



# Estado da arte das mudanças climáticas: visão global e regional.

## O que dizem os modelos sobre o Nordeste

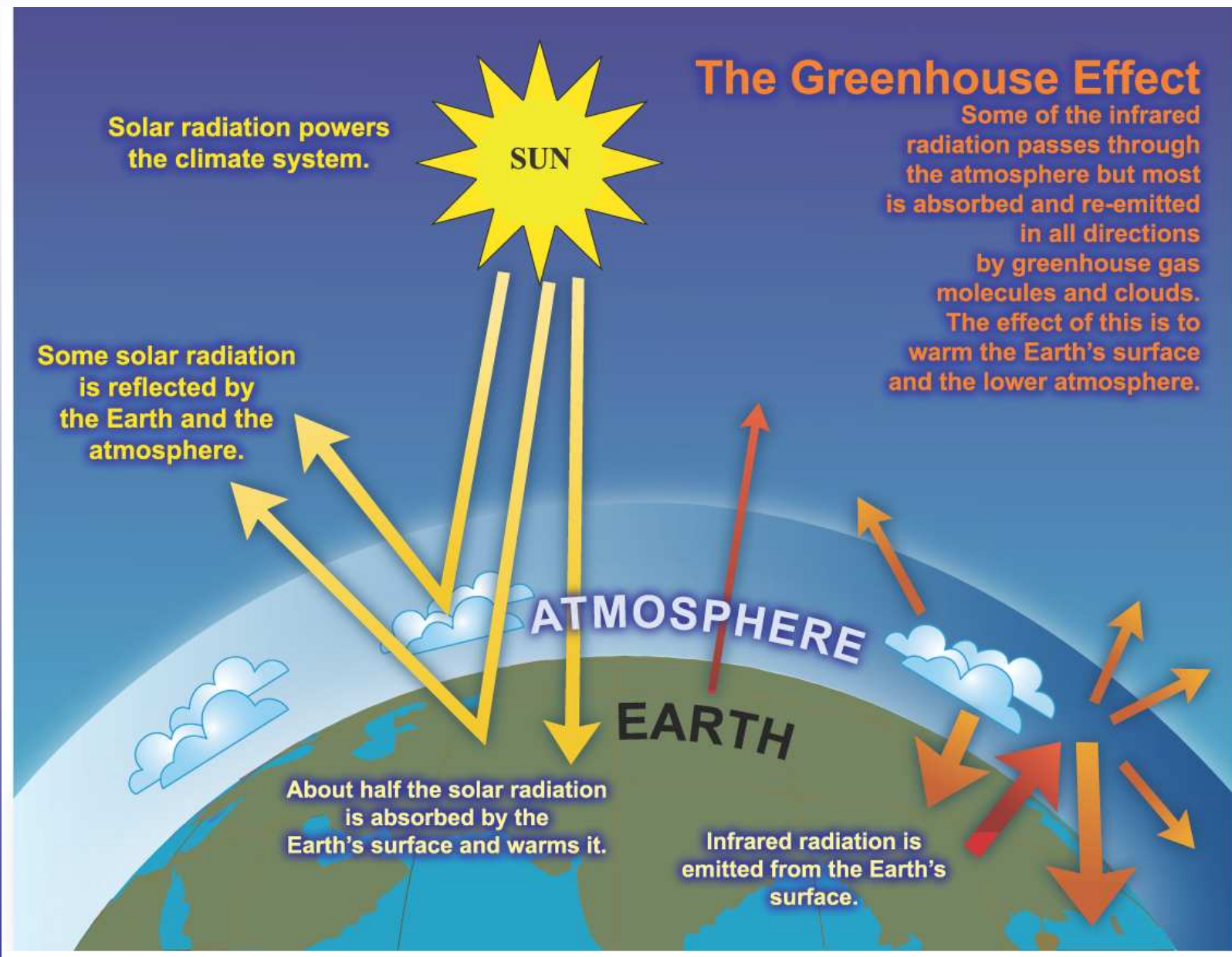
Paulo Nobre

Instituto Nacional de Pesquisas Espaciais - INPE

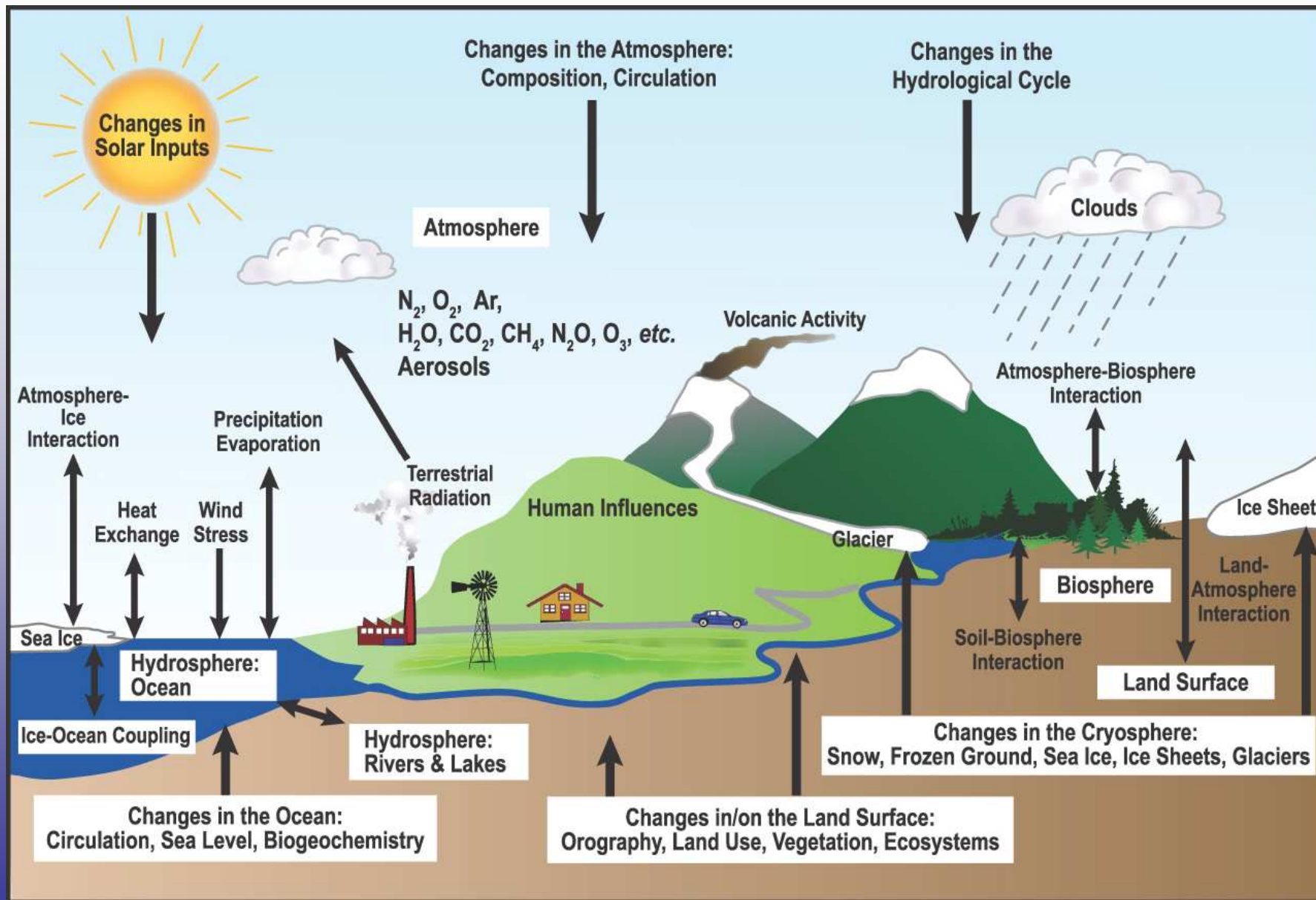
Lançamento do Forum Pernambucano de Mudanças Climáticas

Recife, 17 Fevereiro 2009





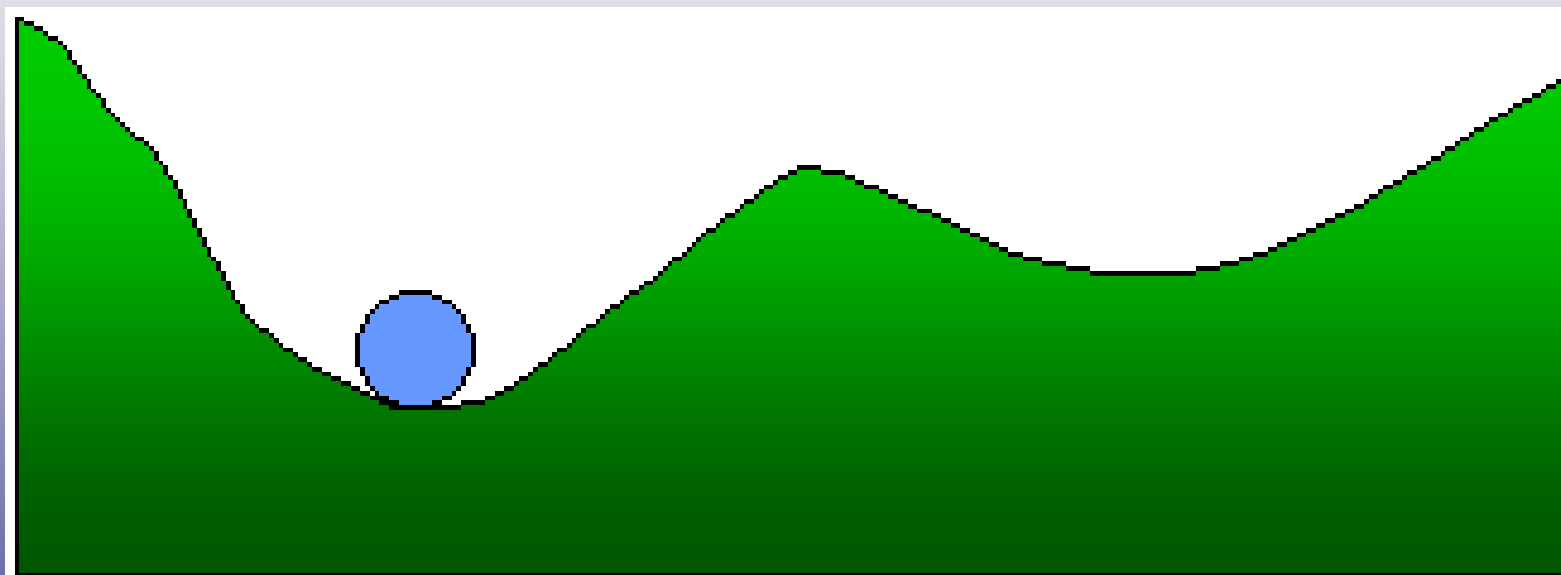
Source: Intergovernmental Panel on Climate Change (IPCC) AR4.



