A combined 3D surface-subsurface model of the middle Miocene Belait Delta, onshore Brunei Darussalam, NW Borneo

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The western flank of the Jerudong Anticline, onshore Brunei Darussalam, provides a rare opportunity to analyse the base of a major Miocene mud-rich delta in outcrop, including kilometre-scale prograding clinoforms and large-scale syndepositional faults. 2D reflection seismic and well data image the depth continuation of this system a few kilometres westward in the subsurface of the Belait Syncline. In order to link geological observations at surface with geophysical signatures in the subsurface, a combined, quantitative 3D surface-subsurface model was built that integrates existing geomorphological, geological and geophysical data. This model allows us to

1) analyse and discuss the relation between geological field observations and the geophysical subsurface signature of corresponding geological features;

2) retro-deform the clastic system to its spatial orientation prior to folding, thus restoring the original middle Miocene 3D geometry of synsedimentary faults, deltaic topset-foreset units and delta-front turbidites;

3) evaluate the primary controlling factors on Miocene delta development in Brunei Darussalam by dynamic stratigraphic modelling.

The construction procedure of the static model, as well as the dynamic modelling components presented in this Brunei case study can be applied as analogue in any other project requiring a full 3D integration of geomorphology, surface geology and subsurface geophysics. The individual modelling outputs generated can be directly used for further geological analyses, including 3D thermal-history and basin modelling, 3D fault-seal and fracture modelling and reservoir/seal prediction.