UNIVERSITY OF
PERPETUAL HELP
SYSTEM-DALTA
CLIMATOLOGY AND GEOLOGY

El Niño

Group 1: Balleta Charles Gondraneos

Analyzing Climate Systems and Geological Formations

CLIMATOLOGY AND GEOLOGY
MAESCI 3320
DR. FREDYROSE IVAN PINAR

Outline

- El Niño
  - I. Introduction
    - Objectives
  - II. Discussion Points
    - A. Geological Impacts
    - B. Geological Records
    - C. Predictive Models
  - III. Conclusion
    - Checking My Understanding
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1 Introduction

Objectives

- Analyze the impacts of El Niño on geological formations in a particular region

Objectives

- Discuss the geological records as evidence of past climatic conditions and how they have shaped the physical landscape.

Objectives

- Explore predictive models that link climate systems with geological changes and discuss their accuracy and implications for future geological forecasts.

II

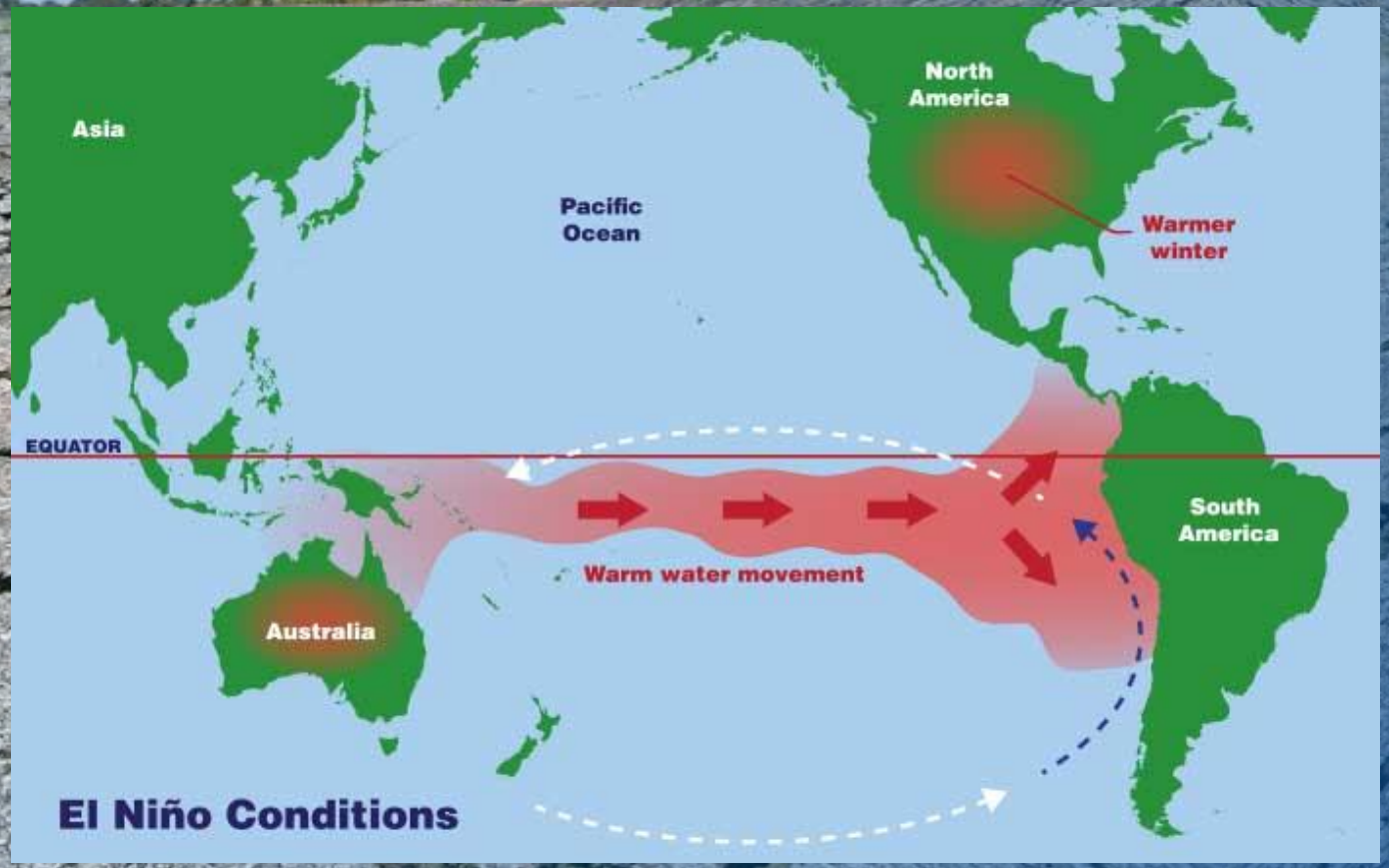
Discussion Points

A

Geological Impacts

Mark Josiah Gondraneos

El Niño



- ✓ Warmer than average sea surface temperatures
- ✓ Central and eastern equatorial Pacific
- ✓ Prolonged droughts, reduced rainfall, higher temperatures