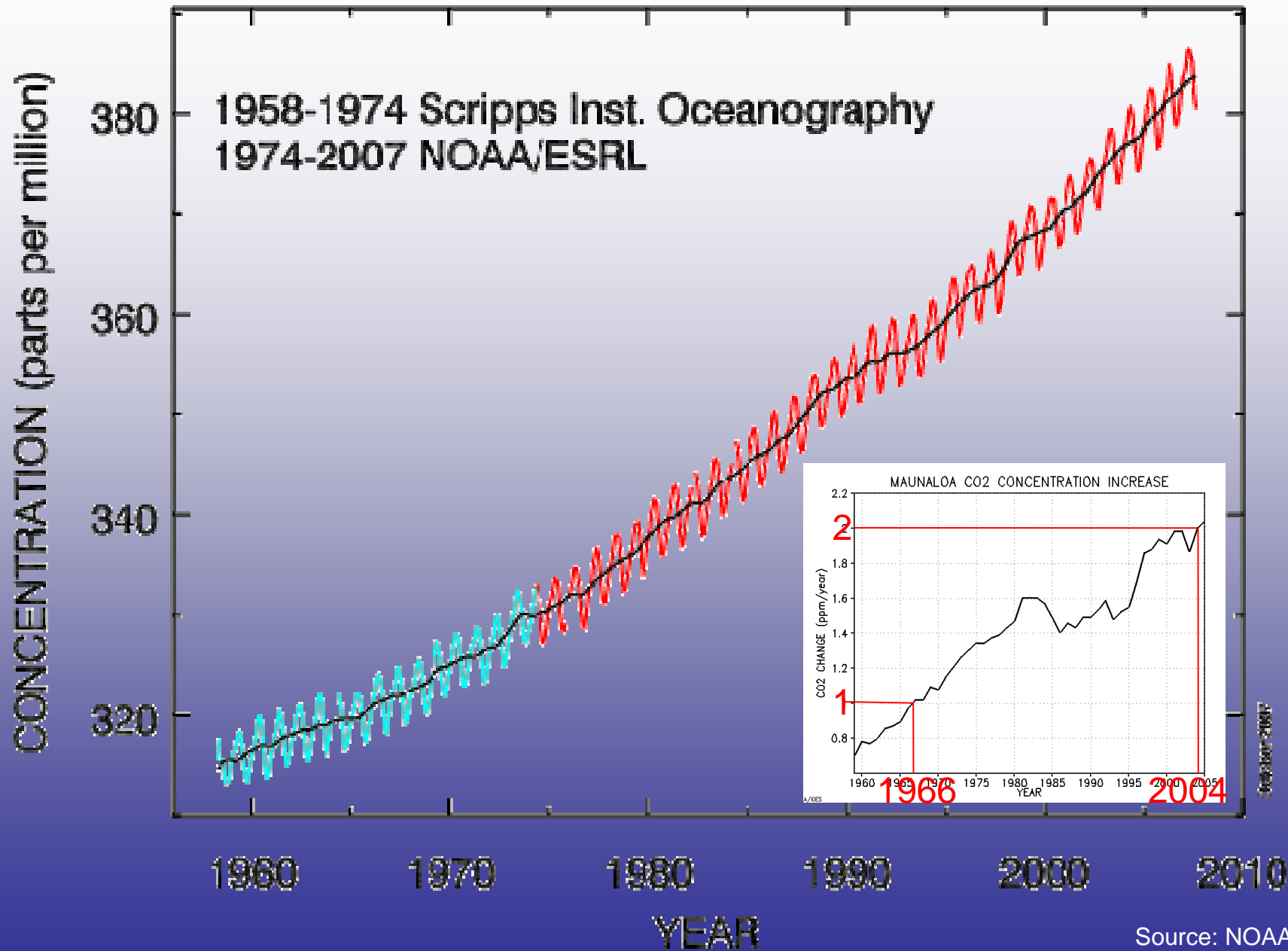
Source: Intergovernmental Panel on Climate Change (IPCC) AR4.



# Dynamical Equilibria Change



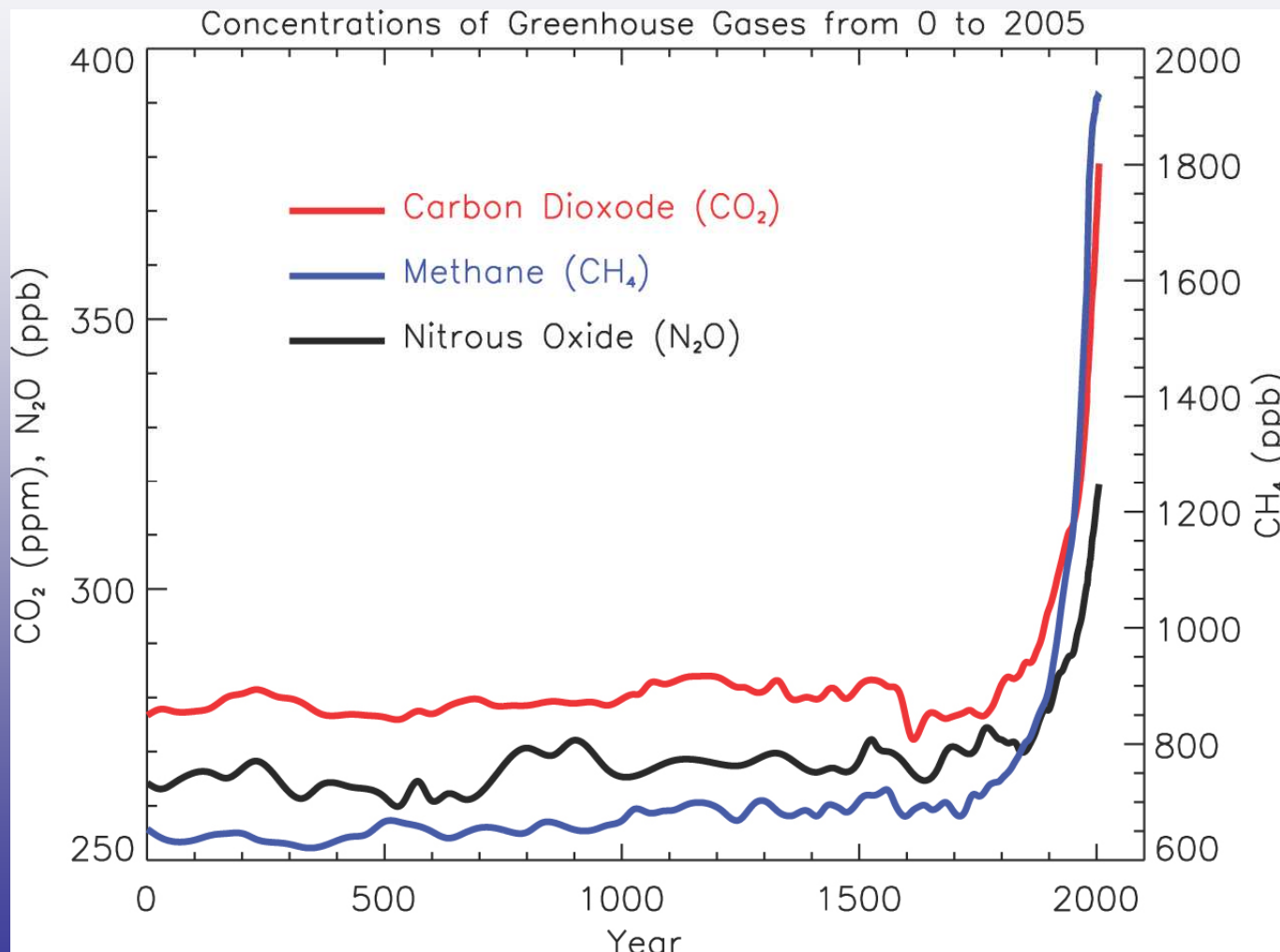
# Atmospheric CO<sub>2</sub> at Mauna Loa Observatory



Source: NOAA.

