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Fundamentals of Seismic Wave Propagation presents a comprehensive introduction to the propagation of high-frequency body-waves in elastodynamics. The theory of seismic wave propagation in acoustic, elastic and anisotropic media is developed to allow seismic waves to be modelled in complex, realistic three-dimensional Earth models. This book provides a consistent and thorough development of modelling methods widely used in elastic wave propagation ranging from the whole Earth, through regional and crustal seismology, exploration seismics to borehole seismics, sonics and ultrasonics. Methods developed include ray theory for acoustic, isotropic and anisotropic media, transform techniques including spectral and slowness methods such as the Cagniard and WKBJ seismogram methods, and extensions such as the Maslov seismogram method, quasi-isotropic ray theory, Born scattering theory and the Kirchhoff surface integral method. Particular emphasis is placed on developing a consistent notation and approach throughout, which highlights similarities and allows more complicated methods and extensions to be developed without difficulty. Although this book does not cover seismic interpretation, the types of signal caused by different model features are comprehensively described. Where possible these canonical signals are described by simple, standard time-domain functions as well as by the classical spectral results. These results will be invaluable to seismologists interpreting seismic data and even understanding numerical modelling results.

Fundamentals of Seismic Wave Propagation is intended as a text for graduate courses in theoretical seismology, and a reference for all seismologists using numerical modelling methods. It will also be valuable to researchers in academic and industrial seismology. Exercises and suggestions for further reading are included in each chapter, and solutions to the exercises and computer programs are available on the internet at http://publishing.cambridge.org/resources/052181538X.

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