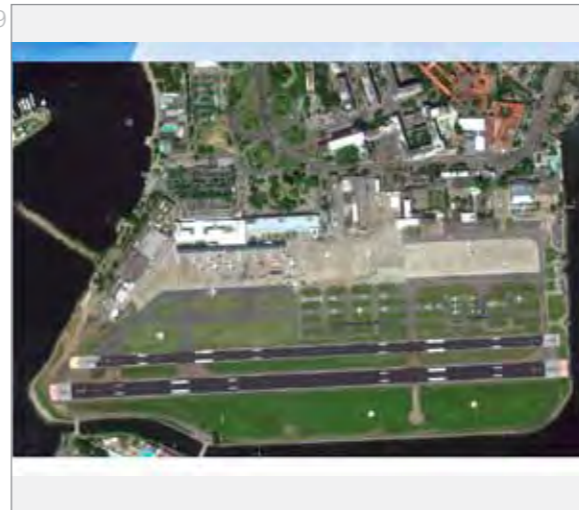
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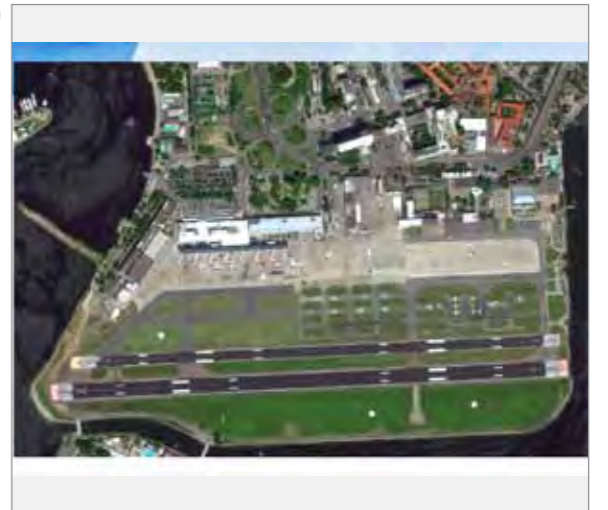
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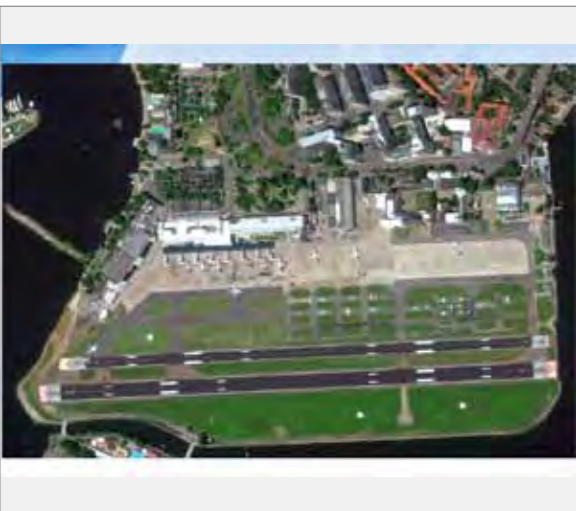
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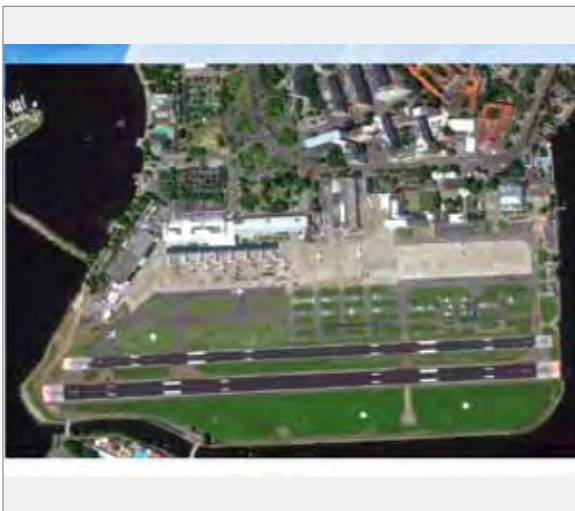
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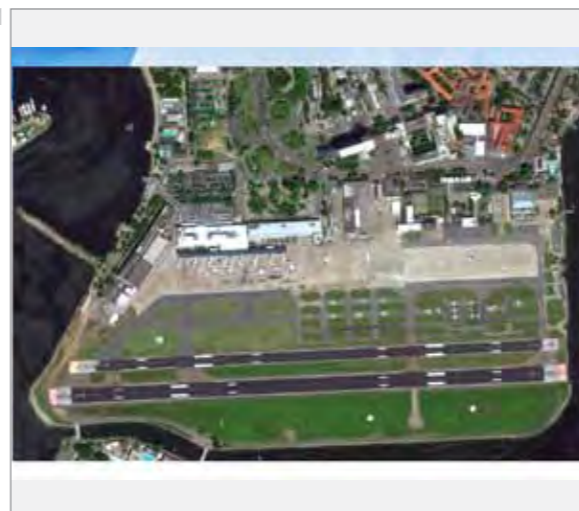
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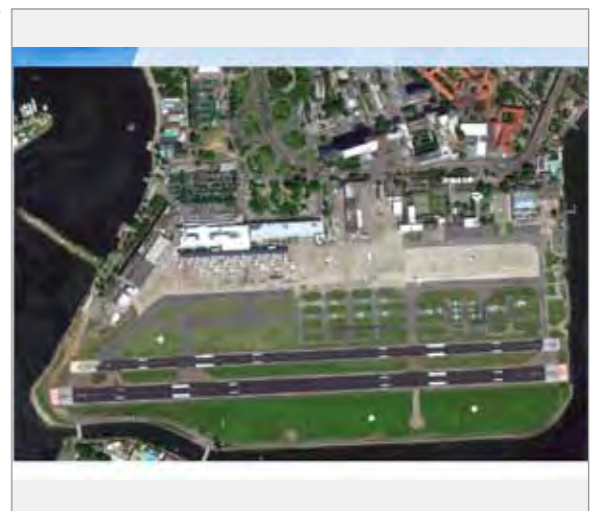
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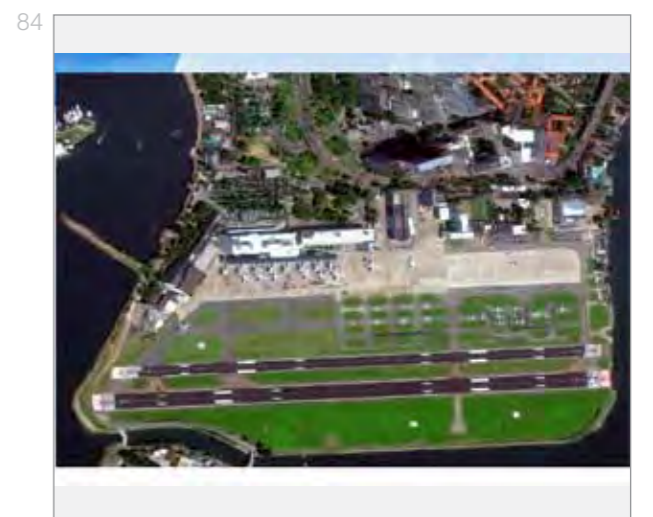
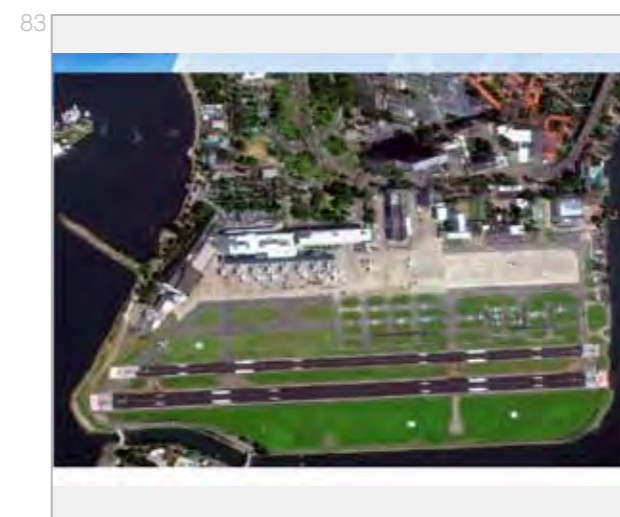
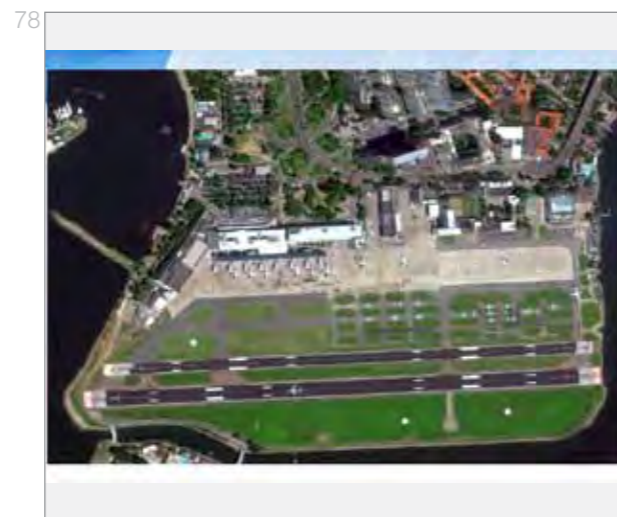
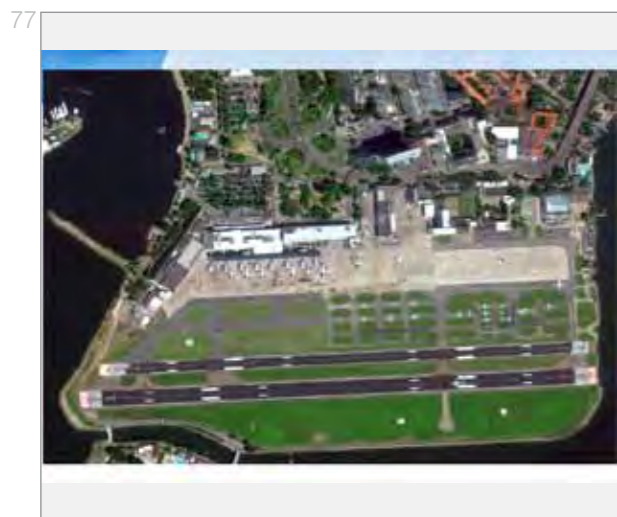
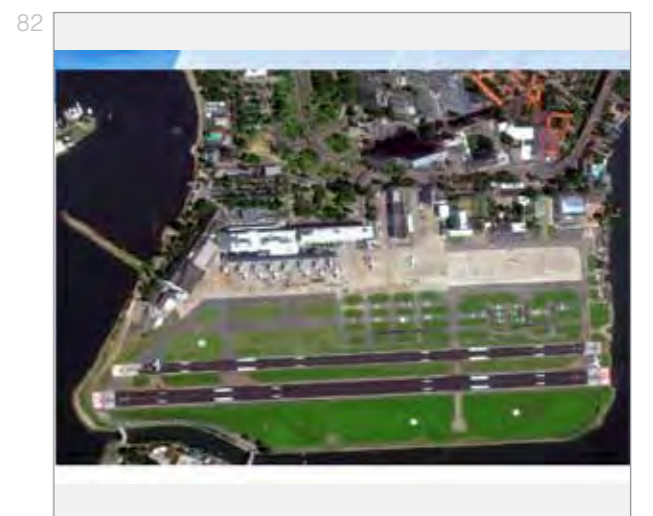
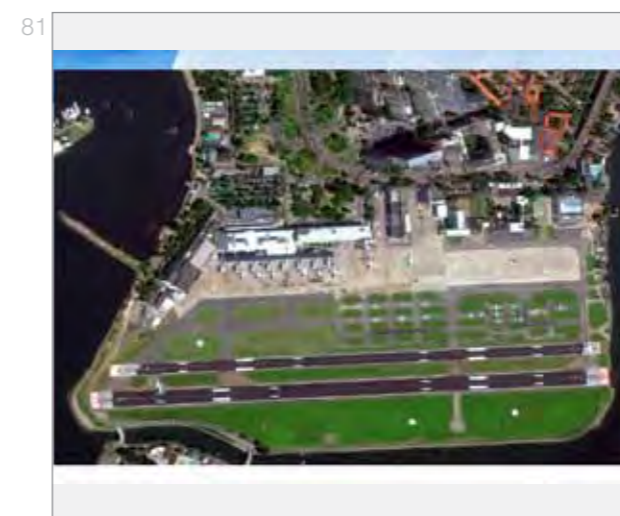
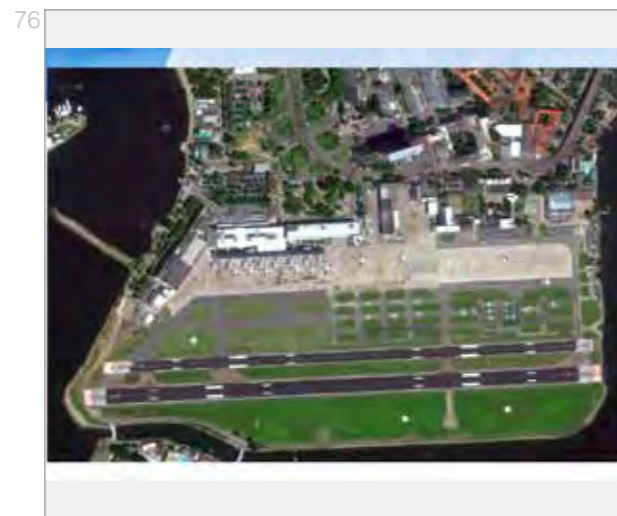
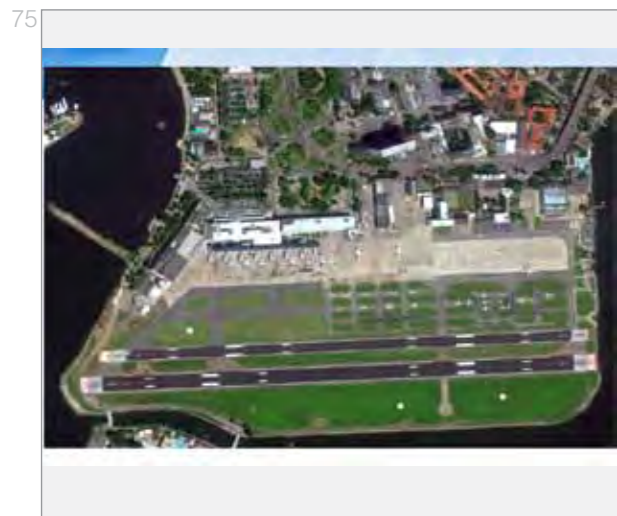
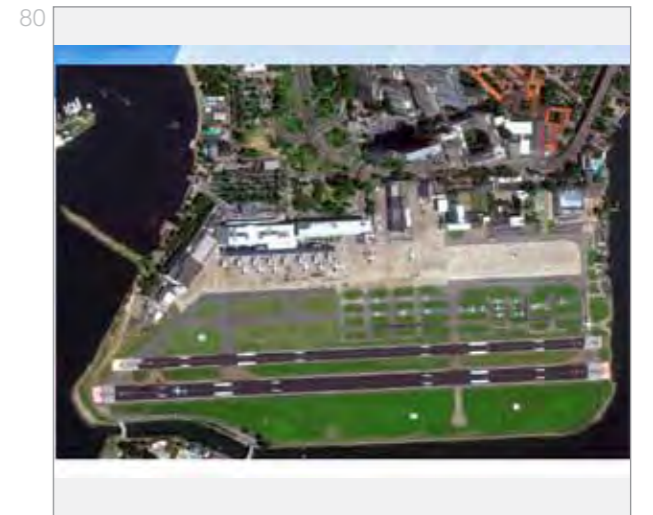
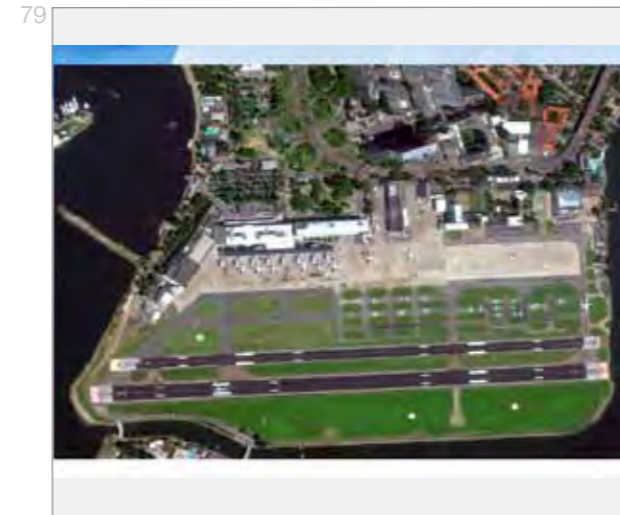
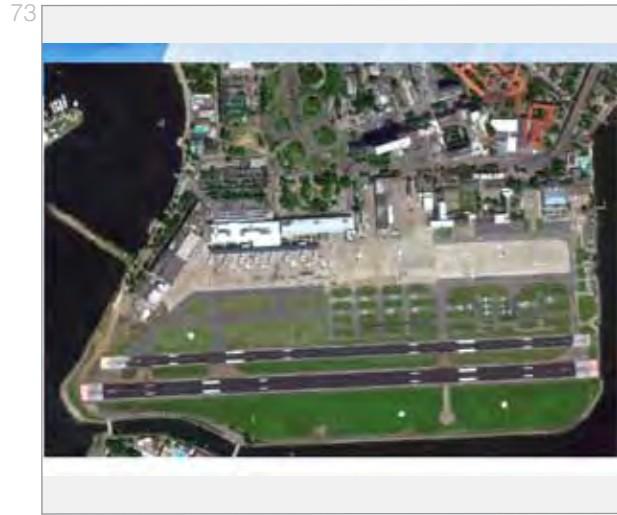


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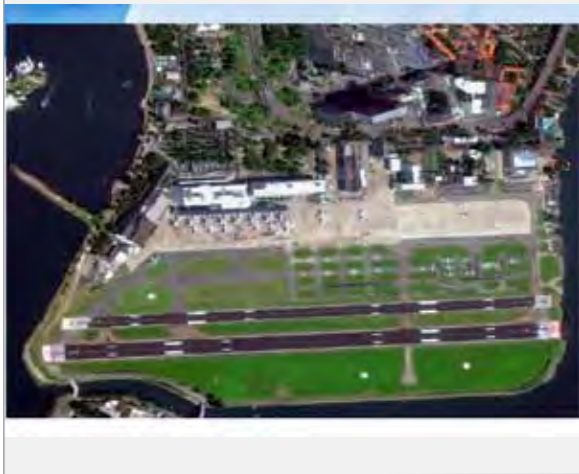


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85



86

Step into the future

Advantages:

1. One planning system;
2. Revisit period - 2 times/24 hours;
3. Super high 4-satellite system capacity - 8 mln sq.km./day;
4. First in the world high resolution satellites constellation (spatial resolution 1,5 m and better)

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Step into the future

88

Step into the future

89

ScanEx

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

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Rumyantsevo village, Moscow, 142784, RUSSIA
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Predicting natural disasters in agriculture using remote sensing data

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

1

Andrey Sarychev
Head of the department of the thematic mapping

2

- Fires
- Desertification
- Overgrowing
- Drought
- Lodging of crops
- Floods

7

desertified areas around roads

8

desertified areas around roads

3

LandSat 6: 05092012: band combination 7-5-3

4

Total calculated area of new burn-scars is over 650 sq km

burn scars

old scars

overgrowing burn scars

LandSat 6: 01152011

9

overgrowing

desertification

LandSat 5: 06162012

10

unaffected agricultural lands

drought area

IK2-DWC2: 07232012

5

Overgrazing is the main cause of desertification in south-european regions of Russia

Approximate area of desertified territories = 800 sq km (18%)

desertified areas around water assets

desertified areas (nearby) (own settlement)

Approximate area of desertified territories = 700 sq km (8%)

LandSat 6: 04282011

LandSat 6: 10152012

6

desertified areas around roads

11

Mean NDVI (2009 – 2012 years)

The 2010 year's drought is considered to be the most severe for more than one hundred years period.

