Overview of the current status of the Northern Eurasia Earth Science Partnership Initiative (NEESPI): Why contemporary climatic changes in Northern Eurasia force us to be expedient in our research

Pavel Groisman

UCAR Project Scientist at NOAA National Climatic Data Center, Asheville, North Carolina, USA

Vladimir M. Kattsov

Main Geophysical Observatory, St. Petersburg, Russia

Richard G. Lawford

International GEWEX Office, Silver Spring, Maryland, USA

Recognition

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

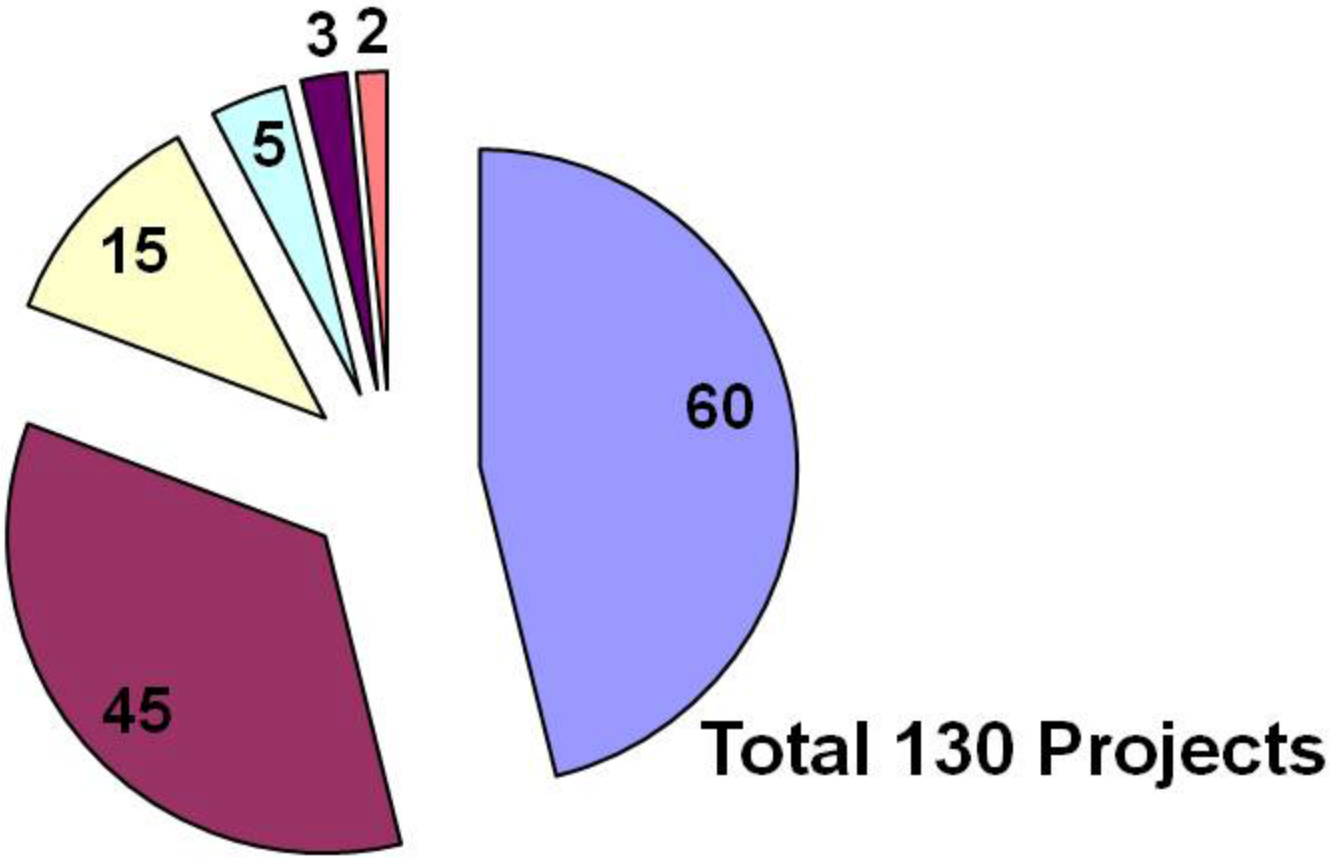
NEESPI duration ~ 10 years (started in 2004)

Current NEESPI Statistics (March 2009):

More than 560 scientists from more than 200 institutions of 30 countries are working on 130 individual funded projects under the Initiative umbrella (with annual budget ~$15M), several more projects are in the process of joining NEESPI, including a new crop of 15 NASA NEESPI projects awarded in February 2009.

Additionally, NEESPI receives in kind assistance from EU, US, Russian, Chinese, Japanese, Ukrainian and International Agencies and Institutions.

NEESPI Projects by country; Dec. 31, 2008



Newly-funded (Feb. 2009) NASA LCLUC NEESPI-related for Russia. Large proposals ($700 to 1100 K per 3 yr)

P.I.	Institution	Title
Walker	University of Alaska	Adaptation to Rapid Land-Use and Climate Changes on the Yamal, Russia
Zhuang	Purdue University	Changes of Land Cover and Land Use and Greenhouse Gas Emissions in Northern Eurasia
Conard	US Forest Service	The Influence of Changing Forestry Practices on the Effects of Wildfire; Interactions between Fire and Changing Climate in Central Siberia
de Beurs	Virginia Polytechnic Institute	Land Abandonment in Russia: Assessing Future Vulnerability and Adaptation to Changing Climate and Population Dynamics

Projects with with focus on Siberia are marked in red

Newly-funded (Feb. 2009) NASA LCLUC NEESPI-related for Russia. Small proposals (~ $300K per 3 yr)

P.I.	University	Title
Knyazikhin	Boston University	Remote sensing of forest structure across multiple scales from leaves to canopies and stands (Fennoscandia)
Radeloff	U. Wisconsin	Land use change, protected areas, and biodiversity in the Caucasus and Ural Mountains (Russia)
Krankina	Oregon State U.	Contribution to studies of LCLUC in Northern Eurasia
Hughes	U. Arizona	Response of forest growth to climate variability and change: remotely-sensed and in situ data for European Russia
Saatchi	U. California, LA	Impacts of Land Cover and Land Use Change on Water and Energy Cycle in Caspian Sea Drainage Basin
O'Neal	U. Delaware	Field and Remotely Sensed Data for Improved Characterization of Permafrost Landscapes in the Russian Arctic
Lettenmaier	U. Washington	Assimilation of tower and satellite-based methane observations for improved estimation of methane fluxes over Northern Eurasia

During the past 13 months we have seven large NEESPI gatherings:

- **June 2-6, 2008, Helsinki, Finland. Regional NEESPI Science Team Workshop "Environmental and Climate Change in High Latitudes of Northern Eurasia** (51 presentations)
- **August 23-28, 2008, Odessa, Ukraine. Regional NEESPI Science Team Workshop "Regional aspects of climate-terrestrial-hydrologic interactions in non-boreal Eastern Europe"** (49 presentations)
- **15-19 December 2008, San-Francisco, USA. NEESPI Session at the Annual Fall AGU Meeting** (47 presentations)
- **4-6 March 2009, St. Petersburg, Russia. NEESPI programmatic Workshop "Hydrological application of changes in land cover/use, water management and climate across Northern Eurasia"** (20 presentations)
- **April 20-23, 2009, Vienna, Austria. NEESPI Session at the EGU General Assembly 2008.** (~ 60 presentations)
- **April 24, 2009, Sopron, Hungary. First Consultative Workshop of the Regional NEESPI Research Center for Non-boreal Southeast Europe**
- **and, finally,**
- **July 14-15, 2009, Krasnoyarsk, Russia. This Workshop**

