

**4th International Workshop on Waves,
Storm Surges and Coastal Hazards**

Incorporating the 18th International Waves Workshop

IHCantabria

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I+D+i para un desarrollo sostenible

Modeling and Assessing Compound Coastal Hazards in a Changing Climate

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Background and Motivation



Gijón (north of Spain) March 4th, 2014

Compound event triggering coastal
flooding

R+D+i for sustainable development



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2023-2024

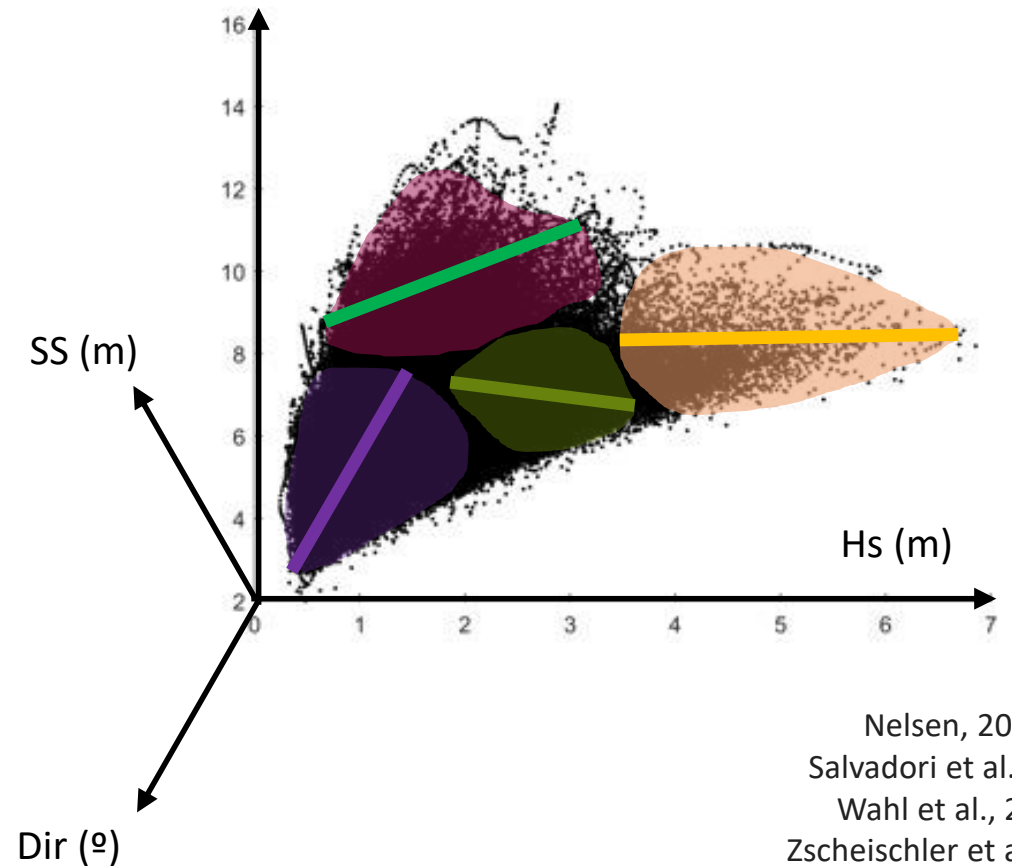
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Background and Motivation

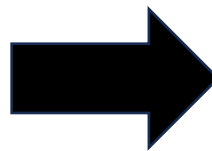


Gijón (north of Spain) March 4th, 2014



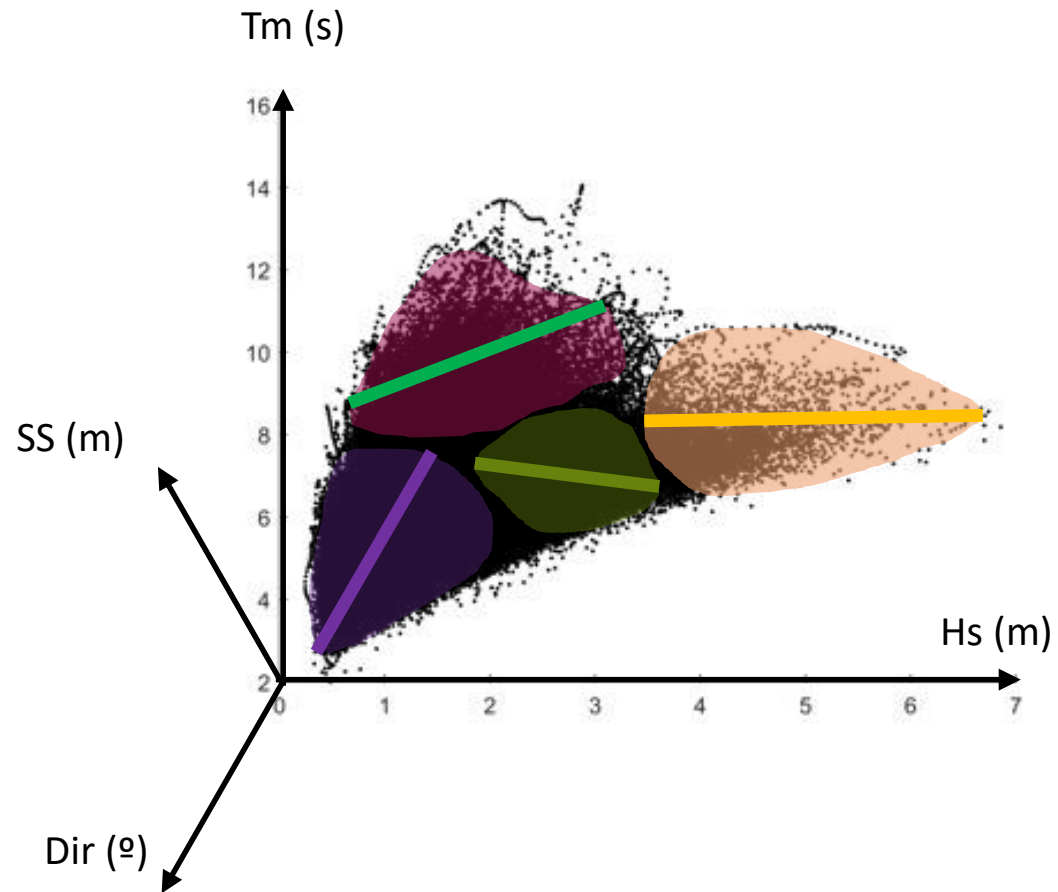
Nelsen, 2006
Salvadori et al., 2007
Wahl et al., 2015
Zscheischler et al., 2020

