CLIMATE AND SUSTAINABLE DEVELOPMENT

Assoc. prof. Jānis Zaļoksnis

The United Nations Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty produced at the **UN Conference on Environment and Development** (UNCED), held in Rio de Janeiro from June 3 to 14, 1992.

The objective of the treaty is to **stabilize greenhouse gas concentrations** in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

Instead, the treaty provides for updates (called "protocols") that would set mandatory emission limits. The principal update is the **Kyoto Protocol (1997)**, which concluded and established legally binding obligations for developed countries to reduce their greenhouse gas emissions.

UNFCCC has been signed by **194** parties (countries).

One of its first tasks was to establish national greenhouse gas **inventories** of greenhouse gas (**GHG**) emissions and removals, which were used to create the **1990 benchmark levels** for accession of Annex I countries to the Kyoto Protocol and for the commitment of those countries to GHG reductions.

The United Nations Framework Convention on Climate Change

The UN FCCC Secretariat, Bonn, Germany

The UNFCCC Secretariat is charged with supporting the operation of the Convention, with offices in **Bonn, Germany.**

On May 17, 2010 **Christiana Figueres** from Costa Rica has been named as the head of the secretariat.

The Secretariat, aims to gain **consensus** through meetings and the discussion of various **strategies**.

The parties to the convention have met annually from 1995 in Conferences of the Parties (**COP**) to assess progress in dealing with climate change.

The World Meteorological Organization Headquarters in Geneva.
IPCC Secretariat is hosted by WMO.

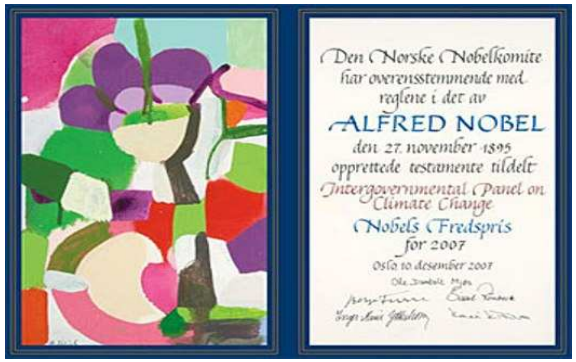
The Intergovernmental Panel on Climate Change (IPCC) is a scientific intergovernmental body set up at the request of member governments.

It was established in 1988 by two UN organizations, - the World Meteorological Organisation and the UN Environmental Programme.

Its mission is to provide comprehensive scientific assessments of current scientific, technical and socio-economic information worldwide about the risk of climate change.

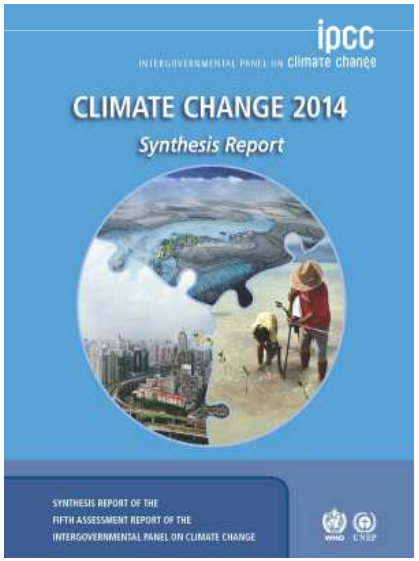
Thousands of scientists and other experts contribute to writing and reviewing reports, which are reviewed by representatives from all the governments, with a Summary for Policymakers being subject to line-by-line approval by all participating governments.

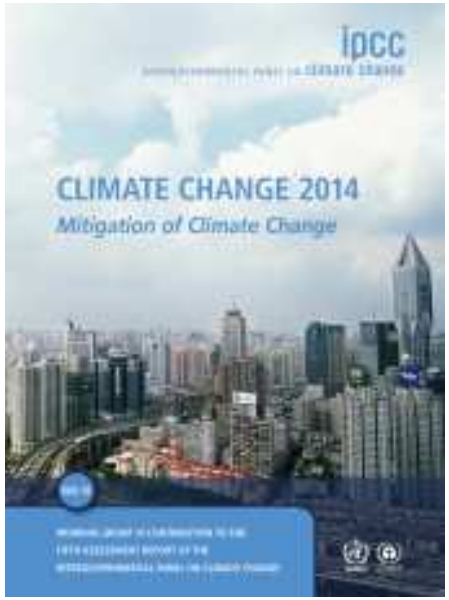
Typically this involves the governments of more than 120 countries.



Oslo, 10 December 2007

The Intergovernmental Panel on Climate Change and Albert Arnold (Al) Gore Jr. were awarded the Nobel Peace Prize "for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change".





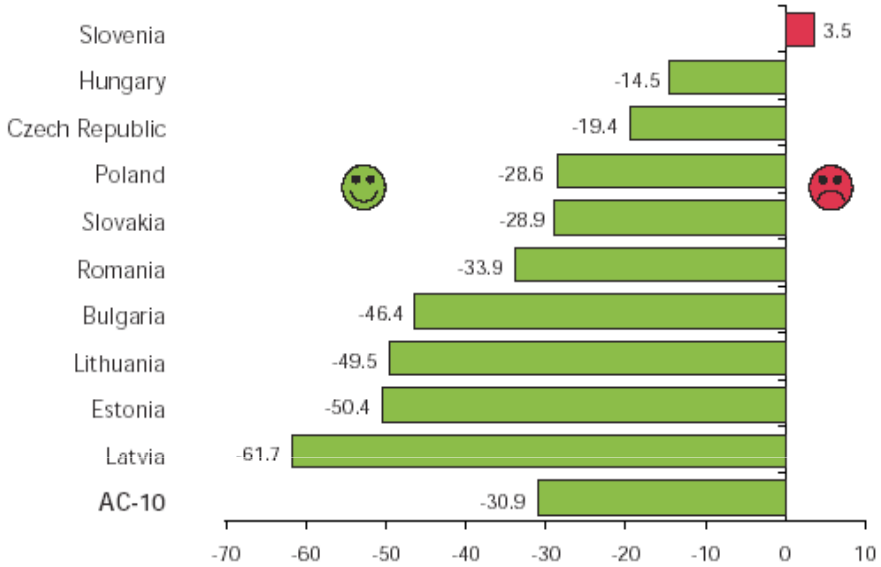
Participation in the Kyoto Protocol

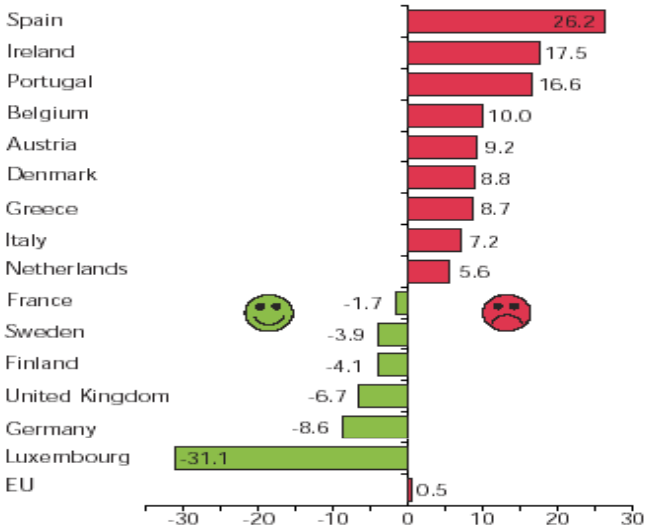
Green = Countries that have signed and ratified the treaty (Annex I countries in dark green).

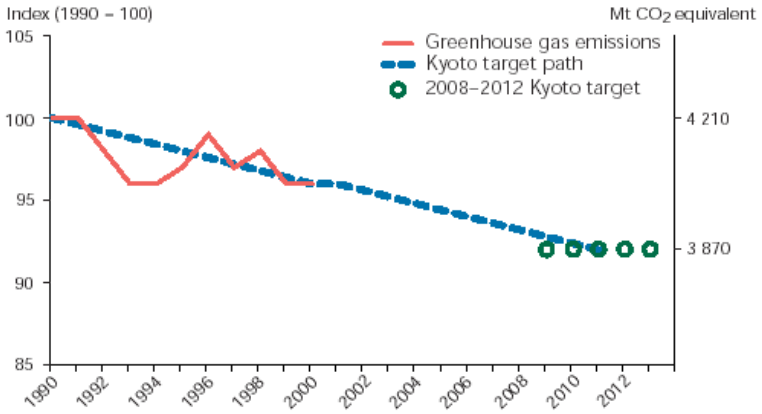
Grey = Countries that have not yet decided.

Brown = No intention to ratify at this stage.

Fulfilment of the Kyoto aims

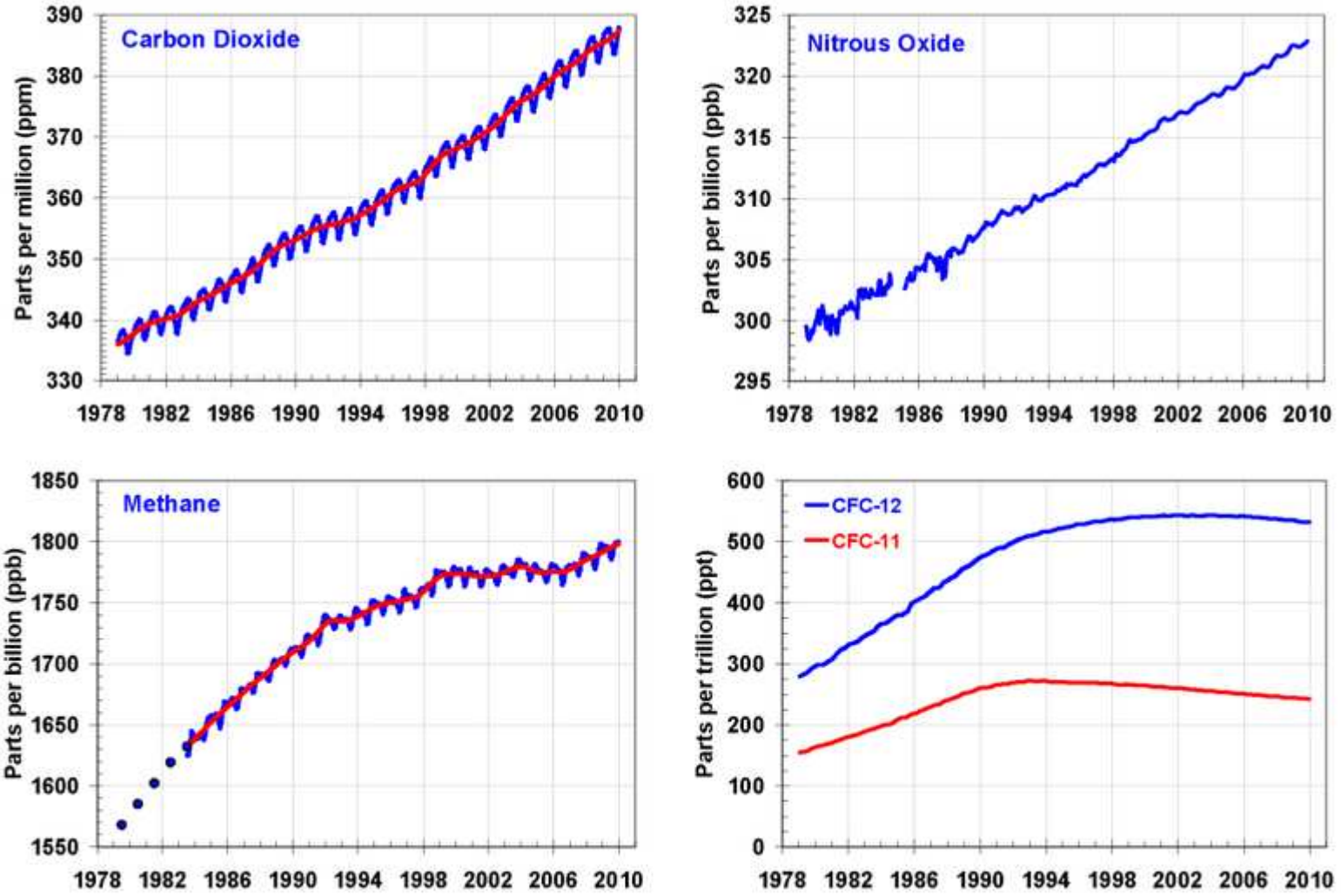






GHG emissions in the EU

Kyoto is intended to cut global emissions of greenhouse gases



Ranking of the world's top ten emitters of GHG's

The first figure is the country's or region's emissions as a percentage of the global total. The second figure is the country's/region's per-capita emissions, in units of tons of GHG per-capita.

1. China – 17%, 5.8
2. United States – 16%, 24.1
3. European Union – 11%, 10.6
4. Indonesia – 6%, 12.9
5. India – 5%, 2.1
6. Russia – 5%, 14.9
7. Brazil – 4%, 10.0
8. Japan – 3%, 10.6
9. Canada – 2%, 23.2
10. Mexico – 2%, 6.4

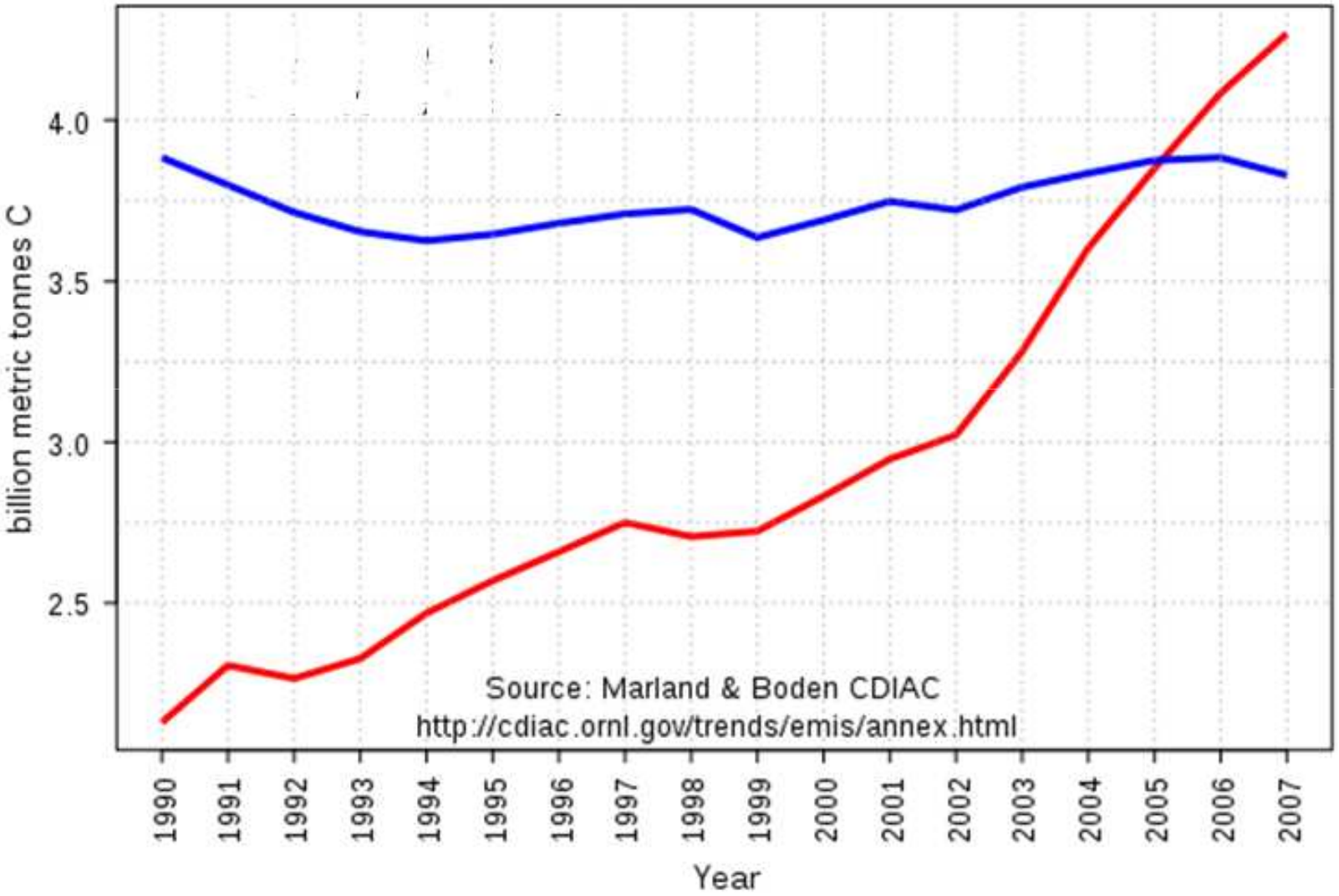
Largest Producers of Fossil Fuels

China Iran Mexico S. Arabia Russia USA

Largest Consumers of Fossil Fuels

China EU India Japan Russia USA

Fossil-Fuel Carbon Dioxide Emissions Annex I (red) countries vs Non-Annex I countries (blue) 1990–2007



COP15
COPENHAGEN
UN CLIMATE CHANGE CONFERENCE 2009

UNITED NATIONS
CLIMATE CHANGE
CONFERENCE
DEC 7 - DEC 18
2009

RAISE YOUR VOICE
CHANGE CLIMATE CHANGE

India's Prime Minister Manmohan Singh (blue) and Indian Minister of Environment and Forests Jaraim Ramesh (behind) during a multilateral meeting with U.S. President Barack Obama, Chinese Premier Wen Jiabao, Brazilian President Lula da Silva and South African President Jacob Zuma at the United Nations Climate Change Conference.

Connie Hedegaard, former President of the UN Climate Change Conference 2009 in Copenhagen. Now EU commissioner for Climate Action.

Information	
Date:	29 Nov.–10 Dec. 2010
Location:	Cancun, Mexico
Participants:	UN FCCC member countries

COP-16 decides:

- to strengthen in relation to a global average temperature rise of 1.5℃ ,
- to shift paradigm towards building a low-carbon society,
- to look forward to a second commitment period for the Kyoto Protocol,
- to provide resources, approaching USD 30 billion for the period 2010-2012,
- to affirm a goal of mobilizing jointly USD 100 billion per year by 2020 to address the needs of developing countries,
- to establish a Green Climate Fund, to be designated as an operating entity of the financial mechanism of the Convention,
- to establish a Technology Mechanism, which will consist of a Technology Mechanism Committee, a Climate Technology Centre and Network.

COP17/CMP7
UNITED NATIONS
CLIMATE CHANGE CONFERENCE 2011
DURBAN, SOUTH AFRICA

From left to right: UN Secretary-General Ban Ki-mmon, President of South Africa Jacob Zuma, President of the Conference Maite Nkoana-Mashabane and UNFCC Deputy Executive Secretary Richard Kinley

Date:	28 November 2011 – 11 December 2011
Location:	Durban, South Africa
Webpage	cop17-cmp7durban.com

Durban platform:

Holding the increase in global average temperature below 2 ℃ or 1.5 ℃ above pre-industrial levels.

