

Experiences with seismic amplitude in Mexican Tertiary sediments

Alistair Brown, Consulting Reservoir Geophysicist, Dallas, Texas, USA

For several years Mexico has been engaged in a major initiative to increase gas production. All along the east coast onshore and offshore seismic amplitude is being used to explore for gas.

There are many amplitude anomalies and many of these are caused by hydrocarbon. Amplitude is a reliable indicator of hydrocarbon in Pliocene and Pleistocene sediments. Amplitude often leads to hydrocarbon in the Upper Miocene and sometimes in older sediments. Depth is also a factor. Visibility of hydrocarbon as bright spots clearly depends on some complex product of age and depth.

Much effort has been expended in determining the polarity and phase of each 3-D data set so that the character of hydrocarbon can be predicted. Much of the data studied is American polarity and close to zero phase. However, many surveys have European polarity and several are close to 90⁰ phase. An attempt has been made to unify color usage so that blue is always positive amplitude and red is always negative amplitude. This is, of course, normal worldwide convention. Using these colors, a hydrocarbon bright spot in American polarity is red-over-blue, and in European polarity is blue-over-red.

Natural pairing of top and base reflections and the clarity of their terminations have been additional important observational evidence. In the thicker reservoirs flat spots are visible. High amplitude-over-background always increases confidence in hydrocarbon identification. Reflection broadening and sag below have provided further evidence. When a reservoir exceeds quarter-wavelength in thickness, accurate estimates of maximum gross thickness are possible.

Data quality issues have always been a concern. These include data acquisition irregularity, no-permit areas, methods of amplitude preservation, low predominant frequency, survey edge effects, and possible phase variability.

Many case history examples will be shown in this paper to illustrate all the above points. Some of the amplitude anomalies are now successful gas wells and some are still prospects.