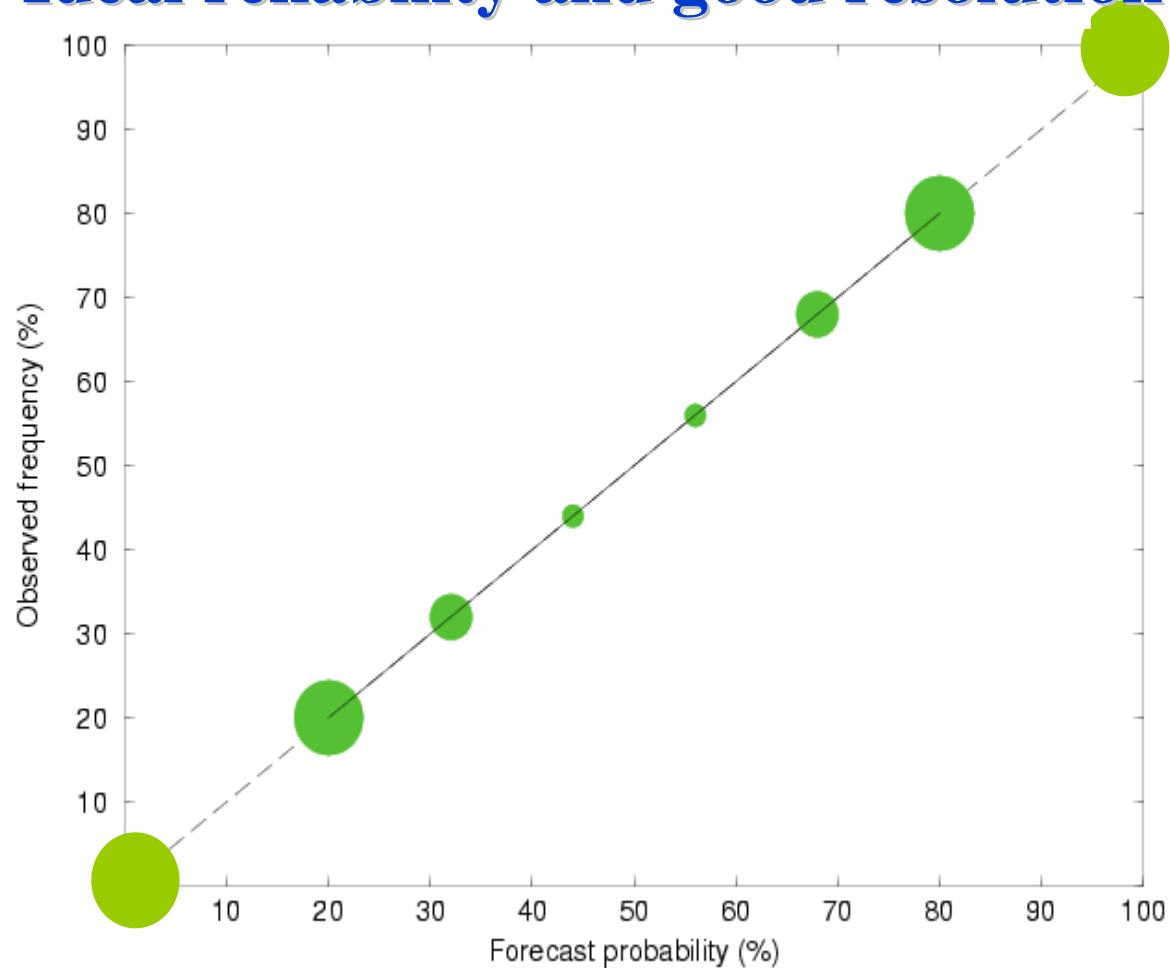
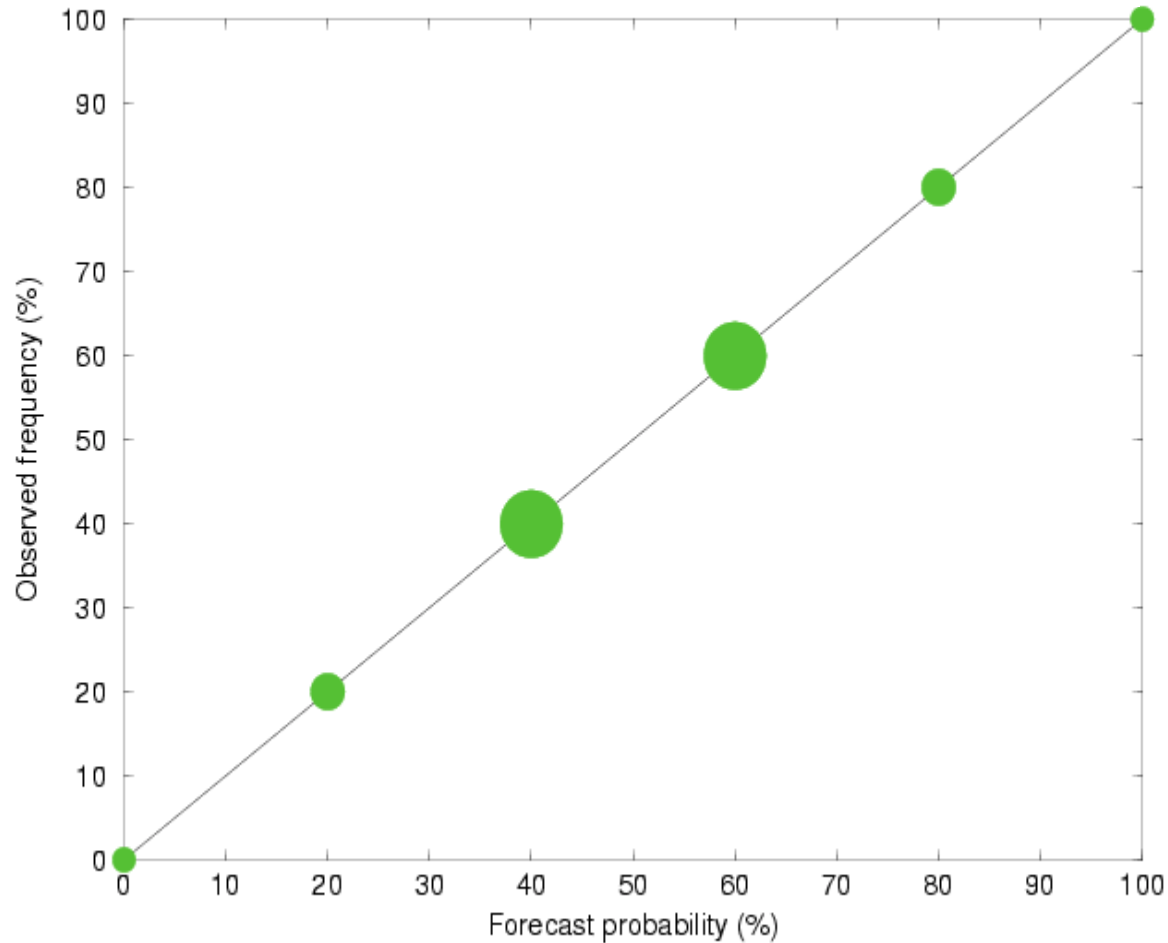


