The Weather Company (Energy Team) And NOAA Data

Presenter: Dr. Michael Ventrice

Beyond the Forecast:

Transforming Business for a Changing World

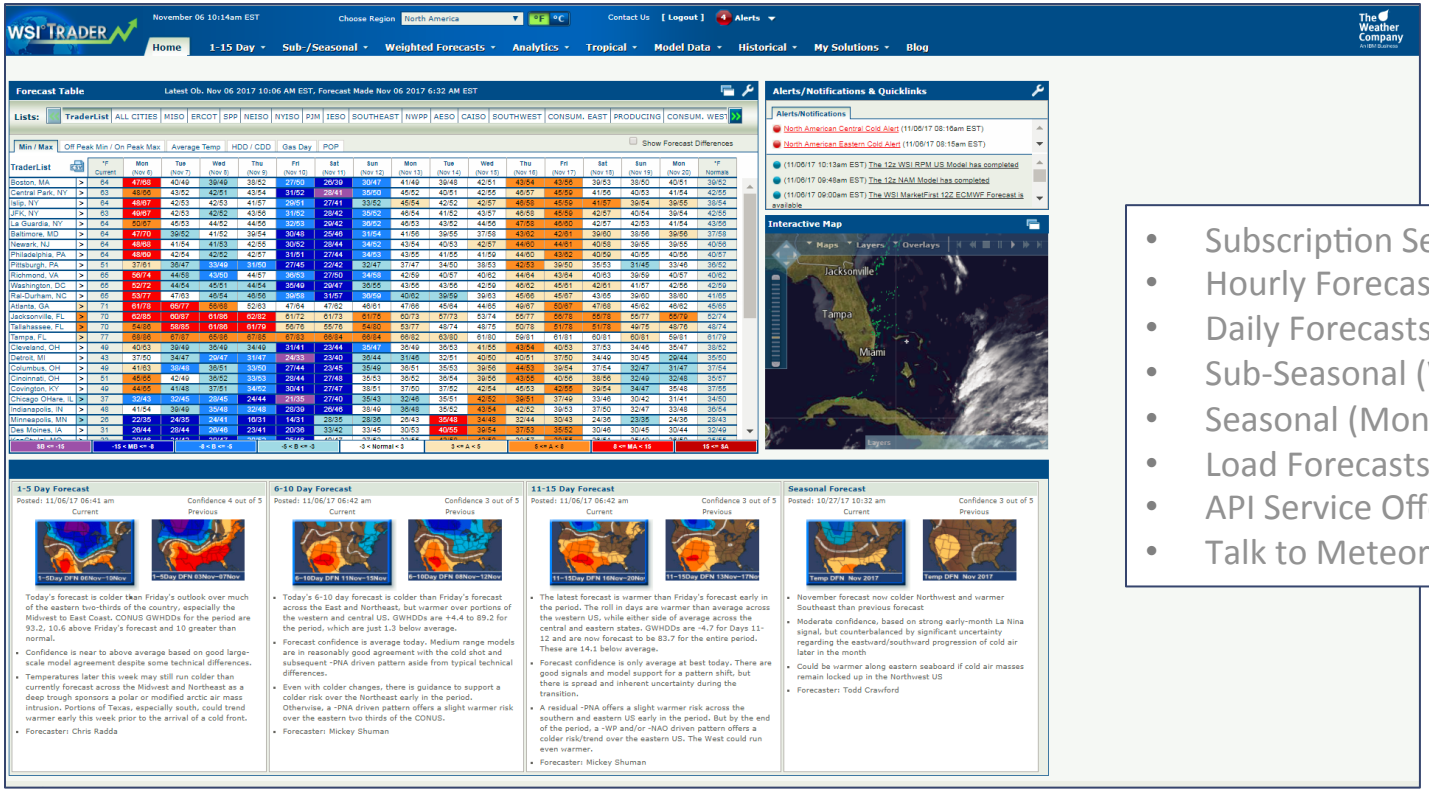
We Are The Weather Company

Globally, we have more than

- 200,000+ personal weather stations
- 200 million mobile app downloads
- 750+ TV stations globally
- 180 million consumers
- 5,000+ businesses
- 140 airlines served

The Weather Company
An IBM Business

WSI Trader



- Subscription Service
- Hourly Forecasts
- Daily Forecasts (Out 15d)
- Sub-Seasonal (Weeks 3-5)
- Seasonal (Months 1-5)
- Load Forecasts
- API Service Offered
- Talk to Meteorologists

The Weather Company
An IBM Business

Weather Company Sub-Seasonal and Seasonal Forecasts

Growing Importance in Energy Trading

- Traders want to take long-term positions
- Interested in extreme heat/cold events
- Forecast Days 16-20 Very Important
- Temperature and Precipitation (Anomaly)
- Renewables (Wind/Solar) Forecasts
- Agriculture, Retail, Insurance Applications

The Weather Company
An IBM Business

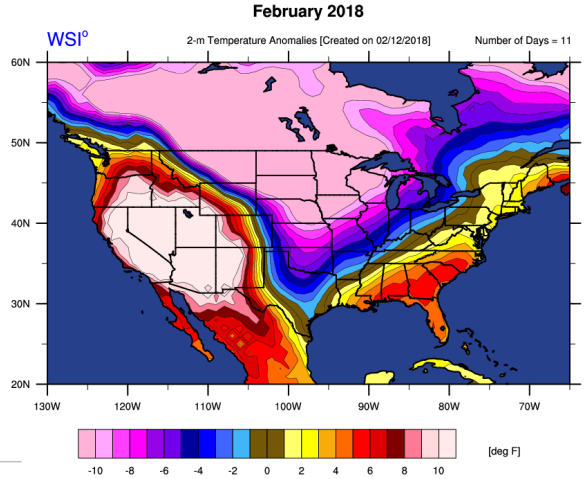
NOAA Data in Sub-Seasonal/ Seasonal Platform

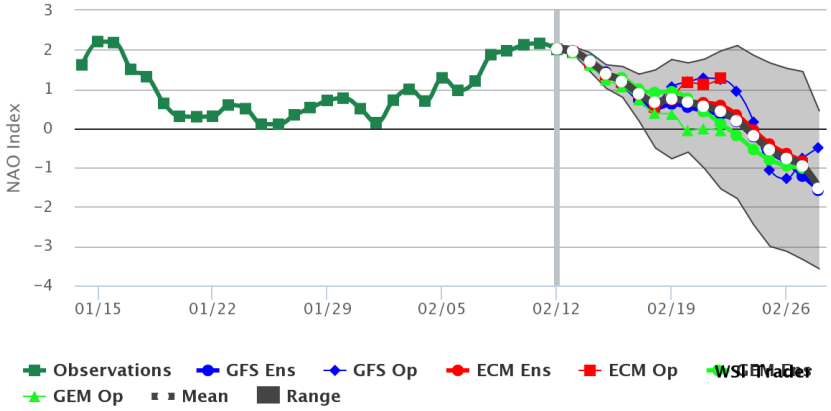
- **0-hr GFS Operational Model**
  - Utilized for a real-time “Observations” dataset
- **CFSv2 Weekly Model**
  - Utilized in Week 3-5 Forecasts
  - Product Suite Available
- **NMME Climate Models**
  - Utilized in Month 1-7 Forecasts
  - Product Suite Available

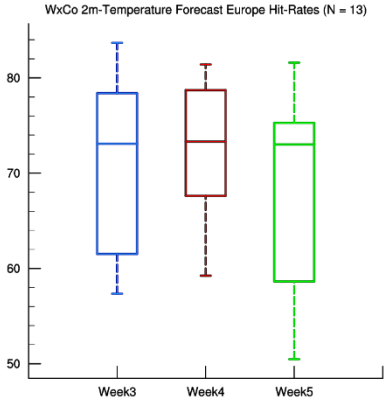
The Weather Company
An IBM Business

GFS 0-hr Forecast – “Observations”

- Stored 0,6,12,18Z 0-hr GFS Op .grib forecasts since 2013
- Used for “Observations” throughout wsitrader.com
- Used in Verification



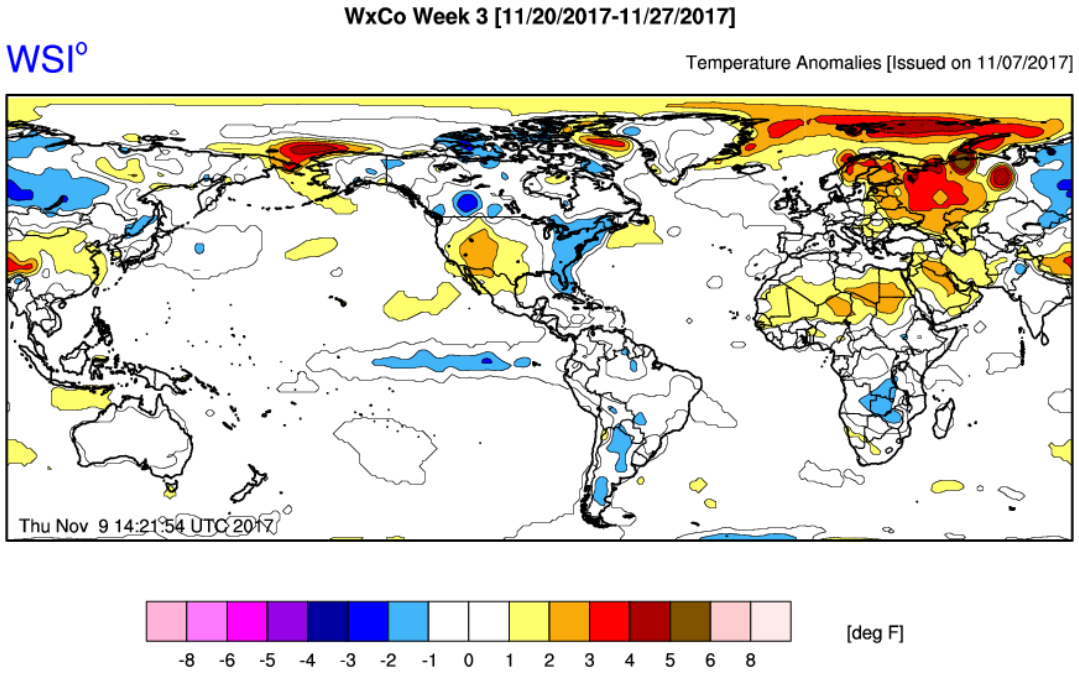




Sub-Seasonal

- **Models**
  1. ECMWF
  2. CFSv2

- **CFSv2 Product Offerings**
  1. 2m Temperature Anomalies
  2. Precipitation Rate Anomalies
  3. 50mb Temperature Anomalies
  4. 50mb Geopotential Heights
  5. 500mb Geopotential Height Anomalies
  6. 200mb Velocity Potential Anomalies
  7. MJO Filtered VP200 Anomalies
  8. Low-Frequency Filtered VP200 Anomalies
  9. Atmospheric ENSO Index