IK2-DWC2: 07162012

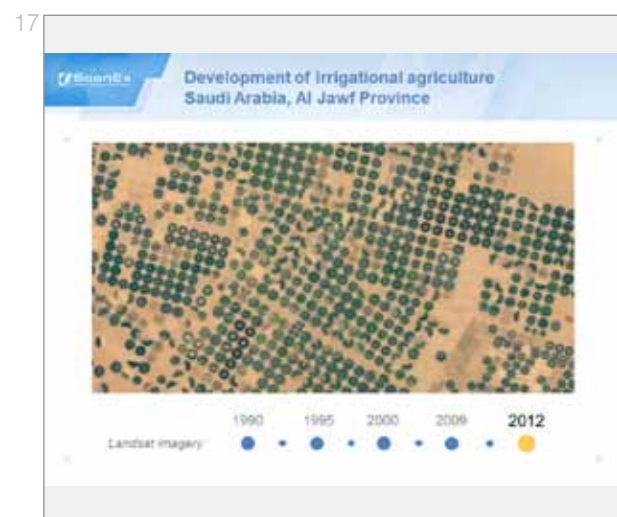
12

lodged crops

normal crops

Light green color indicates areas of lodging

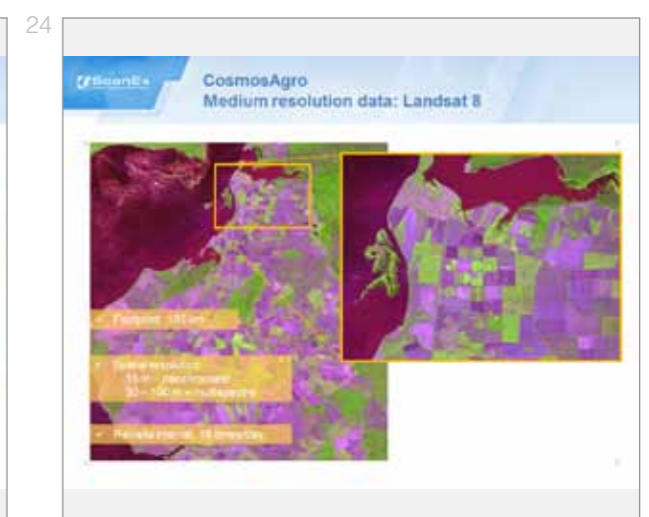
SPOT 5: 06052013



21

CosmosAgro –
universal instrument
of agricultural monitoring

- 22
- CosmosAgro
List of available layers
- MODIS data (regional monitoring):**
- NDVI 16-day composites
 - NDVI 8-day composites
 - quality assurance layers for NDVI
 - snow mask
 - land surface temperature layers
 - variety of integral indexes: VCI, IVI, IVC
- SPOT, DMC, Landsat data (local monitoring):**
- NDVI layers
 - inhomogeneity index layers
 - classification
 - vegetation changes layer



25

CosmosAgro
Medium resolution data: UK-DMC2

26

CosmosAgro
Medium resolution data: SPOT 5/6/7

31

CosmosAgro

Visualization of MOCS/NDVI composites

32

CosmosAgro

Visualization of medium resolution NDVI

27

CosmosAgro
Base coverages

28

CosmosAgro

Base objective information about each field: number, crop, soil, technical and automatically calculated area in hectares

33

CosmosAgro

Visualization of medium resolution original image

34

CosmosAgro
Additional data access

29

CosmosAgro

Simultaneous analysis of NDVI curves for several years

30

CosmosAgro

Simultaneous analysis of NDVI curves for several years (low and medium resolution)

35

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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

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1

Mexican Early Warning System For Disasters

2

MSc. Julio Castillo
Director of Space Security

Dr. Benito Orozco
Director of Scientific Space Research

3

INTRODUCTION

4

CREATION PROCESS

5

GOVERNMENT BOARD

6

NATIONAL PROGRAM OF SPACE ACTIVITIES

- Human Capital
- Scientific and Technological Development
- Industrial and Commercial Competitiveness Development
- International Affairs and Space Security
- Financing

7

STRUCTURE

8

Early Warning System

To Develop and Implement an Early Warning System as the Foundation Stone for Response and Mitigation in the Emergency Response Cycle

9

Challenges for a Developing Country

10

STRATEGY

- National Development Plan
- National Infrastructure Plan
- Proposal of a Early Warning System as part of the space infrastructure for protection of the Mexicans and the natural resources and other public infrastructure.

11

RECENT DEVELOPMENTS

- AEM Board give the approval to request the funding for two EO satellites, one thermal-infrared (MIROS) and one high resolution (better that 1m)
- Also the PND (National Development Plan) consider the action line for the Early Warning System for Disasters

12

BUDGET for Phase 1

USD\$ 200 million
To be approved by MoF

13

Early Warning System Deliverables

14

19

ADDITIONAL ACTIONS

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

20

Many Thanks !

Dr. Benito Orozco Serna
and
Julio Castillo

Mexican Space Agency

15

What we need?

Team Work !

16

INFRAESTRUCTURA ESPACIAL PARA OBSERVACIÓN DE LA TIERRA

17

SPACE INFRASTRUCTURE FOR SATELLITE COMMUNICATIONS

18

MIROS-DLR

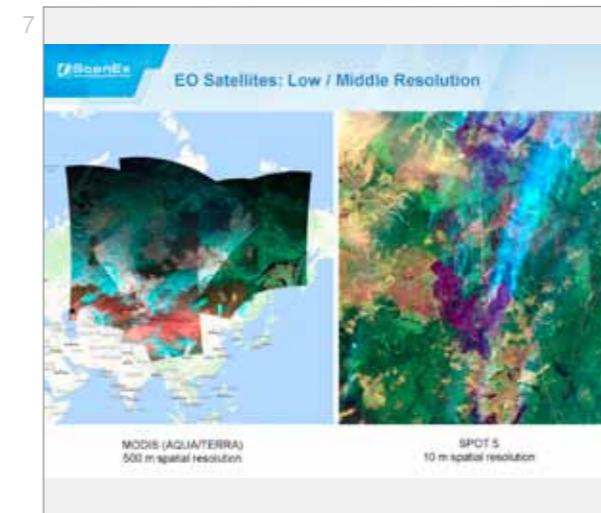
1

ScanEx
 Modern and Prospective Satellite Systems and Their Application for Emergencies Preparedness, Management and Response (EPMR)
 Maria Dorofeeva, ScanEx RDC
 Denpasar, Indonesia
 October 30, 2013

2

Contents

- EO Satellites: Optical vs Radar
- EO Satellites: Resolution
- EO Satellites: Basic Image Dimensions
- EO Satellites: Revisit Time
- Optical EO Satellites: Panchromatic Mode vs Multispectral Mode
- Radar EO Satellites: Polarization
- Operational Satellite Monitoring of Emergencies
- Satellite Data Reception Centers
- Conclusion



9

EO Satellites: Image Dimensions (Swath Width)

Satellite (very high resolution)	Swath width (km)	Satellite (high resolution)	Swath width (km)
GeoEye-1	16.4	KOMPSAT-2	15
WorldView-2	16.4	SPOT 6/7	60
WorldView-1	17.7	SPOT 5	60
Pleiades 1A/1B	20	EROS A	14
QuickBird	16.6		
KOMPSAT-3	15		
EROS B	7		
IKONOS	11.3		

Satellite (middle resolution)	Swath width (km)	Satellite (low resolution)	Swath width (km)
Landsat 8	185	Terra/Aqua	2300
UK-DMC2	650	Suomi NPP	3000

10

EO Satellites: Revisit time

Satellite (very high resolution)	Revisit period (days)	Satellite (high resolution)	Revisit period (days)
GeoEye-1	2-3	KOMPSAT-2	2-3
WorldView-2	2-3	SPOT 6/7	1
WorldView-1	1-2	SPOT 5	1-4
Pleiades 1A/1B	1	EROS A	3-4
QuickBird	2-3		
KOMPSAT-3	2-3		
EROS B	3-4		
IKONOS	2-3		

Satellite (middle resolution)	Revisit period (days)	Satellite (low resolution)	Revisit period (days)
Landsat 8	16	Terra/Aqua	0.25-0.5
UK-DMC2	3	Suomi NPP	0.5-1

5

EO Satellites: Resolution

Low (>100 m)	Middle (10-100 m)	High (1-10 m)	Very High (<1m)
AQUA	Landsat	SPOT 5	EROS B
TERRA	UK-DMC2	SPOT 6/7	GeoEye-1
	RADARSAT-2	EROS A	WorldView-2
		FORMOSAT-2	QuickBird
			IKONOS
			Pleiades

6

EO Satellites: Spatial Resolution

Satellite (very high resolution)	Resolution, m pan (m)	Satellite (high resolution)	Resolution, m
GeoEye-1	0.5 (2)	KOMPSAT-2	1 (4)
WorldView-2	0.5 (2)	SPOT 6/7	1.5 (6)
WorldView-1	0.5	SPOT 5	2.5 (10)
Pleiades 1A/1B	0.5 (2)	EROS A	1.9
QuickBird	0.6 (2.5)		
KOMPSAT-3	0.7 (2.8)		
EROS B	0.7		
IKONOS	0.8 (3.2)		

Satellite (middle resolution)	Resolution, m	Satellite (low resolution)	Resolution, m
Landsat 8		Terra/Aqua	250-1000
UK-DMC2		Suomi NPP	375, 750



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

14

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

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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)

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RADARSAT-2

SAR imaging modes parameters and polarization types

Imaging mode	Nominal resolution	Scene size, km x km	Scene area, km ²	Polarization types		
				Single polarization	Quadrature polarization	
Ultra-Fine	3	20 x 20	400	Yes	HH	HH+VV+HV+VH
Multi-Look Fine	8	50 x 50	2500	Yes	HH	HH+VV+HV+VH
Fine	10	100 x 100	10 000	Yes	HH	HH+VV+HV+VH
Standard	25	100 x 100	10 000	Yes	HH	HH+VV+HV+VH
Wide	30	150 x 150	22 500	Yes	HH	HH+VV+HV+VH
ScanSAR Narrow	50	300 x 300	90 000	Yes	HH	HH+VV+HV+VH
ScanSAR Wide	100	500 x 500	250 000	Yes	HH	HH+VV+HV+VH
Extended High	25	75 x 75	5 625	Yes	HH	HH+VV+HV+VH
Fine Quad-Pol	10	25 x 25	625	Yes	HH	HH+VV+HV+VH
Standard Quad-Pol	25	25 x 25	625	Yes	HH	HH+VV+HV+VH

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SPOT 5/6/7 + Pliades 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

21

RADARSAT-2

Uralovka 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)

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Operational satellite monitoring of emergencies: fires

MODIS data allow to detect hot spots

17

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

Launch: July 2006 Optical Resolution: 1 m
 Launch: May 2012 Optical Resolution: 0,7 m
 Launch: August 2013 Radar Resolution: 1 m

KOMPSAT-3 (Korean Multi-Purpose Satellite)

- Spatial resolution up to 0,7m (panchromatic mode) and up to 2,2m (multispectral mode)
- Swath width 18km

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)

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Operational satellite monitoring of emergencies: fires

SPOT IR imagery allow to detect fire edge

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

25

High resolution satellite data for fire monitoring

EROS B, 2010-05-06, Sarov, Russia

26

Satellite monitoring of low-intensity fires

Low-intensity fire wasn't detected by MODIS, but could be clearly seen on Landsat image

31

Sea storms: damage to coast infrastructure

32

Sea storms: damage to coast infrastructure

27.01.2012 г.

Лето 2011 г.

27

Landslide blocked the road

EROS B image, China

28

Satellite maps of the Port-au-Prince districts, impacted during the earthquake

Спутниковые карты районов Порт-о-Принс, пострадавшие от землетрясения в Гаити 12 января 2010 года

33

Satellite monitoring of emergencies (Costa Concordia liner, January 2012)

EROS B image, 20/01/2012

Liner hit the and ran aground. The vessel is partially sunk and lies on the side.

34

Oil spills detection

RADARSAT-2 image, 25.06.2011, 04:19 UTC

MODIS AQUA image 24.06.2011, 15:23 UTC

29

Change detection

QuikDIA 2008, Google

Duquye-1 03.01.2010, QICEYE

EROS-B 07.01.2010, ImageSat

30

Earthquake in Japan: detailed satellite imagery

Archive image

3.11.2011, DarkSat

35

AIS and satellite data combination

AIS and EO data combination helps to detect vessels that caused oil pollution

36

Satellite Data Reception Centers

Operational network of X-Band UniScan™ ground stations (in total 69, 2012)

<http://www.scanex.ru/en/stations/uniscan/installation.asp>

37

From Earth RS satellites directly to UniScan™ ground station

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!

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www.scanex.com info@scanex.ru

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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



1

Satellite monitoring as basis of expeditious control of sea water areas

Natalia Filimonova, Unit head, RDC SCANEX

2

Maritime Control Services

7

Data Fusion

8

Operational use of satellite monitoring technologies ScanNet and GeoMixer.

13.10.2011 - work done - 1 person by task

Radsat-1 + Radsat-2

detection

modelling

Radsat-1 Radsat-2

monitoring

Spot-6

EROS-B

SAR + Optical data + Oil Spill Modeling + Imaging frequency increasing from 1 image/2 days to 2-3 images per day

3

Monitoring of oil slicks and navigational waterway

EMERGENCY ON THE OIL PLATFORM

4

Satellite-Based Monitoring of Oil Pollutions and ship Navigation Map of Sakhalin area, 2012

Operative products are supplied via Kosmosonline web-portal for clients

9

Oriental Angel

In July, September 2011 Kosmos-HEC captured satellite imagery of the Oriental Angel around Sakhalin Island in the Gulf of Japan. The image showed a vessel moving along the coast of the island. The vessel is the Oriental Angel, a 200,000-ton oil tanker. The image was captured by the Kosmos-HEC satellite on September 20, 2011. The vessel is moving from north to south along the coast of Sakhalin Island.

For previous part of the vessel EROS-B captured image from EROS-B satellite on 13.10.2011. Optical resolution - 1.2 m.

Control image was in the mode of emergency use. Date of Mission: September 20, 2011.

10

AIS DATA

5

Oil Spills and Ship Navigation Map in the Black Sea, 2013

Oil Spills and Ship Navigation Map

Oil Spills

6

Integral Map of Shipping Activity in the Northern Part of Caspian Sea

Geoservice - Caspian Sea-Kosmosonline, September-October 2013

11

The Automatic Identification System (AIS) is an automatic tracking system, used on ships and by vessel traffic services for identifying and locating vessels by electronically exchanging data with other nearby ships, AIS base stations, and satellites.

