

EXPERIMENTAL STUDY OF LOCAL SCOUR AROUND COMPLEX BRIDGE PIERS



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INTRODUCTION

River bed local scour around bridge foundations has been recognized as one of the main causes of bridge failures. Physical and economic considerations lead to bridge foundations composed of complex piers (column, c, pile cap, pc, and pile group, pg). The purpose of this study is to systematically map equilibrium scour at plausible configurations of complex piers.

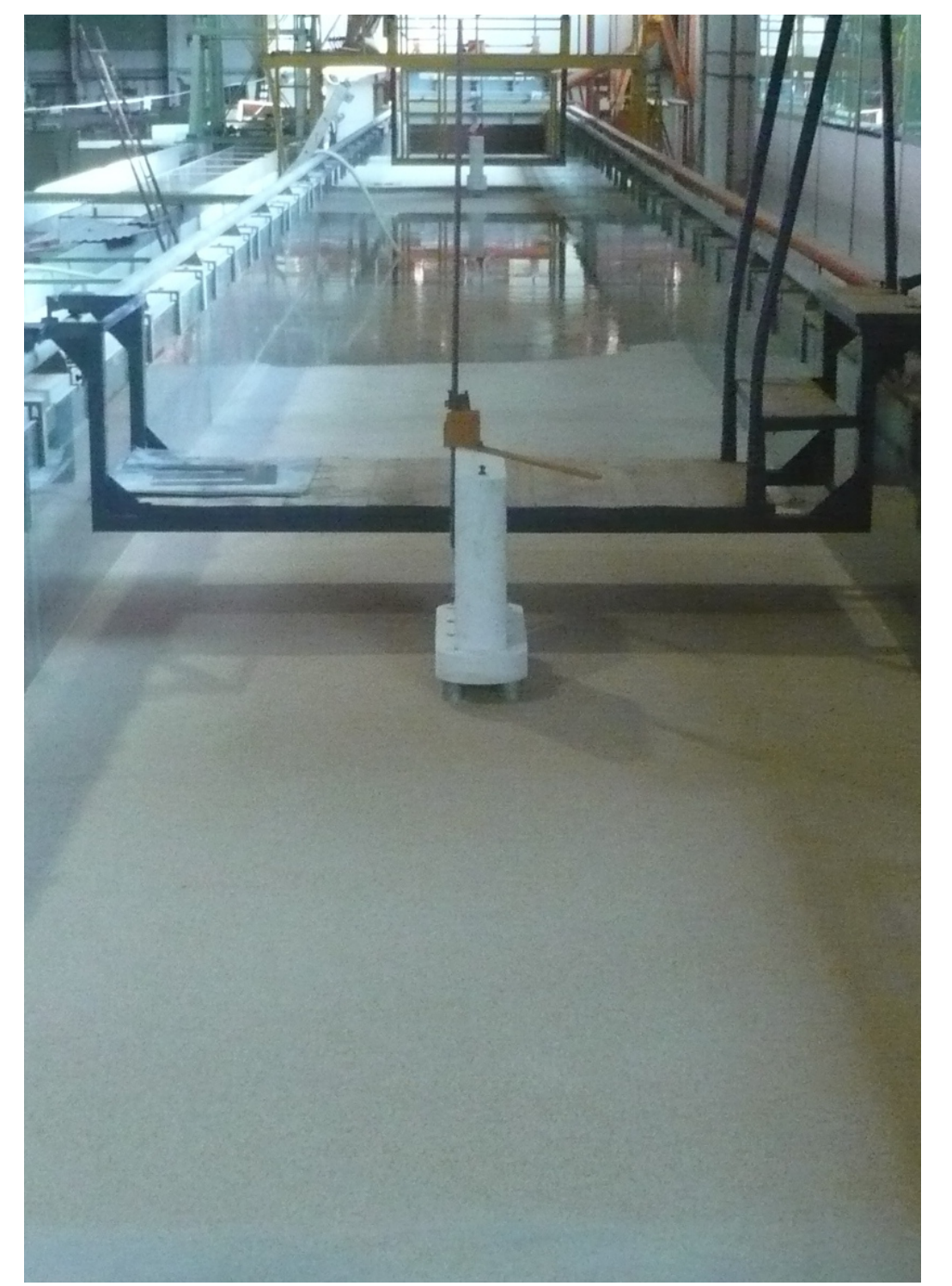
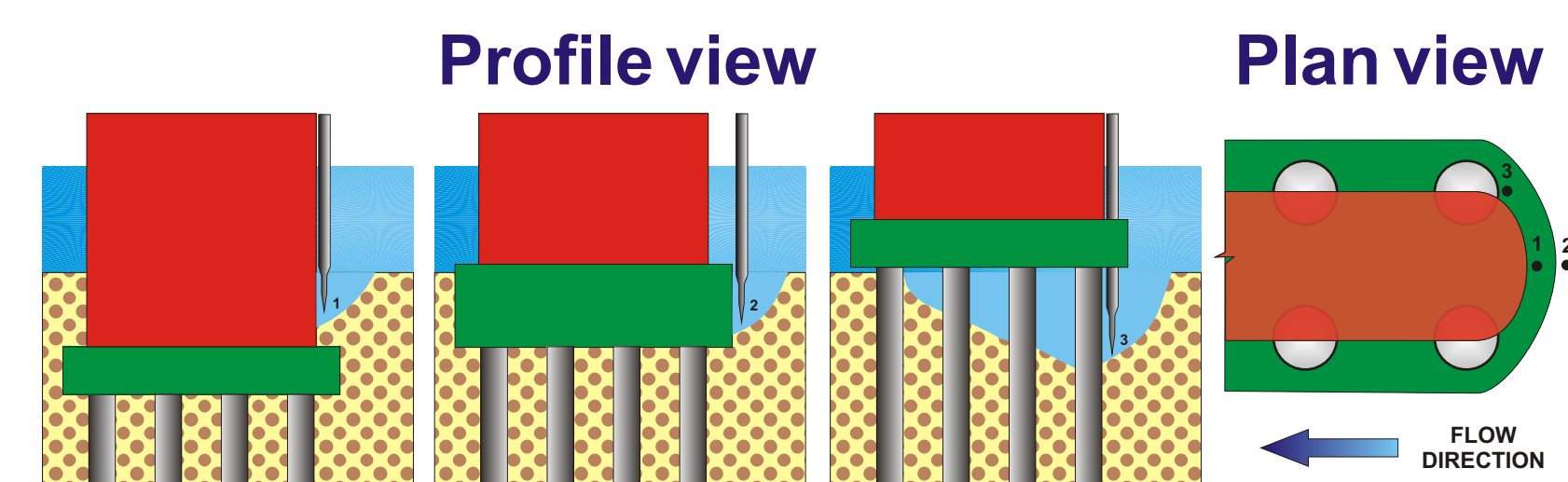


