

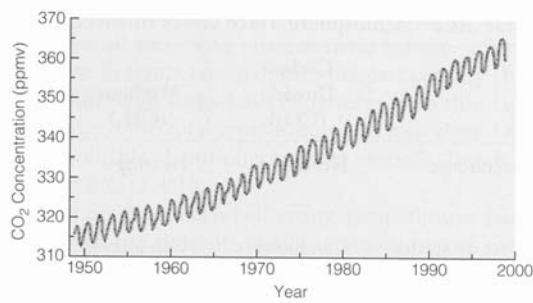
## Climate Dynamics, Modeling the Future



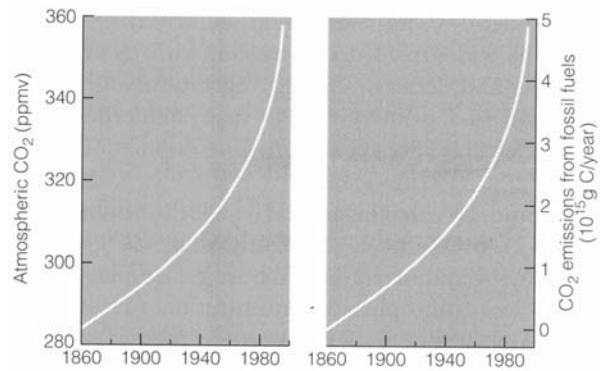
## Anthropogenic Factors?

- 1) Land-use changes  
deforestation - agriculture  
→ increases CO<sub>2</sub> in atmos.  
→ increases aerosols
- 2) increasing greenhouse gases  
CO<sub>2</sub>, CH<sub>4</sub>, CFCs

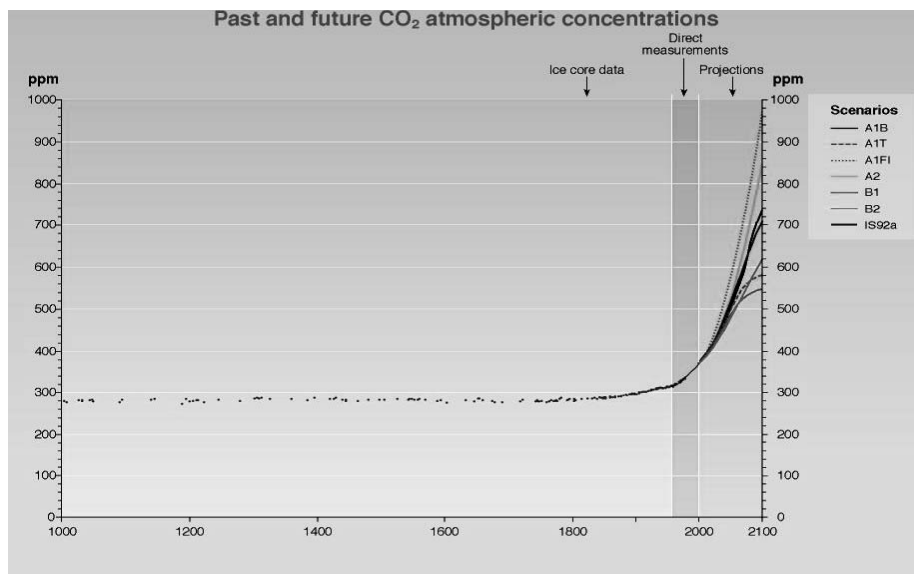




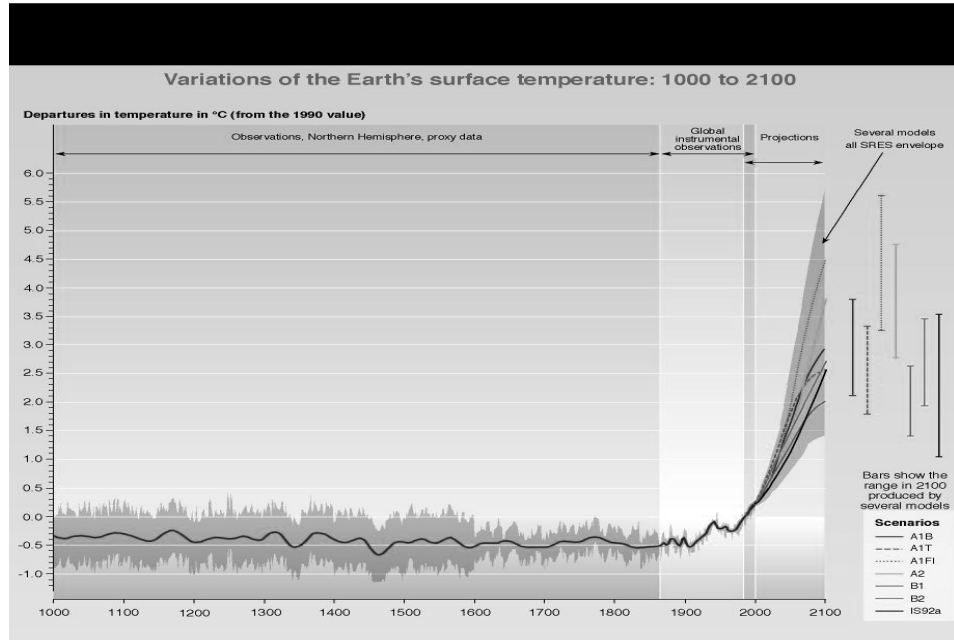
CO<sub>2</sub> ...  
human impact?



