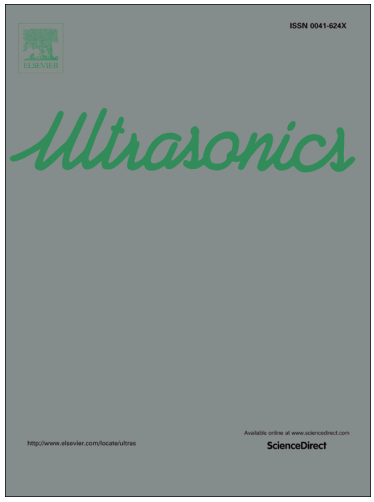

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PII: S0041-624X(16)30056-7
DOI: http://dx.doi.org/10.1016/j.ultras.2016.05.006
Reference: ULTRAS 5280

To appear in: *Ultrasonics*

Please cite this article as: L.K. Santos, J.J.S. de Figueiredo, C.B. da Silva, A study of ultrasonic physical modeling of isotropic media based on dynamic similitude, *Ultrasonics* (2016), doi: http://dx.doi.org/10.1016/j.ultras.2016.05.006

A study of ultrasonic physical modeling of isotropic media based on dynamic similitude

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Abstract

For decades, seismic and ultrasonic physical modeling has been used to help the geophysicists to understand the phenomena related to the elastic wave propagation on isotropic and anisotropic media. Most of the published works related to physical modeling use physical similitudes between model and field (geological environment) only in the geometric and, sometimes, in the kinematics sense. The dynamic similitude is approximately or, most of the time, not obeyed due to the difficulty to reproduce, in laboratory, the forces and tensions excited inside the earth when elastic waves propagate. In this work, we use expressions for dynamic similitude related to the ratio between stiffness coefficients or Lam parameters. The resulting expression for dynamic similitude shows that this type of similitude has multiple solutions in the context of dynamic stress (non-uniqueness problem). However, the regularization of this problem can be reached by controlling porosity and clay content. Ultra- sonic measurements (elastic) as well as petrophysical measurements (density, porosity and clay content) in synthetic sandstone rocks