Dew Point Temperature: Teacher Guide

Level: Intermediate

Subject: Geography

Duration: 50 Min

Type: Individual or Small Group Exercise

Learning Goals:

- To understand how humidity varies during high temperature and low temperature
- To know how temperature varies during high humidity and low humidity
- What time of the day do we have high and low humidity and temperature? This may vary for different regions
- To gain basic skills in computer i.e. using MS Excel

Materials:

- Computer and internet
- Daily and weekly temperature and humidity data from TAHMO station

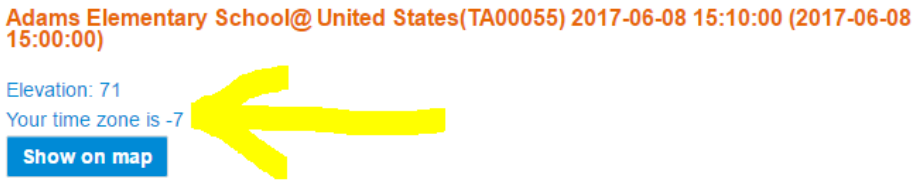
Introduction

You should realize that moisture in the atmosphere can appear in three states--solid, liquid, and a gaseous vapor. It is very rare when the air does not contain some water vapor. When the air is cooled to its saturation point, condensation occurs in the form of clouds and perhaps precipitation. At very high altitudes where the air is very cold, clouds consist of tiny ice crystals. And, of course, precipitation can occur in the form of snow and hail.

- It is possible in the atmosphere for ice crystals to go directly into water vapor, or water vapor directly to ice crystals. This process is called sublimation. The amount of heat involved in sublimation equals the sum of the heat of fusion plus the latent heat of vaporization.
- **Relative Humidity:** The ratio of the actual amount of water vapor in each volume of air to the amount which could be present if the air was saturated at the same temperature. It's commonly expressed as a percentage.
- **Dew Point:** The temperature to which a parcel of air must be cooled to reach its saturation point. It is important to understand that the temperature of the air influences the amount of water vapor that can be bound to the molecules of air. Water vapor capacity increases with temperature increase.

Methods:

1) Each team or group will switch on their laptop and connect to internet.
2) Go to TAHMO S2S program website and download temperature and humidity data for your school
3) Sort and analyse the data for plotting
    i. After downloading the data, filter the solar radiation data for a given specific date.
    ii. Please note that the time in the downloaded file is given in Coordinated Universal Time (UTC) and not local time. To convert from UTC to local time, use the time zone to either add or subtract from the UTC time. The time zone can be found on the School2School.net website for each station under the name of the school.



    iii. Select the solar radiation data for the filtered date from 12am to 11pm local time
    iv. Right click and copy the data. Open another sheet and paste

Calculations:

Calculate dew point temperature using the following formula?

