

Global Climate Change in education process of Moscow University

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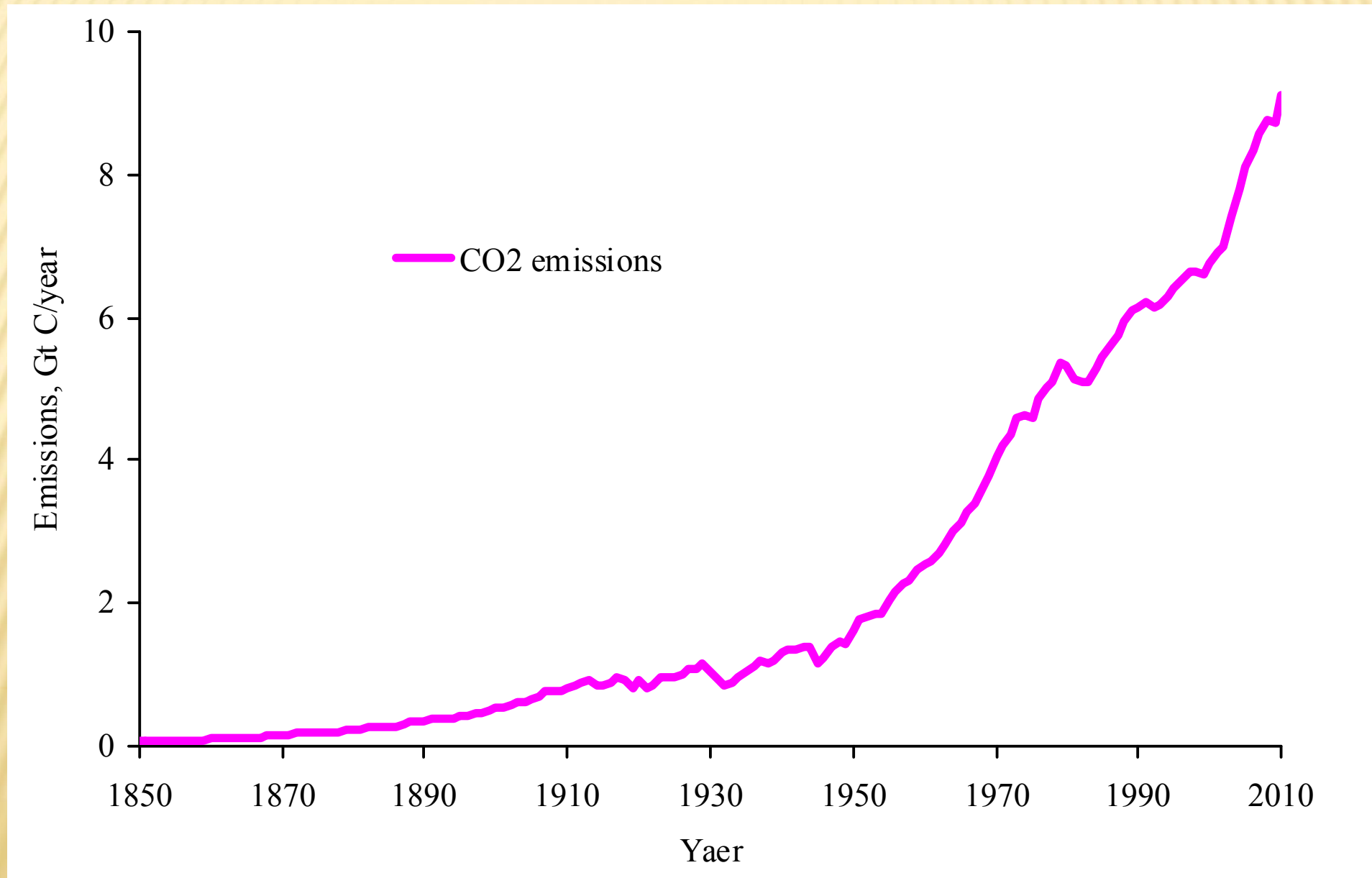


MSU, Bioincubator, 6 of April, 2017

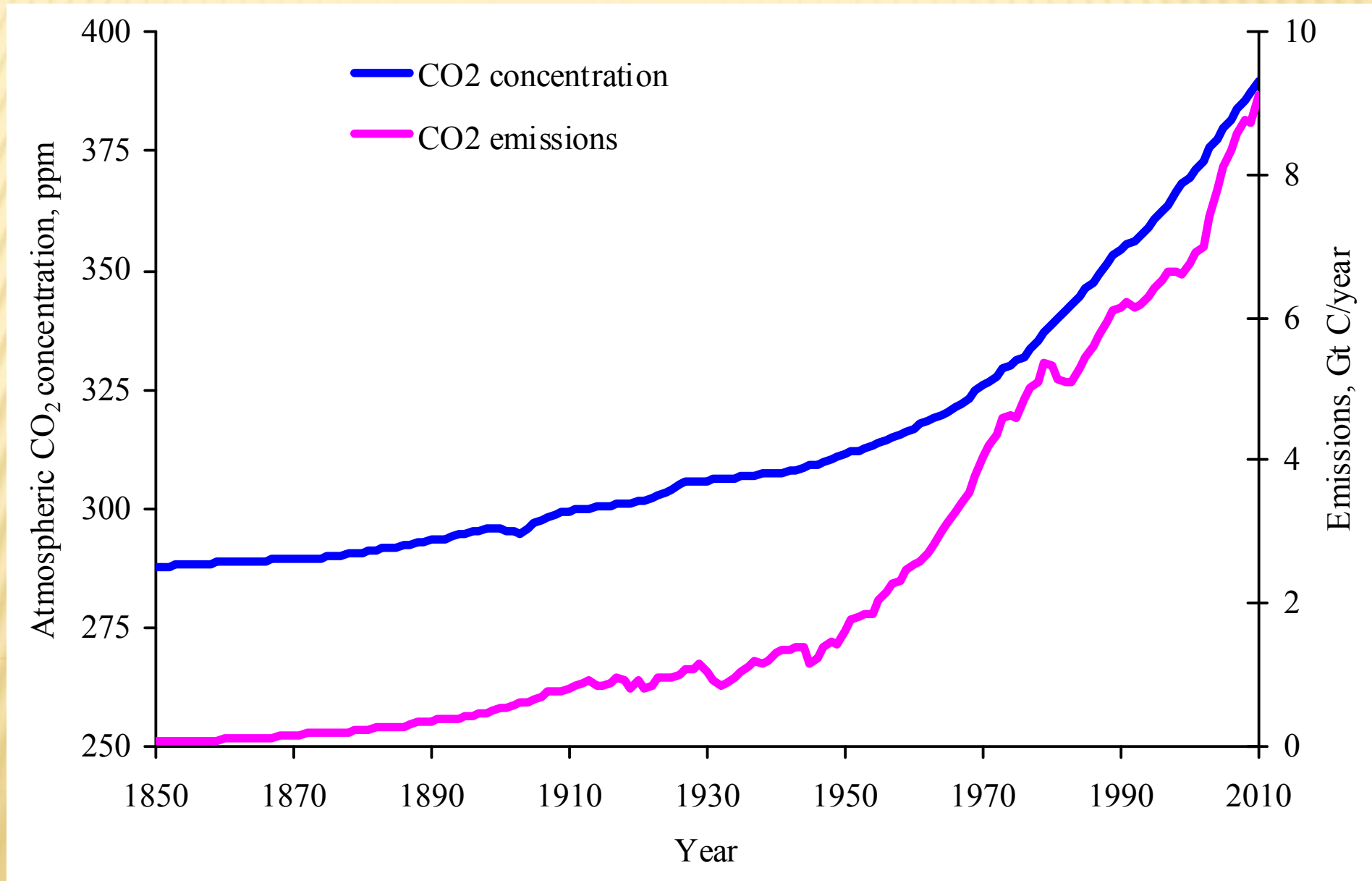
Courses in Moscow University, containing lectures about Global Change

- ✗ “General Ecology”: Faculties of Biology, Philosophy, Politology, Geology
- ✗ “Global Environmental Changes”, Crises and Catastrophes: Interfaculty's Course, Magisterial course (in English)
- ✗ “Global and regional legislative mechanisms of Environmental protection”: Magisterial course (in English)

