Let’s focus on Soot instead!

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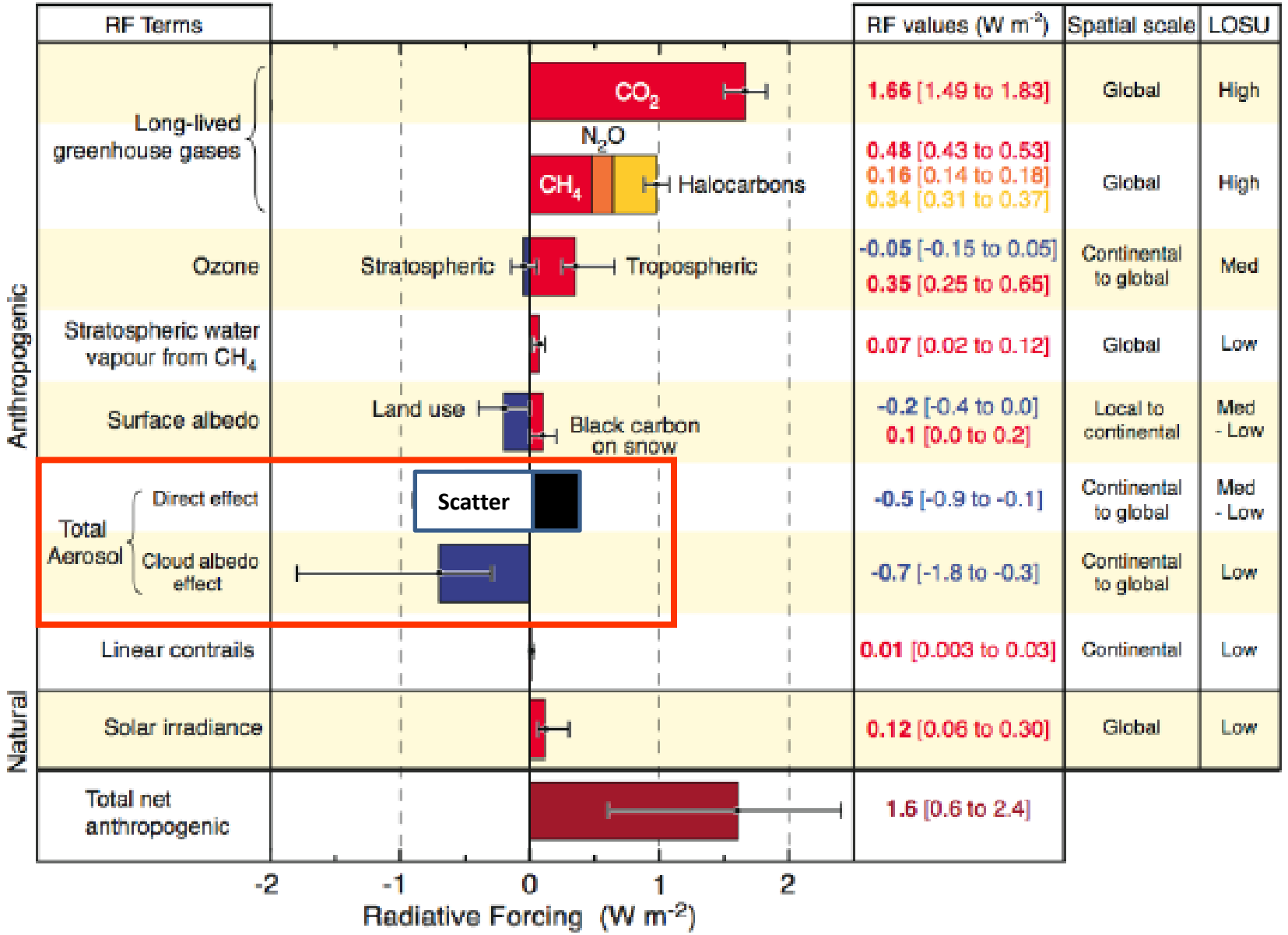
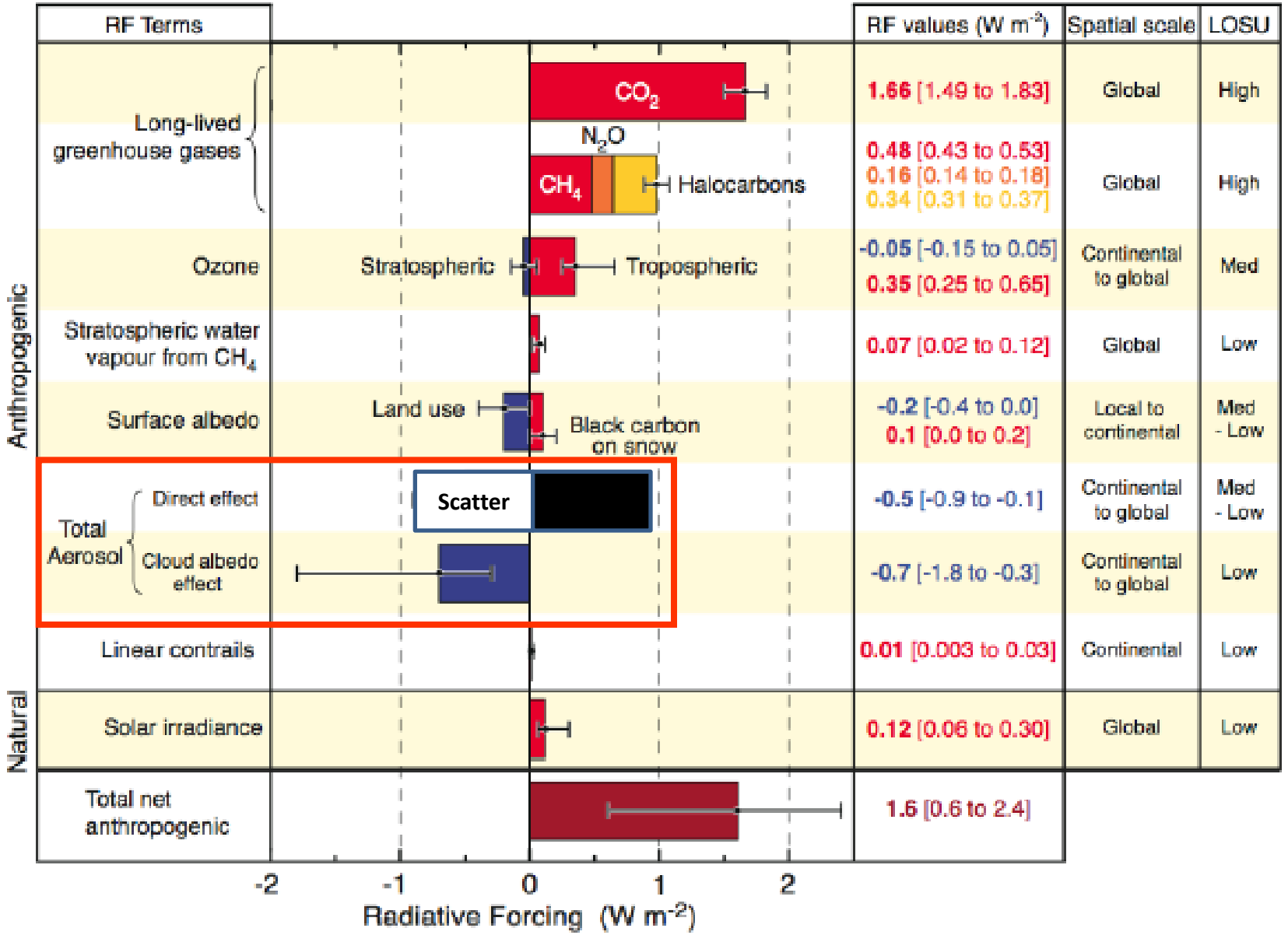
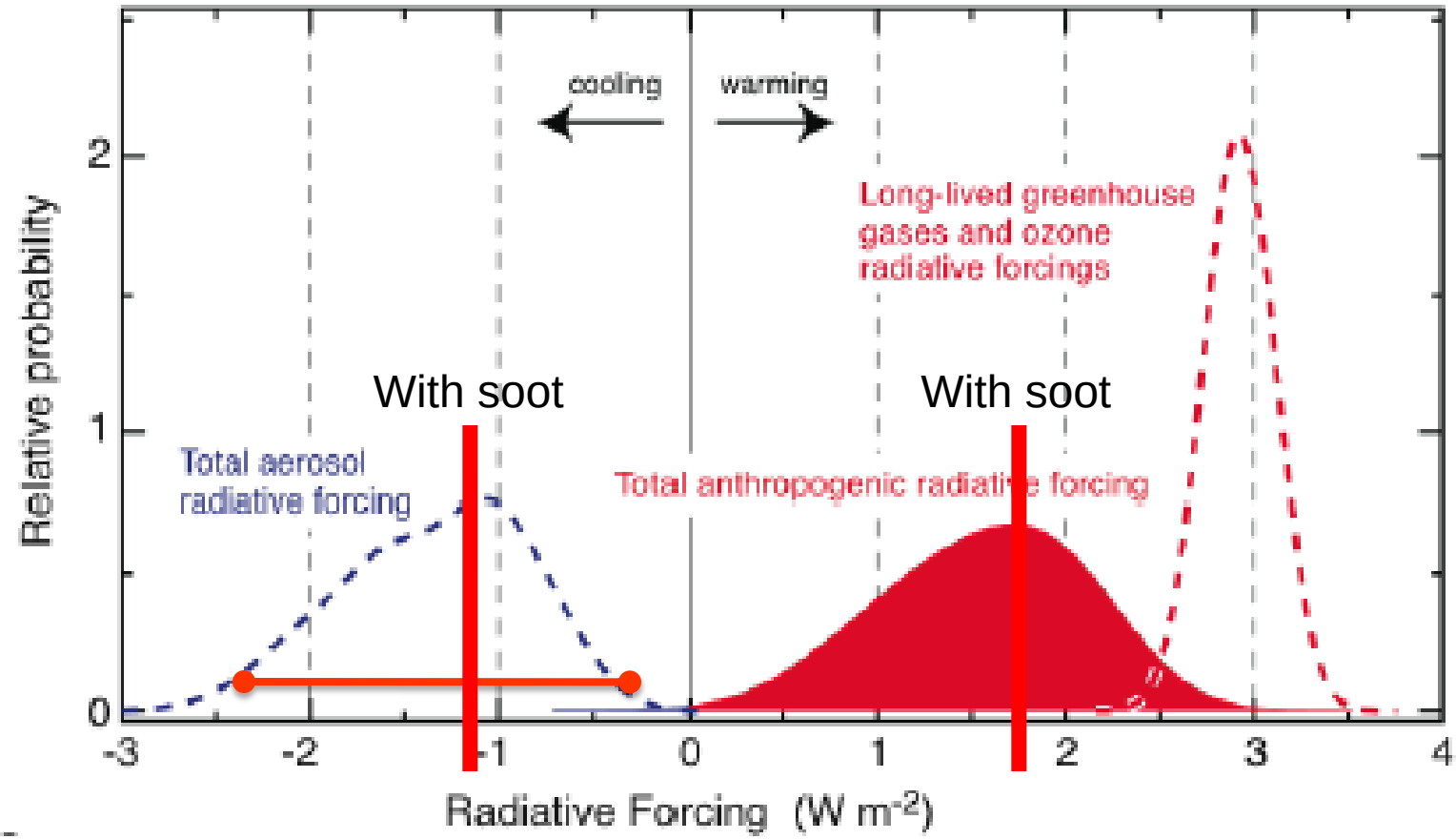
Radiative Forcing Components



