

**54th Session of the Committee on
the Peaceful Uses of Outer Space,
June 7, 2011
Vienna, Austria**



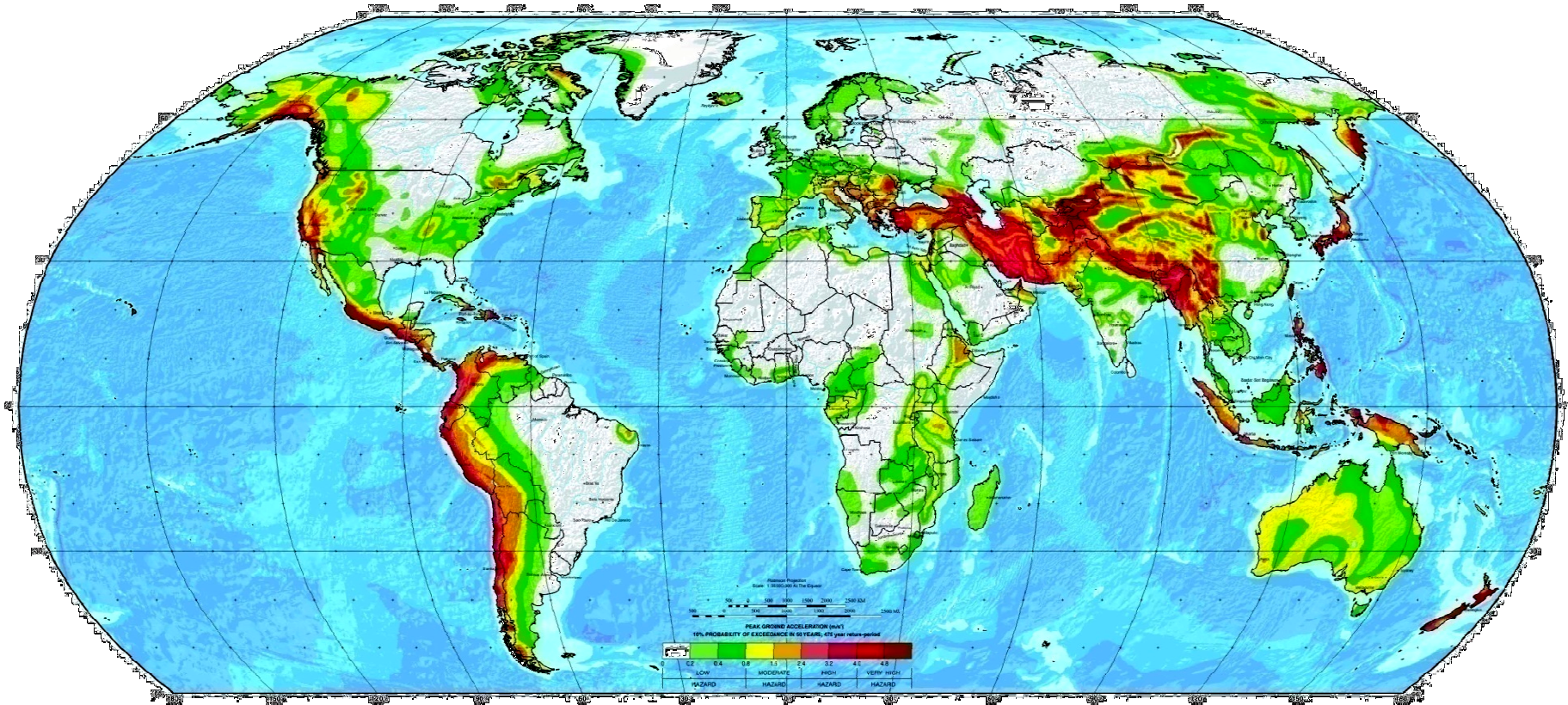
**Dr. Alexander Degtyarev
General Designer- General Director
Yuzhnoye State Design Office**

