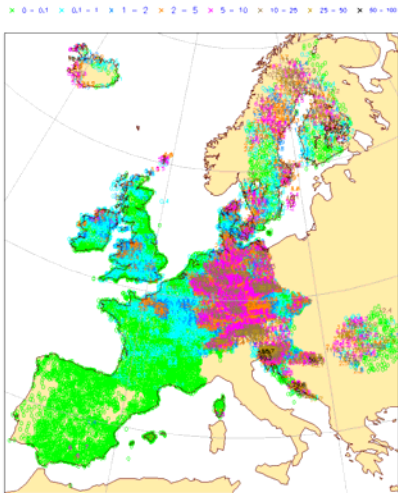


Could a perfect model ever satisfy the forecaster?

On grid-box versus point forecast



A thought experiment by

Ervin Zsoter - ECMWF & Martin Goeber - DWD

David Richardson - ECMWF

Acknowledgement: *Anna Ghelli* for providing the data

The problem

FORECAST

„...the model predicts 20 mm,
therefore there is even some
risk of 50 mm...“

Fact: model value = grid box mean
Task: point forecast

„...the model predicted 20 mm,
but we observed 50 mm
in Stratford upon Point,
thus the **model was wrong**...“

EVALUATION

Framework of a thought experiment

perfect model
imperfectly verified

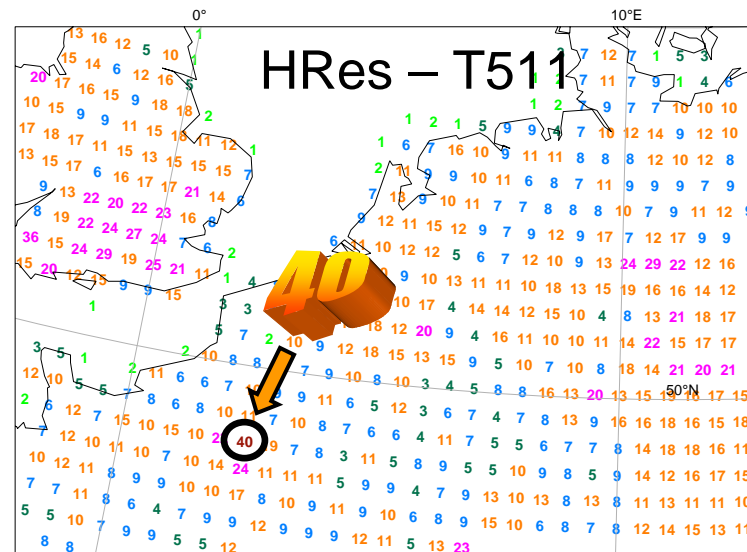
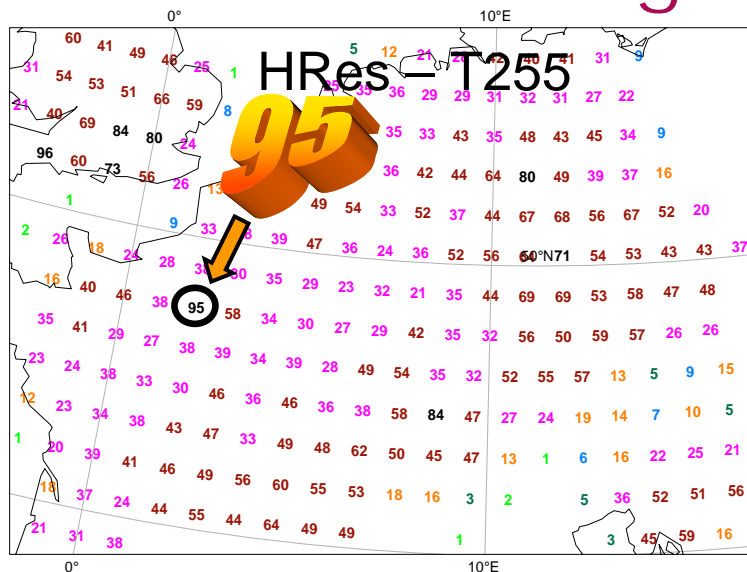
Perfect model value = grid box mean of **observations**

„**truth**“ = maximum observation in grid box

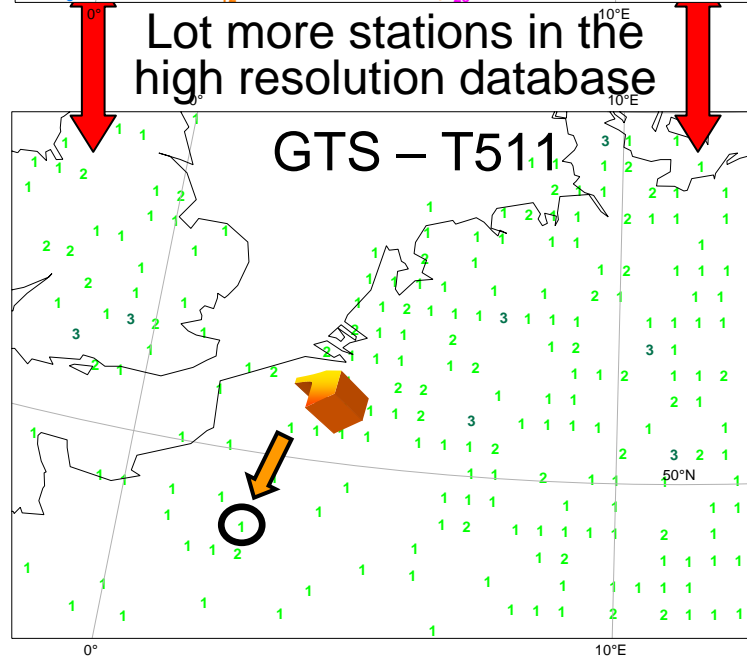
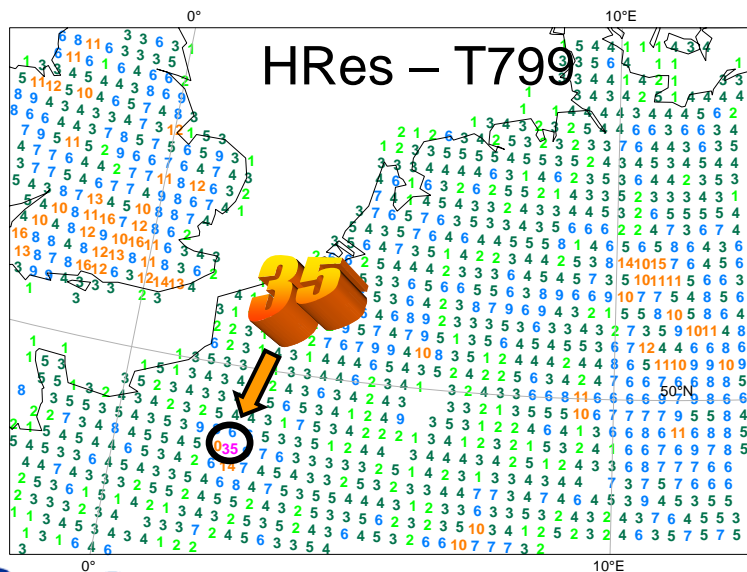
Observations

