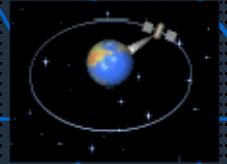


UN Austria/ESA Symposium on “Space Systems – protecting and restoring water resources”.

Austria

Graz

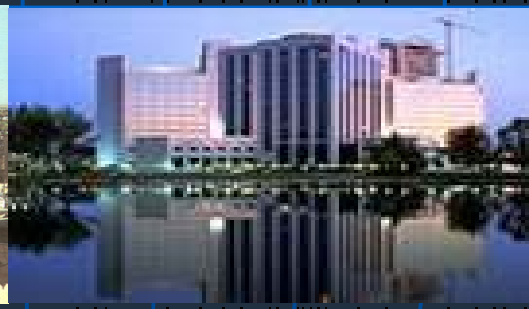
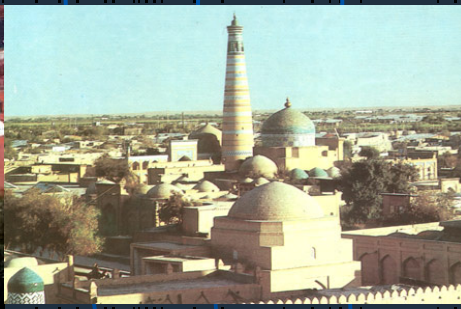
SEPTEMBER 13-16 2005



Director of the Centre of Space Research

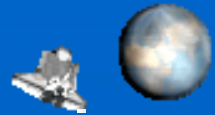
K. Muminov

Space Monitoring of Desertification and Flood processes in Central Asia.



**REPUBLIC OF UZBEKISTAN
ACADEMY OF SCIENCES
CENTRE OF SPACE RESEARCH**

CONTENT OF PRESENTATION



- **INTRODUCTION. BRIEF INFORMATION ABOUT CENTRAL ASIAN COUNTRIES.**
- **DROUGHT AND WATER USE PROBLEMS IN CENTRAL ASIA.**
- **STATUS OF THE MONITORING OF THE DESERTIFICATION, FLOOD AND WATER USE PROCESSES IN CENTRAL ASIA.**
- **ROLE AND SIGNIFICANCE OF SPACE TECHNOLOGIES FOR THE ABOVE PROBLEM.**
- **EFFICIENT WATER USAGE PROBLEMS IN THE COUNTRIES OF CENTRAL ASIA, AND SPACE MONITORING OF THIS PROCESS.**
- **PROBLEM OF ARAL SEA AND ARAL REGION.**
- **ROLE OF UN AND INTERNATIONAL ORGANIZATIONS IN SOLUTION OF DESERTIFICATION, FLOODS, EFFICIENT WATER USAGE PROBLEMS IN THE COUNTRIES OF CENTRAL ASIA.**

INTRODUCTION. BRIEF INFORMATION ABOUT CENTRAL ASIAN COUNTRIES.

Republic of Kazakhstan

Area - 2724,9 000. sq. km.

Population - 14952,7 000 people (by 1999).

Density of population - 5,5 people per sq. km.

Capital – Astana (277 000 чел. данным 1989 г.



Republic of Kyrgyzstan

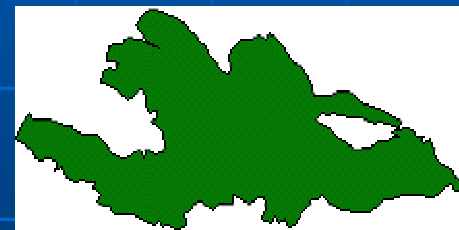
Area - 198,5 000 sq. km.

Population - 4 605 000 people (by 1992 г.)

Density of population - 22,7 people per sq. km.

Capital - Bishkek (around 600 000 people)

Administrative division - 2 provinces, 40 districts, 21 town.



Republic of Tajikistan

Area - 43,1 000 sq. km.

Population - 5 358,3 000 people (1991г.)

Capital Dushanbe - (592 000 people)

Administrative division - 2 provinces, 1 autonomous province, 51 district, 19 towns



INTRODUCTION. BRIEF INFORMATION ABOUT CENTRAL ASIAN COUNTRIES.

Republic of Turkmenistan

Area - 488,1 000 sq. km.

Population - 4,5 mln. people (by official data)

Capital - Ashgabat (around 450 000 people)

Administrative division - 4 provinces, 37 districts, 16 towns



Republic of Uzbekistan

Area - 447,4 000 sq. km.

Population – 25 million people (by 1997)

Capital - Tashkent (2 100.000 people)

Administrative division - 11 provinces,

1 autonomous republic, 141 district, 124 towns.



