

World Climate Service: S2S Forecasts for Energy Markets



World Climate Service

If you knew then what we knew then ...

Founded in 2009

- 12-year history of producing CropProphet
- 16-year history of producing World Climate Service
- R&D funding from U.S. government Small Business Innovation Research grants (SBIRs) focused on weather and climate risk



Company:
Product development
focused

Products

CropProphet



World Climate Service

Content

Crop Yield
Prediction

Seasonal/subseasonal
Forecasting

Decision

Crop
Marketing/Trading

Impact on energy
consumption/production

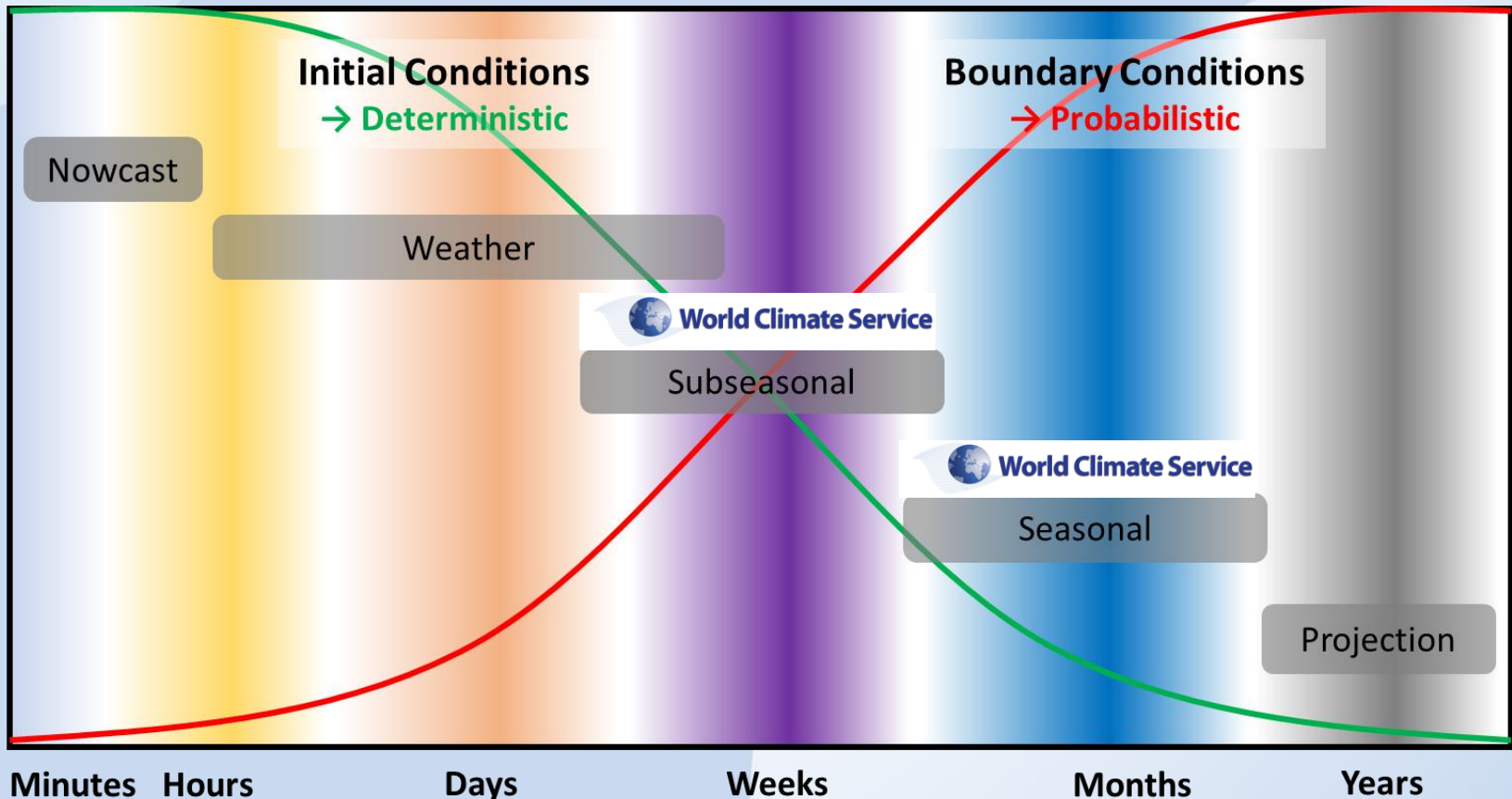
Objective: Create quantitative guidance for weather and climate related decisions based on the best science and information available.