- European rain gauge network of daily (24-hour) accumulations
- 5 years of data
- Very high spatial resolution: synop obs + climate +
- Results with T255, T511 and T799 grid box size
- Minimum number of observation in grid box required

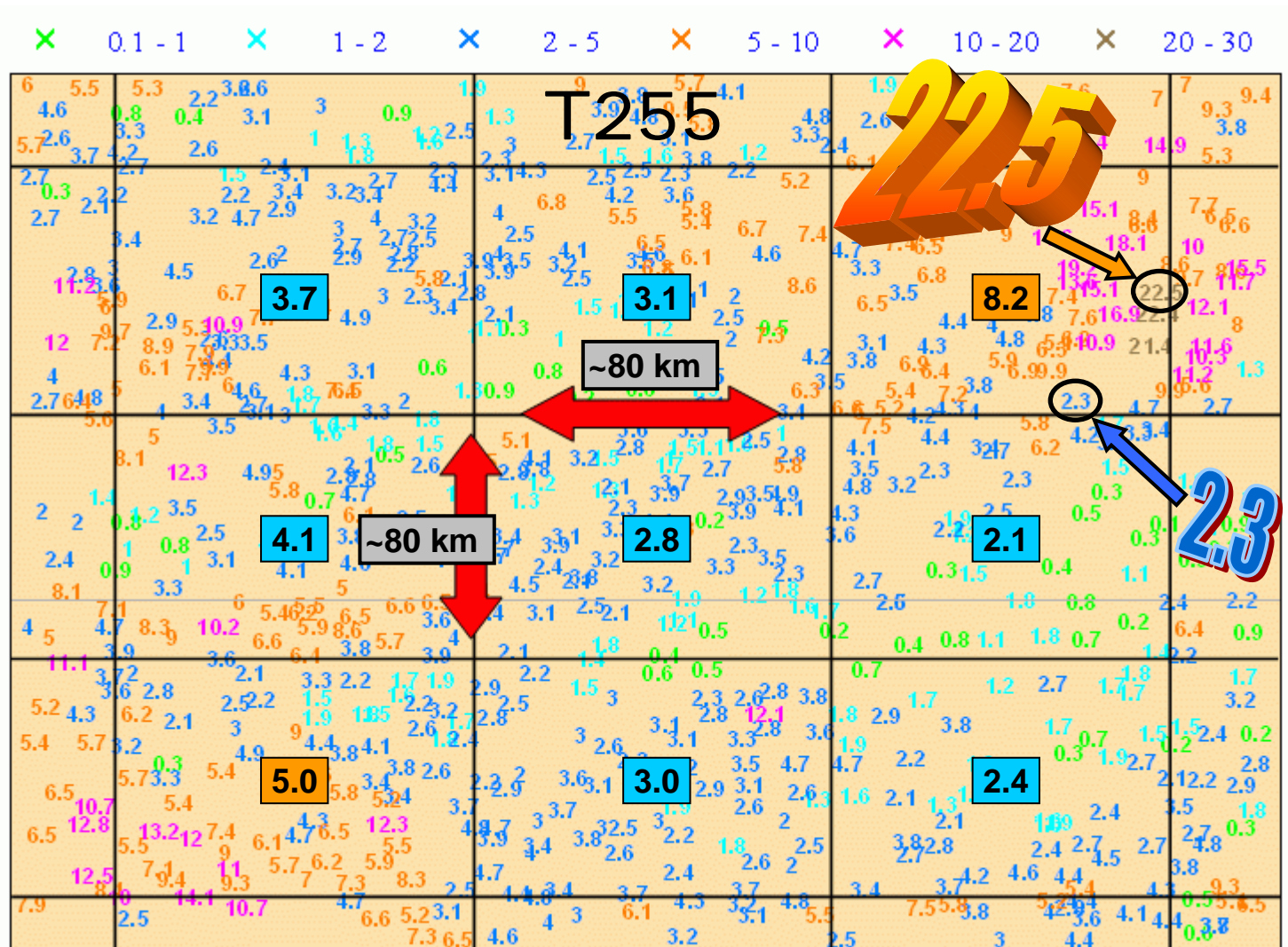
Number of gridded observations



Lot more stations in the high resolution database