Verifying probabilities

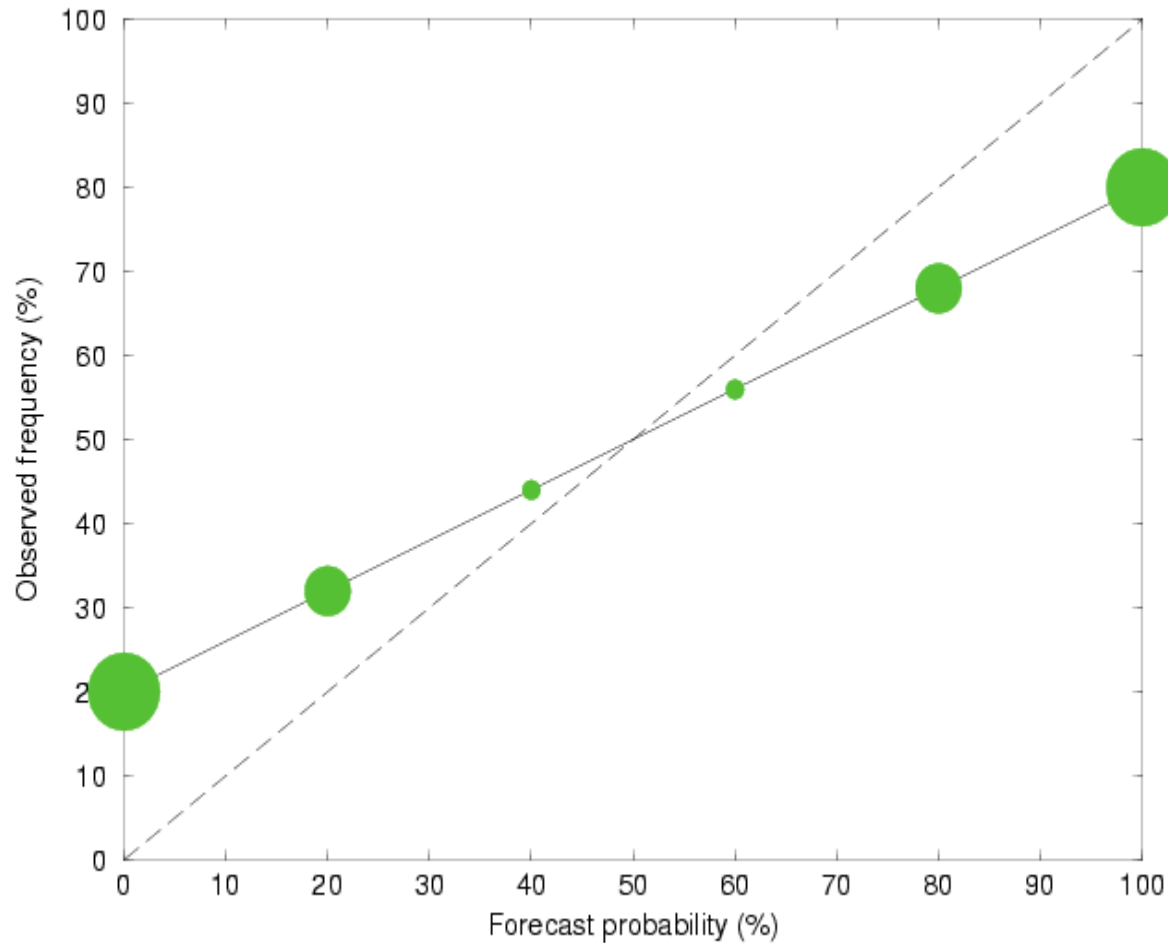
Ideal reliability and good resolution



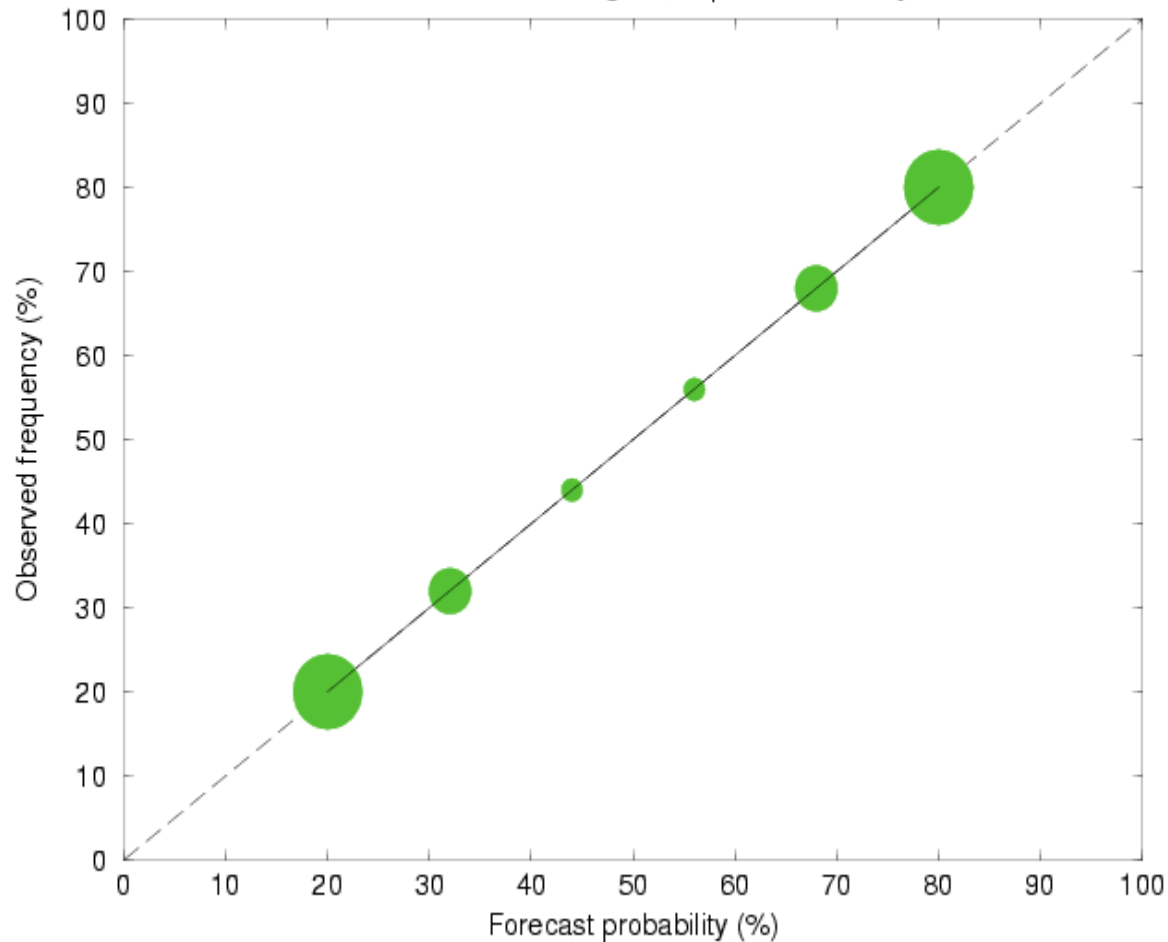