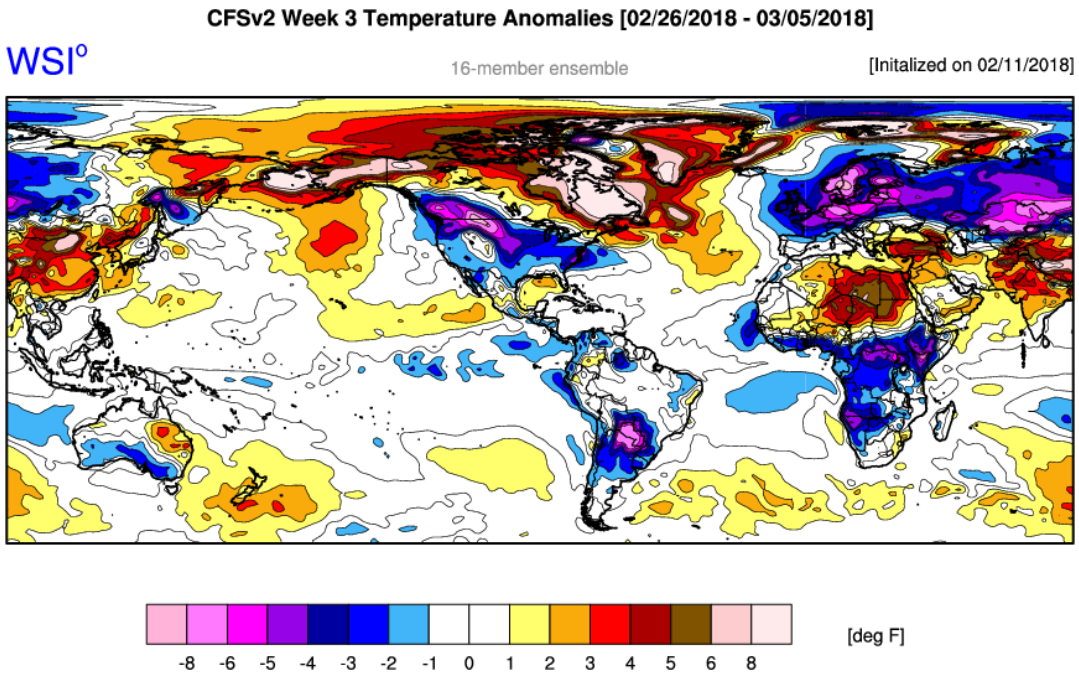
- Week 3, 4, and 5 Forecasts of Temperature + Precipitation Anomalies
  - CFSv2 + ECMWF Blend (Equal Weighting)
  - Human Forecasts are generated for U.S. and Europe (Temperature Only)
  - Data accessible to clients via API or .PDF (Report)

The Weather Company
An IBM Business

Sub-Seasonal

- **Models**
  1. ECMWF
  2. CFSv2

- **CFSv2 Product Offerings**
  1. 2m Temperature Anomalies
  2. Precipitation Rate Anomalies
  3. 50mb Temperature Anomalies
  4. 50mb Geopotential Heights
  5. 500mb Geopotential Height Anomalies
  6. 200mb Velocity Potential Anomalies
  7. MJO Filtered VP200 Anomalies
  8. Low-Frequency Filtered VP200 Anomalies
  9. Atmospheric ENSO Index

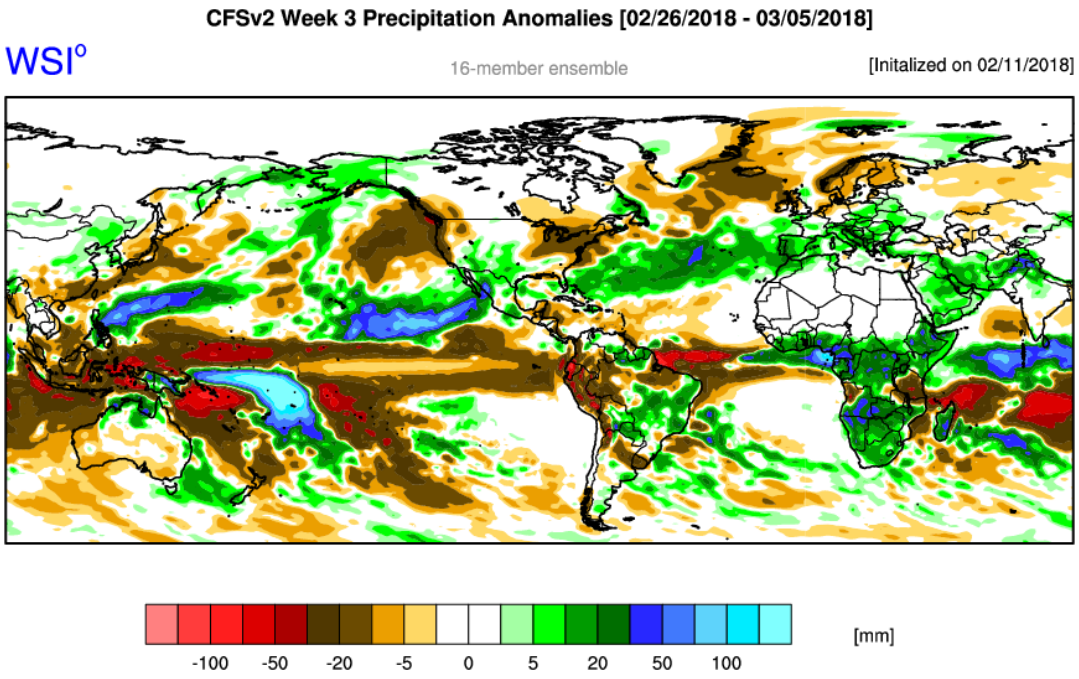


The Weather Company
An IBM Business

Sub-Seasonal

- **Models**
  1. ECMWF
  2. CFSv2

- **CFSv2 Product Offerings**
  1. 2m Temperature Anomalies
  2. Precipitation Rate Anomalies
  3. 50mb Temperature Anomalies
  4. 50mb Geopotential Heights
  5. 500mb Geopotential Height Anomalies
  6. 200mb Velocity Potential Anomalies
  7. MJO Filtered VP200 Anomalies
  8. Low-Frequency Filtered VP200 Anomalies
  9. Atmospheric ENSO Index

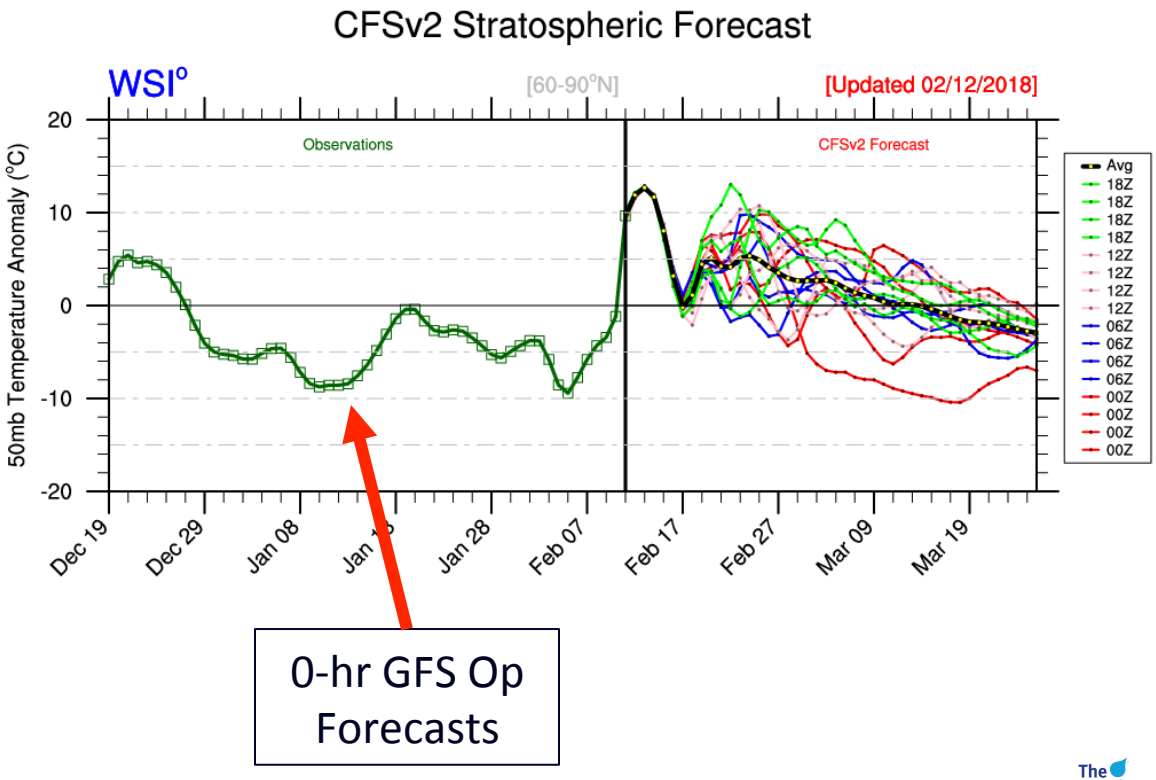


The Weather Company
An IBM Business

Sub-Seasonal

- **Models**
  1. ECMWF
  2. CFSv2

- **CFSv2 Product Offerings**
  1. 2m Temperature Anomalies
  2. Precipitation Rate Anomalies
  3. 50mb Temperature Anomalies
  4. 50mb Geopotential Heights
  5. 500mb Geopotential Height Anomalies
  6. 200mb Velocity Potential Anomalies
  7. MJO Filtered VP200 Anomalies
  8. Low-Frequency Filtered VP200 Anomalies
  9. Atmospheric ENSO Index

