The importance of wave chronology in wave schematization for morphodynamic modeling in coastal zones

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Over the years, a relevant percentage of the population migrate towards coastal areas and nearby. In Spain, nowadays almost 40% of the population is settled close to the coast, and this value increases in summertime. Therefore, these areas have a great social, environmental and economic pressure. Besides their inherent value, both sea level rise and an increase in the frequency and intensity of extreme events are expected over the coming years induced by climate change. According to the last AR6 IPCC Report (2022), natural and anthropised coastal areas will still be at severe risk of erosion and flooding. Therefore, the understanding and modeling of the long-term morphodynamics of near-shore areas with some certainty is crucial for adaptation and mitigation.

Even though the study of coastal morphodynamics has evolved during the last decades, a great computational effort in modelling the effects of the different drivers is still required, particularly to analyze the effects of wave climate on near-shore morphodynamics. On account of the above-mentioned, different wave climate schematization techniques have been developed and applied during the last years: Synthetic Wave Events, SWE, Categorized Wave Classes, CWC, or Seasonal Averaged Wave Events, SAWE. Although with all these techniques shorter but morphodynamically equivalent wave climate time series are obtained, the storm chronology is not always preserved. In this research we aim to analyze the relative importance of maintaining (or not) the wave chronology in efficient morphodynamic simulations. For that, we will run the different existing methods in an idealised numerical model and will present a new type of wave schematization technique, called “Storm Preservation Schematization” (SPS) in which storm chronology is preserved and a variable morphological acceleration factor (morfac) is used, accelerating the morphodynamics changes only during the time intervals between extreme events. Eventually, lowering the computational effort in numerical models will lead to a better understanding of the present and future dynamics of coastal environments.

In order to get a more realistic geometry, the initial conditions used for the comparative simulations between schematization techniques are obtained after a one-year simulation with realistic climate information in an idealised bathymetry. Both the initial simulation and those for
the comparative analysis are performed with the Delft3D model. Initial results after analyzing the final morphologies obtained with each methodology indicate that the new approach for wave schematization (SPS) provide more realistic results when compared to the existing methods, highlighting the importance of keeping the real duration of the storms. Detailed results will be presented at the congress.