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Predicting Wave Overtopping Using an Integrated Modelling Suite

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Understanding future changes in flood risk from waves overtopping seawalls and other structures is a key requirement for the effective management of coastal defences. Occurrences of loss of life and economic damage due to the hazardous nature of wave overtopping are becoming more frequent and coastal managers and users are becoming more health and safety conscious. Seawalls make up most of these defences and range from simple earth banks through to vertical concrete walls and more complex, composite structures. Each of these require different methods for assessing the volume of water overtopping them during storms.

As an introduction to this topic, the EurOtop Overtopping Manual website, http://www.overtopping-manual.com/, presents a state of the art description of available methods for assessing overtopping and its consequences. This includes a comprehensive background, context and a detailed technical manual together with 3 independent methods for calculating wave overtopping - empirical methods (with a fully web-enabled tool), the PC Overtopping application (also web-enabled) and the Neural Network (downloadable).

This paper describes the application of an experimental operational coastal forecast and warning service developed by HR Wallingford and piloted in an area along the Dawlish coastline in South-West England. Infrastructure, in particular the main railway line, is situated right along this stretch of the sea front.

The usual purpose of such systems is to provide accurate and timely warnings of the source and magnitude of coastal hazard. This includes wave and surge levels that lead to potential coastal hazards such as severe wave overtopping or coastal erosion. This prototype example is based on the EuroTop Manual and a SWAN model driven by waves and winds from the UK Met Office North Atlantic European (NAE) wave model and also the UK Environment Agency surge level forecasts also generated by the UK Met Office. The model suite chains together nearshore, non-linear shoaling and breaking and EurOtop Empirical vertical wall methods to give a final overtopping volume at selected points on the coastline.

A suggested improvement to the process by using the OpenMI modelling interface standard is also given.