World Climate Service

If you knew then what we knew then ...

Weather/Climate Timescales



← Time Scale of Prediction →

World Climate Service

If you knew then what we knew then ...

WCS Application

World Climate Service provides

- a single source of objective S2S forecast and analysis information
- to enable forecasting with a probabilistic and risk assessment focus

for commodity trading desks focused on power, gas, and agriculture markets.



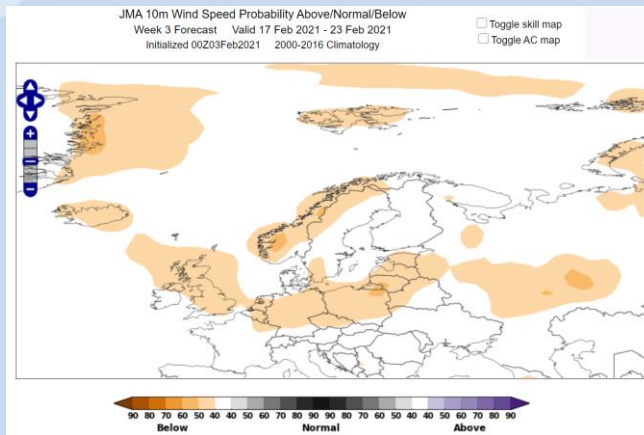
World Climate Service

If you knew then what we knew then ...

