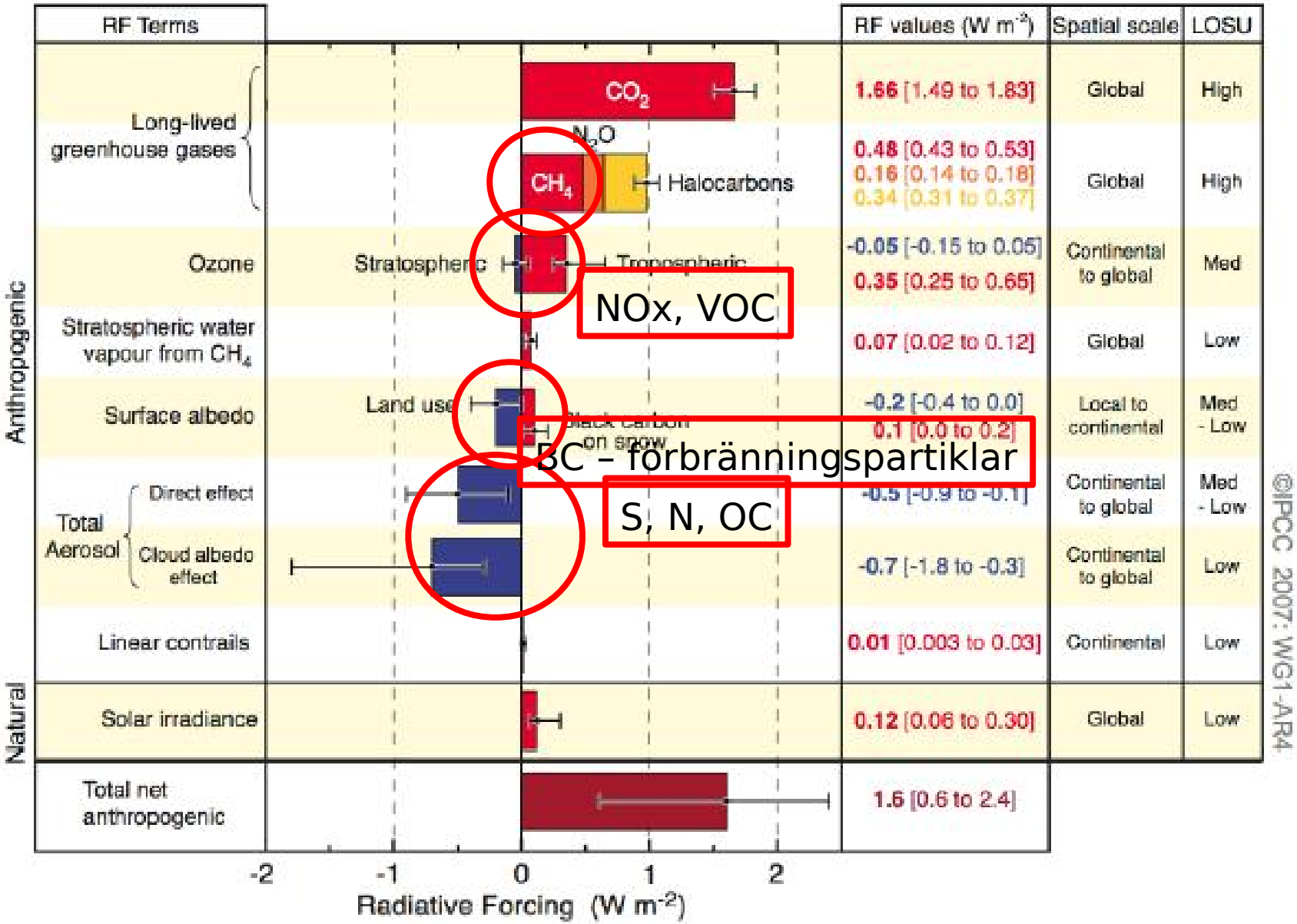
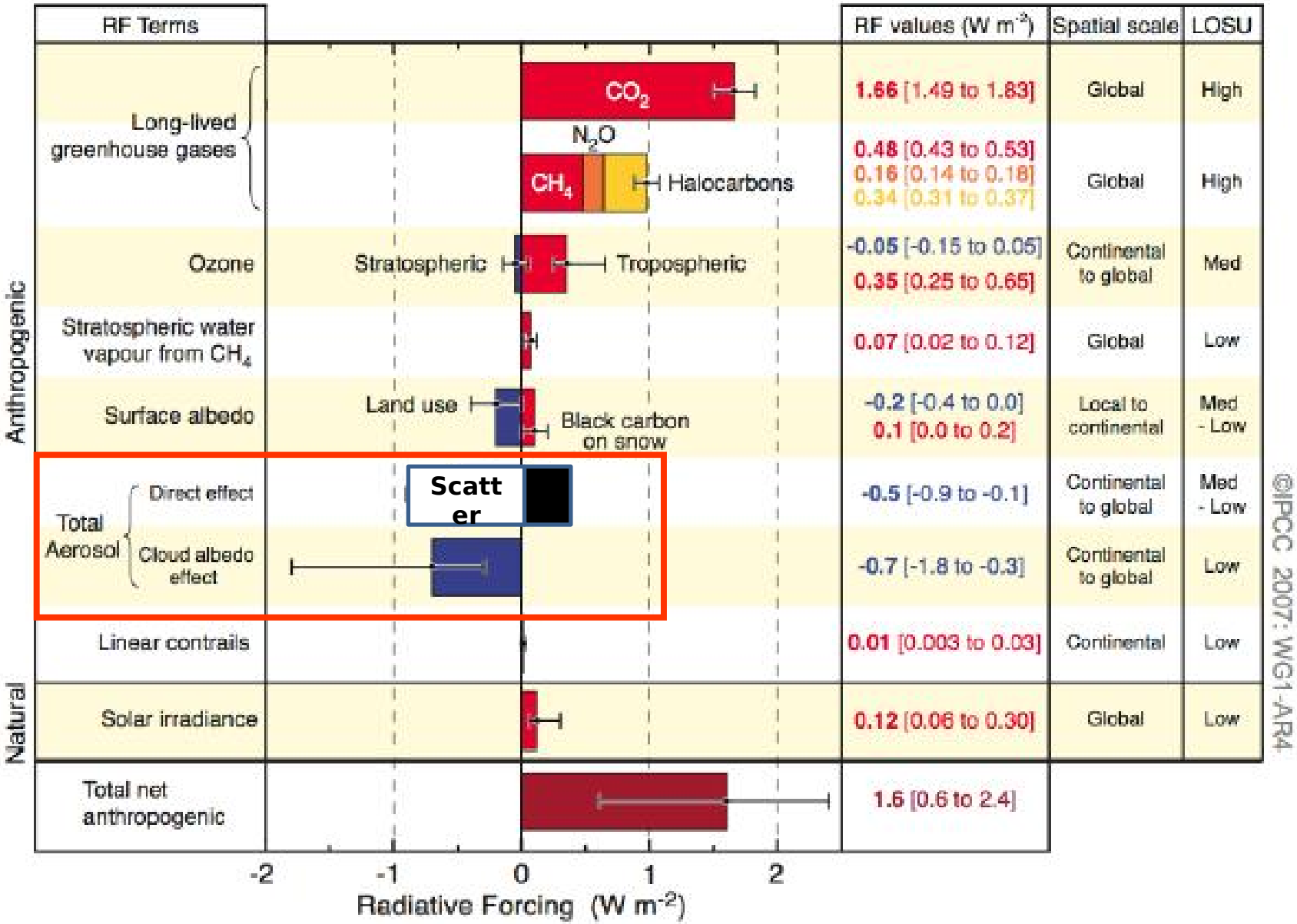
SLCF och deras inverkan på klimat och hälsa

