

Diurnal Temperature Variation vs. Latitude: Teacher Guide

Level: Intermediate

Subject: Geography and Math

Duration: 50 Minutes

Type: Classroom Activity

Learning Goals:

- Define the spatial and temporal limits of the data
- Arrange the data for plotting using Excel
- Compare diurnal temperature variations for two locations at different latitudes
- Represent data using line graphs and carry out simple analysis

Materials

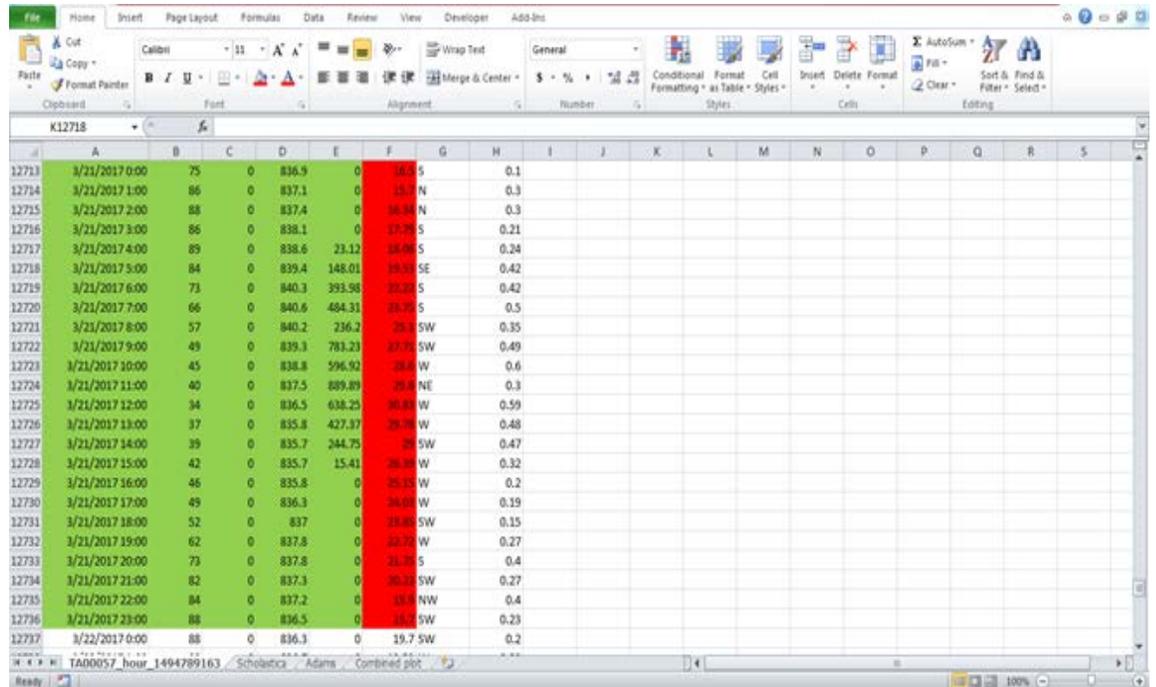
- Access weather data from the S2S TAHMO Website. <http://school2school.net>
- Spreadsheet program like Microsoft Excel

Introduction

Temperature is cyclical, meaning that each day it goes in a cycle with generally warmer temperatures during the day and cooler temperatures during the night. For more information on daily temperature cycles- see the temperature cycle lesson plan at <https://school2school.net/wp-content/uploads/2017/11/temp-cycle.pdf>. This lesson plan focuses on the diurnal temperature variation at different latitudes, comparing the high and low temperatures that occur during the same day. St Scholastica is in a tropical climate while Adams Elementary is a mid-latitude climate, thus these two stations are suggested for comparisons.

Methods:

