

**Report on Joint NASA LCLUC Science Team Meeting  
and GOFC-GOLD/ NERIN, NEESPI, MAIRS Workshop**

**Monitoring land cover, land use and fire  
in agricultural and semi-arid regions of Northern Eurasia**

September 15-19, 2009 (Training Sessions September 20-21)

National Center of Space Research and Technologies, National Space Agency,  
Almaty, KAZAKHSTAN

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**ATTACHMENT 1:** Announcement and Agenda

**ATTACHMENT 2:** List of participants

## **Executive summary**

The Joint NASA Land Cover Land Use Change (LCLUC) Science Team Meeting and Global Observations of Forest Cover – Global Observations of Land Dynamics (GOF-C-GOLD)/ Northern Eurasia Regional Information Network (NERIN), Northern Eurasia Earth Science Partnership Initiative (NEESPI), and Monsoon Asia Integrated Research Study (MAIRS) Workshop was held in Almaty, Kazakhstan September 15-19, 2009 with training sessions on September 20-21. The objectives of the workshop were to provide a forum for international scientific exchange on critical land use issues in Central Asia, to facilitate coordination of satellite based research and applications within the region and to strengthen research being undertaken within the NASA LCLUC program. The meeting was hosted by one of leading institutions in Central Asia focusing on the applied use of various remotely-sensed data -- the National Center for Space Research and Technology (NSRTC) of the Kazakhstan's National Space Agency. The workshop opened with the address from the head of the Kazakhstan's National Space Agency (KNSA) and Kazakh cosmonaut Talgat Musabayev.

The workshop agenda covered four major themes of interest and importance for the region: land cover, land use/agriculture, water resources and fire. Four thematic sessions, group discussions and the concluding expert panel gave an overview of recent research accomplishments and formulated future research and applications development needs. These include – monitoring of the quality and quantity of fresh water resources, crop yield estimation, assessment of land and soil degradation and the impacts of climate change; further development of fire monitoring capabilities in support of long-term fire management strategies.

The workshop was attended by scientists and land managers from 16 countries (Belgium, China, Germany, Iran, Italy, Japan, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Ukraine, United States, and Uzbekistan) – 184 participants total. The participants voiced a unanimous support for better regional cooperation and proposed to create the new Central Asia Regional Information Network (CARIN) in the framework of GOF-C-GOLD.

The training sessions after the workshop were co-sponsored by the UNESCO G-WADI project (Water and Development Information for Arid Lands - A Global Network). The training sessions informed 63 young scientists, regional experts and decision makers about the publicly available satellite-based datasets and introduced data processing methodologies in the thematic framework of the meeting (fire monitoring, land use monitoring, land cover change detection, water management) . The training was well received by the participants, who emphasized in their feedback that the need for training in the region is large, pressing and clearly unmet. The participants are keenly interested in additional training opportunities especially those with hands-on exercises.

In conclusion, this was a well-attended and successful workshop; to maintain the momentum in establishing Central Asia regional network it is important to convene the follow-up meeting of the network leaders soon. The workshop summary has been submitted for publication in the November-December (2009) issue of NASA Earth Observer and science presentations are posted at LCLUC web site

([http://lcluc.umd.edu/Program\\_Information/teammeetings.asp](http://lcluc.umd.edu/Program_Information/teammeetings.asp)).

## Background

The Joint NASA LCLUC Science Team Meeting and GOFD-GOLD/NERIN, NEESPI, and MAIRS Workshop was held in Almaty, Kazakhstan September 15-19, 2009 with training sessions on September 20-21. The objectives of the workshop were to provide a forum for international scientific exchange on critical land use issues in Central Asia, to facilitate coordination of satellite-based research and applications within the region and to strengthen research being undertaken within the NASA LCLUC program. The workshop provided a follow-up on the discussions and research collaboration initiated in 2007 fall NEESPI/LCLUC meeting in Urumqi, China.

