AGU FALL MEETING
San Francisco | 12–16 December 2016

H43F-1520: A Comparison of Patchy Saturation Velocity Models to Ultrasonic Tests.

Thursday, 15 December 2016
13:40 - 18:00
Moscone South - Poster Hall

- ePoster - Poster_AGU_GB_H43F-1520_v10.pdf

Characterization and monitoring of underground reservoir properties is of paramount importance for a multitude of disciplines. Acoustic wave velocity measurements, like in seismic surveys and well logs, are one of the most attractive approaches to gather information about reservoirs, as they provide reliable information with the needed spatial coverage and resolution required for many applications. Yet, the estimation of this parameter in partially saturated rocks can be a challenging assignment due to uncertainties associated with heterogeneities in fluid saturation. In order to analyze and interpret field data at partial saturation conditions, patchy saturation models are used to perform fluid substitution simulations, although commonly some of their underlying assumptions are deliberately ignored. Therefore, this work aims to experimentally investigate the performance of widely used patchy models (Gassmann-Voigt, White's spherical and White et al. layered model) at controlled patchy saturation conditions. Patchy saturated samples were created in the laboratory using a simple saturating and stacking methodology and submitted to ultrasonic tests at two wave frequencies (100 and 250 kHz). From the laboratory data and predictions of the models, it was found that the models based on Biot's theory seem to perform better, as they presented errors smaller than Gassmann-Voigt and are based on more realistic assumptions. Moreover, a simpler velocity average method appears to perform just as well, if not better, than these more complex and commonplace models, since it presented the smallest deviations from the experimentally measured velocities.

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