

SCIENCE SIMULATION TASKS

Alabama Tornado

On March 3rd, 2019, Alabama, Georgia, and Florida experienced a severe tornado outbreak. One of these tornadoes, an EF-4, began in Alabama and continued over the state line into Georgia, causing at least 23 deaths over its nearly 70 mile path.

1. Select a location along the Alabama tornado track, between 32.44° N, 85.48° W and 32.57° N, 85.05° W, on March 3, 2019.
2. Create a table in Desmos to record data at your point from 00:00 on March 3 through 00:00 on March 4th. You should record the following Air (mode) variables at Earth's surface (Height – Sfc):
 - a. MSLP – Mean Sea Level Pressure
 - b. Wind – Wind speed
 - c. CAPE – Convective Available Potential Energy
3. Make a claim about what time the tornado likely touched down. What evidence supports your claim?

Claim

Evidence

4. Record *at least* one more variable from the Overlay list (except for WPD or MI) in Desmos.
 - a. Does the new variable support your claim? Why or why not?

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- Using the patterns you see in your data, explain how these variables could be used to predict the development of future tornadoes. If any would *not* be good predictors of tornado activity explain why not.

- What additional information would you want or need to make your claim stronger?

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ALABAMA TORNADO

Time (24 hr)	MSLP (hPa)	Wind (km/h)	CAPE (J/kg)	
00:00				
03:00				
06:00				
09:00				
12:00				
15:00				
18:00				
21:00				
00:00				

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El Niño and La Niña

The El Niño-Southern Oscillation (ENSO) is a complex weather pattern caused by changes in oceanic and atmospheric conditions in the East-Central Pacific near the equator. The ENSO occurs in two distinct phases (El Niño and La Niña) and contributes to extreme weather events on land. Each phase can last from several months to years and produces specific oceanic, atmospheric, and weather patterns. Oceanic and atmospheric conditions remain in a relatively neutral state which may continue for several years between El Niño and La Niña phases.

1. Focus your simulation on the Pacific Ocean near the Equator. Take some time to explore the Ocean and Air modes and overlays during the following periods:
 - a. August 2015 – March 2016: El Niño conditions
 - b. September 2017 – April 2018: La Niña conditions
 - c. May-Sept. 2014; Mar. 2018 – Feb. 2019: Relatively neutral conditions
2. Draw a model of each phase based on your observations.

Neutral

El Niño

La Niña

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3. Select a location that shows a variety of changes during all three timeframes. Record data in the provided table on the same day for several months during each phase. You should record the variables provided in the table headers and one additional variable of your choice (except for WPD or MI).
4. Using your observations and the patterns in your data, construct a new model that illustrates the oceanic and atmospheric conditions that develop during El Niño and La Niña phases.

El Niño

La Niña

5. Based on your simulation exploration, what do you think causes El Niño and La Niña phases to occur?

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EL NIÑO AND LA NIÑA CONDITIONS

Time (mm/yy)	Ocean: SSTA [†] (°C)	Air: Wind (km/hr)	Air: Temp (°C)	Air: MSLP [‡] (hPa)	
Neutral Period					
El Niño Phase					
La Niña Phase					

† Sea Surface Temperature Anomaly

‡ Mean Sea Level Pressure