Good reliability, but poor resolution



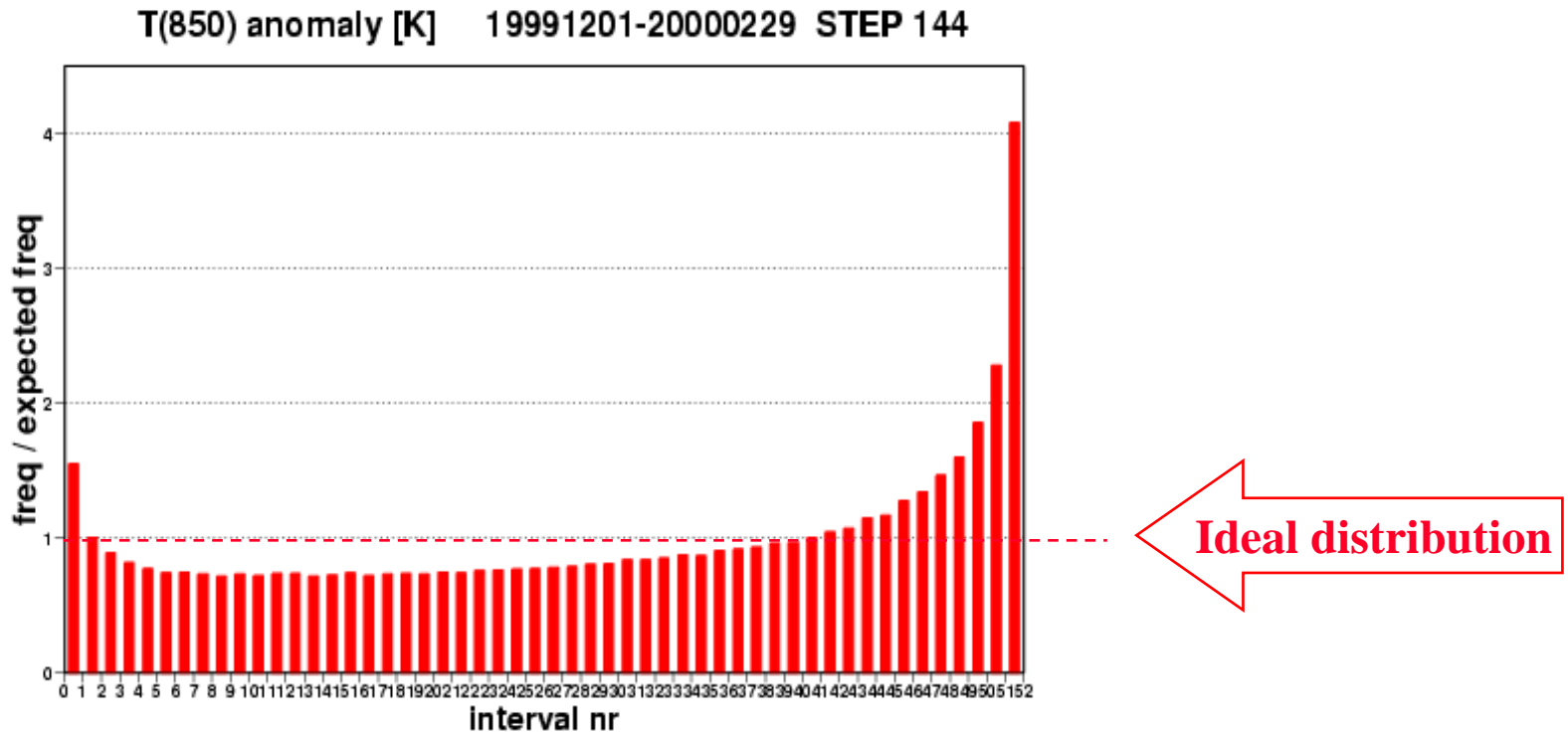
Poor reliability, but good resolution