Example of the sub-grid scale variability

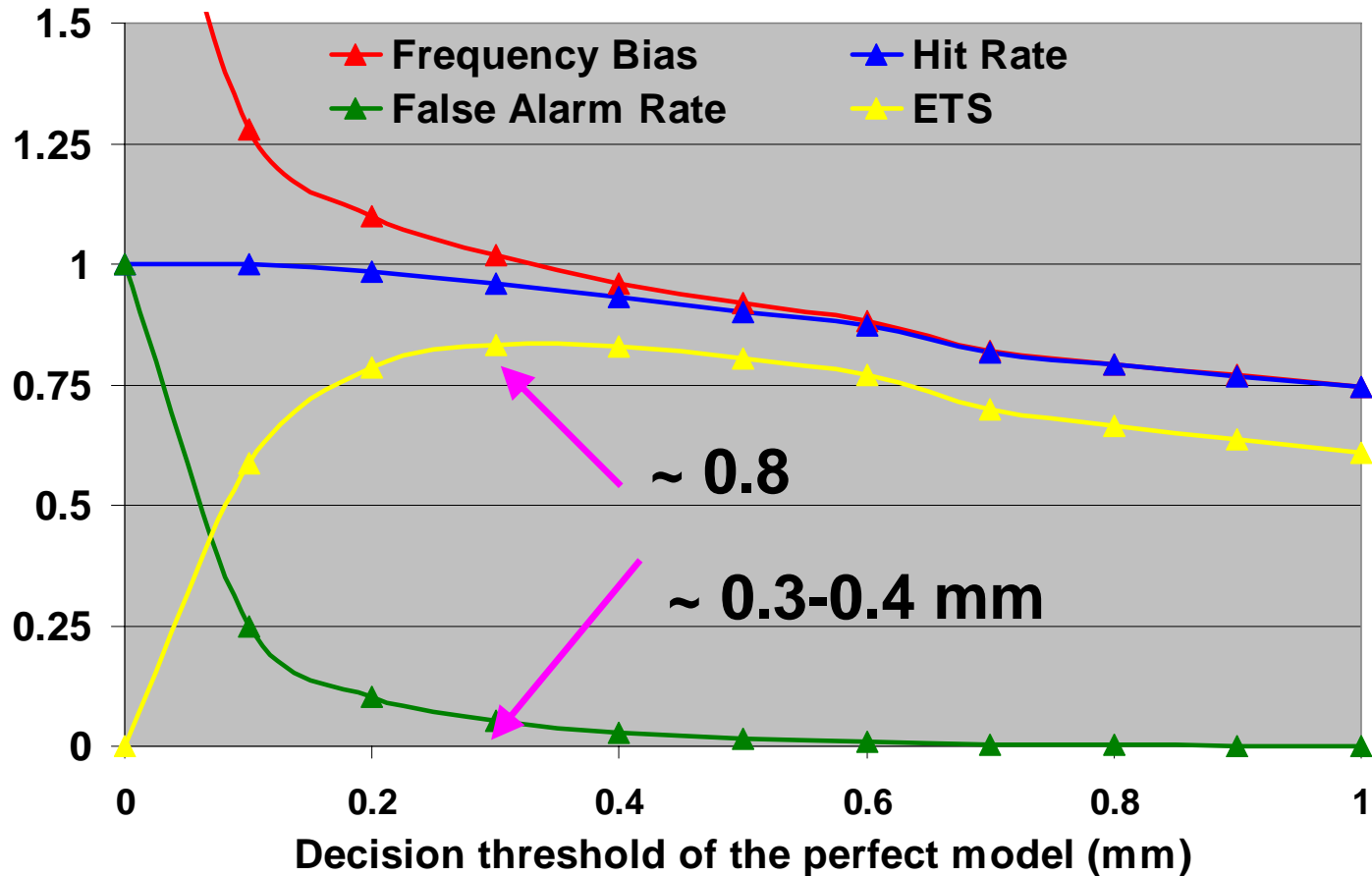


Signal Detection Statistics

winter (6 months), $tp_{24} > 1$ mm, T511

Event = *Maximum precipitation in grid-box* > 1 mm/24h

Forecast = "*perfect model*" = grid-box average of observations

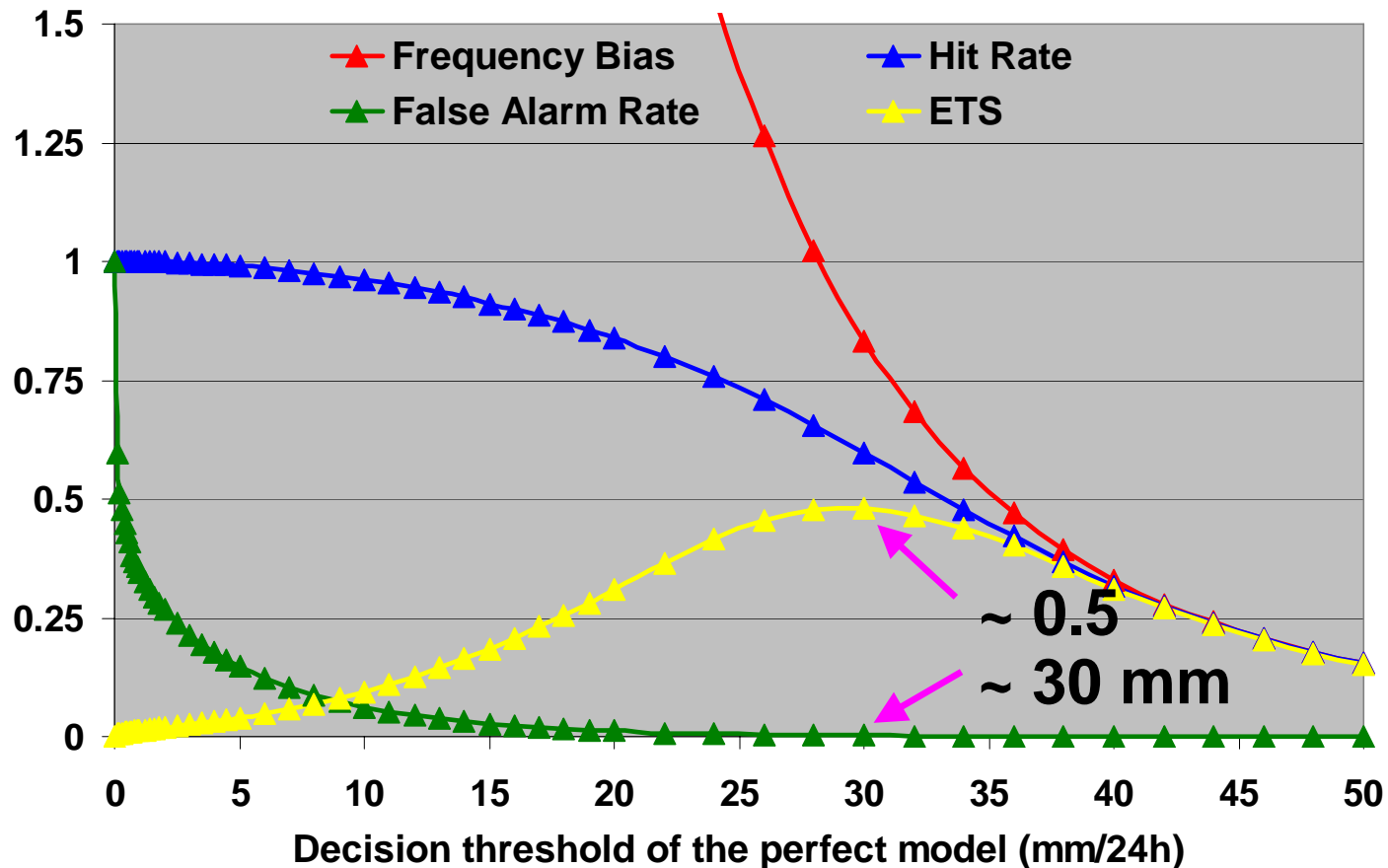


Signal Detection Statistics

