

Environmental Evaluation methods of remote sensing

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Central Asian Institute of Applied Geosciences (CAIAG)

Yangon, Myanmar, 19-21 November 2014

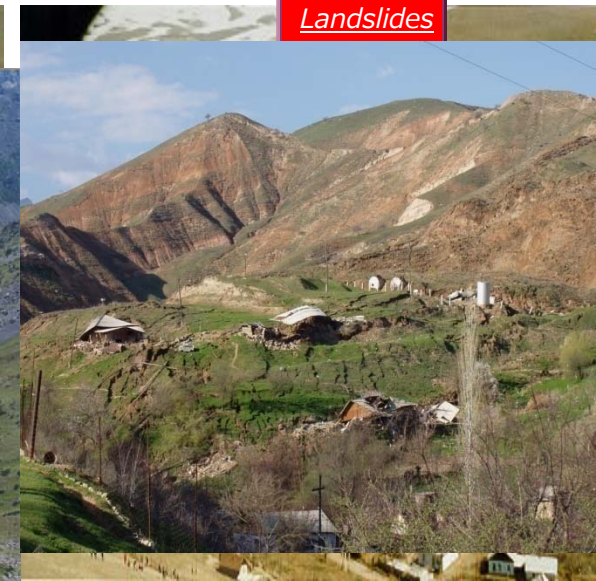
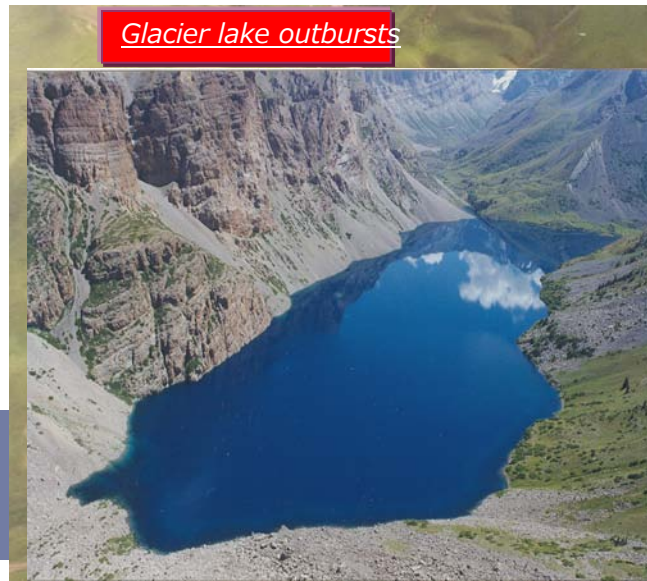
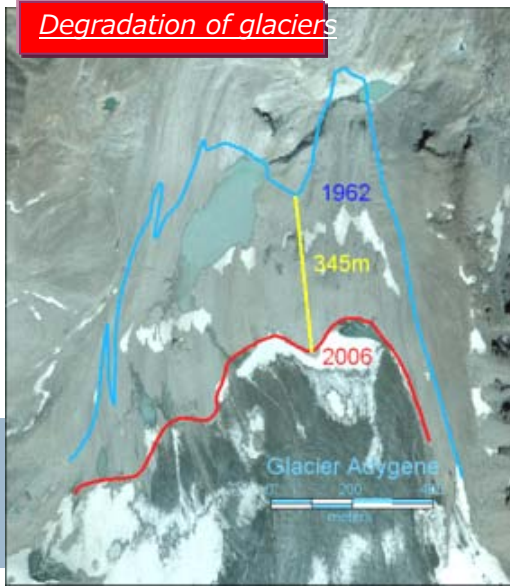
Research and working areas

- Global and regional change processes and their effect on the environment;
- Monitoring and assessment of natural hazards (multi hazard approach), Re–duction of Risks related to natural hazards including multi risk assessment (i.e. earthquakes → land slides) and early warning technologies;
- Applied multi-disciplinary research in the field of geodynamics and geohazard; water and land resources including research of glaciers, rivers, reservoirs, underground water, and
- Capacity development, training courses, education and public outreach.

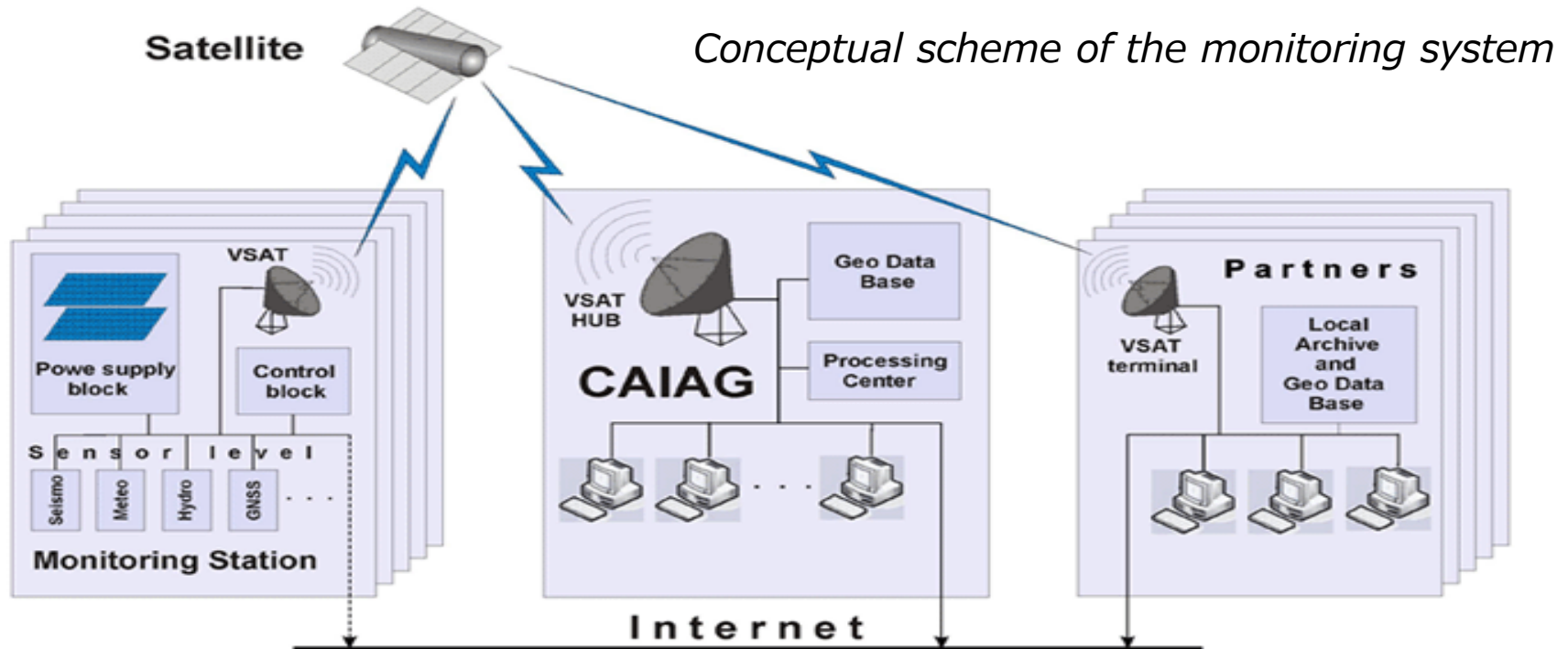
Object of research: Earthquakes



Object of research: water and climate related disasters



Project “Creation of the model hazardous phenomena monitoring system in the quasi-real time”



Aim of the project is a development of principles of the geo-monitoring system creation for acquiring various information on environment state and natural processes.

