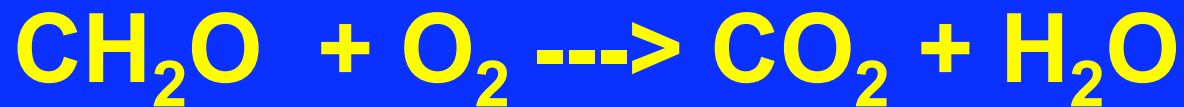
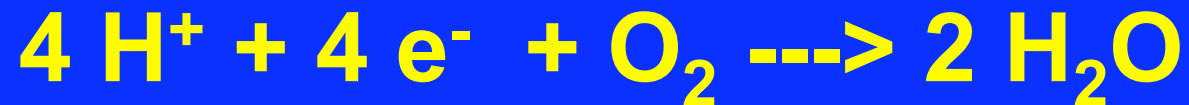
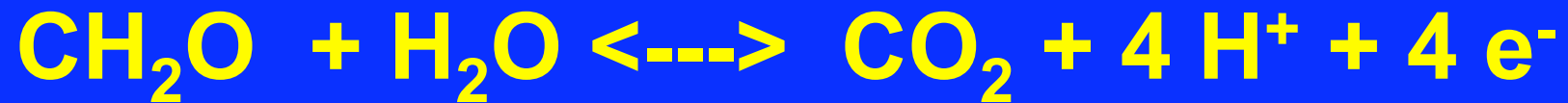


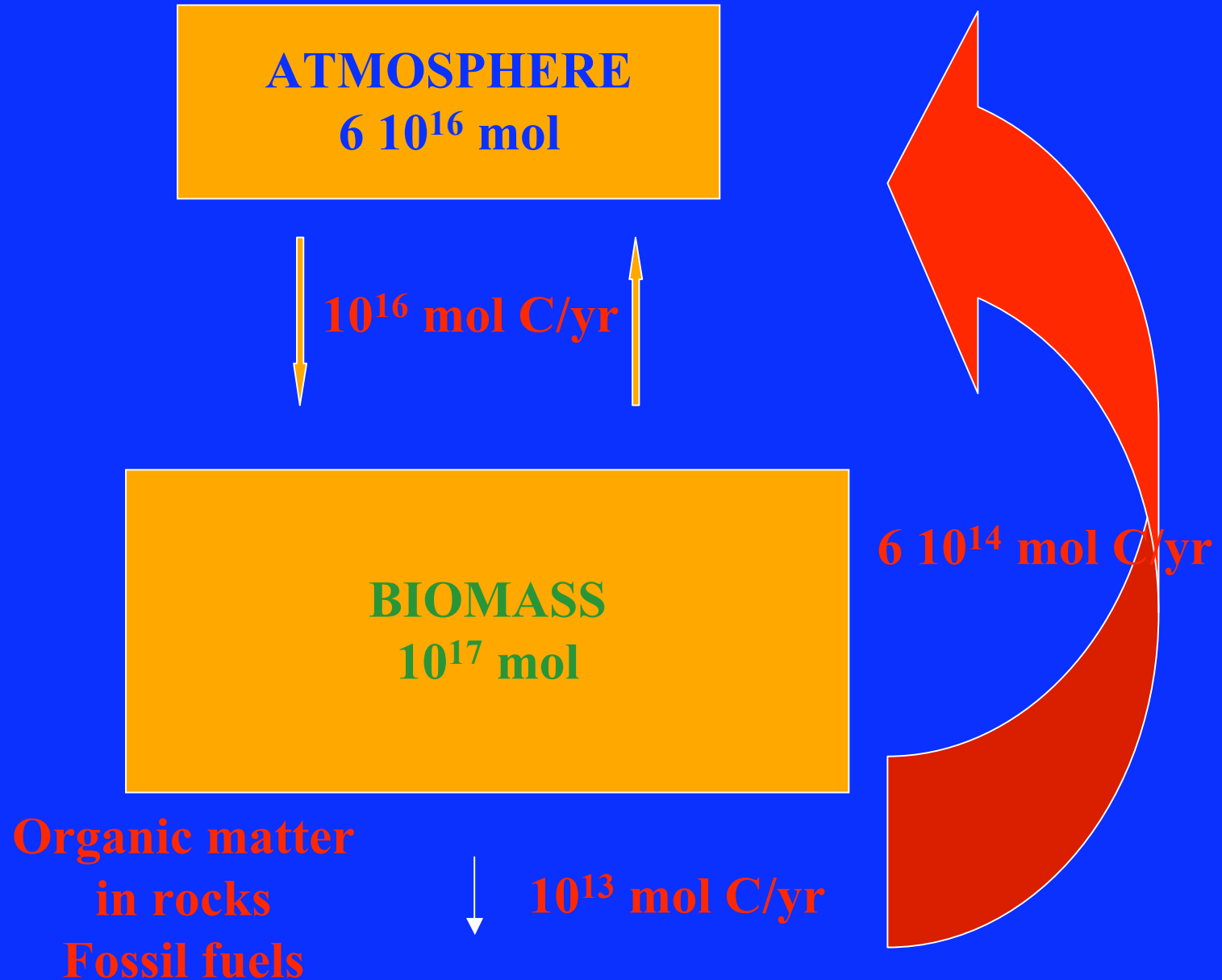
**Anthropogenic effects on the terrestrial
energy balance**

