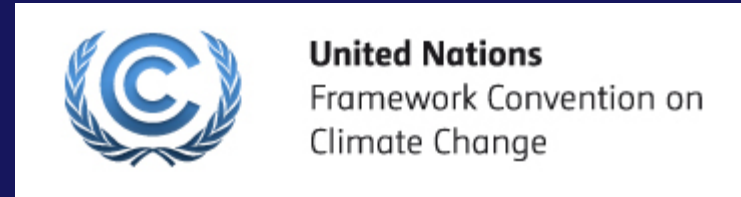


United Nations Climate Change Conference COP 19 in Warsaw Poland 2013



Warsaw Climate Change Conference - November 2013



<http://unfccc.int/2860.php>

Last week marked the conclusion of the nineteenth session of the **Conference of the Parties (COP 19)**.

The annual round of talks on climate change should have brought us one step closer to forging a **LEGALLY BINDING GLOBAL CLIMATE TREATY TO CUT CARBON EMISSIONS**. In a time when the existence of climate change has become indisputable, this could be our last chances to stem the tide.

Here's a quiz about the conference



Climate Change activists demonstrating in front of conference

**Q1 - 2 degrees C of warming
has been identified as the:**

**a) The amount the oceans will
heat up this year, leading to the
disappearance of all glaciers**

**b) the temperature rise beyond
which climate change will become
catastrophic and irreversible**

**c) the degree of warming that has
already occurred**

Q1 - 2 degrees C of warming has been identified as the:

a) The amount the oceans will heat up this year, leading to the disappearance of all glaciers



b) the temperature rise beyond which climate change will become catastrophic and irreversible

c) the degree of warming that has already occurred

Q1 Discussion:

The IPCC – Intergovernmental Panel on Climate Change – noted in its most comprehensive review yet of the science of climate change, that we were running out of our “carbon budget” – the amount of greenhouse gas we can pour into the atmosphere before warming the world by more than 2C, which scientists have identified as a crucial threshold beyond which many of the effects of climate change could become catastrophic and irreversible.



Q2 - The Philippines climate negotiator Naderev “Yeb” Saño’s speech at COP 19 went viral. Tearing up, he promised that following the speech he would:

a) go on a hunger striker for the remainder of the Warsaw conference

b) personally introduce victims of the typhoon to delegates

c) stay in his seat and refuse to leave the auditorium till they came to a meaningful consensus

Q2 - The Philippines climate negotiator Naderev “Yeb” Saño’s speech at COP 19 went viral. Tearing up, he promised that following the speech he would:

a) go on a hunger strike for the remainder of the Warsaw conference

b) personally introduce victims of the typhoon to delegates

c) stay in his seat and refuse to leave the auditorium till they came to a meaningful consensus

Q2 Discussion:

Linking climate change to the increased intensity of storms, an obviously grieving Yeb, said:



“I speak for the countless people who will no longer be able to speak for themselves after perishing from the storm. I speak also for those who have been orphaned by the storm. I speak for the people racing for time to save survivors and alleviate the suffering of the people affected. We can take drastic action now to ensure we prevent a future where super typhoons become a way of life...”

http://www.democracynow.org/2013/11/12/stop_this_madness_filipino_climate_chief

Q3 - Japan made headlines when they said that instead of aiming for a 25% reduction in greenhouse gas emissions by 2020 . . .

a) it would decrease emissions by 30%

b) it would increase its emissions by 3%

c) It would first increase emissions by 3% in the short term then decrease them by 30% over the following decades.

Q3 - Japan made headlines when they said that instead of aiming for a 25% reduction in greenhouse gas emissions by 2020 . . .

a) it would decrease emissions by 30%

b) it would increase its emissions by 3%

c) It would first increase emissions by 3% in the short term then decrease them by 30% over the following decades.

Q3 Discussion:

Japan gives up ambitious CO2 emissions target

The Japanese government is expected to **adjust its targets** to commit to an **emission reduction of 3.8% from 2005** levels.

However, the country's emissions rose by around 7% between 1990 and 2005, meaning that **achieving the new target would actually represent a rise of 3.1% from 1990**. In a statement, UK energy secretary Ed Davey said the Japanese government's decision was **"deeply disappointing"**, and urged it to reconsider. **"As the world's third largest economy, Japan needs to be at the forefront of taking ambitious action."**

Q4 - The Polish hosts of COP 19 came under criticism because . . .

- a) They gave the global coal industry a two-day platform at the talks**
- b) The country's 19,500 windmills were out of order**
- c) Their delegation had wracked up the most number of frequent flier miles**

Q4 - The Polish hosts of COP 19 came under criticism because . . .

a) They gave the global coal industry a two-day platform at the talks

b) The country's 19,500 windmills were out of order

c) Their delegation had wracked up the most number of frequent flier miles

Q4 – Discussion

Poland relies heavily on coal for its energy needs, even though coal is the most carbon-intensive fossil fuel.

The Polish government are known as defenders of coal use within Europe, resisting calls for more emission reduction.

Green groups walk out of UN climate talks

Environment and development groups protest at slow speed and lack of ambition at Warsaw negotiations



Obama administration pondering new carbon emission pledge in wake of Warsaw climate change conference

By George Russell / Published November 22, 2013 / FoxNews.com



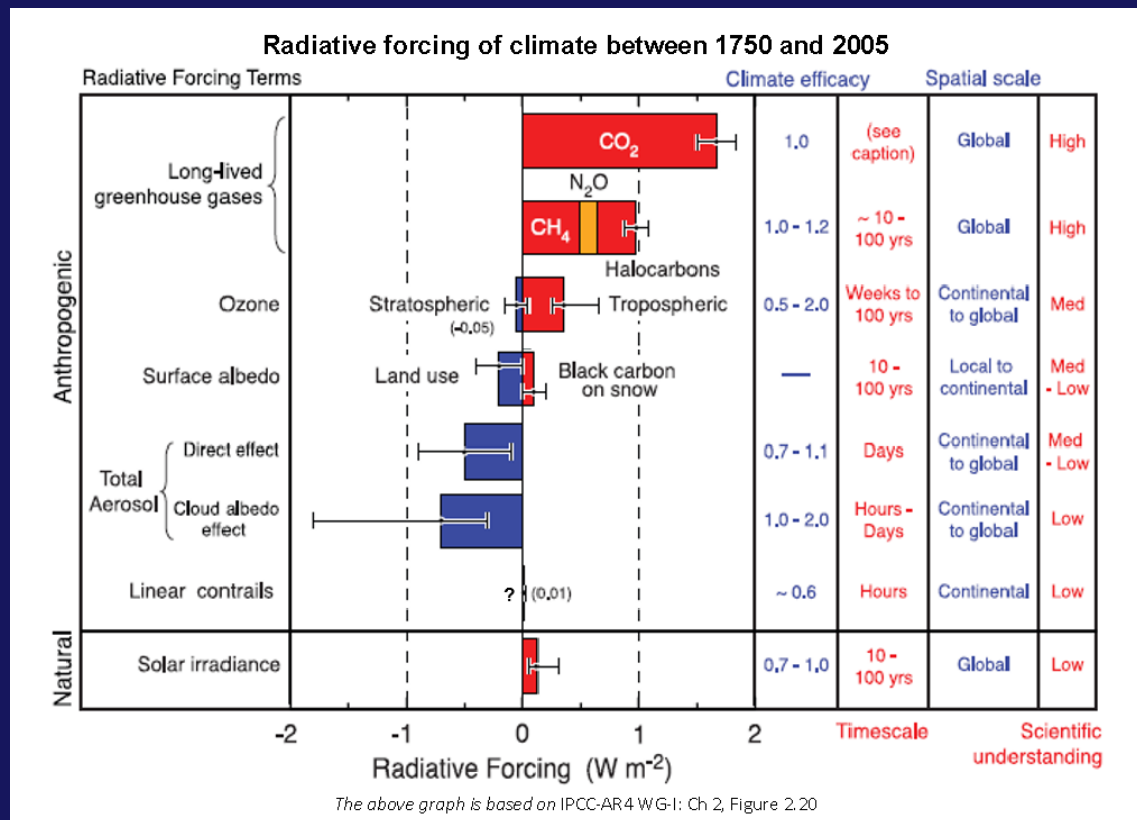
SOURCE OF QUIZ:

<http://www.sundaytimes.lk/131124/magazine/greener-tomorrow-how-much-do-you-know-about-climate-change-take-the-quiz-73911.html>

**RECAP OF WHERE
WE'VE BEEN**

Re-cap: TOPIC # 15, PART B: The Key To It All:

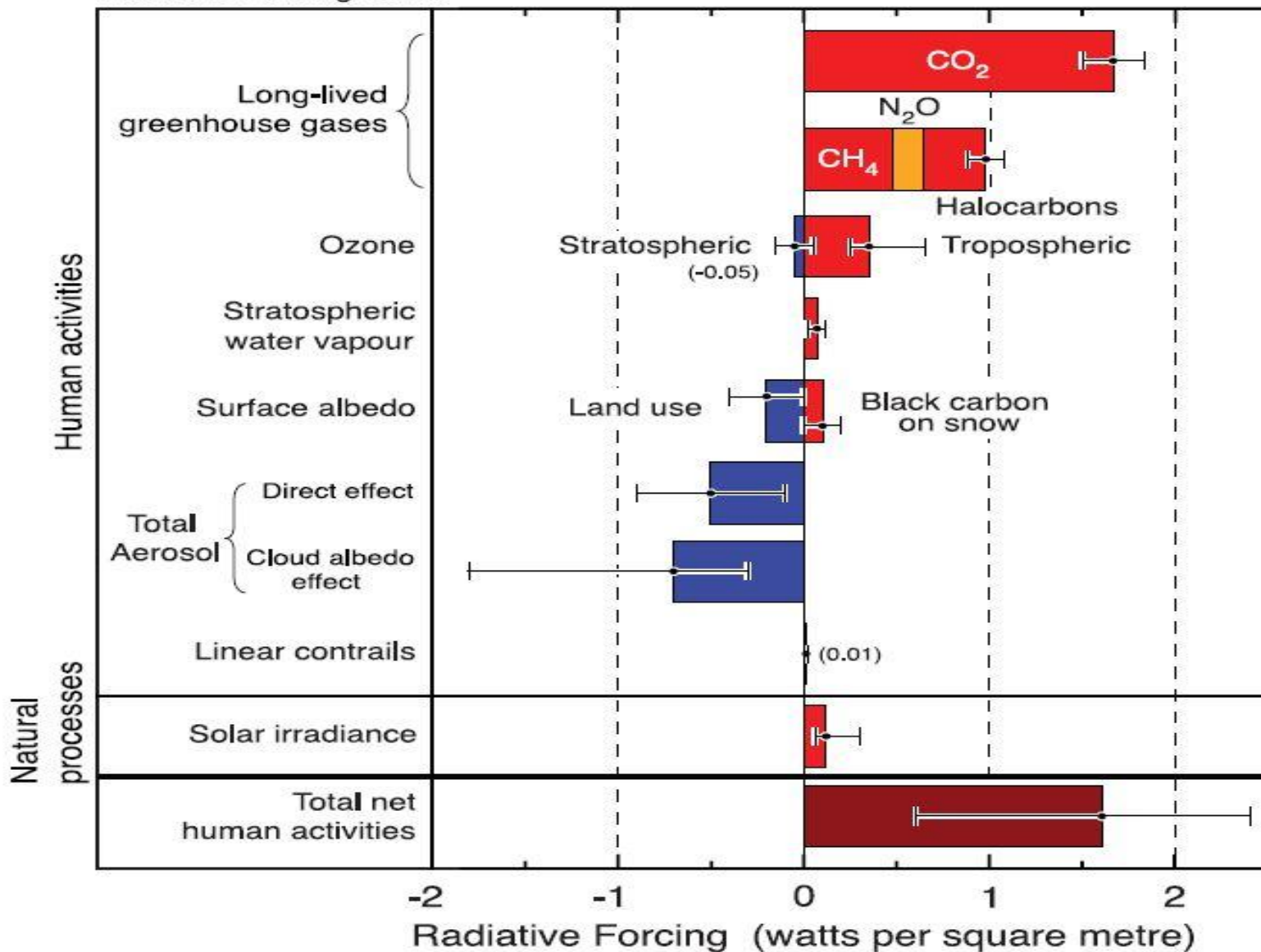
RADIATIVE FORCING OF CLIMATE



IPCC REPORT - 2007

Radiative forcing of climate between 1750 and 2005

Radiative Forcing Terms

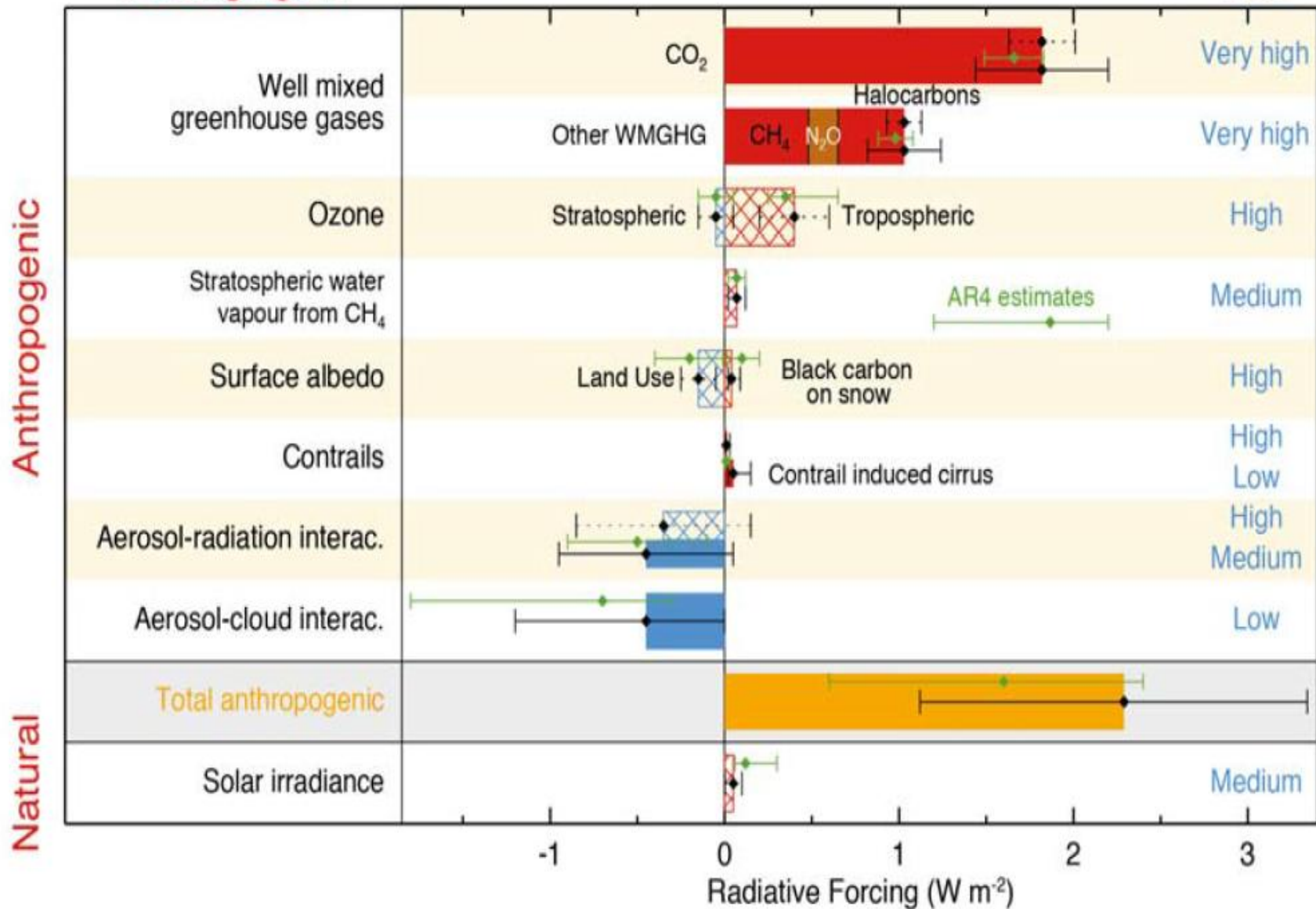


IPCC REPORTS - 2013

Radiative forcing of climate between 1750 and 2011

Forcing agent

Confidence level

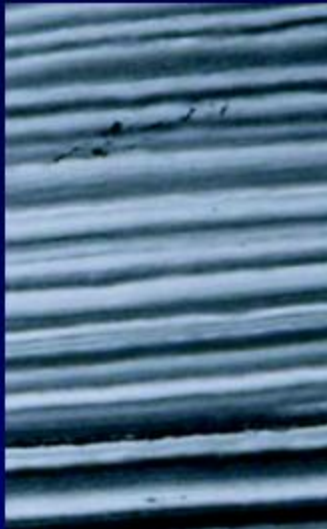


Recap: TOPIC # 15, PART C: Evidence from Natural Archives

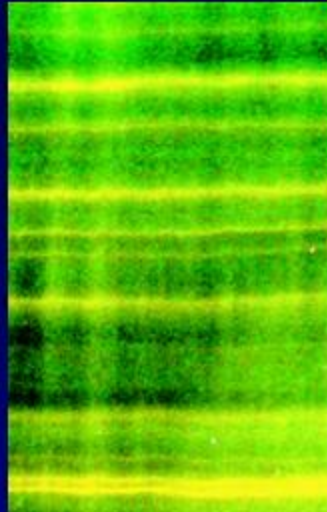
Tree rings



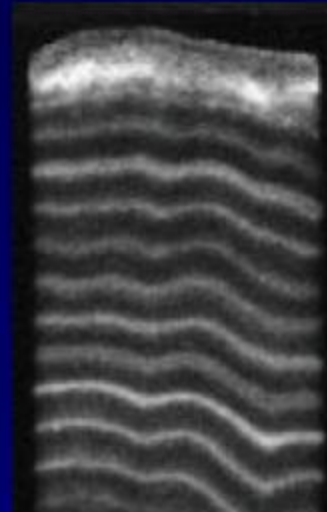
Lake varves
(sediments)



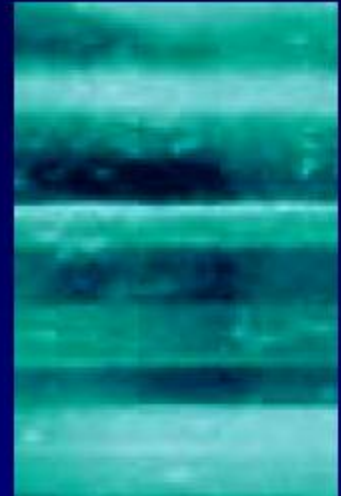
Speleothems
(from cave)



Coral
(annual growth)



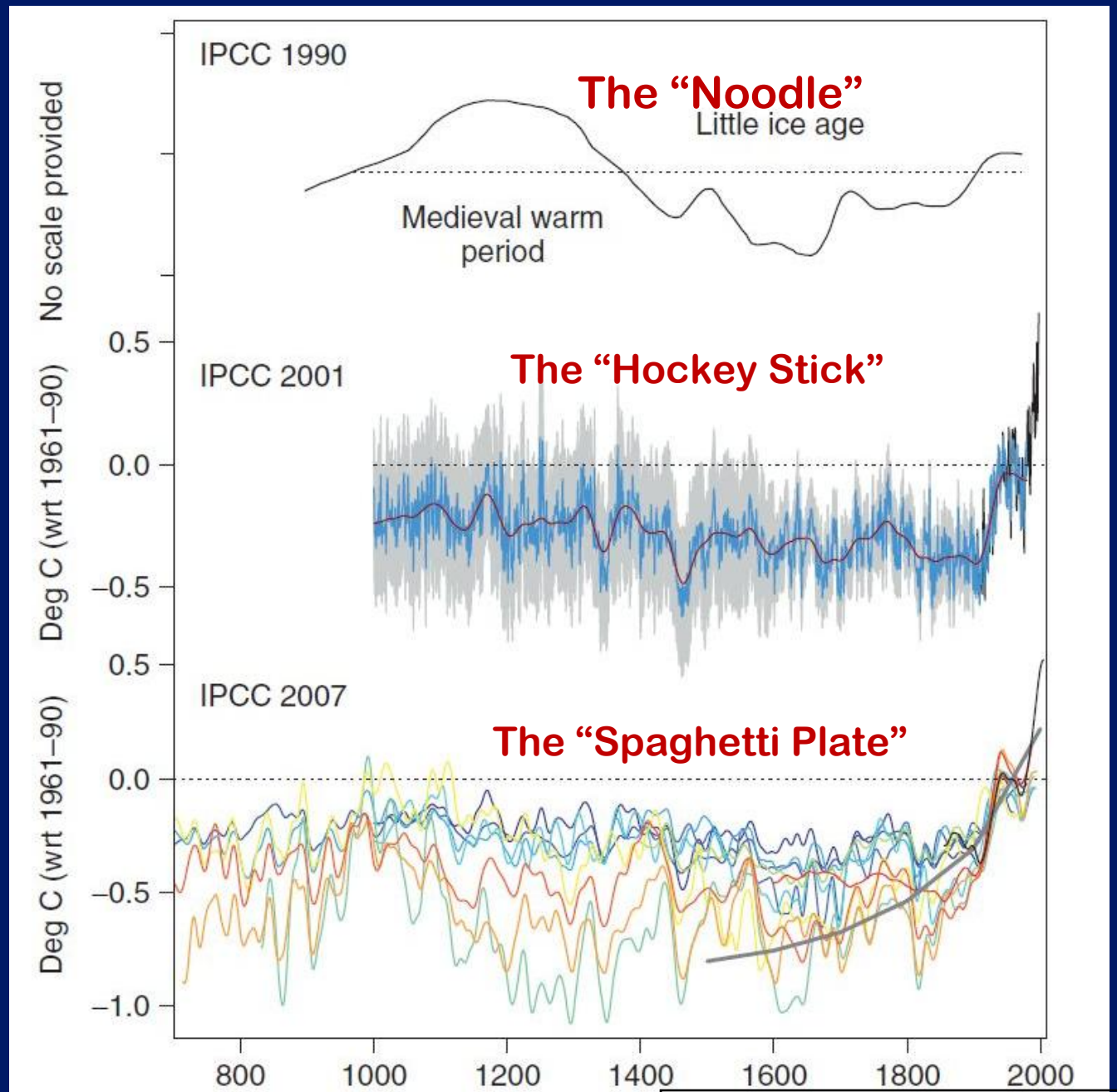
Ice Core



*"The farther backward you can look,
the farther forward you are likely to see."*

