Transforming Risk Management With Probability Forecasts: Weeks to a Season or More

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Prescient Weather Ltd

National Earth System Prediction Workshop
Metrics, Post-Processing, and Products for S2S
NOAA 28 February - 2 March 2018

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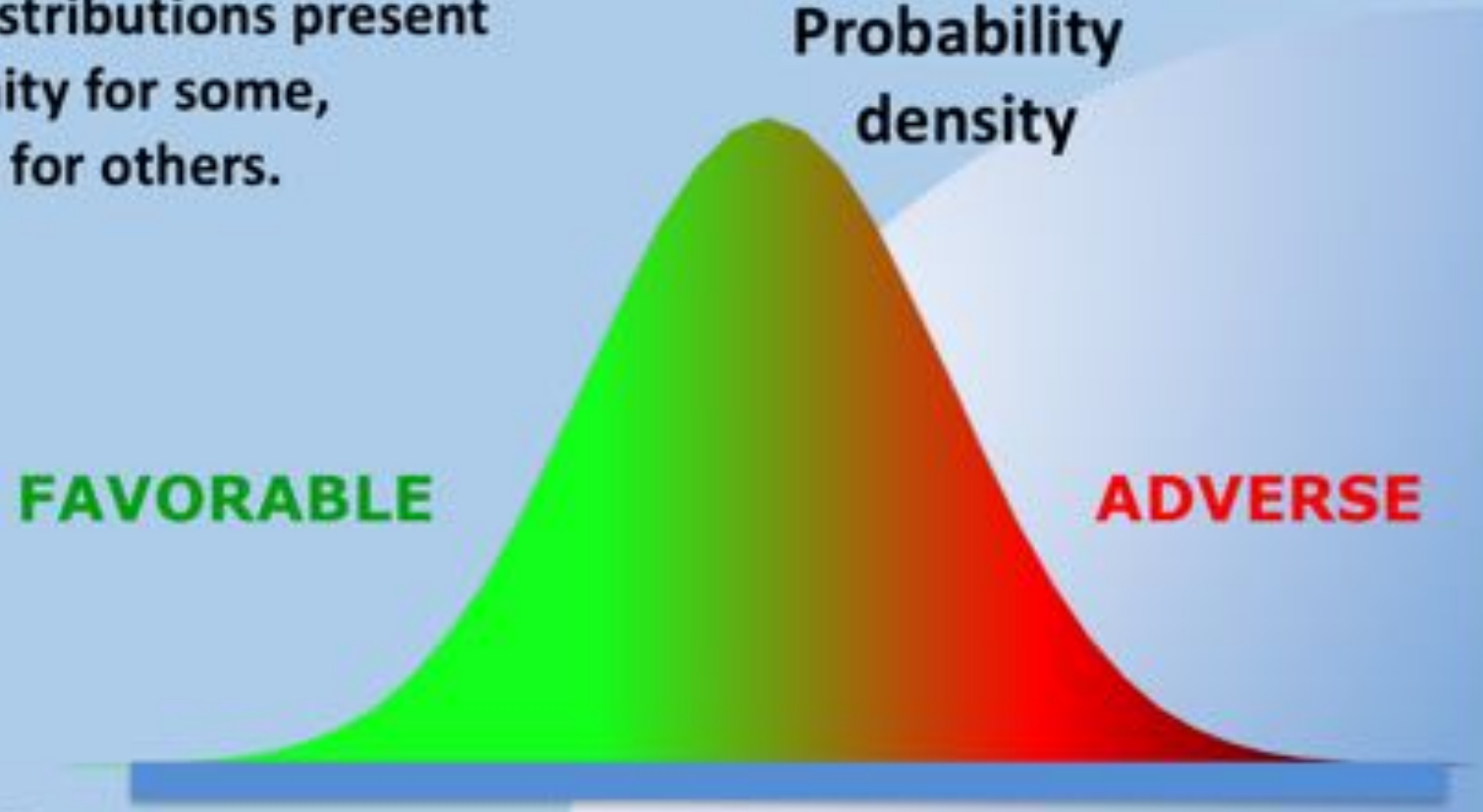
If you knew then what we knew then ...

Today's Presentation

- Value of Forecasts Lies in Good Decisions
- World Climate Service Multi-Model Ensemble
- S2S Forecast Process Today
- Skill of WCS Forecasts
- Recommendation: A Process that Will Improve Forecasts

Adversity and Opportunity

Subseasonal and seasonal climate variations in the tails of distributions present opportunity for some, adversity for others.



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The *value* of
weather and climate forecasts
lies in the *action* they motivate
and the favorable *consequences*
that follow.

Because we know what to expect if we act on the forecast.

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MeteoGroup

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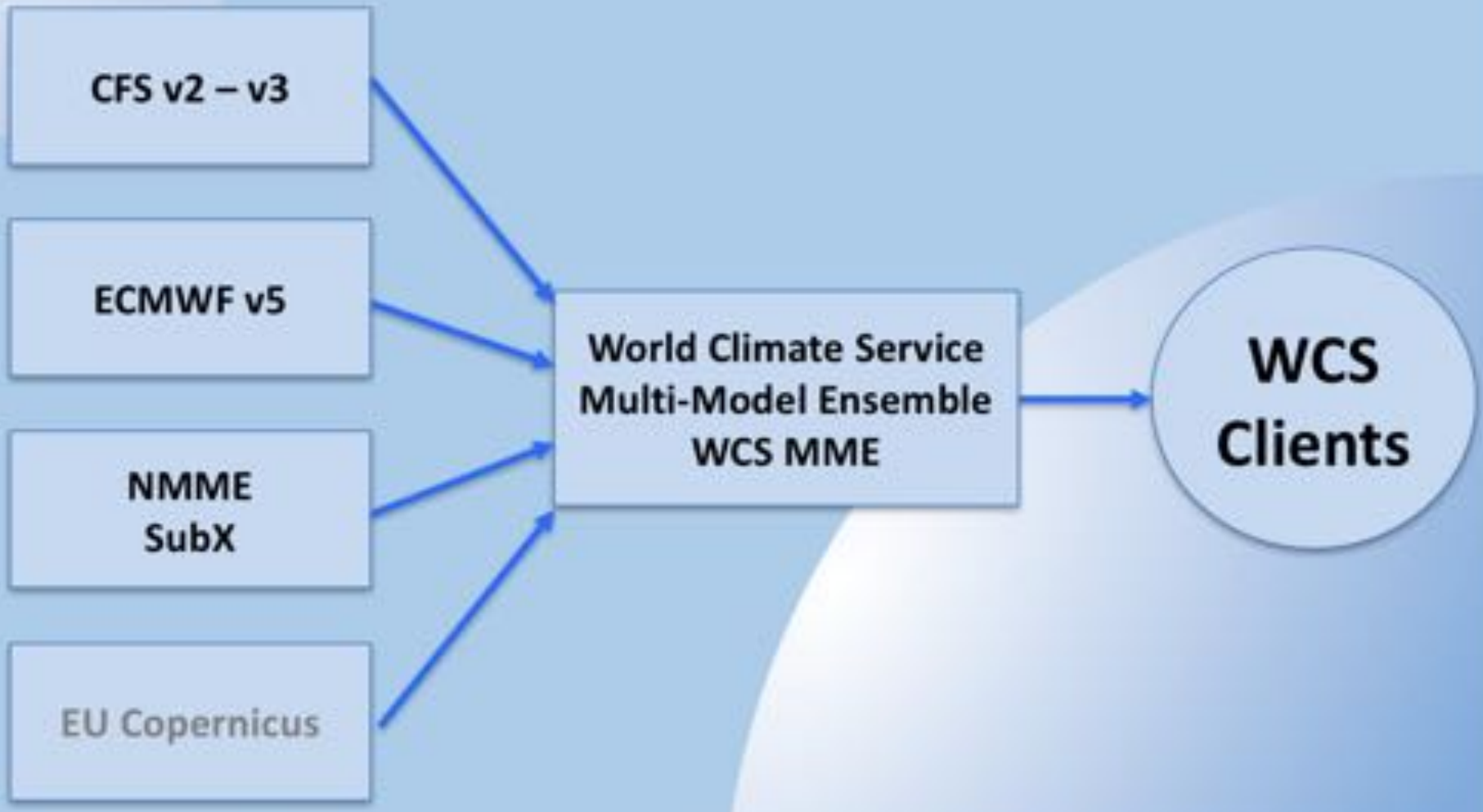
Future Configuration



