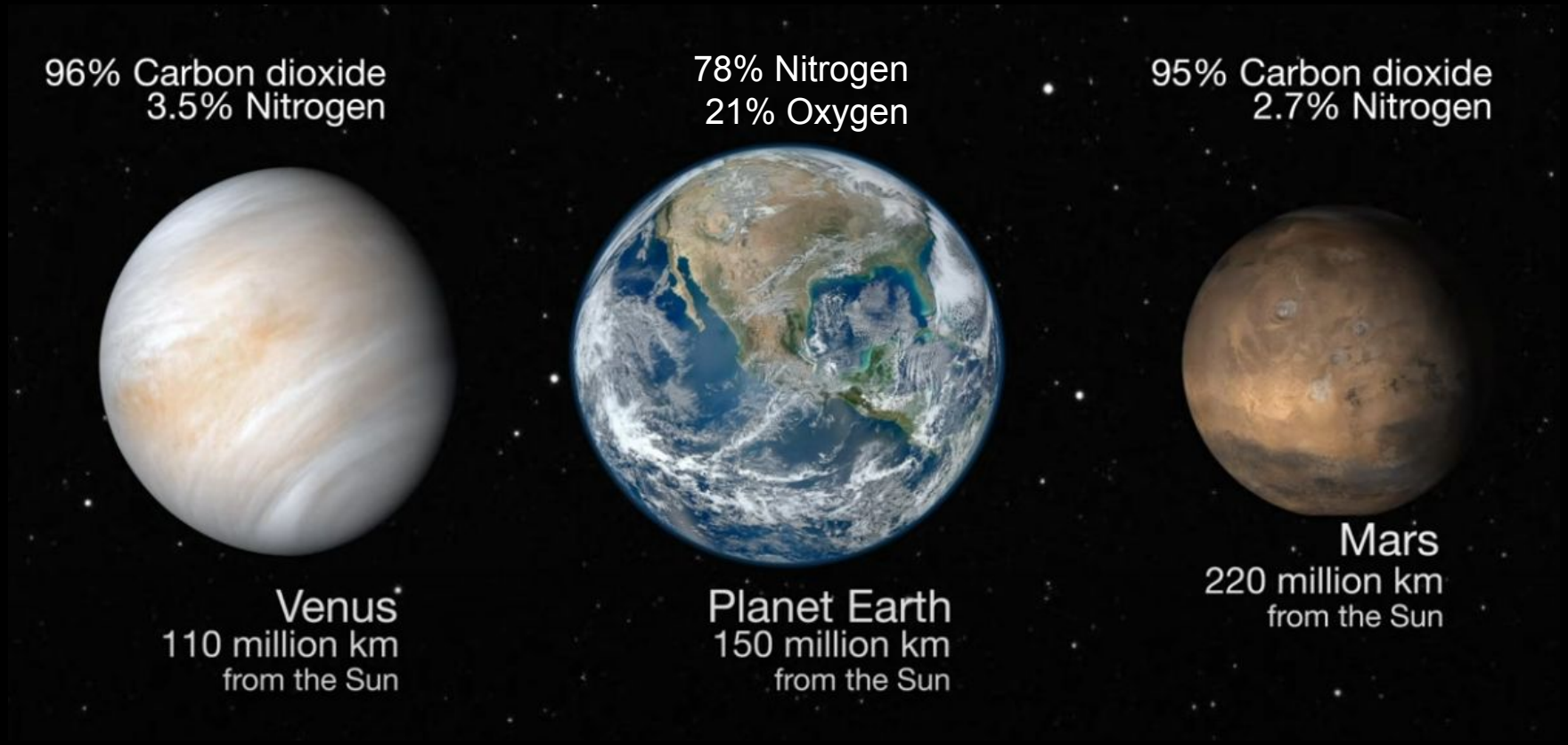
Unit 4
Earth's Atmosphere, Weather, and Climate

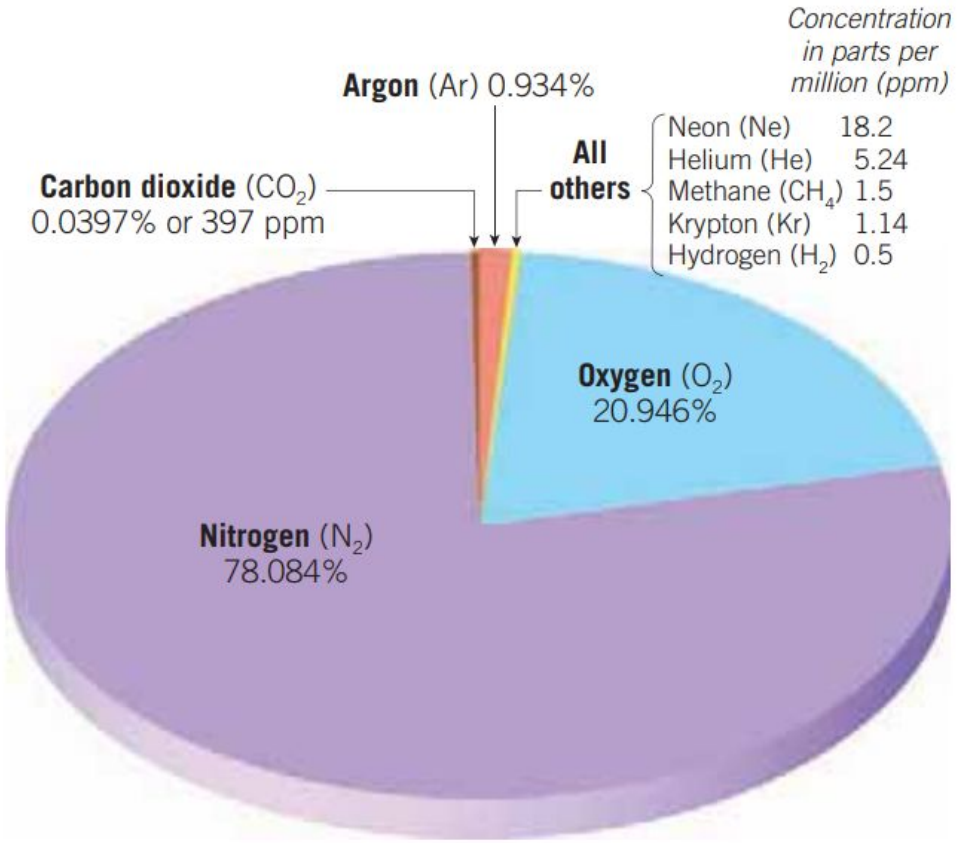
LO.4.1. Students explain the elements and factors influencing Earth's atmospheric conditions and affecting weather and climate.

