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A hybrid rock physical model for wave attenuation in a porous media periodically saturated with three fluids

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In Geophysics, Seismic wave is regarded as an effective tool for the exploration of subsurface of earth. Due to heterogenous nature of rocks beneath surface, seismic wave get attenuate. Wave induced fluid flow at different scale is considered as the main cause of wave attenuation and dispersion. The main intent of this paper is the presentation of a methodology to analyze the combined effect of global, intermediate and local scale heterogeneities, on wave propagation in a cracked porous medium saturated by three immiscible fluids. In order to accomplish our proposed approach, we have choosed appropriate boundary conditions and incorporated heterogeneity due to immiscible fluids forming a layered system within a cracked porous rock, into the Biot poroelastic theory. Three attenuation peaks are appear in wave attenuation curve. Among the three attenuation peaks, first two confirms the fluid compressibility contrast at a mesoscopic scale where the third one indicates the occurrence of squirt flow at the microscopic scale. Velocity dispersion at the same frequencies reinforces the concept of occurrence of destructive interference at the interface between fluids having disparate nature. We further investigated the effects of rock parameters on compressional wave propagation. With above-mentioned inferences, our work arise as a practical tool for the development of rock physical theories with the intention to estimate and identify fluids from seismic data.

Biography

Qazi Adnan Ahmad is currently a PhD Student at School of Geoscience, China University of Petroleum, East China.

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