WS3-01

Integrating Multiscale Information when Using Seismic Information for Geological Modelling

T. Cadoret* (Total S.A.)

SUMMARY

With seismic quality improving every year, it is more and more frequent to use seismic information to help populating geological model. To achieve this, it is essential to handle efficiently the various scale changes it implies.

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This presentation will illustrate tools or workflows, recently developed and used within Total to deal with upscaling or downscaling issues at different levels:

- When performing facies classification using seismic attributes it is necessary to define a training operator based on a facies description compatible with seismic scale. A workflow is proposed allowing to use quantified criteria to help upscaling fine scale geological facies at seismic scale.

- In order to use seismic information for geological model in-filling, we sometimes face a situation where seismic resolution is much larger than the thickness of reservoir model cells. To handle such situation we have developed original geostatistcal functionalities named LCSim and LCKrig. They correspond to linear constrained simulation or krigging allowing distributing petrophysical properties at fine vertical scale making sure that the vertical average of these properties honour the seismic constraint defined at larger scale.

- Petroelastic models (PEM) are necessary to perform seismic backloop in which we use the petrophysical description defined by the 3D geological model to synthesize a theoretical seismic response, that we compare to actual seismic measurements. It gives us a way to highlight zones where these two pieces ofinformation show a poor match and where possibly the geological model could be modified to enhance the fit. To do so the PEM has to operate at a larger scale than the log scale at which they are defined. To improve this aspect we propose to use a PEM optimization tool to improve PEM ability to deliver reliable prediction at the geological model scale.