Future NEESPI Meetings plans:

Sept. 9-15 2009 in Bishkek, Kyrgyzstan. The next Regional NEESPI Event devoted to High Elevation Studies (summer school, and two workshops)

-

NEESPI Sessions at the **Annual Fall AGU Meeting (Dec. 2009, San Francisco, California, USA)** and at the **Annual EGU Assembly (May 2010, Vienna, Austria)** are projected

Two NEESPI-MAIRS Meetings in China are planning for the next 12 months

June 8-12, 2010, Oslo IPY Conference will have a **NEESPI Session**

June 14-18, 2010, Miedzyzdroje, Wolin Island, Poland**. The 6th Study Conference on BALTEX. NEESPI is co-sponsoring the Conference**

NEESPI Outreach, http://neespi.org

During the past 3 years, 23 dedicated NEESPI Workshops and 6 NEESPI Open Science Sessions at the International Meetings were convened and more than 350 papers and books were published (the total number of publications exceeds 500).

In April 2007: 1st Special NEESPI issue (13 papers) in *Global and Planetary Change*

In December 2007: 2nd NEESPI Special issue in *Environmental Research Letters* (15 papers)

In April 2009. Book **"***Regional Aspects of Climate-Terrestrial-Hydrologic Interactions in Non-boreal Eastern Europe"* Groisman and Ivanov (Eds.) published by Springer Verlag.

In May 2009. An overview NEESPI paper in *Bull. Amer. Meteorol. Soc.*

Current situation:

- Two more books are *in press*.
- Submissions of papers to the 3rd NEESPI Special issue in *Environmental Research Letters* is open (we anticipate that ~**40 papers** will be submitted)

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***

First phase foci of NEESPI were monitoring and analyses. **After the NEESPI Workshop in August 2007 at the Aspen Global Change Institute, a new course was accepted towards strengthening of the NEESPI research focus on projections...**

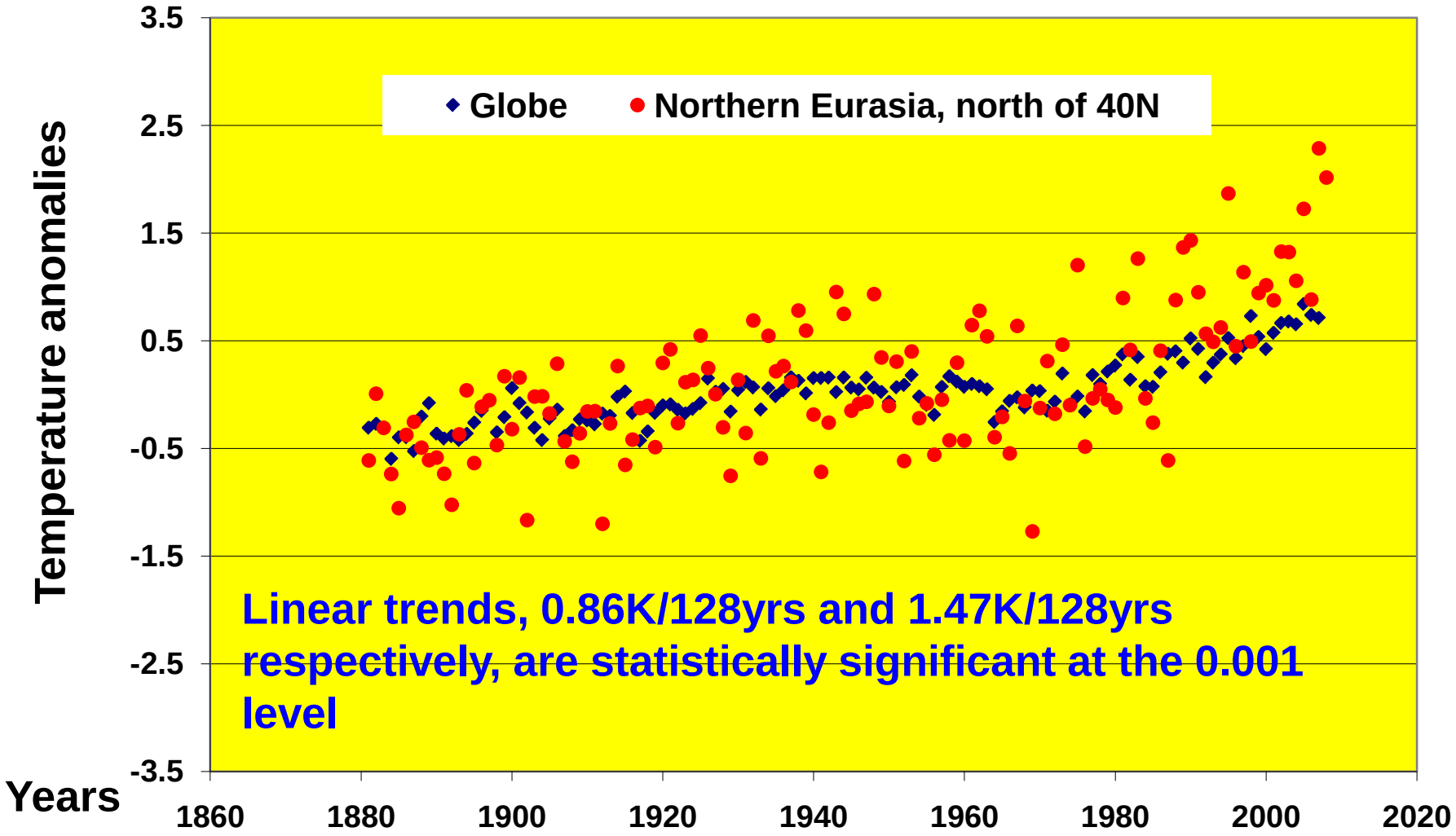
i.e., focus on modeling…

Part 2. Why contemporary climatic changes in Northern Eurasia force us to be expedient in our research?