Shall complete work as early as possible but no later than 2015 in order to adopt new protocol, legal instrument or agreed outcome with legal force, to come into effect and be implemented from 2020.

Governments, including 38 industrialised countries, agreed a second commitment period of the Kyoto Protocol from January 1, 2013. To achieve rapid clarity, Parties to this second period will turn their economy-wide targets into quantified emission limitation or reduction objectives and submit them for review by May 1, 2012.

The conference led to progress regarding the creation of a Green Climate Fund for which a management framework was adopted. The fund is to distribute US$100 bn per year to help poor countries adapt to climate impacts.

DOHA 2012
UN CLIMATE CHANGE CONFERENCE
COP18·CMP8

Date:	26 November 2012 – 8 December 2012
Location:	Doha, Qatar
Attendance:	17 000

Conference outcomes

Kyoto Protocol has been prolonged up to 2020.

The Conference produced a package of documents collectively titled *The Doha Climate Gateway* over objections from Russia and other countries at the session.

The documents collectively contained:

An eight year extension of the Kyoto Protocol until 2020 limited in scope to only 15% of the global carbon dioxide emissions due to the lack of participation of Canada, Japan, Russia, Belarus, Ukraine, New Zealand and the United States and due to the fact that developing countries like China (the world's largest emitter), India and Brazil are not subject to any emissions reductions under the Kyoto Protocol.

Language on loss and damage, formalized for the first time in the conference documents.

The conference made little progress towards the funding of the Green Climate Fund.

CLIMATE VOTE PROJECT

10 million Facebook likes for continuation of the Kyoto protocol

COP-19; 11 - 22 Nov 2013

**The National Stadium in Warsaw,
the main venue of the conference**

Over 10,000 participants from 189 countries have registered to attend the conference, but only 134 ministers announced participation. Four countries that are among the most vulnerable to climate change are represented by their president or prime minister: Tuvalu, Nauru, Ethiopia, and Tanzania.

The United Nations climate conference in Warsaw marked a step forward in the international fight against climate change.

The conference agreed a time-plan for countries to table their contributions to reducing or limiting greenhouse gas emissions under a new global climate agreement to be adopted in 2015. It also agreed ways to accelerate efforts to deepen emission cuts over the rest of this decade, and to set up a mechanism to address losses and damage caused by climate change in vulnerable developing countries.

LIMA COP20 | CMP10

UN CLIMATE CHANGE CONFERENCE 2014

United Nations
Framework Convention on
Climate Change

The 20th session of the Conference of the Parties and the 10th session of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol will be held from **1 to 12 December, 2014**.
COP 20/CMP 10 will be hosted by the Government of Peru, in Lima, Peru.

Paris Agreement

United nations conference
on climate change
COP21/CMP11

The Paris Agreement is an agreement within the framework of the United Nations Framework Convention on Climate Change (UNFCCC) dealing with greenhouse gases emissions mitigation, adaptation and finance starting in the year 2020.

An agreement on the language of the treaty was negotiated by representatives of 195 countries at the 21st Conference of the Parties of the UNFCCC in Paris and adopted by consensus on 12 December 2015.

It was opened for signature on 22 April 2016 (Earth Day) and 177 UNFCCC members signed the treaty, 15 of which ratified it.

It has not entered into force.

The head of the Paris Conference, France's foreign minister Laurent Fabius, said this "ambitious and balanced" plan is a "historic turning point" in the goal of reducing global warming.

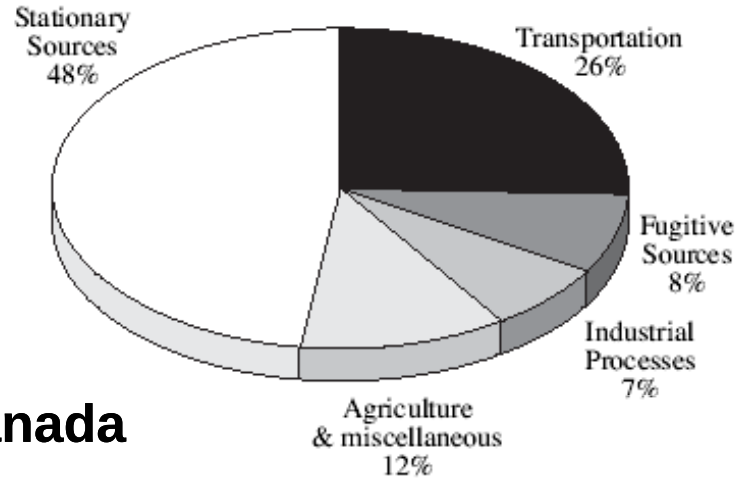
Signing by John Kerry in UN General Assembly Hall for the United States

Heads of delegations at the 2015 UN Climate Change Conference in Paris

Party or signatory	% for ratification	Signed		
Australia	1.46%	22 April 2016		
Bhutan	0.00%	22 April 2016		
Canada	1.95%	22 April 2016		
China	20.09%	22 April 2016		
France	1.34%	22 April 2016		
Germany	2.56%	22 April 2016		
India	4.10%	22 April 2016		
Indonesia	1.49%	22 April 2016		
Iran	1.30%	22 April 2016		
Italy	1.18%	22 April 2016		
Japan	3.79%	22 April 2016		
Latvia	0.03%	22 April 2016		
Lithuania	0.05%	22 April 2016		
Mexico	1.70%	22 April 2016		
Poland	1.06%	22 April 2016		
Russia	7.53%	22 April 2016		
South Africa	1.46%	22 April 2016		
Turkey	1.24%	22 April 2016		
Ukraine	1.04%	22 April 2016		
United Kingdom	1.55%	22 April 2016		
United States	17.89%	22 April 2016		

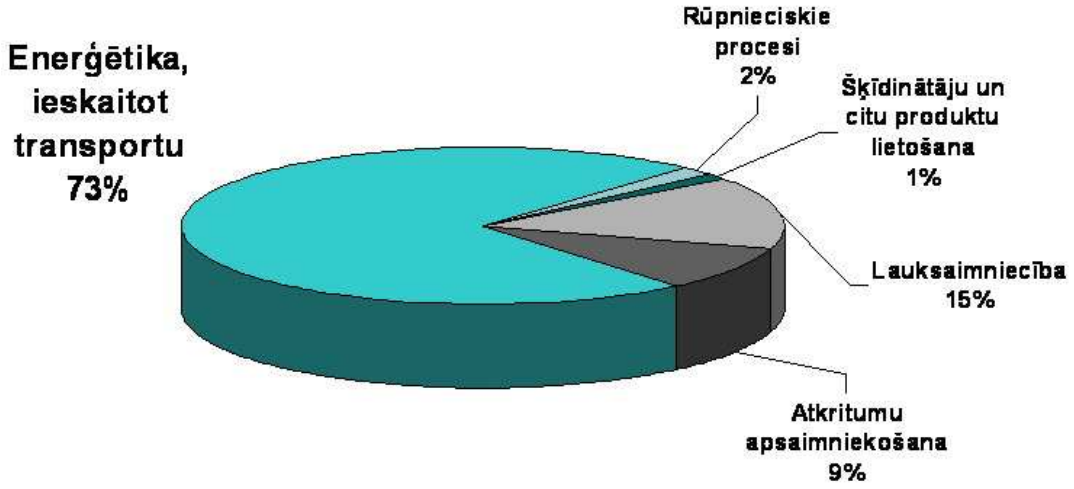
Climate Change – Natural and Antrophogenic Processes

GHG emissions by economies

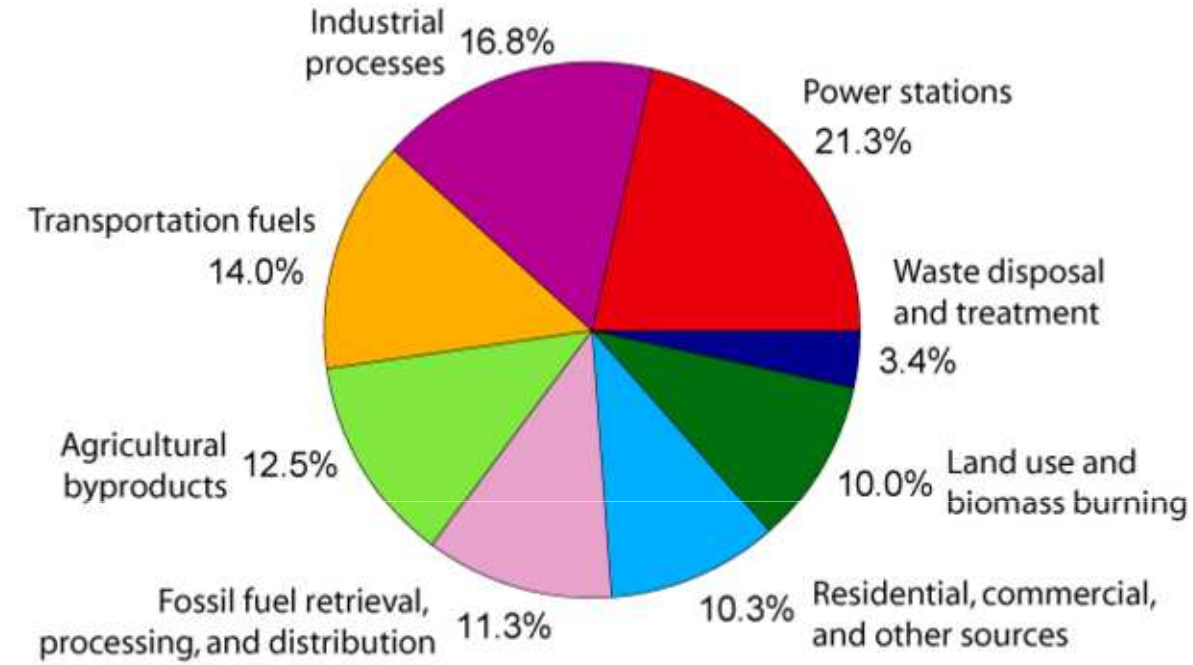


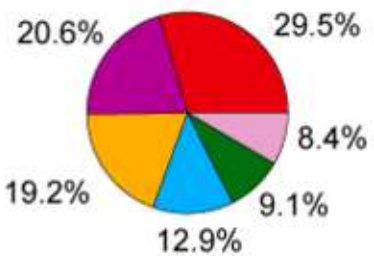
Canada

Latvia

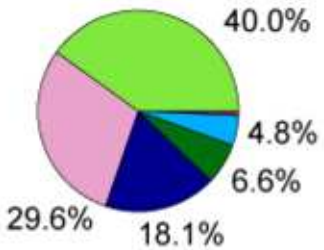


Annual Greenhouse Gas Emissions by Sector

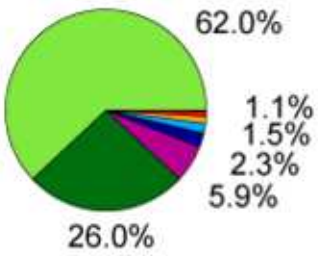




Carbon Dioxide
(72% of total)

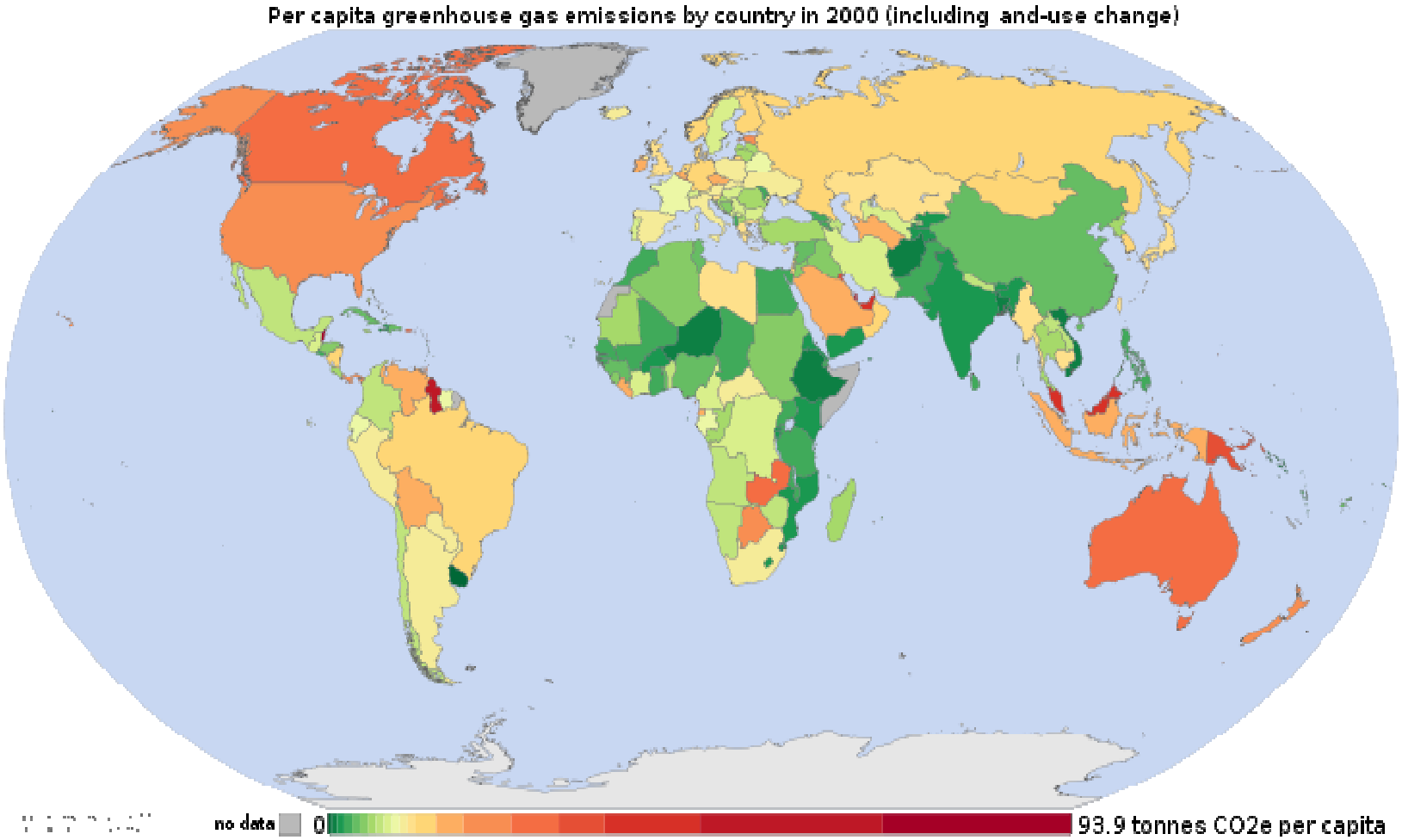


Methane
(18% of total)



Nitrous Oxide
(9% of total)

GHG emissions per person in the World



GLOBAL WARMING

Climate is the statistical summary of weather and meteorological phenomena and occurrences over a long period of time, ranging from a few years or decades to thousands of years.

There is no doubt that human activities (air, water and soil pollution, overpopulation) **do influence climate.**

A sharp increase in the concentration of various gases in the atmosphere is indicative of the increase of anthropogenic influence.

It is evident that the concentrations of gases were considerably lower in the period when industrial production was not yet intense, while they have substantially increased during the last centuries.

A new climate study shows that since the mid-1950s, global average temperatures over land have risen by 0.9 degrees Celsius, confirming previous studies that have found a climate that has been warming – in fits and starts – since around 1900.

Greenhouse effect

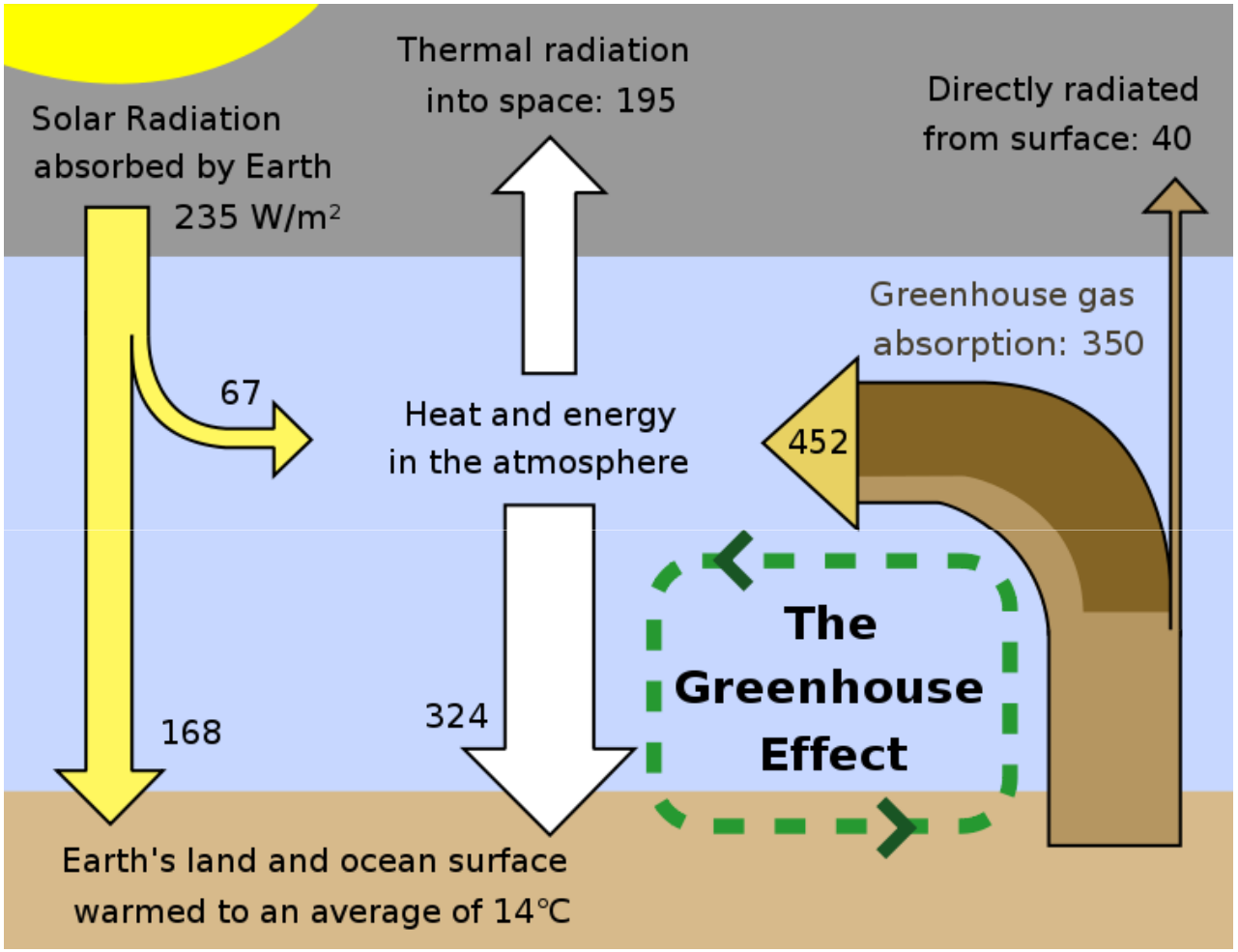
The greenhouse effect is a process by which **thermal radiation from a planetary surface is absorbed by atmospheric greenhouse gases**, and is re-radiated in all directions. Since part of this re-radiation is back towards the surface, energy is transferred to the surface and the lower atmosphere. As a result, the temperature there is higher than it would be if direct heating by solar radiation were the only warming mechanism.

