

A new book is planned for 2010:
**“Environmental Changes in Siberia:
Regional Changes and their Global
Consequences”**

Introduction: *Gutman, Groisman, Gordov*

- **Climate change:** *Groisman*
- **Water cycle changes:** *A. Shiklomanov*
- **Changes in the cryosphere:** *V. Romanovsky,*
- **Terrestrial ecosystems and their changes:** *Shvidenko ,*
- **Human dimensions of land cover and land use changes:**
Bergen
- **Atmospheric pollution:** *Baklanov*
- **Development of Information systems:** *Gordov*

Integration and Synthesis: *Lead authors*

- **Chapter 2. Climate change**
- **Observational evidence of contemporary climatic changes**
 - *Temperature and Arctic sea ice changes*
 - *Changes in precipitation and snow cover*
 - *Changes in the seasonal cycle that impact ecosystems and/or human activity*
 - growing season duration and degree-days for different species
 - heating season duration and degree-days, frost-free season
 - dates of onset/disappearance of stable and unstable snow cover
 - *Changes in extreme events frequency and intensity*
 - winter thaws, inter-daily temperature variability
 - unusually hot/cold days/nights , prolonged hot/cold spells
 - very heavy rain events and wet spells, “flood” weather
 - prolonged no-rain periods, “fire” weather, droughts
 - Rain-on-snow events
- **Projected changes of Siberian climate: *What global and regional climate models say***
- ***Ecosystems’ feedbacks: Why land surface – atmosphere interactions are of special importance for climate projections in Siberia => to Ch. 5***
- **Unresolved issues**

Chapter 3. Hydrological changes: historical analysis, contemporary status and future projections:

- **Change in river flux to the Arctic Ocean**
 - Importance for global climate system. , Monitoring, Increase of discharge to the ocean; Water management impact, Change in seasonality.
- **Changes in river runoff**
 - Hydrological reference monitoring network;, Spatial and Temporal runoff variability; Changes in maximum and minimum runoff.
- **Surface and groundwater hydrology**
 - Distribution/dynamics of lakes and wetlands
 - Observed changes in groundwater and links to wetlands
- **Changes in water temperature and ice regime**
 - Lakes and Reservoirs, Rivers, Energy flux to the ocean
- **Water use**
 - Reservoirs, Irrigation, Other water management, Water availability, Future projections
- **Water quality?**
- **Future projections;**
 - GCM's and RCM's projections, Hydrological models
 - Other estimates., Intercomparison of results

Chapter 4. Changes in the cryosphere

- Permafrost
- Snow cover
- Glaciers

(outline to be prepared)

Chapter 5. Terrestrial Ecosystems and their Change

- **Introduction: Siberian Ecosystems at Edge of the Third Millennium**
 - overall introductory description
 - major features: evolution under the cold environment; zoning; short biogeography;
 - terrestrial ecosystems; major land cover types (forest formations, wetlands, natural grass- and shrublands); problems of biodiversity, productivity, sustainability and vulnerability
 - ongoing and expected drivers of ecosystems change: climate change, dynamics of permafrost and hydrological regimes, anthropogenic impacts
 - major information sources and uncertainties
- **Current climate – ecosystems interactions: tendencies and changes**
 - major indicators of vitality and productivity (live biomass, NPP etc) of major vegetation types (forests, tundra communities, wetlands, grasslands and shrublands) and their links to climate; dynamics for recent decades
 - changes in phenology
 - dynamics of extent and productivity of forests in 1961-2008; changes in allometric interconnections of trees;
 - changes in succession regularities
 - impact of recent/current climate on stability, vulnerability and productivity of ecosystems

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Chapter 5. Terrestrial Ecosystems and their Change, cont.