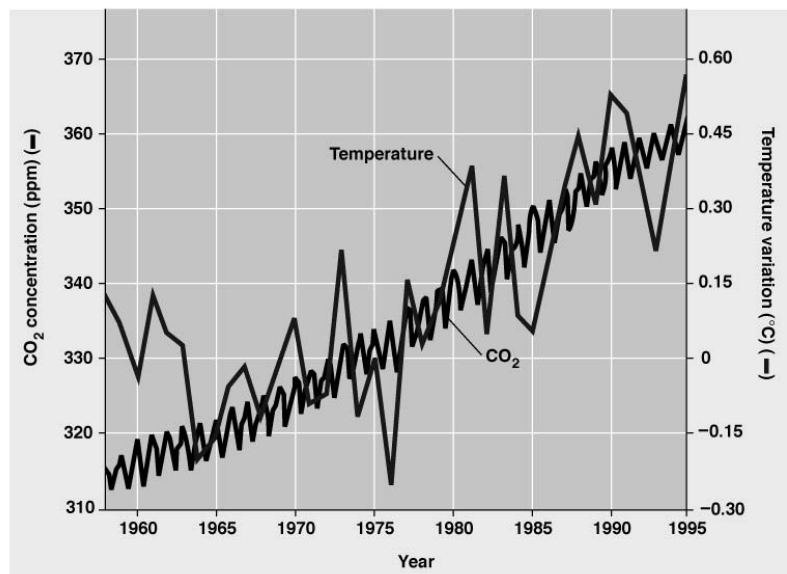
Projected concentrations of CO<sub>2</sub> during the 21<sup>st</sup> century are 2-4x pre-industrial levels



## Comparing & Modeling CO<sub>2</sub>, Warming

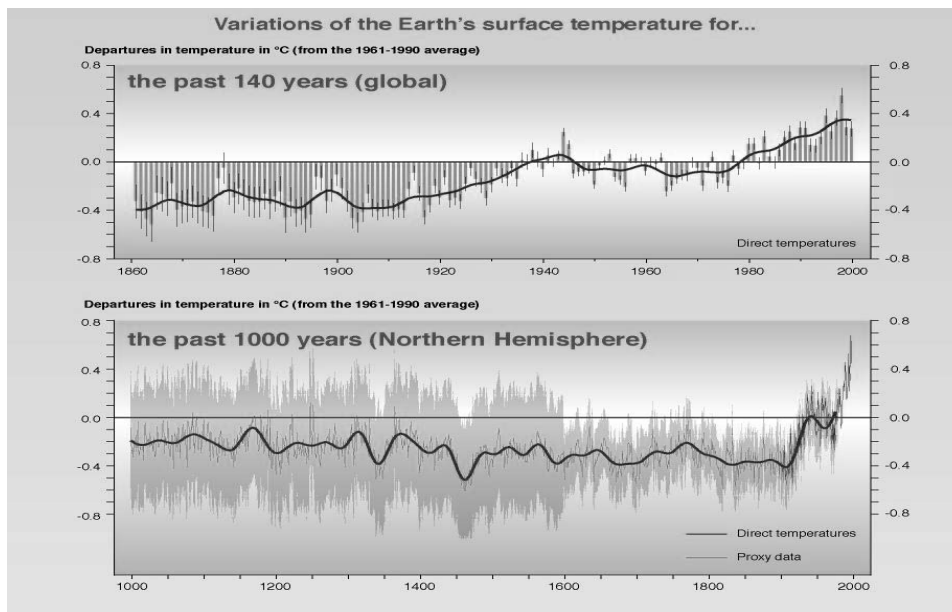
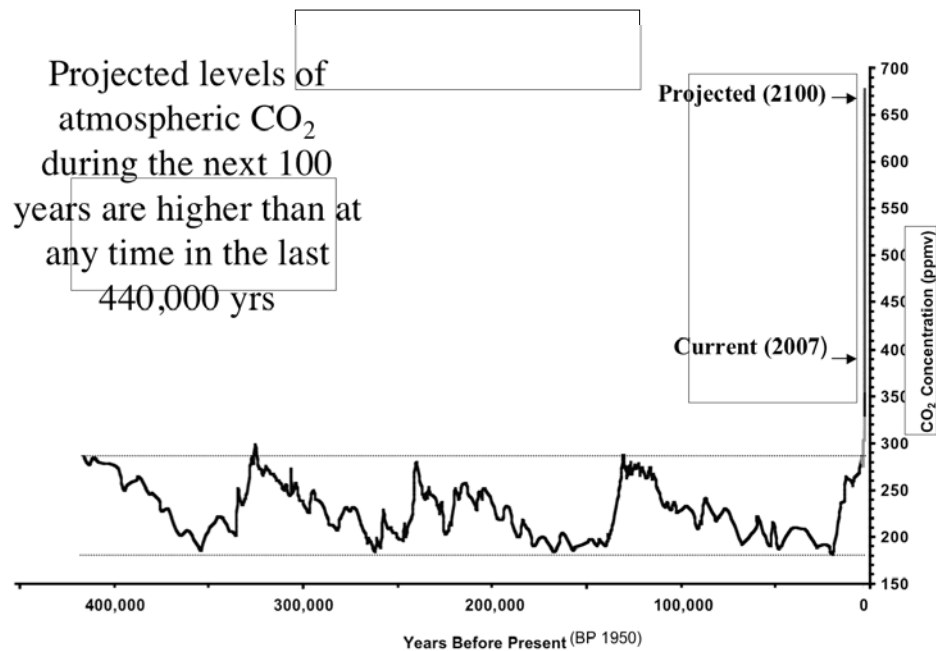


