

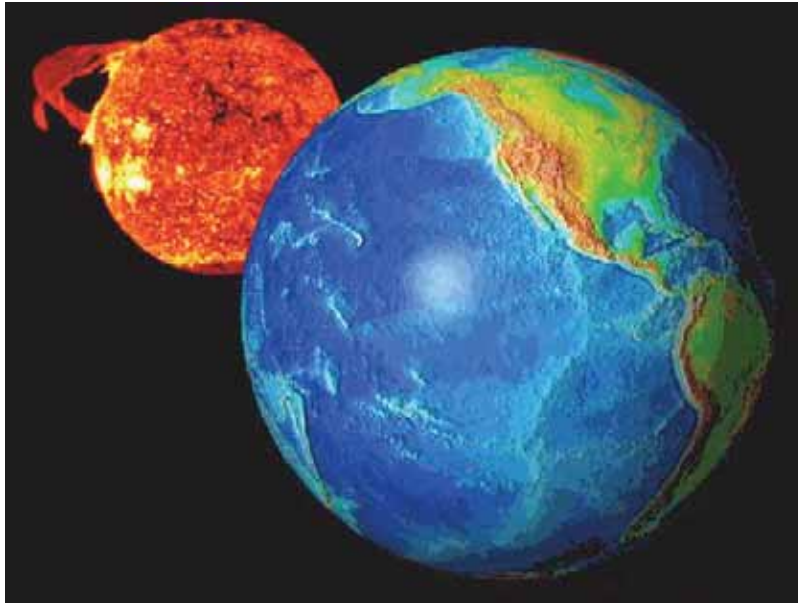
This isn't your parent's sea
level

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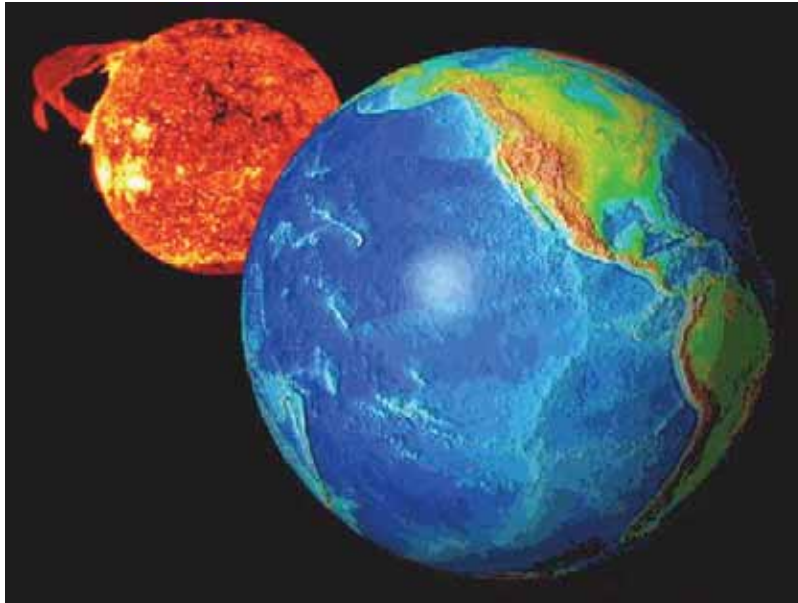
Simple Physics



Global climate depends on three factors

- How much energy we get from the sun: *more sun, warmer planet*
- How much of that energy is reflected back to space (aerosols, ice, etc).. *less reflection, warmer planet*
- Amount of greenhouse gases: *more greenhouse gases, warmer planet*

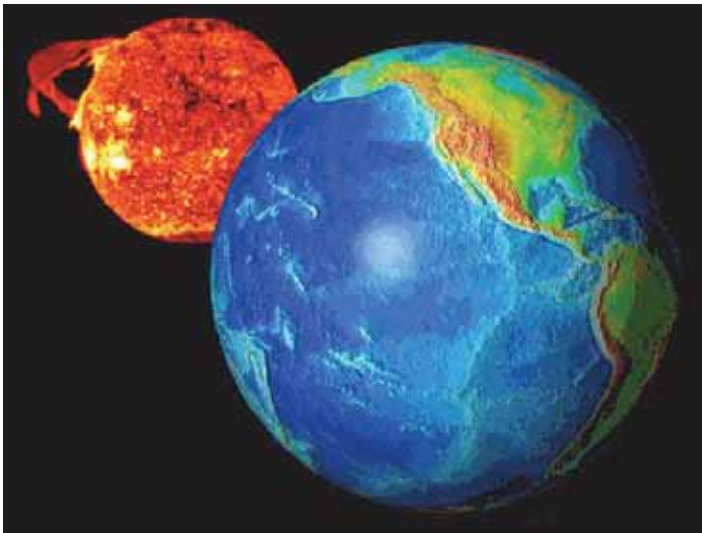
Why would they change?



