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A Handbook for
Seismic Data Acquisition
in Exploration

By Brian J. Evans



society of exploration geophysicists

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By Brian J. Evans

SOCIETY OF EXPLORATION GEOPHYSICISTS

*To my
weekend
who wait
my return*

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Society of Exploration Geophysicists
P. O. Box 702740
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Chapter 5

Survey Positioning

5.1 Introduction

Accurate positioning of a seismic line is as crucial as having the best possible data quality. Positioning is important for three reasons: (1) many data processing steps require accurate relative source and receiver positions; (2) tying several seismic lines together requires knowledge of where they are relative to one another; and (3) when drilling sites are selected from seismic data they have to be referenced back to an actual location on the Earth's surface. Of these reasons, perhaps the last is most important: No exploration company wants to spend millions of dollars drilling, only to miss the target because the seismic data were mispositioned.

Accurate positioning is not a trivial task, especially for marine surveys. Once a seismic vessel has sailed along an intended line, no permanent evidence remains behind to show where the ship actually sailed. Furthermore, at sea, intended shot and receiver positions cannot be identified by markers prior to shooting. Finally, during shooting, both the ship and the trailing equipment are somewhat at the mercy of the wind, currents, and wave action; the position of the shots and receivers cannot, therefore, be controlled accurately. For these reasons, positioning in marine surveys is a so-called real-time activity; that is, position measurements have to be made, recorded, and processed as a line is shot.

For land seismic surveys, positioning does not have the real-time urgency that it does in marine surveys. The shot and receiver positions can be marked on the ground either before or during the shooting of a line. Likewise, accurate marker positions can be measured leisurely at any time. Furthermore, land surveys have the luxury of being referenced to *permanent markers*, locations that are unlikely ever to be moved. Nevertheless, accurate land positioning is not simple. Survey terrains are not flat, so land positioning must include accurate elevation measurements, a dimension that is not so crucial for marine surveys. In swamps, heavily forested regions, and mountainous