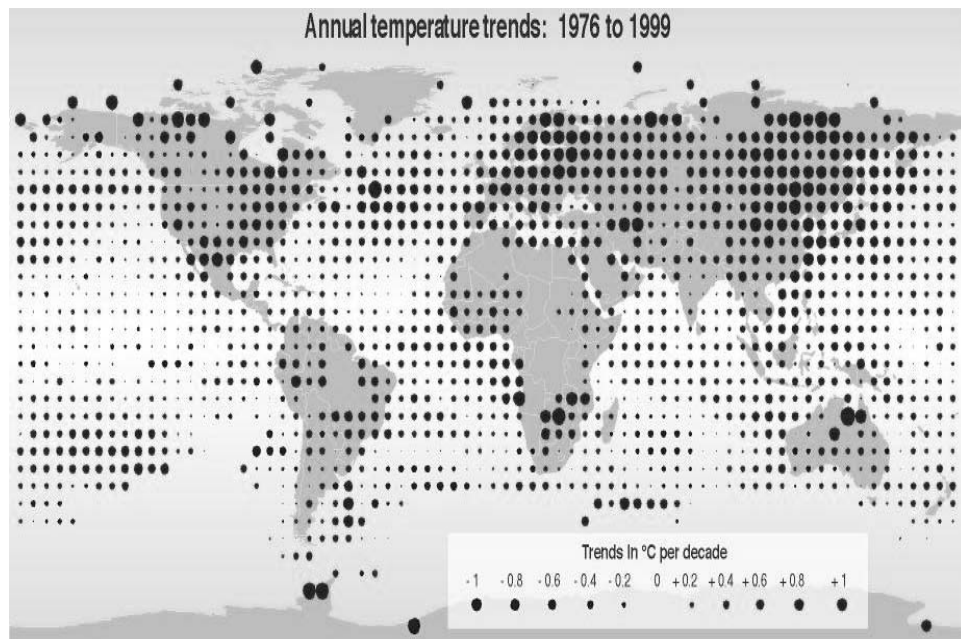
## Carbon accumulation



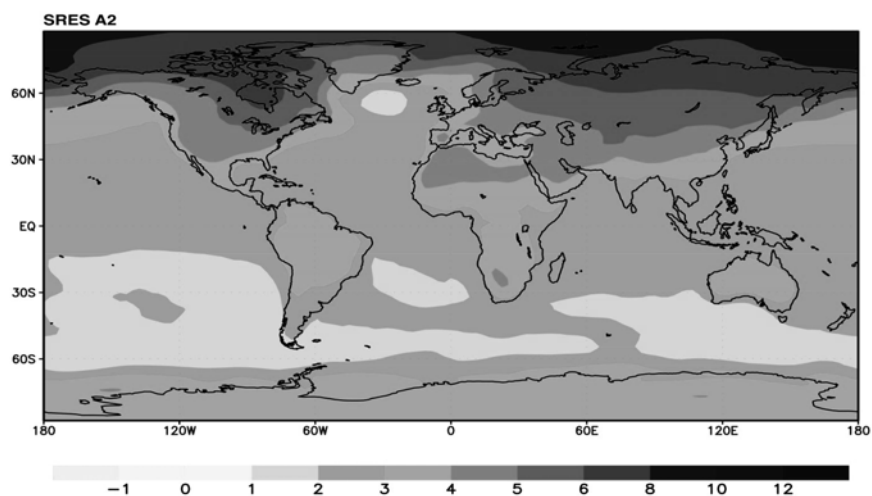
©1999 Addison Wesley Longman, Inc.