A. Geological Impacts

Soil Erosion & Desertification

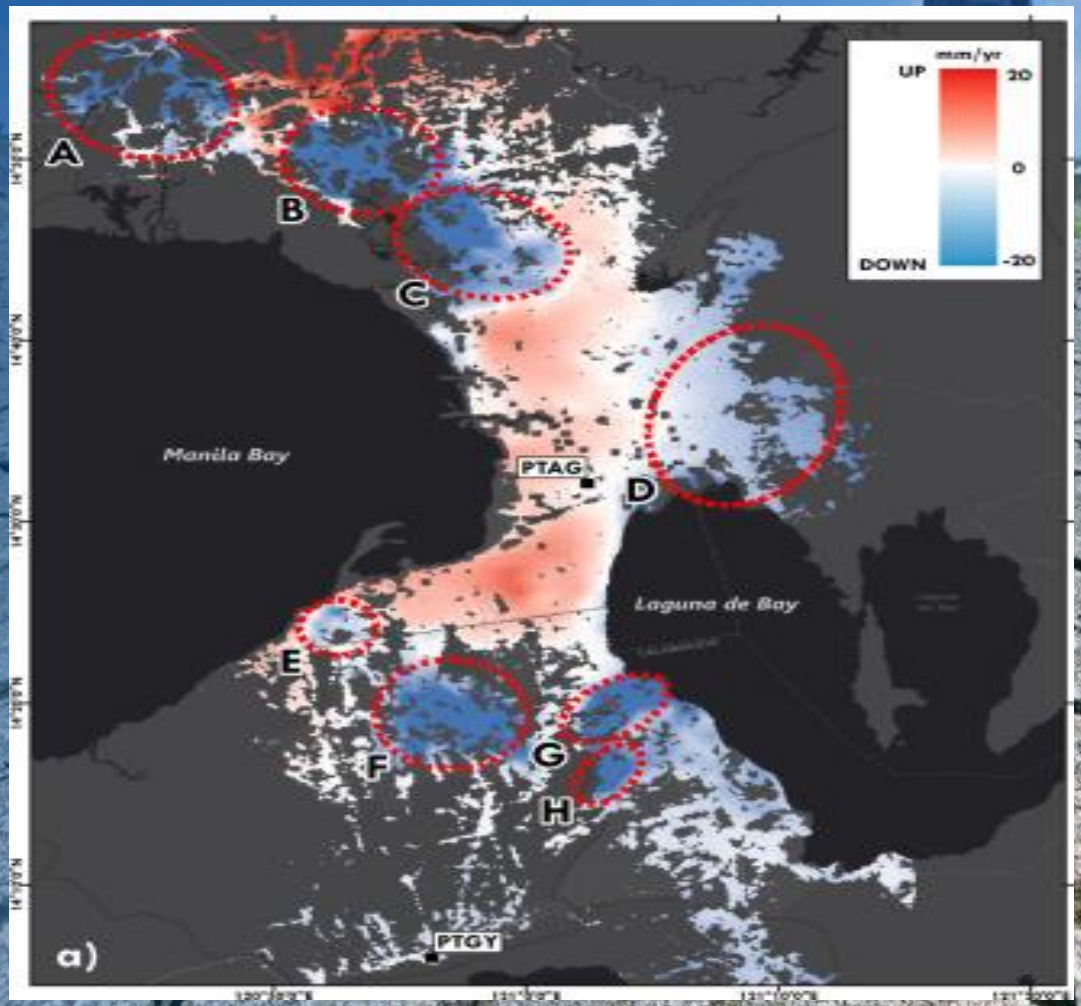
- ✓ Drought weakens vegetation
- ✓ Soil more vulnerable to erosion
- ✓ Reduced agricultural productivity

The 2015–2016 El Niño led to severe soil erosion in Northern Luzon (David et al., 2017).

A. Geological Impacts

Land Subsidence

- ✓ Excessive groundwater extraction due to reduced rainfall
- ✓ Worsening coastal flooding



Pampanga & Bulacan face increasing flood risks due to groundwater depletion (Rodolfo & Siringan, 2006).

A. Geological Impacts

Drying of Rivers and Lakes

- ✓ Reduced river flow and shrinking of lakes due to lower rainfall
- ✓ Alterations of riverbeds and surrounding landscapes due to decreased sediment transport

Lake Lanao's water levels dropped significantly in 1997–1998, exposing lakebed sediments (Cruz et al., 2013).

A. Geological Impacts

Wildfires & Rock Weathering

- ✓ Prolonged dry conditions
- ✓ Weakened rock structures leading to cracks and weathering.

2016 wildfires in Mt. Apo and Sierra Madre destabilized rock formations (DENR, 2017).

A. Geological Impacts

Coastal Erosion

- ✓ Reduced river sediment transport
- ✓ Stronger waves accelerate coastal land loss

Cebu & Palawan experienced severe beach erosion and exposed coral reefs (Siringan & Rodolfo, 2003).