Sun, Albedo, Greenhouse gases

- Sun: Sun itself, orbit of the Earth around the Sun
- Albedo: aerosols (e.g. volcanoes) and reflective surfaces (e.g. ice and snow)
- Amount of greenhouse gases: tectonics, **ocean circulation**, plants (biogeochemistry)

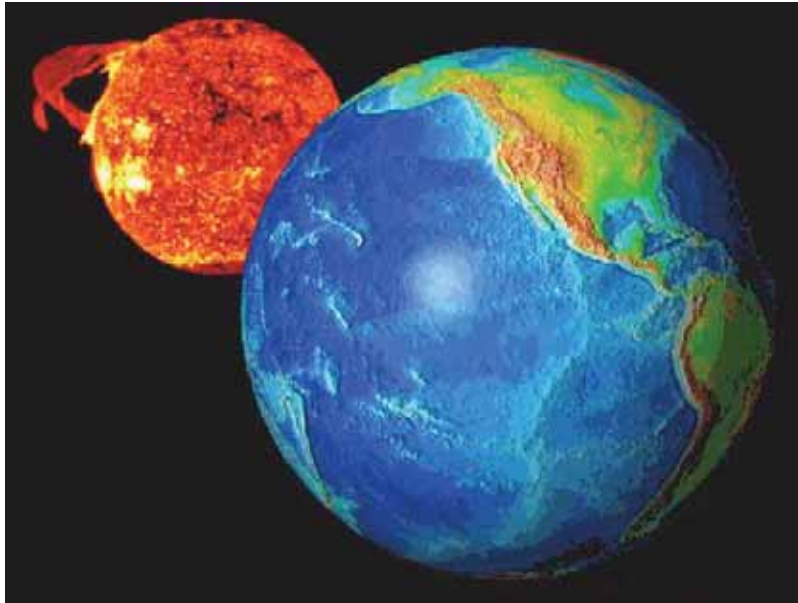
Feedbacks



Sun, Albedo, Greenhouse gases

- Changes in any of these can cause a climate change
- They feedback on each another (except feedbacks to the sun!)
 - Example: more sun, *warmer planet*, less ice, *warmer planet*