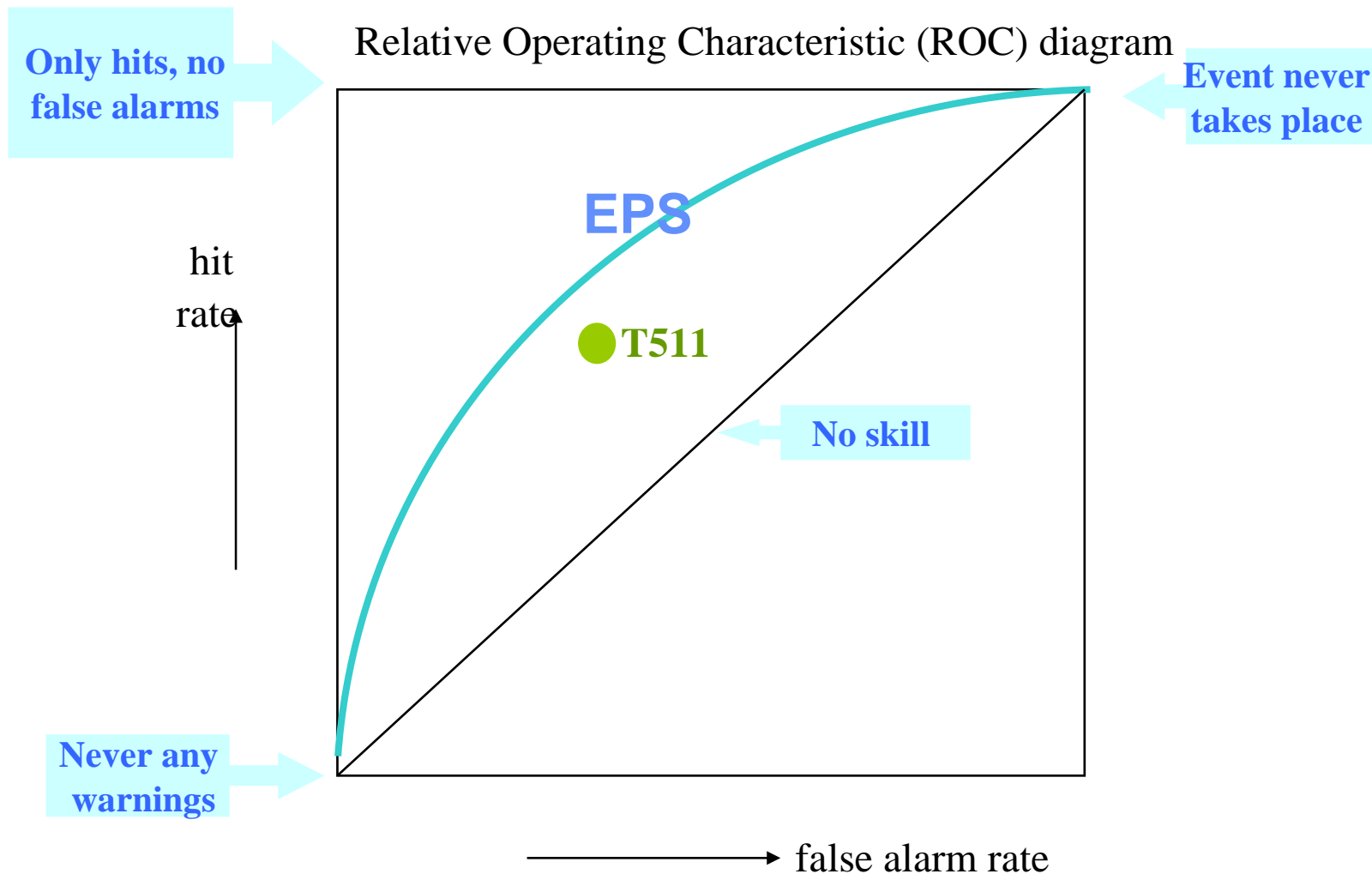
Calibration improves both the reliability and the resolution but to the expense of the range



