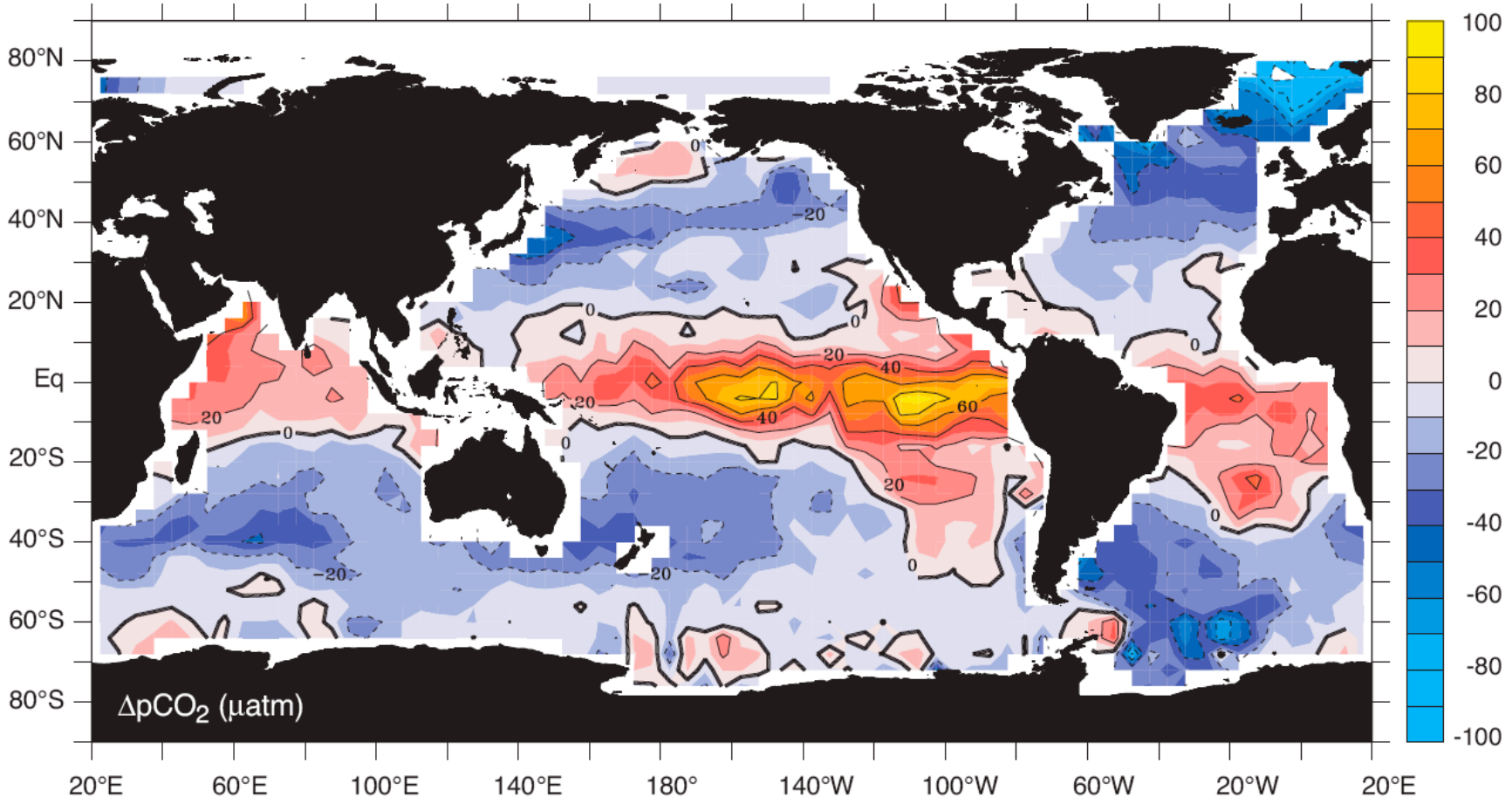
- Problems 10.5, 10.6, 10.8,10.9 due Tuesday 4/15
- Reading 10.3-end, questions due Sunday 4/13

