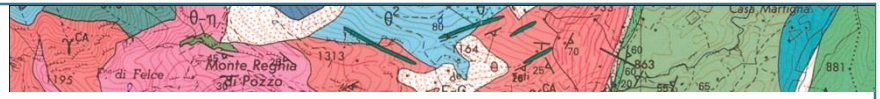
Practical appraisal of extra-probabilistic approach to support decision-making under deep uncertainty for future coastal flooding

Jérémy Rohmer, Gonéri Le Cozannet, Jean Charles Manceau



Practical appraisal of extra-probabilistic approach:

support for decision-making under deep uncertainty for future coastal flooding

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Géosciences pour une Terre durable
brgm

IPCC uncertainty language

“GMSL will rise between […] 0.84 m (0.61–1.10 m, likely range) (RCP8.5) by 2100 (medium confidence) relative to 1986-2005” (SROCC, Chap. 4, 09/2019)

Mastrandrea et al. (2010)

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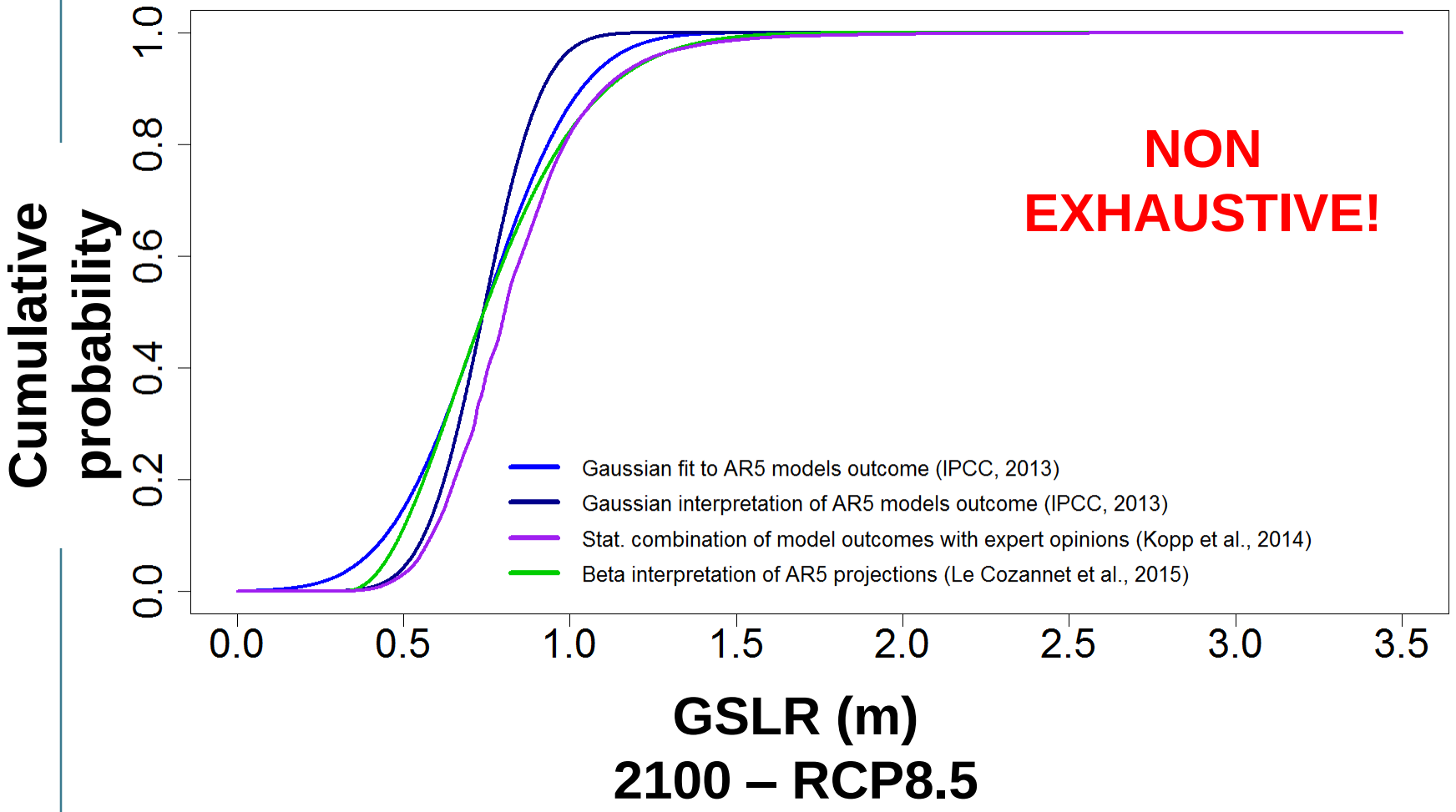
Table 1. Likelihood Scale	
Term*	**Likelihood of the Outcome**
Virtually certain	99-100% probability
Very likely	90-100% probability
Likely	66-100% probability
About as likely as not	33 to 66% probability
Unlikely	0-33% probability
Very unlikely	0-10% probability
Exceptionally unlikely	0-1% probability

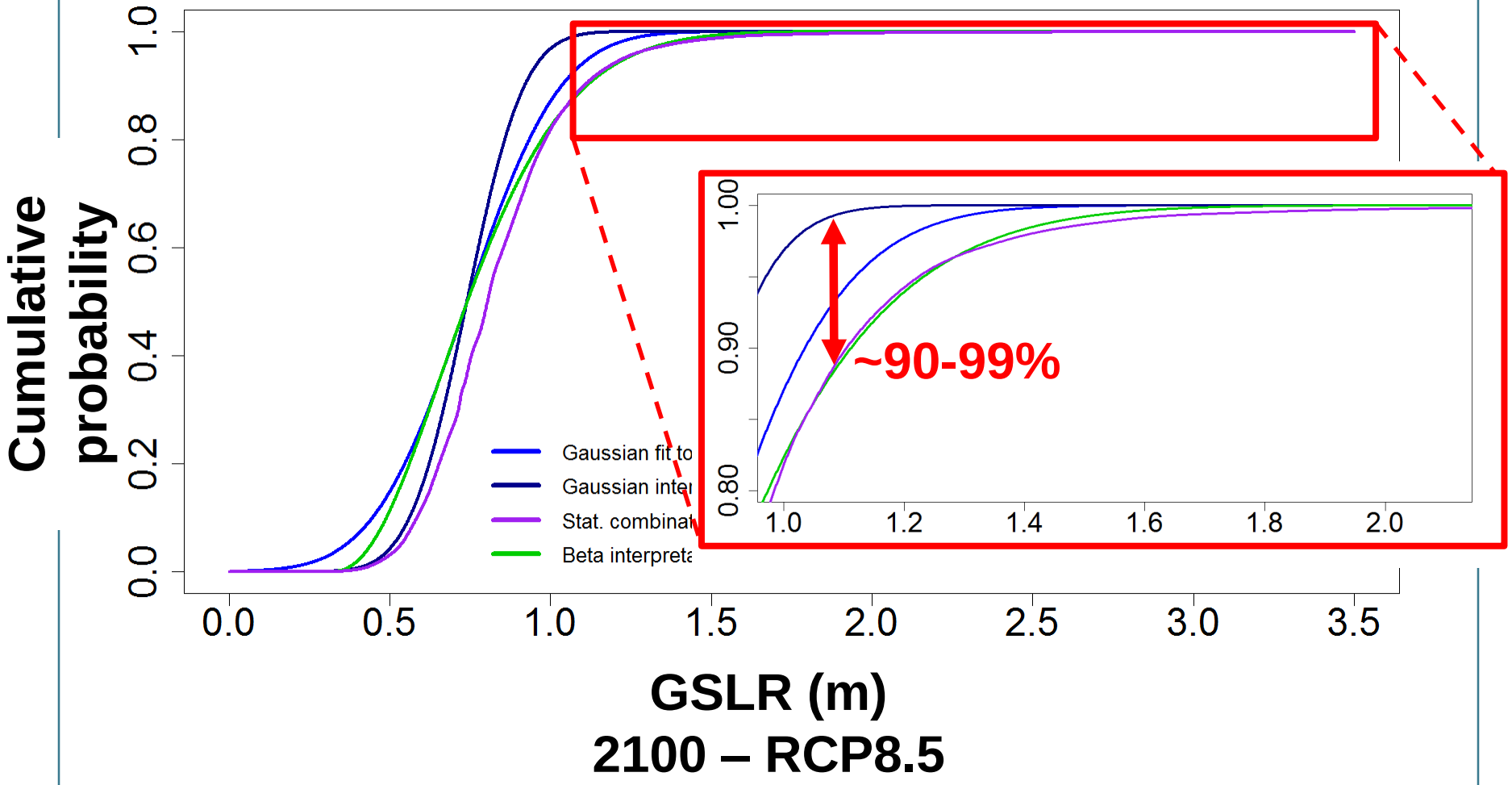
Mastrandrea et al. (2010)

