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United Nations
Office of Outer Space Affairs

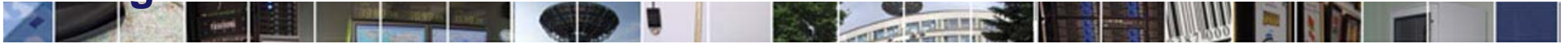
BELARUSIAN SPACE SYSTEM FOR EARTH REMOTE SENSING

NATIONAL ACADEMY OF SCIENCES OF BELARUS
UNITED INSTITUTE OF INFORMATICS PROBLEMS

NATIONAL ACADEMY OF SCIENCES OF BELARUS
GEOINFORMATIONS SYSTEMS
(Founder: UIIP NASB)



Background



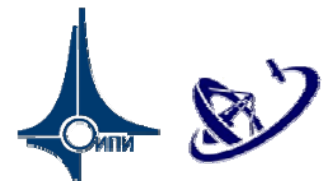
According to the Decree of the President of the Republic of Belarus №609 of 22.12.2004 “On the implementation of the governmental policy of the Republic of Belarus in the field of *Exploration and Use of Outer Space for Peaceful Purposes*”

- the **National Academy of Sciences of Belarus** is a body in charge in Belarus for the implementation of a unified state policy, coordination and state regulation of institutional activities in the exploration and use of outer space for peaceful purposes;
- the Scientific and Engineering Republican Unitary Enterprise "**Geoinformation Systems**" is a National Operator of the Belarusian Space System for Earth Remote Sensing.

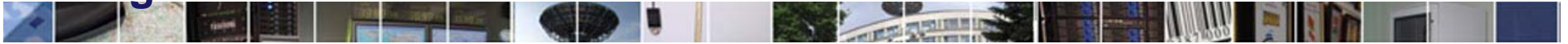


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Background



According to the Decree of the President of the Republic of Belarus №278 of June 14, 2007 the **Belarusian Space System for remote sensing of the Earth** is being implemented.

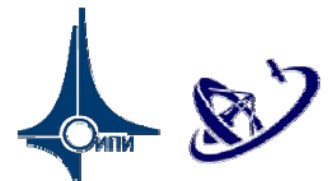
National Space Program of the Republic Belarus has been developed - Resolution № 1517 of the Council of Ministers of the Republic of Belarus from October 14, 2008 "On National Program for Research and Use of Space in Peaceful Purposes for 2008-2012 years"

The main goal of the National Space Program is the development and effective use of scientific and technological potential of Belarus in the field of creating Space facilities and technologies for the solution of social and economical tasks in the interest of the branches of economy, safety of population and increase of science and education level in the country.



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National Responsible Partners



United Institute of Informatics Problems

Head Executor carried out the scientific and organizational support of the National Space Programme

Geo-Information Systems

National Operator of the Belarusian Space System for Earth Remote Sensing

NATIONAL ICT POLICIES KEY RESPONSIBLE BODY

- coordination and state regulation of institutional activities in the exploration and use of outer space for peaceful purposes
- responsible for national and BY-RU Space Programmes:
 - National Space Program (2008-2012);
 - **National Space Program (pending for decision, prelim. 2014-2018)**
 - Joint Space Program “Cosmos BR” (1999-2002)
 - Joint Space Program “Cosmos SG” (2002-2007)
 - Joint Space Program “Cosmos NT” (2008-2011)
 - Joint Space Program “Monitoring SG” (2013-2017)

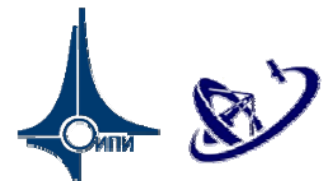
RELEVANT R&D PARTNERS AND EXECUTORS

- Research and design-engineering institutions of the National Academy of Sciences of Belarus (at least 13)
- Universities and research institutions of the Ministry of Education of Belarus (at least 6)
- Design-engineering and industrial institutions of the Ministry of Industry of Belarus (at least 2)
- Institutions of the State Property Committee
- Other Belarusian design-engineering and industrial institutions (at least 3)



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Space Activities

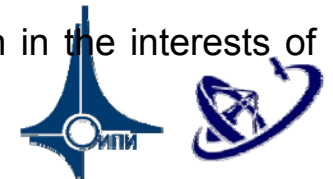


MAIN TASKS OF BY-SPACE ACTIVITY

- manufacturing Space vehicles for remote sensing of the Earth and perspective technologies for Space facilities creation
- construction of ground infrastructure for Space information receiving, processing, distribution and Space vehicle control
- development of information and Space technologies and systems and their introduction in different fields of social and economic activity
- carrying out the scientific research and scientific and engineering works on creation of basic elements, systems and perspective technologies for Space equipment
- creation of training and retraining systems and advanced training of staff involved in Space activity
- forming the state policy in the field of Space activity

RELEVANT SUBPROGRAMMES

- Development of scientific fundamentals, technologies and perspective instruments for carrying out complex investigations of Space and use of Space information
- Space Systems and Technologies
- Development of Belarusian Space System for Remote Sensing of Earth
- Perspective Belarusian Space Vehicles
- Ecological Monitoring, Hydro-Meteorological Observations and Assessment of Nature Use Efficiency
- Application of Space Information in Geodesy and Cartography
- Monitoring the Natural and Techno-genic Emergencies with the Use of Space Information
- Assessment of Actual Condition of Agricultural areas by Space Information Systems
- Creation of Professional Aerospace Education System
- Organization of Safety Support System for Information Space Technologies
- Application of Space Information in the interests of the Forestry



Space Activities



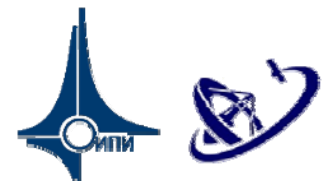
RELEVANT RESULTS OBTAINED

- The automated measuring system for testing electronic components and units of Space devices
- Space Systems and Technologies
- The system “Monitoring - AK” – thematic processing remote sensing data and aviation spectra-zone system “AVIS”
- A pilot sample of inertial navigation module with GPS correction”
- **Ground-based infrastructure of Belarusian Space System of Remote Sensing of Earth**
- **The hard-software facilities: data receiving, planning and control, thematic data processing, creation of the data base of digital information of the terrains, corporative networks design**
- The technology for production of light-weight object-glasses for Space apparatus
- The technology for Uninterruptible Power Supply (UPS) for working in Space
- The technology for serial production of VLSI and also the technology for production of large (till 1000 mm) aspherical mirrors

