

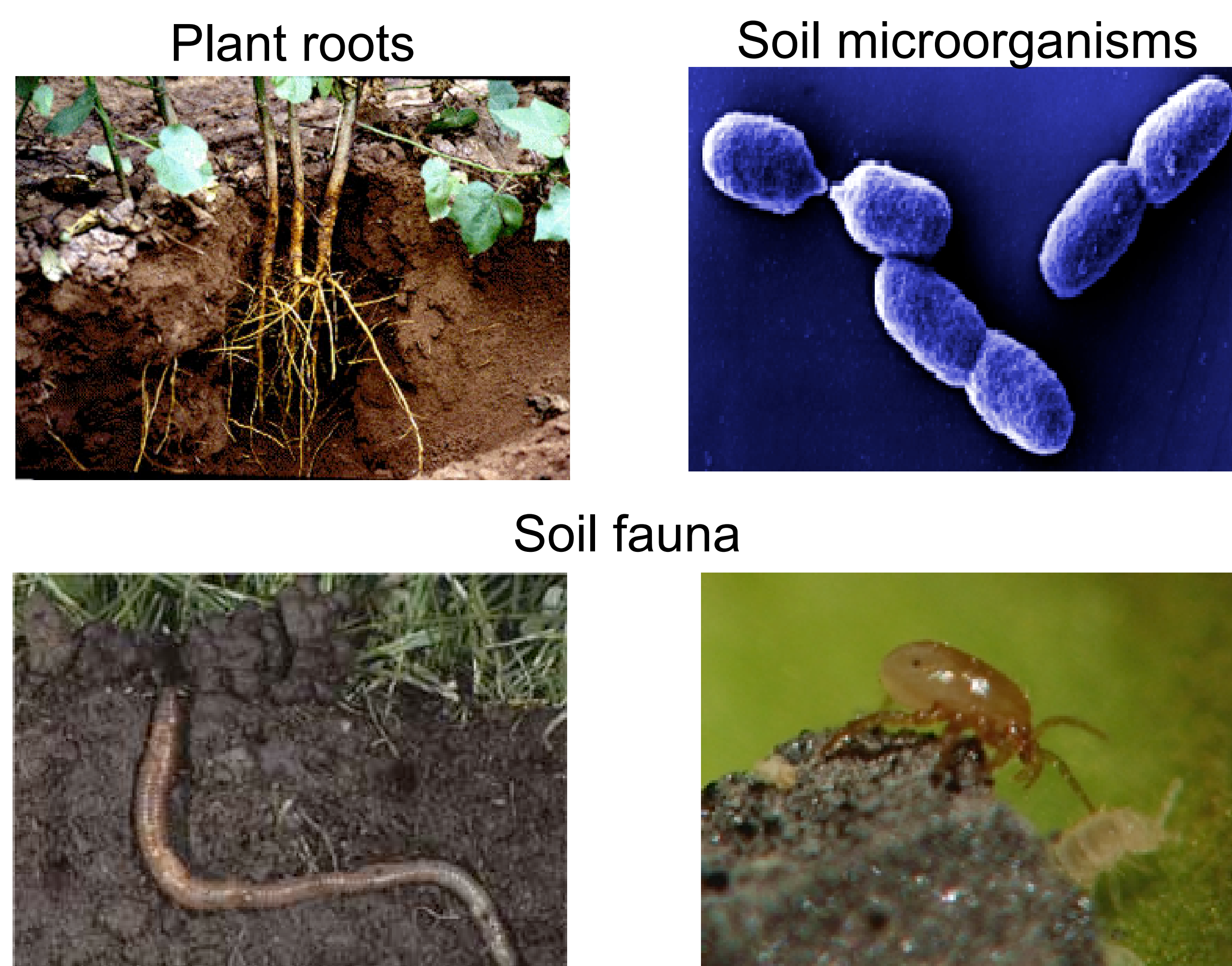
# Will Warmer Soils Accelerate Climate Change?

Emissions of carbon dioxide (CO<sub>2</sub>) and other heat-trapping gases to the atmosphere will raise Earth's surface temperature during this century. On land, warming can itself accelerate climate change. One of the most important accelerators, or "positive feedbacks" to climate change, can be expected from soils. Warming could accelerate the breakdown of a large quantity of carbon in soils, releasing more CO<sub>2</sub>. On a global scale, even a small increase in CO<sub>2</sub> emission from soils will accelerate climate change. Other responses to warming, such as increases in plant growth, may help to compensate for this effect.