Lesson 1: Evolution of Earth's Atmosphere

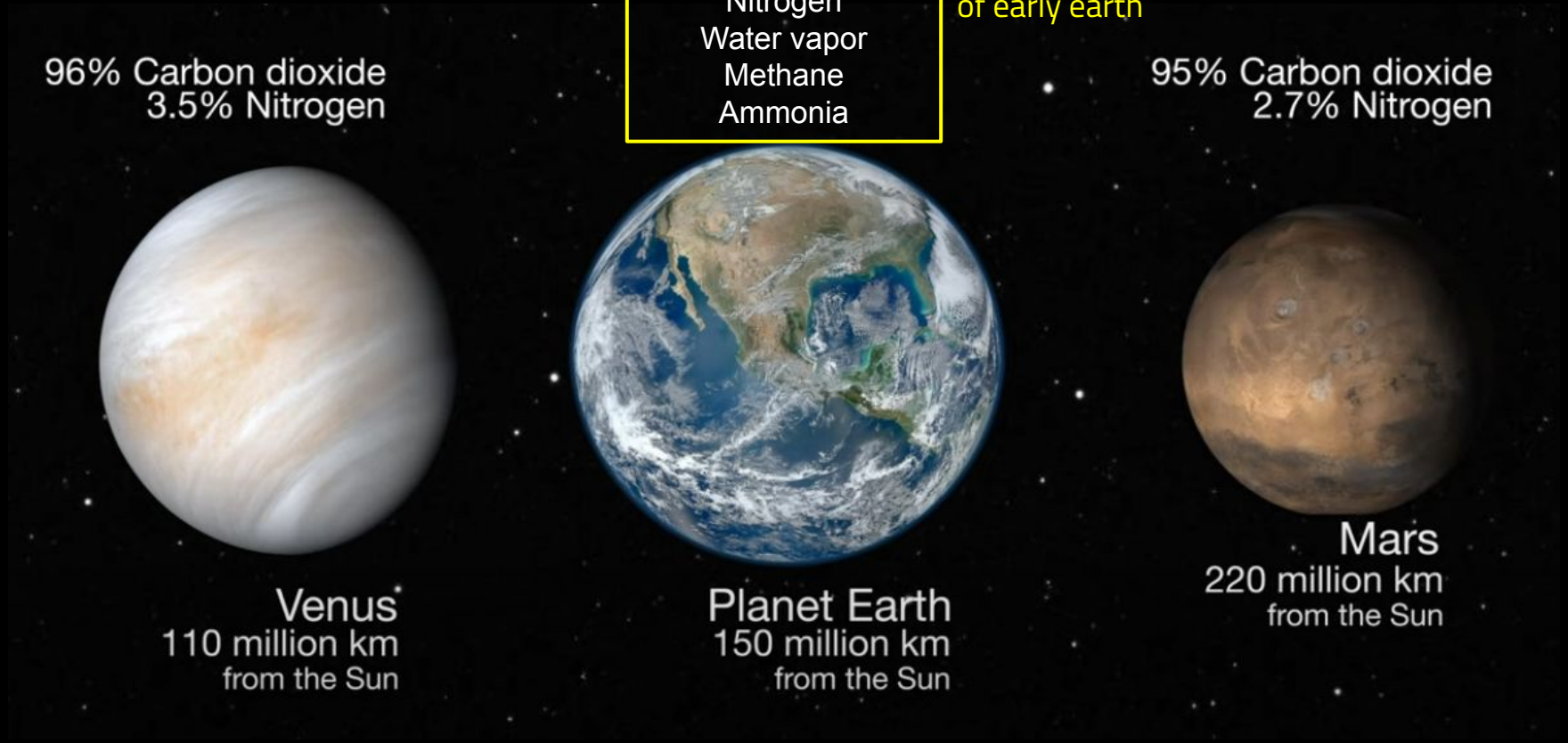
Learning Target: I can describe the evolution and composition of the Earth's atmosphere.



Composition of Earth's atmosphere



How did we get to this state?

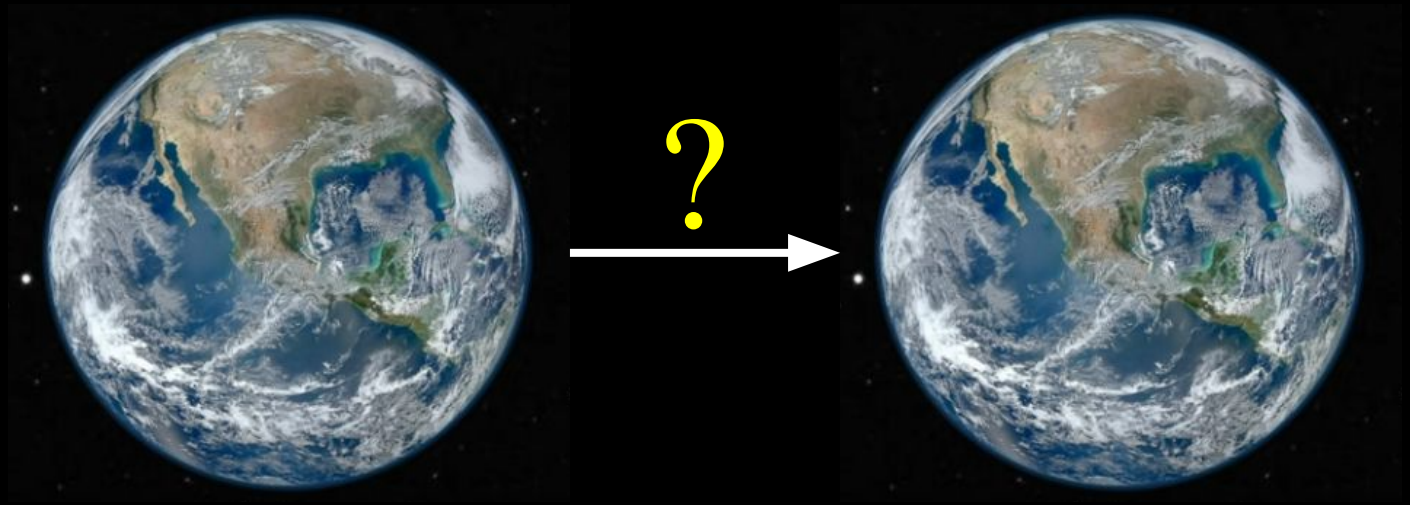


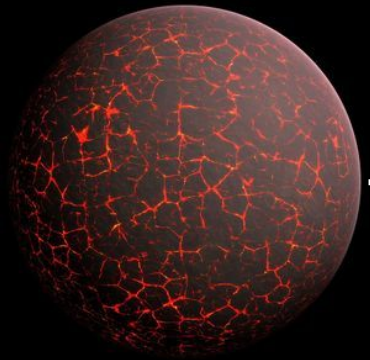
~4 billion years ago

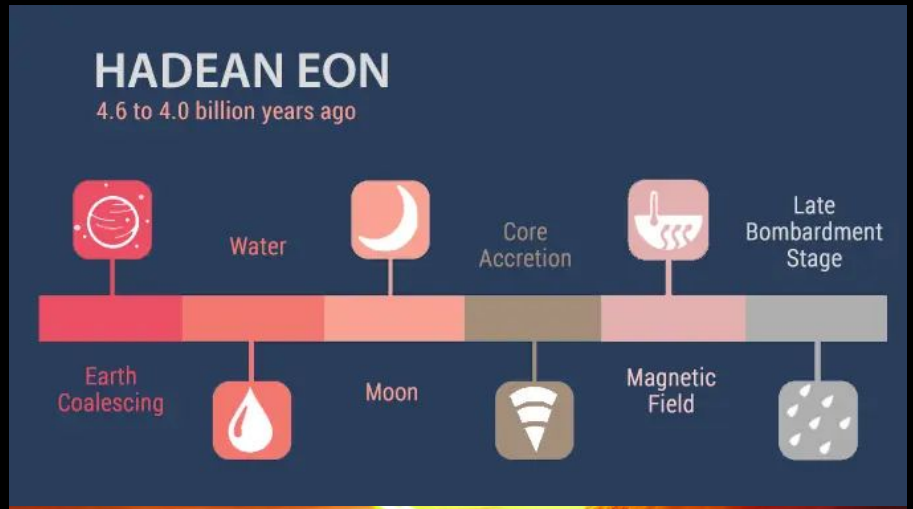
Carbon dioxide
Nitrogen
Water vapor
Methane
Ammonia