Radiative Forcing Components

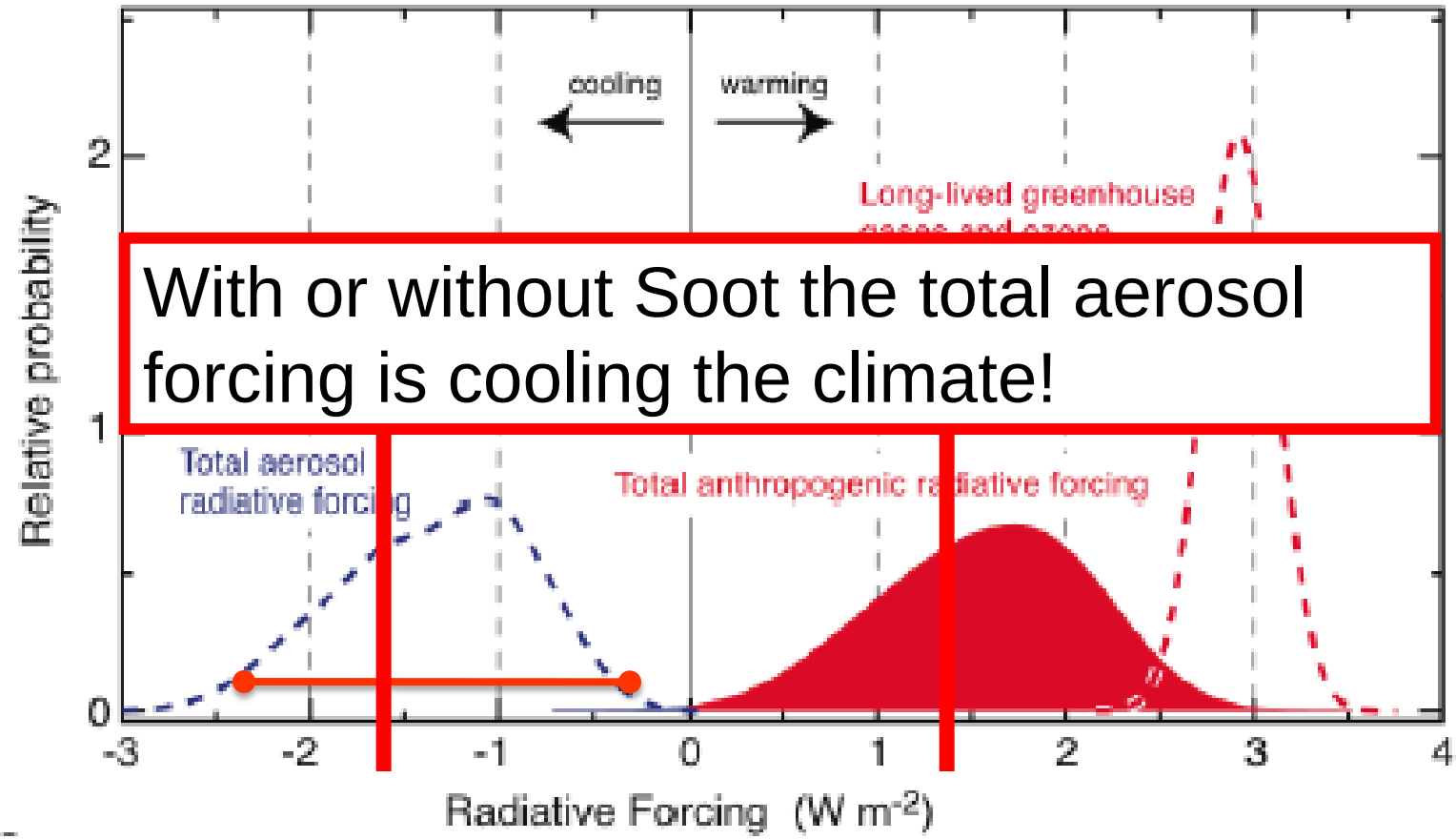


Greenhouse gases + particles =



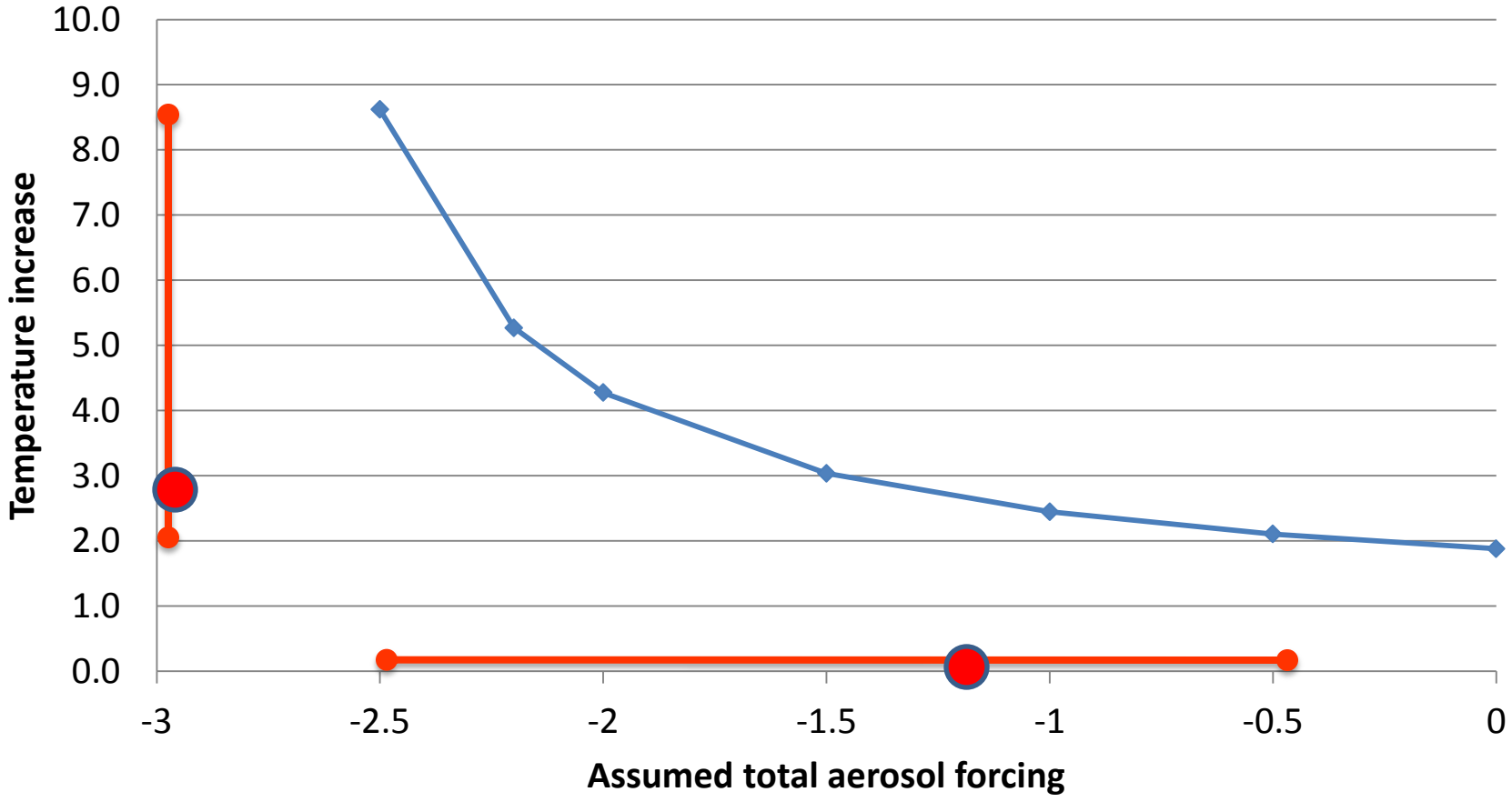
IPCC, chapt. 2, 2007

Greenhouse gases + particles =

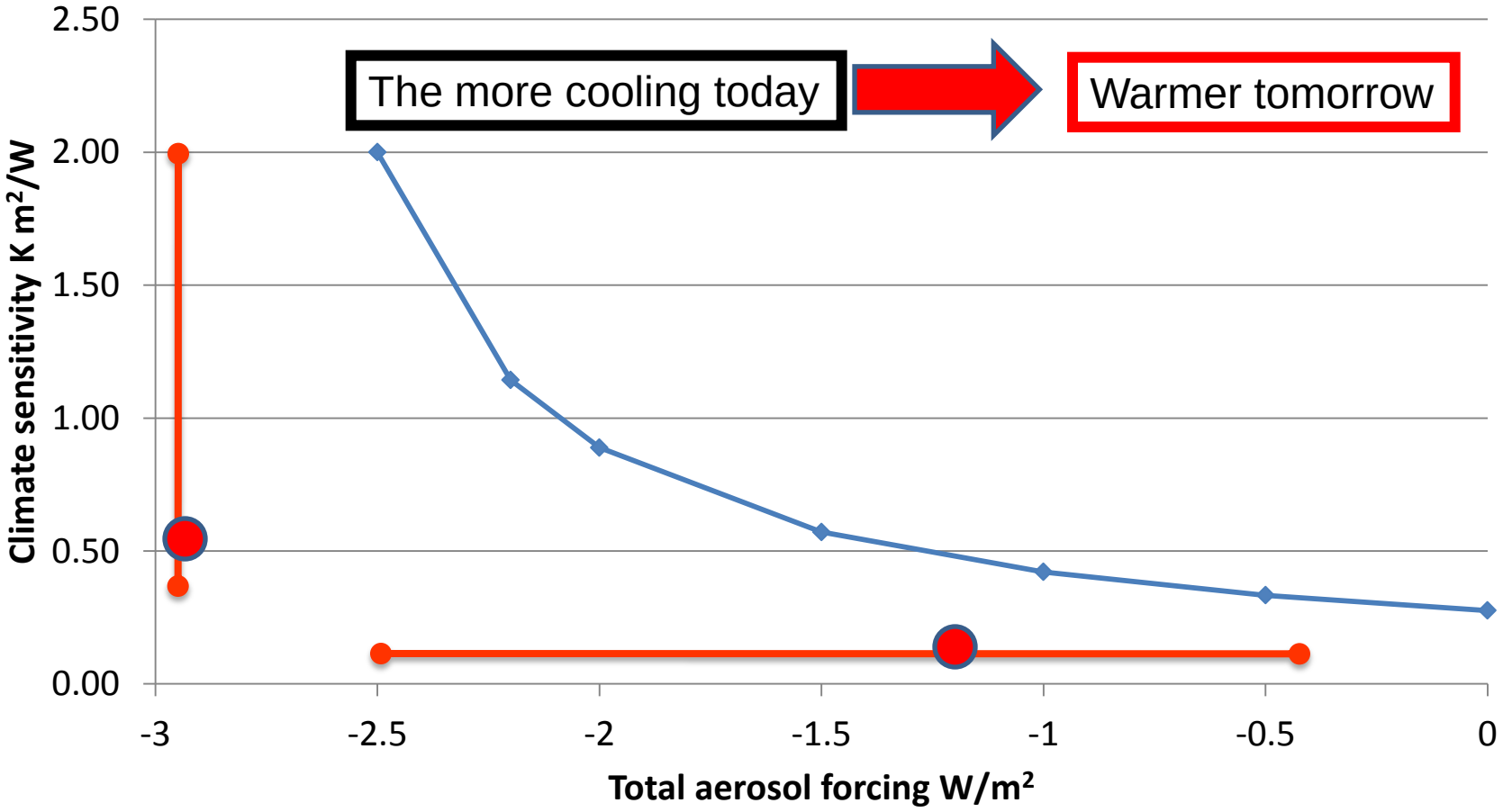


IPCC, chapt. 2, 2007

Global temperature increase at double CO_2 concentration



