

<http://waseda2.t.u-tokyo.ac.jp/~waseda>
waseda@naoe.t.u-tokyo.ac.jp

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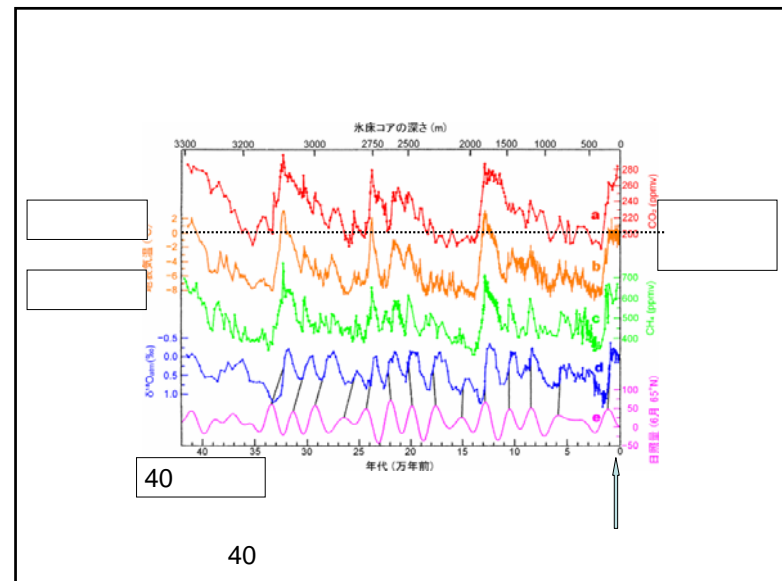
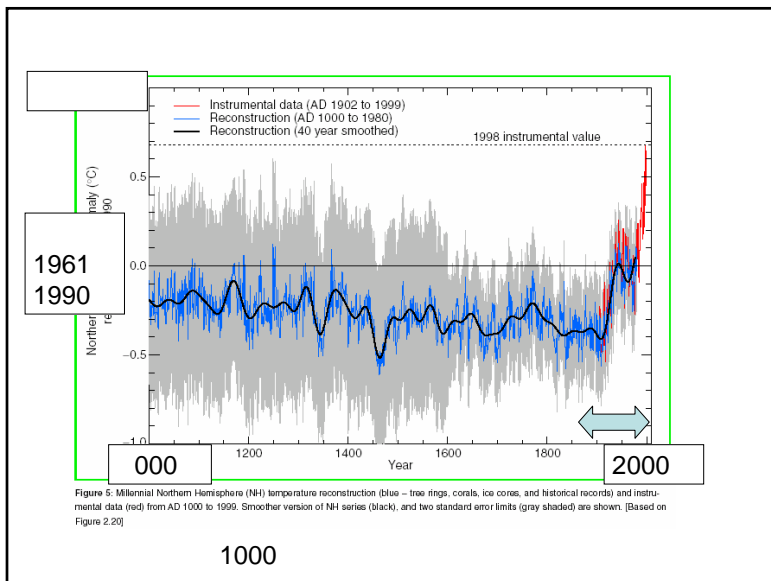
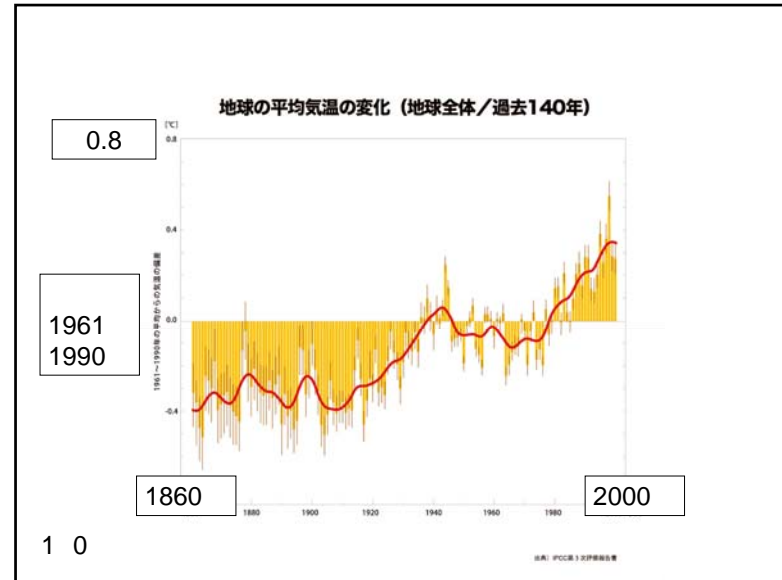
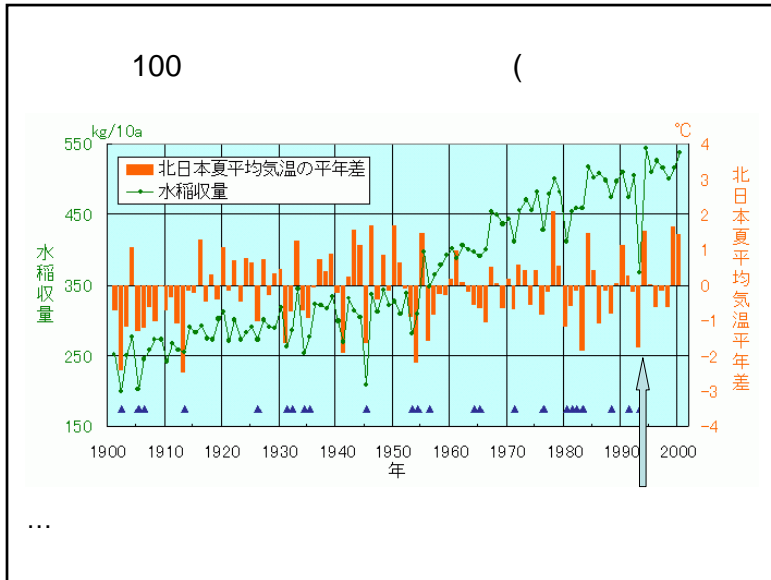