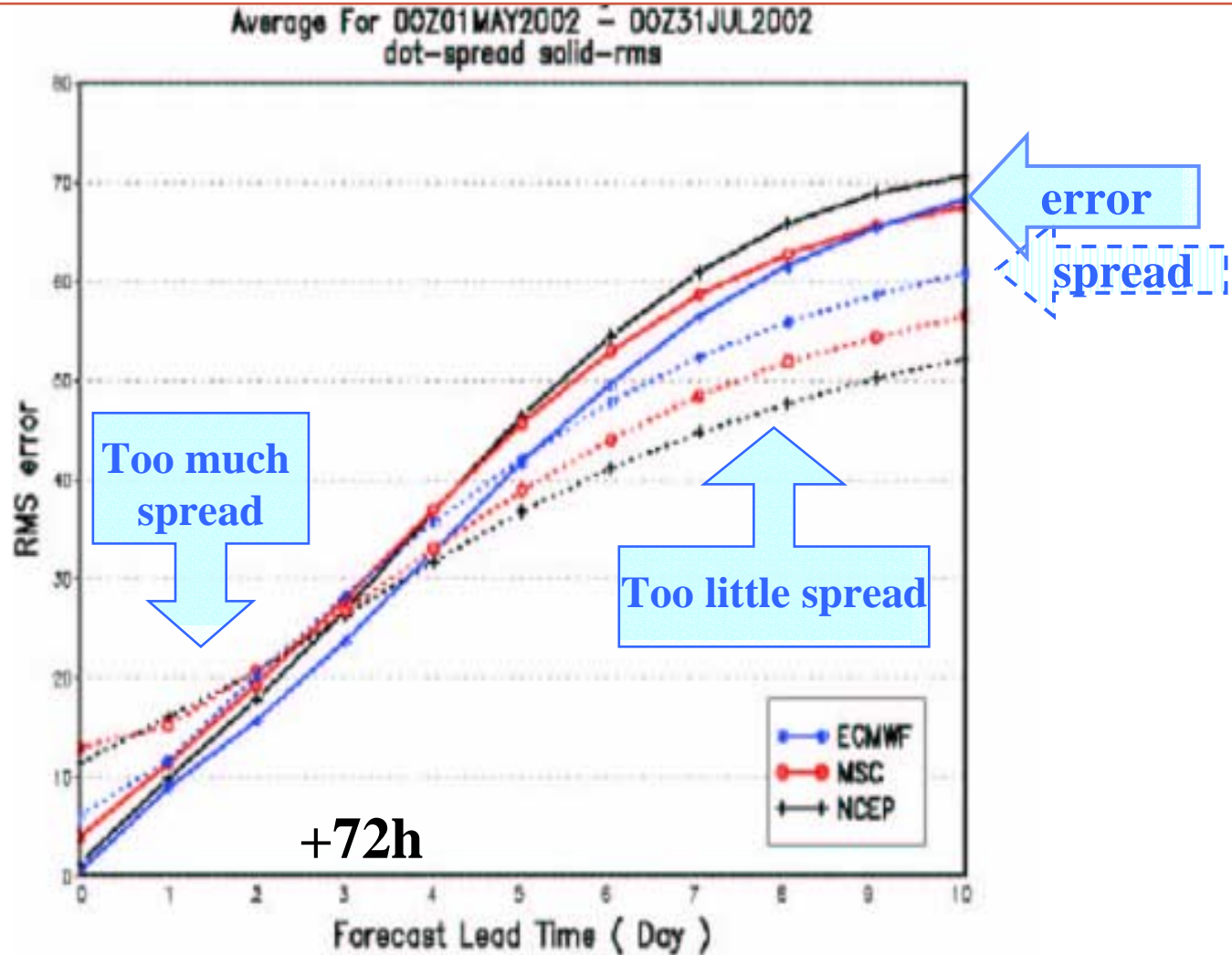
The Talagrand Diagram



$1/50 + 1/50 = 4\%$ should ideally lay outside the plume

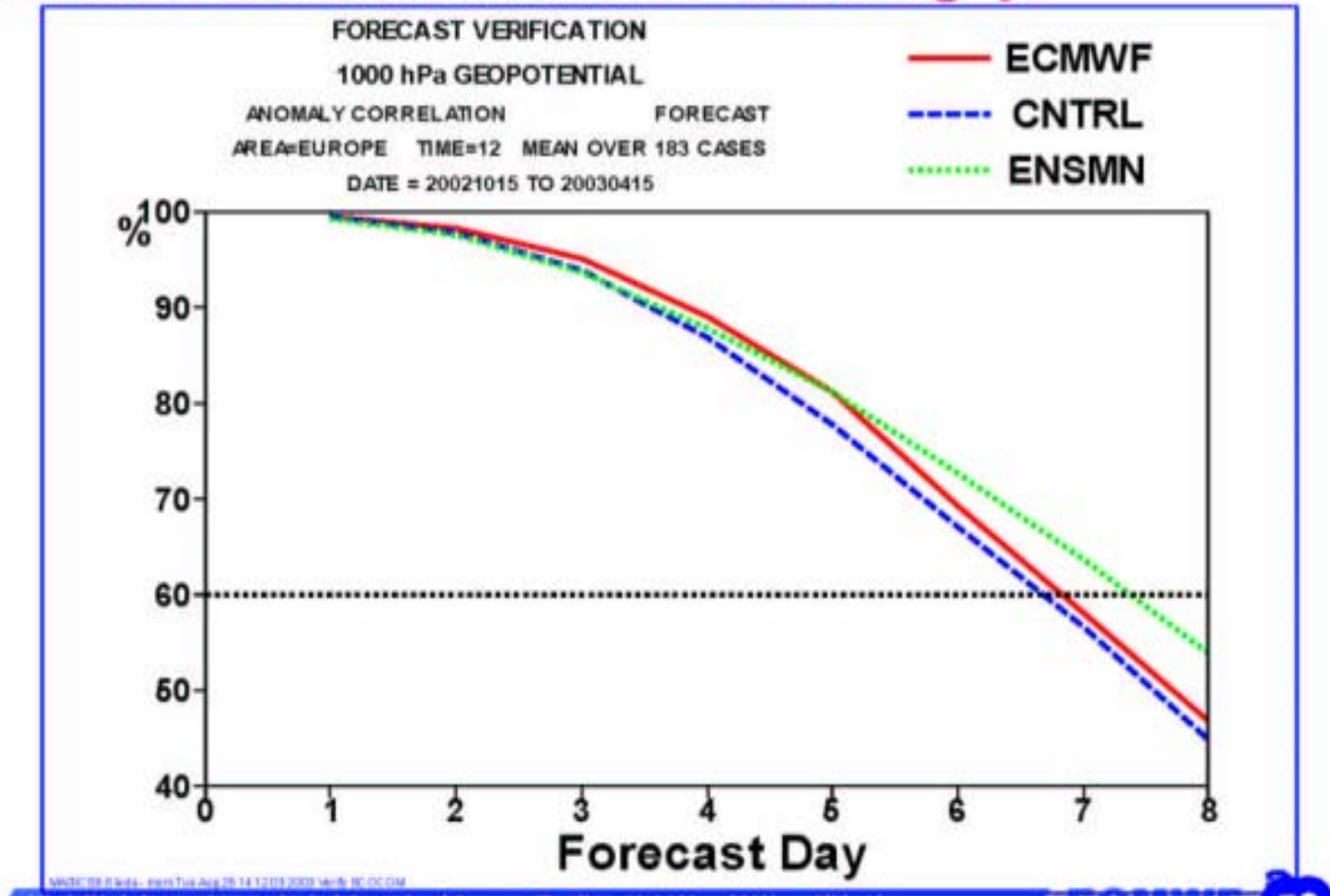


Common problem in EPS systems: under-spread



Problem in the ECMEF EPS system: T255 Control

Winter 2002-2003: the T511/T255 gap



Corso di previsioni meteorologiche

Trento, 1-5 Dec 2003 Anders Persson, SMHI

The Expected Monetary Value (EMV) = likely cost of protection + expected losses when no protection