Data: historical, ice cores

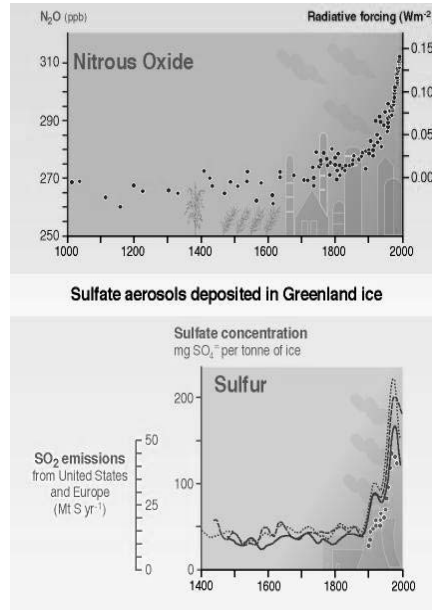
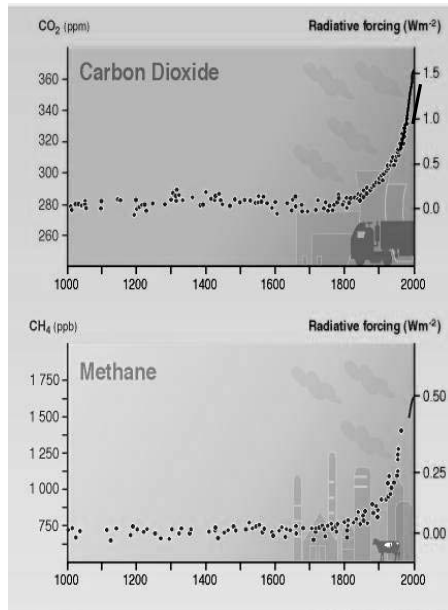




Annual mean temperature change, 2071 to 2100 relative to 1990: Global Average in 2085 = 3.1°C



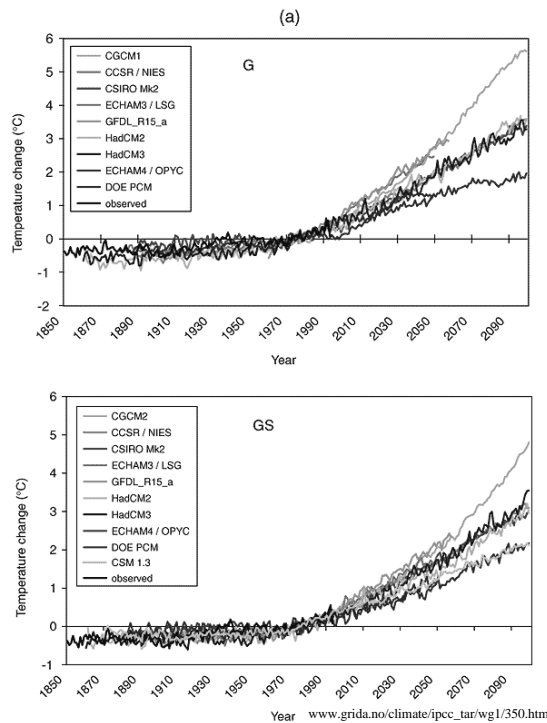
Land areas are projected to warm more than the oceans with the greatest warming at high latitudes



## Temperature & Sulfate aerosols

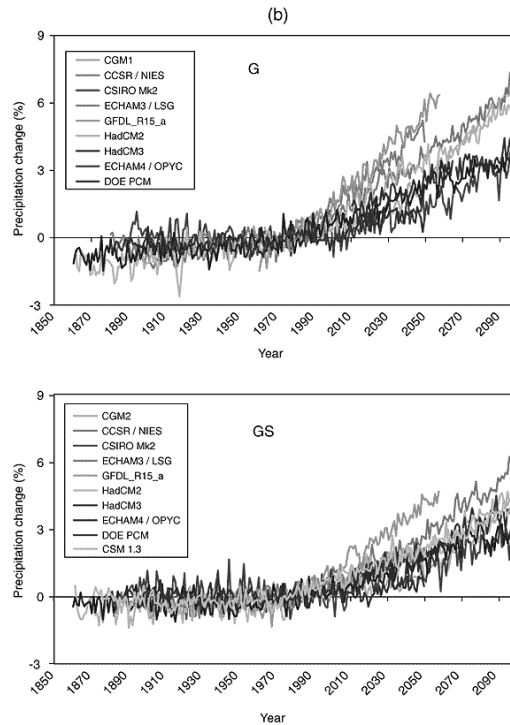


Time evolution of the globally averaged temperature change relative to the years (1961 to 1990) (IS92a simulation). G: greenhouse gas only (top), GS: greenhouse gas and sulphate aerosols (bottom). The observed temperature change (Jones, 1994) is indicated by the black line. (Unit: °C).

