EMCA
EARTHQUAKE MODEL CENTRAL ASIA

# FIRST EMCA WORKSHOP
# 14-15 June 2011 Bishkek (Kyrgyz Republic)

EMCA
EARTHQUAKE MODEL CENTRAL ASIA

# GFZ Engineering Seismology Group

**Leader**

PD Dr.Habil Parolai

**Seismic Hazard and site effects**

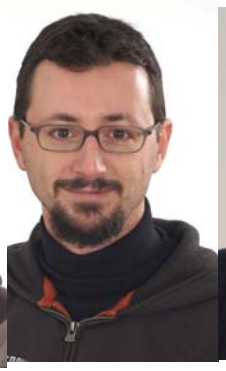
Dr. Bindi

Mr. Ullah

Mr. Pilz

**Early Warning and structural monitoring**

Dr. Picozzi



Dr. Fleming

**Vulnerability and Risk**

Dr. Tyagunov

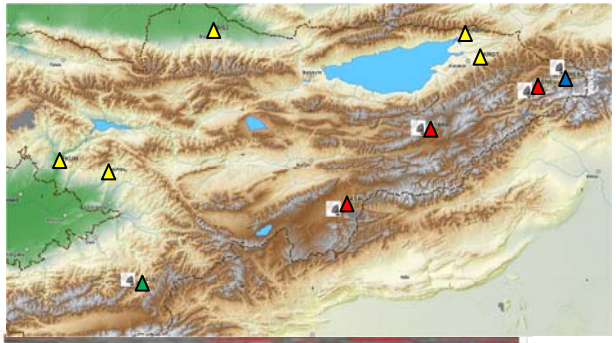
Mr. Wieland

Dr. Pittore

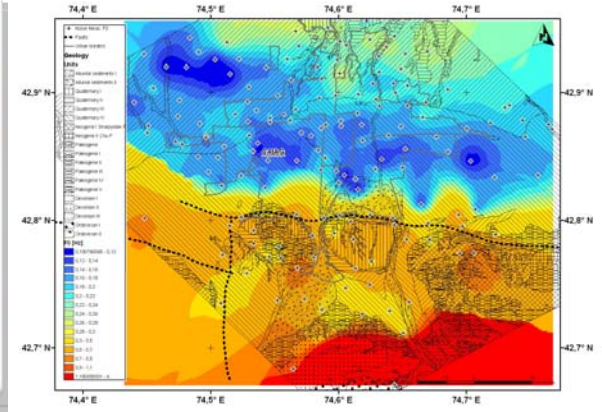
**Mr. Boxberger, Ms Judith Elger,**

**Ms Bojana Petrovic**

# GCO-CA Research



- Watercycle in Central Asia
- Geodynamics of an active continental collision zone
- Georisks and human habitat
- Interaction between climate and geodynamics

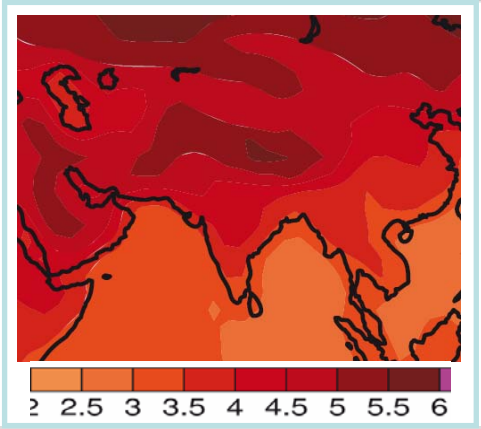



Paleo- and anthropogenous climate variability, monsoon and subarctic dynamics

Geoecology-systems and water balance

Geodynamics, seismicity, surface processes

High elevation, glacier-dynamics and GLOF‘s





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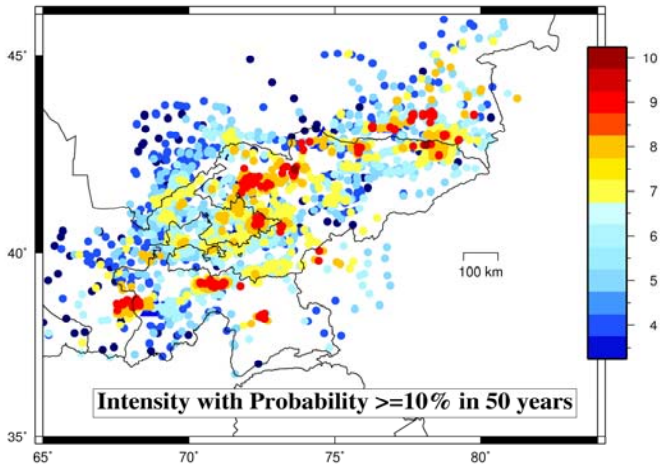
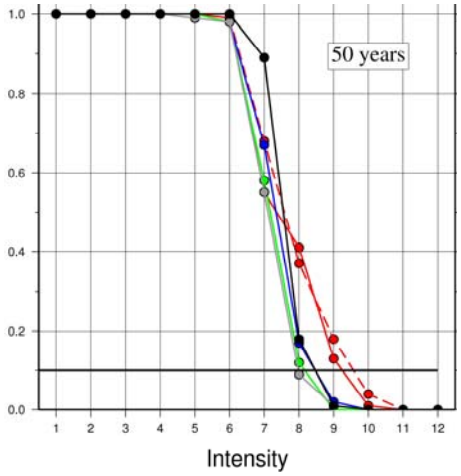
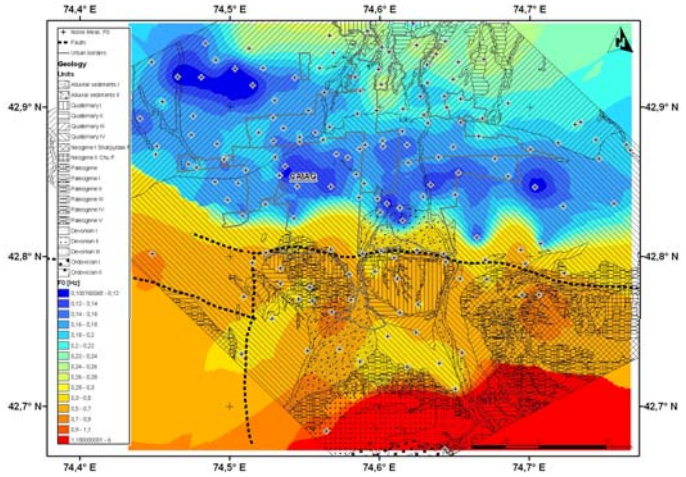
# Seismic Hazard Assessment and site effects




Fundamental resonance frequency map




Almaty
Osh
Dushanbe
Bishkek
Tashkent

Bindi et al. (2011a) in review

Bindi et al. (2011b) submitted

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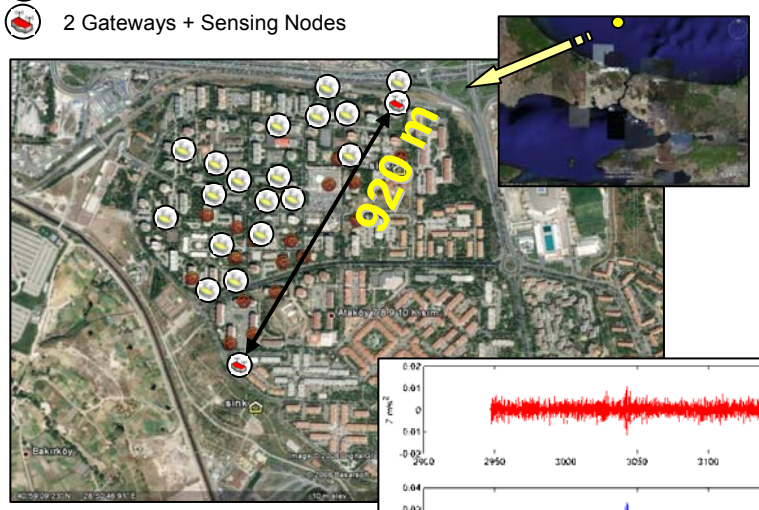
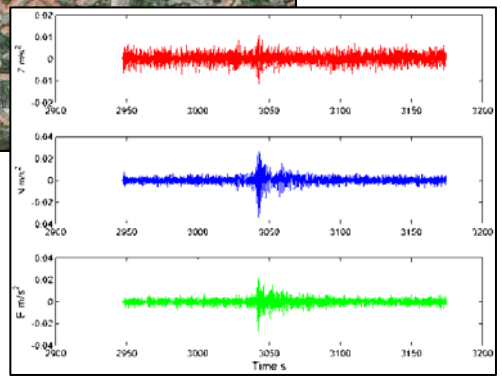
# Early warning and structural monitoring

## Ataköy district , Istanbul (Turkey)

### Early Warning & Rapid Response

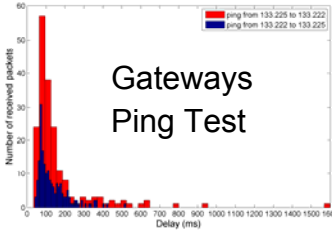
18 Sensing Nodes
2 Gateways + Sensing Nodes



