

When Should I Go Surfing on the North Shore?

An Analysis of Wave Height on the North Shore of Oahu, Hawaii



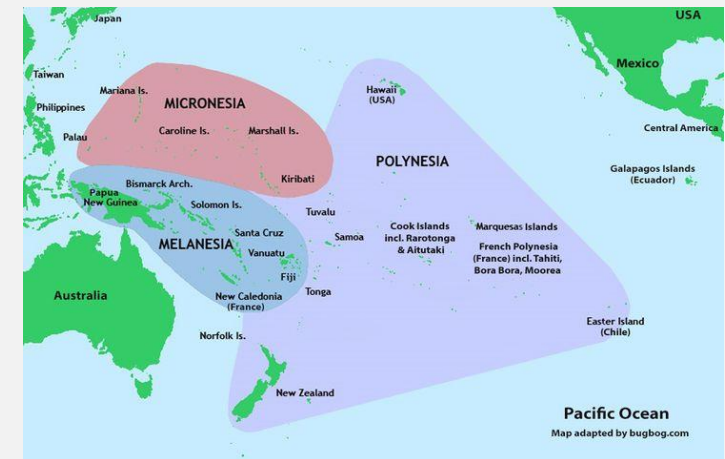
Edward Boynton

An Intro to Surfing and Hawaii

Surfing waves originated in Polynesian islands of the Pacific.

In Hawaii it is very culturally and socially significant.

Governed by a set of rules called Kapu.



The longest boards were called Olo boards and are up to 20ft long.

The Island of Oahu

Home to the capital of Hawaii: Honolulu.

Most populous Hawaiian Island with 953,207 residents.

Multiple world famous surf breaks are located here.



- Waimea Bay



Pipeline

Pipeline is the most famous and photographed wave in the world.

Shallow reef break – perfect for barrel riding.

The last and most coveted event on the World Surf League Championship Tour.

North Shore of Oahu = Important for surfing.



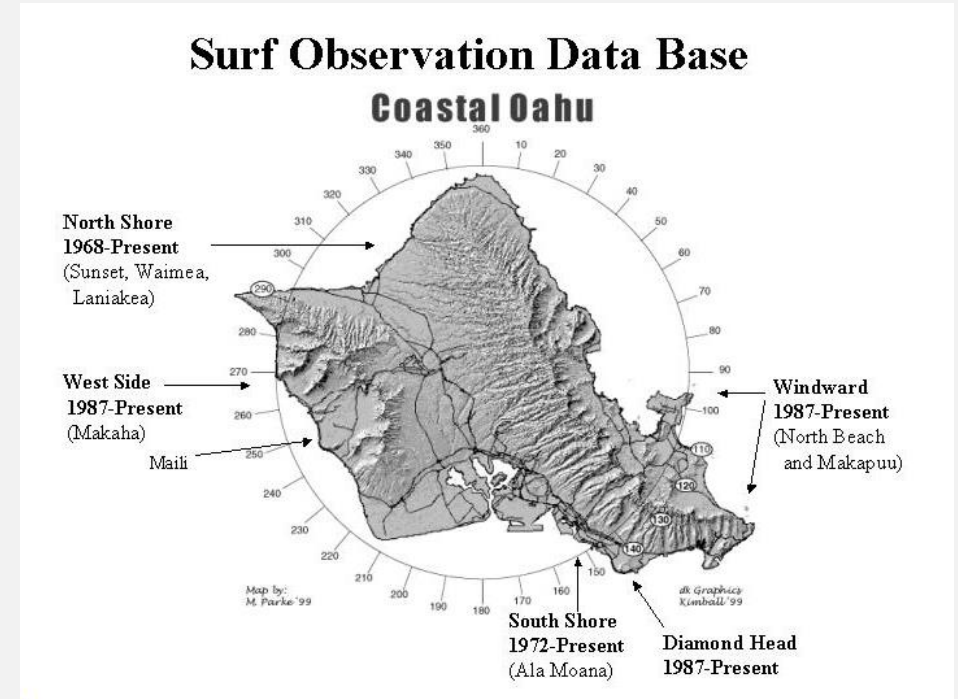
The Data

Includes observations from 1967-2020 on Wave height at different points on Oahu.