Firstly,

- **Changes are accelerating, particularly, in Siberia!**

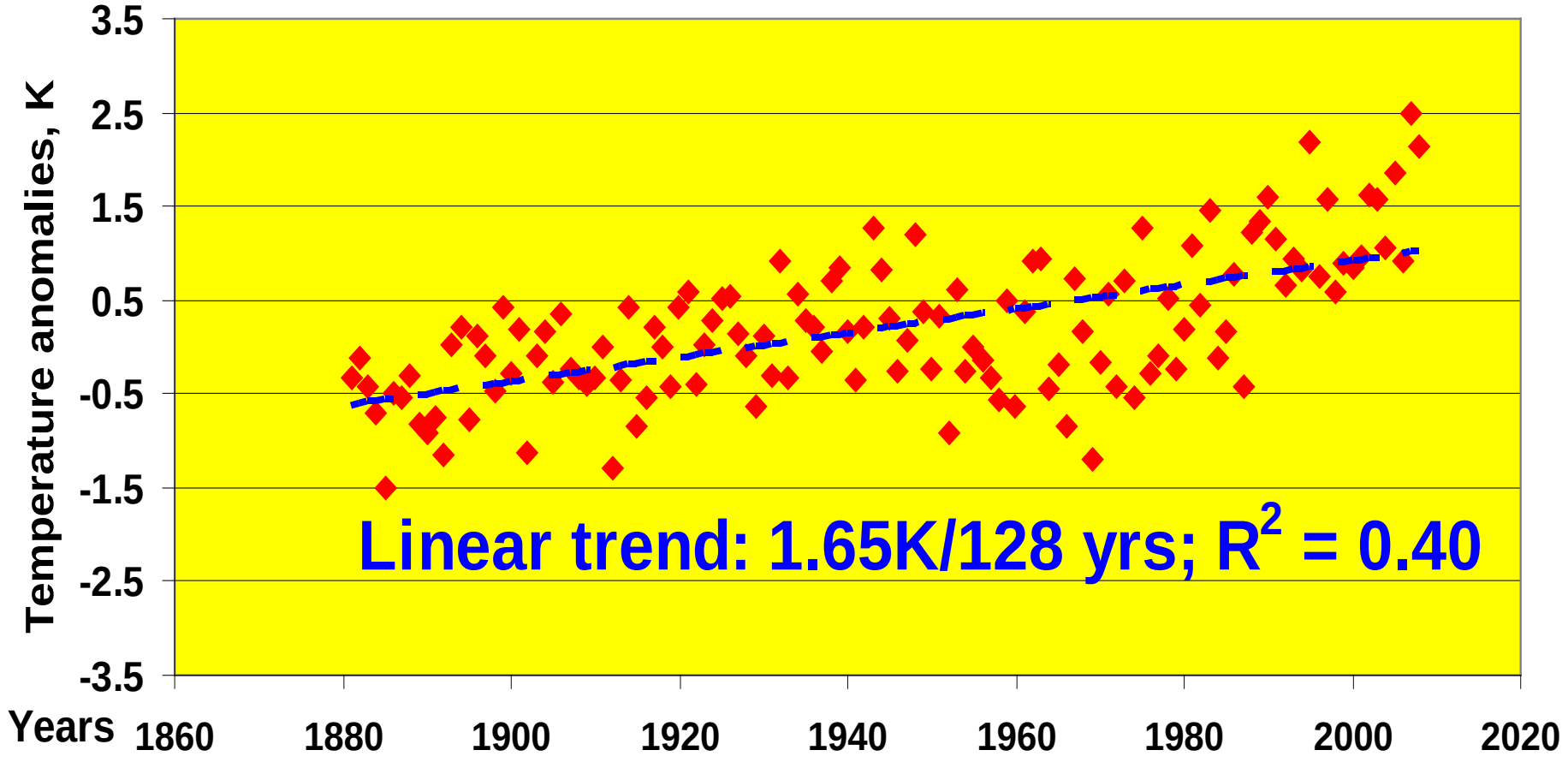
Global (latitudinal zone from 60°S to 90°N) and Northern Eurasia (north of 40° N) surface air temperature anomalies, 1881-2008



(Archive of Lugina et al. 2007 updated).

Northern Asia, north of 40°N. 1881-2008.

Surface air temperature anomalies from the 1951-1975 reference period

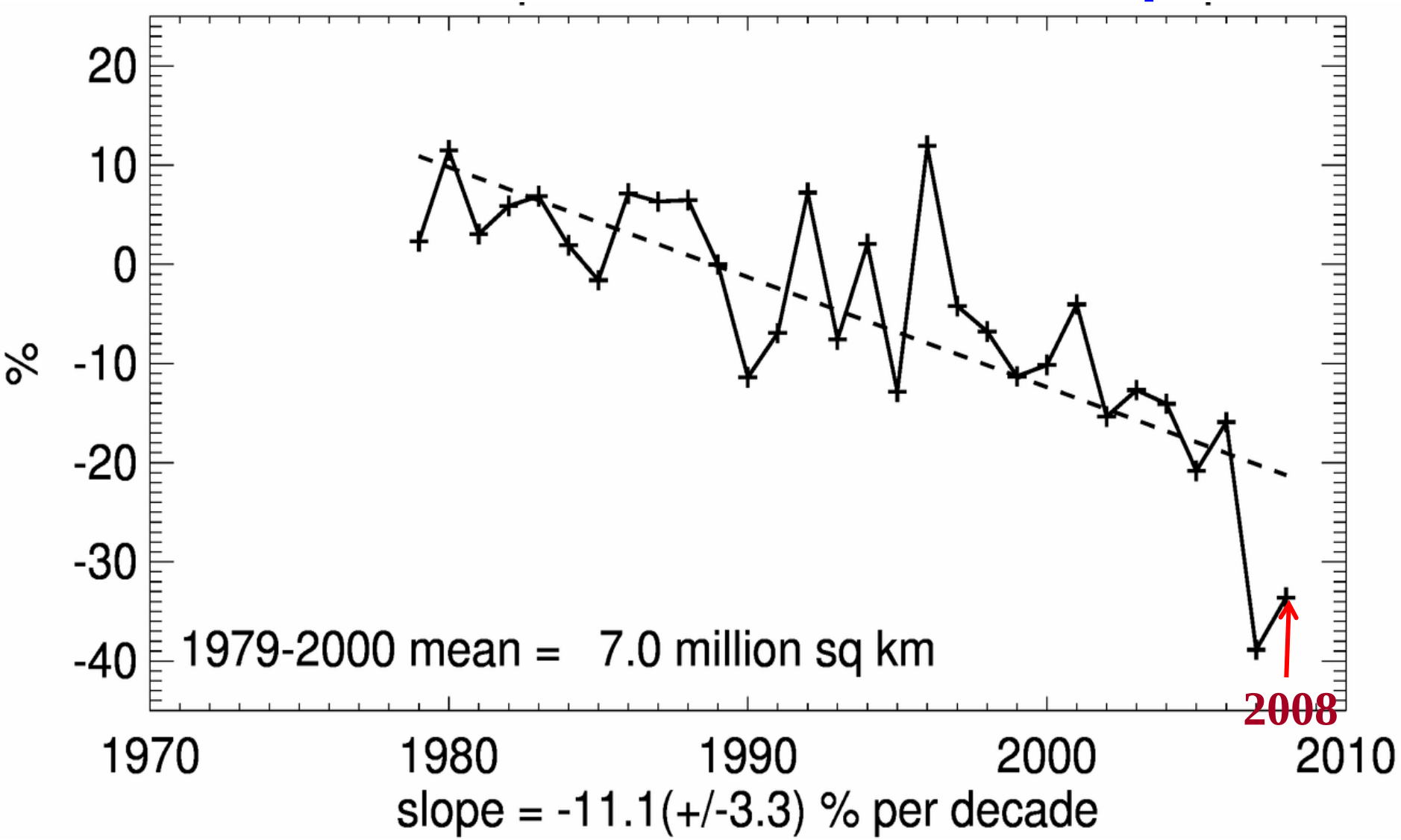


During the past twenty years, all anomalies were above 0.5K and eight of them were above 1.5K. Year 2007 showed a record anomaly of 2.5K.