FOSSIL FUEL COMBUSTION



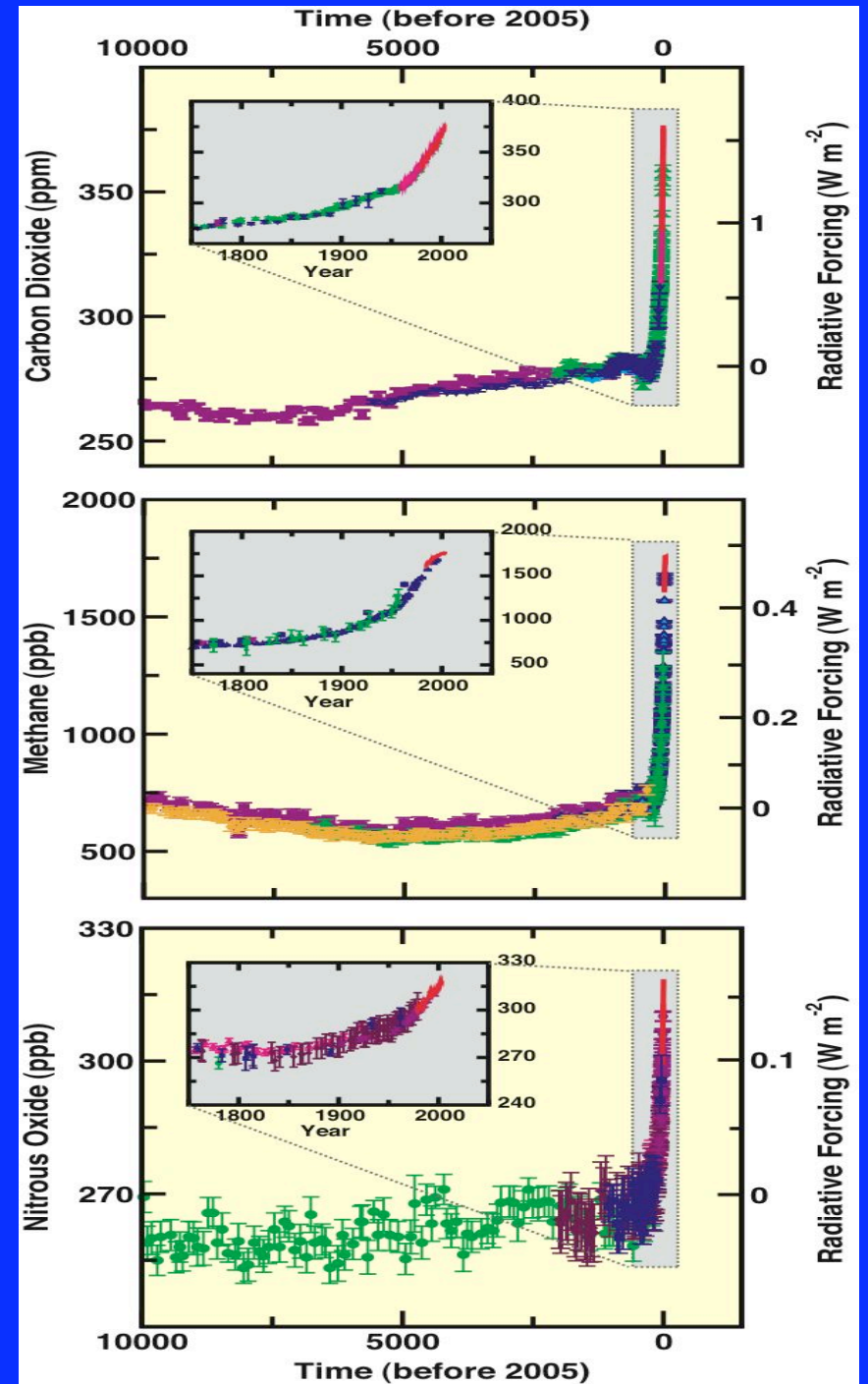
6×10^{14} moles of C/yr

Carbon cycle

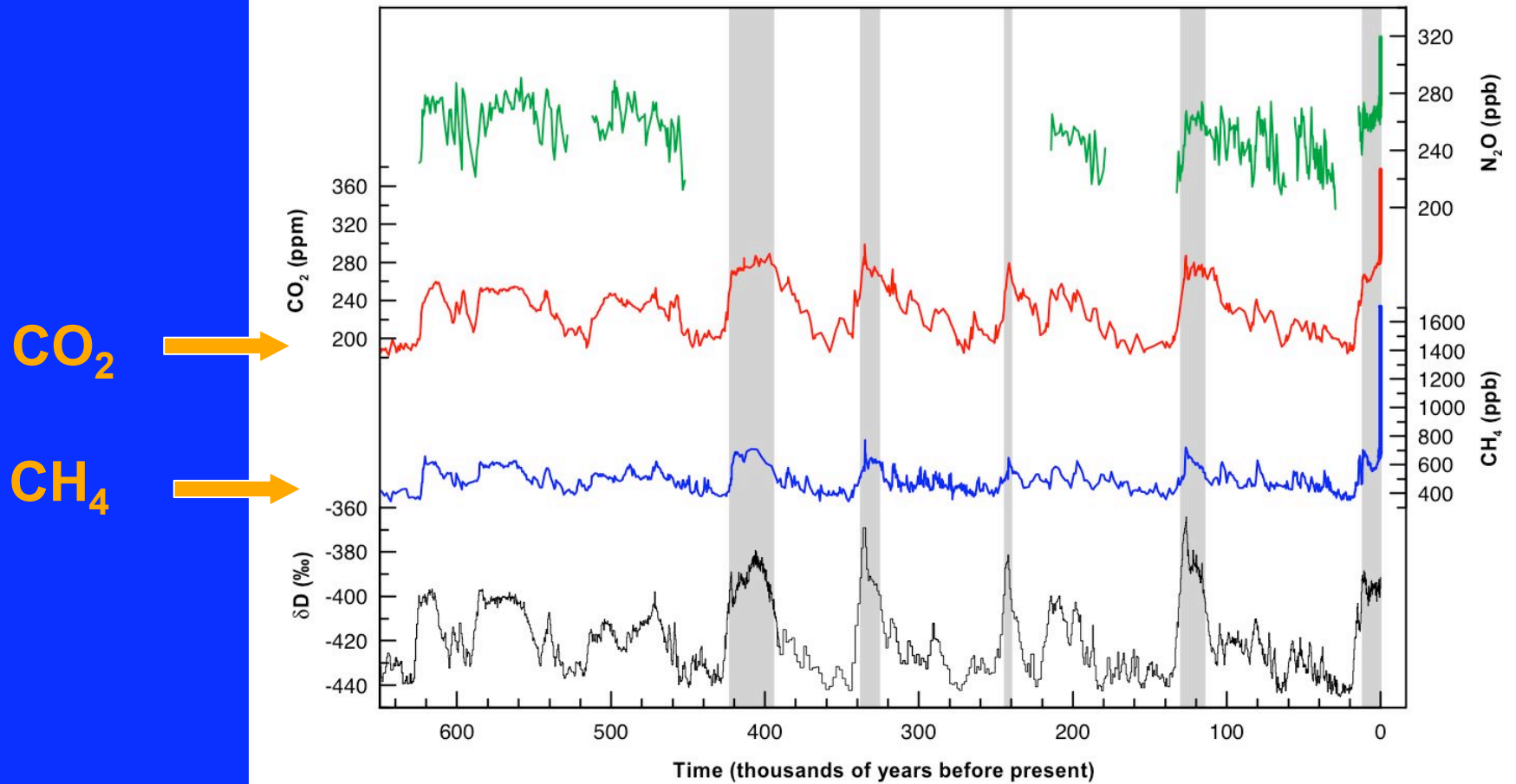


CO₂ is actually dramatically increasing in the atmosphere

This increase is primarily due to fossil fuel combustion



Glacial-Interglacial Ice Core Data



