PAPER D

HIGH RESOLUTION CROSS-WELL IMAGING OF A WEST TEXAS CARBONATE RESERVOIR
Part 4 - Pre-processing, Wavefield Analysis

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ABSTRACT

A well to well seismic survey was acquired in a West Texas oil field in 1991. This cross-well field experiment was acquired in a manner that permitted P-P and S-S reflection arrivals to be extracted from the complex total wavefield. In this paper and the following one, we discuss the extraction and the imaging of the reflection arrivals for the cross-well seismic data. This paper focuses on the wavefield separation and deconvolution of the data. Although reflections are barely distinguishable in the raw data, through adaptive multichannel filters applied in the domains of common source, receiver and vertical offset, we are able to produce reflection wavefields that are highly continuous, with a minimum amount of Rieber mixing. The techniques used in this work require data volumes and associated data filtering operations that are several orders of magnitude larger than those encountered in conventional VSP data analysis. In many respects, this aspect makes data manipulations more similar to conventional surface seismic processing than to VSP processing. The high quality of the S-S reflections imaged from single component borehole hydrophone data in this experiment may reduce the use of multicomponent sources and receivers for some cross-well applications.

 # Now with the University of California, Berkeley

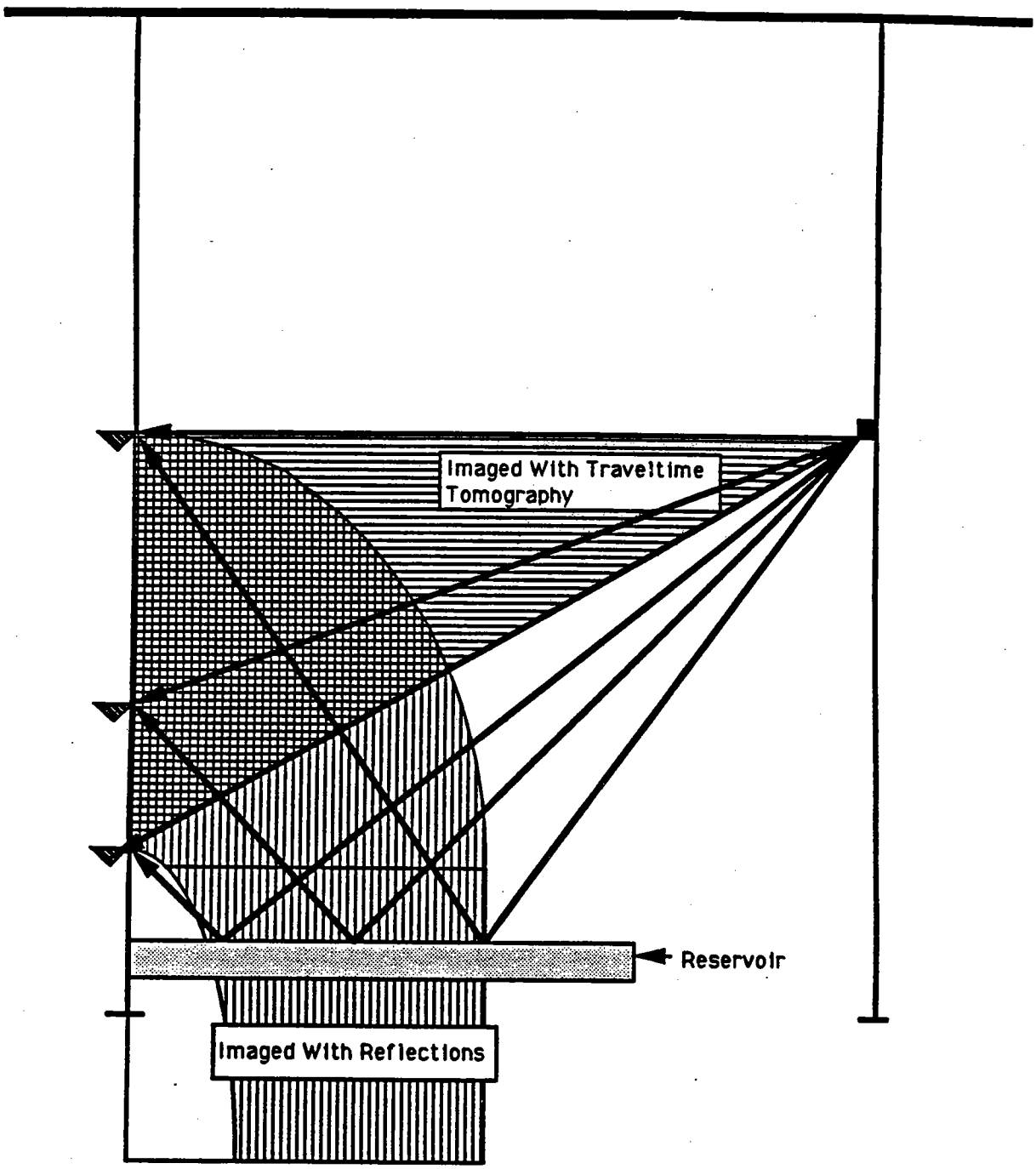

Figure 1: Subsurface region imaged with crosswell traveltime tomography compared with region imaged with crosswell reflections for a single common shot gather.

