Northern Eurasia Earth Science Partnership: Overview

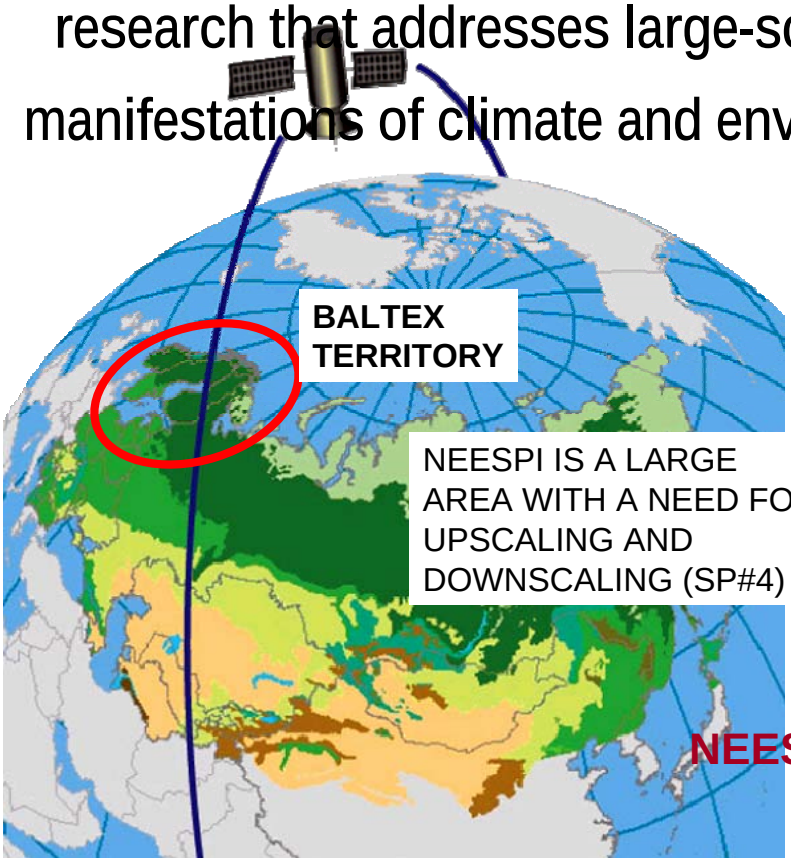
Pavel Groisman UCAR/NCDC Asheville, NC

Richard Lawford IGPO Washington, DC

Eric Wood Princeton U. Princeton, NJ

On behalf of the International NEESPI Science Team

NEESPI is an interdisciplinary program of internationally-supported Earth systems and science research that addresses large-scale and long-term manifestations of climate and environmental change.



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

NEESPI duration ~ 10 years

NEESPI AND ITS PAST

NEESPI and the actions to develop its Science Plan were initially promoted by NASA and Russian Academy of Sciences (2003-2004).