Present aerosol forcing determine future global climate development



IPCC's forcing estimates

Forcing (W/m2)		Low	Medium	High	Extreme
Present	CO2	1,7	1,7	1,7	1,7
	Ozone	0,4	0,4	0,4	0,4
	Scattering	-0,4	-0,9	-1,1	-1,1
	Soot	0,2	0,4	0,4	0,4
	Indirect	-0,3	-0,7	-1,53	-1,8
	Total	2,55	1,86	0,83	0,56
	Aerosol	-0,5	-1,2	-2,23	-2,5
Climate Sensitivity K/Wm^{-2}		0,33	0,48	1,21	2,00

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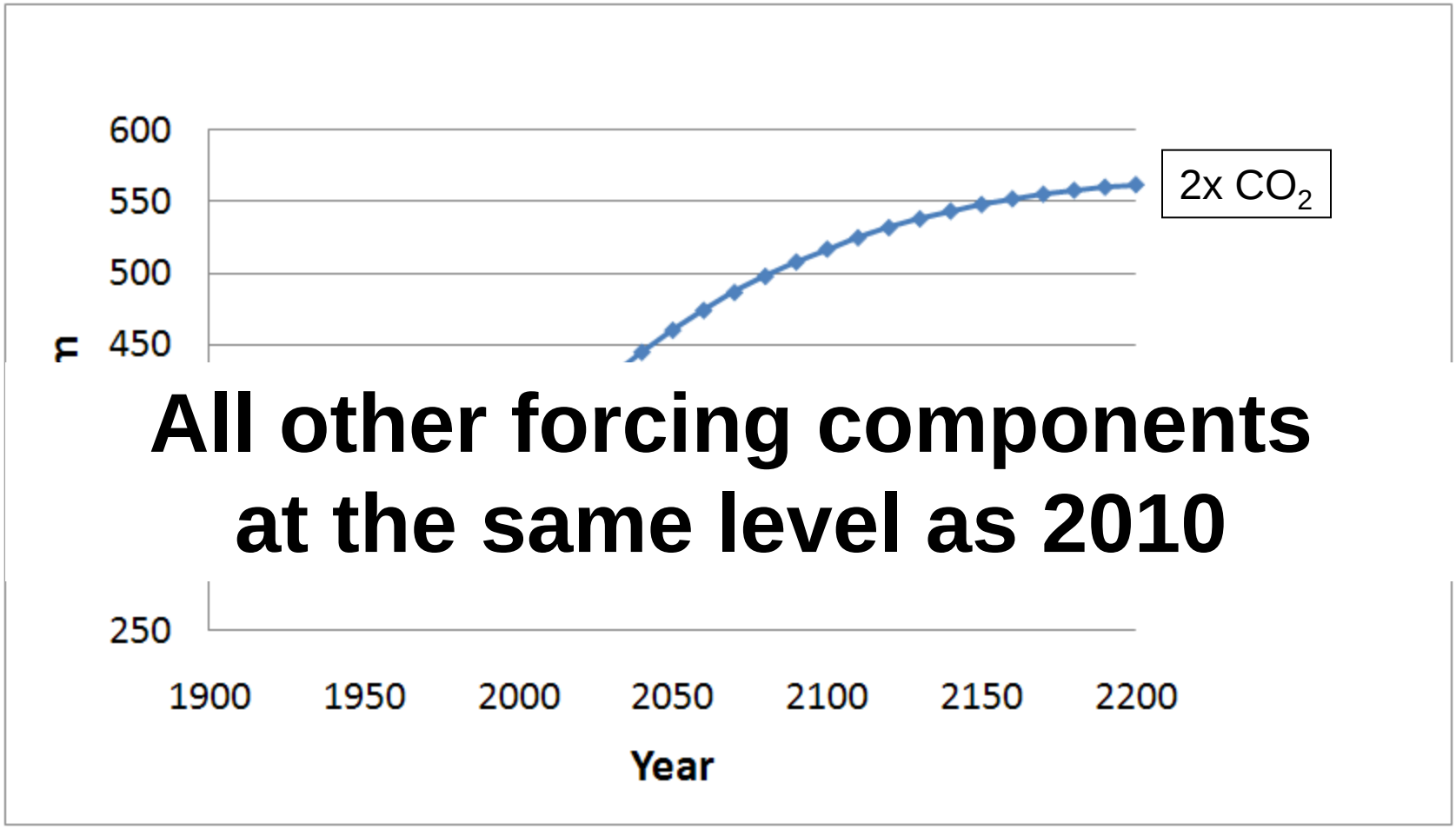
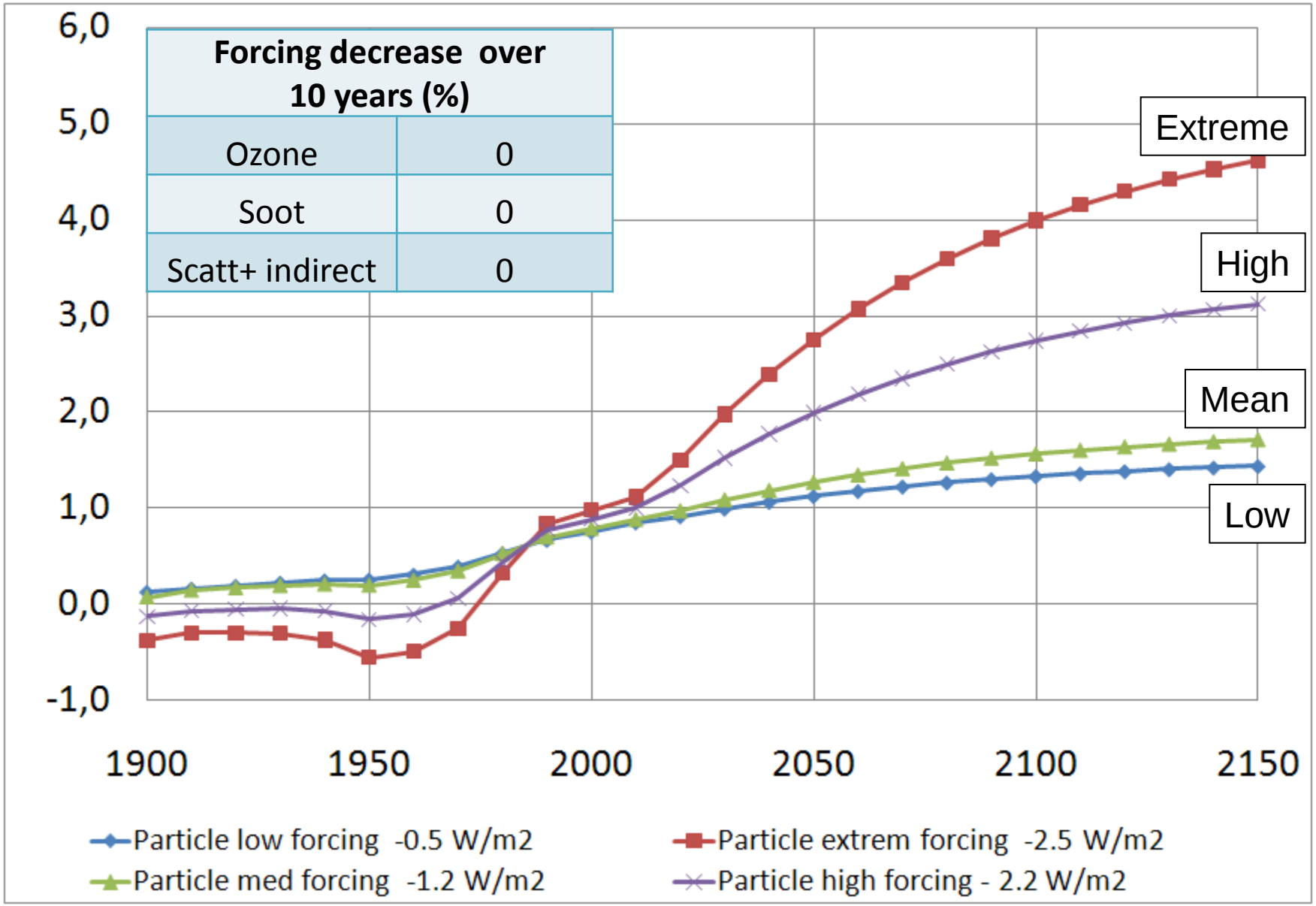
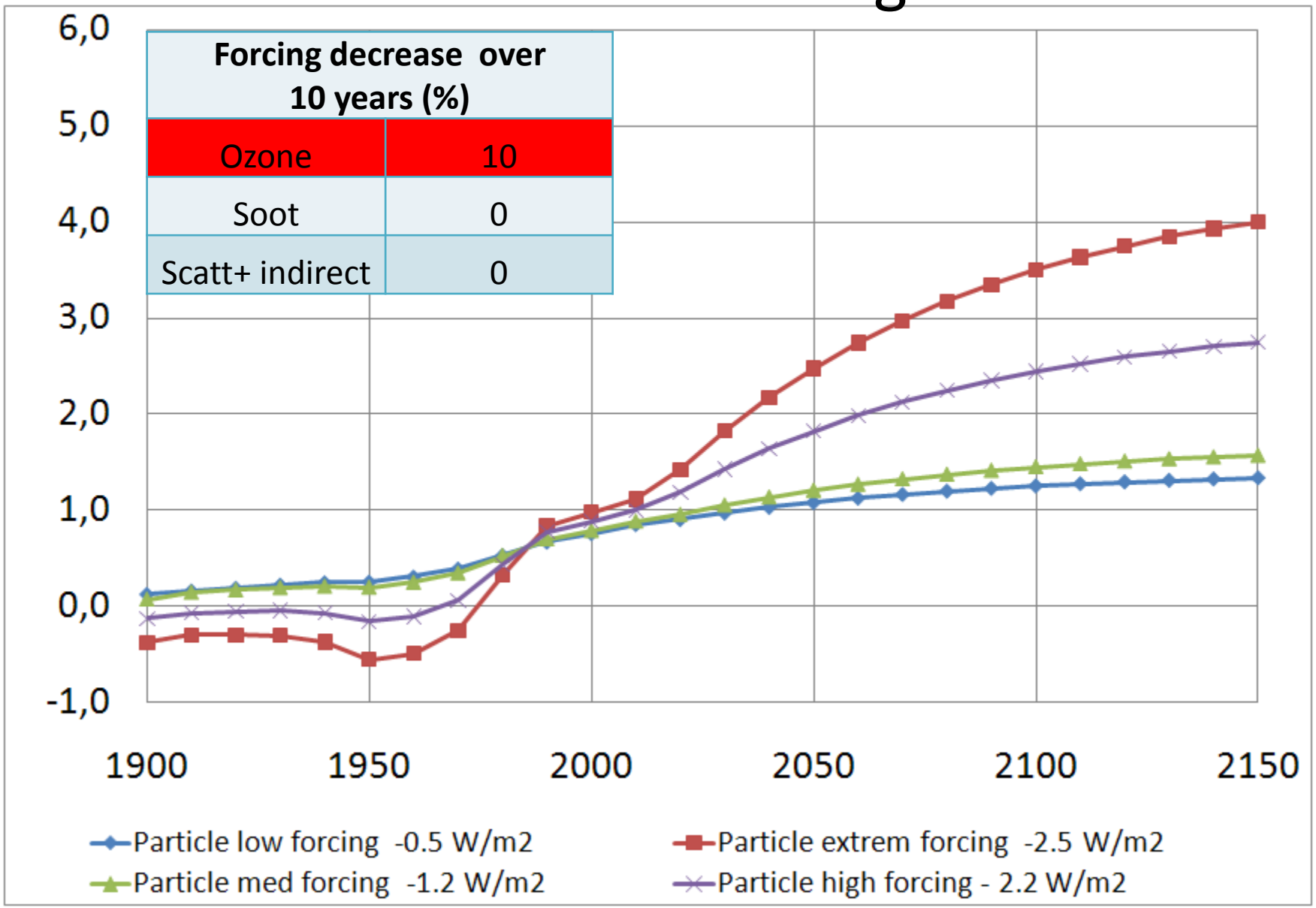
Measured and assumed CO_2 concentration



