Northern Eurasia Earth Science Partnership:

Initiative description and first steps

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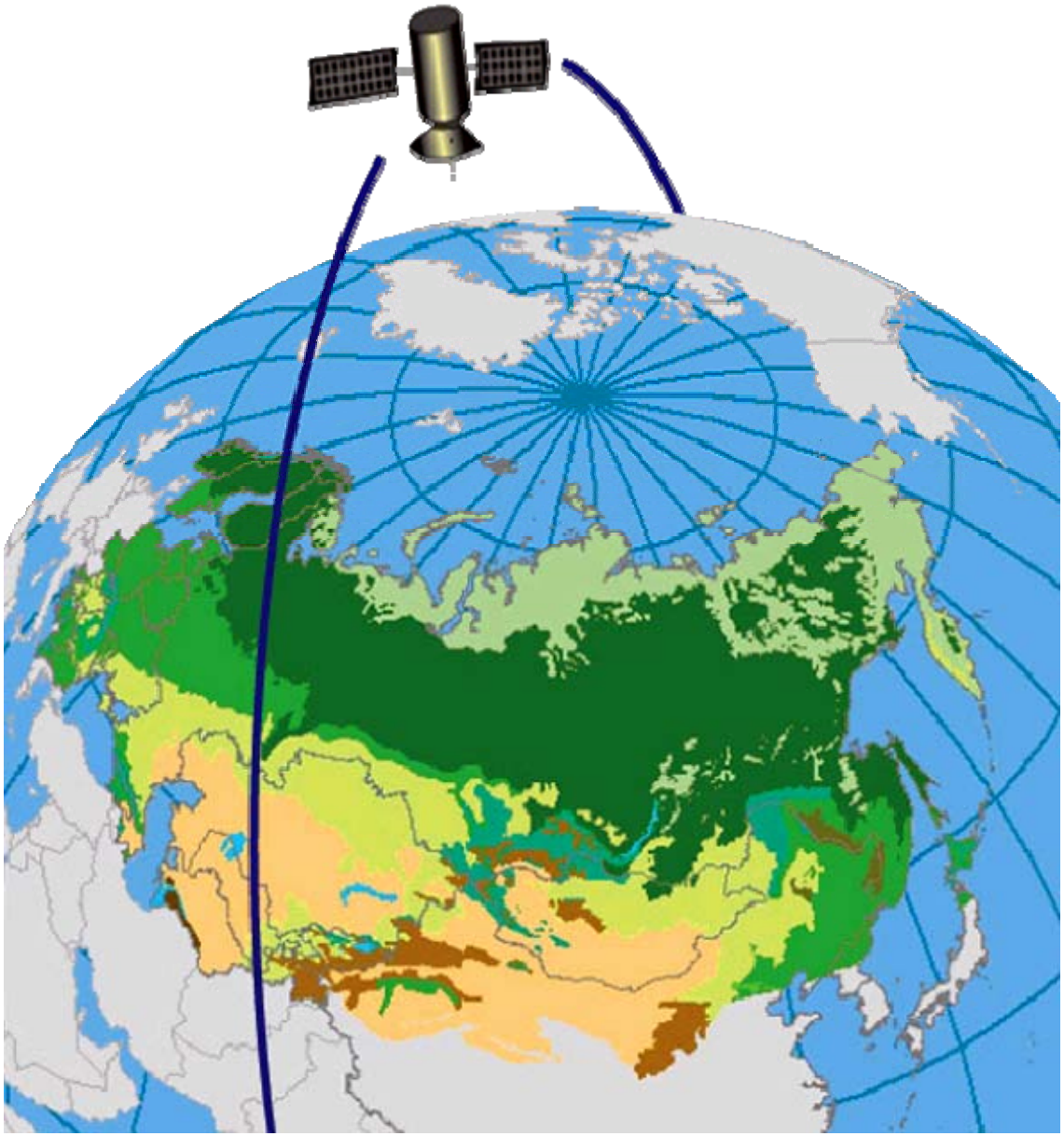
The NEESPI Study Area