EMV = cost \times number of rain forecast + loss \times unforecast rain

		Obs	
		rain	dry
Fc	rain	a	b
	dry	c	d

a + b = number of rain forecasts

c = number of unforecast rain

a + c = number of rain days = R

b + d = number of dry days = D

$$\boxed{\mathbf{R + D = N}}$$

Decision based only on climate:

Never protect $EMV = \text{loss} \times \text{number of rainy days} = L \times R$

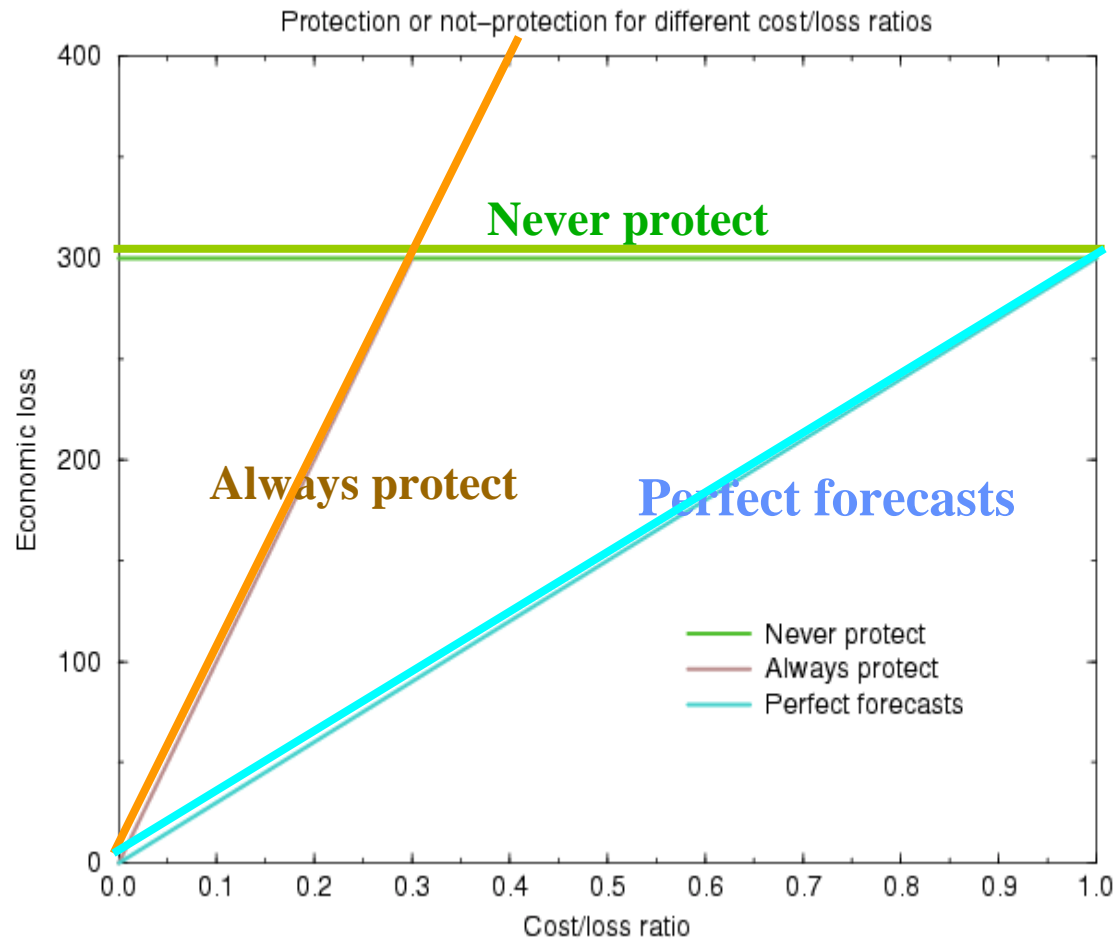
Always protect $EMV = \text{cost} \times \text{days} = C \times N$

