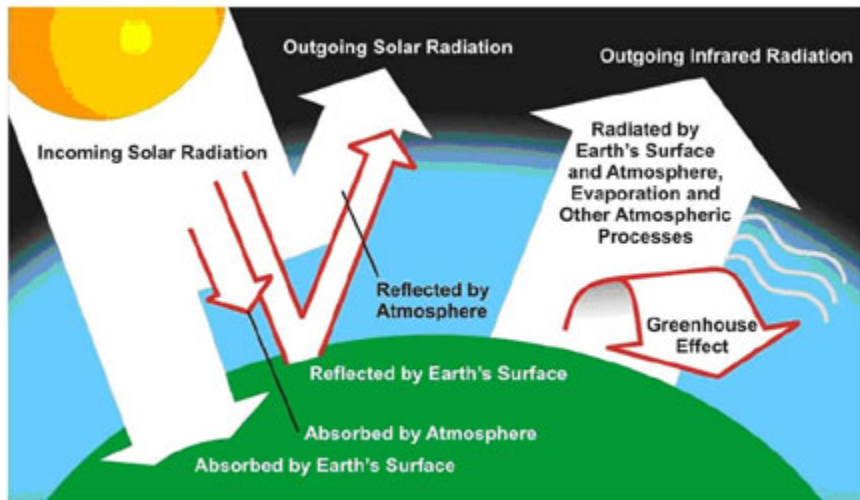


The Greenhouse Effect (Natural and Anthropogenic)

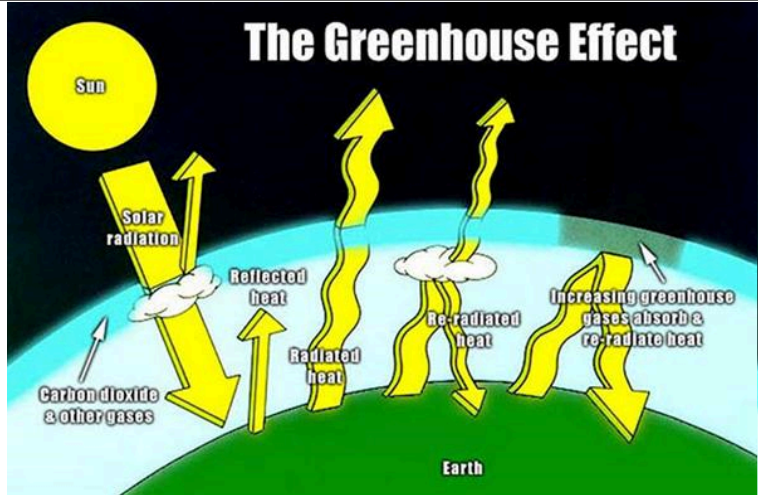
Terms and Concepts: greenhouse gas (GHG), natural Greenhouse Effect, anthropogenic Greenhouse Effect, infrared radiation, photosynthesis

