

Future of the Northern Eurasia Earth Science Partnership Initiative (NEESPI)

Pavel Groisman

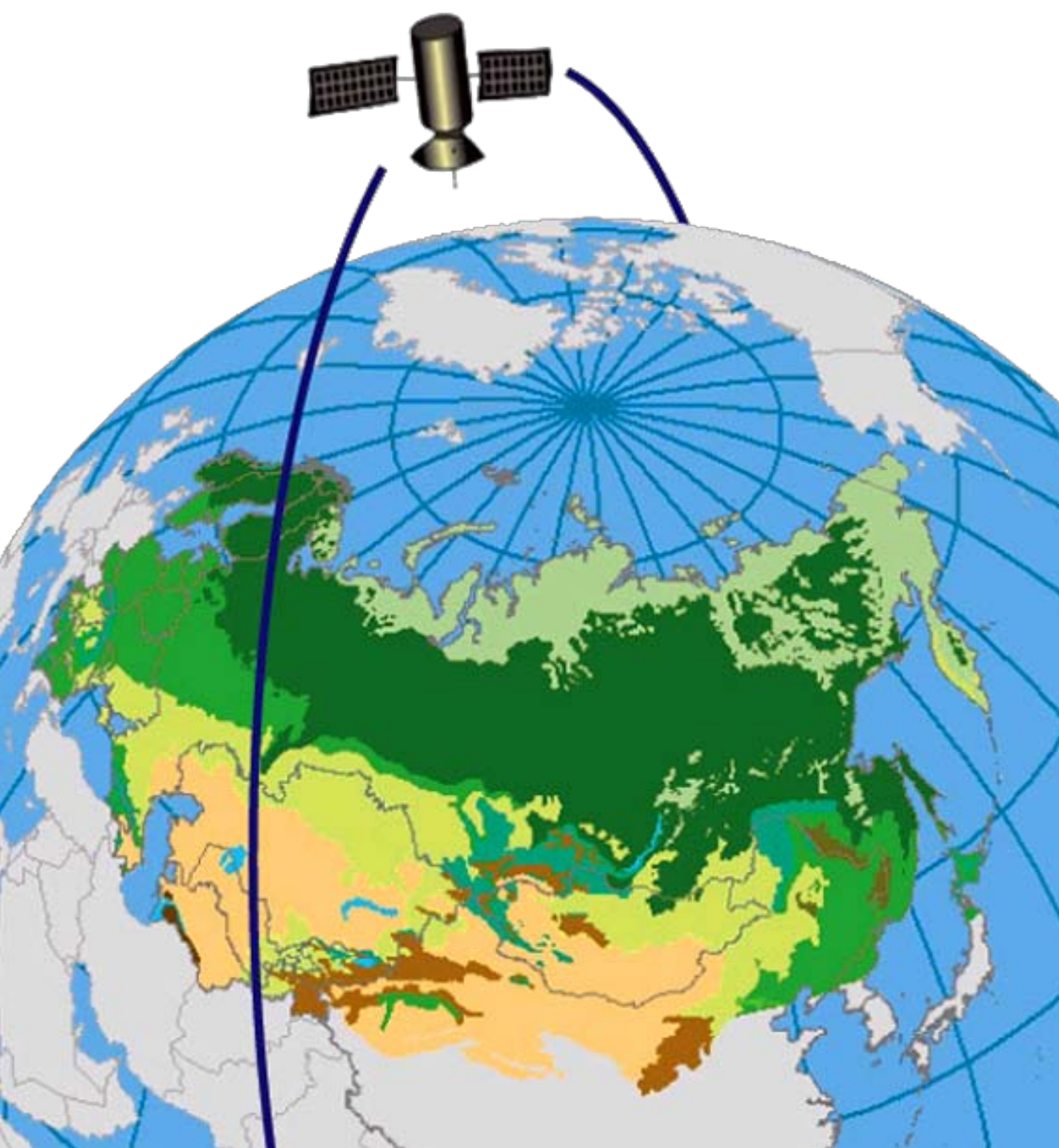
- UCAR at NOAA National Climatic Data Center, Asheville, North Carolina, USA
- Hydrology Science and Services Corporation, Asheville, North Carolina, USA
- Hydrological Cycle Lab, P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences, Moscow, Russia

КОНЦЕПЦИЯ NEE SPI

**В настоящее время происходят
существенные изменения:**

- Изменения климата**
- Изменения окружающей среды**
- Хозяйственная деятельность человека
и её изменения**

**ВСЁ ЭТО СТАЛО ТЕПЕРЬ
ВЗАИМОСВЯЗАННЫМ И ВЛИЯЮЩИМ
ДРУГ НА ДРУГА => ДОЛЖНО
ИССЛЕДОВАТЬСЯ СИНЕРГЕТИЧЕСКИ**



The NEESPI Study Area

<http://neespi.org>

**During the past 10 years, NEESPI
has been 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**

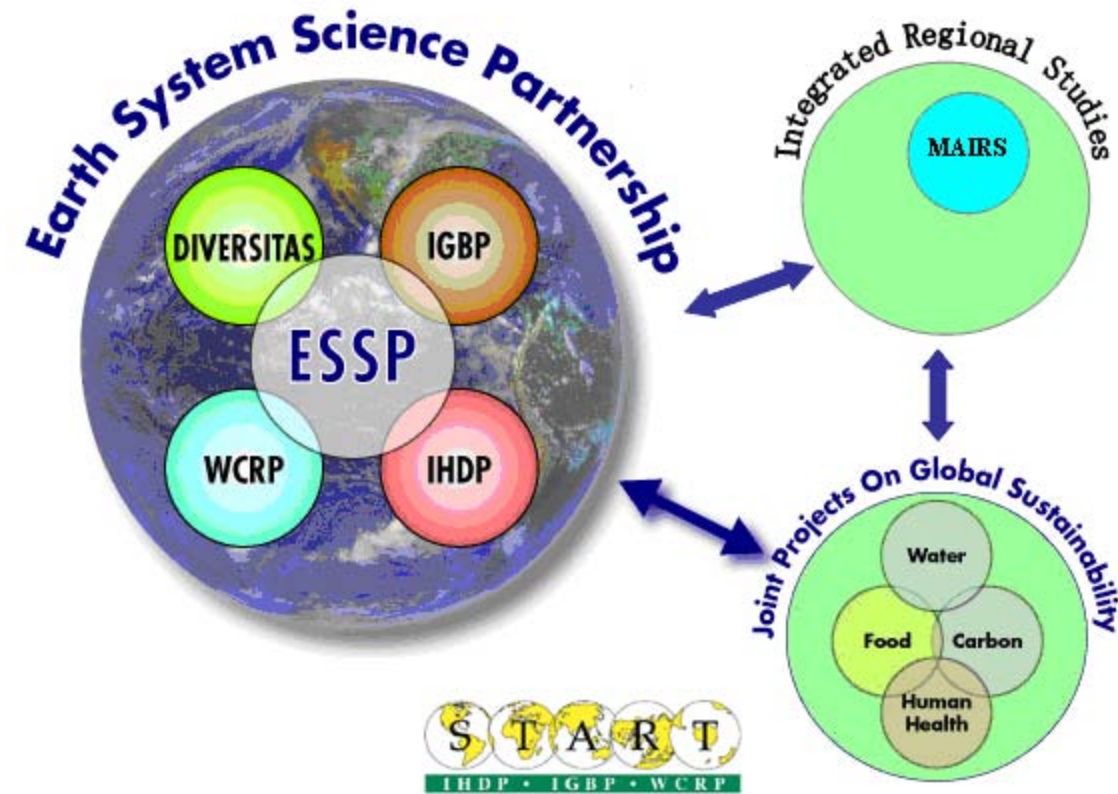
NEESPI duration ~ 10-12 years (started in 2004)