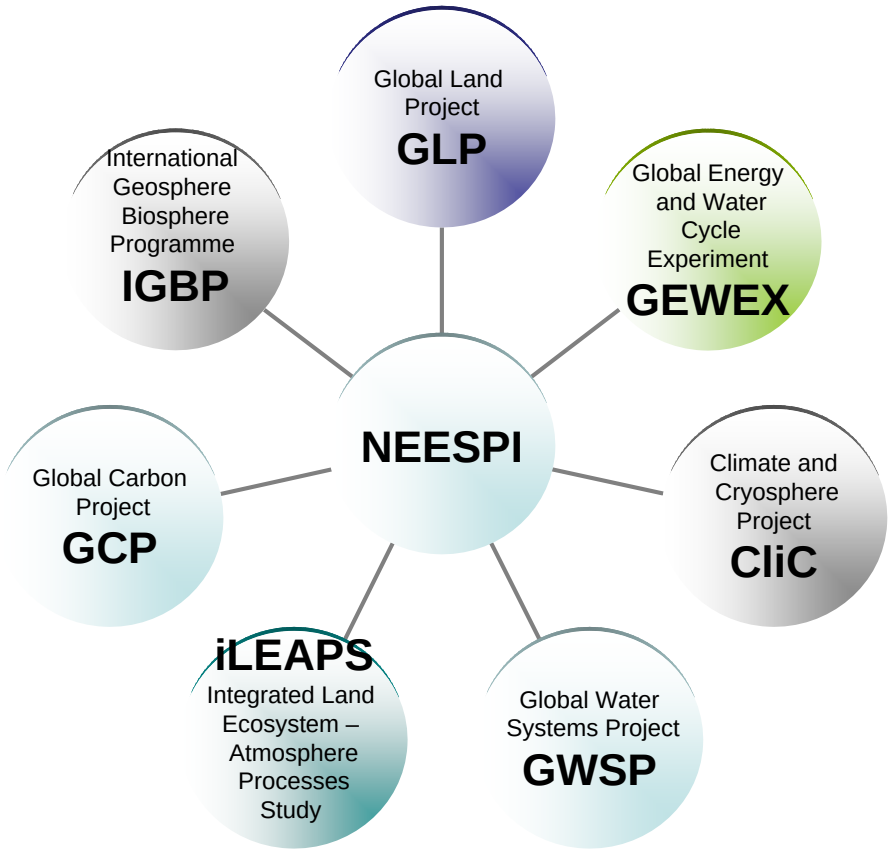
NASA — RAS

Since early 2005, the NEESPI community has worked to make NEESPI inter-agency (in the U.S.) and international.

A central Science question:
"How do terrestrial ecosystems dynamics in the Northern Euroasia interact with and alter the biosphere, atmosphere, cryosphere, and hydrosphere of the Earth?"

The NEESPI Science Plan (available on http://neespi.org) has elements that address concerns of WCRP, IGBP, IHDP, and DIVERSITAS Programs

Links to ESSP Projects and Programs



NEESPI Science plan major focuses

- **Focus on transient zones that are most vulnerable in the future changes**
  - **Coastal zone**
  - **Tundra-forest**
  - **Forest-steppe**
  - **Steppe-desert**
  - **Mountains**

Cold Lands

Dry lands

- **Focus on feedbacks that make the projection of the future changes uncertain**

Please note that with regard to Strategy Point #3: NEESPI has climate regional commonality with the cold and the semi-arid regional climate projects.

Peculiarity of the region

- In contrast to North America, Europe, and several other parts of the globe, NEESPI is lacking many essential tools (e.g., well developed RCMs, hydrological models, regional reanalyses, etc) that are a prerequisite for answering the major NEESPI science questions. There is:
  (a) an urgent need for modern model development and
  (b) investments in Education

Two modes of NEESPI expansion

- Dedicated Calls (recent NASA and RAS and perspective in the NIS, EU, and China)
- Projects that volunteer to join.

Current level of activity:

More than 400 scientists from more than 200 institutions are working on 104 individual funded projects under the Initiative umbrella and approximately 20 projects are in the process of joining NEESPI (+ in kind assistance from EU, US, Russian, Chinese, Japanese, and International Agencies and Institutions)

NEESPI contribution to anthropogenic climate change studies

- Studies of regional anthropogenic forcings:
  - land use change
  - water management
  - air pollution and atmospheric aerosols loading (e.g., from industry)
- Studies of biogeophysical feedbacks to global and regional anthropogenic climatic changes:
  - regional land cover changes and
  - water cycle changes

some of which are leading to non-linear environmental changes desertification, dust storms, forest fires, inundation, coast erosion, etc.