YUZHNOYE

design office

**GLOBAL SPACE SYSTEM OF
SEISMIC ACTIVITY MONITORING**

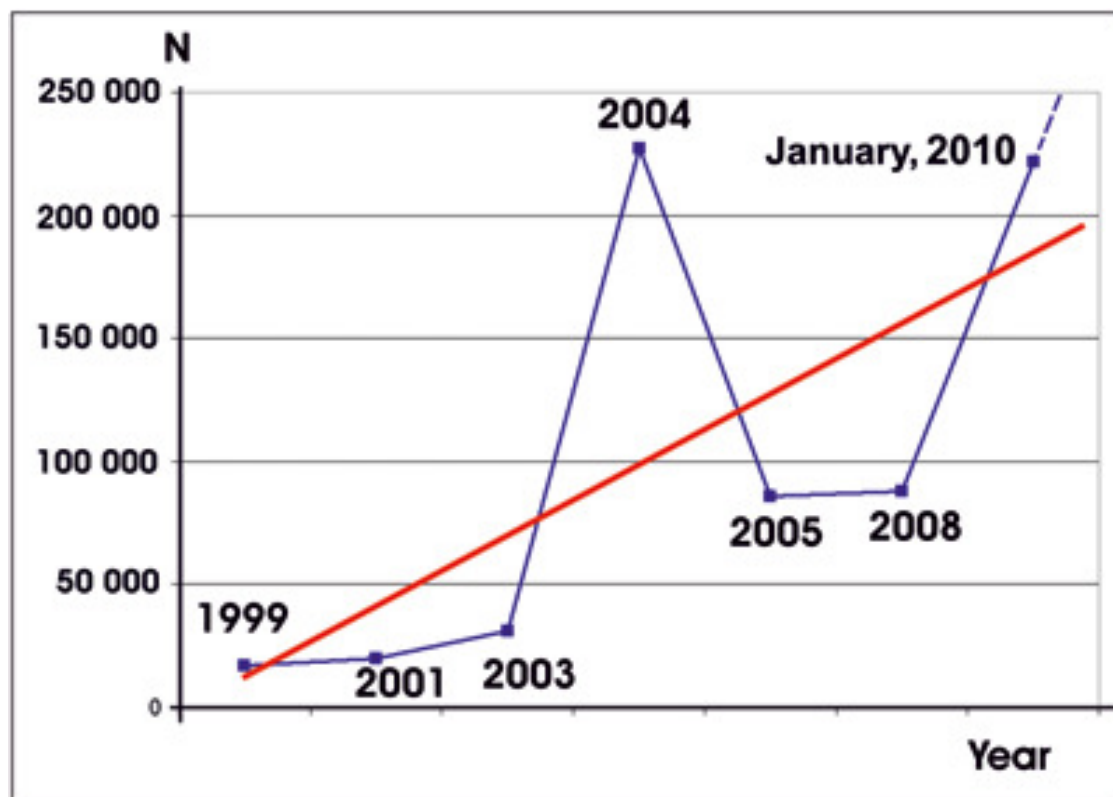
MAP OF SEISMIC ACTIVITY



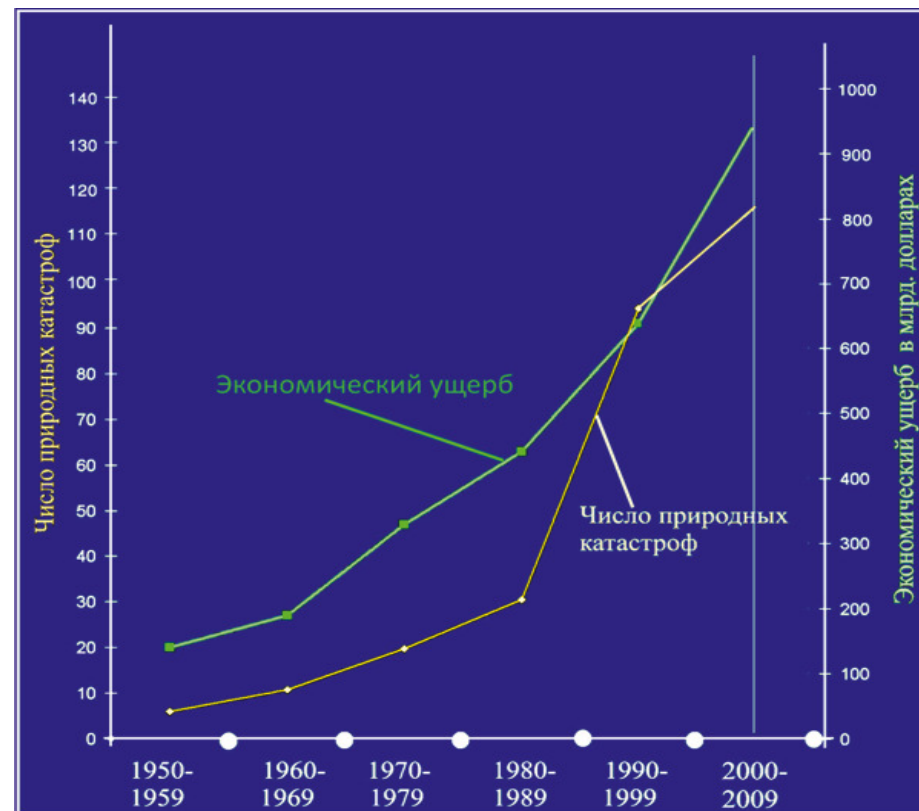
- **1/3 of Earth surface is earthquake-prone zone**
- **for the recent 50 years more than 1 million people in the world died of earth-quakes**

GLOBAL CHANGES OF EARTH SEISMIC ACTIVITY

For the recent 10 years the number of people died of the powerful earth-quakes increase in 8.6 times in comparison with the average index for the decade (during the previous 50 years).



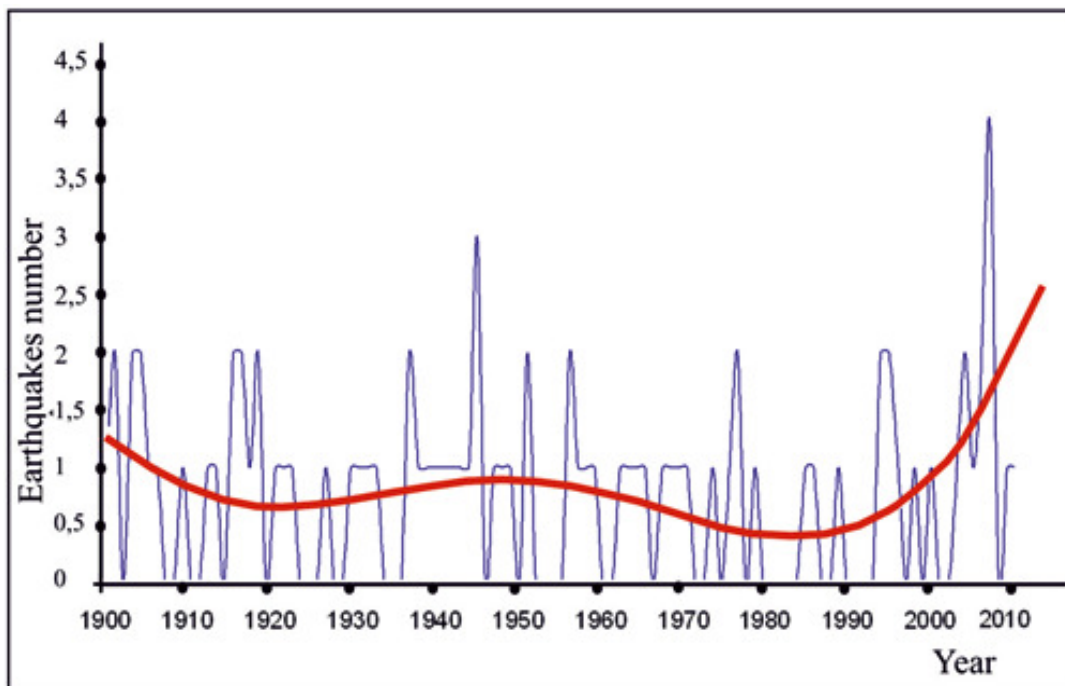
The number of people died of the powerful earth-quakes for the period from January 1999 to January 2010 years



The number of natural disasters and economical damages for the period 1950-2009 years

