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SHORT COURSE, DOI: …

PRE-CONFERENCE SHORT COURSE & LAB WORKSHOP: DAM-BREAK WAVES : FROM THEORY TO APPLICATIONS

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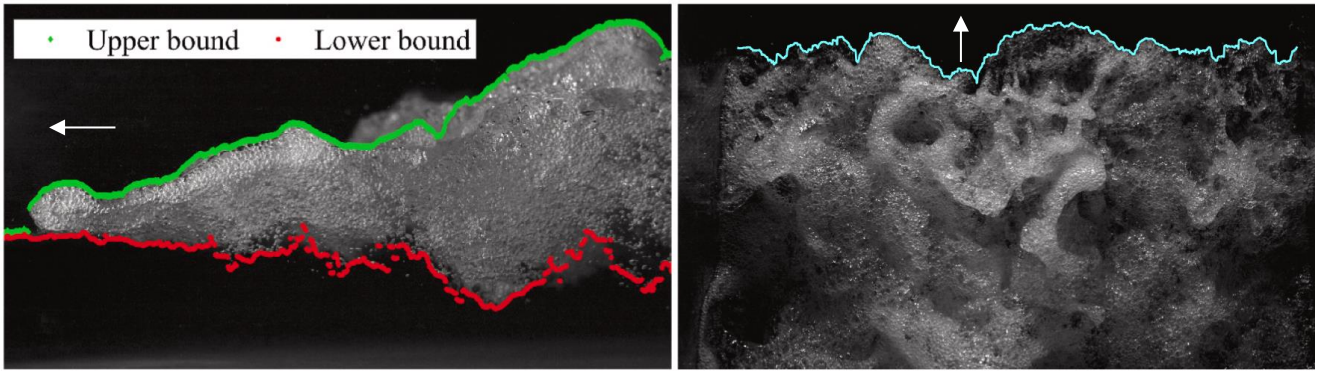
KEYWORDS: Dam-Break Waves, Generation, Propagation, Dry/Bed Conditions, Application, Tsunami, Flash Floods, Dam Breaching, Hydrodynamic And Debris Loading, Scour.

ABSTRACT

Dam-break waves are increasingly used in laboratory settings to reproduce the effects of rapid, highly unsteady and turbulent flows, including tsunamis, (flash)floods and dam/dyke breaching. This special lecture will focus on the characteristics of dam-breaks and their application to various types of laboratory experiments. The lecture will include an overview of the overarching theory, as well as the state-of-the-art in experimental dam-break, including wave generation and propagation (Fig. 1). Particular attention will be given to the multiphase (air-water) nature of dam-break waves, and it will discuss recent developments in laboratory techniques to address the unsteadiness of the flow in space and time, including the use of Ultra-High speed video cameras (16,000 frames per second) for image processing and velocimetry (Fig. 2). In addition, this lecture will also focus on experimental applications to investigate the impacts of such waves on free-standing buildings, including hydrodynamic (Fig. 3) and debris loading (Fig. 4), as well as sediments transport and scour, providing a complete overview of all phenomena involved in the wave-structure interaction.

(a) (b)

Figure 1. Dam-break bore propagation over: (a) wet and (b) dry bed (Nistor et al. 2012).



(a) (b)

Figure 2. Image processing techniques used for edge detection of the air-water region in breaking bores: (a) side view; (b) top view (Wüthrich et al. 2020a).