Radiative Forcing Components



SLCF =
Klimatpåverkande
luftföroreningar

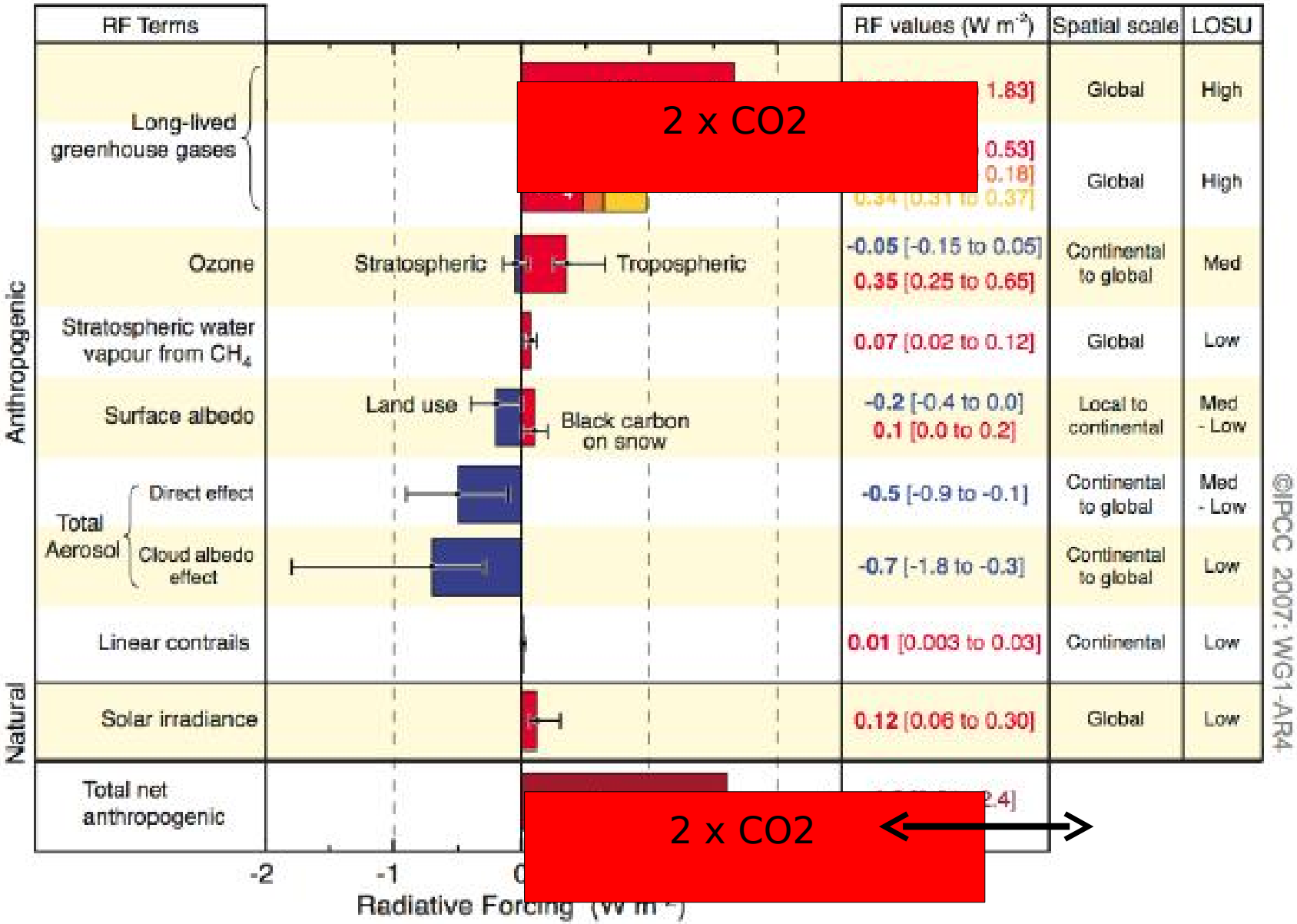
Radiative Forcing Components



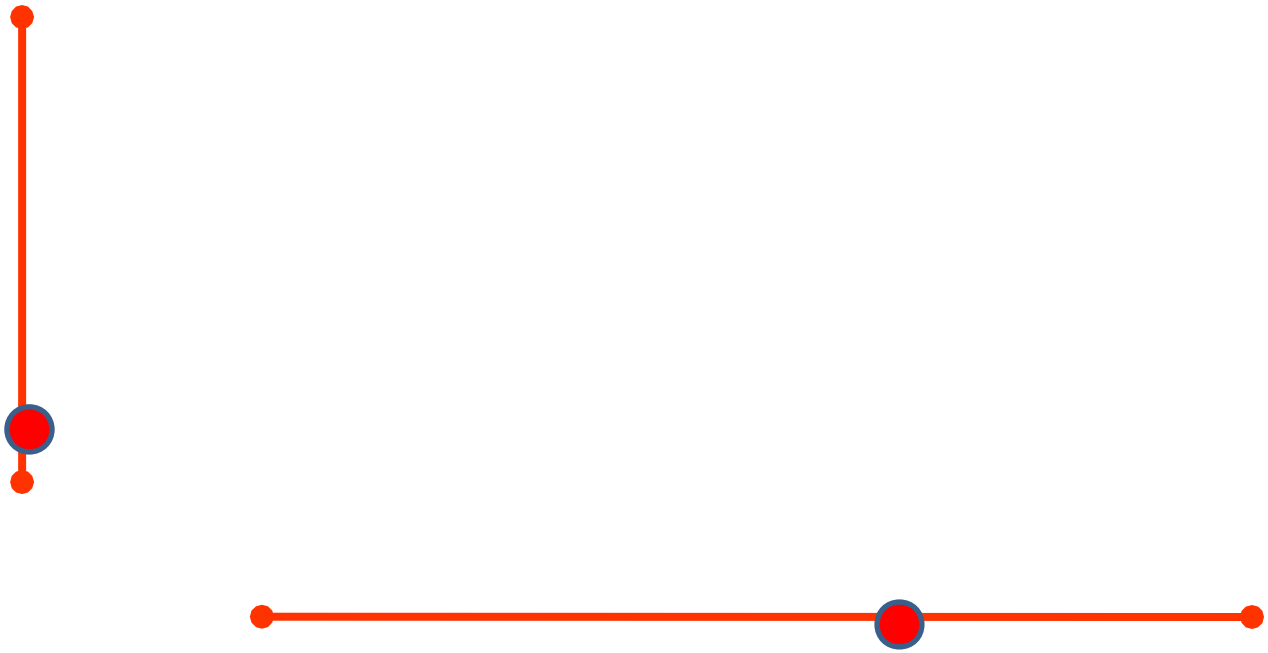
Different processes affecting clouds and thus