More simple physics

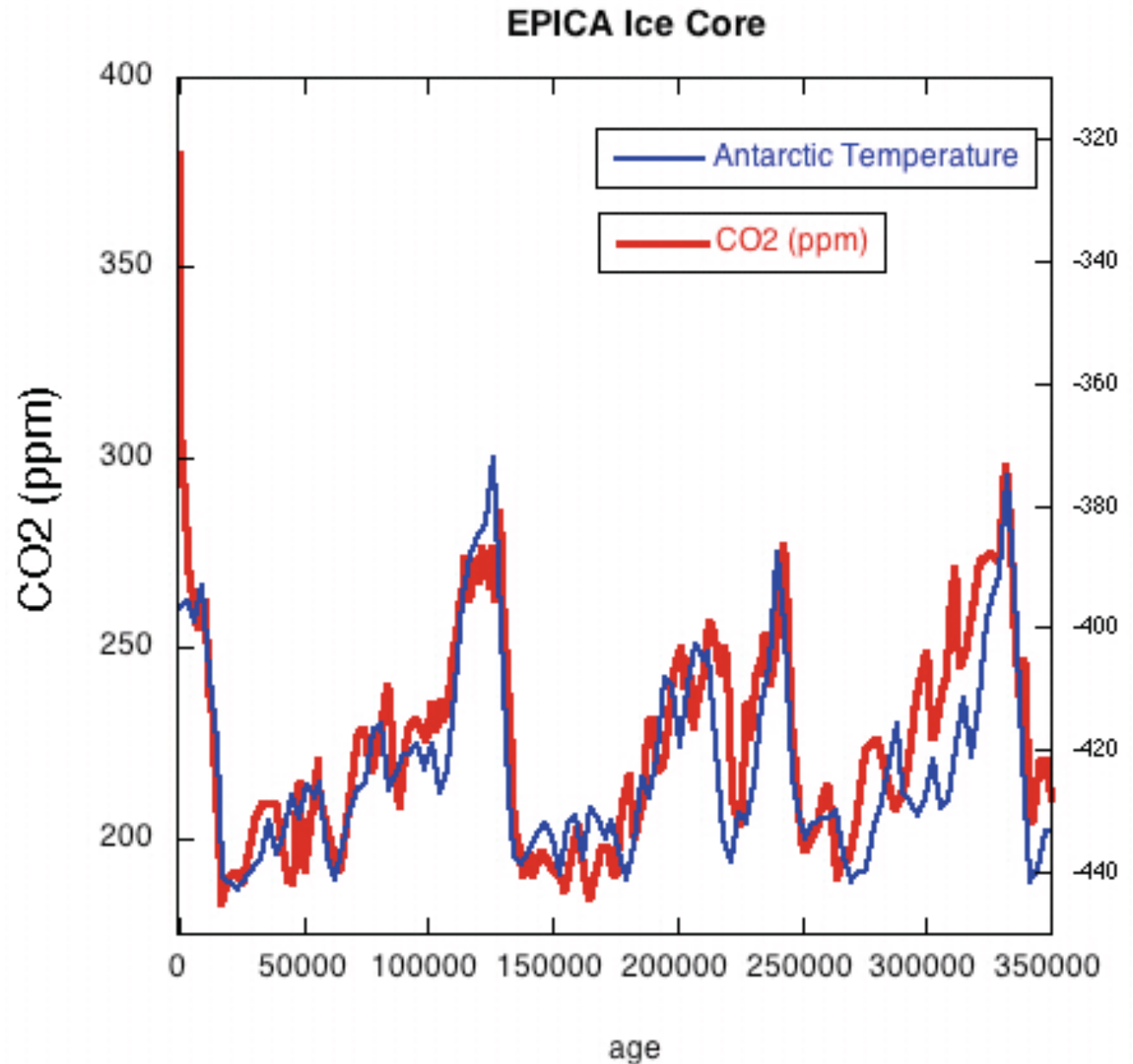


Greenhouse gases are a **natural and important** part of the Earth's energy budget

- Earth's temperature without greenhouse gases = -18°C
- Too cold for advanced life?
- **Earth's temperature with greenhouse gases = $+15^{\circ}\text{C}$**
- ...Cozy...
- Greenhouse gases raise the temperature of the Earth by about 33°C (about 60°F)... *and make the planet habitable*

What does the past tell us?

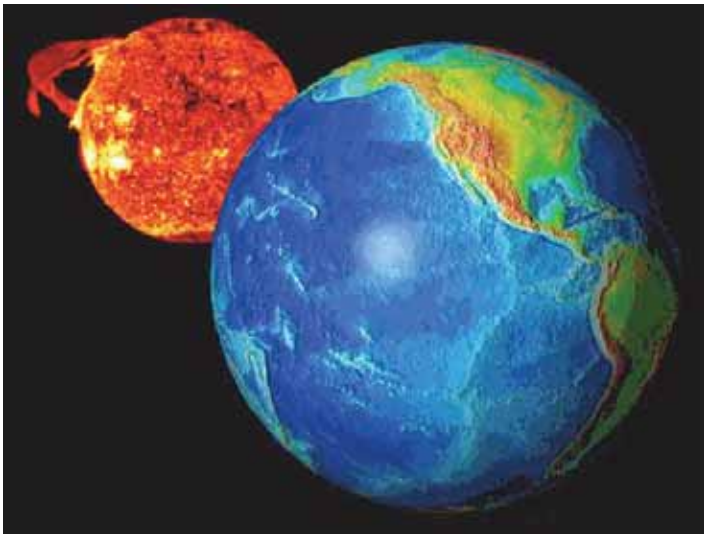
Greenhouse gas levels today are *way* out of line with the past million years



So humans are causing climate change.
Is this surprising? Not really...