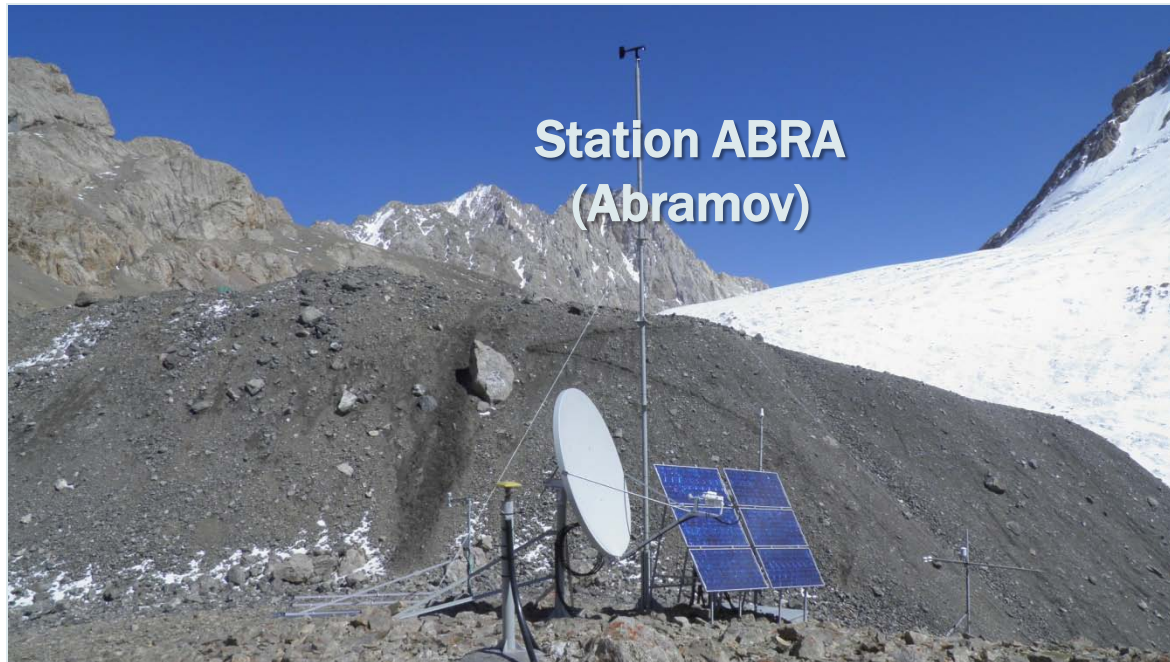
Station TARA (Taragai)

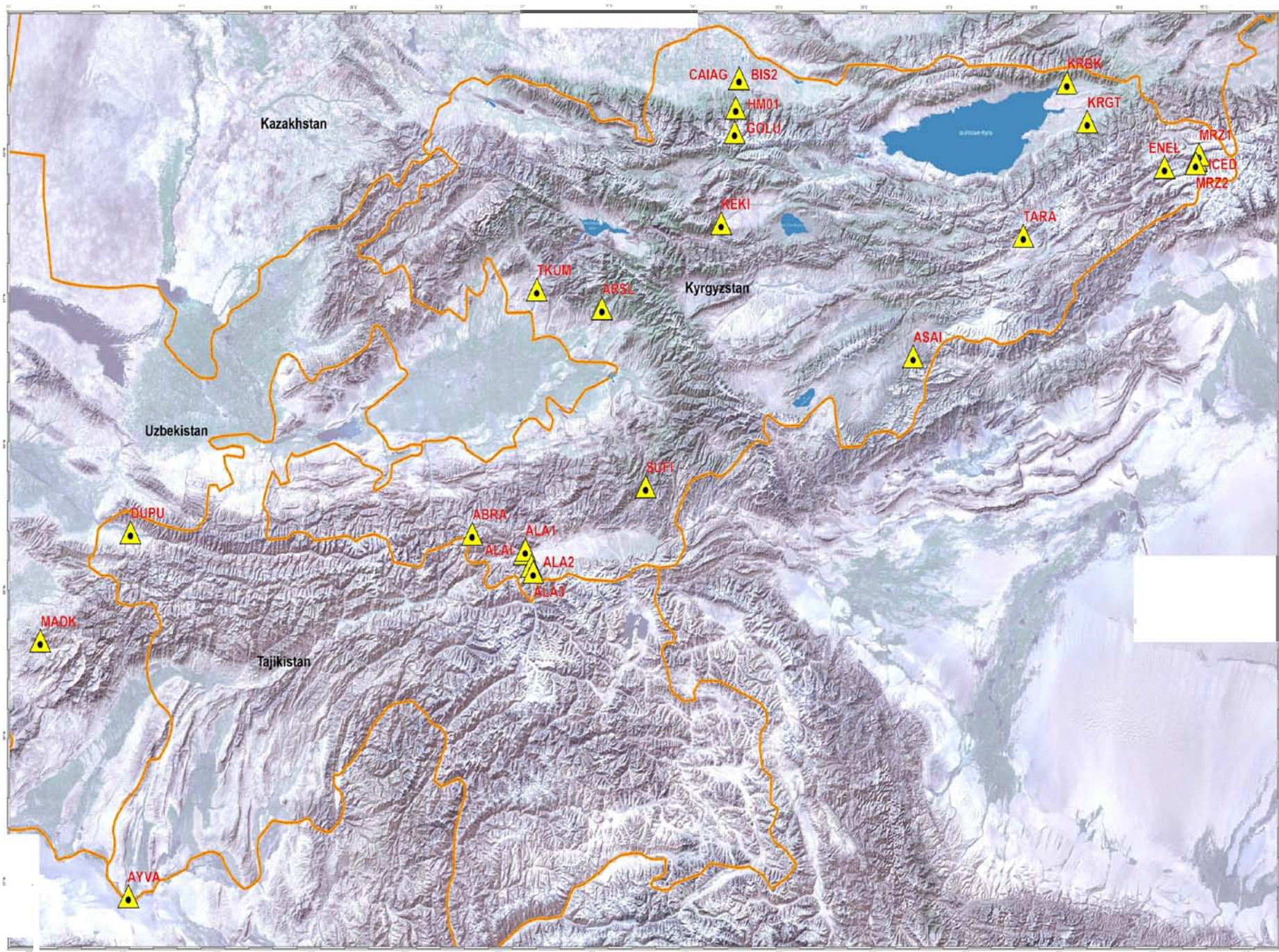


**Station KEKE
(Kokomeren)**



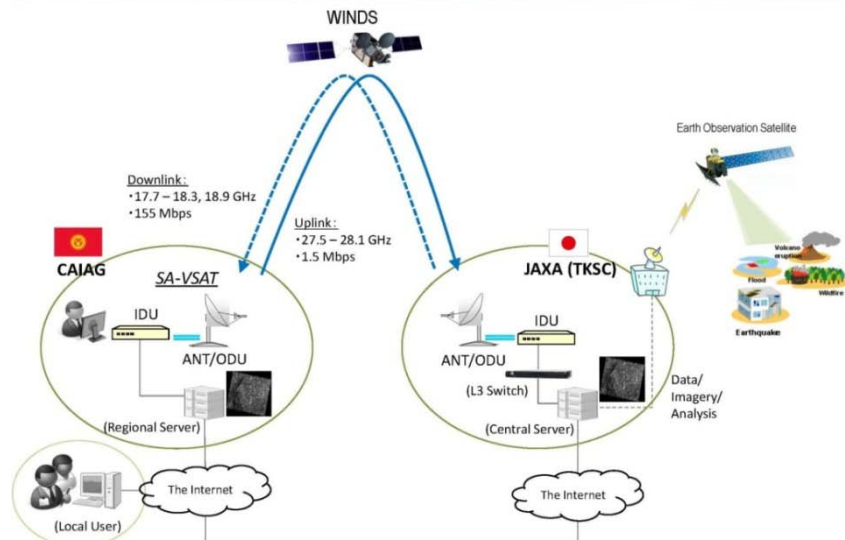
**Station ABRA
(Abramov)**





Sentinel Asia

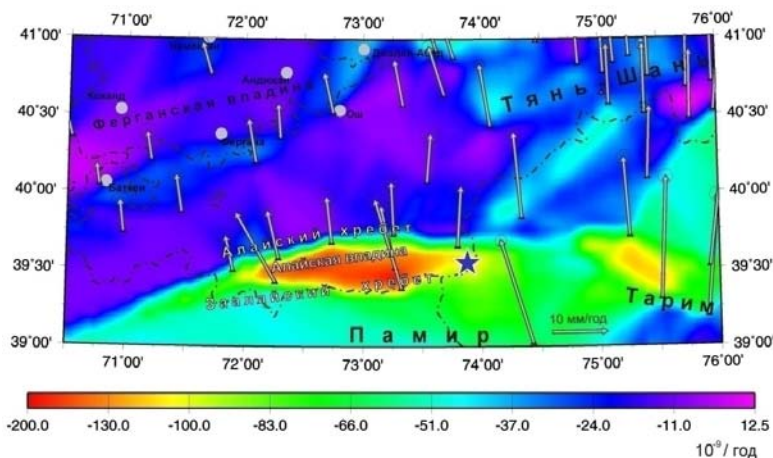
In 2011 a ground satellite station was installed in CAIAG within Sentinel Asia project jointly with specialists from JAXA; this station consists of 1.8 mb satellite antenna and satellite modem, server and appropriate software. Since July, 2009 CAIAG became a member of Sentinel Asia planning group, and since October, 2009 CAIAG as a Data Analysis Center in Central Asia.



