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ABSTRACT
Any quantitative workflow, designed to constrain reservoir models to 3D/4D seismic data, must rely on petro-elastic modelling (or PEM), which relates fluid and rock properties to elastic ones.
Various scales must be accounted for: laboratory cores and well logs, geological and seismic grids, fluid flow simulator models. The petro-elastic model is generally a fine-scale model ("pem"), defined and calibrated for each specific case against core and logs data.
Aiming a 4D history matching workflow at the flow model scale, we then need to validate the use of the logs-scale calibrated "pem" at a larger scale, vertically and laterally. In this paper we proposed a methodology to define an upscaled "PEM" (new set of relationships valid at reservoir-scale), by tuning a fine-scale existing "pem", adjusting the most sensitive and relevant parameters, by an optimisation procedure.Some previous studies already addressed downscaling problems (from reservoir to geological/seismic scale), but no previous work has proposed any solution for an upscaled PEM. The main results of this study, using real field data, are the following:
upscaling is necessary, depending on the degree of static and dynamic heterogeneity; the optimisation procedure is successful in calibrating a fine-scale "pem" to get a reservoir-scale "PEM"; the procedure is sensitive to the Backus averaging parameters, which must be defined carefully; this workflow is performed at wells in this study, but could be extended to reservoir scale, when a fine-scale geological model is available.