Mildred Galero-Balleta

B Geological Records

B. Geological Records

1. Sedimentary Deposits and Oceanic Conditions

A. Ocean sediments

- Biological Indicators
- Sediment Layers and Isotopic Analysis

Plankton fossil

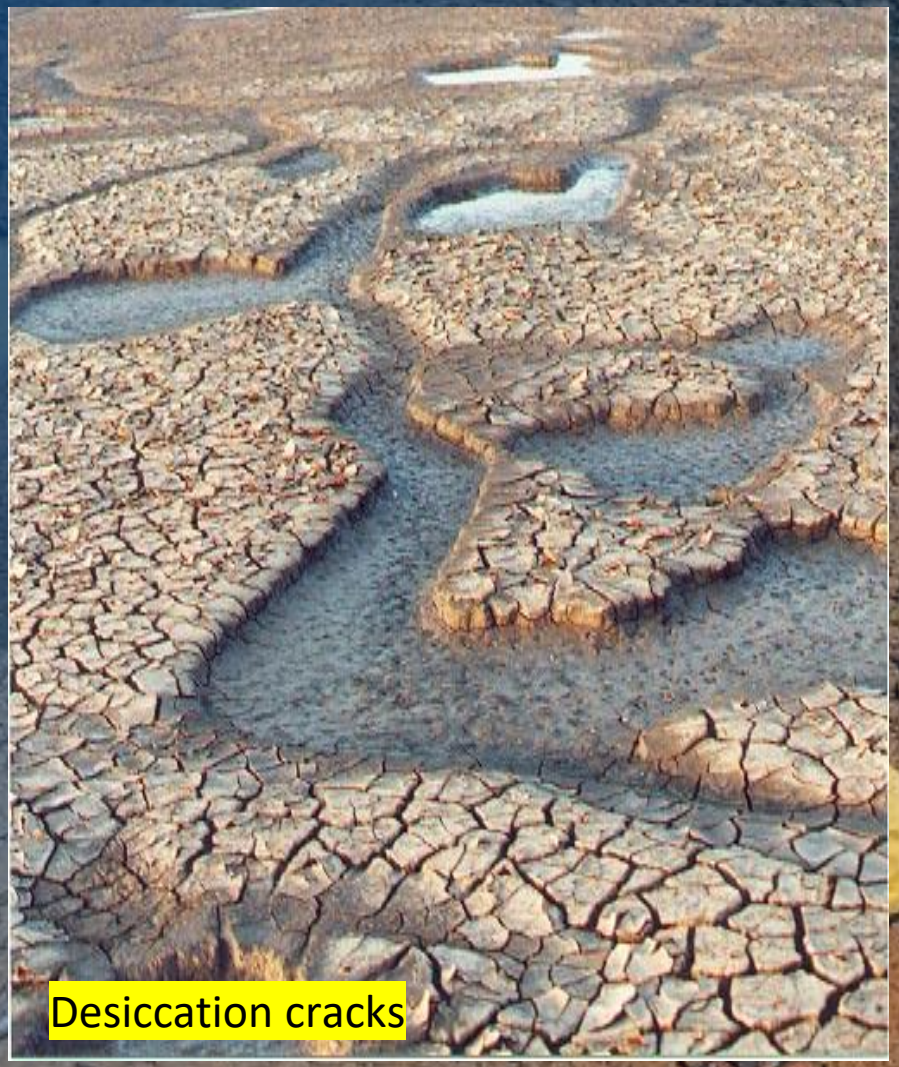
Sediment cores

B. Geological Records

1. Sedimentary Deposits and Oceanic Conditions

B. Lake and River sediments

Flood plains



Desiccation cracks

B. Geological Records

2. Coral Reef Records

A. Coral Growth Patterns
   - Slows down due to warmer waters

B. Coral Oxygen Isotopes
   - Reflects the temperature of the surrounding water

B. Geological Records

3. Terrestrial Climate Impact

A. Flooding Events
- Sediment Deposition

B. Drought and Erosion
- Erosion and Sediment Redistribution


Floodplain


Dry lake bed

B. Geological Records

