Fault Facies modelling – a practical approach to incorporating 3D fault architecture in standard reservoir models

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Present methods for including faults in reservoir simulation models largely disregard the fact that fault impact in reservoirs is commonly not limited to a single, clear-cut fault plane but affects a volume of host rock, thereby creating a complex 3D architecture significantly influencing fluid flow. By failing to incorporate the presence of often extensive fault damage zones and fault core architectures into the reservoir model:
-          actual 3D flow inside and through fault zones is not captured
-          in-place volumes are overestimated
-          fault sealing (including capillary seals) is highly simplified
-          communication along faults can not be forecast
-          model uncertainty cannot be properly evaluated as fault features critical for reservoir behaviour are not included in the model
-          hazardous areas for drilling can not be reliably predicted

The Fault Facies project has developed a practical methodology that allows volumetric gridding of fault zones on reservoir scale models and populating the resulting fault envelopes with realistic fault architectural elements and petrophysical properties. Models are built using a standard reservoir modelling tool (Irap RMS^{TM}) employing a customised gridding algorithm in HAVANA. Architecture and petrophysical properties of the fault zones are modelled by adapting facies model tools developed for object based modelling of sedimentary facies and employing volumetric strain as a conditioning parameter for the resulting fault zone architecture and petrophysical properties. The new method is fully integrated with existing modelling workflows and offers a practical solution to evaluation of fault impact on reservoir fluid flow in realistic detail.