

Estimating Reservoir Thickness from Seismic Using Enhanced Stockwell Transform

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ABSTRACT

Reservoir thickness estimation is crucial for wells placement, wells planning, geosteering deviated wells, and reservoir modeling. The most accurate estimation of reservoir thickness is usually derived from well data, particularly in production fields where wells and data control points are abundant. On the other hand, well data are not sufficient to estimate reservoir thickness in exploration frontiers with small number of wells or where the thickness varies considerably over short distances. In such situations, the seismic data is the best candidate to extract thickness information. In practice, thickness is usually estimated from seismic by the difference between the interpreted top and base of a formation. However, this approach might not be sufficiently accurate especially for the base of the reservoir. We demonstrate a method for estimating reservoir thickness from seismic reflectivity using an enhanced Stockwell Transform (ST). In this method, thickness can be estimated at every point in the seismic cube to produce a thickness cube. Alternatively, the thickness can be estimated for a given horizon to produce thickness map. The method works by first computing an enhanced version of ST to find the resonant frequency, and then estimating the thickness from the wavelength of that frequency. Since velocity in a given formation is almost constant, thickness is proportional to the wavelength of the resonant frequency for that formation. We demonstrated this technique with few examples.