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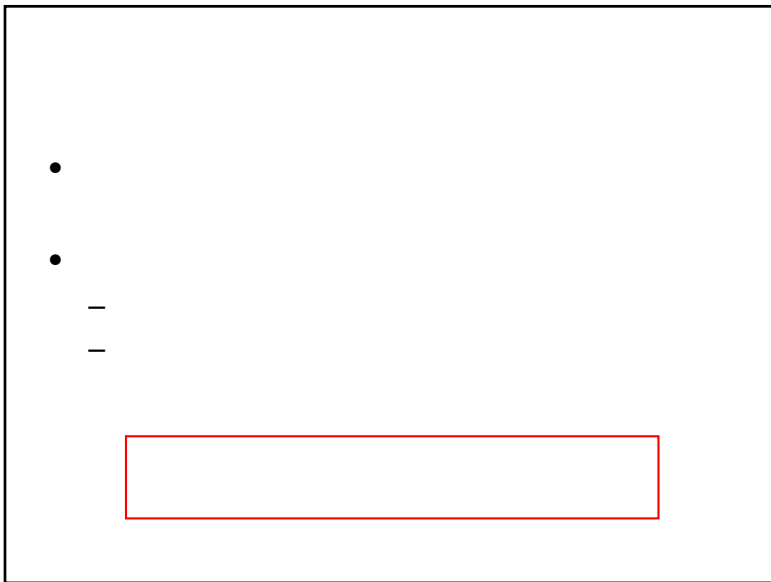
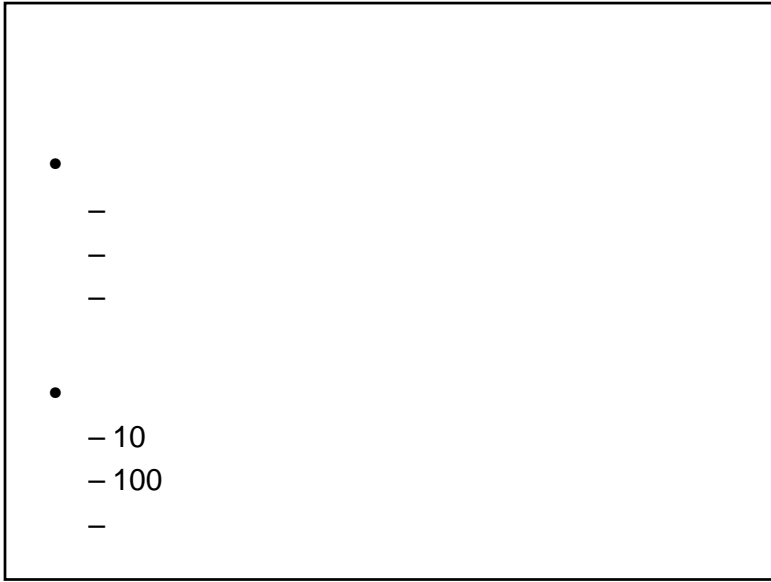
36.2	37.6	36.7
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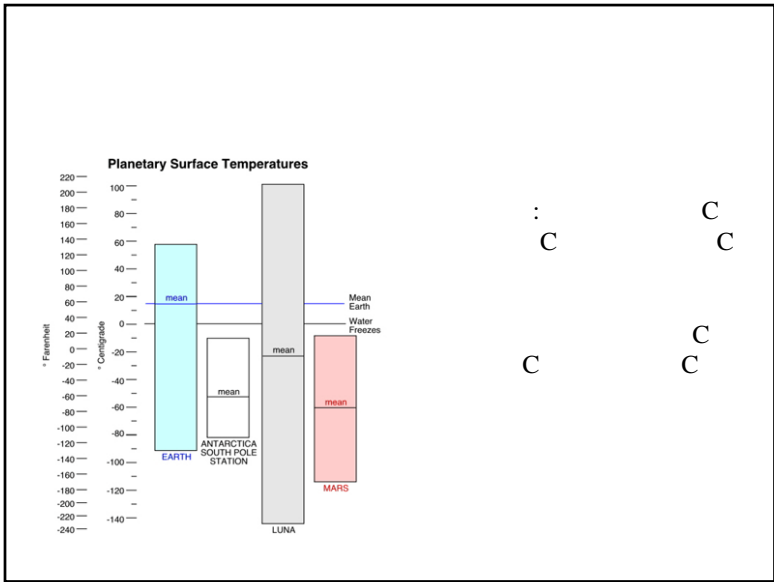
1994

