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The Global Carbon Cycle and its role in climate change



View website

Why study the carbon cycle?

Carbon is everywhere: in the oceans, in rocks and soils, in all forms of life, and in our atmosphere^{1,2,3,4}. Carbon in our atmosphere, mainly in form of carbon dioxide^{1,4,5}, acts as a greenhouse gas^{1,3,4} and is one of the main drivers of human induced **global climate change**^{2,3,4}. It is the contributing factor that we, as humans, arguably influence the most and have the most control over. But where does carbon come from and where does it go? Carbon on our earth goes through a cycle - the so-called **global carbon cycle**^{1,2,3,4}. This cycle is relatively stable and helps regulate the earth's temperatures^{1,3,6}, like a thermostat. It contains several carbon **pools** which are connected via carbon **fluxes**^{1,3,4}. The output from one pool is the input into another³. The global carbon cycle can be split into two domains: a **fast organic**^{1,2,3,4,5} and a **slow inorganic**^{1,2,3,4,6}.

The organic carbon cycle

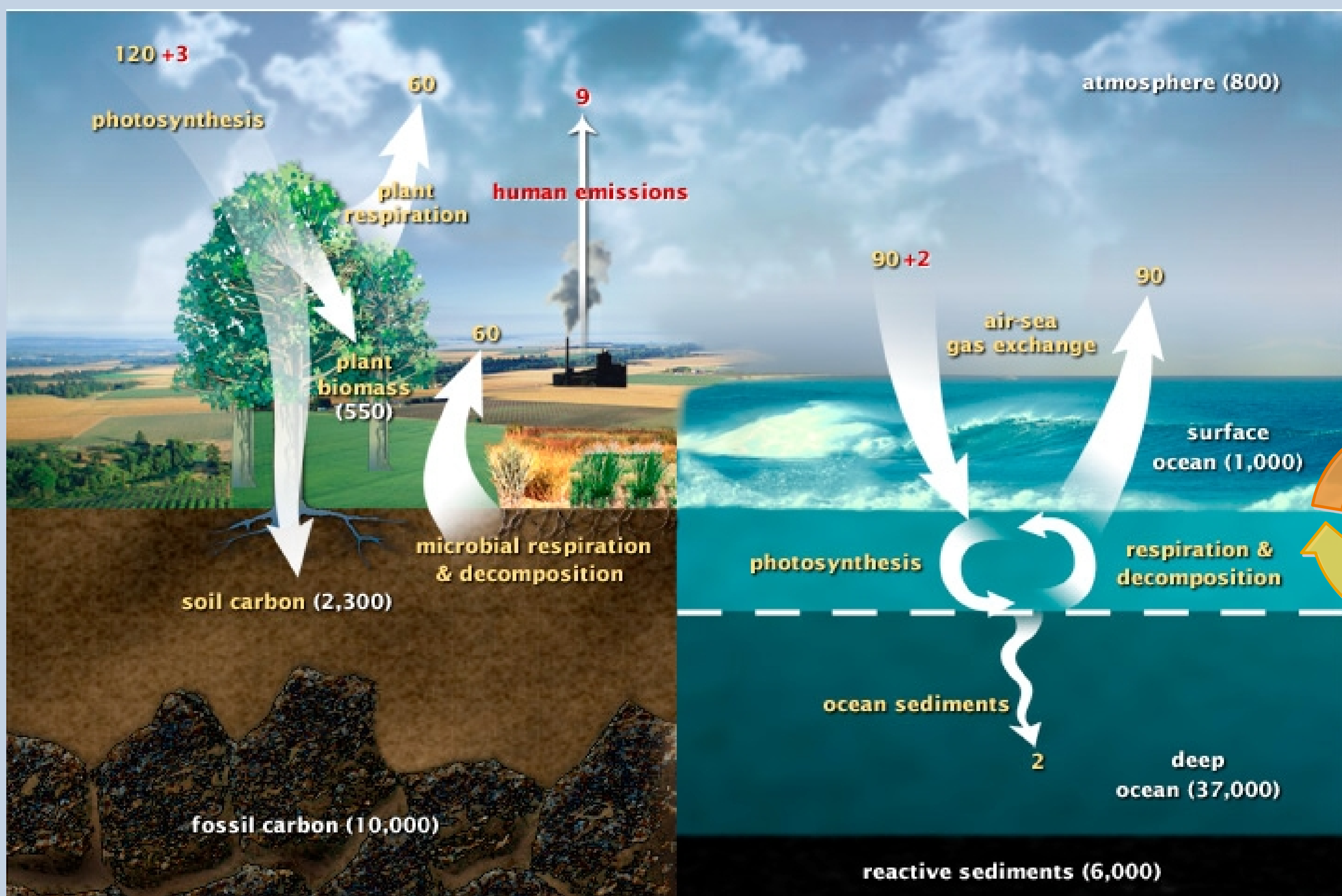


Fig. 1: The organic carbon cycle³. The pool sizes are given in gigatons (1×10^{15} g) and the fluxes (arrows) in gigatons per year.