Also includes:

- Wind direction
- Wind speed
- North Shore Swell Direction

Wave Height is in Hawaiian Scale which is half the wave face height in feet.



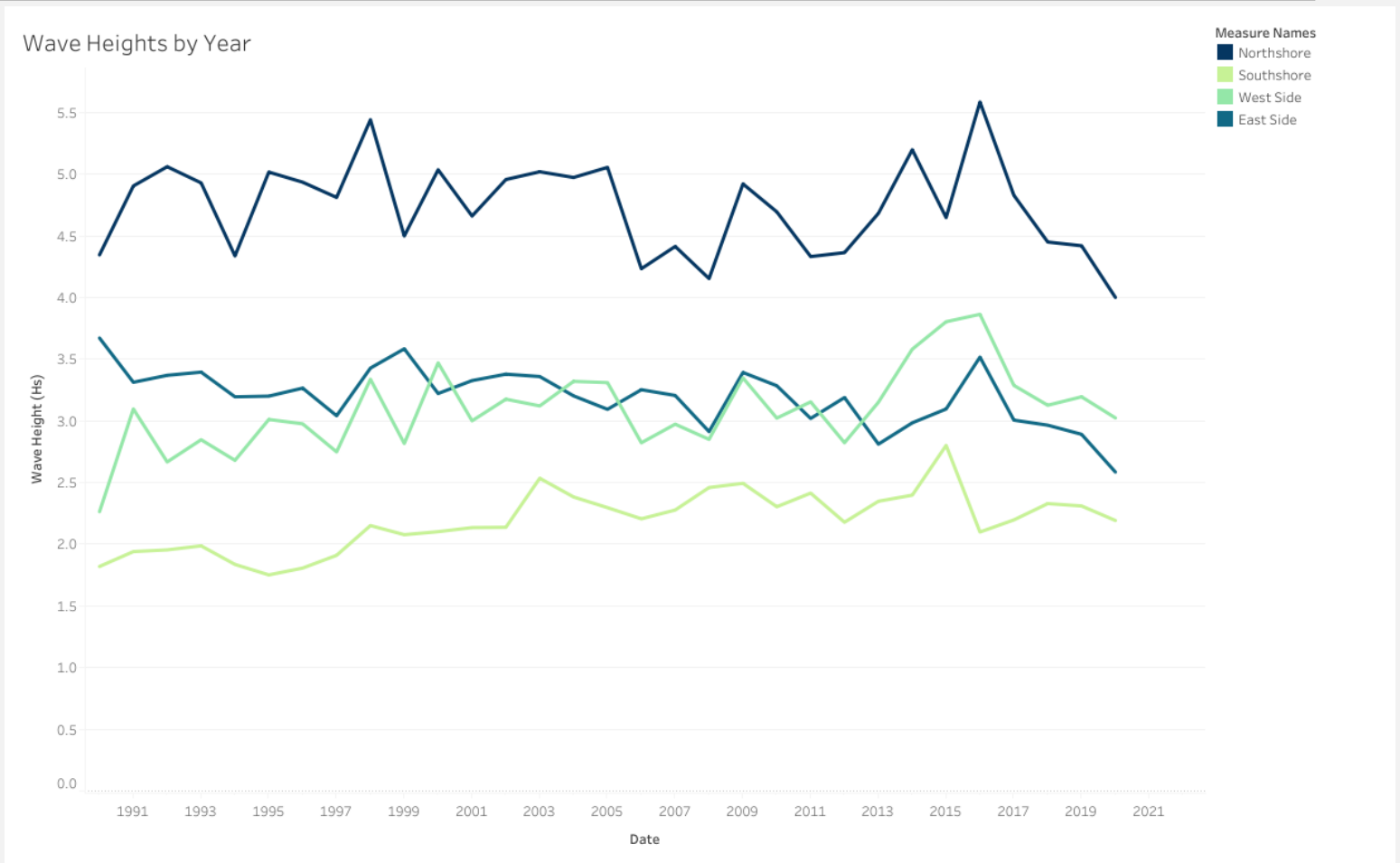
EDA: Trends over time

Data is stationary.