winter (6 months), $tp_{24} > 50$ mm, T511

Event = *Maximum precipitation in grid-box* > 50 mm/24h

Forecast = "*perfect model*" = grid-box average of observations

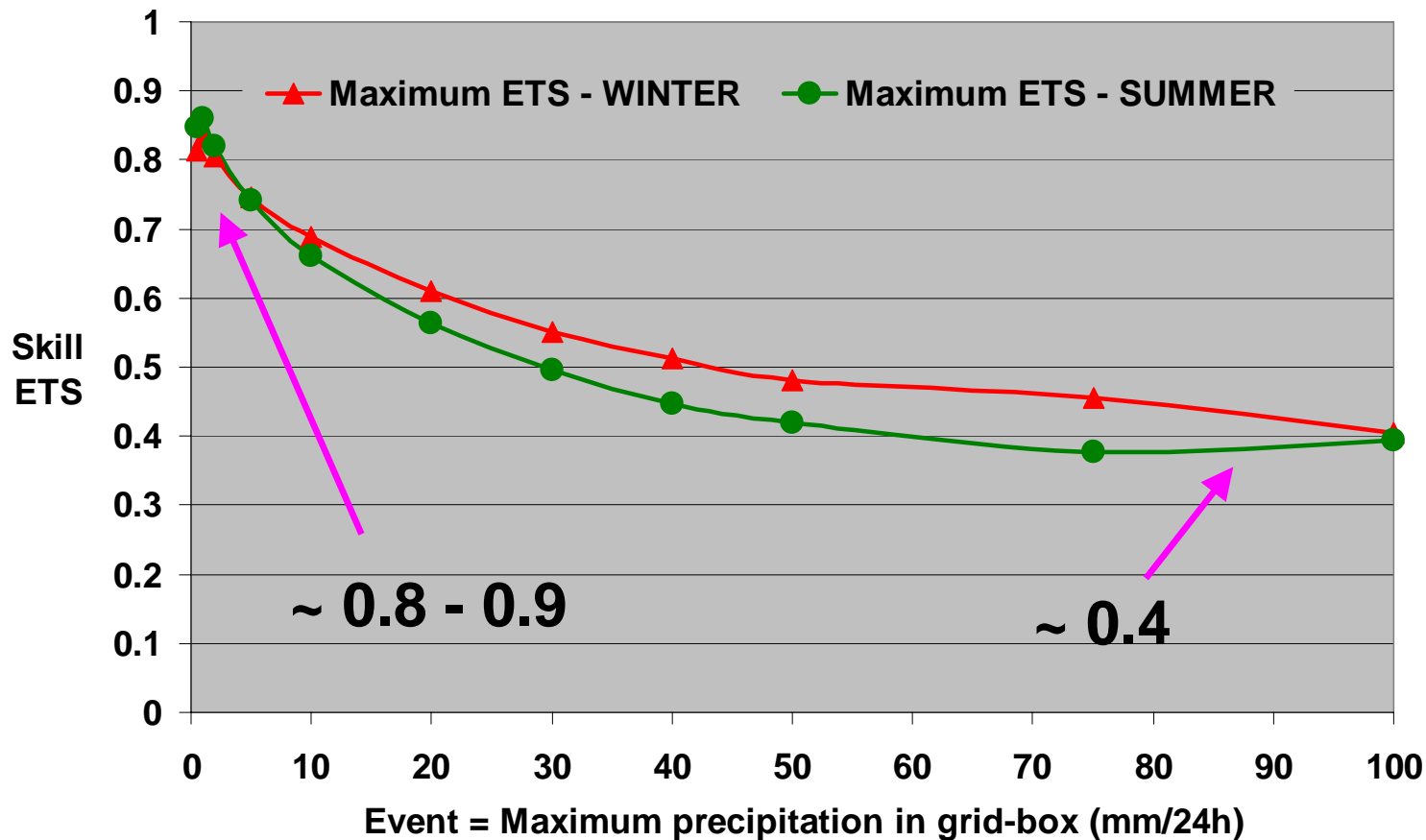


Maximum attainable ETS

Winter versus Summer (6-6 months), T511

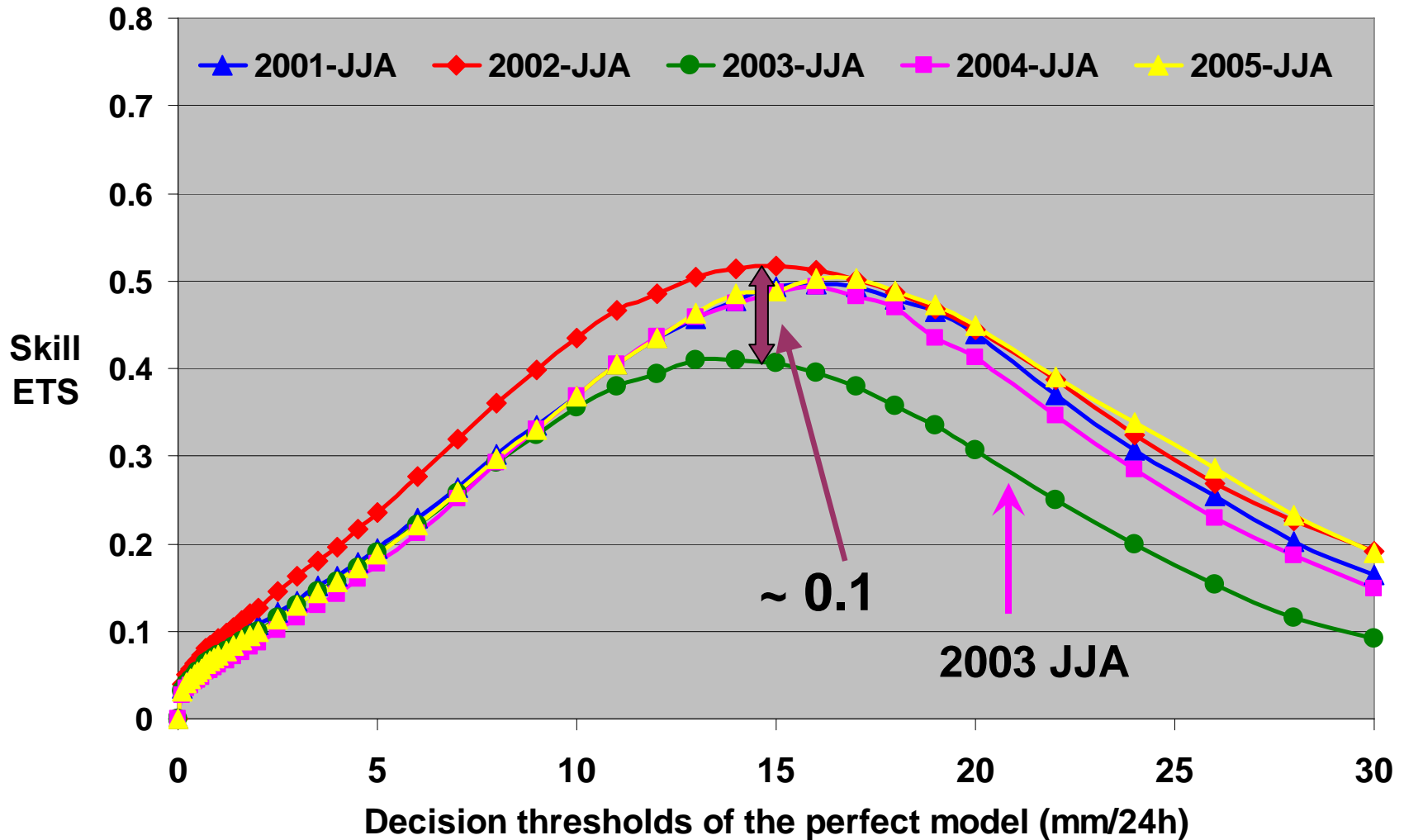
Event = *Maximum precipitation in grid-box > various thresholds*

