

Unit 2 Applications Physical Hydrometeorology

Solve the problems assigned at your class level and to all students. Scan the solutions and send them to me by email prior to Thursday 2359 AST.

1. **All students:** Calculate the average residence time of water in the Earth's atmosphere ($12\,900\text{ km}^3$) for a global precipitation rate of $577\,000\text{ km}^3/\text{y}$ in days.
2. **ATM625:** Write down the water and energy balances at the atmosphere-"surface" interface for Figure 1.

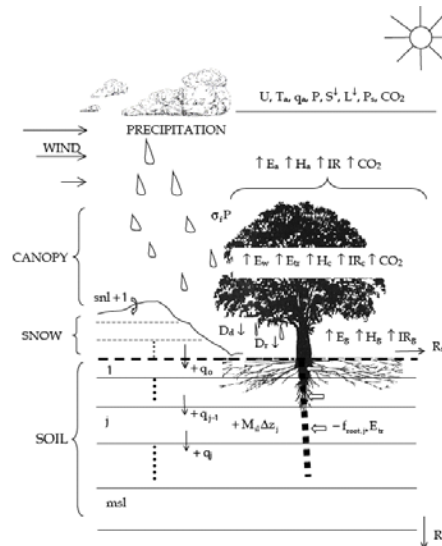


Fig. 1. Schematic view of the Common Land Model (modified after Bonan 2002).

3. **All students:** Calculate the rate of electromagnetic energy emission in W/m^2 for the following hydrometeorological conditions: US standard atmosphere near-surface temperature of 15°C , snow of -10°C , Arctic Ocean of -2°C , cloud top of -20°C , and the Sun of 5700°C . Assume all surfaces are blackbodies. Calculate the wavelength of maximum radiation in μm and determine the portion of the spectrum in which it occurs.
4. **All students:** Take the time series given in last class' excel sheet and perform the following analysis. Examine the range of change in averages, variance, probability of a given value, minimum and maximum value when you
 - Alter the length of the time series
 - Start your analysis at a later date in or shorten the time series
 - Alter the interval you look at

Prepare tables, graphs, plots, whatever is appropriate to share and interpret your results. Discuss what your findings mean for the uncertainty of your analysis and conclusions of your research.