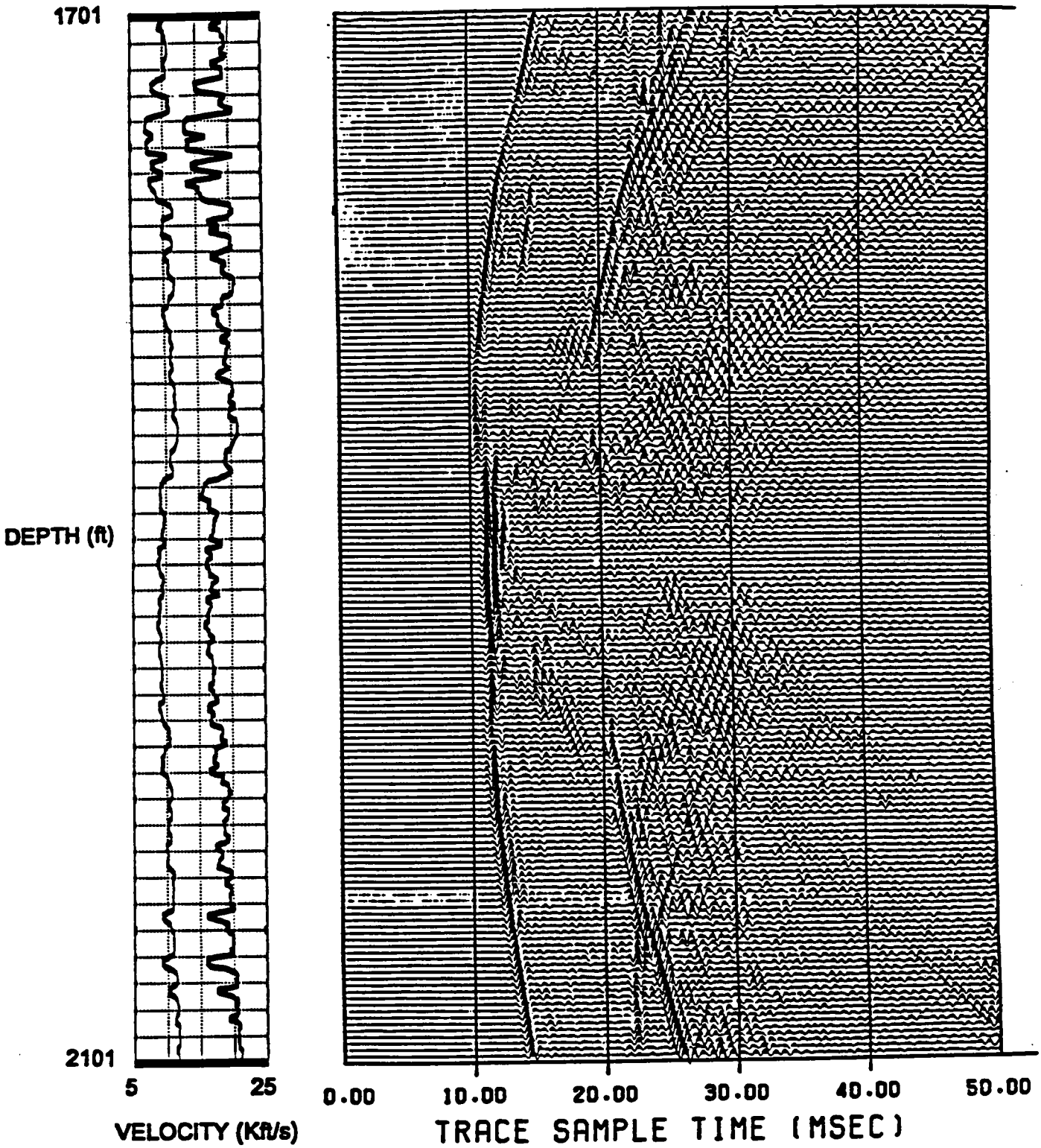

Figure 2: A typical common receiver gather from the West Texas well-to-well experiment. The receiver depth was 1904 ft, just below the top of the reservoir (the bottom of the reservoir was around 1964 ft). Source positions between 