Forecast = "*perfect model*" = grid-box average of observations

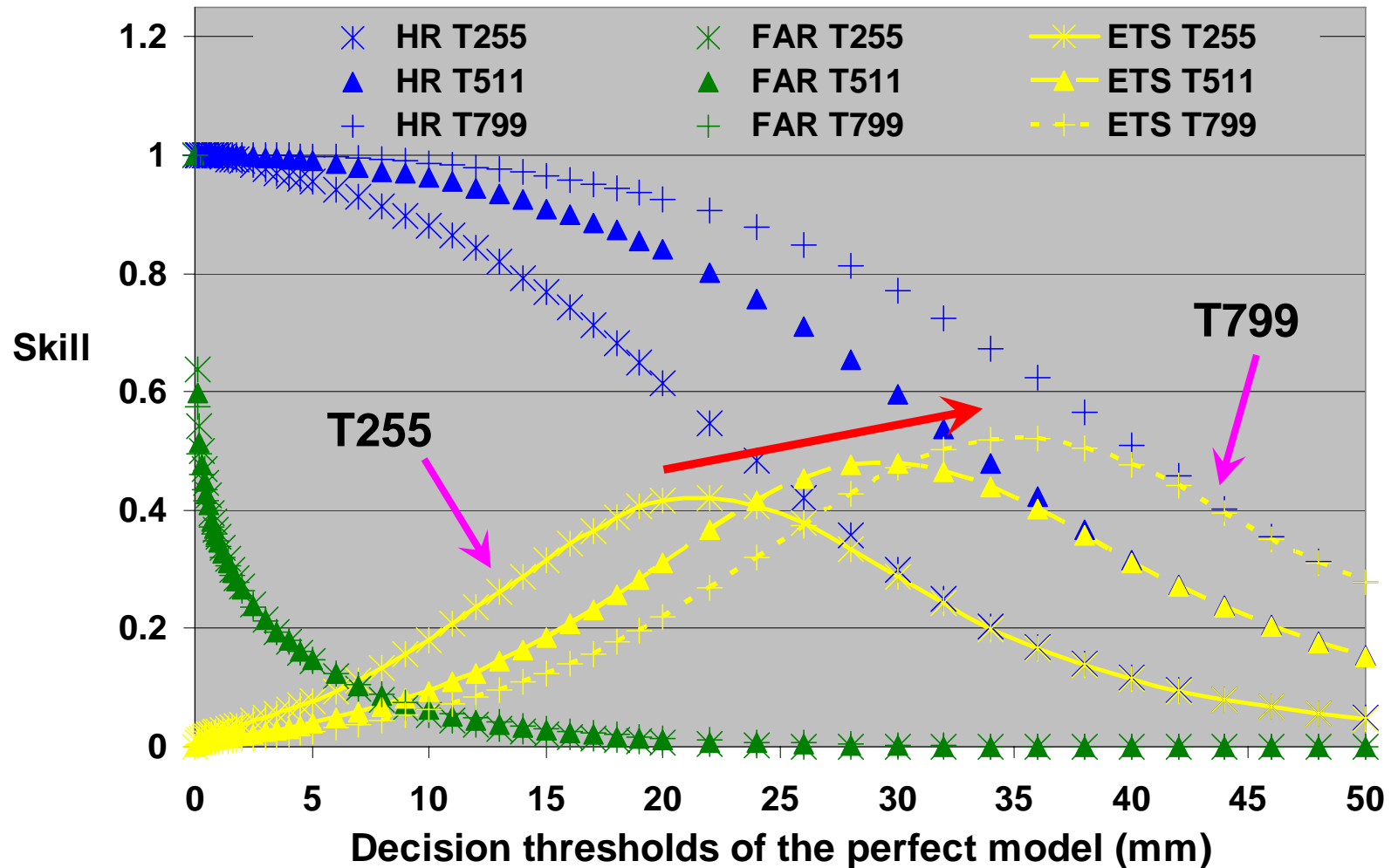


Inter-annual variability

Summer seasons (JJA), tp24 > 30 mm, T511

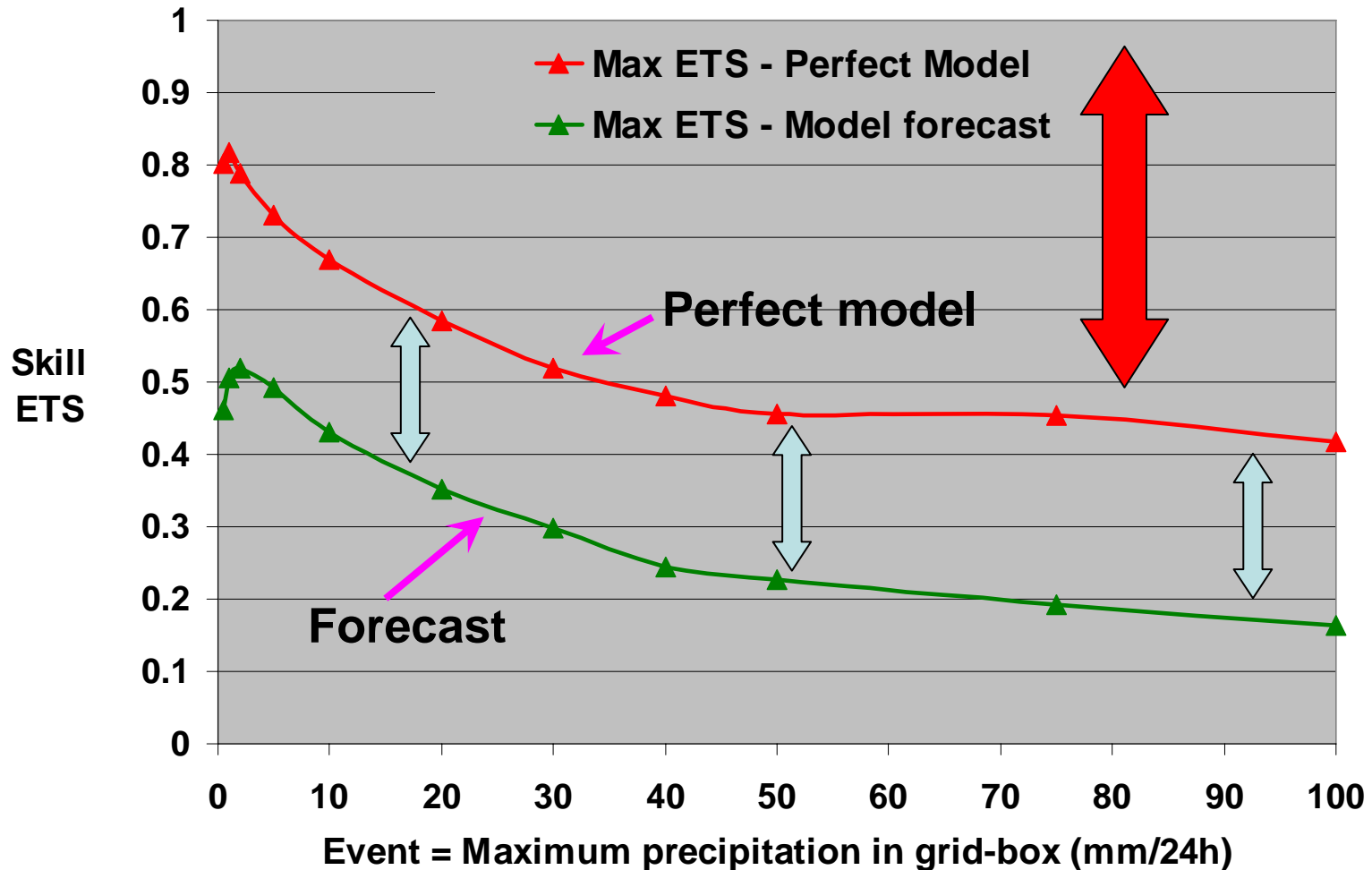


