Some recent results on the dynamics of a mechanically-forced spilling breaker

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We propose an extension of the analyses illustrated at B'Waves 2016 on the dynamics that characterize a mechanically-forced spilling breaker.

With the aim of better understanding the evolution of a strongly unsteady and curved spilling breaker and collect information to validate the analytical model by Brocchini and co-workers [1,2,3], we focus on specific dynamics that characterize: 1) the breaking onset, 2) the mean flow structure and 3) the turbulence structures.

Mean and turbulent quantities of interest have been evaluated through a massive PIV experimental investigation of an unsteady spilling breaker evolving in a sloshing tank [4]. Preliminarily the overall repeatability of the phenomenon has been accurately checked.

Results will be proposed on the importance of extra rates of strain for an unsteady, curved spilling breaker in opposition to what occurs in a hydraulic jump, a flow that is very often regarded as similar to a spilling breaker and used as a proxy to investigate the turbulence of a breaker.

For the first time, the study assesses that for a spilling breaker: a) the extra rate of strain induced by the streamline curvature ($\partial V/\partial s$) is of the same order of magnitude of the mean simple shear ($\partial U/\partial n$); 2) the streamline curvature influences the turbulent structure of the flow. This significantly differs from the observations by Misra and co-workers [3] for the hydraulic jump flow, where the importance of the streamline curvature is ten times less than the mean simple shear.

References

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