The meeting was hosted by the National Center for Space Research and Technology (NSRTC) of the Kazakhstan's National Space Agency. The NSRTC is the leading National institution in Kazakhstan and one of leading institutions in Central Asia focusing on development and operational implementation of land monitoring methodologies based on various remotely-sensed data sources. Equipped with its own ground stations, the NSRTC processes and archives data from the US AVHRR and MODIS, Indian IRS-1C/1D and IRS P6, and Canadian RADARSAT-1 satellites which enables them to support operational needs of land management agencies as well as develop scientific data products.

The workshop agenda was developed to cover 4 major themes of interest and importance for the region: land cover, land use/agriculture, water resources and fire. Four thematic sessions were organized to give an overview of recent research accomplishments and formulate future research and applications development needs. Discussions and expert panel were planned explore opportunities for coordination and collaboration among research teams and ongoing projects aimed at improved observations of agriculture, land-cover, land-use, water resources and fire in the temperate and arid regions of Northern Eurasia. One of the goals of the workshop was to consider the development of regional Central Asian information network, which would sustain the regional exchange of information and satellite monitoring data. The full agenda as well as presentations from the meeting are available at the LCLUC web site: <http://lcluc.umd.edu/>.

The workshop attracted great interest in the region with local media coverage of the event and active participation by 184 scientists and land managers from 16 countries (Belgium, China, Germany, Iran, Italy, Japan, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Ukraine, United States, and Uzbekistan).

## Workshop overview

### *Opening session*

The workshop opened with the address from the head of the Kazakhstan's National Space Agency (KNSA) and Kazakh cosmonaut **Talgat Musabayev**. In his remarks Mr. Musabayev emphasized the commitment of KNSA to support the needs of operational and scientific observations of land from space by preparing the launch of two high resolution satellites collecting data at 1 m and 7 - 20 m resolutions, respectively. He also noted that the role of KNSA in the global space program is expected to increase significantly in the nearest future once the Baikonur Space Launch pad becomes a major venue for human space-flight mission after the cancellation of NASA's shuttle program. Mr. Musabayev's acknowledgement of the importance of the work undertaken by the participants of the workshop was also underlined by professor **Zhumabek Zhantaev**, the president of the National Center of Space Research and Technologies.

The opening remarks were followed by brief presentations describing the existing international programs involved in monitoring and assessment of environmental change in Central Asia and outlining opportunities for regional and international collaborations within the framework of these programs. **Garik Gutman** [NASA HQ – *LCLUC Program manager*] summarized the LCLUC program and current areas of emphasis for NASA’s earth observation program. In his presentation he pointed out that synergistic use of NASA and commercial US assets in optical remote sensing allows evaluation of various processes across different spatial (1 km to 1 m) and temporal (yearly to twice daily observations) scales. He noted that during its 50-year record, NASA launched a suite of systematic and exploratory missions collecting LCLUC-relevant information, with Landsat program being of particular importance because of the unprecedented length of the data record and resolution of imagery.

Environmental processes occurring within Central Asia fall within the area of interest of two large regional science programs. The MAIRS program, introduced by **Jianguo Qi** [NASA-MAIRS – *Program Scientist*], has a strong emphasis on advancing the understanding of the interactions between the human and the natural components of ecosystem functioning in the monsoon Asian region in support of sustainable development. For the NEESPI program, described by **Multu Ozgodan** [University of Wisconsin], Central Asia is of particular interest because it covers many transitional zones (including forest-steppe, steppe-desert, and mountain systems) which frequently are most vulnerable to internal and external change.

The collaboration of scientists within Northern Eurasia is supported through an established GOFC-GOLD regional network NERIN, designed to provide the interface between producers of satellite data products and national level data users. **Olga Krankina** [GOFC-GOLD/NERIN – *coordinator*] invited the regional workshop participants to join the newest data dissemination initiative in Asia in April-May, 2010 and to consider the formation of a separate GOFC-GOLD network in Central Asia.