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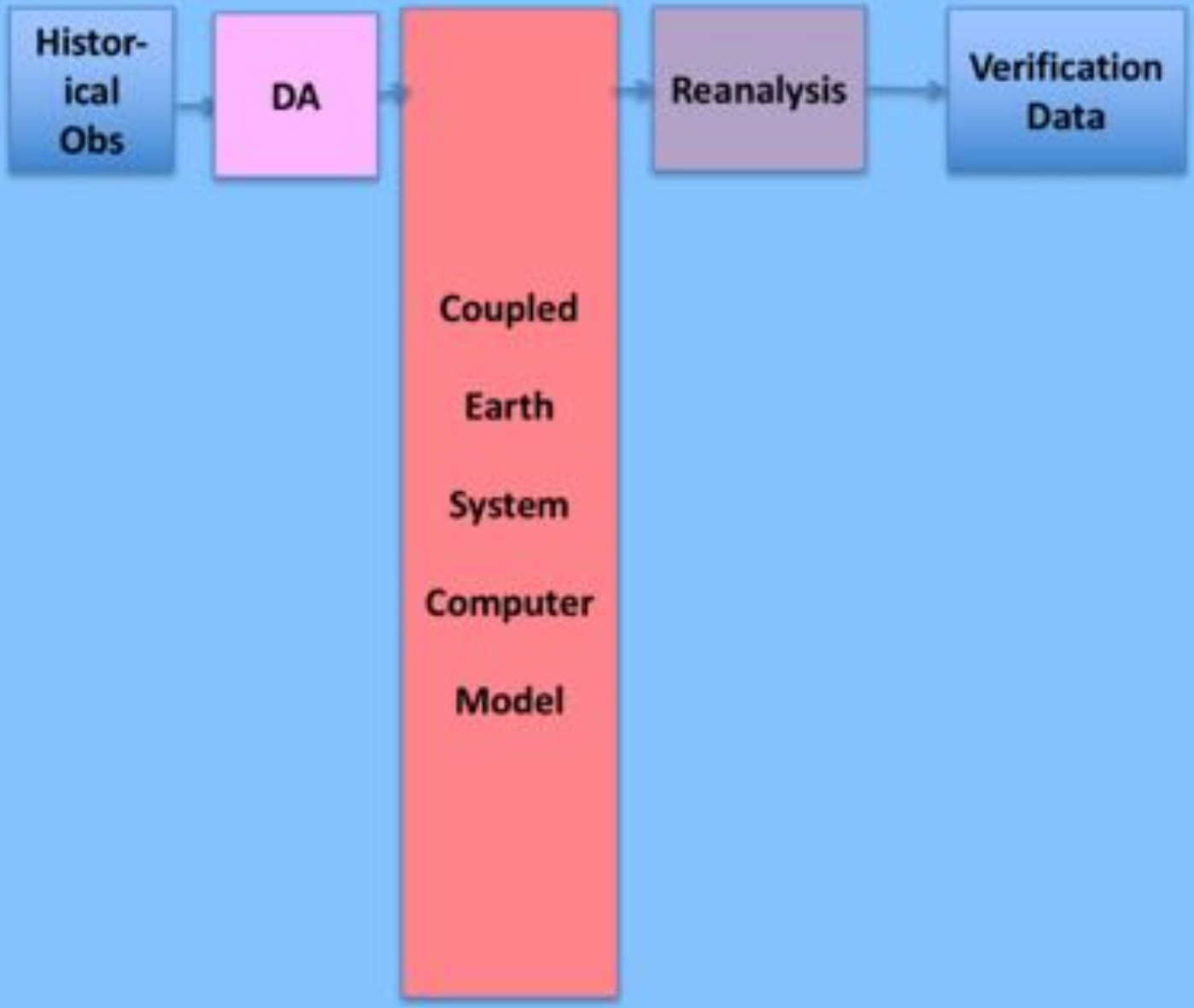
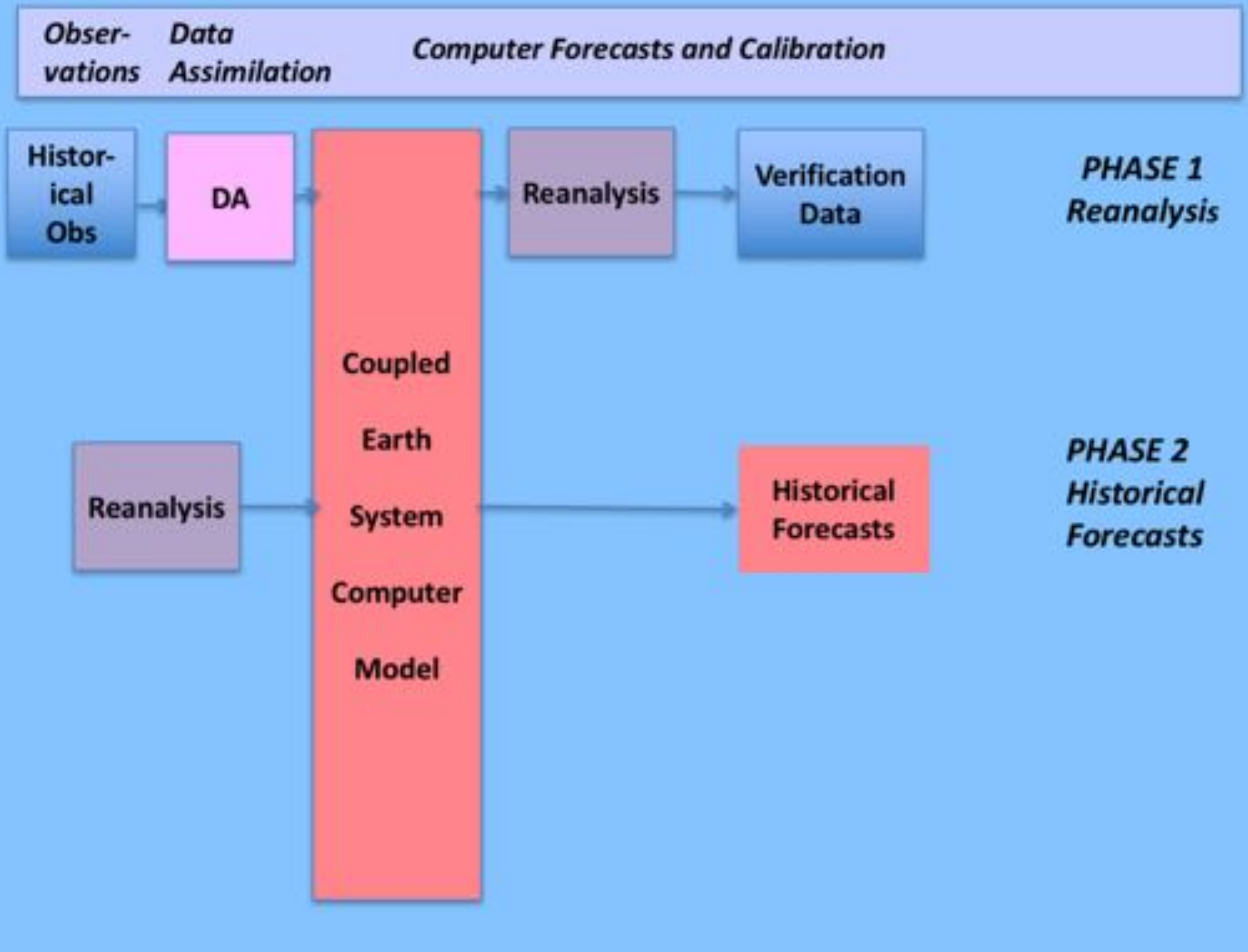
Computing S2S Probability Forecasts