Compound event triggering coastal flooding

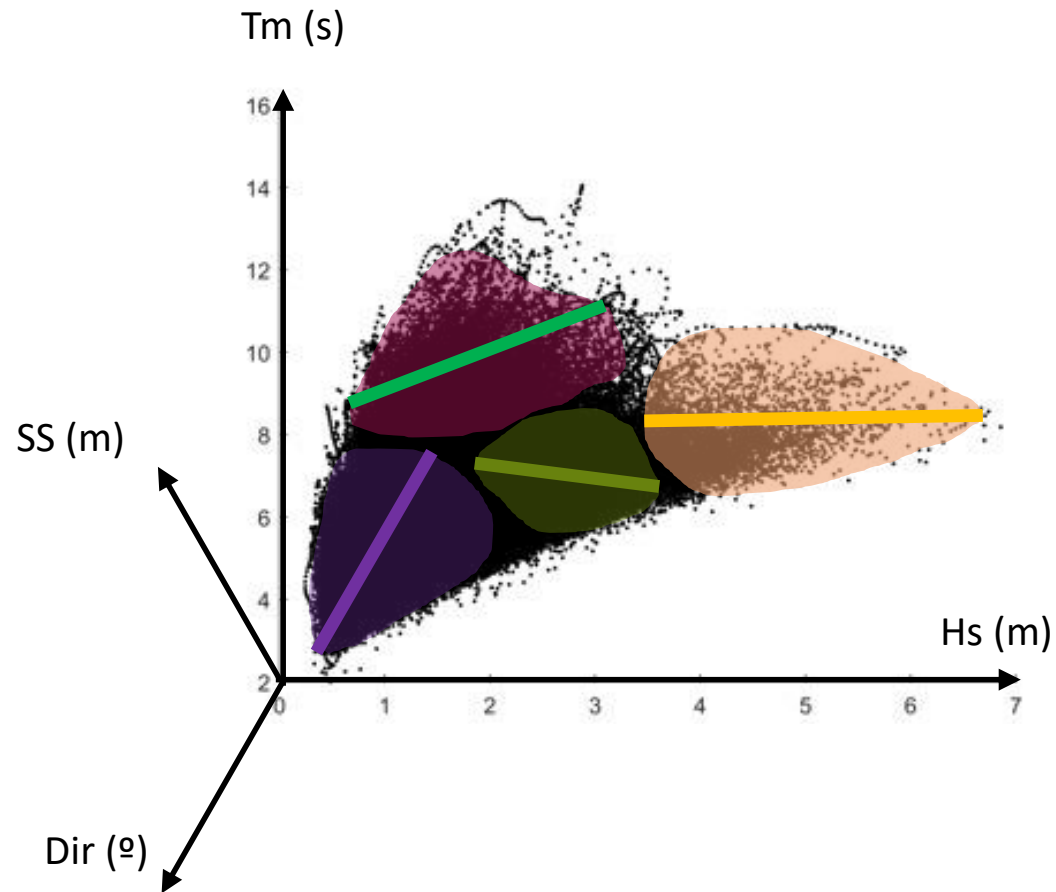


Multivariate statistical techniques

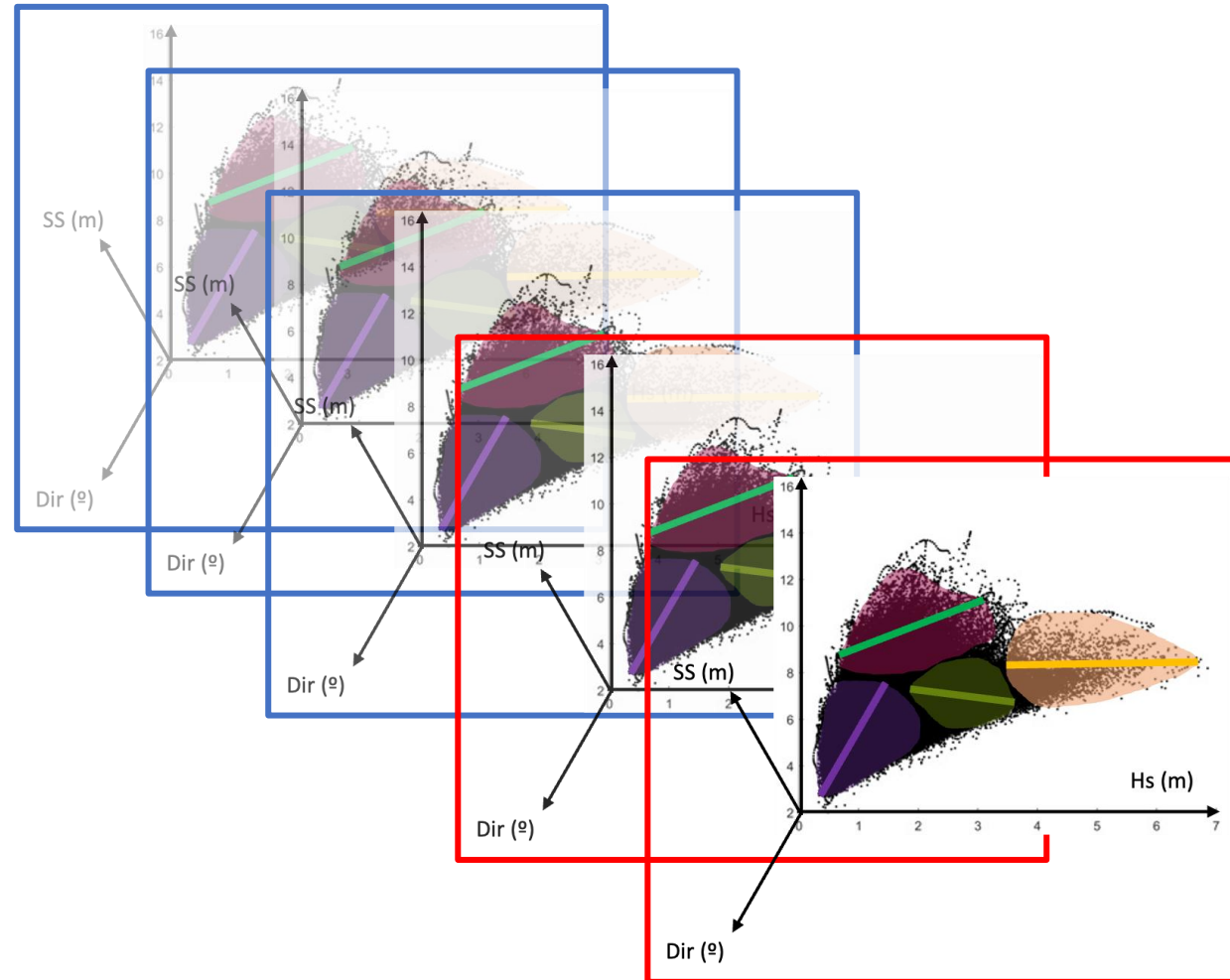
Hindcast databases (baseline period)