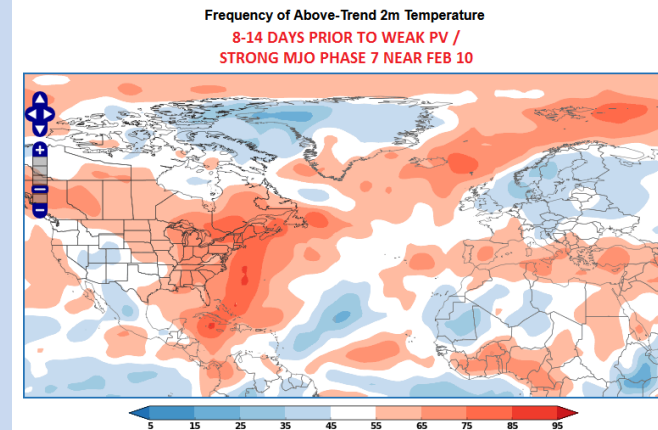
Content – Objective Information

Emphasize **forecast confidence** and **probabilities**

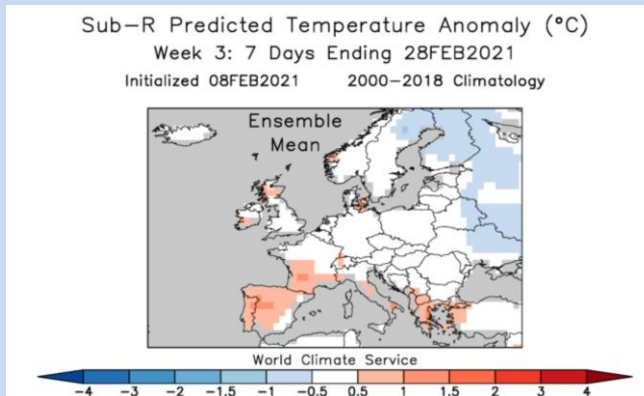
Calibrated
Ensemble
Forecasts



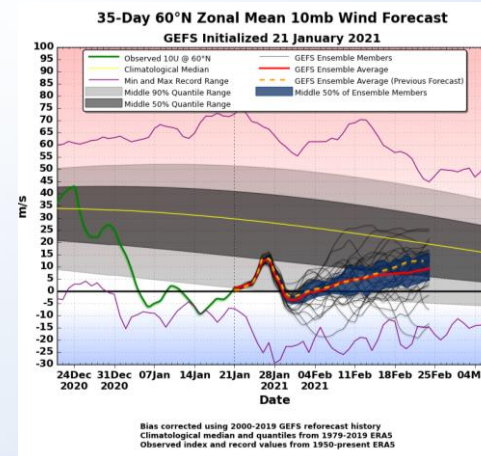
Analog
Analysis



Statistical
Forecasts



Climate
Index
Forecasts

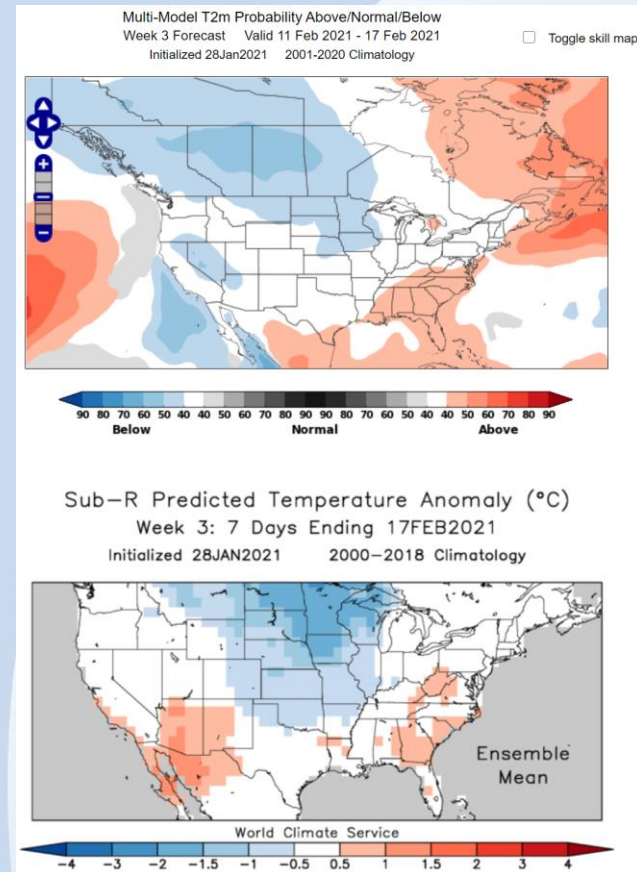
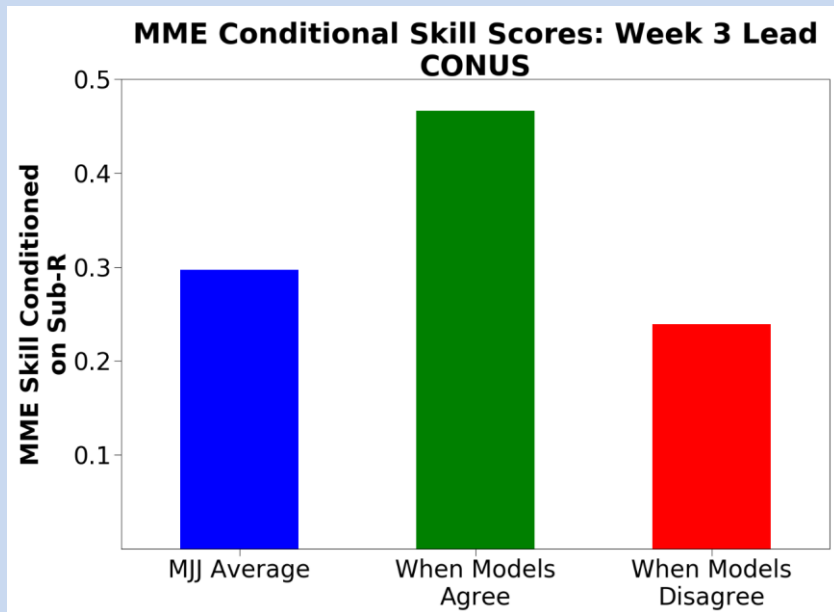


