

Climate and Volume of Incoming Container Ships in Los Angeles

Juliana Koricke, GEOG416, University of North Carolina at Chapel Hill

Background & Objectives

Objective: Explore the potential relationship between incoming container volume at the Port of Los Angeles and climate variables such as temperature, precipitation, and storms from 2009 to 2016.

Background:

- The Port of Los Angeles is the busiest port in the United States with 10.9 million containers passing through the port in 2021. This location is a major part of the supply chain in the US. The products coming into the port come from all over the world, primarily Asia, and includes consumer products from televisions and clothes to medicine and food (Port of Los Angeles, 2022).
- Climate and the supply chain is a prevalent issue. It can affect productivity and revenue for many large companies (Masters, 2021).
- In 2021, a container ship became stuck in the Suez Canal. The grounding was due to many factors, one of them being climate. This delayed over \$9 billion of goods around the world and delayed hundreds of ships (Russon, 2021).

Data & Methods

- Data included from years 2009 to 2016
- Port of Los Angeles Data – measured in Twenty-Foot Equivalent Units (TEUs) the sum of total incoming containers every month
- Monthly Climate data from NOAA - CA and Pacific
 - Storm Events Database (Magnitude)
 - Surface Temperature (Celsius)
 - Precipitation Levels (mm)

Converted all data to z-scores

- Time Series Analysis – gained basic understanding of the data and begin to see potential relationships
- Divided data into extreme climate periods
- Pearson Correlation test in order to compare the volume of incoming containers to understand if there was a difference due to climate factors.