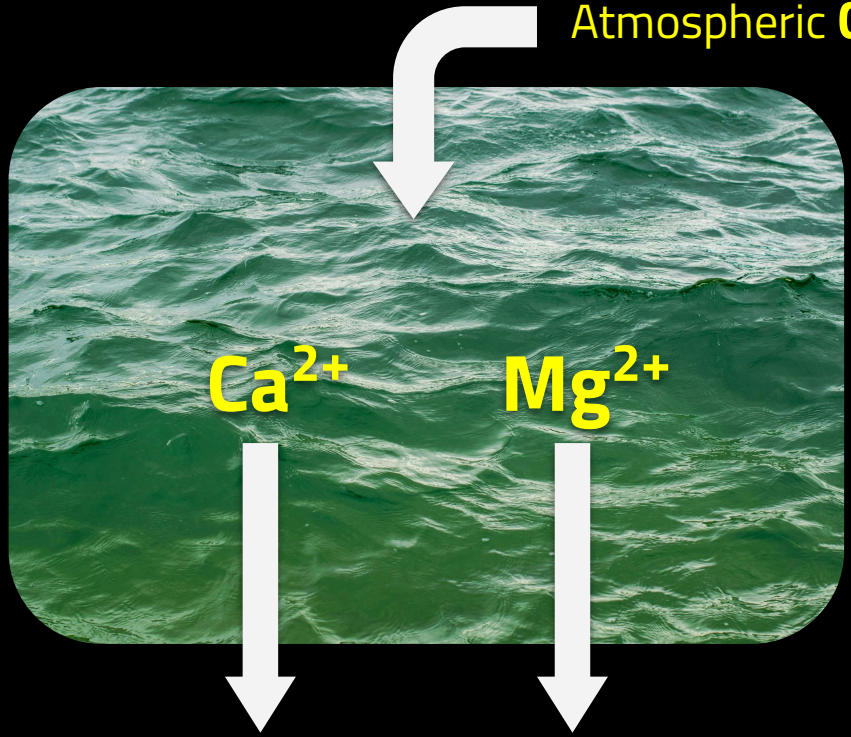
Current era

Nitrogen
Oxygen
Trace elements

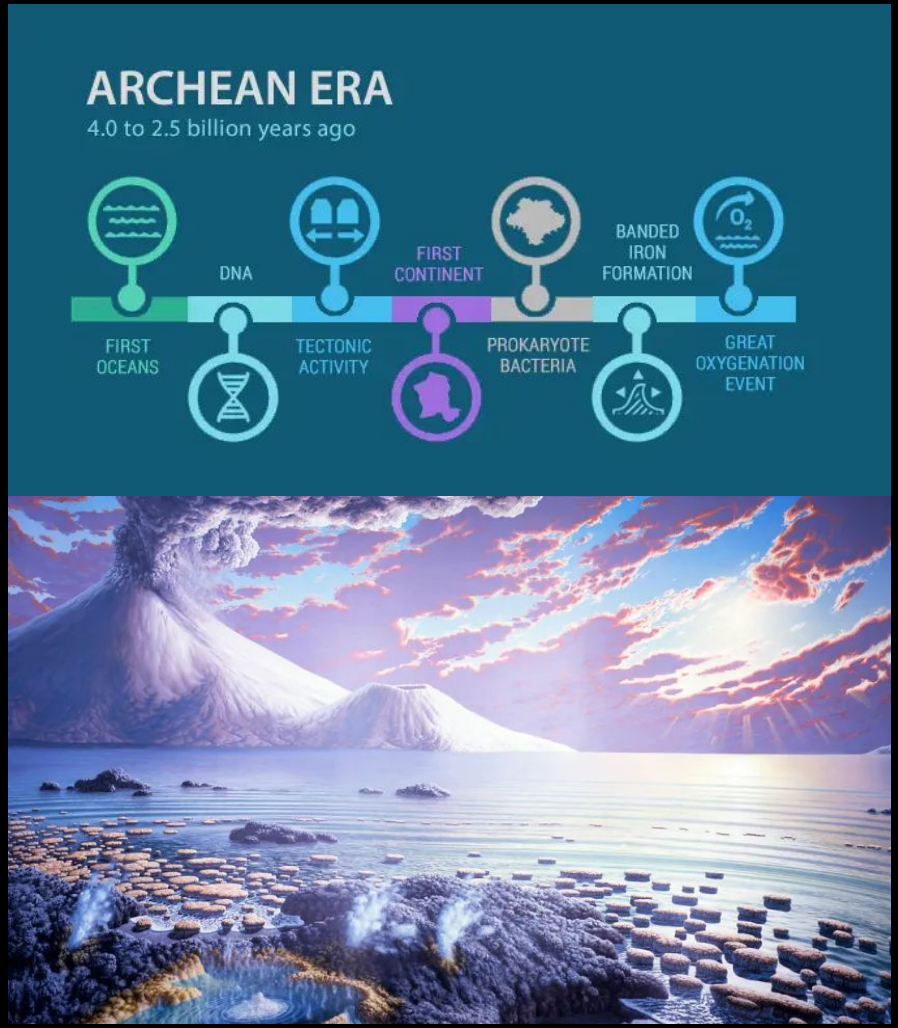


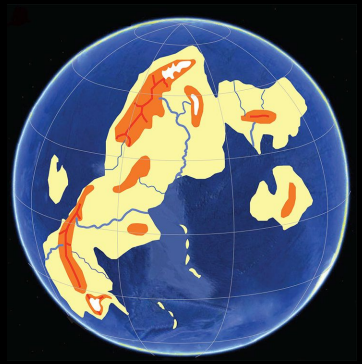


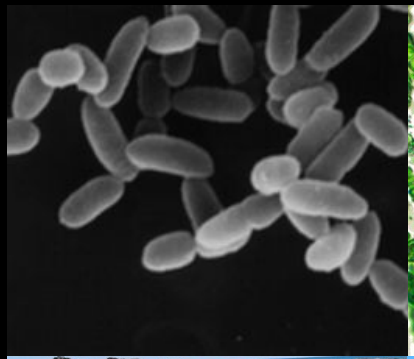




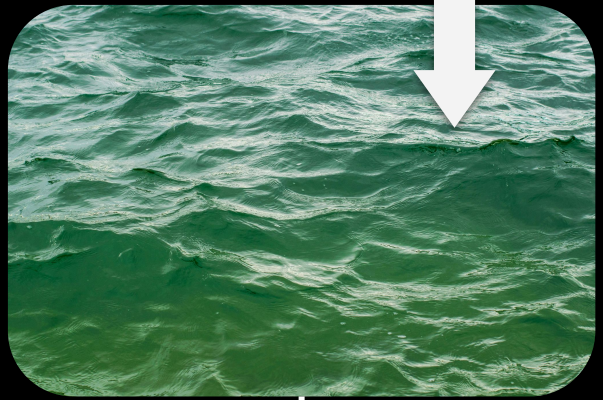
Precipitated and locked in sediments and rocks