EXPERIMENTAL FACILITY

Tests are carried out at CIV flume, LNEC's facility. CIV is a 40 m long, 2 m wide and 1 m deep rectangular tilting flume.

Two independent bottom recess boxes coexist for simultaneous two experiments.

Scour depths are measured at three points depending on the pile cap position and the scour hole evolution, as show in figure:



OBJECTIVES

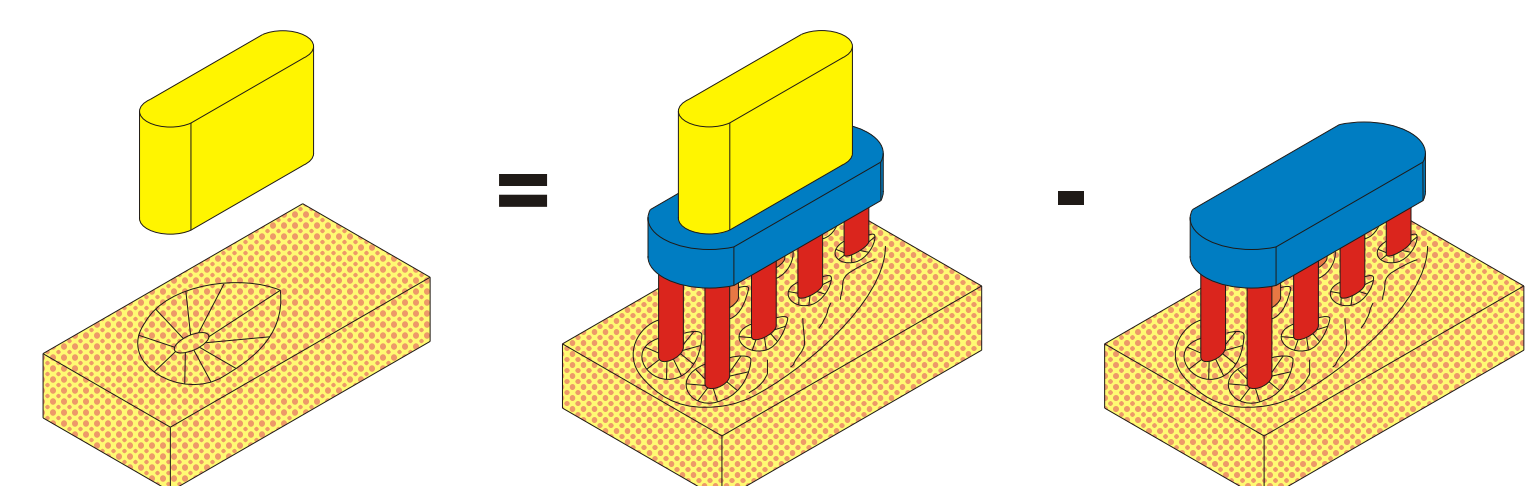
The objectives of the present research are to (1) obtain more laboratory data on the parcel of the scour depth assignable to the complex piers components in order to (2) achieve a sound scour predictor.

METHODOLOGY

The contribution of each complex pier component on scour depth is evaluated by subtraction of it's correspondent parcel as shown in following schemes.