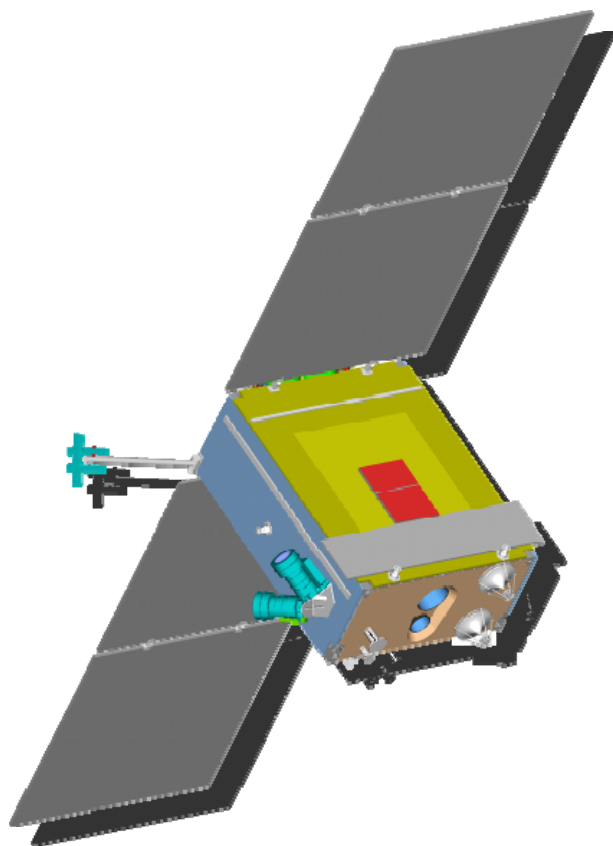


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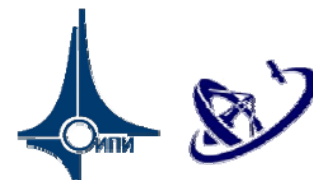
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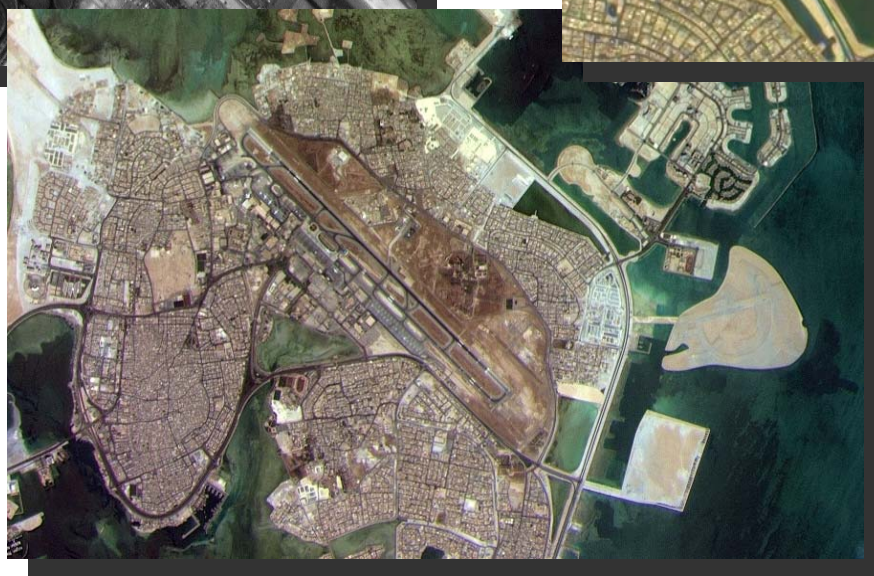
Belarusian Satellite



Solar-synchronous orbit raising, km	510 ± 10
Field of view, km	± 440
Swath , km	20
Resolution:	
– panchromatic subsystem, m	2,1
– Multispectral subsystem, m	10,5
In-orbit life, years	≥ 5
Data transfer rate, mbyte/s	up to 245,76
Orientation accuracy, angl. min	5