Breaking point when $L \times R = C \times N$

Then $C/L = R/N$ = the climatological probability

Action should be taken when the risk,
either climatologically estimated or predicted
exceeds the user's personal cost-loss ratio

Costs when no weather forecasts are available



Three weather services A, B and C compete in the same area where it rains on average 3 days out of 10

Obs

rain dry

A

rain dry

Fc

rain dry

	2	1
	1	6

Very good forecasts

Obs

B

rain dry

rain

Fc

dry

	3	2
	0	5

Over-forecasts

C

Obs

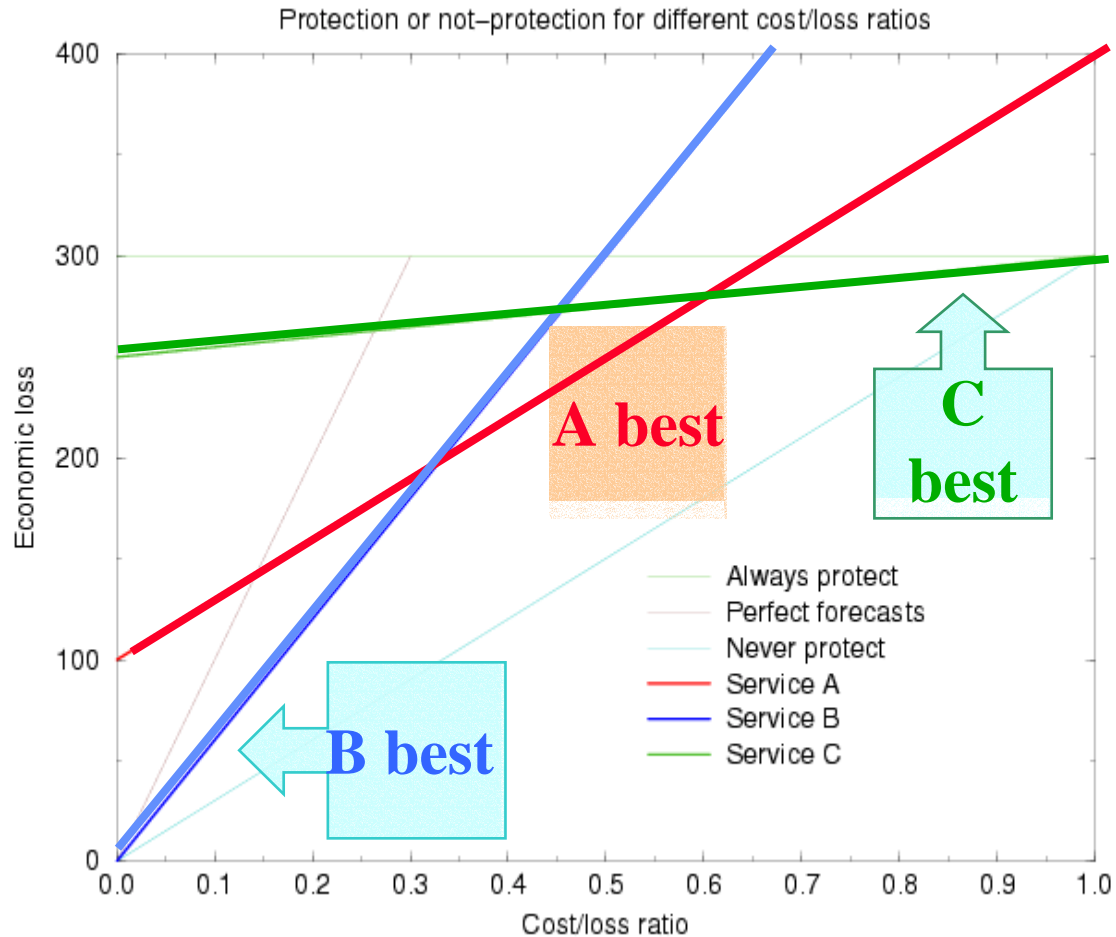
rain

dry

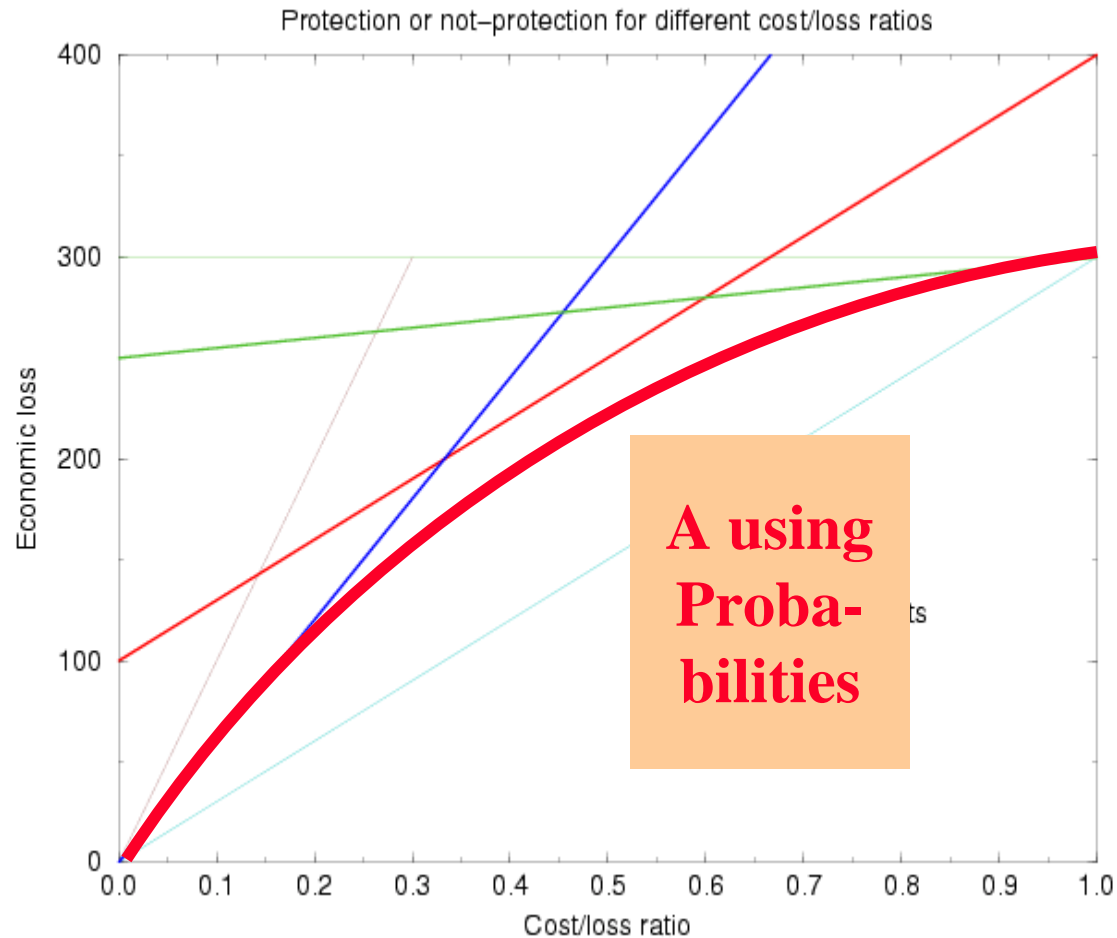
	0.5	0
Fc	2.5	7

