PENNSTATE

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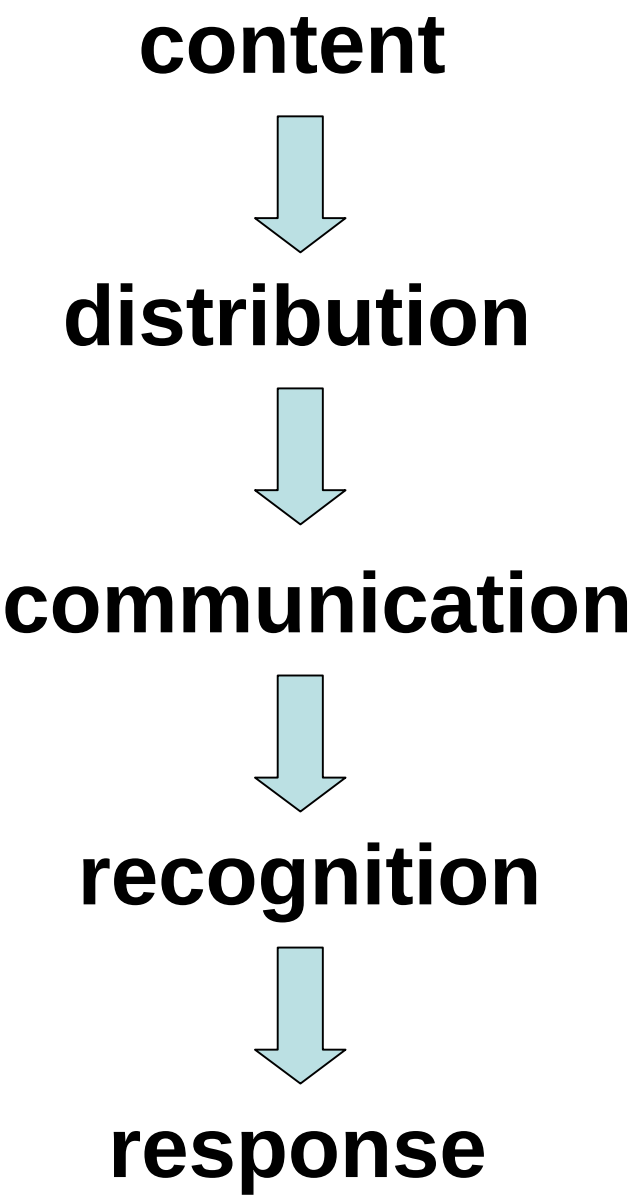
TIGGE Applications: Economics, Energy and Risk Management

Mark S. Roulston

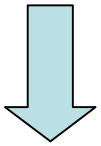
Department of Meteorology,

Pennsylvania State University

Thanks to participants in the tiggesea@met.psu.edu discussion group.


content
distribution
communication
recognition
response

content



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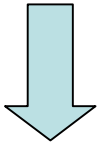
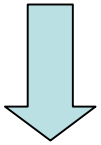
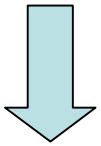


communication



recognition



response

Content: Do forecasts contain information of value?

- Use of prescriptive/normative models to determine whether forecasts improve decision making of a rational decision maker.
- Assume user is *homo economicus.*
- Move beyond classic cost-loss problem to more complex problems.

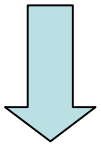
Forecasting for CCGT Power Stations

Neil Gordon & Lenny Smith

Study ignored all other operational matters apart from output of a CCGT plant with temperature, pressure and humidity.

Found that, for a 780 MW plant, using recalibrated global ensemble would lead to annual savings of about £190,000 relative to using an uncalibrated forecast.

content



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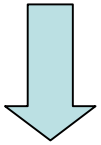

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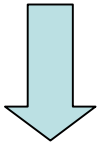

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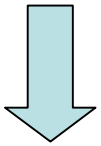