The greenhouse effect was discovered by French mathematician **Joseph Fourier** in 1824, first reliably experimented on by British physicist **John Tyndall** in 1858, and first reported quantitatively by Swedish scientist **Svante Arrhenius** in 1896.

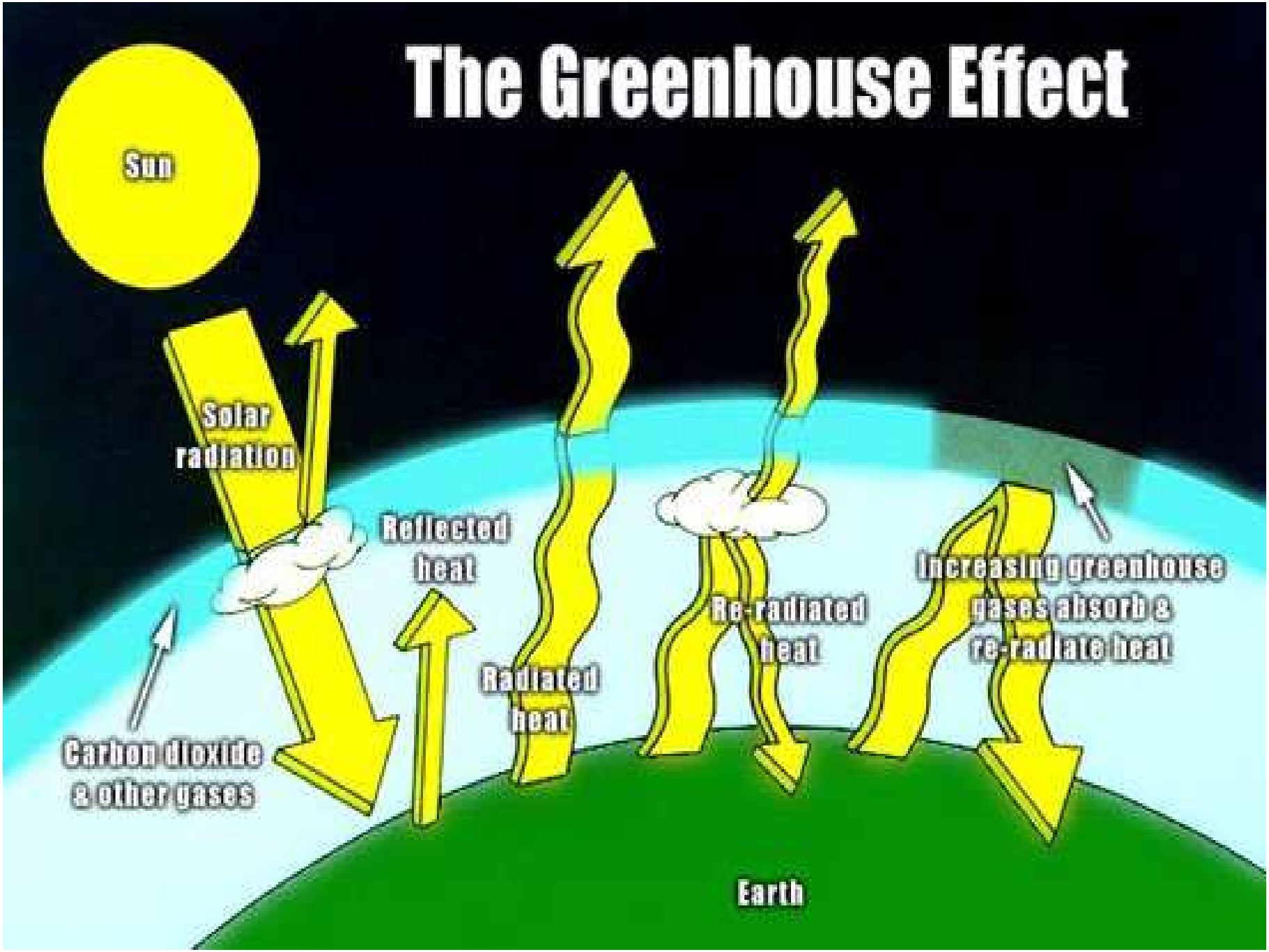
If an ideal thermally conductive blackbody was the same distance from the Sun as the Earth is, it would have a temperature of about **5.3 ℃** . However, since the Earth reflects about 30% of the incoming sunlight, the planet's effective temperature is about −18 ℃, or 33℃ below the actual su rface temperature of about 15 ℃.

The mechanism that produces this difference between the actual surface temperature and the effective temperature is due to the atmosphere and is known as the greenhouse effect.

Greenhouse effect



A representation of the exchanges of energy between the source (the Sun), the Earth's surface, the Earth's atmosphere, and the ultimate sink outer space. The ability of the atmosphere to capture and recycle energy emitted by the Earth surface is the defining characteristic of the greenhouse effect.


The Greenhouse Effect
Sun
Solar radiation
Reflected heat
Radiated heat
Re-radiated heat
Increasing greenhouse gases absorb & re-radiate heat
Carbon dioxide & other gases
Earth

GREENHOUSE GASES

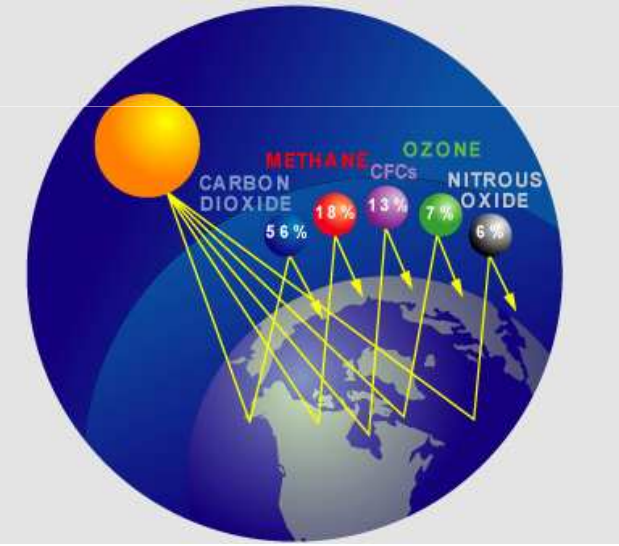
By their percentage contribution to the greenhouse effect on Earth the four major gases are:

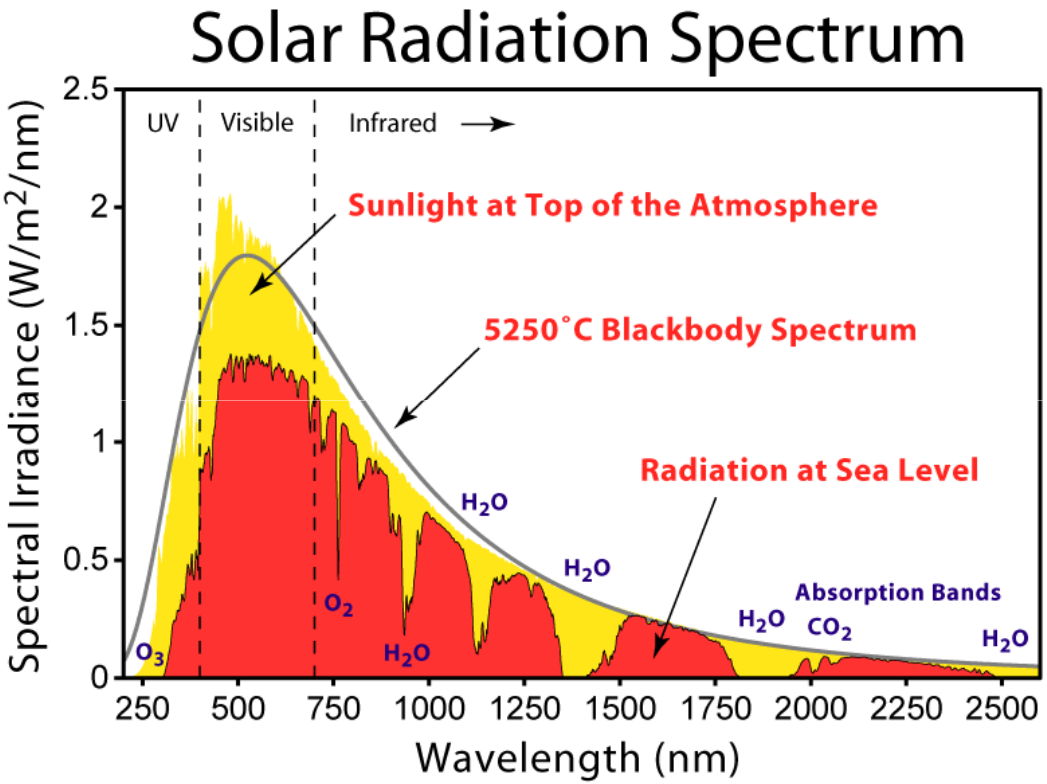
- water vapour, 36–70%,

- carbon dioxide, 9–26%,

- methane, 4–9%,

- ozone, 3-7 %.





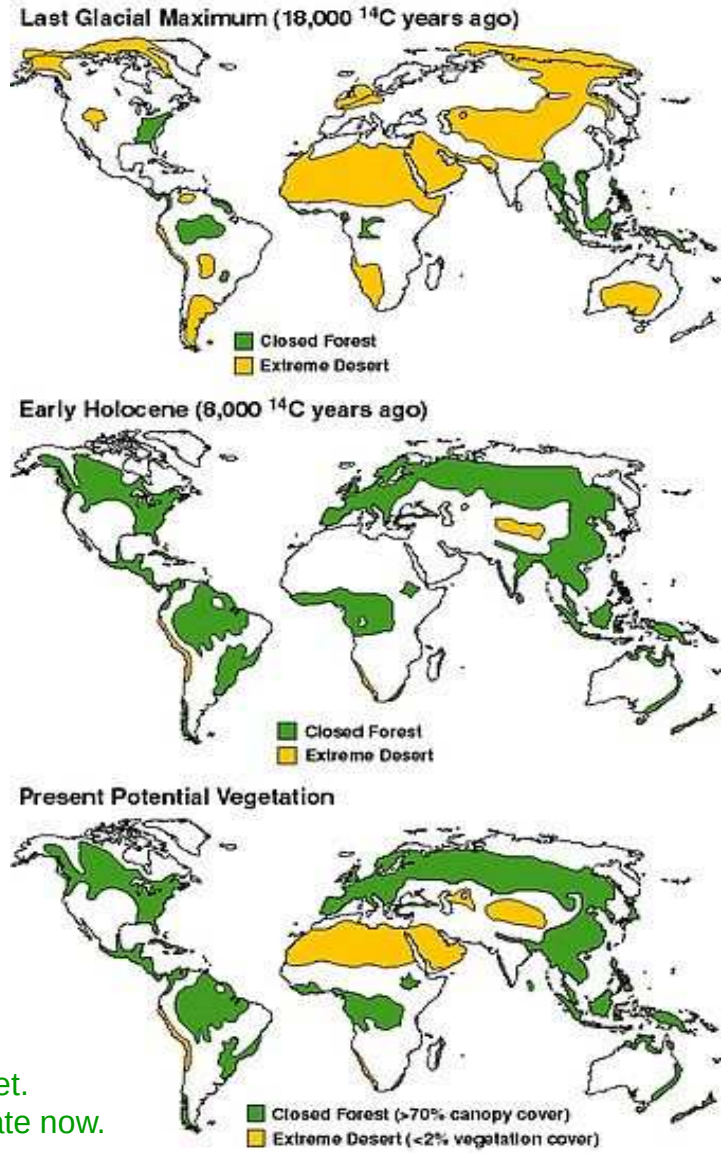
The major non-gas contributor to the Earth's greenhouse effect, clouds, also absorb and emit infrared radiation and thus have an effect on radiative properties of the atmosphere.

Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be a change in average weather conditions or the distribution of events around that average (e.g., more or fewer extreme weather events). Climate change may be limited to a specific region or may occur across the whole Earth.

The concentration of greenhouse gases has increased just within the last 500 years – especially with beginning with the industrial revolution and affecting climate change.

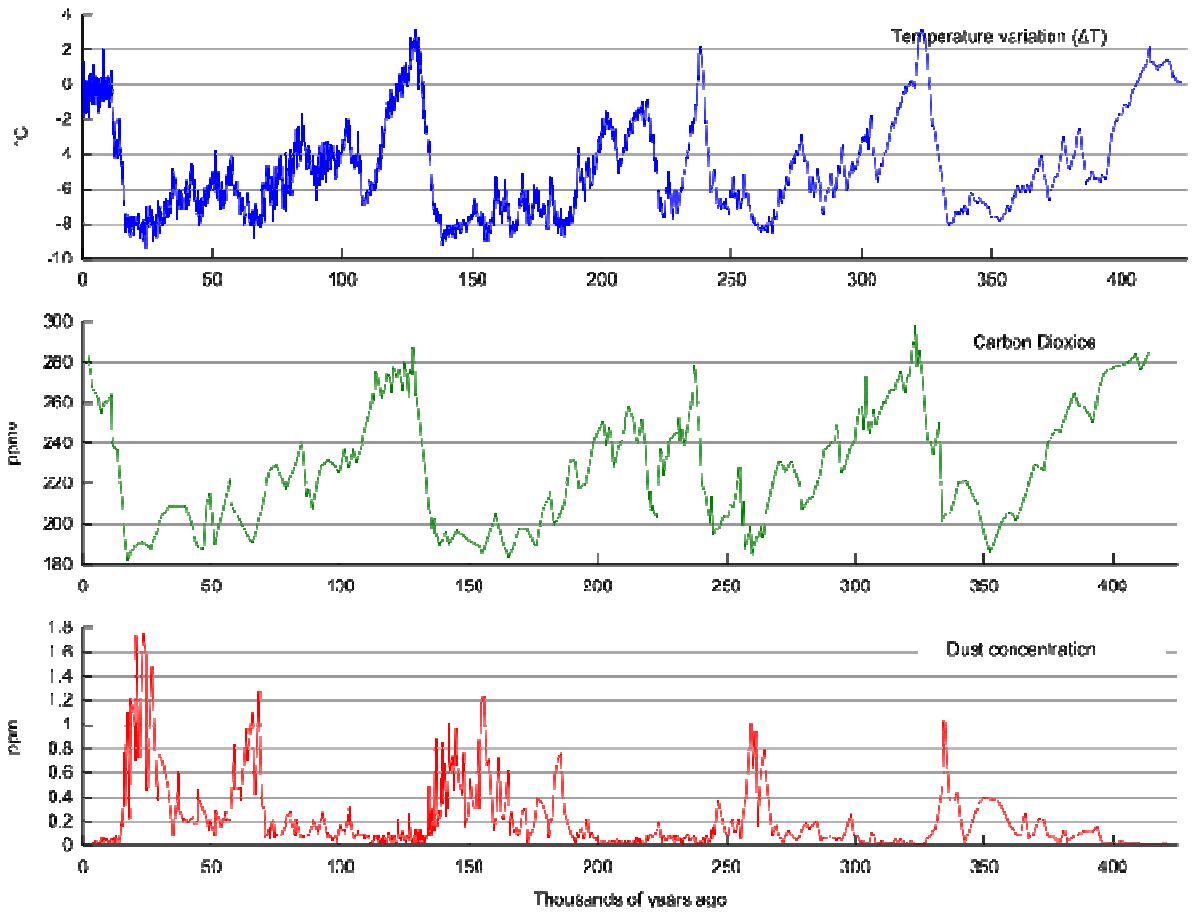
Consequently, the current climate change process could be untimely and unnatural, and it may also lead to many global climate problems that we already witness today.

The phrase ‘global warming’ denotes not only the increase of the Earth’s average temperature, usually measured as the average temperature per year, but also substantial changes in the entire climate system.



Top: Arid ice age climate.
Middle: Atlantic Period, warm and wet.
Bottom: Potential vegetation in climate now.

Variations in CO_2, temperature and dust from the "Vostok" ice core over the last 450,000 year



"Vostok" – a Russian Antarctic research station at the southern Pole of Cold, with the lowest reliably measured natural temperature on Earth of −89.2 ℃

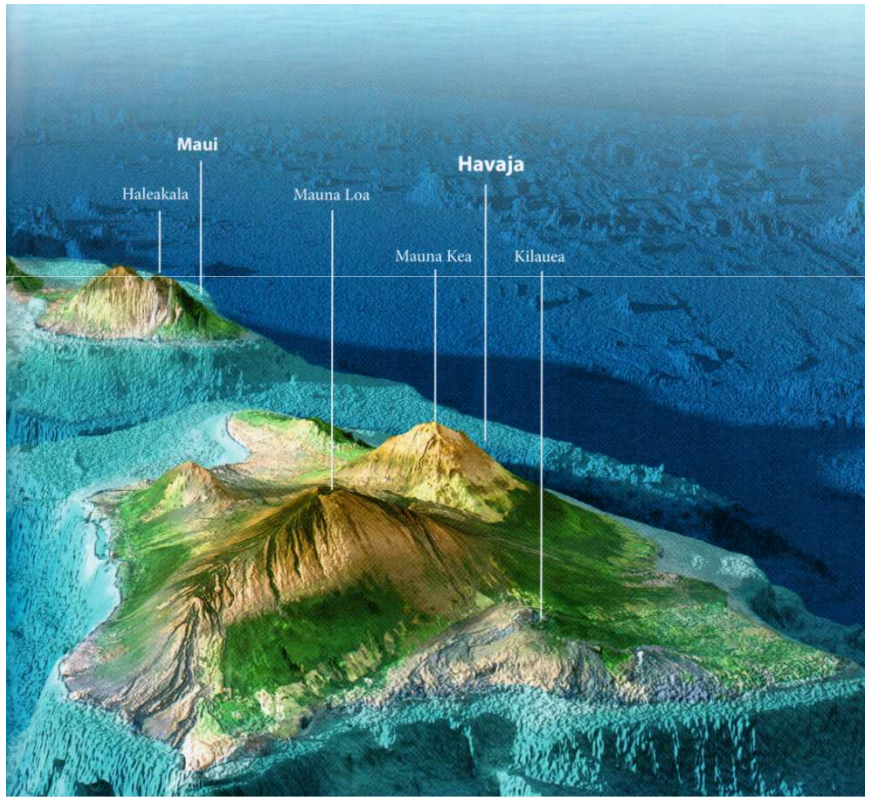
Increasing of the global CO_2 concentration

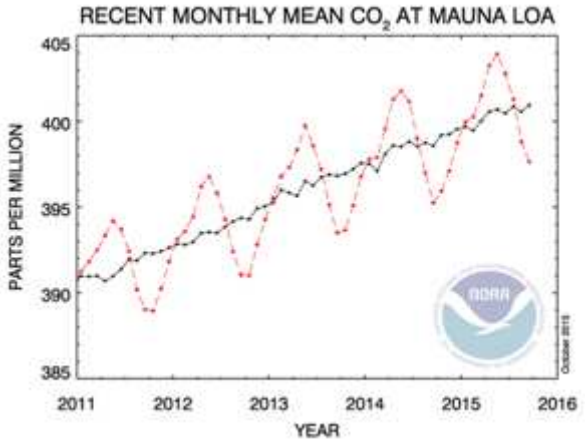
The last four complete years of the Mauna Loa CO_2 record plus the current year are shown.

