

MEETINGS

HGS LUNCHEON MEETING— NOVEMBER 29, 1989

A CASE HISTORY OF VELOCITY PROBLEMS IN THE SHADOW OF A LARGE GROWTH FAULT IN THE FRIO FORMATION, TEXAS GULF COAST

False structure can appear on seismic data in the shadow of normal growth faults, with the upthrown time structure appearing to roll into the fault where no such roll exists in depth. This phenomenon was encountered in a prospect in the Frio formation of the Texas Gulf Coast, where a large growth fault expanded a thick, low-velocity shale above the Frio. Two check-shot velocity surveys, one at either end of the seismic control, demonstrated a severe average velocity gradient across the prospect at the level of the objective geologic formation.

Assuming first one and then the other velocity survey was valid over the entire area for conversion of well data to time produced a drastic difference in the structural interpretations of the seismic data. The more obvious interpretation required a down-to-the-northwest fault with a down-thrown rollover anticline at the objective formation. This interpretation had been previously tested with a dry hole on the crest of the time structure. This interpretation also contradicted a dipmeter in this "crestal" well.

Using a model derived from interval velocities from the nearby check-shot surveys, we were able to demonstrate that over 200 ms of apparent seismic dip in the shadow of the growth fault was false. When we used stacking velocities to perform a depth conversion of the seismic time section, both the apparent dip direction of the formation and interpreted throw direction of the fault were reversed. Based on these results, a well was drilled which demonstrated the qualitative success of our model. We also discovered that minor buried faulting mapped behind the major fault was a false effect caused by velocity contrasts across the growth fault.

This case history proves that the recognition and proper use of velocity gradients can be extremely important in the Gulf Coast.

JAMES L. ALLEN—Biographical Sketch



James L. Allen received a B.S. in physics from Baker University and a Ph.D. in physics from the University of Wyoming. He worked for Exxon Co. USA in Houston and for Esso Exploration, later joining Texas Eastern Transmission Corporation as a geophysical advisor. Dr. Allen started Allen Geophysical Consulting in 1980. He concentrates on Gulf Coast exploration and interpretation with emphasis on special problems.

J. M. BRUSO, JR.—Biographical Sketch



J. M. Bruso, Jr. received a B.S. in geology and is currently working on his M.S. in geophysics at the University of Houston. He has worked for Hunt-Sedco International, Dow Chemical U.S.A. and with several independent geophysical consultants on foreign and domestic assignments. He now works for Allen Geophysical Consulting, where he does exploration and development geophysics for various clients, concentrating on the Gulf Coast.