AVO Effects and Velocity Analysis

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Abstract

Conventional velocity analysis is based on the estimation of velocity from maximum points of coherence measure. Semblance velocity analysis is based on the assumption of constant amplitude and does not take into account amplitude variations with offset. It becomes an important problem when the amplitudes change their sign (Class II AVO response, Rutherford and Williams, 1989). Taking AVO effects into account in the seismogram model should improve determination of stacking velocity and therefore improve results of AVO analysis. To take into account amplitude variations with offset, we should use a generalization of the coherence measure. In this paper we consider some generalizations of coherence semblance, which explicitly implement AVO effects. Because the number of estimated parameters increases, the problem of reduction of velocity precision arises. We investigate the influence of AVO effects, including events with reversed polarity and large amplitude variations, on the accuracy of velocity determination on model and real data. We also derive some analytical expressions, which allow us to estimate the reliability of velocity determination for non-hyperbolic NMO functions.