Impact of the evolution of the sea surface temperature on the coasts of the Valencia Region

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Many sectors that rely heavily on natural ecosystem conditions, such as marine aquaculture, are affected by environmental instability that may be associated with climate change. In order to optimally plan the development of fish or shellfish farming, it is crucial to incorporate climate risk as a decisive factor in selecting marine areas that will henceforth maintain suitable conditions.

Sea surface temperature (SST) is an example of an unstable phenomenon relevant to the fishing industry. In the literature there are many approaches to accurately define and predict the behavior of extreme events caused by environmental instability.

Specifically, there are four lines of research in the framework of spatio-temporal modelling of extreme phenomena. Firstly, conditional models of a spatio-temporal process given a point in time. Secondly, dynamic time series models that integrate spatial dependence. Moreover, hierarchical models in which spatial dependence is incorporated through the random components of the models. And finally, but widely applied, maximum stability processes that represent the interactions of space and time.

SST instability has been analysed by applying two techniques for different purposes. We started by modelling the data using dynamic time series models to assess the temporal behaviour, and then hierarchical models were applied to look at the behaviour of the region as a whole. Finally, the impact of the thermal instability of the sea was studied with the maximum stability process.

Inference and predictions on hierarchical models and maximum stable processes are approximated using the R-INLA package. The results of each analysis provide us with an estimate of the most stable marine areas where fish or shellfish farming will maintain optimal conditions for development.

Keywords: Extreme events, Spatio-temporal models, R-INLA.