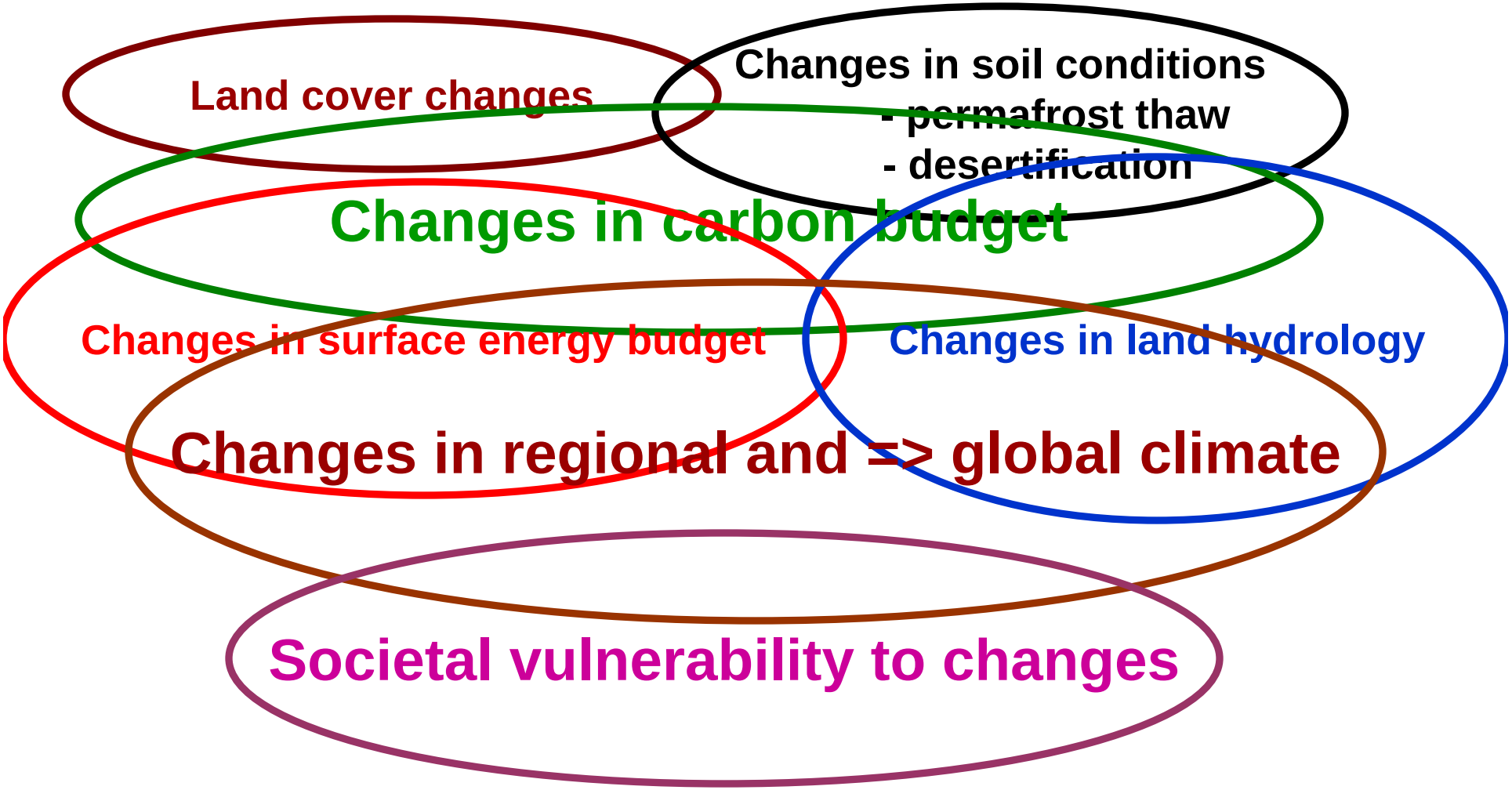
NEESPI Study Area includes: Former Soviet Union, Northern China, Mongolia, Fennoscandia, & Eastern Europe

Rationale for NEESPI

1. Strong interactions in the system **terrestrial ecosystem - atmosphere hydrosphere - cryosphere - human society** and feedbacks to **global energy, water, and carbon cycles in the region**

2. Strong climatic and environmental changes….

Areas of global concern



Radiation balance of forested (RB_f) versus nearby forest-free (RB_0) sites

$RB_f = a\ RB_0 + b$ (Rauner 1972)