World Climate Service

If you knew then what we knew then ...

Multiple Sources Adds Value

Skill comparison of WCS MME when
Sub-R model signal is spatially similar



Dynamical
Model

Statistical
Model



World Climate Service

If you knew then what we knew then ...

What is Calibration?

A two-step process applied to ensemble dynamical model forecasts that uses reforecast data to:

- 1) Correct model biases, and
- 2) Adjust ensemble variances to increase reliability

Reliability:

An event forecasted with a specific probability should occur at that frequency

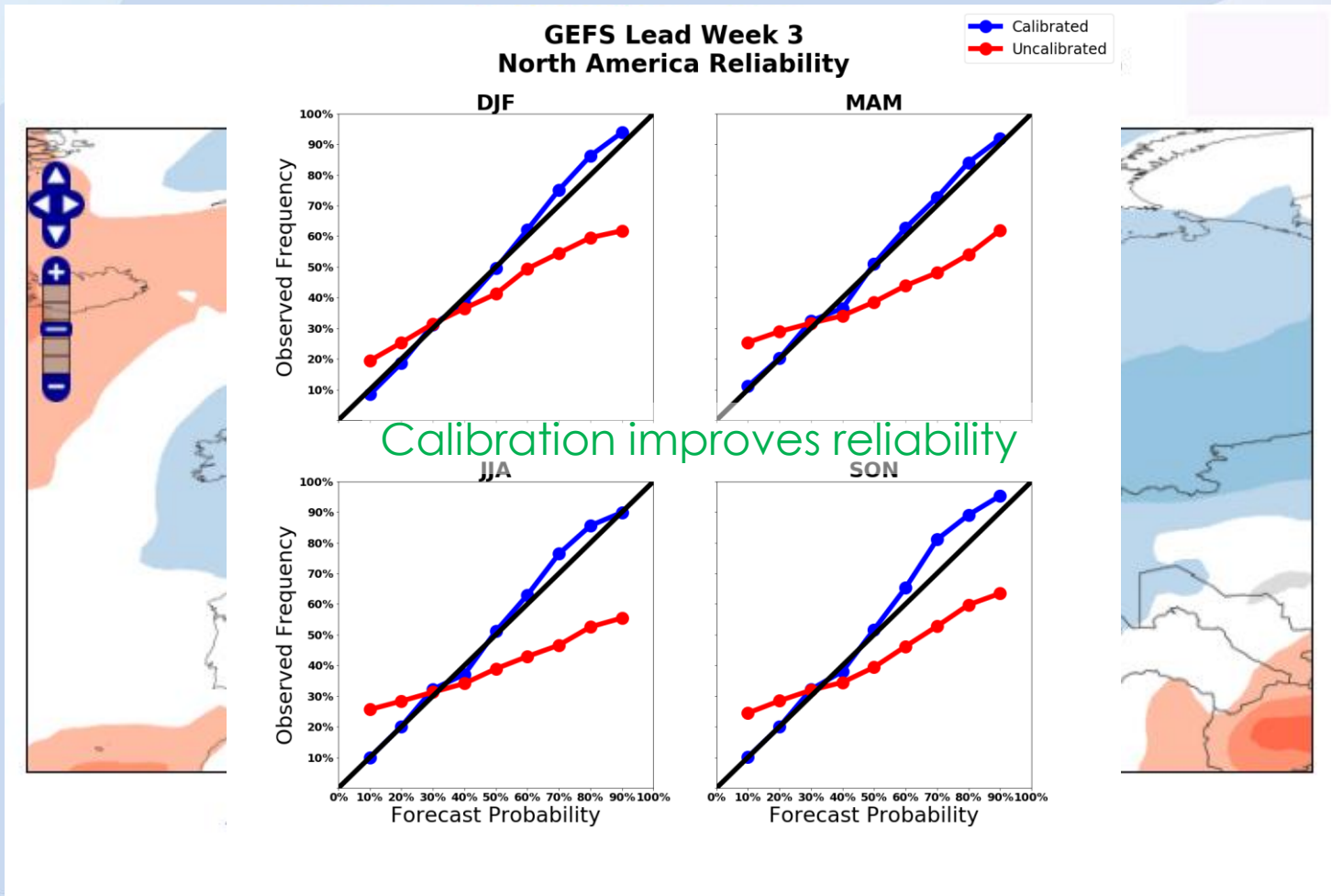
i.e., above normal temperatures should occur 70% of the time when the forecast is 70% chance of above normal temperatures



