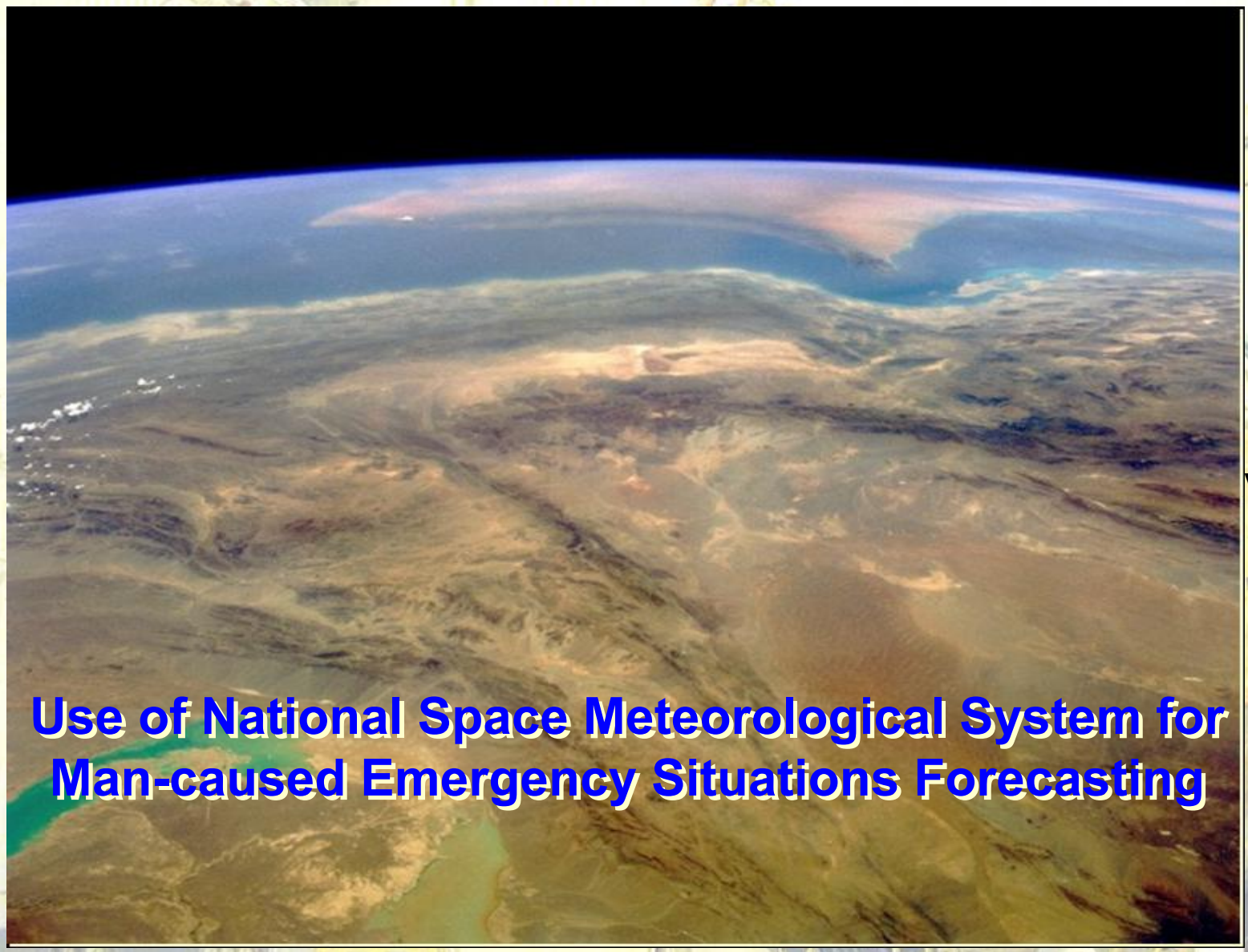
MAKRIDENKO L.A.,
BOYARCHUK K.A.