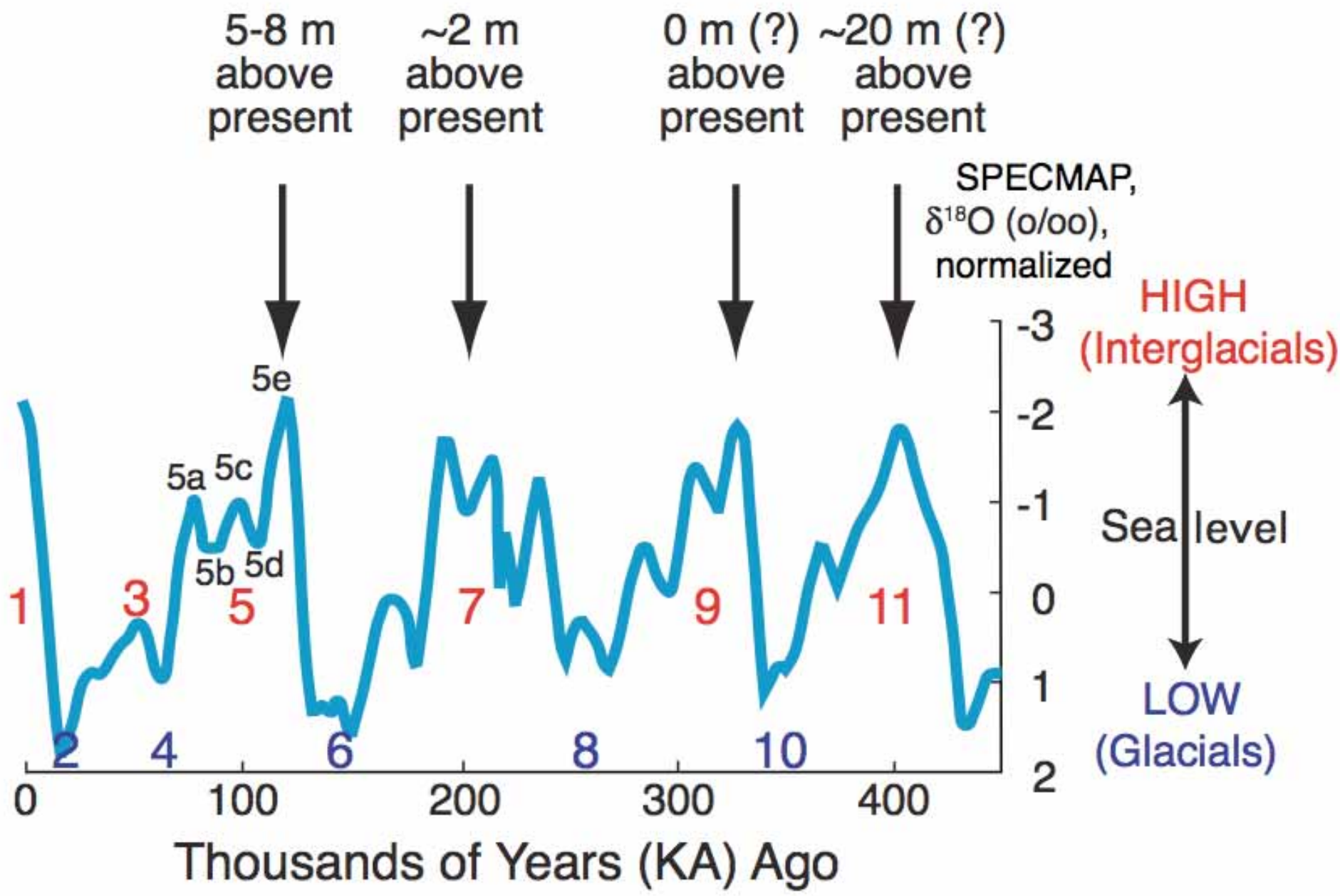


