

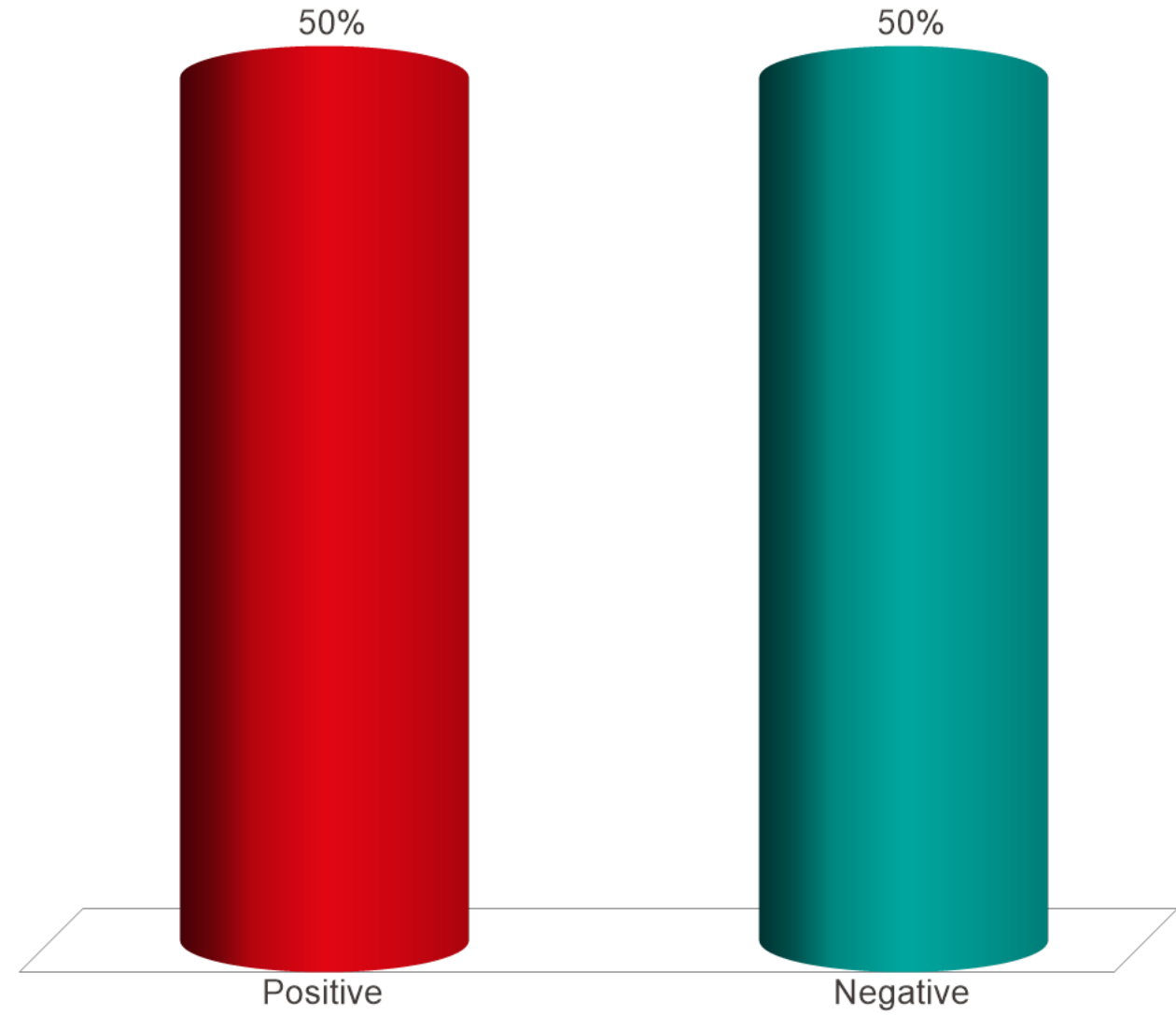
Solutions to quizzes of Lecture 5

What is the sign of λ ?

$$\Delta T_s = -\frac{RF}{\lambda}$$

A. Positive

Negative



What is the value of λ approximately?