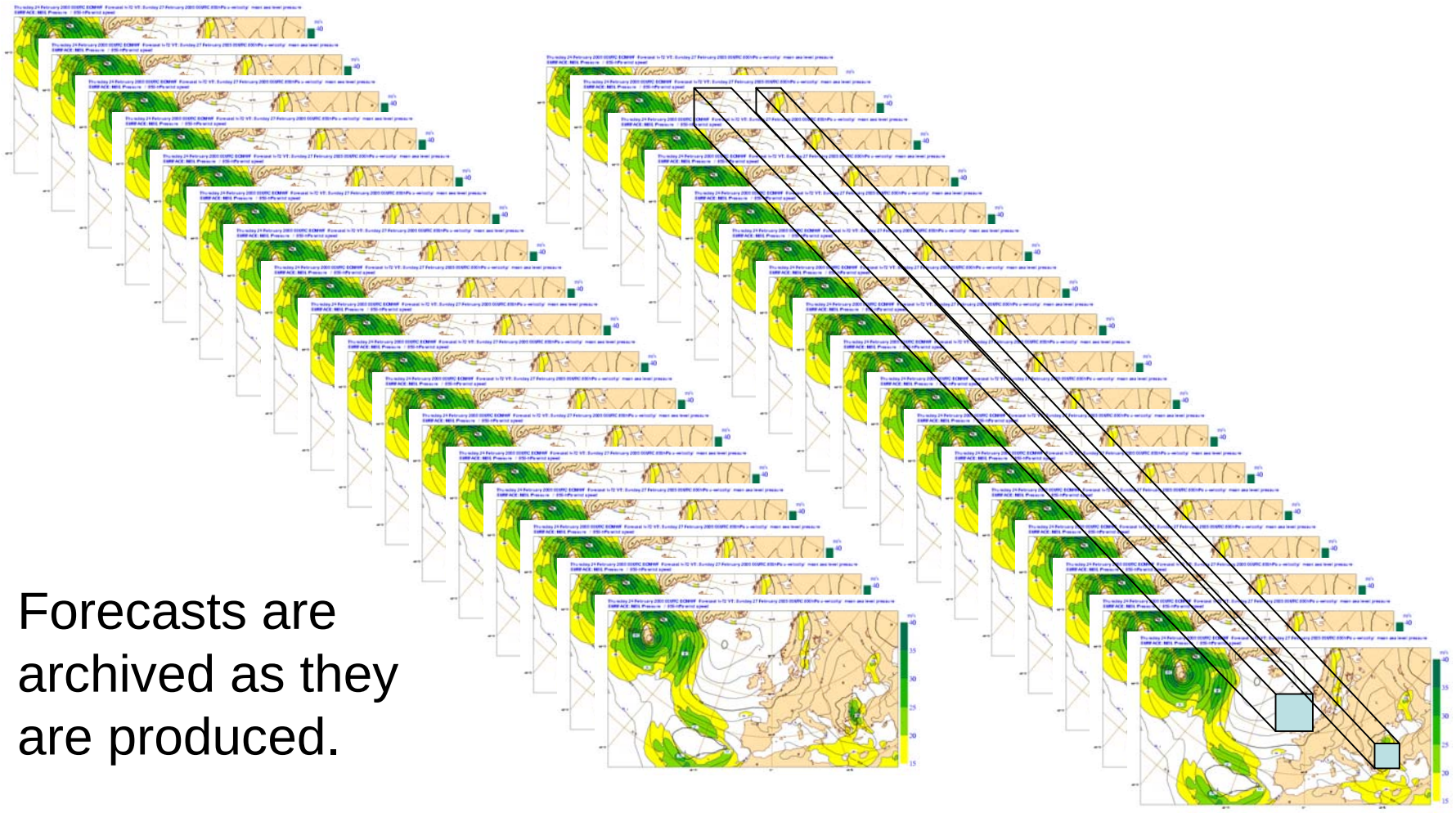
response

Distribution: Will users have access to forecasts?

- Effectiveness of dissemination of TIGGE products will depend on infrastructure.
- Some users will require access to archived forecasts to figure out how to integrate forecasts into decision-making.
- This will require “sliced-and-diced” forecast data.

Distribution (cont.)

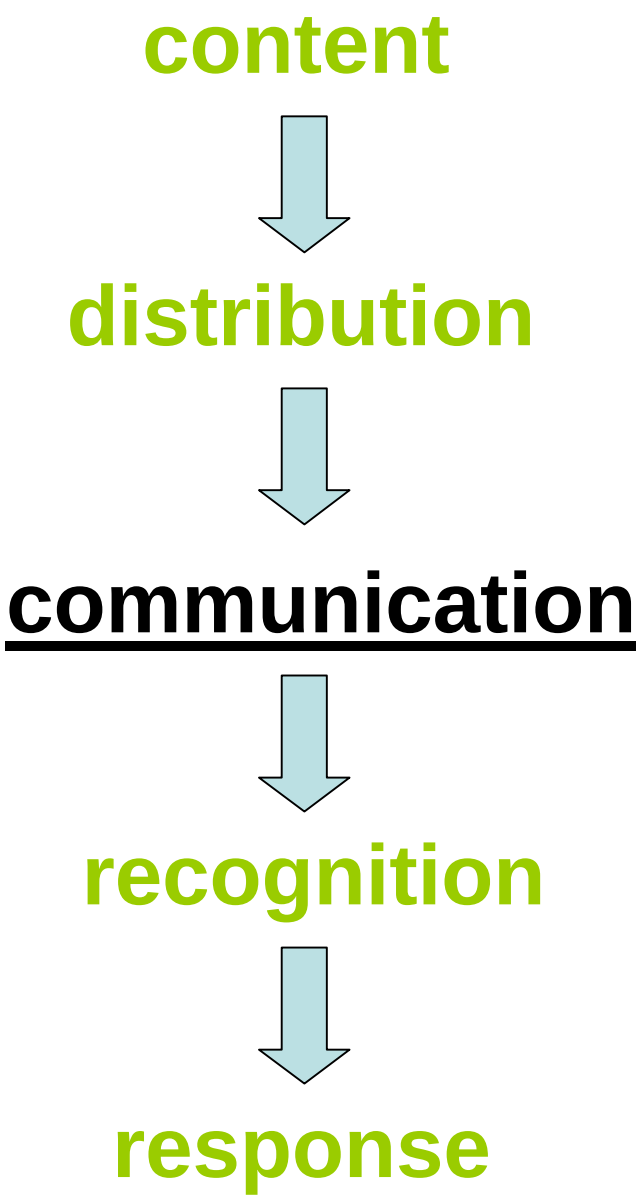
- DEMETER publicly available data-sets a step forward.
- But *publicly available* does not always mean *easily accessible*.
- There are costs associated with obtaining data even when no one is charging for it.