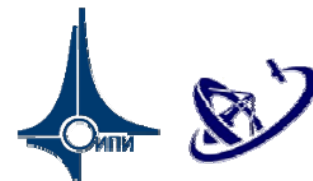


First Belarusian Satellite Images

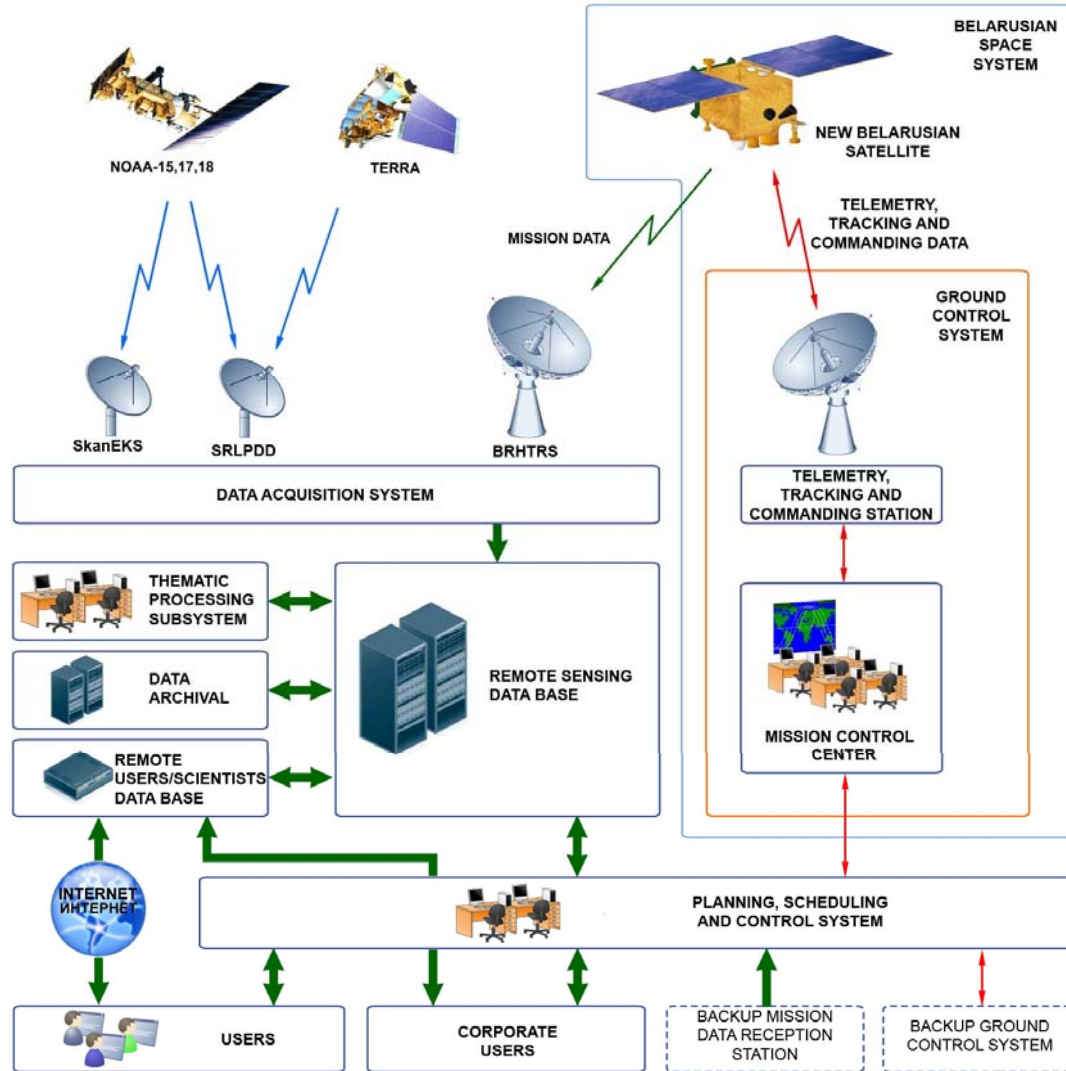


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Belarusian Space System for Earth Remote Sensing

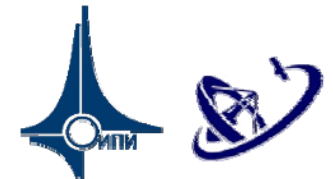


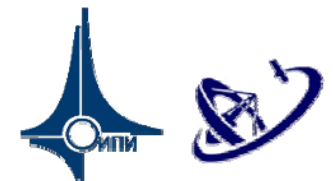
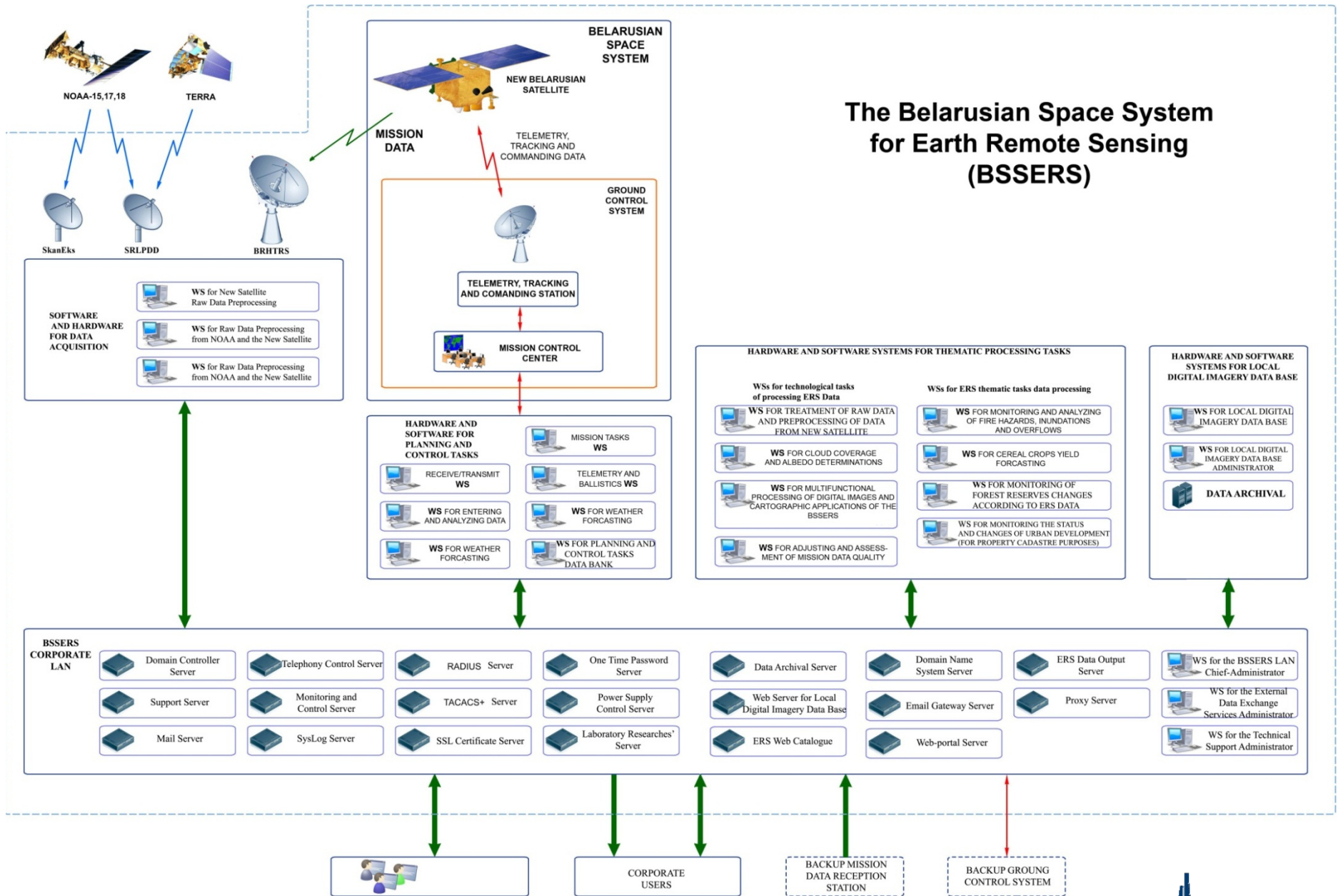
SRLPDD - System for Reception, Logging and Processing of Digital Data
 BRHTRS - Belarusian and Russian High-Throughput Reception System