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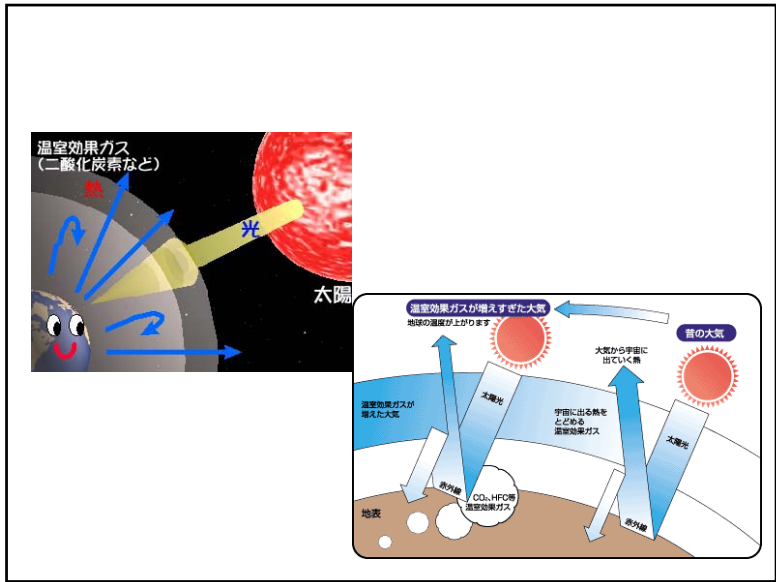
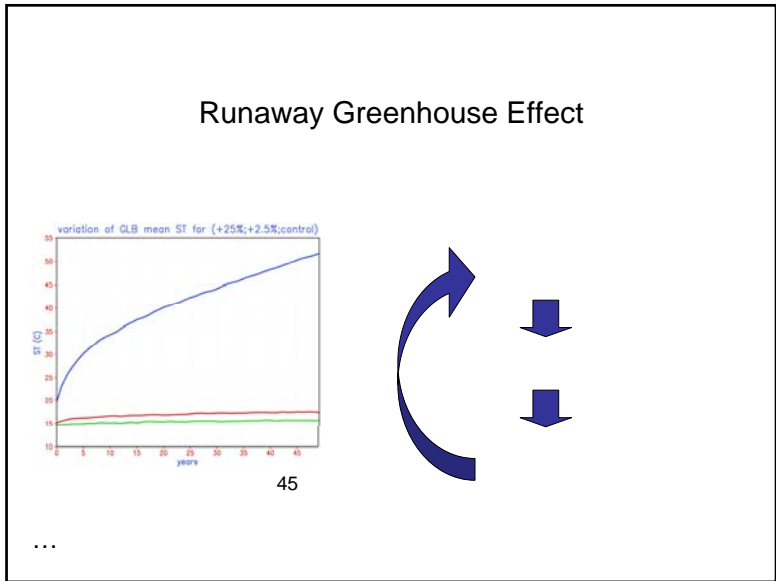
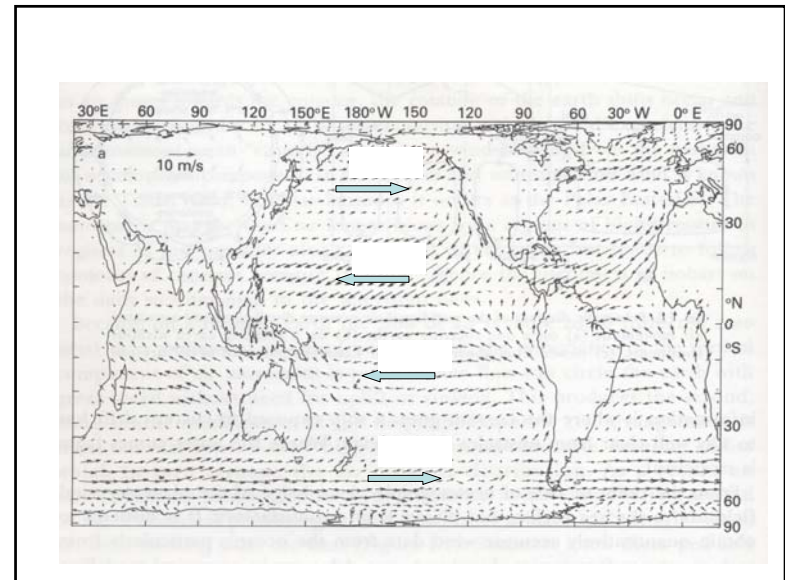
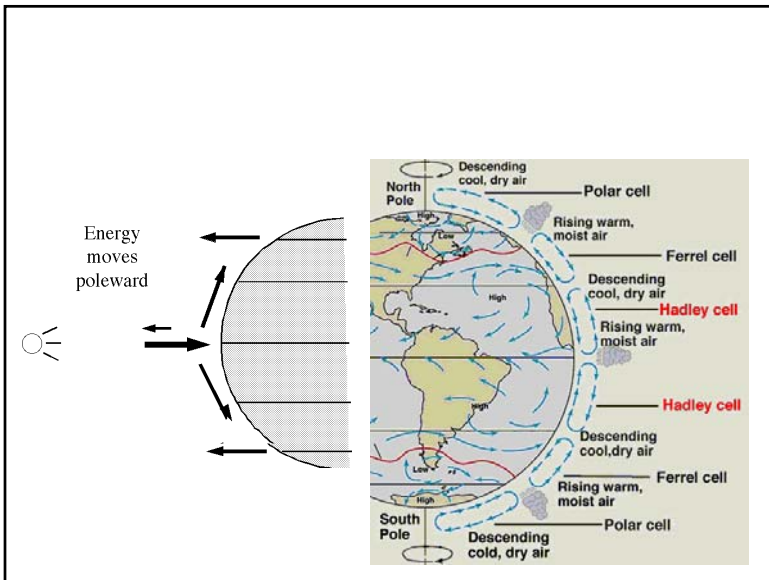