- Winston Churchill

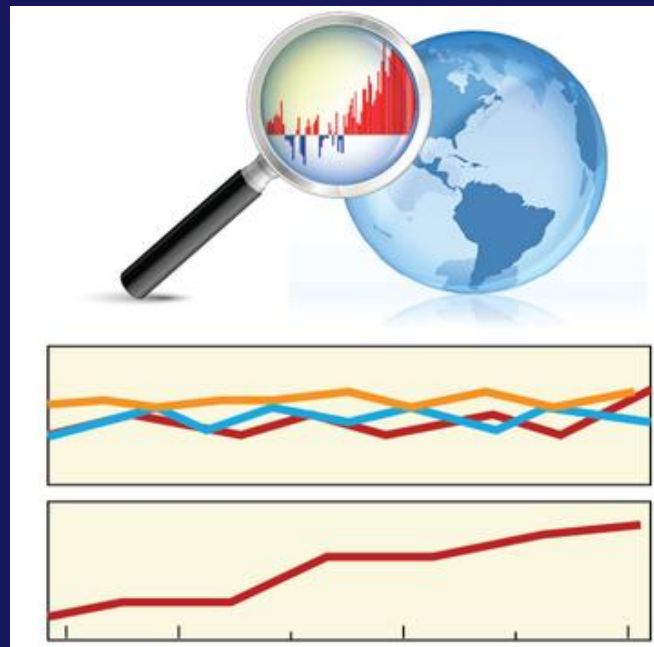
The Scientific Process “in action”



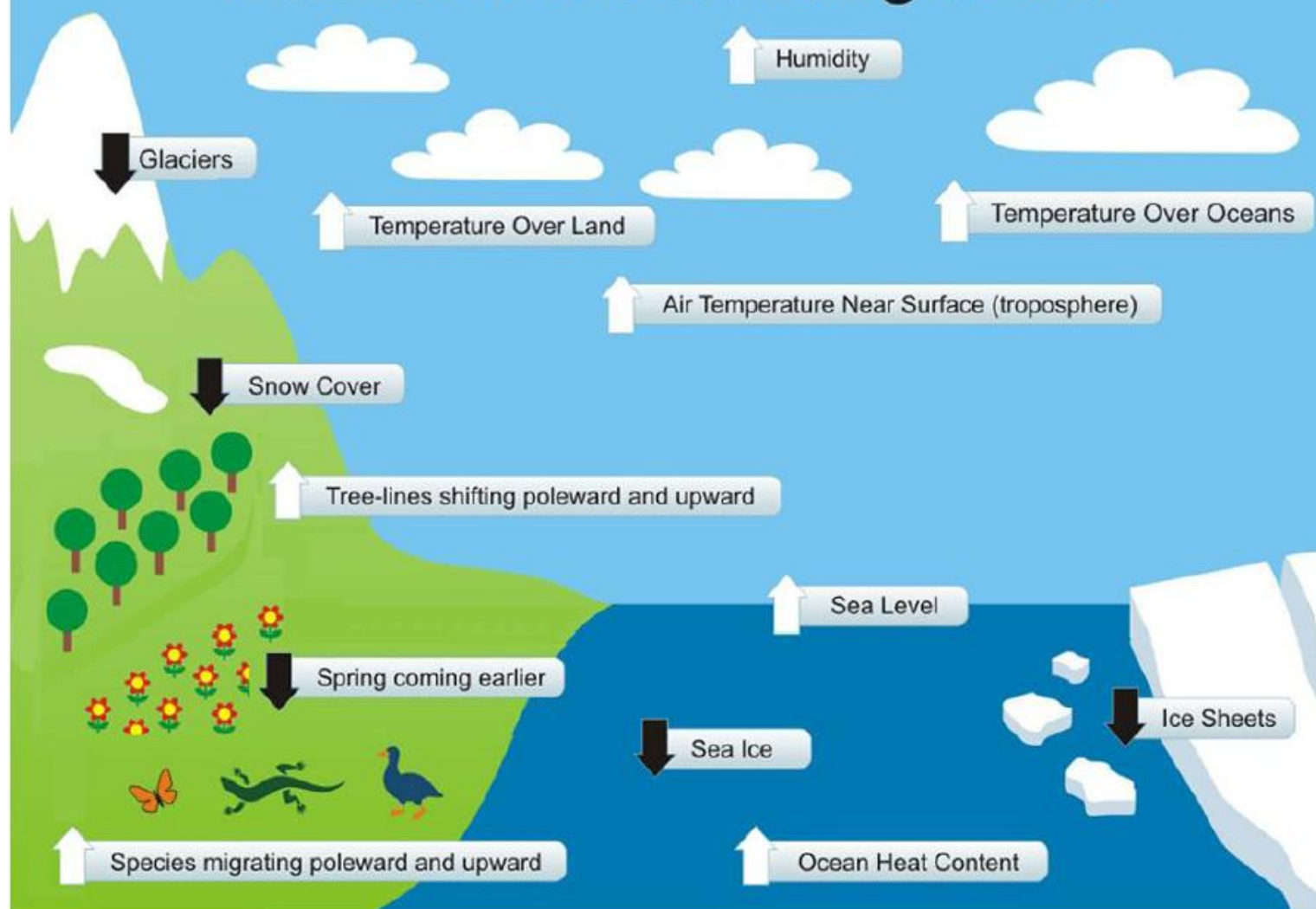
All 3 graphs on p 91

Review of the OBSERVATIONS: DETECTION OF INDICATORS OF A WARMING WORLD

Detection: finding something out of the ordinary – a “signal” emerging from the noise



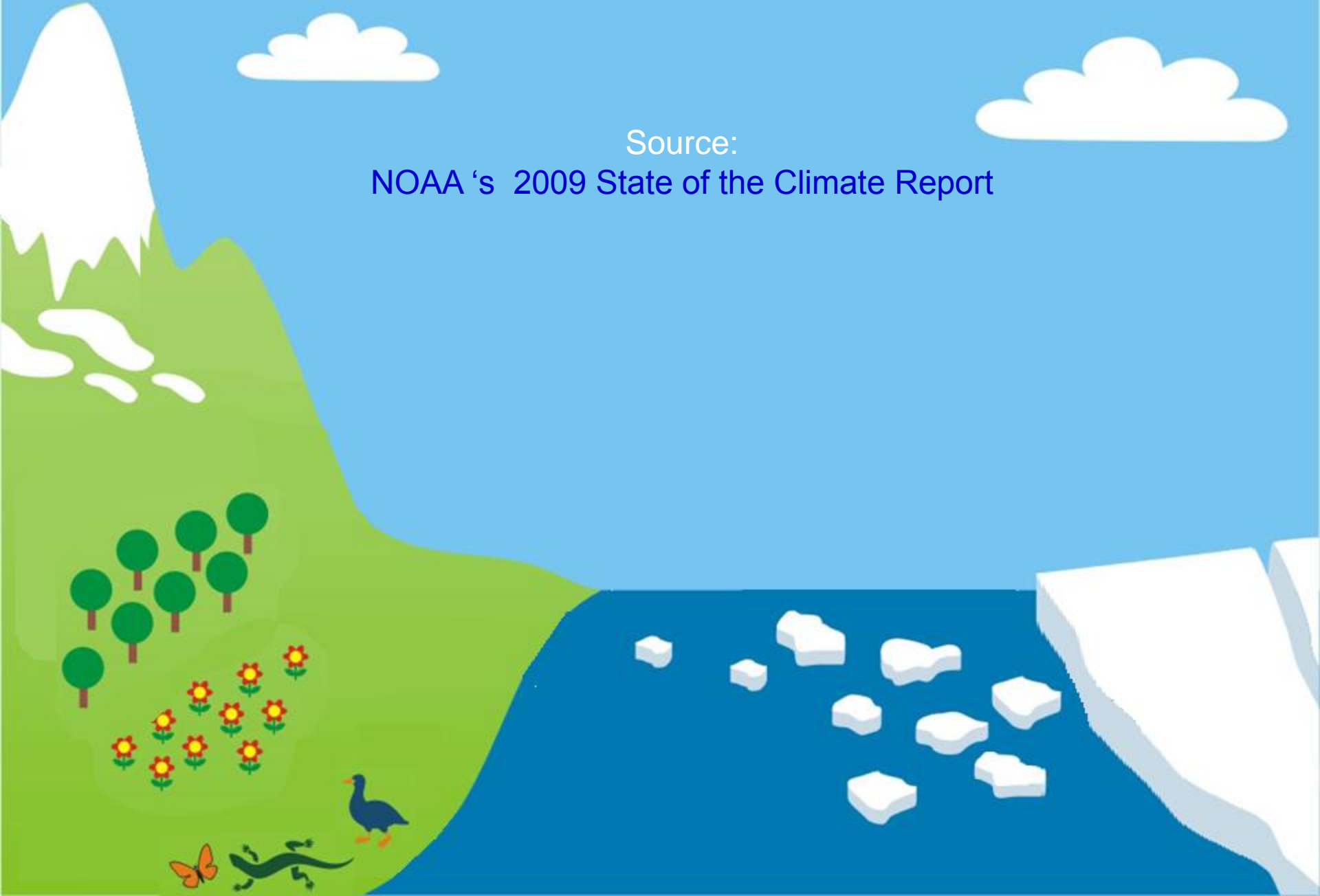
Indicators of a Warming World



Indicators of a Warming World

Source:

NOAA 's 2009 State of the Climate Report

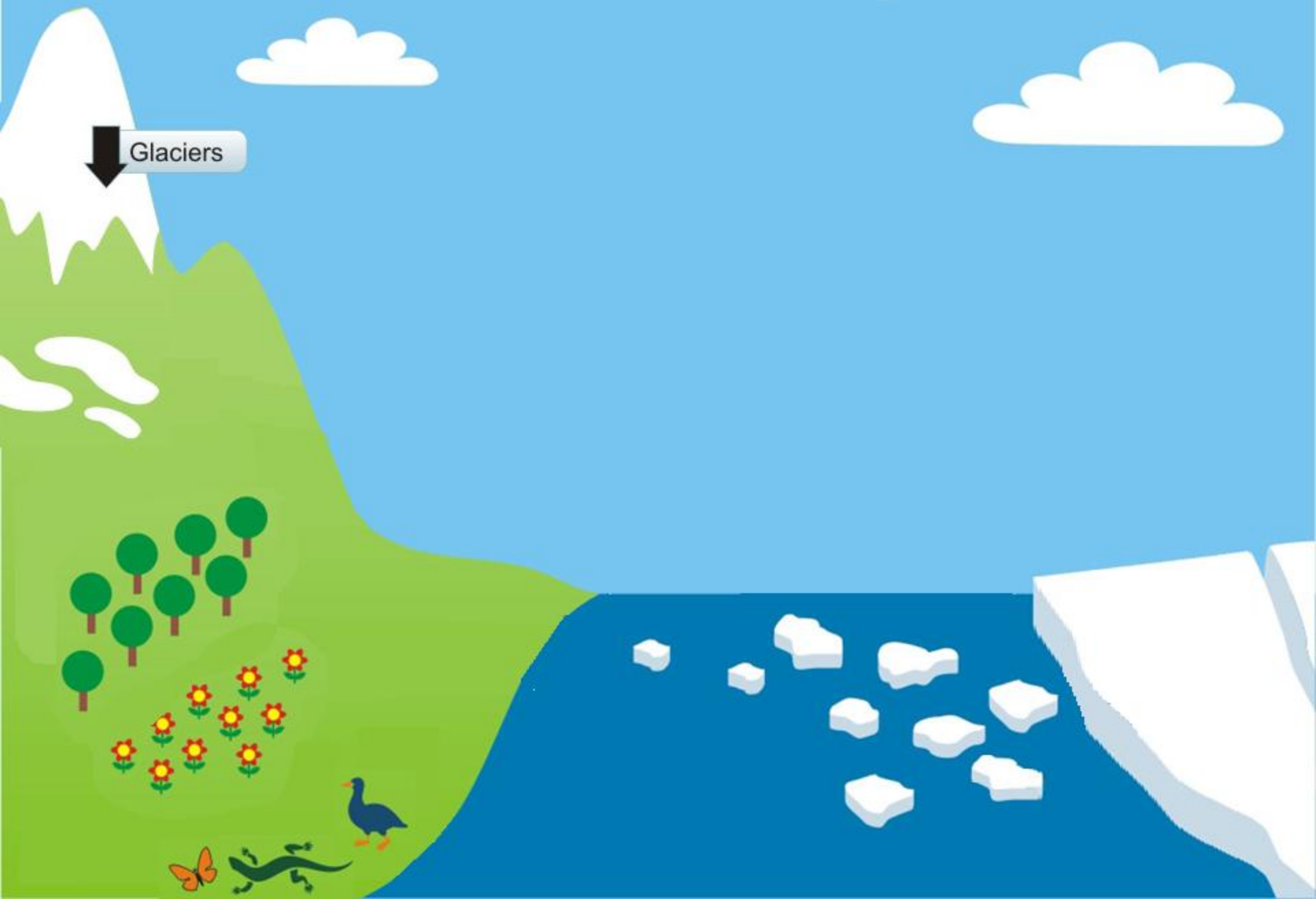


Indicators of a Warming World



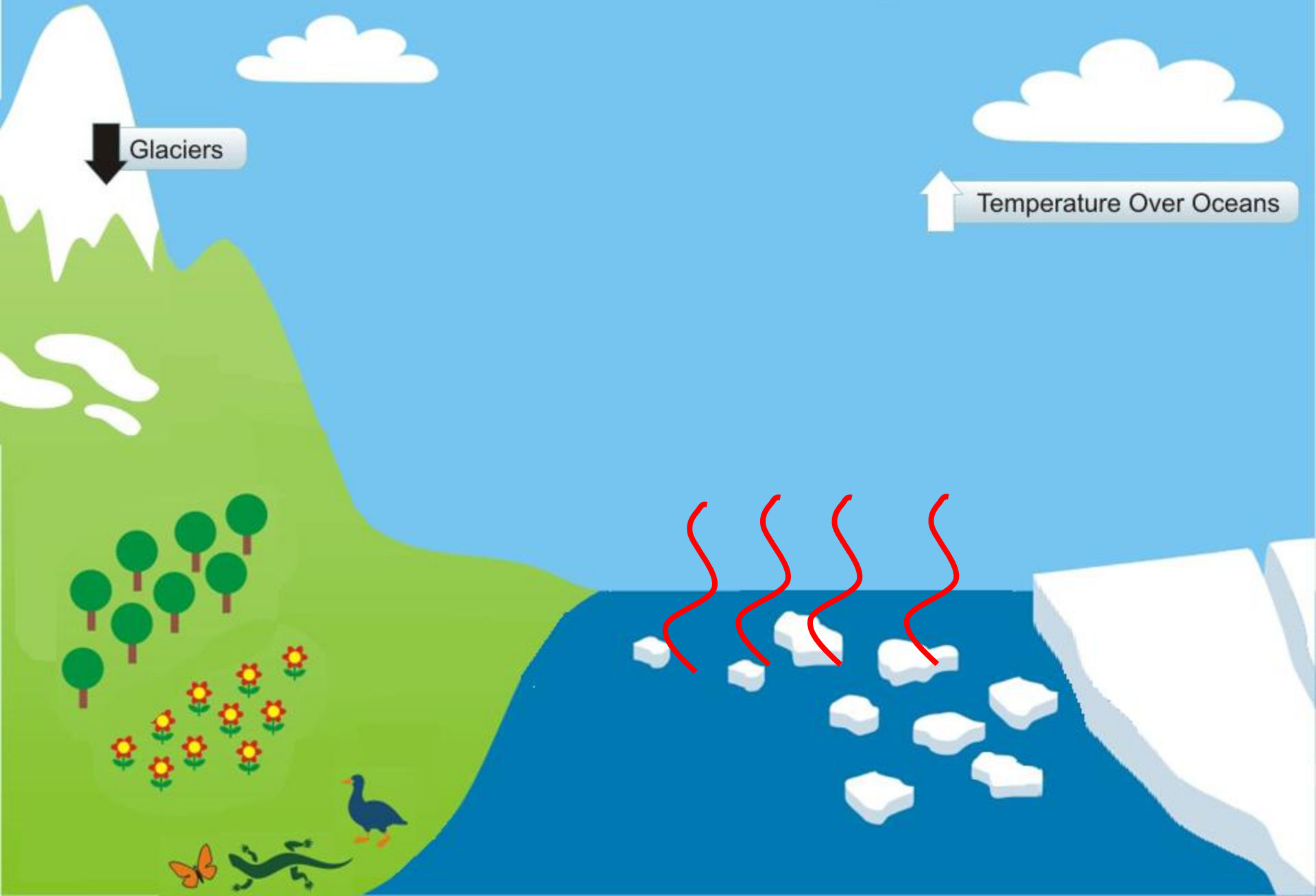
Glaciers

Indicators of a Warming World



Glaciers

Indicators of a Warming World



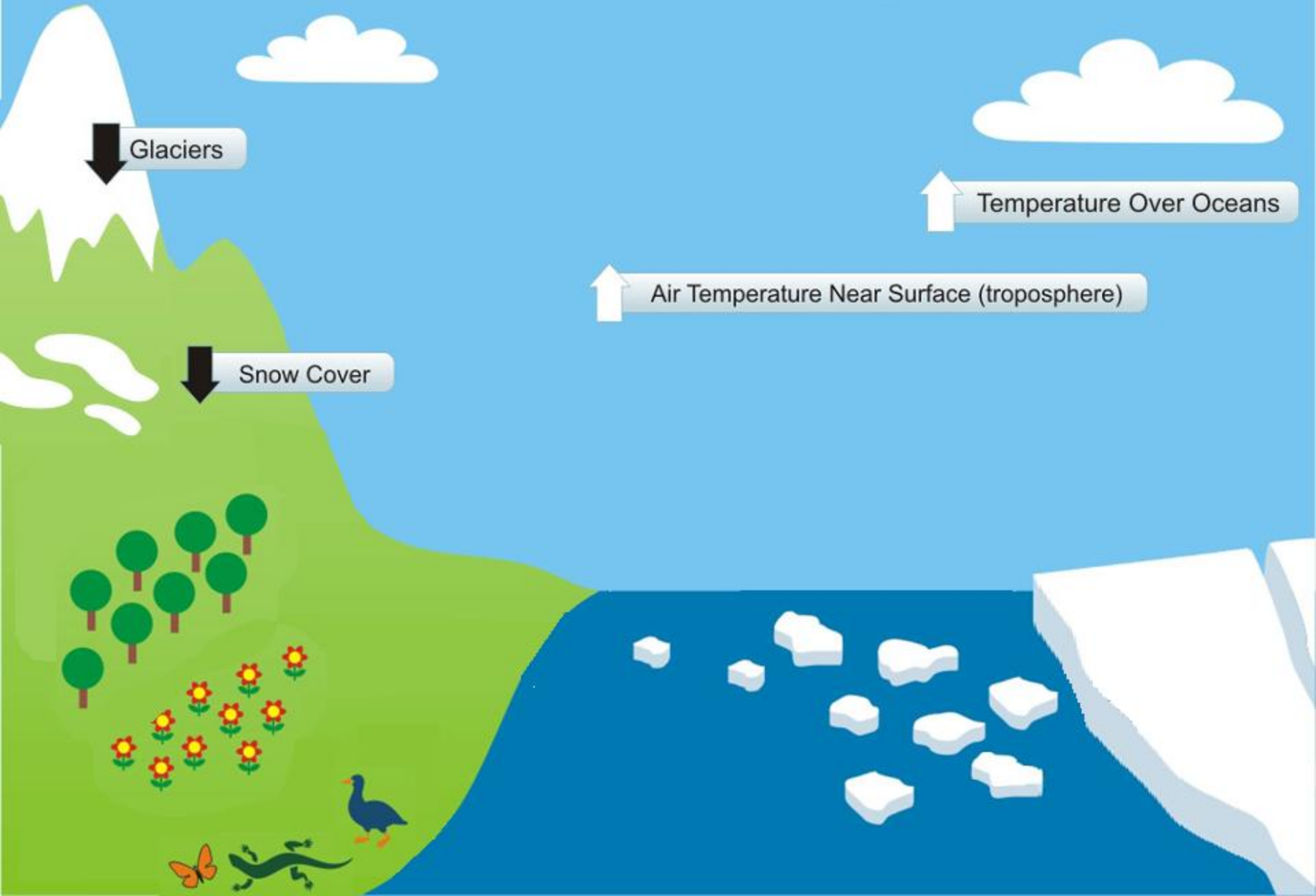
Glaciers

Temperature Over Oceans

Indicators of a Warming World



Indicators of a Warming World



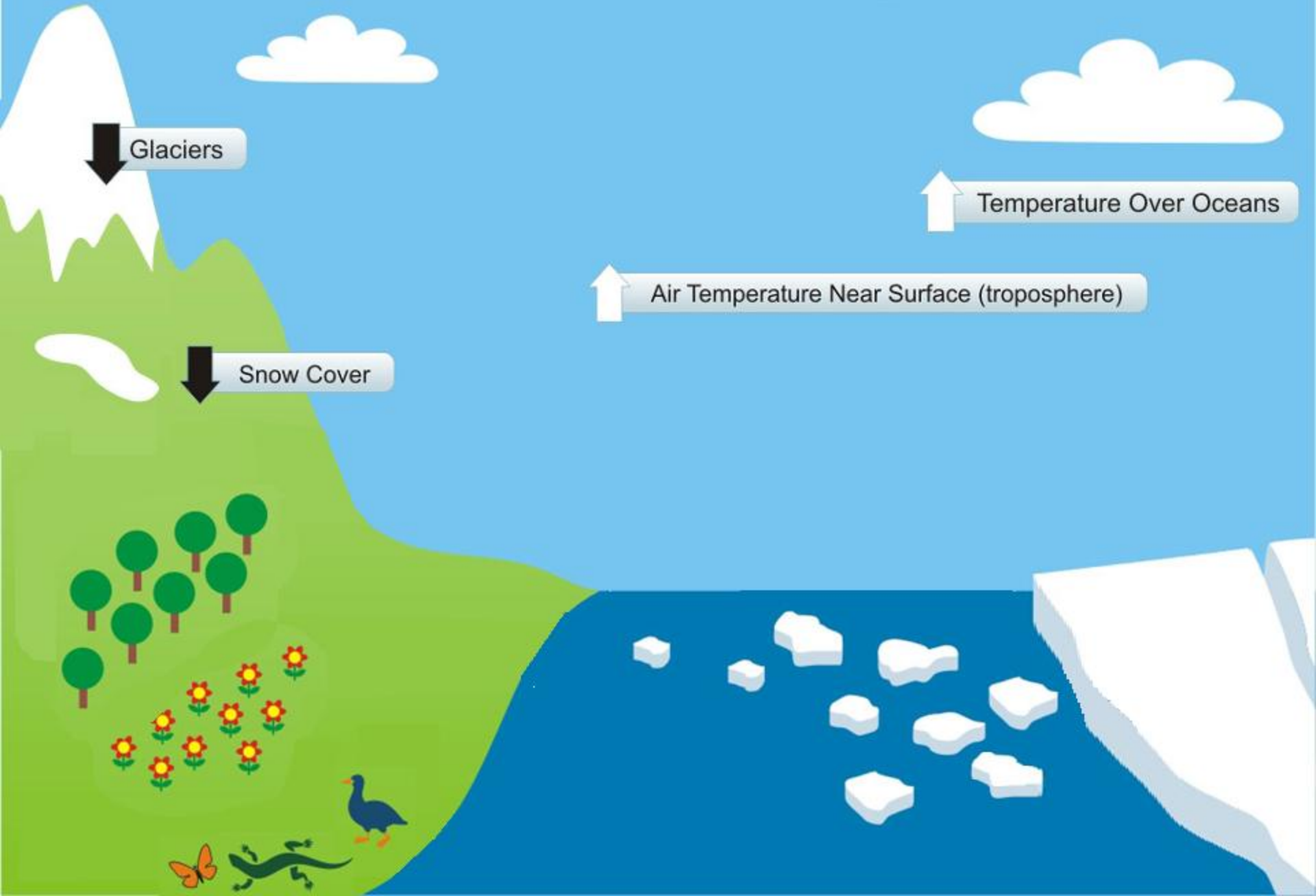
Glaciers

Snow Cover

Temperature Over Oceans

Air Temperature Near Surface (troposphere)