World Climate Service

If you knew then what we knew then ...

Benefits of Calibration

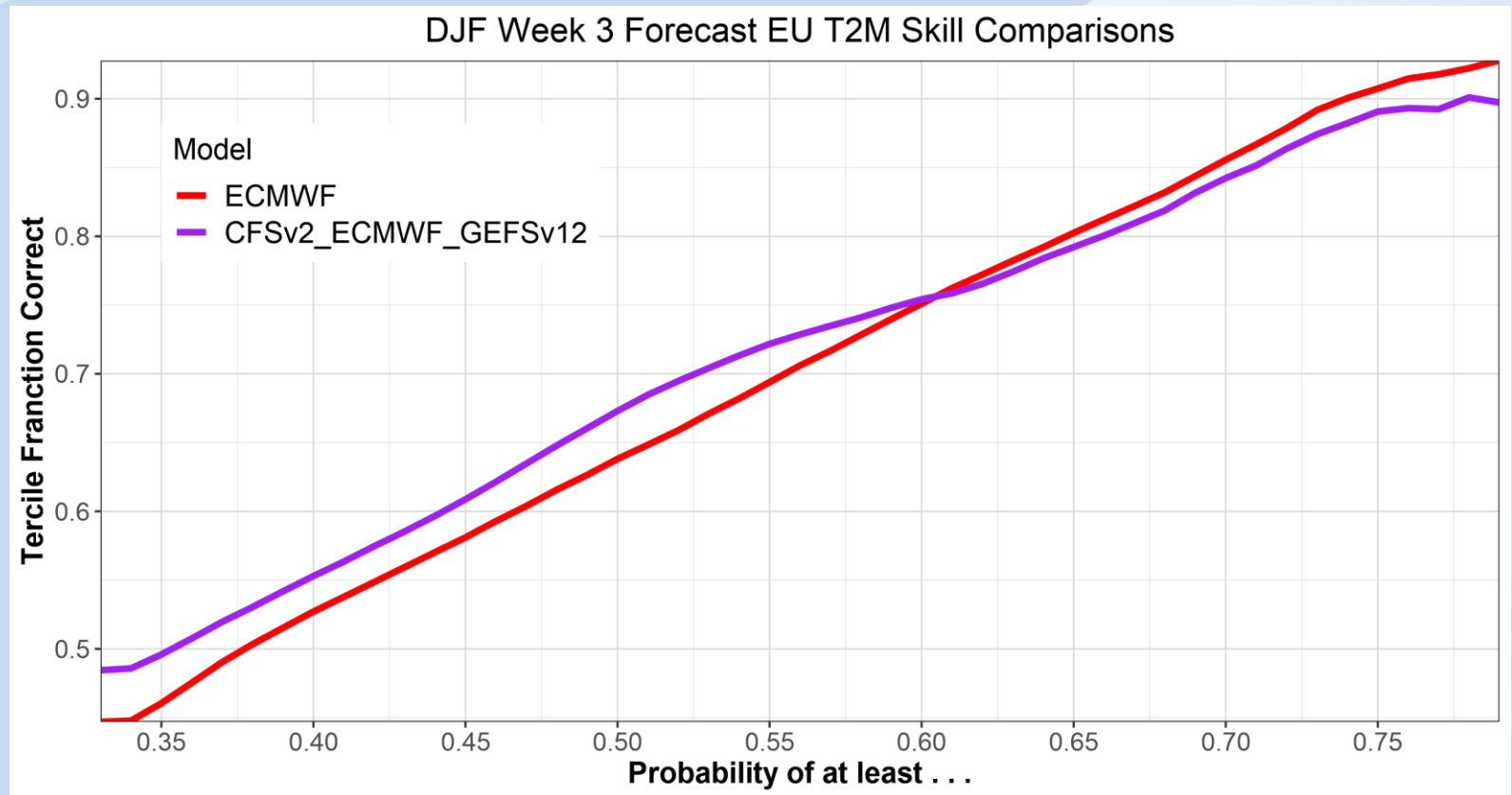


World Climate Service

If you knew then what we knew then ...

Benefits of Calibration

Calibration relates forecast probability to confidence



World Climate Service

If you knew then what we knew then ...