Conifer forest: a = 1.10; b = 20 W m^{-2}

Deciduous forest: a = 1.05; b = 15 W m^{-2}

=> Surface Radiation Budget is strongly affected by "natural" land cover changes:

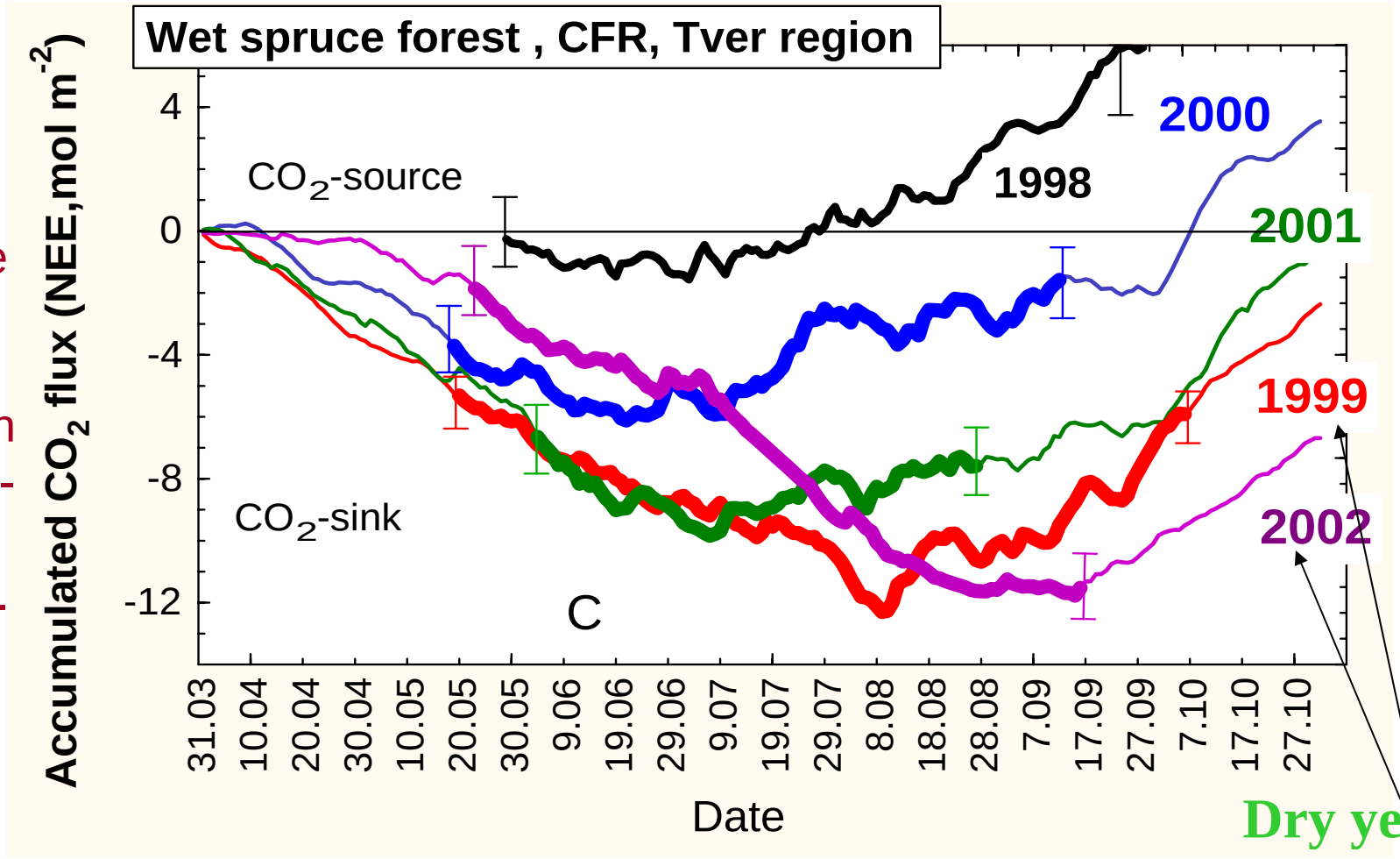
1962

1997

Example of hydrology-vegetation feedback.

Net Ecosystem Exchange [positive CO_2 flux stands for source to the atmosphere]. The sign of annual NEE depends upon weather conditions

From the Archive of the Euro-Siberian Carbon-flux Project.