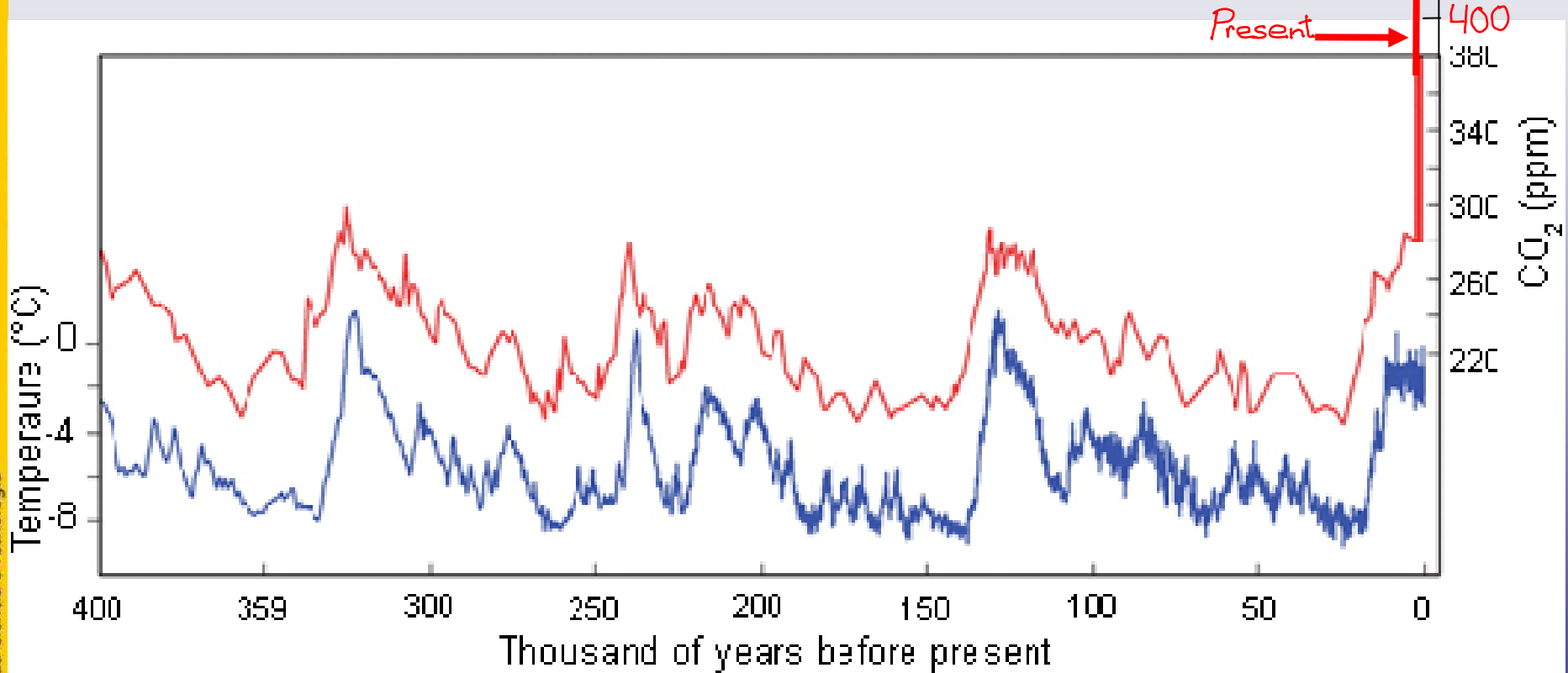


# Concentrations of GHG

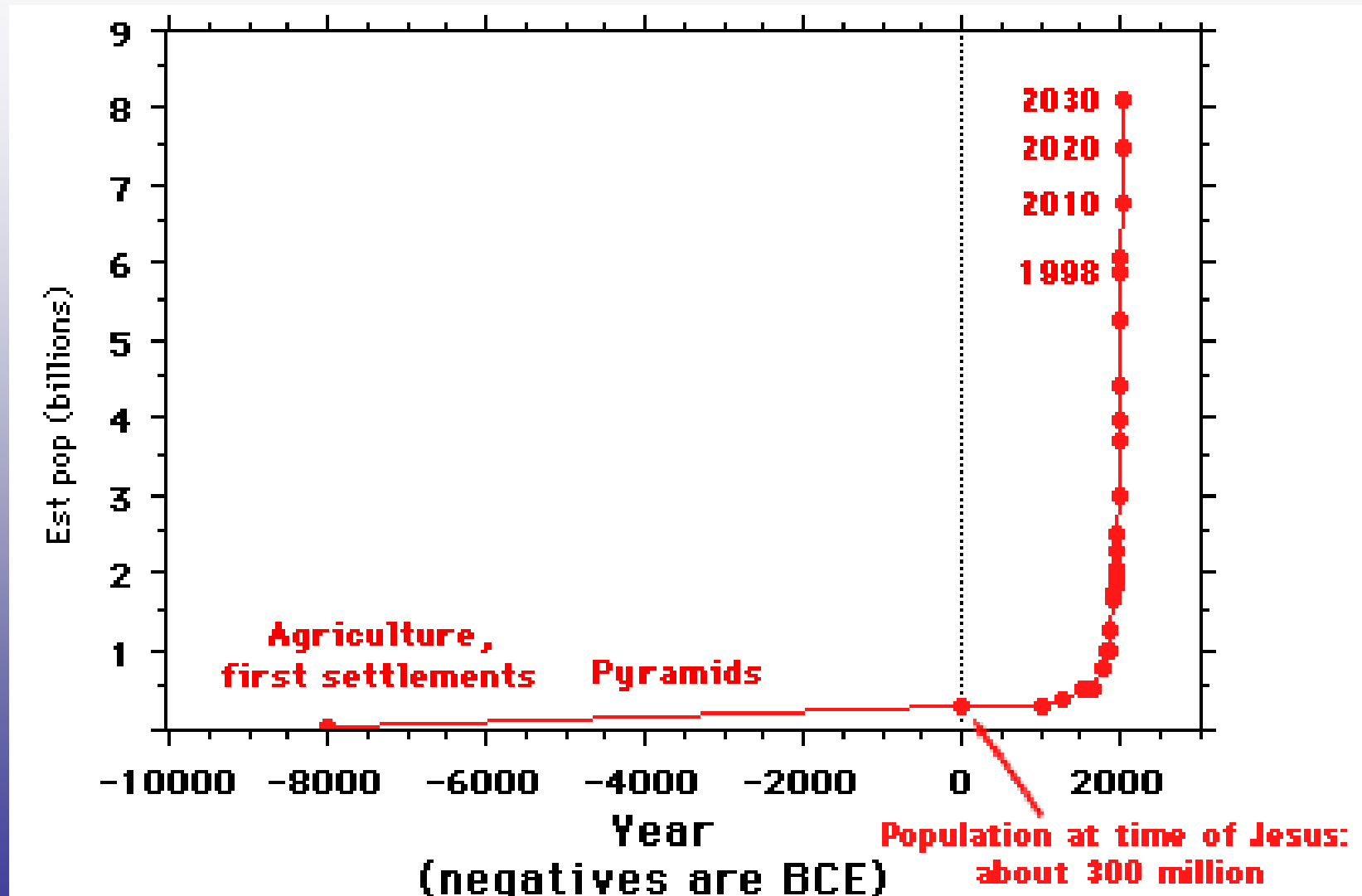


Source: Intergovernmental Panel on Climate Change (IPCC) AR4.

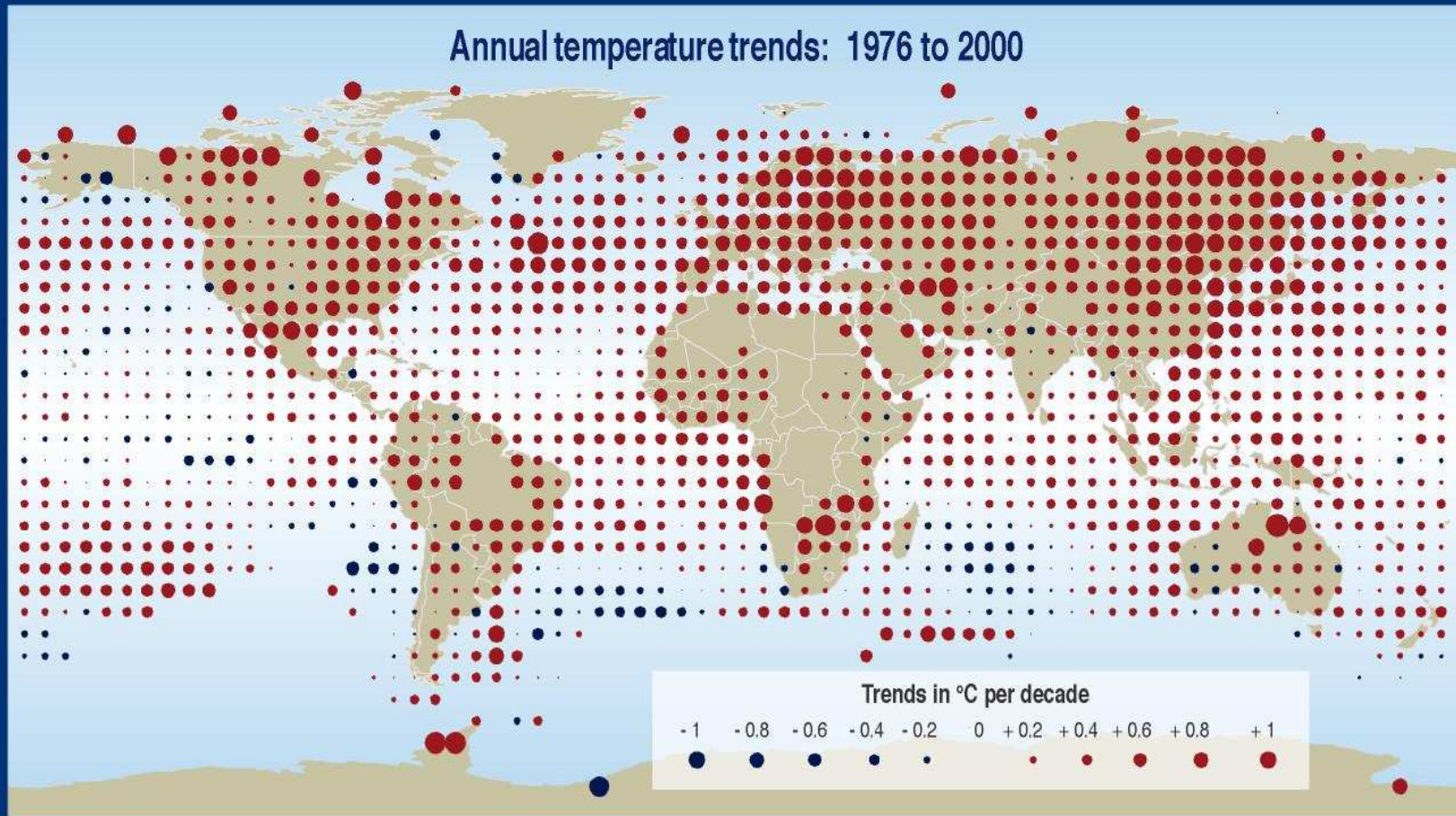
# Global $\text{CO}_2$ Concentration & Air Temperature during the last 400,000 years