Forecasts are archived as they are produced.

Huge number of permutations of how data can be sliced and diced.

Users often want data orthogonally to how it is archived.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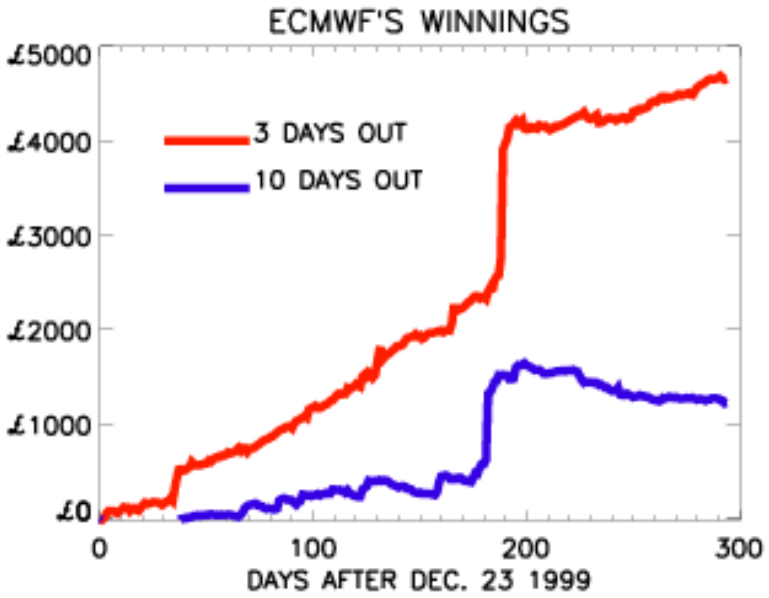
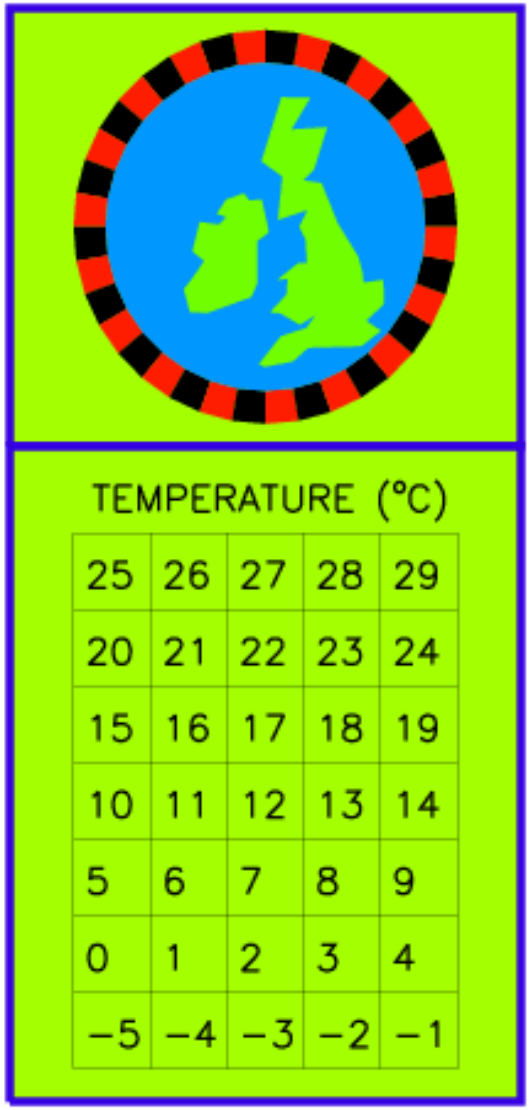
WEATHER ROULETTE