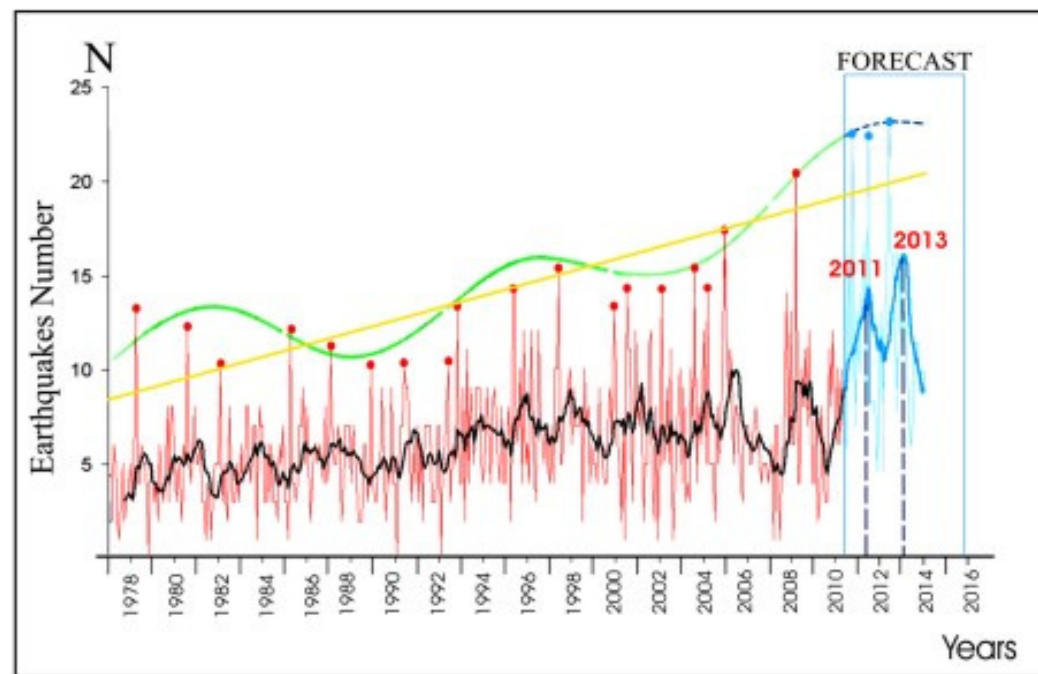
GLOBAL CHANGES OF EARTH SEISMIC ACTIVITY

Dynamics of Earth seismic activity



- The number of earth-quakes from $M > 8$
- schedule of annual earth-quakes;
- polynomial trend of sixth degree.

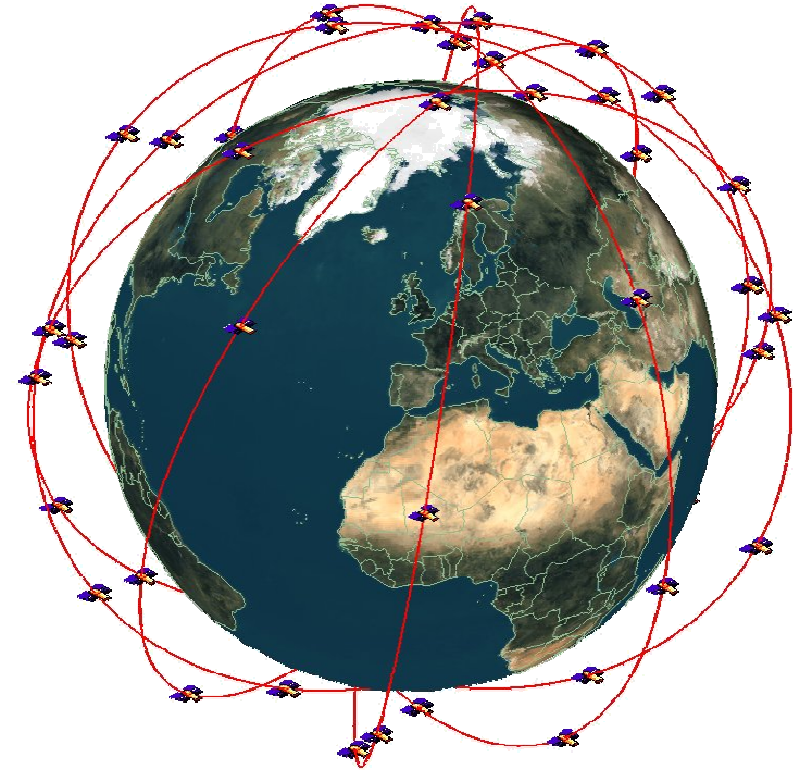
Long-term forecast of Earth seismic activity dynamics



- Monthly number of earth-quakes from $M > 6,5$ (1976 - 2010 years) with forecast till the 2015 year (based on alternating trend)

ADVANTAGES OF SPACE OBSERVATION USE

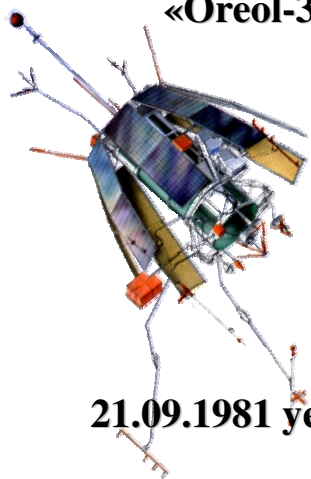
- **wide range of earth-quake precursors observation with the help of complexing of space and ground measurements;**
- **global nature of research;**
- **common data base of the observed geophysical parameters;**
- **insurance of scientific break-in in the research of physical events domain, related with the seismic activity and others.**



RESEARCH OF EARTHQUAKE PRECURSORS WITH THE HELP OF SPACE OBSERVATIONS

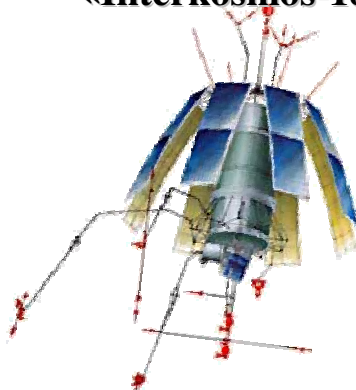
Heritage of Yuzhnoye SDO in the development of monitoring space systems.

«Oreol-3»



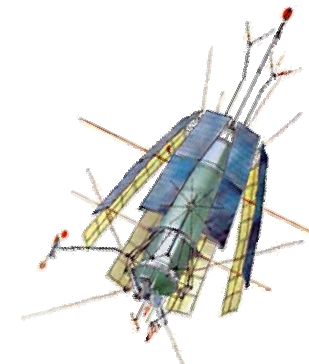
21.09.1981 year

«Interkosmos-18»



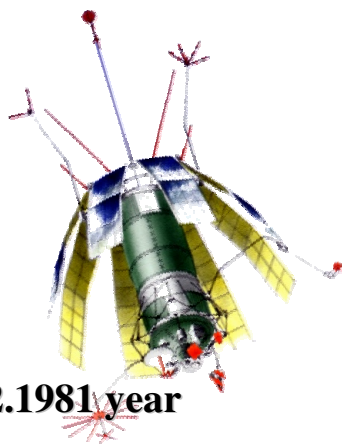
24.10.1978 year

«Interkosmos-19»



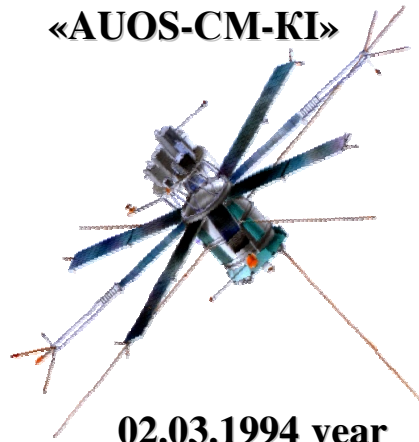
27.02.1979 year

«Interkosmos-21»



