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Travelling waves and large amplification in strongly non-uniform media

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The existence of traveling waves in strongly inhomogeneous media is discussed in the framework of the one-dimensional wave equation with a variable speed. Such solutions are found by using a homogenization, when the variable-coefficient wave equation transforms to a constant-coefficient Klein-Gordon equation. This transformation exists if and only if the spatial variations of the variable speed satisfy a constraint expressed by a second-order ordinary differential equation with two arbitrary parameters. All solutions of the constraint are found in explicit form. Some particular solutions recover asymptotic WKB approximations for slowly varying waves in inhomogeneous media obtained earlier in the literature.It is demonstrated that these solutions describe the large amplification of water waves in the coastal zone.