An Introduction to Seismology, Earthquakes, and Earth Structure

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S. Stein and M. Wysession's *An Introduction to Seismology, Earthquakes, and Earth Structure* is the textbook I've been waiting for. It combines the pedagogical strengths of *Introduction to Seismology* by P. Shearer (1999) and the breadth of coverage of *Modern Global Seismology* by T. Lay and T. Wallace (1995). The "price" of this combination is a rather lengthy text, but it is so well written that the length can be easily forgiven.

At first glance, *An Introduction to Seismology, Earthquakes, and Earth Structure* appears to follow a very traditional path, beginning with a nice overview chapter on the relevance of seismology, followed by chapters on seismic waves that include stress and strain basics, Earth structure, earthquake sources, and seismology and plate tectonics. On closer inspection, though, the reader will find many chapter sections that are rather novel. Included among these are waves on a string, an excellent way to introduce students to the complexity of seismic waves; earthquake geodesy, which establishes the important connection between seismology and deformation studies; and plate kinematics, a clearly presented "short-course" on plate motion studies. These sections, and others like them, significantly enhance the text. The latter two in particular help give the book a broader perspective that is rare in standard seismology texts.

The first five chapters cover the essentials of seismology; these are followed by chapters on signal processing and inverse theory. While these are fine additions in principle, in practice I find them problematic. Both are too brief to truly do justice to the topics; each of which deserves an entire semester to cover appropriately at the graduate level, especially so for inverse theory. At the same time, these chapters, which are 40 and 25 pages long, are far too lengthy to squeeze into a one-semester course on seismology. I also do not think the material is suitable for independent reading by students. I would have found it more useful to have one- or two-page "text boxes" on key aspects of these topics interspersed within the text.

One of the best features of the book is the tremendous set of problems, including extensive computer programming exercises. You could teach the course several times and never assign the same problem twice. I appreciate the inclusion of the answers to most odd problems; having them will benefit the students by giving them "instant feedback" on whether or not they solved a problem correctly, and gives them an opportunity to learn from their mistakes, rather than just lose points. I also appreciate the textbook Web site, which provides electronic versions of the figures, a list of typos, and instructor access to solution sets.

My one major concern about the computer problems is the use of FORTRAN in the section of the appendix on scientific programming. Even though I program in FORTRAN, I feel that examples given in a more common language, or in a more generic form, would be more beneficial to students who are unlikely to find a FORTRAN course taught at their school.

My other criticisms are relatively minor. Some parts of the discussion of stress and strain could have been presented more simply or more clearly, and the section on potentials and boundaries is not tightly organized. The switching between 1-2-3 and x-y-z subscripts in chapter 2 is somewhat irritating and definitely unnecessary. The material on joint hypocenter determination is outdated; the authors have missed an opportunity to highlight an area in which exciting new results,

especially using waveform cross-correlation and double difference location, are emerging at a rapid pace.

The book is very nicely produced. Typographical errors are few and far between. The quality of the figures is excellent. The index, footnotes, and references are extensive. I also enjoyed the occasional humorous footnote.

An Introduction to Seismology, Earthquakes, and Earth Structure belongs on the shelf of every seismologist. I have chosen it as the text for my graduate-level seismology class this semester; but even if one does not choose to teach from it, it can serve as a fantastic resource for interesting examples, challenging problems, added coverage for selected topics, and as a general reference resource. This book is destined to become a classic.

—CLIFFORD THURBER, University of Wisconsin, Madison