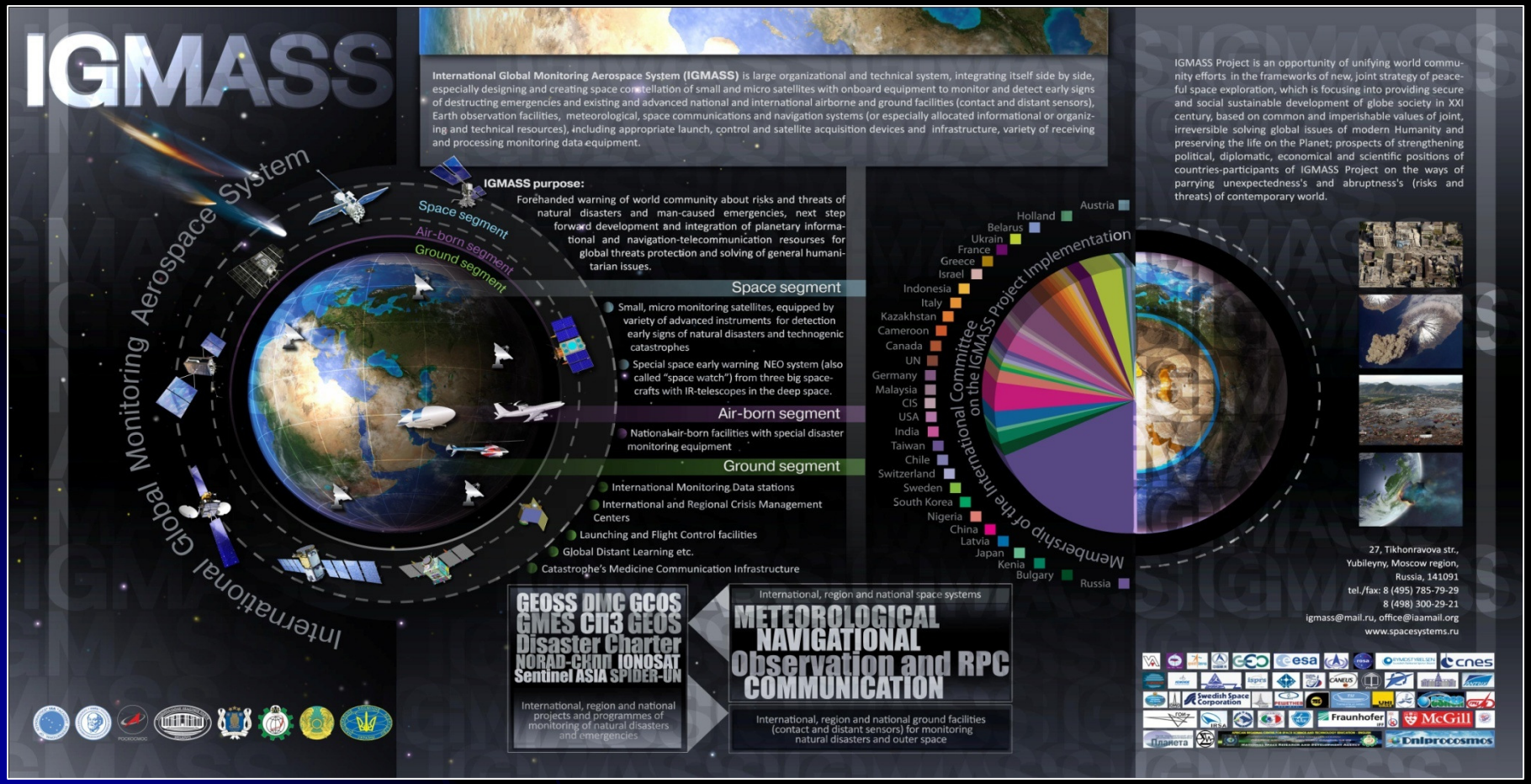
Executive Secretariat of the International Committee
of the IGMASS Project Implementation

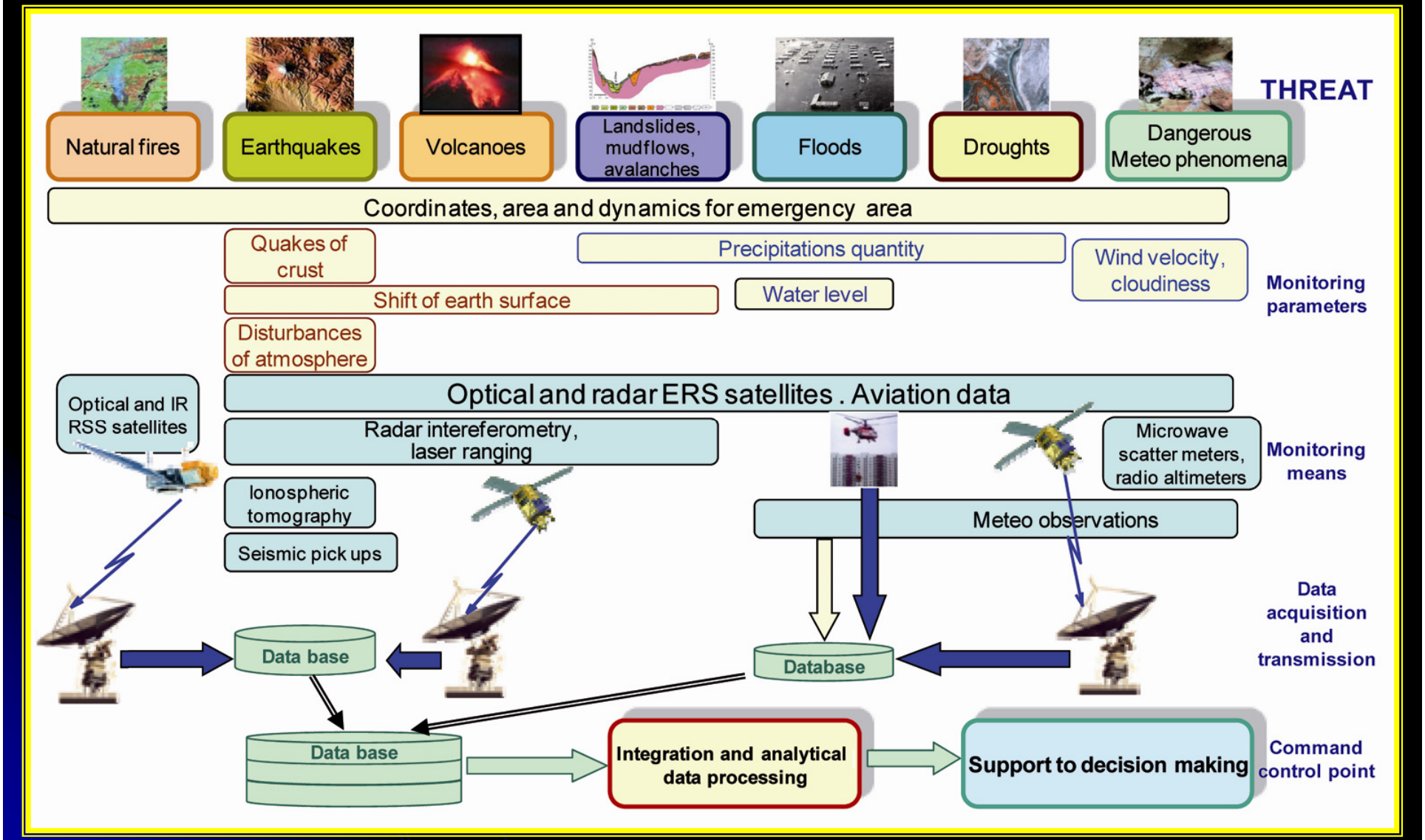
IGMASS Institutional Fundamentals : Progress and Prospects

THE IGMASS. What Does it Mean?

The IGMASS Project is actively promoting throughout last two years at the international level on the auspicious of IAA Russian initiative to create special aerospace system for early warning of the international community about approaching natural and man-made disasters to the global scale, including threats of cosmic origin.