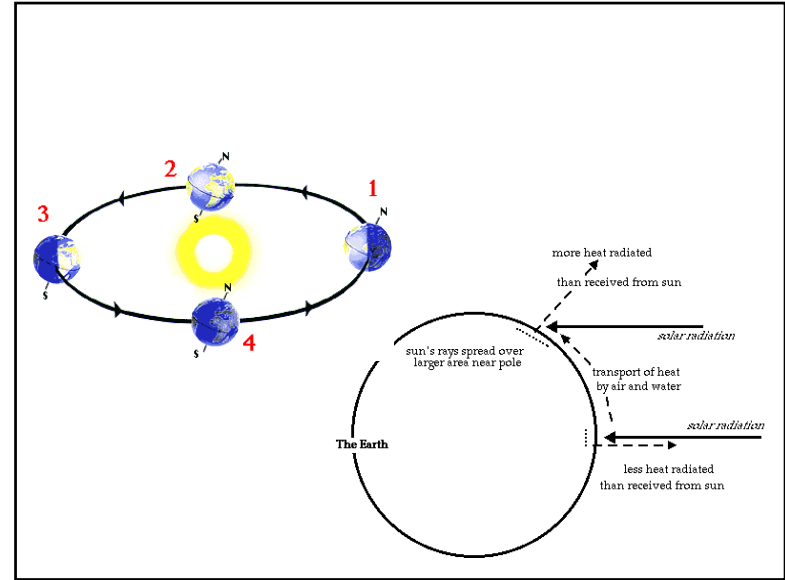
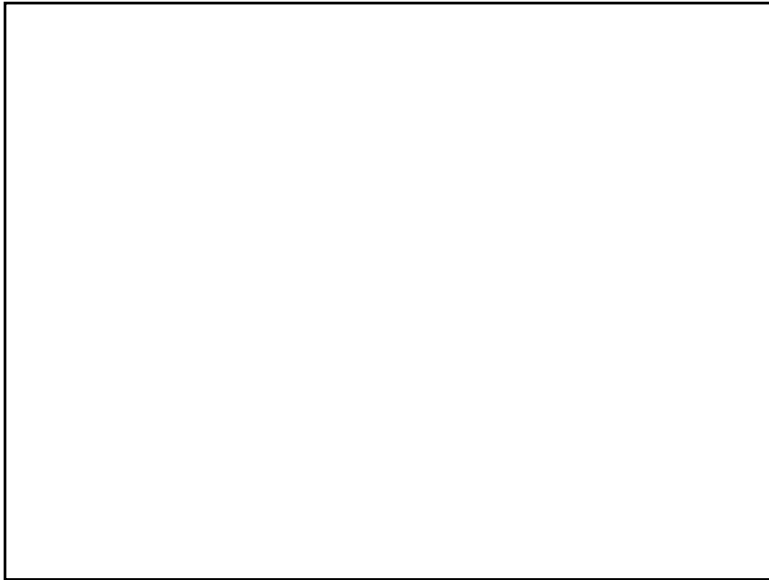
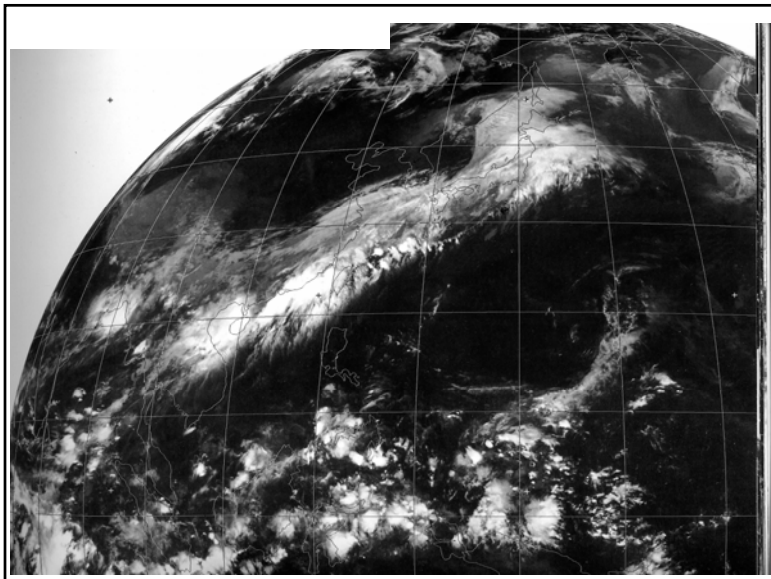
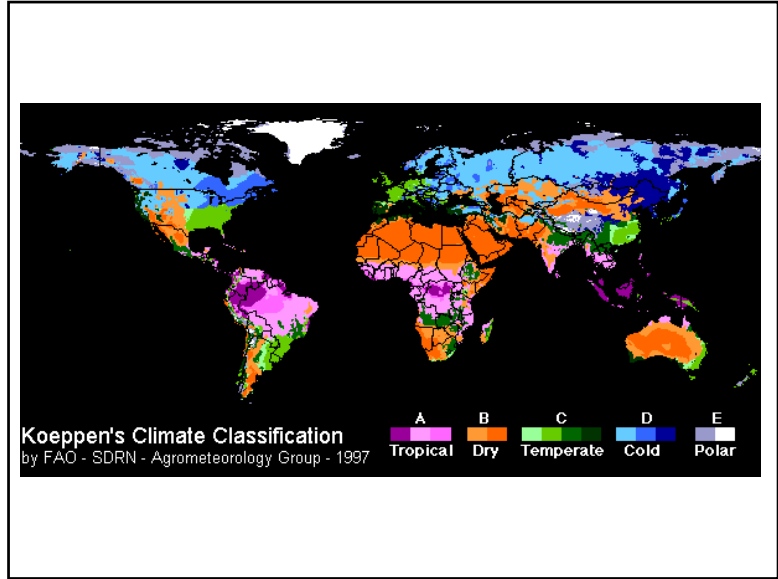
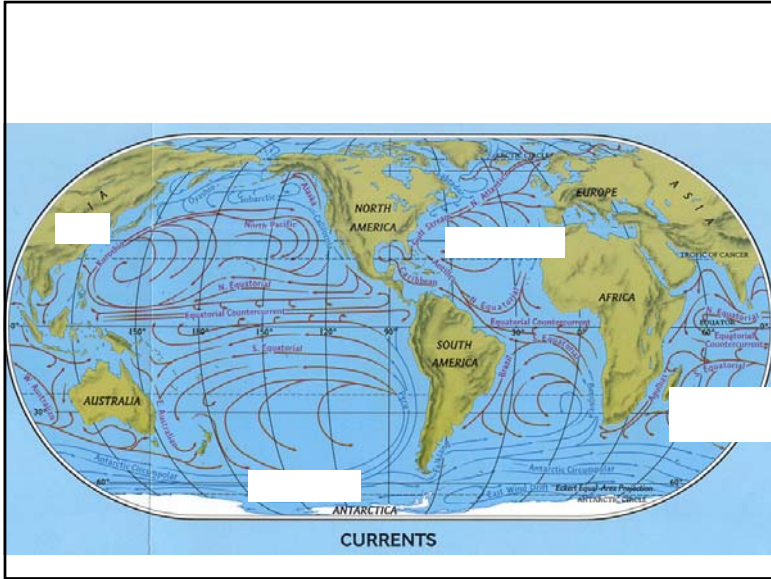


