



**Federal Service for Hydrometeorology  
and Environmental Monitoring**



**VOEIKOV  
MAIN GEOPHYSICAL  
OBSERVATORY**

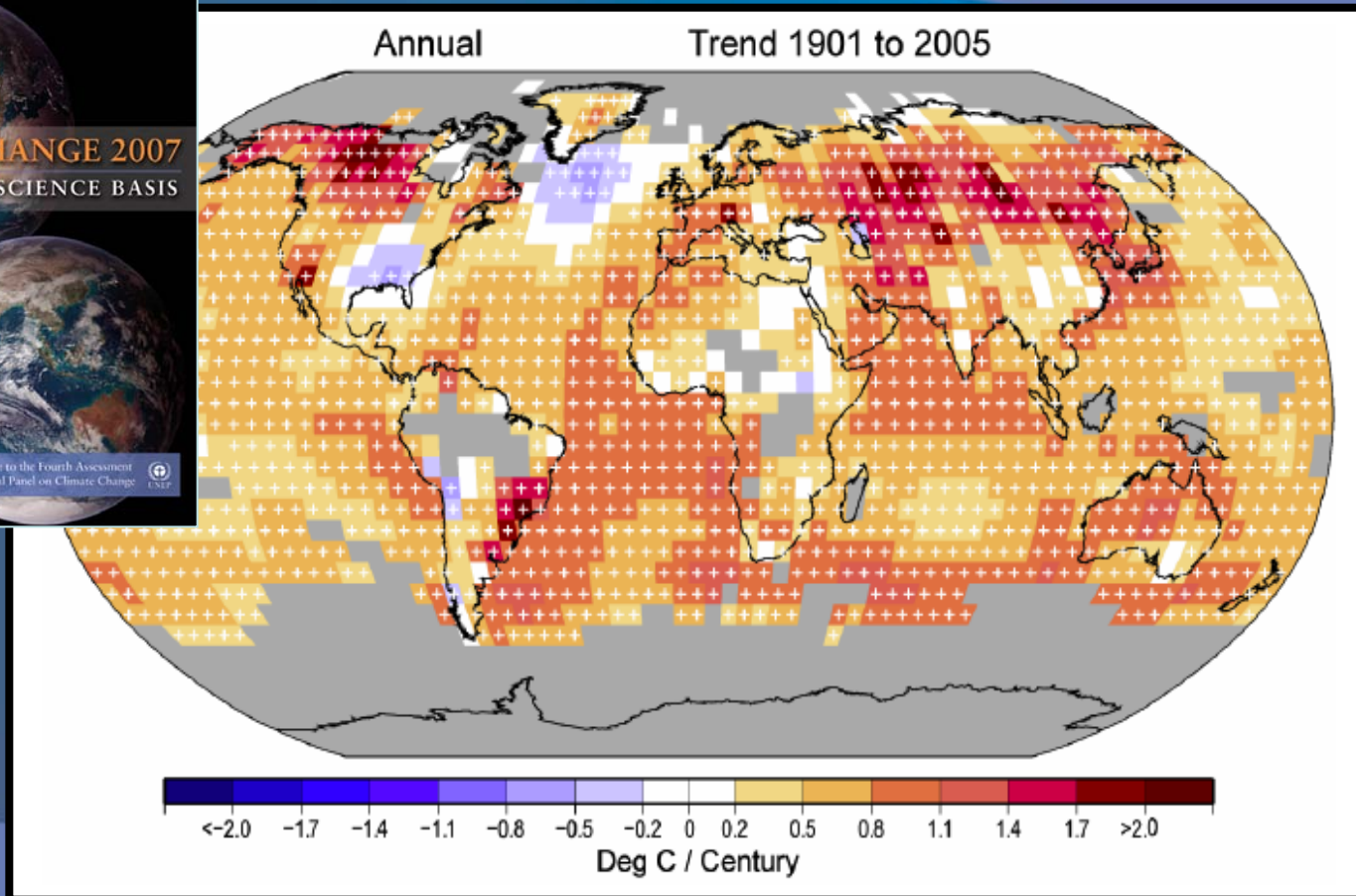
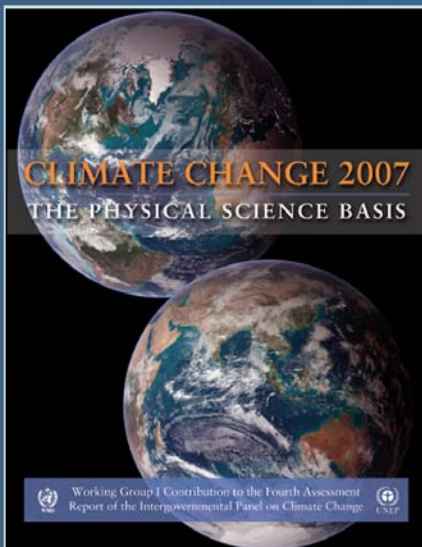
*Since 1849*

# TOWARDS ADAPTATION TO CLIMATE CHANGE: RUSSIAN EXPERIENCE

T.V. Pavlova and V.M. Kattsov

APEC Climate Symposium  
Singapore, 12-15 July 2009

# Russia is warming faster



Over past 100 years:

Global warming **0.75°C**; Russian territory (annually) **1.29°C**;

West Siberia (annually) **1.50°C**; Baikal region (annually) **1.65°C**.