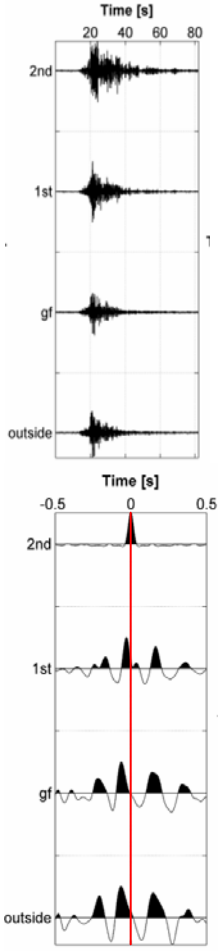

10/07/2008 - 07:50 UTC
Ml 4.9, ~140 km

Network Topology

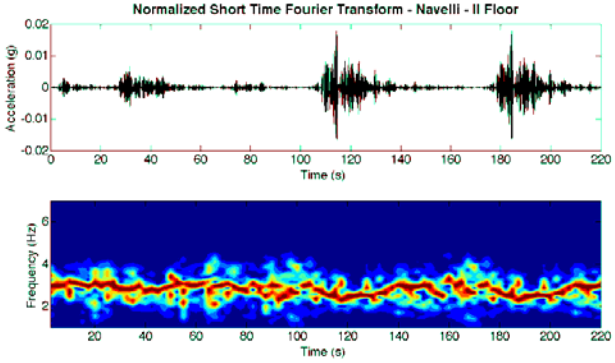

## L'Aquila (Italy) seismic sequence, 2009

### TASK-FORCE Missions




09/04/2009 - 00:53 UTC, Mw = 5.3

### Real-time analysis for Structural Health Monitoring



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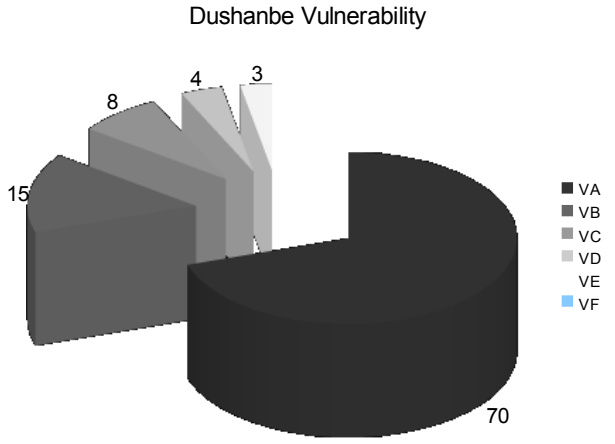
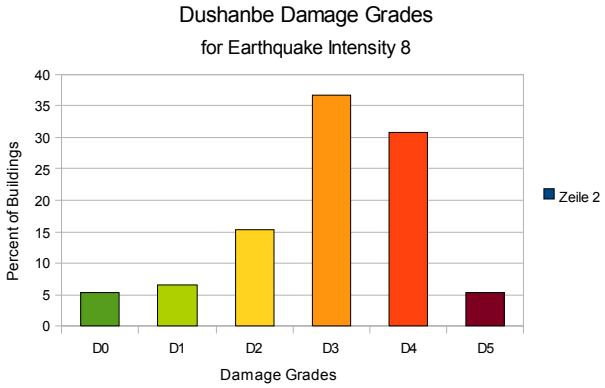
# Vulnerability and Risk

*source: www.digitalglobe.com*




*CEDIM Risk Estimation Tool

- **Open-source** tools, **low-cost** data sources.
- **Globally applicable** on regional and local scale.

# Vulnerability estimation (EMS-98): building scale

Age: 1994-2009
Nr. of storeys: 9
Type: 5-9 storey, concrete, panel, frame
**Vuln: E**

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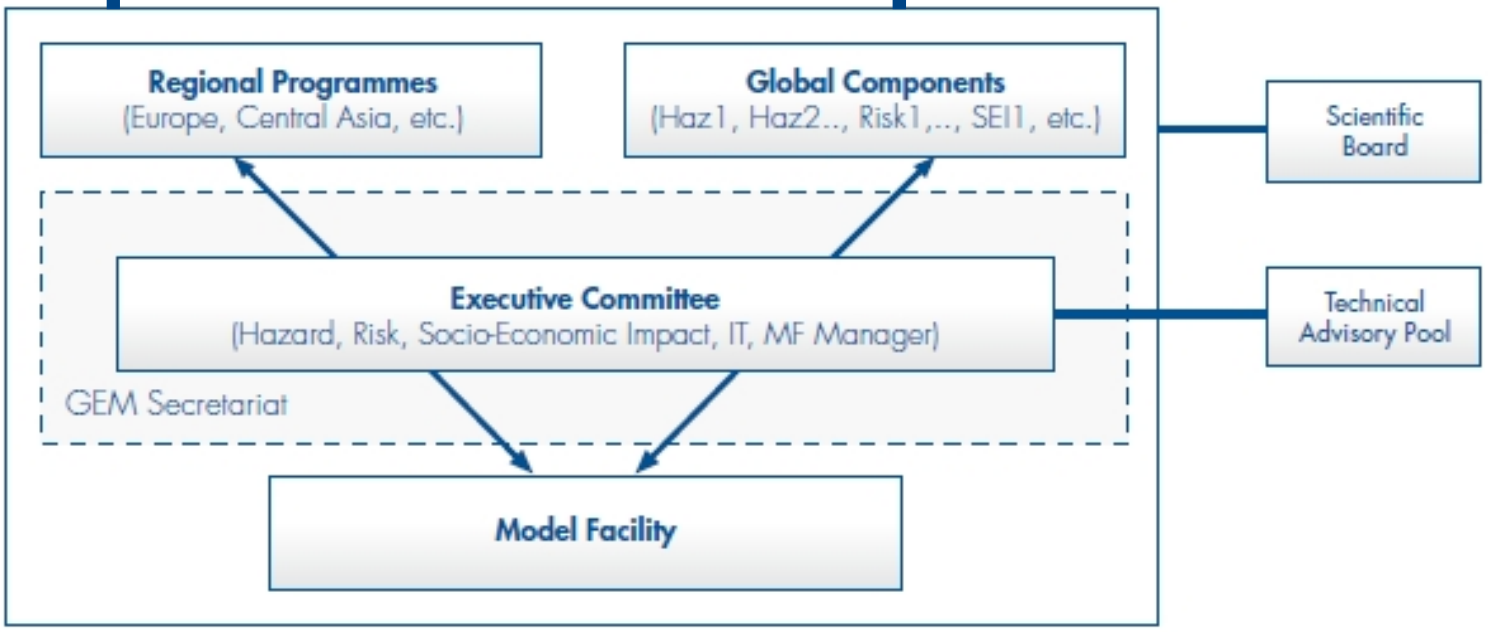
GEM
GLOBAL EARTHQUAKE MODEL

http://www.globalquakemodel.org

Uniform and open standards to calculate and communicate earthquake risk worldwide

## Earthquake Model Central Asia (EMCA)

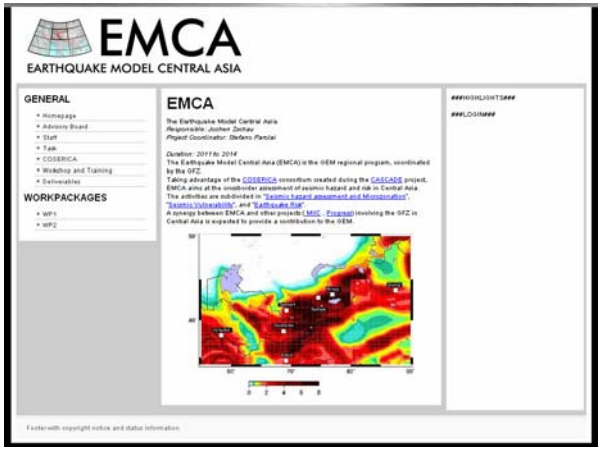
## Inventory Data Capture Tools (IDCT)



# GEM Regional Programs

## Earthquake Model Central Asia (EMCA) Coordinated by GFZ

http://www.emca-gem.org/

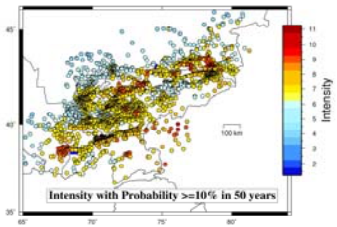


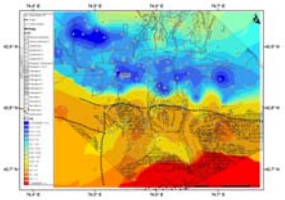

**Seismic and landslides Hazard**

**Microzonation**

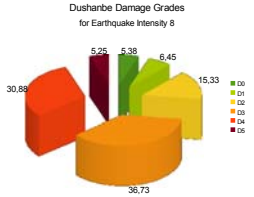
**Vulnerability**

**National and International Projects**



**Seismic and landslides Risk**



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# Earthquake Model Central Asia

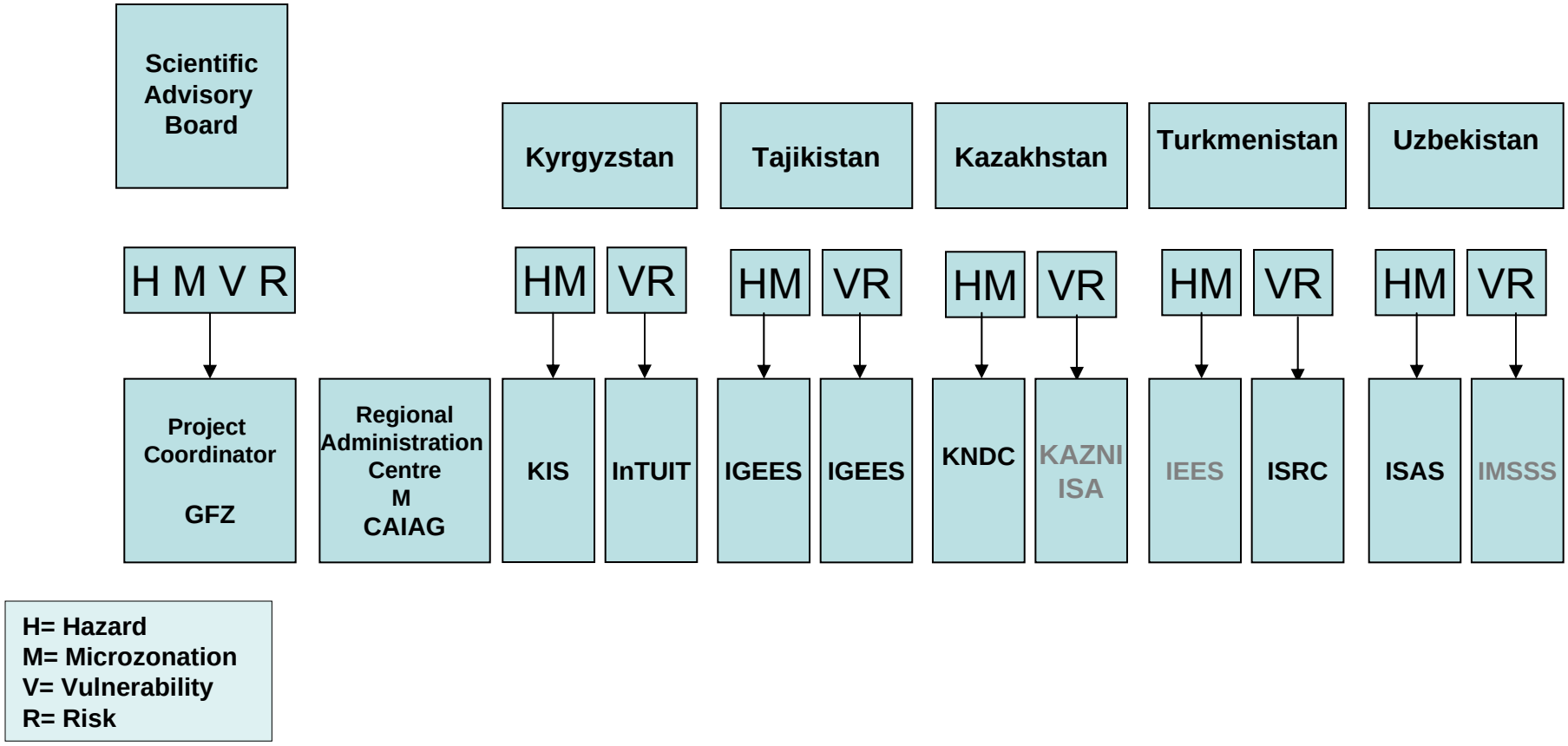

Table 1

EMCA
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**GENERAL**

- Homepage
- Advisory Board
- Staff
- Task
- COSERICA
- Workshop and Training
- Deliverables