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 Emergency Observation  Wildfire Monitoring  Flood Monitoring  MTSAT Imagery  Capacity Building  Web Forum  Emergency JPT Members <table> <tr> <th>No.</th><th>Country</th><th>No.</th><th>Organization</th><th>Data Provider Node (DPN)</th><th>Data Analysis Node (DAN)</th></tr> <tr> <td rowspan="3">1</td><td rowspan="3">Australia</td><td>1</td><td>CSIRO Office of Space Science and Applications (COSSA)</td><td></td><td></td></tr> <tr> <td>2</td><td>Geoscience Australia (GA)</td><td></td><td></td></tr> <tr> <td>3</td><td>Australian Bureau of Meteorology</td><td></td><td></td></tr> <tr> <td rowspan="4">10</td><td rowspan="4">Japan</td><td>17</td><td>Keio University</td><td></td><td></td></tr> <tr> <td>18</td><td>Japan Aerospace Exploration Agency (JAXA)</td><td></td><td></td></tr> <tr> <td>19</td><td>Infrastructure Development Institute (IDI) Japan (IFNet)</td><td></td><td></td></tr> <tr> <td>20</td><td>Hokkaido University</td><td></td><td></td></tr> <tr> <td>11</td><td>Korea</td><td>21</td><td>Korea Aerospace Research Institute (KARI)</td><td></td><td></td></tr> <tr> <td>12</td><td>Kyrgyz</td><td>22</td><td>Central Asian Institute of Applied Geosciences (CAIAG)</td><td></td><td></td></tr> <tr> <td rowspan="2">13</td><td rowspan="2">Lao P.D.R.</td><td>23</td><td>Ministry of Labor and Social Welfare</td><td></td><td></td></tr> <tr> <td>24</td><td>Water Resources and Environment Administration (WREA), Prime Minister Office (PMO)</td><td></td><td></td></tr> <tr> <td rowspan="2">14</td><td rowspan="2">Malaysia</td><td>25</td><td>National Security Division, Prime Minister's Department</td><td></td><td></td></tr> <tr> <td>26</td><td>Malaysian Remote Sensing Agency</td><td></td><td></td></tr> <tr> <td>15</td><td>Mongolia</td><td>27</td><td>National Remote Sensing Center of Mongolia (NRSC)</td><td></td><td></td></tr> <tr> <td rowspan="3">16</td><td rowspan="3">Myanmar</td><td>28</td><td>Department of Meteorology and Hydrology</td><td></td><td></td></tr> <tr> <td>29</td><td>Relief and Resettlement Department</td><td></td><td></td></tr> <tr> <td>30</td><td>Department of Water-Induced Disaster Prevention</td><td></td><td></td></tr> </table>						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	Kyrgyz	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		
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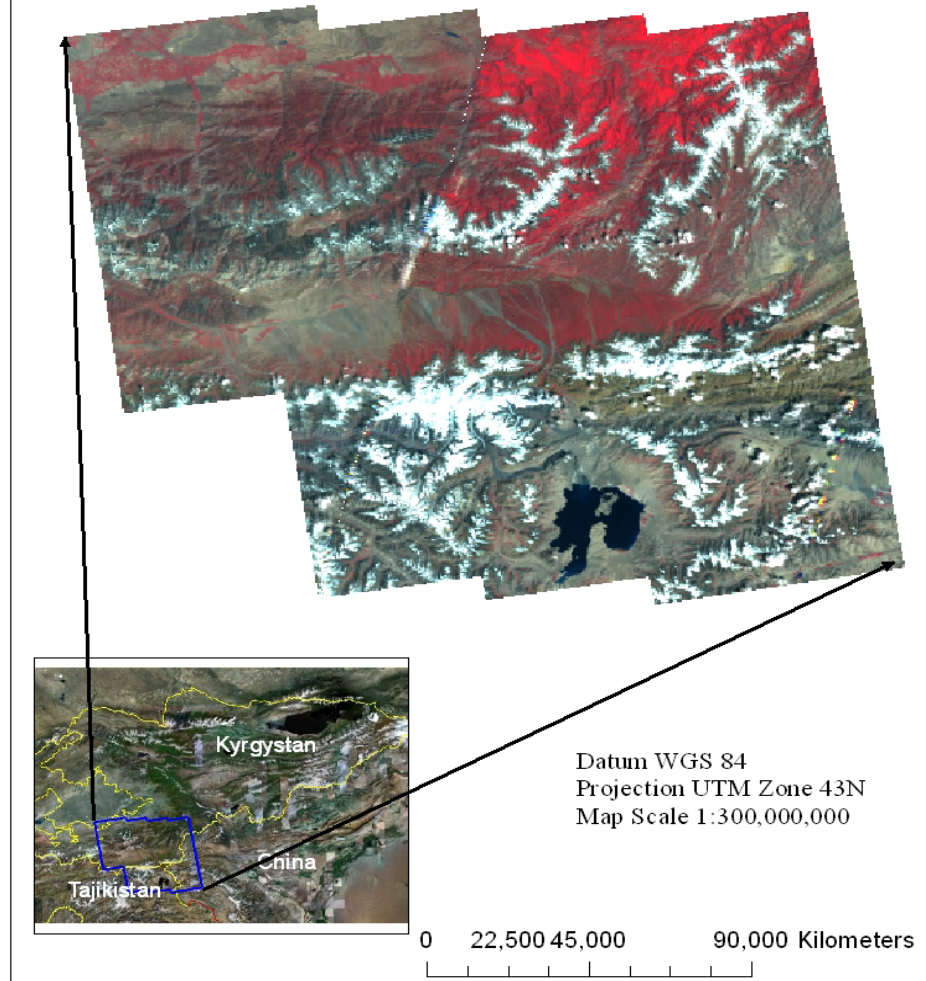