4. Paleoclimate Models and Proxy Data

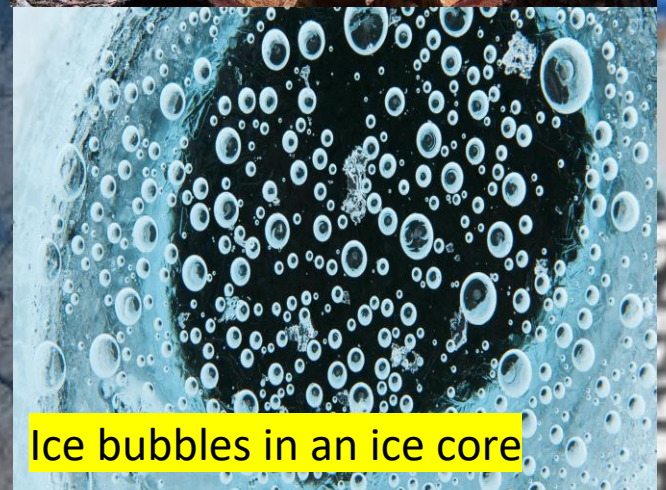
A. Tree Rings

- Wider – above-average rainfall
- Narrow – drought

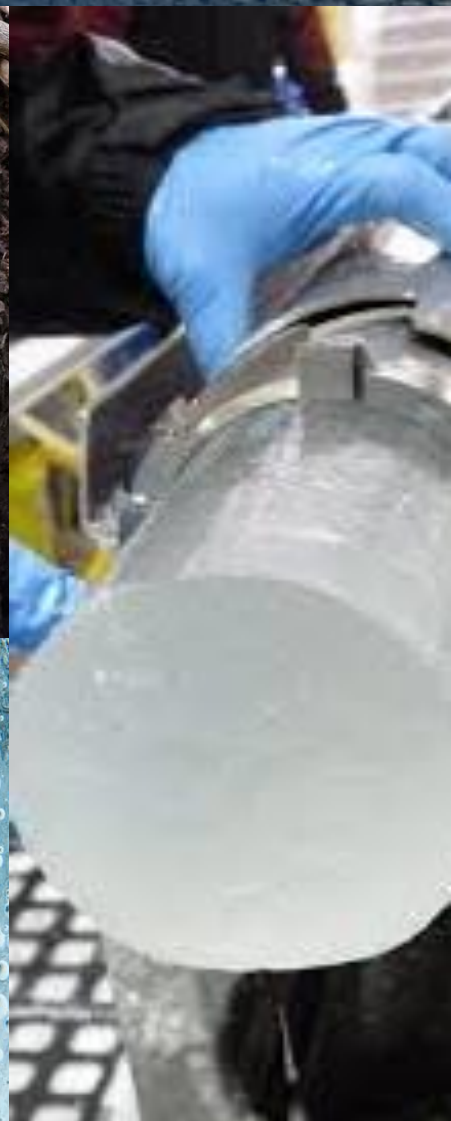
B. Ice Cores

- Air bubbles hold records of past atmospheric composition

Tree rings



Ice bubbles in an ice core



B. Geological Records

5. Impact on Landscape Features

A. Coastal Erosion
- Wave-cut platforms (sea stacks)

B. Changes in Vegetation
- Landslides or sediment transport
- Wildfires


Wave-cut platform


Wildfires

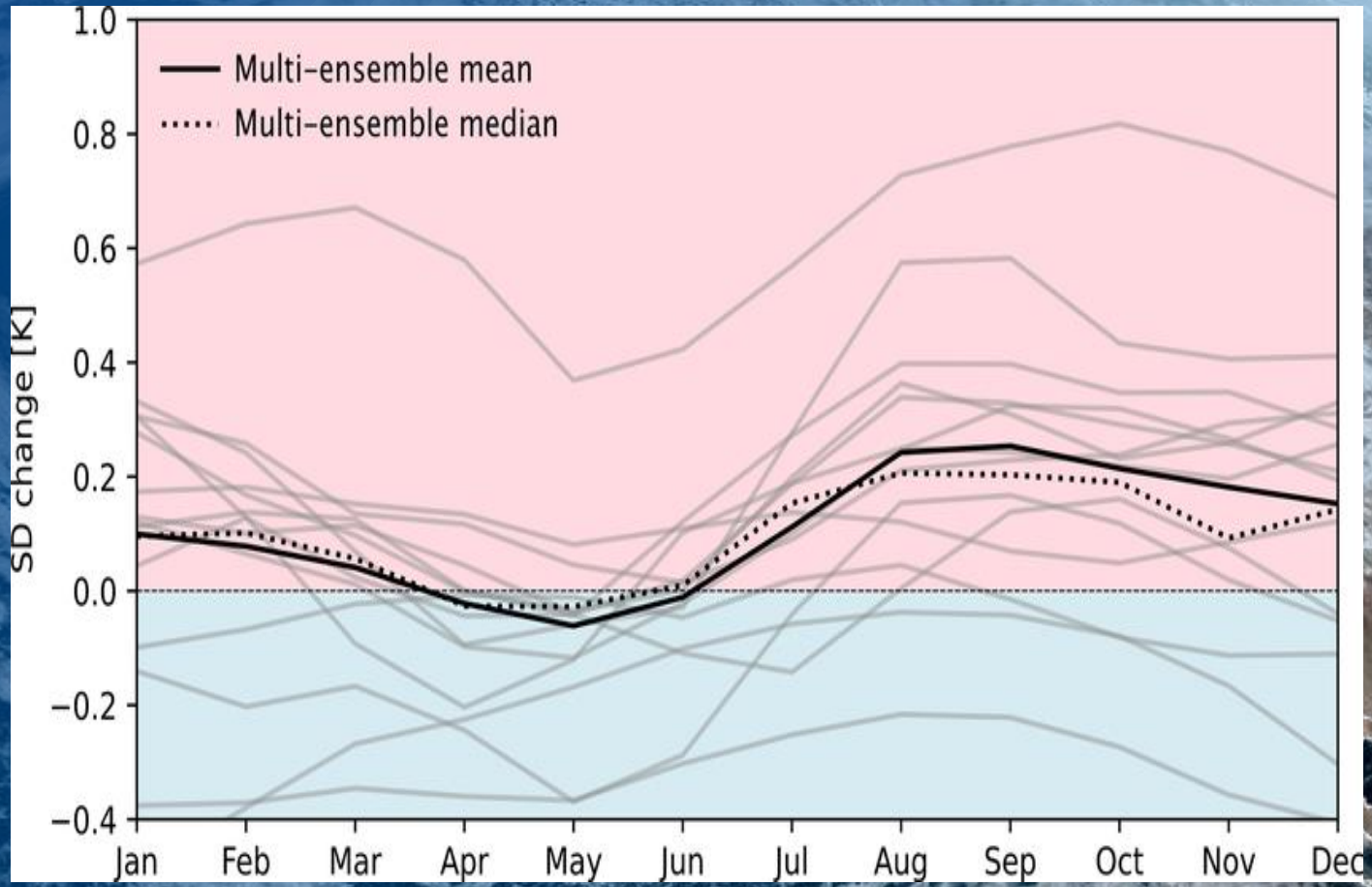
C

Predictive Models

C. Predictive Models

How do we predict El Niño events?

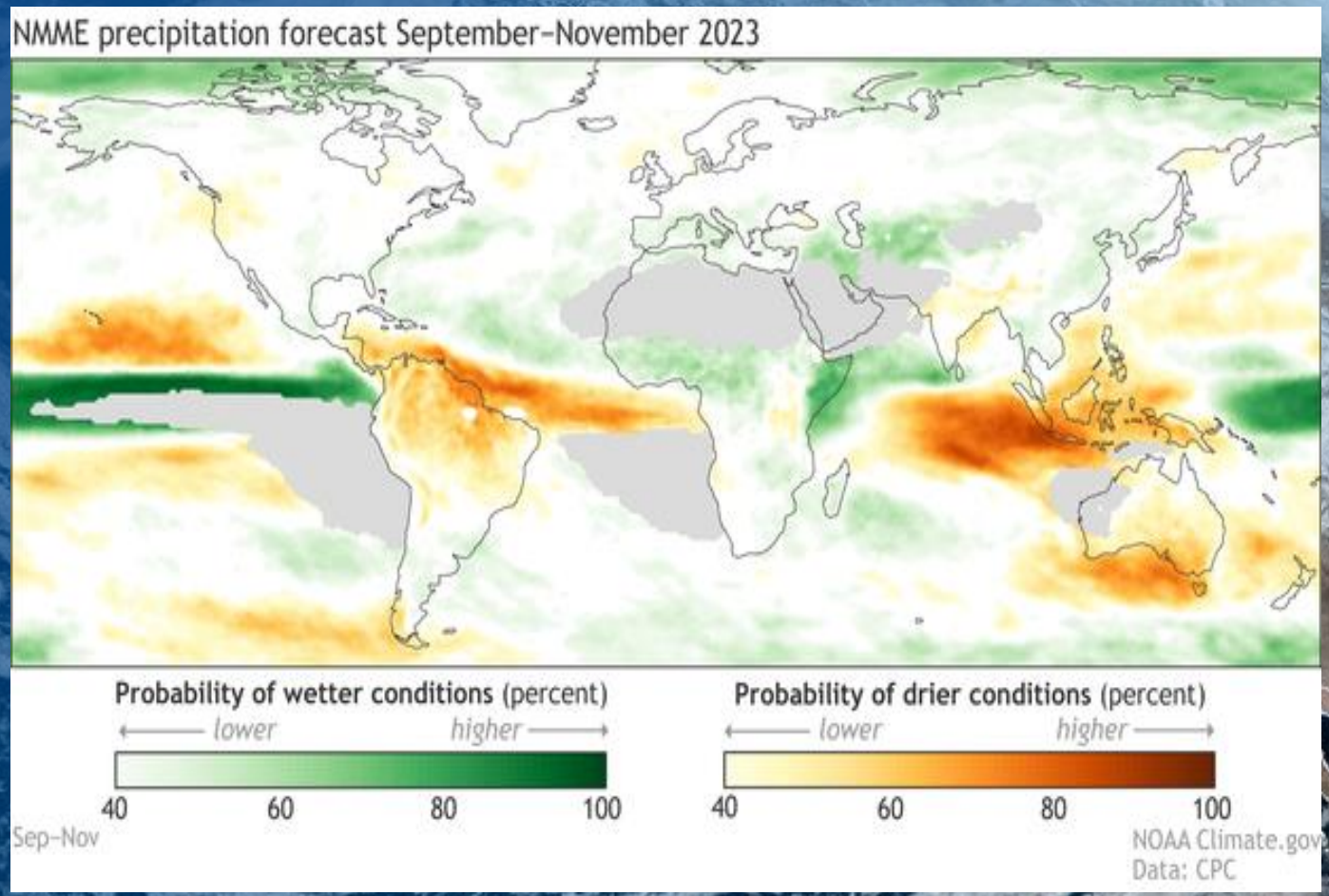
- Temperature, humidity, and wind
- Ensemble technique
- Probabilistic estimates



C. Predictive Models

North American Multi-Model Ensemble (NMME)