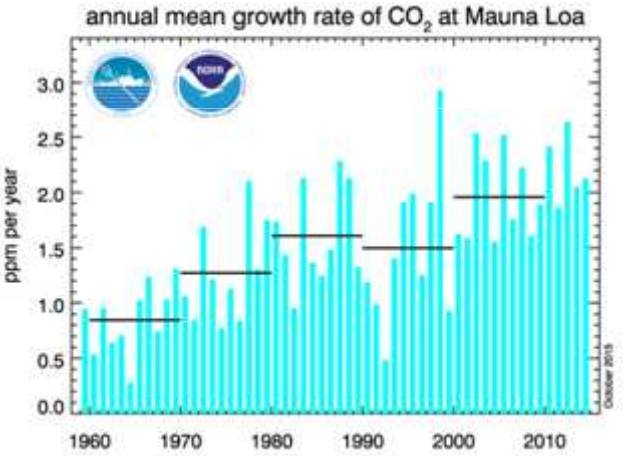
Data are reported as a dry air mole fraction defined as the number of molecules of carbon dioxide divided by the number of all molecules in air, including CO_2itself, after water vapor has been removed.

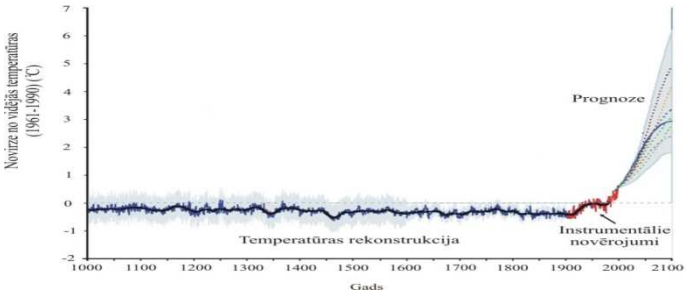
The mole fraction is expressed as parts per million (ppm).

Example: 0.000400 is expressed as 400 ppm.









Week beginning on October 11, 2015: 398.18 ppm
Weekly value from 1 year ago: 395.58 ppm
Weekly value from 10 years ago: 376.93 ppm

March 2016: 404.83 ppm

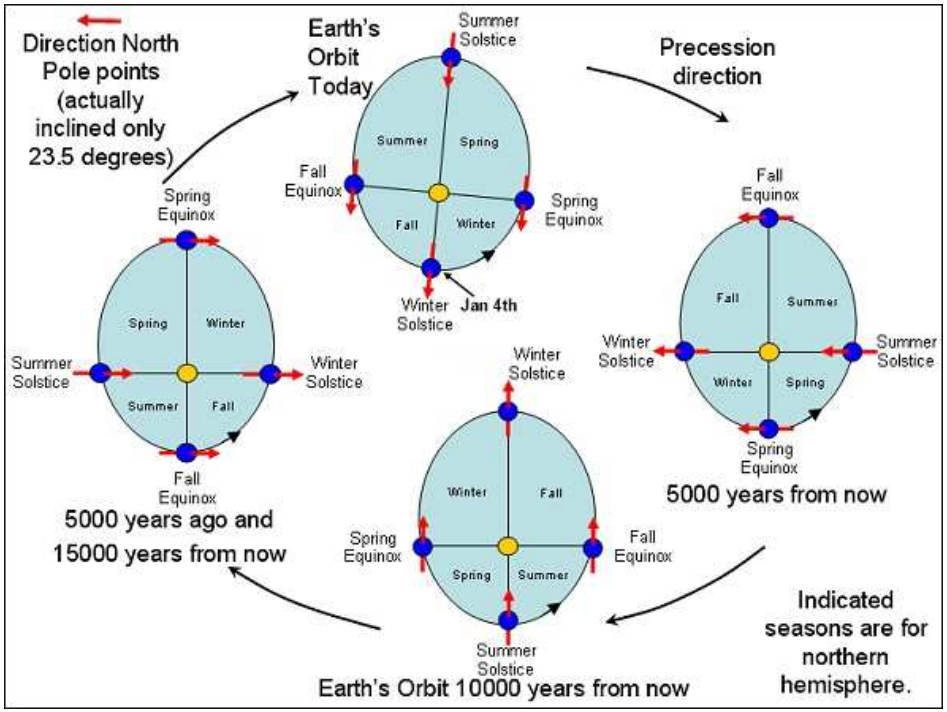
March 2015: 401.52 ppm

ORBITAL VARIATIONS

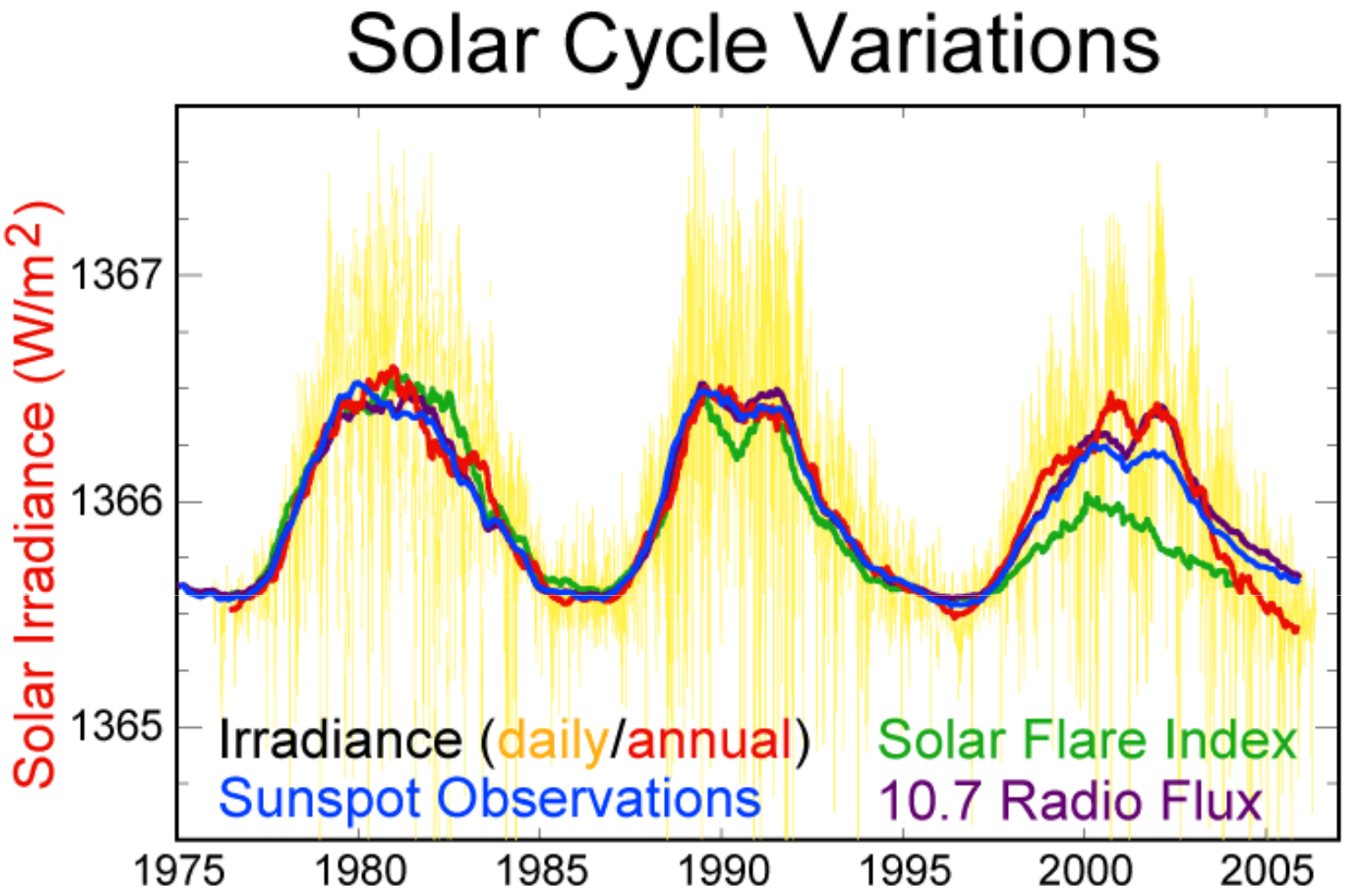
Slight variations in Earth's orbit lead to changes in the seasonal distribution of sunlight reaching the Earth's surface and how it is distributed across the globe.

The three types of orbital variations are variations in Earth's eccentricity, changes in the tilt angle of Earth's axis of rotation, and precession of Earth's axis. Combined together, these produce Milankovitch cycles which have a large impact on climate and are notable for their correlation to glacial and interglacial periods, their correlation with the advance and retreat of the Sahara, and for their appearance in the stratigraphic record.

The IPPC notes that Milankovitch cycles drove the ice age cycles; CO_2 followed temperature change "with a lag of some hundreds of years"; and that as a feedback amplified temperature change.

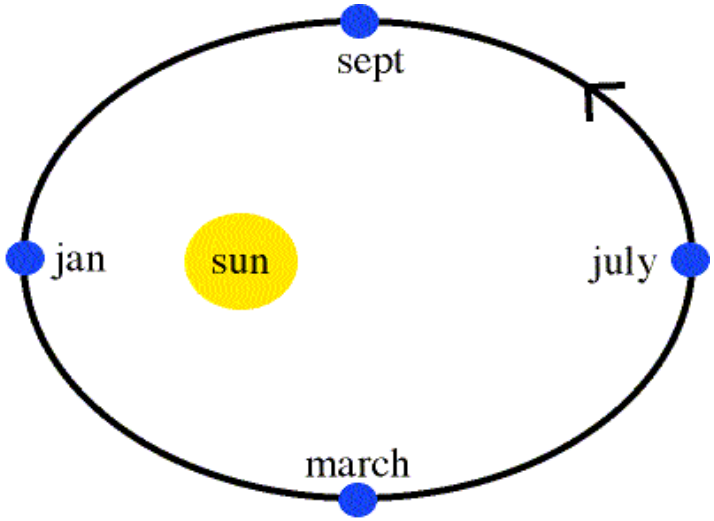


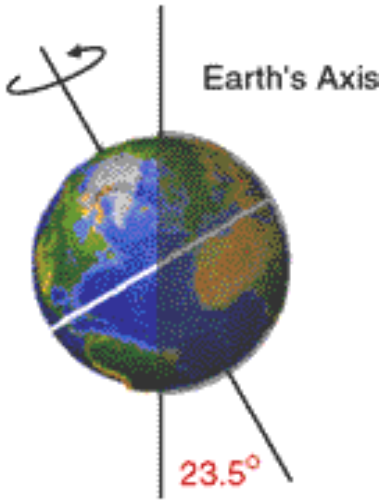
Effects of apsidal precession on the seasons

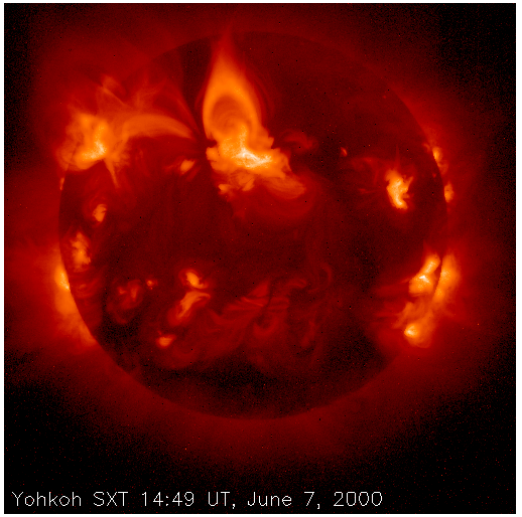


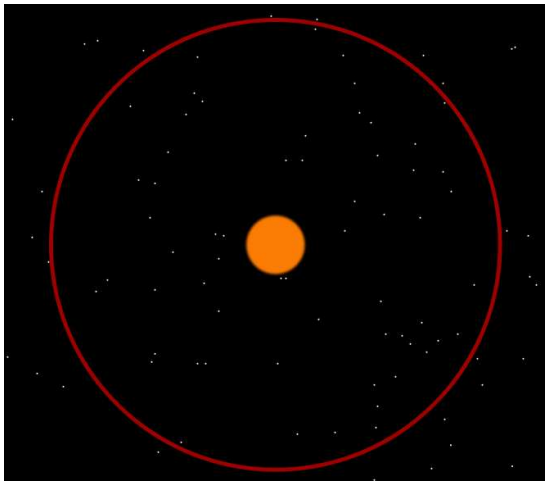
Sun activities cycles have frequency – 11, 36 un 180 years.

Sun activity cycles can change global temperature by 0,33℃ - 0,45℃.

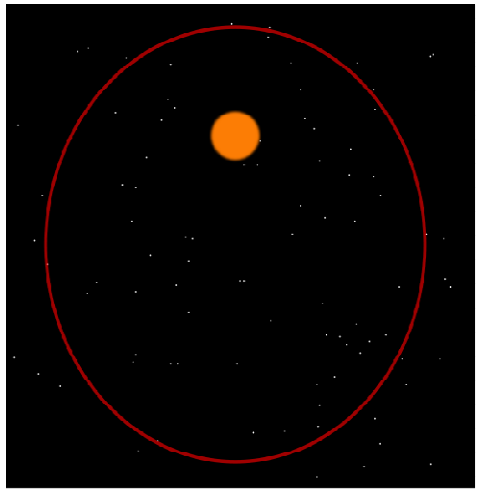








Circular orbit, no eccentricity



Orbit with 0.5 eccentricity

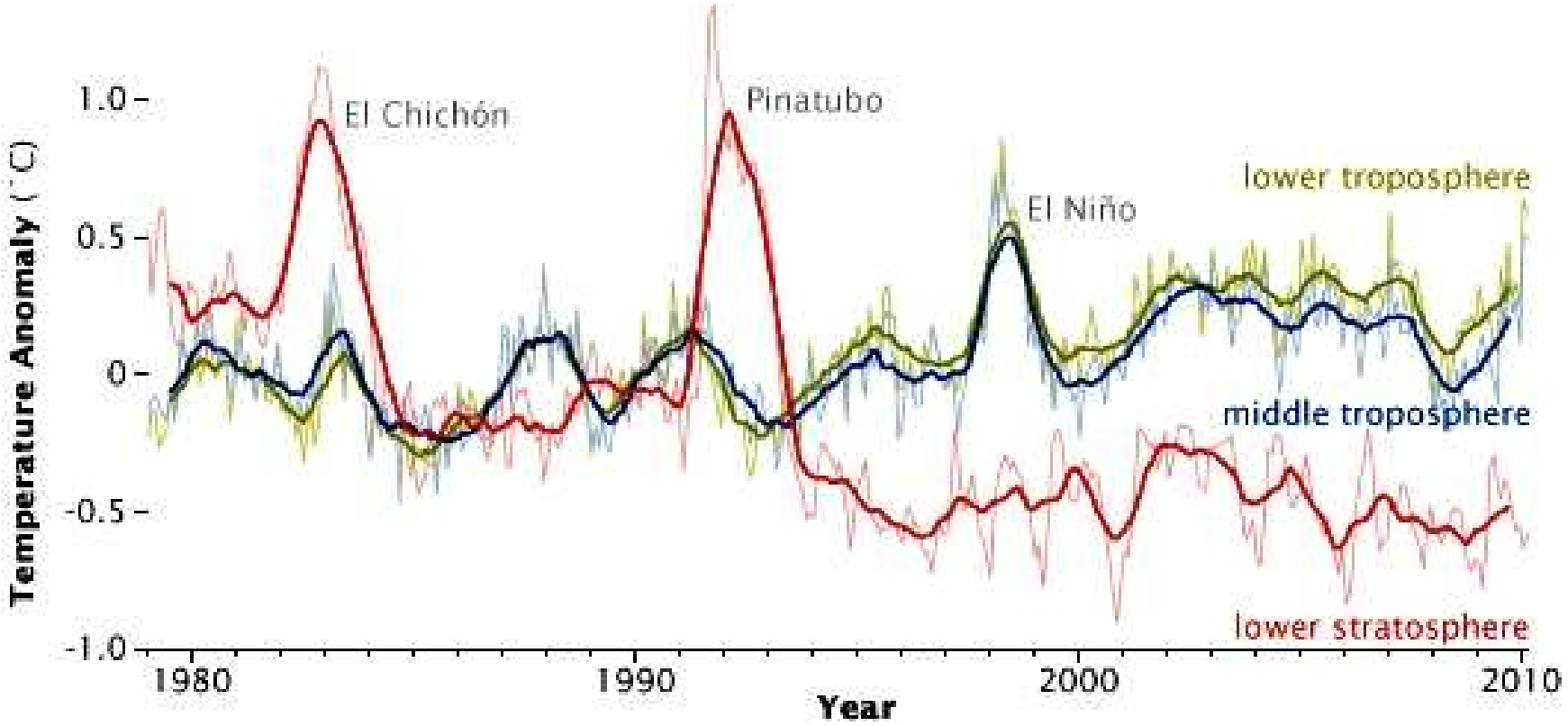
VOLCANISM

Volcanic eruptions release gases and particulates into the atmosphere. Eruptions large enough to affect climate occur on average several times per century, and cause cooling (by partially blocking the transmission of solar radiation to the Earth's surface) for a period of a few years.

The eruption of Moun Pinatubo in 1991, the second largest terrestrial eruption of the 20th century (after the 1912 eruption of Navarupta) affected the climate substantially. Global temperatures decreased by about 0.5 ℃.

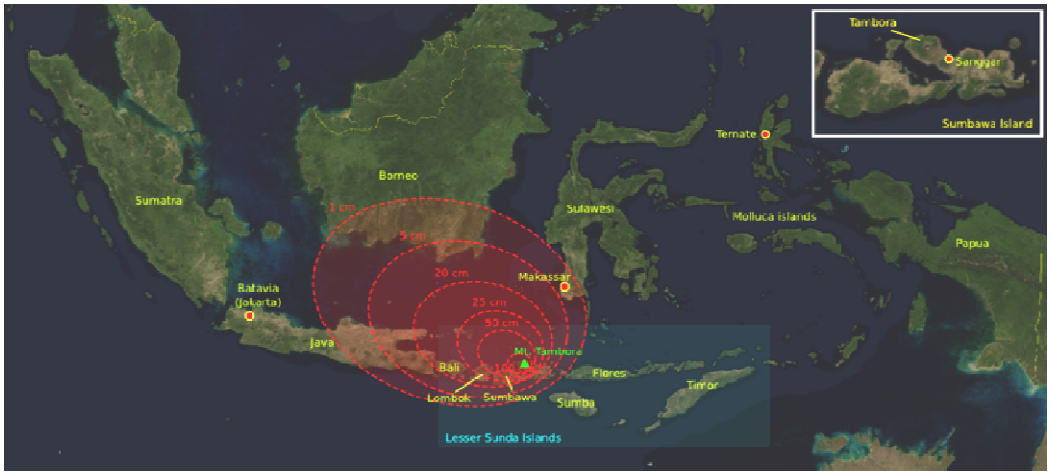
The eruption of Mount Tambora in 1815 caused the “Year Without a Summer”. Much larger eruptions, known as large igneous (vulkaniskas) provinces, occur only a few times every hundred million years, but may cause global warming and mass extinctions.

