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Efficient Joint
Analysis of Surface
Waves and
Introduction
to Vibration Analysis:
Beyond the Clichés

 Springer

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 Springer

ISBN 978-3-030-46302-1 ISBN 978-3-030-46303-8 (eBook)

<https://doi.org/10.1007/978-3-030-46303-8>

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Astronomy is to geology as steeplejack is to what?

Slapstick, Kurt Vonnegut

Preface

Geology, n. The science of the earth's crust—to which, doubtless, will be added that of its interior whenever a man shall come up garrulous out of a well.
The devil's dictionary—Ambrose Bierce

Technical books (textbooks, manuals, guides, and so on) are supposed to be boring and aseptic as if these *qualities* would represent the necessary seal of a serious study. Their audience is usually limited to a pretty restricted niche also because of very specialized terminologies that limit any desirable cross-fertilization (geologists can read only about geology, seismologists about seismology, structural engineers about..., and so on). Even within the, so to speak, geophysical community (*sensu lato*), seismologists and applied geophysicists never seat at the same table and, in case that happens, it is usually to allege their own superiority with respect to the other group.

But this is not without consequences. Applied geophysicists, for instance, routinely use *phase* velocities while ignoring about the relevant opportunities of the *group* velocities.

Topics and case studies presented in this volume were selected from a series of academic and applied works accomplished in the last years, always considering that surface waves represent a valuable tool for the solution of numerous geotechnical and engineering problems and can be applied well beyond the definition of the soil class in terms of response spectra in seismic hazard studies.

Often, both in the academic and professional sectors, works are performed by merely applying a standard and rigid “protocol” that does not necessarily matches the actual characteristics of the problem to solve. This often happens when the fundamentals are not sufficiently clear and, consequently, instead of shaping a solution (acquisition and analysis) that meets the actual needs and fully respect the physics, we apply a sclerotic approach that does not necessarily suit the specific conditions and goals.

In very general terms, the (active and passive) methodologies illustrated in the book address a very precise question: how can we efficiently collect and analyze the seismic data necessary to define unambiguously the subsurface model in terms of shear-wave velocities? How can we be sure (reasonably speaking) that the retrieved

model is correct? How can we set up a joint inversion capable of solving all the possible data and model ambiguities? Does *more* mean necessarily *better*?

The perspective adopted while writing the book is quite simple: once the theory is clear, we can do much more than what we might think (and with a limited field effort). The borders between *theory* and *practice* should slowly fade away and everything should converge into a clear and unitary vision of the wide range of applications that can be tackled even with a limited and simple field equipment.

This is the reason why we decided to include vibration analysis in a book otherwise focused on surface wave acquisition and analysis. On one side, vibration data can be recorded by the same kind of equipment we need for recording surface waves or, in more general terms, seismic data. On the other side, vibration analysis has a prominent importance in all the seismic-hazard national and international building codes that also require the analysis of surface waves for the definition of the shear-wave velocity profile.

Some of the datasets presented and analyzed in the book can be downloaded from the following links: <https://doi.org/10.6084/m9.figshare.12376955> or, alternatively, http://download.winmasw.com/data/Data_Dissemination_Efficient_Surface_Waves_Vibrations_Springer2020_Dal_Moro.rar.

Hope you enjoy the reading and find the way to apply the methodologies described in the book in your daily research or professional work.



Prague, Czech Republic/Udine, Italy

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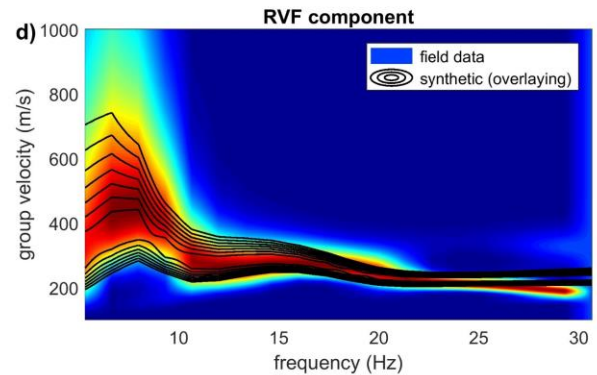
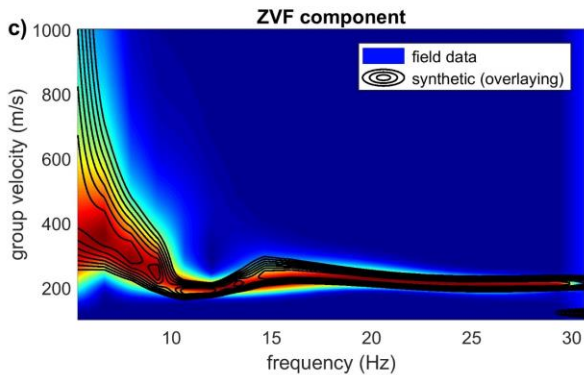
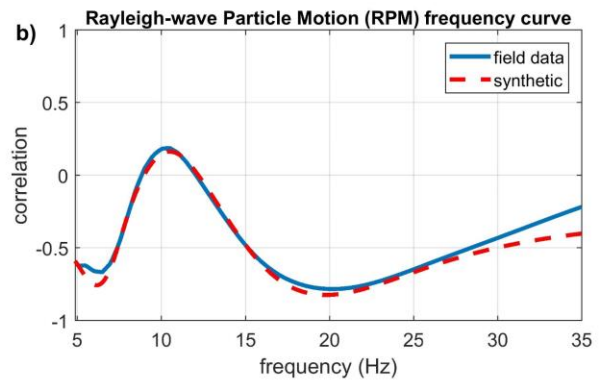
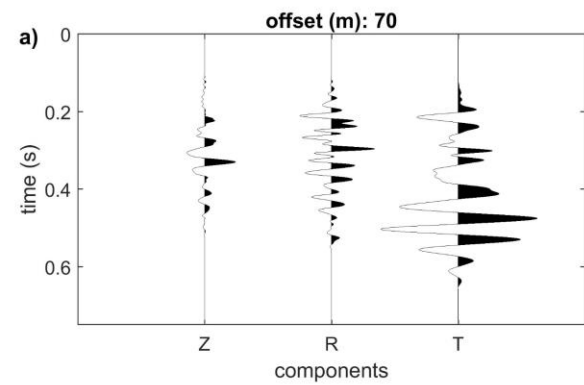
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