Effects	Cloud type	Description	Forcing
First indirect aerosol effect (Twomey effect)	All clouds	The more numerous smaller cloud particles reflect more solar radiation	- 0.5 to - 1.9
Second indirect aerosol effect (Albrecht affect)	All clouds	Smaller cloud particles decrease the precipitation efficiency, thereby prolonging cloud lifetime	- 0.3 to - 1
Semi-direct effect	All clouds	Absorption of solar radiation by soot may cause evaporation of cloud particles	+ 0.1 to - 0.5
Glaciation indirect effect	Mixed ice and liquid water clouds	More ice nuclei increase the precipitation efficiency	0.2 to 1
Thermodynamic effect	Mixed ice and liquid water clouds	Smaller cloud droplets delay the onset of freezing	Uncertain
Riming indirect	Mixed ice and	Smaller cloud droplets	Uncertain

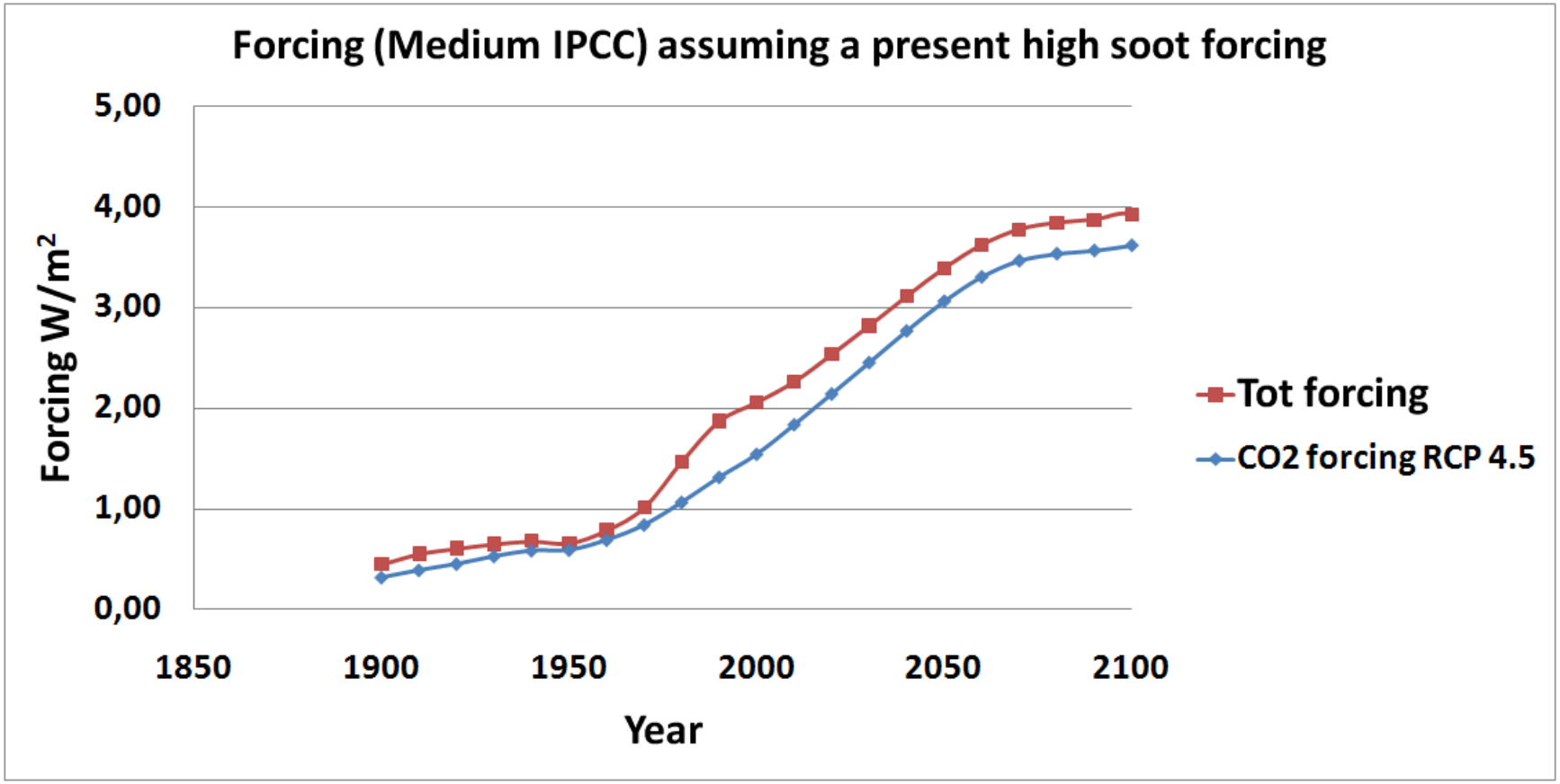
Radiative Forcing Components



Temperature increase at double CO2 concentration

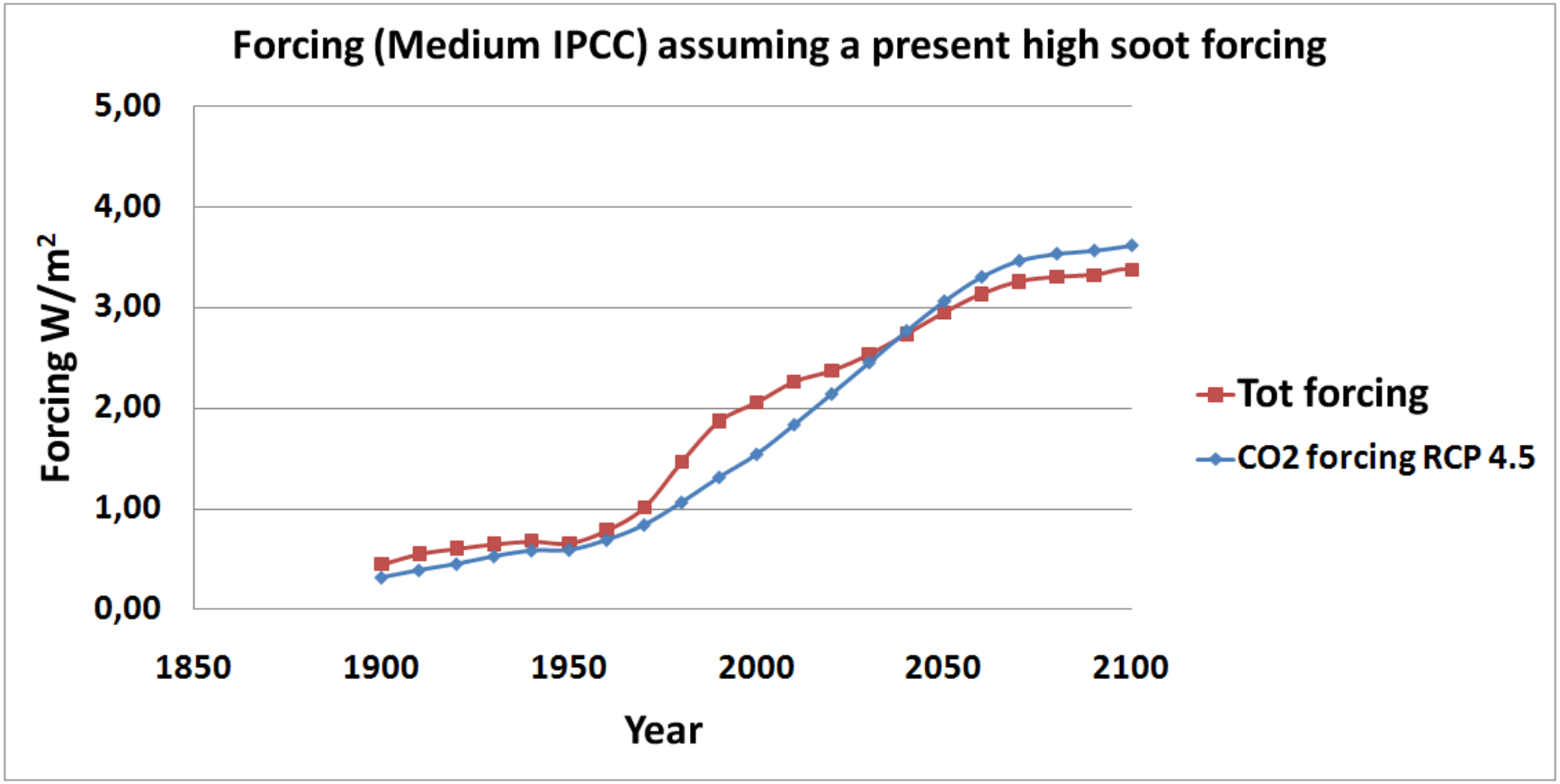


Possible climate directed air quality abatement



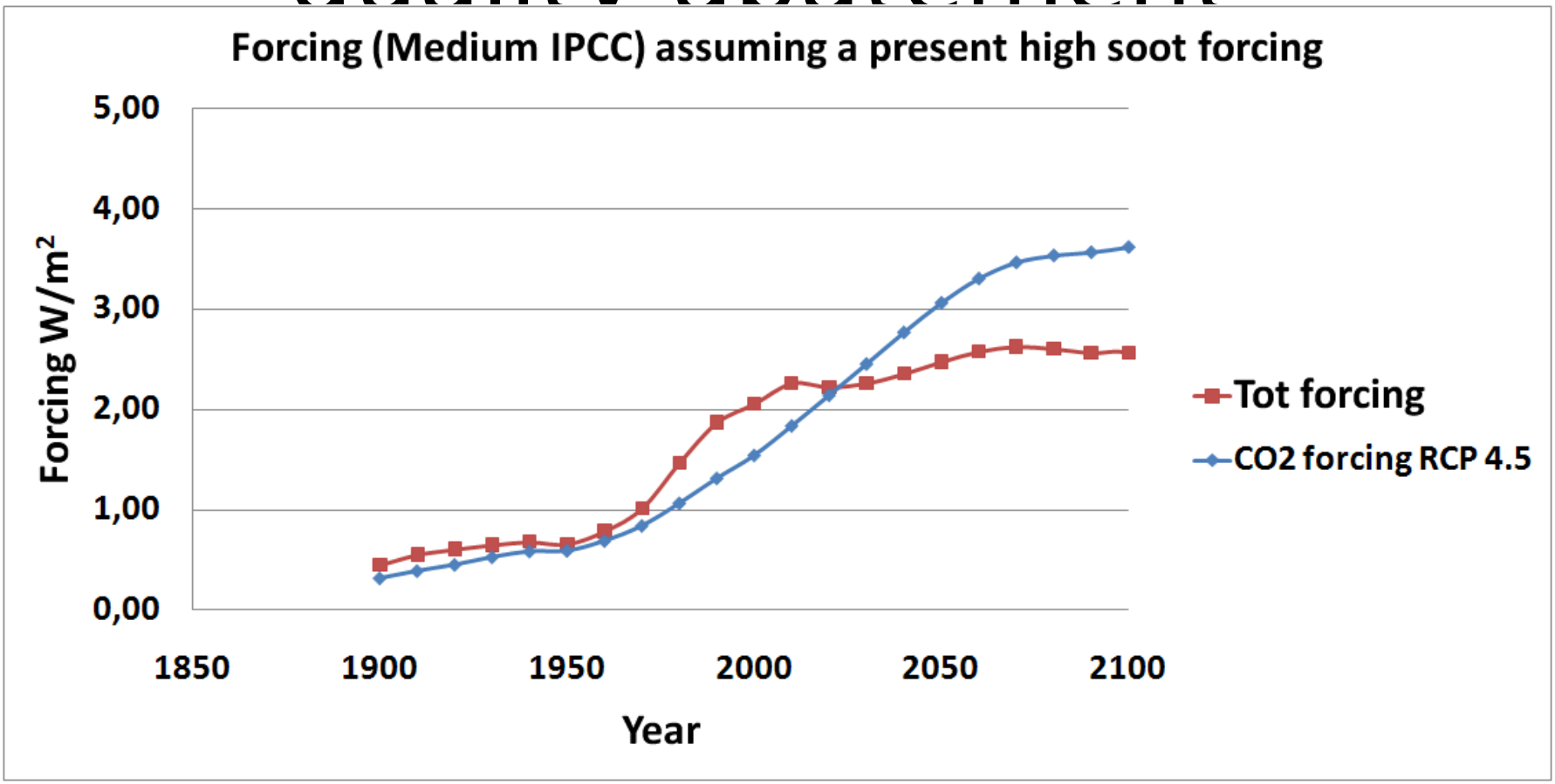
Scenario type 1 assuming constant emissions (2010) or a climate neutral abatement of SLFC, e.g. 3% particle plus 10% soot decrease forcing per decade

Possible climate directed air quality abatement



Scenario type 2 assuming a climate cooling abatement strategy of SLFC, e.g. 3% particles, 20% soot, 20% ozone per decade

Possible climate directed air quality abatement



Scenario type 3 assuming a maximized climate cooling strategy to, e.g. 20% ozone, methane and soot per decade respectively.