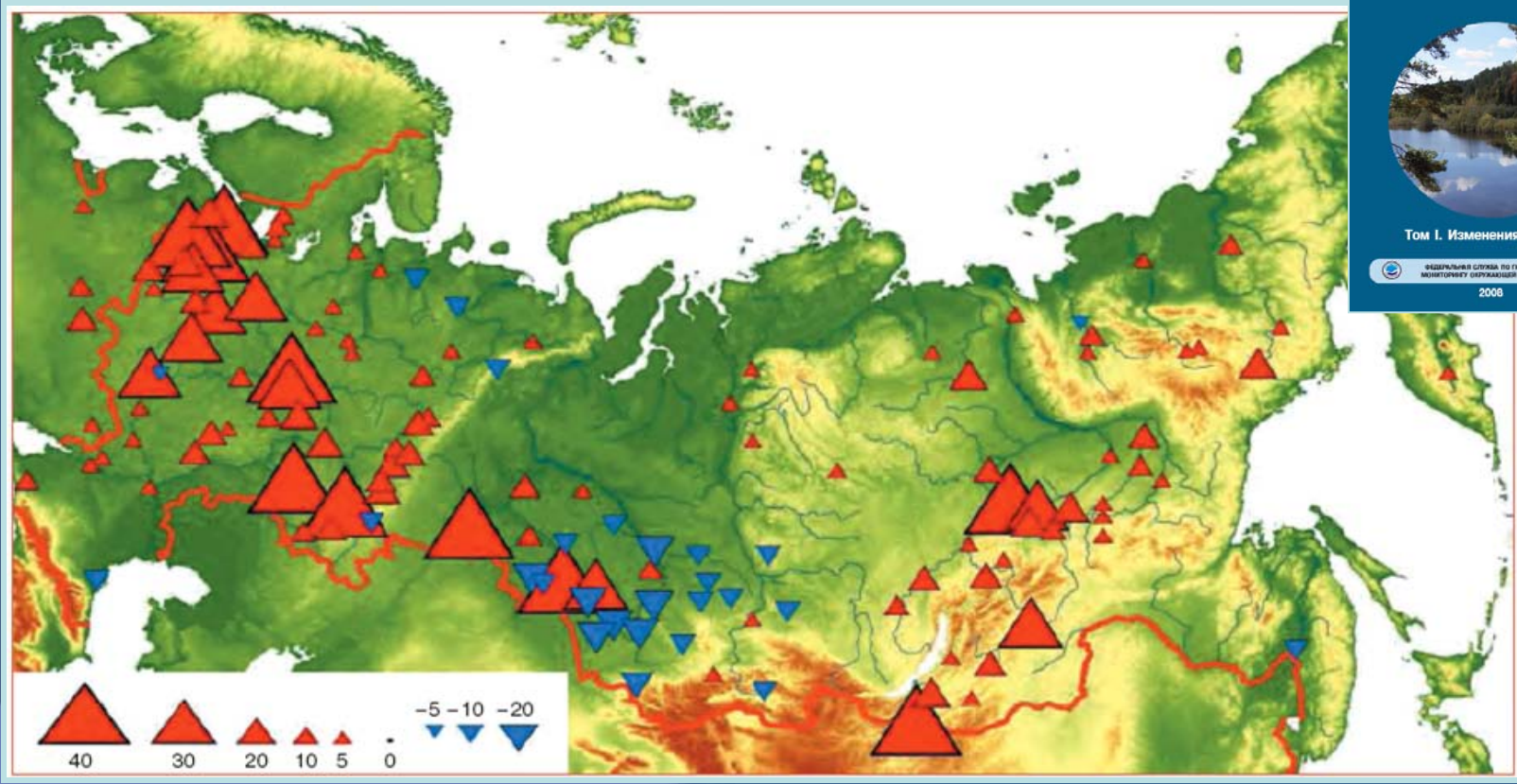
# Roshydromet's First Assessment Report (2008)



You can download it (incl. the Summary in English):  
<http://climate2008.igce.ru/v2008/htm/index00.htm>



# River runoff



Annual mean river discharge anomalies in 1978-2005 (% , relative to 1946-1977)

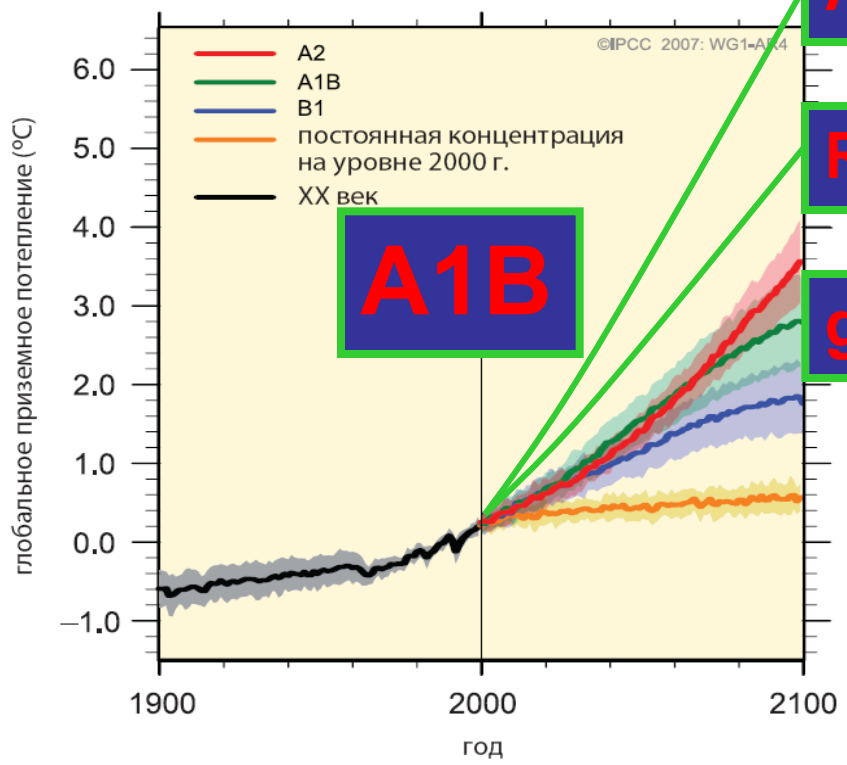
# Weather hazards



Yearly increase of dangerous weather events is 6,3%.

