Book Review

Seismic Inverse Q Filtering by Y. Wang Blackwell publishing, 2008 (hardcover);
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The Earth is a filter for seismic waves; besides the effects of wavefront spreading and transmission/refraction at interfaces, anelasticity and other non-linear processes cause dissipation and dispersion, so that a wavelet will decrease in amplitude and increase in width as it travels. Inverse Q filtering, where Q is the well-known attenuation *quality factor*, is a procedure that endeavors to reverse the propagation effects of dissipation and dispersion, and is very important for both studies of the seismic source, and for enhancing the resolution of images in seismic exploration. The book focuses on this last aspect from a practical point of view; it does not dwell on the physics of the processes causing dissipation and dispersion, but rather on application of different schemes to improve seismic images. Indeed, in the author's words "It is written for practitioners who are attempting to improve seismic quality in terms of resolution and signal-to-noise ratio, such as processing geophysicists, and who are concerned about seismic fidelity in terms of true amplitudes, true timings and true frequencies, such as reservoir geophysicists. It is written particularly as a guide book for seasoned geophysicists who are attempting to develop seismic software for various research settings."

The first chapter (Preface) presents a brief introduction to basic concepts and to the waveform functional form, an exponential with a complex wavenumber (or, later, complex velocity), which will be used throughout the book. It also shows some examples of seismic sections before and after inverse Q filtering; a couple of these show well-log results for comparison and state that

agreement is much better after filtering, but this is hard to see from the figures and no quantitative estimates of fit are given. The next two chapters (part I) present models for attenuation and dispersion, Q models, from various sources. Chapters four to nine (part II) are devoted to different ways of doing the inverse Q filtering, taking very much into account the numerical instability problems caused in amplitude compensation by low signal-to-noise ratios; each way uses different schemes to achieve better resolution while avoiding the above mentioned instability. Among the described methods are stabilization, filtering for phase and amplitude separately, filtering by layers, filtering using the Gabor transform, and migration; their performance is illustrated by their effects on synthetic traces and on real seismic sections. Since one has to know Q in order to correct for it, the last three chapters (part III) deal with methods to estimate Q using data from vertical profiling, reflection, and crosshole tomography.

The book is well written and nicely presented and bound, with almost no typos (a Butterworth filter is used to "control the enthusiasm of the Q process"; the first term in equation (10.3) is referred to as the second).

On the negative side, real data sections look much better after filtering, but, since most of them do not present well-log data for comparison, one cannot help wondering whether those better defined features are real or an artifact of filtering. Illustrating the methods with sections having well-log data, so that performance could be measured in some quantitative way, would have been more convincing.

In conclusion, this very nice and readable book does fulfill its stated aims, and contains a vast amount of useful, well-presented material that will surely be of immense value to the practitioner.

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