Northshore Wave Height is significantly higher than other parts of the island.

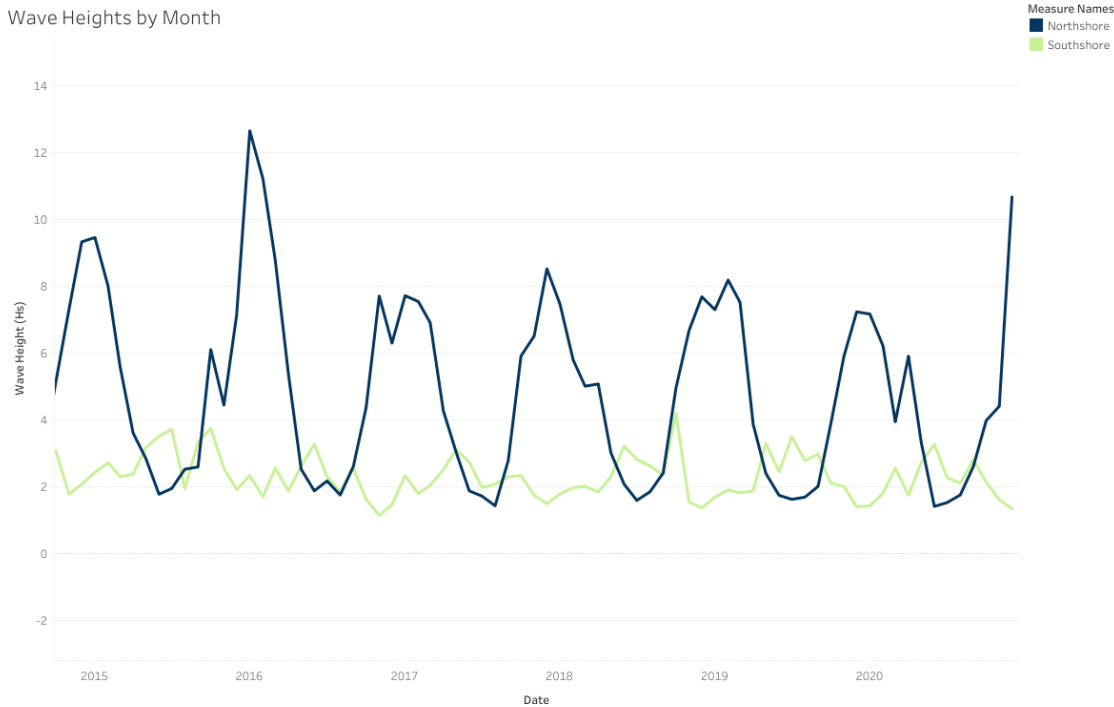
Northshore and West side wave heights strongly correlated.

This is due to regular north Westerly swells.



