EGU21-997
https://doi.org/10.5194/egusphere-egu21-997
EGU General Assembly 2021

Three-dimensional geometry and growth of a basement-involved fault network developed during multiphase extension, Enderby Terrace, North West Shelf of Australia

Hongdan Deng[1,2] and Ken McClay[2,3]
[1]China University of Geosciences, College of Marine Science and Technology, China (denghongdan@gmail.com)
[2]Royal Holloway University of London, Department of Earth Sciences, UK (Hongdan.Deng.2013@live.rhul.ac.uk)
[3]Adelaide University, Australian School of Petroleum, Australia (terratectonicsaustralia8115@yahoo.com)

Basement fault reactivation, and the growth, interaction, and linkage with new fault segments are fundamentally three-dimensional and critical for understanding the evolution of fault network development in sedimentary basins. This paper analyses the evolution of a complex, basement-involved extensional fault network on the Enderby Terrace on the eastern margin of the Dampier sub-basin, NW Shelf of Australia. A high-resolution, depth-converted, 3D seismic reflection data volume is used to show that multiphase, oblique extensional reactivation of basement-involved faults controlled the development of the fault network in the overlying strata. Oblique reactivation of the pre-existing faults initially led to the formation of overlying, en échelon Late Triassic – Middle Jurassic fault segments that, as WNW–directed rifting progressed on the margin, linked by breaching of relay ramp to form two intersecting fault systems (F1 and F2-F4). Further reactivation in the Latest Jurassic – Early Cretaceous (NNW–SSE extension) produced an additional set of en échelon fault arrays in the cover strata. The final fault network consists of main or principal faults and subordinate or splay faults, together with branch lines that link the various components. Our study shows that breaching of relay ramps and/or vertical linkages produces vertical and horizontal branch lines giving complex final fault geometries. We find that repeated activity of the basement-involved faults tends to form continuous and planar fault architectures that favor displacement transfer between the main constituent segments along strike and with depth.