



Space Geospatial Data Utilizing For Complex Diagnosis Of Earthquake Precursors

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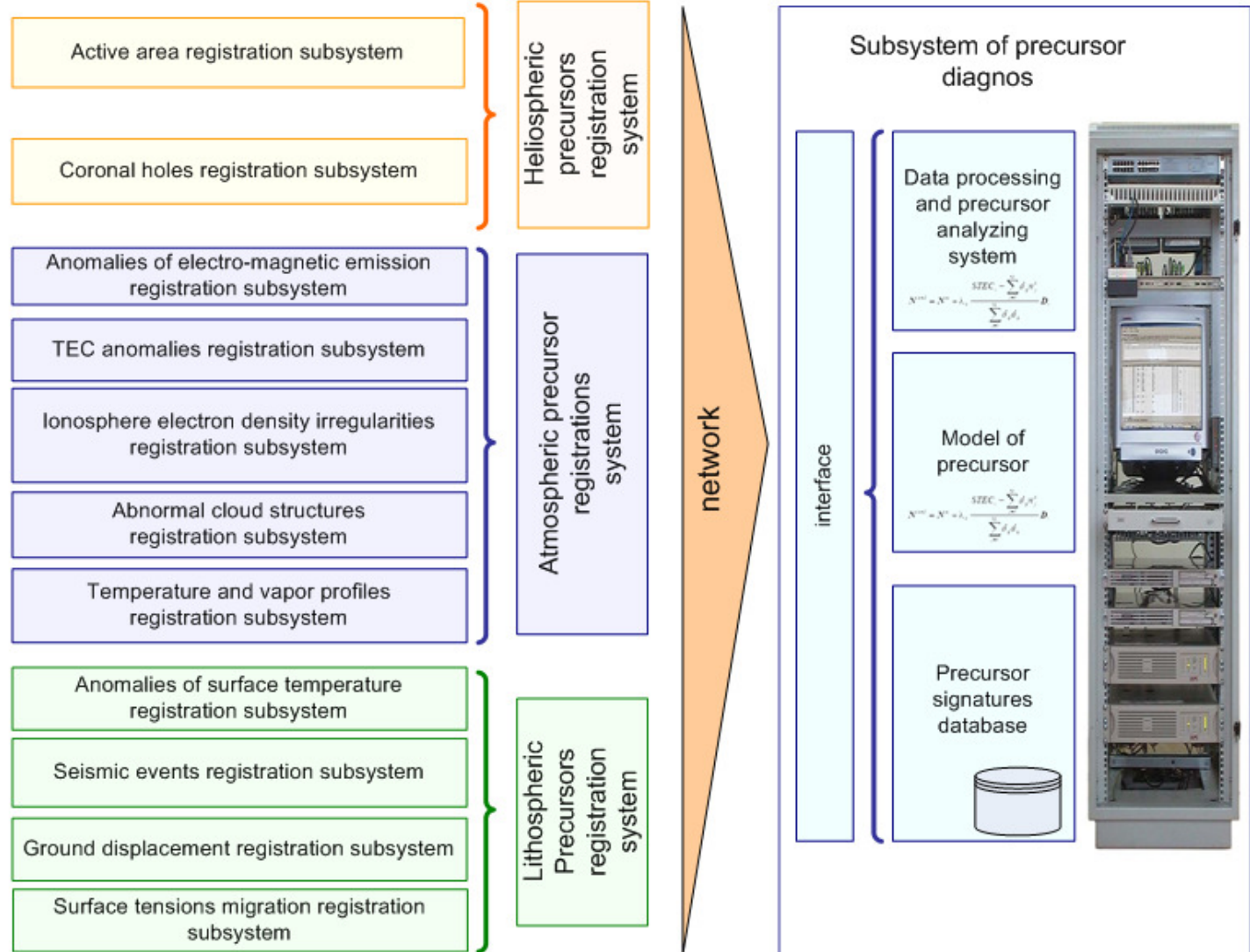
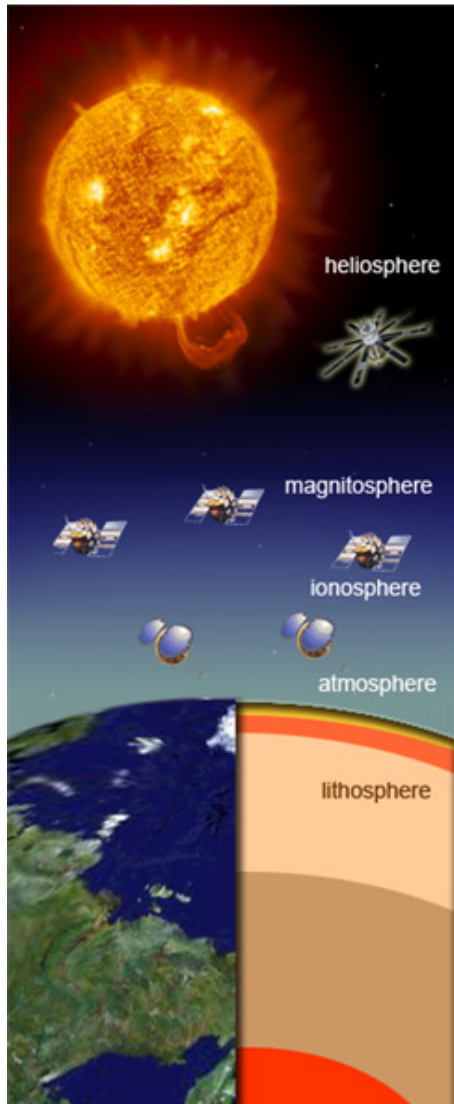
**JOINT STOCK COMPANY
«RUSSIAN SPACE SYSTEMS»**