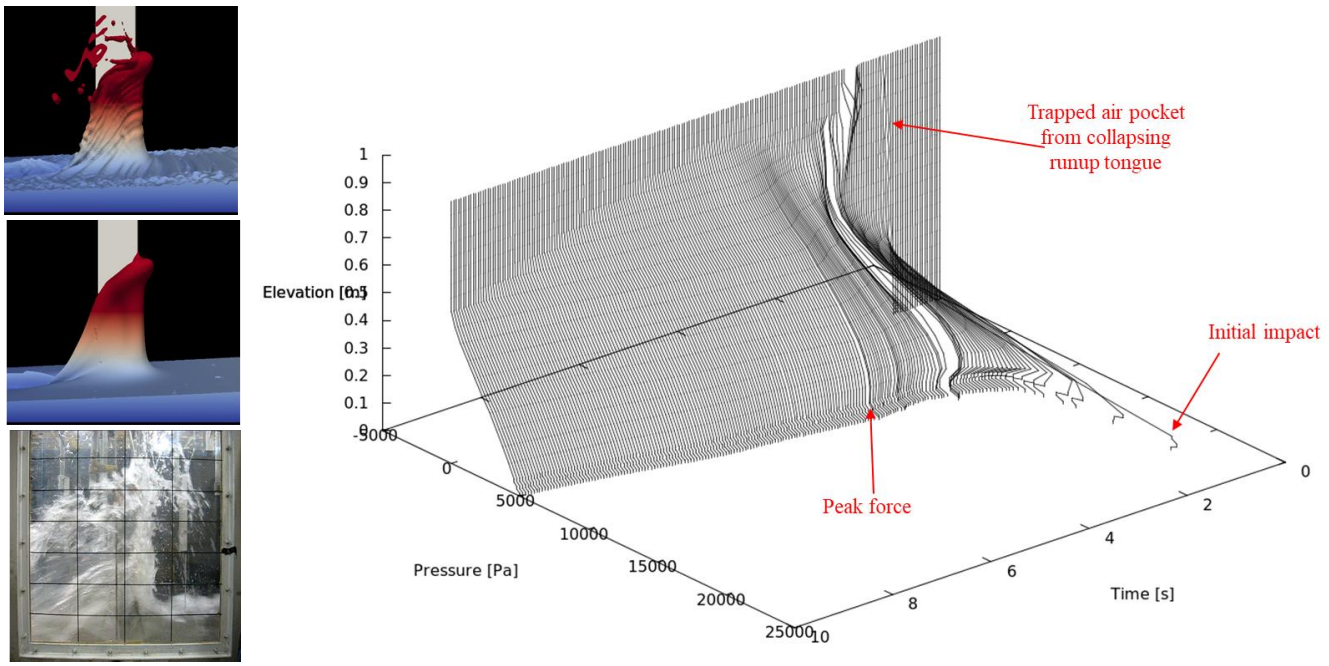
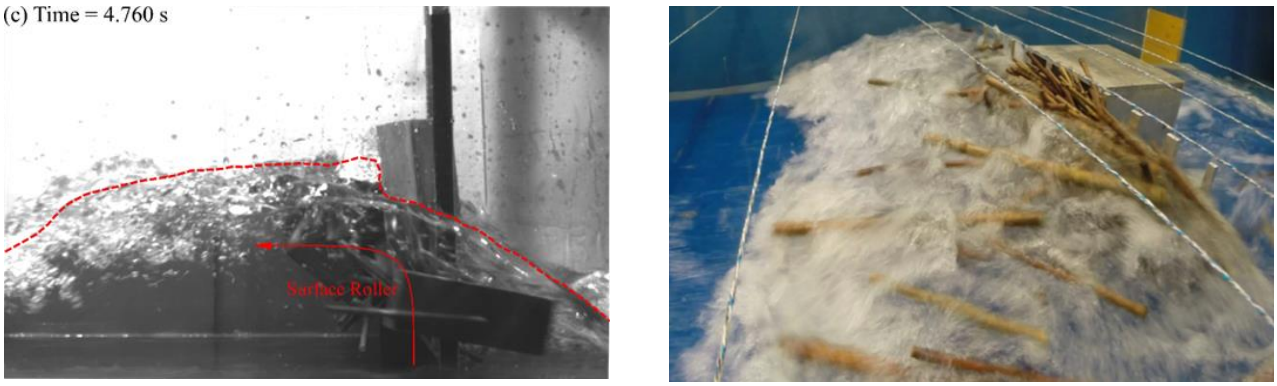


Figure 3. Time-history of hydrodynamic loading due to dam-break impact (Nistor et al. 2012)



(a) (b)

Figure 4. Combined debris and hydrodynamic loading due to dam-break/bore impact: (a) Nistor et al. (2021); (b) Wüthrich et al. (2020b), considering only (natural) driftwood.

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