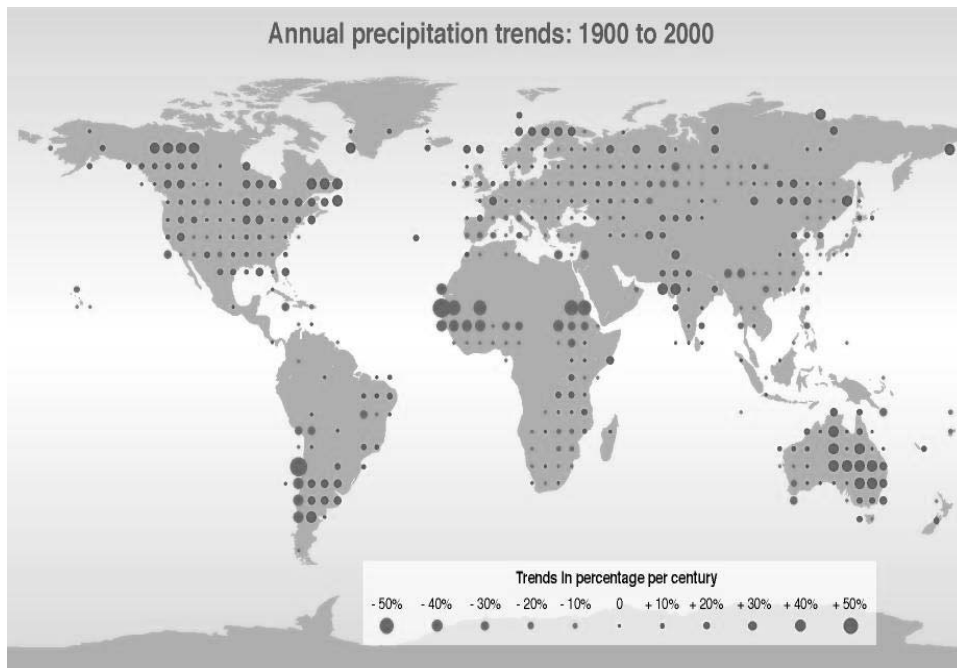


## Precipitation & Sulfate aerosols

Time evolution of the globally averaged precipitation change relative to the years (1961 to 1990) G: greenhouse gas only (top), GS: greenhouse gas and sulphate aerosols (bottom). (Unit: %).

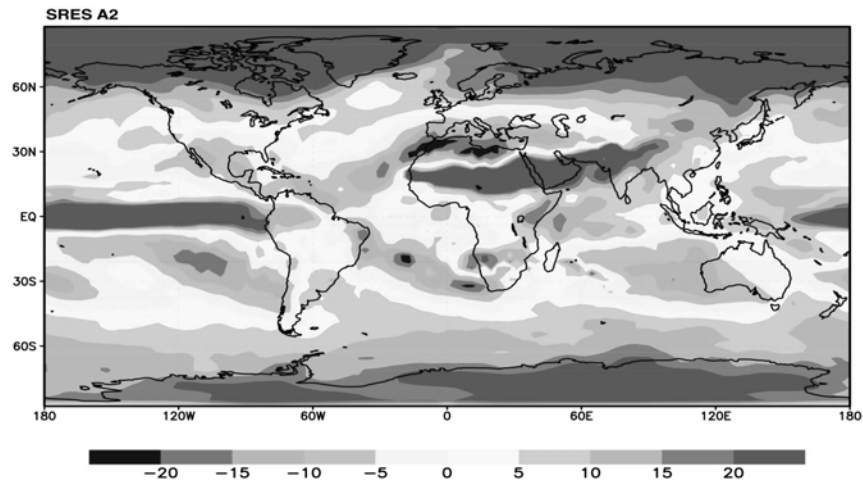


[www.grida.no/climate/ipcc\\_tar/wg1/350.htm](http://www.grida.no/climate/ipcc_tar/wg1/350.htm)