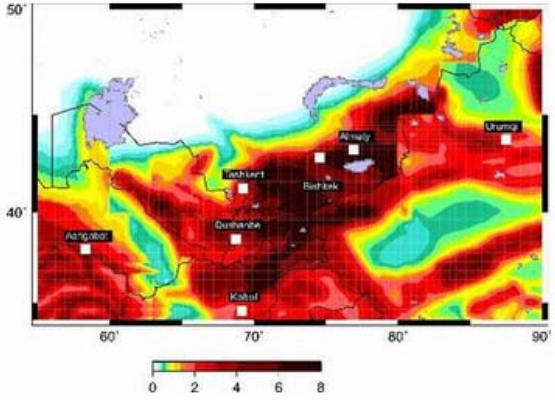
**WORKPACKAGES**

- WP1
- WP2

## EMCA

The Earthquake Model Central Asia
*Responsible: Jochen Zschau*
*Project Coordinator: Stefano Parolai*

*Duration: 2011 to 2014*
The Earthquake Model Central Asia (EMCA) is the GEM regional program, coordinated by the GFZ.
Taking advantage of the COSERICA consortium created during the CASCADE project, EMCA aims at the crossborder assessment of seismic hazard and risk in Central Asia.
The activities are subdivided in "Seismic hazard assessment and Microzonation", "Seismic Vulnerability", and "Earthquake Risk".
A synergy between EMCA and other projects ( MIIC , Progress) involving the GFZ in Central Asia is expected to provide a contribution to the GEM.




###HIGHLIGHTS###

###LOGIN###

Footer with copyright notice and status information

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# Earthquake Model Central Asia
# GFZ participants

**Project Responsible**

Prof. Zschau

**Project Coordinator**:

Dr. Parolai

## Seismic Hazard

Dr. Bindi

Mr. Ullah

## Vulnerability and Risk

Dr. Tyagunov

Mr. Wieland

Dr. Pittore

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EARTHQUAKE MODEL CENTRAL ASIA

# Networking

*Cross-border scientific „Consortium for Earthquake Risk Reduction“ (COSERICA)*

Bilateral MoU signed between GFZ and:

**Afghanistan** University of Kabul, Department of Geosciences Kabul
**Kazakhstan** LLC Institute of Seismology (IOS), **Almaty**
**Kazakhstan** National Nuclear Center, Institute of Geophysical Research, Center for Acquisition and Processing of Special Seismic Information (KNDC), **Almaty**
**Kyrgyzstan** Central-Asian Institute for Applied Geosciences (CAIAG), **Bishkek**
**Kyrgyzstan** Institute of Seismology (KIS), **Bishkek**
**Kyrgyzstan** International University for Innovation Technologies, **Bishkek**
**Kyrgyzstan** Kyrgyz State University of Construction, Transportation and Architecture, **Bishkek**
**Tajikistan** Institute of Earthquake Engineering and Seismology (IEES), **Dushanbe**
**Turkmenistan** Institute of Seismology and Earthquake Engineering, **Ashgabat**
**Turkmenistan** Scientific Res. Ins. of Seismic-resistance Const., **Ashgabat**
**Uzbekistan** Institute of Seismology of Academy of Sciences of Republic of Uzbekistan, **Tashkent**

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EARTHQUAKE MODEL CENTRAL ASIA

# Detailed Time Table

| | 2011 | | | | 2012 | | | | 2013 | | | | 2014 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| **Workshops** | | | | | | | | | | | | | |
| **Training** | | | | | | | | | | | | | |
| **Support local scientists** | | | | | | | | | | | | | |
| **Milestones** | | | | M1 | | | | M2 | | | | M3 | M4 |
| **Deliverables** | | | | D1 | | | | D2-D3 | | | | D4 | |

**M1=**Collection data for input in seismic hazard completed, consensus on the cross border hazard model and building classification scheme reached

**M2=**Harmonized low and high resolution hazard model ready, low and high resolution vulnerability data set ready

**M3=**Harmonized risk model for CA ready

**M4=**Effective dissemination of the results carried out

**D1=** Deliverable on available data for seismic hazard

**D2=** Deliverable on harmonised seismic hazard

**D3=** Deliverable on vulnerability data set

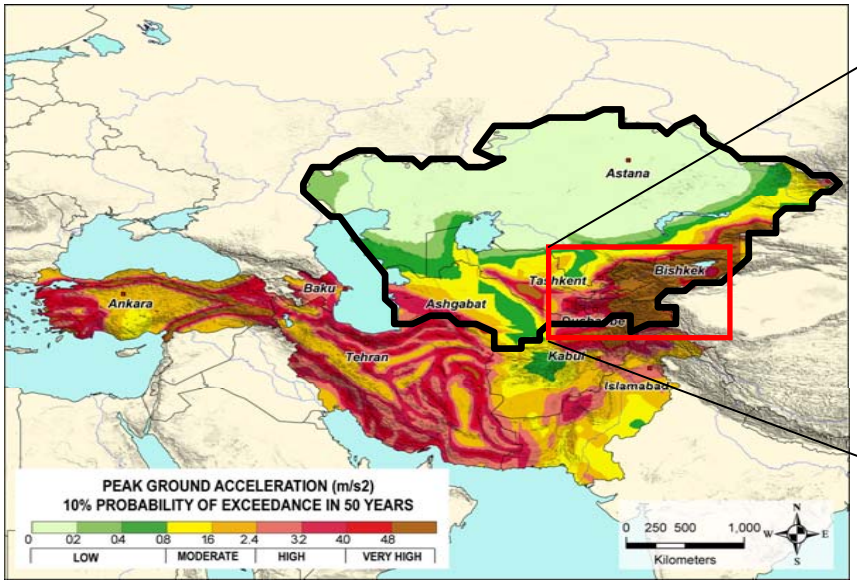
**D4=** Deliverable on harmonised seismic risk

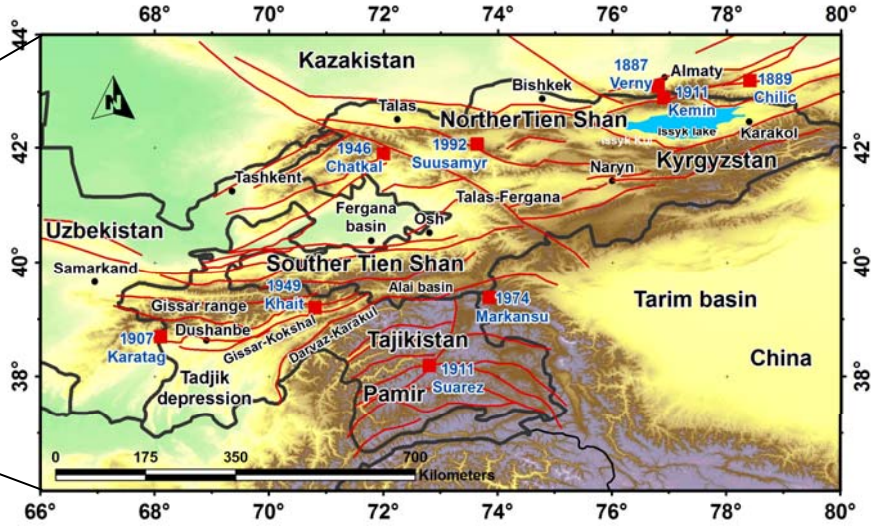
2011 Site effect studies in Karakol (Kyrgyzstan)

2012 Site effect studies in Dushanbe and other sites in Tajikistan

Developments:

- Extension of the investigated area in particular to the West (Turkmenistan) and if possible to the South (Afghanistan)



