




ITU

*Role of Geospatial Professionals
in Risk and Disaster Management
and Preventing Natural Catastrophes*

Orhan ALTAN

FIG Working Week 09, Eilat

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ITU **What is Changing? CRED report**



CRED



Annual Disaster Statistical Review
The Numbers and Trends 2007

J.M. Schreiner
G. de Polain de Waroux
R. Dekker
D. Galati-Fogor
S. Pionetti

The Centre for Research on the Epidemiology of Disasters (CRED) was established in 1973.

In 1980, CRED became a World Health Organization (WHO) Collaborating Centre as part of WHO's Global Program for Emergency Preparedness and Response.

Since then, CRED has increased its international network substantially and collaborates closely with numerous UN agencies, inter-governmental and governmental institutions, non-governmental organizations, research institutes and universities.

2

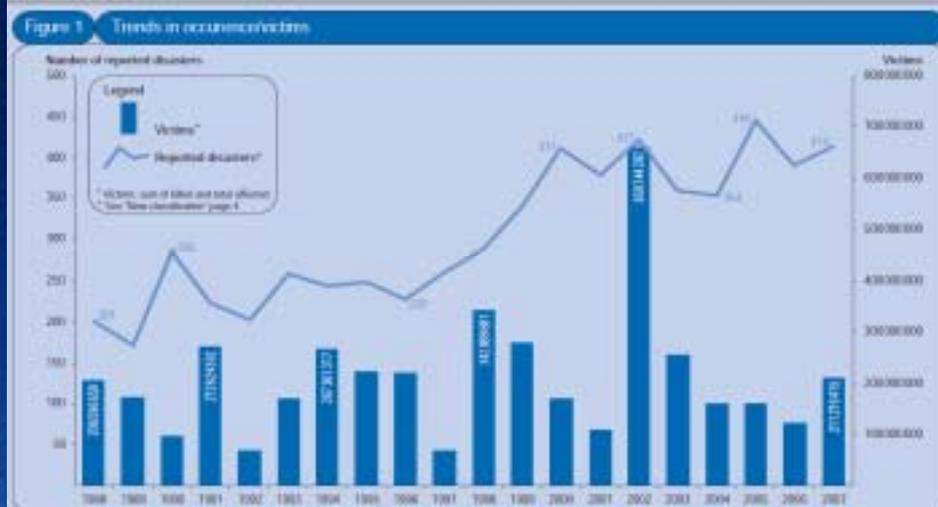


FIG Working Week 09, Eilat

Center for Research on the Epidemiology of Disasters (CRED) Report 2007

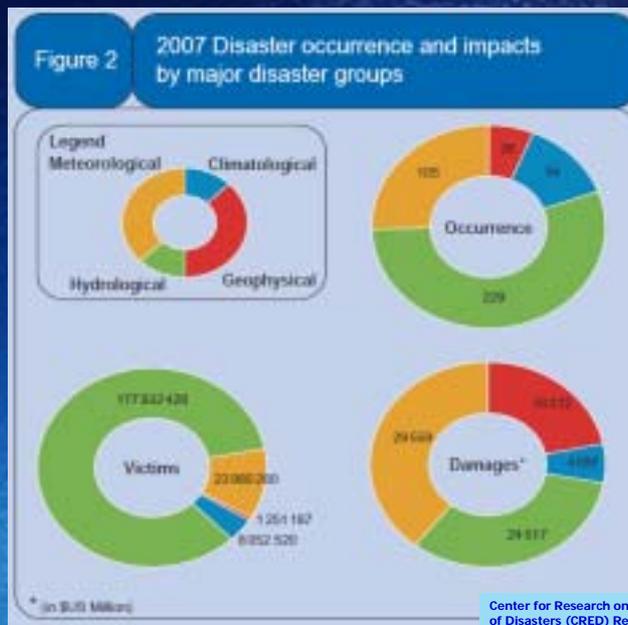
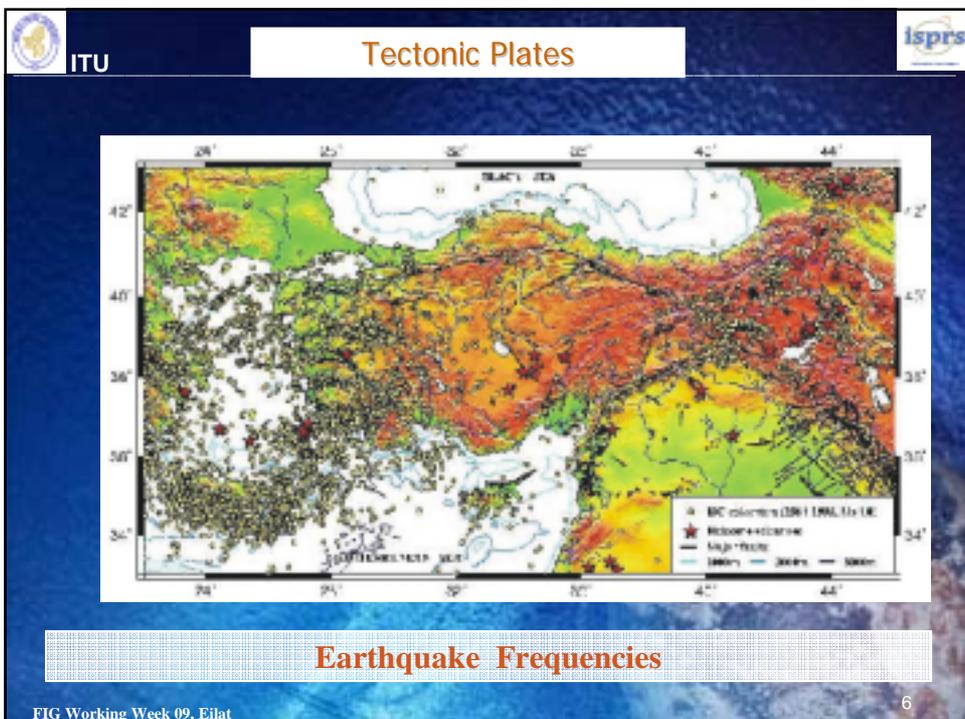
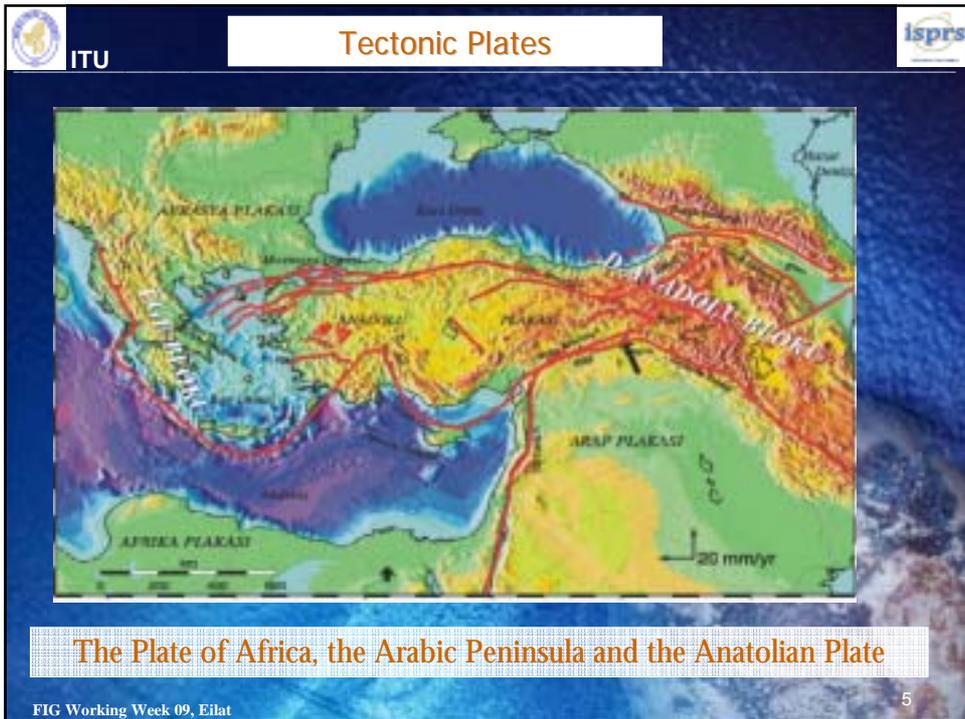