$$\mathbf{Td = T - ((100 - RH)/5)}$$

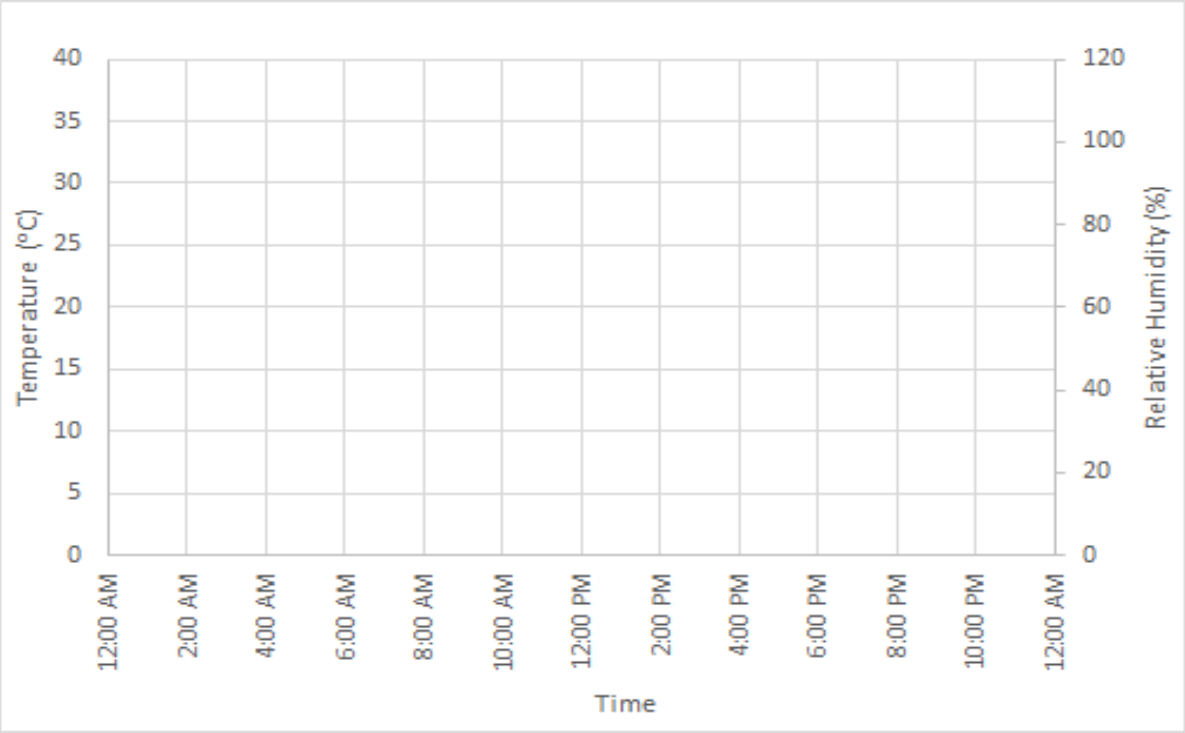
Where; RH = Relative Humidity (in percent)

Td = Dew point temperature (in degree Celsius)

T = Observed air temperature (in degree Celsius)

Results

Plot your results for temperature, relative humidity, and dew point temperature on the graph below. Use the left y-axis as the scale for both temperature and dew point temperature; use the right y-axis as the scale for the relative humidity data points.



Discussion:

How is the weekly trend of temperature and humidity? Can we make analogue weather prediction from the trend? (Answer: The teacher will guide the students in plotting graphs for weekly trends of temperature and humidity. From the trend graphs, analogue prediction can be done by looking at continuous similar trends of the temperature and humidity.)

How is the relationship between humidity and temperature? (Answer: Relative humidity is the ratio (expressed as a percentage) of the amount of moisture in the air to the maximum amount that can be present at that temperature. ... Because warm air can hold more water vapor than cool air, relative humidity falls when the temperature rises if no moisture is added to the air.)

Why does the relative humidity go up as the temperature goes down? (Answer: Relative humidity is the ratio of partial pressure (P1) of the water vapor in the current air to the saturation pressure (P2) of the water vapor air at constant temperature. If the temperature decreases then the amount of water vapor which the air can hold decreases, thus saturation vapor pressure (P2) decreases. Thus, Relative Humidity increases.)

Why do we experience lower temperatures when the air is humid? (Answer: If the water vapor content stays the same and the temperature drops, the relative humidity increases. If the water vapor content stays the same and the temperature rises, the relative humidity decreases. This is because colder air doesn't require as much moisture to become saturated as warmer air.)

Temperature vs relative humidity: Student Worksheet

Define the following:

Relative Humidity: _____

Dew Point: _____

Methods:

1) Each team or group will switch on their laptop and connect to internet.
2) Go to TAHMO S2S program website and download temperature and humidity data for your school
3) Sort and analyse the data for plotting. To achieve the following will be done
    i. After downloading the data, filter the solar radiation data for a given specific date.
    ii. The downloaded data is given in UTC, change the time to local time using the time zone information from the School2School.net website
    iii. Select the solar radiation data for the filtered date from 12am to 11pm
    iv. Right click and copy the data. Open another sheet and paste

Calculations:

Calculate dew point temperature for one day using the following formula:

$$\mathbf{Td = T - ((100 - RH)/5)}$$

Where; RH = Relative Humidity (in percent)