NEESPI Background

- Ten years ago NEESPI was established to address large-scale and long-term manifestations of climate and environmental change in Northern Eurasia (<http://neespi.org>). This web site contains the NEESPI history, presentations at the NEESPI past conferences, the **NEESPI Science Plan** (260 pp.) and its **Executive Summary** (18 pp.; also dubbed in 2007 as a refereed publication in the Special NEESPI issue of “*Global and Planetary Change*”).
- The NEESPI domain is shown in the map.
- NEESPI Science Plan includes elements of WCRP, IGBP, IHDP и DIVERSITAS.

Earth System Science Partnership

Sponsored by
WMO and ICSU



ESSP = WCRP + IGBP + IHDP + DIVERSITAS

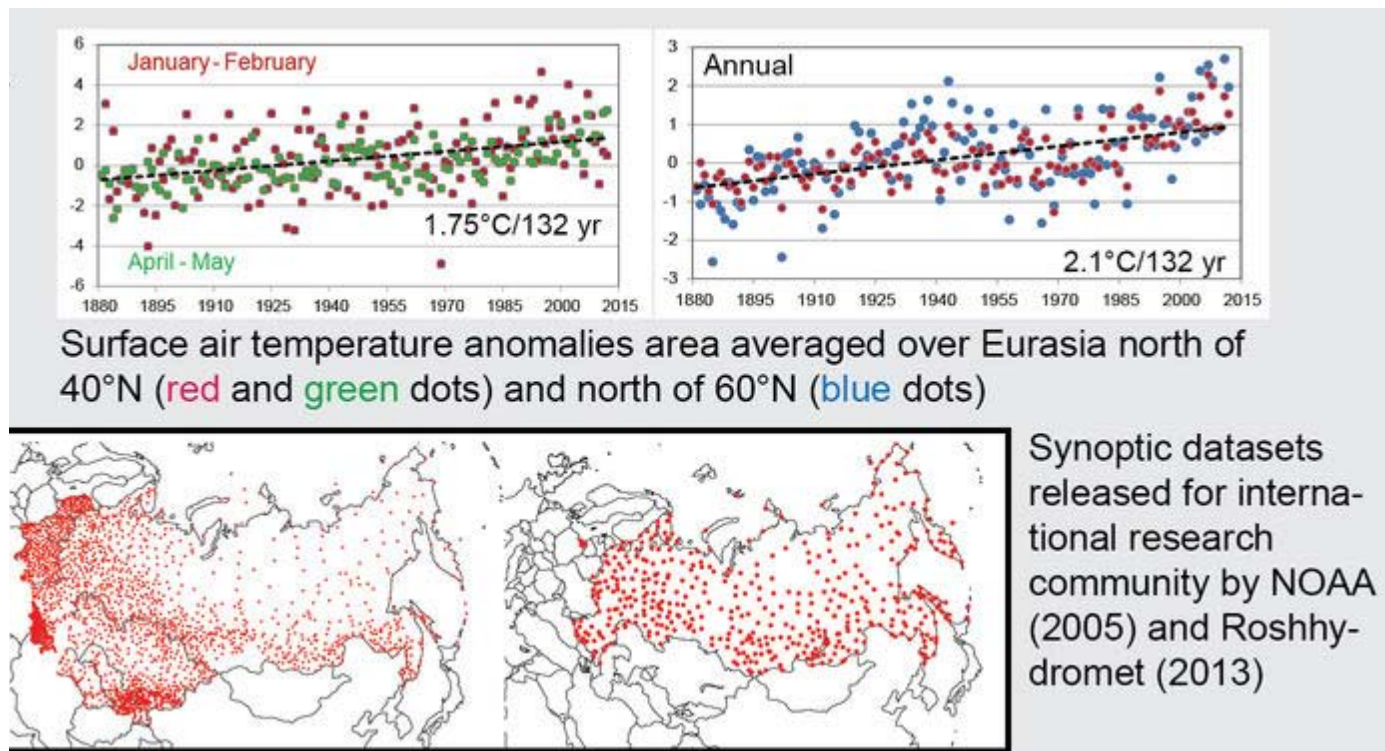
- World Climate Research Programme
- International Geosphere Biosphere Program
- International Human Dimension Program
- Studies of Biodiversity

Plus:

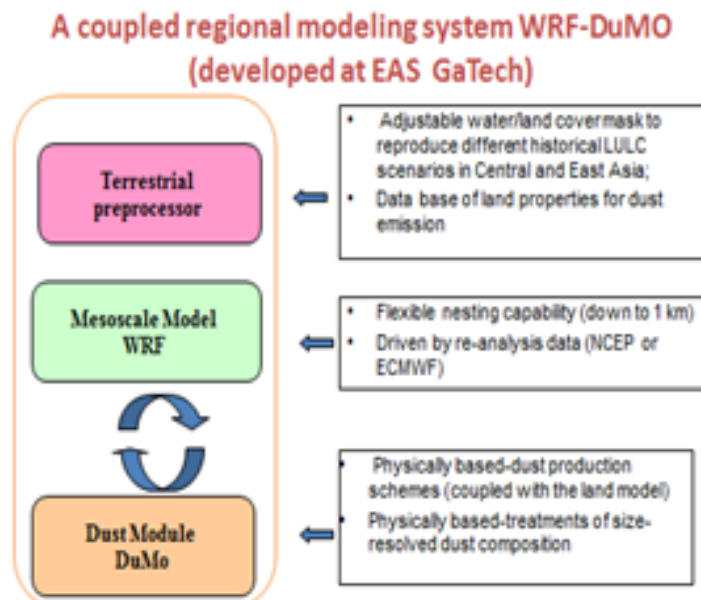
- GLP
- GWSP
- GCP

NEESPI's facilitating role has been in promoting international large-scale regional studies and framing the diverse individual projects into a 3-phase balanced Programme