Different present total aerosol forcing (climate sensitivity) will give different temperature response!



Global temp trend at different total aerosol forcing



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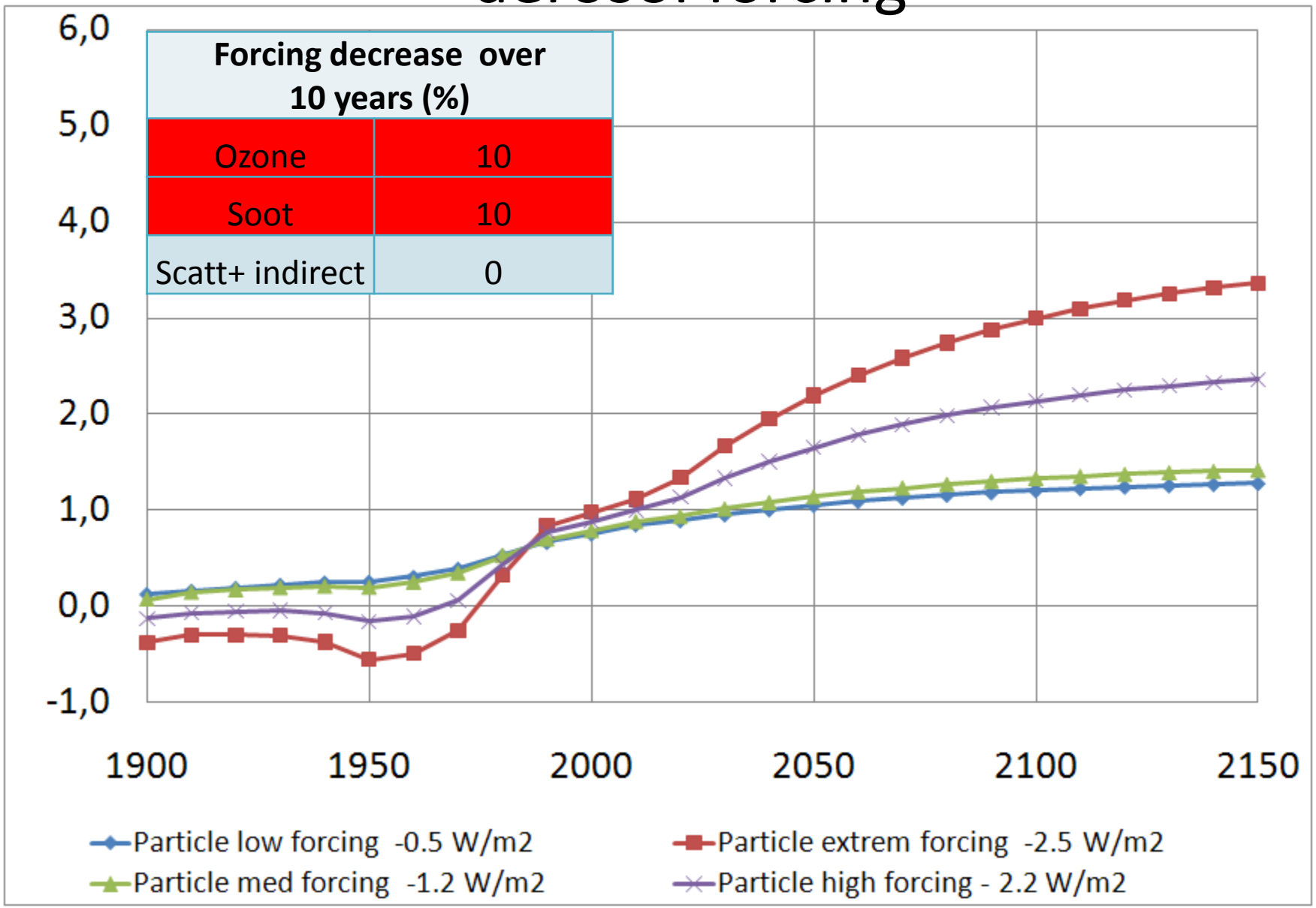

