



# Northern Eurasia Earth Science Partnership Initiative

## *Summary of the NEESPI Program, Progress and Plans*

Don Deering  
NASA-NEESPI Project Manager  
NASA GSFC

LCLUC Program Science Team Meeting  
January 12, 2005





# Outline of the NEESPI Summary



- Overview of rationale for the Northern Eurasia Earth Science Partnership Initiative (NEESPI)
- Brief history of NEESPI development progress to date
- **Cursory overview of the Science Plan** (see the NEESPI Web site for complete Science Plan and Executive Overview documents)
- **Recent activities toward “internationalizing” the NEESPI**





# Major Regional Initiatives With LCLUC Elements

*(from Garik Gutman's LCLUC Mtg Presentation)*



- NACP: North American Carbon Project
- LBA: Regional Field Campaign in Amazon
- **NEESPI: Northern Eurasia Earth Science Partnership Initiative**
- CARPE: Central African Regional Project for Environment (CARP) in Congo Basin in Partnership with US AID





# What is the NEESPI?



European Commission/JRC [www.jrc.ec.europa.eu](http://www.jrc.ec.europa.eu)



The **N**orthern **E**urasia **E**arth **S**cience **P**artnership **I**nitiative, or NEESPI is

- A currently *active* multidisciplinary program of research focused on critical Earth system science issues in Northern Eurasia.
- it is an *evolving integrated, regional* program of internationally-supported Earth systems science research,
- which has as its foci scientific issues in northern Eurasia that are currently relevant to regional and Global scientific and decision-making communities.





# What is the NEESPI?



## ... from a Pragmatic Perspective

- An instrument for coordinating with other countries and multiple government agencies on Northern Eurasian science topics of mutual interest - and defining the roles where each partnering organization can contribute effectively
- A tool for defining and developing a prioritized science planning strategy for optimizing allocation of scientific resources for the study of this enormous complex region of global importance
- A mechanism for integrating disparate Earth science investigations from many countries and agencies that are already working in the *region* of Northern Eurasia
- An opportunity to uniquely draw together knowledgeable scientists and develop mechanisms for obtaining and sharing sometimes difficult-to-obtain data and results about this large landmass and conduct critically important, unbiased Earth systems science





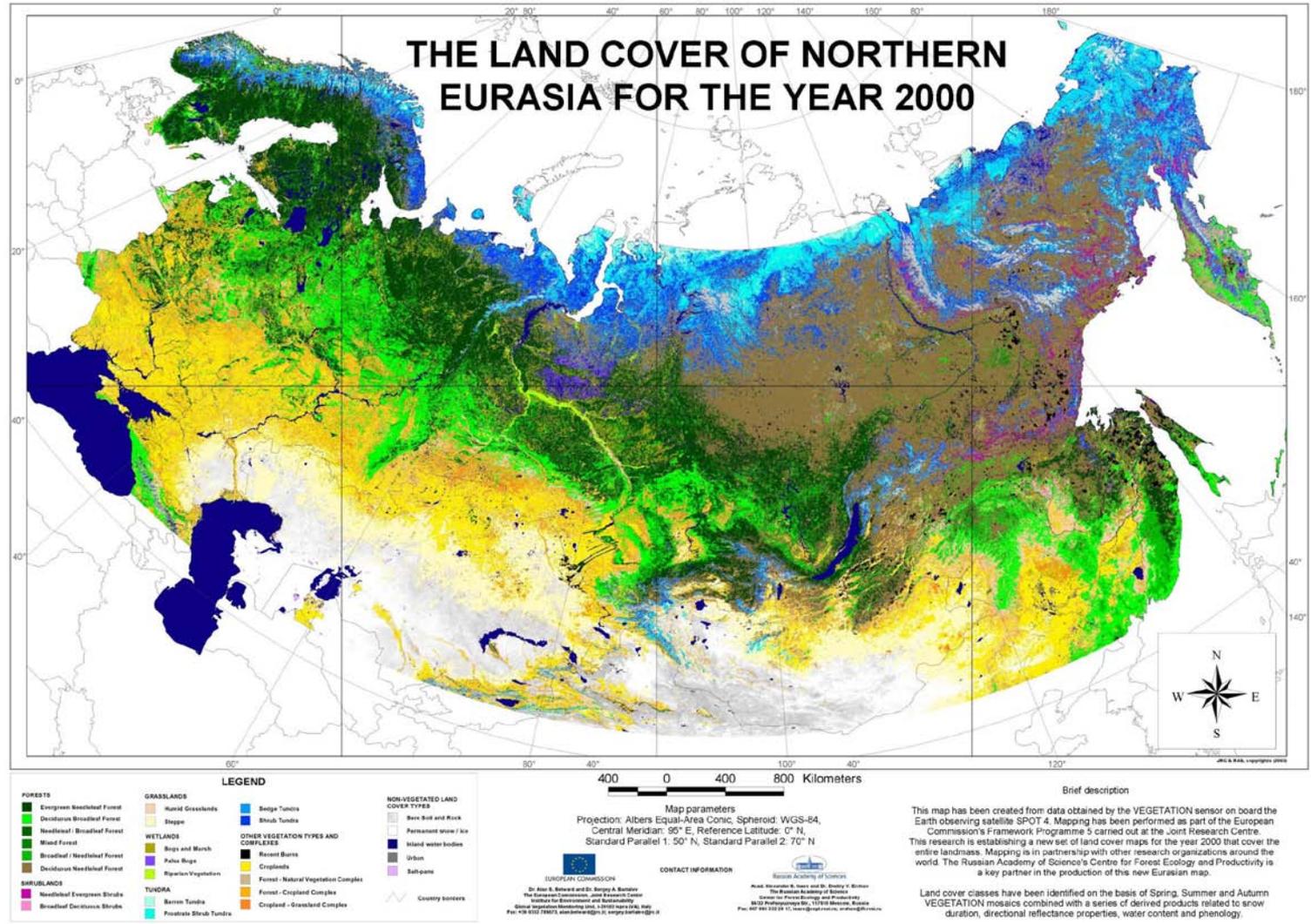
# What is the NEESPI Study Area ?