Table 1.2. *The greenhouse gases*

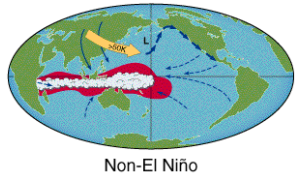
Gas	Basic absorption wavelengths (μm)	Contribution
Water vapour (H_2O)	2.66, 2.74, 6.27	55-70%
Carbon dioxide (CO_2)	4.26, 7.52, 14.99	25%
Chlorofluorocarbons (CFCs)	typical bonds: 9.52, 13.8, 15.4	11%
Methane (CH_4)	3.43, 6.85, 7.27	5%
Nitrous oxide (N_2O)	4.50, 7.78, 16.98	2%
Ozone (O_3), sulphur dioxide (SO_2), other oxides of nitrogen, carbon monoxide (CO), etc.		<1% each



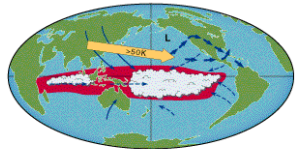




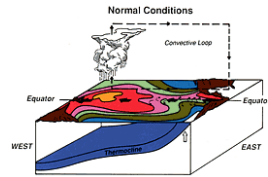
El Nino and La Nina



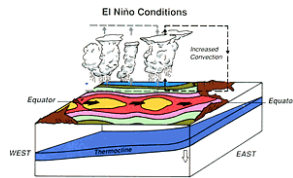
Non-El Niño



El Niño

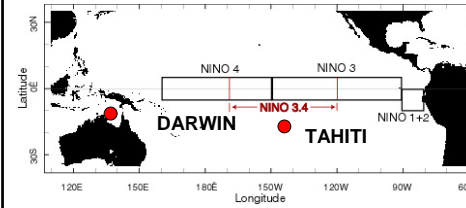


Normal Conditions

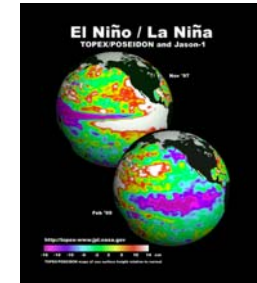


El Niño Conditions

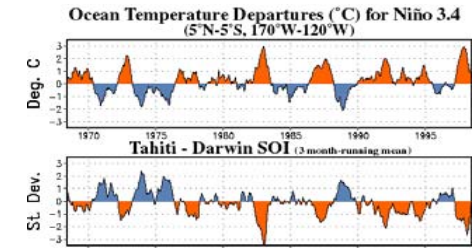
Signatures of El Nino and La Nina



ENSO CYCLE



Niño
Darwin Tahiti
Southern Oscillation



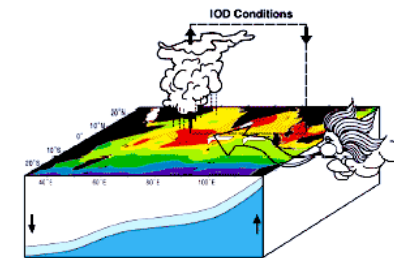
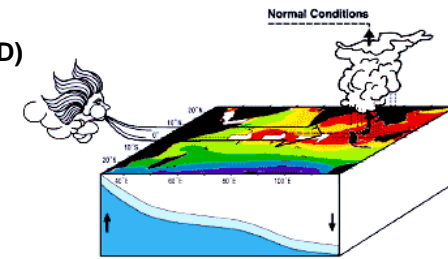
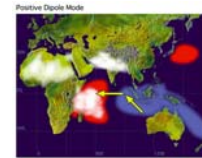
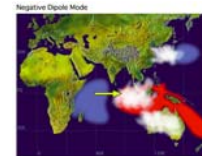
Teleconnection



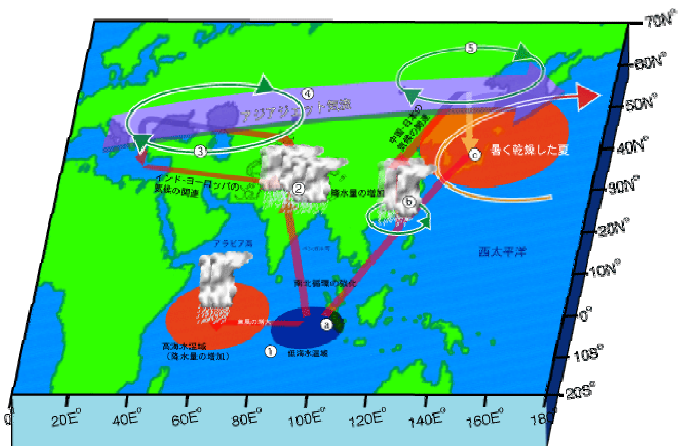
図4-15 PJテレコネクションパターンの模式図(Nitta, 1987)
西太平洋域で海面水温が高く、対流活動が活発な、いわゆるラ・ニーニャ期間中の夏季に出現しやすいパターン。

La Nina
El Nino

Indian Ocean Dipole (IOD)