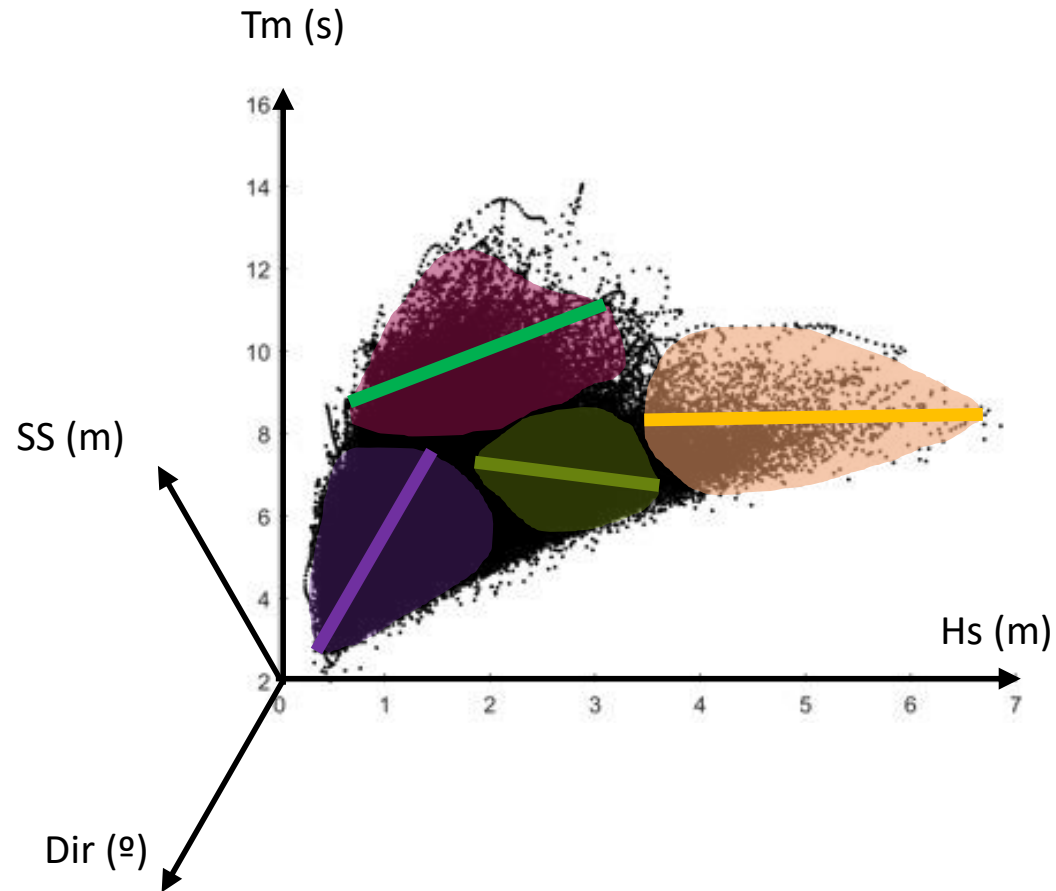
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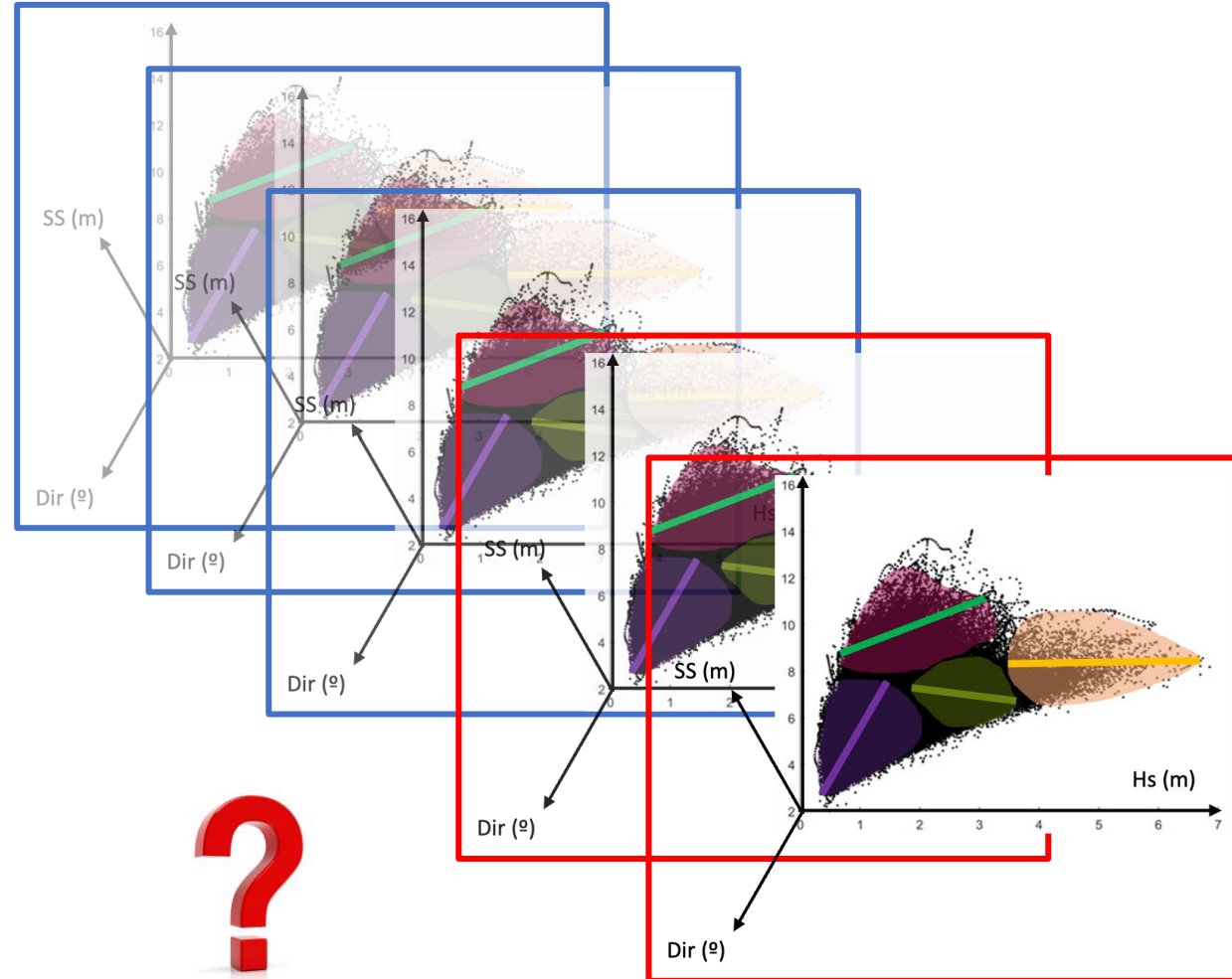
Multivariate & multiple climate change projections