PHASE 1
Reanalysis


Obser-
vations
Data
Assimilation
Computer Forecasts and Calibration
Histor-
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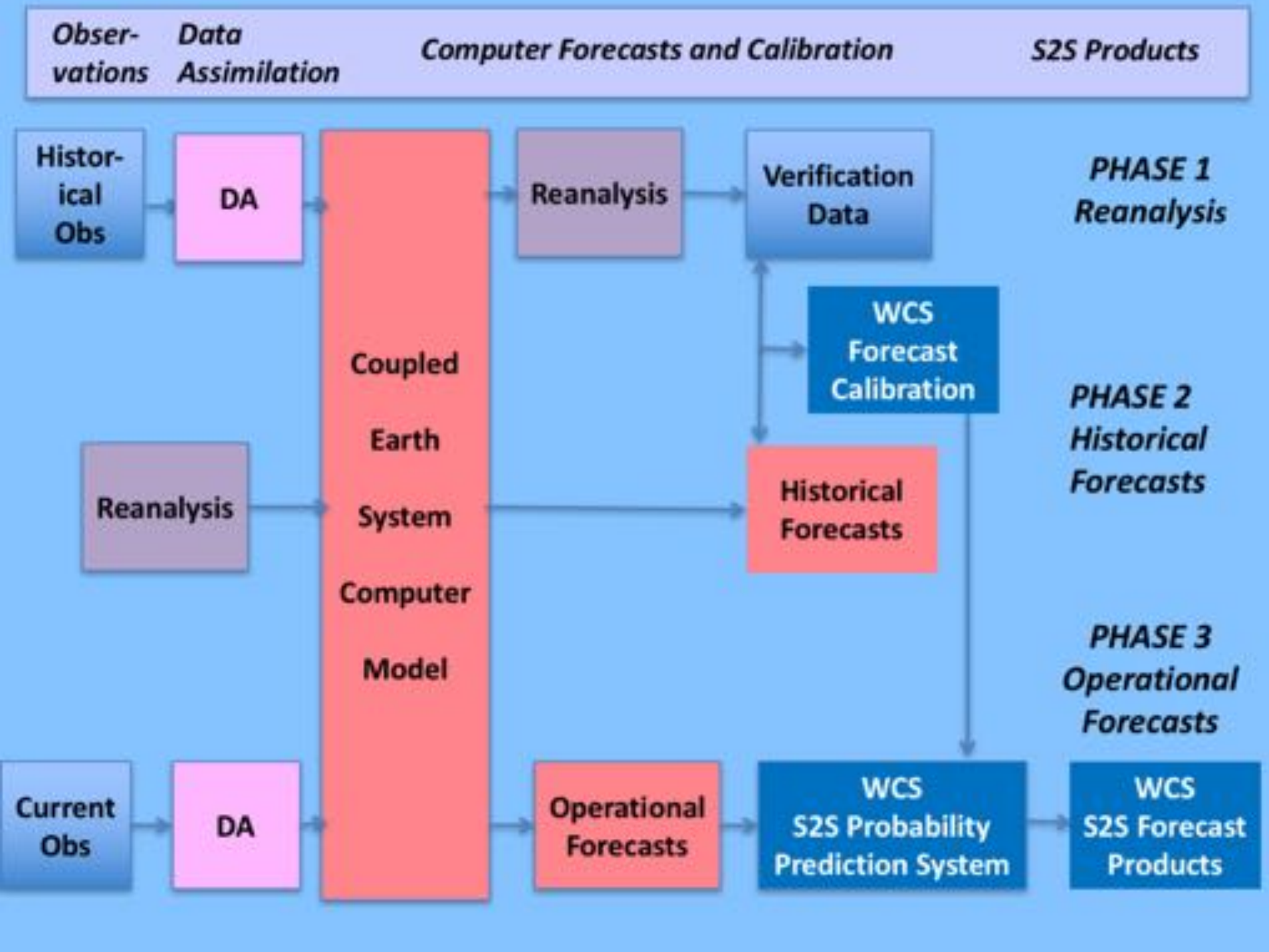
Obs
DA
Coupled
Earth
System
Computer
Model
Reanalysis
Verification
Data
PHASE 1
Reanalysis
Reanalysis
Historical
Forecasts
PHASE 2
Historical
Forecasts


Obser-vations
Data Assimilation
Computer Forecasts and Calibration
S2S Products
Histor-ical Obs
DA
Coupled Earth System Computer Model
Reanalysis
Verification Data
PHASE 1 Reanalysis
WCS Forecast Calibration
PHASE 2 Historical Forecasts
Reanalysis
Historical Forecasts
PHASE 3 Operational Forecasts
Current Obs
DA
Operational Forecasts
WCS S2S Probability Prediction System
WCS S2S Forecast Products

WCS Histories for Calibration and Verification

Model	Reanalysis for Calibration and Verification	Period of Record
Seasonal Forecasts		
CFS2	CFSR	1982-2010
ECMWF 5	ERA-Interim	1981-2016
WCS MME	ERA-Interim	1982-2010
NMME	Model Anomaly	
Subseasonal		
CFS2	CFSR	2001-2010
ECMWF MFS	CFSR	1998-2017
WCS MME	CFSR	2001-2010