Use of National Space Meteorological System for Man-caused Emergency Situations Forecasting

COPUOS
43rd session
February 20 – March 3, 2006
Vienna, AUSTRIA

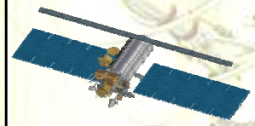
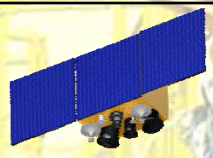
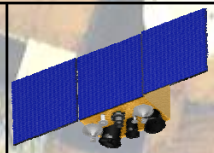
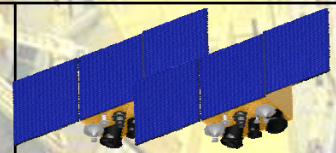
40 YEARS IN SPACE

Federal Governmental Unitary Enterprise
"Research and Production Enterprise – All-Russian Scientific and Research Institute of Electromechanics with Plant named after A.G. Iosifian"
"NPP VNIIEM"

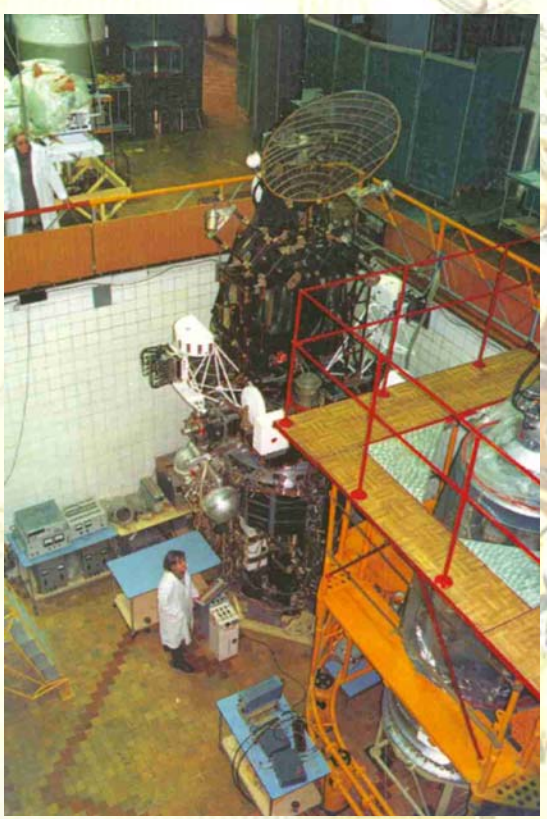
There are 75 S\V were launched during 40 years
Total spaceflight time of "NPP VNIIEM" S\V in the space is 208 years

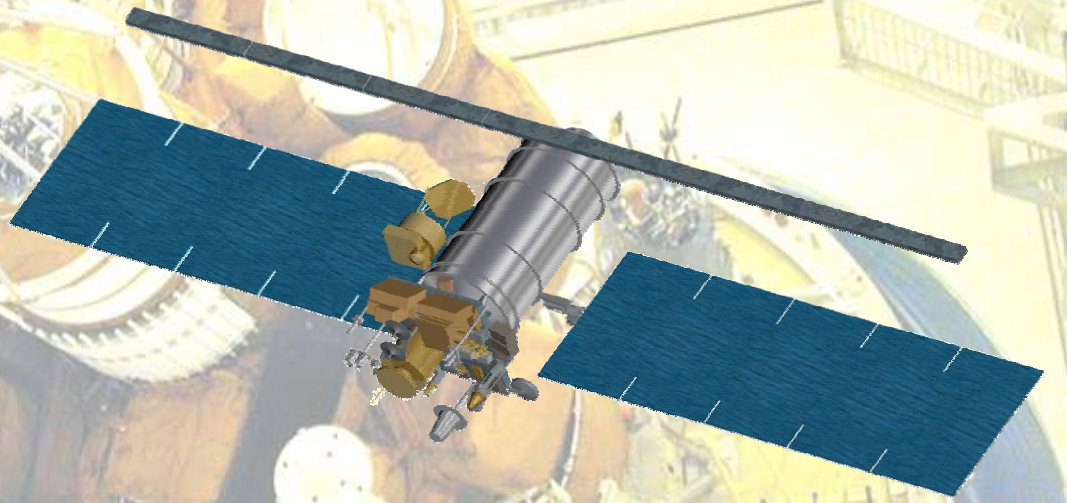
Names of SC series	Active lifetime, years
The first generation	
1. 1963-1969 "Meteor" series	8
2. 1969-1977 "Meteor" series	22
3. 1973-1983 "Meteor-Nature" series	7
The second generation	
4. 1877-1995 "Meteor-2" series	22
4. 1980-2000 "Resource-01" series	4
The third generation	
5. 1988-1995 "Meteor-3" series	5
Geostationary S\V	
6. 1994-1998 "Electro"	1