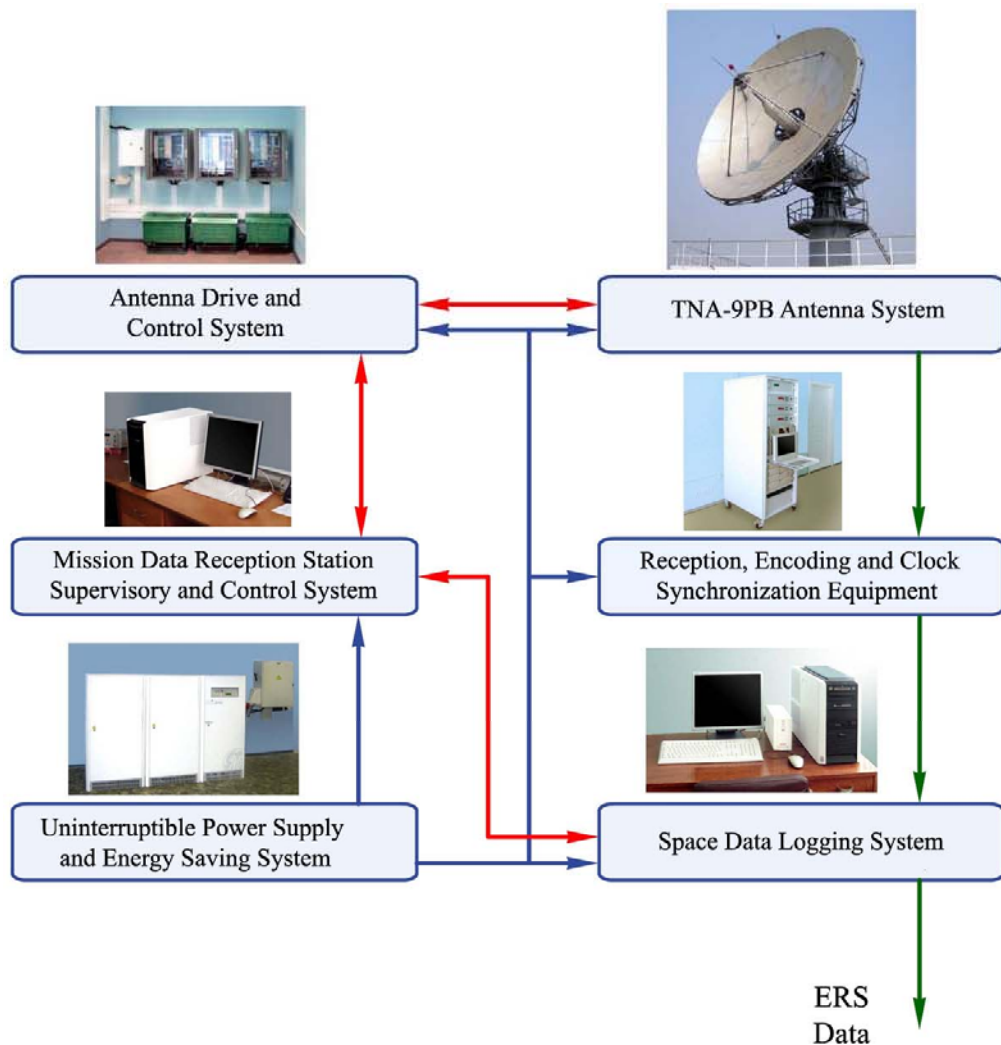
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Ground Receiving Station (Tracking and Acquisition Station)

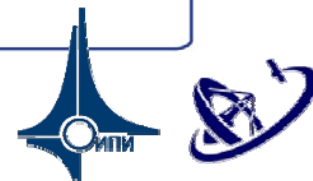


Tasks to be solved

1. Antenna pointing to satellite and tracking spacecraft during communication sessions.
2. Satellite signal reception, amplification and conversion.
3. Demodulation, conversion to digital code and logging of data from space.
4. Preprocessing of ERS received data and its transmission to the BSSERS Data Bank.