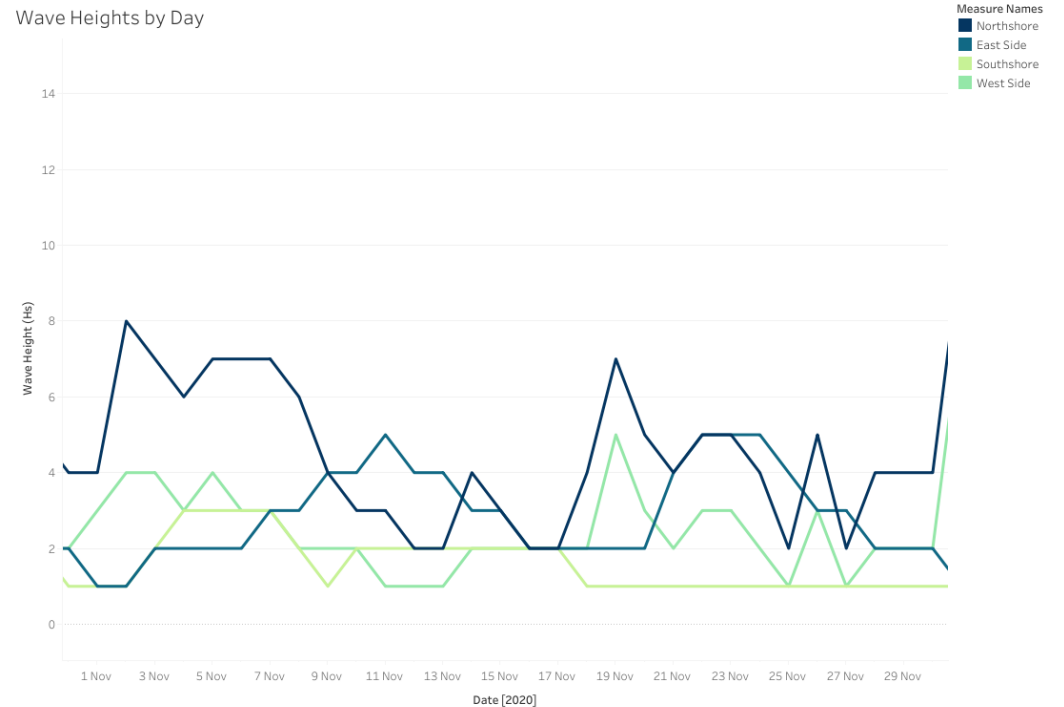
EDA: Trends over time

Wave Heights by Month



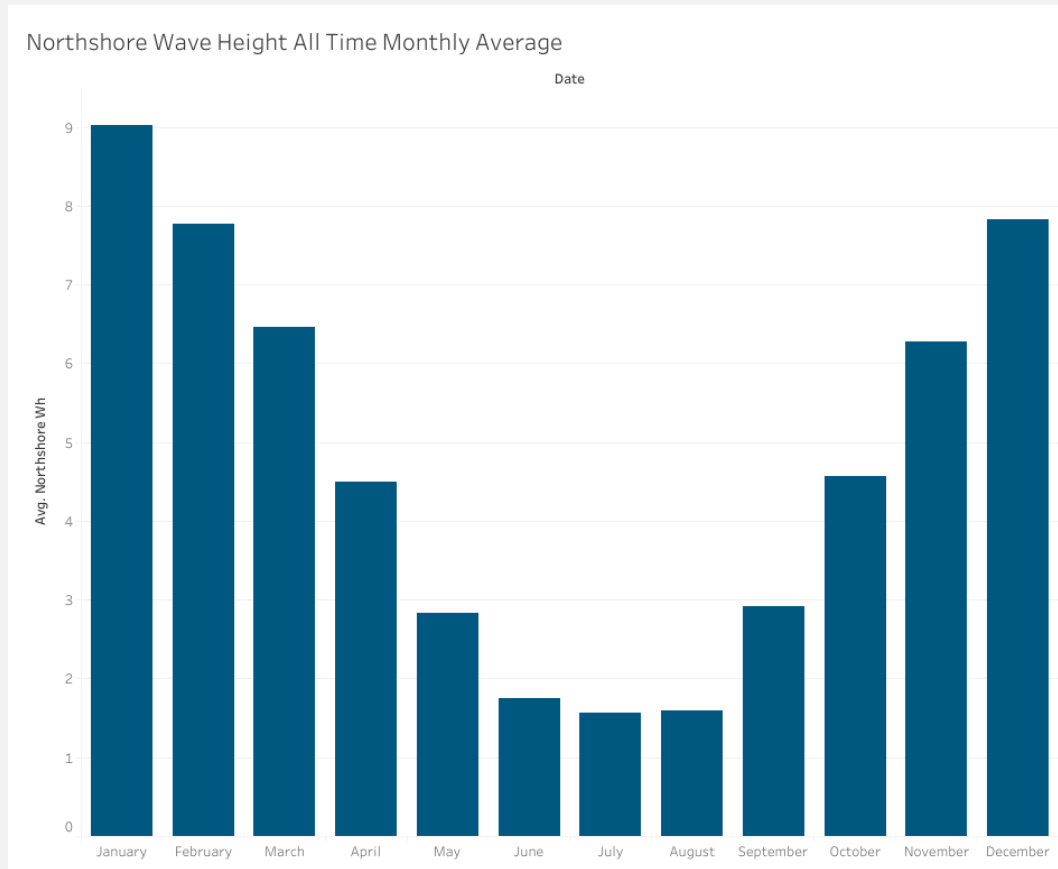
Note the Seasonality of both waves.