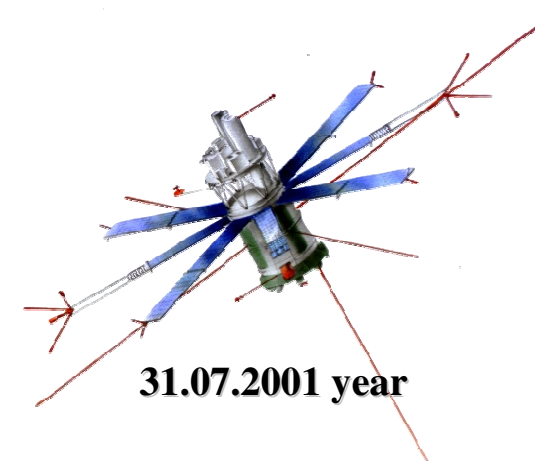
06.02.1981 year

«AUOS-CM-KI»



02.03.1994 year

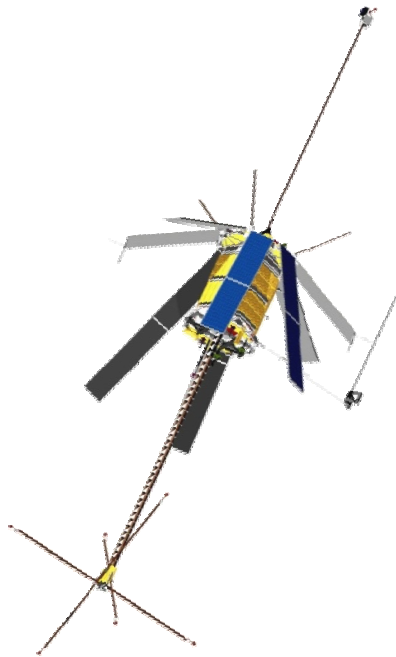
«AUOS-CM-KF»



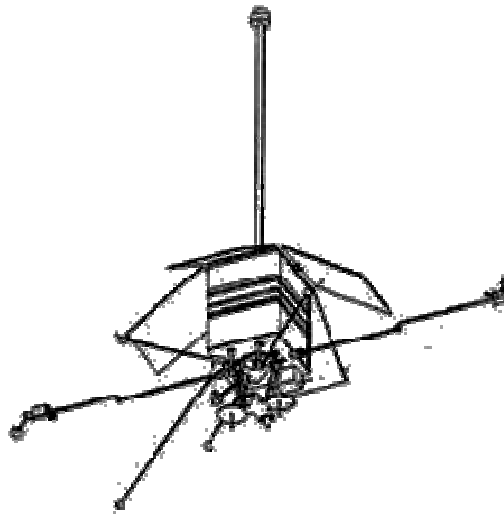
31.07.2001 year

SATELLITES OF SPACE COMPLEX “EARTHQUAKE PRECURSORS”

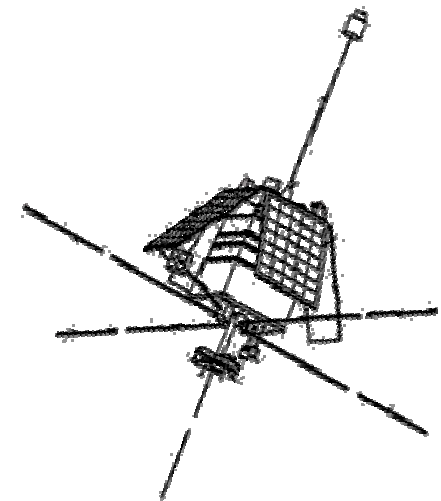
The most efficient way for research is global space monitoring of changes in the ionosphere, magnetosphere and in the Earth crust, related with the seismic activity.