FIG Working Week 09, Eilat

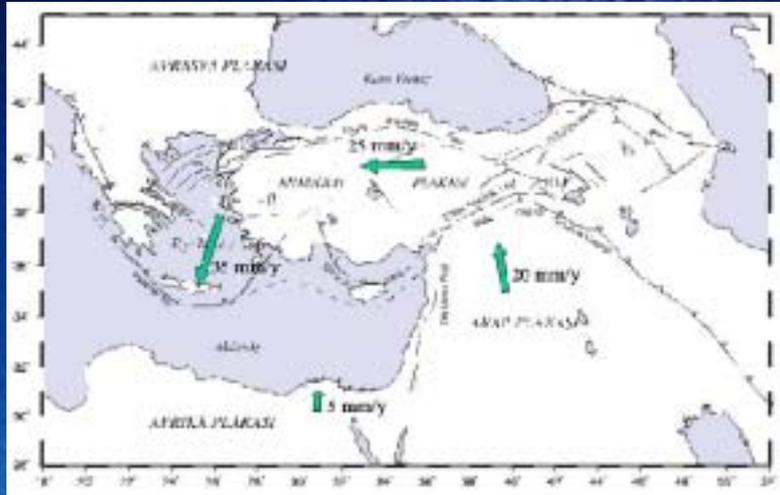
Center for Research on the Epidemiology of Disasters (CRED) Report 2007





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Tectonic Plates



Tectonic Plate movements, McClusky et.al.(1999)

FIG Working Week 09, Eilat



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(adapted from Yilmaz Aslantürk)

Before

During

After

Optimal allocation of available resources for risk reduction

- strengthening
- rebuilding

in regard to possible earthquakes

Damage reduction/control

Emergency help and rescue

Aftershock hazards

Rehabilitation of infrastructure functionality

Condition assessment and updating

Optimal allocation of resources for rebuilding and strengthening

FIG Working Week 09, Eilat

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(adapted from Yamaz Aslanturk)

Before	During	After
<p>Optimal allocation of available resources for risk reduction</p> <ul style="list-style-type: none"> - strengthening - rebuilding <p>in regard to possible earthquakes</p>	<p>Damage reduction/control</p> <p>Emergency help and rescue</p> <p>Aftershock hazards</p>	<p>Rehabilitation of infrastructure functionality</p> <p>Condition assessment and updating</p> <p>Optimal allocation of resources for rebuilding and strengthening</p>

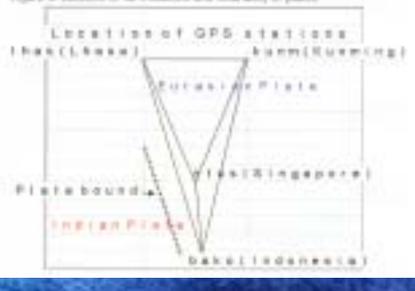
FIG Working Week 09, Eilat 9

ITU  **GEODETIC MEASUREMENTS AS A MEANS OF EARLY WARNING** 

Figure 1: Triangle network of GPS station



Figure 5: Location of GPS stations and boundary of plates



Shunji Muri; Harumi Araki;
Was Early Warning of Sumatra Earthquake possible? Coordinates,
 July 2005, p. 8-11

Figure 6: Daily change of triangle area in yr plane

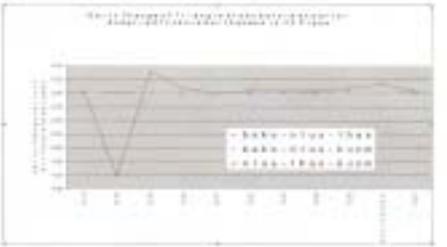
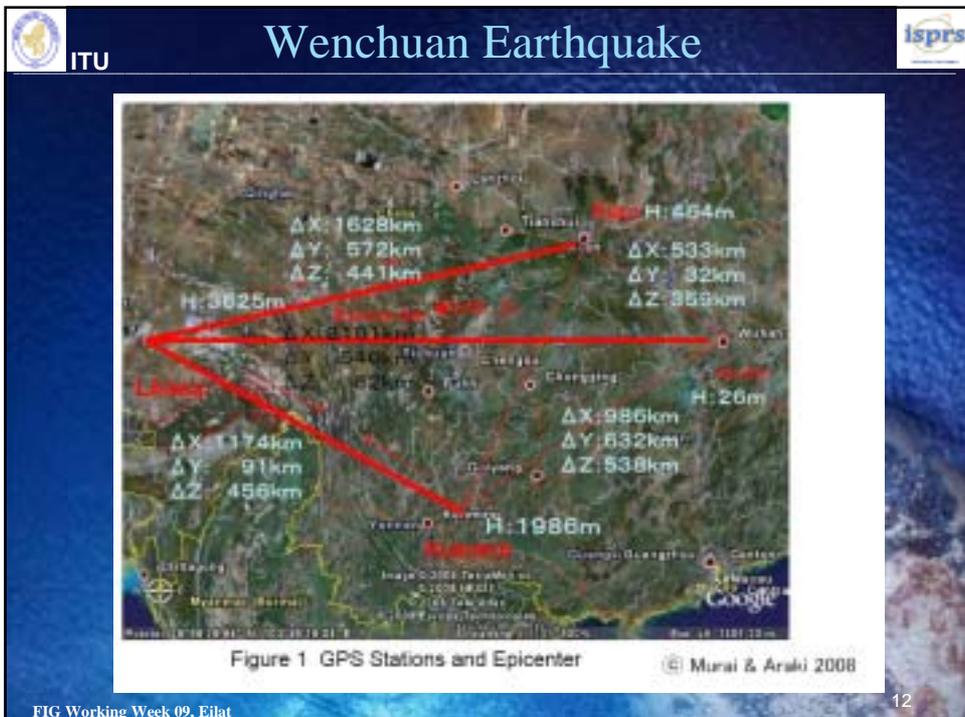
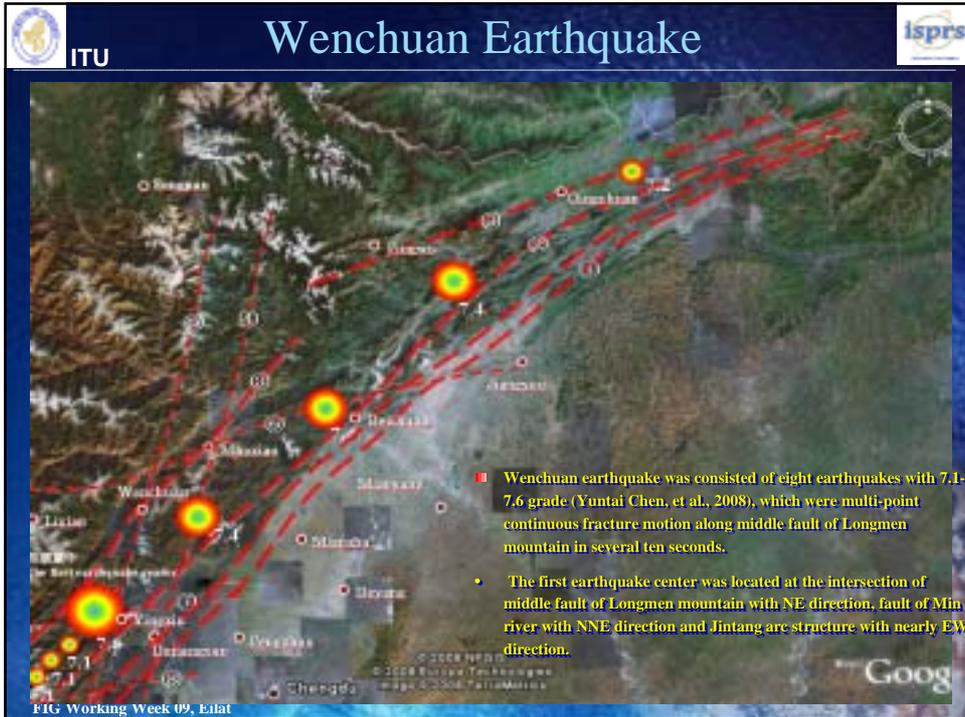