Wave Heights by Day



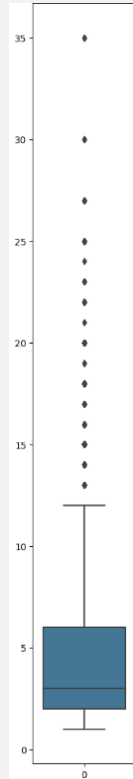
High level of Variance day to day.

EDA: Monthly Averages

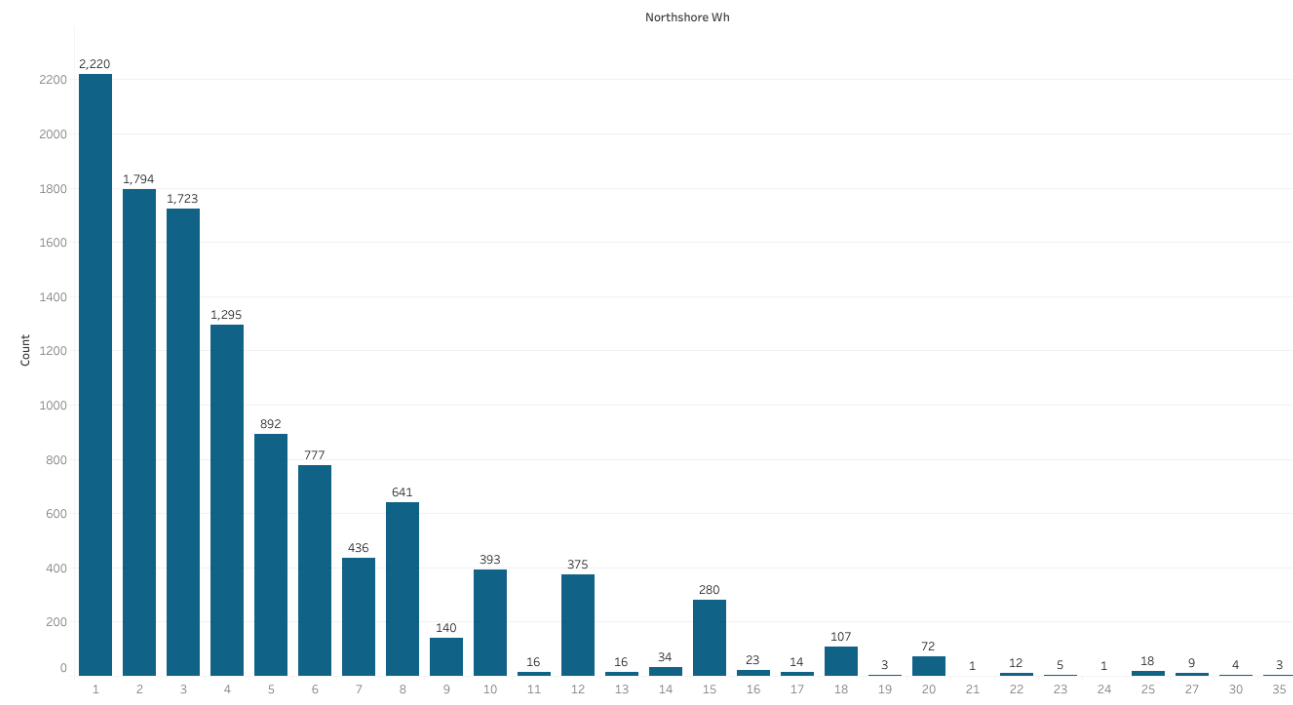


- January sees the largest waves
- June July and August see the smallest < 2

EDA: Frequency of Different Observations



