SPECIAL PROJECT PROGRESS REPORT

All the following mandatory information needs to be provided. The length should *reflect the complexity and duration* of the project.

Reporting year	2025………………………………………….……
Project Title:	IAMCOAST – IntegrAtive Multivariate Tool for Future Shoreline Evolution and COASTal Flooding Vulnerability Assessments in Portugal …………………………………………….……
Computer Project Account:	spptlemo / prt8438 ……………………………….……
Principal Investigator(s):	Gil Ramos Lopes Gonçalves Lemos ……………….……
	…………………………………………………….……
Affiliation:	Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa
Name of ECMWF scientist(s) collaborating to the project (if applicable)	Pedro Matos Soares, Rita Margarida Cardoso, Daniela Lima, Virgílio Bento
	…………………………………………………….……
Start date of the project:	01-01-2025 ……………………………………….……
Expected end date:	31-12-2027 ……………………………………….……

Computer resources allocated/used for the current year and the previous one
(if applicable)
Please answer for all project resources

		Previous year		Current year	
		Allocated	Used	Allocated	Used
High Performance Computing Facility	(units)	---	---	100.000.000	43.000.000
Data storage capacity	(Gbytes)	---	---	120.000	16.000

Summary of project objectives (10 lines max)

This project aims to provide a complete, comprehensive assessment of the combined impacts of changes in sea levels, tides, storm surge and wave climates, producing projections for the ~1000 km of the Portuguese mainland coastline, using high-resolution, CMIP6-based modelling. It is designed to capture small-scale processes and feedbacks often overlooked in similar studies. Its goal is to produce detailed coastal geomorphological data and probabilistic risk maps to inform targeted adaptation strategies. The project assesses future changes in extreme events (waves and total water levels), shoreline evolution, and coastal flooding risks, distinguishing between permanent inundation and episodic flooding. Outputs include shoreline projections, modified digital terrain models, vulnerability and risk analyses, and cost-benefit evaluations of adaptation measures. Results will support national planning and contribute to global climate modelling initiatives like COWCLIP.

Summary of problems encountered (10 lines max)

At the current stage of the project, TASK1 and TASK2 have been partially completed. Several adjustments to the initially proposed methodology had to be conducted and testing for the most suitable parameterizations to use within the SWAN wave model, for the propagation of the global wave products (8-member ensemble and ERA5 reanalysis) within the regional, 1 km resolution downscaling domain (*e.g.*, JONSWAP peak enhancement factor, number of frequencies and directions, computational time-step). These were critical processes to be defined since they will influence the entire project. These have been accounted for, and the downscaling has begun, initially for the 1 km resolution, which will provide boundary conditions for the 100 m local dynamic modelling.

Summary of plans for the continuation of the project (10 lines max)

The project is expected to continue following the proposed timeline and methodology, to the most extent. Small changes may be in place, *i.e.*, using the PCR model (Ranasinghe et al., 2012) instead of the ShorelineS, considering statistical depictions of the wave and sea level changes in the future instead of a continuous modelling (which would possibly be unfeasible for the duration of the project). The 10 key-locations proposed should be located at Ofir, Costa Nova, Furadouro, Cova Gala, Leiria, Nazaré, Caparica, Sines, Lagos and Faro.

List of publications/reports from the project with complete references

Kumar, R., Lemos, G., Semedo, A., Li, J.-G. (2025). A global high-resolution CMIP6 ensemble of wave climate simulations and projections using a coastal multigrid: Configuration and performance evaluation. Ocean Modelling, 197, 102566. DOI: https://doi.org/10.1016/j.ocemod.2025.102566.

Summary of results

As of June 2025, tasks within the "WP1 – Forcing Data and Performance Evaluation" have been conducted. A global CMIP6 ensemble of wave climate simulations and projections was produced, to force the SWAN wave model for the downscaling that is currently underway – fully implemented and running. The ERA5 reanalysis was used to evaluate the performance of the global product, with satisfactory results. The reanalysis is also being downscaled with SWAN to assess the performance of the regional (1 km) and local (100 m) products and provide the basis for bias correction. Tidal projections were generated using harmonic analysis and buoy data has been gathered. SLR projections have also been gathered for the shoreline evolution and coastal flooding assessments. The 10 key-locations have been defined. Local modelling at 100 m resolution for these areas will begin shortly.