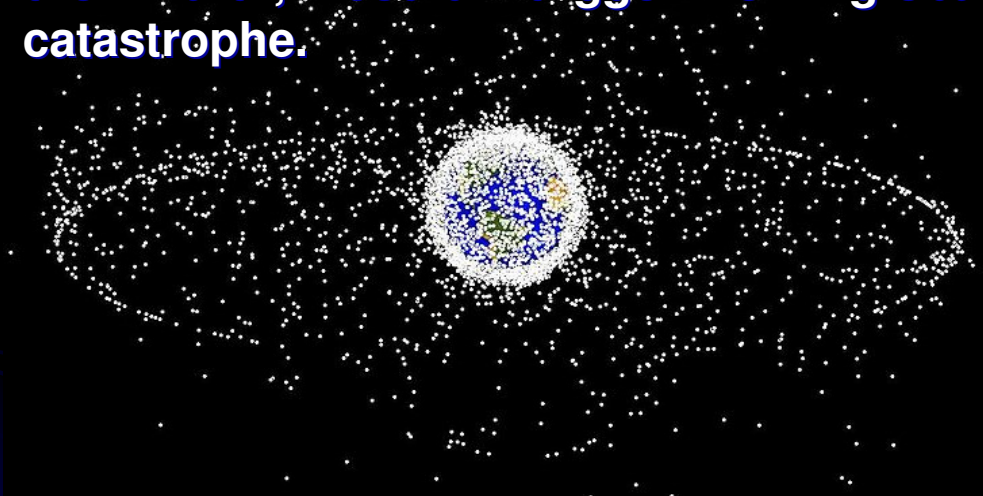


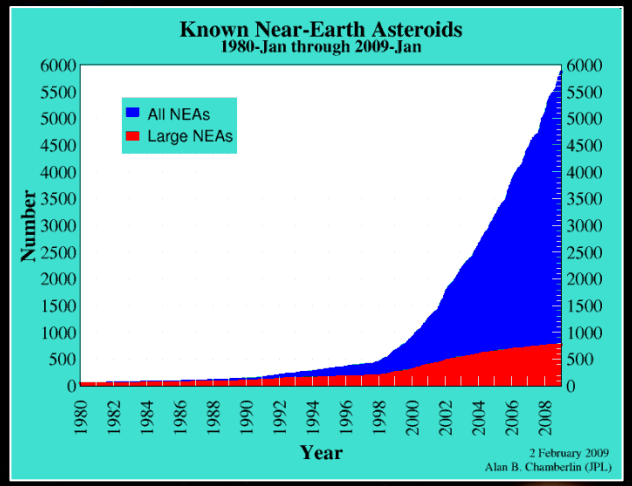
Conceptual Basis of the IGMASS Project



Global Outer Space Risks and Threats

Now, we know about dozens asteroids and comets approaching our planet (for example, 99942 Apophis, 1997VRZ, 1994 WK12), which in case of its fall down into the Earth, could trigger off global catastrophe.

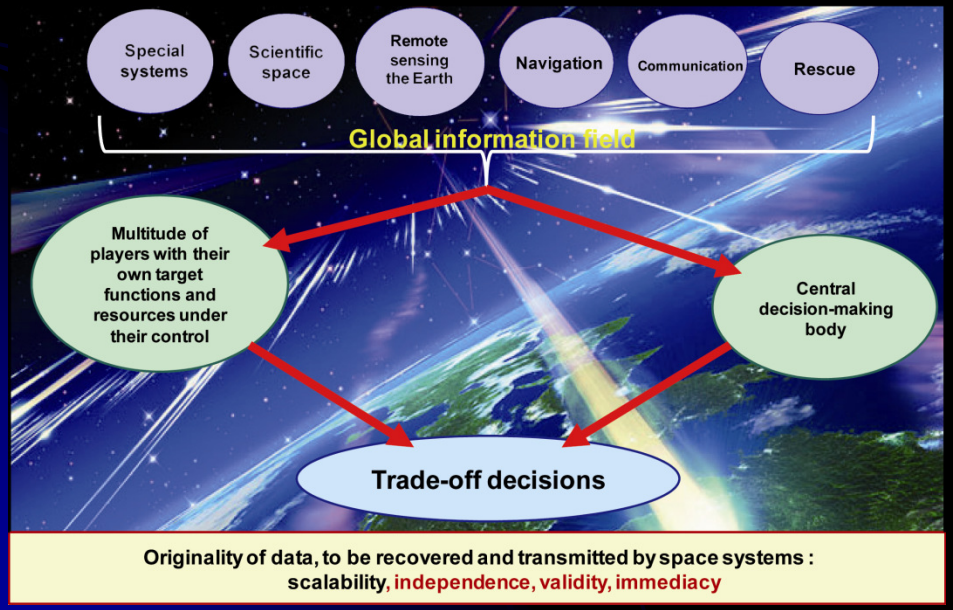




Space debris have been recognized as a potential problem. Even though the current space debris population may not represent an immediate and excessive danger, the risk of collision with debris is continuously growing.

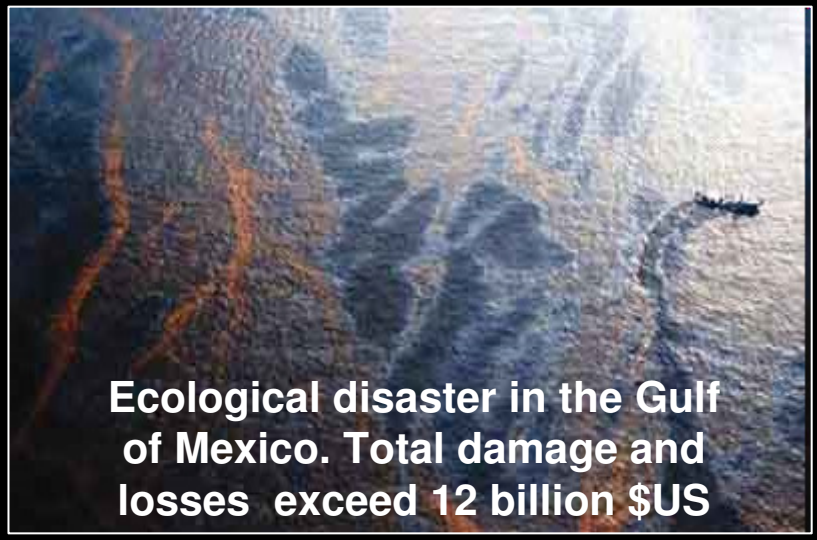
IGMASS' Creation Purposes

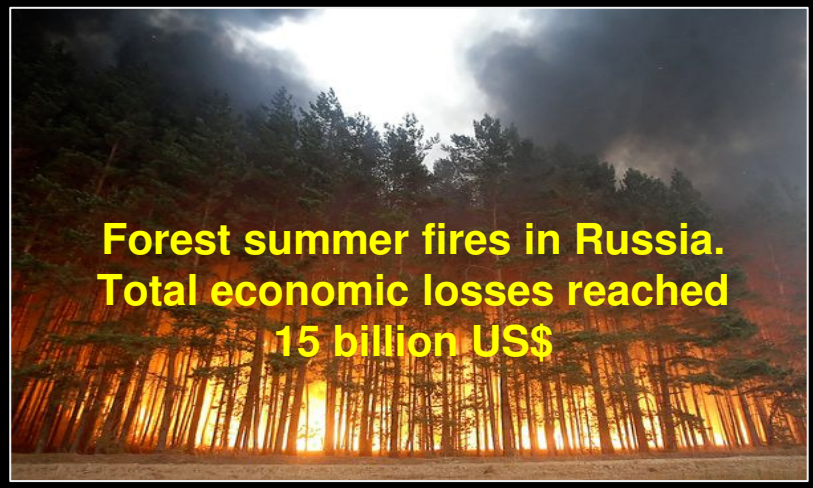
- Early warnings of natural and man-made disasters through its global and effective forecasting, involving integrated use of Earth-based, air and space systems all over the world
- Social, economic, seismic, environmental and geophysical security, prevention of global space threats (asteroid, space junk etc.), as well as the unify and joint development of information, navigation and telecommunication resources for solving of general humanitarian issues (distant education, cultural heritage protection, medicine of catastrophes etc.)
- Gradual formation of a unified "Global Information Security Field"



Originality of data, to be recovered and transmitted by space systems : scalability, independence, validity, immediacy

Main Year 2010 Natural and Man-Made Disasters





…Natural and man-made disasters have caused world global economy losses in the year 2010 more than 222 billion US dollars.

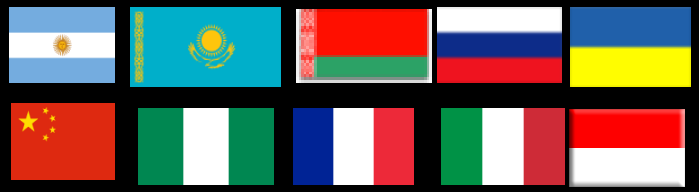
(World's second-sized insurance company Swiss Re).

