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Explicit formulation for the Rayleigh wave field induced by surface stresses in an orthorhombic half-plane

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Abstract

We develop an explicit asymptotic model for the Rayleigh wave field arising in case of stresses prescribed on the surface of an orthorhombic elastic half-plane. The model consists of an elliptic equation governing the behaviour within the half-plane, with boundary values given on the half-plane surface by a wave equation. Consequently, propagation along the surface is entirely accounted for by the hyperbolic equation, which, besides, may be immediately recast in terms of the associated surface displacement. The model readily solves otherwise involved dynamic problems for prescribed surface stresses, and its effectiveness is demonstrated for the classical Lamb's problem, as well as for the steady-state moving load problem. The latter example shows that the proposed model is really obtained by perturbation around the steady-state solution for a load moving at the Rayleigh speed.

Keywords: Asymptotic model, Rayleigh wave, Moving load

1. Introduction

Surface waves in anisotropic elastic media have been well investigated on the grounds of their wide range of application in defect detection, waveguide scattering and earthquake analysis. A large degree of interest has been raised by surface waves propagating in crystals, starting from the work of R. Stoneley [29], which generalizes the classical result of Lord Rayleigh concerning isotropic

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