Near-Front Wave Profile on Shallow Water over a Rapidly Oscillating Bottom Generated by Time-Dependent Spatially Localized Source

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We consider the 2D wave equation with rapidly oscillating velocity and time-dependent right-hand side vanishing for large time and localized in a neighborhood of some point of the physical plane. We present asymptotic formulas describing the solutions of this problem and connecting the solution profile with the form of the right-hand side source. We show that for some specific sources these formulas can be expressed via special functions like the Airy functions Ai and Bi, Erf, Erfc, etc., which allow one to analyze the oscillations near the front generated by the bottom oscillation and time-oscillation of the source. We compare these oscillations with the oscillations due to water wave dispersion. Applications to tsunami wave propagation are discussed.