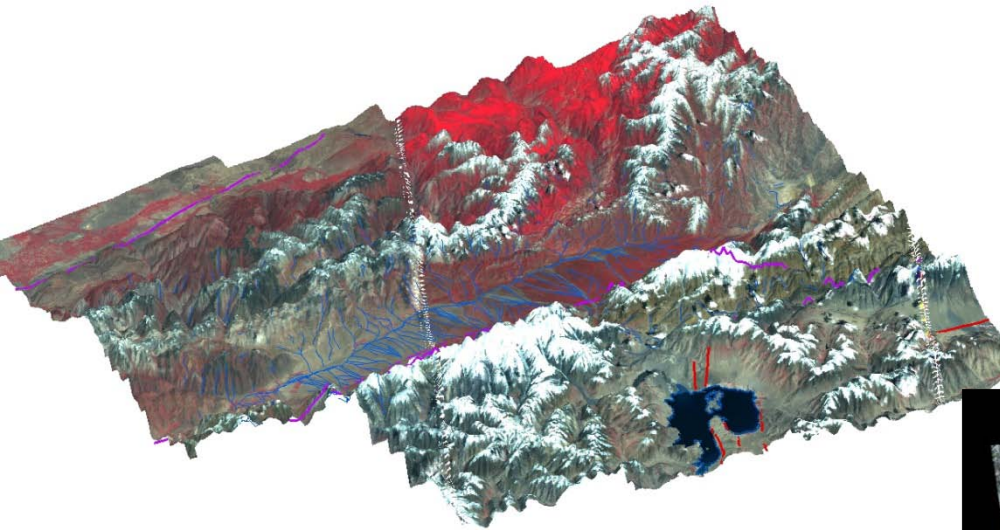
NURA EARTHQUAKE 5 OCTOBER 2010



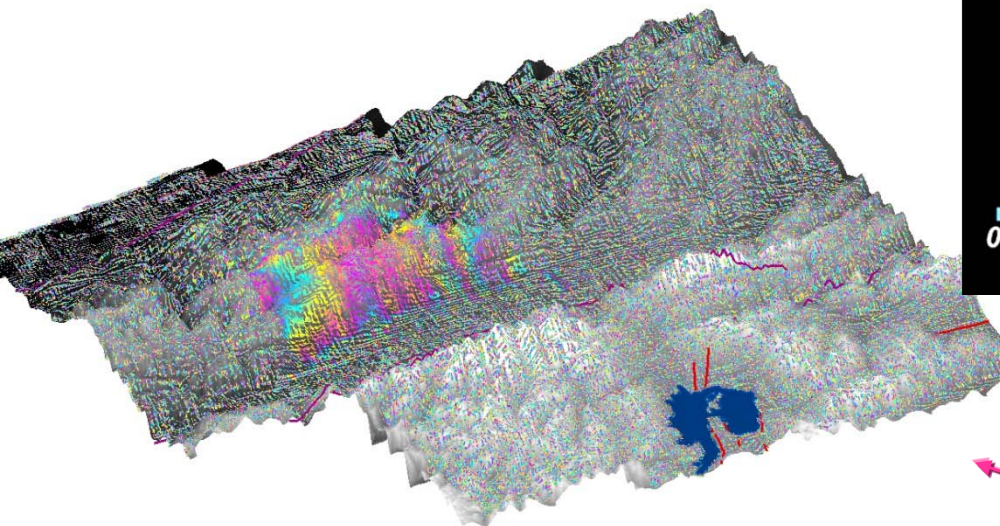
Data of GPS measurements

Landsat7 TM Images of Pamir-Alai Area Kyrgyz Republic



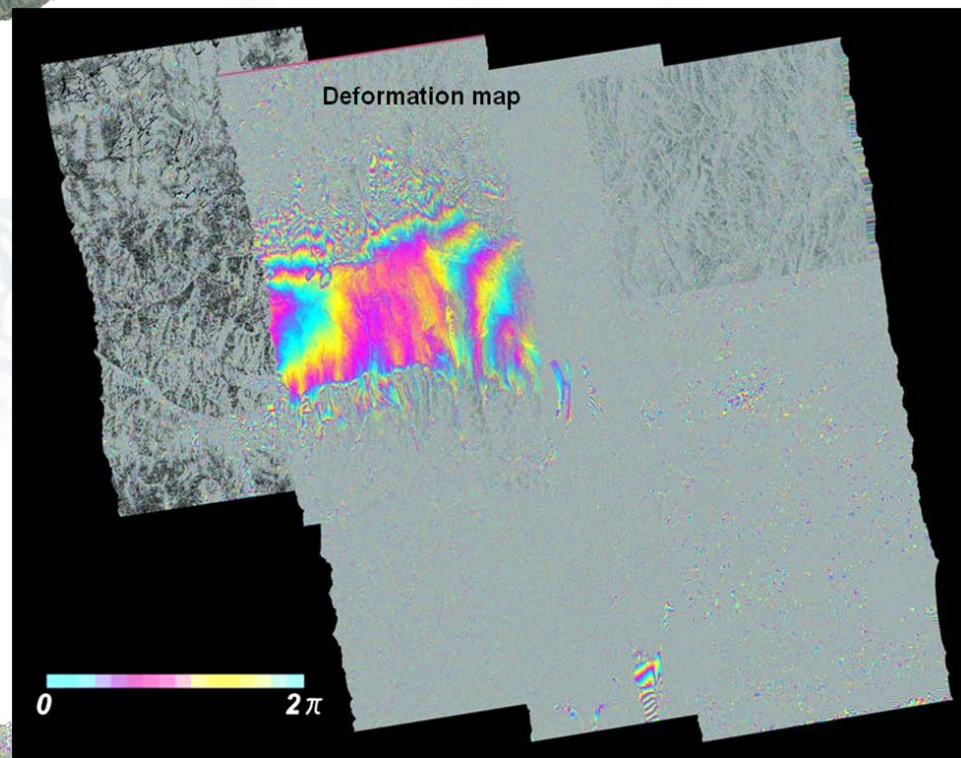


Interpolated SRTM DEM



SRTM DEM overlaid
with deformation map

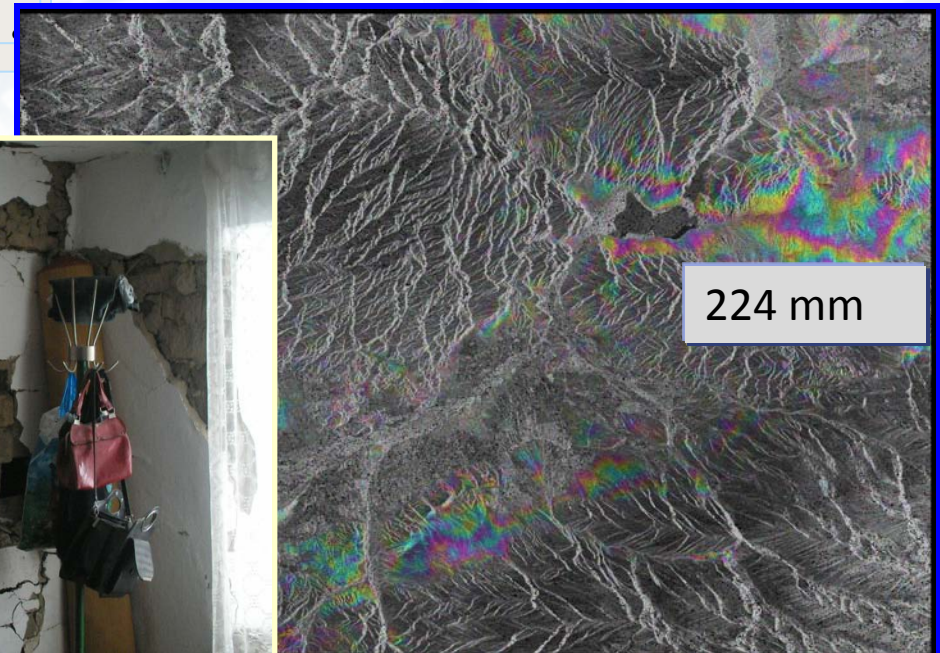
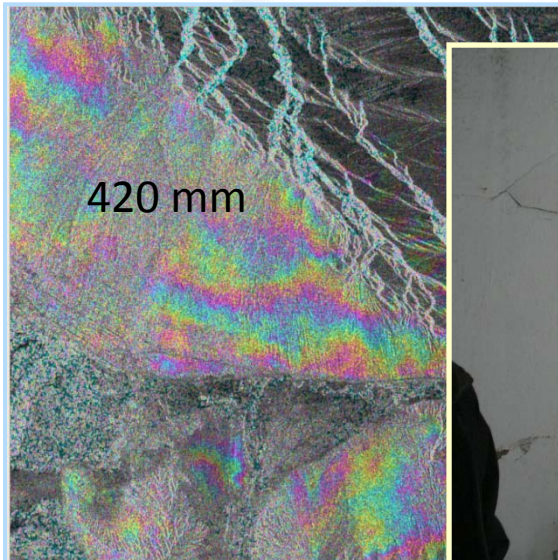
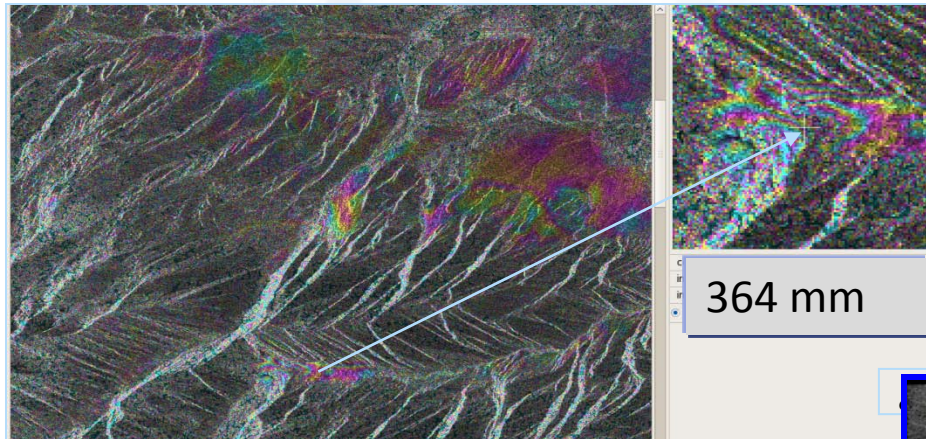
Preliminary results
of InSAR technique



SAR interferometry in the Kochkor earthquake area, December 26, 2006

Processing of ENVISAT data using
GAMMA software (JAXA)

Horizontal displacement with clearly defined
colored borders, each color is of 28 mm