TEMPERATURE AT HEATHROW

TABLE MAXIMUM: £100

1982–99 CLIMATOLOGICAL ODDS

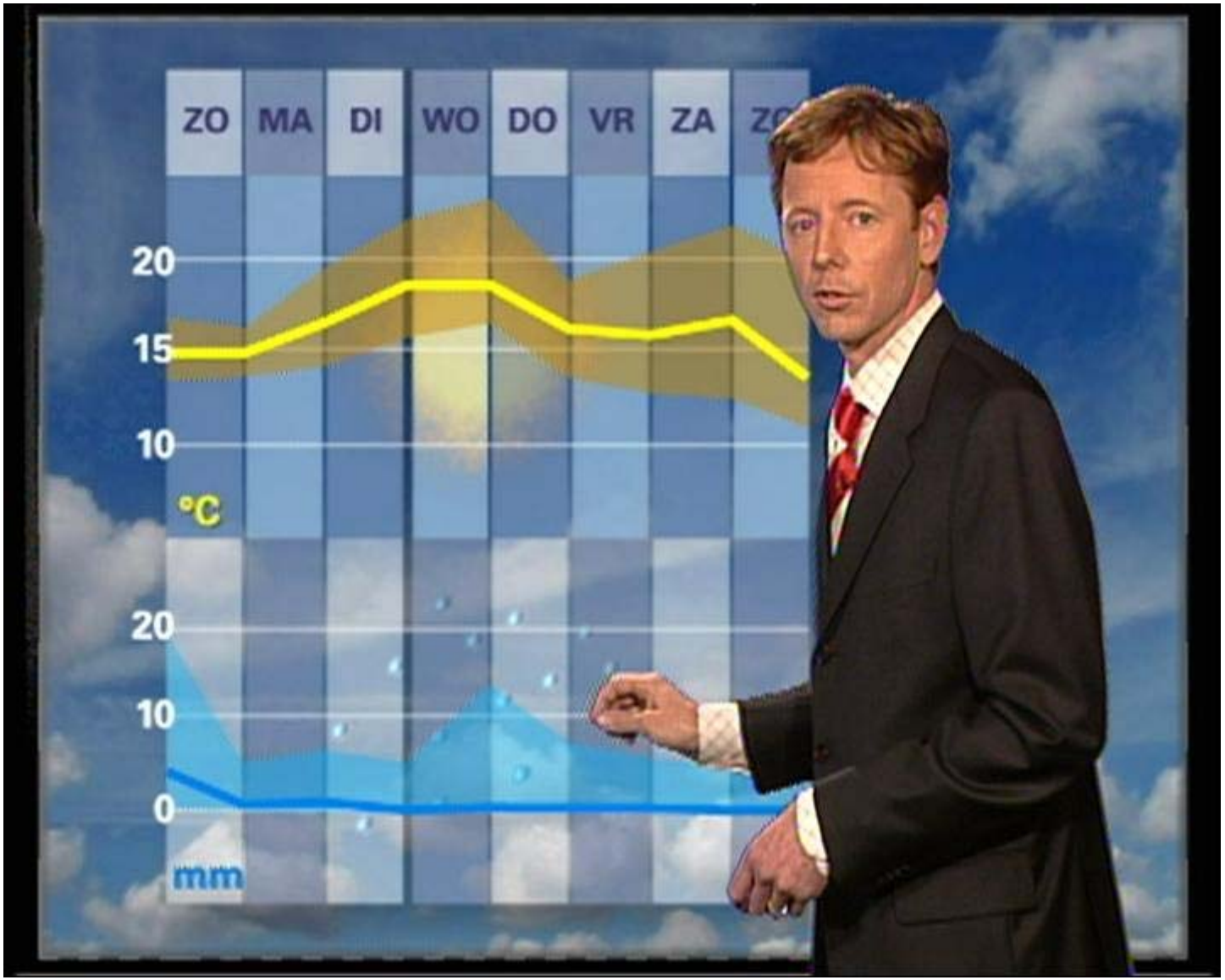




Medium range skill is probabilistic skill.

At lead times as long as 14 days any skill the forecasts will have will be skill **in a probabilistic sense**.