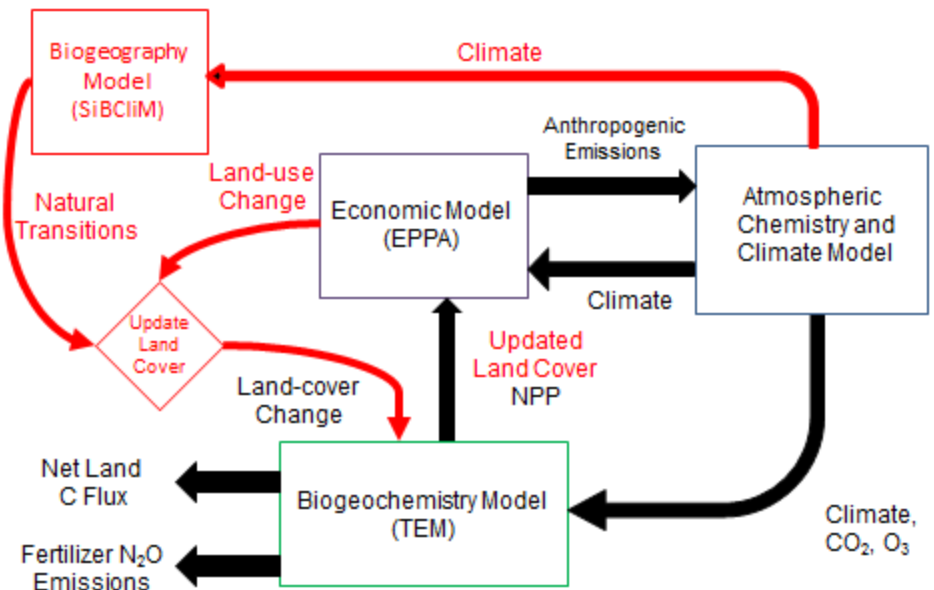
- **The first phase** of NEESPI projects has focus on documenting, monitoring and analyses of climatic changes, biogeochemical cycles, land use, and land cover changes over Northern Eurasia



- **The second NEESPI phase** (launched circa 2007) put forward environmental modeling with the major focus on blending regional climate, vegetation, carbon flux, permafrost, hydrological, and dust production models within a Northern Eurasia modeling suite to be linked to (embedded in) the state of the art Earth System models.

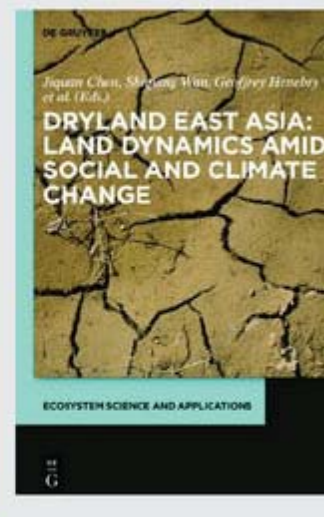
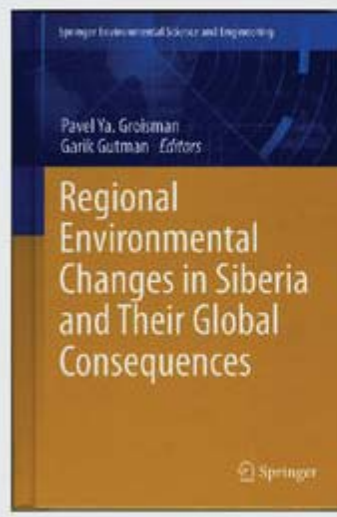
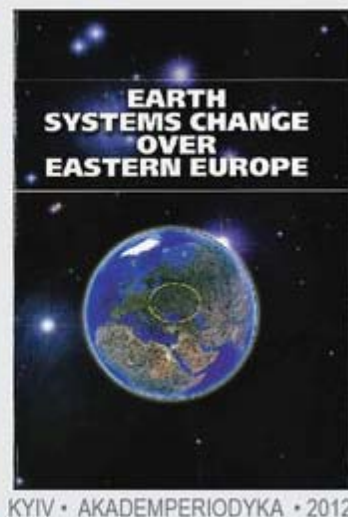
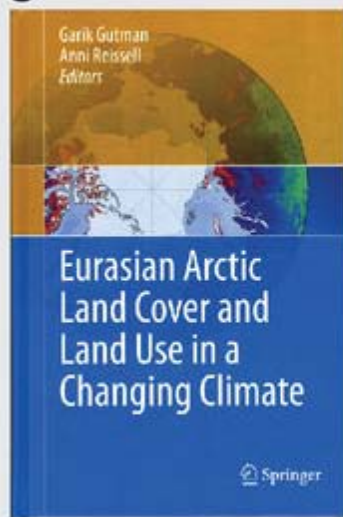


Darmenova et al. 2009; *JGR*.



Kicklighter et al. 2014; *ERL*.

The latest (present phase 3) NEESPI research foci consist from integrated assessments and projections and include a synergy of the knowledge gained from the analyses of the regional observational databases and from the development of and experimentation with regional Earth system modeling tools. **In particular, in the last 3 years, four review books summarized knowledge of the regional Earth System status and dynamics.**



Book about the changes in Central Asia (~2015)

NEESPI Success Metrics

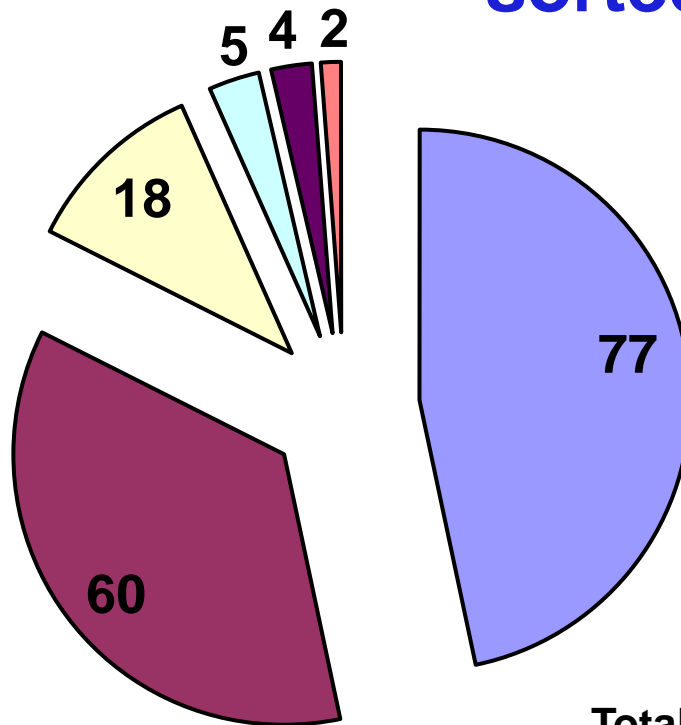
- NEESPI Project achievements are published and summarized in overview articles and books
- **Bridging, infilling the holes in the regional research activities**
- Preparation of a new breed of early career scientists who defended their PhD theses while working on North Eurasia and Arctic studies
- **Advances in building of the North Eurasian Modeling Suite**

NEESPI Statistics

- Throughout its duration, NEESPI served and is serving as an umbrella for **167 individual research projects (always with an international participation)** with an annual budget close to 15 million US dollars (cf., the next Figure, where international NEESPI projects are grouped by the major national funding source). More than **750 scientists from more than 200 institutions of 30 countries** worked or are working under the Initiative umbrella.
- In 2014, we anticipate a new generation of NEESPI projects funded in Russia (Ministry of Education and Science, RAS), the United States (NSF, NASA), China, and Europe.

