CENTRAL ASIAN INSTITUTE FOR APPLIED GEOSCIENCES

www.caiag.kg

Co-Directors: A. Moldobekov
J. Lauterjung
Central-Asian Institute for Applied Geosciences was established in 2004 on the basis of the Cooperative Agreement between the Government of the Kyrgyz Republic and the German Center for Geosciences, Potsdam

- Legal status – public foundation
- CAIAG is a non-commercial research institute
- CAIAG’s founders are the Government of the Kyrgyz Republic and the German Center for Geosciences, Potsdam
- CAIAG is financed from three sources: country budget, financing from German projects and third parties projects
- The staff is 60 persons, 60% of them are research workers.
Automatic complex network of monitoring of natural processes
Monitoring stations network
(total number of stations – 60)
Data transmission systems of the monitoring network

- VSAT
- Radio channels
- Mobile communication (Megacom, Beeline)
- Internet
Aksay Station for seismic, meteorological and GPS observations

This year the station registered air temperature of -48.3°C

Measured hydrometeorological parameters:

- Temperature and humidity
- Atmosphere pressure
- Liquid precipitation
- Wind speed and direction
- Soil temperature and humidity
- Solar radiation
- Water equivalent of snow (at 3 stations)
- Water discharge in the river (at 1 station)
- Water level in reservoirs (satellite imagery)
Station at the Abramov Glacier (meteorological and GPS observations)

The station is set in 2013 instead of destroyed one during the Batken events

- Location of the base camp of our expedition, January 2017 (H = 4100 m)
Sensor Data Storage System (SDSS)

- Data from stations are transmitted to the SDSS database which is stored in CAIAG’ server
- 94 objects of observation
- 115 measured parameters
- 205 mln records
- Can be used by stakeholders
Sensor Data Storage System (SDSS)

Taragay Station

Tasks:
Accumulation, storage, visualization and export of sensor data.

Air temperature from SDSS database for Taragay station
Sensor Data Storage System (SDSS)

The water surface level of the Toktogul and Kairakum reservoirs according to satellite altimetry
GPS monitoring
(local areas and regions in general)

GPS stations network is used for research:
• Tectonic movements of earth crest
• Landslide movement
• Glaciers movement
• Cloud distribution (is planned)
• Snow cover (is planned)
The system is installed in MES and CAIAG

Automatical processes data on earthquakes and displays data on depth, balls

CAIAG specialist processes data and submits the updated parameters to MES upon request

Seismic monitoring (SeisComp3)
Seismic monitoring (for the early warning system)

Strong movements stations

ACROSS stations are located in the fire stations:
12 stations in the north for Bishkek and
7 stations in the south for Osh city

SOSEWIN stations are installed in 8 buildings of various types in Bishkek city and in a 150 m deep well in CAIAG territory
Seismic monitoring (for the early warning system)

The scheme of a network of stations of strong movements. Green Rectangles indicate working stations.

Presto program: automatic data processing, determination of magnitude and hypocentre on 2-3 nearest stations.
The system for estimating the intensity of an earthquake and probabilistic damage

Caravan

(1) The program sets the parameters of an earthquake and

(2) calculates the intensity of the earthquake shock
The system for estimating the intensity of an earthquake and probabilistic damage

Caravan

(3) program calculates also the possible losses and their distribution over the territory

- The Caravan program is installed in the Ministry of Emergency Situations
- Using the program, specialists of the MES will be able to promptly calculate the possible damage and human casualties in the epicenter area and make decisions on the necessary measures to eliminate the consequences
Seismic microzoning
Bishkek, Naryn and Karakol cities

Points for measuring seismic noise in Naryn
Seismic microzoning in Bishkek: fundamental resonance frequency of soils

- The map is designed for estimation of local seismicity during strong earthquakes in Bishkek.
- The map contains the information on frequency characteristics of soils and indicates potential movements of ground in case of maximum earthquake.