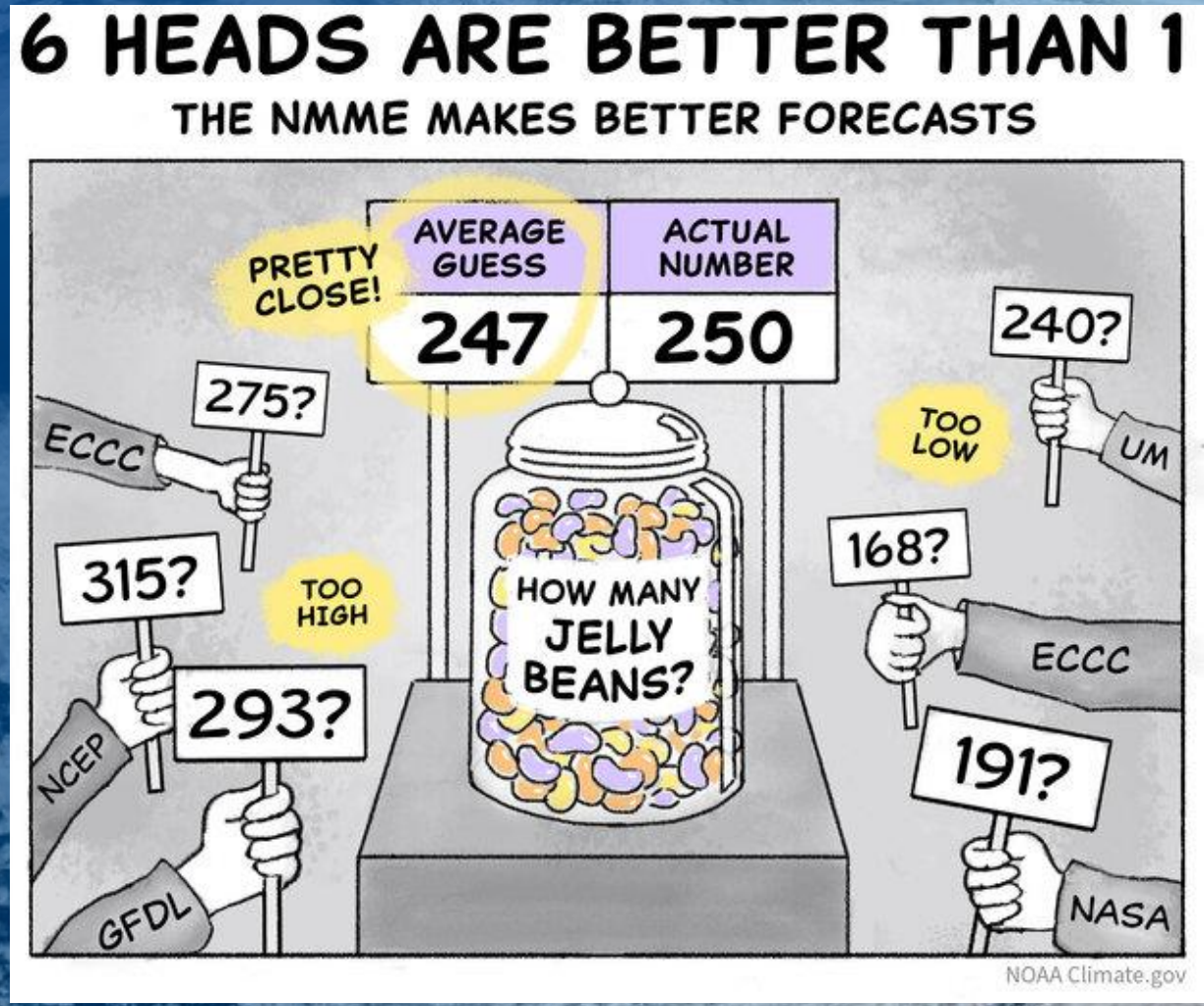
- Computer Climate Models
- Three-month Averages
- Better than single model



C. Predictive Models

North American Multi-Model Ensemble (NMME)

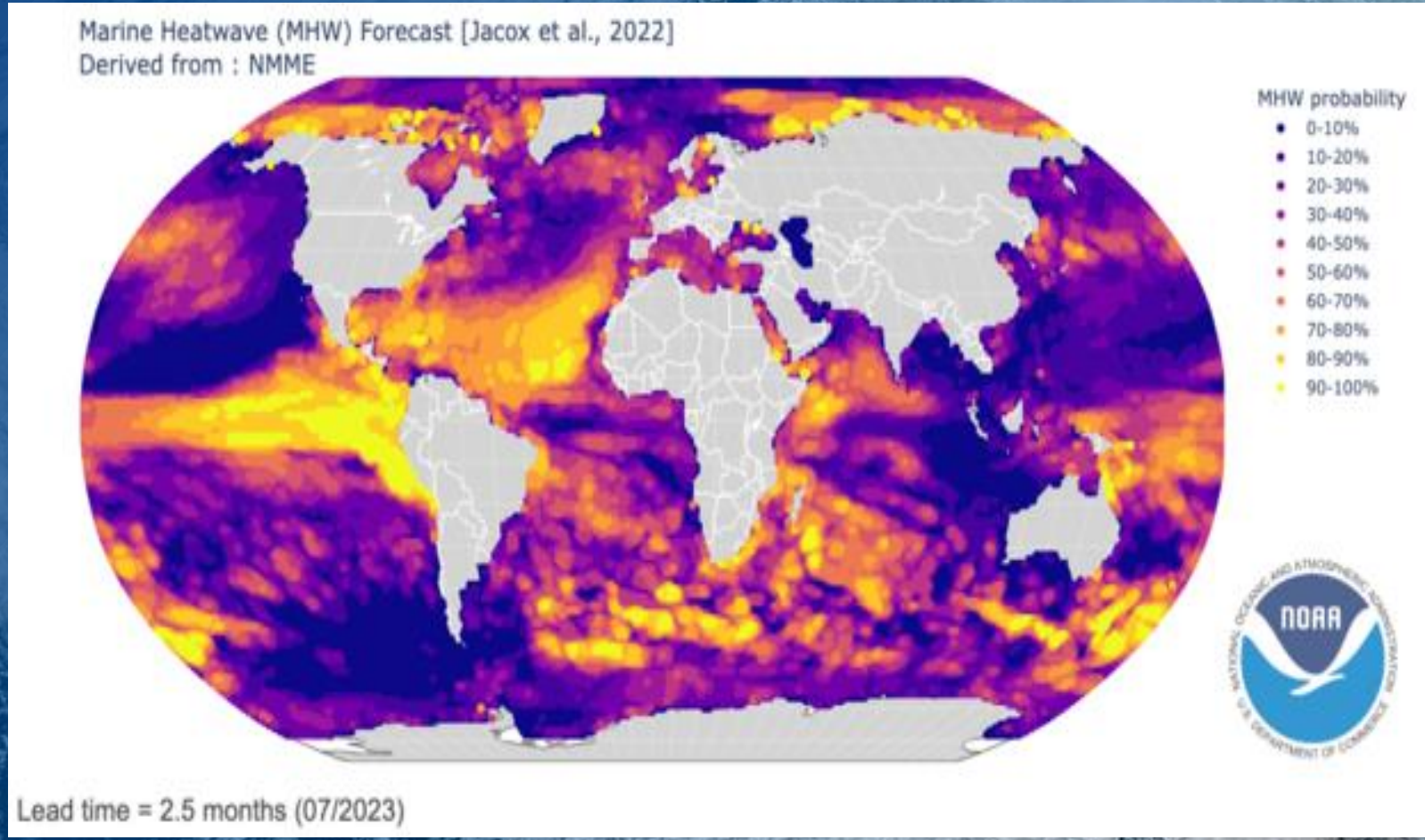
- National Aeronautics and Space Administration
- Environment and Climate Change Canada
- National Oceanic and Atmospheric Administration (NCEP, GFDL, CPC)
- International Research Institute for Climate and Society
- University of Miami



C. Predictive Models

North American Multi-Model Ensemble (NMME)

