



Land in the Earth System 2 HS24

Recap: Terrestrial greenhouse gases

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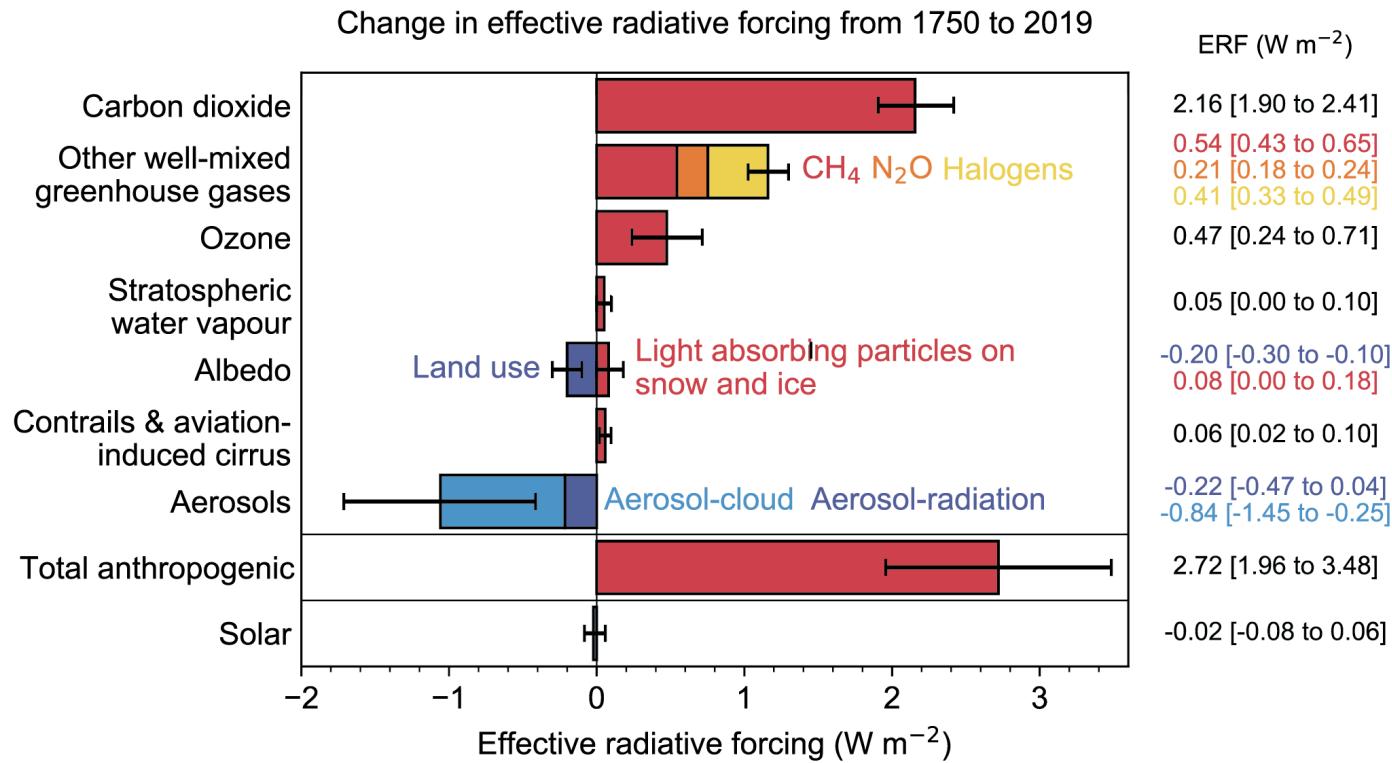
11.11.2024