Federal Space Program
2006 – 2015

Meteorological S/V					
	Electro-1			**Electro-2**	**Electro M-P**
	 **Meteor-M 1**	 **Meteor-M 2**		 **Meteor-M 2**	
Remote sensing S/V					
S/V for monitoring of the natural resources, ecological and cartography					
Resurs-DK1				**Resurs-P1**	**Resurs-P2**
S/V for monitoring of the emergency situations, the great oceans and water resources					
	 **Canopus-V 1**		 **Canopus-V 2**		 **Canopus-V 3 & 4**
Radiolocation S/V					
		Arcon 2-M			**Arcon 2-1**
06	07	08	09	10	11-15

Space complex
“Meteor - 3M” with spacecraft “Meteor - M”





The space complex for operative receipt of hydro-meteorological information for whether forecasting and environmental monitoring.

Main characteristics of SC “Meteor-M”

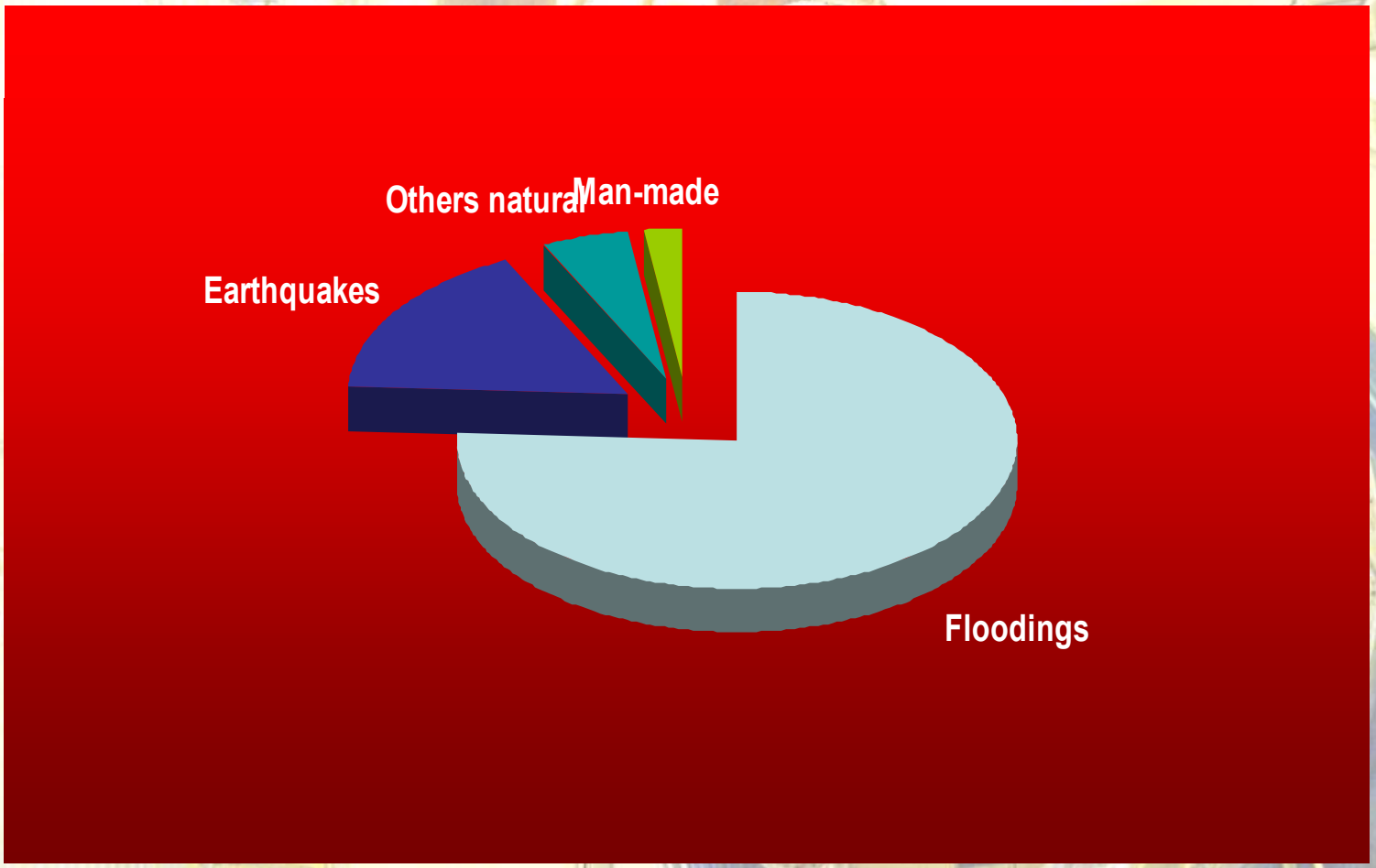
State Costumer Costumers	Roskosmos, Roshydromet, Defense Ministry of RF
Leading Developer	GUE “RESEARCH AND PRODUCTION ENTERPRISE ALL-RUSSIA SCIENTIFIC-RESEARCH INSTITUTE OF ELECTROMECHANICS with PLANT named after A.G. IOSIPHYAN”
SC orbit	SSO, altitude – 882km., inclination - 98.77°, orbital period – 101.3 min.
Designation of SC “Meteor-3M” with “Meteor-M” #1	Database organization and management for solving of the problems of operating meteorology, hydrology, agricultural meteorology, climate and environment monitoring.
Main characteristics of SC “Meteor-M” #1	Weight – 2700kg Weight of payload is not less than 1200kg Mid-day power supply capacity – 1.4kW SC orientation: three-axial, orientation accuracy – not worse than 10’, stabilization accuracy – not worse than 10-4°/sec. Active life – 5 years
Launch vehicle	Launcher “Soyuz-2 (“b” mod.)” and booster “Fregat”
Scheduled beginning of FT	2007