- the cycle acts on a max. of approximately 100 years³
- **pools**: atmosphere, biota, sediments, ocean^{1,3,4}
- **fluxes**: photosynthesis, respiration, decomposition^{1,3,4,5}

The inorganic carbon cycle

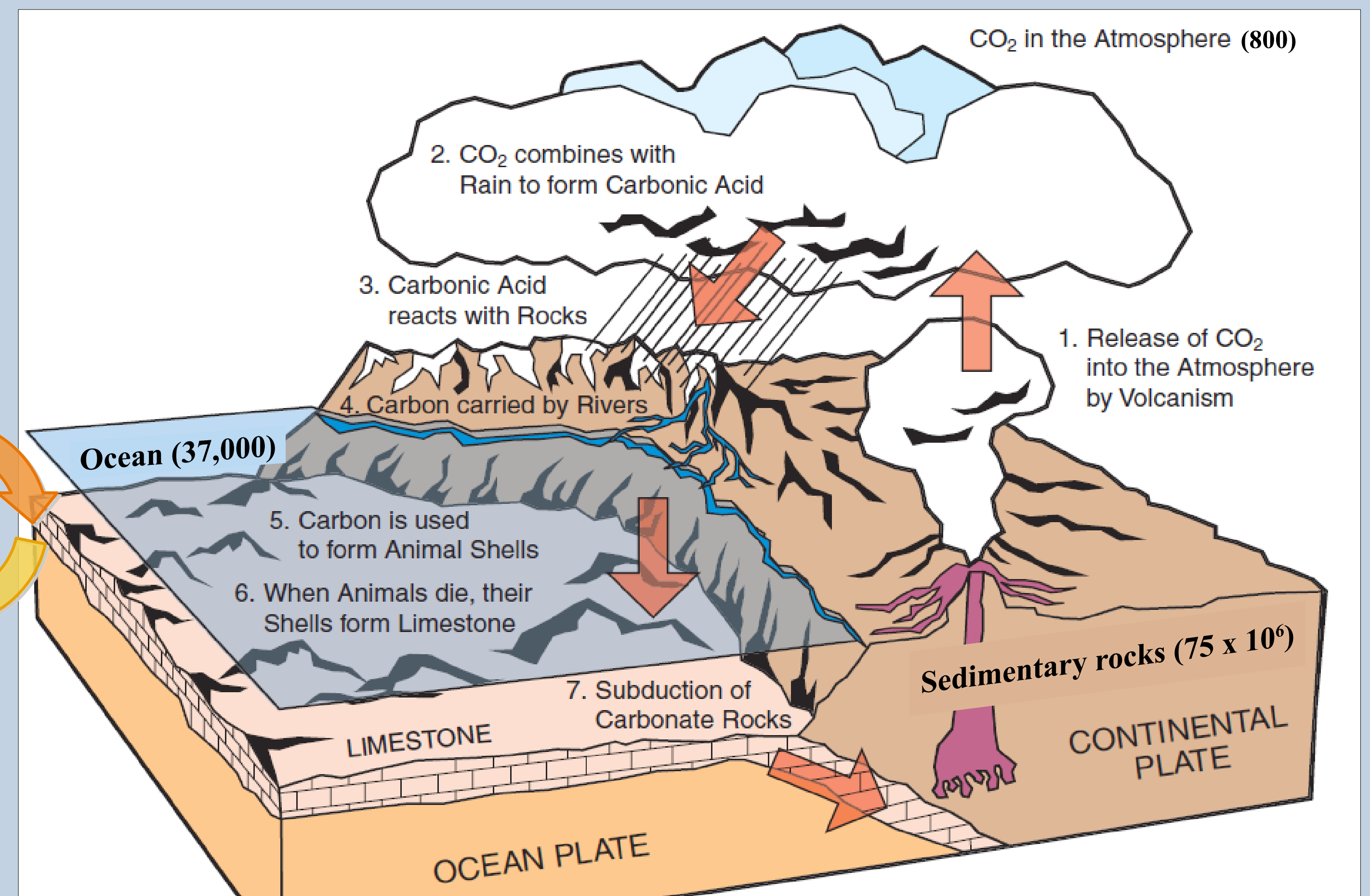


Fig. 2: The inorganic carbon cycle (modified)⁷. The pool sizes are given in gigatons (1×10^{15} g).

- the cycle acts on up to millions or hundreds of millions of years³
- **pools**: atmosphere, ocean, sediments/rocks^{1,3,4}
- **fluxes**: weathering, sedimentation, volcanism^{1,3,4,6}

Human influences on the carbon cycle

Humans alter the fluxes of the global carbon cycle mainly by **burning fossil fuels** and changing the way **land is used**^{1,3,4}. By doing so carbon that was sealed in the ground is released. This released carbon moves through the carbon cycle, thus affecting several different carbon pools on earth. This redistribution of carbon can have several effects on our planet^{1,3}.