A Jumble of History Periods
A Chaos of Five Grid Resolutions

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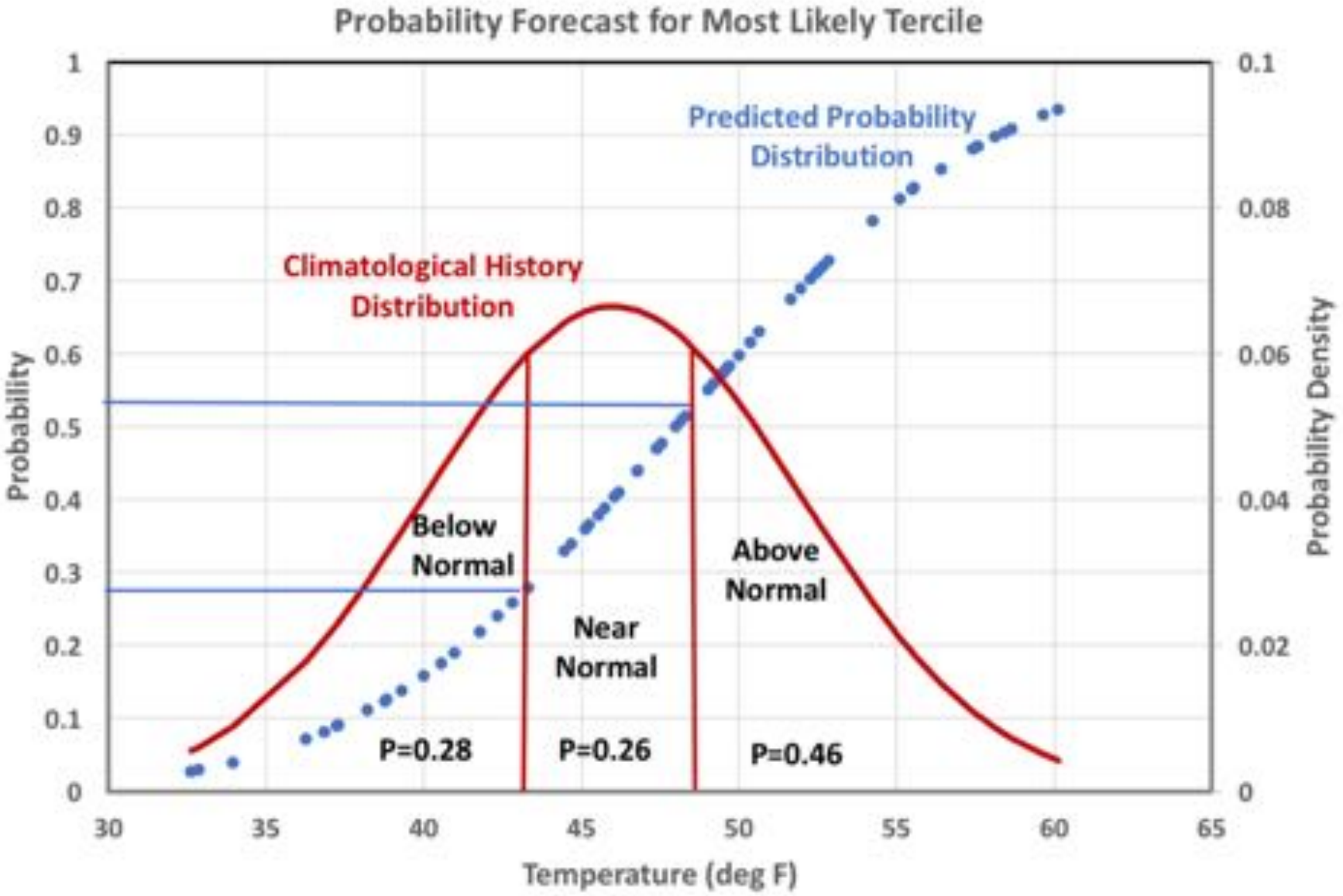

Probability Forecast for Most Likely Tercile
Predicted Probability Distribution
Climatological History Distribution
Below Normal
Near Normal
Above Normal
P=0.28
P=0.26
P=0.46
Probability
Probability Density
Temperature (deg F)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.1
0.08
0.06
0.04
0.02
0
30
35
40
45
50
55
60
65