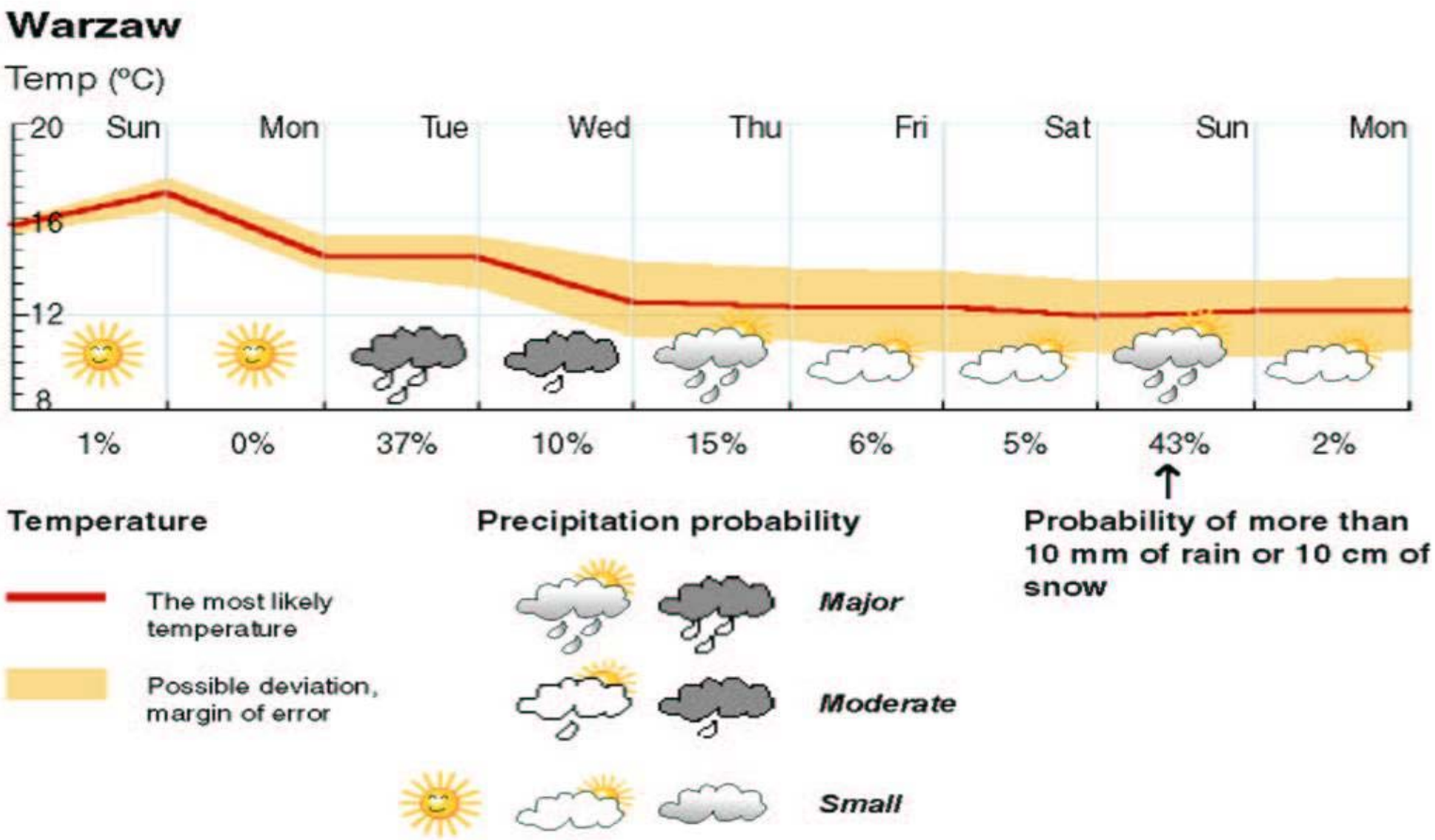
Any improvement in skill obtained due to THORPEX will be improvements in skill **in a probabilistic sense**.



