

Shock-Induced Surface Waves in Porous Reservoirs

G. Chao⁽¹⁾, D.M.J. Smeulders⁽¹⁾, M.E.H. van Dongen⁽²⁾

(1) *Delft University of Technology, Department of Applied Earth Sciences, Delft, The Netherlands*

(2) *Eindhoven University of Technology, Department of Applied Physics, Eindhoven, The Netherlands*

A detailed knowledge of the relation between the material properties and the propagation of surface waves in liquid-saturated porous media is important in order to obtain an accurate characterization of water and hydrocarbon reservoirs. The fundamental surface mode the tube wave and its relation with permeability has been subject of study in the past. In this work, the frequency-dependent properties of the different surface modes that propagate in a cylindrical interface between a fluid and a fully saturated porous medium are studied theoretically and experimentally. Numerical calculations based on Biot's theory are presented for the dispersion relation, pore pressure and displacements of the different waves. Experimentally, we use shock waves to generate surface waves in a borehole. Synthetic and natural samples with permeability values ranging from 360 mD to 10.8 mD were used to study the permeability effects in the broad band of frequencies (1–60 kHz) involved in the experiments.

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