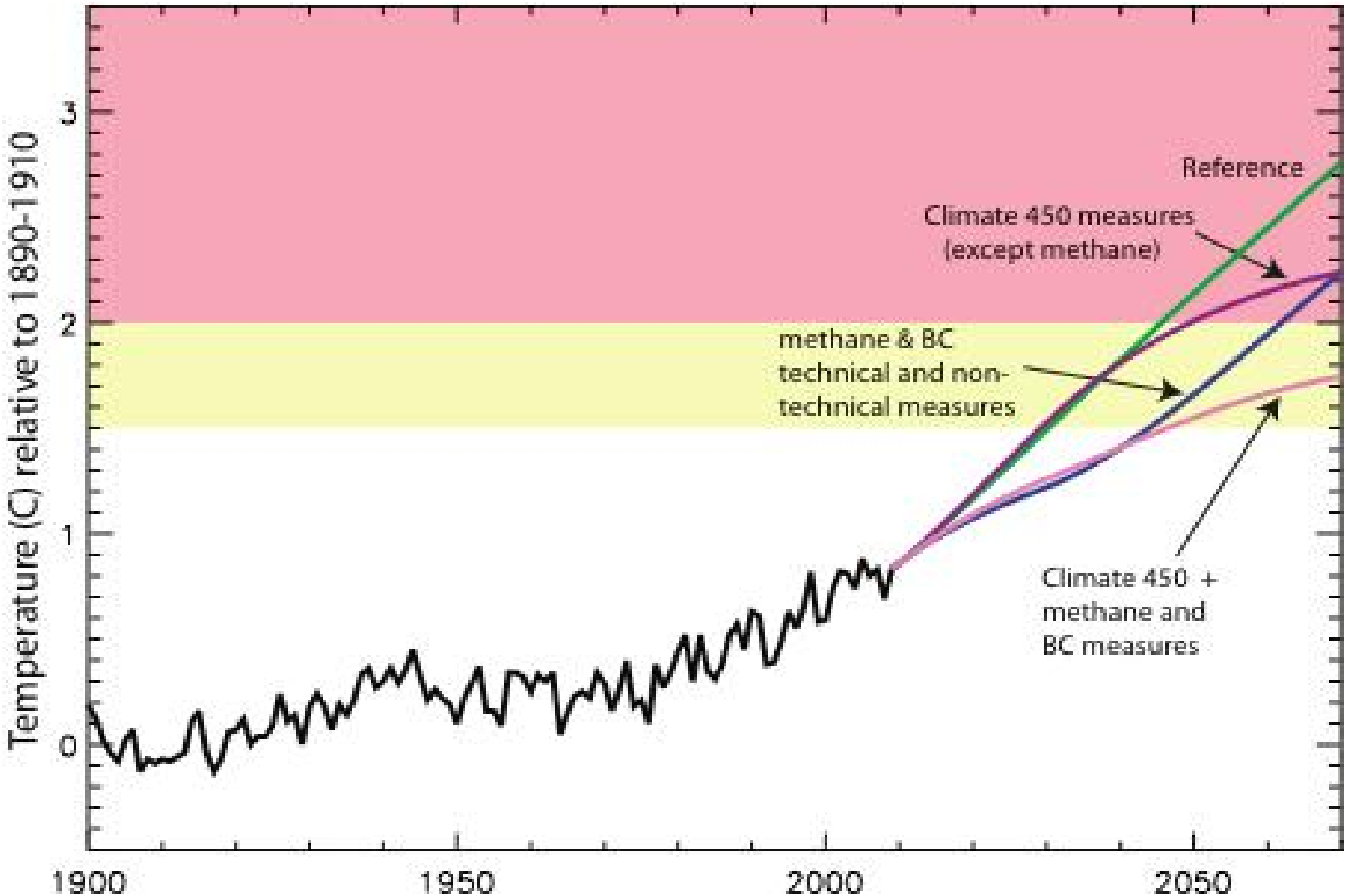
UNEP BC assessment

BC measures (affecting BC and other co-emitted compounds)	
Diesel particle filters for road and off-road vehicles	Transport
Elimination of high-emitting vehicles in road and off-road transport	
Replacing coal by coal briquettes in cooking and heating stoves	Residential
Pellet stoves and boilers, using fuel made from recycled wood waste or sawdust, to replace current wood-burning technologies in the residential sector in industrialized countries	
Introduction of clean-burning biomass stoves for cooking and heating in developing countries[2, 3]	
Substitution of clean-burning cookstoves using modern fuels for traditional biomass cookstoves in developing countries[2, 3]	
Replacing traditional brick kilns with vertical shaft kilns and Hoffman kilns	Industry
Replacing traditional coke ovens with modern recovery ovens, including the Industry improvement of end-of-pipe abatement measures in developing countries	
Ban of open field burning of agricultural waste[2]	Agriculture

