Ocean Warming, Modeled

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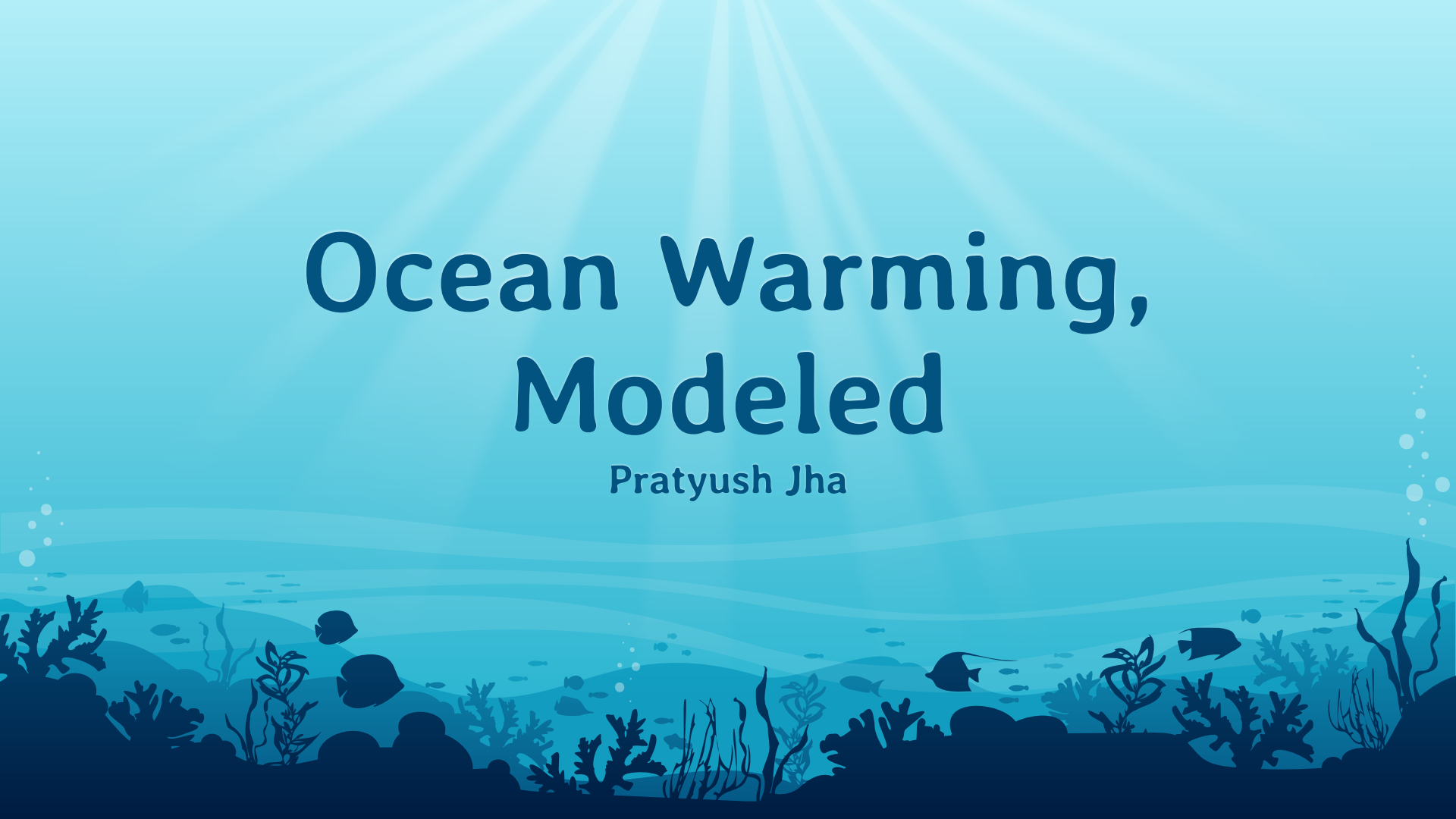


The Issue

8”