### ***Science issues***

Concern about the environmental impact of global climate change on the Central Asian region was at the forefront of the Almaty meeting agenda. The Almaty workshop focused its work on relating the observations of environmental and land-use processes directly to human-well being, linking the scientific research to operational land monitoring and decision-making support. The increasing demand for agricultural production and concerns about food security, natural disasters such as fire, drought, flooding, degradation of land resources through soil erosion and dramatic reductions in fresh water availability are the immediate concerns in dry lands of Central Asia. Remotely sensed observations and analysis play an important role in quantifying changes in these phenomena and informing land management decisions. The workshop was organized in four major themes covering land cover, land use/agriculture, water resources, and fire with the goal of reviewing the existing regional approaches to monitoring these processes and the availability of satellite data sources, products, and monitoring capabilities. Selected highlights from science presentations are shown below.

**Zairulla Dyusenbekov** [a member of the National Academy of Sciences of Kazakhstan] delivered the plenary overview of the historic perspective and present state of the land resources of Kazakhstan. He noted that three quarters of land resources in Kazakhstan are under Agricultural use (85% pasture and 10% croplands). Academician Dyusenbekov named desertification the greatest threat to land resources of Kazakhstan. This statement was echoed in many other presenters. **Rashid Kulmatov** [Uzbekistan] stated that land degradation due to

overgrazing, over cultivation, poor irrigation and salinization of soil, and deforestation was primary threats to land resources of the Aral Sea Basin as well. Inefficient agricultural practices and poor condition of the irrigation network lead to wide spread water-driven erosion of irrigated lands and waste of water resources.

Water quality and quantity are of high importance in this region of moisture-limited ecosystems. Observations and modeling of Central Asian rivers discharge and surface water balance were presented by **Natalya Agaltseva** [Uzbekistan] and **Jiquan Chen** [USA]. Their findings show an overall decrease of water discharge driven by a direct increase in water consumption and modification of land cover through reduction of woody vegetation and subsequent increase in grasslands and deserts. The presenters also expressed a rising concern about water availability in connection with observed and predicted changes in mountain glaciers. **Zamir Ahmed Soomro** [Pakistan] presented a national approach for capturing and storing rainwater within natural depressions in the landscape to increase water storage capacity and minimize water loss. **Alexander Nikolaenko** [Kazakhstan] raised the importance of international cooperation in solving transboundary water issues which are likely to become prominent and contentious within the immediate future.

Monitoring land and water resources is directly connected with the vital issue of short- and long-term food security and agricultural production. **Nadiya Muratova** [Kazakhstan], **Olivier Leo** [Italy], **Igor Savin** [Russia], and **Andrey Chernov** [Russia] introduced regional and national systems of satellite-based monitoring of crop production and forecasting of crop yields. All presenters emphasized the need to supplement the available moderate resolution observations with high and very high resolution imagery to improve the accuracy of agricultural monitoring. **Chris Justice** [GOFC-GOLD Fire, GEO Ag, USA] invited regional scientists to participate in a GEOS Agricultural Experiment aimed at evaluating the applicability of a suite of Earth Observing (EO) data sources including very high and moderate resolution optical data and microwave observations. **Geoff Henebry** [USA] emphasized the limitations of the traditional assessments of change in vegetation monitoring and argued for a shift towards a dynamic representation of the landscape focusing on temporal patterns of change. He advocated the switch to monitoring surface phenologies as a standard practice for observations and modeling practices in preparation to the 6<sup>th</sup> IPCC assessment report.

The role of satellite observations in disaster monitoring is also well established in the region. **Oleg Arkhipkin** [Kazakhstan] and **Magsar Erdenetuya** [Mongolia] presented regional and national systems of fire monitoring. Operational goals of fire monitoring dictate the need for near-real time data availability and thus they are more developed within countries with data receiving capabilities, such as Mongolia and Kazakhstan. However, globally available datasets described by **Tatiana Loboda** [USA] present a viable alternative for countries which currently do not possess a national fire monitoring capacity.