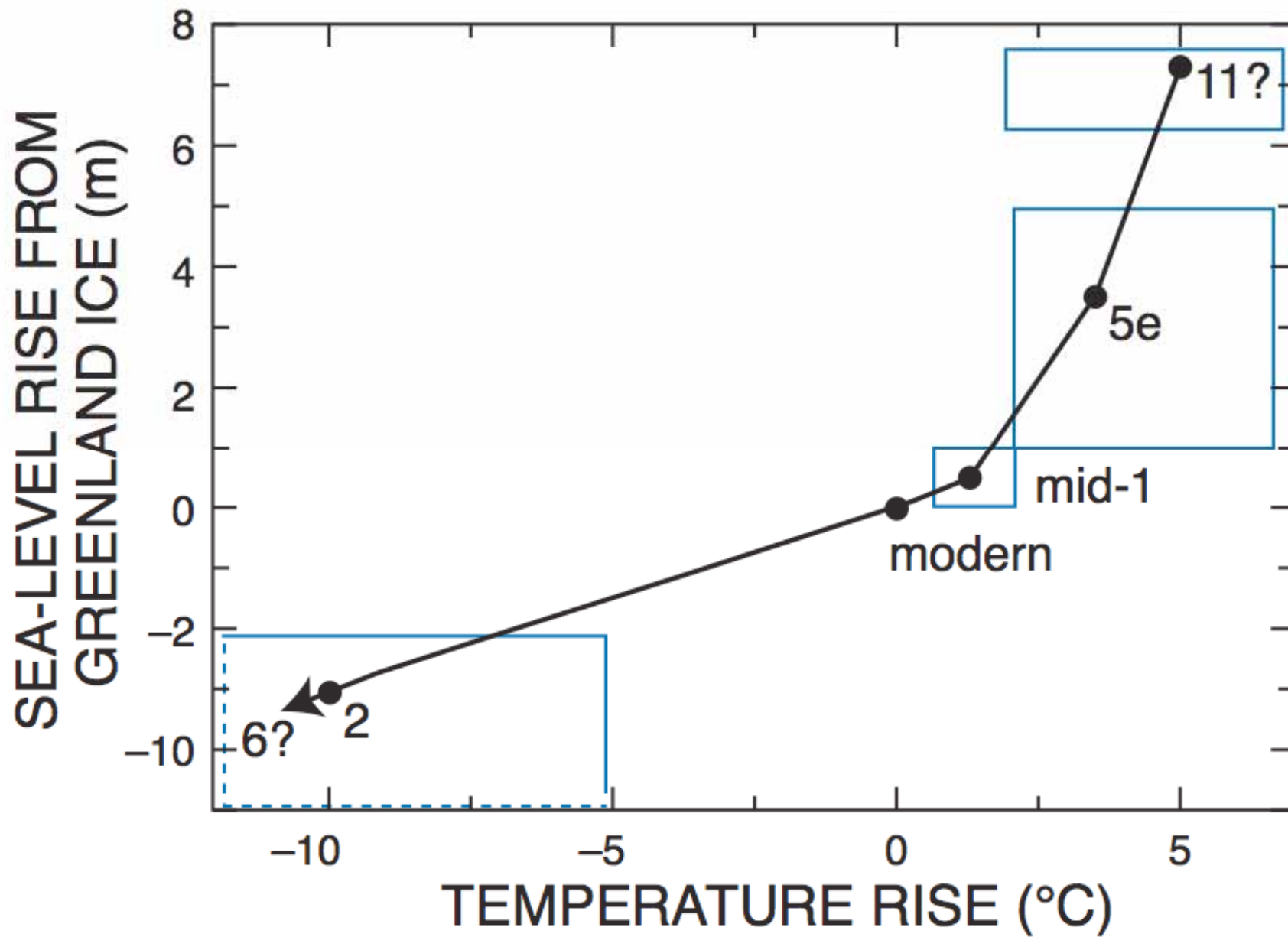
What else does the past tell us?