Impact on land cover...

Two possible scenarios after the permafrost thaw:

Wetlands

Steppe

The overarching NEESPI science question:

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

This question can be reformulated in a pragmatic way as:

- **How do we develop our predictive capability of terrestrial ecosystems dynamics over Northern Eurasia for the 21st century to support global projections as well as informed decision making and numerous practical applications in the region?**

Link to Coordinated Observation and Prediction of the Earth System (COPES)

Example of topical science questions:

Ecosystems and climate interactions. Science question:

- **How do we account for the synergy of feedbacks of major processes within the regional terrestrial ecosystems, climate, cryosphere, and hydrosphere of Northern Eurasia and their interactions with society?**

ESSP: IGBP [iLEAPS, GLP, AIMES]; GWSP; GCP ;

WCRP [GEWEX, CLiC]; IHDP; DIVERSITAS

NEESPI Science Plan Structure

1. INTRODUCTION
2. SCIENTIFIC QUESTIONS AND MOTIVATION
3. MAJOR SCIENTIFIC TOPICS
   - 3.1. Terrestrial ecosystem dynamics
   - 3.2. Biogeochemical cycles
   - 3.3. Surface energy and water cycles
   - 3.4. Land use interactions: societal-ecosystem linkages
   - 3.5. Ecosystems and climate interactions
   - 3.6. Topics of special interest
     - 3.6.1. Cold land region processes
     - 3.6.2. Coastal zone processes
     - 3.6.3. Atmospheric aerosols and pollution
4. REMOTE SENSING
5. MODELING
6. DATA AND INFORMATION TECHNOLOGY
7. EDUCATION
8. RESEARCH STRATEGY

Scientific Background Appendix

TOOLS

NEESPI Deliverables:

to have in ~10 years

- **A suite of process –oriented models for each major terrestrial process in all its interactions**
- **A suite of global and regional models that seamlessly incorporate all regionally specific feedbacks associated with terrestrial processes**
- **An integrated observational knowledge data base for environmental studies**
- **A system in place that can serve the emergency needs of the society**

NEESPI first steps

Current NEESPI statistics

NEESPI Science Plan Preparation Team includes more than 90 scientists (representing mostly academia) from 11 countries with the majority of them are from the United States and Russia.

More than forty five individual research projects (always with the international participation) are currently funded and approximately twenty projects are pending under the NEESPI umbrella.

308 scientists of 173 institutions from 29 countries are participating in the first 47 funded projects