- Studies of biogeochemical feedbacks to global and regional anthropogenic climatic changes:
  - release/sequestration of CO_2 and CH_4 from/to terrestrial pools of carbon in permafrost, soil, bogs, and vegetation
  - loading of the atmosphere with aerosols from fires, dust storms, and other “natural” consequences of anthropogenic climatic changes

NEESPI directly contribute (will contribute) to four WMO/ICSU endorsed IPY Activities:

- #138, “Cold Land Processes in the Northern Hemisphere continents and their Coastal Zone: Regional and Global Climate and Societal-Ecosystem Linkages and Interactions” (PIs: Vladimir Kotlyakov and **Pavel Groisman**;
- # 139 “Greening of the Arctic: Circumpolar Biomass” (PI, Donald Walker and Howard Epstein);
- #140 “Hydrological Impact of Arctic Aerosols” (PIs **Judith Curry** and **Irina Sokolik**); and
- #104 “The Arctic Hydrological Cycle Monitoring, Modeling and Assessment Program” (PIs, Árni Snorrason and Charles Vörösmarty)

NEESPI contribution to extremes studies

- **Most of the NEESPI domain is a region of vulnerable agriculture and/or silviculture** (frequent droughts, expanded forest fires, pest infestations, permanent water deficit that is compensated from shrinking resources of the retreating cryosphere (snow, glaciers, permafrost) and reservoirs.
- **Large climatic changes in the NEESPI region cause more frequent non-typical “unusual” weather conditions** (earlier snow melt, thaws, strong storms, to which environment and society are not ready) and these weather conditions thus, are also considered as extremes
- **Therefore, extreme events monitoring, studies of the origin of extreme events, their projections, and mitigation strategies are among the major foci of numerous funded (and projected) NEESPI projects** covering the entire NEESPI domain (i.e., 20% of the Global Land Area).

Coping with Growing Pains

While the NEESPI Science Plan is balanced, a quick growth and non-proportionate funding caused different paces of development of different NEESPI components. To mitigate this disproportionality in implementation, we:

- **structure the Initiative by Topical and Regional Focus Research Centers**
- **move the NEESPI data support to Permanent Science Data and Services Centers, and**
- **promote clustering (integration) among the NEESPI**

Regarding strategy point #2:
There is a need for distributed infrastructure in order to ensure that each of their data. In some cases national capabilities are poorly developed and CEOP data infrastructure could bring them up to a common level with other countries very quickly.

Example of the NEESPI Focus Research Center

NEESPI Focus Research Center for Cold Land Processes and Arctic Coastal Studies (CLAC FRC)

- **Venue: International Arctic Research Center, University of Alaska Fairbanks, Alaska**
- **Objectives: conduct, promote, and facilitate research aimed at improved understanding and modeling of the cold land processes in the Earth System focusing on Northern Eurasia and its coastal zone**
- **Links to International Projects: CliC**
- **Leaders: Romanovsky, Hinzman, Walsh, Walker, Sergienko, Zheleznyak, Makshtas, Fukuda, Atkinson, Kofinas, Semiletov, Forbes**
- **Current Science foci:**
  - **Permafrost**
  - **Cold land hydrology and global biogeochemical cycles**
  - **Cryosphere interactions with climate, biota, and environment**
  - **Humans in the Arctic**
- **Funded and pending proposals to NSF, NOAA, NASA, JAMSTEC, JAXA, Far Eastern Branch of Russian Academy of Sciences, DOE, and ONR; 4 recognized IPY activities**
- **Other relevant activities:**
  - ✓ **The Focus Research Center is going to serve as one of the base institutions for CliC studies in Northern Eurasia and Alaska**

Currently, there are the following NEESPI Focus Research Centers

- ***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***
- ***Center for Land Cover Studies***
- ***Regional Center for Dry Land Processes Studies***
- ***Regional Center for NEESPI Studies in Eastern Europe***
- ***Regional Center for NEESPI Studies in Siberia***

Regarding Strategy Point #1 and 5:
Data are needed for a wide range of studies by scientists from a number of disciplines. This could be a rich area for CEOP pilot projects.

Link to CEOP Strategy Point #6:
NEESPI has an open data policy – however it is unclear because of the heritage of NEESPI countries that they will readily adopt to this expectation and commitment. CEOP can help to ensure that this happens.

- NEESPI has an open data policy
- Rich historic in-situ data sets, modernization of existing networks, introduction of new modern instrumentation to the NEESPI domain from the Arctic to the Central Asian and Gobi Deserts will be of help to the CEOP data collection strategy