- Real-time forecasts
- Extensive research
- Retrospective forecasts

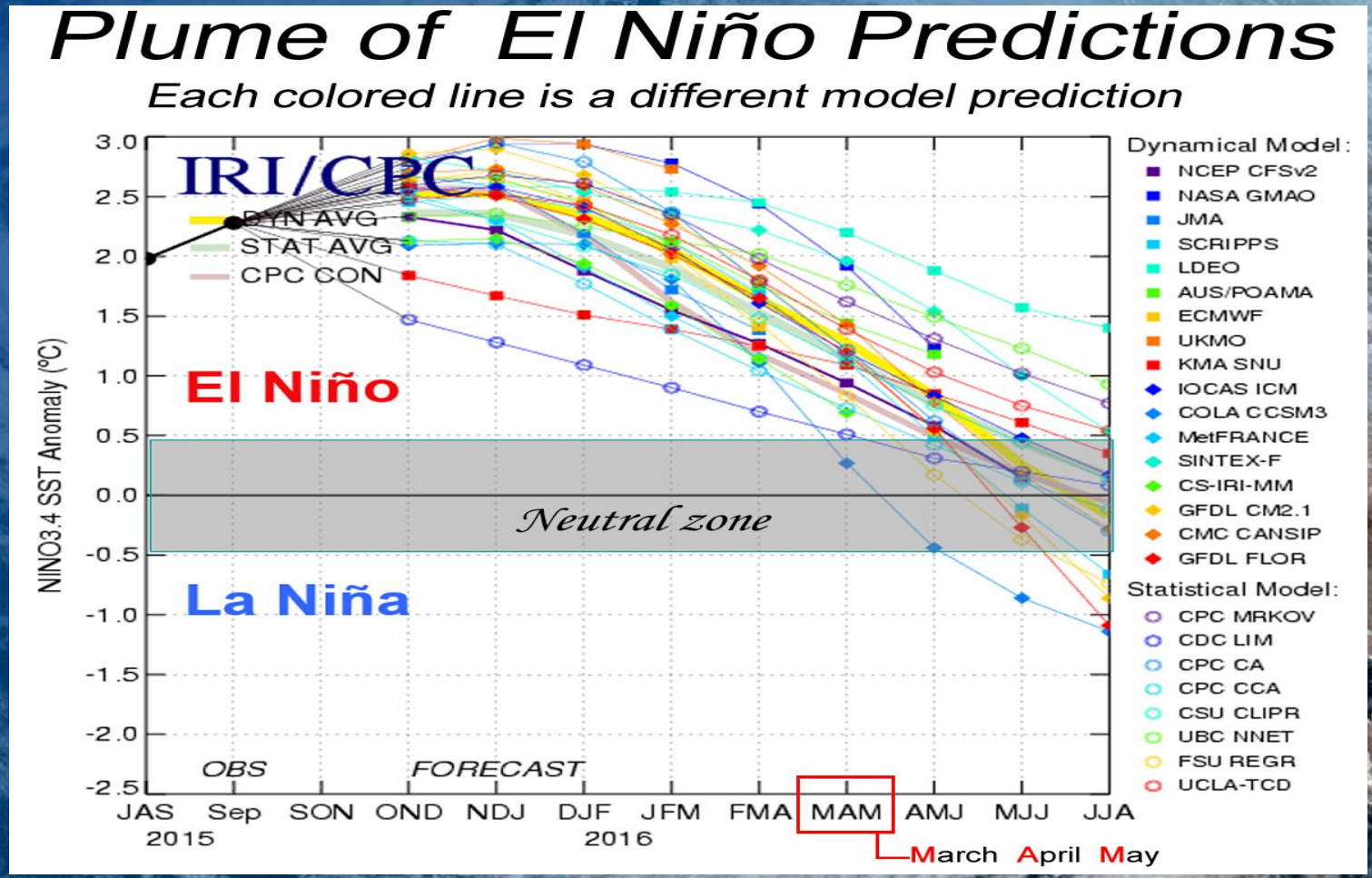


C. Predictive Models

How good have models been at predicting ENSO in the 21st century?

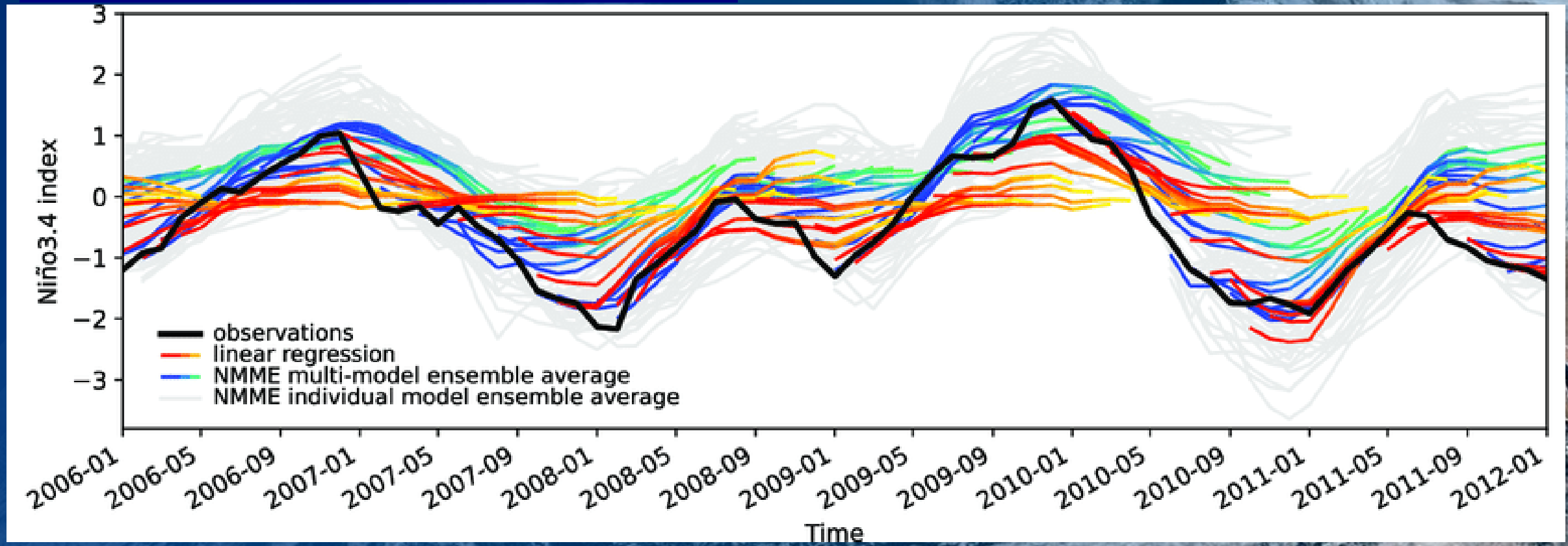
Types of Models

- Dynamical (observational data to simulate future climate using equations)
- Statistical (historical data to find patterns)