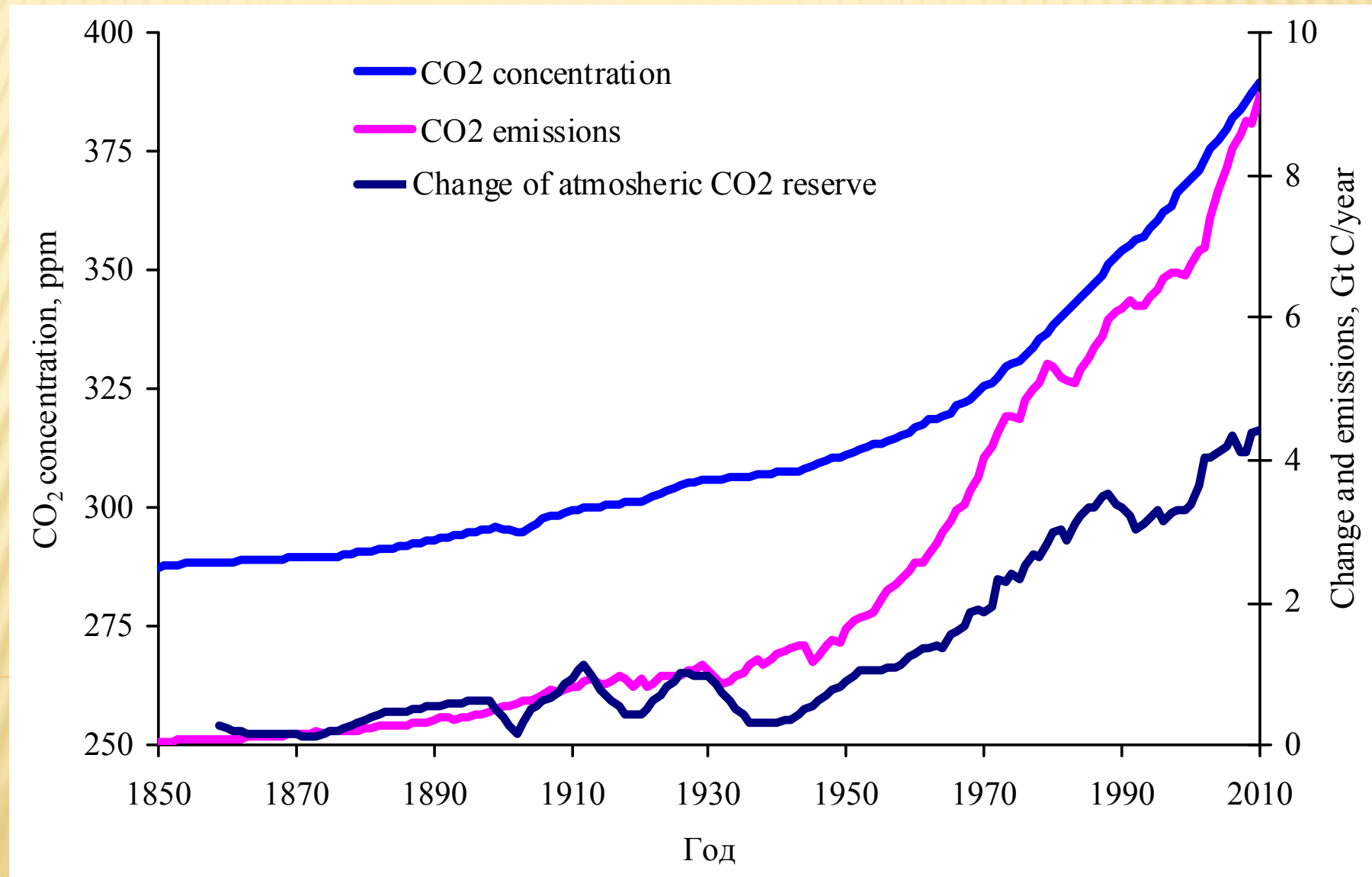
Increase of anthropogenic CO₂ emissions



Anthropogenic CO₂ emissions lead to increase of atmospheric CO₂ concentration



50% of emitted carbon is left in atmosphere,
50% is sequestered by land and ocean



The Greenhouse Effect

Some solar radiation is reflected by the Earth and the atmosphere.

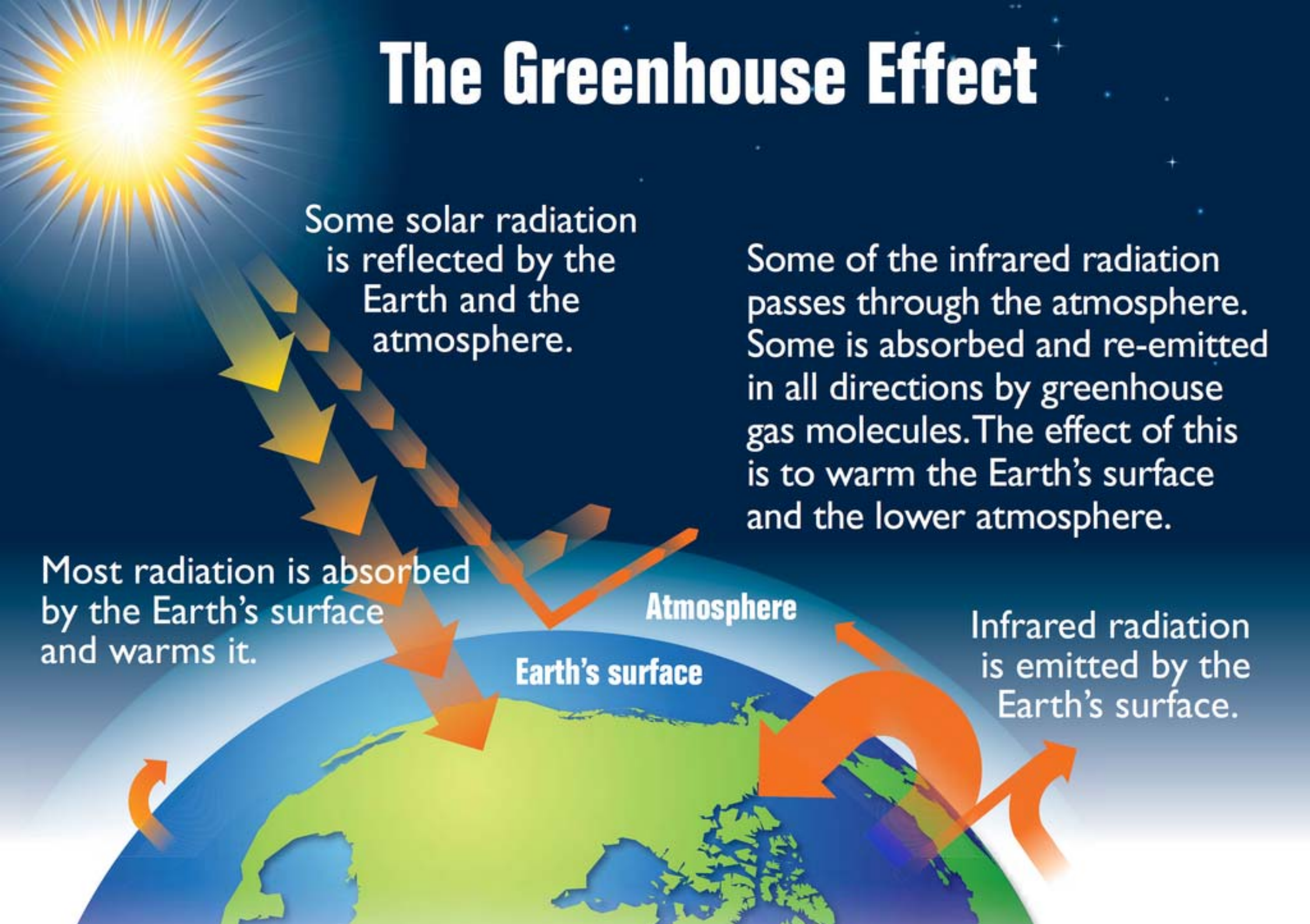
Some of the infrared radiation passes through the atmosphere. Some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.

Most radiation is absorbed by the Earth's surface and warms it.

