

CONCEPT FOR MONITORING OF CLIMATIC AND NATURAL PROCESSES IN SIBERIA

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Monitoring goal: to obtain real data providing long-term forecast of climatic and natural changes in Siberia and nature management risk assessment taking into account contemporary impact of natural and anthropogenic factors

Scientific and methodical objectives

1. To develop theoretical grounds for description of interdependent natural and climatic processes taking into account their hierarchy and feedbacks.
2. To substantiate locations for monitoring network stations accounting for climatic and natural peculiarities and socio-economic prospects.
3. To make a list of parameters and indicators to be measured for climatic and natural processes and to determine measurement mode.
4. To develop monitoring database format in order to mate it with the world data and to validate mathematical models.
5. To develop uniform information-measuring complexes for integrated regional studies.

Climate-regulating and environmental factors and phenomena

Factors	Main phenomena
Heliospheric	<p>Cyclic variations of solar energy fluxes (Milankovich cycles).</p> <p>Cyclic variations of solar activity (Wolf numbers).</p> <p>Variations of gravity, associated with Solar system dynamics.</p>
Geospheric	<p>Horizontal energy and mass transfer in the atmosphere and oceans, including circulation, cyclones and currents.</p> <p>Vertical energy and mass transfer in the atmosphere and oceans, including convection and turbulent exchange.</p> <p>Evolutionary and sporadic geodynamic phenomena, including volcanism and earthquakes.</p>
Biospheric	<p>Vegetation period phenomena, including changes in respiratory metabolism and radiation balance.</p> <p>Regional succession (change of biocenoses).</p> <p>Biogeochemical variations in atmosphere and oceans.</p>
Anthropogenic	<p>Industrial aerosol and gaseous exhausts, including greenhouse gases.</p> <p>Landscape, hydrological and orographic consequences of industrial activity.</p>
Cosmogeneous	<p>Variations of cosmic rays fluxes, including modulation by solar wind.</p> <p>Variations of meteor showers, including collisions with asteroids.</p>

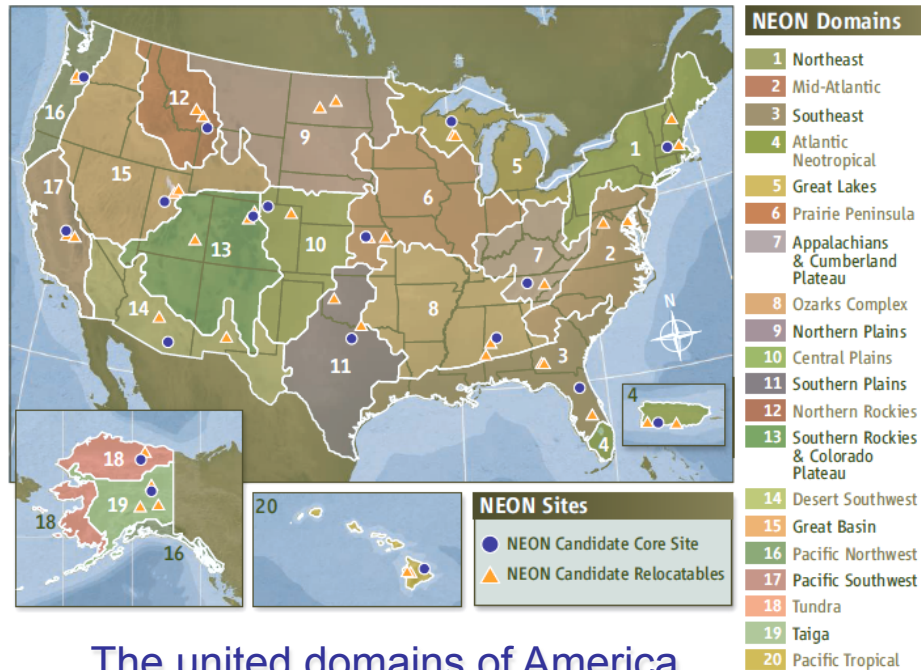
A network planned for monitoring of climatic and natural processes in Siberia



Reference monitoring stations

1. Tomsk (city)
2. Tomsk (Vasyuganie)
3. Ulan-Ude (Istomino)
4. Chita (Arakhley)
5. Krasnoyarsk (Zotino)
6. Barnaul (Aktru)
7. Novosibirsk (Chany)
8. Kyzyl (Dolinnaya)
9. Yakutsk (Spasskaya Pad')
10. Irkutsk (Mondy)
11. Khaty-Mansiisk (Shapsha)
12. Nadym (Polyarnaya)

The National Ecological Observatory Network (NEON)



Niwot Ridge is one of 20 "wildlands" spots slated to be part of NEON.