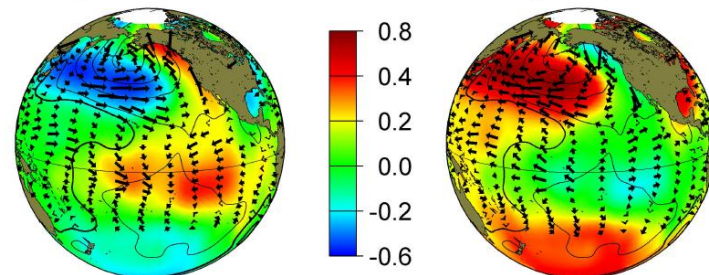
Teleconnection



Pacific Decadal Oscillation

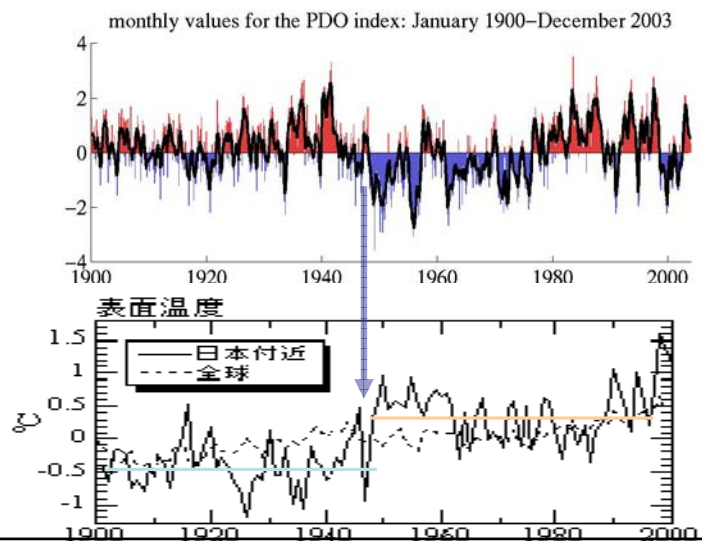
positive phase

negative phase

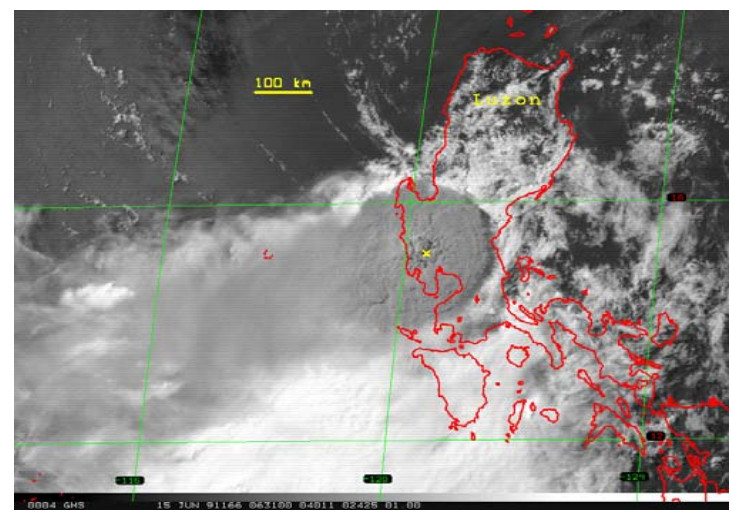


Color: SST; Contour: sea level pressure; Arrow: wind

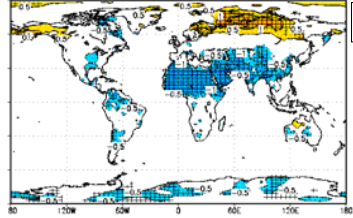
Regime shift – associated with Pacific Decadal Oscillation



– Mt. Pinatubo

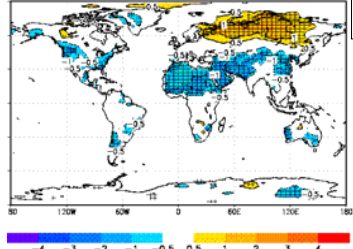


ΔT_s (K) AQ – QBO ensemble avr, DJF 91/92

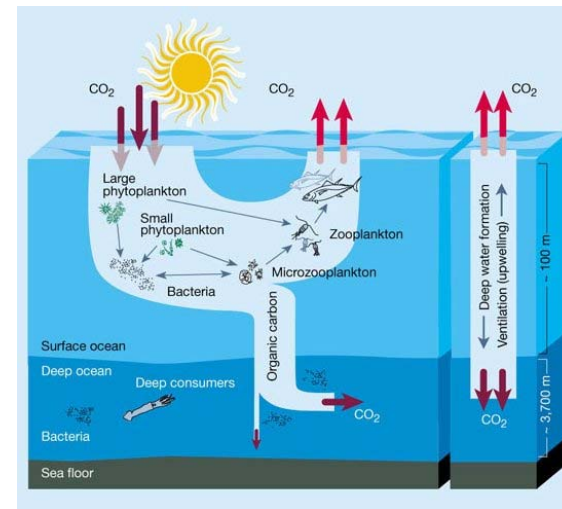


Pinatubo

ΔT_s (K) AQ – QBO ensemble avr, DJF 92/93

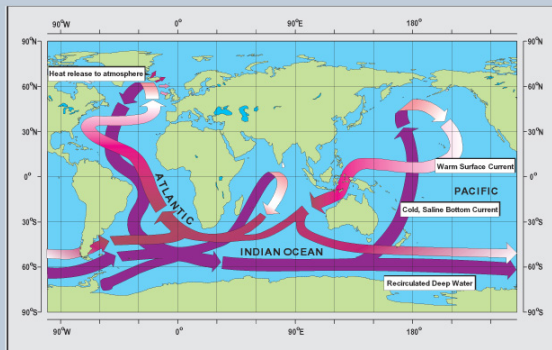


Biological Pump



The Atlantic Thermohaline Circulation

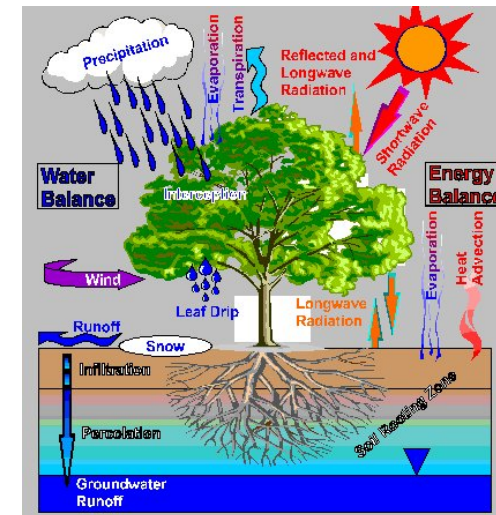
- A Key Element of the Global Oceanic Circulation -