The largest concentrations in CO_2 and CH_4 over the last million year

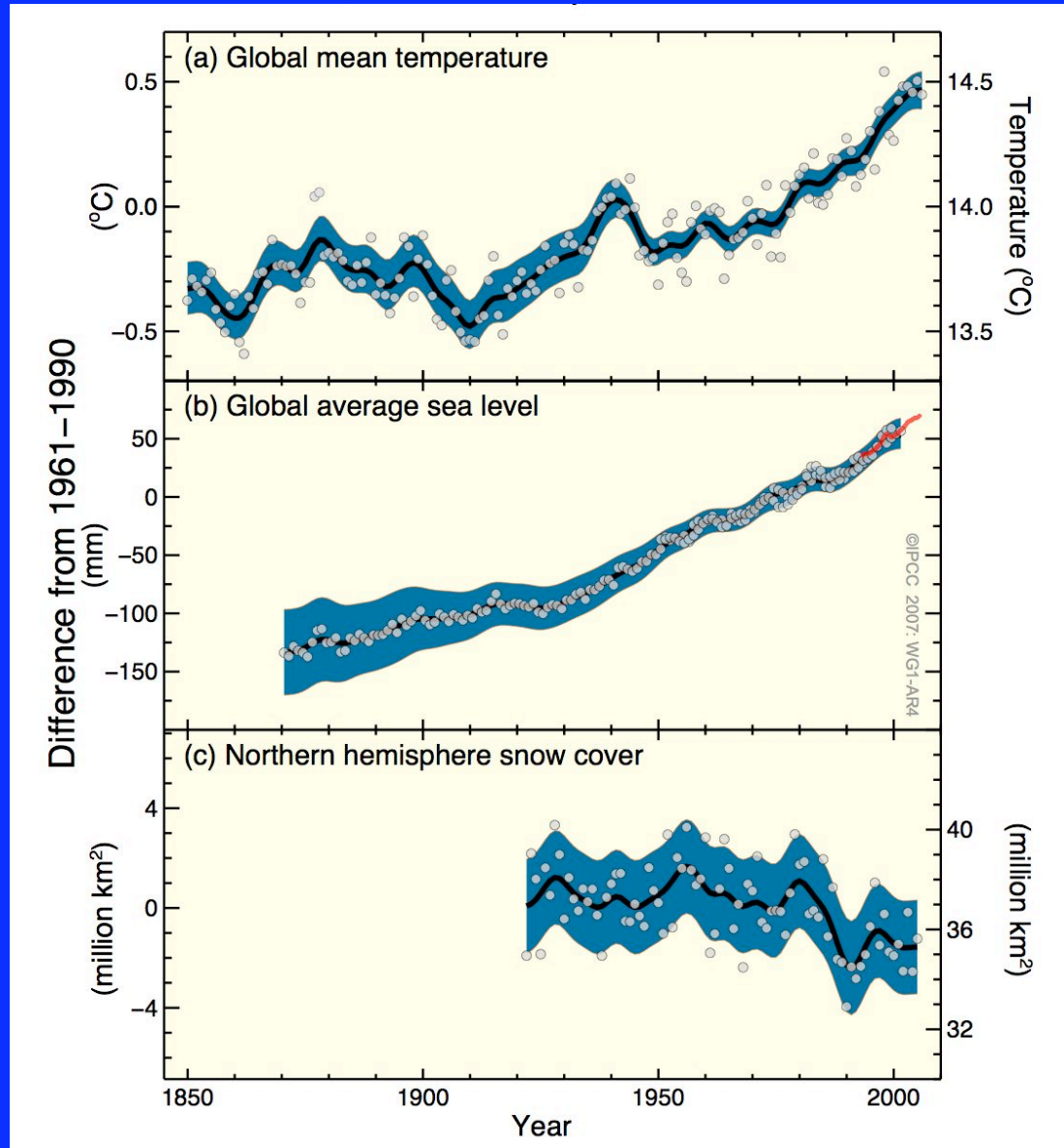
Global Warming

IPCC (GIEC) feb 2007

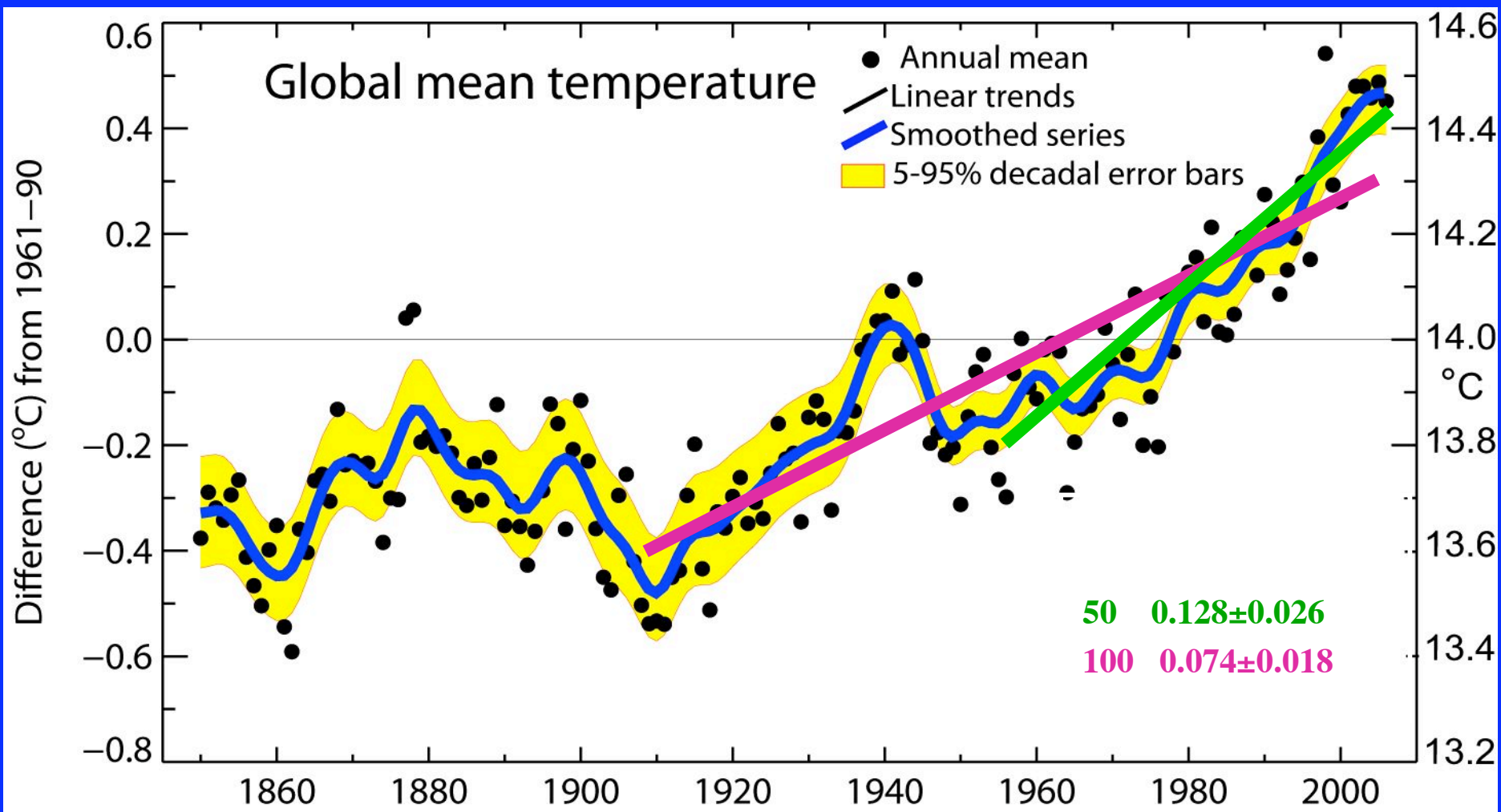
Average T

Average sea level

Northern hemisphere
Snow cover



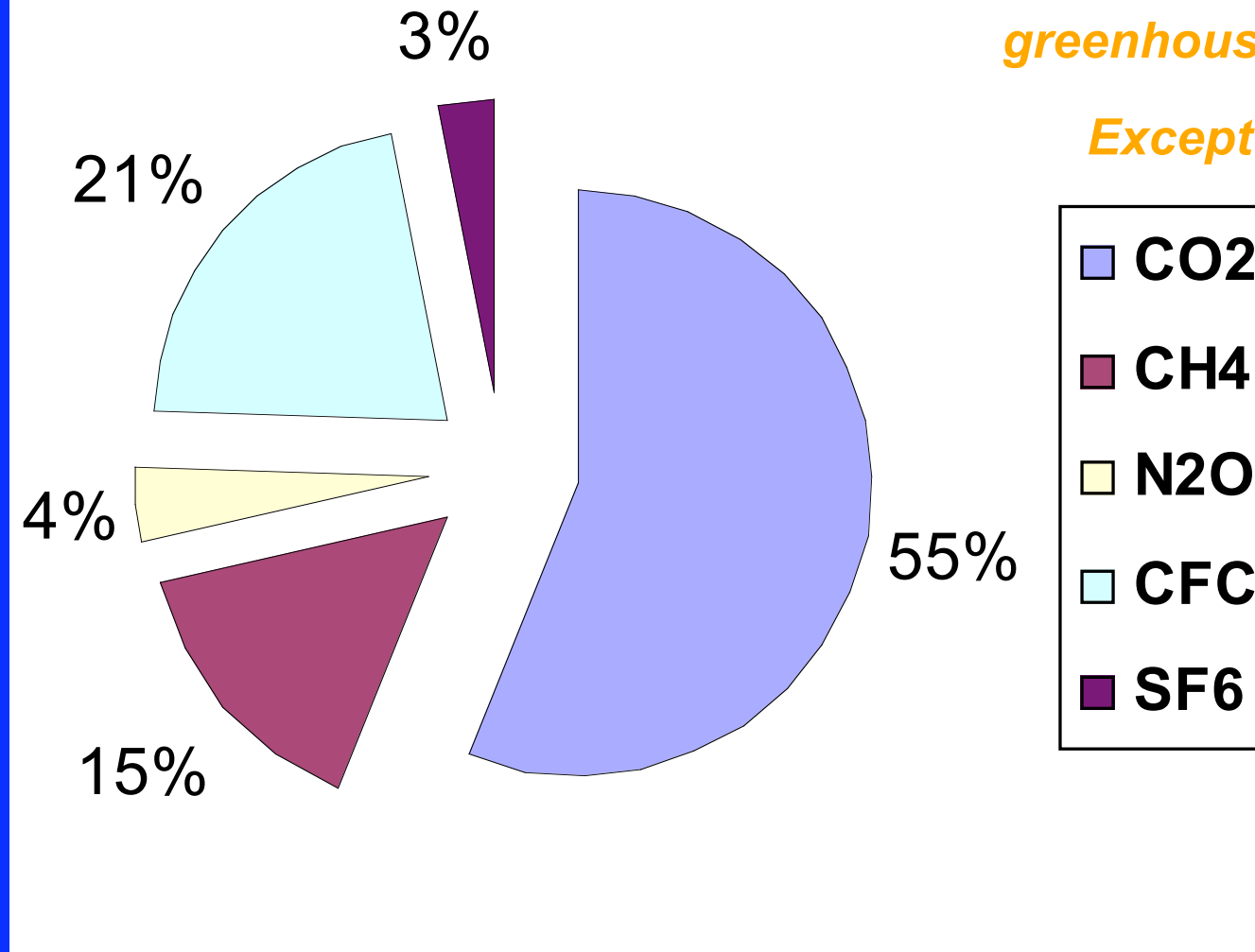
Reality of global warming