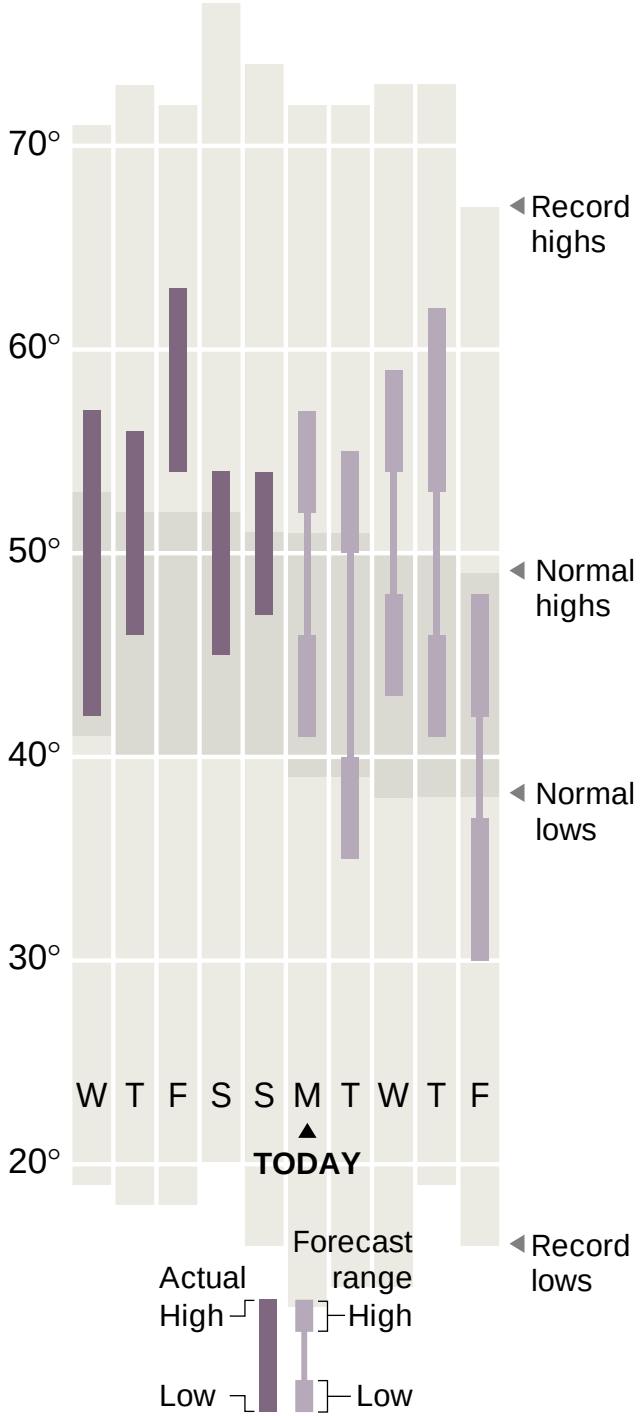
Thanks to Tim Palmer, ECMWF

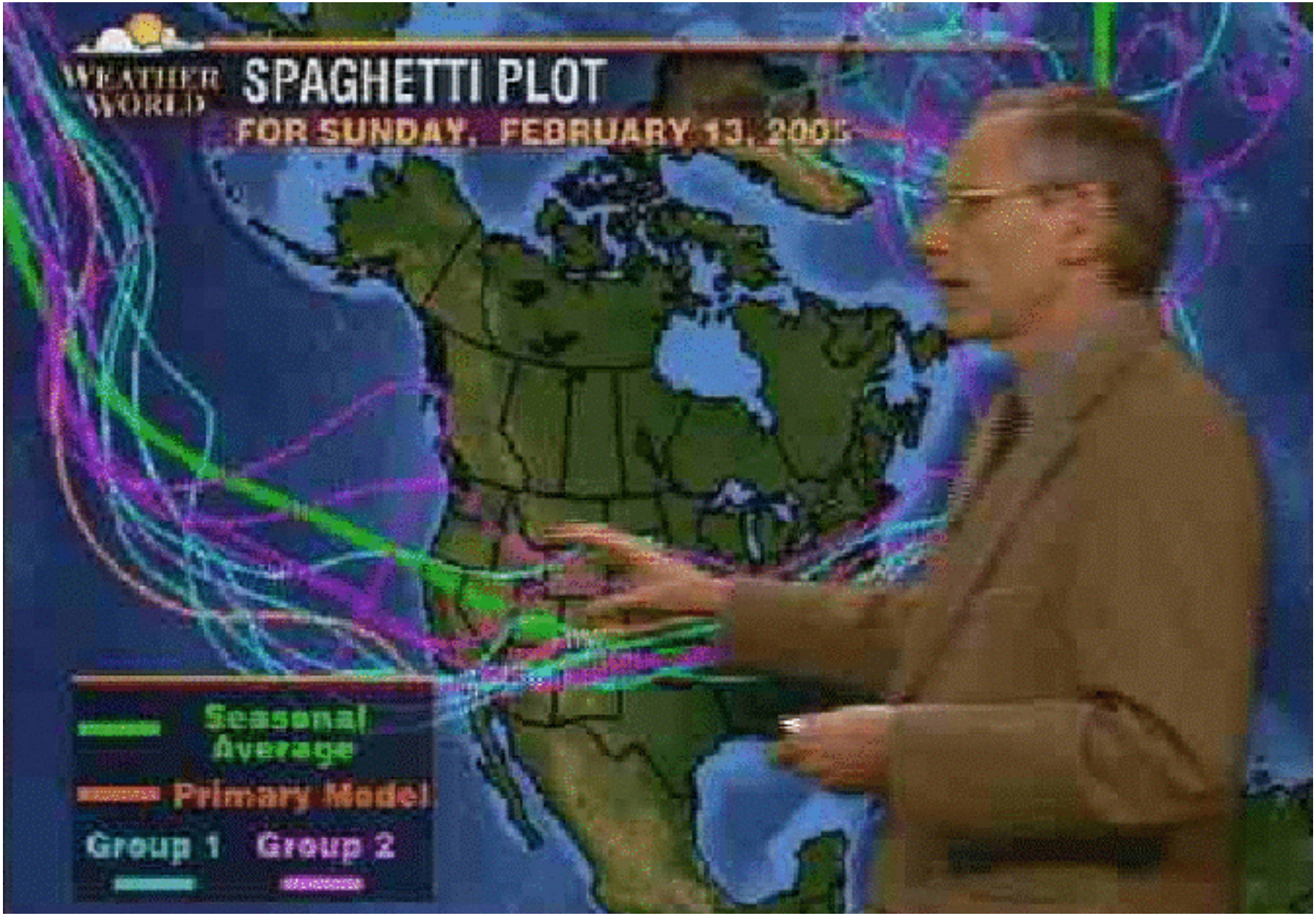
EPS - Epsgram

Temperature and precipitation probability for the next 9 days.