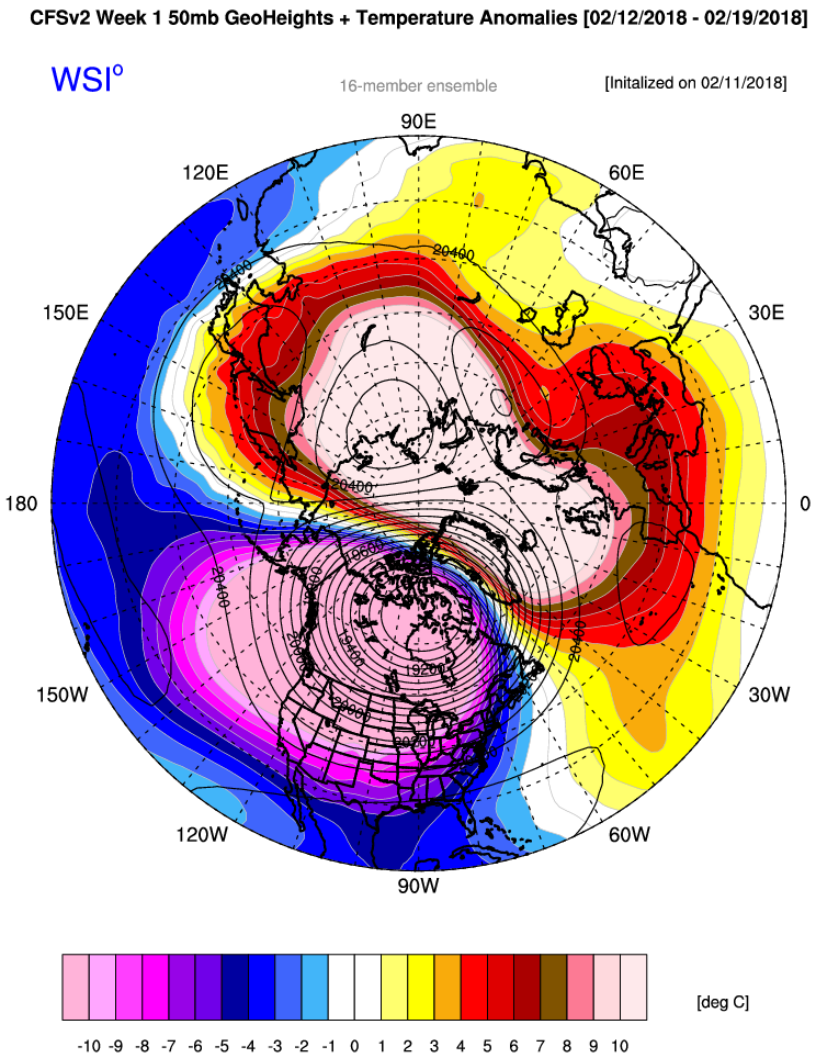


The Weather Company
An IBM Business

Sub-Seasonal

- **Models**
  1. ECMWF
  2. CFSv2

- **CFSv2 Product Offerings**
  1. 2m Temperature Anomalies
  2. Precipitation Rate Anomalies
  3. 50mb Temperature Anomalies
  4. 50mb Geopotential Heights
  5. 500mb Geopotential Height Anomalies
  6. 200mb Velocity Potential Anomalies
  7. MJO Filtered VP200 Anomalies
  8. Low-Frequency Filtered VP200 Anomalies
  9. Atmospheric ENSO Index

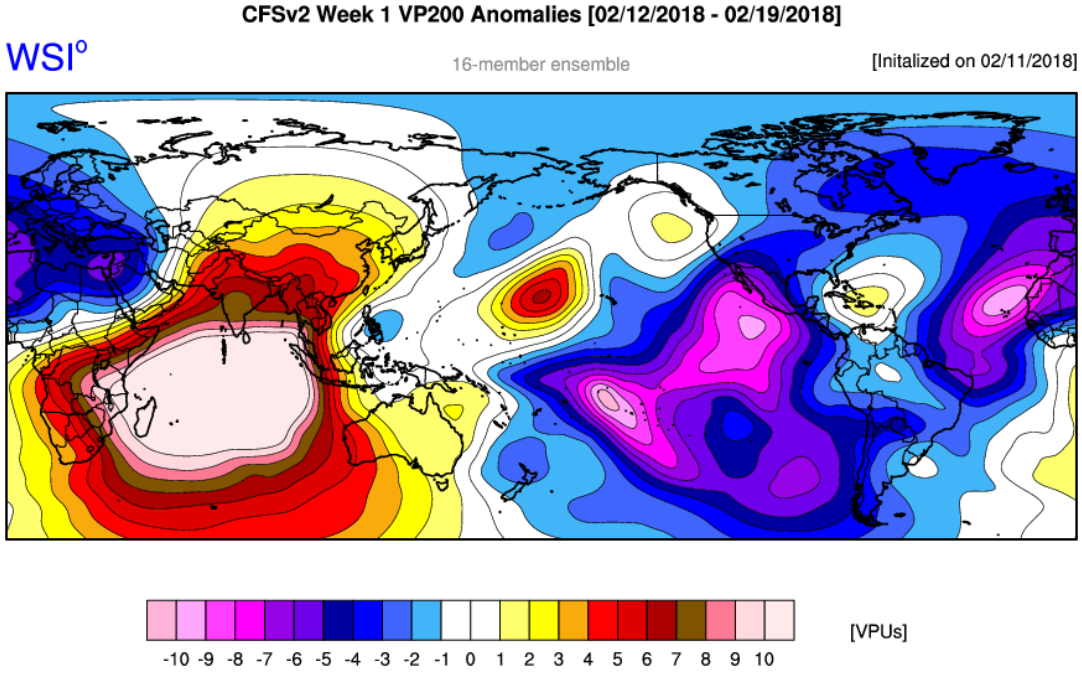


The Weather Company
An IBM Business

Sub-Seasonal

- **Models**
  1. ECMWF
  2. CFSv2

- **CFSv2 Product Offerings**
  1. 2m Temperature Anomalies
  2. Precipitation Rate Anomalies
  3. 50mb Temperature Anomalies
  4. 50mb Geopotential Heights
  5. 500mb Geopotential Height Anomalies
  6. 200mb Velocity Potential Anomalies
  7. MJO Filtered VP200 Anomalies
  8. Low-Frequency Filtered VP200 Anomalies
  9. Atmospheric ENSO Index