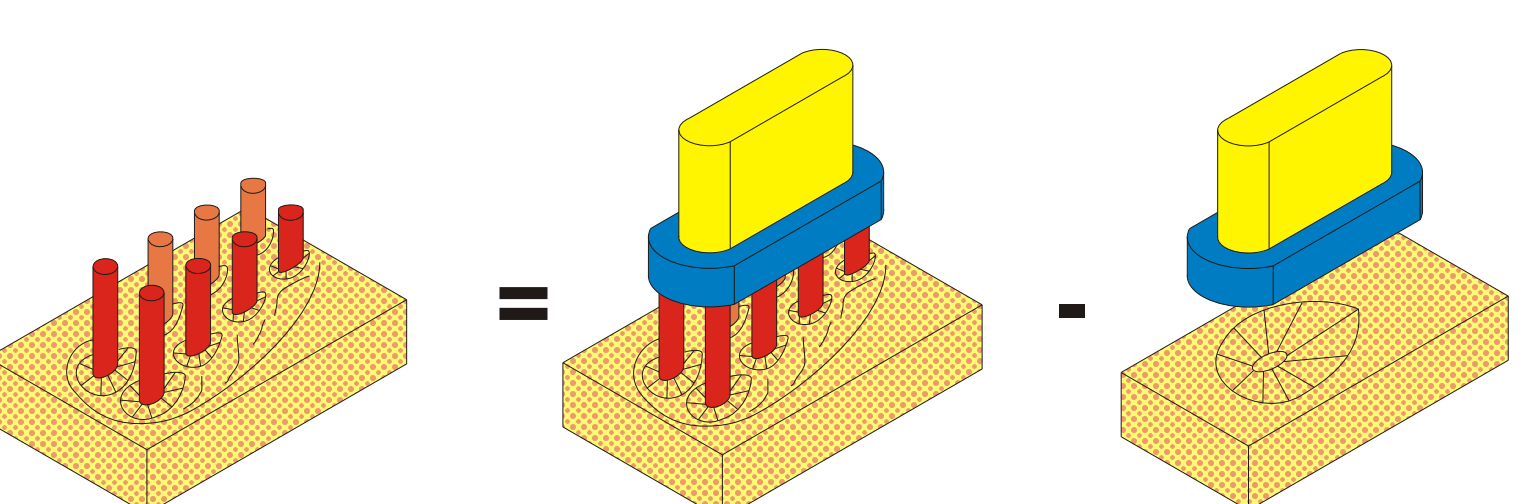
Column scour depth component

$$d_s^c = d_s^{all} - d_s^{pc,pg}$$



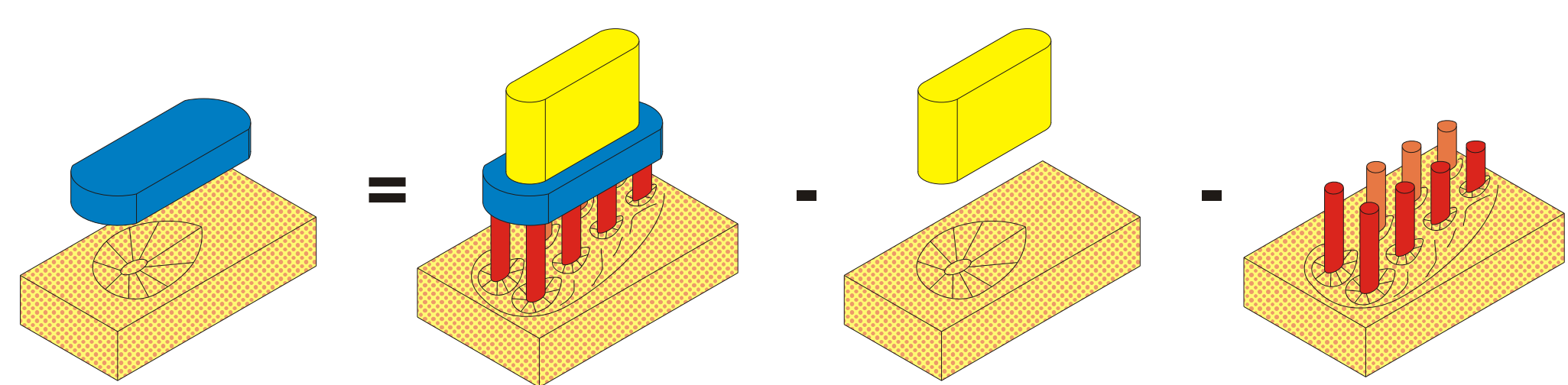
Pile group scour depth component

$$d_s^{pg} = d_s^{all} - d_s^{c,pc}$$



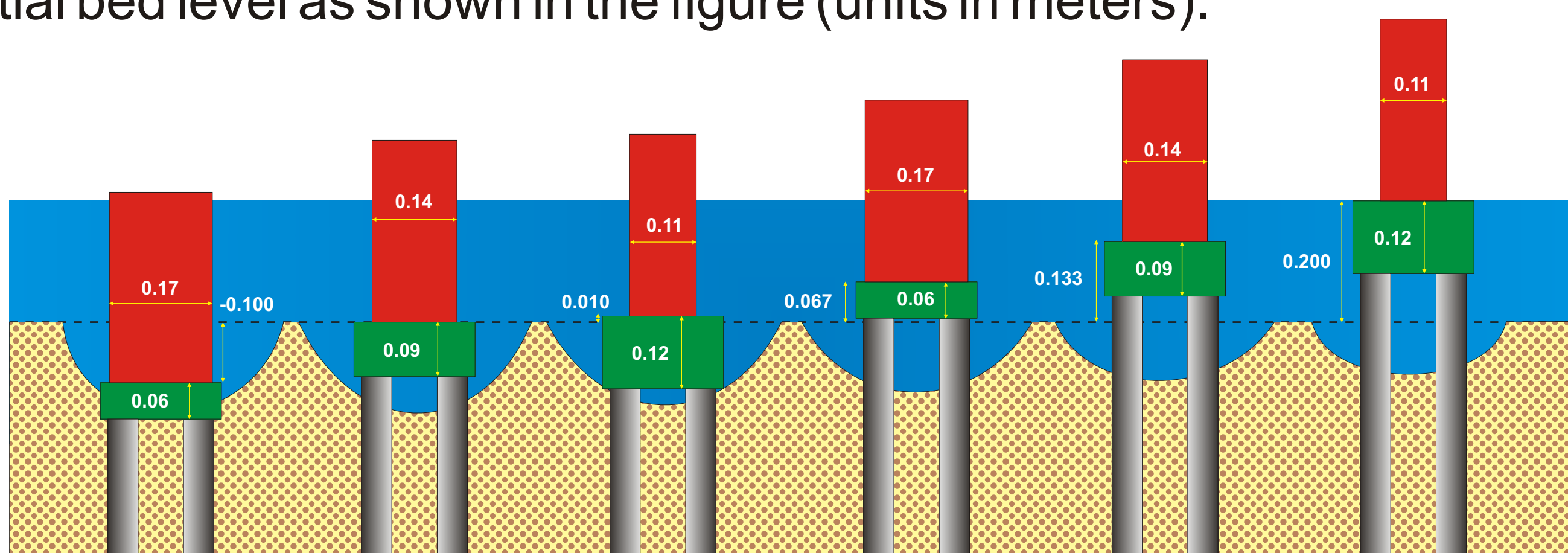
Pile cap scour depth component

$$d_s^{pc} = d_s^{all} - d_s^c - d_s^{pg}$$



The complex pier models tested in laboratory include 3 different column widths, 3 pile cap thickness and one pile group composition (2 rows of 4 piles).