Main technical characteristics

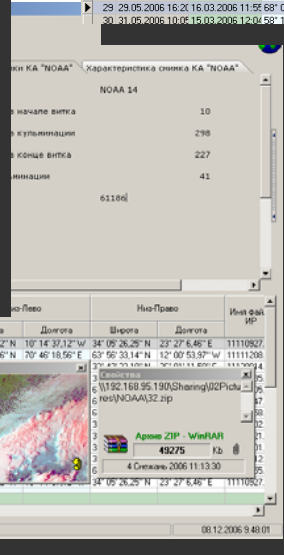
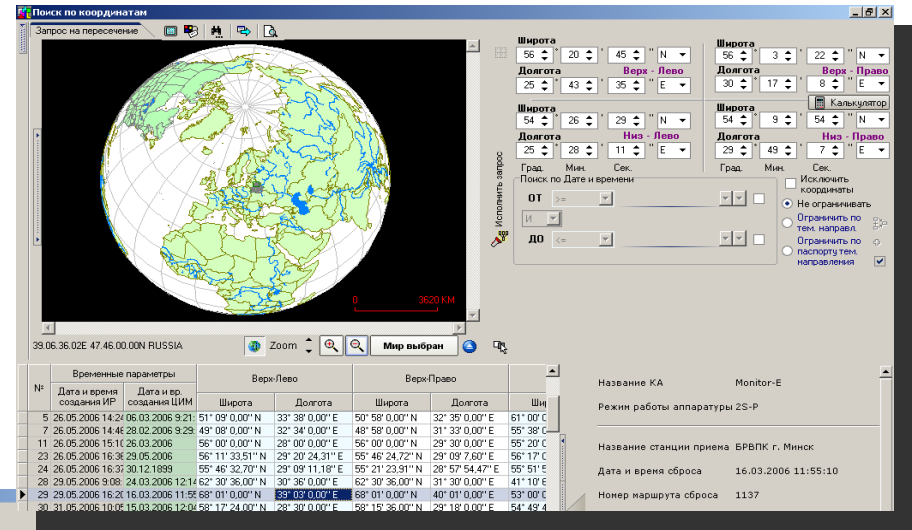
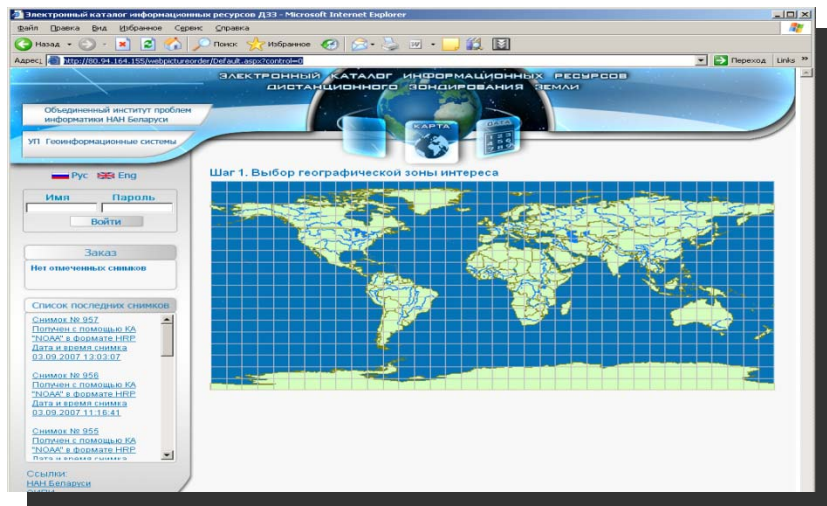
- > 9 meters diameter parabolic disk antenna
- > Antenna gross weight - 14 tones
- > Received frequency range - 8 to 8,4 GHz
- > Space-to-Ground data rates - 245 Mbits/s
- > Bit error rate (BER) - 10^{-6}
- > Antenna pointing and control modes: programm controlled mode, autotracking and manual mode



Distributed Database of Digital Information of Terrain



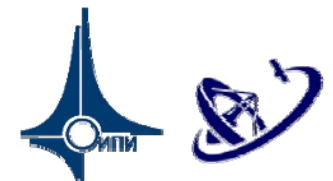
- Placement, gathering and cataloging of RS-information, digital maps and results of thematic processing
- Web-access to all resources with search function



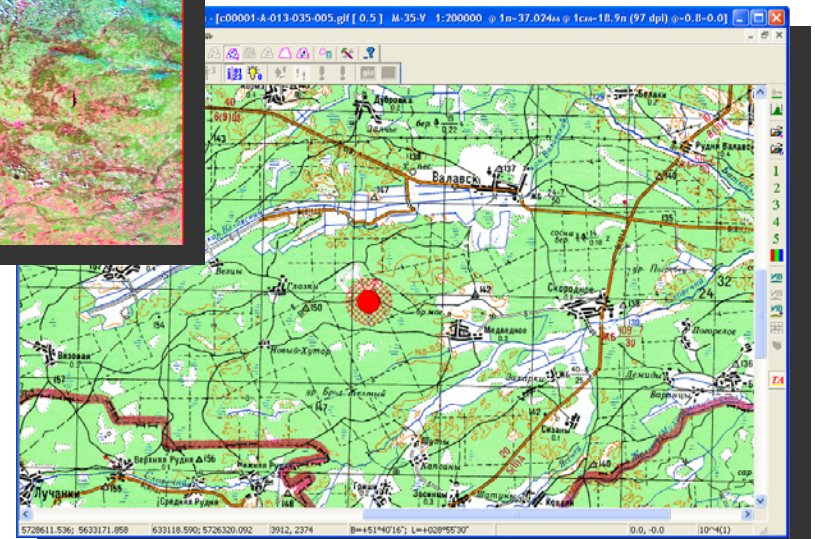
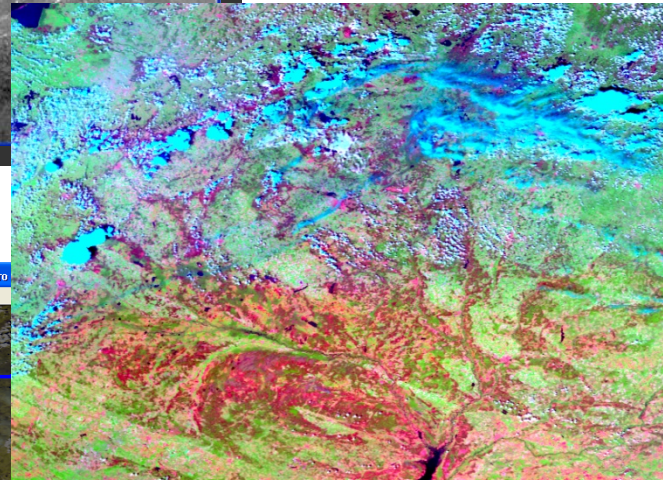
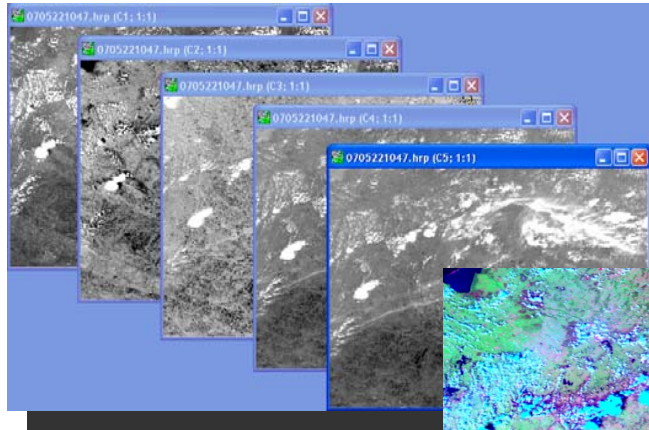
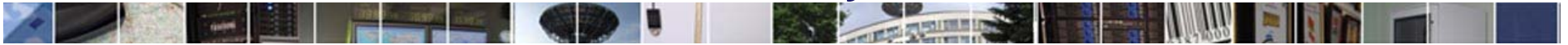
- Registration and processing of orders
- Resource Interchange with other data-banks