Completed and ongoing NEESPI Projects by country (or group of countries), April 2014

sorted by funding source



Total 166 Projects

■ All US Agencies

■ All Russian Agencies

■ All EU Agencies

■ All Japanese Agencies

■ All Chinese Agencies

■ Canada

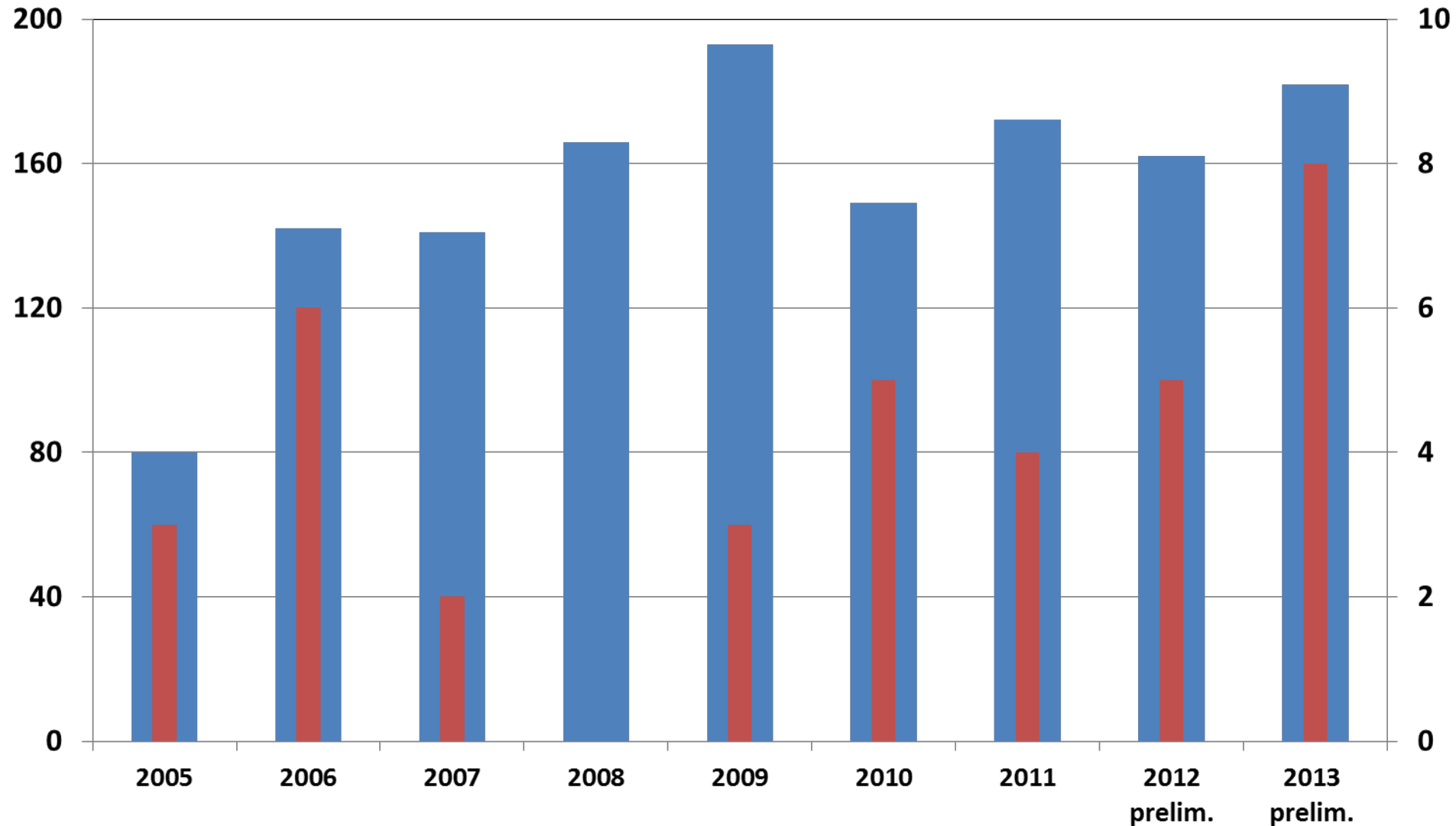
NEESPI publications by year

Papers

Peer-reviewed publications

Books

Books



NEESPI Outreach, <http://neespi.org>

- After the First NEESPII Science Team Meeting (IIASA, Laxenburg, Austria, February 2006), ~**30** dedicated NEESPI Workshops and **19** NEESPI Open Science Sessions at the International Meetings were convened.
- **Two or more** Early Career Scientists Summer Schools per year were organized in the past six years (since 2009).
- During the Mega-Project life, more than **1370** papers and **31** books were published or are in press; their list is regularly updated at http://neespi.org/science/NEESPI_publications.pdf. In particular, since 2010, about **465** peer-reviewed papers and/or book chapters were published or are in press.
- More than **80 PhD students** defended their theses while working within the NEESPI framework.

Further NEESPI activities in 2014-15:

- Ongoing next *Environ. Res. Lett.* Special NEESPI Issue, ~60 confirmed contributors; 32 published papers.
- This Conference
- **December 15-19, 2014, San Francisco, USA.** Open NEESPI Session at the Annual Fall **AGU** Meeting; 42 abstracts
- **April 9-11, 2015, Prague, Czech Republic.** NEESPI Science Summation **Anniversary Workshop** and its Transition to the “*Northern Eurasia Future*”
- **April 12-17, 2015, Vienna, Austria.** Open NEESPI Session at the Annual **EGU** Assembly
- **April 20-23, 2015, Washington, DC.** NASA Carbon Cycle and Ecosystem Focus Area Science Team Meeting, Washington, DC
- **May 23-29, 2015, Makuhari, Japan.** Open NEESPI Session at the Annual **JpGU** Meeting

Future Earth: New global platform for sustainability research

- Rio de Janeiro, Brazil (14 June, 2014) — An alliance of international partners from global science, research funding and UN bodies, **launched a bold new 10-year initiative on global environmental change research for sustainability at the Forum on Science and Technology and Innovation for Sustainable Development.**
- *Future Earth* – research for global sustainability, will provide a cutting-edge platform to coordinate scientific research which is designed and produced in partnership with governments, business and, more broadly, society.

Goal: Interdisciplinary solution-oriented approach that will allow effective policy-making in environment management and control

MAIRS => Future Asia; BALTEX => Baltic Future; etc.