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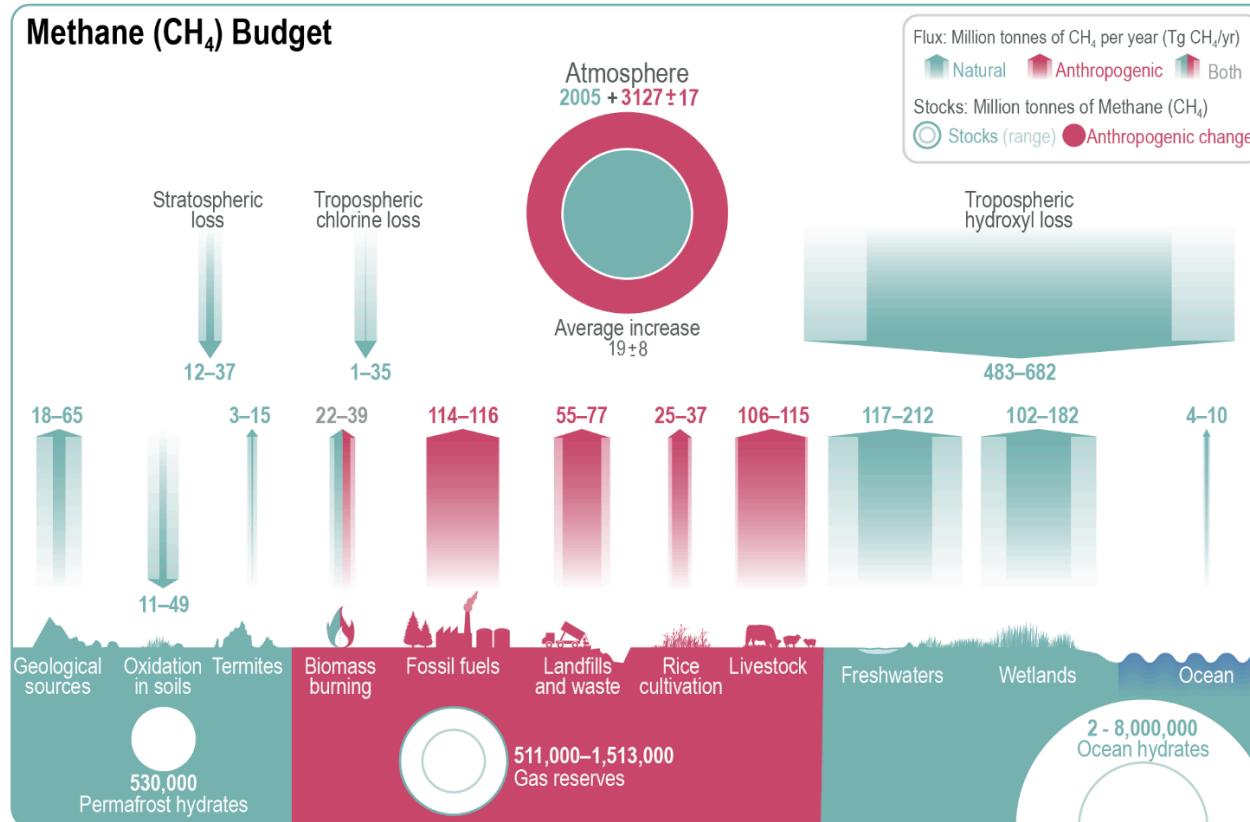
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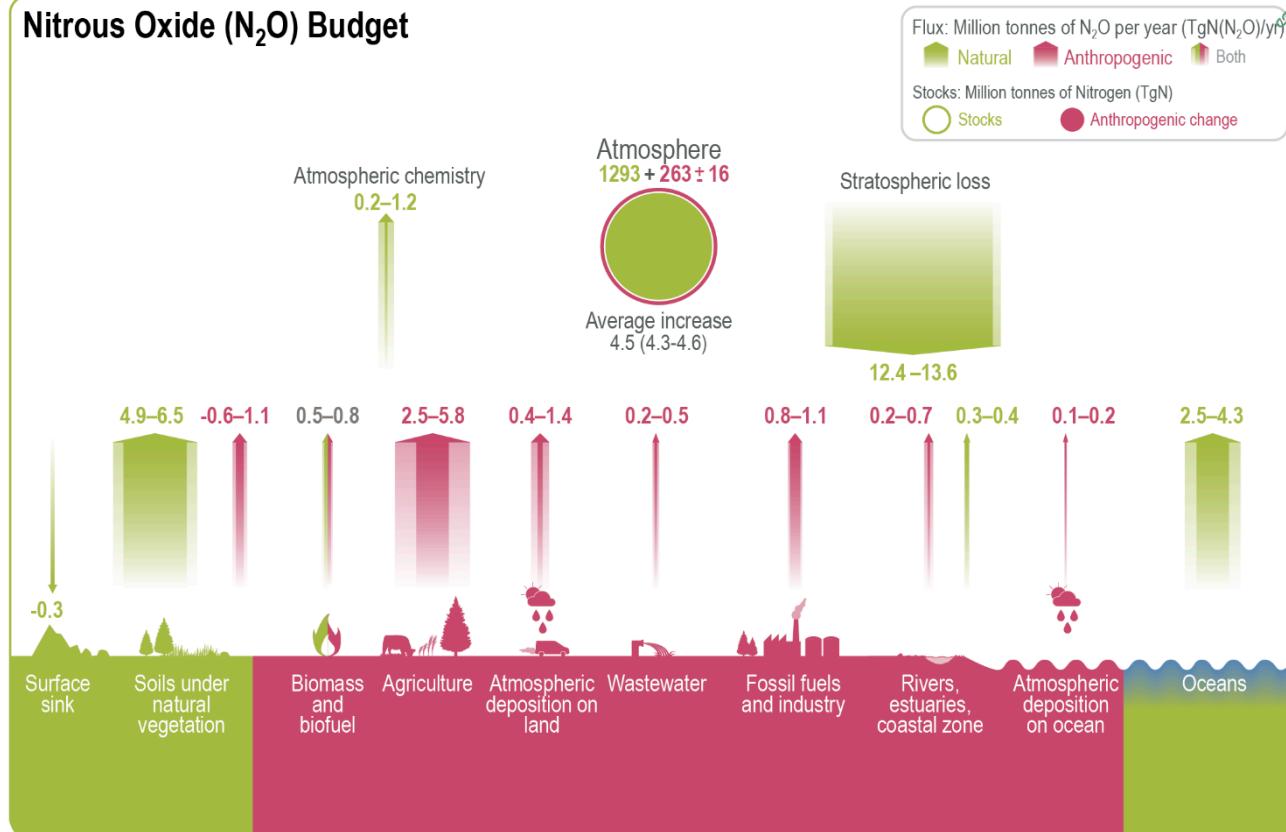
Effective radiative forcings



