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Seismic data analysis of intensity, orientation & distribution of fractures in basement rocks for reservoir characterization

Mohit Kumar
Wipro Technologies, India

Natural fractures are classified in two broad categories of joints & faults on the basis of shear movement in the deposited strata. Natural fracture always has structural high relationship with extensional or non-extensional tectonics & sometimes the result is seen in the form of micro cracks. Geological evidences suggest that both large & small scale fractures help in to analyze the seismic anisotropy which essentially contributes in to characterization of petro physical properties behavior associated with directional migration of fluid. We generally question why basement study is much needed as historically it is being treated as non-productive & geoscientist had no interest in exploration of these basement rocks. Basement rock goes under high pressure and temperature & seems to be highly fractured because of the tectonic stresses that are applied to the formation along with the other geological factors such as depositional trend, internal stress of the rock body, rock rheology, pore fluid & capillary pressure. Sometimes carbonate rocks also plays the role of basement & igneous body e.g. basalt deposited over the carbonate rocks & fluid migrate from carbonate to igneous rock due to buoyancy force & adequate permeability generated by fracturing. So, in order to analyze the complete petroleum system, FMC (Fluid Migration Characterization) is necessary through fractured media including fracture intensity, orientation & distribution both in basement rock & county rock. Thus, good understanding of fractures can lead to project the correct wellbore trajectory or path which passes through potential permeable zone generated through intensified P-T & tectonic stress condition. This papers deals with the analysis of these fracture property such as intensity, orientation & distribution in basement rock as large scale fracture can be interpreted on seismic section however small scale fractures shows ambiguity in interpretation because fracture in basement rock lies below the seismic wavelength & hence shows erroneous result in identification. Seismic attribute technique also helps us to delineate the seismic fracture & subtle changes in fracture zone & these can be inferred from azimuthal anisotropy in velocity & amplitude and spectral decomposition. Seismic azimuthal anisotropy derives fracture intensity & orientation from compressional wave & converted wave data and based on variation of amplitude or velocity with azimuth. Still detailed analysis of fractured basement requires full isotropic & anisotropic analysis of fracture matrix & surrounding rock matrix in order to characterize the spatial variability of basement fracture which supports the migration of fluid from basement to overlying rock.

Biography

Mohit Kumar has completed his graduation from University of Petroleum & Energy Studies, Dehradun. Currently, he is working as Geologist in Wipro Technologies.

mohit1992kumar@gmail.com

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