IGMASS Project Progress

Presenting on profile International scientific forums	Dnepropetrovsk, Ukraine (2007, 2009); Korolyov, Russia; Tunis; Shanghai, China (2008); Versailles, France (2009); Rome, Italy; Haifa, Israel; Paris, France; Moscow and Kazan, Russia; Donetsk, Ukraine; Beijing, China; Bonn, Germany; Washington, USA; Boyua, Cameroon (2010)
Official presenting to the International Academy of Astronautics (IAA)	Glasgow, Scotland (2008)
Project Manager Assignment and IGMASS' working experts group creation (from IAA)	Paris, France (2009)
Project Researches and preparing of IGMASS' working experts group conclusion	Yubileynyy, Russia (2009)
Submitting Project Researches and IGMASS' working experts group conclusion to the IAA	Daejon, Republic of Korea (2009)
Project detailed discussion and forming of international body to manage the project	Limassol, Cyprus (2009); Riga, Latvia; Stockholm, Sweden (2010), Prague (Czech Republic)
Project submitting to the UN level (STS COPUOS)	Vienna, Austria (2010)

Cooperation in the frameworks of IGMASS Project

Space agencies and specialized government institutions



International organizations and private companies

Space-rocket enterprises

Academician institutions

Non-governmental organizations

Research institutes, Institutions of higher education

Promotion of the IGMASS Project in 2010

IAA Golden Jubilee Summit in Washington on November 17, 2010, which brought together leaders of 29 national space agencies and similar profile organizations representing Argentina, Austria, Belarus, Brazil, Britain, China, Germany, European Union, India, Israel, Italy , Kazakhstan, Canada, China, Mexico, Netherlands, Nigeria, Norway, Russia, Romania, Saudi Arabia, Thailand, Ukraine, Czech Republic, Chile, France, South Korea, Japan, as well as participating of the Chairman of the UN COPUOS, has once again demonstrated sincere and genuine interest to the Project.

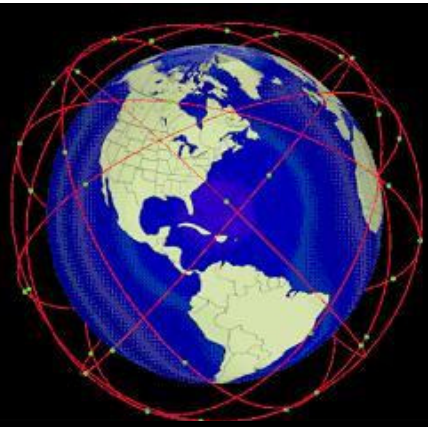
IGMASS Structure

SPIDER-UN

GEOSS | KOSPAS-SARSAT | GMES

Sentinel Asia | DMC | GCOS

Disaster Charter | IONOSAT | …



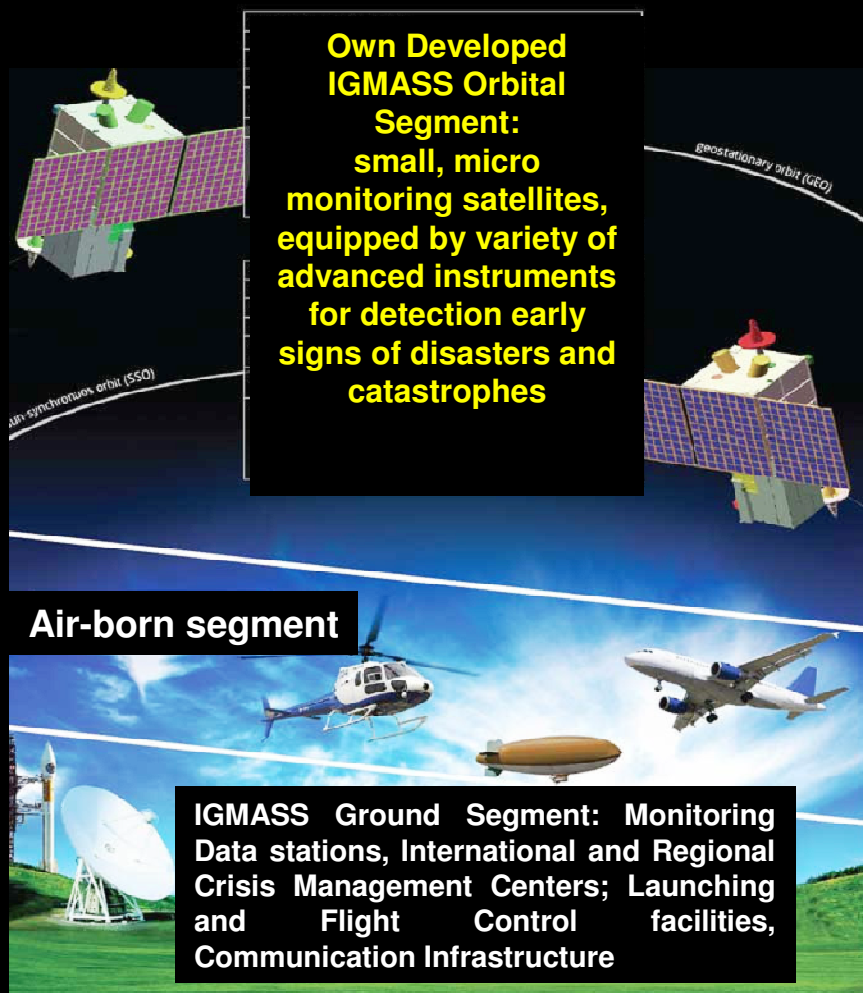
International, regional and national projects and programmes of monitoring of natural disasters and emergencies

+

International, regional and national space systems

- Meteorological
- Navigational
- Observation and RSC
- Communication

International, regional and national ground facilities (contact and distant sensors) for monitoring natural disasters and outer space

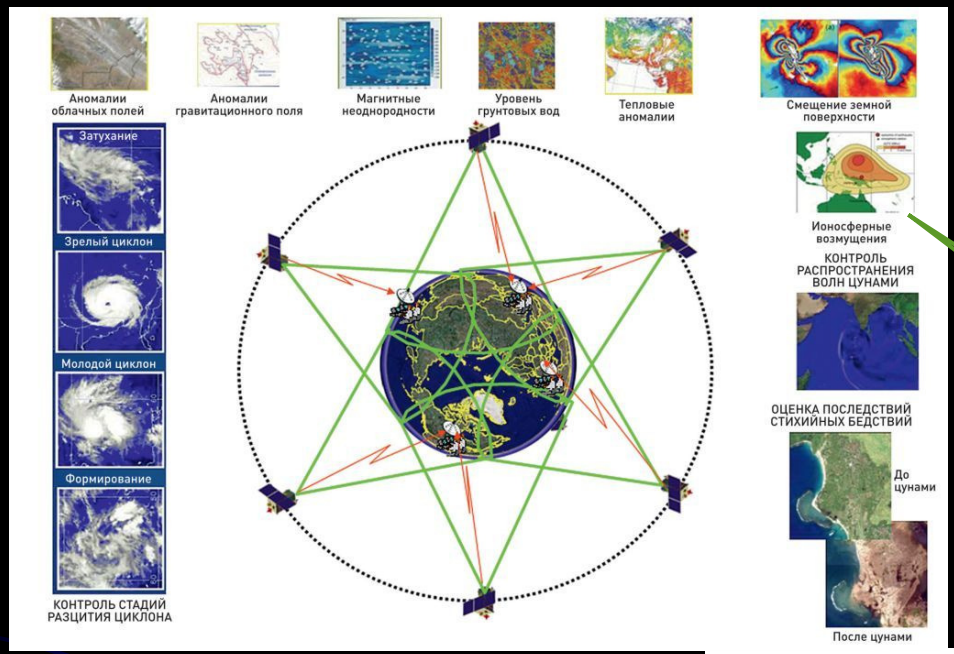


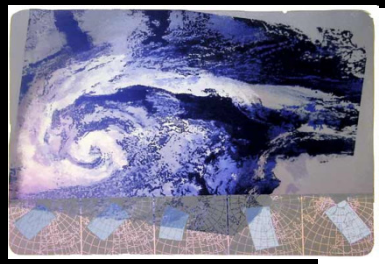
Own Developed IGMASS Orbital Segment: small, micro monitoring satellites, equipped by variety of advanced instruments for detection early signs of disasters and catastrophes