Vienna, 2010



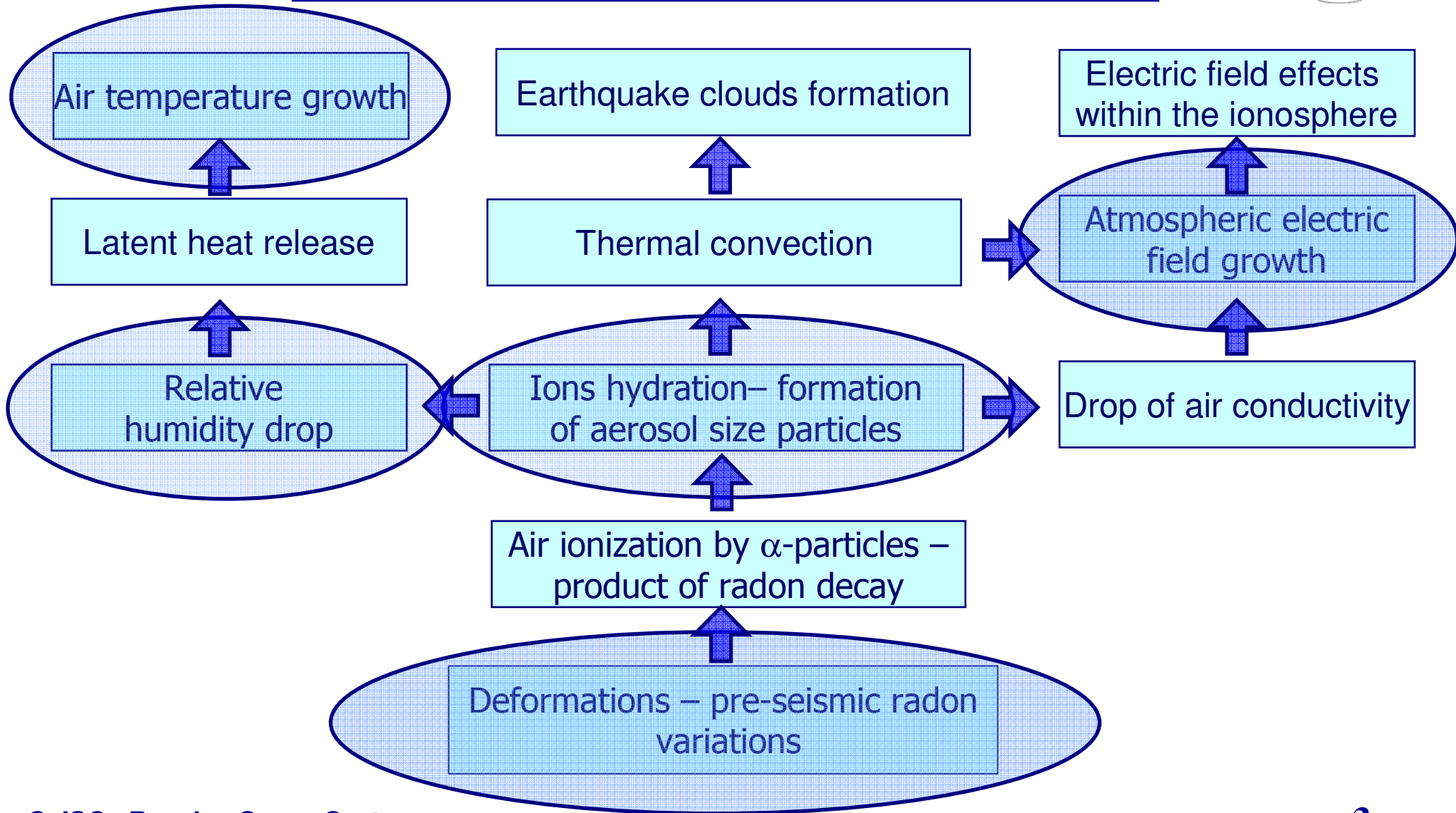


Earthquake Precursors Registration System Flowchart



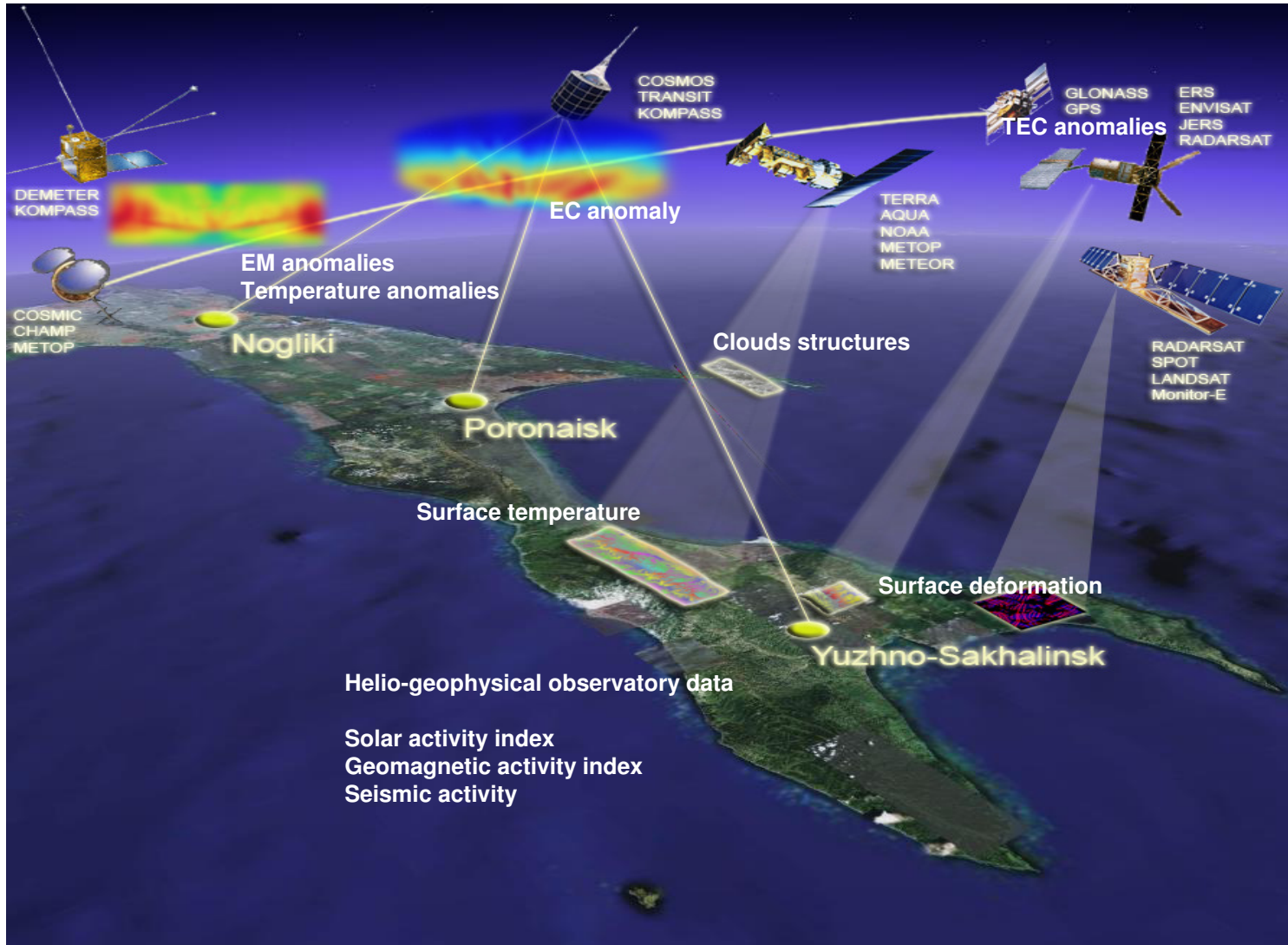


Seismic-caused
Atmospheric Disturbances Appearance Principle
(Model of Lithosphere-Atmosphere-Ionosphere Coupling)