## Soil Breathes!

**Soil respiration** is the release of carbon dioxide when plant roots, microorganisms and soil fauna "exhale." Usually, most of the CO<sub>2</sub> released from the soil comes from microorganisms that consume and decompose dead plant and animal remains. Soil respiration happens fastest in warm, wet, and fertile places. For this reason, warmer soils will speed up respiration, sending more CO<sub>2</sub> into the atmosphere.

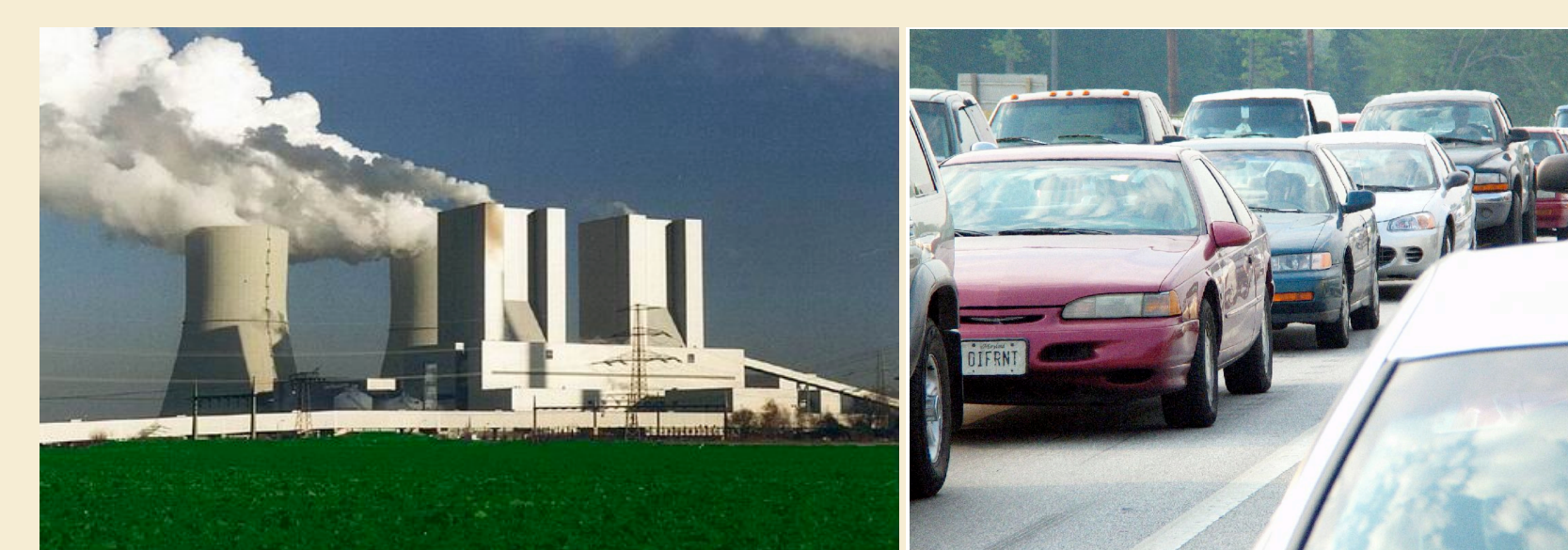
