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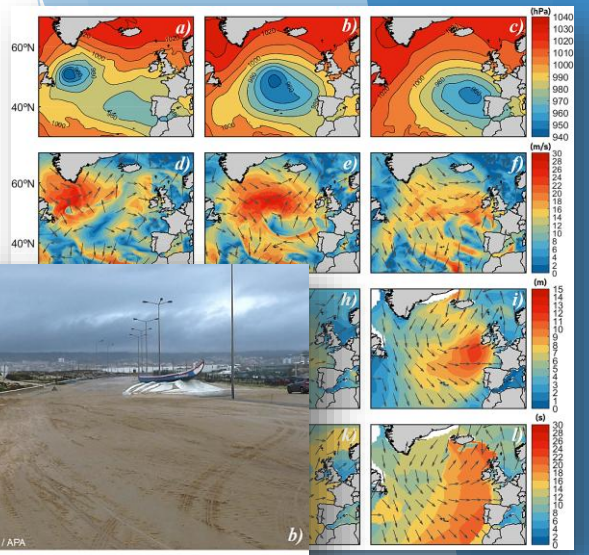
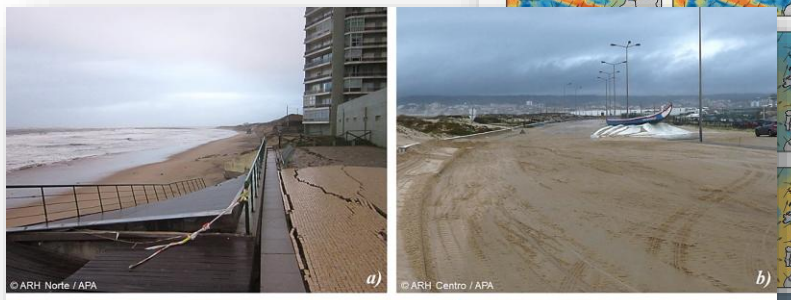
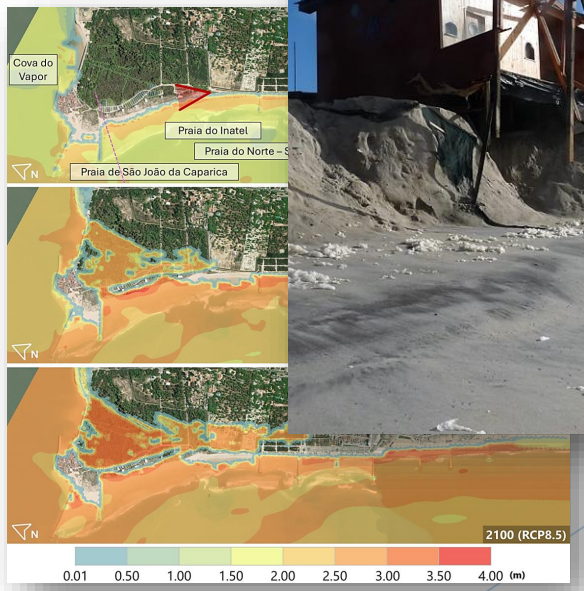
A physical climate storyline for the Hercules (Christina) storm in Portugal – extreme coastal flooding under a changing climate

Gil Lemos

Pedro M. M. Soares, Ricardo Simões, Carlos Antunes, Ivana Bosnic, Celso Pinto







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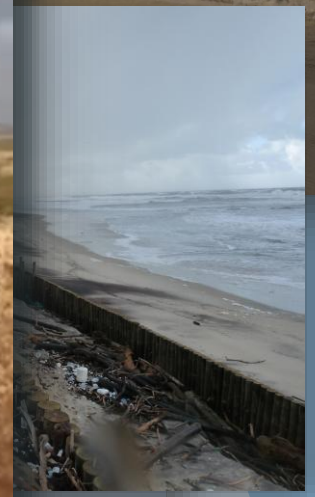
CONTEXT & MOTIVATION

→ In January 2014, the swells from Hercules (Christina) storm produced one of the most extreme coastal er
in Portugal