FIG Working Week 09, Eilat



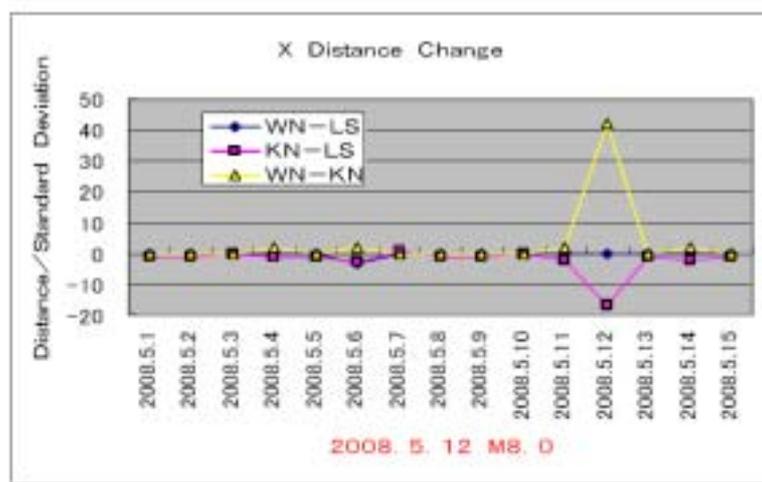


Figure 3 Change of X direction distance at three base lines

© Murai & Araki 2008

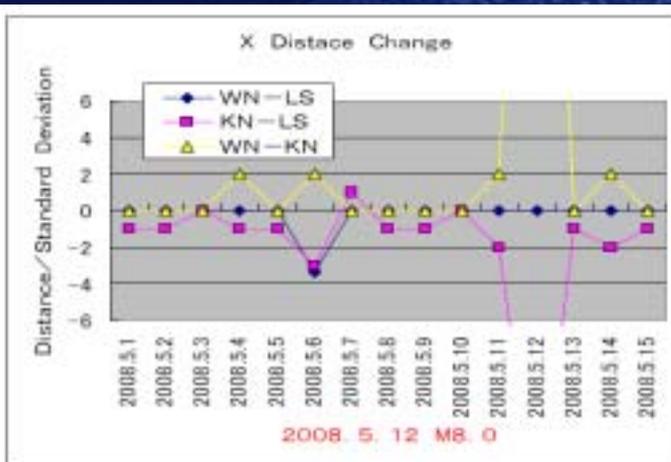
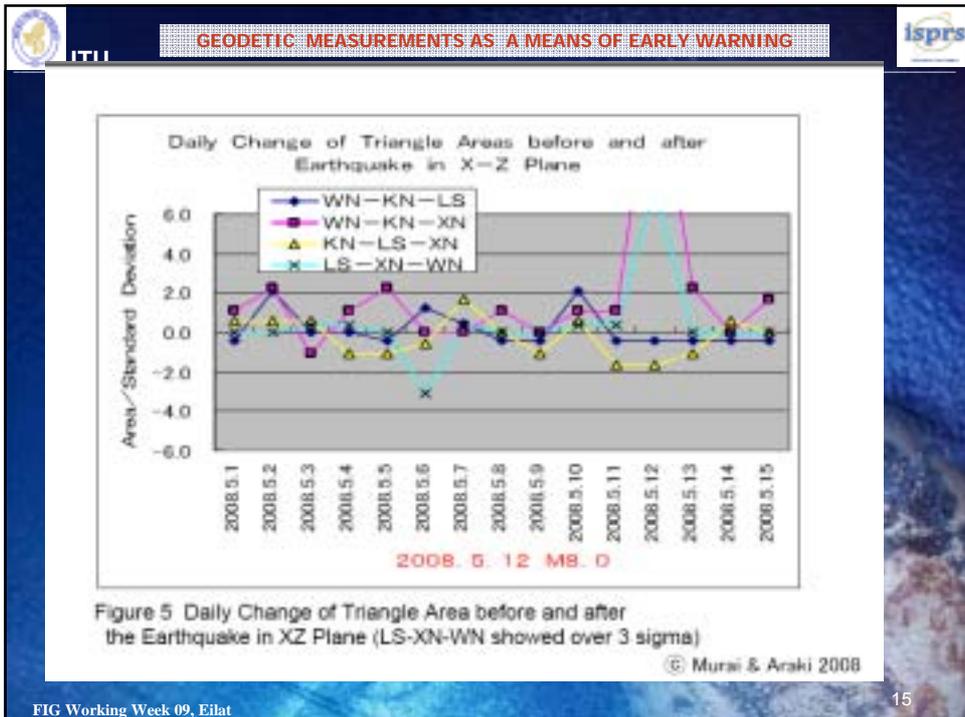


Figure 4 Normalized Change of Distances of three Baselines (WN-LS and KN-LS showed over 3 sigma)

© Murai & Araki 2008





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Earthquake in L'Aquila







Italy muzzled scientist who predicted quake

ROME (Reuters) - An Italian scientist predicted a major earthquake around L'Aquila weeks before disaster struck the city on Monday, killing more than 300 people, but was reported to authorities for spreading panic.

The government on Monday resisted the warning, by seismologist **Giuseppe Giuliani**, had no scientific foundation.

The first tremors in the region were felt in mid-January and continued at regular intervals, creating mounting alarm in the medieval city, about 100 km (60 miles) west of Rome.

Vans with loudspeakers drove around the town a month ago telling locals to evacuate their houses after Giuliani, from the National Institute of Astrophysics, predicted a large quake was on the way, prompting the mayor's anger.

Giuliani, who based his forecast on concentrations of radon gas around seismically active areas, was reported to police for "spreading alarm" and

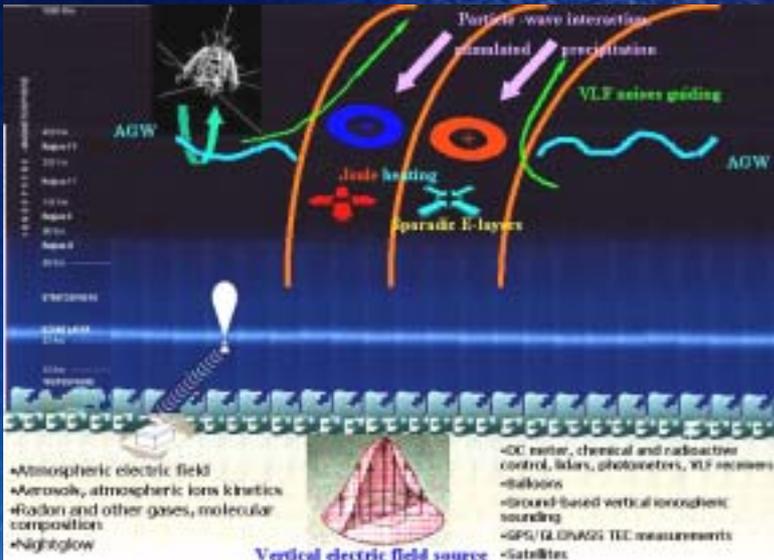
FIG Working Week 09, Eilat



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Seismo-ionospheric coupling model schematic presentation