RF Tower

Data Buoy

Offshore Platform

Satellite

12

AIS USING

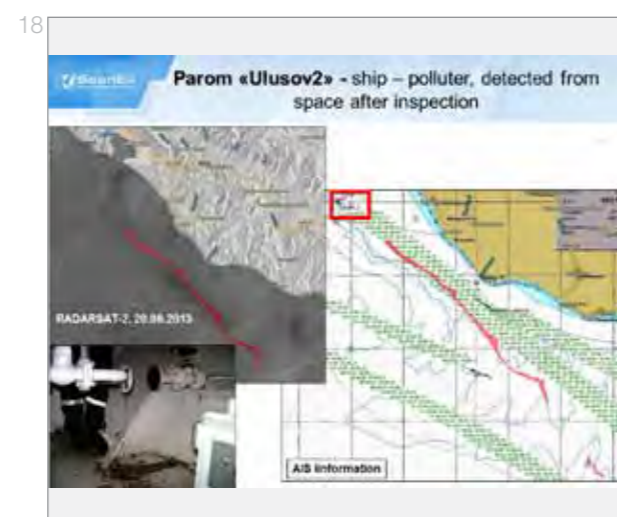
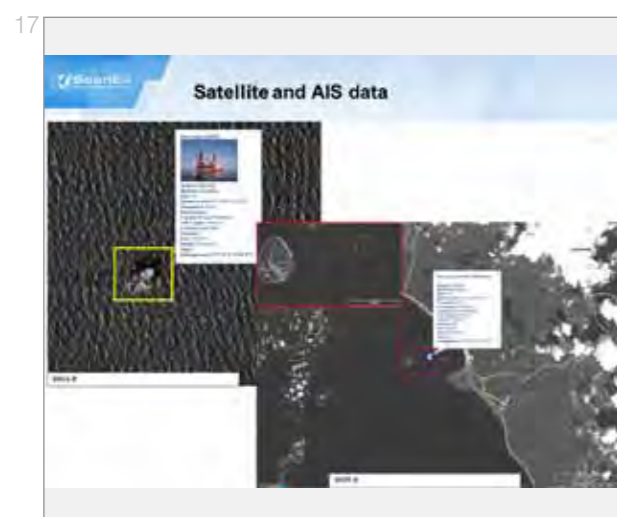
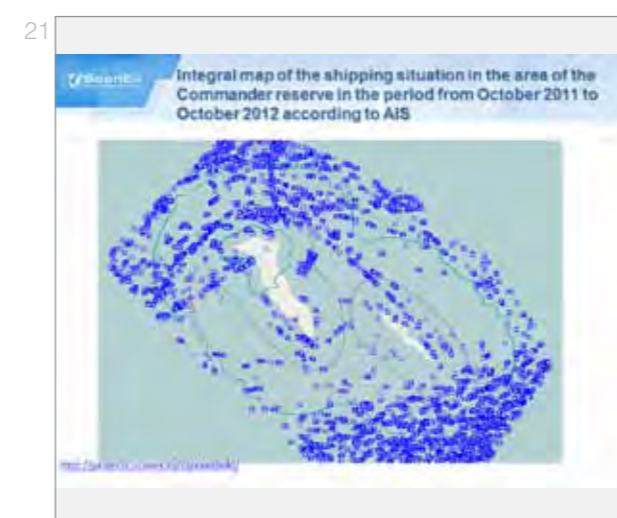
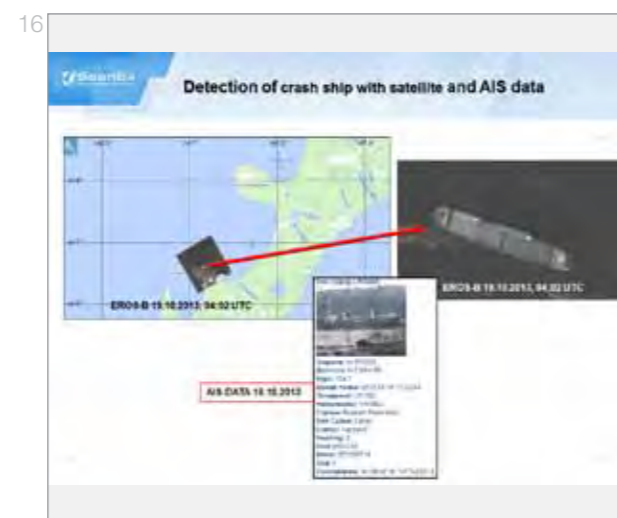
CONTROL AND SECURITY

THE TRACKS OF THE SHIPS

Search and Saving

Environmental monitoring

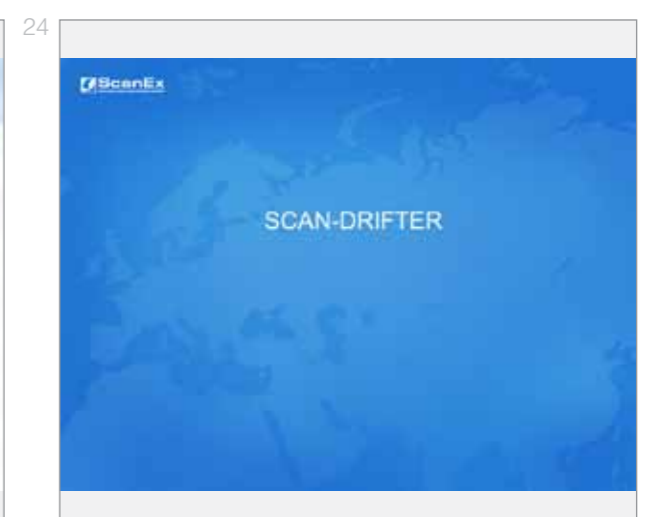
© ExactEarth

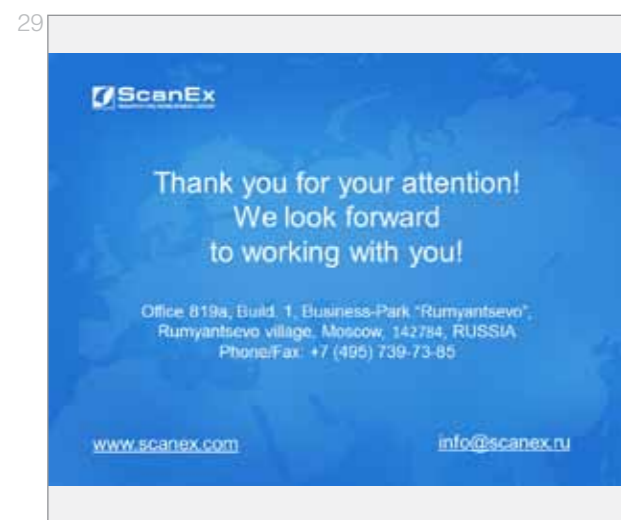
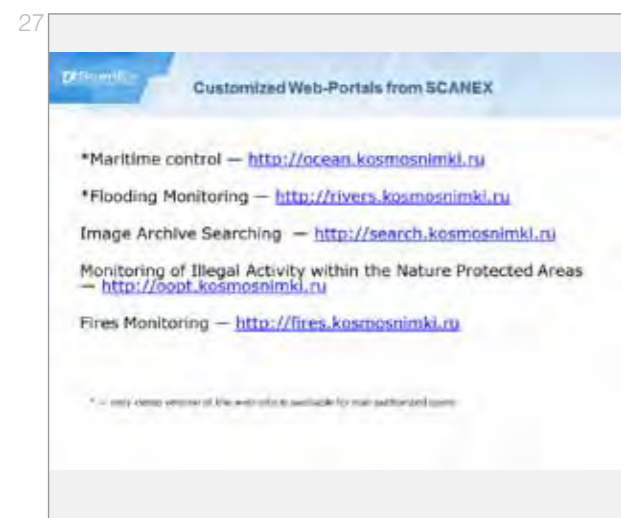


23

ScenEx Results of ship monitoring of marine environment in the area of the Commander reserve according to the AIS in the period from October 2011 to October 2012

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2011	1	2	3	4	5	6	7	8	9	10	11	12	100
2012	1	2	3	4	5	6	7	8	9	10	11	12	100







Near real-time identification of adverse forest effect using remote sensing data

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

1

Near real-time identification of adverse forest effect using remote sensing data.

Andrey Sarychev
Head of the department of the thematic mapping

2

Forest monitoring

- Rockfall
- Windblow
- Fire
- Logging

7

Fires
Russia, The Sakha (Yakutia) Republic

GeoEye-1 09092012

8

Fires
Mexico, State Coahuila de Zaragoza

Approximately 1000 sq kilometers during 10 days of fire

Burned area is around 2700 sq km

GeoEye-1 09092012 A,B

GeoEye-1 09092012 A,B

3

Forest destroyed by the rockfall
Russia, Altay Region

rockfall

GeoEye-1 08182011

4

Windblow
Russia, Kirov Region

unaffected forest

windblow

GeoEye-2 08142011

9

Logging Infrastructure (1)
Russia, Primorye Region

Spots of infrastructure:
1 - road (red)
2 - bridge (yellow)
3 - dam

GeoEye-1 10062008

10

Logging Infrastructure (2)
Russia, Primorye Region

road to timber transportation

ALOS 09040007

5

Fire monitoring system
fires.kosmosnimki.ru

6

Fires
Russia, The Sakha (Yakutia) Republic

burnt area

GeoEye-1 08172008

11

Types of logging
Russia, Primorye Region

selective logging

clearcut logging

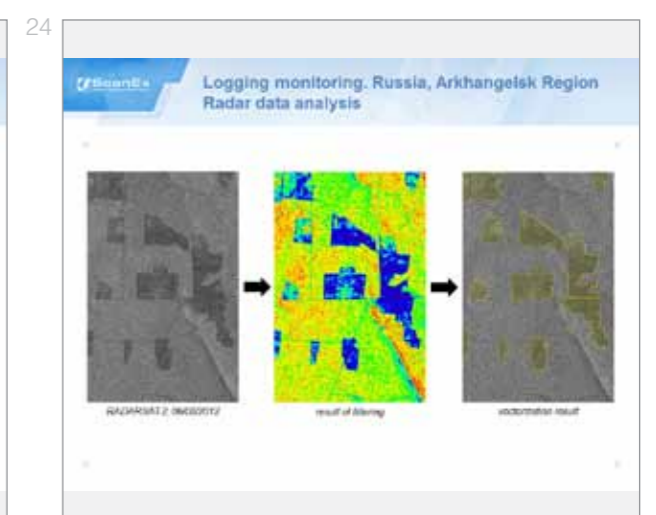
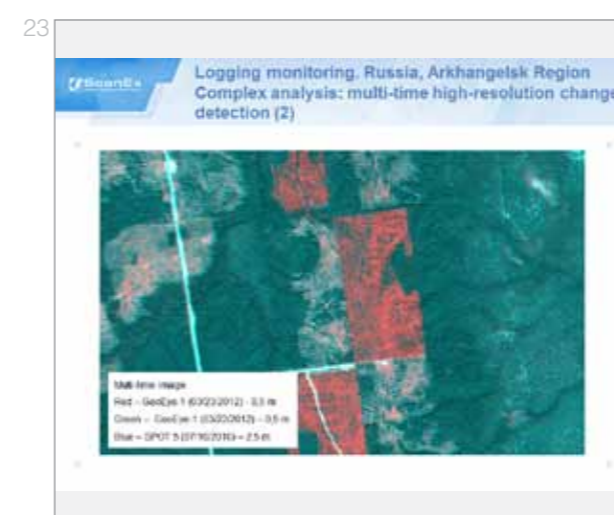
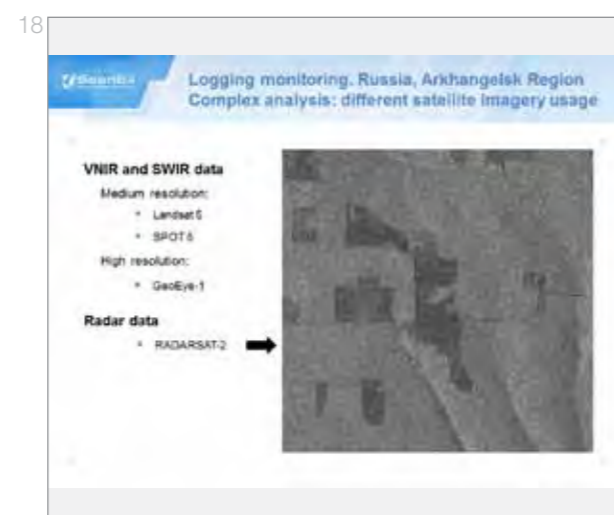
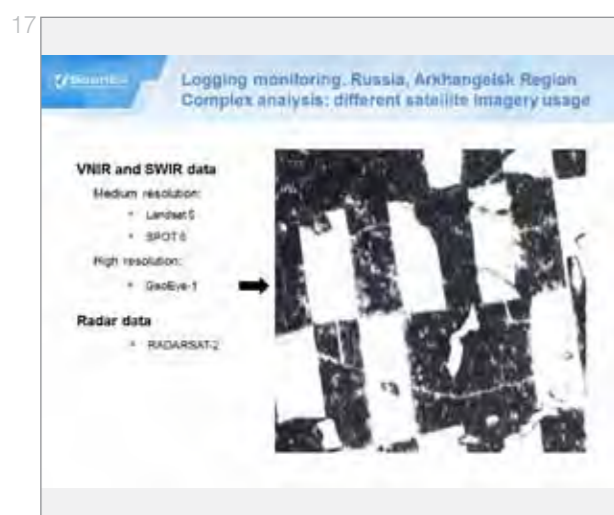
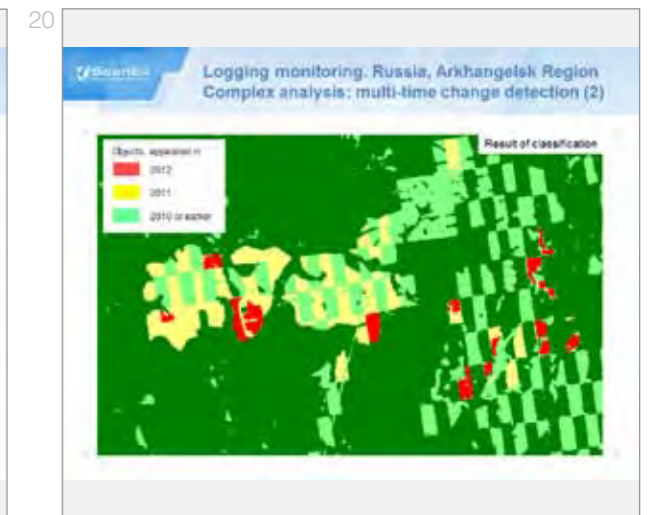
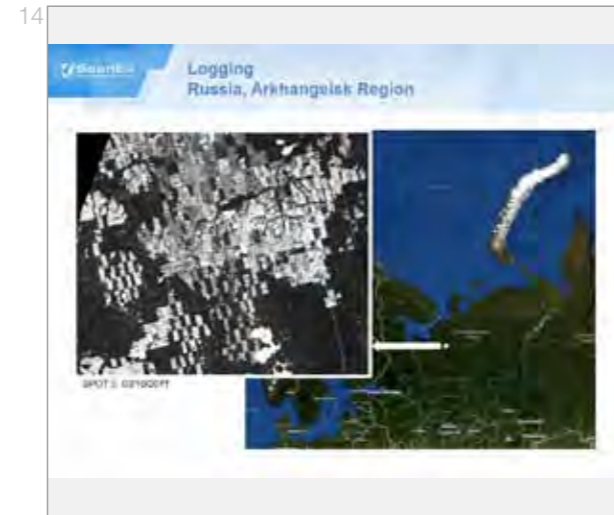
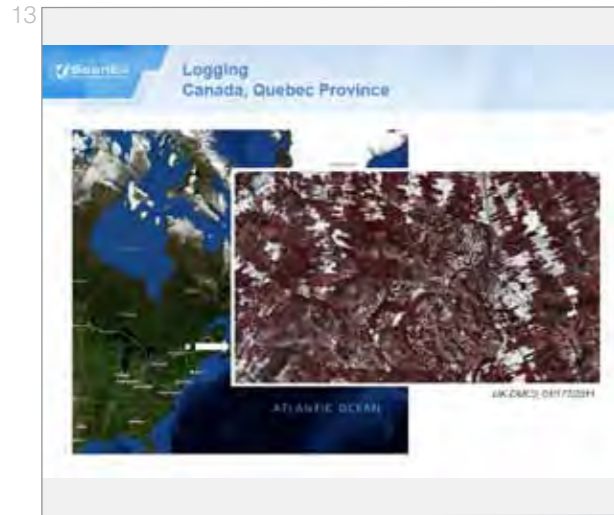
GeoEye-1 08042010

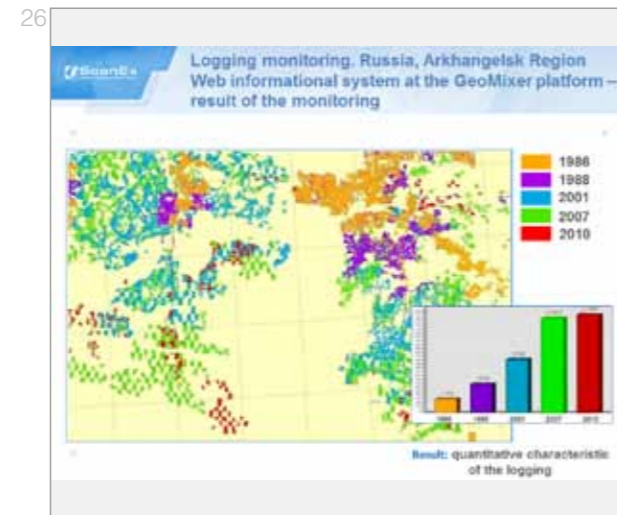
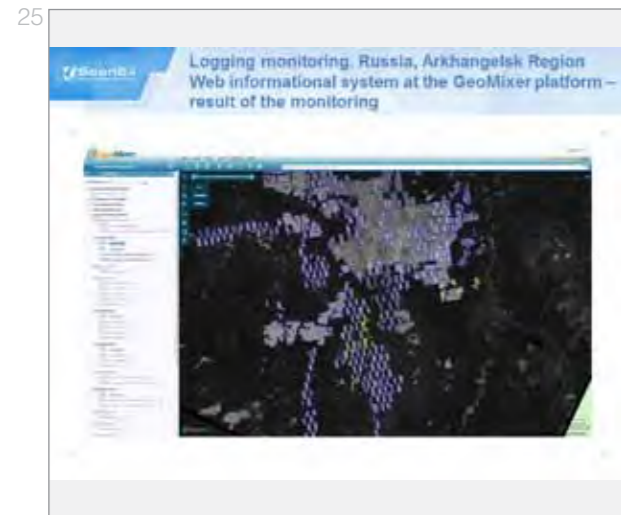
12

Logging
China, Heilongjiang Province

GeoEye-1 08042010

GeoEye-1 10042011





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Environmental challenges to be faced today

What does current amount of logging mean for us?