Main satellite



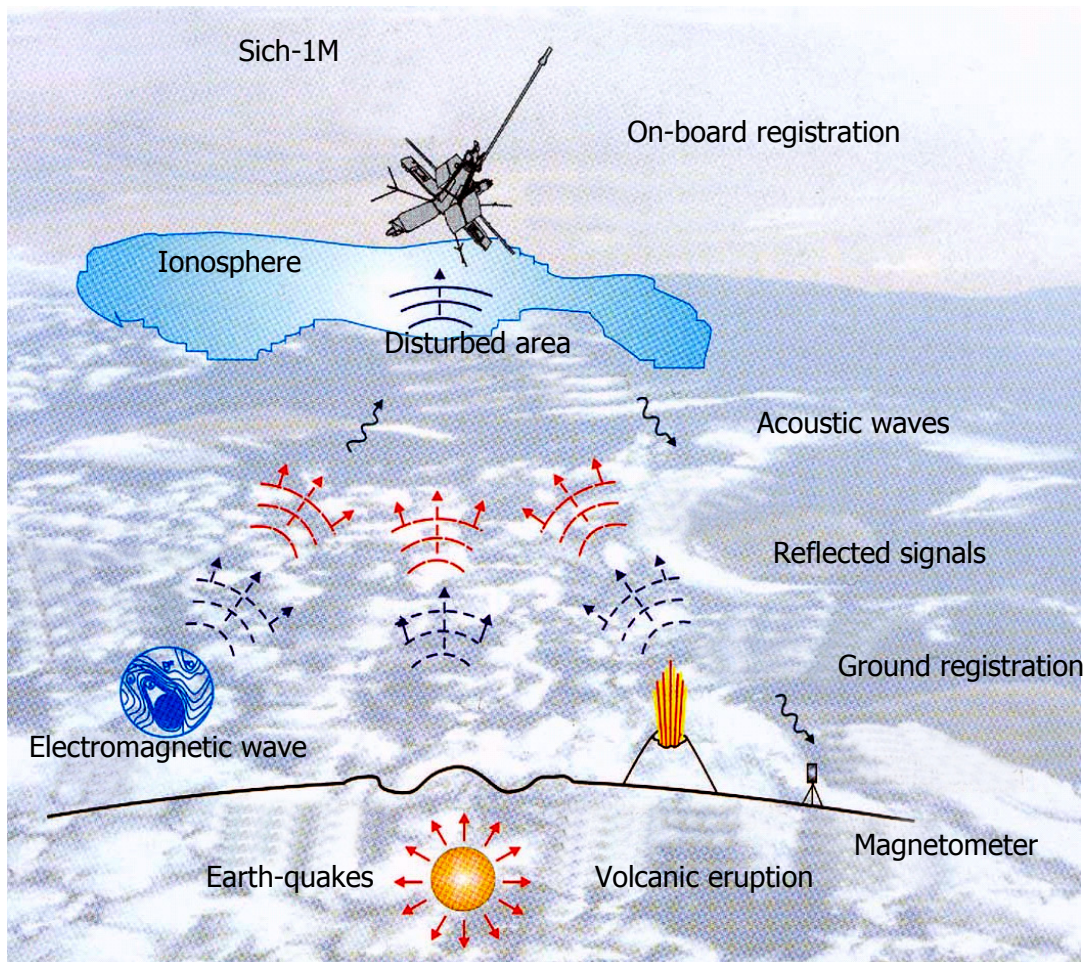
Sub-satellite



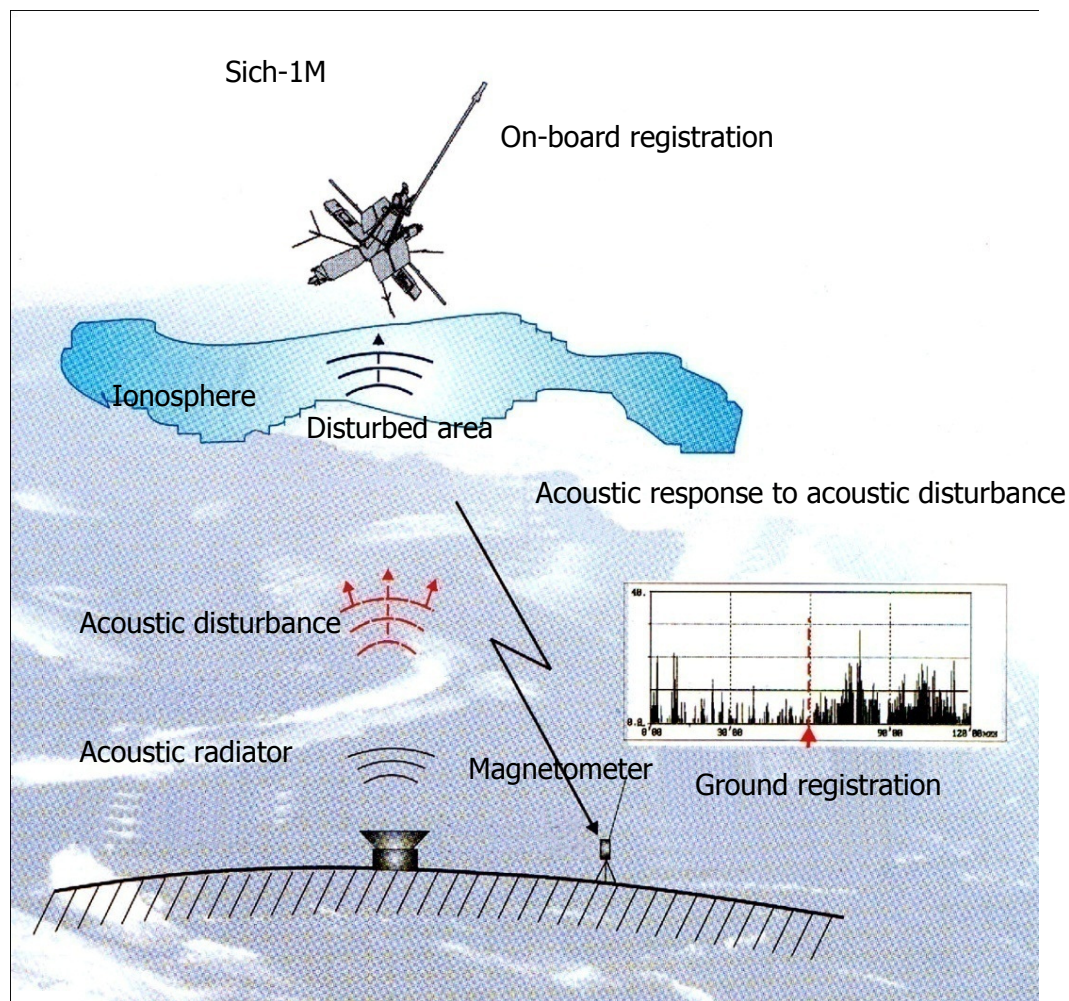
Sub-satellite

PROJECT CONCEPT “VARIANT” OF SPACE SYSTEM «SICH-1M» (2004)