Secondly,

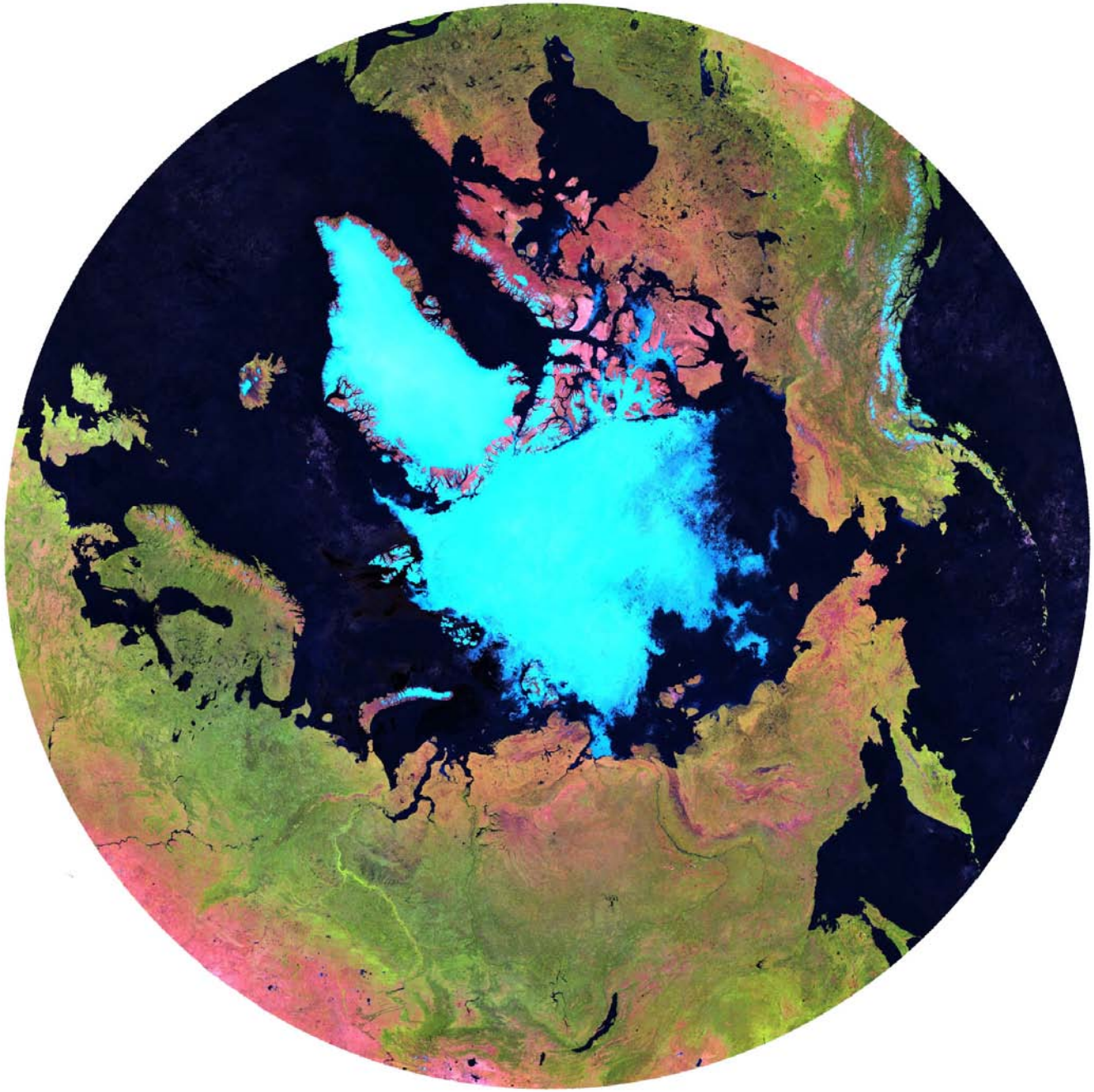
- We are facing a non-linearity in environmental and climatic changes in Northern Eurasia right now due to
  - Dramatic retreat of the Arctic sea Ice that is causing
    - rampaged coastal erosion (up to 10 m yr^{-1})
    - release of carbon (both, methane and CO_2) stored in the frozen shelf and coast (Shakhova et al. 2009), and
    - additional source of heat and moisture in early winter