## Sources of soil respiration



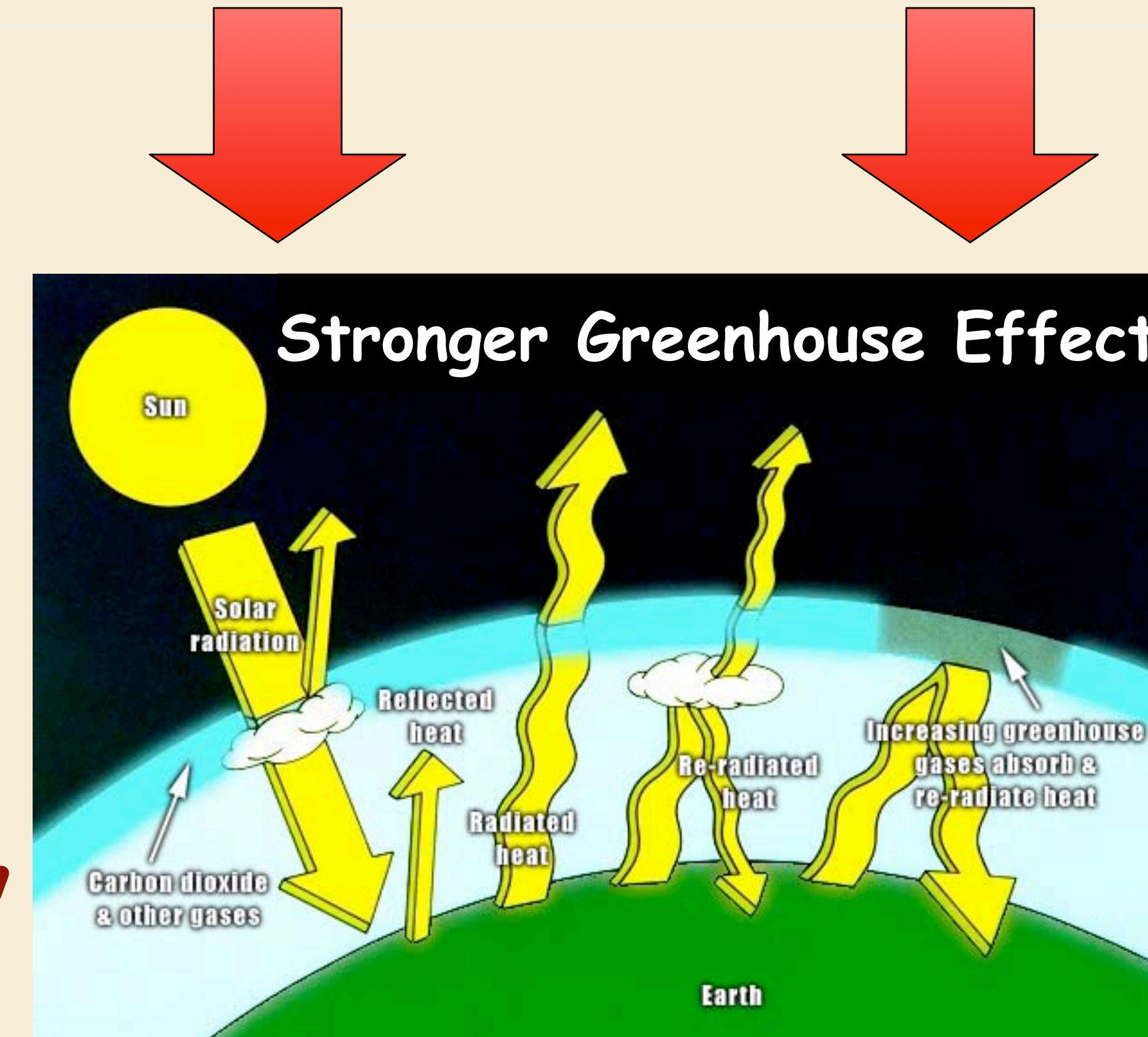
## Global warming & soil respiration: the positive feedback loop

1. Fossil fuels are burned, releasing carbon dioxide (CO<sub>2</sub>)
2. The CO<sub>2</sub> redirects outgoing radiation back to earth, warming the surface
3. Higher temperatures accelerate the decomposition of organic matter
4. Decomposition releases more CO<sub>2</sub>, further enhancing the greenhouse effect

And the cycle continues...

