Book Review

Seismic Imaging and Inversion: Application of Linear Inverse Theory by Robert H. Stolt and Arthur B. Weglein,
Cambridge University Press, 2012; ISBN: 978-1-107-014090-9 (hbk), USD: 125.00

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This is a very handsome (in all senses of the word) book: nicely bound and well printed, with good and clear illustrations, besides which it is also useful for both understanding and applying the material it presents. Could be re-titled *Everything you wanted to know about seismic imaging and inversion, but were afraid to ask*.

The book begins with an introduction that presents a brief motivation and an overall picture about modeling, migration, and imaging, and ends with a short discussion that will make sense to non-practitioners only after they have read the book.

Next, the basic migration concepts are introduced: Kirchhoff migration, downward continuation, reverse time migration, frequency-wavenumber migration (and its relation to Kirchhoff migration), Radon transform, and some hybrid methods. This material, and all material throughout the book, is presented quite clearly and systematically. The fifty pages of Chapter 2 contain enough information for a short introductory course.

Chapters three and four deal with prestack f - k migration, including ray theoretical migration, and with migration limitations (finite bandwidth, finite aperture, extra and missing data, finite time window).

The book moves progressively to topics like realistic models, Green's functions, scattering potential, reflectivity (with emphasis on point reflectivity), synthesizing reflection data, and asymptotic modeling and migration.

All basic concepts are clearly and systematically presented, going from simple to complex, aided by figures both clear and illustrative. Whenever applicable, all subjects go from scalar to acoustic to elastic wave treatments, and from 2D to 2.5D to 3D.

The book is particularly easy to read because necessary background material, that some readers may already know but some other readers may need, is presented in very good, useful, appendices that occupy 95 out of the total 404 pages. One appendix contains a glossary and conventions. The other appendices deal with coordinates and vectors, Fourier and Radon transforms, surface and pointwise reflectivity, filters (including filter properties, filters and linear operators, and many other filters: bandpass, derivative and fractional derivative, integral and fractional integral, Hilbert transform, rho, inflection, Bessel function), stationary phase, diffraction integral, and wave-, ray-, and reflector-based coordinates.

The text presents all essential references, and avoids cluttering with unnecessary ones.

In conclusion, this is a very useful book; for beginners it presents a thorough, comprehensive, step by step treatment; for teachers it constitutes a very good source, including exercises, on which to base a course; for practitioners it can be a handy vademecum.

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