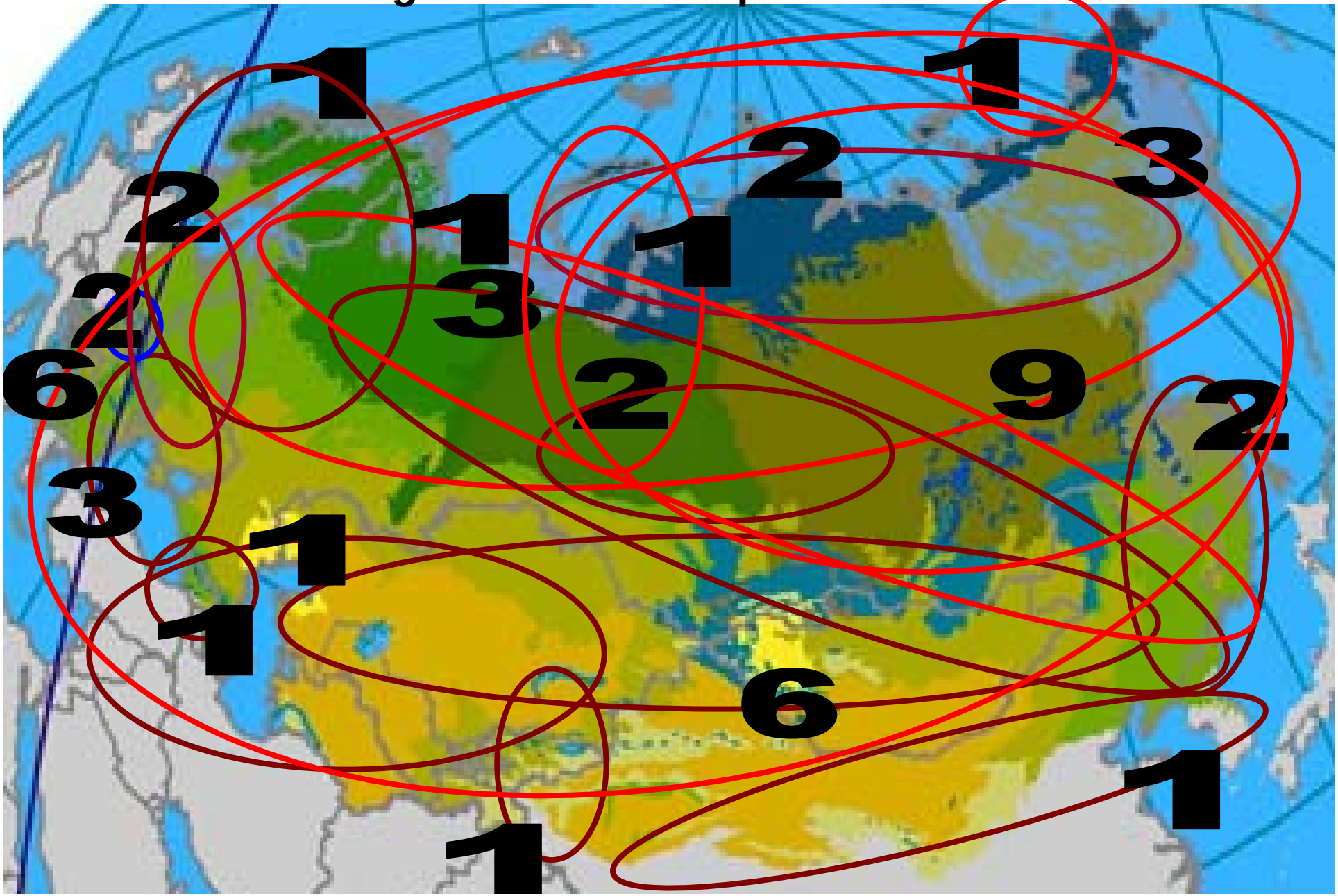
NEESPI Senior Scientists by country

(308 scientists from 173 institutions; 47 projects)

- Russia 94 scientists 41 institutions
  - including Moscow 51 scientists 19 institutions
  - most active Institution: RAS Sukachev Institute of Forest Research (6sci. in 7 projects)
- China 26 scientists 15 institutions
  - most active Institution: Institute of Botany, Chinese Acad. Sci. (5 scientists)
- United States 100 scientists 46 institutions
  - most active institution: University of Maryland (10 scientists in 10 projects)
- European Union (W) 38 scientists 27 institutions 10 countries
  - including Finland 10 scientists 5 institutions
  - including Germany 11 scientists 9 institutions
- Japan **8 scientists** **Intern. Arctic Res. Ctr. + 5 institutions**
- Canada 4 scientists 4 institutions
- NIS countries, Mongolia, Korea, Syria, and Eastern Europe
  38 scientists 34 institutions 14 countries