# World Population



### Annual temperature trends: 1976 to 2000

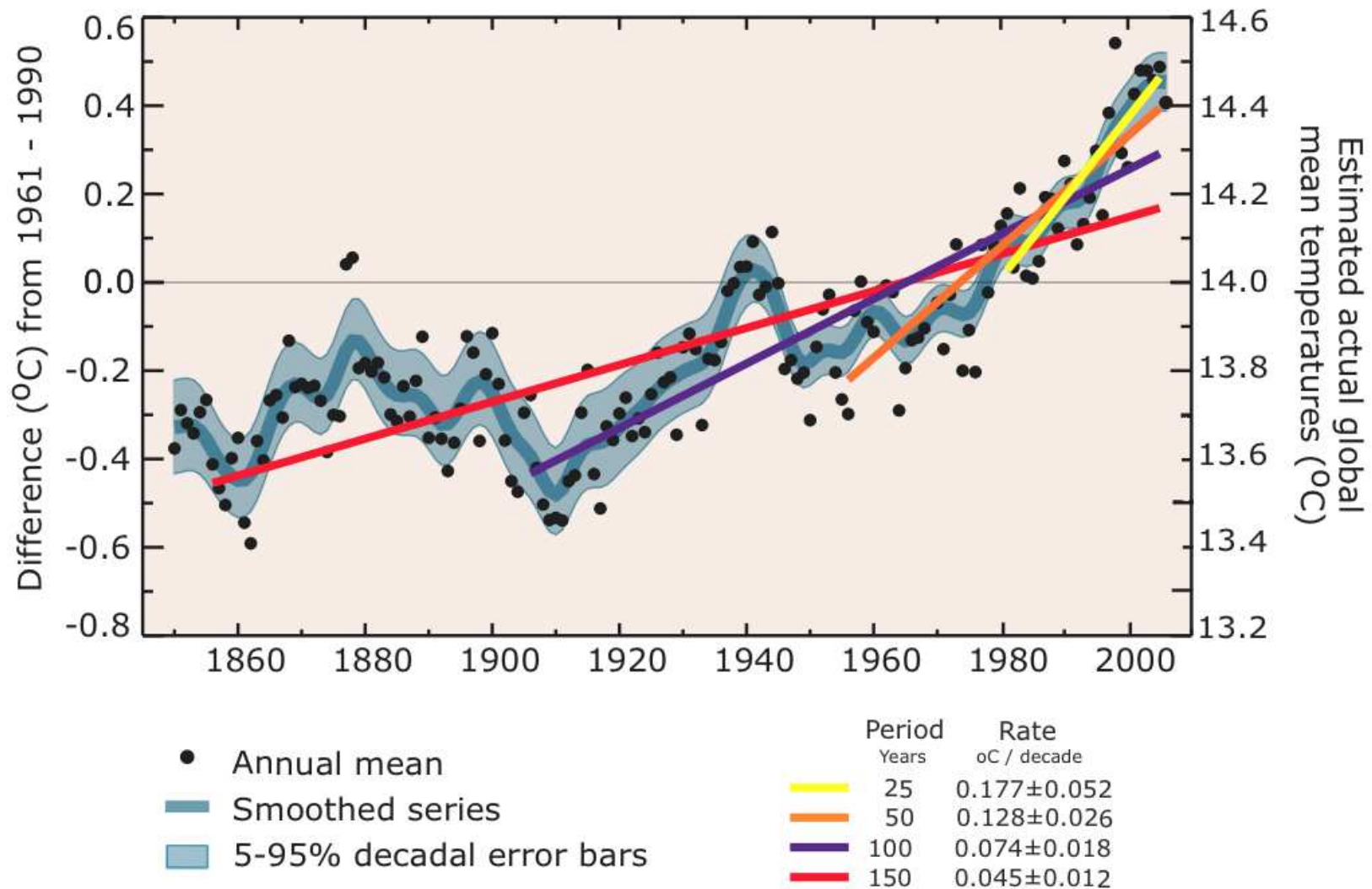


SYR - FIGURE 2-6b

# Climate change is accelerating



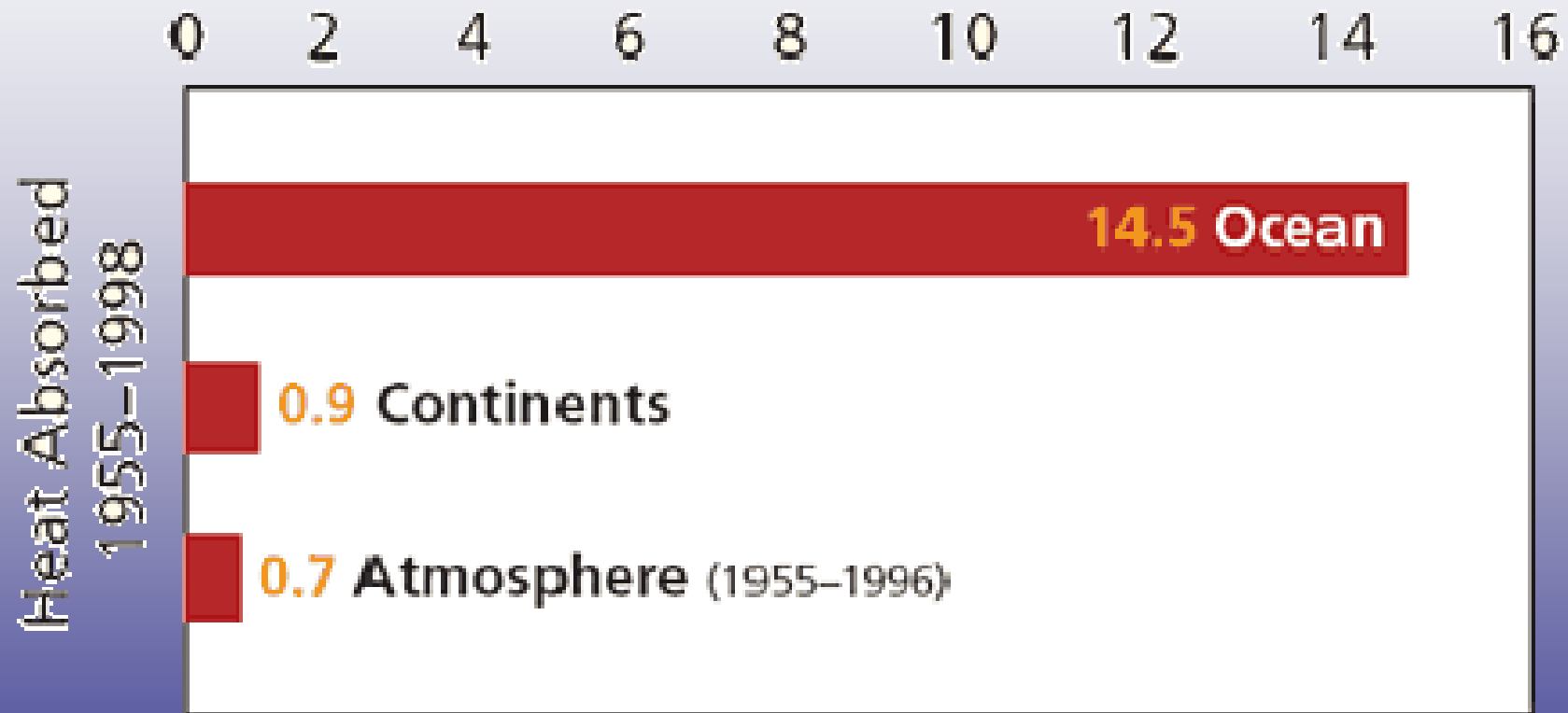
Global mean temperature



Source: Intergovernmental Panel on Climate Change (IPCC) AR4.



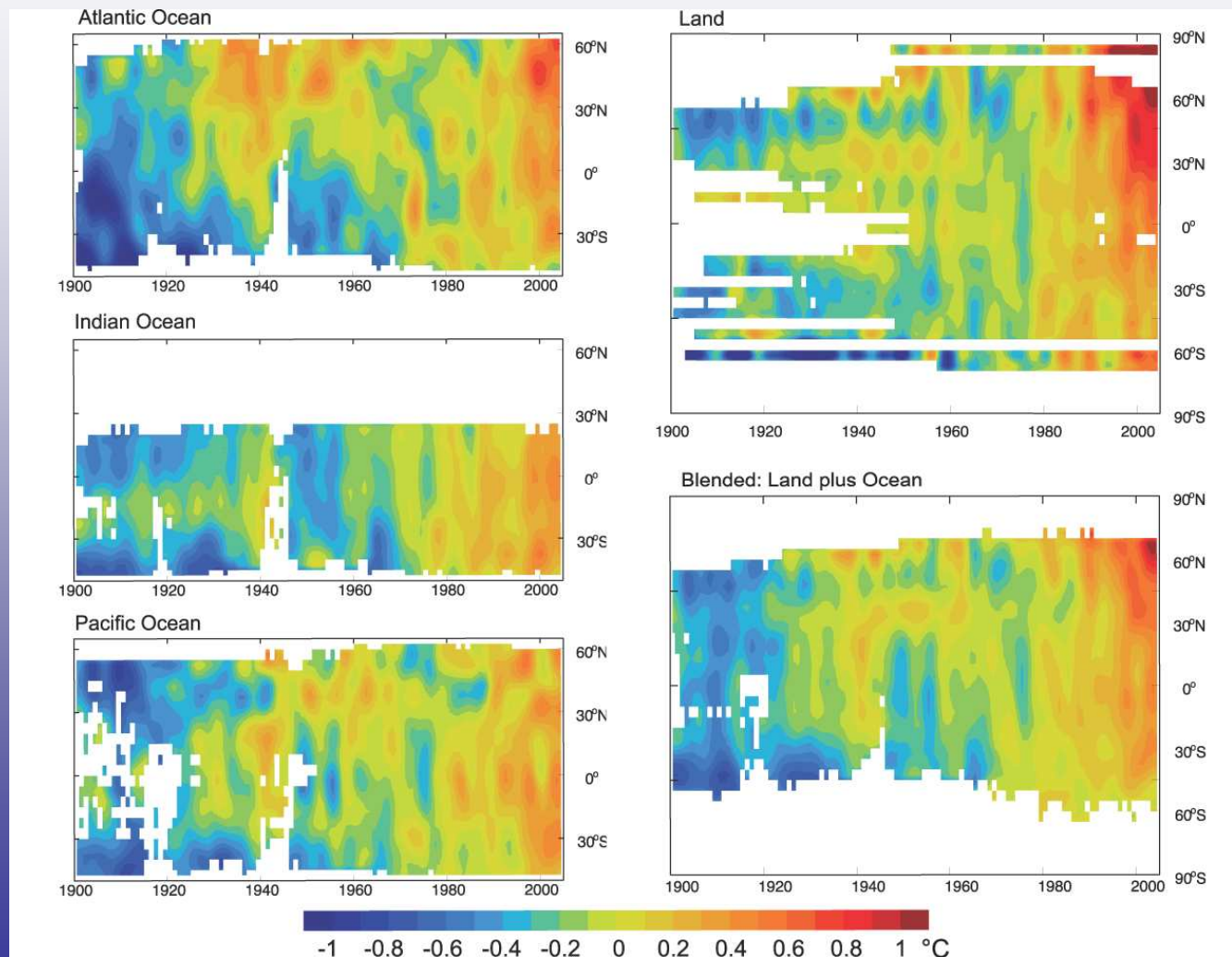
# The oceans absorb 80% of the Greenhouse extra heating.