→ Left more than **16 M** infrastructure and indirect costs

→ Maximum measure

H_{max} **= 14.91 m**



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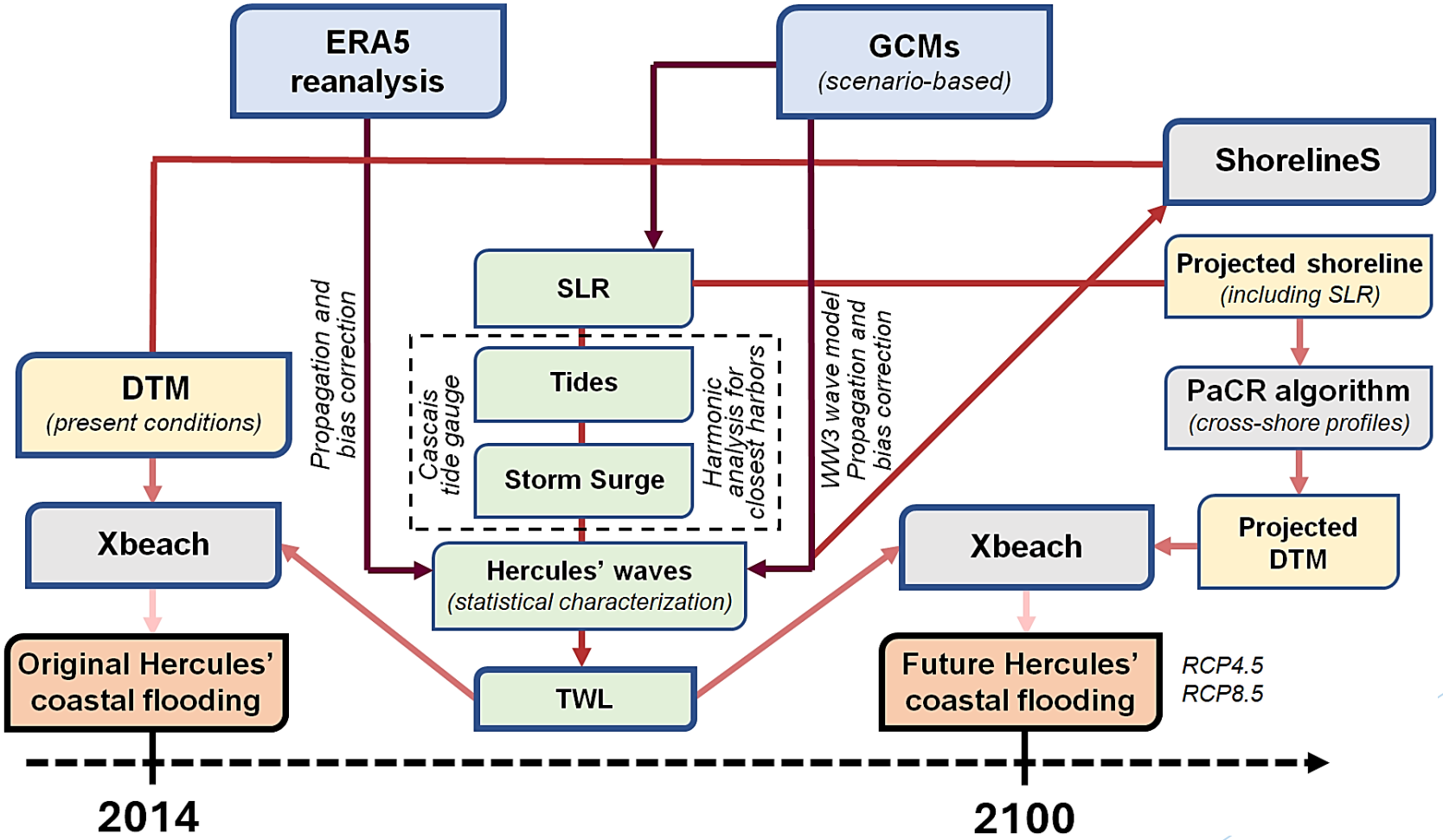
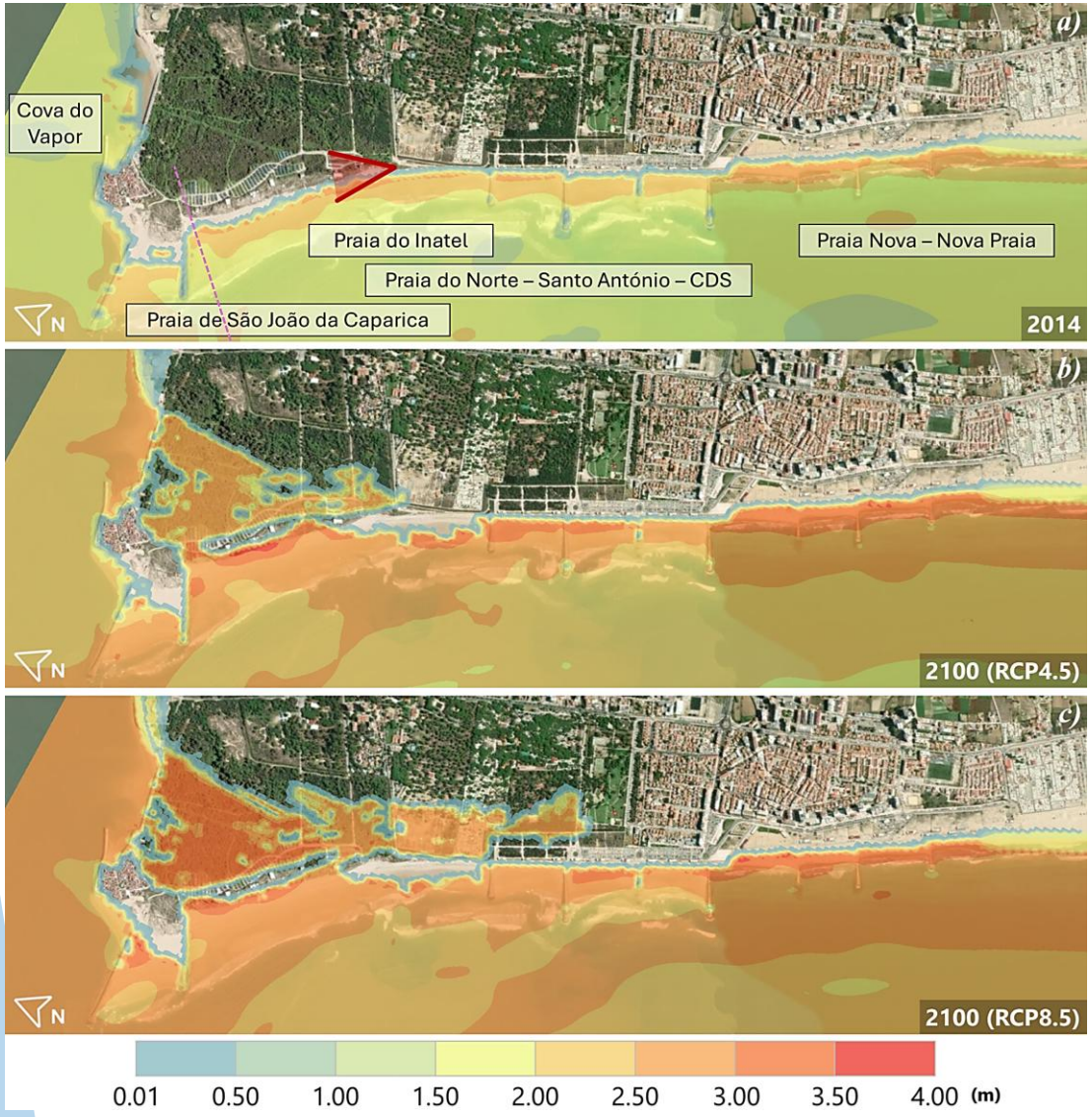
METHODS

