



Foreword

J.-L. Mari, M. Mendes

Based on their experience in geophysics as applied to the oil and gas industry, and in the geotechnical field, the authors have set out to explain how conventional seismic methods used in deep exploration geophysics for imaging can be applied to certain geotechnical and hydrogeological surveys, and to site characterizations in the framework of seismic hazard studies. After reviewing the current state of knowledge in seismic wave propagation, refraction and reflection seismic methods, the book aims to describe how seismic tomography and full waveform inversion methods can be used to obtain seismic images of the subsurface. The book highlights the benefit of combining different seismic methods through various synthetic and field examples. In addition to these examples, the authors provide readers with guidelines to carry out these operations, in terms of acquisition, as well as processing and interpretation.

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A graduate of the *Institut Physique du Globe Strasbourg* and the IFP School (petroleum geosciences, major in geophysics in 1978), Jean-Luc Mari was employed by IFP *Energies Nouvelles* in 1979 as a research engineer in the Geophysics Department. Here he worked on several research projects, such as high-resolution seismic surveying, reservoir monitoring, and the development of borehole tools, in collaboration with industrial partners GdF-Suez, CGG, Total and ELF Aquitaine.

In 1986, he was seconded to ELF Aquitaine where he worked on reservoir geophysics. He joined IFPEN in 1987 and was seconded to the Reservoir Department, where he studied, in particular, the benefits of using geophysical methods in horizontal wells. In 1994 he was appointed to the IFP School as a professor and obtained the accreditation to supervise earth science research (HDR). He was an expert in geophysics for IFP *Energies Nouvelles*.

Jean-Luc was a member of the EAGE and an associate editor for *Near Surface Geophysics*. Currently retired from IFP *Energies Nouvelles*, Jean-Luc is an independent researcher and consultant in geophysics. He is a member of the board and of the accreditation committee for the Association for Quality in Applied Geophysics (AGAP - *Association pour la Qualité en Géophysique Appliquée*).

An author and co-author of patents and numerous scientific articles, Jean-Luc Mari has also contributed to educational scientific books and has been involved in the design and development of online learning modules, tutorials and e-books. In 2010, he received a Knighthood from the *Ordre des Palmes Académiques*.

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Manuela Mendes



Since 1990, Manuela Mendes has been an assistant professor at the *Instituto Superior Técnico*, Portugal. She received an MSc. (1986) in Geophysics and a PhD. (1989) in Earth Sciences from the University of Paris VII.

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In 1989 Manuela worked as a researcher at the *Compagnie Générale de Géophysique* (CGG), France, and participated

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She contributes regularly to peer reviewing, academic committees and is an expert-evaluator for the European Commission. Her main research interests are seismic-volcanic risk and seismic imaging applications for the oil industry, the environment and culture heritage.

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Hervé Chauris



Hervé Chauris graduated in 1996 from the *École des Mines de Paris* (Paris School of Mines, France), as a civil engineer. After a research master in Geophysics, he attained a PhD in Geophysics from the *École des Mines de Paris*. He then worked for Shell in Rijswijk, The Netherlands, between 2000 and 2005, within the seismic imaging R&D department. He became an associate professor at MINES ParisTech in 2006, before taking on a full professor position at the same institute in 2011.

Hervé completed his accreditation to supervise research in earth sciences (HDR) in 2010, on the theme “seismic imaging from locally coherent events”. His main research interests are related to the development of new algorithms for quantitative seismic imaging. Coherent events refer to the fact that seismic waves have an intrinsic spatial size. He has developed a large number of imaging algorithms in the context of Migration Velocity Analysis, a focusing technique to evaluate the quality of a given velocity model through the consistency between independent seismic images. The main applications have been developed in the context of exploration geophysics and near surface characterization.

Since 2006, Hervé Chauris has supervised 12 PhD students, 5 post-docs and 15 masters students. He has published more than 30 articles and is a co-author of 100 conference presentations. He is a member of EAGE, SEG and SIAM, a reviewer for Geophysics among other journals, and is associate editor for Geophysical Journal International and Geophysical Prospecting. He is also responsible for Geosciences education for civil engineer students at MINES ParisTech, and head of the geophysical team within the Geosciences department.

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Béatrice Yven



Béatrice Yven studied at the University of Paris Diderot where she received her PhD in Geophysics in 2001. Her research work focused on the characterization of the petrological and petrophysical properties of 3,000 m of volcanic deposits in a high-energy geothermal field. She performed a wide variety of laboratory experiments on core samples and analysed them with well logging data to extrapolate acoustic and thermal properties at the site scale.

Béatrice joined the French National Agency for Radioactive Waste Management (Andra) in 2002 where she is in charge of the 3D modelling for thermal, hydraulic and mechanical properties of the site expected to host the radioactive waste disposal. She has participated in several major R&D programmes and reference documents.

From 2014, Béatrice Yven has been working on the monitoring of geological disposal facilities. Since 2017 she has been responsible for the monitoring team and has supervised the R&D programme to ensure that reliable, durable, metrological qualified and tested monitoring systems will be available at the time of repository construction to respond to monitoring objectives.

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Michel Hayet



Graduating from the *École Nationale Supérieure de Géologie Appliquée de Nancy* in 1984, Michel Hayet was employed by CGG as a seismologist, party chief, area manager and area geophysicist, mainly in land and shallow water seismic acquisition. In 2009, he joined the *Agence nationale pour la gestion des déchets radioactifs (Andra)*, responsible for high-resolution 3D seismic surveying. Michel is the current chairman of AGAP, Association for Quality in Applied Geophysics (*Association pour la Qualité en Géophysique Appliquée*).

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