Indicators of a Warming World



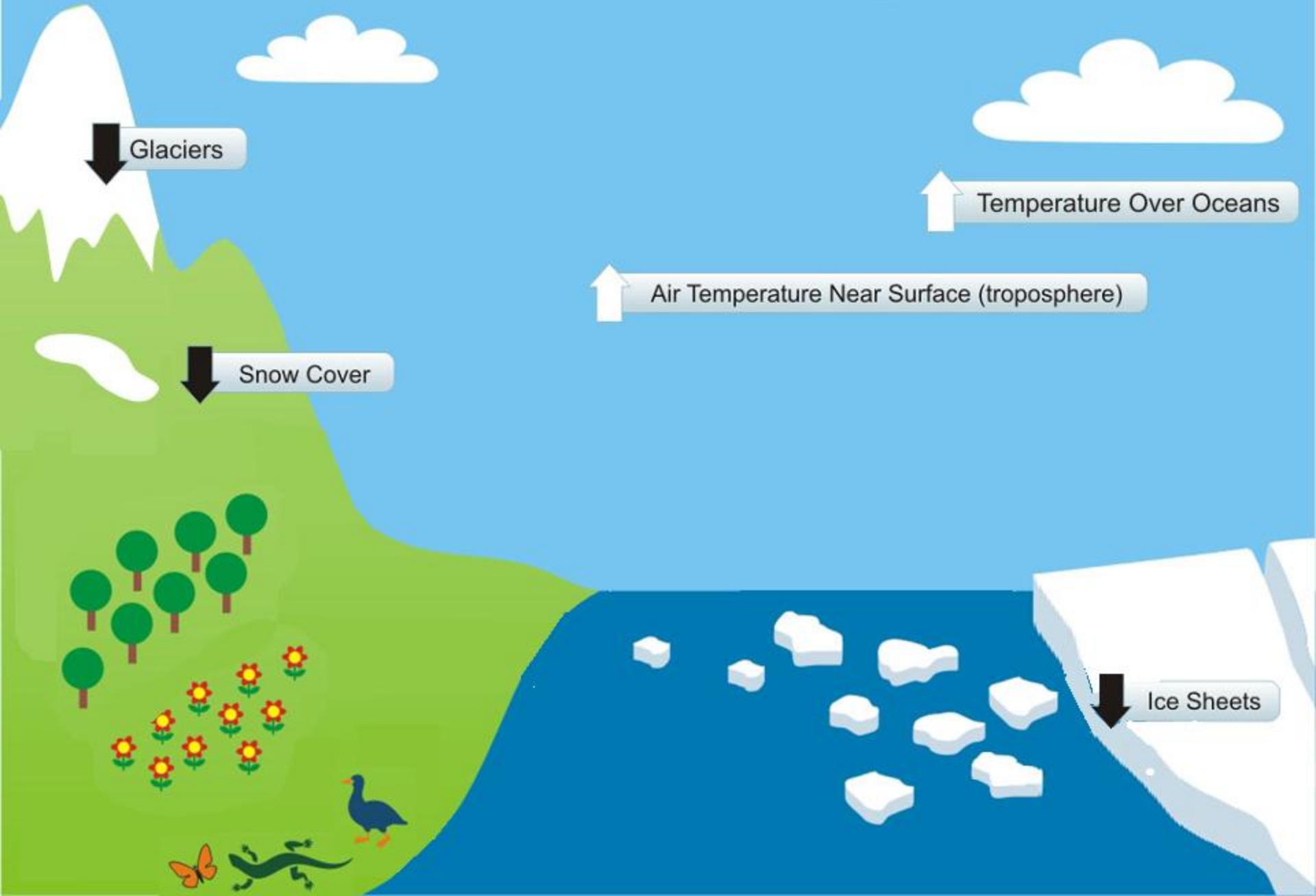
Glaciers

Snow Cover

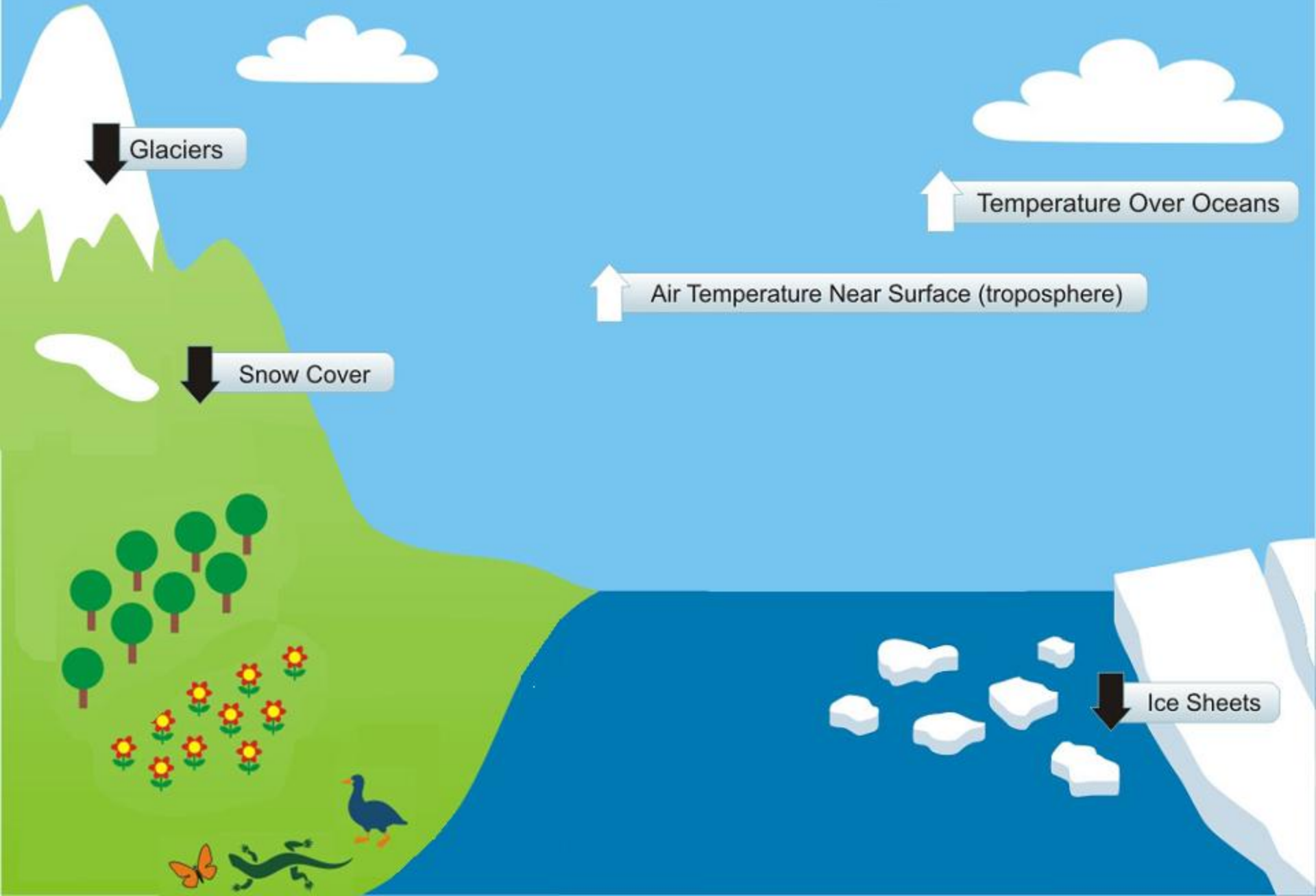
Temperature Over Oceans

Air Temperature Near Surface (troposphere)

Indicators of a Warming World



Indicators of a Warming World



Glaciers

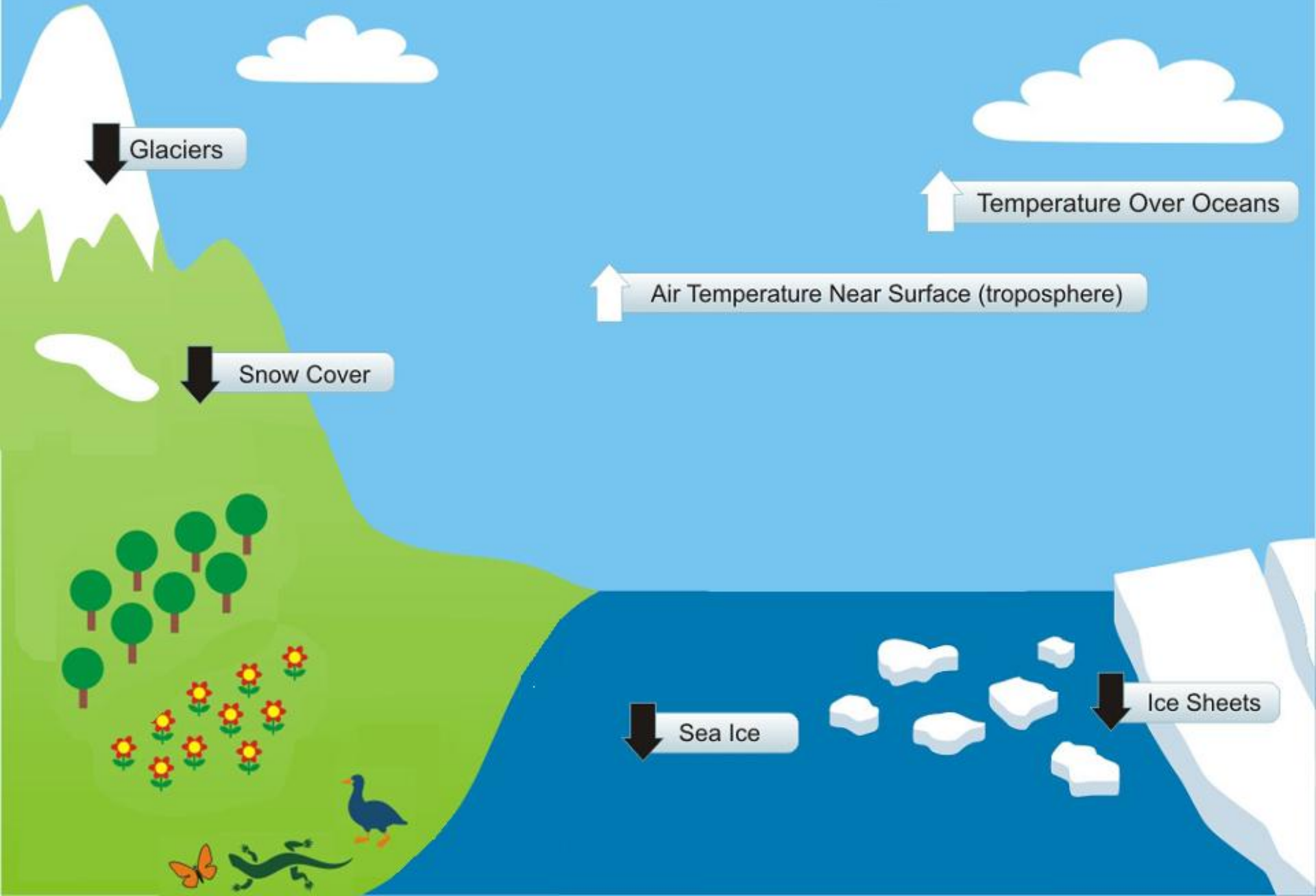
Temperature Over Oceans

Air Temperature Near Surface (troposphere)

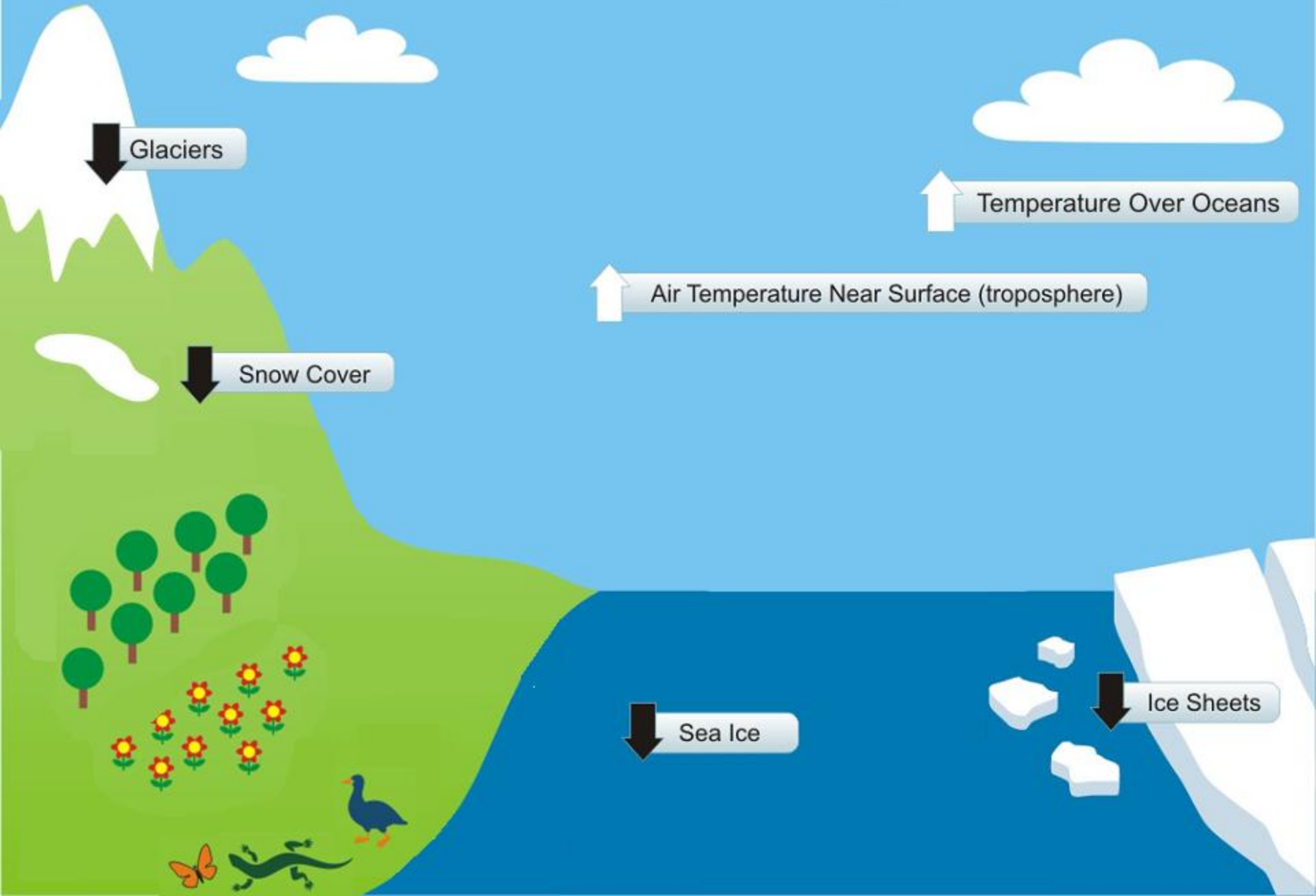
Snow Cover

Ice Sheets

Indicators of a Warming World



Indicators of a Warming World



Glaciers

Temperature Over Oceans

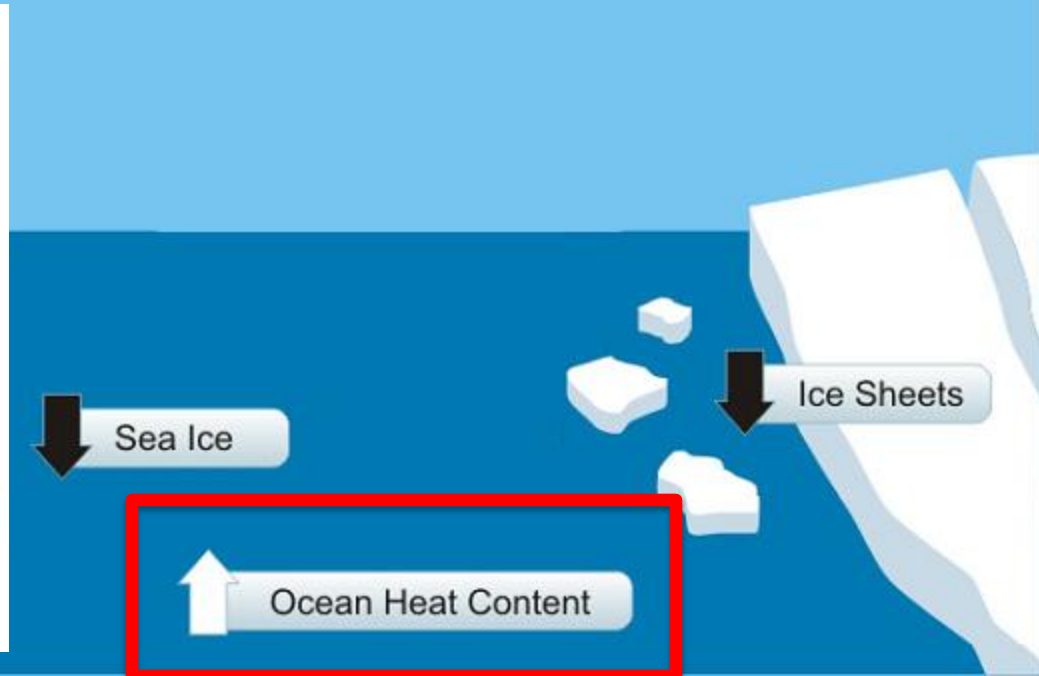
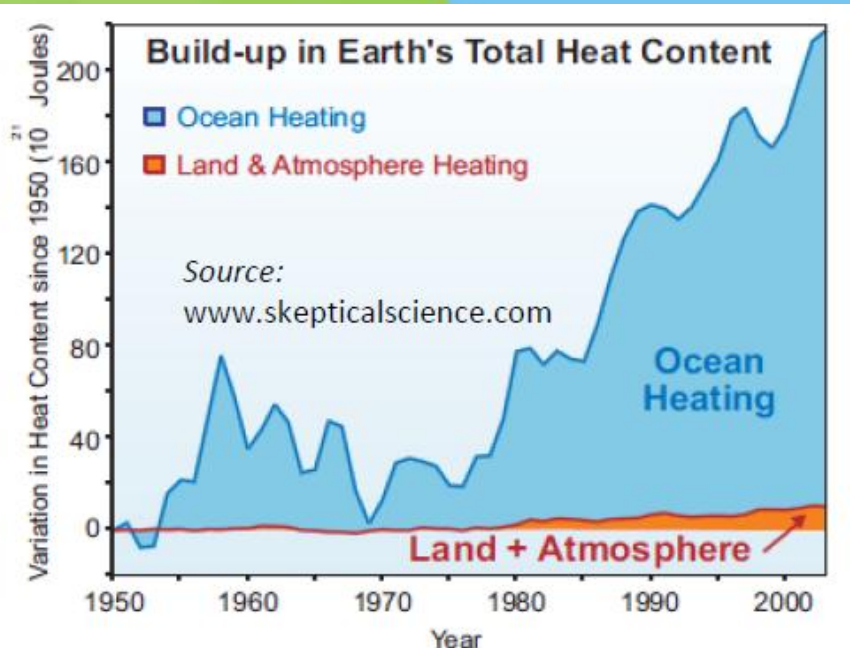
Air Temperature Near Surface (troposphere)