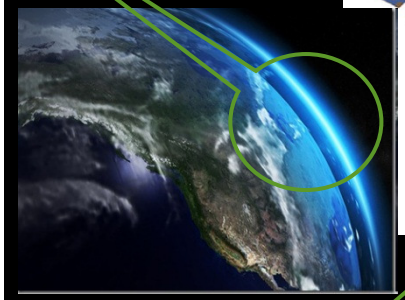
Air-born segment

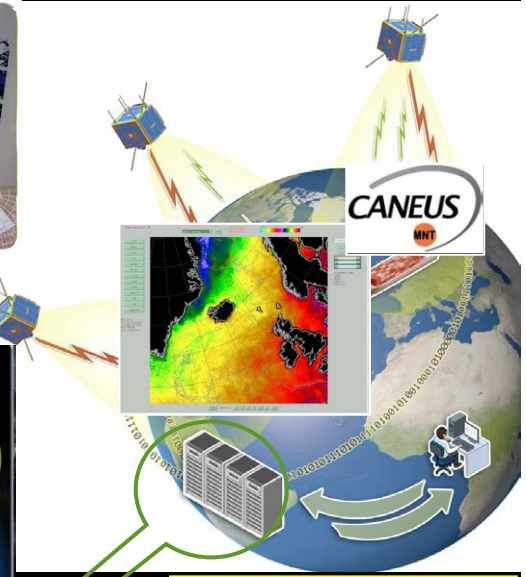
IGMASS Ground Segment: Monitoring Data stations, International and Regional Crisis Management Centers; Launching and Flight Control facilities, Communication Infrastructure

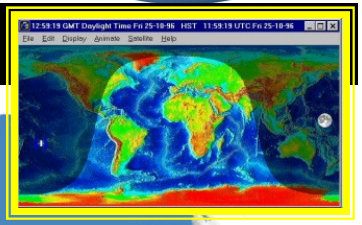
IGMASS GROUND INFRASTRUCTURE TO RECEIVE MONITORING INFORMATION

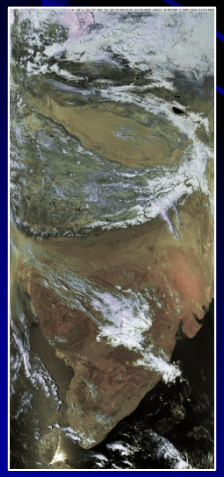










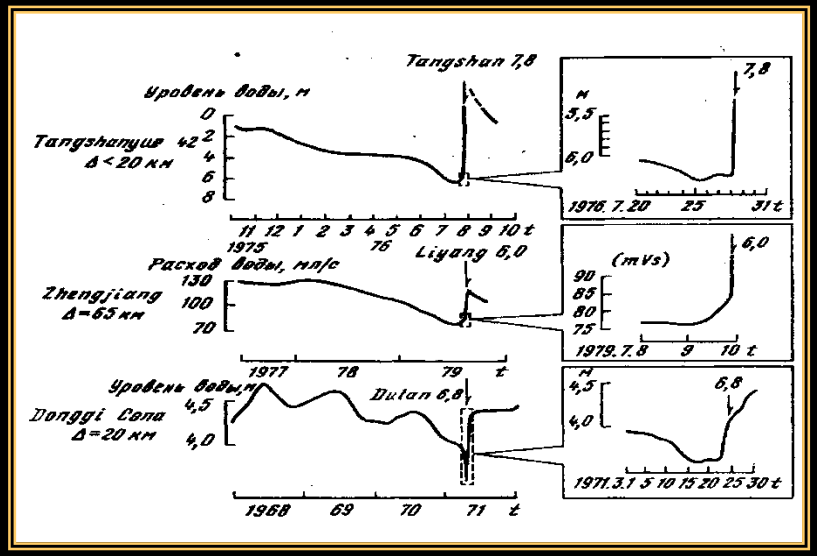


International system of receiving and integrated processing of satellite data

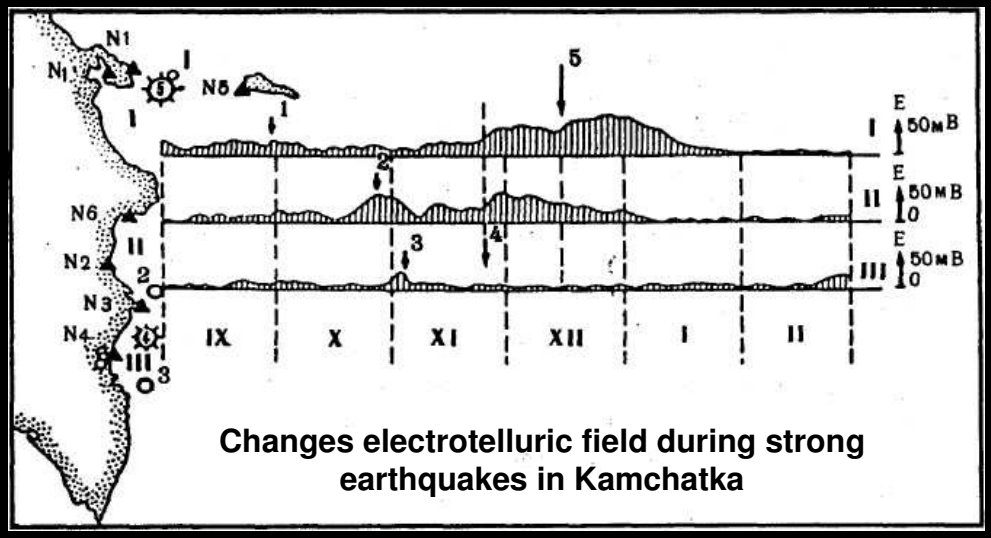
Additional advanced facilities to receive and process of monitoring information (uncovering symptoms of natural disasters)

Facilities to access telecommunication systems

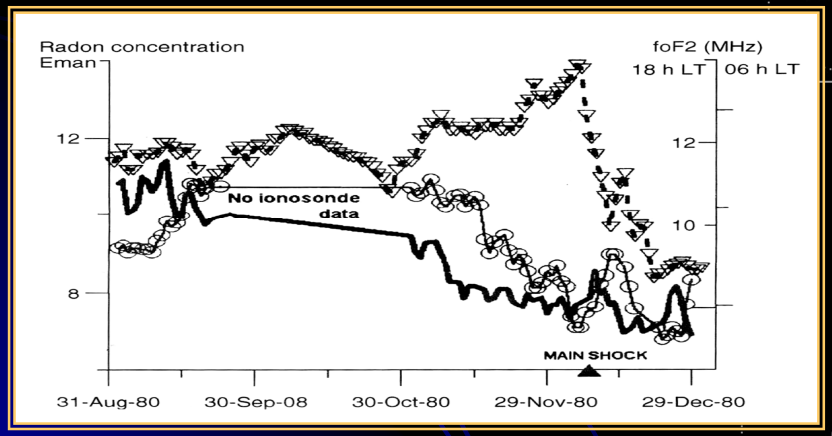
Some precursors of Coming Earthquakes



The characteristic shape of the hydrodynamic precursors of earthquakes recorded in China



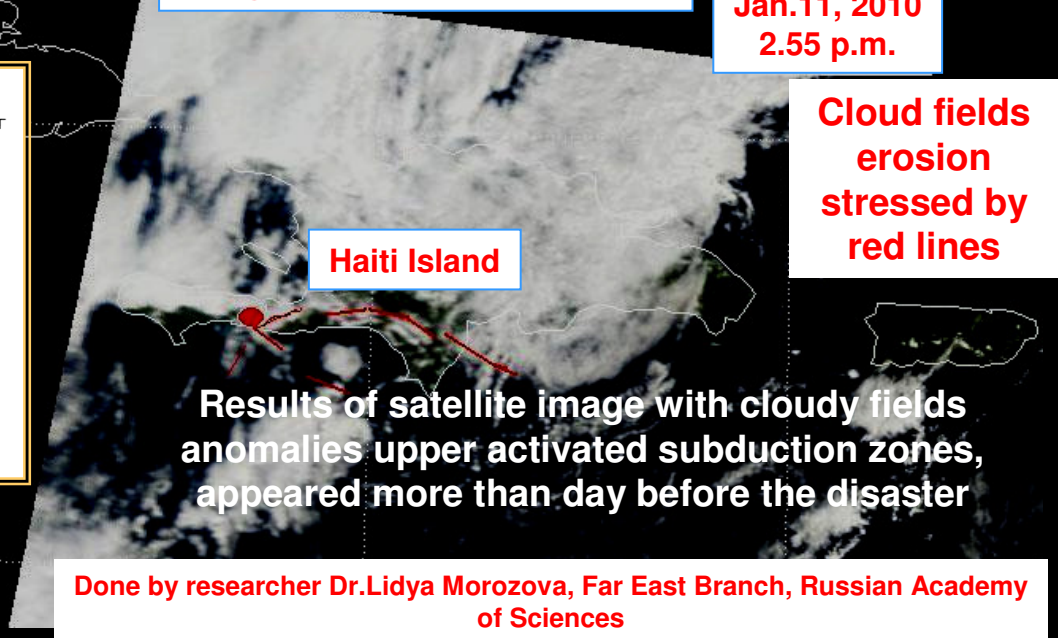
Changes electrotelluric field during strong earthquakes in Kamchatka



Changes Radon concentration (full line) together with daytime (triangles) and nighttime (circles) critical ionosphere frequency. Tashkent earthquake

Image from TERRA Satellite

Jan.11, 2010
2.55 p.m.