Different resolutions T255 - T511 - T799 winter (6 months), tp24 > 50 mm



How about real model forecasts?

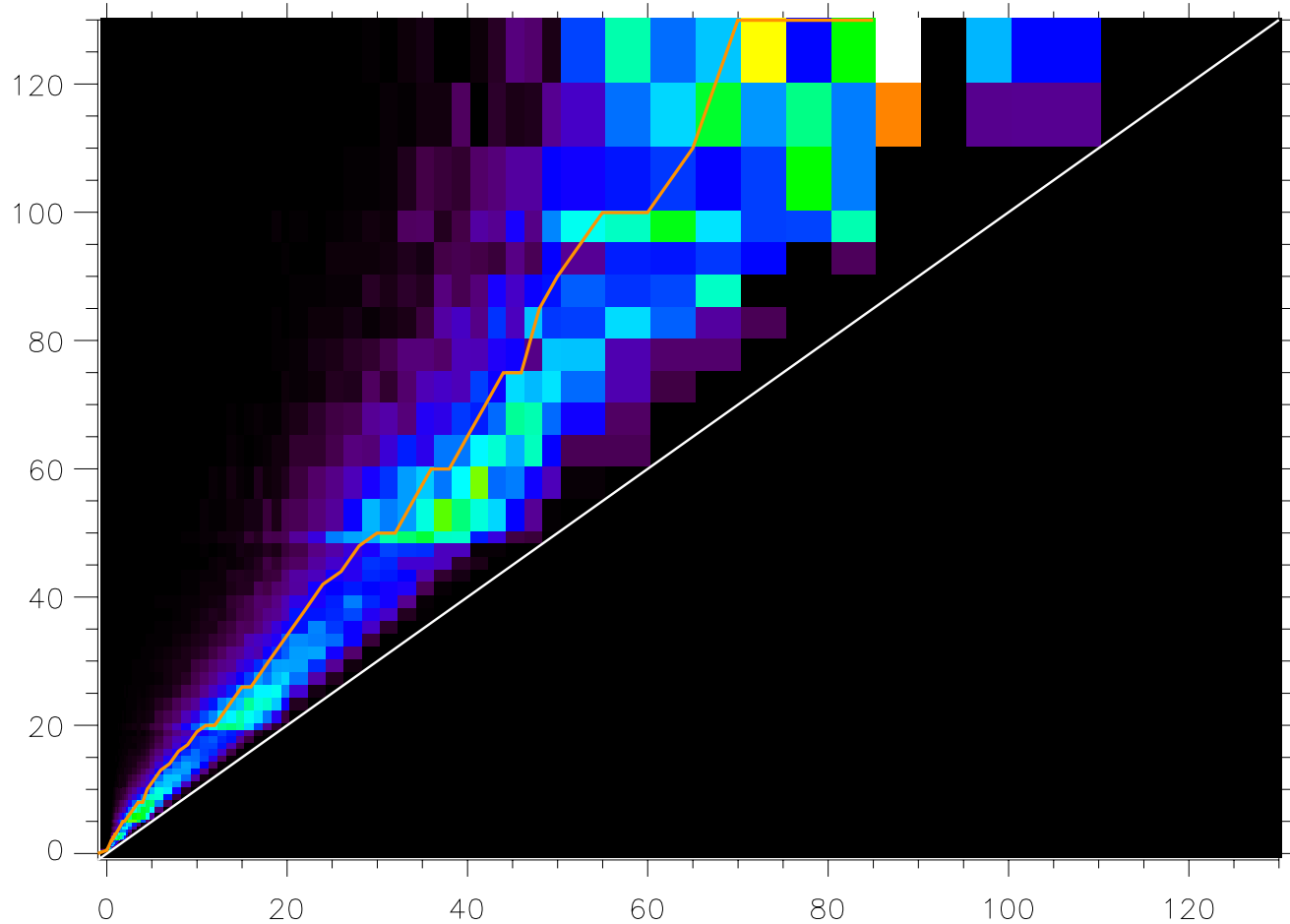
Maximum ETS, Winter of 2004-2005 (DJF), T511





Thank you !