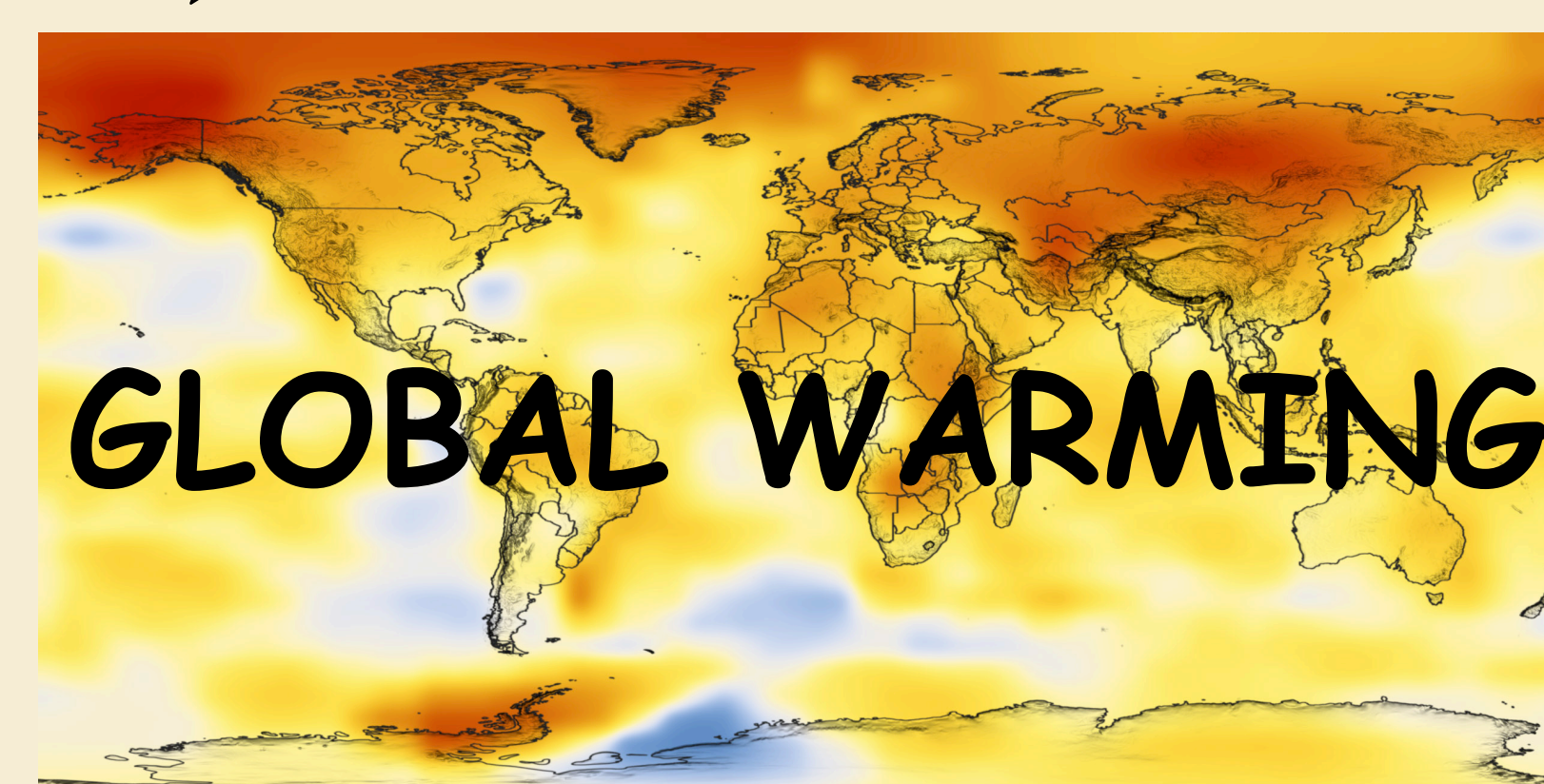


### 1. Fossil fuel burning



2. More heat trapped in atmosphere

4. More CO<sub>2</sub> released



3. Warmer soils

## Decomposition releases CO<sub>2</sub> into the air



Decomposition of fallen leaves

## How will climate change affect soil respiration?

- ❖ Temperature is one of the most important factors affecting organic matter decomposition.
- ❖ Soil organic matter consists of a variety of different materials that differ in their degree of decomposability.
- ❖ Some of the materials are easily decomposable, but other complex substances such as lignin (a major component of plant wood) are very resistant to decomposition.
- ❖ Warmer temperatures are likely to speed up decomposition of the more resistant types of soil organic matter, returning carbon dioxide from the soil to the atmosphere.

## Take-home message

As the climate warms, decomposition will speed up, and soils will release carbon dioxide to the atmosphere. This process will further accelerate climate change. Increased plant growth could help to offset this effect.