

Climate Modelling in-class worksheet 3 (week 4)

Group members:

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The focus of this week's assignment is to calculate forcing and feedback using a 1-dimensional radiative equilibrium model. The scientific community has failed to converge on a standard notation for any of this, so this worksheet compares the differences and similarities between Hartmann Chapter 10, the Gerard Roe feedback article presented by Luke, and the course notebooks.

- 1) Define the symbol ΔR used in Rose notebook *14-climate sensitivity and feedback*, including units
- 2) What symbol does Hartmann Chapter 10 use for this same concept?
- 3) How about Roe?
- 4) In Section 14.2.3, Rose calculates the *stratospheric adjusted radiative forcing* and gets a value of 4.3 Wm^{-2} for doubled CO_2 . How does this compare with Hartmann's value in Section 10.3.1?
- 5) Hartmann in section 10.3.1 discusses the *Planck feedback*. Is this the same as Rose's *Equilibrium climate sensitivity without feedback*? Explain how they are similar or different? What are the units and values for each?
- 6) Can you find the same Planck feedback concept in Roe? Is Roe's approach more similar to Hartmann or Rose?
- 7) Hartmann shows OLR as a function of surface temperature, and surface temperature as a function of CO_2 , in figures 10.2 and 10.3. How do his values of OLR and surface temperature compare with values you get for OLR in Lab 14 section 5?
- 8) Hartmann writes the climate sensitivity parameter with Planck and H_2O feedbacks as $(\lambda_R)_{\text{FRH}}$. How would Rose represent this using the notation of lab 14? How about Roe?