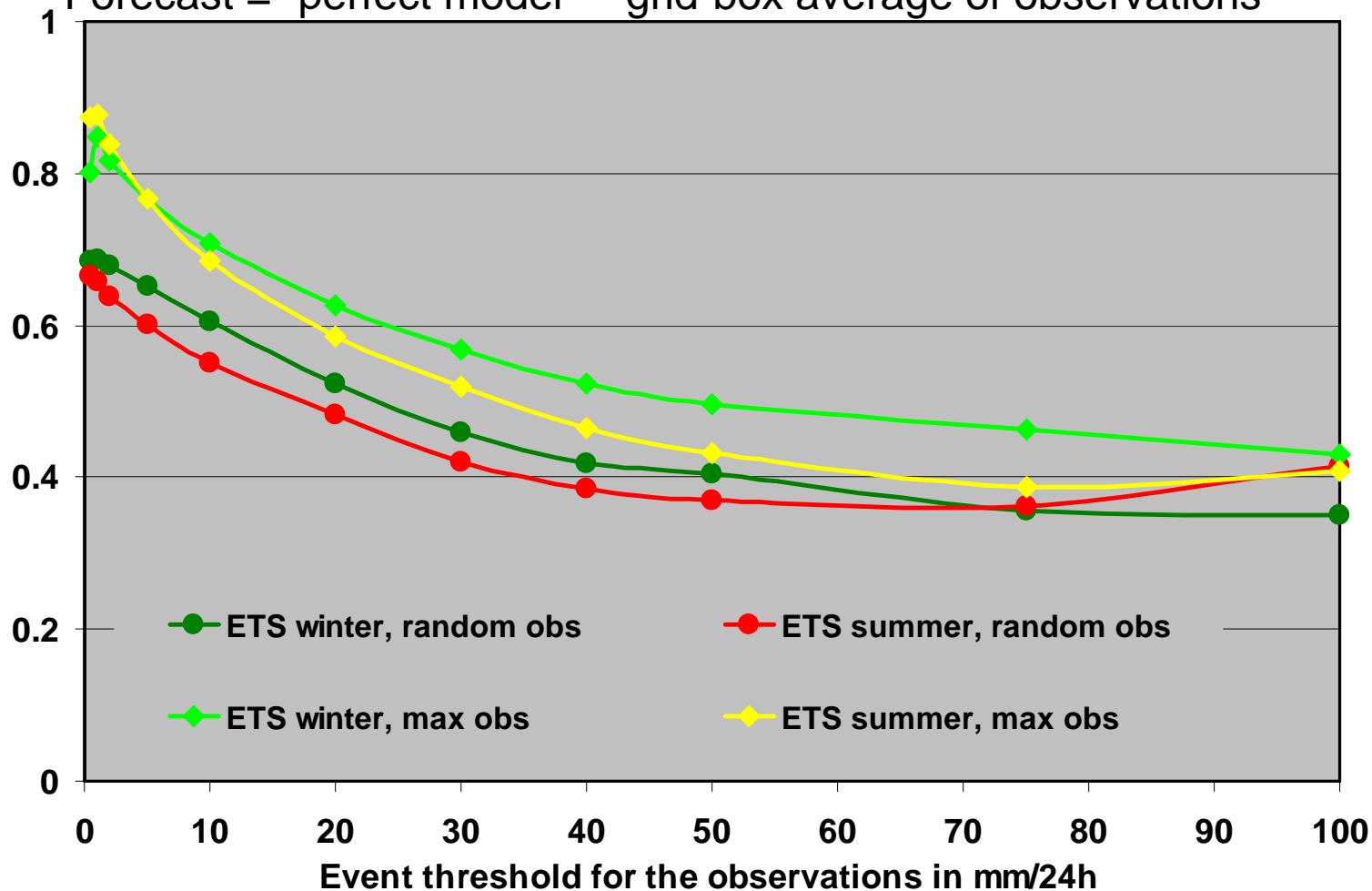
Joint pdf of the perfect model and grid-box maximum values



Overall max scores, Winter versus Summer (6-6 months), T511, 2001.01.01 – 2005.12.31