Arctic Sea Ice Extent Anomalies, Sept., %

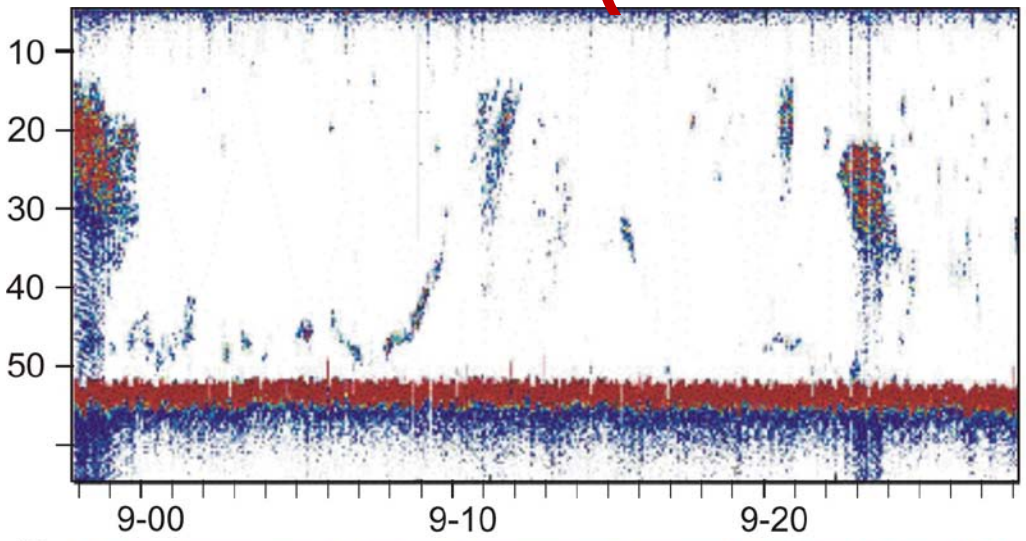


Courtesy of Dr. Florence Fetterer, NSIDC, Boulder, Colorado

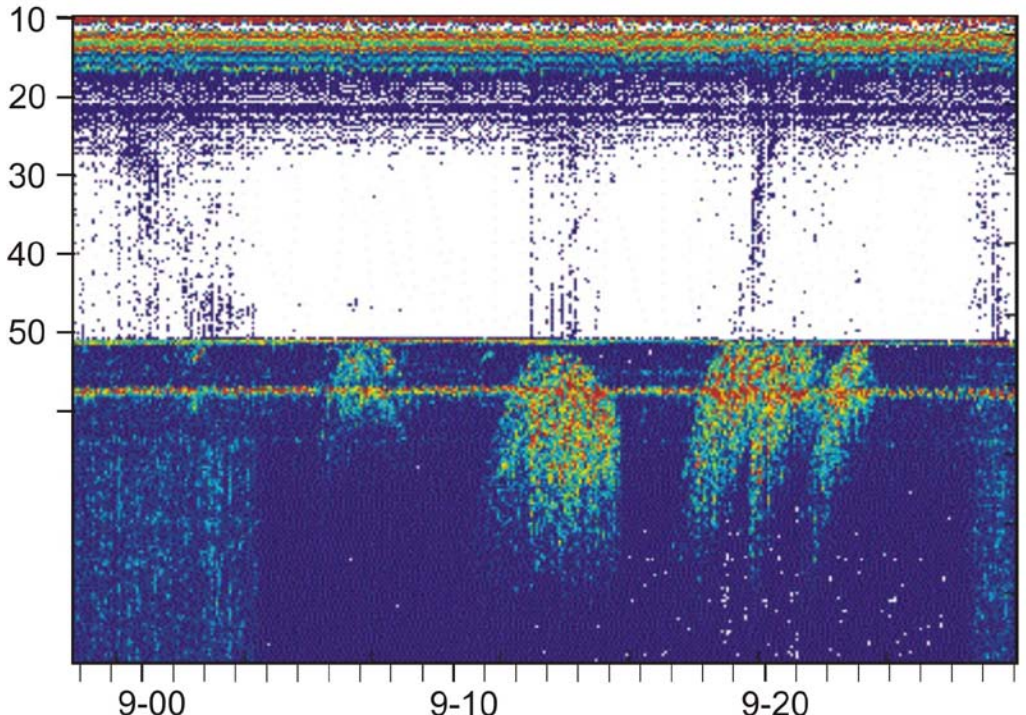
Terra-MODIS RGB, July-Sept 2008, 250 m resolution. Courtesy of Dr. Alexander Trishchenko, Chief, Canada Centre for Remote Sensing



Methane bubble release from the seabed in the East Siberian Sea (Shakhova et al. 2009).



Bubble clouds
in the water column



Gas-charged sediments
and bubble clouds
in the water column

Sea depth~50m

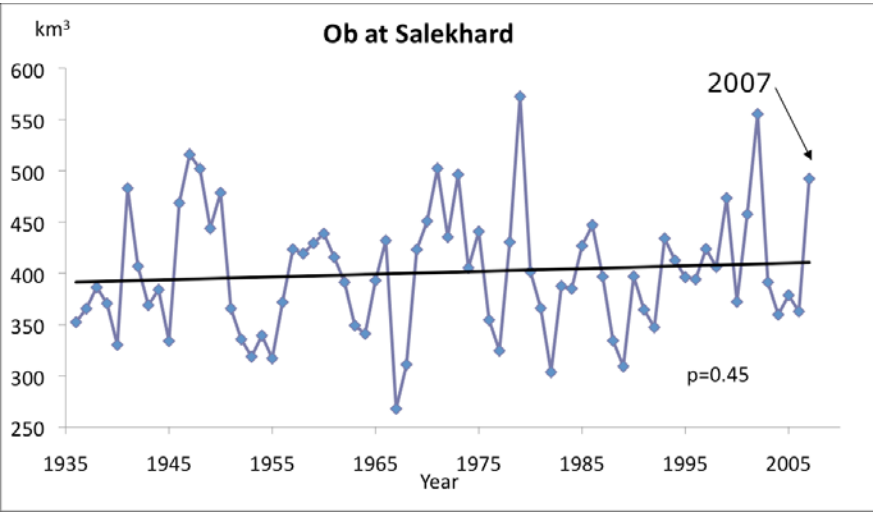
Secondly,

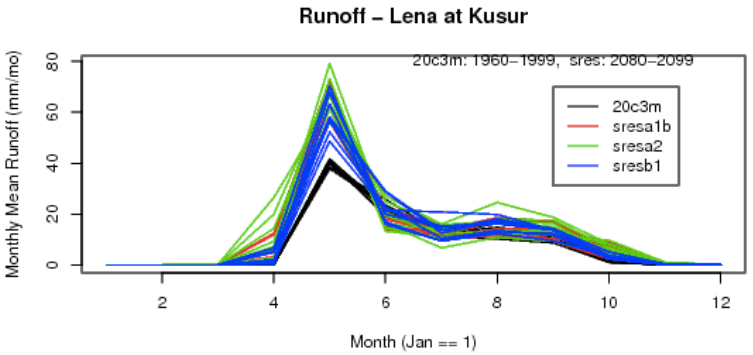
- We are facing a non-linearity in environmental and climatic changes in Northern Eurasia right now due to
  - Dramatic retreat of the Arctic sea Ice that is causing
    - rampaged coastal erosion (up to 10 m yr^{-1})
    - release of carbon (both, methane and CO_2) stored in the frozen shelf and coast (Shakhova et al. 2009), and
    - additional source of heat and moisture in early winter
  - Impact on the World Ocean thermohaline circulation due to changes in the fresh water inflow into the Arctic Ocean

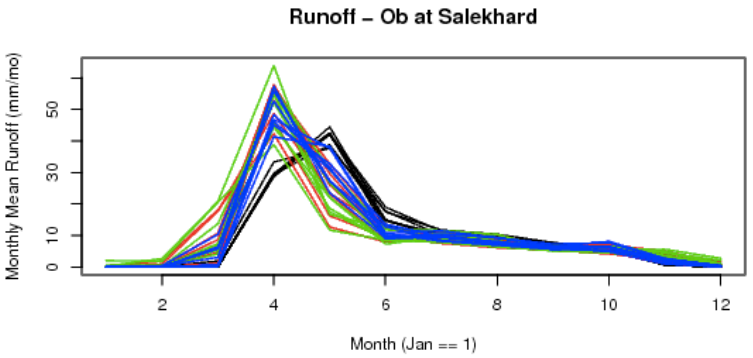
Pan-Arctic Ocean Drainage

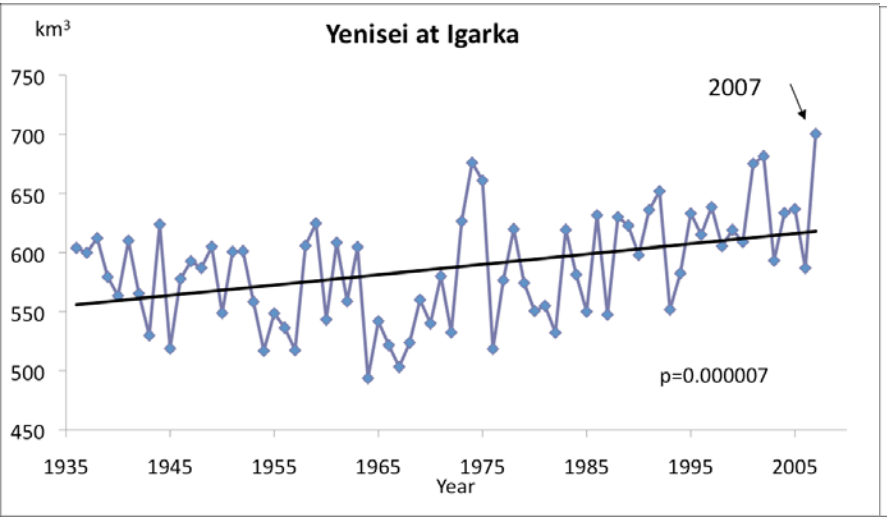
Runoff changes in the deltas of three major Siberian rivers. Observations and future projections

