

STATISTICAL APPROACHES TO ASSES CLIMATE CHANGE COASTAL IMPACTS

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Motivation

STATISTICAL DOWNSCALING





Methodology





More details in Camus et al., 2014; Pérez et al., 2015; Camus et al., 2017



Global Statistical Projections

PROJECTED CHANGES in Hs Scenario RCP8.5 – Multi-model Ensemble For the period **2070-2099** Relative to the period 1979-2005 Multi-m

Multi-model annual mean Hs (m) (1979-2005)















Methodology







45

-0.24 -0.21

-0.18 -0.15

-0.12 -0.09 -0.06 -0.03

45 45[°] S 90°S -30 -35 -atitude Multi-model changes annual Hs 0

Regional Projections

INTERMODEL CHANGES Scenario RCP8.5 For the period **2070-2099** Relative to the period 1979-2005





Climate Change Assessment of Coastal Impacts

Present

Future



SS: DAC database

AT: reconstruction from an harmonic analysis

SLR: Slangen et al., 2014





Climate Change Assessment of Coastal Impacts



MULTI-MODEL PROJECTED CHANGES Scenario RCP8.5

For the period **2070-2099** Relative to the period 1979-2005

Camus et al., 2017

200

IHcantabria





Climate Change Assessment of Coastal Impacts



MULTI-MODEL PROJECTED CHANGES

Scenario RCP8.5 For the period **2070-2099** Relative to the period 1979-2005



Latitude

















































Hs= 5.6 m; Tp= 6.9 s; Dir=54.1°; marea=3.20 m. 1948/05/16 04:00

















Probabilistic Assessment of Port Operability under Climate Change











Conclusions

- The spatial resolution of wave projections depends on the historical wave database used as reference, not fixed as in dynamical simulations (e.g., global projections at 1.0° or regional projections at 0.25° or higher). Semi-supervised WTs at a 1.0° x 1.0° grid can be used to downscale wave climate at different spatial resolutions.
- Low computational effort is required to quantify uncertainty associated with climate change scenarios and various GCMs, to cover the whole century (not limited to the end of the 21st century as most dynamical simulations) and to update CMIP outputs.
- Multivariate marine projections can be obtained using the same statistical scheme (not limited to wave height as other statistical methodologies)
- Coastal impact can be assessed by means of direct downscaling of impact indicators which integrate climate change variations of various marine hazards and SLR.
- A probabilistic assessment of the impact of climate change on port operability due to wave agitation is introduced based on the semi-supervised WT collection. The results highlights the importance of modelling the non-linear effect of SLR in the wave penetration inside the port using a physical process-based model.

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Correlation Coefficient Hs

Validation of the statistical model

NRMSE Hs

Correlation Coefficient Tp

NRMSE Tp

Relative to the period 1979-2005

Global Statistical Projections

0.3

Multi-model annual mean Tp (s) (1979-2005)

Multi-model changes annual Tp

13 14 15 9 10 12 -0.3 -0.27 -0.24 -0.21 -0.18 0.21 0.24 0.27 8 11 16 -0.15

Multi-model changes JFM Tp

Multi-model changes JAS Tp

Temporal Series annual mean Hs

relative to the period 1979–2005

Multi-model changes annual Hs

0.3 -0.27 -0.24 -0.21 -0.18 -0.15 -0.12 -0.09 -0.06 -0.03 0 0.03 0.06 0.09 0.12 0.15 0.18 0.21 0.24 0.27

Global Statistical Projections

ID06 (South Pacific)

Historical Climate Conditions

Reconstruction of Hs inside the port Probabilistic Assessment of Port Agitation

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