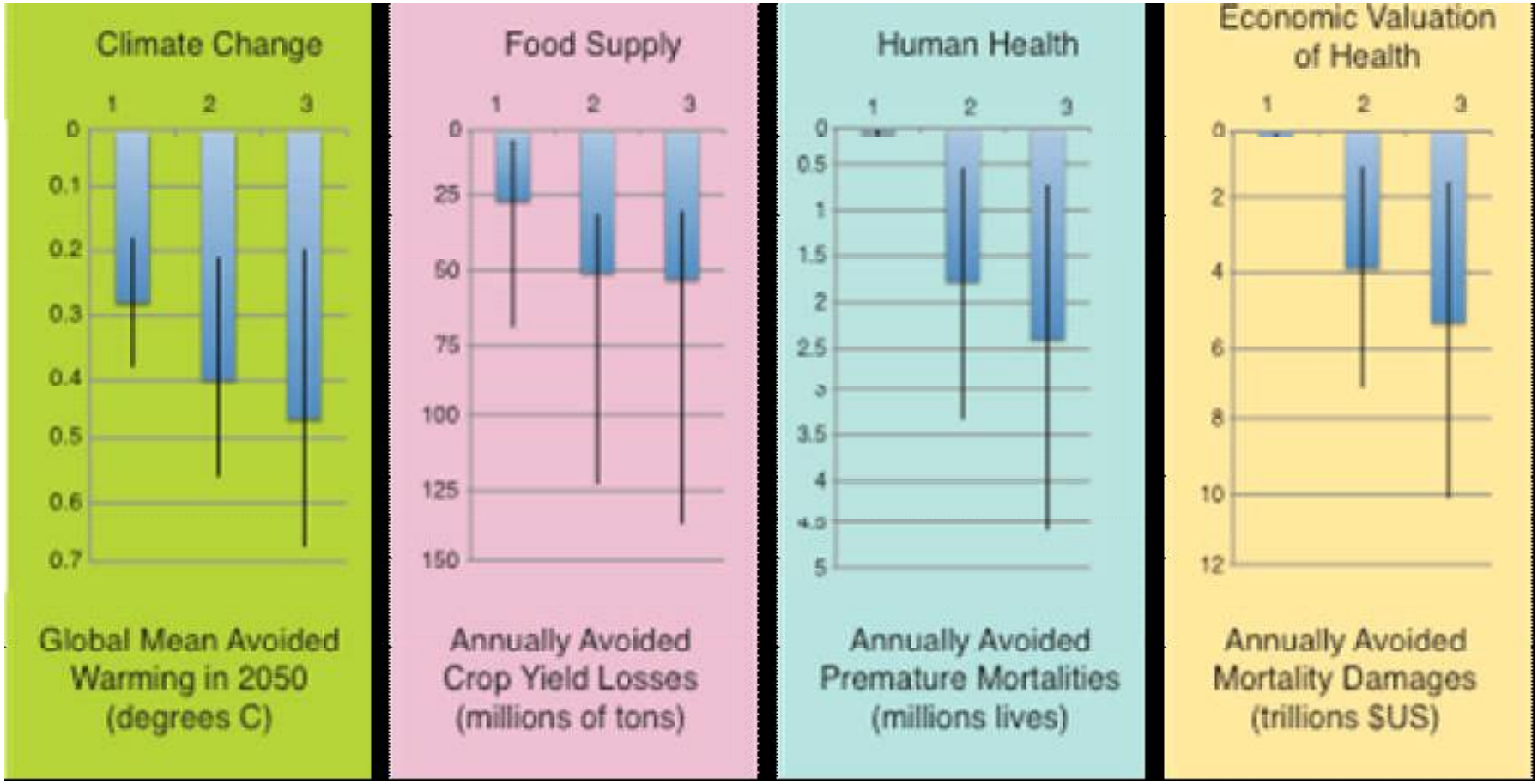
[1] There are measures other than those identified in the table that could be implemented. For example, electric cars would have a similar impact to diesel particulate filters but these have not yet been widely introduced; forest fire controls could also be important but are not included due to the

Measure1	Sector
CH4 measures	
Extended pre-mine degasification and recovery and oxidation of CH4 from ventilation air from coal mines	Extraction and transport of fossil fuel
Extended recovery and utilization, rather than venting, of associated gas and improved control of unintended fugitive emissions from the production of oil and natural gas	
Reduced gas leakage from long-distance transmission pipelines	
Separation and treatment of biodegradable municipal waste through recycling, composting and anaerobic digestion as well as landfill gas collection with combustion/utilization	Waste management
Upgrading primary wastewater treatment to secondary/tertiary treatment with gas recovery and overflow control	
Control of CH4 emissions from livestock, mainly through farm-scale anaerobic digestion of manure from cattle and pigs	Agriculture
Intermittent aeration of continuously flooded rice paddies	

UNEP BC assessment

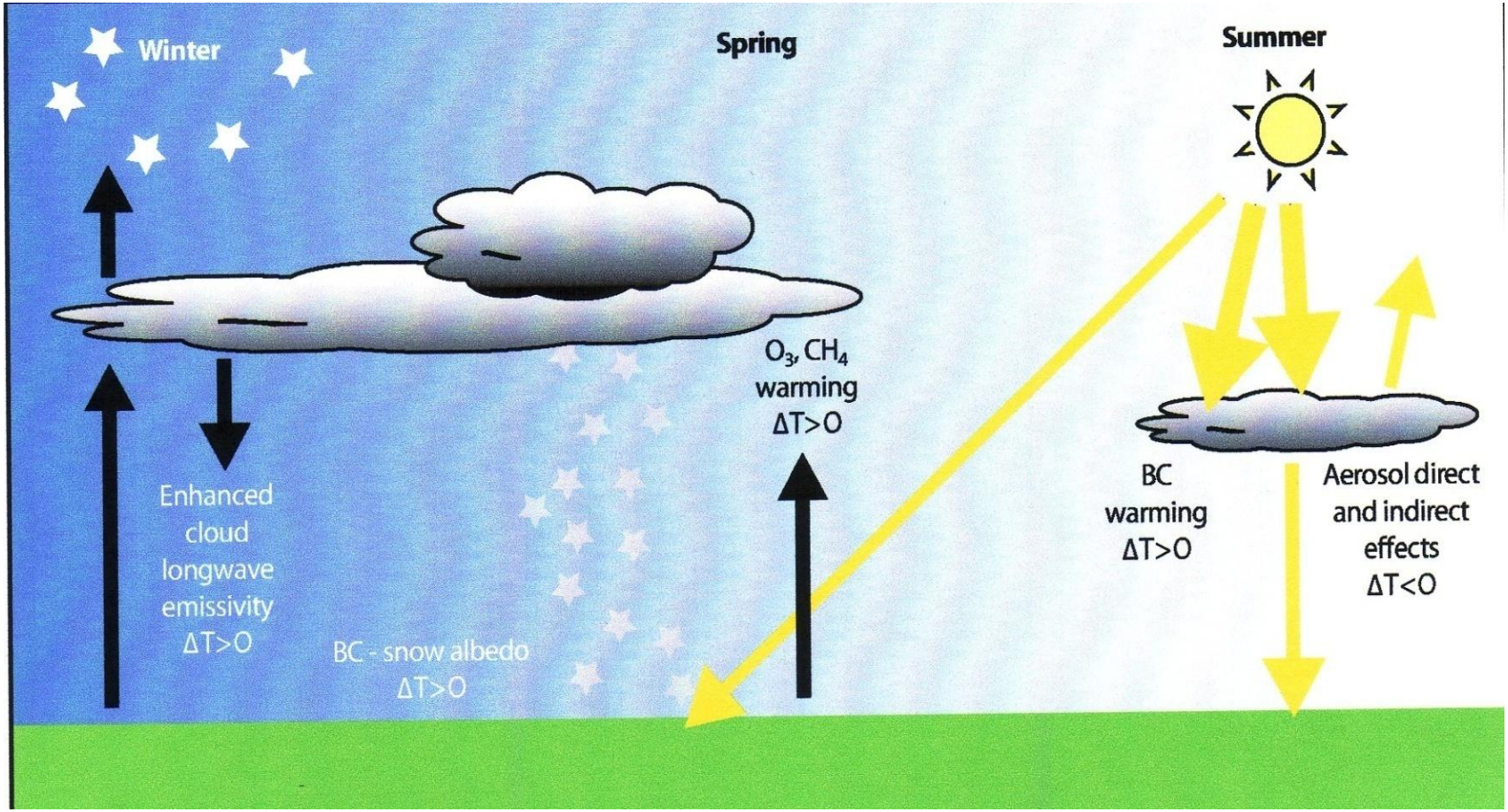


Global impacts of the additional emissions controls on methane and products of incomplete combustion (including BC, OC



1/ Methane measures, 2/ 1+BC technical measures, 3/ 2+ Non-technical measu

Forcing mechanisms in the Arctic due to short-lived



ΔT indicates the surface temperature response (Quinn et al., 2008).