**TOTAL: - AREA OF CENTRAL ASIA - 3,997 MILLIONS SQ. KM.
- POPULATION OF CENTRAL ASIA – 54,4 MILLION**



Map of Central Asia

Uzbekistan, Kazakhstan, Kyrgyzstan, Turkmenistan, and Tajikistan

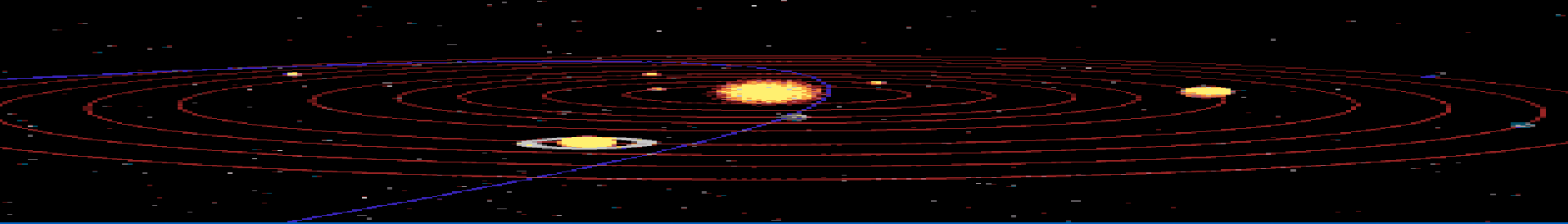




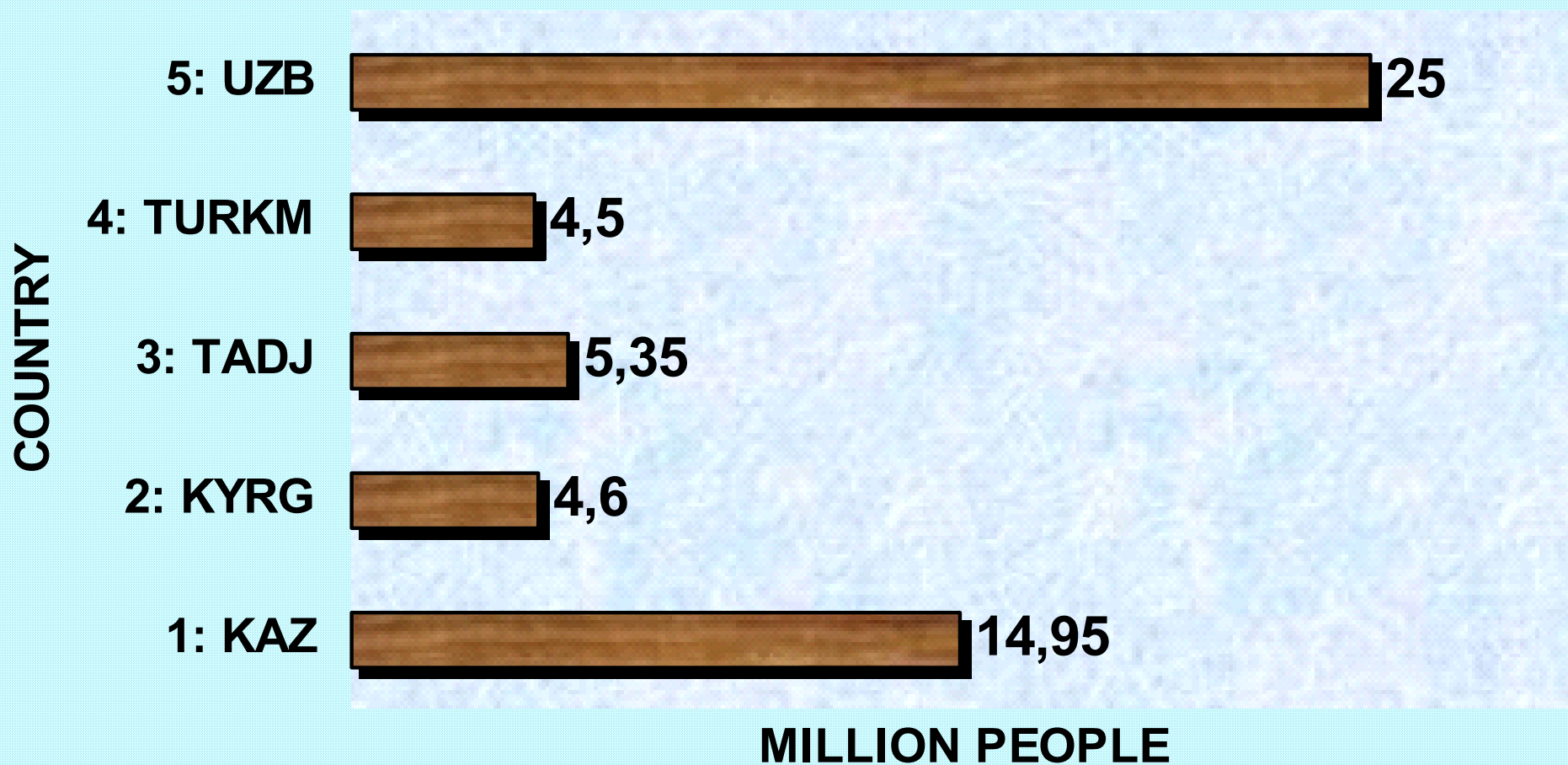
©ROMAN ZELENCOV 2001

AREA OF CENTRAL ASIA COUNTRIES





POPULATION OF CENTRAL ASIA COUNTRIES

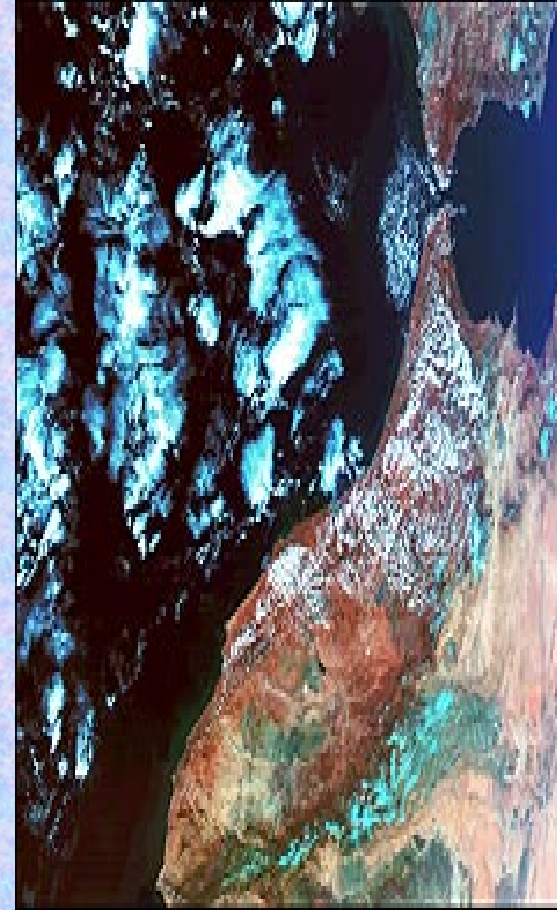
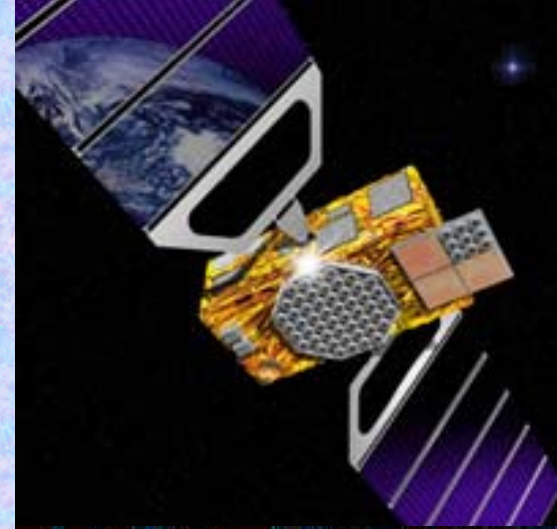


DROUGHT AND WATER USAGE PROBLEMS IN CENTRAL ASIA.

Today the main problems of Central Asian countries in ecological content are the problems of desertification, and efficient water usage. These problems involve other aspects of ecology and, of course vital spheres of human activities, such as agriculture and etc.

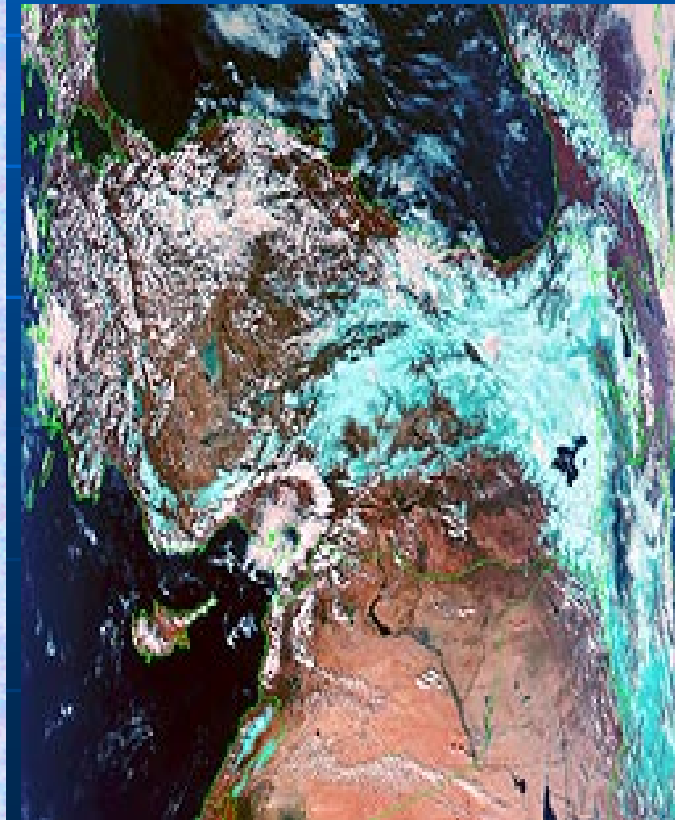
Sub regional program to combat desertification defines Central Asia as area, including Republics of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

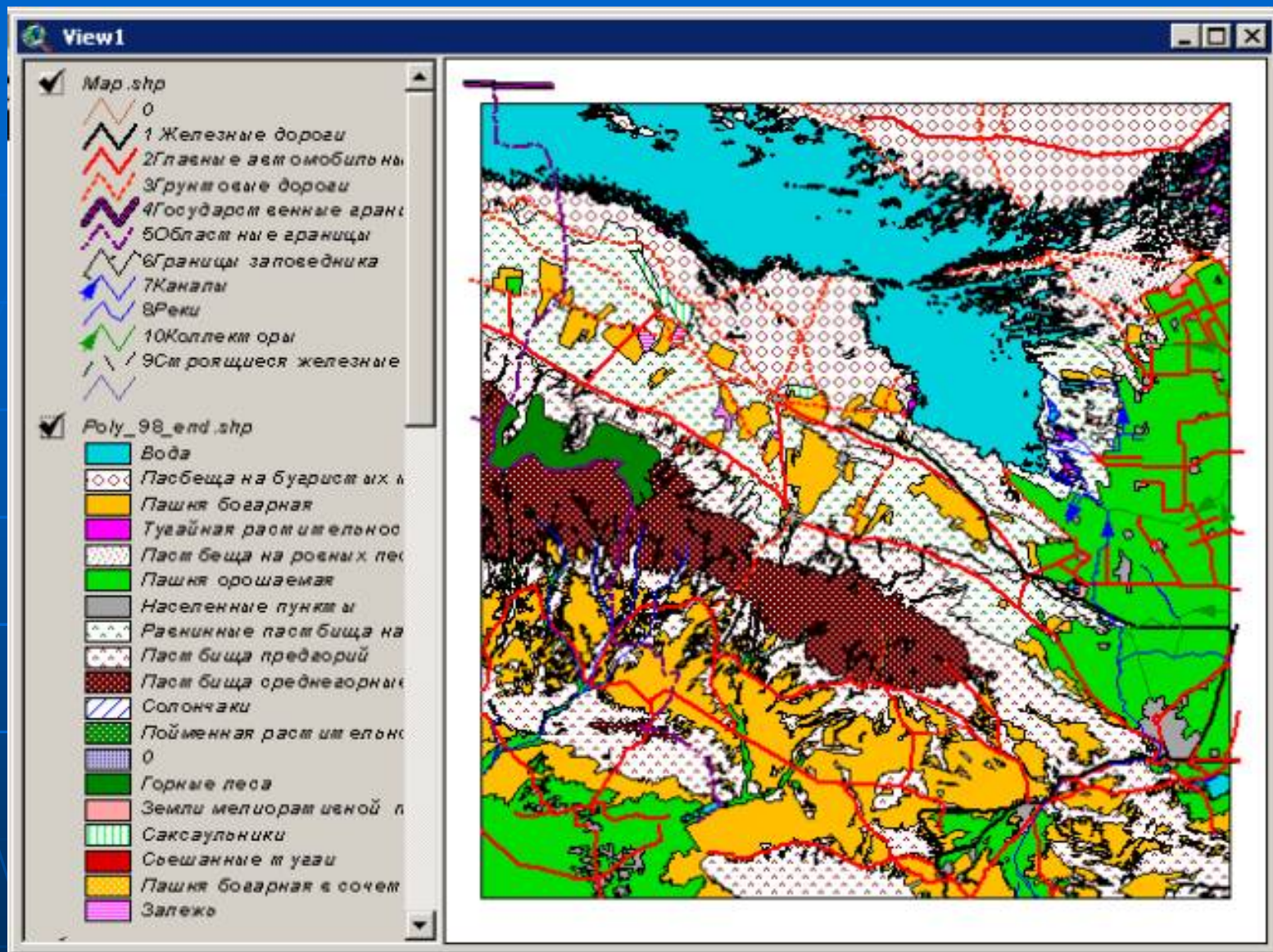
Central Asian subregion is characterized by common, geographical, cultural and historical achievements, and nowadays by the disastrous environmental changes in the basin of Aral Sea



DROUGHT AND WATER USAGE PROBLEMS IN CENTRAL ASIA.

Central Asian coordination committee RIOD, international network of NGO to combat desertification are publishing bulletin devoted to the desertification problems in Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan) and bordering countries. It is publication became possible due to financial support of Secretary Convention to combat desertification of UN and Government of Sweden.