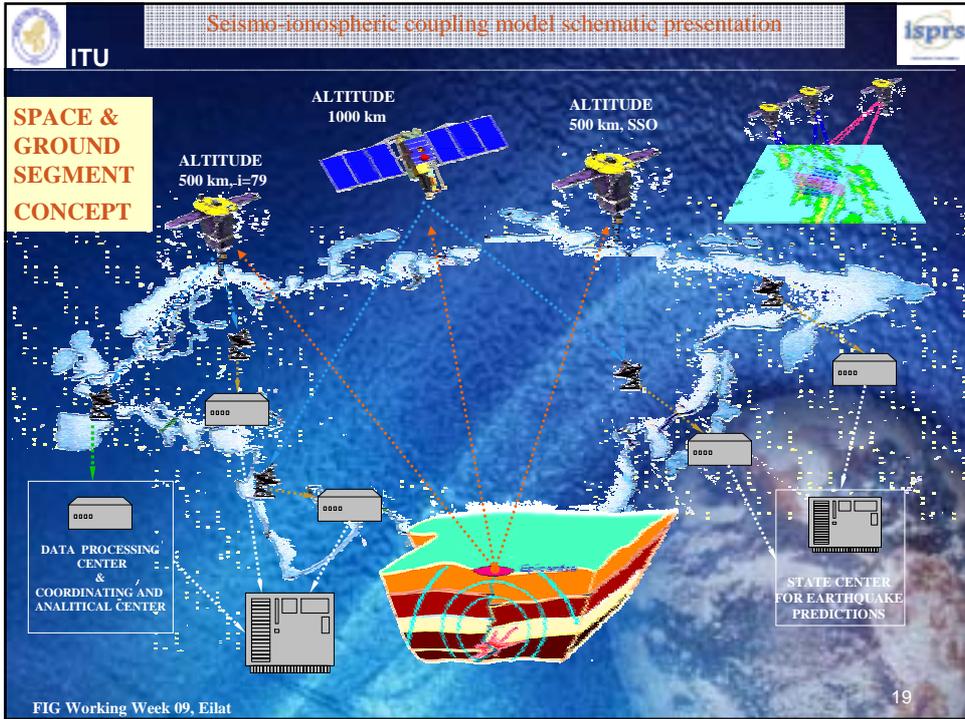


The diagram illustrates the coupling between seismic activity and the ionosphere. It shows Alfvén Gravitational Waves (AGW) interacting with the ionosphere, leading to particle-wave interactions, ionospheric heating, and the formation of sporadic E-layers. VLF waves are shown being guided by the ionosphere. A vertical electric field source is depicted at the bottom, with a list of associated phenomena and measurement techniques.

- Atmospheric electric field
- Aerosols, atmospheric ions kinetics
- Radon and other gases, molecular composition
- Nightglow

- DC, meter, chemical and radioactive control, lasers, photometers, VLF receivers
- Balloons
- Ground-based vertical ionospheric sounding
- GPS/GLONASS TEC measurements
- Satellites

FIG Working Week 09, Eilat



RISC PREPAREDNESS

Number of Hourly Damaged Building : Model A

A. Garagon et al.: CONSTRUCTING A WEB-BASED GIS FOR EARTHQUAKE MONITORING IN TURKEY: FIG Working Week 2005, Cairo

F. Batuk et al.: The New Zoning Approach for Earthquake Risk Approach, G14DM, Delft, 2005

and Identify for querying

Reference Map

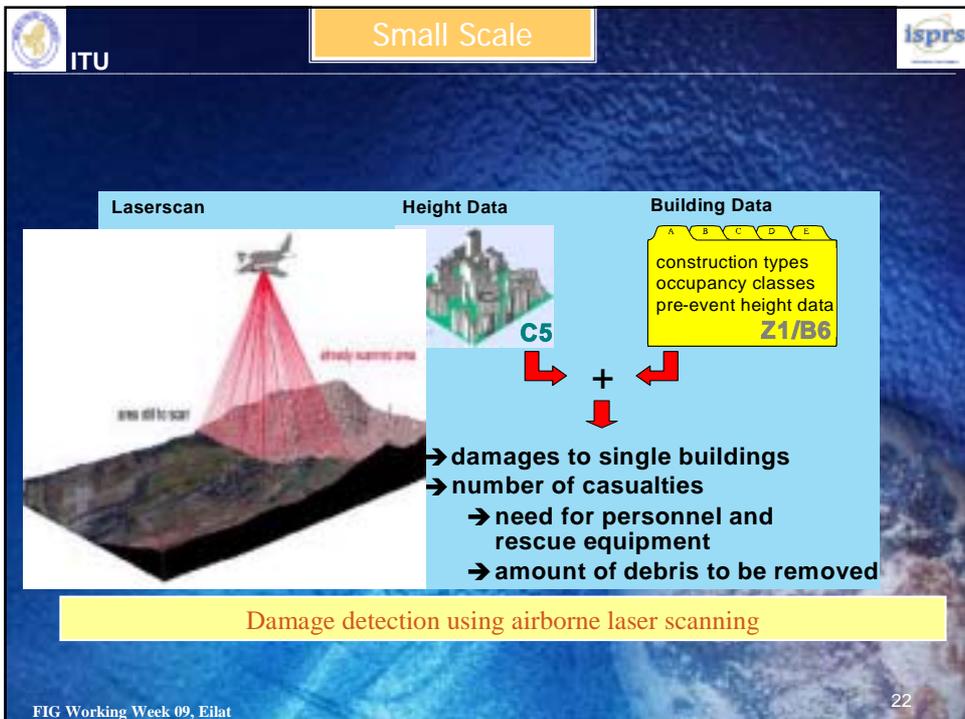
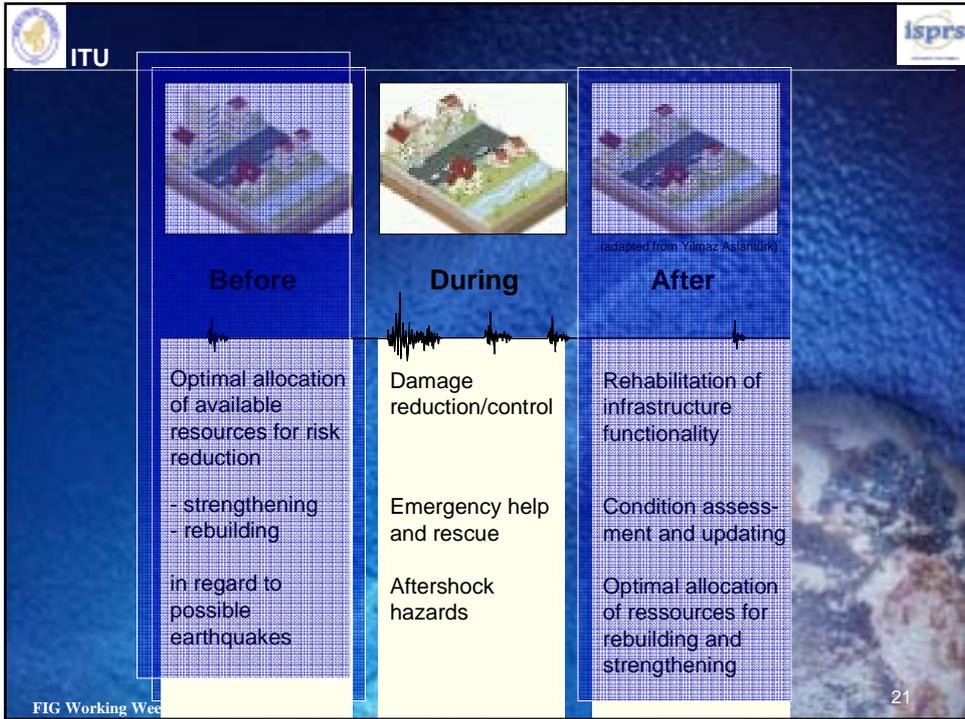
Layer Control