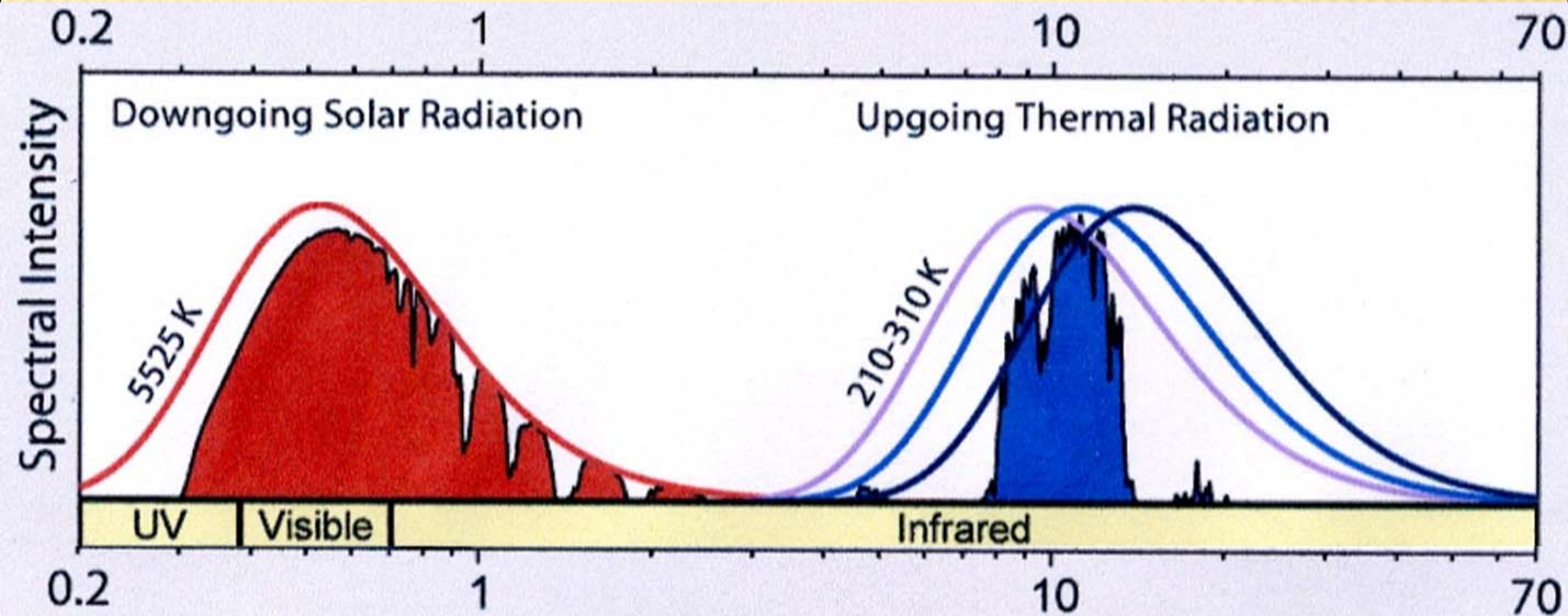
Atmosphere

Earth's surface

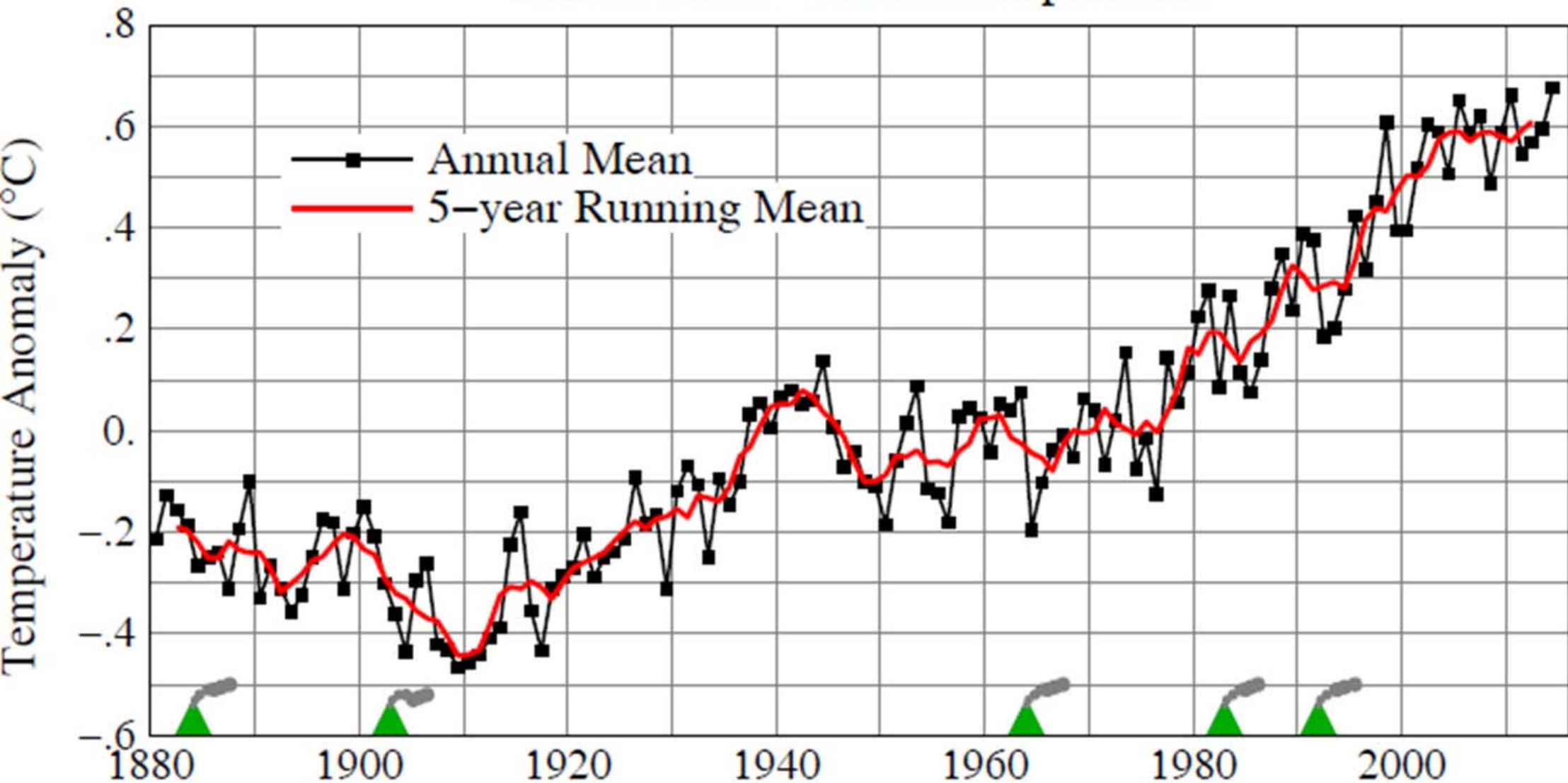
Infrared radiation is emitted by the Earth's surface.



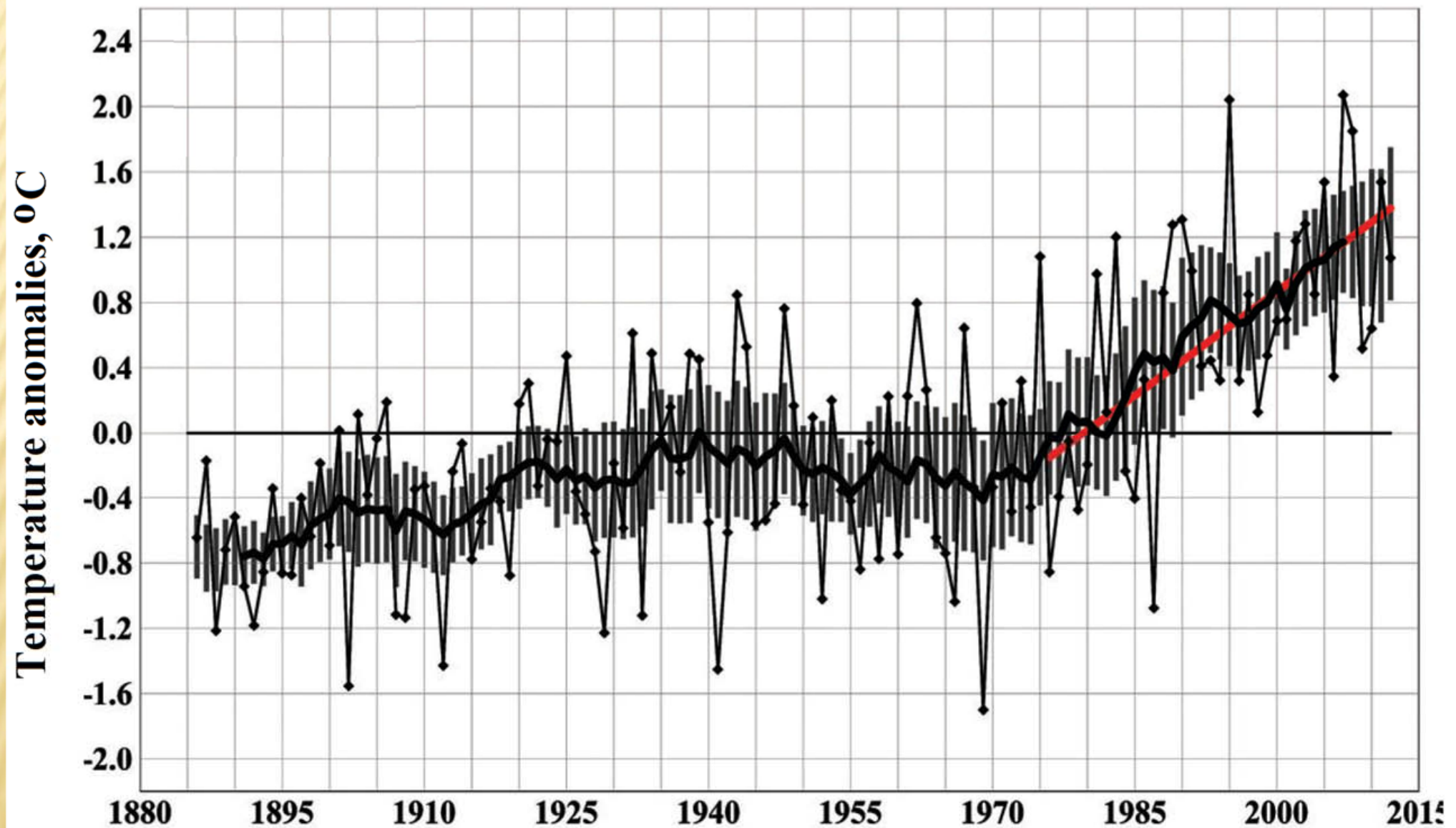
Radiation from Sun and from Earth, transmitted by the atmosphere