Latest Discussion: <http://www.eli.org/events/end-sustainability>

Transition Plans

Large NEESPI Workshop *in Prague, Czech Republic; spring exact dates TBD, 2015* where:

- We shall develop of the *Future Northern Eurasia* Program that will be built upon NEESPI and
- Outline the integrative book (Springer Publ. House) that will summarize major NEESPI results

Major NEESPI Science question remains intact:

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

But it is the time to expand this academic curiosity question “how?” to another, more practical:

- What will the changes in this ecosystems dynamics and interactions mean for the societal well-being, activities, health, and strategic planning?**

Ten Research Foci emerged in discussions within the NEESPI community during the past 12 months making the following list:

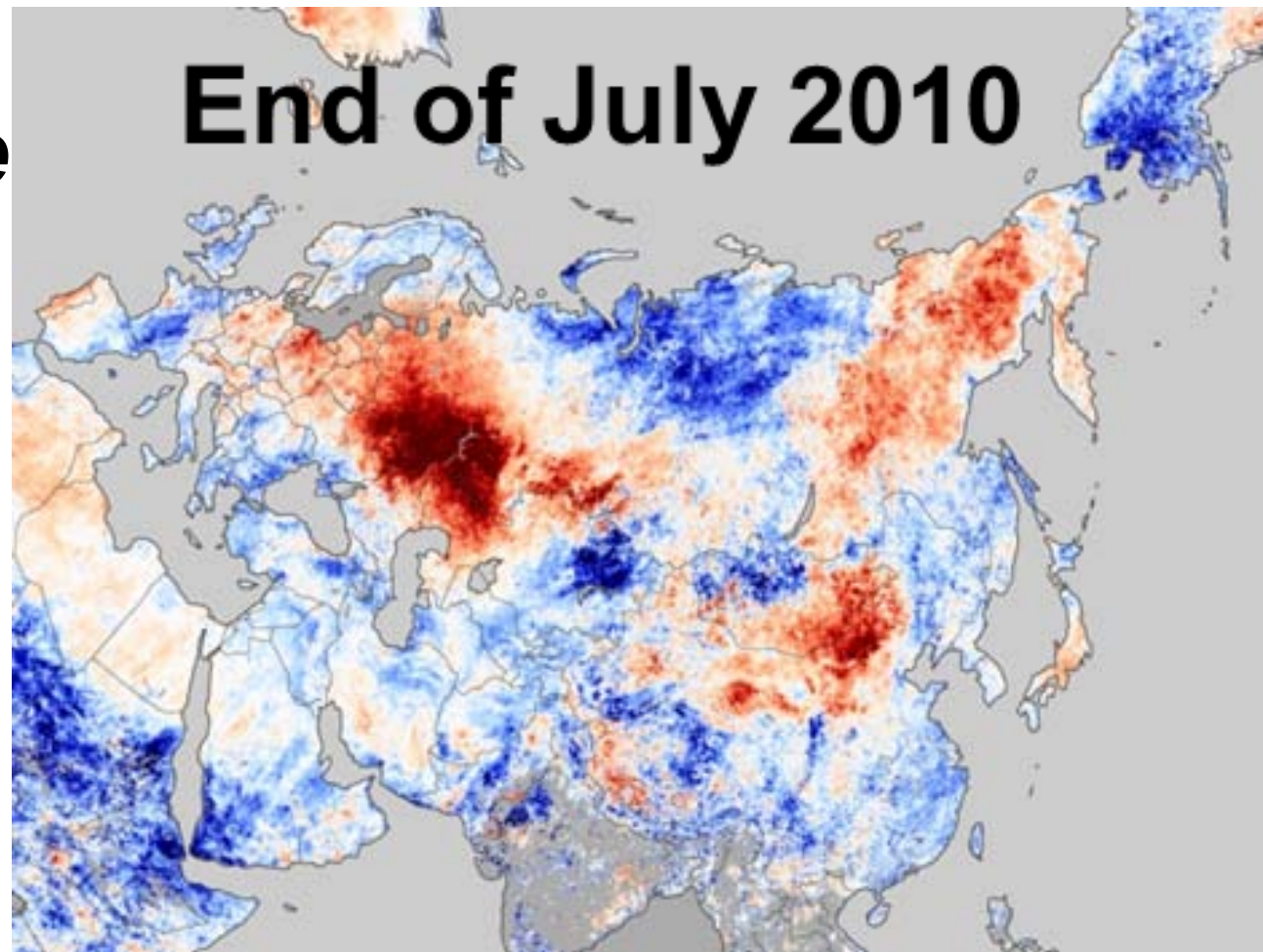
Group 1

1. Increasing frequency and intensity of **extremes** (intense rains, floods, droughts, and wild fires)
2. Global change and, in particular, **warming of the Arctic**
3. Retreat of the **cryosphere**: snow cover, sea and ground ice
4. Changes in the terrestrial water cycle; quantity and quality of **water supply** available for societal needs)
5. Biosphere changes (**ecosystem shifts**; changes in the carbon cycle; land cover, desertification and dust storms)

New Challenges

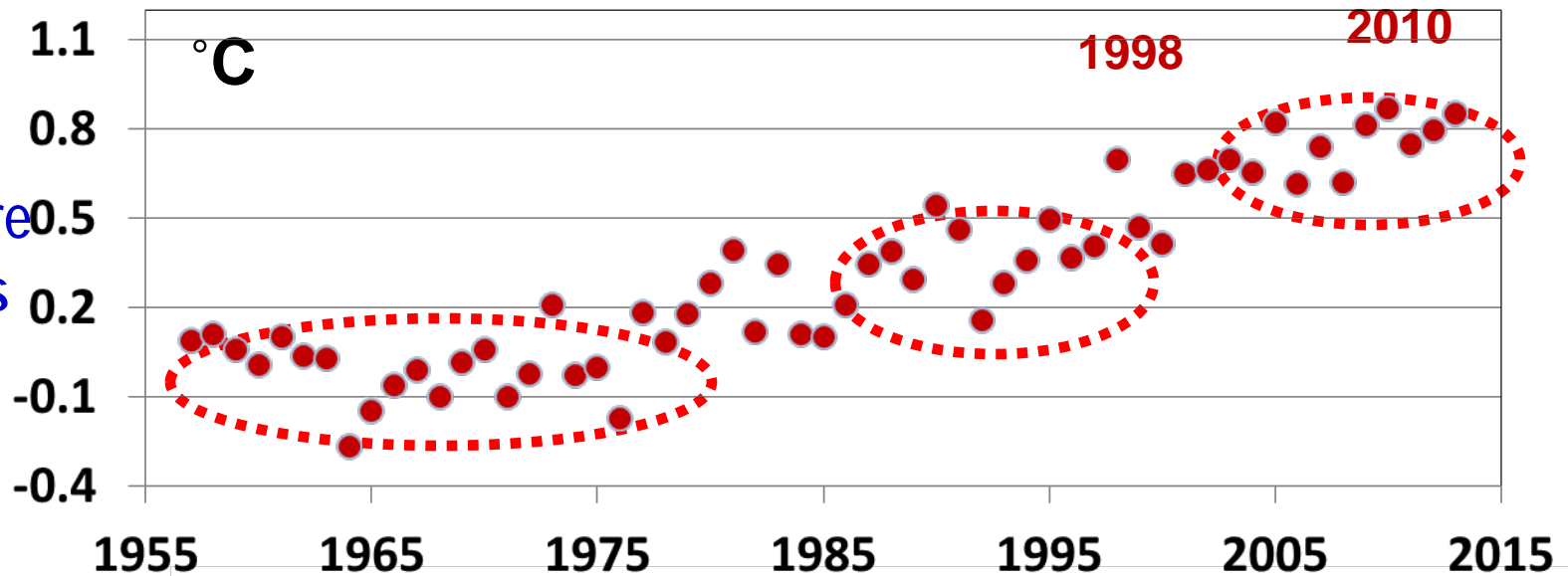
- a. **Extremes: Mechanisms of extremes in changing climate and environment.**