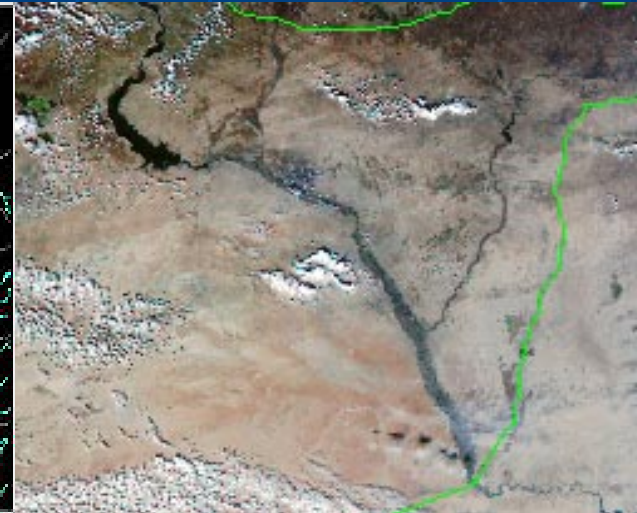
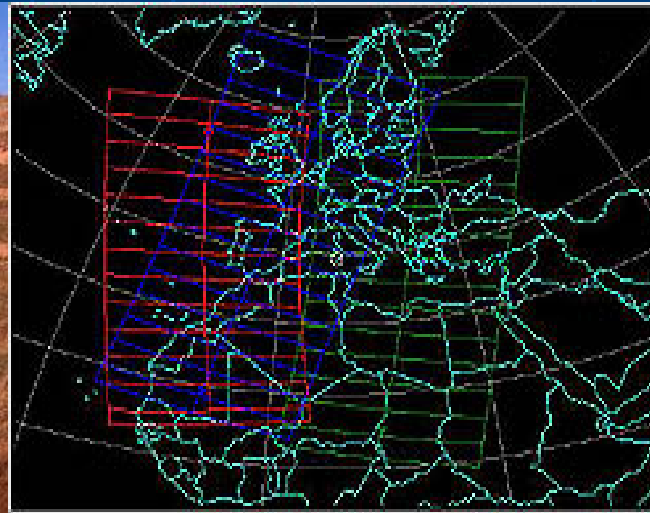


Land use/Land cover map generated by the specialists of Tashkent Institute of Space Engineering, Area of southern Nuratau, by Landsat image analysis, 1989-1998

DROUGHT AND WATER USAGE PROBLEMS IN CENTRAL ASIA.

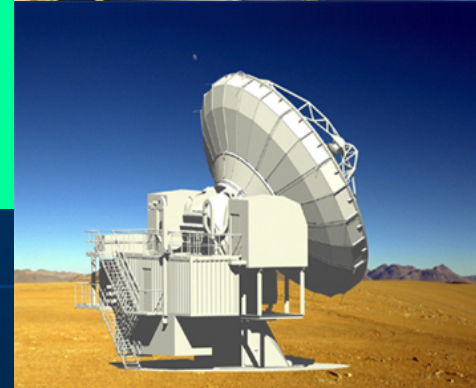
To avert desertification, in the transitional stage of Central Asian countries to the market economy, such a measures has to be taken, that would slow desertification process inherited by the previous social order.

To set such a rules in the society, that would prevent violation of ecological balance, and acceleration of desertification in all regions of Central Asia. A great help in solution of this problem is provided by UN, international organizations, foundations, national organizations of European countries. Secretary Convention to combat desertification of UN also supports project of strengthening of NGOs participation in this process.



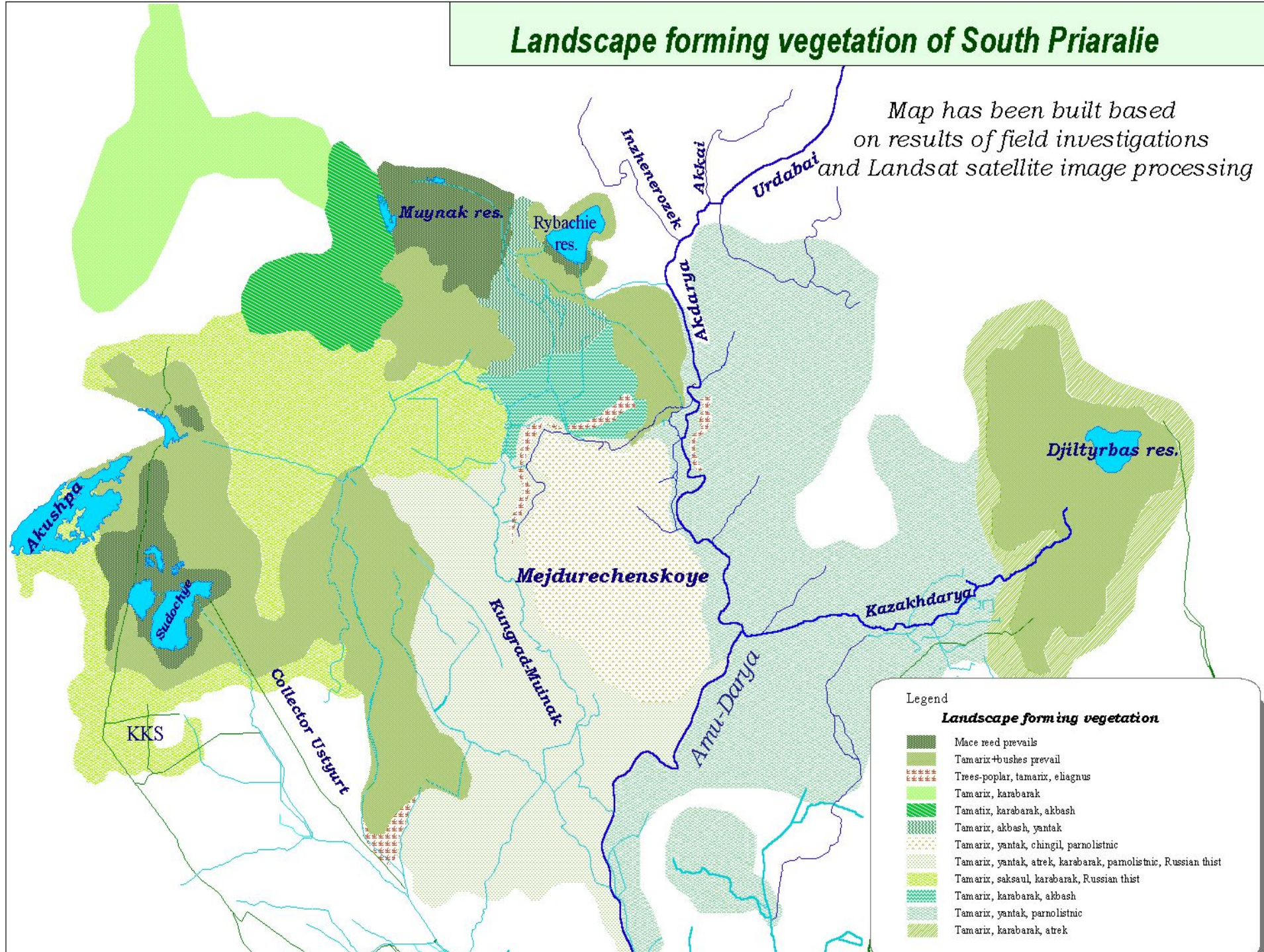
**STATUS OF THE MONITORING OF THE DESERTIFICATION, FLOOD
AND WATER USE PROCESSES IN CENTRAL ASIA.
ROLE AND SIGNIFICANCE OF SPACE TECHNOLOGIES FOR THE
ABOVE PROBLEM.**

Main water resources of Central Asian region are formed by surface discharge of Amudarya and Sirdarya rivers and their tributaries. In each of the considered basins there is component of unaccounted surface discharge, generated by numerous, but minor flows of temporal watercourses, underground flows from pre-mountainous and sub-mountainous areas, and also by precipitation infiltration, not detected by hydro-meteorological methods. Rivers discharge is characterized by significant annual and long-term irregularity. Annual fluctuations depend on the character of rivers' infusion. Glaciers and snowfields play an important role in discharge of large rivers. Their tributaries are mainly depend on snow-rainfall nutrition.



Landscape forming vegetation of South Priaralie

Map has been built based on results of field investigations and Landsat satellite image processing



Variant I.

Schematic map of water flow allocation in the years of maximum water supply

Corrected calculation by "Aral Consult"

