



HAL
open science

Numerical study of quantitative inverse wave problems in visco-acoustic and visco-elastic media

Florian Faucher

► **To cite this version:**

Florian Faucher. Numerical study of quantitative inverse wave problems in visco-acoustic and visco-elastic media. Workshop RNTW04 - Synergistic workshop on Rich and Nonlinear tomography, Jun 2023, Cambridge, United Kingdom. hal-04355871

HAL Id: hal-04355871

<https://hal.science/hal-04355871>

Submitted on 21 Dec 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Numerical study of quantitative inverse wave problems in visco-acoustic and visco-elastic media.

Florian Faucher¹,

We consider the propagation of waves in media with attenuation. Attenuation is a frequency-dependent phenomenon and several constitutive laws exist to consider it, each leading to different models of wave equations. In the inverse problem for the reconstruction of the physical properties from the measurements of waves, considering a medium with attenuation leads to additional unknown coefficients to recover (those that represent the attenuation), while the precise attenuation law characterizing the medium is also unknown a priori. In this work, we consider the inverse wave problem for visco-acoustic and visco-elastic media. We use time-harmonic formulations which allow us to unify the models of attenuation using complex-valued parameters and illustrate the wave propagation depending on the attenuation model. We carry out quantitative reconstruction with attenuation model uncertainty using an iterative minimization procedure. Furthermore, we also consider the case of reflecting boundaries surrounding the sample, which lead to multiple reflections within the domain and complicate the reconstruction.

¹Project-Team Makutu, Inria Bordeaux, University of Pau and Pays de l'Adour, France.