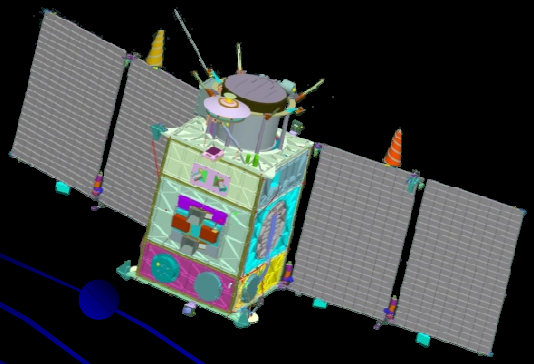


Cloud fields erosion stressed by red lines

Results of satellite image with cloudy fields anomalies upper activated subduction zones, appeared more than day before the disaster

Done by researcher Dr.Lidya Morozova, Far East Branch, Russian Academy of Sciences

Own Developed IGMASS Orbital Segment



Specifically create and deploy orbital constellation of advanced small and micro satellites with special equipment for monitoring the geo-sphere and outer space, ballistic structure of which will be determined by the nomenclature and priority tasks of forecasting and warning

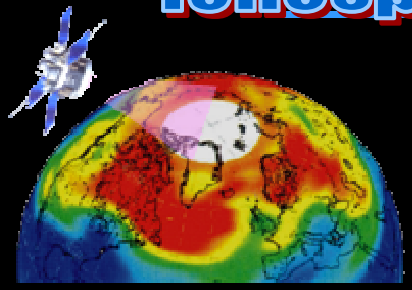
Main satellite characteristics

Mass (max): 120 - 400 kg;
Mass of payload: 40÷120 kg.
Lifetime: up to 10 years

Payload

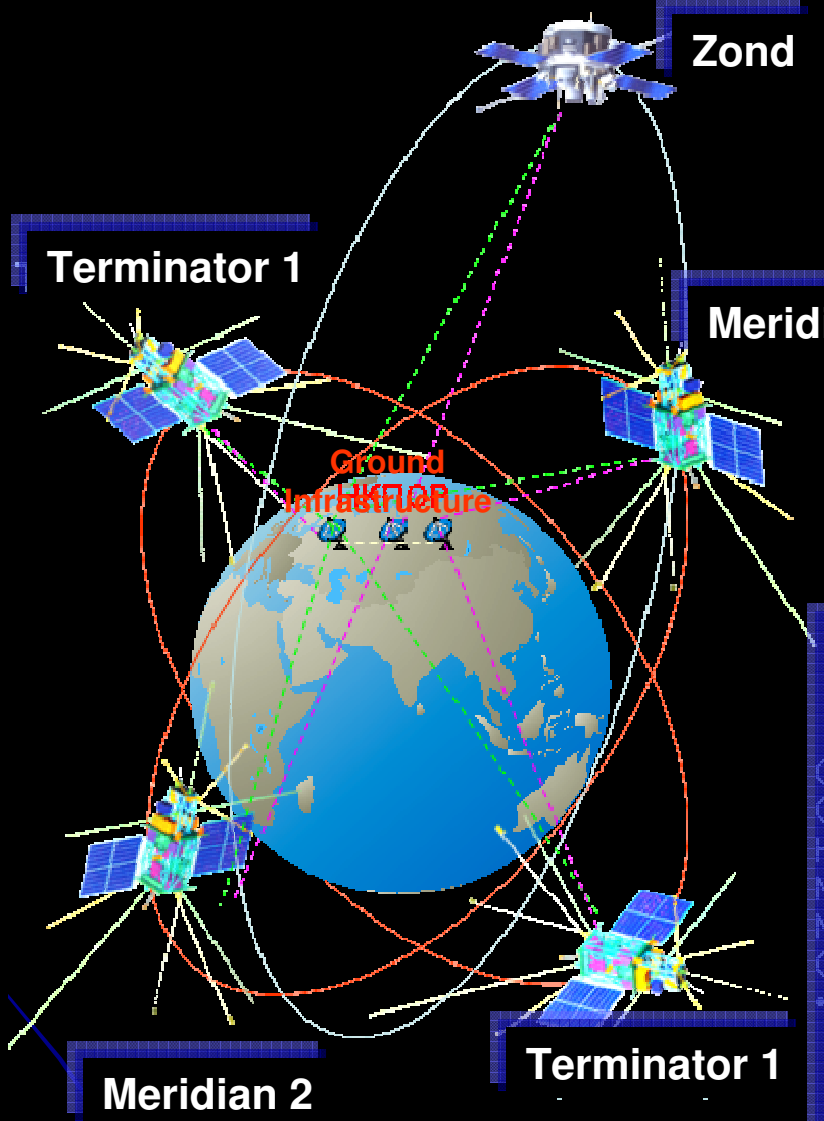
Highly sensitive radiometric visible and IR range equipment, low (LF) and high frequency (HF) wave complexes, plasma complexes, complexes to monitor charged particles, magnetometer,s mass-analyzers, spectrometers

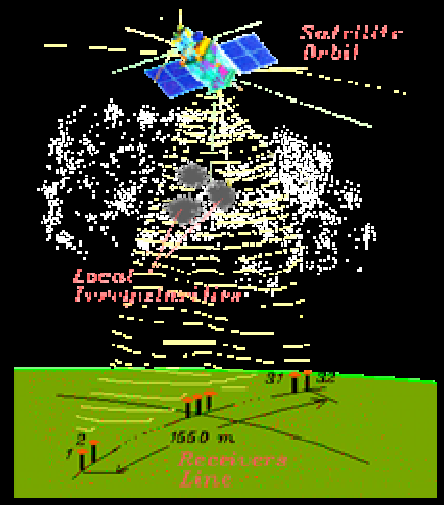
Ionosphere Monitoring Project "GEOFISIKA"



"Zond" satellite for detailed observation

One small satellite (350 kg) on polar , high inclined elliptical orbit (H =350-1200 km);
Equipment mass – 150 kg;
Content of the equipment:
• instrumental complex of ozone observations;
• multispectral complex UV visual and infrared radiation;
• sensor of the Sun activity;
• UV camera images of the Sun;
• Sensors corpuscular (solar and galactic) radiation;
• X-ray detectors;
• device for measuring the temperature of neutral atmospheric constituents;
• sensors of electric and magnetic fields





Ionosphere Constellation ("Terminator" and "Meridian" satellites)

4 small satellites;
Satellite mass – 200 kg;
Equipment mass – 80 kg;
Content of the equipment: radiophysics complex (ionosonde) for external and transionospheric ionospheric sounding

"SOYUZ-SAT-O" Small Satellites Facilities

GOAL of the EO microsatellite Soyuz-Sat-O: regular and on-line survey of the Earth surface in visible and near infared bands of spectrum, storage and transmission images to the ground stations.