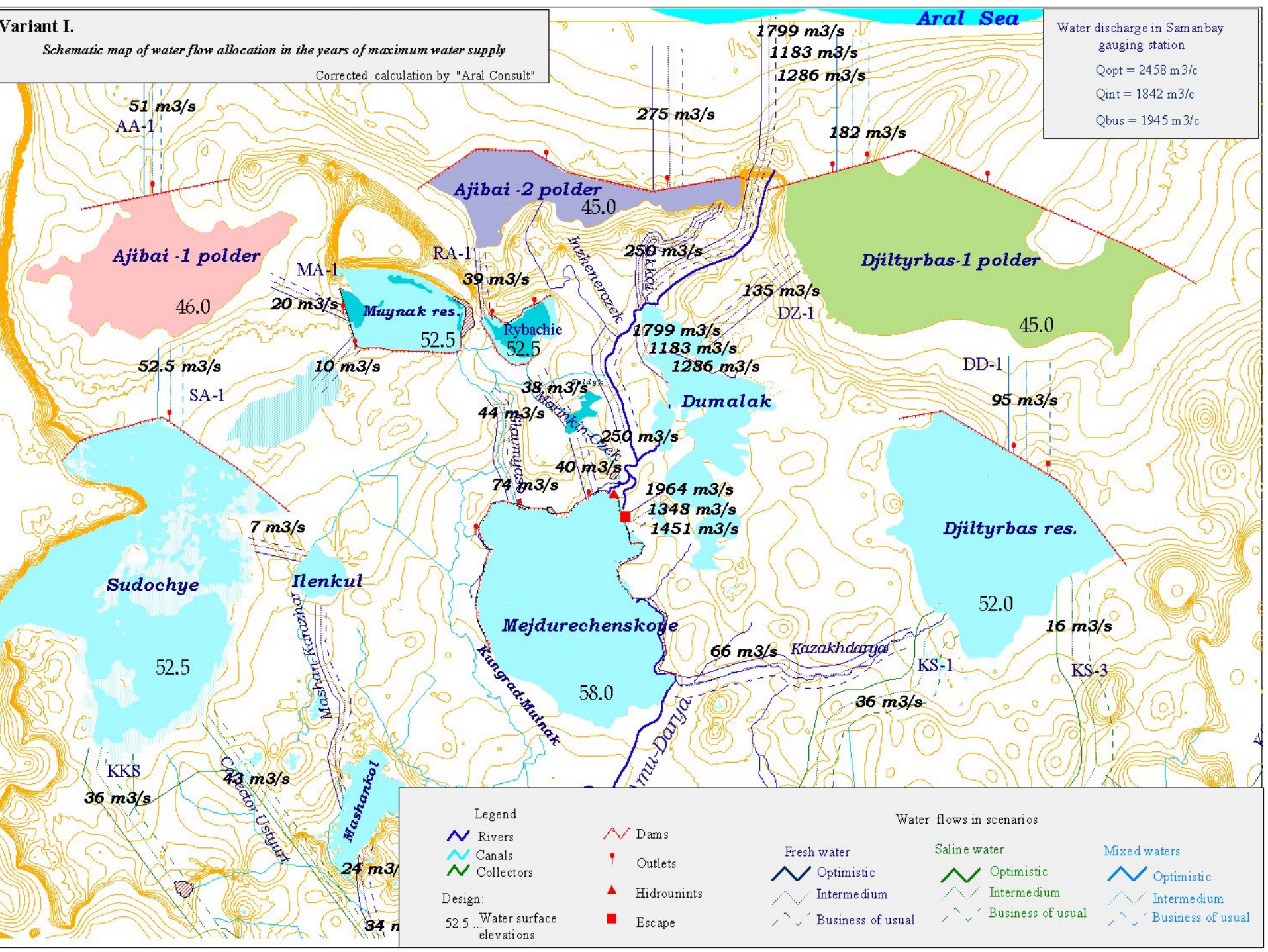
Aral Sea

Water discharge in Samanbay gauging station

$Q_{opt} = 2458 \text{ m}^3/\text{s}$

$Q_{int} = 1842 \text{ m}^3/\text{s}$

$Q_{bus} = 1945 \text{ m}^3/\text{s}$



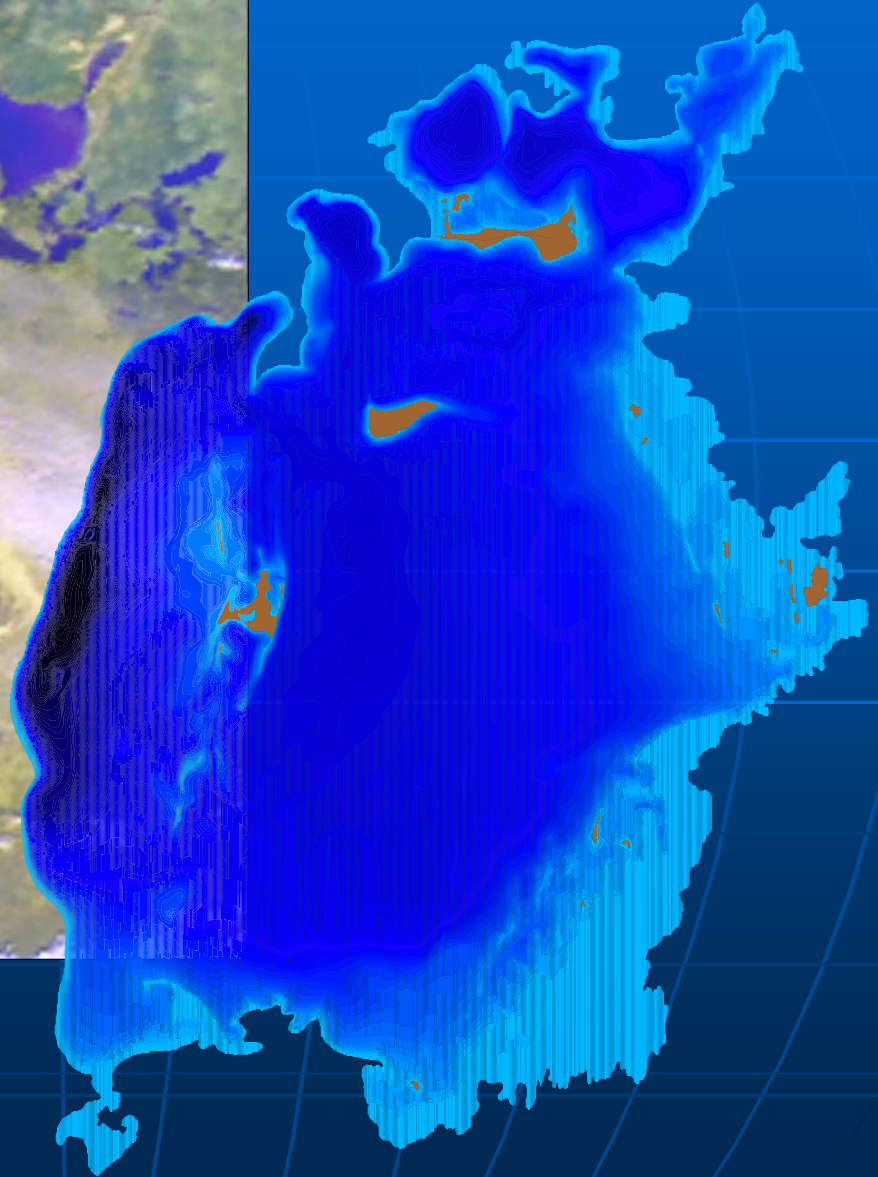
STATUS OF THE MONITORING OF THE DESERTIFICATION, FLOOD AND WATER USE PROCESSES IN CENTRAL ASIA. ROLE AND SIGNIFICANCE OF SPACE TECHNOLOGIES FOR THE ABOVE PROBLEM.

In the basin of Amudarya river there is a possibility of seasonal regulation of discharge of the rivers (Amudarya, Kashkadarya, Surkhandarya), ensuring with a 90%, 60.7 km³/year of discharge.

In the basin of Sirdarya river, cascade of water reservoirs (Toktogul, Kayrakum, Andijan, Charwak, Chardarya) allows full (up to 93%) regulation, in other words long term discharge regulation, but since 1991 upper Toktogul water reservoir works for energy production, sharply increasing discharge (upto 8 km³/year) in non-vegetation period, and decreasing discharge in vegetation period (up to 2 km³/year during dry years). Such mode of operation of Toktagul water reservoir decreases degree of satisfaction of water consumers' requirements in middle and lower streams, and leads to irrigational deficits in dry years.