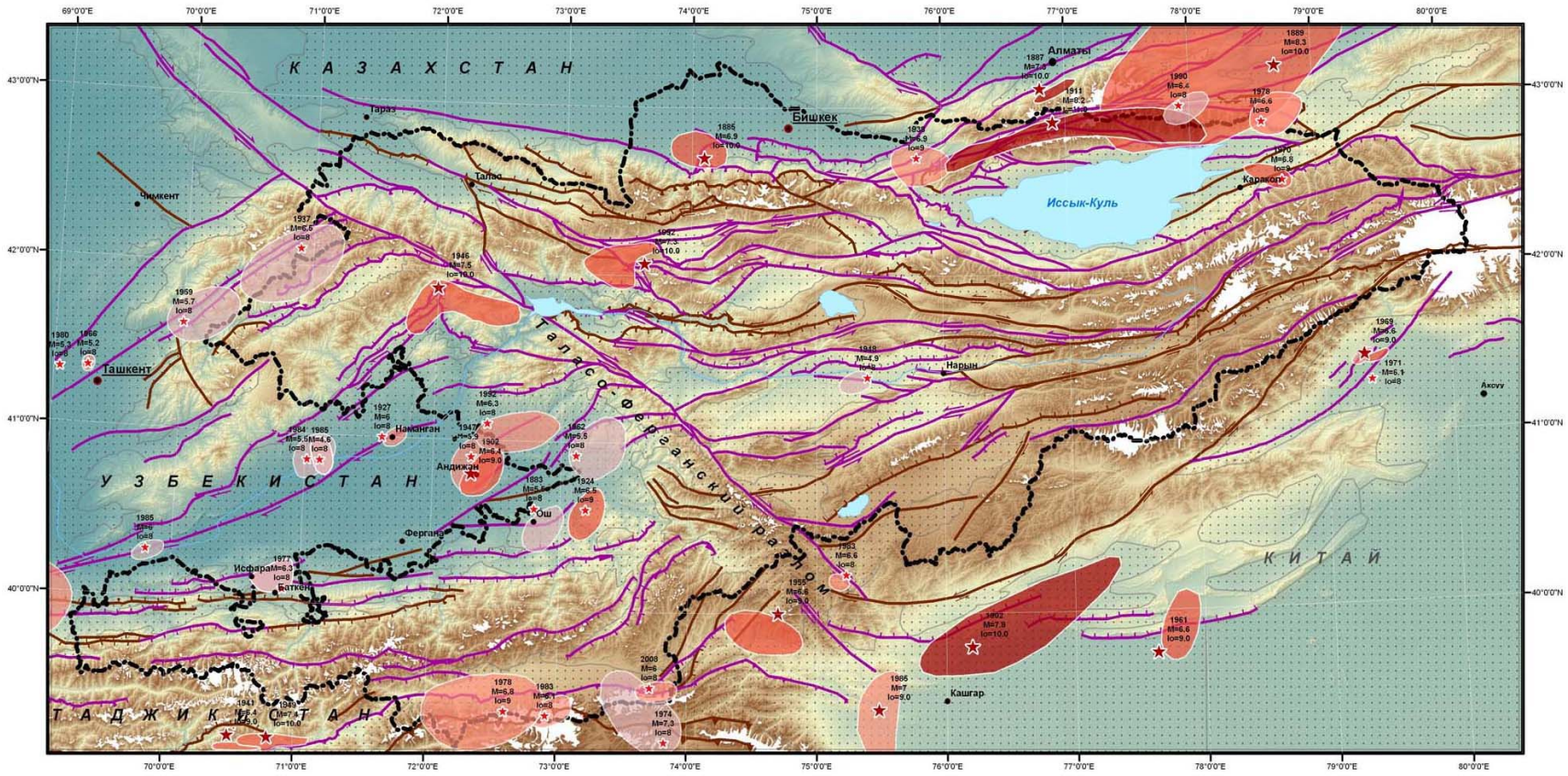




- Fault and Zonation model (harmonisation with EMME)

- GMPE?? (regional vs local; numerical simulations)

EMME
EARTHQUAKE MODEL OF THE MIDDLE EAST REGION

# Сейсмическая карта Кыргызстана на 2009 год



# Sentinel Asia

Disaster Management Support System in the Asia-Pacific Region

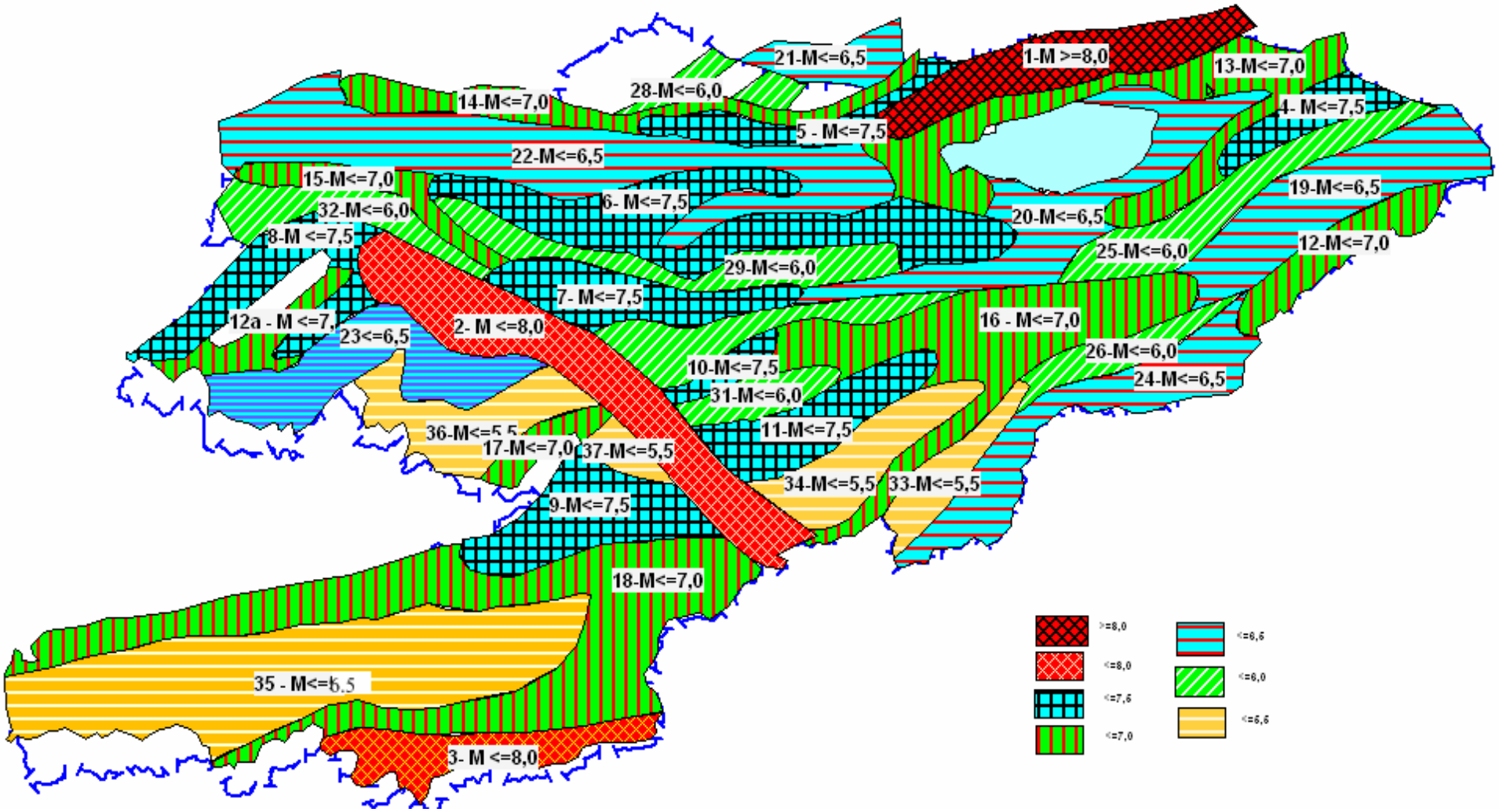


Emergency Observation
Wildfire Monitoring
Flood Monitoring
MTSAT Imagery
Capacity Building
Web Forum

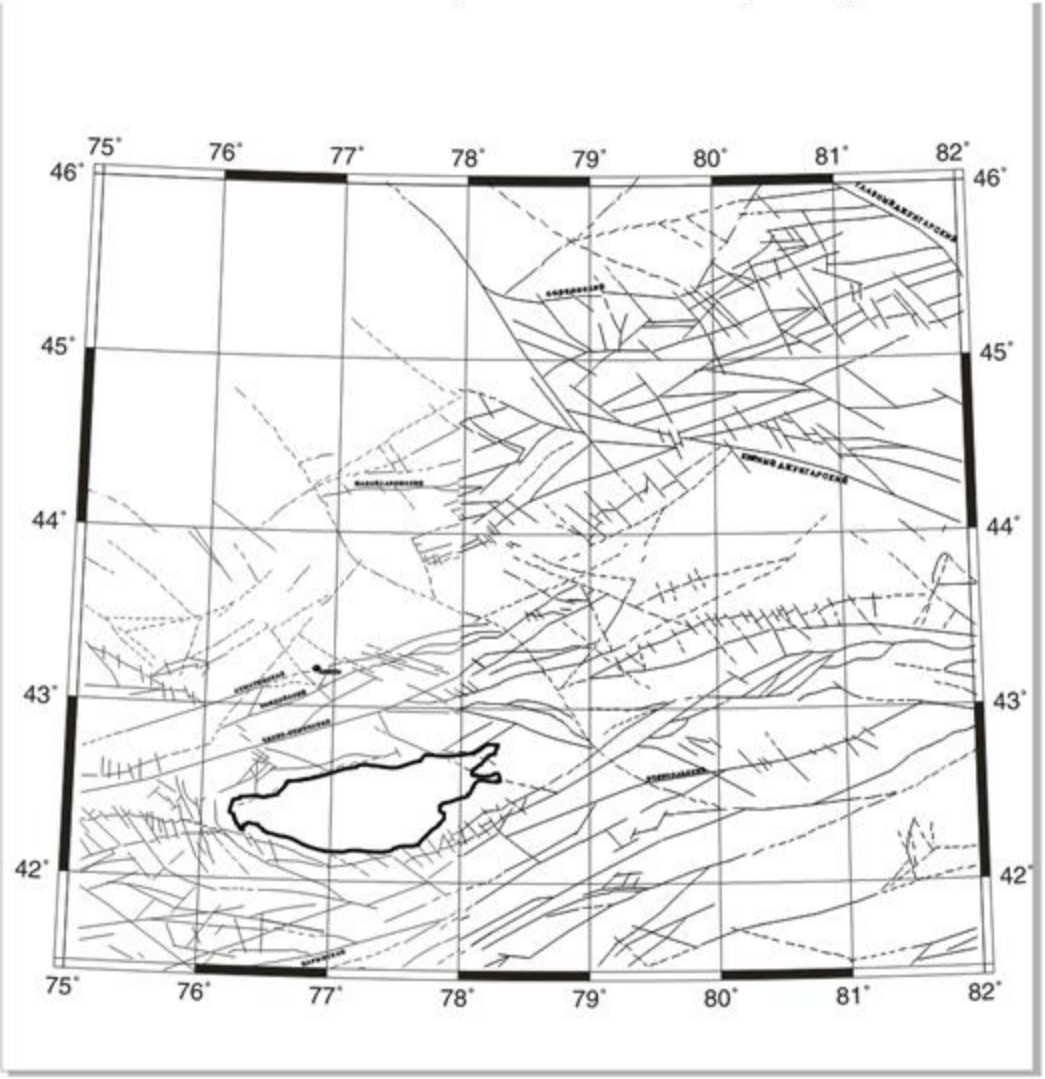
## JPT Members

| No. | Country | No. | Organization | Data Provider Node (DPN) | Data Analysis Node (DAN) |
|---|---|---|---|---|---|
| 1 | Australia | 1 | CSIRO Office of Space Science and Applications (COSSA) | | |
| | | 2 | Geoscience Australia (GA) | | |
| | | 3 | Australian Bureau of Meteorology | | |
| 10 | Japan | 17 | Keio University | | |
| | | 18 | Japan Aerospace Exploration Agency (JAXA) | ● | |
| | | 19 | Infrastructure Development Institute(IDI) Japan (IFNet) | | |
| | | 20 | Hokkaido University | | |
| 11 | Korea | 21 | Korea Aerospace Research Institute(KARI) | ● | |
| 12 | Kyrghyz | 22 | Central Asian Institute of Applied Geosciences (CAIAG) | | ● |
| 13 | Lao P.D.R. | 23 | Ministry of Labor and Social Welfare | | |
| | | 24 | Water Resources and Environment Administration (WREA), Prime Minister Office (PMO) | | |
| 14 | Malaysia | 25 | National Security Division, Prime Minister's Department | | |
| | | 26 | Malaysian Remote Sensing Agency | | |
| 15 | Mongolia | 27 | National Remote Sensing Center of Mongolia (NRSC) | | |
| 16 | Myanmar | 28 | Department of Meteorology and Hydrology | | |
| | | 29 | Relief and Resettlement Department | | |
| | | 30 | Department of Water Induced Disaster Prevention | | |