Northshore Wave Height Count Plot



Lower wave heights are more common

Outliers at the higher Wave heights

Rounder numbers see a higher frequency

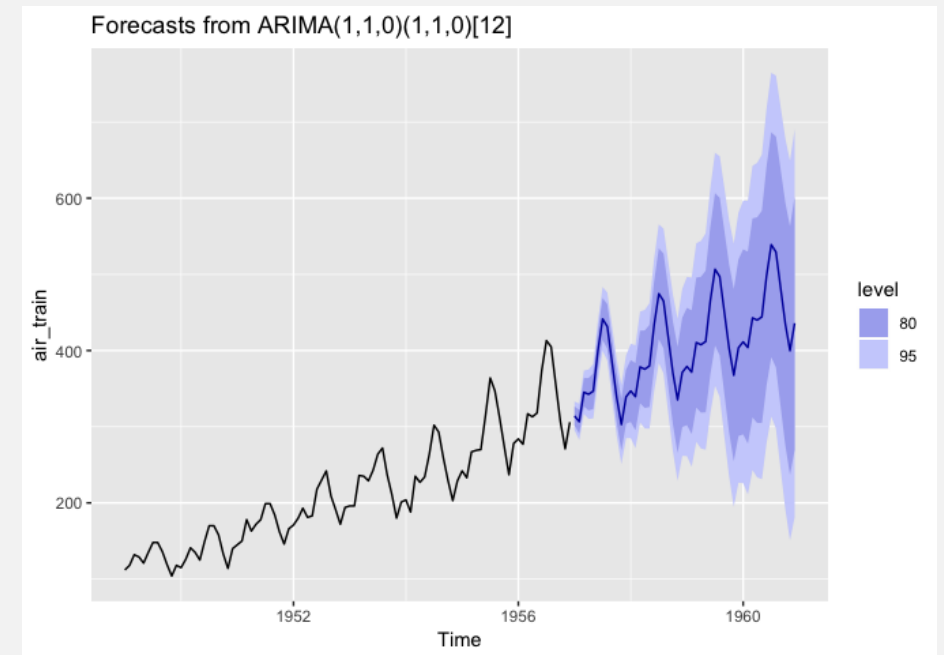
- Eyeball observations (limitation)

Arima model

What is an Arima model?