Aral Sea



Map of Aral Sea

1848

SEA OF ARAL
In Kirghiz- ARAL- TENGHIZ, i.e. Sea of Islands

Greatest depth 37 fathoms

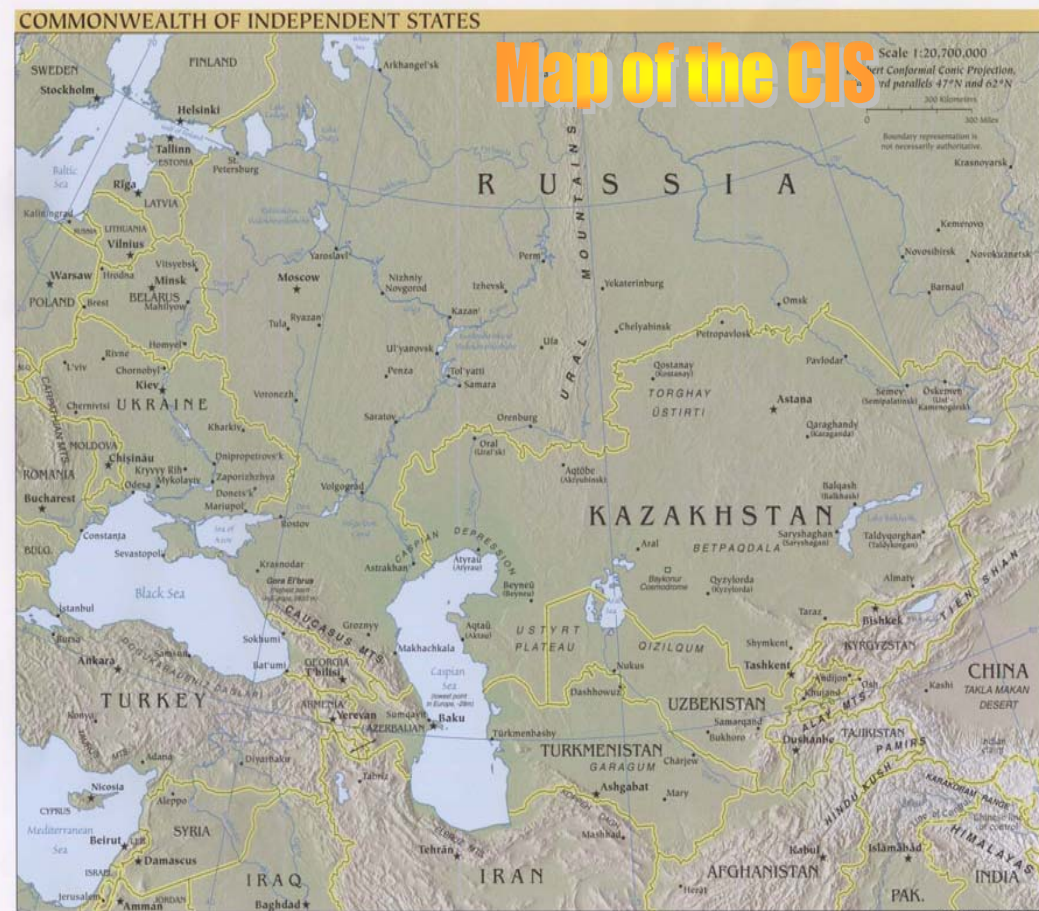
THE GREAT SEA

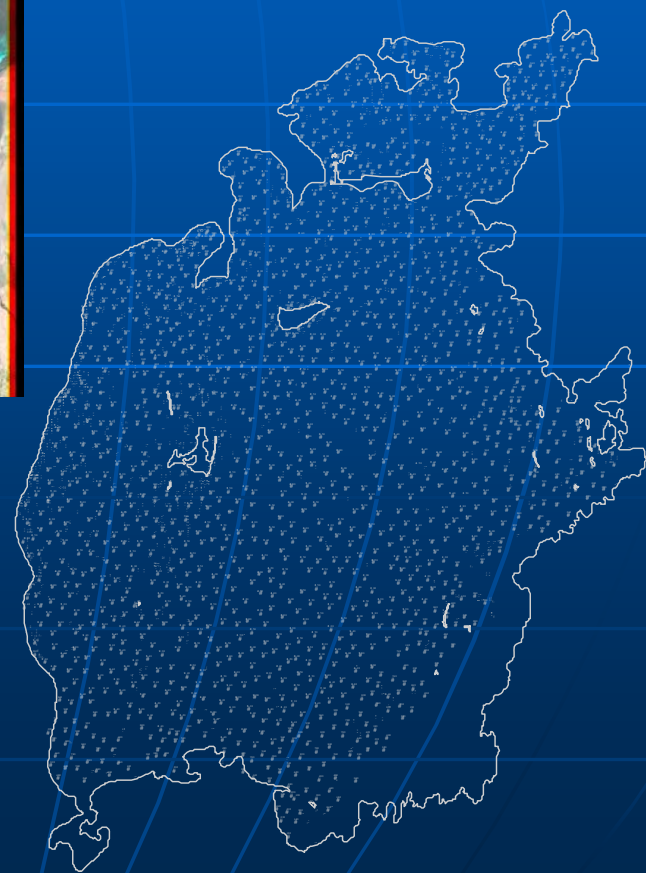
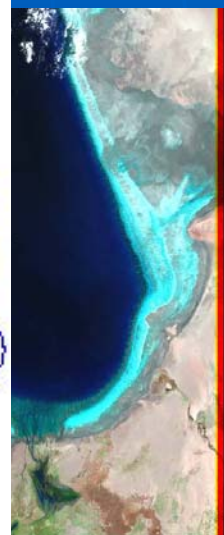
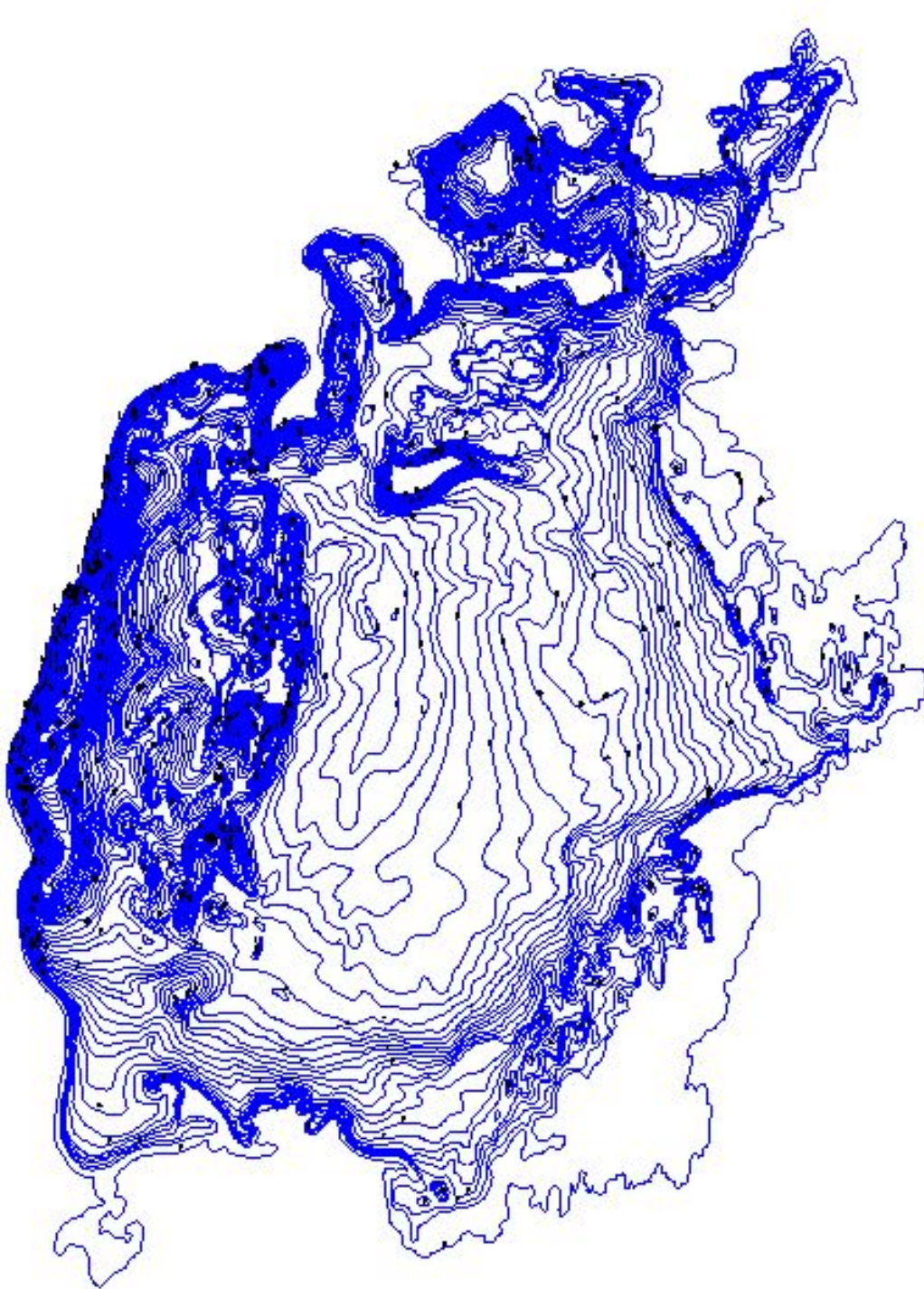
THE KHYAT RIVER

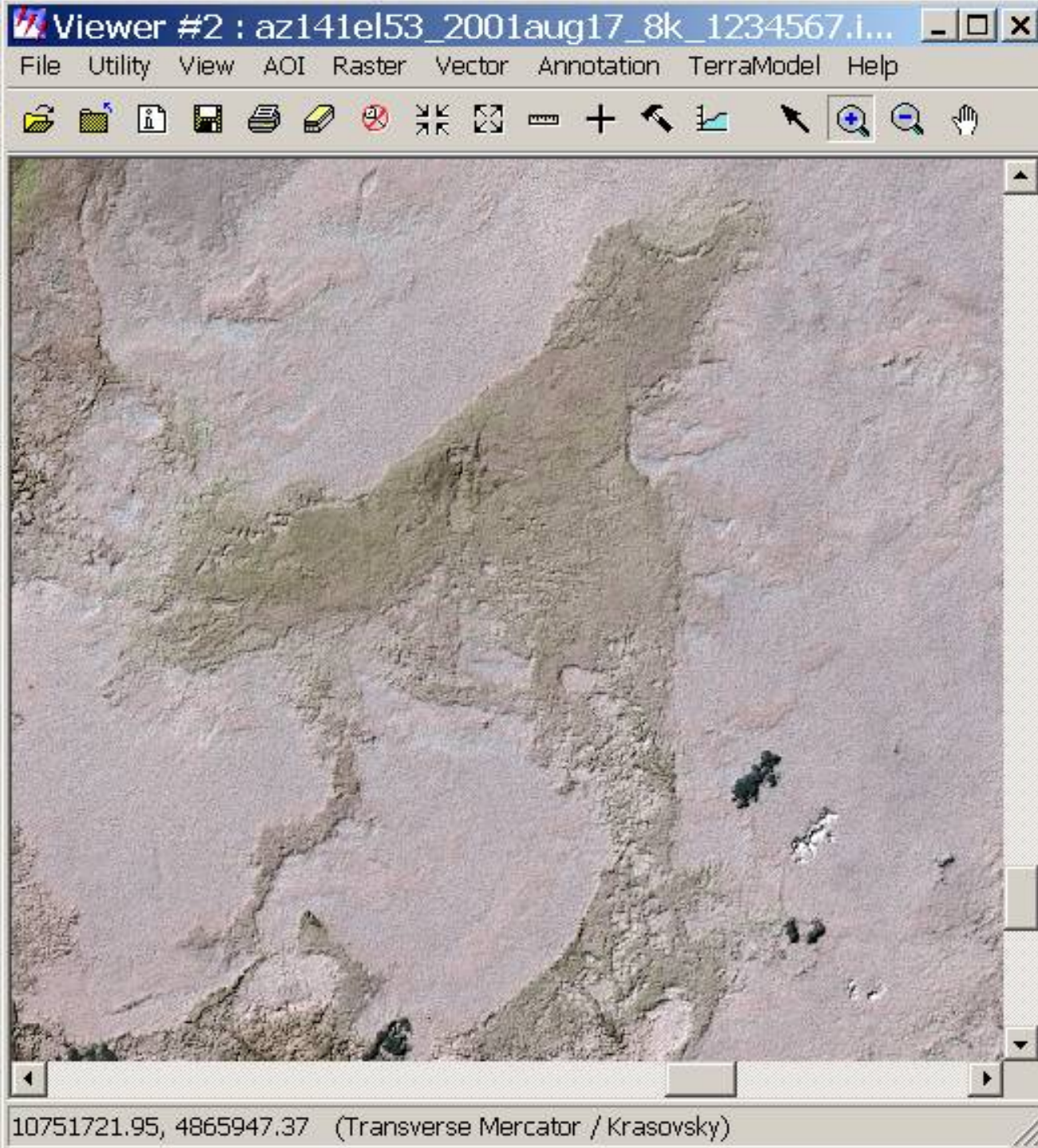
SEA OF KHIVA

SURVEY OF THE SEA OF ARAL BY Commander A. Butakoff, Imper' Russ' Navy.