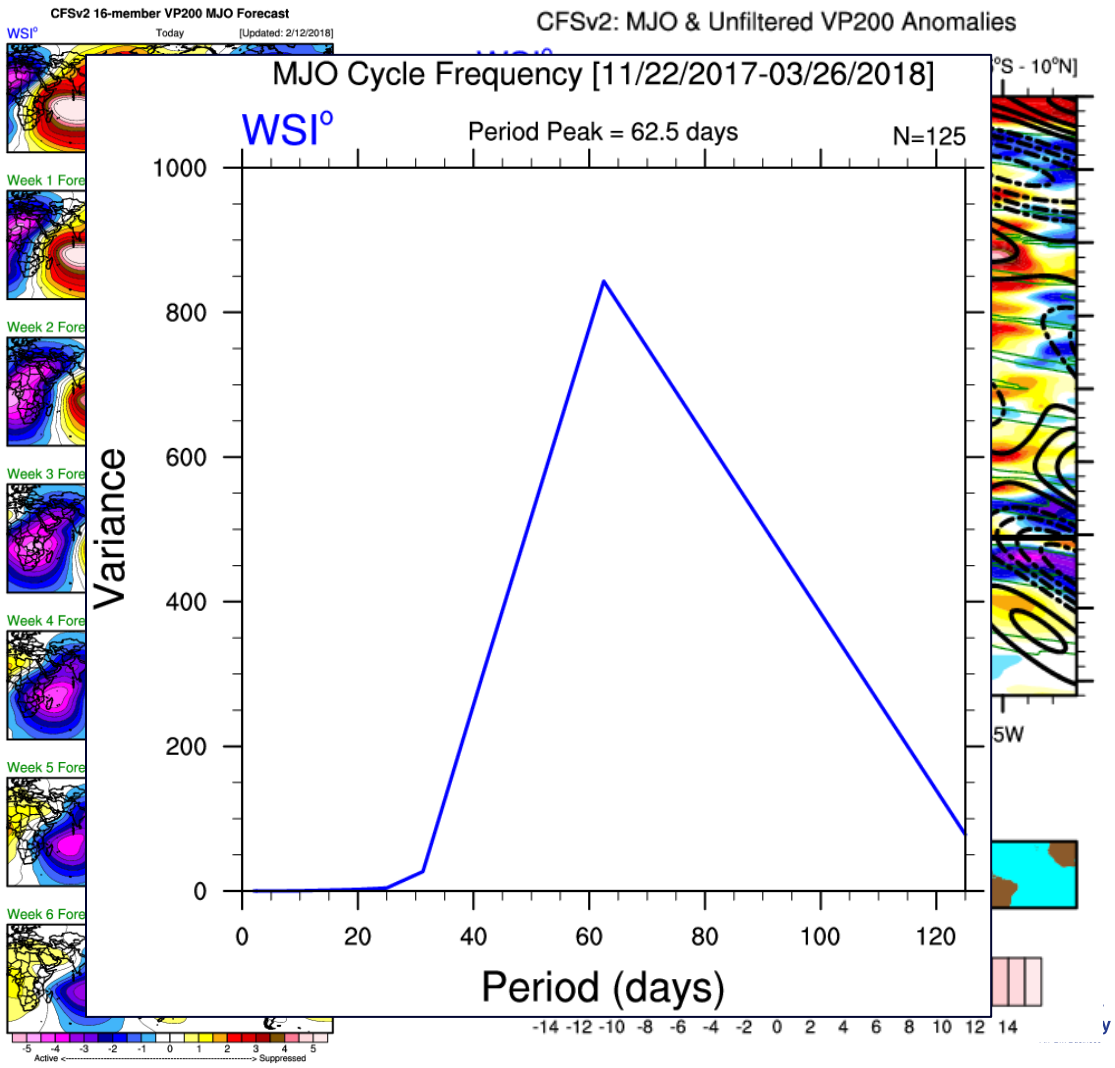


The Weather Company
An IBM Business

Sub-Seasonal

- **Models**
  1. ECMWF
  2. CFSv2

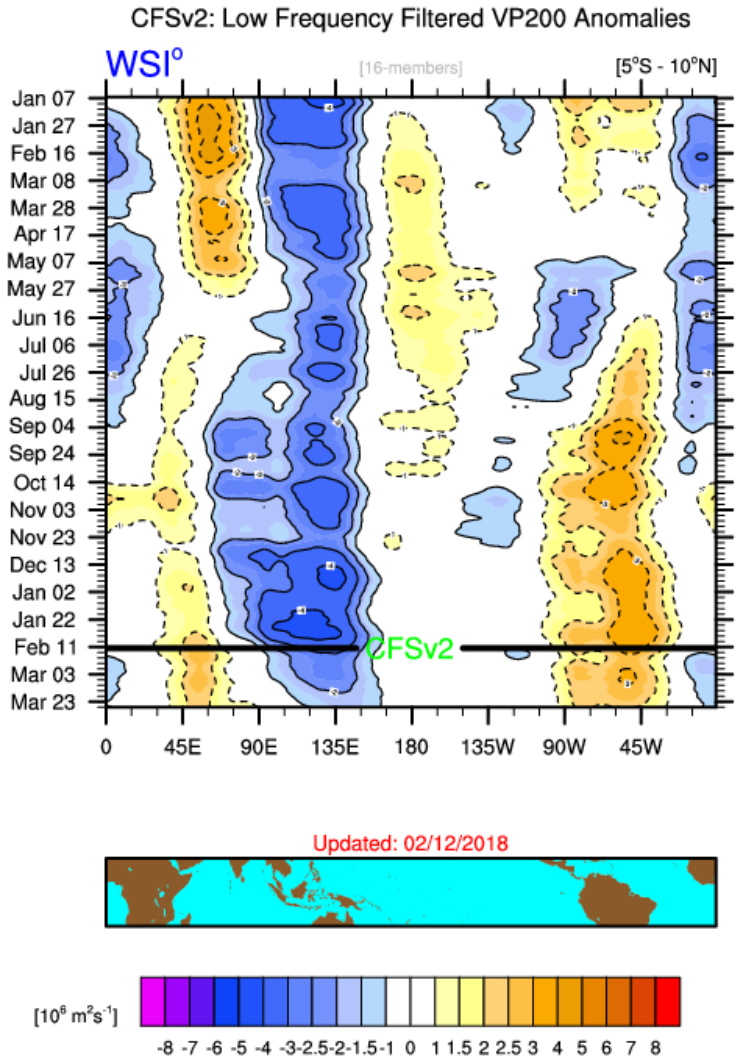
- **CFSv2 Product Offerings**
  1. 2m Temperature Anomalies
  2. Precipitation Rate Anomalies
  3. 50mb Temperature Anomalies
  4. 50mb Geopotential Heights
  5. 500mb Geopotential Height Anomalies
  6. 200mb Velocity Potential Anomalies
  7. MJO Filtered VP200 Anomalies
  8. Low-Frequency Filtered VP200 Anomalies
  9. Atmospheric ENSO Index



Sub-Seasonal

- **Models**
  1. ECMWF
  2. CFSv2

- **CFSv2 Product Offerings**
  1. 2m Temperature Anomalies
  2. Precipitation Rate Anomalies
  3. 50mb Temperature Anomalies
  4. 50mb Geopotential Heights
  5. 500mb Geopotential Height Anomalies
  6. 200mb Velocity Potential Anomalies
  7. MJO Filtered VP200 Anomalies
  8. Low-Frequency Filtered VP200 Anomalies
  9. Atmospheric ENSO Index

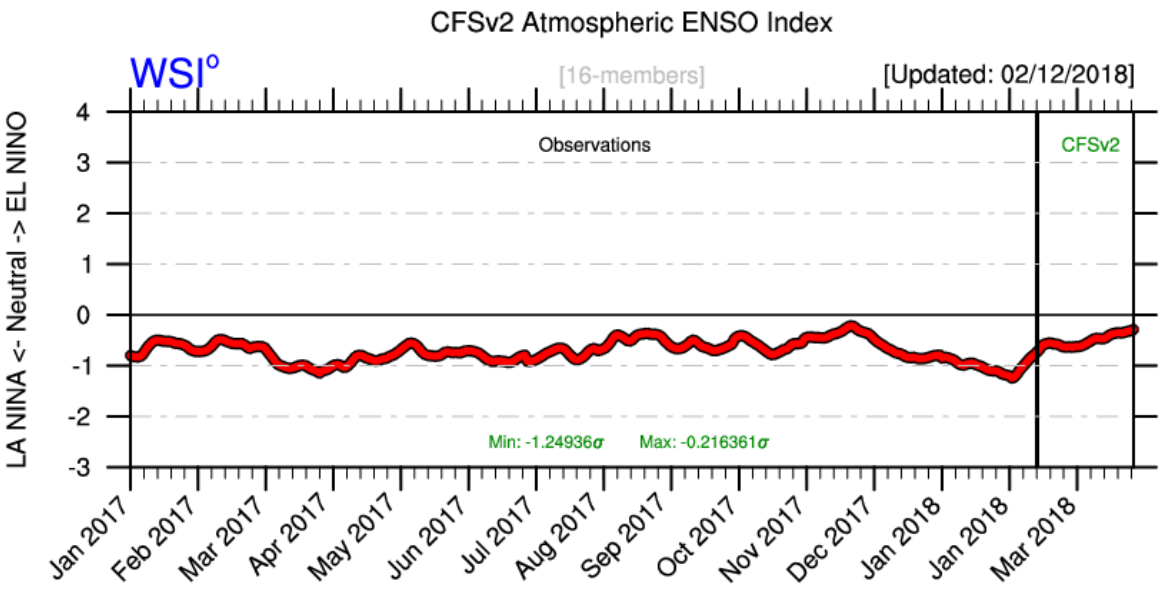


The Weather Company
An IBM Business

Sub-Seasonal

- **Models**
  1. ECMWF
  2. CFSv2

- **CFSv2 Product Offerings**
  1. 2m Temperature Anomalies
  2. Precipitation Rate Anomalies
  3. 50mb Temperature Anomalies
  4. 50mb Geopotential Heights
  5. 500mb Geopotential Height Anomalies
  6. 200mb Velocity Potential Anomalies
  7. MJO Filtered VP200 Anomalies
  8. Low-Frequency Filtered VP200 Anomalies
  9. Atmospheric ENSO Index



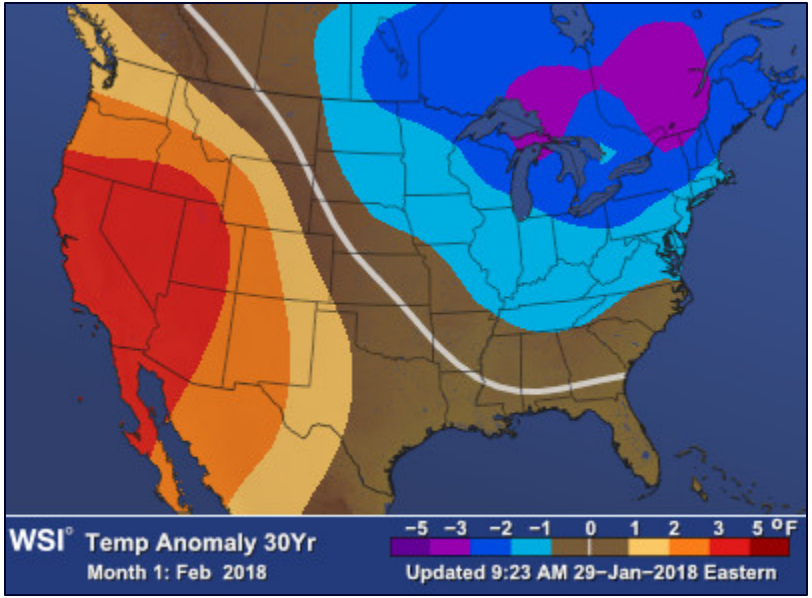
2018 AMS Poster: **New ENSO Identification: Applications for Seasonal Prediction** (https://ams.confex.com/ams/98Annual/webprogram/Paper321547.html)