- A. $0 \text{ W m}^{-2} \text{ K}^{-1}$
- B. $3 \text{ W m}^{-2} \text{ K}^{-1}$
- C. $-3 \text{ W m}^{-2} \text{ K}^{-1}$
- D. $\sim -2 \text{ W m}^{-2} \text{ K}^{-1}$

1. Assume the climate system equilibrates after some time.
2. Use the information from the lecture to derive λ . *E.g. figures with RF and some value on global warming.*

Deriving λ

$$N = RF + \lambda \Delta T$$

N: net top of atmosphere energy balance,
 RF: radiative forcing,
 ΔT : global surface temperature response,
 λ : feedback factor

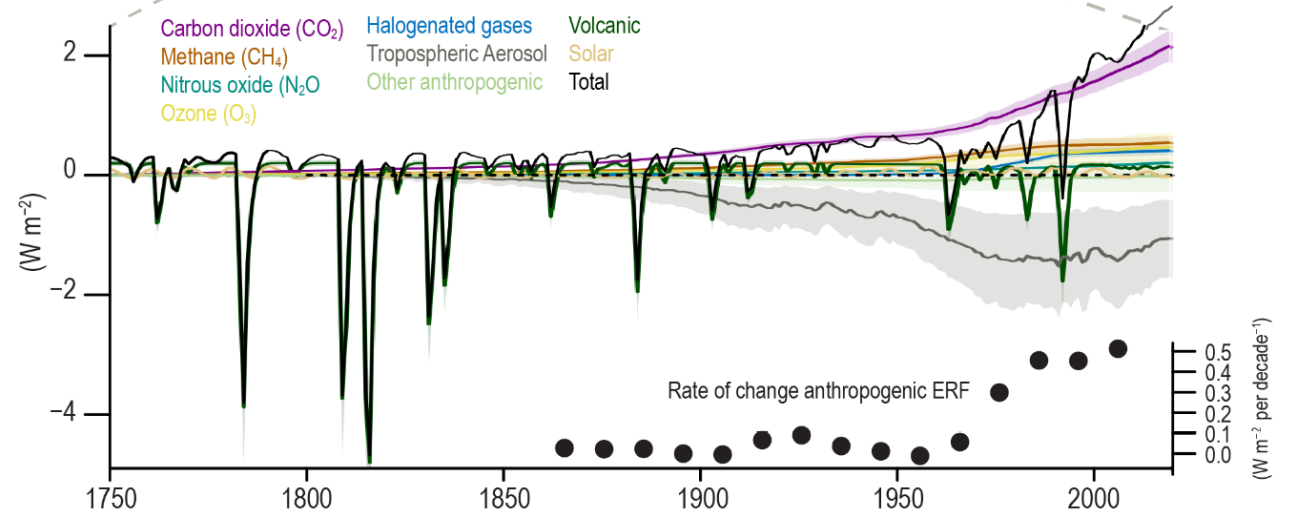
$$0 = 2 + \lambda * 1.3$$

$$\lambda = -1.5 \text{ W/m}^2 \cdot ^\circ\text{C}$$

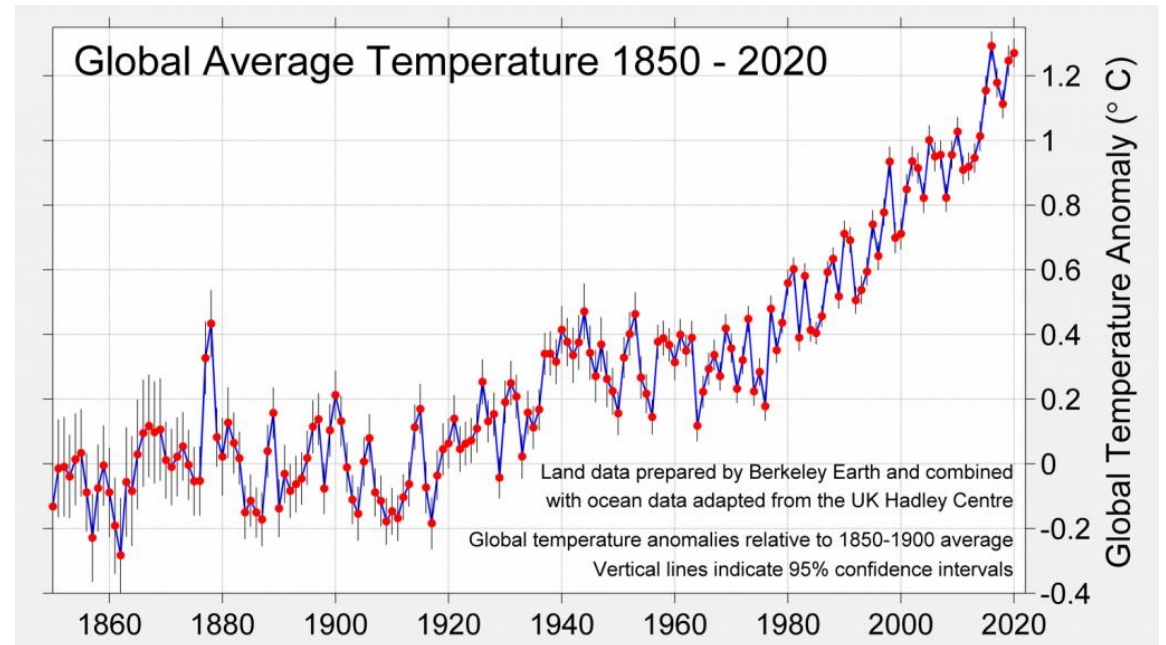
Why was the calculation physically only an approximation?

RF

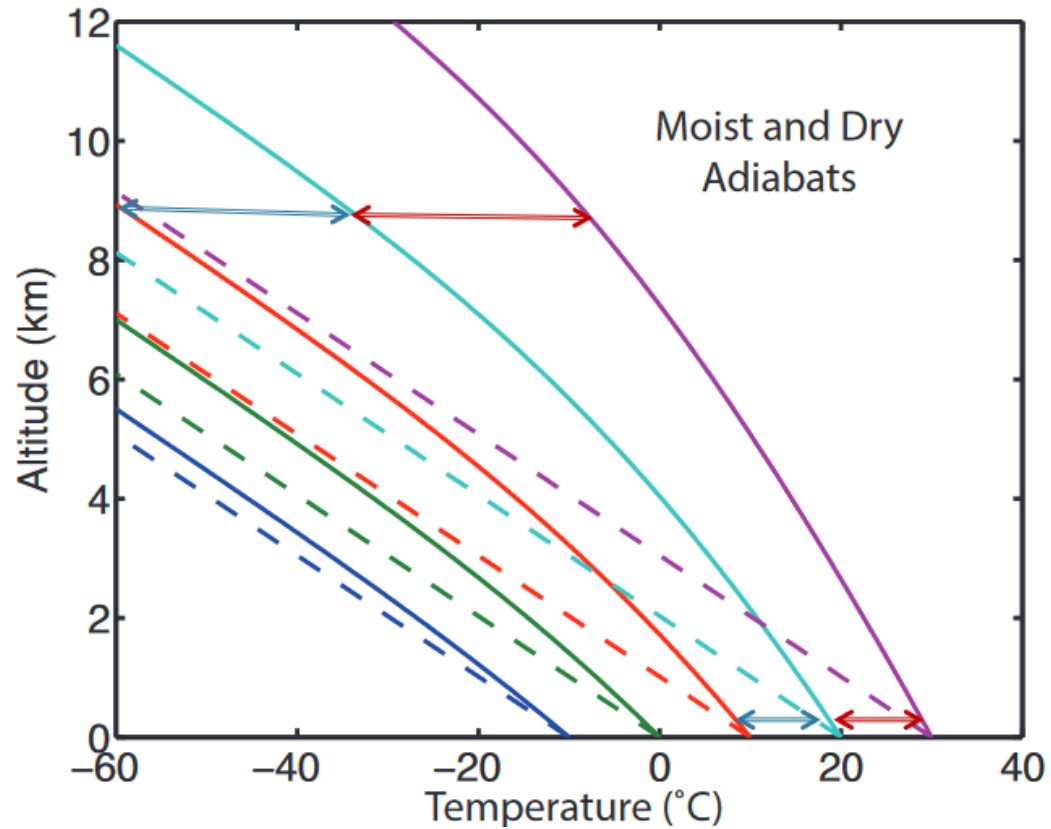
(d) The increase in effective radiative forcing since the late 19th century is driven predominantly by warming GHGs and cooling aerosol. ERF is changing at a faster rate since the 1970s.