1848



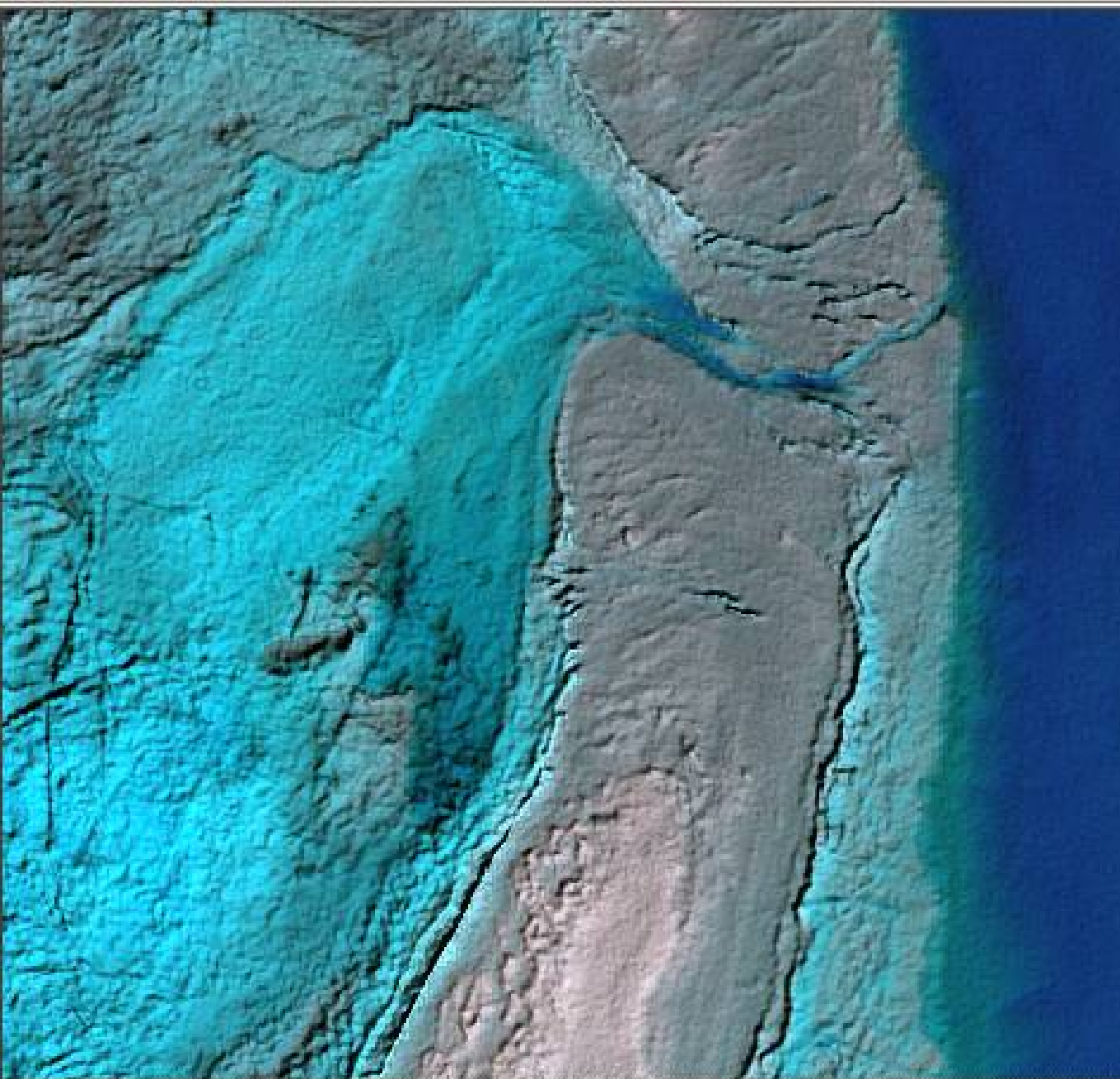




Large salt-marsh
in the South-east

Landsat-7
161_29
Bands
1, 3, 5

August 17 2001

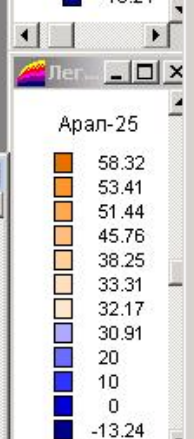
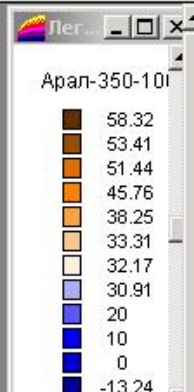
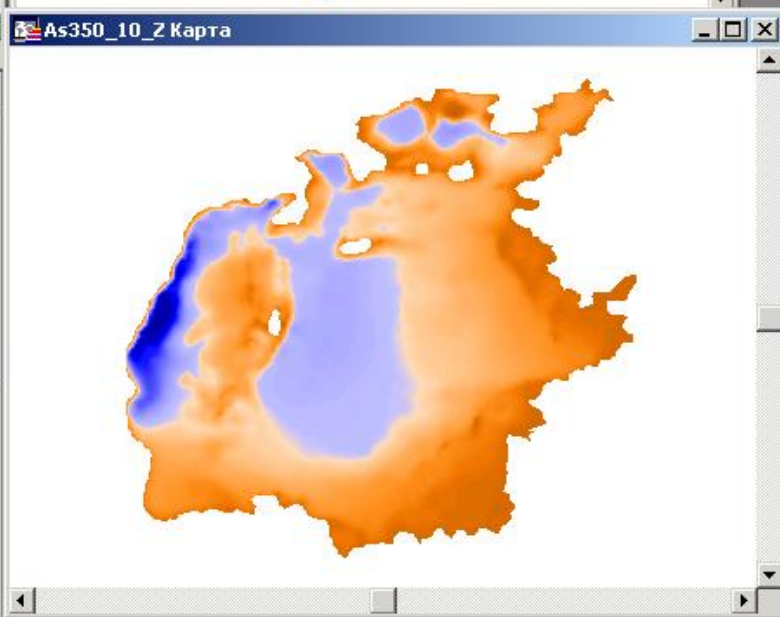
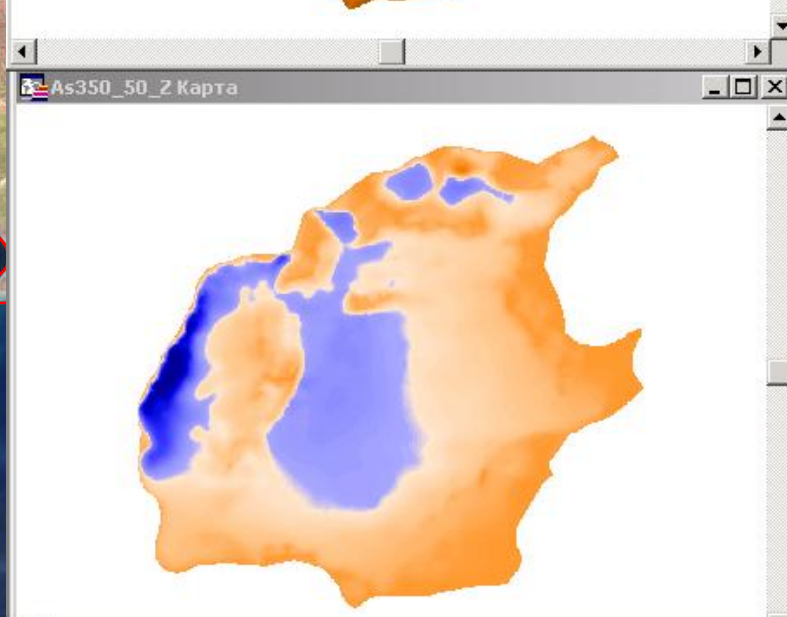
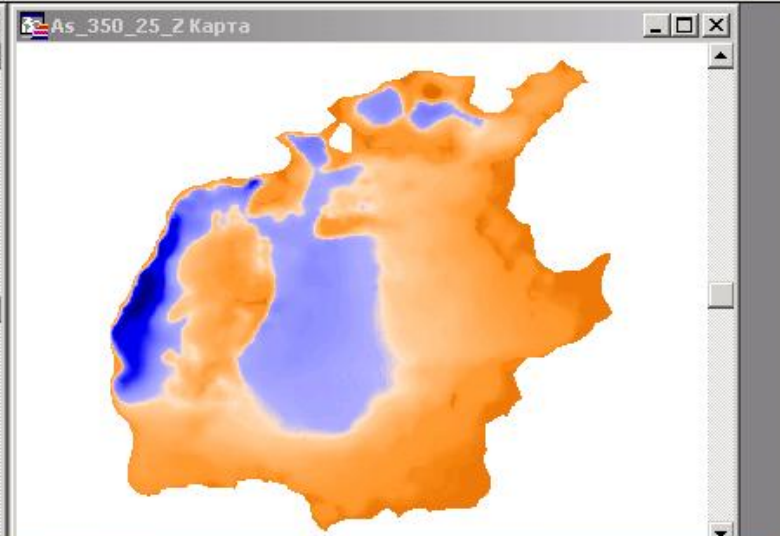
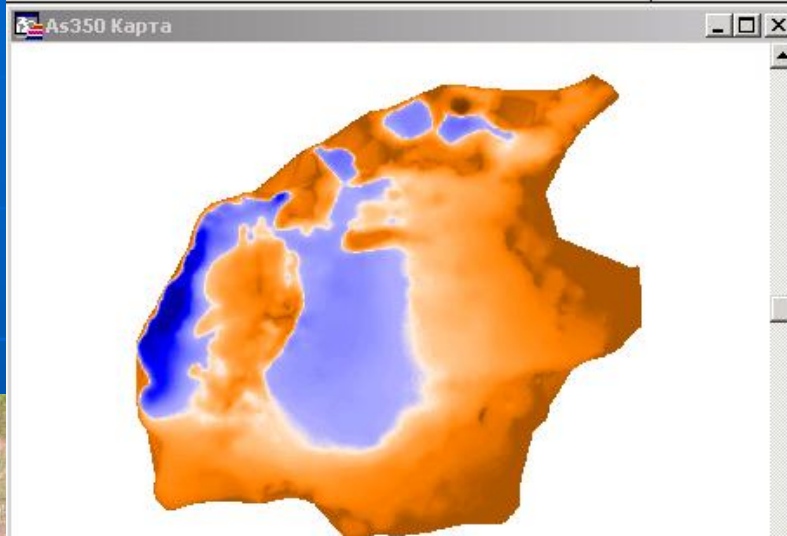