# The changes will strengthen

Многомодельные средние значения и оцениваемые диапазоны потепления



**A1B**

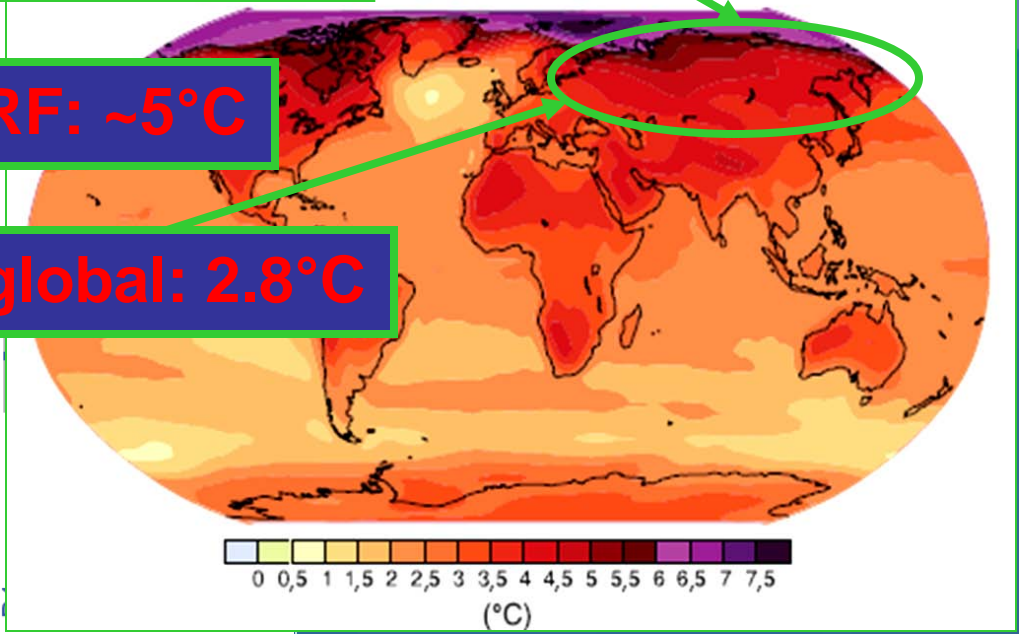
**Arctic: ~7°C**

**RF: ~5°C**

**global: 2.8°C**

**4-7°C**

распределение приземного потепления

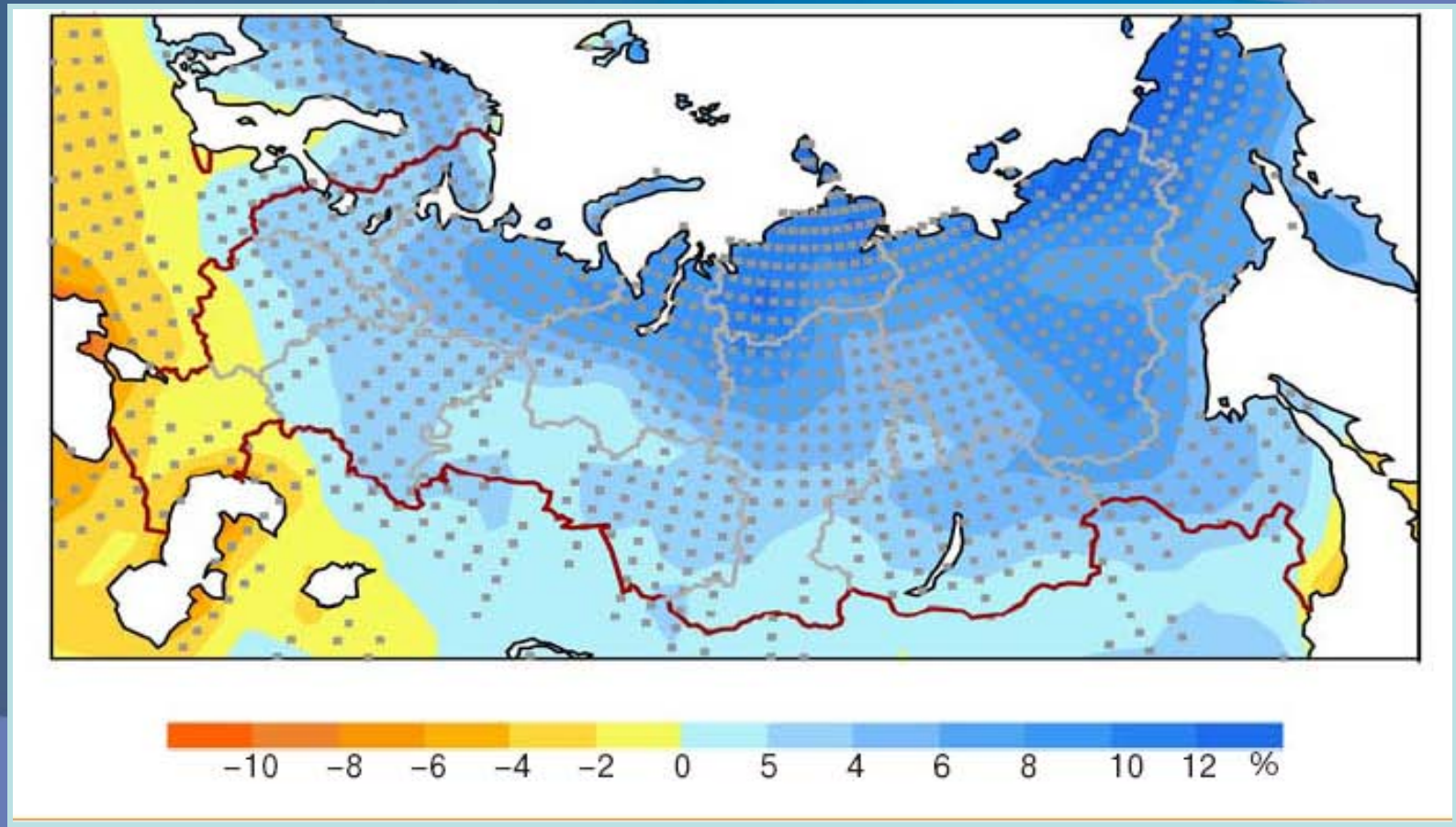


Within next 1-2 decades, **independently of scenario**, the