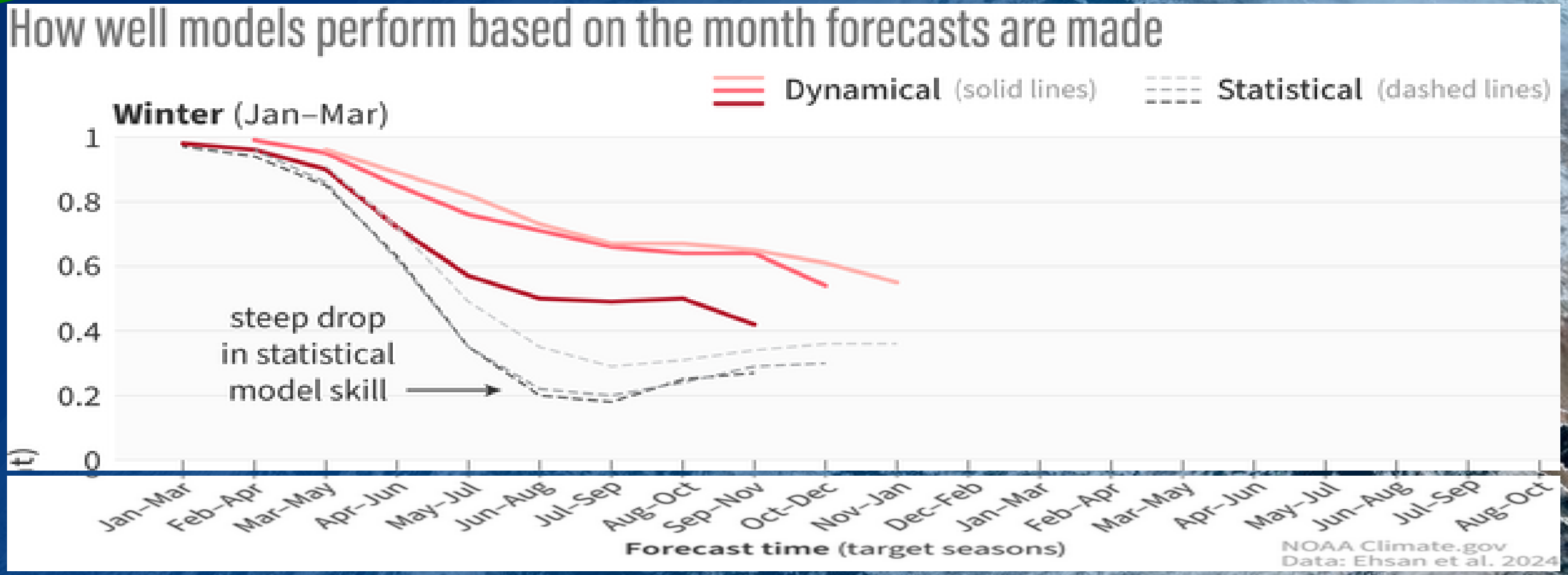


C. Predictive Models

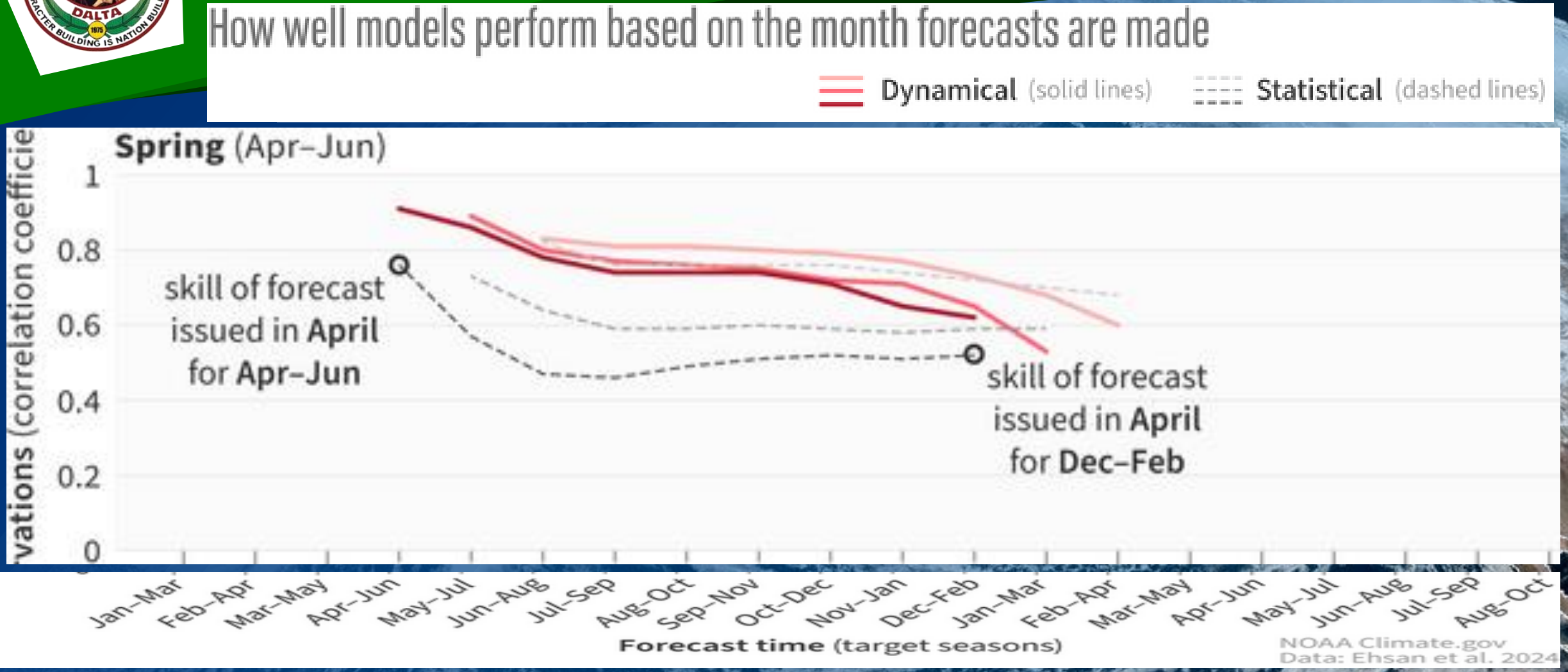
Hybrid Model (Statistical-Dynamical)