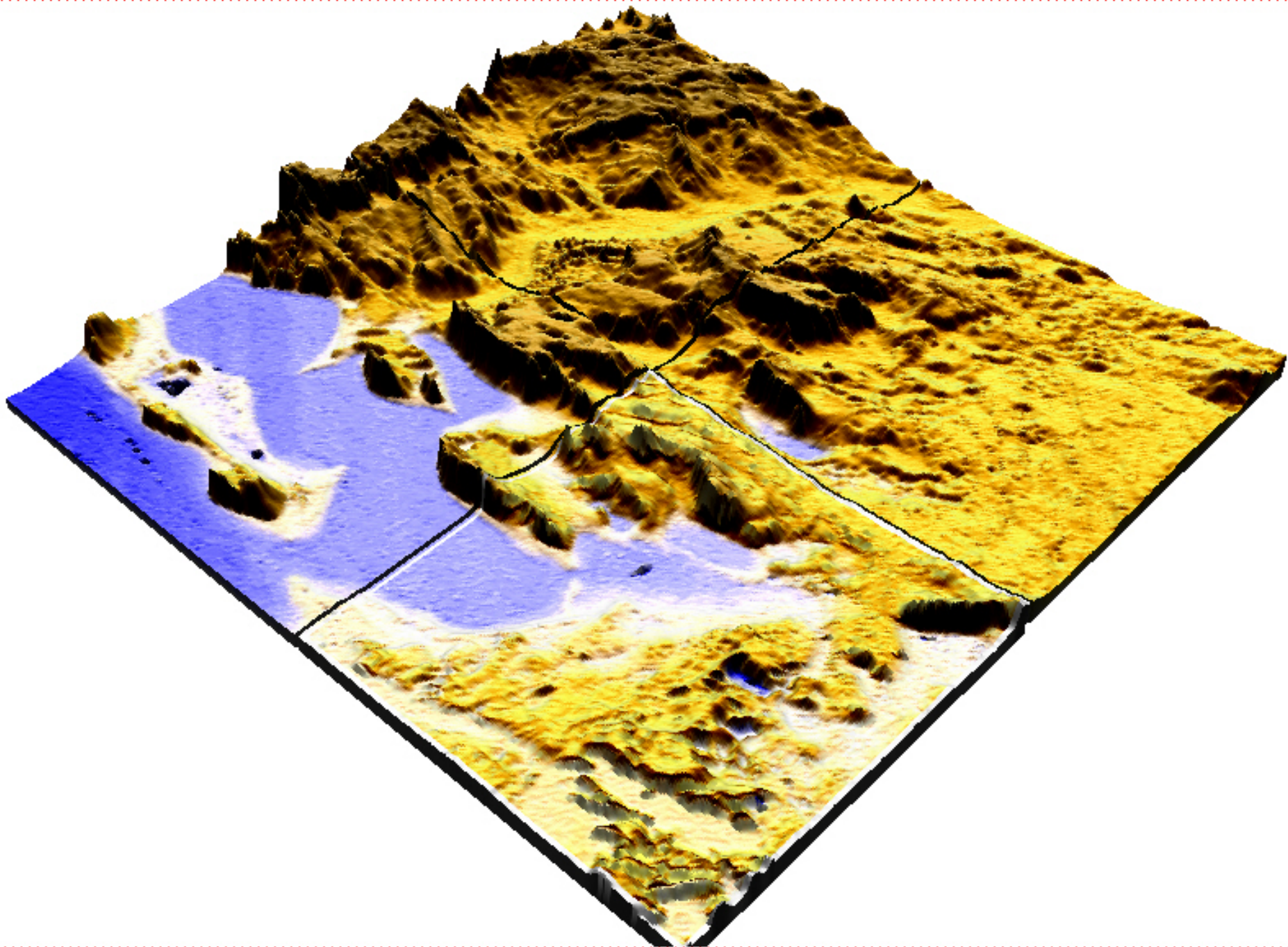
Coastal area of
Aral Sea. Blue
color reflect
areas covered by
salt.

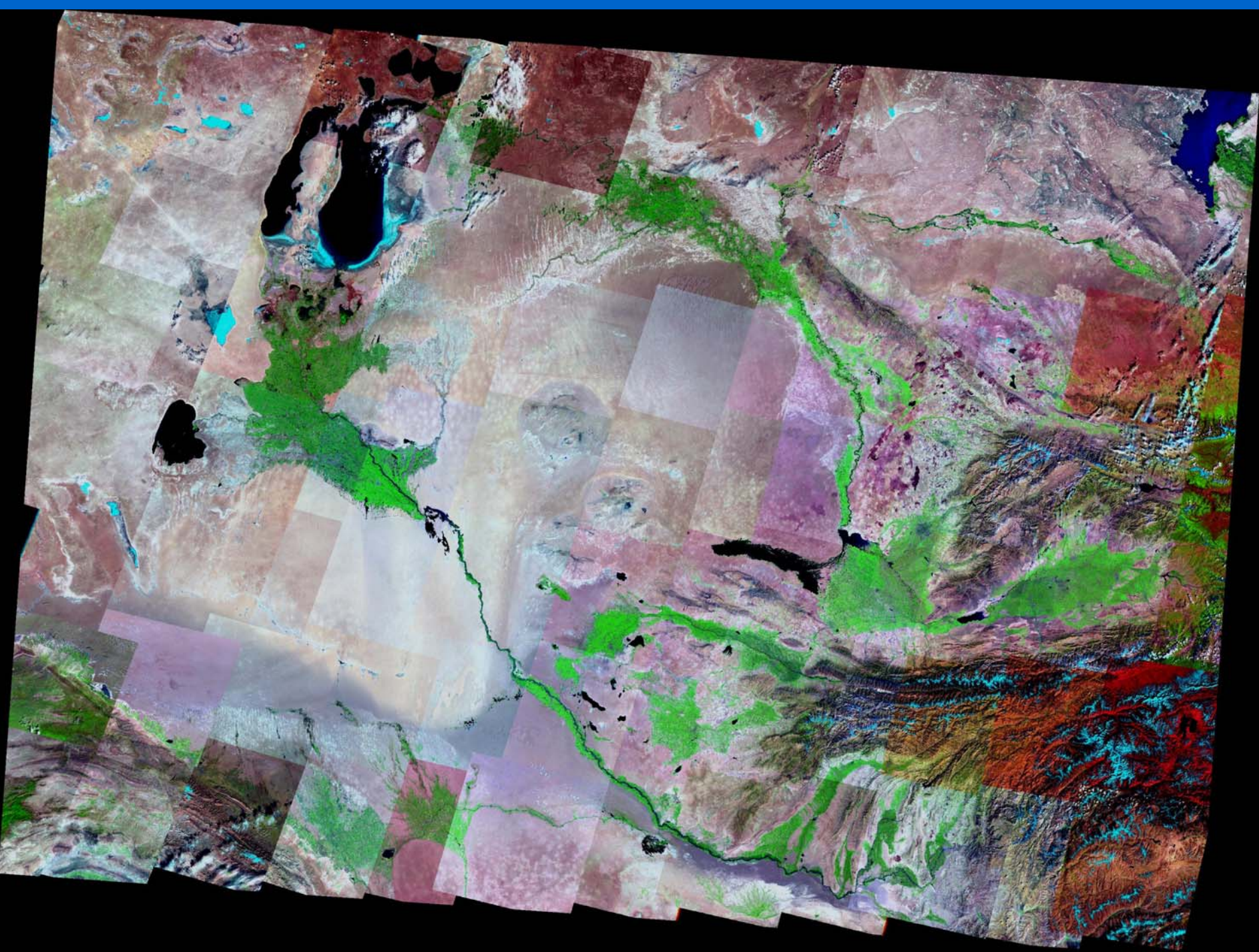
Landsat-7
(August 17 2001)



10676535.49, 4910532.42 (Transverse Mercator / Krasovsky)

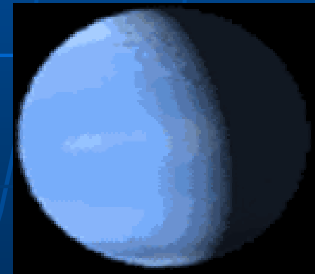
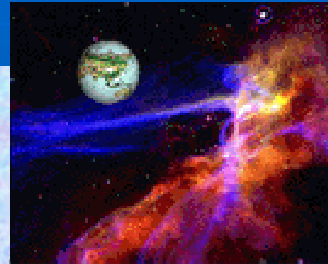






ROLE OF UN AND INTERNATIONAL ORGANIZATIONS IN SOLUTION OF DESERTIFICATION, FLOODS, EFFICIENT WATER USAGE PROBLEMS IN THE COUNTRIES OF CENTRAL ASIA.