**NEESPI Study Area includes:**

**Former Soviet Union, Northern China and Mongolia, Scandinavia & Eastern Europe**

*Map Courtesy of European Commission, JRC*





# Why Should We Care About Northern Eurasia ?



## Unique features of Northern Eurasia:

- **The world's largest cold region.**
  - 2/3 of global permafrost =10M sq.km.
- **More than 1/2 of Global terrestrial carbon**
- **World's largest forest; with important deciduous Larch dominance**
- **The most continental climate.**
  - controls intensity of Eurasian monsoon.
- **Large landmass effects**
  - high levels of climate and weather variability and **highly vulnerable** natural and agricultural ecosystems.
- **Extensive, variable dry land areas**
  - largest source of dust in the extratropics.
- **Extensive wildfires**
  - potential for large climate change feedback

14% of global organic terrestrial carbon  
25% of world forests

• The changes in this region have the potential to affect the entire Earth system – and may already be doing SO.

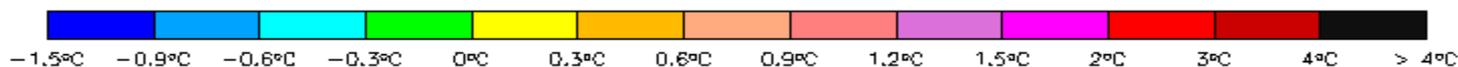
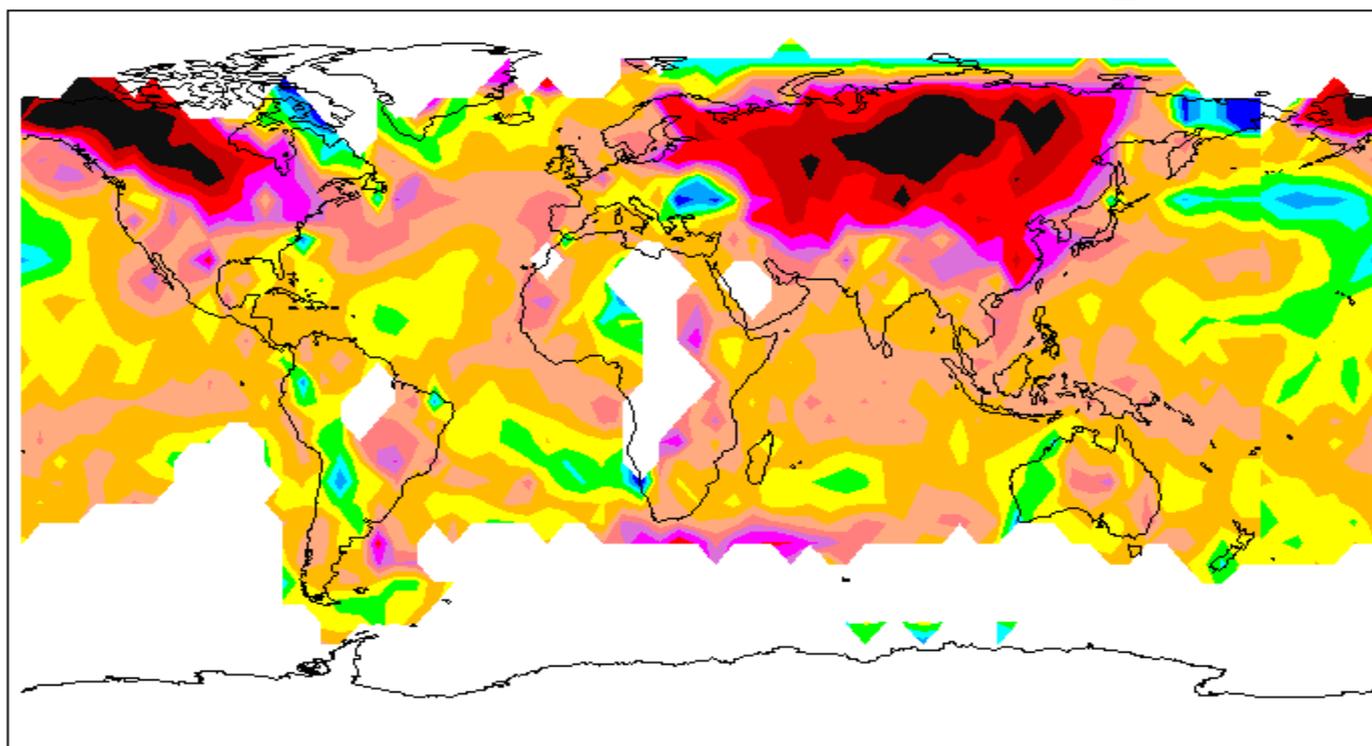