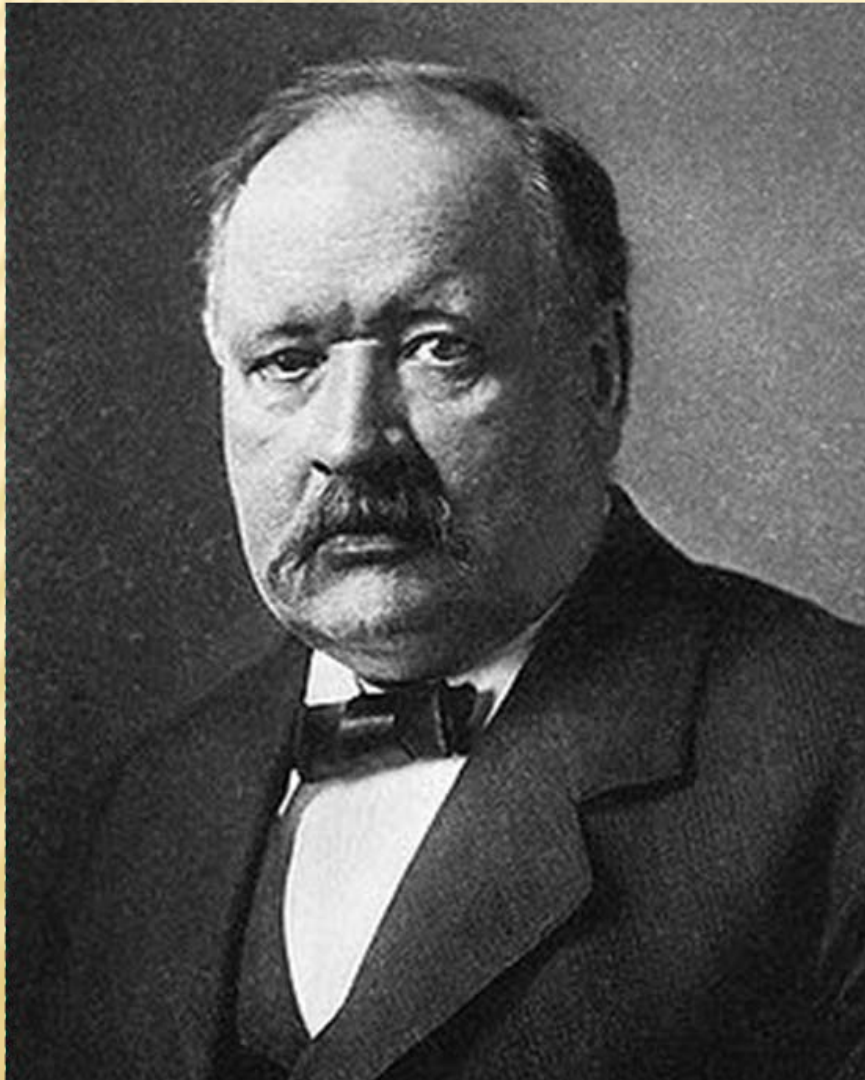
Global Land–Ocean Temperature



Temperature increase in Russia is two times faster than global



- ✖ Svante Arrhenius (1859-1927) opened the greenhouse effect.



- ✖ Budyko Mihail Ivanovich (1920-2001) proposed the concept of anthropogenic climate change.

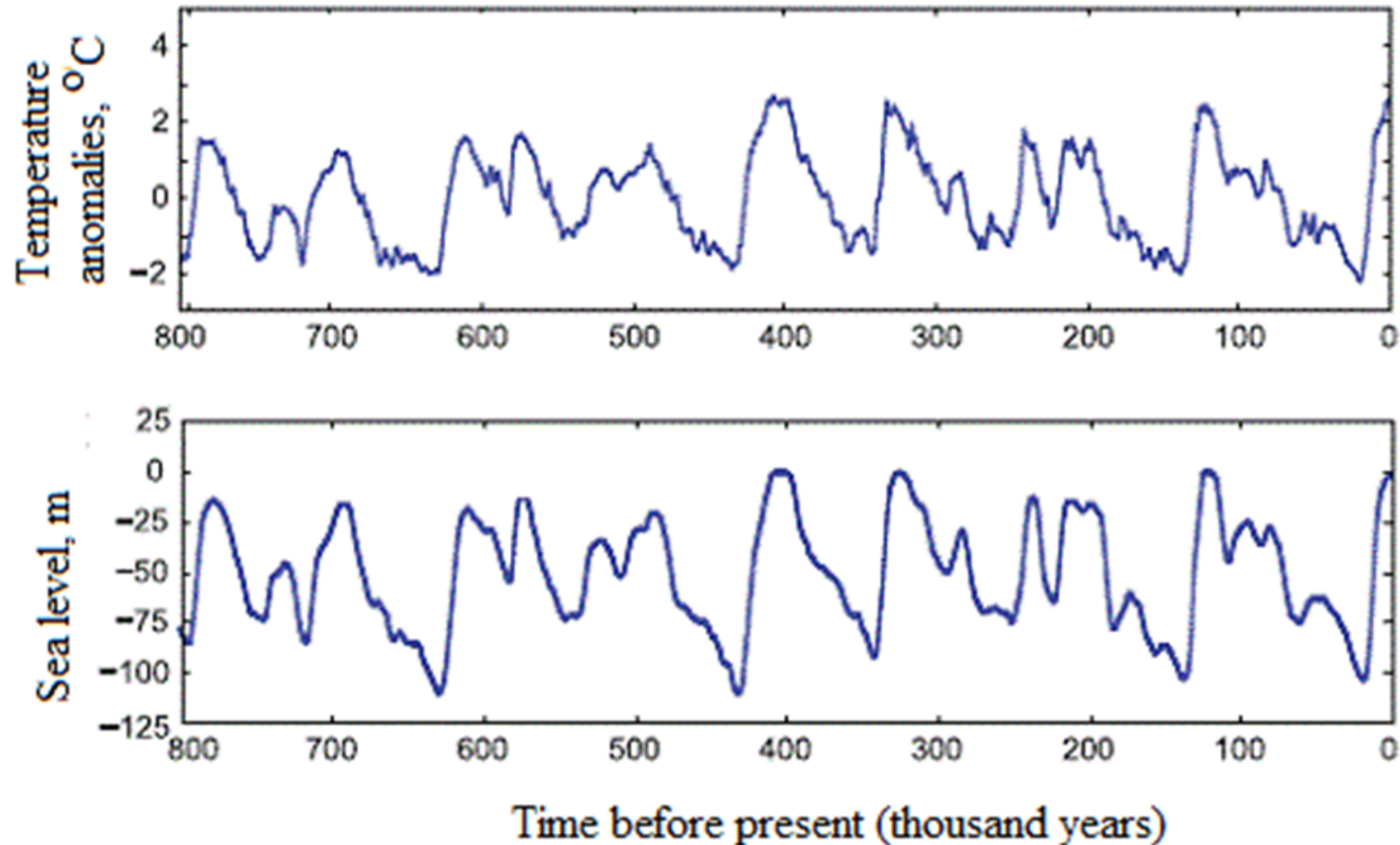


Negative effects of global warming

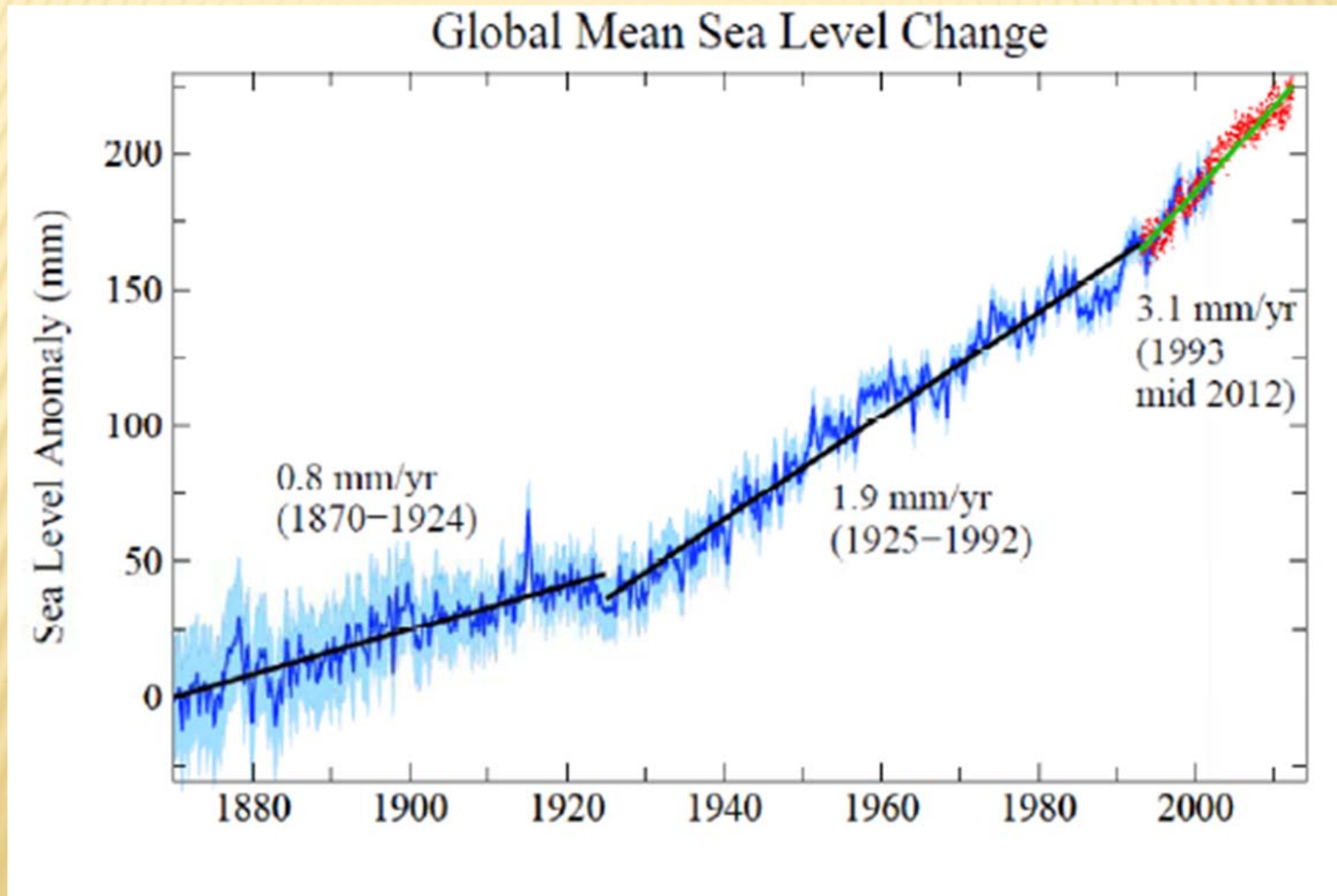
- ✗ Sea level increase
 - ✗ Increase of frequency of extreme weather events (floods, hurricanes, droughts)
 - ✗ Problem with water supply in arid regions
 - ✗ Permafrost melting, destruction of infrastructure in arid regions
 - ✗ Expanding of harmful species and diseases
 - ✗ Biodiversity threats
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Sea level increase:

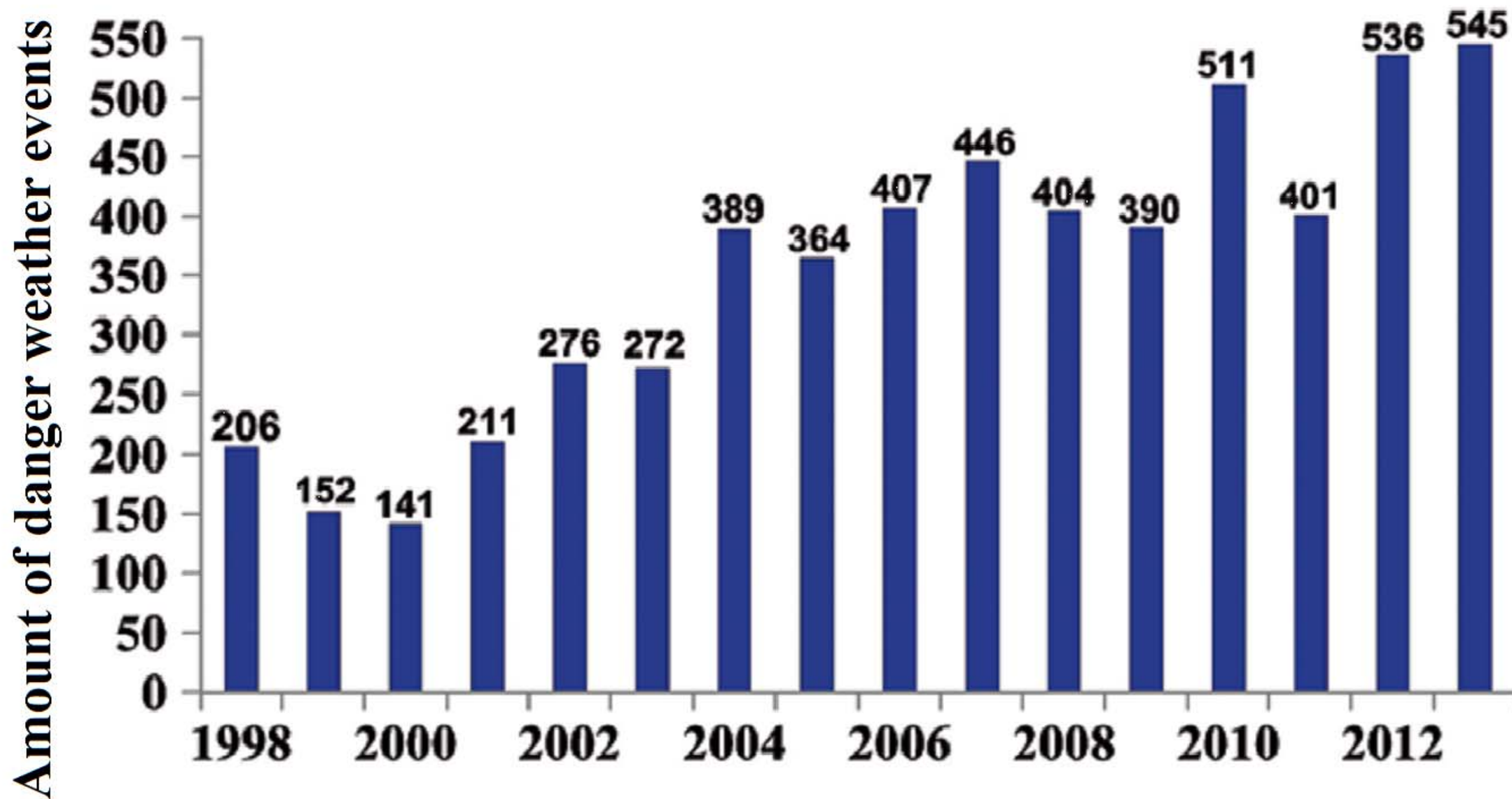
- 1) melting of terrestrial glaciers;
- 2) thermal expansion of water.



The ocean level increased on 17 cm during XX century.
Ocean level rise at 1 m is possible to end of XXI century.



Rise of amount of danger weather events in Russia



Flood in Khabarovsk region (2013)



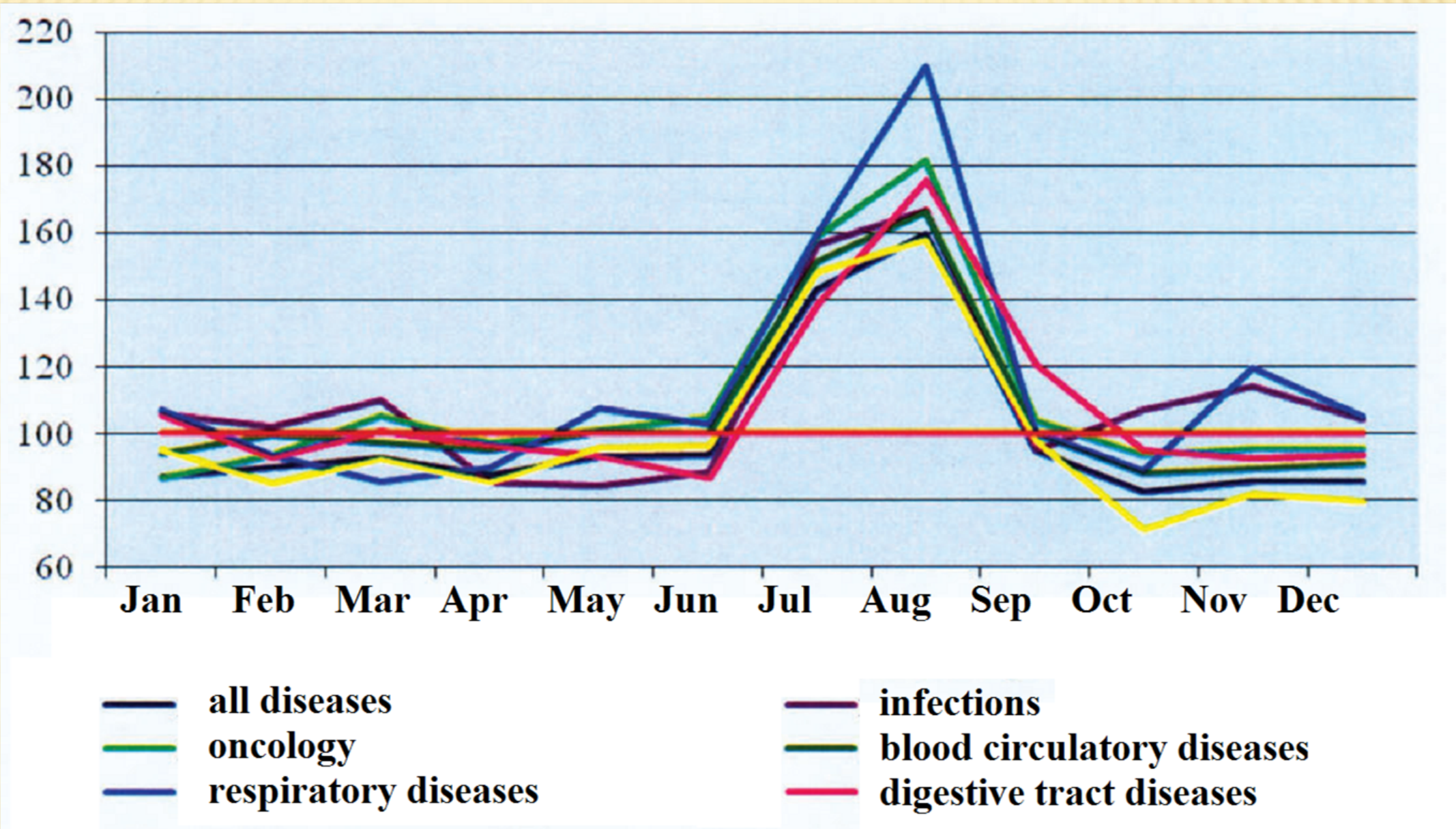
Massive windfall in Kostroma region (2011)