Results

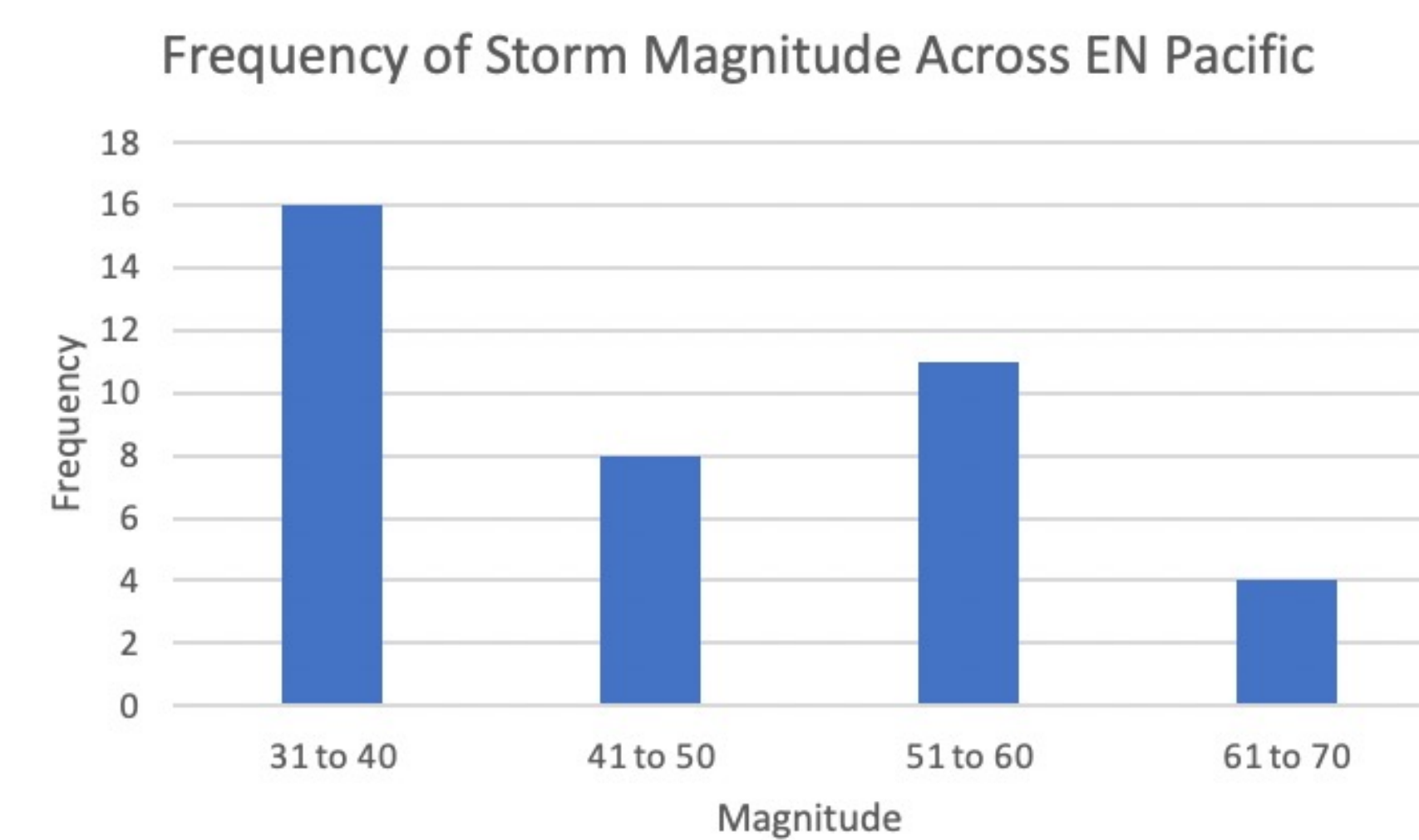


Figure 1: NOAA Eastern North Pacific Storm Magnitude Frequency (Koricke, 2022)

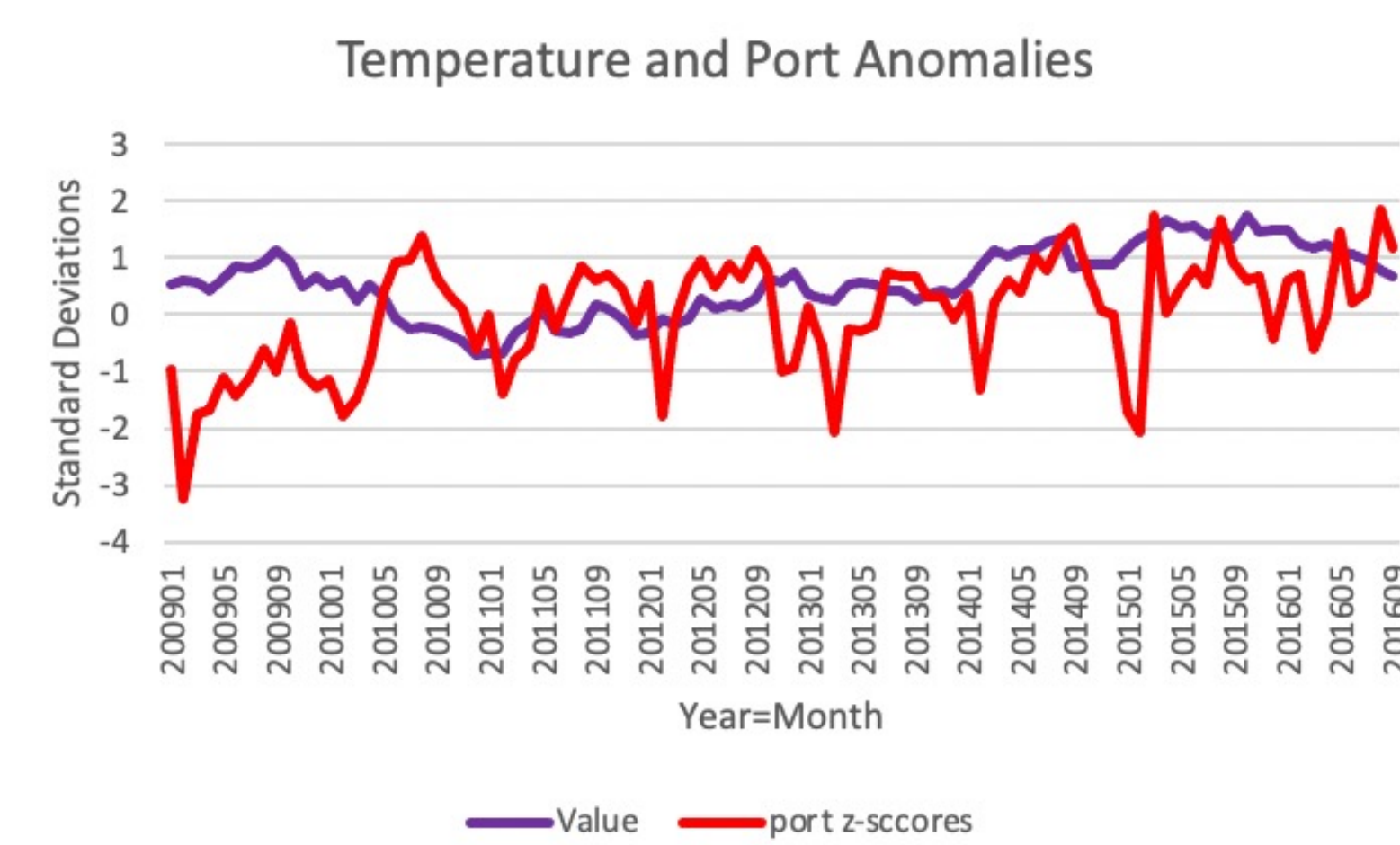


Figure 4: Time Series Relationship between Temperature and Port Anomalies (Koricke, 2022)