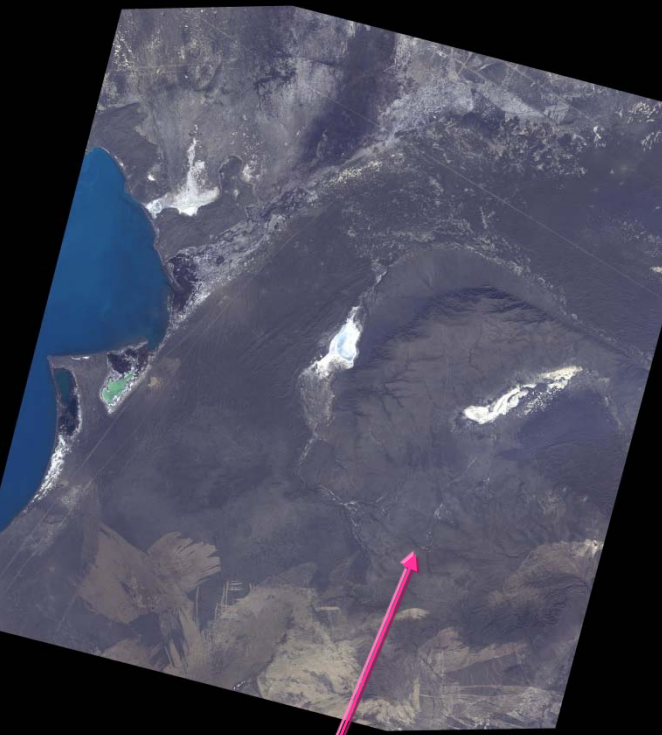


March 12, 2010 flood in Kazakhstan due to rupture on the dam at village Kyzyl-Agash



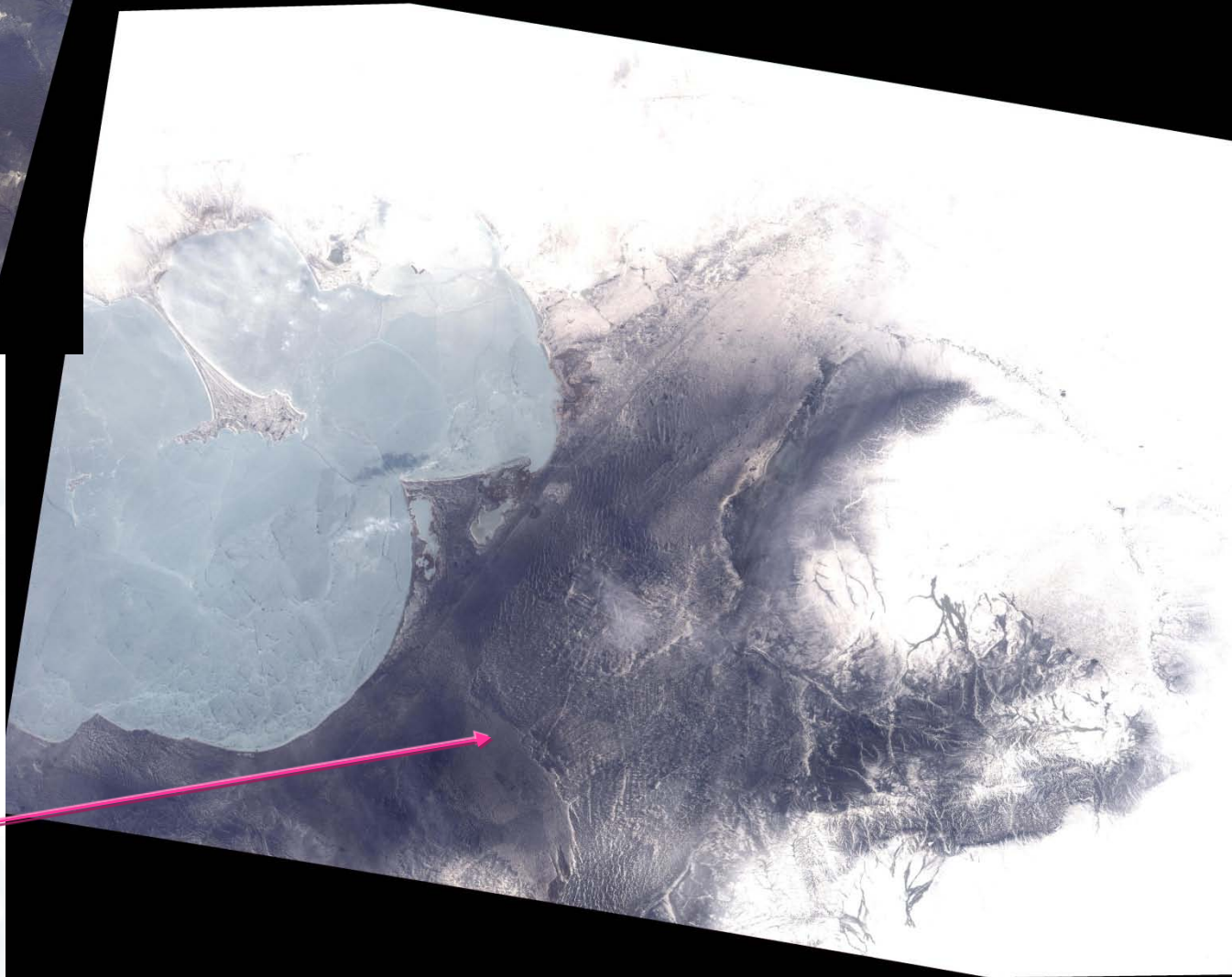
The death toll from the flood 34, thousand evacuated Emergencies Ministry informed. Spring flooding is a frequent occurrence in Central Asia but a sudden rise in temperatures following weeks of heavy snow storms has exacerbated the problem this year.

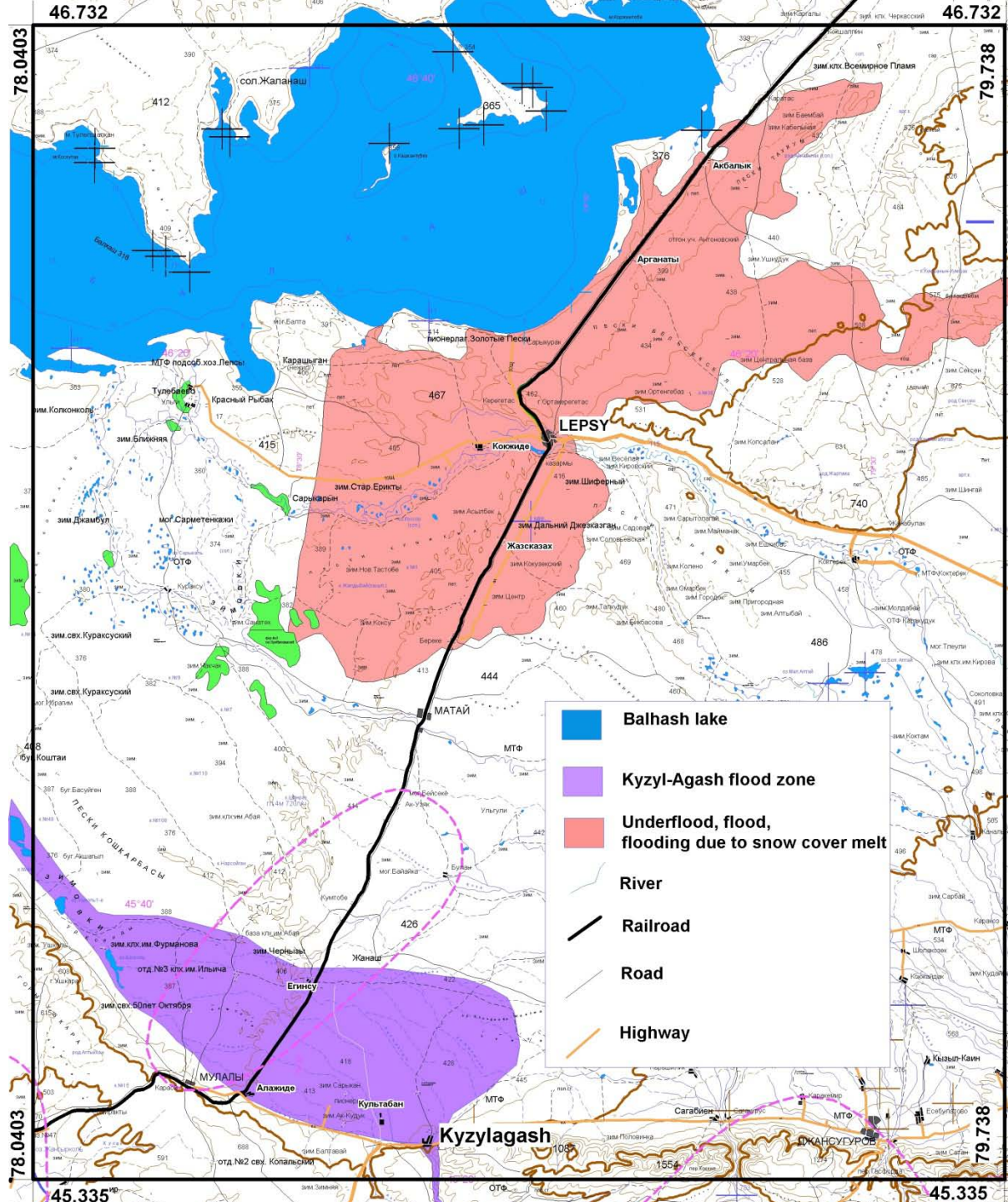
Emergency Observation were requested
on ALOS data