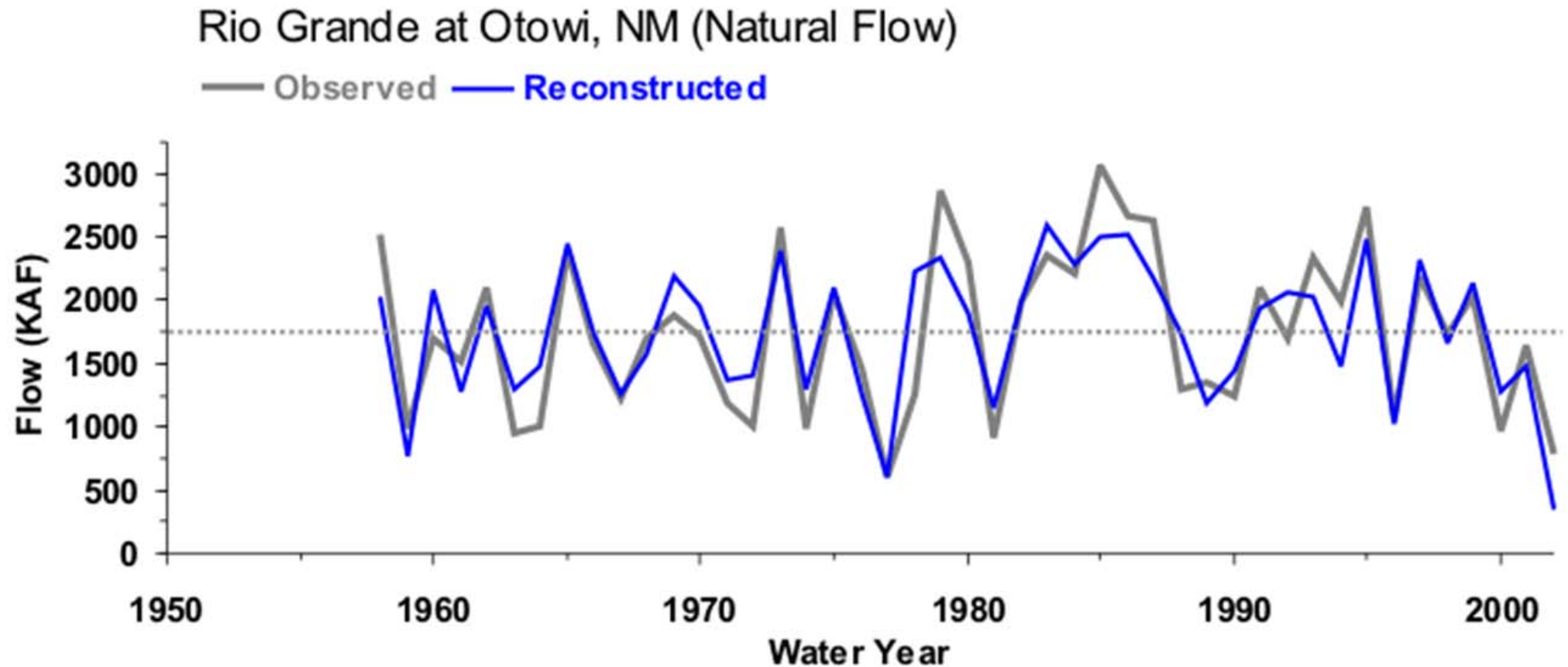
Abnormal heat in central Russia (2010)



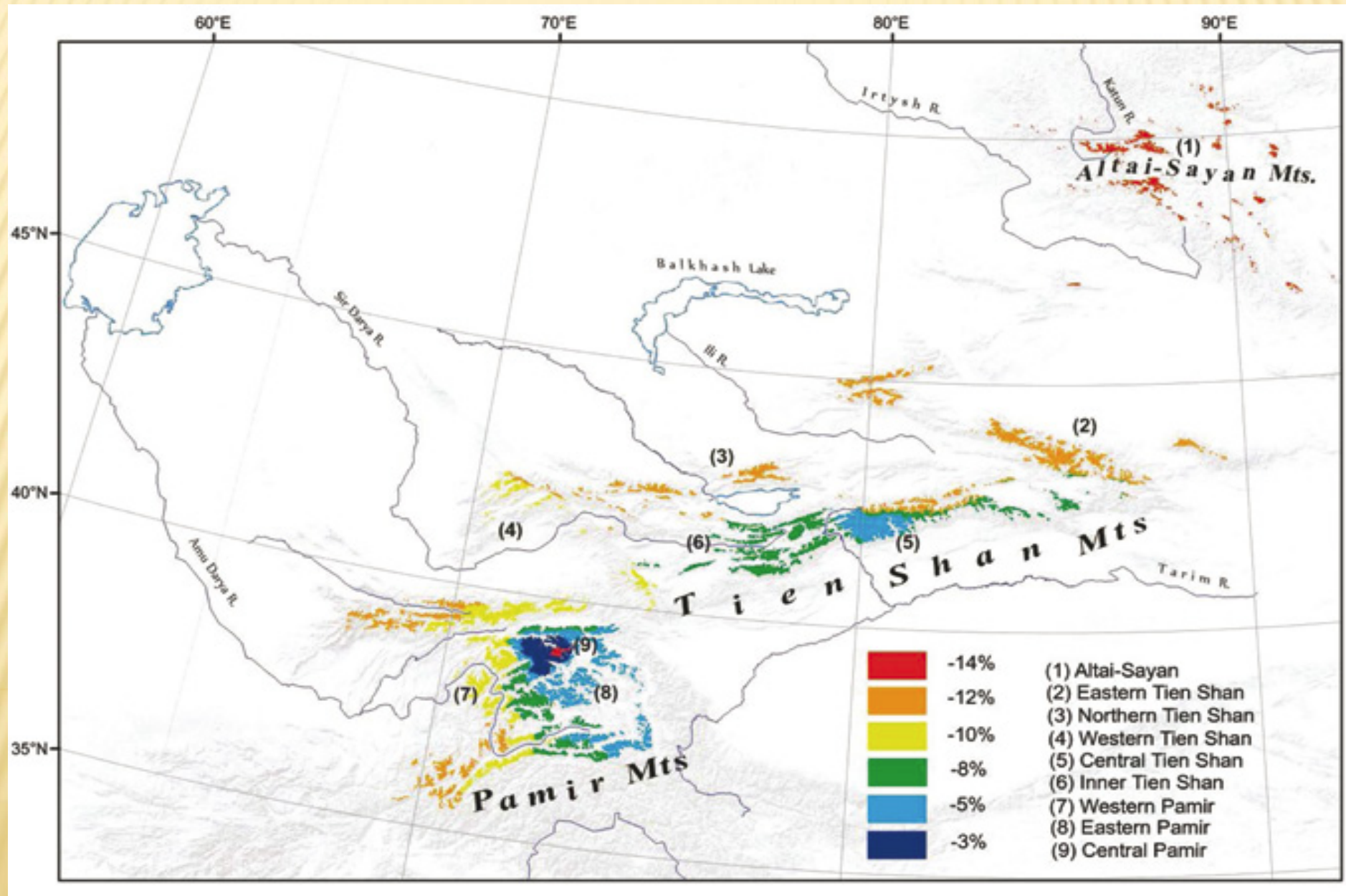
Mortality in Moscow in 2010



Dynamics of Rio Grande discharge



Mountain glacier decrease in Central Asia (1960-2008)