1701 ft and 2101 ft every 2.5 ft are shown.

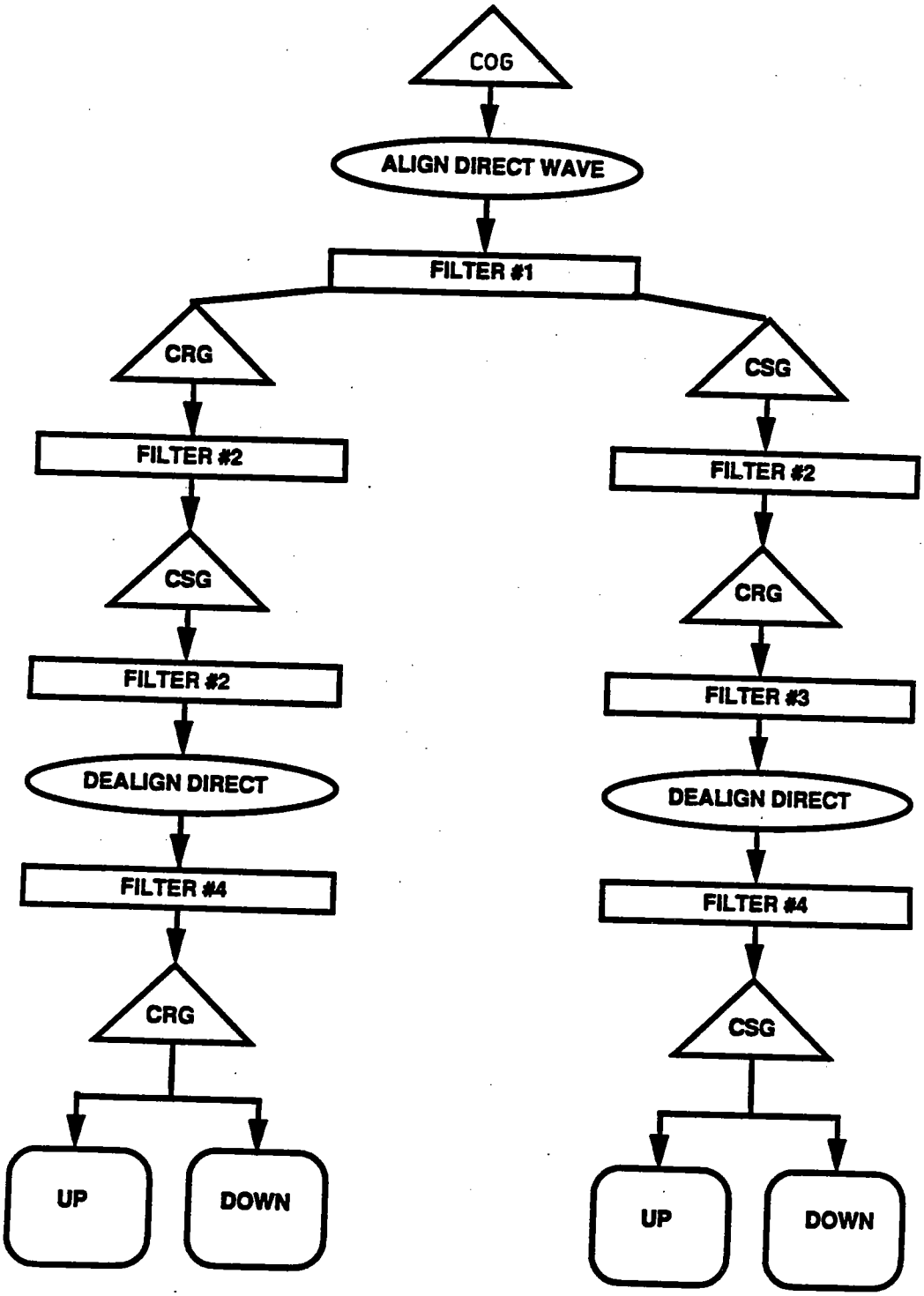

Figure 4: Wavefield separation processing flow used to extract crosswell reflections. Triangles are sorts, rectangles are multichannel filters, and ellipses are time aligning operations.