Map Display

Legend

Querying results

FIG Working Week 09, Eilat



ITU Small Scale isprs



Damage detection using helicopters and video cameras

FIG Working Week 09, Eilat 23

ITU Monitoring in Large Scale isprs



Vehicle-borne Laser Mapping System (VLMS)

FIG Working Week 09, Eilat 24

ITU Monitoring in Large Scale isprs

Vehicle-borne Laser Mapping System (VLMS)



Laser Scanner
Line Camera

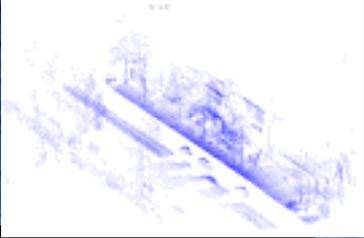
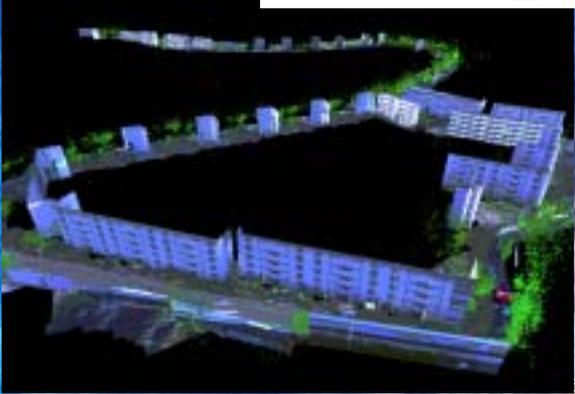



FIG Working Week 09, Eilat

ITU Monitoring in Large Scale isprs




FIG Working Week 09, Eilat 26



Monitoring in Large Scale



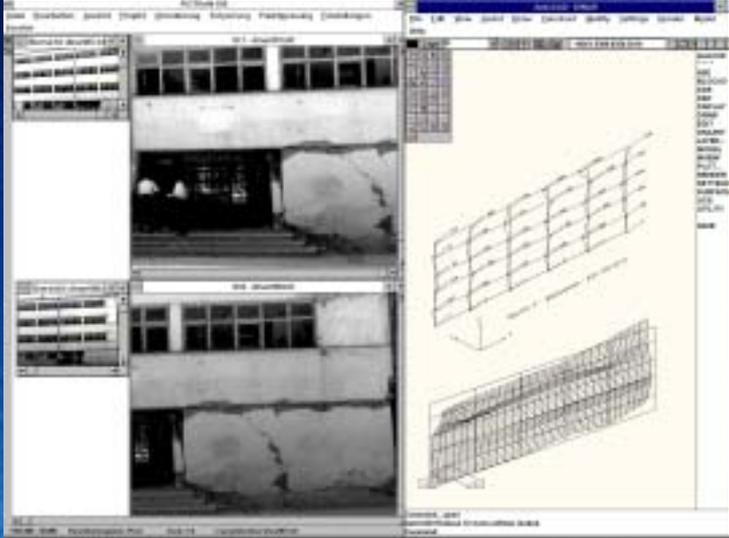


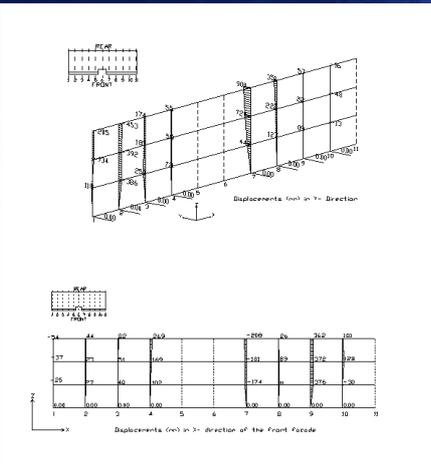
FIG Working Week 09, Eilat

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Monitoring in Large Scale





Ministry of Public Works and Settlement
Government of Republic of Turkey
Specification for Structures to be Built in Disaster Areas

- The *storey drift*, Δ_i , of any column or structural wall shall be determined by Eq.(6.19) as the difference of displacements between the two consecutive stories.

$$\Delta_i = d_i - d_{i-1} \quad (6.19)$$

- The maximum value of storey drifts within a storey, $(\Delta)_{max}$, calculated by Eq.(6.19) for columns and structural walls of the i 'th storey of a building for each earthquake direction shall satisfy the unfavourable one of the conditions given by Eqs.(6.20)

$(\Delta)_{max} / h_i \leq 0.0035 \quad (6.20a)$

$(\Delta)_{max} / h_i \leq 0.02 / R \quad (6.20b)$

FIG Working Week 09, Eilat

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ITU **Monitoring in Large Scale - Visualisation** isprs

3D-Modelling of a Structure

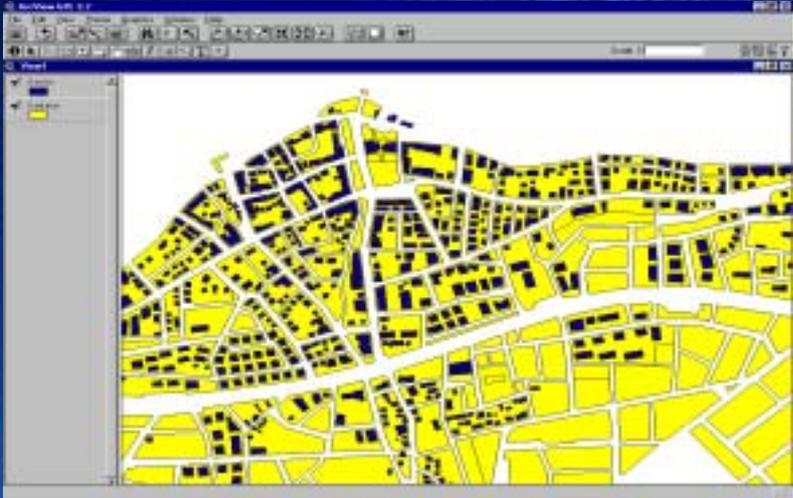
FIG Working Week 09, Eilat 31

ITU **Monitoring in Large Scale - Visualisation** isprs

Visualization of Crack structures in 3D

FIG Working Week 09, Eilat 32

ITU **Earthquake GIS** isprs



EO-GIS in that area of Gölçuk

FIG Working Week 09, Eilat 33

Detailed description: This slide shows a screenshot of a GIS software interface. The main window displays a map of a coastal urban area. Buildings are represented by yellow polygons, and roads are shown as white lines. The map is overlaid on a satellite-style background. The interface includes a toolbar at the top and a legend on the left side. The text 'EO-GIS in that area of Gölçuk' is centered at the bottom of the map area. The slide is part of a presentation from ITU and isprs, with the title 'Earthquake GIS'. The footer indicates it is from FIG Working Week 09, Eilat, slide 33.