AREA OF APPLICATION

Provision of Russia's Federal service subdivisions of hydrometeorology and environmental monitoring, appropriate services of AF of RF, and other departments with operative space information for solution of the following primal problems :

- **analysis and weather forecast in regional and global scale**
- **analysis and forecast of the sea and ocean water area condition, including, the ice situation checking**
- **analysis and forecast of near space gelio-geophysical situation, conditions of the ionosphere and magnetic field of the Earth**
- **climate and global changes monitoring**
- **emergency situations monitoring**
- **surrounding ambience ecological monitoring**
- **biological productivity of vegetable cover monitoring**
- **investigations of correlations between physical and biophysical processes in the ocean**
- **geological investigations.**

Statistics of catastrophes in XX century



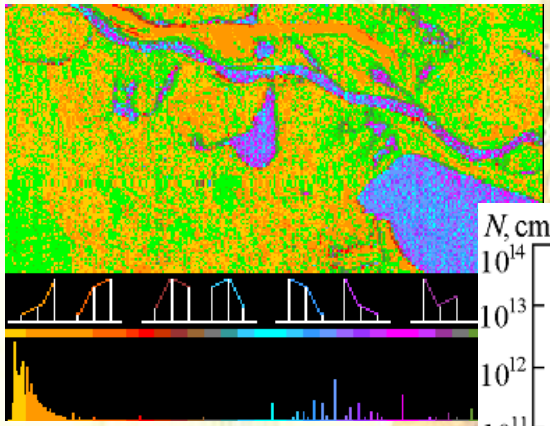
Control and protection systems of NPP

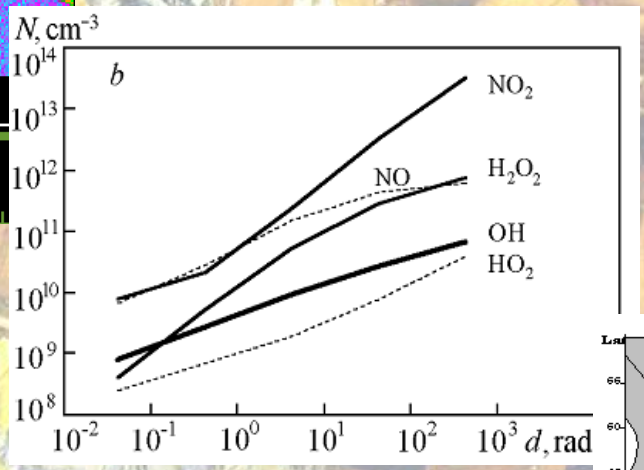
Electrical equipment of information systems, control and protection systems, reloading machines control systems of nuclear reactors of NPPs in Russia, Ukraine, Armenia, Czechia, Finland, India, Slovakia, Hungary, Bulgaria, China.