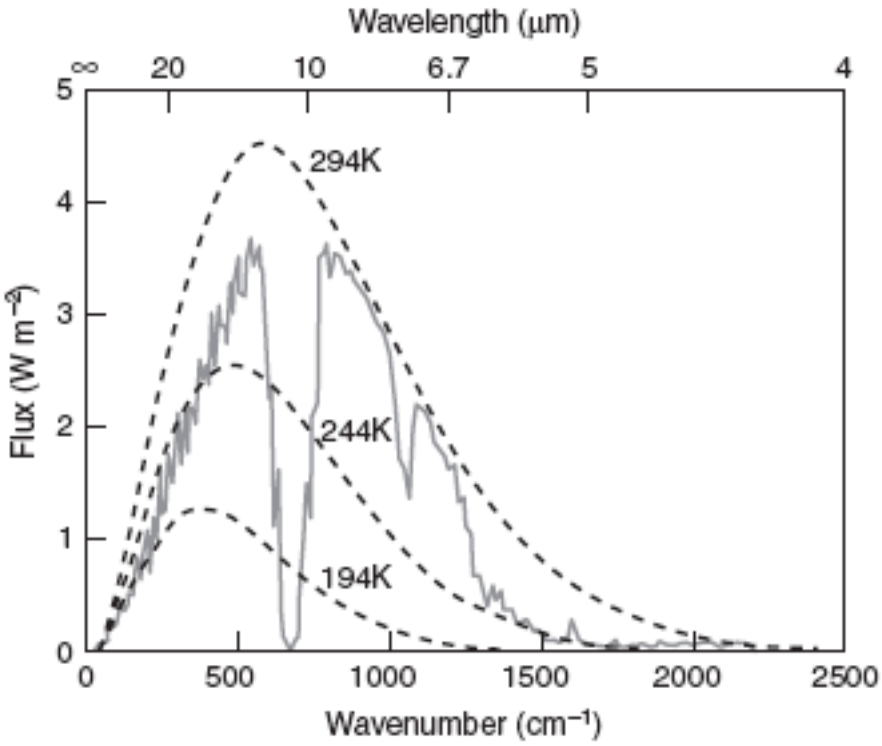
Do we always see positive DpCO2 now, even in upwelling areas?



Why is anthropogenic radiative forcing so much smaller than natural?

TABLE 10.1.1
Major greenhouse gases
Mixing ratios, present rate of increase, and increase in radiative forcing are from Ramaswamy et al. *[2001]. Preindustrial radiative forcing is from* Dickinson and Cicerone *[1986].*

	Mixing Ratio in Dry Air (ppm)			*Radiative Forcing ($W m^{-2}$)*	
Gas	*1765*	*1992*	*Current Rate of Increase (% yr^{-1})*	*Preindustrial (<1765)*	*Anthropogenic (1765–1990)*
H_2O	—	—	—	94	—
CO_2	278	356	0.4	50	1.46
CH_4	0.7	1.71	0.6	1.1	0.48
CFC-11	0.0	0.000268	0.0	0.0	0.07
CFC-12	0.0	0.000503	1.4	0.0	0.17
Other CFCs	—	—	—	—	0.10
N_2O	0.275	0.310	0.25	1.25	0.15
Total				146	2.43


Wavelength (μm)
∞
20
10
6.7
5
4
294K
244K
194K
Flux (W m⁻²)
0
1
2
3
4
5
0
500
1000
1500
2000
2500
Wavenumber (cm⁻¹)

Is lambda 1.8+-0.7 Wm-2K-1 or 1.7+-0.8 Wm-2K-1? Page 397 has it both ways (I guess one is a typo)

λ = climate sensitivity parameter

$$\Delta T = \frac{\Delta Q}{\lambda}$$

Why is the increased production of aerosol in the northern hemisphere compared to the southern hemisphere?

Table I
Main sources of aerosols.