Data source: Levitus, Antonov and Boyer (2005).  
Earth's heat balance presented in units of  $10^{26}$  joules—

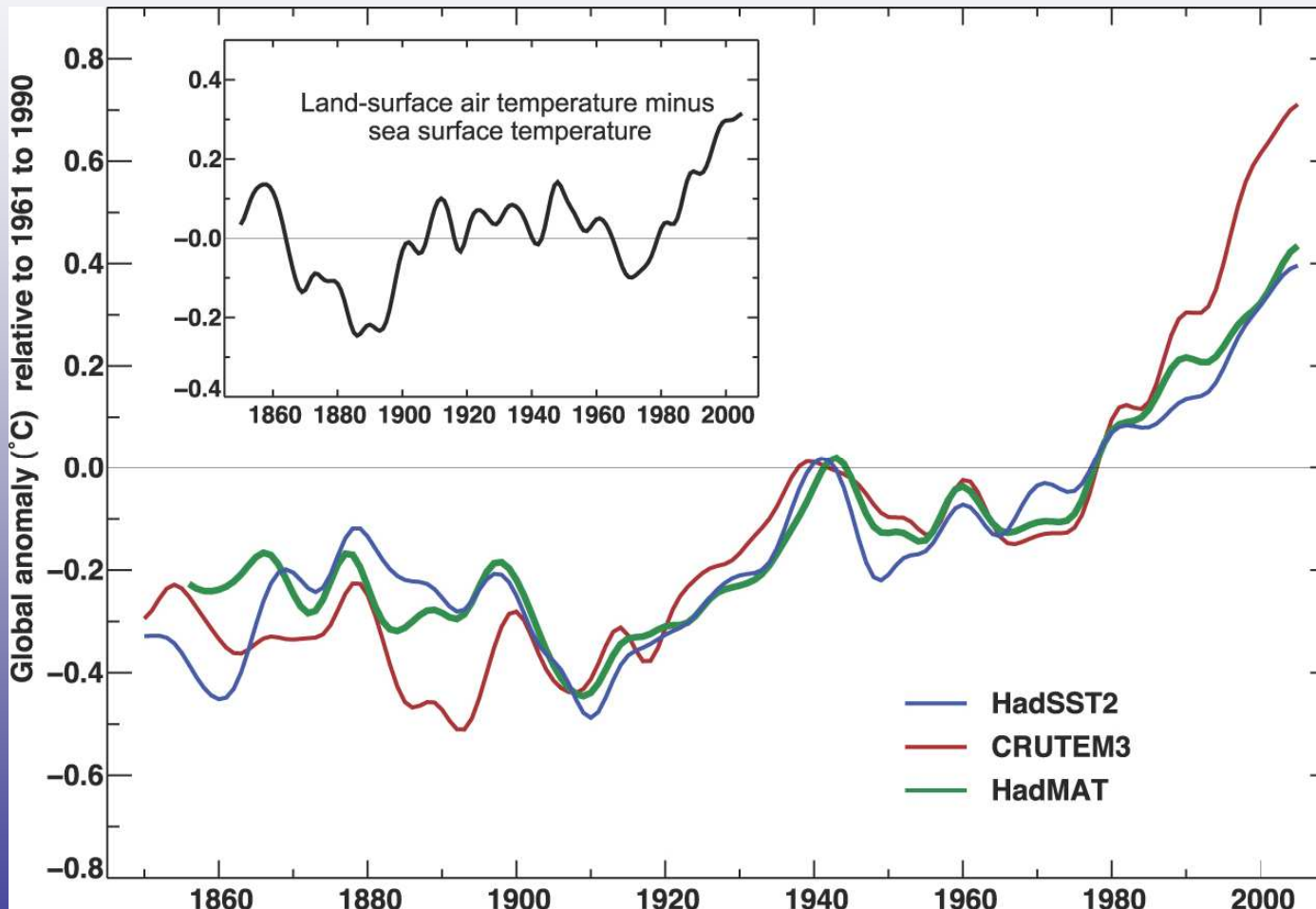


# Upper Oceans & Land Temperature trends



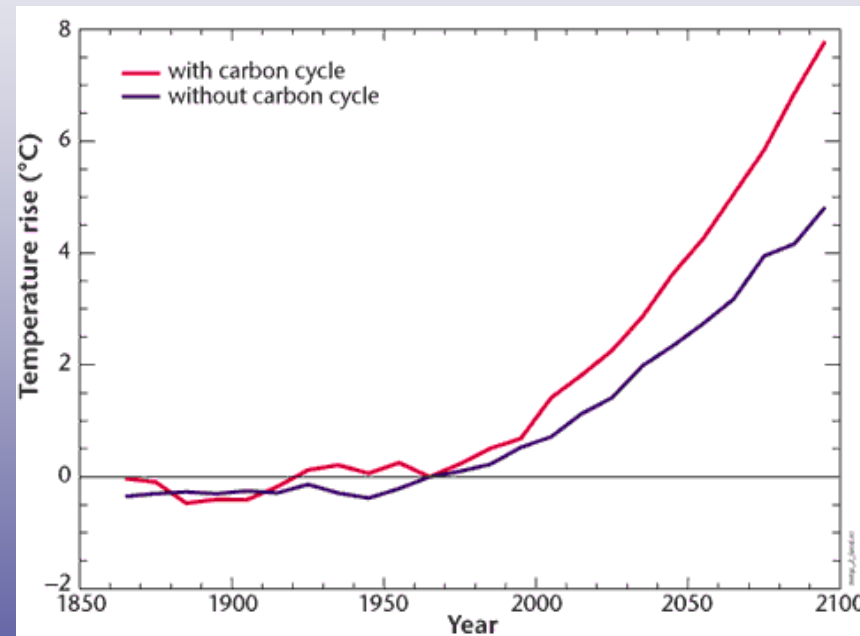
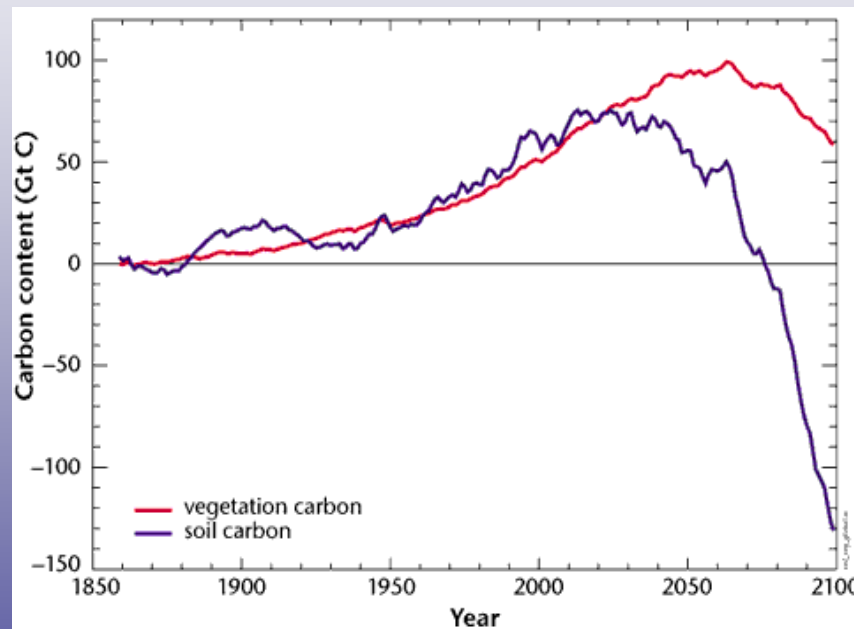
Source: Intergovernmental Panel on Climate Change (IPCC) AR4.

