On the relevance of the Bore-Soliton-Splash to extreme waves, tsunami run-up and wave energy?

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The bore-soliton-splash experiment consists of the following (Bokhove et al. 2011). Two major solitons are created by opening a sluice gate in an initially still water-wave channel of uniform depth. The front soliton breaks, becomes a bore shortly after its initiation, and crashes into a linearly converging, closed V-shaped channel end. This first wave reflects and draws a deep trough in which the unbroken second soliton precisely crashes. It yields a 3.5 to 4m vertical jet. The amplification factor of the waves' heights and the height of the jet is about ten. The catch is that this large amplification phenomenon only occurs when water levels in canal and sluice gates are finely tuned. The first question to be discussed is why this is the case? Our attempts to simulate the splash with smoothed particle hydrodynamics will be analyzed with the aim to understand the sensitivity of this tuning.

The second question to be discussed is the relevance of the bore-soliton-splash to extreme waves in the ocean. This includes the relation with recent analytical work on soliton interactions by Kodama (Li et al. 2011). The third question to be discussed is its relevance to the Tohoku tsunami run-up in converging valleys such as Onagawa Wan (bay), where the amplification factor was estimated to be five. Does the splash experiment suggest measures to dissipate the wave energy? The final question to be discussed concerns its potential for generating energy.

O. Bokhove, E. Gagarina, W. Zweers, and A. Thornton 2011: Bore Soliton Splash -van spektakel tot oceaan-golf? *Nederlands Tijdschrift voor Natuurkunde* **77**, 446-450. (In Dutch.) Movie and presentation links via: http://wwwhome.math.utwente.nl/ bokhoveo/
W. Li, H. Yeh, and Y. Kodama 2011: On the Mach reflection of a solitary wave: revisited. *J. Fluid Mech.* **672**, 326-357.