- Huge massive of data required for GIS, often available only from satellite images. For the last years this joining of Remote Sensing and informational technologies was extremely efficient, for example, in the program of agricultural monitoring MAPS of European Union, which will be transferred and adapted to the natural conditions of Central Asia.
- “Tasis” project devoted to this theme, called “Informational System of ecological and agricultural monitoring” (ISEAM) is conducted by GAF consortia. Since the project is devoted to the joining of informational technology and agriculture, no wonder that project supervisor, Dr. Johan A Jacob is agronomist and a specialist in natural resources, while his colleagues, parallel group supervisors Dr. Trevor Bomon, is a GIS expert, Ant’e Cooper is a specialist in Remote Sensing, cartography and GIS.
- ISEAM is an international project, aiming to create regional network of national informational systems, simultaneously in several countries. Ministry of agricultural and water resources of Uzbekistan, Uzbekistan Space Agency, National Space Agency of Kazakhstan, Mongolian Ministry of Environment are the project partners. System will have different users, among whom, might be any organization wishing to know, what is happening to the environment, for example, ministries of environment, State land committees, ministries of economy, and ministry of statistics.



**ROLE OF UN AND INTERNATIONAL ORGANIZATIONS IN SOLUTION OF
DESERTIFICATION, FLOODS, EFFICIENT WATER USAGE PROBLEMS IN THE COUNTRIES
OF CENTRAL ASIA..**

**% of
corresponden
ce of ground
truth and
remote
sensing data**

**Culture recognition, conducted in the ISEAM framework in the period
since 1999-2001 ("Sholkor" farm)**



**Yellow
-wheat- 57%**

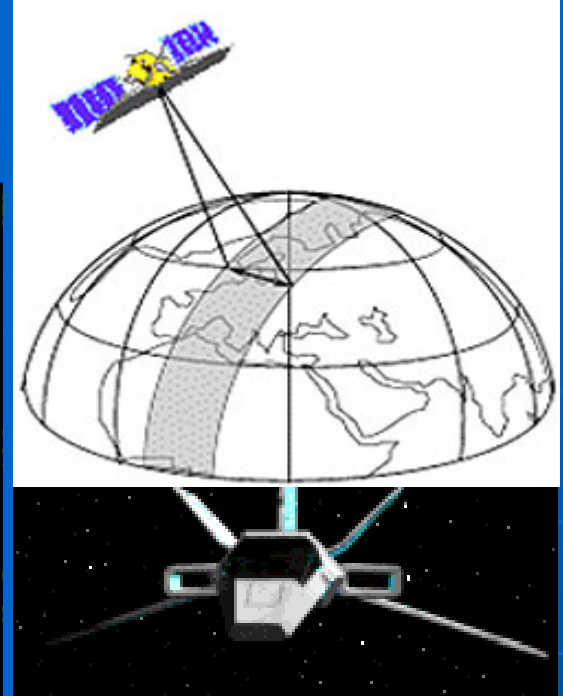
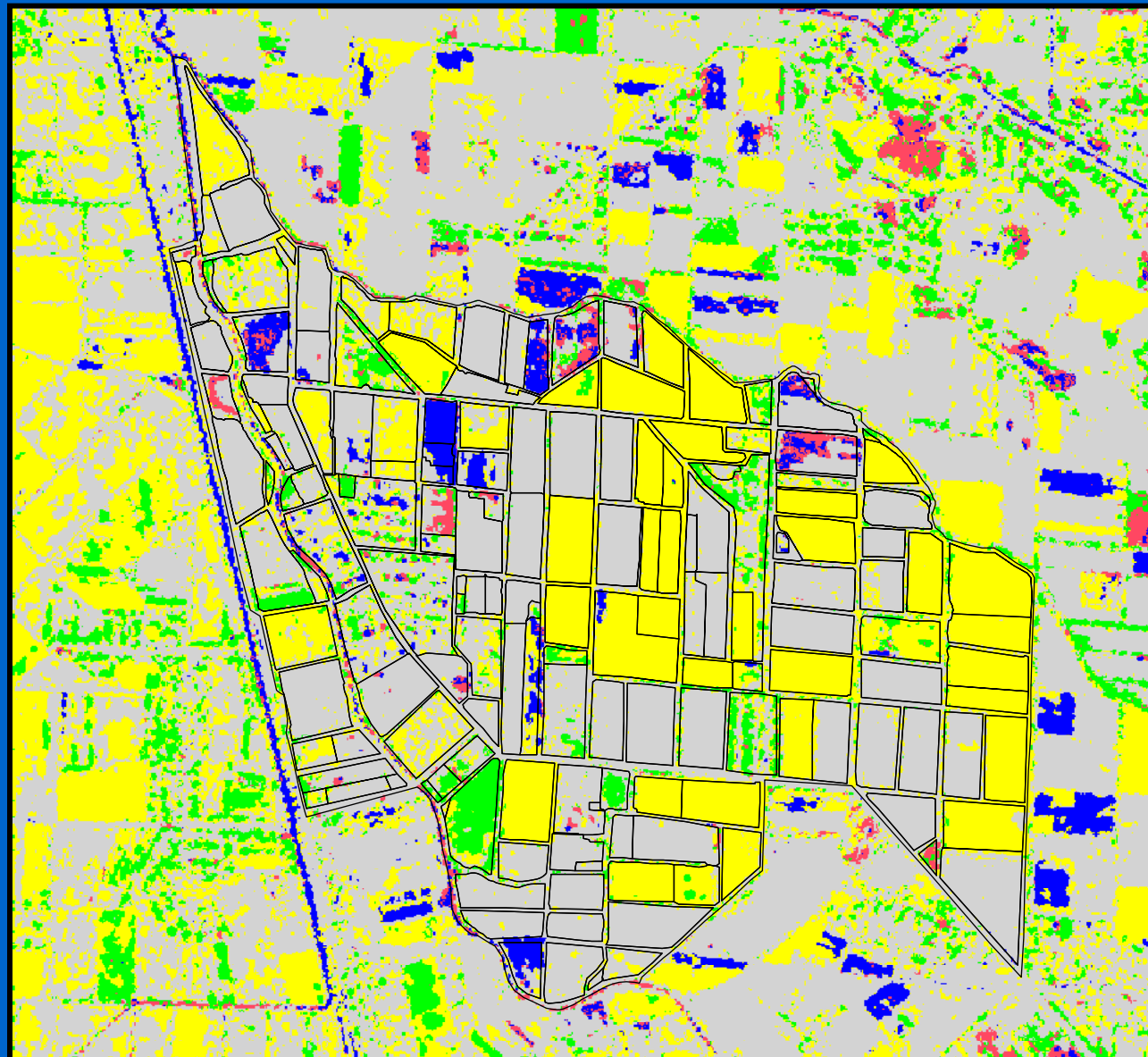
**Grey
-Cotton – 43%**

**Red
- Rice – 99%**

**Blue
- Water- 100%**

**Green
- Lucerne – 94%**

"Shuruziyajk" Farm



Yellow
wheat
Grey
Cotton
Red
Rice
Blue
Water
Green
Lucerne

ROLE OF UN AND INTERNATIONAL ORGANIZATIONS IN SOLUTION OF DESERTIFICATION, FLOODS, EFFICIENT WATER USAGE PROBLEMS IN THE COUNTRIES OF CENTRAL ASIA.

By the UN initiative in the end of February 2005 report of application of modern technologies (among which, of course Space Technologies), for solution of global and local ecological problems, and prevention of natural and technical disasters, etc. was prepared. Technologies, types of their application, initiatives, opening and strengthening horizons of inter-institutional collaboration were included in the report. Generally technologies, types of their application, initiatives are realized by the different institutions of UN, but they become much more efficient due to inter-institutional collaboration. Following institutions of UN participated in the preparation of the report:

Department of Peacekeeping Operations

United Nations Office for Project Services

Office for Outer Space Affairs

Secretariat of the International Strategy for Disaster Reduction

United Nations Environment Programme

World Food Programme

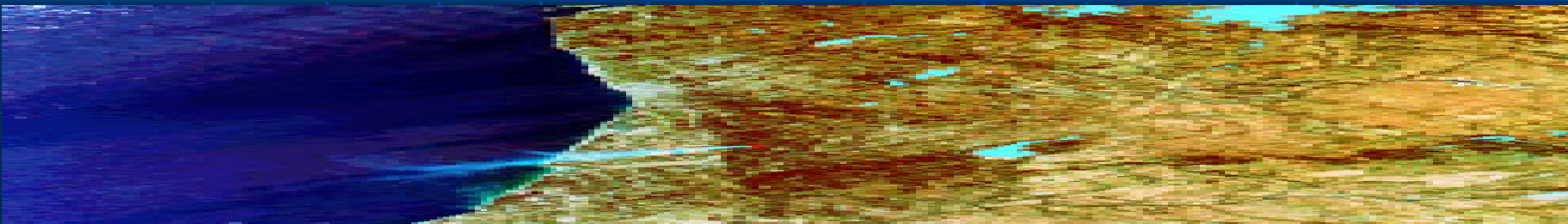
United Nations Institute for Training and Research

United Nations Educational, Scientific and Cultural Organization

World Health Organization

International Atomic Energy Agency

We can see huge work of UNOOSA and other Institutions of UN, represented on the webpage of UNOOSA.





CONCLUSION

We think that initiatives of UN and international organizations, aimed to avert desertification processes, floods, and efficient water usage technologies development are very useful and required. We understand that a good result could only be obtained in a tight collaboration of above mentioned organizations, and national organizations in each country responsible for ecological and social questions. In the republic of Uzbekistan around hundred projects are realized aimed to secure sustainable development, taking into account available ecological problems, such as Aral Sea drying. Results of some works were represented during this presentation.

I would like to thank Mr. Sergio Camacho, all organizers and sponsors, state of Styria and The mayoralty of city of CRAZ, ESA, and United Nation office for Outer space affairs, all the members of the COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE, for the invitation and provision of excellent working atmosphere on the symposium.

During the preparation of this presentation, papers kindly provided by Dr. Alexander Tuchin – member of Irrigation and Water Problems Institute, Dr. Vakil Gataullin, and Dr. Mikhail Potorjinskiy – correspondingly Director, and Deputy Director of Tashkent Space Engineering Institute. I would also would like to express my thanks to my colleagues: Igor Ibragimov, Olga Rasuleva, Muzafar Malikov for their consultations, help and collaboration.

THANK YOU FOR YOUR ATTENTION!