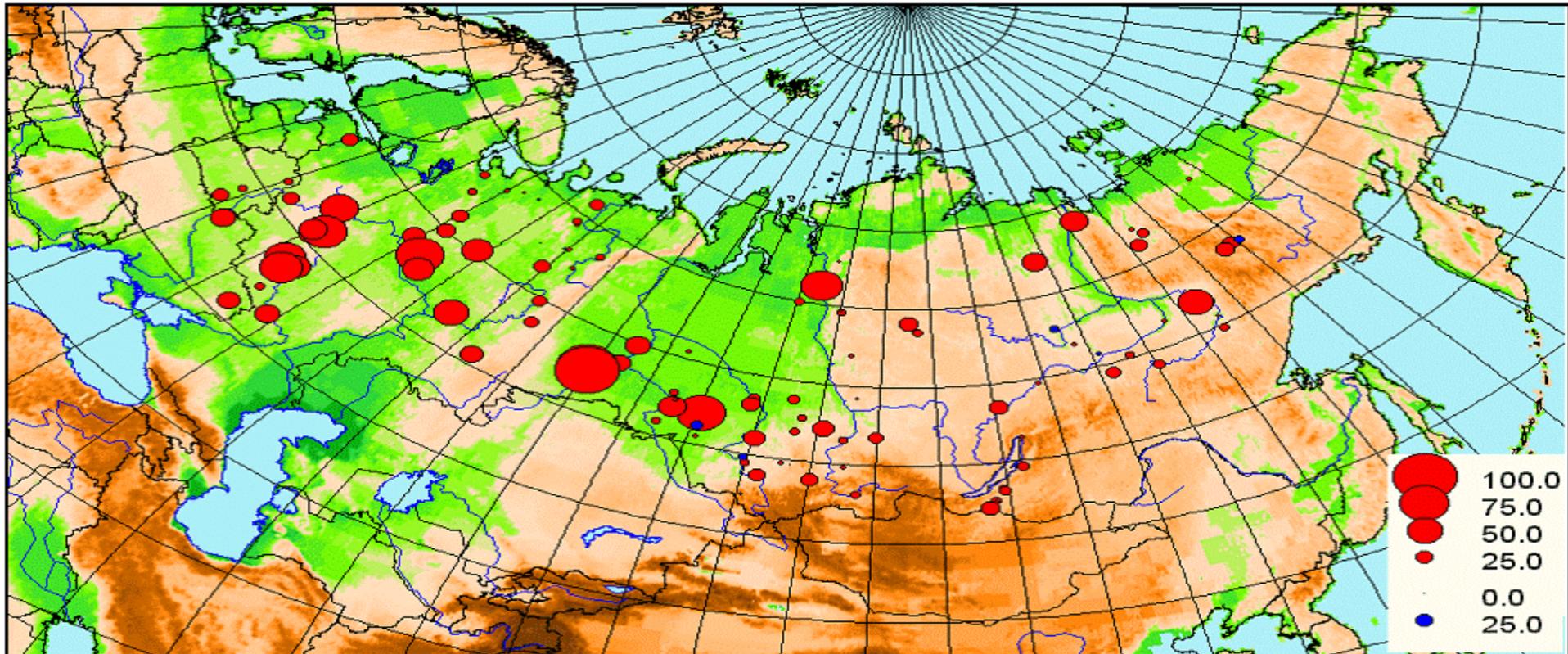
# Interagency NEESPI Meeting



## Mean Winter Temperature Change 1965 to 2004 over the globe



- Data source: (Jones and Moberg 2003). Processed by the U.S. NOAA NCDC Global Climate at the Glance Mapping System.



Winter runoff deviations for the 1978-2000 period compared to the long-term mean for ~ previous 55 years  
(Georgievsky et al. 2003)



## What is so Important About Northern Eurasia ?



Soegaard, et al. 2004<sup>1</sup> of Denmark stated,

***“The carbon budget of the High Arctic is one of the best indicators of the health of our planet . . .***

***“Because of strong feedback mechanisms in the Arctic even moderate temperature changes may be amplified and result in large environmental responses.***

---

<sup>1</sup> Global Change Newsletter, No. 59, Sep. 2004





# What is so Important About Northern Eurasia ?



## Unique features of Northern Eurasia:

- The world's largest cold region.
  - 2/3 of global permafrost =10M sq.km.
- More than 1/2 of Global terrestrial carbon
- World's largest forest; with important deciduous Larch dominance
- The most continental climate.
  - controls intensity of Eurasian monsoon.
- Large landmass effects
  - high levels of climate and weather variability and highly vulnerable natural and agricultural ecosystems.
- Extensive, variable dry land areas
  - largest source of dust in the extratropics.
- Extensive wildfires
  - potential for large climate change feedback

14% of global organic terrestrial carbon  
25% of world forests

- The changes in this region have the potential to affect the entire Earth system – *and may already be doing so.*
- The region has **unique features** that need to be better understood, parameterized, and accounted for
  - *Without clear understanding of them, the description and accurate modeling of the entire Earth system may not be possible.*
- Results from the study will have **benefits to the societies of the region as well as to the global community.**
  - *e.g., large-scale human land use change effects with potential for feedbacks for climate and human habitability)*





