

SEASONAL FORECASTING FOR THE US WEATHER MARKET

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Objective

To Quantify the Seasonal Predictability of
those US Weather Market Products of
Interest to TSUNAMI Members.

Products Include: HDDs, CDDs, Rainfall
and Snowfall.

Lead-Times: 1-12 Months.

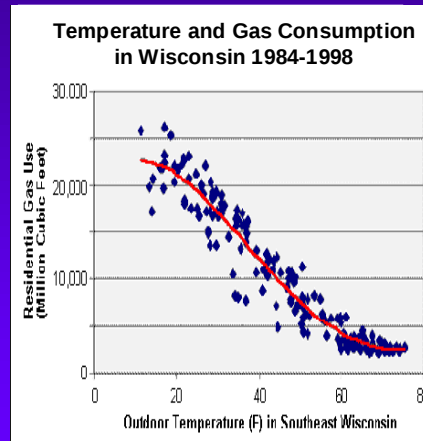
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Relevance (1)

- Weather impacts businesses representing US \$1 trillion of the US GNP.
- Non-industrial heating and cooling energy sales alone average US \$70 billion per year.



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Relevance (2)

- US Weather Market is growing rapidly:
 - ENRON - \$105 million securitisation.
 - KOCH - \$100 million securitisation.
 - Launch of 'tradeweather.com' - new on-line trading of weather risk (temp. and precip.)

How can Seasonal Forecasts help?

- Prices determined from historical weather data.
- Skilful seasonal forecasts can maximise financial returns on weather options.

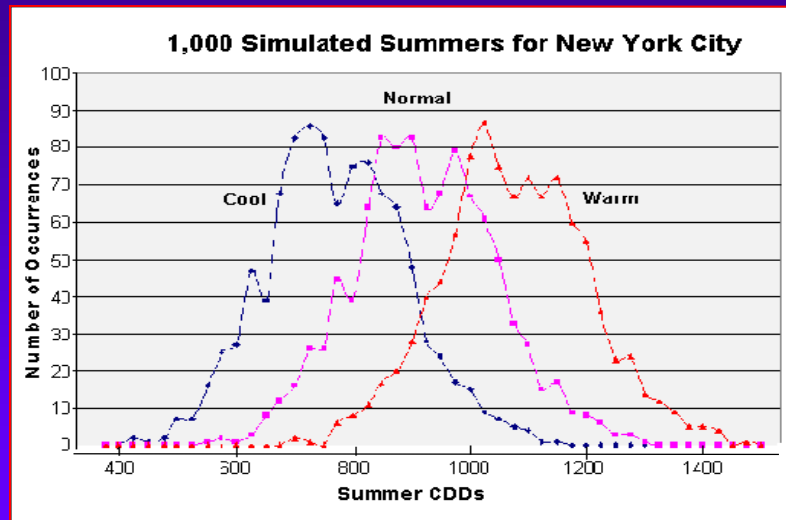
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Relevance (3)



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Methodology

- Statistical
- 1950-1999 data.
- Investigate both contemporaneous and lagged correlation forcings.
- Assess **true skill** of each model forecast for the 1990-1999 period.
- Make forecasts at agreed lead-times out to 12 months.
- Express forecasts as probabilities.

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Deliverables

- Assessment of long-range forecast skill for 1990-1999 of monthly and seasonal HDD, CDD, rainfall, and snowfall for a range of US cities of interest to the sponsor.
- Issue real-time seasonal forecasts during project.
- Provide sponsor with detailed report describing the model and its forecast skill at various leads for the weather transactions of interest.

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Worked Example

Concord (NH) CDDs for July-August

- What is the prediction skill at a 6-month lead, ie in January?
- Compare skills from lag-correlation and contemporaneous correlation models.
- Use sea surface temperatures and mean sea level pressures as predictors.