The importance of developing adaptation strategies to climate-induced changes in ecosystem functioning was a recurrent topic of the workshop presentations and discussions. **Lubov Lebed** [Kazakhstan] presented long-term meteorological trends indicating a consistent increase in temperature and decrease in precipitation between 1850 and 2000 and the potential changes in pasture biomass productivity under the projected scenarios of climate change. **Irina Vitkovskaya** [Kazakhstan] noted that areas with low vegetation productivity in the “steppe-desert” zone were extended between 2000 and 2008. Climate-induced changes are further amplified by changes in economic situation as demonstrated by **Dennis Ojima** [USA] and

**Chuluun Togtohyn** [Mongolia], who showed that vulnerability of rangelands to climate and land-water use changes in Mongolia increased since transition to market economy in 1992.

### *Discussions and recommendations*

The workshop provided a fruitful environment for the regional and international participants to exchange knowledge about environmental concerns in Central Asia and share methodological advances in monitoring various land use and ecological processes using satellite data. During plenary discussions, expert panel discussion, and informal exchange of opinions at poster sessions and during the field trip, the participants identified five research areas of greatest concern:

- 1) the quality and quantity of fresh water resources as the strongest case for a regional network activity;
- 2) crop yield estimation, crop monitoring and the use of fire in agriculture in the context of ensuring regional food security;
- 3) land and soil degradation leading to reduction in land productivity over time and increasing vulnerability of the natural and agricultural systems;
- 4) climate change and variability in the context of concerns for adaptation of human systems different conditions and understanding the processes and informing the policy makers; a
- 5) augmenting fire monitoring capabilities with regional fire ecology research in support of long-term fire management strategies.

At the end of the workshop the participants voiced a unanimous consensus for better regional cooperation in addressing the issue of land monitoring in support of scientific research and decision making for resource management. The similarities in historical development of the region are now expressed in the similarity of the environmental issues across the region and potentially leading to trans-boundary tensions over resource availability, particularly starkly expressed in disputes over fresh water quality and quantity between the countries sharing common watersheds. The shared challenges within the region and the diversity in economic and technological development have led to recognition that greater regional cooperation both in terms of science and resource management would be beneficial. The general sentiment of participants was expressed by Bolot Moldobekov [Kyrgyzstan]: “We are not using remote sensing enough because there is little info where the remotely sensed data can be used. More information dissemination is necessary to inform people of what is available from remote sensing. We also need to integrate these data to models for example for water cycle modeling. There are very few people in Central Asia who are qualified to work with remotely sensed data and we need to add training for specialists to develop the new capacity”.

A decision to create the Central Asia Regional Information Network (CARIN) in the framework of GOF-C-GOLD to facilitate the continued flow and exchange of data and methodologies as well as scientific findings throughout the region was welcomed and supported by representatives from all participating countries in Central Asia including Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, Turkmenistan, Mongolia, China, and Russia. A planning meeting for the network will be held in the spring of next year in Almaty, followed by a GOF-C-GOLD Regional Network Workshop tentatively planned for 2011 to be held in Uzbekistan. In addition, a plan is being developed to invite a group of young experts from the region to EDC as part of GOF-C-GOLD Data Initiative.

Garik Gutman [USA] raised a concern about the lack of linkages between the regional scientists who research land cover and land use change and related processes in high elevation

environments and the regional LCLUC agriculture and water-issues focused groups. He noted that linking the glacier and high elevation research to the dry lands studies in this region is critical because mountain glaciers present a major fresh water source in these arid water limited ecosystems. Thus climate change effects at high elevations would ultimately have impacts on land use and societal well-being in the agricultural regions. He encouraged the two scientific communities to take full advantage of opportunities to exchange the flow of information and ideas by increasing their participation in workshops organized by either of the groups.