Several credible probabilistic projections based on slighly different assumptions have been published



Le Cozannet et al. (2017) based on AR5; see also Bakker et al. (2017)

Does it matter?



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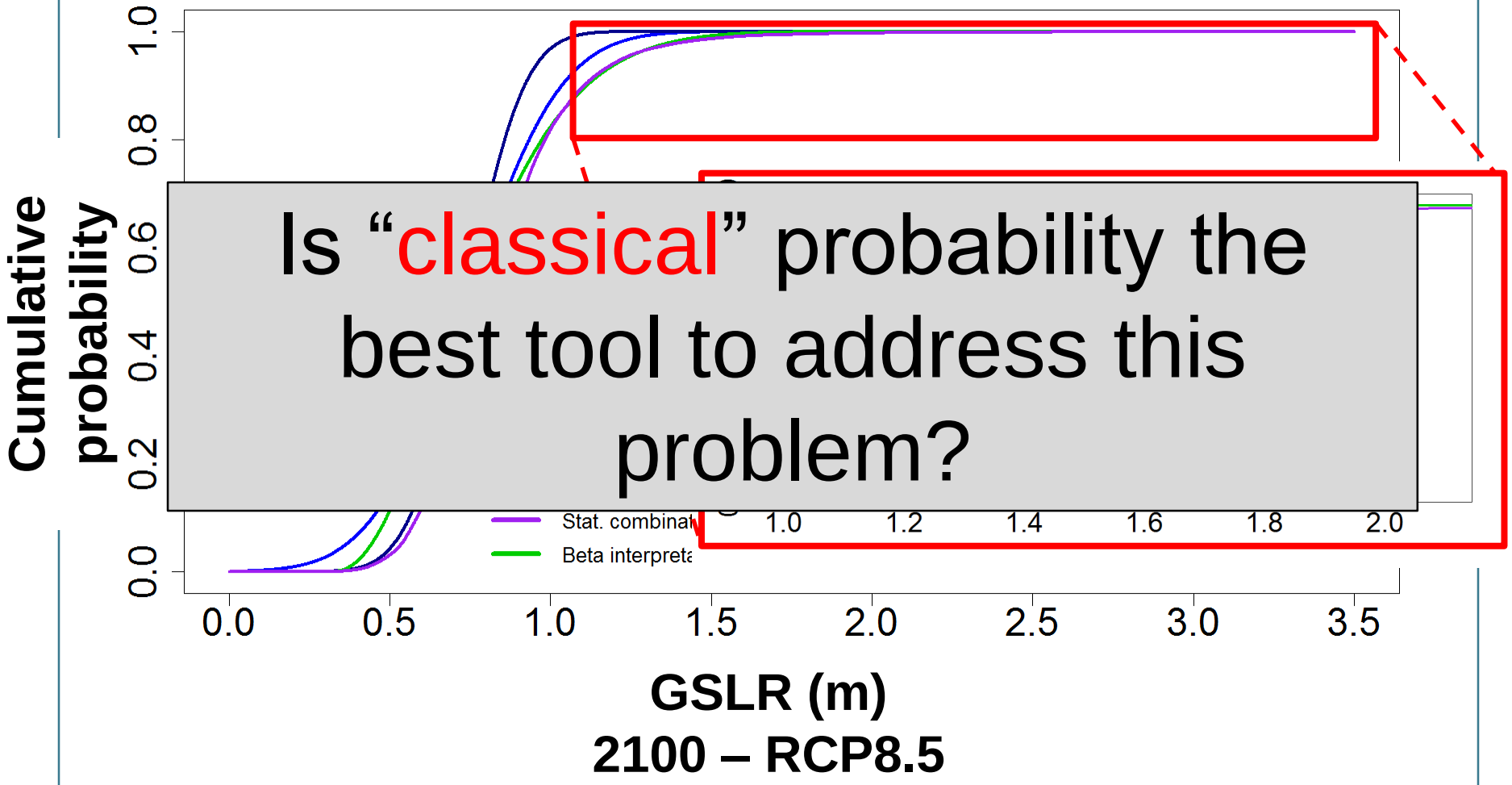

Is "classical" probability the best tool to address this problem?