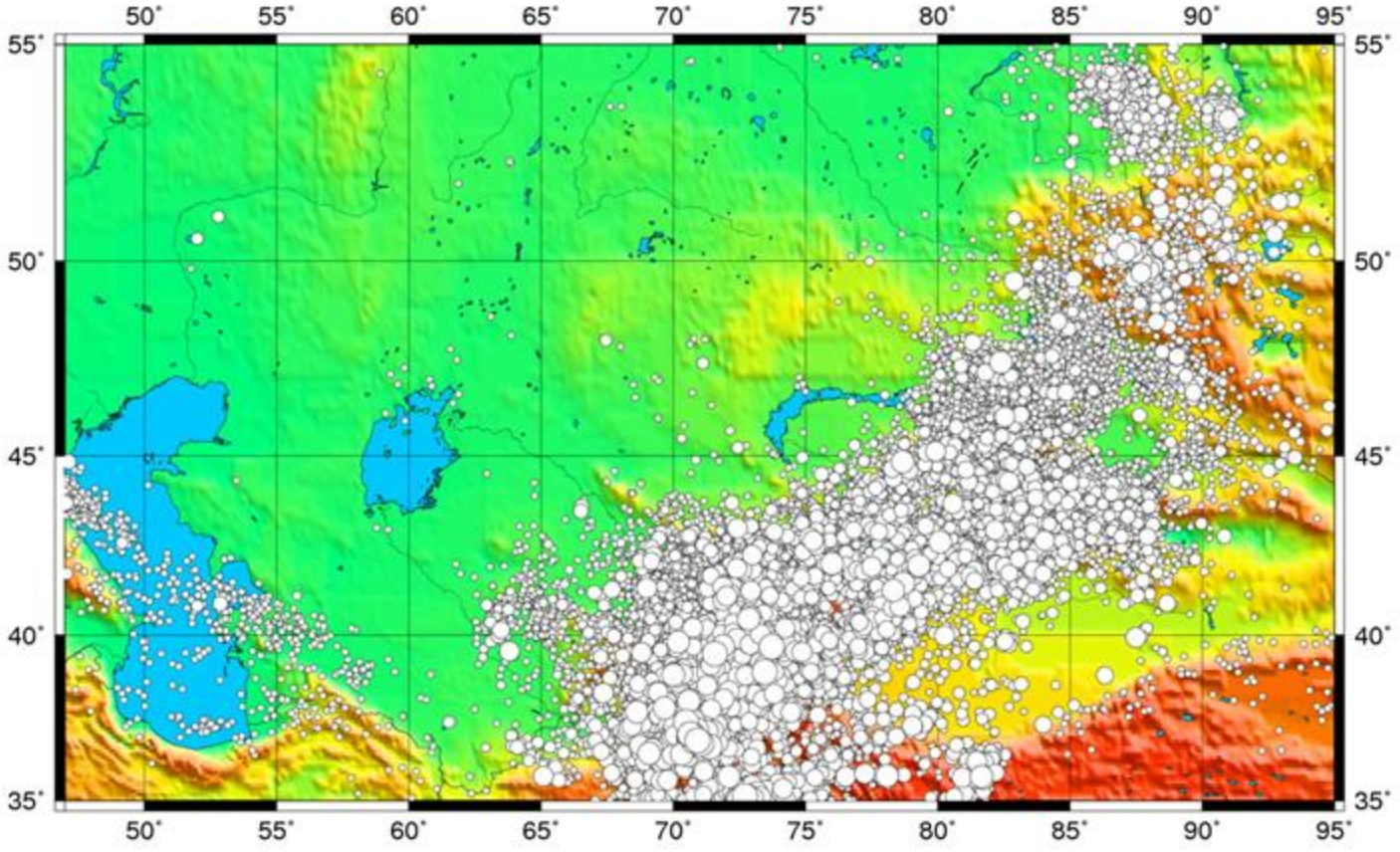
# Карта зон возможных очагов землетрясений



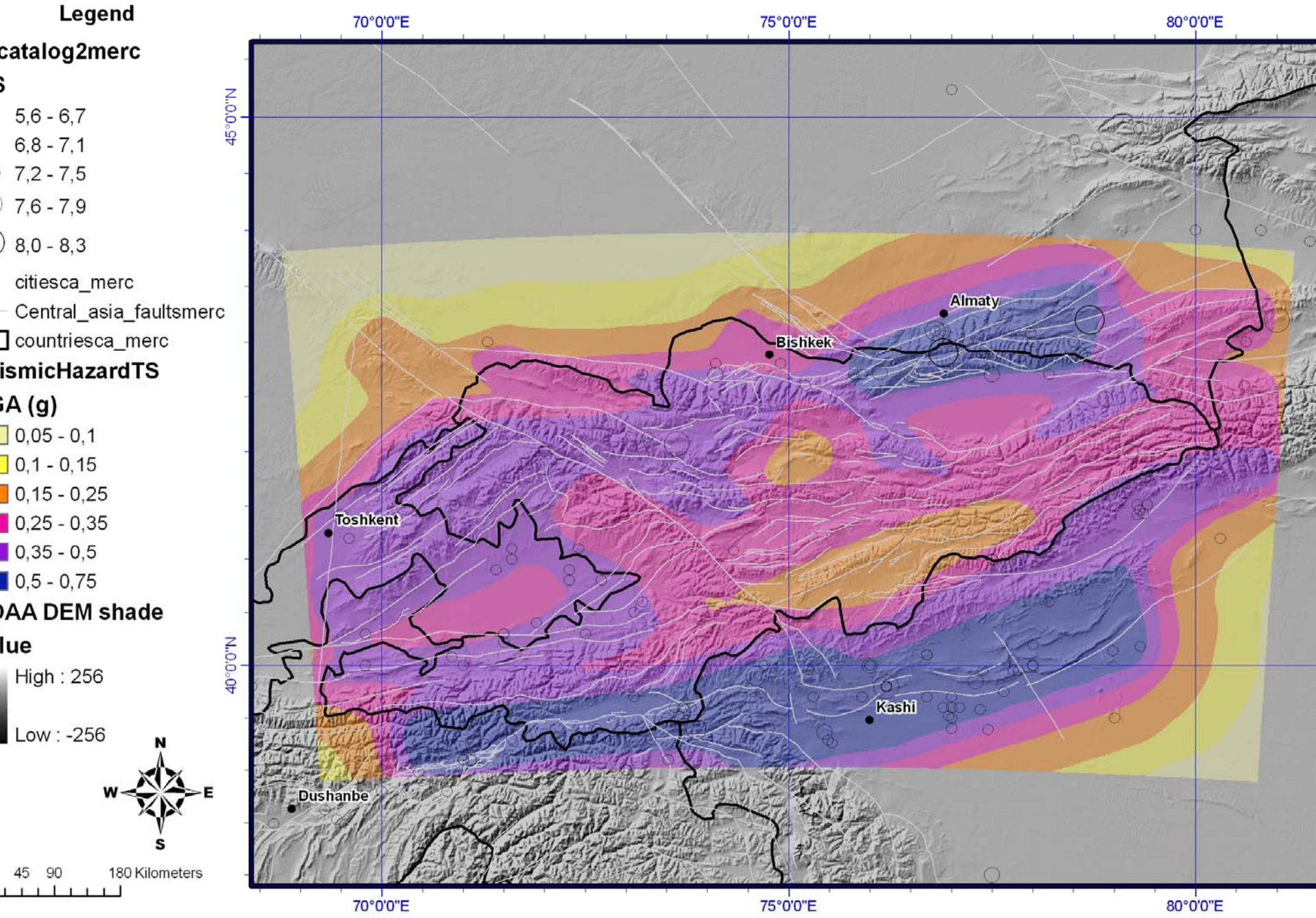
# Карта основных разломов территории Казахстана и прилегающих районов



- Составляется сводный сейсмологический бюллетень по данным двух сетей наблюдений, который представляется на веб-сайт
- www.kndc.kz.