global warming will make **0.2°C per decade**.

# Improved structure and increased area of agricultural planting



# Increase of water resources

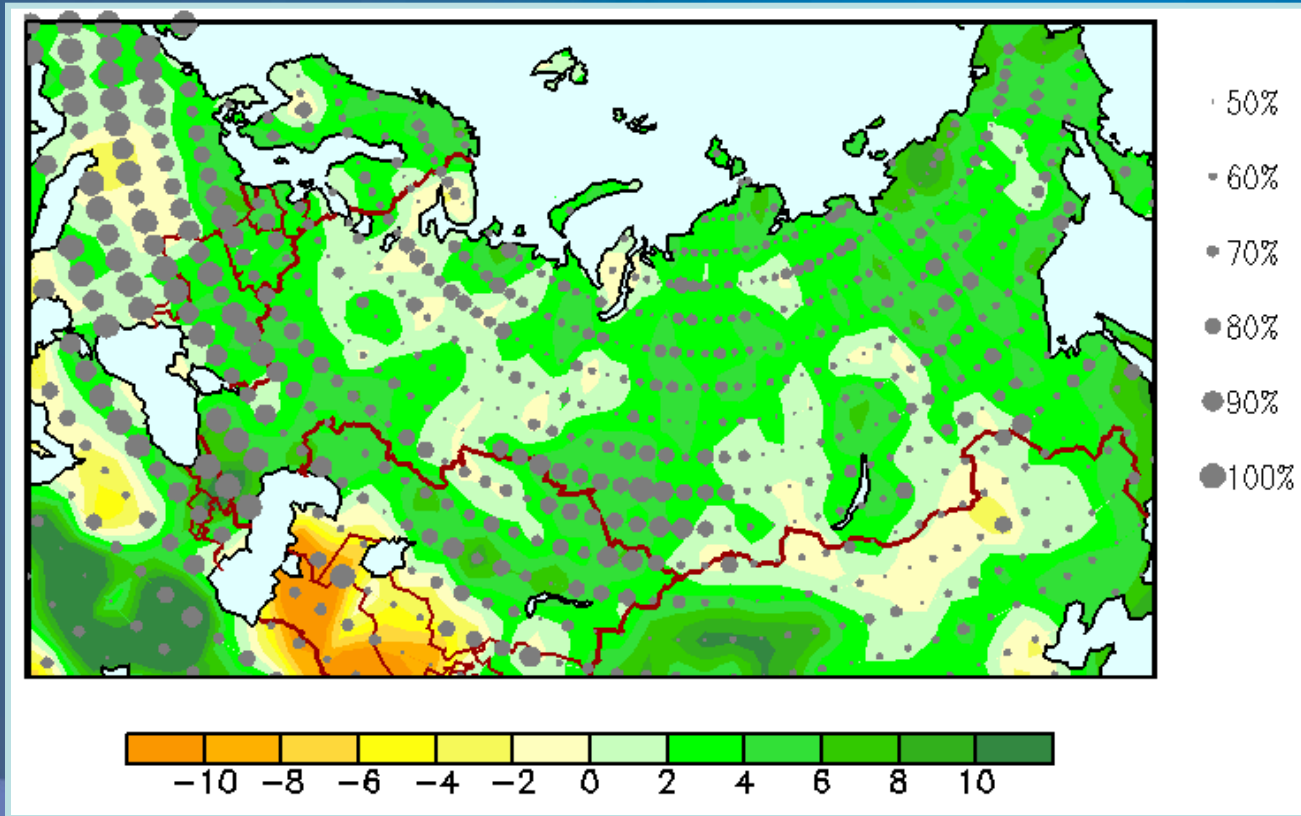


Changes of river discharge by 2050: (% , relative to 1980-1999 )

# Droughts, extreme precipitation, floods



....., extreme precipitation, .....