Le Cozannet et al. (2017) based on AR5

Alternative setting: **interval**

IPCC(AR5)
***likely* range**

GSLR (m)
2100 – RCP8.5

More than just an interval

Probability P that GSLR is within the interval

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Possibility setting

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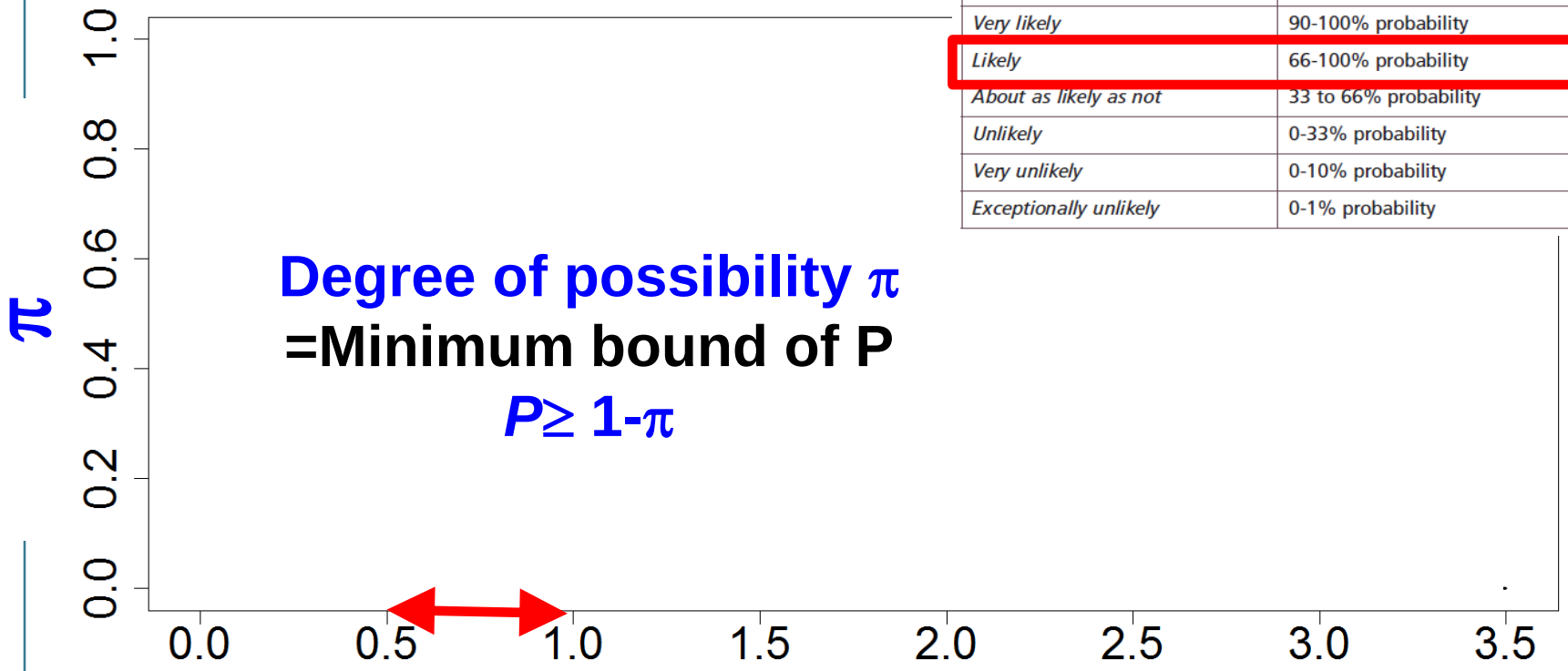
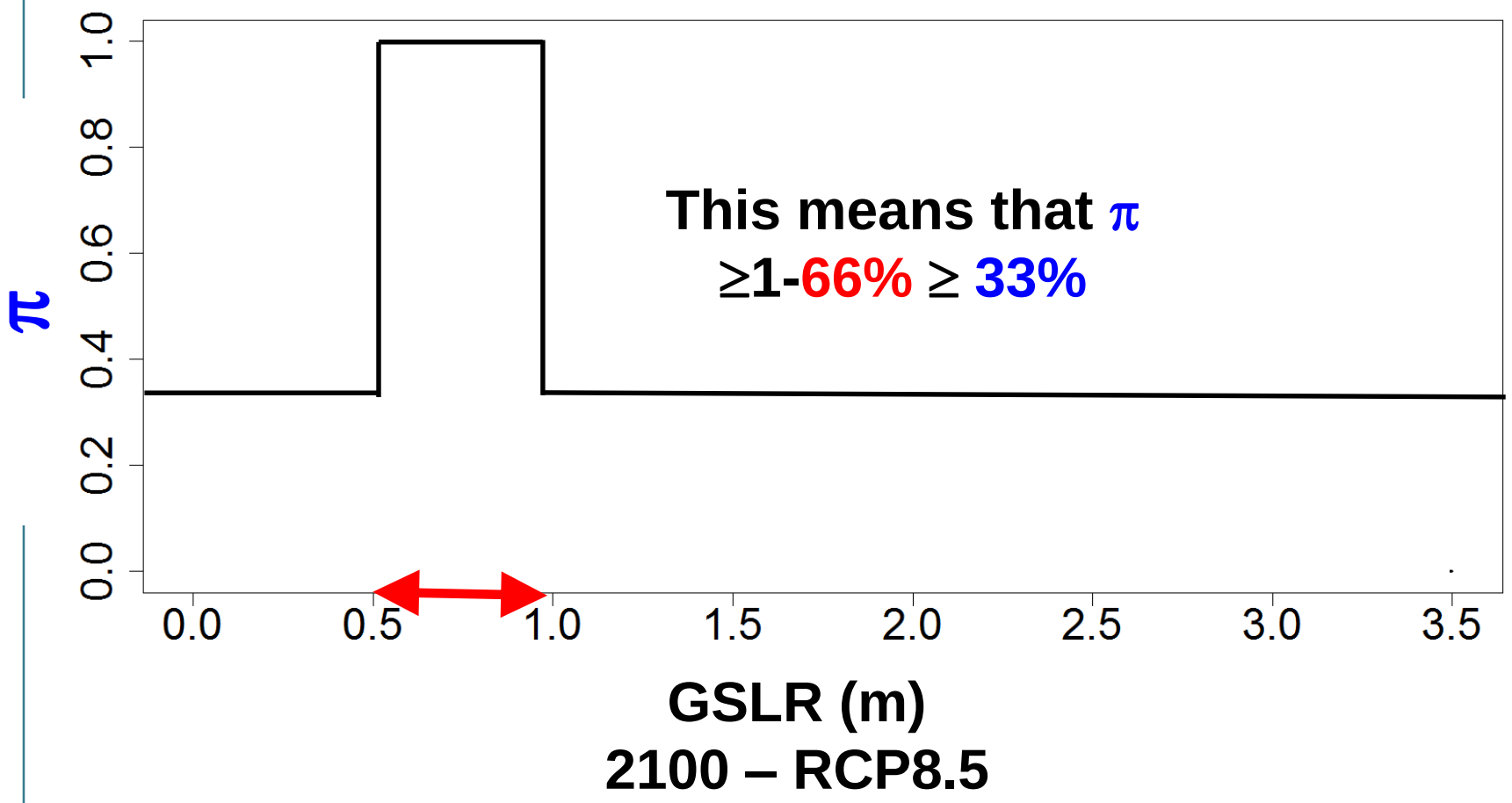
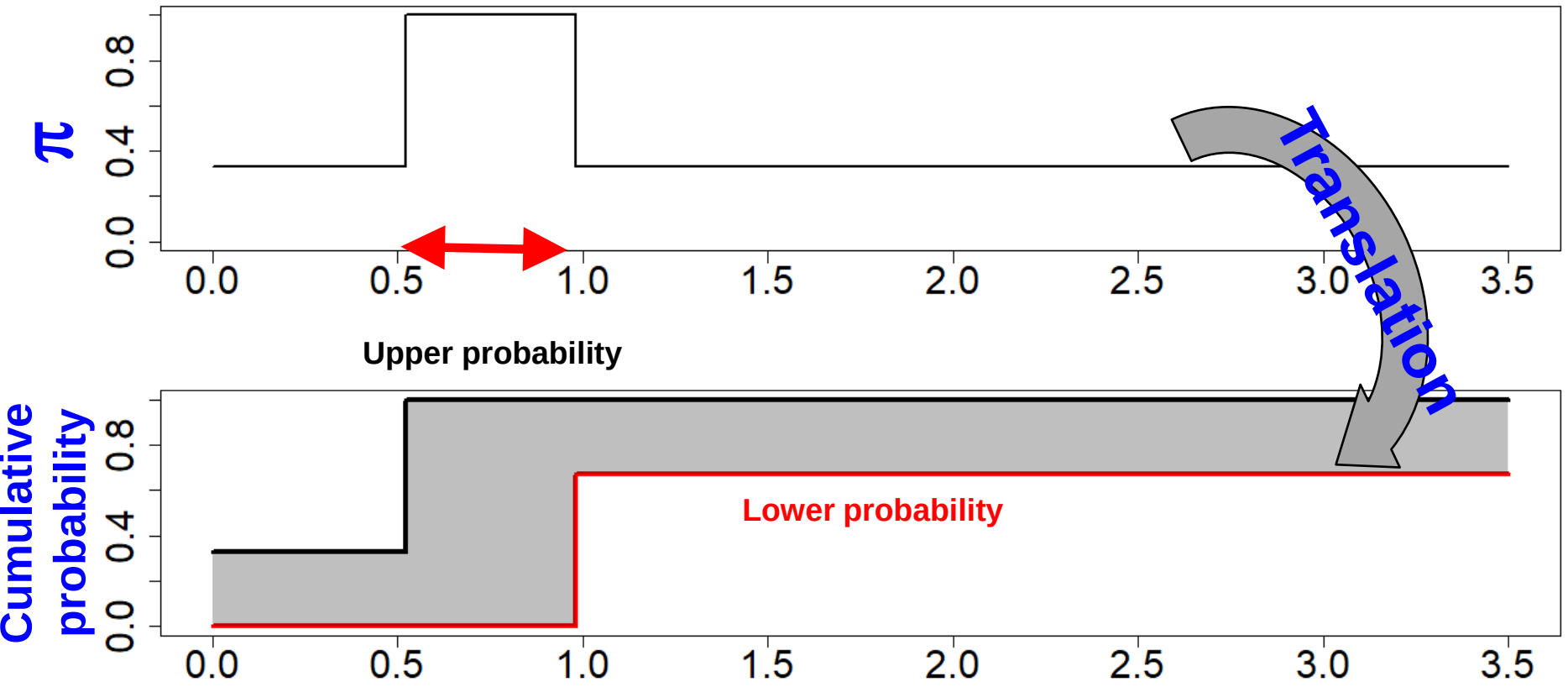