# The Need for the NEESPI?



***Fundamental problem:*** There is a lack of needed data and adequate understanding of the functioning of the biophysical system *of the Northern Eurasia region - which points to the need for well-integrated projects . . .*





In his first editorial (Sep.2004) as the new **Executive Director of the IGBP, Kevin Noone** made the following statements:

***“ . . . scientific integration requires more than collating results from a number of independent projects, and must be planned and resourced from the beginning as a scientific activity in its own right.”***



# The Need for the NEESPI?



*Fundamental problem:* There is a lack of needed data and adequate understanding of the functioning of the biophysical system of the Northern Eurasia region -- which points to the need for well-integrated projects . . . and

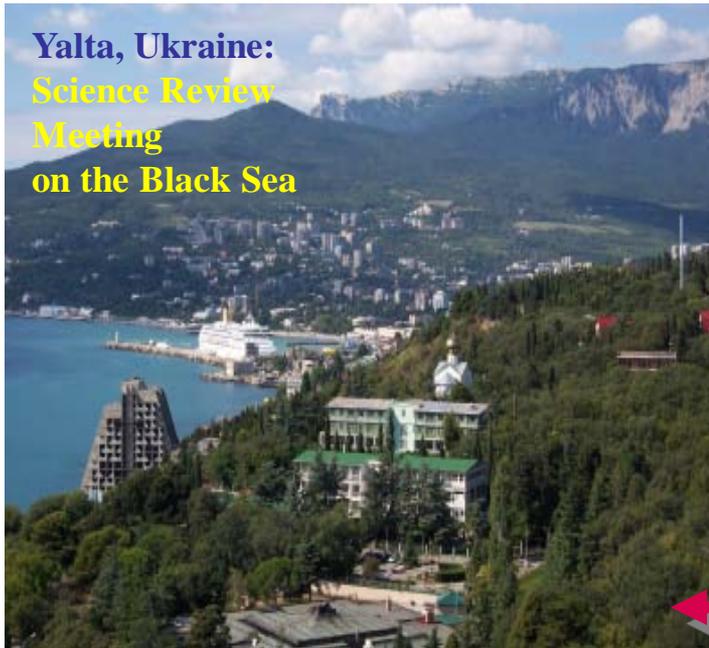
Due to the size of Northern Eurasia and the scope of the multidisciplinary integration required at many levels, the expertise and support from many international participants are needed in order to achieve the comprehensive NEESPI objectives.

**NASA and the RAS began formal development of the NEESPI by**

- **formally initiating a dialog in January 2002**
- **Conducting science planning workshops in 2003**



- **April 21 - 25 2003:**  
**1<sup>st</sup> NEESPI Science Plan  
Workshop**  
**Suzdal, Russia.**



- **September 7-9, 2003:**  
**NEESPI Science Review  
Meeting**

Yalta, Crimea -  
Ukraine



# The Need for the NEESPI?



*Fundamental problem:* The lack of needed data and understanding of the functioning of the Northern Eurasia region.

Due to the integration of expertise from international order NEESPI



## NEESPI SCIENCE PLAN EDITORS:

Pavel Ya. Groisman  
NASA-NEESPI  
Project Scientist  
National Climatic Data Center  
NOAA, Asheville, USA

Sergey A. Bartalev  
RAS-NEESPI  
Project Scientist  
Space Research Institute  
RAS, Moscow, Russia

NASA and the RAS began formal development of the NEESPI by

- formally initiating a dialog in January 2002
- Conducting science planning workshops in 2003
- **Developing, reviewing, revising and publishing the NEESPI Science Plan in 2004**





# NEESPI Science Plan: Overarching Science Question - I



**Basic: How do Northern Eurasia's terrestrial ecosystems dynamics interact with and alter the biosphere, atmosphere, and hydrosphere of the Earth?**

**Applied: Can we develop predictive capabilities of the terrestrial ecosystems dynamics over Northern Eurasia that can adequately support informed decision-making and a variety of practical applications in the region and for the globe?**

## **Major Uncertainties**

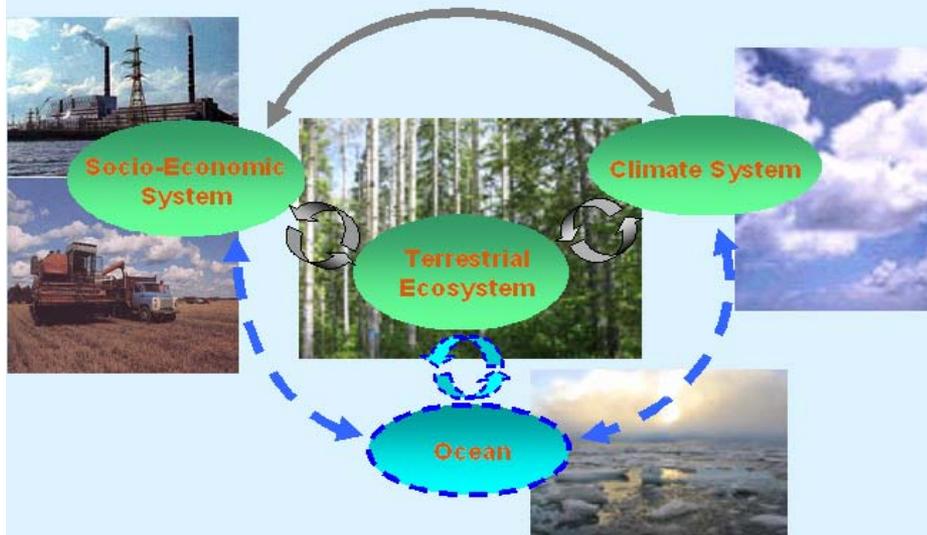
- **We have witnessed significant changes in climate, hydrosphere, cryosphere, and land cover in Northern Eurasia but *we do not adequately understand the roles of the relevant processes (e.g., global C cycle/budget) or the interactions that produced the observed results (changes).***
- **Due to both the scale and rate of changes, this situation is highly undesirable – we need to accurately model the processes that will provide for needed future projections of climatic and environmental changes and their impacts on society.**



What are the consequences of the climate and environmental changes in Northern Eurasia for surrounding regions and the Earth's global system?