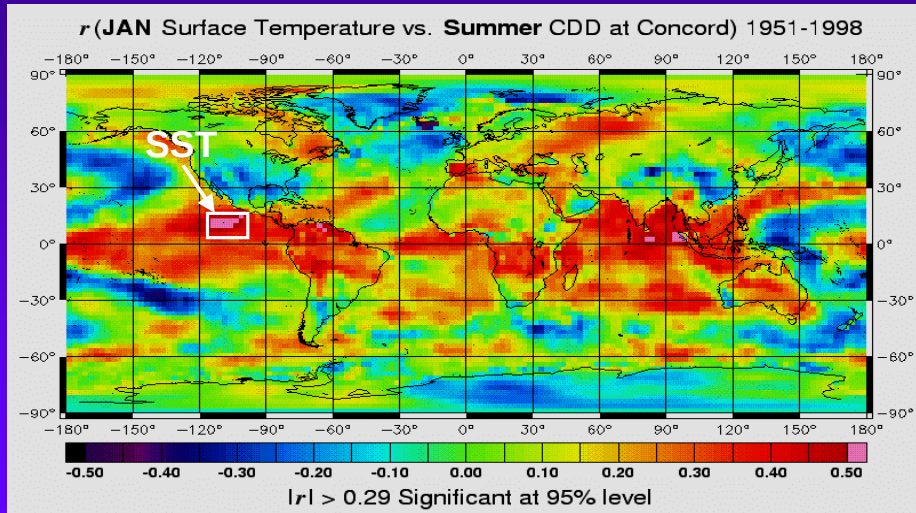
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JAN SST Predictor



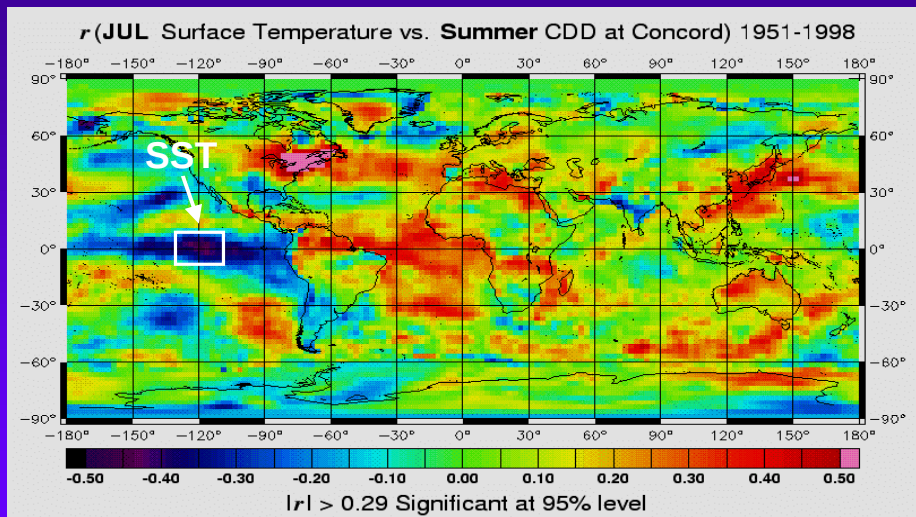
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JULY SST Predictor



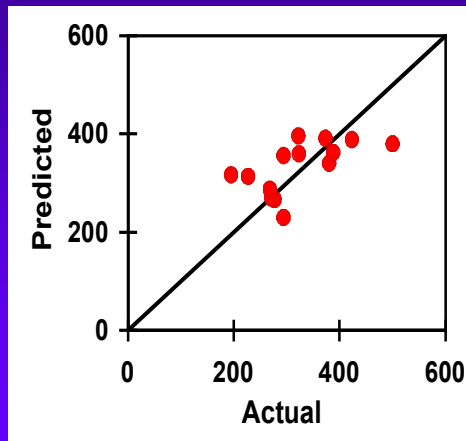
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JAN Forecast of Concord CDD (1984-1998)