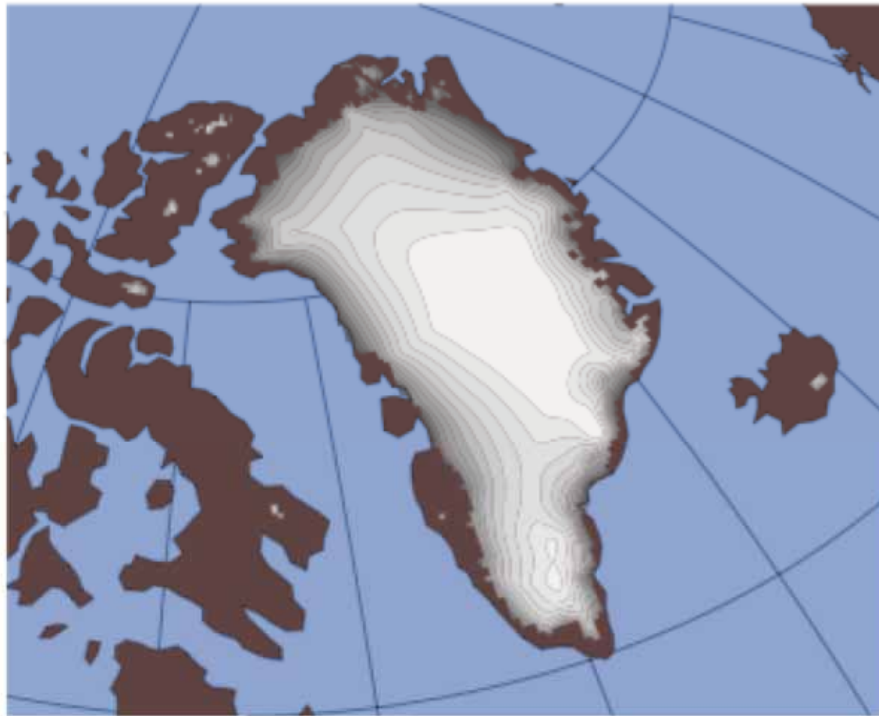
Even more simple physics

- When the Earth is warmer:
 - Less land ice (and sea ice as well)
 - Higher sea level
- And the opposite when its cooler

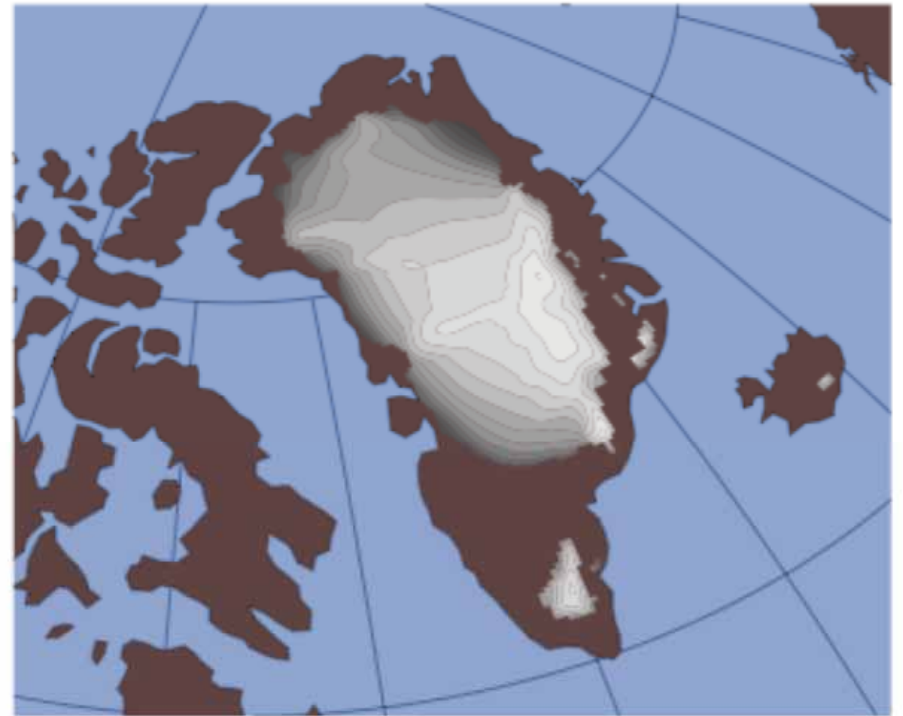




Present



Last Interglaciation



300 700 1100 1500 1900 2300 2700

Ice Sheet Topography (meters)