CO₂ is a « greenhouse » gas

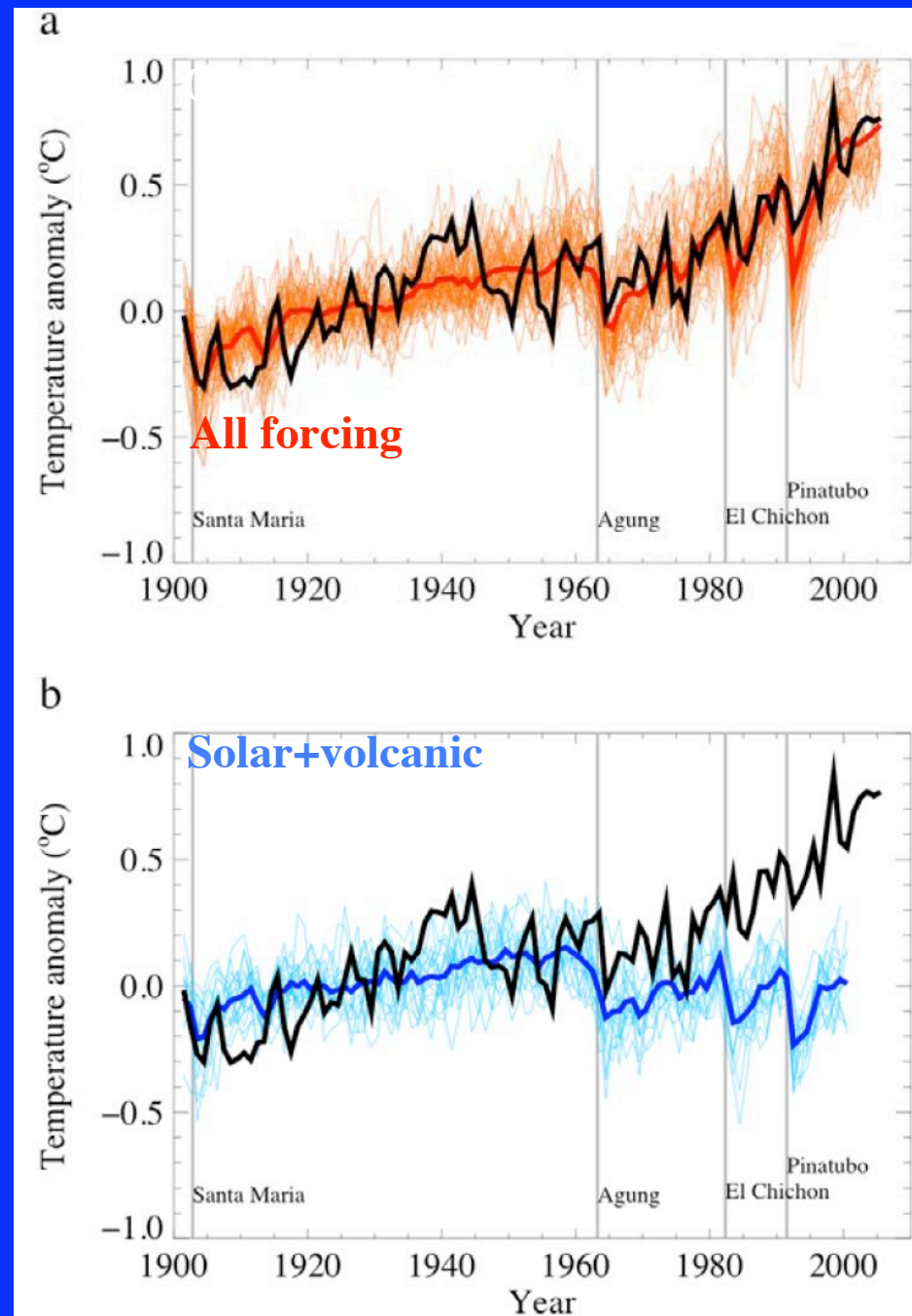
*Contributions to
greenhouse heating*

Except water



Model-supported link between atmospheric CO₂ increase and global warming

Minimal statement:
Even those who do not
believe that CO₂ increase
is the primary cause of
global warming will
probably be ready to