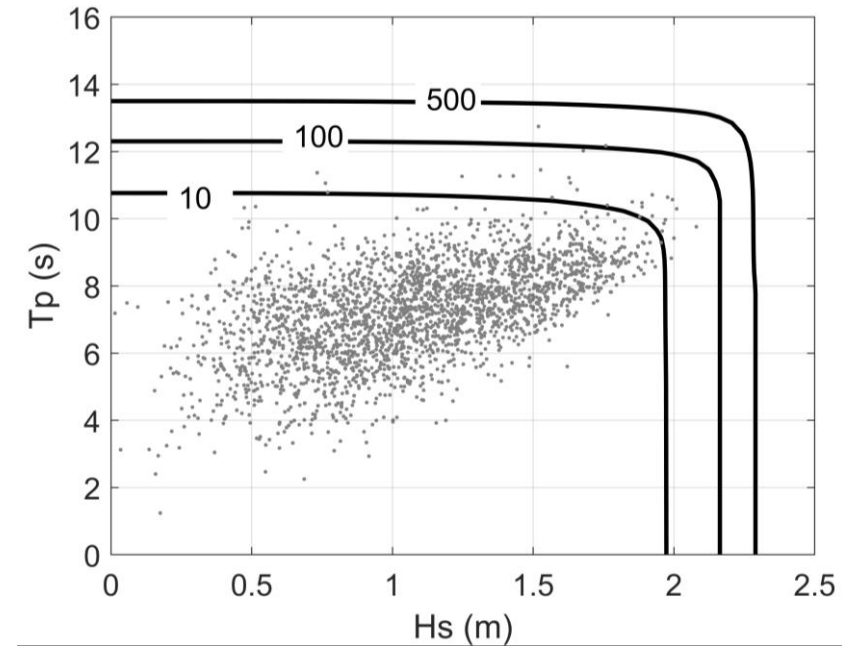


Hindcast databases (baseline period)

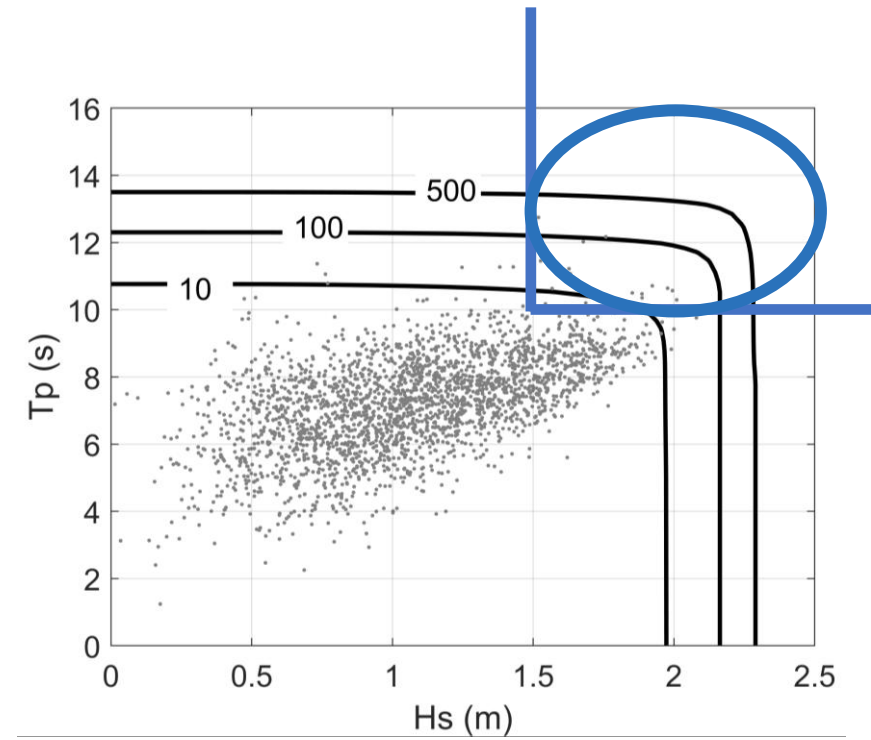


Multivariate & multiple climate change projections





Context



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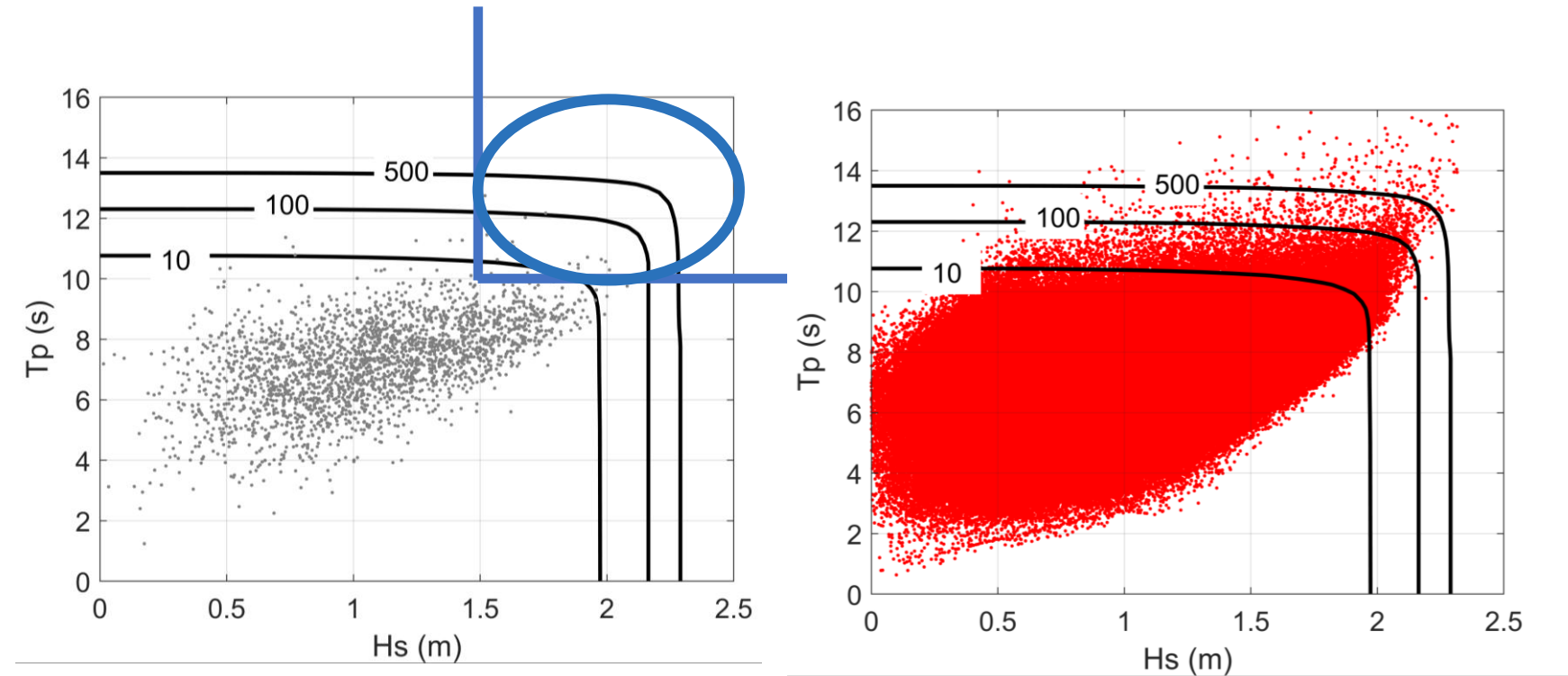