- ✓ every 2 seconds we lose the forest area equal to the football field
- ✓ every day – area more than Pinar del Rio city and it's surroundings
- ✓ every month – area more than Pinar del Rio province
- ✓ every year – area equal to Cuba

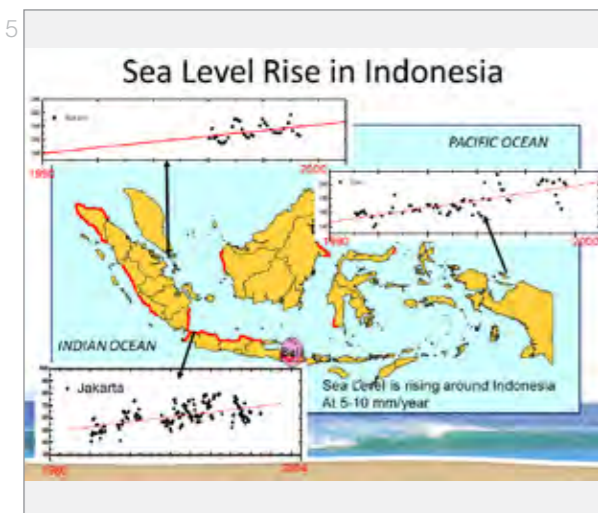
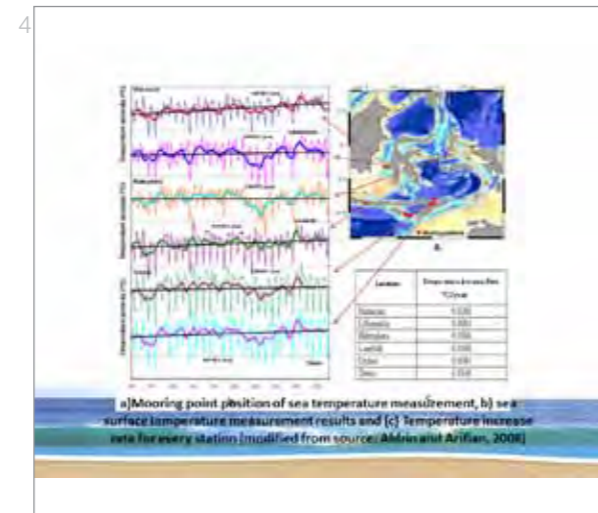
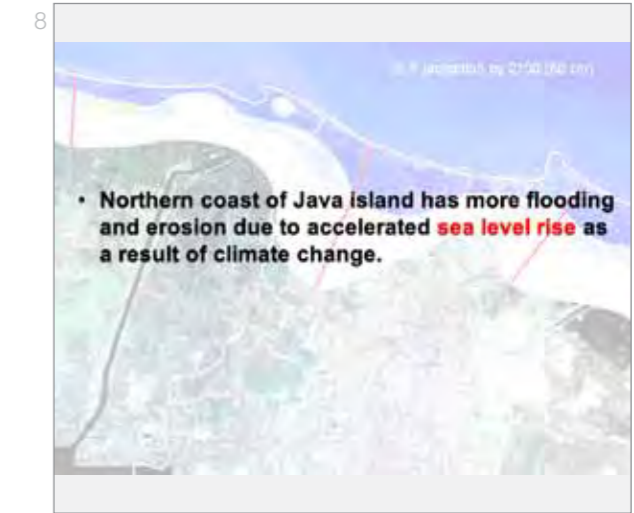
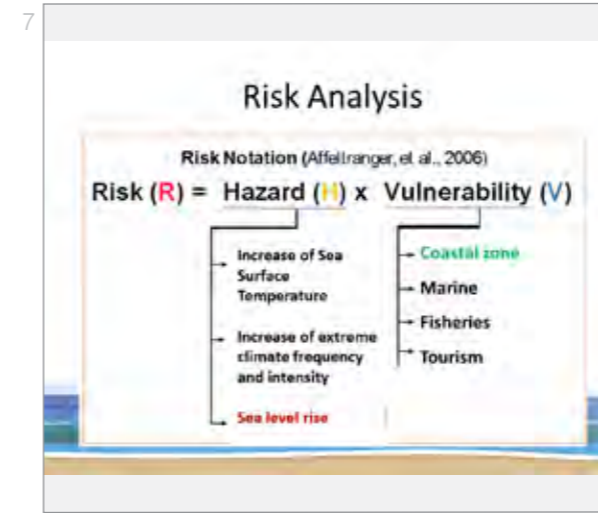
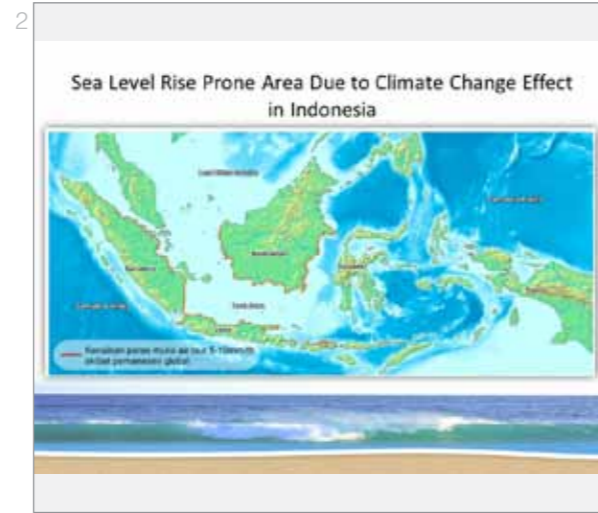
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Thank you for your attention!
We look forward
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www.scanex.com info@scanex.ru

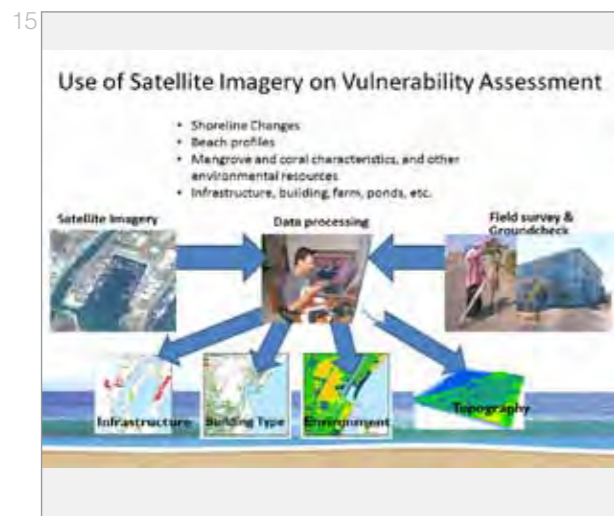


Slide 6: The Depth of Risk Study

Scale	Data Needs	Scope	Action Level	Accruration	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

Source: [Lathif, 2005]





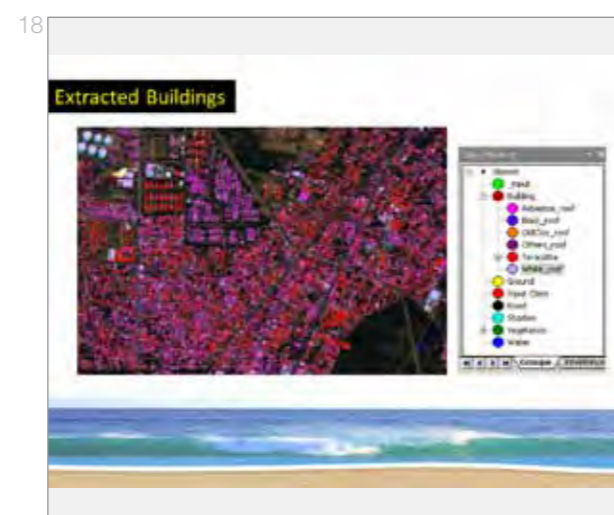
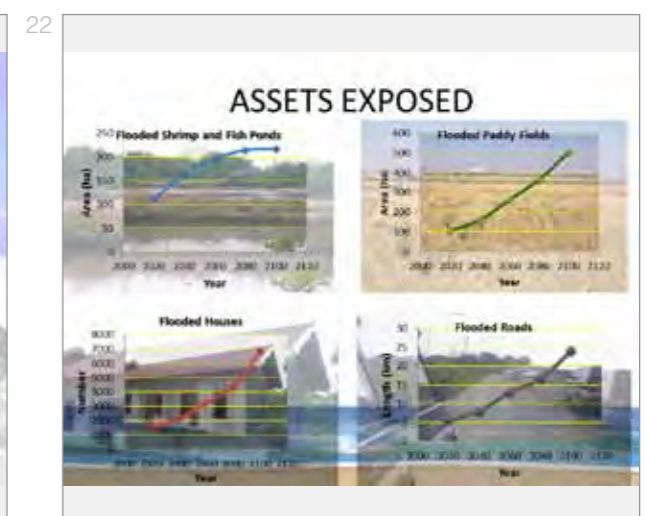
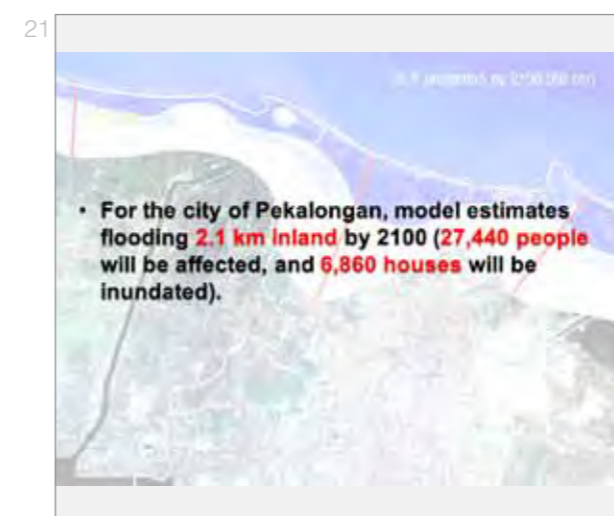
16

Vulnerability Assessment of Building

The vulnerability of buildings is dependent on a variety of form and functional factors that can be grouped to indicate the social-economic class of the people or the building itself.

- Segmentation** → Each segment of image is regarded as an object to be classified in further processes. Segment optimization was done in order to fit the segment with buildings edges.
- Building Extraction**
 - Segmentation → each segment of image is regarded as an object to be classified in further processes
 - Classification → to group the resulting objects into thematic classes
- Field Surveys** → to get primary data about building properties
- Building Structure Analysis** → "translate" the building's physical properties into remote sensing measurable parameters

(source: Sumaryono, 2008)



23

The Strategy

SHORT TERM	MEDIUM TERM	LONG TERM
<ul style="list-style-type: none"> CONDUCT RISK ASSESSMENT AND COST/BENEFIT ANALYSIS BUILD STILT HOUSES COASTAL VEGETATION PLANTING BUILDING CAPACITY AND PUBLIC PARTICIPATION 	<ul style="list-style-type: none"> MAINSTREAMING SPATIAL PLAN, COASTAL PLAN, SECTORAL PLAN FAMILY PLANNING BUILDING CAPACITY AND PUBLIC PARTICIPATION CONSULTATION PROCESS TO DEVELOP POLICY ON PHASING OUT DEVELOPMENT IN EXPOSED AREA 	<ul style="list-style-type: none"> RELOCATING THREATENED HOUSES ESTABLISHING COASTAL SETBACK ZONES SEAWALL BUILDING CAPACITY AND PUBLIC PARTICIPATION WASTE WATER MANAGEMENT DRINKING WATER SUPPLIES FAMILY PLANNING LAND CONVERSION - FARMY FIELDS TO FISH/SHRIMP PONDS

24


Conclusion

- Northern Coast of Java areas are prone to climate change that threaten the sustainability of social and economic development.
- Satellite technology is useful as a tool for decision makers in mitigating disasters.
- It covers intervention of five main activities from governance, Integrated Coastal Management, Disaster Risk Reduction Plan, coastal habitat rehabilitation, and adaptation measures.

25

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

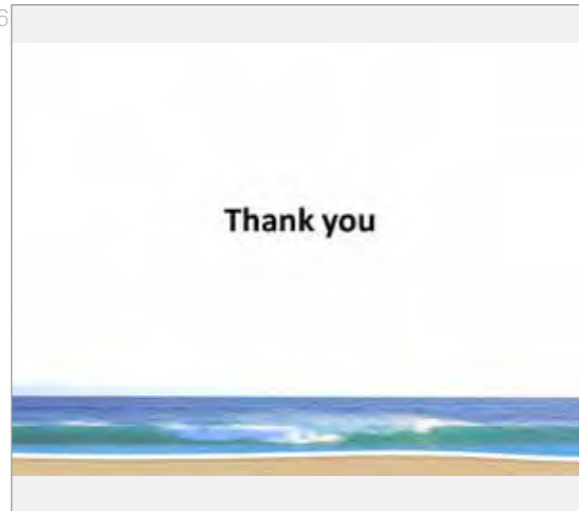
Disaster Map:

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

Disaster Monitoring:

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

26





Roscosmos Participation in the International Charter on Space and Major Disasters

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

ROSCOSMOS PARTICIPATION IN THE INTERNATIONAL CHARTER ON SPACE AND MAJOR DISASTERS

International Charter on Space and Major Disasters

- The Charter was initiated in 1999 following the UNSPACE III conference held in Vienna, Austria in 1999.
- The Charter aims at providing a unified system of space data acquisition and delivery to those affected by natural or man-made disasters through Authorized Users. Each member agency has committed resources to support the provisions of the Charter and this is helping to mitigate the effects of disasters on human life and property.
- The Charter closely collaborates with a great number of international organizations to achieve better coordination in the issue of space technologies application for disaster effects mitigation (UNSPIDER, UNOOSA, Sentinel Asia).

Research Center for Earth Operative Monitoring – Russian ERS Systems Operator

Equipped with the most advanced space data reception, processing and archiving tools and technologies

Performs an entire technological cycle of Russian and foreign ERS satellites: planning, acquisition and data recording, processing, archiving, storing and dissemination

Maintains a unified E-catalog and the ROSCOSMOS archive of the remote sensing data, provides consumers with a remote access to space data

Equipped with the most advanced antenna systems

Charter/Coordinating Seminar Moscow, 05-06 Sept 2012

Seminar provided by: **Brenda Jones, USGS**

Seminar venue: **Research Center for Earth Operative Monitoring (NTs OMs)**

Seminar participants:

- Roscosmos representatives
- Russian Emergency representatives
- ERS OMs personnel involved in Charter

Main seminar issues:

- Charter functions and interfaces:
 - Authorized User (AU)
 - On-Duty Operator (ODO)
 - Emergency On-call Operator (ECO)
 - Project Manager (PM)
- Charter governing bodies interfaces:
 - Executive Secretariat (ES)
 - Board
- Web-master
- Roles and functions of the Project Manager (PM) and Emergency On-call Operator (ECO)
- Charter Partner agencies and their assets
- Project Manager Report
- Project Manager Welcome Letter
- Live Exercise

The Charter Members In October 2013

On the August 28th at the International air saloon MAKS-2013 the official signing ceremony of the document confirming Roscosmos accession to the Charter took place.

ROSCOSMOS CONTRIBUTION TO THE CHARTER

Russian Remote Sensing Satellites Available for the Charter Purposes

Kanopus-V No1
(In operation since 2003)

Application for emergency monitoring tasks:

- technological and natural disasters monitoring, including hydrometeorological phenomena monitoring
- forest fires and major environmental pollution emissions detection;
- anomalous phenomena registration in order to research earthquake prediction possibility;
- oil spills monitoring;
- infrastructure destruction assessment of disaster-affected cities

Sensor characteristics:

Payload	Spectral bands	Operating modes	Swath	Resolution	Revisit period
Panchromatic imaging system (PIS)	Panchromatic: 0.54-0.86 μ	Hard to ± 40°	23 km	2.1 m	5 days
Multispectral imaging system (MIS)	Multispectral: 0.49-0.52 μ, 0.51-0.60 μ, 0.63-0.66 μ, 0.75-0.84 μ				

ROSCOSMOS activities in the frame of the Charter

- ROSCOSMOS provides the Data from ROSCOSMOS ERS satellites and Archive according to ROSCOSMOS Data policy
- ROSCOSMOS delivers the Earth Observation Data of Level 1B processing in conformity with international norms and standards.
- ROSCOSMOS ensures the availability of its staff to perform the following duties:
 - An Emergency On-Call Officer (ECO), who is approachable 24 hours/day when ROSCOSMOS is on-duty in the Charter
 - A 24 hours/day an Operator of the Russian ERS systems – to receive requests for Russian space data delivery within the Charter frameworks
 - Project Manager (PM)
 - Communication Representatives
- ROSCOSMOS nominates its representatives to the Charter Board and the Executive Secretariat

Roscosmos Contribution to the Charter

Roscosmos Center for coordination with the Charter and EMERCOM Russia was established using the facilities of Russian RS systems operator the Research Centre for Earth Operative Monitoring (NTs OMs) of JSC "Russian Space Systems"

Provides the Charter Authorized Users with an access to satellite data with processing level 1B, acquired from Roscosmos space systems and free the remote sensing data archive

The Center staff perform the following functions:

- Emergency On-Call Officer (ECO), that operates 24 hours a day when Roscosmos is on duty in the Charter
- Project Manager, Communication Representative

Appoints representatives to the Charter Board and the Executive Secretariat

Kanopus-V No1 Sample Images

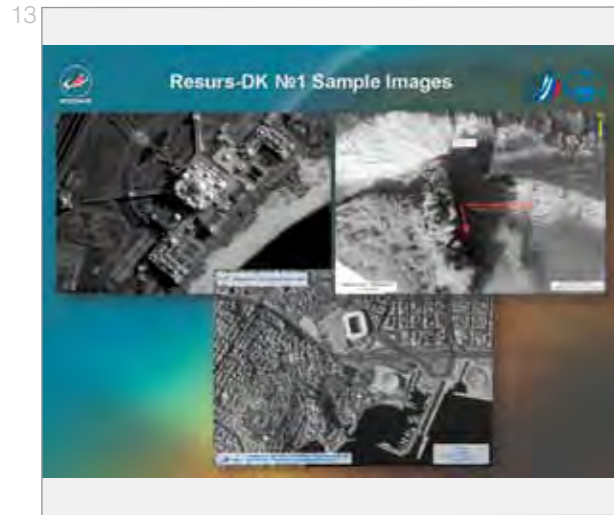
Resurs-DK No1
(In operation since 2006)