Natural	Anthropogenic
Primary	***Primary***
Mineral aerosol	Industrial dust
Sea salt	Soot
Volcanic dust	Biomass burning
Organic aerosols	
Secondary	***Secondary***
Sulfates from biogenic gases	Sulfates from SO_2
Sulfates from volcanic SO_2	Organic aerosols from VOCs
Organic aerosols from VOCs	Nitrates from NO_x
Nitrates from NO_x	

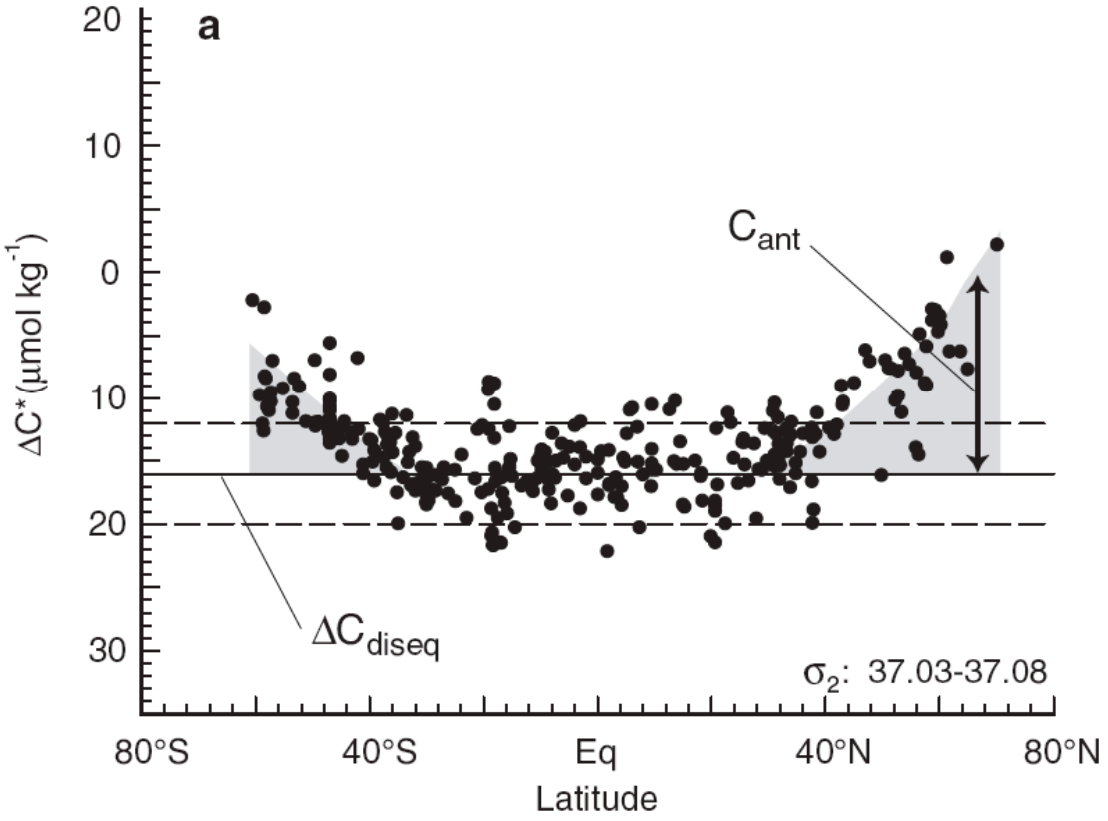
Note : VOC = Volatile Organic Compound