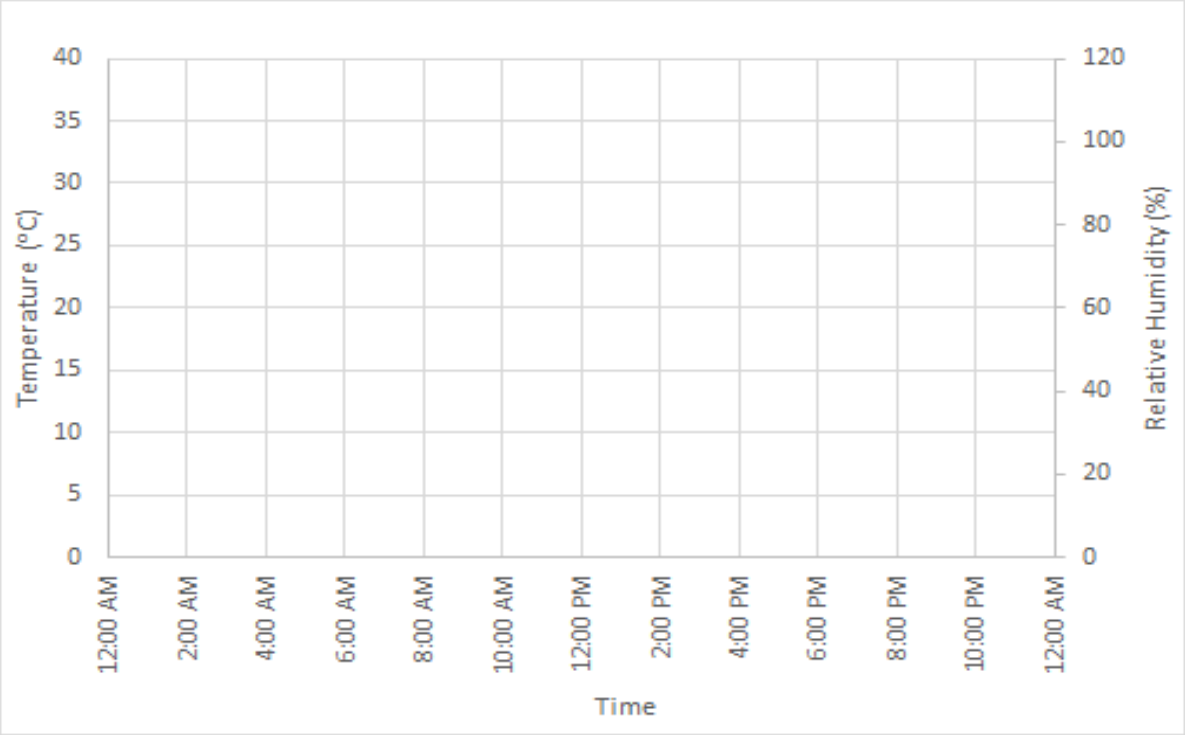
Td = Dew point temperature (in degree Celsius)

T = Observed air temperature (in degree Celsius)

Fill out the results table with the temperature, relative humidity, and dew point temperature. Then, plot your results for temperature, relative humidity, and dew point temperature on the graph in the results section. Use the left y-axis as the scale for both temperature and dew point temperature; use the right y-axis as the scale for the relative humidity data points.

Results:

Time	Temperature (°C)	Relative Humidity (%)	Dew point temperature (°Celsius)
12 am			
1 am			
2 am			
3 am			
4 am			
5 am			
6 am			
7 am			
8 am			
9 am			
10 am			
11 am			
12 pm			
1 pm			
2 pm			
3pm			
4pm			
5 pm			
6 pm			
7 pm			
8 pm			
9 pm			
10 pm			
11 pm			



Verify your hand drawn plots with MS Excel plots.

Discussion:

How is the weekly trend of temperature and humidity? Can we make analogue weather prediction from the trend?

_____

_____

How is the relationship between humidity and temperature?

_____

_____

Why does the relative humidity go up as the temperature goes down?

_____

_____

Why do we experience lower temperatures when the air is humid?

_____

_____