

## Contribution to the Analytical Study of Barrier Surface Waves: Decomposition of the Solution

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**Abstract :** When a partially or completely immersed solid moves in a liquid such as water, it undergoes a force called hydrodynamic drag. Reducing this force has always been the objective of hydrodynamic engineers to make water slide better on submerged bodies. This paper deals with the examination of the different terms composing the analytical solution of the flow over an obstacle embedded at the bottom of a hydraulic channel. We have chosen to use a linear method to study a two-dimensional flow over an obstacle, in order to understand the evolution of the drag. We set the following assumptions: incompressible inviscid fluid, irrotational flow, low obstacle height compared to the water height. Those assumptions allow overcoming the difficulties associated with modelling these waves. We will mathematically formulate the equations that allow the determination of the stream function, and then the free surface equation. A similar method is used to determine the exact analytical solution for an obstacle in the shape of a sinusoidal arch.

**Keywords :** analytical solution, free-surface wave, hydraulic channel, inviscid fluid

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