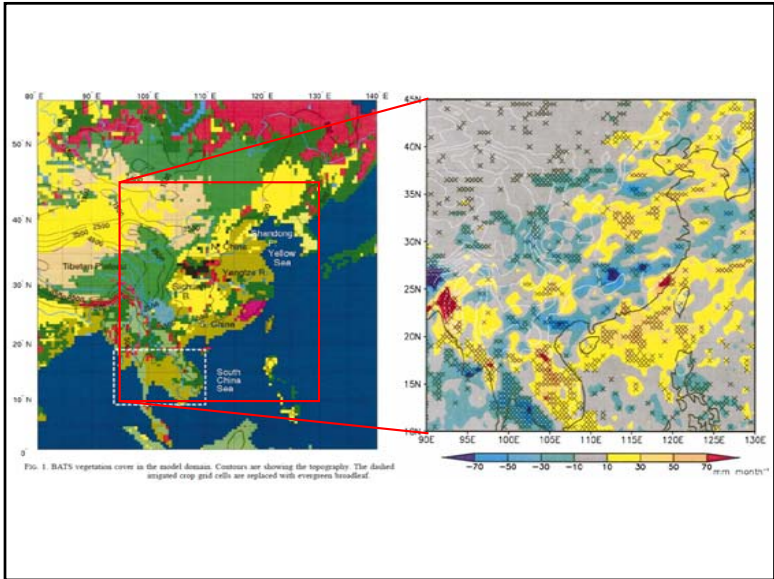
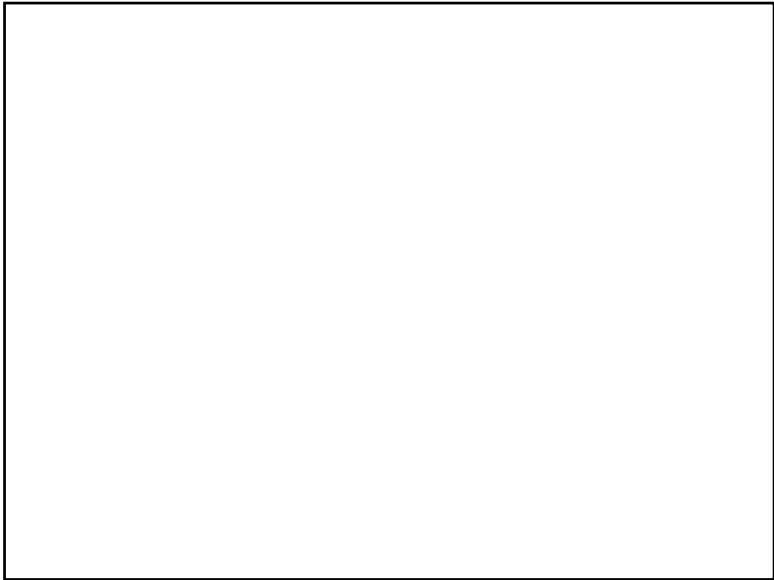
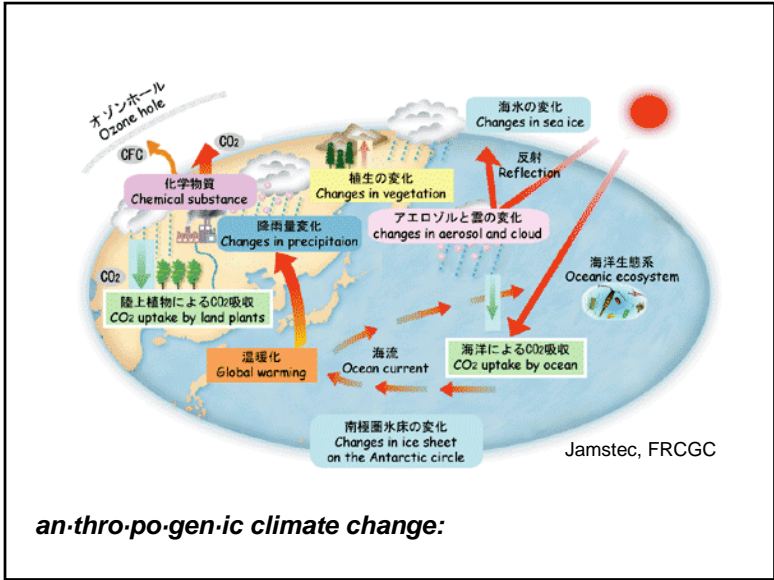


Schematic diagram of the global ocean circulation pathways, the 'conveyor' belt (after W. Broecker, modified by E. Maier-Reimer).