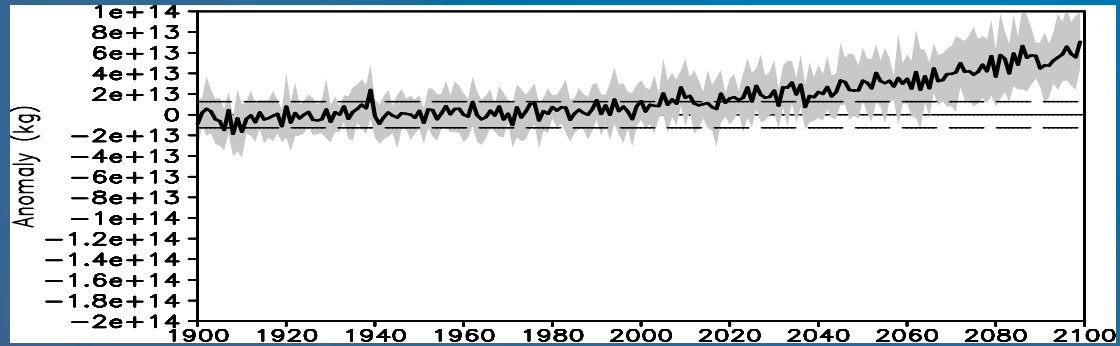
Relative change of extreme summer precipitation (higher than 90<sup>th</sup> percentile) by mid-21<sup>st</sup> century



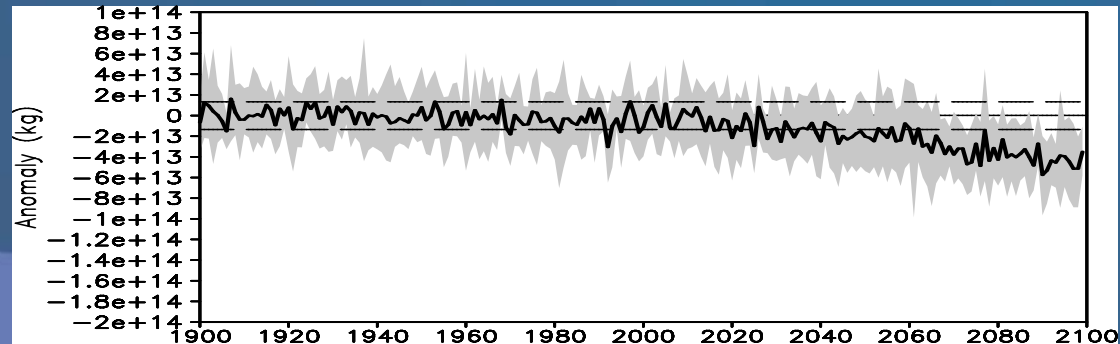
.....