A review of published studies indicates that annual volcanic emissions of carbon dioxide, including amounts released from mid-ocean ridges, volcanic arcs, and hot spot volcanoes, are only the equivalent of 3 to 5 days of human caused output.



In atmospheric temperature from 1979 to 2010, determined by NASA satellites, effects appear from aerosols released by major volcanic eruptions.

Mount Tambora, Indonesia

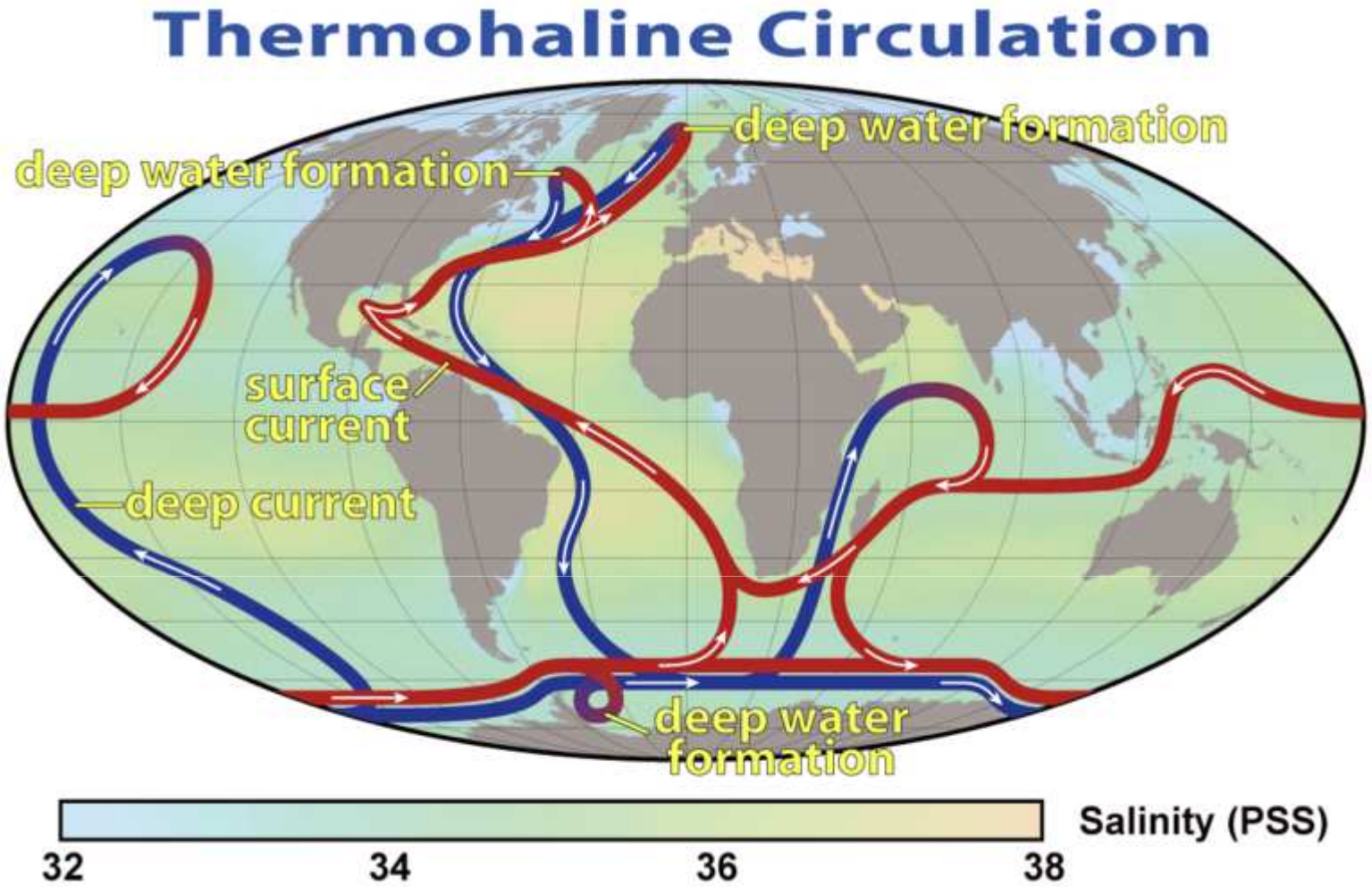


The estimated volcanic ash fall regions during the 1815 eruption. The red areas show thickness of volcanic ash fall.

The outermost region (1 cm thickness) reached Borneo and the Sulawesi islands.

Along with grain prices deteriorated criminal situation and greed. Here – hanged black marketeer.

" Death by the wayside " - symbolic picture that reflects the dire reality in many parts of Europe at a time when Tambor volcano ashes blocked the Sun's rays.

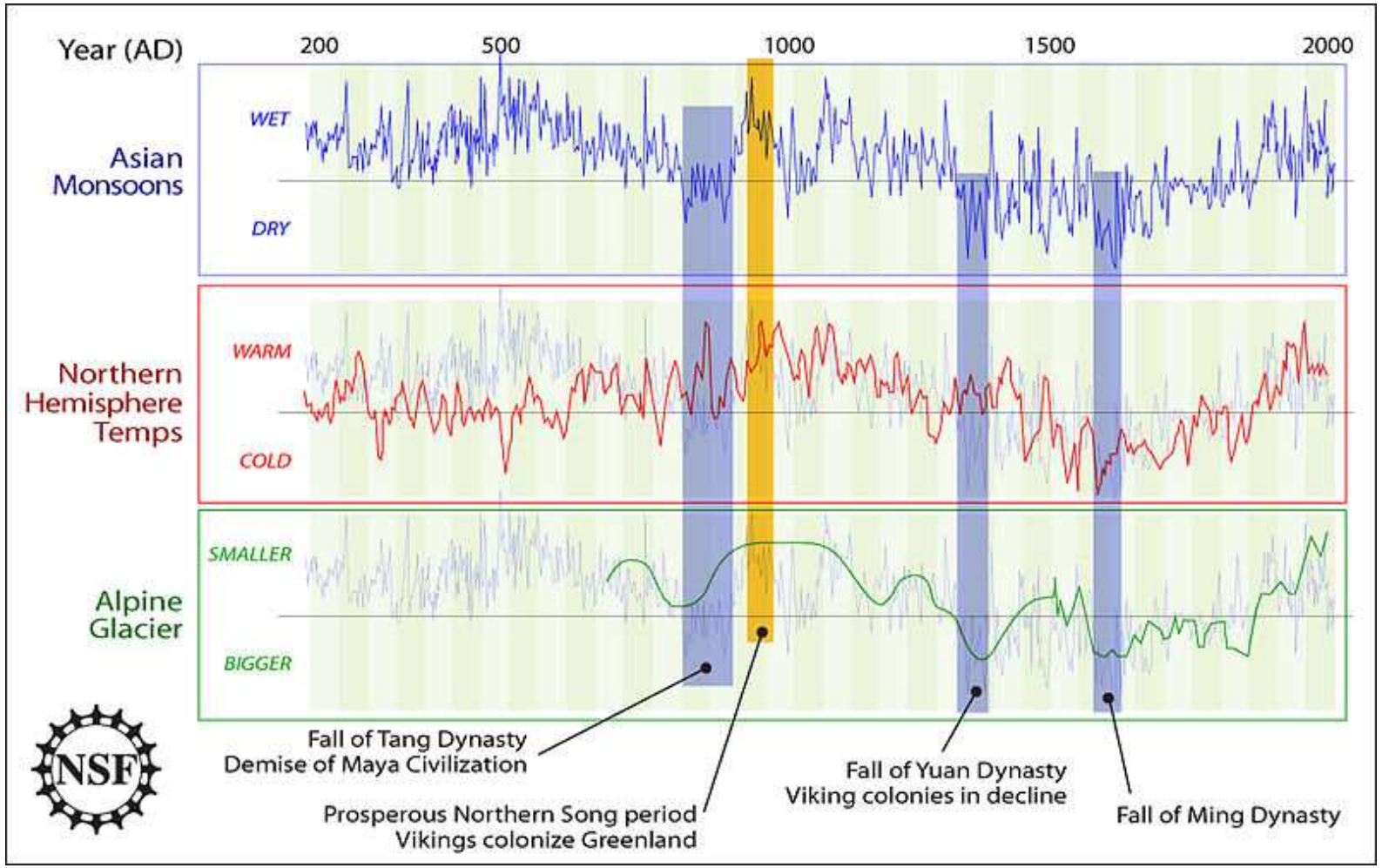


The map shows the general location and direction of the warm surface (red) and cold deep water (blue) currents of the thermohaline circulation.

Salinity is represented by colour in units of the Practical Salinity Scale.

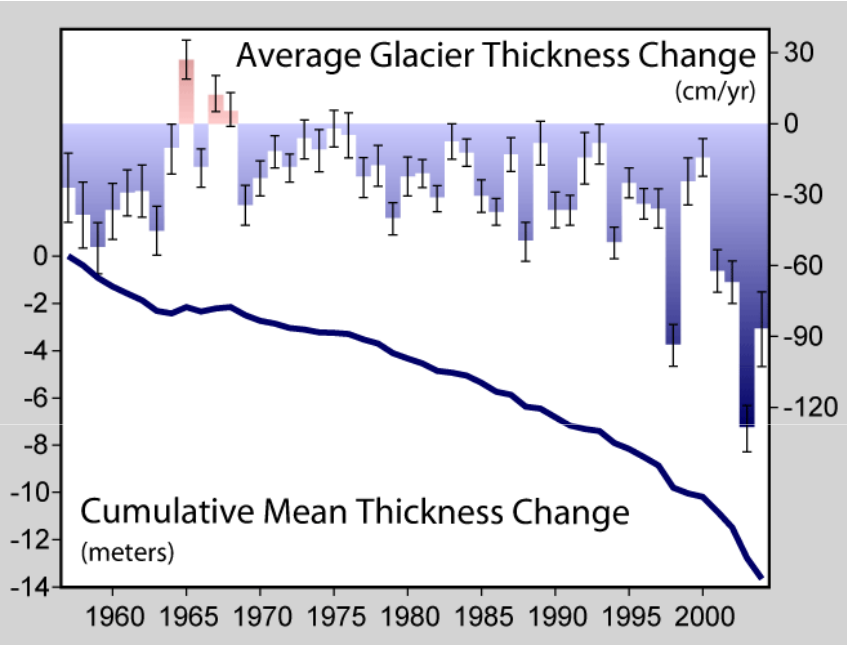
Low values (blue) are less saline, while high values (orange) are more saline.

Evidence for climatic change



Comparisons between Asian Monsoons from 200 A.D. to 2000 A.D. (staying in the background on other plots), Northern Hemisphere temperature, Alpine glacier extent (vertically inverted as marked), and human history as noted by the U.S.

GLACIERS



Glaciers are considered among the most sensitive indicators of climate change. Their size is determined by a mass balance between snow input and melt output. As temperatures warm, glaciers retreat unless snow precipitation increases to make up for the additional melt; the converse is also true.

A world glacier inventory has been compiled since the 1970s, initially based mainly on aerial photographs and maps but now relying more on satellites. This compilation tracks more than 100,000 glaciers covering a total area of approximately 240,000 km^2, and preliminary estimates indicate that the remaining ice cover is around 445,000 km^2.

The World Glacier Monitoring Service collects data annually on glacier retreat and glacier mass balance. From this data, glaciers worldwide have been found to be shrinking significantly, with strong glacier retreats in the 1940s, stable or growing conditions during the 1920s and 1970s, and again retreating from the mid 1980s to present.

Aletsch glacier

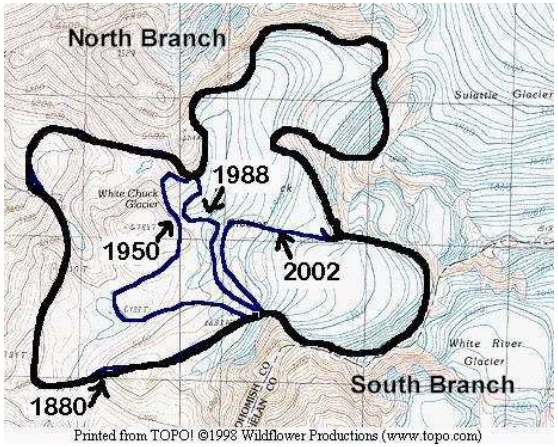
The largest glacier of the Alps (Bernese Alps), in Switzerland.

The retreat of Aletsch Glacier in in 1979, 1991 and 2002.

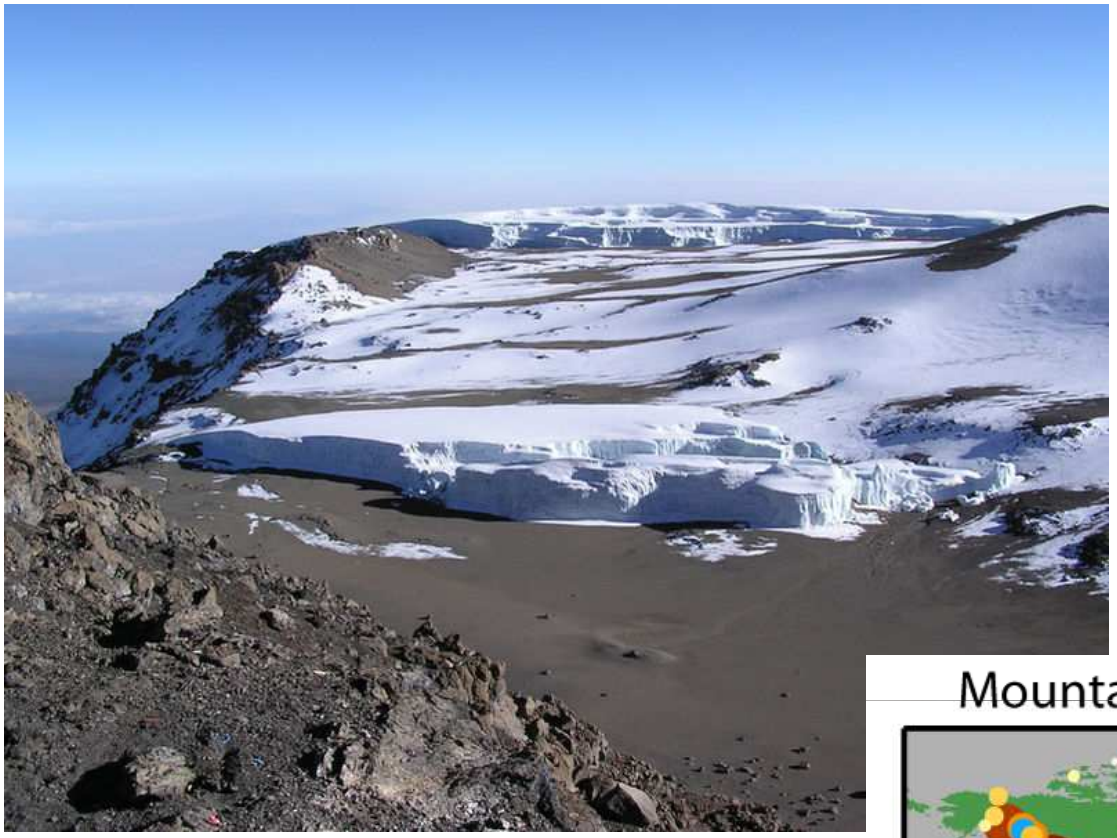
Melting of the mountain glaciers

Whitechuck glacier, the Cascade Range, US.

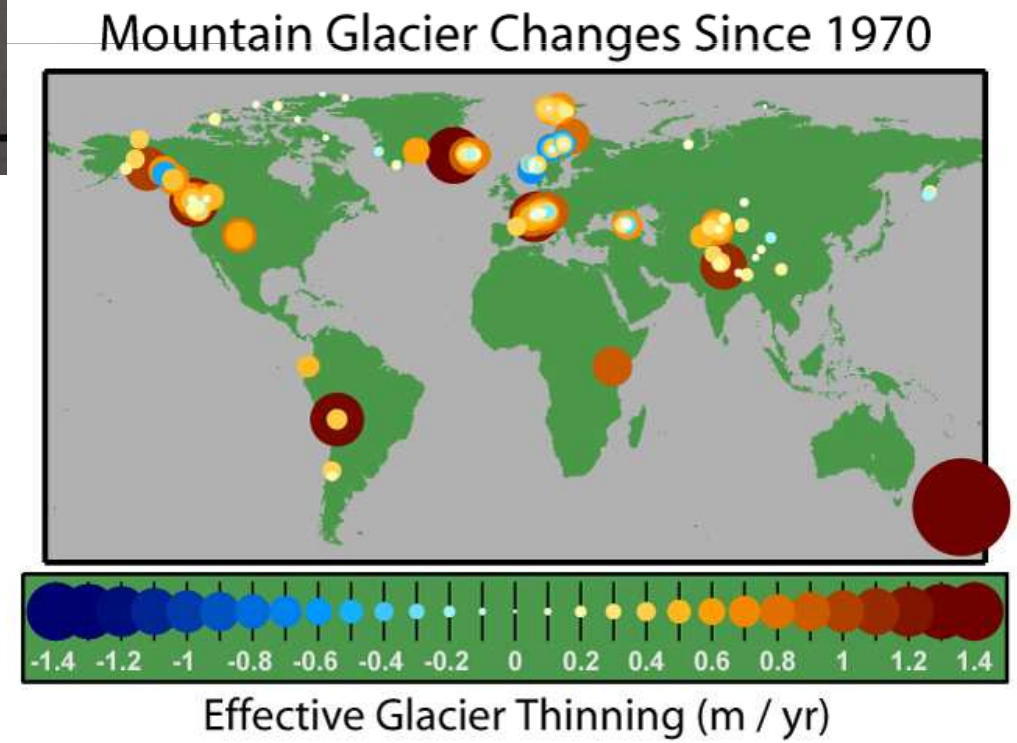
1973.

