Two multi-component near-offset VSP experiments from the Conoco Borehole Test Facility, Oklahoma are analysed in terms of shear-wave birefringence. The shear-wave birefringence is compared with permeability and porosity logs. A correlation exists between the highly permeable/porous zones in the sandstone formations and the degree of shear-wave birefringence.

The shear-wave birefringence observations are inverted using a global optimization technique known as a genetic algorithm. Inversion results suggest that the fracture system is sub-vertically orientated. The resolution for the fracture dip parameter is constrained by the choice of source azimuths which lie on approximately opposite azimuths.

A class of anisotropic materials, which may exist in real rocks, with hexagonal symmetry is identified with shear-wave behaviour contrary to usual expectations. For these materials the Thomsen gamma parameter is negative. We investigate whether realistic situations exhibit this type of anisotropy using equivalent media formulations. Cracks/fractures and fine layering are found to be an unlikely source for such materials. However, systems comprised of aligned prolate ellipsoids are found to exhibit this type of anisotropy. Such a situation may represent sandstones for which individual sandstone particles are depositionally aligned.