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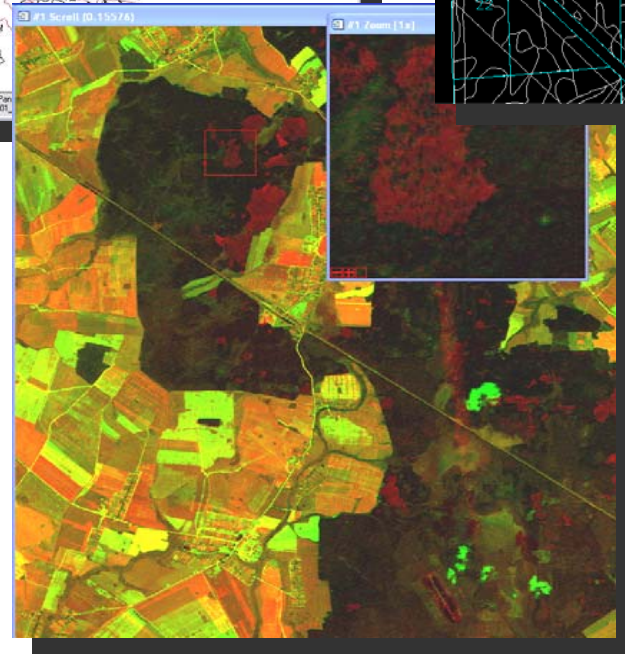
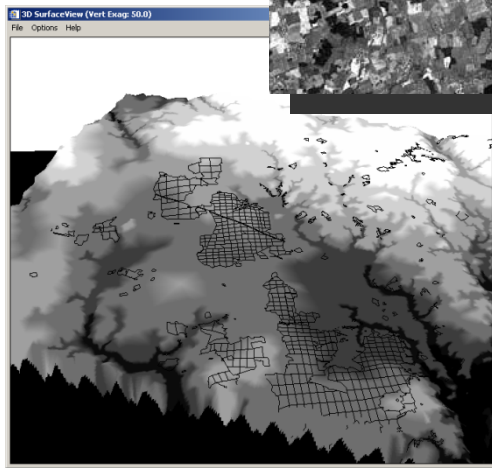
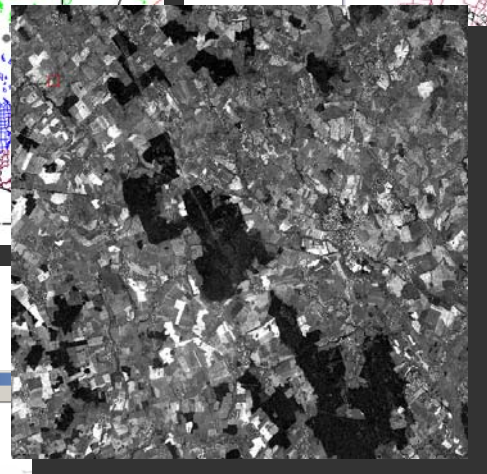
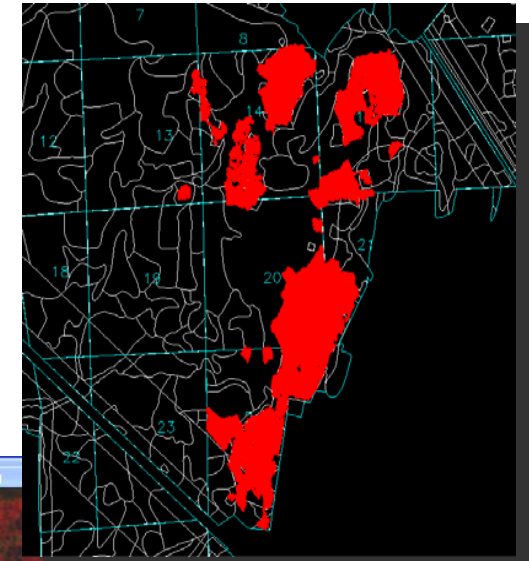
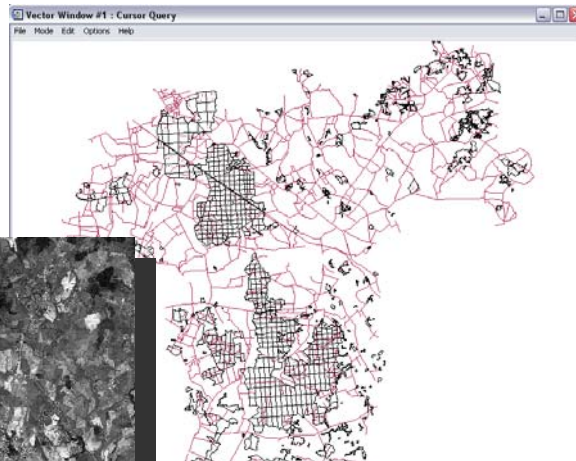
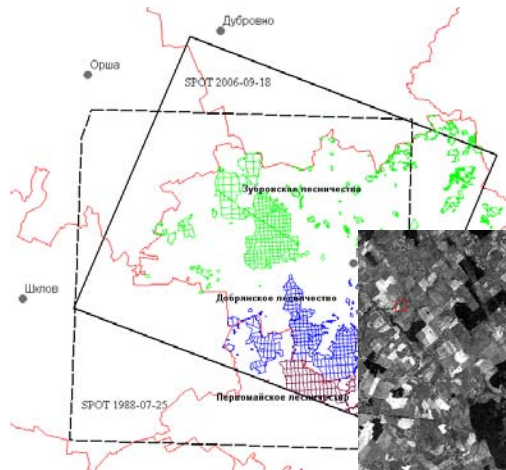
Use of Satellite Data for Thermal Anomaly Detection



