

Homework # 2; due Wednesday, Feb. 15

Reading: Chapters 3 of Boecker and Grondelle's *Environmental Physics*

5. It is observed that the atmospheric temperature typically drops linearly with height at a rate (known as the *temperature lapse rate* of about 7 K/km up to about 10 km above the Earth surface. Explain these observations (both the linearity and the order of magnitude of the lapse rate) based on the assumption that the cooling is due to adiabatic expansion of air warmed by the surface of the Earth as it expands as it rises (or cool air heats as it descends).
6.
 - a. Assuming that the mixed surface layer of the ocean is 120 m deep, what is the heat capacity of the mixed layer, c_s ?
 - b. Assuming that the *climate sensitivity* is $G = 0.8 \text{ K}/(\text{W}/\text{m}^2)$ (the IPCC number), and that the time constant for the time delay due to the ocean warming (or cooling!) is $\tau = c_s G$, estimate τ .
7. Watch the video of the [colloquium by Prof. Richard Muller](#) on "A Reexamination of Global Warming." Provide a summary of key points, for example, in the form of about ten one-two sentence "bullet points."