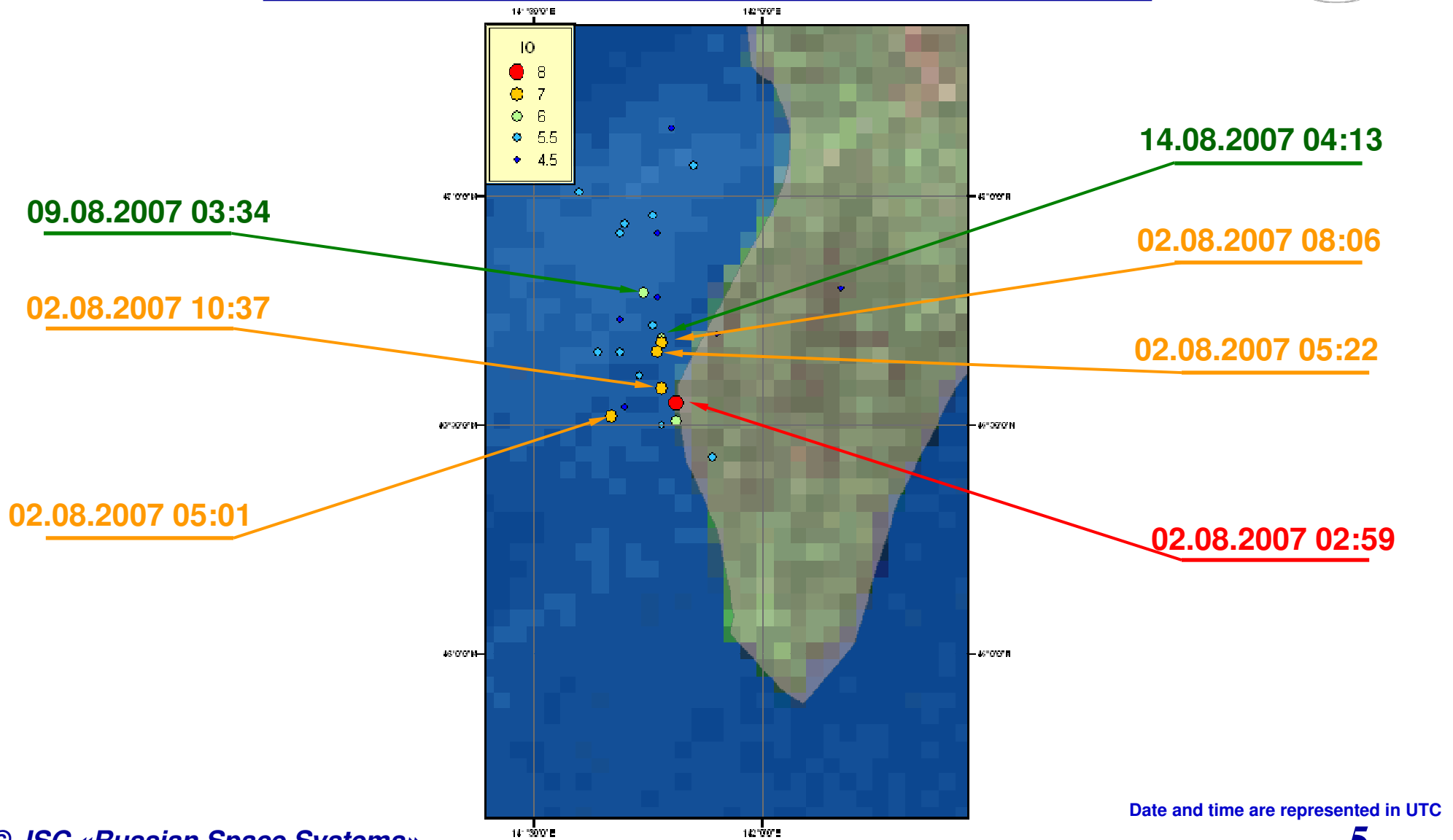


Information Support of the Earthquake Precursors Integrated Diagnose on Satellite Monitoring Base



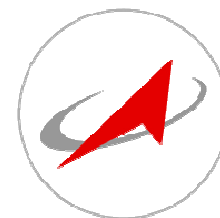


Seismic Activity in Sakhalin Island (Russia) (Geophysical Survey RAS)





Anomaly Phenomena in Different Media (21.07.2007 - 03.08.2007)