Usage of S/V "Meteor-M" for Radiological contamination monitoring

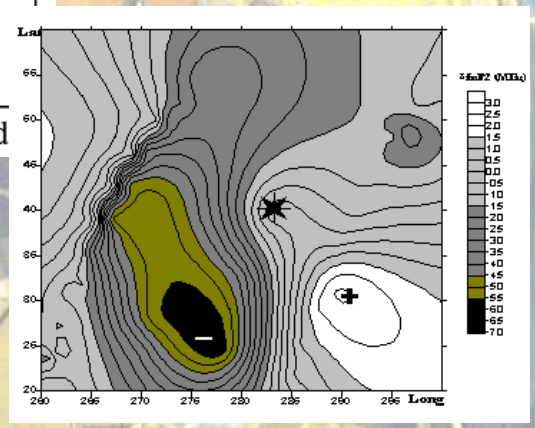
Bioindication

Results of computation of multispectral maps of Chernobyl NPP zone obtained by means of MSU-E scanner are shown here



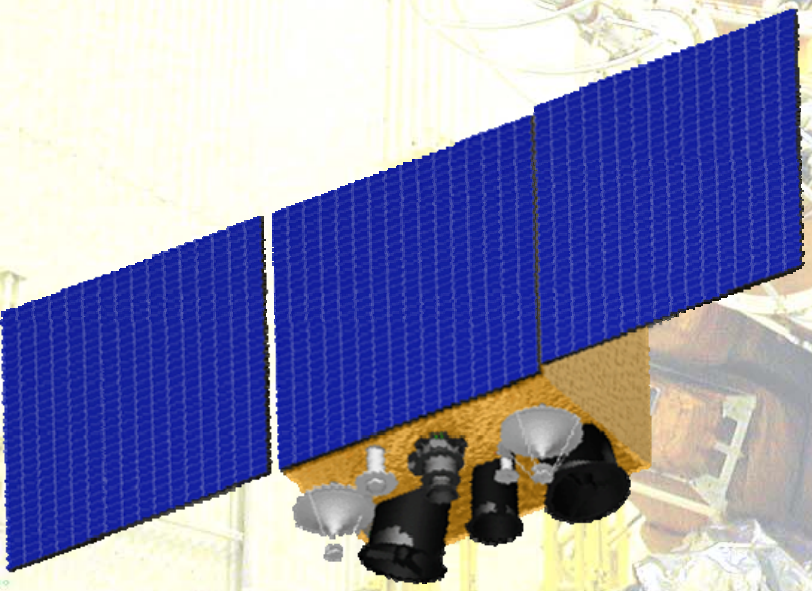


Method of small gas components of atmosphere



Ionospheric response

Spacecraft “Canopus”



Main characteristics

➢ Mass of SC	< 350 kg
➢ Operational orbit	SSO
• altitude (H)	~ 500 km
• inclination (i)	~ 98 grad.
➢ Payload:	
1. Panchromatic camera	2 pcs.
– lock-in band	2 x 20 = 40 km
– resolution (pixel projection)	2.1 m
– Stereoscopic shot	20 x 50 km
2. Multipixel camera	1 pc.
– lock-in band	48 km
– resolution (pixel projection)	10 m
3. MSU-200 (3 spectral channels)	
– lock-in band	250 km
– resolution (pixel projection)	25 m
4. Geophysical complex	
5. On-board memory	72 Gb
6. Information transmission speed	300 Mb/s
➢ Launching facilities:	
- group launch of 2 SC	RC “Rockot”
	“Dnepr”
	“Strela”
➢ Active life time	5…7 years

Spacecraft “Canopus”
Problems for solving

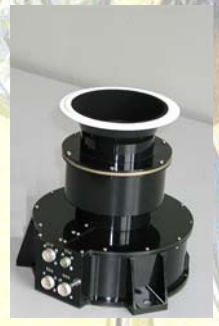
- Monitoring of technogenic and natural emergency situations including natural hydrometeorologic phenomena
- Monitoring of the radioactive pollutions
- Mapping
- Detection of seats of forest fires, large pollutant emissions in natural environment
- Registration of the abnormal physical phenomena for earthquake prediction
- Monitoring of agricultural activity, water and coastal resources
- Land tenure
- High efficient observation of assigned areas on the Earth surface