CFSv2 Solar Radiation Probability Above/Normal/Below

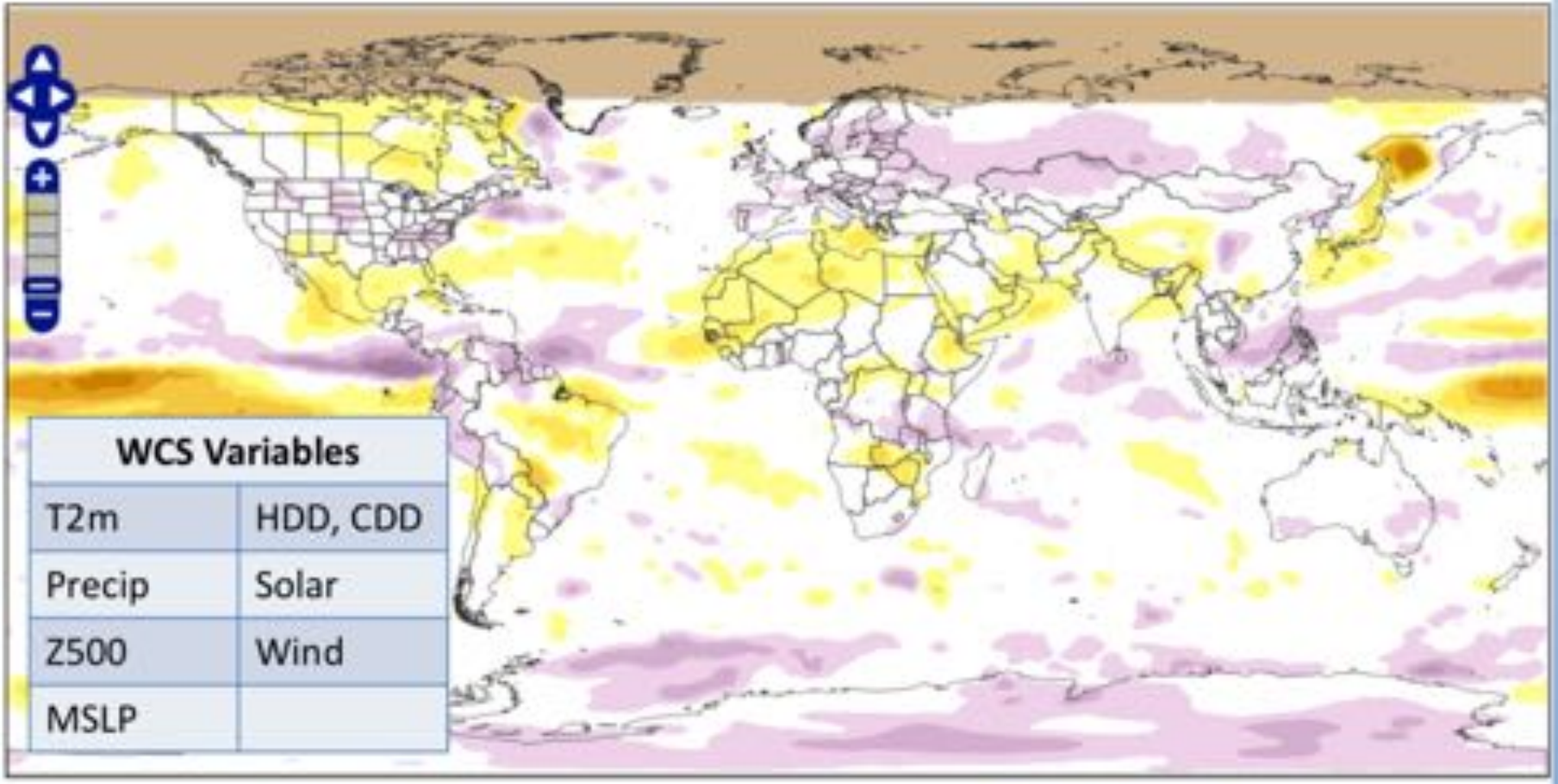
Forecast Valid January 2018

Initialized 00Z25Nov2017 - 18Z04Dec2017 1981-2010 Climatology

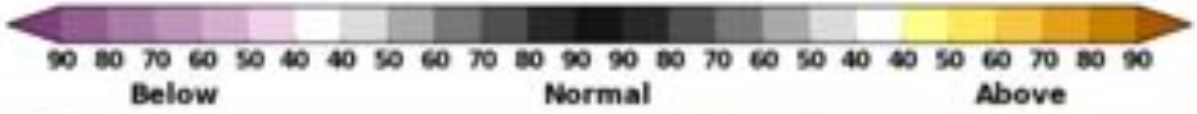
Logged in as

Toggle skill map

Logout



WCS Variables	
T2m	HDD, CDD
Precip	Solar
Z500	Wind
MSLP	



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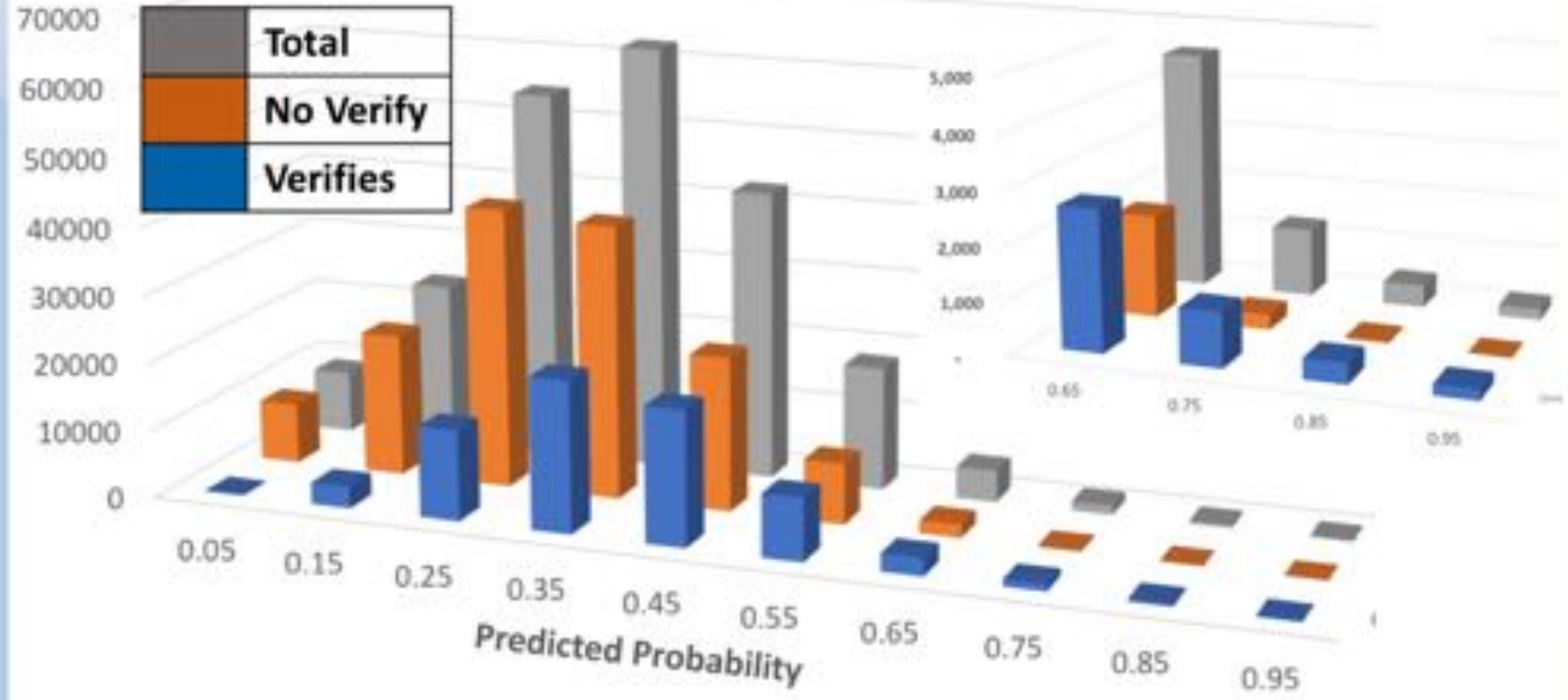
Forecast Skill Statistics