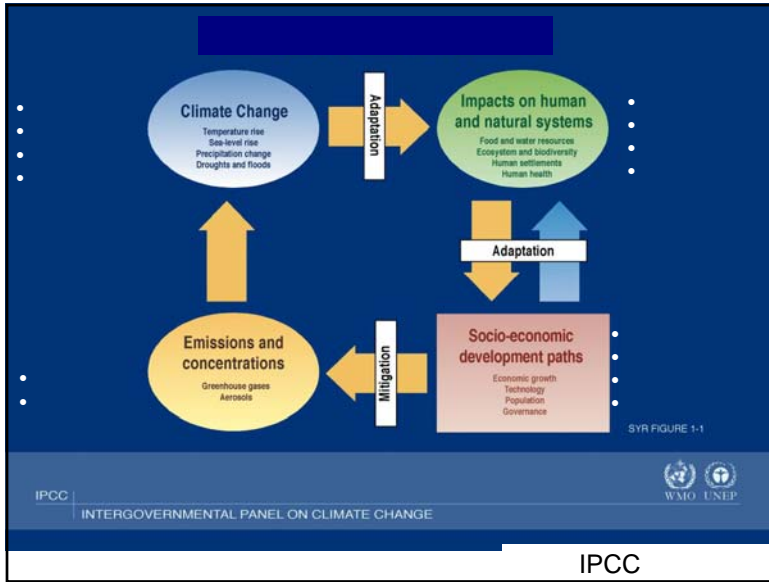
AV/D3/99-2

Land surface processes

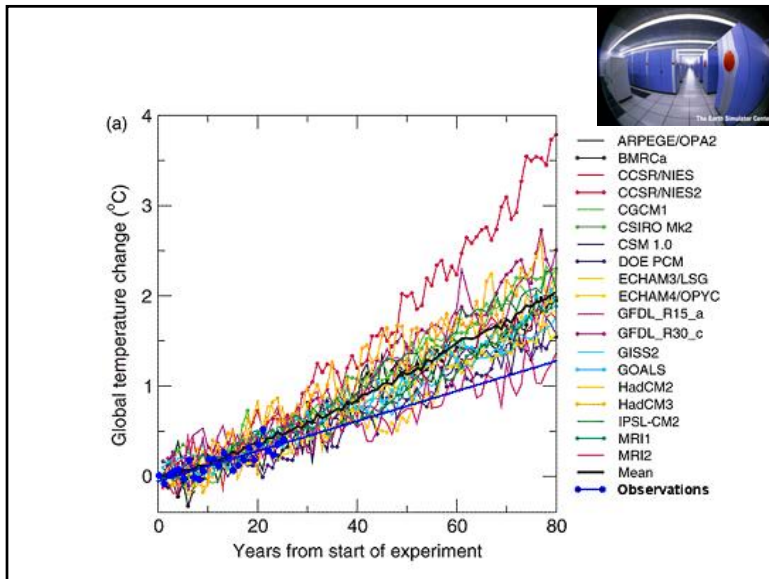
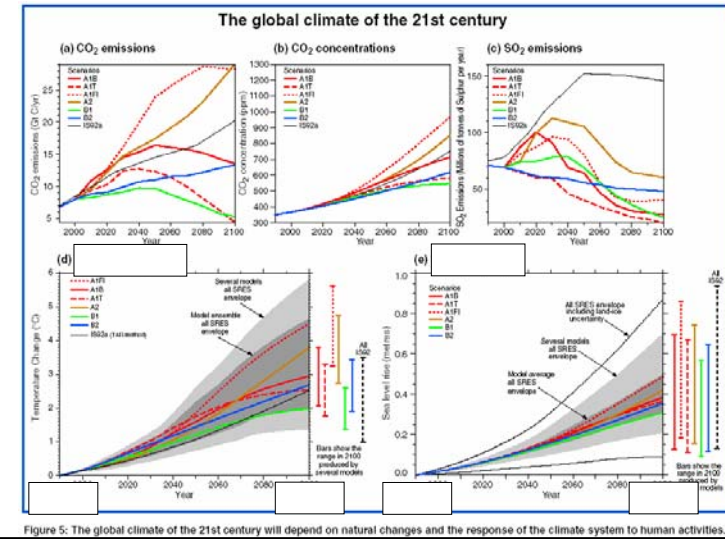




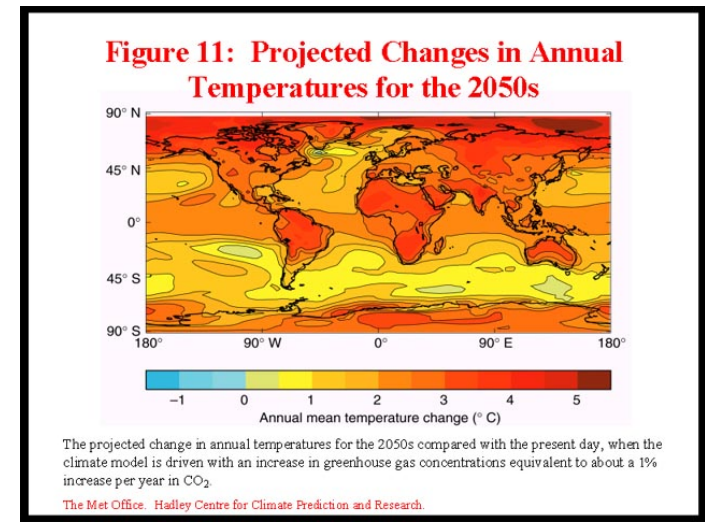
		World Climate Research Program (WCRP)
		IPCC (Intergovernmental Panel for Climate Change)
	Callendar	CO2
	Moller	IPCC
	Manabe&Wetherald	IPCC
CO2	Mercer	IPCC
	Manabe	CO2



IPCC Emission Scenarios

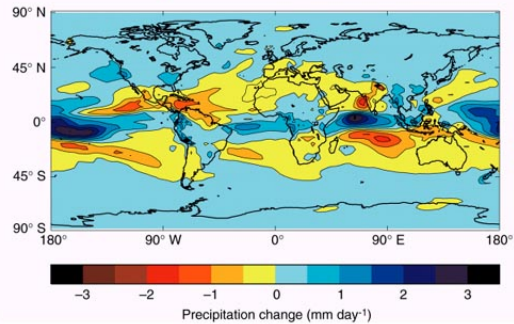


Impacts of global warming <http://www.ipcc.ch/press/sp-cop6.htm>



Impacts of global warming <http://www.ipcc.ch/press/sp-cop6.htm>

Figure 12: Projected Changes in Annual Precipitation for the 2050s

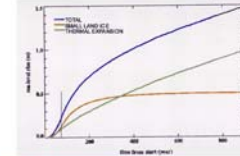


The projected change in annual precipitation for the 2050s compared with the present day, when the climate model is driven with an increase in greenhouse gas concentrations equivalent to about a 1% increase per year in CO₂.

The Met Office - Hadley Centre for Climate Prediction and Research

Impacts of global warming <http://www.ipcc.ch/press/sp-cop6.htm>

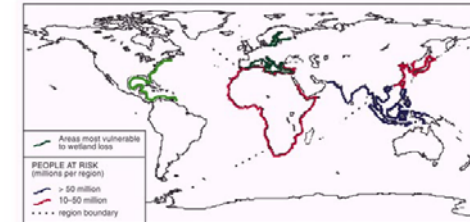
Figure 13: Sea Level Rise Commitment
Thermal expansion and land ice melt after an initial 1% increase in CO₂ for 70 years



The Met Office - Hadley Centre for Climate Prediction and Research

Figure 18: People at Risk from a 44 cm sea-level rise by the 2080s

Assuming 1990s Level of Flood Protection



Source: R. Nicholls, M&E Research University in the U.K., Meteorological Office 1997, *Climate Change and its Impacts: A Global Perspective*.

Impacts of global warming <http://www.ipcc.ch/press/sp-cop6.htm>

Figure 17: Vector (insect)-borne Diseases

Disease	Vector	Population at risk (millions)	Present distribution	Likelihood of altered distribution with warming
Malaria	mosquito	2,100	(sub)tropics	✓✓
Schistosomiasis	water snail	600	(sub)tropics	✓✓
Filariasis	mosquito	900	(sub)tropics	✓
Onchocerciasis (river blindness)	black fly	90	Africa/Latin America	✓
African trypanosomiasis (sleeping sickness)	tsetse fly	50	tropical Africa	✓
Dengue	mosquito	unavailable	tropics	✓✓
Yellow fever	mosquito	unavailable	tropical South America & Africa	✓

Likely ✓
Very likely ✓✓

Source: Modified WHO, as cited in Stone (1995).