- Before class, the teacher can download and arrange the temperature data for both Scholastica and Adams Elementary school in advance to save on time. However, take a few minutes to practically guide the students on how you accessed, downloaded and arranged the data you are presenting to them. There is a video tutorial on the School-2-School website with more information on how to download the TAHMO data. The TAHMO data are saved in a CSV file format, a format is compatible with several analysis programs including Microsoft Excel, Open Access, and Google Sheets.
- The students can be divided to work in groups if the computer access is limited. The teacher should decide on the criteria knowing the composition and capabilities of the students. The choice of stations can be changed depending on the preference of the teacher and the students.
- The TAHMO data from the school2school website will have several columns. The first column has the date and time of the data record in Universal Time Coordinates. 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. You will need to convert the time for each station to the local time for the following analysis. When your students look at the data, ask for them to get familiar with the data by asking questions like what the time frequency is and what variables are recorded. [Answer: stations record humidity, precipitation, air pressure, solar radiation, air temperatures, wind directions and wind speed in hourly interval]
- Extract the temperature data for the specific date of choice for the 24hours. This should be done for the two stations. In Excel, plot the combined lined graph for both stations for the same day i. e 21st March 2017. As a geography student, what's unique with the 21st March and 23rd September dates of the year? [Answer: The times of the year when the sun is overhead the equator is normally referred to as the Equinox dates. The Equinox dates are usually around 21st March and 23rd September every year. During Equinox, the length of the day and night are usually equal. During the other times of the year, the sun is either on the Southern or Northern hemispheres.]

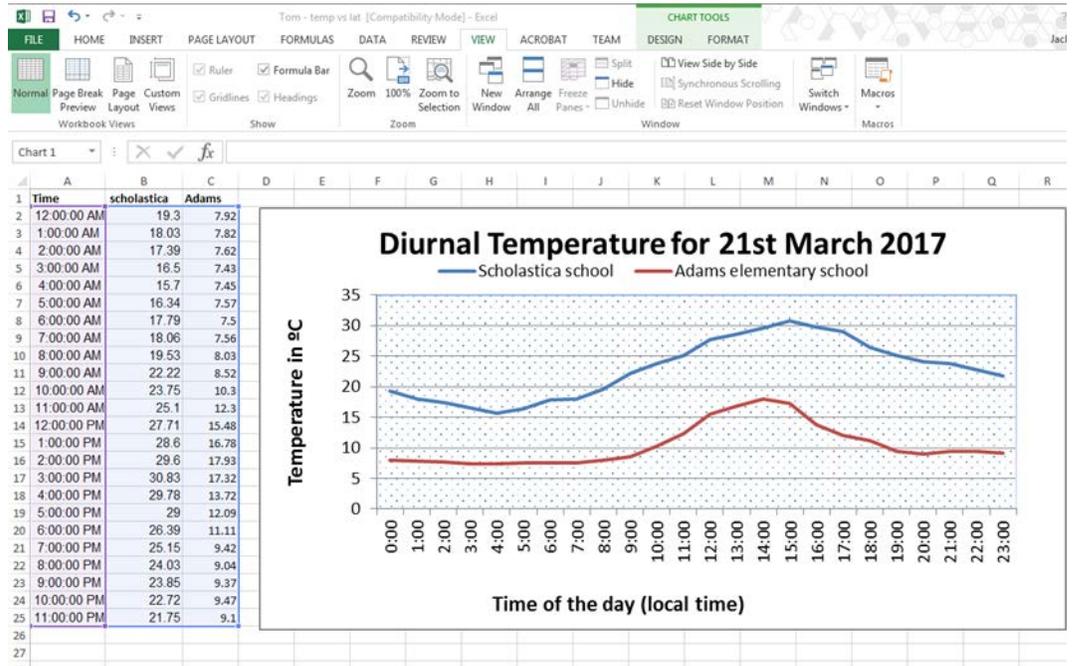


- In a new worksheet on the same spreadsheet, arrange your temperature data for the selected date to have three columns for time of the day, Temperature for Adams and temperature for Scholastica. Arrange your data in the spreadsheet as follows.

Time	St Scholastica	Adams
12:00:00 AM		
1:00:00 AM		
2:00:00 AM		
....		
8:00:00 PM		
9:00:00 PM		
10:00:00 PM		
11:00:00 PM		

- Next, plot a line graph for the 24 hour air temperature data for the two stations. The data should be arranged and plotted as shown below. Click on the insert button on the menu tool bar. A new bar opens and under the charts, select line and select further the

type of line graph you want. The graphs must have temperature measurements in the Y-axis in any measurement unit and time in hours labeled in the X-axis. The interval for the time must be one hour. To be able to analyze and interpret the graphical data, the teacher can ask the students to answer the questions in the student worksheet and discuss the data from the graphs and compare for the two stations.