Under-forecasts

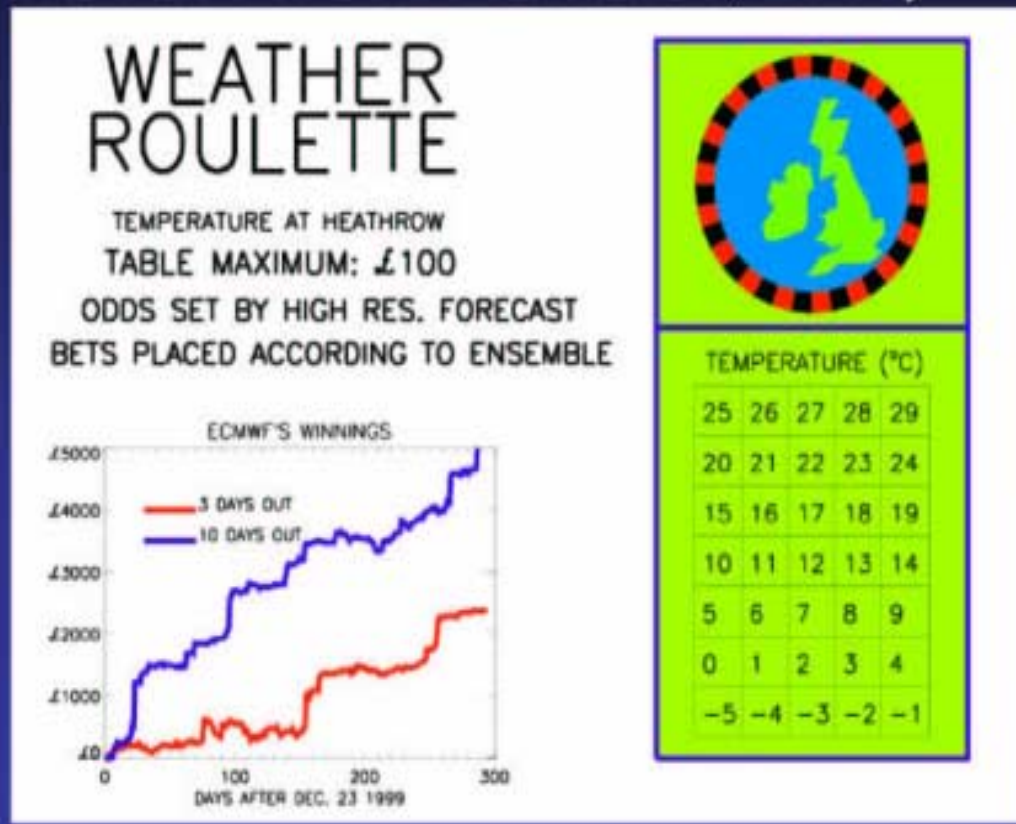
Costs when weather forecasts are available



Costs when weather forecasts are available



Value of EPS over high-res deterministic forecast for financial weather-derivative trading based on Heathrow temperature (Roulston and Smith, London School of Economics, 2003)



Decisions, utility and risk aversion

	Answer correct?	
	Yes	No
Take money	£500 000	£500 000
Give answer	£1 000 000	£32 000



- Will it rain on the golf course on Sunday morning?
- $U(£500\,000) > 0.5U(£1\,000\,000) + 0.5U(£32\,000)$
- Risk averse
 - Protect at lower probability threshold than C/L