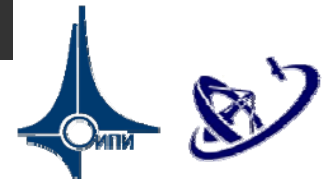
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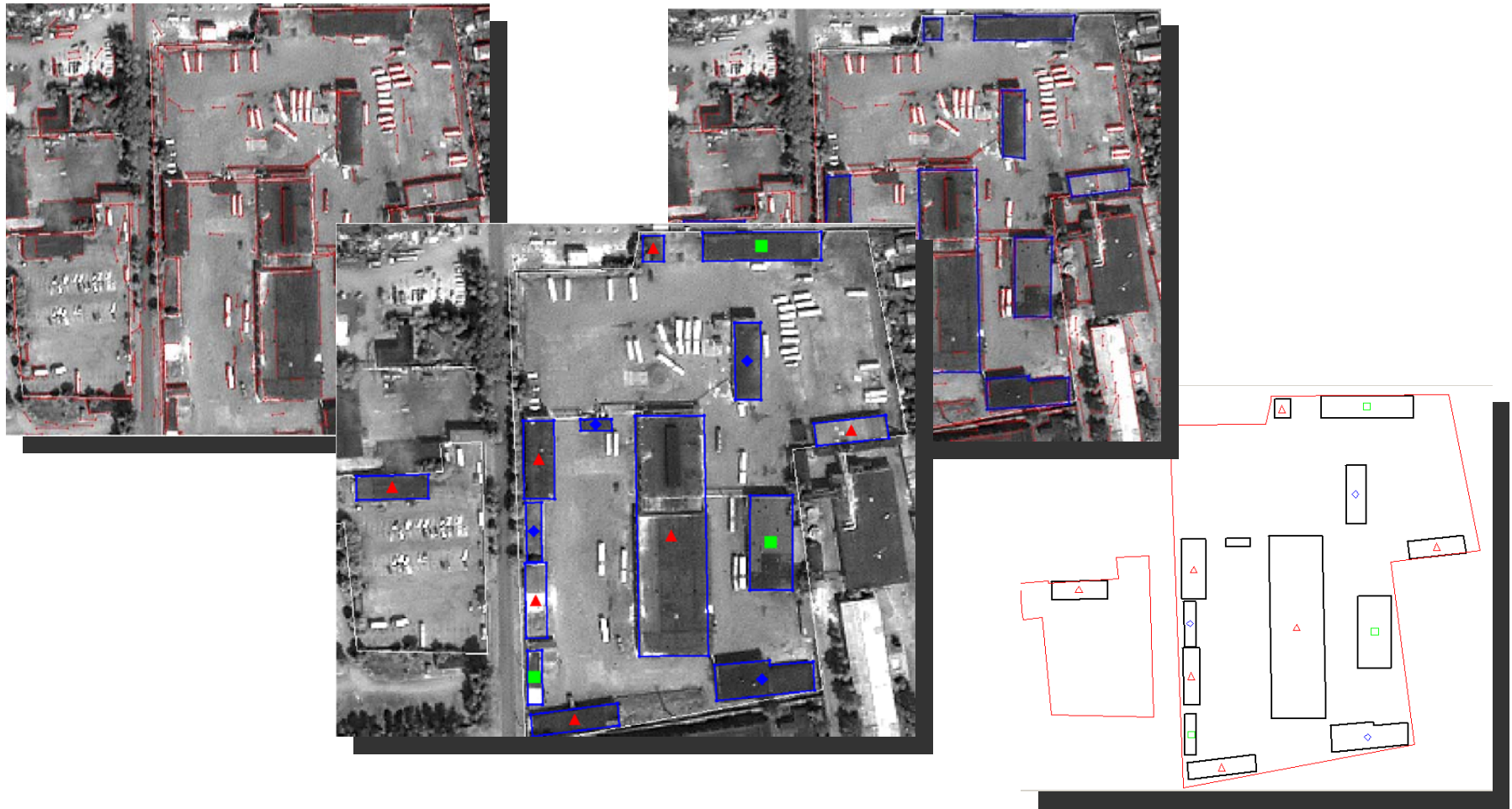
Outcrop of Woodland Damage Using ERS Data



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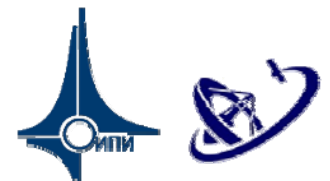


