



## **On a new hybrid method to modelize the turbulence over marine sand ripples**

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Marine sand ripples are frequently observed due to water motion. Modelling coastal sediment transport is a difficult task because of the turbulent small-scale processes. At regional scale, the accurate methods such as LES and DNS cannot be used due to limitations of computing resources. Most of coastal models are based on the RANS method. A hybrid method combining RANS and LES is a relevant option. We implement a new hybrid method in our 3D hydrodynamic model forced by the waves. The first step was to test on cases where the intraripple dynamic is resolved. RANS and LES are employed near the bottom and elsewhere respectively, thus allowing us to ensure a better accuracy of the results than using a fully RANS model. This also reduces the computational cost compared to a fully LES model. The validation step was performed with two sets of field data and also with the data from Dune2D model which uses only RANS for turbulence. The main comparison results are: a) the vertical profiles of the velocity are similar to all the data b) the turbulent kinetic energy, underestimated by Dune2D, agrees with the observations c) the concentration of the suspended sediment is simulated with a better accuracy than using Dune2D, however it remains slightly lower than the observations. Secondly, the hybrid method is evaluated for coastal simulations in the Bay of Somme where the effects of ripples are parameterized. As expected, our method improves the results in comparison with the original fully RANS model.