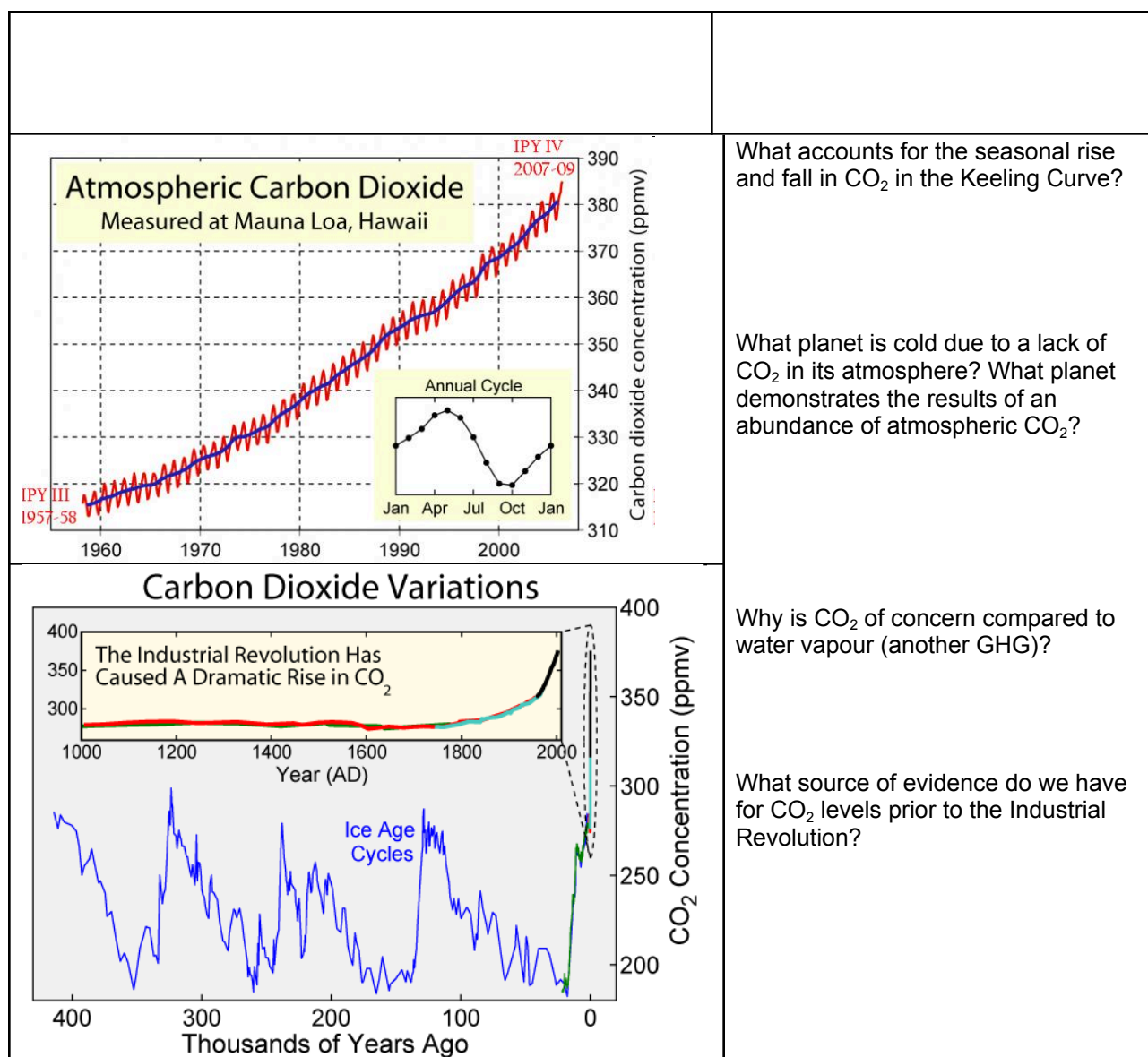
Definition: “Anthropogenic” =

The Natural Greenhouse Effect

 The diagram illustrates the natural greenhouse effect. It shows a cross-section of Earth with a green surface and a blue atmosphere. A large yellow sun in the top left corner emits 'Incoming Solar Radiation' (red arrows). Some arrows are 'Reflected by Atmosphere' and others 'Reflected by Earth's Surface'. The radiation that is 'Absorbed by Earth's Surface' is shown as red arrows pointing down. From the surface, 'Outgoing Infrared Radiation' (white arrows) points upwards. A red arrow labeled 'Greenhouse Effect' points from the outgoing infrared radiation back towards the Earth's surface, indicating that the atmosphere is trapping some of the heat. Labels include: Incoming Solar Radiation, Outgoing Solar Radiation, Outgoing Infrared Radiation, Reflected by Atmosphere, Reflected by Earth's Surface, Absorbed by Atmosphere, Absorbed by Earth's Surface, and Greenhouse Effect.	Notes: ◇
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The Anthropogenic (Enhanced) Greenhouse Effect

 The diagram, titled 'The Greenhouse Effect', shows a cross-section of Earth with a green surface and a blue atmosphere. A yellow sun in the top left corner emits 'Solar radiation' (yellow arrows). Some arrows are 'Reflected heat'. The radiation that is 'Radiated heat' from the Earth's surface is shown as yellow arrows pointing upwards. A red arrow labeled 'Carbon dioxide & other gases' points from the surface into the atmosphere. The atmosphere is shown with clouds and a wavy yellow arrow labeled 'Re-radiated heat' pointing back towards the Earth's surface. A label 'Increasing greenhouse gases absorb & re-radiate heat' points to the atmosphere. The Earth is labeled 'Earth' at the bottom.	What are some ways that humans contribute GHGs into the atmosphere? Why is this also called the Enhanced Greenhouse Effect?
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What accounts for the seasonal rise and fall in CO₂ in the Keeling Curve?