AGC 33%

PVE 37%

CLIM 12.5 CDD

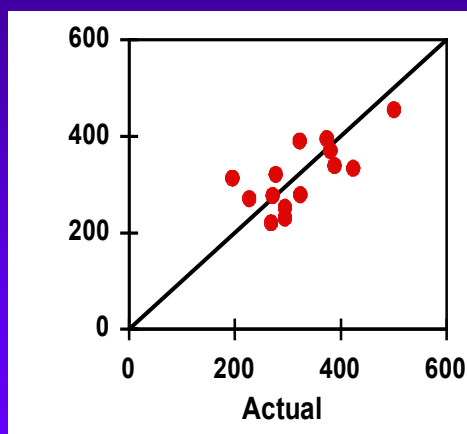
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JULY Forecast of Concord CDD (1984-1998)



AGC 40%

PVE 48%

CLIM 14.2 CDD

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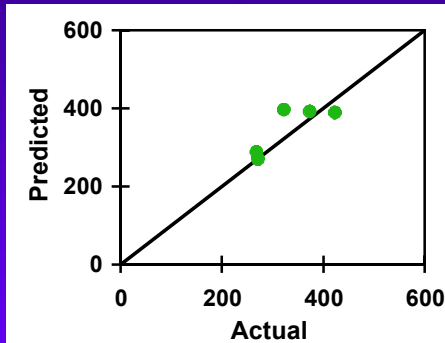


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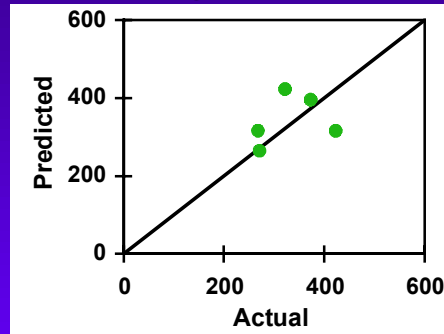
Skill Comparison (1994-1998)

January Model



AGC 56%
PVE 65%
CLIM 26.9 CDD

July Model



AGC 16%
PVE -33%
CLIM -0.5 CDD

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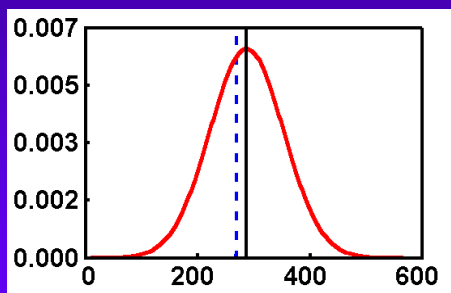


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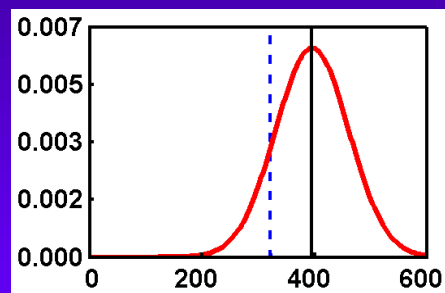
Probability Distributions JAN Model

1997



CONCORD CCDs

1998



CONCORD CCDs

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Expertise

- We issue a range of long-range forecasts for US hurricane strikes, UK windstorm impacts, and NW Pacific typhoons. See <http://forecast.mssl.ucl.ac.uk> for full information.
- In the last month we have issued:
 - (a) the longest range forecast for US hurricane landfalls, a year ahead of the 2000 season.
 - (b) the first Met. Office endorsed extended-range forecast of UK winter storminess.

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1999 Forecasts vs Actual

Atlantic Total Numbers

		<u>IH</u>	<u>H</u>	<u>TC</u>
Average	1951-1998	2.4	5.8	9.8
Actual (to date)	1999	4	7	11
TSUNAMI	1999	2 (± 1)	7 (± 3)	12 (± 3)

USA Landfalling

		<u>IH</u>	<u>H</u>	<u>TC</u>
Average	1951-1998	0.6	1.5	3.1
Actual (to date)	1999	1	3	5
TSUNAMI	1999	1 (± 1)	2 (± 1)	4 (± 2)

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Summary

**The work programme is technically feasible,
low risk, and provides sound opportunities
for benefitting enterprising insurers.**