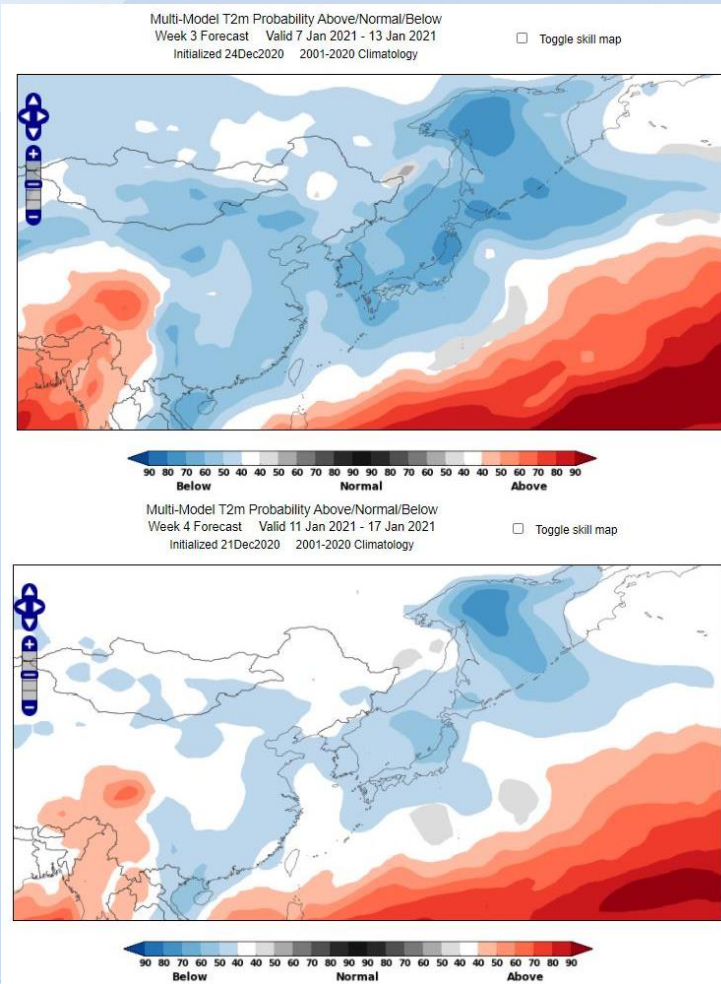
Forecast of Opportunity

Wall Street Journal
Jan 11, 2021

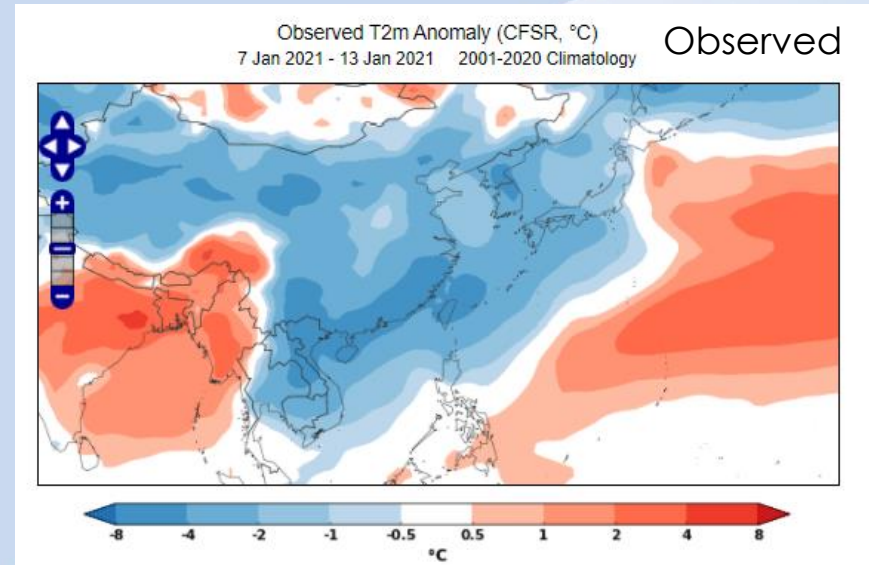
Cold Snap Sparks Record Rise in Natural Gas Prices in Asia