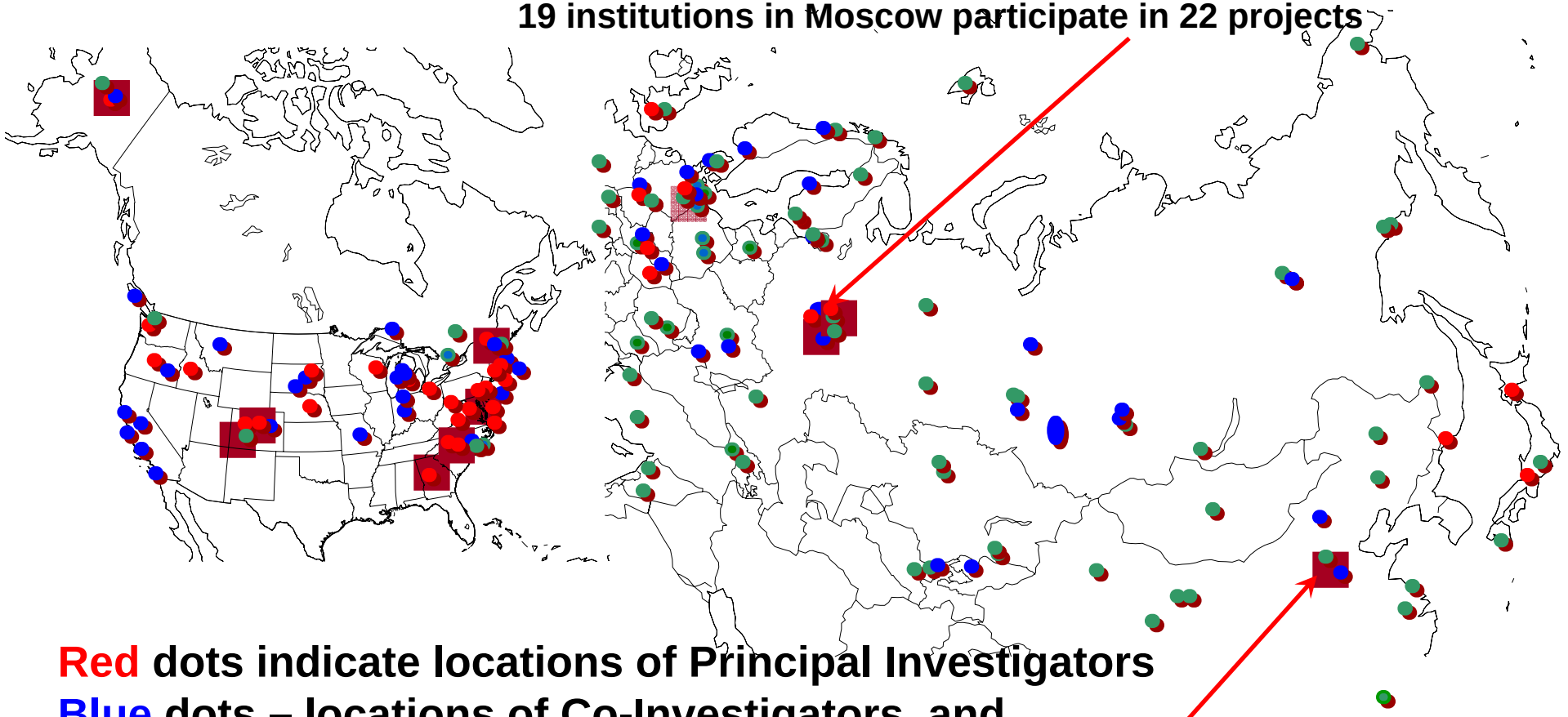
Large fraction of hidden participation from the NEESPI domain

Currently active NEESPI projects' count and regions of their implementation



NEESPI Scientific Network

(On January 18, 2006: 308 scientists from 173 institutions; 47 projects)



Red dots indicate locations of Principal Investigators
Blue dots – locations of Co-Investigators, and
Green dots - locations of Collaborators.
Squares show Focus Research and Science Support Centers.

Current distribution of projects by major research themes. One project could be included in several groups

- Biogeochemical Cycles 25
- Hydrology 21
- Cryosphere 21
- Land Use 18/19
- Atmospheric Aerosols/Pollution 15
- Integrative, Large scale, Modeling 21
- Land cover 10
- **Total** **47**

Example of the NEESPI funded project

Quantifying the Effects of Land Use Change on Carbon Budgets in the Black Sea Region.

PI: Curtis Woodcock Boston University, Boston, USA

Co-PIs:

Xiaowen Li Boston University, Boston, USA

Mutlu Ozdogan Boston University, Boston, USA

Richard Houghton The Woods Hole Research Center, Woods Hole, USA

Collaborators:

Vladimir Gancz and Viorel Blujdea, Forest Research and Management Institute, Bucharest, Romania

Hristo Nikolov Green Balkans Federation, Plovdiv, Bulgaria

Mykola Zalogin Institute of Sustainable Development of Ukraine, Kyiv, Ukraine

Niko Beroutchachvili Geographical Society of Georgia, Tbilisi, Georgia

Emin Zeki Baskent Karadeniz Teknik Üniversitesi, Trabzon, Turkey

Aydin Tufekcioglu Kafkas Universitesi, Artvin, Turkey

Example of the NEESPI funded project

Understanding the role of changes in land use/land cover and atmospheric dust loading and their coupling on climate change in the NEESPI study domain drylands