The Weather Company
An IBM Business

Seasonal

- **Models**
  1. ECMWF
  2. NMME
  3. CanSIPS

- **NMME Product Offerings**
  1. 2m Temperature Anomalies
  2. Precipitation Rate Anomalies
  3. 50mb Temperature Anomalies
  4. 50mb Geopotential Heights
  5. 500mb Geopotential Height Anomalies
  6. 200mb Velocity Potential Anomalies
  7. MJO Filtered VP200 Anomalies
  8. Low-Frequency Filtered VP200 Anomalies
  9. Atmospheric ENSO Index



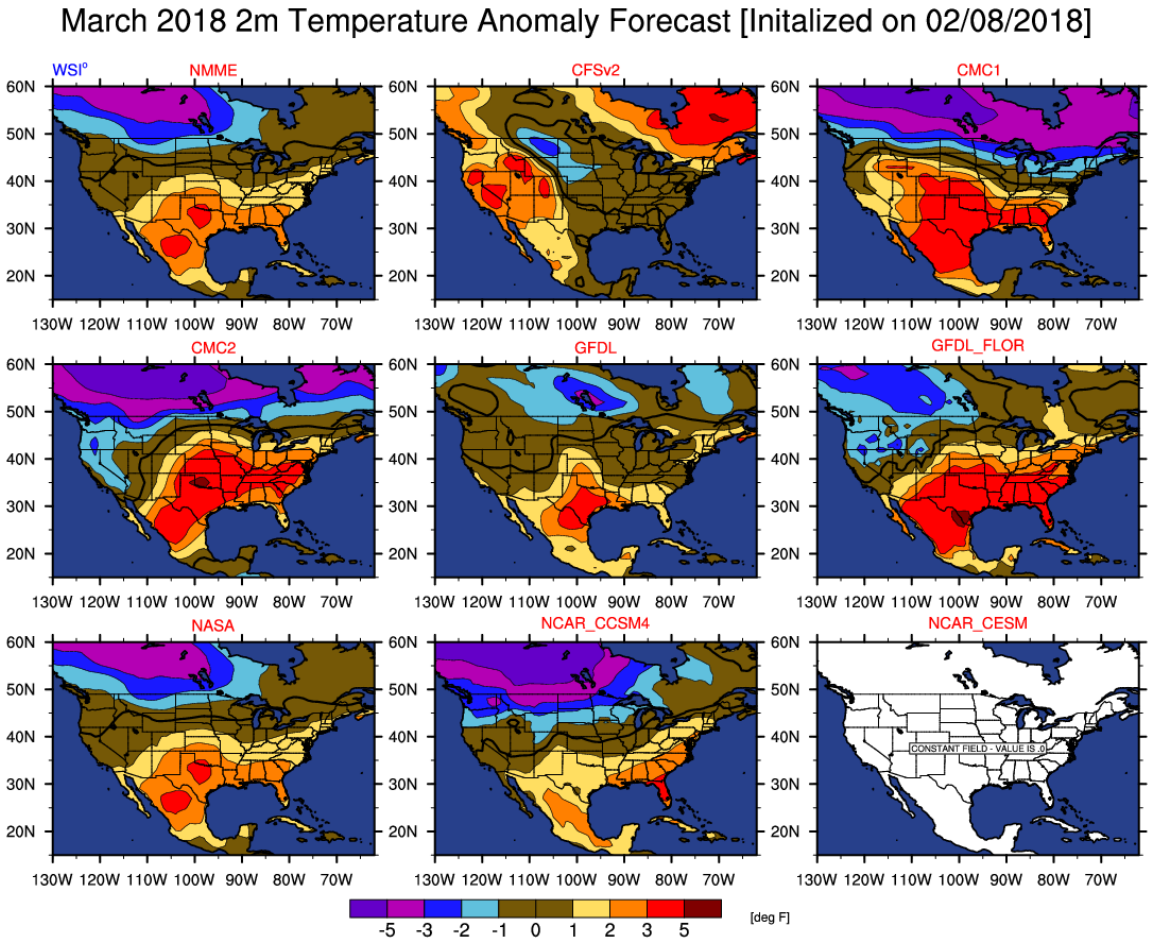
- Only Using Ensemble Means at the moment
  - Building a Probabilistic Platform for Seasonal
    - Version 1 = ECMWF
    - Version 2 = ECMWF + CFSv2
    - Version 3 = ECMWF + CFSv2 + NMME?

The Weather Company
An IBM Business

Seasonal

- **Models**
  1. ECMWF
  2. NMME
  3. CanSIPS

- **NMME Product Offerings**
  1. 2m Temperature Anomalies
  2. 2m Temperature Differences
  3. Precipitation Anomalies
  4. Precipitation Differences
  5. SST Anomalies
  6. SST Differences
  7. ENSO Forecast
  8. Pacific Decadal Oscillation
  9. Atlantic Multidecadal Oscillation

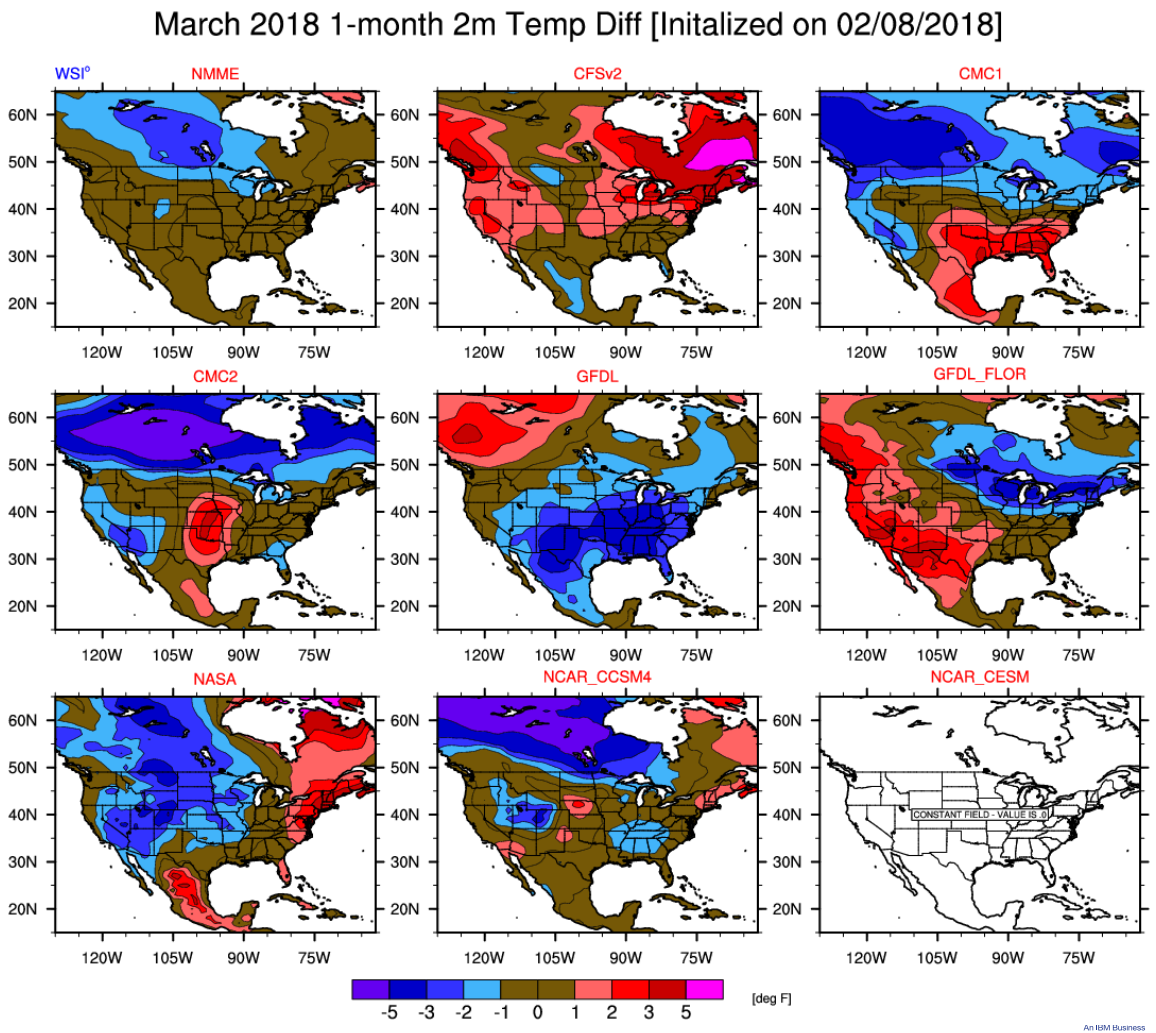


The Weather Company
An IBM Business

Seasonal

- **Models**
  1. ECMWF
  2. NMME
  3. CanSIPS

- **NMME Product Offerings**
  1. 2m Temperature Anomalies
  2. 2m Temperature Differences
  3. Precipitation Anomalies
  4. Precipitation Differences
  5. SST Anomalies
  6. SST Differences
  7. ENSO Forecast
  8. Pacific Decadal Oscillation
  9. Atlantic Multidecadal Oscillation