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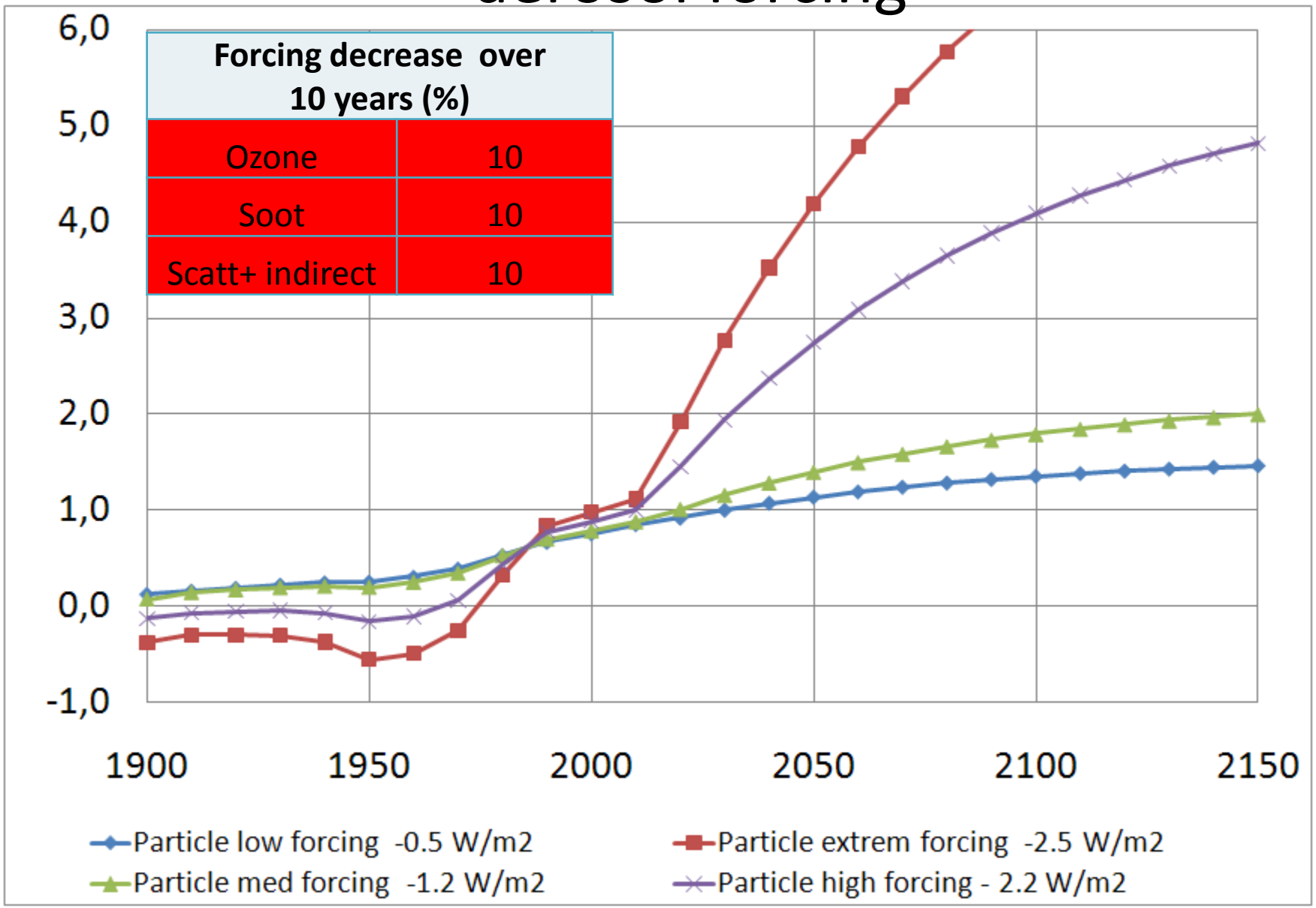
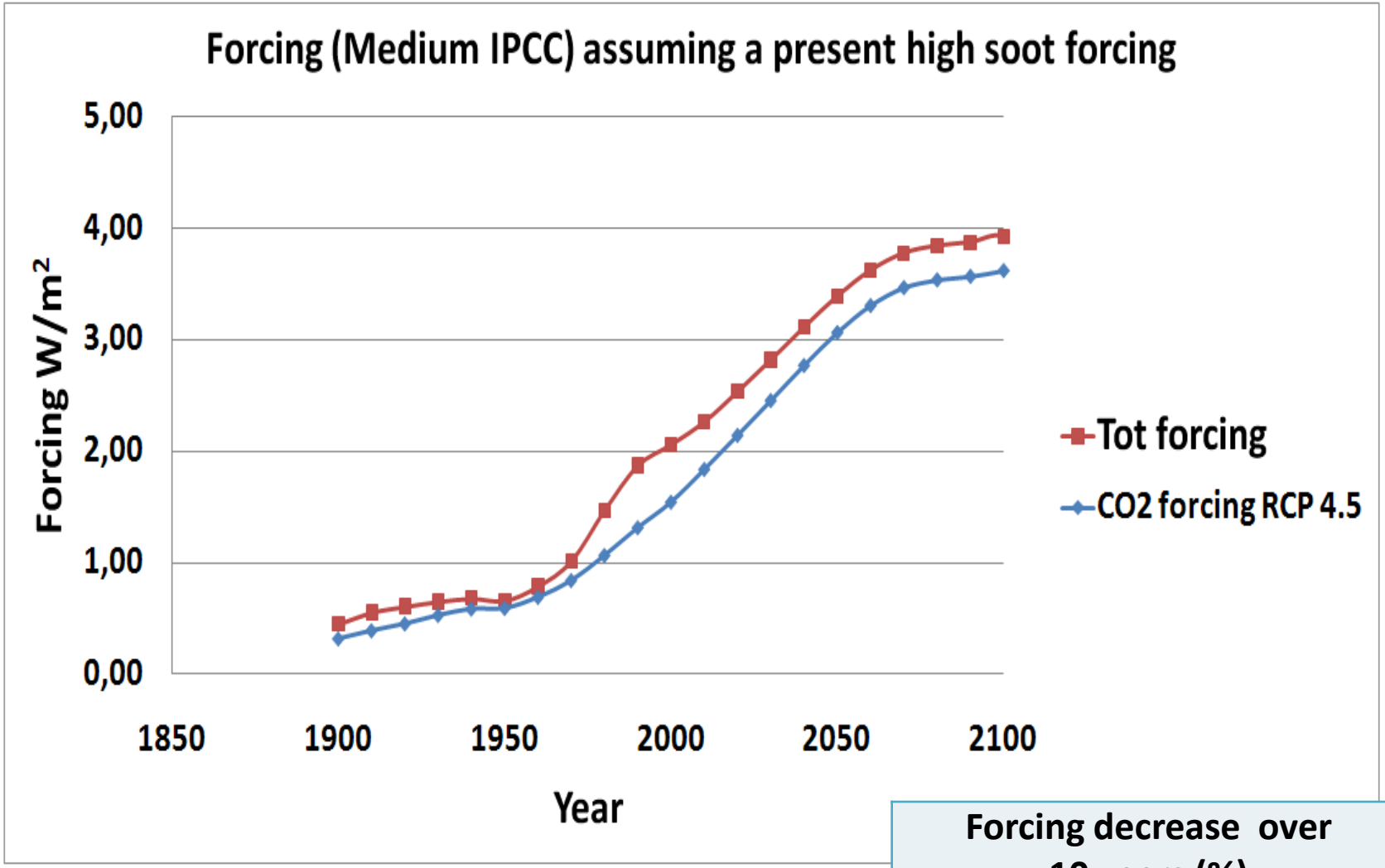