Research of influence terrestrial effects to the ionosphere

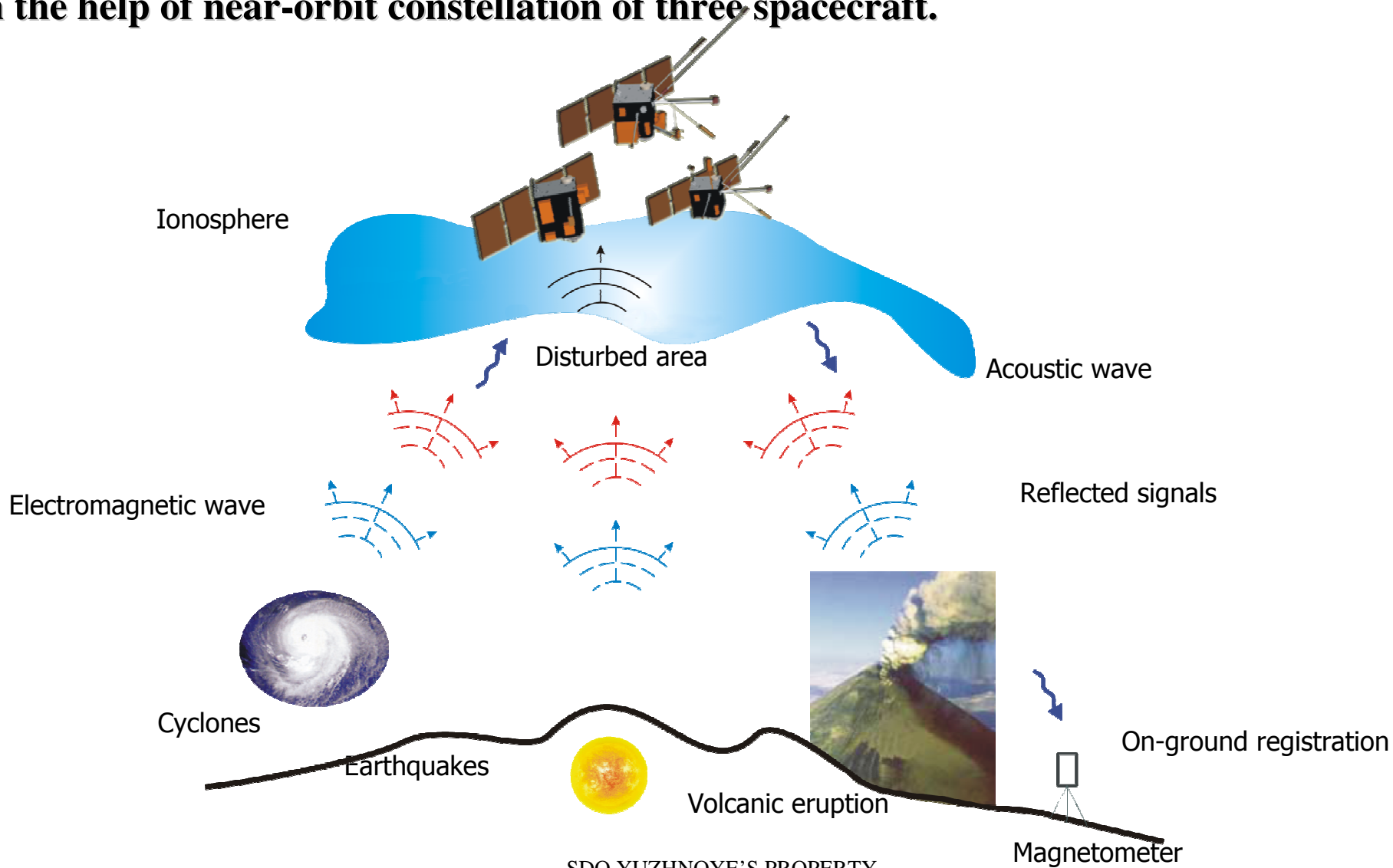


Ground-space experiment on research of acoustic channel of litospheric-ionospheric links



CONCEPT OF SPACE SYSTEM

Conducting of scientific experiments on forecasting and diagnostics of man-caused disasters with the help of near-orbit constellation of three spacecraft.



MAIN TASKS OF THE SYSTEM

- **search, detection and research of ionosphere disturbances, caused by Earth seismic activity;**
- **research of physical mechanisms influence in the system: “Earth crust-atmosphere-ionosphere-magnetosphere”;**
- **development of satellite monitoring principles of ionosphere aspects in the interests of earth-quakes forecast;**
- **control of seismic activity and earth-quake forecast;**
- **recommendations for action in the critical situations.**

COMPOSITION OF SPACE SYSTEM

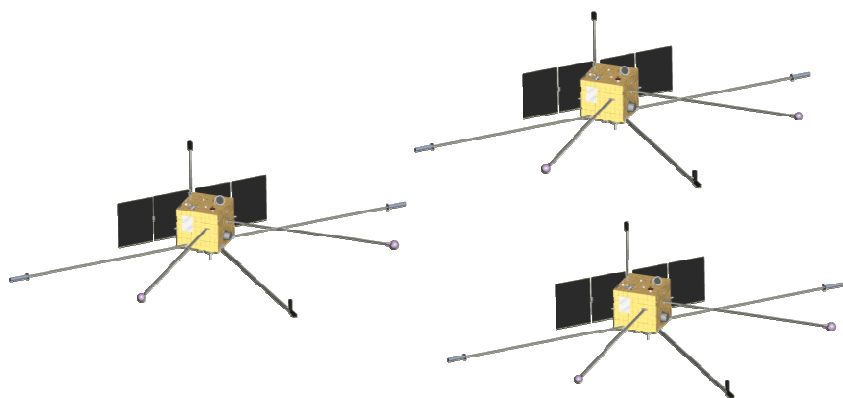
- **space segment;**
- **means of deployment and support of system space segment;**
- **ground control complex;**
- **ground data complex;**
- **network of ground test sites.**

SPACE SYSTEM BASED ON SPACECRAFT CLUSTER (AS ONE OPTION) FOR MULTIPOSITION MEASUREMENTS

Cluster consists of three spacecraft with identical composition of scientific equipment on the circular near-polar orbit, altitude 450 km.

In the horizontal plane satellites form triangle or linear configuration.

Mutual disposal of satellites could be from several dozens to several hundreds kilometers.



Wave tests

Electric probes

Langmuir probe

Sensor of neutral particles

Ferro probe magnetometer of steady field

System of data acquisition

System of payload data transfer

Mass of spacecraft, kg

~170

Orientation

three-axis active

Maximal power, power supply subsystem, Watt

465

Period of active operation, years

5

SPACE SEGMENT

Space segment of space system presents a constellation of spacecraft in composition of 6-8 clusters (18-24 spacecraft) spacecraft.

Structure of constellation (number of orbit planes and its inclination) will be determined upon the results of experimental stage of space system development.

Initial stage of space system development is planned to perform based on the orbital constellation of 3 spacecraft (one spacecraft cluster) which are in one plane and launched to the orbit by one launch-vehicle.

Spacecraft of cluster are designed on the base of subsystem and decisions, tested in the outer space which allow to decrease costs on development space system and create unified space platform for space segment. Development of platform will allow to manufacture spacecraft of global monitoring space system.

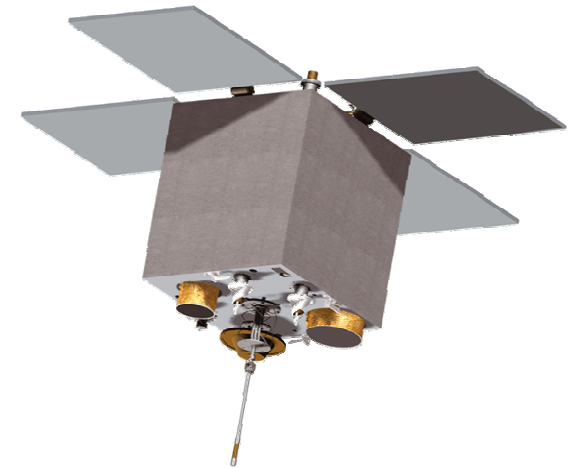
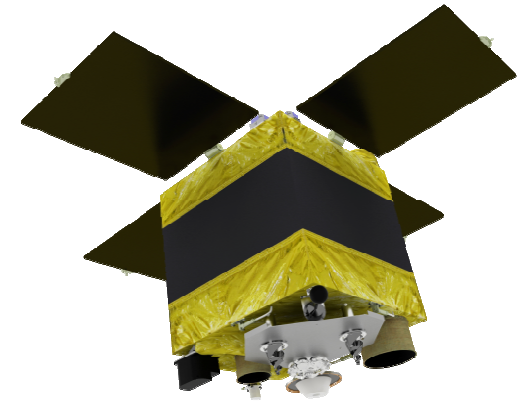
Complex of scientific equipment for solving tasks of space segment is formed by international cooperation of developers based on instrument complex of developed Projects.