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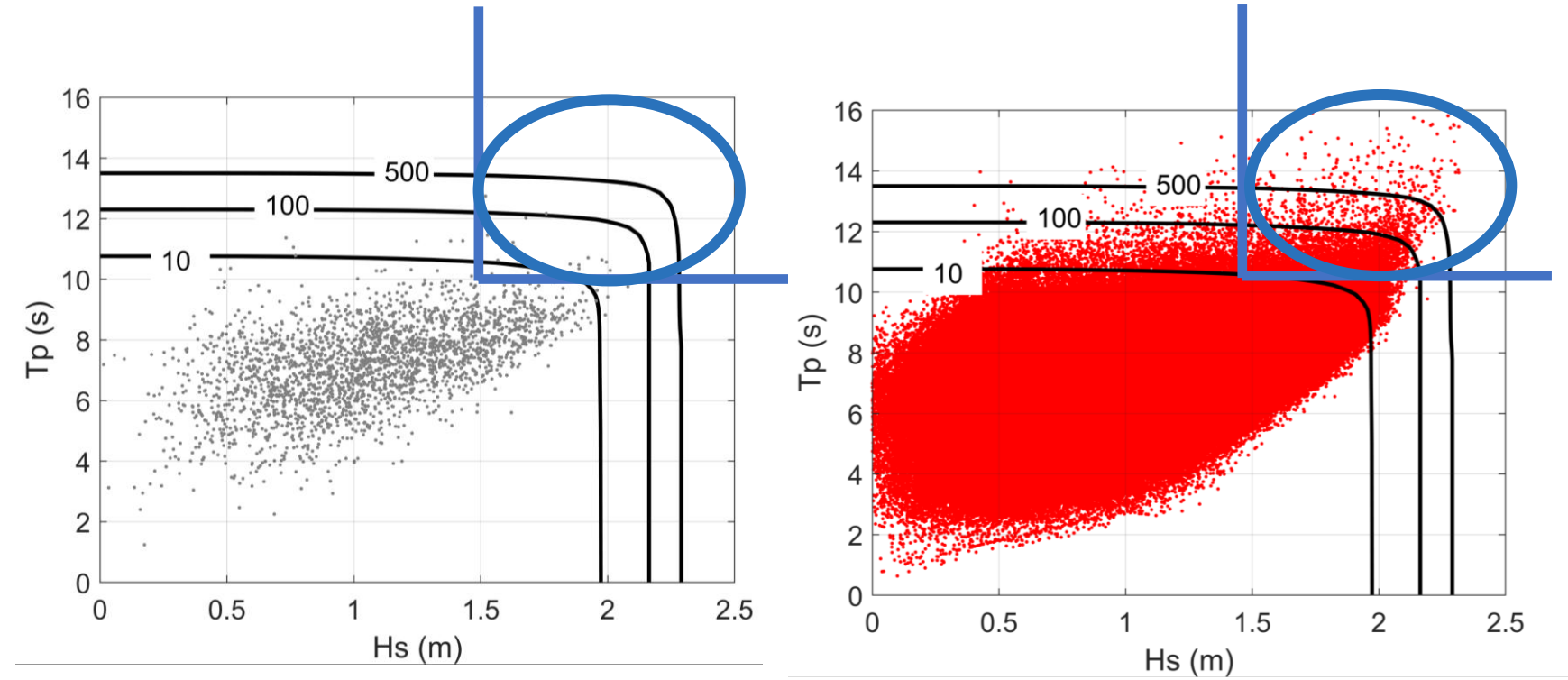


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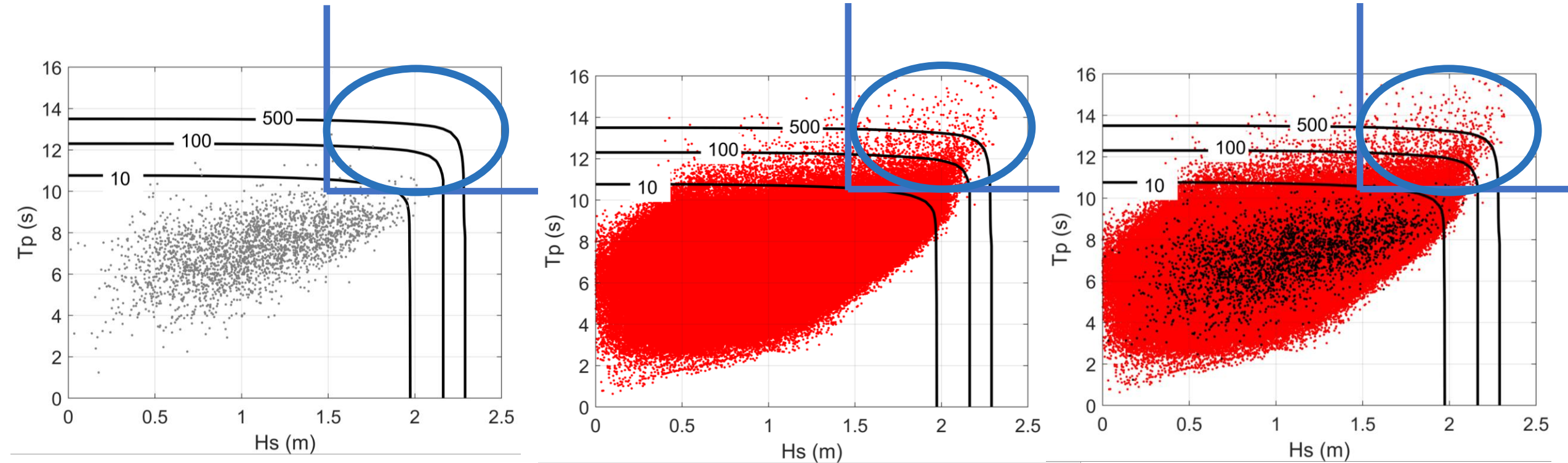
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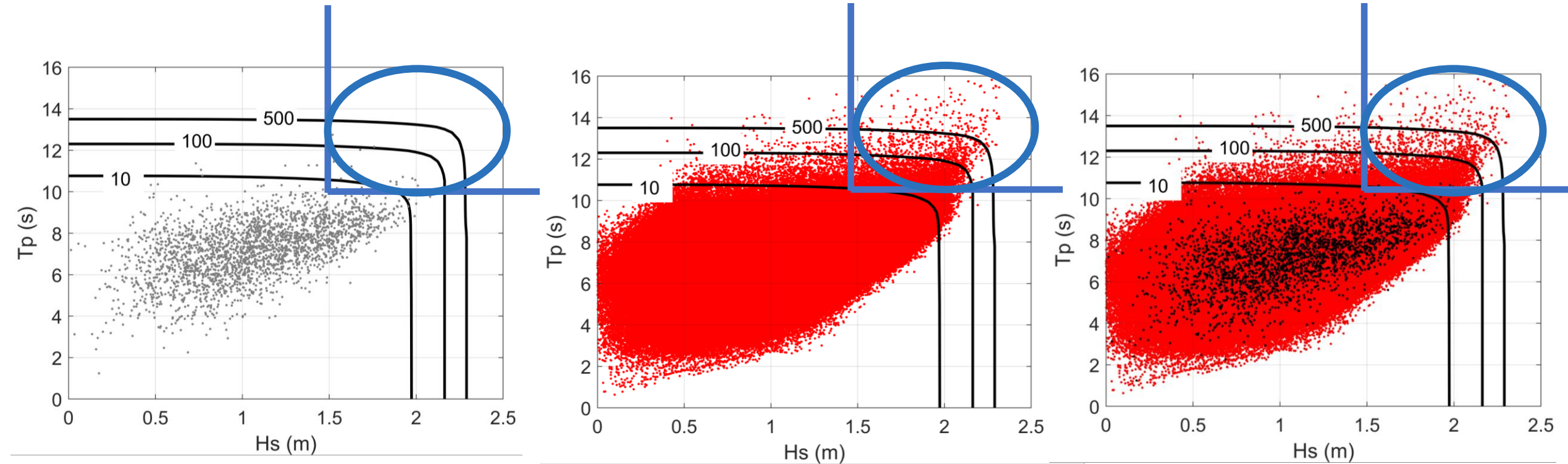