C. Predictive Models



C. Predictive Models



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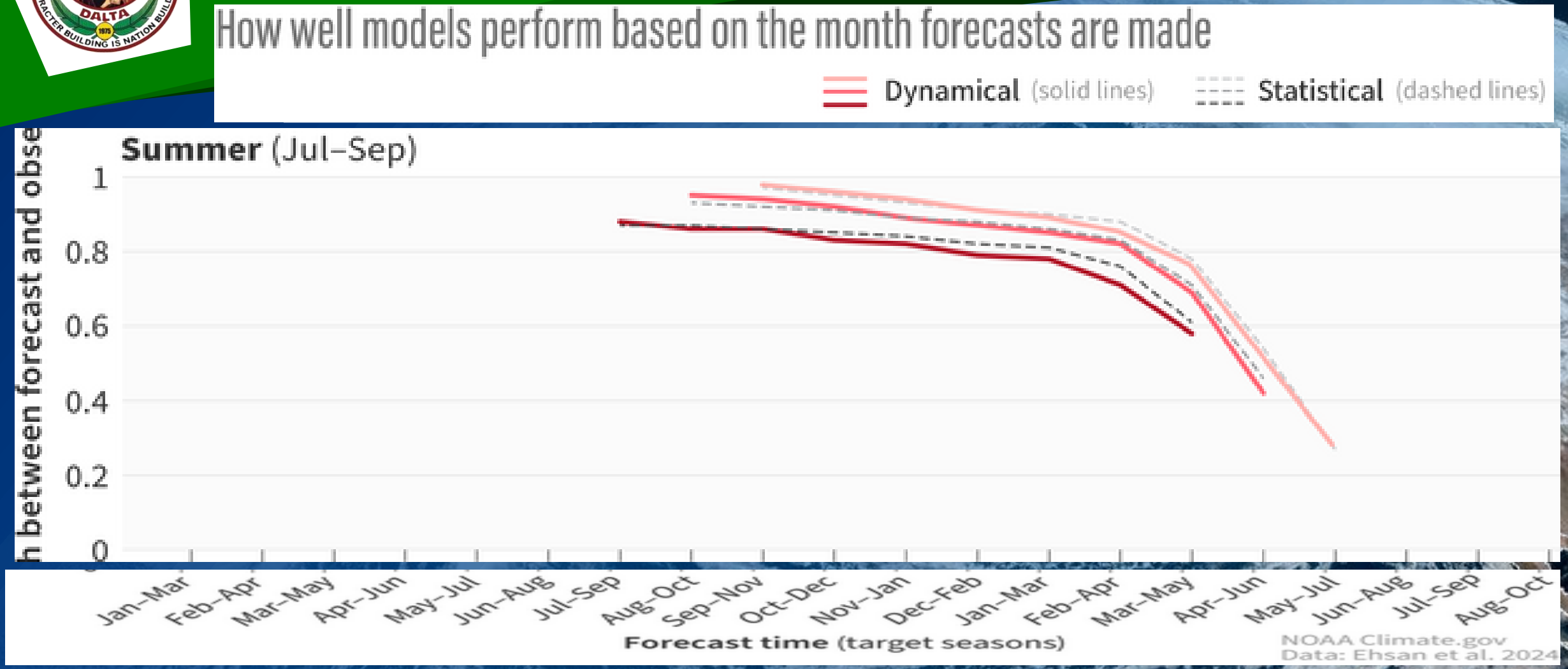
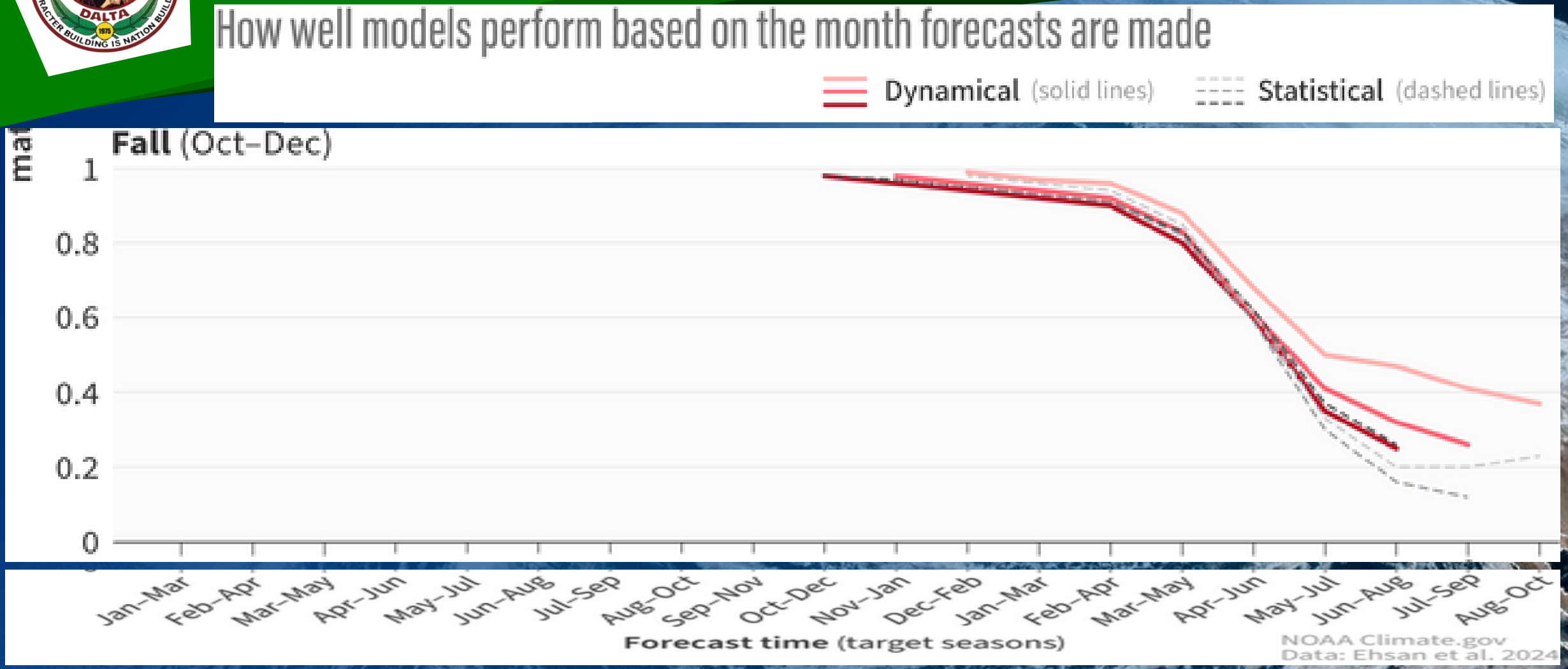


C. Predictive Models



III

Conclusion

CLIMATOLOGY AND GEOLOGY: Analyzing Climate Systems and Geological Formations – El Niño

Checking My Understanding

02:00

#El Niño: What is a clear and concise way to explain El Niño?

Join at
slido.com
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#El Niño: What is a clear and concise way to explain El Niño?

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