Global Sea Level rise in the past century

30%

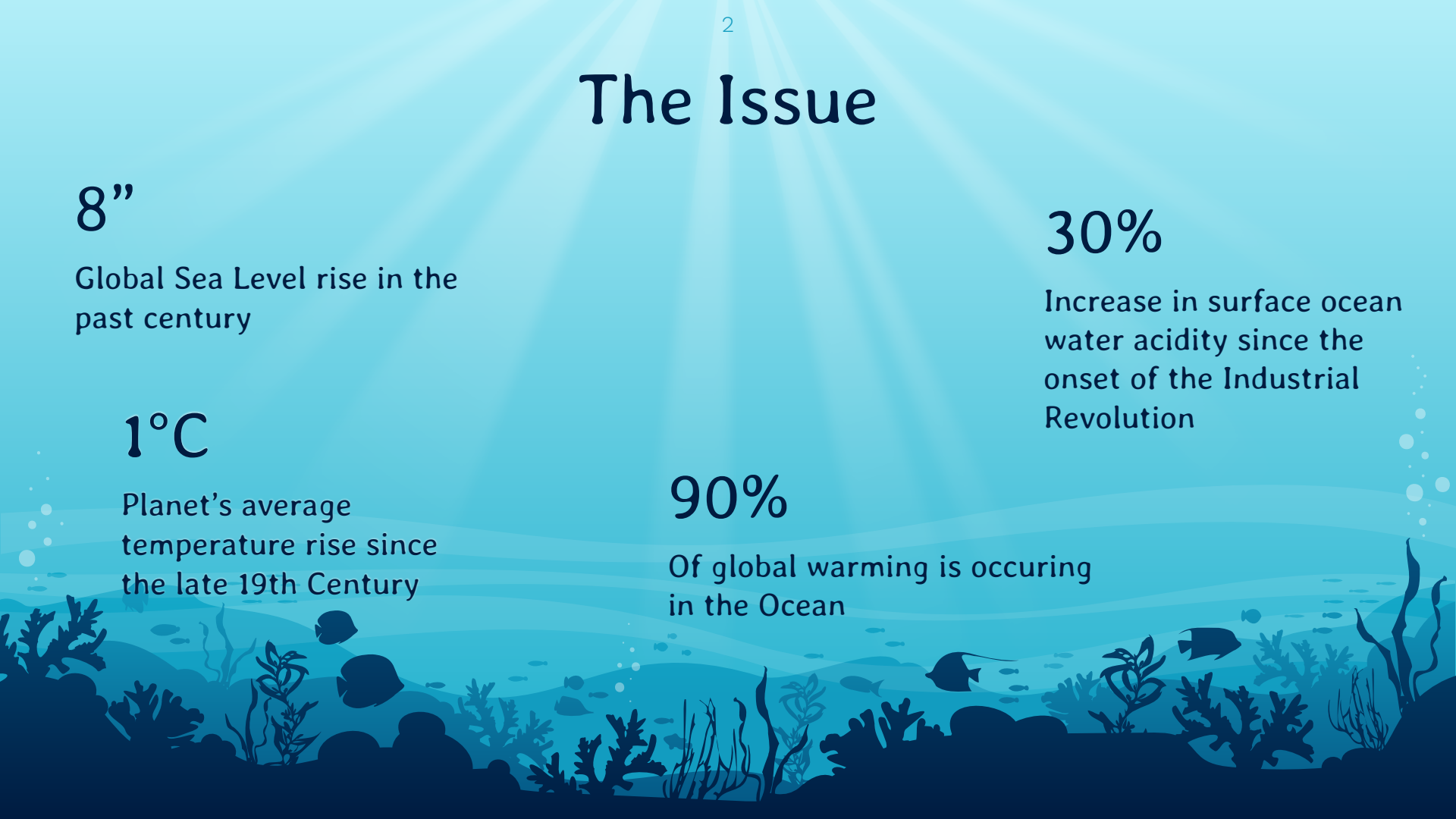
Increase in surface ocean water acidity since the onset of the Industrial Revolution