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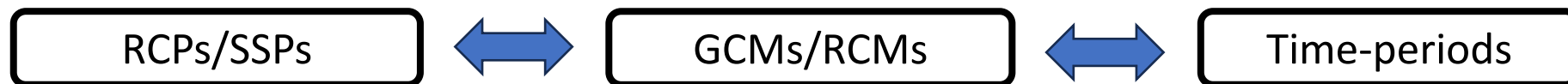


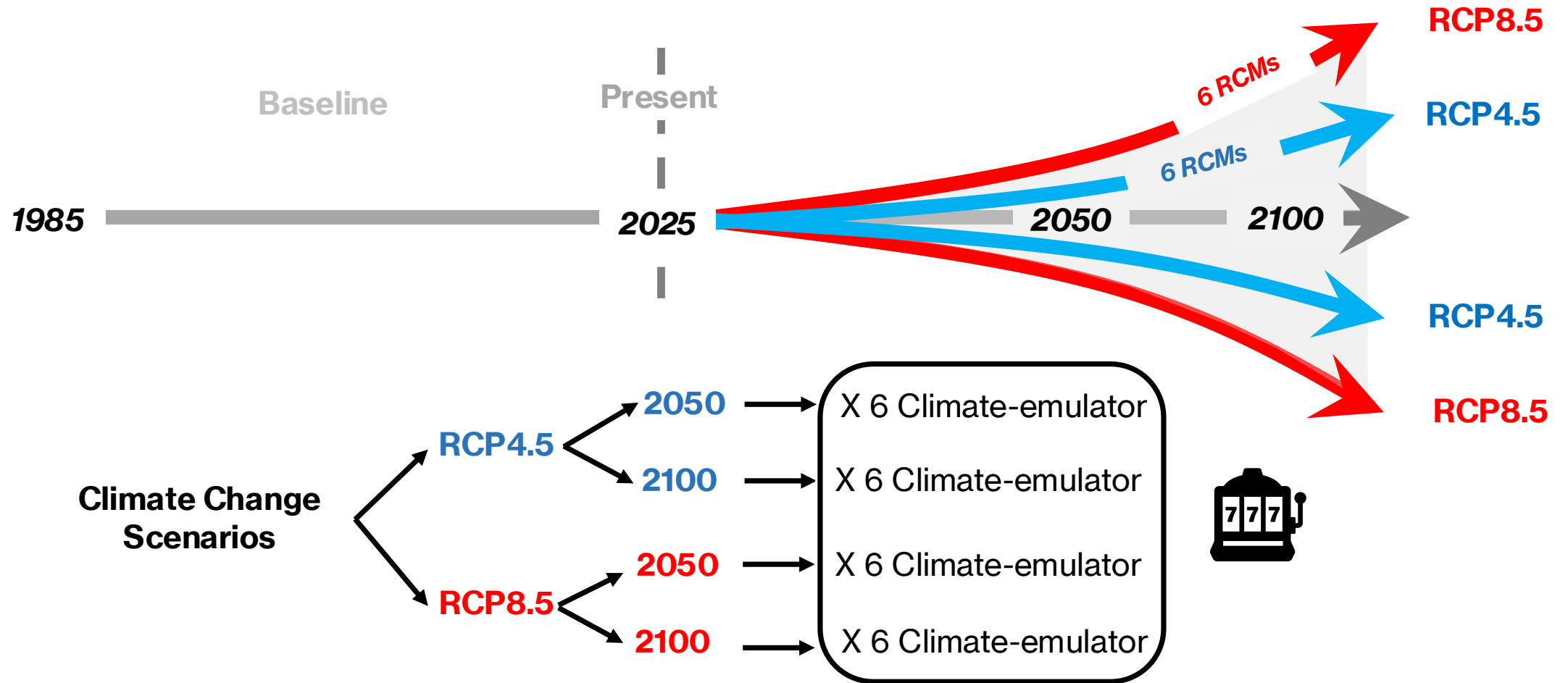
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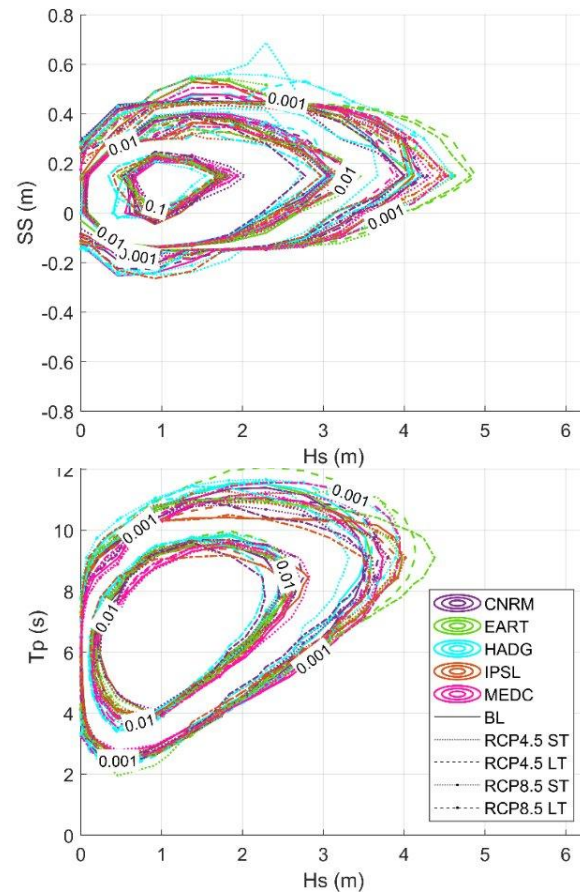
How can we deal with an accurate multivariate extreme value analysis under different **climate change scenarios**?