Fig. 3: Human influences on the carbon cycle: (A) traffic⁸, (B) factories⁹, (C) clear cut forests¹⁰, and (D) agriculture¹¹.

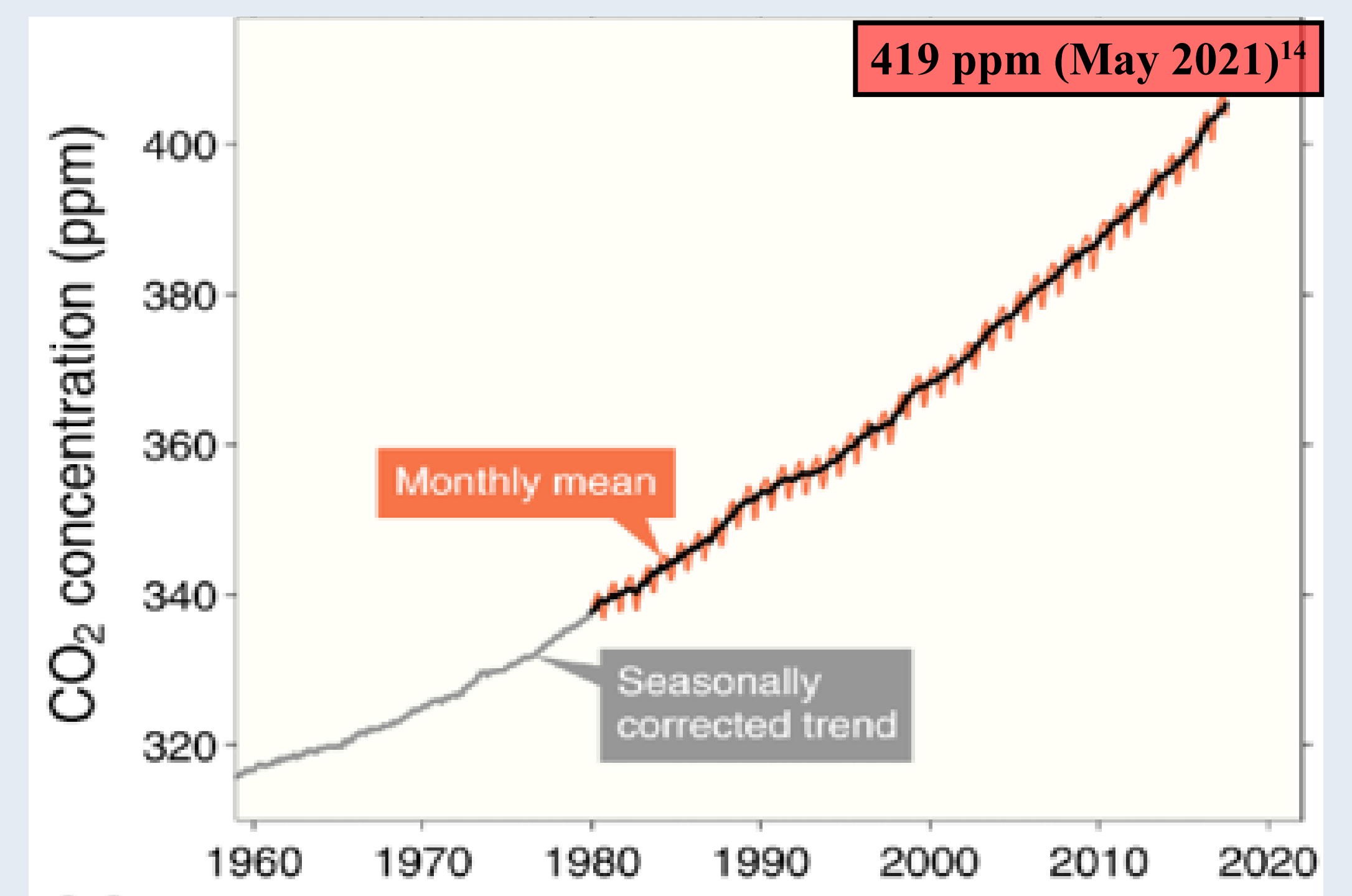


Fig. 4: Atmospheric carbon dioxide (ppm) over time^{12,13} (modified).

Conclusion

Every form of life is built from carbon^{1,2,3}. Our food is made of carbon³, our energy depends on carbon², and carbon is the basis for us as human beings^{1,2,3}. We use carbon and emit it every single day, increasing our impact on the carbon cycle, but this has now led us to a serious challenge: global climate change^{2,3,4}.

We have to ask: How will the global carbon cycle be affected and how will it change? What effects will the changes have to our life on earth? And most importantly we have to ask ourselves: **What can we do to limit the carbon emissions and how can we contribute?**