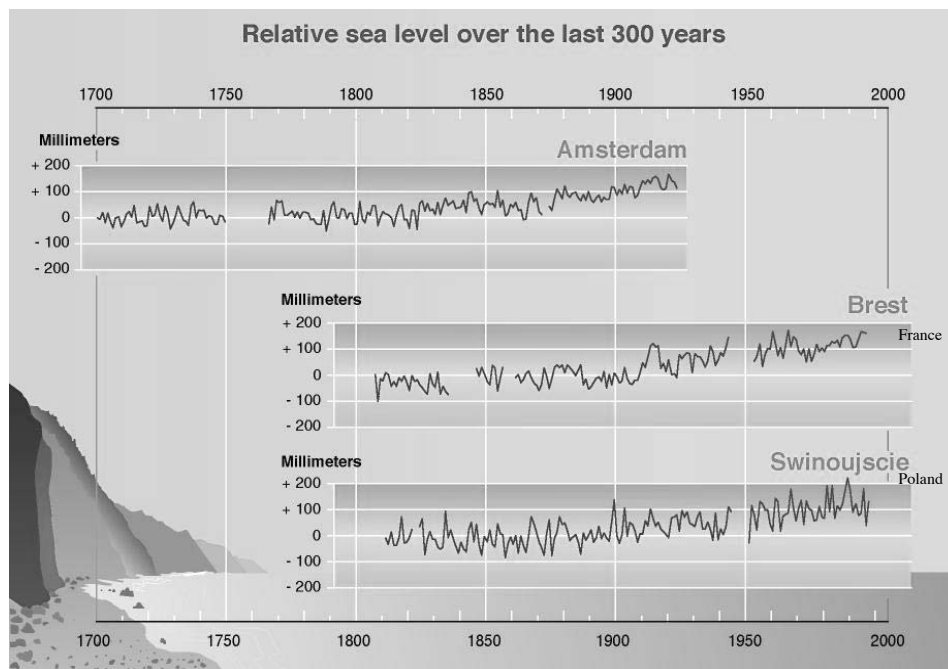


Climate: Some areas are projected to become wetter, others drier with an overall increase projected

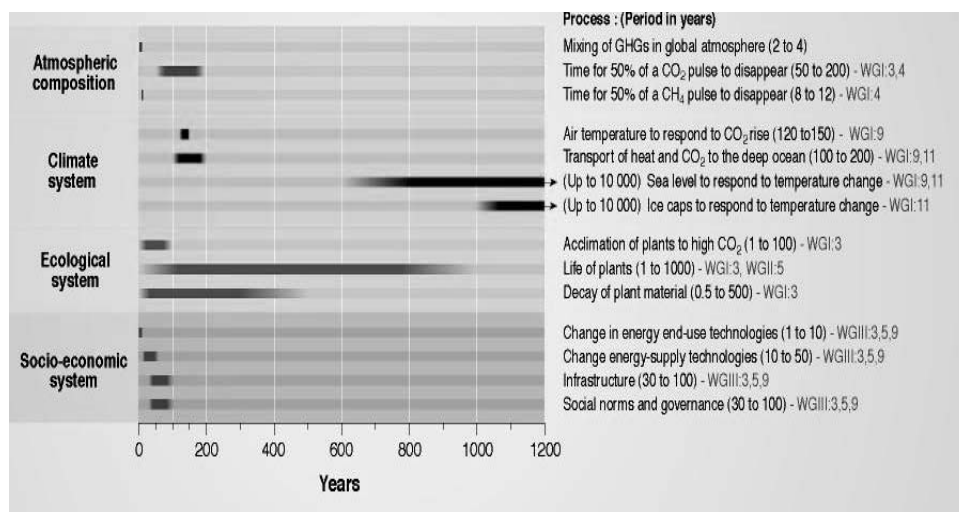
1°C inc. -> ~6% H<sub>2</sub>O<sub>vapor</sub> -> inc. precip.



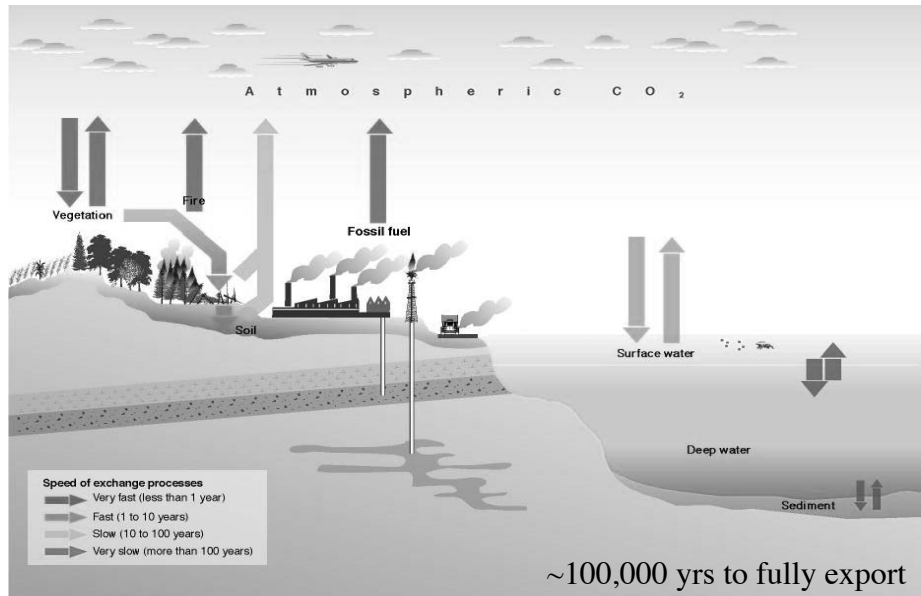
Annual mean precipitation change: 2071 to 2100 Relative to 1990