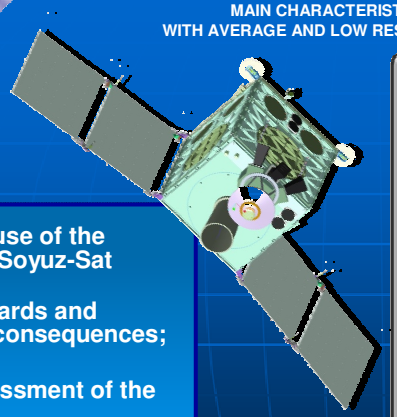
MAIN CHARACTERISTICS OF THE MICROSATELLITE WITH HIGH RESOLUTION OPTOELECTRONIC CAMERA

Sun Synchronous Orbit:	
Altitude H, km	575
Inclination I, degree	97,7
Number of observation channels:	
Panchromatic mode	1
Multispectral mode	5
Spatial resolution (Ground Sample Distance - GSD), m	
Panchromatic mode	1,7
Multispectral mode	3,5 - 4,0
Span, km	40,0
Swath, km	700,0
Rate of image transmission to the ground stations	
(X–band), Mb/sec	160,0
On-board memory volume, GB	128,0
Alignment accuracy, angular minute	6
Stabilization accuracy, degree/sec	10-3
Evaluation precision in orbit:	
Mass center coordinates, m	±15
Velocity, m/sec	±1
Average daily power, W	150,0
Weight, kg	180,0
Lifetime, years	5
Putting in orbit	Piggy-back payload
Time of manufacture, years	2

Tasks that can be solved with use of the microsatellite on the base of the Soyuz-Sat platform;

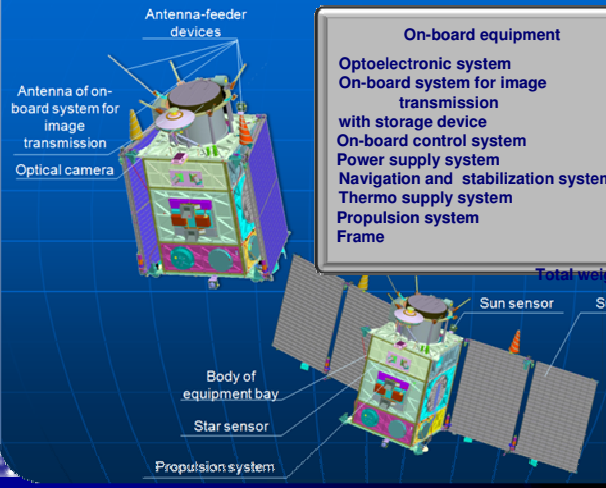
- **monitoring of the natural hazards and emergency situations, and their consequences;**
- **ecological monitoring;**
- **monitoring and efficient assessment of the agricultural objects;**
- **monitoring of the sea coast and shore.**

MAIN CHARACTERISTICS OF THE MICROSATELLITE WITH AVERAGE AND LOW RESOLUTION OPTOELECTRONIC CAMERA



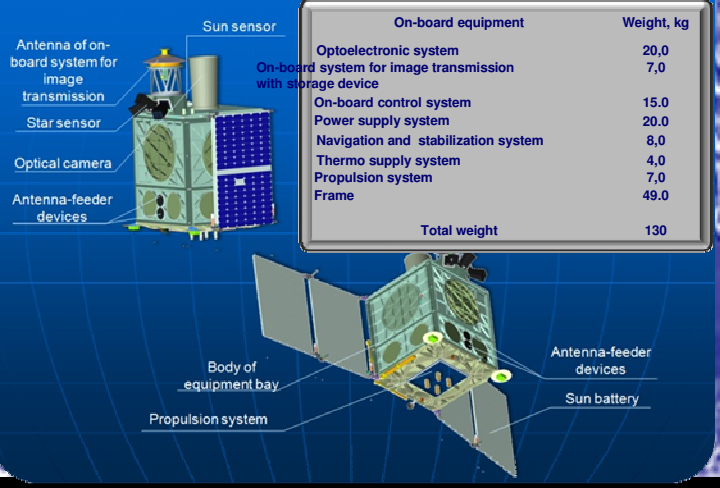
Sun Synchronous Orbit:	
Altitude H, km	575
Inclination I, degree	97,7
Number of observation channels:	
Panchromatic mode	1
Multispectral mode	5
Spatial resolution (GSD), m	
Panchromatic mode	8,0-10,0
Multispectral mode	15,0 - 20,0
Span, km	80,0
Swath, km	700,0
Rate of image transmission to the ground stations	
(X–band), Mb/sec	160,0
On-board memory volume, GB	80,0
Alignment accuracy, angular minute	20
Stabilization accuracy, degree/sec	10-3
Evaluation precision in orbit:	
Mass center coordinates, m	±25
Velocity, m/sec	±10
Average daily power, W	80,0
Weight, kg	130,0
Lifetime, years	5
Putting in orbit	Piggy-back payload
Time of manufacture, years	2

STRUCTURE OF THE MICROSATELLITE WITH HIGH RESOLUTION OPTOELECTRONIC CAMERA



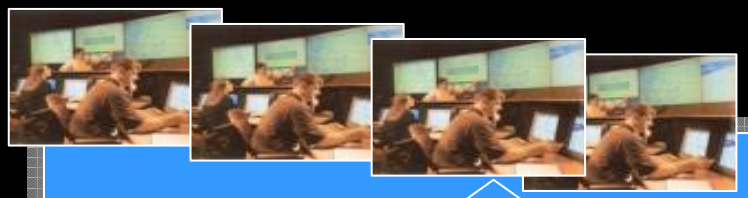
On-board equipment	Weight, kg
Optoelectronic system	35,0
On-board system for image transmission with storage device	7,8
On-board control system	21.5
Power supply system	25.5
Navigation and stabilization system	10,0
Thermo supply system	6,0
Propulsion system	7,0
Frame	67.2
Total weight	180

STRUCTURE OF THE MICROSATELLITE WITH AVERAGE AND LOW RESOLUTION OPTOELECTRONIC CAMERA



On-board equipment	Weight, kg
Optoelectronic system	20,0
On-board system for image transmission with storage device	7,0
On-board control system	15.0
Power supply system	20.0
Navigation and stabilization system	8,0
Thermo supply system	4,0
Propulsion system	7,0
Frame	49.0
Total weight	130

Monitoring Information Managenent Hierarchy

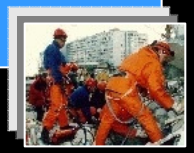


UN

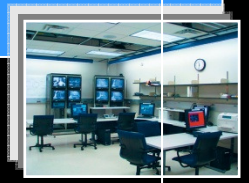
INTERNATIONAL CRISIS MANAGEMENT CENTRES

UPPER LEVEL: utilization of monitoring information

NATIONAL AND REGIONAL EMERGENCY FORCES

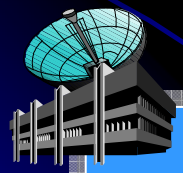


NATIONAL AND REGIONAL CENTRES CRISIS MANAGEMENT



REGIONAL CENTRES OF AIR-BORNE AND GROUND SENSORS MONITORING DATA COLLECTING AND PROCEEDING

MEDIUM LEVEL: interpretation of monitoring data



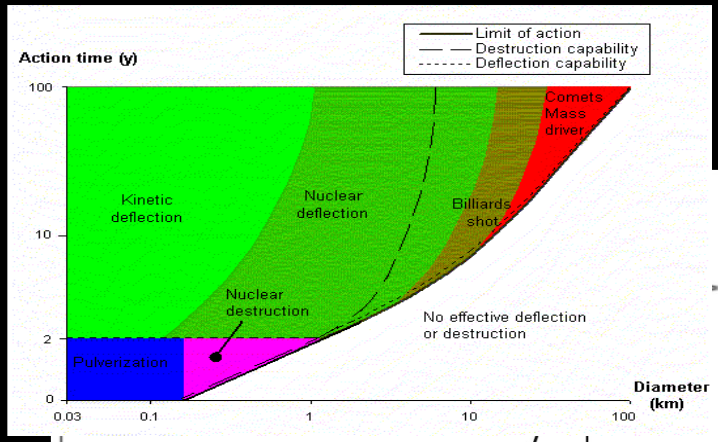
NATIONAL AND REGIONAL MONITORING DATA RECEIVING STATIONS

International, regional and national ground facilities (contact and distant sensors)

INTERNATIONAL MONITORING DATA RECEIVING STATIONS (5 stations all over the world)

LOW LEVEL: receiving and proceeding of monitoring data

Early Warning about Space Threats



1st echelon satellite (SV_1) , 1st echelon satellite (SV_2) – space vehicles of the asteroids detection and preliminary their ephemerids determination;

2st echelon satellite(SV_3) - space vehicles of the precision ephemerids determination

Russian scientists studied advanced project to create a system of live asteroid and comet threat monitoring.

At a rough guess to effectively foresee the appearance of stellar bodies before at least 3-5 days it would possible to create special two echelons space system (also called "Space Sentinel") from three big aircrafts with IR-telescopes in gravity neutral points.

POLITICAL ASPECTS OF THE IGMASS PROJECT IMPLEMENTATION

Positive

Participation in a wide-scale and long-term International project-level UN

Signing intergovernmental agreements on scientific-technical cooperation at regional and global levels

The growth of the International prestige of the state-Project participant

The possibility of solving socio-political and economical issues of the and region

Prospects of new political initiatives
(for strengthening global and regional security)

Negative

The use of monitoring technology and information-telecommunication system resources in the military applied purposes

Political gambling on the Project objectives and its participation

Scientific and industrial espionage in the framework of the Project

SOME LEGAL ASPECTS OF THE IGMASS PROJECT IMPLEMENTATION

Correct documentation of International Statute of the Project and its management

Further development of national and international rule-making in the field of space-based monitoring (data receiving and distributing, integration of informational and telecommunication resources of various countries and organizations)

International law issues of the IGMASS creating and deploying in wide international cooperation (designing, engineering and using of its space segment, data dissemination, the status of terrestrial infrastructure, the procedure for notifying states about the threats, etc.)