# Land areas are warming faster than the oceans



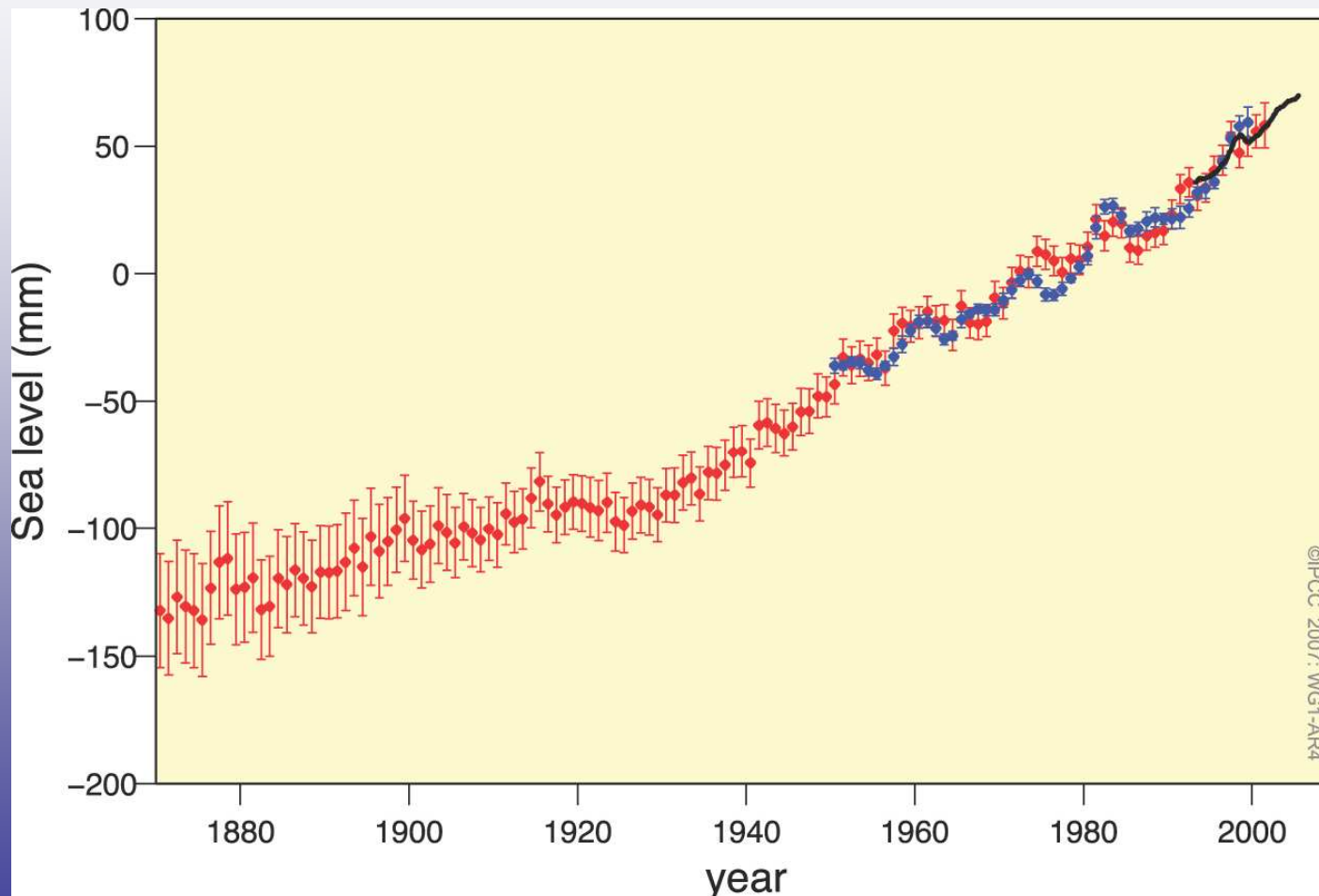


# Carbon Cycle Effects on Carbon and Temperature Changes





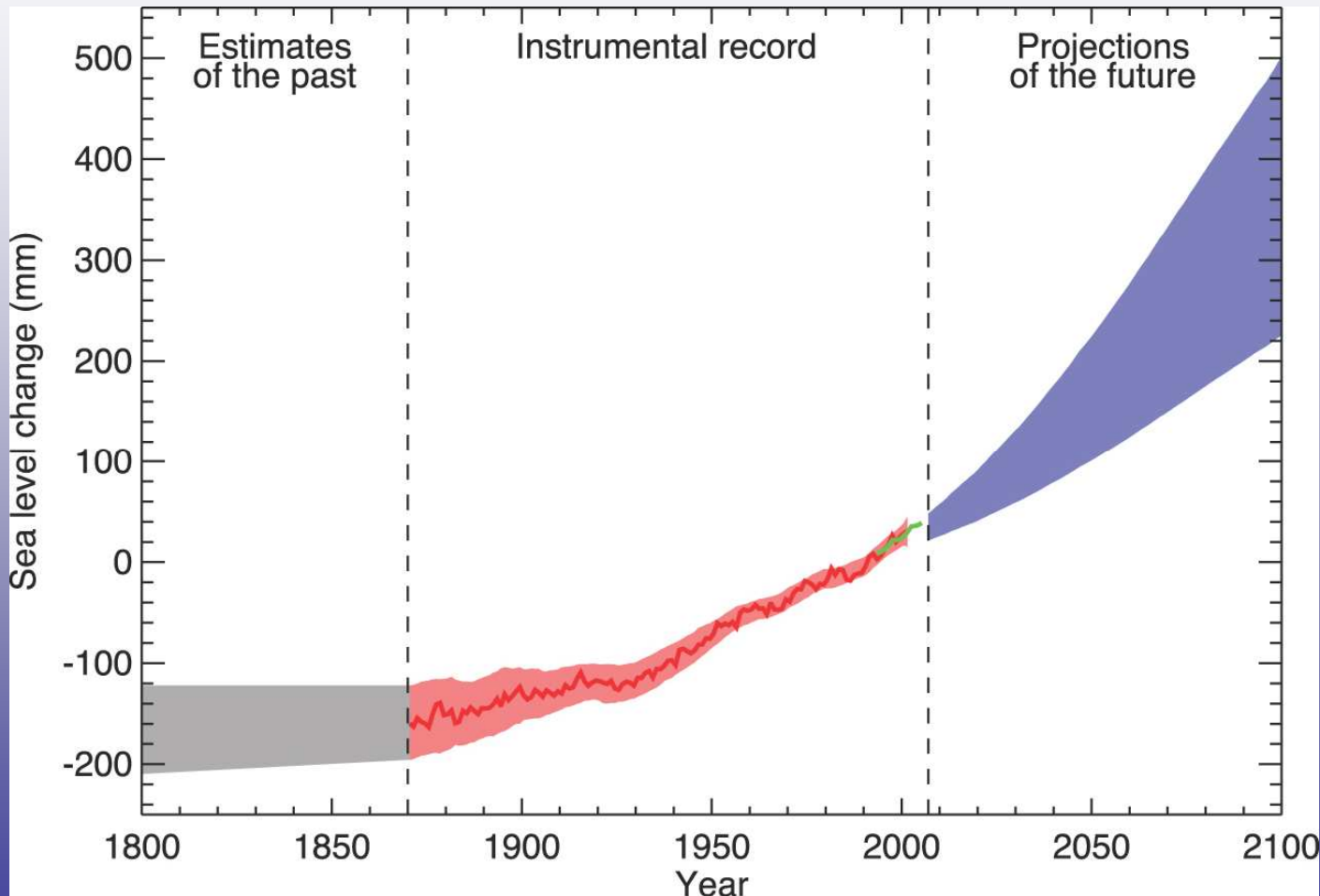
# Global Sea Level is Rising



Source: Intergovernmental Panel on Climate Change (IPCC) AR4.



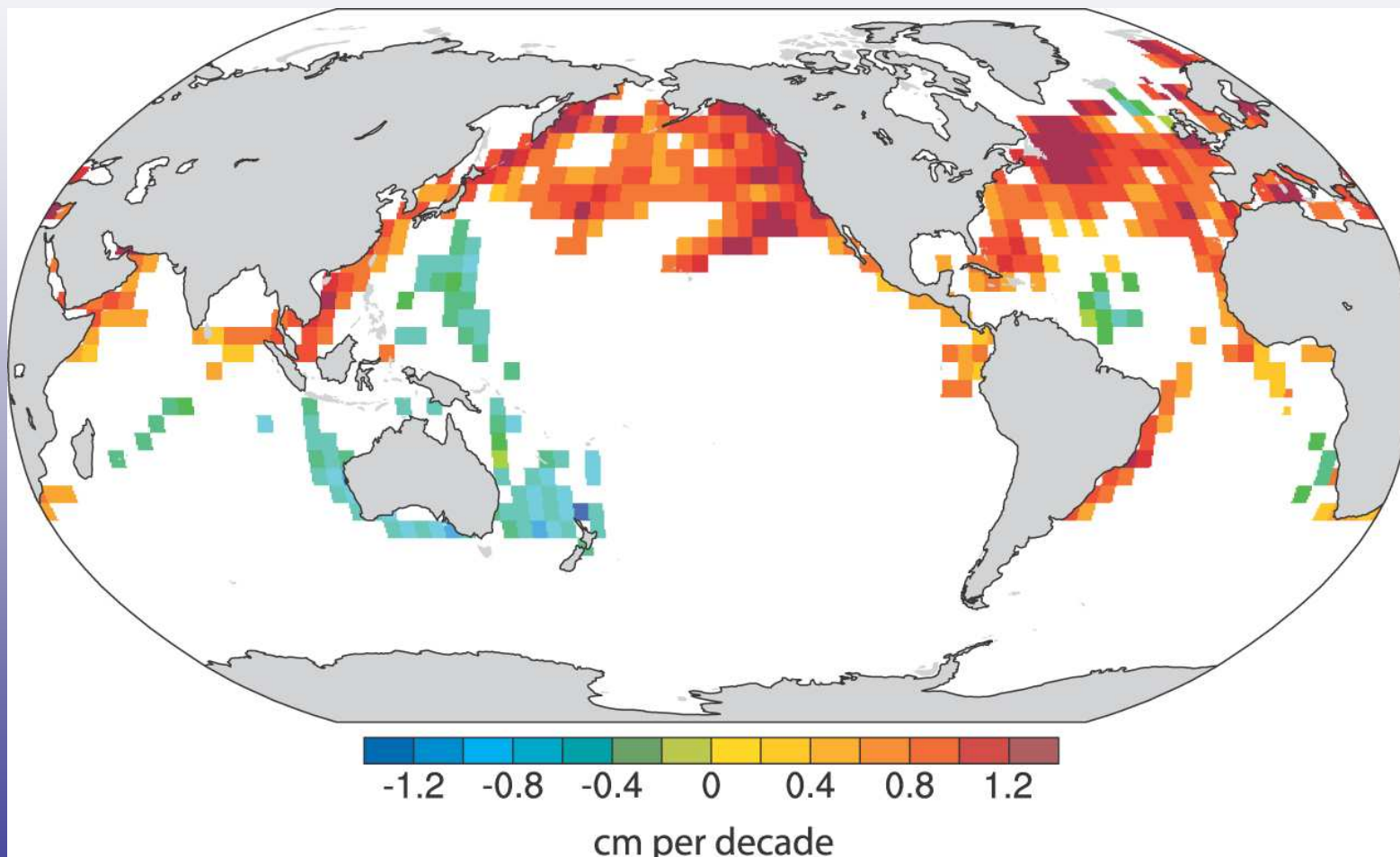
# Global Sea Level Observation/Projections



Source: Intergovernmental Panel on Climate Change (IPCC) AR4.