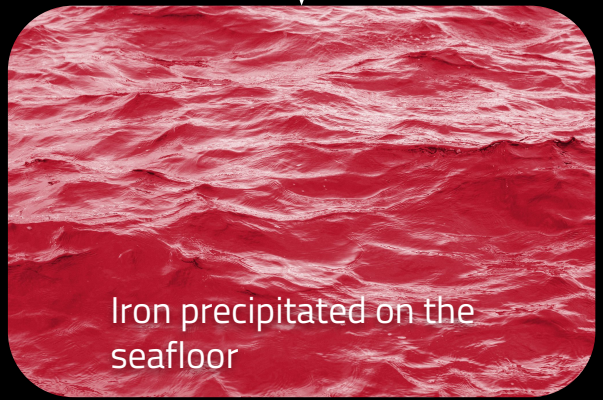




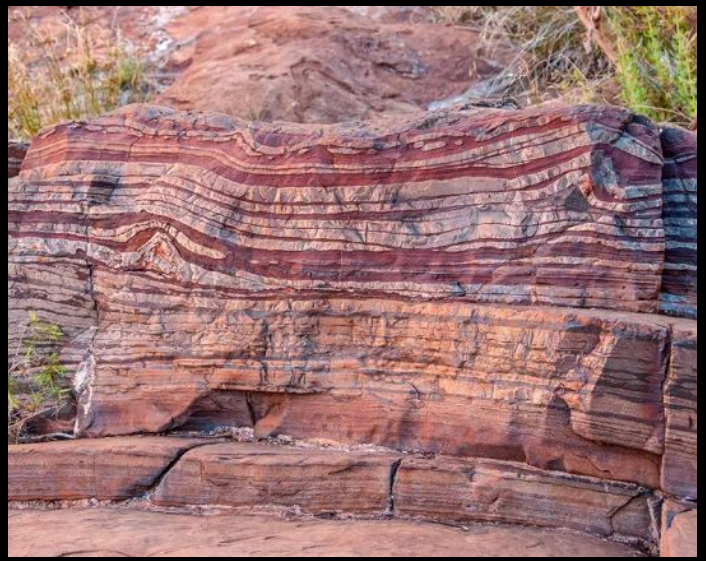


Atmospheric O_2



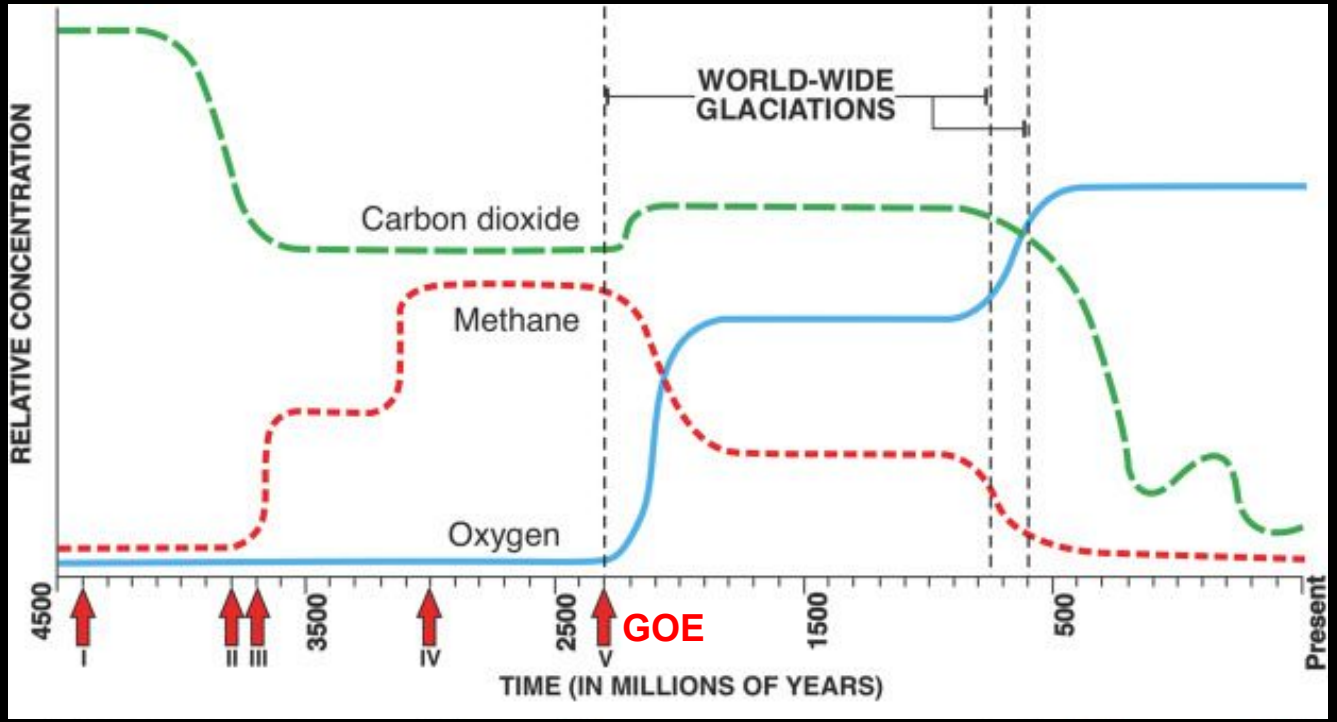


Iron precipitated on the seafloor



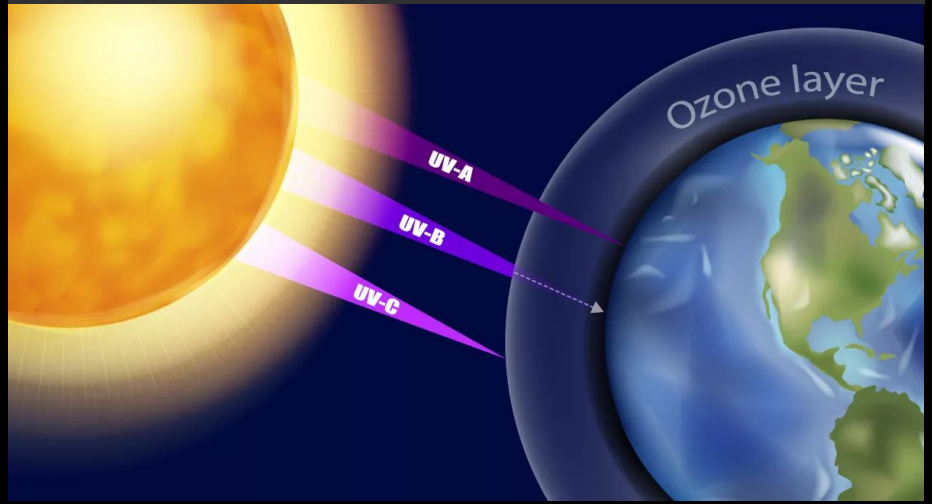
Banded iron formation

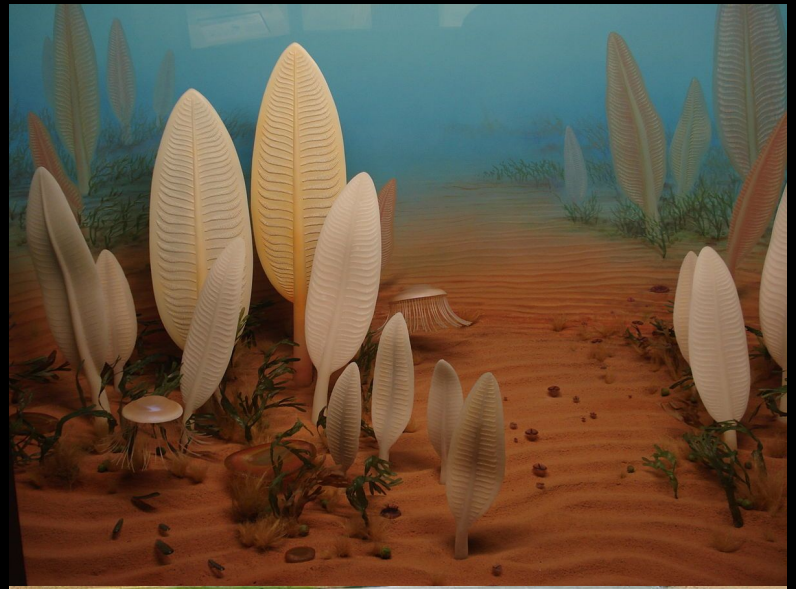
Great Oxidation Event (GOE) ~2.3 to 2.2 bya