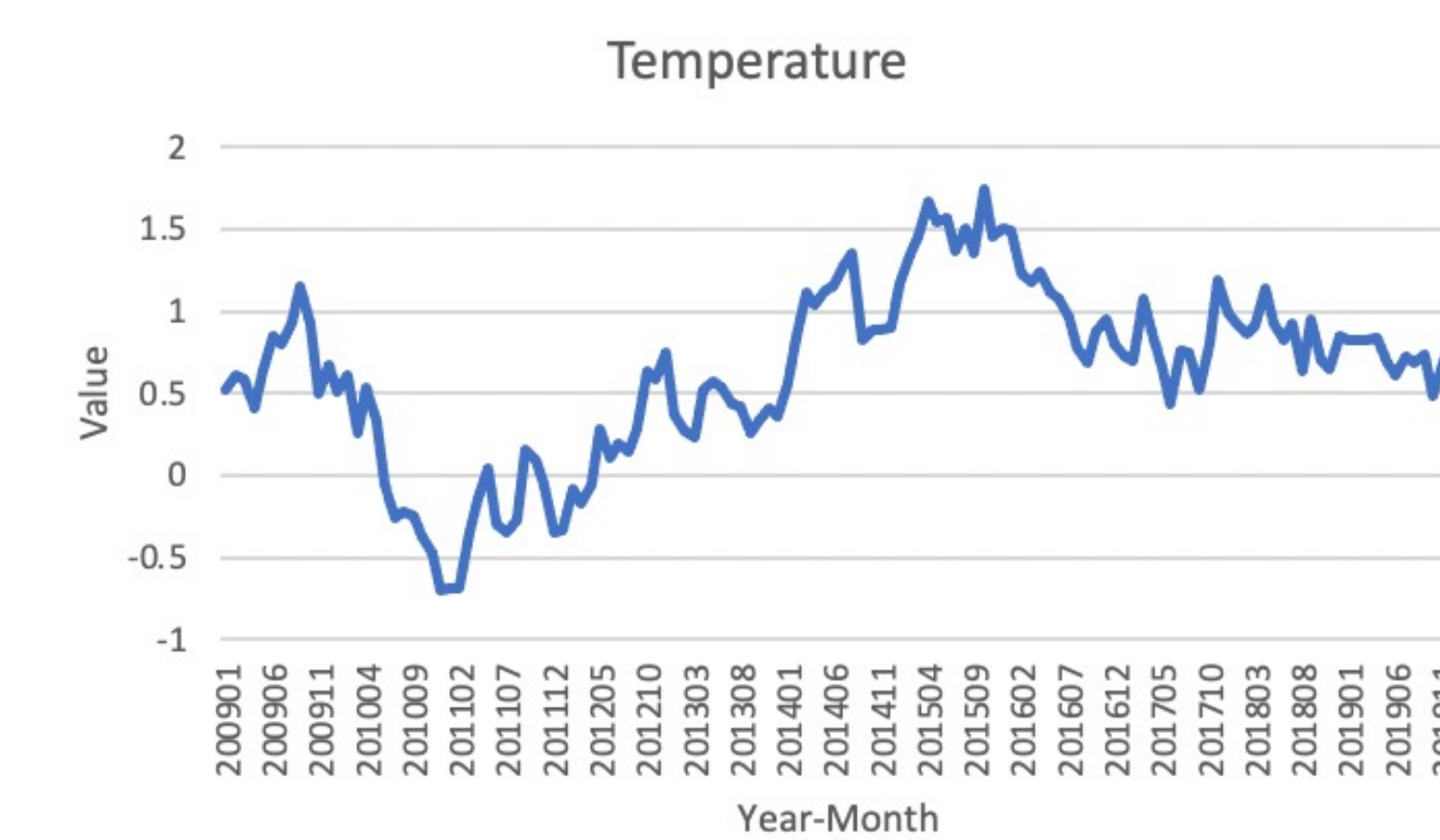


Figure 2: NOAA Eastern North Pacific Temperature Anomalies (Koricke, 2022)