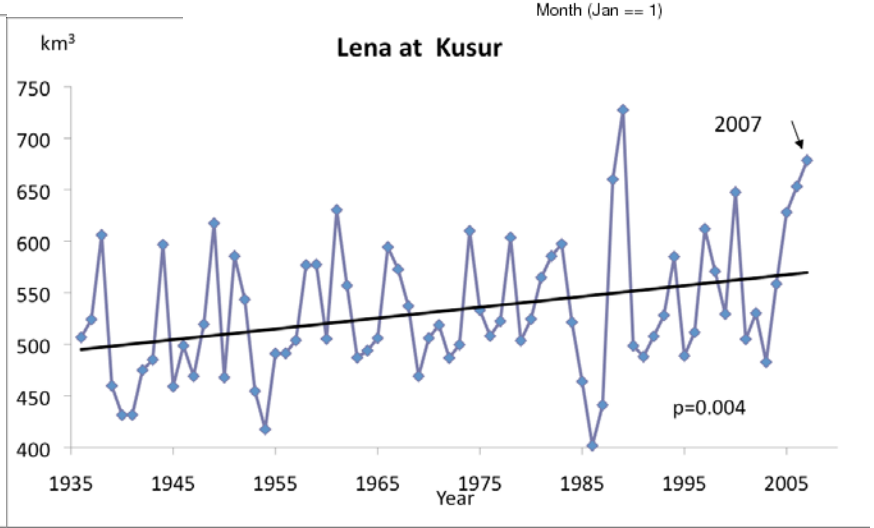
Lammers and Shiklomanov (2009)

