

RESERVOIR IMAGING USING INDUCED MICROSEISMICITY

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Activities within a hydrocarbon reservoir, such as producing oil or injecting fluid, change in-situ stresses which consequently cause micro-earthquakes. The induced microseismic events are small earthquakes producing high frequency waves which can be used to give a better understanding of the hydrocarbon reservoir. However, induced microseismic events are too small in magnitude to be detected on the surface due to seismic wave attenuation through the overburden. Therefore, in order to make use of such induced microseismic waves for monitoring, characterizing and/or imaging of the hydrocarbon reservoir, one should use buried sensors within monitoring wells. The microseismic events generated within a hydrocarbon reservoir as a result of the production activities are recorded. Then, the recorded first arrival times are used in inversion process to arrive at a detailed velocity model in the vicinity of the reservoir. The inversion process is based on a fast 3D finite-difference code using the eikonal equation to model the travel times of first arriving seismic events and; therefore, making the inversion of large 3D model practical. The methodology could lead to enhanced understanding and hence efficient management of the hydrocarbon reservoir. This in turn would enhance the understanding of fluid movements resulting in improved petroleum recovery from the reservoir.

Technical Area: Seismic Modelling and Inversion, Reservoir Characterisation