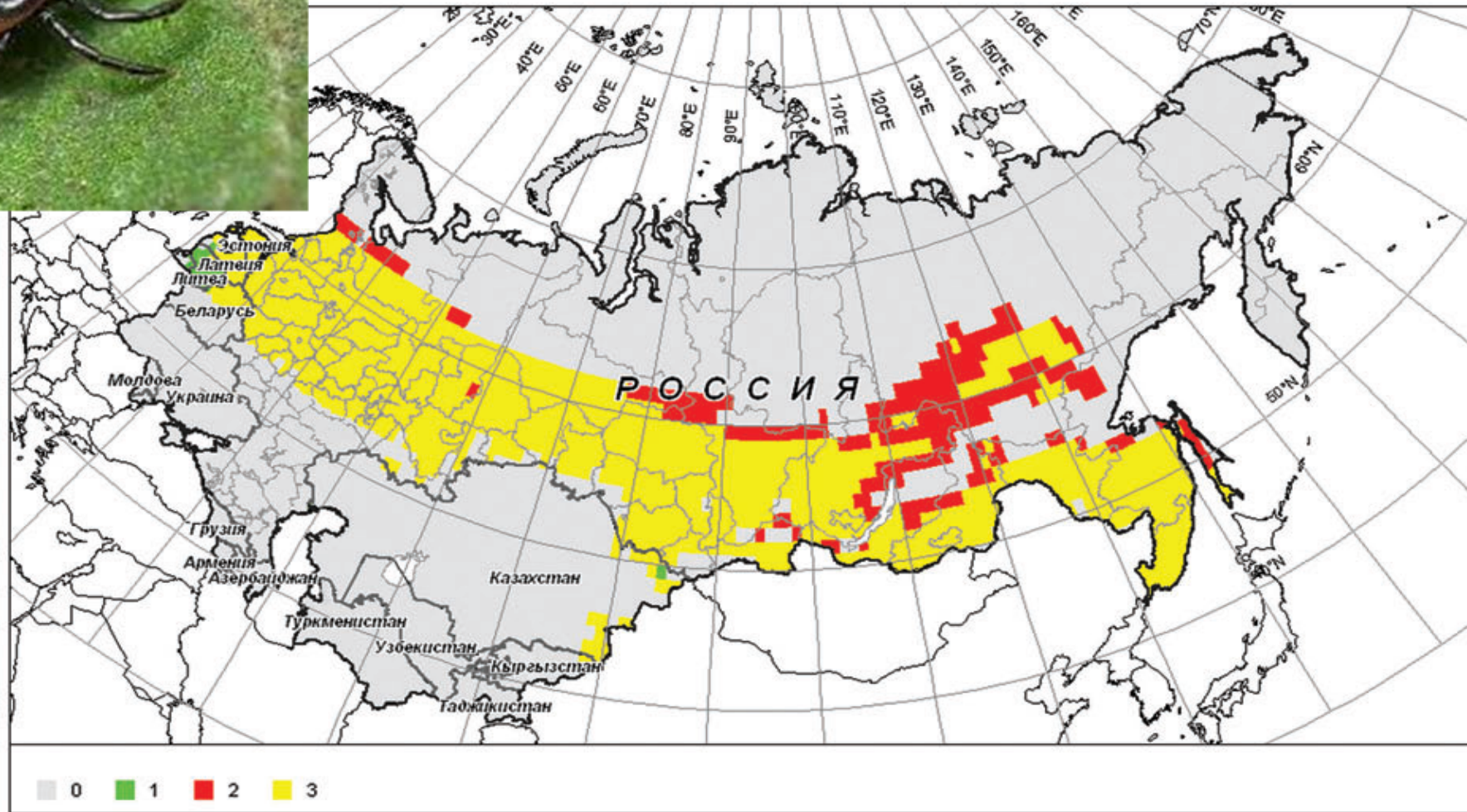
Destruction of shores of Arctic seas



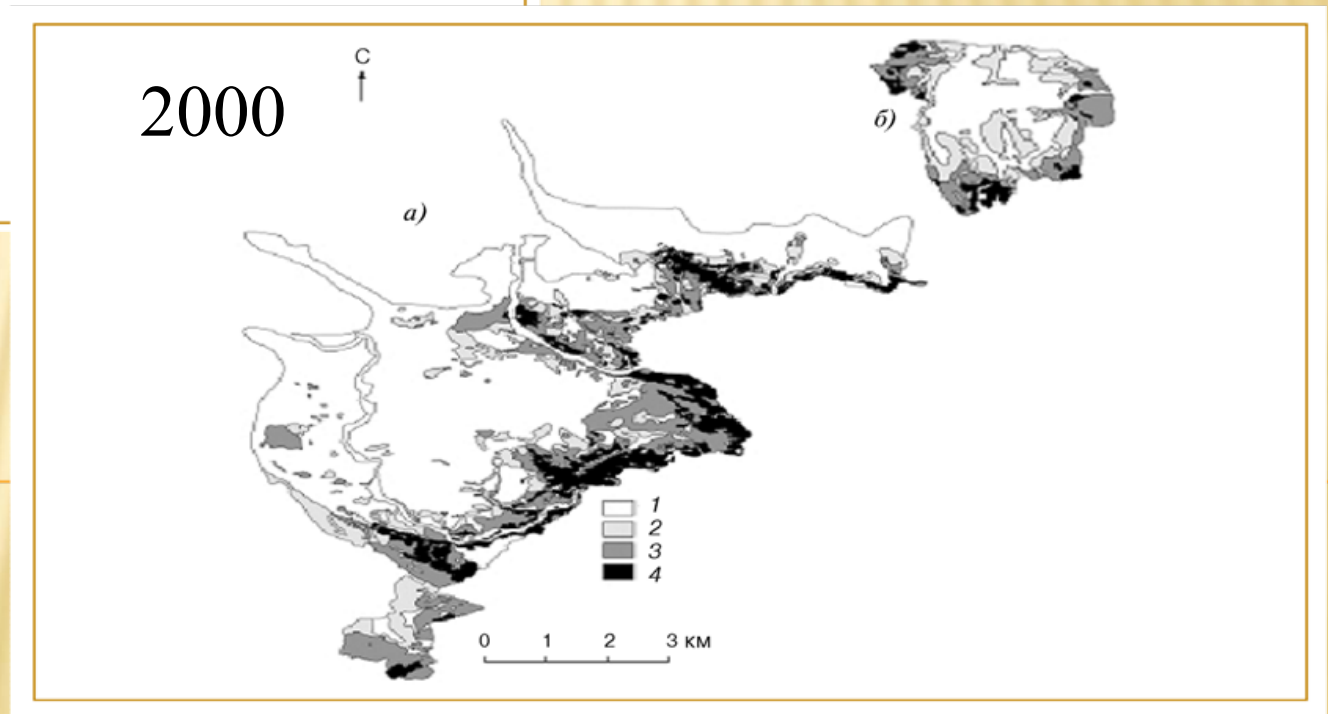
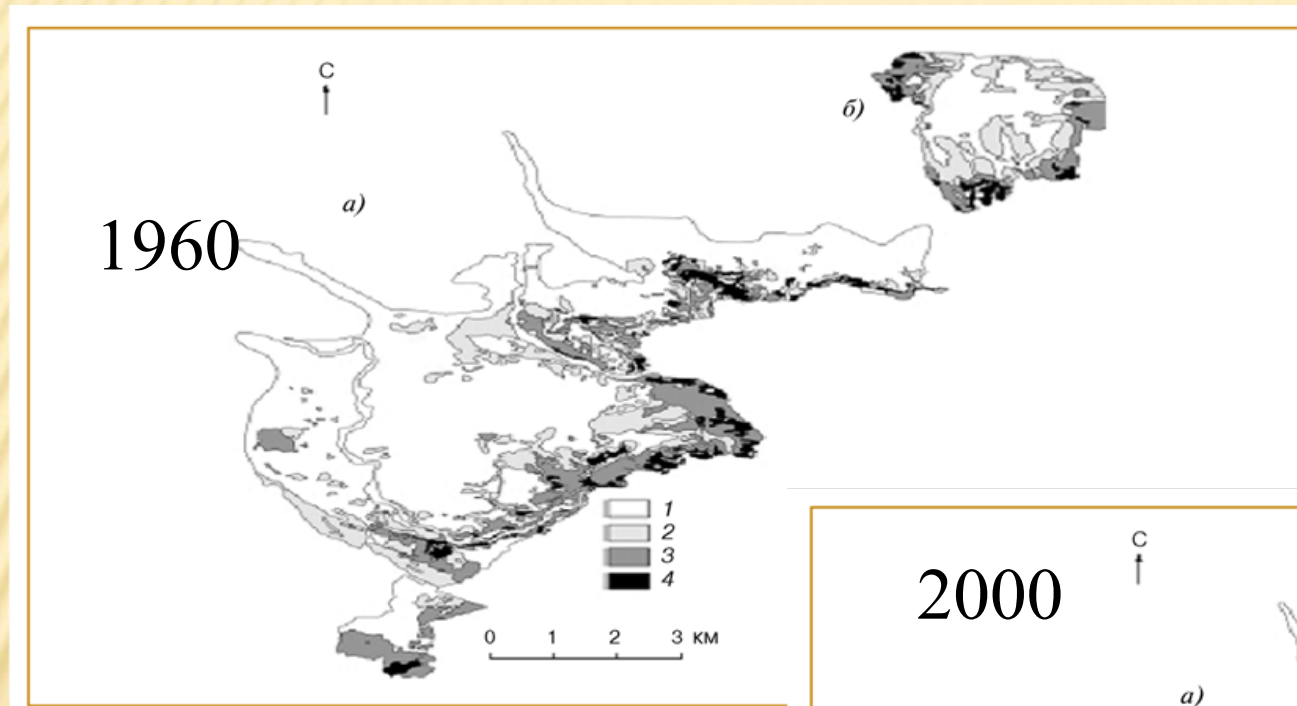
Expanding of malarial mosquito areal from 1951-1980 to 1981-2010



Expanding of pasture mite areal from 1951-1980 to 1981-2010



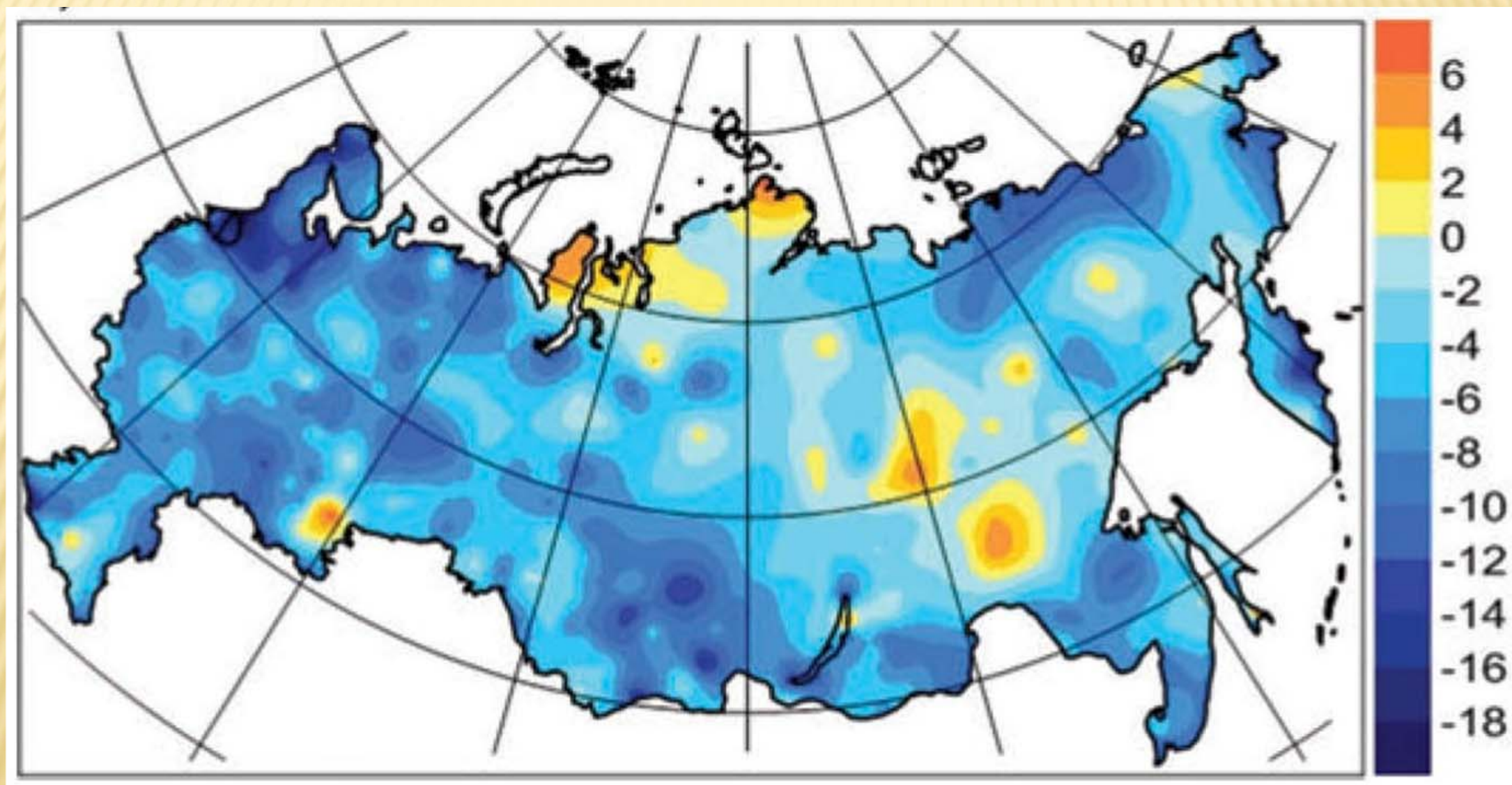
Changes of vegetation cover of Polar Ural: expanding of woody vegetation