Application for emergency monitoring tasks:

- forest fires monitoring;
- volcanoes eruption monitoring
- flood monitoring;
- oil spills monitoring;
- infrastructure destruction assessment of disaster-affected cities

Sensor characteristics:

Payload	Spectral bands	Operating modes	Swath	Resolution	Revisit period
Optical-electronic sensor (Gerton-1)	Panchromatic: 0.58-0.80 μ	Hard to ± 15°	±15 km	3-5 m	5 days



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Meteor-M №1
In operation since 2009

Application for emergency monitoring tasks:

- forest fires monitoring

Sensor characteristics:

Payload	Spectral bands	Operating modes	Swath	Resolution	Revisit period
• Visible channel (small area) • Visible (200x200 km)	• 0.4-0.7 μm • 0.7-0.9 μm • 0.9-1.1 μm • 1.1-1.3 μm • 1.3-1.5 μm	• Day	• 2000 km	• 1000 m	• 1 day
• Infrared channel (small area) • Infrared (200x200 km)	• 3.7-4.0 μm • 3.9-4.1 μm • 4.1-4.3 μm • 4.3-4.5 μm • 4.5-4.7 μm	• Day/night	• 2000 km	• 1000 m	• 1 day
• Thermal channel (small area) • Thermal (200x200 km)	• 10.4-10.8 μm • 10.8-11.2 μm • 11.2-11.6 μm • 11.6-12.0 μm	• Day/night	• 2000 km	• 1000 m	• 1 day

19

The Charter Activation during the flood in the Far Eastern Federal District

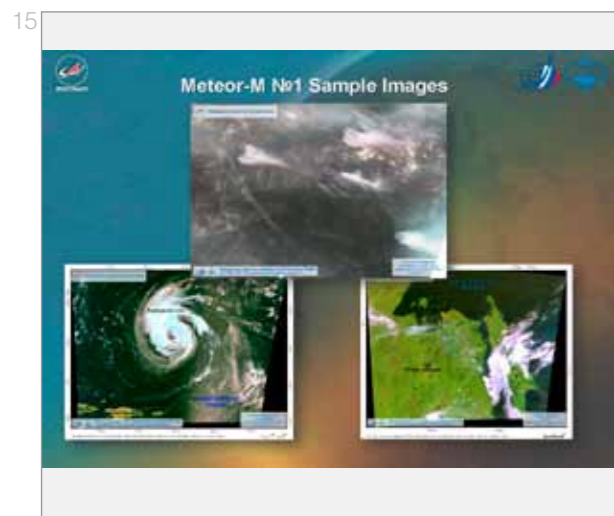
Follow the request sent by EMERCOM Russia on August 19 the Charter was activated to monitor the flood in the Far Eastern Federal District, Russia. The staff of Roscosmos Center for coordination with the Charter and EMERCOM Russia appointed the Project Manager and ensured efficient coordination with RS sats operators involved in the emergency monitoring, and the National Crisis Management Centre of EMERCOM.

After activating the Charter by the request of EMERCOM Russia new and archive images covering 2 million square kilometers were acquired from optical and radar satellites, such as TerraSar-X, Radarsat-2, Spot-5, Landsat and others.

20

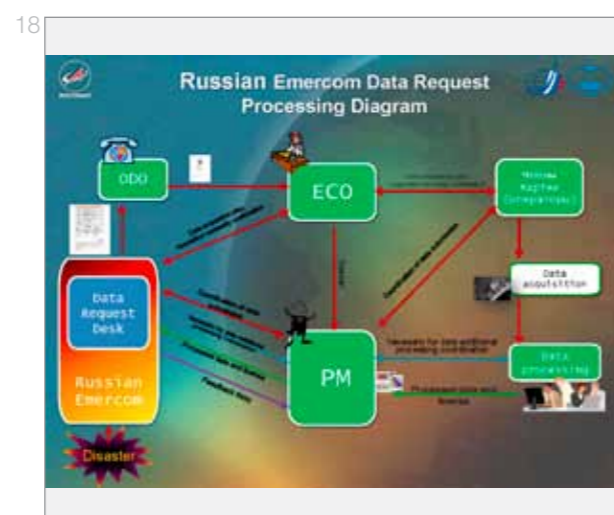
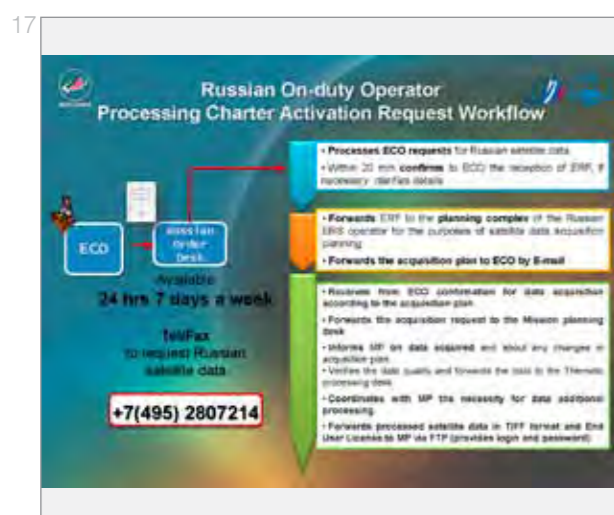
Roscosmos to Charter Accession Way Forward

Our special attention is paid to the widening of remote sensing applications used for mitigation of emergencies. 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 Charter on Space and Major Disasters, thus stimulating our active participation in the mechanism of the Charter.



21

Thank you!



1

UN-SPIDER
 "UN-SPIDER: A model approach to reduce vulnerabilities to hazards through good practices in geospatial information management"

luc.st-pierre@unoosa.org

2

UN-SPIDER
 Space-based Information for Disaster Management and Emergency Response

"Ensure that all countries and international and regional organizations have access to and develop the capacity to use all types of space-based information to support the full disaster management cycle."

- Especially by being a gateway to space information for disaster management support;
- serving as a bridge to connect the disaster management and space communities; and
- being a facilitator of capacity-building and institutional strengthening (A/RES/63/110).

7

UN-SPIDER
 THE FUTURE WE WANT
 Para 274

We recognize the importance of space-technology-based data, in situ monitoring, and reliable geospatial information for sustainable development policy-making, programming and project operations... We recognize the need to support developing countries in their efforts to collect environmental data.

8

UN-SPIDER
 UN-SPIDER Activities

- Knowledge Portal:** The UN-SPIDER Knowledge Portal is a web-based tool for information, communication and process support. Users can find and share data, maps, guides and products through the portal.
- Technical Advisory Support:** UN-SPIDER provides support to countries in assessing national capacity and in evaluating disaster and risk reduction activities, policies and plans with regard to the use of space-based technologies.
- Capacity Building:** UN-SPIDER facilitates capacity building and institutional strengthening, including the development of curricula and an e-learning platform (e-SPIDER).
- Facilitating Cooperation:** UN-SPIDER bridges the gap between the space and disaster management communities. UN-SPIDER fosters all levels and creates forums where both communities can work.

Small Money Bigger

3

UN-SPIDER
 The Office for Outer Space Affairs (UNOOSA)
 ITS MISSION STATEMENT:

The core business of the Office is to promote international cooperation in the use of outer space to achieve development goals for the benefit of humankind.

4

UN-SPIDER
 Images from earth observing satellites help assess the damage caused by disasters and assess vulnerability to hazards.

Satellite communications help warn people who are at risk, especially in remote areas. They help connect a disaster zone to the outside world.

Global navigation satellite systems enable us to obtain positional information on events that have to be mapped.

9

UN-SPIDER
 UN-SPIDER Team

Network of Regional Support Offices (RSOs), 16

National Focal Points (45)

UN-SPIDER in Vienna, UN-SPIDER Beijing Office, UN-SPIDER Bonn Office

10

UN-SPIDER
 Network of Regional Support Offices

Map showing regional support offices: ALGERIA, ARGENTINA, AUSTRALIA, AUSTRIA, BANGLADESH, BRAZIL, CANADA, CHINA, COLOMBIA, CUBA, DOMINICAN REPUBLIC, EGYPT, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, INDIA, INDONESIA, ITALY, JAPAN, KAZAKHSTAN, KENYA, KUWAIT, LIBYA, MALAYSIA, MALTA, MEXICO, MOROCCO, NETHERLANDS, NIGERIA, NORWAY, OMAN, PAKISTAN, PANAMA, PERU, POLAND, ROMANIA, RUSSIA, SAUDI ARABIA, SOUTH AFRICA, SOUTH KOREA, SPAIN, SWEDEN, SWITZERLAND, THAILAND, TURKEY, UKRAINE, USA, UZBEKISTAN, VIETNAM, YEMEN.

5

UN-SPIDER
 Pledge of 168 Countries @ World Conference on Disaster Risk Reduction (DRR), Hyogo, Kobe, Japan, 2005

3 GOALS

- To integrate disaster risk reduction into sustainable development policies and planning.
- To develop and strengthen institutions, Communities Mechanisms and capacities to build resilience to hazards.
- To systematically incorporate risk reduction approaches into the implementation of emergency preparedness, response and recovery programs.

Hyogo Framework for Action 2005 - 2015: Building the Resilience of Nations and Communities to Disasters

6

UN-SPIDER
 HFA - Priority Actions

5 PRIORITY AREAS

1. Making disaster risk reduction a priority
2. Improving risk information and early warning
3. Building a culture of safety and resilience
4. Reducing the risks in key sectors
5. Strengthening preparedness for response

Support from space technologies

11

UN-SPIDER
 A web portal for information, communication, and process support. A platform which supports knowledge management, capacity building, technical advisory support and support to emergency and humanitarian assistance.
<http://www.un-spider.org>

Screenshot of the UN-SPIDER Knowledge Portal interface.

12

UN-SPIDER
 Space Application Guides

Scientific and technical papers, best practices and case studies, etc.

News and Events from the space and the disaster risk management community.

Guides on technologies, institutions and organizational mechanisms

Links to data and information sources

Repository of freely available Earth observation data and products

- Hazard-specific datasets
- Digital Elevation Models
- Land use and land cover maps
- Satellite data
- Search engines for geospatial data

Recommended practices on the use of web-based maps

Lessons learned from drought in Iran, floods in Pakistan and earthquakes in Japan

Best practices on geo-information for disaster and risk management

13

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

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

Technical Advisory Mission (2008 - 2013)

20

UN-SPIDER Technical Advisory Missions

15

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

Baseline data

Thematic data on terrain and natural resources

Disaster specific data

Utility and infrastructure data

Satellite images (Pre and Post disaster event)

Most of the georeferenced information is derived from the satellite images

16

Baseline Data- Geographic Reference

Data	Description	Reference to Disaster Management
Administrative units	Historical, provincial state, district boundaries in the locations of towns and villages	Used to address disaster risks and the village boundaries in GIS format to assist in all phases of disaster management. This is essential to have a base to which other data is linked such as demographic, socio-economic data and monitoring with time etc.
Demography	Population density, population growth, sex, education etc.	Demographic data provides insights into population trends. Trends in the population is critical to understand the socio-economic status of the population in the area of risk.
Socio-economic details	Education, occupation, income, agricultural, comprehensive information based on household survey	Socio-economic information provides important basis to understand the social and economic status of the population in the area of risk.
Amenities	Health facilities including rural, urban, public, medical services, schools, communication, gas stations etc.	Information on amenities provides important basis to understand the socio-economic status of the population in the area of risk.

21

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.
- UNEP and UNO/ 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 formal mandate, could facilitate the capacity building for the staff of the Government through a series of training and satellite technology in cooperation with ...
- The government should consider organizing familiarisation 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

Dominican Republic, 13-17 May 2013

Follow-up Activity of TAM in 2012 and Institutional Strengthening Mission in 2011
Experts from UN-SPIDER and ISRO

- 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, sub-sampling and unprocessed 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 modeling.
- Topic 7: Use of thermal data for change detection.
- Topic 8: Introduction to the web portal TAMT.
- Topic 10: Hands-on projects in groups.

17

Utility and Infrastructure data – Risk and vulnerability assessment

Item	Details	Reference to Disaster Management
Transport network	Urban transport network including roads and other modes of transport like metro, rail, etc.	Urban transport network provides critical information during response phase about routes to disaster affected areas. Equipment in the area of the transport network is critical to ensure rescue efforts. Data on electricity network is important to ensure that disaster management plans at local level.
Electricity network	Urban and rural electricity network	Urban and rural electricity network provides critical information during response phase. Data on electricity network is important to ensure that disaster management plans at local level.
Cadastral details	Urban and rural cadastral details	Cadastral mapping using high resolution satellite data is essential to ensure that disaster management plans at local level. Data provides critical input to the identification, assessment and the development of disaster management plans at local level. Data is essential for the development of disaster management plans at local level.
Region specific utility network	High resolution satellite data	High resolution satellite data provides critical information during response phase. Data on electricity network is important to ensure that disaster management plans at local level.

18

Thematic data on terrain and natural resources

Item	Details	Reference to Disaster Management
Elevation and slope	Topographic information on the terrain and slope	Topographic information provides critical information during response phase. Data on electricity network is important to ensure that disaster management plans at local level.
Landcover	Information on land cover and vegetation	Landcover information provides critical information during response phase. Data on electricity network is important to ensure that disaster management plans at local level.
Forest types	Information on forest types and distribution	Forest types information provides critical information during response phase. Data on electricity network is important to ensure that disaster management plans at local level.
Soil	Information on soil types and distribution	Soil information provides critical information during response phase. Data on electricity network is important to ensure that disaster management plans at local level.
River and drainage network	Information on river and drainage network	River and drainage network information provides critical information during response phase. Data on electricity network is important to ensure that disaster management plans at local level.
Coastal profile	Information on coastal profile	Coastal profile information provides critical information during response phase. Data on electricity network is important to ensure that disaster management plans at local level.

23

International Charter Space and Major Disasters

overview of current virtual constellation

24

International Charter Space and Major Disasters

Charter Operational Loop

25

UN-SPIDER International Charter Space and Major Disasters

Non-Disclosure Agreement (NDA)

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

Note: This document is available in French, Spanish, and Arabic.

26

UN-SPIDER International Charter Space and Major Disasters

General Activation Time Line

- 21/01/2013 Charter activation and UNOSAT nominated as PM
 - PM immediately begins communications with End Users and maintains active communications throughout the activation
- 22/02/2013 First image received. End User provided with imagery schedule (updated as activation proceeds)
- 23/03/2013 First map product provided to End User
- 24-31/03/2013 3 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

GMES Emergency Management Mapping Service: operational since 1 April 2012

Non-rush mode products

- On demand
- Tailored on user needs
- Weeks-months

Reference maps

Pre-disaster situation maps

Reference maps

Post-disaster situation maps

Preparedness/Prevention

Response/Relief

Recovery/Development

Emergency

Rush mode products

- On demand
- Standardized
- Hours-days

Reference maps

Delineation maps

Grading maps

External validation

28

UN-SPIDER

- Technical Advisory Mission to Vietnam, 25 – 29 March 2013
- Technical Advisory Mission to Ghana, Nov/Dec 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

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UN-SPIDER

- 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)

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UN-SPIDER

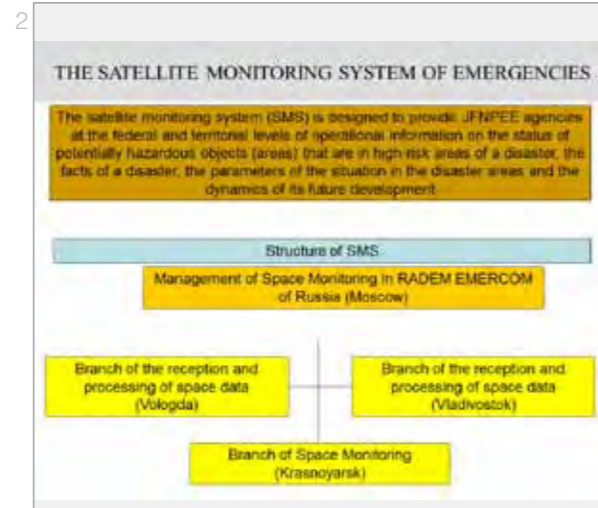
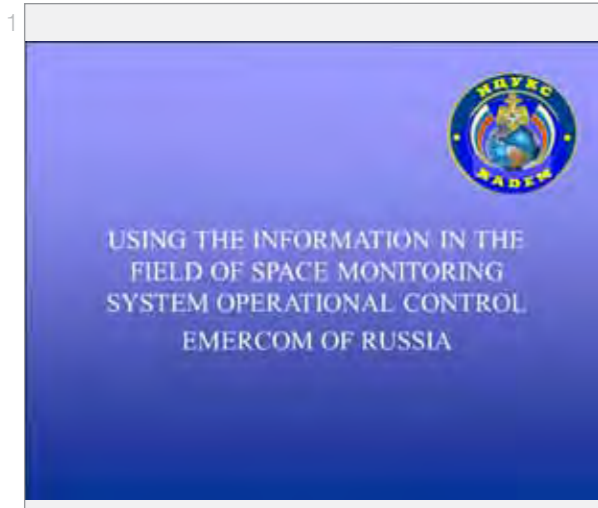
luc.st-pierre@unoosa.org

skype: [stpierre/luc](https://www.skype.com/en/contacts/stpierre/luc)

