

CE 374K Hydrology, University of Texas at Austin, Homework #3, Spring 2012

1. On 9 February 2012 at 8AM, the weather conditions in Austin, Texas were as follows:

Weather for Austin, TX



38°F | °C

Clear

Wind: NE at 5 mph

Humidity: 89%

Thu



58° 47°

Fri



56° 41°

Sat



56° 40°

Sun



52° 47°

Detailed forecast: [The Weather Channel](#) - [Weather Underground](#) - [AccuWeather](#)

The air pressure was 102.6 kPa of Mercury at this time. Calculate the specific humidity, vapor pressure, and saturated vapor pressure. For these water vapor conditions, what is the dew point temperature?

2. An intense thunderstorm is 0.5 km in diameter and rain is falling beneath it at a rate of 50 mm/hour. At what is the power being supplied to this thunderstorm in MW by condensation of moisture within the storm clouds to produce this rate of rainfall?

3. If the mean annual net radiation over the earth is 105 W/m² and the annual evaporation from the earth is 577,000 km³/year (Table 1.1.2), what proportion of the earth's net radiation is used to supply evaporation?

4. Problem 3.4.3 in text

5. Infiltration occurs on a Loam soil with initial effective saturation of 30%. If the water is initially ponded, compute the cumulative infiltration and the infiltration rate at one hour intervals up to 5 hours. Suppose that instead water is not ponded initially but that a rainfall of 1 cm/hr occurs continuously. Determine the ponding time and the time it will take to achieve the same cumulative infiltration as was achieved under ponded conditions in 5 hours.