Discussions

- How is weather information useful in our daily lives at the local level? [Answer: Weather information is helpful in our social lives as it help us plan our social activities such as sports, weddings and parties among other things. In addition, the weather information is useful in our agriculture, aviation, disaster management, security and transport in general. Farmers need to know when the rains begin and when it ceases; flood forecasts can be helpful in averting disasters. Weather information is therefore useful in our lives]
- We know that the earth revolves around the sun and rotates about its own axis. Which of the two (revolution around the sun or rotation on own axis) causes day and night? [Answer: The earth rotation about its own axis causes day and night. When it is day on one side of the globe, it is night on the other side of the globe. Therefore, we can see from the above graph that when it's 12.00PM universal time, the temperatures are very low in Adams and very high in Scholastica. The revolution of the earth around the sun causes the four major seasons of winter, summer, spring and autumn.]

- What do you expect the plot of diurnal temperature look like? When is temperature at a minimum? When is the temperature at the highest? Use to plot below to draw a sketch of what you predict the daily temperature graph to look like. [Answer: we expect the temperature rises steadily from midnight to reach the peak at midday then falls gradually as the night approaches. The minimum temperature occurs at night, the maximum temperature occurs during midday]
- As a class, use Excel to plot the Temperature vs time for the schools that you looked at. Is the plot similar to what you sketched? Why or why not? [Answers may vary: in general locations that are closer to the equator will have higher maximum temperatures than locations that are farther from the equator]
- Considering the general temperatures from the two stations, what dressing codes would you recommend for someone visiting the two areas? [Answers may vary: Considering the observed temperature variation for the day in Scholastica, I would recommend generally light clothing during the day. Since the temperatures steadily rises, it would be advisable to dress in light cloths. However, the clothing choice is further dependent on one's health, preference and other weather elements. Outdoor activities are highly recommended. The temperature at Adams steadily falls before rising gradually later in the day. The general dressing code here should be warm cloths and maybe heavy for some times. Everyone should keep warm and indoor activities are encouraged.]

Diurnal Temperature Vs Latitude: Student Worksheet

Match the weather elements to the instrument used to measure it by drawing a line between them.

Weather element

Instrument

Air pressure

Anemometer

Rainfall

Wind sock

Wind speed

Solarimeter

Solar radiation

Rain gauge

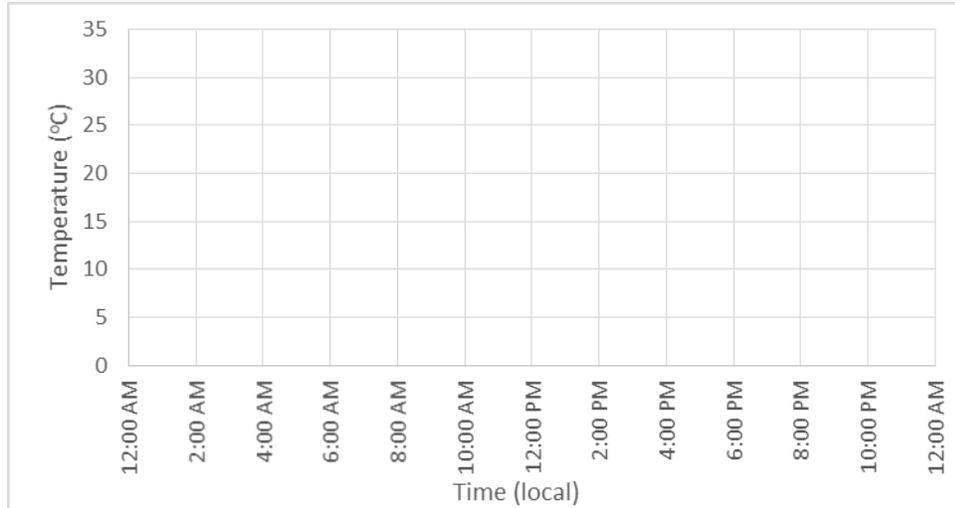
Wind direction

Barometer

How is weather information useful in our daily lives at the local level?

We know that the earth revolves around the sun and rotates about its own axis. Which of the two (revolution around the sun or rotation on own axis) causes day and night?

What do you expect the plot of diurnal temperature look like? When is temperature at a minimum? When is the temperature at the highest? Use to plot below to draw a sketch of what you predict the daily temperature graph to look like.



As a class, use Excel to plot the Temperature vs time for the schools that you looked at. Is the plot similar to what you sketched? Why or why not?

Describe the temperature variation for the whole day for the two stations. How are they similar, how are they different?

Considering the general temperatures from the two stations, what dressing codes would you recommend for someone visiting the two areas?