- → **5 key-locations** along the Portuguese coastline
- → 6-member ensemble of downscaled and bias corrected wave climate simulations and projections + ERA5 downscaled waves
- → 6-member ensemble of storm surge simulations and projections
- → 21-member ensemble of SLR projections
- → Tidal projections for the closest harbors



RESULTS (teaser)



Costa da Caparica (South of Lisbon)

2014

→ Generalized loss of sediment, with the dune coord retreating up to 15 m. Damages affected commerce and communication routes.

By the end of the 21st century

(*independently of the scenario*)

→ The further eroded **dune coord is expected to break**.

→ The seawall near Cova do Vapor is projected to be overtopped, **isolating several hundred people**.

→ Under RCP8.5, coastal flooding extends towards urbanized areas, just 200 m from **habitational areas**.

Coastal flooding areas	2014 Hercules (km^2)	2100 Hercules (RCP4.5) (km^2; ND in %)	2100 Hercules (RCP8.5) (km^2; ND in %)
All key-locations	1.198	2.279 (+90.2%)	2.918 (+144%)

Number of impacted buildings	2014 Hercules (R / C / I / S)	2100 Hercules (RCP4.5) (R / C / I / S)	2100 Hercules (RCP8.5) (R / C / I / S)
All key-locations	44 / 16 / 1 / 11 (72)	148 / 51 / 1 / 29 (229) +218%	352 / 79 / 1 / 37 (469) +551%

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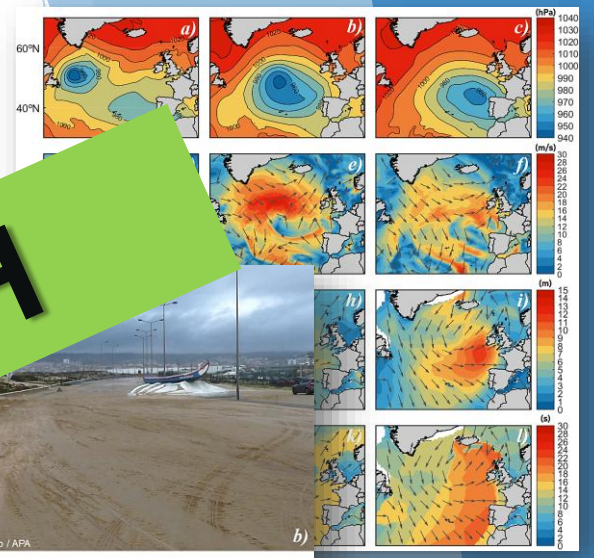
THANK YOU VERY MUCH



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