Snow Cover

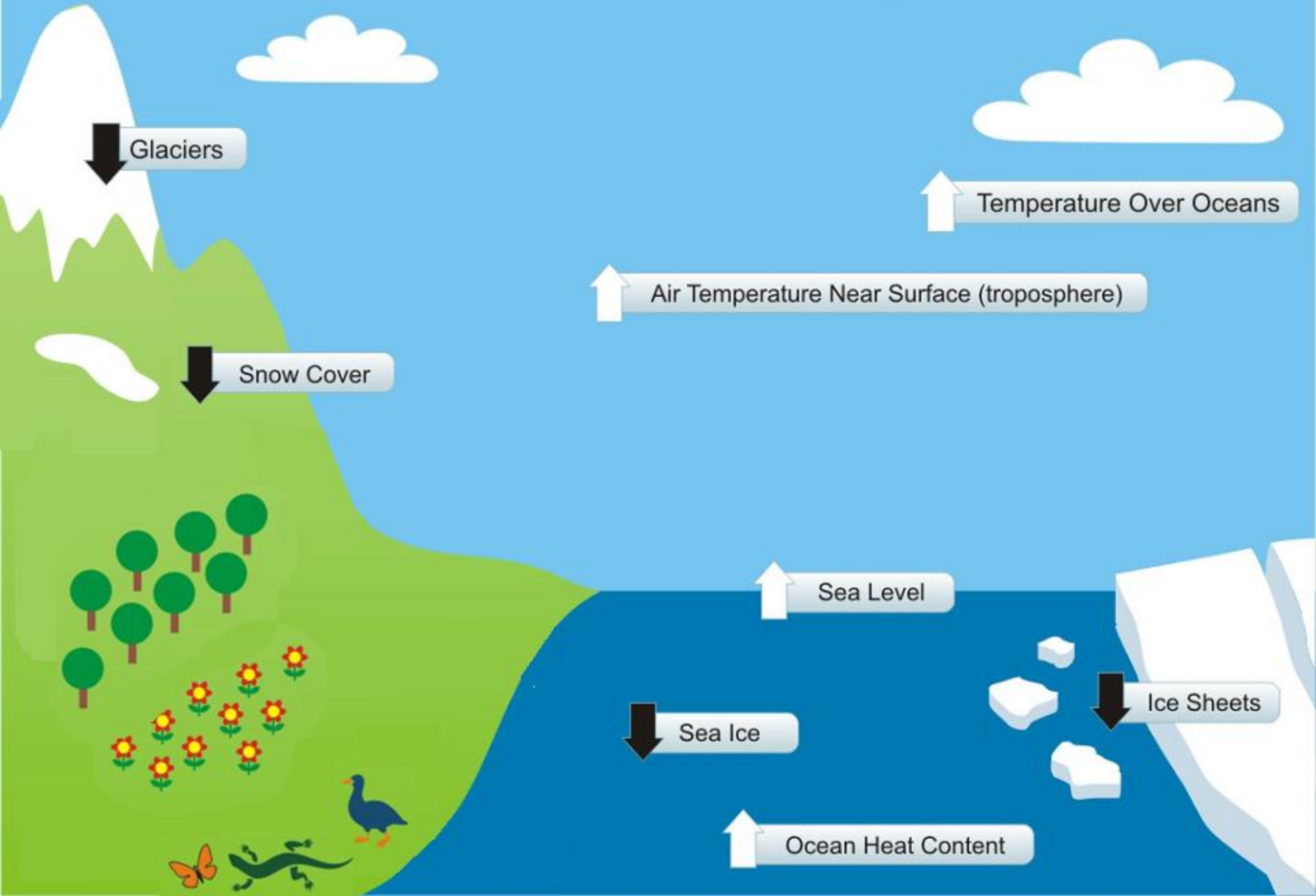
Sea Ice

Ice Sheets

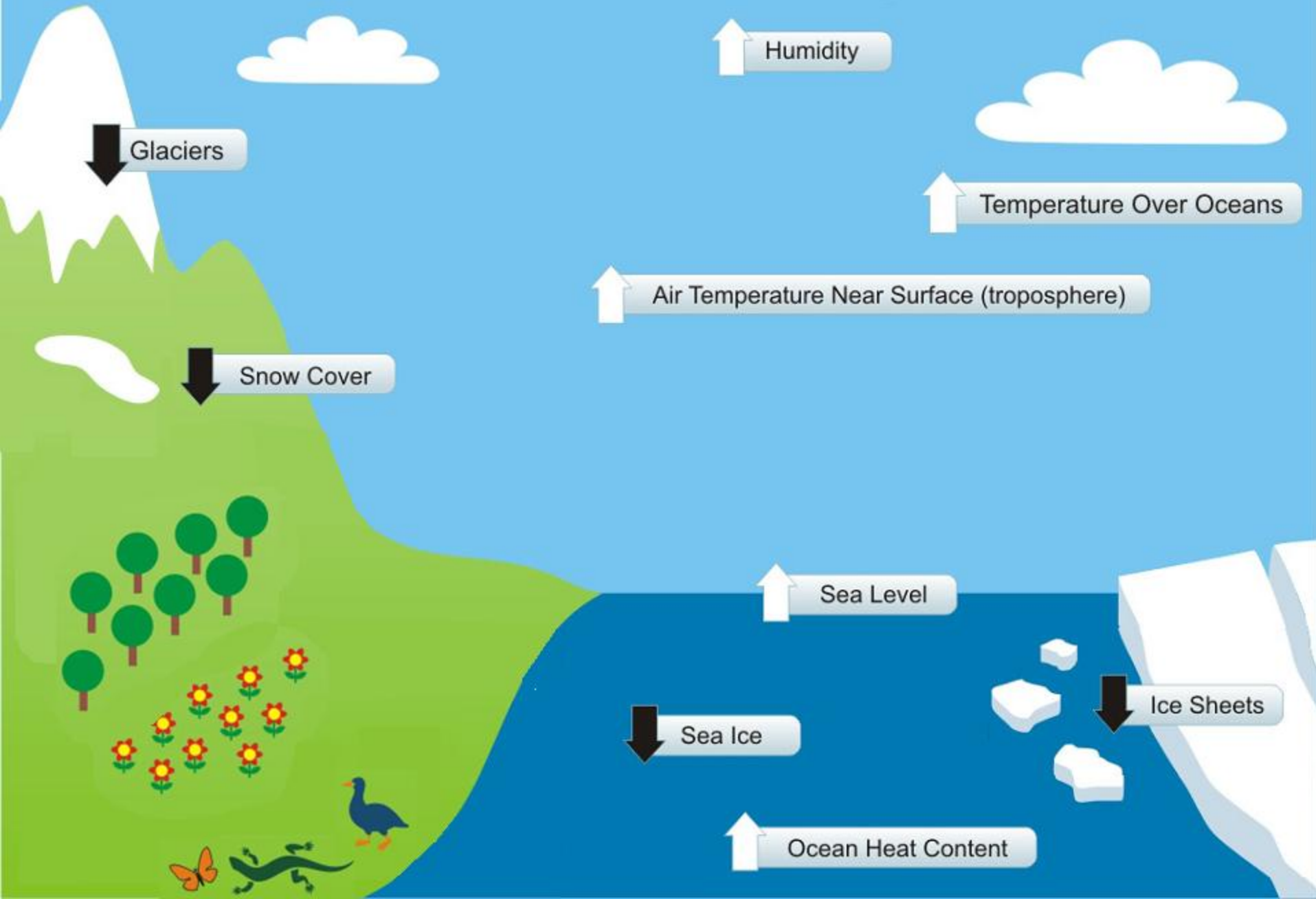
Indicators of a Warming World



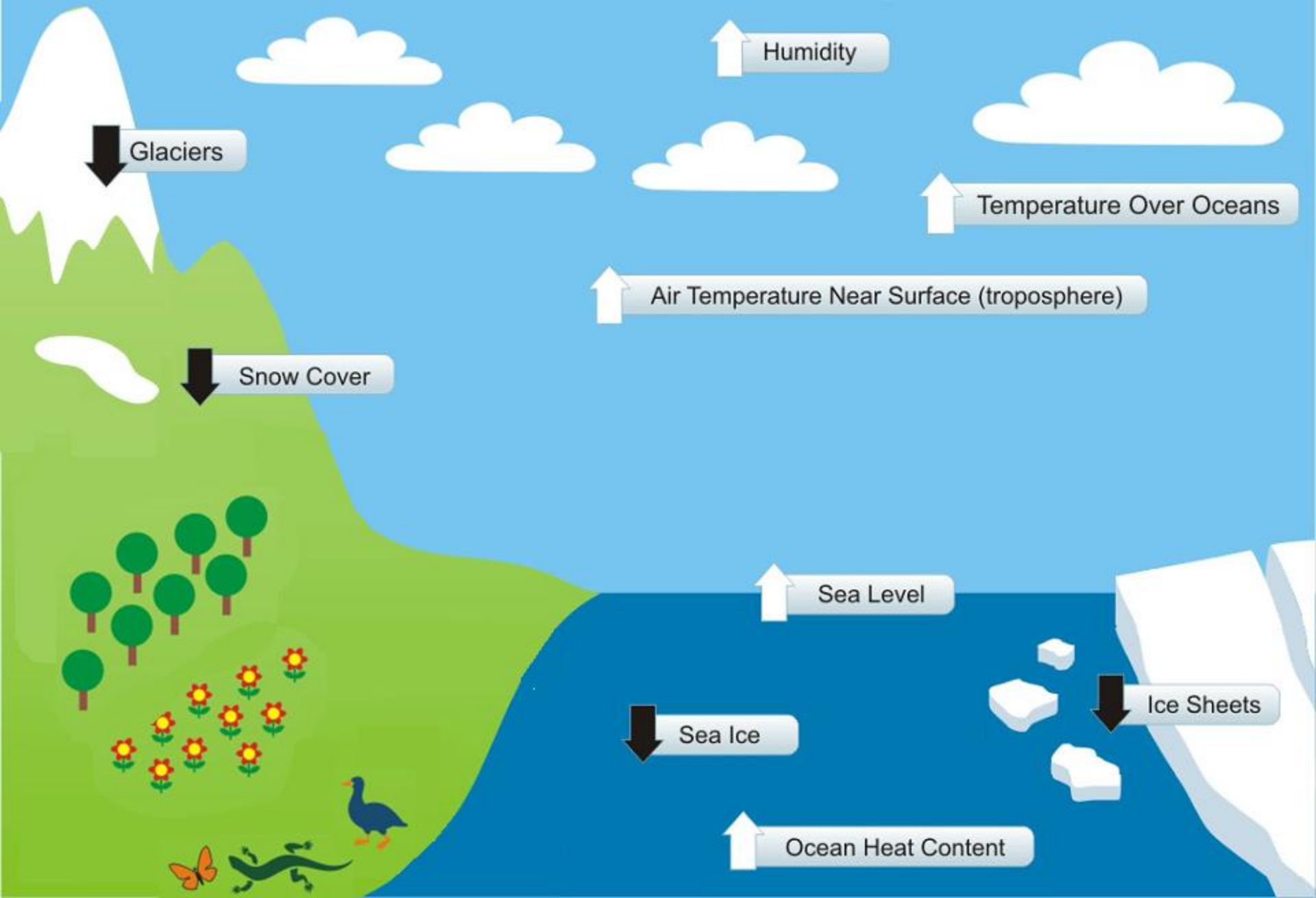
Indicators of a Warming World



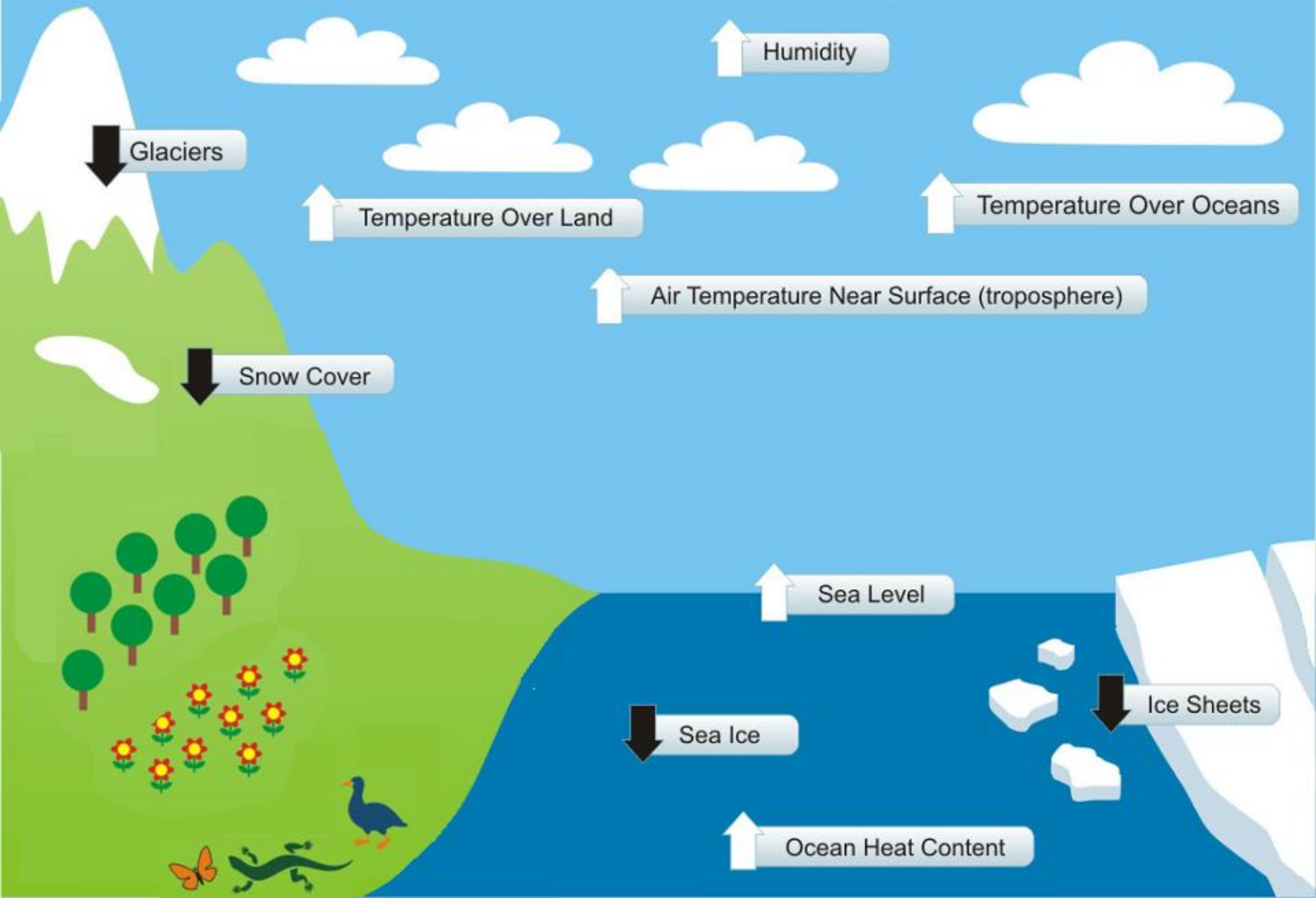
Indicators of a Warming World



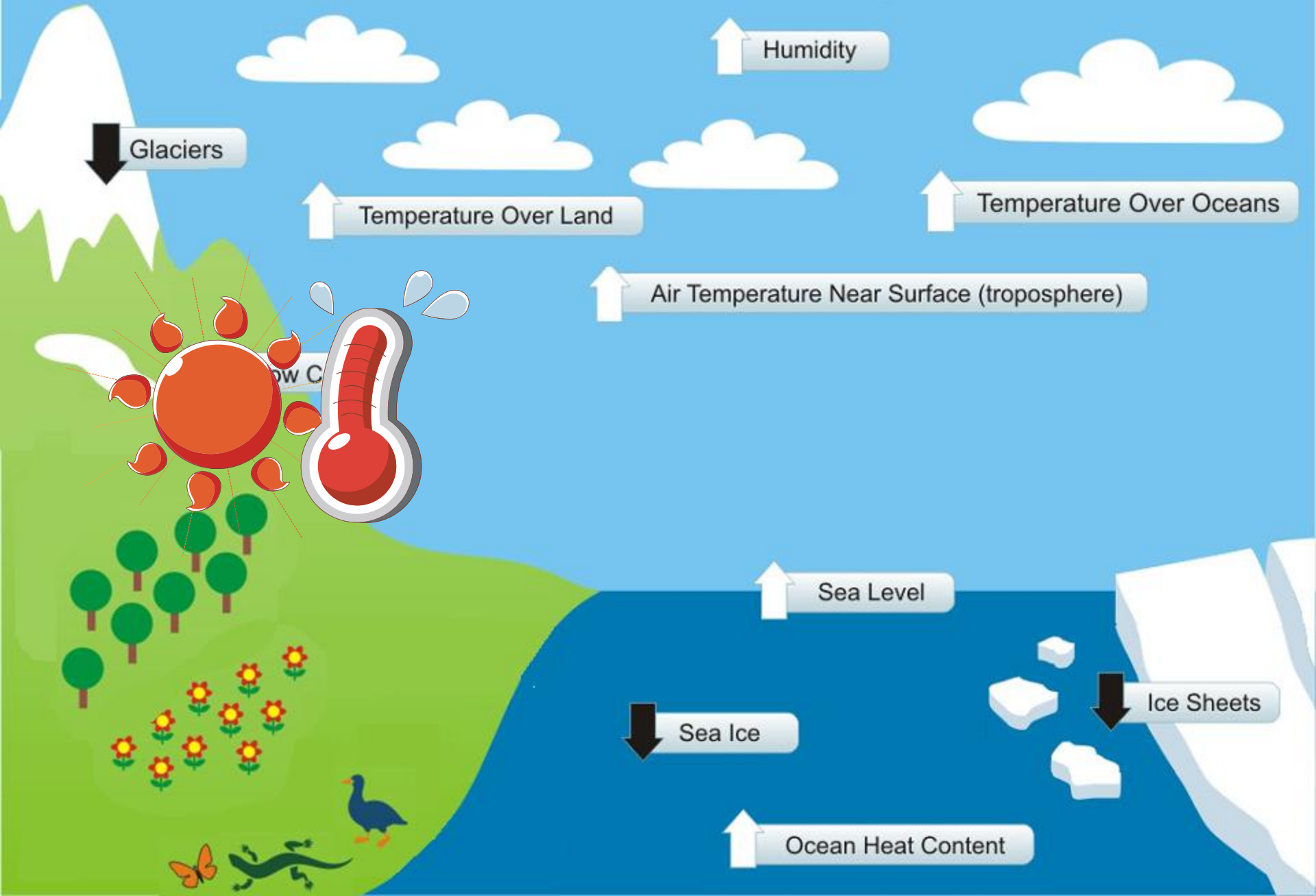
Indicators of a Warming World



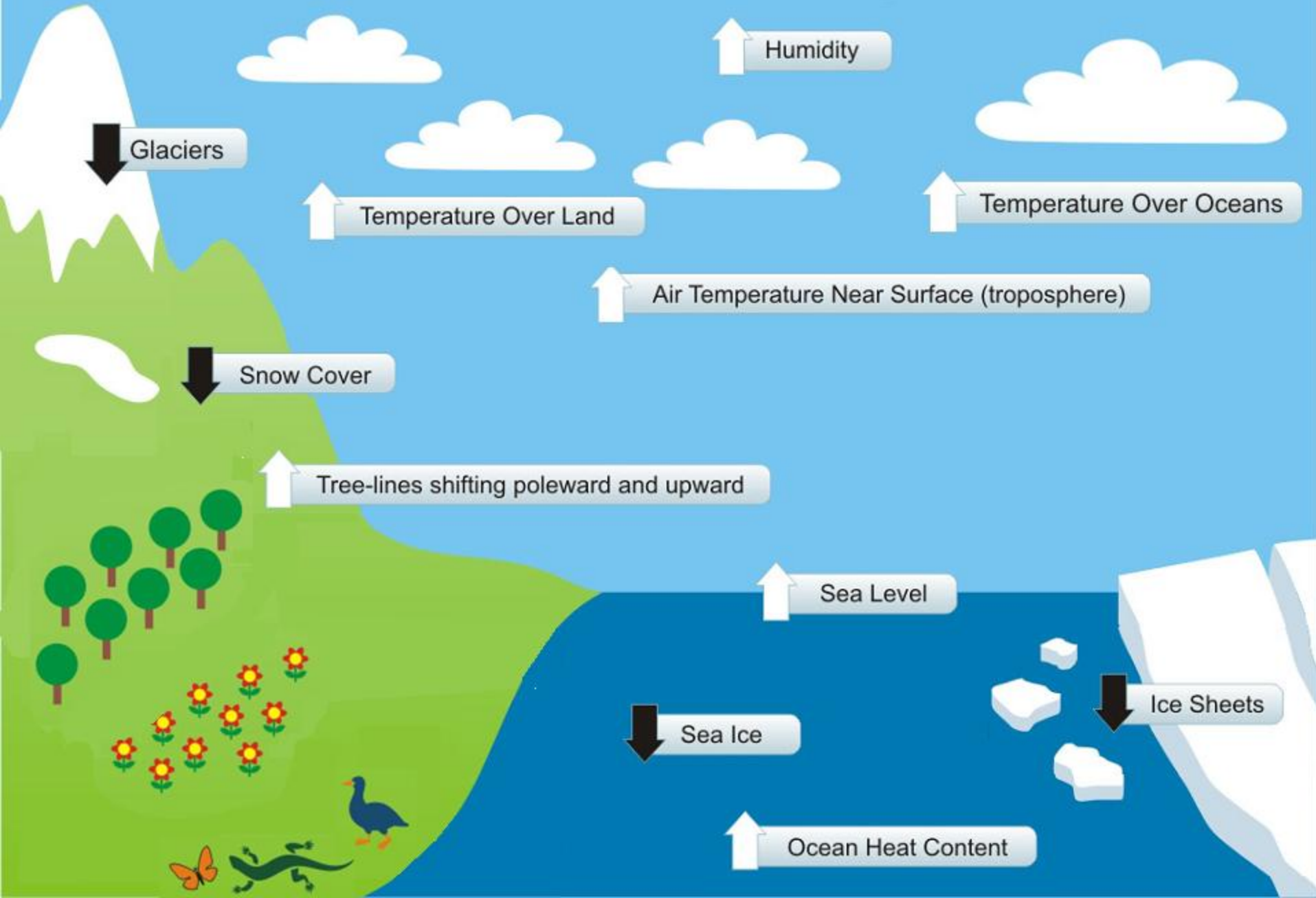
Indicators of a Warming World



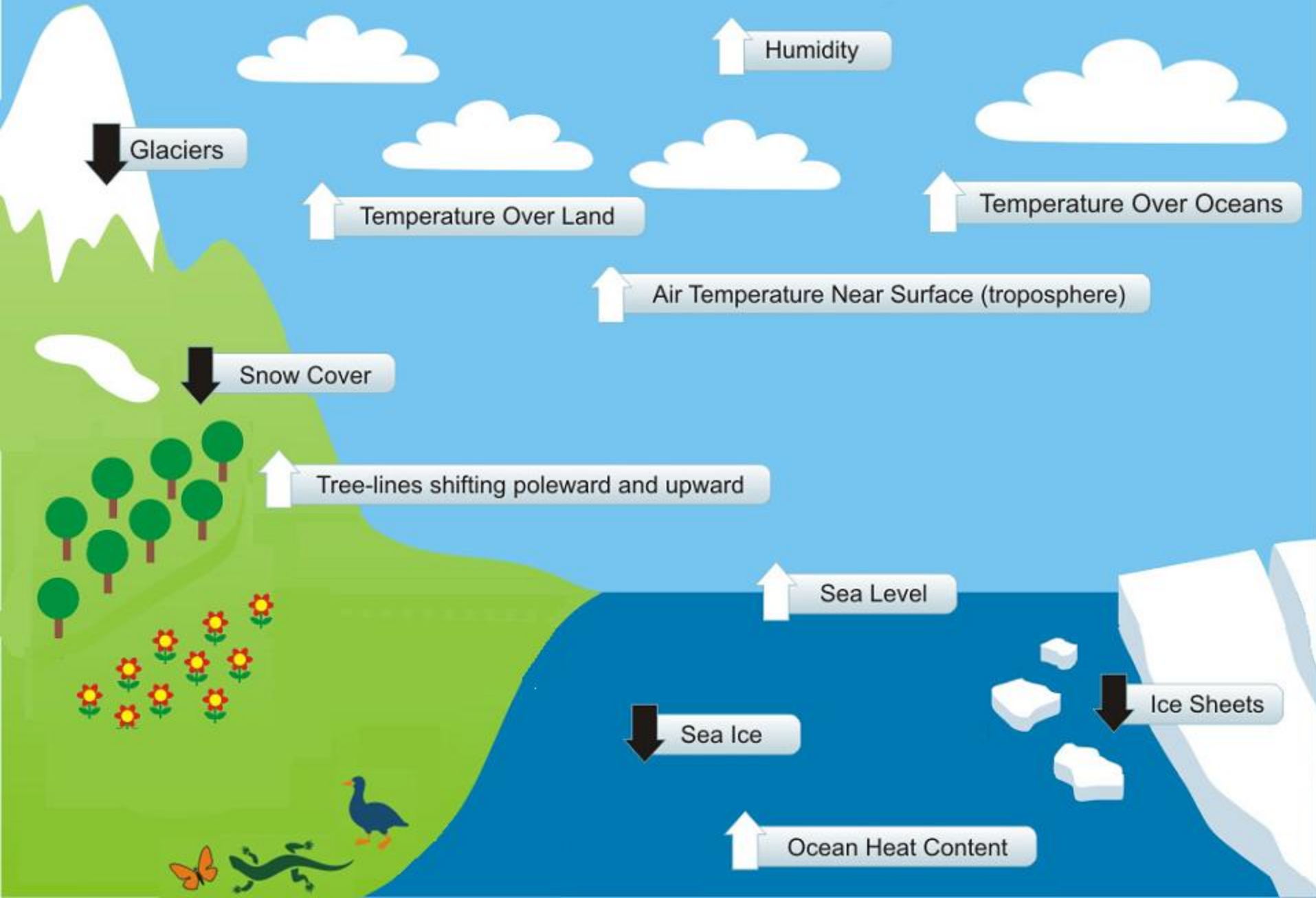
Indicators of a Warming World



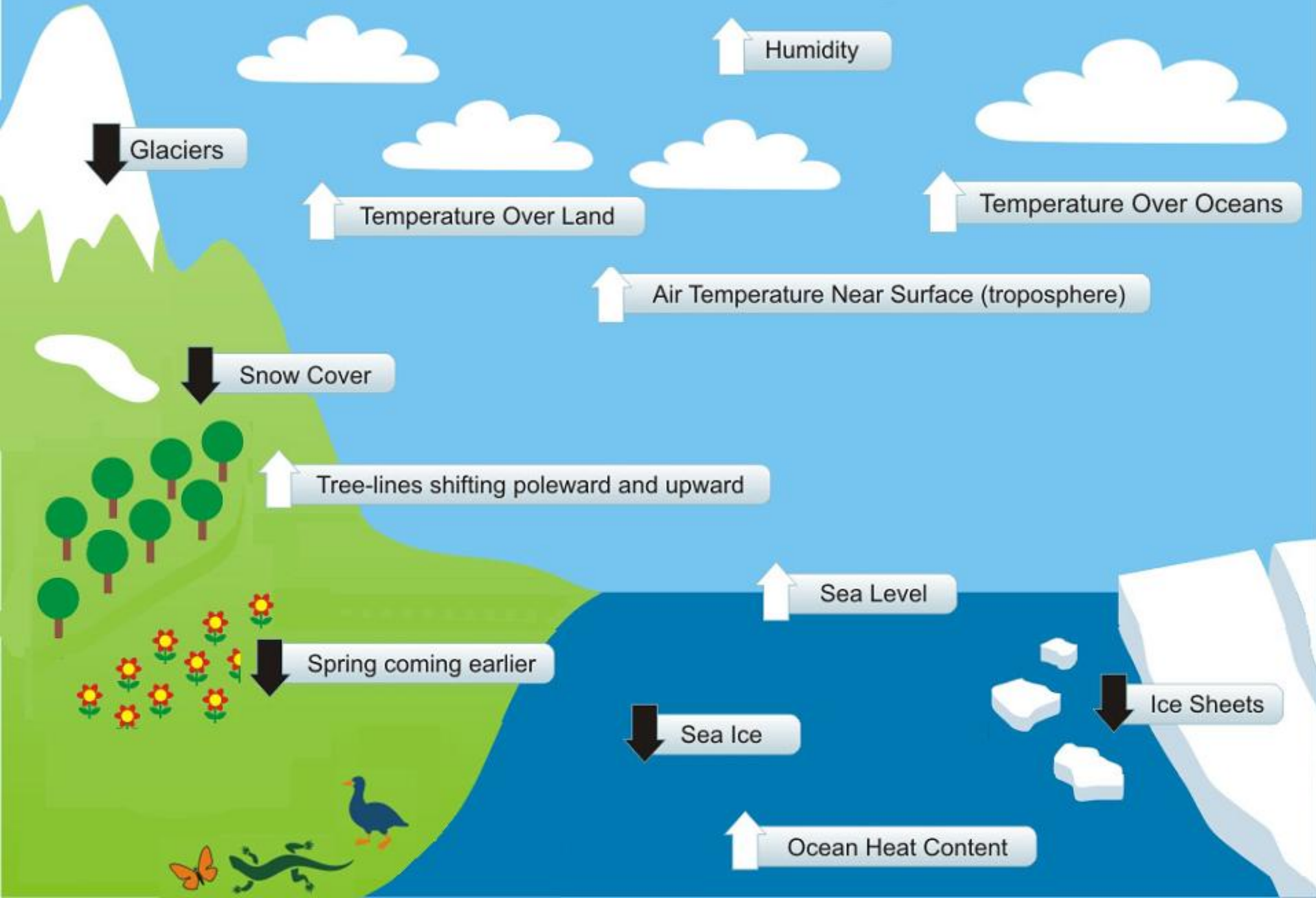
