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# Modelling Wave-Driven Coastal Sediment Transport in a Climate Change Scenario

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Coastal morphodynamics is the result of a number of processes in which most of the driving factors strongly depend on climatic conditions. Thus, climate change is one of the most impacting constraints in governing long-term coastal landscape evolution: in particular, such influence acts through sea level rise and the effects of changes in atmospheric dynamics. While the former causes a general retreat of the shoreline and the flooding of the underlying coastal zones, with a direct effect on the coastal zone, changes in atmospheric dynamics modify landscape processes via storm surge and wave climate variations. In particular, modifications in wave storminess affect coastal sediment transport, with possibly relevant implications especially in environments with strong morphodynamic activity.

In the present work we investigate the impact of a possible climate change scenario on wave-driven coastal sediment transport in a deltaic system in the Northern Adriatic Sea with reference to the period 2070-2099. To this aim, the results of a spectral wave model (SWAN) forced with climatological wind fields have been used. These were obtained by means of a high-resolution Regional Climate Model (COSMO-CLM) with reference to the IPCC A1B emission scenario. The resulting wave climate has been used as a constraint for a hydro- morphodynamic model, which was applied to a test site on the Po Delta (Northern Italy): relevant transport processes have been studied both at decadal and at storm time scales and compared with the corresponding results of a control analysis (1965-1995) representing the actual climate.

A predicted reduction of the cyclonic activity in the Northern Adriatic Sea produces a decrease in significant wave height (Benetazzo et al., 2012), thus generating non-negligible impacts on sediment resuspension and transport processes along the western Adriatic coast. In particular, compared to cross-shore transport, long-shore sediment drift appears to be most affected by the wave climate change, suggesting different responses of the long- and short- term coastal morphodynamic processes.

The present work can find fruitful applications in the long-term modelling of coastal and transitional environments, whose morphology is strongly influenced by sediment content in the near-shore water column. Furthermore, predicting the effect of climate change on littoral processes is the key for an appropriate coastal management at decadal to centennial scale: hence, besides providing information about the future trend of a reach of the Italian coast, this work aims to suggest a possible methodological approach for coastal planning and protection.

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References

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