Degree of possibility π
=Minimum bound of P
***P*≥ 1-π**

Possibility setting



Extra-probabilities



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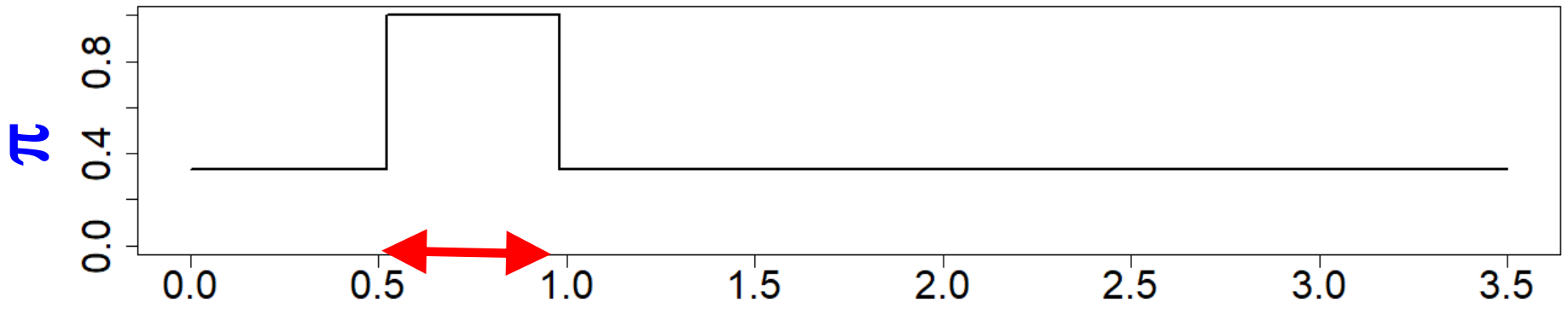
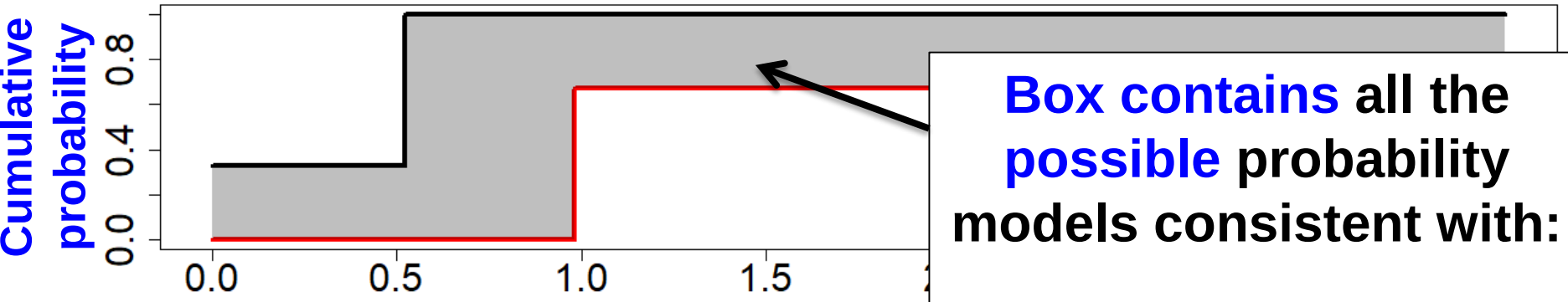
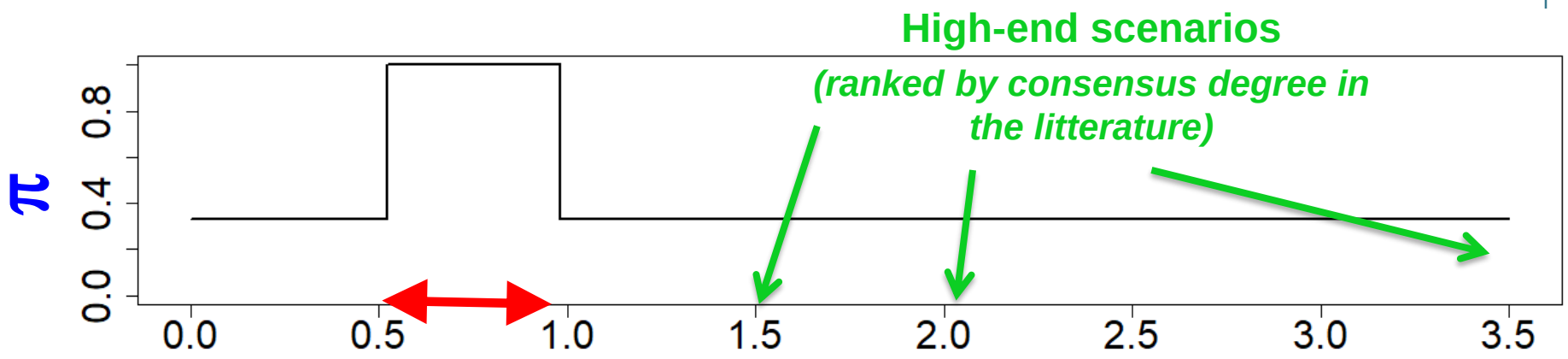