False Color
Composite (FCC)
before

FCC after the flood,
the image clearly
shows wet areas



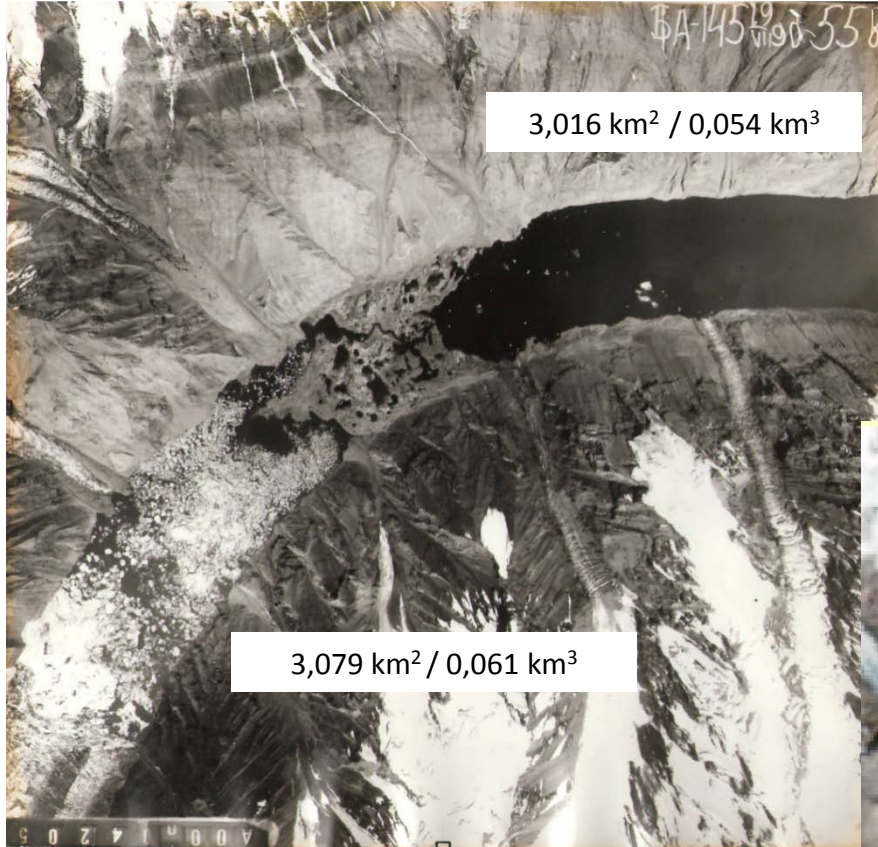


Disaster area maps were created by visual interpretation from ALOS data and by Topographic maps (scale 1:100 000) and information from Ministry of extreme emergency.

The underflooding zone of the Balhash sea area is 2 604 square kilometers and

Kyzyl Agash flood area is 1 128 square kilometers.

Lake development monitoring



(7 days before outburst)



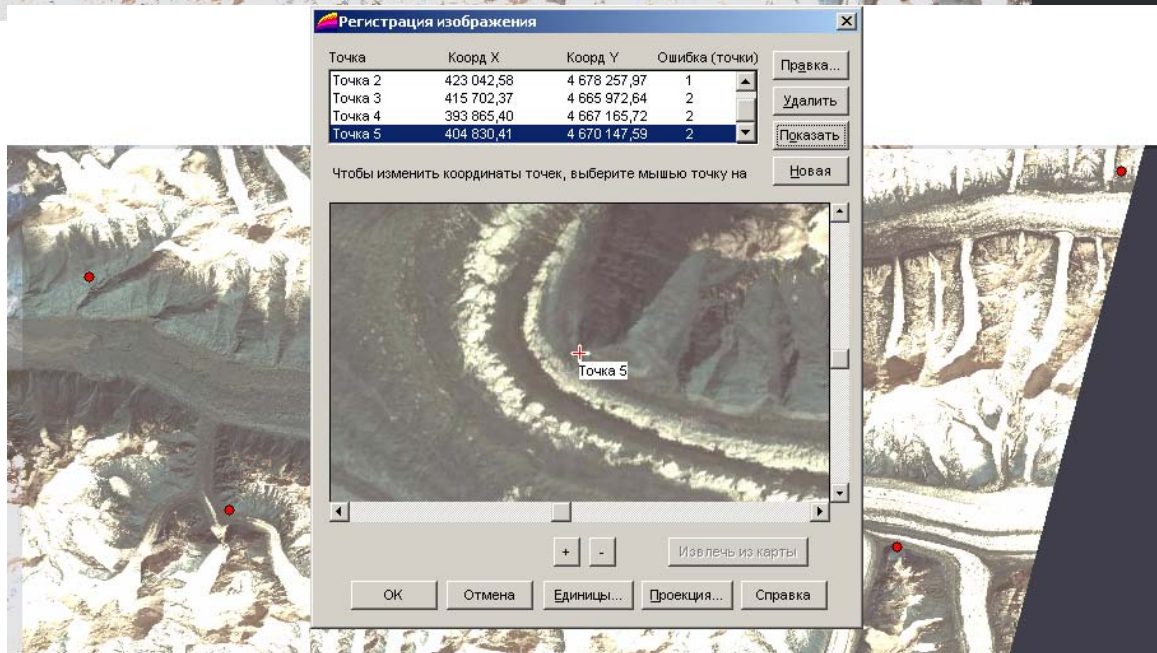
(36 days before outburst)

Aerial photograph 29.07.1990 (left), Landsat TM image 10.09.1990 (right)

Glacier ice movement and velocity

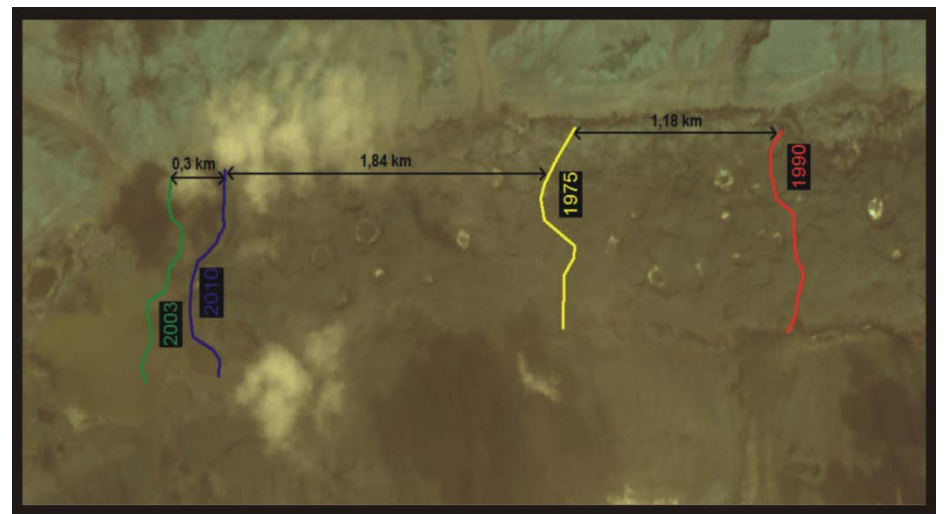
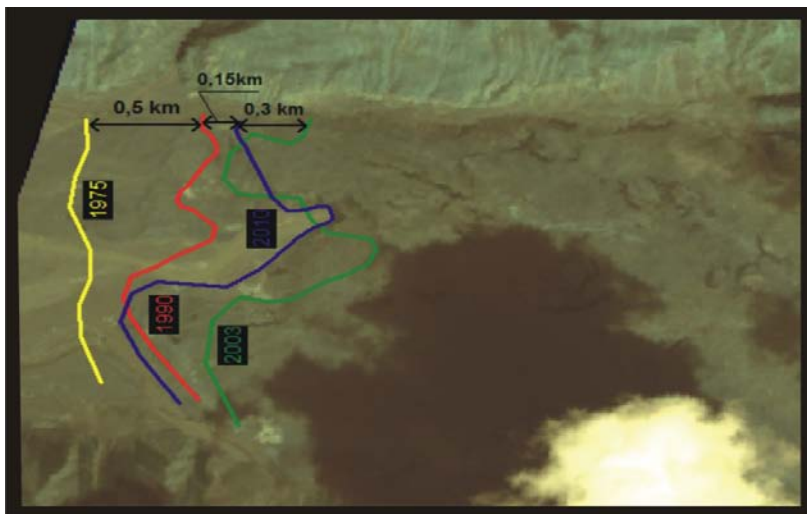