accept that decreasing
atmospheric CO₂ will
have cooling effects and
that it is one of the only
possible reasonable action
of mankind on climate



CO₂ is an « acid » gas

*Corals may suffer
from ocean acidification*



Seawater

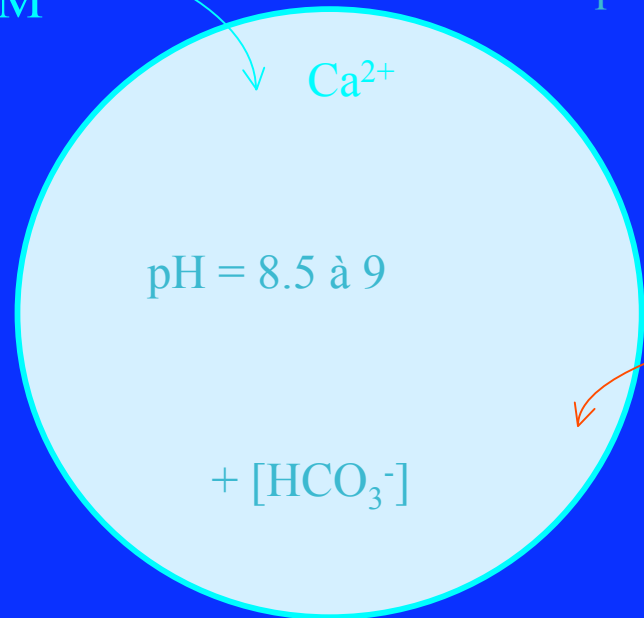
$[Ca^{2+}] = 10 \text{ à } 11 \text{ mM}$