The united domains of America. Scientists divided the United States into 20 ecological domains. Three sites within each domain will be instrumented.

E.Pennisi. A Groundbreaking Observatory To Monitor the Environment. **SCIENCE**, 2010, vol.328, p. 418-420.

Block diagram of a standard observation site incorporated into regional monitoring network

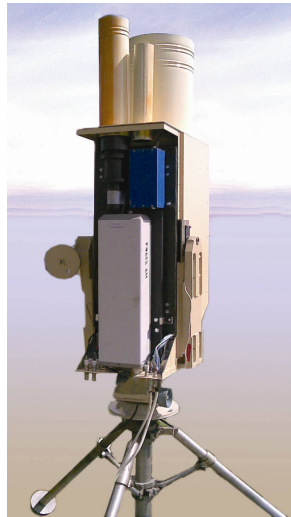


Instrumentation for monitoring

1. Foreign and Russian certified devices.
2. Import-substituting certified devices.
3. Designing and certification of new instruments during project implementation.



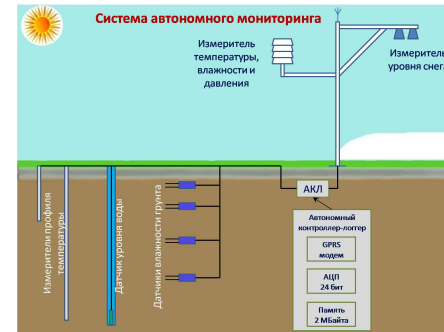
Automated meteorological complex (IMCES SB RAS)
Monitoring of meteorological quantities fluctuations in surface atmospheric layer



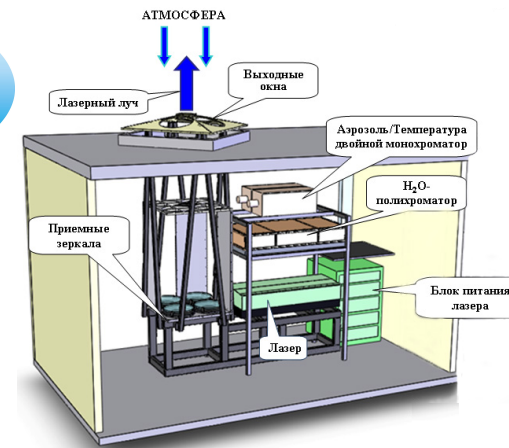
Aerosol lidar (IAO SB RAS) Monitoring of altitude profile of troposphere aerosol



Solar spectrophotometer (IAO SB RAS) Monitoring of atmosphere optical thickness



Soil thermal hydrometer (IMSEC SB RAS) Monitoring of subsurface temperature and soil humidity profiles



Raman lidar (IMCES SB RAS, IAO SB RAS) Monitoring of altitude profiles of trace gases in the atmosphere

Information and technological provision of monitoring

Three-level information and technological system is provided that includes :

1. **Local servers** intended for primary acquisition and archiving data from ground observation stations with subsequent analysis of *regional* climatic and natural changes.
2. **Network portal (on the base of IMCES SB RAS)** intended for acquisition and processing data from ground observation network with subsequent analysis of *interregional* climatic and natural changes.
3. **Central portal** intended for complex analysis of data from ground observation network, remote sensing (from space) data and data of monitoring of socio-economic processes in Siberia with subsequent *decision making*.

Problems to be solved

1. Stepwise equipment of monitoring stations: Tomsk (Vasyuganie), Ulan-Ude (Istomino), Krasnoyarsk (Zotino), Chita (Arakhley), etc.
2. Unification of instrumentation and measuring mode.
3. Unification of observation results' format for corporate portal.
4. Incorporation of reference monitoring network into Russian and international monitoring networks.
5. Financial provision of expenditures associated with creation and exploitation of the Center and reference monitoring network.

Thanks for your
attention!