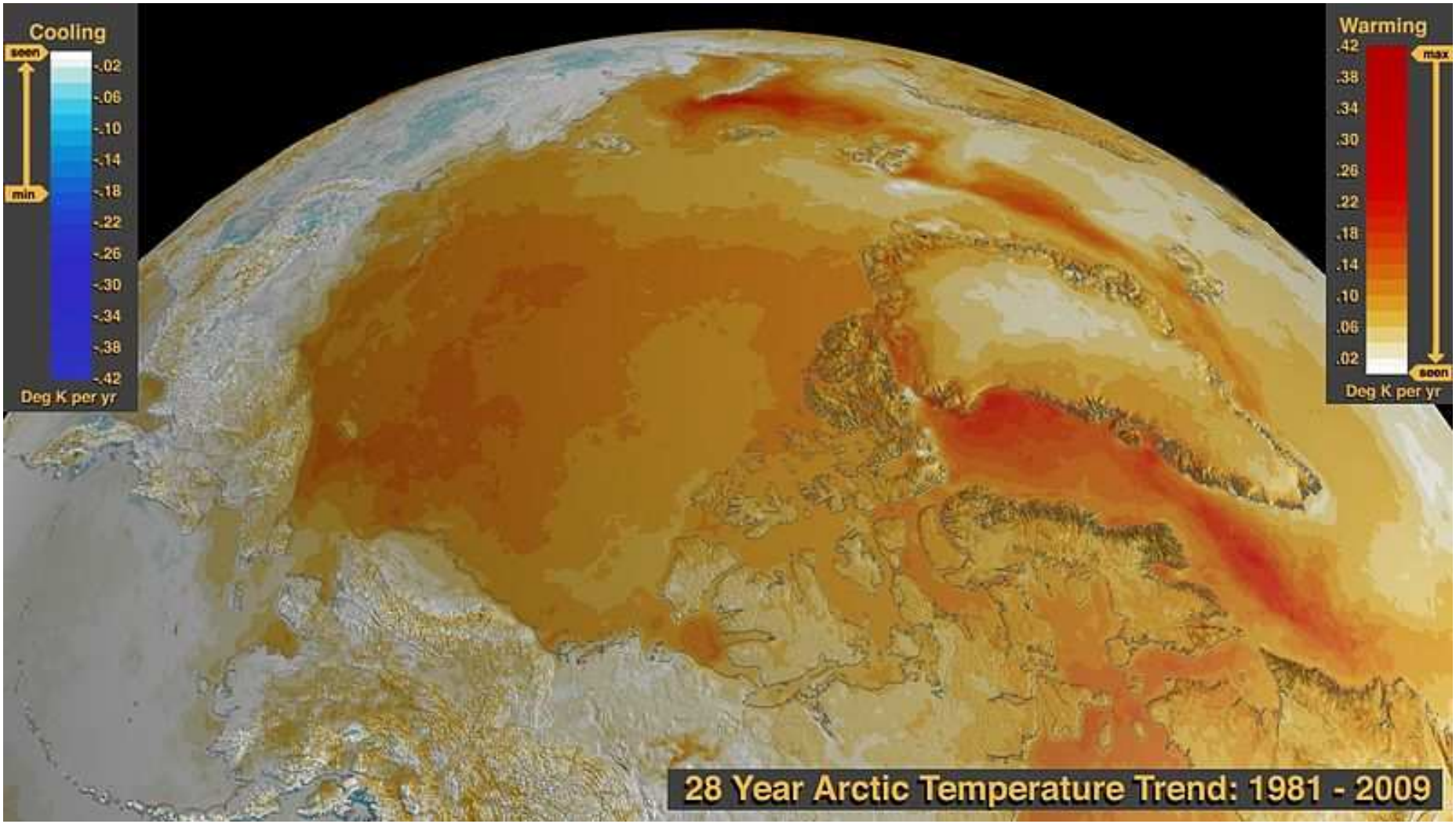


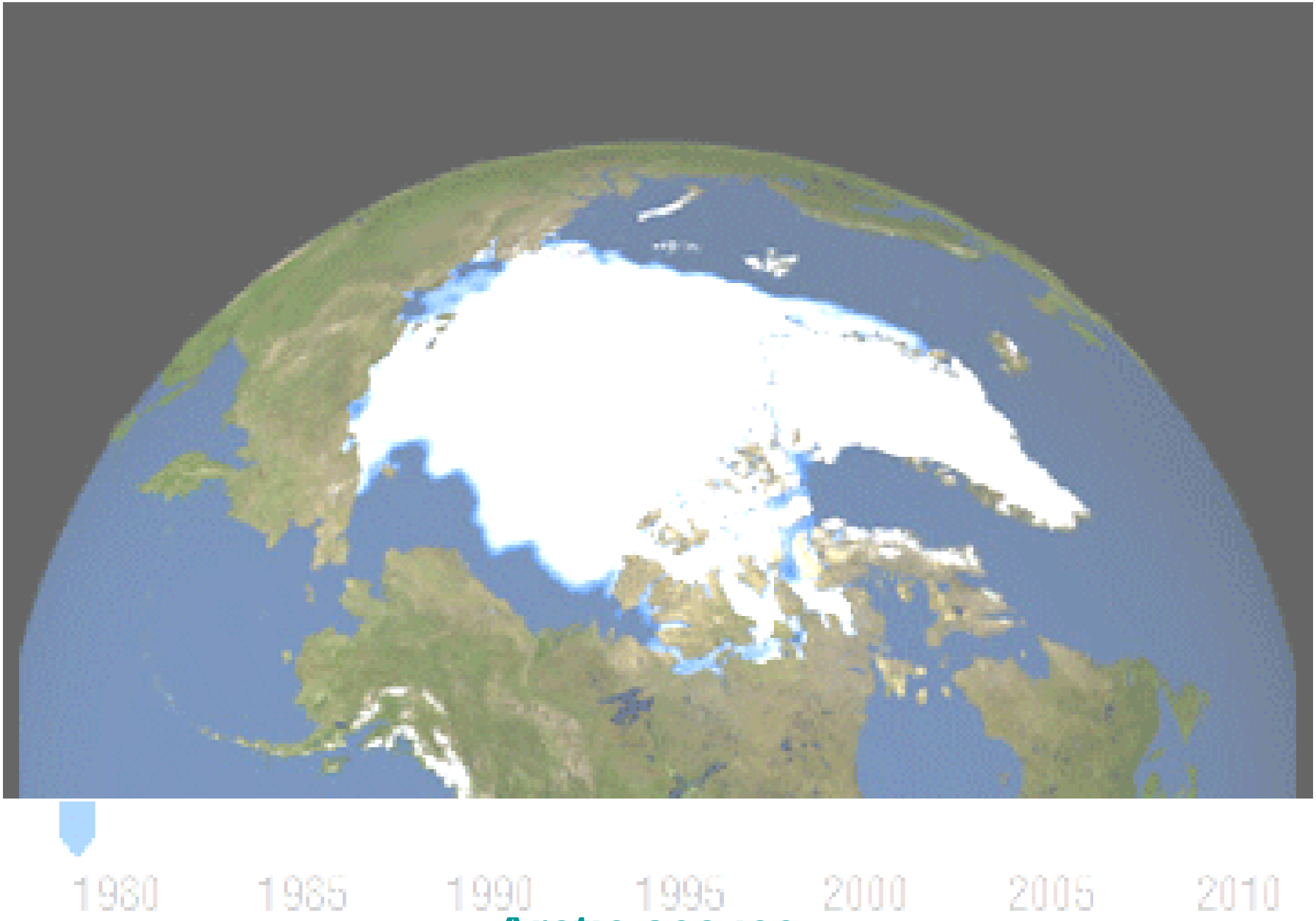
2006, glacier retreat by 1,9 km.



Mount Kilimanjaro




Cooling
seen
min
-.02
-.06
-.10
-.14
-.18
-.22
-.26
-.30
-.34
-.38
-.42
Deg K per yr
Warming
.42
.38
.34
.30
.26
.22
.18
.14
.10
.06
.02
max
seen
Deg K per yr
28 Year Arctic Temperature Trend: 1981 - 2009



Arctic sea ice loss

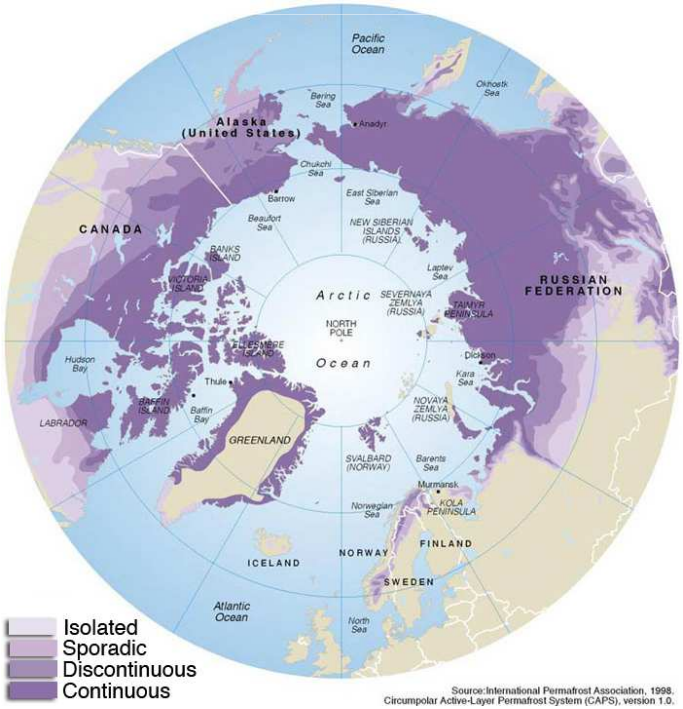
PERMAFROST

Permafrost or cryotic soil is soil at or below the freezing point of water 0 ℃ for two or more years. Most permafrost is located in high latitudes (in and around the Arctic and Antarctic regions), but alpine permafrost may exist at high altitudes in much lower latitudes.

Permafrost accounts for 0.022 % of total water on earth and exists in 24 % of exposed land in the Northern Hemisphere. It also occurs subsea on the continental shelves of the continents surrounding the Arctic , portions of which were exposed during the last glacial period.

A global temperature rise of 1.5 ℃ above current le vels would be enough to start the thawing of permafrost in Siberia, according to of scientists.

Thickness of the active layer varies by year and location, but is typically 0.6–4 m thick. In areas of continuous permafrost and harsh winters, the depth of the permafrost can be as much as 1,493 m in the northern Lena and Yana river basins in Siberia.



Climate Changes

Temperature rise in the Northern Hemisphere and particularly in the Baltic Sea Region does not occur evenly throughout the year; for the most part, **only the winter months have become warmer**.

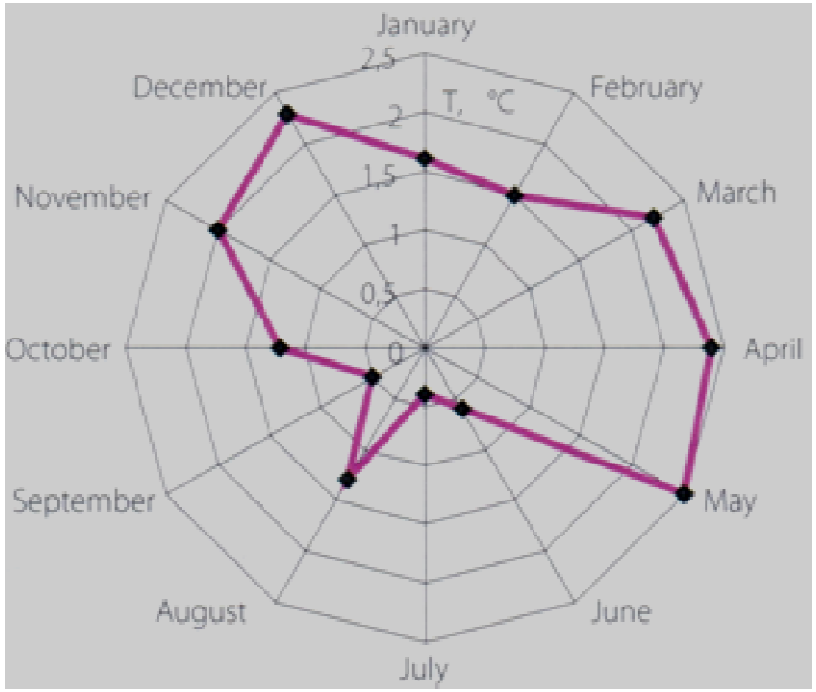
The effects of global warming are not equally intense in all regions of the Earth. Global warming has affected the **rainfall patterns** – they have recently become more irregular, **leaving some regions with almost no precipitation** and causing long drought periods, while elsewhere rainfalls have become much more frequent than before.

In some regions, such as China, long drought periods alternate with severe floods, seriously impeding the agricultural production.

Precipitation is the source of freshwater which flows into the seas and oceans, changing the freshwater and saltwater proportion.

These changes, in turn, affect the warm ocean current patterns. The mean sea level rises due to the increased precipitation and the **melting of glaciers, ice cups and ice sheets**.

As a consequence, the **habitable dry land areas decrease**. Global warming and the related climate change can also cause serious economic problems.



Average monthly temperature rise in Riga, 1851–2008.

UN IPPC alternative models for the prospective development of society and climate change

- Scenario A1 (**“zero” growth**). Greenhouse gas concentration in the atmosphere remains at the level of year 2000; there is no economic and population growth, and climate change is driven by the climate system inertia only.

- Scenario B1 (**sustainable development**). Natural growth continues until the middle of the 21st century, then the population declines; the economic development continues.

- Scenario A2 (**“everything goes on as before”**). This scenario describes a differentiated world, in which each nation relies on its own powers and resources; the population is constantly growing; economic development is regionally-oriented.

Scenario A1B (**technological progress**). This scenario describes a world of rapid economic development, population growth and technological progress that allows to reduce the consumption of material resources.

TEMPERATURE AND SEA LEVEL CHANGES

The climate change future scenarios predict that the air temperature will rise by **1–8 degrees** on average, and the warming rate is projected to be higher than it was in the 20th century.

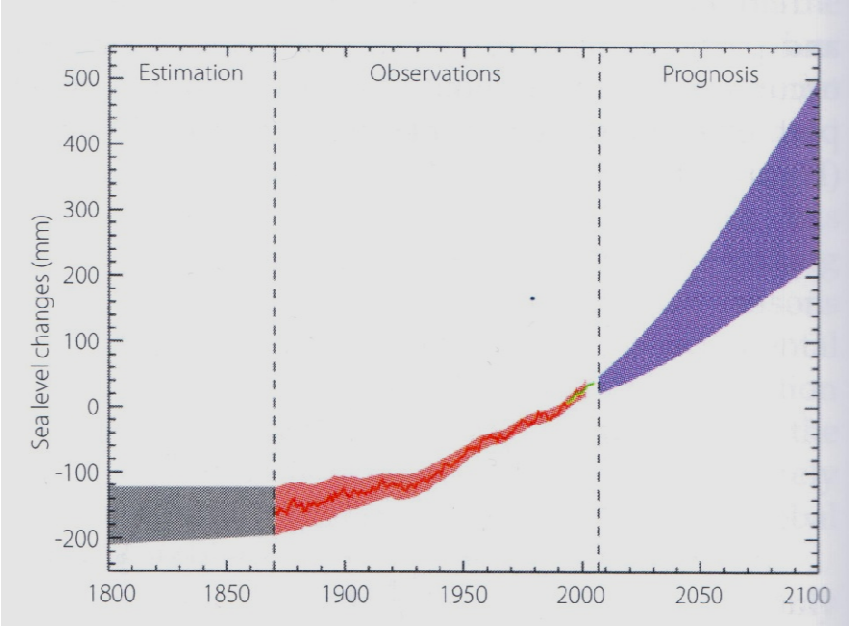
Global warming will definitely affect the average rainfall on the Earth.

Along with the increase in temperature, the moisture concentration and hence **rainfall** will also increase.

Precipitation will not be regular, and there will be a risk of drought periods in many regions of the Earth. Rainfall changes can affect the Earth's processes, for example, heavy precipitation in polar regions may affect the stability of glaciers and ocean currents.

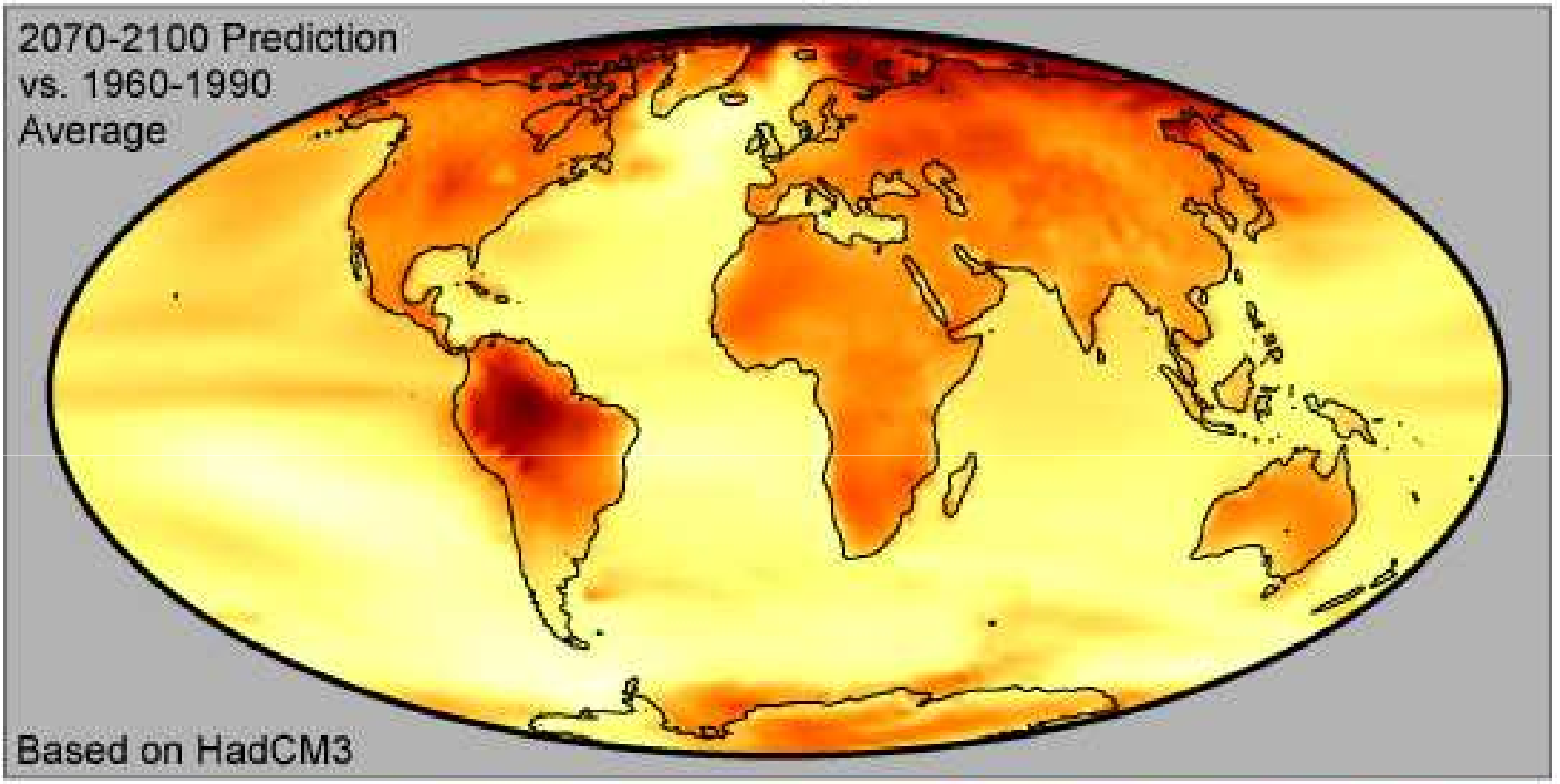
Both rainfall changes and global warming affect the global sea level. As the Earth's temperature rises, the ice sheets of the polar region begin to melt, and it turns out that the permafrost boundary is not permanent at all.