$[CO_3^{2-}] = 100 \text{ à } 300 \text{ } \mu\text{M}$

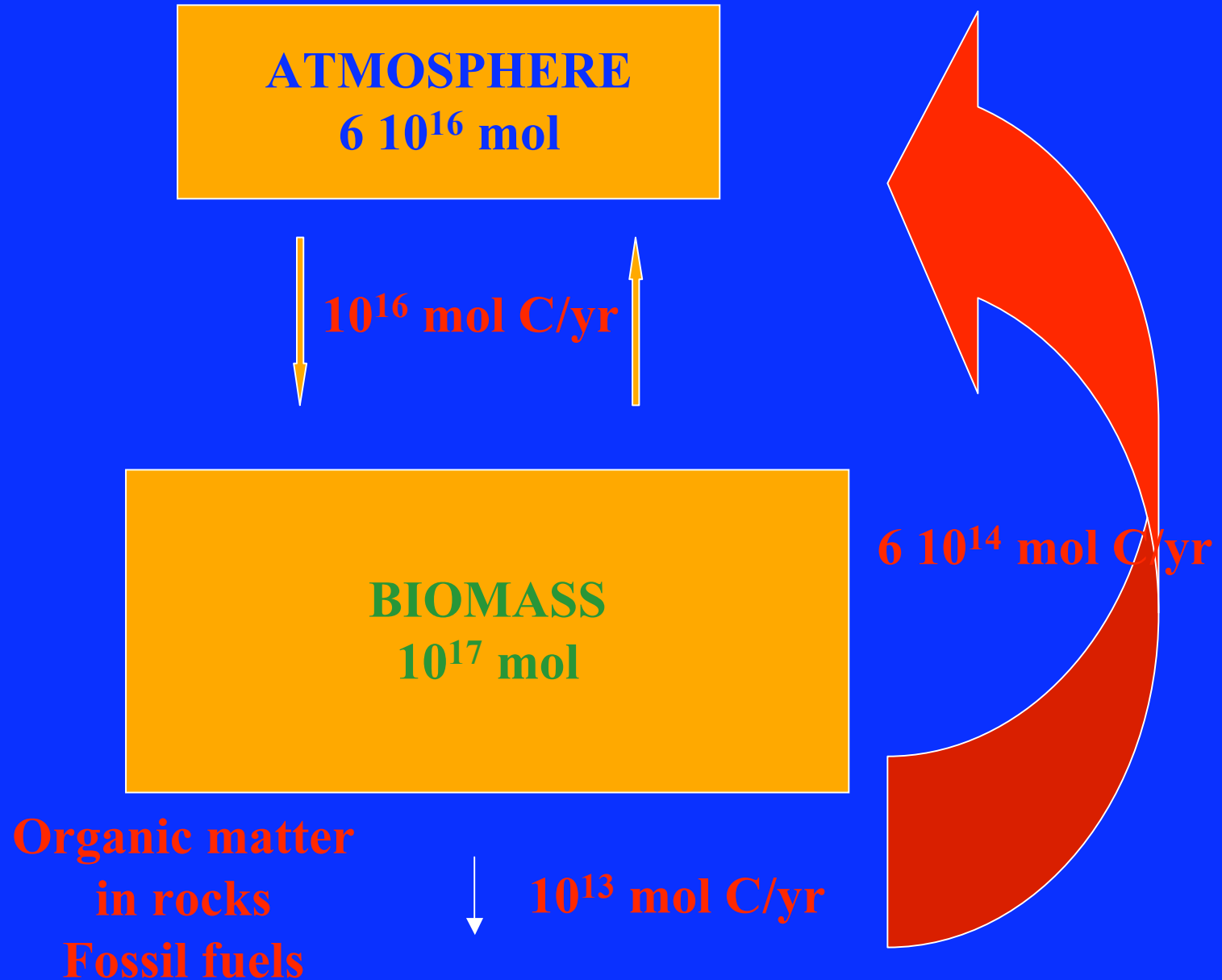
endoplasm

pH = 7.2

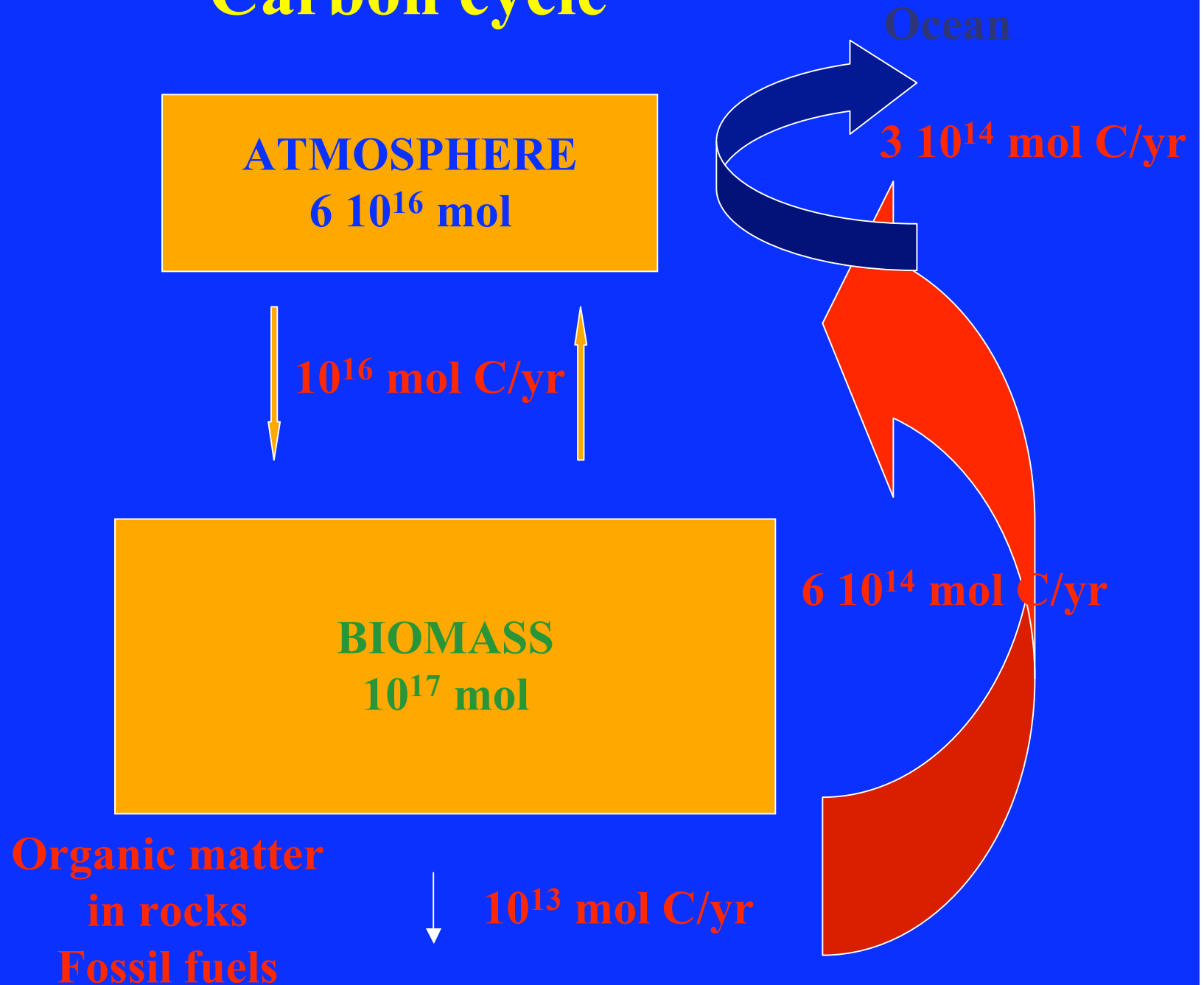
Chloroplastes ou
algues
symbiotiques



Carbon cycle