### ***Field Trips***

One full-day field trip was organized by local hosts to give the overview of regional geography, land use, and historic development of the landscape. Commentary during the trip was provided by local experts. The trip included a visit to the agricultural research institute with introduction of land cultivation practices and a vast collection of plants cultivated in the region. The trip also served as an opportunity for discussions among workshop participants. The second (optional) field trip was to observe land-use and natural hazard management in mountain region near Almaty; 6 participants attended.

### ***Training sessions***

The workshop was followed up by a two-day long training session which was co-sponsored by the UNESCO G-WADI project (Water and Development Information for Arid Lands - A Global Network). The training sessions were attended by 63 meeting participants and were aimed at informing the regional experts and decision makers about the publicly available satellite-based datasets and introducing data processing methodologies necessary to ensure the high quality of results. Participants provided feedback which was very positive; they all felt that they learned a lot. The participants emphasized in their feedback that the need for training in the region is large, pressing and clearly unmet. The participants are keenly interested in additional training opportunities especially those with hands-on exercises. In conclusion of the training, certificates of completion were distributed by Jianguo Qi, Olga Krankina, and Nadiya Muratova.

### ***Follow-up***

The workshop summary has been submitted for publication in the 2010 January – February issue of NASA Earth Observer ( [http://eospsoc.gsfc.nasa.gov/eos\\_homepage/for\\_scientists/earth\\_observer.php](http://eospsoc.gsfc.nasa.gov/eos_homepage/for_scientists/earth_observer.php) ) and science presentations are posted at LCLUC web site ([http://lcluc.umd.edu/Program\\_Information/teammeetings.asp](http://lcluc.umd.edu/Program_Information/teammeetings.asp)). Papers from Almaty meeting and from 2007 Urumqi China meeting will be published in a special issue of Journal of Regional Environmental Change (<http://www.springer.com/environment/global+change+-+climate+change/journal/10113>); Guest Editor Dr. Jianguo Qi, Michigan State University, USA).

**ATTACHMENT 1: Announcement and Agenda**

**Joint NASA LCLUC Science Team Meeting and  
GOF-C-GOLD/NERIN, NEESPI, MAIRS Workshop**

**Monitoring land cover, land use and fire  
in agricultural and semi-arid regions of Northern Eurasia**

September 15-19, 2009 (Training Sessions September 20-21)

National Center of Space Research and Technologies, National Space Agency,  
Almaty, KAZAKHSTAN

The growth of human population, increasing demand for agricultural production and concerns about food security in the world are among the reasons for growing interest in land monitoring based on satellite remote sensing. The semi-arid regions are also very sensitive to global climate change and all vegetation there depends strongly on weather conditions and water availability. Land cover, land use change, state of agriculture and various natural/ artificial phenomena such as fire, drought, flooding, soil erosion by water and wind are the subject of research using the remote sensing. Remotely sensed observations and analysis play an important role in quantifying changes in these phenomena and informing land management decisions.

The workshop is organized around 4 major themes (land cover, land use/agriculture, water resources and fire) with the goal of reviewing the availability of satellite data, products, and processing methods for land monitoring in temperate and semi-arid regions of Northern Eurasia. An additional focus for the workshop is the definition of requirements for land cover and land use characterization that address the needs of users in these regions and the community of scientists working on regional environmental issues.

Presentations and discussions at the workshop will give an overview of recent research accomplishments and formulate future research and applications development needs. The workshop will explore opportunities for coordination and collaboration among research teams and ongoing projects aimed at improved observations of agriculture, land-cover, land-use, water resources and fire in the temperate and arid regions of Northern Eurasia. English-Russian translation will be provided. The workshop is hosted by the National Center of Space Research and Technologies of the Kazakhstan National Space Agency (<http://www.spaceres.kz/>). For additional information about the workshop contact:

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Online registration:  
[http://lcluc.umd.edu/Program\\_Information/meeting-  
registration\\_almaty.asp](http://lcluc.umd.edu/Program_Information/meeting-registration_almaty.asp)