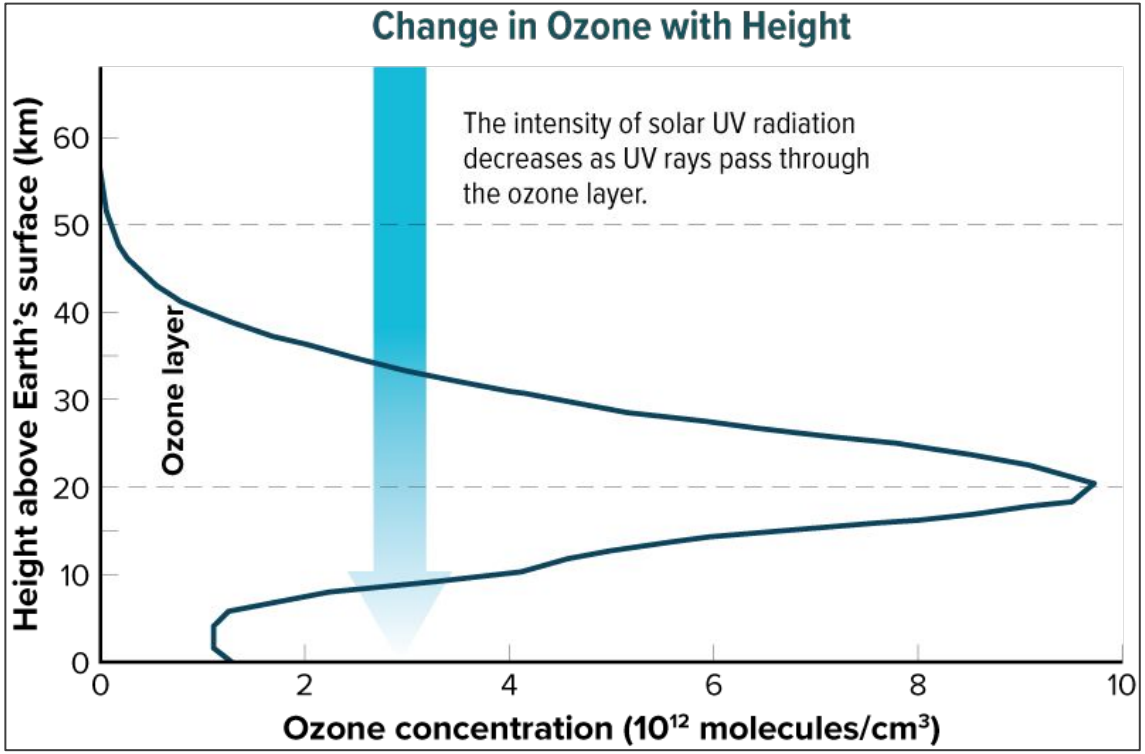


PROTEROZOIC EON

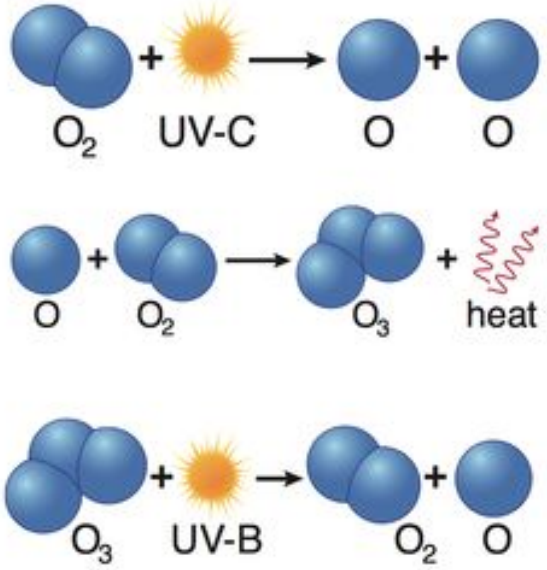
2500 to 541 million years ago

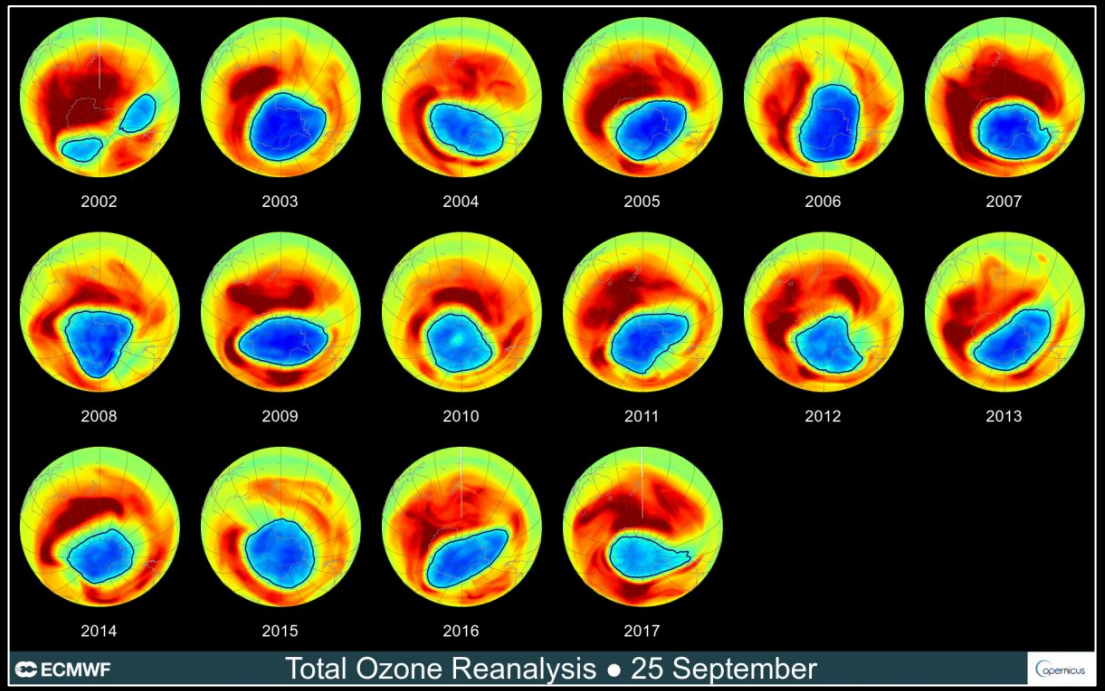






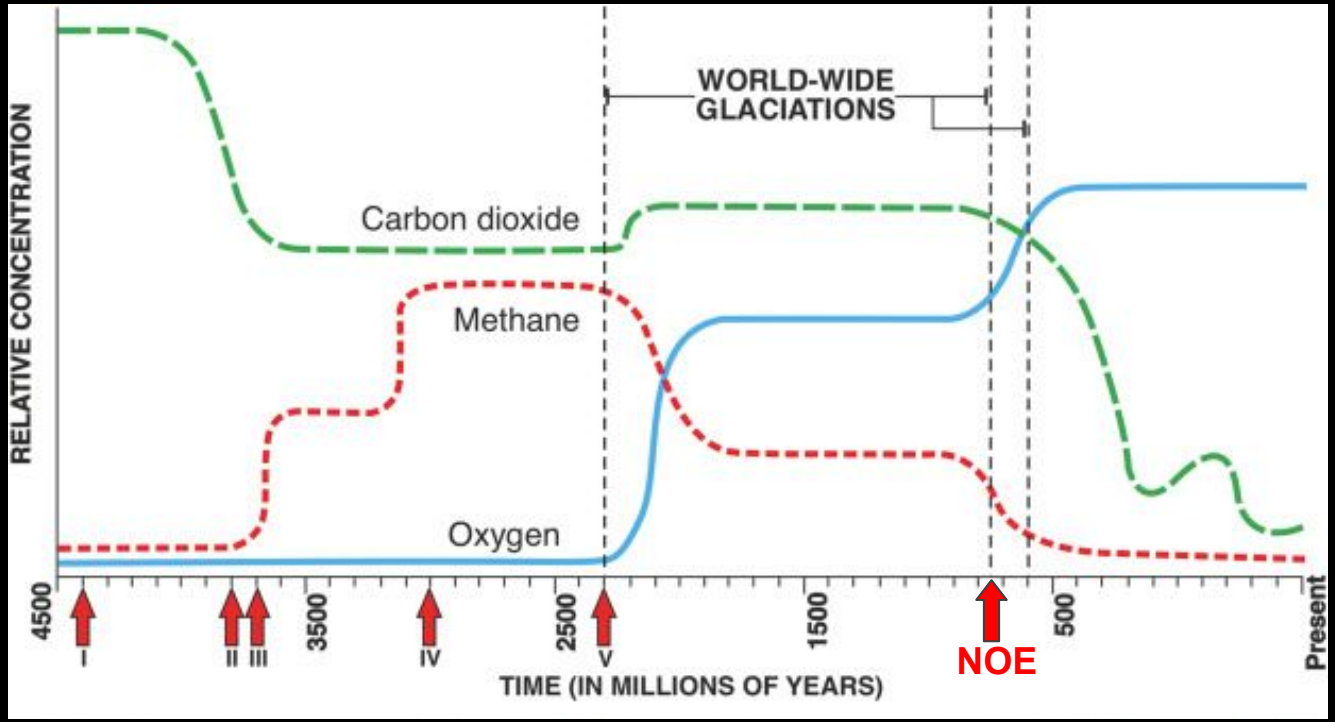
Natural ozone production & destruction



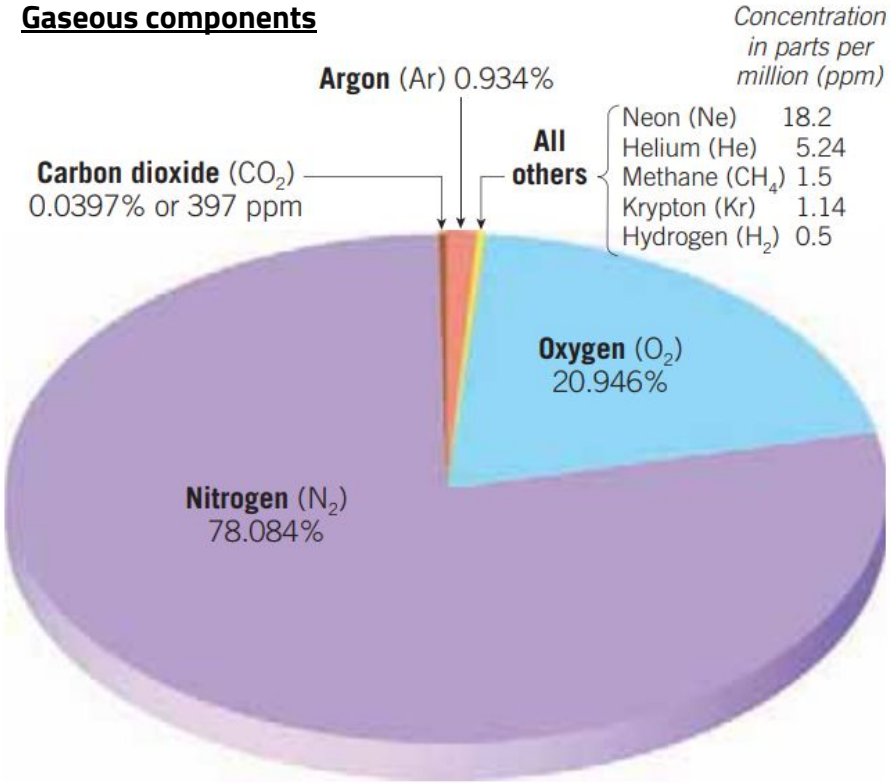


Montreal Protocol (1987)
International agreement aimed at protecting the ozone later by regulating the use of ozone-depleting substances.