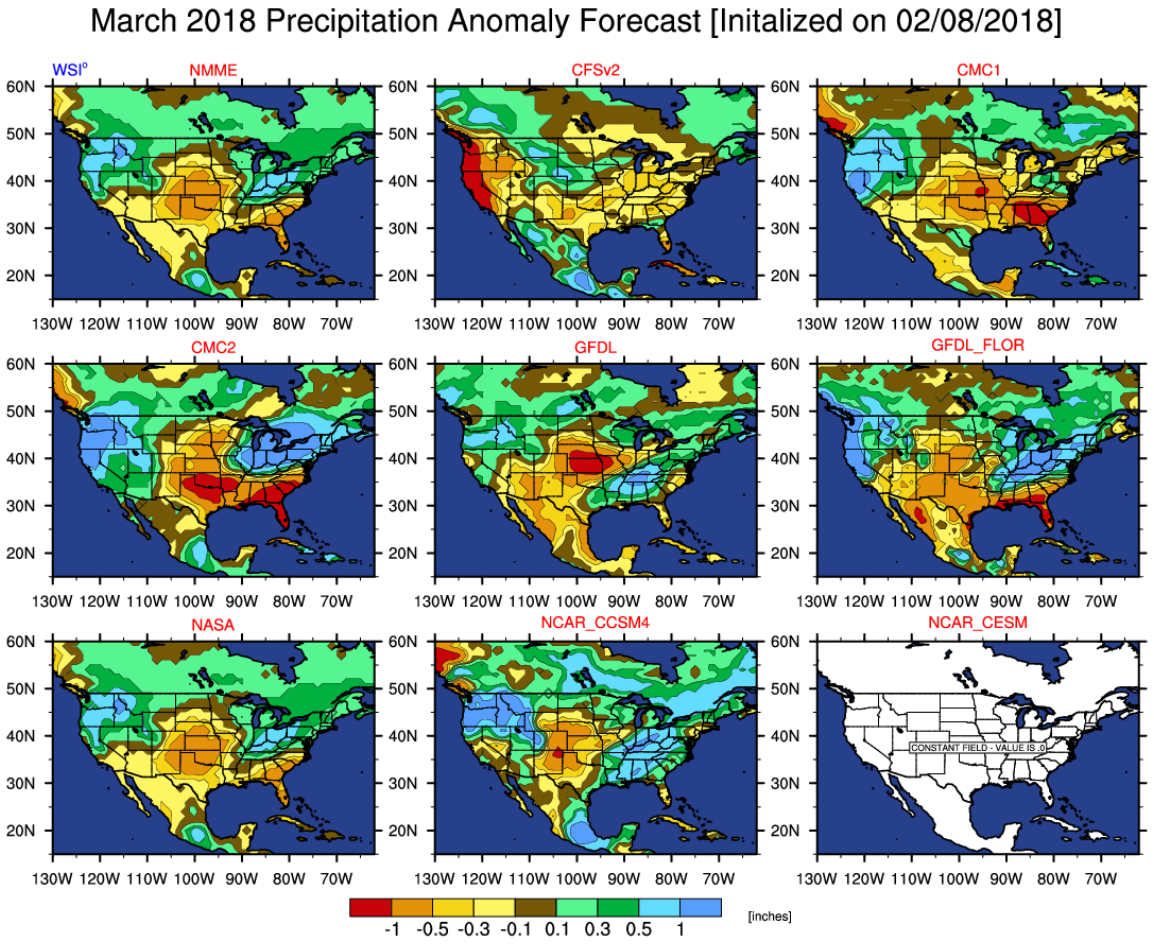


An IBM Business

Seasonal

- **Models**
  1. ECMWF
  2. NMME
  3. CanSIPS

- **NMME Product Offerings**
  1. 2m Temperature Anomalies
  2. 2m Temperature Differences
  3. Precipitation Anomalies
  4. Precipitation Differences
  5. SST Anomalies
  6. SST Differences
  7. ENSO Forecast
  8. Pacific Decadal Oscillation
  9. Atlantic Multidecadal Oscillation

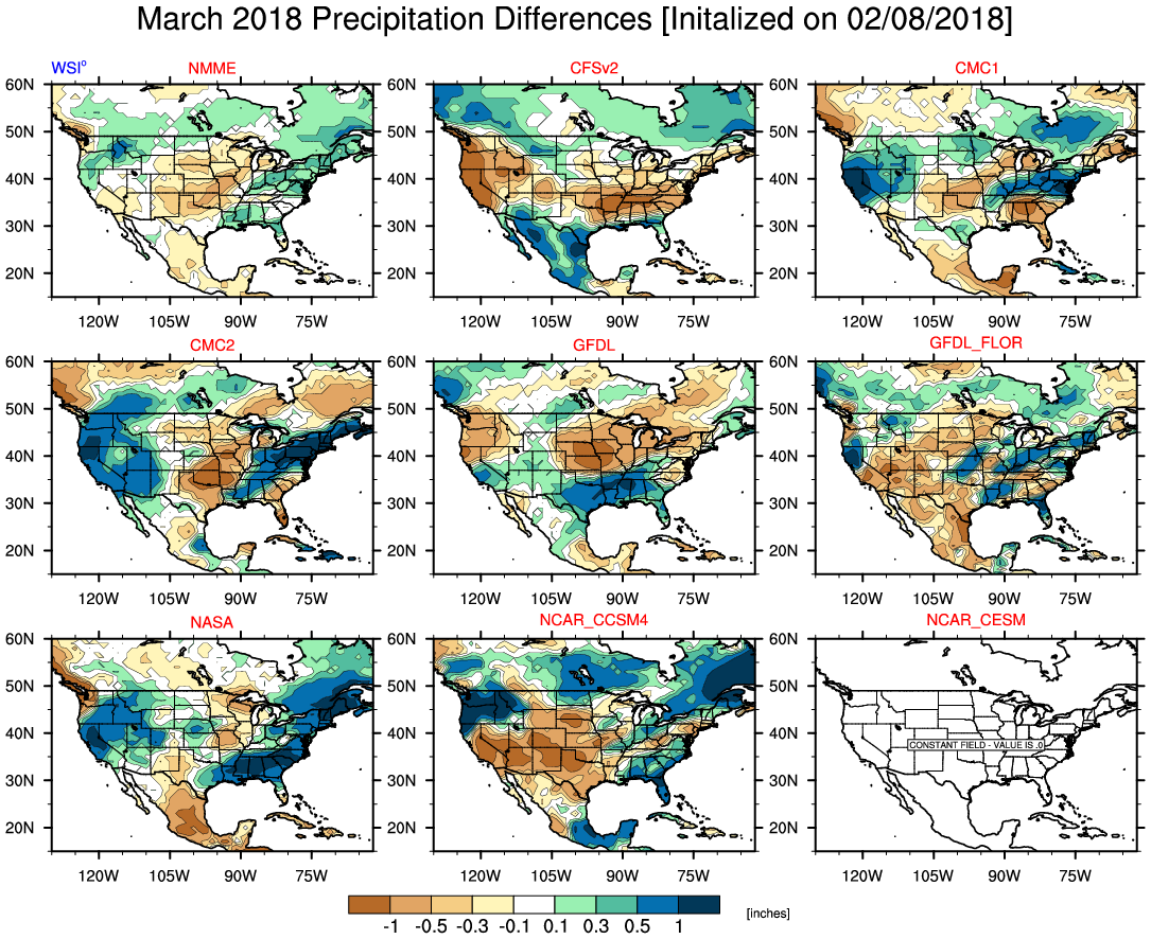


The Weather Company
An IBM Business

Seasonal

- **Models**
  1. ECMWF
  2. NMME
  3. CanSIPS

- **NMME Product Offerings**
  1. 2m Temperature Anomalies
  2. 2m Temperature Differences
  3. Precipitation Anomalies
  4. Precipitation Differences
  5. SST Anomalies
  6. SST Differences
  7. ENSO Forecast
  8. Pacific Decadal Oscillation
  9. Atlantic Multidecadal Oscillation

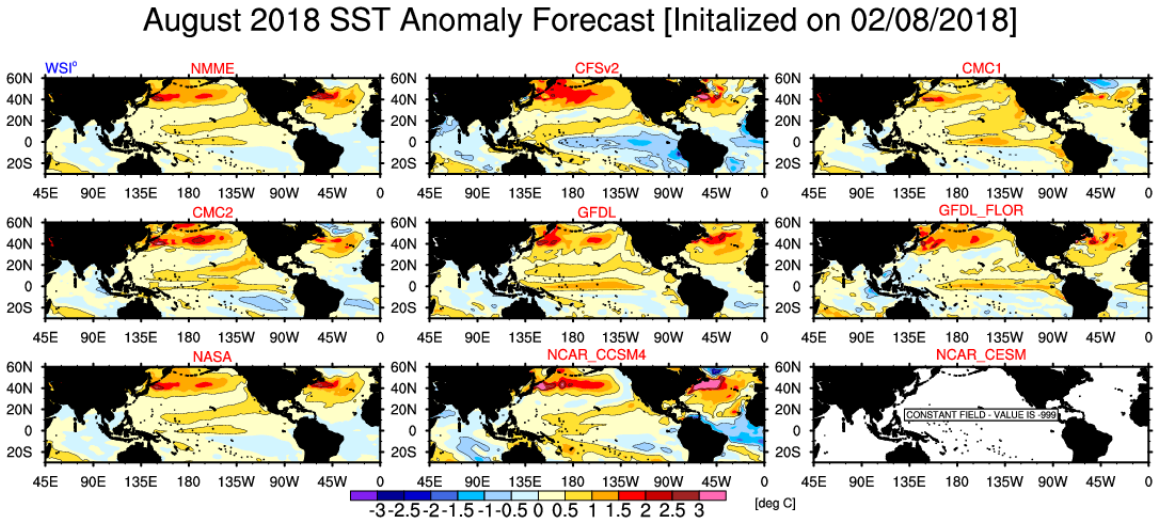


The Weather Company
An IBM Business

Seasonal

- **Models**
  1. ECMWF
  2. NMME
  3. CanSIPS

- **NMME Product Offerings**
  1. 2m Temperature Anomalies
  2. 2m Temperature Differences
  3. Precipitation Anomalies
  4. Precipitation Differences
  5. SST Anomalies
  6. SST Differences
  7. ENSO Forecast
  8. Pacific Decadal Oscillation
  9. Atlantic Multidecadal Oscillation