Methane sources and sinks



Nitrous oxide sources and sinks



Atmospheric concentration dynamics

Change in concentration → $\frac{dC(t)}{dt} = E(t) - \frac{1}{\tau} C(t)$

The diagram illustrates the components of the differential equation for atmospheric concentration dynamics. On the left, the text "Change in concentration" is followed by a right-pointing arrow. To the right of the arrow is the differential equation $\frac{dC(t)}{dt} = E(t) - \frac{1}{\tau} C(t)$. Three arrows point from labels below the equation to its terms: an arrow from "Emissions" points to the term $E(t)$; an arrow from "Atmospheric lifetime" points to the term $\frac{1}{\tau} C(t)$; and an arrow from "Concentration" points to the term $C(t)$.

Concentration

Change in concentration

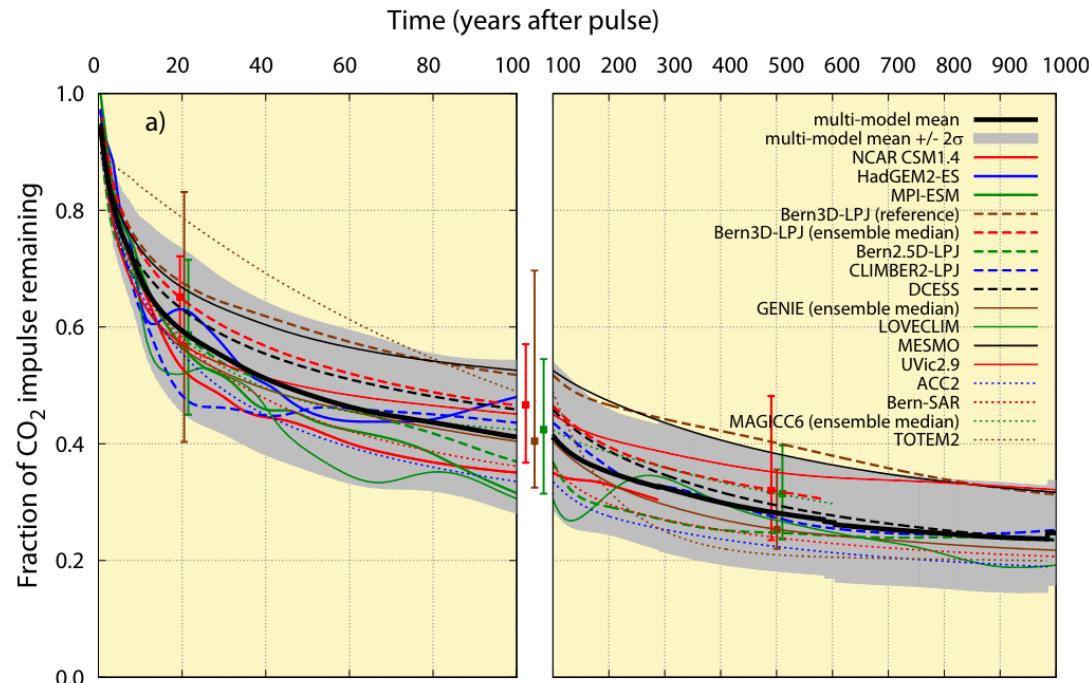
$\frac{dC(t)}{dt} = E(t) - \frac{1}{\tau} C(t)$