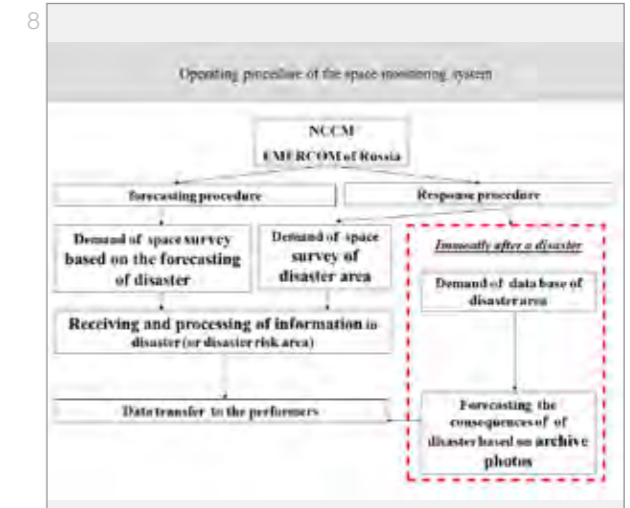
www.un-spider.org

www.unoosa.org

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

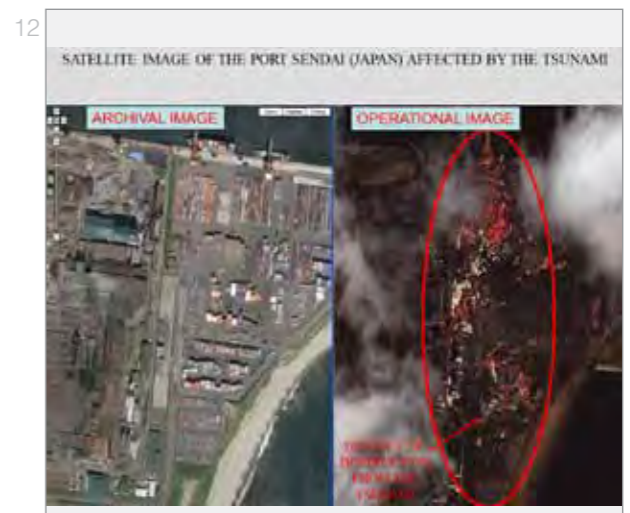
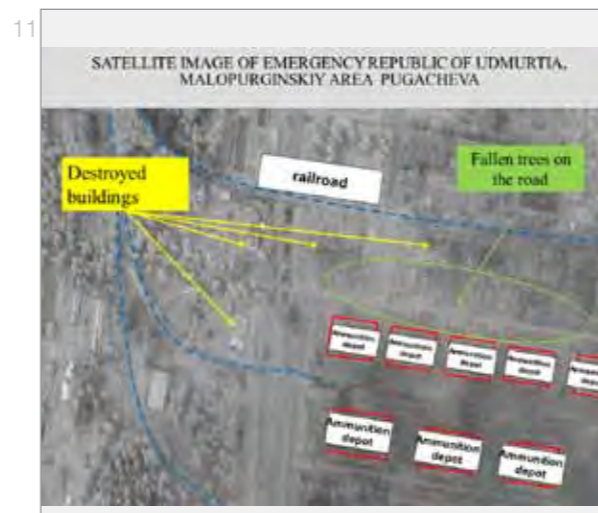
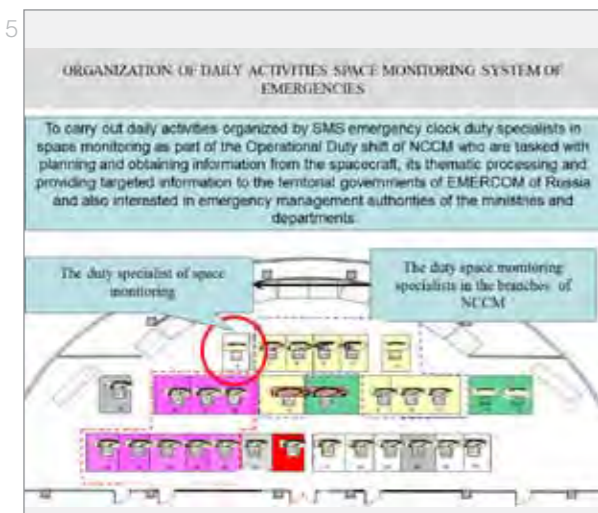


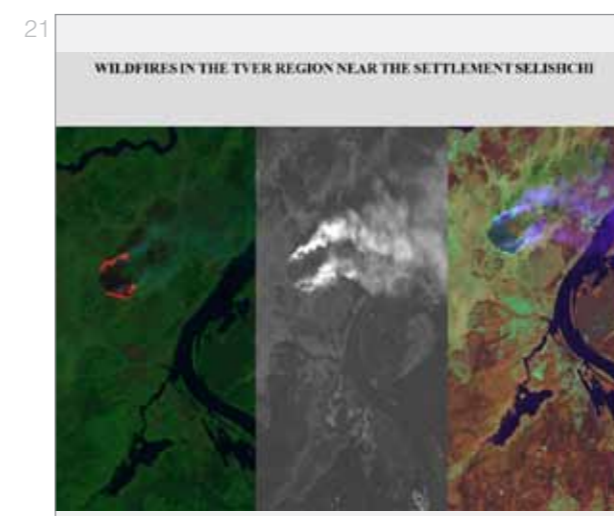
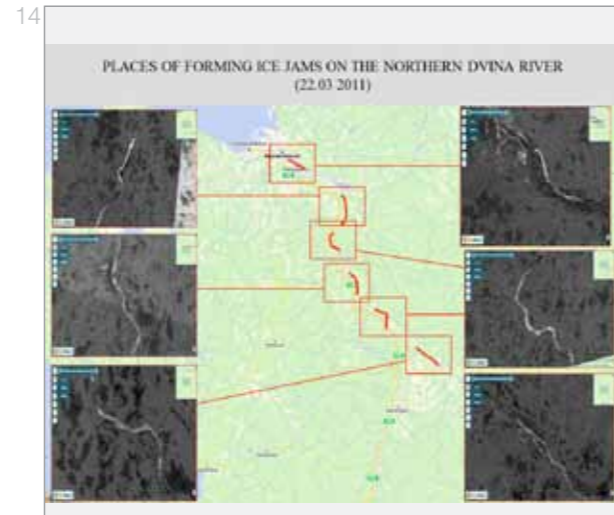
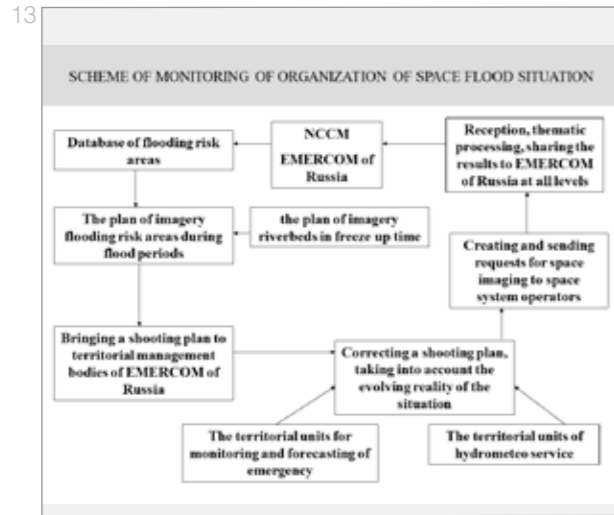
- MISSIONS ARE BASED ON THE DATA OF THE SPACE MONITORING SYSTEM
1. Assessment the situation in the disaster area; assessment the condition of focal points in the disaster risk area.
 2. Monitoring of the inundation and flooding situation.
 3. Monitoring of the natural fire situation.
 4. Assessment the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

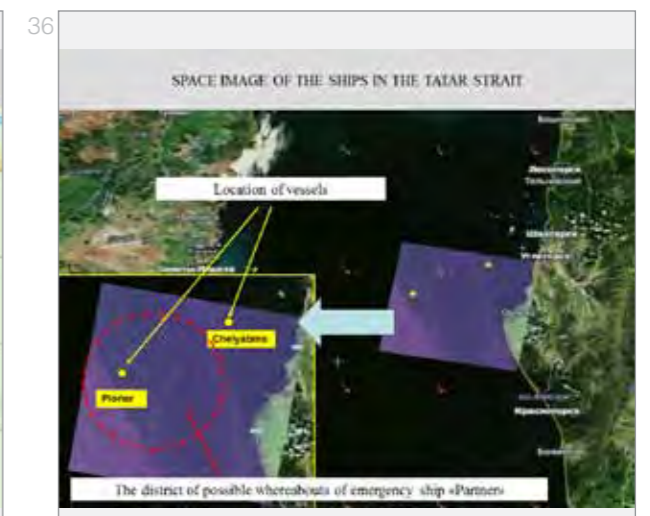
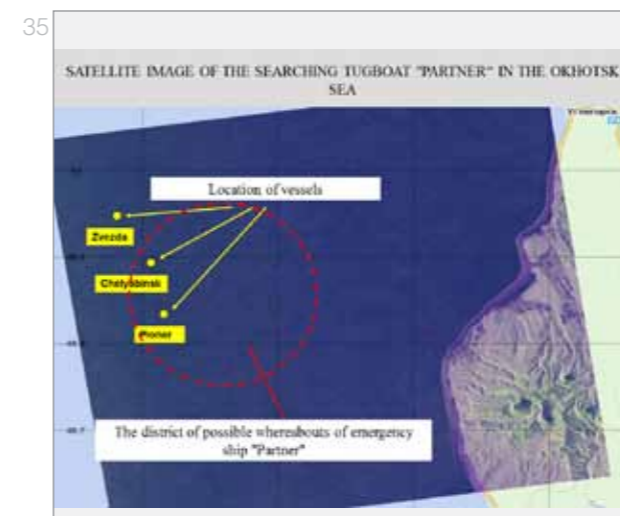
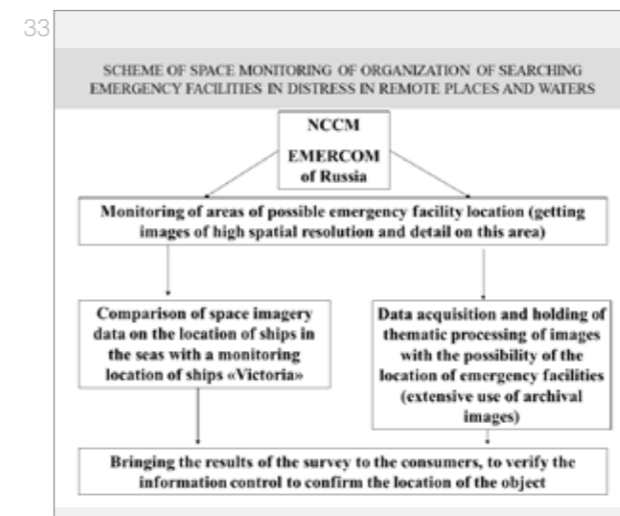
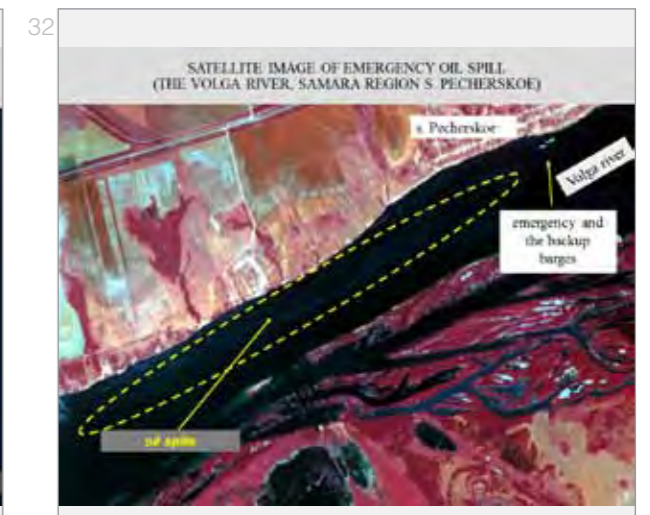
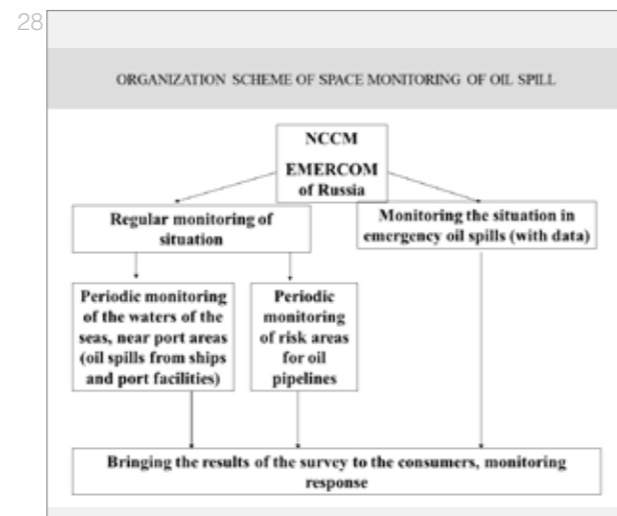
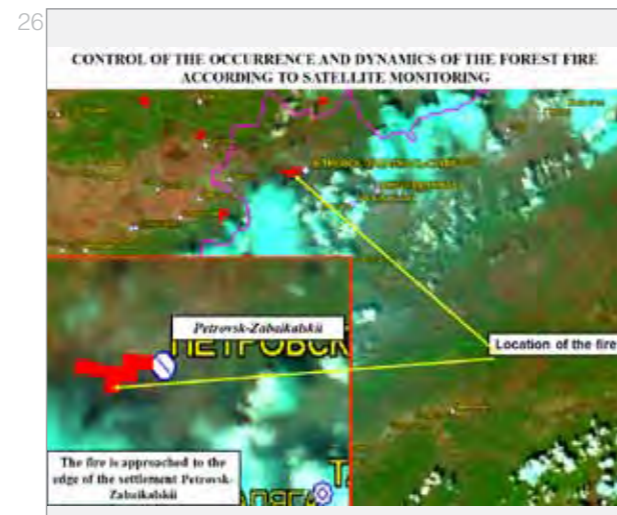
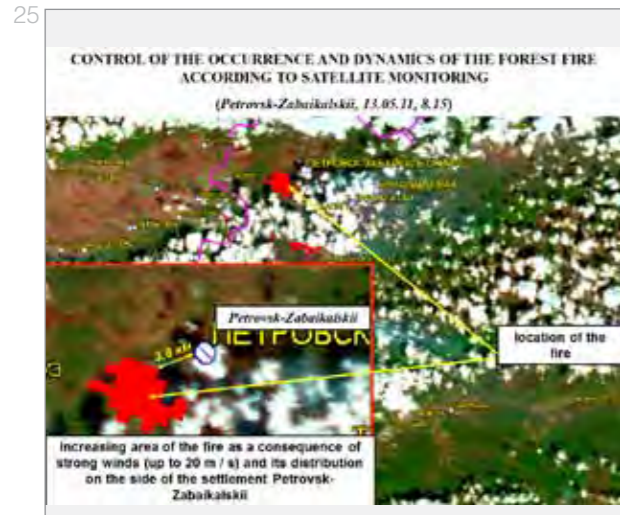


Slide 4 is titled "SPACE MONITORING PERFORMANCE CAPABILITIES FOR THE DATA OBTAINED FROM THE SATELLITES".

Type of satellite	EROS-B	SPOLE-S	EROS-A	LandSat-5	UK-BMC2	SPOLE-4	TERRA-A	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: in 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

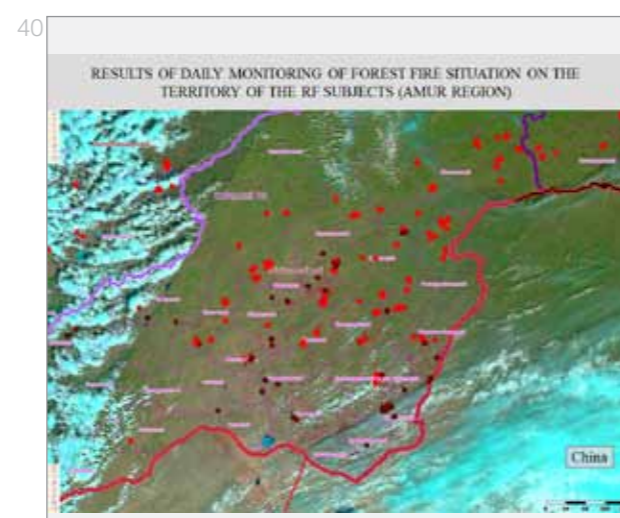
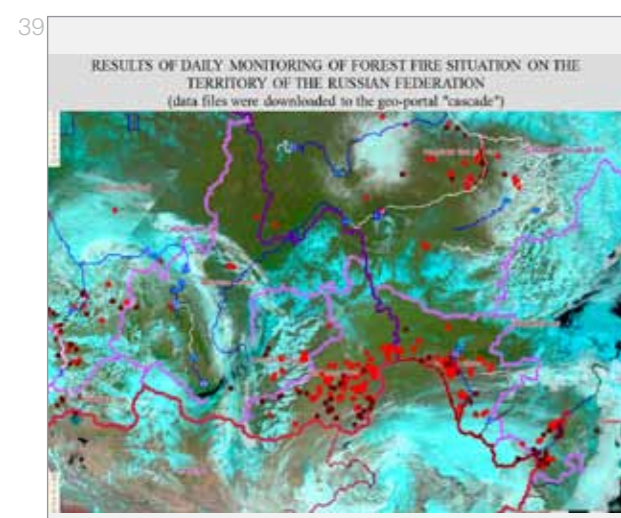
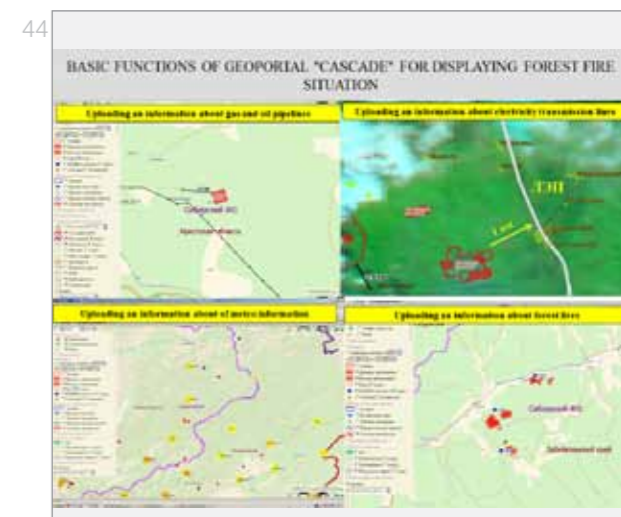
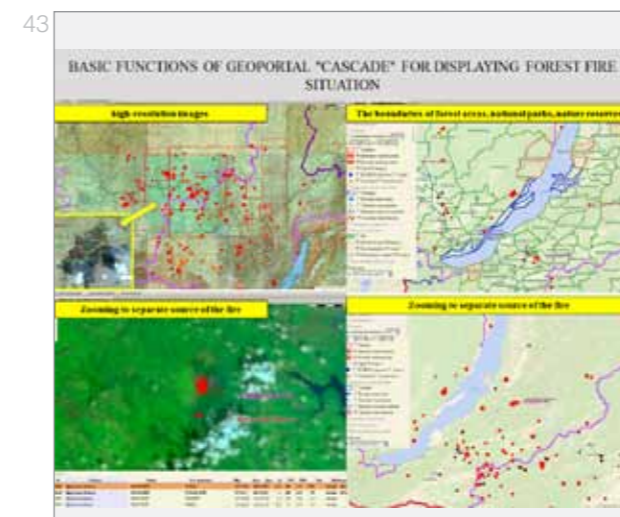