Indicators of a Warming World



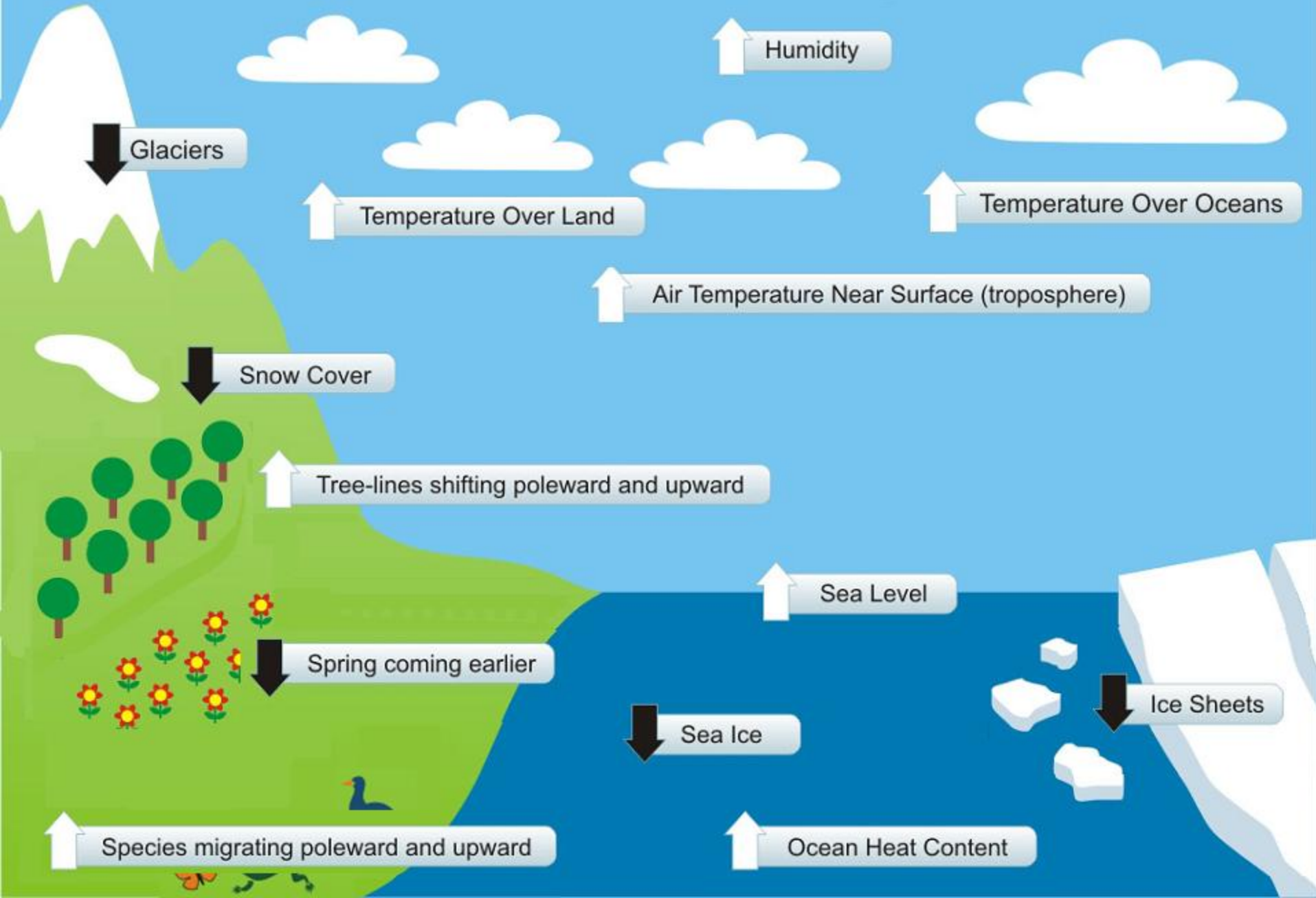
Indicators of a Warming World



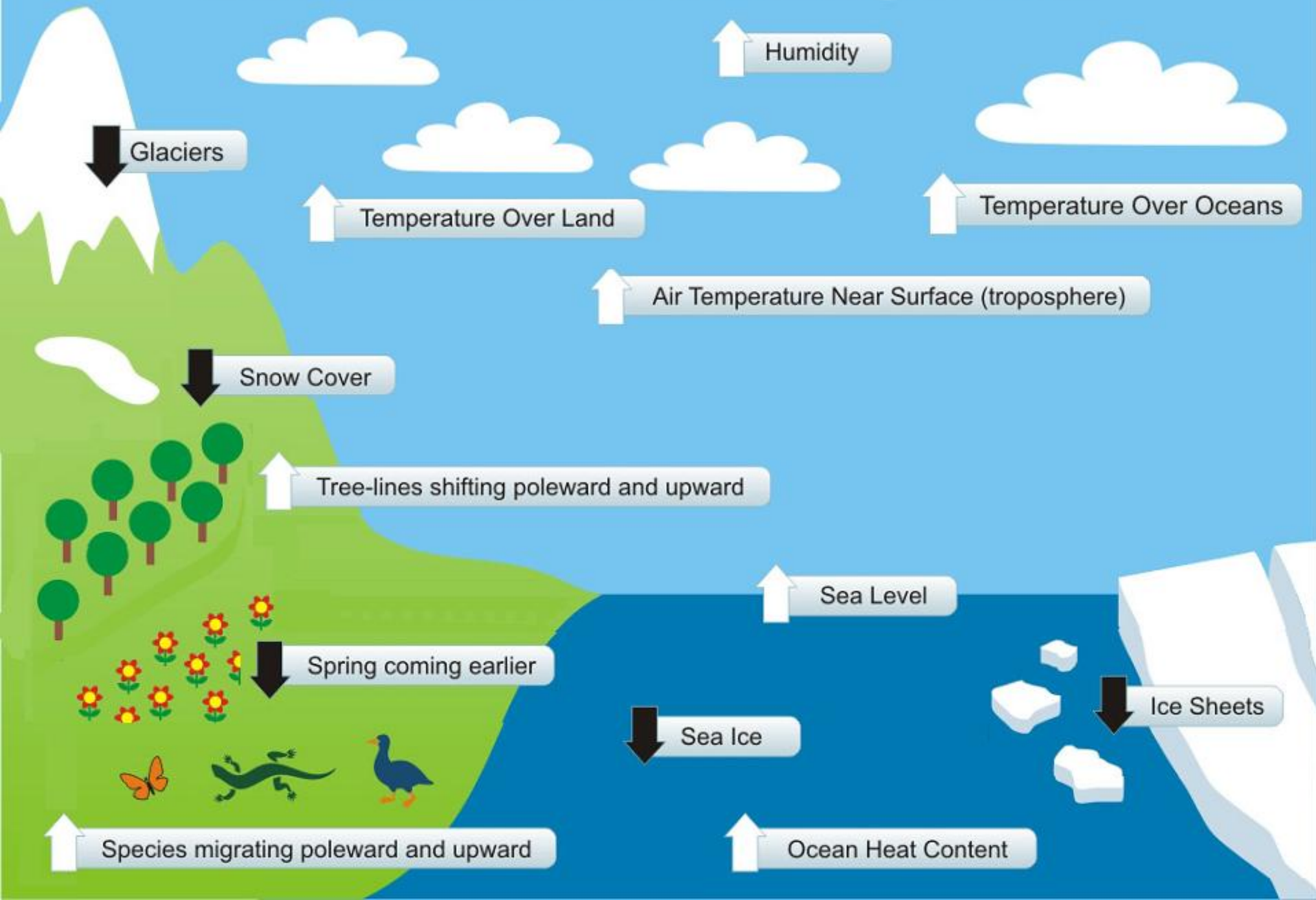
Indicators of a Warming World



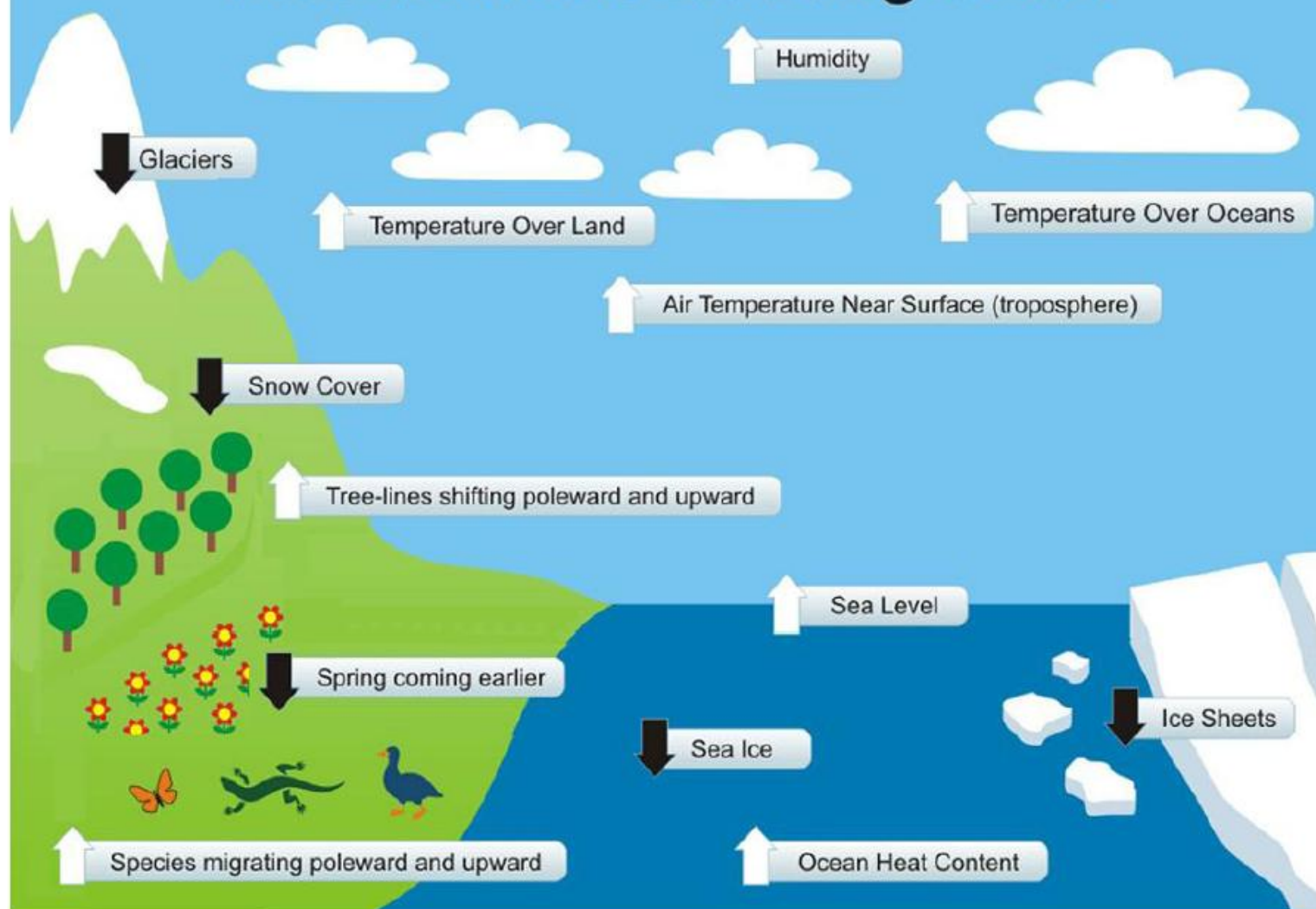
Indicators of a Warming World



Indicators of a Warming World

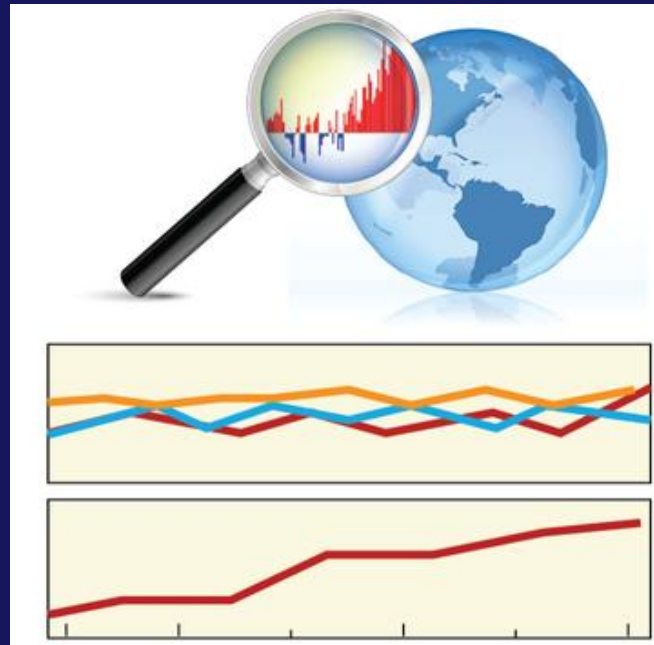


Indicators of a Warming World



OBSERVATIONS: DETECTION OF INDICATORS OF A WARMING WORLD

Detection: finding something out of the ordinary – a “signal” emerging from the noise



SORTING OUT THE CAUSES OF THESE DETECTED OBSERVATIONS!