Neoproterozoic Oxidation Event (NOE) ~800 to 542 mya



Composition of Earth's atmosphere



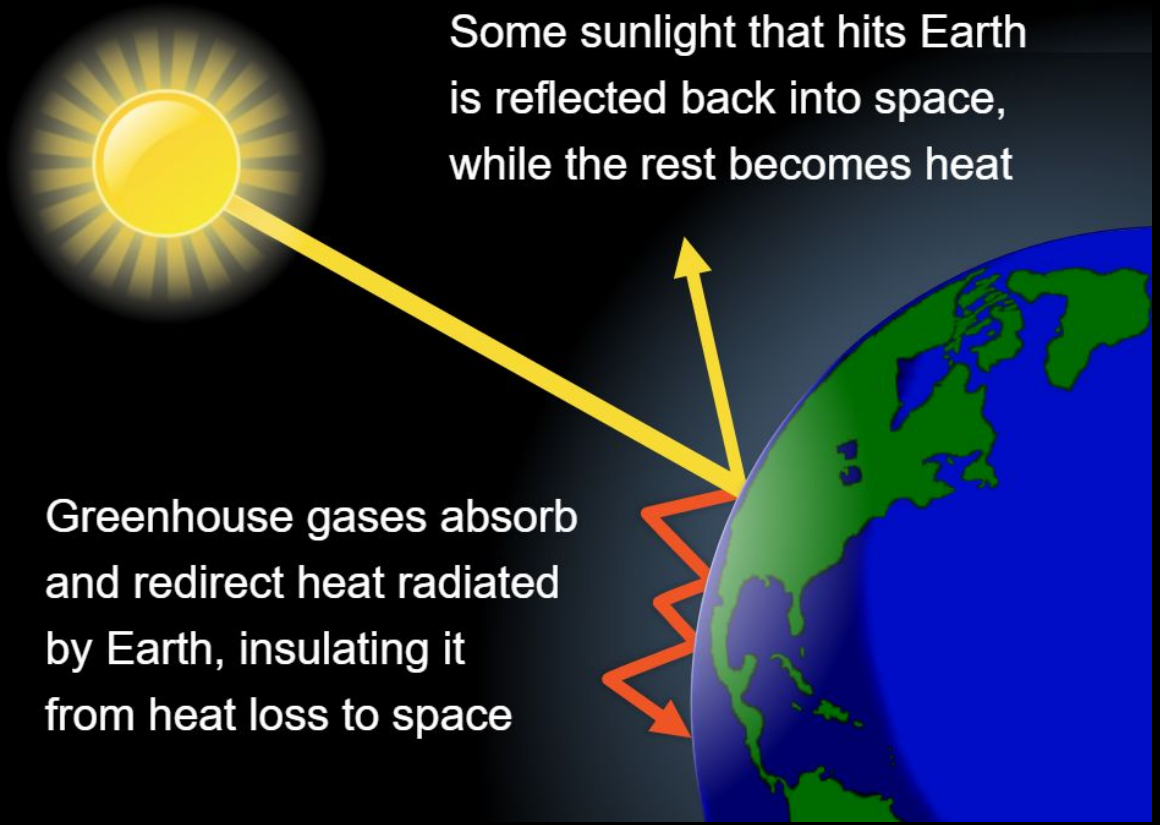
Variable components: important substances in the atmosphere that vary between time and locations

Water vapor: constitutes about 0% to 4% of the atmosphere by volume, depending on temperature and humidity conditions