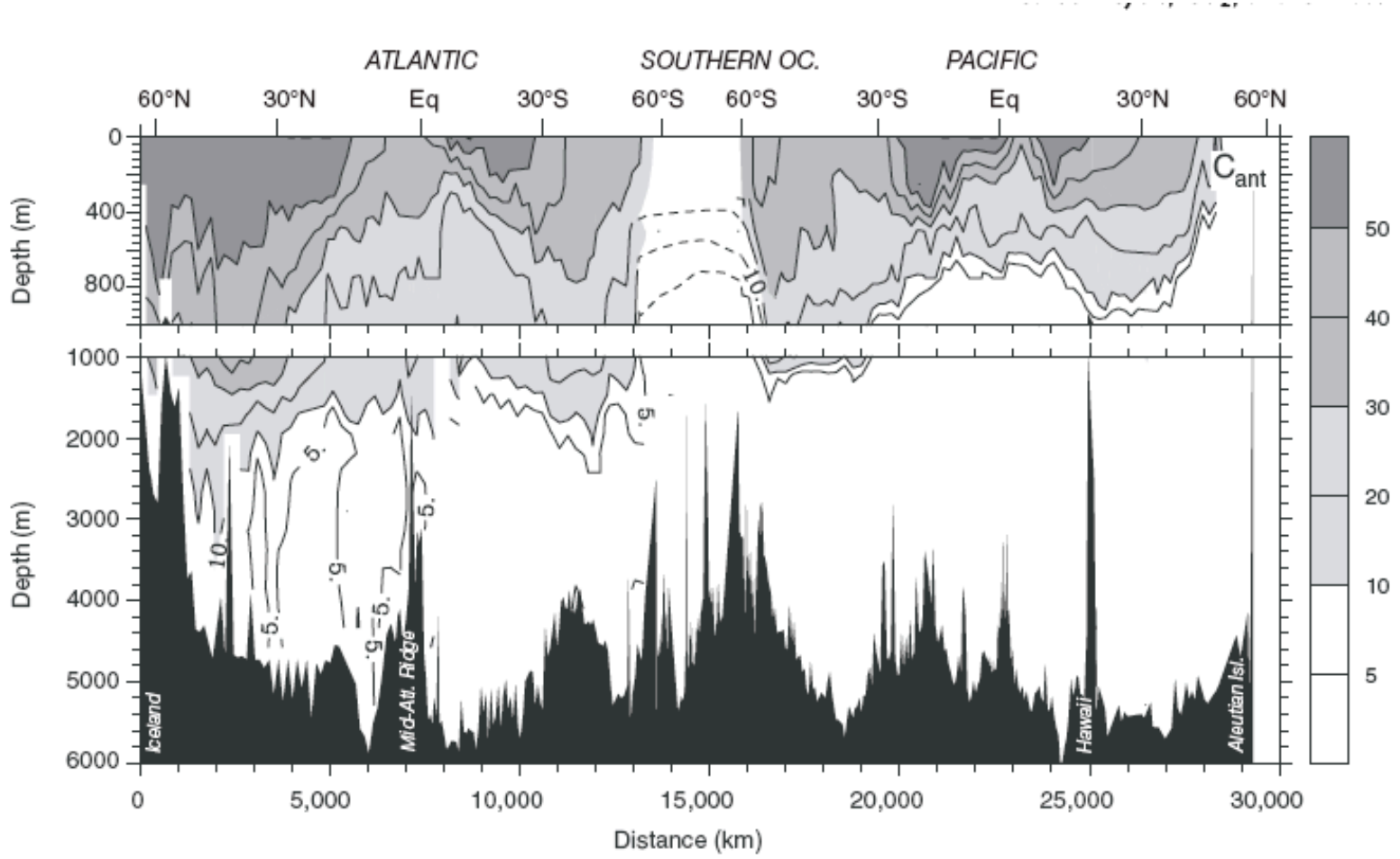
How does hypoxia feed back to atmospheric CO2?

$$C_{ant} = DIC^{obs} - \Delta DIC_{bio} - DIC_{eq\ pi} - \Delta DIC_{diseq}$$
$$= \Delta C^{*} - \Delta DIC_{diseq}$$

$$\Delta DIC^{i}_{diseq}(\sigma) = \Delta C^{*}|_{\sigma = const}$$

For the part of the isopycnal where $C_{ant} = 0$





Concentrations of C_{ant} = highest in subtropics

Total column amount of C_{ant} = highest in N. Atlantic