Temp Below Normal, DJF, North America, ECMWF 1981-2016



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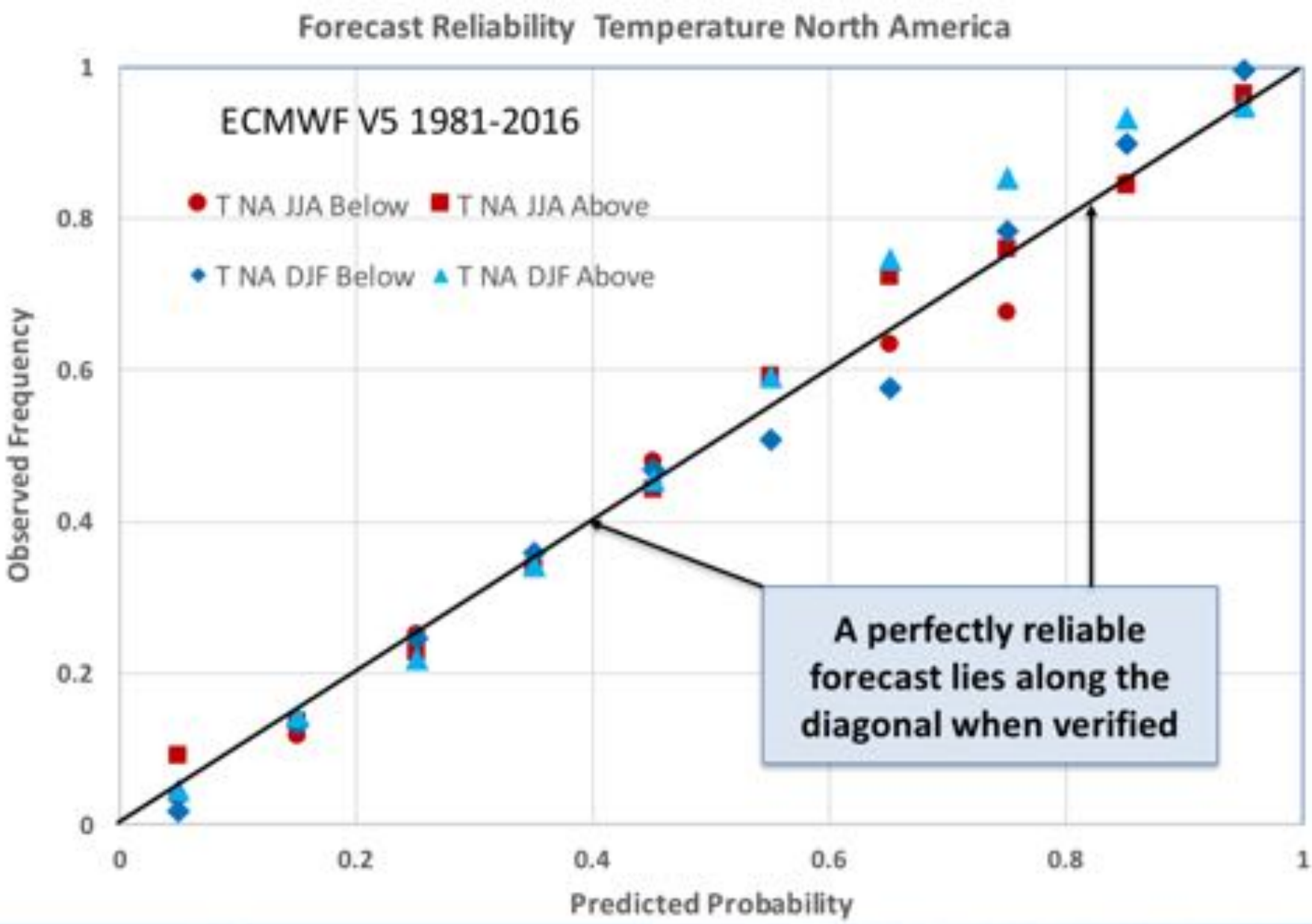

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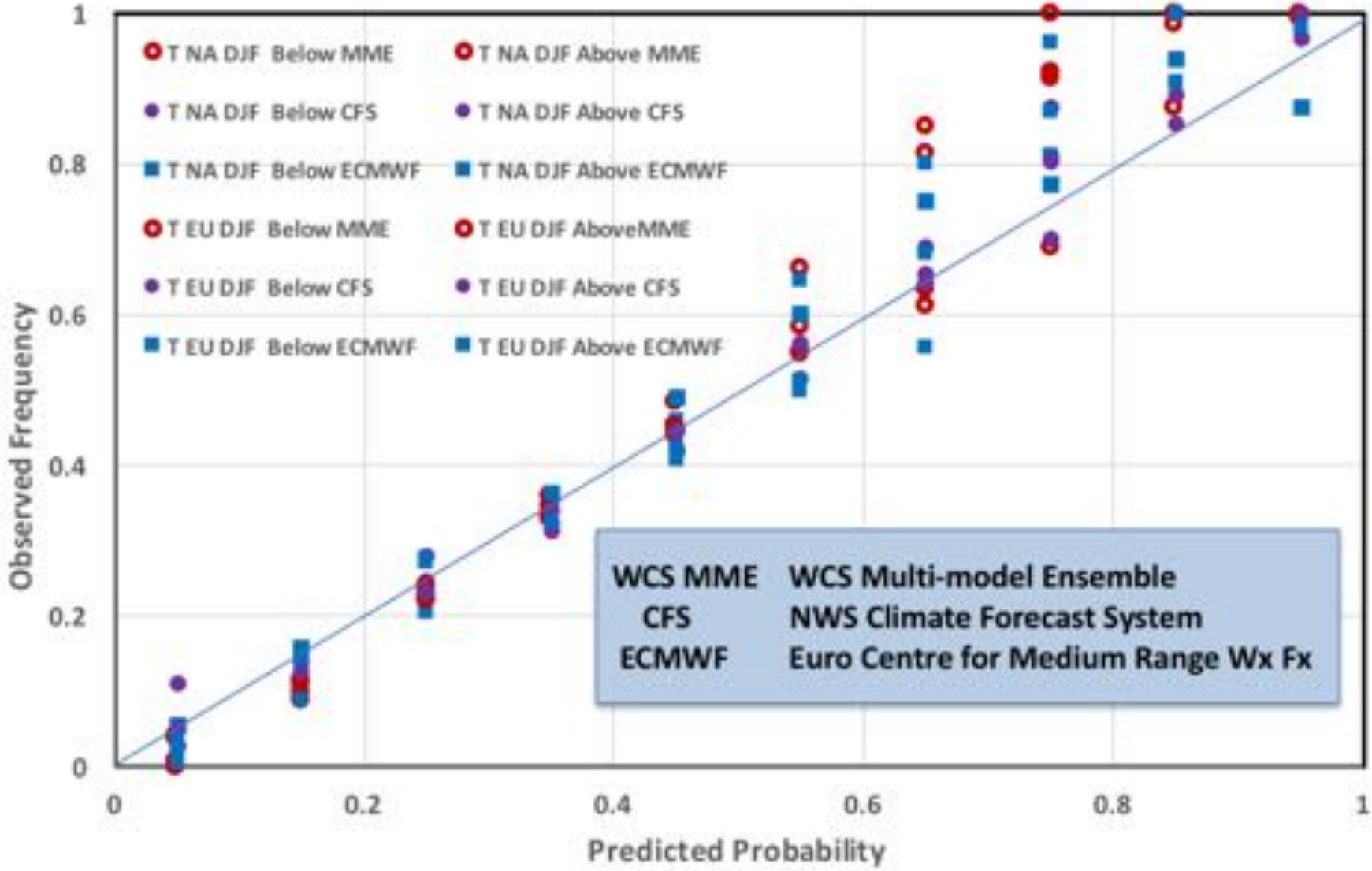
Reliability Three DJF Forecasts for NA and EU -- WCS MME, CFS V2, ECMWF V5