What are the consequences on global changes for regional environment, economy, and quality of life in Northern Eurasia?

Primary Components for study in Northern Eurasia as part of the Global System



## Feedbacks

What will be the consequences of socio-economic changes in Northern Eurasia on environment?

How will this anthropogenic impact on ecosystems change in Northern Eurasia and over the globe?



# NEESPI Science Plan: ISSUES of Special Interest for the Global Earth System Regarding Changes in Northern Eurasia



- Terrestrial ecosystem changes and their associated carbon pools
- Accelerated climatic changes
- Permafrost
- Changes in surface albedo
- Bogs
- Fresh water transport to the Arctic
- Erosion in the coastal zone
- Aridization and aeolian/aerosol input
- Human-induced land use changes across pre- and post-Soviet era

“The Earth’s climate system and human disturbance of the climate system is more complicated and multi-dimensional than commonly assumed.

This may make *skillful prediction of the future climate impossible!*”

– R. Pielke, *Top 10 Overlooked Issues in Climate Change Science*, 2004





# Critical Role of Remote Sensing in NEESPI

(a Key Role for NASA in NEESPI)



- **Expansive region - requires synoptic view assessments for adequate spatial characterizations**
- **Significant areas of the region (e.g., Arctic, Siberia, and Central Asia) are not well documented and can benefit by augmenting in-situ observations**
- **Present and planned remote sensing products (e.g., LAI, NEE, precipitation, surface energy budget, cloudiness, water vapor) are “imperfect” and/or need to be better calibrated and validated**
- **Assessment of the state of present climate and environment and their changes will be more reliable through integration of high-quality remote sensing products with in situ observations in analyses and should be improved when applied within process-based models**

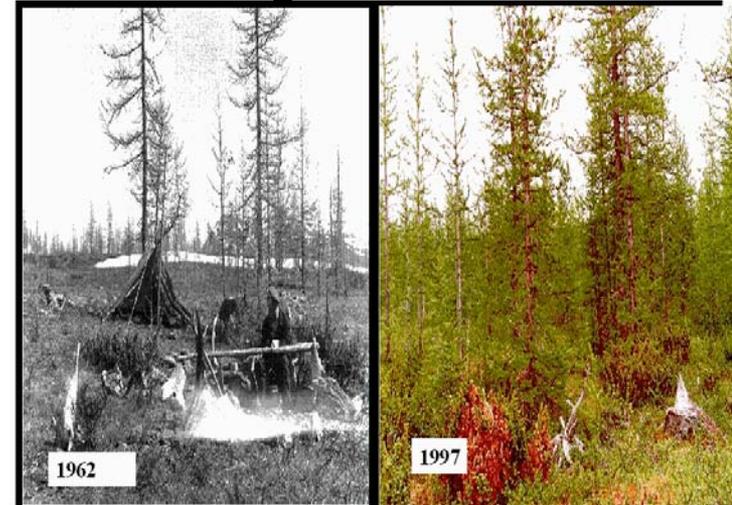


What are the current geographical and temporal distributions of the major stores and fluxes of carbon and other elements in Northern Eurasia?

What are the major drivers and feedback mechanisms that control the dynamics of the biogeochemical cycles at local, regional, and continental scales?

What are the likely future dynamics of biogeochemical cycles that are important to the functioning of the Earth system and the human society?

What points of intervention and windows of opportunity exist for society to manage biogeochemical cycles in order to mitigate adverse consequences?





# The Need for the NEESPI and a Strategic Evolution



*Fundamental problem:* There is a lack of needed data and adequate understanding of the functioning of the biophysical system of the Northern Eurasia region which points to the need for well-integrated projects.

Due to the size of Northern Eurasia and the scope of the multidisciplinary integration required at many levels, the expertise and support from many international participants are needed in order to achieve the comprehensive NEESPI objectives.

➤ **International Support is Required for:**  
**Further Science Plan Development, International Coordination, Project Funding and Integrated Implementation**