This melting causes the water level in oceans to rise. The climate change models project that, until 2100, the water level in seas and oceans will have risen by **0.09 to 0.88 metres**.

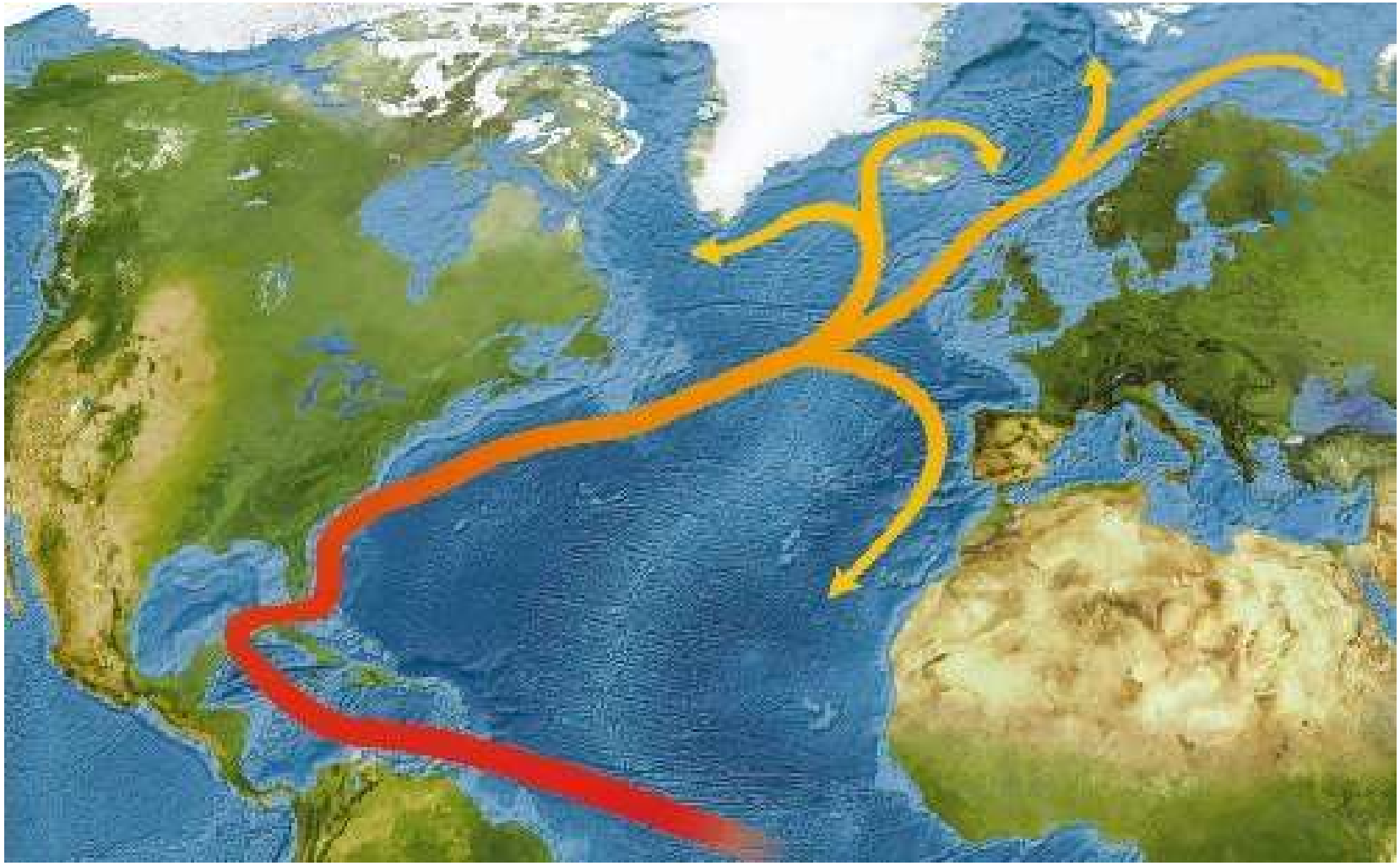


Confirmed and projected sea level changes. This figure shows the actual and possible changes in the water level in seas and oceans in the period between 2000 and 2100.

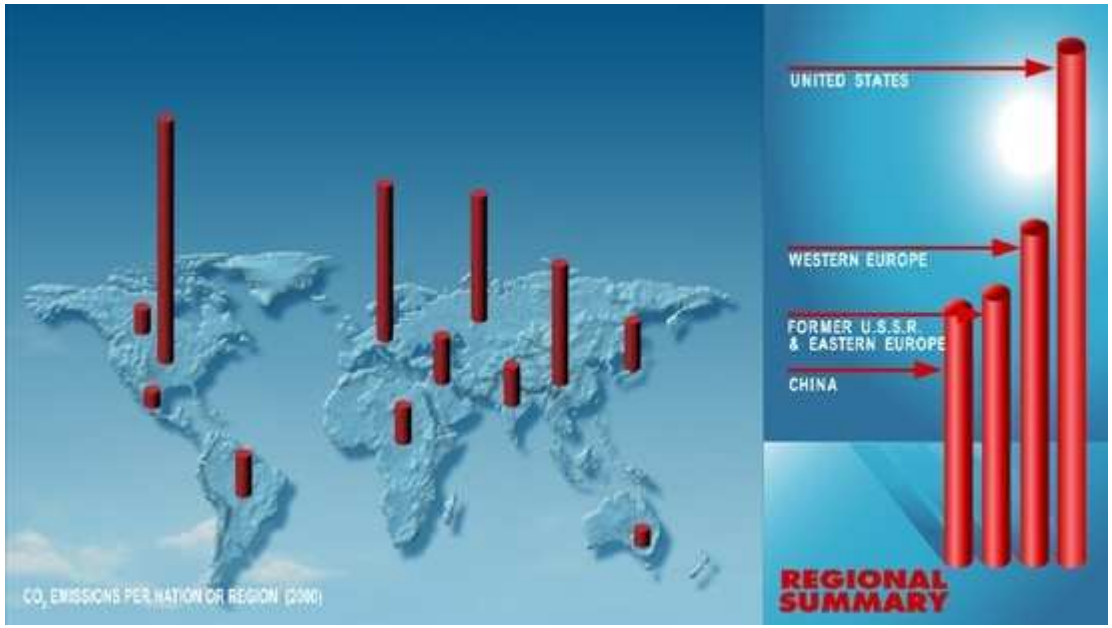
Global Warming Predictions



The Gulf stream

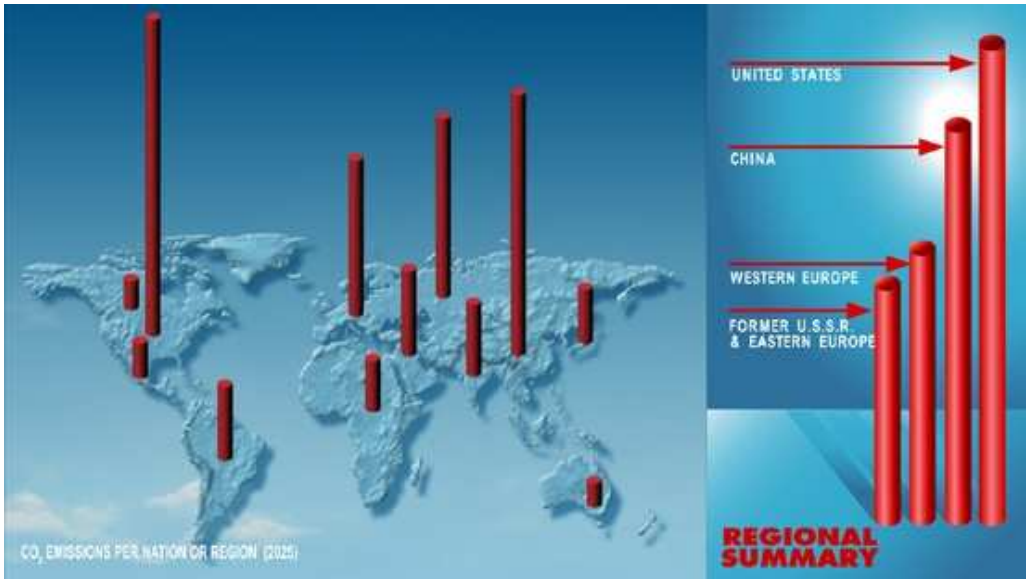


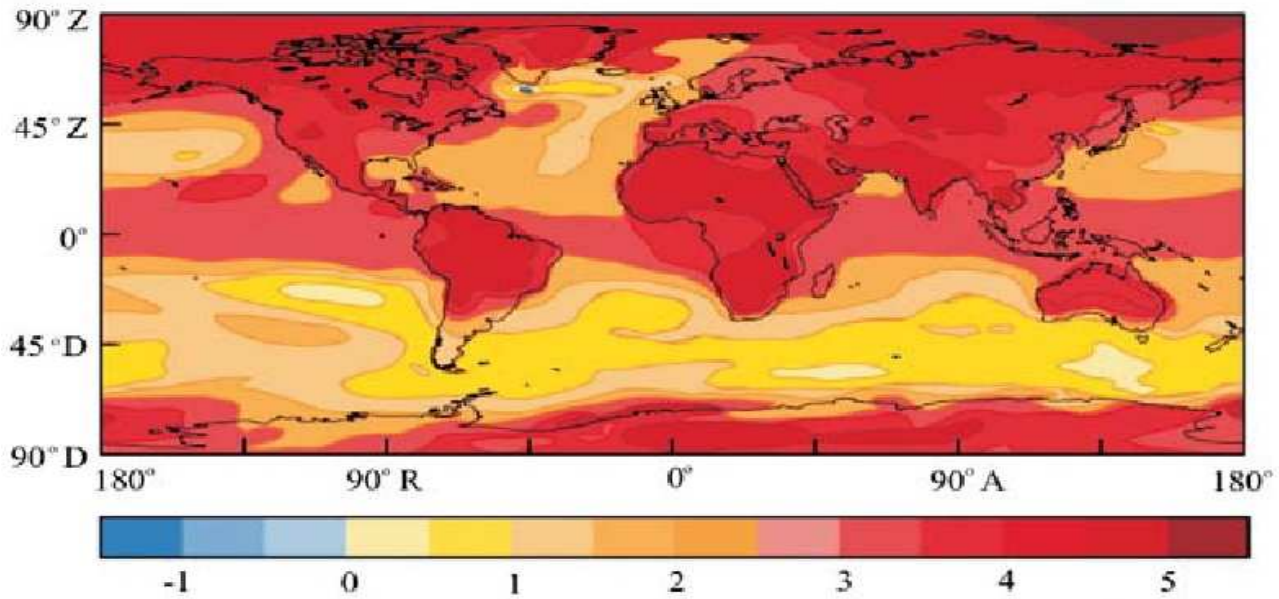
CO_2 emissions



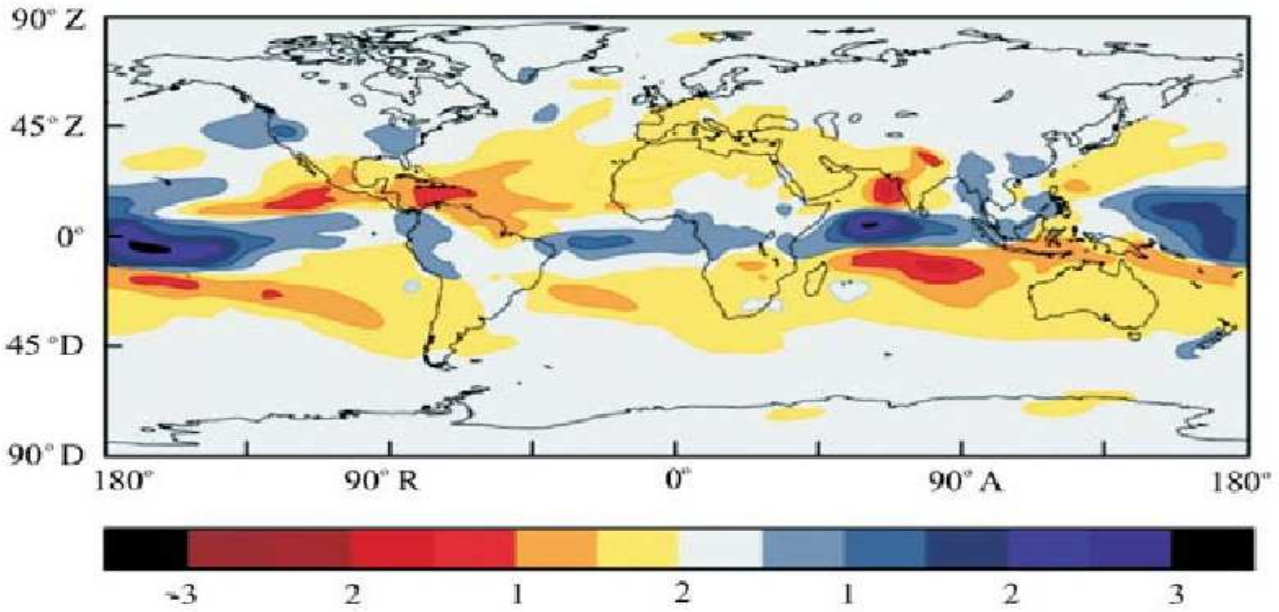
2000.

2025.





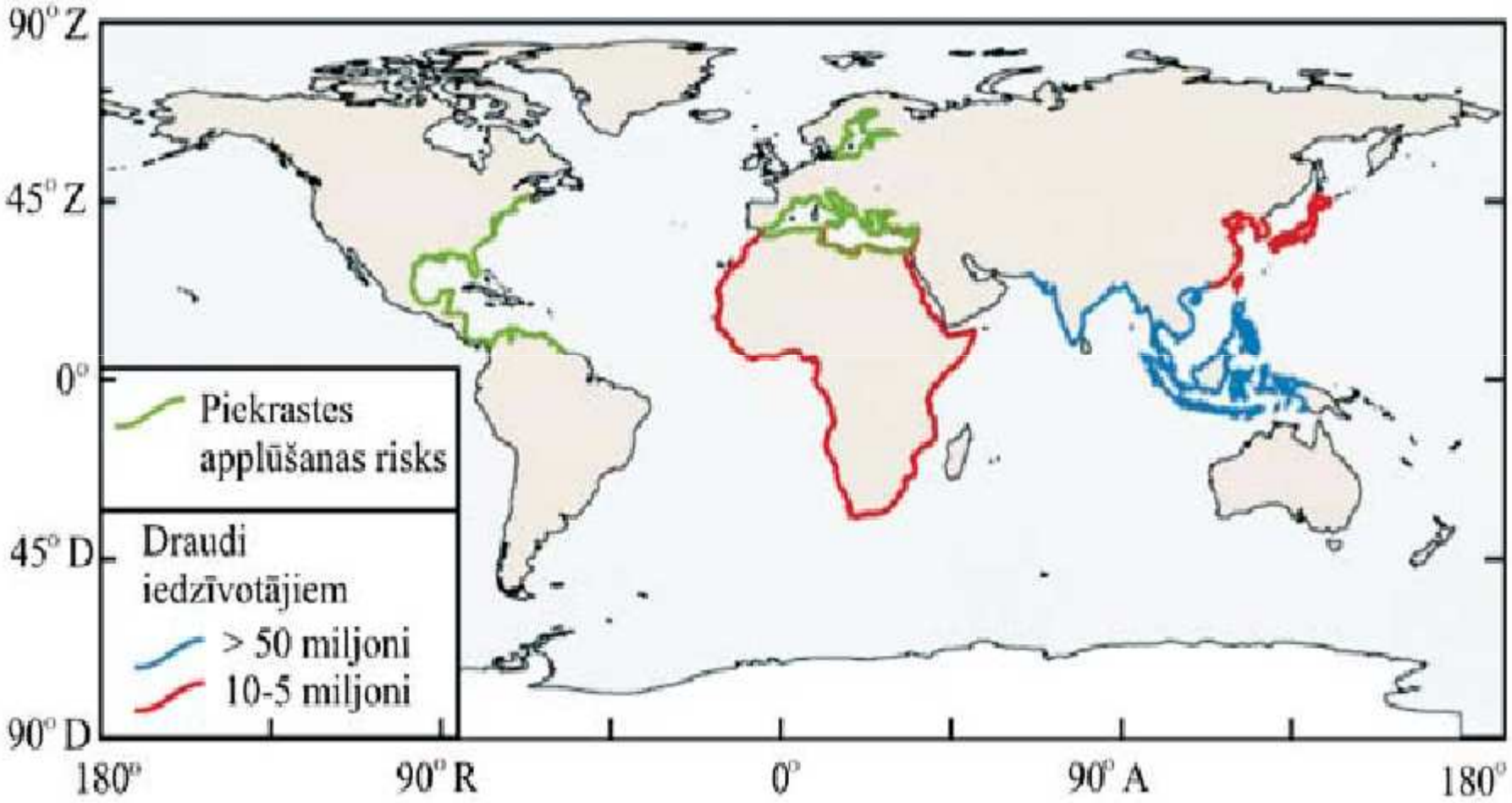
Prognozētās gada vidējās temperatūras izmaiņas 2050. gadā, °C



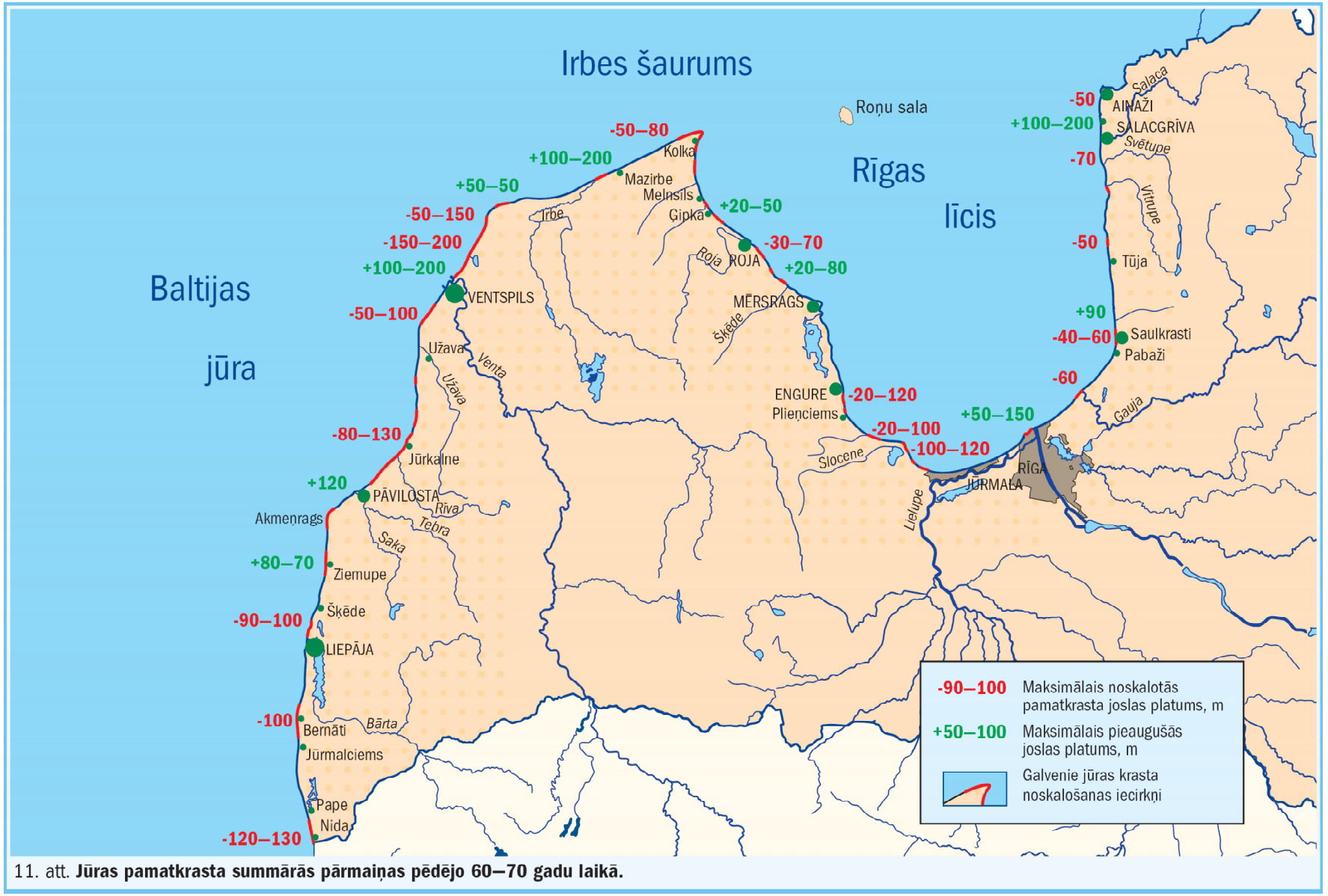
Prognozētās nokrišņu daudzuma izmaiņas 2050. gadā, °C

Temperature and precipitation change by 2050.