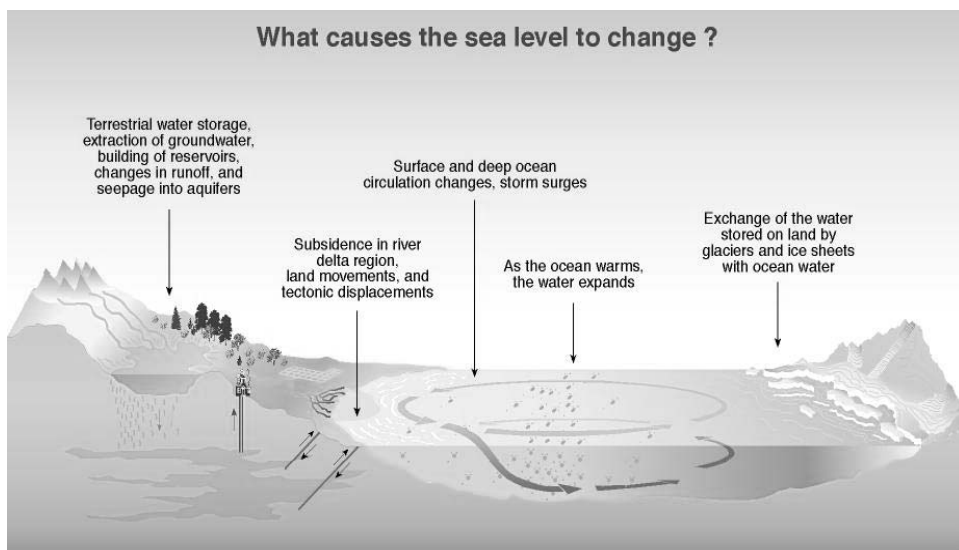
## Impact Fact 1:



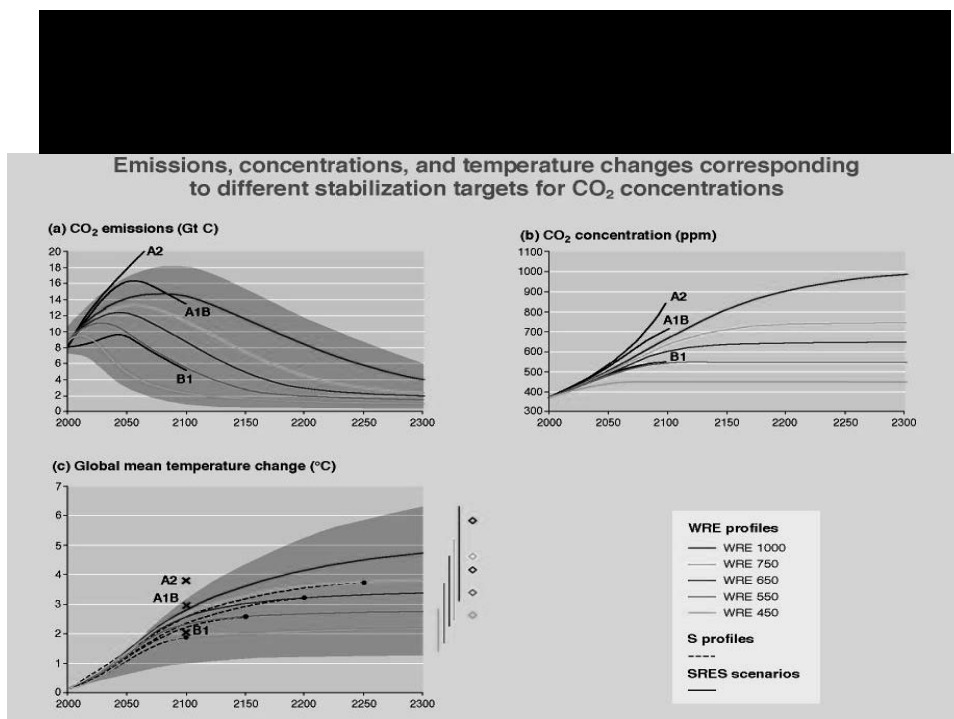
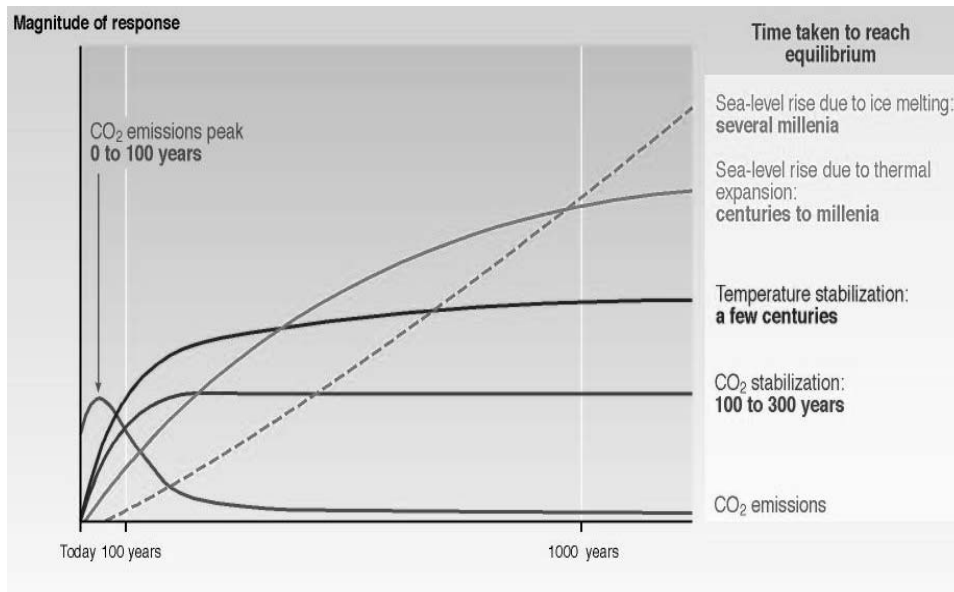
## Impact Fact 2:



## Impact Fact 3:



### Impact Fact 4:



## Sea Level Changes

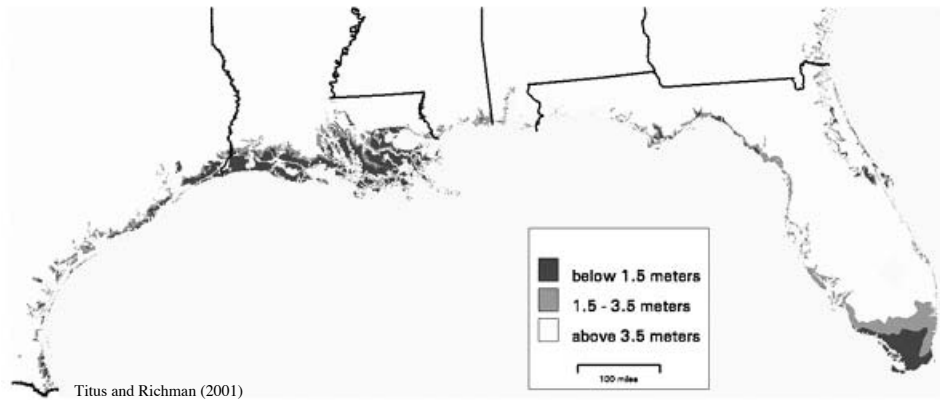
30 cm by 2050 (99% prob.)  
~50 cm by 2100 (99% prob.)

...even if all GG production  
completely ceased today.

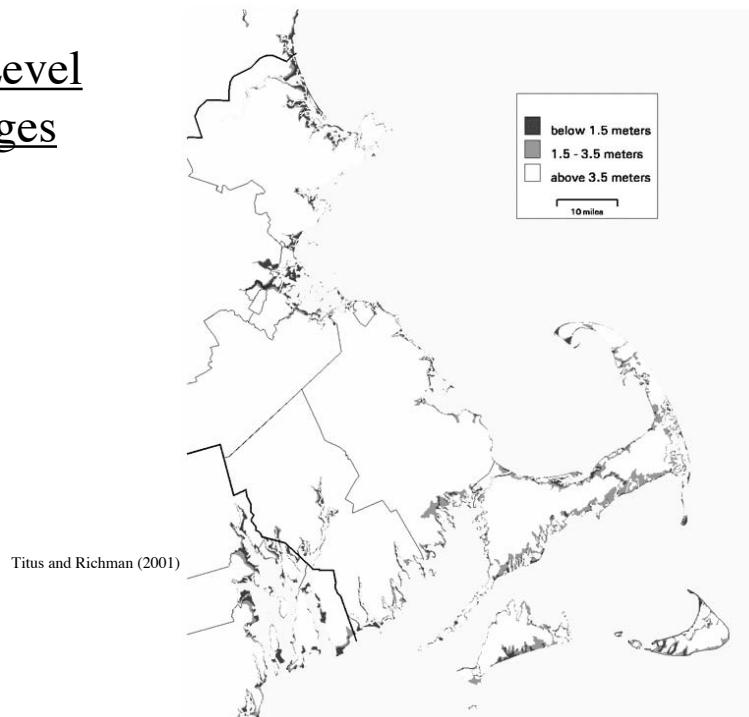
Red ~ 1.3 m

Spring tides ~ 60 cm

Thus, red = area flooded by 70 cm rise



## Sea Level Changes



## How will these climate changes impact us?