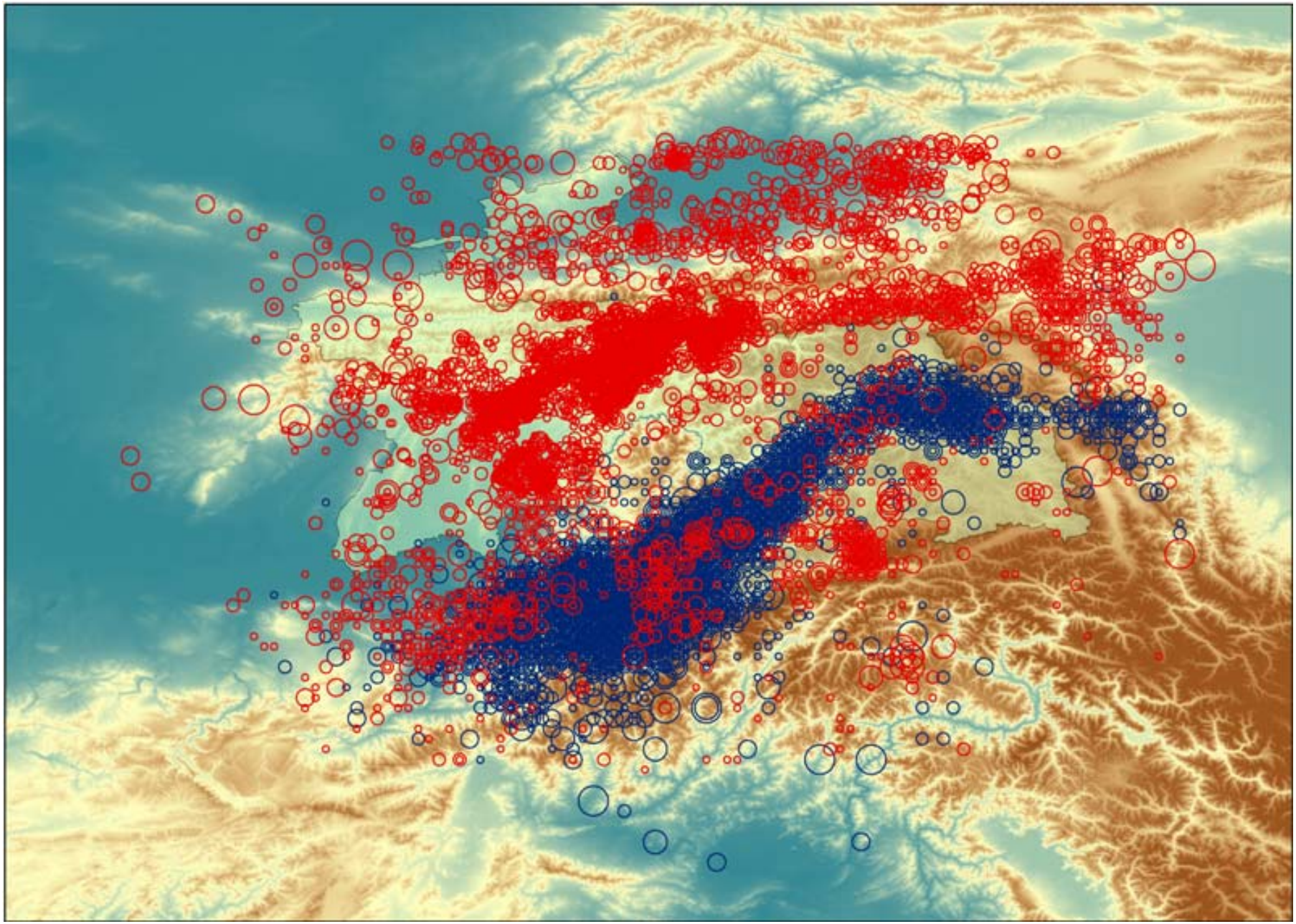


# Probabilistic PGA map of the Kyrgyz Tien Shan and surrounding regions

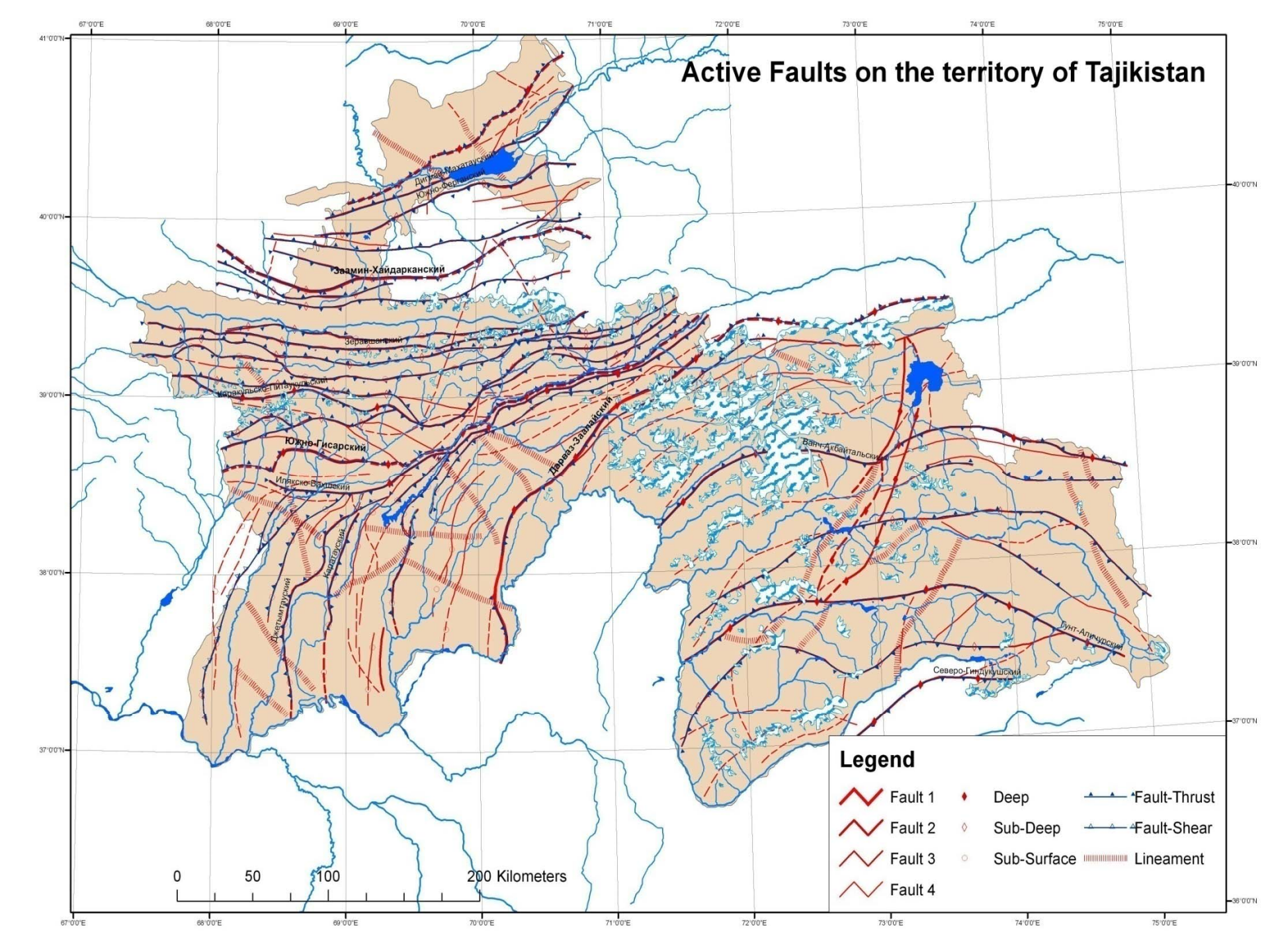


# Batken, 2007, 7

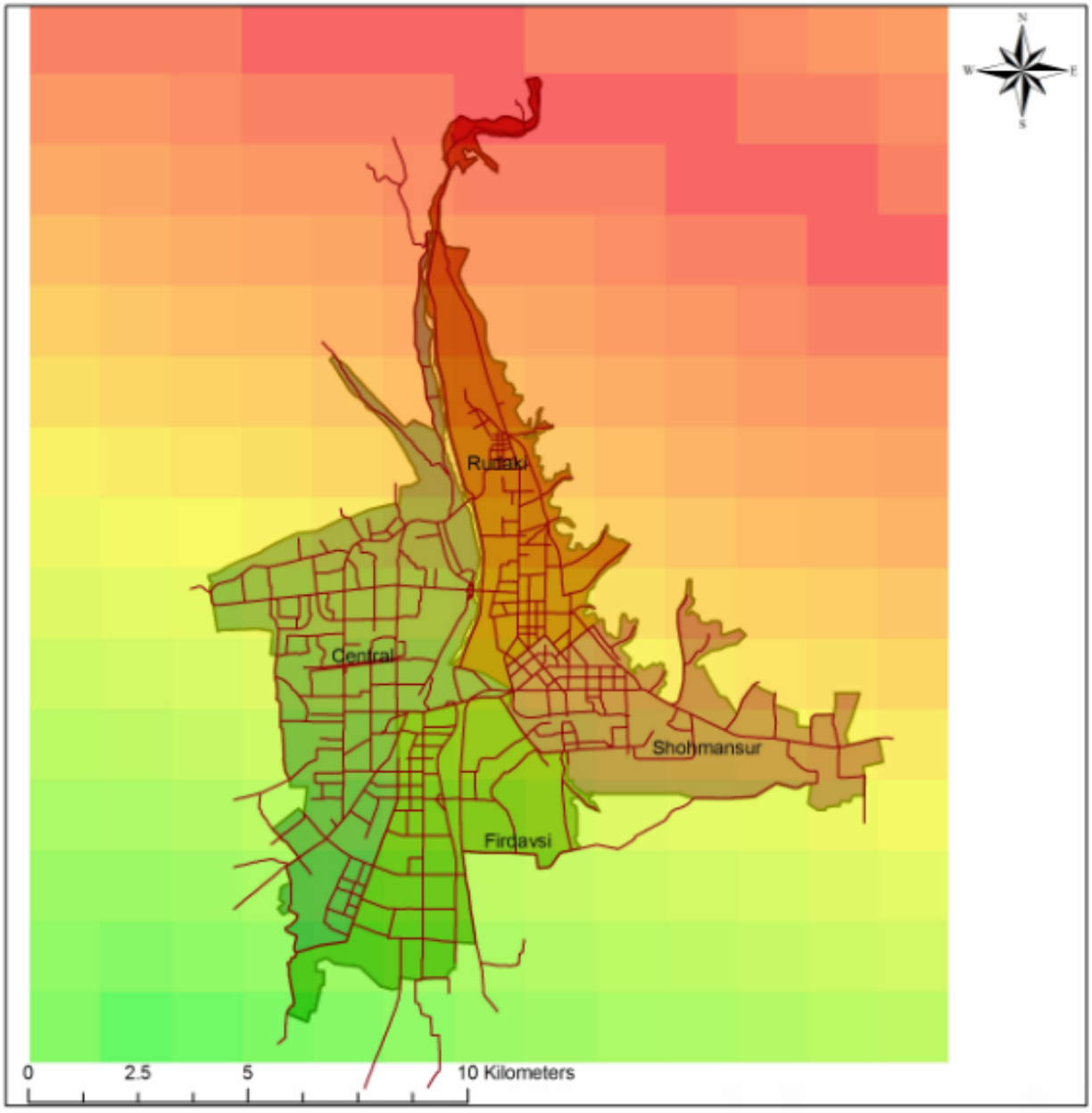
# Buildings with seismic isolation



Распределение коровых (H<= 75 км) и глубокофокусных (H>= 75 км) землетрясений на территории Таджикистана