ITU **Tsunami Risk Map of a 3m high wave in Istanbul's Coasts** isprs



Tsunami Risk Map of a 3m high wave in Istanbul's Coasts

FIG Working Week 09, Eilat 34

Detailed description: This slide displays a tsunami risk map of Istanbul's coasts. The map uses a color gradient to represent risk levels: green for low risk, yellow for moderate risk, and red for high risk. The high-risk areas (red) are concentrated along the coastlines and in some inland areas. The map is overlaid on a satellite-style background. The text 'Tsunami Risk Map of a 3m high wave in Istanbul's Coasts' is centered at the bottom of the map area. The slide is part of a presentation from ITU and isprs, with the title 'Tsunami Risk Map of a 3m high wave in Istanbul's Coasts'. The footer indicates it is from FIG Working Week 09, Eilat, slide 34.

ITU Charter Products isprs

Post tsunami QuickBird image, 28-Dec-04

Pre tsunami QuickBird image, 23-Jun-04

QuickBird Stereo Color Image 28 December 2004

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ITU Charter Products isprs

High Resolution QuickBird image of the devastated area

INDONESIA/SUMATRA - Banda Aceh Region - Map 6 1:18,000

FIG Working Week 09, Eilat

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ITU **Wenchuan Earthquake** isprs

- The Wenchuan Earthquake which China suffered on 12 May 2008 proved to be one of the catastrophic ones in the history.
- As of 11 June 2008, the Chinese State Council Information Office reported;
- **69,146 persons killed, 17,516 missing, and 374,131 injured.**

FIG Working Week 09, Eilat 37

ITU **Beijing Congress** isprs



FIG Working Week 09, Eilat 38

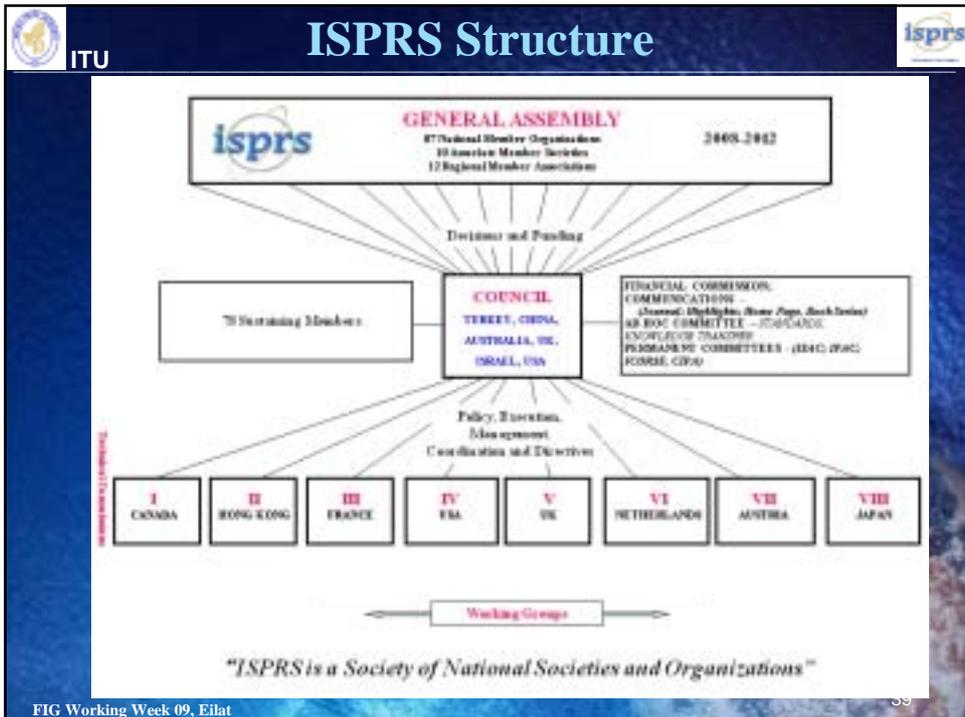


FIG Working Week 09, Eilat

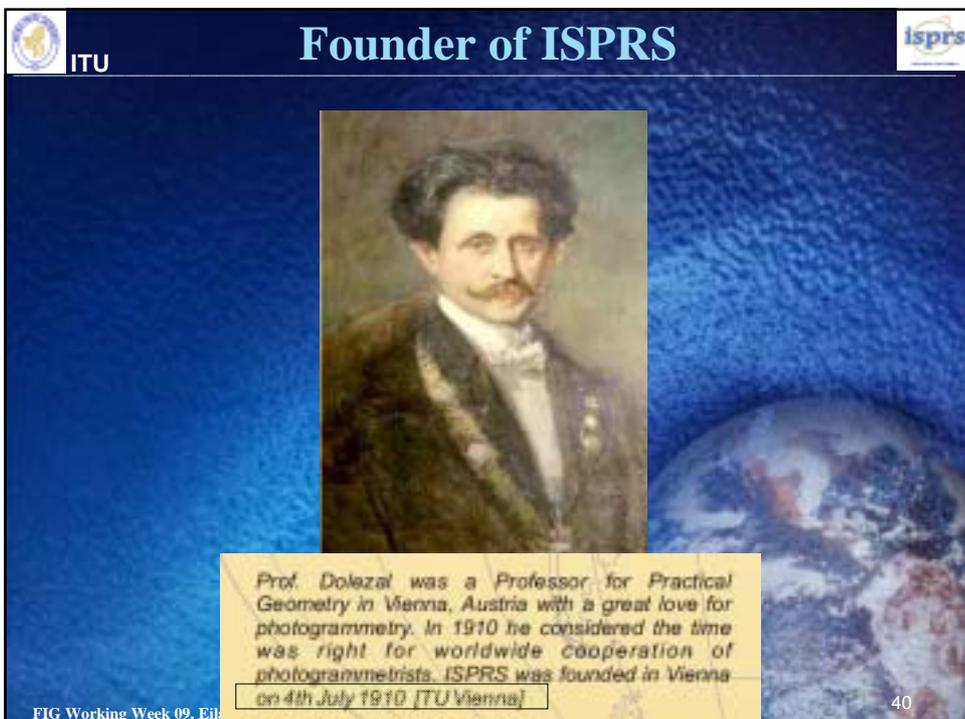


FIG Working Week 09, Eilat

ISPRS Council has decided to celebrate the Centenary with several actions;

- **4th of July 2010** a celebration date in Vienna
- To prepare and propose a new strategic plan for the Society
- To use this event outreaching our sciences and society to the outside world



Wienerrathaus



Festsaal



Beijing Declaration



International Society for Photogrammetry and Remote Sensing
 Internationale Gesellschaft für Photogrammetrie und Fernerkundung
 Société Internationale de Photogrammétrie et de Télédétection



Beijing Declaration

A Declaration approved by delegates at the ISPRS Congress calls on international communities to work together and commit adequate resources to promote the peaceful use of geospatial technology for the benefit of society and the environment. The document requests the ISPRS community to realize the full potential of information from imagery through research and development, identify networking, international co-operation, inter-disciplinary integration and education and training. It also sets out a number ways in which the ISPRS and international communities can work to this end. The Declaration was made by the General Assembly of ISPRS at its XXII Congress held in Beijing.

We, members of The International Society for Photogrammetry and Remote Sensing (ISPRS) and participants of the XXIIst ISPRS Congress in Beijing, recognize the importance of imagery to measure and monitor the natural and man-made features on planet Earth and to explore other planets of the solar system, especially after witnessing the important role of photogrammetry, remote sensing and spatial information systems in the rescue operation and damage assessment of the recent devastating natural disasters.

We note scientific developments reported during the technical sessions of the Congress and the great progress made in the use of imagery from many different platforms, with increased interest for a wide variety of applications. We particularly note:

- Wide applications of Earth observation technologies and tools to the fields of socio-economic sustainable development, natural disaster prediction, mitigation and response, maintenance of biodiversity, cultural heritage conservation, global and environmental climate change monitoring, energy exploration and management, land use and land cover inventory, food security, sustainable use of water resources, and human habitat, management and health.