Carbon cycle

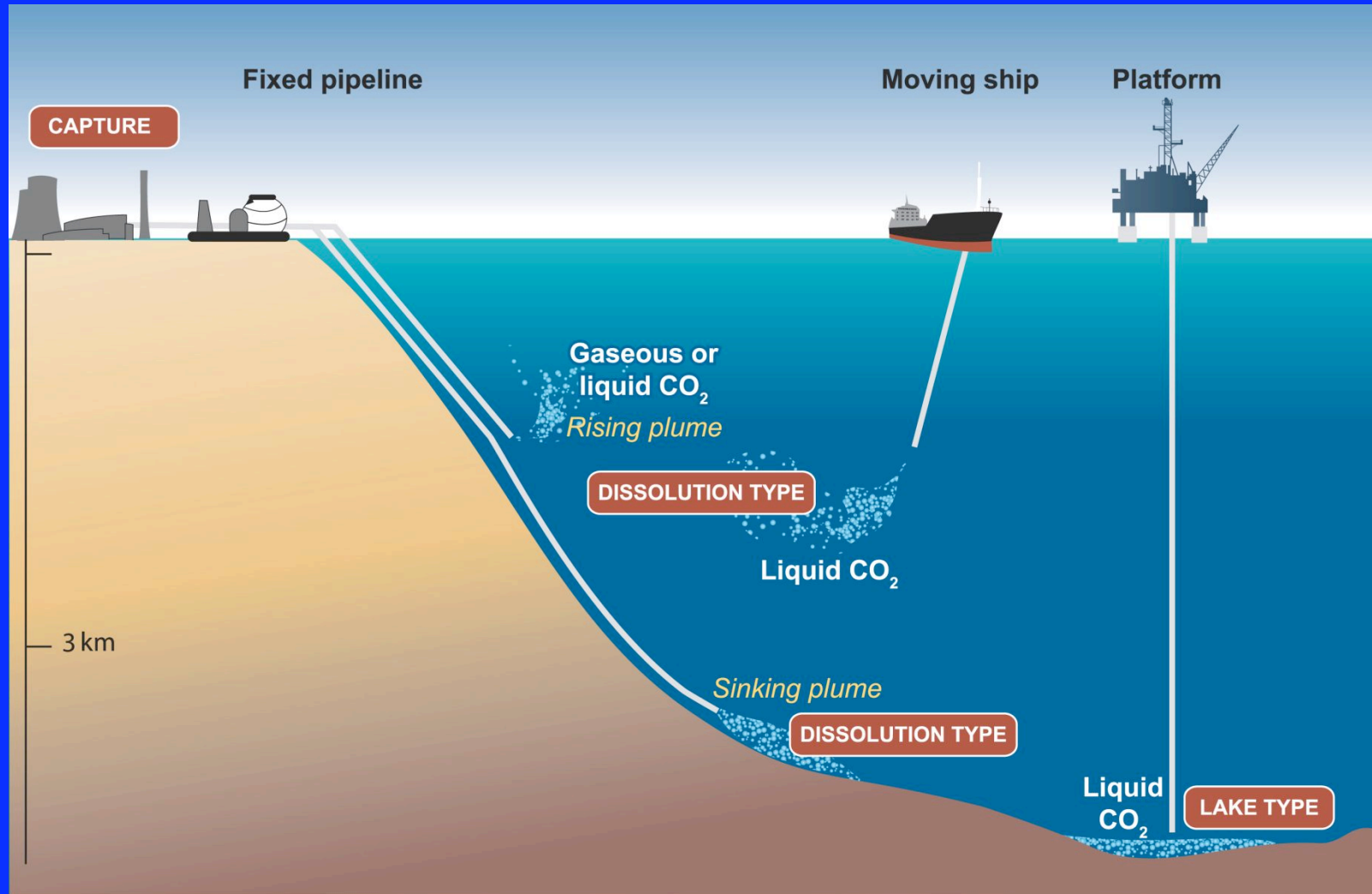


CO₂ sink

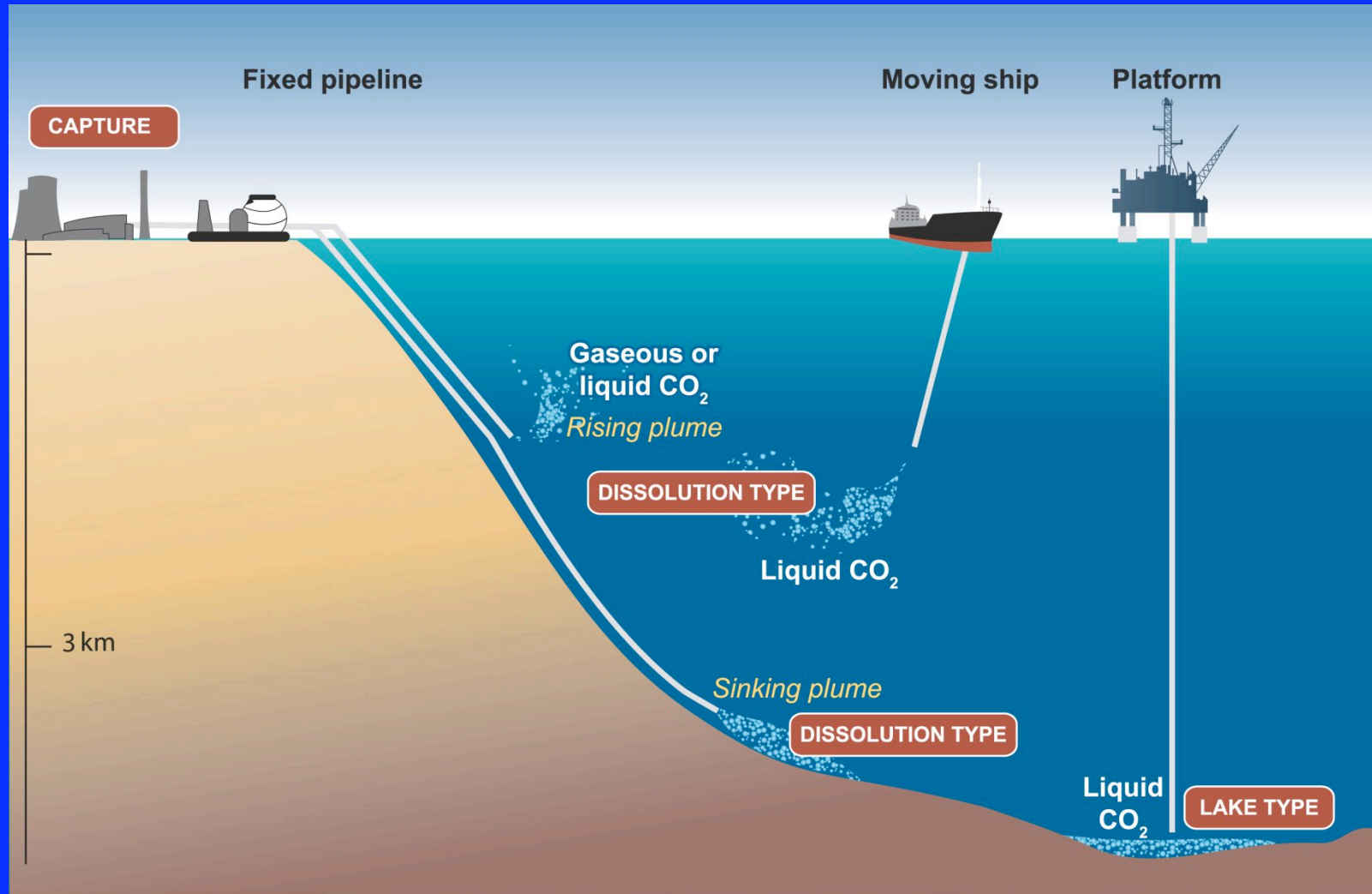
Ocean $3 \cdot 10^{14}$ mol C/yr

Characteristic mixing time : several kyrs

Acceleration?