# Observed Sea Level Change

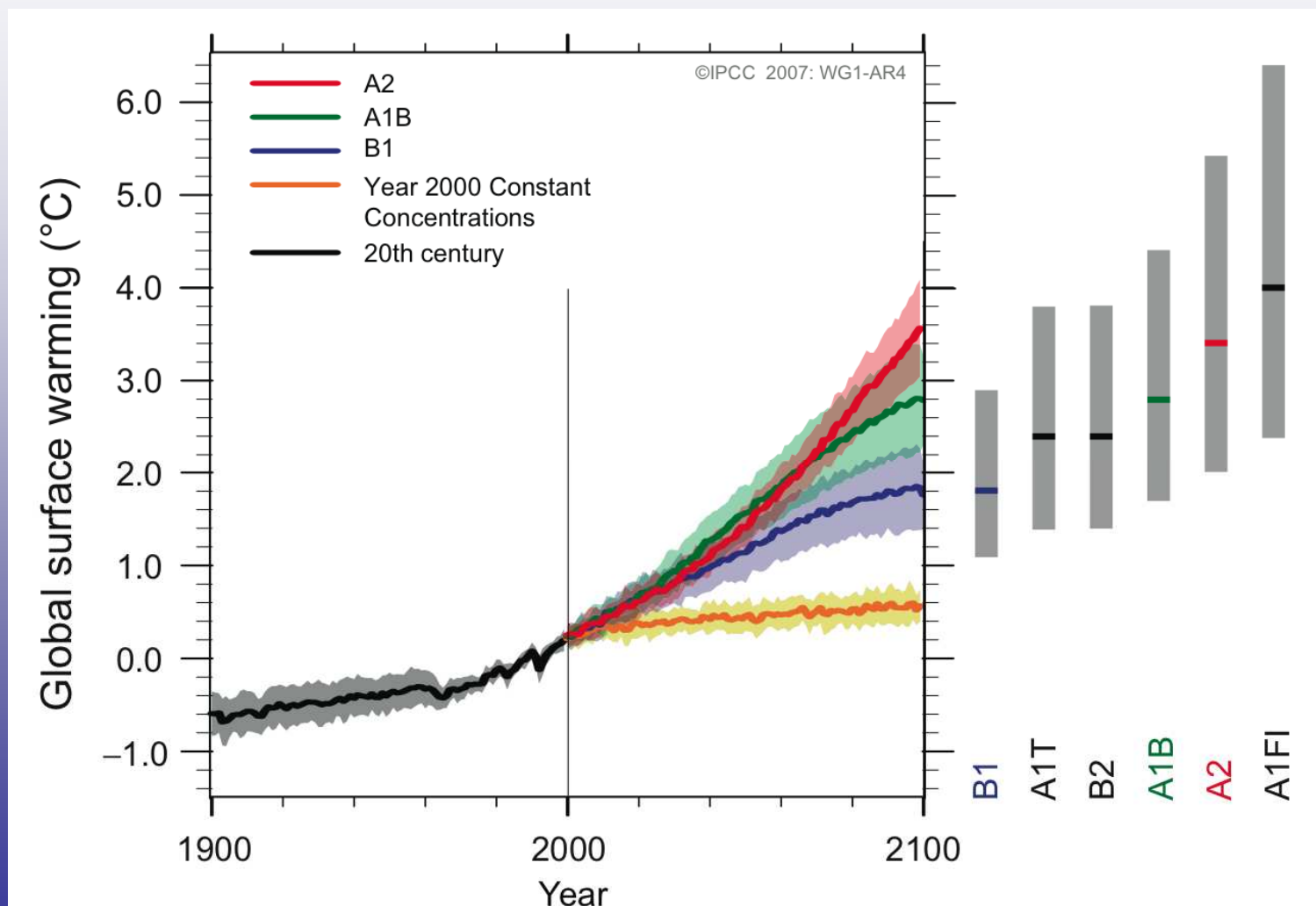


Source: Intergovernmental Panel on Climate Change (IPCC) AR4.



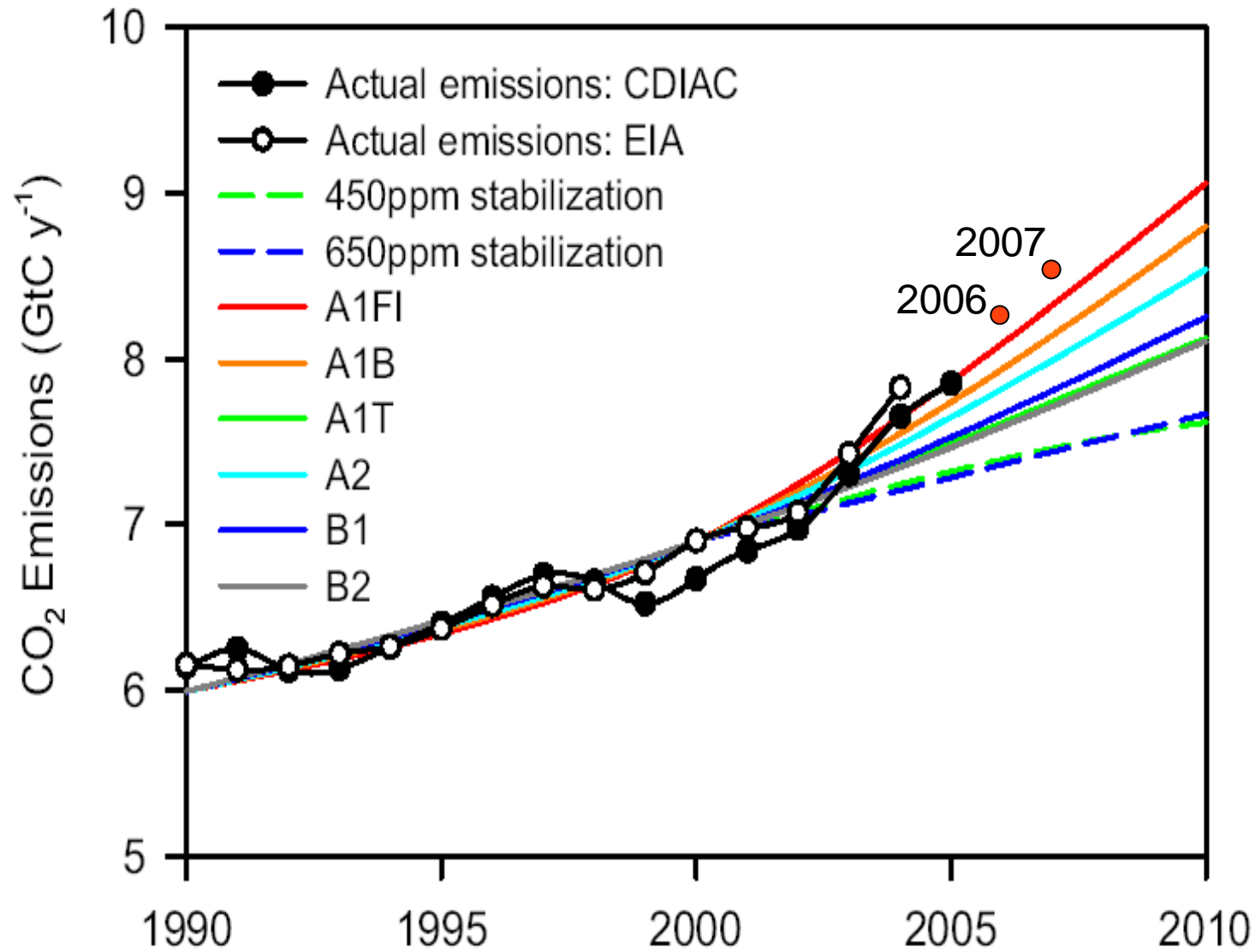
# Warming will continue

Projected future warming with different emissions scenarios



Source: Intergovernmental Panel on Climate Change (IPCC) AR4.

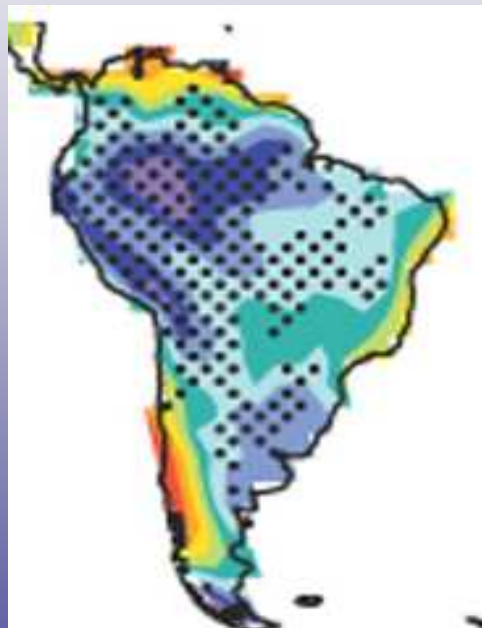
# So how are we doing so far...?



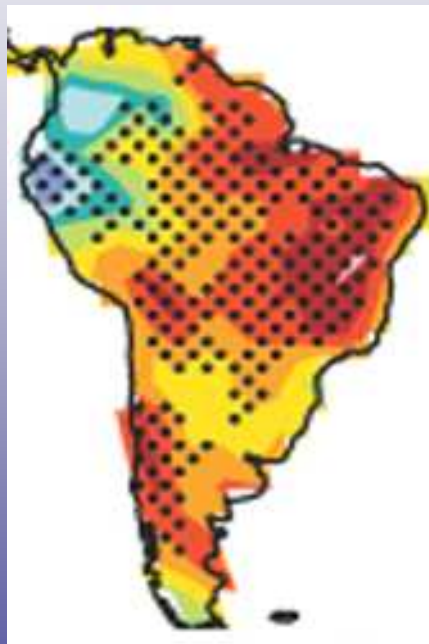


# Extreme Events Scenarios

Precip. Intensity



Dry Days



Heat Waves

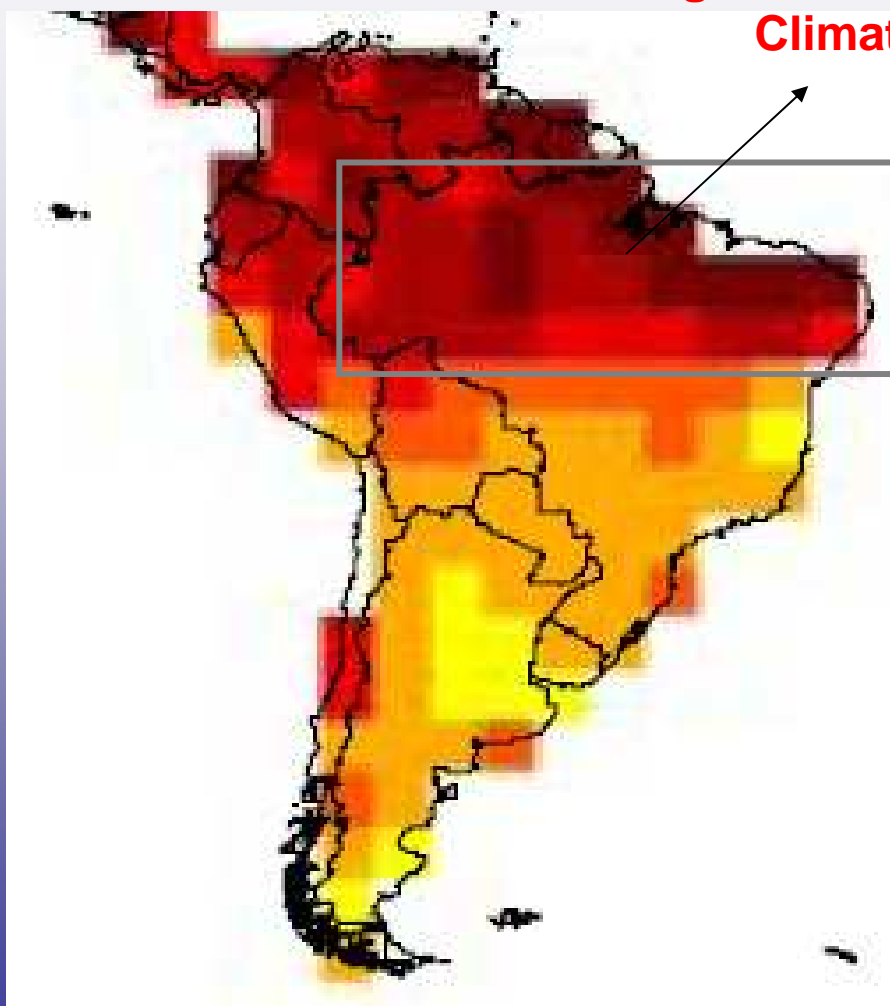


Source: Intergovernmental Panel on Climate Change (IPCC) AR4.