Active Faults on the territory of Tajikistan
Дигмай-Махатауский
Южно-Ферганский
Заамин-Хайдарканский
Зеравшанский
Каракульско-Питнакский
Южно-Гисарский
Ийлякско-Вахшский
Дарваз-Заванский
Ванч-Акбайтальский
Кашгауский
Жетымтауский
Пунт-Аличурский
Северо-Гиндукушский
0
50
100
200 Kilometers
Legend
Fault 1
Fault 2
Fault 3
Fault 4
Deep
Sub-Deep
Sub-Surface
Fault-Thrust
Fault-Shear
Lineament

Dushanbe_SHA_1.jpg - Picasa Photo Viewer




# Seismic hazard evaluation for Dushanbe city in PGA

Table A1. Seismic Intensity scale with relation to ground motion.[1]

| PGA (m/s²) | <0.17 | 0.17-1.4 | 1.4-3.9 | 3.9-9.2 | 9.2-18 | 18-34 | 34-65 | 65-124 | >124 |
|---|---|---|---|---|---|---|---|---|---|
| PGV (cm/sec) | <0.1 | 0.1-1.1 | 1.1-3.4 | 3.4-8.1 | 8.1-16 | 16-31 | 31-60 | 60-116 | >116 |
| ESTIMATED INTENSITY | I | II-III | IV | V | VI | VII | VIII | IX | X+ |
| Description | | | | | | | | | |
| I | Not felt, no item displaced, and no damage. | | | | | | | | |
| II | Intensity felt, no items displaced, and no damage. | | | | | | | | |
| III | Weak shaking, hanging objects swing slightly, and no damage. | | | | | | | | |
| IV | Mild shaking, hanging objects swing and windows and doors rattle, and no damage. | | | | | | | | |
| V | Moderate shaking, hanging objects swing considerably and precarious objects may fall over, and negligible damage to unreinforced masonry buildings. | | | | | | | | |
| VI | Strong shaking with few people losing their balance, furniture may be shifted, and few unreinforced masonry buildings suffer slight structural damage. | | | | | | | | |
| VII | Very strong shaking and difficult to stand, objects fall from shelves, and many unreinforced masonry buildings will suffer slight to moderate structural damage and few will experience moderate to heavy structural damage. | | | | | | | | |
| VIII | Severe shaking, furniture overturned, and many unreinforced masonry buildings will suffer moderate to heavy structural damage and few will experience heavy to very heavy structural damage. | | | | | | | | |
| IX | Violent shaking with people forcibly thrown to the ground, monuments and columns fall, and most unreinforced masonry buildings will suffer heavy to very heavy structural damage. | | | | | | | | |
| X+ | Extreme shaking, and most unreinforced masonry buildings will suffer very heavy structural damage. | | | | | | | | |

**Legend**

**PGA_Dushanbe**

**Value**

High : 685.317

Low : 458.998

**Districts_Dushanbe**

**Name**

- Central
- Firdavsi
- Rudaki
- Shohmansur

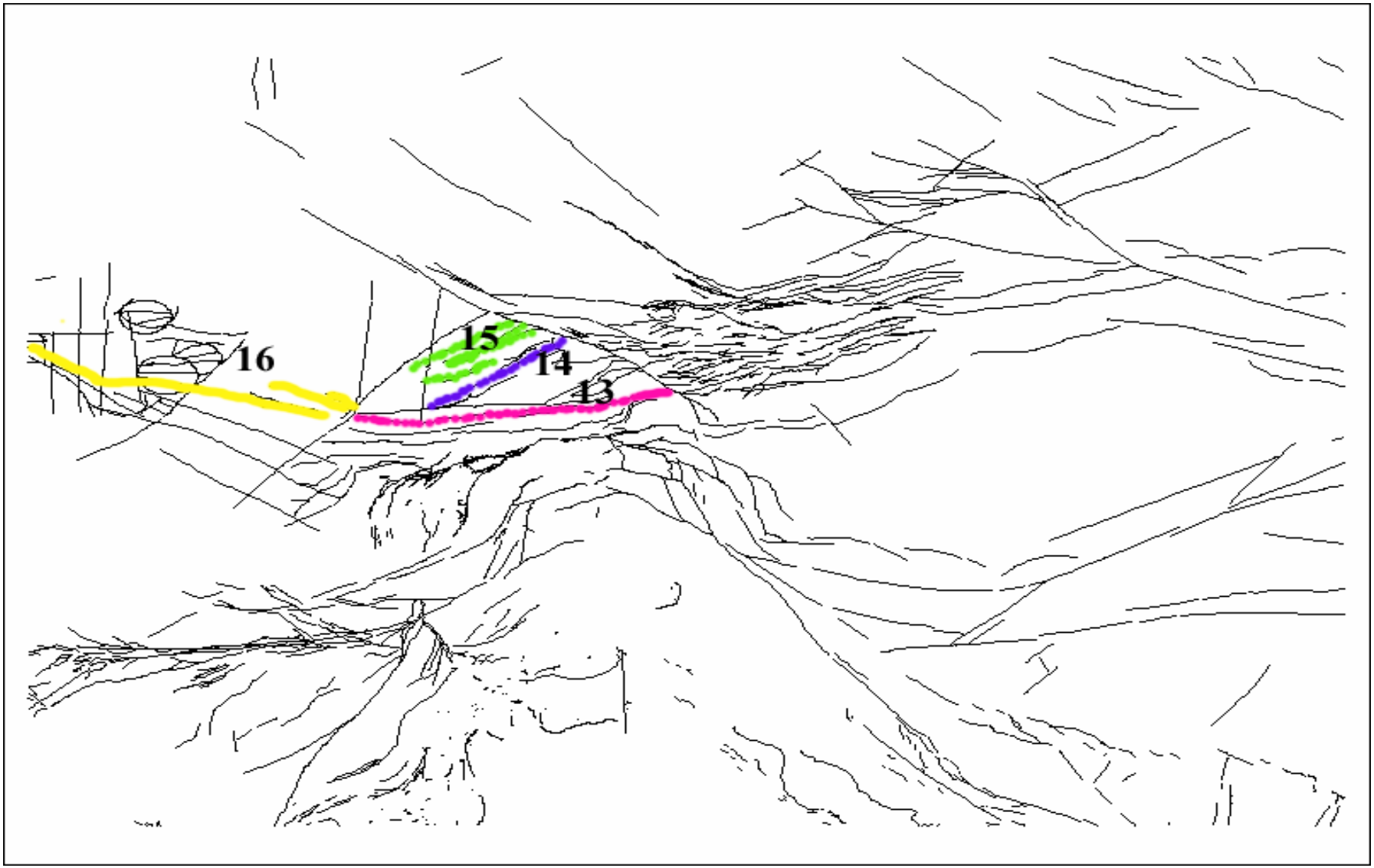
A.R. Ischuk, 2010

**Характер повреждений зданий, возведенных с учетом 7-балльной сейсмики**

**Существующая застройка городов и населенных пунктов Таджикистана отличается широким разнообразием. При этом, между застройкой городов и сельских населенных пунктов имеется значительный контраст**


**В жилой застройке сельских населенных пунктов капитальные дома представлены, как правило, 2-х, реже 3-х этажными кирпичными или каменными зданиями, составляющих не более 10% застройки.**

# Карта активных разломов Центральной Азии. 13 – Южно-Ферганский разлом; 14 – Северо-Ферганский разлом; 15 – Каржантауский разлом; 16 – Западно Тянь-Шаньский разлом

