

Large-scale laboratory measurements of the pore pressure response to bichromatic waves in the swash zone

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Introduction

The swash zone is the dynamic coastal region where waves intermittently cover and expose the beach. These waves also induce fluctuations in groundwater levels through infiltration and exfiltration. The flow through the bed can have a mobilising or stabilising effect, and therefore influence the amount of sediment that is transported. Furthermore, strong pressure gradients can lead to bed fluidisation, which leads to large instantaneous suspension of sediments. To better understand these processes, new measurements of pore pressures under large-scale bichromatic waves were conducted in the Barcelona CIEM wave flume (for details see van der Werf et al., 2019). These unique measurements will help providing better insight into how subsurface flows and pressure gradients influence sediment transport, and ultimately morphodynamics, in the swash zone.

Results and outlook

In this work, we will present the data and initial findings. Figure 1 shows the pressure response to a bichromatic wave ($H_1 = H_2 = 0.32$ m, $F_1 = 0.31$ Hz, $F_2 = 0.26$ Hz). It shows that deeper pressure sensors show a more attenuated pressure signal. Furthermore, an analytical model for pore pressures could reproduce the measured results accurately (Pauli 2020). Future research focusses on the implications for sediment transport and how such implications can be implemented in numerical models.

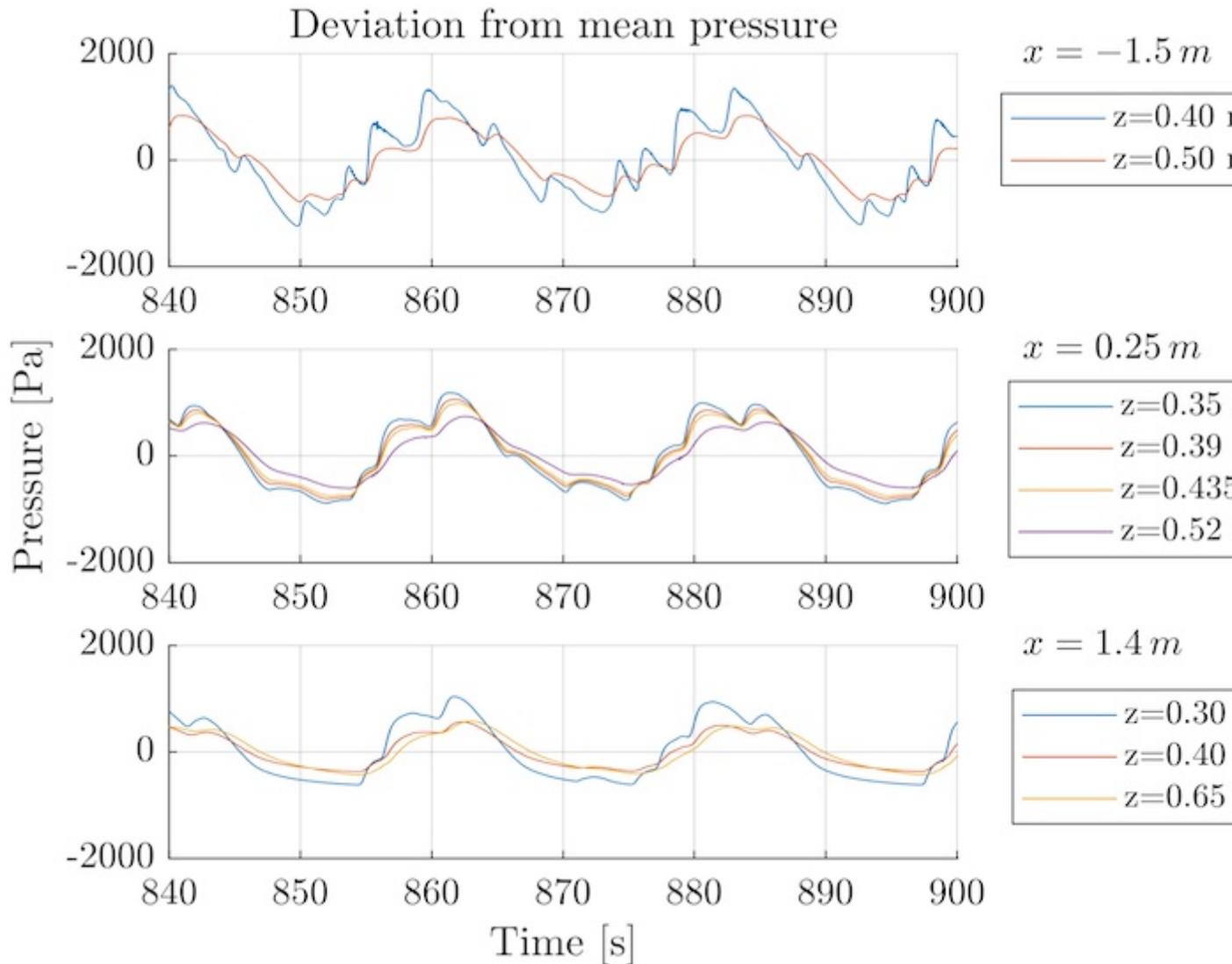


Figure 1: Measured pore pressure response at three different cross-shore locations and different burial depths z , below the initial beach profile. Here x is the landward position with respect to the still water line.

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