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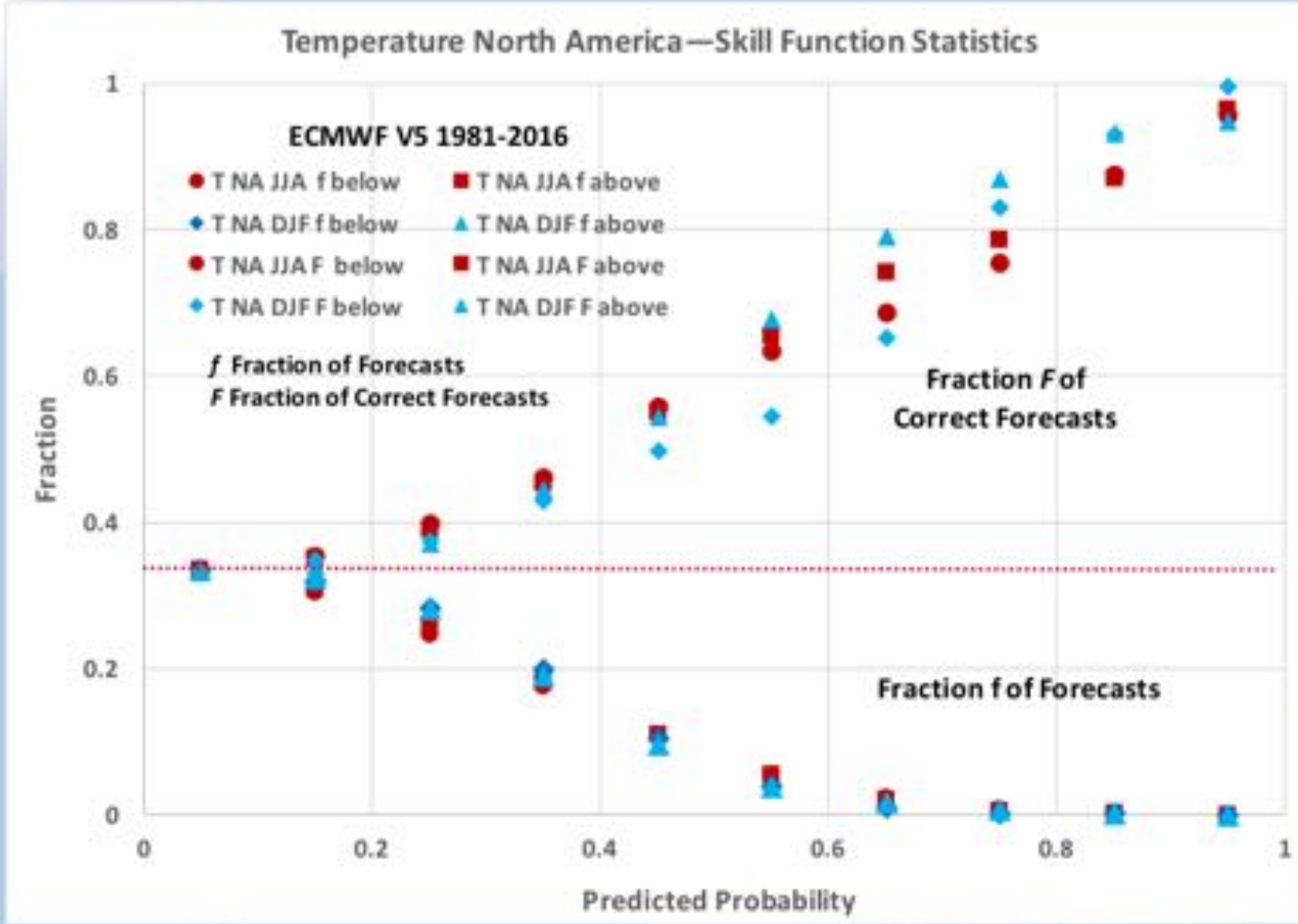

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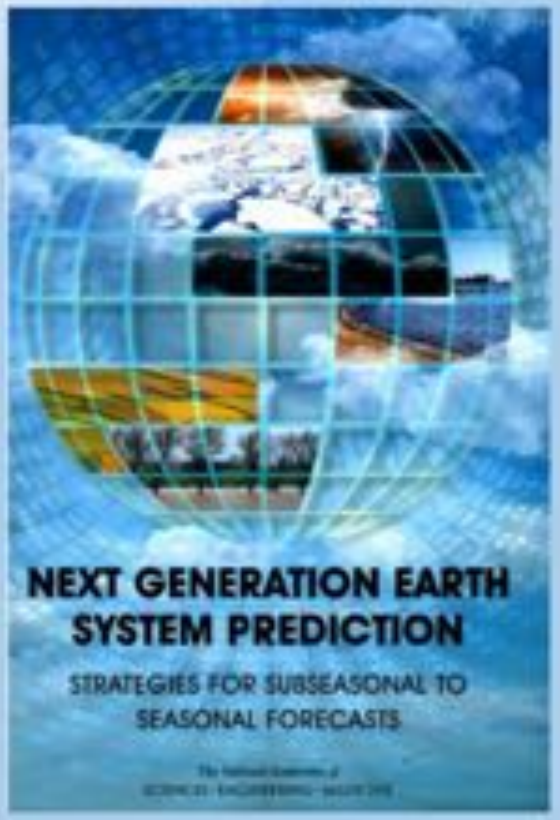
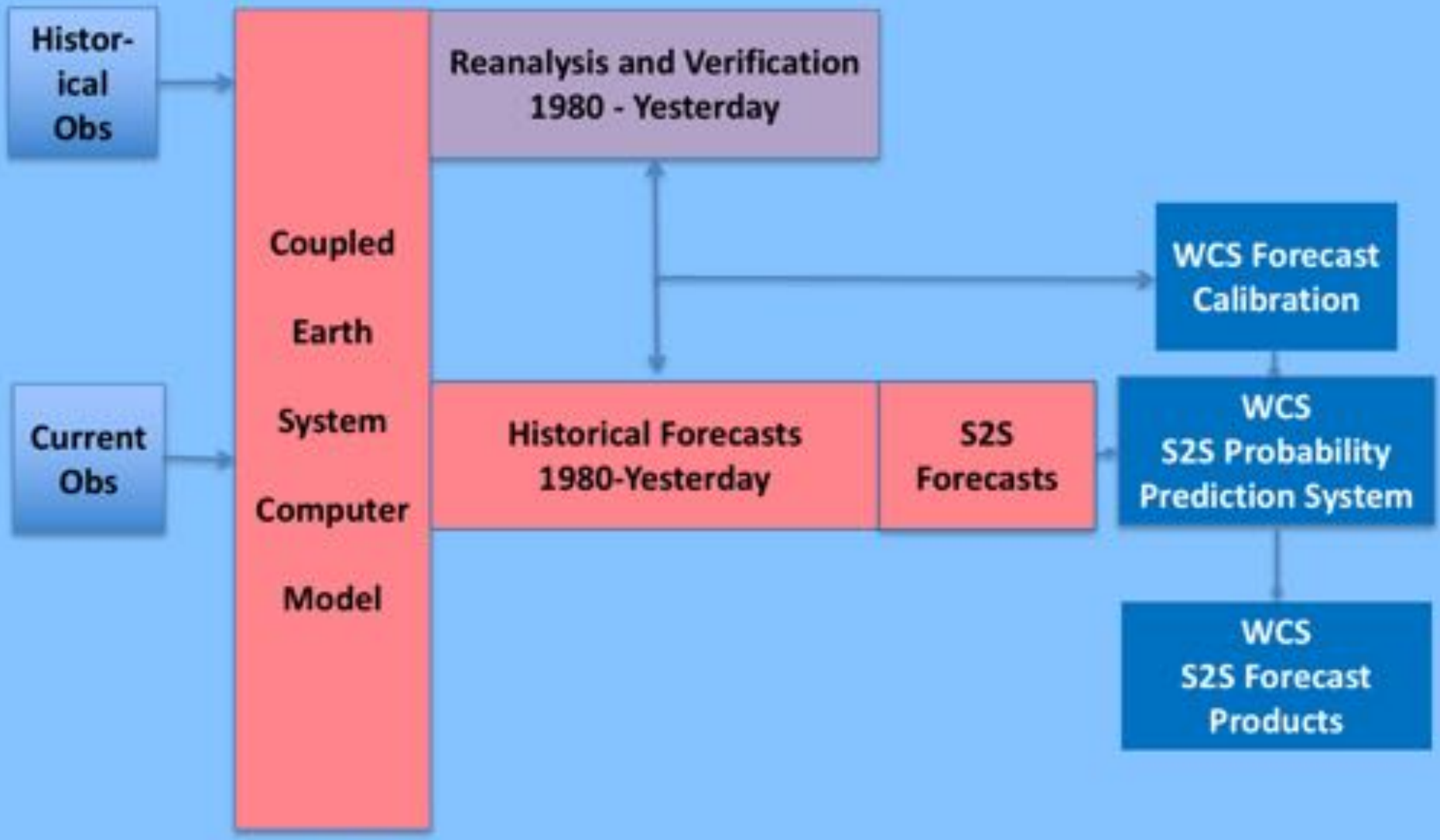