Box contains all the possible probability models consistent with:

1. **IPCC likely range**

Let us add more information



Le Cozannet et al. (2017)

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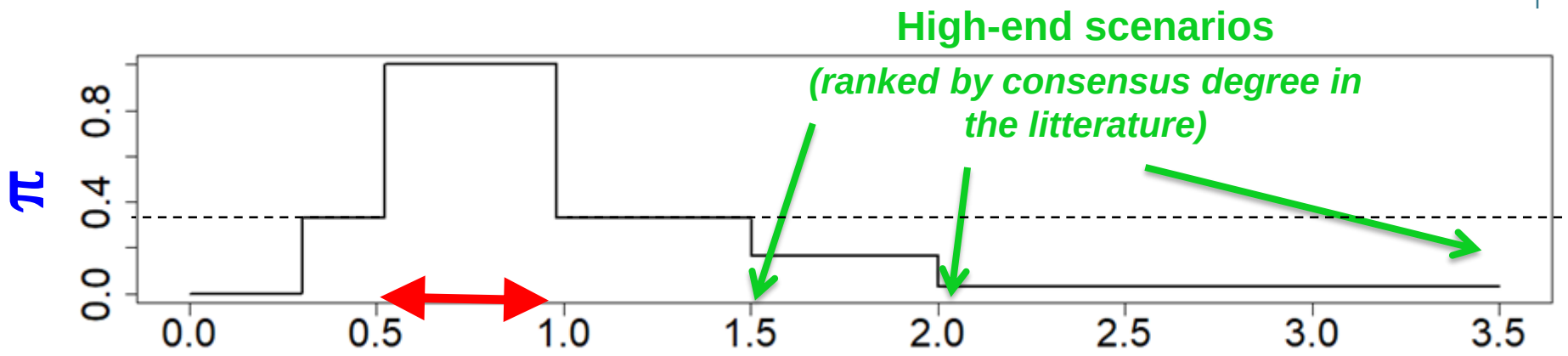
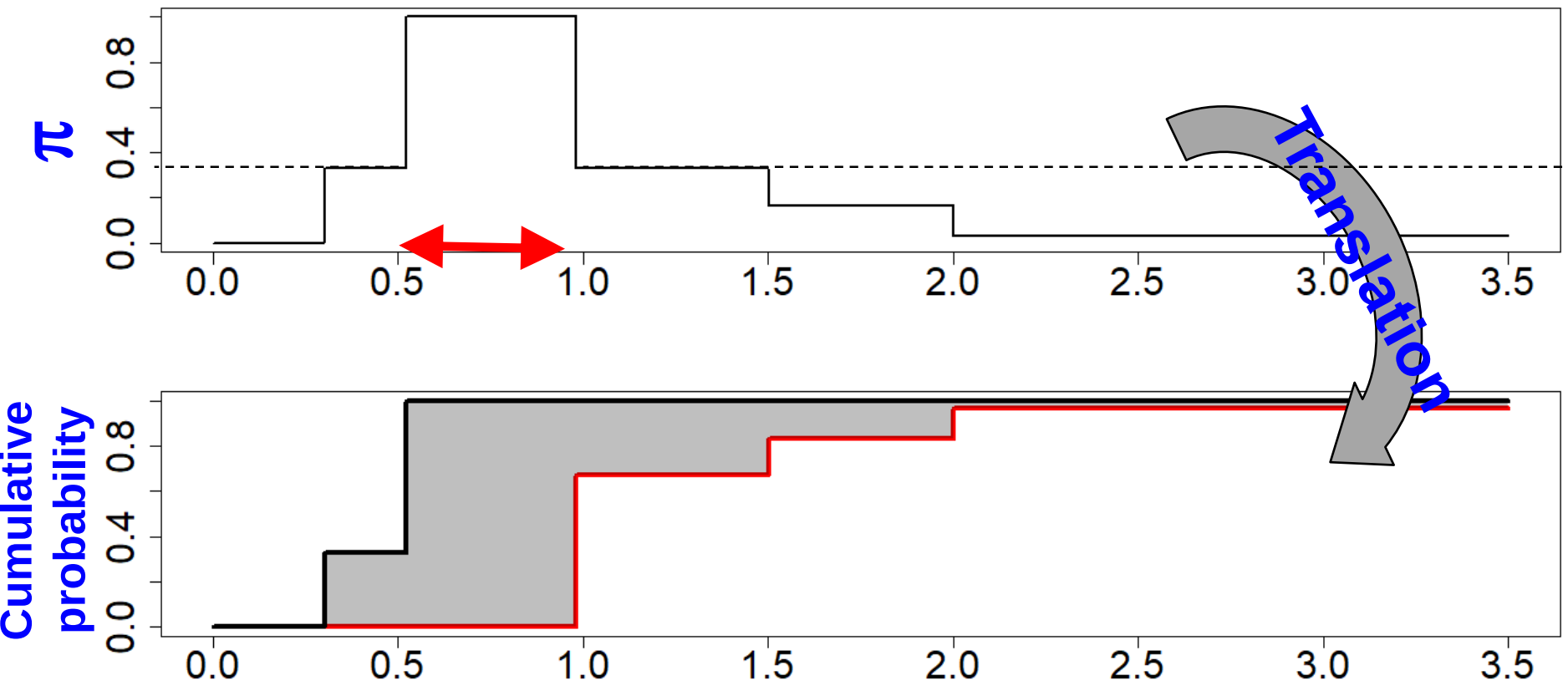


Le Cozannet et al. (2017)