Anthropogenic sulfur

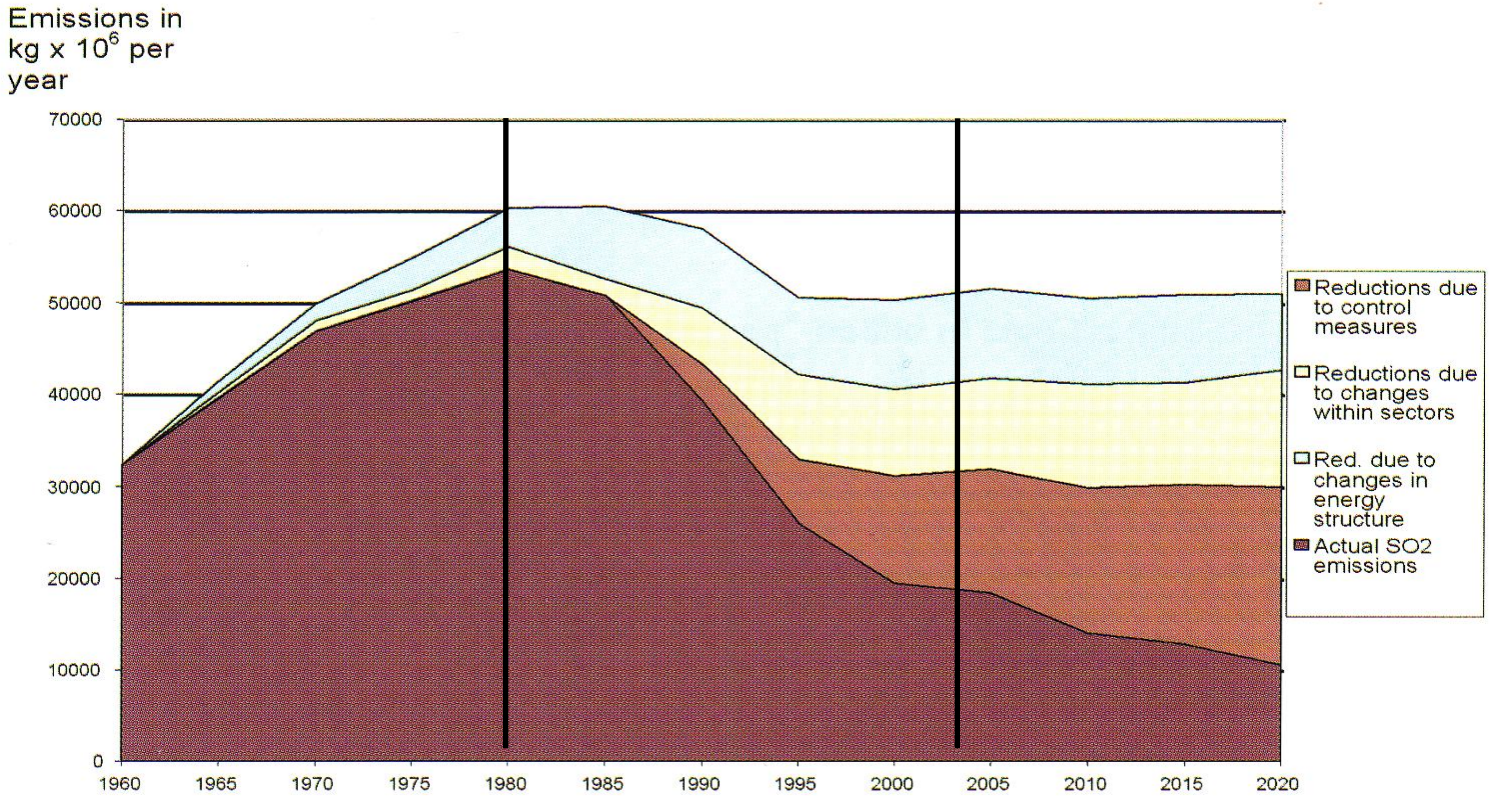
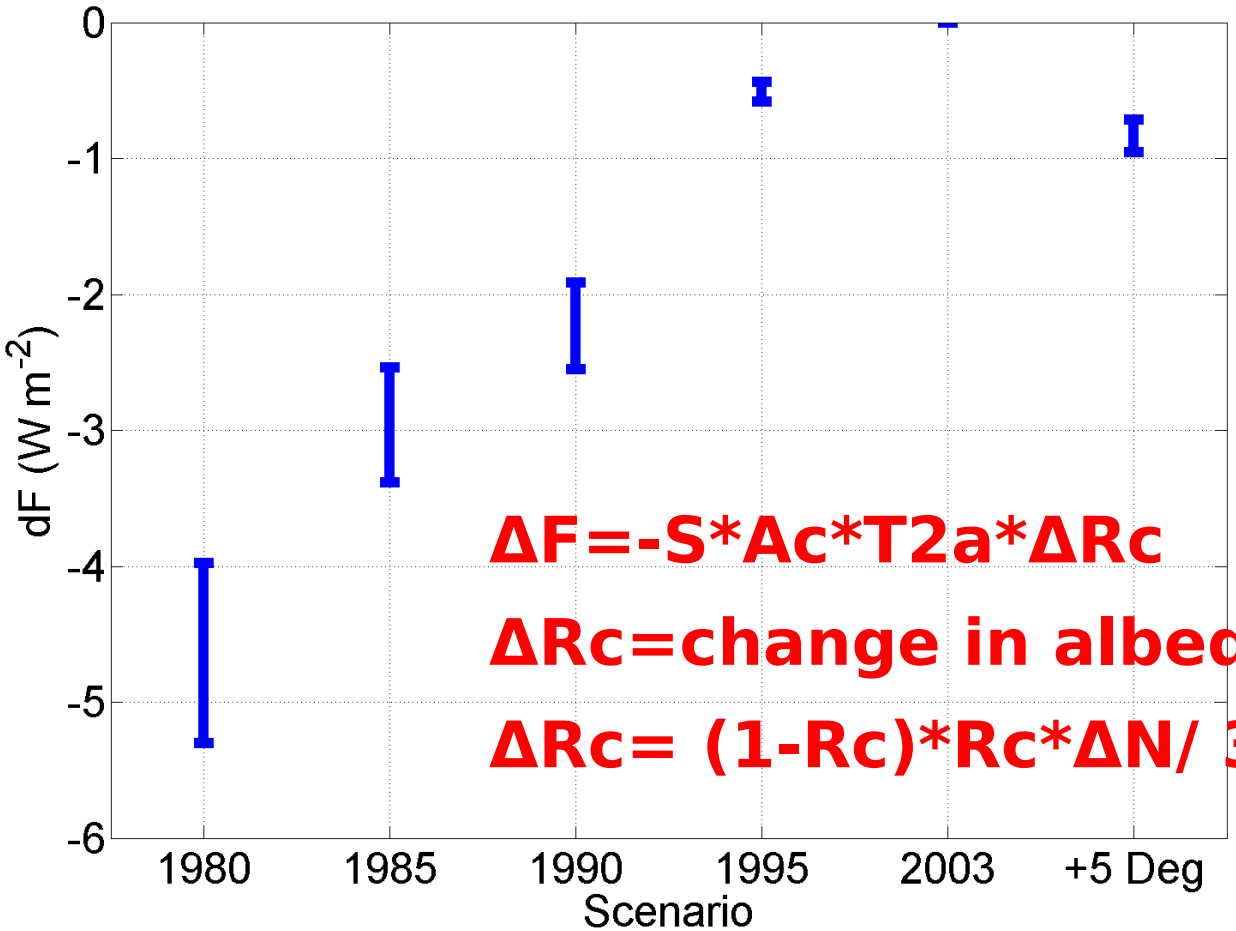