Spacecraft “Canopus”
Main purpose equipment

Panchromatic camera
(weight = 42.3 kg)

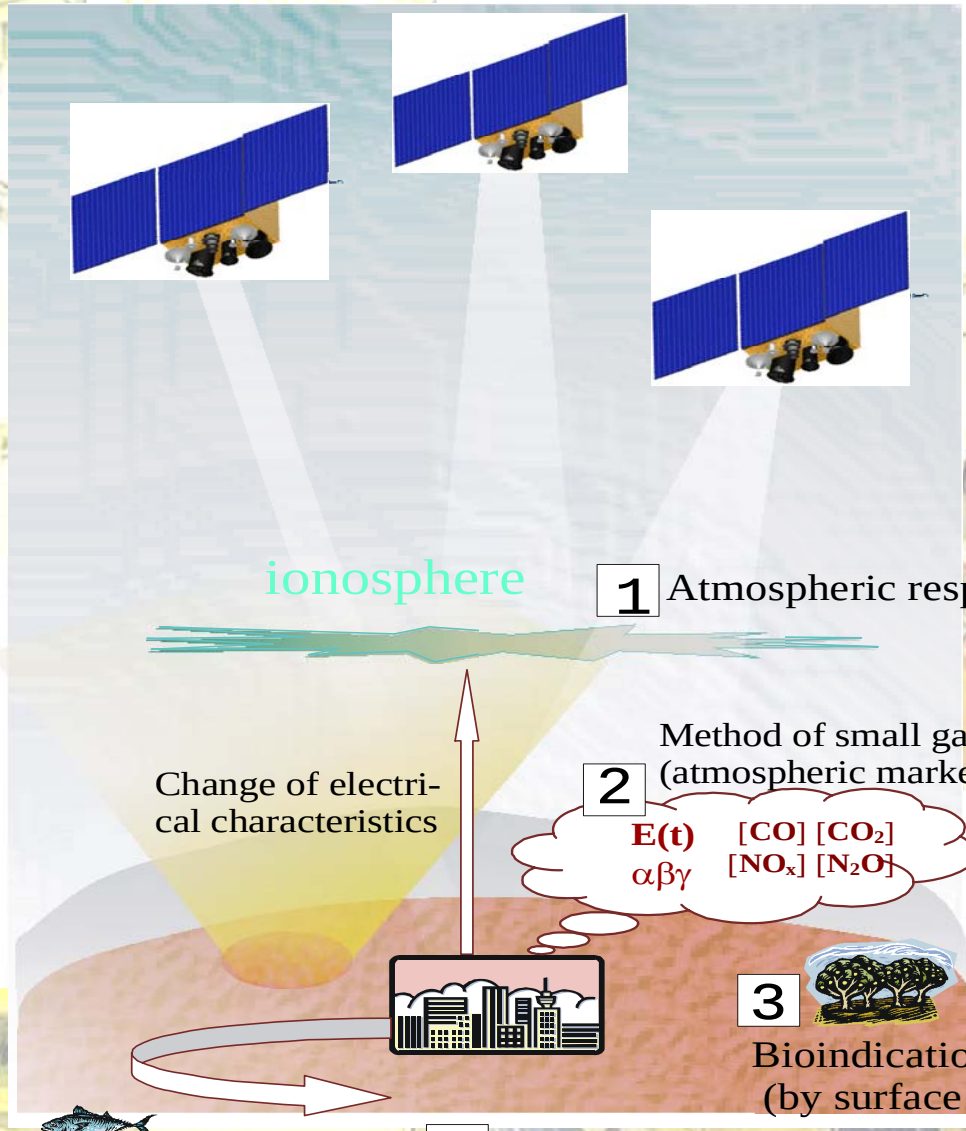
Multispectral camera (4 ranges)
(weight = 18.7 kg)

On-board information system unit
(weight = 13.3 kg)



MSU-200
(weight $<$ 5 kg)

Space Constellation



Federal space agency

Governmental Unitary Enterprise

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