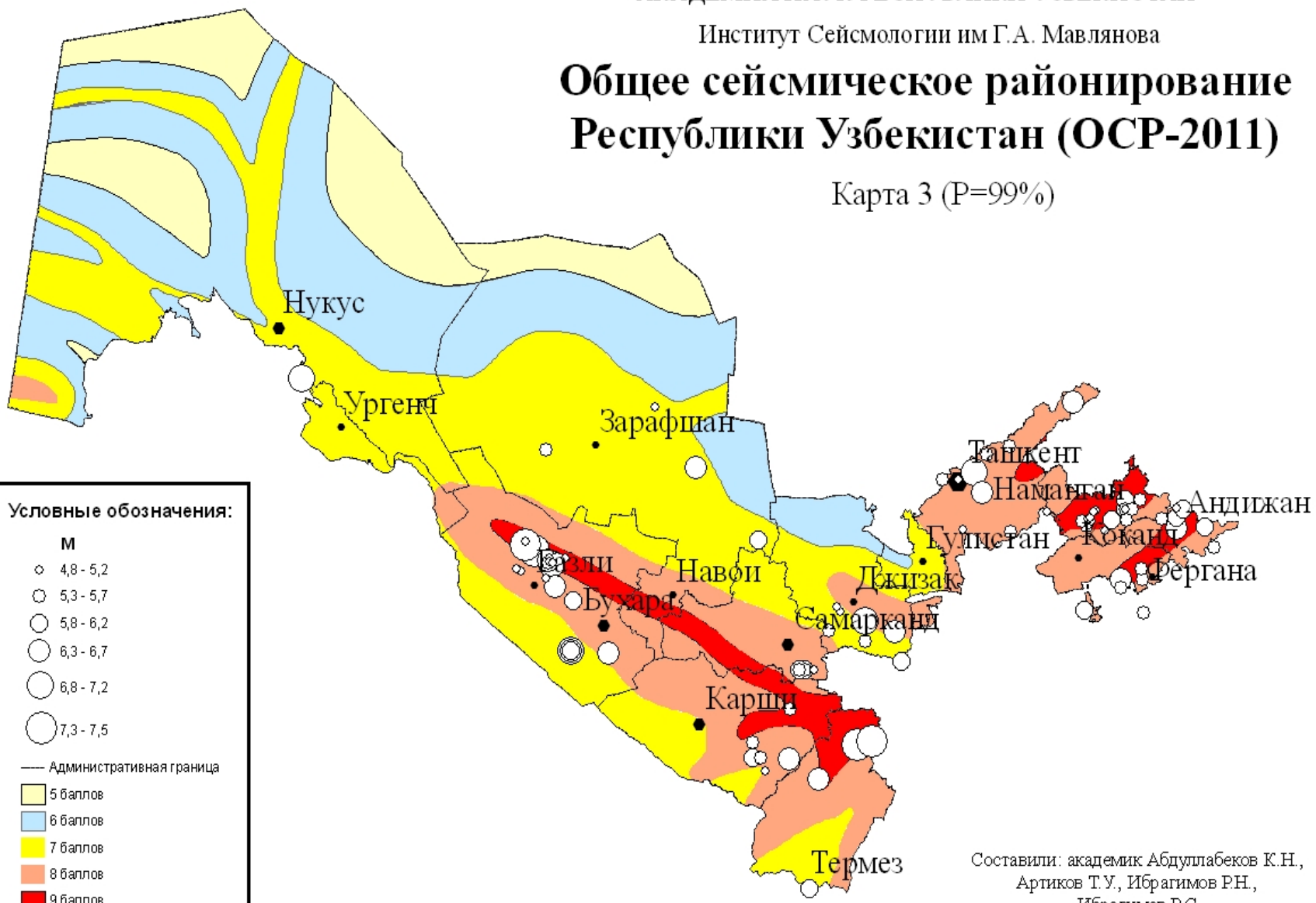


АКАДЕМИЯ НАУК РЕСПУБЛИКИ УЗБЕКИСТАН

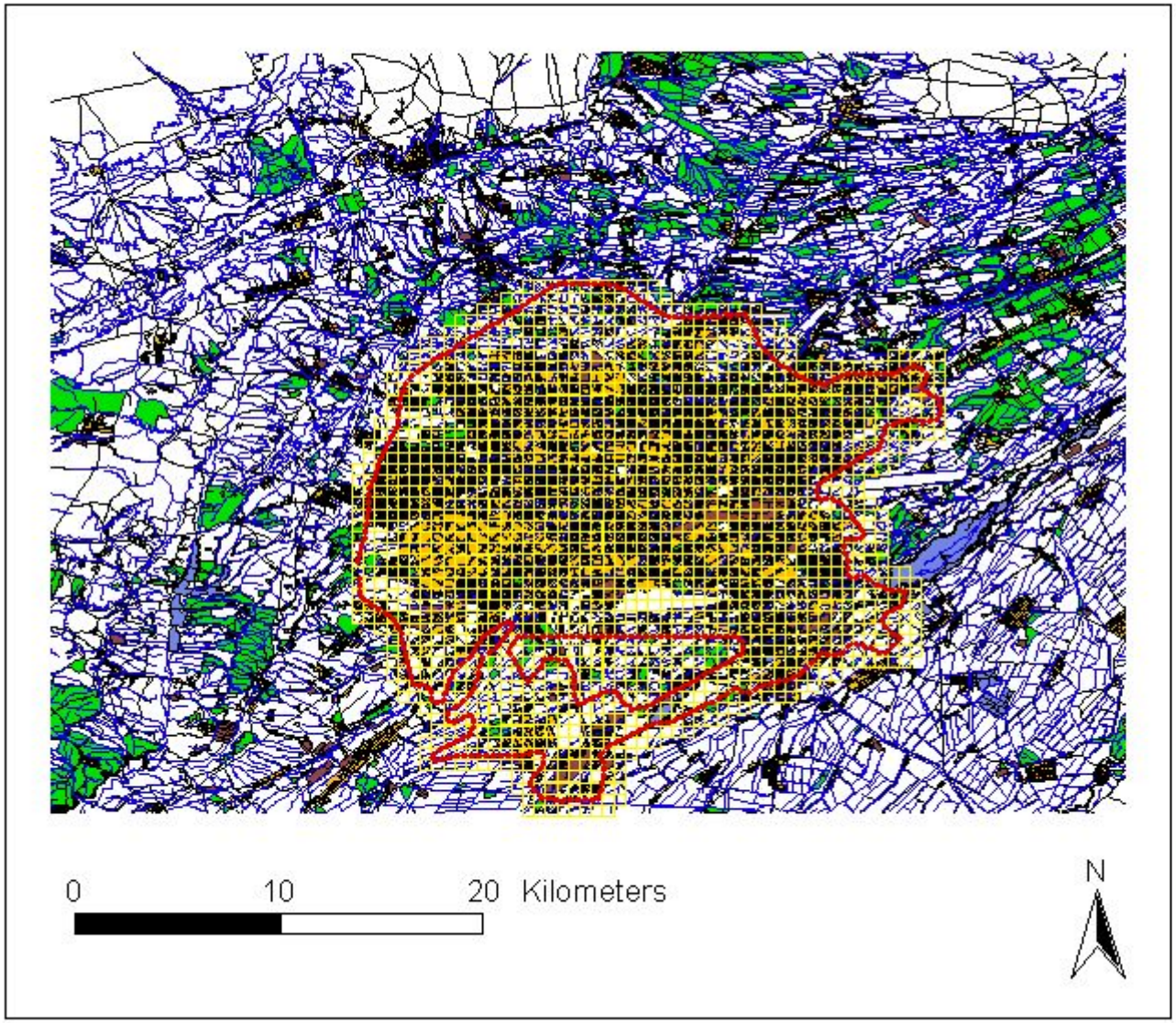
Институт Сейсмологии им Г.А. Мавлянова

# Общее сейсмическое районирование Республики Узбекистан (ОСР-2011)

Карта 3 (P=99%)



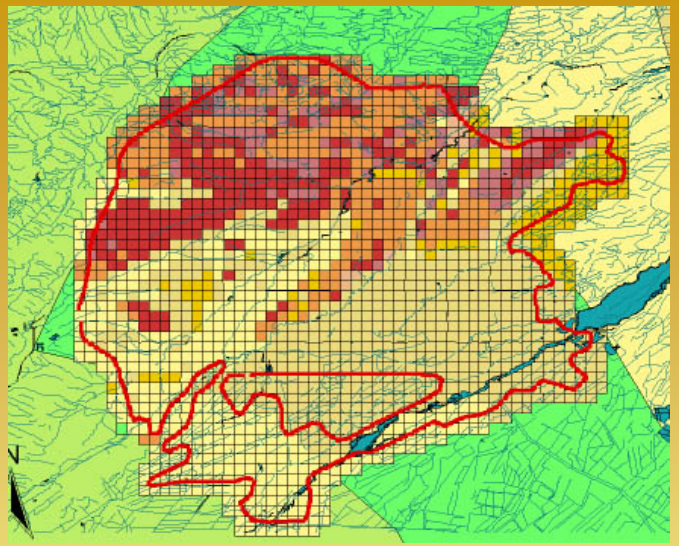

Составили: академик Абдуллабеков К.Н., Артиков Т.У., Ибрагимов Р.Н., Ибрагимов Р.С.

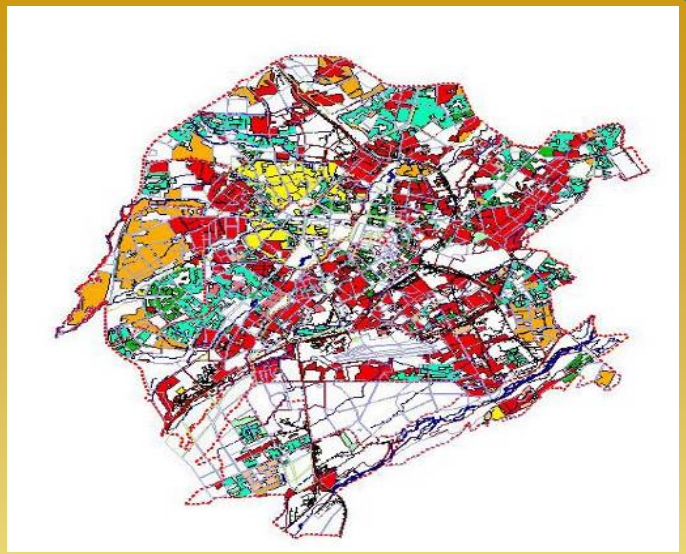


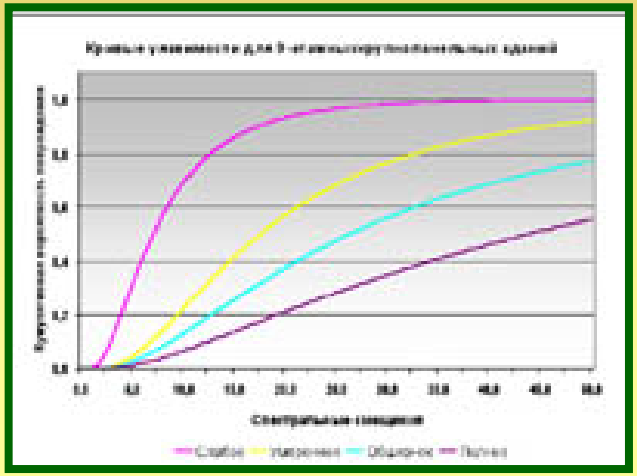

**Tashkent city area**

Территория города была разбита на ячейки с размерами 0.005°x 0.005° и все параметры вводились в атрибутивные поля тематических слоев

City border.shp
grid for Tashkent
Canals
Roads
Residential buildings
Industrial Enterprises
Rivers, Lakes
Parks, Woodes







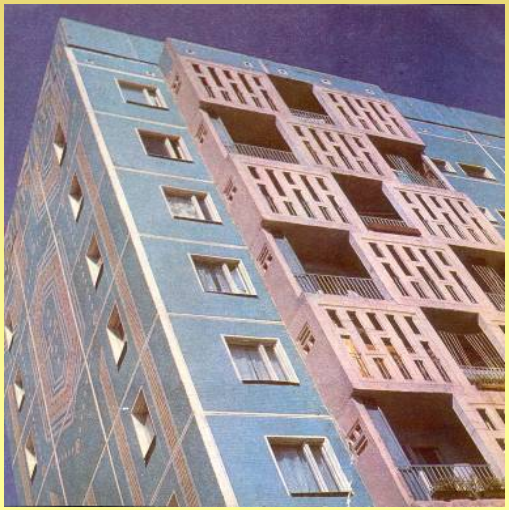


Схема процедура проведения исследований

# Interaction With Other Regional Programs