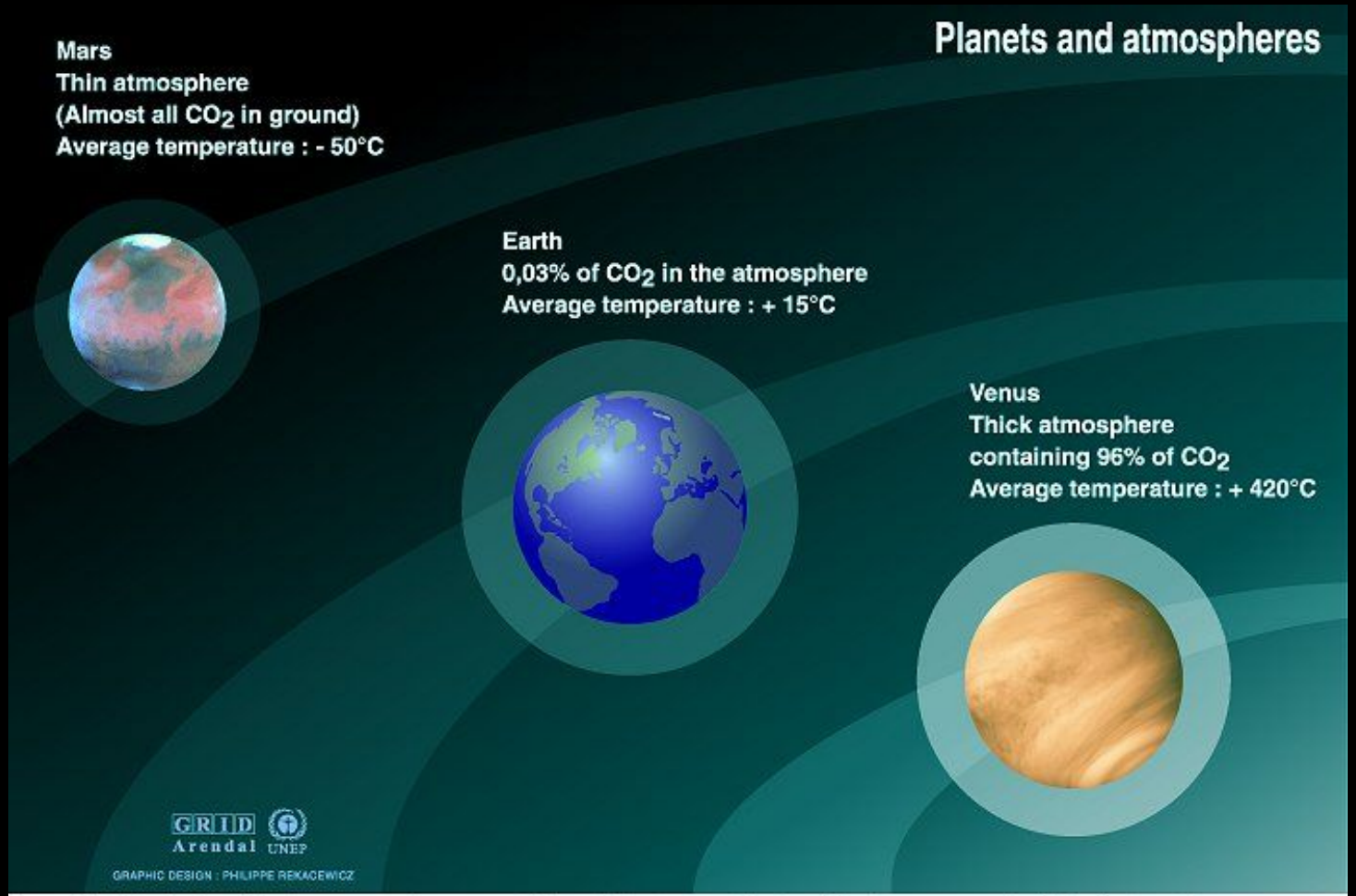
Ozone: concentrated in a zone 20-50 km from the surface; constitutes 0.0012% of the atmosphere

Aerosols: tiny suspended particles in the air (dust, soot, and others) that could affect air quality and weather