## AGENDA

Sept. 15 – Participant arrival

### **Day 1. Sept 16 (Wednesday)**

8:30 – Participant registration and poster set-up begins

### **9:00 – 10:30 Session 1a. Introductions and opening comments (Chair – Zhumabek Zhantaev)**

9:00 Welcome from Talgat Musabaev, Chairman of the National Space Agency of the Republic of Kazakhstan

9:10 Presentation of the Workshop Objectives – Olga Krankina

### **International and National Program presentations**

9:20 NASA LCLUC – Garik Gutman

9:40 GOFC-GOLD NERIN – Olga Krankina

9:50 NEESPI – Mutlu Ozdogan

10: 00 Programs at Regional Ecological Center for Central Asia – Talaibek Makeev

**10:10 Science Keynote Address** – Land Resources of Kazakhstan: history and present condition – Zairulla D. Dyusenbekov (Kazakhstan) – 30 minutes

*Coffee 10:40-11:00*

### **11:00 – 13:00 Session 1b. National Overviews on Land cover-land use, Fire and Agriculture: projects, activities and organizations Chair -- Olga Krankina**

Kazakhstan (Lev Spivak, JSC “NCSRT”, Almaty)

Russia (Igor Savin, IKI, Moscow)

Mongolia (Tsolmon Renchin, NUM, Ulaan-Baatar)

Kyrgyzstan (Bolat Moldobekov, CAIAG, Bishkek)

Tajikistan (Alexander Finaev, Dushanbe)

Uzbekistan (Alim Pulatov, EcoGIS Center, Tashkent)

Turkmenistan (Ogulsona Kariyeva, Ashgabad)

*Lunch (13:00 – 14:00) – (poster set up for Session 2b)*

### **14:00 – 14:15 – Group Photo of Meeting Participants**

### **14:15 -- 18:00 Session 2. Agricultural Land Use**

### **14:15 - 16:00 Session 2a. Agricultural Land Use --Plenary Presentations Chair – Chris Justice**

14:15 The GEO Global Agricultural Monitoring Task – Chris Justice (USA)

14:25 Crop yield forecast and the goals of remote sensing of croplands in Kazakhstan - Nadiya Muratova (JSC “NCSRT”, Kazakhstan)

14:45 Remote sensing in support of European agricultural policies: the MARS Project - Olivier Leo (JRC, Italia)

15:05 Agricultural monitoring of Central Asia using Remote Sensing: an overview - (Igor Savin, Russia)

15:20 Monitoring vegetation condition in Central Asia: an overview – (Geoff Henebry, SDSU-USA)

15:40 Application of Remote Sensing Data in Regional GIS of Agro industrial complex - A. Chernov (Russia)

**Session 2b Poster Session: Agriculture Land Use (and Coffee) 16:00 – 17:00**

The accuracy of Kazakhstan crop mapping using multi-resolution satellite data - Alexey Terekhov (Kazakhstan)

Application of original derivative vegetation indices for testing vegetation state. Approach to field technologies. – Taras Kazantsev (Ukraine)

Human vulnerability and adaptations to climate change in arid environments of Central Asia - Elena Lioubimtseva (USA)

The NASA Global Agricultural Monitoring Project: Central Asia - Chris Justice, Inbal Becker-Reshef, Eric Vermote (USA)

CropWatch: Central Asia. - Lu Shanlong (China)

Regional evaluation of crop rotation system and spatio-temporal variation of soil organic carbon dynamics for rainfed cereal farming in northern Kazakhstan – Takata Yusuke (Japan)

Wheat yield forecasting system using SPOT Vegetation data in Uzbekistan -- Bakhtiyor Pulatov (Uzbekistan)

NASA Data and Services Supporting Monsoon Asia Integrated Regional Study in Eastern Asia – Greg Leptoukh (USA)

**Session 2c. 17:00 – 18:00 Plenary Synopsis of Posters, Presentations and Discussion Session on regional priorities for agricultural land use monitoring (Chair - Chris Justice)**