Control points for co-registration



Co-registration errors

Speed of surface motion and retreat of glacier snouts of western and southern Enilchek

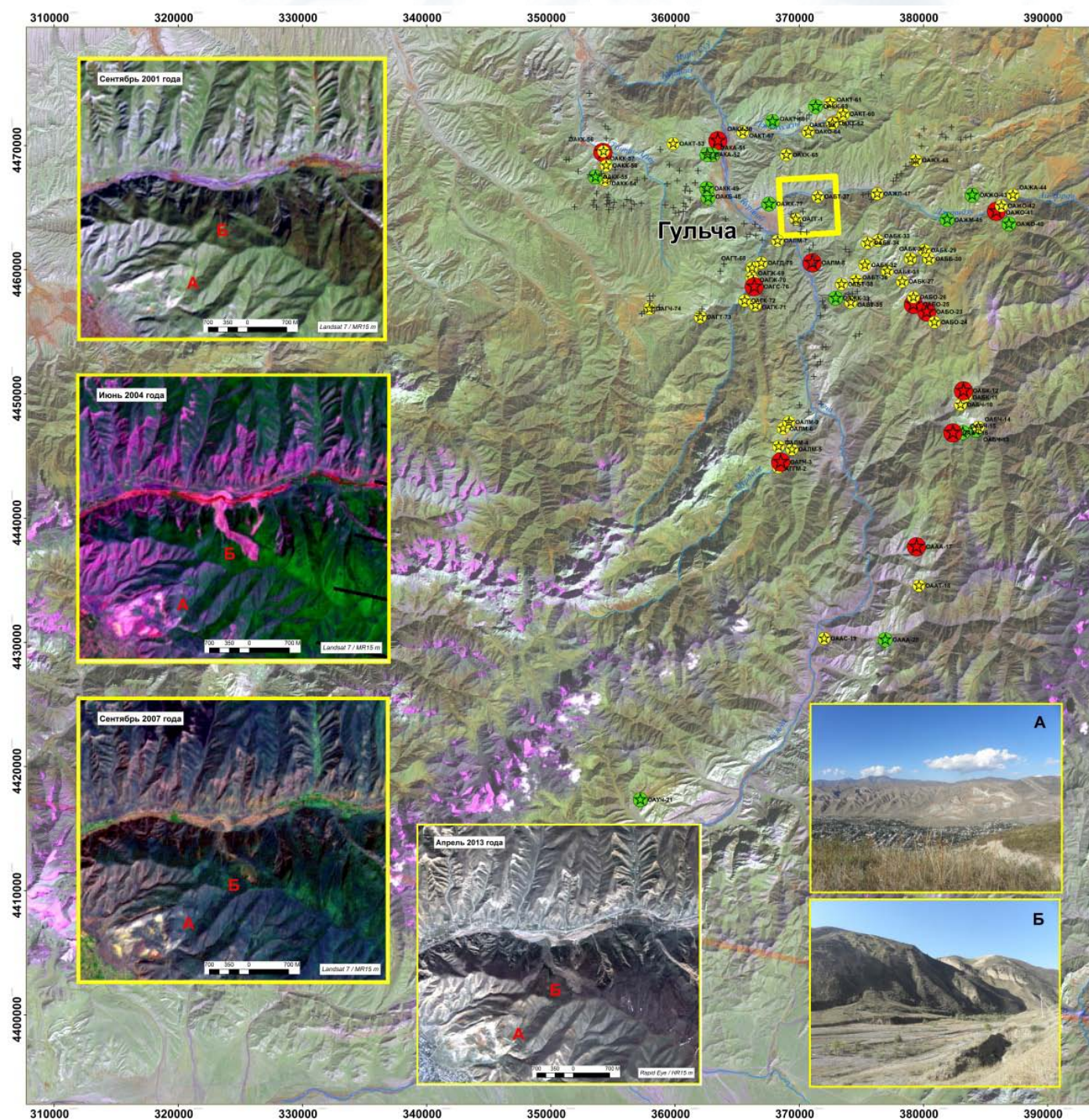


Using the tools of GIS and RS techniques in the study of landslide processes



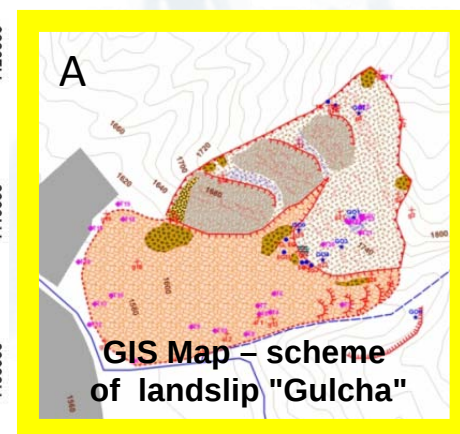
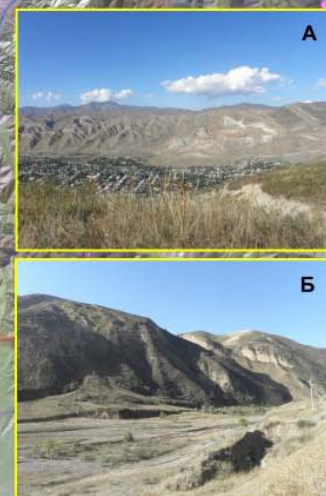
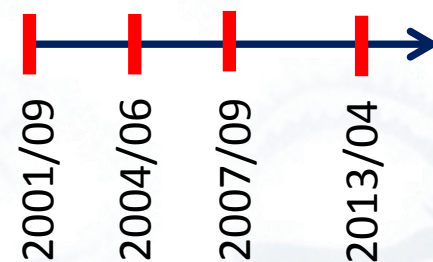
Satellite photograph Quick Bird, Sensor: QB02, data: Nov 27. 2006, from « Google Earth », landslide "«Kol -Tash" Area Mailisu with elements interpretation.

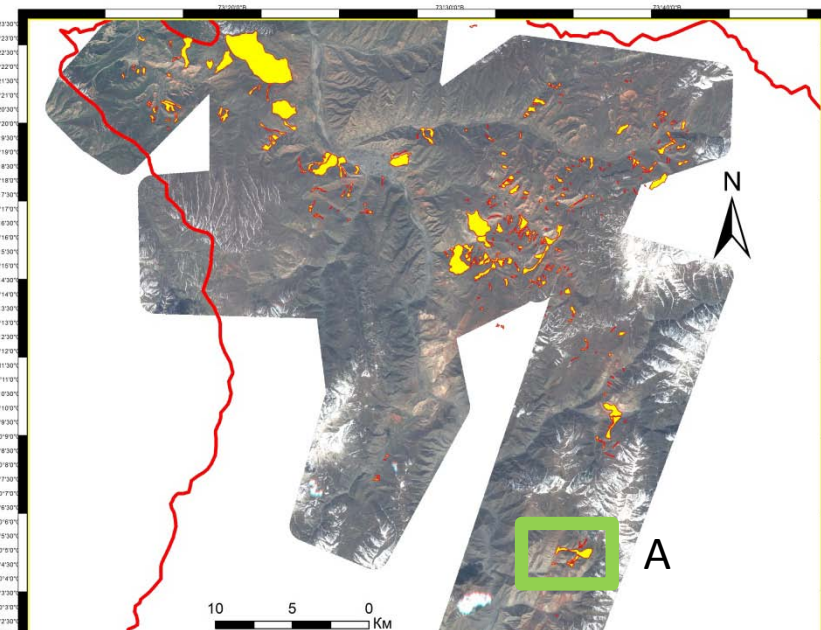




Location map of
landslides on the Alai
region.

