THE IMPLICATIONS OF TRANSITIONAL CLIMATE REGIONS ON COASTAL RISK

Itxaso Odériz, IHCantabria - Instituto de Hidráulica Ambiental de la Universidad de Cantabria, itxaso.oderiz@unican.es
Nobuhito Mori, Disaster Prevention Research Institute Kyoto University, mori.nobuhito.8a@kyoto-u.ac.jp
Rodolfo Silva, Instituto de Ingeniería Universidad Nacional Autónoma de México, RSilvaC@iingen.unam.mx
Iñigo J. Losada, IHCantabria - Instituto de Hidráulica Ambiental de la Universidad de Cantabria, losadai@unican.es

INTRODUCTION

The latest report of the IPCC-AR6 warned that coastal regions are one of the most vulnerable areas in the current climate emergency. In response, the knowledge concerning projected climatic-impact drivers (total water level, average and extreme waves) is rapidly progressing to reduce future coastal flooding and erosion risks.

TRANSITIONAL WAVE CLIMATE REGIONS

Climate change also shifts atmospheric circulation and affects the climate regions and their surrounding areas. A poleward displacement of tropical and extratropical circulations has been documented, and this is projected to increase under climate change scenarios (Lucas et al., 2014). The atmospheric circulation regulates processes at the synoptic scale, such as ocean wave generation and propagation (Odériz et al., 2021). The areas where waves are generated and their associated tracks are expected to shift, becoming wave climates increasingly frequent where they did not (Odériz et al., 2022). In line with these findings, over the last decade, more intense southerlies swells have been affecting the Eastern Pacific coast. We have named these areas, where the variability of two wave climates that converge are expected to change, Transitional Wave Climate Regions (TWCR). For example, an increase in the number of wave systems approaching a coast will greatly affect the near-shore wave conditions (e.g., wave flux energy and mean wave direction). These regions will therefore face uncommon hazards and impacts, currently disregarded for the coastal risk management agenda.

OBJECTIVES AND RESULTS

This study aims to identify transitional wave climate regions and proposes a map of these critical areas. A spatial-temporal and multivariate analysis, based on Machine Learning approaches, was used to classify the wave parameters into climates for the end of the century (2081-2099) under the RCP8.5 scenario. In addition, an ensemble of 8 global ocean wave projections from different GCMs was analyzed, identifying those coastlines which will see future change in the occurrence frequency of a wave climate. The majority of these regions are located in southwestern and eastern ocean basins. Identifying these areas is a crucial step toward reformulating coastal risk engineering needs in a changing climate.

REFERENCES

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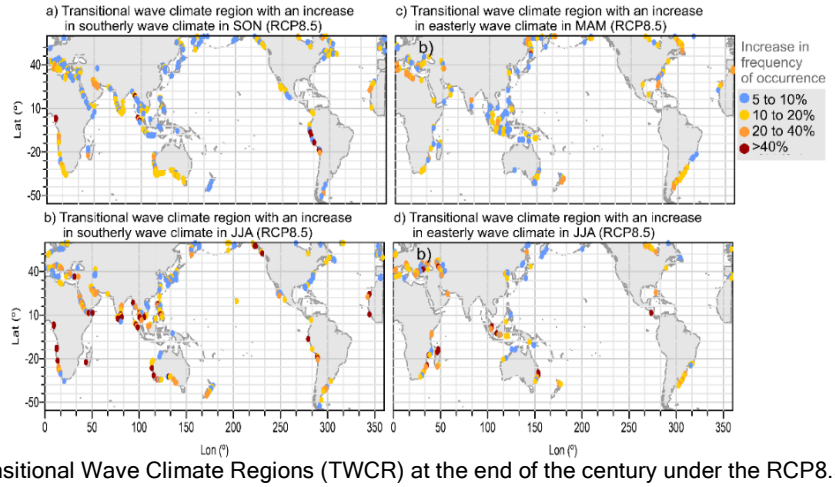

Figure 1 - Transitional Wave Climate Regions (TWCR) at the end of the century under the RCP8.5 scenario. TWCR for the southerly wave climate in a) SON (September-October-November), b) JJA (June-July-August), and for the easterly wave climate in c) MAM (March, August, May) and d) JJA.