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# Integration of petroleum systems and geomechanical modeling workflow. Case study: Lower Magdalena Basin (Colombia)

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## Abstract

Petroleum systems modeling is presented as complementary methodology which aims to reduce the uncertainty of geomechanical reservoir analysis and to improve stress prediction. Instead of the *a priori* assumptions concerning mechanical properties and pore pressures commonly used in static geomechanical models, the incorporation of the burial history through geological time and migration history of a sedimentary basin can provide process-based geomechanical input parameters and initial conditions for present-day and future states of stress.

In order to illustrate the practical relevance of the workflow, a 3D geomechanical assessment of a gas condensate reservoir in Northern Colombia was performed considering the geological basin evolution of the key petroleum system elements and processes. The integration of this information contributes in the definition of the influence of geological processes in the mechanical parameters and to improve the prediction of basin-wide stresses. Nevertheless, it has been reported the necessity of an intensive calibration process to test the capabilities of this methodology, implying the requirement of a statistically representative data set. Main results of this methodology include data cubes for present-day such as Young's modulus, Poisson ratio, pore pressure and all components of the 3D stress tensor as an input for a specific geological age.

The good correlation with in situ measurements shows the importance of understanding the reservoir evolution through time, additionally to identifying the main events that conditioned the present-day stress state, in order to deliver more accurate and reliable results, less uncertainties in predictive phases and having the capability of being replicated in different basins all over the world.