Figure 6.1. The prevention of SO2 emissions in Europe 1960-2020: actual levels compared to hypothetical levels taking into account energy consumption growth

Source: IIASA

Forcing estimate relative 2003:



ΔF=-S*Ac*T2a*ΔRc

ΔRc=change in albedo

ΔRc= (1-Rc)*Rc*ΔN/ 3N

mey 1994

Average insolation (S)
210 W m-2

Typical cloud cover (Ac):
0.6

Transmissivity (Ta):
0.76

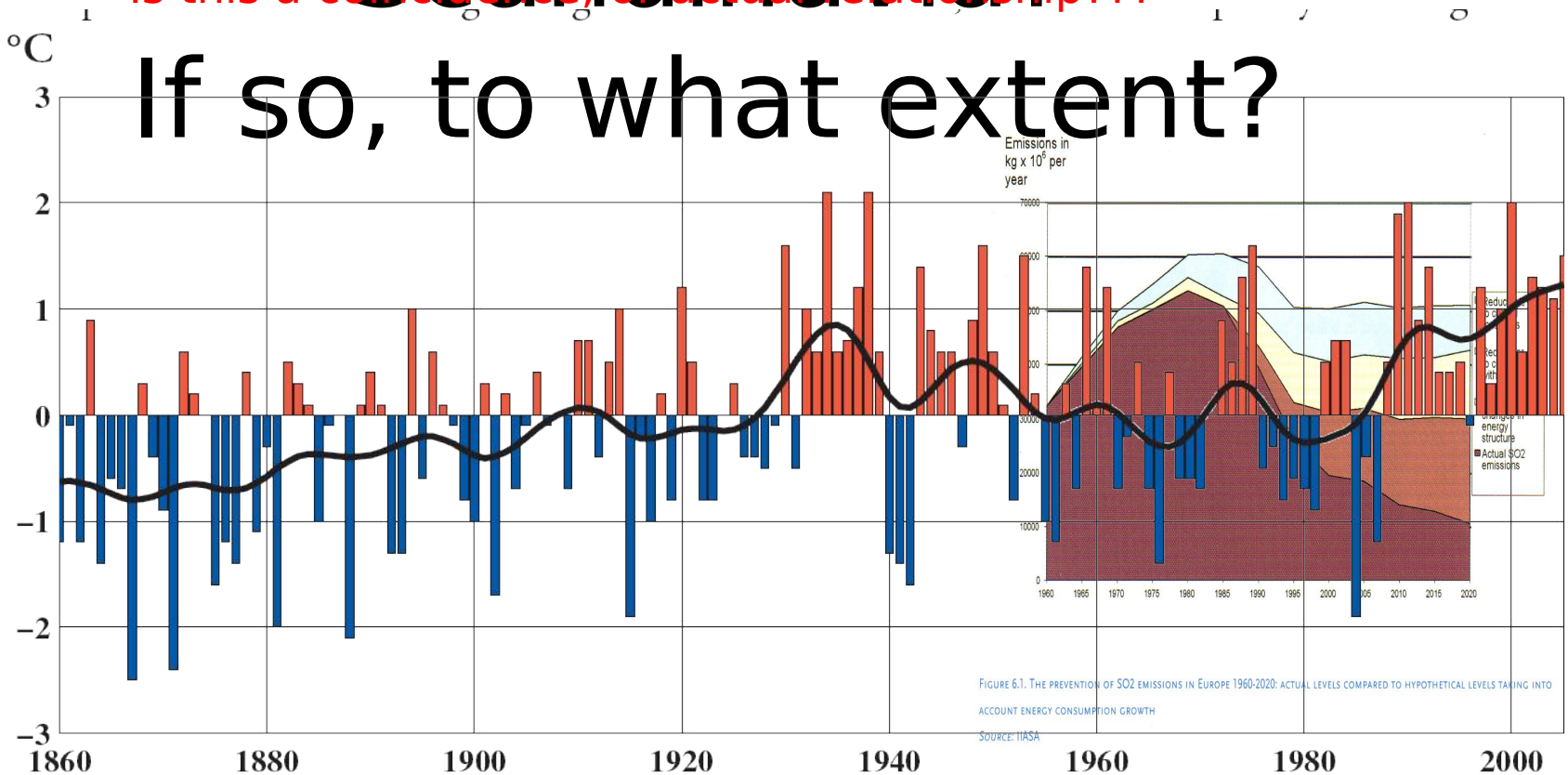
Typical cloud albedo 2003 (Rc):
0.25-0.75

Cloud Droplet Number (N);
Number of particles

Have this reduction affected temperatures over Scandinavia?

Is this a coincidence, or actual relationship???

If so, to what extent?



Sammanfattning

- Klimatpåverkande luftföroreningar
- KL väsentligt bidrag i att mildra klimatförändringar
- Samordnat och effektivt åtgärdsarbete möjligt
- Åtgärder påverkar luftkvalitet och **klimat** regionalt