- The map is submitted to Gosststroy.
- At present, issues on using this map in updated SNiPs are discussed in Gosstroy.
Seismic microzoning in Karakol and Naryn

Map of soils resonance characteristics for Karakol

Map of soils resonance characteristics for Naryn
The map is compiled in 2015-2017 and was submitted to MES and Gosstroy in May, 2017.
• MES will use the map for taking measures on protection of population in case of an earthquake.
• Gosstroy will discuss issues on practical use of the map when developing general layout for built-up areas.
Implemented projects
The methodology of forecast of river runoff for the period of high water and months of seasonal snowmelt was introduced into Kyrgyzhydromet in 2013:

- space images MODIS are downloaded daily in automatic mode,
- they are processed in the program for removing clouds from the snow cover MODSNOW,
- forecast of runoff is calculated taking into account the snow cover.
Forecasts for low-water (2008), high-water (2002) and average water content periods (2009)

- Kyrgyzhydromet makes a forecast for the vegetation period of April-September, May-September and May, June, July

- Kyrgyzhydromet transmits the forecast data to all interested organizations (Government Office, MES, JSC Electric Stations, Department of Water Resources, etc.)

- CAIAG provides methodological and technical support

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<th>№</th>
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<th>Рассчитанный сток, м³/с</th>
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Forecasts for vegetation period for inflow into large reservoirs

- A statistic model for calculating average water discharge for vegetation period for Orto-Tokoy, Kirovsk and Toktogul reservours.
- The methodics on the base of the model is implemented in Kyrgyzhydromet in March 2017.

Example of inflow forecast into Orto-Toloy reservour for low-water (2008), high-water (2002) and average periods (2009)

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Landslide catalog of Osh and Jalal-Abad oblasts

- GIS maps are compiled on landslide-prone areas
- Similar work is planned in the nearest future for Batken oblast.
**Landslide catalog (Alay district)**

- Over 500 landslide areas are systemized and downloaded in the catalog for Osh and Jalal-Abad oblasts.
- The catalog contains more than 20 parameters of landslide.
- The catalog was submitted to the MES of the KR for taking measures to mitigate the risk, and informing the population and local authorities.

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Количество зафиксированных оползнях в Южных областях Кыргызской Республики

по Ибатулину Х.В.

По данным МЧС
Before 2013, MESB МЧС до 2013 г. в качестве каталога использовались used data for 1992-1999 for its catalog
Assessment of natural hazards
2013 >> 2017 >

- IMPLEMENTATION OF THE PROJECT FOR BATKEN, JALAL-ABAD AND OSH OBLASTS;

- TARGET – UPDATE THE CATALOG AND CREATE UNIFIED DATABASE FOR LANDSLIDE AREAS;

- USED REMOTE SENSING METHODS, INCLUDING GIS TECHNOLOGIES.
TECHNICAL PASSPORT FOR DANGEROUS AREA WITH PHOTOS
Карта распространения оползнеопасных участков (обследованные по южной части территории КР).
Seismic microzoning of Bishkek, Naryn and Karakol

Location of stations for measuring seismic noise in Naryn.
Stages of stratification

Bishkek

Progress / Results

L3 (Bishkek)

1-2 story stone, brick, adobe buildings of type 1

1-2 story stone, brick, adobe buildings of type 2

1-2 story stone, brick, adobe buildings of type 3

3-6 story stone, brick, concrete, panel buildings

7-9 story concrete, panel, frame and monolithic buildings

L1 (main)

urban

planting

water

Other rocks, soils

L2 (main)

residential

industrial/commercial

mixed composition
Real-time risk assessment for Bishkek city

Earthquake scenario by EMS 98 scale

Vulnerability assessment by EMS 98 scale

Algorithm for vulnerability and damage calculation by the earthquake scenario with M=7.5
Seismic microzoning of the territories of large cities and settlements in Kyrgyzstan and the Central Asian countries

The works on seismic microzoning of territories of 7 cities in Central Asia was done during 2008-2015: including 3 cities of the Kyrgyz Republic:

- Bishkek
- Karakol
- Naryn

and 4 cities from the neighboring countries:

- Tashkent, Uzbekistan
- Dushanbe, Tajikistan
- Khorog, Tajikistan
- Almaty, Kazakhstan

Map of the resonance frequencies of ground in the territory of Naryn town, according to seismic noise

The works on seismic microzoning of territories of 7 cities in Central Asia was done during 2008-2015: including 3 cities of the Kyrgyz Republic:
Compilation of maps on dangerous natural hazards and phenomena