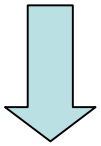
Thanks to Anders Persson, SMHI


70°
60°
50°
40°
30°
20°
Record highs
Normal highs
Normal lows
Record lows
W T F S S M T W T F
TODAY
Actual
High
Low
Forecast range
High
Low



WeatherWorld, Penn State/WPSX

content



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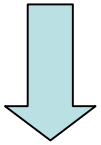

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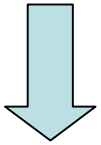

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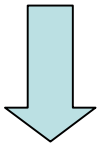
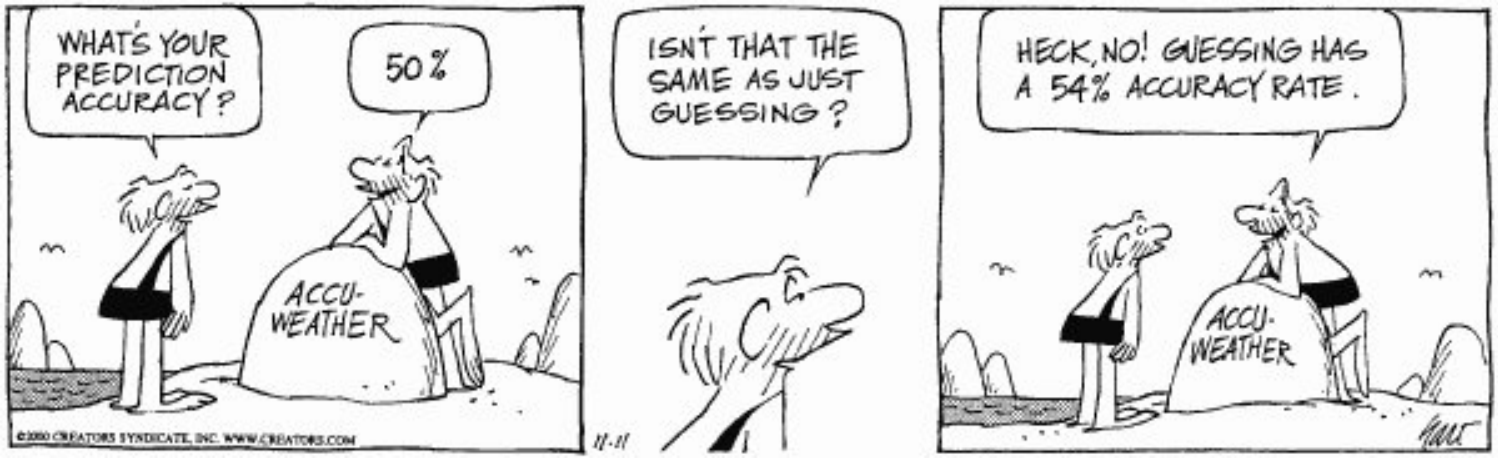
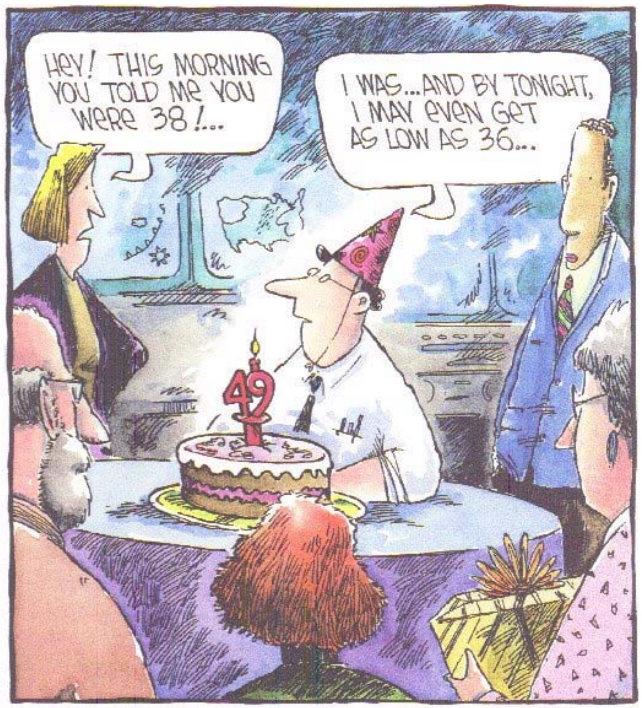


response





Meteorologists' Birthdays


LIVE 5 weather
Wasatch Front
7 DAY FORECAST
Mon Tue Wed Thu Fri SAT SUN
39 44 45 44 45 45 49
27 28 32 28 27 29 31

STATEMENT OF UNCERTAINTY

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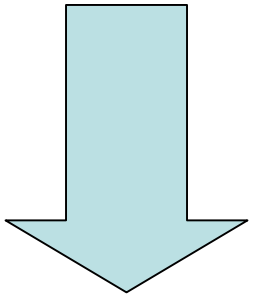
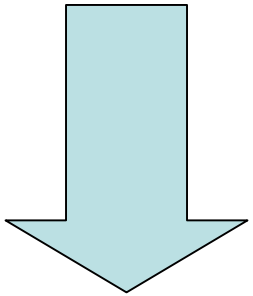
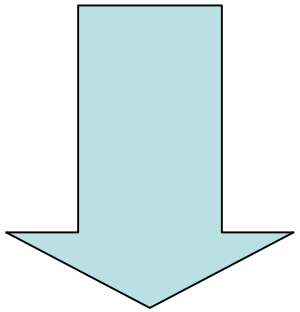