Results

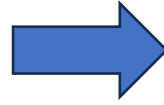
Climate-based emulator (offshore location)



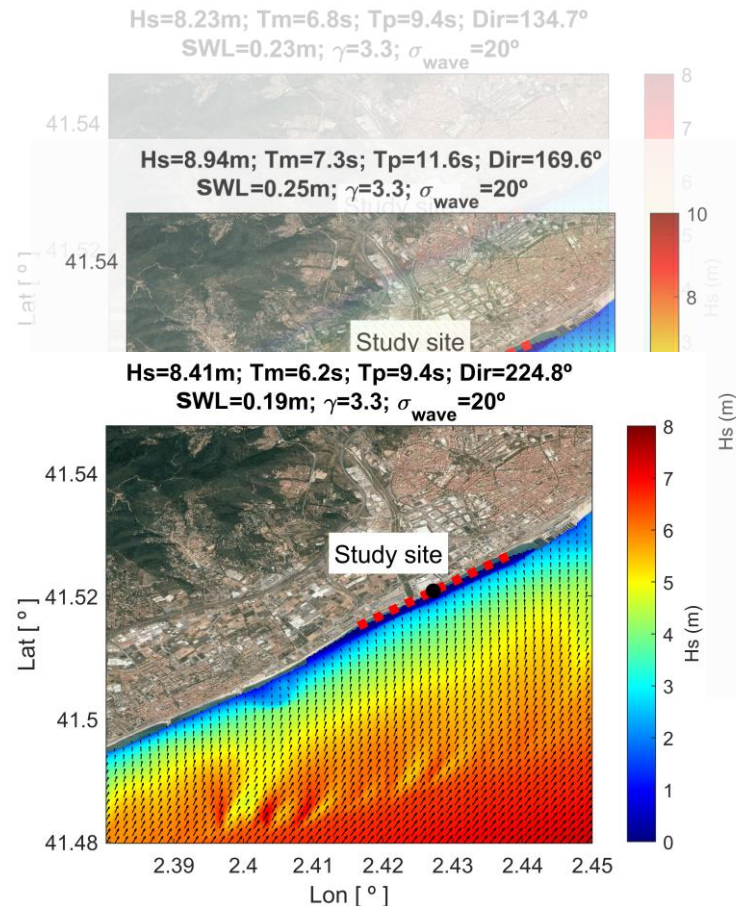
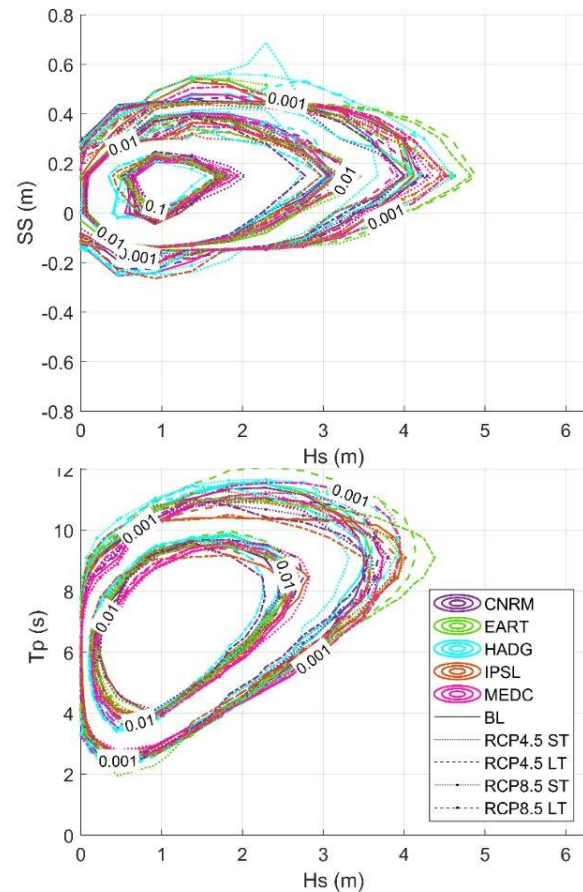
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Results

Climate-based emulator
(offshore location)



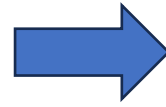
Hybrid-driven downscaling to
the local scale



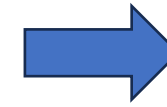
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Results