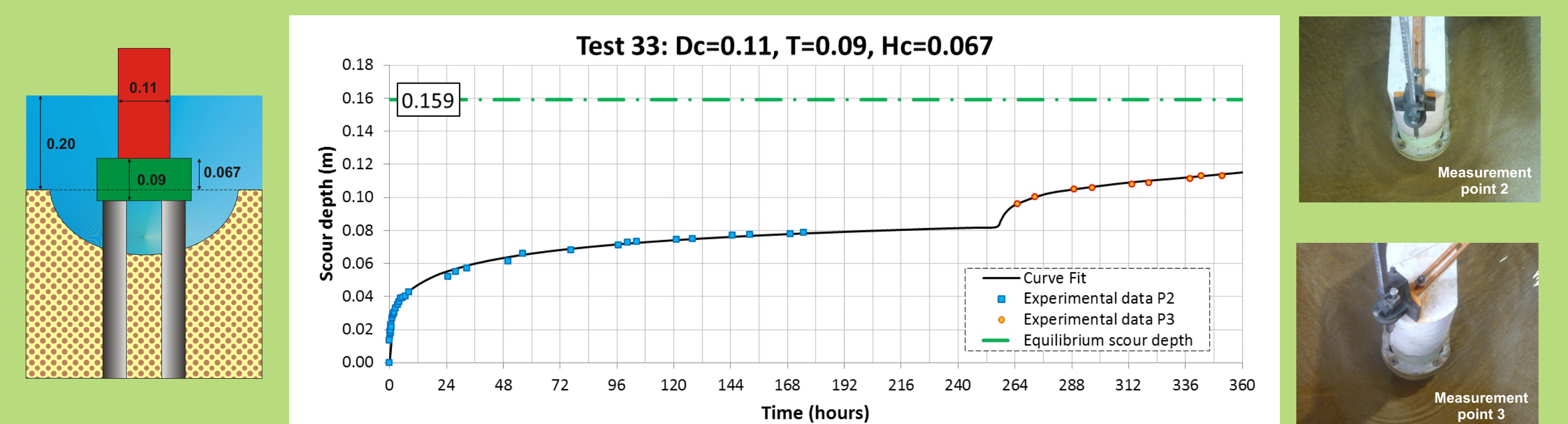
The campaign considers six positions of the pile cap in relation to the initial bed level as shown in the figure (units in meters).



RESULTS

Tests duration vary from 350 to 620 hours. Data acquisition includes graphical representation of the maximum scour depth evolution for each experiment, distinguishing the point of measurement and photos in different phases as shown.

Scour depth evolution



Scour hole evolution



ACKNOWLEDGEMENTS

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