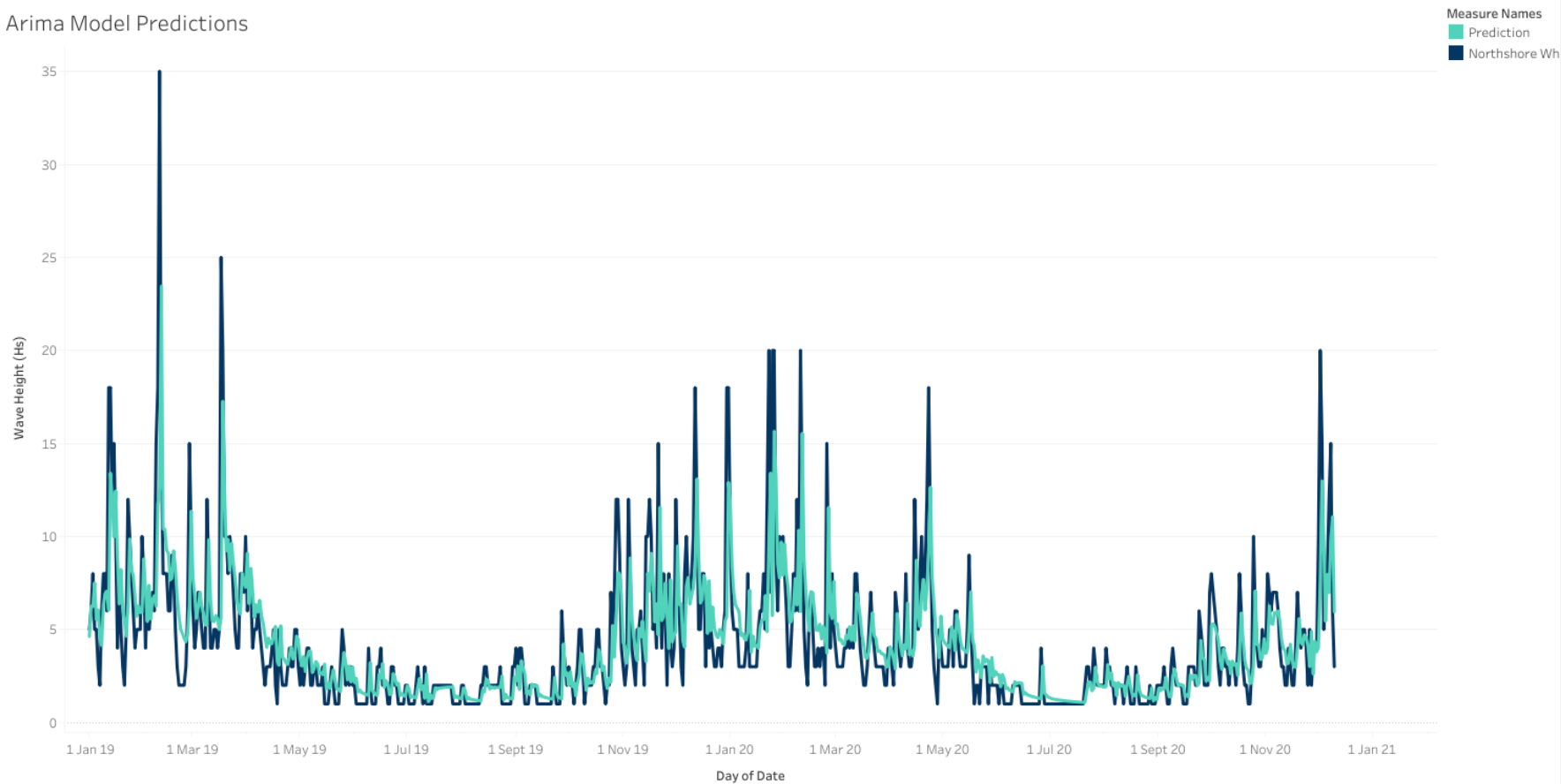
Stands for: Autoregressive | Integrated | Moving Average