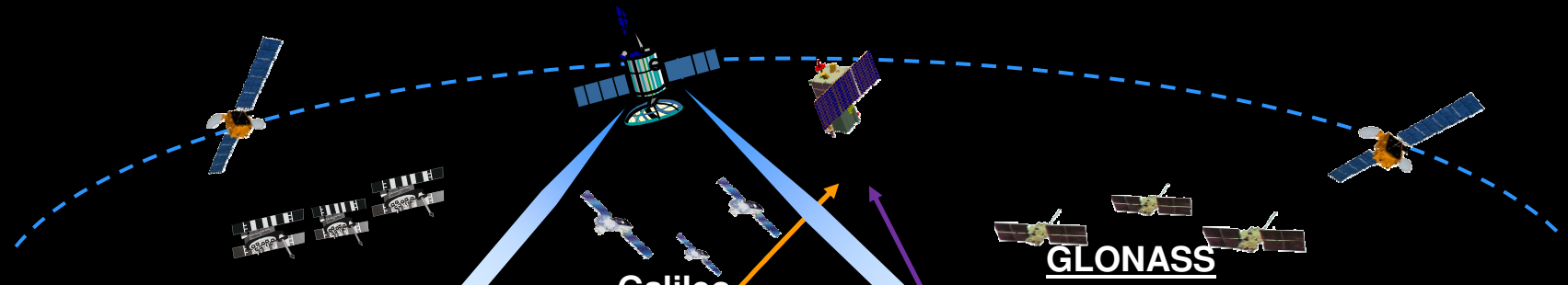
The status of technical and intellectual property created during the Project implementation

Terms of engaging national and international informational, navigational and telecommunication resources into the Project

Procedures of the Project funding (financing)

Responsibility for failure to provide warning data or its tendentious interpretation (due to mistakes or other reasons)

Some Humanitarian aspects of IGMASS Project Implementation



GPS NAVSTAR

Galileo

GLONASS

Satellite communication (VSAT)

Satellite communication(VSAT)

R&D Institutes

IHL

KNOWLEDGE SOURCE

A. Distance learning: training of space specialists and development of educational programs in unequipped areas

B. Telematics (transport corridors): vehicles location and statute control in remote territories

C. Cultural Heritage saving and protection in disaster dangerous areas

D. Catastrophe medicine: location and statute control, medical consulting the victims of emergencies

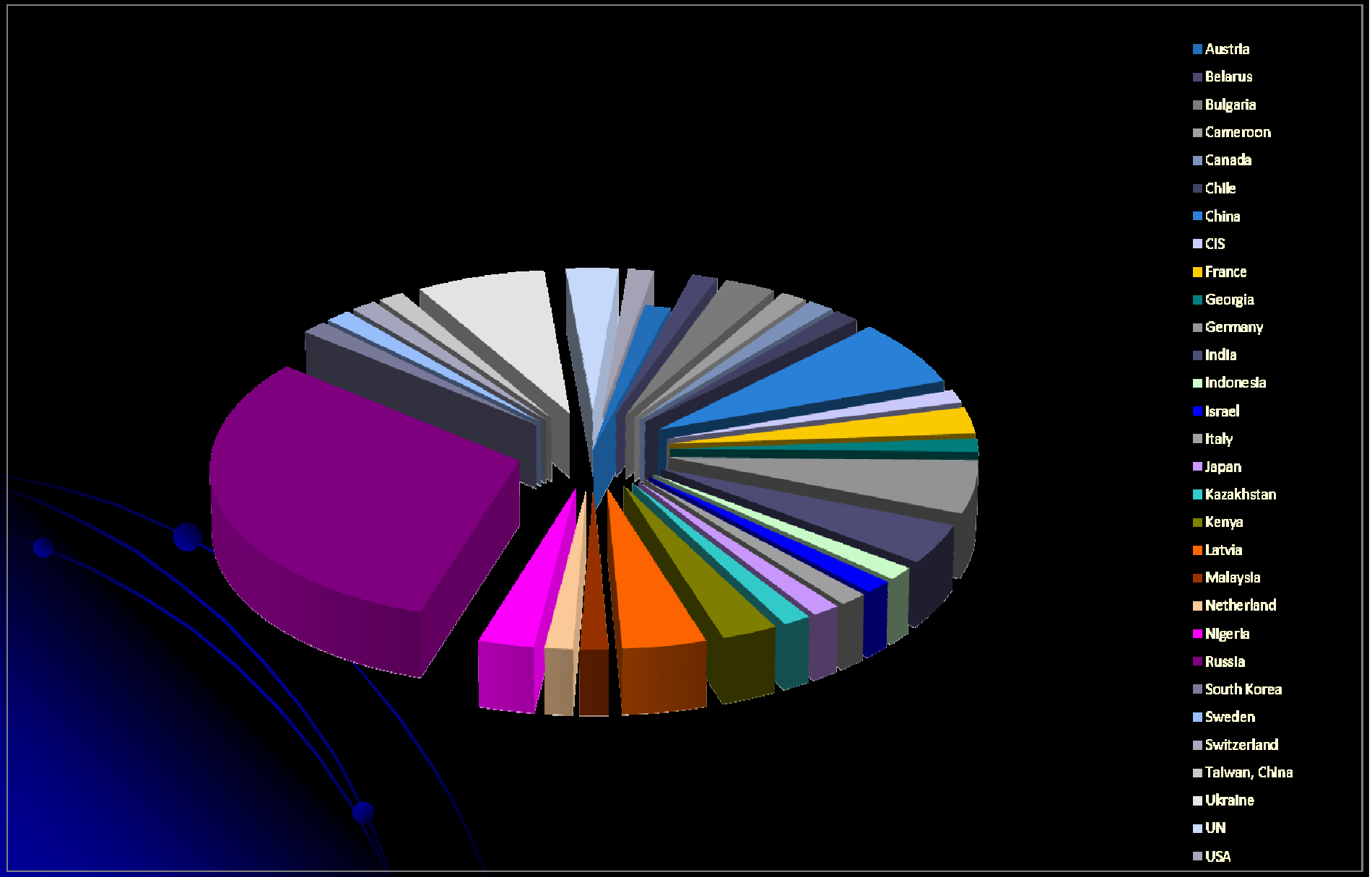
Universities, Scientific centres and Laboratories

KNOWLEDGE CONSUMERS

Medical Offices:
National centres of Catastrophes Medicine, its regional and territorial branches, clinical bases; telemedicine systems

Casualties:
participants of extreme expeditions;
jammed up at the zones of emergencies;
persons requested permanent medical control

Membersip of the International Committee on IGMASS Project Implementation

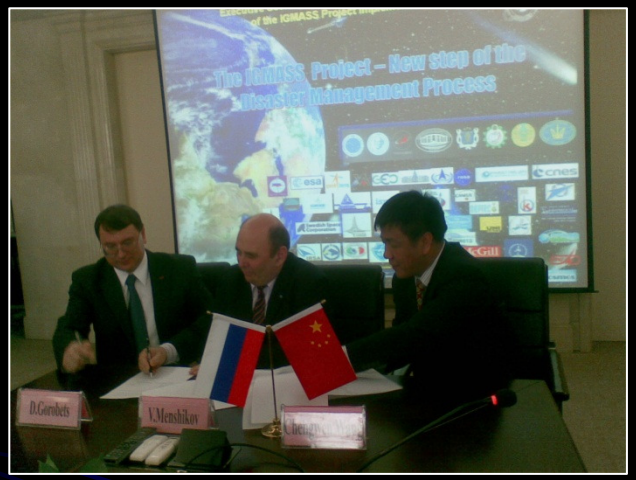


Promotion of the IGMASS Project in 2010

On September 27, 2010 during the first working day of the 61st International Congress of Astronautics in Prague, the International Committee on the IGMASS Project Implementation (ICPI) held its first working session. The main topic of the ICPI Session was the adoption of draft of its Charter and Activities Plan for the coming year.

During the ICPI Session was decided to hold on May 18-21, 2011 Third ICPI Session on the IGMASS agenda in Madrid, (Spain) by days of the "Russian Space Week ".