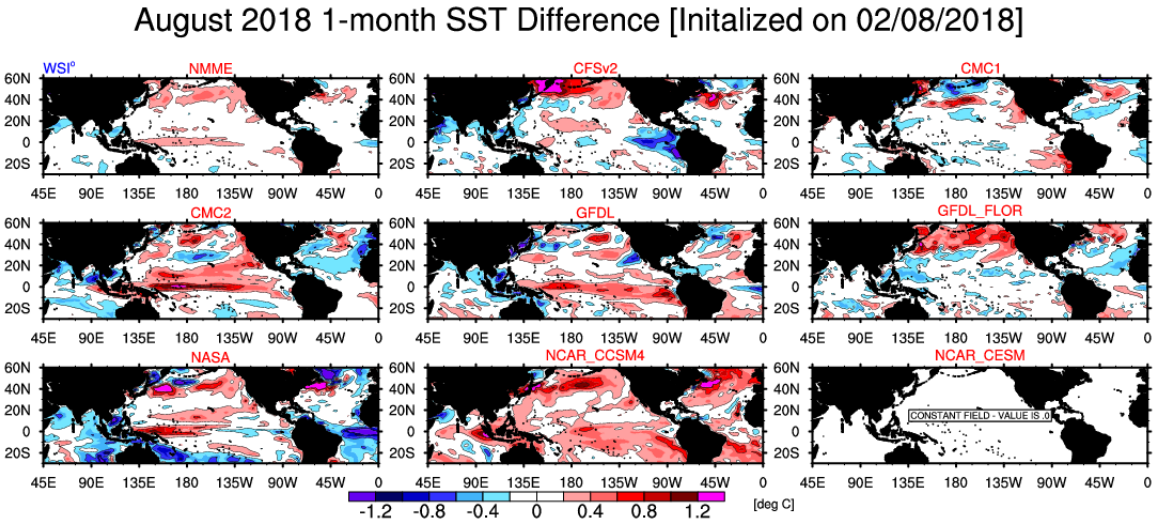


The Weather Company
An IBM Business

Seasonal

- **Models**
  1. ECMWF
  2. NMME
  3. CanSIPS

- **NMME Product Offerings**
  1. 2m Temperature Anomalies
  2. 2m Temperature Differences
  3. Precipitation Anomalies
  4. Precipitation Differences
  5. SST Anomalies
  6. SST Differences
  7. ENSO Forecast
  8. Pacific Decadal Oscillation
  9. Atlantic Multidecadal Oscillation

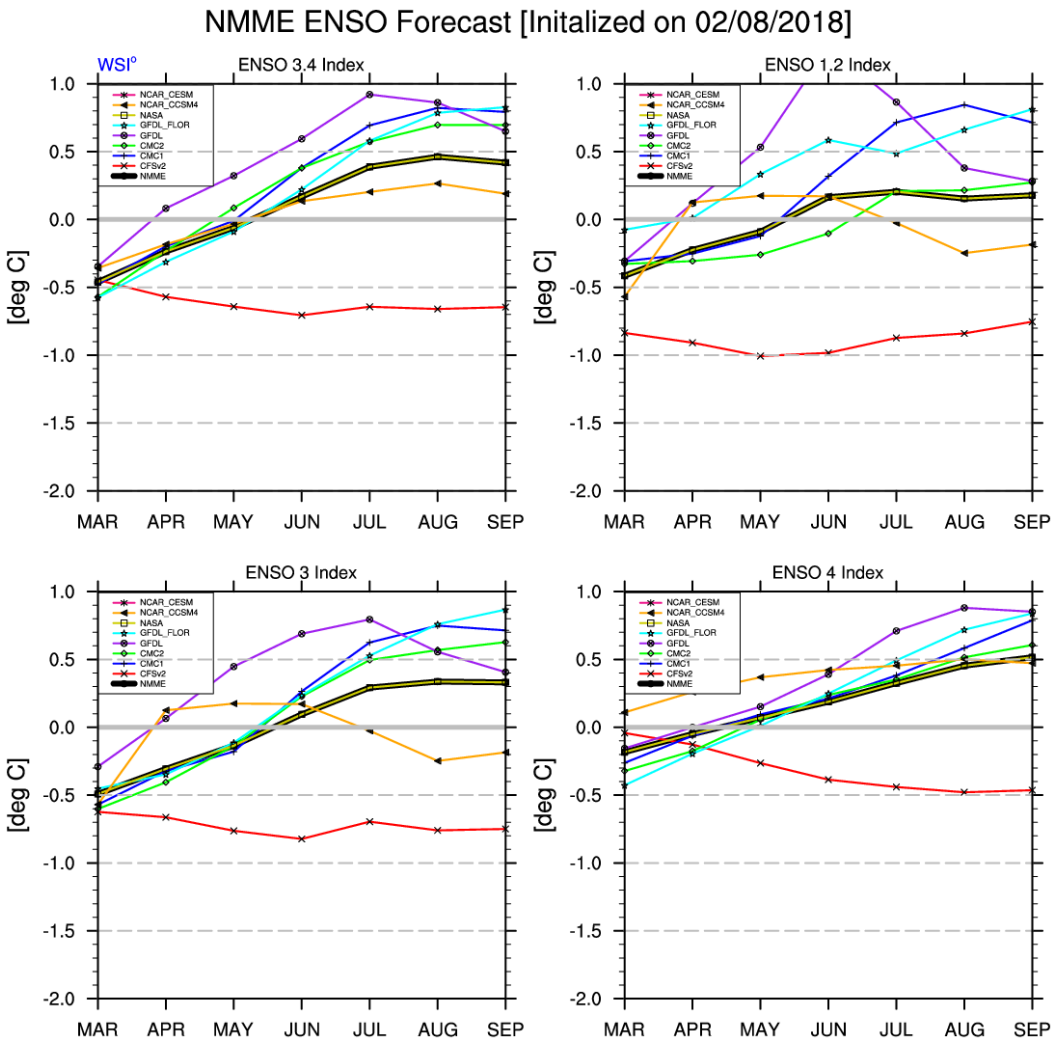


The Weather Company
An IBM Business

Seasonal

- **Models**
  1. ECMWF
  2. NMME
  3. CanSIPS

- **NMME Product Offerings**
  1. 2m Temperature Anomalies
  2. 2m Temperature Differences
  3. Precipitation Anomalies
  4. Precipitation Differences
  5. SST Anomalies
  6. SST Differences
  7. ENSO Forecast
  8. Pacific Decadal Oscillation
  9. Atlantic Multidecadal Oscillation

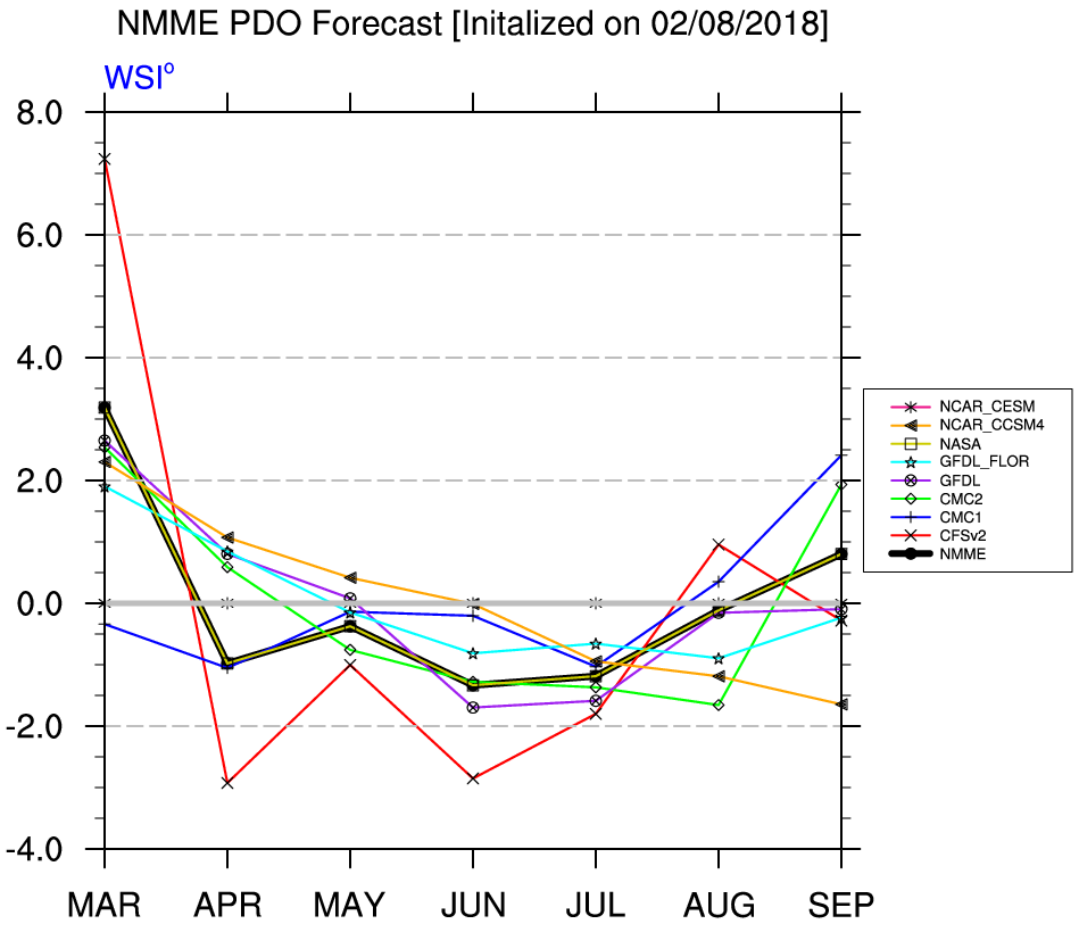


The Weather Company
An IBM Business

Seasonal

- **Models**
  1. ECMWF
  2. NMME
  3. CanSIPS

- **NMME Product Offerings**
  1. 2m Temperature Anomalies
  2. 2m Temperature Differences
  3. Precipitation Anomalies
  4. Precipitation Differences
  5. SST Anomalies
  6. SST Differences
  7. ENSO Forecast
  8. Pacific Decadal Oscillation
  9. Atlantic Multidecadal Oscillation

