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Statistical comparison of different strategies to reduce computational time within high resolution hydromorphodynamic modelling

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Hydromorphodynamic modelling has as one of its pillars the speed of obtaining results. Sometimes it is only due to the necessity to finish some work or to make other simulations but for example when talking about operational systems, this problematic takes even more strength. If other coastal operational modelling have to be coupled after, the model itself has to be fed by other models or the results have to be published periodically, the importance of the simulation speed is clear. A problem appears because there is an insoluble paradigm which doesn't allow to make simulations combining the best approaches for this three variables: low "computational time", high "resolution" and huge "study area". For example, if we want to simulate a huge coastal area but we need to present the results as soon as possible (i.e. low computational time), we will not be able to use a high-resolution grid because it will fail in the second statement. This problem appears in all the other possible scenarios involving this three variables where the best response for all of them cannot be satisfied at the same time due to the paradigm. Then, since it is impossible to totally solve this problematic, a lot of efforts have been made to reduce its effects and to work with the best possible approaches. In this work, two methodologies that try to improve the performance of the hydromorphodynamic simulations with XBeach model are tested and statically compared with the typical performance. On one hand, a direct reduction of the computational time using parallel computing, specifically Message Passing Interface (MPI) with Cluster application. On the other hand, the conversion of the grids that are used for the simulation from rectangular to curvilinear in order to increase only the resolution of the area of interest in the grid, maintaining lower resolutions for the rest of the area.

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