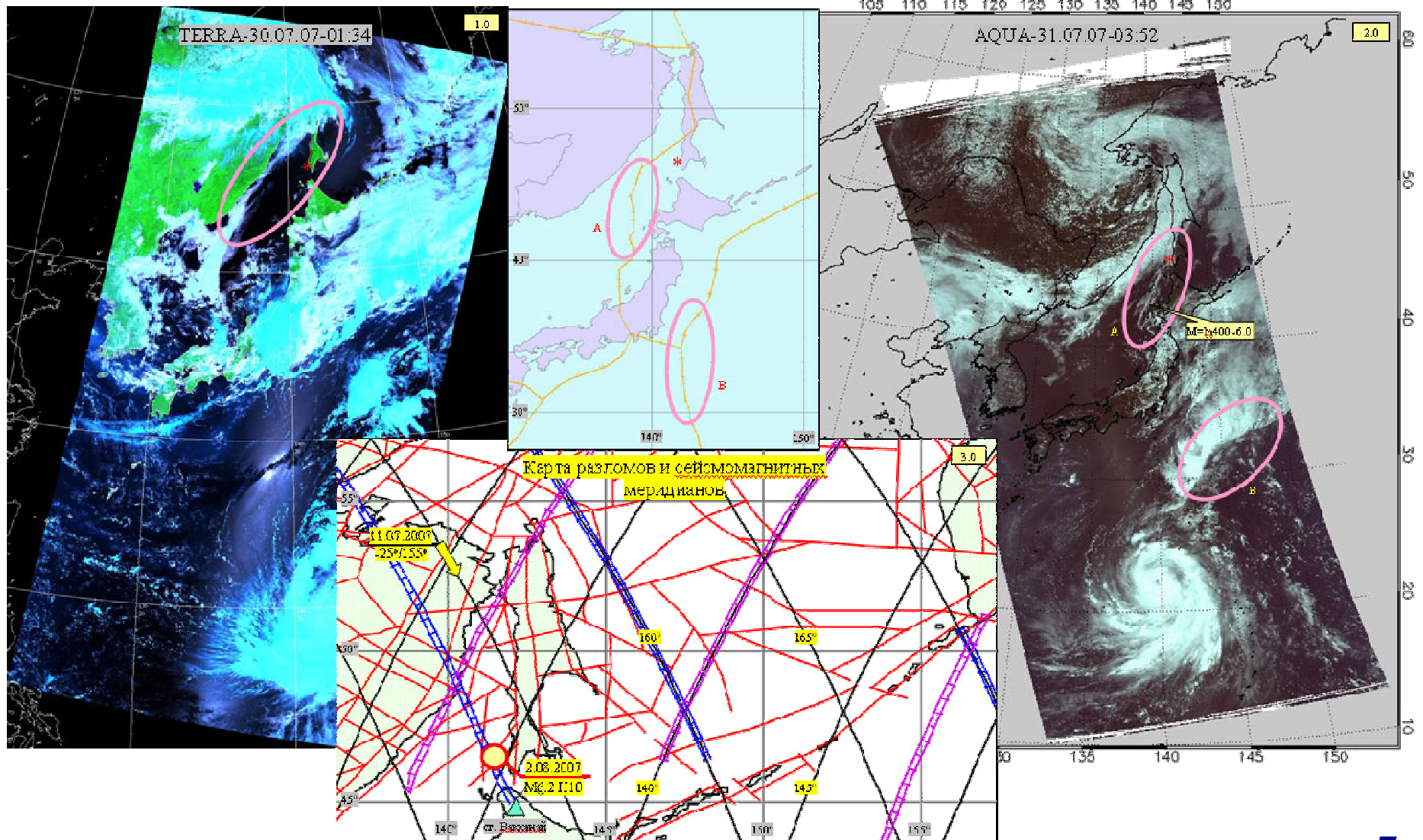


	22.07.2007	30.07.2007
Air temperature anomalies	not revealed	revealed
Air relative humidity anomalies	not revealed	revealed
Sea surface temperature anomalies	revealed	revealed
Surface temperature anomalies	revealed	revealed
Ionosphere TEC anomalies	not revealed	revealed
Ionosphere electron concentration anomalies	revealed	revealed

The research parameters variations has forerun the earthquake in 02.08.2007 02:37 UTC and epicenter located in 46.68°N, 141.77°E, IO 7-8