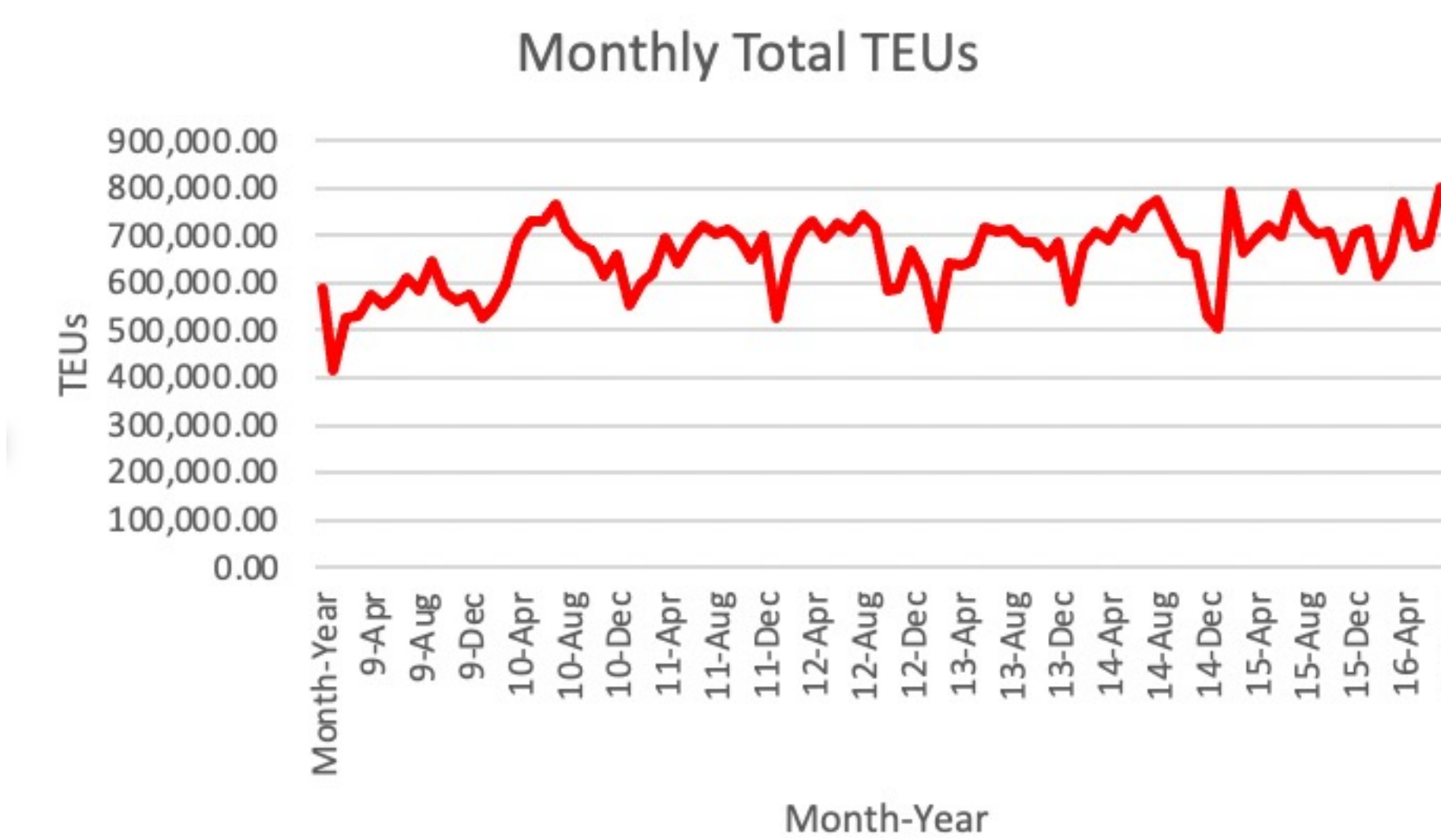


Figure 5: Port of Los Angeles Incoming Volume of Container Ships Time Series (Koricke, 2022)