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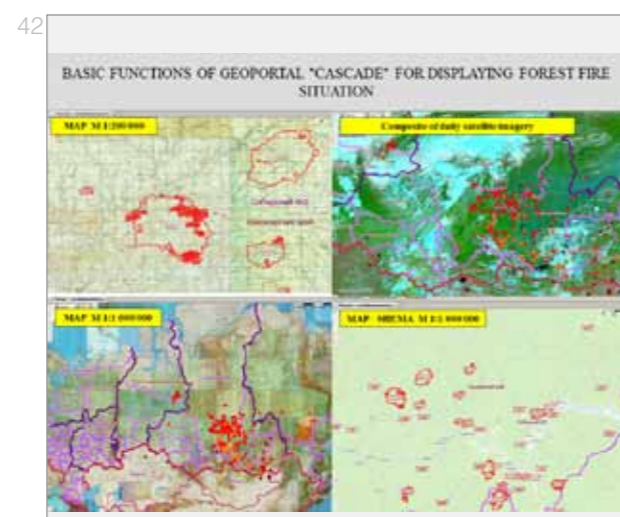
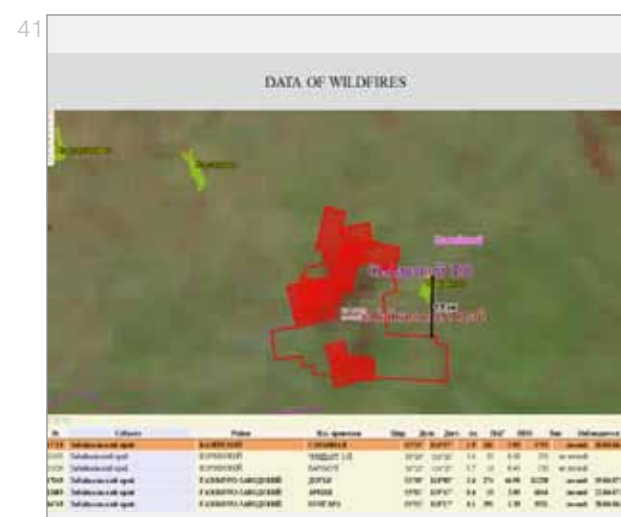
Information resources based on space monitoring system of EMERCOM of Russia

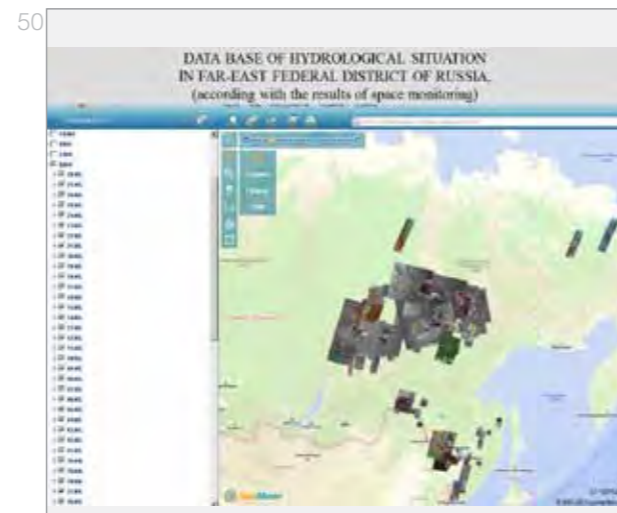


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SUMMARY TABLE OF THE RESULTS OF DAILY MONITORING OF FOREST FIRE SITUATION IN THE RUSSIAN FEDERATION

№	№ субъекта	№ объекта	Дата	№ объекта	Шир. (град.)	Дол. (град.)	Выс. (м)	Площ. (га)	Статус
1	01	001	10.08.2010	1001001	50.0000	100.0000	100	100	активен
2	01	002	10.08.2010	1001002	50.0000	100.0000	100	100	активен
3	01	003	10.08.2010	1001003	50.0000	100.0000	100	100	активен
4	01	004	10.08.2010	1001004	50.0000	100.0000	100	100	активен
5	01	005	10.08.2010	1001005	50.0000	100.0000	100	100	активен



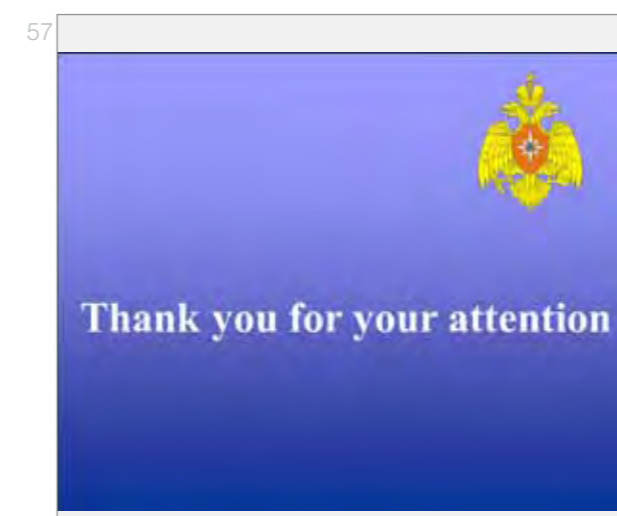


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INUNDATION SITUATION
(additional information from the local authorities)

СОСТОЯНИЕ ПЕРЕСЫЩЕНИЯ ВОДЫ

Имя	Ссылка на территорию	Дополнительная информация	Дополнительная информация	Уровень воды	Данные
Имя	Ссылка на территорию	Дополнительная информация	Дополнительная информация	Уровень воды	Данные
Имя	Ссылка на территорию	Дополнительная информация	Дополнительная информация	Уровень воды	Данные



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

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

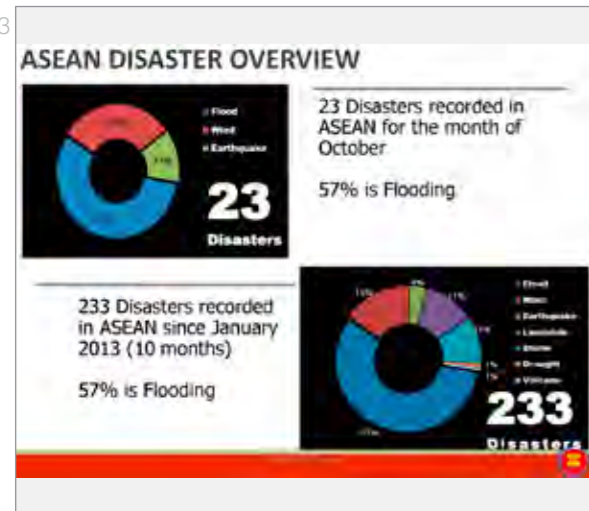
AHA CENTRE
ASEAN Coordinating Centre for Humanitarian Assistance on disaster management

Current Status and Future Needs of Space-based Information for Regional Disaster Monitoring and Response at AHA Centre
Application of Satellite Technology for Emergency Preparedness and Response in ASEAN 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.*

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



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 2005

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

Objective: Reducing disaster losses 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

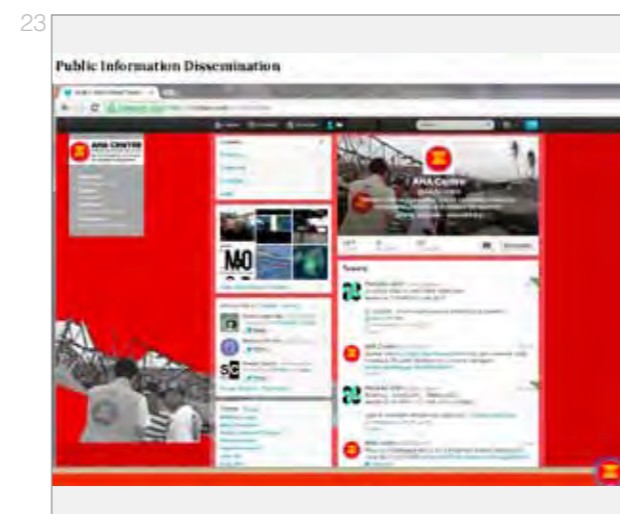
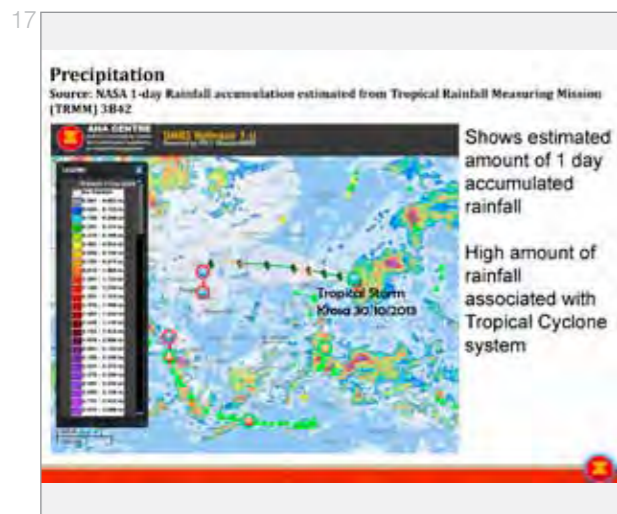
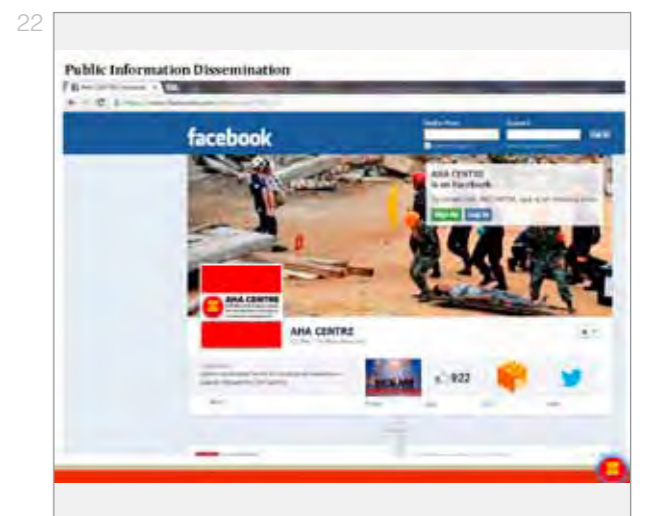
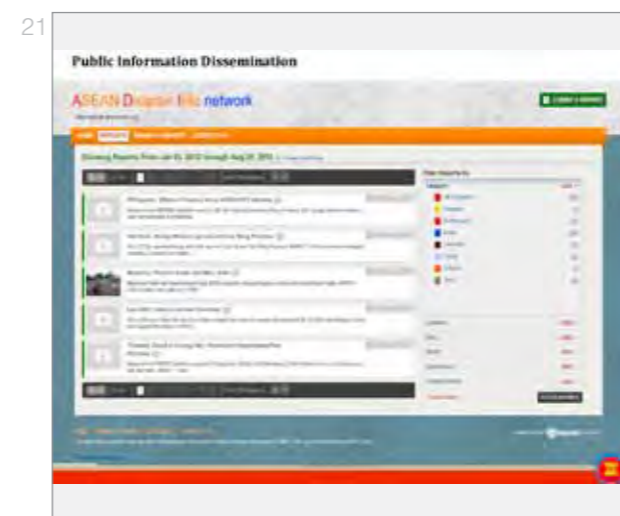
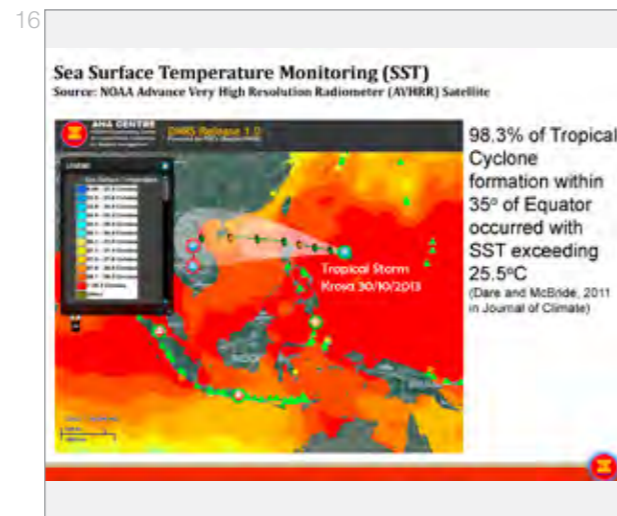
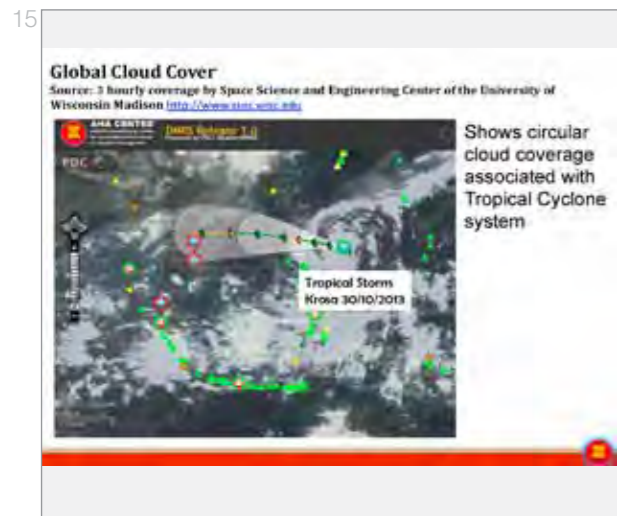
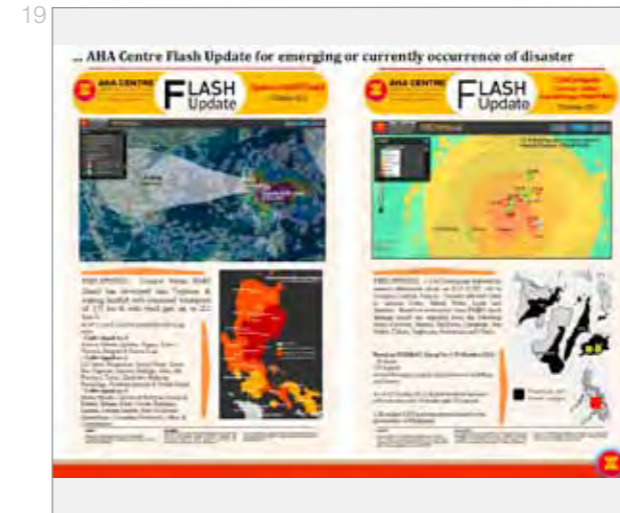
A LOT OF EFFORT HAS BEEN MADE BY ASEAN IN ESTABLISHING ASEAN COORDINATING CENTRE FOR HUMANITARIAN ASSISTANCE ON DISASTER MANAGEMENT (AHA CENTRE) AS THE OPERATIONAL ENGINE OF AADMER

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)



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)



25

AHA Centre Response to Aceh Earthquake 8 – 11 July 2013

5. Assessment of Disaster Impact (How many and where the impact of the disaster was on the lives, housing, transport and health, before and after the disaster)

Based on the latest release on 14 Aug 2013 at 14:30 to 14:45 (RFP, 1st-3rd) the impact of the disaster is:

- Affected village: 100
- Household: 175 out of 220 village
- High Target: 200 out of 220 village
- 0-100%
- 2-50% (partial)
- 50-100% (severe damage)
- 100% (total damage)
- All high roads are not available
- Disaster impact on 17 km x 10 km (100 km x 100 km) (100 km x 100 km)
- 100% (Total damage)

26

AHA Centre Response to Effect of SW Monsoon Philippines 22 – 25 August 2013

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Future Needs

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

- Rapid impact assessment analysis
- Provide situation map

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Future Needs

Regular Regional Flood Monitoring

Thailand Flood Monitoring System

Example provided by Thailand Geo-Informatics and Space Technology Development

Available every 2 days

Utilizing available satellite: Landsat 7

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

FLOOD IN LAO PDR

CASUALTY NUMBERS (as of 26 Aug 2013)

Deaths: 20
Affected People: 112,500
Damaged Houses: 213

28

Challenges

Flood in Cambodia

September – October 2013

168 death
1.5 millions people affected
Disaster Charter activation 21 October 2013
Activated by UNHCR/UNOSAT
By 25 October 2013
Several images available