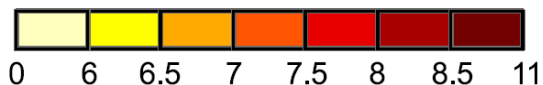
The aggregated CCI (Climate Change index) on a grid basis for South America, for the 2071-2100 period in relation to 1961-90. (Baettig et al. 2007).

### Regions more vulnerable to Climate Change

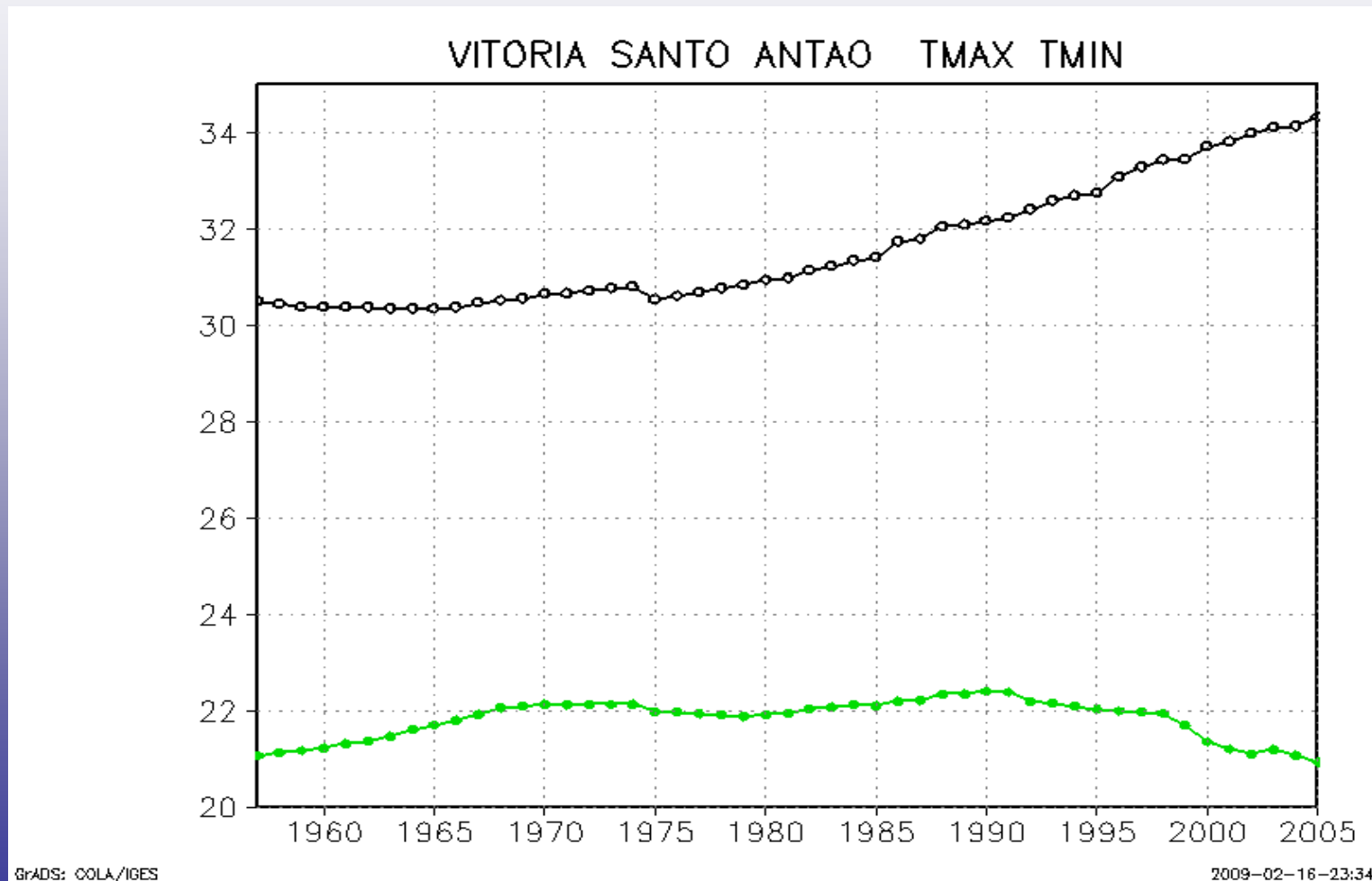


Climate will change most strongly relative to today's natural variability in the tropics due to both precipitation changes and seasonal temperature events.

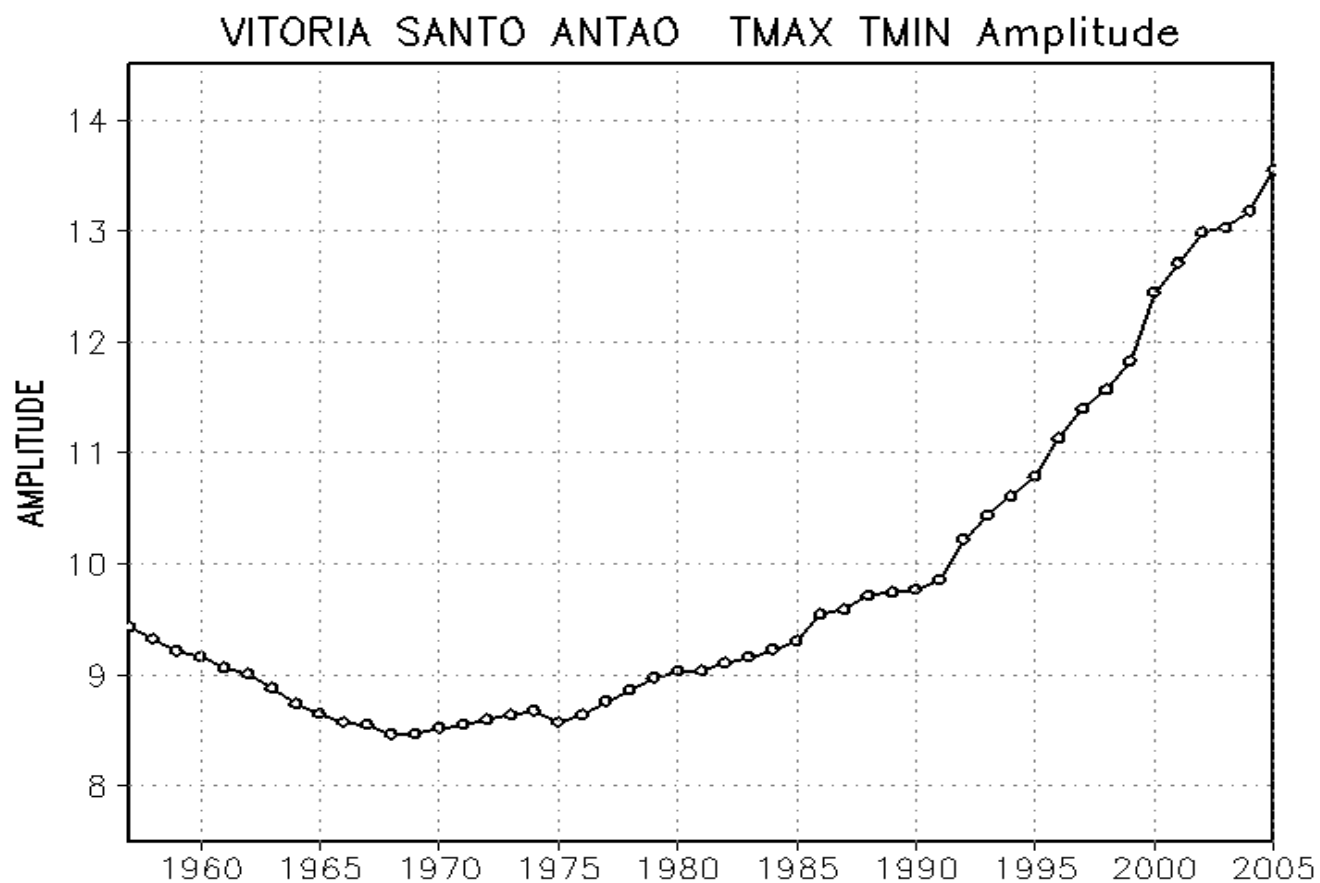
Climate is expected to change more strongly relative to today's natural variability in these more vulnerable countries than in many countries with a high HDI and thus lower vulnerability.



# Sinais de Desertificação Sertão Pernambucano



# Desertificação: aumento da amplitude térmica diária



GrADS: COLA/IGES

2009-02-16-23:38

# Sobre as Mudanças Climáticas em Pernambuco:

- Formulação de políticas públicas para o entendimento, mitigação e adaptação às mudanças climáticas
- Fortalecimento da capacidade técnico-científica observacional e de modelagem do Estado
- Manutenção do Capital arbóreo regional/nacional.
- Envolvimento da sociedade civil



# ***Ainda há tempo para evitar os piores impactos da mudança climática, se tomarmos ações enérgicas agora.***

As evidências científicas são contundentes: mudança climática é uma ameaça global séria e demanda uma resposta global urgente.

*The Stern Review*



Os benefícios de ações vigorosas e preventivas em muito superam os custos econômicos da inação.

*The Stern Review*





Mudanças Climáticas devem ser  
tratadas com EDUCAÇÃO:

Toda Criança Na Escola