Attribution: determining the cause of
the detected trend

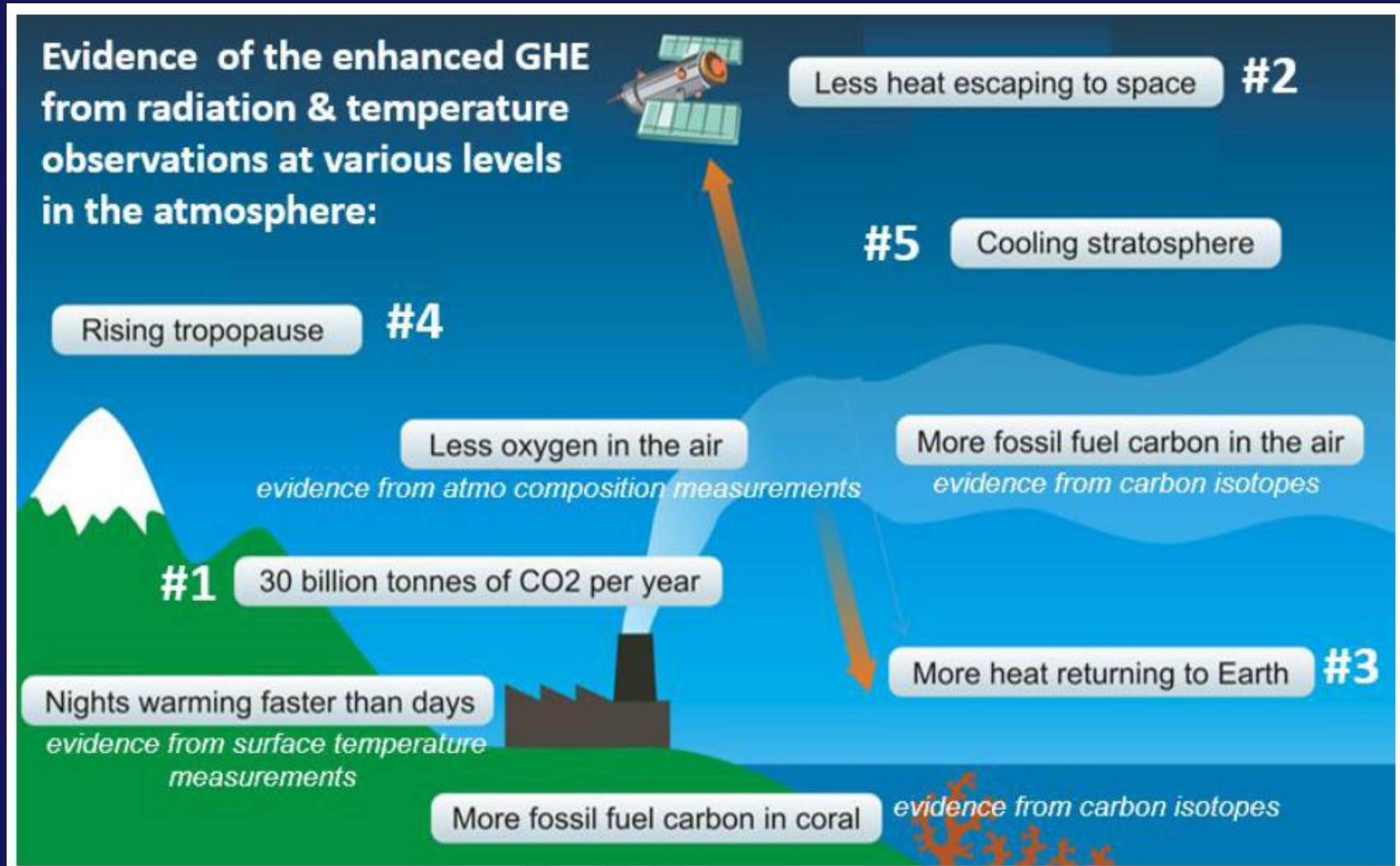
NATURAL vs HUMAN INFLUENCES

Fingerprint

The [climate](#) response pattern in space and/or time to a specific forcing is commonly referred to as a fingerprint. Fingerprints are used to detect the presence of this response in observations and are typically estimated using forced [climate model](#) simulations.

Lesson 4 Tutorial (see Glossary)

Some Indicators of a Human Fingerprint on Climate Change:

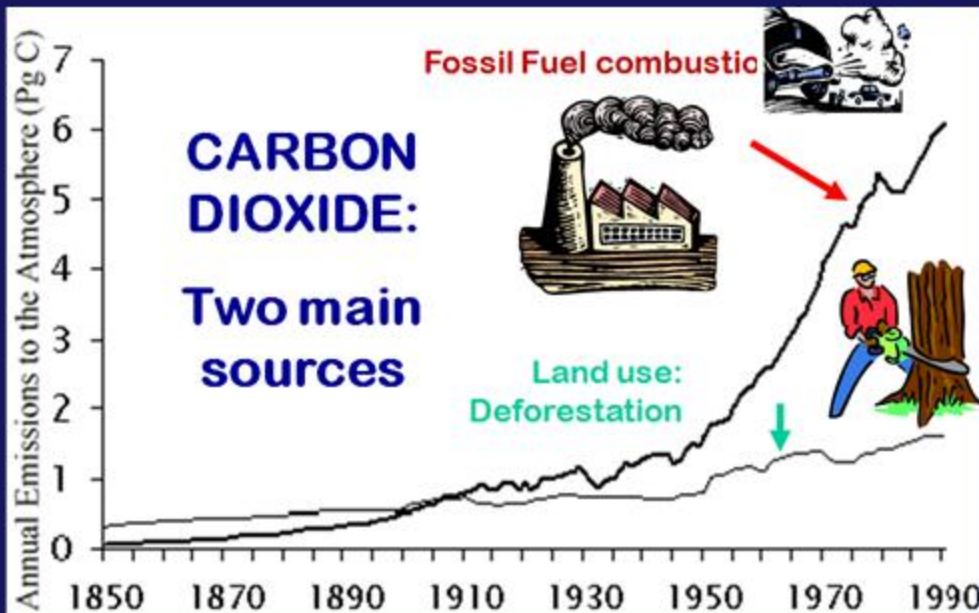


Can you link the indicators in the figure with processes we've covered this semester that are linked to an ANTHROPOGENIC influence?

What processes are linked to each of these indicators?

1. 30 billion tonnes of CO₂ emitted into the atmosphere per year:
2. Less heat escaping to space at the top of the atmosphere:
3. More heat returning to Earth:
4. Rising tropopause:
5. Cooling stratosphere:

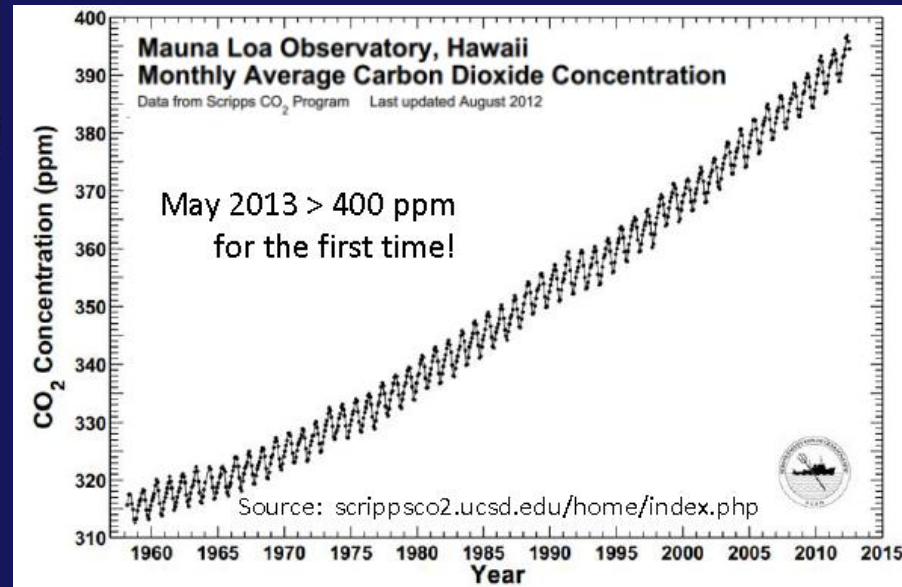
1. 30 billion tonnes of CO₂ emitted into the atmosphere per year:



← **Process = Emissions!**
Where the CO₂ comes from . . .

Concentration →

What's gotten into the atmosphere
(Keeling Curve measures it!)

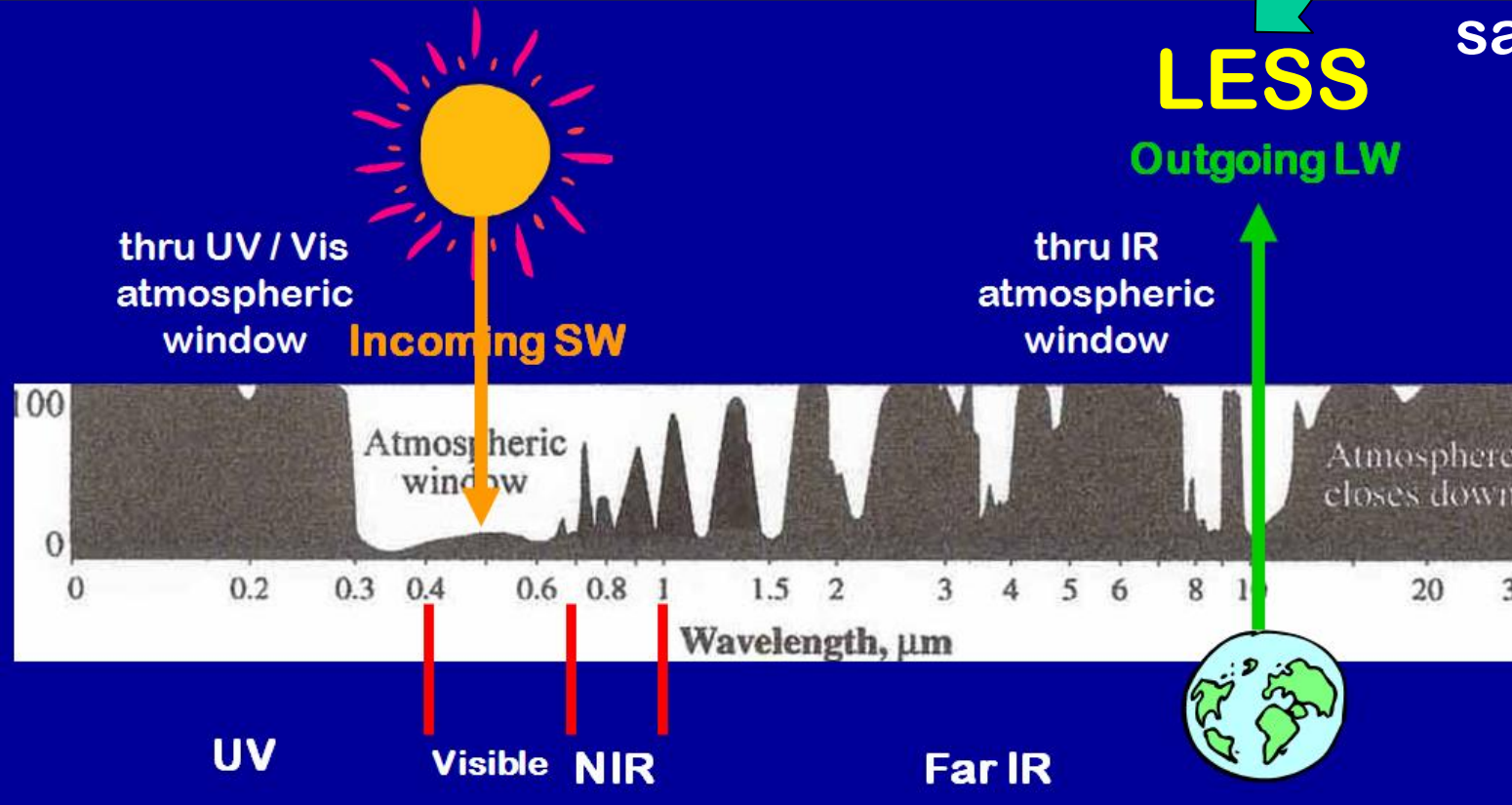


2. Less heat escaping to space at the top of the atmosphere:



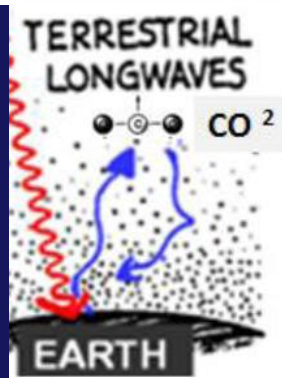
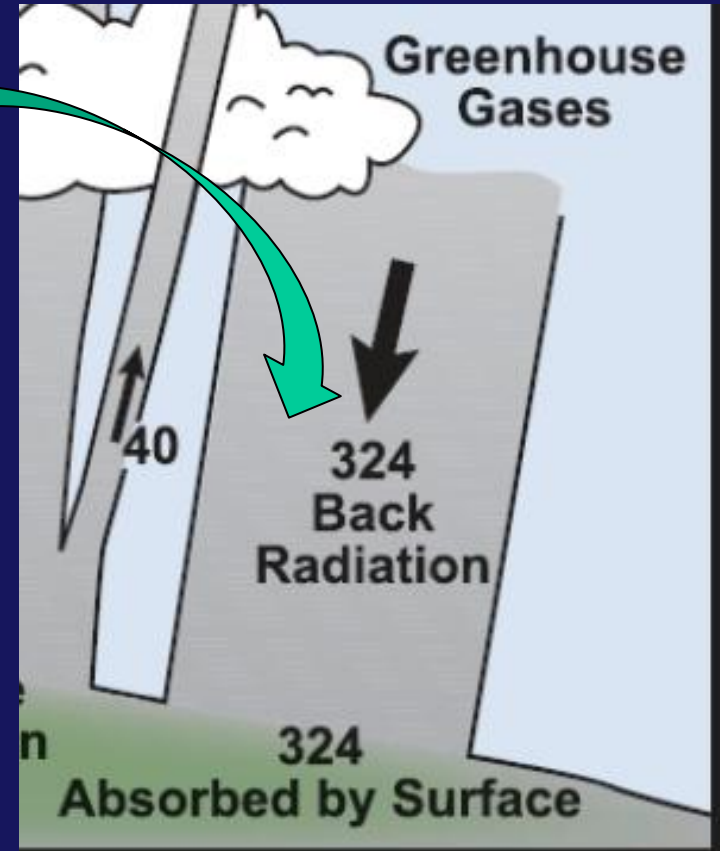
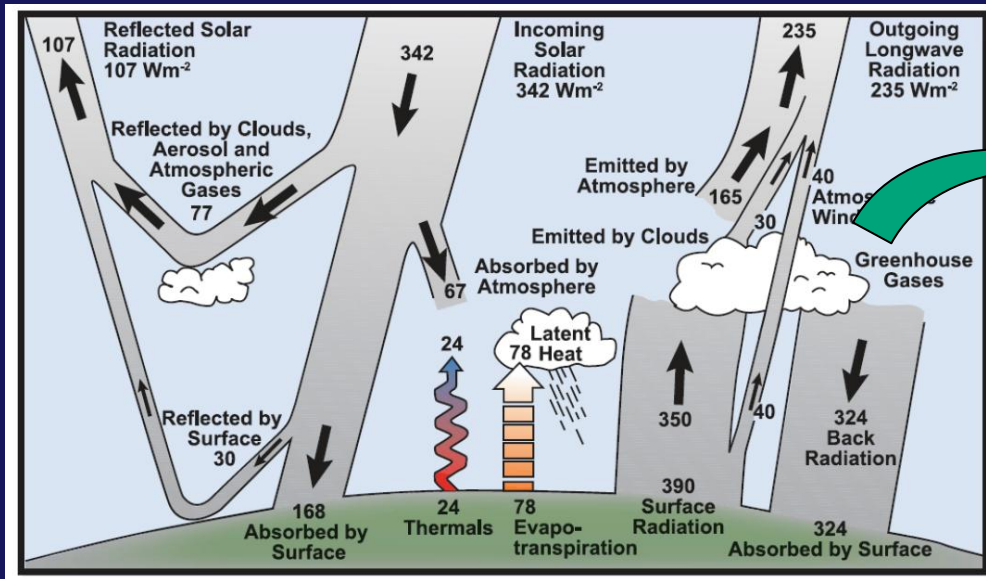
Measured by satellites

LESS
Outgoing LW



Process: **ENHANCED Greenhouse Effect** In the Troposphere keeps IR from escaping to space!

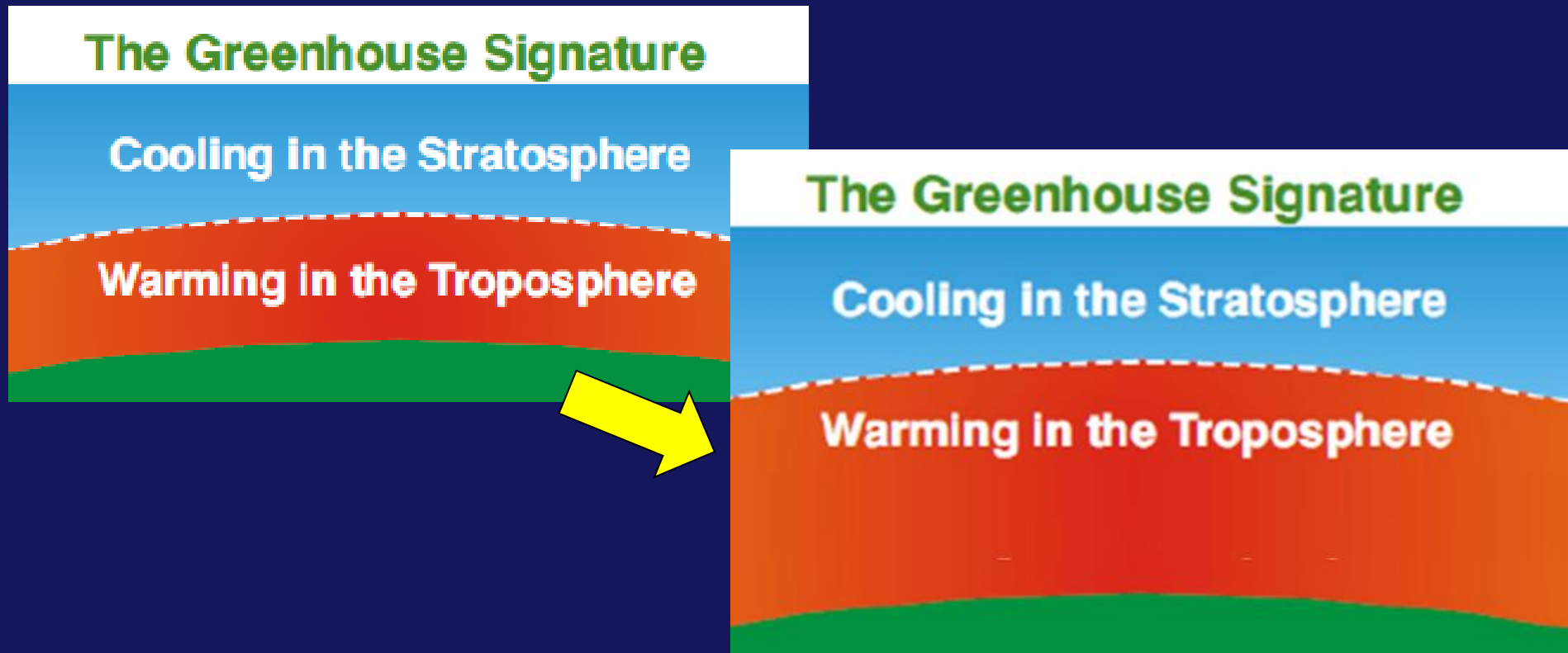
3. More heat returning to Earth:



Process: **ENHANCED Greenhouse Effect**
RADIATES MORE IR back to earth's Surface!