Anomaly Cloud Structures 30.07.2007 and 31.07.07

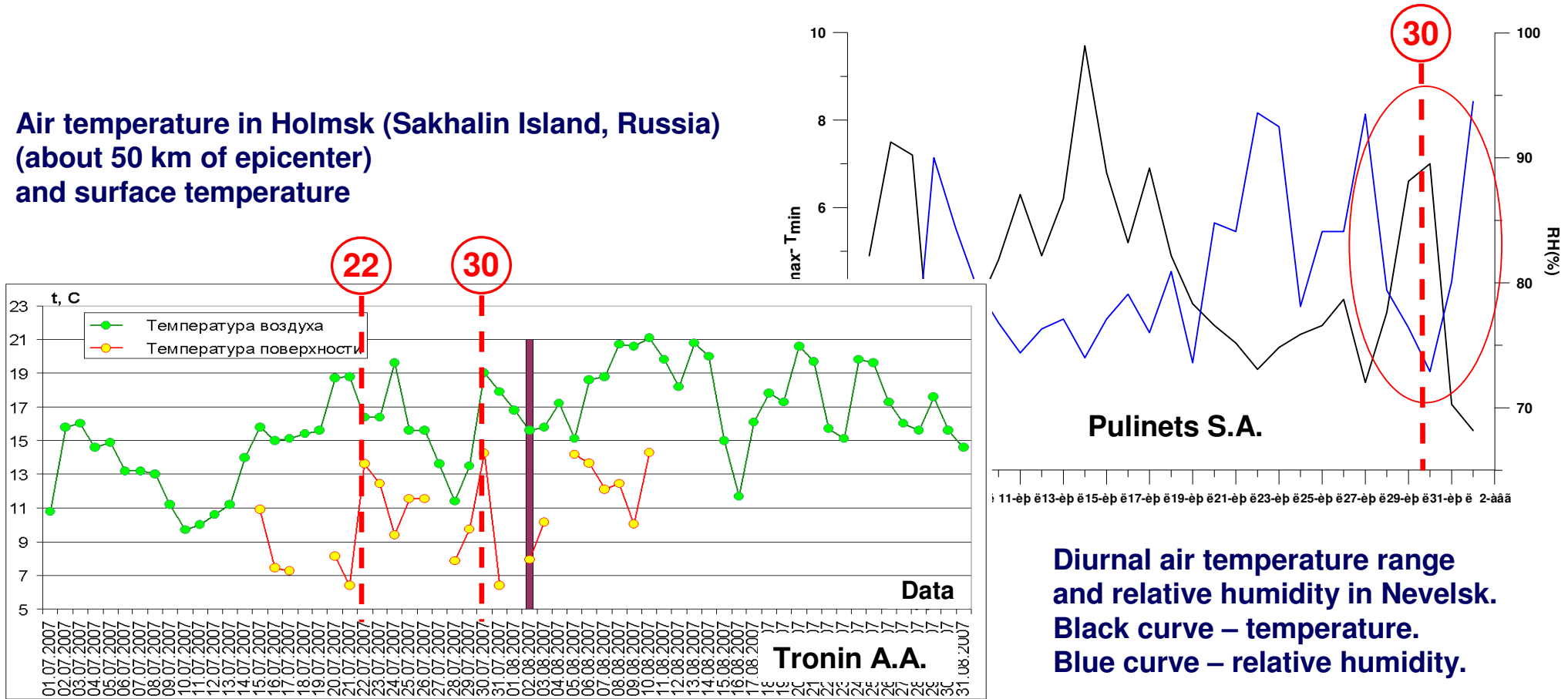




The Diurnal Air Temperature Range and Air Relative Humidity Variations

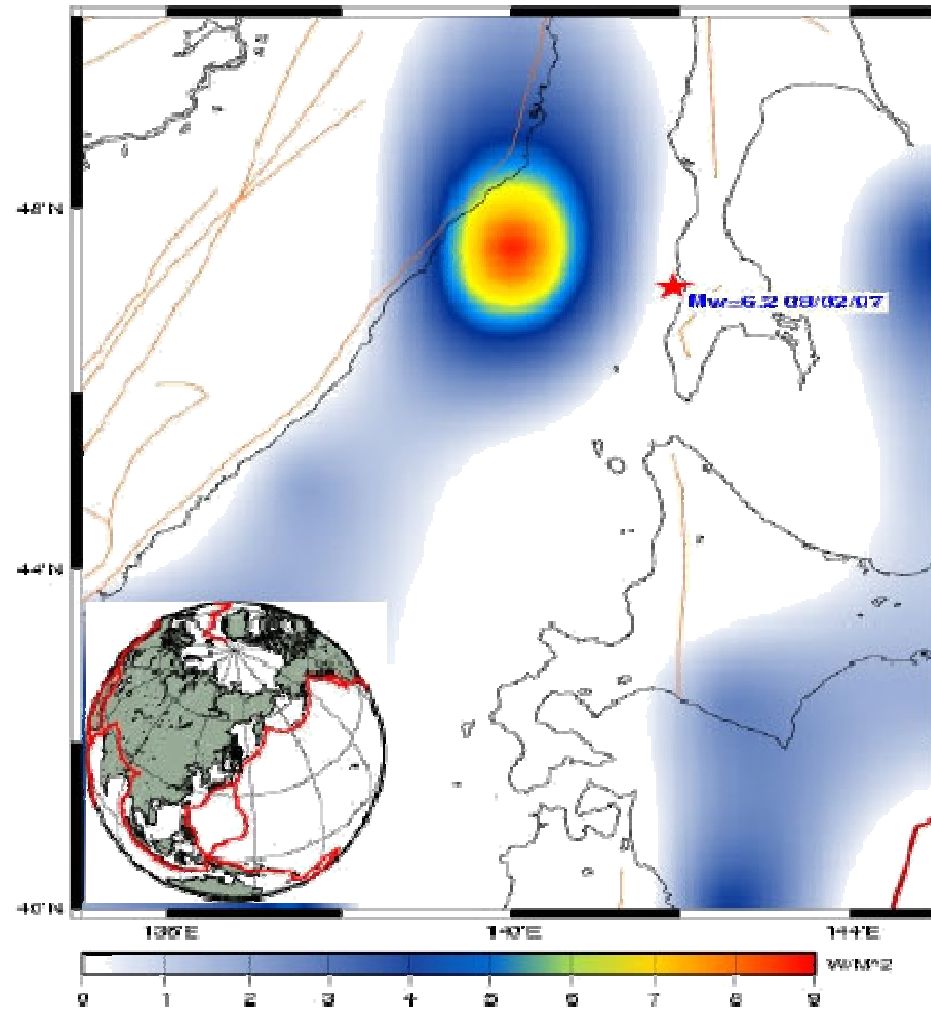


**Air temperature in Holmsk (Sakhalin Island, Russia)
(about 50 km of epicenter)
and surface temperature**





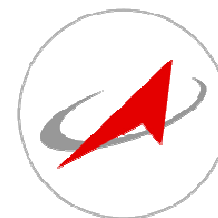
Outgoing Longwave Radiation Variations



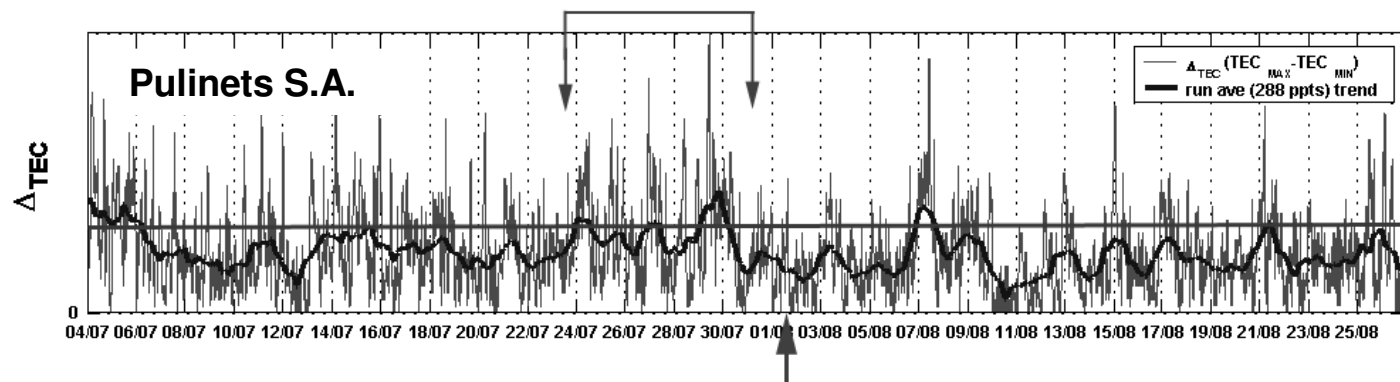
D. Ouzounov
NASA/GSFC/SSAI/GMU 9



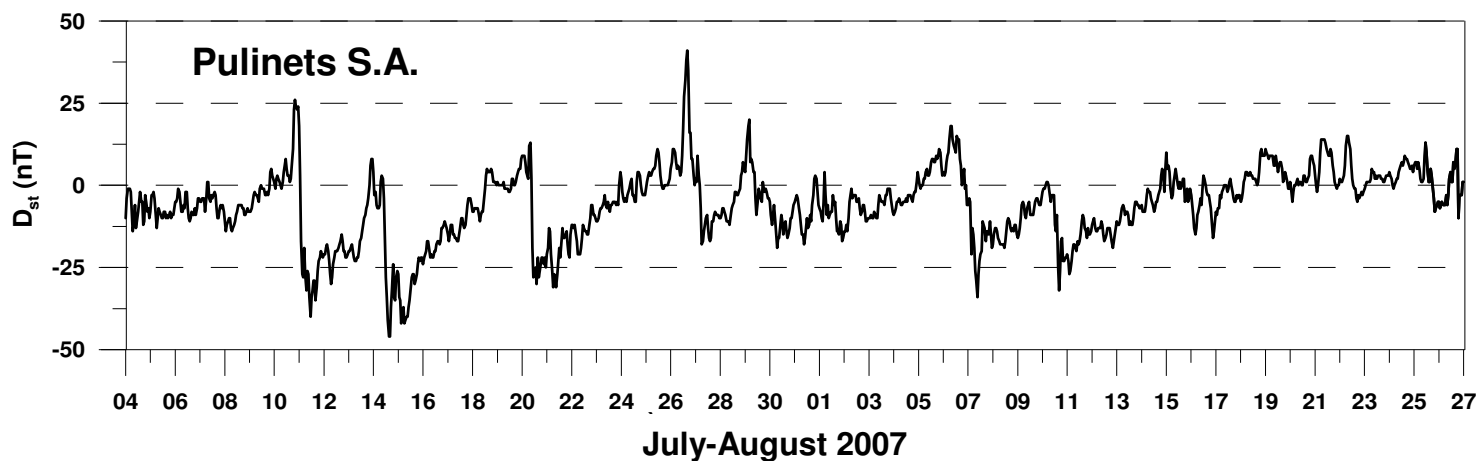
Ionosphere Total Electron Content Variations