Translation into **probabilities**



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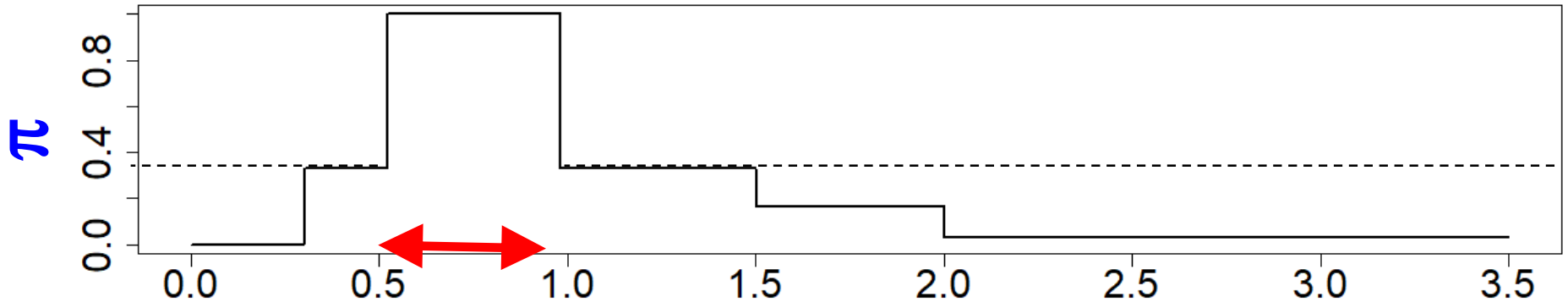
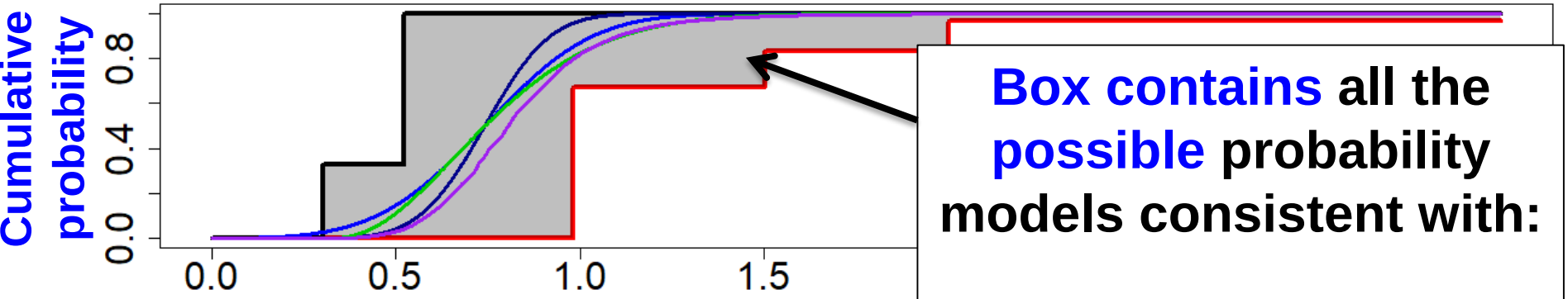
Translation into probabilities



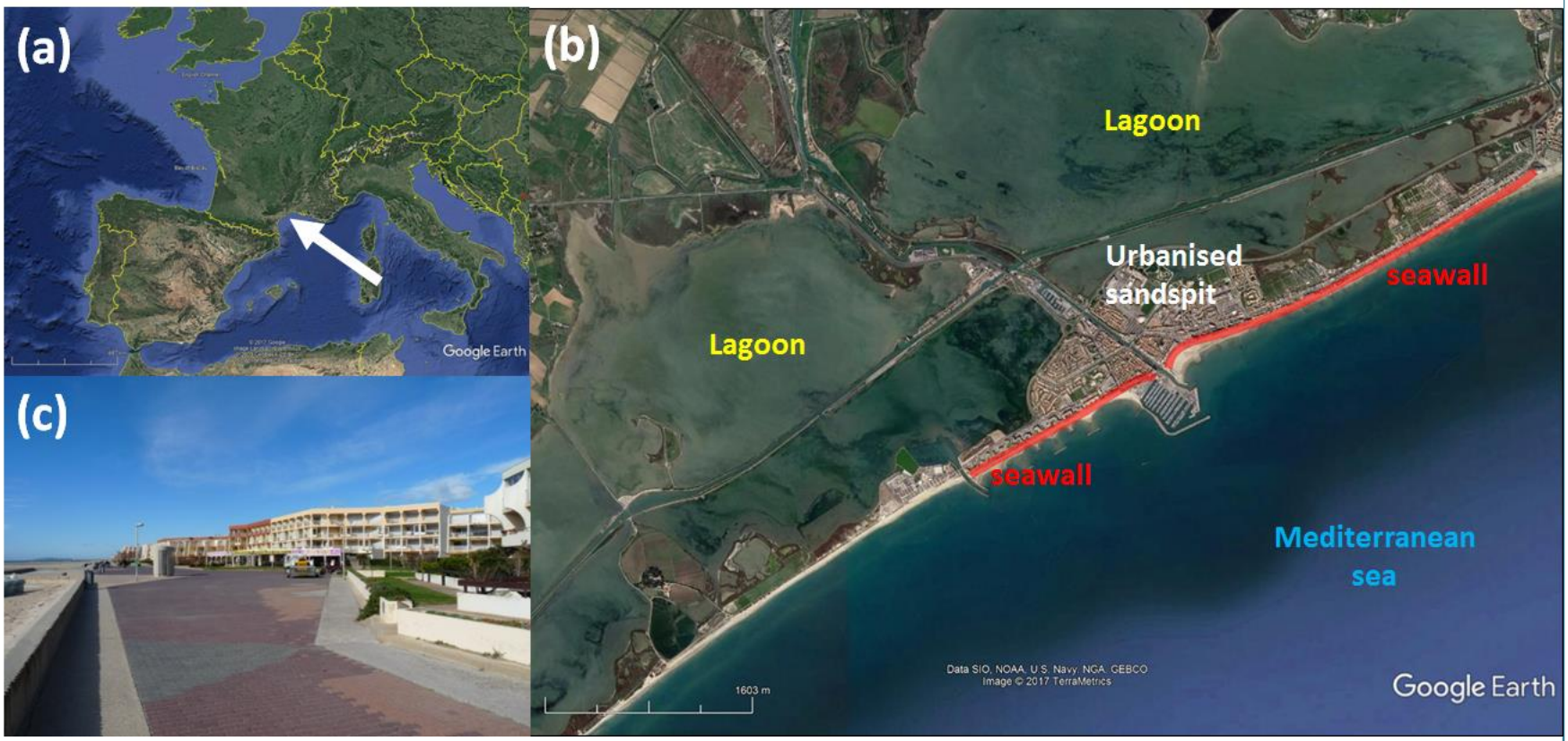


Box contains all the possible probability models consistent with:

1. **IPCC likely range**
2. **HE scenarios**

Le Cozannet et al. (2017)

What is the probability of flooding by 2100?



Rohmer et al. (2019)