....., floods

March

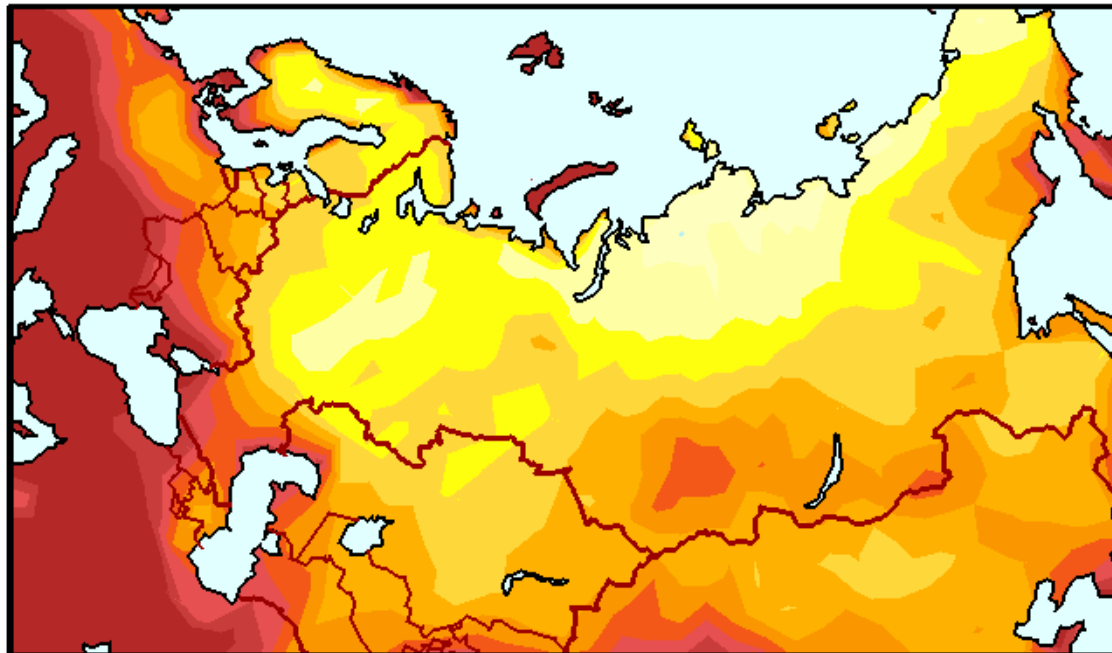


May



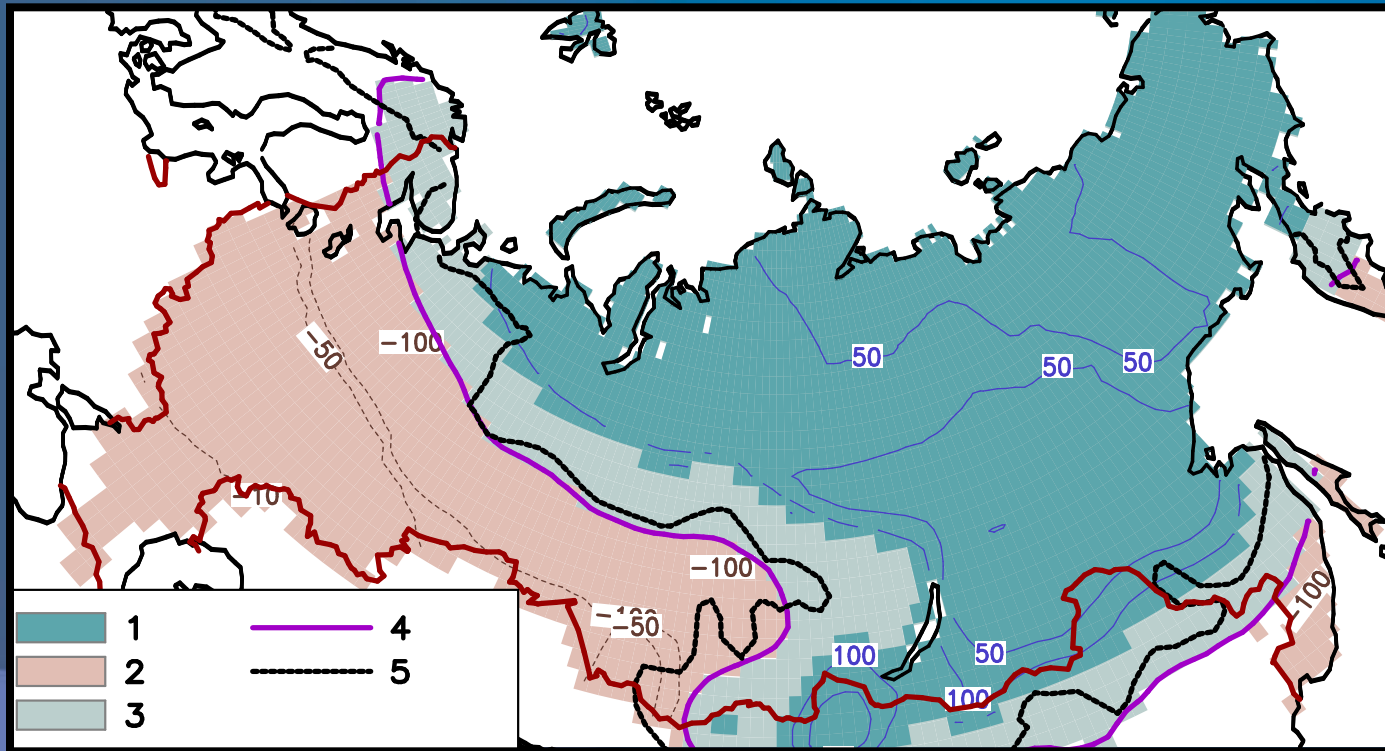
The Lena watershed: anomalies of the integral snow mass (kg) (A2)

# Heat waves



Relative (% to 1980-1999) increase of maximum duration of summer heat waves by 2050.

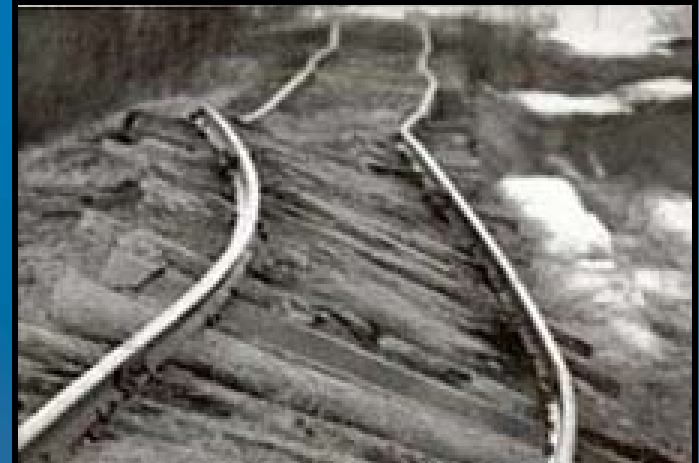
# Permafrost thawing



Replacement of seasonal thawing by seasonal freezing by 2050.



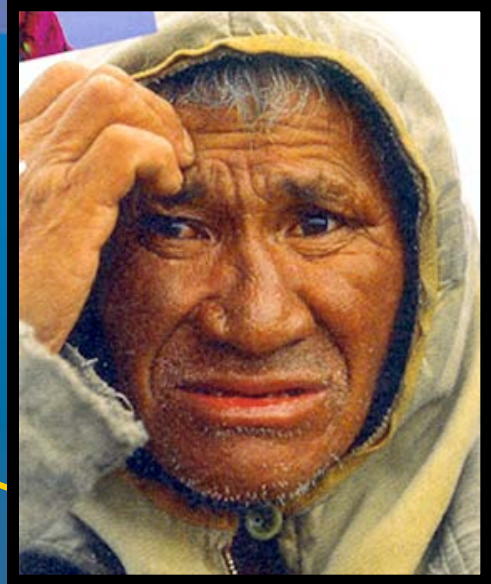
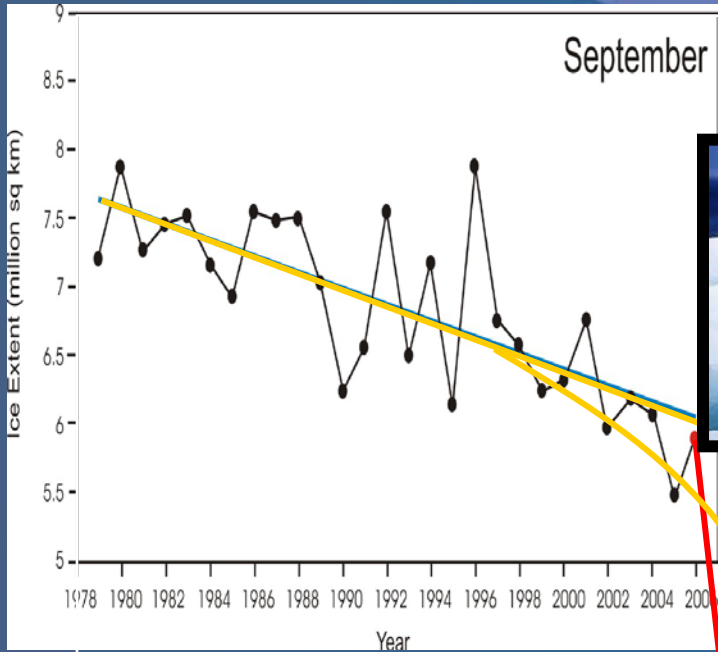
## Climate and infrastructure