4. Rising tropopause:

Process: **Due to (2) and (3) more heat stays in the TROPOSPHERE and because heat rises, so does the TROPOPAUSE!**



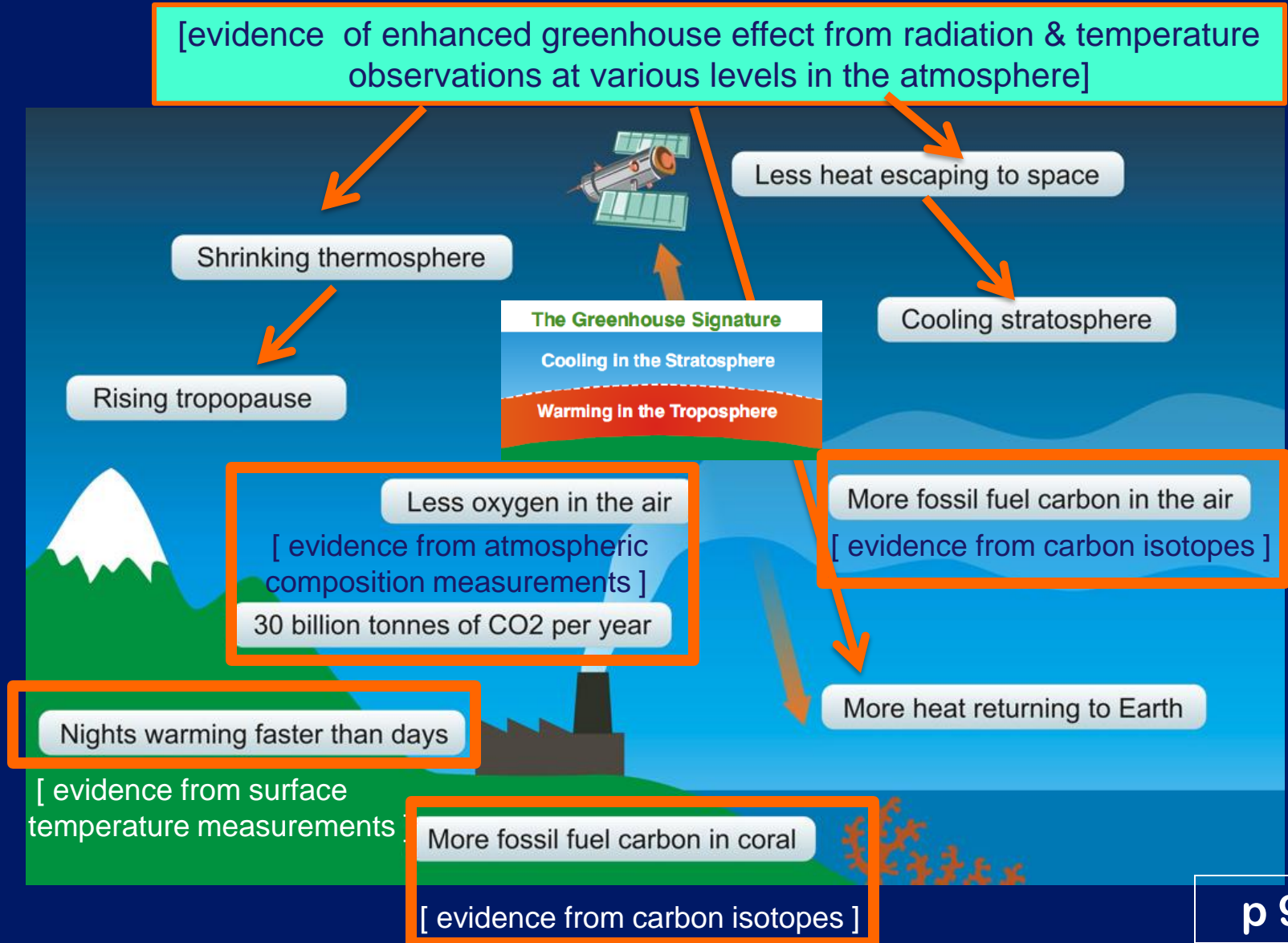
5. Cooling stratosphere:

Process: **Due to (2) and (3) more heat stays in the TROPOSPHERE and less escapes upward to the STRATOSPHERE, so the STRATOSPHERE COOLS**



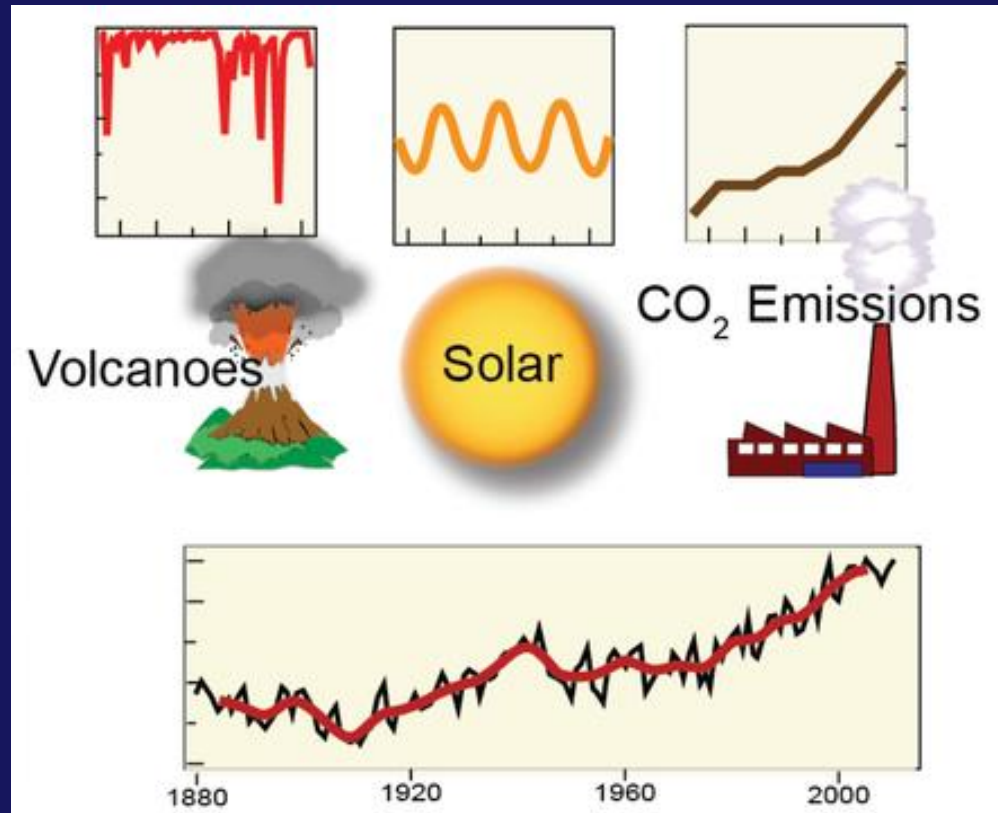
10 Indicators of a Human Fingerprint on Climate Change

Source: NOAA's 2009 State of the Climate Report

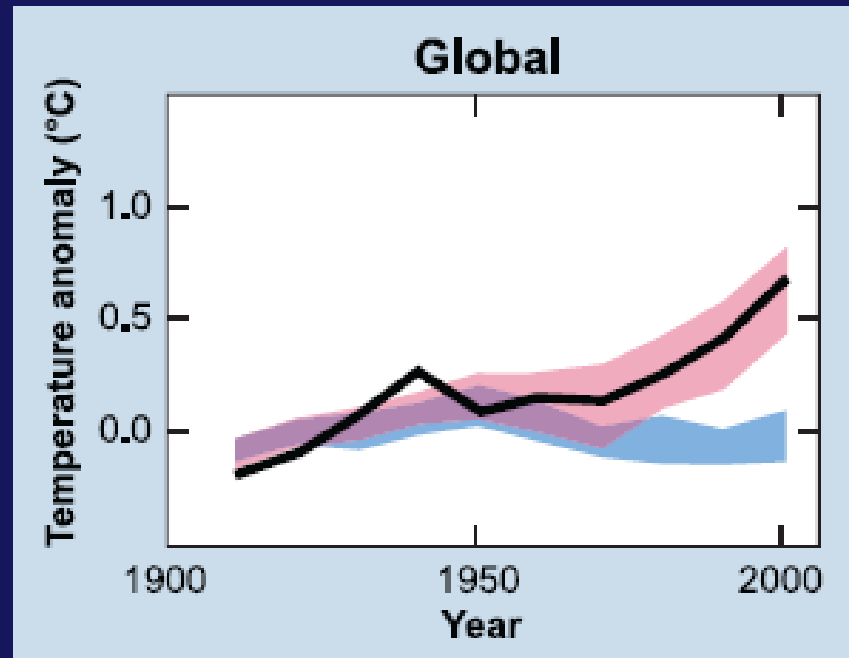


USING MODELS TO SORTING OUT THE CAUSES OF WARMING

Attribution: determining the cause of the detected trend



TOPIC # 15, PART D: Evidence from Model Comparisons Natural vs. Anthropogenic

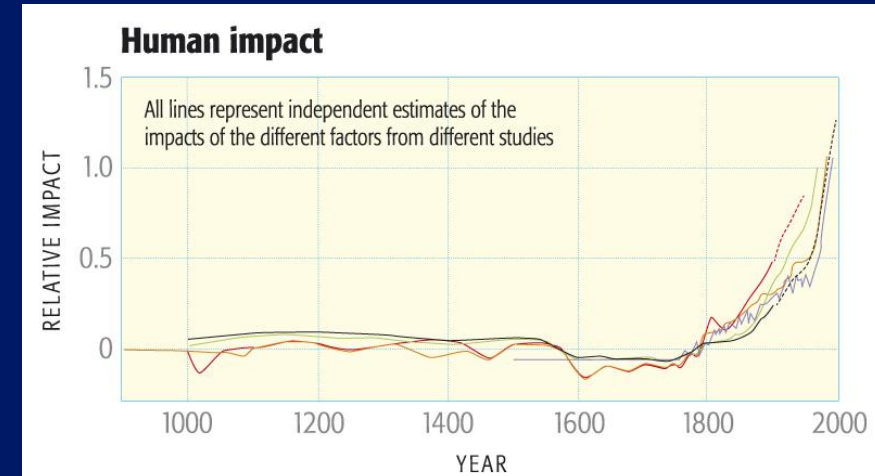
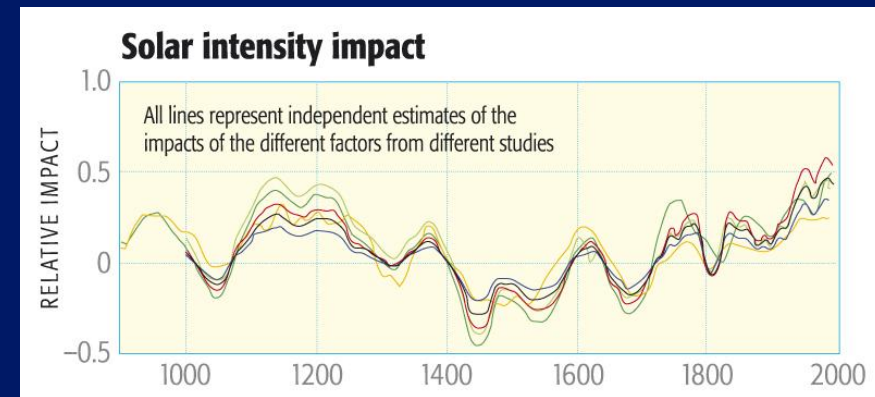
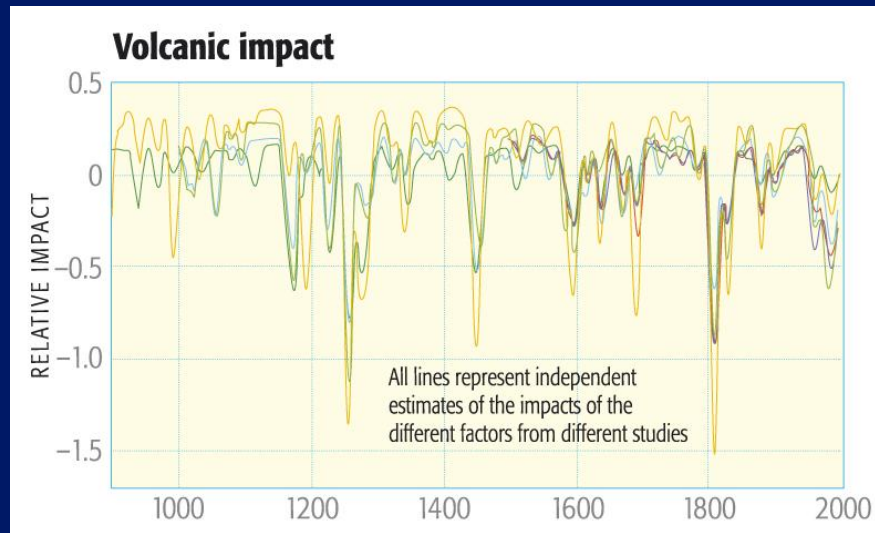


In addition to the “Natural - Archive – Paleo” Approach, **COMPUTER MODELS** have been created to estimate the radiative forcings of the PAST!

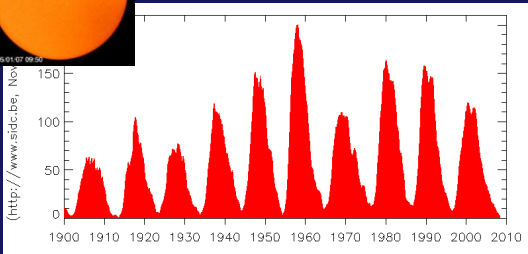
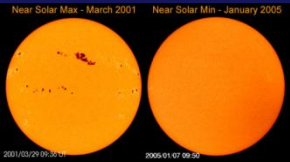
**Estimates Of
Natural & Human
Impacts On
Climate Over The
Past 1000 Years**

From
Dire Predictions
p 81

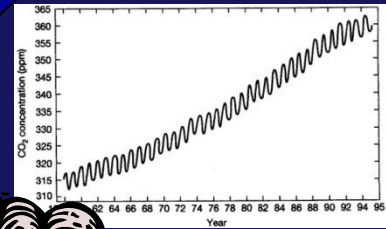
On top of p 92
in Class Notes



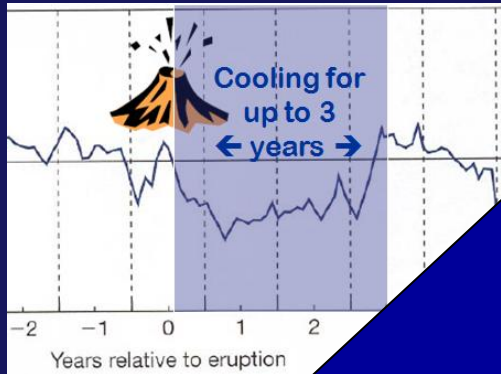
NATURAL FORCING



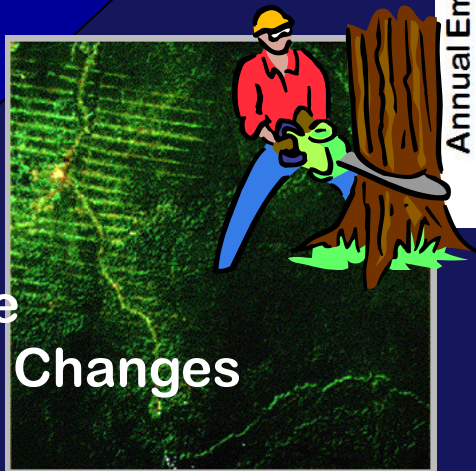
Solar output variations, sunspots



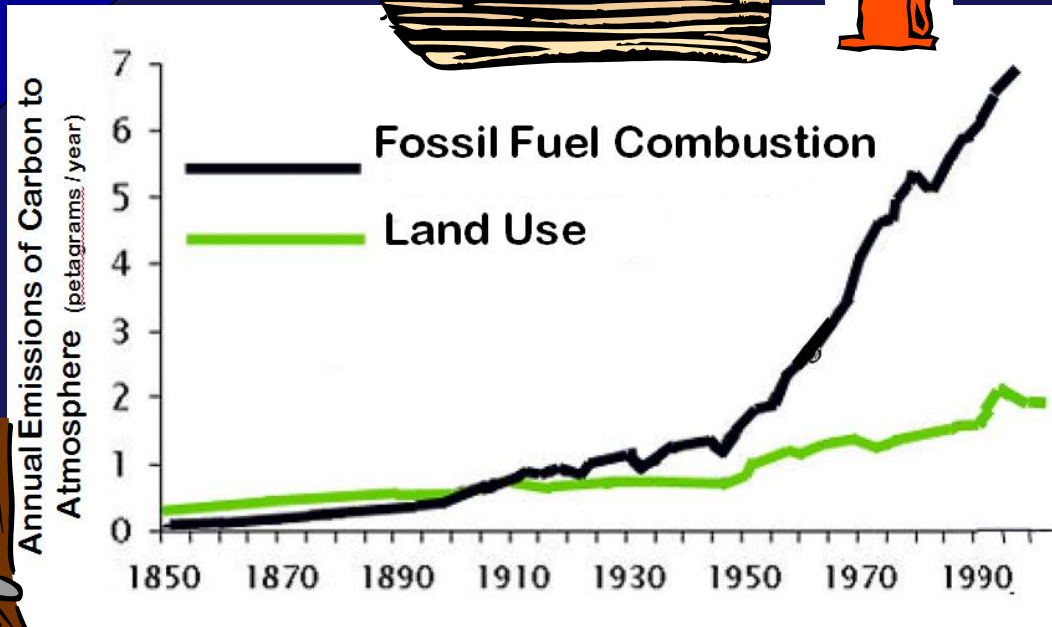
GHG's, soot, SO₂



Volcanic eruptions

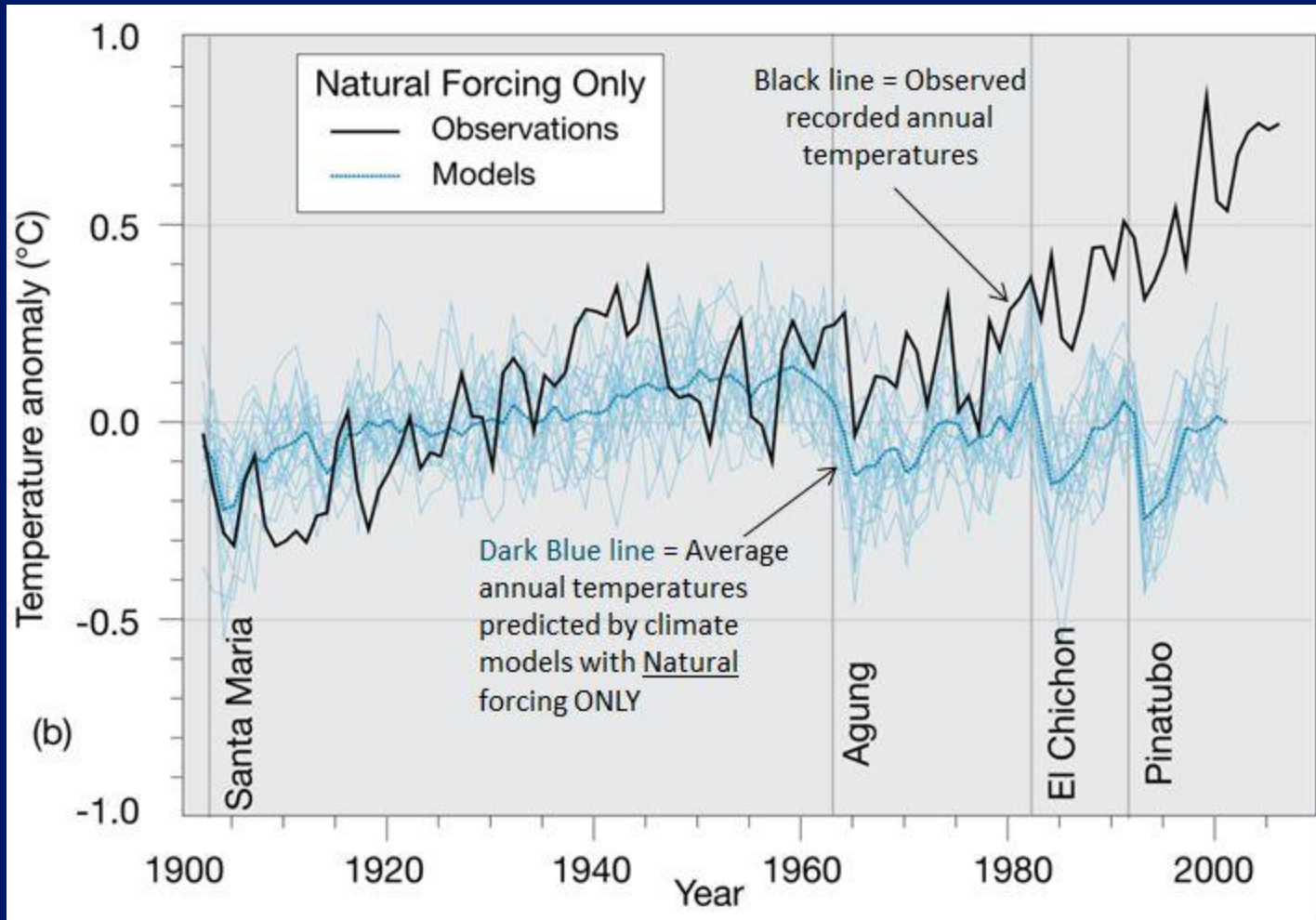
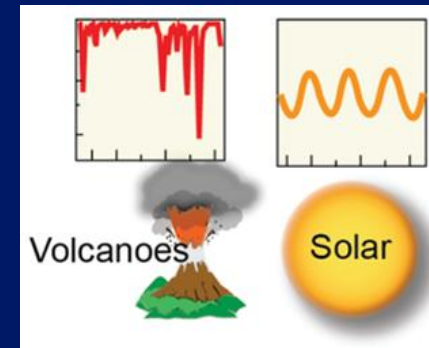


Surface Albedo Changes



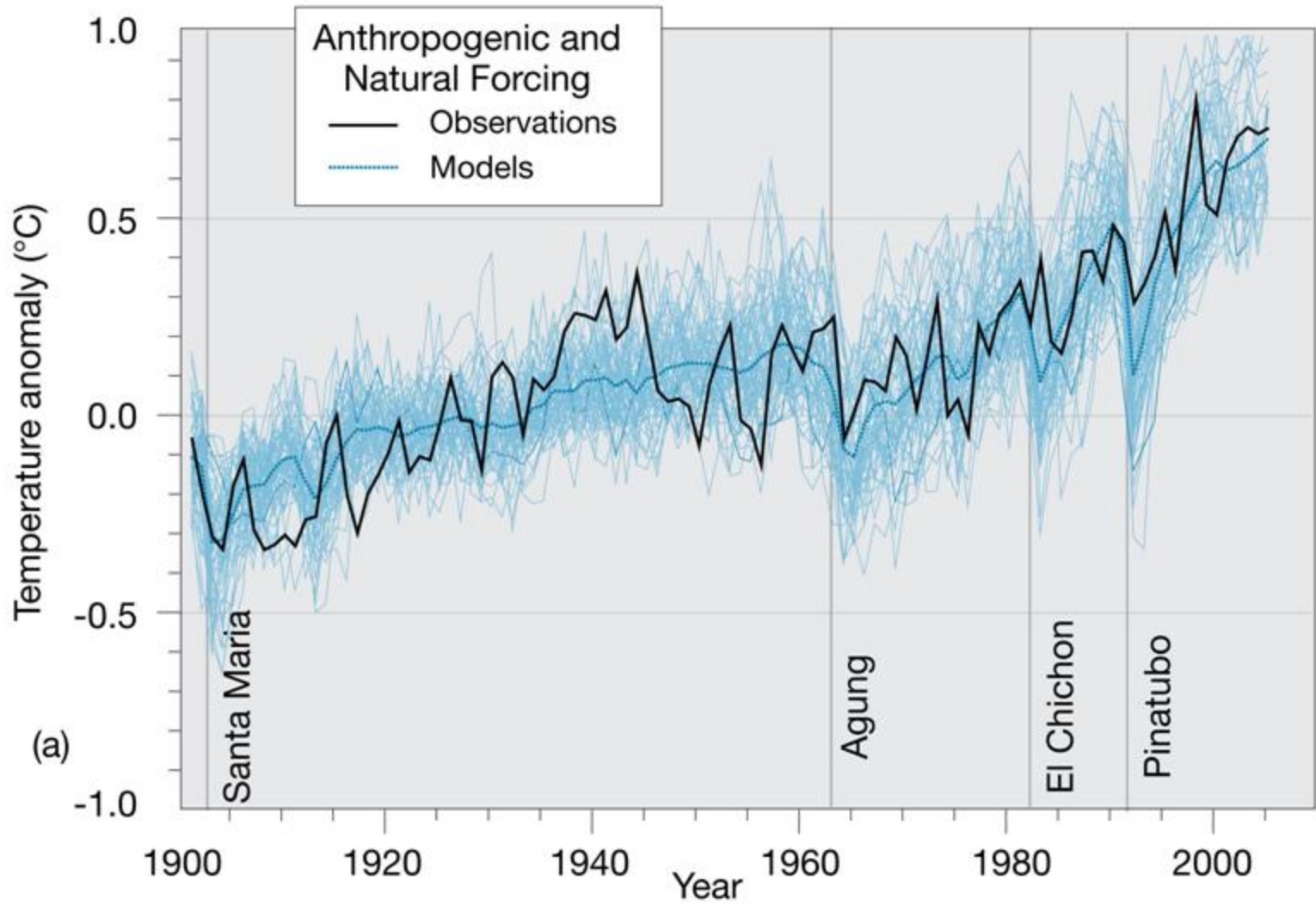
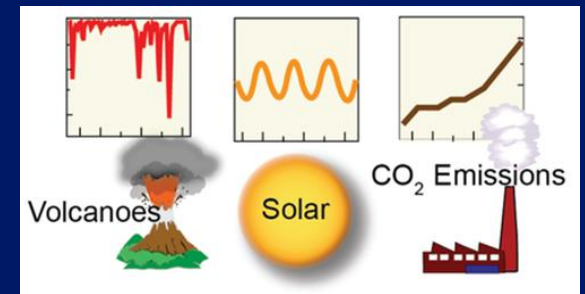
ANTHROPOGENIC FORCING