Climate Change scenario

Scenarios RCP2.6,4.5,6.0,8.5

Global SLR projection

Kopp et al. (2014)'s projections

Highend scenarios

Regional SL variability

Triangle probability law

Extreme water levels

Pareto probability law

Wave setup

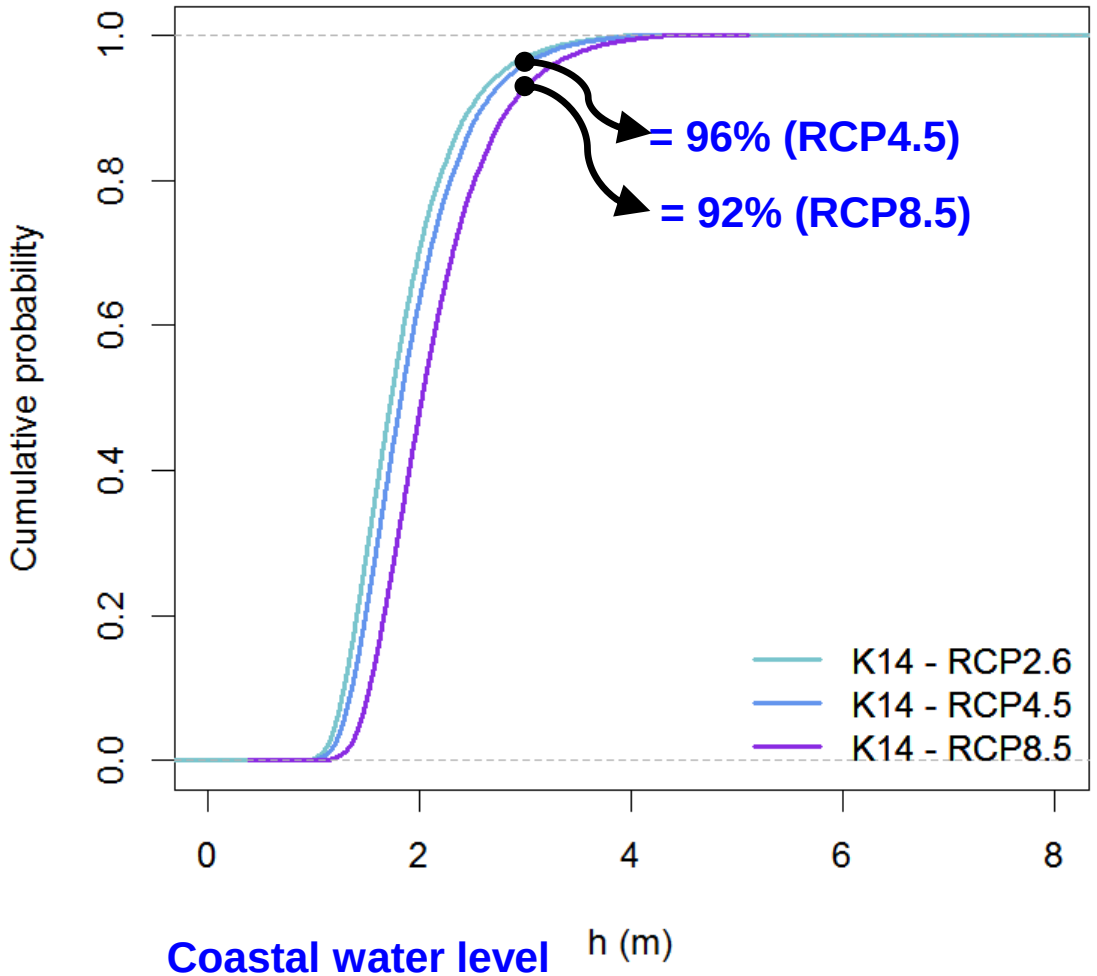
Uniform probability law

Cascade of uncertainty

Coastal water level h

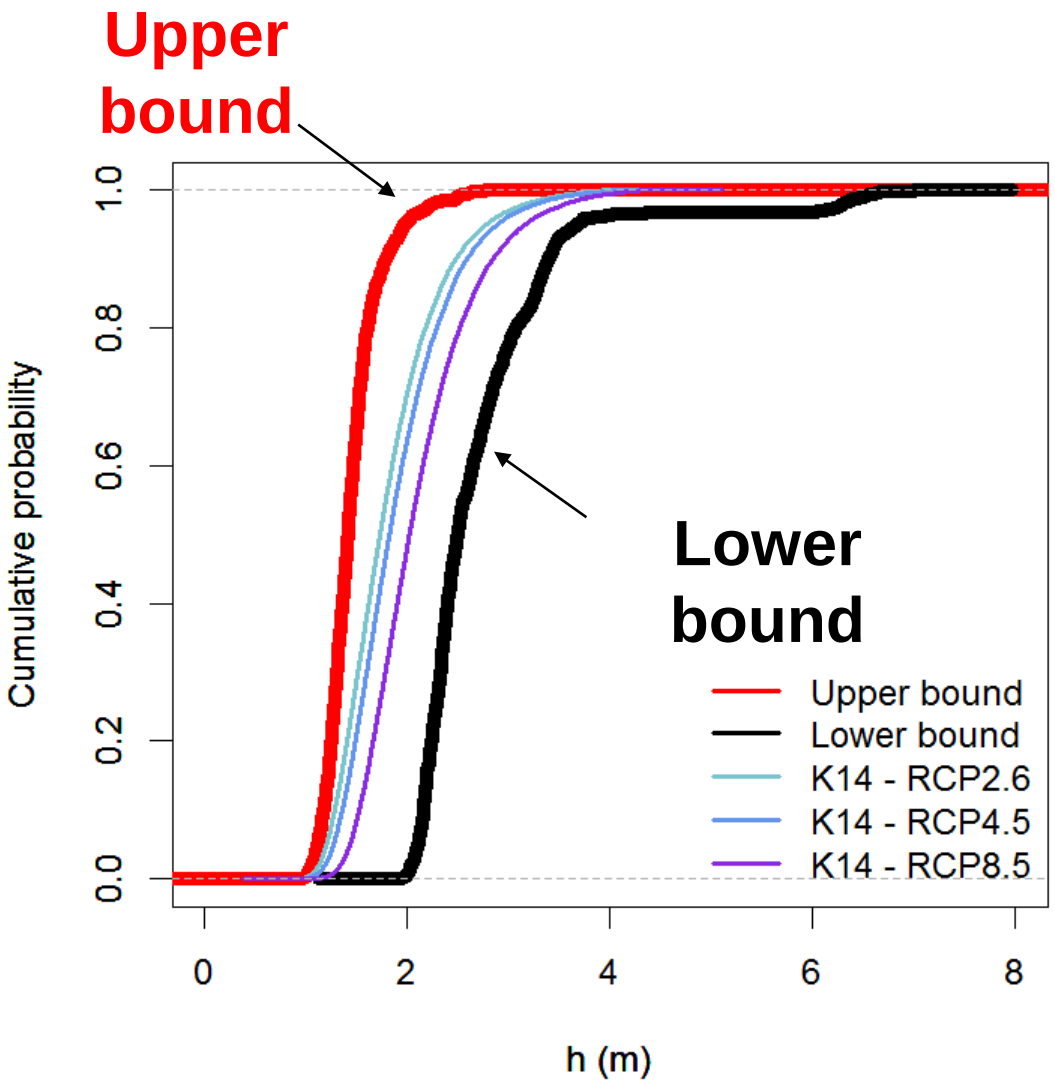
Using probabilities

Probability of non-exceedance, threshold=3m



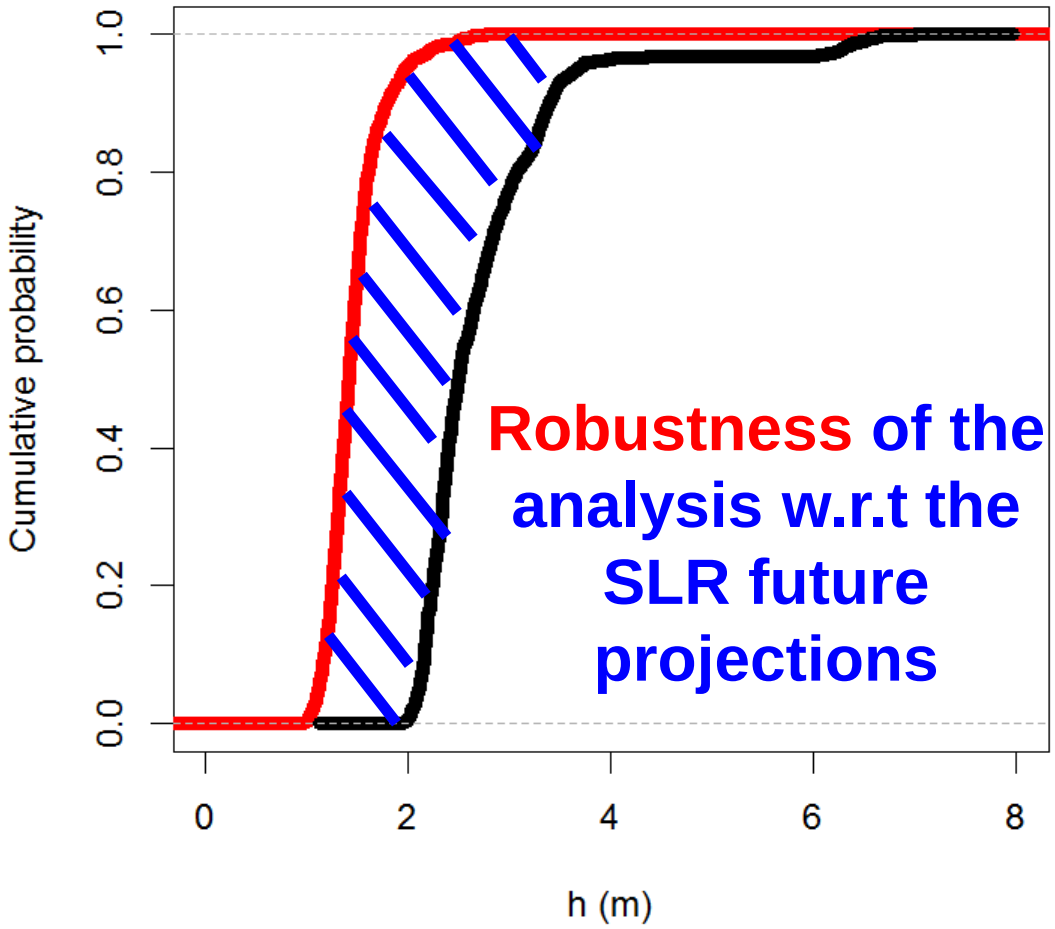
Coastal water level

Using now imprecise probabilities (p-box)



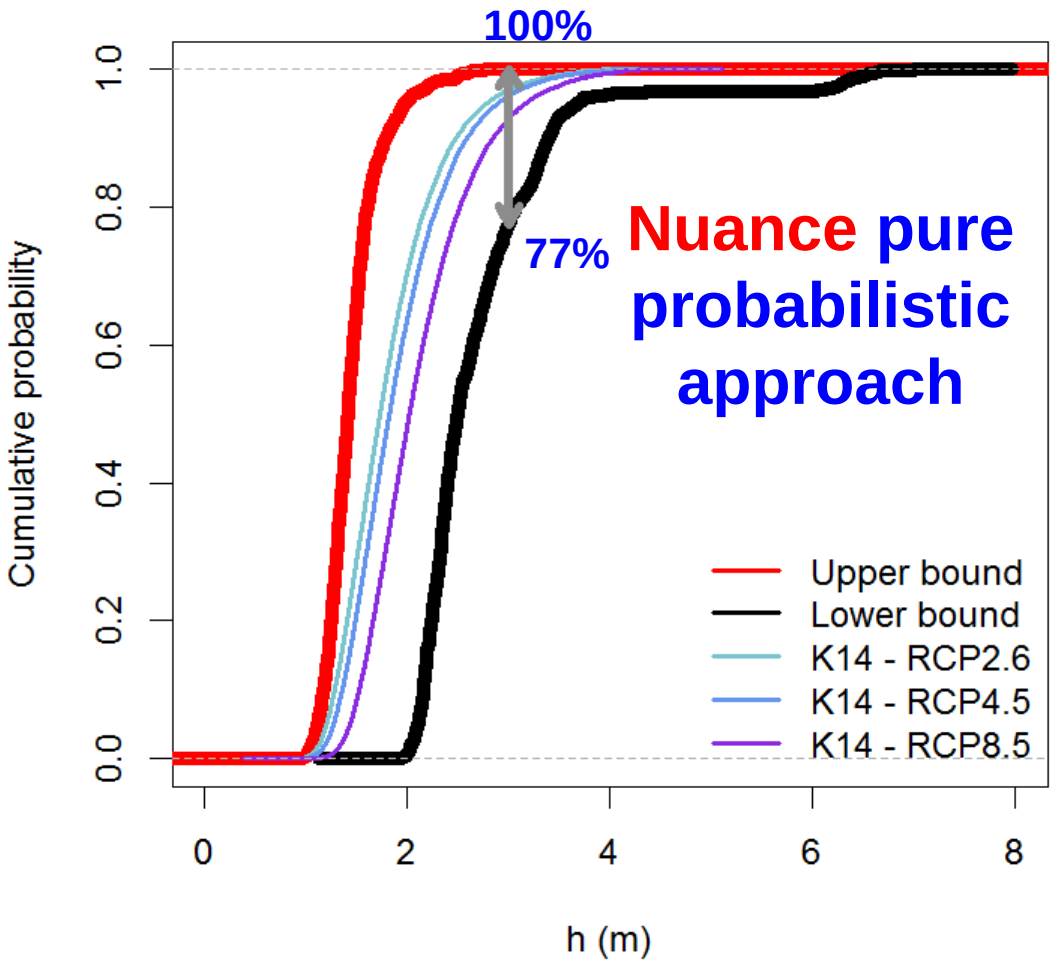
Propagation using algorithm implemented in R (pkg HYRISK, Rohmer et al., 2018)

Using now imprecise probabilities (p-box)



Rohmer et al. (2019)

Probability of non-exceedance, threshold=3m