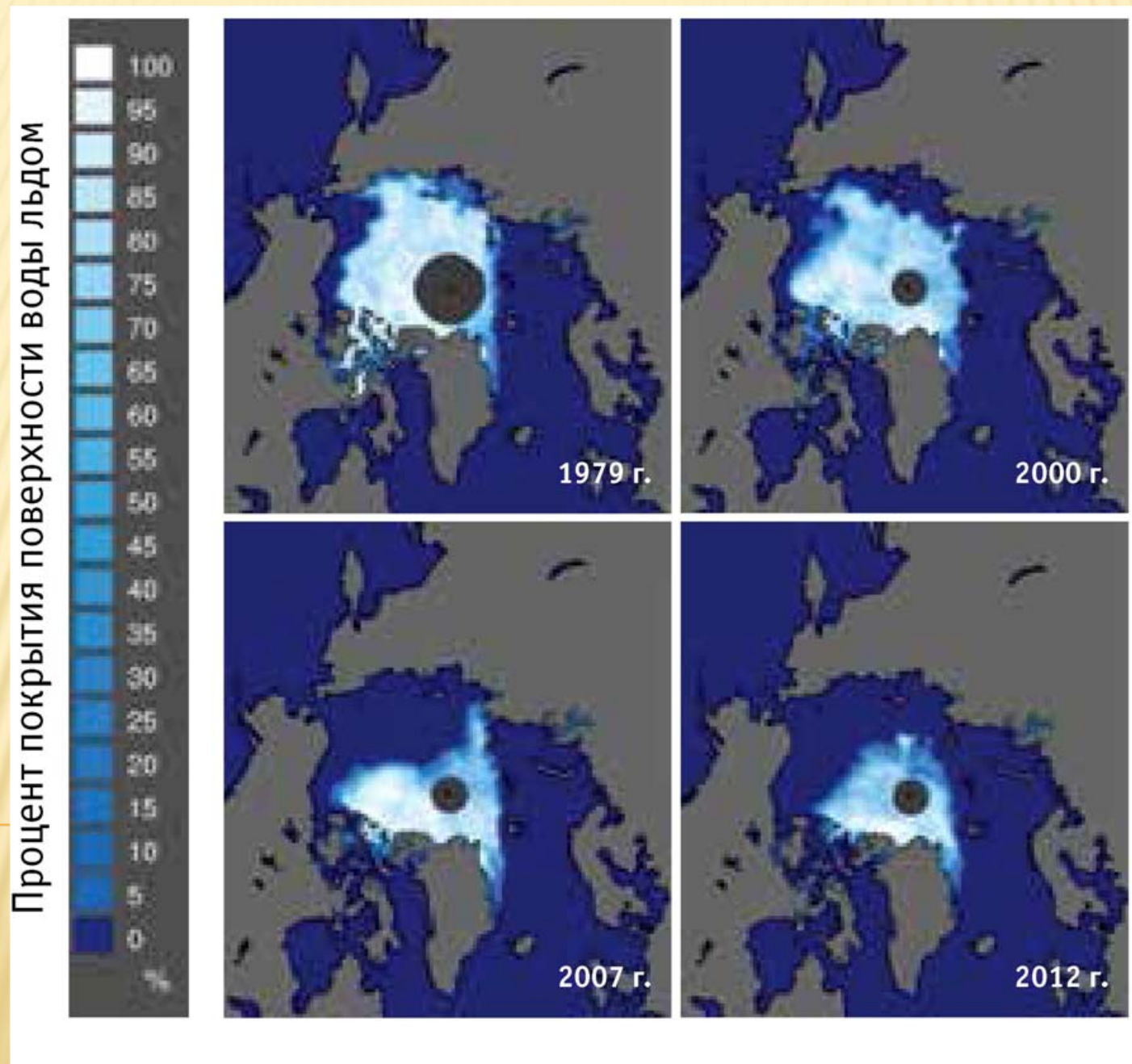
Effects of Global Change, positive to Russia

- ✗ Decrease of heating season
 - ✗ Navigation in Northern Sea Route
 - ✗ Increase of agricultural productivity
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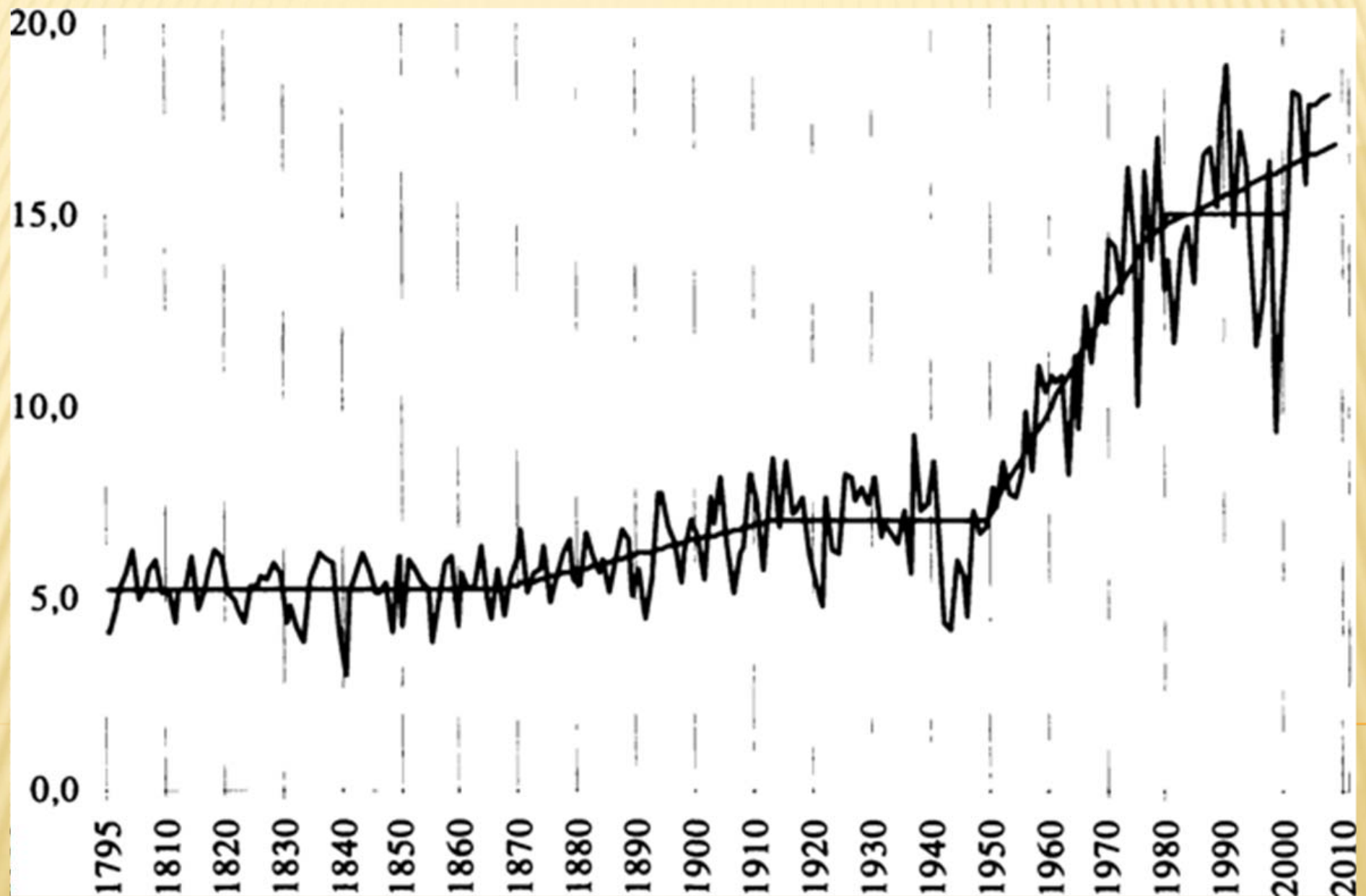
Changes of heating period (days) in 1991-2010 comparing with 1971-1990.



Changes of ice cover of Arctic Ocean



Harvest of grain crops in Russia (100 kg/ha)



Conclusions

- ✗ The negative effects of Climate Change is more essential for society and nature comparing with positive, same to World and Russia.
- ✗ The decrease of fossil fuel emissions is not only way to save climate, but also decision of many ecological problems, related with environmental pollutions.
- ✗ Department of General Ecology tries to disseminate the objective view on Climate Change in Moscow State University, Russian expert community and Russian society.