

Locating Optimal Onshore Drilling Spot by Heuristic Passive Seismic

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ABSTRACT

Sometimes geologist must determine drilling spot without adequate information. It is common in exploration phase where 2D seismic is the only available subsurface information. Seismic 2D lines usually have acquired in crossing or parallel configuration using space between 200 to 500 m. This acquisition geometry will leave a blank area which is usually filled by a geostatistical method in the G&G process. A similar situation exists in a 3D seismic area where geological complexity, such as channel or lenses reservoirs, makes it difficult to detect a pay zone.

Geologist has to locate the drilling spot, even in the 'blank area' without subsurface information support. In this case, some confirmation methods are necessary to ensure the drilling success. One of the methods is Hydrocarbon Microtremor Analysis (HyMas) which is based on the low frequency of passive seismic data. It is known empirically that the frequency amplitude of 2-5 Hz will be higher when geophone is placed above the pay zone. This anomaly is a resonance emitted from the hydrocarbon. When the geophone located on top of a pay zone, the vertical tremor response (V) will be higher than horizontal tremor response (H), hence the V/H will be higher than 1. Outside of a pay zone, the V/H becomes less than 1. The HyMas method is popular in onshore exploration because of its cost-efficient and simplicity.

Although relatively low cost, it is still challenging to detect a pay zone especially in complex geological environments such as channel or lenses reservoirs. To increase the effectiveness of survey we can use a heuristic algorithm to find the best drilling location in an efficient way. Using V/H information from on-site passive seismic processing, and confirmed by geological play concept, this method can detect pay zone boundary in minimal steps, hence increasing drilling success with only a tiny cost.