The S2S Committee offered a number of substantial recommendations.

But as a company whose computers, on land and in the cloud, grind away at S2S forecasts every day, we will offer a single recommendation that would simplify operations for users of the model output and allow us to significantly improve the forecast products we deliver to our customers

A Strategy for Continuous Forecast Improvement



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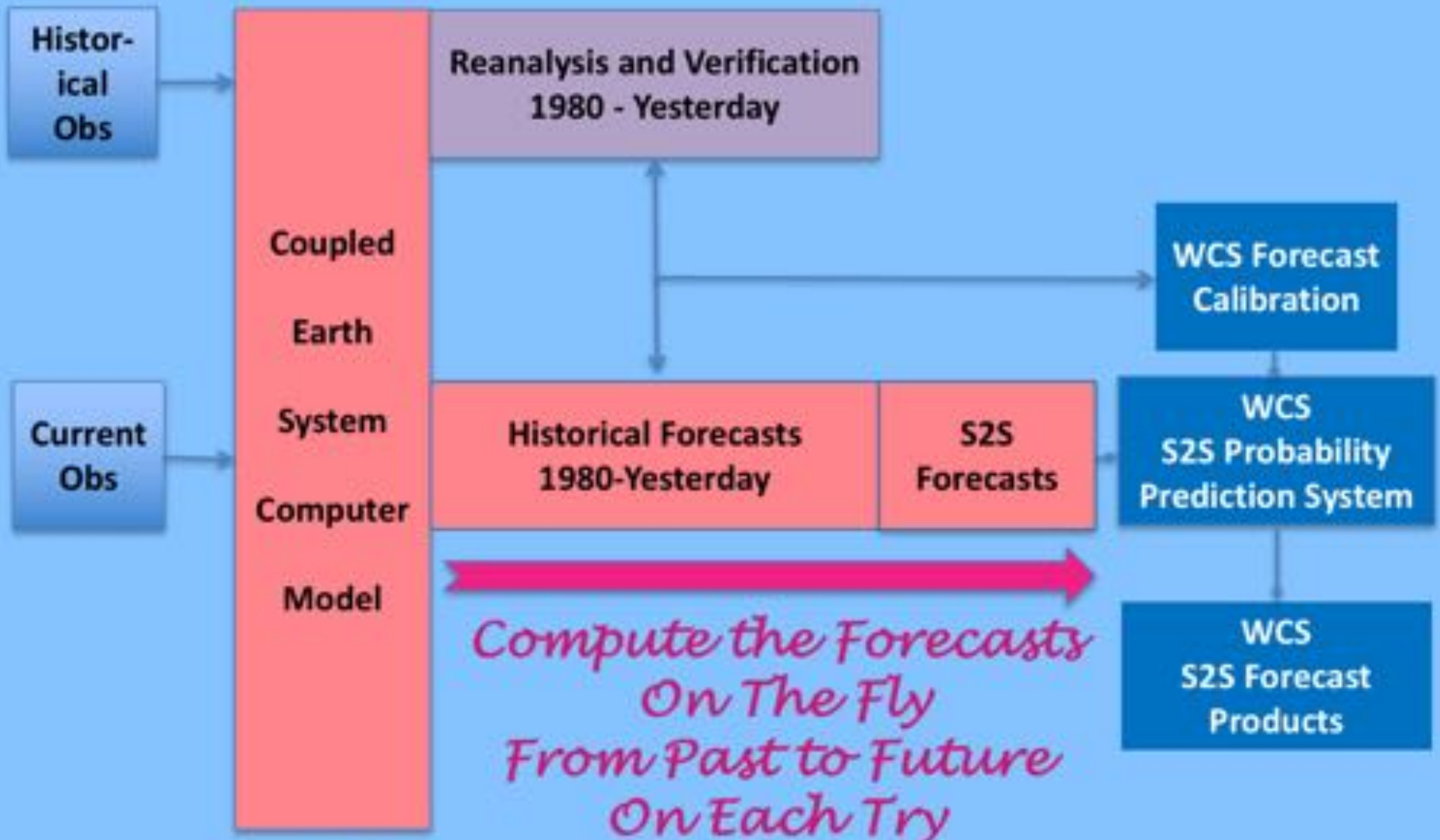
A Strategy for Continuous Forecast Improvement



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ADVANTAGES
of the Proposed Strategy

- Consistent, evolving model history
- Recent events and trends included
- Uniform grid resolution
- Continuous model improvement now possible, desirable, and indeed mandatory!

Historical Forecasts 1980-Yesterday	S2S Forecasts

Compute the Forecasts On The Fly From Past to Future On Each Try

Better Forecasts
Better Decisions

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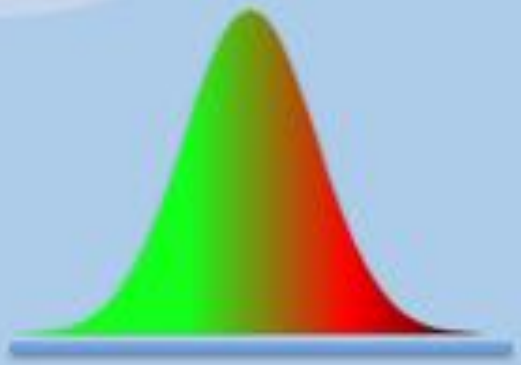
Foresee, Prepare, Act
With Reliable Probability Forecasts



The Cost of Computer Power For Major Improvement Is Small Compared To the Value of…

Lives Saved
Property Protected
Financial Loss Averted

Predictable and Reliable Performance In the Public and Private Sectors Contributing to National Well-Being

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Acknowledgment

The development of the S2S forecast capability by Prescient Weather Ltd has been supported in part by NOAA SBIR Phase I and Phase II contracts.

Additional information on WCS is available

John A Dutton, Richard P James, Jeremy D Ross

Transforming Risk Communication with Probability Forecasts for Energy: Weeks to a Century or More

AMS, 10 January 2018, Austin TX

Abstract and recording available at AMS website

Weather & Climate Services For the Energy Industry
Chapter 12

Open Access - Downloadable

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