Monitoring the Integrity and Fidelity

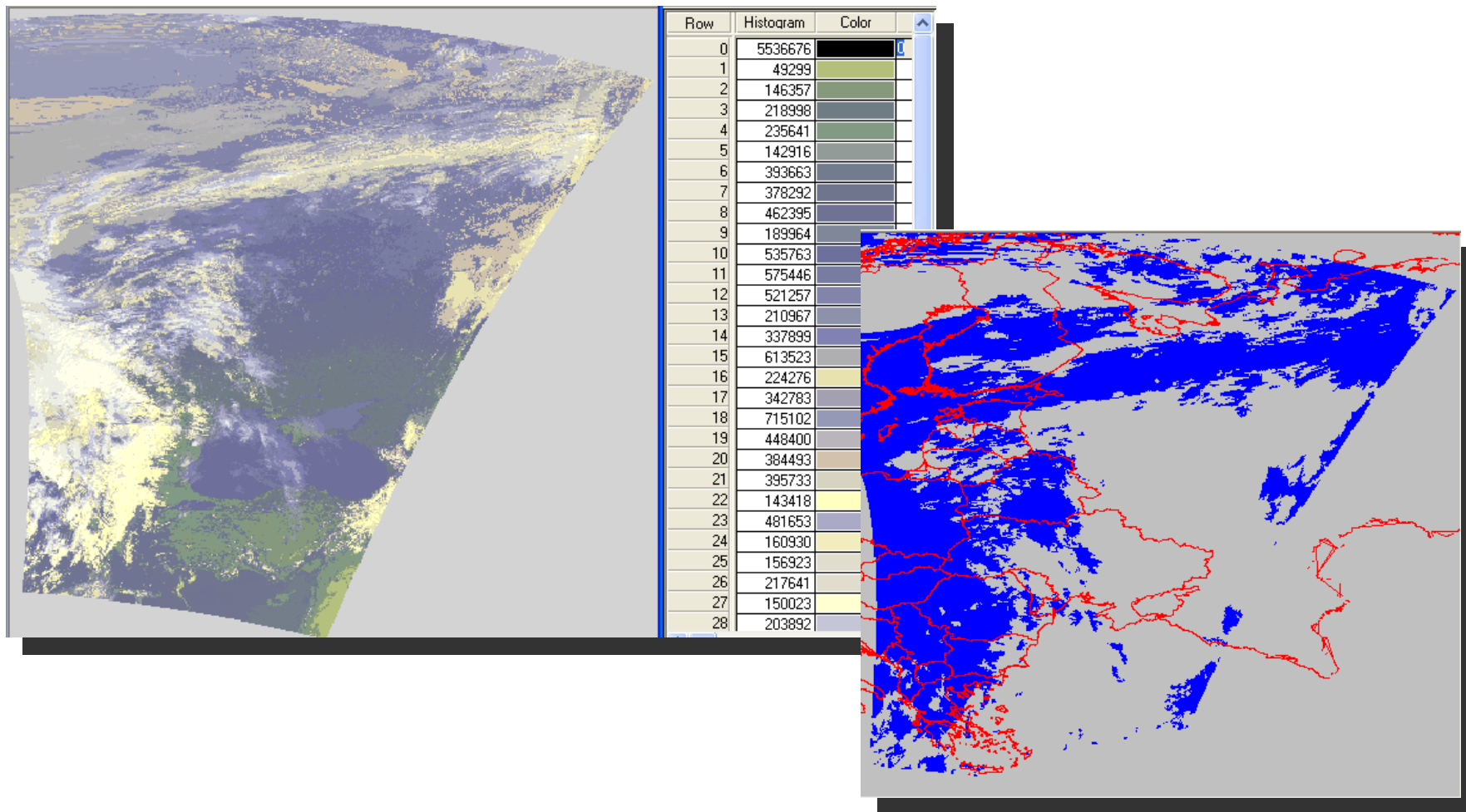


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Cloud Cover Monitoring



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Planning Satellite Mission Tasks

Комплекс полетных заданий

Период - 01.01.2009 11

Планирование

№ заявки	Наименование
<input checked="" type="checkbox"/>	1 Юг
<input checked="" type="checkbox"/>	2 Урал
<input checked="" type="checkbox"/>	3 Московская
<input checked="" type="checkbox"/>	1 Гродненская

Приоритет: Научная
 Доставка: по каналам связи
 Станция приема: БРВПК
 Дата съемки: от 27.10.2009 до 10.11.2009

Координаты объекта

минимум	
Широта	Долгота
53°42'12"	26°58'14"
максимум	
Широта	Долгота
54°19'51"	26°34'20"

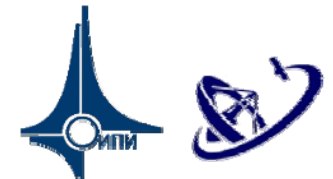
Уточненные координаты

Широта	Долгота
53°42'12"	26°16'51"
54°16'20"	25°58'14"
54°19'51"	26°15'55"
53°45'37"	26°34'20"

DMB 20.10.2009 12:00:30 Виток 11616 ППИ Тень Заявки НЛ 09101900-09102200-03 Широта 48°05'21" Долгота 42°06'37"



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Belarusian Priorities in Space Research



EARTH OBSERVATION

(EU Horizon2020)

- EO applications
- Use of Copernicus Sentinel Data
- Reprocessing and calibration of space-based data
- Land and Climate change monitoring
- Technological development

SATELLITE NAVIGATION

(EU Horizon2020)

- EGNSS applications
- EGNSS awareness + capacity building

ONGOING INTERESTED ACTIVITIES

(National Space Program for 2014 – 2018)

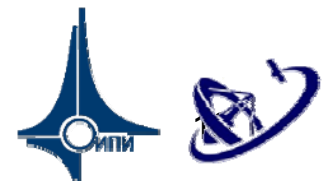
- Further development of the Remote Sensing System of Belarus.
- Creation of the National Satellite Communication System of Belarus and launching a Belarus Telecommunication Satellite.
- Creation of the unified Navigation and Time support System in Belarus.
- Further development of human resources supply, scientific and technological, legal and regulatory support of Space activity in Belarus.

**New National Space Program of Belarus for 2014 – 2018
is now pending for decision of the Council of Ministers of Belarus**

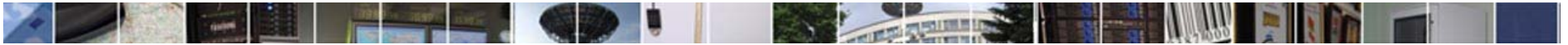


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Contact Points



United Institute of Informatics Problems
of the National Academy of Sciences of
Belarus

www.uiip.bas-net.by

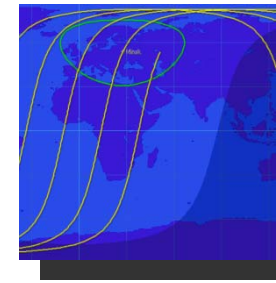
HORIZON 2020

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Fax.:+375 17 331 84 03

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Geoinformations Systems

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Dr. Sergei Zolotoy

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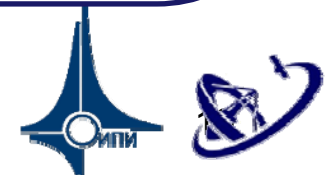
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