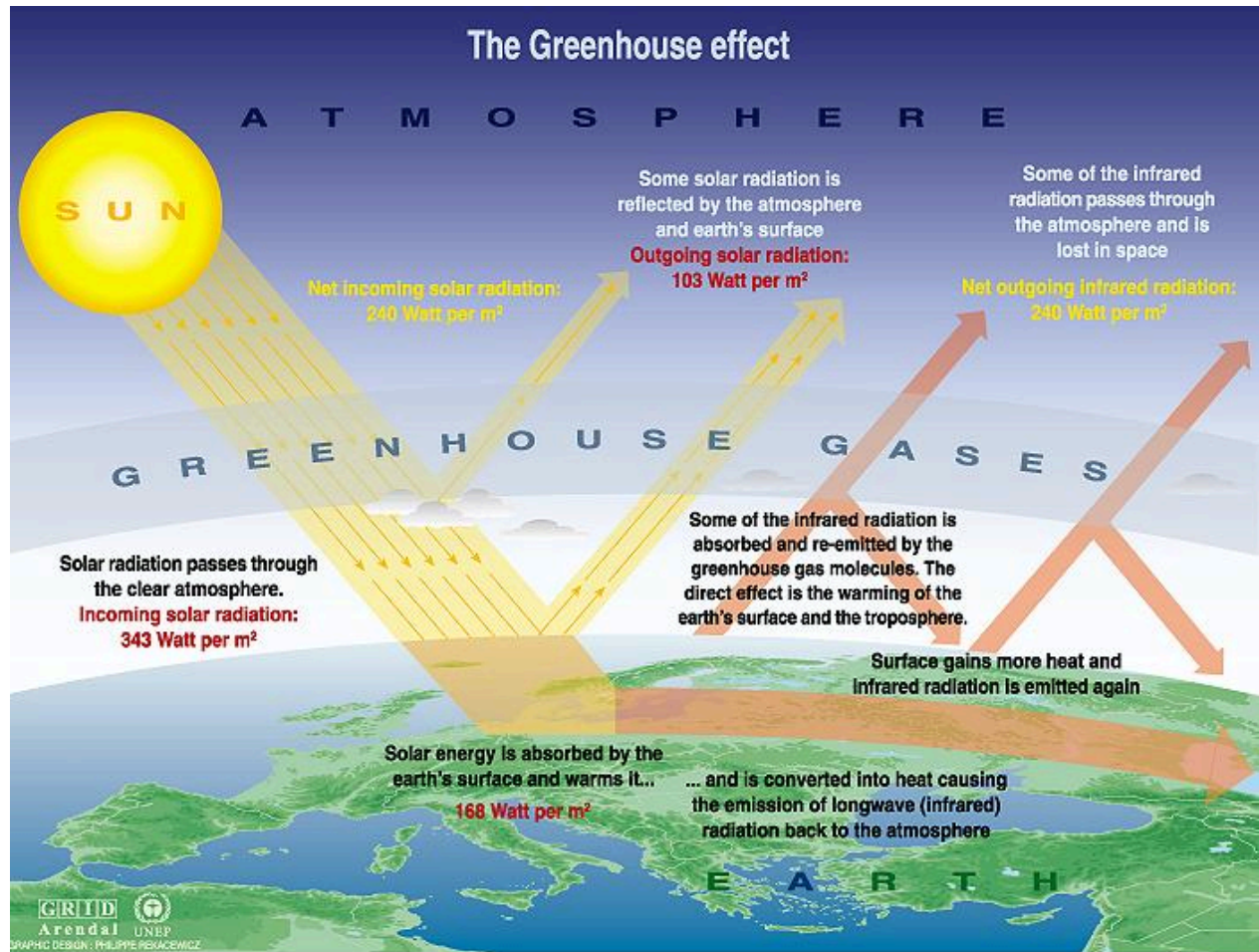
What planet is cold due to a lack of CO₂ in its atmosphere? What planet demonstrates the results of an abundance of atmospheric CO₂?

Why is CO₂ of concern compared to water vapour (another GHG)?

What source of evidence do we have for CO₂ levels prior to the Industrial Revolution?

Anthropogenic Sources of Greenhouse Gases (pp. 384-386)

Greenhouse Gas	Sources	Atmospheric Lifetime (years)
Carbon dioxide (CO ₂)		
Methane (CH ₄)		
Nitrous oxide (N ₂ O)		
Chlorofluorocarbons (CFCs)		



Sources: Okanagan university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996.