ΔT



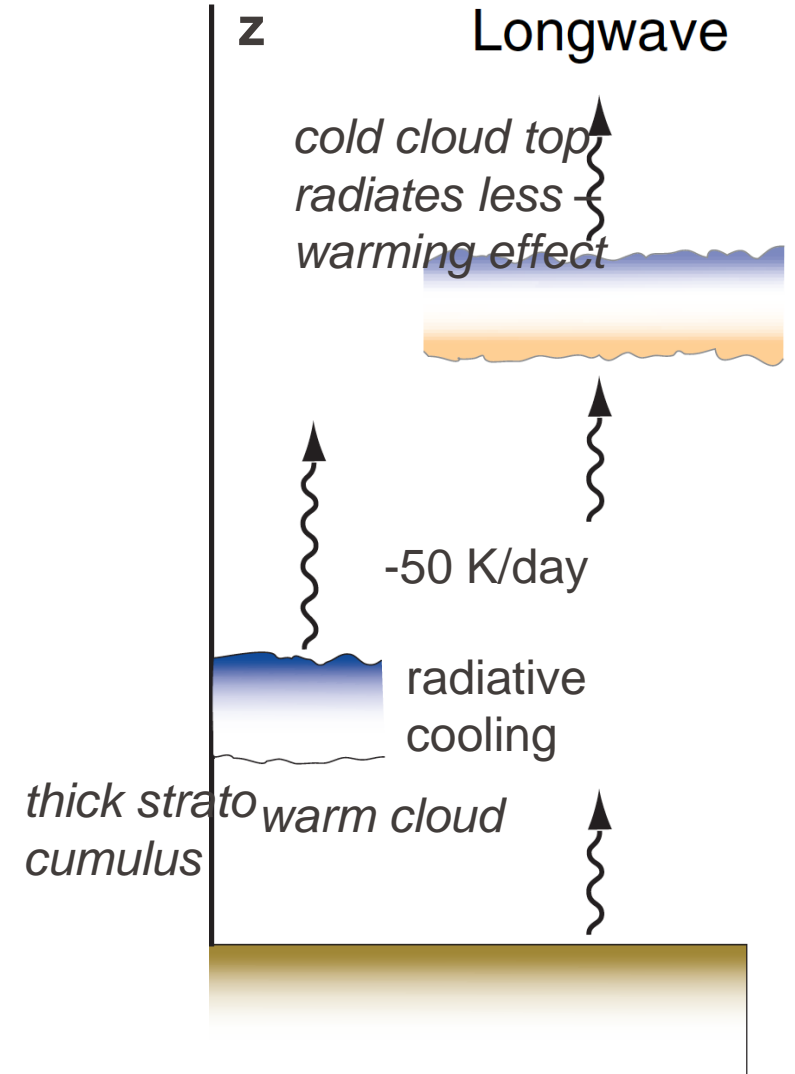
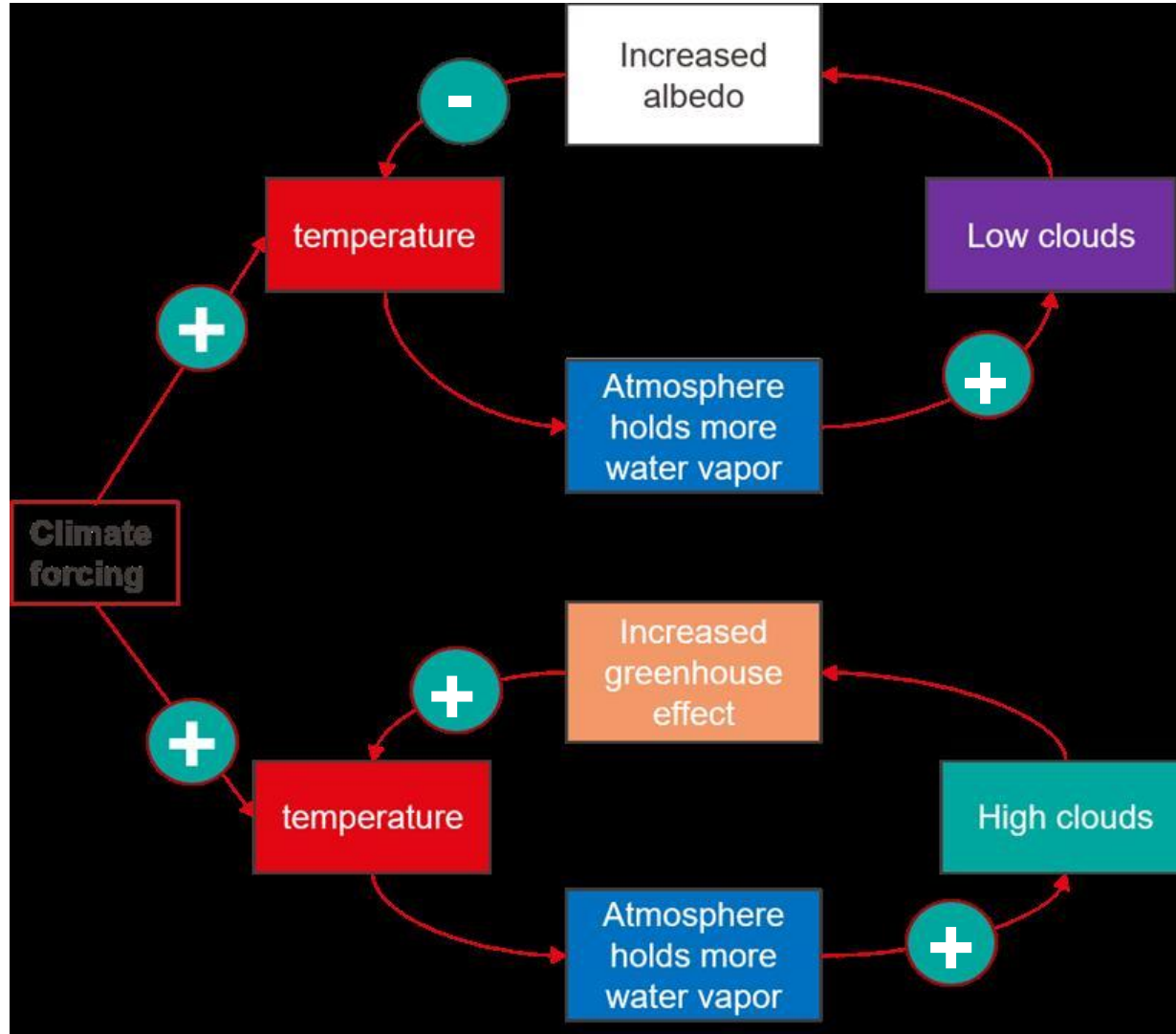
Which line is the moist adiabat?



A. Dashed

Solid

Cloud feedback: Where is the negative feedback?



What is the unit of ECS?

K or °C

B. W m^{-2}

C. $^{\circ}\text{C m}^{-2}$

What does it mean if there is larger negative forcing by aerosol-cloud interactions?

- A. It will lead to less global temperature increase in the future.

The warming by GHG is actually stronger than we anticipated.