4 days of Activation

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Radarsat 2

34

AHA CENTRE

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

Application of Satellite Technology for Emergency Preparedness and Response (EMER) Asia Pacific Region
25-31 October 2013, Bali, Indonesia

janggam.adhityawarma@ahacentre.org

www.ahacentre.org

<http://adinet.ahacentre.org>

<http://facebook.com/ahacentre>

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Challenges

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

30

Challenges

Earthquake in Philippines

15 October 2013

7.2 M Earthquake, Bohol Island, Central Visayas, PHILIPPINES

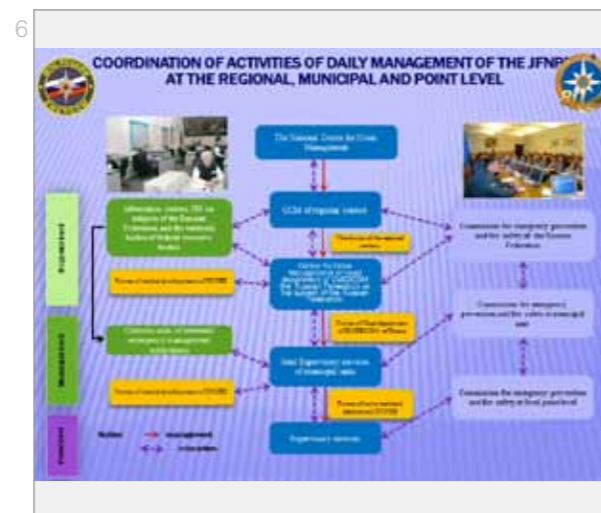
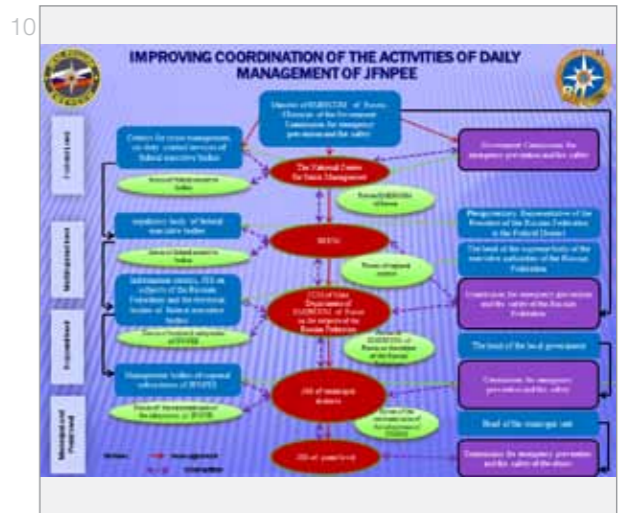
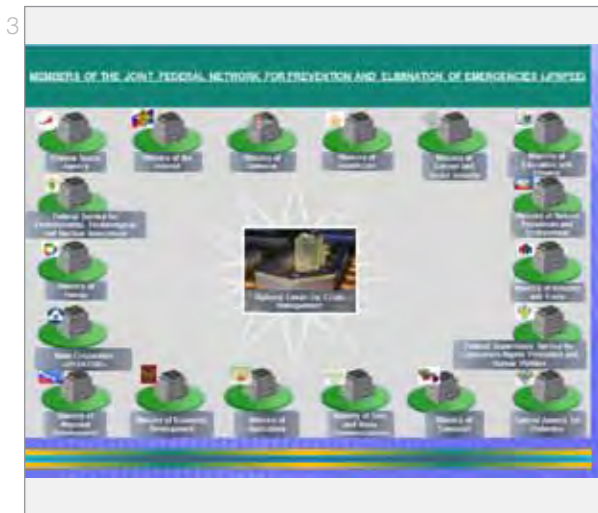
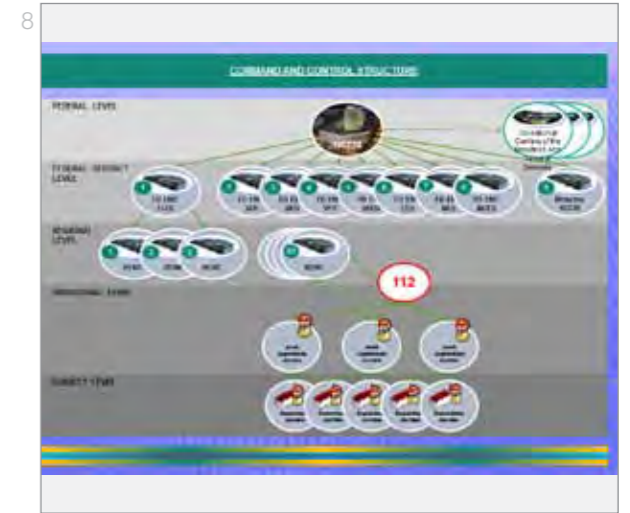
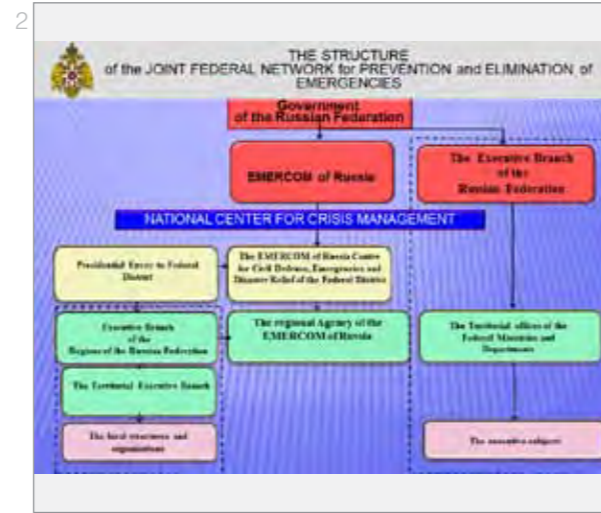
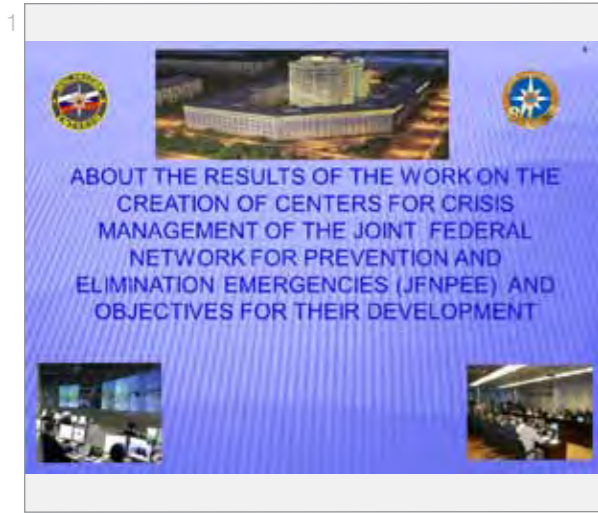
Bohol island area: 3,219 sqkm
City of Carmen near the epicenter area: 248 sqkm

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

Note: Cost is estimated based on KSAT 2013 pricing list

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

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

1

ScanEx Transparent World

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

www.scanex.ru
www.transparentworld.ru

2

Existing problems

- No national positive idea integrating the public and the society in struggle for preservation of the country's common space, related to improvement of environmental conditions and control of illegal activities in the regions.
- No modern innovation geoinformation resources and programs, capable of harmonizing and supporting a constructive dialog between the Civil Society and Authorities in part of modern efforts to promote "green growth" of the economy.
- No actually working programs on introduction of modern innovation technologies into educational process

7

Russian network of UniScan™ ground receiving stations

- 4 center, 10 UniScan™ stations
- Reception from 15 RS satellites
- Over 100 communications passes per day
- Over 600 GB of data daily

8

Country's imagery coverage

Coverage with data acquired from SPOT 4 satellites (10 m, color) for 2012

Cloud cover - not more than 20%

3

Existing problems

How to resolve?

4

Space images. Application advantages

- Authentic, up-to-date, unbiased (space imagery data do not pass through any filters of judgment - the information is absolutely impartial)
- Operational, efficient (data is received in near real-time mode)
- Cost-efficient as compared to ground and aerial surveys
- Retrospective (images for different years and different seasons)
- Coverage (continuous imaging, not fragmented)

9

Imagery coverage

Spatial resolution of images from 50 cm to 10 m

Possibility of high- and very-high resolution imagery coverage of the Moscow Region territory (Coverage for 1 day)

SPOT 4	Planet DLR
SPOT 6	IKONOS-2
SPOT 7	IKONOS-3
SPOT 5	IKONOS-3

10

Satellite images application possibilities

Application of satellite images and geoinformation systems for environmental protection:

- Investment tasks

5

Why geospatial technologies are important for civil society?

- Many socially relevant issues are of spatial character
- Space images today – is one of the few independent sources of impartial information that does not pass through any filters of judgment
- Continuous satellite imagery of the Earth - the "black boxes" of our planet, what is happening is being detected and can not be concealed, even if the traces of what is happening on the ground have been destroyed
- Maps (images) – is a universal language for all interested persons

6

Satellite images. Monitoring of territories, facilities and phenomena

- Monitoring of natural resources
- Monitoring of urban infrastructure facilities
- Monitoring of construction progress
- Monitoring of emergencies
- Monitoring of natural resources
- Monitoring of geographically coordinated targets
- Environmental monitoring

11

Satellite images application possibilities

Tasks:

- Data collection on previously detected violations
- Transformation to a visual cartographic material
- Publication of materials on different violations

Results:

- Detection of current status of objects and sites
- Getting cartographic materials, required for a visual display of the violation scales
- Availability of information to all interested
- Transparency of economic activities

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Satellite images application possibilities

Application of satellite images and geoinformation systems for environmental protection:

- Inventory tasks
- Monitoring

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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.

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Satellite images application possibilities

Monitoring

Clearcuts. Felina beyond the licensed area limits, Khimki forest



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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



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Satellite images application possibilities

Monitoring

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



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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



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Satellite images application possibilities

Monitoring

Inundations. Peat-bogs inundations of the protected natural areas



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Satellite images application possibilities

Monitoring

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



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Satellite images application possibilities

Monitoring

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



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Satellite images application possibilities

Monitoring

Inundations. Peat-bogs inundations of the protected natural areas



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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

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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

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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

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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;

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Satellite images application possibilities

Monitoring:
Attacks of pests on plants, Bark beetles

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Satellite images application possibilities

Application of satellite images and geoinformation systems for environmental protection:

1. Inventory tasks
2. Monitoring
3. Informing the public and education

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Open geospatial information and technology

- + Lifting restrictions on GPS accuracy for civil purpose
- + Copyright-free status for Landsat images
- + Posting 1980, 1990 and 2000 Landsat images for open access
- + Open free access to complete archive of Landsat images
- + A number of open sets of spatial GIS-data: DCW, VMap0, VMap1, SRTM...
- + Open global web-mapping services: Google Maps/Google Earth, MS Bing, Yandex maps, Kosmosnimki.ru, ...
- + Creating open copyright-free maps by the users (Open Street Map)
- + GIS software application with open source code (Quantum GIS)

43

Difference from other projects

The portal has been developed not only to collect data about previously detected violations, but to search for new infringements based on satellite images directly on the portal.

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Concerns of the society

- Improved transparency in land relations
- Detection of illegal activities and legal prosecution of those guilty, increasing the level of consciousness of citizens
- Conservation of natural environment and historical sites for future generations
- Uniting the groups of citizens, having common interests (in this case - environmental protection)
- Visualization of implemented volunteers' projects presentation (planting trees, waste removal, etc.).

39

A new project – Space Watch. Open data creation, publication and application

Space Watch:

- + A tool for a bilateral dialog between citizens and the state
- + Protection of natural and cultural heritage
- + Introduction of technology innovations
- + Fostering civil responsibility

40

Space Watch – the way it works

45

Concerns of the state

- Operational detection of law violations – information is provided supported by visual illustrations, coordinates and sizes of subject matter.
- Full control over execution of governmental resolutions
- Technology innovations development
- Environmental protection

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Concerns of the users

- + User-friendly, convenient, interesting
- + A true chance to make own region better
- + Prevention of possible violations
- + "A glance" on the results of own activities from space
- + Sharing views with like-minded community

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Main interface

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Main interface

Other concerned people may add data and discuss the subject matter

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ScanEx
Transparent World

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

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Phone/Fax: +7 (495) 739-73-85

www.scanex.ru www.transparentworld.ru
e-mail: info@scanex.ru e-mail: info@transparentworld.ru



Prevention and Management of Natural Disasters

PT CLS ASEAN
 Philippe Courrouyan
 Satellite Operational Solutions to Earth Problems

INTRODUCTION TO CLS/PI 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

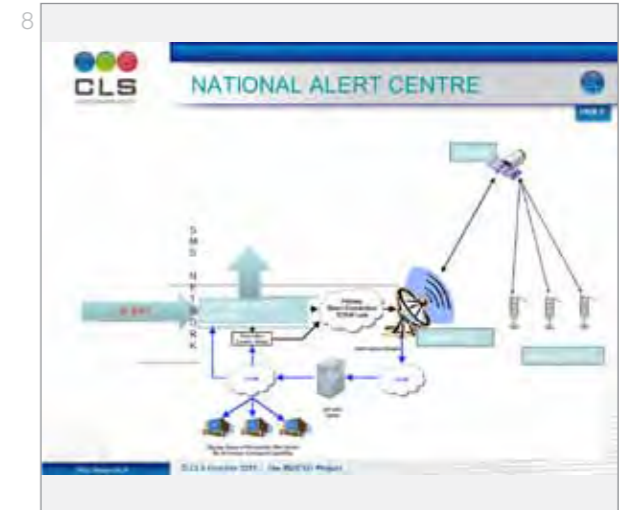
PT CLS ARGOS INDONESIA :
 20 Engineers and developers in Jakarta
 Processing Centre di Jakarta 24/7
 Clients : VSI/ KKP/Bakorkamla/Perhubungan etc ..

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



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

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

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 - 5W 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
- Omnidirectional
- Minimal preventative maintenance required to ensure 100% availability - IP 65 Rated, NEMA 4K, non-combustive
- GPS synchronization to synchronize the sounding of several horns at a given locale
- Manual On/Off Test/Control Switch and Remote activation

HORNS ARE IDEAL For Remote areas: Islands, mountain villages

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

Case study: Semarang
 Over-abstraction of ground water (DOK Nookaw)

Objective of the project: to analyse ground motion for Semarang in Java, Indonesia

Analysis and results

- Subsidence analysis has been conducted in two time periods: 1999-2000 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 assisting local government's services in assessing and minimizing flood risks as a consequence of subsidence

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

After the Disaster

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

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.

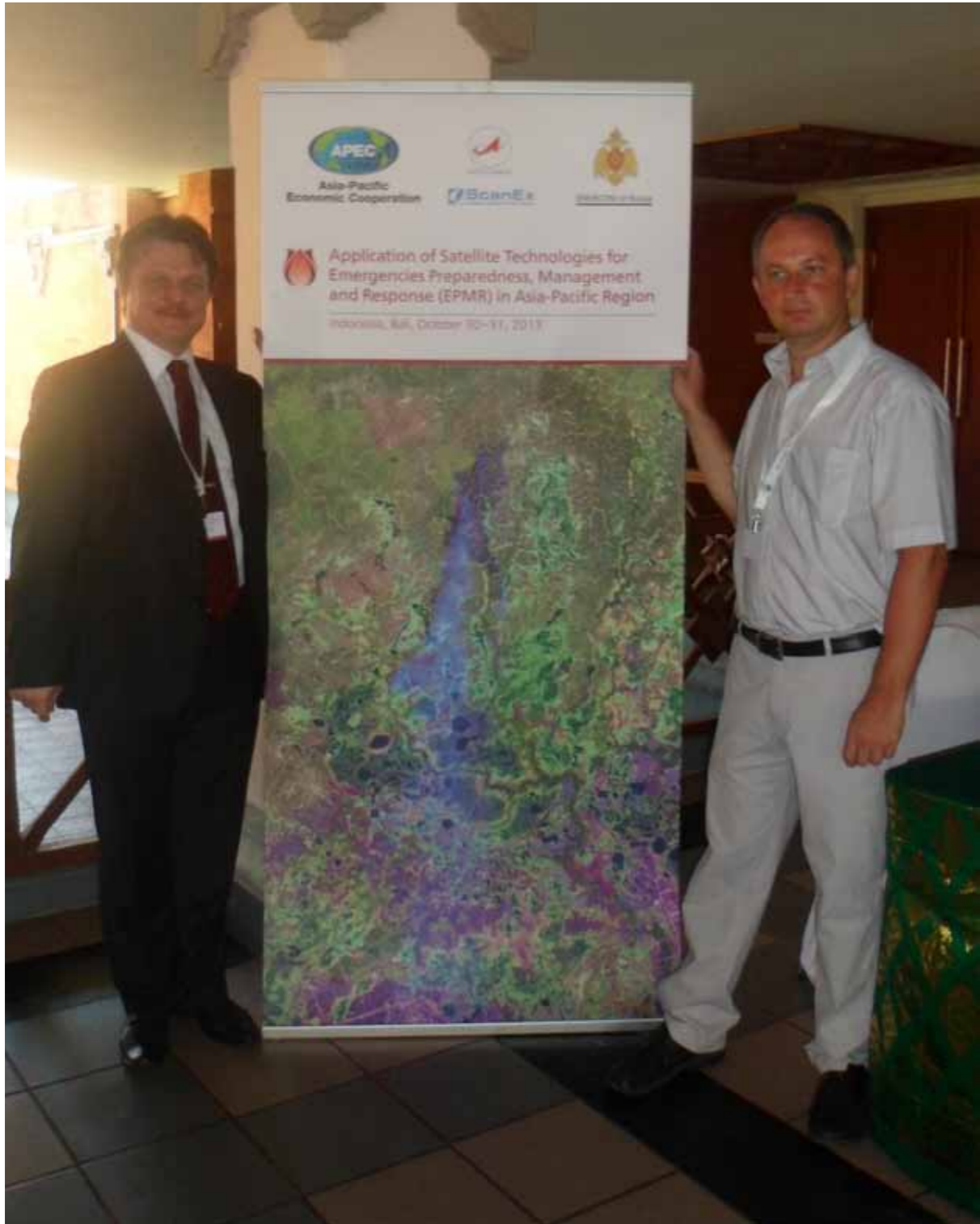
Russian Federation, represented by EMERCOM of Russia, is always open for cooperation and exchange of practice in the area of prevention and elimination of all types of natural and man-made disasters, as well as other types. Once again, thank you to all the participants!

We wish you great cosmic weather!

Pictures

















APEC Project EPWG 01/2012A

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