Traders are struggling to secure enough vessels to transport LNG from the U.S. Gulf Coast to Asia in time to meet rampant demand

Week 3
Forecast



Week 4
Forecast



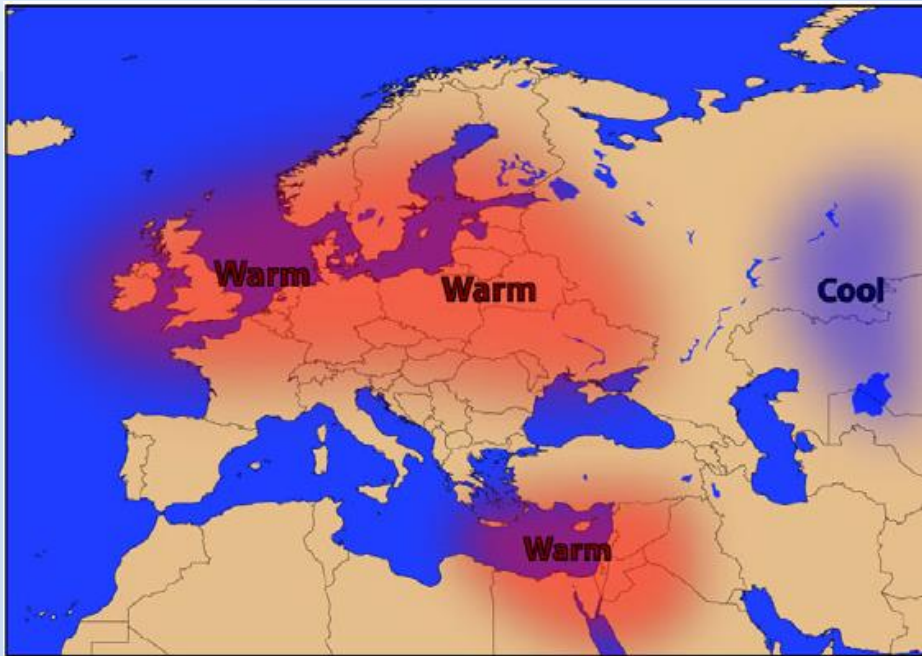
○ Probabilities enable
evaluation of risk