Regional ionosphere
variability index

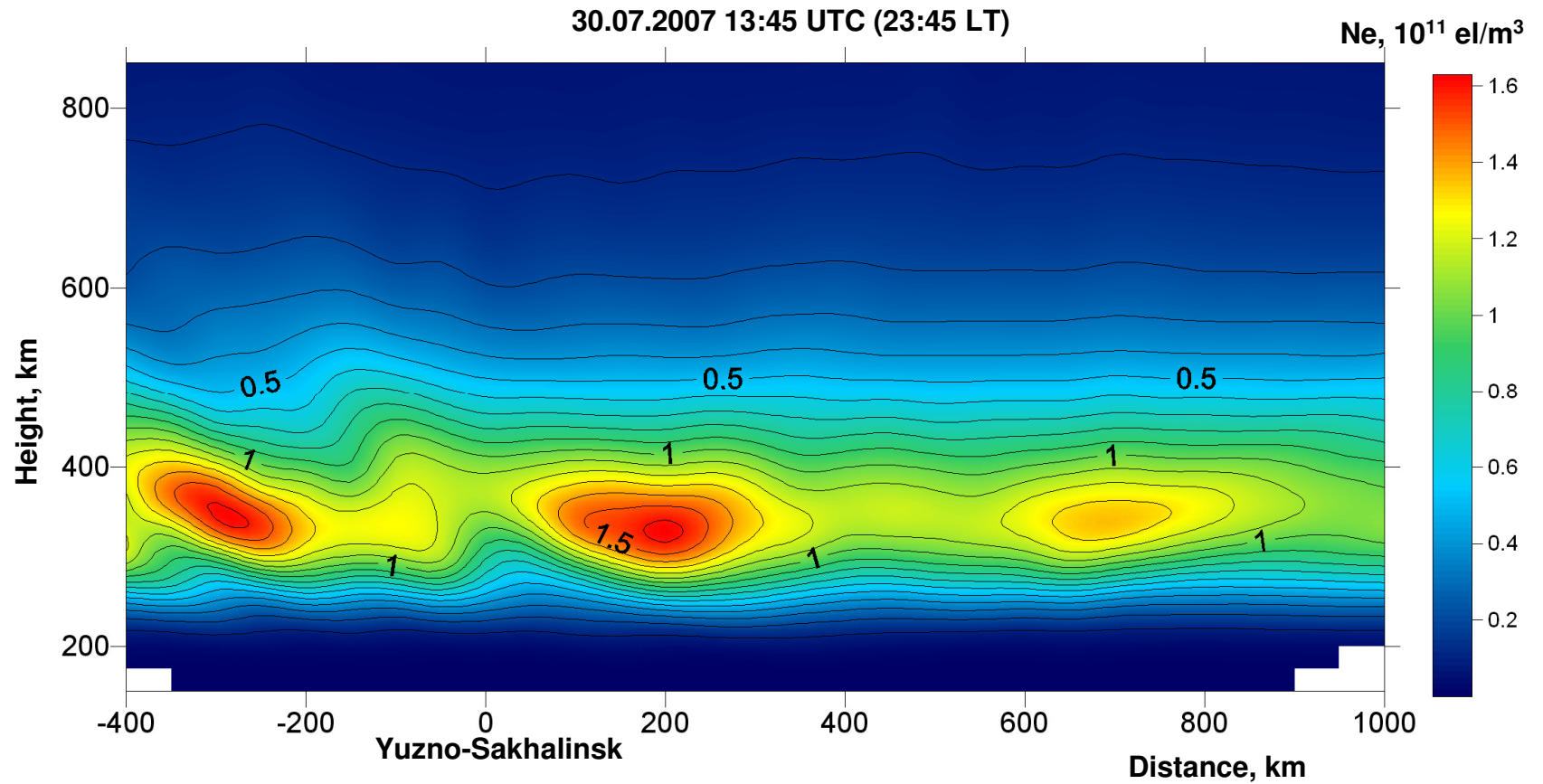


Dst index



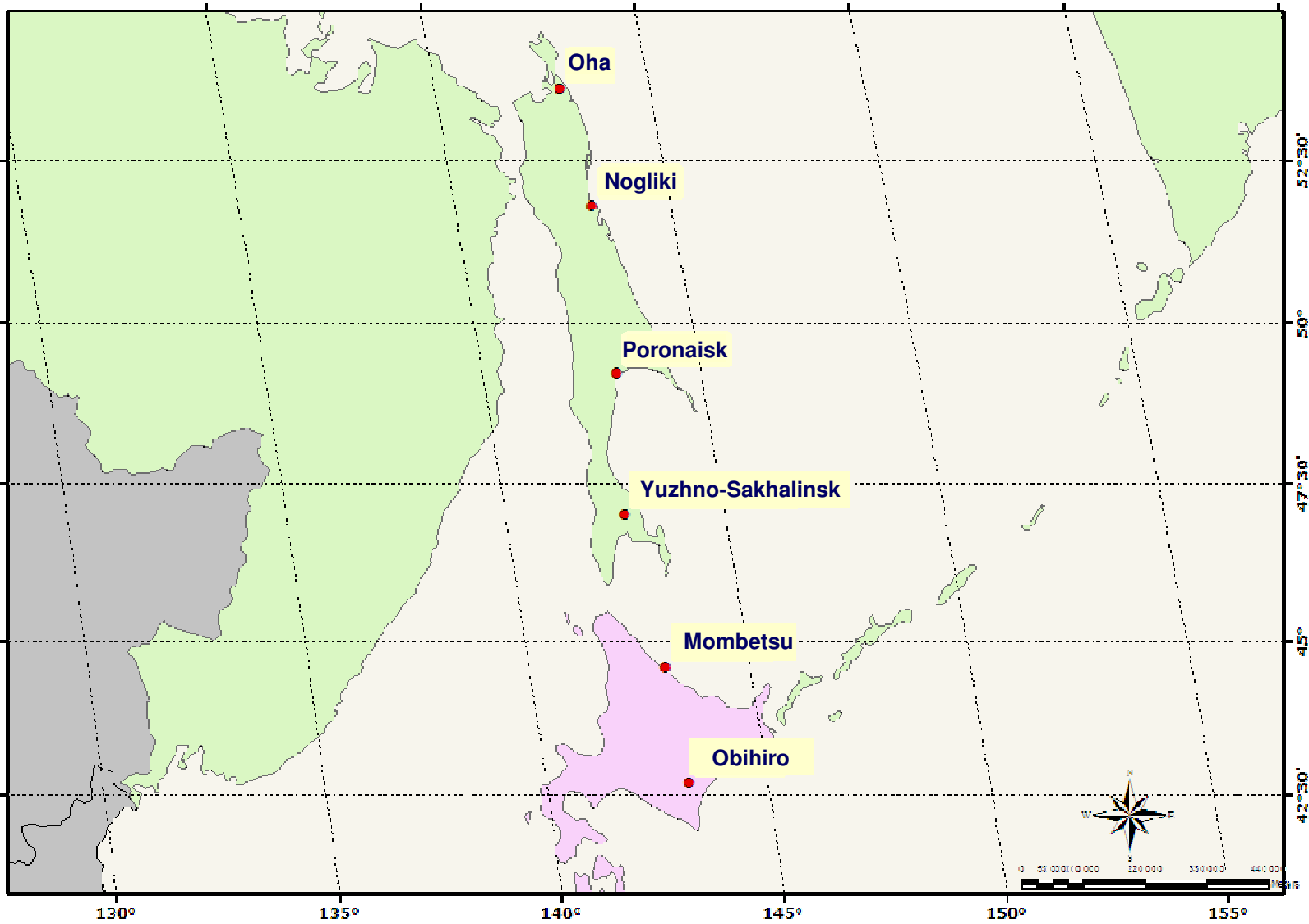


Ionosphere Electron Concentration Height Distribution
30.07.2007 13:45 UTC



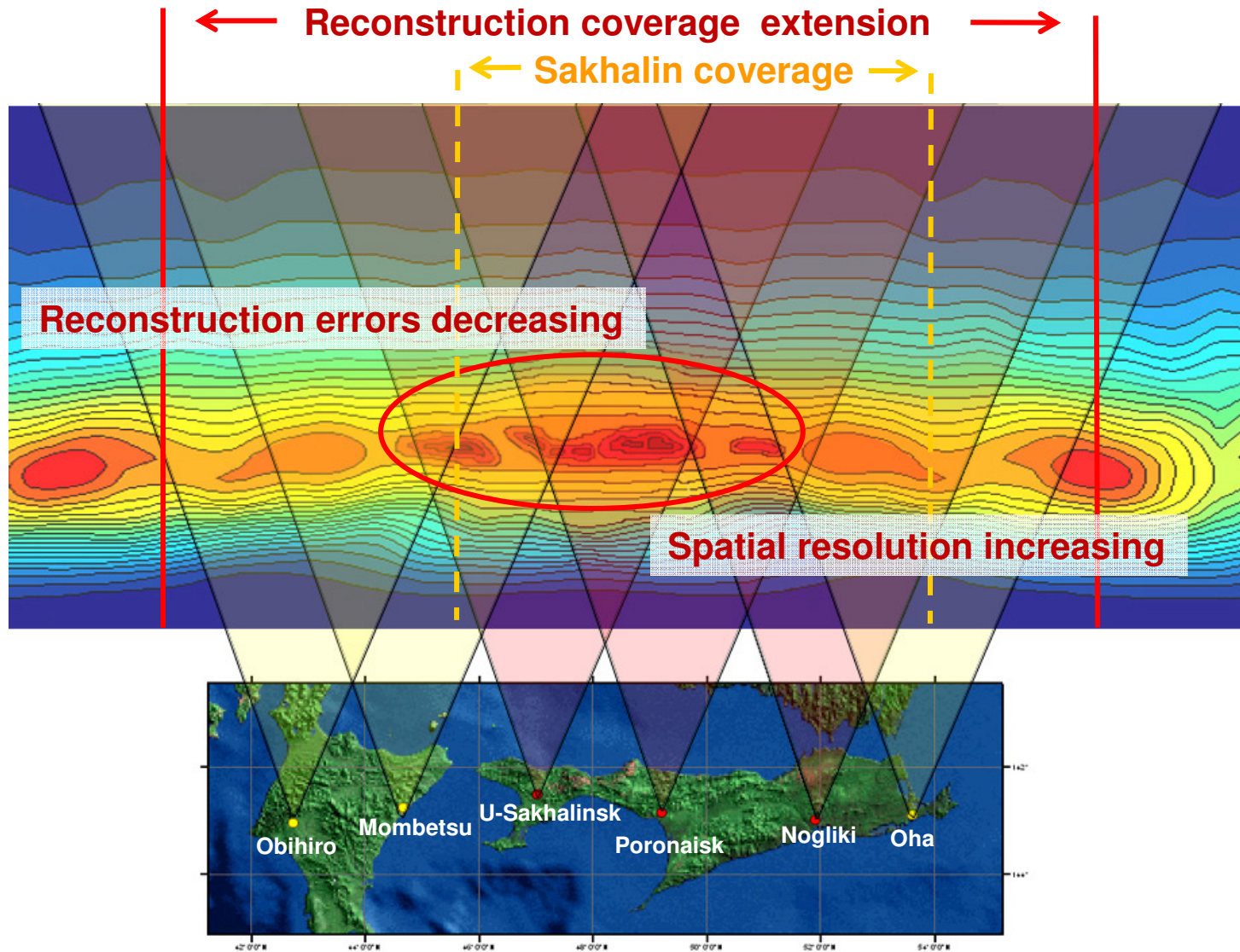


Perspectives of Data Receiving Segment



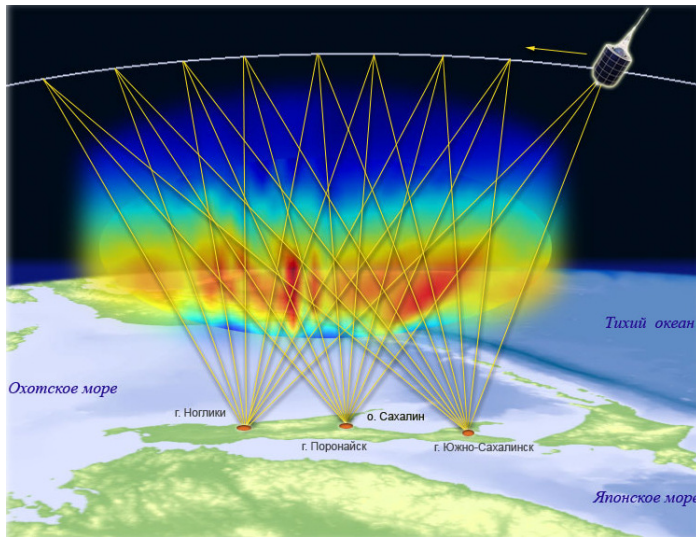


The Receiving Segment Enlargement Benefits



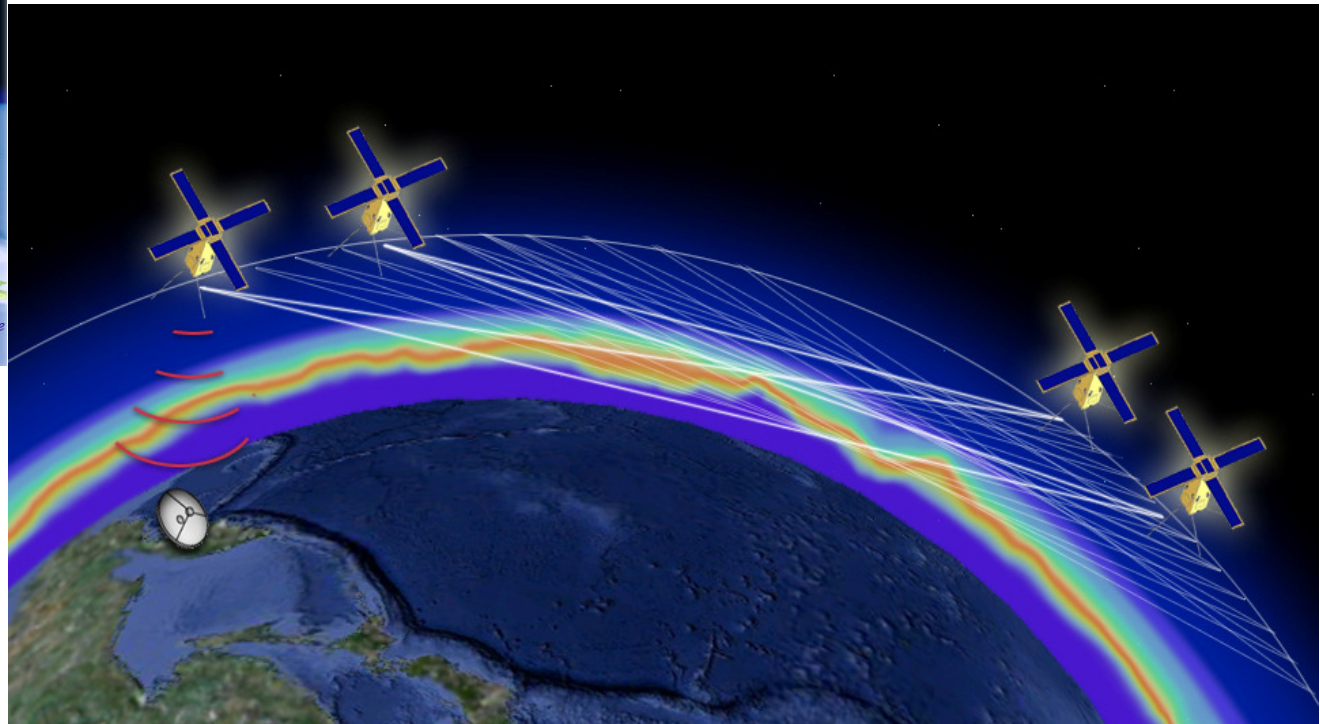


Использование наноспутников для глобального мониторинга состояния ионосферы



Traditional ionosphere tomography scheme with ground stations provides only local monitoring

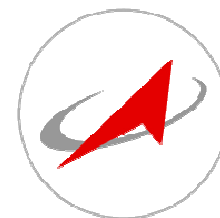
Perspective ionosphere monitoring system on the basis of nano-satellites cluster



Signals receiving segment transfer into space makes it possible to realize the global ionosphere monitoring and to completely refuse from ground tomography stations



Ionosphere monitoring small satellite prototype on the basis of TNS-0