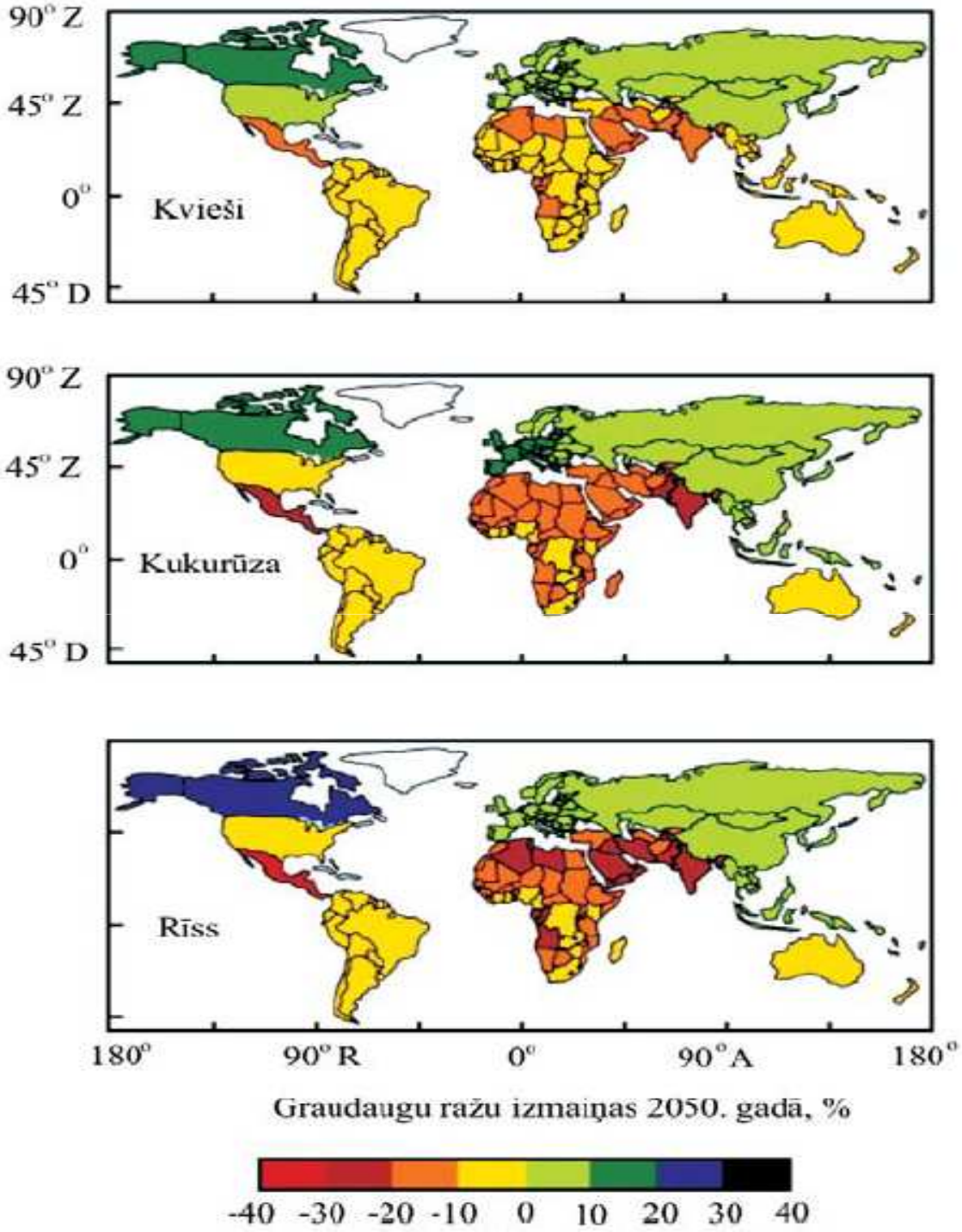
Climate change and coastal processes



Costal changes at the last 70 years,
G. Eberhards, 2004.

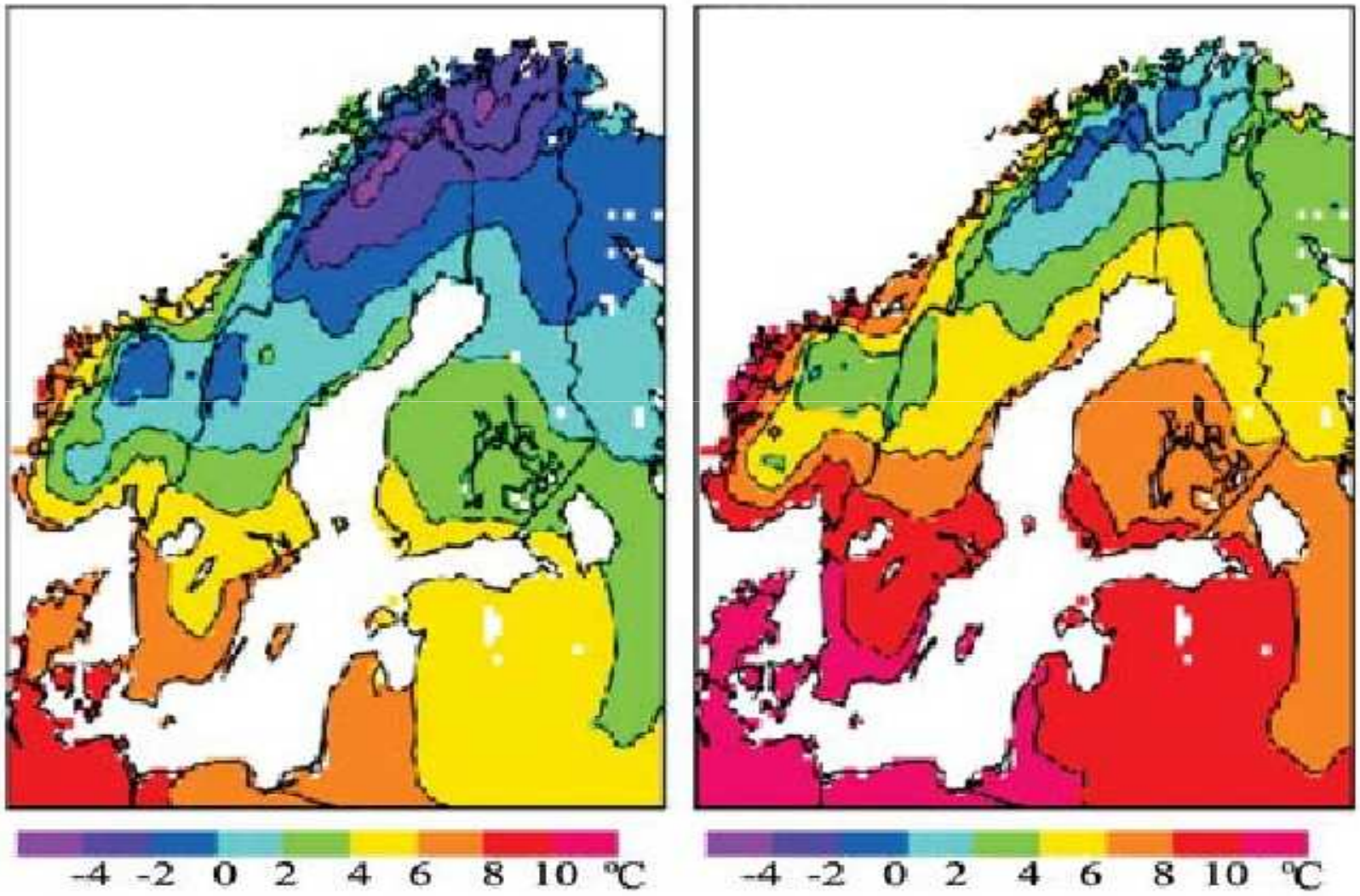


11. att. **Jūras pamatkrasta summārās pārmaiņas pēdējo 60–70 gadu laikā.**

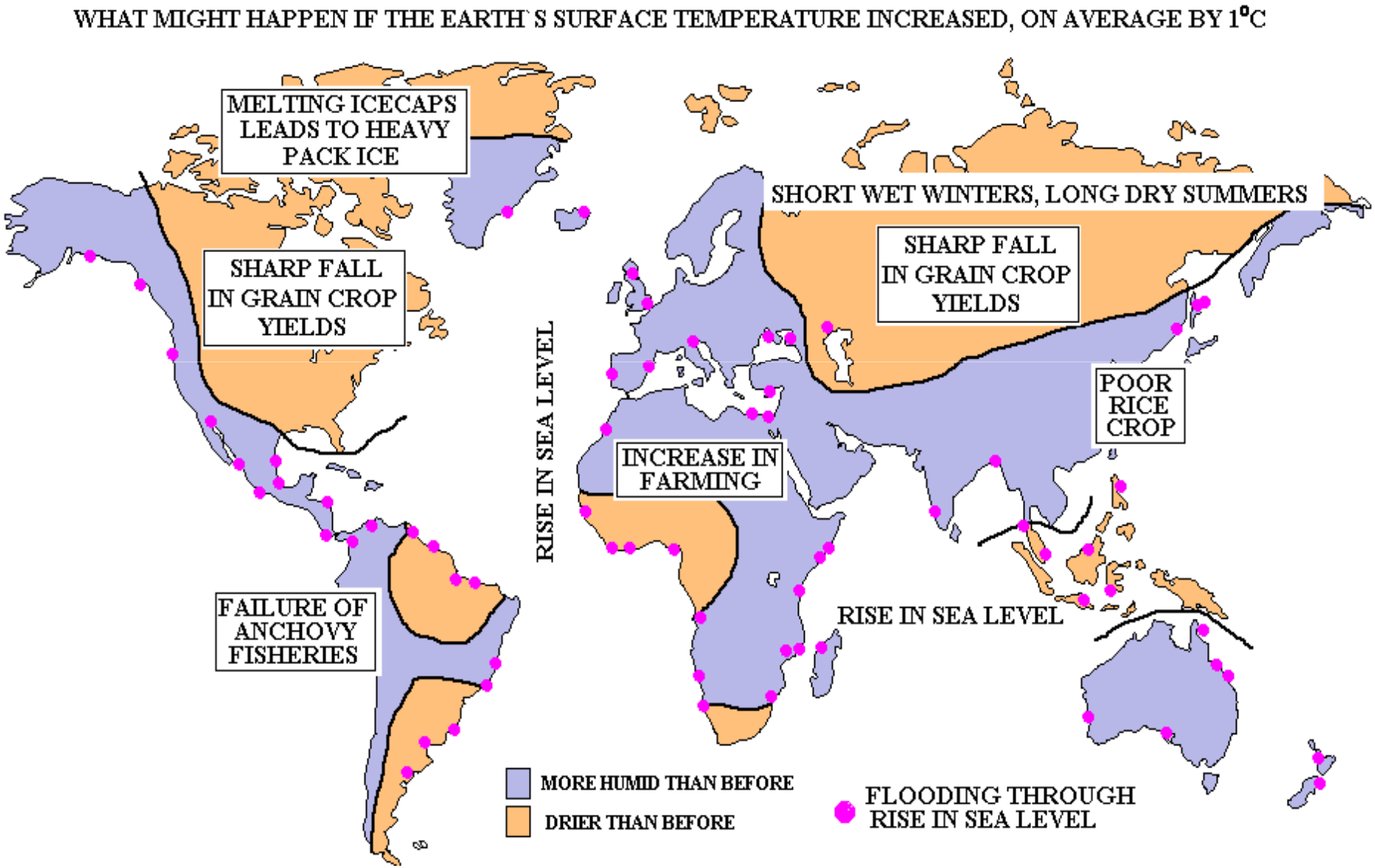


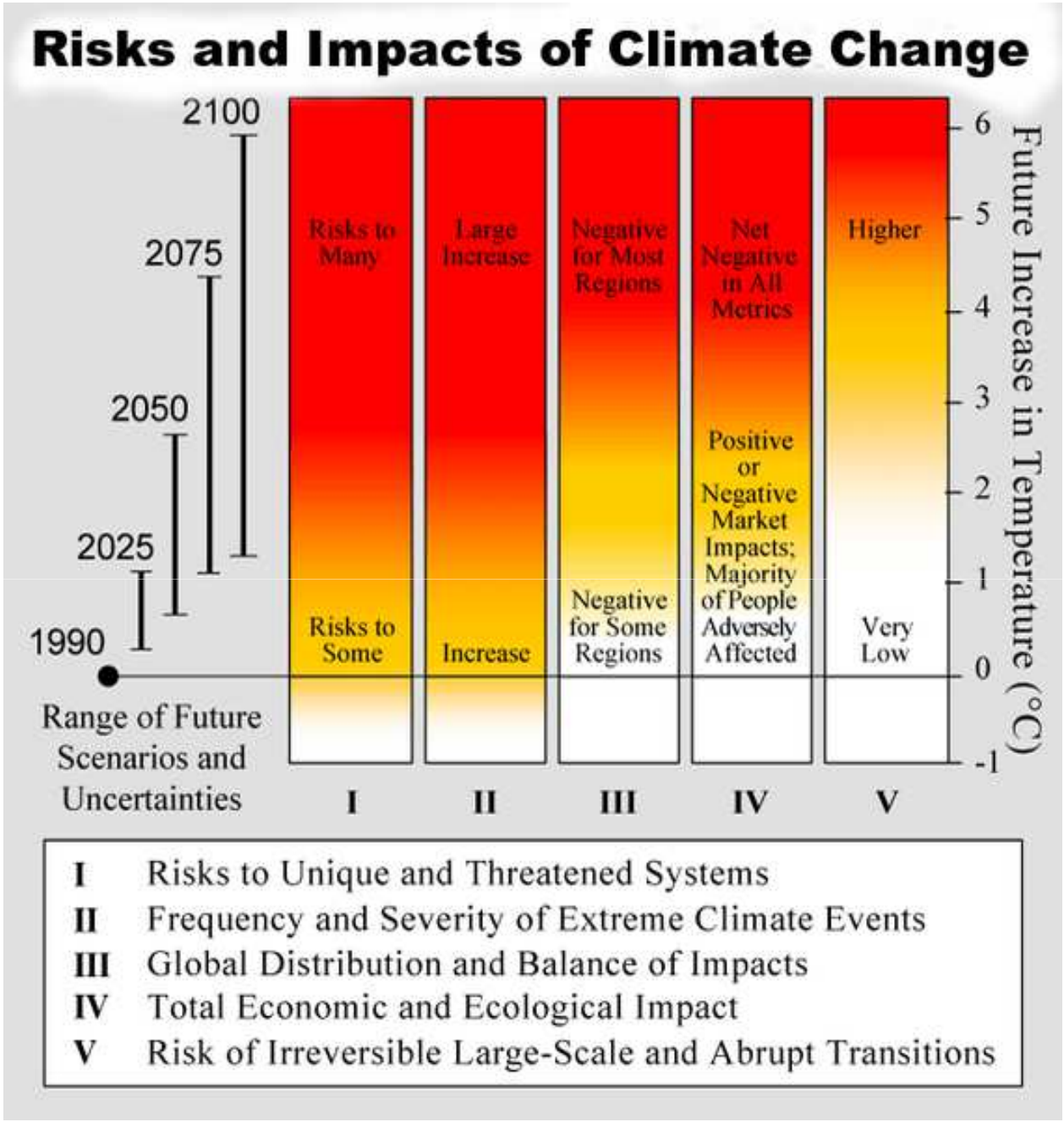
Climate change and productivity of agricultural species

Average annual temperature in the Baltic Sea region: (A) – (1961.– 2000.); (B) – 2100.



Global Climate Change in the World




Risks and Impacts of Climate Change
2100
2075
2050
2025
1990
Range of Future Scenarios and Uncertainties
Risks to Many
Risks to Some
Large Increase
Increase
Negative for Most Regions
Negative for Some Regions
Net Negative in All Metrics
Positive or Negative Market Impacts; Majority of People Adversely Affected
Higher
Very Low
I
II
III
IV
V
6
5
4
3
2
1
0
-1
Future Increase in Temperature (°C)
I Risks to Unique and Threatened Systems
II Frequency and Severity of Extreme Climate Events
III Global Distribution and Balance of Impacts
IV Total Economic and Ecological Impact
V Risk of Irreversible Large-Scale and Abrupt Transitions

North Europe and Baltic Sea in winter

Take care !