Event = Randomly selected versus max observation in grid-box > x mm/24h

Forecast = "perfect model" – grid-box average of observations

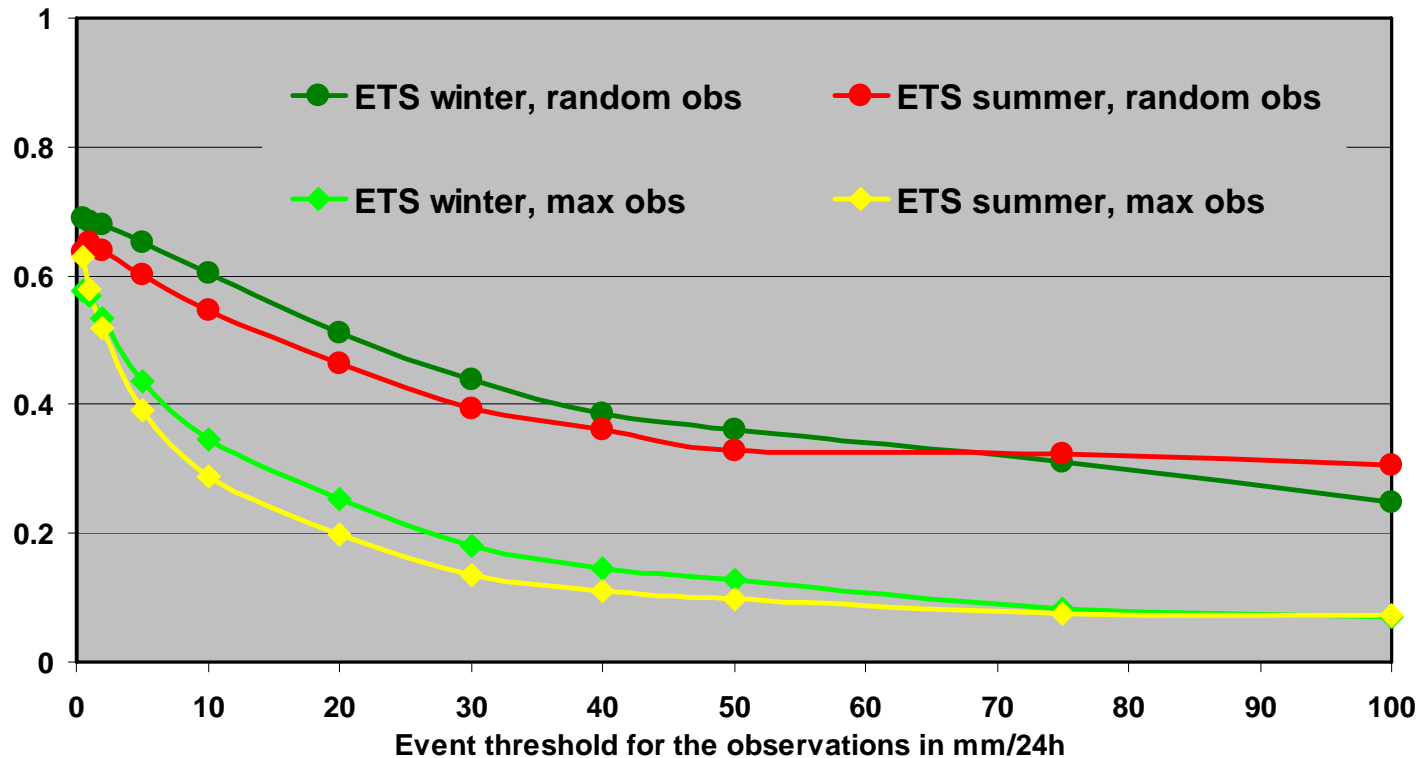


Scores for matching thresholds, Winter vrs Summer

(6-6 months), T511, 2001.01.01 – 2005.12.31

Event = Randomly selected versus max observation in grid-box > x mm/24h

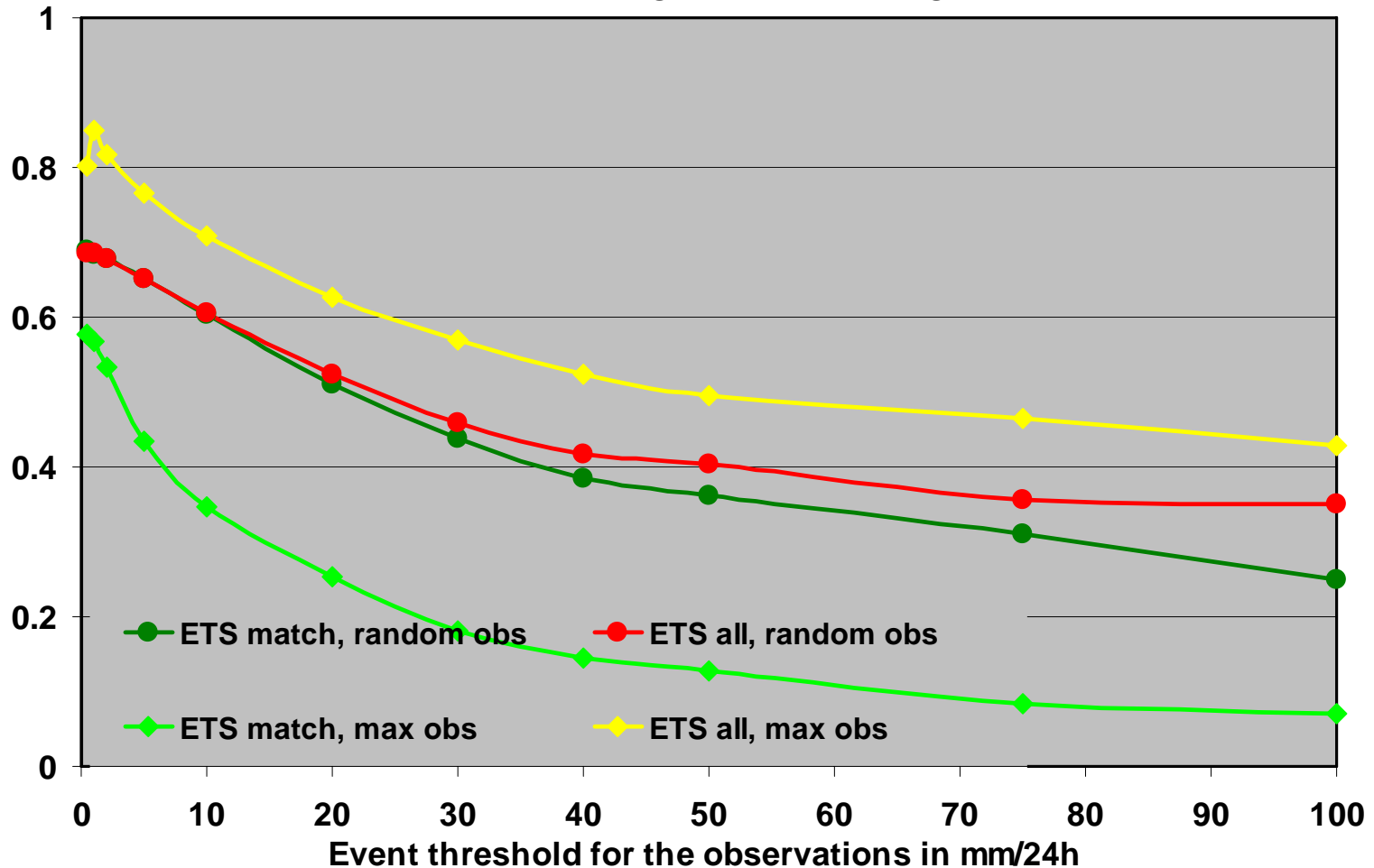
Forecast = “perfect model” – grid-box average of observations > 50 mm/24h



Random obs vrs Max obs & Overall max scores vrs Scores for matching "pm" thresholds, Winter (ONDJFM)

Event = Randomly selected vrs max observation in grid-box > x mm/24h

Forecast = "perfect model" – grid-box average of observations



Random obs vrs Max obs & Overall max scores vrs Scores for matching thresholds, Summer (AMJJAS)

Event = Randomly selected vrs max observation in grid-box > x mm/24h

Forecast = "perfect model" – grid-box average of observations

