Lightning in the Peaks: Northern Arizona Climate and Lightning Strikes

This is a preview of the published version of the quiz

Started: May 27 at 9:46am

Quiz Instructions

For the following questions, investigate the monthly changes in lightning strike, temperature, dew point, and precipitation data for Flagstaff, Arizona.

Remember, dew point simply is the temperature that the air would have to cool to in order for moisture in the air to condense into water droplets (forming dew or clouds). Humidity on the other hand is the ratio of moisture in the air compared to how much it can hold. This is dependent on temperature, so we'll stick with dew point as it easier to see a seasonal shift.

In essence, the higher the dew point, the more moisture that exists within the atmosphere - *however,* dew point cannot exceed air temperature and is dependent on air temperature. Colder air simply cannot hold as much moisture, so there is less available to condense and form clouds (think of polar deserts like Antarctica!).

When you hear of dry heat, that often is associated with warm, dry air, meaning a large difference between temperature and dew point. When that begins to change, and dew point increases, it feels humid and uncomfortable, and you are more likely to have rain and storms.

Changes in dew point are one of the driving features for the change in precipitation and lightning strikes across the southwestern United States during the summer, as the North American Monsoon becomes more prominent.

Monthly climate data for Flagstaff, Arizona can be found below.

Monthly Air Temperature

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
°C	1.7	2.8	4.4	7.2	11.6	18.3	19.4	16.6	15.0	10.0	3.9	0.6
°F	35.1	37.0	39.9	45.0	52.9	64.9	66.9	61.9	59.0	50.0	39.0	33.1

Monthly Dew Point Temperature

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
°C	-9.4	-5.0	-6.1	-5.6	-3.9	-3.9	10.6	11.1	10.0	2.8	-5.6	-3.9
°F	15.0	23.0	21.0	22.0	25.0	25.0	51.0	52.0	50.0	37.0	22.0	25.0

Monthly Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mm	50.0	54.0	50.0	34.0	35.0	12.0	121.0	132.0	67.0	35.0	33.0	45.0
in	2.0	2.1	2.0	1.3	1.4	0.5	4.8	5.2	2.6	1.4	1.3	1.8

Study Area Lightning Strikes

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	0	0	10	25	25	10	3200	3500	500	10	0	0

Question 1

2 pts

First, let's understand why we are using lightning strikes in August, and not in May or June. It has to do with the change of moisture in the atmosphere, brought by the North American Monsoon. To prove this, answer the following questions using the data table above:

*Monthly Percentage = ((Sum of May, June OR July, August) / Total Precipitation)*100*

Calculate the percentage of annual precipitation that falls in May and June: [Select]

Calculate the percentage of annual precipitation that falls in July and August: [Select]

Which month of the year had the greatest difference between temperature and dew point: [Select]

Which two months had the highest number of lightning strikes: [Select]

Recall your knowledge from the lecture on the North American Monsoon.

Why does the precipitation and lightning strike count change so dramatically throughout the summer? [Select]

Question 2

2 pts

Fast travel to the eastern edge of Flagstaff at these coordinates: 35.2191 N , -111.5863 W.

Change the geovisualization layer to display air temperature.

Use the helicopter fast travel mode to go from your current location to 35.4023N, -111.7008 W, a transect taking you up and over the San Francisco Peaks to the northwest.

While you travel, closely look at the lightning strike distribution. What lightning strike pattern do you observe while moving up and over the San Francisco Peaks in this transect?

HINT: You can see where lightning strikes are happening by observing the small circles on the ground. Those are where lightning will randomly strike, and if you waited (or flew) and watched, would see this clustering.

- ○ The greatest clusters of lightning occurs primarily on the middle-slopes on cool north and west facing sides of the peaks and hills.

- ○ The greatest clusters of lightning occurs primarily along the high ridgeline and mountain tops of the San Francisco Peaks.
- ○ The greatest clusters of lightning occurs primarily on the middle-slopes on warm south and east facing sides of the peaks and hills.
- ○ The greatest clusters of lightning occurs primarily in the low, flat regions near Flagstaff and west of the San Francisco peaks.

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