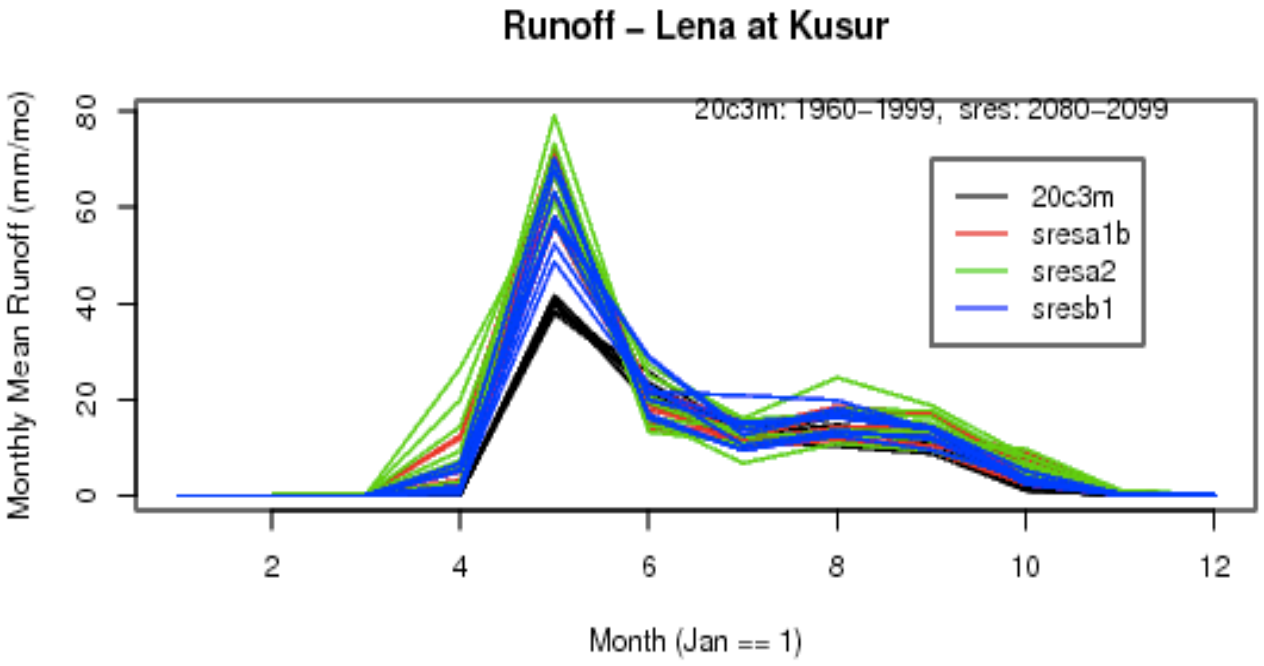


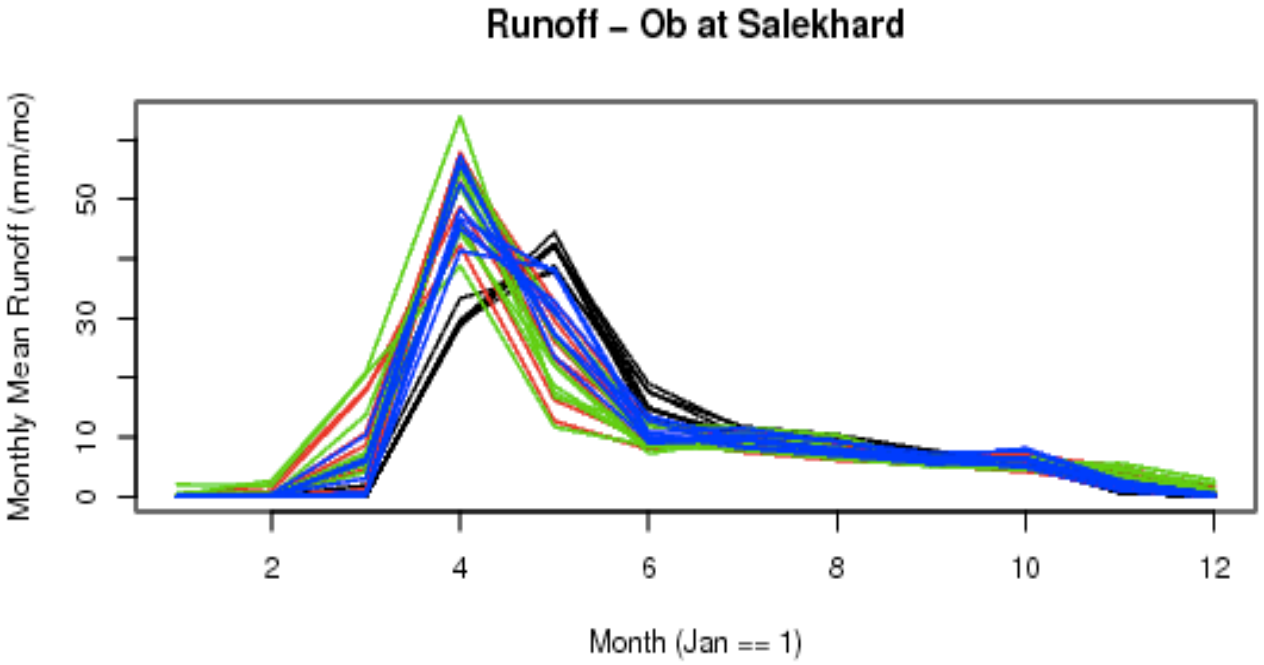










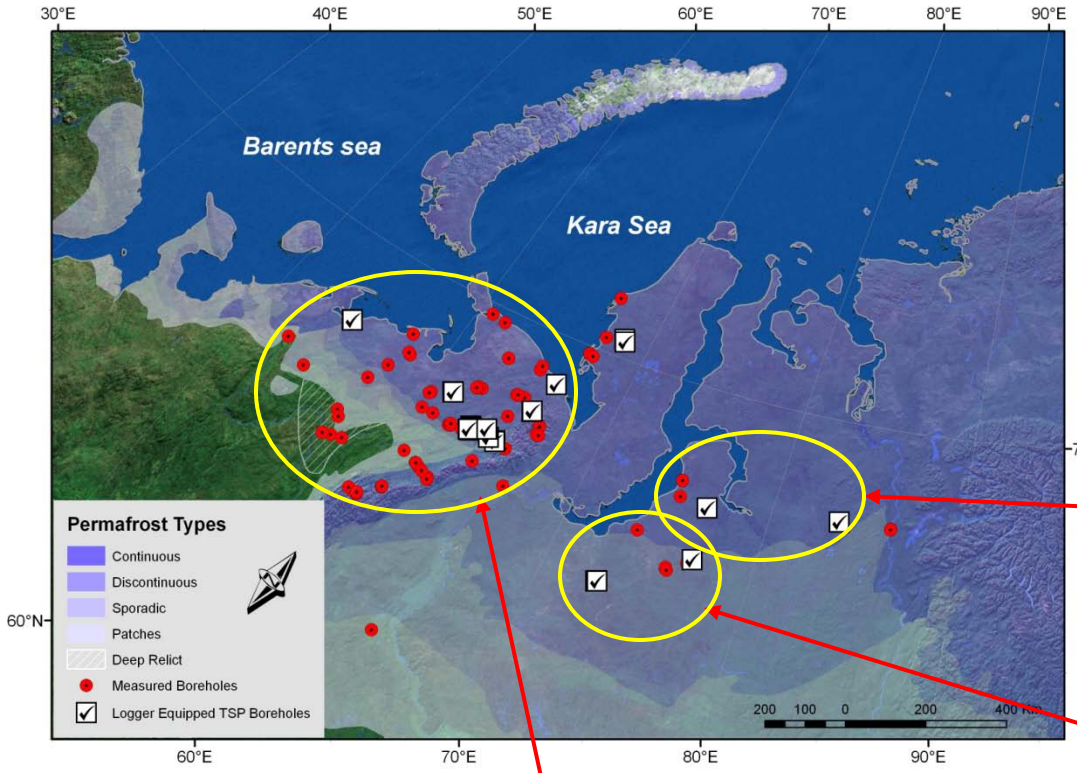


Projected runoff changes in the deltas of three major Siberian rivers. Observations (black lines) and future projections

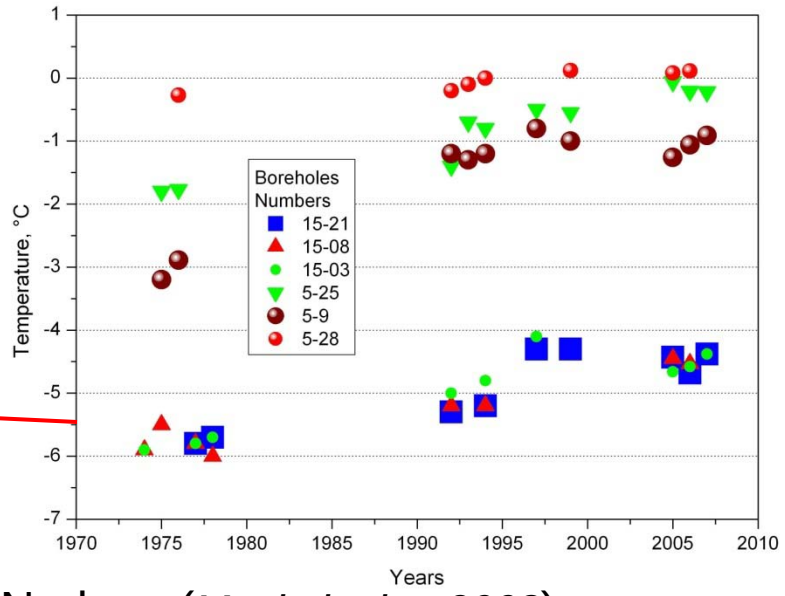
Lammers and Shiklomanov (2009)

Secondly,

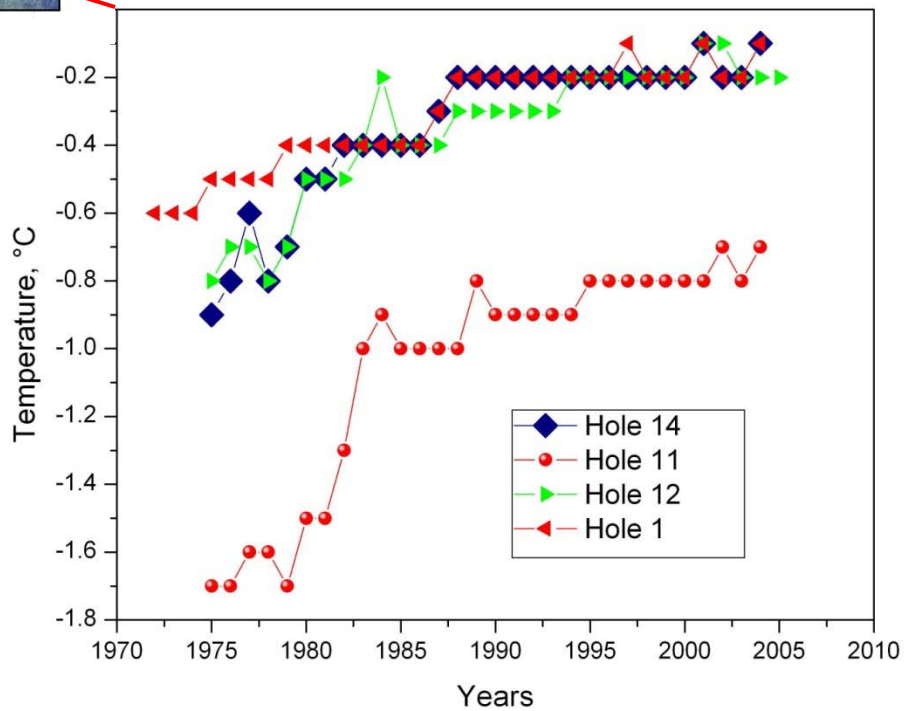
- We are facing a non-linearity in environmental and climatic changes in Northern Eurasia right now due to
  - Dramatic retreat of the Arctic sea Ice that is causing
    - **rampaged coastal erosion (up to 10 m yr^{-1})**
    - **release of carbon (both, methane and CO_2) stored in the frozen shelf and coast (Shakhova et al. 2009), and**
    - **additional source of heat and moisture in early winter**
  - Impact on the World Ocean thermohaline circulation due to changes in the fresh water inflow into the Arctic Ocean
  - Feedbacks to the global carbon budget and climate due to
    - **Permafrost thaw**
    - **Wetlands transformation**
    - **Land cover changes and**
    - **Ecosystems shift**