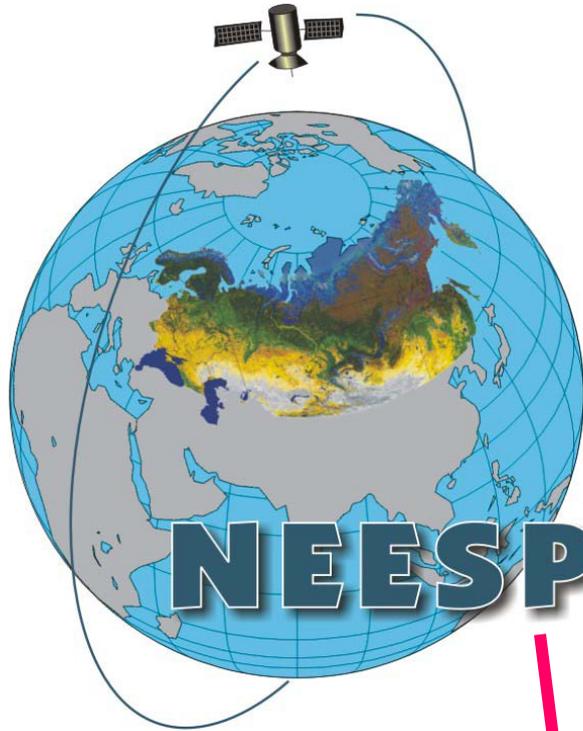
## NASA Vision of the NEESPI "Strategic Evolution"

- ✓ When NEESPI reaches its developmental maturation for full implementation, NEESPI should –
- ✓ **Involve many, if not most, countries within the boundaries of Northern Eurasia**
- ✓ **Be multi-national**
  - ✓ in scientific participation
  - ✓ in project funding sponsorship
  - ✓ in project organizational leadership
  - ✓ Including,
    - ✓ multiple US gov't agencies
    - ✓ multiple Russian gov't agencies
    - ✓ multiple European gov't agencies, etc.
- ✓ **Be Science Community-Driven!**





# The NEESPI has many potential international links

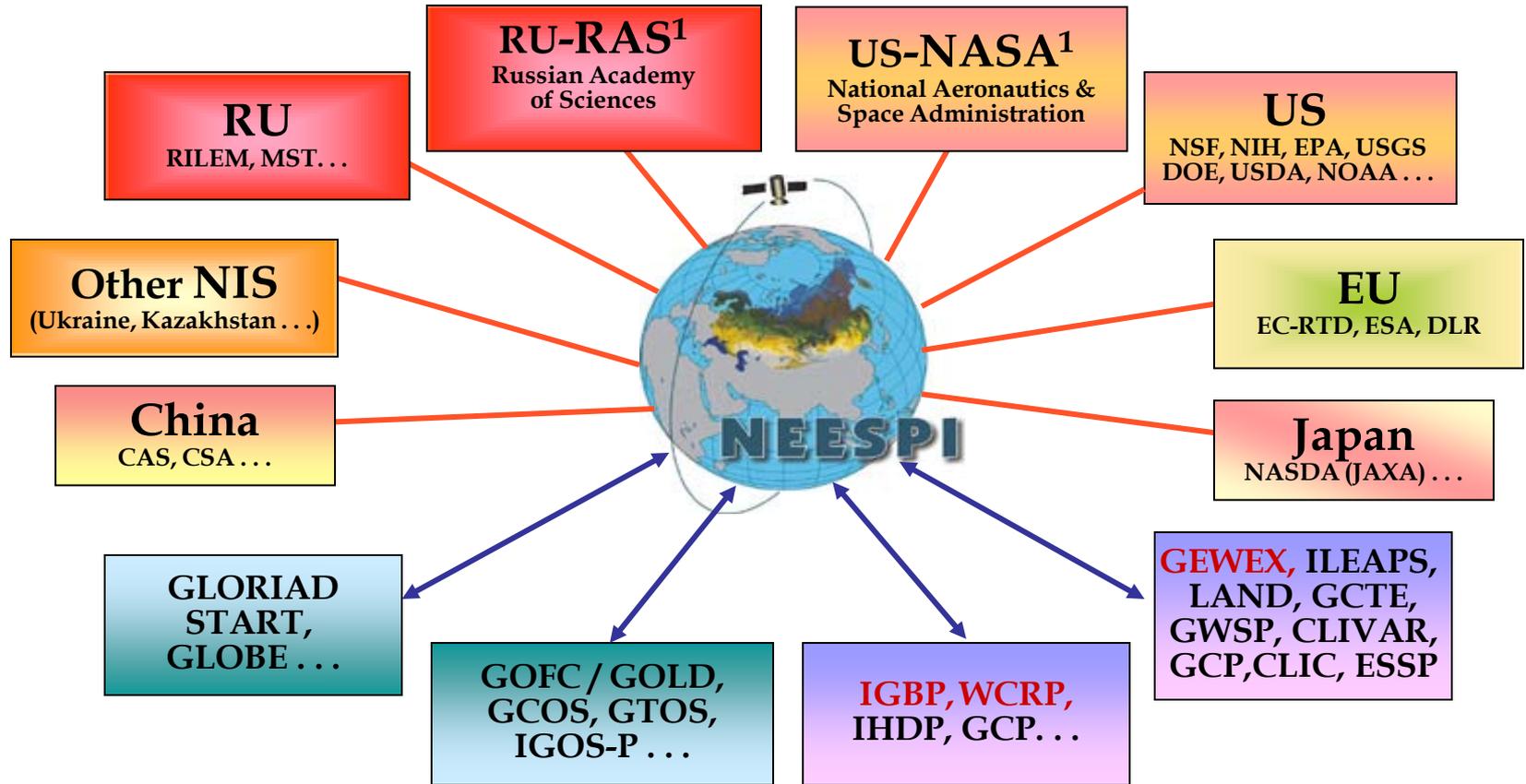


Earth System  
Science Partnership



(R.Lawford, GEWEX)