***Temperature
Anomalies:***

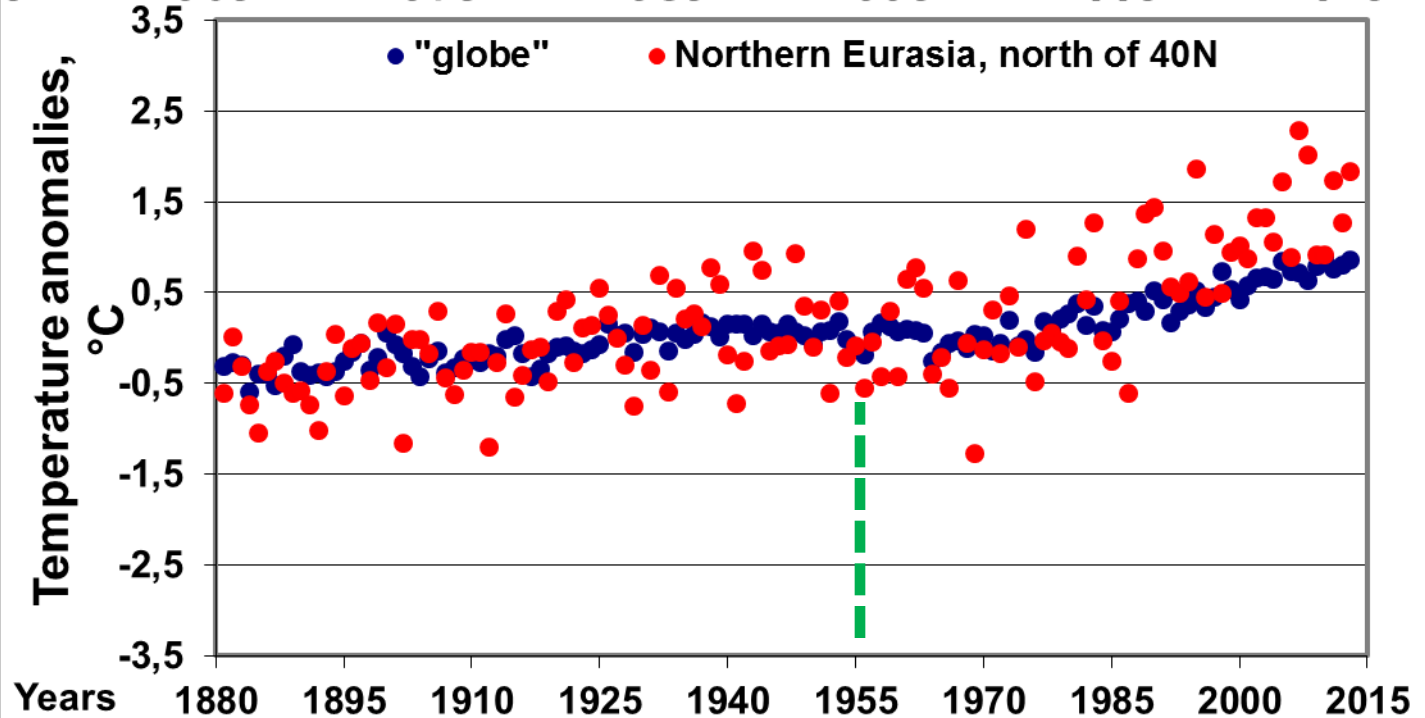


Global Annual Surface Air Temperature Anomalies, °C

Global
temperature
anomalies



Rates of increase of annual temperature for the "globe" (60°S to 90°N) and Northern Eurasia are 0.91 °C/130 yr and 1.5°C/130yr respectively (Lugina *et al.* 2007, updated).

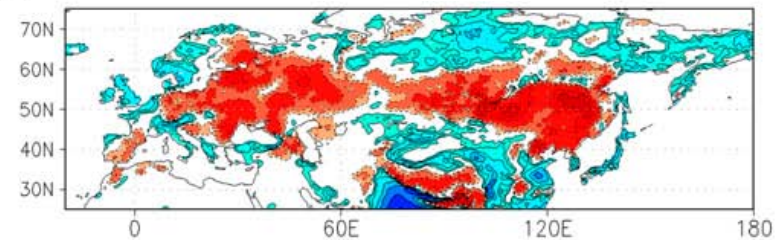
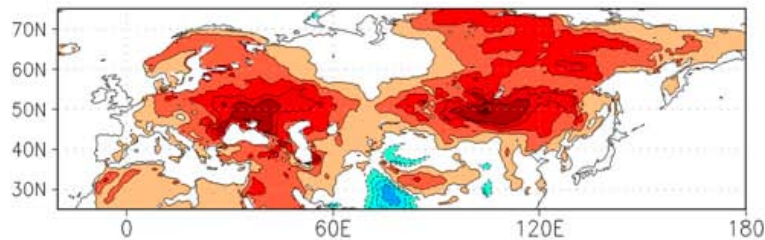


Differences of long-term summer (JJA) means between 1996-2011 and 1980-1995 periods (Schubert et al. 2014)

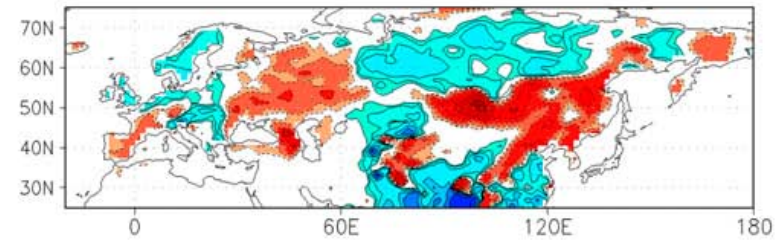
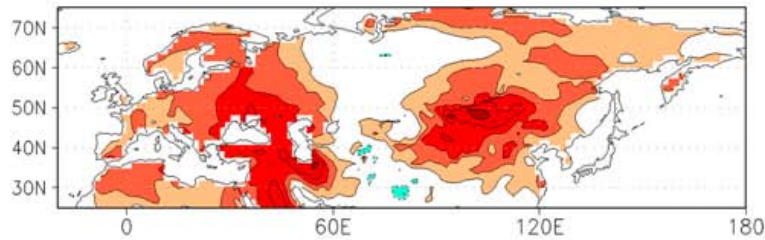
Surface air temperature