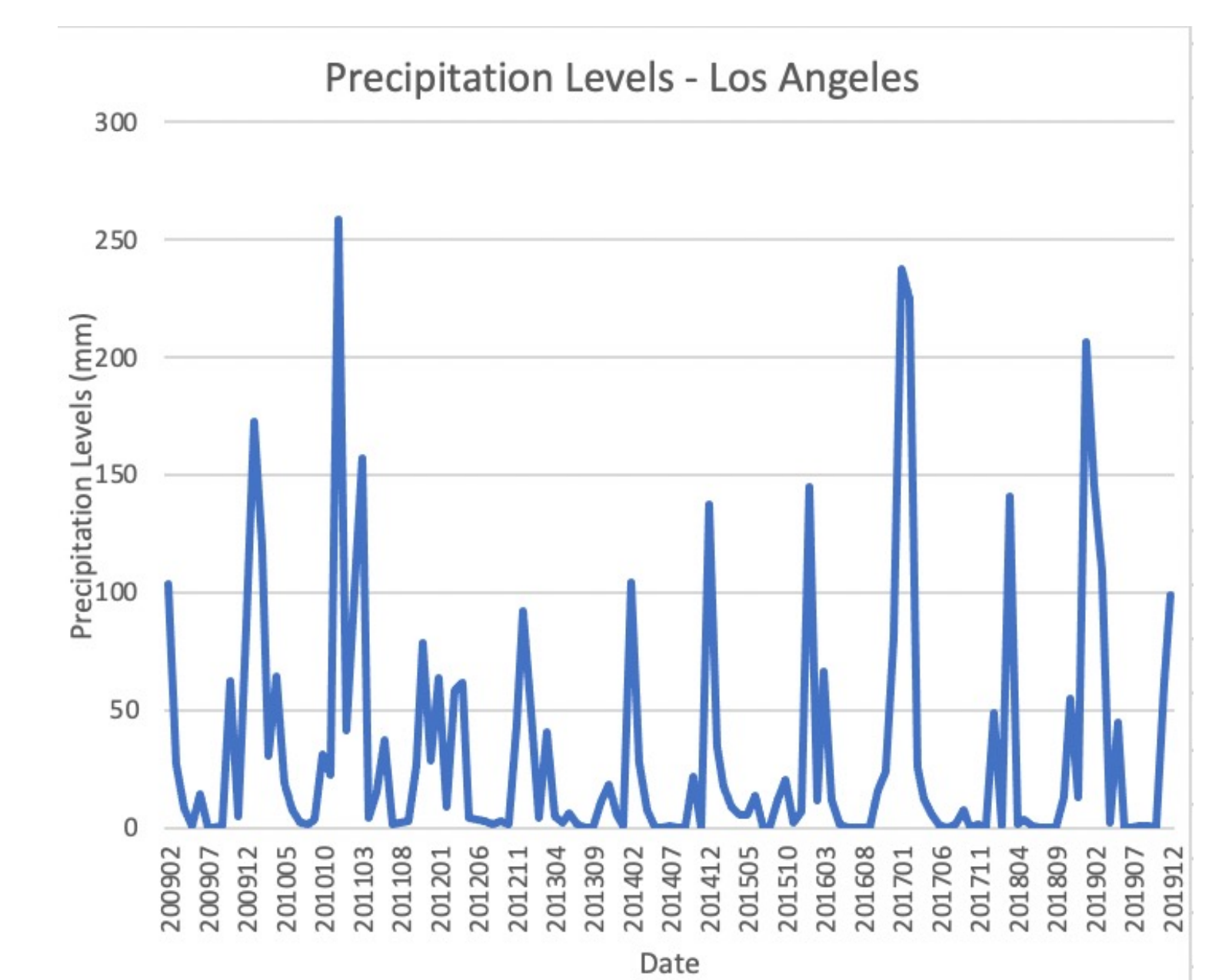


Figure 3: NOAA Precipitation Levels for Los Angeles Area (Koricke, 2022)