PI: Irina Sokolik Georgia Institute of Technology, Atlanta, Georgia, USA

Co-PIs:

Robert Dickinson Georgia Institute of Technology, Atlanta, Georgia, USA

Yongjiu Dai Beijing Normal University, Beijing, China

George Golitsyn Obukhov Institute of Atmospheric Physics, Russian Academy of Sciences, Moscow, Russia

Collaborators:

R. Bektursunova Eurasian National University, Akmolla, Kazakhstan

B. Maricorena and G. Bergametti, Laboratoire Interuniversitaire des Systèmes Atmosphériques, Paris, France

D. Jugler Institute of Meteorology and Hydrology, Ulaan Baatar, Mongolia

Y. Shao City University of Hong Kong, China

I. Uno Institute Applied Mechanics, Kyushu University, Japan

M. Mikami MRI/JMA, Japan

Y. Chun Meteorological Research Institute, Seoul, Korea.

Currently, we envision seven NEESPI Focus Research Centers

- **Existing:**
- ***Center for Cold Land Processes and Arctic Coastal Studies***
- ***Center for Water System Studies***
- ***Center on Aerosol Studies***
- ***Center for Land Use Studies***
- ***Center for Biogeochemical Cycle Studies***

Projected:

Center for Land Cover Studies and Center for Integration of the NEESPI Results and Modeling Studies

NEESPI Science and Data Support Centers

- **Within the United States**
- ***For hydrometeorological information:***
- ***National Climatic Data Center, Asheville, NC***
- ***For remote sensing information:***
- ***Goddard Space Flight Center, Greenbelt, MD***

Within the Russian Federation

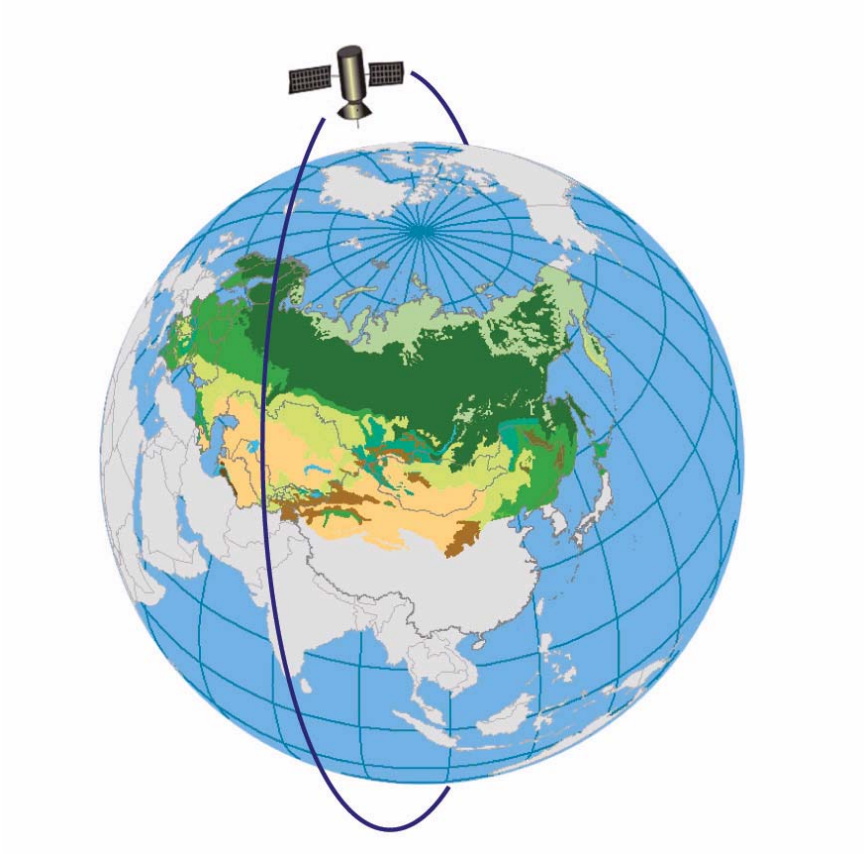
- ***For hydrometeorological information:***
- ***Research Institute For Hydrometeorological Information, Obninsk, Kaluga Area***
- ***For remote sensing information:***
- ***SCANEX Corp., Moscow***

Within China

- ***Beijing Climate Center***

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