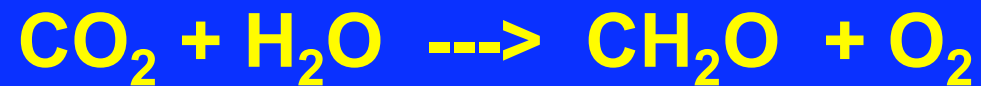
Not a good idea

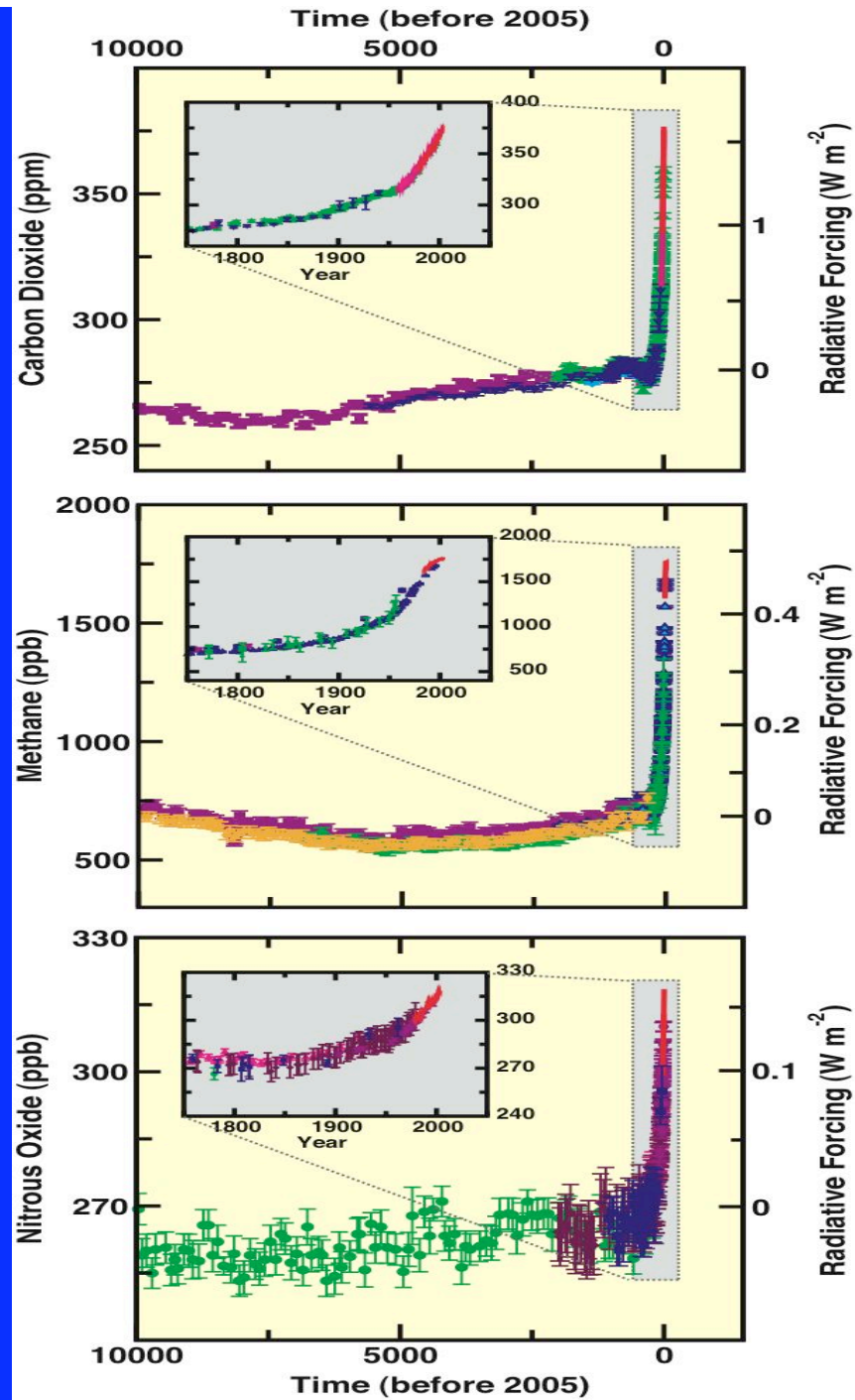


CO₂ sink

Biomass 10^{14} mol C/yr

How to make more biomass?





Eutrophication



Phytoplankton enhancement





Fertilization