SPACE SEGMENT

SDO YUZHNOYE'S HERITAGE IN DEVELOPMENT OF SPACE SYSTEM

Yuzhnoye SDO proposes to use microsatellite platform of “Sich-2” (scheduled launch in 2011) as a base space platform of wide application

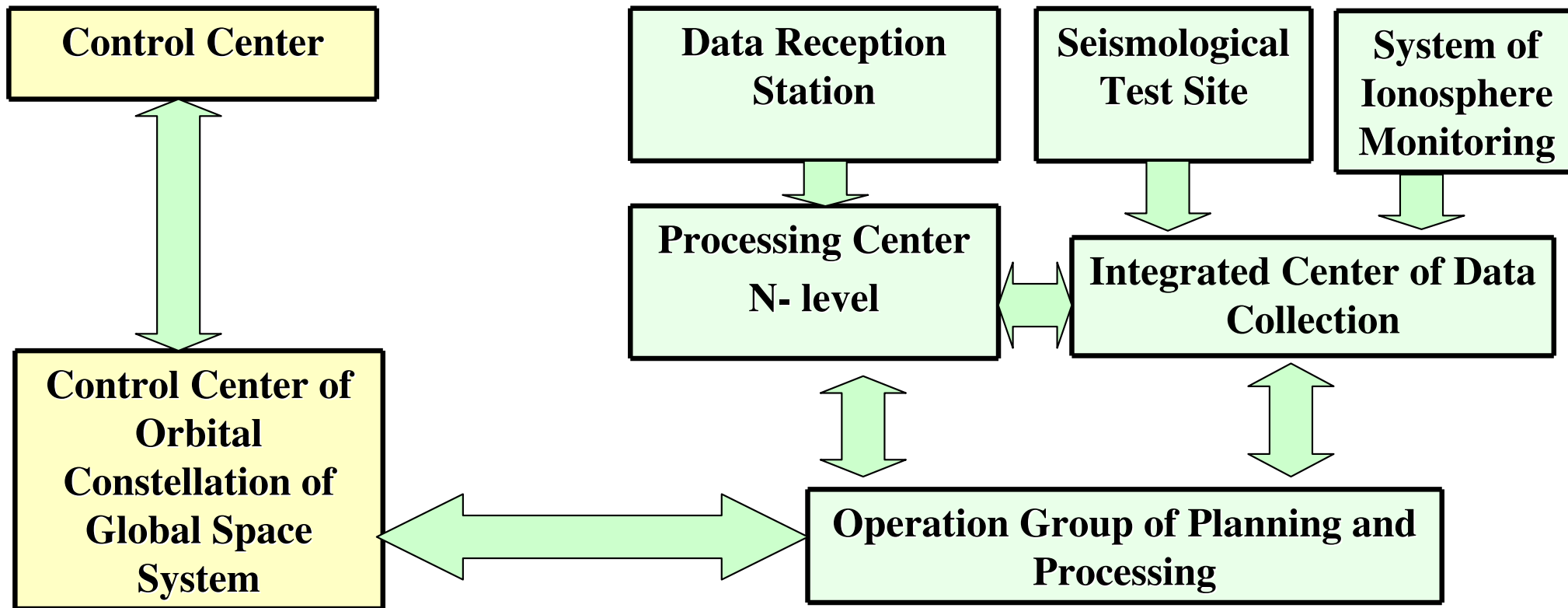
Platform passed final adjustment in conditions of outer space on satellite «Egyptsat-1» (launched on April 17, 2007)