FIG Working Week 09, Eilat

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Disaster Management in ISPRS



WG IVB - 3D Spatial Data Integration for Disaster Management and Environmental Monitoring
 Home Page: <http://www.commission.org/ivb/>

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WG VBI - Disaster Management
 Home Page: <http://www.commission.org/vbi/>

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WG IVB - Terms of Reference

- * 3D data models (geometry, topology, self content)
- * 3D data structures, algorithms and stacks
- * 3D data models for management of geo-D
- * Data models allowing for efficient 3D view
- * Analysis of 3D disaster management and

WG VBI - Terms of Reference:

- * Generation of vulnerability and hazard zone maps for different type of disasters, such as forest fire, cyclone, floods, drought, volcanic eruption, earthquakes, land slides etc. and identification & assessment of potential risk zones
- * Integrate recently sensors observations and communication strategies with enhanced prediction modelling capabilities for disaster detection, early warning, monitoring, and damage assessment
- * Development of disaster management plans for pre, during and post disaster situations and enhance support for early warning systems, emergency response, mitigation and recovery planning
- * Collaborate with GEO and take part in GEO task where appropriate

FIG Working Week 09, Eilat

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Conclusions

- Geo-Information Sciences is an important tool for observing human induced and natural disasters.
- Scientific research and different applications show this is a very important tool
- BUT!!!
- How can we assure that the decision makers and governmental institutions realise this fact???

FIG Working Week 09, Eilat 45

ITU isprs

Conclusions



Leading government officials (First Deputy Prime Minister Li Zhaoyang accompanied with the Minister of Agriculture and Natural Resources Xu Shouzhai) spent some time with the Council of ISPRS and leading delegates in order to take their opinions (photo above).

FIG Working Week 09, Eilat 46

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Conclusions



CAS President Presents Chinese Premier "Remote Sensing Atlas of Wenchuan Earthquake" On November 4, member of the Standing Committee of the Political Bureau of the CPC Central Committee and Chinese Premier Wen Jiabao paid a visit to the Chinese Academy of Sciences (CAS), whereupon Vice Chairman of the NPC Standing Committee and CAS President Lu Yongxiang gave a warm welcome to the Premier and presented him the "Remote Sensing Atlas of Wenchuan Earthquake" as a souvenir.

FIG Working Week 09, Eilat

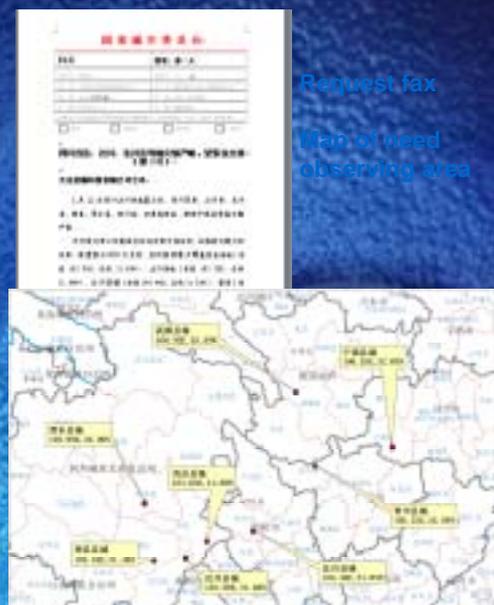
ITU isprs

Wenchuan Earthquake



↓ ↓

**Image data &
Technical support**



Request fax

Area of need observing area

FIG Working Week 09, Eilat

ITU **Aerial- Spaceborne Programs** isprs

Ministry of Land Resources
National Bureau of Surveying and Mapping
Chinese Academy of Sciences
Wuhan University

Remote Sensing Communities

Optical Camera: SWDC, ADS40, DMS etc.
Synthetic Aperture Radar

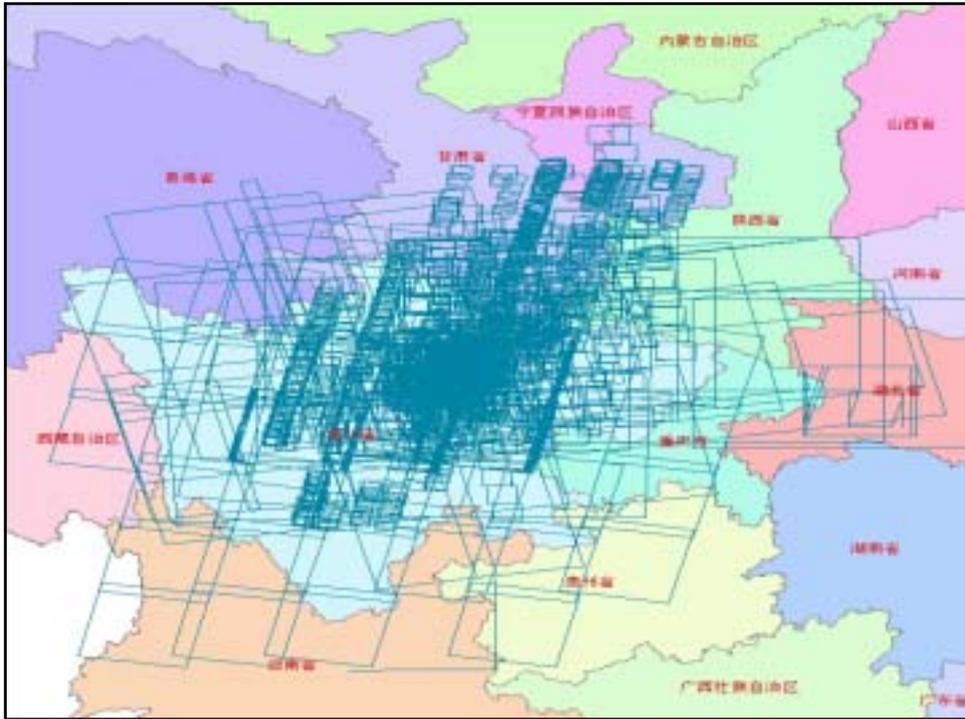
Camera & Sensors

FIG Working Week 09, Eilat 49

ITU **Aerial- Spaceborne Programs** isprs

	India	Active	Programmed	Total
RS-1	China	0	246	246
Fuzhou 2	China Taiwan	3	146	149
CBERS-02B	China	400	25	425
Resource 02	China	7	16	23
Beijing 1	China	2	14	16
COSSMO- SkyMed	Italy	0	10	10
QuickBird	U.S.A	0	20	20
TERRA ASTER	U.S.A	0	14	14
LANDSAT-7	U.S.A	10	4	14
WorldView	U.S.A	12	0	12
IKONOS	U.S.A	3	0	3
ALOS	Japan	10	21	31
IRS-P5	India	6	23	29
IRS-P6	India	10	0	10
ENVISAT AGAP	ESA	0	10	10
SPOT 5, 4, 2	France	122	23	145
TerraX-SAR	Germany	0	11	11
EROS-B	Israel	0	10	10
RadarSat-1	Canada	2	11	13
TOPSAT	Britain	0	2	2
UK-DMC	Britain	0	4	4
DMC NigeriaSat-1	Nigeria	0	7	7
Total		627	625	1252