MERRA

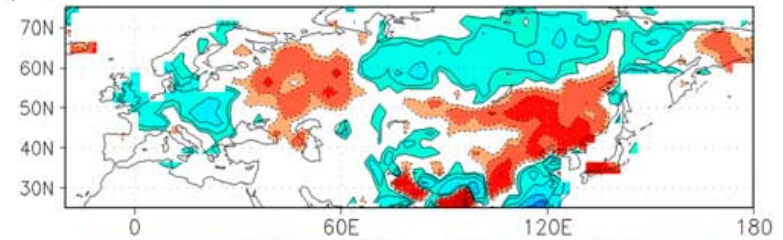
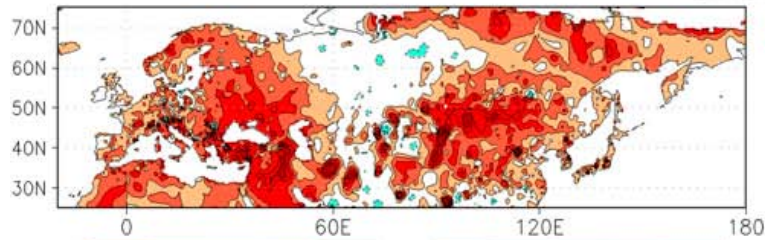
Precipitation



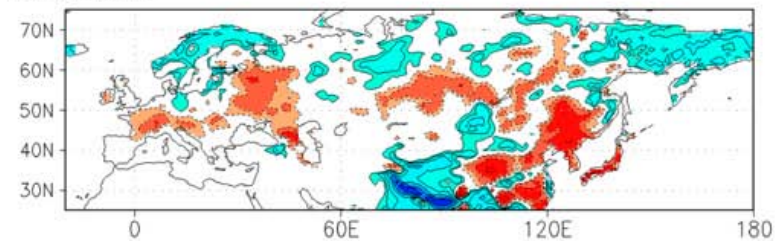
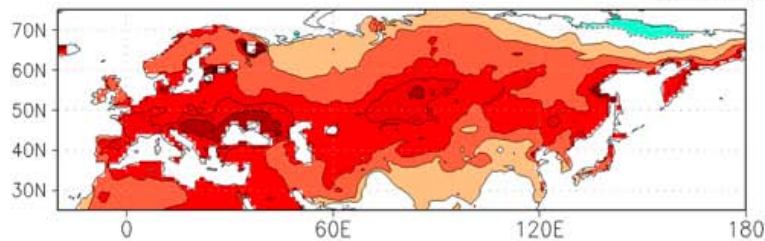
ERA_Interim



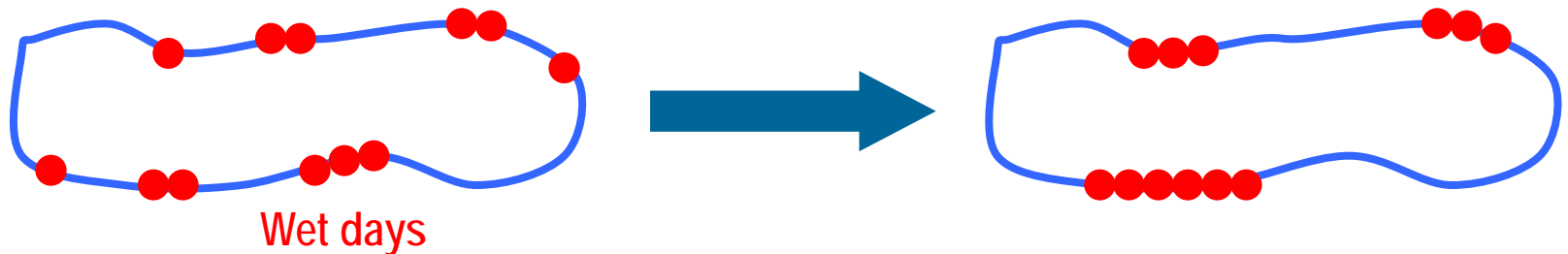
GHCN_CAMS/GPCP



GEOS5_AMIP EnsMean



Beads with a fixed number of stones illustrate how we can have in the same region simultaneously increases in prolonged Wet Day and Dry Day Periods even with unchanged precipitation totals (design by O.G. Zolina).



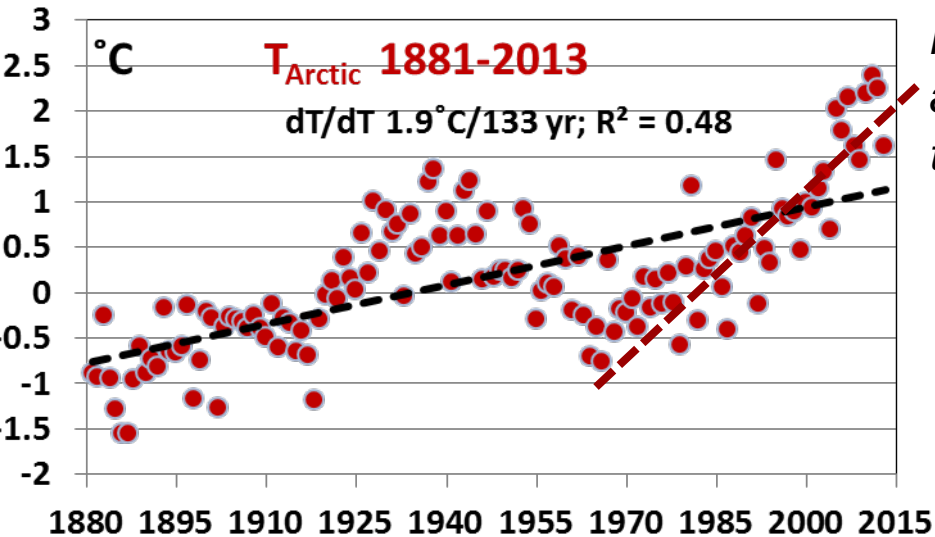
New challenges

a. Extremes.

b. Global impact of the

Arctic warming:

Annual surface air temperature anomalies area-averaged over the 60°N - 90°N latitudinal zone

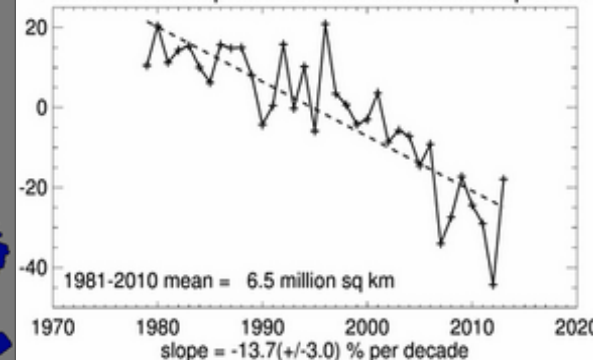


Northern Hemisphere sea ice extent as of mid-September 2012 and September sea ice extent anomalies, %



One of the first UCMO GCM sensitivity experiments with polar ice replaced by water at 0°C. Changes in January surface air temperature, °C (Newson 1973).