# Climate and cities



# A different Arctic



2007 2008

4  
3  
2  
1  
0

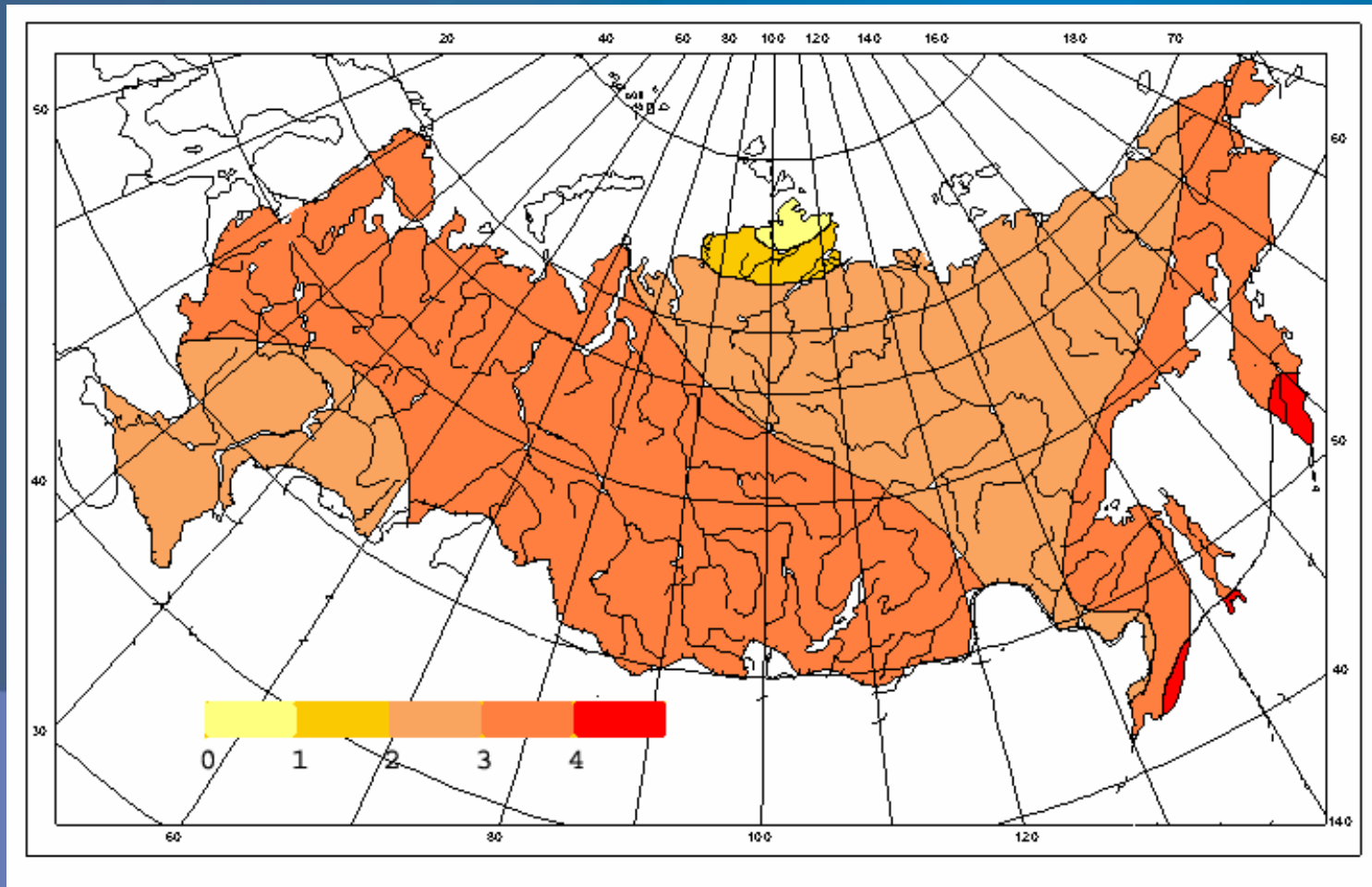


2070?

?