- **Changes of disturbance regimes and succession dynamics**

- vegetation fire: extent, frequency, severity
- insect and diseases outbreaks
- impacts of industries/ oil & gas extraction/ air pollution/ soil contamination on ecosystems
- changes of anthropogenic impacts on forests (logging), agriculture, land cover – land use change; human appropriation of NPP
- impacts of disturbances on succession regularities and land use – land cover change
- processes of degradation and green desertification

- **Changes of the resource and biospheric role of Siberian ecosystems**

- methodological aspects of assessment of the biospheric role: biodiversity and major biogeochemical cycles
- current and future terrestrial carbon and nitrogen budgets of Siberia - synthesis
- expected impacts of climate change on biogeography of ecosystems (with a special emphasis to forest) .
- prediction of future state and functioning of Siberian taiga forests (future climate + forest management) – model LANDIS-II

- **Adaptation and mitigation strategies –**

- needs/ content of a new paradigm of human-nature interactions in high latitudes
- Siberian ecosystems and Kyoto/ post Kyoto developments
- needs of anticipatory strategies of adaptation of Siberian landscapes to, and mitigation of, negative consequences of climate change

Chapter 6. Human Dimensions of Environmental Change

- **Rationale.** Many environmental changes are ultimately driven by human activities decision-making, whether as part of gradual historical changes, major shifts in socio-economic paradigms, changes in particular institutions and land management, or local human adaptation strategies. In Siberia, all of these drivers have been and continue to be part of shaping the landscape (biosphere, hydrosphere, atmosphere). Because studies have demonstrated that such changes leave an imprint on the land observable from space, it is important to understand what the human dimensions of environmental change have been in Siberia, especially starting in the past 20th century and continuing to the present.
- **Historical context**
 - Pre-20th century,
 - changes in land and resource management that accompanied the rise of communism
 - changes associated with the dissolution of the FSU, and
 - socio-economics, demographics, institutions and pressures facing today's Siberian Landscapes. [
- **Feedbacks of land use changes:**
 - adaptations to the permafrost thaw;
 - adaptations of local and indigenous populations to environmental change now and in the past.
- **How these human drive patterns** that a now observable via satellite remote sensing and capture in models, have had or are likely to have **influence on patterns of land cover and processes in the ecosystems.**

Chapter 7. Atmospheric pollution

- **Peculiarities of Siberian environmental protection problems:** risk assessment, and tendencies in environmental modeling in Siberia,
- **Concept of environmental modeling:** Statement of the problem,
- **Environmental models** general aspects of atmospheric pollution modeling,
 - ,physical content of typical environmental models,
 - ,interaction between air quality modeling and health risk assessment,
 - complex environmental risk assessment and vulnerability evaluation,
 - climate change and air quality modeling,
- **Environment and climate interactions**
 - analysis of dynamic systems evolution for prognosis and design,
 - construction of informative basis systems and prognostic scenarios
 - organization for environmental studies, deterministic and deterministic-stochastic (probabilistic) scenarios, analysis of scenario ensembles,
- **Applied environmental problems in Siberian region**
 - identification areas of increased environmental risks, climatic centers of activity,,
 - territorial risk assessment with AEROSIBNET, applications of forward and inverse techniques for risk assessment,
 - assessment of influence of the Boguchan reservoir and hydropower plant on the ambient atmosphere, emission source systems, etc.

Chapter 8. Development of Information Systems (Development of Information-Computational Infrastructure)

- Earth and Space Science Informatics for regional studies
- GEOVANNI information system for the NEESPI domain
- Web system for regional climatic and meteorological datasets processing and visualization
- The SIB-ESS-Cluster and Support NEESPI with Data Services
- Russian baseline datasets for Northern Eurasia climate studies
- New hybrid Land Cover Dataset for Russia

Final Section

- **Integration and Synthesis**

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FOR MORE INFORMATION SEE THE NEESPI WEB SITE:

<http://neespi.org>



Side Note:
*“NEESPI” is pronounced
approximately like the
Russian phrase for
“Don’t sleep”*

Northern Eurasia Earth Science Partnership Initiative