Recent contacts in Beijing and Jakarta on the IGMASS Collaboration

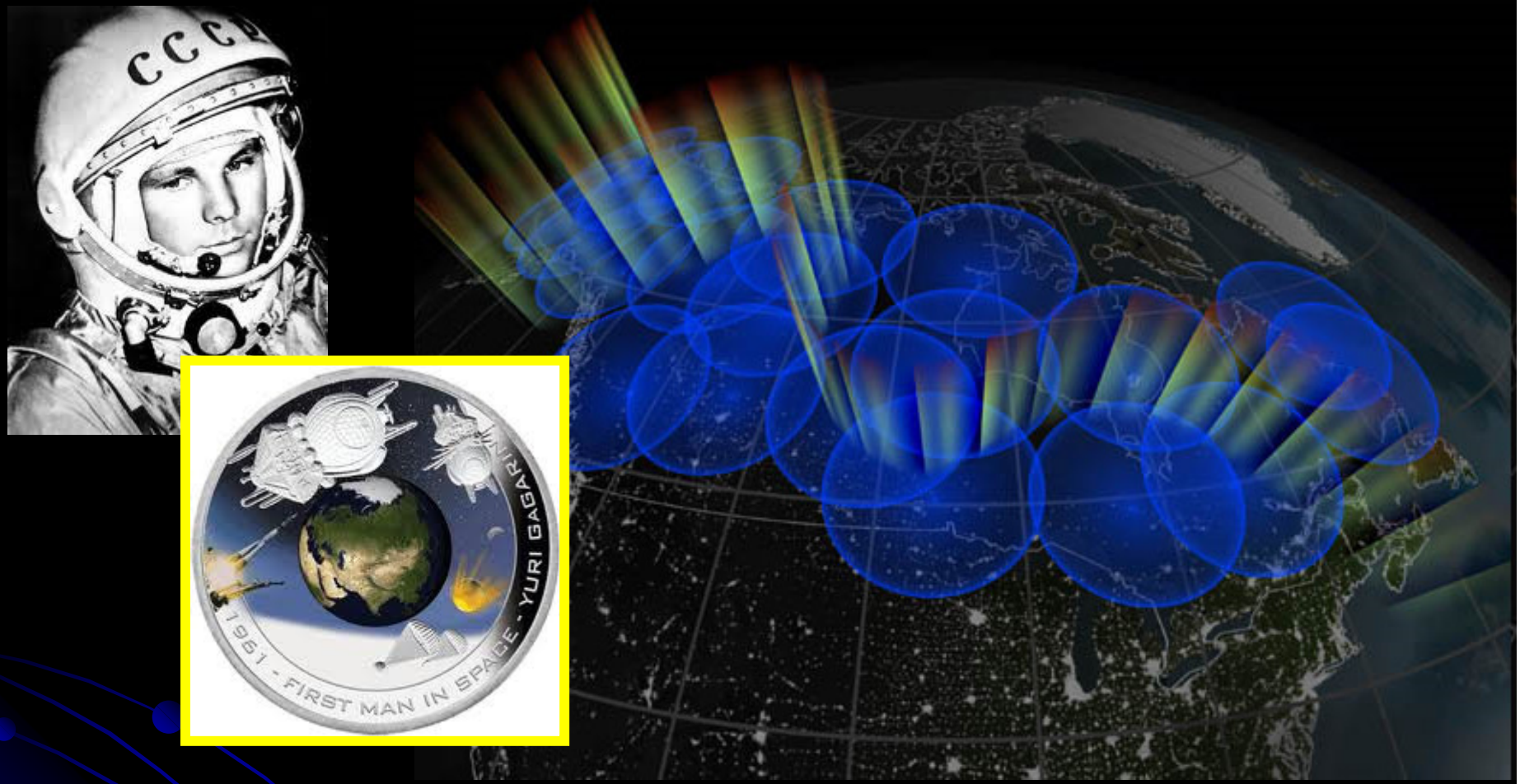


During January, 2011 the ICPI representatives hold several profile meetings in Beijing and Jakarta with participation of representatives of National space agencies of China and Indonesia (CNSA and LAPAN) for introduction the Project at both these countries.

Chinese and Indonesian experts much interested in applied researches at the field of searching disasters pre-signs, complex proceeding and using monitoring information via ground infrastructure facilities of the countries.

Exclusive attention was drawn into the questions of small and micro satellites as well as up-to date geophysical equipment, which has to design in the frame of the Project.

As the meetings results some MOUs and protocols were signed and discussed, including preliminary agreements about regional South Asian cooperation (APSCO and ASEAN).



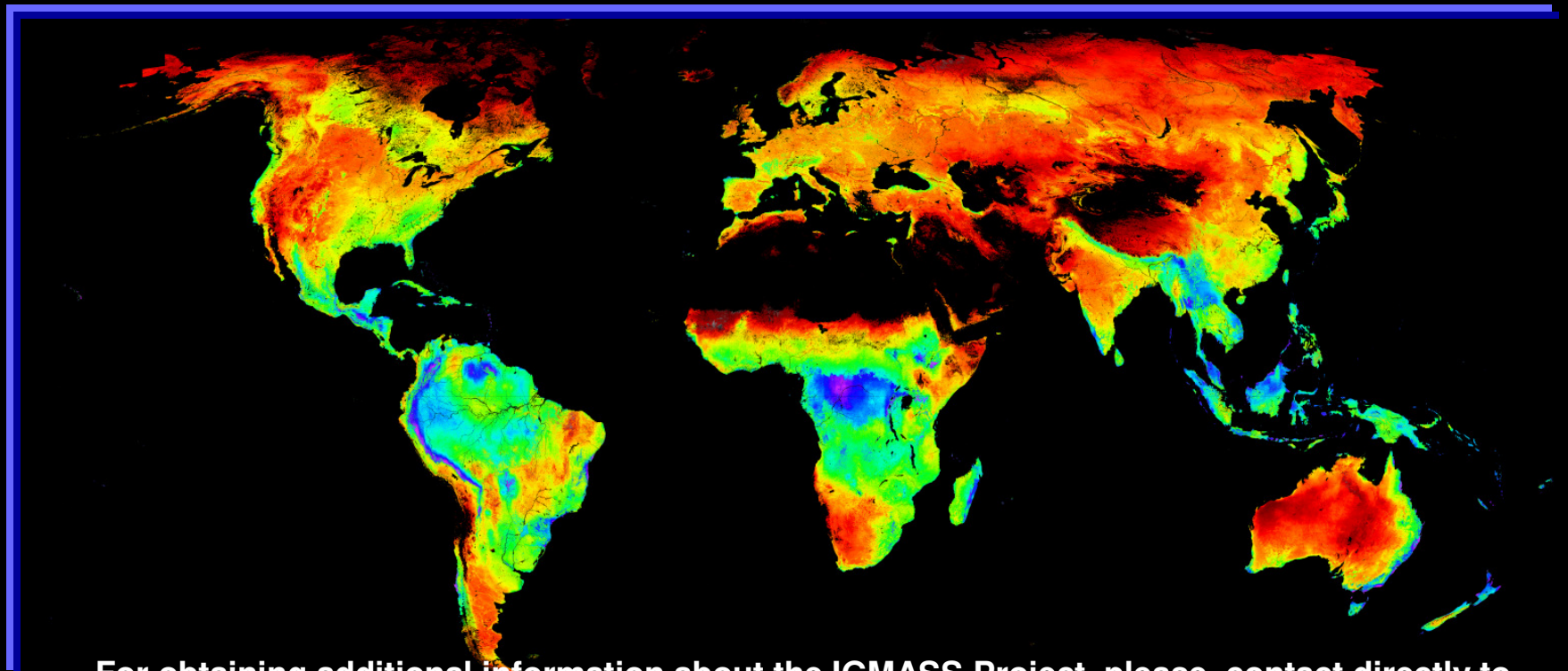
On the eve of 50th Anniversary of Yuri Gagarin Space Flight the IGMASS Project is an unique opportunity to unify world community efforts in the framework of new, joint strategy of peaceful space exploration, which is focusing into providing secure and social sustainable development of globe society in XXI century

IGMASS Project Governing Body Proposals for the Session

1. To discuss the issue about official recognition and support of the IGMASS Project by the UN institutions

2. To appeal all countries-participants join the IGMASS Project for its implemention in following areas:
   - researches and developments in the field of precursors of natural and man-made disasters identification;
   - creation of the IGMASS space segment, based on up-to-date small and microsatellites;
   - deployment of ground infrastructure for receiving and processing global aerospace monitoring data.

3. To include the question about the IGMASS Project implementation into STS final resolution and future agenda UN General Assembly and profile UN events



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