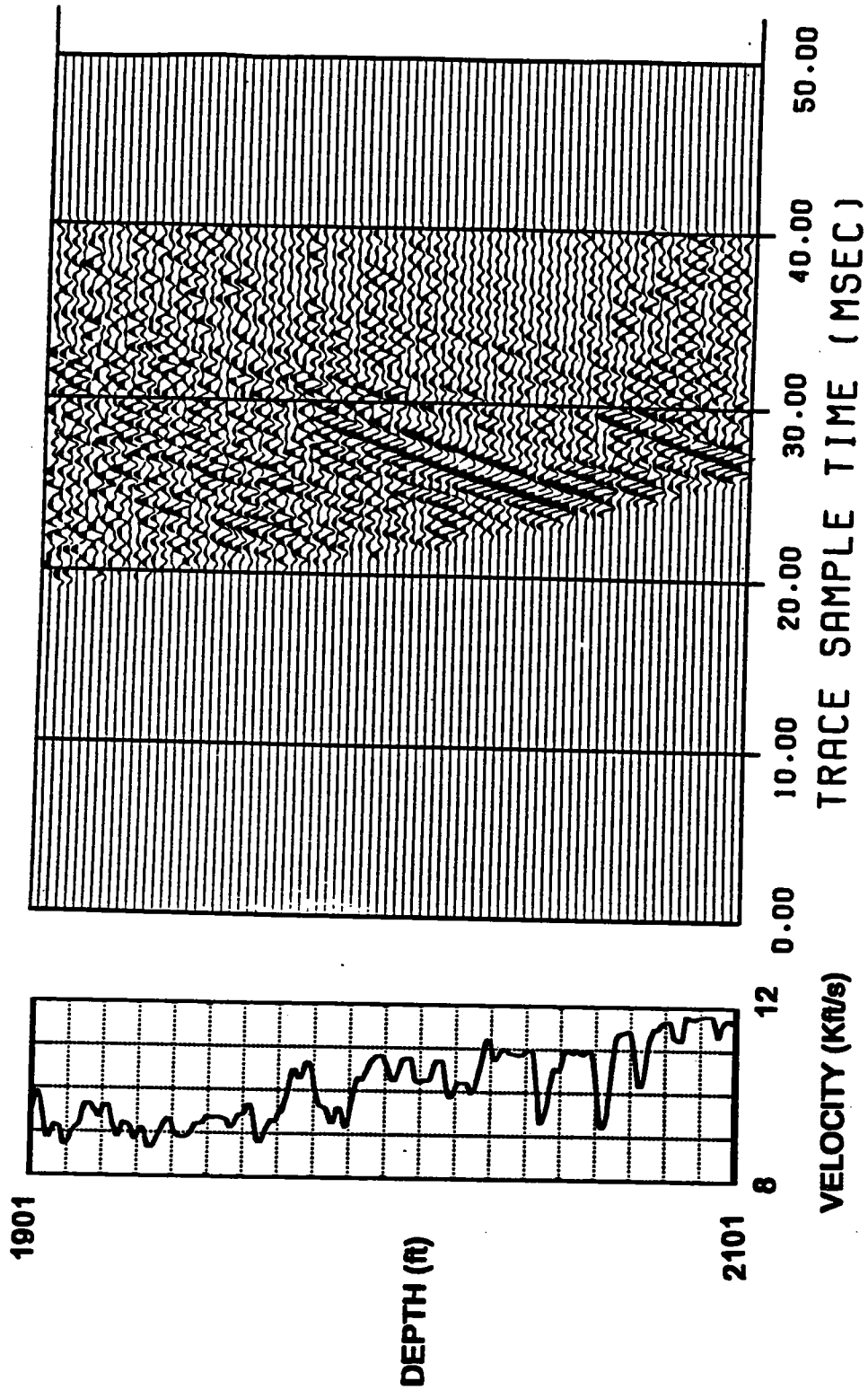

Figure 5: Upgoing S-wave reflection wavefield for the data displayed in Figure 2.

ACKNOWLEDGMENTS

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