1980 1990 2000 2010 2020 2030 2040 2050

# Heating period decrease by 2015



# Russia's climate related advantages

- ✓ Northward shift of the northern boundary of “comfortable living zone” as a result of the climate getting milder;
- ✓ Decrease of energy requirements in the heating period;
- ✓ Improvement of sea ice conditions and, accordingly, transport conditions in the arctic seas, increased accessibility of arctic shelves;
- ✓ Improved structure and increased area of agricultural planting, increased efficiency of stock-raising (if a number of measures are taken);
- ✓ Increased boreal forest productivity;
- ✓ Increased water resources (for Russia as a whole, with some local deficits) and improved conditions for hydroenergetics;
- ✓ ...

## A higher adaptation potential of the country as a whole:

- Large territory;
- Large water resources;
- Relatively small part of the population, living in the most vulnerable (to climate change) regions.

# Russia's climate related challenges

- ✓ Increase of frequency, intensity, and duration of droughts in some regions, and extreme precipitation, floods, soil overmoistening of agricultural lands in others;
- ✓ Increase of wild fire danger in forests;
- ✓ Permafrost degradation with a damage for infrastructure in northern regions;
- ✓ Ecosystem disbalance;
- ✓ Increase of energy demand for air conditioning in summer;
- ✓ ...

## Disadvantages of Russia:

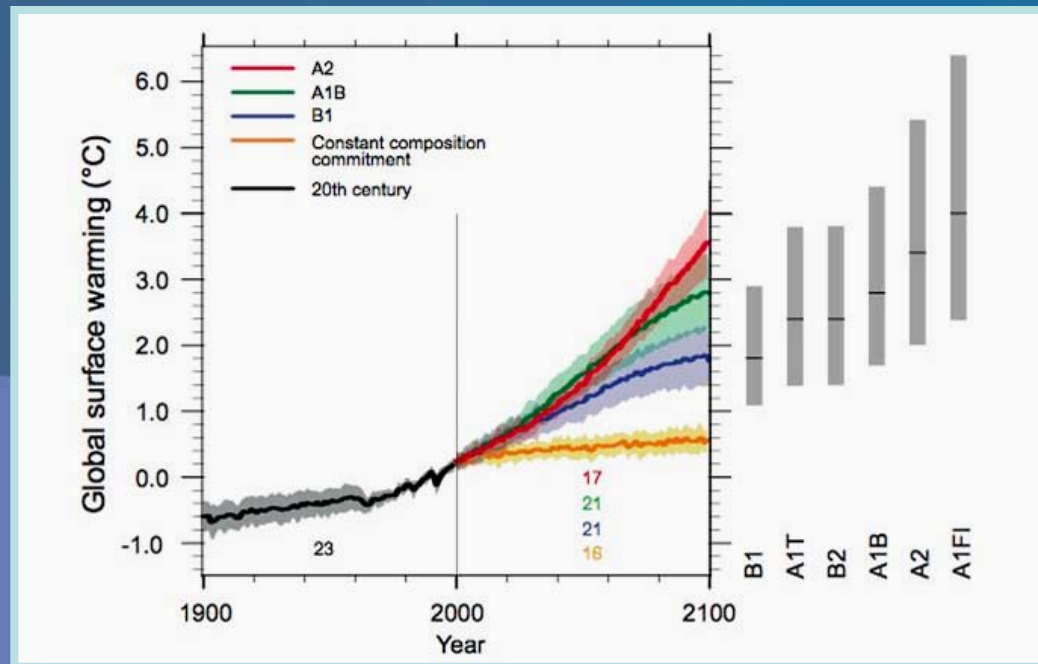
- Combination of low density of population with large territory leading to relatively large transport needs;
- Cold climate, determining the higher demand for building heating;
- Burden of responsibility for the world energy security (fossil fuel mining and transportation in the interest of foreign importers).

# What is facing us and what can we do?

**Inevitability within next decades:** Observed climate changes will enhance. **Adaptation** is necessary.

**Options exist for the second half of the 21<sup>st</sup> century:** Difference between the scenarios (as a result of political decisions today) is increasing through the second half of the century.

**Mitigation** is needed.



# What is facing us and what can we do?

## Climate Doctrine of Russian Federation

(approved by the RF government in April 2009)

RF climate policy implies developing and realization of the corresponding **national strategy** and – on its basis – federal, regional and sectorial programmes and action plans.

# What is facing us and what can we do?



The Economics of  
**Climate Change**  
The Stern Review

**We need quantification of climate impacts!**



NICHOLAS STERN

CAMBRIDGE



Федеральная служба по гидрометеорологии  
и мониторингу окружающей среды  
(Росгидромет)



## СТРАТЕГИЧЕСКИЙ ПРОГНОЗ

ИЗМЕНЕНИЙ КЛИМАТА РОССИЙСКОЙ ФЕДЕРАЦИИ  
НА ПЕРИОД ДО 2010-2015 ГГ.  
И ИХ ВЛИЯНИЯ НА ОТРАСЛИ ЭКОНОМИКИ РОССИИ



Федеральная служба по гидрометеорологии  
и мониторингу окружающей среды  
(Росгидромет)

## МАТЕРИАЛЫ

К СТРАТЕГИЧЕСКОМУ ПРОГНОЗУ  
ИЗМЕНЕНИЙ КЛИМАТА РОССИЙСКОЙ ФЕДЕРАЦИИ  
НА ПЕРИОД ДО 2010-2015 ГГ. И ИХ ВЛИЯНИЯ  
НА ОТРАСЛИ ЭКОНОМИКИ РОССИИ



In preparation...

# Roshydromet's “macroeconomic” national climate impact assessment

# World Climate Conference-3

Better climate information for a better future



Geneva, Switzerland

31 August–4 September 2009



World  
Meteorological  
Organization

Weather • Climate • Water