Forecasts univariate continuous data, based off the previous data



My Arima model

Arima Model Predictions



Captured Seasonal trends

Didn't catch outliers

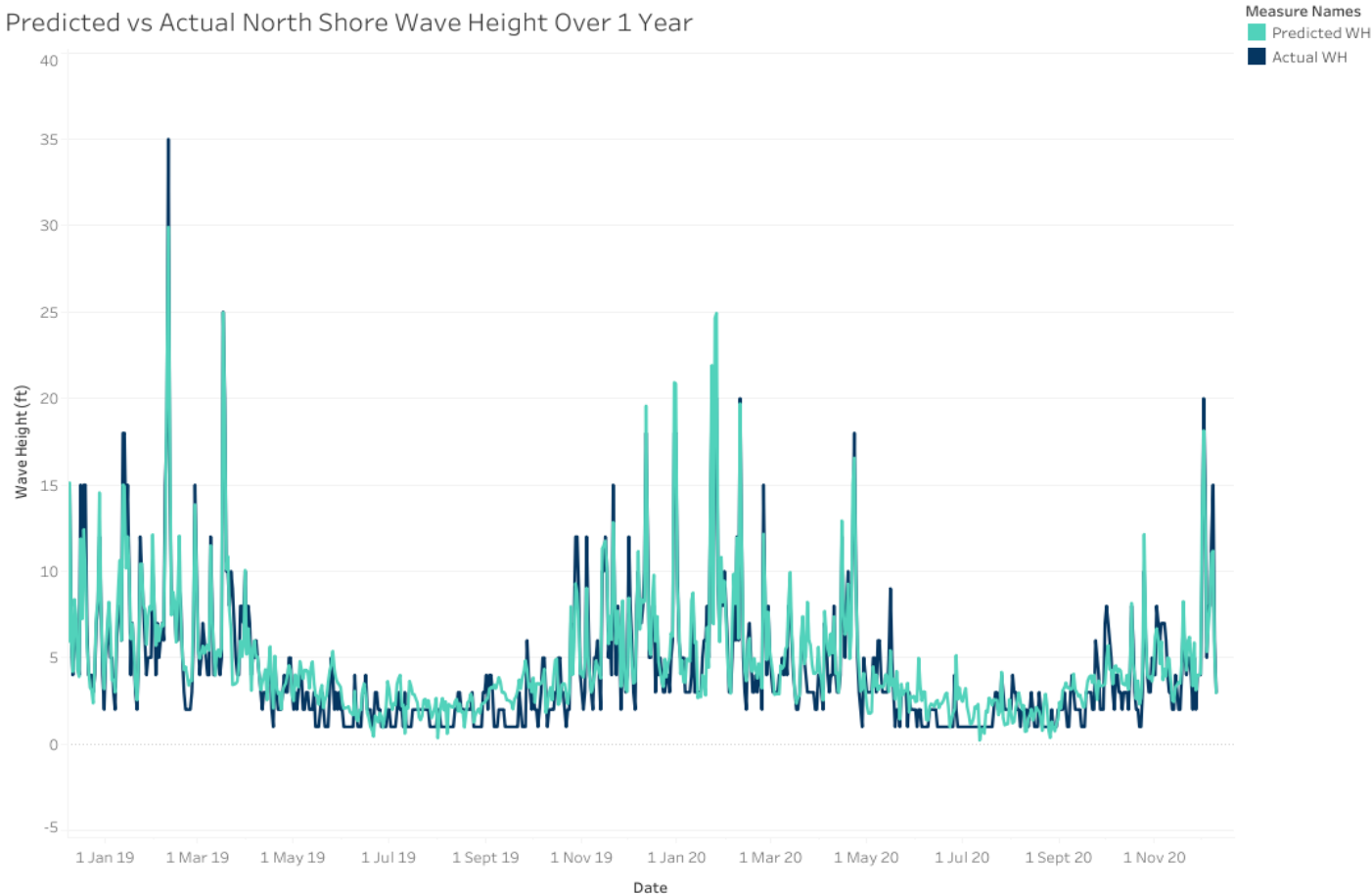
Rmse = 2.6

Mape = 41.6%

Slightly limited model

Linear regression model

Predicted vs Actual North Shore Wave Height Over 1 Year



Features used:

- Waveheights from other parts of Oahu
- Wind direction
- Wind speed
- Swell direction

Slightly better at capturing outliers

rmse = 1.90 – lower than Arima(2.6)

mape = 43%-higher than Arima(41.6%)

Needs more data

Model conclusions

Predicting Wave Height is like predicting the weather – hard.

For linear regression More data such as temperature and air pressure may have been helpful

Improved Arima



Surfing Conclusions

Be prepared for anything

If you are a professional surfer go in the Winter.

If you are not go in the summer.



Thanks For Listening!



Waves are my favourite thing – Alex Caian