1°C

Planet’s average temperature rise since the late 19th Century

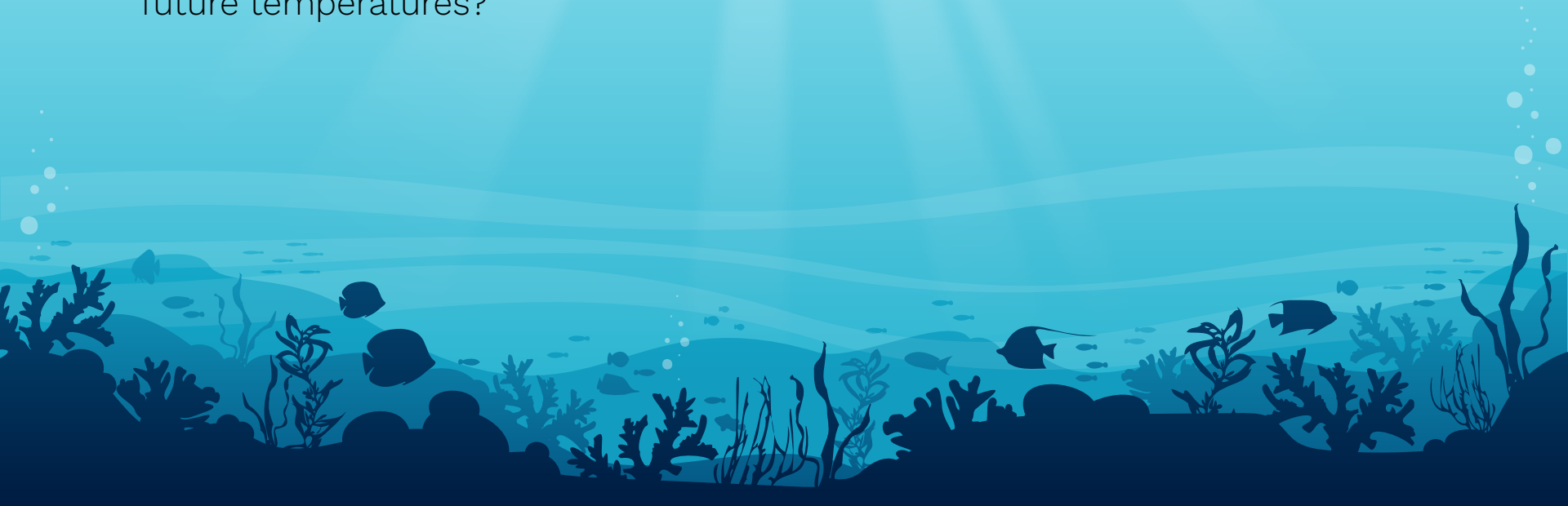
90%

Of global warming is occuring in the Ocean



The Big Question:

Just how fast is the ocean warming? How can we model that, and forecast future temperatures?



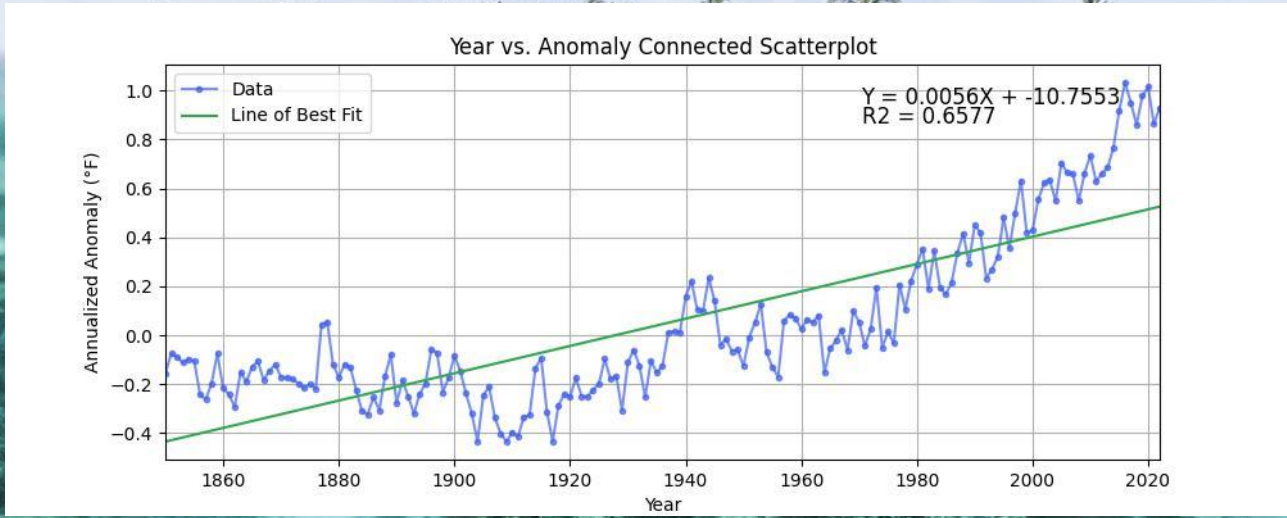
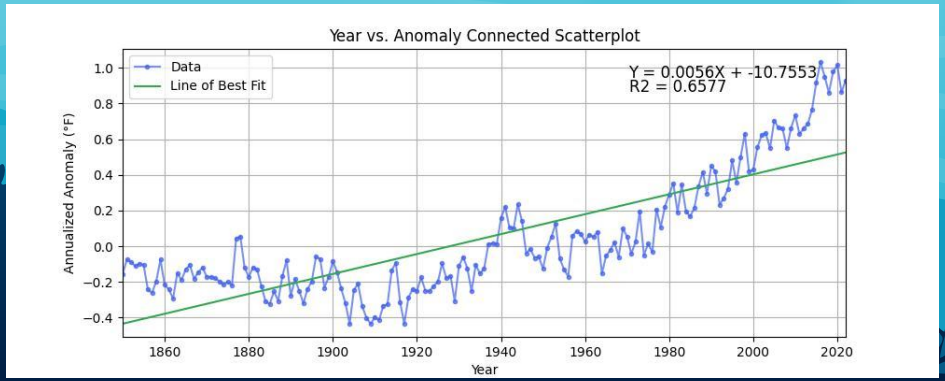