Conclusions so far

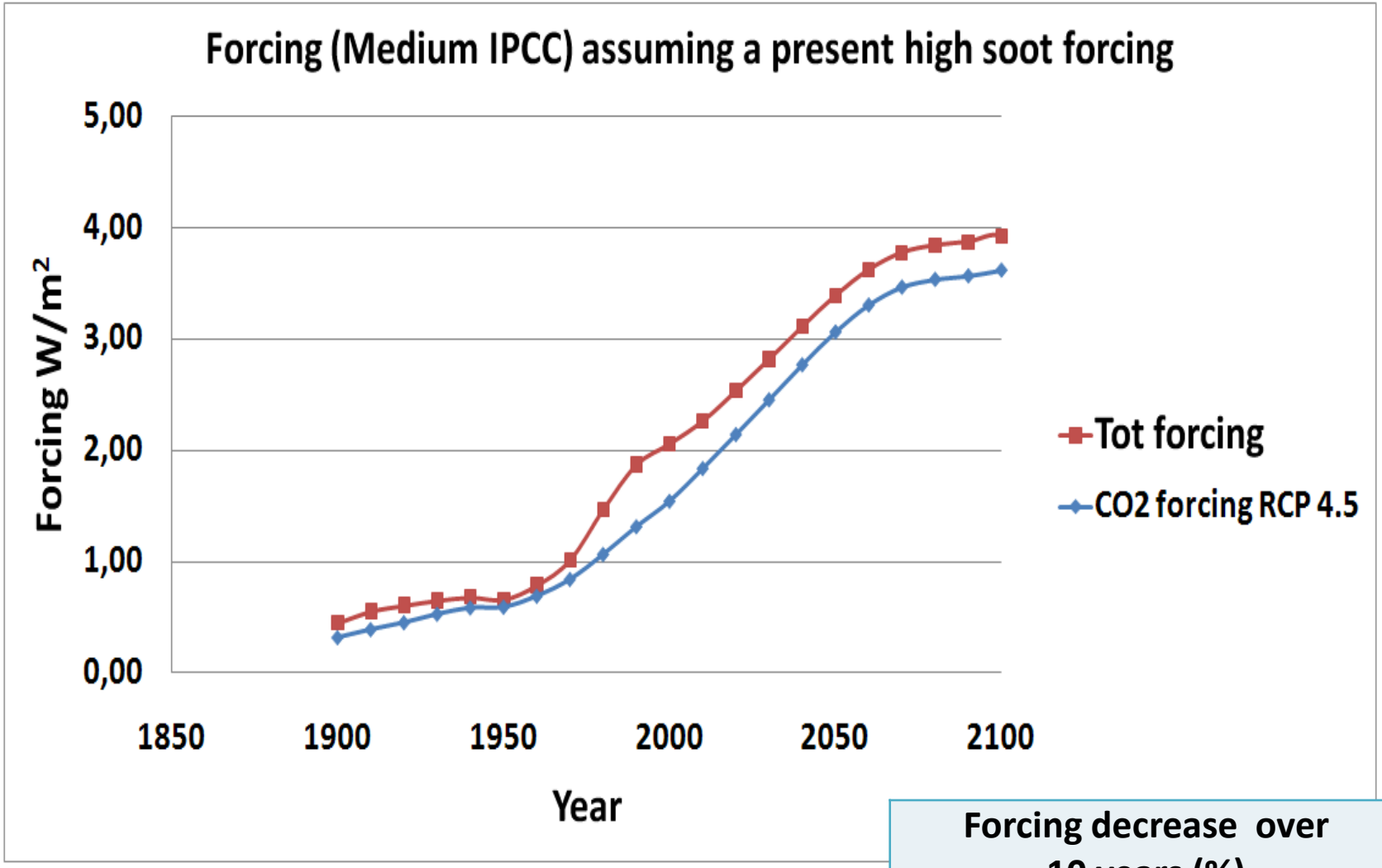
- CO2 dominates the forcing and thus the climate effect
- The magnitude of the climate effect depends on the climate sensitivity, i.e. present total aerosol forcing!
- The climate effect of different abatement measures is proportional to the relative forcing influence
- The low and medium aerosol forcing cases give similar results while the extreme forcing case gives a very large effect however still proportional to relative forcing