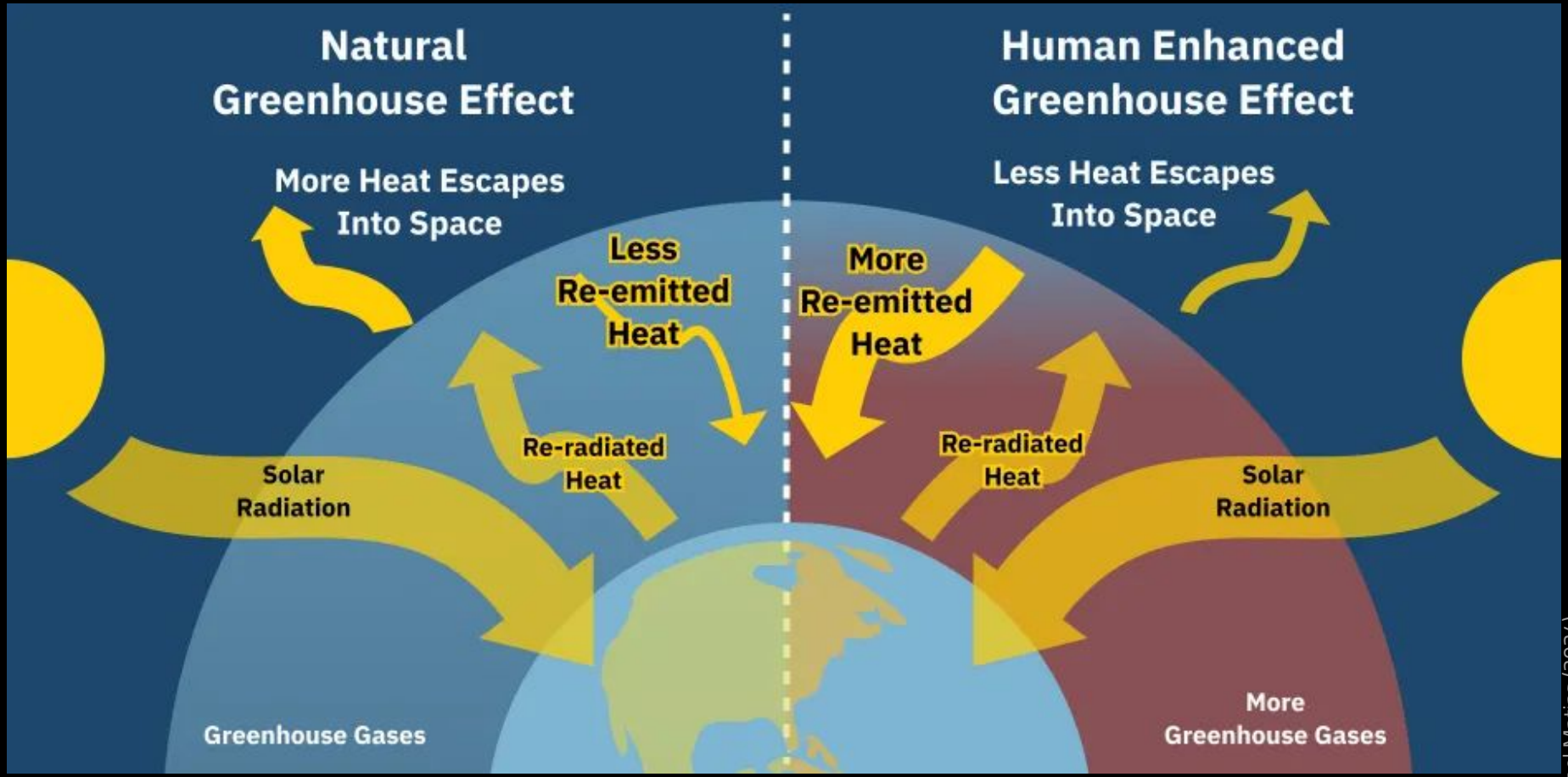
The Greenhouse Effect

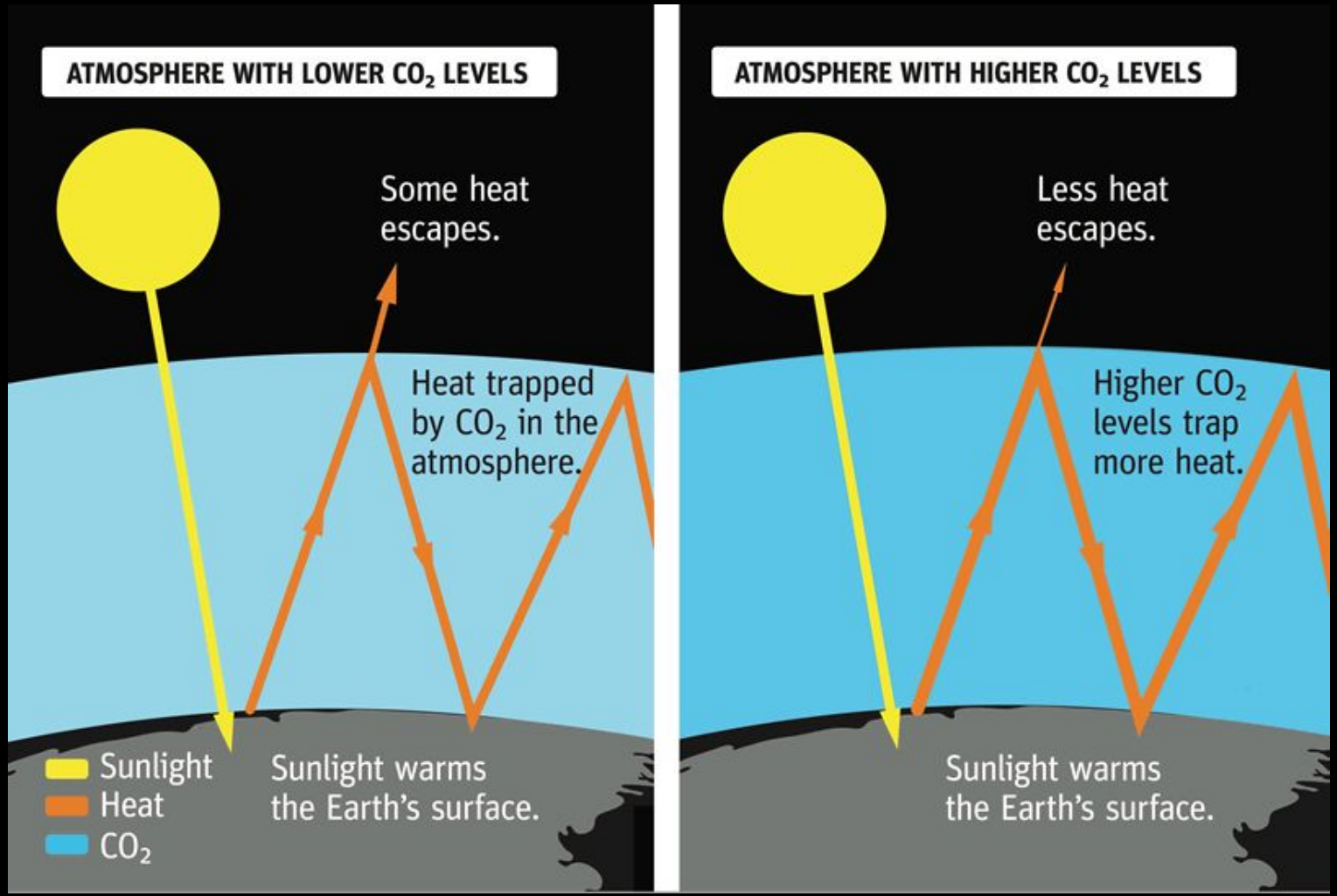


Planets and atmospheres



Sources: Calvin J. Hamilton, Views of the solar system, www.planetscapes.com; Bill Arnett , The nine planets, a multimedia tour of the solar system, www.seds.org/billa/tnp/nineplanets.html





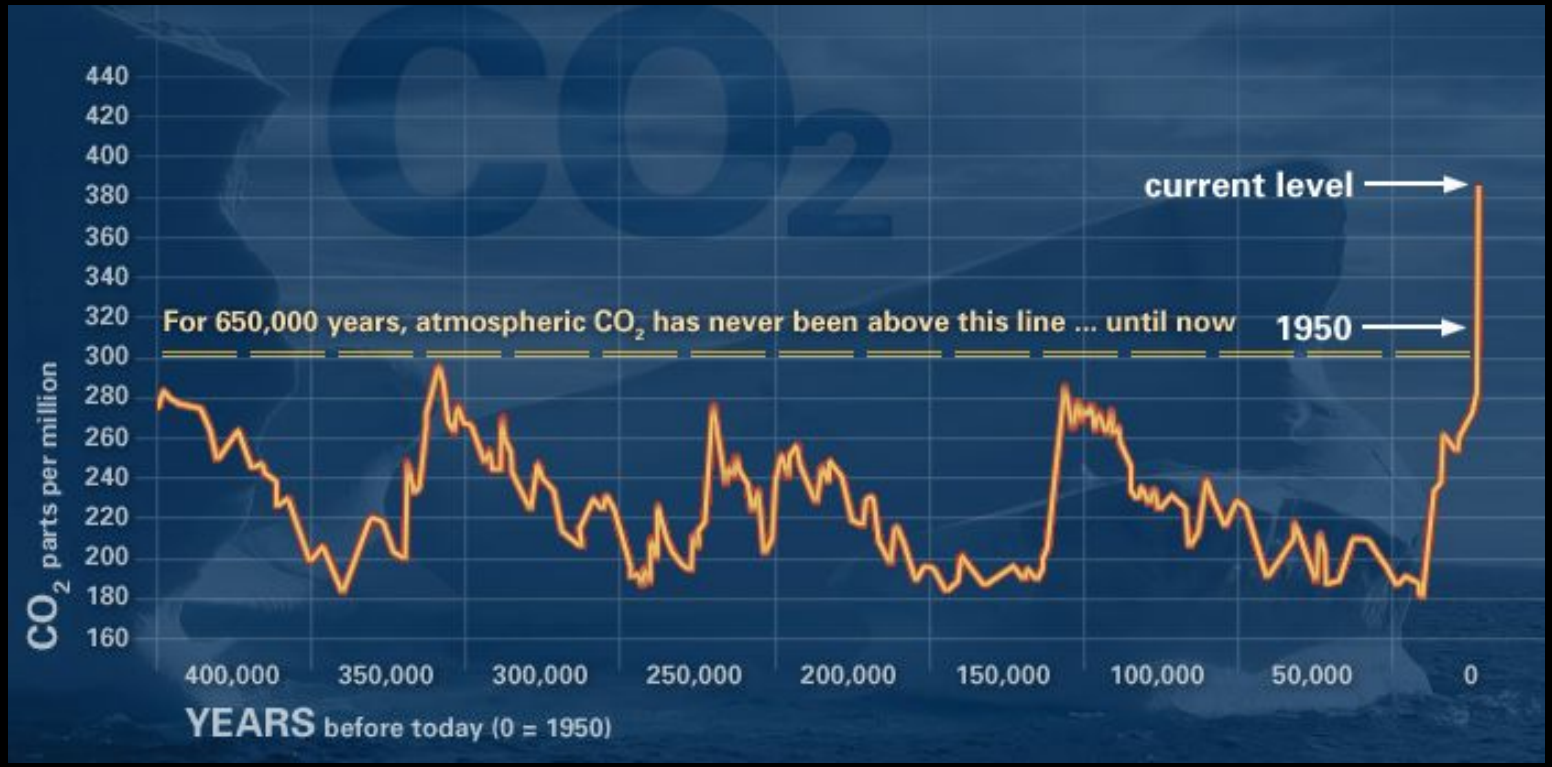


Image: https://climate.nasa.gov/images/evidence_CO2.jpg