# NEESPI REQUIRES ADDITIONAL SPONSORSHIP AND LINKAGES<sup>1</sup>



## Research Funding Organizations

- Initial NEESPI Program Development ( <sup>1</sup>Founding Organizations)
- Research Funding Support
- Organization & Implementation Committee

## International Project Sponsors

- Program Development
- Scientist Networks
- Data Sharing
- Data Analysis/ Synthesis



# **SOME OF THE POTENTIAL BENEFITS OF THE NEESPI TO INTERNATIONAL SCIENCE**



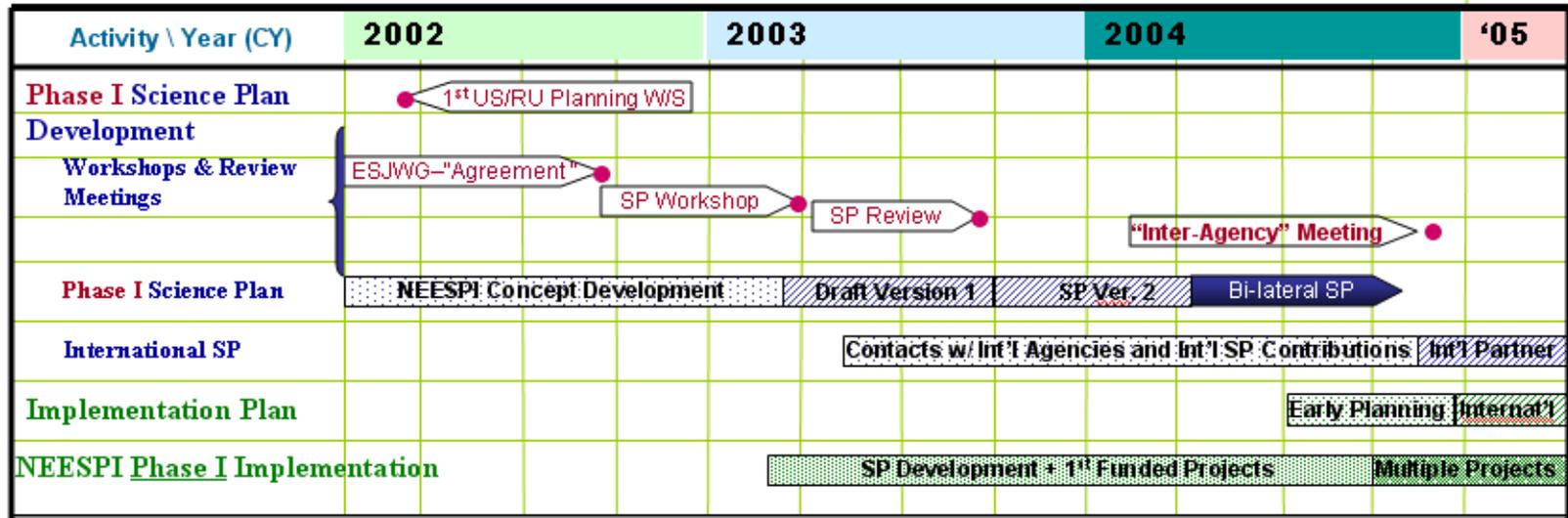
- 1. PROVIDE A BASIS FOR COLLABORATIVE RESEARCH BASED ON AGREED AGENDAS.**
- 2. BUILD RESEARCH NETWORKS TO TACKLE FOCUSED SCIENTIFIC QUESTIONS THAT ARE BEYOND THE CAPABILITIES OF INDIVIDUALS/ NATIONAL CAPABILITIES.**
- 3. PROMOTE STANDARDIZED METHODOLOGIES.**
- 4. PROVIDE COORDINATION FOR COMPLEX, MULTINATIONAL FIELD CAMPAIGNS.**
- 5. CAN PROVIDE SUPPORT FOR LONG-TERM FIELD OBSERVATIONS.**
- 6. FACILITATE MODEL INTERCOMPARISONS AND COMPARISONS WITH DATA.**
- 7. PROVIDE MORE VISIBILITY FOR RESEARCH EFFORTS AND A STRONGER CASE FOR SUPPORT.**