World Climate Service

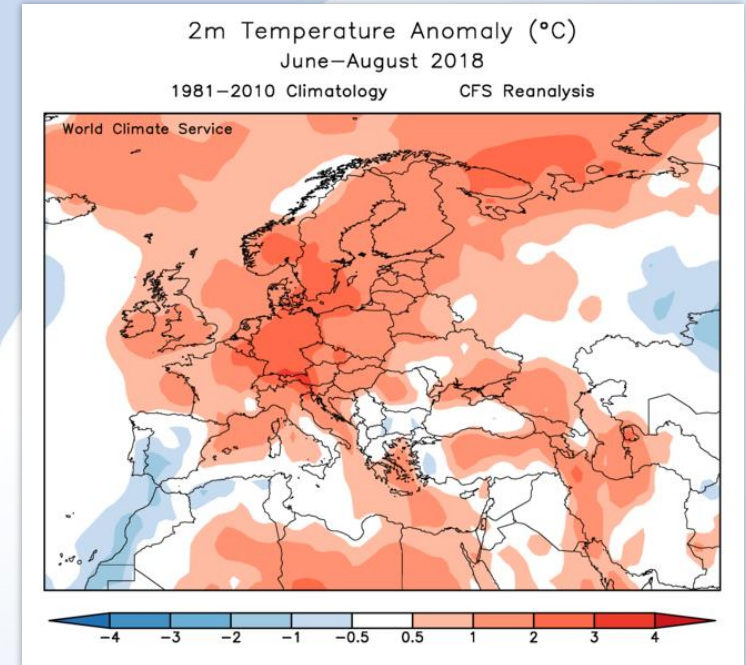
If you knew then what we knew then ...

Subjective Forecasts

A Forecast for June, July, August 2018



What Actually Happened



World Climate Service

If you knew then what we knew then ...

Performance of WCS Seasonal Forecasts

QUICK LOOK: North America

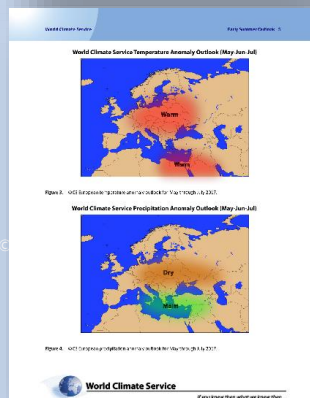
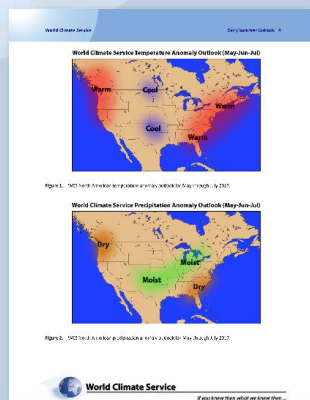
Confidence: low to moderate



QUICK LOOK: Europe

Confidence: moderate to high in Scandinavia, low to moderate elsewhere

Above-normal vs Below-normal



WCS Forecast Skill - Temperature		
Binary Forecasts - Percentage Correct		
2008-2018		
Forecast Confidence	North America	Europe
Low	55	51
Moderate	63	62
High	72	74
Forecast Period	North America	Europe
2008-2013	58	57
2014-2018	69	64

- 50% is break-even
- High confidence enhances skill
- Improving trend – recent success



World Climate Service

If you knew then what we knew then ...

Conclusions

- S2S forecasting performance benefits from multiple sources of objective information
- Probabilistic analyses enables quantification of risks and communication of confidence
- Continued research will make S2S forecasts increasingly valuable



World Climate Service

If you knew then what we knew then ...

Thank You

<https://www.worldclimateservice.com>

Twitter: @WorldClimateSvc

Jan Dutton

jan.dutton@prescientweather.com



World Climate Service

If you knew then what we knew then ...