FIG Working Week 09, Eilat 50

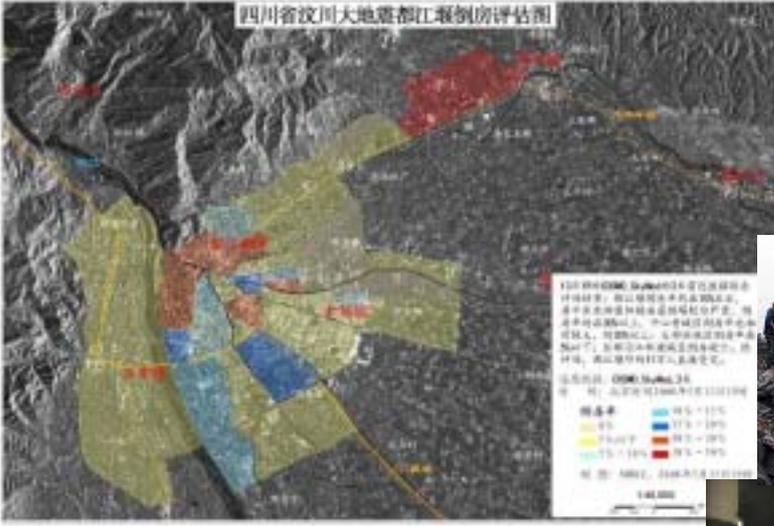




Monitoring of Collapsed Buildings



四川省汶川大地震都江堰制房评估图

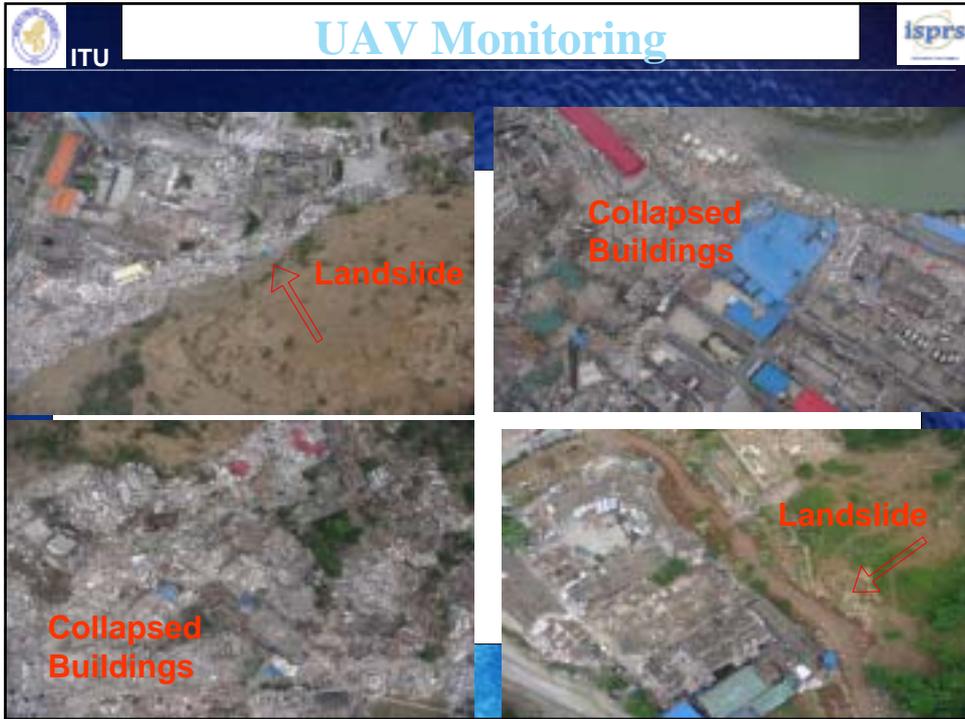


1. 汶川大地震 (2008年5月12日) 造成严重人员伤亡和财产损失，给我国经济社会发展带来沉重打击。震中地区房屋倒塌严重，许多房屋严重倾斜甚至完全倒塌，给当地居民生命财产造成重大损失。同时，地震还造成大量房屋严重破坏，给当地居民生命财产造成重大损失。震中地区房屋倒塌严重，许多房屋严重倾斜甚至完全倒塌，给当地居民生命财产造成重大损失。同时，地震还造成大量房屋严重破坏，给当地居民生命财产造成重大损失。

信息来源：中国地震局
 编 者：北京城市勘测研究院
 编 号：JGJ 146-2004
 图 例：
 倒塌率：
 0% - 10% (Blue)
 10% - 20% (Green)
 20% - 30% (Yellow)
 30% - 40% (Orange)
 40% - 50% (Red)




FIG Working Week 09, Eilat





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JBGIS Best Practises Booklet on Geo-information for Risk and Disaster Management



Joint Board of Geospatial Information Societies (JB GIS) is a coalition of leading international geospatial societies. The members of the JB GIS are **FIG, IAG, ICA, IHO, IMTA, ISCGM, ISPRS and GSDI.**

*The aim **JBGIS Best Practises Booklet** is to assist governments, local authorities, and other stakeholders concerned with natural hazards in potentially vulnerable areas, and outline the potential uses of the Geo-Information Technologies to governmental, institutional and operative decision makers. The Booklet is intended to cover all regions of the world and all phases of the disaster management cycle.*

The "**JBGIS Best Practises Booklet**" to be released by a Press Conference in Vienna in July 2010

FIG Working Week 09, Eilat

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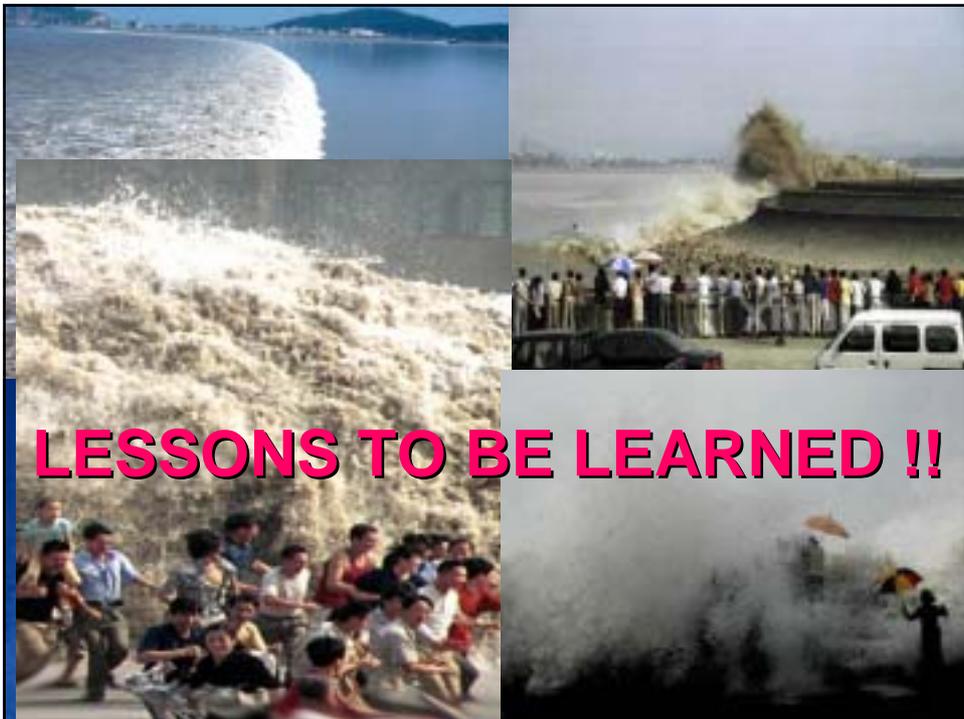
Do not forget your culture, inheritance and tradition



FIG Working Week 09, Eilat



Do not forget your culture, inheritance and tradition





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the END

FIG Working Week 09, Eilat 60

A presentation slide with a dark blue background. The text "the END" is written in a large, white, sans-serif font in the center. The background image shows a view of Earth from space, with a bright blue atmospheric glow. Logos for ITU and isprs are in the top left and right corners respectively. The text "FIG Working Week 09, Eilat" is in the bottom left, and the number "60" is in the bottom right.



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IT'S NOT THE END - to be cont.

FIG Working Week 09, Eilat

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