*(R.Lawford, GEWEX)*

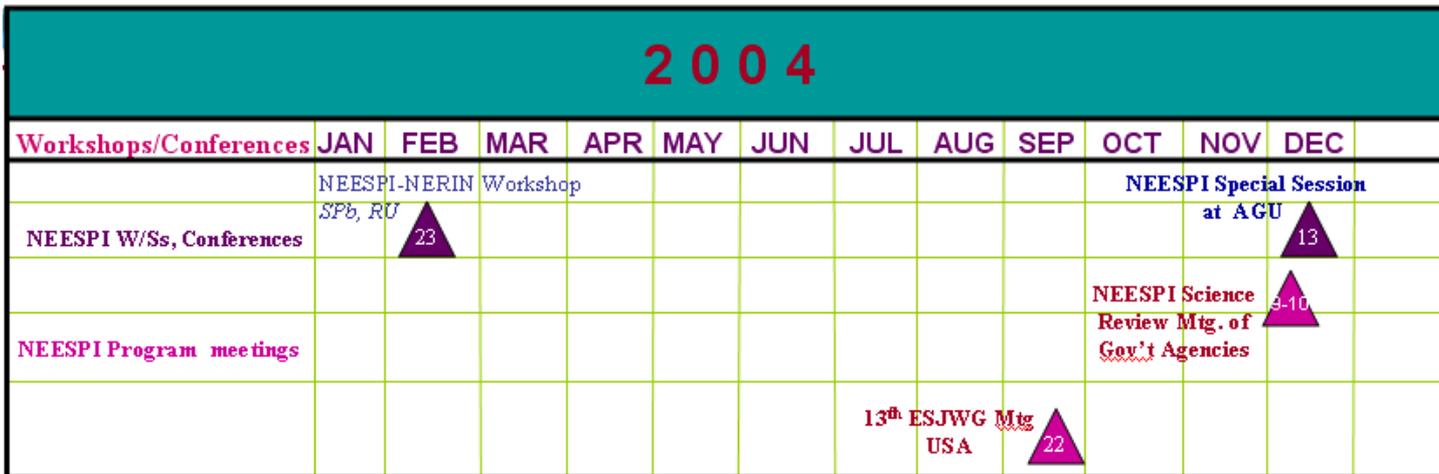




# NEESPI Progress & Development Timeline



## NEESPI 2004 Accomplishments





## Current NEESPI Development Activities



... MORE WORK IS NEEDED TO DEVELOP A VIABLE NEESPI ORGANIZATIONAL STRUCTURE THAT WILL BE ACCEPTABLE TO MANY PARTNERING SPONSORS AND PARTICIPATING SCIENCE ORGANIZATIONS.

... FUNDING SPONSORS WILL NEED TO BE ACTIVE IN GUIDING THE FURTHER DEVELOPMENT OF THE NEESPI ORGANIZATIONAL STRUCTURE.

**CURRENT ACTIVITIES** in the development of the NEESPI are designed to expand the active participants in the program by engaging key research program leaders in the planning process in order to:

- Understand types of research they currently support in Northern Eurasia
- Begin discussions regarding shared interests in such research
- Seek to **expand upon existing research capabilities for integrated, regional research** *through coordination and collaboration* while achieving mutual benefits to all groups involved.





## Recent NEESPI Development Activities & Near-term Plans



- Toward this objective . . .

a meeting of key research *program managers and directors* from more than 20

U.S. agencies;

European, Russian, and Ukrainian government organizations; and

International science organizations

was held during **09-10 December 2004** in Washington DC

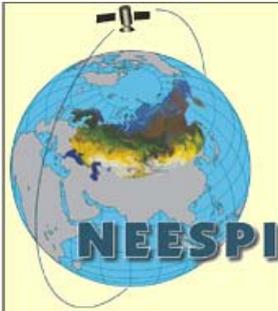
with the goal of expanding international involvement in the NEESPI.

The next step in the NEESPI strategic evolution is expected to be the convening (Spring 2005?) of a first fully international NEESPI Steering Committee of active and potential sponsors and international science program leaders to discuss and define organizational structures that will enable full international participation and implementation and . . . ***transitioning from a NASA-driven to a Science Community-driven regional, integrated research program.***



**FOR MORE INFORMATION SEE THE NEESPI WEB SITE:**

***<http://neespi.gsfc.nasa.gov>***



[Home](#)

[NEESPI News](#)

[Science](#)

[Organization](#)

[Meetings](#)

[International](#)

[Opportunities for Participation](#)

[FAQs](#)

[Team Page](#)

## Northern Eurasia Earth Science Partnership Initiative



[NEESPI Goals](#)

[Scientific Rationale](#)

[Background](#)

[Science Plan Overview](#)

### **Introduction**

[Russian Version](#)

The Northern Eurasia Earth Science Partnership Initiative, or NEESPI, is a currently active, yet strategically evolving program of internationally-supported Earth systems science research, which has as its foci issues in northern Eurasia that are relevant to regional and Global scientific and decision-making communities (see [NEESPI Mission Statement](#)).

This part of the globe is undergoing significant changes – particularly those changes associated with a rapidly warming climate in this region and with important changes in governmental structures since the early 1990s and their associated influences on land use and the environment across this broad expanse. How this carbon-rich, cold region component of the Earth system functions as a regional entity and interacts with and feeds



# BACK-UP SLIDES

## FOLLOW





## NASA Contribution to NEESPI

(from Garik Gutman's LCLUC Mtg Presentation)



- Lead the Remote Sensing component
- Facilitate RS data provision to Science Team
- Support US participants in NEESPI activities
- Assist in developing collaborative links with in-country scientists of Northern Eurasia
- Fund peer-reviewed selected proposals





## “Future”

from Garik Gutman’s LCLUC Mtg Presentation



- LCLUC ST meetings: Fixed dates for 3 years in advanced under consideration – mid-April
- **NEESPI Science Team meeting – immediately after the LCLUC**
- Solicitations will be announced through annual omnibus announcements (ROSES)
- No LCLUC solicitation next year
- Watch for other programs with LCLUC-related topics





# NEESPI's ~10 yr Goals



- **An integrated observational knowledge data base for environmental studies in Northern Eurasia**
- **A suite of process –oriented models for each major terrestrial process in all its interactions (including societal)**
- **A suite of global and regional models that incorporate key regionally specific feedbacks associated with terrestrial ecosystems in Northern Eurasia**
  - essential tools for both future environmental change projections and for informed decisions on land use and environmental protection policies.
- **A prototype system in place that could demonstrate serving the management needs of society**
  - (e.g., early warning / management / emergencies, such as mitigation of floods, fire, droughts, and other natural disasters)