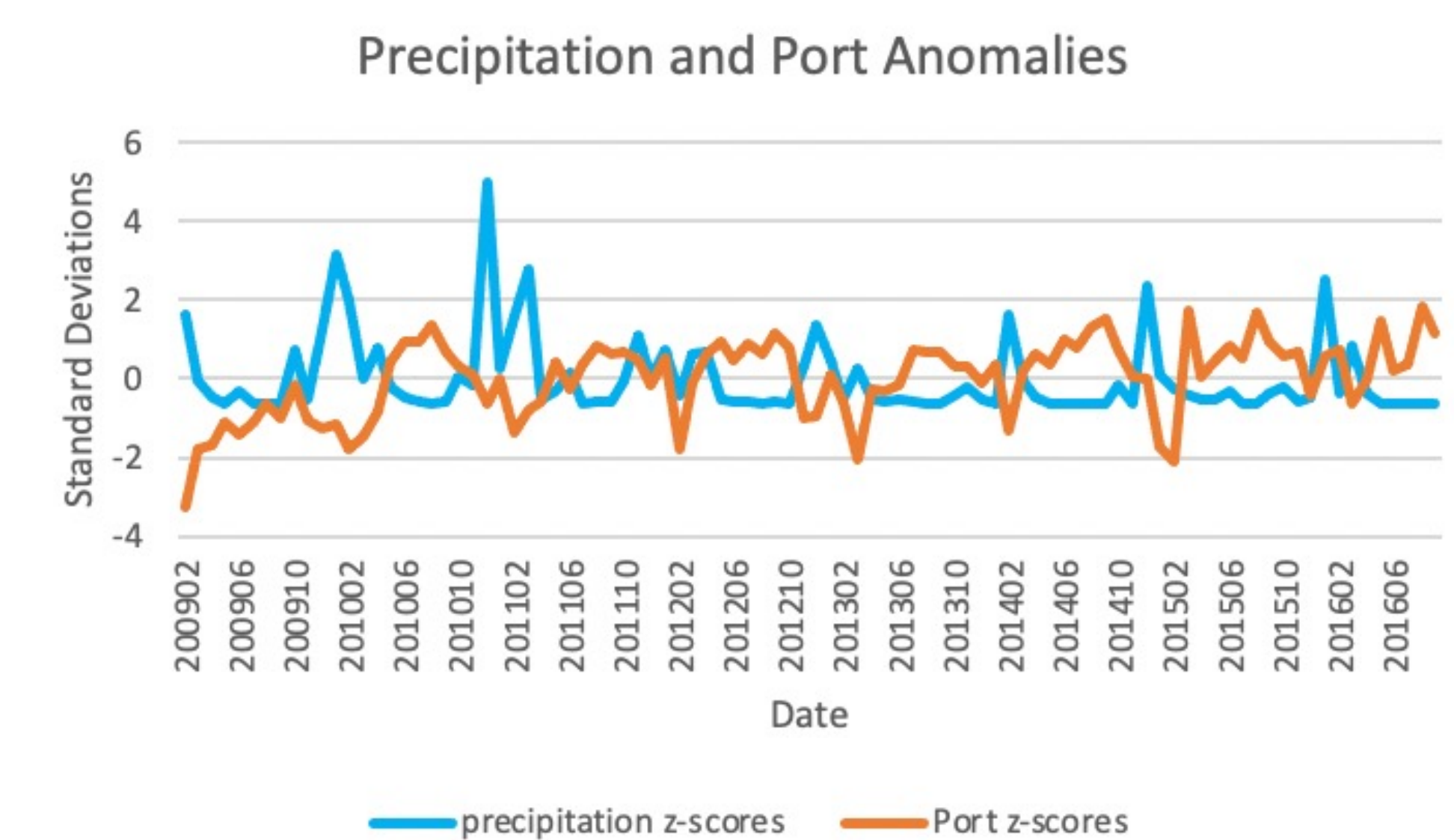


Figure 6: Time Series of Precipitation and Port Data (Koricke, 2022)

Discussion

- The relationship between storms and the volume at the Port of Los Angeles had a strong positive correlation and was statistically significant. The port data was compared between stormy seasons (November-April) and dry seasons (May-October) and there was a difference in container data, which signifies that the storms did impact the port (Figure 1).
- Between the precipitation data and the container data, there is a negative correlation. This is clear from a correlation value equal to -0.39 , as this is a weak, negative correlation. There was not a statistically significant relationship between these two variables. The volume of incoming containers was not significantly different between extreme wet and dry periods (Figure 3 and 6).
- For temperature and container volume, there is a slight positive correlation, however, it was not a statistically significant result. Between hot and cold periods, the volume of containers was not significantly different (Figure 2 and 4).
- Throughout the course of the research, many limitations became clear. For instance, the available data was limited based on time, as it would have been more beneficial to expand the time period. In order to fully analyze climate and impacts on container ships, it would be best to track the routes of the ships and the climate instances that the ship faces to be able to track the specific impacts and the exact delay that climate factors cause at the Port of Los Angeles.