Rohmer et al. (2019)

Summary

Pros…

Nuance too confident probabilistic results
Picture **what is unknown**

} **This presentation**

Support decision-making w.r.t deep uncertainties
Guide new **knowledge gathering**

See also…

Climatic Change

July 2019, Volume 155, Issue 1, pp 95–109 | Cite as

Addressing ambiguity in probabilistic assessments of future coastal flooding using possibility distributions

Authors | Authors and affiliations

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…and **cons**

- Communication
- Too sophisticated?

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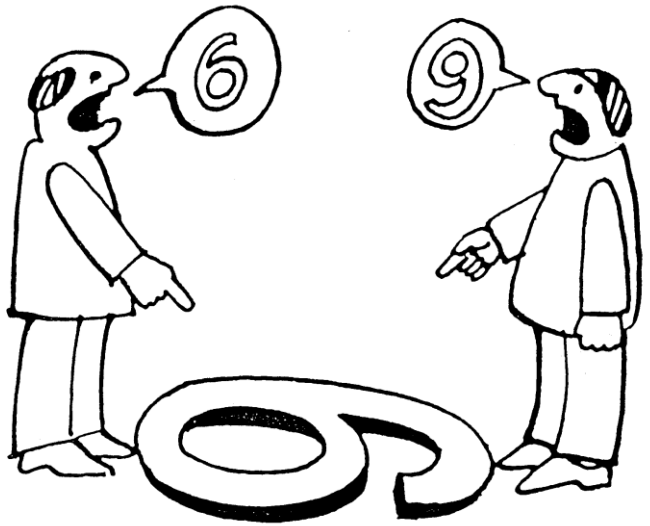
> **Need for different perspectives** (extra-probabilistic, frequentist, Bayesian, robust, etc.)



Thank you for your attention!