Fig 1: Year vs. Annualized Anomaly, Feat. Line of Best Fit

Indexing With Time, Consistently

HOW DO WE BEST ACCOMMODATE FOR THE DATA'S FEATURES?

- Data resembles a polynomial curve more than a linear function
- More deterministic than stochastic
  - Consistent despite mean reversive behavior
  - Quadratic consistency does not suggest an element of randomness
- Time Series with a wide ranging yet relatively small dataset



Why Use Prophet?

- Prophet
  - Algorithm includes methods to account for changepoints, holidays, seasons, cycles
  - Outperformed most other models tested (Exp. Smoothing, Linear Regression, ARIMA, SARIMA, ARIMAX)
  - Underperformed quadratic regression, though this is expected
    - Quadratic regression runs the risk of overfitting data

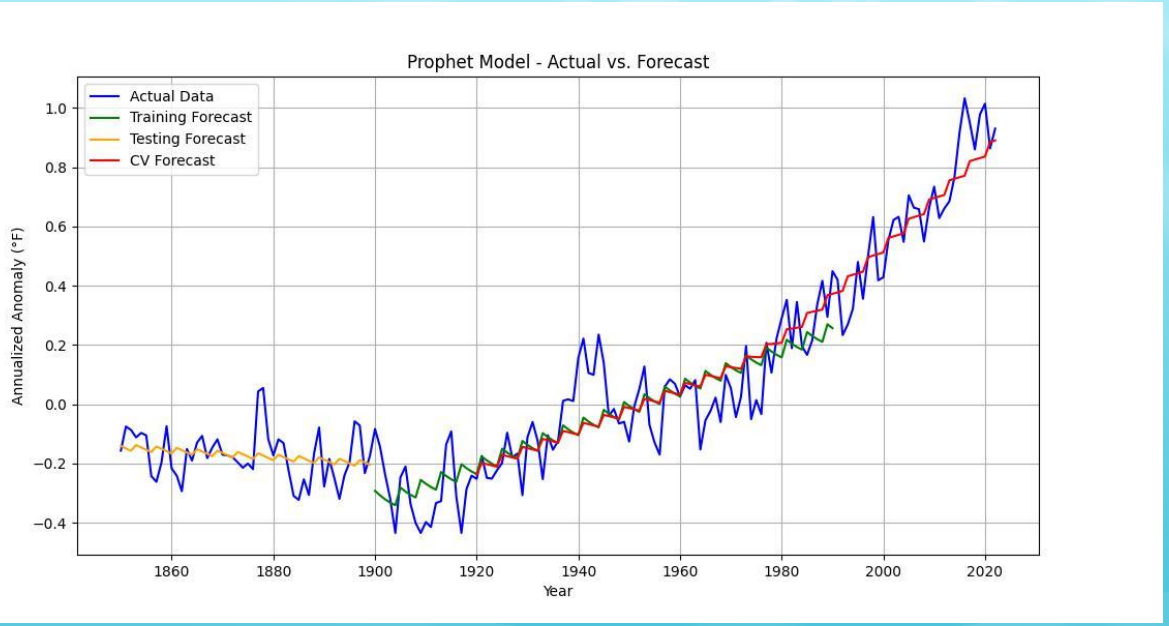


Fig 2: Prophet Model

Dataset	MAPE (%)	MSE	MAE
Train	3.09	0.013211	0.090018
Test	1.11	0.006567	0.062656
CV	14.69	0.01155	0.083338

Fig 3: Performance Table

Model Interpretation

- Errors across the board were quite low, with CV MAPE being an outlier
- Model performed best on the training dataset
  - Model is able to generalize new data well
- Data is not normally distributed as evidenced by the Shapiro-Wilk test; low MAE is promising

Model Interpretation Cont'd

- CV MAPE was relatively high
  - Low performance due to usage of untrained data
  - Biased toward low predictions, heavy penalty on high predictions
    - Biased, underestimated results