Mean forcing for all but Soot

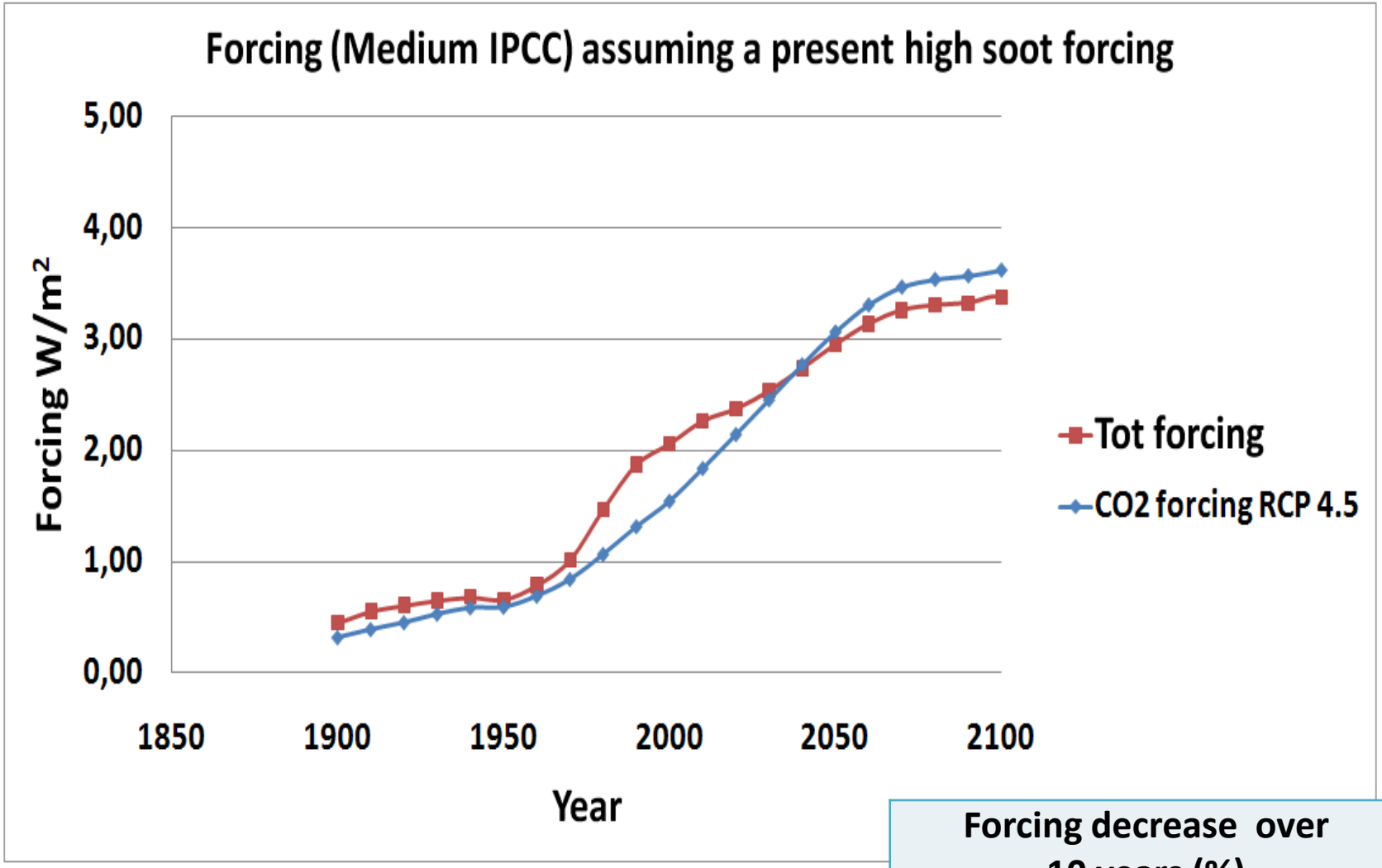
Forcing (W/m2)		Low	Medium	High	Extreme
Present	CO2	1,7	1,7	1,7	1,7
	Ozone	0,4	0,4	0,4	0,4
	Scattering	-0,9	-0,9	-0,9	-0,9
	Soot	0,2	0,4	0,8	1,2
	Indirect	-0,7	-0,7	-0,7	-0,7
	Total	**1,65**	**1,86**	**2,27**	**2,68**
	Aerosol	**-1,4**	**-1,2**	**-0,8**	**-0,4**
Climate Sensitivity		**0,54**	**0,48**	**0,37**	**0,33**



Forcing decrease over 10 years (%)	
Ozone	0
Soot	0
Scatt+ indirect	0



Forcing decrease over 10 years (%)	
Ozone	0
Soot	10
Scatt+ indirect	3



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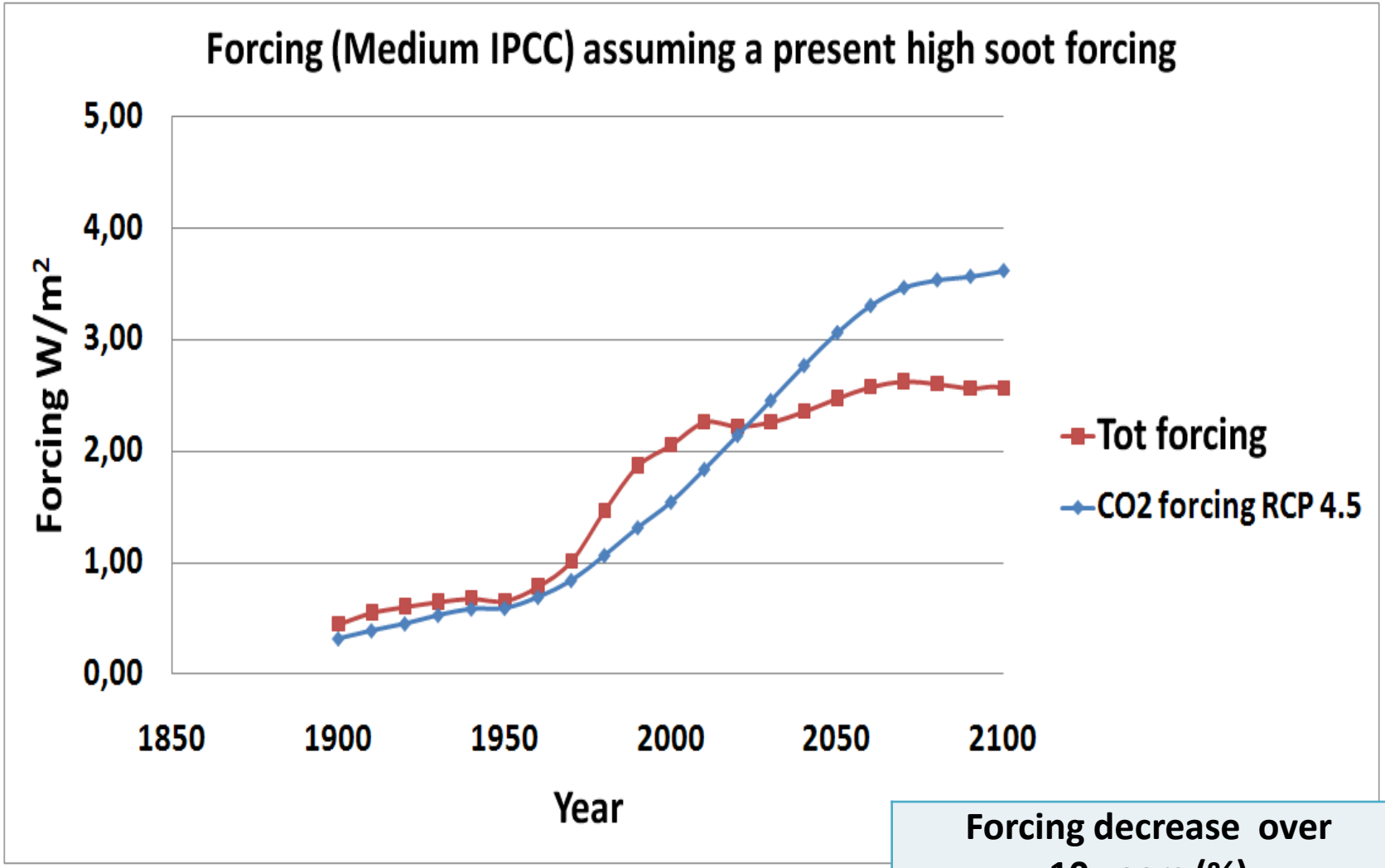

Forcing decrease over 10 years (%)	
Methane	20
Ozone	20
Soot	10
Scatt+ indirect	3

Conclusion concerning soot

- Abatement of the soot, i.e. only the absorbing part of the particles, can have an significant effect on the climate! (will lower the temperature increase at 2xCO_2 proportional to soot forcing /total forcing)

- HOWEVER Abatement of soot will imply indirectly abatement of particulate organic carbon which is cooling the atmosphere. Net effect probably << assumed soot forcing, possibly even cause warming.

Conclusion concerning soot

- BUT abatement of soot seems to cause lower NOx emissions and then lower Ozone which cause higher oxidation potential in the atmosphere and thus lower methane concentrations.

- AND abatement of soot can also cause lower methane emissions from bio combustion

Thank you for your attention