Preface

The characterization of porous materials (e.g., sandstone) is very important for geotechnical and reservoir engineers. For this purpose, often use is made of acoustic waves that are sent through the medium. The desired material parameters can be estimated from the measured signals. In many cases, only the velocity or the attenuation of the acoustic waves is employed and much information carried by the waves remains untouched. Therefore, in this book I investigate the feasibility of the characterization of porous media using information contained in full acoustic waveforms as observed in different components (e.g., particle motion and fluid pressure).

After the introductory chapters that give general insight in the problem of wave propagation in porous media, I subsequently address the mathematical description of pseudo/leaky interface waves, their experimental detection, and the estimation of medium parameters. In the mathematical part, the main question is how to compute the wave attributes of an interface wave (e.g., velocity, attenuation, impedance) from analytical expressions associated with an entire wavefield. In the experimental part, I verify that the interface-wave impedance can be extracted from measurements and thus be used in applications. Next, I show that it is possible to estimate permeability and porosity of a porous medium by simultaneously exploiting different waveform attributes of a pseudo interface wave, and finally I also give an application of this idea to the seismic practice where permeability and porosity can be estimated from the combination of different body-wave reflection coefficients.

This monograph is the official publication of the material that originally has been written in my Ph.D. thesis that was accepted by Delft University of Technology. After the defense in 2011, Guy Drijkoningen came up with the idea to nominate the thesis for publication in the Springer Theses series, and thanks to the

endorsement of Christ Glorieux (Katholieke Universiteit Leuven) it was accepted by Springer in March 2012. I thank both of them for their efforts and willingness. Also the sponsoring of The Netherlands Research Centre for Integrated Solid Earth Sciences (ISES) is gratefully acknowledged.

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