MODELED TEMPERATURE based on **NATURAL FORCING ONLY:**

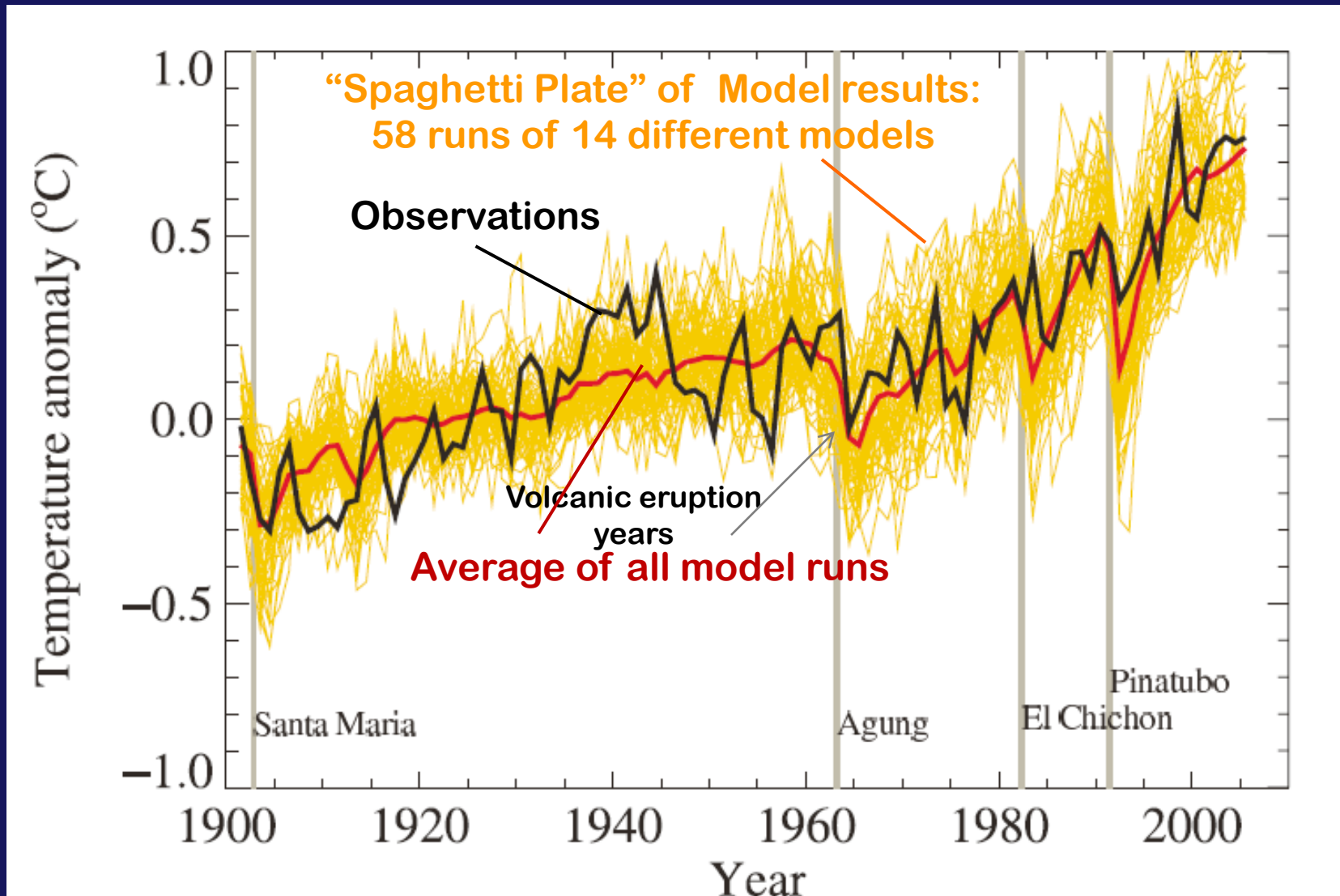


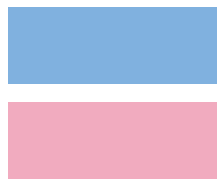
Models cannot reproduce the observed temperature trend since ~ 1980

MODELED TEMPERATURE based on **NATURAL +** **ANTHROPOGENIC FORCING**



MODELED TEMPERATURE based on NATURAL + ANTHROPOGENIC FORCING





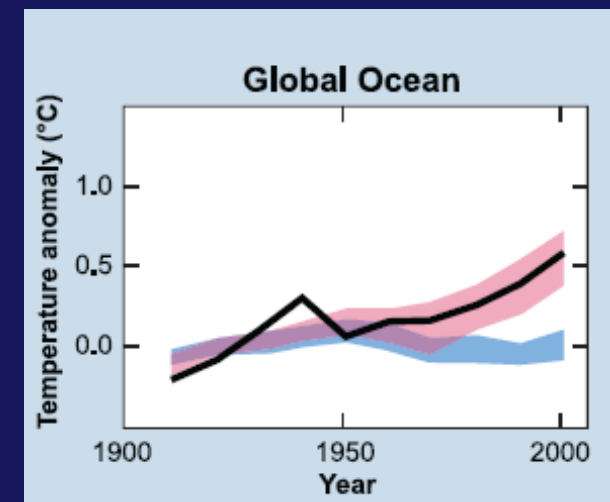
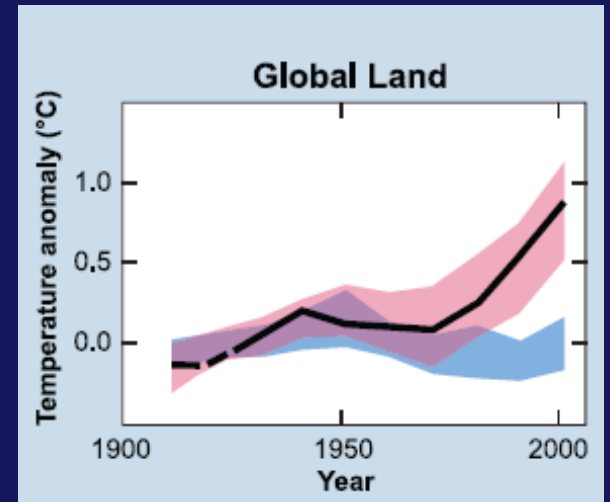
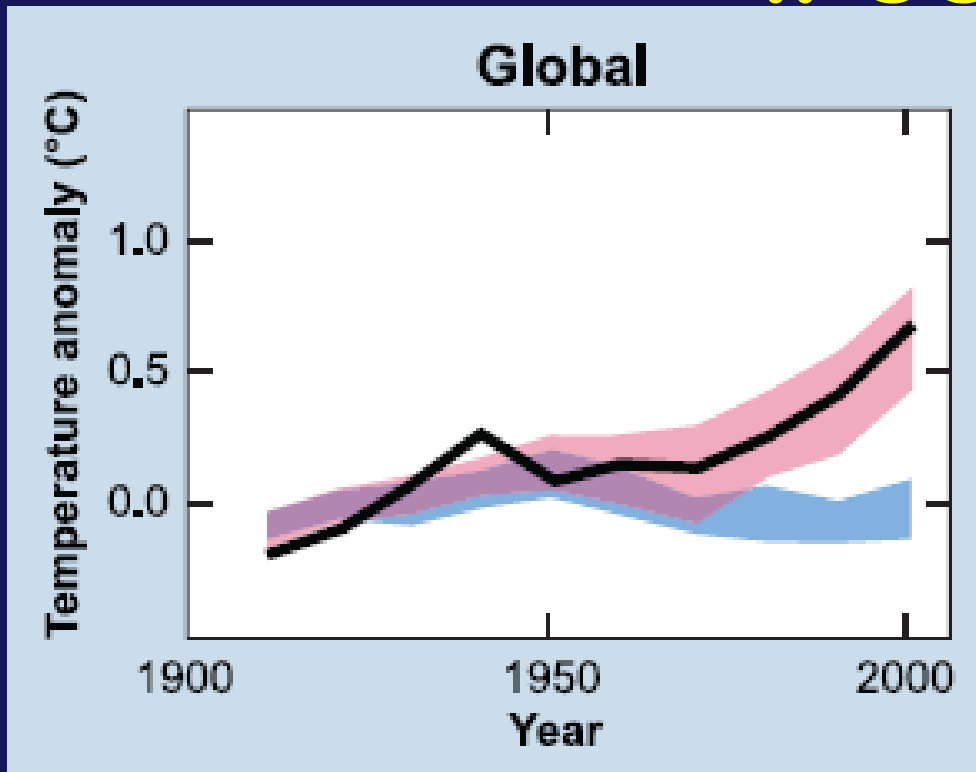
models using only natural forcings

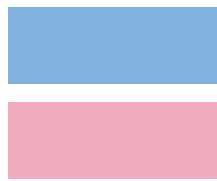
models using both natural and anthropogenic forcings



observations

**2007
IPCC**





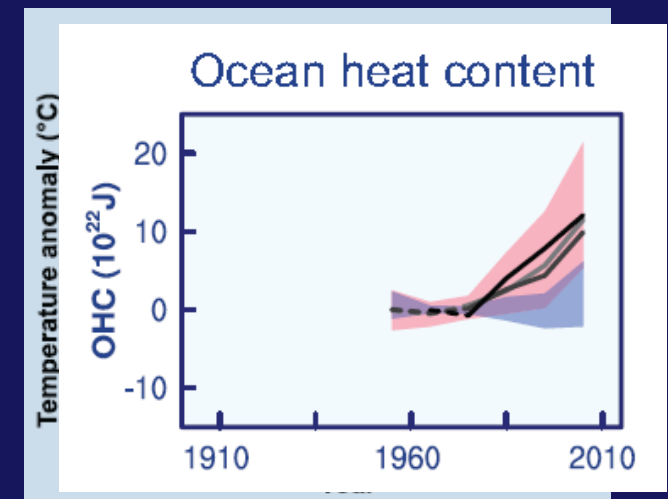
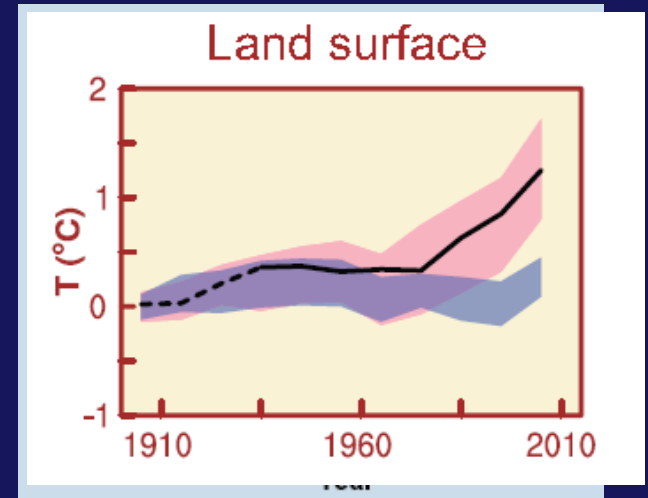
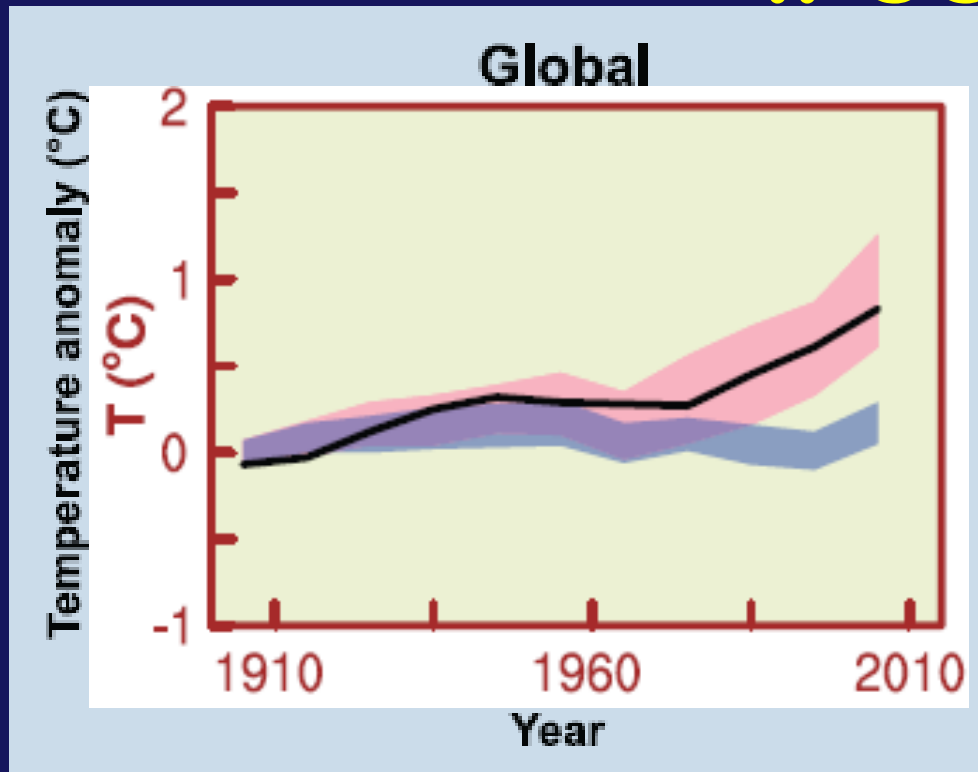
models using only natural forcings

models using both natural and anthropogenic forcings

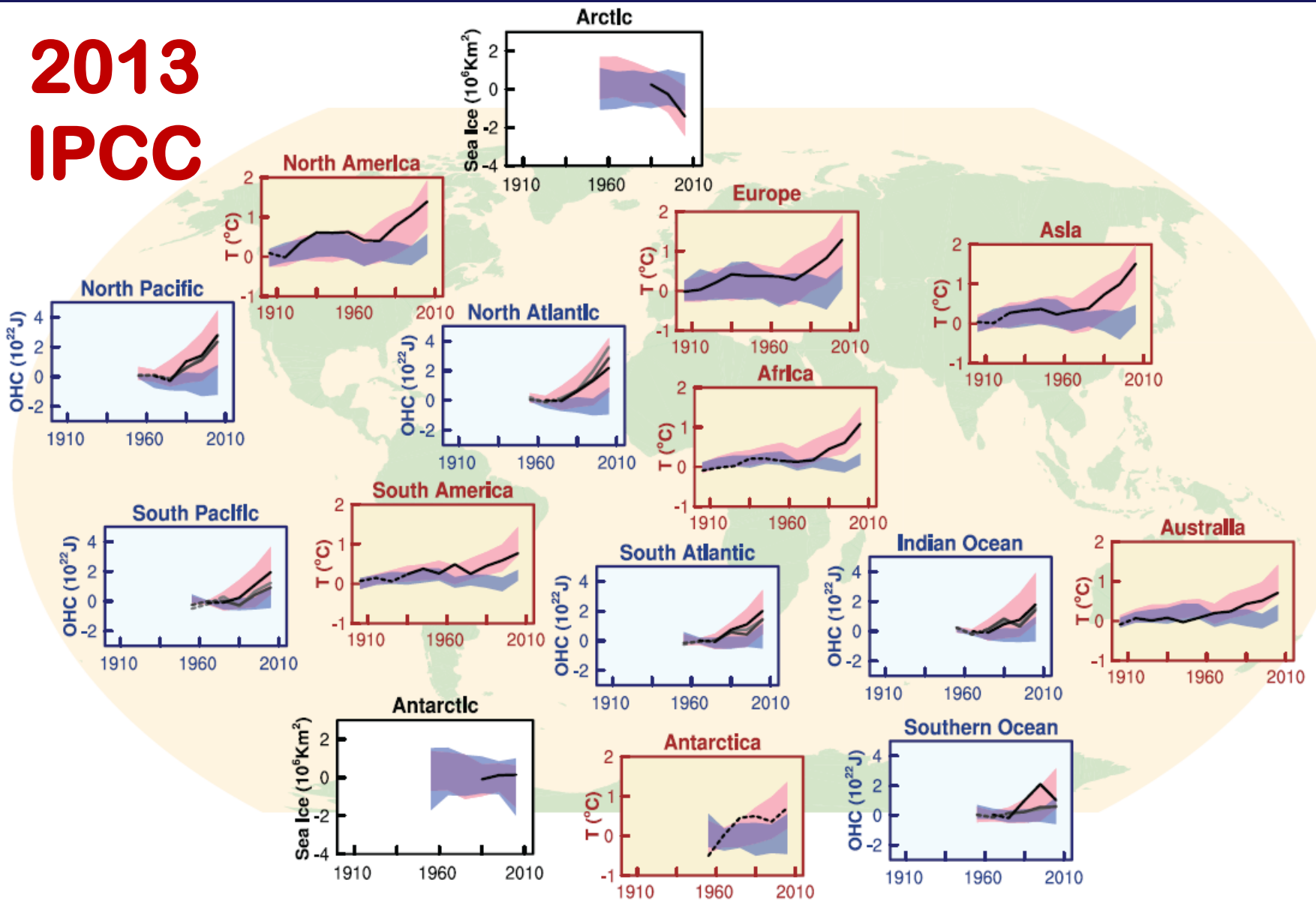


observations

2013
IPCC



2013 IPCC

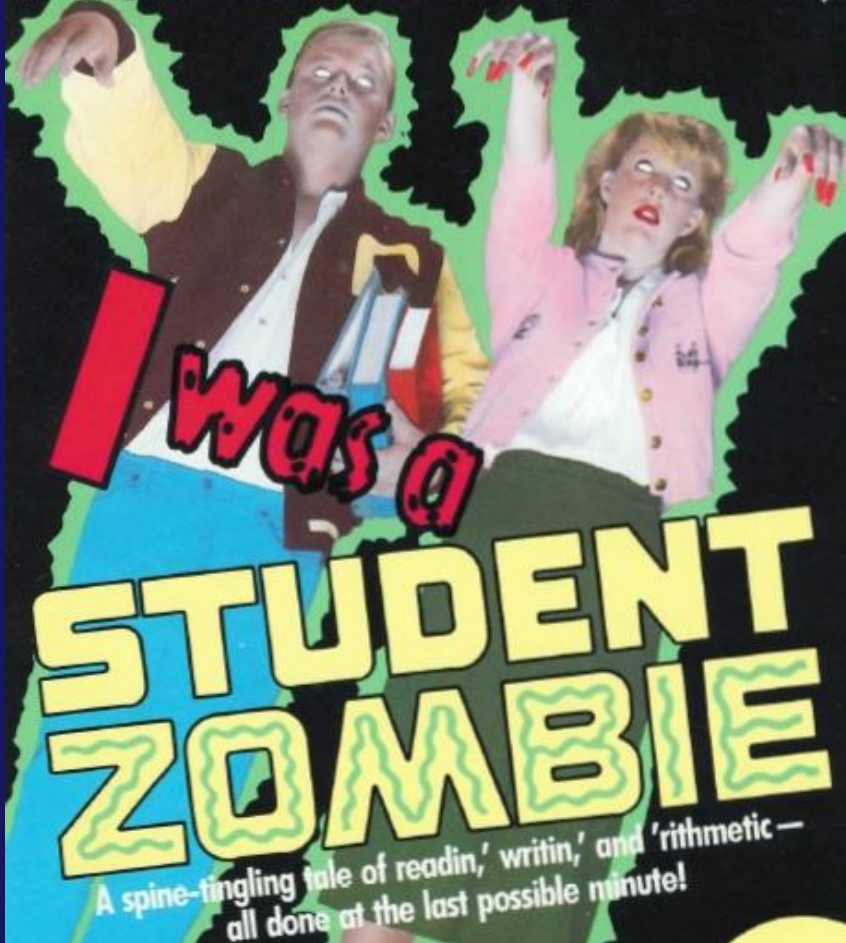


Observations

Models using only natural forcings

Models using both natural and anthropogenic forcings

It's happening right now...in YOUR town...
in YOUR school...in YOUR class...in YOUR BRAIN!



ZOMBIE
BREAK !

**MORE ON
SOLUTIONS!!!!**



**HAPPY
THANKSGIVING!**