WS11 P03

Uncertainty analysis in forward stratigraphic modeling: new approaches to de-risk geological models

N. Hawie* (Beicip-Franlab), A. Thebault (Beicip-Franlab)

Summary

Traditionally, forward stratigraphic models have been used to better assess vertical and lateral facies variations with regards to several environmental parameters affecting both siliciclastic and carbonate realms (i.e., eustasy, carbonate production versus depth and time, wave energy and direction, drainage systems characteristics, subsidence amongst others). Models were generated manually and several scenarios related to input parametrization were tested. Such manual and lengthy tasks hindered the complex assessment of uncertainties and risks related to the geological model while sensitivity of interacting input parameters could not be manually assessed. In order to answer the Oil and Gas industry needs, a new approach has been developed combining forward stratigraphic modeling using DionisosFlow and automated multi-realization and uncertainty analysis using CougarFlow tools. This innovative approach was tested on siliciclastic, carbonate and mixed systems at basin and field scales allowing the end user to simulate hundreds of automated scenarios using a Latin Hypercube Experimental design and a response surface approach. This integrated work tackles challenges faced in classical stochastic geological modelling by providing a stratigraphically-constrained and process based approach of the facies distribution in reservoir and basin models.

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Nicolas Hawie, Alcide Thebault (Beicip-Franlab)

nicolas.hawie@beicip.com

alcide.thebault@beicip.com

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