*19:00 Official Dinner*

**Day 2 Sept. 17 (Thursday)**

**8:30 – 10:30 Session 3a. Land Cover Monitoring and Validation (Chair - Jianguo Qi)**

8:30 GOFC-GOLD Land Cover IT and validation task -- Pontus Olufson (USA)

8:50 The experience of land cover changes detection by satellite data – Irina Vitkovskaya (Kazakhstan)

9:10 Land system change in pastoral systems of Mongolia – Dennis Ojima (USA)

9:30 Pasture Monitoring based on the Remote Sensing and Ground Observation Base (example of Balkhash area) -- Lyubov' Lebed (Kazakhstan)

9:50 USDA-ARS grasslands project in Central Asia - Phil Heilman (USA)

10:00 Regional aspects of land cover change and interaction with climate -- Gensuo Jia (China)

10:20 Using satellite remote sensing to study and monitor the Aral Sea and Adjacent Zone -- Phil Micklin (USA)

**10:40 – 11:40 Session 3a. Land Cover Monitoring and Validation (Poster Session and Coffee)**

40 years of landuse changes in Baiyangdian Wetland - Lu Shanlong (China)

Conceptual framework for rezoning and monitoring of phyto-reclamation on the exposed bed of the Aral Sea -- Galina Stulina (Uzbekistan)

Key territories for bird conservation in Turkmenistan -- Atamyrat Veyisov (Turkmenistan)

Land Cover of Northern Eurasia: Comparison and Assessment of Coarse Resolution Maps – D. Pflugmacher et al. (USA, Olga Krankina, presenter)

New Land Cover Map for Northern Eurasia -- Sulla-Menashe et al. (Olga Krankina, presenter)

The main drivers of land degradation in Uzbekistan – Muhtor Nasyrov (Uzbekistan)

Decision tree approach based on object oriented for land cover classification in mountain area  
Lei Zhang (China)

Land cover changes using MODIS data – Magsar Erdenetuya (Mongolia)

Land Cover and Carbon Sequestration in Drylands of Kazakhstan - Assessment by Remote Sensing and field data - Martin Kappas (Germany)

The new MODIS derived land cover map of Russia (250 m) -- Sergey Bartalev, Igor Savin (Russia)

3D for participatory spatial planning – Muratbek Koshoev (Kyrgyzstan)

Land surface phenology dynamics in Central Asia: impacts of land use change and climate variability - Jahan Kariyeva (USA)

**11:40 – 12:45 Session 3c Synopsis of Presentations and Discussion: Regional Research Priorities for Land Cover Monitoring and Validation (Chair – Jianguo Qi)**

*12:45 – 14:00 Lunch*

**14:00 – 18:00 Almaty city tour**

**Day 3 Sept 18 (Friday)** Field trip: demonstration and discussion of different types of landuse in South Kazakhstan.

**Day 4. Sept. 19 (Saturday)**

**8:30 – 10:30 Session 4a. Fire Monitoring and Fire Science in Dryland Ecosystems of Northern Eurasia – Chair Tatiana Loboda**

8:30 GOFC-Fire Program Goals and Initiatives – Chris Justice

8:50 Global Fire Monitoring Center activities in drylands of Northern Eurasia - Johann Goldammer

9:10 Regional Central Asia and Northeast Asia Wildland Fire Networks – Leonid Kondrashov

9:30 Satellite Monitoring of Fire in Kazakhstan - Oleg Arkhipkin

9:50 Remote sensing approach for forest and steppe fire monitoring in Mongolia – M. Erdenetuya

10:10 NASA MODIS Global Fire Monitoring and its applications in Northern Eurasia – Tatiana Loboda

*10:30 – 10:45 Coffee Break*

**10:45 – 13:05 Session 5a . Water Resources and Monitoring. Chairs - Alex Shiklomanov and Jianguo Qi 20 min. each**

10:45 Water Resources of Central Asia: Contemporary Status and Future Projections – Natalia Agaltsova, Alex Shiklomanov