Welcome to the front lines

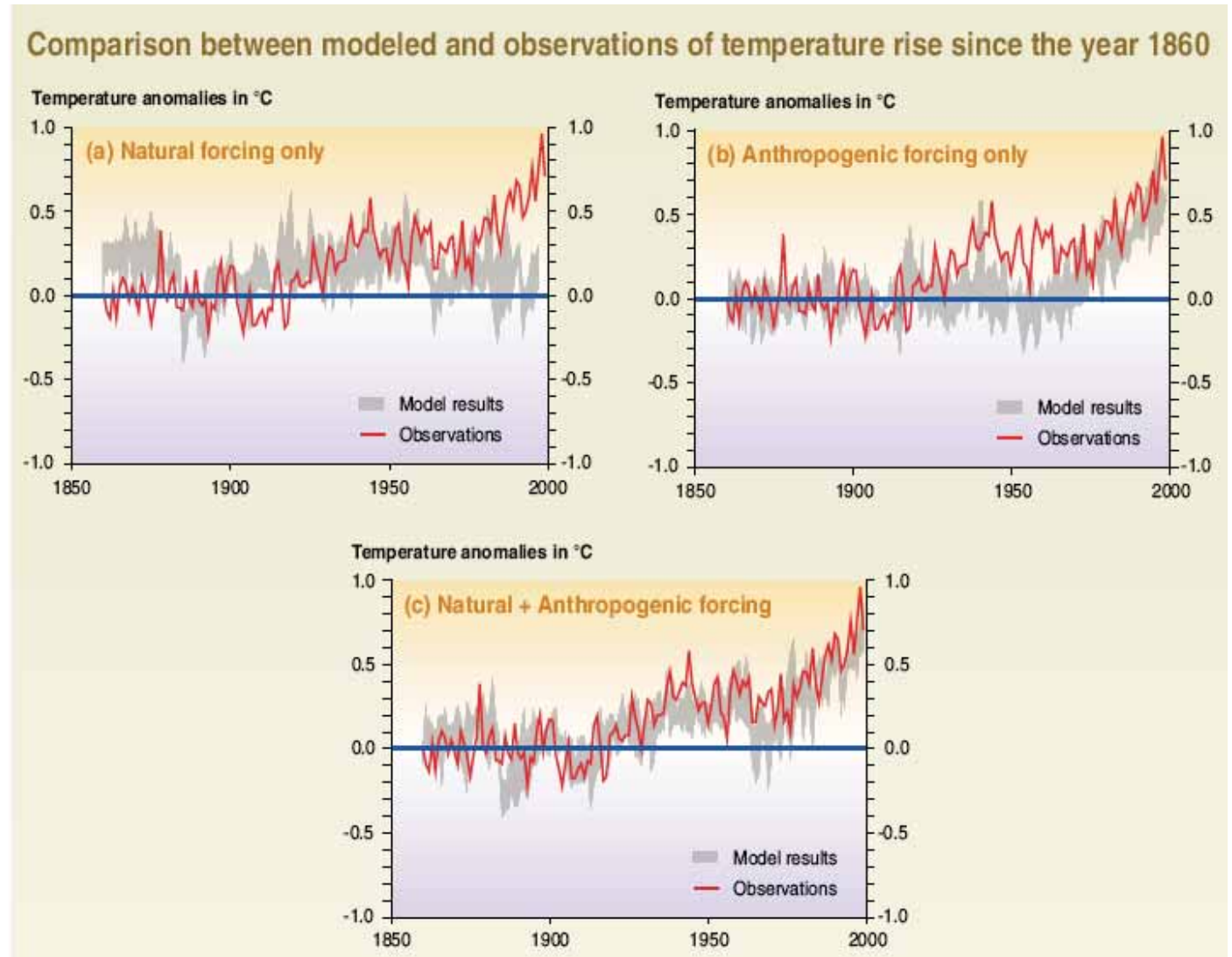
- Climate is changing, sea level is rising. This we know with certainty. How high and how fast is where the debate is today, but ultimately, it will be meters higher if we stay on the path we are currently following.
- It is your city and community that is being sacrificed (“Forward he cried ... from the rear...”)
- Knowledge is everything
- You can weigh your options and choose

Responsibility

- Others have fewer choices
 - Those who are too poor to move
 - Those who will inherit our decisions
 - Species going extinct because of our actions
- We know right, and wrong. We are the one species who does.

Predicting global climate

Models,
simple and
complex,
agree...
with our three
inputs, we
can account
for
temperature
changes of
the past 100
years



Is it surprising that humans are causing climate change?

- **Not really**...simply put, we're the biggest cause of change on the planet.
- We have altered the Earth's energy balance *and changed climate*
- We cause 10 times more erosion *than all natural processes*
- We make more fertilizer *than all bacteria on the land*
- We make more sulfate *than all ocean phytoplankton*

What to do?

- Let your representatives know how you feel!
- Call and email those who make decisions *on your behalf* and let them know how you feel