ACCOUNTABILITY

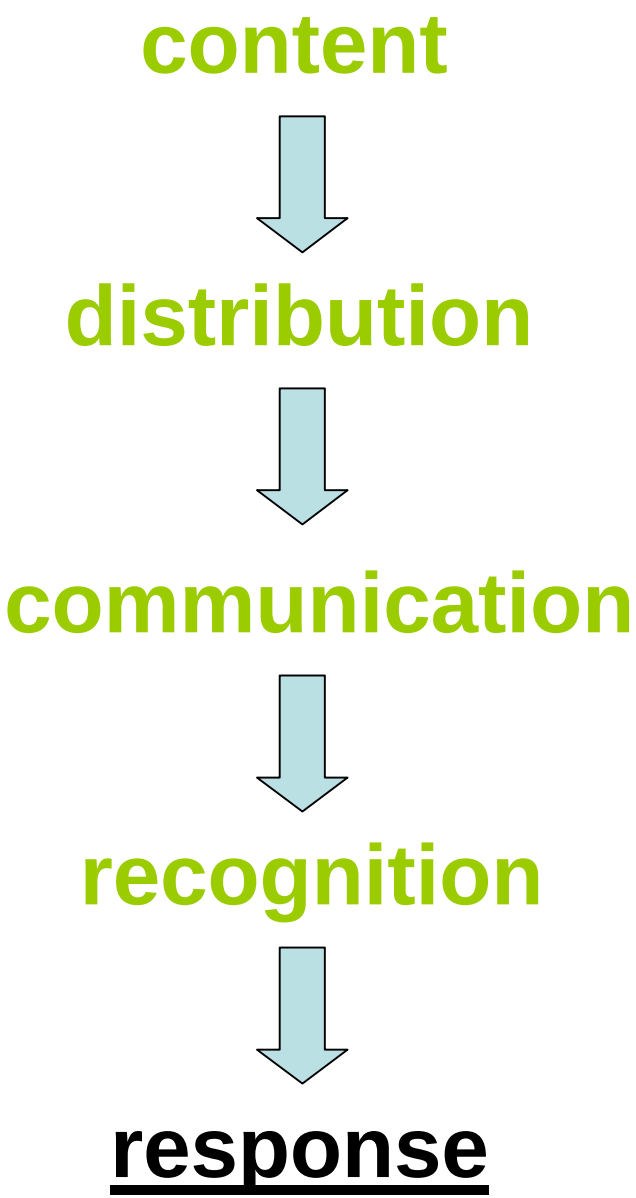
STATEMENT OF UNCERTAINTY



ACCOUNTABILITY



CREDIBILITY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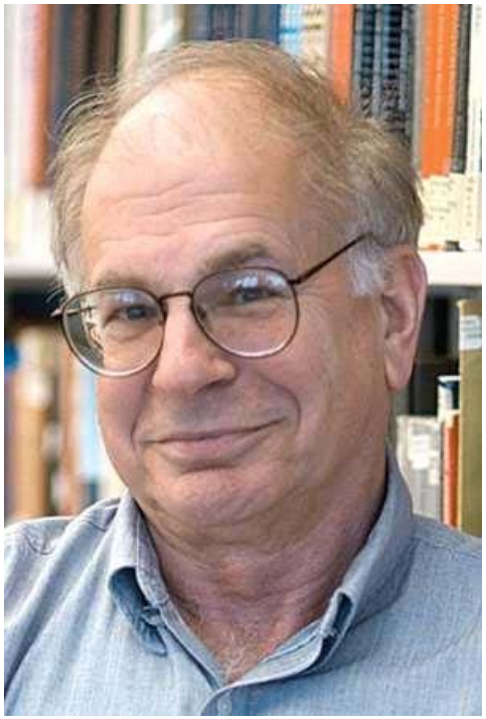
Response: Will users respond appropriately?

- Automated decision-making systems can behave like *homo economicus.*
- Most decisions are still made by *homo sapiens* who must integrate weather information with other information.
- Therein lies another possible weak link in the value chain.

"*Kahneman has thus demonstrated that in situations with uncertainty, human judgment often exploits rules of thumb which systematically contradict fundamental propositions in probability theory*."

From citation for Nobel Prize in Economics awarded to Daniel Kahnemann, 2002.



Tversky and Kahneman presented this problem to 156 **money managers**

	option	**A: d<30**	**B: 30<d<35**	**C: d>35**	**%**
PROBLEM I	f	$25K	$25K	$25K	68
	g	$25K	0	$75K	32
PROBLEM II	f’	0	$25K	$25K	23
	g’	0	0	$75K	77

PROBLEM I : $$p_B U(\$25K) + p_C U(\$25K) > p_C U(\$75K)$$

PROBLEM II: $$p_B U(\$25K) + p_C U(\$25K) < p_C U(\$75K)$$

Summary

- extraction of socio-economic benefits from THORPEX/TIGGE is inextricably linked to extraction of socio-economic benefits from probabilistic forecasts
- THORPEX/TIGGE will not provide widespread benefits until dissemination of forecast uncertainty is widespread
- even then, actual benefit will depend on human perceptions and responses, user training might enhance value of forecasts