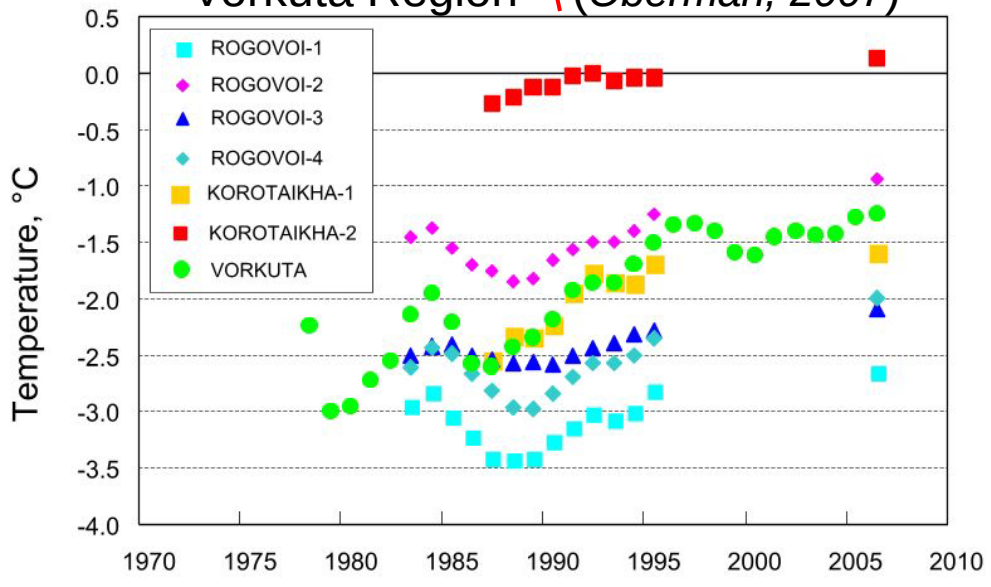
Urengoy (*Drozdov, 2008*)



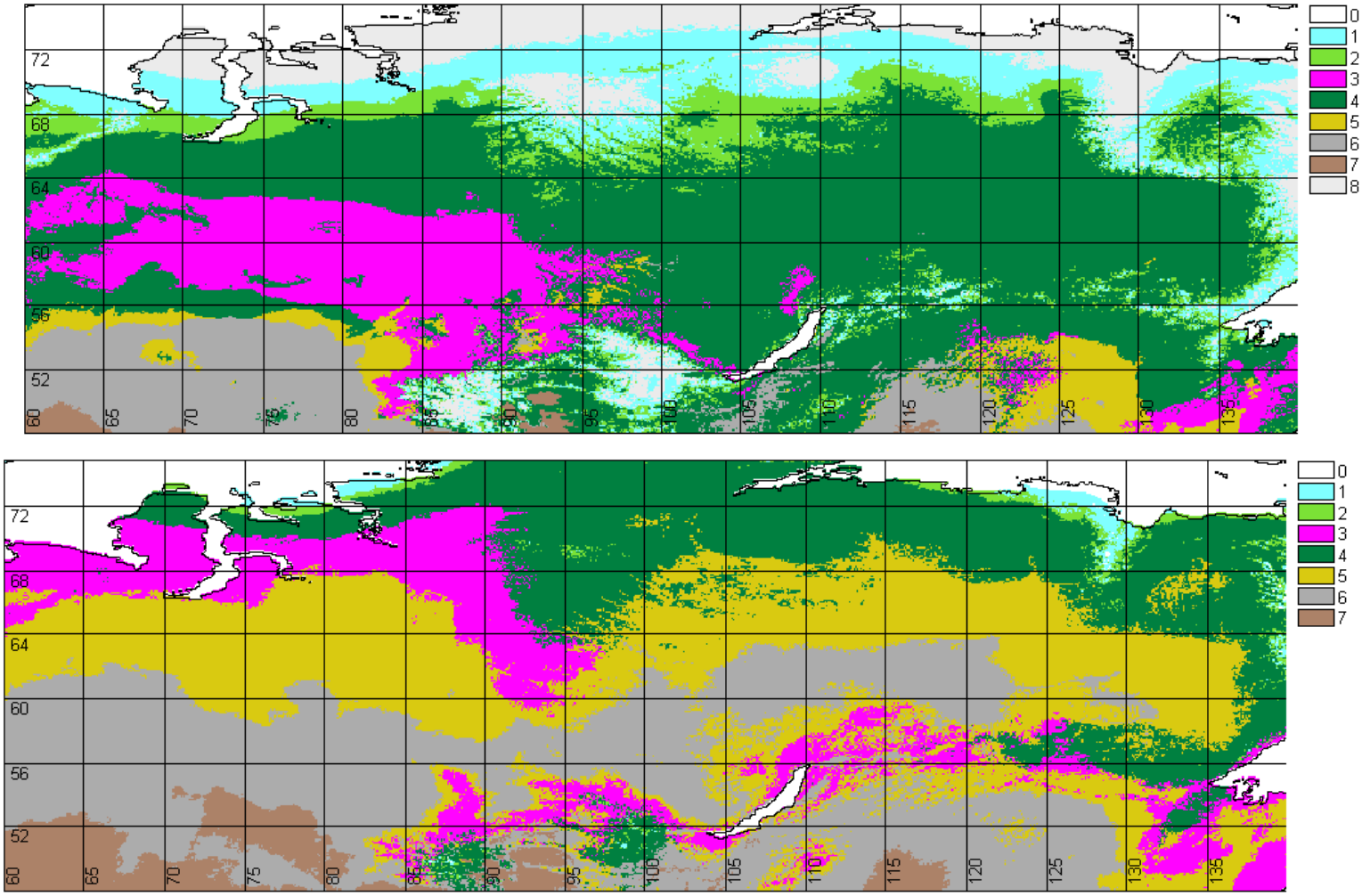
Nadym (*Moskalenko, 2008*)



Vorkuta Region (*Oberman, 2007*)



Biome distribution over Siberia in current (a) and 2090 (b) climates (Vygodskaya et al. 2007)



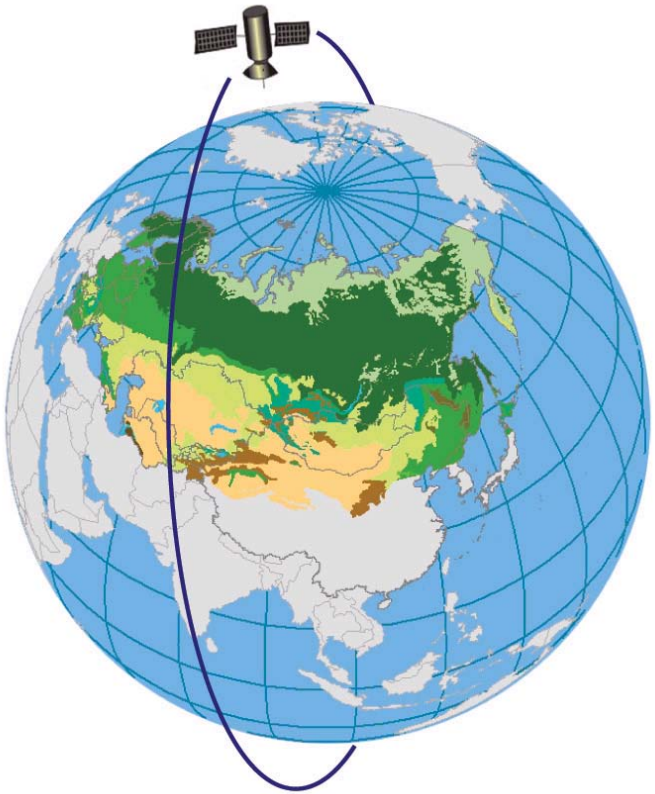
Water (0),Tundra (1), forest-tundra (2), darkleaf taiga (3) and lightleaf taiga (4), forest-steppe (5), steppe (6), semidesert (7), and polar desert (8).


Central Yakutia

Thus, it is better to hurry!

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