GROUND SEGMENT

GROUND CONTROL COMPLEX

GROUND DATA COMPLEX



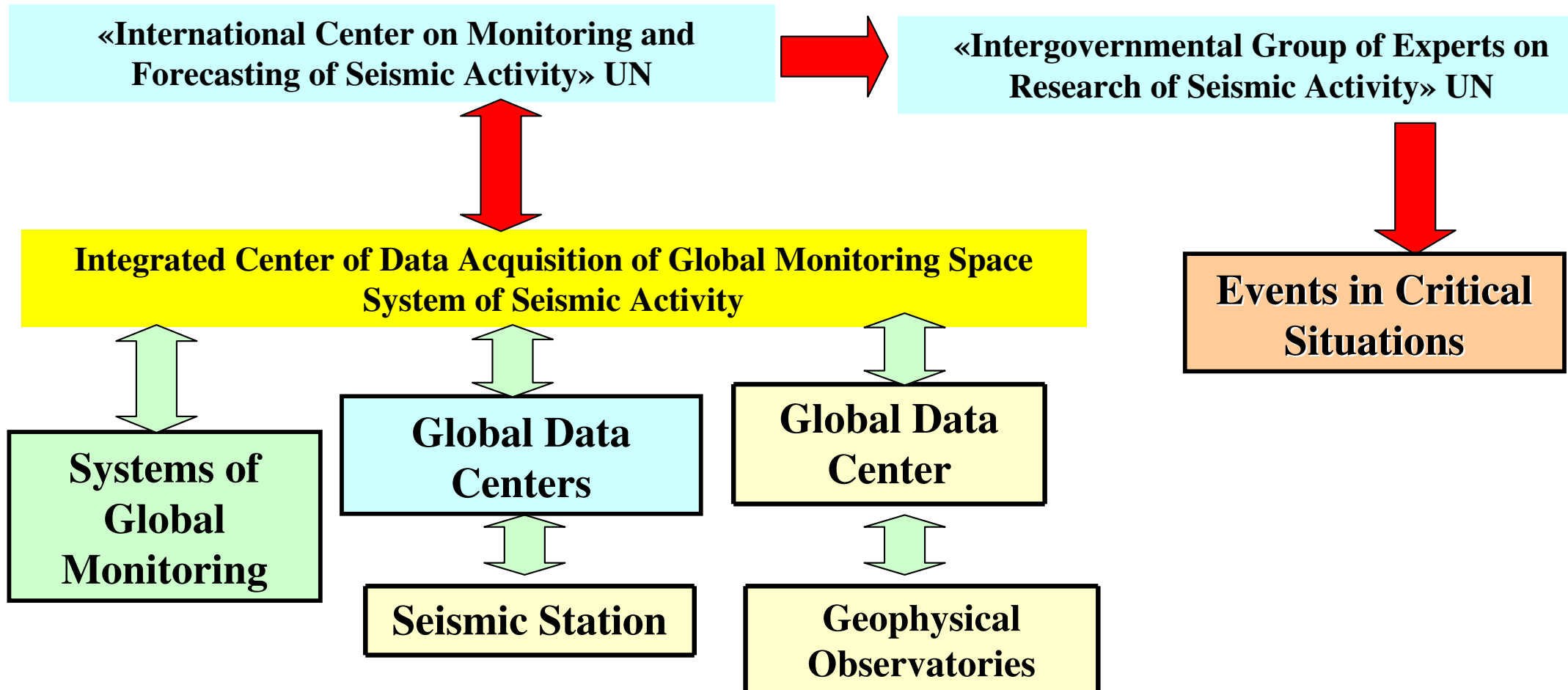
MEANS OF DEPLOYMENT AND SUPPORT OF ORBITAL SPACE SYSTEM



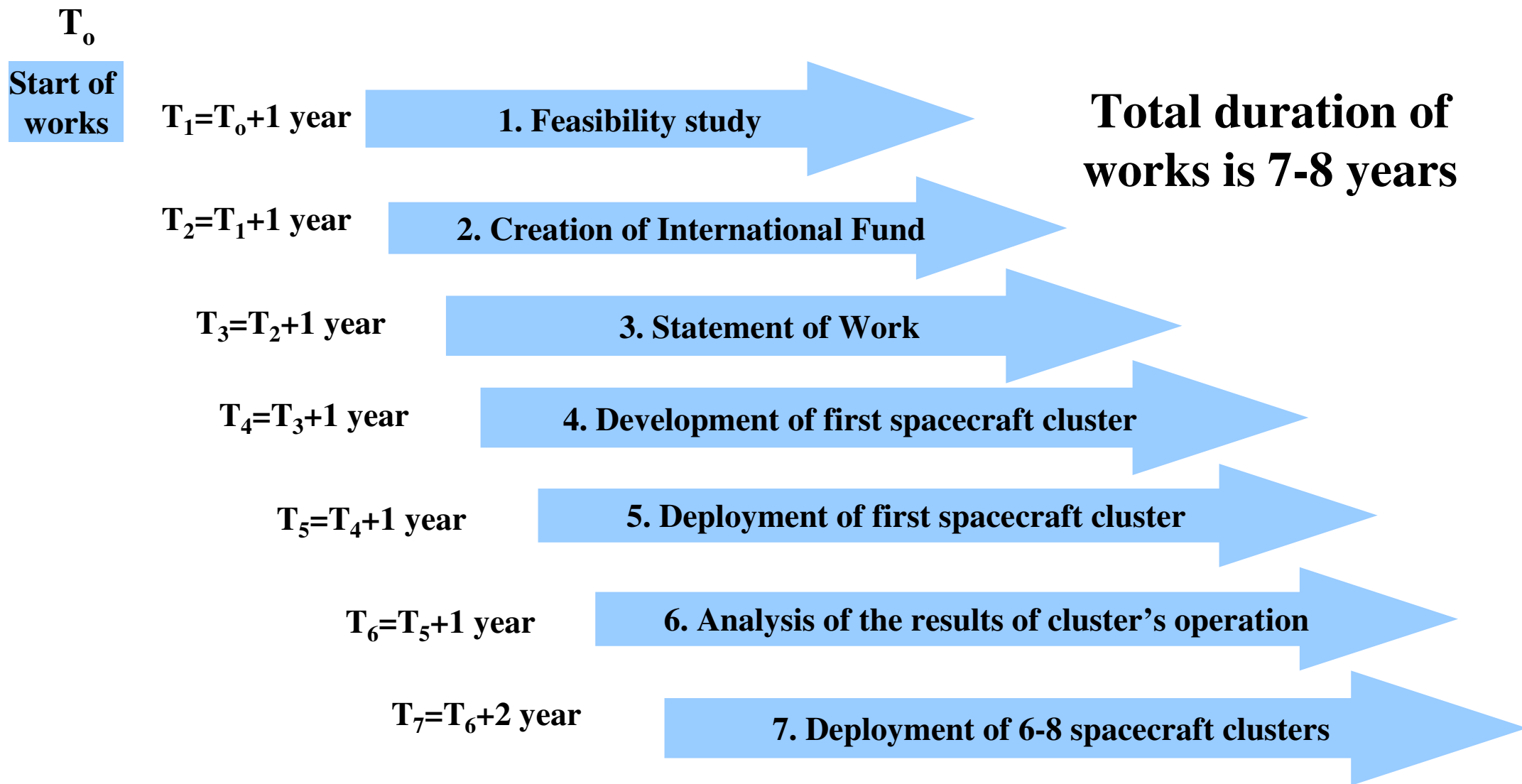
LV Dnepr



DATA INTERACTION OF GLOBAL SEISMIC ACTIVITY MONITORING SPACE SYSTEM WITH DATA AND DECISION MAKING CENTERS



TENTATIVE SCHEDULE OF GLOBAL MONITORING SPACE SYSTEM OF SEISMIC ACTIVITY DEVELOPMENT



FINANCIAL ASPECTS

- **Management and funding of the Project could be implemented through the specially created International Fund.**
- **Space agencies, governmental and private organizations, funds, interested in implementation of such Project, International Academy of Astronautics, International Astronautical Federation, could act as members of the Fund under condition of payment membership fee.**
- **Countries possessing seismic ground stations could participate in the Project on in-kind condition, namely by receiving, processing and distributing seismic data for the Project interests.**

GLOBAL SPACE SYSTEM OF SEISMIC ACTIVITY MONITORING (GSSSA) AS A PART OF INTERNATIONAL GLOBAL MONITORING AEROSPACE SYSTEM (IGMAS)

**Purpose of IGMAS is ensuring of
timely warning of world association
on forthcoming disasters.**

**Purpose of GSSSA is monitor of
seismic activity and earthquake
forecast.**

**Formation of global
monitoring system
during the active
support of UN, IAA,
IAF**

PROPOSALS FOR CREATION, INTERACTION AND DATA EXCHANGE BETWEEN INTERNATIONAL ORGANIZATIONS AND CENTERS

- 1. Create under the UN «International Center on Monitoring and Forecasting of Seismic activity».**
- 2. Create under the UN «Intergovernmental Group of Experts on Seismic Activity Research».**
- 3. Create under the IAA and IAF «Interagency Group on Seismic Activity Research».**
- 4. Create «Center of Analysis of Seismic Activity for Formation of Recommendations on Actions Under the Critical Seismic Activity».**
- 5. Develop under the UN joint interaction of international organization, centers and elements of global monitoring seismic activity system for recommendations on decision making and joint actions in the critical situations.**
- 6. Adopt international standards for government of different countries in case of critical seismic activity.**

THANK YOU !

CONTACT INFORMATION:

Dr. ALEXANDER DEGTYAREV

**General Designer- General Director
Yuzhnoye State Design Office**

E-mail: space@yuzhnoye.com

Tel: +38 056 371 32 10

Fax: +38 056 770 01 25