11:05 Investigating the Relationship Between Land Use/Land Cover Change, Hydrologic Cycle, and Climate in Semi-Arid Central Asia – Mutlu Ozdogan

11:25 Review of water problems and undertaking decisions in Central Asia - A. Nikolaenko

11:45 Effects of Land Use Change on the Energy and Water Balance of the Semi-Arid Region of Inner Mongolia – Jiquan Chen

12:05 The modern problems of using, management and protection of land-water resources of Aral Sea basin - Rashid Kulmatov

12:25 Water and its observation in arid regions - Xin Li

12:45 Discussion

*Lunch 13:00 – 14:00*

#### **14:00 – 15:00 pm Poster Sessions 4b and 5b**

##### **Fire**

Satellite Monitoring of Fire in Russia - Anatoly Lagutin (Russia)

Recent trends of the fire induced vegetation change in Kazakhstan dry lands – Alexey Terekhov et al. (Kazakhstan)

Burned lands as source of dust in arid regions of Turkmenistan – Madina Batyrbayevav et al. (Kazakhstan)

##### **Water:**

Land Use Ecosystem Climate Interactions in Monsoon Asia – Hanqin Tian

Using satellite remote sensing to study and monitor the Aral Sea and Adjacent Zone -- Phil Micklin

Approach to the assessment of the climate change impact to the water availability and water demand for area of the intensive runoff use - Natalia Agaltsova (Uzbekistan)

Monitoring the water level in Balkhash Lake and discharge of the Ili River: application of remote sensing – Pavel Propastin (Germany)

#### **15:00 – 18:00 Concluding session**

15:00 Synopsis of Presentations and Discussion for Session 4: Regional Research Priorities for Fire Science (Chris Justice)

15:20 Synopsis of Presentations Session 5: Regional Research Priorities for Water Resources and Monitoring (Alex Shiklomanov)

15:40 Panel on Regional Research Priorities (5 min comments from a panel of regional experts); General Discussion of Regional Research Priorities and Formation of Regional GOF-C-GOLD Network (Olga Krankina – moderator, Chris Justice, rapporteur)

17:30 Special Issue Announcement – Jianguo Qi, Solicit papers for a special issue in a peer reviewed journal

17:40 Summary Presentations on future plans and funding opportunities – Garik Gutman

### **Close of Workshop 18:00**

### **Day 5. Sept. 20 (Sunday) – Training Session One**

#### **1. Training Sessions – Geospatial Methods and Applications**

8:30 – 8:40 Introduction and Overview of Training Sessions (Jianguo Qi)

8:40 – 10:30 Thematic data analysis of Landsat TM and ETM+ imagery (Tatiana Loboda)

10:30 – 11:00 Break

11:00 – 11:45 Thematic data analysis of Landsat TM and ETM+ imagery (Tatiana Loboda)

11:45 – 12:45 Geospatial tools and methods for fire monitoring and management (Tatiana Loboda)

12:45 – 14:00 Lunch

14:00 – 15:00 MODIS technical overview and products (Tatiana Loboda)

15:00 – 18:00 Geospatial applications in land-use/land-cover change processes in Central Asia (Mutlu Ozdogan) with coffee break

18:00 – 18:05 Issues and overview/update of the second day of training (Jianguo Qi)

### **Day 6. Sept. 21 (Monday) Training Session Two**

8:30 – 10:30 Water and its management in arid regions (Xin Li)

*10:30-11:00 Coffee Break*

11:00 – 12:30: Remote sensing methods for rangeland degradation and climate change studies  
(Gensuo Jia / Jiaguo Qi)

*12:45 -14:00 Lunch*

14:00 – 16:30 Land cover validation exercise (Pontus Olufsson)

*16:30-17:00 Coffee Break*

17:00 – 17:30 Discussion, trainee feedback and training workshop summary - Jiaguo Qi

17:30 – 18:00 Awarding Certificates of completed training - Jiaguo Qi and Olga Krankina



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