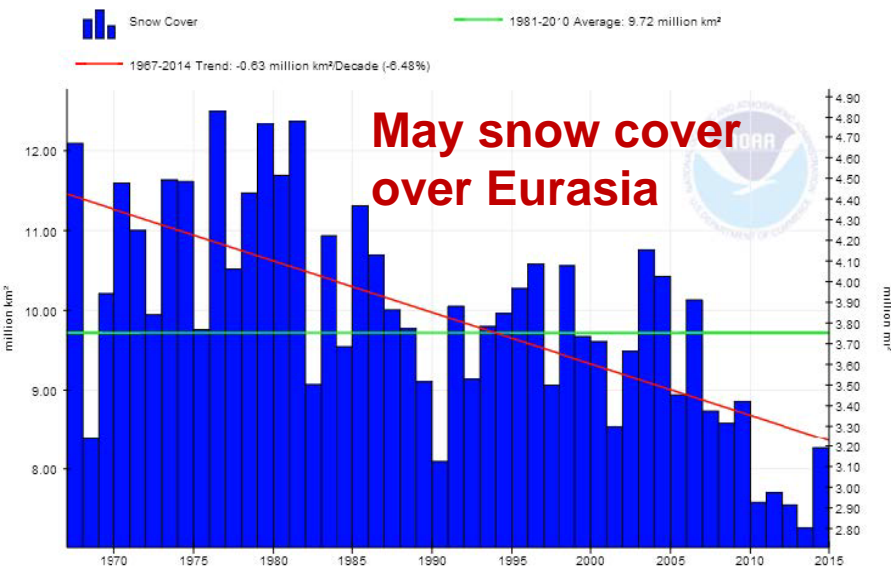
September 1979-2013 anomalies, %



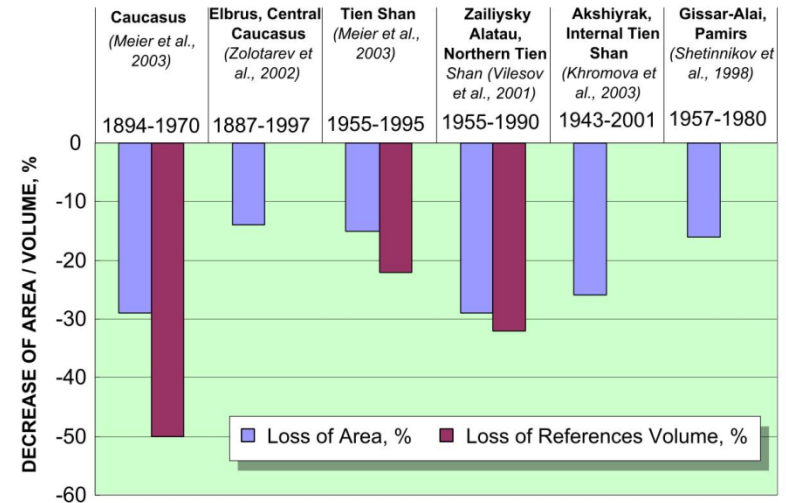
Source: U.S. National Snow & Ice Data Center, Boulder, Colorado, USA

New Challenges: c. Cryosphere retreat

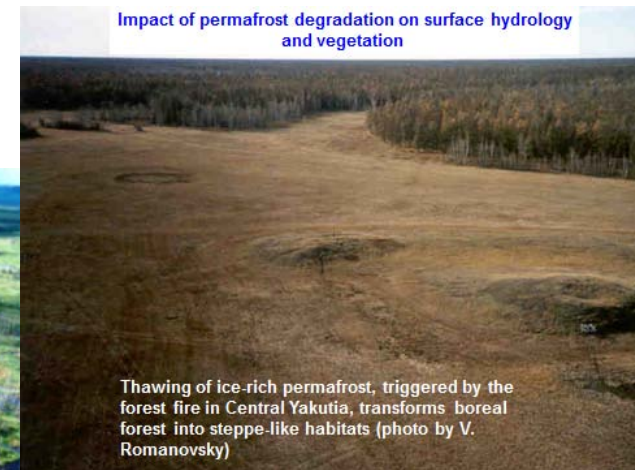
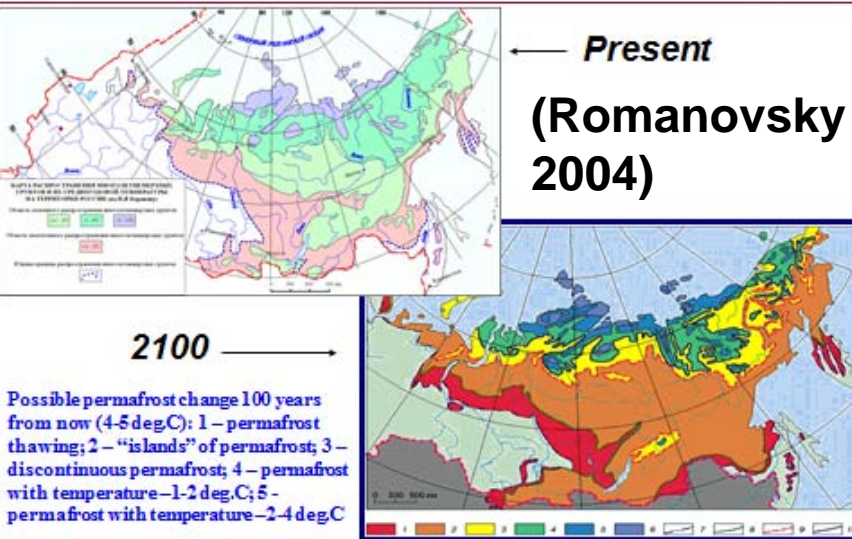
May Eurasia Snow Cover Extent (1967-2014)



LONG-TERM CHANGES IN AREA AND VOLUME OF GLACIERS
IN SELECTED MOUNTAIN REGIONS



Projected changes of Permafrost



Continuation of the list

Group 2

6. Pressure on agriculture and pastoral production (growing supply demand, changes in land use; food security)
7. Changes in infrastructure (roads; new routes; construction codes; air, water, and soil pollution; strategic planning)
8. Societal actions to mitigate negative and benefit from positive consequences of environmental changes
9. Assessment / Quantification of the role of Northern Eurasia in the global Earth and Socioeconomic systems

Group 3

10. Using newly available advanced research tools
 - (a) Observations (e.g., GPM)
 - (b) Models (e.g., new ESMs)

FOR MORE INFORMATION SEE THE NEESPI WEB SITE:

<http://neespi.org>



(COURTESY PHC)



Side Note:

***“NEESPI” is pronounced
approximately like the
Russian phrase for***

“Don’t sleep”

Northern Eurasia Earth Science Partnership Initiative

谢谢!

Thank you!

Спасибо!

Challenges

- International and interagency collaboration
 - Data exchange (insufficient)
 - Joint funding (still problems)
 - Language barriers (need investments)
- Support of early career scientists
- Insufficient interdisciplinary collaboration
 - *Specialist is like gumboil, his fullness is one sided*
- Only in the last years NEESPI began receive substantial support from inside the domain
- New in 2014 and thereafter: **Political issues**