- 21 maps (Kyrgyzstan and 7 oblasts), including 13 types of emergency situations and 12 topographic layers, are produced.
- The maps were submitted to the Office of the Prime Minister of the Kyrgyz Republic, the MES, oblast state administrations and regional departments of the Ministry of Emergency Situations.
The study of glaciers of Kyrgyzstan

to determine their balance, morphological, dynamic characteristics, glacial runoff, and climatic conditions

Glaciers: 1 – Golubin, 2 – Orto Koi-Suu, 3 – Kichi-Jargylchak, 4 - Chychkan, 5 – Karabatkak, 6 – Western Suek, 7 – No. 354, 8 – Petrov, 9 – Enilchek, 10 – Abramov
Example of determining the mass balance on the Golubina Glacier

The maps were submitted to the Office of the Prime Minister of the Kyrgyz Republic, the MES, oblast state administrations and regional departments of the Ministry of Emergency Situations.
Changes on glacier tongue’s boundaries of the Abramov Glacier

Changes on glacier tongue’s boundaries of the Petrov Glacier from 1869 to 2015 год

- Topo maps, archives, space imagery and published data are used.
Study of underground water in Chu basin with automatic stations «OTT_ecoLog_500», «OTT Orpheus Mini»

Average annual level of underground water on well 1301-4
Средний годовой уровень подземных вод по скважине 1301-4
School and pre-school safety in Kyrgyzstan

UNICEF/USAID
Data Platform on disaster risks in the Kyrgyz Republic

http://geonode.mes.kg

Topograficheskaya karta Kyrgyzstana c rel'effnoi otmivkoy

139 layers
25 maps
111 documents
41 users

World Bank project
Mass digitization and renewal of urban and rural cadastral maps

World Bank project

Done:

Number of maps: 3145
Number of cadastral plots: 425968
Number of GPS control points: 9545
Number of layers: 30
National Data Base for Wild Animals of Kyrgyzstan

Snow leopard

Status: VU, Critically Endangered. CR, C2(3)b. R. Occurs in Piskem, Chandilash, Talas, Kyrgyz, Sarysuurmy, Chabel, Ferghana, Turkistan, Ayn, Kuegii, Tektek, Naryn-Tuu, Moindo-Tuu, Al-Bashni, Sary-Jaz, and Kokshait-Tau Mountains. Elevations: 3,200-4,600 m (9,800-15,100 ft) above sea level. Prefers mountainous terrain with hills for observation and hiding spots among stones and bushes (Cirtopoc, Jampsen). Vists forest only during rainfalls from one river valley to another. Occurs in forest zones in winter following wild goats. It was common species in the past, total numbers were up to 1,400 animals. For the last decade, the Leopard's numbers drastically reduced and do not exceed 150-200 individuals. The highest density is in Northern Tian Shan. World's total numbers are 5-2,796 animals. Southwest species are most active in dry and night time. Hunting season begins in February-March, pregnancy lasts for 88-103 days. Female delivers 1-3 cubs, rarer – up to 5, once in a two years. Uses for food: wild goats, sheep, marmots, and relatively rare deer, game, snowcocks, chukars. Diseases poorly investigated, tables and mane are all well known. Limiting factors are reduction in numbers of wild goats and sheeps.
### Water Data Bases

Водопользование

#### Привязка ирригационной сети к районам

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Training for specialists of ministeries and departments of the KR

Training for MES, Gosstroy and KSUCA specialists on Seismic Risk Assessment (2017 г.)

Training for MES departments specialists on Using GIS for natural hazards assessment. (2015 г.)

GNSS School in Central Asia, 2018

Training on underground water study (2015 г.)
Summer school on glaciers’ mass balance: measurements and analysis

Summer school is conducted annually in the last 3-4 years within CATCOS и CICADA projects with support of the Swiss Agency on Development and Cooperation (SDC) and UNESCO Cluster Bureau (Almaty) in Kyrgyzstan, Kazakhstan, Tajikistan and Uzbekistan by Freeburg University and CAIAG. Young specialists and post graduates from Central Asia (Afghanistan, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan and Uzbekistan) study in summer school. The international team of experts in the field of glaciers monitoring and capacity building, train the participants.
Thank you for attention!

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