Emissions

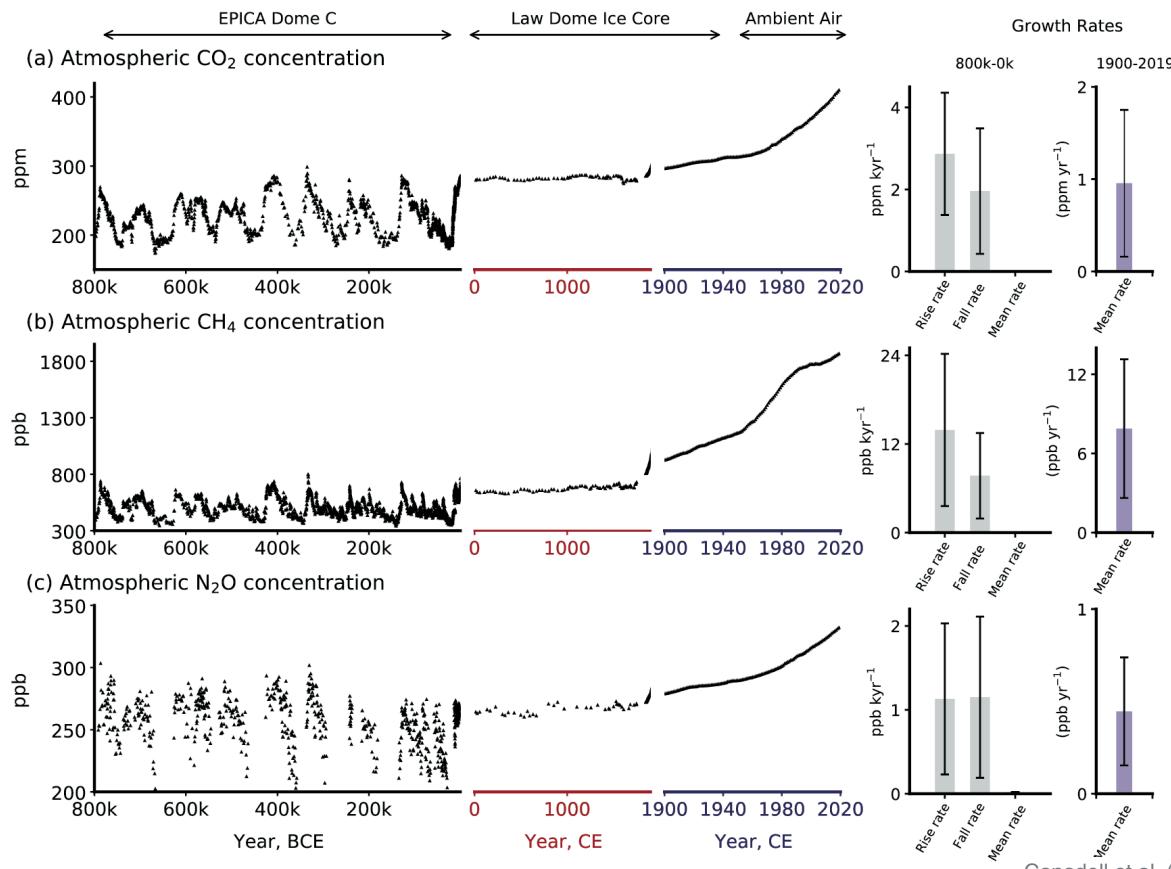
Atmospheric lifetime

$$C(t) = C_0 e^{-kt}$$

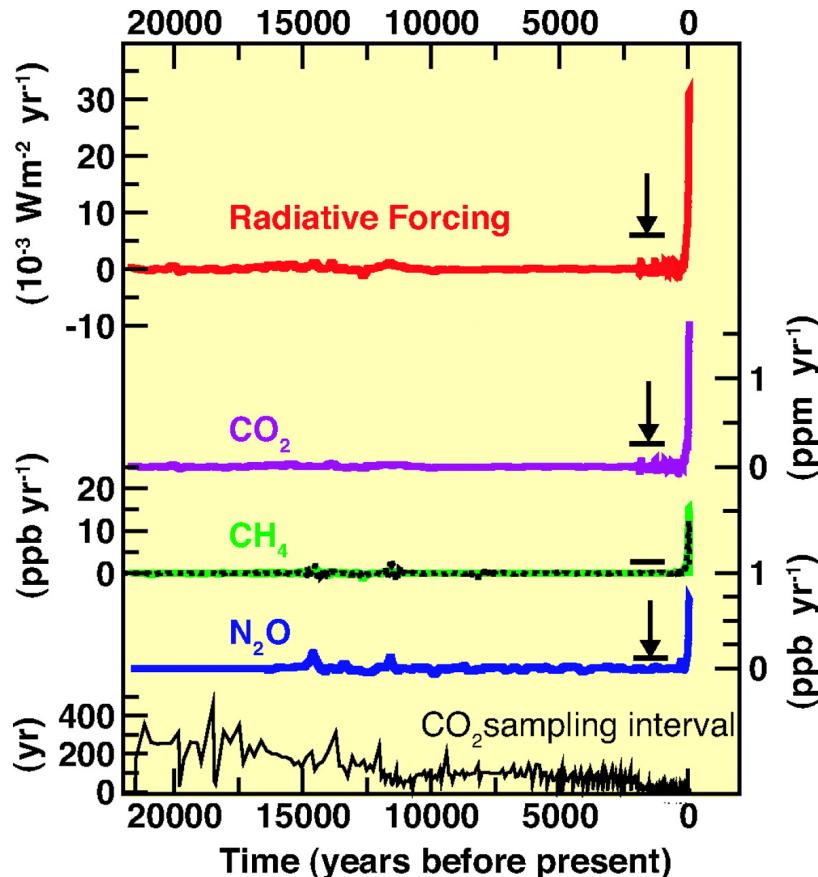
Remaining atmospheric fraction for CO₂



Past GHG concentrations



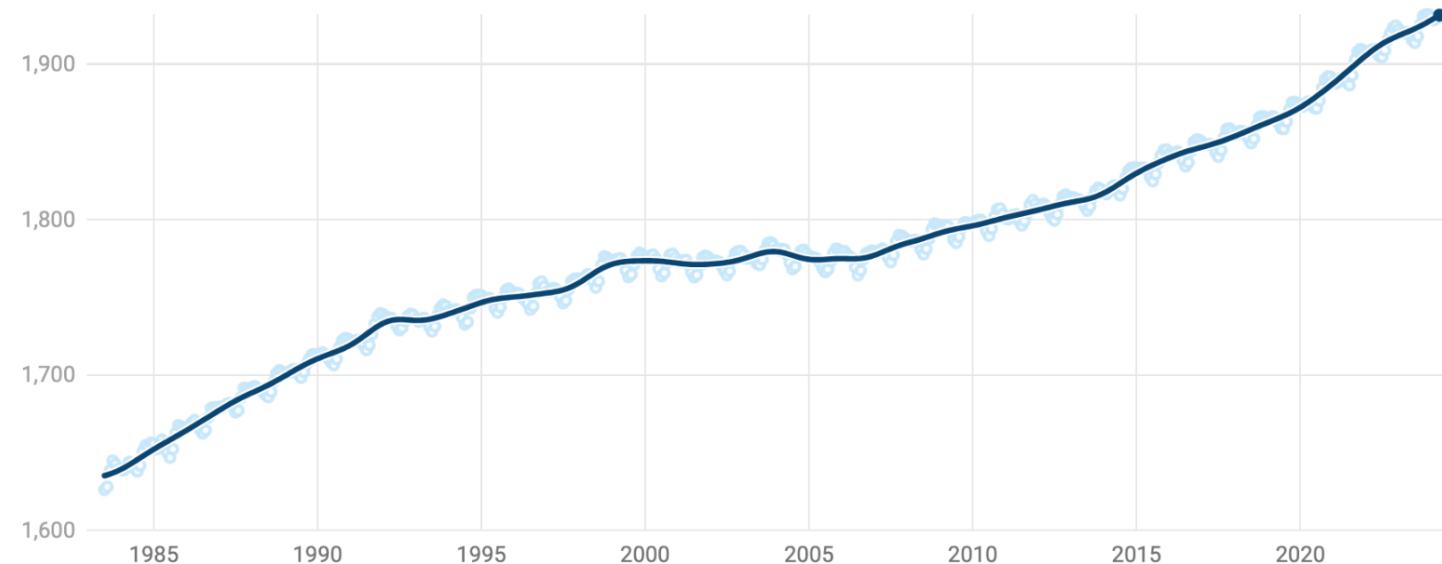
Change rates of past GHG concentrations



Recent change in methane concentrations

Methane levels in the atmosphere have increased by 17% over the past four decades

Global monthly average concentrations of methane over 1983-2024 in parts per billion



Source: US National Oceanic and Atmospheric Administration. Note truncated axis.

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