TNS-0



TNS-0 #2



Mass: ~ 10 kg
Power: <6 W
Price: 250 000 euro

Payload: two-frequency coherent transmitter

Mass: < 1 kg (including antenna)
Power: < 2 W
Price: 20 000 euro (w/o design work)





Remote Sensing TNS-1 As A Prototype For Ionosphere Research Satellite

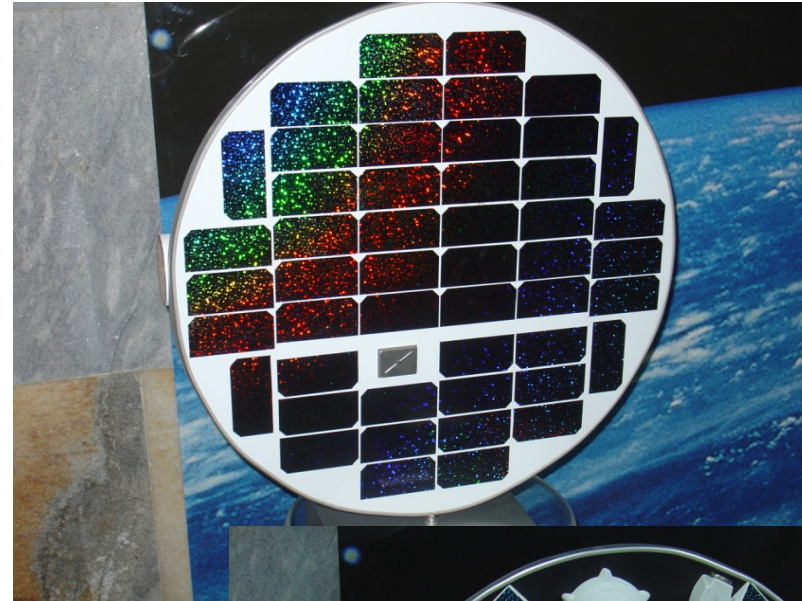


Satellite systems:

- Attitude system – rotate stabilization and active magnetic orientation
- Power supply system on the basis of GaAs-solar battery
- Control channel via Globalstar system
- GLONASS/GPS navigation system

Possible payload:

- Remote sensing equipment
- Ionosphere tomography equipment
- C-band radio-line





Conclusions



1. The major goals and objectives for the experiment are achieved;
2. The complex study of space geospatial data, experimentally measured parameters of the “Heliosphere-atmosphere-lithosphere” system and anomalies possibly corresponded to seismic activity allocation (anomalies of TEC and ionosphere electron concentration distribution, outgoing longwave radiation variations, specific clouds formation...) is performed;
3. The basic principals for making the regional prototype of the earthquake precursors monitoring automated system based on space geospatial information and technologies including the combined usage of several information sources (navigation systems, visible cameras and IR sensors) and meteorological data in the frameworks of the LAIC model are shown;
4. The importance of the Russian ionosphere tomography chain spreading to Japan territory (2 stations in Mombetsu and Obihiro) in the frameworks of the potential international collaboration is revealed;
5. The possibility of the new space geospatial data gathering systems creation on the basis of the small satellites is revealed.



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Thanks for your attention!

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