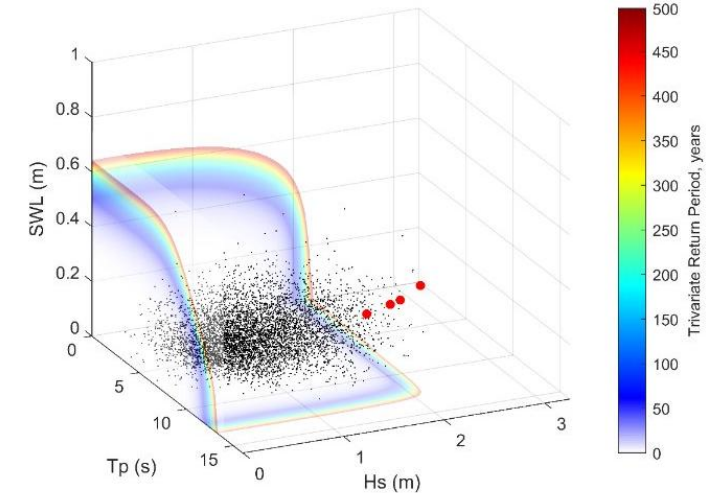
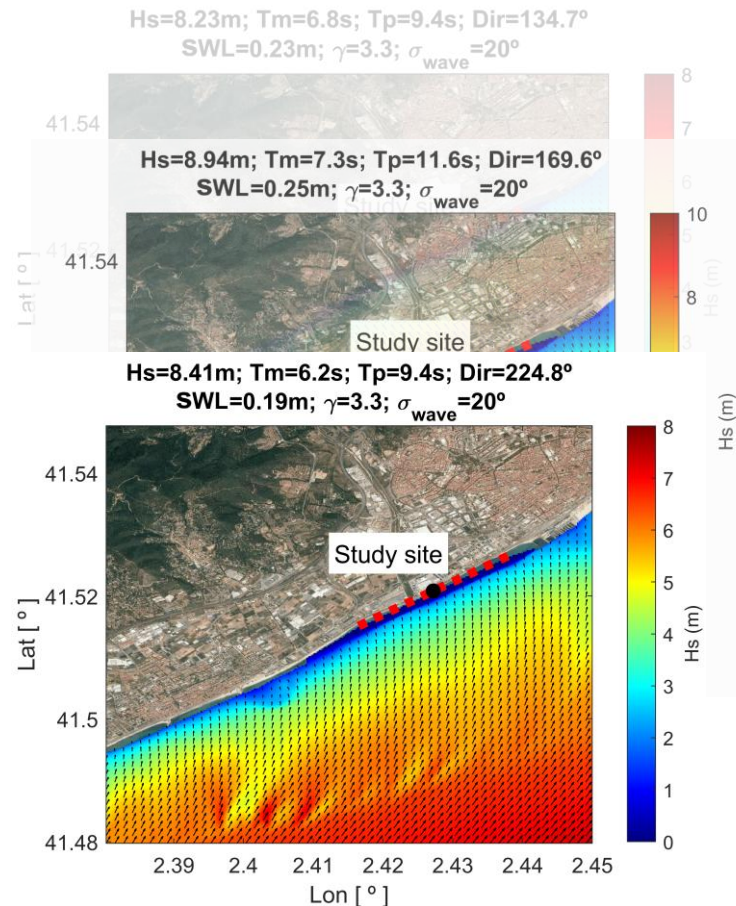
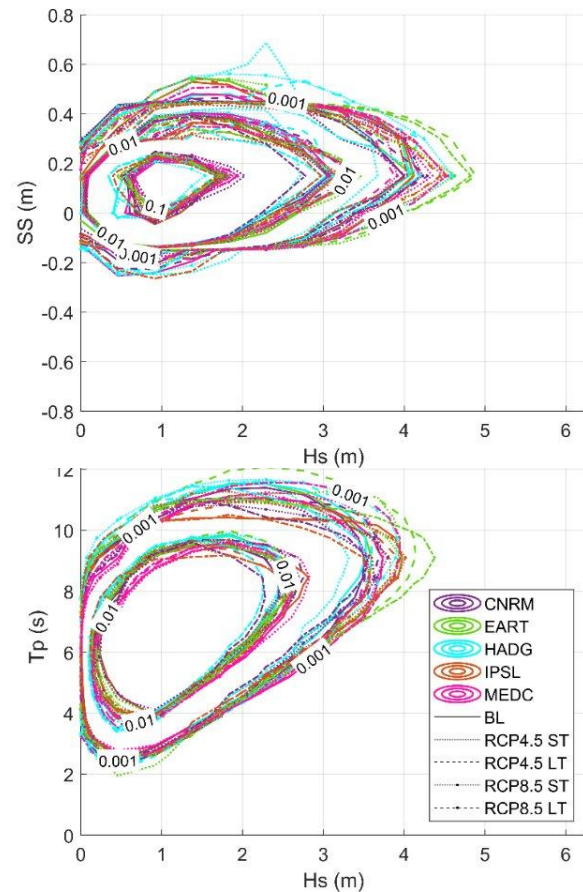
Climate-based emulator
(offshore location)



Hybrid-driven downscaling to
the local scale



Analysis of compound
hazards



Coastal flooding:
 $f(H_s, T_p, SS, SLR, AT)$

	10-year	50-year	500-year
Baseline	0.49 m	0.59 m	0.77 m
RCP4.5 (2050)	0.69 m	0.78 m	0.81 m
RCP4.5 (2100)	1.02 m	1.13 m	1.28 m
RCP8.5 (2050)	0.74 m	0.82 m	1.05 m
RCP8.5 (2100)	1.16 m	1.26 m	1.44 m

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For more details:



Coastal Engineering
Volume 189, April 2024, 104490



Projecting compound wave and sea-level events at a coastal structure site under climate change

D. Lucio , J.L. Lara, A. Tomás, I.J. Losada



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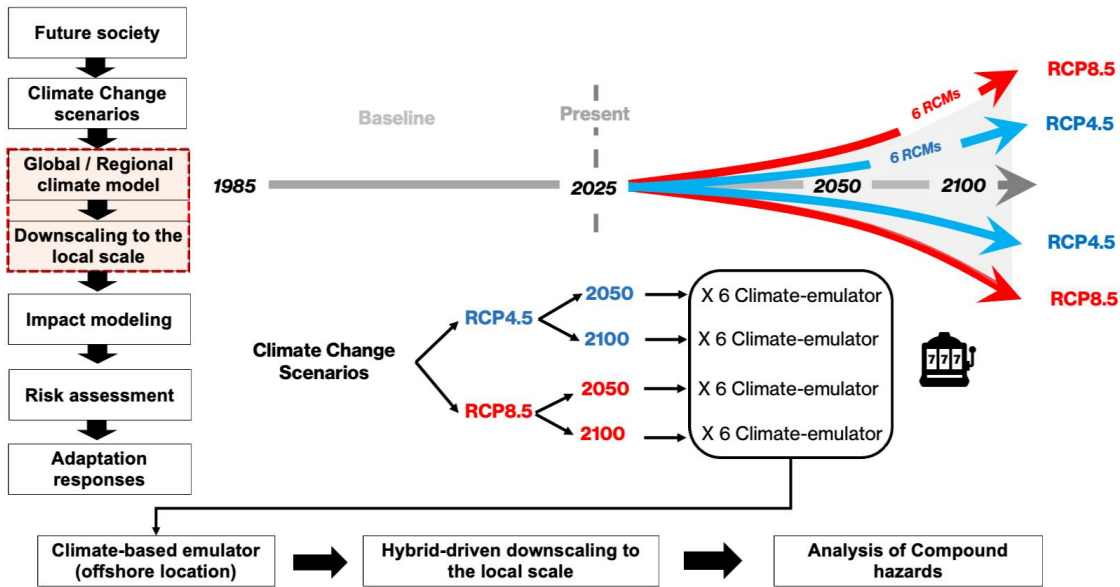
^a IH Cantabria – Instituto de Hidráulica Ambiental de la Universidad de Cantabria

Research question

How will the intensity and frequency of extreme climate events evolve, and what will be their impact on coastal areas?

Methods

Top-down approach



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Thanks for your attention

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