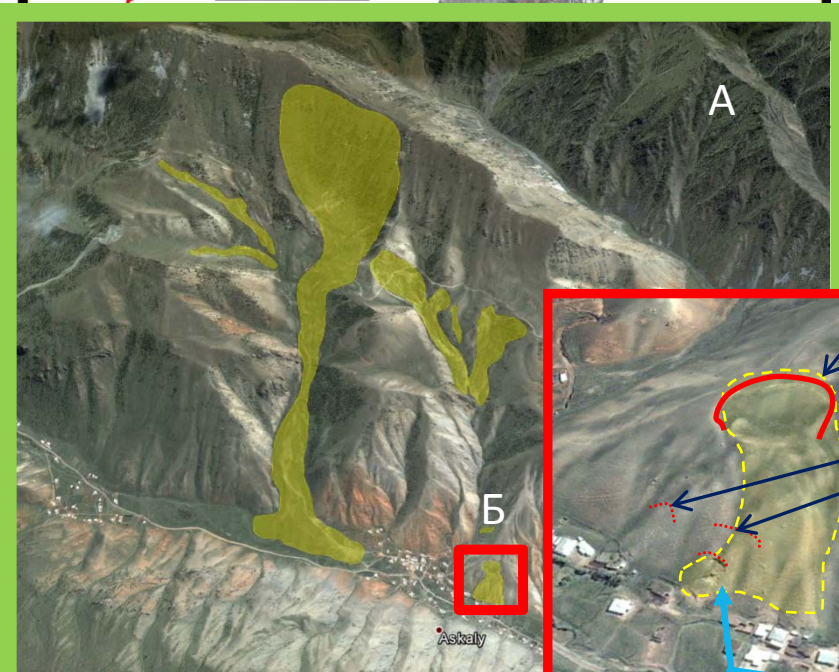
Dynamics of
landslides in time.





According to preliminary results of decoding and direct characteristics there are more than 300 landslide areas in total 34,367 km² (0,45% from the total territory)

According to geometric characteristics 61% of investigated landslide areas (77 yч.) develop in seismically-gravitational and steeply slope areas of modern hydronet.

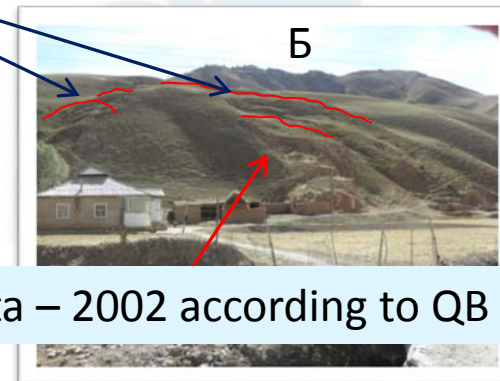


1st displacement. Data?

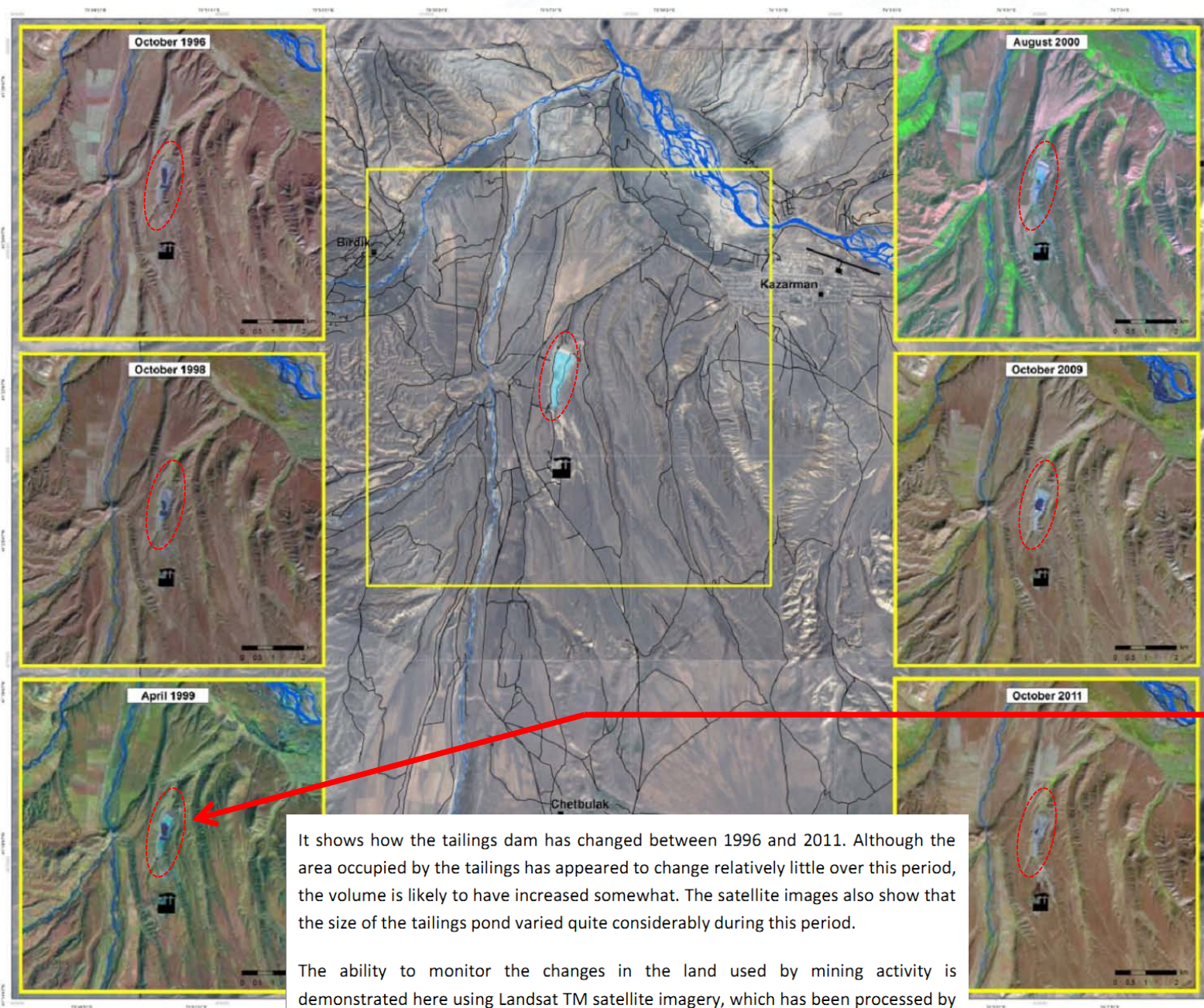
2nd displacement. Data - June 2011



2nd displacement. Data – 2002 according to QB



In the frame project “EO-Minners”.



CHANGE OF THE MINING FOOTPRINT THROUGH TIME - KAZARMAN - KYRGYZSTAN

Increasing the area of the water body on the pulp is interconnected with a change in methodology for extracting gold from ore at the mill.

It shows how the tailings dam has changed between 1996 and 2011. Although the area occupied by the tailings has appeared to change relatively little over this period, the volume is likely to have increased somewhat. The satellite images also show that the size of the tailings pond varied quite considerably during this period.

The ability to monitor the changes in the land used by mining activity is demonstrated here using Landsat TM satellite imagery, which has been processed by experts to highlight the area of the tailings dam.

Conclusions:

- Presented potential of the satellite zonation system are effective for spatial-temporary precise monitoring.
- For integrated analysis of surface processes, the satellite zonation data should be analyzed together with other thematic data, based on GIS methods.
- Obtained results show a high potential of the satellite zonation to understand landslide formation processes and objective assessment of their hazard.
- Assessment of natural hazards on regional level requires a further development of satellite sensors and methods, based on GIS.



Thank you for you attention!



www.caiag.kg

Photo: Enylchek glacier, Kyrgyzstan