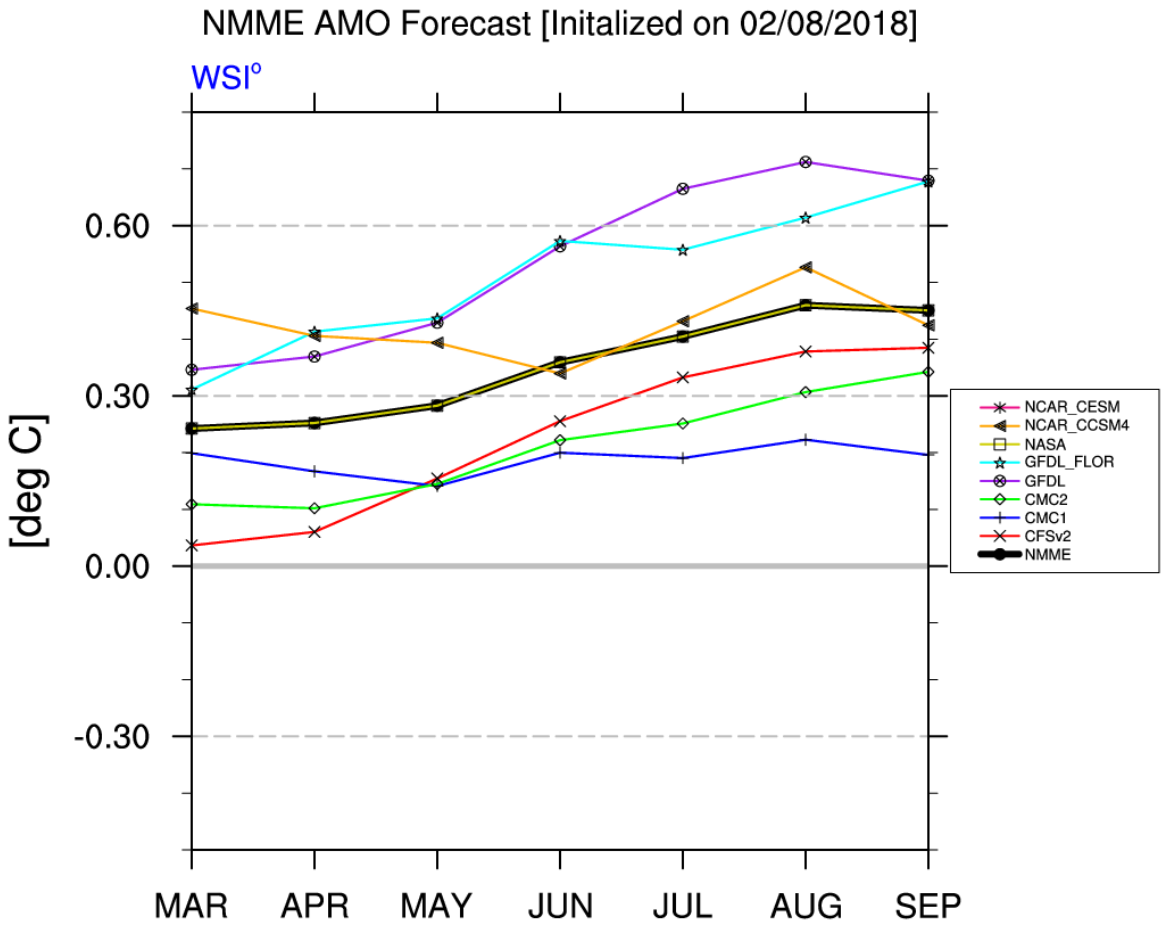


The Weather Company
An IBM Business

Seasonal

- **Models**
  1. ECMWF
  2. NMME
  3. CanSIPS

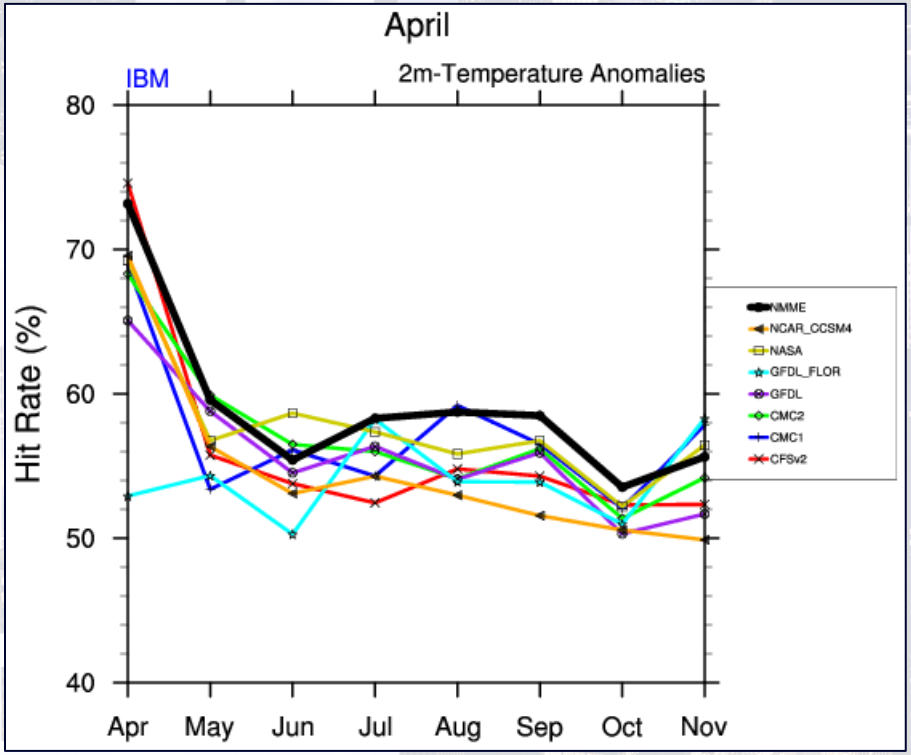
- **NMME Product Offerings**
  1. 2m Temperature Anomalies
  2. 2m Temperature Differences
  3. Precipitation Anomalies
  4. Precipitation Differences
  5. SST Anomalies
  6. SST Differences
  7. ENSO Forecast
  8. Pacific Decadal Oscillation
  9. Atlantic Multidecadal Oscillation



The Weather Company
An IBM Business

NMME Research

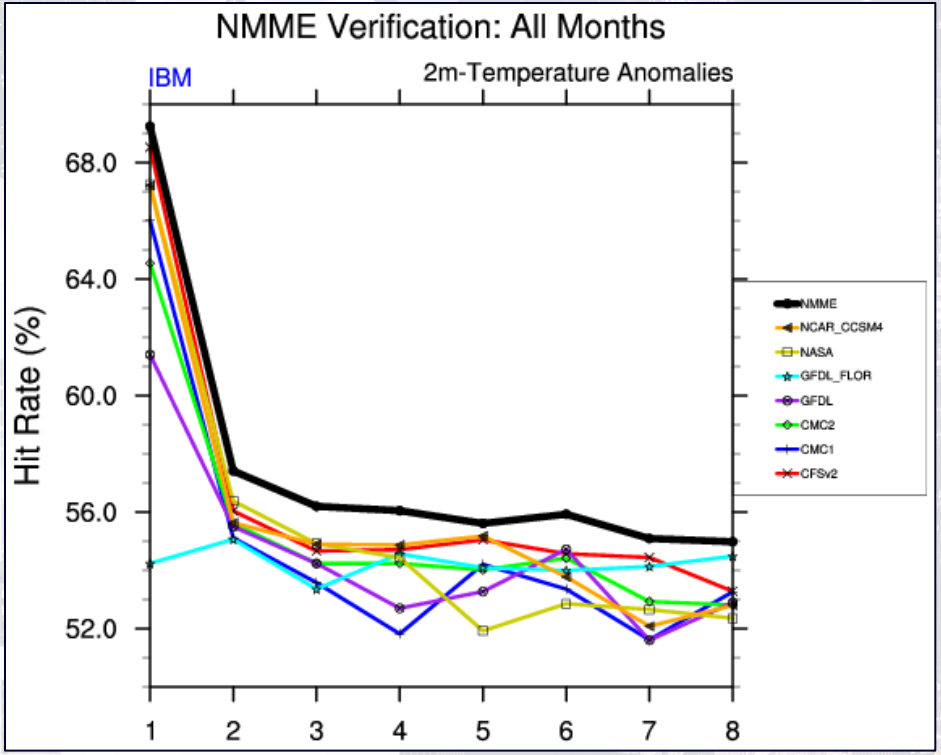
- Explored Skill in Predicting Temperatures and Precipitation (U.S. & Europe) for all lead times
- Break down into Monthly Periods
  - Odd Spike in November Skill?



The Weather Company
An IBM Business

NMME Research

- Explored Skill in Predicting Temperatures and Precipitation (U.S. & Europe) for all lead times



The Weather Company
An IBM Business

Conclusions

- Large use of NOAA data inside the Weather Company – Energy Focused Business (not limited to)
- GFS 0-hr forecasts are used to create a quick, on the fly updating observational dataset
- CFSv2 is used as a component model for Sub-Seasonal Forecasts
- NMME is used as a component model of Seasonal Forecasts

WSI TRADER

The Weather Company
An IBM Business

Thank You

Dr. Michael Ventrice
Mentrice@us.ibm.com

The Weather Company
An IBM Business